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APPLICATION NUMBER: *17/956,889*
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Assignee name and address: ENTROPIC COMMUNICATIONS, LLC
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The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature /Andrea L. Gothing/	Date 2021-05-04
Name Andrea L. Gothing	Telephone 415-830-0613
Title Licensing Officer and Authorized Signatory, Entropic Communications, LLC	

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Application Number	
Filing Date	2022-09-30
First Named Inventor	Madhukar Reddy
Art Unit	
Examiner Name	
Attorney Docket Number	28427US16

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	1	6906498		2005-06-14	Breuch et al.	
	2	6992855		2006-01-31	Ehrlich	
	3	7095454		2006-08-22	Waight et al.	
	4	7167694		2007-01-23	Khoini-Poorfard et al.	
	5	7362178		2008-04-22	Montemayor et al.	
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	7	7421259		2008-09-02	Gomez et al.	
	8	8285240		2012-10-09	Seendripu et al.	

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	9	8374568		2013-02-12	Seendripu et al.	
	10	8374569		2013-02-12	Seendripu et al.	
	11	8374570		2013-02-12	Seendripu et al.	
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	19	9210362		2015-12-08	Reddy et al.	

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	20	8526898		2013-09-03	Reddy et al.	
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	31	6282184		2001-08-28	Lehman et al.	
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	42	11381866		2022-07-05	Reddy et al.	

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	4	20040110522	A1	2004-06-10	Reddy et al.	
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	Examiner Name	
	Attorney Docket Number	28427US16

	9	20030228855	A1	2003-12-11	Herz et al.	
	10	20040058661	A1	2004-03-25	Hsu et al.	
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	13	20070179649	A1	2007-08-02	Mitsuno	
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	1	2087623	EP	A2	2009-08-12	RF Magic Inc.		

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	Attorney Docket Number	28427US16

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	1	JEFFREY A. WELDON, et al. "A 1.75-GHz Highly Integrated Narrow-Band CMOS Transmitter With Harmonic-Rejection Mixers, IEEE Journal of Solid-State Circuits, December 2001, pages: 2003-2015, Vol. 36, No. 12, Seattle, Washington.	
	2	Int'l Search Report and Written Opinion Appln No. PCT/2010/031631 mailed June 17, 2010.	
	3	Int'l Search Report and Written Opinion Appln No. PCT/2010/031627 mailed June 18, 2010.	

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Signature	/Wayne H. Bradley/	Date (YYYY-MM-DD)	2022-09-30
Name/Print	Wayne H. Bradley	Registration Number	39916

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Applicant(s): R F MAGIC INC [US] ± (R.F. MAGIC INC, ; RF MAGIC, INC)

Classification: - international: *H03J1/00; H04B1/28; H04H40/90*
- cooperative: H04B1/28; H04H40/90

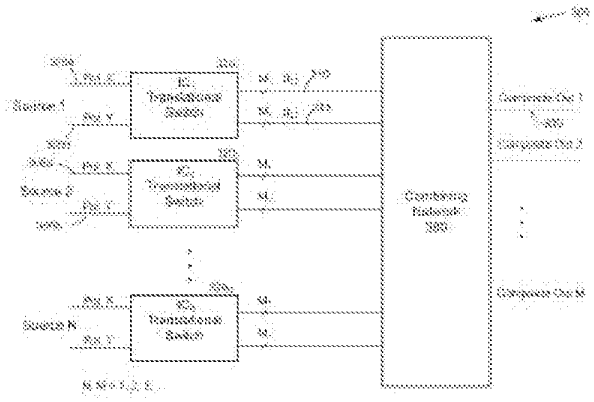
Application number: EP20070870121 20071231

Priority number(s): WO2007US89192 20071231 ; US20060864352P 20061103 ; US20070885814P 20070119 ; US20070886933P 20070128

Also published as: EP2087623 (B1) US2008112385 (A1) US2012099623 (A1) US8892026 (B2) WO2008064371 (A2) more

Abstract not available for EP2087623 (A2)
Abstract of corresponding document: US2008112385 (A1)

Circuits, systems, and methods for assembling a composite signal include a frequency translation circuit coupled to receive an input signal and operable to generate a plurality of frequency-translated versions of the input signal at a respective plurality of different frequencies, the plurality of frequency-translated input signals defining a group of frequency translated signals. The plurality of frequency translated signals may each be processed to provide a composite signal.



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(11) Veröffentlichungsnummer:
(11) Publication number: **EP 2 087 623 A0**
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WO 2008/064371 (Art. 153(3) EPÜ).

International application published by the World Intellectual Property Organization under number:

WO 2008/064371 (Art. 153(3) EPC).

Demande internationale publiée par l'Organisation Mondiale de la Propriété Intellectuelle sous le numéro:

WO 2008/064371 (art. 153(3) CBE).

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A 1.75-GHz highly integrated narrow-band CMOS transmitter with harmonic-rejection mixers

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A 1.75-GHz Highly Integrated Narrow-Band CMOS Transmitter With Harmonic-Rejection Mixers

Jeffrey A. Weldon, R. Sekhar Narayanaswami, Jacques C. Rudell, *Member, IEEE*, Li Lin, Masanori Otsuka, Sebastien Dedieu, Luns Tee, *Student Member, IEEE*, King-Chun Tsai, *Student Member, IEEE*, Cheol-Woong Lee, and Paul R. Gray, *Fellow, IEEE*

***Abstract*—A highly integrated 1.75-GHz 0.35-μm CMOS transmitter is described. The I/Q modulator-based transmitter facilitates integration through the use of a unique mixer, termed a harmonic-rejection mixer, and a wide loop bandwidth phase-locked loop (PLL) for the RF synthesizer. The harmonic-rejection mixers are used to eliminate the need for a discrete IF filter and the use of a wide loop bandwidth PLL allowed for the complete integration of the synthesizers using low-Q components while achieving low phase noise. The entire transmit signal path from the digital-to-analog converters to the power amplifier, including two fully integrated frequency synthesizers, is integrated into a single-chip solution. The transmitter was tested with a testing buffer before the power amplifier (PA) and achieved less than 1.3° rms phase error when modulating a DCS-1800 GMSK signal. The prototype consumed 151 mA from a 3-V supply. A class-C PA, capable of driving 25 dBm off-chip, was included and the output was compared to the testing buffer with little change in the transmitter performance.**

***Index Terms*—Class-C power amplifier, CMOS RF, digital-to-analog converter, frequency synthesizer, harmonic-rejection mixer, harmonic-rejection transmitter, image-rejection mixer, low-pass filter, phase-locked loop, power amplifier, quadrature generation, radio architectures, radio transmitter, wireless communications.**

I. Introduction

THE DEMAND for wireless connectivity supporting both voice and data has dramatically increased in recent years. Advancements in wireless technology have largely been driven by the desire for lower cost solutions. One method of achieving this price reduction is through increased levels of integration in both the transmitter and the receiver. In addition to reducing the number of ICs needed, eliminating the need for costly discrete components can also lower the overall cost. Consequently, methods of integration have received considerable attention over the last few years [1], with the goal of complete integration of both the digital and analog circuits onto a single chip. CMOS is amenable to high integration due to the fact that the vast majority of digital integrated circuits as well as many analog integrated circuits [2] are implemented in CMOS technologies. However, maintaining high performance in a wireless system, with an integrated CMOS solution, requires advances at both the architectural and circuit level because many current implementations are not amenable to integration in CMOS.

Recently, significant effort has been directed toward the implementation of integrated CMOS receivers [3], [4]. The focus of this work is to demonstrate techniques that would allow for a highly integrated high-performance CMOS transmitter and eliminate the need for costly discrete components. The challenge was to maintain the high performance needed by cellular communications systems while using low-Q on-chip components inherent to standard CMOS. A prototype was fabricated using a 0.35-μm double-poly five-layer metal CMOS technology. The transmitter operated at 1.75 GHz and was designed for a narrow-band cellular standard, DCS-1800, an up-banded version of GSM. Although the prototype was only tested with one standard, the architecture was chosen to facilitate multistandard operation. The transmitter integrated the entire signal path from the digital-to-analog converters (DACs) to the power amplifier (PA) including two frequency synthesizers. The full integration of the transmitter was facilitated by a number of techniques including the harmonic-rejection mixer (HRM) and a wide-loop-bandwidth phase-locked loop (PLL).

Section II discusses relevant transmitter architectures and their potential for integration in CMOS and multistandard operation. Section III focuses on the harmonic-rejection transmitter in more detail while addressing a few of the key concepts and circuit blocks. Section IV examines the CMOS prototype transmitter used to demonstrate the previously discussed concepts, and Section V presents the measured results from this transmitter. Finally, some conclusions are made in Section VI.

II. Transmitter Architectures

Transmitter implementations to date have used a variety of architectures, each of which exhibits features making them well suited for implementing a specific standard. However, if the goal is multistandard operation, a transmitter architecture with high flexibility is desired. Furthermore, high performance is required if a difficult standard is among the targeted applications. In particular, RF systems with large cell sizes, such as cellular communication systems, generally require higher performance than short-range systems such as Bluetooth. The issue is further complicated by the fact that CMOS integration using low-Q components limits the performance of many circuit techniques. As

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J. A. Weldon, R. S. Narayanaswami, J. C. Rudell, L. Tee, K.-C. Tsai, C.-W. Lee, and P. R. Gray are with the Berkeley Wireless Research Center, University of California, Berkeley, CA 94704 USA (e-mail: weldon@eecs.berkeley.edu).

L. Lin is with Broadcom Corporation, San Jose, CA 95110 USA.

M. Otsuka is with Hitachi, Ltd., Tokyo, Japan.

S. Dedieu is with STMicroelectronics, Grenoble, France.

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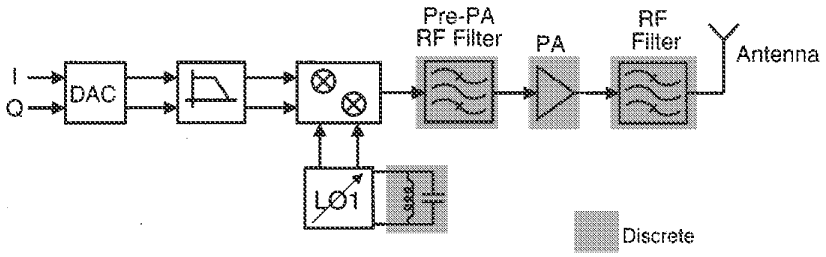


Fig. 1. Direct upconversion transmitter block diagram.

a result, new architectures and circuit techniques must be investigated if the goal is high-performance multistandard operation using CMOS and its inherently low-Q devices.

The vast majority of transmitters fall into two classes: I/Q modulator-based transmitters and voltage-controlled oscillator (VCO)-based transmitters. Although VCO-based transmitters have shown promise with respect to the elimination of discrete components [5], [6], they are fundamentally limited to constant-envelope modulation schemes. In contrast, I/Q modulator-based transmitters can operate with both constant and nonconstant envelope modulation, making them well suited for multistandard operation. To begin the discussion of I/Q modulator-based transmitters, a homodyne or direct upconversion transmitter is evaluated, followed by a discussion of the traditional heterodyne or indirect upconversion transmitter. Finally, a modified heterodyne transmitter is presented called the harmonic-rejection transmitter.

A. Direct-Upconversion Transmitter (Homodyne)

The direct-upconversion transmitter, shown in Fig. 1, is attractive because of the simplicity of the signal path. The in-phase (I) and quadrature (Q) baseband digital signals pass through a DAC and a baseband filter before the signal is upconverted to RF in a single step. The I and Q signals are then combined before passing through a pre-PA RF filter, a PA, and a second RF filter. Channel tuning is typically performed with a single RF channel-select frequency synthesizer. The shaded components in Fig. 1 would likely remain discrete if CMOS integration with low-Q components was attempted for a number of reasons. In particular, integrating a low-phase noise RF channel-select frequency synthesizer using low-Q components would be particularly difficult for narrow-band cellular standards such as GSM. This would lead to the use of a discrete VCO tank circuit to meet the required phase-noise performance with reasonable power consumption. Aside from the tank circuit, a discrete pre-PA RF filter is needed for two reasons. First, the filter reduces potential third-order intermodulation in the PA that could degrade modulation accuracy. This can be seen in Fig. 2 when the third harmonic of the desired signal intermodulates with the desired signal to produce an unwanted third harmonic of the baseband signal. The pre-PA RF filter is also needed to attenuate transmitted noise that in turn reduces the filtering requirement after the PA. This allows the use of a single filter after the PA with potentially lower loss than if a pre-PA filter was not used. Aside from the need for discrete components, the direct upconversion transmitter suffers from some well-known problems. First, the local oscillator (LO) feedthrough is relatively large because of the high frequency used in the I/Q modulator. The second, and potentially more severe, problem is LO pulling which occurs because the transmitted signal is running at the same frequency as the LO. This condition would only get worse with PA integration. One method to reduce LO pulling is offset mixing [7], [8], but this technique does not address any of the other integration issues. To further improve transmitter performance, an indirect upconversion transmitter is often used.

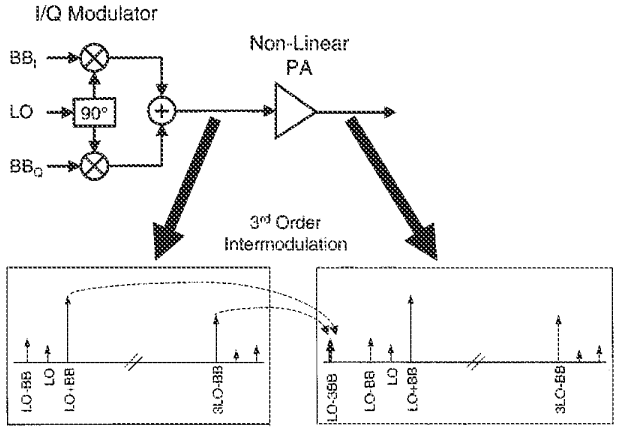


Fig. 2. Third-order intermodulation in PA.

B. Indirect Upconversion Transmitter (Heterodyne)

The indirect upconversion transmitter, shown in Fig. 3, can be viewed as the transmitter version of the superheterodyne receiver. Like the homodyne transmitter, an I/Q modulator is used; however, now the baseband signal is frequency translated to a fixed IF. The signal is then typically filtered to remove unwanted IF harmonics. The IF signal is then upconverted to RF before it passes through a pre-PA RF filter, the PA, and a final RF filter. Like the direct upconversion transmitter, channel tuning is performed with a single RF channel-select frequency synthesizer, and again, the shaded components would likely remain discrete if CMOS integration with low-Q components was attempted. In addition, yet another discrete component, the IF filter, has been added. Furthermore, little has been done to ease the requirements of the RF VCO tank circuit or the pre-PA RF filter. However, this transmitter does have a number of performance advantages. First, LO feedthrough is reduced because of the lower frequency used in the I/Q modulator, and second, LO pulling is reduced because neither oscillator is operating at the transmitted frequency. To further improve performance a modi-

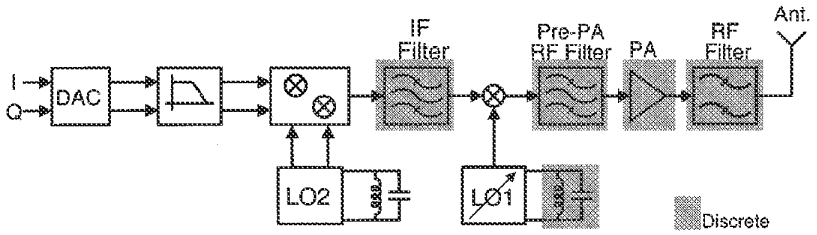


Fig. 3. Indirect upconversion transmitter block diagram.

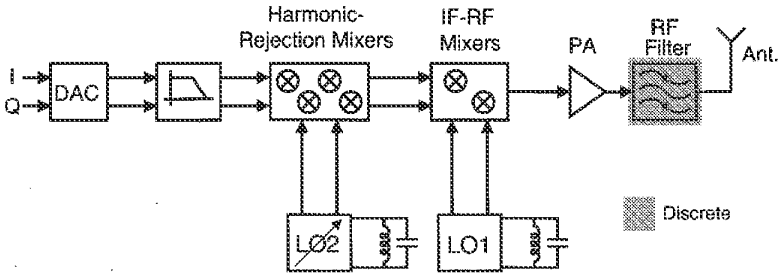


Fig. 4. Harmonic-rejection transmitter block diagram.

fied indirect-upconversion transmitter was used, called the harmonic-rejection transmitter.

C. Harmonic-Rejection Transmitter

The two-step transmitter shown in Fig. 4 is called the harmonic-rejection transmitter (HRT) because of the unique mixers used in the baseband to IF upconversion. This transmitter maintains the performance advantages of the traditional indirect upconversion transmitter in that both LO pulling and LO feedthrough are reduced. In addition, for reasons shown later, the dependency on discrete components has been reduced. For a given performance metric, removal of the IF filter and pre-PA filter may now be possible, as well as complete integration of the RF VCO tank circuit. Integration of the tank circuit is achieved by switching the roles of the synthesizers as compared to a conventional heterodyne transmitter. Channel tuning is now performed with the IF synthesizer while the RF synthesizer is fixed in frequency. By reversing the roles of the two synthesizers, the total phase noise of both synthesizers can be reduced when using low-Q on-chip components for the VCO tank circuitry.

The IF filtering requirement is relaxed by the use of HRMs for the baseband to IF upconversion. As previously mentioned, conventional switching mixers introduce relatively large harmonics at multiples of the IF frequency that require the use of a high-Q filter not amenable to CMOS integration. In contrast, the HRM not only frequency translates the baseband signal to IF but also avoids the need for a discrete filter by attenuating the third and fifth IF harmonics. This attenuation is achieved by effectively multiplying the baseband signal by a 3-bit, amplitude-quantized sinusoid. The details of the HRM will be discussed in more detail in Section III.

In addition to the relaxation of the IF filtering requirement, the requirements on the pre-PA RF filter have also been relaxed. The pre-PA filter is needed to reduce potential third-order intermodulation and to attenuate transmitted noise and spurs. Since the transmitted noise is typically dominated by the phase noise of the synthesizers, switching the roles of the synthesizers potentially allows for low-phase-noise integrated synthesizers which in turn reduce the pre-PA filtering requirement. Also, as previously mentioned, energy located at three times the carrier frequency can intermodulate and degrade the modulation accuracy. In an indirect upconversion transmitter, energy is generated at three times the carrier frequency from the 3LO2 × 3LO1 mixing product. However, due to the rejection of the third IF harmonic, third-order intermodulation is a less significant problem in the HRT. Consequently, the pre-PA RF filter is no longer needed to prevent significant third-order intermodulation. As a result, PA integration is now possible, because the RF filtering can be performed with one RF filter after the PA.

The next section will discuss some of the important details of the HRT, focusing on the HRM and frequency synthesizers.

III. Transmitter Details

A. Harmonic-Rejection Mixer

A key building block in the HRT is the harmonic-rejection mixer (HRM). Switching mixers are commonly used in RF transceivers because of their numerous advantages compared to other mixer topologies [9]. However, these mixers generate harmonics of the local oscillator frequency, which consequently need filtering. The top half of Fig. 5(a) shows a conventional switching mixer in which the baseband signal is effectively multiplied by a square-wave LO2 signal. The resulting upconverted signal now has relatively large copies of the baseband signal located at odd multiples of the LO frequency. Typically, a high-Q filter is needed to attenuate these copies. Alternatively, an HRM could be used to attenuate the third and fifth LO harmonics, reducing the IF filtering requirement. The fundamental concept of the HRM, shown in Fig. 5(b), is to multiply the baseband signal by a 3-bit, amplitude-quantized sinusoid, $f_{\mathrm{LO2h}}(t)$. Because the first harmonic of $f_{\mathrm{LO2h}}(t)$ is located

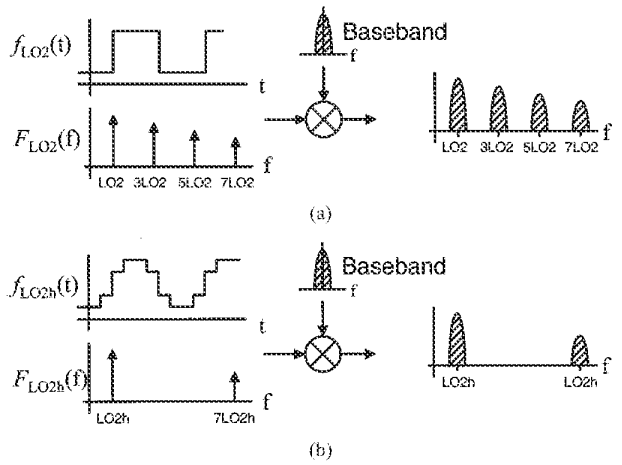


Fig. 5. (a) Conventional switching mixer. (b) Harmonic-rejection fundamentals.

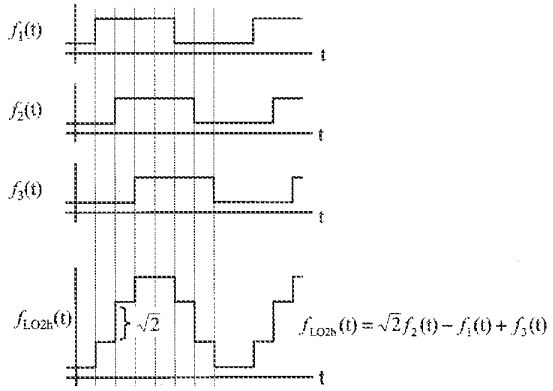


Fig. 6. Harmonic-rejection signal generation.

at seven times the fundamental frequency, the first significant copy of the upconverted baseband signal is also located at seven times the fundamental frequency. Consequently, the IF filtering requirement is greatly relaxed, leading to removal of the IF filter. The next challenge was to generate $f_{LO2h}(t)$ while maintaining the advantages of using a current-commutating switching mixer. Current-commutating switching mixers allow for a relatively low LO swing, which is critical for integration using low-Q components.

To generate $f_{LO2h}(t)$, three square waves are summed as shown in Fig. 6. To accurately represent a quantized sinusoid, the magnitude of $f_2(t)$ is scaled by $\sqrt{2}$. To better understand the rejection of the third and fifth harmonics, it is instructive to expand the three square waves using a Fourier series. The Fourier series representation of the three square waves up to the fifth-order component is given by

$$f_1(t) = \frac{\sqrt{2}}{\pi}\left[(\cos(\omega t) - \sin(\omega t)) + \frac{1}{3}(\cos(3\omega t) + \sin(3\omega t)) - \frac{1}{5}(\cos(5\omega t) - \sin(5\omega t))\ldots\right] \quad (1)$$

$$f_2(t) = \frac{2}{\pi}\left[\cos(\omega t) - \frac{1}{3}\cos(3\omega t) + \frac{1}{5}\cos(5\omega t)\ldots\right] \quad (2)$$

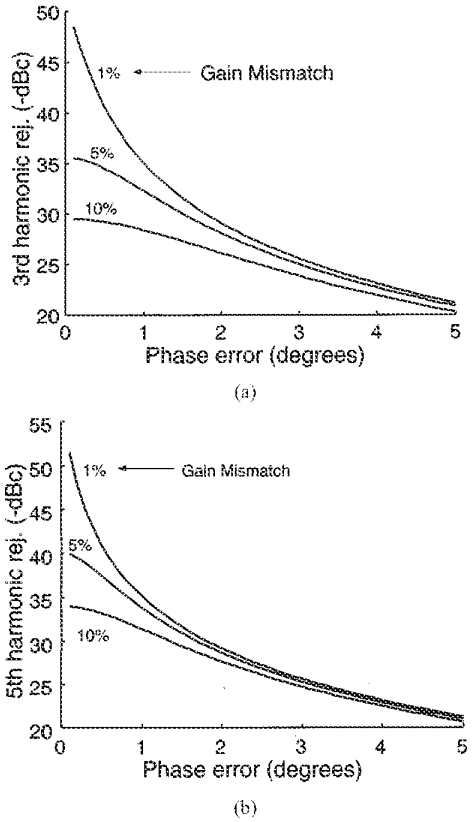


Fig. 7. Harmonic-rejection with mismatch. (a) For third harmonic. (b) For fifth harmonic.

$$f_3(t) = \frac{\sqrt{2}}{\pi}\left[(\cos(\omega t) + \sin(\omega t)) + \frac{1}{3}(\cos(3\omega t) - \sin(3\omega t)) - \frac{1}{5}(\cos(5\omega t) + \sin(5\omega))\ldots\right]. \quad (3)$$

Summing the three ideal square waves with $f_2(t)$ scaled by $\sqrt{2}$ results in the total rejection of the third and fifth harmonics. However, similar to a single-sideband mixer, gain and phase mismatch result in nonideal cancellation of the third and fifth harmonics. The rejection of the third and fifth harmonic are given by

$$\mathrm{HRM}_3 = \left(\frac{1}{9}\right)((1 - \cos(3\theta)(1+\Delta))^2 + ((1+\Delta)\sin(3\theta))) \quad (4)$$

$$\mathrm{HRM}_5 = \left(\frac{1}{25}\right)((1 - \cos(5\theta)(1+\Delta))^2 + ((1+\Delta)\sin(5\theta))) \quad (5)$$

where Δ is the gain mismatch and θ is the phase mismatch. The rejection depends strongly on the phase error in the original signal. Shown in Fig. 7 is the harmonic rejection plotted as a function of phase error for different gain errors. Fig. 7(a) shows the rejection of the third harmonic while Fig. 7(b) shows the rejection of the fifth harmonic. Note that as the phase and gain error increase the rejection of the third harmonic approaches 9.5 dBc while the rejection of the fifth harmonic approaches 14 dBc, which are the levels of an ideal square wave. For one-

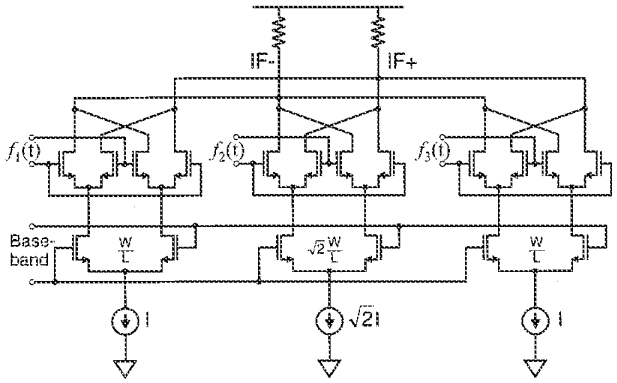


Fig. 8. Harmonic-rejection mixer circuit diagram.

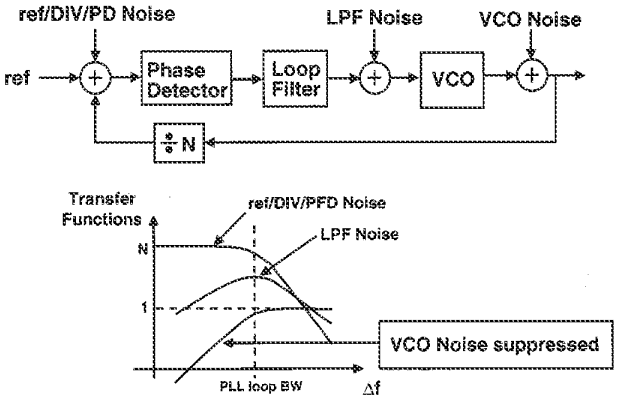


Fig. 9. VCO phase-noise suppression in wide-loop-bandwidth PLL.

degree phase error and 1% matching, approximately 35 dB of rejection is achieved for both the third and fifth harmonics.

To implement the HRM, each square wave, $f_1(t)$, $f_2(t)$, and $f_3(t)$, is mixed with the baseband signal and then the three outputs are summed. The advantage of this approach is that a low-noise switching mixer can now be used. However, a potential disadvantage is that scaling the LO voltage, by $\sqrt{2}$ in this case, will not proportionally scale the output voltage swing. The simplified circuit schematic for the HRM is shown in Fig. 8. The HRM consists of three current-commutating submixers. The transconductance stage of each submixer is driven with the identical baseband signal. However, the switches are driven by the three phase-shifted square waves. The current output of the three submixers is summed to generate the final output signal. Consequently, the baseband signal is effectively multiplied by a 3-bit amplitude-quantized sinusoid. To scale $f_2(t)$ by $\sqrt{2}$, the current switched in the middle submixer was increased by $\sqrt{2}$ by scaling the tail current source. Furthermore, to maintain an equivalent linearity performance in the three submixer transconductance stages, the input transistors were also scaled in the middle submixer to give a V_{dsat} that is equal in the three submixers.

B. Frequency Synthesizers

This transmitter architecture offers advantages with respect to full integration of the frequency synthesizer with on-chip low-Q VCOs. As previously mentioned, channel tuning is now performed with the low frequency synthesizer while the RF synthesizer is fixed in frequency. This achieves lower phase noise than the standard configuration because it allows for the use of a wide loop bandwidth for the RF synthesizer.

Performing channel-tuning with the lower frequency IF synthesizer allows the RF synthesizer to have an extended loop bandwidth, which has the effect of suppressing the close-to-carrier phase noise produced by the VCO. This may be better understood by evaluating the phase-noise transfer functions of the various components within a PLL to the output of the synthesizer, as illustrated in Fig. 9. Here, the phase-noise transfer function from the VCO to the PLL output has a high-pass characteristic relative to the carrier. Because the channel tuning is performed using the lower frequency IF synthesizer, the comparison frequency of the RF synthesizer can be significantly raised,

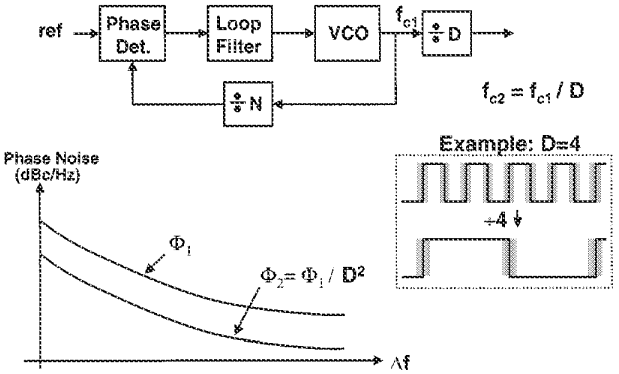


Fig. 10. Phase noise of low-frequency synthesizer.

by as much as a few orders of magnitude. Typically, for reasons related to the stability of a second-order PLL, the loop bandwidth must be anywhere from a fourth to a tenth of the comparison frequency. Therefore, the higher comparison frequency allows an increased loop bandwidth for the RF synthesizer, significantly extending the close-to-carrier bandwidth where VCO phase-noise suppression will occur. The overall RF synthesizer close-to-carrier phase-noise performance can then be designed such that the phase-noise performance is no longer dominated by a noisy integrated VCO using low-Q components in the tank circuit.

Although the lower frequency synthesizer must now perform channel tuning, lower phase noise, relative to the carrier power, can inherently be achieved due to the lower operating frequency. In this transmitter system, narrow channel tuning must be performed. Consequently, the maximum reference frequency and PLL loop bandwidth are limited, ultimately reducing the band of close-to-carrier VCO phase-noise suppression. The concept of inherently lower phase noise at lower frequencies may be understood with a time-domain interpretation, which is illustrated in Fig. 10. Assume for the moment that the PLL used to synthesize the channel spacing required by a narrow-band system produces an output at RF, instead of IF (again, the loop bandwidth would be small). If the output of this synthesizer is divided down to the IF frequency, there is an inherent lowering in both the rms jitter and phase noise as compared to the carrier.

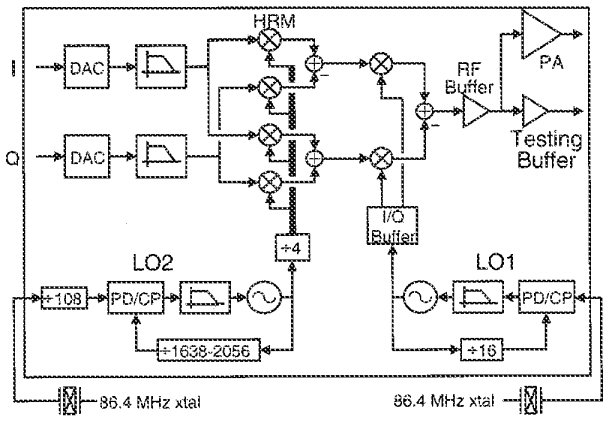


Fig. 11. CMOS prototype HRT block diagram.

This is illustrated in Fig. 10 for $D = 4$, where the time-domain waveform at the output of the synthesizer is shown at the bottom. Before the divider, each edge of the waveform contains jitter, resulting from noise generated inside the PLL. If it is assumed that an idealized noiseless divider is used to lower the frequency by a divider ratio D, then the divider will only capture the timing jitter from one of D edges, yet the period of the fundamental waveform increases by a factor of D. Stated differently, the rms timing jitter on the lower frequency LO, at the divider D output, will have the same timing jitter on each edge, however, the period of the waveform is increased by a factor of D. Thus, the jitter relative to the fundamental period has decreased by a factor D. For close-to-carrier phase noise, the timing error created from edge to edge is correlated at the output of the divider. Because of this correlation in timing error from edge to edge, the effect of a noiseless divider is to reduce the close-to-carrier phase noise by the square of the division ratio, in this case D. In the actual implementation of the IF synthesizer used in the transmitter prototype, the channel-tuning synthesizer produces an output in the range of 1.3104 to 1.4704 GHz, in 800-kHz steps. The IF synthesizer output is then divided down by a factor of 4; thus, the close-to-carrier phase noise produced at the output of the synthesizer is reduced by a factor of 16.

The RF synthesizer used by this prototype transmitter has been previously described in [10] and realizes a 1.3824-GHz oscillator with a loop bandwidth of 8 MHz. The IF synthesizer produces frequencies from 327.6 to 367.6 MHz in 200-kHz steps and has a 40-kHz loop bandwidth.

IV. CMOS Prototype

A CMOS prototype HRT was fabricated in a 0.35-μm double-poly five-layer metal process. A block diagram of the HRT is shown in Fig. 11. The HRT integrated the entire transmit signal path from the DACs to the PA, including two frequency synthesizers. Ten-bit digital I and Q baseband signals are brought on chip and passed through two 10-bit resistor string DACs and then filtered by two Sallen & Key third-order low-pass filters. The signals are then upconverted to a variable IF using four HRMs. Four mixers are used to provide image rejection for the baseband signal and to generate both I and Q IF signals. The IF signals are then upconverted to RF using

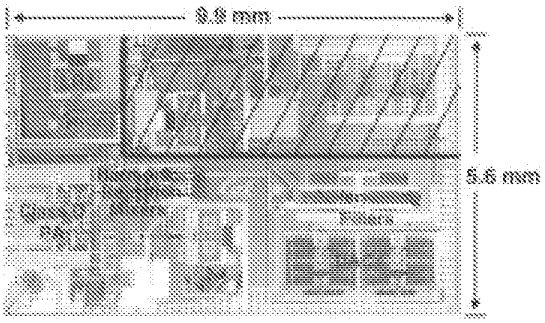


Fig. 12. Die photo.

two inductively loaded current-commutating mixers. The RF signal is then buffered before being driven off-chip with either a testing buffer or an integrated class-C PA. The testing buffer is capable of driving 0 dBm into 50 Ω, while the PA is capable of delivering 25 dBm. A die micrograph is shown in Fig. 12.

With the high level of integration implemented in this work, coupling between circuits and circuit blocks can severely degrade performance. The chip was fabricated in an epitaxial process; the epitaxial layer had a resistivity of 10 Ω-cm, while the substrate had a resistivity of 0.01 Ω-cm. With such a low substrate resistivity, it is quite possible that large signals injected into the substrate from the digital circuits or from the power amplifier (PA) can couple back into the sensitive analog sections. To reduce the effects of substrate coupling, three general techniques were used throughout the chip. First, a fully differential signal path was used from the output of the DACs through the output of both the PA and the testing buffer. Ideally, a differential circuit will see coupling from the substrate, due to other circuit blocks, as common-mode noise, and will reject those signals. Both frequency synthesizers were also implemented in a fully differential fashion, including the VCO control voltages. Differential control voltages were used to maximize the immunity of the frequency synthesizers to coupling through the substrate, from other blocks as well as each other. Second, independent supplies, which were heavily bypassed both on and off chip, were used for each of the circuit blocks. This was done so that the local supply and ground would move together; any voltage fluctuations on either the ground or supply nodes would ideally not impact the signals as they moved through the signal path. Third, multiple substrate contacts were placed around the transistors so that the body would move in unison with the local supply and ground. Therefore, any substrate coupling would also be coupled into the supply and ground local to a given circuit block, and would therefore minimize the effect of that coupling on the differential signal path.

To better understand the circuit implementation, a more detailed description of some of the key circuit blocks will follow. The blocks to be discussed include the DAC, the Sallen & Key filter, the RF quadrature generator, and the PA.

A. DAC

Fig. 13 shows the basic structure of the resistor string DAC used in the transmitter. The digital-to-analog conversion is made

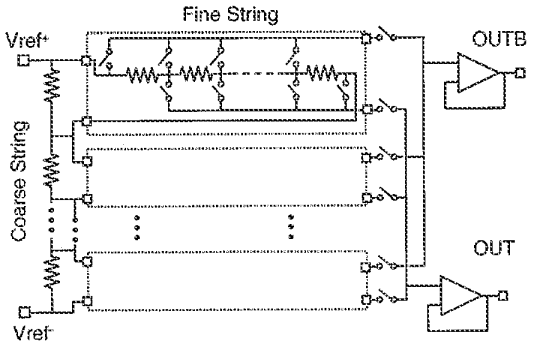


Fig. 13. Dual resistor string DAC schematic.

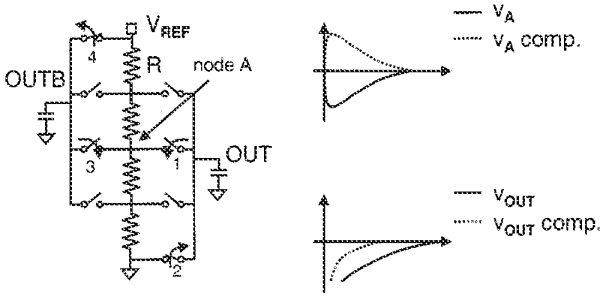


Fig. 14. Glitch reduction circuit technique for DAC.

in two steps using two 5-bit resistor strings that select the appropriate output analog level. In the design of a resistor-string DAC, there is usually a tradeoff between the maximum speed of the DAC and its power consumption. As the total value of the resistance in the resistor string increases, the overall power consumption is reduced, but the time needed for the output voltage to settle is also increased. A critical factor in the settling time is the issue of capacitive coupling between the output and the intermediate nodes in the resistor string. The intermediate nodes in the resistor string should stay at a fixed voltage at all times, but as switches close and open and different intermediate nodes are tied to the output, there is an instantaneous change on the intermediate nodes (for example, node A in Fig. 14) that causes an increase in the settling time of the output. This problem can be reduced through the use of a set of replica switches and a dummy capacitor, as shown in Fig. 14. Switches 3 and 4 switch in opposition to switches 1 and 2, respectively, and thereby induce an equal and opposite effect on the intermediate node voltage A. The uncompensated voltage at node A is summed with the glitch reduction due to the switches 3 and 4, resulting in a reduced fluctuation voltage at node A, as shown in Fig. 14. This allows the voltage at the output to settle more quickly to its desired value; furthermore, in simulation, the power consumption can be reduced as much as 30% for a given settling time. Moreover, the use of complementary switches performs the operation of single-ended to differential conversion. In the actual implementation, the function of the dummy capacitor was performed with the complementary output buffer.

B. Sallen & Key Filter

After the DACs, the I and Q baseband signals are filtered before upconversion. The filtering is performed with a third-order Sallen & Key low-pass filter. The filter uses a buffer in the feedback path to improve the rejection. Shown on the left side of Fig. 15 is a conventional Sallen & Key filter. The feedback capacitor C_1 introduces a zero in the transfer function which decreases the attenuation at higher frequencies. However, the wide-band noise is critical in transmitters, because it may corrupt the highly sensitive receivers nearby. One method of improving the attenuation, at the cost of increased power, is to increase the bandwidth of the forward buffer used in the filter. Alternatively, the effect of the zero may be reduced by adding a buffer in the feedback path as shown in the right side of the Fig. 15. The buffer blocks the zero introduced by the capacitor allowing for a lower bandwidth in the forward buffer. The plot shows the expected attenuation for the two configurations with equal power consumption. At higher frequencies, approximately a 30-dB improvement in the high-frequency attenuation is predicted by simulation with the feedback amplifier, as compared to a conventional Sallen & Key filter consuming equal power.

C. RF Quadrature Generator

The amount of sideband suppression obtained by an image-rejection mixer is highly dependent on the phase accuracy of the I and Q LO signals. For this transmitter system, the quadrature accuracy of the I and Q LO signals further relax the RF filtering requirement of the IF image. Additional and specific requirements of the quadrature generation circuitry used by this transmitter are that both the loading at the output of the synthesizer (or VCO) and the degradation in the VCO tank Q be minimized. Traditional methods of generating quadrature from a single phase include frequency dividers and passive filters realized with resistors and capacitors. The first LO (RF synthesizer) directly generates the frequency required for upconversion by the corresponding mixers, eliminating the possibility of using a frequency divider to generate quadrature LOs. Two common passive filter approaches include using an RC-CR filter or an asymmetric polyphase filter [11]. These passive methods for generating quadrature suffer from a variety of drawbacks, which can include both phase and amplitude frequency dependence, phase error from either component mismatch or process variations, and loss in LO carrier power.

Despite the well-known problems, polyphase filters are still an effective method for generating highly accurate quadrature signals from a single phase. However, there are several mechanisms of loss in this filter that typically require power-consuming buffers at the input and output of the filter. Polyphase filters generate quadrature from a single phase by passing the signal through multiple stages of an RC network when the signal frequency is near the 3-dB frequency of the RC network. Other contributing factors to loss in a polyphase filter include the parasitics associated with bottom plate capacitance used to create the capacitors. If the output is directly coupled to the mixer input, then an ac-coupling capacitor might be needed, which introduces additional parasitics and loss in LO carrier power.

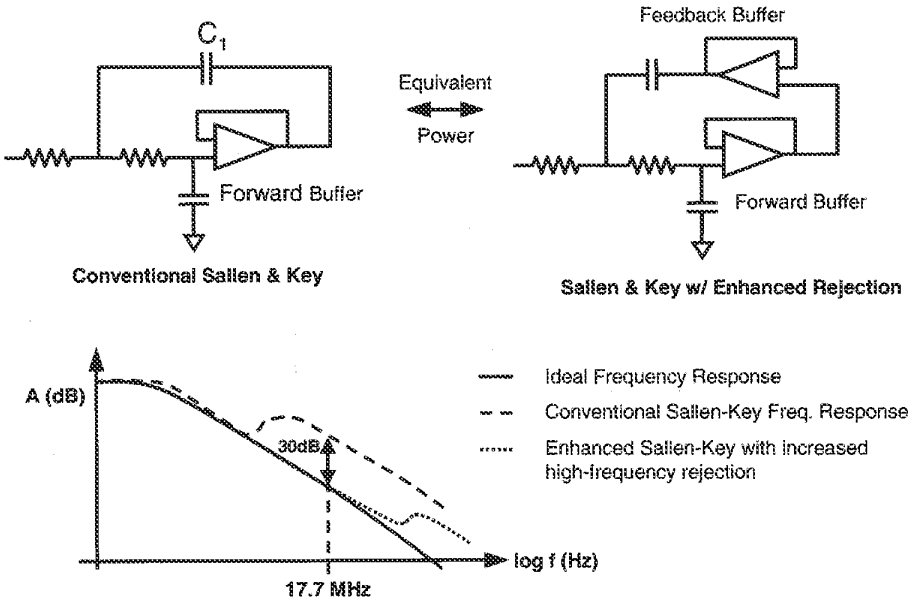


Fig. 15. Improved rejection from Sallen & Key filter.

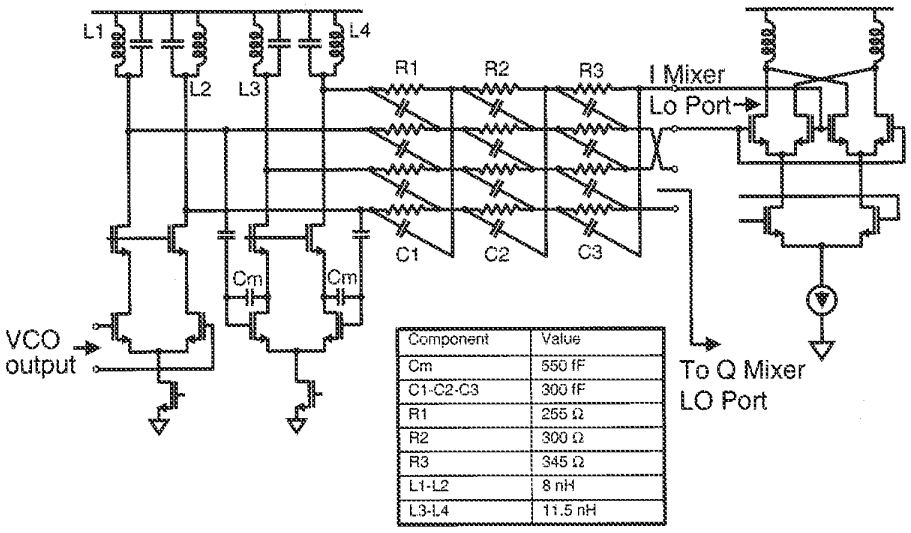


Fig. 16. High-frequency (LO1) VCO buffer quadrature generator circuit schematic.

The circuit shown in Fig. 16 reduces one mechanism of loss in the polyphase filter by using a buffer which drives the input of the filter with signals roughly in quadrature and thus eliminates the inherent 3-dB loss associated with converting a single phase to quadrature phases. Two common source buffers before the polyphase generate signals which are roughly 90° out of phase at the inductively loaded nodes when the operating frequency is near the g_m/C_m of the second buffer [12]. In addition, the input impedance looking into the buffer is capacitive with the exception of the gate resistance r_g, therefore minimizing the reduction in the VCO tank Q and loading. The Q of the LC tank at the buffer output, shown as L1-L4 in Fig. 16, is approximately 1.5 when loaded with the polyphase filter. The mixer LO input was designed to have a common mode at V_{dd} and thus the need for an ac-coupling capacitor has been eliminated as well as its associated loss.

D. Power Amplifier

Previous sections detailed the transmitter architecture, including the benefits of the harmonic rejection architecture with respect to the filtering required before the PA. These benefits allow for the use of an integrated highly nonlinear PA when a constant-envelope modulation scheme is used. Recent efforts that have investigated nonlinear PAs have focused primarily on switch-mode nonlinear PAs, such as class-D and class-E PAs [13], [14]. One drawback to switch-mode PAs, especially with respect to their potential for integration, is the need for a dc–dc converter in order to perform power control, which is

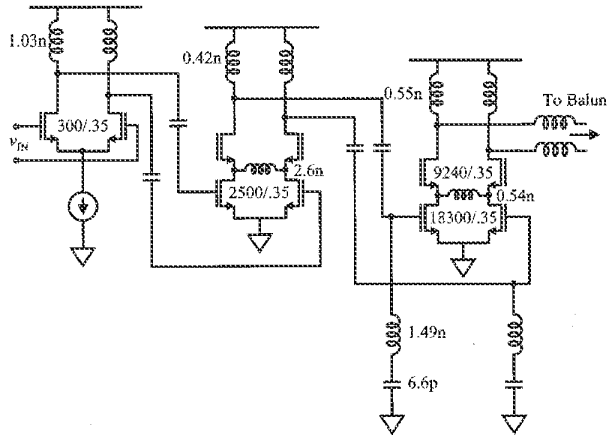


Fig. 17. Class-C power amplifier circuit schematic.

required in most cellular communications systems. In general, the only way to vary the output power level of a switch-mode PA is to vary the power supply; thus the need for the dc–dc converter, which can be difficult to integrate. Therefore, a different solution was explored.

In this work, a class-C architecture was used for the PA. The class-C architecture is an extension of the class-A and class-B architectures. In the class-C architecture, the angle of conduction (the portion of the cycle when the device is on) is less than 180°; the device is biased such that it is off for more than one-half the cycle by setting the dc bias below the threshold voltage of the device. Consequently, the input signal turns the device on for only a fraction of the period. This reduction in the period when the device conducts current serves to reduce the power consumed in the device and thus potentially raises the efficiency of the PA.

In the design of submicron CMOS PAs, a key limitation is the oxide breakdown voltage, which limits the available voltage swing at the drain of the transistor. As a result, the load impedance seen by the device needs to be extremely low in order to deliver the required amount of power without damaging the device. Furthermore, the current level must rise in proportion with the reduced voltage swing. Since CMOS generally has a poor transconductance when compared with silicon bipolar or Gallium Arsenide technologies, the device sizes required can be quite large in order to generate the required output power.

Fig. 17 shows the circuit diagram of the three-stage fully differential class-C PA used in this work. The stages are ac-coupled in order to allow the input device of each stage to be biased independent of the output of the previous stage. Since the PA was to be used in an integrated environment, the previous stages would likely not be able drive a heavy load; therefore, three stages were used in order that the first stage would not load down the output of the mixer. The first stage was biased in a class-A fashion, with a variable tail current source that controls the gain and thus the output power level. The final two stages are biased in a class-C fashion and use a cascode structure with the top devices biased at the supply in order to reduce the stress on the oxide due to voltage excursions at the outputs of those stages. At the input to the final stage, a different tuning technique was used to peak the gain at the desired frequency. Due to the high current drive required and the poor transconductance of CMOS, the output transistor size was extremely large (18 300 μm/0.35 μm); using a single spiral inductor to tune out all the capacitance between the second and third stages required an extremely small value inductor (on the order of 0.1 nH). That inductor was quite difficult to implement without parasitic trace inductance affecting the tuning at that node. Instead, a series LC was used in parallel with the gate capacitance of the final stage in order to provide a peaking of the impedance at that node. Furthermore, inductors were used across the differential cascode node in the second and third stages, in order to reduce the current required to charge and discharge the capacitors at those nodes and boost the efficiency. The inductors used at the output of the first and second stages as well as those at the cascode nodes were implemented as spiral inductors on chip; the other inductors used in this circuit were implemented as bond wires, in order to take advantage of their higher Q. The inputs of the second and third stages were biased at 0.35 V with a bias voltage generated on chip.

V. Results

Although the HRT was designed to facilitate multistandard operation, the performance of the transmitter was tested with the DCS 1800 specifications. This up-banded version of GSM was chosen for a number of reasons. First, it requires very high modulation accuracy from the transmitter. Second, DCS 1800 requires very low unwanted spurious transmission especially in the receive band. Finally, DCS 1800 uses a constant envelope modulation scheme making it well suited for use with a highly nonlinear class-C power amplifier.

A. Measured Results With Testing Buffer

The results in this section were measured using a testing buffer after the mixers, in parallel with the PA, as opposed to the PA itself. The next section will compare some of this data when the measurements were taken at the output of the PA instead of the testing buffer.

A critical test for all transmitters is the single-sideband test in which a single baseband tone is upconverted to RF. Although I/Q modulator-based transmitters are ideal for multistandard operation, gain mismatch and phase error in the modulator generally limit the modulation accuracy. Shown in Fig. 18 is the output of the transmitter when a 50-kHz baseband tone is upconverted to RF. The unwanted image suppression was measured at −56 dBc, implying that the gain and phase were matched very well throughout the transmitter. This was accomplished with careful layout techniques and the measurement transmitter has no external tuning. The carrier suppression was measured at −38 dBc while the third-order distortion was measured at −46 dBc. The third-order distortion was dominated by the baseband inputs of the HRMs.

Another key transmitter performance test is measuring the output when a modulated baseband signal is used as opposed to a single tone. Typically, different RF standards provide a spectral mask under which the transmitted signal must fall. Meeting

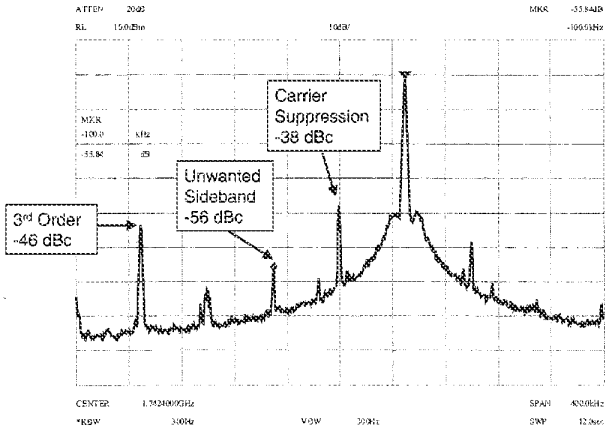


Fig. 18. Transmitter output with single-sideband test.

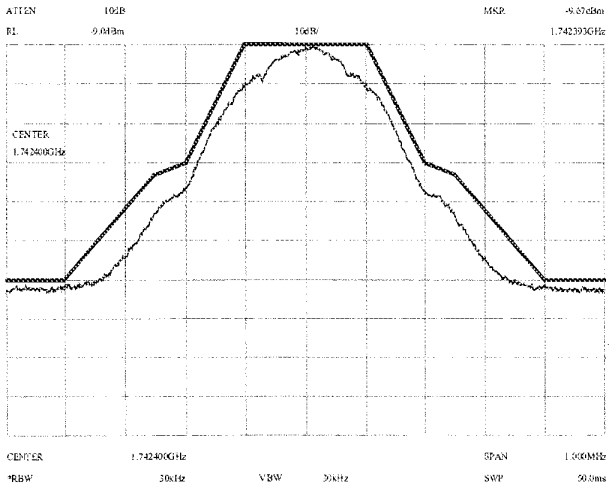


Fig. 19. Transmitter output with modulated baseband signal.

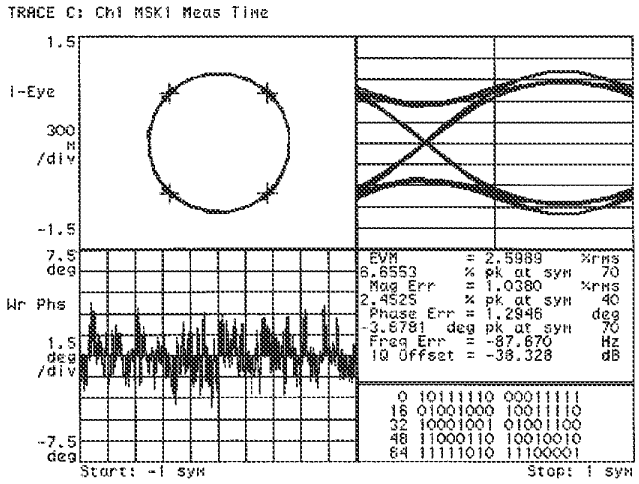


Fig. 20. Modulation accuracy of transmitter.

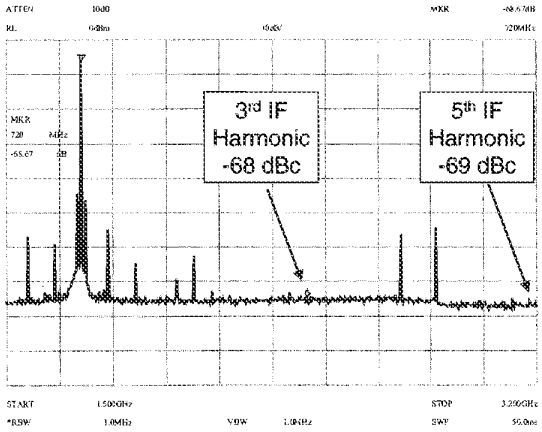


Fig. 21. Wide-band spectrum at transmitter output.

this specification requires low phase noise from the frequency synthesizer and high linearity in the baseband circuits. To test the HRT a DCS 1800 GMSK modulated baseband signal was used. Shown in Fig. 19 is the measured output spectrum along with the DCS-1800 spectral mask requirement. The measured results are limited by the phase noise of the frequency synthesizers.

Although the spectral mask limits the transmitted noise and unwanted spectral emissions, it does not measure the modulation accuracy. This test is typically performed using a modulated baseband signal and comparing the transmitted signal with the ideal signal. The DCS-1800 standard requires that the rms phase error is less than 5° with a peak phase error no larger than 20°. The measured results for the HRT are shown in Fig. 20 and the rms phase error is 1.3° while the peak phase error is 3.7°. This error was probably caused by the nonidealities in the I/Q modulator along with the phase noise of the synthesizers.

In addition to the close-in spectral mask requirements, DCS 1800 limits the unwanted transmissions that could potentially fall in the receive band. Consequently, the limit for the transmitted noise measured at 20-MHz offset from the carrier is -151 dBc/Hz. This transmitter was measured at -126 dBc/Hz. This noise was primarily caused by the phase noise of the frequency synthesizers. To meet the DCS 1800 specification, an RF filter is needed with 25 dB of attenuation at a 20-MHz offset. Such attenuation is achievable with a single RF filter allowing for a highly integrated transmitter requiring only one filter afterwards.

Finally, as a test of the HRM, a wide-band output spectrum was measured. The results are shown in Fig. 21. The suppression of the third IF harmonic was measured to be -68 dBc while the fifth IF harmonic suppression was measured to be -69 dBc. Although the third IF harmonic was further suppressed by the IF–RF image-reject mixer, the fifth IF harmonic was only suppressed by the HRM. The third IF harmonic on the low side of the carrier frequency was only suppressed by the HRM, and it was below the noise floor of the spectrum analyzer.

B. Measured Results With PA

The transmitter was also tested with the class-C PA. Shown in Fig. 22 are the results of a single-sideband test using the same 50-kHz signal. The test setup introduced approximately 2 dB of

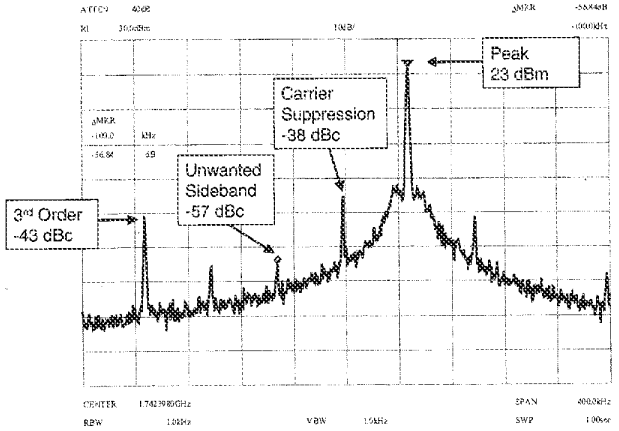


Fig. 22. Single-sideband test with PA output.

TABLE I
SUMMARY OF MEASURED RESULTS

VDD = 3 Volts Temp.= 25°C

	Testing Buffer	PA
Single Sideband Suppression	-56 dBc	-57 dBc
LO2 3rd Harmonic Spur	-68 dBc	-68 dBc
LO2 5th Harmonic Spur	-69 dBc	-69 dBc
IF Image Suppression	-60 dBc	-60 dBc
RF Carrier Suppression	-38 dBc	-38 dBc
RMS Phase Error	1.3°	N/A
Peak Phase Error	3.7°	N/A
20 MHz Carrier Offset Noise	-126 dBc/Hz	-121 dBc/Hz
3rd Order Distortion	-46 dBc	-43 dBc
Output Power	0 dBm	25 dBm
Active Chip Area	20 mm²	24 mm²
Technology	0.35 µm DP-5M CMOS	0.35 µm DP-5M CMOS

loss between the output of the PA and the measurement equipment. The differential to single-ended conversion was accomplished using a microstrip balun similar to the balun described in [14]. Comparing Fig. 22 with Fig. 18 shows very little difference. The integrated PA had little effect on the transmitter output when a single-sideband test was performed. Furthermore, although not shown here, the wide-band spectrum also showed little change compared to the wide-band output measured at the testing buffer. Although the integrated PA had little effect on the modulation performance, the noise at 20-MHz offset was affected by the PA. As previously mentioned, the noise measured with the testing buffer was −126 dBc/Hz while the noise measured with the PA was −121 dBc/Hz. Substrate coupling is the likely cause of the increased noise.

The integrated class-C PA was designed for 1.5-W peak power and was tested as standalone component. The peak measured power of the standalone PA was measured at 1.2 W. This power was not achieved in the integrated version because of the lower than expected gain in the transmitter. This was due to lower than expected Qs for the on-chip spiral inductors which are critical for gain.

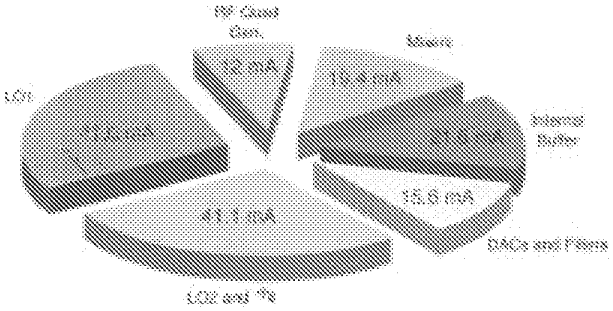


Fig. 23. Transmitter current consumption.

C. Results Summary

A summary of the measured results is shown in Table I. The table shows the results when measured with the testing buffer and the PA. Shown in Fig. 23 is the power consumption of the transmitter excluding the testing buffer and the PA. The lower than expected Qs negatively impacted the power consumption. The current for certain circuit blocks was increased to achieve the desired output power. Because the gain was lower than expected in the transmit path, the power output and the efficiency of the PA were significantly lower than expected.

VI. CONCLUSION

A fully integrated CMOS transmitter has been demonstrated. The entire transmit signal path including the PA and the frequency synthesizers were integrated in a 0.35-μm double-poly five-layer metal CMOS process. The transmitter demonstrated cellular performance requiring only a single RF filter after the PA. The need for pre-PA filtering was removed through the use of a harmonic-rejection transmitter and a wide-loop-bandwidth RF synthesizer. The performance met many of the key requirements of DCS 1800, an up-banded version of GSM. Furthermore, due to careful planning, the effect of on-chip coupling was minimized. This was evident by the fact that the chip incorporated two frequency synthesizers, two DACs, and a 25-dBm PA. Furthermore, the PA had a minimal effect on the performance when the PA output was compared to the output from a post-mixer testing buffer.

ACKNOWLEDGMENT

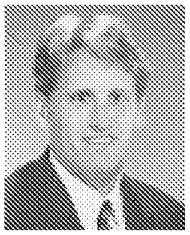
The authors would like to thank STMicroelectronics for their support and for chip fabrication services. Further, the authors are grateful to Agilent Technologies, Atmel, Conexant Systems, National Semiconductor, Nokia Mobile Phones, Nortel Networks, and Philips Research for their valued contributions.

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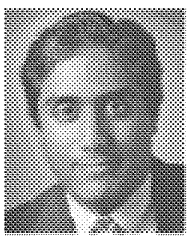
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Jeffrey A. Weldon received the B.S. degree from the University of California, Berkeley, in engineering physics in 1992. He is currently working toward the Ph.D. degree at the University of California, Berkeley, in the Electrical Engineering and Computer Science Department, where he is studying analog circuit design for RF applications.

His research focuses on wireless transmitter architectures well suited for high levels of integration in CMOS. In addition, he is investigating CMOS mixers for wireless applications.

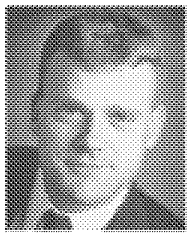
Mr. Weldon was a co-recipient of the 1998 ISSCC Jack Kilby Best Student Paper Award.



R. Sekhar Narayanaswami was born in Lubbock, TX, on November 5, 1971. He received the B.S. and M.S. degrees in electrical engineering and computer sciences in 1993 and 1998, respectively, both from the University of California, Berkeley. He is currently working toward the Ph.D. degree in the area of RF analog circuit design in CMOS technologies.

His research focuses on the implementation and integration of RF power amplifiers for mobile devices in CMOS technologies.

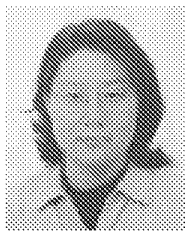
Mr. Narayanaswami is a member of Tau Beta Pi and Eta Kappa Nu.



Jacques C. Rudell (S'96–M'00) received the B.S. degree in electrical engineering from the University of Michigan, Ann Arbor. In his junior year, he was dedicated a James B. Angell Scholar. After graduation, he spent two years as an IC Designer and Project Manager at Delco Electronics, Kokomo, IN. While at Delco, his work focused mainly on bipolar analog circuits for automotive applications. In 1991, he returned to graduate school at the University of California, Berkeley. He received the M.S.E.E. degree in 1993, focusing on high-speed low-power digital adaptive equalization techniques for magnetic disk-drive channels employing class-IV partial response. Also at the University of California, Berkeley, he received the Ph.D. degree in 2000, focusing on wireless receiver architectures and systems suitable for high levels of integration in CMOS as well as multistandard/modal operation.

He worked as a Post-Doctoral Researcher at the University of California, Berkeley, in the spring of 2000. Currently, he is an Independent Consultant in Silicon Valley.

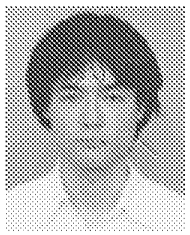
Dr. Rudell is a member of Tau Beta Pi and Eta Kappa Nu. He received the 1998 ISSCC Jack Kilby Best Student Paper Award. In 1999, he received the UC Berkeley EECS Demetri Angelakos Memorial Achievement Award.



Li Lin received the B.S. degree in electrical engineering from Portland State University, Portland, OR, in 1994, and the M.S. and Ph.D. degrees in electrical engineering from the University of California, Berkeley, in 1996 and 2000, respectively.

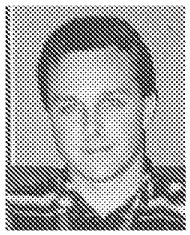
Since 2000, she has been with Broadcom Corporation, San Jose, CA, where she is a Staff Scientist working on RF integrated circuit design for wireless communication.

Dr. Lin is a member of Eta Kappa Nu and Tau Beta Pi.



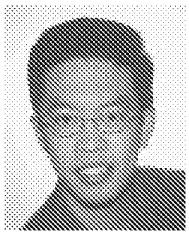
Masanori Otsuka was born in Saitama, Japan, in 1965. He received the B.S. and M.S. degrees in electrical engineering from the Science University of Tokyo, Tokyo, Japan, in 1989 and 1991, respectively.

In 1991, he joined Central Research Laboratory, Hitachi Ltd., Tokyo, and moved to Semiconductor and Integrated Circuits Division in 1995, where he has been engaged in developing CMOS D/A and A/D converters. From 1997 to 1998, he was a Visiting Industrial Fellow in Dr. P. Gray's research group at the University of California, Berkeley. During his stay, he investigated D/A converters for wireless systems.



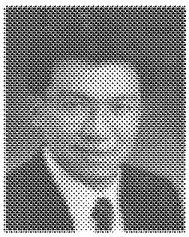
Sebastien Dedieu received the DESS of Microelectronic and the DEA of Electronic degrees from the University of Bordeaux, France, in 1993.

From 1993 until 1998, he was with STMicroelectronics Central R&D, France, as an Analog Design Engineer in the field of phase-locked loops and clock recovery for ATM (SDH/SONET) and GSM/DCS1800 applications. From 1998 to 1999, he was a Visiting Industrial Fellow in Dr. P. Gray's research group at the University of California, Berkeley. During his stay, he implemented a variable gain amplifier and active filters for a fully integrated RF transceiver. Since 1999, he worked at STMicroelectronics, Crolles, France, on phase quadrature locked loop for digital and cable TV receivers. He is currently developing synthesizers for HiperLAN/2 and 802.11applications. His research interests include mixed RF and analog VLSI circuit design in wireless and cable communications.



Luns Tee (S'93) received the B.A.Sc. degree in engineering science from the University of Toronto, Toronto, ON, Canada, in 1995. He is currently working toward the Ph.D. degree in electrical engineering at the University of California, Berkeley.

He is currently investigating transmitter linearization techniques for portable wireless applications.



King-Chun Tsai (S'95) received the B.S. degree in electrical engineering from Boston University, Boston, MA, in 1994. He is currently working toward the Ph.D. degree in electrical engineering at the University of California, Berkeley.

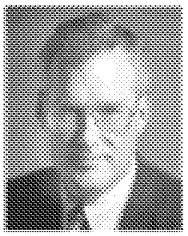
He has been a Teaching Assistant in a number of circuit design classes at the University of California, Berkeley. In the summer of 1998, he was with the Silicon Circuits Research Department at Bell Laboratories, Lucent Technologies, where he conducted research in microwave balun design. He joined Marvell Semiconductor Inc. in 2001, where he continued his work in designing RF ICs for wireless applications.

Mr. Tsai was recognized as an Outstanding Graduate Student Instructor at the University of California, Berkeley, in 1996.



Cheol-Woong Lee received the B.S. degree in electrical engineering from the Seoul National University, Seoul, Korea, in 1997. He is currently working toward the Ph.D. degree in electrical engineering at the University of California, Berkeley, where his interest is in RF and analog integrated circuits.

In 1996 and 1997, he investigated and developed a hardware system for 600-dpi color scanner with Thymedia Company Ltd., Seoul, Korea. In 1999, he designed a board to test the multistandard RF monolithic chip at RF research group in the department of electrical engineering at the University of California, Berkeley.



Paul R. Gray (M'69–SM'76–F'80) was born in Jonesboro, AR, on December 8, 1942. He received the B.S., M.S., and Ph.D. degrees from the University of Arizona, Tucson, in 1963, 1965, and 1969, respectively.

In 1969, he joined the Research and Development Laboratory, Fairchild Semiconductor, Palo Alto, CA, where he was involved in the application of new technologies for analog integrated circuits, including power integrated circuits and data conversion circuits. In 1971, he joined the faculty of the Department of Electrical Engineering and Computer Sciences, University of California, Berkeley. His research interests during this period have included bipolar and MOS circuit design, electrothermal interactions in integrated circuits, device modeling, telecommunications circuits, and analog–digital interfaces in VLSI systems. He is the co-author of a widely used college textbook on analog integrated circuits. During year-long industrial leaves of absence from the University of California, Berkeley, he served as Project Manager for Telecommunications Filters at Intel Corporation, Santa Clara, CA, during 1977–78, and as Director of CMOS Design Engineering at Microlinear Corporation, San Jose, CA, during 1984–1985. At the University of California, Berkeley, he has held several administrative posts, including Director of the Electronics Research Laboratory (1985–1986), Vice-Chairman of the EECS Department for Computer Resources (1988–1990), Chairman of the Department of Electrical Engineering and Computer Sciences (1990–1993), and Dean of the College of Engineering (1996–June 2000). He is currently the Executive Vice Chancellor and Provost and Roy W. Carlson Professor of Engineering.

Dr. Gray has been co-recipient of best paper awards at the IEEE International Solid-State Circuits Conference and the European Solid-State Circuits Conference, and was co-recipient of the IEEE R. W. G. Baker Prize in 1980, the IEEE Morris K. Liebman Award in 1983, and the IEEE Circuits and Systems Society Achievement Award in 1987. In 1994, he received the IEEE Solid-State Circuits Award. He served as editor of the IEEE JOURNAL OF SOLID-STATE CIRCUITS from 1977 through 1979, and as Program Chairman of the 1982 International Solid-State Circuits Conference. He served as President of the IEEE Solid-State Circuits Council from 1988 to 1990. He is a member of the National Academy of Engineering.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: ARDESHIR TABIBI
TOWNSEND AND TOWNSEND AND CREW LLP
TWO EMBARCADERO CENTER
8TH FLOOR
SAN FRANCISCO, CA 94111-3834

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	17 JUN 2010
Applicant's or agent's file reference 22287-28-1PC	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 10/31631	19 April 2010 (19.04.2010)	17 April 2009 (17.04.2009)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06F 17/00 (2010.01)
USPC - 700/94

Applicant MAXLINEAR, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	31 May 2010 (31.05.2010)	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No. PCT/US 10/31631

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/31631

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	6, 15, 26	YES
	Claims	1-5, 7-14, 16-25, 27-43	NO
Inventive step (IS)	Claims	None.	YES
	Claims	1-43	NO
Industrial applicability (IA)	Claims	1-43	YES
	Claims	None.	NO

2. Citations and explanations:

Claims 1-5, 7-14, 16-25 and 27-43 lack novelty under PCT Article 33(2) as being anticipated by US 2003/0228855 A1 to Hertz et al. (hereinafter 'Hertz').

As per claim 1, Hertz teaches a wideband multimedia recorder for recording a plurality of radio channels (Abstract, para. [0012]) comprising: a wideband receiver (antenna, 100) configured to concurrently receive the plurality of radio channels (Fig. 2, para. [0013]); an analog-to-digital converter (ADC, 237) configured to digitize the plurality of radio channels (Fig. 2, [0066]); a digital front end module configured to frequency down-convert the digitalized plurality of radio channels to a number of radio channels in a baseband (para.[0045], [0069]); a demodulator module configured to demodulate the number of radio channels to a corresponding number of data streams (para. [0048], [0067]); a digital signal processing circuitry configured to process the demodulated number of data streams (para. [0049]); a storage unit (removable storage, 255) configured to store the processed number of data streams (Fig. 2, para.[0055], [0119]); and a control circuitry having a user interface for receiving control commands (para. [0053], [0108]).

As per claim 2, Hertz further teaches a first mixer and a second mixer, the first mixer is configured to generate an in-phase signal from the digitalized plurality of channels and a second mixer is configured to generate a quadrature signal from the digitized plurality of channels (para. [0087], [0093]).

As per claim 3, Hertz further teaches a pre-select filter that precedes the analog-to-digital converter and is configured to pass through the plurality of channels to the analog-to-digital converter (para. [0062], [0078]).

As per claim 4, Hertz further teaches wherein the radio front end module comprises: a wideband low noise amplifier configured to concurrently receive the plurality of radio channels (para. [0062], [0078]); a frequency synthesizer configured to generate an oscillator frequency (para. [0067]); a mixer module coupled to the low noise amplifier and the frequency synthesizer and configured to generate the in-phase and quadrature signals (para. [0093]); and a low-pass filter configured to eliminate unwanted frequency components in the in-phase and quadrature signals (para. [0062]).

As per claim 5, Hertz further teaches wherein the digital front end comprises a number of mixers, each one of the mixers is coupled to the digital in-phase and quadrature signals and configured to generate an associated radio channel in the baseband (para. [0069], [0093]).

As per claim 7, Hertz further teaches wherein the digital front end module further comprises a decimator module configured to decimate each one of the number of radio channels in the baseband (para. [0070], [0092]).

As per claim 8, Hertz further teaches wherein the demodulator module comprises a number of frequency modulation (FM) demodulators (para. [0067]).

As per claim 9, Hertz further teaches wherein the digital signal processing circuitry comprises a plurality of compression engines that are capable of encoding anyone of the demodulated number of data streams with one of a plurality of compression schemes (para. [0106]).

As per claim 10, Hertz further teaches wherein one of the plurality of compression schemes is one of the W AV, MP3, AC3, WMA, AAC audio formats (WMA, para. [0106]).

As per claim 11, Hertz further teaches wherein the digital processing circuitry comprises at least a decompression engine configured to decompress one of the stored encoded number of data streams (para. [0025]).

As per claim 12, Hertz further teaches wherein the storage unit comprises one of the optical compact disc, magnetic hard-disk, or flash memory (flash memory, para. [0055]).

As per claim 13, Hertz further teaches wherein the control circuitry manages playback and recording operations based on the user's control commands (Abstract, para. [0013], [0108]).

As per claim 14, Hertz further teaches wherein the playback is performed on a third-party device (para. [0013], [0052]).

---See Supplemental Sheet---

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/31631

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2 Citations and explanations:

As per claim 16, Hertz further teaches an RBDS decoder for parsing radio broadcast data service information embedded in the demodulated number of data streams (para. [0112], [0113]).

As per claim 17, Hertz further teaches wherein the act of parsing comprises determining an occupancy, a location, an identity, and/or content that is associated with at least one of the demodulated number of data streams (para. [0112], [0113]).

As per claim 18, Hertz further teaches wherein the RBDS decoder comprises a plurality of digital decoding circuits that operate in parallel (para. [0018]).

As per claim 19, Hertz further teaches wherein the parsed radio broadcast data service information is stored in a first section of the storage unit ([para. [0114]).

As per claim 20, Hertz further teaches an output unit configured to transmit wirelessly at least one of the number of data streams in response to a user's control commands (para. [0056], [0095]).

As per claim 21, Hertz teaches a wideband personal radio recorder system (Abstract, para. [0012]) comprising: at least a first tuner and a second tuner (para. [0076]), the first tuner configured to receive a first frequency spectrum (AM band) including a first plurality of radio channels (para. [0076]) and convert the first frequency spectrum to a first in-phase signal and a first quadrature signal (para. [0087], [0093]), the second tuner configured to receive a second frequency spectrum (FM band) including a second plurality of radio channels (para. [0076]) and convert the second frequency spectrum to a second in-phase signal and a second quadrature signal (para. [0087], [0093]); at least a first analog-to-digital converter module and a second analog-to- digital module (para. [0076]), the first analog-to-digital converter module (para. [0076]) configured to digitize the first in- phase and quadrature signals (para. [0087], [0093]) , the second analog-to-digital converter module (para. [0076]) configured to digitize the second in-phase and quadrature signals (para. [0087], [0093]); at least a first digital front end module (para. [0076]) having a first plurality of complex mixers configured to frequency down-convert the first digital in-phase and quadrature signals to a first number of radio channels in a baseband (para.[0045], [0069]), a second digital front end module (para. [0076]) having a second plurality of complex mixers configured to frequency down-convert the second digital in-phase and quadrature signals to a second number of radio channels in the baseband (para.[0045], [0069]); a demodulator module coupled to the first and second digital front end modules (para. [0076]) and configured to demodulate the first and second numbers of radio channels to obtain a plurality of data streams (para. [0048], [0067]); a digital signal processing circuitry coupled to the demodulator module and configured to encode the plurality of data streams (para. [0049]); a storage unit (removable storage, 255) coupled to the digital processing circuitry and configured to store the encoded plurality of data streams (Fig. 2, para.[0055], [0119]); and a control circuitry having a user interface for receiving control commands from a user (para. [0053], [0108]).

As per claim 22, Hertz further teaches wherein the first and second tuners, the first and second analog-to-digital converter modules, and the first and second digital front end modules are configured to operate concurrently)para. [0076]).

As per claim 23, Hertz further teaches wherein the digital signal processing circuitry further comprises an RBDS decoder for parsing radio broadcast data service (RBDS) information embedded in the demodulated number of data streams (para. [0112], [0113]).

As per claim 24, Hertz further teaches wherein the parsed RBDS information is stored in a first section of the storage unit (para. [0114]).

As per claim 25, Hertz further teaches wherein the digital signal processing circuitry further comprises at least a decoding engine configured to decode at least one of the stored plurality of data streams for playback (para. [0025]).

As per claim 27, Hertz teaches a method of recording a plurality of radio channels with a wideband receiver (Abstract, para. [0012]) comprising: receiving a radio signal including the plurality of radio channels (para. [0013]); converting the radio signal to an in-phase signal and a quadrature signal (para. [0093]); digitizing the in-phase and quadrature signals (para. [0066]); frequency-shifting the plurality of radio channels to a baseband by mixing the digital in-phase and quadrature signals concurrently with a plurality of complex mixers (para. [0045], [0069]); demodulating the plurality of radio channels in the baseband to obtain a corresponding plurality of data streams (para. [0048], [0067]); encoding the plurality of data streams (para. [0106]); and storing the encoded plurality of data streams (para. [0055], [0119]).

As per claim 28, Hertz further teaches filtering and decimating the frequency-shifted plurality of channels before demodulating (para. [0097]).

As per claim 29, Hertz further teaches retrieving the stored plurality of data streams (para. [0025]); and decoding at least one of the plurality of data streams for playback (para. [0025]).

As per claim 30, Hertz further teaches wherein the encoding comprises at least one of a plurality of audio compression schemes (para. [0106]).

As per claim 31, Hertz further teaches parsing radio broadcast data service (RBDS) information embedded in the plurality of demodulated data streams (para. [0012]-[0014]); storing the radio data service information (para. [0012]-[0014]); and building a directory based on the stored RBDS information (para. [0014]).

As per claim 32, Hertz further teaches wherein the parsing comprises determining an occupancy, a location, an identity, and/or content that is associated with at least one of the plurality of demodulated data streams (para. [0112], [0113]).

---See Supplemental Sheet---

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/31631

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box V.2 Citations and explanations:

As per claim 33, Hertz further teaches transmitting wirelessly, in response to user's control commands, at least one of the plurality of data streams (para. [0056]).

As per claim 34, Hertz teaches a method of recording a plurality of radio channels with a multi-tuner receiver (Abstract, para. [0012]) comprising: providing at least a first tuner and a second tuner (para. [0076]), the first and second tuners configured to operate concurrently (para. [0076]), the first tuner configured to receive a first frequency (AM band) spectrum including a first plurality of radio channels (para. [0076]), the second tuner configured to receive a second frequency spectrum (FM band) including a second plurality of radio channels (para. [0076]), the first tuner (para. [0076]) being configured to convert the first frequency spectrum to a first in-phase signal and a first quadrature signal (para. [0087], [0093]), and the second tuner (para. [0076]) configured to convert the second frequency spectrum to a second in-phase signal and a second quadrature signal (para. [0087], [0093]); converting the first frequency spectrum to a first in-phase and a first quadrature signal (para. [0076], [0087], [0093]); converting the second frequency spectrum to a second in-phase and a second quadrature signal (para. [0076], [0087], [0093]); digitizing the first and second in-phase and quadrature signals (para. [0076]); multiplying the first in-phase and quadrature signals with a first plurality of complex mixers to obtain a first plurality of in-phase and quadrature signals at a baseband (para.[0045], [0069]), wherein each one of the first number of in-phase and quadrature signals represents one of the first plurality of radio channels (para.[0045], [0069]); multiplying the second in-phase and quadrature signals with a second plurality of complex mixers to obtain a second plurality of in-phase and quadrature signals at the baseband, wherein each one of the second number of in-phase and quadrature signals represents one of the second plurality of radio channels (para.[0045], [0069]); demodulating the each one of the first and second pluralities of in-phase and quadrature signals to obtain a plurality of data streams (para. [0048], [0067]); encoding the plurality of data streams (para. [0049]); and storing the encoded plurality of data stream para.[0055], [0119]).

As per claim 35, Hertz further teaches filtering and then decimating the each one of the first and second pluralities of in-phase and quadrature signals before demodulating (para. [0097]).

As per claim 36, Hertz further teaches playing back at least one of the stored plurality of data streams (para. [0025]).

As per claim 37, Hertz further teaches wherein the encoding comprises at least one of the WAV, MP3, AC3, AAC, WMA audio compression formats (WMA, para. [0106]).

As per claim 38, Hertz further teaches wherein the digitizing the first and second inphase and quadrature signals is performed concurrently. (para. [0076]).

As per claim 39, Hertz further teaches wherein the demodulating the each one of the first and second pluralities of in-phase and quadrature signals is performed concurrently (para. [0095]).

As per claim 40, Hertz further teaches wherein the encoding is performed in parallel for each one of the plurality of data streams (para. [0020]).

As per claim 41, Hertz further teaches parsing radio broadcast data service (RBDS) information embedded in the plurality of demodulated data streams (para. [0012]-[0014]); storing the radio data service information (para. [0012]-[0014]); and building a directory based on the stored RBDS information (para. [0114]).

As per claim 42, Hertz further teaches wherein the parsing comprises determining an occupancy, a location, an identity, and/or content that is associated with at least one of the plurality of demodulated data streams (para. [0112], [0113]).

As per claim 43, Hertz further teaches transmitting wire1essly, in response to a user's control commands, at least one 3 of the plurality of data streams (para. [0056]).

Claims 15 and 26 lack an inventive step under PCT Article 33(3) as being obvious over Hertz in view of US 2003/0158614 A1 to Friel et al. (hereinafter 'Friel').

As per claim 15, Hertz does not teach a battery configured to supply power to the recorder for continual operation in the event that an external power supply is turned off. However, Friel does teach a battery configured to supply power to the recorder for continual operation in the event that an external power supply is turned off (para. [0002]). It would have been obvious to one of ordinary skill in the art to modify the recorder, as taught by Hertz, so as to include the use of a battery, as taught by Friel, because the battery ensures that the recorder will maintain tower, thus saving the memory storage and user controls.

As per claim 26, Hertz does not teach a battery configured to supply power to the recorder for continual operation in the event that an external power supply is turned off. However, Friel does teach a battery configured to supply power to the recorder for continual operation in the event that an external power supply is turned off (para. [0002]). It would have been obvious to one of ordinary skill in the art to modify the recorder, as taught by Hertz, so as to include the use of a battery, as taught by Friel, because the battery ensures that the recorder will maintain tower, thus saving the memory storage and user controls.

---See Supplemental Sheet---

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/31631

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2 Citations and explanations:

Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over Hertz in view of US 5705949 A to Alelyunas et al. (hereinafter 'Alelyunas').

As per claim 6, Hertz does not teach wherein each one of the plurality of mixers is a digital complex mixer comprising four digital multipliers and two digital adders. However, Aleyunas does teach wherein each one of the plurality of mixers is a digital complex mixer comprising four digital multipliers and two digital adders (Fig. 1). It would have been obvious to one of ordinary skill in the art to modify the recorder, as taught by Hertz, so as to include a portion of the circuit to include 4 multipliers and 2 adders, as taught by Aleyunas, because they provide for compensation of phase error, thus reducing the potential of errors in the recorder (col. 3, ln 10-24).

Claims 1-43 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 22287-28-1PC	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 10/31631	International filing date *(day/month/year)* 19 April 2010 (19.04.2010)	(Earliest) Priority Date *(day/month/year)* 17 April 2009 (17.04.2009)
Applicant MAXLINEAR, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed.
      ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/31631

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 17/00 (2010.01)
USPC - 700/94
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC - 700/94

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 370/203, 206, 215, 297, 307, 310, 464, 546; 700/94; 704/500 (keyword limited; see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST(PGPB,USPT,EPAB,JPAB); Google Patents; Google. Search Terms Used: record, save, store, radio, channel, broadcast, program, frequency, RBDS, RDS, baseband, base, band, analog, digital, ADC, A/D, digitze, DSP, signal, processing, storage, disc, flash, memory, hard, disk, demodulate, user, owner, operator, human, control, interface, display, co

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2003/0228855 A1 (Hertz et al.) 11 December 2003 (11.12.2003) entire document, especially: Fig. 2, Abstract, para. [0012]-[0014], [0018], [0025], [0045], [0048], [0049], [0053], [0055], [0056], [0062]-[0070], [0076],[0078], [0087], [0092], [0093], [0095], [0106]-[0108], [0112]-[0114], [0119]	1-5, 7-14, 16-25, 27-43 --- 6, 15, 26
Y	US 2003/0158614 A1 (Friel et al.) 21 August 2003 (21.08.2003) para. [0002]	15, 26
Y	US 5,705,949 A (Alelyunas et al.) 06 January 1998 (06.01.1998) Fig. 1, col. 3, ln 10-24	6
A	US 2007/0179649 A1 (Mitsuno) 02 August 2007 (02.08.2007) entire document	1-43

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2010 (31.05.2010)	17 JUN 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
ARDESHIR TABIBI
TOWNSEND AND TOWNSEND AND CREW LLP
8TH FLOOR
TWO EMBARCADERO CENTER
SAN FRANCISCO, CA 94111

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	18 JUN 2010
Applicant's or agent's file reference 22287-27-1PC	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2010/031627	19 April 2010	17 April 2009

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H04B 1/06 (2010.01)
USPC - 455/260

Applicant MAXLINEAR, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	26 May 2010	Blaine Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2010/031627

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. type of material

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material

      ☐ on paper

      ☐ in electronic form

   c. time of filing/furnishing

      ☐ contained in the international application as filed

      ☐ filed together with the international application in electronic form

      ☐ furnished subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Form PCT/ISA/237 (Box No. I) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2010/031627

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	4, 7-9 and 16-25	YES
	Claims	1-3, 5, 6, 10-15, 26 and 27	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-27	NO
Industrial applicability (IA)	Claims	1-27	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-3, 5, 6, 10-15, 26 and 27 lack novelty under PCT Article 33(2) as being anticipated by Feher.

Regarding claim 1, Feher discloses a wideband receiver system (paragraph [0231]) comprising: a wideband receiver configured to concurrently receive a plurality of desired RF channels (in-phase and quadrature-phase baseband channels, paragraph [0276]); said wideband receiver comprising: a mixer module (multipliers also known as mixers, paragraphs [236] and [0243]) coupled to the plurality of desired RF channels and having a first mixer (mixer 11.13 of Fig. 17b) configured to generate an in-phase signal and a second mixer (mixer 11.16 of Fig. 17b) configured to generate a quadrature signal (an in-phase (I) and quadrature (Q) channels, Fig. 6 and paragraph [0237]); a wideband analog-to-digital converter (ADC) module (paragraph [0247]) having a first wideband ADC (19.15 of Fig. 19) coupled with the in-phase signal and configured to generate a digitalized in-phase signal and a second wideband ADC (19.8 of Fig. 19) coupled with the quadrature signal and configured to generate a digitalized quadrature signal (paragraph [0257]); and a digital frontend (DFE) module (5.17 and 5.5 of Fig. 5) having a plurality of complex mixers (5.8 and 5.20 of Fig. 5) coupled to the digital in-phase and quadrature signals, each one of the plurality of complex mixers frequency-shifting a different one of the plurality of the desired RF channels to a baseband signal (paragraph [0236]).

Regarding claim 2, Feher discloses a local oscillator (5.9 and 5.21 of Fig. 5) having an oscillator frequency centered around the plurality of the desired RF channels (paragraph [0236]).

Regarding claim 3, Feher discloses that the local oscillator comprises a phaselocked loop (paragraph [0247]).

Regarding claim 5, Feher discloses that each one of the plurality of complex mixers comprises a pair of digital multipliers (5.8 and 5.20 of Fig. 5), each pair of the digital multipliers is coupled to a numerically controlled oscillator (5.9 and 5.21 of Fig. 5) (multipliers 5.8 and 5.20 of Fig. 5 are coupled to oscillators 5.9 and 5.21 of Fig. 5, respectively, paragraph [0236]).

Regarding claim 6, Feher discloses that the DFE module (5.17 and 5.5 of Fig. 5) further comprises a plurality of channel filters (5.6 and 5.18 of Fig. 5), each one of the plurality of channel filters is coupled to each one of the plurality of complex mixers (5.8 and 5.20 of Fig. 5) and configured to filter one of the plurality of the desired channels (paragraph [0236]).

Regarding claim 10, Feher discloses an up-converter module (20.4b of Fig. 20) configured to frequency-shift the plurality of desired RF channels in the baseband to an intermediate frequency band (paragraph [0258]).

Regarding claim 11, Feher discloses that the up-converter module (20.4b of Fig. 20) comprises a plurality of N up-mixers (5.8 and 5.20 of Fig. 5) having a plurality of associated oscillator frequencies (5.9 and 5.21 of Fig. 5), wherein N is an integer value equal to the plurality of the desired RF channels (paragraph [0261]); wherein the plurality of associated oscillator frequencies are so chosen so that when mixing with the plurality of desired channels in the baseband, the mixed products occupy a contiguous frequency spectrum, or a substantially-contiguous frequency spectrum with one or more spacings between the desired channels (paragraphs [0246] and [0280]), wherein the one or more spacings are variable (inherent in a spread frequency spectrum), and wherein the one or more spacings are smaller than or comparable to a channel bandwidth, or small measured as a fraction of the bandwidth of the first and second wideband ADCs (paragraphs [0236], [0237] and [0257]).

Regarding claim 12, Feher discloses that the mixed products comprise spectra that are spaced in such a way so as to avoid overlap with known frequency bands containing potential or actual interferers (paragraph [0261]).

Regarding claim 13, Feher discloses that the mixed products comprise spectra that are spaced in such a way so as to avoid overlap with known frequency bands that introduce interference to other systems (paragraph [0261]).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2010/031627

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Regarding claim 14, Feher discloses that each one of the plurality of N up-mixers is a digital complex mixer (5.8 and 5.20 of Fig. 5) and each one of the plurality of associated oscillator frequencies (5.9 and 5.21 of Fig. 5) is generated by a numerically controlled oscillator (numerically controlled oscillator, paragraph [0247]).

Regarding claim 15, Feher discloses a digital-to-analog converter (paragraphs [0247] and [0254]) configured to convert the contiguous group of channels in the intermediate frequency spectrum to an analog waveform.

Regarding claim 26, Feher discloses a method of receiving a plurality of radio frequency (RF) channels including a number of desired channels (paragraphs [0221] and [0231]) that are located in non-contiguous portions of a frequency spectrum and grouping the desired channels in a contiguous frequency spectrum (paragraph [0261]), the method comprising: concurrently receiving the plurality of RF channels; producing an in-phase signal and a quadrature signal by mixing the plurality of RF channels (in-phase and quadrature-phase baseband channels, paragraph [0276]) with a first oscillator frequency 5.9 of Fig. 5) and a second local frequency (5.21 of Fig. 5); digitizing the in-phase and quadrature signals (19.10a of Fig. 19); and frequency down-shifting the digital in-phase and quadrature signals to a baseband signal using a number of complex mixers (mixers 11.13 and 11.16 of Fig. 17b, paragraphs [236] and [0243]), wherein the first and second oscillator frequencies are identical and have a phase shift of 90' degree between them, wherein the number of complex mixers correspond to the number of desired channels (Feher, paragraph [0243]).

Regarding claim 27, Feher discloses frequency up-shifting the baseband signal to an intermediate frequency; and converting the frequency up-shifted baseband signal to an analog waveform (paragraphs [0247] and [0254]).

Claims 4 and 16-25 lack an inventive step under PCT Article 33(3) as being obvious over Feher in view of Currivan.

Regarding claims 4 and 24, Feher discloses that the desired RF channels conform to Video over Internet Protocol (VilP) as well as Voice over Internet Protocol (VoIP) (paragraph [0236]). However, Feher fails to disclose that the plurality of desired RF channels conform to a Data Over Cable Service Interface Specification (DOCSIS) protocol. In the same field of endeavor, Currivan discloses that the plurality of desired RF channels conform to a Data Over Cable Service Interface Specification (DOCSIS) protocol (paragraphs [0027] and [0028]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Currivan to incorporate the above features into the invention of Feher for the benefit of providing an equivalent data throughput of N channels to a user, though the user perceives a single channel (Currivan, paragraph [0027]).

Regarding claim 16, Feher discloses a multi-tuner receiver system (paragraphs [0221] and [0231]) for receiving a plurality of desired radio frequency (RF) channels (in-phase and quadrature-phase baseband channels, paragraph [0276]) that extend over multiple non-contiguous portions of a broad frequency spectrum and grouping them in a contiguous frequency spectrum, the system comprising: a first tuner (multiple receiver, paragraph [0200]) configured to receive a first portion of the broad frequency spectrum, the first tuner includes a first mixer (mixer 11.13 of Fig. 17b) module coupled to a first oscillator (5.9 of Fig. 5) and is configured to generate a first in-phase signal and a first quadrature signal (an in-phase (I) and quadrature (Q) channels, Fig. 6 and paragraph [0237]); a second tuner (multiple receiver, paragraph [0200]) configured to receive a second portion of the broad frequency spectrum, the second tuner includes a second mixer module (mixer 11.16 of Fig. 17b) coupled to a second oscillator (5.21 of Fig. 5) and is configured to generate a second in-phase signal and a second quadrature signal (an in-phase (I) and quadrature (Q) channels, Fig. 6 and paragraph [0237]); a first analog-to-digital converter module (19.10a of Fig. 19) configured to digitize the first in-phase and quadrature signals; a second analog-to-digital converter module (19.2 of Fig. 19) configured to digitize the second in-phase and quadrature signals (paragraphs [0247] and [0254]). Feher fails to disclose first and second digital frontends. In the same field of endeavor, Currivan discloses a first digital frontend (DFE) module (112 sub 1 of Fig. 1) having a first bank of down-mixers coupled to the first digital in-phase and quadrature signals, each of the first bank of down-mixers is configured to frequency shift one of the desired RF channels in the first portion of the broad frequency spectrum (paragraphs [0019], [0031] and [0078]); and a second digital frontend (DFE) module (112 sub 2 of Fig. 1) having a second bank of down-mixers coupled to the second digital in-phase and quadrature signals, each of the second bank of down-mixers is configured to frequency shift one of the desired RF channels in the second portion of the broad frequency spectrum; wherein the first DFE module frequency-shifts the desired RF channels in the first portion of the broad frequency spectrum to a first portion of a baseband signal (paragraphs [0019], [0031] and [0078]); wherein the second DFE module frequency-shifts the desired RF channels in the second portion of the broad frequency spectrum to a second portion of the baseband signal (paragraphs [0018]-[0021]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Currivan to incorporate the above features into the invention of Feher for the benefit of selecting a first baseband signal corresponding to a first channel and for selecting a second baseband signal corresponding to a second channel, respectively (Currivan, paragraph [0019]).

Regarding claim 17, Currivan discloses a crossbar switch (a carrier adjustment module) interposed between the first and second analog-to-digital converter modules and the first and second DFE modules (paragraph [0019]).

Regarding claim 18, Feher discloses a first up-converter module (20.3b of Fig. 20) having a first bank of up-mixers (mixer 11.13 of Fig. 17b) coupled to the first portion of the baseband signal and configured to frequency shift the first portion of the baseband signal to a first portion of an intermediate frequency spectrum (5.9 of Fig. 5 and an in-phase (I) and quadrature (Q) channels, Fig. 6 and paragraph [0237]); a second up-converter module (20.4b of Fig. 20) having a second bank of up-mixers (mixer 11.16 of Fig. 17b) coupled to the second portion of the baseband signal and configured to frequency shift the second portion of the baseband signal to a second portion of the intermediate frequency spectrum (5.21 of Fig. 5 and an in-phase (I) and quadrature (Q) channels, Fig. 6 and paragraph [0237]); and a digital-to-analog converter (19.10a and 19.2 of Fig. 19) configured to convert the first and second portions of the intermediate frequency spectrum to an analog waveform signal (paragraphs [0247] and [0254]).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2010/031627

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Regarding claim 19, Currivan discloses a crossbar switch interposed between the first and second DFE modules and the first and second up-converter modules (a carrier adjustment module).

Regarding claim 20, Feher discloses that the first and second portions are adjacent to each other and non-overlapping (paragraph [0261]).

Regarding claim 21, Feher discloses that each one of the first bank of down-mixers comprises a pair of digital multiplier having an input terminal coupled to a numerically controlled oscillator (multipliers also known as mixers, paragraphs [236] and [0243]).

Regarding claim 22, Feher discloses that the first DFE module (5.17 of Fig. 5) further comprises a plurality of channel filters (5.6 and 5.18 of Fig. 5), each one of the plurality of channel filters is coupled to each one of the first bank of down-mixers (5.8 and 5.20 of Fig. 5) and configured to filter one of the frequency down-shifted RF channels (paragraph [0236]).

Regarding claim 23, Feher discloses that the plurality of desired RF channels conform to one of a digital video broadcasting (DVB) standard (paragraph [0190]).

Regarding claim 25, Feher discloses that the plurality of RF channels conform to a television broadcasting standard (paragraph [0231]).

Claims 7-9 lack an inventive step under PCT Article 33(3) as being obvious over Feher in view of Hoctor.

Regarding claim 7, Feher discloses a plurality of channel filters (5.6 and 5.18 of Fig. 5). Feher fails to disclose that each one of the plurality of channel filters is a finite impulse response filter. In the same field of endeavor, Hoctor discloses that each one of the plurality of channel filters is a finite impulse response filter (paragraph [0061]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hoctor to incorporate the above features into the invention of Feher for the benefit of processing signals processed by the decimation filter (Hoctor, paragraph [0061]).

Regarding claim 8, Feher discloses a plurality of channel filters (5.6 and 5.18 of Fig. 5). Feher fails to disclose that the DFE module further comprises a decimator module configured to decimate each one of the plurality of the desired channels in the baseband. In the same field of endeavor, Hoctor discloses that the DFE module (paragraph [0067]) further comprises a decimator module (paragraph [0061]) configured to decimate each one of the plurality of the desired channels in the baseband (paragraph [0059]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hoctor to incorporate the above features into the invention of Feher for the benefit of eliminating undesirable signals and reduce the sampling rate to an appropriate frequency for baseband operation (Hoctor, paragraph [0059]).

Regarding claim 9, Feher discloses a plurality of channel filters (5.6 and 5.18 of Fig. 5). Feher fails to disclose that the DFE module further comprises a decimator module configured to decimate each one of the plurality of the desired channels to a demodulator. In the same field of endeavor, Hoctor discloses that the DFE module (paragraph [0067]) further comprises a decimator module (paragraph [0061]) configured to decimate each one of the plurality of the desired channels to a demodulator (paragraph [0064]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hoctor to incorporate the above features into the invention of Feher for the benefit of eliminating undesirable signals and reduce the sampling rate to an appropriate frequency for baseband operation (Hoctor, paragraph [0059]).

Claims 1-27 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 22287-27-1PC	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2010/031627	International filing date *(day/month/year)* 19 April 2010	(Earliest) Priority Date *(day/month/year)* 17 April 2009
Applicant MAXLINEAR, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant
   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 4
      ☒ as suggested by the applicant
      ☐ as selected by this Authority, because the applicant failed to suggest a figure
      ☐ as selected by this Authority, because this figure better characterizes the invention
   b. ☐ none of the figures is to be published with the abstract

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/031627

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04B 1/06 (2010.01)
USPC - 455/260
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - H04B 1/06, 1/00 (2010.01)
USPC - 455/260, 209, 42, 180.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2007/0032220 A1 (FEHER) 08 February 2007 (08.02.2007) entire document	1-3, 5, 6, 10-15, 26 and 27 --- 4, 7-9 and 16-25
Y	US 2007/0263754 A1 (CURRIVAN et al) 15 November 2007 (15.11.2007) entire document	4 and 16-25
Y	US 2007/0002961 A1 (HOCTOR et al) 04 January 2007 (04.01.2007) entire document	7-9
A	US 5,590,156 A (CARNEY) 31 December 1996 (31.12.1996) entire document	1-27
A	US 5,768,260 A (KLINE et al) 16 June 1998 (16.06.1998) entire document	1-27

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 May 2010	18 JUN 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2005)

Electronic Acknowledgement Receipt	
EFS ID:	46727884
Application Number:	17956889
International Application Number:	
Confirmation Number:	8470
Title of Invention:	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL
First Named Inventor/Applicant Name:	Madhukar Reddy
Customer Number:	23446
Filer:	Wayne Bradley/Laura Foley
Filer Authorized By:	Wayne Bradley
Attorney Docket Number:	28427US16
Receipt Date:	30-SEP-2022
Filing Date:	
Time Stamp:	08:29:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	28427US16_ADS.pdf	2197236 4d0efab6b7a9420231d42f05dbfd3a3bcfb3062c	no	10

Warnings:

Information:					
2	Oath or Declaration filed	28427US06_Declarations_executed.pdf	336661 44750254e8ce14db07258504c15bc9b027a9eb02	no	3
Warnings:					
Information:					
3	Drawings-only black and white line drawings	28427US06_Figures.pdf	4419764 3146aa711b9cb4885113ed88fc4c2537ca051c59	no	10
Warnings:					
Information:					
4		28427US08_CON_Specification.pdf	135177 db8ad20ff9549a1be835281e273d2302ebf25b23	yes	27

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	21
Claims	22	26
Abstract	27	27

Warnings:					
Information:					
5	Power of Attorney	Entropic_POA.pdf	178652 e6db8e1b2d4d91029828cff590ccdcff8015ee72	no	2
Warnings:					
Information:					
6	Information Disclosure Statement (IDS) Form (SB08)	28427US16_IDS_sb08a_EFS-WEB.pdf	1237326 cb2c1f641e2739cfec2797a534a361418bda5d40	no	9
Warnings:					
Information:					
7	Foreign Reference	EP2087623A2.pdf	112213 112c7af198fa095a19b1da28e1827b7e61c79aef	no	2

Warnings:					
Information:					
8	Non Patent Literature	NPL_1.pdf	603163 5088d48613579b3d2816d5522ec4dd7a0ecca16f	no	14
Warnings:					
Information:					
9	Other reference-Patent/Application/ Search Documents	NPL_2.pdf	443966 4bfc54746c564f3cb9b7cd840dd98df22fb2fe7a	no	8
Warnings:					
Information:					
10	Other reference-Patent/Application/ Search Documents	NPL_3.pdf	413840 d2b4d3610b34404f76c07a733fd5e032965754d1	no	7
Warnings:					
Information:					
		Total Files Size (in bytes):	10077998		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Madhukar		Reddy	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Carlsbad	CA	US

Mailing Address of Inventor:

Address 1	6966 La Place Court
Address 2	Ste. 100

City	State/Province	Postal Code	Country
Carlsbad	CA	92008	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Curtis		Ling	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Carlsbad	CA	US

Mailing Address of Inventor:

Address 1	6966 La Place Court
Address 2	Ste. 100

City	State/Province	Postal Code	Country
Carlsbad	CA	92008	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Tim		Gallagher	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

City	Carlsbad	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	6966 La Place Court		
Address 2	Ste. 100		
City	Carlsbad	**State/Province**	CA
Postal Code	92008	**Country**	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	23446		
Email Address	mhmpto@mcandrews-ip.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL		
Attorney Docket Number	28427US16	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)
Customer Number	23446		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17862946	2022-07-12
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17862946	Continuation of	17587462	2022-01-28
Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17587462	Continuation of	17217244	2021-03-30
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17217244	Continuation of	16430506	2019-06-04	10972781	2021-04-06
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16430506	Continuation of	15792318	2017-10-24	10313733	2019-06-04

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15792318	Continuation of	14948881	2015-11-23	9819992	2017-11-14
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14948881	Continuation of	14617973	2015-02-10	9210363	2015-12-08
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14617973	Continuation of	13962871	2013-08-08	9100622	2015-08-04
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13962871	Continuation of	12762900	2010-04-19	8526898	2013-09-03
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
12762900	Claims benefit of provisional	61170526	2009-04-17		

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Entropic Communications, LLC		
Mailing Address Information For Applicant:			
Address 1	1345 Avenues of the Americas		
Address 2	46th Fl.		
City	New York	**State/Province**	NY
Country	US	Postal Code	10105
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Wayne H. Bradley/			Date (YYYY-MM-DD)	2022-09-30
First Name	Wayne H.	Last Name	Bradley	Registration Number	39916

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	28427US16
	Application Number	
Title of Invention	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Attorney Docket No. 89194-002720US-883946

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WIDEBAND TUNER ARCHITECTURE

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/962,871 filed on August 8, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Madhukar Reddy Date (Optional) :

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Attorney Docket No. 89194-002720US-883946

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WIDEBAND TUNER ARCHITECTURE

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/962,871 filed on August 8, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Curtis Ling Date (Optional) :

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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Title of Invention	WIDEBAND TUNER ARCHITECTURE

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filed on August 8, 2013.

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LEGAL NAME OF INVENTOR

Inventor: Tim Gallagher Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

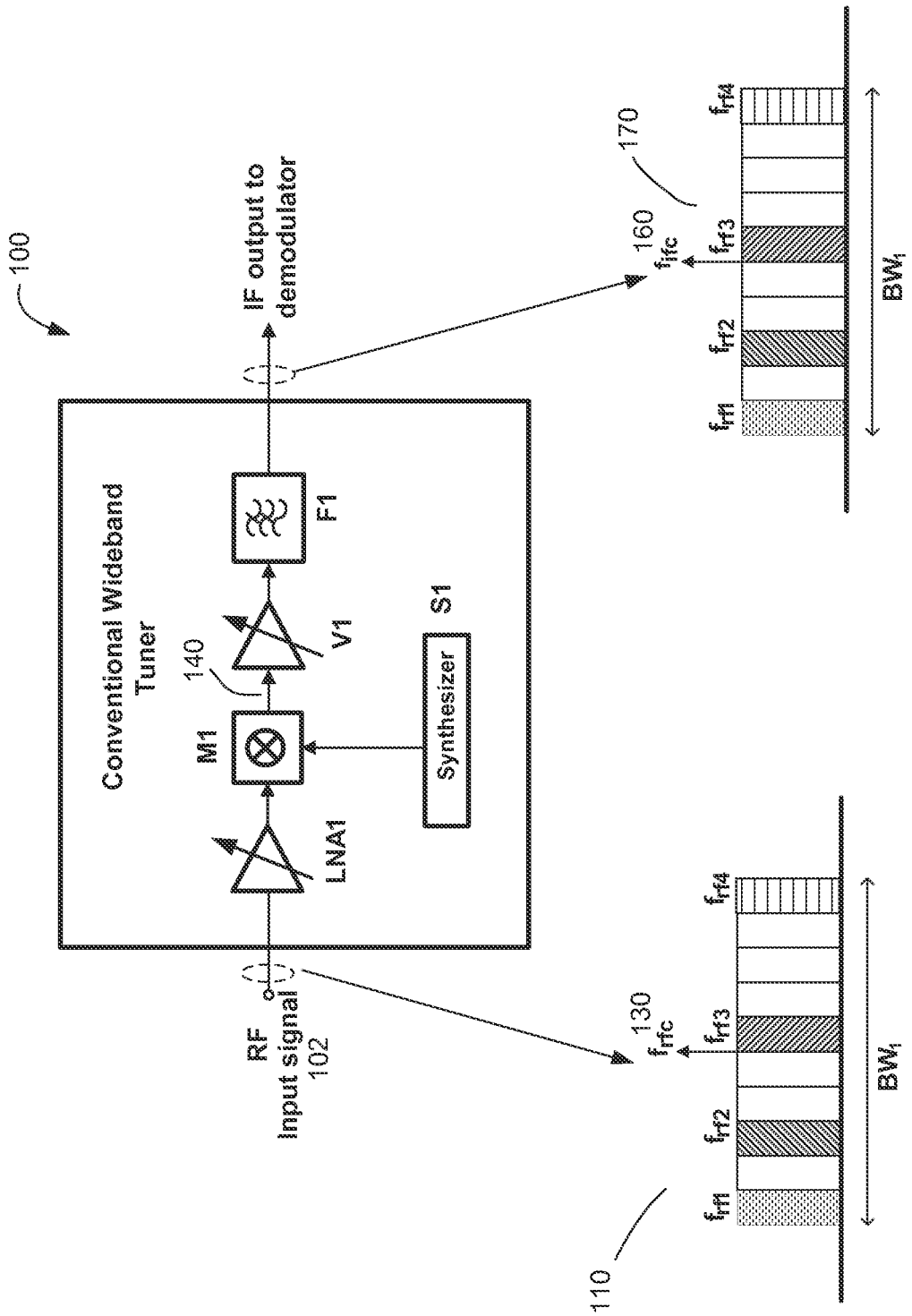


FIG. 1
(Prior Art)

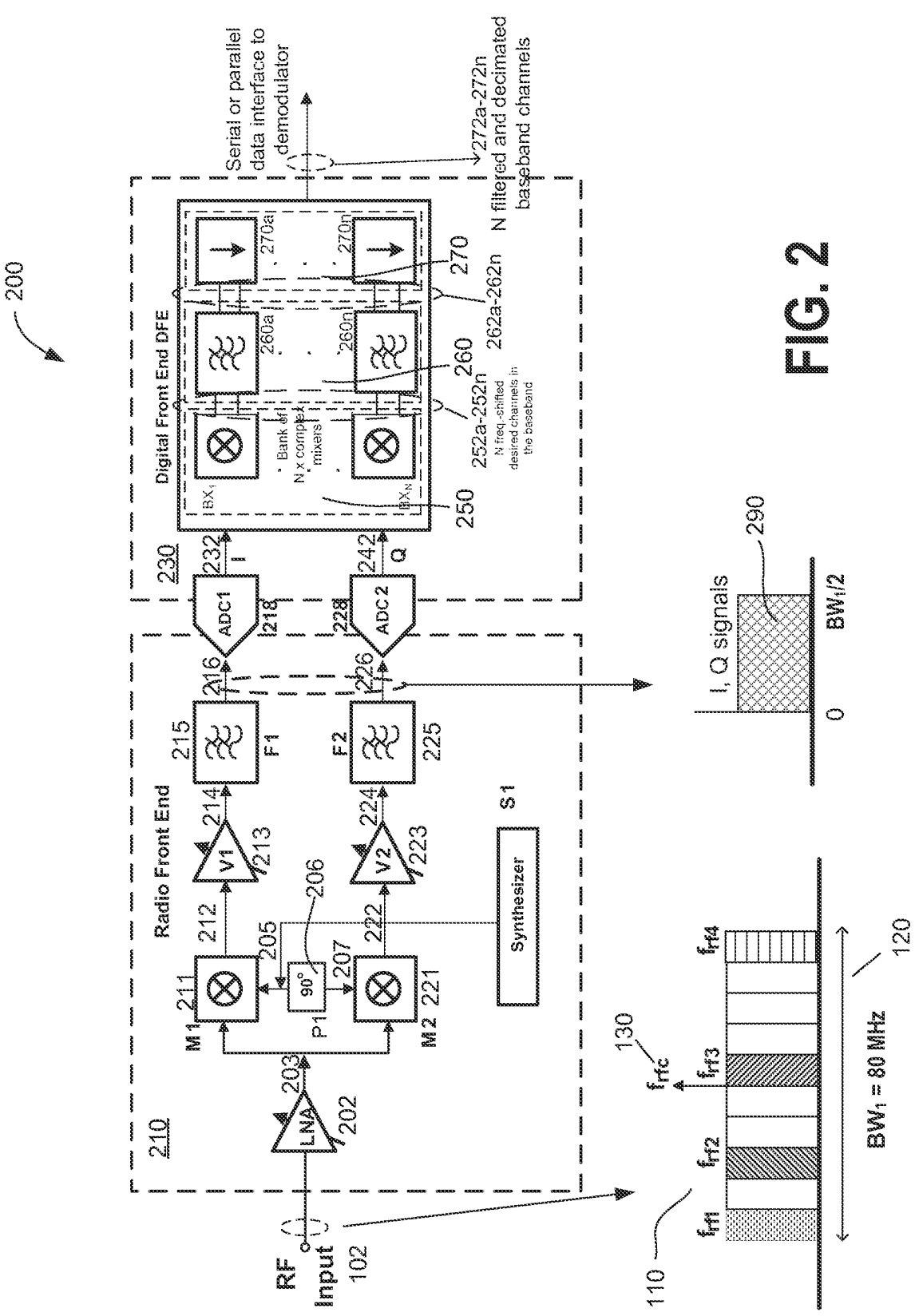

200
Digital Front End DFE
Serial or parallel data interface to demodulator
272a-272n
N filtered and decimated baseband channels
270
270a
270n
260
260a
260n
262a-262n
252a-252n
N freq.-shifted desired channels in the baseband
250
Bank of N x complex mixers
230
232
242
Q
ADC1
ADC2
218
228
216
226
Radio Front End
210
215
225
F1
F2
214
224
213
223
V1
V2
S 1
Synthesizer
206
205
207
212
222
211
221
M1
M2
P1
90°
LNA
203
202
RF Input
102
I, Q signals
290
0
BW1/2
130
110
120
BW1 = 80 MHz

FIG. 2

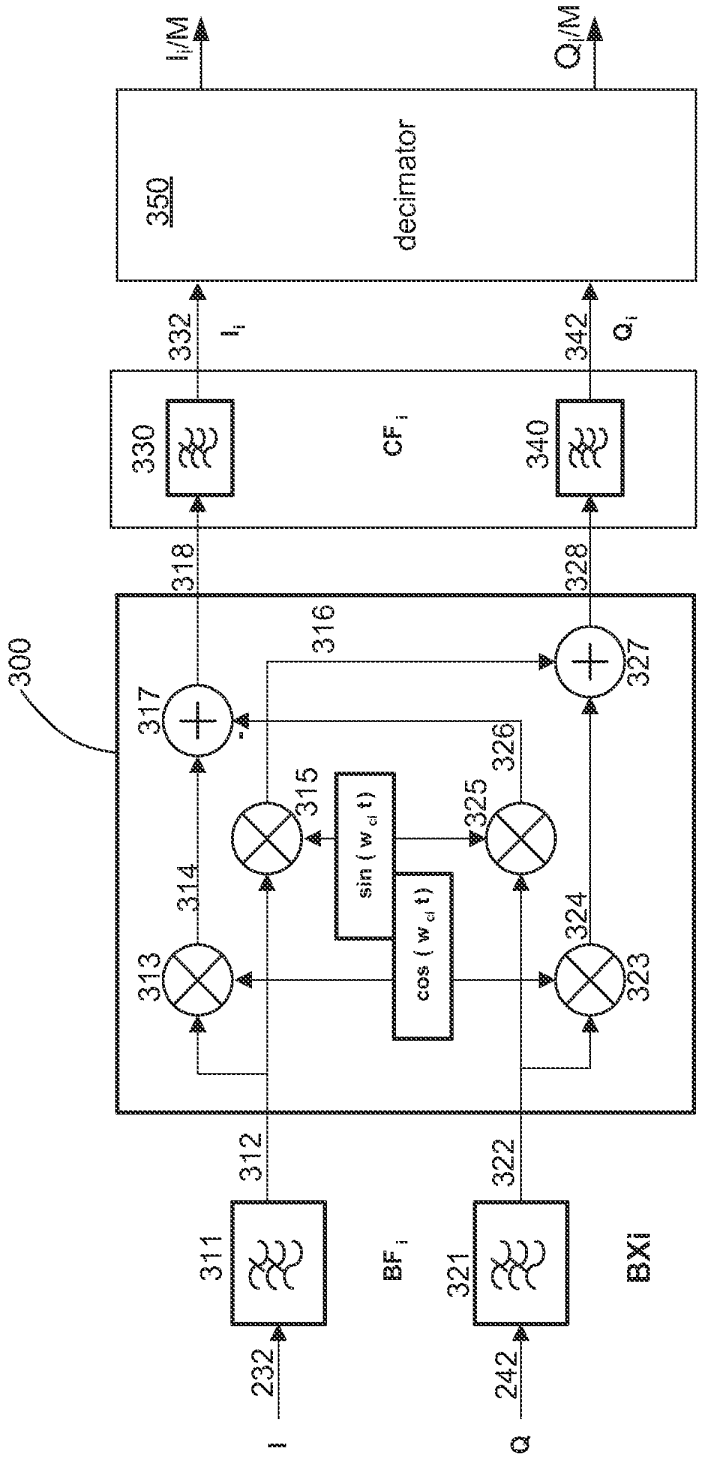

I
232
311
312
BF$_i$
313
314
315
316
317
318
sin (w$_{ci}$ t)
cos (w$_{ci}$ t)
300
Q
242
321
322
BXi
323
324
325
326
327
328
330
332
I$_i$
CF$_i$
340
342
Q$_i$
350
decimator
I$_i$/M
Q$_i$/M

FIG. 3

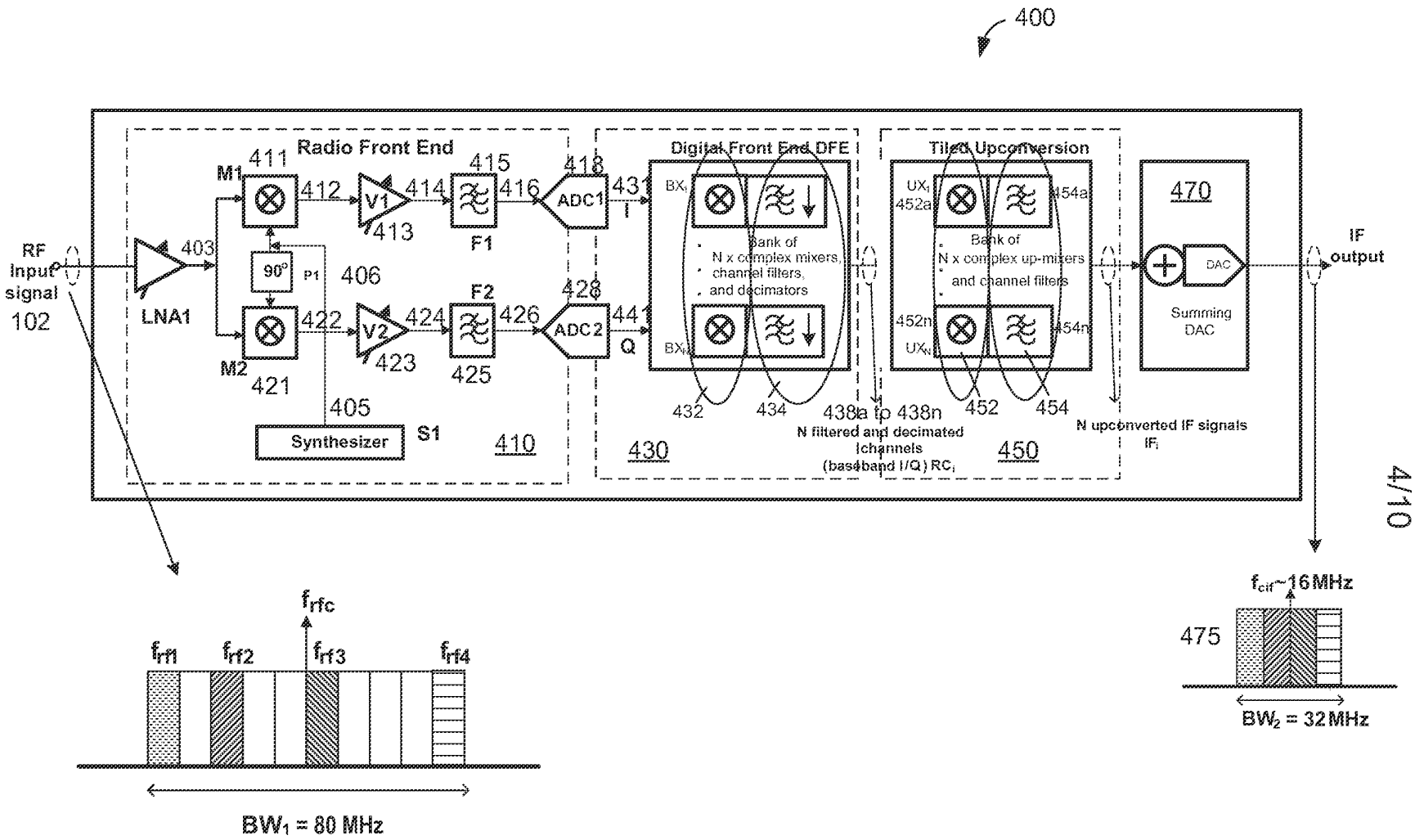

400
Radio Front End
Digital Front End DFE
Tiled Upconversion
RF input signal
102
LNA1
403
M1
M2
411
412
V1
413
414
415
F1
416
ADC1
418
431
I
90°
P1
406
F2
421
422
V2
423
424
425
426
ADC2
428
441
Q
405
Synthesizer
S1
410
BX1
BXN
Bank of
N x complex mixers,
channel filters,
and decimators
430
432
434
438a to 438n
N filtered and decimated
channels
(baseband I/Q) RCi
UX1
452a
454a
452n
UXN
454n
Bank of
N x complex up-mixers
and channel filters
450
452
454
N upconverted IF signals
IFi
470
DAC
Summing
DAC
IF output
4/10
frfc
frf1
frf2
frf3
frf4
BW1 = 80 MHz
fcif~16MHz
475
BW2 = 32MHz

FIG. 4

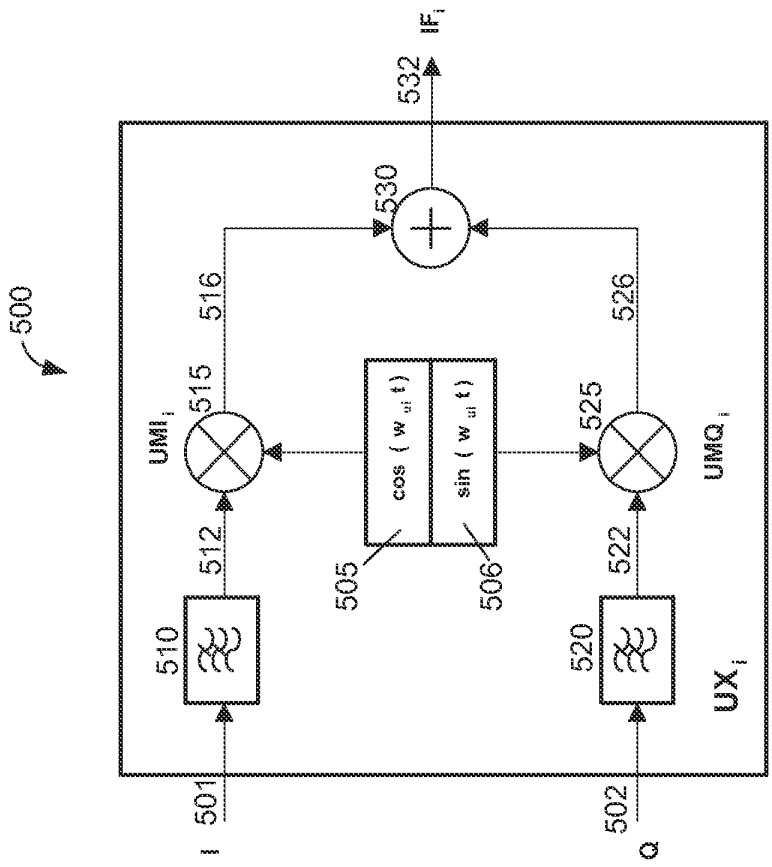

500
501
I
502
Q
510
512
515
516
520
522
525
526
530
532
505
506
cos (w_ui t)
sin (w_ui t)
UMI_i
UMQ_i
UX_i
IF_i

FIG. 5

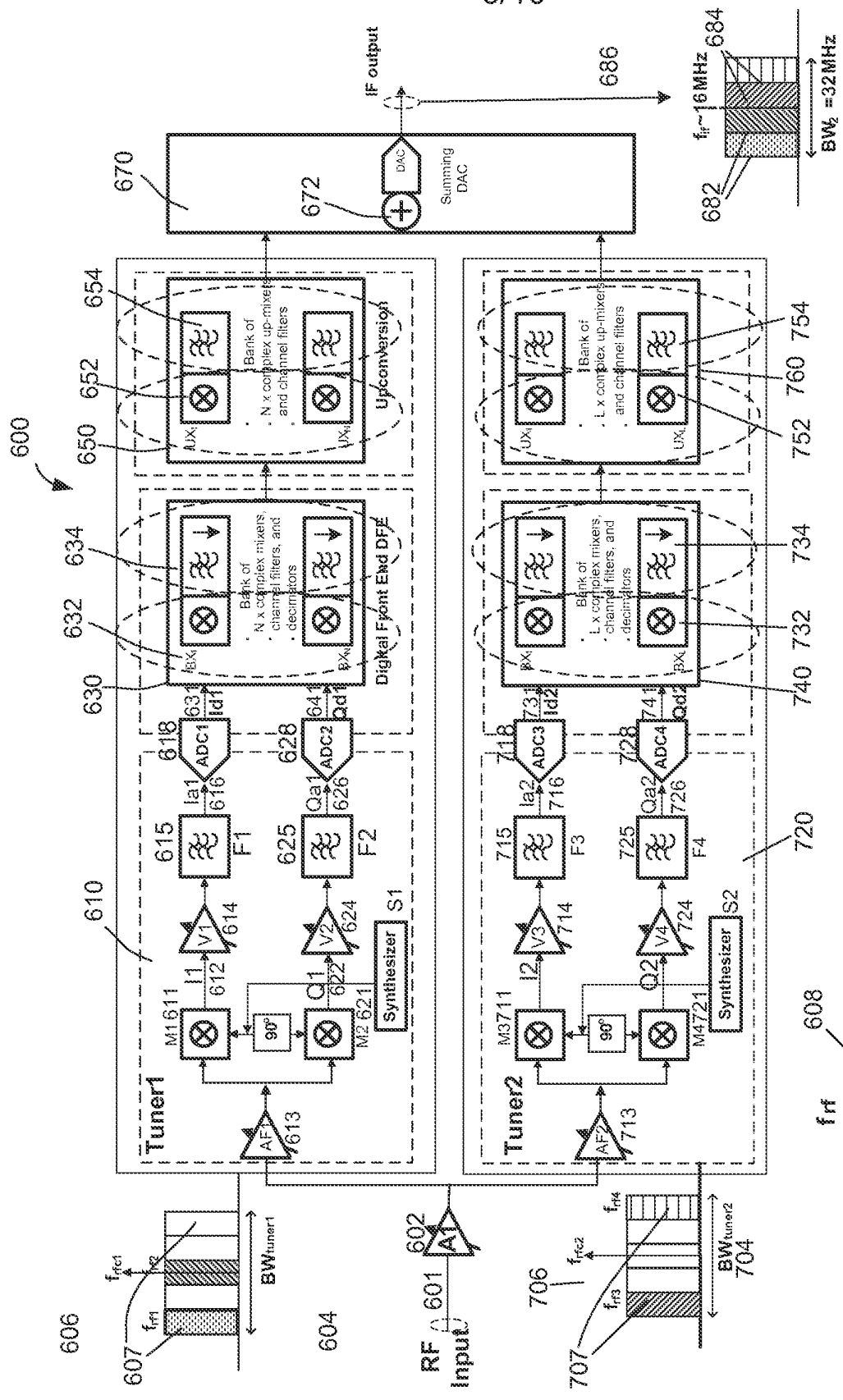

600
606
604
610
720
608
Tuner1
Tuner2
RF input
602
601
607
706
707
704
670
672
686
684
682
IF output
Summing DAC
DAC
Digital Front End DFE
Upconversion
Bank of
. N x complex mixers,
. channel filters, and
. decimators
. N x complex up-mixers
and channel filters
. L x complex mixers,
. L x complex up-mixers
AF1
AF2
A1
M1611
M2 621
M3711
M4721
90°
I1
Q1
I2
Q2
V1
V2
V3
V4
Synthesizer
S1
S2
F1
F2
F3
F4
ADC1
ADC2
ADC3
ADC4
Ia1
Qa1
Ia2
Qa2
Id1
Qd1
Id2
Qd2
IUX1
QUX1
IUXL
QUXL
IBX1
QBX1
IBXL
QBXL
BWTuner1
BWTuner2
BW= 80 MHz
f rf
f rf1
f rf2
f rf3
f rf4
f rfc1
f rfc2
f if~16 MHz
BW2 =32 MHz

FIG. 6

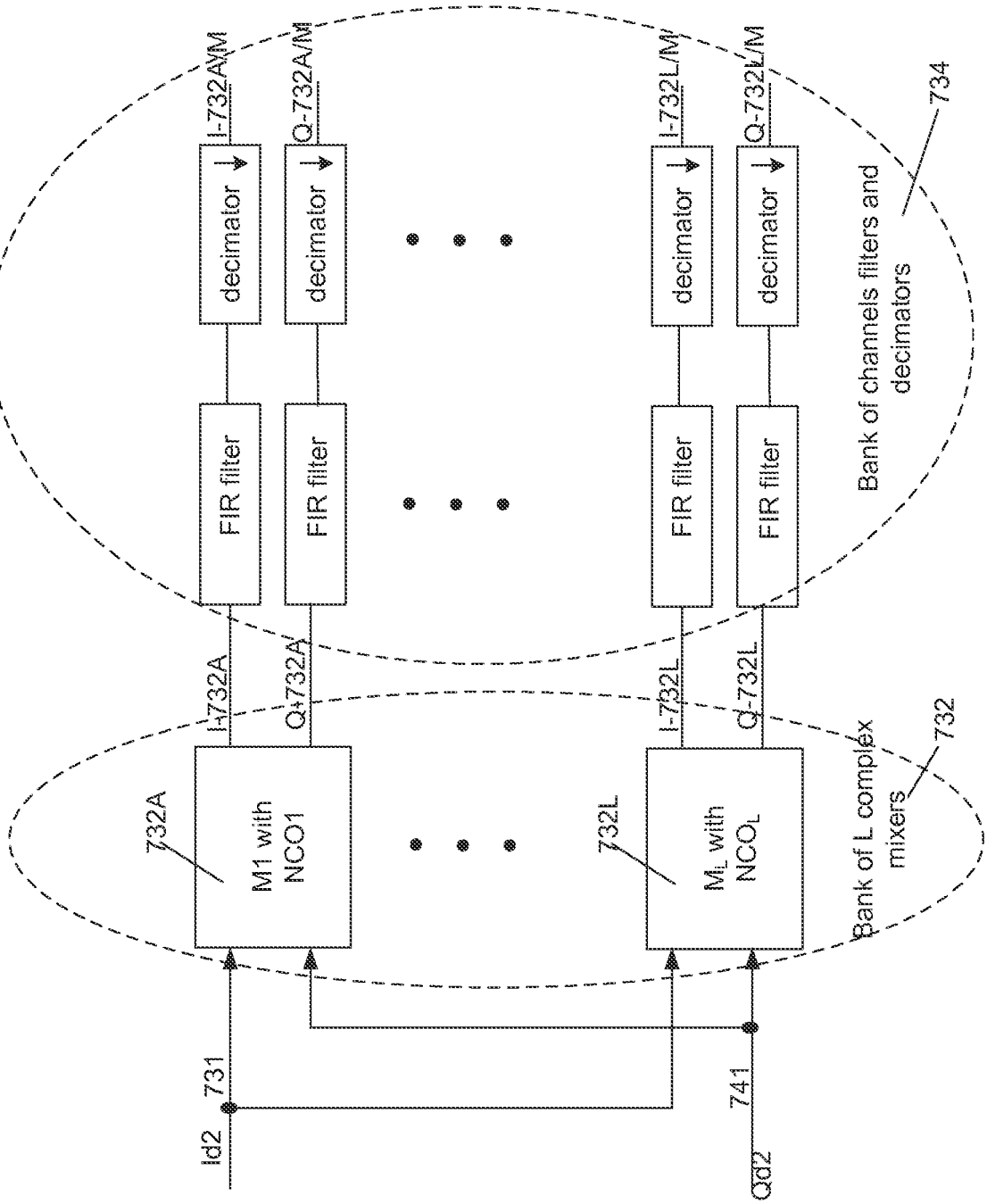

Id2
731
Qd2
741
732A
M1 with NCO1
732L
ML with NCOL
Bank of L complex mixers
732
I-732A
Q-732A
I-732L
Q-732L
FIR filter
decimator
I-732A/M
Q-732A/M
I-732L/M
Q-732L/M
Bank of channels filters and decimators
734

FIG. 7

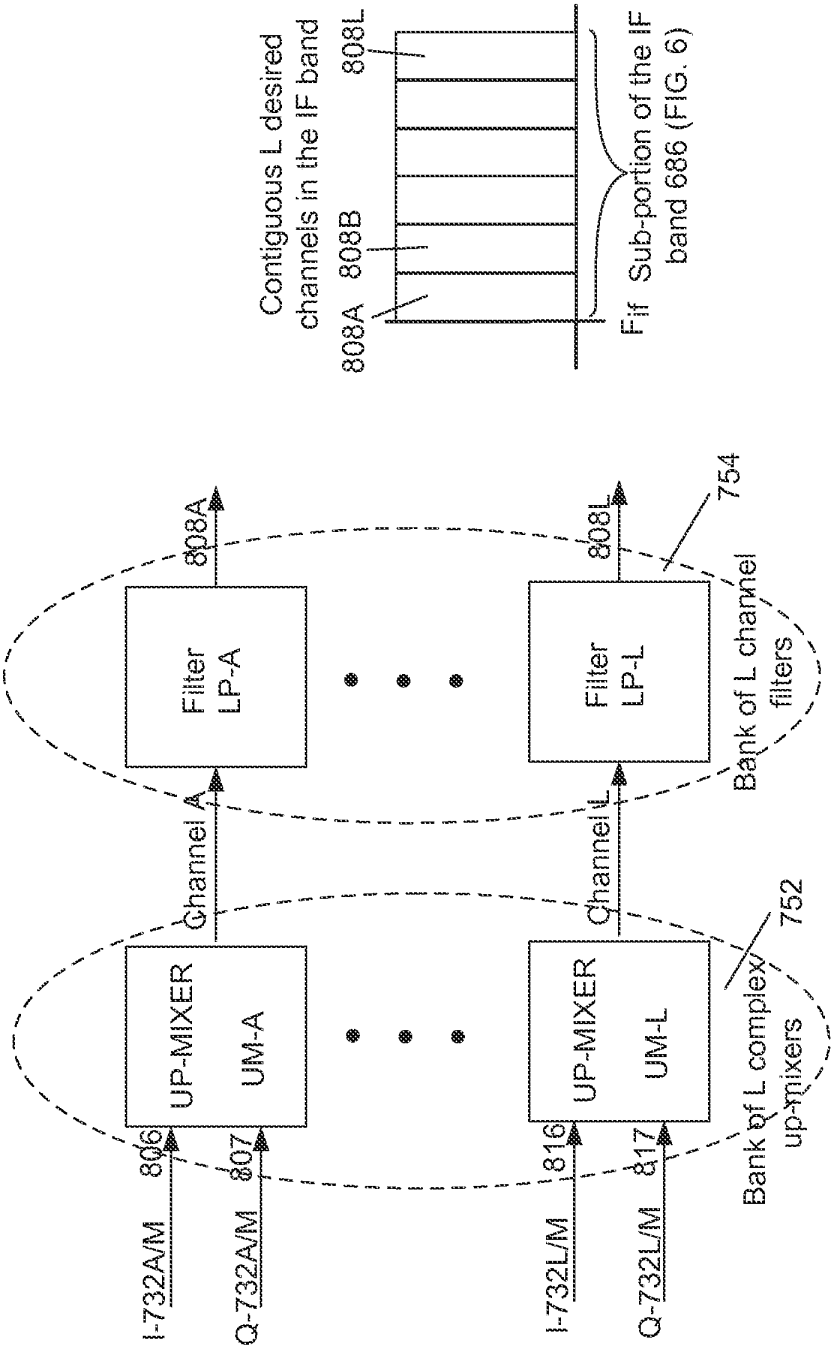

Contiguous L desired channels in the IF band
808L
808B
808A
Fif
Sub-portion of the IF band 686 (FIG. 6)
808A
808L
754
Filter LP-A
Filter LP-L
Bank of L channel filters
Channel A
Channel L
752
UP-MIXER UM-A
UP-MIXER UM-L
Bank of L complex up-mixers
806
807
816
817
I-732A/M
Q-732A/M
I-732L/M
Q-732L/M

FIG. 8

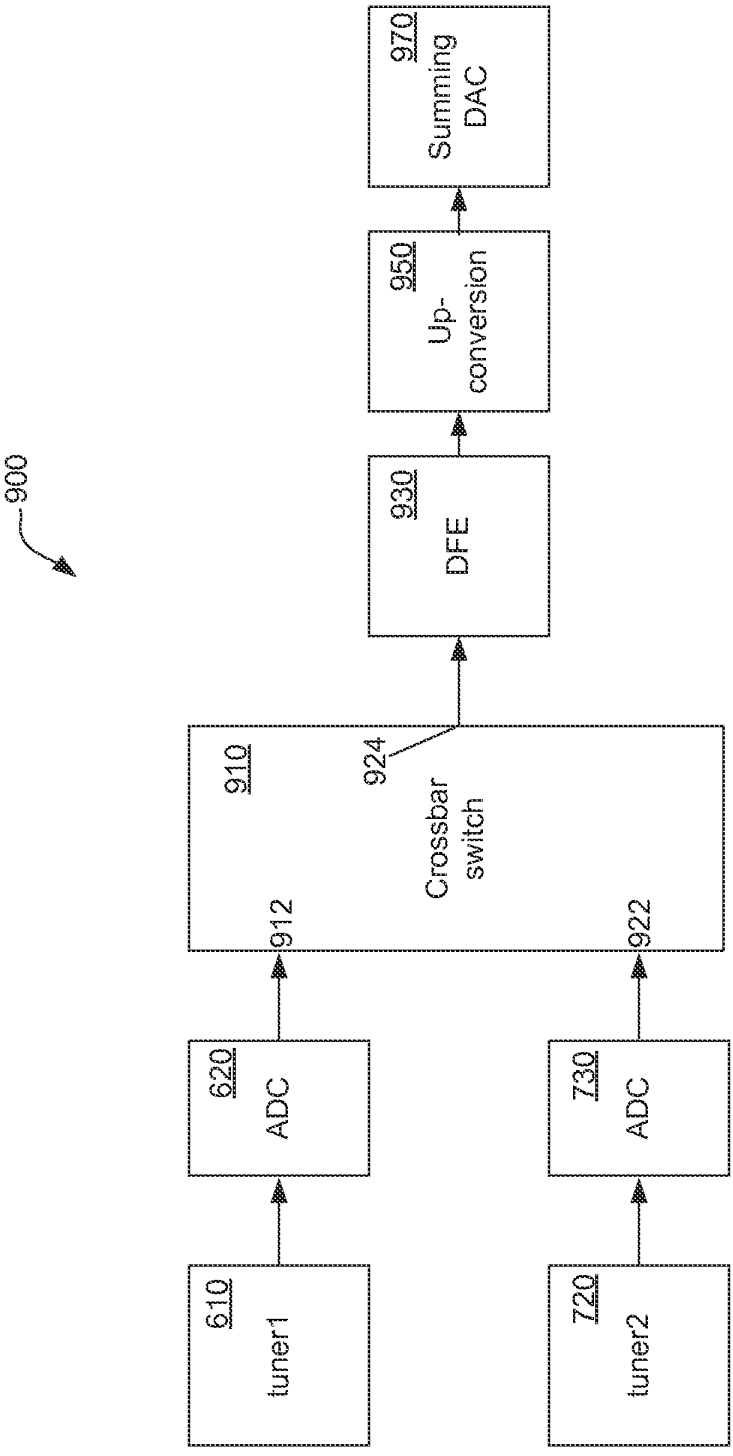

900
610
tuner1
620
ADC
912
910
Crossbar
switch
924
930
DFE
950
Up-
conversion
970
Summing
DAC
720
tuner2
730
ADC
922

FIG. 9

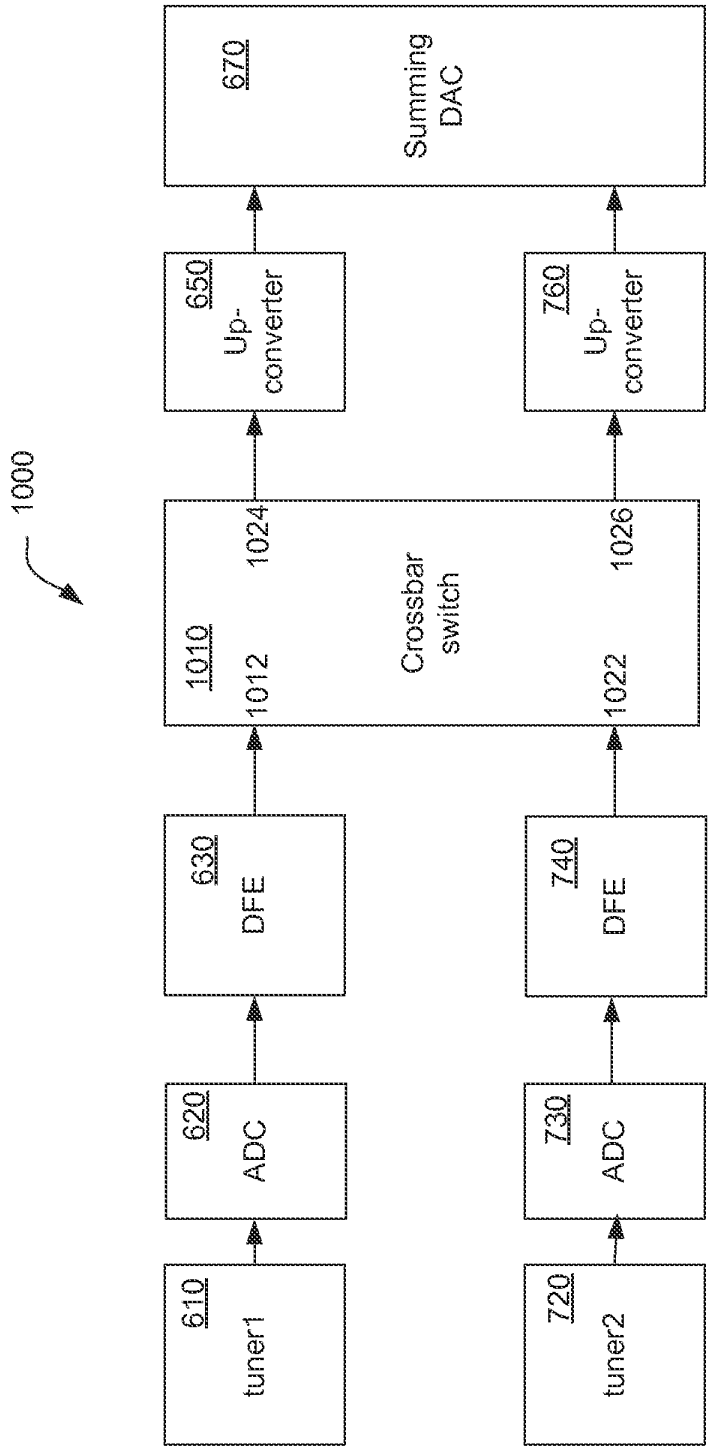

1000
610
tuner1
620
ADC
630
DFE
1010
1012
1022
Crossbar switch
1024
1026
650
Up-converter
670
Summing DAC
720
tuner2
730
ADC
740
DFE
760
Up-converter

FIG. 10

WIDEBAND TUNER ARCHITECTURE

PRIORITY CLAIM

[0001] This application is a continuation of U.S. patent application 14/617,973 (now patent 9,210,363) filed on February 10, 2015, which is a continuation of U.S. patent application 13/962,871 (now patent 9,100,622) filed on August 08, 2013, which is a continuation of U.S. patent application 12/762,900 filed on April 19, 2010 (now U.S. Patent 8,526,898), which claims the benefit of priority to U.S. provisional application 61/170,526 filed April 17, 2009, now expired. Each of the above referenced documents is hereby incorporated by reference in its entirety.

BACKGROUND

[0002] This invention relates to wideband receiver systems and methods having a wideband receiver that is capable of receiving multiple radio frequency channels located in a broad radio frequency spectrum. In particular, the invention relates to wideband receiver systems that are capable of receiving multiple desired television channels that extend over multiple non-contiguous portions of the broad frequency spectrum and grouping them into a contiguous, or substantially-contiguous, frequency spectrum.

[0003] Receivers used to down-convert and selectively filter TV channels are referred to as tuners, and tuners designed to concurrently receive several TV channels are referred to as wideband tuners. Existing tuners for these applications down-convert a swath of channels to an intermediate frequency, which are then sent to a demodulator. Because the swath of channels is not contiguous, this swath includes the desired channels as well as undesired channels. The demodulator employs a high-speed data converter to capture this swath of desired and undesired channels in the digital domain and subsequently filters out the desired channels.

[0004] In general, television channels broadcasted over the air or over cable networks are distributed across a broad frequency spectrum. That is, the channel frequencies may not be adjacent to each other. In certain applications such as DVR and picture-in-picture, the receiver system may have to concurrently receive several desired channels that may or may not be contiguous. The wideband receiver requirement poses a trade-off to the system to limit either the dynamic range of the wideband tuner or reduce the bandwidth covered by the tuner so that fewer channels may be received and processed by the demodulator.

[0005] FIG. 1 shows a conventional wideband tuner 100. Tuner 100 may be a direct conversion tuner and includes a low noise amplifier LNA1 having an input terminal coupled to a radio frequency (RF) input signal 102 and an output terminal coupled to a mixer M1. The RF signal may include one or more television channels receiving from a cable network via an RF connector or wirelessly via an antenna. The RF input signal may include the VHF and UHF television channels in a terrestrial television broadcasting system or the CATV channels in cable networks. In order to receive all broadcasted channels present in the RF input signal, LNA1 must necessarily have a wide tuning range, high linearity, and low noise. Mixer M1 is coupled to a synthesizer S1 that can generate an oscillator frequency located around the center of the RF signal. Mixer M1 frequency down-converts the received RF input signal to a more convenient intermediate frequency (IF) band. Tuner 100 includes an amplifier V1 having a programmable gain for amplifying the IF signal, which is then band-pass filtered by a filter F1 before outputting to a demodulator.

[0006] In general, the RF signal includes multiple desired channels that are located in non-contiguous portions of a radio frequency spectrum. As shown in FIG. 1, the swath of channels 110 occupies a bandwidth BW1 120 at an RF center frequency f_{rfc} 130. Synthesizer S1 may be tuned to a frequency around the center frequency f_{rfc} 130 for

mixing channels 110 to an intermediate frequency f_{ifc} 160, the frequency down-mixed channels 140 are amplified by amplifier V1 and then filtered by F1 to produce a swath of channels 170 centered around frequency f_{ifc} 160. In an exemplary application shown in FIG. 1, bandwidth BW1 contains 10 channels. In the case where channels are TV channels that are spaced at either 6 MHz or 8 MHz in most parts of the world, bandwidth BW1 120 would span from 60-80 MHz, i.e., the down-converted bandwidth at the intermediate frequency would require a bandwidth equal to at least BW1, or at least 80 MHz when such architecture is used. It is noted that in other applications where the desired RF channels are located in the low band such as channels numbers 2 to 6 (VHF in the terrestrial TV broadcast or CATV) and in the high band such as channels numbers 14 to 83 of the UHF TV broadcast or channel numbers 63-158 of the CATV's ultra band, the bandwidth BW1 can be 800 MHz or higher. This wide bandwidth of 800 MHz would require a very expensive digital processing circuitry such as very high-speed analog to digital conversion and high-speed processor in the demodulator.

[0007] It is desirable to have wideband receiver systems that can increase the dynamic range without requiring expensive data conversion, filtering and channel selection at the demodulator.

BRIEF SUMMARY

[0008] An embodiment of the present invention includes a wideband receiver system that is configured to concurrently receive multiple radio frequency (RF) channels including a number of desired channels that are located in non-contiguous portions of a frequency spectrum and group the desired channels in a contiguous or substantially-contiguous frequency band at an intermediate frequency spectrum, where the term "substantially-contiguous" includes spacing the desired channels close to each other (e.g. as a fraction of the total system bandwidth, or relative to a channel bandwidth) but with a spacing that can be variable to accommodate the needs of overall system. The term "contiguous" heretofore encompasses "substantially-contiguous." The term "spacing" is referred to as the frequency difference between adjacent channels. The system includes a wideband receiver having a complex mixer module for down-shifting the multiple RF channels and transforming them to an in-phase signal and a quadrature signal in the baseband or low intermediate frequency (IF) band. The system further includes a wideband analog-to-digital converter module that digitizes the in-phase and quadrature signals. The digital in-phase and quadrature signals are provided to a digital frontend module that contains a bank of complex mixers that frequency-shift the number of desired channels to a baseband where the desired channels are individually filtered.

[0009] The digital frontend module may also include a decimator module that decimates the desired RF channels by a factor M before demodulating them to a digital data stream.

[0010] In certain embodiments of the present invention, the wideband receiver system additionally includes an up-converter module having multiple complex up-mixers, each of the complex up-mixers is configured to frequency up-shift each one of the desired RF channels to a sub-portion of an IF spectrum, wherein all sub-portions of the desired channels are adjacent to each another and form a contiguous frequency band in the IF

spectrum. The act of frequency shifting the desired channels to the IF spectrum allows the wideband receiver system to directly interface with commercially available demodulators. Allowing the spacing of the desired channels in the contiguous spectrum to be variable allows a system to optimize placement of these desired channels for the purposes of avoiding sensitive portions of the spectrum which may either be vulnerable to spurious signals and interference; or which may generate interference directly or as a harmonic product, to other systems.

[0011] In another embodiment of the present invention, a multi-tuner receiver system having two or more tuners is provided to receive multiple desired RF channels that extend over several non-contiguous sub-portions of a broad frequency spectrum and group them into a contiguous frequency spectrum. The multi-tuner system includes at least a first tuner that processes a first sub-portion of the broad frequency spectrum into a first in-phase signal and a first quadrature signal and a second tuner that processes a second sub-portion of the broad frequency spectrum into a second in-phase signal and a second quadrature signal. The multi-tuner receiver system further includes a first analog-to-digital converter module that digitizes the first in-phase and quadrature signals and a second analog-to-digital converter module that digitizes the second in-phase and quadrature signals. In addition, the multi-tuner system includes a first digital frontend module having a first number of complex mixers corresponding to a first number of the desired RF channels located in the first sub-portion of the broad frequency spectrum and a second digital frontend module having a second number of complex mixers corresponding to a second number of the desired RF channels located in the second sub-portion of the broad frequency spectrum. The first digital frontend module frequency shifts the first number of the desired RF channels to a first plurality of baseband signals and the second digital frontend module frequency shifts the second number of the desired RF channels to a second plurality of baseband signals.

[0012] The multi-tuner system further includes a first up-converter module having a plurality of N complex mixers, wherein N is an integer value equal to the number of desired channel. The first up-converter module frequency up-shifts the first plurality of the baseband signals to a first portion of an intermediate frequency. In addition, the multi-tuner system includes a second up-converter module that frequency up-shifts the second plurality of the baseband signals to a second portion of an intermediate frequency. The first and the second portions of the intermediate frequency are non-overlapping and located adjacent to each other to form a contiguous intermediate frequency (IF) band. The multi-tuner system further includes a digital-to-analog converter that converts the contiguous IF band to an analog waveform signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a schematic block diagram of a conventional wideband tuner;

[0014] FIG. 2 is a schematic block diagram of a wideband receiver system according to an embodiment of the present invention;

[0015] FIG. 3 is a simplified circuit diagram of a complex down-mixer according to an embodiment of the present invention;

[0016] FIG. 4 is a simplified schematic block diagram of a wideband receiver system according to another embodiment of the present invention;

[0017] FIG. 5 is a simplified circuit diagram of a complex up-mixer according to an embodiment of the present invention;

[0018] FIG. 6 is a simplified schematic block diagram of a wideband multi-tuner receiver system according to an embodiment of the present invention;

[0019] FIG. 7 is a block diagram illustrating an exemplary digital front end according to an embodiment of the present invention in more detail;

[0020] FIG. 8 is a block diagram illustrating an exemplary tiled up-converter module according to an embodiment of the present invention in more detail;

[0021] FIG. 9 is a simplified block diagram of a wideband multi-tuner receiver system 900 according to an embodiment of the present invention; and

[0022] FIG. 10 is a simplified block diagram of a wideband multi-tuner receiver system 1000 according to another embodiment of the present invention.

DETAILED DESCRIPTION

[0023] FIG. 2 is a schematic block diagram of a wideband receiver system 200 according to an embodiment of the present invention. Wideband receiver system 200 includes a radio front end 210 and a digital front end 230. Radio front end 210 may be a single very wide-band tuner receiver that captures the desired swath of channels located in non-contiguous portions of the spectrum having a frequency bandwidth BW1 120. In this example, the number of available channels in BW1 120 is assumed to be 10 with each channel occupying an 8 MHz bandwidth for a total of 80 MHz. Radio front end 210 is shown as including a low noise amplifier LNA 202 having an input terminal configured to receive an RF input signal 102. In the example shown, RF signal 102 includes four desired RF channels having the respective carrier frequency f_{rf1}, f_{rf2}, f_{rf3}, and f_{rf4} that are located in non-contiguous portions of the wide frequency spectrum BW1. It is understood, however, that spectrum BW1 120 may have any other number of desired frequencies that are not contiguous. LNA 202 has a very low noise figure and very high linearity and a wide tuning range (i.e., very high IIP2 and IIP3 intercept points) to maximize a signal-to-noise-and distortion ratio (SNDR) at the amplifier output. LNA 202 may have a programmable gain to amplify RF signal 102 to adequate voltage levels for mixers M1 211 and M2 221.

[0024] Mixers M1 211 and M2 221 may be conventional mixers formed using, for example, differential Gilbert cells. Each of the mixers 211 and 221 multiplies (mixes) an amplified RF signal 203 with a respective first oscillator frequency signal 205 and a second oscillator frequency signal 207 to generate an in-phase signal 212 and a quadrature signal 222 that have a phase shift of 90° degree between them. Mixers 211 and 221 are identical so that the amplitude of the in-phase signal 212 and quadrature signal 222 are the same. The first and second oscillator frequencies 205 and 207 are identical and have a 90° degree phase shift generated through a 90° degree phase shifter P1 206. Synthesizer S1 may be a single local oscillator operable to generate the oscillator

frequency 205 for converting the receive RF signal 102 to a zero-IF or low-IF band. Synthesizer S1 can be a coarse (large step) phase locked loop. Synthesizer S1 can also be programmable to cover the wideband frequency of the analog and digital terrestrial broadcast and/or the cable television system. The RF signal 102 may have relatively uniform signal strength in a cable network. However, its signal strength may extend in several orders of magnitude in a terrestrial broadcast system, thus, LNA 202 and/or mixers M1 211, M2 221 are required to have a relatively high dynamic range to handle the large variations in the signal strength.

[0025] In-phase signal 212 and quadrature signal 222 are further amplified and filtered by respective amplifiers V1 213, V2 223 and filters F1 215, F2 225 to generate a filtered in-phase signal 216 and a filtered quadrature signal 226. Filters F1 215 and F2 225 may be passive or active low-pass filters to filter out any unwanted frequency components of the signals 214 and 224 before digitizing them for further processing in digital front end 230. It is understood that the in-phase path 216 and the quadrature path 226 must have the same amplitude spectrum and maintain a fixed phase relationship, i.e., amplifiers V1 213, V2 223 and filters F1 215, F2 225 must be substantially identical. Because the two paths 216 and 226 are in quadrature, the spectral components from both positive and negative frequencies can be overlaid so that the bandwidth (cutoff frequency) of filters F1 215 and F2 225 can be one half of the BW1 bandwidth 120.

[0026] Analog-to-digital converters ADC1 218 and ADC2 228 are high-speed (i.e., high sampling rate) converters to maximize the dynamic range. In an exemplary application, radio front end 210 operates as a nominal zero-IF down-mixer so that signals 216 and 226 have a nominal bandwidth 290 equal to one half of the RF signal bandwidth BW1 thanks to the complex down-mixer architecture. In other embodiment, radio front end 210 operates as a low-IF down-mixer so that the nominal bandwidth 290 of signals 216 and 226 is greater than one half of the bandwidth BW1. In practice, the sampling rate

of ADC1 218 and ADC2 228 is chosen to be higher than the Nyquist sampling requirement, i.e., the filtered analog quadrature signals 216 and 226 may be over-sampled in order to reduce or avoid aliasing of undesired signals into the digitized I and Q signals.

[0027] ADC1 218 generates a digital signal I 232 that is a digital representation of the analog filtered signal 216; ADC2 228 generates a digital signal Q 242 that is a digital representation of the analog filtered signal 226. Digital signals I 232 and Q 242 are then applied to a bank of N complex mixers 250, wherein N is an integer value corresponding to the number of desired RF channels located in the non-contiguous portions of the frequency spectrum BW1. It is understood that the number N can be any integer value. In one embodiment, N can be equal to the number of all available channels that exist in the licensed frequency spectrum to provide system flexibility. In other embodiments, N can be equal to the number of all receivable channels within a geographic area. In yet another embodiment, N can be an integer value less than the number of receivable channels with the geographic area to reduce system costs. In the exemplary embodiment shown in FIG. 2, the number of desired channels is 4. That is, each of the 4 complex mixers 250 mixes in-phase and quadrature signals 232 and 242 with an associated frequency to generate a corresponding baseband, which is then individually filtered, decimated and provided to an associated demodulator.

[0028] Each of the N complex mixers 250 receives the digital signals I 232 and Q 242 from ADCs 218 and 228 to extract a different one of the desired channels and frequency-shifts the extracted signals to the baseband frequency. Each of the frequency shifted desired channels 252 is filtered by an associated filter module (identified as 260a to 260n). In an embodiment, each of the filtered signals 260a to 260n may be sent directly to an associated demodulator (identified as 270a to 270n) for extracting the original information transmitted in the associated desired channel. In another embodiment, each

of the filtered signals 262a to 262n is further decimated before providing to a demodulator. A path of digital front end 230 is described in more detail below.

[0029] FIG. 3 is a simplified circuit diagram of one of the signal paths 272a to 272n of digital front end 230 shown in FIG. 2 according to an embodiment of the present invention. In an embodiment, digital signal I 232 may be further filtered by a filter 311 to obtain a filtered signal 312. Similarly, digital signal Q 242 may be further filtered by a filter 321 to obtain a filtered signal 322. Thus, digital signals 312 and 322 only contain low-frequency components with undesired high-frequency components being eliminated by respective filters 311 and 321. It is noted that filtered signals 312 and 322 are interposed between the respective ADCs 218, 228 and the bank of N complex mixers 250.

[0030] Mixer 300, which represents one of the N complex mixers 250, includes four multipliers 313, 315, 323, and 325. Multipliers 313 and 315 multiply the filtered signal 312 with respective $\cos(\omega_{ci}t)$ and $\sin(\omega_{ci}t)$ signals and generate respective products 314 and 316. Similarly, multipliers 323 and 325 multiply the filtered Q signal 322 with respective $\cos(\omega_{ci}t)$ and $\sin(\omega_{ci}t)$ signals and generate respective products 324 and 326. An adder 317 sums the products 314 and 326 to generate a frequency-shifted signal I 318. An adder 327 sums the products 324 and 316 to generate a frequency-shifted signal Q 328. Basically, complex mixer 300 causes a frequency shift of the filtered components 312 and 322 to respective baseband signals 318 and 328 in the digital domain according to the operation:

$$Y(t) = X(t) * e^{-j\omega_c t} \quad (1)$$

or taken the Fourier transform, we obtain:

$$Y(\omega)=X(\omega-\omega_c) \quad (2)$$

[0031] Multipliers 313, 315, 323, and 325 are identical digital multipliers. In an embodiment, a numerically controlled oscillator with quadrature output generates the $\cos(\omega_{ci}t)$ and $\sin(\omega_{ci}t)$ signals. Numerically controlled oscillators (NCO) can be implemented using a phase accumulator and a look-up table. NCOs are known to those of skill in the art and will not be described herein. The frequency ω_{ci} is so chosen that each one of the desired channels embedded in the digital signals I 232 and Q 242 will be downshifted to the baseband. In the given example shown in FIG. 2, the bank of N complex mixers will have four complex mixers, each one of the N (i.e., four) complex mixers is coupled to an individual NCO having a distinct frequency ω_{ci} so that when mixing the filtered digital I and Q signals 312 and 322 with that frequency, each one of the complex mixers will generate the signals I (318) and Q (328) of a corresponding one of the desired channels at the baseband.

[0032] In an embodiment, baseband signals 318 and 328 are further individually filtered by respective filters 330 and 340 that are identified as one of the filters 260a-n in FIG. 2. Filters 330 and 340 may be band-pass or low-pass filters having a narrow bandwidth equal to the bandwidth of a desired channel. In certain embodiments, filters 330 and 340 can be analog passive or active low-pass or complex band-pass filters such as polyphase filters. In another embodiment, filters 330 and 340 can be digital low-pass filters, such as finite impulse response (FIR) filters to eliminate high frequency components that may be aliased back to the baseband signals Ii (332) and Qi (342) when decimated by subsequent decimator 350.

[0033] The reduced sampling rate of the N desired baseband channels will be sent as a serial or parallel digital data stream to a demodulator using a serial or parallel data interface according to commonly known methods, as shown in FIG. 2. This approach provides several advantages over conventional tuner architectures. First, it eliminates the need of expensive data conversion, filtering and channel selection on the demodulator

side. Second, it removes undesired channels from the signal path at an early stage, thus relieves the large dynamic range requirement in the demodulator.

[0034] FIG. 4 shows a simplified schematic block diagram of a wideband receiver system 400 according to another embodiment of the present invention. Wideband receiver system 400 includes a radio front end 410, a digital front end 430, a tiled up-conversion module 450, and a summing digital-to-analog converter module DAC 470. Radio front end 410 includes a low noise amplifier LNA1 that receives an RF input signal 102 and provides an amplified RF signal 403 to mixers M1 411 and M2 421. Mixer M1 411 is coupled to an oscillator frequency 405 of a synthesizer S1 whereas mixer M2 421 is coupled with the oscillator frequency 405 via a phase shifter P1 406 that generates a 90° degree phase-shift to the oscillator frequency 405. Mixers M1 411 and M2 421 generate respective in-phase signal 412 and quadrature signal 422 that are further amplified by respective amplifiers V1 413 and V2 423. The amplified in-phase and quadrature signals 414, 424 are then filtered by filters F1 415 and F2 425 to eliminate undesired frequency components that would be aliased back to the in-phase and quadrature signals when digitally sampled by subsequent analog-to-digital converters ADC1 418 and ADC2 428. Digital signals I 422 and Q 442 at the input of digital front end 430 are digital representations of the filtered analog in-phase and quadrature signals 416, 426 before the ADCs. Digital front end 430 include a bank of N complex mixers 432 comprising 432a to 432n identical mixers, where N is an integer value corresponding to the number of the desired channels located in non-contiguous portions of the frequency spectrum. Each of the N complex mixers 432a to 432n frequency down-converts signals I 432 and Q 442 to an associated baseband. Each of the frequency down-converted I and Q signals are coupled to respective low-pass, band-pass, or decimating filters 434. In this regard, the radio front end 410 and the digital front end 430 are similar to respective radio front end 210 and digital front end 230 of FIG. 2 that have been described in detail above.

[0035] In an alternative embodiment of the present invention, the N filtered and decimated channels 438a to 438n (where indices a to n correspond to the associated number of desired channels) are not provided to a demodulator for demodulation. Instead, the N filtered and decimated channels 438a to 438n are further frequency up-converted to an intermediate frequency (IF) spectrum. In order to achieve that, the N filtered and decimated channels are coupled to a tiled up-conversion module 450 that includes a bank of N complex up-mixers, where N is an integer value correspond to the number of desired received channels. The N complex up-mixers include identical digital mixers 452a to 452n that will be described further in detail below with reference to FIG. 5. The N up-shifted channels are then filtered by a subsequent bank of channel filters 454 that, in an embodiment, comprises N individual finite impulse response (FIR) filters. The N filtered channels are then digitally combined and converted to the analog domain by a summing digital-to-analog converter module DAC 470. The N up-shifted channels are adjacent to each other and form a contiguous or substantially-contiguous set of channels 475 in the IF spectrum centered around f_{if} as illustrated in FIG. 4. In an embodiment, the spectra of the mixed products are spaced in such a way so as to avoid overlap with known frequency bands containing potential or actual interferers. In another embodiment, the spectra of the mixed products are spaced in such a way so as to avoid overlap with frequency bands that might introduce interference to other systems. In general, because the bandwidth BW_2 is substantially lower than BW_1, the IF frequency f_{if} can be set proportionally lower, e.g., typically about 16 MHz to accommodate the spectrum of BW2 of up to 32 MHz (corresponding to the total bandwidth of the four desired channels, each having a bandwidth of 8 MHz in this example).

[0036] The up-conversion approach of FIG. 4 provides several advantages over conventional tuner architectures. First, it allows the demodulator to operate the data converter at a lower data rate and with lower resolution (fewer bits) due to the fact that the contiguous channels have a narrower bandwidth. Second, the up-conversion approach

provides full compatibility with existing demodulators that require an analog IF signal. Third, it removes undesired channels from the signal path at an early stage, thus relieves the requirement of a high dynamic range requirement of the demodulator's analog-to-digital converter and the demodulator itself.

[0037] FIG. 5 shows a simplified exemplary circuit diagram of a complex up-mixer 500 according to an embodiment of the present invention. Up-mixer 500 is one of the N complex up-mixers 452a to 452n in tiled up-conversion module 450 shown in FIG. 4. Up-mixer 500 includes filter 510 and 520 configured to eliminate unwanted frequency components present in respective input signals I 501 and Q 502. Filtered signals 512 and 522 are provided to up-mixers UMI 515 and UMQ 525 that multiply the filtered signals 512 and 522 with respective $\cos(\omega_u t)$ and $\sin(\omega_u t)$. The products 516 and 526 are summed in an adder 530 to generate an IF signal 532 according to the following equation:

$$IF(t)=I(t)*\cos(\omega_u t)+Q(t)*\sin(\omega_u t) \qquad (3)$$

[0038] Up-mixers UMI 515 and UMQ 525 are identical digital multipliers that multiply the respective filtered signal 512 and 522 with a cosine function 505 and a sine function 506 that can be generated from a NCO using a digital phase accumulator and a look-up table.

[0039] As described above, TV channels are grouped into multiple frequency bands in North America. For example, channels 2 through 6 are grouped in VHF-low band (aka band I in Europe), channels 7 through 13 in VHF-high band (band III), and channels 14 through 69 in UHF band (bands IV and V). In order to receive such a wide frequency spectrum, the low noise amplifier and mixer must have very low noise, wide tuning range and high linearity as described above in the wideband receiver systems 200 and 400. However, a wideband receiver having a single tuner with high sensitivity may have a high power consumption. For certain applications, it may be advantageous to use multiple tuners that are optimized for a given frequency band, such as a dedicated tuner

for the low VHF band, another dedicated tuner for the high VHF band and the UHF band, and yet other dedicated tuners for receiving the digital video broadcasting (DVB) via satellite (DVB-S), via cable (DVB-C), or terrestrial digital video broadcasting (DVB-T). The multi-tuner approach may also be advantageously applied to cable networks that carry TV programs on an 88 MHz to 860 MHz according to the Data Over Cable Service Interface Specification (DOCSIS) protocol.

[0040] FIG. 6 shows a simplified schematic block diagram of a wideband multi-tuner receiver system 600 according to an embodiment of the present invention. In an embodiment, multi-tuner system 600 includes low noise amplifier A1 602 for receiving an RF input signal 601. Amplifier A1 602 is coupled to at least a tuner1 610 and a tuner2 720. In another embodiment, multi-tuner system 600 may not include amplifier 602 so that RF input signal 601 can be received directly at each tuner 610 and 720.

[0041] Tuner1 610 includes an amplifying filter AF1 613 that filters and amplifies a first portion BWtuner1 604 of a broad frequency spectrum 608 that contains a first plurality of RF channels 606 including desired channels 607 having respective channel frequencies f_{rf1} and f_{rf2}. The first portion of the broad frequency spectrum BWtuner1 604 is then frequency down-converted to a low-IF or zero-IF in-phase signal I1 612 and a quadrature signal Q1 622 through respective mixer M1 611 and M2 621. Signals I1 612 and Q1 622 are further amplified and low-pass filtered before applying to respective analog-to-digital converters ADC1 618 and ADC2 628 that convert analog signals Ia1 616 and Qa1 626 to respective digital in-phase signal Id1 631 and digital quadrature signal Qd1 641. Because tuner1 610 only covers a portion BWtuner1 604 of the entire frequency spectrum 608 having fewer channels, the ADC1 618 and ADC2 628 can be slower-speed analog-to-digital converters with a large number of bits, i.e., large dynamic range.

[0042] Digital signals Id1 631 and Qd1 641 are then provided to a digital front end DFE 630 that includes a first bank of N complex mixers 632 and channel and decimating filters 634. The first bank of N complex filters 632 has N identical complex mixers, where N is an integer value equal to the number of desired channels located in the first portion BWtuner1 604 of the broad frequency spectrum 608. In an embodiment, each one of the first bank of N complex mixers includes four digital mixers that multiply digital stream Id1 631 and Qd1 641 with respective digitized cosine function and sine function to generate the sum and difference frequency components, as shown in FIG. 3. The digitized cosine and sine frequency, i.e., the mixer frequency is so chosen so that when mixing signals Id1 631 and Qd1 641 will move them to a baseband or a low-IF band. In an embodiment, channel and decimating filters have similar structures as filters 330 and 340 and demodulator 350 as shown in FIG. 3. That is, channel and decimating filters include digital low-pass filters 330 and 340 that eliminates unwanted high frequency components of the baseband signals I and Q prior to applying them to a decimator 350 (FIG. 3) that reduces the sample frequency without any loss of information since Id1 631 and Qd1 641 are sampled at a much higher frequency by the respective ADC1 618 and ADC2 628.

[0043] The decimated desired channels are then provided to an up-converter module 650 that includes a bank of N up-mixers. The bank of N up-mixers includes N identical up-mixers whose structure is shown in FIG. 5. In an embodiment, N is an integer value equal to the number of desired channels present in BWtuner1 604. Each one of the up-mixer frequency-shifts the baseband signals I and Q of each one of the desired channels to an appropriate portion of the intermediate frequency band according to Equation (3). In other words, the bank of N up-mixers is "frequency multiplexing" the desired channels onto a first portion 682 of an IF band 686.

[0044] Similarly, tuner2 720 includes an amplifying filter AF2 713 that is configured to receive a second portion BWtuner2 704 of the broad frequency spectrum 608. The second portion 704 contains a second plurality of RF channels 706 including a second number of desired channels. In the exemplary illustration of FIG. 6, the second portion 704 has a frequency bandwidth of BWtuner2 that contains desired channels 707 having respective channel frequencies f_{rf3} and f_{rf4}. Tuner2 720 includes elements such as mixers M3 711, M4 721, amplifiers V3 714, V4 724, filters F3 715, F4 725 and analog-to-digital converters ADC3 731 and ADC4 741 that are substantially the same as the like-named elements of the signal path of tuner1 610. Thus, redundant description is omitted herein.

[0045] Digital in-phase signal Id2 731 and digital quadrature signal Qd2 741 are then provided to digital front end 740. Digital front end 740 includes a bank of L complex filters, where L is an integer value equal to the number of desired channels in the second portion BWtuner2 704 of the broad frequency spectrum 608. Each one of the bank of L complex filters is a digital complex mixer configured to transform the signals Id2 731 and Qd2 741 to baseband signals that are further filtered by individual digital low-pass filters such as FIR filters before decimated by a subsequent decimator. The elements of digital front end 740 are substantially similar to those described in digital front end 630. Thus, redundant description is omitted herein.

[0046] The decimated baseband I and Q channels are further provided to a subsequent up-conversion module 760 that performs a function substantially similar to that of the up-conversion module 650 already described above. The outputs of up-conversion module 650 and 760 can be tiled to generate a contiguous set of IF frequencies 682, 684 centered at f_{if} 686. In an embodiment, the outputs of up-conversion module 650 and 760 are digitally summed and converted to an analog signal by summing DAC 670. In another embodiment, the up-conversion modules 650 and 760 and the

digital summing function 672 can be performed using an inverse discrete Fourier transform or an inverse Fast Fourier transform operation.

[0047] The multi-tuner architecture provides the flexibility that multiple commercially available tuners can be used without the need of designing a wideband tuner. For example, a tuner designed for a terrestrial broadcast digital TV can be used together with a tuner dedicated to receiving a cable signal and/or a tuner for receiving a satellite broadcast signal. The multi-tuner receiver system provides an additional advantage that other tuners can be added quickly to the system to accommodate any future applications. Additionally, the multi-tuner architecture allows the use of slower speed (i.e., lower cost) analog-to-digital converters with a larger number of bits for achieving large dynamic range.

[0048] FIG. 7 shows a block diagram of an exemplary digital front end of the invention in more detail. In an embodiment, in-phase signal Id2 731 and quadrature signal Qd2 741 at the output of respective ADC converters 718 and 728 are provided to each of the L complex mixers 732 comprising mixers 732A to 732L. A more detailed description of each of L complex mixers is shown in FIG. 3. Mixer 732A multiplies Id2 731 and Qd2 741 with a cosine signal and a sine signal that are generated from an NCO1 and produces an I-732A signal and a Q-732A signal that are further individually filtered by an FIR filter before decimating. The bank of L complex mixers corresponds to the block 732 in FIG. 6; and the set of FIR filters and decimator corresponds to the block 734 in FIG. 6. Each decimated pair of I-732i/M in the baseband, where the index "i" is from A to L, is further provided to a subsequent up-mixer for frequency-shifting to an intermediate frequency as shown in FIG. 8.

[0049] FIG. 8 shows an exemplary embodiment of a bank of L complex up-mixers according to the present invention. Each decimated pair of complex signals I-732i/M and Q-732i/M is provided to an associated complex up-mixer, whose frequency is so chosen

that when mixing with the pair of complex signals I-732i/M and Q-732i/M will generate an associated channel at a predetermined sub-portion of the intermediate frequency band 686 (FIG. 6). A more detailed schematic block of one of the L up-mixers is described above together with FIG. 5.

[0050] FIG. 9 is a simplified block diagram of a wideband multi-tuner receiver system 900 according to an embodiment of the present invention. In an embodiment, system 900 includes a crossbar switch 910 having at least an input terminal 912 configured to receive signals from an analog-to-digital converter (ADC) 912 and an input terminal 922 configured to receive signals from an ADC 922. Crossbar switch 910 also includes an output terminal 924 that is coupled to a digital front end 930. In an embodiment, input terminals 912 and 922 of crossbar switch 910 have P inputs, where P is an integer value that is equal to the total number of desired channels received by tuner1 610 and tuner2 720. Output terminal 924 of crossbar switch 910 have Q outputs, where Q is an integer value that is equal to the total number of desired channels received by tuner1 610 and tuner2 720.

[0051] In an embodiment, digital front end 930 may include a bank of R complex mixers that frequency shifts the received channels to a baseband. Digital front end 930 may combine digital front end 630 and 740 shown in FIG. 6. Similarly, a tiled up-conversion module 950 may include up-converter modules 650 and 760 of FIG. 6.

[0052] System 900 further includes a summing DAC that operates similarly as summing DAC 470 and 670 that have been described in detail in relation with respective FIG. 4 and FIG. 6 above. Thus, redundant description is omitted herein.

[0053] FIG. 10 is a simplified block diagram of a wideband multi-tuner receiver system 1000 according to another embodiment of the present invention. System 1000 includes at least tuner1 610 coupled with digital front end 630 through an analog-to-digital converter 620 and tuner2 720 coupled with digital front end 740 through an

analog-to-digital converter 730. System 1000 further includes a crossbar switch 1010 that is interposed between digital front ends 630, 740 and up-conversion modules 650, 760. Crossbar switch 1010 includes an input terminal 1012 having S inputs coupled with DFE 630 and an input terminal 1022 having T inputs coupled with DFE 740. In an embodiment, S is an integer value equal to the number of desired channels processed in DFE 630 and T is an integer value equal to the number of desired channels processed in DFE 740. Crossbar switch 1010 further includes an output terminal 1024 having U outputs coupled with up-converter module 650 and an output terminal 1024 having V outputs coupled with up-converter module 760. In an embodiment, the total number of the outputs U and V is equal to the sum of the inputs S and T. Thus, crossbar switch 1010 allows the routing of any channel from either DFE 630 or DFE 740 to up-converters 650 or 760. It is understood that system 1000 is not as flexible as system 900 because DFE 630 and DFE 740 are already pre-assigned to respective tuner1 (610) and tuner2 (720). However, this pre-assigned arrangement allows a simpler implementation of crossbar switch 1010 that operates at lower speeds.

[0054] While several embodiments in accordance with the present invention have been described, it is to be understood that the above description is intended to be illustrative and not restrictive. Many embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

CLAIMS

What is claimed is:

1. A system comprising:

a first analog-to-digital converter (ADC) configured to digitize a first frequency band comprising a first plurality of channels;

a second ADC configured to digitize a second frequency band comprising a second plurality of channels; and

a digital frontend (DFE) circuit operatively coupled to the first ADC and the second ADC, the DFE being configured to:

frequency shift one or more channels from the first plurality of channels; and

frequency shift one or more channels from the second plurality of channels, wherein the frequency-shifted one or more channels from the first plurality of channels and the frequency-shifted one or more channels from the second plurality of channels are combined into an intermediate frequency (IF) signal.

2. The system of claim 1, wherein the IF signal is a digital signal and the DFE is configured to output the IF signal via a serial interface.

3. The system of claim 1, wherein the IF signal is a digital signal and the DFE is configured to output the IF signal via a parallel interface.

4. The system of claim 1, wherein:

prior to the frequency shift of the one or more channels from the first plurality of channels and the frequency shift of the one or more channels from the second plurality of channels, there is a first, greater amount of separation in frequency between the one or more channels from the first plurality of

channels and the one or more channels from the second plurality of channels; and

after the frequency shift of the one or more channels from the first plurality of channels and the frequency shift of the one or more channels from the second plurality of channels, there is a second, lesser amount of separation in frequency between the frequency-shifted one or more channels from the first plurality of channels and the frequency-shifted one or more channels from the second plurality of channels.

5. The system of claim 1, wherein the DFE comprises a plurality of channel filters configured to perform selection of the one or more channels from the first plurality of channels and the one or more channels from the second plurality of channels.

6. The system of claim 5, wherein each one of the plurality of channel filters is a finite impulse response filter.

7. The system of claim 1, wherein the DFE is configured to:

adjust a sample rate of the frequency-shifted one or more channels from the first plurality of channels; and

adjust a sample rate of the frequency-shifted one or more channels from the second plurality of channels.

8. The system of claim 1, wherein each of the frequency shift of the one or more channels from the first plurality of channels and the frequency shift of the one or more channels from the second plurality of channels comprises a down-shift and an up-shift.

9. The system of claim 1, wherein the first plurality of channels and second plurality of channels are satellite broadcast television channels.

10. A method comprising:

digitizing, by a first analog-to-digital converter (ADC), a first frequency band comprising a first plurality of channels;

digitizing, by a second ADC, a second frequency band comprising a second plurality of channels;

frequency shifting, by a digital frontend (DFE) circuit operatively coupled to the first ADC and the second ADC, one or more channels from the first plurality of channels; and

frequency shifting, by the DFE, one or more channels from the second plurality of channels, wherein the frequency-shifted one or more channels from the first plurality of channels and the frequency-shifted one or more channels from the second plurality of channels are combined into an intermediate frequency (IF) signal.

11. The method of claim 10, comprising outputting, by the DFE, the IF signal via a serial interface.

12. The method of claim 10, comprising outputting, by the DFE, the IF signal via a parallel interface.

13. The method of claim 10, wherein:

prior to the frequency shifting of the one or more channels from the first plurality of channels and the frequency shifting of the one or more channels from the second plurality of channels, there is a first, greater amount of separation in frequency between the one or more channels from the first plurality of

channels and the one or more channels from the second plurality of channels; and

after the frequency shifting of the one or more channels from the first plurality of channels and the frequency shifting of the one or more channels from the second plurality of channels, there is a second, lesser amount of separation in frequency between the frequency-shifted one or more channels from the first plurality of channels and the frequency-shifted one or more channels from the second plurality of channels.

14. The method of claim 10, comprising selecting, by a plurality of channel filters of the DFE, the one or more channels from the first plurality of channels and the one or more channels from the second plurality of channels.

15. The method of claim 14, wherein each one of the plurality of channel filters is a finite impulse response filter.

16. The method of claim 10, comprising:

adjusting, by the DFE, a sample rate of the frequency-shifted one or more channels from the first plurality of channels; and

adjusting, by the DFE, a sample rate of the frequency-shifted one or more channels from the second plurality of channels.

17. The method of claim 10, wherein each of the frequency shifting of the one or more channels from the first plurality of channels and the frequency shifting of the one or more channels from the second plurality of channels comprises down-shifting and up-shifting.

18. The method of claim 10, wherein the first plurality of channels and second plurality of channels are satellite broadcast television channels.

ABSTRACT

A wideband receiver system comprises a wideband analog-to-digital converter (ADC) module and a digital frontend (DFE) module. The wideband ADC is configured to concurrently digitize a band of frequencies comprising a plurality of desired channels and a plurality of undesired channels. The DFE module is coupled to the digital in-phase and quadrature signals. The DFE module is configured to select the plurality of desired channels from the digitized band of frequencies, and generate an intermediate frequency (IF) signal comprising the selected plurality of desired channels and having a bandwidth that is less than a bandwidth of the band of frequencies, where the generation comprises frequency shifting of the selected plurality of desired channels. The IF signal may be a digital signal and the DFE is configured to output the IF signal via a serial or parallel interface.

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SUITE 3400
CHICAGO, IL 60661

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Inventor(s)

Madhukar Reddy, Carlsbad, CA;
Curtis Ling, Carlsbad, CA;
Tim Gallagher, Carlsbad, CA;

Applicant(s)

Entropic Communications, LLC, New York, NY;

Power of Attorney: The patent practitioners associated with Customer Number 23446

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Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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Title

SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/956,889	09/30/2022	Madhukar Reddy	28427US16

CONFIRMATION NO. 8470

23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

FORMALITIES LETTER

OC0000000049684745

Date Mailed: 10/14/2022

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to the above-identified nonprovisional application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee has not been received.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Surcharge as set forth in 37 CFR 1.16(f) has not been received.

  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required (including the fees noted above) are as follows. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $**320** basic filing fee.
- $**160** surcharge.
- $**700** search fee.
- $**800** examination fee.
- $(**0**) previous unapplied payment amount.
- $**1980** TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

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Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/saabdurahman/

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/956,889

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	* 0			OR	x =	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x =	0
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Application	Document	Mailroom Date	Attorney Docket No.
17956889	APP.FILE.REC	10/14/2022	28427US16
	NTC.MISS.PRT	10/14/2022	28427US16

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/956,889	09/30/2022		0	28427US16	18	2

CONFIRMATION NO. 8470

CORRECTED FILING RECEIPT

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Date Mailed: 10/19/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Madhukar Reddy, Carlsbad, CA;
Curtis Ling, Carlsbad, CA;
Tim Gallagher, Carlsbad, CA;

Applicant(s)

Entropic Communications, LLC, New York, NY;

Power of Attorney: The patent practitioners associated with Customer Number 23446

Domestic Priority data as claimed by applicant

This application is a CON of 17/862,946 07/12/2022 PAT 11,490,152
which is a CON of 17/587,462 01/28/2022 PAT 11,399,206
which is a CON of 17/217,244 03/30/2021 ABN
which is a CON of 16/430,506 06/04/2019 PAT 10,972,781
which is a CON of 15/792,318 10/24/2017 PAT 10,313,733
which is a CON of 14/948,881 11/23/2015 PAT 9,819,992
which is a CON of 14/617,973 02/10/2015 PAT 9,210,363
which is a CON of 13/962,871 08/08/2013 PAT 9,100,622
which is a CON of 12/762,900 04/19/2010 PAT 8,526,898
which claims benefit of 61/170,526 04/17/2009

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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If Required, Foreign Filing License Granted: 10/13/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/956,889**

Projected Publication Date: Reprint Filing Receipt

Non-Publication Request: No

Early Publication Request: No
Title

SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Application	Document	Mailroom Date	Attorney Docket No.
17956889	APP.FILE.REC	10/19/2022	28427US16

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PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket No. 28427US16

In the Application of: Madhukar Reddy Serial No.: 17/956,889 Filed: September 30, 2022 Title: SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL Group Art Unit: Not yet assigned Confirmation No.: 8470 Customer No.: 23466	**Electronically Filed: November 17, 2022**

PRELIMINARY AMENDMENT

Applicant submits this Preliminary Amendment in connection with the above-identified newly filed continuation application ("Instant Application").

CONTENTS OF THIS CORRESPONDENCE

General Statement on Filing of Amendments begins on page 2.

Amendments to the Specification begin on page 3.

Amendments to the Claims begin on page 4.

Remarks begin on page 8.

Filing Of Amendments

Title 37 USC, §1.125(a) states that "If the number or nature of the amendments or the legibility of the application papers renders it difficult to consider the application, or to arrange the papers for printing or copying, the Office may require the entire specification, including the claims, or any part thereof, be rewritten." The Applicant submits that this does not apply in the present situation because the preliminary amendment submitted was in the proper format, does not include an excessive number of amendments, and is perfectly legible. Accordingly, the Applicant respectfully submits that, in general, a preliminary amendment is a proper vehicle for effecting changes to the claims.

Amendments to the Specification

Please amend the title as follows:

SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL ~~WIDEBAND TUNER ARCHITECTURE~~

Please amend paragraph [0001] as follows:

[0001] This application is a continuation of U.S. patent application 17/862,946 filed on July 12, 2022 (now patent 11,490,152), which is a continuation of U.S. patent application 17/587,462 filed on January 28, 2022 (now patent 11,399,206), which is a continuation of U.S. patent application 17/217,244 filed on March 30, 2021 (abandoned), which is a continuation of U.S. patent application 16/430,506 (now patent 10,972,781) filed on June 4, 2019, which is a continuation of U.S. patent application 15/792,318 (now patent 10,313,733) filed October 24, 2017, which is a continuation of U.S. patent application 14/948,881 (now patent 9,819,992) filed November 23, 2015, which is a continuation of U.S. patent application 14/617,973 (now patent 9,210,363) filed on February 10, 2015, which is a continuation of U.S. patent application 13/962,871 (now patent 9,100,622) filed on August 08, 2013, which is a continuation of U.S. patent application 12/762,900 filed on April 19, 2010 (now U.S. Patent 8,526,898), which claims the benefit of priority to U.S. provisional application 61/170,526 filed April 17, 2009, now expired. Each of the above referenced documents is hereby incorporated by reference in its entirety.

Amendments to the Claims:

This listing of claims will replace all prior version and listings of claims in the application.

What is claimed is:

1-18 (Cancelled)

19. (New) A method for operating a television receiver, comprising:

receiving, by an input terminal, an input signal comprising broadcast channels, the broadcast channels comprising a plurality of desired channels and a plurality of undesired channels, wherein the plurality of desired channels are non-contiguous;

processing, by a radio front end coupled to the input terminal, the input signal to generate a processed input signal;

digitizing, by an analog-to-digital converter (ADC) coupled to the radio front end, the processed input signal to generate a digitized signal;

selecting, by a digital frontend (DFE) coupled to the ADC, the plurality of desired channels from the digitized signal; and

outputting, by the DFE, the selected plurality of desired channels to at least one demodulator as a digital datastream, wherein the demodulator extracts information encoded in the digital datastream.

20. (New) The method of claim 19, wherein the DFE outputs the digital datastream via a serial interface.

21. (New) The method of claim 19, wherein the DFE outputs the digital datastream via a parallel interface.

22. (New) The method of claim 19, wherein the ADC comprises:
a first ADC configured to generate a digital in-phase signal; and
a second ADC configured to generate a digital quadrature signal.

23. (New) The method of claim 19, wherein the extracted information is stored for use in a digital video recorder (DVR).

24. (New) The method of claim 19, wherein the extracted information is output for a picture-in-picture display.

25. (New) The method of claim 19, wherein the plurality of desired channels comprises at least one television channel.

26. (New) The method of claim 19, wherein the plurality of undesired channels comprises at least one television channel.

27. (New) The method of claim 19, wherein the broadcast channels comprise satellite broadcast channels.

28. (New) The method of claim 19, wherein the broadcast channels comprise cable broadcast channels.

29. (New) A television receiver device, comprising:
an input terminal operable to receive an input signal comprising broadcast channels, the broadcast channels comprising a plurality of desired channels and a plurality of undesired channels, wherein the plurality of desired channels are non-contiguous;
a radio front end, coupled to the input terminal, operable to process the input signal;
an analog-to-digital converter (ADC), coupled to the radio front end, operable to digitize the processed input signal to generate a digitized signal; and

a digital frontend (DFE), coupled to the ADC, operable to select the plurality of desired channels from the digitized signal and output the selected plurality of desired channels to at least one demodulator as a digital datastream, wherein the demodulator is operable to extract information encoded in the digital datastream.

30. (New) The television receiver device of claim 29, wherein the DFE is operable to output the digital datastream via a serial interface.

31. (New) The television receiver device of claim 29, wherein the DFE is operable to output the digital datastream via a parallel interface.

32. (New) The television receiver device of claim 29, wherein the ADC comprises:
a first ADC configured to generate a digital in-phase signal; and
a second ADC configured to generate a digital quadrature signal.

33. (New) The television receiver device of claim 29, wherein the extracted information is stored for use in a digital video recorder (DVR).

34. (New) The television receiver device of claim 29, wherein the extracted information is output for a picture-in-picture display.

35. (New) The television receiver device of claim 29, wherein the plurality of desired channels comprises at least one television channel.

36. (New) The television receiver device of claim 29, wherein the plurality of undesired channels comprises at least one television channel.

37. (New) The television receiver device of claim 29, wherein the broadcast channels comprise satellite broadcast channels.

38. (New) The television receiver device of claim 29, wherein the broadcast channels comprise cable broadcast channels.

REMARKS

The Applicant requests entry of this preliminary amendment prior to prosecution on the merits. No new matter has been added.

With respect to the present application, Applicant hereby rescinds any disclaimer of claim scope made in the parent application or any predecessor or related application. The Examiner is advised that any previous disclaimer of claim scope, if any, and the alleged prior art that it was made to allegedly avoid, may need to be revisited. Nor should a disclaimer of claim scope, if any, in the present application be read back into any predecessor or related application.

The Commissioner is hereby authorized to charge any fees required by this submission including any extra claims fees, to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Respectfully submitted,

Date: November 17, 2022

/Wayne H. Bradley /
Wayne H. Bradley
Reg. No. 39,916

McAndrews, Held & Malloy, Ltd.
500 W. Madison Street - Suite 3400
Chicago, Illinois 60661
(312)-775-8000

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/956,889	09/30/2022	Madhukar Reddy	28427US16

CONFIRMATION NO. 8470

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- The application search fee must be submitted.
- The application examination fee must be submitted.
- Surcharge as set forth in 37 CFR 1.16(f) has not been received.

  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required (including the fees noted above) are as follows. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- **$320** basic filing fee.
- **$160** surcharge.
- **$700** search fee.
- **$800** examination fee.
- **$(0)** previous unapplied payment amount.
- **$1980** TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be addressed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

REPLY VIA ELECTRONIC FILING

A reply may be submitted via electronic filing only by registered users of the appropriate USPTO patent electronic filing system and must include:

- A separate document having the document description, "**Applicant response to Pre-Exam Formalities Notice**"; and
- the item(s) for which a reply period is set forth above.

For more information about electronic filing, contact the Patent Electronic Business Center (EBC) 1-866-217-9197 or visit https://www.uspto.gov/ebc

NOTE: If the reply is not being submitted electronically, a copy of this notice must be included.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/saabdurahman/

Electronic Patent Application Fee Transmittal

Application Number:	17956889
Filing Date:	30-Sep-2022
Title of Invention:	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL
First Named Inventor/Applicant Name:	Madhukar Reddy
Filer:	Wayne Bradley/Laura Foley
Attorney Docket Number:	28427US16

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	1051	1	160	160
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1980**

Electronic Acknowledgement Receipt	
EFS ID:	47045918
Application Number:	17956889
International Application Number:	
Confirmation Number:	8470
Title of Invention:	SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL
First Named Inventor/Applicant Name:	Madhukar Reddy
Customer Number:	23446
Filer:	Wayne Bradley/Laura Foley
Filer Authorized By:	Wayne Bradley
Attorney Docket Number:	28427US16
Receipt Date:	17-NOV-2022
Filing Date:	30-SEP-2022
Time Stamp:	15:00:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1980
RAM confirmation Number	E2022AGF00562269
Deposit Account	130017
Authorized User	Laura Foley
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		28427US16_FINAL_Prelim_Amendment1.pdf	273224 f65d97b2a57eb95587dc081503a626d1581055e4	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	2
	Specification	3	3
	Claims	4	7
	Applicant Arguments/Remarks Made in an Amendment	8	8
	Applicant Response to Pre-Exam Formalities Notice	9	10

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	46819 f224dc74605287660b6913abfa8fd068559d6071	no	2

Warnings:

Information:

Total Files Size (in bytes):	320043

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7130576		2006-10-31	Gurantz et al.	
	2	7542715		2009-06-02	Gurantz et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Entropic Communications, LLC v. Charter Communications, Inc. Civil Action No. 2:22-cv-00125-JRG, Defendants' Invalidity and Subject-Matter Eligibility Contentions.	
	2	Entropic Communications, LLC v. DirecTV, LLC and Entropic Communications, LLC v. Dish Network Corp., Civil Action No. 2:22-cv-00075-JRG and Civil Action No. 2:22-cv-00076-JRG, Defendants' P.R. 3-3 Invalidity Contentions.	
	3	Appendix A - 576 Patent - Additional References and Obviousness Chart.	
	4	Appendix B - 715 Patent - Additional References and Obviousness Chart.	
	5	Ex D1 - Invalidity Claim Chart US9210362 - Favrat.	
	6	Ex D2 - Invalidity Claim Chart US9210362 - Li.	
	7	Ex D3 - Invalidity Claim Chart US9210362 - McNeely.	
	8	Ex D4 - Invalidity Claim Chart US9210362 - Zhang.	
	9	Ex D5 - Invalidity Claim Chart US9210362 - Pugel.	
	10	Ex. A1 - Invalidity Claim Chart - 576 Patent - Ardemagni.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

	11	Ex. A2 - Invalidity Claim Chart - 576 Patent - Basawapatna.	
	12	Ex. A3 - Invalidity Claim Chart - 576 Patent - Carnero.	
	13	Ex. A4 - Invalidity Claim Chart - 576 Patent - Davis 055.	
	14	Ex. A5 - Invalidity Claim Chart - 576 Patent - Davis 730.	
	15	Ex. A6 - Invalidity Claim Chart - 576 Patent - Gregoire.	
	16	Ex. A7 - Invalidity Claim Chart - 576 Patent - Inose.	
	17	Ex. A8 - Invalidity Claim Chart - 576 Patent - James.	
	18	Ex. A9 - Invalidity Claim Chart - 576 Patent - Kang.	
	19	Ex. A10 - Invalidity Claim Chart - 576 Patent - Lovinggood.	
	20	Ex. A11 - Invalidity Claim Chart - 576 Patent - Mutzig.	
	21	Ex. A12 - Invalidity Claim Chart - 576 Patent - Petruzzelli.	

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	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

	22	Ex. A13 - Invalidity Claim Chart - 576 Patent - Pugel 200.	
	23	Ex. A14 - Invalidity Claim Chart - 576 Patent - Williams 419.	
	24	Ex. A15 - Invalidity Claim Chart - 576 Patent - Williams 873.	
	25	Ex. B1 - Invalidity Claim Chart - 715 Patent - Ardemagni.	
	26	Ex. B2 - Invalidity Claim Chart - 715 Patent - Carnero.	
	27	Ex. B3 - Invalidity Claim Chart - 715 Patent - Davis 055.	
	28	Ex. B4 - Invalidity Claim Chart - 715 Patent - Davis 730.	
	29	Ex. B5 - Invalidity Claim Chart - 715 Patent - Fisk.	
	30	Ex. B6 - Invalidity Claim Chart - 715 Patent - Gregoire.	
	31	Ex. B7 - Invalidity Claim Chart - 715 Patent - Hicks.	
	32	Ex. B8 - Invalidity Claim Chart - 715 Patent - Kang.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

	33	Ex. B9 - Invalidity Claim Chart - 715 Patent - Mutzig.	
	34	Ex. B10 - Invalidity Claim Chart - 715 Patent - Oishi.	
	35	Ex. B11 - Invalidity Claim Chart - 715 Patent - Petruzzelli.	
	36	Ex. B12 - Invalidity Claim Chart - 715 Patent - Williams 419.	
	37	Ex. B13 - Invalidity Claim Chart - 715 Patent - Williams 873.	
	38	Entropic Communications, LLC v. DirecTV, LLC and Entropic Communications, LLC v. Dish Network Corp., Civil Action No. 2:22-cv-00075-JRG and Civil Action No. 2:22-cv-00076-JRG, Defendants' P.R. 3-3 Invalidity Contentions.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2022-09-30
	First Named Inventor	Madhukar Reddy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	28427US16

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Wayne H. Bradley/	Date (YYYY-MM-DD)	2022-11-17
Name/Print	Wayne H. Bradley	Registration Number	39916

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

ENTROPIC COMMUNICATIONS, LLC, Plaintiff, v. CHARTER COMMUNICATIONS, INC.; SPECTRUM ADVANCED SERVICES, LLC; AND SPECTRUM MANAGEMENT HOLDING COMPANY, LLC,, Defendants.	Civil Action No. 2:22-cv-00125-JRG

DEFENDANTS' INVALIDITY AND SUBJECT-MATTER ELIGIBILITY CONTENTIONS

Pursuant to the Court's First Amended Docket Control Order (Dkt. 40), the Court's Standing Order Regarding Subject-Matter Eligibility Contentions (the "Standing Order", and the Court's Patent Rules 3-3 and 3-4, Defendants Charter Communications, Inc.; Spectrum Advanced Services, LLC; And Spectrum Management Holding Company, LLC, (collectively, "Defendants") respectfully submit these invalidity and subject-matter eligibility contentions with respect to the asserted claims of U.S. Patent Nos. 8,223,775 (the "'775 Patent"), 8,284,690 (the "'690 Patent"), 8,792,008 (the "'008 Patent"), 9,210,362 (the "'362 Patent"), 9,825,826 (the "'826 Patent"), and 10,135,682 (the "'682 Patent") (collectively, the "Asserted Patents") identified by Plaintiff Entropic Communications, LLC, ("Entropic" or "Plaintiff") in its Amended Complaint and in its disclosures under Patent Rules 3-1 and 3-2 ("Infringement Contentions").

The currently asserted claims, as reflected in Plaintiff's Infringement Contentions, are:

- Claims 18-19 of the '775 Patent;
- Claims 1, 7-9, 11, and 15-16 of the '690 Patent;

- Claims 1 and 2 of the '008 Patent;
- Claims 11 and 12 of the '362 Patent;
- Claims 1-4 and 6-9 of the '826 Patent; and
- Claims 1-3 of the '682 Patent;

As detailed further below, the Asserted Patents are anticipated by, or obvious in view of, one more of the prior art references being produced at CHARTER_ENTROPIC00033653 - CHARTER_ENTROPIC00046345 pursuant to 35 U.S.C. § 102 and/or § 103, as well as invalid under 35 U.S.C. §§ 101 and 112.

I. PRELIMINARY STATEMENT

These invalidity contentions and subject-matter eligibility contentions are based on Defendants' current knowledge and understanding of the Asserted Patents and prior art, of Plaintiff's infringement theories (inasmuch as they can be inferred from its Infringement Contentions), and of the facts and other information available as of the date of these invalidity contentions. Defendants' investigation, discovery, and analysis of information related to this action is ongoing. Additional discovery, elucidation of Plaintiff's impermissibly vague infringement contentions, and/or orders of the Court may require Defendants to amend or supplement these invalidity contentions and subject-matter eligibility contentions, and Defendants expressly reserve the right to do so as the case proceeds. These contentions represent Defendants' good-faith effort to provide a comprehensive identification of prior art relevant to this case. Defendants, however, reserve the right to modify or supplement their prior art list and invalidity and subject-matter eligibility contentions at a later time with, or based upon, pertinent information that may be subsequently discovered.

A. No Waiver

Nothing in these invalidity and subject-matter eligibility contentions is intended, nor should be construed, as a waiver of any noninfringement position or argument under 35 U.S.C. §§ 101 or 112. Defendants' statements herein (including the accompanying claim charts) reflect Defendants' present understanding of the purported scope of the claims as alleged by Plaintiff in its Infringement Contentions (as best those contentions can be understood in light of their present deficiencies).

The asserted claims have yet to be construed. As a result, Defendants have based these invalidity and subject-matter eligibility contentions upon its knowledge and understanding of the potential scope of the asserted claims at this time, and, in part, upon the apparent interpretations of the asserted claims advanced by Plaintiff in its Infringement Contentions. Defendants may disagree with Plaintiff's interpretation of the meaning of many terms and phrases in the asserted claims. Defendants have provided these invalidity and subject-matter eligibility contentions based in part on their present understanding of Plaintiff's apparent constructions and interpretations of the asserted claims. These invalidity and subject-matter eligibility contentions do not represent Defendants' agreement or view as to the proper interpretation of any claim term contained therein. Any similarity between any apparent claim interpretation in any of Defendants' invalidity charts submitted herewith and in any of the contentions supplied by Plaintiff is not an admission or agreement with Plaintiff about the meaning of any claim term, but rather a reflection of the fact that the subject matter Plaintiff believes is claimed is present in the prior art, or that the claims are otherwise invalid. These invalidity and subject-matter eligibility contentions are made in the alternative, and should not be interpreted to rely upon, or in any way affect, the non-infringement arguments Defendants may advance in this case. Defendants reserve the right to amend, supplement, or materially modify its invalidity and subject-matter eligibility contentions as the

case proceeds. Defendants also reserve the right to amend, supplement, or materially modify its invalidity and subject-matter eligibility contentions based on any infringement and/or additional claim construction positions that Plaintiff may take in this case.

Defendants also reserve the right to amend, supplement, or materially modify their invalidity and subject-matter eligibility contentions in response to any claim construction or interpretation positions that Plaintiff may take. Defendants also reserve the right to assert that a claim is indefinite, not enabled, or fails to meet the written description requirement of 35 U.S.C. § 112 based on any claim construction or interpretation position Plaintiff may take in this case or based on any claim construction the Court may adopt in this case.

B. No Admission

Nothing disclosed herein is an admission or acknowledgement that any product accused of infringement by Plaintiff in its Infringement Contentions (the "Accused Products"), or any of Defendants' other products or services, infringes any of the asserted claims.

Defendants further note that Plaintiff appears to rely upon overly broad interpretations of the asserted claims. At the same time, Plaintiff's Infringement Contentions are in most places too general and vague to discern Plaintiff's infringement theories and how exactly Plaintiff contends each Accused Product meets or practices each element of the asserted claims. Specifically, Plaintiff's Infringement Contentions fail to clearly identify the aspects or features of the Accused Products that Plaintiff contends meet the elements of the asserted claims. As a result, Defendants have been prejudiced in their ability to prepare these invalidity and subject-matter eligibility contentions. In addition, Plaintiff's Infringement Contentions, in many cases, continue to fail to put Defendants on notice of Plaintiff's interpretation of the asserted claims, further prejudicing Defendants' ability to identify relevant prior art. In addition, Plaintiff has not identified theories of infringement under the doctrine of equivalents for any of the Asserted Patents. Defendants have

relied on Plaintiff's apparent representation that it has no doctrine of equivalents theories for any claims in preparing these invalidity and subject-matter eligibility contentions, and any attempt by Plaintiff to present an untimely doctrine of equivalents assertion would be severely prejudicial to Defendants. To the extent that Plaintiff is later permitted by the Court to amend its contentions to cure any deficiencies of its current contentions or to pursue any currently undisclosed doctrine of equivalents theories, Defendants expressly reserve the right to supplement or amend these invalidity and subject-matter eligibility contentions to account for such amendments.

To the extent that any prior art references disclose the same functionality or feature of any of the Accused Products, Defendants reserve the right to argue that said feature or functionality does not practice any element of any of the asserted claims, and to argue, in the alternative, that if said feature or functionality is found to practice any element of any of the asserted claims, then the prior art reference demonstrates that the element is not novel, is obvious, and/or is otherwise not patentable.

Attached hereto are representative claim charts that identify where the elements of the asserted claims of the Asserted Patents may be found in the prior art and further identifying why those references are not novel or non-obvious. The references cited in the attached claim charts may disclose the limitations of the asserted claims expressly and/or inherently. The suggested obviousness combinations may be presented in conjunction with or in the alternative to Defendants' contentions regarding anticipation. These obviousness combinations should not be construed to suggest that any reference included in any combination is not anticipatory in its own right. Further, to the extent that Plaintiff contends that any of the references identified do not constitute prior art under 35 U.S.C. § 102, Defendants reserve the right to rely upon other prior art

references in the same patent family with substantially identical disclosures as evidence of invalidity based on the same theories as those disclosed below.

C. Reservation of Rights

Prior art not currently included in this disclosure may become relevant. Defendants are currently unaware of the extent, if any, to which Plaintiff will contend that limitations of the asserted claims are not disclosed in the prior art identified by Defendants. Defendants reserve the right to identify other references that would have made the addition of the allegedly missing limitation to the disclosed device or method obvious or show that the allegedly missing limitation would have been known or readily apparent to one of ordinary skill in the art at the time of the invention in light of the disclosure of the prior art at issue. Defendants further reserve the right to rely on any of the references produced at CHARTER_ENTROPIC00033653 - CHARTER_ENTROPIC00046345 in order to demonstrate the state of art at the alleged times of invention and as evidence of the knowledge of one of ordinary skill in the art[1] in support of any motivations to modify or combine the charted prior art references with other references or knowledge.

Plaintiff may also be aware of additional prior art that is not known to Defendants. To the extent that Plaintiff produces additional prior art responsive to Defendants' discovery requests after these contentions are served, Defendants may supplement their invalidity contentions with prior art contained in such production once Defendants have had a fair opportunity to review, analyze, and chart such prior art. Defendants reserve the right to amend their invalidity contentions with any additional potential prior art known by Plaintiff but not yet disclosed to Defendants.

[1] For purposes of these Invalidity and Subject-Matter Eligibility Contentions, the term "general knowledge" includes the common knowledge and common sense of a person of ordinary skill in the art ("POSITA") as well as the general knowledge of POSITAs in a particular field.

Defendants provide these invalidity and subject-matter eligibility contentions only for the claims that have been asserted by Plaintiff, but reserve the right to seek invalidation of all claims in each of the Asserted Patents.

D. Ongoing Investigation

Defendants' investigation is ongoing, and Defendants expressly reserve the right to amend their disclosures and document production to account for evidence uncovered as their investigation continues. Such amendments include identifying and relying on additional references that may result from Defendants' further search and analysis. Defendants reserve the right to supplement these contentions in light of any additional prior art of which Plaintiff is aware and fails to disclose to Defendants in discovery, or that might be subsequently disclosed by Plaintiff in response to Defendants' discovery requests. Defendants anticipate issuing subpoenas to third parties believed to have knowledge, documentation and/or corroborating evidence concerning some of the prior art listed herein and/or additional prior art. These third parties include, but are not limited to, the authors, employers of authors, inventors, assignees, or former or current employees of assignees or previous assignees, of the references identified in these invalidity contentions. For example, Defendants anticipate issuing subpoenas to potential prior artists including but not limited to individuals and entities responsible for the development of prior art systems. Defendants reserve the right to supplement these contentions in light of any newly discovered information produced by these or other entities from which Defendants may seek discovery.

II. ALLEGED PRIORITY DATE OF THE ASSERTED PATENT CLAIMS

Plaintiff asserted the following priority dates for the asserted claims in its Infringement Contentions:

Asserted Patent	Filing Date	Priority Claim(s)
'775 patent	Sept. 30, 2003	Sept. 30, 2003
'690 patent	Dec. 10, 2009	U.S. Provisional Patent Application No. 61/122,687 (filed Dec.15, 2008) U.S. Provisional Patent Application No. 61/179,454 (filed May 19, 2009)
'008 patent	Sept. 10, 2012	U.S. Provisional Patent Application No. 61/532,098 (filed Sept. 8, 2011)
'362 patent	Dec. 8, 2015	U.S. Provisional Patent Application No. 61/170,526 (filed Apr. 17, 2009)
'826 patent	Nov. 23, 2015	U.S. Provisional Patent Application No. 61/532,098 (filed Sept. 8, 2011)
'682 patent	Jan. 9, 2018	U.S. Provisional Patent Application No. 61/674,742 (filed Jul. 23, 2012)

It is Plaintiff's burden to show entitlement to its asserted priority dates, and Defendants assert that Plaintiff has failed to meet that burden. Plaintiff has further failed in its obligations to disclose "the priority date to which each asserted claim allegedly is entitled" (P.R. 3-1(e)) by (1) failing to set forth, for each of the '690, '008, '362, '826, and '682 Patents, the priority date that each Asserted Claim is entitled to, and (2) disclosing, for the '008 and '826 Patents, an ambiguous, unsupported, and improper priority date of "at least as early as February 15, 2011." To the extent Plaintiff attempts to rely on a priority date that precedes the filing date of any prior application, Defendants reserve the right to supplement these contentions.

A. '008 and '826 Patents

Further, the '008 and '826 Patents' claims of priority to U.S. Provisional Patent Application No. 61/532,098 (the "'098 Provisional") are improper. Specifically, the written description of the '098 Provisional does not support the subject matter claimed in either the '008 and '826 Patents.

For example, Claim 1 of the '008 Patent requires a "signal monitor operable to . . . report said determined characteristic to a source of said received signal." '008 Patent, 7:20-24. Similarly, Claim 1 of the '826 Patent requires "controlling the transmission of network management messages back to said headend based on said measured characteristic of said received signal, wherein said measured characteristic is different than said network management messages." '826 Patent, 7:51-55.

The written description of the '098 Provisional, however, does not set forth any disclosure sufficient to demonstrate that the inventor had possession of at least the above clamed subject matter at the time of filing the '098 Provisional or earlier, nor does the '098 Provisional describe at least the above claimed subject matter in such full, clear, concise, and exact terms to enable an ordinarily skilled artisan to practice the alleged inventions of either the '008 or '826 Patents. Accordingly, for at least this reason, the '008 Patent and '826 Patent are not entitled to claim priority to the '098 Provisional.

III. THE '775 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits A1 through A4 and/or described below anticipate and/or render obvious, alone or in combination, the asserted claims of the '775 Patent.

1. The '775 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '775 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits A1 through A4, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the

content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '775 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '775 Patent. Further, Defendants contend that any prior art reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent App. Pub. No. 2001/0039600 A1	November 08, 2001	Brooks	A1
U.S. Patent No. 6,493,874	December 10, 2002	Humpleman	A2
U.S. Patent App. Pub. No. 2003/0161333 A1	August 28, 2003	Schain	A3
U.S. Patent No. 7,127,734	October 24, 2006	Amit	A4

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems. Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

* * * * *

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '775 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '775 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '775 Patent is not explicitly disclosed by any prior art identified above and/or in Exhibits A1 through A4, any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits A1 through A4 with each other, at least because all of these references relate to cable television, broadband networking, and home networking in the same field of endeavor.

For example, U.S. Patent Application Publication No. 2001/0039600 A1 ("Brooks") teaches a "cable modem having a programmable media access controller (MAC). A single cable

modem device includes all necessary MAC functions. The invention allows programmable MAC functions to support evolving standards (e.g., DOCSIS) without requiring expensive hardware upgrades. Bifurcated microprocessor architecture, in which first processing circuitry is programmed to implement MAC functionality for processing information flowing to and from cable media interface circuitry, and second embedded processor core or host system processor provides operating system functionality are used. Alternatively, separate processor cores provide MAC functionality for downstream and upstream data paths, respectively. Cable media interface circuitry, and other peripheral circuitry, are coupled to a peripheral bus that is linked by a bridge circuit to a system bus. The processing circuitry MAC is communicatively coupled to the system bus. Centralized DMA control directs data transfer between the peripheral and system buses as determined, at least in part, by the programmable MAC." Brooks at Abstract.

Furthermore, U.S. Patent No. 6,493,874 ("Humpleman") teaches a "set-top electronics and network interface unit arrangement [that] is connected to an internal digital network interconnecting devices in the home. The digital network operates on a single, nomodulated, baseband channel. Entertainment services are introduced into the network through network interface units that are coupled to an external network and to the internal network. The network interface units perform the necessary interfacing between the external and internal networks, and make the entertainment services available to all terminals connected to the internal network. Set-top electronics that are separate from the network interface units connect to the internal network and convert the information in the digital data stream for display, by a television, for example." Humpleman at Abstract.

Similarly, U.S. Patent Application Publication No. 2003/0161333 A1 ("Schain") teaches a "broadband gateway [] that combines a broadband modem [] and a residential gateway [] in a

single unit. The single unit features a unique dual bridge, shared module architecture that reduces redundancy in the broadband gateway [] at the same time it minimizes interactions between modules in the broadband gateway []. This minimized interaction permits the broadband gateway [] to operate at peak efficiency and allows for continued development of portions of the broadband gateway [] without necessarily incurring compliance testing for the broadband portion of the broadband gateway [].” Schain at Abstract.

U.S. Patent No. 7,127,734 (“Amit”), moreover, discloses “a system and methods for communication between subscribers’ devices over cable infrastructure designed to carry video signals, using pass-band frequency bands, without transmission through a CATV headend device. A particular application of this system and method is home networking over coaxial TV cables. The disclosed system will allow very high-speed digital and analog communications within the home and from the home to external devices or networks using low cost devices. The present invention provides home networking solutions that utilize in-home TV wiring for supplying high rate connectivity between any two home networking nodes. The present invention does not load the city cable TV (CATV) network.” Amit, 2:34-48.

Accordingly, because the identified references are directed to similar devices in similar fields of endeavor, a person of ordinary skill in the art would have been motivated to combine the teachings of two or more references with a reasonable expectation of success.

a) **“a data networking engine implemented in a first circuit that includes at least one processor, the data networking engine programmed with software that when executed by the at least one processor of the first circuit causes the data networking engine to perform home networking functions including interfacing with customer provided equipment” (Claim 18)**

To the extent that it is determined that any of the above references do not disclose “a data networking engine implemented in a first circuit that includes at least one processor, the data

networking engine programmed with software that when executed by the at least one processor of the first circuit causes the data networking engine to perform home networking functions including interfacing with customer provided equipment," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Schain discloses "The cable modem device 100 can be implemented in a variety of products, including external or internal cable modems with Ethernet and/or USB connections, multifunction home-networking products, interactive set-top-box solutions, digital satellite receivers, wireless networking devices having antennas, Small Office/Home Office (SOHO) equipment and Internet Protocol (IP) telephony products. Accordingly, various embodiments of the invention may interface with non-traditional 'cable media (e.g., any type of media capable of transporting MPEG packets), and the precise nature of the data transmission media is not considered critical to the invention."). Schain at ¶ [0025]. *See also id.* at ¶ [0027] ("The broadband modem 120 converts the data being transmitted on broadband medium into a data format, usually Internet protocol (IP) over Ethernet, which is usable by the computer equipment and vice versa. The residential gateway 130 takes the data provided by the broadband modem 120 and provides it to the subscriber's equipment and vice versa."); *id.* at ¶ [0033] ("If the external packet is destined for the cable modem (i.e., it's destination is one of the IP based processes implemented in the cable applications layer 210), it is forwarded to the IP stack 220. If the external packet is destined for a device in the local network, then it is forwarded into the local network through the appropriate local network interface (for example, the Ethernet driver 240) attached to the bridge 230. The residential gateway processing (i.e. packet filtering, address translation,

firewall, etc.) may be applied prior to the packet being forwarded to the local network interface."); *id.* at ¶ [0035]

Furthermore, Humpleman, for example, discloses, at 3:24-27, "Communication with the outside world is performed through a number of separate network interface units (NIU's) 32 and may be combined physically in an entrance unit 30, with each network interface unit 32 permitting a connection between a different external network and the home network 10. The different external networks may carry different types of signals. These may be, for example, broadcast signals (digital or mixed analog/digital) carried on hybrid fiber coax or cable. Other types of signals are ISDN, broadcast/digital satellite service, FTTC, FTTH, ADSL, and others. At least the following data types may be carried: compressed video, compressed audio, compressed internet WWW graphics and data, internet e-mail and other data, computer file data and control message data." *See also id.* at 4:46-54 ("An exemplary model of the installation of the home network 10 of the present invention within a house 36 is depicted in FIG. 2. The home network 10 is a long range backbone capable of up to 100 m cable runs, for example, from a switched hub 38 that forms part of the internal network 34. In the exemplary installation depicted in FIG. 2, the entrance unit 30 with its multiple network interface units 32 are located in a utility area of the house, along with the switched hub 38.").

Furthermore, Brooks discloses, for example, at ¶ [0044], "An Ethernet external datalink is also coupled to the APB 214, and is comprised of an Ethernet media access controller (EMAC) 226 and the MII 126. In the disclosed embodiment of the invention, the EMAC 226 supports the MAC sublayer of the IEEE 802.3 specification and allows it to be connected to an IEEE 802.3 10/100 Mbps (100Base-T and 10Base-T) MII compatible EPHY device or seven-wire HomeLan PHY device. The MII 126 provides a port to transmit and receive data that is media independent,

multi-vendor interoperable, and supports all data rates and physical standards. The port consists of datapaths that are generally four bits wide in each direction, as well as control and management signals. The MII 126 can be configured as a glueless connection to support Ethernet or HomeLan serial mode.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) **"a cable modem engine implemented in a second circuit that includes at least one processor, the second circuit being separate from the first circuit, the cable modem engine programmed with software that when executed by the at least one processor of the second circuit causes the cable modem engine to perform cable modem functions other than the home networking functions performed by the data networking engine, the cable modem functions including interfacing with cable media, and the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine, the cable modem engine including a DOCSIS controller and a DOCSIS MAC processor, the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput" (Claim 18)**

To the extent that it is determined that any of the above references do not disclose "a cable modem engine implemented in a second circuit that includes at least one processor, the second circuit being separate from the first circuit, the cable modem engine programmed with software that when executed by the at least one processor of the second circuit causes the cable modem engine to perform cable modem functions other than the home networking functions performed by the data networking engine, the cable modem functions including interfacing with cable media, and the cable modem engine configured to enable upgrades to its software in a manner that is

independent of upgrades to the software of the data networking engine, the cable modem engine including a DOCSIS controller and a DOCSIS MAC processor, the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Brooks discloses, at ¶ [0024] "FIG. 1 is a block diagram of an exemplary cable modem device 100 having a programmable cable media access controller (hereinafter referred to as a programmable MAC) in accordance with the present invention. The cable modem device 100 permits MAC functions to be programmed to support evolving standards, such as DOCSIS, without concomitant hardware upgrades. The disclosed circuitry may be part of a single integrated circuit, or a combination of integrated circuits. Alternatively, host system circuitry may be leveraged to perform certain of the functions described below". *See also id.* at ¶ [0042] ("As previously mentioned, a number of physical interfaces to external data sources are coupled to the APB 214. In particular, a cable media access controller (CMAC) 224, including a system timer and interfaces to the cable downstream PHY circuitry 114 and cable upstream PHY circuitry 118, is provided to support communications with a cable media 134. The CMAC 224 hardware and firmware combine to support a desired specification (e.g., a DOCSIS feature set for the MAC sub-layer of an MCNS cable modem). In general, CMAC 224 aligns incoming packets and prepends a time stamp and appends a pattern recognition trailer structure to form word packets to be delivered to memory by the DMA controller 212. The CMAC 224 is also responsible for requesting data from the DMA controller 212 at the appropriate time, calculating checksums, and encrypting all or part of the upstream data and bursting the data to the upstream cable upstream PHY circuitry

118. Exemplary details of the later operation are provided in the previously-incorporated patent application entitled 'Method and Apparatus for Upstream Burst Transmission Synchronization in Cable Modems.' Delta sigma converter circuitry 228 is also coupled to the CMAC 224 to provide automatic gain control and other functionality for the cable PHY layer").

Moreover, Humpleman discloses, for example, at 3:24-37, "Communication with the outside world is performed through a number of separate network interface units (NIU's) 32 and may be combined physically in an entrance unit 30, with each network interface unit 32 permitting a connection between a different external network and the home network 10. The different external networks may carry different types of signals. These may be, for example, broadcast signals (digital or mixed analog/digital) carried on hybrid fiber coax or cable. Other types of signals are ISDN, broadcast/digital satellite service, FTTC, FTTH, ADSL, and others. At least the following data types may be carried: compressed video, compressed audio, compressed internet WWW graphics and data, internet e-mail and other data, computer file data and control message data"); *see also id.* at 9:50-10:3 ("The separation of the network interface unit 32 from the set-top electronics 40 provides a number of advantages, as described earlier. The functions (responsibilities) of the conventional set-top boxes with integrated network interface units are divided in embodiments of the present invention. For example, in preferred embodiments, the network interface unit 32 is responsible for performing external network specific interfacing, tuning demodulation, and error correction. It provides external network specific video descrambling and encryption/decryption (credit card number, user password, etc.). The network interface unit 32 also provides an external network specific program guide. Additionally, it performs MPEG transport demultiplexing to a single stream and MPEG reference clock recovery. In preferred embodiments of the invention, the network interface unit provides home network.

Ethernet interfacing and MPEG/Ethernet clock locking. It also provides the software to support the external network and home network protocols for multiple streams and multiple users. The network interface unit also has the software to act as the gateway for the home network and control the buffering of data as necessary.")

Schain, for example, discloses at ¶ [0060], "Carried in the communications channel is a data/information stream (typically, a bi-directional stream) that contains the actual information being received and transmitted by the computer(s) and digital device(s) connected to the broadband gateway 500. The information stream is forwarded to a DOCSIS MAC/PHY layer processor 510, where the information stream (in its encoded form) is converted into a standardized data format, such as a data packets or even a raw data stream that can be used by the devices connected to the broadband gateway 500. For example, the DOCSIS MAC/PHY layer processor 510 can provide a stream of Ethernet packets with IP packets encapsulated therein. In addition to the format conversion, the DOCSIS MAC/PHY processor 510 can perform tasks such as low-level error detection and correction and encryption and decryption. Note that should the broadband medium be different from coaxial cabling, a different MAC/PHY processor would be used. The converted information stream is provided to a common bus 515 by the DOCSIS MAC/PHY processor 510. The common bus 515 is used by devices and functional units in the broadband gateway 500 to share and exchange control information and data" *See also id.* at ¶ [0065] ("Referring now to FIG. 6, a block diagram illustrates a single board implementation of the broadband gateway 605 according to a preferred embodiment of the present invention. The broadband gateway 605 includes a tuner 610 that is coupled to a DOCSIS MAC/PHY processor 615. An example of a DOCSIS MAC/PHY processor 615 that would be usable in the broadband gateway 605 would be a Texas Instruments TNETC 4042 integrated MAC/PHY integrated circuit. The TNETC 4042 is

certified for DOCSIS technical standard version 1.1. Coupled to the DOCSIS MAC/PHY 615 is a processing element 620. An example of a processing element 620 would be a Texas Instruments TNETC 4305. The TNETC 4305 is a processor with built in communications peripherals. Finally, coupled to the processing element 620 are a series of integrated circuits used to provide connectivity to the broadband gateway 605. These circuits include a USB interface circuit 625 and an Ethernet interface circuit 630. Should the broadband gateway 605 offer wireless connectivity through an IEEE 802.11 wireless Ethernet network, the broadband gateway 605 would also have a wireless interface circuit 635. An example of a wireless interface circuit 635 would be a Texas Instruments ACX-100. The ACX-100 is a single-chip MAC controller with an IEEE 802.11b compliant baseband processor. Also present, but not shown in FIG. 6, is a block of memory. The memory can be used to store code and as buffers for data arriving at and leaving the broadband gateway.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "a data bus that connects the data networking engine to the cable modem engine, wherein the cable modem functions performed by the cable modem engine are completely partitioned from the home networking functions performed by the data networking engine" (Claim 18)

To the extent that it is determined that any of the above references do not disclose "a data bus that connects the data networking engine to the cable modem engine, wherein the cable modem functions performed by the cable modem engine are completely partitioned from the home networking functions performed by the data networking engine," as claimed, it would have been

obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Brooks discloses "FIG. 2 is a schematic block diagram providing exemplary details of the cable modem device 100 of FIG. 1. In this embodiment of the invention, the cable modem device 100 utilizes the Advanced System Bus (ASB 210) and Advanced Peripheral Bus (APB 214) protocol and bus architecture as specified in the Advanced Microcontroller Bus Architecture (AMBA) specification. The AMBA specification defines an on-chip communication standard for designing high-performance embedded microcontrollers. The ASB 210 is generally utilized for high-performance system modules, supporting the efficient connection of processors, on-chip memories, and off-chip external memory interfaces with low-power peripheral/macrocell functions. The APB 214 is generally utilized with low-power peripherals, and is optimized for minimal power consumption and reduced interface complexity in supporting peripheral functions." Brooks at ¶ [0032]. *See also id.* at ¶ [0034] ("An ASB-APB bridge/centralized DMA controller 212 is provided for linking the ASB 210 to the lower bandwidth APB 214, where most of the peripheral devices in the cable modem device 100 are located. As discussed in greater detail below, the ASB-APB bridge/centralized DMA controller 212 is both an ASB 210 master and an APB 214 master, and utilizes burst transfers and pipelining of data to optimize bus efficiency."; *id.* at ¶ [0035] ("The APB 214 provides the basic peripheral macrocell communications infrastructure. Such peripherals typically have interfaces which are memory-mapped registers, have few high-bandwidth interfaces, and are accessed under program control (such as the programmable MAC). In the disclosed embodiment of the invention, certain performance enhancements have been made to the APB and ASB, as well as the device interfaces to these buses, as set forth in greater detail in previously incorporated patent applications entitled, 'System and

Method for Providing an Improved Synchronous Operation of an Advanced Peripheral Bus with Backward Compatibility', and 'Asochronous Centralized Multi-Channel DMA Controller'."

Humpleman discloses, for example, "[t]he digital signals are distributed throughout the home over an internal network 34. In certain preferred embodiments, the internal network 34 is essentially Ethernet of type 10base-T or 100base-T twisted pair but a special switch hub is employed to make the network scalable to any number of terminal units each able to receive high bit-rate video." Humpleman at 3:55-61. *See also id.* at 5:6-26 ("The present invention, as shown in FIGS. 1 and 2, separates the functionality of the network interface units 32 from the set-top electronics 40. Conventionally, a set-top box contains a network interface unit whose components are internally connected by a bus to the set-top electronics components. By contrast, however, the present invention provides a separation of the network interface units 32 and the set-top electronics 40, with the internal network 34 interposed therebetween. This arrangement permits multiple set-top electronics to be distributed throughout the home 36 less expensively, since the electronics of a network interface unit do not have to be duplicated for each set-top electronics. Additionally, having separate network interface units 32 coupled to different external networks and to a common internal network 34 frees the homeowner from being forced to receive all programming from a single source, such as the telephone or cable company. The separation also allows the homeowner to add, drop or change services simply by changing one of the network interface units 32, without the need for replacing all of the set-top electronics 40 throughout the home 36.").

Furthermore, Schain discloses, for example, at ¶ [0048], "When packets need to cross the local network and external network interface, i.e., a packet with a local network source address and an external network destination address (and vice versa, a packet from an external device with the destination address being the global NAT address pertaining to an internal device's address), a

virtual data link 350 connecting the local bridge 345 to the cable bridge 315 (and vice versa) is used. The virtual data link 350 permits packets needing to cross the interface to move from one portion of the broadband gateway 135 to the other. For example, a local packet addressed to some destination in the external network will cross the virtual data link 350 and enter the cable bride 315. According to a preferred embodiment of the present invention, packet filtering (including address filtering) and network address translation can be performed in the virtual data link 350. The virtual data link 350 is a natural place to perform the packet filtering and network address translation due to its position in the partition of the two bridges. This will be done either internally within the virtual data link 350 or by the virtual data link providing the packet to a dedicated module for packet processing (e.g. NAT and firewall modules). After entering the cable bridge 315, the packet is injected into the external network via the cable driver 310." *See also id.* at ¶ [0051] ("Use of the virtual data link 350 permits the logical separation of the two bridges 315 and 345 while permitting the sharing of the same IP stack 320. By keeping the two bridges separate, the processing of external and local packets can be kept separate. The separation of the bridges can even allow each bridge to be implemented using separate modules, even if the modules are executing on the same processing element. Through the use of separate modules, interaction between the processing performed by the two bridges is reduced. Typically, when applications are implemented as separate modules, interaction can only be achieved via specified methods and not by arbitrary methods developed by the creator of the applications such as illegal accesses to a shared memory, therefore, interaction between the modules are reduced and controlled. By reducing the interaction, there is a reduced chance of errors resulting from unintended corruption of data and memory. The reduction in the interaction between the modules also permits better balancing the processing resources allocated to the processing of the external packets and local

packets in the respective bridges. This makes it easy to achieve maximum overall processing rate and efficiency.") *id.* at ¶ [0060] ("For example, the DOCSIS MAC/PHY layer processor 510 can provide a stream of Ethernet packets with IP packets encapsulated therein. In addition to the format conversion, the DOCSIS MAC/PHY processor 510 can perform tasks such as low-level error detection and correction and encryption and decryption. Note that should the broadband medium be different from coaxial cabling, a different MAC/PHY processor would be used. The converted information stream is provided to a common bus 515 by the DOCSIS MAC/PHY processor 510. The common bus 515 is used by devices and functional units in the broadband gateway 500 to share and exchange control information and data.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

d) "wherein all DOCSIS functions are localized in the cable modem engine" (Claim 19)

To the extent that it is determined that any of the above references do not disclose "wherein all DOCSIS functions are localized in the cable modem engine," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Brooks, for example, teaches "[b]ifurcated microprocessor architecture, in which first processing circuitry is programmed to implement MAC functionality for processing information flowing to and from cable media interface circuitry, and second embedded processor core or host system processor provides operating system functionality are used. Alternatively, separate processor cores provide MAC functionality for downstream and upstream data paths, respectively.

Cable media interface circuitry, and other peripheral circuitry, are coupled to a peripheral bus that is linked by a bridge circuit to a system bus. The processing circuitry MAC is communicatively coupled to the system bus. Centralized DMA control directs data transfer between the peripheral and system buses as determined, at least in part, by the programmable MAC." Brooks at Abstract. *See also id.* at ¶ [0014] ("The cable modem device of a disclosed embodiment of the invention utilizes a bifurcated microprocessor architecture in which first processing circuitry (e.g., an embedded processor core) is programmed to implement the desired MAC functionality for processing information flowing to and from cable media interface circuits. A second embedded processor core or host system processor provides operating system functionality and controls the boot process for the first embedded processor core. In a further embodiment, separate processor cores are provided for implementing MAC functionality for the downstream and upstream data paths, respectively.").

Furthermore, Humpleman, for example, discloses, "an arrangement in which the set-top electronics that support the media output devices, such as televisions, are separate from the network interface units that interface to external networks. The separation of the network interface unit functions from the set-top electronics allows a single network interface unit to be used to interface with an external network and provide programming selectively to a multitude of set-top electronics and televisions within the home. This reduces the need for duplication of the network interface functions at each television or other end product. (media output device) and thereby reduces the costs for the typical homeowner who will have more than one television set in the home. Further, having multiple separate network interface units on the network allows the consumer to pick and choose among available services, and not be constrained to a single service provider. Changing a service may be performed simply by exchanging or adding a different

network interface unit configured to interface with the new external network." Humpleman at 2:10-30. *See also id.* at 5:6-22 ("The present invention, as shown in FIGS. 1 and 2, separates the functionality of the network interface units 32 from the set-top electronics 40. Conventionally, a set-top box contains a network interface unit whose components are internally connected by a bus to the set-top electronics components. By contrast, however, the present invention provides a separation of the network interface units 32 and the set-top electronics 40, with the internal network 34 interposed therebetween. This arrangement permits multiple set-top electronics to be distributed throughout the home 36 less expensively, since the electronics of a network interface unit do not have to be duplicated for each set-top electronics. Additionally, having separate network interface units 32 coupled to different external networks and to a common internal network 34 frees the homeowner from being forced to receive all programming from a single source, such as the telephone or cable company.").

Schain, for example, teaches, at ¶ [0006], "[a] fairly common solution to the processing of external and local packets is to create two separate modules that are separately responsible for processing external packets and local packets. By separating the processing, it is much less likely that there would be interference since there is no interaction unless a packet crosses the interface. However, the separation of the processes can result in unnecessary duplication of modules, such as the communications protocol modules." *See also id.* at ¶ [0042] ("Although the twin bridge logical architecture displayed in FIG. 2 b is shown as being a part of a broadband gateway 135, an advantage of the twin bridge architecture is that the two bridges can be implemented in separate devices, i.e., the cable modem portion of the twin bridge architecture can simply be a cable modem while the residential gateway portion can simply be a residential gateway. The Ethernet interface module 255 (or some other type of interconnect, either wired or wireless) would then be connecting

both devices through appropriate network interface drivers in the two physically coupled devices.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '775 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '775 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '775 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "a first circuit that includes at least one processor " (claim 18)
    - The terms "first circuit" and "circuit" do not appear and are not described anywhere in the specification or drawings of the '775 Patent. For at least this reason, the written description of the '775 Patent thus fails to demonstrate that the inventor had possession of the claimed subject matter and fails to enable a person of ordinary skill in the art to make, use, or practice the full scope of the claimed subject matter without undue experimentation.
- " a second circuit that includes at least one processor " (claim 18)
    - The terms "second circuit" and "circuit" do not appear and are not described anywhere in the specification or drawings of the '775 Patent. The written description of the '775 Patent thus fails to demonstrate that the inventor had possession of the claimed subject matter and fails to enable a person of ordinary skill in the art to make, use, or practice the full scope of the claimed subject matter without undue experimentation.

- "the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine " (claim 18)
    - The specification and drawings of the '775 Patent do not set forth any description as to how the cable modem engine enables upgrades of any software, thereby failing to demonstrate that the inventor had possession of the claimed subject matter.
- "wherein all DOCSIS functions are localized in the cable modem engine" (claim 19)
    - The specification and drawings of the '775 Patent do not set forth a description of the term "DOCSIS functions." The written description of the '775 Patent thus fails to demonstrate that the inventor had possession of the claimed subject matter and fails to enable a person of ordinary skill in the art to make, use, or practice the full scope of the claimed subject matter without undue experimentation.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '775 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '775 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '775 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "data networking engine" (claim 18)
    - The term "data networking engine" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.
- "cable modem engine" (claim 18)

- The term "cable modem engine" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.

- "DOCSIS functions" (claim 19)
  - The term DOCSIS functions lacks antecedent basis, thereby rendering the claim indefinite.

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and review of the '775 Patent, the term set forth above is indefinite because it is inconsistent with and broader than the alleged invention disclosed in the specification and during prosecution and, furthermore, lacks antecedent basis. Thus, a person of ordinary skill in the art at the time of the invention would not understand the scope of the relevant claim with reasonable certainty, even when the claim is read in light of the specification and prosecution history.

Furthermore, as stated above, at least the terms "data networking engine" and "cable modem engine" invoke 35 U.S.C. § 112, ¶ 6 without sufficient disclosure of corresponding structure, and are therefore indefinite. Pursuant to Patent Rule 3-3(c), these terms, to the extent they can be understood by Defendants, are identified in the prior art, as set forth at least in Exhibits A1-A4.

IV. THE '690 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits B1 through B6 and/or described below anticipate and/or render obvious, alone or in combination, one or more of the asserted claims of the '690 Patent.

1. The '690 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '690 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits B1 through B6, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '690 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '690 Patent. Further, Defendants contend that any prior art reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent No. 7,895,632	February 22, 2011	Sadja	B1
U.S. Patent App. Pub. No. 2007/0286143 A1	December 13, 2007	Olson	B2
U.S. Patent App. Pub. No. 2005/0088980 A1	April 28, 2005	Olkkonen	B3
U.S. Patent App. Pub. No. 2012/0106452 A1	October 28, 2010	Kneckt	B4
U.S. Patent App. Pub. No. 2008/0298333 A1	December 4, 2008	Seok	B5
U.S. Patent App. Pub. No. 2007/0047492 A1	March 1, 2007	Kim	B6

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems. Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '690 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

* * * * *

To the extent any prior art reference set forth above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '690 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '690 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '690 Patent is not explicitly disclosed by any prior art identified above and/or in Exhibits B1 through B6, any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits B1 through B6 with each other, at least because all of these references relate to the use of probes, probe requests, and polling messages in computer networks, such as, for example, cable television networks and wireless local area networks. The references set forth above are therefore all in the same or similar fields of endeavor.

For example, U.S. Patent. No. 7,895,632 ("Sadja") teaches a "cable television diagnostic method for a cable television network [that] involves sending a polling message to a plurality of modems forming a part of a plurality of television set top boxes from a cable television headend via a cable television cable connection to the set top boxes; wherein the polling message instructs the cable television set top boxes to obtain at least one operational parameter of each of the television set top boxes; receiving a plurality of response messages from the cable television set top boxes, each containing the at least one operational parameter of the television set top boxes; determining that one of the operational parameters from one of the television set top boxes is outside of a specified range of values; and aggregating the operational parameters of the plurality of set top boxes received in the response messages to determine if the same operational parameter is outside the range of specified values for more than the one of the television set top boxes." Sadja at Abstract.

Furthermore, U.S. Patent Application Publication No. 2007/0286143 A1 ("Olson") teaches a "method, an apparatus, and a software program to implement a method to detect a rogue access point of a wireless network. . . . The method . . . includes sending a scan request to one or more managed APs, including one or more of a request for the receiving managed AP to scan for beacons and probe responses and a request for the receiving managed AP to request its clients to scan for beacons and probe responses. The method further includes receiving reports from at least one of the receiving managed APs, a report including information on any beacon or probe response received that was sent by an AP. For each beacon or probe response on which information is received, the method analyzes the information received in the report about the AP that sent the beacon or probe response, the analyzing including ascertaining if the MAC address of the AP that sent the beacon or probe response matches a MAC address of an AP in the AP database to ascertain whether or not the AP is a potential rogue AP or a managed or friendly AP." Olson at Abstract.

Additionally, U.S. Patent Application Publication No. 2005/0088980 A1 ("Olkkonen") discloses "[in] order for a IEEE 802.11 mobile station to communicate with other mobile stations in an ad hoc network, it must first find the stations. The process of finding another station is by inquiring. Active inquiry requires the inquiring station to transmit queries and invoke responses from other wireless stations in an ad hoc network. In an active inquiry, the mobile station will transmit a probe request frame. If there is an ad hoc network on the same channel that matches the service set identity (SSID) in the probe request frame, a station in that ad hoc network will respond by sending a probe response frame to the inquiring station. The probe response includes the information necessary for the inquiring station to access a description of the ad hoc network. The inquiring station will also process any other received probe response and Beacon frames." Olkkonen at ¶ [0014].

Further, U.S. Patent Application Publication No. 2012/0106452 A1 ("Kneckt") discloses "receiving, by a broker station in a wireless network, a broker activation request message from a first client station, the broker activation request message comprising wireless networking capabilities of the first client station. The method may also include sending a networking capability message to at least one other client station, the network capability message comprising identifier and wireless network capabilities of the first client station, the networking capability message being based at least partly on the broker activation request message." Kneckt at Abstract.

In addition, U.S. Patent Application Publication No. 2008/0298333 A1 ("Seok") teaches "a scan procedure in a wireless local access network, and station and frame format for the scan procedure. In the scan procedure, a second station receives from a first station a probe request frame. . . . [T]he second station transmits a probe response frame to the first station in response to the probe request frame." Seok at Abstract.

Further, U.S. Patent Application Publication No. 2007/0047492 A1 ("Kim") teaches a "mobile station 1 transmits a probe request frame to detect a new access point, and the first and second access points 21 and 22 receive the probe request frame (71). That is, active scanning in which a mobile station spontaneously transmits a probe request frame to detect an access point is performed." Kim at ¶ [0051]. Kim further discloses "the first access point 21 transmits the extended probe response frame of FIG. 8 to the mobile station 1 in response to the probe request frame received in operation 71, and the mobile station 1 receives the extended probe response frame (73). Then, channel scanning between the first access point 21 and the mobile station 1 is terminated." *Id.* at ¶ [0054].

Accordingly, because the identified references are directed to similar devices in similar fields of endeavor, a person of ordinary skill in the art would have been motivated to combine the teachings of two or more references with a reasonable expectation of success.

a) **"receiving in a first node, a probe request specifying a first plurality of parameters associated with the generation and transmission of a probe, wherein the first plurality of parameters at least specify content payload of the probe and a second node" (Claim 1)**

To the extent that it is determined that any of the above references do not disclose "receiving in a first node, a probe request specifying a first plurality of parameters associated with the generation and transmission of a probe, wherein the first plurality of parameters at least specify content payload of the probe and a second node," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings[2].

For example, Sadja, for example, teaches, at 14:44-56, "At 708, the system selects a set top box for polling, and at 712, that set top box is polled for conditional access information or other information that can be used to detect theft of service. One example is to poll the set top box for a channel to which the set top box is currently tuned. If the channel is an unauthorized channel, the cable system operator can deduce that the user of the set top box is somehow obtaining unauthorized access to such channels. Similarly, in some embodiments of set top boxes, it may be possible to poll for codes that actually describe the conditional access rights that have been purchased by the user of the set top box. In either case, that information is retrieved from the set top box by way of polling at 712."

[2] The teachings set forth below are also applicable to "a first node transmitting a probe request to a second node, the probe request specifying a first plurality of probe parameters for a physical layer probe," as recited in Claim 9 and "the first node transmitting a second probe request to a third node," as recited in Claim 11.

In addition, Olson, for example, teaches that "a wireless network uses management frames at the MAC layer designed, sent, and received for management purposes. For example, in a WLAN that conforms to the IEEE 802.11 standard, an AP regularly transmits beacon frames that announce the AP's presence, i.e., advertises the AP's services to potential clients so that a client may associate with the AP. Similarly, a client can send a probe request frame requesting any AP in its radio range to respond with a probe response frame that, in a similar manner to a beacon frame, provides information for the requesting client (and any other radios in its radio range and able to receive its channel) sufficient for a client to decide whether or not to associate with the AP." Olson at ¶ [0051].

Similarly, Olkkonen, for example, discloses "[i]n order for a IEEE 802.11 mobile station to communicate with other mobile stations in an ad hoc network, it must first find the stations. The process of finding another station is by inquiring. Active inquiry requires the inquiring station to transmit queries and invoke responses from other wireless stations in an ad hoc network. In an active inquiry, the mobile station will transmit a probe request frame. If there is an ad hoc network on the same channel that matches the service set identity (SSID) in the probe request frame, a station in that ad hoc network will respond by sending a probe response frame to the inquiring station." Olkkonen at ¶ [0014].

Furthermore, Kneckt, for example, discloses "FIG. 9B is a block diagram showing a capability request 208 according to another example embodiment. According to this example, the capability request 208 may include a probe request. The capability request 208 or probe request may include, for example, an SSID field 924, a supported rates field 926, a request information field 928, an extended supported rates field 930, and a vendor specific field 932. The request

information field 928 subfields including, for example, any or all of the subfields of the requested network types field 906 described above with reference to FIG. 9A." Kneckt at ¶ [0076].

Seok, for example, discloses "an active scanning method. In this method, a non-AP STA hoping to be a member of a specific ESS first transmits a probe request frame. The probe request frame contains specific service information requested by the non-AP STA. The APs having received the probe request frame transmit a probe response frame to the non-AP STA in response to the received probe request frame. The probe response frame includes a variety of information required for network access through the APs. Accordingly, the non-AP STA can acquire a list of associable APs from the received probe response frame." Seok at ¶ [0011].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) "determining a second plurality of parameters associated with generation and transmission of the probe" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "determining a second plurality of parameters associated with generation and transmission of the probe," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.[3]

Sadja, for example, discloses "[a]t 616, the set top box begins monitoring the data channel using the DOCSIS modem to await a polling query from the cable system headend. During its operation, the set top box may update its memory with the latest operational parameters which

[3] The teachings set forth below are also applicable to "wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node," as recited in Claim 9.

might include the calculated short-term and long-term averages of certain data such as bit error rates or amplifier gains. If a poll is received at 626, control passes to 630 where the poll query is parsed to determine what data are being requested in the poll. The requested data are then retrieved from memory or from an appropriate storage register at 634, and a response is transmitted to the cable system headend at 640." Sadja at 13:48-59.

Olson, for example, discloses that "[t]he beacon/probe response information sent includes one or more of: The SSID in the beacon or probe response. Beacon time (TSF timer) information. In one embodiment, this is sent in the form of TSF offset determined by comparing the timestamp in the beacon/probe response with the TSF timer at the managed AP receiving the response or at the managed client receiving the response. Configuration parameters included in the received beacon/probe response." Olson at ¶ [0071].

Furthermore, Olkkonen, for example, discloses "a station in that ad hoc network will respond by sending a probe response frame to the inquiring station. The probe response includes the information necessary for the inquiring station to access a description of the ad hoc network." Olkkonen at ¶ [0014]. *See also id.* at ¶ [0211] ("when an arriving IEEE 802.11 wireless device arrives within the communication range of any member of an IEEE 802.11 ad hoc network 102(I), its probe request frame 560(I) inquiry signals are answered by a member of the ad hoc network 102(I) detecting the inquiry. If the responding member is an ad hoc network information provider 106(I), it responds with a probe response 570(I) containing a service attribute response 577(I) with information accessed from its memory characterizing the ad hoc network.").

As another example, Kneckt discloses, at ¶ [0038], "[t]he client stations 106, 108, 110, 112, 114, 116 may receive more detailed information about the wireless networking or communication capabilities of one or more other client stations 106, 108, 110, 112, 114, 116 by sending a capability

request message 208 to the broker station 104 via the air interface, to which the broker station 104 may respond by sending a network capability message, such as a capability response message to the respective client station 106, 108, 110, 112, 114, 116. The capability response message may include more detailed information about the requested client station 106, 108, 110, 112, 114, 116 than the networking service announcement message." *See also id.* at ¶ [0040] ("The requests and responses between the requesting client station 106 and the requested client station 108 may also allow the requesting client station 106 and requested client station 108 to select the optimal networking or communications protocol for their communication. For example, the requesting client station 106 and/or the requested client station 108 may select an optimal wireless networking or communication protocol based on throughput, power consumption, and/or forwarding capabilities.")

Seok, for example, discloses "[t]he probe response frame includes a variety of information required for network access through the APs. Accordingly, the non-AP STA can acquire a list of associable APs from the received probe response frame." Seok at ¶ [0011]. *See also id.* at ¶ [0060] ("The request information element is used to specify information pieces which are requested to be contained in the probe response frame by the response STA, for example, the AP 4.").

Further, Kim, for example, teaches "FIG. 8 is a view illustrating the construction of an extended probe response frame according to an exemplary embodiment of the present invention. Referring to FIG. 8, the probe response frame is a management frame according to the IEEE 802.11 standard. A frame body field of the probe response frame includes a timestamp field 81, a beacon interval field 82, a capability information field 83, an SSID field 84, a supported rates field 85, an FH parameter set field 86, a DS parameter set field 87, a CF parameter set field 88, and an IBSS parameter set field 89." Kim at ¶ [0057].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "generating the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "generating the probe in accordance with the first plurality of parameters and the second plurality of parameters, wherein the probe has a form dictated by the first plurality of parameters," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.[4]

For example, Sadja discloses "[a]nother common remote query method used by equipment manufactures is by performing an HTTP GET request and parsing the response data. The data is returned in either in XML or HTML format, which can easily be parsed and the appropriate data extracted, or the data is returned in HTML, as a diagnostics web page from which the appropriate data can also be parsed and extracted." Sadja at 8:52-58. *See also id.* at 11:61-12:4 ("A cable television diagnostic method for a cable television network consistent with certain embodiments involves sending a polling message to a plurality of modems forming a part of a plurality of television set top boxes from a cable television headend via a cable television cable connection to the set top boxes; wherein the polling message instructs the cable television set top boxes to obtain

[4] The teachings below are also applicable to "wherein the probe is generated in accordance with the first plurality of parameters and in accordance with a second plurality of parameters determined by the second node," as recited in Claim 9, and "wherein the second probe is generated according to the second probe request, as recited in Claim 11.

at least one operational parameter of each of the television set top boxes; receiving a plurality of response messages from the cable television set top boxes, each containing the at least one operational parameter of the television set top boxes"); *id.* at 13:54-59 ("If a poll is received at 626, control passes to 630 where the poll query is parsed to determine what data are being requested in the poll. The requested data are then retrieved from memory or from an appropriate storage register at 634, and a response is transmitted to the cable system headend at 640.").

Olson, for example, teaches, at ¶ [0084], "[a] frame we call the Measurement Report Frame from the client provides a report in response to a Measurement Request Frame. The Report frame includes the MAC address of the station providing the report, the identifier from the corresponding Measurement Request Frame, and one or more measurement elements. The measurement elements for the case of a beacon or probe response include one or more of the channel number, the duration over which the beacon/probe response was measured, the PHY type (DSS, 5 GHz OFDM, and so forth), the RSSI of the beacon/probe response, the parent TSF, e.g., all or some of the lower order bits of the serving AP's TSF at the time the client received the beacon or probe response, the TSF in the beacon/probe response, and one or more other elements that are in the received beacon/probe response frame."

Olkkonen, moreover, teaches, for example, "[t]he effect of receiving a probe request 560(I) is to cause the station 106(I), for example, to respond with a probe response 570(I) of FIG. 7B. In accordance with the invention, when an arriving IEEE 802.11 wireless device arrives within the communication range of any member of an IEEE 802.11 ad hoc network 102(I), its probe request frame 560(I) inquiry signals are answered by a member of the ad hoc network 102(I) detecting the inquiry. If the responding member is an ad hoc network information provider 106(I), it responds with a probe response 570(I) containing a service attribute response 577(I) with information

accessed from its memory characterizing the ad hoc network. If, instead, an ordinary device 108(I) in an ad hoc network 102(I) is the first to respond to the probe request frame 560(I) inquiry signals of the arriving device 100(I), the responding device responds with a probe response 570(I) containing the address of the ad hoc network information provider 106(I)." Olkkonen ¶ [0211]. *See also id.* at ¶ [0229] ("The effect of receiving a probe request 560(I) is to cause the station to respond with a probe response 570(I). The probe response frame contains nearly all the same information as a Beacon frame, including the timestamp, beacon interval, capability information, information elements of the service set identity (SSID), supported rates, one or more physical parameter sets, the optional contention-free parameter set, and the optional ad hoc network parameter set.").

Furthermore, Kneck discloses, for example, "the broker station 104 may respond to receiving the capability request message 208 by sending network capability message, such as a capability response message 210 to the requesting client station 106. The capability response message 208 may [identify] client stations 108, 110, 112 which are capable of communicating with the requesting client station 106 on a peer-to-peer basis via at least one of the wireless networking or communication protocols indicated by the capability request message 206. The capability response message 210 may be based on the compiled wireless networking or communication capabilities." Kneckt at ¶ [0077].

Seok, furthermore, discloses, for example, "all the APs having received the probe request frame from the non-AP STA 2 do not transmit the probe response frame, but only the AP 4 corresponding to values which are set in some fields of the probe request frame having been received and which satisfies the following conditions transmits the probe response frame. Here, some fields may be all or a part of the identification information for identifying an AP or an access

network (AN) such as the DS. The AP 4 transmitting the probe response frame is an AP supporting the interworking service, that is, an interworking-capable AP." Seok at ¶ [0068].

In addition, Kim, for example, teaches "the frame body field of the extended probe response frame further includes fields recording information regarding access points that are estimated to be present in the communication area of the mobile station 1, that is, a number of associated stations field 810 recording the number of mobile stations associated with the access point, and a number of frames field 811 recording the number of frames transmitted from or received by the access point for a period of time F." Kim at ¶ [0058]; *see also id.* at ¶ [0057].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

d) "transmitting the probe from the first node to the second node" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "transmitting the probe from the first node to the second node," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.[5]

Sadja, for example, teaches "STB 122 can operate in a bidirectional communication mode so that data and other information can be transmitted not only from the system's head end to the end user, or from a service provider to the end user of the STB 122, but also, from the end user upstream using an out-of-band channel. In one embodiment, such data passes the system bus 230

[5] The teachings below are also applicable to "the first node receiving the probe from the second node," as recited in Claim 9, and "he first node receiving a second probe from the third node," as recited in Claim 11.

to DOCSIS (Data Over Cable System Interface Specification) compliant modem 244 the diplexer 202 and out the transmission medium 220." Sadja at 4:41-48. *See also id.* at 13:56-62 ("The requested data are then retrieved from memory or from an appropriate storage register at 634, and a response is transmitted to the cable system headend at 640. Control then passes back to 626 to await the next poll. When no poll is received, the set top box simply continues to accumulate data on the modem and set top box performance in the loop defined by 612, 620, 626, and back to 612.").

Olson, moreover, discloses, for example, "in a WLAN that conforms to the IEEE 802.11 standard, an AP regularly transmits beacon frames that announce the AP's presence, i.e., advertises the AP's services to potential clients so that a client may associate with the AP. Similarly, a client can send a probe request frame requesting any AP in its radio range to respond with a probe response frame that, in a similar manner to a beacon frame, provides information for the requesting client (and any other radios in its radio range and able to receive its channel) sufficient for a client to decide whether or not to associate with the AP." Olson at ¶ [0049].

Further, Olkkonen teaches, for example, "when an arriving IEEE 802.11 wireless device arrives within the communication range of any member of an IEEE 802.11 ad hoc network 102(I), its probe request frame 560(I) inquiry signals are answered by a member of the ad hoc network 102(I) detecting the inquiry." Olson at ¶ [0211]. *See also id.* at ¶ [0217] ("Active inquiry allows an IEEE 802.11 mobile station to find an ad hoc network while minimizing the time spent inquiring. The station does this by actively transmitting queries that invoke responses from stations in an ad hoc network. In an active inquiry, the mobile station 100(I) will move to a channel and transmit a probe request frame 560(I). If there is an ad hoc network 102(I) on the channel that matches the service set identity (SSID) in the probe request frame 560(I), the responding station

in that ad hoc network will respond by sending a probe response frame 570(I) to the inquiring station 100.").

In addition, Kneckt, for example, discloses "[t]he client stations 106, 108, 110, 112, 114, 116 may receive more detailed information about the wireless networking or communication capabilities of one or more other client stations 106, 108, 110, 112, 114, 116 by sending a capability request message 208 to the broker station 104 via the air interface, to which the broker station 104 may respond by sending a network capability message, such as a capability response message to the respective client station 106, 108, 110, 112, 114, 116." Kneckt at ¶ [0038]. *See also id.* at ¶ [0040] ("The requested client station 108 may respond to the capability activation request by sending a capability activation response to the requesting client station 106 either directly via the air interface, or may route the capability activation request to the requesting client station 106 through the broker station 104. The capability activation response message may indicate or select one or more of the wireless communication or networking protocols indicated by the capability activation response message.").

Further, Seok, for example, discloses "a scanning procedure for a station receiving a probe request frame, the scanning procedure comprising allowing the station to respond with a probe response frame, only if: a Service Set Identifier (SSID) element in the probe request frame indicates a wildcard SSID or the SSID of the station." Seok at ¶ [0021]. *See also id.* at ¶ [0021] ("Referring to FIG. 2 again, one or more APs 4 having received the probe request frame transmits a probe response frame in response to the probe request frame (S20). The probe response frame is transmitted to the non-AP STA 2.").

Furthermore, Kim discloses, for example, "the first access point 21 counts the number of frames that it transmitted or received for a period of time F in order to measure the amount of data

that the first access point 21 transmitted or received in the period of time F (72). The period of time F must be less than the difference between the amount of time required to receive the probe request frame and the amount of time required to transmit a response frame to the probe request frame." Kim at ¶ [0053]. *See also id.* at ¶¶ [0054]-[0057].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

e) "wherein the probe request requests a probe that assists in diagnosing a network problem" (Claim 7); and "wherein the probe request is configured to diagnose a network problem" (Claim 15)

To the extent that it is determined that any of the above references do not disclose either "wherein the probe request requests a probe that assists in diagnosing a network problem" or "wherein the probe request is configured to diagnose a network problem," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Sadja teaches "[w]hile considering the functionality of the digital set top box, it is noted that the STB contains functionality that can be used to effectively operate as an extremely powerful diagnostic tool situated at each installation. Each STB contains a powerful computer, a digital television receiver and a high speed modem that together can function to provide on-demand subscriber information, network information and diagnostics that places a great deal of power at the fingertips of the network operator." Sadja at 3:33-43. *See also id.* at 8:46-51 ("SNMP is the prevailing choice for remote diagnostics due to its explicit design as a standardized method of 'Network Management'. Any SNMP enabled device found in the headend

will respond to SNMP requests, including all network infrastructures (CMTS, routers, etc) and most servers (Linux & Windows based)."); *id.* at 8:52-58 ("Another common remote query method used by equipment manufactures is by performing an HTTP GET request and parsing the response data. The data is returned in either in XML or HTML format, which can easily be parsed and the appropriate data extracted, or the data is returned in HTML, as a diagnostics web page from which the appropriate data can also be parsed and extracted."); *id.* at 11:61-12:11 ("A cable television diagnostic method for a cable television network consistent with certain embodiments involves sending a polling message to a plurality of modems forming a part of a plurality of television set top boxes from a cable television headend via a cable television cable connection to the set top boxes; wherein the polling message instructs the cable television set top boxes to obtain at least one operational parameter of each of the television set top boxes; receiving a plurality of response messages from the cable television set top boxes, each containing the at least one operational parameter of the television set top boxes; determining that one of the operational parameters from one of the television set top boxes is outside of a specified range of values; and aggregating the operational parameters of the plurality of set top boxes received in the response messages to determine if the same operational parameter is outside the range of specified values for more than the one of the television set top boxes.").

Furthermore, Olson teaches, for example, at ¶ [0086], "[o]ne embodiment of the rogue detection method uses information about beacons and probe responses received by APs and/or client stations that are managed by the WLAN manager 107. The method will be described by way of example using FIG. 6 that shows the tasks and messaging performed by the WLAN Manager 103, the Subnet Context Manager 105, the AP 107 in the subnet of Subnet Context Manager 105, and a client 115 of the AP 107."

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

f) "wherein the probe request is generated by a network operator and uploaded to the second/first node" (Claims 8 and 16)

To the extent that it is determined that any of the above references do not disclose "wherein the probe request is generated by a network operator and uploaded to the second [or first] node," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

In one example, Sadja teaches "two-way capable STBs containing DOCSIS modems can provide more than just video and program guide services to the customer. The STB can keep the operator apprised of every aspect of the STB in the customer's house, ranging from the current video PID to the CA security device ID. This enhanced use of two-way communications allows the cable operators to monitor their plant, with a seamless logical extension of the plant past the tap to the actual devices in the subscriber's home. Thus, for the first time operators are provided the opportunity to monitor the network and its endpoints, not just the infrastructure." Sadja at 6:38-47. *See also id.* at 9:8-23 ("Effective monitoring begins in the headend, ensuring the core systems of the cable operator are functioning as expected and providing early detection of problems. Certain embodiments consistent with the present invention use various communication paths to aggregate headend systems status. All SNMP (Simple Network Management Protocol) and HTTP (Hyper-Text Transfer Protocol) enabled devices can be polled on scheduled intervals for status updates. Information about video/data delivery, device statuses and real-time log files can be stored on a centralized monitoring server thru the use of databases and the Linux syslog

service. By monitoring and analyzing the incoming data, based on MSO defined criteria, the system can automatically take scripted response actions and/or alert appropriate personal pagers, text messaging, email or other means. This allows efficient problem notification and resolution, minimizes downtime, and reduces maintenance costs.").

Olson, furthermore, discloses, for example, a "method includes receiving a scan request at the AP to scan for beacons and probe responses, the request received from a WLAN manager managing a set of managed APs and client stations of the managed APs." Olson at ¶ [0021]. *See also id.* at ¶ [0022] ("For each beacon or probe response on which information is received at the WLAN manager, the WLAN manager may analyze the information received in the report about the potential rogue AP that sent the beacon or probe response.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

g) "first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe" (Claim 9)

To the extent that it is determined that any of the above references do not disclose a "first plurality of probe parameters comprising a form for the probe including a modulation profile for the probe," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Sadja, for example, teaches "most manufacturers do not create their own remote data query system and protocols. Instead, they use one of two major open-standard systems. The two most frequently used methods for gathering data are currently the open-standard SNMP (Simple Network Management Protocol) and the open-standard HTTP (Hyper Text Transfer Protocol)

using XML (eXstensible Markup Language) or HTML (HyperText Markup Language) each of which are open-standards." 8:32-39. *See also id.* at 8:40-44 ("The DOCSIS specification requires, and CableLabs ensures, that every DOCSIS cable modem is equipped with a simple SNMP agent and responds to a standard set of requests. This provides a uniform interface to the cable modem, regardless of manufacturer."); *id.* at 12:59-13:33 ("The table below shows some exemplary values (variables) that can be retrieved during a polling operation consistent with certain embodiments of the present invention. Those skilled in the art will appreciate that these values may be readily available for retrieval by the set top box in many conventional designs, or could be designed into others with minimal modification. More extensive data can also be made available without departing from embodiments consistent with the present inventions.. . . QAM Channel Status[,] QAM Config Data[,] QAM SNR/CNR (Signal To Noise Ratio, Carrier To Noise Ratio)[,] QAM MER (Modulation Error Ratio).").

Olkkonen, moreover, discloses, for example, "[e]xamples of the metric used to rank the ad hoc networks by the received signal quality include Bit Error Rate accumulated over time, Packet Error Rate accumulated over time, received signal strength, link quality measurements, continuous-wave interference, co-channel interference, clear channel assessment (collision avoidance), collisions per unit time, retry counts, and frames canceled per unit time." Olkkonen at ¶ [0028]. *See also id.* at ¶ [0109] ("The arriving device 100 then compiles the network discovery menu in the arriving device, that ranks the ad hoc networks within its range by the received signal strength or other metric of the received signal quality."); *id.* at ¶ [0162] ("The quality of the signal characteristics can be measured by the received signal strength, the bit error rate, or other quality of service (QoS) metrics. Then step 430 ranks the ad hoc networks by the quality of service (QoS) metrics.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

h) "wherein the first probe and second probe are transmitted simultaneously using OFDMA" (Claim 11)

To the extent that it is determined that any of the above references do not disclose "wherein the first probe and second probe are transmitted simultaneously using OFDMA," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Olson, for example, teaches, at ¶ [0084], "[a] frame we call the Measurement Report Frame from the client provides a report in response to a Measurement Request Frame. The Report frame includes the MAC address of the station providing the report, the identifier from the corresponding Measurement Request Frame, and one or more measurement elements. The measurement elements for the case of a beacon or probe response include one or more of the channel number, the duration over which the beacon/probe response was measured, the PHY type (DSS, 5 GHz OFDM, and so forth), the RSSI of the beacon/probe response, the parent TSF, e.g., all or some of the lower order bits of the serving AP's TSF at the time the client received the beacon or probe response, the TSF in the beacon/probe response, and one or more other elements that are in the received beacon/probe response frame."

Seok, for example, discloses "[i]n recent years, with the development of the wireless communication technology, 54 Mbps in maximum can be supported by applying the orthogonal frequency division multiplex (OFDM) technology, etc. to the WLAN. In addition, the IEEE 802.11 has developed or is developing wireless communication techniques for improvement in quality of

service (QoS), compatibility of an access point (AP) protocol, security enhancement, radio measurement or radio resource measurement, wireless access in vehicular environment, fast roaming, mesh network, inter-working with external networks, wireless network management, and the like." Seok at ¶ [0008].

Similarly, Olkkonen discloses "[t]he IEEE 802.11 (a) Standard is designed for either the 2.4 GHz ISM band or the 5 GHz U-NII band, and uses orthogonal frequency division multiplexing (OFDM) to deliver up to 54 Mbps data rates." Olkkonen at ¶ [0013].

Furthermore, transmitting probes simultaneously using OFDMA would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '690 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '690 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '690 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "probe request" (claims 1, 7-9, 11, 15, and 16)
    - The specification and drawings of the '690 Patent do not define or describe the term "probe request" in such full, clear, and concise terms

sufficient to demonstrate that the inventor was in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation.

- "a form dictated by the first plurality of parameters" (claim 1)
    - The specification and drawings of the '690 Patent do not describe parameters that dictate a form for a probe in such full, clear, and concise terms sufficient to demonstrate that the inventor was in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation.
- "wherein the probe request is generated by a network operator and uploaded to the second node" (claim 8)
    - The specification and drawings of the '690 Patent fail to disclose a network operator generating and uploading a probe request to a node.
- "physical layer probe" (claim 9)
    - The specification and drawings of the '690 Patent do not define or describe the term "physical layer probe," demonstrating that the inventor was not in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation.
- "probe parameters comprising a form for the probe" (claim 9)
    - The specification and drawings of the '690 Patent do not define or describe "probe parameters" that comprise a "form" for a probe, demonstrating that the inventor was not in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation.
- "wherein the probe request is generated by a network operator and uploaded to the first node" (claim 16)
    - *See supra* (claim 9).

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and

do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '690 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '690 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '690 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "wherein the first probe and second probe are transmitted simultaneously using OFDMA" (claim 11)
    - The term "first probe" lacks antecedent basis, rendering the claim indefinite.

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions, at least one or more of these claim terms, phrases, and limitations are indefinite because they are inconsistent with and broader than the alleged invention disclosed in the specification and during prosecution, and given Plaintiff's apparent constructions of the claims, any person of ordinary skill in the art at the time of the invention would not understand what is claimed with reasonable certainty, even when the claims are read in light of the specification and prosecution history.

V. THE '008 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits C1 through C10 and/or described below anticipate and/or render obvious, alone or in combination, one or more of the asserted claims of the '008 Patent.

1. The '008 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '008 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits C1 through C10, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '008 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '008 Patent. Further, Defendants contend that any prior art reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Applications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent No. 9,686,594	June 20, 2017	Gomez	C1
U.S. Patent No. 5,874,992	February 23, 1999	Caporizzo	C2
U.S. Patent App. Pub. No. 2007/0286311 A1	December 13, 2007	Coyne	C3
U.S. Patent App. Pub. No. 2009/0128708 A1	May 21, 2009	Huffman	C4
U.S. Patent No. 6,704,372	March 9, 2004	Zhang	C5
U.S. Patent No. 8,582,694	November 12, 2013	Velazquez	C6

U.S. Patent No. 8,424,049	April 16, 2013	Skelly	C7
U.S. Patent No. 5,808,671	September 15, 1998	Maycock	C8
U.S. Patent App. Pub. No. 2005/0114879 A1	May 26, 2005	Kamieniecki	C9
U.S. Patent No. 7,403,486	July 22, 2008	Flask	C10

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems. Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

* * * * *

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '008 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been either inherent in the art or obvious to a person of ordinary skill in the art, even if Defendants have not

specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '008 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '008 Patent are not explicitly disclosed by any prior art identified above and/or in Exhibits C1 through C10, any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits C1 through C10 with each other, at least because all of these references relate to receiving and/or analyzing broadband or wideband signals over cable television and telecommunications networks. The references set forth above are therefore all in the same or similar fields of endeavor.

For example, U.S. Patent No. 9,686,594 ("Gomez") teaches "[a] system, method, and apparatus to allow an operator of a broadcast communication system, such as a cable television or satellite television service to provide some examples, to diagnose performance of this communication system remotely. The operator of a first communication device, such as a cable modem termination system (CMTS) to provide an example, may remotely diagnosis performance problems, or potential performance problems, occurring at a second communication device, such as a cable modem (CM) to provide an example, or a group of second communication devices." Gomez at Absract.

Further, U.S. Patent No. 5,874,992 ("Caporizzo") teaches "a settop terminal which analyses each data packet received by the settop terminal and determines whether the received data packet includes errors. The bit error rate is continually calculated, monitored and stored. When the

bit error rate exceeds a predetermined threshold, the settop terminal generates a warning signal for transmission to the headend, which diagnoses the problem. In this case the cable system can utilize the results from a group of households that have the same problem in order to isolate the source of failure." Caporizzo at 1:64-2:6.

Furthermore, U.S. Patent Application Publication No. 2007/0286311 A1 ("Coyne") teaches "a channelized receiver" having extended capabilities to enable a communications system "to perform electronic surveillance monitoring (ESM)", "receive, process and provide information to downstream devices," provide "wideband communications capability," and which includes "a programmable demodulator for extracting communications data from incoming signals." Coyne at Abstract.

Additionally, U.S. Patent Application Publication No. 2009/0128708 A1 ("Huffman") discloses a "multimedia signal monitoring unit" that includes "a multimedia signal receiver for receiving an encoded multimedia stream, and a plurality of decoders." Huffman at Abstract. Further, the "monitoring unit includes an analysis module employing multiple algorithms for demodulating and analyzing a digital multimedia signal." *Id.* at ¶ [0012].

Furthermore, U.S. Patent No. 6,704,372 ("Zhang") teaches "a digital multi-channel demodulator circuit. The demodulator includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to a lower frequency band. An ADC receives the multi-channel analog RF signal from the frequency-block down-converter and converts the multi-channel analog RF signal to a multi-channel digital RF signal. A digital channel demultiplexer receives the multi-channel digital RF signal from the ADC and demultiplexes the multi-channel digital RF signal into separate digital RF channels." Zhang at Abstract.

U.S. Patent No. 8,582,694 ("Velazquez") discloses "a dynamic channelizer that is adaptively tuned based on detected signals, . . . a powerful software reconfigurable digitizer that is adaptively optimized for the current signal environment to control important receiver parameters such as bandwidth, dynamic range, resolution, and sensitivity." Velazquez at This approach adaptively adjusts the signal processing to provide optimal performance for the current signal environment. The adaptive adjustment uses heuristic and iterative approaches for identification of signals of interest and jammer/interference signals for tuning the digital channelizer and for selecting appropriate high-performance digital signal processing techniques to trade off bandwidth, dynamic range, resolution, and sensitivity." Velazquez at 1:46-58.

Furthermore, U.S. Patent No. 8,424,049 ("Skelly") teaches "[a] video signal is provided to a set top box. An instruction to record a specified portion of the video signal, thereby creating a video sample, is provided to the set top box. The video sample is received from the set top box. Reference video corresponding to the video sample is obtained. A comparison of the video sample and the reference video is performed." Skelly at Abstract.

Furthermore, U.S. Patent No. 5,808,671 ("Maycock") teaches an "[a]pparatus for and a method of monitoring the transmission of an analog video signal through a video signal transmission channel, e.g. a fiber optic cable from a headend capturing the analog video signal at a location remote from the headend and select a signal channel from the captured video signal. The selected signal channel is digitized and serialized as a digital signal and the digital signal is transmitted as an optical signal through an optical fiber cable to a monitoring location, where the digital signal is converted to an analog video signal which is displayed on a video monitor." Maycock at Abstract.

In addition, U.S. Patent Application Publication No. 2005/0114879 A1 ("Kamieniecki") teaches that "[i]nformation related to signal quality on the downstream and upstream paths [] in a cable network may be monitored [] at selected ones of a plurality of set-top boxes [] and sent by the set-top box to the headend [] as it is collected, or when the set-top box is polled by the headend." Kamieniecki at Abstract.

Furthermore, U.S. Patent No. 7,403,486 ("Flask") teaches "[a]n apparatus that includes a coupling, a signal level measurement circuit, a communication circuit and a processing circuit. The coupling is configured to connect to and received broadband RF signals from a coaxial cable termination of a communication network. The signal level measurement circuit is operably coupled to the coupling, and is operable to generate signal level measurements regarding a first set of the broadband RF signals." Flask at Abstract.

Accordingly, because the identified references are directed to similar devices and techniques in similar fields of endeavor, a person of ordinary skill in the art would have been motivated to combine the teachings of two or more references with a reasonable expectation of success.

a) "an analog-to-digital converter operable to digitize a received signal spanning an entire television spectrum comprising a plurality of television channels, said digitization resulting in a digitized signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "an analog-to-digital converter operable to digitize a received signal spanning an entire television spectrum comprising a plurality of television channels, said digitization resulting in a digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Gomez teaches "the receiver 402 may be characterized as being a wide-band and/or full band capture receiver. In this example, the receiver 402 can include a wide-band capture analog digital converter (ADC) that is capable of converting multiple channels and/or services within the received communication signal 452 from a representation in the analog domain to a representation in the digital domain." 11:32-39.

Coyne, moreover, teaches, for example, "[c]ombiner 220 combines these signals to a wideband or ultra-wideband spectral space, and provides output to analog-to-digital converter (ADC) 230. ADC 230 provides a digital representation of the combined signal to channelizer 240, which de-multiplexes that digital signal into one or more channel outputs 245." Coyne at ¶ [0022].

Velazquez discloses, for example, "FIG. 3 illustrates the software reconfigurable digitizer 210 according to an embodiment of the invention. Here, the software reconfigurable digitizer 210 comprises an array of analog-to-digital converters (ADC) 310A-D and reconfigurable DSP algorithms 320 responsive to the adaptive real-time control algorithm 230. The use of four ADCs 310A-D as shown is exemplary only—the use of four ADCs 310A-D increases the bandwidth of the conversion by four times while maintaining very high resolution." Velazquez at 7:38-46.

Furthermore, Skelly teaches, for example, "Video distribution network 110 may include one or more components for known types of video networks, such as digital, optical, or analog networks. Further, video signal 101 may be converted from analog to digital or vice-versa within video distribution network 110. Video distribution network 110 provides signal 101 to set top box (STB) 115. STB 115 is usually, although not necessarily, located at a customer premises such as a residence, hotel, office, etc. subscribing to video services provided via network 110." Skelly at 2:33-37.

Additionally, Maycock discloses, for example, "[a] demodulator 34 has two output paths. A first path extends to an audio demodulator 36 and the other extends to an analog-to-digital converter 38. The resolution of the analog-to-digital converter 38 is chosen carefully so as not to degrade the performance of the received signal. In the present embodiment of the invention, the analog-to-digital converter 38 provides 8 bit resolution giving a theoretical signal-to-noise ratio of approximately 60 dB." Maycock at 4:25-34.

Flask, furthermore, discloses, for example, "[an] ADC 364 is operable to generate digital samples of the filtered and gain adjusted IF signal and provide those samples to the DSP 366. Such ADCs are known." Flask at 13:25-28.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) "a signal monitor operable to: analyze said digitized signal to determine a characteristic of said digitized signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "a signal monitor operable to: analyze said digitized signal to determine a characteristic of said digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Gomez teaches "[t]he one or more plant diagnostic tools measure various signal parameters of various signals within the communication system 100 and provide these signal parameters to the service provider location 102. The signal parameters may include one or more of spectral density, received signal strength, relative strength of different channels and services, noise floor and interference, transmitter frequency offsets, and/or any other suitable signal

parameter that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the present disclosure." Gomez at 4:61-5:3.

Caporizzo, moreover, teaches, for example, "a settop terminal which analyses each data packet received by the settop terminal and determines whether the received data packet includes errors. The bit error rate is continually calculated, monitored and stored." Caporizzo at 1:64-2:1. *See also id.* at 5:50-61 ("the settop terminal 10 detects and determines the BER on the channel currently viewed by the subscriber. The BER may be calculated for any time duration. (e.g. five minutes, ten minutes or one hour) or continuously, and stored in memory 160. The central processor 71 may also instruct the settop terminal 10 to determine the BER on selected CATV channels whenever the subscriber terminal is not turned ON. Accordingly, the BER of every channel may be monitored by the CATV network operator daily, hourly or even more frequently. As a result, BER data may be collected for every channel and at every time during the day.").

Furthermore, Coyne discloses, for example, "programmable demodulator 250 may be capable of processing channel output generated by channelizer 240 to suit any number of applications. In one example, programmable demodulator 250 may execute one or more programmed procedures to compensate for Doppler frequency shift, which can occur when a signal is received on a mobile platform from a transmitter which is moving with respect to the mobile platform. For example, a signal received by a first airplane from a second airplane that is moving toward the first airplane at a supersonic speed may shift, for example, up to 4 MHz, and can cause a receiver on the first airplane tuned to a specific channel to lose the signal. Accordingly, in some embodiments, programmable demodulator 250 may process channel output of channelizer 240 to detect and/or compensate for Doppler frequency shift." Coyne at ¶ [0036]. *See also id.* at ¶ [0044] ("System 400 also includes a switch which allows a connection to be made to either of terminals

420A or 420B. When a connection is made to terminal 420A, channelizer 240 provides channel output to signal detection decision logic 430. For example, channel output may be provided to threshold mask generation module 120 and decision logic 140 (described above with reference to FIG. 1). When a connection is made to terminal 420B, channel output is provided to demodulation processing logic 440. For example, channel output may be provided to programmable demodulator 250 (FIG. 2), which may extract communications data therefrom (e.g., for delivery to interface module 260).").

In addition, Huffman discloses, for example, "[m]onitoring unit 106 may monitor the transmission subsystem and the reception subsystem for a multimedia signal, since error can occur at either location. Monitoring unit 106 may monitor and diagnose errors resulting from the signal transmission or receiver equipment as well as errors resulting from geographical or environmental disturbances, including weather related disturbances." Huffman at ¶ [0024].

Furthermore, Flask teaches, for example, "The measurement circuit 304 is a circuit that performs or at least plays a significant role in the measurement operations of the device 300. In the embodiment of FIG. 3, the measurement circuit 304 performs analog television signal level measurement, digital signal level measurement, MER, BER measurements, Docsis measurements and cooperates with the control processor 370 of the control/interface circuit 306 to perform throughput and packet loss measurements. It will be appreciated that the measurement circuit 304 (alone or in combination with other circuits) may be configured to perform a different set of tests that includes at least some of the above mentioned tests, as well as others." Flask at 9:22-33.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the

claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "a signal monitor operable to: report said determined characteristic to a source of said received signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "a signal monitor operable to: report said determined characteristic to a source of said received signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, discloses "[t]he parameter measurement module 406 may additionally provide the one or more signal parameters, or the indications of the one or more signal parameters, as one or more signal parameters 464 which are in turn provided to the service provider by the transmitter 408 to remotely diagnose performance problems, or potential performance problems, within the communication system in real time." Gomez at 12:58-64.

Similarly, Caporizzo discloses, for example, "the settop terminal 10 may initiate a procedure for determining the BER of upstream communications sent from the settop terminal 10 to the headend 15. In this embodiment, the settop terminal 10 generates a message and transmits this message to the headend 15. In the same manner as described for the preferred embodiment, the central processor 71 within headend 15 includes means 70 for receiving the message, detecting errors, calculating the BER and forwarding the BER back to the settop terminal 10." Caporizzo at 6:45-54.

Furthermore, Huffman discloses, for example, at ¶ [0029], "Monitoring unit 106 may also connect, wirelessly or otherwise, to a local or remote monitoring station via a communications link so as to enable monitoring unit 106 to upload data related to multimedia signal 103 to the

monitoring station. If the monitoring station is notified of an error in multimedia signal 103 by monitoring unit 106, technicians are able to begin diagnosing and correcting the same."

In addition, Kamieniecki discloses, for example, "The invention therefore provides a method to allow a set-top box (STB) to collect statistics on plant health by monitoring the forward (downstream) and reverse (upstream, return path) transport cable signals, and reporting this information back to the cable headend. Kamieniecki at ¶ [0016]. *See also id.* at ¶ [0017] ("The monitoring feature can operate automatically in the background so as not to disturb any viewer experiences; i.e., when the STB is turned 'off' and in an idle state. The STB will collect statistics on plant health, as indicated by signal quality, on a channel-by-channel basis. It is within the scope of the invention that fewer than all of the channels are monitored. (The channel map can indicate which channels will be monitored.) These statistics can either be stored for future collection by the headend 102 via a two way polling mechanism, or the STB 110 can actively transmit (report, forward) the statistics back to the head-end as they are collected. Two-way polling can be implemented, for example, by polling the STB from the headend via the downstream path (typically on the OOB channel), and having the STB report back via the upstream path."

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

d) "a data processor operable to process a television channel to recover content carried on the television channel" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "a data processor operable to process a television channel to recover content carried on the television

channel," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, discloses "[t]he baseband processor 404 may process the received sequence of data 454 to provide a recovered sequence of data 456 for one or more devices of the communication system." Gomez at 11:45-48. *See also id.* at 14:33-36.

Caporizzo, moreover, teaches, for example, "[t]he settop terminal 10 receives an input signal from the CATV dropline 60. The tuner 130 tunes to the channel desired by the subscriber and removes the carrier frequency. A demodulator 132 and a VBI data receiver 134 extract the VBI data from the analog audio and video (A/V) signals. The analog A/V signals are then forwarded by the microprocessor 138 to the modulator 144 which places the A/V signals on a selected RF carrier frequency, typically television channel 3 or 4, for input to the television set 20." Caporizzo at 4:5-14.

Furthermore, Huffman discloses, for example, "[a] multimedia signal 103 is sent from transmitter 107 to regional office 102 of a content provider or service provider. Regional office 102 sends multimedia signal 103 to receivers 104, e.g. televisions, to be demodulated by the receiver units and converted to signals capable of being viewed by a user on display device 105." Huffman at ¶ [0029]. *See also id.* at ¶ [0017] ("regional office 102 transmits multimedia signal 103 to one or more multimedia signal receivers 104. To the extent that multimedia signal 103 is compressed, encrypted, and/or otherwise encoded, multimedia signal receivers 104 are operable to decode multimedia signal 103 and display the decoded signal on a display device 105. Multimedia signal receiver 104 and display device 105 may be implemented as a set top box connected to a television set or a set top box connected to a display monitor.").

Zhang, moreover, discloses, for example, as background, "[t]he function of each tuner 110 is to select an RF channel falling within a specific frequency band. There is one tuner for each RF channel. The input RF signal for a tuner contains many or all RF channels. Each tuner then converts the frequency of its selected RF channel to a lower fixed frequency pass band for cable systems, or to baseband for satellite systems. Each ADC 120 then digitizes the selected RF signal. Then each digital demodulator 130 performs signal demodulation and outputs recovered digital bits with error indication signals." Zhang at 1:50-61. *See also id.* at 4:18-25 ("Many functional blocks can be shared between different demodulators. Such functional blocks, for example, can include numeric controlled oscillators (NCOs), timing error detection circuitry, carrier recover circuitry, etc. Because of the resource sharing between such demodulators, significant power saving is achieved. Hence, with such embodiments of the present invention, more RF channels can be demodulated in a single chip.").

Furthermore, Maycock teaches, for example, an "apparatus for monitoring the transmission of a video signal from a headend employs means at a location remote from the headend for capturing the video signal. The captured video signal is passed to a channel selector, which selects a signal channel from the captured video signal. The selected channel is then demodulated, digitized and serialized in a digitizer and transmitted as a digital video signal to a monitoring location, where it is converted back into an analog video signal for display on a monitor and test equipment." Maycock at 2:20-29.

Flask, moreover, teaches "the baseband audio-visual baseband information for each broadcast channel is modulated onto a particular channel frequency carrier and then combined with all of the other channel frequency carriers to form a multichannel broadband RF signal. The broadband RF signal provided to the headend optical encoder/decoder 124. The headend optical

encoder/decoder 124 converts the broadband RF signal to an optical signal, which then propagates through the fiber plant 114 to the nodes 126. The nodes 126 convert the optical signal back to a broadband RF signal and then provide the broadband RF signal to the lines of the cable plant 116. The cable plant 116, the network tap lines 118 and the subscriber drop lines 120 cooperate to provide the broadband RF signal to each subscriber premise 122. If the subscriber premise 122 has a television 128 operably connected to the drop line 120, then the television 128 may tune and display any of a plurality of audiovisual programs within the broadband RF signal." Flask at 5:55-6:4.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

e) "a channelizer operable to: select a first/second portion of said digitized signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "a channelizer operable to: select a first [and] second portion of said digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Coyne, for example, discloses, at ¶ [0005], "[i]n channelized receiver 100, input energy is provided to channelizer 110, which includes multiple filters 110 1, 110 2 . . . 110 n. Each filter in filter bank 110 has a different center frequency, with the filters being ordered in accordance with their center frequencies. The output of each filter represents the components of the input having frequencies falling in the pass band of that filter. The outputs of channelizer 110 are applied to a bank of comparators 130 1, 130 2 . . . 130 n." *See also id.* at ¶ [0022] ("Combiner 220 combines

these signals to a wideband or ultra-wideband spectral space, and provides output to analog-to-digital converter (ADC) 230. ADC 230 provides a digital representation of the combined signal to channelizer 240, which de-multiplexes that digital signal into one or more channel outputs 245."); *id.* at ¶ [0030] ("In some embodiments, channelizer 240 de-multiplexes the output of ADC 230 to separate it into different communication sets, such as voice data, video, data streams, other information, or a combination thereof.").

Furthermore, Zhang teaches, for example, "[a] digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C1 to Cn. The specific implementation of channel demultiplexer 230 will depend on the specific application and requirements. Alternative channel demultiplexer embodiments are described in more detail below (FIGS. 2 and 3). Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels C1 to Cn and then selects one or more of the RF channels D1 to Dm from one or more of the digital RF channels C1 to Cn. RF channels C1 to Cn contain content channels that are selected or used by a subscriber." Zhang at 3:60-4:4. *See also id.* at 4:33-43 ("FIG. 3 is a simplified high-level schematic diagram of a digital tuner 300, which in some embodiments of the present invention, can be used to implement digital channel demultiplexer 230 of FIG. 2. Digital tuner 300 includes a bank of n numeric control oscillators (NCOs) 310(1 . . . n), complex multipliers 320(1 . . . n), and low-pass filters (LPFs) 330(1 . . . n). One chain of each of these elements is used for each RF channel. The exact number of these elements will depend on the number of RF channels to be demultiplexed. In this specific embodiment, low-pass filters 330 are high-speed finite impulse response (FIR) filters.").

Further, Velazquez discloses, for example, "[f]or example, the user may desire to track the 10 largest amplitude signals. The adaptive real-time control algorithm 230 catalogs the 10 largest

amplitude signals detected by the signal detection algorithm 240, provides input to the dynamic channelizer 220 on the location and bandwidth of those signals so they can be extracted, and provides input to the digitizer 210 to activate one or more DSP techniques to enhance the detected signals." Velazquez at 6:58-65.

Kamieniecki discloses, for example, that a "set-top box 110 has more than one tuner (112, 114) so that it can receive out-of-band (OOB) communications simultaneously with in-band (IB) communications. This means that subscribers can be tuned to a channel receiving audio and video content while, at the same time, the STB 110 is receiving instructions in an OOB channel. The communications from the headend 102 to the STB 110 comprises the OOB channel(s) and a plurality of IB channels." Kamieniecki at ¶ [0013]; FIG. 1.

Flask, moreover, discloses, for example, "the test equipment included an RF signal receiver and circuitry for measuring signals received on select channels of the system. Measurement a large number of channels provides a rough spectrum analysis of the cable network. Various test devices that measured analog cable television channels were developed." Flask at 1:55-60 (Background of the Invention). *See also id.* at 17:52-61 ("Another operation of the device 300 is digital channel SLM. In particular, one measure of HFC system operation is the signal level of digital television signals, or even digital data signals such as those that carry Internet data packets. As with new or existing analog service, it is useful to perform digital channel SLM for digital cable service. For new service, the measurements ensure the quality of the physical plant signal path to each customer. For existing service, the measurements may be used to troubleshoot problems on a particular channel or set of channels.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the

claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

f) "a channelizer operable to: concurrently output said first portion of said digitized signal to said signal monitor and said second portion of said digitized signal to said data processor" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "a channelizer operable to: concurrently output said first portion of said digitized signal to said signal monitor and said second portion of said digitized signal to said data processor," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

In one example, Coyne discloses, at ¶ [0044], "[s]ystem 400 includes combiner 220, ADC 230 and channelizer 240, described above with reference to FIG. 2. System 400 also includes a switch which allows a connection to be made to either of terminals 420A or 420B. When a connection is made to terminal 420A, channelizer 240 provides channel output to signal detection decision logic 430." *See also id.* at ¶ [0047] ("functionality provided by signal detection decision logic 430 and demodulation processing logic 440 may be provided by a single component which, for example, executes programmed procedures that perform either or both functions, and/or other functions. In this respect, signal detection decision logic 430 and demodulation processing logic 440 should be viewed as functional (and not necessarily physical) components which may be implemented in any suitable fashion."); *id.* at ¶ [0005] ("The outputs of comparators 130 1, 130 2 . . . 130 n are provided to decision logic 140, which processes the outputs to identify whether certain of the channels contains a signal that should be selected for further processing."); id. at ¶ [0022] ("ADC 230 provides a digital representation of the combined signal to channelizer 240, which de-multiplexes that digital signal into one or more channel outputs 245. Programmable

demodulator 250 processes the output(s) 245 to extract communications data, and provides one or more outputs 255 to interface module 260. Interface module 260 provides output(s) 255 to one or more downstream devices (e.g., onboard a military vehicle)."

Kamieniecki discloses, for example, "[t]here is a bi-directional flow of information between the subscriber's set-top box 110 and the cable operator's headend 102. The set-top box 110 has more than one tuner (112, 114) so that it can receive out-of-band (OOB) communications simultaneously with in-band (IB) communications. This means that subscribers can be tuned to a channel receiving audio and video content while, at the same time, the STB 110 is receiving instructions in an OOB channel."

Furthermore, Huffman discloses, for example, "[e]ach circuit board 405 contained within the chassis 403 of monitoring unit 106 may directly tap into the multimedia signal output to the receivers 104, or may in the alternative be connected to another control circuit that further directs the signals incoming to and outgoing from monitoring unit 106." Huffman at ¶ [0030]. *See also id.* at ¶ [0034] ("In use, monitoring unit 106 may be continuously monitoring outgoing television signals for multiple channels of content using multiple chip sets with different processing capabilities, i.e., it is demodulating and processing the data packets for each output channel using chipsets corresponding to multiple generations of receivers. To do this, a particular circuit board 405 is either automatically selected or selected by a user as described above. The circuit board then outputs appropriate monitoring or diagnostic signals to the station and the next circuit board is queried. When a new chipset is delivered to market, the operator removes the top portion of the monitoring unit and either expands the number of boards, or replaces a board already contained therein. The monitoring unit is then reset, i.e., the maximum number of circuit boards, time to query each board, etc., and the monitoring unit resumes monitoring the digital signal. In this way,

monitoring unit 106 is capable of changing and expanding to test digital signals according to the capabilities of different generations of chipsets.").

Additionally, Flask teaches, for example "receiver circuit 328 and the signal level measurement circuit 330 are both connected to the frequency conversion circuit 308 of the tuner circuit 302 through a splitter 350. The receiver circuit 328 includes a gain adjustment amplifier 352 and the modem circuit 332. The modem circuit 332 is operable to receive Internet protocol packets (VoIP or otherwise) and provide output to various devices on the control/interface circuit 306. In one mode (VoIP mode), the modem circuit receives VoIP protocol data packets and provides analog voice signals to the speaker phone chip 374 of the control/interface circuit 306. In another mode, the modem circuit receives IP data packets and provides the packets to the control processor 370 of the control/interface circuit 306. In still another mode, the modem circuit 332 provides BER, MER, packet loss, delay (latency) and jitter information to the control processor 370, as will be discussed further below. Thus the modem circuit 332 enables reception of VoIP packets, the reception of other non-VoIP Internet data packets, and the performance of various measurements, including BER, MER, packet loss, delay and jitter measurements." Flask at 12:42:61.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

g) "wherein said first portion of said digitized signal spans said entire television spectrum" (Claim 2)

To the extent that it is determined that any of the above references do not disclose "wherein said first portion of said digitized signal spans said entire television spectrum," as claimed, it would

have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, discloses "[i]n some situations, the sounding source and/or the sounding receiver may be implemented as a full-band transmitter and a full-band capture receiver, respectively. In these situations, the full-band transmitter by provide the sounding signal that occupies multiple communication channels with are all received by the full-band capture receiver." Gomez at 6:6-12. *See also id.* at 11:32-39 ("For example, the receiver 402 may be characterized as being a wide-band and/or full band capture receiver. In this example, the receiver 402 can include a wide-band capture analog digital converter (ADC) that is capable of converting multiple channels and/or services within the received communication signal 452 from a representation in the analog domain to a representation in the digital domain."); *id.* at 14:28-32.

Additionally, Zhang, for example, teaches "[a] multi-channel RF input signal typically includes a plurality of RF channels, each characterized by a different carrier frequency and being modulated in accordance with desired information to be carried on that channel. Each channel's bandwidth is less than the spacing of the carrier frequencies. For example, carrier frequencies in the UHF band (300 MHz to 3 GHz) may be spaced at 6 MHz intervals. Included are receiver chains 102 a, 102 b, and 102 c. Each chain includes a tuner 110, an analog-to-digital converter (ADC) 120 and a digital demodulator 130. Digital demodulator 130 includes a forward error correction (FEC) circuit (not explicitly shown)." Zhang at 1:35-49.

Moreover, Huffman discloses, for example, "if the multimedia signal 103 as received by monitoring unit 106 is a broadcast signal, monitoring unit 106 may demodulate and/or decode the multimedia signal so that the multimedia signal 103 as delivered to receiver 104-2 is demodulated and/or decoded. Although FIG. 1 depicts tap 108 as being located between regional office 102 and

receiver(s) 104, the tap may also be located further 'upstream' such as where multimedia signal 103 is received by regional office 102." Huffman at ¶ [0020]. *See also* Flask at 18:52-65.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '008 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '008 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '008 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "a channelizer operable to: . . . concurrently output said first portion of said digitized signal to said signal monitor and said second portion of said digitized signal to said data processor" (claim 1)
    - The specification and drawings of the '008 Patent fail to disclose that the channelizer is operable to concurrently output a first portion of a signal to a signal monitor and a second portion of the signal to a data processor, demonstrating that the inventor was not in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation. *See, e.g.*, '008 Patent at 4:45-50 ("The data processing module 156 may process one or more of bands C_1-C_J to recover data on one or more channels (e.g., television and/or DOCSIS channels) present in those bands while the monitoring module 154 may *concurrently process* band C_{J+1} to measure/determine characteristics of all or a portion of the signal S between f_{lo} and f_{hi}.") (emphasis added); *id.* at 6:28-36 (describing the *sequential outputting* of bands to the data processor and signal monitor); *id.* at FIG. 4.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '008 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '008 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '008 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "signal monitor" (claim 1)
    - The term "signal monitor" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.
- "data processor" (claim 1)
    - The term "data processor" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.
- "channelizer" (claim 1)
    - The term "channelizer" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions, at least one or more of these claim terms, phrases, and limitations are indefinite because they are inconsistent with and broader than the alleged invention disclosed in the specification and during

prosecution, and given Plaintiff's apparent constructions of the claims, any person of ordinary skill in the art at the time of the invention would not understand what is claimed with reasonable certainty, even when the claims are read in light of the specification and prosecution history.

Furthermore, as stated above, at least the terms "signal monitor," "data processor," and "channelizer" invoke 35 U.S.C. § 112, ¶ 6 without sufficient disclosure of corresponding structure, and are therefore indefinite. Pursuant to Patent Rule 3-3(c), these terms, to the extent they can be understood by Defendants, are identified in the prior art, as set forth at least in Exhibits C1-C10.

VI. THE '362 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits D1 through D5 and/or described below anticipate and/or render obvious, alone or in combination, one or more of the asserted claims of the '362 Patent.

1. The '362 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '362 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits D1 through D5, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '362 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '362 Patent. Further, Defendants contend that any prior art

reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent No. 7,265,792	September 4, 2007	Favrat	D1
U.S. Patent App. Pub. No. 2007/0098089 A1	May 3, 2007	Li	D2
WIPO Pub. No. WO 2006/119489 A2	November 9, 2006	McNeely	D3
U.S. Patent No. 6,704,372	March 9, 2004	Zhang	D4
WIPO Pub. No. WO 2007/145637	December 21, 2007	Pugel	D5

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems.

Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

* * * * *

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '362 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '362 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '362 Patent is not explicitly disclosed by any prior art identified above and/or in Exhibits D1 through D5, any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits D1 through D5 with each other, at least because all of these references relate to receiving, processing, digitizing, and extracting information from signals, such as broadband and wideband RF signals, on cable television, satellite, and other telecommunication networks. The references set forth above are therefore all in the same or similar fields of endeavor.

For example, U.S. Patent No. 7,265,792 ("Favrat") teaches a "television receiver includes a frequency conversion circuit, an analog-to-digital converter, a signal processor, and a signal output circuit. The frequency conversion circuit receives an input RF signal in one of several television signal formats and converts the input RF signal to an intermediate frequency signal. The

analog-to-digital converter samples the intermediate frequency signal and generates a digital representation thereof. The signal processor processes the digital representation of the intermediate frequency signal in accordance with the television signal format of the input RF signal and generates digital output signals indicative of information encoded in the input RF signal. Finally, the signal output circuit receives the digital output signals from the signal processor and provides one or more output signals corresponding to the digital output signals." Favrat at Abstract.

Furthermore, U.S. Patent Application Publication No. 2007/0098089 A1 ("Li") teaches a receiver "for receiving data corresponding to a portion of an incoming radio frequency (RF) spectrum, determining a set of estimates including one or more pairs of a channel frequency estimate and a symbol rate estimate from the data via a linear spectrum analysis, and determining a refined set of estimates from the set of estimates via at least one non-linear spectrum analysis. In this way, a blind scan process may be performed to obtain channel estimates in a rapid manner." Li at ¶ [0007].

Furthermore, WIPO Publication No. WO 2006/119489 A2 ("McNeely") teaches an "apparatus (600) includes a receiver (604a-c, 610a-c) for receiving a plurality of digitally multiplexed signals, each digitally multiplexed signal associated with a different physical transmission channel, and for simultaneously recovering from at least two of the digital multiplexes a plurality of bit streams." McNeely at Abstract.

In addition, U.S. Patent No. 6,704,372 ("Zhang") teaches "a digital multi-channel demodulator circuit. The demodulator includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to a lower frequency band. An ADC receives the multi-channel analog RF signal from the frequency-block down-converter and converts the multi-channel analog RF signal to a multi-channel digital RF signal. A

digital channel demultiplexer receives the multi-channel digital RF signal from the ADC and demultiplexes the multi-channel digital RF signal into separate digital RF channels." Zhang at Abstract.[6]

Furthermore, WIPO Publication No. WO 2007/145637 A1 ("Pugel") teaches "a method and apparatus for simultaneous reception of a plurality of digital television channels. Specifically, the apparatus of the present invention is directed to a multichannel receiver circuit including a plurality of amplifier-filter circuits configured to receive a multichannel analog RF input signal, the plurality of amplifier-filter circuits including at least a first amplifier-filter circuit configured to generate a first analog signal including a first band of frequencies and a second amplifier-filter circuit configured to generate a second analog signal including a second band of frequencies. A plurality of analog-to-digital converters is provided, each respectively coupled to one of the plurality of amplifier- filter circuits, the plurality of analog-to-digital converters including at least a first analog-to-digital converter configured to receive the first analog signal and generate a first digital signal and a second analog-to-digital converter configured to receive the second analog signal and generate a second digital signal. A digital tuner is provided, coupled to receive at least the first and second digital signals generated by the plurality of analog-to-digital converters, the digital tuner configured to recover a plurality of digital RF channels." Pugel at ¶ [0010].

Accordingly, because the identified references are directed to similar devices and techniques in similar fields of endeavor, a person of ordinary skill in the art would have been motivated to combine the teachings of two or more references with a reasonable expectation of success.

[6] Zhang was also applied *supra* to the asserted claims of the '008 Patent.

a) **"in a wideband receiver system: downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels" (Claim 11)**

To the extent that it is determined that any of the above references do not disclose "in a wideband receiver system: downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Favrat, for example, discloses "[t]he output signal of bandstop filter 113 is then coupled to a mixer 114, controlled by a phase-locked loop 115. Mixer 114 operates to tune the filtered input RF signal to the desired frequency range in one or more frequency conversions and generate the IF signal. Frequency conversion circuit 110 provides the IF signal on a terminal 116 have a preselected intermediate frequency." Favrat at 4:63-5:2.

Furthermore, Li discloses, for example, "as shown in FIG. 1, the output of LNA 15 is provided to a mixer 20 a, which downconverts the incoming RF signals to an intermediate frequency (IF). While not shown in FIG. 1, it is to be understood that mixer 20 a may mix the incoming signals with a received local oscillator (LO) frequency." Li at ¶ [0024].

McNeely, moreover, discloses, for example, "[t]he RF processing block 210 may contain circuitry for filtering undesired energy outside the signal frequency range, may correct for any frequency response errors introduced, and may amplify the signal to a level necessary for input to the analog to digital (A/D) converter 220. The input RF processing block 210 may also contain any mixing circuits necessary to position the L-band signal in the correct frequency range for operation of the A/D converter 220." McNeely at 11, ll. 5-12.

In addition, Zhang teaches, for example, "[a] digital multi-channel demodulator circuit according to an embodiment of the invention includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to a lower frequency band." Zhang at 2:3-7.

Further, Pugel teaches, for example, in claim 14: "digital processor (130) multiplexes said first, second, and third digital signals, downconverts said multiplexed signal and extracts desired information to be coupled to said first and second demodulator circuits (141 , 142)."

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) "digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels" (Claim 11)

To the extent that it is determined that any of the above references do not disclose "digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Favrat, for example, discloses "[d]igitizing IF circuit 120 includes a bandpass filter 121, a variable gain amplifier 122 and an analog-to-digital converter (ADC) 123. The IF signal is filtered by bandpass filter 121. Then, amplifier 122 operates on the filtered IF signal for the purpose of

regulating the dynamic range of ADC 123. ADC 123 operates to digitize the analog IF signal and provide a digital IF signal on a terminal 124." Favrat at 5:16-23.

As another example, Li discloses, at ¶ [0026], "after filtering, the filtered signals are amplified in a third gain stage 40 a, which may be another PGA, for example. The amplified signals are then passed to an analog-to-digital converter (ADC) 45 a which converts the signals into a digital representation."

McNeely, moreover, teaches, at page 11, line 13, "A/D converter 220 digitizes the processed L-band signal into a series of samples, each sample containing a group of bits."

Furthermore, both Zhang and Pugel disclose this limitation. *See, e.g.*, Zhang at 2:7-10 ("An ADC receives the multi-channel analog RF signal from the frequency-block down-converter and converts the multi-channel analog RF signal to a multi-channel digital RF signal."); Pugel at ¶ [0008] ("A plurality of analog-to-digital converters is provided, each respectively coupled to one of the plurality of amplifier- filter circuits, the plurality of analog-to-digital converters including at least a first analog-to-digital converter configured to receive the first analog signal and generate a first digital signal and a second analog-to-digital converter configured to receive the second analog signal and generate a second digital signal.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies" (Claim 11)

To the extent that it is determined that any of the above references do not disclose "selecting, by digital circuitry of said wideband receiver system, said plurality of desired television

channels from said digitized plurality of frequencies," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Li, for example, discloses "[a]fter fine tuning, the digitized signals are provided to a digital filter 55 a, which may be a narrowband digital filter. In various implementations, filter 55 a may be a variable filter controlled to pass only a desired channel, e.g., corresponding to a selected television channel. Filter 55 a may support both adjacent channel suppression and decimation for various band rates. While the bandwidth of the narrowband filter may vary, in a DBS implementation, a selected channel having a frequency of between approximately 1.0 and 30.0 MHz may be passed." Li at ¶ [0027].

Further, McNeely discloses, for example, "digital channel selector 230 receives the sampled signal and proceeds to select and down-convert each of the individual physical channels that have been selected." McNeely at 11, ll. 28-30.

Furthermore, Zhang teaches, for example, "digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C1 to Cn. The specific implementation of channel demultiplexer 230 will depend on the specific application and requirements. Alternative channel demultiplexer embodiments are described in more detail below (FIGS. 2 and 3). Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels C1 to Cn and then selects one or more of the RF channels D1 to Dm from one or more of the digital RF channels C1 to Cn. RF channels C1 to Cn contain content channels that are selected or used by a subscriber." Zhang at 3:60-4:4.

Pugel discloses, for example, at ¶ [0038], "digital tuner 130 may include a channel selector 315 to permit selection of one or more particular digital channels desired to be recovered. For

example, a selected set of digital cable television channels may be communicated to the digital tuner 130 via the channel selector 315 corresponding to a plurality of pay- per-view selections desired by members of a household."

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

d) "outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream" (Claim 11)

To the extent that it is determined that any of the above references do not disclose "outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Favrat, for example, teaches "[f]or the digital television signals, signal output circuit 440 includes a serializer 442 for converting the processed digital IF signal from the DSP circuit into a serial digital data stream. In this manner, the digital signals for digital television can be provided to a digital demodulator through a serial digital interface." Favrat at 7:59-65.

Additionally, Li discloses, for example, "after being filtered in filter 55 a, the digitized data may be amplified in a fourth gain stage 60 a, which may be a digital amplifier such as a digital VGA. The resulting signals are then provided to further processing circuitry of a receiver, for example, demodulation circuitry 65. Demodulator 65 may be used to demodulate incoming signals, which are modulated according to a selected modulation scheme, such as QPSK, BSPK, or another such modulation scheme." Li at ¶ [0028].

McNeely also teaches this limitation, for example, at page 19, line 22 ("The outputs of the digital channel selector 510 each individually connect to a digital demodulator (demod) 52Oa-M.").

Zhang and Pugel also disclose this limitation. *See, e.g.*, Zhang at 2:13-17 ("embodiments include a digital selector that receives the separate RF channels and selects one or more RF channels, and a plurality of demodulators that receive one or more of the RF channels from the digital selector and demodulate one or more of the RF channels."); Pugel at ¶ [0010] ("in addition to the above a plurality of demodulator circuits is coupled to the digital tuner, the plurality of demodulator circuits including at least a first demodulator circuit configured to receive and demodulate a first channel of the plurality of digital RF channels and a second demodulator circuit being configured to receive and demodulate a second channel of the plurality of digital RF channels.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

e) "outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface" (Claim 12)

To the extent that it is determined that any of the above references do not disclose "outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Favrat, for example, discloses "[f]or the digital television signals, signal output circuit 440 includes a serializer 442 for converting the processed digital IF signal from the DSP circuit into a

serial digital data stream. In this manner, the digital signals for digital television can be provided to a digital demodulator through a serial digital interface." Favrat at 7:59-65.

Furthermore, the above limitation would have been obvious because it involves a simple substitution of one known element for another to obtain predictable results. Furthermore, implementing this limitation would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '362 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '362 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '362 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "A wideband receiver" and "a wideband analog-to-digital converter (ADC)" (claim 11)

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '362 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '362 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '362 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "a plurality of desired television channels and a plurality of undesired television channels" (claim 11)
    - The terms "desired" and "undesired" are subjective terms that fail to inform a person of ordinary skill in the art of the boundaries of the claimed subject matter.
- "mixer module" (claim 11)
    - The term "mixer module" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.
- "digital circuitry" (claim 11)
    - The term "digital circuitry" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions, at least one or more of these claim terms, phrases, and limitations are indefinite because they are inconsistent with and broader than the alleged invention disclosed in the specification and during prosecution, and given Plaintiff's apparent constructions of the claims, any person of ordinary skill in the art at the time of the invention would not understand what is claimed with reasonable certainty, even when the claims are read in light of the specification and prosecution history.

Furthermore, as stated above, at least the terms "mixer module" and "digital circuitry" invoke 35 U.S.C. § 112, ¶ 6 without sufficient disclosure of corresponding structure, and are therefore indefinite. Pursuant to Patent Rule 3-3(c), these terms, to the extent they can be understood by Defendants, are identified in the prior art, as set forth at least in Exhibits D1-D5.

VII. THE '826 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits E1 through E5 and/or described below anticipate and/or render obvious, alone or in combination, one or more of the asserted claims of the '826 Patent.

1. The '826 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '826 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits E1 through E5, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '826 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '826 Patent. Further, Defendants contend that any prior art reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent No. 9,686,594	June 20, 2017	Gomez	E1
U.S. Patent No. 5,874,992	February 23, 1999	Caporizzo	E2
U.S. Patent App. Pub. No. 2007/0286311 A1	December 13, 2007	Coyne	E3
U.S. Patent App. Pub. No. 2009/0128708 A1	February 23, 1999	Huffman	E4
U.S. Patent No. 7,403,486	July 22, 2008	Flask	E5

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems. Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

* * * * *

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '826 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '826 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '826 Patent is not explicitly disclosed by any prior art identified above and/or in Exhibits E1 through E5, any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits E1 through E5, and Exhibits C1 through C10 cited for the '008 Patent[7], with each other, at least because all of these references relate to receiving and/or analyzing broadband or wideband signals over cable television and telecommunications networks. The references set forth above are therefore all in the same or similar fields of endeavor.

For example, U.S. Patent No. 9,686,594 ("Gomez") teaches "[a] system, method, and apparatus to allow an operator of a broadcast communication system, such as a cable television or

[7] The '008 and '826 Patents are in the same family, have identical specifications, and both claim priority to U.S. Provisional Patent Application No. 61/532,098. To the extent the asserted claims of the '826 Patent overlap with those of the '008 Patent, the claims of the '826 Patent are invalid for at least the same reasons set forth above for the '008 Patent.

satellite television service to provide some examples, to diagnose performance of this communication system remotely. The operator of a first communication device, such as a cable modem termination system (CMTS) to provide an example, may remotely diagnosis performance problems, or potential performance problems, occurring at a second communication device, such as a cable modem (CM) to provide an example, or a group of second communication devices." Gomez at Abstract.

Further, U.S. Patent No. 5,874,992 ("Caporizzo") teaches "a settop terminal which analyses each data packet received by the settop terminal and determines whether the received data packet includes errors. The bit error rate is continually calculated, monitored and stored. When the bit error rate exceeds a predetermined threshold, the settop terminal generates a warning signal for transmission to the headend, which diagnoses the problem. In this case the cable system can utilize the results from a group of households that have the same problem in order to isolate the source of failure." Caporizzo at 1:64-2:6.

Furthermore, U.S. Patent Application Publication No. 2007/0286311 A1 ("Coyne") teaches "a channelized receiver" having extended capabilities to enable a communications system "to perform electronic surveillance monitoring (ESM)", "receive, process and provide information to downstream devices," provide "wideband communications capability," and which includes "a programmable demodulator for extracting communications data from incoming signals." Coyne at Abstract.

Additionally, U.S. Patent Application Publication No. 2009/0128708 A1 ("Huffman") discloses a "multimedia signal monitoring unit" that includes "a multimedia signal receiver for receiving an encoded multimedia stream, and a plurality of decoders." Huffman at Abstract.

Further, the "monitoring unit includes an analysis module employing multiple algorithms for demodulating and analyzing a digital multimedia signal." *Id.* at ¶ [0012].

Furthermore, U.S. Patent No. 6,704,372 ("Zhang") teaches "a digital multi-channel demodulator circuit. The demodulator includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to a lower frequency band. An ADC receives the multi-channel analog RF signal from the frequency-block down-converter and converts the multi-channel analog RF signal to a multi-channel digital RF signal. A digital channel demultiplexer receives the multi-channel digital RF signal from the ADC and demultiplexes the multi-channel digital RF signal into separate digital RF channels." Zhang at Abstract.

U.S. Patent No. 8,582,694 ("Velazquez") discloses "a dynamic channelizer that is adaptively tuned based on detected signals, . . . a powerful software reconfigurable digitizer that is adaptively optimized for the current signal environment to control important receiver parameters such as bandwidth, dynamic range, resolution, and sensitivity." Velazquez at This approach adaptively adjusts the signal processing to provide optimal performance for the current signal environment. The adaptive adjustment uses heuristic and iterative approaches for identification of signals of interest and jammer/interference signals for tuning the digital channelizer and for selecting appropriate high-performance digital signal processing techniques to trade off bandwidth, dynamic range, resolution, and sensitivity." Velazquez at 1:46-58.

Furthermore, U.S. Patent No. 8,424,049 ("Skelly") teaches "[a] video signal is provided to a set top box. An instruction to record a specified portion of the video signal, thereby creating a video sample, is provided to the set top box. The video sample is received from the set top box.

Reference video corresponding to the video sample is obtained. A comparison of the video sample and the reference video is performed." Skelly at Abstract.

Furthermore, U.S. Patent No. 5,808,671 ("Maycock") teaches an "[a]pparatus for and a method of monitoring the transmission of an analog video signal through a video signal transmission channel, e.g. a fiber optic cable from a headend capturing the analog video signal at a location remote from the headend and select a signal channel from the captured video signal. The selected signal channel is digitized and serialized as a digital signal and the digital signal is transmitted as an optical signal through an optical fiber cable to a monitoring location, where the digital signal is converted to an analog video signal which is displayed on a video monitor." Maycock at Abstract.

In addition, U.S. Patent Application Publication No. 2005/0114879 A1 ("Kamieniecki") teaches that "[i]nformation related to signal quality on the downstream and upstream paths [] in a cable network may be monitored [] at selected ones of a plurality of set-top boxes [] and sent by the set-top box to the headend [] as it is collected, or when the set-top box is polled by the headend." Kamieniecki at Abstract.

Furthermore, U.S. Patent No. 7,403,486 ("Flask") teaches "[a]n apparatus that includes a coupling, a signal level measurement circuit, a communication circuit and a processing circuit. The coupling is configured to connect to and received broadband RF signals from a coaxial cable termination of a communication network. The signal level measurement circuit is operably coupled to the coupling, and is operable to generate signal level measurements regarding a first set of the broadband RF signals." Flask at Abstract.

Accordingly, because the identified references are directed to similar devices and techniques in similar fields of endeavor, a person of ordinary skill in the art would have been

motivated to combine the teachings of two or more references with a reasonable expectation of success.

a) "one or more circuits of a receiver coupled to a television and data service provider headend via a hybrid fiber coaxial (HFC) network" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "one or more circuits of a receiver coupled to a television and data service provider headend via a hybrid fiber coaxial (HFC) network," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, teaches a "service provider location 102 manages the upstream and the downstream transfer of the video, audio, and/or data to and/or from the subscriber locations 104.1 through 104.n. The service provider location 102 provides its video, audio, and/or data in the downstream through a communication channel 106 to the subscriber locations 104.1 through 104.n. The communication channel 106 may be characterized as an interface between the service provider location 102 and the subscriber locations 104.1 through 104.n. The communication channel 106 may include, but is not limited to, a microwave radio link, a satellite channel, a fiber optic communication cable, a hybrid fiber optic communication cable system, a copper communication cable, or a concatenation of any combination of these, and including relays and frequency translations, to provide some examples." Gomez at 4:4-19.

Similarly, Caporizzo teaches, for example, a "CATV transmission network 5 begins with a plurality of coaxial or fiber optic trunk lines 40 coupled to the headend 15. Some portions of the CATV plant may use fiber optic cables instead of coaxial transmission cables." Caporizzo at 2:46-49.

Similarly, Huffman teaches, for example, "regional office 102 delivers multimedia signal 103 to receiver(s) 104 over a wired access network, which may have a physical medium

implemented with twisted copper cable, coaxial cable, fiber optic cable, any combination thereof, or a suitable alternative." Huffman at ¶ [0019].

See also Flask at 3:25-45 ("FIG. 1 shows an exemplary test configuration that employs an analysis device 100 according to the present invention within a communication network 110. The communication network 110 is a land-based broadband network typically known as a cable network. In the embodiment described herein, the communication network 110 is a hybrid fiber coax or HFC network that employs both fiber optic links and coaxial cable to effect radio frequency communications between a plurality of subscribers and a network headend 112. The network headend 112 is further operable to provide Internet communications between a plurality of subscribers and one or more devices 152 connected to the Internet 150. The devices 152 are external to the communication network 110. The analysis device 100 is operable to test multiple parameters of the network, including by way of example, the signal strength at a remote location of the network 110, whether Internet connectivity is available at remote locations of the network 110, and/or digital channel quality at remote locations of the network 110. The precise combination of features in the analysis device 100 may vary from embodiment to embodiment.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) "receiving, via said HFC network, a signal that carries a plurality of channels, wherein said channels comprise one or both of television channels and data channels" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "receiving, via said HFC network, a signal that carries a plurality of channels, wherein said channels comprise one or both of television channels and data channels," as claimed, it would have

been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Gomez teaches "[a] communication system 100 facilitates bi-directional communication of information, such as video, audio, and/or data to provide some examples, between a service provider location 102 and one or more subscriber locations 104.1 through 104.n." Gomez at 3:50-54. *See also id.* at 1:26-31 ("A cable system is a system of providing television, internet data, and/or other services from a cable service provider to cable service subscribers via radio frequency signals transmitted to one or more customer premises through, but not limited to, optical fibers and/or coaxial cables.") (Background of the Invention).

Similarly, in its Background of the Invention, Caporizzo discloses "[c]able television (CATV) communication networks are being used more frequently for applications that require transmission of data, in addition to analog audio and video information. With the onset of utilizing CATV networks for data-critical applications (such as home banking and shopping) and life-saving applications (such as medical alert and alarm services), transmission of error-free data has become a necessity."

Coyne, moreover, discloses, for example, "[i]n some embodiments, channelizer 240 de-multiplexes the output of ADC 230 to separate it into different communication sets, such as voice data, video, data streams, other information, or a combination thereof." Coyne at ¶ [0030].

Huffman, for example, further discloses, at ¶ [0016], "regional office 102 may receive multiple multimedia signals 103 including one or more broadcast multimedia signals and one or more multimedia signals delivered via a backbone connection to the national headend. In this manner, regional office 102 may combine and deliver, to its subscribers, national 'feeds' as well as regionally or locally broadcasted content. Regional office 102 may also insert content such as

regional or local advertising, insert metadata such as electronic programming guide information." *See also* Flask at 6:5-14 ("A portion of the broadband signal is reserved for downstream and upstream data packet communication. The data packet communication in the embodiment described herein comprises data to be communicated using TCP/IP standards, and which may be communicated to remote computers 152 over the Internet 150. The CMTS 134 effectively transmits downstream data packets to cable modems 130 using known modulation techniques, and receives upstream data packets from the cable modems 130 using known demodulation techniques.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "digitizing said received signal to generate a digitized signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "digitizing said received signal to generate a digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the exemplary teachings set forth with respect to the '008 Patent. *See supra* at § V.A.2.a).

d) "selecting a first/second portion of said digitized signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "selecting a first [or second portion] of said digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the exemplary teachings set forth with respect to the '008 Patent. *See supra* at § V.A.2.e).

e) "processing said selected second portion of said digitized signal to recover information carried in said plurality of channels" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "processing said selected second portion of said digitized signal to recover information carried in said plurality of channels," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the exemplary teachings set forth with respect to the '008 Patent. *See supra* at § V.A.2.d).

f) "analyzing said selected first portion of said digitized signal to measure a characteristic of said received signal" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "processing said selected second portion of said digitized signal to recover information carried in said plurality of channels," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the exemplary teachings set forth with respect to the '008 Patent. *See supra* at § V.A.2.b).

g) "controlling the transmission of network management messages back to said headend based on said measured characteristic of said received signal, wherein said measured characteristic is different than said network management message" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "controlling the transmission of network management messages back to said headend based on said measured characteristic of said received signal, wherein said measured characteristic is different than said network management message," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the exemplary teachings set forth with respect to the '008 Patent. *See supra* at § V.A.2.c).

h) "wherein said network management messages indicate whether a parameter is outside of acceptable bounds" (Claim 2)

To the extent that it is determined that any of the above references do not disclose "wherein said network management messages indicate whether a parameter is outside of acceptable bounds," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Gomez discloses "[t]he parameter measurement module 406 may additionally provide the one or more signal parameters, or the indications of the one or more signal parameters, as one or more signal parameters 464 which are in turn provided to the service provider by the transmitter 408 to remotely diagnose performance problems, or potential performance problems, within the communication system in real time." Gomez at 12:58-64.

Furthermore, Caporizzo discloses, for example, "[w]hen the bit error rate exceeds a predetermined threshold, the settop terminal generates a warning signal for transmission to the headend, which diagnoses the problem. In this case the cable system can utilize the results from a group of households that have the same problem in order to isolate the source of failure." Caporizzo at 2:1-6 (Background of the Invention).

Huffman, moreover, discloses, for example, "[t]o quantify the quality of an incoming signal, monitoring unit 106 may monitor parameters including packet error rate for decoding the signal into packets; the signal-to-noise ratio after equalization and phase correction, at the point where the signal goes into a decoder." Huffman at ¶ [0024].

Flask, moreover, discloses, for example, "the control processor 370 receives the information representative of the delay, packet loss and jitter in the VoIP connection. In step 1045, the control processor displays information representative of the delay, packet loss and jitter. The control processor 370 optionally compares one or more these values with one or more thresholds

to provide an indication of whether the values are within one or more predetermined limits. Multiple thresholds may be used to define different measures of quality." Flask at 28:35-46.

Furthermore, indicating that a parameter is outside of acceptable bounds would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

i) "wherein said parameter is a modulation parameter of said received signal" (Claim 3)

To the extent that it is determined that any of the above references do not disclose "wherein said parameter is a modulation parameter of said received signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, teaches that "one or more plant diagnostic tools measure various signal parameters of various signals within the communication system 100 and provide these signal parameters to the service provider location 102. The signal parameters may include one or more of spectral density, received signal strength, relative strength of different channels and services, noise floor and interference, transmitter frequency offsets, *and/or any other suitable signal parameter that will be apparent to those skilled in the relevant art(s)* without departing from the spirit and scope of the present disclosure. The service provider location 102 may then use these signal parameters to remotely diagnose the performance problems, or the potential performance

problems, within the communication system 100 in real time." Gomez at 4:61-5:7 (emphasis added).

Maycock, moreover, discloses, for example, "[t]he critical parameters of cable television system performance comprises the quality of the picture and the audio signal." 1:31-33. *See also, e.g.*, Velazquez at 1:59-63 ("The present invention employs a signal detection algorithm that uses techniques such as statistical, spectral, and wavelet analysis to identify the location, bandwidth, level, and modulation type of signals of interest and jammer/interference signals.").

Furthermore, providing an indication of a modulation parameter would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

j) "wherein said parameter is a transmit power of said received signal" (Claim 4)

To the extent that it is determined that any of the above references do not disclose "wherein said parameter is a transmit power of said received signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, discloses "[an] operator of the service provider location 102 may adjust a frequency allocation, such as a channel-line up to provide an example, of various signals within the communication system 100, a relative power level within one or more channels of the frequency allocation." Gomez at 5:51-56. *See also id.* at 4:61-66 ("The one or more plant

diagnostic tools measure various signal parameters of various signals within the communication system 100 and provide these signal parameters to the service provider location 102. The signal parameters may include one or more of spectral density, received signal strength.").

Further, in its Background of the Invention section, Maycock discloses "[t]o determine the quality of its transmission, cable TV operators have relied upon the measurement of operating parameters of amplifiers employed in co-axial cable in the system as an indirect indication of the transmitted signal quality passing through the amplifiers. Data derived from the parameters, such as power, temperature, and housing status (i.e. open or closed), is encoded by a status monitoring modem and transferred into a return path frequency allocation of the co-axial cable, typically in the frequency band 5 to 35 MHZ." Maycock at 1:15-24. *See also* Flask at 26:24-26 ("The SNR and received power level of the test CM is measured directly by the CMTS 134, which may suitably include an SLM device similar to that of the device 300.").

Furthermore, providing an indication of a transmit power of a received signal would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

k) "wherein said characteristic is signal power/phase vs. frequency" (Claims 6 and 7)

To the extent that it is determined that any of the above references do not disclose "wherein said characteristic is signal power [or phase] vs. frequency," as claimed, it would have been

obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

As noted above, Gomez, for example, teaches "signal parameters may include one or more of spectral density, received signal strength, relative strength of different channels and services, noise floor and interference, transmitter frequency offsets, *and/or any other suitable signal parameter that will be apparent to those skilled in the relevant art(s)* without departing from the spirit and scope of the present disclosure." Gomez at 4:64-5:3 (emphasis added). *See also id.* at 12:39-44 ("one or more signal parameters may include a spectral density, a received signal strength, a relative strength of different channels and services, noise floor and interference, transmitter frequency offset, and/or any other suitable parameter that will be recognized by those skilled in the relevant art(s)").

Huffman, moreover, discloses, for example, "computer program 508 may include analysis module 515, which may include computer executable instructions stored in computer program 508 for use in analyzing the decoded multimedia stream from circuit boards 405. Analysis module 515 may determine characteristics of the stream including packet error rate for decoding the signal into packets, signal-to-noise ratio after equalization and phase correction." Huffman at ¶ [0031]. *See also, e.g.*, Velazquez at 11:26-29 ("For each test signal, a buffer of approximately 128K samples is captured and the FFT spectrum is analyzed to measure the relative amplitude and phase shift of each of the distortion components.").

Furthermore, measuring signal power or phase vs. frequency of a signal would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

l) "wherein said characteristic is one of: signal-to-noise ratio, peak-to-average ratio, noise levels, bit error rate, and symbol error rate" (Claim 8)

To the extent that it is determined that any of the above references do not disclose "wherein said characteristic is one of: signal-to-noise ratio, peak-to-average ratio, noise levels, bit error rate, and symbol error rate," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Gomez, for example, teaches "[t]he signal parameters may include one or more of spectral density, received signal strength, relative strength of different channels and services, noise floor and interference, transmitter frequency offsets, and/or any other suitable signal parameter that will be apparent to those skilled in the relevant art(s)." 4:64-5:2.

Furthermore, Caporizzo discloses, for example, in its Background of the Invention, "[o]ne method for measuring the signal-to-noise ratio on a cable television system without taking the system out of service is disclosed in U.S. Pat. No. 5,073,822 (Gamm et al.). This system uses a modified spectrum analyzer for determining signal-to-noise ratios at certain locations within the CATV network." Caporizzo at 1:42-48.

Huffman, moreover, discloses, for example, "[t]o quantify the quality of an incoming signal, monitoring unit 106 may monitor parameters including packet error rate for decoding the signal into packets; the signal-to-noise ratio after equalization and phase correction." Huffman at ¶ [0024]. *See also, e.g.*, Maycock at 6:23-26 ("The video analyzer 62 measures signal quality parameters such as signal-to-noise ratio, differential gain, differential phase and other video

parameters."). *See also* Flask at 26:24-26 ("The SNR and received power level of the test CM is measured directly by the CMTS 134, which may suitably include an SLM device similar to that of the device 300.").

Furthermore, measuring any of signal-to-noise ratio, peak-to-average ratio, noise levels, bit error rate, and/or symbol error rate of a signal would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

m) "configuring, by said one or more circuits, a bandwidth and/or center frequency of said selected first portion of said digitized signal" (Claim 9)

To the extent that it is determined that any of the above references do not disclose "configuring, by said one or more circuits, a bandwidth and/or center frequency of said selected first portion of said digitized signal," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Coyne teaches "[i]n channelized receiver 100, input energy is provided to channelizer 110, which includes multiple filters 110 1, 110 2 . . . 110 n. Each filter in filter bank 110 has a different center frequency, with the filters being ordered in accordance with their center frequencies." Coyne at ¶ [0005].

Further, Huffman, at ¶ [0018], discloses, for example, "[i]n a coaxial based system, for example, in which regional office 102 transmits all or substantially all available channels of

multimedia content to the end user simultaneously, the desired multimedia signal 103 may correspond to particular frequency band and receiver 104 may be operable as a tuner that selects multimedia signal 103 from the composite signal."

Zhang, furthermore, discloses, for example "[n]umeric oscillator 310(1) generates a frequency, or 'target' frequency, that matches the characteristic frequency of a desired RF channel, or 'target' RF channel. The output of NCO 310(1) is multiplied by all the RF channels received at complex multiplier 320(1). When an multi-channel RF signal is multiplied with the output of NCO 310(1), the frequency of target RF channel signal is shifted to a desired channel. In some embodiments of the present invention, the target RF channel is shifted to a baseband, i.e., centered at DC." Zhang at 4:52-61.

Additionally, Velazquez discloses, for example, "[t]he adaptive real-time control algorithm employs blind adaptive background analysis and heuristic analysis to dynamically adjust parameters of the DSP algorithms 320, e.g., frequency response, center frequency, and/or bandwidth, for optimal performance." Velazquez at 8:4-8.

Further, Flask discloses, for example, "[t]he frequency conversion circuit 308 is a circuit that converts the frequency of an incoming broadband signal such that a select channel frequency of between 4 and 1000 MHz is centered about a predetermined intermediate frequency (IF)." Flask at 8:12-16.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '826 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '826 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '826 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "controlling the transmission of network management messages back to said headend based on said measured characteristic of said received signal, wherein said measured characteristic is different than said network management messages" (claim 1)
    - The specification and drawings of the '826 Patent do not describe network management messages being different than a measured characteristic, demonstrating at least that the inventor was not in possession of the claimed invention.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '826 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '826 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defend ants assert that the asserted claims of the '826 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "performing by one or more circuits of a receiver" (claim 1)

- The term "one or more circuits" invokes 35 U.S.C. § 112 ¶ 6 without disclosure of sufficient corresponding structure, thereby rendering the term indefinite.

- "wherein said network management messages indicate whether a parameter is outside of acceptable bounds" (claim 2)
  - The term "acceptable" is a subjective term that fails to inform a person of ordinary skill in the art of the boundaries of the claimed subject matter.

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions, at least one or more of these claim terms, phrases, and limitations are indefinite because they are inconsistent with and broader than the alleged invention disclosed in the specification and during prosecution, and given Plaintiff's apparent constructions of the claims, any person of ordinary skill in the art at the time of the invention would not understand what is claimed with reasonable certainty, even when the claims are read in light of the specification and prosecution history.

Furthermore, as stated above, at least the term "one more circuits" invokes 35 U.S.C. § 112, ¶ 6 without sufficient disclosure of corresponding structure, and is therefore indefinite. Pursuant to Patent Rule 3-3(c), these terms, to the extent they can be understood by Defendants, are identified in the prior art, as set forth at least in Exhibits E1-E5.

VIII. THE '682 PATENT IS INVALID

A. Identification of Prior Art

Defendants contend that the prior art references charted in Exhibits F1 through F5 and/or described below anticipate and/or render obvious, alone or in combination, one or more of the asserted claims of the '682 Patent.

1. The '682 Patent is Anticipated by the Prior Art

Some or all of the asserted claims of the '682 Patent are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references identified in the claim charts included in Exhibits F1 through F5, which identify specific examples of where each limitation of the asserted claims is found in the prior art references. As explained above, the cited portions of prior art references identified in the attached claim charts are exemplary in nature and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art.

Defendants identify the following references as anticipating one or more of the asserted claims of '682 Patent under 35 U.S.C. § 102. The table of anticipating references below is exemplary, and it does not constitute an admission that any reference not listed below does not also anticipate the claims of the '682 Patent. Further, Defendants contend that any prior art reference in the attached charts that is charted for each limitation of any given claim, anticipates that claim, regardless of whether that prior art reference is listed in the following tables.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name	Exhibit Number
U.S. Patent App. Pub. No. 2012/0269242 A1	October 25, 2012	Prodan	F1
U.S. Patent App. Pub. No. 2007/0223512 A1	September 27, 2007	Cooper	F2
U.S. Patent App. Pub. No. 2009/0219856 A1	September 3, 2009	Richardson	F3
U.S. Patent No. 7,751,338	July 6, 2010	Azenko	F4
U.S. Patent App. Pub. No. 2004/0085987 A1	May 6, 2004	Gross	F5

b) Prior Art Systems

Defendants' further investigation and/or subsequent discovery from Plaintiff or third parties with knowledge regarding prior art systems may reveal additional information about relevant prior art systems. Defendants reserve the right to supplement these Invalidity Contentions based on subsequent investigation and discovery, including from third parties. In particular, Plaintiff has not yet produced art relevant to the systems in its control and/or in the control of any former officers and employees.

Defendants additionally reserve the right to rely on any system, product, or public knowledge or use that embodies or otherwise incorporates any of the prior art patents and publications listed above. Defendants further reserve the right to identify and rely on systems that represent different versions or are otherwise related variations of the identified systems. Defendants also incorporate by reference any and all other prior art systems identified in any other case brought by Plaintiff and/or involving the Asserted Patents.

* * * * *

To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an asserted claim of the '682 Patent, Defendants contend that any difference between that prior art and the corresponding patent claim would have been obvious to a person of ordinary skill in the art, even if Defendants have not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

2. The '682 Patent Would Have Been Obvious Over the Prior Art

To the extent Plaintiff argues that any limitation of the asserted claims of the '682 Patent is not explicitly disclosed by any prior art identified above and/or in Exhibits F1 through F5, any purported differences are such that the claimed subject matter as a whole would have been obvious

to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. The prior art would have, therefore, rendered the relevant claims invalid as obvious under 35 U.S.C. § 103.

Furthermore, it would have been obvious to combine any of the prior art in Exhibits F1 through F5 with each other, at least because all of these references relate to the grouping of devices and network elements (such as, for example, cable modems) in cable television and other telecommunication networks. The references set forth above are therefore all in the same or similar fields of endeavor.

For example, U.S. Patent Application Publication No. 2012/0269242 A1 ("Prodan") teaches a system in which "measured signal strength versus frequency profiles may be used to group CMs into multiple categories, which are then used as the basis for the assignment of upstream transmission frequency bands, or when a preferred frequency band is unavailable, for assignment of lower capacity modulation schemes to CMs." Prodan at ¶ [0044].

Furthermore, U.S. Patent Application Publication No. 2007/0223512 A1 ("Cooper") discloses techniques "directed toward configuring logical channels in a network. More particularly, this disclosure is directed toward grouping network elements according to certain parameters to configure logical channels in a network." Cooper at ¶ [0002].

In addition, U.S. Patent Application Publication No. 2009/0219856 A1 ("Richardson") teaches "[a] communication system receives attributes associated with access terminals within a cell and groups them in accordance with similarities between the received attributes. Resource assignment messages customized to their respective attributes are transmitted to the groups, thereby ensuring that all groups receive these messages." Richardson at Abstract.

Moreover, U.S. Patent No. 7,751,338 ("Azenko") discloses "[a] process for grouping cable modems by type/modulation profile and/or throughput ability into different logical groups. Each logical group is commanded to transmit on an upstream which has a burst profile set to effectively use the throughput ability of the cable modem." Azenko at Abstract.

U.S. Patent Application Publication No. U.S. 2004/0085987 A1 ("Gross"), moreover, discloses communication devices that "may be actuated in groups of two or more, and parameter sets determined accordingly; or various combinations of single and group actuations may be performed and the corresponding parameter sets determined." Gross at ¶ [0098].

Accordingly, because the identified references are directed to similar devices and techniques in similar fields of endeavor, a person of ordinary skill in the art would have been motivated to combine the teachings of two or more references with a reasonable expectation of success.

a) "determining, by a cable modem termination system (CMTS), for each cable modem served by said CMTS, a corresponding signal-to-noise ratio (SNR) related metric" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "determining, by a cable modem termination system (CMTS), for each cable modem served by said CMTS, a corresponding signal-to-noise ratio (SNR) related metric," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Prodan teaches "[i]n an embodiment, the signal strength versus frequency profiles of the CMs are measured at the headend. Alternatively, the profiles may be measured at a cable modern termination system (CMTS) that sits between the CMs and the headend, and then provided to the headend. Different measures may be associated with the received signal strength, including, for example, the SNR, the bit error rate (BER), etc." Prodan at ¶ [0032].

Furthermore, Cooper, discloses, for example, "a microprocessor configured to determine network parameters associated with a selected network element based on communications with the selected network element; and a receiver configured to receive signals indicative of the network parameters from a network element, wherein the microprocessor is configured to assign the network element to a logical channel based on the network parameters. The network parameters may include one of: upstream or downstream modulation error ratio (MER), upstream or downstream signal to noise ratio (SNR)." Cooper at ¶ [0008].

In addition, Azenko discloses, for example, "[d]uring initial training or ranging of each modem, the CMTS calculates SNR and/or monitors the received power. If after the maximum number of attempts to correct inadequate received power or inadequate SNR, acceptable received power or SNR is not achieved, the CMTS moves the CMs with problems to a lower throughput, more robust upstream channel so that effective communications for registration purposes can be achieved with each CM." Azenko at 3:34-42.

In a similar field of endeavor, Richardson discloses, for example, "[a]t AP 110 x, the transmitted and modulated signals from the ATs are received by antenna 218, processed by a receiver unit 232, and demodulated and decoded by an RX data processor 234. The decoded signals can be provided to a data sink 236. Receiver unit 232 may estimate the received signal quality (e.g., the received signal-to-noise ratio (SNR)) for each terminal and provide this information to controller 220." Richardson at ¶ [0043].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

b) "assigning, by said CMTS, each cable modem among a plurality of service groups based on a respective corresponding SNR-related metric" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "assigning, by said CMTS, each cable modem among a plurality of service groups based on a respective corresponding SNR-related metric," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Prodan, for example, discloses "CMs are grouped based on their signal strength versus frequency profiles into multiple categories. The category that a CM belongs to governs frequency band allocation to the CM." Prodan at ¶ [0034]. *See also id.* at ¶ [0044] ("In addition, the measured signal strength versus frequency profiles may be used to group CMs into multiple categories, which are then used as the basis for the assignment of upstream transmission frequency bands, or when a preferred frequency band is unavailable, for assignment of lower capacity modulation schemes to CMs."); *id.* at ¶ [0044] ("embodiments extend to any algorithm that makes uses of measured/estimated/anticipated signal strength versus frequency profiles to optimize one or more performance parameters (e.g., power utilization, SNR levels, transmit powers, throughput, network load, etc.) according to a set of constraints (e.g., limited upstream frequency spectrum, available upstream frequency bands, maximum CM transmit power, minimum required SNR, minimum required throughput per CM/flow, flow priority, etc.). As described above, in practice, embodiments may be implemented by grouping CMs into different categories, thus making the optimization more tractable.").

Cooper, furthermore, teaches, for example, "Performance parameters 1020 could include: . . . upstream or downstream signal to noise ratio (SNR) . . . A threshold (appropriate to the network element parameter selected) is preferably specified for each logical channel to allow the

application to isolate (or group) the various network elements into logical channels based upon the threshold." Cooper at ¶ [0037].

In addition, Azenko discloses, for example, "grouping is first done on type with monitoring of SNR and/or received power during initial training and subgrouping of CMs with power shortfall or bad SNR to lower power." Azenko at 2:11-14. *See also id.* at 5:15-19 ("Subgroupings can be based upon: the received signal-to-noise ratio; the packet loss rate; the bit error rate; the byte error rate; the received signal power; the RS codeword error rate or the cable node to which a cable modem is coupled.").

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

c) "generating, by said CMTS for each one of said plurality of service groups, a composite SNR-related metric based at least in part on a worst-case SNR profile of said SNR-related metrics corresponding to said one of said plurality of service groups" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "generating, by said CMTS for each one of said plurality of service groups, a composite SNR-related metric based at least in part on a worst-case SNR profile of said SNR-related metrics corresponding to said one of said plurality of service groups," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Cooper, for example, teaches, at ¶ [0033], "[a] channel configuration window" that an operator can use to "quickly decipher what proportion of the modems (e.g., 75%) possess a network element parameter greater than THRESHOLD1 and less than THRESHOLD2. This

understanding is useful in allowing the operator to identify which parameters should be utilized as a basis for grouping network elements into various logical channels and as a basis to select necessary thresholds."

Prodan, furthermore, discloses, for example, "embodiments address the problem of allocation of frequency bands to CMs in a cable network as an optimization problem having known fixed constraints (e.g., maximum cable modem transmit power, minimum required signal strength at headend, etc.) and an objective function (e.g., overall power utilization in the network, variance in signal strength among CMs at the headend, etc.) to minimize/maximize." Prodan at ¶ [0029].

As a further example, Richardson teaches, in the area of cellular communications, "power requirements vary as a function of AT location within a cell as well as SNR, and other factors. Moreover, size of bit masks impacts resource utilization as well. Conventional systems typically assign bit masks as a function of worst case scenarios in order to mitigate loss of assignment information to ATs." Richardson at ¶ [0049].

Additional examples of this limitation are disclosed by Gross and Azenko. *See, e.g.*, Gross at ¶ [0100] ("FIG. 5C shows a number of sets 45 a-49 d of bit allocations for the subchannels 49 e and which may represent a corresponding number of different communication devices or conditions associated with communications over these subchannels. A single composite parameter set 49 f may be formed as a function of the parameter sets 49 a-49 d by, for example, selecting, for each subchannel, the minimum bit allocation among the sets 49 a-49 d for each of the subchannels 49 e. Such a set represents a 'worst case' condition for activation of any of the devices associated with the sets 49 a-49 d."). *See also* Azenko at 14:13-25; 15:56-63.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the

claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

d) "selecting, by said CMTS, one or more physical layer communication parameter to be used for communicating with said one of said plurality of service groups based on said composite SNR-related metric" and "communicating, by said CMTS, with one or more cable modems corresponding to said one of said plurality of service groups using said selected one or more physical layer communication parameter" (Claim 1)

To the extent that it is determined that any of the above references do not disclose "selecting, by said CMTS, one or more physical layer communication parameter to be used for communicating with said one of said plurality of service groups based on said composite SNR-related metric" and/or "communicating, by said CMTS, with one or more cable modems corresponding to said one of said plurality of service groups using said selected one or more physical layer communication parameter," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

For example, Prodan discloses "[f]requency spectrum and modulation scheme assignment according to embodiments may be performed dynamically . . . In addition, the frequency allocation scheme and the modulation scheme assignment can be made per CM or per flow. When per flow assignment is used, different flows from the same CM may be transmitted using different frequencies bands and modulation schemes." Prodan at ¶ [0046]. *See also id.* at ¶ [0047] ("Specifically, embodiments extend to any algorithm that makes uses of measured/estimated/anticipated signal strength versus frequency profiles to optimize one or more performance parameters (e.g., power utilization, SNR levels, transmit powers, throughput, network load, etc.) according to a set of constraints (e.g., limited upstream frequency spectrum,

available upstream frequency bands, maximum CM transmit power, minimum required SNR, minimum required throughput per CM/flow, flow priority, etc.").

Cooper, moreover, discloses, for example, at ¶ [0039], "[s]ystem performance may include many things including: maximum through-put, maximum number of network elements supported, quality of service (QOS) performance, ease of manageability from the service provider perspective, and others. As such, the system may automatically determine the optimum value for the threshold settings or it may allow an operator to analyze his network and manually select the desired threshold settings." *See also* Azenko at 12:34-40 ("This method divides up the CMs into at least two groups. One group transmits on one logical channel with a high throughput and which contains only CMs which do not have a high attenuation path or at least which have adequate power and/or adequate SNR to meet the received power and/or SNR specification at the CMTS.")

Furthermore, Gross discloses, for example, in the area of voice communications, "measurements of the SNR levels across a number of the subchannels during a given communications condition or state provides a 'fingerprint' which may reliably be used to quickly select a parameter set, such as the set of bit allocations or the set of gains, for use in subsequent communications during that state." Gross at ¶ [0043]. In the area of cellular communications, Richardson discloses, for example, "controller 220 may provide power control (PC) commands that are used to adjust transmit power of active ATs, and scheduler 230 may provide assignments of carriers for the ATs. These various types of data may be sent on different transport channels." Richardson ¶ [0039].

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the

claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

e) "wherein said one or more physical layer communication parameter includes one or more of: transmit power, receive sensitivity, timeslot duration, modulation type, modulation order, forward error correction (FEC) type, and FEC code rate" (Claim 2)

To the extent that it is determined that any of the above references do not disclose "wherein said one or more physical layer communication parameter includes one or more of: transmit power, receive sensitivity, timeslot duration, modulation type, modulation order, forward error correction (FEC) type, and FEC code rate," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

As one example, Prodan discloses "a multiplicity of modulation schemes may be determined for each CM, e.g., based on the favored and second-favored, etc., frequency bands for each CM, and then the modulation scheme may be assigned dynamically depending on the existing needs and priorities (QoS) of an individual CM in view of the needs and priorities of the collection of CMs in the network." Prodan at ¶ [0045].

Similarly, Cooper discloses, for example, a "Modulation Profile display panel" that "provides the ability for the operator to configure various profile configuration templates which may later be assigned to an individual logical channel." Cooper at ¶ [0036]. Using the Modulation Profile display panel, an "operator may view, create and edit modulation profiles [] which optimize the specific needs of a subset of the network elements." *Id.* *See also* Azenko at 12:43-47 ("modems are grouped to transmit on a different logical channel with a more robust burst profile (more overhead for FEC) and lower throughput. The burst profile for this logical channel will be such as to be able to handle the lower received power and/or the lower SNR.")

In the area of cellular communications, Richardson discloses, for example, "messages are transmitted to various groups based on their SNR conditions. Each group corresponds to one interlace of traffic resource . . . groups closer to the AP can have higher SNR values and thereby their bit masks may be transmitted with lower power whereas groups having lower SNR values will require bit masks to be transmitted with higher power." Richardson at ¶ [0077]. *See also* Gross at ¶ [0034] ("changes in power level (and corresponding changes in bit allocation and other communication parameters) for communications in either the upstream or the downstream direction, or both, may be made, and sets of control parameters may be defined on these power levels as well for use in controlling communications.").

Furthermore, selecting transmit power, receive sensitivity, timeslot duration, modulation type, modulation order, forward error correction (FEC) type, and/or FEC code rate would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

f) "wherein said CMTS uses orthogonal frequency division multiplexing (OFDM) over a plurality of subcarriers for said communicating." (Claim 1)

To the extent that it is determined that any of the above references do not disclose "wherein said CMTS uses orthogonal frequency division multiplexing (OFDM) over a plurality of subcarriers for said communicating," as claimed, it would have been obvious to modify the teachings of that reference to include this feature at least in view of the following exemplary teachings.

Richardson, for example, discloses, in the area of wireless communications, "[e]xamples of . . . multiple-access systems include . . . orthogonal frequency division multiple access (OFDMA)." Richardson at ¶ [0001] (Background of the Invention). *See also id.* at ¶ [0038] ("system controller 130 couples to APs 110 and provides coordination and control for these base stations. System controller 130 may be a single network entity or a collection of network entities. For a distributed architecture, the APs may communicate with one another as needed. In some aspects, the system may support multiple protocols such as . . . OFDMA"). *See also* Seok at ¶ [0008] ("54 Mbps in maximum can be supported by applying the orthogonal frequency division multiplex (OFDM) technology."); Olkkonen at ¶ [0013] ("[t]he IEEE 802.11 (a) Standard is designed for either the 2.4 GHz ISM band or the 5 GHz U-NII band, and uses orthogonal frequency division multiplexing (OFDM) to deliver up to 54 Mbps data rates").

Furthermore, using orthogonal frequency division multiplexing (OFDM) over a plurality of subcarriers would have been obvious to try, as it involves a choice from a finite number of identifiable, predictable solutions, with a reasonable expectation of success.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine one or more of the above references with any reference that allegedly lacks disclosure of the claimed feature. Further, a person of ordinary skill in the art would have been motivated to do so with a reasonable expectation of success.

B. Invalidity of the '682 Patent Based on 35 U.S.C. § 112, ¶ 1 (Enablement and Written Description)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '682 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '682 Patent are invalid for failure to provide a written description that enables the full scope of the asserted claims and demonstrates

that the inventor had possession of the claimed invention based on at least the following claim terms, phrases, or limitations:

- "generating, by said CMTS for each one of said plurality of service groups, a composite SNR-related metric based at least in part on a worst-case SNR profile of said SNR-related metrics corresponding to said one of said plurality of service groups" (claim 1)
    - The specification and drawings of the '682 Patent do not define or describe how the CMTS generates a composite SNR-related metric based at least in part on a worst-case SNR profile in such full, clear, and concise terms sufficient to demonstrate that the inventor was in possession of the claimed invention. Further, the lack of sufficient written description for this term fails to enable a person of ordinary skill in the art to practice the claimed subject matter without undue experimentation.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions and apparent interpretation of the scope of the asserted claims, at least one or more of these claim terms, phrases, and limitations are not described in the specification of the Asserted Patents and do not enable a person of ordinary skill in the art to practice the claimed invention without undue experimentation.

C. Invalidity of the '682 Patent Based on 35 U.S.C. § 112, ¶ 2 (Indefiniteness)

Based on Defendants' present understanding of Plaintiff's asserted scope of the claims of the '682 Patent, to the extent such positions can be understood from Plaintiff's Infringement Contentions, Defendants assert that the asserted claims of the '682 Patent are invalid for reciting at least the following claim terms, phrases, or limitations:

- "assigning, by said CMTS, each cable modem among a plurality of service groups based on a respective corresponding SNR-related metric;" (claim 1)
    - The term "a respective corresponding SNR-related metric" is indefinite in view of the earlier recitation of "a corresponding signal-to-noise-ration (SNR) related metric."

These claim terms, phrases, and limitations, as apparently construed by Plaintiff, violate the definiteness requirements of 35 U.S.C. § 112.

Based on Defendants' present understanding of Plaintiff's Infringement Contentions, at least one or more of these claim terms, phrases, and limitations are indefinite because they are inconsistent with and broader than the alleged invention disclosed in the specification and during prosecution, and given Plaintiff's apparent constructions of the claims, any person of ordinary skill in the art at the time of the invention would not understand what is claimed with reasonable certainty, even when the claims are read in light of the specification and prosecution history.

IX. OTHER RELEVANT REFERENCES

Defendants reserve the right to rely on the prior art references identified in connection with one of the Asserted Patents in connection with any other of the Asserted Patents. In addition, Defendants hereby cite the following additional references as being relevant to the subject matter claimed in the Asserted Patents. Defendants reserve the right to rely on one or more of the following references as anticipatory references under 35 U.S.C. § 102, as further evidence of obviousness under 35 U.S.C. § 103, as background references demonstrating the state of the art at the time of the alleged in invention of the Asserted Patents, as a limitation upon the doctrine of equivalents, or for any other purpose. Based on further investigation and discovery, based on positions that Plaintiff may take regarding the scope of the asserted claims, and/or based on the Court's claim construction, Defendants reserve the right to revise these contentions and to rely on these references to prove the invalidity of the Asserted Patents in a manner consistent with this Court's Rules and with the Federal Rules of Civil Procedure.

a) Prior Art Patents and Publications

Number	Published/Issued Date	Short Name
U.S. Patent App. Pub. No. 2009/0252112 A1	October 8, 2009	Shimomura

U.S. Patent App. Pub. No. 2005/088980 A1	April 28, 2005	Mikko
U.S. Patent App. Pub. No. 2006/0248429 A1	November 2, 2006	Grandhi
U.S. Patent App. Pub. No. 2007/0002884 A1	January 4, 2007	Jaakkola
U.S. Patent App. Pub. No. 2006/0159041 A1	July 20, 2006	Zhun
U.S. Patent No. 9,655,031	May 16, 2017	Sashihara
U.S. Patent App. Pub. No. 2006/0268749 A1	November 30, 2006	Rahman
U.S. Patent App. Pub. No. 2006/0111103 A1	May 25, 2006	Jeong
U.S. Patent App. Pub. No. 2009/0011768 A1	January 8, 2009	Seok '768
U.S. Patent App. Pub. No. 2010/0257265 A1	October 7, 2010	Hamada
U.S. Patent No. 7,013,342	March 14, 2006	Riddle
CN 101,489,222 A	July 22, 2009	Xu
U.S. Patent App. Pub. No. 2008/0014870 A1	January 17, 2008	Kim '870
KR 100,814,402 B1	March 18, 2008	Hur
U.S. Patent No. 8,582,675	November 12, 2013	Harris
U.S. Patent App. Pub. No. 2013/0091528 A1	April 11, 2013	Honda
U.S. Patent No. 7,116,958	October 3, 2006	Brown
CN 101,404,782 A	April 8, 2009	Yeh
U.S. Patent No. 5,535,240	July 9, 1996	Carney
U.S. Patent No. 5,719,867	February 17, 1999	Borazjani
U.S. Patent App. Pub. No. 2009/0174822 A1	July 9, 2009	Pugel '822
U.S. Patent No. 2004/0218700 A1	November 4, 2004	Zhang '700
U.S. Patent No. 6,760,342	July 6, 2004	Skones
U.S. Patent App. Pub. No. 2009/0141833 A1	June 4, 2009	Kim '833

U.S. Patent No. 7,145,972	December 5, 2006	Kumar
U.S. Patent No. 6,980,913	December 27, 2005	Meir
U.S. Patent No. 7,684,467	March 23, 2010	Li '467
U.S. Patent App. Pub. No. 2010/0226330 A1	September 9, 2010	Haque
U.S. Patent App. Pub. No. 2008/0225174 A1	September 18, 2008	Greggain
U.S. Patent App. Pub. No. 2005/0243910 A1	November 3, 2005	Lee
U.S. Patent App. Pub. No. 2009/0235316 A1	September 17, 2009	Wu
U.S. Patent No. 2010/0239052 A1	September 23, 2010	Ballester
JP 2009/177834 A	August 6, 2009	Blair
JP 2007/502090 A	February 1, 2007	Di
JP 2006/504986 A	February 9, 2006	Petrovic
JP 2002/512750 A	April 23, 2002	Marsh
U.S. Patent App. Pub. No. 2005/0183130	August 18, 2005	Sadja '130
U.S. Patent No. 6,356,539	March 12, 2002	Zuliani
U.S. Patent App. Pub. No. 2008/0066113 A1	March 13, 2008	Skelly '113
U.S. Patent No. 7,010,265	March 7, 2006	Coffin
U.S. Patent No. 6,496,546	December 17, 2002	Allpress
U.S. Patent No. 8,514,982	August 20, 2013	Dubash
EP 0774181 B1	May 21, 1997	Carney
U.S. Patent App. Pub. No. 2007/0091212	April 26, 2007	Lee '212
U.S. Patent No. 7,463,874	December 9, 2008	Kang
U.S. Patent No. 8,599,312	December 3, 2013	Hendrickson
U.S. Patent No. 8,605,224	December 10, 2013	Trager
U.S. Patent App. Pub. No. 2008/0106652	May 8, 2008	Magnusen

JP 2008/263338 A	October 30, 2008	Nakano
U.S. Patent No. 6,118,499	September 12, 2000	Fang
EP 0883934 B1	August 28, 2002	Dent
U.S. Patent App. Pub. No. 2010/0074167 A1	March 25, 2010	Dale
U.S. Patent App. Pub. No. 2011/0103274 A1	May 5, 2011	Vavik
U.S. Patent App. Pub. No. 2013/0272353 A1	October 17, 2013	Fox
U.S. Patent App. Pub. No. 2013/0294489 A1	November 7, 2013	Thibeault
U.S. Patent App. Pub. No. 2008/0101210 A1	May 1, 2008	Thompson
U.S. Patent No. 7,548,548	June 16, 2009	Rakib
U.S. Patent No. 6,757,253	June 29, 2004	Cooper '253
U.S. Patent App. Pub. No. 2008/0022162 A1	January 24, 2008	Qiu
U.S. Patent App. Pub. No. 2013/0107921 A1	May 2, 2013	Prodan '921
U.S. Patent App. Pub. No. 2010/0100919 A1	April 22, 2010	Hsue
U.S. Patent App. Pub. No. 2008/0140823 A1	June 12, 2008	Thompson '823
U.S. Patent No. 7,991,888	August 2, 2011	Beser
U.S. Patent App. Pub. No. 2002/0062486 A1	May 23, 2002	Park
U.S. Patent No. 8,041,351	June 26, 2008	Quigley
U.S. Patent No. 2004/0015997	January 22, 2004	Ansari
U.S. Patent App. Pub. No. 2011/0072422 A1	March 24, 2011	Brauer
JPH 03251796 A	November 11, 1991	Shigehiro
KR 2001/0001312 A	January 5, 2001	Hun-gi
U.S. Patent App. Pub. No. 2003/0161333	August 28, 2008	Schain
U.S. Patent No. 6,332,210	December 18, 2001	Barkataki

U.S. Patent App. Pub. No. 2004/0230997	November 18, 2004	Kaylani
U.S. Patent App. Pub. No. 2003/0163722	August 28, 2003	Anderson
KR 1999/0047147 A	July 5, 1999	Lim
U.S. Patent No. 6,453,472	September 17, 2002	Leano
WO 2001/017175 A1	March 8, 2001	Quigley '175
U.S. Patent No. 7,583,704	September 1, 2009	Walker
U.S. Patent App. Pub. No. 2002/0021465	February 21, 2002	Moore
U.S. Patent App. Pub. No. 2003/0106067	June 5, 2003	Hoskins
U.S. Patent No. 7,423,982	September 9, 2008	Briggs
U.S. Patent No. 2002/0049861	April 25, 2002	Bunn
KR 2001/0075753 A	August 11, 2001	Yoon
U.S. Patent No. 4,450,534	May 22, 1984	Solimeno
U.S. Patent No. 7,227,933	June 5, 2007	Davis
U.S. Patent App. Pub. No. 2004/0181811	September 16, 2004	Rakib
U.S. Patent No. 8,126,044	February 28, 2012	Cavanagh
U.S. Patent No. 8,649,421	February 11, 2014	Renken
U.S. Patent No. 7,978,735	July 12, 2011	Ezra
U.S. Patent App. Pub. No. 2008/0120667	May 22, 2008	Zaltsman
U.S. Patent No. 5,008,903	April 16, 1991	Betts
U.S. Patent No. 7,227,889	June 5, 2007	Roeck
U.S. Patent No. 6,782,884	August 31, 2004	Chen
U.S. Patent App. Pub. No. 2003/0145075	July 31, 2003	Weaver
U.S. Patent App. Pub. No. 2010/0180315	July 15, 2010	Nakamichi

U.S. Patent App. Pub. No. 2005/0122996	June 9, 2005	Azenkot
U.S. Patent No. 7,246,368	July 17, 2007	Millet
U.S. Patent No. 6,031,878	February 29, 2000	Tomasz
U.S. Patent No. 7,489,641	February 10, 2009	Miller
U.S. Patent No. 7,788,684	August 31, 2010	Petrovic '684
U.S. Patent No. 8,352,995	January 8, 2013	Sadja '995
U.S. Patent App. Pub. No. 2004/0093370	May 13, 2004	Blair '370
WIPO Pub. No. WO 97/32403	September 4, 1997	Dent

b) Non-patent Prior Art Publications

Author or Publisher	Title	Publication/Use Date
IEEE Computer Society	IEEE Standard for Information technology---- Telecommunications and information exchange between systems---- Local and metropolitan area networks---- Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications	June 12, 2007
Matthew Gast	802.11 Wireless Networks: The Definitive Guide	April 2002
CWNP (Certified Wireless Network Professionals)	Link Adaptation	September 18, 2007

Anand Prasad, Neeli Prasad	802.11 WLANs and IP Networking: Security, QoS, and Mobility	2005
ECMA International	Standard ECMA-368: High Rate Ultra Wideband PHY and MAC Standard	December 2005
Mike Kershaw, Joshua Wright	802.11b Firmware-Level Attacks	September 29, 2006
Cisco Press	Cisco Network Security Fundamentals: Wireless Security	December 30, 2004
S. M. Jahangir Alam, M. Rabiul Alam, Guoqing Hu, and Md. Zakirul Mehrab	Bit Error Rate Optimization in Fiber Optic Communications	December 2011
Fred Harris, Robert McGwier, Benjamin Egg	A coupled multichannel filter bank and sniffer spectrum analyzer	September 16, 2010
A D Sayers	Techniques for Digital Implementation of Multi-mode Radio Receivers	2005
Mohammad Hajirostam	ON-CHIP BROADBAND TUNER DESIGN FOR CABLE MODEM AND DIGITAL CATV	2007
Embedded Staff	Dealing with the mobile TV design challenge	July 28, 2008
Christopher Bowick	Radio Architectures, Pt 5: ADCs and Receivers	March 24, 2008
Peter E. Buxa	Parameterizable Channelized Wideband Digital Receiver for High Update Rate	2007
Roghoyeh Salmeh	LNA and Mixer Designs for RF Front-Ends	June 2007
Walt Kester	Which ADC Architecture Is Right for Your Application?	June 2005
Maxim Integrated	Application Note 290: ADCs For Simultaneous Sampling	October 1, 2000
Stefan Andersson	Multiband LNA Design and RF-Sampling Front-Ends for Flexible Wireless Receivers	2006
Bill Schweber	TV tuner IC captures analog, digital standards, features LNA and tracking	July 29, 2009

	filters for superior performance	
Anders Jonasson, Nedim Ramiz	Construction of a digital-TV receiver for the second-generation satellite broadcasting, DVB-S2	July 20, 2007
Douglas Mauro, Kevin Schmidt	Essential SNMP	July 2001
Walter Ciciora, James Farmer, David Large, Michael Adams	Modern Cable Television Technology - Video, Voice, and Data Communications, 2nd Edition	2003
Walter Ciciora, James Farmer, David Large	Modern Cable Television Technology - Video, Voice, and Data Communications, 1st Edition	1998

X. SUBJECT-MATTER ELIGIBILITY OF THE ASSERTED PATENTS

Section 101 "defines the subject matter that may be patented under the Patent Act." *Bilski v. Kappos*, 561 U.S. 593, 601 (2010). Under § 101, the scope of patentable subject matter encompasses "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." *Id.* (quoting 35 U.S.C. § 101). These categories are not limitless, as § 101 contains an important exception—abstract ideas are not patentable. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 573 U.S. 208, 134 S. Ct. 2347, 2354 (2014). The determination of whether a claim recites patent-eligible subject matter under § 101 is guided by the two-step analytical framework set forth in *Alice*, *id.* at 2355. The first step requires determining whether the claims are directed to an abstract idea. *Id.* If so, the second step requires determining whether the claim elements, considered individually and as an ordered combination, "amount to significantly more" than the patent-ineligible concept. *Id.*

The first step in the *Alice/Mayo* framework is to examine the focus of the claim and determine whether the claim as a whole is directed to an abstract idea. *See Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1346 (Fed. Cir. 2015) ("Under step one of *Mayo/Alice*, the

claims are considered in their entirety to ascertain whether their character as a whole is directed to excluded subject matter."). While courts should be careful not to oversimplify the claims at this stage of the analysis, the analysis should not focus on excess verbiage or implementation details, but instead focus on the "concept embodied by the majority of the limitations." *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715 (Fed. Cir. 2014); *see also Affinity Labs of Texas, LLC v. DirecTV, LLC*, 838 F.3d 1253, 1256 (Fed. Cir. 2016) (examining claim after being "stripped of excess verbiage"). Transformation into a patent-eligible claim requires "more than simply stating the abstract idea while adding the words 'apply it.'" *Id.* (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1294 (2012)). Also, a claim is not meaningfully limited if it includes only token or insignificant pre- or post-solution activity—such as merely identifying a technological environment. *Mayo*, 132 S. Ct. at 1297–98, 1300–01. Finally, "simply appending conventional steps, specified at a high level of generality," to abstract ideas cannot make those ideas patentable. *Mayo*, 132 S. Ct. at 1300; *see also Fort Props., Inc. v. Am. Master Lease LLC*, 671 F.3d 1317, 1323 (Fed. Cir. 2012) ("Such a broad and general limitation does not impose meaningful limits on the claim's scope.").

The Federal Circuit has clarified that a relevant inquiry at *Mayo/Alice* step one is to "ask whether the claims are directed to a specific improvement in the capabilities of computing devices, or, instead, 'a process that qualifies as an 'abstract idea' for which computers are invoked merely as a tool.'" *Core Wireless Licensing S.A.R.L. v. LG Elecs., Inc.*, 880 F.3d 1356, 1361-62 (Fed. Cir. 2018) (quoting *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1336 (Fed. Cir. 2016)). In *Core Wireless*, the Federal Circuit noted that in *Enfish*, "unlike claims that merely 'add[ ] conventional computer components to well-known business practices,' the claimed self-referential table was 'a specific type of data structure designed to improve the way a computer stores and

retrieves data in memory.'" *Id.* (quoting *Enfish*, 822 F.3d at 1338–39) (underlining added). The Federal Circuit further emphasized that claims directed to the improvement in the functioning of a computer must teach a specific and new method that enables a computer "to do things it could not do before." *Id.* For example, in *Finjan, Inc. v. Blue Coat Systems, Inc.*, the Federal Circuit "held claims directed to a behavior-based virus scanning method directed to patent eligible subject matter because they 'employ[ ] a new kind of file that enables a computer security system to do things it could not do before.'" *Id.* (citing *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299 (Fed. Cir. 2018)).

As further disclosed in Exhibit G, the asserted claims of the '690 Patent are directed to patent-ineligible subject matter under 35 U.S.C. § 101.

As further disclosed in Exhibit H, the asserted claims of the '682 Patent are directed to patent-ineligible subject matter under 35 U.S.C. § 101.

As further disclosed in Exhibit I, the asserted claims of the '008 Patent are directed to patent-ineligible subject matter under 35 U.S.C. § 101.

As further disclosed in Exhibit J, the asserted claims of the '826 Patent are directed to patent-ineligible subject matter under 35 U.S.C. § 101.

As further disclosed in Exhibit K, the asserted claims of the '362 Patent are directed to patent-ineligible subject matter under 35 U.S.C. § 101.

These Eligibility Contentions address only those claims that Plaintiff has asserted in its Infringement Contentions against Defendants. Defendants incorporate by reference any and all other subject matter eligibility contentions that have or will be served in this case or any other case brought by Plaintiff and/or involving the Asserted Patents. Defendants incorporate by reference any and all other bases for invalidity identified during prosecution, reexamination, or any other

proceeding before the United States Patent and Trademark Office regarding the Asserted Patents, or any other patents in the same family as any Asserted Patent.

Respectfully submitted,

Dated: September 2, 2022

/s/ Albert J. Boardman

Deron R. Dacus
State Bar No. 00790553
The Dacus Firm, P.C.
821 ESE Loop 323, Suite 430
Tyler, TX 75701
Phone: (903) 705-1117
Fax: (903) 581-2543
ddacus@dacusfirm.com

Daniel L. Reisner
David Benyacar
Palak Mayani Parikh
Albert J. Boardman
ARNOLD & PORTER KAY SCHOLER LLP
250 West 55th Street
New York, New York 10019-9710
Telephone: (212) 836-8000
Email: daniel.reisner@arnoldporter.com
Email: david.benyacar@arnoldporter.com
Email: palak.mayani@arnoldporter.com
Email: albert.boardman@arnoldporter.com

Attorneys for Defendants Charter Communications, Inc., Spectrum Advanced Services, LLC and Spectrum Management Holding Company, LLC

CERTIFICATE OF SERVICE

I hereby certify that, on September 2, 2022, a true and correct copy of the foregoing document was served on the below counsel of record for Plaintiff:

James Shimota
Jason Engel
George Summerfield
K&L GATES LLP
70 W. Madison Street, Suite 3300
Chicago, IL 60602
Tel.: (312) 372-1121
jim.shimota@klgates.com
jason.engel@klgates.com
george.summerfield@klgates.com

Nicholas F. Lenning
K&L GATES LLP
925 Fourth Ave., Suite 2900
Seattle, WA 98104
Tel.: (206) 623-7580
nicholas.lenning@klgates.com

Wesley Hill (Texas Bar No. 24032294)
Andrea Fair (Texas Bar No. 24078488)
WARD, SMITH & HILL, PLLC
1507 Bill Owens Pkwy
Longview, TX 75604
Tel: (903) 757-6400
wh@wsfirm.com
andrea@wsfirm.com

/s/ Albert J. Boardman
Albert J. Boardman

ADDITIONAL REFERENCES AND OBVIOUSNESS CHART FOR U.S. PATENT NO. 7,130,576[1]

For the reasons explained in more detail in the cover pleading to Defendants' Invalidity Contentions, to the extent a primary reference does not disclose one or more of the elements of the asserted claims, a person of ordinary skill in the art would be motivated to combine the primary reference with any other primary reference that discloses that limitation or with one or more of the references listed in the charts below or in the cover pleading to Defendants' Invalidity Contentions. For clarity, obviousness grounds for each dependent claim incorporate obviousness grounds for the claim(s) from which it depends in addition to any obviousness grounds identified in the charts for the dependent claim. References to figures, drawings, and the like refer to the cited items as well as any accompanying or related text.

The prior art references charted below are the following:

- U.S. Patent No. 3,051,938 ("Levy")
- U.S. Patent No. 5,724,091 ("Freeman")
- U.S. Patent No. 5,936,660 ("Gurantz")
- U.S. Patent No. 6,430,742 ("Chanteau")
- U.S. Patent No. 6,480,551 ("Ohishi")
- U.S. Patent No. 6,888,888 ("Tu")

[1] Defendants apply the prior art in light of Plaintiff's improper assertions of infringement and improper application of the claims. Defendants do not agree with Plaintiff's application of the claims, or that the claims satisfy 35 U.S.C. § 112. In the invalidity contentions cover pleading, Defendants identified terms in the '576 patent that it contends are governed by 35 U.S.C. § 112(6). While the charts below identify where certain elements are found in the prior art, including the identity of structures, acts or materials in each item of prior art that perform the function for terms governed by 35 U.S.C. § 112(6), Defendants' contentions herein are not, and should in no way be seen as, admissions or adoptions as to any particular claim scope or construction, or as any admission that any particular element is met in any particular way. Defendants object to any attempt to imply claim construction from this chart. Defendants' prior art invalidity contentions are made in a variety of alternatives and do not represent Defendants' agreement or view as to the meaning, definiteness, written description support for, or enablement of any claim contained therein.

- U.S. Patent No. 6,970,717 ("Behrens")
- U.S. Patent No. 7,263,713 ("Oishi")
- U.S. Patent No. 7,359,447 ("Sage")
- U.S. Patent No. 7,376,387 ("Eck")
- U.S. Patent Publication No. 2002/0038450 ("Staal")
- International Published Patent Application No. WO 00/004704 ("Ellis")
- Japanese Published Unexamined Patent Application JP 2001/128138 ("Ishizaki")
- Japanese Published Unexamined Patent Application JP 2002/135745 ("Ogami")

Asserted Claims	Additional References and Disclosure
14[pre] 14. A method of communicating a plurality of transponder signals from a satellite outdoor unit (ODU) that receives a plurality of satellite broadband signals to an integrated receiver decoder (IRD) over a single cable connected to the ODU, the method comprising the steps of:	Defendants take no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, the obviousness reference(s) listed below disclose, explicitly and/or inherently, a method of communicating a plurality of transponder signals from a satellite outdoor unit (ODU) that receives a plurality of satellite broadband signals to an integrated receiver decoder (IRD) over a single cable connected to the ODU. See, e.g.: Oishi at Abstract: In a television signal transmission system, CS broadcasting signals received via a master antenna are converted into intermediate frequency signals in an LNB (Low Noise Block Down Converter). The CS intermediate frequency signals then undergo conversion of the modulation format, for example, from QPSK into 64-QAM, so that CS broadcasting

Asserted Claims	Additional References and Disclosure
	signals from each transponder, having a bandwidth of, for example, 27 MHZ, are accommodated in a narrower bandwidth, for example, 6 MHZ, which is equivalent to one channel of terrestrial broadcasting services. Then, the signals accommodated in the narrower bandwidth is frequency shifted into a vacant frequency band in the VHF band or the UHF band. Accordingly, the CS signals accommodated in the narrower band and frequency-shifted into the vacant band are multiplexed with terrestrial broadcasting signals in the VHF and UHF bands and BS intermediate frequency signals so that all these signals are delivered to each house hold via a single cable. Oishi at 1:9–19: The present invention generally relates to television signal distributor apparatuses, receiver apparatuses, and television signal transmission systems and methods. More specifically, the present invention relates to a television signal distributor apparatus, a receiver apparatus, a television signal transmission system and method, which are particularly suitable for implementing a small-scale television signal distribution network in which television signals received via a master antenna provided on the rooftop at collective housing, such as an apartment building, are delivered to each household via a cable. Oishi at 1:21–31: In collective housing such as an apartment building, there is usually provided a television signal transmission system in which television signals received via a master antenna provided on the rooftop are delivered to each household via a cable. In VHF-band and UHF-band terrestrial broadcasting services, broadcasting stations are allocated with respectively different frequency bands. The television signal transmission system mixes signals received via a VHF antenna and a UHF antenna while adjusting the gain thereof, and then delivers the mixed signals to each household via a single cable. Oishi at 2:12–32:

Asserted Claims	Additional References and Disclosure
	More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 3:22–30: Accordingly, it is an object of the present invention to provide a television signal distribution apparatus, a receiver apparatus, and a television signal transmission system and method, which allows, without implementing large-scale works, terrestrial broadcasting signals in the VHF and UHF bands, the BS intermediate frequency signals,

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	and CS intermediate frequency signals of a CS broadcasting service which employs two or more satellites to be multiplexed for transmission to each household via a single cable. Oishi at 3:31–53: To this end, the present invention provides a television signal transmission system including a television signal distributor apparatus which delivers signals received via a master antenna to each household via a cable; and at least one receiver apparatus provided in each household. The television signal distributor apparatus includes a modulation format converting unit for converting the modulation format of received CS broadcast signals to thereby accommodate the signals in a narrower bandwidth, and for frequency-shifting the signals accommodated in the narrower bandwidth into a vacant frequency band; and a mixing unit for mixing for transmission via the cable the frequency-shifted signals accommodated in said narrower bandwidth with other type or types of received broadcast signals. The at least one receiver apparatus includes a receiving unit for receiving CS broadcast signals which have undergone conversion of modulation format so as to be accommodated in a narrower bandwidth and which have then been frequency-shifted into a vacant frequency band; a demodulating unit for demodulating the received signals in accordance with the modulation format after conversion; and a decoding unit for decoding the output from the demodulating unit to obtain video signals and audio signals. Oishi at 3:54–4:3: In accordance with the present invention, the modulation format of CS intermediate frequency signals is converted, for example, from QPSK to 64-QAM; thus, CS broadcasting signals from each transponder, having a bandwidth of, for example, 27 MHz, are accommodated in a bandwidth of, for example, 6 MHz, which is equivalent to a single channel for terrestrial broadcasting. The CS signals which have undergone conversion of the modulation format are frequency-shifted into a vacant channel in the VHF band or the UHF band. The frequency-shifted CS signals are multiplexed with BS intermediate frequency signals and terrestrial broadcasting signals for transmission to each household via a single cable. Accordingly, signals for a CS broadcasting service, even if provided via

Asserted Claims	Additional References and Disclosure
	two or more satellites, can be transmitted to each household via a single cable together with signals for a BS broadcasting service and terrestrial broadcasting signals. Oishi at 4:45–56: In accordance with the present invention, CS broadcasting signals from each transponder received via a master antenna undergo conversion of the modulation format so that the signals are accommodated in a narrower bandwidth. The signals accommodated in the narrower bandwidth are then frequency-shifted into a vacant channel in the VHF band or the UHF band. This eliminates the need to provide an additional band for the CS broadcasting signals; thus, the CS broadcasting signals, even if serviced by two or more satellites, can be delivered to each household via a single cable together with terrestrial television broadcasting signals and BS broadcasting signals. Chanteau at 1:37–44: Digital data channels which can be used in computers are broadcast by certain satellites. If, in the same house one user wishes to watch a television broadcast coming from a certain satellite, that is to say, carried by a certain cable, whereas another user would like to work on a computer with the data transmitted by another satellite, that is to say, carried by another cable, there is a conflict. The invention notably has for its object to remedy this conflict. Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source.

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	Tu at Abstract: Methods and systems for processing a single sub-channel that includes two or more combined channels. Using intermediate frequency sub-sampling, two or more channels from a broad band signal are combined into a single sub-channel for further analog and digital processing. Each of the two or more channels is down converted to an intermediate frequency, filtered to remove certain undesired channels, and combined such that the two or more channels are adjacent to each other. A digital representation of the sub-channel is produced from the combined intermediate frequency channels. Each channel within the digital representation is down converted to baseband, and the in-phase and quadrature components are separated from each other. Compared to one direct down conversion technique, intermediate frequency sub-sampling as described in the application may reduce the number of analog to digital converters and control amplifiers used in analog processing by a factor of four. Tu at 4:15-24: The present invention combines two or more channels into a sub-channel such that certain signal processing may be performed on the combined sub-channel rather than on the two or more channels separately. An input signal includes a plurality of available channels that may contain any type of data, such as video, audio, electronic program guides, control signals, electronic publications, software, scripts, Internet content, etc. In a satellite environment, the input signal may have channels for any of one or more received transponder signals. Tu at 7:13-31: RF switch 412 receives an input signal, such as the one shown in FIG. 5A, that contains a plurality of channels or transponders, labeled T1-Tn. As used in this application, the term "channel" should be interpreted broadly to encompass any particular bandwidth of interest, independent of whether or not data within the bandwidth is related. For example, channel accurately describes the bandwidth used to broadcast a single television program.

Asserted Claims	Additional References and Disclosure
	Likewise, channel accurately describes a bandwidth that includes the broadcast signal from two or more television programs that have been combined in accordance with the present invention. Further, a channel may contain any type of data or content. At times, a combined channel may be referred to as a channel pair to emphasize that the bandwidth includes two or more separate and unrelated data streams. Therefore, regardless of the number of independent, separate, and/or unrelated data streams within any arbitrary bandwidth, the term channel may be used to reference the bandwidth. Tu at 7:32-48: The input signal may be received from any of several sources, including a satellite system that receives broadcast signals from one or more satellites. One exemplary system receives signals from three separate satellites, with the signal from each satellite containing 32 channels or transponders. Like the term channel, "transponder" should be interpreted broadly to encompass any particular bandwidth of interest. In some circumstances, transponder may refer to the entire bandwidth transmitted by a satellite, whereas in other circumstances, transponder is a reference to a particular data stream within a larger overall bandwidth. Based at least in part on viewer input, the satellite system selects a plurality of the 96 channels to be included in the input signal received by RF switch 412. Although not shown, the analog ASIC may include multiple RF inputs. The frequency of the received input signal ranges from about 900 MHz to about 2200 MHz. Ishizaki at [0028]: According to a first aspect of the present invention, there is provided a CATV for distributing video information to a subscriber terminal connected via a CATV network and performing bidirectional communication between the CATV center and the subscriber terminal. In the system, the CATV center multiplexes the video information and the downlink data information of the two-way communication and distributes the multiplexed video information to the subscriber terminal on the same physical channel, and the subscriber terminal transmits the video information from a single received physical channel. And downlink data information of the two-way communication.

Asserted Claims	Additional References and Disclosure
	Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Ogami at [0004]: Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314 converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a. Freeman at 1:16–21:

Asserted Claims	Additional References and Disclosure
	The present invention relates generally to interactive response systems, and more particularly to an interactive television system which provides interactive programming using compressed, digital data having more than one video signal on a broadcast channel, or a multiplexed signal within a digital format, or both. Freeman at 2:9–19: The present invention is an interactive cable television system which utilizes digital video signals to provide customized viewing responsive to user selections. A standard cable or direct broadcast satellite television distribution network is utilized for transmitting the interactive and other programming to users. The present invention allows a plurality of viewers to be simultaneously provided with a plurality of different program information message signals related in time and content to each other. The interactive program comprises a plurality of video signals related in time and content to one another. Freeman at 2:20–50: The video signals are converted into digital format for transmission. In a digital format, it is possible to transmit more than one video signal per cable television channel. Further, it is possible to transmit video signals via conventional telephone lines. If desired, the various digital video signals may be compressed before transmission. Compression allows an even larger number of video signals to be transmitted over a channel of the transmission media. A multiplexer combines the various digital signals into a reduced number of transmission data streams for transmission. The various NTSC television channels may be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. The multiplexer in conjunction with the television transmission system multiplexes the desired data streams onto the desired channels, and transmits these signals over the NTSC channels. The number of video signals which may be multiplexed onto a data stream on a single transmission channel will vary depending on the video signals to be transmitted. The television channels containing a data stream of multiplexed video signals may be transmitted over a standard cable television distribution network, or direct broadcast satellite transmission system. A receiver receives one or more television

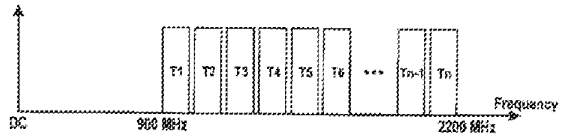
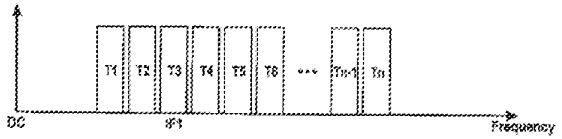
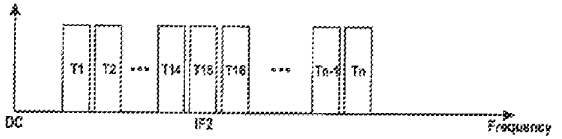
Asserted Claims	Additional References and Disclosure
	channels, some or all containing a multiplexed data stream of video signals or non-multiplexed digital video signals, and in conjunction with a signal selector, selects a particular data channel/data stream for playback, then selects a particular video signal from the data stream's multiplexed signal, and finally expands the video signal, if necessary, for playback to a television monitor.
14[a] communicating a transponder request signal to the ODU from the IRD;	The obviousness reference(s) listed below disclose, explicitly and/or inherently, communicating a transponder request signal to the ODU from the IRD. See, e.g.: Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Freeman at 2:51–59: A multiple choice controller operates to control the receiver and signal selector to select a particular video signal for playback. If more than one channel is received, the multiple

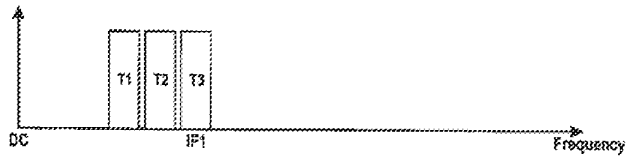
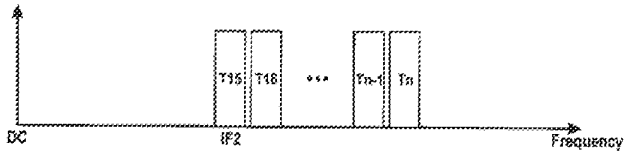
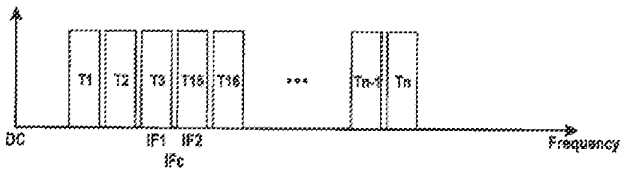
Asserted Claims	Additional References and Disclosure
	choice controller may be programmed to map the different channels, and the multiple signals thereon, to a serial numerical channel representation to simplify use by the user. The signal selector includes the necessary expansion apparatus corresponding with the compression scheme in use. Freeman at 2:60–67: In practice, a user selects a desired interactive program to be viewed. Using the multiple choice controller, the user selectably responds to information displays or interrogatory messages and the signal selector selects a particular multiplexed video signal and de-multiplexes, expands and displays the selected video signal. Alternatively, the signal selector may select a video signal based on personal profile information stored in memory.
14[b] in the ODU, digitizing the plurality of satellite broadband signals, selecting and extracting a plurality of transponder signals from the received satellite broadband signals, wherein the selecting is responsive to the transponder request signals;	The obviousness reference(s) listed below disclose, explicitly and/or inherently, in the ODU, digitizing the plurality of satellite broadband signals, selecting and extracting a plurality of transponder signals from the received satellite broadband signals, wherein the selecting is responsive to the transponder request signals. See, e.g.: Oishi at 1:9–19: The present invention generally relates to television signal distributor apparatuses, receiver apparatuses, and television signal transmission systems and methods. More specifically, the present invention relates to a television signal distributor apparatus, a receiver apparatus, a television signal transmission system and method, which are particularly suitable for implementing a small-scale television signal distribution network in which television signals received via a master antenna provided on the rooftop at collective housing, such as an apartment building, are delivered to each household via a cable. Chanteau at 1:46–54:

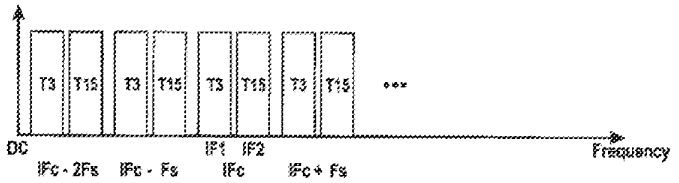
Asserted Claims	Additional References and Disclosure
	For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:54–3:6: The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may, for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also

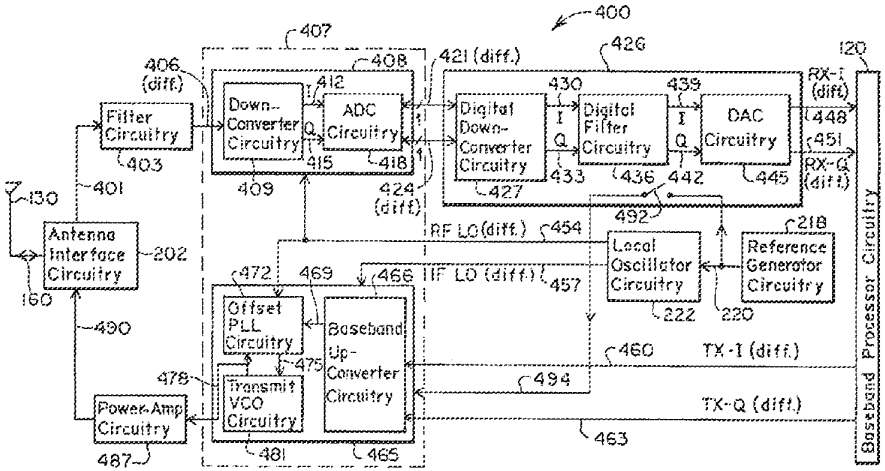
Asserted Claims	Additional References and Disclosure
	arranged on the cables 1-4, but in the latter case one would need four times as many of them. Tu at 4:52-5:4: Now, further processing may be performed on the sub-channel, rather than on the first and second channels separately. For example, the sub-channel may be amplified and converted to a digital representation. In contrast, other techniques may divide a single channel into two components. Using these other techniques, two channels become four, whereas using the present invention, the two channels become one. By comparison, these other techniques require as many as four amplifiers and four analog to digital converters for every amplifier and analog to digital converter used when practicing the present invention. Using fewer analog components improves heat dissipation, reliability, and use of space, while reducing cost and power consumption. As a result, the present invention greatly facilitates a single integrated circuit implementation for the analog processing needed in simultaneously tuning multiple channels contained within a received input signal. Thus, the present invention also facilitates the development of a single receiver capable of simultaneously tuning multiple channels, thereby meeting consumer demands, at an appropriate cost. Tu at 6:46-64: In intermediate frequency sub-sampling, analog to digital ("A/D") conversion is performed on an analog carrier signal at an intermediate frequency rather than at baseband. The A/D sampling produces a replica of the intermediate frequency modulated carrier signal with images positioned at (IFc+/−N*Fs), where IFc is the center frequency of the desired signal spectrum, N=1, 2, 3, . . . , and Fs is the sampling frequency of the A/D. Preferably, and in accordance with the present invention where two arbitrary channels are down converted to intermediate frequencies IF1 and IF2, and combined such that the intermediate frequency channels are adjacent to each other, IFc=(IF1+IF2)/2. More generally, IFc is considerably higher than either Fs or the maximum frequency component of the desired signal. In order to satisfy the Nyquist criteria, Fs should be at least twice the maximum frequency of the

Asserted Claims	Additional References and Disclosure
	desired signal to prevent spectral aliasing. The desired signal image closest to DC is digitally mixed down to baseband for digital demodulation and decoding. Tu at 11:20-55: A/D converters 442 convert the input IF analog signal to 8 bits of digital output data with a two's complement binary data format. The output digital signal spectrum contains the original analog input spectrum and sets of images residing at IFc+/−N*Fs, as shown in FIG. 5H. As above, IFc is the center frequency of the channel pair T3 and T15, or (IF1+IF2)/2. A/D converters 442 operate with the following performance over the input bandwidth from DC to 500 MHz. The output signal to noise ratio ("SNR") without harmonics and spurious-free dynamic range ("SFDR") distortions is better than 45 dB. Output SNR with harmonics and SFDR distortions is better than 42 dB. The input sampling clock rate does not exceed 135 MSPS. A/D converters 442 are examples of digital conversion means for producing a digital representation of the resulting multiple channel intermediate frequency signal. A/D converters 442 are shown as dashed because optionally they may be part of the digital demodulator and decoder ASIC shown in FIGS. 4B-4D. Therefore, FIG. 4A shows an analog version of a first sub-channel (channel T3 tuned by frequency synthesizer 1 and channel T15 tuned by frequency synthesizer 2) labeled AS1-1-2, and a digital version of a first channel, labeled DS1-1-2, etc. The transponder channels shown in FIGS. 5A-5H may be tuned by any of the signal paths. Furthermore, if A/D converters 442 are part of the analog ASIC illustrated in FIG. 4A, FIG. 5H may represent the DS1-1-2 output of A/D converter 442-1-2. Alternatively, if A/D converters 442 are part of the ASIC illustrated in FIGS. 4B-4D, FIG. 5G may represent the output of AMP 436-1-2, labeled AS1-1-2. As noted previously, FIG. 4A does not show all signal paths, but the processing of the signal paths not shown is similar to the signal paths illustrated and described in connection with FIG. 4A. Tu at Figs. 5A-5F:

Asserted Claims	Additional References and Disclosure
	 FIG. 5A  FIG. 5B  FIG. 5C

Asserted Claims	Additional References and Disclosure
	 FIG. 5D  FIG. 5E  FIG. 5F

Asserted Claims	Additional References and Disclosure
	 FIG. 5G  FIG. 5H Behrens at 2:26-37: In one embodiment, a receiver digital circuitry according to the invention includes a digital down-converter circuitry and a digital filter circuitry. The digital down-converter circuitry mixes a digital input signal provided by a receiver analog circuitry with an intermediate frequency (IF) local oscillator signal to generate a digital down-converted signal. The digital filter circuitry filters the digital down-converted signal to generate a filtered digital signal. The receiver analog circuitry resides within a first integrated circuit and the receiver

Asserted Claims	Additional References and Disclosure
	digital circuitry resides within a second integrated circuit. The second integrated circuit couples to the first integrated circuit via a one-bit digital interface. Behrens at Fig. 4:  FIG. 4 Behrens at 9:65-10:14: FIG. 4 shows a more detailed block diagram of an embodiment 400 of an RF transceiver partitioned according to the invention. The transceiver includes receiver analog circuitry 408, receiver digital circuitry 426, and transmitter circuitry 465. In the receive mode, the antenna interface circuitry 202 provides an RF signal 401 to a filter circuitry 403. The filter circuitry 403 provides a filtered RF signal 406 to the receiver analog circuitry 408. The receiver analog circuitry 408 includes downconverter (i.e., mixer) circuitry 409 and

Asserted Claims	Additional References and Disclosure
	analog-to-digital converter (ADC) circuitry 418. The down-converter circuitry 409 mixes the filtered RF signal 406 with an RF local oscillator signal 454, received from the local oscillator circuitry 222. The down-converter circuitry 409 provides an in-phase analog down-converted signal 412 (i.e., I-channel signal) and a quadrature analog down-converted signal 415 (i.e., Q-channel signal) to the ADC circuitry 418. Behrens at 10:15-40: The ADC circuitry 418 converts the in-phase analog down-converted signal 412 and the quadrature analog down-converted signal 415 into a one-bit in-phase digital receive signal 421 and a one-bit quadrature digital receive signal 424. (Note that FIGS. 4-8 illustrate signal flow, rather than specific circuit implementations; for more details of the circuit implementation, for example, more details of the circuitry relating to the one-bit in-phase digital receive signal 421 and the one-bit quadrature digital receive signal 424, see FIGS. 9-14.) Thus, The ADC circuitry 418 provides the one-bit in-phase digital receive signal 421 and the one-bit quadrature digital receive signal 424 to the receiver digital circuitry 426. As described below, rather than, or in addition to, providing the one-bit in-phase and quadrature digital receive signals to the receiver digital circuitry 426, the digital interface between the receiver analog circuitry 408 and the receiver digital circuitry 426 may communicate various other signals. By way of illustration, those signals may include reference signals (e.g., clock signals), control signals, logic signals, hand-shaking signals, data signals, status signals, information signals, flag signals, and/or configuration signals. Moreover, the signals may constitute single-ended or differential signals, as desired. Thus, the interface provides a flexible communication mechanism between the receiver analog circuitry and the receiver digital circuitry. Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal

Asserted Claims	Additional References and Disclosure
	receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Freeman at 1:16–21: The present invention relates generally to interactive response systems, and more particularly to an interactive television system which provides interactive programming using compressed, digital data having more than one video signal on a broadcast channel, or a multiplexed signal within a digital format, or both. Freeman at 2:20–50: The video signals are converted into digital format for transmission. In a digital format, it is possible to transmit more than one video signal per cable television channel. Further, it is possible to transmit video signals via conventional telephone lines. If desired, the various digital video signals may be compressed before transmission. Compression allows an even larger number of video signals to be transmitted over a channel of the transmission media. A multiplexer combines the various digital signals into a reduced number of transmission data streams for transmission. The various NTSC television channels may be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. The multiplexer in conjunction with the television transmission system multiplexes the desired data streams onto the desired channels, and transmits these signals over the NTSC channels. The number of video signals which may be multiplexed

Asserted Claims	Additional References and Disclosure
	onto a data stream on a single transmission channel will vary depending on the video signals to be transmitted. The television channels containing a data stream of multiplexed video signals may be transmitted over a standard cable television distribution network, or direct broadcast satellite transmission system. A receiver receives one or more television channels, some or all containing a multiplexed data stream of video signals or non-multiplexed digital video signals, and in conjunction with a signal selector, selects a particular data channel/data stream for playback, then selects a particular video signal from the data stream's multiplexed signal, and finally expands the video signal, if necessary, for playback to a television monitor. Freeman at 2:51–59: A multiple choice controller operates to control the receiver and signal selector to select a particular video signal for playback. If more than one channel is received, the multiple choice controller may be programmed to map the different channels, and the multiple signals thereon, to a serial numerical channel representation to simplify use by the user. The signal selector includes the necessary expansion apparatus corresponding with the compression scheme in use. Freeman at 2:60–67: In practice, a user selects a desired interactive program to be viewed. Using the multiple choice controller, the user selectably responds to information displays or interrogatory messages and the signal selector selects a particular multiplexed video signal and de-multiplexes, expands and displays the selected video signal. Alternatively, the signal selector may select a video signal based on personal profile information stored in memory.
14[c] combining extracted selected transponder signals into a composite signal;	The obviousness reference(s) listed below disclose, explicitly and/or inherently, combining extracted selected transponder signals into a composite signal. *See, e.g.*:

Asserted Claims	Additional References and Disclosure
	Oishi at Abstract: In a television signal transmission system, CS broadcasting signals received via a master antenna are converted into intermediate frequency signals in an LNB (Low Noise Block Down Converter). The CS intermediate frequency signals then undergo conversion of the modulation format, for example, from QPSK into 64-QAM, so that CS broadcasting signals from each transponder, having a bandwidth of, for example, 27 MHZ, are accommodated in a narrower bandwidth, for example, 6 MHZ, which is equivalent to one channel of terrestrial broadcasting services. Then, the signals accommodated in the narrower bandwidth is frequency shifted into a vacant frequency band in the VHF band or the UHF band. Accordingly, the CS signals accommodated in the narrower band and frequency-shifted into the vacant band are multiplexed with terrestrial broadcasting signals in the VHF and UHF bands and BS intermediate frequency signals so that all these signals are delivered to each house hold via a single cable. Oishi at 1:9–19: The present invention generally relates to television signal distributor apparatuses, receiver apparatuses, and television signal transmission systems and methods. More specifically, the present invention relates to a television signal distributor apparatus, a receiver apparatus, a television signal transmission system and method, which are particularly suitable for implementing a small-scale television signal distribution network in which television signals received via a master antenna provided on the rooftop at collective housing, such as an apartment building, are delivered to each household via a cable. Oishi at 1:21–31: In collective housing such as an apartment building, there is usually provided a television signal transmission system in which television signals received via a master antenna provided on the rooftop are delivered to each household via a cable. In VHF-band and UHF-band terrestrial broadcasting services, broadcasting stations are allocated with respectively different frequency bands. The television signal transmission system mixes

Asserted Claims	Additional References and Disclosure
	signals received via a VHF antenna and a UHF antenna while adjusting the gain thereof, and then delivers the mixed signals to each household via a single cable. Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 6:43–48: The BS parabola antenna 2 receives signals from a broadcasting satellite 6. The parabola antenna 2 is provided with an LNB 7. The LNB 7 converts signals in the 12-GHz band received by the parabola antenna 2 into intermediate frequency signals in the 1-GHz band. The output of the LNB 7 is fed to the mixer 5. Oishi at 6:49–51: The antennas 3A and 3B receive terrestrial broadcasting signals in the VHF and UHF bands. The outputs of the antennas 3A and 3B are fed to the mixer 5.

Asserted Claims	Additional References and Disclosure
	Oishi at 6:52–54: The mixer 5 mixes the output from the modulation format conversion unit 4, the output from the LNB 7, and the output from the antennas 3A and 3B. Tu at 4:40-51: Next, the first and second intermediate frequency signals are combined, the first and second intermediate frequencies having been selected so that the first channel and the second channel are now adjacent to each other, regardless of their relative positions in the input signal. Because the first intermediate frequency may include signals that are below the first channel and the second intermediate frequency may include signals above the second channel, signals below the first channel and above the second channel are removed from the combined first and second intermediate frequency signal. At this point, the first and second channels have been combined into a sub-channel. Tu at 8:55-9:21: Using the output frequencies of frequency synthesizers 428, mixers 432 produce up to eight independent desired channels with the channel center frequencies positioned at two different intermediate frequencies, IF1 and IF2 (only local oscillator frequencies LO1,1 and LO1,2, and mixers 432-1A and 432-1B are shown). Mixers 432 are one example of down conversion means for down converting a first channel to a first, relatively lower, intermediate frequency, and for down converting a second channel to a second relatively higher intermediate frequency. Down conversion means may further comprise crystal oscillator 426 and/or frequency synthesizers 428. Note that FIG. 4A only shows the signal paths for two channels being combined into a single sub-channel. Similar processing occurs for the other tuned channels, but the details are omitted from the drawing for clarity. After mixing, each of the IF1 and IF2 signals remains a wide-band signal, which contains the composite transponder channels of the input signal. For example, FIG. 5B shows a desired channel T3 centered at IF1, and FIG. 5C shows a desired channel T15 centered at IF2. The relationship between the intermediate frequencies (IF1 and IF2), local oscillator

Asserted Claims	Additional References and Disclosure
	frequencies (LO1,1 and LO1,2), and desired transponder channels (T3 and T15) is given by the following equations. IF 1=desired transponder channel T 3 center frequency−LO 1,1 frequency IF 2=desired transponder channel T 15 center frequency−LO 1,2 frequency IF 2−IF 1=transponder channel spacing The transponder channel spacing depends on the satellite standard and the channel bandwidth. Tu at 9:32-50: Variable low pass filters ("LPFs") 438 remove the upper side band transponders from the desired channel centered at IF1, and variable high pass filters ("HPFs") 435 remove the lower side band transponders from the desired channel centered at IF2, before power summers 437 combine IF1 and IF2 into a single sub-channel. (Only low pass filter 438-1A, high pass filter 435-2A, and power summer 437-1-2 are shown.) FIG. 5D shows channel T3, centered at IF1, after passing through low pass filter 438-1A, and FIG. 5E shows channel T15, centered at IF2, after passing through high pass filter 435-2A. FIG. 5F shows the filtered IF1 combined with the filtered IF2, at a frequency IFc, centered between the two channels. Low pass filters 438 are an example of first removal means for removing signals above the first channel, and high pass filters 435 are an example of second removal means for removing signals below the second channel. At this stage, the desired channels, T3 and T15, are adjacent to each other, regardless of the relative positions T3 and T15 occupied in the input signal. Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3

Asserted Claims	Additional References and Disclosure
	and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Freeman at 4:21–34: The present invention is an interactive television system in which a plurality of viewers are simultaneously provided with a plurality of different program information message signals. A plurality of video signals 1 are provided. Video signals 1 may be, for example, various field and/or audio synchronized camera angles of a sporting event, or a game show having a content and host acting responsively to user selections. Alternatively, video signals 1 may be any video signals suitable for interactive conversation, such as those described in U.S. Pat. Nos. 4,847,700, 3,947,972, 4,602,279, 4,264,925, or 4,264,924, the contents of which are incorporated specifically herein by reference. Various types of time and content related video signals exist which are suitable for interactive operation. Freeman at 4:35–48: In previous systems, these various signals would be transmitted to a receiver on separate broadcast or cable channels, each requiring a separate 6 Mhz NTSC channel. According to the present invention, video signals 1 are directed to analog-to-digital ("A/D") convertors 2 which convert the various video signals into digital format for transmission. A/D convertors 2 may be of any conventional type for converting analog signals to digital

Asserted Claims	Additional References and Disclosure
	format. An A/D convertor may not be needed for each video signal 1, but rather fewer convertors, or even a single convertor are capable of digitizing various video signals 1. Interactive video programs may also be delivered to a cable or other distribution network in pre-digitized and/or precompressed format. Freeman at 4:49–57: Digital conversion results in very large amounts of data. It may therefore be desirable to reduce the amount of data to be sent, allowing more signals to be sent over a single transmission channel. For example, a single frame of digitized NTSC video represents over 350 Kbytes of data. Therefore, two hours of standard video is about 80 Gbytes. Since there are 30 frames/sec in such video, the data transfer rate is 22 Mbytes/sec. This large amount of data is preferably reduced by digital compression. Freeman at 6:16–22: Multiplexer 4 receives the incoming compressed, digitized video signals and in a predetermined conventional fashion, in conjunction with transmitter 5, multiplexes the desired video signal onto the desired channels, and transmits these signals over the NTSC channels. Certain NTSC channels may contain only one video or other signal, in analog or digital form.
14[d] transmitting the composite signal over the single cable from the ODU to the IRDs, wherein the modulation of the transponder signal is not altered by the steps of selecting, combining, and transmitting.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, transmitting the composite signal over the single cable from the ODU to the IRDs, wherein the modulation of the transponder signal is not altered by the steps of selecting, combining, and transmitting. *See, e.g.*: Oishi at Abstract: In a television signal transmission system, CS broadcasting signals received via a master antenna are converted into intermediate frequency signals in an LNB (Low Noise Block Down Converter). The CS intermediate frequency signals then undergo conversion of the

Asserted Claims	Additional References and Disclosure
	modulation format, for example, from QPSK into 64-QAM, so that CS broadcasting signals from each transponder, having a bandwidth of, for example, 27 MHZ, are accommodated in a narrower bandwidth, for example, 6 MHZ, which is equivalent to one channel of terrestrial broadcasting services. Then, the signals accommodated in the narrower bandwidth is frequency shifted into a vacant frequency band in the VHF band or the UHF band. Accordingly, the CS signals accommodated in the narrower band and frequency-shifted into the vacant band are multiplexed with terrestrial broadcasting signals in the VHF and UHF bands and BS intermediate frequency signals so that all these signals are delivered to each house hold via a single cable. Oishi at 1:9–19: The present invention generally relates to television signal distributor apparatuses, receiver apparatuses, and television signal transmission systems and methods. More specifically, the present invention relates to a television signal distributor apparatus, a receiver apparatus, a television signal transmission system and method, which are particularly suitable for implementing a small-scale television signal distribution network in which television signals received via a master antenna provided on the rooftop at collective housing, such as an apartment building, are delivered to each household via a cable. Oishi at 1:21–31: In collective housing such as an apartment building, there is usually provided a television signal transmission system in which television signals received via a master antenna provided on the rooftop are delivered to each household via a cable. In VHF-band and UHF-band terrestrial broadcasting services, broadcasting stations are allocated with respectively different frequency bands. The television signal transmission system mixes signals received via a VHF antenna and a UHF antenna while adjusting the gain thereof, and then delivers the mixed signals to each household via a single cable. Oishi at 2:12–32:

Asserted Claims	Additional References and Disclosure
	More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 3:22–30: Accordingly, it is an object of the present invention to provide a television signal distribution apparatus, a receiver apparatus, and a television signal transmission system and method, which allows, without implementing large-scale works, terrestrial broadcasting signals in the VHF and UHF bands, the BS intermediate frequency signals,

Asserted Claims	Additional References and Disclosure
	and CS intermediate frequency signals of a CS broadcasting service which employs two or more satellites to be multiplexed for transmission to each household via a single cable. Oishi at 3:31–53: To this end, the present invention provides a television signal transmission system including a television signal distributor apparatus which delivers signals received via a master antenna to each household via a cable; and at least one receiver apparatus provided in each household. The television signal distributor apparatus includes a modulation format converting unit for converting the modulation format of received CS broadcast signals to thereby accommodate the signals in a narrower bandwidth, and for frequency-shifting the signals accommodated in the narrower bandwidth into a vacant frequency band; and a mixing unit for mixing for transmission via the cable the frequency-shifted signals accommodated in said narrower bandwidth with other type or types of received broadcast signals. The at least one receiver apparatus includes a receiving unit for receiving CS broadcast signals which have undergone conversion of modulation format so as to be accommodated in a narrower bandwidth and which have then been frequency-shifted into a vacant frequency band; a demodulating unit for demodulating the received signals in accordance with the modulation format after conversion; and a decoding unit for decoding the output from the demodulating unit to obtain video signals and audio signals. Oishi at 3:54–4:3: In accordance with the present invention, the modulation format of CS intermediate frequency signals is converted, for example, from QPSK to 64-QAM; thus, CS broadcasting signals from each transponder, having a bandwidth of, for example, 27 MHz, are accommodated in a bandwidth of, for example, 6 MHz, which is equivalent to a single channel for terrestrial broadcasting. The CS signals which have undergone conversion of the modulation format are frequency-shifted into a vacant channel in the VHF band or the UHF band. The frequency-shifted CS signals are multiplexed with BS intermediate frequency signals and terrestrial broadcasting signals for transmission to each household via a single cable. Accordingly, signals for a CS broadcasting service, even if provided via

Asserted Claims	Additional References and Disclosure
	two or more satellites, can be transmitted to each household via a single cable together with signals for a BS broadcasting service and terrestrial broadcasting signals. Oishi at 4:45–56: In accordance with the present invention, CS broadcasting signals from each transponder received via a master antenna undergo conversion of the modulation format so that the signals are accommodated in a narrower bandwidth. The signals accommodated in the narrower bandwidth are then frequency-shifted into a vacant channel in the VHF band or the UHF band. This eliminates the need to provide an additional band for the CS broadcasting signals; thus, the CS broadcasting signals, even if serviced by two or more satellites, can be delivered to each household via a single cable together with terrestrial television broadcasting signals and BS broadcasting signals. Oishi at 6:55–56: The output of the mixer 5 is fed through a cable 10 and via a distributor to a terminal 14 in each household. Ishizaki at [0028]: According to a first aspect of the present invention, there is provided a CATV for distributing video information to a subscriber terminal connected via a CATV network and performing bidirectional communication between the CATV center and the subscriber terminal. In the system, the CATV center multiplexes the video information and the downlink data information of the two-way communication and distributes the multiplexed video information to the subscriber terminal on the same physical channel, and the subscriber terminal transmits the video information from a single received physical channel. And downlink data information of the two-way communication. Ogami at Abstract:

Asserted Claims	Additional References and Disclosure
	PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Ogami at [0004]: Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314 converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a. Freeman at 2:9–19: The present invention is an interactive cable television system which utilizes digital video signals to provide customized viewing responsive to user selections. A standard cable or direct broadcast satellite television distribution network is utilized for transmitting the interactive and other programming to users. The present invention allows a plurality of

Asserted Claims	Additional References and Disclosure
	viewers to be simultaneously provided with a plurality of different program information message signals related in time and content to each other. The interactive program comprises a plurality of video signals related in time and content to one another. Freeman at 2:20–50: The video signals are converted into digital format for transmission. In a digital format, it is possible to transmit more than one video signal per cable television channel. Further, it is possible to transmit video signals via conventional telephone lines. If desired, the various digital video signals may be compressed before transmission. Compression allows an even larger number of video signals to be transmitted over a channel of the transmission media. A multiplexer combines the various digital signals into a reduced number of transmission data streams for transmission. The various NTSC television channels may be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. The multiplexer in conjunction with the television transmission system multiplexes the desired data streams onto the desired channels, and transmits these signals over the NTSC channels. The number of video signals which may be multiplexed onto a data stream on a single transmission channel will vary depending on the video signals to be transmitted. The television channels containing a data stream of multiplexed video signals may be transmitted over a standard cable television distribution network, or direct broadcast satellite transmission system. A receiver receives one or more television channels, some or all containing a multiplexed data stream of video signals or non-multiplexed digital video signals, and in conjunction with a signal selector, selects a particular data channel/data stream for playback, then selects a particular video signal from the data stream's multiplexed signal, and finally expands the video signal, if necessary, for playback to a television monitor. Freeman at 7:51–56: The multiplexed interactive program may be transmitted over a single telephone line, if desired. In this embodiment, multiple choice controller 9 is programmed to switch between

Asserted Claims	Additional References and Disclosure
	the various video signals on the single telephone line. If additional channels were desired, a two-way configuration is used as described below.
15. The method of claim 14 wherein the step of selecting and extracting a transponder signal comprises the step of: filtering a transponder signal with a band pass filter having a bandwidth ranging from 5% to 100% wider than the bandwidth of the transponder signal.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the step of selecting and extracting a transponder signal comprises the step of: filtering a transponder signal with a band pass filter having a bandwidth ranging from 5% to 100% wider than the bandwidth of the transponder signal. *See* claim 14, *supra*. *See, e.g.*: Tu at Abstract: Methods and systems for processing a single sub-channel that includes two or more combined channels. Using intermediate frequency sub-sampling, two or more channels from a broad band signal are combined into a single sub-channel for further analog and digital processing. Each of the two or more channels is down converted to an intermediate frequency, filtered to remove certain undesired channels, and combined such that the two or more channels are adjacent to each other. A digital representation of the sub-channel is produced from the combined intermediate frequency channels. Each channel within the digital representation is down converted to baseband, and the in-phase and quadrature components are separated from each other. Compared to one direct down conversion technique, intermediate frequency sub-sampling as described in the application may reduce the number of analog to digital converters and control amplifiers used in analog processing by a factor of four. Tu at 2:25-37: Beginning with the analog processing shown in FIG. 3A, RF switch 312 receives an L-band radio frequency input signal that is approximately 1 GHz wide (from about 900 MHz to about 2200 MHz). The input signal contains multiple transponder channels that may be referred to as simply transponders or channels. Wide-band low noise amplifier ("LNA

Asserted Claims	Additional References and Disclosure
	WB") 316 ensures that the received signal power level is sufficient for the processing that follows. Signals outside of the bandwidth of interest are rejected by wide-band band pass filter ("BPF WB") 322. Eight frequency synthesizers 328 use crystal oscillator 326 to generate appropriate frequencies for directly converting one or more channels to baseband. Tu at 7:64-8:14: Wide-band band pass filter ("BPF WB") 422 rejects unwanted out of band spurious and image frequency components, such as may be created in down converting satellite signals to the input signal. For example, although not shown, unwanted out of band spurious and image frequency components may be present below channel T1 and above channel Tn of FIG. 5A. The 3 dB pass-band is approximately 1125 MHz wide centered at about 1550 MHz with cut-off frequencies at about 925 MHz and 2050 MHz. The amplitude response of BPF WB 422 varies no more than about 0.2 dB and the phase response departs less than +/−3 degrees from linear phase shift, for any 63 MHz frequency band within the pass-band. Amplitude variation within the pass-band is less than 3 dB. The 40 dB stop-band frequencies at 725 MHz and 2250 MHz, and the amplitude response is at least 40 dB attenuated for both upper side and lower side frequencies of the stop-band. BPF WB 422 has an insertion loss of less than 3 dB. Tu at 10:32-63: Band pass filters 439 reject undesired lower and upper sideband transponder channels after the IF1 and IF2 signal paths are combined by power summers 437 into a sub-channel of two tuned transponder channels that are adjacent to each other (only band pass filter 439-1-2 is shown). The rejection of undesired transponder channels helps the automatic gain control loop ("AGC") to operate properly since the architecture uses wide band analog to digital ("A/D") converters. (The AGC loop is described more fully below with reference to amplifiers 436, A/D converters 442, and FIG. 4B). Rejecting undesired channels prevents A/D saturation when a high signal level is present at its input and helps translate the desired analog signal to a digital format. Band pass filters 439 are an example of third

Asserted Claims	Additional References and Disclosure
	removal means for removing signals below the first channel and signals above the second channel from the combined first and second intermediate frequencies. For band pass filters 439, the amplitude response varies no more than about 0.2 dB, and the phase response has less than +/−3 degrees departure from linear phase shift, for any 63 MHz frequency band within the pass-band from (IF1−0.7Rs) MHz to (IF2+0.7Rs) MHz. The amplitude variation within the pass-band is less than 0.4 dB. The 3 dB pass-band frequencies are at (IF1−0.75Rs) MHz and (IF2+0.7Rs) MHz and the 30 dB stop-band frequencies are at (IF1−1.4Rs) MHz and (IF2+1.4Rs) MHz. For frequencies lower or higher than the stop-band frequencies, the amplitude response is at least 30 dB attenuated. Insertion loss for band pass filters 439 is less than 3 dB. FIG. 5G shows the combined channels T3 and T15, after a band bass filter 439 has removed undesired upper and lower sideband channels, with IFc being the center frequency of the channel pair. Gain control amplifiers ("AMPs") 436 are second stage am Tu at Claim 1: 1. A system capable of receiving a signal that includes a plurality of channels, wherein the system allows at least two channels to be selected from the plurality of channels and combined into one sub-channel, such that certain signal processing may be performed on the one sub-channel, and wherein the certain signal processing of the one sub-channel requires fewer of certain components than would be required to process the at least two channels separately, the system comprising: at least two frequency sources, one for each of at least two channels to be selected from a plurality of channels included within an input signal; at least two mixers, each connected to one of the at least two frequency sources and the input signal, wherein one of the at least two mixers positions a first channel at a first intermediate frequency (IF), relative lower than a second intermediate frequency (IF) and

Asserted Claims	Additional References and Disclosure
	the other positions a second channel at the second intermediate frequency (IF), relative higher than the first intermediate frequency (IF); low pass filter connected to one of the mixers, wherein the low pass filter receives the first IF and removes signals above the first channel; a high pass filter connected to one of the mixers, wherein the high pass filter receives the second IF and removes signals below the second channel; a summer connected to the low and high pass filters, wherein the summer receives and combines the first filtered IF and second filtered IF, such that the first channel and the second channel are adjacent to each other; and a band pass filter connected to the summer, wherein the band pass filter receives the combined first and second filtered IFs and removes signals below the first channel and above the second channel, such that a resulting multiple channel IF signal contains the adjacent first and second channels.
16. The method of claim 14 wherein the step of combining comprises frequency translating the selected and extracted transponder channels to a variable frequency before combining.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the step of combining comprises frequency translating the selected and extracted transponder channels to a variable frequency before combining. *See* claim 14, *supra*. *See, e.g.*: Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate

Asserted Claims	Additional References and Disclosure
	frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are

Asserted Claims	Additional References and Disclosure
	converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated

Asserted Claims	Additional References and Disclosure
	frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10.
17. The method of claim 15 further comprising frequency translating the selected transponder channels to a predetermined frequency before combining.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising frequency translating the selected transponder channels to a predetermined frequency before combining. *See* claim 15, *supra*. *See, e.g.*: Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band

Asserted Claims	Additional References and Disclosure
	A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control

Asserted Claims	Additional References and Disclosure
	interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10.
18. The method of claim 14 further comprising the step of splitting the composite signal inside a home and distributing to a plurality of IRDs.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising the step of splitting the composite signal inside a home and distributing to a plurality of IRDs. *See* claim 14, *supra*. *See, e.g.*: Gurantz at 3:50–62:

Asserted Claims	Additional References and Disclosure
	In the prior art, a single household could use an individual digital video decoder settop box 10 for each independently operating television set 12, as in FIG. 1. As used herein, a television set may be any video signal display device including conventional televisions and computer monitors. Each set-top box 10 has a remote control 14 associated with it. The signals into the household are split by splitter 16 for delivery to each of the set-top boxes 10. In addition to a constant cost per television in the household, each set-top would probably be authorized as an individual subscriber, independent of one another. Each set-top 10 would have it's own conditional access unit, and as systems often use such replaceable security elements, it's own smartcard. Gurantz at 3:63–4:3: The present invention allows the use of a single converter box for cable or satellite pay-per-view and/or subscription digital video system, using a single conditional access unit (smartcard). A typical example of this single household digital video converter box 100 is shown in FIG. 2, for three television sets 12 in the home. Each television set has a remote control 18 associated with it for communication with the converter box 100. Ishizaki at [0041]: The center modem 128 is a communication device on the center side for providing a program or a communication service according to a subscriber's request, and is connected via an optical / coaxial cable 135 via a head end (HE) 130. DS on the sender side The bidirectional communication is performed with the cable modem built in the TB 140. The broadcast receivers 100, 102, 104, the storage server 108, the server 114, the management device 120, the multiplexing device 106, the program information control device 122, and the encryption device 124. The QAM modulator 126 and the center modem 128 are mutually connected by a center LAN system 132. Ogami at [0004]:

Asserted Claims	Additional References and Disclosure
	Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314 converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a.
19. The method of claim 14 wherein the transponder request signal is transmitted over the cable from an IRD and all IRDs receive the same composite signal.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the transponder request signal is transmitted over the cable from an IRD and all IRDs receive the same composite signal. *See* claim 14, *supra*. *See, e.g.*: Ishizaki at [0028]: According to a first aspect of the present invention, there is provided a CATV for distributing video information to a subscriber terminal connected via a CATV network and performing bidirectional communication between the CATV center and the subscriber terminal. In the system, the CATV center multiplexes the video information and the downlink data information of the two-way communication and distributes the multiplexed video information to the subscriber terminal on the same physical channel, and the subscriber terminal transmits the video information from a single received physical channel. And downlink data information of the two-way communication. Freeman at 2:9–19: The present invention is an interactive cable television system which utilizes digital video signals to provide customized viewing responsive to user selections. A standard cable or direct broadcast satellite television distribution network is utilized for transmitting the interactive and other programming to users. The present invention allows a plurality of

Asserted Claims	Additional References and Disclosure
	viewers to be simultaneously provided with a plurality of different program information message signals related in time and content to each other. The interactive program comprises a plurality of video signals related in time and content to one another. Freeman at 7:51–56: The multiplexed interactive program may be transmitted over a single telephone line, if desired. In this embodiment, multiple choice controller 9 is programmed to switch between the various video signals on the single telephone line. If additional channels were desired, a two-way configuration is used as described below.
20. The method of claim 14 wherein the transponder request signal is transmitted over a wireless link to the ODU.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the transponder request signal is transmitted over a wireless link to the ODU. *See* claim 14, *supra*. *See, e.g.*:
21[a] 21. The method of claim 14 further comprising the steps of: frequency translating the selected transponder channels to a variable frequency before combining; and	The obviousness reference(s) listed below disclose, explicitly and/or inherently, frequency translating the selected transponder channels to a variable frequency before combining. *See* claims 14, 16, *supra*. *See, e.g.*: Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate

Asserted Claims	Additional References and Disclosure
	frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are

Asserted Claims	Additional References and Disclosure
	converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna.
21[b] splitting the composite signal inside a home and distributing to a plurality of IRDs.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, splitting the composite signal inside a home and distributing to a plurality of IRDs. *See* claim 18, *supra*. *See, e.g.*: Gurantz at 3:50–62: In the prior art, a single household could use an individual digital video decoder settop box 10 for each independently operating television set 12, as in FIG. 1. As used herein, a television set may be any video signal display device including conventional televisions and computer monitors. Each set-top box 10 has a remote control 14 associated with it. The signals into the household are split by splitter 16 for delivery to each of the set-top boxes 10. In addition to a constant cost per television in the household, each set-top would probably be authorized as an individual subscriber, independent of one another. Each set-top 10 would have it's own conditional access unit, and as systems often use such replaceable security elements, it's own smartcard. Gurantz at 3:63–4:3: The present invention allows the use of a single converter box for cable or satellite pay-per-view and/or subscription digital video system, using a single conditional access unit (smartcard). A typical example of this single household digital video converter box 100 is shown in FIG. 2, for three television sets 12 in the home. Each television set has a remote control 18 associated with it for communication with the converter box 100. Ogami at [0004]:

Asserted Claims	Additional References and Disclosure
	Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314 converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a.
22. The method of claim 21 wherein the transponder request signal is transmitted over the cable from an IRD.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the transponder request signal is transmitted over the cable from an IRD. *See* claims 19, 21, *supra*. *See, e.g.*: Ogami at [0004]: Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314 converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a.
23. The method of claim 21 wherein the transponder request signal is transmitted over a wireless link to the ODU.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the transponder request signal is transmitted over a wireless link to the ODU. *See* claims 20, 21, *supra*. *See, e.g.*:

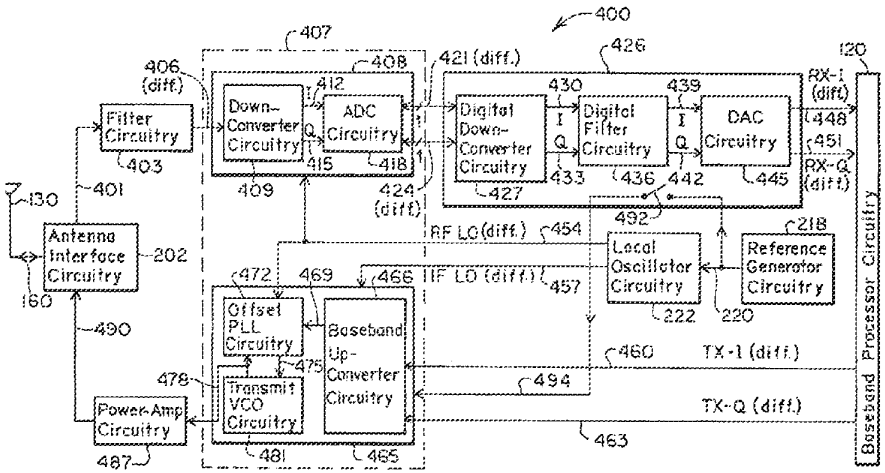
Asserted Claims	Additional References and Disclosure
34. The method of claim 14, wherein selecting and extracting comprises applying a pass band filter transfer function to the digitized broadband signal.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein selecting and extracting comprises applying a pass band filter transfer function to the digitized broadband signal. *See* claims 14, 15, *supra*. *See, e.g.*: Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:45–53: Television signals transmitted by terrestrial channel, received by antenna 50, are amplified by an amplifier 55 which covers a range of frequencies running from 45 to 862 MHz and are sent over a cable T through a low-pass filter 56 whose cutoff frequency is about 900 MHz. These terrestrial signals are then applied both to the four cables 1-4 by means of the couplers CT1, CT2, CT3, CT4 and these cables, in addition to signals received from the satellite, each deliver all the signals received from terrestrial stations. Chanteau at 2:54–3:6: The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their

Asserted Claims	Additional References and Disclosure
	frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may, for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also arranged on the cables 1-4, but in the latter case one would need four times as many of them. Tu at Abstract: Methods and systems for processing a single sub-channel that includes two or more combined channels. Using intermediate frequency sub-sampling, two or more channels from a broad band signal are combined into a single sub-channel for further analog and digital processing. Each of the two or more channels is down converted to an intermediate frequency, filtered to remove certain undesired channels, and combined such that the two or more channels are adjacent to each other. A digital representation of the sub-channel is produced from the combined intermediate frequency channels. Each channel within the digital representation is down converted to baseband, and the in-phase and quadrature components are separated from each other. Compared to one direct down conversion

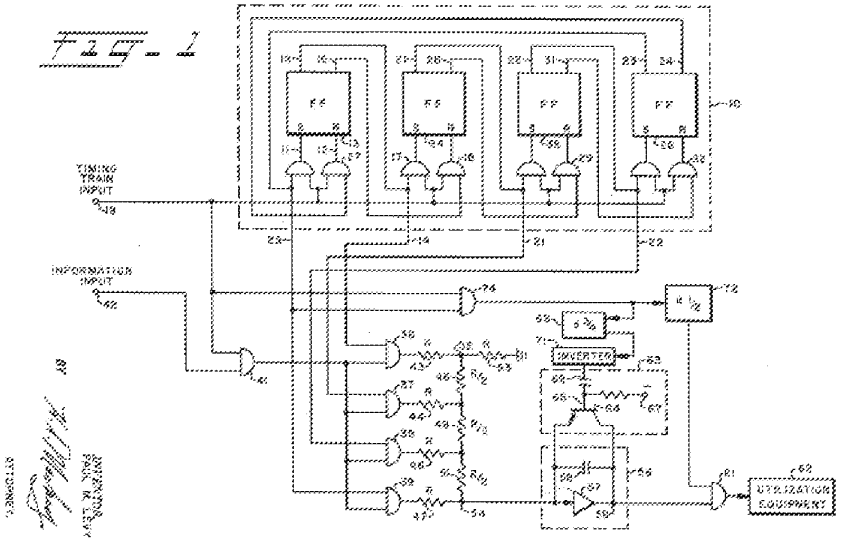
Asserted Claims	Additional References and Disclosure
	technique, intermediate frequency sub-sampling as described in the application may reduce the number of analog to digital converters and control amplifiers used in analog processing by a factor of four. Tu at 2:25-37: Beginning with the analog processing shown in FIG. 3A, RF switch 312 receives an L-band radio frequency input signal that is approximately 1 GHz wide (from about 900 MHz to about 2200 MHz). The input signal contains multiple transponder channels that may be referred to as simply transponders or channels. Wide-band low noise amplifier ("LNA WB") 316 ensures that the received signal power level is sufficient for the processing that follows. Signals outside of the bandwidth of interest are rejected by wide-band band pass filter ("BPF WB") 322. Eight frequency synthesizers 328 use crystal oscillator 326 to generate appropriate frequencies for directly converting one or more channels to baseband. Tu at 7:64-8:14: Wide-band band pass filter ("BPF WB") 422 rejects unwanted out of band spurious and image frequency components, such as may be created in down converting satellite signals to the input signal. For example, although not shown, unwanted out of band spurious and image frequency components may be present below channel T1 and above channel Tn of FIG. 5A. The 3 dB pass-band is approximately 1125 MHz wide centered at about 1550 MHz with cut-off frequencies at about 925 MHz and 2050 MHz. The amplitude response of BPF WB 422 varies no more than about 0.2 dB and the phase response departs less than +/−3 degrees from linear phase shift, for any 63 MHz frequency band within the pass-band. Amplitude variation within the pass-band is less than 3 dB. The 40 dB stop-band frequencies at 725 MHz and 2250 MHz, and the amplitude response is at least 40 dB attenuated for both upper side and lower side frequencies of the stop-band. BPF WB 422 has an insertion loss of less than 3 dB. Tu at 10:32-63:

Asserted Claims	Additional References and Disclosure
	Band pass filters 439 reject undesired lower and upper sideband transponder channels after the IF1 and IF2 signal paths are combined by power summers 437 into a sub-channel of two tuned transponder channels that are adjacent to each other (only band pass filter 439-1-2 is shown). The rejection of undesired transponder channels helps the automatic gain control loop ("AGC") to operate properly since the architecture uses wide band analog to digital ("A/D") converters. (The AGC loop is described more fully below with reference to amplifiers 436, A/D converters 442, and FIG. 4B). Rejecting undesired channels prevents A/D saturation when a high signal level is present at its input and helps translate the desired analog signal to a digital format. Band pass filters 439 are an example of third removal means for removing signals below the first channel and signals above the second channel from the combined first and second intermediate frequencies. For band pass filters 439, the amplitude response varies no more than about 0.2 dB, and the phase response has less than +/−3 degrees departure from linear phase shift, for any 63 MHz frequency band within the pass-band from (IF1−0.7Rs) MHz to (IF2+0.7Rs) MHz. The amplitude variation within the pass-band is less than 0.4 dB. The 3 dB pass-band frequencies are at (IF1−0.75Rs) MHz and (IF2+0.7Rs) MHz and the 30 dB stop-band frequencies are at (IF1−1.4Rs) MHz and (IF2+1.4Rs) MHz. For frequencies lower or higher than the stop-band frequencies, the amplitude response is at least 30 dB attenuated. Insertion loss for band pass filters 439 is less than 3 dB. FIG. 5G shows the combined channels T3 and T15, after a band bass filter 439 has removed undesired upper and lower sideband channels, with IFc being the center frequency of the channel pair. Gain control amplifiers ("AMPs") 436 are second stage am Tu at Claim 1: 1. A system capable of receiving a signal that includes a plurality of channels, wherein the system allows at least two channels to be selected from the plurality of channels and combined into one sub-channel, such that certain signal processing may be performed on the one sub-channel, and wherein the certain signal processing of the one sub-channel

Asserted Claims	Additional References and Disclosure
	requires fewer of certain components than would be required to process the at least two channels separately, the system comprising: at least two frequency sources, one for each of at least two channels to be selected from a plurality of channels included within an input signal; at least two mixers, each connected to one of the at least two frequency sources and the input signal, wherein one of the at least two mixers positions a first channel at a first intermediate frequency (IF), relative lower than a second intermediate frequency (IF) and the other positions a second channel at the second intermediate frequency (IF), relative higher than the first intermediate frequency (IF); low pass filter connected to one of the mixers, wherein the low pass filter receives the first IF and removes signals above the first channel; a high pass filter connected to one of the mixers, wherein the high pass filter receives the second IF and removes signals below the second channel; a summer connected to the low and high pass filters, wherein the summer receives and combines the first filtered IF and second filtered IF, such that the first channel and the second channel are adjacent to each other; and a band pass filter connected to the summer, wherein the band pass filter receives the combined first and second filtered IFs and removes signals below the first channel and above the second channel, such that a resulting multiple channel IF signal contains the adjacent first and second channels. Behrens at Fig. 4:

Asserted Claims	Additional References and Disclosure
	 FIG. 4 Behrens at 9:65-10:14: FIG. 4 shows a more detailed block diagram of an embodiment 400 of an RF transceiver partitioned according to the invention. The transceiver includes receiver analog circuitry 408, receiver digital circuitry 426, and transmitter circuitry 465. In the receive mode, the antenna interface circuitry 202 provides an RF signal 401 to a filter circuitry 403. The filter circuitry 403 provides a filtered RF signal 406 to the receiver analog circuitry 408. The receiver analog circuitry 408 includes downconverter (i.e., mixer) circuitry 409 and analog-to-digital converter (ADC) circuitry 418. The down-converter circuitry 409 mixes the filtered RF signal 406 with an RF local oscillator signal 454, received from the local oscillator circuitry 222. The down-converter circuitry 409 provides an in-phase analog down-converted signal 412 (i.e., I-channel signal) and a quadrature analog down-converted signal 415 (i.e., Q-channel signal) to the ADC circuitry 418.

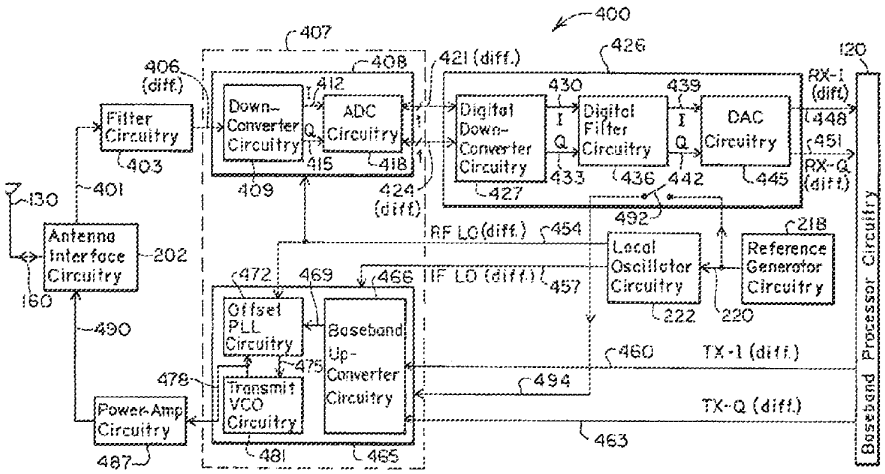
Asserted Claims	Additional References and Disclosure
35. The method of claim 14, further comprising converting the selected signal to an analog signal using a digital to analog converter prior to combining.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising converting the selected signal to an analog signal using a digital to analog converter prior to combining. *See* claim 14, *supra*. *See, e.g.*: Levy at 1:33–35: The invention thus has for its purpose the provision of an improved converter for translating binary digital serial signals to analog signals. Levy at Fig. 1:

Asserted Claims	Additional References and Disclosure
	 Levy at 3:28–56: In the operation of this digital-analog converter, let it be assumed that the information signals inserted at terminal 42 consists of consecutive 4-bit words in which a logical l is represented by negative potential for the duration of one clock period and a logical 0 by 0 potential during Ia clock period. The first bit of a word received represents the least significant digit. If, for example, the word 0100 is to be received, the most significant bit being written first, equivalent to the decimal number 4, it may be represented by the graph F, FIGURE 2. During the least significant bit time, to to t1, the input 42 is not energized so that, at the time of the first clock pulse 33 when AND circuit 36 is enabled, AND circuit 4l is not enabled, and the resistors 43, 44, 46 and 47 remain grounded through their AND circuits and the information input terminal. During the second period, t1 to t2, when AND circuit 37 is enabled, AND circuit 41 is again not enabled, and the resistor network remains grounded. During the third period, t2 to t3, when AND circuit 38 is enabled, AND circuit

Asserted Claims	Additional References and Disclosure
	4l is also enabled, so that a pulse of the shape and duration of a timing pulse is applied through resistor 46 and the weighting network to the integrator, where it charges the capacitor 58 to a selected potential. During the fourth period, t3 to t4 there again is no current through the weighting network. Since, however, in lan active integrator, the output remains constant at its last altered `value when the input is zero, the potential at terminal 59 remains at the level which it had attained by the end of the third bit period. Levy at claims 1–3: 1. A converter for converting a binary word containing N bits into an analog quantity comprising, an N-stage ring counter, an AND gating circuit for each one of the stages of said ring counter, each AND gating circuit having one of a pair -of inputs connected to an output of a respective stage of said ring counter, timing means connected to said ring counter for generating output pulses in the outputs of respective stages thereof in time sequence whereby said AND gating circuits are enabled in sequence, means operated by said timing means for sequentially applying the bits of said binary word to all of the other of said pairs of inputs of said AND gating circuits, computing network means havino the output of each of said AND gating circuits impressed on selected terminals thereof and producing a current the magnitude of which is determined lby the order of significance of the AND gating circuits rendered conductive by the simultaneous application of signal pulses to the inputs thereof, an integrator connected to the output of said computing network means, and utilization means having the output of said integrator impressed thereon. 2. A converter for converting a binary word containing N bits into an analog quantity comprising, an N- stage ring counter, a counter AND gating circuit for each one of the stages of said ring counter, each counter AND gating circuit having one of a pair of inputs connected to an output of a respective stage of said ring counter, timing means applying a train of pulse signals to said ring counter for generating output pulses in the outputs of respective stages thereof in time sequence whereby said counter AND gating circuits lare enabled in sequence, an input AND gating circuit conjointly operated by said timing signals and signal pulses representative of said binary word and having its output

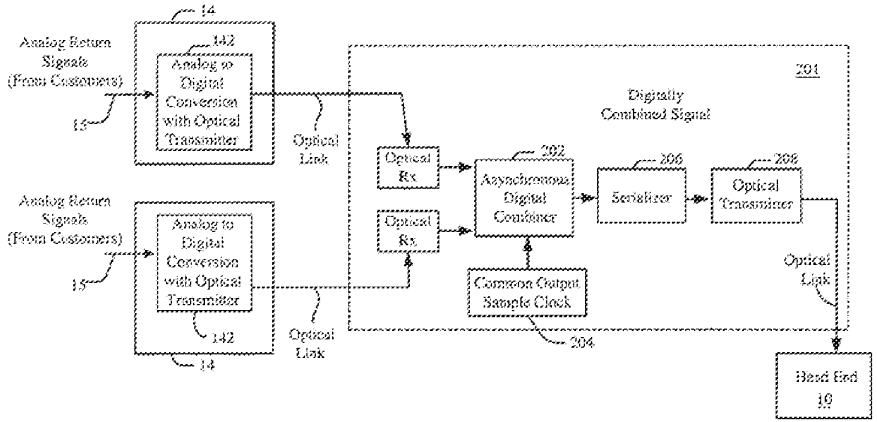
Asserted Claims	Additional References and Disclosure
	connected to all of the other of the pairs of inputs of said counter AND gating circuits, computing network means having the output of each of said counter AND gating circuits impressed on selected terminals thereof and producing therefrom `output current pulses the magnitude of which is determined by the order of significance of the counter AND gating circuit rendered conductive by the simultaneous application of pulses to the inputs thereof, an integrator connected to the output of said computing network means, and utilization means having the output of said integrator impressed thereon. 3. A converter for converting a binary word containing N bits into an `analog quantity comprising, an N-stage ring counter, :a counter AND gating circuit for each one of the stages of said ring counter, each counter AND gating circuit having one of a pair of inputs connected to an output oef a respective stage of said ring counter, timing means `applying a train of pulse signals to said ring counter for generating output pulses in the outputs of respective stages thereof in time sequence whereby said counter AND gating circuits are enabled in sequence, an input AND gating circuit conjointly operated by said timing signals `and signal pulses representative of said binary word and having its output connected to all of the other of the pairs of inputs of said counter AND gating circuits, computing network means having the output of each of said counter AND gating circuits impressed on selected terminals thereof and producing therefrom output current pulses the magnitude of which is determined by the order of significance of the counter AND gating circuit rendered conductive by the simultaneous application of pulses to the inputs thereof, an integrator connected to the output of said computing network means, utilization means, means including a first delay means operated by the output of the final stage of said ring counter for transferring the signal stored in said integrator to said utilization means, said first delay means introducing la delay lof less than the period of said train of pulse signals, and means including second delay means operated by the output of said final stage of said ring counter for clearing the signal magnitude stored in said integrator, said second delay means introducing a delay greater than said first delay but still less than the period of said train of pulse signals. Behrens at 10:41-58:

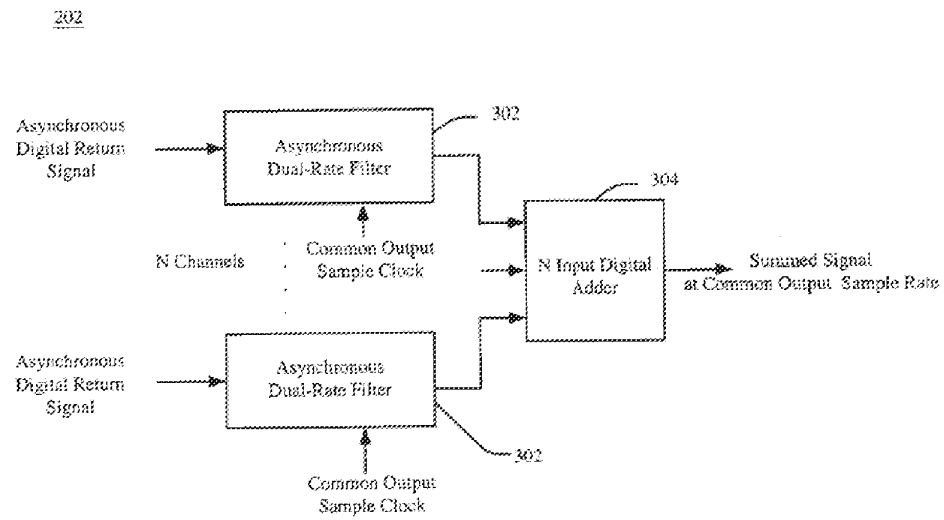
Asserted Claims	Additional References and Disclosure
	The receiver digital circuitry 426 includes digital down-converter circuitry 427, digital filter circuitry 436, and digital-to-analog converter (DAC) circuitry 445. The digital down-converter circuitry 427 accepts the one-bit in-phase digital receive signal 421 and the one-bit quadrature digital receive signal 424 from the receiver analog circuitry 408. The digital down-converter circuitry 427 converts the received signals into a down-converted in-phase signal 430 and a down-converted quadrature signal 433 and provides those signals to the digital filter circuitry 436. The digital filter circuitry 436 preferably comprises an infinite impulse response (IIR) channel-select filter that performs various filtering operations on its input signals. The digital filter circuitry 436 preferably has programmable response characteristics. Note that, rather than using an IIR filter, one may use other types of filter (e.g., finite impulse-response, or FIR, filters) that provide fixed or programmable response characteristics, as desired. Behrens at 10:59-67: The digital filter circuitry 436 provides a digital in-phase filtered signal 439 and a digital quadrature filtered signal 442 to the DAC circuitry 445. The DAC circuitry 445 converts the digital in-phase filtered signal 439 and the digital quadrature filtered signal 442 to an in-phase analog receive signal 448 and a quadrature analog receive signal 451, respectively. The baseband processor circuitry 120 accepts the in-phase analog receive signal 448 and the quadrature analog receive signal 451 for further processing. Behrens at Fig. 4:

Asserted Claims	Additional References and Disclosure
	 FIG. 4
36. The method of claim 14, wherein the combining is performed in the digital domain.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the combining is performed in the digital domain. *See* claim 14, *supra*. *See, e.g.*: Sage at 2:50–53: Accordingly, what is needed is a device for and a method of combining multiple digital return signals in a CATV return path without requiring multiple analog/digital conversions.

Asserted Claims	Additional References and Disclosure
	Sage at 2:57–64: In an asynchronous digital signal combiner, input samples from multiple nodes are interpolated digitally to a common sample rate that is defined by a single frequency source. The interpolated samples, which are synchronous, are digitally summed. Because the asynchronous digital summer of the present embodiment does not require A/D converters, D/A converters and analog summers, it is smaller, costs less and consumes less power than conventional signal combiners. Sage at 2:65–3:5: The asynchronous digital signal combiner includes a plurality of signal receivers for receiving digital data streams, a clock source, a set of asynchronous dual-rate filters and a digital summer. Each digital data stream contains a sequence of digital data values that may be asynchronous with respect to at least one of the other digital data streams. A clock source generates a common output clock signal having a common output sample rate. Sage at 3:6–15: The asynchronous dual-rate filters are coupled to the signal receivers and the clock source. Each asynchronous dual-rate filter receives a respective digital data stream at a respective input sample clock rate and generates a respective interpolated sequence of digital output samples, which are sampled at the common output sample rate. Thus, outputs of the asynchronous dual-rate filters are synchronous. Finally, the digital summer digitally sums the outputs of the asynchronous dual-rate filters so as to generate a sequence of summed digital signals at the common output sample rate. Sage at 4:21–32: Unlike prior art combiners, the digital return signal combiner 202 of the hub 201 of the present invention combines the asynchronous digital return signals without converting the asynchronous digital return signals to analog signals. The signal combiner 202 interpolates the asynchronous digital return signals to a common sample rate. The common sample rate

Asserted Claims	Additional References and Disclosure
	is the frequency of an output sample clock signal generated by a clock generator 204. The interpolated digital return signals are synchronous and are summed digitally with a high degree accuracy by the digital signal combiner 202 to produce a sequence of combined digital signals at the rate of the output sample clock signal. Sage at 4:33–50: To avoid the resulting combined digital signal from being "clipped" when the amplitude of the summed signal exceeds the maximum value that can be represented within each of the received digital return signals, the digital signal combiner 202 may produce digital signals having a larger number of bits per sample than the samples in the digital return signals received from the nodes 14. For instance, if four digital return signals, each having 10-bits per sample, are combined by the combiner 202, the combiner 202 may be configured to generate 12-bit combined digital signals. Alternately, the combiner 202 may be configured to internally generate summed signals having more bits than the samples in the digital return signals received from the nodes, but to output only the N most significant bits per summed signal, where N is the number of bits per sample in the digital return signals. In yet other embodiments, other mechanisms may be used to prevent clipping of the combined digital signals generated by the combiner 202. Sage at 4:54–5:6: FIG. 5 is a block diagram of the digital return signal combiner 202 according to an embodiment of the present invention. Multiple digital return signals with different sample rates are received by the combiner 202. Each digital return signal is processed by a digital asynchronous dual rate filter 302. In particular, the asynchronous filter 302 converts the digital return signals at their respective input sample rates to re-clocked signals at a Common Output Sample Rate. These re-clocked signals, which are now synchronous, are then added by a synchronous digital adder 304 to form a summed digital signal. In other words, the output signal samples are the sum of the input samples adjusted to the Common Output Sample Rate. The summed digital signal is provided then to a serialization circuit 206 (FIG. 4), such as a SERDES circuit, and an optical transmitter 208 to be serialized and

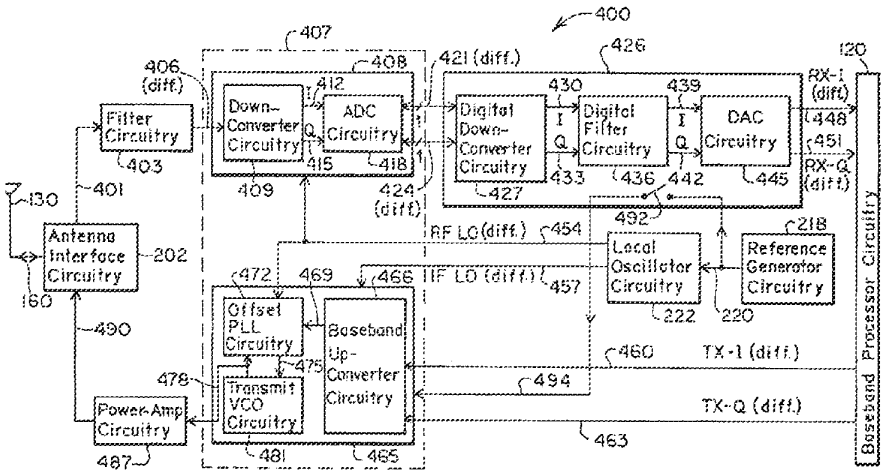
Asserted Claims	Additional References and Disclosure
	then transmitted to the head end 10. The summing of the asynchronous digital return signals is achieved without digital-to-analog or analog-to-digital conversions. Thus, disadvantages of the prior art analog combiners are avoided. Sage at Figs. 4–5:  Fig. 4

Asserted Claims	Additional References and Disclosure
	 Fig. 5
37. The method of claim 17, wherein frequency translating comprises using a digital mixer to apply a rotating phasor to the data samples to translate their frequency.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein frequency translating comprises using a digital mixer to apply a rotating phasor to the data samples to translate their frequency. *See* claim 17, *supra*. *See, e.g.*: Oishi at 2:12–32:

Asserted Claims	Additional References and Disclosure
	More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting

Asserted Claims	Additional References and Disclosure
	signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:54–3:6: The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may,

Asserted Claims	Additional References and Disclosure
	for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also arranged on the cables 1-4, but in the latter case one would need four times as many of them. Behrens at Fig. 4:

Asserted Claims	Additional References and Disclosure
	 FIG. 4 Behrens at 9:65-10:14: FIG. 4 shows a more detailed block diagram of an embodiment 400 of an RF transceiver partitioned according to the invention. The transceiver includes receiver analog circuitry 408, receiver digital circuitry 426, and transmitter circuitry 465. In the receive mode, the antenna interface circuitry 202 provides an RF signal 401 to a filter circuitry 403. The filter circuitry 403 provides a filtered RF signal 406 to the receiver analog circuitry 408. The receiver analog circuitry 408 includes downconverter (i.e., mixer) circuitry 409 and analog-to-digital converter (ADC) circuitry 418. The down-converter circuitry 409 mixes the filtered RF signal 406 with an RF local oscillator signal 454, received from the local oscillator circuitry 222. The down-converter circuitry 409 provides an in-phase analog

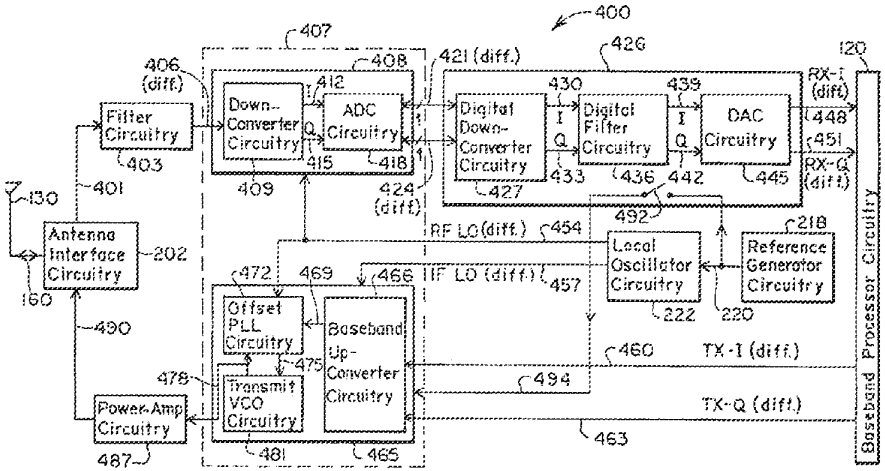
Asserted Claims	Additional References and Disclosure
	down-converted signal 412 (i.e., I-channel signal) and a quadrature analog down-converted signal 415 (i.e., Q-channel signal) to the ADC circuitry 418. Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated

Asserted Claims	Additional References and Disclosure
	frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10.
38. The method of claim 14, further comprising frequency translating the digitized broadband signal prior to selecting and extracting transponder signal.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising frequency translating the digitized broadband signal prior to selecting and extracting transponder signal. *See* claims 14, *supra*. *See, e.g.*: Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band

Asserted Claims	Additional References and Disclosure
	A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:54–3:6:

Asserted Claims	Additional References and Disclosure
	The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may, for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also arranged on the cables 1-4, but in the latter case one would need four times as many of them. Tu at 8:55-9:21: Using the output frequencies of frequency synthesizers 428, mixers 432 produce up to eight independent desired channels with the channel center frequencies positioned at two different intermediate frequencies, IF1 and IF2 (only local oscillator frequencies LO1,1 and LO1,2, and mixers 432-1A and 432-1B are shown). Mixers 432 are one example of

Asserted Claims	Additional References and Disclosure
	down conversion means for down converting a first channel to a first, relatively lower, intermediate frequency, and for down converting a second channel to a second relatively higher intermediate frequency. Down conversion means may further comprise crystal oscillator 426 and/or frequency synthesizers 428. Note that FIG. 4A only shows the signal paths for two channels being combined into a single sub-channel. Similar processing occurs for the other tuned channels, but the details are omitted from the drawing for clarity. After mixing, each of the IF1 and IF2 signals remains a wide-band signal, which contains the composite transponder channels of the input signal. For example, FIG. 5B shows a desired channel T3 centered at IF1, and FIG. 5C shows a desired channel T15 centered at IF2. The relationship between the intermediate frequencies (IF1 and IF2), local oscillator frequencies (LO1,1 and LO1,2), and desired transponder channels (T3 and T15) is given by the following equations. IF 1=desired transponder channel T 3 center frequency−LO 1,1 frequency IF 2=desired transponder channel T 15 center frequency−LO 1,2 frequency IF 2−IF 1=transponder channel spacing The transponder channel spacing depends on the satellite standard and the channel bandwidth. Tu at 11:56-67: The tuned channels, such as channel T3 and T15 of FIG. 5H, are digitally converted to baseband and undergo further digital signal processing for data recovery, as will be discussed below in greater detail with reference to FIGS. 4B-4D. Note that FIGS. 4B-4D show only the processing of one sub-channel that includes a pair of tuned transponder channels. The upper signal path, beginning with mixers 449-1A and 449-1B, processes one of the tuned transponder channels, and the lower signal path, beginning with mixers 449-

Asserted Claims	Additional References and Disclosure
	2A and 449-2B, processes the other tuned transponder channel. Similar processing occurs for the other sub-channels and will not be described or illustrated separately. Behrens at Fig. 4:  FIG. 4 Behrens at 9:65-10:14: FIG. 4 shows a more detailed block diagram of an embodiment 400 of an RF transceiver partitioned according to the invention. The transceiver includes receiver analog circuitry 408, receiver digital circuitry 426, and transmitter circuitry 465. In the receive mode, the antenna interface circuitry 202 provides an RF signal 401 to a filter circuitry 403. The filter circuitry 403 provides a filtered RF signal 406 to the receiver analog circuitry 408. The receiver analog circuitry 408 includes downconverter (i.e., mixer) circuitry 409 and

Asserted Claims	Additional References and Disclosure
	analog-to-digital converter (ADC) circuitry 418. The down-converter circuitry 409 mixes the filtered RF signal 406 with an RF local oscillator signal 454, received from the local oscillator circuitry 222. The down-converter circuitry 409 provides an in-phase analog down-converted signal 412 (i.e., I-channel signal) and a quadrature analog down-converted signal 415 (i.e., Q-channel signal) to the ADC circuitry 418. Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67:

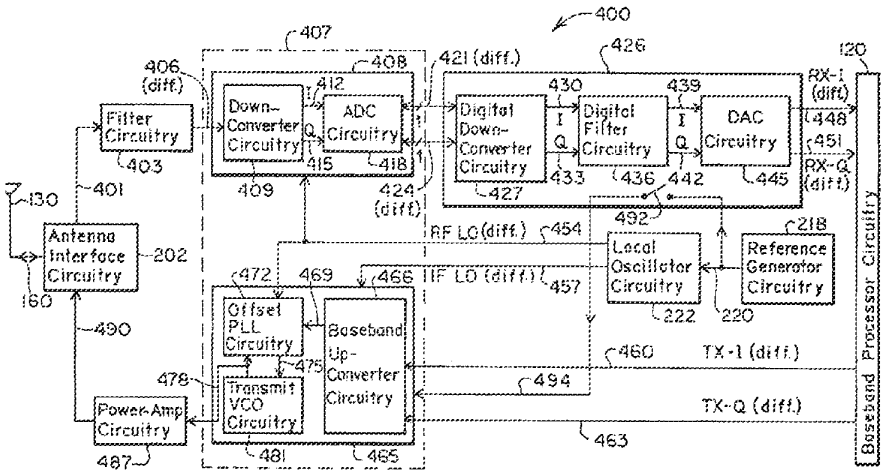
Asserted Claims	Additional References and Disclosure
	After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10.
39. The method of claim 38, wherein frequency translating comprises translating the original digitized broadband signal to locate a selected transponder channel at baseband.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein frequency translating comprises translating the original digitized broadband signal to locate a selected transponder channel at baseband. *See* claim 38, *supra*. *See, e.g.*: Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18.

Asserted Claims	Additional References and Disclosure
	Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for

Asserted Claims	Additional References and Disclosure
	inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:54–3:6: The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may, for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also arranged on the cables 1-4, but in the latter case one would need four times as many of them. Tu at 8:55-9:21:

Asserted Claims	Additional References and Disclosure
	Using the output frequencies of frequency synthesizers 428, mixers 432 produce up to eight independent desired channels with the channel center frequencies positioned at two different intermediate frequencies, IF1 and IF2 (only local oscillator frequencies LO1,1 and LO1,2, and mixers 432-1A and 432-1B are shown). Mixers 432 are one example of down conversion means for down converting a first channel to a first, relatively lower, intermediate frequency, and for down converting a second channel to a second relatively higher intermediate frequency. Down conversion means may further comprise crystal oscillator 426 and/or frequency synthesizers 428. Note that FIG. 4A only shows the signal paths for two channels being combined into a single sub-channel. Similar processing occurs for the other tuned channels, but the details are omitted from the drawing for clarity. After mixing, each of the IF1 and IF2 signals remains a wide-band signal, which contains the composite transponder channels of the input signal. For example, FIG. 5B shows a desired channel T3 centered at IF1, and FIG. 5C shows a desired channel T15 centered at IF2. The relationship between the intermediate frequencies (IF1 and IF2), local oscillator frequencies (LO1,1 and LO1,2), and desired transponder channels (T3 and T15) is given by the following equations. IF 1=desired transponder channel T 3 center frequency−LO 1,1 frequency IF 2=desired transponder channel T 15 center frequency−LO 1,2 frequency IF 2−IF 1=transponder channel spacing The transponder channel spacing depends on the satellite standard and the channel bandwidth. Tu at 11:56-67: The tuned channels, such as channel T3 and T15 of FIG. 5H, are digitally converted to baseband and undergo further digital signal processing for data recovery, as will be discussed below in greater detail with reference to FIGS. 4B-4D. Note that FIGS. 4B-4D show only the processing of one sub-channel that includes a pair of tuned transponder

Asserted Claims	Additional References and Disclosure
	channels. The upper signal path, beginning with mixers 449-1A and 449-1B, processes one of the tuned transponder channels, and the lower signal path, beginning with mixers 449-2A and 449-2B, processes the other tuned transponder channel. Similar processing occurs for the other sub-channels and will not be described or illustrated separately. Behrens at 10:41-58: The receiver digital circuitry 426 includes digital down-converter circuitry 427, digital filter circuitry 436, and digital-to-analog converter (DAC) circuitry 445. The digital down-converter circuitry 427 accepts the one-bit in-phase digital receive signal 421 and the one-bit quadrature digital receive signal 424 from the receiver analog circuitry 408. The digital down-converter circuitry 427 converts the received signals into a down-converted in-phase signal 430 and a down-converted quadrature signal 433 and provides those signals to the digital filter circuitry 436. The digital filter circuitry 436 preferably comprises an infinite impulse response (IIR) channel-select filter that performs various filtering operations on its input signals. The digital filter circuitry 436 preferably has programmable response characteristics. Note that, rather than using an IIR filter, one may use other types of filter (e.g., finite impulse-response, or FIR, filters) that provide fixed or programmable response characteristics, as desired. Behrens at 10:59-67: The digital filter circuitry 436 provides a digital in-phase filtered signal 439 and a digital quadrature filtered signal 442 to the DAC circuitry 445. The DAC circuitry 445 converts the digital in-phase filtered signal 439 and the digital quadrature filtered signal 442 to an in-phase analog receive signal 448 and a quadrature analog receive signal 451, respectively. The baseband processor circuitry 120 accepts the in-phase analog receive signal 448 and the quadrature analog receive signal 451 for further processing. Behrens at Fig. 4:

Asserted Claims	Additional References and Disclosure
	 FIG. 4
40. The method of claim 14, further comprising maintaining a channel translation table at the outdoor unit, the channel translation table specifying assigned frequency slots for transponder channels in the composite signal.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising maintaining a channel translation table at the outdoor unit, the channel translation table specifying assigned frequency slots for transponder channels in the composite signal. *See* claim 14, *supra*. *See, e.g.*: Eck at 1:7–9:

Asserted Claims	Additional References and Disclosure
	The present invention relates to an autoscan system that determines a translation between satellite television frequencies and cable television frequencies. Eck at 2:30–38: In accordance with one aspect of the present invention, a method of generating a translation table correlating satellite frequencies to cable frequencies comprises the following steps: a) tuning to a cable frequency; b) reading satellite service data from a signal at the cable frequency, wherein the satellite service data includes an indicium of a satellite frequency; c) storing in a translation table the indicium in association with the cable frequency of step a); and, d) repeating steps a)-c) for other cable frequencies. Eck at 2:39–52: In accordance with another aspect of the present invention, a method is provided to generate a translation table that correlates satellite frequencies carrying satellite QPSK signals to cable frequencies carrying corresponding QAM signals. The method comprises the following steps: a) scanning the cable frequencies; b) for each of the cable frequencies carrying a QAM signal, reading satellite service data from the corresponding QAM signal, wherein the satellite service data includes a satellite frequency; and, c) storing in the translation table the satellite frequency contained in the satellite service data read from each QAM signal carried on a cable frequency, wherein each satellite frequency is stored in the translation table in association with a corresponding cable frequency. Eck at 2:53–61: In accordance with yet another aspect of the present invention, a translation table is stored on a computer readable storage medium. The translation table holds satellite frequency indicia and cable frequencies. The satellite frequency indicia correspond to satellite QPSK signals, and the cable frequencies correspond to cable QAM signals transmodulated from the QPSK signal. Each of the satellite frequency indicia as stored in the translation table uniquely corresponds to one of the cable frequencies.

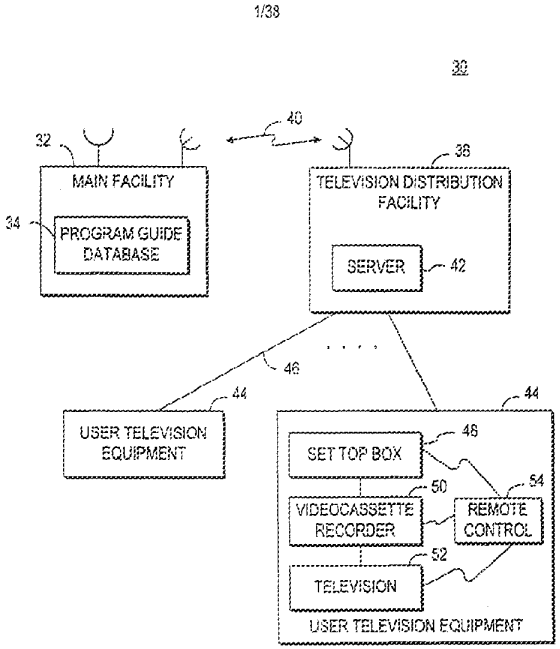
Asserted Claims	Additional References and Disclosure
	Eck at 8:29–32: Moreover, as described above, the translation table holds satellite frequency, CATV frequency pairs. Instead, the translation table could hold satellite channel number, CATV frequency pairs. Oishi at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable.

Asserted Claims	Additional References and Disclosure
	Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz) is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Oishi at 9:34–42: The setting for the CS tuner 13 is made via an operation unit 62, and the setting is displayed in a display unit 63. The control circuit 61 is provided with a frequency conversion table 64. The frequency conversion table 63 shows the correspondence between the frequency information of the satellite system shown in NIT (Network Information Table) and the frequency information of the transmission system of the signals transmitted via the cable 10. The frequency conversion table 64 is referenced when the receiving frequency is set in the tuner circuit 43. Oishi at 9:48–56: An ordinary CS broadcast receiver obtains NIT including information regarding carrier frequency characteristics, and based thereon, set the receive frequency to a desired channel. Then, reference is made to PAT (Program Association Table) packet. PAT includes information regarding channels on the carrier waves, and PID for PMT (Program

Asserted Claims	Additional References and Disclosure
	Map Table) representing the contents for each of the channels. Based on the PAT information, video packets and audio packets for a desired channel on the carrier waves are separated, so that a desired program is received. Oishi at 9:57–65: In accordance with the system, however, the CS intermediate frequency signals are frequency-shifted into a vacant channel in the VHF band or in the UHF band in the modulation format conversion unit 4 when the signals are transmitted to each household via the cable 10; thus, it is not feasible to set receive frequency directly from NIT information. It may be possible, but very complex, to rewrite NIT information when the signals are frequency-shifted in the modulation format conversion unit 4. Oishi at 9:66–10:3: Accordingly, in this embodiment, a frequency conversion table 54 is provided. The frequency conversion table stores the correspondence between frequency information for the satellite system obtained from the NIT and frequency information for the signal transmitted via the cable 10. Oishi at 10:4–10: In order to receive a desired program, NIT information must be obtained. NIT information is not frequently updated, and is provided once a day and stored in a storage medium within the receiver apparatus. FIG. 7 shows the data structure of NIT. NIT includes satellite delivery descriptor which describes frequency information and transmission parameters required to receive the signals. Oishi at 10:11–15:

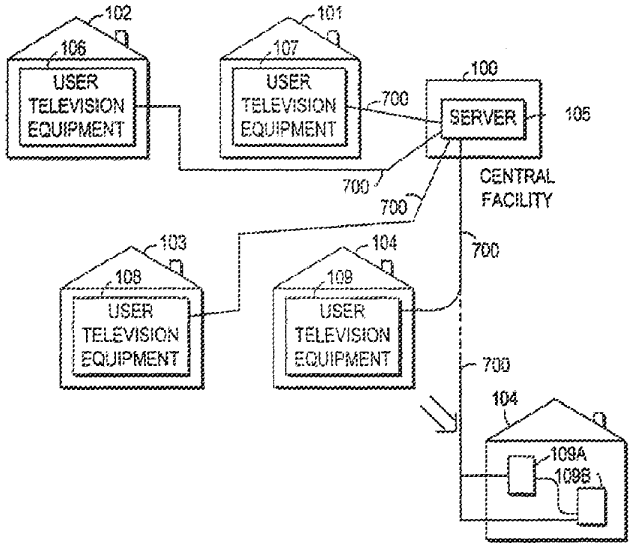
Asserted Claims	Additional References and Disclosure
	FIG. 8 shows the data structure of the satellite delivery descriptor. Information regarding programs for each channel is described in service list descriptor included in NIT. The data structure of the service list descriptor is shown in FIG. 9. Oishi at 10:16–23: In receive operation, first, information regarding the channel, i.e., frequency band, including a desired program is obtained from the service list descriptor and the satellite delivery descriptor included in NIT. Then, a frequency of the cable transmission system corresponding to the obtained frequency is read from the frequency conversion table 64. The receive frequency of the tuner circuit 43 is set in accordance with the frequency read from the frequency conversion table 64. Oishi at 10:24–27: Then, reference is made to PAT packets, and based on PAT information, video packets and audio packets with PID corresponding to a desired channel are separated, so that a desired program is received. Oishi at 10:28–34: The frequency conversion table 64, which shows the correspondence between the frequency information of the satellite system described in NIT included in data transmitted from a satellite, and actual frequency information of the signals transmitted via the cable 10, is created when the system is initially powered on after the system is configured, in a processing as shown in FIG. 10. Oishi at 10:34–42: FIG. 10 is a flowchart showing an example of processing for creating the frequency conversion table 64 which shows the correspondence between the frequency information described in NIT of the satellite system and the frequency information of the cable transmission system. Referring to FIG. 10, in step S1, a desired channel is specified, for

Asserted Claims	Additional References and Disclosure
	example, via a menu displayed on the screen, so that corresponding QAM signals are received and NIT information is obtained. Oishi at 10:43–58: In a television signal transmission system, once the frequency information of the cable transmission system is set, the information need not be frequently updated. In addition, channel information in the initial setting can be notified to the viewers by, for example, those in charge of management of the relevant facility. Thus, in step S 2, the frequency information of the cable transmission system is input via, for example, initial setting menu displayed on the screen. Accordingly, the frequency conversion table 64, which shows the correspondence between the frequency information of the satellite system and the frequency information of the cable transmission system, is created and stored in memory in step S3. Because the channels for retransmission of the CS signals are fixed, i.e., the bands A2 and A4 in FIG. 3, the setting of frequency information can be made in accordance with the setting of the modulation format conversion unit 4 prior to shipping of receiver apparatuses. Ellis at 11:17-12:5: Detailed Description of the Preferred Embodiments An illustrative program guide system 30 in accordance with the present invention is shown in FIG. 1. Main facility 32 contains a program guide database 20 34 for storing program guide information such as television program guide program listings data, pay-per-view ordering information, television program promotional information, etc. Information from database 34 may be transmitted to multiple television 25 distribution facilities such as television distribution facility 38 via communications links such as communications link 40. Only one such television distribution facility 38 and one communications link 40 are shown in FIG. 1 to avoid over-complicating the 30 drawings. Link 40 may be a satellite link, a telephone network link, a cable or fiber optic link, a microwave link, a combination of such links, or any other suitable communications path. If it is desired to transmit video signals (e.g., for advertising and promotional videos) over link 40 in addition to data

Asserted Claims	Additional References and Disclosure
	signals, a relatively high bandwidth link such as a satellite link is generally preferable to a relatively low bandwidth link such as a telephone line. Ellis at Fig. 1:  *FIG. 1* Ellis at 12:6-14:

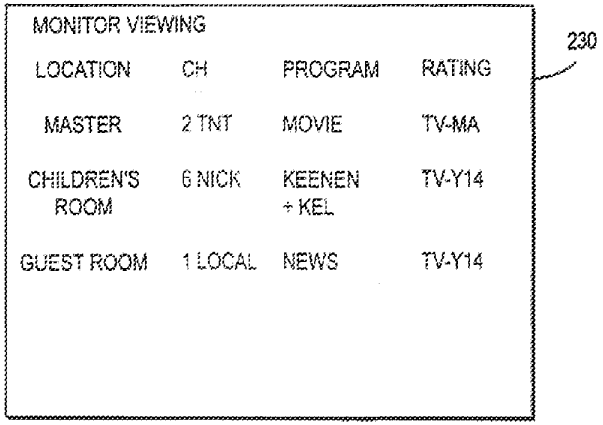
Asserted Claims	Additional References and Disclosure
	Television distribution facility 38 is a facility for distributing television signals to users,such as a cable system headend, a broadcast distribution facility, or a satellite television distribution facility or the like. The program guide information transmitted by main facility 32 to television distribution facility 38 includes television program listings data such as program times, channels, titles, descriptions, etc. Ellis at 12:31-13:4: A server 42 may be provided in television distribution facility 38 for handling data distribution tasks and for storing local information. If desired, server 42 may be used to implement a client-server based interactive television program guide system. In such a system, client functions may be performed at user television equipment 44. Server 42 may be capable of handling text, graphics, and video. Ellis at 13:5-11: Television distribution facility 38 distributes program guide and advertising information to the user television equipment 44 of multiple users via communications paths 46. Program guide data and other information may be distributed over an out-of-band channel on paths 46 or using any other suitable distribution technique. Ellis at 13:12-14:3 Each user has a receiver, which is typically a set-top box such as set-top box 48, but which may be other suitable television equipment into which circuitry similar to set-top-box circuitry has been integrated. If desired, user television equipment 44 may be an advanced television receiver or a personal computer television (PC/TV). For purposes of illustration, the present invention will generally be described in connection with user television equipment based on a set-top box arrangement. Program guide data may be distributed to set-top boxes 48 periodically and stored or may be distributed continuously and handled

Asserted Claims	Additional References and Disclosure
	"on the fly.", or by request. Television distribution 25 facility 38 may poll set-top boxes 48 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated authorization techniques). Main facility 32 preferably contains a processor to handle information distribution tasks. Each set-top box 48 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 48. Television distribution facility 38 may contain a processor for tasks associated with implementing server 42 and for handling tasks associated with the distribution of program guide and other information. Ellis at 14:4-13: Each set-top box 48 is may connected to an optional videocassette recorder 50 or other suitable recording device (e.g., digital storage device) so that selected television programs may be recorded. Each videocassette recorder 50 may be connected to a television 52. To record a program, set-top box 48 tunes to a particular channel and sends control signals to videocassette recorder 50 (e.g., using an infrared transmitter) that direct videocassette recorder 50 to start and stop recording at the appropriate times. Ellis at 19:16-20:4: FIG. 7a shows an illustrative configuration in which multiple homes are handled by a common server. Server 105 may be located at central facility 100. Central facility 100 may be a private home, a 20 commercial building, a network node, or other suitable structure that may be connected to a plurality of homes. In the example of FIG. 7a, server 105 is connected to user television equipment 106, 107, 108, and 109 that is located in homes 101, 102, 103, and 104, respectively via communication paths 700. When multiple user television equipment devices exist within a home as shown by devices 109a and 109b, each user television equipment device may communicate with the server 105 independently via communication paths 700, alternatively only one device may communicate while the other communicates via a home network. In other words, in alternative arrangements, there are either 1) multiple connections to an outside server and

Asserted Claims	Additional References and Disclosure
	each user television equipment device communicates with the server independently with no need for an in-home network, or, 2) only one connection to an outside server and each user television device communicates with each other through an in-home network. Ellis at Fig. 7a:  *FIG. 7a* Ellis at 20:11-26: Graphics information for messages, advertisements and the like may be downloaded periodically (e.g., once per day) to set-top boxes 48 of FIG. 1 and stored locally. The graphics information may be accessed locally when needed by the program guides implemented on set-top boxes 48. Graphics information may also be provided in a continuously looped arrangement on one or more digital channels on paths 46. With such a

Asserted Claims	Additional References and Disclosure
	continuously-looped arrangement, a map indicating the location of the latest graphics information may be downloaded periodically to set-top boxes 48 (e.g., once per day) or continuously. This allows the content on the digital channels to be updated. The program guides on set-top boxes 48 may use the map to locate desired graphics information on the digital channels. Ellis at 23:29-24:6: In any of the above arrangements, an interactive television program guide on each user television equipment device may provide various features for displaying television program listings information for the user and for providing various program guide functions such as parental control, favorites, pay-per-view purchasing, etc. For example, if the user presses the appropriate buttons on remote control 54, the user may be presented with a time-ordered or channel-ordered grid or table of television program listings or other such programming information. Ellis at 27:16-24: At step 1015, the user can access parental control screen 190 of FIG. 16 and may use remote control 54 to navigate between options such as set channels option 191, set maximum rating option 193, and monitor viewing option 195. The user may navigate to set channels screen 200 of FIG. 18a by selecting set channels option 191 at step 1016 of FIG. 17 by moving the highlight region 192 and pressing select. Ellis at 27:25-31: If the user selects set channels option 191 at step 1016, at step 1020 the program guide provides the user with an opportunity to set which channels are to be blocked. The user may block specific channels using remote control 54 to scroll through and select 30 from channel options 201, 202, 203, and 204 of FIG. 18a. Ellis at 29:11-27:

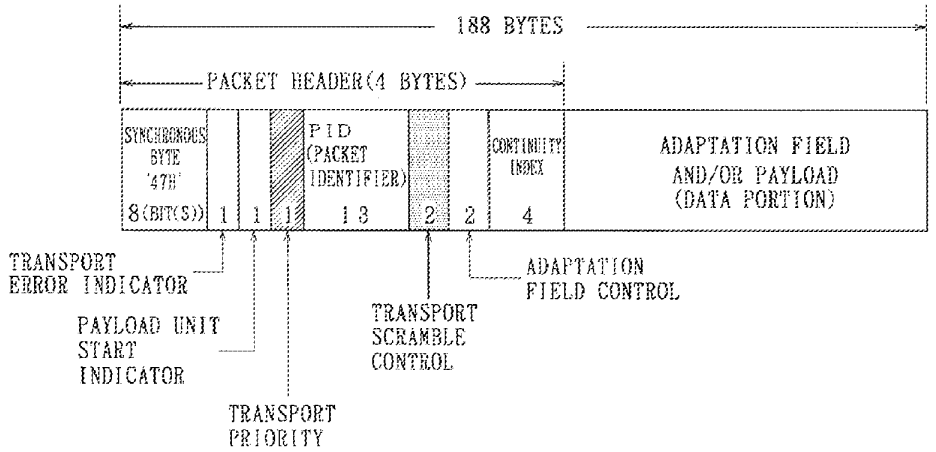
Asserted Claims	Additional References and Disclosure
	The program guide at the user's location may then, in one alternative, provide the user with monitor viewing screen 230, which shows the channel that each location is currently viewing or an overlay such as a banner or small information box that shows the channels that the other locations are viewing, but that also allows the user to continue watching programming at the user's location. The program guide at the user's location may poll the program guides at other locations within the household to determine whether anyone is currently viewing television and to which channels they are tuned. The monitor viewing screen may also allow the viewing of video, audio, or still images associated with the channel being viewed at another location. For example, the video of the remote location may be shown in a small box on the screen while the current channel's video is in the background. Ellis at Fig. 19:

Asserted Claims	Additional References and Disclosure
	 *FIG. 19* Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the

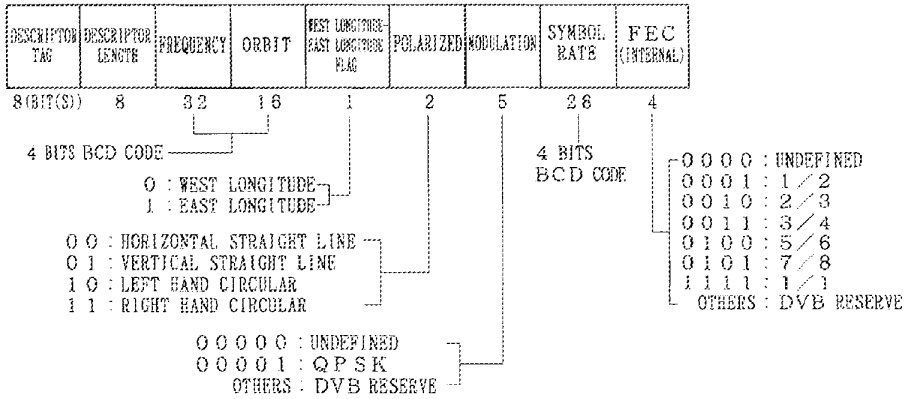
Asserted Claims	Additional References and Disclosure
	series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10. Ohishi at 1:7-20: This invention relates generally to a signal processing device preferably being used when digital broadcasting programs broadcast through an arbitrary network are transmitted to another network, and a switching method of signal processors suitable for use in the signal processing device. More specifically, this invention relates to a signal processing device being able to transmit the digital broadcasting programs broadcast through a first network to a second network by detecting a NIT (Network Information Table) from digital broadcast data on the first network, changing the NIT so as to be applicable to the second network and substituting said changed NIT for the NIT of digital broadcast data on the first network to obtain digital broadcast data on the second network. Ohishi at 2:12-35:

Asserted Claims	Additional References and Disclosure
	The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first table-detecting means detects the NIT from digital broadcast data on the first network and the table changing means changes said NIT so that the NIT is applicable to said second network. For example, when a cable television enterprise or the like provides delivery service of a satellite digital multi-channel broadcast with transmitting device for modulation and conversion or the like by using its own network, a frequency information of the NIT is changed. Further, preferably, said table-changing means deletes an information relating to the digital broadcast signal failing to correspond to a digital information signal on said second network, from the digital broadcast signal on said first network when the number of digital broadcast signal on said second network becomes less than the one of digital broadcast signal on said first network. Ohishi at 4:65-5:31: Referring now to FIG. 1, there is shown a digital CATV system 10 as a preferred embodiment of the invention, which is used for a satellite digital multi-channel broadcast. The system 10 comprises an antenna 11 for receiving digital broadcast signals sent from a plurality of transponders (satellite repeaters) of a communication satellite 20, and a transmitting device for modulation and conversion 12 for converting a transmission frequency of each received digital broadcast signal, and changing a modulation scheme thereof, etc. to generate a CATV digital broadcast signal and transmitting it to a transmission path 13. Incidentally, STB (Set Top Box) 14-1 through 14-m used as receiving terminals are electrically connected to the transmission path 13. Images in

Asserted Claims	Additional References and Disclosure
	channels selected by these STE 14-1 through 14-m are respectively displayed on monitors 15-1 through 15-m corresponding to the STE 14-1 through 14-m. The digital broadcast signals transmitted from the communication satellite 20 will first be explained. In the present embodiment, the digital broadcast signals are ones corresponding to a DVB (Digital Video Broadcasting) system. FIG. 2B shows a frame configuration of digital broadcast data employed in the DVB system. One frame of the digital broadcast data comprises eight MPEG2 transport packets (see FIG. 2A). In this case, by using a synchronous byte lying within each packet, one synchronous byte (=4 7H) every eight packets is inverted to a byte (=ESH) so that the frame synchronization thereof maybe obtained. Incidentally, an error correction code based on reed solomon (204, 188) is added to each MPEG2 transport packet (MPEG2 TS packet) The digital broadcast data shown in FIG. 2B is QPSK (Quadrature Phase Shift Keying)-modulated and thereafter frequency-converted into an SHF band, thus resulting in digital broadcast signals transmitted from the communication satellite 20. Ohishi at 5:32-45: FIG. 3 shows a packet configuration of an MPEG2 transport packet composed of 188 bytes. The leading four bytes of said 188 bytes constitute a packet header. A PID (Packet Identifier) indicative of the attribute of an individually provided stream (data string) of the corresponding packet is placed in the packet header. As is well known, a PES (Packetized Elementary Stream) packet indicative of a packet configuration as shown in FIG. 4 is disposed in a payload (data portion) of the MPEG2 transport packet in re-divided form. Further, a PAT (Program Association Table), a PMT (Program Map Table), an NIT (Network Information Table), etc. used as PSI (Program Specific Information) defined in an MPEG2 system are also provided in the payload. Ohishi at Fig. 3:

Asserted Claims	Additional References and Disclosure
	FIG. 3  Ohishi at 6:4-15: FIG. 6 shows a table structure of the PMT. An explanation will be made of principal contents which does not overlap with the PAT. A table ID indicates the classification of a table and is given as "0x02" in the case of the PMT. A PCR PID indicates a PID of the packet including a program clock reference (PCR) defined as the reference upon decoding. A stream type indicates the type of signal transmitted in the form of a stream such as video, audio and added data. Further, the NIT indicates physical information on a transmission path, i.e., satellite orbits, polarized waves, frequencies every transponders, etc., in the case of a satellite. As described above, the PAT specifies the PID of the NIT itself. Ohishi at 6:16-45:

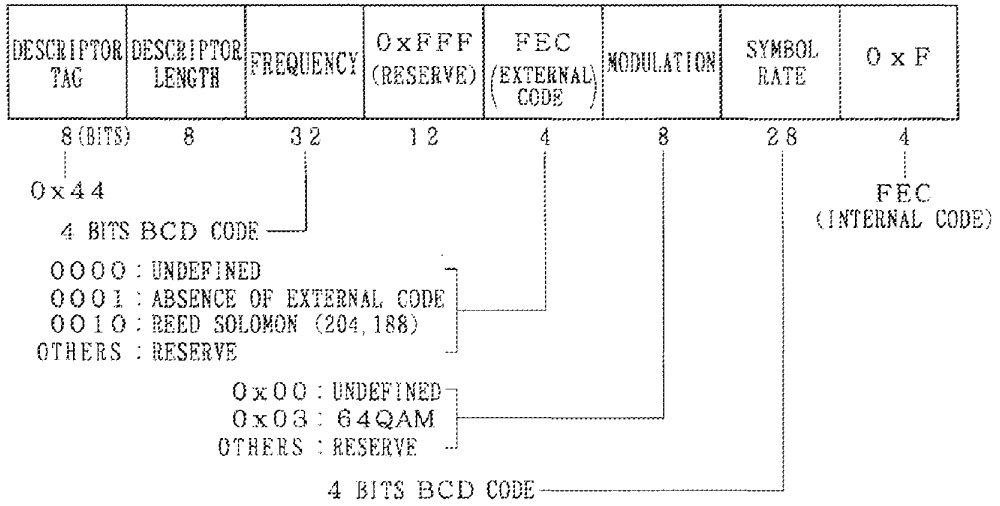
Asserted Claims	Additional References and Disclosure
	FIG. 7 indicates a table structure of the NIT. An explanation will be made of principal contents thereof, which does not overlap with the PAT and PMT. A table ID indicates the type of table. The corresponding network is given as "0x40" and other networks are given as "0x41". A network ID is used to identify each network. In the case of satellites, the network ID corresponds to each satellite. An explanation will further be made of two descriptors that play an important role as some of the NIT. First, a satellite delivery system descriptor will be explained. This type of descriptor is used as a first descriptor repeated in accordance with a TS (Transport Stream) descriptor length and is set as a pair together with a TSID. FIG. 8 shows the structure of the satellite delivery system descriptor. A descriptor tag is defined by a DVB and indicates the classification of each descriptor. In this descriptor, it is given as "0x43". The frequency indicates a transmission frequency for each stream (transponder herein). An orbit, a west longitude-east longitude and a Polarized wave indicate the orbit and polarized wave of a satellite, respectively. A modulation, a symbol rate and a forward error correction code (internal code) rate indicate specifications related to a transmission system, respectively. Secondary, a service list descriptor will be explained. This service list descriptor is used as second or later descriptors repeated in accordance with a TS (Transport Stream) descriptor length. The service list descriptor also indicates an ID of a service (channel) multiplexed onto the corresponding stream (the transponder here). Namely, a plurality of service list descriptors are attached to one TSID. Ohishi at Fig. 8:

Asserted Claims	Additional References and Disclosure
	FIG. 8  Ohishi at 6:53-7:9: An example of the operation of the receiver for receiving the above-described digital broadcast signals transmitted form the communication satellite 20 will be explained briefly. In the PAT and the PMT, each of the program numbers corresponds to a channel number selected by the viewer and the service ID corresponds to a channel number selected by the viewer in the NIT, respectively. Further, the NIT includes information about the entire network, i.e., all the transponders and makes the same tables transmitted in parallel through all the transponders, whereas the PAT and the PMT respectively comprise only information about transmitted programs lying within transponders, and are different in contents from one another every transponders. Now consider where a viewer has selected an "M" channel through the receiver. After the receiver has received an NIT through a fixed PID, "M" is searched for a service ID in a service list descriptor of the NIT. A satellite delivery system descriptor provided before the

Asserted Claims	Additional References and Disclosure
	service list descriptor including the service ID"M" in combination is received and the frequency of a transponder transmitting the "M" channel is recognized to thereby control a received frequency. Thereafter, a PAT is detected from a digital broadcast signal sent from the transponder transmitting the "M" channel and "M" is searched for a program number lying within the PAT. Ohishi at 7:63-8:5: Further, the signal processor 32-1 comprises an NIT detection circuit 44 for detecting an NIT (Network Information Table) from the MPEG2 transport packets S3 successively outputted from the ECC decoder 43, and a memory for storing a table NITa detected by the NIT detection circuit 44 and a memory 46 for storing a NITb being applicable to CATV, obtained by changing the table NITa stored in the memory 45 by means of the controller 31. The NIT detection circuit 44 detects the NIT based on the fixed PID. Ohishi at 8:6-14: Since the table structure of the NIT in the digital broadcast data related to the communication satellite 20 is represented as shown in FIG. 7 as described above, a table structure of the table NITa detected by the NIT detection circuit 44 is also similar to the above. In the controller 31, a satellite delivery system descriptor (see FIG. 8) having transmission frequency information or the like in the table NITa is changed to a CATV delivery system descriptor whose structure is shown in FIG. 11, upon obtaining the table NITb. Ohishi at Fig. 11:

Asserted Claims	Additional References and Disclosure

FIG. 11

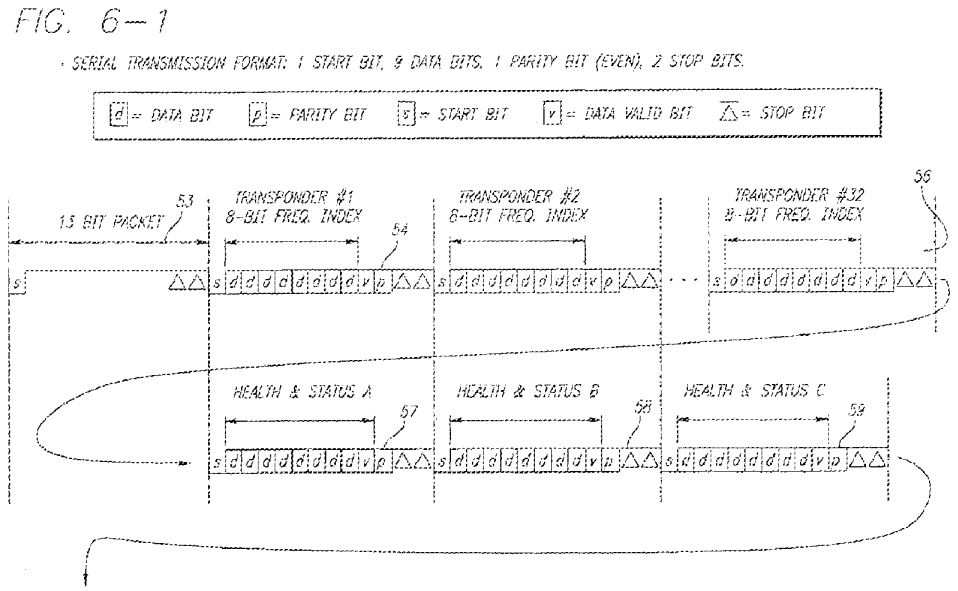


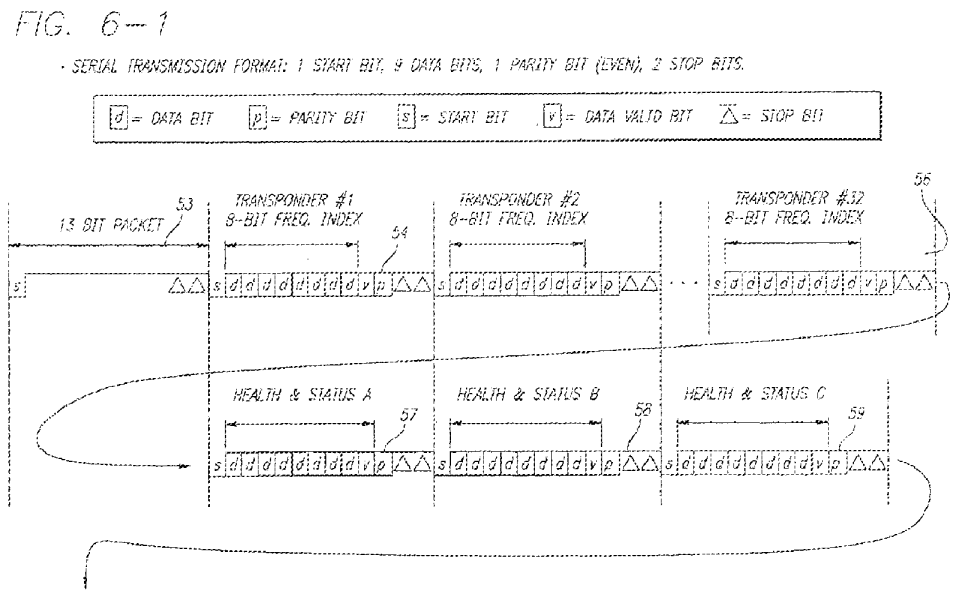
Ohishi at 9:4-15:

Each of the NIT substitution circuits 48 of the signal processors 32-2 through 32-N substitutes the NITb stored in the memory 46 of the signal processor 32-1 for the NIT. Further, each of the tuner 41 of the signal processors 32-2 through 32-N selects the corresponding digital broadcast signal sent from the second through Nth transponders of the communications satellite 20 out of a plurality of the digital broadcast signals received by the antenna 11 so that said digital broadcast signal is frequency-converted to obtain a QPSK-modulated signal Sl. The control unit 31 controls the received frequency of each of the tuner 41 of the signal processors 32-2 through 32-N by the interface 47.

Asserted Claims	Additional References and Disclosure
	Ohishi at 9:38-64: The MPEG2 transport packet S3 successively outputted from the ECC decoder 43 are supplied to the NIT detection circuit 44, where an NITa is detected from the MPEG2 transport packets S3. The detected table NITa is supplied to the memory 45 where it is stored therein. For example, such operation of detection of the NITa by the NIT detecting circuit 44 is carried out at once a day. The control unit 31 reads the corresponding table NITa from the memory 45 and changes a satellite delivery system descriptor (see FIG. 8) in the table NITa to a CATV delivery system descriptor (see FIG. 11). Further, the controller 31 deletes information about a TS (Transport Stream) ID corresponding to each digital broadcast signal unused in CATV in the table NITa, for example to thereby obtain a table NITb applicable to the CATV. Thereafter, the controller 31 causes the memory 46 to store the table NITb therein. Further, the MPEG2 transport packets S3 successively outputted from the ECC decoder 43 are supplied to the NIT substitution circuit 48 where an NIT is detected and the table NITb stored in the memory 46 is substituted for said the NIT. When, in this case, the information about the TS ID corresponding to each digital broadcast signal unused in the CATV in the table NITa is deleted by the controller 31 upon obtaining the table NITb, the NIT substitution circuit 48 inserts dummy bits into a portion related to the deleted information. Ohishi at 10:35-42: For this reason, such CATV digital broadcast signals BS-1 through BS-N changes only NIT out of a PSI (Program Specification Information) in digital satellite broadcasting. Thus, at the STB (Set Top Box) 14-1 through 14-m used as receiving terminals, which are connected to the transmission path 13 of CATV, the same operation for selecting channel as the operation for selecting channel at the receiver of the digital satellite broadcasting may be performed.

Asserted Claims	Additional References and Disclosure
	Staal at [0016]: The system modulates and upconverts the signal bytes in each MPEG2 QAM packet and passes them through a cable plant constructed to receive modulated QAM bytes (or NTSC signals) which are demodulated at the settop box. The additional FEC bytes correct to 8 errors within a MPEG2QAM packet and are then removed. The superpacket is deframed to obtain the original MPEG2QAM packets. After finding a first television channel, the side bytes are processed to determine the frequency location of the other channels in the apartment receivers and any existence of uncorrectable errors. The MPEG2QAM bytes are decompressed and encoded to reproduce the television images in the apartment receivers. Staal at [0042]-[0044]: FIG. 6 indicates a sequence of the thirteen (13) bit packets. As previously discussed, the first such packet 53 in the sequence indicates the start of the sequence of packets. The second one 54 of such packets is indicated as "Transponder #1". It indicates (in the 2nd through 9th bits) the particular frequency location in the cable plant that the television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals from the first one of the thirty two (32) transponders in the satellites 12, 14 and 16. In like manner, successive instances of such thirteen (13) bit packets indicate the frequency location in the cable plant that television receivers in the apartments in the apartment building should be tuned to receive the transmodulated television signals from successive channels of the thirty two (32) transponders in the apartment building. This may be seen from the designation of the second packet 54 in FIG. 6 as "Transponder #1" and from the designation in FIG. 6 of the thirty third (33rd) packet 56 in FIG. 4 as "Transponder #32". Successive instances 57 through 63 of the thirteen (13) bit packets after the packet 56 designated as "Transponder #32" are then provided. These 13-bit packets indicate other information than the particular frequency location of the television channel for the television signals from the different channels of the transponders in the satellites 12, 14 and 16. For example, the 13-bit groups 57-63, designated as "Health & Status A-G", may

Asserted Claims	Additional References and Disclosure
	indicate certain specified information such as the error messages, phone numbers for service, BER thresholds, transmodulator temperature, etc. Staal at Fig. 6-1:  Staal at [0058]: A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2QAM packets 42 in each superpacket. The MPEG2QAM packets 42 are then deframed as at 114 to recover the MPEG2QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123.

Asserted Claims	Additional References and Disclosure
	When the side bytes 48 are processed, the frequency location in the cable plant that television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above. Staal at Fig. 6-1:  Staal at [0058]:

Asserted Claims	Additional References and Disclosure
	A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2QAM packets 42 in each superpacket. The MPEG2QAM packets 42 are then deframed as at 114 to recover the MPEG2QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123. When the side bytes 48 are processed, the frequency location in the cable plant that television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above.
41. The method of claim 38, further comprising providing the channel translation table to the IRD to allow the IRD to tune to a desired selected translated transponder channel.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, further comprising providing the channel translation table to the IRD to allow the IRD to tune to a desired selected translated transponder channel. *See* claim 38, *supra*. *See, e.g.*: Eck at 1:7–9: The present invention relates to an autoscan system that determines a translation between satellite television frequencies and cable television frequencies. Eck at 1:54–64: A better alternative would be to store a frequency translation table in non-volatile memory of a set top box. This translation table would, therefore, contain the relationship between each satellite channel frequency indicated by the service data in the satellite signals and the corresponding unused cable channel frequency of the transmodulated signal. Accordingly, when a user selects a satellite channel, the set top box looks up the corresponding cable

Asserted Claims	Additional References and Disclosure
	channel frequency in the translation table and tunes the CATV tuner to the proper cable channel frequency corresponding to the satellite frequency of the selected satellite channel. Eck at 2:10–26: The present invention permits automatic loading of a translation table at installation of a set top box. In order to implement this automatic loading, the set top box is arranged to scan through the entire CATV frequency spectrum in order to find all possible transmodulated QAM signals. As each QAM signal is found, the satellite frequency contained in the satellite service data of the QAM signal is read and is loaded into the translation table in association with the cable frequency at which the QAM signal was found. Accordingly, when a user desires to tune to a particular program in one embodiment of the present invention, the user selects the appropriate satellite channel, the satellite service data corresponding to the selected satellite channel is read, the satellite frequency contained in this satellite service data is used to read the corresponding cable frequency from the translation table, and the CATV tuner is tuned to that cable frequency. Eck at 2:30–38: In accordance with one aspect of the present invention, a method of generating a translation table correlating satellite frequencies to cable frequencies comprises the following steps: a) tuning to a cable frequency; b) reading satellite service data from a signal at the cable frequency, wherein the satellite service data includes an indicium of a satellite frequency; c) storing in a translation table the indicium in association with the cable frequency of step a); and, d) repeating steps a)-c) for other cable frequencies. Eck at 2:39–52: In accordance with another aspect of the present invention, a method is provided to generate a translation table that correlates satellite frequencies carrying satellite QPSK signals to cable frequencies carrying corresponding QAM signals. The method comprises the following steps: a) scanning the cable frequencies; b) for each of the cable frequencies carrying a QAM signal, reading satellite service data from the corresponding QAM signal,

Asserted Claims	Additional References and Disclosure
	wherein the satellite service data includes a satellite frequency; and, c) storing in the translation table the satellite frequency contained in the satellite service data read from each QAM signal carried on a cable frequency, wherein each satellite frequency is stored in the translation table in association with a corresponding cable frequency. Eck at 2:53–61: In accordance with yet another aspect of the present invention, a translation table is stored on a computer readable storage medium. The translation table holds satellite frequency indicia and cable frequencies. The satellite frequency indicia correspond to satellite QPSK signals, and the cable frequencies correspond to cable QAM signals transmodulated from the QPSK signal. Each of the satellite frequency indicia as stored in the translation table uniquely corresponds to one of the cable frequencies. Eck at 7:55–8:3: When a QAM signal is fully locked, the satellite frequency is read from the service data contained in the acquired QAM signal. This satellite frequency is entered into the translation table in association with the CATV frequency at which the QAM signal just acquired was found. Thereafter, coarse scanning for the next QAM signal can be resumed in 1 MHZ increments starting with a frequency that is 6 MHZ (or 8 MHZ, depending on channel size) above the QAM signal that was just found. This process continues until the scanning is completed through the entire full scanning range. At this point, the translation table, which is stored in memory of the set top box, holds a complete set of all satellite frequencies and their corresponding CATV frequencies. Eck at 8:29–32: Moreover, as described above, the translation table holds satellite frequency, CATV frequency pairs. Instead, the translation table could hold satellite channel number, CATV frequency pairs.

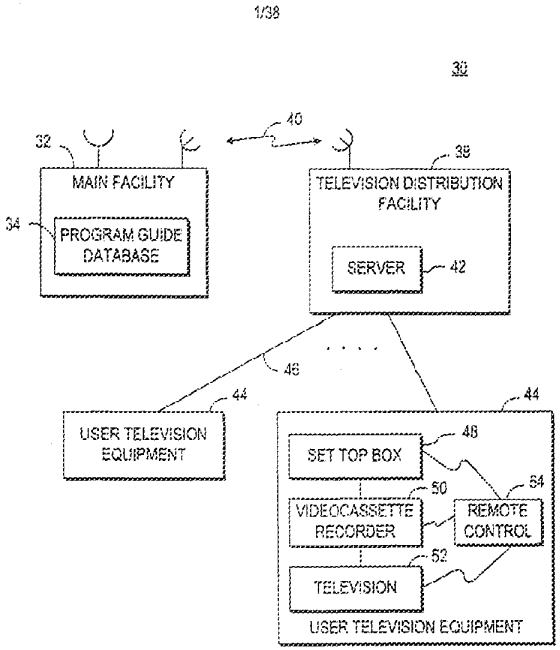
Asserted Claims	Additional References and Disclosure
	Oishi '713 at 2:12–32: More specifically, when BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals are mixed for transmission via the same cable in the conventional television signal transmission systems, the frequency allocation of the mixed signals is as shown in FIG. 2. Referring to FIG. 2, the frequency allocation includes the VHF low band A 11, the VHF mid band A12, the VHF high band A13, the VHF super high band A14, the UHF band A15, and the frequency band A16 for BS intermediate frequency signals. When CS intermediate frequency signals are also mixed with the BS intermediate frequency signals and the VHF-band and UHF-band terrestrial broadcasting signals for transmission via the same cable, frequency bands A17 and A18 above the frequency band A16 for BS intermediate frequency signals are allocated respectively for vertically polarized signals and horizontally polarized signals of the CS intermediate frequency signals. The vertically polarized signals and the horizontally polarized signals of the CS intermediate frequency signals in the 1-GHz band B11 and B12 are frequency-shifted into the frequency bands A17 and A18. Oishi at 2:33–43: As described above, by frequency-shifting CS intermediate frequency signals so that the CS intermediate frequency signals are allocated in the frequency bands A 17 and A18 above the frequency band A16 for BS intermediate frequency signals, the frequency band A16 for BS intermediate frequency signals and the frequency bands A17 and A18 for CS intermediate frequency signals do not overlap, allowing the VHF-band and UHF-band terrestrial broadcasting signals, the BS intermediate frequency signals, and the CS intermediate frequency signals to be transmitted via a single cable. Oishi at 4:57–5:9: FIG. 3 shows the frequency allocation of signals transmitted via a cable. Referring to FIG. 3, A 1 (90 MHz to 108 MHz) is the VHF low band, A2 (108 MHz to 170 MHz) is the VHF mid band, A3 (170 MHz to 222 MHz) is the VHF high band, A4 (222 MHz to 470 MHz)

Asserted Claims	Additional References and Disclosure
	is the VHF super high band, A5 (470 MHz to 770 MHz) is the UHF band, and A6 (1035 MHz to 1335 MHz) is a band for intermediate frequency signals of BS broadcasting signals. Currently, the VHF low band A1 and the VHF high band A3 are used for VHF terrestrial television broadcasting, and the UHF band A5 is used for UHF terrestrial television broadcasting. The VHF mid band A2 and the VHF super high band A4 are allocated for CATV (Cable Television); and therefore, the bands are vacant where CATV service is not used. The BS broadcasting signals are broadcast on electromagnetic waves in the 12-GHz band. When received via a parabola antenna, the BS broadcasting signals are converted into intermediate frequency signals in the 1-GHz band in an LNB (Low Noise Block Down Converter) provided in association with the parabola antenna. Oishi at 9:34–42: The setting for the CS tuner 13 is made via an operation unit 62, and the setting is displayed in a display unit 63. The control circuit 61 is provided with a frequency conversion table 64. The frequency conversion table 63 shows the correspondence between the frequency information of the satellite system shown in NIT (Network Information Table) and the frequency information of the transmission system of the signals transmitted via the cable 10. The frequency conversion table 64 is referenced when the receiving frequency is set in the tuner circuit 43. Oishi at 9:48–56: An ordinary CS broadcast receiver obtains NIT including information regarding carrier frequency characteristics, and based thereon, set the receive frequency to a desired channel. Then, reference is made to PAT (Program Association Table) packet. PAT includes information regarding channels on the carrier waves, and PID for PMT (Program Map Table) representing the contents for each of the channels. Based on the PAT information, video packets and audio packets for a desired channel on the carrier waves are separated, so that a desired program is received. Oishi at 9:57–65:

Asserted Claims	Additional References and Disclosure
	In accordance with the system, however, the CS intermediate frequency signals are frequency-shifted into a vacant channel in the VHF band or in the UHF band in the modulation format conversion unit 4 when the signals are transmitted to each household via the cable 10; thus, it is not feasible to set receive frequency directly from NIT information. It may be possible, but very complex, to rewrite NIT information when the signals are frequency-shifted in the modulation format conversion unit 4. Oishi at 9:66–10:3: Accordingly, in this embodiment, a frequency conversion table 54 is provided. The frequency conversion table stores the correspondence between frequency information for the satellite system obtained from the NIT and frequency information for the signal transmitted via the cable 10. Oishi at 10:4–10: In order to receive a desired program, NIT information must be obtained. NIT information is not frequently updated, and is provided once a day and stored in a storage medium within the receiver apparatus. FIG. 7 shows the data structure of NIT. NIT includes satellite delivery descriptor which describes frequency information and transmission parameters required to receive the signals. Oishi at 10:11–15: FIG. 8 shows the data structure of the satellite delivery descriptor. Information regarding programs for each channel is described in service list descriptor included in NIT. The data structure of the service list descriptor is shown in FIG. 9. Oishi at 10:16–23: In receive operation, first, information regarding the channel, i.e., frequency band, including a desired program is obtained from the service list descriptor and the satellite delivery descriptor included in NIT. Then, a frequency of the cable transmission system

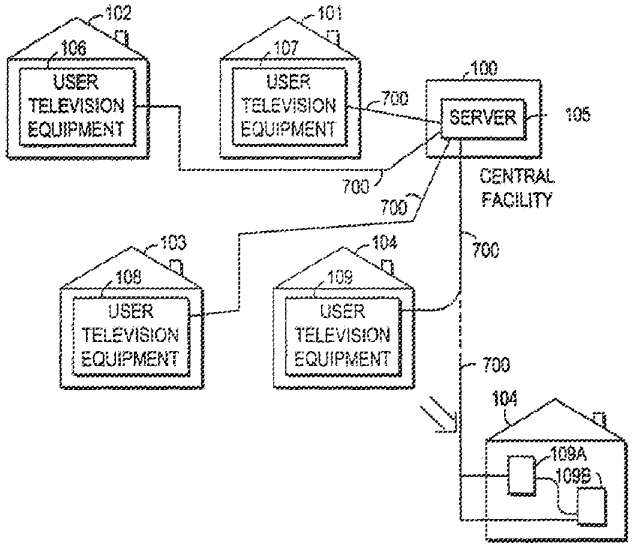
Asserted Claims	Additional References and Disclosure
	corresponding to the obtained frequency is read from the frequency conversion table 64. The receive frequency of the tuner circuit 43 is set in accordance with the frequency read from the frequency conversion table 64. Oishi at 10:24–27: Then, reference is made to PAT packets, and based on PAT information, video packets and audio packets with PID corresponding to a desired channel are separated, so that a desired program is received. Oishi at 10:28–34: The frequency conversion table 64, which shows the correspondence between the frequency information of the satellite system described in NIT included in data transmitted from a satellite, and actual frequency information of the signals transmitted via the cable 10, is created when the system is initially powered on after the system is configured, in a processing as shown in FIG. 10. Oishi at 10:34–42: FIG. 10 is a flowchart showing an example of processing for creating the frequency conversion table 64 which shows the correspondence between the frequency information described in NIT of the satellite system and the frequency information of the cable transmission system. Referring to FIG. 10, in step S1, a desired channel is specified, for example, via a menu displayed on the screen, so that corresponding QAM signals are received and NIT information is obtained. Oishi at 10:43–58: In a television signal transmission system, once the frequency information of the cable transmission system is set, the information need not be frequently updated. In addition, channel information in the initial setting can be notified to the viewers by, for example, those in charge of management of the relevant facility. Thus, in step S 2, the frequency

Asserted Claims	Additional References and Disclosure
	information of the cable transmission system is input via, for example, initial setting menu displayed on the screen. Accordingly, the frequency conversion table 64, which shows the correspondence between the frequency information of the satellite system and the frequency information of the cable transmission system, is created and stored in memory in step S3. Because the channels for retransmission of the CS signals are fixed, i.e., the bands A2 and A4 in FIG. 3, the setting of frequency information can be made in accordance with the setting of the modulation format conversion unit 4 prior to shipping of receiver apparatuses. Ellis at 11:17-12:5: Detailed Description of the Preferred Embodiments An illustrative program guide system 30 in accordance with the present invention is shown in FIG. 1. Main facility 32 contains a program guide database 20 34 for storing program guide information such as television program guide program listings data, pay-per-view ordering information, television program promotional information, etc. Information from database 34 may be transmitted to multiple television 25 distribution facilities such as television distribution facility 38 via communications links such as communications link 40. Only one such television distribution facility 38 and one communications link 40 are shown in FIG. 1 to avoid over-complicating the 30 drawings. Link 40 may be a satellite link, a telephone network link, a cable or fiber optic link, a microwave link, a combination of such links, or any other suitable communications path. If it is desired to transmit video signals (e.g., for advertising and promotional videos) over link 40 in addition to data signals, a relatively high bandwidth link such as a satellite link is generally preferable to a relatively low bandwidth link such as a telephone line. Ellis at Fig. 1:

Asserted Claims	Additional References and Disclosure
	 *FIG. 1* Ellis at 12:6-14: Television distribution facility 38 is a facility for distributing television signals to users, such as a cable system headend, a broadcast distribution facility, or a satellite television distribution facility or the like.

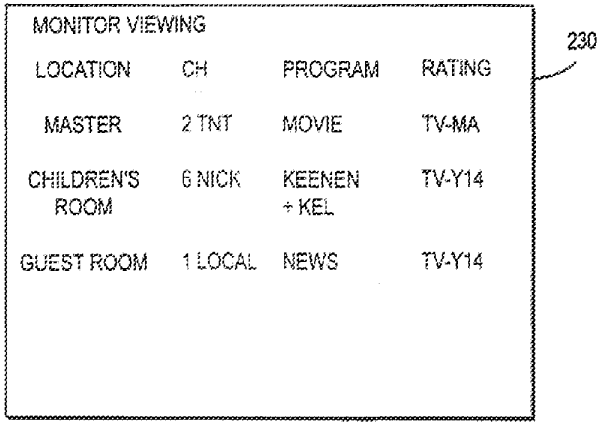
Asserted Claims	Additional References and Disclosure
	The program guide information transmitted by main facility 32 to television distribution facility 38 includes television program listings data such as program times, channels, titles, descriptions, etc. Ellis at 12:31-13:4: A server 42 may be provided in television distribution facility 38 for handling data distribution tasks and for storing local information. If desired, server 42 may be used to implement a client-server based interactive television program guide system. In such a system, client functions may be performed at user television equipment 44. Server 42 may be capable of handling text, graphics, and video. Ellis at 13:5-11: Television distribution facility 38 distributes program guide and advertising information to the user television equipment 44 of multiple users via communications paths 46. Program guide data and other information may be distributed over an out-of-band channel on paths 46 or using any other suitable distribution technique. Ellis at 13:12-14:3 Each user has a receiver, which is typically a set-top box such as set-top box 48, but which may be other suitable television equipment into which circuitry similar to set-top-box circuitry has been integrated. If desired, user television equipment 44 may be an advanced television receiver or a personal computer television (PC/TV). For purposes of illustration, the present invention will generally be described in connection with user television equipment based on a set-top box arrangement. Program guide data may be distributed to set-top boxes 48 periodically and stored or may be distributed continuously and handled "on the fly.", or by request. Television distribution 25 facility 38 may poll set-top boxes 48 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated authorization techniques). Main facility 32 preferably contains a processor to handle

Asserted Claims	Additional References and Disclosure
	information distribution tasks. Each set-top box 48 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 48. Television distribution facility 38 may contain a processor for tasks associated with implementing server 42 and for handling tasks associated with the distribution of program guide and other information. Ellis at 14:4-13: Each set-top box 48 is may connected to an optional videocassette recorder 50 or other suitable recording device (e.g., digital storage device) so that selected television programs may be recorded. Each videocassette recorder 50 may be connected to a television 52. To record a program, set-top box 48 tunes to a particular channel and sends control signals to videocassette recorder 50 (e.g., using an infrared transmitter) that direct videocassette recorder 50 to start and stop recording at the appropriate times. Ellis at 19:16-20:4: FIG. 7a shows an illustrative configuration in which multiple homes are handled by a common server. Server 105 may be located at central facility 100. Central facility 100 may be a private home, a 20 commercial building, a network node, or other suitable structure that may be connected to a plurality of homes. In the example of FIG. 7a, server 105 is connected to user television equipment 106, 107, 108, and 109 that is located in homes 101, 102, 103, and 104, respectively via communication paths 700. When multiple user television equipment devices exist within a home as shown by devices 109a and 109b, each user television equipment device may communicate with the server 105 independently via communication paths 700, alternatively only one device may communicate while the other communicates via a home network. In other words, in alternative arrangements, there are either 1) multiple connections to an outside server and each user television equipment device communicates with the server independently with no need for an in-home network, or, 2) only one connection to an outside server and each user television device communicates with each other through an in-home network.

Asserted Claims	Additional References and Disclosure
	Ellis at Fig. 7a:  FIG. 7a Ellis at 20:11-26: Graphics information for messages, advertisements and the like may be downloaded periodically (e.g., once per day) to set-top boxes 48 of FIG. 1 and stored locally. The graphics information may be accessed locally when needed by the program guides implemented on set-top boxes 48. Graphics information may also be provided in a continuously looped arrangement on one or more digital channels on paths 46. With such a

Asserted Claims	Additional References and Disclosure
	continuously-looped arrangement, a map indicating the location of the latest graphics information may be downloaded periodically to set-top boxes 48 (e.g., once per day) or continuously. This allows the content on the digital channels to be updated. The program guides on set-top boxes 48 may use the map to locate desired graphics information on the digital channels. Ellis at 23:29-24:6: In any of the above arrangements, an interactive television program guide on each user television equipment device may provide various features for displaying television program listings information for the user and for providing various program guide functions such as parental control, favorites, pay-per-view purchasing, etc. For example, if the user presses the appropriate buttons on remote control 54, the user may be presented with a time-ordered or channel-ordered grid or table of television program listings or other such programming information. Ellis at 27:16-24: At step 1015, the user can access parental control screen 190 of FIG. 16 and may use remote control 54 to navigate between options such as set channels option 191, set maximum rating option 193, and monitor viewing option 195. The user may navigate to set channels screen 200 of FIG. 18a by selecting set channels option 191 at step 1016 of FIG. 17 by moving the highlight region 192 and pressing select. Ellis at 27:25-31: If the user selects set channels option 191 at step 1016, at step 1020 the program guide provides the user with an opportunity to set which channels are to be blocked. The user may block specific channels using remote control 54 to scroll through and select 30 from channel options 201, 202, 203, and 204 of FIG. 18a. Ellis at 29:11-27:

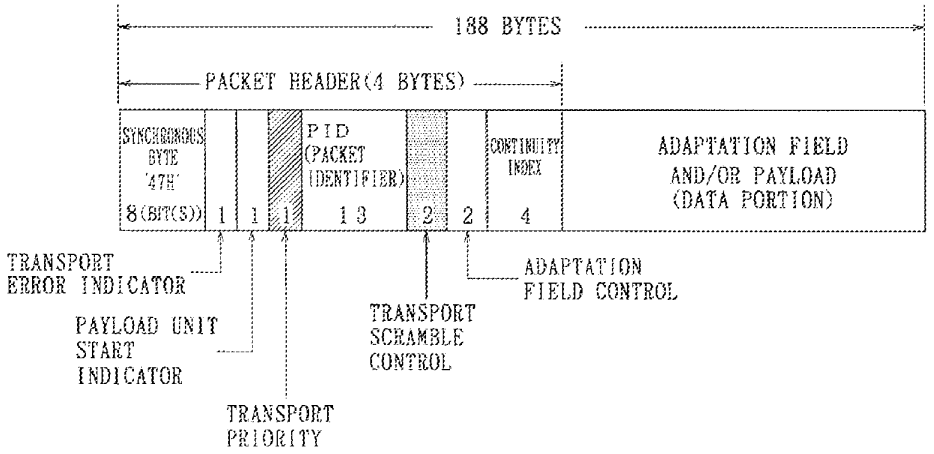
Asserted Claims	Additional References and Disclosure
	The program guide at the user's location may then, in one alternative, provide the user with monitor viewing screen 230, which shows the channel that each location is currently viewing or an overlay such as a banner or small information box that shows the channels that the other locations are viewing, but that also allows the user to continue watching programming at the user's location. The program guide at the user's location may poll the program guides at other locations within the household to determine whether anyone is currently viewing television and to which channels they are tuned. The monitor viewing screen may also allow the viewing of video, audio, or still images associated with the channel being viewed at another location. For example, the video of the remote location may be shown in a small box on the screen while the current channel's video is in the background. Ellis at Fig. 19:

Asserted Claims	Additional References and Disclosure
	 *FIG. 19* Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250. The multiple channels on bus 250 are provided synchronously and simultaneously to the

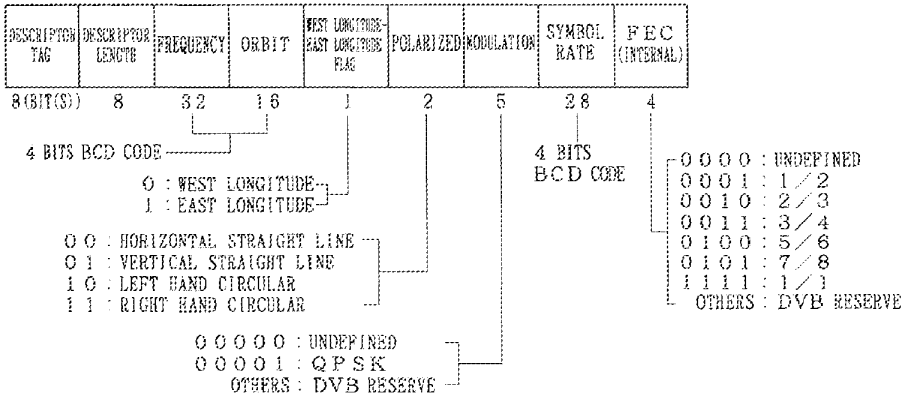
Asserted Claims	Additional References and Disclosure
	series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10. Ohishi at 1:7-20: This invention relates generally to a signal processing device preferably being used when digital broadcasting programs broadcast through an arbitrary network are transmitted to another network, and a switching method of signal processors suitable for use in the signal processing device. More specifically, this invention relates to a signal processing device being able to transmit the digital broadcasting programs broadcast through a first network to a second network by detecting a NIT (Network Information Table) from digital broadcast data on the first network, changing the NIT so as to be applicable to the second network and substituting said changed NIT for the NIT of digital broadcast data on the first network to obtain digital broadcast data on the second network.

Asserted Claims	Additional References and Disclosure
	Ohishi at 2:12-35: The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first table-detecting means detects the NIT from digital broadcast data on the first network and the table changing means changes said NIT so that the NIT is applicable to said second network. For example, when a cable television enterprise or the like provides delivery service of a satellite digital multi-channel broadcast with transmitting device for modulation and conversion or the like by using its own network, a frequency information of the NIT is changed. Further, preferably, said table-changing means deletes an information relating to the digital broadcast signal failing to correspond to a digital information signal on said second network, from the digital broadcast signal on said first network when the number of digital broadcast signal on said second network becomes less than the one of digital broadcast signal on said first network. Ohishi at 4:65-5:31: Referring now to FIG. 1, there is shown a digital CATV system 10 as a preferred embodiment of the invention, which is used for a satellite digital multi-channel broadcast.

Asserted Claims	Additional References and Disclosure
	The system 10 comprises an antenna 11 for receiving digital broadcast signals sent from a plurality of transponders (satellite repeaters) of a communication satellite 20, and a transmitting device for modulation and conversion 12 for converting a transmission frequency of each received digital broadcast signal, and changing a modulation scheme thereof, etc. to generate a CATV digital broadcast signal and transmitting it to a transmission path 13. Incidentally, STB (Set Top Box) 14-1 through 14-m used as receiving terminals are electrically connected to the transmission path 13. Images in channels selected by these STE 14-1 through 14-m are respectively displayed on monitors 15-1 through 15-m corresponding to the STE 14-1 through 14-m. The digital broadcast signals transmitted from the communication satellite 20 will first be explained. In the present embodiment, the digital broadcast signals are ones corresponding to a DVB (Digital Video Broadcasting) system. FIG. 2B shows a frame configuration of digital broadcast data employed in the DVB system. One frame of the digital broadcast data comprises eight MPEG2 transport packets (see FIG. 2A). In this case, by using a synchronous byte lying within each packet, one synchronous byte (=4 7H) every eight packets is inverted to a byte (=ESH) so that the frame synchronization thereof maybe obtained. Incidentally, an error correction code based on reed solomon (204, 188) is added to each MPEG2 transport packet (MPEG2 TS packet) The digital broadcast data shown in FIG. 2B is QPSK (Quadrature Phase Shift Keying)-modulated and thereafter frequency-converted into an SHF band, thus resulting in digital broadcast signals transmitted from the communication satellite 20. Ohishi at 5:32-45: FIG. 3 shows a packet configuration of an MPEG2 transport packet composed of 188 bytes. The leading four bytes of said 188 bytes constitute a packet header. A PID (Packet Identifier) indicative of the attribute of an individually provided stream (data string) of the corresponding packet is placed in the packet header. As is well known, a PES (Packetized Elementary Stream) packet indicative of a packet configuration as shown in FIG. 4 is disposed in a payload (data portion) of the MPEG2 transport packet in re-divided form. Further, a PAT (Program Association Table), a PMT (Program Map Table), an NIT

Asserted Claims	Additional References and Disclosure
	(Network Information Table), etc. used as PSI (Program Specific Information) defined in an MPEG2 system are also provided in the payload. Ohishi at Fig. 3: FIG. 3  Ohishi at 6:4-15: FIG. 6 shows a table structure of the PMT. An explanation will be made of principal contents which does not overlap with the PAT. A table ID indicates the classification of a table and is given as "0x02" in the case of the PMT. A PCR PID indicates a PID of the packet including a program clock reference (PCR) defined as the reference upon decoding.

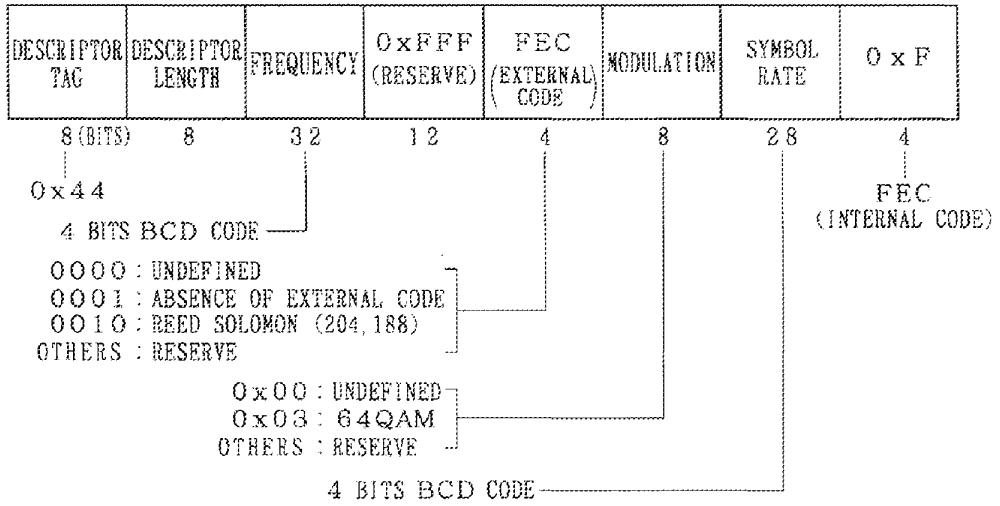
Asserted Claims	Additional References and Disclosure
	A stream type indicates the type of signal transmitted in the form of a stream such as video, audio and added data. Further, the NIT indicates physical information on a transmission path, i.e., satellite orbits, polarized waves, frequencies every transponders, etc., in the case of a satellite. As described above, the PAT specifies the PID of the NIT itself. Ohishi at 6:16-45: FIG. 7 indicates a table structure of the NIT. An explanation will be made of principal contents thereof, which does not overlap with the PAT and PMT. A table ID indicates the type of table. The corresponding network is given as "0x40" and other networks are given as "0x41". A network ID is used to identify each network. In the case of satellites, the network ID corresponds to each satellite. An explanation will further be made of two descriptors that play an important role as some of the NIT. First, a satellite delivery system descriptor will be explained. This type of descriptor is used as a first descriptor repeated in accordance with a TS (Transport Stream) descriptor length and is set as a pair together with a TSID. FIG. 8 shows the structure of the satellite delivery system descriptor. A descriptor tag is defined by a DVB and indicates the classification of each descriptor. In this descriptor, it is given as "0x43". The frequency indicates a transmission frequency for each stream (transponder herein). An orbit, a west longitude-east longitude and a Polarized wave indicate the orbit and polarized wave of a satellite, respectively. A modulation, a symbol rate and a forward error correction code (internal code) rate indicate specifications related to a transmission system, respectively. Secondary, a service list descriptor will be explained. This service list descriptor is used as second or later descriptors repeated in accordance with a TS (Transport Stream) descriptor length. The service list descriptor also indicates an ID of a service (channel) multiplexed onto the corresponding stream (the transponder here). Namely, a plurality of service list descriptors are attached to one TSID.

Asserted Claims	Additional References and Disclosure
	Ohishi at Fig. 8: FIG. 8  Ohishi at 6:53-7:9: An example of the operation of the receiver for receiving the above-described digital broadcast signals transmitted form the communication satellite 20 will be explained briefly. In the PAT and the PMT, each of the program numbers corresponds to a channel number selected by the viewer and the service ID corresponds to a channel number selected by the viewer in the NIT, respectively. Further, the NIT includes information about the entire network, i.e., all the transponders and makes the same tables transmitted in parallel through all the transponders, whereas the PAT and the PMT respectively comprise

Asserted Claims	Additional References and Disclosure
	only information about transmitted programs lying within transponders, and are different in contents from one another every transponders. Now consider where a viewer has selected an "M" channel through the receiver. After the receiver has received an NIT through a fixed PID, "M" is searched for a service ID in a service list descriptor of the NIT. A satellite delivery system descriptor provided before the service list descriptor including the service ID"M" in combination is received and the frequency of a transponder transmitting the "M" channel is recognized to thereby control a received frequency. Thereafter, a PAT is detected from a digital broadcast signal sent from the transponder transmitting the "M" channel and "M" is searched for a program number lying within the PAT. Ohishi at 7:63-8:5: Further, the signal processor 32-1 comprises an NIT detection circuit 44 for detecting an NIT (Network Information Table) from the MPEG2 transport packets S3 successively outputted from the ECC decoder 43, and a memory for storing a table NITa detected by the NIT detection circuit 44 and a memory 46 for storing a NITb being applicable to CATV, obtained by changing the table NITa stored in the memory 45 by means of the controller 31. The NIT detection circuit 44 detects the NIT based on the fixed PID. Ohishi at 8:6-14: Since the table structure of the NIT in the digital broadcast data related to the communication satellite 20 is represented as shown in FIG. 7 as described above, a table structure of the table NITa detected by the NIT detection circuit 44 is also similar to the above. In the controller 31, a satellite delivery system descriptor (see FIG. 8) having transmission frequency information or the like in the table NITa is changed to a CATV delivery system descriptor whose structure is shown in FIG. 11, upon obtaining the table NITb. Ohishi at Fig. 11:

Asserted Claims	Additional References and Disclosure

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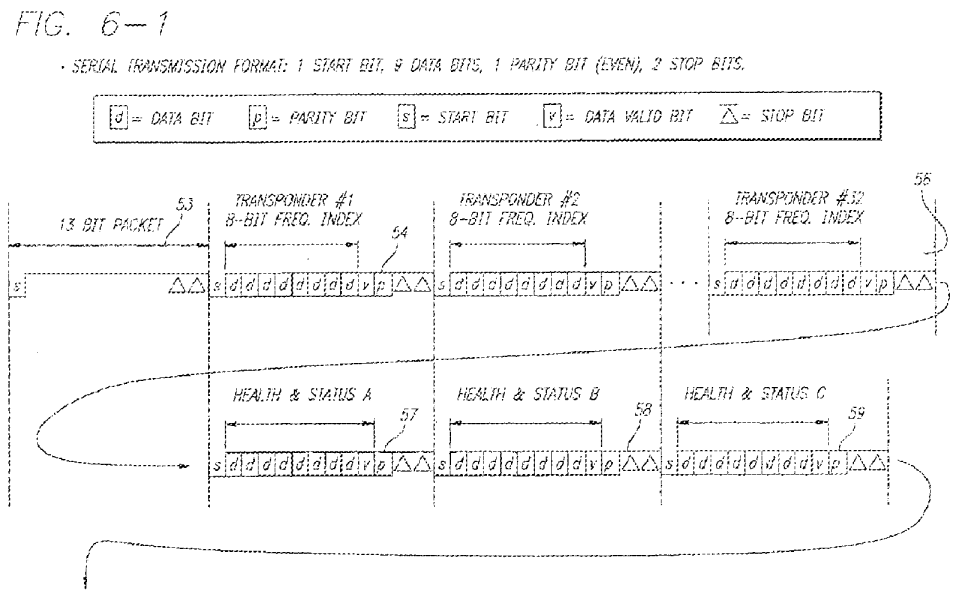


Ohishi at 9:4-15:

Each of the NIT substitution circuits 48 of the signal processors 32-2 through 32-N substitutes the NITb stored in the memory 46 of the signal processor 32-1 for the NIT. Further, each of the tuner 41 of the signal processors 32-2 through 32-N selects the corresponding digital broadcast signal sent from the second through Nth transponders of the communications satellite 20 out of a plurality of the digital broadcast signals received by the antenna 11 so that said digital broadcast signal is frequency-converted to obtain a QPSK-modulated signal Sl. The control unit 31 controls the received frequency of each of the tuner 41 of the signal processors 32-2 through 32-N by the interface 47.

Asserted Claims	Additional References and Disclosure
	Ohishi at 9:38-64: The MPEG2 transport packet S3 successively outputted from the ECC decoder 43 are supplied to the NIT detection circuit 44, where an NITa is detected from the MPEG2 transport packets S3. The detected table NITa is supplied to the memory 45 where it is stored therein. For example, such operation of detection of the NITa by the NIT detecting circuit 44 is carried out at once a day. The control unit 31 reads the corresponding table NITa from the memory 45 and changes a satellite delivery system descriptor (see FIG. 8) in the table NITa to a CATV delivery system descriptor (see FIG. 11). Further, the controller 31 deletes information about a TS (Transport Stream) ID corresponding to each digital broadcast signal unused in CATV in the table NITa, for example to thereby obtain a table NITb applicable to the CATV. Thereafter, the controller 31 causes the memory 46 to store the table NITb therein. Further, the MPEG2 transport packets S3 successively outputted from the ECC decoder 43 are supplied to the NIT substitution circuit 48 where an NIT is detected and the table NITb stored in the memory 46 is substituted for said the NIT. When, in this case, the information about the TS ID corresponding to each digital broadcast signal unused in the CATV in the table NITa is deleted by the controller 31 upon obtaining the table NITb, the NIT substitution circuit 48 inserts dummy bits into a portion related to the deleted information. Ohishi at 10:35-42: For this reason, such CATV digital broadcast signals BS-1 through BS-N changes only NIT out of a PSI (Program Specification Information) in digital satellite broadcasting. Thus, at the STB (Set Top Box) 14-1 through 14-m used as receiving terminals, which are connected to the transmission path 13 of CATV, the same operation for selecting channel as the operation for selecting channel at the receiver of the digital satellite broadcasting may be performed.

Asserted Claims	Additional References and Disclosure
	Staal at [0016]: The system modulates and upconverts the signal bytes in each MPEG2 QAM packet and passes them through a cable plant constructed to receive modulated QAM bytes (or NTSC signals) which are demodulated at the settop box. The additional FEC bytes correct to 8 errors within a MPEG2QAM packet and are then removed. The superpacket is deframed to obtain the original MPEG2QAM packets. After finding a first television channel, the side bytes are processed to determine the frequency location of the other channels in the apartment receivers and any existence of uncorrectable errors. The MPEG2QAM bytes are decompressed and encoded to reproduce the television images in the apartment receivers. Staal at [0042]-[0044]: FIG. 6 indicates a sequence of the thirteen (13) bit packets. As previously discussed, the first such packet 53 in the sequence indicates the start of the sequence of packets. The second one 54 of such packets is indicated as "Transponder #1". It indicates (in the 2nd through 9th bits) the particular frequency location in the cable plant that the television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals from the first one of the thirty two (32) transponders in the satellites 12, 14 and 16. In like manner, successive instances of such thirteen (13) bit packets indicate the frequency location in the cable plant that television receivers in the apartments in the apartment building should be tuned to receive the transmodulated television signals from successive channels of the thirty two (32) transponders in the apartment building. This may be seen from the designation of the second packet 54 in FIG. 6 as "Transponder #1" and from the designation in FIG. 6 of the thirty third (33rd) packet 56 in FIG. 4 as "Transponder #32". Successive instances 57 through 63 of the thirteen (13) bit packets after the packet 56 designated as "Transponder #32" are then provided. These 13-bit packets indicate other information than the particular frequency location of the television channel for the television signals from the different channels of the transponders in the satellites 12, 14 and 16. For example, the 13-bit groups 57-63, designated as "Health & Status A-G", may

Asserted Claims	Additional References and Disclosure
	indicate certain specified information such as the error messages, phone numbers for service, BER thresholds, transmodulator temperature, etc. Staal at Fig. 6-1:  Staal at [0058]: A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2QAM packets 42 in each superpacket. The MPEG2QAM packets 42 are then deframed as at 114 to recover the MPEG2QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123. When the side bytes 48 are processed, the frequency location in the cable plant that television receivers in the apartments in the apartment building should tune to receive the

Asserted Claims	Additional References and Disclosure
	transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above.
42. The method of claim 14, wherein selecting and extracting comprises low-pass filtering the translated digitized broadband signal thereby substantially removing signal information from non-selected transponder channels.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein selecting and extracting comprises low-pass filtering the translated digitized broadband signal thereby substantially removing signal information from non-selected transponder channels. *See* claim 14, *supra*. *See, e.g.*: Chanteau at 1:46–54: For this purpose, a device according to the invention comprises at least a down-converter for selecting from a satellite source a signal that transports digital data so as to lower the signal frequency and bring the frequency to within the frequency range of the signals transmitted by the terrestrial source, and at least a coupler, called digital signal coupler, for inserting the signal that has a lowered frequency between those coming from the terrestrial source. Chanteau at 2:45–53: Television signals transmitted by terrestrial channel, received by antenna 50, are amplified by an amplifier 55 which covers a range of frequencies running from 45 to 862 MHz and are sent over a cable T through a low-pass filter 56 whose cutoff frequency is about 900 MHz. These terrestrial signals are then applied both to the four cables 1-4 by means of the

Asserted Claims	Additional References and Disclosure
	couplers CT1, CT2, CT3, CT4 and these cables, in addition to signals received from the satellite, each deliver all the signals received from terrestrial stations. Chanteau at 2:54–3:6: The installation additionally includes down-converters DC1 to DC3 which permit of taking from satellite sources at least one signal which transports digital data and the lowering of its frequency to bring the frequency to within the range of frequencies of the signals received by terrestrial channel. Here, for example, the down-converter DC1 receives from the satellite source 41 signals comprising, inter alia, digital data signals, lowers their frequency by known means which are not shown, such as an oscillator associated to a mixer, and a given data channel is selected by means of a bandpass filter BP1. Another bandpass filter BP2 selects another data channel of the same satellite. The down-converter DC2 with the filters BP3 and BP4 performs the same functions for two other data channels coming from the satellite source 21. The assembly DC3+BP5 still performs the same function for a single data channel coming from the satellite source 11. The source 31 may, for example, not have any data channel, or the residents of the premises may not be interested in the data channels it has. Chanteau at 3:7–19: The data channels selected by BP1 and BP2, of which the frequency is lowered, are added together in the cable T by means of a digital signal coupler CN12, those of BP3 and BP4 by a coupler CN34, and those of BP5 by a coupler CN5. As, generally, there are not many terrestrial transmitters suitable for reception at a given point, there is room in the 45-862 MHz range for adding data channels. The couplers CN are arranged upstream of the terrestrial signal couplers CT in the connection T coming from the terrestrial source. These couplers could also be inserted between the antenna 50 and the amplifier 55, or also arranged on the cables 1-4, but in the latter case one would need four times as many of them. Tu at Abstract:

Asserted Claims	Additional References and Disclosure
	Methods and systems for processing a single sub-channel that includes two or more combined channels. Using intermediate frequency sub-sampling, two or more channels from a broad band signal are combined into a single sub-channel for further analog and digital processing. Each of the two or more channels is down converted to an intermediate frequency, filtered to remove certain undesired channels, and combined such that the two or more channels are adjacent to each other. A digital representation of the sub-channel is produced from the combined intermediate frequency channels. Each channel within the digital representation is down converted to baseband, and the in-phase and quadrature components are separated from each other. Compared to one direct down conversion technique, intermediate frequency sub-sampling as described in the application may reduce the number of analog to digital converters and control amplifiers used in analog processing by a factor of four. Tu at 2:25-37: Beginning with the analog processing shown in FIG. 3A, RF switch 312 receives an L-band radio frequency input signal that is approximately 1 GHz wide (from about 900 MHz to about 2200 MHz). The input signal contains multiple transponder channels that may be referred to as simply transponders or channels. Wide-band low noise amplifier ("LNA WB") 316 ensures that the received signal power level is sufficient for the processing that follows. Signals outside of the bandwidth of interest are rejected by wide-band band pass filter ("BPF WB") 322. Eight frequency synthesizers 328 use crystal oscillator 326 to generate appropriate frequencies for directly converting one or more channels to baseband. Tu at 7:64-8:14: Wide-band band pass filter ("BPF WB") 422 rejects unwanted out of band spurious and image frequency components, such as may be created in down converting satellite signals to the input signal. For example, although not shown, unwanted out of band spurious and image frequency components may be present below channel T1 and above channel Tn of FIG. 5A. The 3 dB pass-band is approximately 1125 MHz wide centered at about 1550 MHz with cut-off frequencies at about 925 MHz and 2050 MHz. The amplitude response

Asserted Claims	Additional References and Disclosure
	of BPF WB 422 varies no more than about 0.2 dB and the phase response departs less than +/−3 degrees from linear phase shift, for any 63 MHz frequency band within the pass-band. Amplitude variation within the pass-band is less than 3 dB. The 40 dB stop-band frequencies at 725 MHz and 2250 MHz, and the amplitude response is at least 40 dB attenuated for both upper side and lower side frequencies of the stop-band. BPF WB 422 has an insertion loss of less than 3 dB. Tu at 10:32-63: Band pass filters 439 reject undesired lower and upper sideband transponder channels after the IF1 and IF2 signal paths are combined by power summers 437 into a sub-channel of two tuned transponder channels that are adjacent to each other (only band pass filter 439-1-2 is shown). The rejection of undesired transponder channels helps the automatic gain control loop ("AGC") to operate properly since the architecture uses wide band analog to digital ("A/D") converters. (The AGC loop is described more fully below with reference to amplifiers 436, A/D converters 442, and FIG. 4B). Rejecting undesired channels prevents A/D saturation when a high signal level is present at its input and helps translate the desired analog signal to a digital format. Band pass filters 439 are an example of third removal means for removing signals below the first channel and signals above the second channel from the combined first and second intermediate frequencies. For band pass filters 439, the amplitude response varies no more than about 0.2 dB, and the phase response has less than +/−3 degrees departure from linear phase shift, for any 63 MHz frequency band within the pass-band from (IF1−0.7Rs) MHz to (IF2+0.7Rs) MHz. The amplitude variation within the pass-band is less than 0.4 dB. The 3 dB pass-band frequencies are at (IF1−0.75Rs) MHz and (IF2+0.7Rs) MHz and the 30 dB stop-band frequencies are at (IF1−1.4Rs) MHz and (IF2+1.4Rs) MHz. For frequencies lower or higher than the stop-band frequencies, the amplitude response is at least 30 dB attenuated. Insertion loss for band pass filters 439 is less than 3 dB. FIG. 5G shows the combined channels T3 and T15, after a band bass filter 439 has removed undesired upper and lower sideband channels, with IFc being the center frequency of the channel pair.

Asserted Claims	Additional References and Disclosure
	Gain control amplifiers ("AMPs") 436 are second stage am Tu at Claim 1: 1. A system capable of receiving a signal that includes a plurality of channels, wherein the system allows at least two channels to be selected from the plurality of channels and combined into one sub-channel, such that certain signal processing may be performed on the one sub-channel, and wherein the certain signal processing of the one sub-channel requires fewer of certain components than would be required to process the at least two channels separately, the system comprising: at least two frequency sources, one for each of at least two channels to be selected from a plurality of channels included within an input signal; at least two mixers, each connected to one of the at least two frequency sources and the input signal, wherein one of the at least two mixers positions a first channel at a first intermediate frequency (IF), relative lower than a second intermediate frequency (IF) and the other positions a second channel at the second intermediate frequency (IF), relative higher than the first intermediate frequency (IF); low pass filter connected to one of the mixers, wherein the low pass filter receives the first IF and removes signals above the first channel; a high pass filter connected to one of the mixers, wherein the high pass filter receives the second IF and removes signals below the second channel; a summer connected to the low and high pass filters, wherein the summer receives and combines the first filtered IF and second filtered IF, such that the first channel and the second channel are adjacent to each other; and a band pass filter connected to the summer, wherein the band pass filter receives the combined first and second filtered IFs and removes signals below the first channel and

Asserted Claims	Additional References and Disclosure
	above the second channel, such that a resulting multiple channel IF signal contains the adjacent first and second channels.

Appendix B – Invalidity Claim Chart for Additional References and Obviousness

ADDITIONAL REFERENCES AND OBVIOUSNESS CHART FOR U.S. PATENT NO. 7,542,715[1]

For the reasons explained in more detail in the cover pleading to Defendants' Invalidity Contentions, to the extent a primary reference does not disclose one or more of the elements of the asserted claims, a person of ordinary skill in the art would be motivated to combine the primary reference with any other primary reference that discloses that limitation or with one or more of the references listed in the charts below or in the cover pleading to Defendants' Invalidity Contentions. For clarity, obviousness grounds for each dependent claim incorporate obviousness grounds for the claim(s) from which it depends in addition to any obviousness grounds identified in the charts for the dependent claim. References to figures, drawings, and the like refer to the cited items as well as any accompanying or related text.

The prior art references charted below are the following:

- U.S. Patent No. 5,724,091 ("Freeman")
- U.S. Patent No. 6,480,551 ("Ohishi")
- U.S. Patent No. 7,099,951 ("Laksono '951")
- U.S. Patent No. 7,200,855 ("Laksono '855")
- U.S. Patent No. 7,301,900 ("Laksono '900")
- U.S. Patent No. 7,376,387 ("Eck")

[1] Defendants apply the prior art in light of Plaintiff's improper assertions of infringement and improper application of the claims. Defendants do not agree with Plaintiff's application of the claims, or that the claims satisfy 35 U.S.C. § 112. In the invalidity contentions cover pleading, Defendants identified terms in the '715 patent that it contends are governed by 35 U.S.C. § 112(6). While the charts below identify where certain elements are found in the prior art, including the identity of structures, acts or materials in each item of prior art that perform the function for terms governed by 35 U.S.C. § 112(6), Defendants' contentions herein are not, and should in no way be seen as, admissions or adoptions as to any particular claim scope or construction, or as any admission that any particular element is met in any particular way. Defendants object to any attempt to imply claim construction from this chart. Defendants' prior art invalidity contentions are made in a variety of alternatives and do not represent Defendants' agreement or view as to the meaning, definiteness, written description support for, or enablement of any claim contained therein.

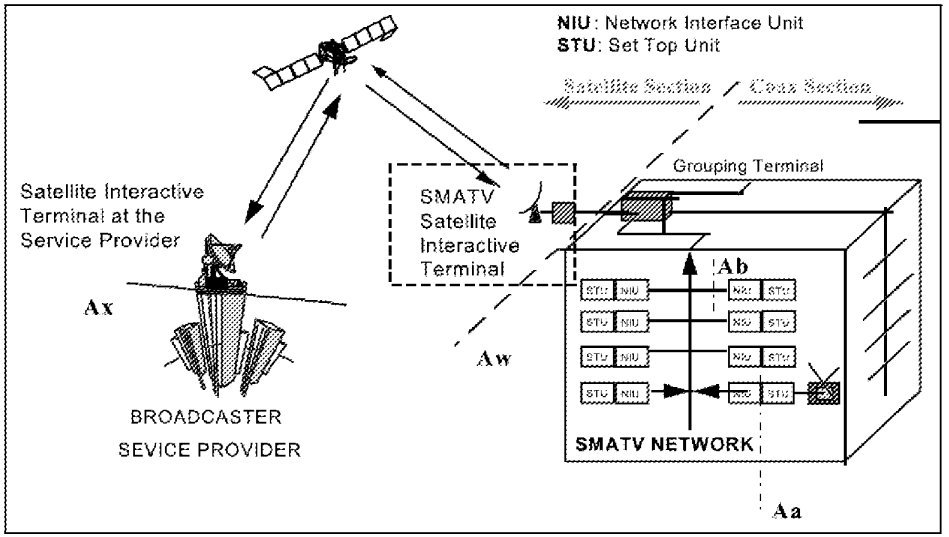
Appendix B – Invalidity Claim Chart for Additional References and Obviousness

- U.S. Patent Publication No. 2002/0038458 ("Staal")
- International Published Patent Application No. WO 00/004704 ("Ellis")
- International Published Patent Application No. WO 01/005156 ("Eames")
- Japanese Published Unexamined Patent Application JP 2001/128138 ("Ishizaki")
- Japanese Published Unexamined Patent Application JP 2002/135745 ("Ogami")
- TR 101 201 V1.1.1 (1997-10) - "Digital Video Broadcasting (DVB); Interaction channel for Satellite Master Antenna TV (SMATV) distribution systems; Guidelines for versions based on satellite and coaxial sections ("TR 101 201 V1.1.1")

Asserted Claims	Additional References and Disclosure
9[pre] 9. A signal distribution system for distributing a plurality of low noise amplifier and block converter (LNB) output signals from a satellite outdoor unit (ODU) comprising:	Defendants take no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, the obviousness reference(s) listed below disclose, explicitly and/or inherently, a signal distribution system for distributing a plurality of low noise amplifier and block converter (LNB) output signals from a satellite outdoor unit (ODU). *See, e.g.*: Ishizaki at [0028]: According to a first aspect of the present invention, there is provided a CATV for distributing video information to a subscriber terminal connected via a CATV network and performing bidirectional communication between the CATV center and the subscriber terminal. In the system, the CATV center multiplexes the video information and the downlink data information of the two-way communication and distributes the multiplexed video information to the subscriber terminal on the same physical channel, and the subscriber terminal transmits the video information from a single received physical channel. And downlink data information of the two-way communication.

Asserted Claims	Additional References and Disclosure
	Ishizaki at [0041]: The center modem 128 is a communication device on the center side for providing a program or a communication service according to a subscriber's request, and is connected via an optical / coaxial cable 135 via a head end (HE) 130. DS on the sender side The bidirectional communication is performed with the cable modem built in the TB 140. The broadcast receivers 100, 102, 104, the storage server 108, the server 114, the management device 120, the multiplexing device 106, the program information control device 122, and the encryption device 124. The QAM modulator 126 and the center modem 128 are mutually connected by a center LAN system 132. Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Freeman at 1:16–21:

Asserted Claims	Additional References and Disclosure
	The present invention relates generally to interactive response systems, and more particularly to an interactive television system which provides interactive programming using compressed, digital data having more than one video signal on a broadcast channel, or a multiplexed signal within a digital format, or both. TR 101 201 V1.1.1 at 6: "The present document provides guidelines and recommendations for the implementation of an Interaction Channel (IC) based on two way satellite links, to users connected to Satellite Master Antenna Television (SMATV) systems. The system provides the IC through the concatenation of a satellite section and a coaxial section (see figure I) in a seamless fashion. Guidelines and recommendations provided in the present document are valid for the implementation of very cost effective solutions matched to the SMA TV scenario as well as for the reuse of already operating satellite networks which are currently installed in a huge amount of buildings throughout Europe."

Asserted Claims	Additional References and Disclosure
	 **Figure 1: DVB Interaction Channel for SMATV System overview** TR 101 201 V1.1.1 at 11: **Satellite Master Antenna Television (SMATV) system:** A SMATV system is defined as a system which is intended for the distribution of TV, sound and Multimedia signals to households located in one or more adjacent buildings. These signals are received by a satellite receiving antenna and may be combined with terrestrial TV signals. SMATV distribution systems are also known as community antenna installations or domestic TV cable networks. A SMATV system represents a means for sharing the same resource among several users for satellite and terrestrial reception. Two systems have been defined in EN 300 473 [1] for the satellite digital TV distribution through SMATV: **a) SMATV system A (SMATV-DTM):** This system approach consist of the trans-modulation from satellite Quaternary Phase Keying (QPSK) signals as defined in EN 300

Asserted Claims	Additional References and Disclosure
	421 [2] (DVB-S) to a Quadrature Amplitude Modulation (QAM) scheme as defined in EN 300 429 [3] (DVB-C). The process of trans-modulation without baseband interfacing is also known as Transparent Trans-modulation and the head-end unit performing this function is known as Transparent Digital Trans-modulator (TDT). **b) SMATV system B:** This system is based on the use of QPSK modulation. The SMATV system B concept allows a direct reception of digital satellite signals using frequency conversion of the received satellite signal to a frequency band appropriate to the characteristics of the SMATV distribution network. The functional elements of this system are given in the baseline satellite specification EN 300 421 [2] (DVB-S). Two configurations of SMATV system B are considered as follows: **b.1) SMATV-IF:** which uses the IF as delivered by the Low Noise Block (LNB) (e.g. 950 - 2 150 MHz); **b.2) SMATV-S:** which uses a conversion to the extended S-band (e.g. 230 - 470 MHz).
9[a] a gateway in communication with the ODU and at least one set top box (STB);	The obviousness reference(s) listed below disclose, explicitly and/or inherently, a gateway in communication with the ODU and at least one set top box (STB). See, e.g.: Eames at 1:13–2:3: A number of different types of distribution systems are utilized for transporting video signals to residences including over-the-air-broadcasting, cable television systems (also known as Community Access Television (CATV) systems) , wireless distribution systems including Multichannel Microwave Distribution Systems (MMDS) and Local Microwave Distribution Systems (LMDS) , and Direct Broadcast Systems (DBS) which are based on satellite transmissions. These systems are broadcast in nature since they transmit a number of channels to groups of subscribers, with the channel selection being performed locally at the subscriber television or television set-top box. Broadcast systems have the advantage that they can provide a large number of channels to a large number of subscribers at the

Asserted Claims	Additional References and Disclosure
	relatively low cost. The drawback of broadcast systems is that although some broadcast systems can provide a substantial number of video selections, they are ultimately limited in the number of channels which can be transported. Eames at 4:2–20: In the present invention broadcast signals are received from a satellite, wireless, or other broadcast source at a gateway device located in the residence. The gateway device also has a connection to a twisted wire pair, coaxial cable, or other transmission medium which supports switched digital video services. Upon receiving a channel request, the gateway determines if that channel is available in the broadcast stream or if it must be requested for transmission over the SDV network. In a preferred embodiment, an authorization request is sent from the gateway to a centralized control unit to determine if the subscriber has authorization to receive the channel. If the channel is available on the broadcast stream, the gateway is sent an authorization message to permit decoding the channel at the gateway for presentation to the subscriber. If the channel is not available from the broadcast stream, a request is made for the channel from the SDV network, and the channel is transmitted over the SDV transmission path. Eames at 8:11–20: FIG. 1 illustrates one embodiment of the present invention in which a DSL system is used in conjunction with a satellite transmission system. Although the broadcast system of FIG. 1 is a satellite based system, the invention is not limited to satellite based broadcasts but can be used with a variety of broadcast systems including over-the-air transmission systems, MMDS or LMDS wireless networks, cable networks, or any other broadcast system in which multiple channels are simultaneously transmitted to a plurality of subscribers. Eames at 8:21–9:11:

Asserted Claims	Additional References and Disclosure
	In FIG. 1 satellite 192 transmits a signal which is received by residence 100 using a satellite/wireless antenna 120. A switched digital network is also in place and is comprised of a Broadband Digital Terminal (BDT) 166, which receives signals from an ATM network 172 through a broadband interface 176, as well as receiving telephone signals from a Public Switched Telephone Network (PSTN) 174 through a narrowband interface 178. In one embodiment the BDT 166 is connected to a remotely located Universal Service Access Multiplexer (USAM) via an optional fiber 144. USAM 140 contains a Very High-Speed Digital Subscriber Line (VDSL) modem 142 which connects to a residence via outside plant twisted wire pairs 150. In this embodiment the VDSL modem 142 supports data rates up to an exceeding 25 Mb/s over loop lengths of up to 3,000 ft. The BDT 166 is capable of supporting multiple USAMs 140 using a plurality of optical fibers 144 or using a passive optical network. USAM 140 supports a plurality of subscriber connections and can accommodate multiple VDSL models 142. Eames at 9:12–28: The switched digital network illustrated in FIG. 1 is capable of providing voice, video and data services to residence 100. In providing telephone services calls are received via PSTN 174 at BDT 166 and are transmitted to CO USAM 160 and through ADSL model 162 to residence 100. In a preferred embodiment ADSL modem 162 contains circuitry for generating an analog voice signal which is transmitted over outside plant twisted wire pairs 150 and which his received at NID 122 which separates out the voice signal and transmits it to telephone 104. Data services are received via ATM network 172 and are transmitted from BDT 166 to CO USAM 160 through ADSL model 162 over outside plant twisted wire pairs 150 and to a getaway 110 located in residence 100. Gateway 110 provides an interface to computer 114 via a gateway-computer connection 116 which in a preferred embodiment is Ethernet over twisted wire pairs. In this way data services are provided to the residence. Eames at 10:1–19:

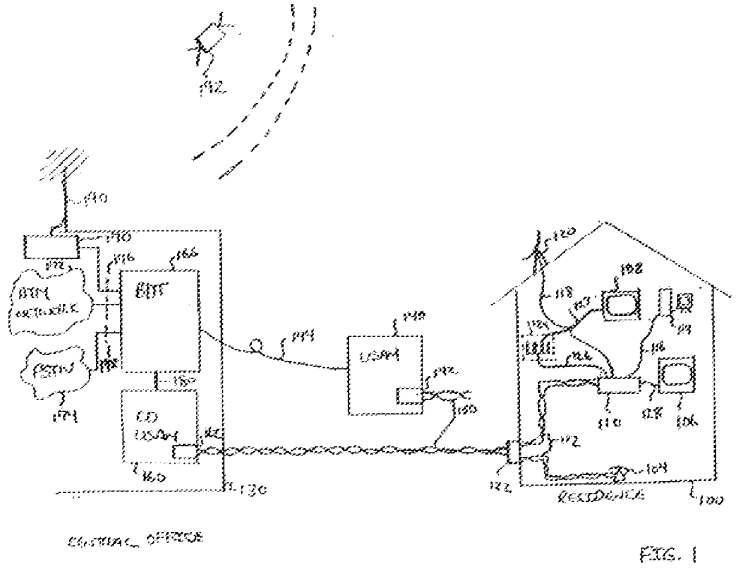
Asserted Claims	Additional References and Disclosure
	In the embodiment illustrated in FIG. 1 switched digital services are provided directly from the central office 130 to the residence 100 by an Asymmetric Digital Subscriber Line (ADSL) modem 162 which is connected to a Network Interface Device (NID) 122 at residence 100 via outside plant twisted wire pairs 150. ADSL modem 162 is located in a Central Office USAM (CO USAM) 160 which is connected to BDT 166 via a BDT-CO USAM connection 180. Central office 130 also contains an off-air antenna 190 which receives the over-the-air broadcasts including local television channels. In alternate embodiments the local programming is received at central office 130 via another type of wireless connection, through a data network, or via ATM network 172. As shown in FIG. 1 signals received from the off-air antenna 190 are transmitted to an off-air receiver/decoder 170 which converts the analog signals to digital signals. In a preferred embodiment the off-air signals are converted to Motion Pictures Expert Group (MPEG) packets contained in an ATM transport stream. Video services can be provide over the switched digital network by receiving video programming either from off-air receiver/decoder 170 or through ATM network 172 at BDT 166. BDT 166 switches packets or cells containing video to CO USAM 160 which transmits the requested video channel over outside plant twisted wire pairs 150 to gateway 110 through NID 122 and over in-home twisted wire pairs 112. Eames at 10:20–27: Gateway 110 is capable of providing video to one or more televisions and provides video programming to a first television 106 through a gateway to first television connection 128. In a preferred embodiment the gateway to first TV connection is an S-video connection operating over an S-video cable. Gateway 110 is also capable of providing video signals to other televisions, such as a second television 108 and can do so via a gateway-splitter connection 126, splitter 124 and splitter to second television connection 127. A gateway which supports multiple analog televisions from one received digital stream is described in detail in US Patent Application 09/026,036 entitled "Video, Data and Telephone Gateway," of which Thomas Eames and Charles Eldering are the inventors, which is incorporated herein by reference. Eames at 11:27–12:4:

Asserted Claims	Additional References and Disclosure
	In operation the system illustrated in FIG. 1 allows the reception of a plurality of broadcast channels at gateway 110 from the satellite/wireless antenna 120 via a satellite/wireless receiver connection 118. In a preferred embodiment the satellite/wireless receiver connection 118 is a coaxial cable running from satellite/wireless antenna 120 to gateway 110. Eames at 12:5–13: Depending on the bandwidth provided by the DSL connection in the switched digital platform data or data and video services are available to gateway 110. In an ADSL system operating at 6 Mb/s a limited number of video channels can be transported simultaneously over the DSL system. By providing access to broadcast programming simultaneously with access to switched digital programming the user can access either type of channels through gateway 110. Eames at 12:14–13:9: In operation a user selects a channel at residence 100, with the request being transmitted to gateway 110 via an infrared, wireless, or coaxial signal originating from a remote control . Methods for transmitting channel selections to a gateway is described in detail in US Patent Application 09/525,488 entitled "Method and Apparatus for Transmitting Wireless Signals Over Media" and US Patent Application 09/526,100 entitled "Optical Conversion Device", which are both incorporated herein by reference. Gateway 110 determines if that channel is part of the broadcast lineup or needs to be requested from the switched digital platform. In a preferred embodiment the channel request is transmitted over the DSL connection to BDT 166 which contains software capable of authorizing or denying the subscriber channel request. In addition to authorizing or denying the subscriber request the BDT 166 can determine if the channel is already being received over ATM network 172, or if it must be requested from a video server. BDT 166 is capable of receiving a plurality of broadcast channels via ATM network 172 but may also request specialized programs in support of Video on Demand (VoD) services. In this way the subscriber has access to both

Asserted Claims	Additional References and Disclosure
	broadcast and switched digital programming and can simultaneously receive broadcast channels and one or more switched digital channels. Eames at 13:10–20: In an alternate embodiment gateway 110 can determine if a selected channel is part of the broadcast lineup, and has authority to grant access to that channel locally without transmitting the channel request to BDT 166. In this embodiment traditional satellite based security can be utilized to prevent unauthorized access to satellite or other broadcast services . The security systems are based on the use of transmitted keys which prevent gateway 110 from decoding unauthorized services. Security systems for broadcast entertainment services are well known to those skilled in the art. Eames at 13:21–14:8: FIG. 2 illustrates a use case diagram for a wireless xDSL gateway such as gateway 110 illustrated in FIG. 1. Use case diagrams are part of the Unified Modeling Language (TJML) and are useful in describing systems, software, and methods of doing business. As shown in FIG. 2, a customer 200 interacts with this system which contains a receive channel request function 218, a determine channel source function 220, and a decoding and present channel function 222. The system also contains a demodulated satellite/wireless signal function 210 which is capable of receiving and demodulating broadcast signals provided by a satellite/wireless service provider 204. An xDSL service provider 208 interacts with a request channel authorization function 212 and a receive channel authorization function 214 for controlling which channels customer 200 is authorized access to receive. The wireless xDSL gateway system also contains a demodulate xDSL signal function 216. Eames at 16:3–26: FIG. 5 illustrates an architecture for a preferred embodiment of a wireless/xDSL residential gateway. As shown in FIG. 5 the wireless/xDSL gateway has an input for broadcast signals

Asserted Claims	Additional References and Disclosure
	which may be received in a direct broadcast satellite/digital video broadcast (DBS/DVB) format, LMDS format, or other broadcast format. The signals are received at a DBS triple tuner 510 which is capable of tuning three separate frequency segments in the broadcast spectrum. The output of DBS triple tuner 510 is received by the DBS/LMDS/DVB format processor 512 which is capable of receiving digital video in DBS/LMDS/DVB formats. The output of DBS/LMDS/DVB format processor 512 is received by an MPEG buffer 516 which stores digital video MPEG packets until they can be decoded by MPEG decoder 530, which is capable of supporting audio and video decoding. The output of MPEG decoder 530 is received by an audio/video input/output modulation device 534, which is capable of presenting the video in a variety of formats including RF modulated onto a known channel (e.g. channel 3) , an National Television Standards Committee (NTSC) baseband signal, or an S video signal. Audio/video input output modulation device 534 can also generate audio baseband signals and other specialized video and audio output formats. Eames at 18:18–23: In an alternate embodiment an FTTC system delivers video signals across a coaxial cable which does not use an xDSL format. In this case xDSL processor 514 is replaced by a FTTC processor. Similarly, other types of input processors can be used to support FTTH or other local loop switched network architectures. Eames at 18:24–19:10: FIG. 6 illustrates a preferred embodiment of a gateway device in the form of an integrated circuit gateway processor (ICGP) 680 which can be used to realize many of the function of the wireless/xDSL residential gateway shown m FIG. 5. One of the advantages of the integrated circuit gateway processor 680 shown in FIG. 6 is that it can provide the core functions for video and graphics processing, independent of the external media and transmission/reception technique. As shown in FIG. 6 external media dependent devices 690 can be utilized to receive DVB, DBS, (or other xDSL) cable signals in the form of digital cable signals or according to the Data Over Cable System Interface Specification (DOCSIS), or MMDS/LMDS signals. In a preferred embodiment the signals are received

Asserted Claims	Additional References and Disclosure
	over a standardized interface such as an ATM UTOPIA interface 624 or a DOCSIS interface 622. Eames at 21:8–16: The main host residential gateway 700 also interfaces to a switched network which may be a DSL network, FTTC, FTTH or other switched infrastructure. In a preferred embodiment the switched infrastructure is an ADSL network in which signals are transmitted directly from a central office over outside plant twisted wire pairs 150. DSL signals are received at a diplex filters 702 which separates out telephone signals 710 which are received by logic block 712. Eames at 22:18–23:2: In the gateway system illustrated in FIG. 7 signals can be distributed to devices in the home over inside twisted wire pairs 112. This allows use of the existing home wiring for the distribution of video signals and is based on the use of a Home Network Interface (HNI) device 730. HNI devices 730 are based on the transmission of digital signals over twisted wire pairs using a suitable modulation format and standardized protocols. In a preferred embodiment the digital signal is a 20 Mb/s signal transmitted above the POTs spectrum in a VDSL like modulation format and is based on Internet protocols in an IEEE 802.3 compliant data format. A Quality of Service (QoS) functionality is supported such that video signals can arrive at the remote devices uninterrupted. Eames at Fig. 1:

Asserted Claims	Additional References and Disclosure
	 FIG. 1 Ishizaki at [0041]: The center modem 128 is a communication device on the center side for providing a program or a communication service according to a subscriber's request, and is connected via an optical / coaxial cable 135 via a head end (HE) 130. DS on the sender side The bidirectional communication is performed with the cable modem built in the TB 140. The broadcast receivers 100, 102, 104, the storage server 108, the server 114, the management device 120, the multiplexing device 106, the program information control device 122, and the encryption device 124. The QAM modulator 126 and the center modem 128 are mutually connected by a center LAN system 132. Laksono '951 at 1:22–42:

Asserted Claims	Additional References and Disclosure
	As is also known, communication systems have two basic configurations: wide area networks (WAN) and local area networks (LAN). In addition, WAN and/or LAN communication systems may use a variety of transmission types including broadcast transmissions, asymmetrical transmissions, and symmetrical transmissions. In a broadcast communication system, a network hub transmits data to a plurality of users with little or no data being transmitted from the users to the network hub. Examples of broadcast communication systems include radio systems, NTSC (national television standards committee) television systems (e.g., regular TV), high definition television systems, cable systems, and satellite systems. In each of these broadcast communication systems, a network hub (e.g., radio station, television station, et cetera) transmits a broadcast signal. Any user within range of the broadcast signal and who has an appropriate receiver (e.g., radio, television, et cetera) can receive the broadcast signal. Such broadcast systems employ a particular data transmission protocol such as amplitude modulation, frequency modulation, ultra-high frequency, very high frequency, et cetera. Laksono '951 at 5:46–57: Generally, the present invention provides a method and apparatus for providing multimedia services to a local area network. Such a method and apparatus includes processing that begins by receiving a plurality of channels from at least one multimedia source. For example, the plurality of channels may be received via a satellite connection, cable connection, NTSC broadcast, et cetera. The processing continues by receiving selection requests from at least one client module via a communication path. The client module is affiliated with a client device such as a television, computer, laptop computer, monitor, personal digital assistant, et cetera. Laksono '951 at 5:58–67: The processing continues by generating a set of channel select commands from the select request. The generation of the set of channel select commands includes interpreting the selection request, verifying the authenticity of the client transmitting the request, and determining appropriate access privileges for the respective client. The processing

Asserted Claims	Additional References and Disclosure
	continues by selecting a set of channels from the plurality of channels based on the set of channel select commands. As such, of all the channels received, only a few are selected, i.e., the ones chosen by the clients, to comprise the set of channels. Laksono '951 at 6:1–12: The processing continues by mixing the set of channels into a stream of channel data. The processing then continues by transmitting the stream of channel data via the communication path to the at least one client module such that each client associated with a client module receives the channel data for the respective channels that they had selected. With such a method and apparatus, an in-home communication network is established that allows multiple client devices to have independent access to multimedia sources without requiring traditional receiving and/or transmitting equipment associated with independent access to such multimedia sources. Laksono '951 at 6:13–28: The present invention can be more fully described with reference to FIGS. 1 through 65. FIG. 1 illustrates a multimedia system 10 that includes a multimedia server 12, a plurality of client modules 14–22 operably coupled to a plurality of clients 26–34. The multimedia server 12 is operably coupled to receive a plurality of channels 36 from a multimedia source 24. The multimedia source 24 may be a satellite connection, cable connection, antenna connection for NTSC television broadcast, HDTV broadcast, PAL broadcast, et cetera. As one of average skill in the art will appreciate, the multimedia server 12 may be a stand-alone device, may be incorporated in a satellite receiver, set-top box, cable box, HDTV tuner, home entertainment receiver, et cetera. In addition, the multimedia server 12 may be implemented using discrete components, integrated circuits, and/or a combination thereof. Laksono '951 at 6:29–36:

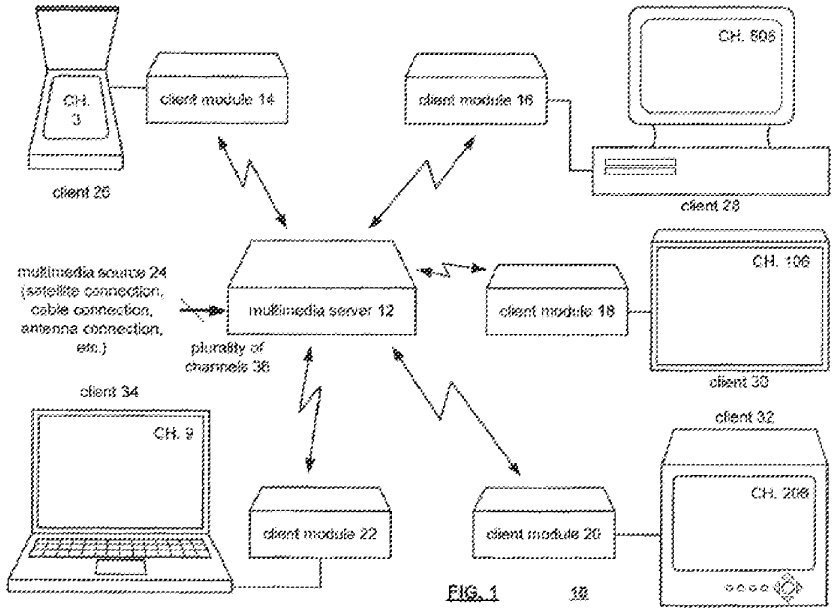
Asserted Claims	Additional References and Disclosure
	The multimedia server 12 communicates with the plurality of client modules 14–22 via a communication path, which may be a radio frequency communication path, a wire line connection, an infrared connection, and/or any other means for conveying data. As such, the multimedia server 12 and each of the client modules 14–22 include a receiver and/or transmitter operable to convey data via the given type of communication path. Laksono '951 at 6:37–52: As shown, each client module is operably coupled to one of the clients. For example, client module 14 is operably coupled to client 26, which is representative of a personal digital assistant. Client module 16 is operably coupled to client 28, which is representative of a personal computer. Client module 18 is operably coupled to client 30, which is representative of a monitor (e.g., LCD monitor, flat panel monitor, CRT monitor, et cetera). Such a monitor may include speakers, or a speaker connection, control functions including channel select, volume control, picture quality, et cetera. Client module 20 is operably coupled to client 32, which may be a television set, high definition television (HDTV), standard definition television (SDTV), a home theatre system, et cetera. Client module 22 is operably coupled to client 34, which is representative of a laptop computer. Laksono '951 at 6:53–58: As one of average skill in the art will appreciate, the client module 22 may be a separate device from its associated client or embedded within the client. In addition, one of average skill in the art will further appreciate that the client modules 14–22 may be implemented utilizing discrete components and/or integrated circuits. Laksono '951 at 6:59–7:5: Each of the clients 26–34, via its associated client module 14–22, selects one or more channels from the plurality of channels 36. As shown, client 26 has selected channel 3 of the plurality of channels for viewing. Accordingly, client module 14 relays the channel selection of channel 3 to the multimedia server 12. The multimedia server 12 selects

Asserted Claims	Additional References and Disclosure
	channel 3 from the plurality of channels 36. The data corresponding to channel 3 is then multiplexed with the data for the other channels and transmitted from the multimedia server 12 to each of the client modules 14–22. Client module 14 monitors the transmission from the multimedia server 12 and extracts the data corresponding to channel 3. The extracted data for channel 3 is then provided to the client 26 for display. Laksono '951 at 7:6–24: Client module 16, 18, 20 and 22 perform a similar function for their associated clients 28, 32 and 34, respectively. As shown, client 28 has selected channel 505, client 30 has selected channel 106, client 32 has selected channel 206 and client 34 has selected channel 9. The client modules 16–22 provide the channel selection of its respective client 28–34 to the multimedia server 12. Multimedia server 12 extracts the selected channels from the plurality of channels for each selection request, multiplexes the data for each of the selected channels (for this example channel 3, 9, 106, 206 and 505) into a stream of data. The stream of data is then transmitted to each of the client modules. Each client module extracts the appropriate data of the selected channel for its respective client. For example, client module 16 monitors the transmitted data for data related to channel 505, client module 18 monitors for data related to channel 106, client module 20 monitors the transmission for data related to channel 206 and client module 22 monitors the transmission for data related to channel 9. Laksono '951 at 7:25–41: From each client's prospective, the client 26–34 has independent access to the multimedia source 24. Accordingly, client 26 may at any time change its channel selection from, for example, channel 3 to channel 120. The client module 14 provides the channel selection request to the multimedia server 12, which now retrieves data related to channel 120 for client 26 as opposed to channel 3. Similarly, client 28–34 could also change their channel selection from the illustrated selection to another channel. Note that if two clients have selected the same channel, for example, client 26 and 28 both have selected channel 3, the multimedia server 12 would only extract data for channel 3 once and place in the header

Asserted Claims	Additional References and Disclosure
	information of the data relating to channel 3 the identity of both client module 14 and 16. As such, client module 14 and 16 would extract the same data from the transmission by the multimedia server 12 and provide it to its respective clients. Laksono '951 at 7:42–51: As one of average skill in the art will appreciate, the multimedia system of FIG. 1 provides each client with independent access to the multimedia source 24. As an alternate embodiment, the functionality of client modules 14–22 may vary. For example, client module 14 may not provide all the independent functionality that client module 16 does. For example, client module 14 may not have independent channel selection capabilities but only selecting channels that one of the other clients have selected. Alternatively, one client module may service a plurality of clients. Laksono '951 at 10:52–11:11: FIG. 5 illustrates a schematic block diagram of a multimedia system 130 that includes multimedia server 132, client modules 134–142, clients 26–34, and a plurality of multimedia sources. The multimedia sources include VCR 86, DVD player 82, digital audio storage device 104, DVD audio 106, radio receiver 108, CD player 110, multimedia source 24, public switch telephone network 66, wide area network 44, and/or any other type of audio and/or video source. In this system 130, the clients 26–34 may select playback from, and/or connection to, any one of the multimedia sources. The selection request from each client module would identify the desired multimedia source, the client, the desired service and any other information to assist the multimedia server 132 in processing the request. As such, one client may be accessing the Internet, while another client is watching a satellite broadcast channel, while another is listening to a CD playback, while another is talking on the telephone, and yet another is watching a DVD playback. This is all done via the multimedia server 132 without requiring the clients to have direct access to the multimedia sources and without the requirement that each client have its own multimedia source and/or multimedia source connection. In essence, multimedia server 132 provides the functionality of one or more of multimedia server 12,

Asserted Claims	Additional References and Disclosure
	42, 88 and 102 of FIGS. 1–4. While client modules 134–142 provide the functionality of one or more of the client modules described generally with reference to FIGS. 1–4. Laksono '951 at 11:12–24: As one of average skill in the art will appreciate, the multimedia server 12, 42, 88, 102, and/or 132 may be incorporated in a home theatre receiver, television set, modem, set-top box, cable receiver, satellite receiver, VCR, DVD player, et cetera to provide the networking functionality as generally described in FIGS. 1–5. As one of average skill in the art will further appreciate, the clients 26–34 of FIGS. 1–5 may be any one of a personal computer, a laptop computer, a personal digital system, a video telephone, a digital telephone, a cellular telephone, a monitor, a television, a high definition television, a printer, a facsimile machine, and/or any devices that includes an audio and/or video display. Laksono '951 at 19:49–59: In general, the multimedia server provides access for a plurality of clients to one or more of the multimedia services by receiving requests 182–190, 258–266, 298–306 and/or 320–328 from a client module. The multimedia server processes the request to produce packets of data 180, 268, 296 and/or 356 or multiplex client data 230 depending on the type of request. In addition, the client modules may provide packets of information 210–218, which contain data for Internet connections, telephone connections, and/or client-to-client communications. The multimedia server processes packets as described generally with reference to FIGS. 1–10. Laksono '951 at 19:60–20:19: Client module 14–22, 46–54, 90–98, 112–120 and/or 134–142 includes a processing module 364 and memory 366. The client module is operably coupled to a client 26, 28, 30, 32 and/or 34 to provide display data 368. The display data may include audio data, video data and/or text data. The type of display data 368 will depend on the particular multimedia

Asserted Claims	Additional References and Disclosure
	source being accessed for the client. The processing module 364 may be a single processing device or a plurality of processing devices. Such a processing device may be a microprocessor, microcontroller, microcomputer, central processing unit, programmable gate array, state machine, logic circuitry, digital signal processor, and/or any device that manipulates signals (analog and/or digital) based on operational instructions. The memory 366 may be a single memory device or a plurality of memory devices. Such a memory device may be a read-only memory, random access memory, erasable memory, flash memory, magnetic tape memory, system memory, and/or any device that stores digital information. Note that when processing module 364 implements one or more of its functions via a state machine or logic circuitry, the memory storing the corresponding operational instructions is embedded within the circuitry comprising the state machine and/or logic circuit. The functions performed by processing module 364 and stored in memory 366 are described in greater detail with reference to FIGS. 52–62 and have been generally described with reference to FIGS. 1–10. Laksono '951 at Fig. 1:

Asserted Claims	Additional References and Disclosure
	 Laksono '855 at 1:23–44: As is also known, communication systems have two basic configurations: wide area networks (WAN) and local area networks (LAN). In addition, WAN and/or LAN communication systems may use a variety of transmission types including broadcast transmissions, asymmetrical transmissions, and symmetrical transmissions. In a broadcast communication system, a network hub transmits data to a plurality of users with little or no data being transmitted from the users to the network hub. Examples of broadcast communication systems include radio systems, NTSC (national television standards committee) television systems (e.g., regular TV), high definition television systems, cable systems, and satellite systems. In each of these broadcast communication systems, a network hub (e.g., radio station, television station, et cetera) transmits a broadcast signal.

Asserted Claims	Additional References and Disclosure
	Any user within range of the broadcast signal and who has an appropriate receiver (e.g., radio, television, et cetera) can receive the broadcast signal. Such broadcast systems employ a particular data transmission protocol such as amplitude modulation, frequency modulation, ultra-high frequency, very high frequency, et cetera. Laksono '855 at 2:13–22: With the number of households having multiple television sets increasing, and many users wanting the latest and greatest video viewing services. As such, many households have multiple satellite receivers, cable set-top boxes, modems, et cetera. As is further known, dependent multiple access to satellite broadcasts may be achieved by linking slave televisions to a master television. The master television has full control of, and independent access to, the satellite receiver while the slave televisions receive whatever channel has been selected by the master. Laksono '855 at 6:26–34: The multimedia server 12 communicates with the plurality of client modules 14–22 via a communication path, which may be a radio frequency communication path, a wire line connection, an infrared connection, and/or any other means for conveying data. As such, the multimedia server 12 and each of the client modules 14–22 include a receiver and/or transmitter operable to convey data via the given type of communication path. Laksono '855 at 7:62–8:2: The plurality of client modules 46–54 communicates with the multimedia server 42 via a communication path. The communication path may be a radio frequency communication path, infrared communication path, and/or wire line communication path. In this system 40, the multimedia server 42 is providing independent access for each of the clients 26–34 to the public switch telephone network 66 and/or to the wide area network 44.

Asserted Claims	Additional References and Disclosure
	Laksono '900 at 1:24–44: As is also known, communication systems have two basic configurations: wide area networks (WAN) and local area networks (LAN). In addition, WAN and/or LAN communication systems may use a variety of transmission types including broadcast transmissions, asymmetrical transmissions, and symmetrical transmissions. In a broadcast communication system, a network hub transmits data to a plurality of users with little or no data being transmitted from the users to the network hub. Examples of broadcast communication systems include radio systems, NTSC (national television standards committee) television systems (e.g., regular TV), high definition television systems, cable systems, and satellite systems. In each of these broadcast communication systems, a network hub (e.g., radio station, television station, et cetera) transmits a broadcast signal. Any user within range of the broadcast signal and who has an appropriate receiver (e.g., radio, television, et cetera) can receive the broadcast signal. Such broadcast systems employ a particular data transmission protocol such as amplitude modulation, frequency modulation, ultra-high frequency, very high frequency, et cetera. Laksono '900 at 5:46–6:7: Generally, the present invention provides a method and apparatus for a multimedia server to function as a hub based network server. Such a method and apparatus includes processing that begins by receiving packets from at least one of a plurality of clients. The processing continues by determining whether a network access application is active for this particular client. The network access application may be a web browser application, email application, et cetera. When the network access application is active for the client, the processing continues by processing the data of the packets in accordance with the network access application. For instance, if the network access application is a web browser, the data is processed in accordance with the web browser application. The processing then continues by determining access to a network connection for transmission of the network data. The determination of access is based on a client access-to-the network connection scheme. Since a plurality of clients may be simultaneously in need of access to a network connection, e.g., a modem, access to the network connection needs to be shared. As such,

Asserted Claims	Additional References and Disclosure
	the client accessed-to-network connection scheme allocates access to the network connection in a predetermined manner. The processing then continues by transporting the network data via the network connection. With such a method and apparatus, an in-home communication network is established that allows multiple client devices to have independent access to multimedia sources without requiring traditional receiving and/or transmitting equipment associated with independent access to such multimedia sources. Laksono '900 at 6:24–31: The multimedia server 12 communicates with the plurality of client modules 14-22 via a communication path, which may be a radio frequency communication path, a wire line connection, an infrared connection, and/or any other means for conveying data. As such, the multimedia server 12 and each of the client includes 14-22 include a receiver and/or transmitter operable to convey data via the given type of communication path. TR 101 201 V1.1.1 at 7: The Satellite Interactive Terminal (SIT) is the key equipment of the satellite section, which is composed by the RF antenna subsystem and the satellite modem to provide inter-activity to the SMATVusers. One SIT would be needed per building although in some cases it might be convenient to collect the interaction traffic of several adjacent buildings into a single GT. For the satellite section, implementation examples are given for both identified scenarios and for different satellite network technologies such as Code Division Multiple Access (CDMA) and Time Division Multiple Access (TDMA) with the aim of showing the feasibility to implement open and inter-operable systems based on existing standards. In order to provide purely illustrative implementation examples, specific sizing examples are provided for hypothetical services and traffic scenarios, deriving antenna sizes, power required, possible configurations, etc.
9[b] a signal selector that receives a plurality of broadband LNB signals comprising a plurality of transponder signals, the signal selector is	The obviousness reference(s) listed below disclose, explicitly and/or inherently, a signal selector that receives a plurality of broadband LNB signals comprising a plurality of transponder signals, the signal selector is responsive to transponder select information

Asserted Claims	Additional References and Disclosure
responsive to transponder select information transmitted by the gateway and selects a plurality of transponder signals from at least one broadband LNB signal based on the transponder select information;	transmitted by the gateway and selects a plurality of transponder signals from at least one broadband LNB signal based on the transponder select information. See, e.g.: Freeman at 2:9–19: The present invention is an interactive cable television system which utilizes digital video signals to provide customized viewing responsive to user selections. A standard cable or direct broadcast satellite television distribution network is utilized for transmitting the interactive and other programming to users. The present invention allows a plurality of viewers to be simultaneously provided with a plurality of different program information message signals related in time and content to each other. The interactive program comprises a plurality of video signals related in time and content to one another. Freeman at 2:20–50: The video signals are converted into digital format for transmission. In a digital format, it is possible to transmit more than one video signal per cable television channel. Further, it is possible to transmit video signals via conventional telephone lines. If desired, the various digital video signals may be compressed before transmission. Compression allows an even larger number of video signals to be transmitted over a channel of the transmission media. A multiplexer combines the various digital signals into a reduced number of transmission data streams for transmission. The various NTSC television channels may be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. The multiplexer in conjunction with the television transmission system multiplexes the desired data streams onto the desired channels, and transmits these signals over the NTSC channels. The number of video signals which may be multiplexed onto a data stream on a single transmission channel will vary depending on the video signals to be transmitted. The television channels containing a data stream of multiplexed video signals may be transmitted over a standard cable television distribution network, or direct broadcast satellite transmission system. A receiver receives one or more television channels, some or all containing a multiplexed data stream of video signals or non-

Asserted Claims	Additional References and Disclosure
	multiplexed digital video signals, and in conjunction with a signal selector, selects a particular data channel/data stream for playback, then selects a particular video signal from the data stream's multiplexed signal, and finally expands the video signal, if necessary, for playback to a television monitor. Freeman at 2:60–67: In practice, a user selects a desired interactive program to be viewed. Using the multiple choice controller, the user selectably responds to information displays or interrogatory messages and the signal selector selects a particular multiplexed video signal and de-multiplexes, expands and displays the selected video signal. Alternatively, the signal selector may select a video signal based on personal profile information stored in memory. Freeman at 4:21–34: The present invention is an interactive television system in which a plurality of viewers are simultaneously provided with a plurality of different program information message signals. A plurality of video signals 1 are provided. Video signals 1 may be, for example, various field and/or audio synchronized camera angles of a sporting event, or a game show having a content and host acting responsively to user selections. Alternatively, video signals 1 may be any video signals suitable for interactive conversation, such as those described in U.S. Pat. Nos. 4,847,700, 3,947,972, 4,602,279, 4,264,925, or 4,264,924, the contents of which are incorporated specifically herein by reference. Various types of time and content related video signals exist which are suitable for interactive operation. Laksono '951 at 11:50–63: The network interface controller 168 receives the channel selection 178 and prepares it for transmission via the communication path 192 to the multimedia server 12. The processing performed by the network interface controller 168 is dependent on the type of communication path 192. For example, if the communication path is a wire line connection, the channel selection 178 may be processed in accordance with a type of

Asserted Claims	Additional References and Disclosure
	transceiving that includes time division multiplexing (TDM), frequency division multiplexing (FDM), pulse code modulation (PCM), amplitude shift keying (ASK), phase shift keying (PSK), quadrature phase shift keying (QPSK), quadrature amplitude modulation (QAM), carrier sense multiple access (CSMA), CSMA with collision avoidance and/or CSMA with collision detection. Laksono '951 at 11:64–12:11: The network interface controller 168 provides the process channel selection 178 as a channel select request 190 to the transceiving module 154 of multimedia server 12. As one of average skill in the art will appreciate, client modules 14–20 perform a similar function as client module 22 in producing their respective channel select request 182–188. As one of average skill in the art will appreciate, the channel selection 178 may include selecting an audio channel, video channel, a particular audio source (e.g., CD playback), a particular video source (e.g., DVD player), etc. In addition, the channel select request 182–190 may further include volume adjust, picture quality settings and adjustments, displaying restrictions, purchase request, picture-in-picture activation and deactivation, picture-in-picture channel select, video pausing, reverse play, fast forward, and/or audio muting. Laksono '951 at 12:12–27: The transceiving module 154 receives the channel select requests 182–190 from the plurality of client modules 14–22 via the communication path 192. The transceiving module 154 extracts the physical layer information from the requests 182–190 to retrieve the respective channel select requests 164. The transceiving module 154 provides the channel select request 164 to control module 156. As an analogy, note that the channel selections 178 may correspond to network layer data while the channel selection request 182–190 may correspond to physical layer data of a ISO standardized communication system. As such, channel selection request utilize physical layer type identification within its header and include in its data section the channel selections 178. The channel selections include a header section and data section corresponding to the particular channel selected.

Asserted Claims	Additional References and Disclosure
	Laksono '951 at 12:28–40: The control module 156 processes the channel select request 164. The processing of the channel select request includes authenticating the request and preparing a set of channel selection commands 160 therefrom. The tuning module 150 receives the set of channel selection commands 160 and extracts a set of channels 162 from a plurality of channels 158 based on the set of channel selection commands 160. The plurality of channels corresponds to channels provided via a satellite connection, a cable connection, an NTSC broadcast, an HDTV broadcast, a PAL broadcast, et cetera. The tuning module 150 provides data for each of the channels of the set of channels 162 to the channel mixer 152. Laksono '951 at 15:52–57: The tuning module 240 receives the set of selection commands 252 and selects data from one or more of the multimedia sources 82, 86, and 248 based on the corresponding selection commands 252. The tuning module 240 provides the data from the selected multimedia sources as a set of channels 254 to the channel mixer 242. Laksono '951 at 20:20–31: FIG. 12 illustrates a more detailed schematic block diagram of multimedia server 12 of the multimedia communication system of FIG. 1. The multimedia server 12 includes the tuning module 150, the channel mixer 152, the transceiving module 154, and the control module 156. The tuning module 150 includes a plurality of tuners 370–376, an encoding module 380, and a bus interface module 382. The channel mixer 152 includes at least one stream parsing module 390, a memory controller 394, memory 392, a processor 396, and a data transcoding module 388. The stream parsing module 390 includes a plurality of bit stream modules 398–404. Laksono '951 at 20:32–42:

Asserted Claims	Additional References and Disclosure
	In operation, the control module 156 provides the set of channel select commands 160 to the tuning module 150. As shown, each tuner receives an individual channel select command from the control module 156. Alternatively, the control module 156 provides a stream of data containing the channel select commands 160 to the tuning module 150. The tuning module then would interpret the stream of data to identify the particular commands being received and then provide individual channel select commands to tuners 370–376. Each of the tuners 370–376 has its input coupled to receive the plurality of channels 158. Laksono '951 at 20:43–61: The plurality of channels may be received via a satellite connection, cable connection, NTSC broadcast, PAL broadcast, HDTV broadcast, et cetera. Accordingly, each of the tuners 370–376 would include a corresponding tuner functionality and construction. For example, if the plurality of channels 158 is being received via an NTSC broadcast, each of the tuners includes a television encoder to isolate one of the plurality of channels and produce digitized video as an output. Alternatively, if the plurality of channels 158 is received via a satellite connection, each of the tuners includes a satellite tuner as found in commercially available satellite receivers. The satellite tuner outputs, in MPEG 2 format, one or more channels of the plurality of channels. Similarly, for HDTV, cable TV, et cetera the tuners would be of a construct corresponding to the particular source of the plurality of channels. Since the construct of such tuners for each of the sources is known, no further discussion will be presented for the tuners except to further illustrate the concepts of the present invention. Laksono '951 at 35:46–62: The process proceeds to Step 712 where a select request is received from at least one client module via a communication path. The communication path as previously discussed in FIGS. 20–22 may be a radio frequency communication path, IR communication path, and/or wire line communication path. The selection request may be from one client module or a plurality of client modules, each client may be requesting access to a different channel, the same channel or any combination thereof. The selection request includes the identity of

Asserted Claims	Additional References and Disclosure
	the particular client module and the identity of the particular channel and/or source for the channel. As such, the selection request includes sufficient information for the multimedia server to determine the particular audio and/or video source of the particular channel and the desired channel. For example, the selection request may indicate that channel 5 of a satellite broadcast is to be the channel of interest for a particular client module. Laksono '951 at 37:17–23: As one of average skill in the art will appreciate, a single stream of data is provided from the multimedia server to the plurality of client modules. The stream of channel data includes the data corresponding to each selection made by the client modules. Thus, each client module receives the entire stream of channel data and extracts only the data relevant to service its particular selection request. Laksono '855 at 2:13–22: With the number of households having multiple television sets increasing, and many users wanting the latest and greatest video viewing services. As such, many households have multiple satellite receivers, cable set-top boxes, modems, et cetera. As is further known, dependent multiple access to satellite broadcasts may be achieved by linking slave televisions to a master television. The master television has full control of, and independent access to, the satellite receiver while the slave televisions receive whatever channel has been selected by the master. Laksono '855 at 5:62–6:9: The processing continues by selecting a channel of the plurality of channels for each of the channel selection commands to produce selected channels. As such, for each channel selection command, a corresponding channel is selected from the plurality of channels. The processing continues by encoding the selected channels based on a data conveyance protocol (e.g., encoding scheme and/or modulation scheme). The encoded channel data is then conveyed to a plurality of clients. With such a method and apparatus, an in-home

Asserted Claims	Additional References and Disclosure
	communication network is established that allows multiple client devices to have independent access to multimedia sources without requiring traditional receiving and/or transmitting equipment associated with independent access to such multimedia sources. Laksono '855 at 6:57–7:3: Each of the clients 26–34, via its associated client module 14–22, selects one or more channels from the plurality of channels 36. As shown, client 26 has selected channel 3 of the plurality of channels for viewing. Accordingly, client module 14 relays the channel selection of channel 3 to the multimedia server 12. The multimedia server 12 selects channel 3 from the plurality of channels 36. The data corresponding to channel 3 is then multiplexed with the data for the other channels and transmitted from the multimedia server 12 to each of the client modules 14–22. Client module 14 monitors the transmission from the multimedia server 12 and extracts the data corresponding to channel 3. The extracted data for channel 3 is then provided to the client 26 for display. Laksono '900 at 2:13–22: With the number of households having multiple television sets increasing, and many users wanting the latest and greatest video viewing services. As such, many households have multiple satellite receivers, cable set-top boxes, modems, et cetera. As is further known, dependent multiple access to satellite broadcasts may be achieved by linking slave televisions to a master television. The master television has full control of, and independent access to, the satellite receiver while the slave televisions receive whatever channel has been selected by the master. Laksono '900 at 6:54–67: Each of the clients 26-34, via its associated client module 14-22, selects one or more channels from the plurality of channels 36. As shown, client 26 has selected channel 3 of the plurality of channels for viewing. Accordingly, client module 14 relays the channel selection of channel 3 to the multimedia server 12. The multimedia server 12 selects channel 3 from the plurality of channels 36. The data corresponding to channel 3 is then multiplexed with the data for the other channels and transmitted from the multimedia

Asserted Claims	Additional References and Disclosure
	server 12 to each of the client modules 14-22. Client module 14 monitors the transmission from the multimedia server 12 and extracts the data corresponding to channel 3. The extracted data for channel 3 is then provided to the client 26 for display. TR 101 201 V1.1.1 at 7: The GT at the SMATV performs the collection and the distribution of information coming from and going to the UTs. It is composed by the GT Interactive Network Adapter (INA), the Medium Access Control (MAC) functions and the interfaces with the SIT in order to collect/distribute the information in the SMA TV coax network related to each UT's Interactive Interface Module (IIM). TR 101 201 V1.1.1 at 11: Satellite Interactive Terminal (SIT): The SIT is the key equipment of the satellite section for providing the Interaction Channel (IC) to SMATV systems. It is composed by the RF antenna subsystem with transmission and reception capabilities and the satellite modem. The SIT is installed at the head-end of each building for providing a two-way communications path between the service provider and the SMATV coaxial section; if the SMATV Grouping Terminal (GT) allows it, a single SIT would be able to collect traffic from several buildings. It is assumed a high number of SIT to be deployed becoming a consumer type equipment. SMATV Grouping Terminal (GT): The GT at the SMATV performs the collection and the distribution of information coming from and going to the User Terminals (UT). It is composed by the GT Interactive Network Adapter (INA), the Medium Access Control (MAC) functions and the interfaces with the SIT in order to collect/distribute the information in the SMATV coax network related to each UT (Interactive Interface Module - IIM). TR 101 201 V1.1.1 at 17:

Asserted Claims	Additional References and Disclosure
	The Interaction Channel (IC) is made up by two sections, satellite and coaxial, as depicted in figure 1. For the Return Interaction path (upstream), the interactive traffic from the users is transmitted in the lower part of the frequency band of the bi-directional (passive) coaxial distribution network and is collected at the SMATV head-end by the Grouping Terminal (GT), then it is transported to the service provider through the SMATV Satellite Interactive Terminal (SIT). For the Forward Interaction path (downstream) the responses from the service provider are distributed through the bi-directional satellite network to the SIT at the SMA TV head-ends and then, inside each building, the distribution is performed through the GT to each user using the lower part of the frequency band of the bi-directional (passive) coaxial distribution network. Alternatively, or in parallel, the Forward Interaction path (downstream) could be embedded into the BC in the MPEG-2 Multiplex, when required by the capacity in the Forward Interaction path or the type of application.
9[c] a frequency translator coupled to the signal selector that is capable of shifting the selected transponder signals to new carrier frequencies to produce RF signals; and	The obviousness reference(s) listed below disclose, explicitly and/or inherently, a frequency translator coupled to the signal selector that is capable of shifting the selected transponder signals to new carrier frequencies to produce RF signals. *See, e.g.*: Freeman at 9:30–58: As shown in FIG. 7, a two way link (similar to FIG. 2) may also be used, employing virtual channels back to the user. In this embodiment, multiple video signals, preferably related in time and synchronous to each other, are present at a cable headend 300 on multiple channels A, B, C, . . . N of a video signal bus 250. The signals may be locally generated or received from a remote location (such as a sporting arena) by receivers 200, 202, 204, and 206. Alternatively, if the remotely received signals are digitally multiplexed onto one channel, a digital demultiplexer would replace receivers 200-206 and would &multiplex the signals and place each signal on a separate bus channel. The local or remote signals are synchronized by sync circuit 208. A number of remote control interactive switches 210, 212, 214, 216, and 218 are connected to video signal bus 250.

Asserted Claims	Additional References and Disclosure
	The multiple channels on bus 250 are provided synchronously and simultaneously to the series of remote control interactive switches 210, 212, 214, 216, 218. These remote control interactive switches are dynamically allocated to users who request access to an interactive program. Each switch is connected to a frequency agile modulator 220, 222, 224, 226, 228 to assign the switch a virtual channel in order to connect a signal from bus 250 to a specific user at a remote site. Each switch is assigned to a single user so the number of switches present at the headend is the limiting factor to the number of users who can interact simultaneously. If it is assumed that only a portion of the users will interact simultaneously, an algorithm is used to determine the optimum number of remote switches necessary to assure an acceptable percentage of access. Freeman at 9:59–67: After passing through the frequency agile modulators 220, 222, 224, 226, 228, the signals from video signal bus 250 progress through the cable (or broadcast TV) system 260. The signals may pass through RF feed 262 and amplifier 230. The user's set top box 232, 234, 236, containing a frequency agile demodulator, is tuned to the frequency of the associated frequency agile modulator 220, 222, 224, 226, 228. The decoded signal from the set top box 232, 234, 236 is displayed on television monitor 10.
9[d] a signal combiner coupled to at least one frequency translator capable of combining at least two RF signals to produce a composite signal;	The obviousness reference(s) listed below disclose, explicitly and/or inherently, a signal combiner coupled to at least one frequency translator capable of combining at least two RF signals to produce a composite signal. *See, e.g.*: Ishizaki at [0028]: According to a first aspect of the present invention, there is provided a CATV for distributing video information to a subscriber terminal connected via a CATV network and performing bidirectional communication between the CATV center and the subscriber terminal. In the system, the CATV center multiplexes the video information and the downlink data information of the two-way communication and distributes the multiplexed

Asserted Claims	Additional References and Disclosure
	video information to the subscriber terminal on the same physical channel, and the subscriber terminal transmits the video information from a single received physical channel. And downlink data information of the two-way communication. Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Freeman at 1:16–21: The present invention relates generally to interactive response systems, and more particularly to an interactive television system which provides interactive programming using compressed, digital data having more than one video signal on a broadcast channel, or a multiplexed signal within a digital format, or both. Freeman at 6:16–22:

Asserted Claims	Additional References and Disclosure
	Multiplexer 4 receives the incoming compressed, digitized video signals and in a predetermined conventional fashion, in conjunction with transmitter 5, multiplexes the desired video signal onto the desired channels, and transmits these signals over the NTSC channels. Certain NTSC channels may contain only one video or other signal, in analog or digital form. Freeman at 6:23–35: As indicated earlier, the number of video signals which may be multiplexed onto a data stream on a single transmission channel will vary. Also, the number of channels which use data streams may vary. The transmission data streams are transmitted by transmitter 4 via transmission media 6 to a receiving station 7. The transmitter 4, media 6, and receiver 7 may be any conventional means for transmitting digital video signals including broadcast television, cable television, direct broadcast satellite, fiber optic, or any other transmission means. Alternatively, the invention may be self-contained in a stand-alone system, as explained below. Laksono '951 at 12:41–46: The channel mixer 152 mixes (i.e., multiplexes) the set of channels 162 to produce a stream of channel data 166. The mixing of the set of channels includes converting the data of each channel into a generic data type and then converting the generic data into a specific data format for transmission as the stream of channel data 166. Laksono '951 at 15:58–64: The channel mixer 242 processes the set of channels 254 by converting the data of each multimedia source into generic data. The generic data is converted into a specific format video data, which is then combined into a stream of channel data 256. The transceiving module 246 receives the stream of channel data 256 and packetizes it for transmission as packets of data 268.

Asserted Claims	Additional References and Disclosure
	Laksono '951 at 21:14–26: The channel mixer 152 is operably coupled to receive the encoded channel data 386 from tuning module 150. The channel mixer 152 receives the encoded channel data 386 via the stream parsing module 390. The stream parsing module 390 includes a plurality of bit stream modules 398–404. Each of the bit stream modules 398–404 monitors the bus for data corresponding to a particular channel of interest. Accordingly, each of the bit stream modules 398–404 is allocated to process data related to a particular client module. For example, bit stream module 398 may be allocated to process data for client module 14 of FIG. 1, while bit stream module 400 is allocated to process data for client module 16 of FIG. 1, et cetera. Laksono '951 at 36:40–51: The process then proceeds to Step 718 where the set of channels are mixed into a stream of channel data. The channel data is mixed in such a way as to identify the particular source of the channel data, the destination of the channel data, the select request, and/or any other identifying information needed to ensure that the appropriate client module receives the appropriate data. As one of average skill in the art will appreciate, the stream of channel data may be stored on a hard drive within the multimedia server for subsequent retrieval and/or use. As such, the multimedia server, via a hard drive and appropriate software, may perform a digital VCR function or like function.
9[e] wherein the modulation of the composite signal is the same as the modulation of the broadband LNB signals and wherein the composite signal is transmitted to the gateway and the gateway receives the composite signal, decodes specific programs, and distributes the	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the modulation of the composite signal is the same as the modulation of the broadband LNB signals and wherein the composite signal is transmitted to the gateway and the gateway receives the composite signal, decodes specific programs, and distributes the programs over a digital local area network (LAN) to STBs. *See, e.g.*: Ishizaki at [0041]:

Asserted Claims	Additional References and Disclosure
programs over a digital local area network (LAN) to STBs.	The center modem 128 is a communication device on the center side for providing a program or a communication service according to a subscriber's request, and is connected via an optical / coaxial cable 135 via a head end (HE) 130. DS on the sender side The bidirectional communication is performed with the cable modem built in the TB 140. The broadcast receivers 100, 102, 104, the storage server 108, the server 114, the management device 120, the multiplexing device 106, the program information control device 122, and the encryption device 124. The QAM modulator 126 and the center modem 128 are mutually connected by a center LAN system 132. Ogami at Abstract: PROBLEM TO BE SOLVED: To enjoy a variety of broadcasting signals, communication signals and accumulated record signals at an arbitrary location (room). SOLUTION: A satellite broadcasting signal 1, a TV broadcasting signal 2, a CATV broadcasting signal 3 and a telephone channel signal 4 are received and demodulated at an external signal receiving and demodulating unit 51 of a home server 5. The external signal receiving and demodulating unit 51 leads a broadcasting channel selected according to a user's request to a digital signal processing unit 52 where it is converted to a common data signal. Going through a signal control unit 54, whether the video signal converted to a common data signal is wireless or wired is selected based on an address of a display unit 6, modulated by a wireless control unit 58, and the signal is transmitted from an antenna unit 60 to the display which issued the request signal. The video signal transmitted from the home server 5 is received by an antenna unit of the display 6, video signal is demodulated at the wireless control unit, and then supplied to a display (signal converter) recognition control unit. If the signal is a video signal with an address of the display added thereon, it is displayed at the display unit via the signal processing unit. Ogami at [0004]: Through the coaxial cables 251 to 253, and a distributor 313 for distributing to rooms a to c through CS. A distributor 314 distributes the signal received by the broadcast receiving antenna unit 213a to the rooms a and b via coaxial cables 254 and 255. The distributor 314

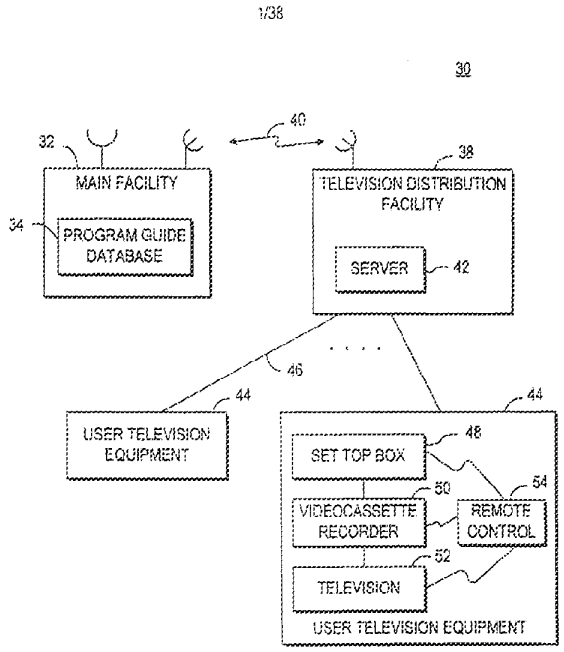
Asserted Claims	Additional References and Disclosure
	converts the signal supplied via the outdoor cable 214a of the CATV network into a coaxial cable. Distributors 412a and 412b for distributing to rooms a and b in the house via cables 256 and 257 are connected to antenna unit 2 unscramble the BS broadcast received from 11a. Laksono '951 at 12:47–52: The transceiving module 154 transmits the stream of channel data 166 in packets of channel data 180. Alternatively, the stream of channel data 166 may be transmitted in frames of channel data. Each of the client modules 14–22 receives the packets, or frames, of channel data 180 via its network interface controller 168. TR 101 201 V1.1.1 at 7: The Satellite Interactive Terminal (SIT) is the key equipment of the satellite section, which is composed by the RF antenna subsystem and the satellite modem to provide inter-activity to the SMATVusers. One SIT would be needed per building although in some cases it might be convenient to collect the interaction traffic of several adjacent buildings into a single GT. For the satellite section, implementation examples are given for both identified scenarios and for different satellite network technologies such as Code Division Multiple Access (CDMA) and Time Division Multiple Access (TDMA) with the aim of showing the feasibility to implement open and inter-operable systems based on existing standards. In order to provide purely illustrative implementation examples, specific sizing examples are provided for hypothetical services and traffic scenarios, deriving antenna sizes, power required, possible configurations, etc. TR 101 201 V1.1.1 at 11: **Satellite Master Antenna Television (SMATV) system:** A SMATV system is defined as a system which is intended for the distribution of TV, sound and Multimedia signals to households located in one or more adjacent buildings. These signals are received by a satellite receiving antenna and may be combined with terrestrial TV signals. SMATV

Asserted Claims	Additional References and Disclosure
	distribution systems are also known as community antenna installations or domestic TV cable networks. A SMATV system represents a means for sharing the same resource among several users for satellite and terrestrial reception. Two systems have been defined in EN 300 473 [1] for the satellite digital TV distribution through SMATV: **a) SMATV system A (SMATV-DTM):** This system approach consist of the trans-modulation from satellite Quaternary Phase Keying (QPSK) signals as defined in EN 300 421 [2] (DVB-S) to a Quadrature Amplitude Modulation (QAM) scheme as defined in EN 300 429 [3] (DVB-C). The process of trans-modulation without baseband interfacing is also known as Transparent Trans-modulation and the head-end unit performing this function is known as Transparent Digital Trans-modulator (TDT). **b) SMATV system B:** This system is based on the use of QPSK modulation. The SMATV system B concept allows a direct reception of digital satellite signals using frequency conversion of the received satellite signal to a frequency band appropriate to the characteristics of the SMATV distribution network. The functional elements of this system are given in the baseline satellite specification EN 300 421 [2] (DVB-S). Two configurations of SMATV system B are considered as follows: **b.l) SMATV-IF:** which uses the IF as delivered by the Low Noise Block (LNB) (e.g. 950 - 2 150 MHz); **b.2) SMATV-S:** which uses a conversion to the extended S-band (e.g. 230 - 470 MHz). TR 101 201 V1.1.1 at 11: Satellite Interactive Terminal (SIT): The SIT is the key equipment of the satellite section for providing the Interaction Channel (IC) to SMATV systems. It is composed by the RF antenna subsystem with transmission and reception capabilities and the satellite modem. The SIT is installed at the head-end of each building for providing a two-way communications path between the service provider and the SMATV coaxial section; if the SMATV Grouping Terminal (GT) allows it, a single SIT would be able to collect traffic

Asserted Claims	Additional References and Disclosure
	from several buildings. It is assumed a high number of SIT to be deployed becoming a consumer type equipment. TR 101 201 V1.1.1 at 17: The Interaction Channel (IC) is made up by two sections, satellite and coaxial, as depicted in figure 1. For the Return Interaction path (upstream), the interactive traffic from the users is transmitted in the lower part of the frequency band of the bi-directional (passive) coaxial distribution network and is collected at the SMATV head-end by the Grouping Terminal (GT), then it is transported to the service provider through the SMATV Satellite Interactive Terminal (SIT). For the Forward Interaction path (downstream) the responses from the service provider are distributed through the bi-directional satellite network to the SIT at the SMA TV head-ends and then, inside each building, the distribution is performed through the GT to each user using the lower part of the frequency band of the bi-directional (passive) coaxial distribution network. Alternatively, or in parallel, the Forward Interaction path (downstream) could be embedded into the BC in the MPEG-2 Multiplex, when required by the capacity in the Forward Interaction path or the type of application. TR 101 201 V1.1.1 at 26: 5.3.2 Alternative interfaces 5.3.2.1 LAN based interfaces In order to facilitate the evolution towards Multimedia broadband applications, alternative interfaces based on Local Area Networks (LAN) technology are identified in order to provide solutions to the potential barriers that the RS-232 may present in terms of maximum bit rate. For this purpose a typical Ethernet interface is proposed, which is very extended and facilitates the interconnections to LAN for any other kind of needs.

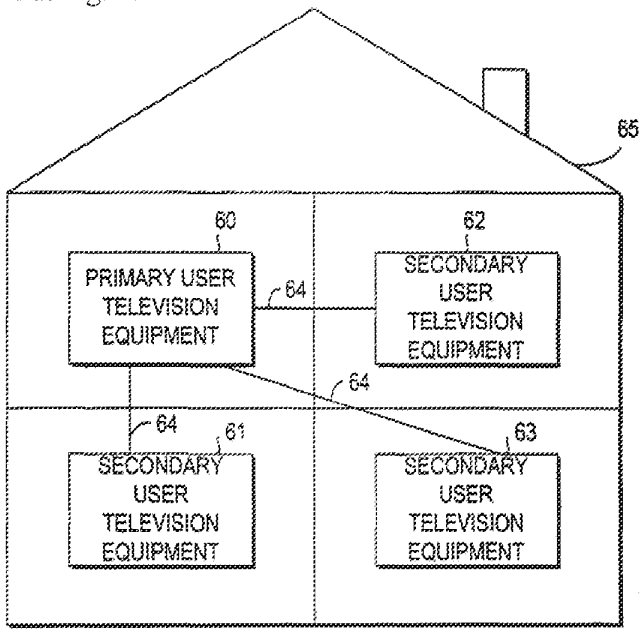
Asserted Claims	Additional References and Disclosure
	For the mechanical and electrical characteristics the interface shall comply with EIA 568-A [21], i.e. it shall be an IEEE 10 Base-T Ethernet (IEEE 802-3 [20]) with RJ-45 connectors. With respect to the framing and error control a standard for framing of data packets into Ethernet is described in IEEE 802-3 [20].
10. The signal distribution system of claim 9 wherein a translation table maps original channel locations on the selector input to new channel locations on the selector output.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein a translation table maps original channel locations on the selector input to new channel locations on the selector output. See claim 9, supra. See, e.g.: Eck at 1:7–9: The present invention relates to an autoscan system that determines a translation between satellite television frequencies and cable television frequencies. Eck at 2:30–38: In accordance with one aspect of the present invention, a method of generating a translation table correlating satellite frequencies to cable frequencies comprises the following steps: a) tuning to a cable frequency; b) reading satellite service data from a signal at the cable frequency, wherein the satellite service data includes an indicium of a satellite frequency; c) storing in a translation table the indicium in association with the cable frequency of step a); and, d) repeating steps a)-c) for other cable frequencies. Eck at 2:39–52: In accordance with another aspect of the present invention, a method is provided to generate a translation table that correlates satellite frequencies carrying satellite QPSK signals to cable frequencies carrying corresponding QAM signals. The method comprises the following steps: a) scanning the cable frequencies; b) for each of the cable frequencies carrying a QAM signal, reading satellite service data from the corresponding QAM signal,

Asserted Claims	Additional References and Disclosure
	wherein the satellite service data includes a satellite frequency; and, c) storing in the translation table the satellite frequency contained in the satellite service data read from each QAM signal carried on a cable frequency, wherein each satellite frequency is stored in the translation table in association with a corresponding cable frequency. Eck at 2:53–61: In accordance with yet another aspect of the present invention, a translation table is stored on a computer readable storage medium. The translation table holds satellite frequency indicia and cable frequencies. The satellite frequency indicia correspond to satellite QPSK signals, and the cable frequencies correspond to cable QAM signals transmodulated from the QPSK signal. Each of the satellite frequency indicia as stored in the translation table uniquely corresponds to one of the cable frequencies. Eck at 8:29–32: Moreover, as described above, the translation table holds satellite frequency, CATV frequency pairs. Instead, the translation table could hold satellite channel number, CATV frequency pairs. Ellis at 11:17-12:5: Detailed Description of the Preferred Embodiments An illustrative program guide system 30 in accordance with the present invention is shown in FIG. 1. Main facility 32 contains a program guide database 20 34 for storing program guide information such as television program guide program listings data, pay-per-view ordering information, television program promotional information, etc. Information from database 34 may be transmitted to multiple television 25 distribution facilities such as television distribution facility 38 via communications links such as communications link 40. Only one such television distribution facility 38 and one communications link 40 are shown in FIG. 1 to avoid over-complicating the 30 drawings. Link 40 may be a satellite link, a telephone network link, a cable or fiber optic link, a microwave link, a combination

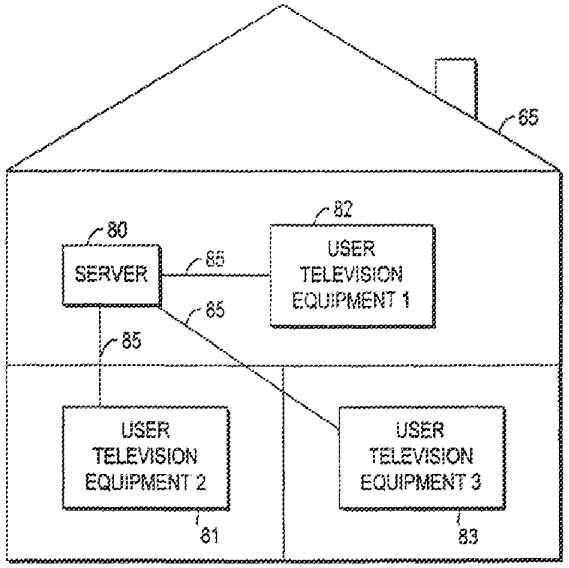
Asserted Claims	Additional References and Disclosure
	of such links, or any other suitable communications path. If it is desired to transmit video signals (e.g., for advertising and promotional videos) over link 40 in addition to data signals, a relatively high bandwidth link such as a satellite link is generally preferable to a relatively low bandwidth link such as a telephone line. Ellis at Fig. 1:  FIG. 1

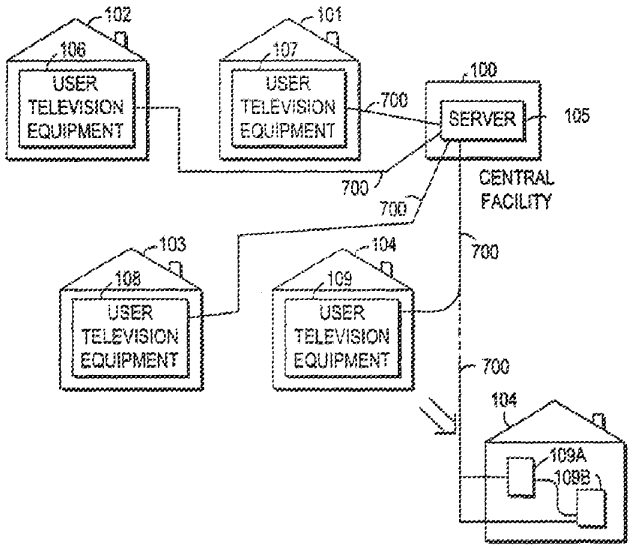
Asserted Claims	Additional References and Disclosure
	Ellis at 12:6-14: Television distribution facility 38 is a facility for distributing television signals to users, such as a cable system headend, a broadcast distribution facility, or a satellite television distribution facility or the like. The program guide information transmitted by main facility 32 to television distribution facility 38 includes television program listings data such as program times, channels, titles, descriptions, etc. Ellis at 12:31-13:4: A server 42 may be provided in television distribution facility 38 for handling data distribution tasks and for storing local information. If desired, server 42 may be used to implement a client-server based interactive television program guide system. In such a system, client functions may be performed at user television equipment 44. Server 42 may be capable of handling text, graphics, and video. Ellis at 13:5-11: Television distribution facility 38 distributes program guide and advertising information to the user television equipment 44 of multiple users via communications paths 46. Program guide data and other information may be distributed over an out-of-band channel on paths 46 or using any other suitable distribution technique. Ellis at 13:12-14:3 Each user has a receiver, which is typically a set-top box such as set-top box 48, but which may be other suitable television equipment into which circuitry similar to set-top-box circuitry has been integrated. If desired, user television equipment 44 may be an advanced television receiver or a personal computer television (PC/TV). For purposes of illustration, the present invention will generally be described in connection with user television

Asserted Claims	Additional References and Disclosure
	equipment based on a set-top box arrangement. Program guide data may be distributed to set-top boxes 48 periodically and stored or may be distributed continuously and handled "on the fly.", or by request. Television distribution 25 facility 38 may poll set-top boxes 48 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated authorization techniques). Main facility 32 preferably contains a processor to handle information distribution tasks. Each set-top box 48 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 48. Television distribution facility 38 may contain a processor for tasks associated with implementing server 42 and for handling tasks associated with the distribution of program guide and other information. Ellis at 14:4-13: Each set-top box 48 is may connected to an optional videocassette recorder 50 or other suitable recording device (e.g., digital storage device) so that selected television programs may be recorded. Each videocassette recorder 50 may be connected to a television 52. To record a program, set-top box 48 tunes to a particular channel and sends control signals to videocassette recorder 50 (e.g., using an infrared transmitter) that direct videocassette recorder 50 to start and stop recording at the appropriate times. Ellis at 16:16-17:8: FIG. 3 shows an illustrative arrangement for interconnecting various user television equipment devices in accordance with the present invention. Primary user television equipment 60 may be connected to secondary user television equipment 61, secondary user television equipment 62, and secondary user television equipment 63 via communication paths 64. Communications paths 64 may be any suitable communications path for in-home network, such as twisted pair lines, Ethernet links, fiber optics, power lines, radio-frequency (RF) links, infrared (IR) and links other wireless links, firewire (IEEE 1394) paths, dedicated cables, etc. As shown, one or more pieces of secondary user television equipment may be connected to primary user television equipment 60 in a star

Asserted Claims	Additional References and Disclosure
	configuration if desired. User television equipment devices are typically located in different rooms within home 65. For example, primary user television equipment 60 may be placed in the parents' bedroom, secondary user television equipment 61 may be placed in the children's room, secondary user television equipment 62 may be placed in a living room, and secondary user television equipment 63 may be placed in a guest room. With such an arrangement, the parents' bedroom may be used as a master location to adjust user settings for the program guides on the user television equipment in the children's room and the other rooms. Ellis at Fig. 3:  FIG. 3

Asserted Claims	Additional References and Disclosure
	Ellis at 18:5-22: FIG. 5 shows an illustrative configuration based on a client-server architecture. Server 80 may be connected to user television equipment 81, 82, and 83 via communication paths 85. Equipment 81, 82, and 83 and server 80 may be placed in various rooms within 10 home 65. For example, server 80 may be placed in a den, user television equipment 81 may be placed in a children's room, user television equipment may be placed in a living room, user television equipment 83 may be placed in a parents' room. Communication paths 85 may be any in-home network suitable to transmit video, audio and data, such as dedicated cable fiber optics, firewire links, RF links, etc. As, in the examples of FIGS. 4a, 4b, and 4c, different communications path arrangements such as buses, rings and the like, may be used to interconnect user television equipment based on a client-server architecture. Ellis at Fig. 5:

Asserted Claims	Additional References and Disclosure
	 *FIG. 5* Ellis at 19:16-20:4: FIG. 7a shows an illustrative configuration in which multiple homes are handled by a common server. Server 105 may be located at central facility 100. Central facility 100 may be a private home, a 20 commercial building, a network node, or other suitable structure that may be connected to a plurality of homes. In the example of FIG. 7a, server 105 is connected to user television equipment 106, 107, 108, and 109 that is located in homes 101, 102, 103, and 104, respectively via communication paths 700. When multiple user television equipment devices exist within a home as shown by devices 109a and 109b, each user television equipment device may communicate with the server 105

Asserted Claims	Additional References and Disclosure
	independently via communication paths 700, alternatively only one device may communicate while the other communicates via a home network. In other words, in alternative arrangements, there are either 1) multiple connections to an outside server and each user television equipment device communicates with the server independently with no need for an in-home network, or, 2) only one connection to an outside server and each user television device communicates with each other through an in-home network. Ellis at Fig. 7a:  FIG. 7a Ellis at 20:11-26:

Asserted Claims	Additional References and Disclosure
	Graphics information for messages, advertisements and the like may be downloaded periodically (e.g., once per day) to set-top boxes 48 of FIG. 1 and stored locally. The graphics information may be accessed locally when needed by the program guides implemented on set-top boxes 48. Graphics information may also be provided in a continuously looped arrangement on one or more digital channels on paths 46. With such a continuously-looped arrangement, a map indicating the location of the latest graphics information may be downloaded periodically to set-top boxes 48 (e.g., once per day) or continuously. This allows the content on the digital channels to be updated. The program guides on set-top boxes 48 may use the map to locate desired graphics information on the digital channels. Ellis at 23:29-24:6: In any of the above arrangements, an interactive television program guide on each user television equipment device may provide various features for displaying television program listings information for the user and for providing various program guide functions such as parental control, favorites, pay-per-view purchasing, etc. For example, if the user presses the appropriate buttons on remote control 54, the user may be presented with a time-ordered or channel-ordered grid or table of television program listings or other such programming information. Ellis at 27:16-24: At step 1015, the user can access parental control screen 190 of FIG. 16 and may use remote control 54 to navigate between options such as set channels option 191, set maximum rating option 193, and monitor viewing option 195. The user may navigate to set channels screen 200 of FIG. 18a by selecting set channels option 191 at step 1016 of FIG. 17 by moving the highlight region 192 and pressing select. Ellis at 27:25-31:

Asserted Claims	Additional References and Disclosure
	If the user selects set channels option 191 at step 1016, at step 1020 the program guide provides the user with an opportunity to set which channels are to be blocked. The user may block specific channels using remote control 54 to scroll through and select 30 from channel options 201, 202, 203, and 204 of FIG. 18a. Ellis at 29:11-27: The program guide at the user's location may then, in one alternative, provide the user with monitor viewing screen 230, which shows the channel that each location is currently viewing or an overlay such as a banner or small information box that shows the channels that the other locations are viewing, but that also allows the user to continue watching programming at the user's location. The program guide at the user's location may poll the program guides at other locations within the household to determine whether anyone is currently viewing television and to which channels they are tuned. The monitor viewing screen may also allow the viewing of video, audio, or still images associated with the channel being viewed at another location. For example, the video of the remote location may be shown in a small box on the screen while the current channel's video is in the background. Ellis at Fig. 19:

Asserted Claims	Additional References and Disclosure

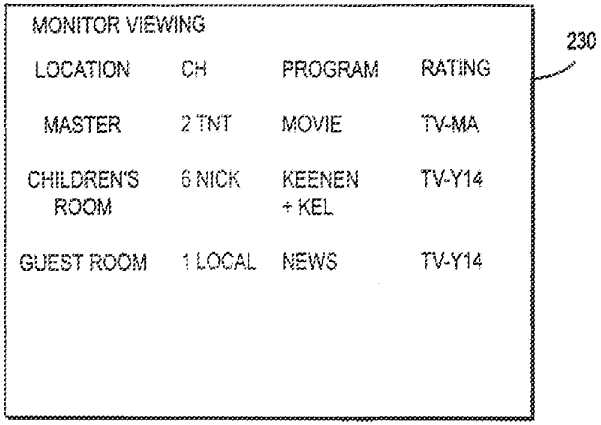


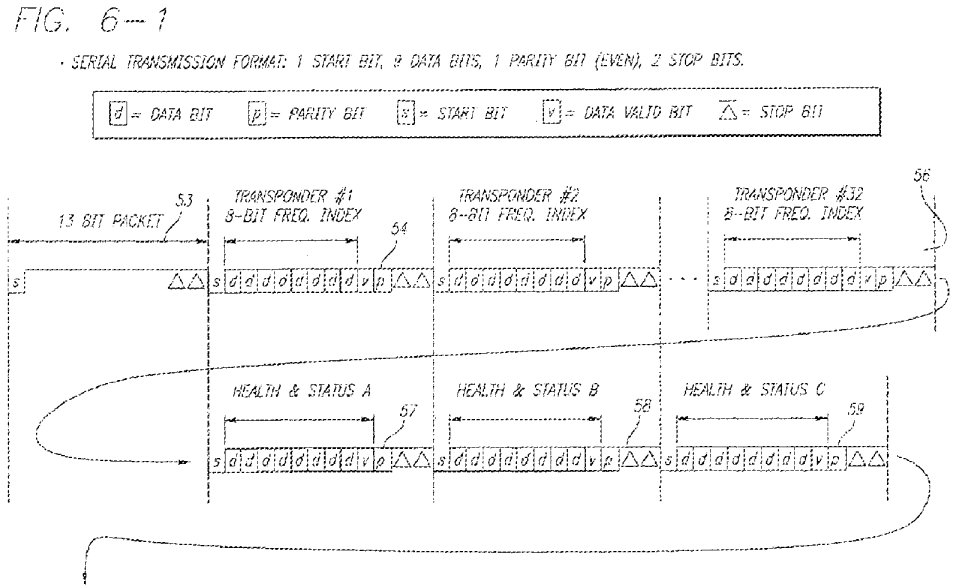
FIG. 19

Staal at [0016]:

The system modulates and upconverts the signal bytes in each MPEG2 QAM packet and passes them through a cable plant constructed to receive modulated QAM bytes (or NTSC signals) which are demodulated at the settop box. The additional FEC bytes correct to 8 errors within a MPEG2QAM packet and are then removed. The superpacket is deframed to obtain the original MPEG2QAM packets. After finding a first television channel, the side bytes are processed to determine the frequency location of the other channels in the apartment receivers and any existence of uncorrectable errors. The MPEG2QAM bytes are decompressed and encoded to reproduce the television images in the apartment receivers.

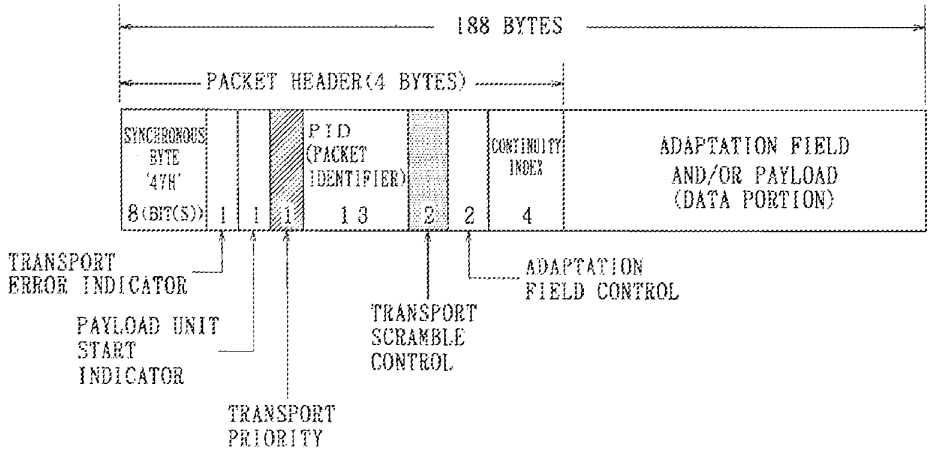
Staal at [0042]-[0044]:

Asserted Claims	Additional References and Disclosure
	FIG. 6 indicates a sequence of the thirteen (13) bit packets. As previously discussed, the first such packet 53 in the sequence indicates the start of the sequence of packets. The second one 54 of such packets is indicated as "Transponder #1". It indicates (in the 2nd through 9th bits) the particular frequency location in the cable plant that the television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals from the first one of the thirty two (32) transponders in the satellites 12, 14 and 16. In like manner, successive instances of such thirteen (13) bit packets indicate the frequency location in the cable plant that television receivers in the apartments in the apartment building should be tuned to receive the transmodulated television signals from successive channels of the thirty two (32) transponders in the apartment building. This may be seen from the designation of the second packet 54 in FIG. 6 as "Transponder #1" and from the designation in FIG. 6 of the thirty third (33rd) packet 56 in FIG. 4 as "Transponder #32". Successive instances 57 through 63 of the thirteen (13) bit packets after the packet 56 designated as "Transponder #32" are then provided. These 13-bit packets indicate other information than the particular frequency location of the television channel for the television signals from the different channels of the transponders in the satellites 12, 14 and 16. For example, the 13-bit groups 57-63, designated as "Health & Status A-G", may indicate certain specified information such as the error messages, phone numbers for service, BER thresholds, transmodulator temperature, etc. Staal at Fig. 6-1:

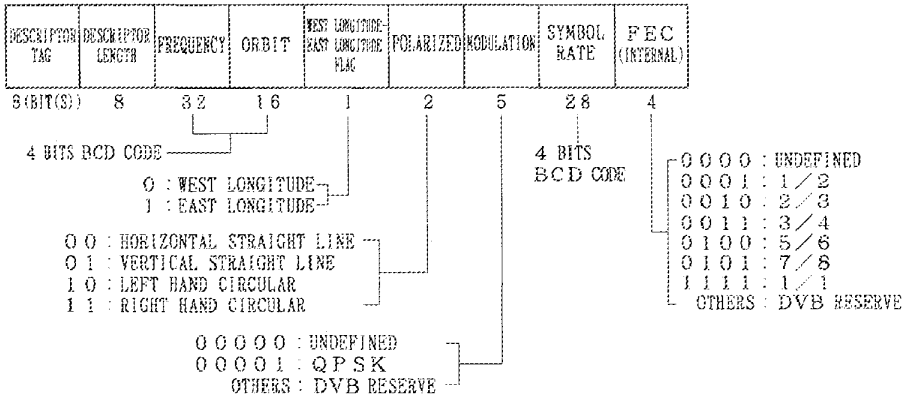
Asserted Claims	Additional References and Disclosure
	 Staal at [0058]: A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2QAM packets 42 in each superpacket. The MPEG2QAM packets 42 are then deframed as at 114 to recover the MPEG2QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123. When the side bytes 48 are processed, the frequency location in the cable plant that television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in

Asserted Claims	Additional References and Disclosure
	FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above. Ohishi at 1:7-20: This invention relates generally to a signal processing device preferably being used when digital broadcasting programs broadcast through an arbitrary network are transmitted to another network, and a switching method of signal processors suitable for use in the signal processing device. More specifically, this invention relates to a signal processing device being able to transmit the digital broadcasting programs broadcast through a first network to a second network by detecting a NIT (Network Information Table) from digital broadcast data on the first network, changing the NIT so as to be applicable to the second network and substituting said changed NIT for the NIT of digital broadcast data on the first network to obtain digital broadcast data on the second network. Ohishi at 2:12-35: The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first table-detecting means detects the NIT from digital broadcast data on the first network and the table changing means changes said NIT so that the NIT is applicable to said second network. For example, when a cable television enterprise or the like provides delivery service of a satellite digital multi-channel broadcast with transmitting device for modulation and conversion or the like by using its own network, a frequency information of the NIT is changed. Further, preferably, said table-changing means deletes an information relating to the digital broadcast signal failing to correspond to a digital information signal on said second network, from the digital broadcast signal on said first

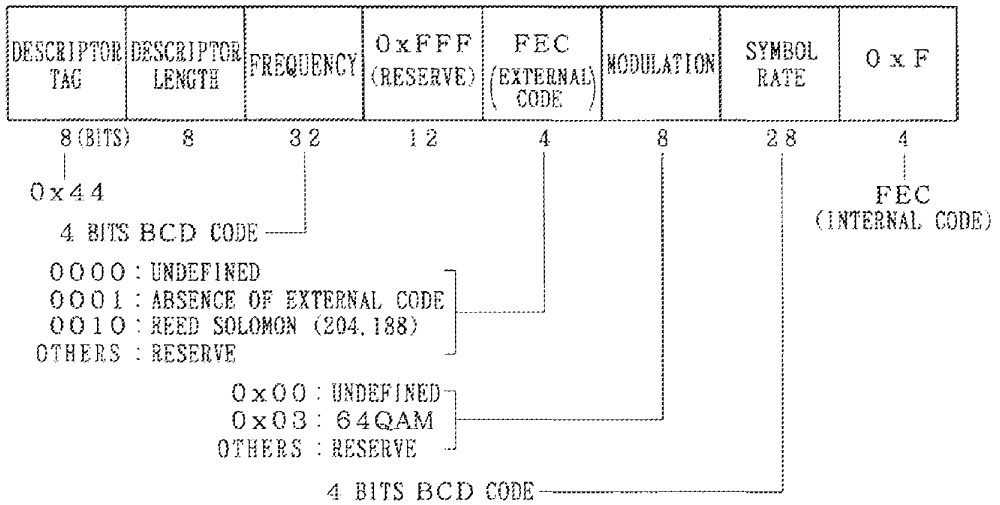
Asserted Claims	Additional References and Disclosure
	network when the number of digital broadcast signal on said second network becomes less than the one of digital broadcast signal on said first network. Ohishi at 4:65-5:31: Referring now to FIG. 1, there is shown a digital CATV system 10 as a preferred embodiment of the invention, which is used for a satellite digital multi-channel broadcast. The system 10 comprises an antenna 11 for receiving digital broadcast signals sent from a plurality of transponders (satellite repeaters) of a communication satellite 20, and a transmitting device for modulation and conversion 12 for converting a transmission frequency of each received digital broadcast signal, and changing a modulation scheme thereof, etc. to generate a CATV digital broadcast signal and transmitting it to a transmission path 13. Incidentally, STB (Set Top Box) 14-1 through 14-m used as receiving terminals are electrically connected to the transmission path 13. Images in channels selected by these STE 14-1 through 14-m are respectively displayed on monitors 15-1 through 15-m corresponding to the STE 14-1 through 14-m. The digital broadcast signals transmitted from the communication satellite 20 will first be explained. In the present embodiment, the digital broadcast signals are ones corresponding to a DVB (Digital Video Broadcasting) system. FIG. 2B shows a frame configuration of digital broadcast data employed in the DVB system. One frame of the digital broadcast data comprises eight MPEG2 transport packets (see FIG. 2A). In this case, by using a synchronous byte lying within each packet, one synchronous byte (=4 7H) every eight packets is inverted to a byte (=ESH) so that the frame synchronization thereof maybe obtained. Incidentally, an error correction code based on reed solomon (204, 188) is added to each MPEG2 transport packet (MPEG2 TS packet) The digital broadcast data shown in FIG. 2B is QPSK (Quadrature Phase Shift Keying)-modulated and thereafter frequency-converted into an SHF band, thus resulting in digital broadcast signals transmitted from the communication satellite 20. Ohishi at 5:32-45:

Asserted Claims	Additional References and Disclosure
	FIG. 3 shows a packet configuration of an MPEG2 transport packet composed of 188 bytes. The leading four bytes of said 188 bytes constitute a packet header. A PID (Packet Identifier) indicative of the attribute of an individually provided stream (data string) of the corresponding packet is placed in the packet header. As is well known, a PES (Packetized Elementary Stream) packet indicative of a packet configuration as shown in FIG. 4 is disposed in a payload (data portion) of the MPEG2 transport packet in re-divided form. Further, a PAT (Program Association Table), a PMT (Program Map Table), an NIT (Network Information Table), etc. used as PSI (Program Specific Information) defined in an MPEG2 system are also provided in the payload. Ohishi at Fig. 3: F I G. 3  Ohishi at 6:4-15:

Asserted Claims	Additional References and Disclosure
	FIG. 6 shows a table structure of the PMT. An explanation will be made of principal contents which does not overlap with the PAT. A table ID indicates the classification of a table and is given as "0x02" in the case of the PMT. A PCR PID indicates a PID of the packet including a program clock reference (PCR) defined as the reference upon decoding. A stream type indicates the type of signal transmitted in the form of a stream such as video, audio and added data. Further, the NIT indicates physical information on a transmission path, i.e., satellite orbits, polarized waves, frequencies every transponders, etc., in the case of a satellite. As described above, the PAT specifies the PID of the NIT itself. Ohishi at 6:16-45: FIG. 7 indicates a table structure of the NIT. An explanation will be made of principal contents thereof, which does not overlap with the PAT and PMT. A table ID indicates the type of table. The corresponding network is given as "0x40" and other networks are given as "0x41". A network ID is used to identify each network. In the case of satellites, the network ID corresponds to each satellite. An explanation will further be made of two descriptors that play an important role as some of the NIT. First, a satellite delivery system descriptor will be explained. This type of descriptor is used as a first descriptor repeated in accordance with a TS (Transport Stream) descriptor length and is set as a pair together with a TSID. FIG. 8 shows the structure of the satellite delivery system descriptor. A descriptor tag is defined by a DVB and indicates the classification of each descriptor. In this descriptor, it is given as "0x43". The frequency indicates a transmission frequency for each stream (transponder herein). An orbit, a west longitude-east longitude and a Polarized wave indicate the orbit and polarized wave of a satellite, respectively. A modulation, a symbol rate and a forward error correction code (internal code) rate indicate specifications related to a transmission system, respectively.

Asserted Claims	Additional References and Disclosure
	Secondary, a service list descriptor will be explained. This service list descriptor is used as second or later descriptors repeated in accordance with a TS (Transport Stream) descriptor length. The service list descriptor also indicates an ID of a service (channel) multiplexed onto the corresponding stream (the transponder here). Namely, a plurality of service list descriptors are attached to one TSID. Ohishi at Fig. 8: F I G. 8  Ohishi at 6:53-7:9: An example of the operation of the receiver for receiving the above-described digital broadcast signals transmitted form the communication satellite 20 will be explained briefly. In the PAT and the PMT, each of the program numbers corresponds to a channel number selected by the viewer and the service ID corresponds to a channel number selected by the viewer in the NIT, respectively. Further, the NIT includes information

Asserted Claims	Additional References and Disclosure
	about the entire network, i.e., all the transponders and makes the same tables transmitted in parallel through all the transponders, whereas the PAT and the PMT respectively comprise only information about transmitted programs lying within transponders, and are different in contents from one another every transponders. Now consider where a viewer has selected an "M" channel through the receiver. After the receiver has received an NIT through a fixed PID, "M" is searched for a service ID in a service list descriptor of the NIT. A satellite delivery system descriptor provided before the service list descriptor including the service ID"M" in combination is received and the frequency of a transponder transmitting the "M" channel is recognized to thereby control a received frequency. Thereafter, a PAT is detected from a digital broadcast signal sent from the transponder transmitting the "M" channel and "M" is searched for a program number lying within the PAT. Ohishi at 7:63-8:5: Further, the signal processor 32-1 comprises an NIT detection circuit 44 for detecting an NIT (Network Information Table) from the MPEG2 transport packets S3 successively outputted from the ECC decoder 43, and a memory for storing a table NITa detected by the NIT detection circuit 44 and a memory 46 for storing a NITb being applicable to CATV, obtained by changing the table NITa stored in the memory 45 by means of the controller 31. The NIT detection circuit 44 detects the NIT based on the fixed PID. Ohishi at 8:6-14: Since the table structure of the NIT in the digital broadcast data related to the communication satellite 20 is represented as shown in FIG. 7 as described above, a table structure of the table NITa detected by the NIT detection circuit 44 is also similar to the above. In the controller 31, a satellite delivery system descriptor (see FIG. 8) having transmission frequency information or the like in the table NITa is changed to a CATV delivery system descriptor whose structure is shown in FIG. 11, upon obtaining the table NITb.

Asserted Claims	Additional References and Disclosure
	Ohishi at Fig. 11: FIG. 11  Ohishi at 9:4-15: Each of the NIT substitution circuits 48 of the signal processors 32-2 through 32-N substitutes the NITb stored in the memory 46 of the signal processor 32-1 for the NIT. Further, each of the tuner 41 of the signal processors 32-2 through 32-N selects the corresponding digital broadcast signal sent from the second through Nth transponders of the communications satellite 20 out of a plurality of the digital broadcast signals received

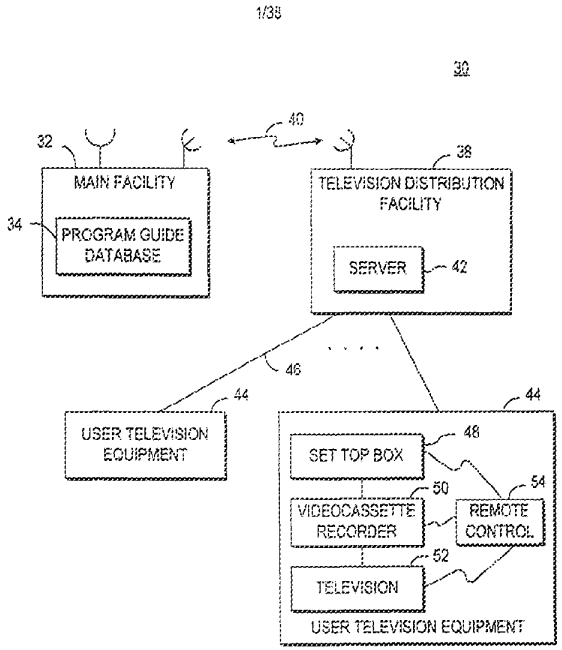
Asserted Claims	Additional References and Disclosure
	by the antenna 11 so that said digital broadcast signal is frequency-converted to obtain a QPSK-modulated signal Sl. The control unit 31 controls the received frequency of each of the tuner 41 of the signal processors 32-2 through 32-N by the interface 47. Ohishi at 9:38-64: The MPEG2 transport packet S3 successively outputted from the ECC decoder 43 are supplied to the NIT detection circuit 44, where an NITa is detected from the MPEG2 transport packets S3. The detected table NITa is supplied to the memory 45 where it is stored therein. For example, such operation of detection of the NITa by the NIT detecting circuit 44 is carried out at once a day. The control unit 31 reads the corresponding table NITa from the memory 45 and changes a satellite delivery system descriptor (see FIG. 8) in the table NITa to a CATV delivery system descriptor (see FIG. 11). Further, the controller 31 deletes information about a TS (Transport Stream) ID corresponding to each digital broadcast signal unused in CATV in the table NITa, for example to thereby obtain a table NITb applicable to the CATV. Thereafter, the controller 31 causes the memory 46 to store the table NITb therein. Further, the MPEG2 transport packets S3 successively outputted from the ECC decoder 43 are supplied to the NIT substitution circuit 48 where an NIT is detected and the table NITb stored in the memory 46 is substituted for said the NIT. When, in this case, the information about the TS ID corresponding to each digital broadcast signal unused in the CATV in the table NITa is deleted by the controller 31 upon obtaining the table NITb, the NIT substitution circuit 48 inserts dummy bits into a portion related to the deletedinformation. Ohishi at 10:35-42: For this reason, such CATV digital broadcast signals BS-1 through BS-N changes only NIT out of a PSI (Program Specification Information) in digital satellite broadcasting. Thus, at the STB (Set Top Box) 14-1 through 14-m used as receiving terminals, which are connected to the transmission path 13 of CATV, the same operation for selecting channel

Asserted Claims	Additional References and Disclosure
	as the operation for selecting channel at the receiver of the digital satellite broadcasting may be performed.
11. The signal distribution system of claim 10 wherein the translation table is maintained by a controller located in the gateway and the translation table is communicated to devices in the network.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the translation table is maintained by a controller located in the gateway and the translation table is communicated to devices in the network. See claim 10, supra. See, e.g.: Eck at 1:7–9: The present invention relates to an autoscan system that determines a translation between satellite television frequencies and cable television frequencies. Eck at 1:54–64: A better alternative would be to store a frequency translation table in non-volatile memory of a set top box. This translation table would, therefore, contain the relationship between each satellite channel frequency indicated by the service data in the satellite signals and the corresponding unused cable channel frequency of the transmodulated signal. Accordingly, when a user selects a satellite channel, the set top box looks up the corresponding cable channel frequency in the translation table and tunes the CATV tuner to the proper cable channel frequency corresponding to the satellite frequency of the selected satellite channel. Eck at 2:10–26: The present invention permits automatic loading of a translation table at installation of a set top box. In order to implement this automatic loading, the set top box is arranged to scan through the entire CATV frequency spectrum in order to find all possible transmodulated QAM signals. As each QAM signal is found, the satellite frequency contained in the satellite service data of the QAM signal is read and is loaded into the

Asserted Claims	Additional References and Disclosure
	translation table in association with the cable frequency at which the QAM signal was found. Accordingly, when a user desires to tune to a particular program in one embodiment of the present invention, the user selects the appropriate satellite channel, the satellite service data corresponding to the selected satellite channel is read, the satellite frequency contained in this satellite service data is used to read the corresponding cable frequency from the translation table, and the CATV tuner is tuned to that cable frequency. Eck at 2:30–38: In accordance with one aspect of the present invention, a method of generating a translation table correlating satellite frequencies to cable frequencies comprises the following steps: a) tuning to a cable frequency; b) reading satellite service data from a signal at the cable frequency, wherein the satellite service data includes an indicium of a satellite frequency; c) storing in a translation table the indicium in association with the cable frequency of step a); and, d) repeating steps a)-c) for other cable frequencies. Eck at 2:39–52: In accordance with another aspect of the present invention, a method is provided to generate a translation table that correlates satellite frequencies carrying satellite QPSK signals to cable frequencies carrying corresponding QAM signals. The method comprises the following steps: a) scanning the cable frequencies; b) for each of the cable frequencies carrying a QAM signal, reading satellite service data from the corresponding QAM signal, wherein the satellite service data includes a satellite frequency; and, c) storing in the translation table the satellite frequency contained in the satellite service data read from each QAM signal carried on a cable frequency, wherein each satellite frequency is stored in the translation table in association with a corresponding cable frequency. Eck at 2:53–61: In accordance with yet another aspect of the present invention, a translation table is stored on a computer readable storage medium. The translation table holds satellite frequency indicia and cable frequencies. The satellite frequency indicia correspond to satellite QPSK

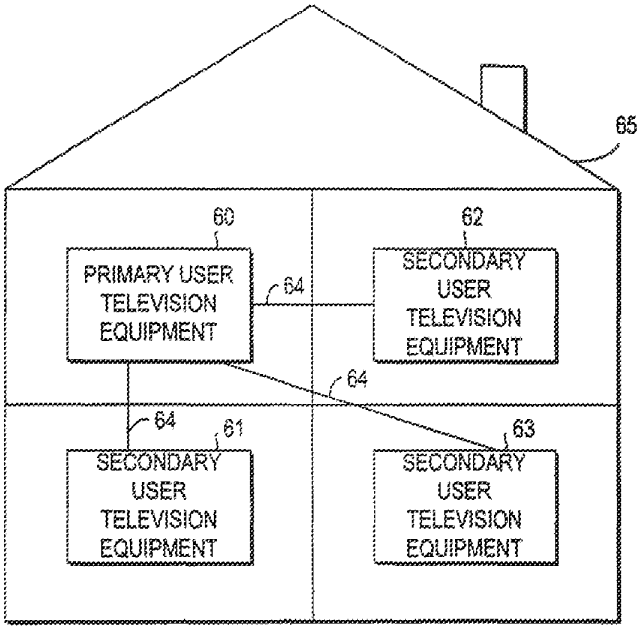
Asserted Claims	Additional References and Disclosure
	signals, and the cable frequencies correspond to cable QAM signals transmodulated from the QPSK signal. Each of the satellite frequency indicia as stored in the translation table uniquely corresponds to one of the cable frequencies. Eck at 7:55–8:3: When a QAM signal is fully locked, the satellite frequency is read from the service data contained in the acquired QAM signal. This satellite frequency is entered into the translation table in association with the CATV frequency at which the QAM signal just acquired was found. Thereafter, coarse scanning for the next QAM signal can be resumed in 1 MHZ increments starting with a frequency that is 6 MHZ (or 8 MHZ, depending on channel size) above the QAM signal that was just found. This process continues until the scanning is completed through the entire full scanning range. At this point, the translation table, which is stored in memory of the set top box, holds a complete set of all satellite frequencies and their corresponding CATV frequencies. Eck at 8:29–32: Moreover, as described above, the translation table holds satellite frequency, CATV frequency pairs. Instead, the translation table could hold satellite channel number, CATV frequency pairs. Ellis at 11:17-12:5: Detailed Description of the Preferred Embodiments An illustrative program guide system 30 in accordance with the present invention is shown in FIG. 1. Main facility 32 contains a program guide database 20 34 for storing program guide information such as television program guide program listings data, pay-per-view ordering information, television program promotional information, etc. Information from database 34 may be transmitted to multiple television 25 distribution facilities such as television distribution facility 38 via communications links such as communications link 40. Only one such television distribution facility 38 and one communications link 40 are

Asserted Claims	Additional References and Disclosure
	shown in FIG. 1 to avoid over-complicating the 30 drawings. Link 40 may be a satellite link, a telephone network link, a cable or fiber optic link, a microwave link, a combination of such links, or any other suitable communications path. If it is desired to transmit video signals (e.g., for advertising and promotional videos) over link 40 in addition to data signals, a relatively high bandwidth link such as a satellite link is generally preferable to a relatively low bandwidth link such as a telephone line. Ellis at Fig. 1:

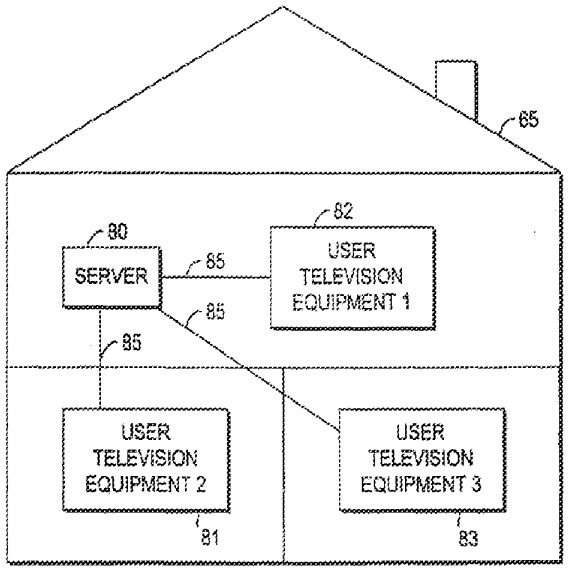
Asserted Claims	Additional References and Disclosure
	 *FIG. 1* Ellis at 12:6-14: Television distribution facility 38 is a facility for distributing television signals to users, such as a cable system headend, a broadcast distribution facility, or a satellite television distribution facility or the like.

Asserted Claims	Additional References and Disclosure
	The program guide information transmitted by main facility 32 to television distribution facility 38 includes television program listings data such as program times, channels, titles, descriptions, etc. Ellis at 12:31-13:4: A server 42 may be provided in television distribution facility 38 for handling data distribution tasks and for storing local information. If desired, server 42 may be used to implement a client-server based interactive television program guide system. In such a system, client functions may be performed at user television equipment 44. Server 42 may be capable of handling text, graphics, and video. Ellis at 13:5-11: Television distribution facility 38 distributes program guide and advertising information to the user television equipment 44 of multiple users via communications paths 46. Program guide data and other information may be distributed over an out-of-band channel on paths 46 or using any other suitable distribution technique. Ellis at 13:12-14:3 Each user has a receiver, which is typically a set-top box such as set-top box 48, but which may be other suitable television equipment into which circuitry similar to set-top-box circuitry has been integrated. If desired, user television equipment 44 may be an advanced television receiver or a personal computer television (PC/TV). For purposes of illustration, the present invention will generally be described in connection with user television equipment based on a set-top box arrangement. Program guide data may be distributed to set-top boxes 48 periodically and stored or may be distributed continuously and handled "on the fly.", or by request. Television distribution 25 facility 38 may poll set-top boxes 48 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated authorization techniques). Main facility 32 preferably contains a processor to handle

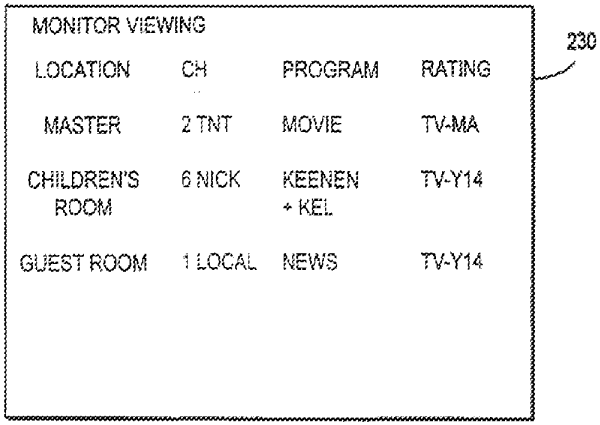
Asserted Claims	Additional References and Disclosure
	information distribution tasks. Each set-top box 48 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 48. Television distribution facility 38 may contain a processor for tasks associated with implementing server 42 and for handling tasks associated with the distribution of program guide and other information. Ellis at 14:4-13: Each set-top box 48 is may connected to an optional videocassette recorder 50 or other suitable recording device (e.g., digital storage device) so that selected television programs may be recorded. Each videocassette recorder 50 may be connected to a television 52. To record a program, set-top box 48 tunes to a particular channel and sends control signals to videocassette recorder 50 (e.g., using an infrared transmitter) that direct videocassette recorder 50 to start and stop recording at the appropriate times. Ellis at 16:16-17:8: FIG. 3 shows an illustrative arrangement for interconnecting various user television equipment devices in accordance with the present invention. Primary user television equipment 60 may be connected to secondary user television equipment 61, secondary user television equipment 62, and secondary user television equipment 63 via communication paths 64. Communications paths 64 may be any suitable communications path for in-home network, such as twisted pair lines, Ethernet links, fiber optics, power lines, radio-frequency (RF) links, infrared (IR) and links other wireless links, firewire (IEEE 1394) paths, dedicated cables, etc. As shown, one or more pieces of secondary user television equipment may be connected to primary user television equipment 60 in a star configuration if desired. User television equipment devices are typically located in different rooms within home 65. For example, primary user television equipment 60 may be placed in the parents' bedroom, secondary user television equipment 61 may be placed in the children's room, secondary user television equipment 62 may be placed in a living room, and secondary user television equipment 63 may be placed in a guest room. With such an arrangement, the parents' bedroom may be used as a master location to adjust user

Asserted Claims	Additional References and Disclosure
	settings for the program guides on the user television equipment in the children's room and the other rooms. Ellis at Fig. 3:  FIG. 3 Ellis at 18:5-22: FIG. 5 shows an illustrative configuration based on a client-server architecture. Server 80 may be connected to user television equipment 81, 82, and 83 via communication paths 85.

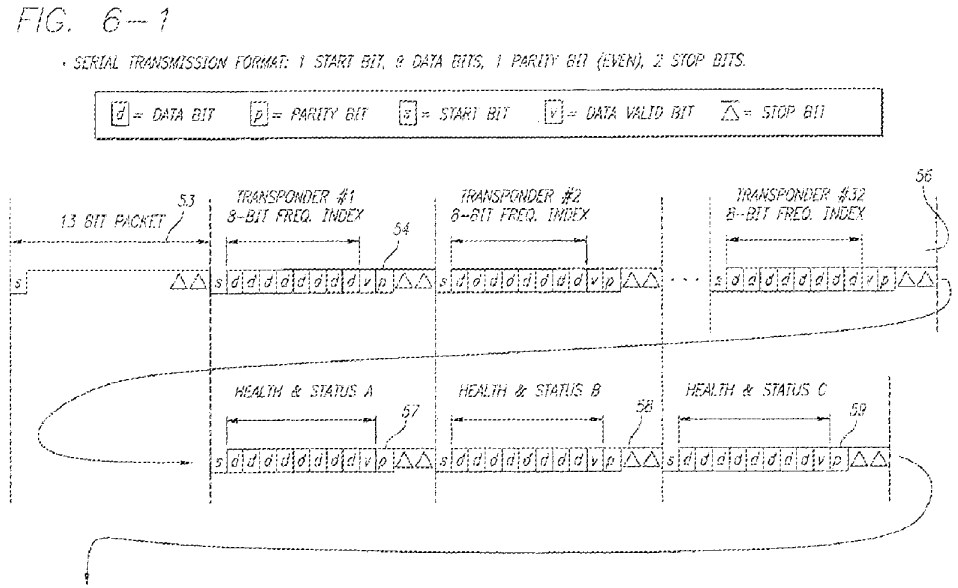
Asserted Claims	Additional References and Disclosure
	Equipment 81, 82, and 83 and server 80 may be placed in various rooms within 10 home 65. For example, server 80 may be placed in a den, user television equipment 81 may be placed in a children's room, user television equipment may be placed in a living room, user television equipment 83 may be placed in a parents' room. Communication paths 85 may be any in-home network suitable to transmit video, audio and data, such as dedicated cable fiber optics, firewire links, RF links, etc. As, in the examples of FIGS. 4a, 4b, and 4c, different communications path arrangements such as buses, rings and the like, may be used to interconnect user television equipment based on a client-server architecture. Ellis at Fig. 5:

Asserted Claims	Additional References and Disclosure
	 *FIG. 5* Ellis at 20:11-26: Graphics information for messages, advertisements and the like may be downloaded periodically (e.g., once per day) to set-top boxes 48 of FIG. 1 and stored locally. The graphics information may be accessed locally when needed by the program guides implemented on set-top boxes 48. Graphics information may also be provided in a continuously looped arrangement on one or more digital channels on paths 46. With such a continuously-looped arrangement, a map indicating the location of the latest graphics information may be downloaded periodically to set-top boxes 48 (e.g., once per day) or continuously. This allows the content on the digital channels to be updated. The program

Asserted Claims	Additional References and Disclosure
	guides on set-top boxes 48 may use the map to locate desired graphics information on the digital channels. Ellis at 23:29-24:6: In any of the above arrangements, an interactive television program guide on each user television equipment device may provide various features for displaying television program listings information for the user and for providing various program guide functions such as parental control, favorites, pay-per-view purchasing, etc. For example, if the user presses the appropriate buttons on remote control 54, the user may be presented with a time-ordered or channel-ordered grid or table of television program listings or other such programming information. Ellis at 27:16-24: At step 1015, the user can access parental control screen 190 of FIG. 16 and may use remote control 54 to navigate between options such as set channels option 191, set maximum rating option 193, and monitor viewing option 195. The user may navigate to set channels screen 200 of FIG. 18a by selecting set channels option 191 at step 1016 of FIG. 17 by moving the highlight region 192 and pressing select. Ellis at 27:25-31: If the user selects set channels option 191 at step 1016, at step 1020 the program guide provides the user with an opportunity to set which channels are to be blocked. The user may block specific channels using remote control 54 to scroll through and select 30 from channel options 201, 202, 203, and 204 of FIG. 18a. Ellis at 29:11-27: The program guide at the user's location may then, in one alternative, provide the user with monitor viewing screen 230, which shows the channel that each location is currently viewing or an overlay such as a banner or small information box that shows the channels

Asserted Claims	Additional References and Disclosure
	that the other locations are viewing, but that also allows the user to continue watching programming at the user's location. The program guide at the user's location may poll the program guides at other locations within the household to determine whether anyone is currently viewing television and to which channels they are tuned. The monitor viewing screen may also allow the viewing of video, audio, or still images associated with the channel being viewed at another location. For example, the video of the remote location may be shown in a small box on the screen while the current channel's video is in the background. Ellis at Fig. 19:  FIG. 19 Staal at [0016]:

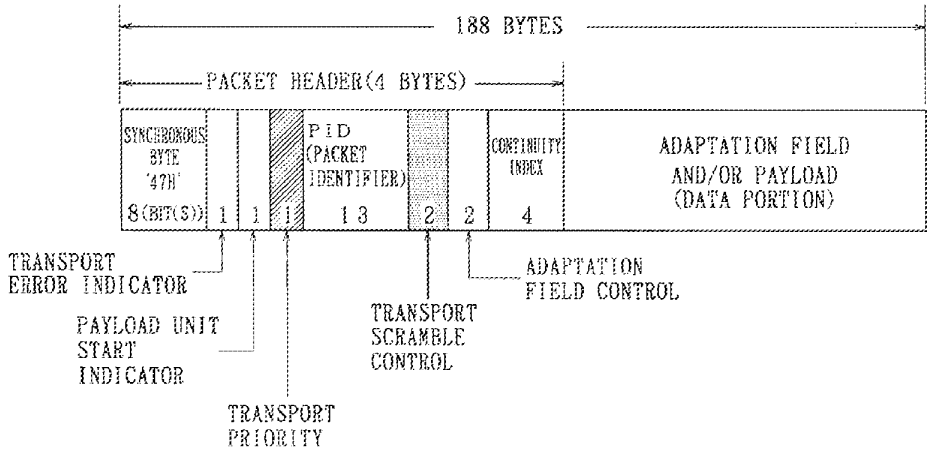
Asserted Claims	Additional References and Disclosure
	The system modulates and upconverts the signal bytes in each MPEG2 QAM packet and passes them through a cable plant constructed to receive modulated QAM bytes (or NTSC signals) which are demodulated at the settop box. The additional FEC bytes correct to 8 errors within a MPEG2QAM packet and are then removed. The superpacket is deframed to obtain the original MPEG2QAM packets. After finding a first television channel, the side bytes are processed to determine the frequency location of the other channels in the apartment receivers and any existence of uncorrectable errors. The MPEG2QAM bytes are decompressed and encoded to reproduce the television images in the apartment receivers. Staal at [0042]-[0044]: FIG. 6 indicates a sequence of the thirteen (13) bit packets. As previously discussed, the first such packet 53 in the sequence indicates the start of the sequence of packets. The second one 54 of such packets is indicated as "Transponder #1". It indicates (in the 2nd through 9th bits) the particular frequency location in the cable plant that the television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals from the first one of the thirty two (32) transponders in the satellites 12, 14 and 16. In like manner, successive instances of such thirteen (13) bit packets indicate the frequency location in the cable plant that television receivers in the apartments in the apartment building should be tuned to receive the transmodulated television signals from successive channels of the thirty two (32) transponders in the apartment building. This may be seen from the designation of the second packet 54 in FIG. 6 as "Transponder #1" and from the designation in FIG. 6 of the thirty third (33rd) packet 56 in FIG. 4 as "Transponder #32". Successive instances 57 through 63 of the thirteen (13) bit packets after the packet 56 designated as "Transponder #32" are then provided. These 13-bit packets indicate other information than the particular frequency location of the television channel for the television signals from the different channels of the transponders in the satellites 12, 14 and 16. For example, the 13-bit groups 57-63, designated as "Health &

Asserted Claims	Additional References and Disclosure
	Status A-G", may indicate certain specified information such as the error messages, phone numbers for service, BER thresholds, transmodulator temperature, etc. Staal at Fig. 6-1:  Staal at [0058]: A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2QAM packets 42 in each superpacket. The MPEG2QAM packets 42 are then deframed as at 114 to recover the MPEG2QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123. When the side bytes 48 are processed, the frequency location in the

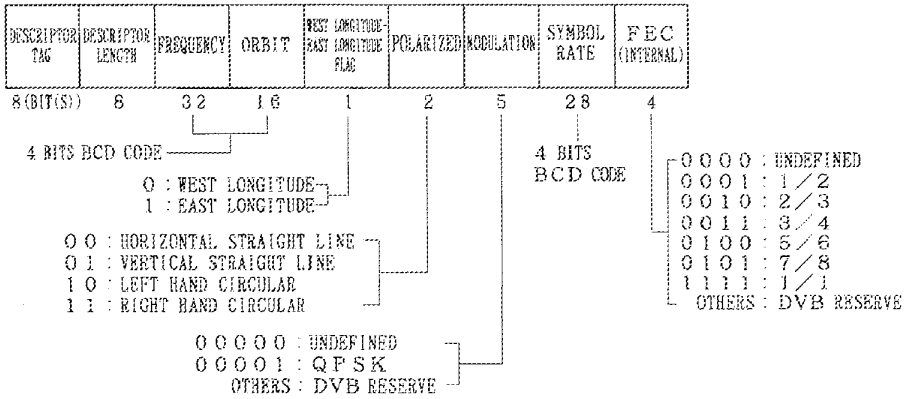
Asserted Claims	Additional References and Disclosure
	cable plant that television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above. Ohishi at 1:7-20: This invention relates generally to a signal processing device preferably being used when digital broadcasting programs broadcast through an arbitrary network are transmitted to another network, and a switching method of signal processors suitable for use in the signal processing device. More specifically, this invention relates to a signal processing device being able to transmit the digital broadcasting programs broadcast through a first network to a second network by detecting a NIT (Network Information Table) from digital broadcast data on the first network, changing the NIT so as to be applicable to the second network and substituting said changed NIT for the NIT of digital broadcast data on the first network to obtain digital broadcast data on the second network. Ohishi at 2:12-35: The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first table-detecting means detects the NIT from digital broadcast data on the first network and the table changing means changes said NIT so that the NIT is applicable to said second network. For example, when a cable television enterprise or the like provides delivery service of a satellite digital multi-channel broadcast with transmitting device for

Asserted Claims	Additional References and Disclosure
	modulation and conversion or the like by using its own network, a frequency information of the NIT is changed. Further, preferably, said table-changing means deletes an information relating to the digital broadcast signal failing to correspond to a digital information signal on said second network, from the digital broadcast signal on said first network when the number of digital broadcast signal on said second network becomes less than the one of digital broadcast signal on said first network. Ohishi at 4:65-5:31: Referring now to FIG. 1, there is shown a digital CATV system 10 as a preferred embodiment of the invention, which is used for a satellite digital multi-channel broadcast. The system 10 comprises an antenna 11 for receiving digital broadcast signals sent from a plurality of transponders (satellite repeaters) of a communication satellite 20, and a transmitting device for modulation and conversion 12 for converting a transmission frequency of each received digital broadcast signal, and changing a modulation scheme thereof, etc. to generate a CATV digital broadcast signal and transmitting it to a transmission path 13. Incidentally, STB (Set Top Box) 14-1 through 14-m used as receiving terminals are electrically connected to the transmission path 13. Images in channels selected by these STE 14-1 through 14-m are respectively displayed on monitors 15-1 through 15-m corresponding to the STE 14-1 through 14-m. The digital broadcast signals transmitted from the communication satellite 20 will first be explained. In the present embodiment, the digital broadcast signals are ones corresponding to a DVB (Digital Video Broadcasting) system. FIG. 2B shows a frame configuration of digital broadcast data employed in the DVB system. One frame of the digital broadcast data comprises eight MPEG2 transport packets (see FIG. 2A). In this case, by using a synchronous byte lying within each packet, one synchronous byte (=4 7H) every eight packets is inverted to a byte (=ESH) so that the frame synchronization thereof maybe obtained. Incidentally, an error correction code based on reed solomon (204, 188) is added to each MPEG2 transport packet (MPEG2 TS packet) The digital broadcast data shown in FIG. 2B is QPSK (Quadrature Phase Shift Keying)-modulated and thereafter frequency-

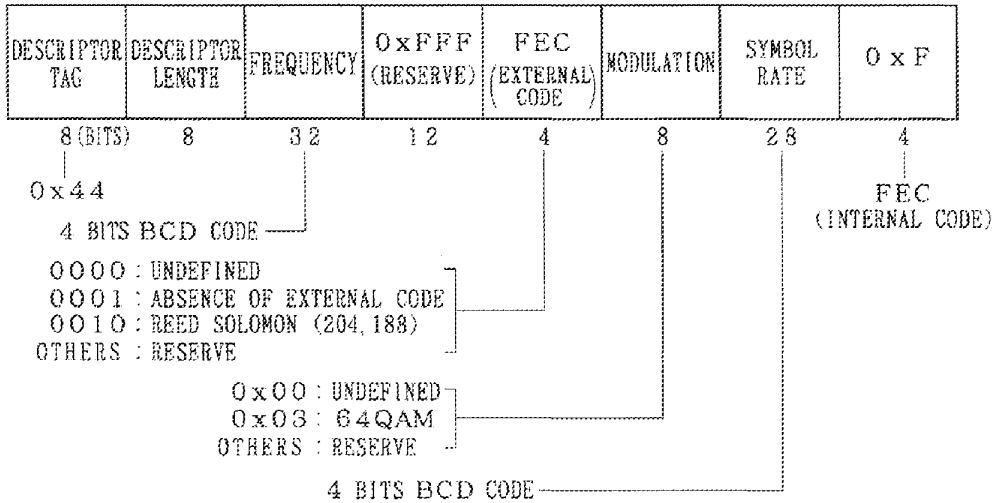
Asserted Claims	Additional References and Disclosure
	converted into an SHF band, thus resulting in digital broadcast signals transmitted from the communication satellite 20. Ohishi at 5:32-45: FIG. 3 shows a packet configuration of an MPEG2 transport packet composed of 188 bytes. The leading four bytes of said 188 bytes constitute a packet header. A PID (Packet Identifier) indicative of the attribute of an individually provided stream (data string) of the corresponding packet is placed in the packet header. As is well known, a PES (Packetized Elementary Stream) packet indicative of a packet configuration as shown in FIG. 4 is disposed in a payload (data portion) of the MPEG2 transport packet in re-divided form. Further, a PAT (Program Association Table), a PMT (Program Map Table), an NIT (Network Information Table), etc. used as PSI (Program Specific Information) defined in an MPEG2 system are also provided in the payload. Ohishi at Fig. 3:

Asserted Claims	Additional References and Disclosure
	FIG. 3  Ohishi at 6:4-15: FIG. 6 shows a table structure of the PMT. An explanation will be made of principal contents which does not overlap with the PAT. A table ID indicates the classification of a table and is given as "0x02" in the case of the PMT. A PCR PID indicates a PID of the packet including a program clock reference (PCR) defined as the reference upon decoding. A stream type indicates the type of signal transmitted in the form of a stream such as video, audio and added data. Further, the NIT indicates physical information on a transmission path, i.e., satellite orbits, polarized waves, frequencies every transponders, etc., in the case of a satellite. As described above, the PAT specifies the PID of the NIT itself. Ohishi at 6:16-45:

Asserted Claims	Additional References and Disclosure
	FIG. 7 indicates a table structure of the NIT. An explanation will be made of principal contents thereof, which does not overlap with the PAT and PMT. A table ID indicates the type of table. The corresponding network is given as "0x40" and other networks are given as "0x41". A network ID is used to identify each network. In the case of satellites, the network ID corresponds to each satellite. An explanation will further be made of two descriptors that play an important role as some of the NIT. First, a satellite delivery system descriptor will be explained. This type of descriptor is used as a first descriptor repeated in accordance with a TS (Transport Stream) descriptor length and is set as a pair together with a TSID. FIG. 8 shows the structure of the satellite delivery system descriptor. A descriptor tag is defined by a DVB and indicates the classification of each descriptor. In this descriptor, it is given as "0x43". The frequency indicates a transmission frequency for each stream (transponder herein). An orbit, a west longitude-east longitude and a Polarized wave indicate the orbit and polarized wave of a satellite, respectively. A modulation, a symbol rate and a forward error correction code (internal code) rate indicate specifications related to a transmission system, respectively. Secondary, a service list descriptor will be explained. This service list descriptor is used as second or later descriptors repeated in accordance with a TS (Transport Stream) descriptor length. The service list descriptor also indicates an ID of a service (channel) multiplexed onto the corresponding stream (the transponder here). Namely, a plurality of service list descriptors are attached to one TSID. Ohishi at Fig. 8:

Asserted Claims	Additional References and Disclosure
	FIG. 8  Ohishi at 6:53-7:9: An example of the operation of the receiver for receiving the above-described digital broadcast signals transmitted form the communication satellite 20 will be explained briefly. In the PAT and the PMT, each of the program numbers corresponds to a channel number selected by the viewer and the service ID corresponds to a channel number selected by the viewer in the NIT, respectively. Further, the NIT includes information about the entire network, i.e., all the transponders and makes the same tables transmitted in parallel through all the transponders, whereas the PAT and the PMT respectively comprise only information about transmitted programs lying within transponders, and are different in contents from one another every transponders. Now consider where a viewer has selected an "M" channel through the receiver. After the receiver has received an NIT through a fixed PID, "M" is searched for a service ID in a service list descriptor of the NIT. A satellite delivery system descriptor provided before the

Asserted Claims	Additional References and Disclosure
	service list descriptor including the service ID"M" in combination is received and the frequency of a transponder transmitting the "M" channel is recognized to thereby control a received frequency. Thereafter, a PAT is detected from a digital broadcast signal sent from the transponder transmitting the "M" channel and "M" is searched for a program number lying within the PAT. Ohishi at 7:63-8:5: Further, the signal processor 32-1 comprises an NIT detection circuit 44 for detecting an NIT (Network Information Table) from the MPEG2 transport packets S3 successively outputted from the ECC decoder 43, and a memory for storing a table NITa detected by the NIT detection circuit 44 and a memory 46 for storing a NITb being applicable to CATV, obtained by changing the table NITa stored in the memory 45 by means of the controller 31. The NIT detection circuit 44 detects the NIT based on the fixed PID. Ohishi at 8:6-14: Since the table structure of the NIT in the digital broadcast data related to the communication satellite 20 is represented as shown in FIG. 7 as described above, a table structure of the table NITa detected by the NIT detection circuit 44 is also similar to the above. In the controller 31, a satellite delivery system descriptor (see FIG. 8) having transmission frequency information or the like in the table NITa is changed to a CATV delivery system descriptor whose structure is shown in FIG. 11, upon obtaining the table NITb. Ohishi at Fig. 11:

Asserted Claims	Additional References and Disclosure
	FIG. 11  Ohishi at 9:4-15: Each of the NIT substitution circuits 48 of the signal processors 32-2 through 32-N substitutes the NITb stored in the memory 46 of the signal processor 32-1 for the NIT. Further, each of the tuner 41 of the signal processors 32-2 through 32-N selects the corresponding digital broadcast signal sent from the second through Nth transponders of the communications satellite 20 out of a plurality of the digital broadcast signals received by the antenna 11 so that said digital broadcast signal is frequency-converted to obtain a QPSK-modulated signal SI. The control unit 31 controls the received frequency of each of the tuner 41 of the signal processors 32-2 through 32-N by the interface 47.

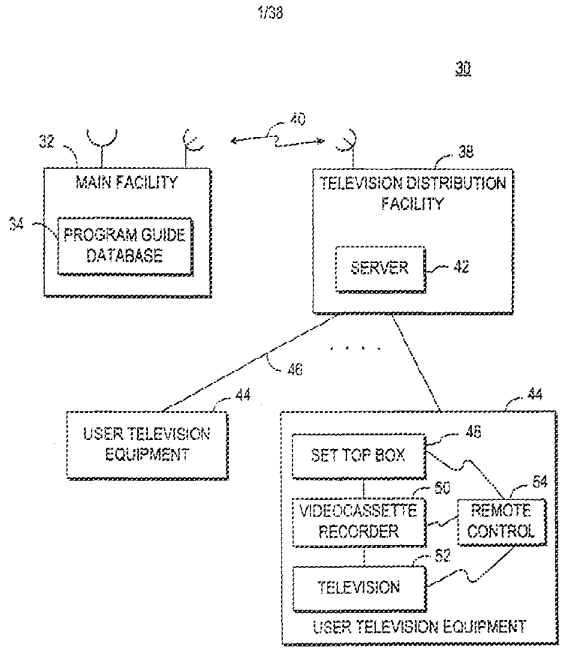
Asserted Claims	Additional References and Disclosure
	Ohishi at 9:38-64: The MPEG2 transport packet S3 successively outputted from the ECC decoder 43 are supplied to the NIT detection circuit 44, where an NITa is detected from the MPEG2 transport packets S3. The detected table NITa is supplied to the memory 45 where it is stored therein. For example, such operation of detection of the NITa by the NIT detecting circuit 44 is carried out at once a day. The control unit 31 reads the corresponding table NITa from the memory 45 and changes a satellite delivery system descriptor (see FIG. 8) in the table NITa to a CATV delivery system descriptor (see FIG. 11). Further, the controller 31 deletes information about a TS (Transport Stream) ID corresponding to each digital broadcast signal unused in CATV in the table NITa, for example to thereby obtain a table NITb applicable to the CATV. Thereafter, the controller 31 causes the memory 46 to store the table NITb therein. Further, the MPEG2 transport packets S3 successively outputted from the ECC decoder 43 are supplied to the NIT substitution circuit 48 where an NIT is detected and the table NITb stored in the memory 46 is substituted for said the NIT. When, in this case, the information about the TS ID corresponding to each digital broadcast signal unused in the CATV in the table NITa is deleted by the controller 31 upon obtaining the table NITb, the NIT substitution circuit 48 inserts dummy bits into a portion related to the deletedinformation. Ohishi at 10:35-42: For this reason, such CATV digital broadcast signals BS-1 through BS-N changes only NIT out of a PSI (Program Specification Information) in digital satellite broadcasting. Thus, at the STB (Set Top Box) 14-1 through 14-m used as receiving terminals, which are connected to the transmission path 13 of CATV, the same operation for selecting channel as the operation for selecting channel at the receiver of the digital satellite broadcasting may be performed.

Asserted Claims	Additional References and Disclosure
12. The signal distribution system of claim 10 wherein the translation table is maintained by a controller located in the ODU and the translation table is communicated to devices in the network.	The obviousness reference(s) listed below disclose, explicitly and/or inherently, wherein the translation table is maintained by a controller located in the ODU and the translation table is communicated to devices in the network. *See* claim 10, *supra*. *See, e.g.*: Eck at 1:7–9: The present invention relates to an autoscan system that determines a translation between satellite television frequencies and cable television frequencies. Eck at 1:54–64: A better alternative would be to store a frequency translation table in non-volatile memory of a set top box. This translation table would, therefore, contain the relationship between each satellite channel frequency indicated by the service data in the satellite signals and the corresponding unused cable channel frequency of the transmodulated signal. Accordingly, when a user selects a satellite channel, the set top box looks up the corresponding cable channel frequency in the translation table and tunes the CATV tuner to the proper cable channel frequency corresponding to the satellite frequency of the selected satellite channel. Eck at 2:10–26: The present invention permits automatic loading of a translation table at installation of a set top box. In order to implement this automatic loading, the set top box is arranged to scan through the entire CATV frequency spectrum in order to find all possible transmodulated QAM signals. As each QAM signal is found, the satellite frequency contained in the satellite service data of the QAM signal is read and is loaded into the translation table in association with the cable frequency at which the QAM signal was found. Accordingly, when a user desires to tune to a particular program in one embodiment of the present invention, the user selects the appropriate satellite channel, the satellite

Asserted Claims	Additional References and Disclosure
	service data corresponding to the selected satellite channel is read, the satellite frequency contained in this satellite service data is used to read the corresponding cable frequency from the translation table, and the CATV tuner is tuned to that cable frequency. Eck at 2:30–38: In accordance with one aspect of the present invention, a method of generating a translation table correlating satellite frequencies to cable frequencies comprises the following steps: a) tuning to a cable frequency; b) reading satellite service data from a signal at the cable frequency, wherein the satellite service data includes an indicium of a satellite frequency; c) storing in a translation table the indicium in association with the cable frequency of step a); and, d) repeating steps a)-c) for other cable frequencies. Eck at 2:39–52: In accordance with another aspect of the present invention, a method is provided to generate a translation table that correlates satellite frequencies carrying satellite QPSK signals to cable frequencies carrying corresponding QAM signals. The method comprises the following steps: a) scanning the cable frequencies; b) for each of the cable frequencies carrying a QAM signal, reading satellite service data from the corresponding QAM signal, wherein the satellite service data includes a satellite frequency; and, c) storing in the translation table the satellite frequency contained in the satellite service data read from each QAM signal carried on a cable frequency, wherein each satellite frequency is stored in the translation table in association with a corresponding cable frequency. Eck at 2:53–61: In accordance with yet another aspect of the present invention, a translation table is stored on a computer readable storage medium. The translation table holds satellite frequency indicia and cable frequencies. The satellite frequency indicia correspond to satellite QPSK signals, and the cable frequencies correspond to cable QAM signals transmodulated from

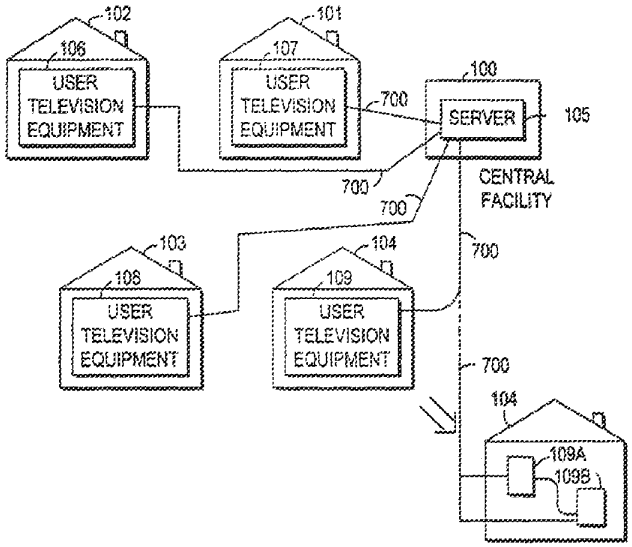
Asserted Claims	Additional References and Disclosure
	the QPSK signal. Each of the satellite frequency indicia as stored in the translation table uniquely corresponds to one of the cable frequencies. Eck at 7:55–8:3: When a QAM signal is fully locked, the satellite frequency is read from the service data contained in the acquired QAM signal. This satellite frequency is entered into the translation table in association with the CATV frequency at which the QAM signal just acquired was found. Thereafter, coarse scanning for the next QAM signal can be resumed in 1 MHZ increments starting with a frequency that is 6 MHZ (or 8 MHZ, depending on channel size) above the QAM signal that was just found. This process continues until the scanning is completed through the entire full scanning range. At this point, the translation table, which is stored in memory of the set top box, holds a complete set of all satellite frequencies and their corresponding CATV frequencies. Eck at 8:29–32: Moreover, as described above, the translation table holds satellite frequency, CATV frequency pairs. Instead, the translation table could hold satellite channel number, CATV frequency pairs. Ellis at 11:17-12:5: Detailed Description of the Preferred Embodiments An illustrative program guide system 30 in accordance with the present invention is shown in FIG. 1. Main facility 32 contains a program guide database 20 34 for storing program guide information such as television program guide program listings data, pay-per-view ordering information, television program promotional information, etc. Information from database 34 may be transmitted to multiple television 25 distribution facilities such as television distribution facility 38 via communications links such as communications link 40. Only one such television distribution facility 38 and one communications link 40 are shown in FIG. 1 to avoid over-complicating the 30 drawings. Link 40 may be a satellite

Asserted Claims	Additional References and Disclosure
	link, a telephone network link, a cable or fiber optic link, a microwave link, a combination of such links, or any other suitable communications path. If it is desired to transmit video signals (e.g., for advertising and promotional videos) over link 40 in addition to data signals, a relatively high bandwidth link such as a satellite link is generally preferable to a relatively low bandwidth link such as a telephone line. Ellis at Fig. 1:

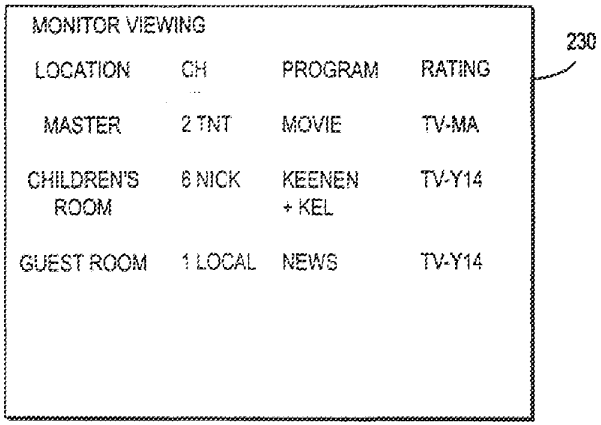
Asserted Claims	Additional References and Disclosure
	 *FIG. 1* Ellis at 12:6-14: Television distribution facility 38 is a facility for distributing television signals to users, such as a cable system headend, a broadcast distribution facility, or a satellite television distribution facility or the like.

Asserted Claims	Additional References and Disclosure
	The program guide information transmitted by main facility 32 to television distribution facility 38 includes television program listings data such as program times, channels, titles, descriptions, etc. Ellis at 12:31-13:4: A server 42 may be provided in television distribution facility 38 for handling data distribution tasks and for storing local information. If desired, server 42 may be used to implement a client-server based interactive television program guide system. In such a system, client functions may be performed at user television equipment 44. Server 42 may be capable of handling text, graphics, and video. Ellis at 13:5-11: Television distribution facility 38 distributes program guide and advertising information to the user television equipment 44 of multiple users via communications paths 46. Program guide data and other information may be distributed over an out-of-band channel on paths 46 or using any other suitable distribution technique. Ellis at 13:12-14:3 Each user has a receiver, which is typically a set-top box such as set-top box 48, but which may be other suitable television equipment into which circuitry similar to set-top-box circuitry has been integrated. If desired, user television equipment 44 may be an advanced television receiver or a personal computer television (PC/TV). For purposes of illustration, the present invention will generally be described in connection with user television equipment based on a set-top box arrangement. Program guide data may be distributed to set-top boxes 48 periodically and stored or may be distributed continuously and handled "on the fly.", or by request. Television distribution 25 facility 38 may poll set-top boxes 48 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated

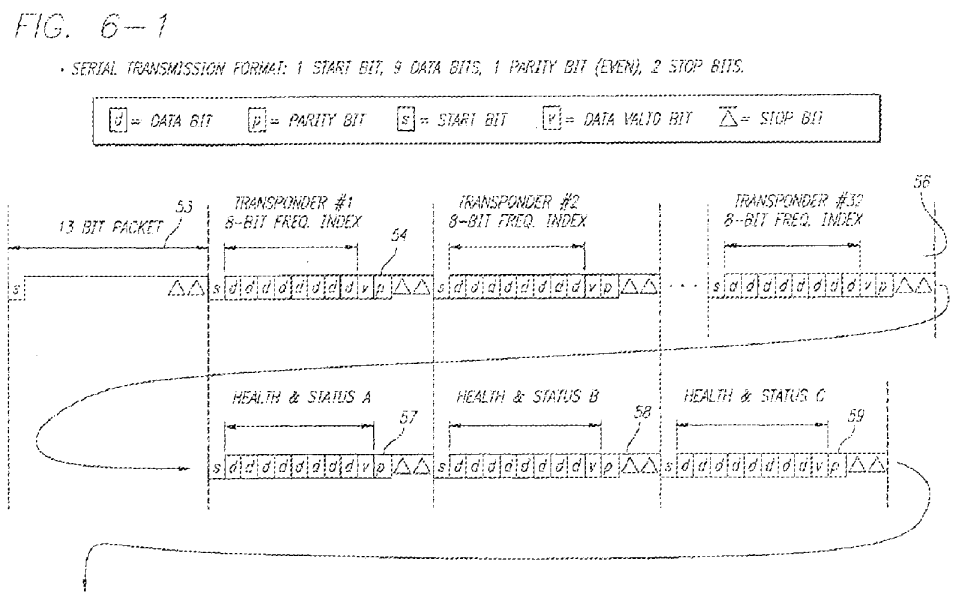
Asserted Claims	Additional References and Disclosure
	authorization techniques). Main facility 32 preferably contains a processor to handle information distribution tasks. Each set-top box 48 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 48. Television distribution facility 38 may contain a processor for tasks associated with implementing server 42 and for handling tasks associated with the distribution of program guide and other information. Ellis at 14:4-13: Each set-top box 48 is may connected to an optional videocassette recorder 50 or other suitable recording device (e.g., digital storage device) so that selected television programs may be recorded. Each videocassette recorder 50 may be connected to a television 52. To record a program, set-top box 48 tunes to a particular channel and sends control signals to videocassette recorder 50 (e.g., using an infrared transmitter) that direct videocassette recorder 50 to start and stop recording at the appropriate times. Ellis at 19:16-20:4: FIG. 7a shows an illustrative configuration in which multiple homes are handled by a common server. Server 105 may be located at central facility 100. Central facility 100 may be a private home, a 20 commercial building, a network node, or other suitable structure that may be connected to a plurality of homes. In the example of FIG. 7a, server 105 is connected to user television equipment 106, 107, 108, and 109 that is located in homes 101, 102, 103, and 104, respectively via communication paths 700. When multiple user television equipment devices exist within a home as shown by devices 109a and 109b, each user television equipment device may communicate with the server 105 independently via communication paths 700, alternatively only one device may communicate while the other communicates via a home network. In other words, in alternative arrangements, there are either 1) multiple connections to an outside server and each user television equipment device communicates with the server independently with

Asserted Claims	Additional References and Disclosure
	no need for an in-home network, or, 2) only one connection to an outside server and each user television device communicates with each other through an in-home network. Ellis at Fig. 7a:  *FIG. 7a* Ellis at 20:11-26: Graphics information for messages, advertisements and the like may be downloaded periodically (e.g., once per day) to set-top boxes 48 of FIG. 1 and stored locally. The graphics information may be accessed locally when needed by the program guides implemented on set-top boxes 48. Graphics information may also be provided in a continuously looped arrangement on one or more digital channels on paths 46. With such a continuously-looped arrangement, a map indicating the location of the latest graphics

Asserted Claims	Additional References and Disclosure
	information may be downloaded periodically to set-top boxes 48 (e.g., once per day) or continuously. This allows the content on the digital channels to be updated. The program guides on set-top boxes 48 may use the map to locate desired graphics information on the digital channels. Ellis at 23:29-24:6: In any of the above arrangements, an interactive television program guide on each user television equipment device may provide various features for displaying television program listings information for the user and for providing various program guide functions such as parental control, favorites, pay-per-view purchasing, etc. For example, if the user presses the appropriate buttons on remote control 54, the user may be presented with a time-ordered or channel-ordered grid or table of television program listings or other such programming information. Ellis at 27:16-24: At step 1015, the user can access parental control screen 190 of FIG. 16 and may use remote control 54 to navigate between options such as set channels option 191, set maximum rating option 193, and monitor viewing option 195. The user may navigate to set channels screen 200 of FIG. 18a by selecting set channels option 191 at step 1016 of FIG. 17 by moving the highlight region 192 and pressing select. Ellis at 27:25-31: If the user selects set channels option 191 at step 1016, at step 1020 the program guide provides the user with an opportunity to set which channels are to be blocked. The user may block specific channels using remote control 54 to scroll through and select 30 from channel options 201, 202, 203, and 204 of FIG. 18a. Ellis at 29:11-27:

Asserted Claims	Additional References and Disclosure
	The program guide at the user's location may then, in one alternative, provide the user with monitor viewing screen 230, which shows the channel that each location is currently viewing or an overlay such as a banner or small information box that shows the channels that the other locations are viewing, but that also allows the user to continue watching programming at the user's location. The program guide at the user's location may poll the program guides at other locations within the household to determine whether anyone is currently viewing television and to which channels they are tuned. The monitor viewing screen may also allow the viewing of video, audio, or still images associated with the channel being viewed at another location. For example, the video of the remote location may be shown in a small box on the screen while the current channel's video is in the background. Ellis at Fig. 19:  FIG. 19

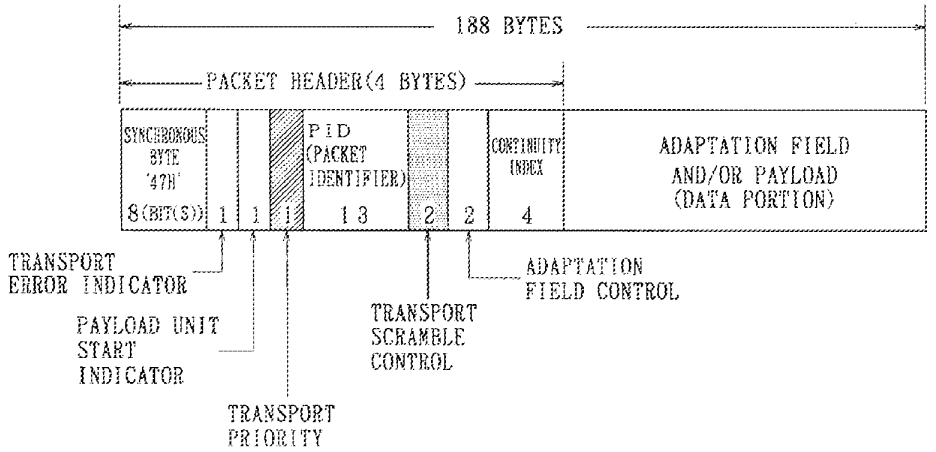
Asserted Claims	Additional References and Disclosure
	Staal at [0016]: The system modulates and upconverts the signal bytes in each MPEG2 $_{QAM}$ packet and passes them through a cable plant constructed to receive modulated QAM bytes (or NTSC signals) which are demodulated at the settop box. The additional FEC bytes correct to 8 errors within a MPEG2$_{QAM}$ packet and are then removed. The superpacket is deframed to obtain the original MPEG2$_{QAM}$ packets. After finding a first television channel, the side bytes are processed to determine the frequency location of the other channels in the apartment receivers and any existence of uncorrectable errors. The MPEG2$_{QAM}$ bytes are decompressed and encoded to reproduce the television images in the apartment receivers. Staal at [0042]-[0044]: FIG. 6 indicates a sequence of the thirteen (13) bit packets. As previously discussed, the first such packet 53 in the sequence indicates the start of the sequence of packets. The second one 54 of such packets is indicated as "Transponder #1". It indicates (in the 2nd through 9th bits) the particular frequency location in the cable plant that the television receivers in the apartments in the apartment building should tune to receive the transmodulated television signals from the first one of the thirty two (32) transponders in the satellites 12, 14 and 16. In like manner, successive instances of such thirteen (13) bit packets indicate the frequency location in the cable plant that television receivers in the apartments in the apartment building should be tuned to receive the transmodulated television signals from successive channels of the thirty two (32) transponders in the apartment building. This may be seen from the designation of the second packet 54 in FIG. 6 as "Transponder #1" and from the designation in FIG. 6 of the thirty third (33rd) packet 56 in FIG. 4 as "Transponder #32". Successive instances 57 through 63 of the thirteen (13) bit packets after the packet 56 designated as "Transponder #32" are then provided. These 13-bit packets indicate other information than the particular frequency location of the television channel for the television signals from the different channels of the transponders in the satellites 12, 14 and 16. For example, the 13-bit groups 57-63, designated as "Health &

Asserted Claims	Additional References and Disclosure
	Status A-G", may indicate certain specified information such as the error messages, phone numbers for service, BER thresholds, transmodulator temperature, etc. Staal at Fig. 6-1:  Staal at [0058]: A stage 112 is included in the chip 110 to use and strip the forward error correction 46 from the MPEG2$_{QAM}$ packets 42 in each superpacket. The MPEG^{2}QAM packets 42 are then deframed as at 114 to recover the MPEG^{2}QAM packets. The data in the side bytes 48 are then extracted and processed by a stage 116 under the control of a microprocessor 123. When the side bytes 48 are processed, the frequency location in the cable plant that television receivers in the apartments in the apartment building should tune

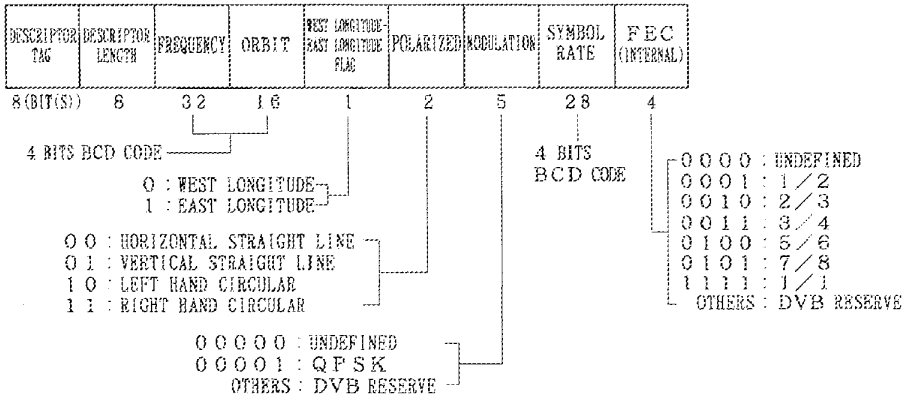
Asserted Claims	Additional References and Disclosure
	to receive the transmodulated television signals for each of the transponders in the satellites 12, 14 and 16 are determined. This is shown in FIG. 6 and described in detail above. Health and status information is also determined from the side bytes 48 as shown in FIG. 6 and described in detail above. A parity check is also provided by the side bytes 48 as shown in FIG. 6 and described in detail above. Ohishi at 1:7-20: This invention relates generally to a signal processing device preferably being used when digital broadcasting programs broadcast through an arbitrary network are transmitted to another network, and a switching method of signal processors suitable for use in the signal processing device. More specifically, this invention relates to a signal processing device being able to transmit the digital broadcasting programs broadcast through a first network to a second network by detecting a NIT (Network Information Table) from digital broadcast data on the first network, changing the NIT so as to be applicable to the second network and substituting said changed NIT for the NIT of digital broadcast data on the first network to obtain digital broadcast data on the second network. Ohishi at 2:12-35: The first digital broadcast signal on the first network has a predetermined transmission frequency. A frequency of said first digital broadcast signal is frequency-converted by a second frequency-converting means so that the digital modulated signal may be obtained. Then, the digital broadcast data on the first network are obtained by demodulating said digital modulated signal. Such digital broadcast data on the first network have the NIT being applicable to the first network. The first table-detecting means detects the NIT from digital broadcast data on the first network and the table changing means changes said NIT so that the NIT is applicable to said second network. For example, when a cable television enterprise or the like provides delivery service of a satellite digital multi-channel broadcast with transmitting device for modulation and conversion or the like by using its own network, a frequency information

Asserted Claims	Additional References and Disclosure
	of the NIT is changed. Further, preferably, said table-changing means deletes an information relating to the digital broadcast signal failing to correspond to a digital information signal on said second network, from the digital broadcast signal on said first network when the number of digital broadcast signal on said second network becomes less than the one of digital broadcast signal on said first network. Ohishi at 4:65-5:31: Referring now to FIG. 1, there is shown a digital CATV system 10 as a preferred embodiment of the invention, which is used for a satellite digital multi-channel broadcast. The system 10 comprises an antenna 11 for receiving digital broadcast signals sent from a plurality of transponders (satellite repeaters) of a communication satellite 20, and a transmitting device for modulation and conversion 12 for converting a transmission frequency of each received digital broadcast signal, and changing a modulation scheme thereof, etc. to generate a CATV digital broadcast signal and transmitting it to a transmission path 13. Incidentally, STB (Set Top Box) 14-1 through 14-m used as receiving terminals are electrically connected to the transmission path 13. Images in channels selected by these STE 14-1 through 14-m are respectively displayed on monitors 15-1 through 15-m corresponding to the STE 14-1 through 14-m. The digital broadcast signals transmitted from the communication satellite 20 will first be explained. In the present embodiment, the digital broadcast signals are ones corresponding to a DVB (Digital Video Broadcasting) system. FIG. 2B shows a frame configuration of digital broadcast data employed in the DVB system. One frame of the digital broadcast data comprises eight MPEG2 transport packets (see FIG. 2A). In this case, by using a synchronous byte lying within each packet, one synchronous byte (=4 7H) every eight packets is inverted to a byte (=ESH) so that the frame synchronization thereof maybe obtained. Incidentally, an error correction code based on reed solomon (204, 188) is added to each MPEG2 transport packet (MPEG2 TS packet) The digital broadcast data shown in FIG. 2B is QPSK (Quadrature Phase Shift Keying)-modulated and thereafter frequency-

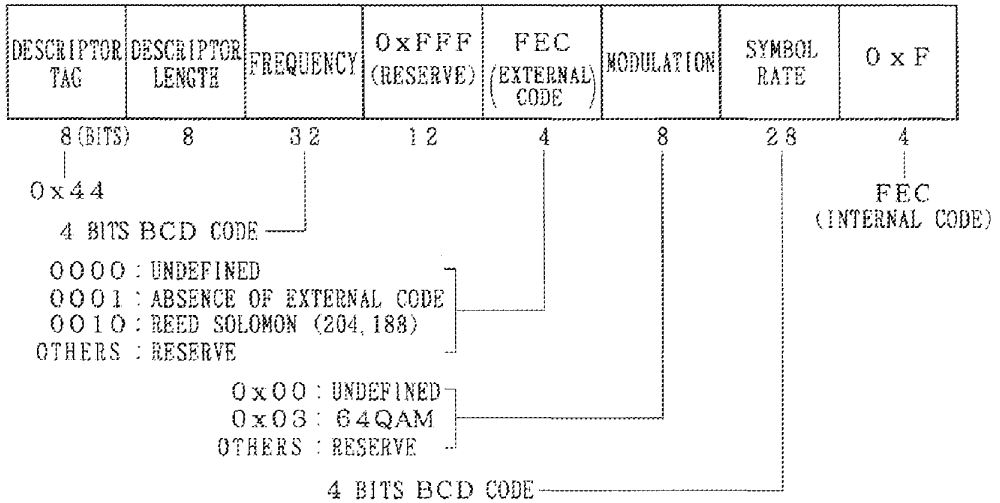
Asserted Claims	Additional References and Disclosure
	converted into an SHF band, thus resulting in digital broadcast signals transmitted from the communication satellite 20. Ohishi at 5:32-45: FIG. 3 shows a packet configuration of an MPEG2 transport packet composed of 188 bytes. The leading four bytes of said 188 bytes constitute a packet header. A PID (Packet Identifier) indicative of the attribute of an individually provided stream (data string) of the corresponding packet is placed in the packet header. As is well known, a PES (Packetized Elementary Stream) packet indicative of a packet configuration as shown in FIG. 4 is disposed in a payload (data portion) of the MPEG2 transport packet in re-divided form. Further, a PAT (Program Association Table), a PMT (Program Map Table), an NIT (Network Information Table), etc. used as PSI (Program Specific Information) defined in an MPEG2 system are also provided in the payload. Ohishi at Fig. 3:

Asserted Claims	Additional References and Disclosure
	FIG. 3  Ohishi at 6:4-15: FIG. 6 shows a table structure of the PMT. An explanation will be made of principal contents which does not overlap with the PAT. A table ID indicates the classification of a table and is given as "0x02" in the case of the PMT. A PCR PID indicates a PID of the packet including a program clock reference (PCR) defined as the reference upon decoding. A stream type indicates the type of signal transmitted in the form of a stream such as video, audio and added data. Further, the NIT indicates physical information on a transmission path, i.e., satellite orbits, polarized waves, frequencies every transponders, etc., in the case of a satellite. As described above, the PAT specifies the PID of the NIT itself. Ohishi at 6:16-45:

Asserted Claims	Additional References and Disclosure
	FIG. 7 indicates a table structure of the NIT. An explanation will be made of principal contents thereof, which does not overlap with the PAT and PMT. A table ID indicates the type of table. The corresponding network is given as "0x40" and other networks are given as "0x41". A network ID is used to identify each network. In the case of satellites, the network ID corresponds to each satellite. An explanation will further be made of two descriptors that play an important role as some of the NIT. First, a satellite delivery system descriptor will be explained. This type of descriptor is used as a first descriptor repeated in accordance with a TS (Transport Stream) descriptor length and is set as a pair together with a TSID. FIG. 8 shows the structure of the satellite delivery system descriptor. A descriptor tag is defined by a DVB and indicates the classification of each descriptor. In this descriptor, it is given as "0x43". The frequency indicates a transmission frequency for each stream (transponder herein). An orbit, a west longitude-east longitude and a Polarized wave indicate the orbit and polarized wave of a satellite, respectively. A modulation, a symbol rate and a forward error correction code (internal code) rate indicate specifications related to a transmission system, respectively. Secondary, a service list descriptor will be explained. This service list descriptor is used as second or later descriptors repeated in accordance with a TS (Transport Stream) descriptor length. The service list descriptor also indicates an ID of a service (channel) multiplexed onto the corresponding stream (the transponder here). Namely, a plurality of service list descriptors are attached to one TSID. Ohishi at Fig. 8:

Asserted Claims	Additional References and Disclosure
	FIG. 8  Ohishi at 6:53-7:9: An example of the operation of the receiver for receiving the above-described digital broadcast signals transmitted form the communication satellite 20 will be explained briefly. In the PAT and the PMT, each of the program numbers corresponds to a channel number selected by the viewer and the service ID corresponds to a channel number selected by the viewer in the NIT, respectively. Further, the NIT includes information about the entire network, i.e., all the transponders and makes the same tables transmitted in parallel through all the transponders, whereas the PAT and the PMT respectively comprise only information about transmitted programs lying within transponders, and are different in contents from one another every transponders. Now consider where a viewer has selected an "M" channel through the receiver. After the receiver has received an NIT through a fixed PID, "M" is searched for a service ID in a service list descriptor of the NIT. A satellite delivery system descriptor provided before the

Asserted Claims	Additional References and Disclosure
	service list descriptor including the service ID"M" in combination is received and the frequency of a transponder transmitting the "M" channel is recognized to thereby control a received frequency. Thereafter, a PAT is detected from a digital broadcast signal sent from the transponder transmitting the "M" channel and "M" is searched for a program number lying within the PAT. Ohishi at 7:63-8:5: Further, the signal processor 32-1 comprises an NIT detection circuit 44 for detecting an NIT (Network Information Table) from the MPEG2 transport packets S3 successively outputted from the ECC decoder 43, and a memory for storing a table NITa detected by the NIT detection circuit 44 and a memory 46 for storing a NITb being applicable to CATV, obtained by changing the table NITa stored in the memory 45 by means of the controller 31. The NIT detection circuit 44 detects the NIT based on the fixed PID. Ohishi at 8:6-14: Since the table structure of the NIT in the digital broadcast data related to the communication satellite 20 is represented as shown in FIG. 7 as described above, a table structure of the table NITa detected by the NIT detection circuit 44 is also similar to the above. In the controller 31, a satellite delivery system descriptor (see FIG. 8) having transmission frequency information or the like in the table NITa is changed to a CATV delivery system descriptor whose structure is shown in FIG. 11, upon obtaining the table NITb. Ohishi at Fig. 11:

Asserted Claims	Additional References and Disclosure
	F I G. 1 1  Ohishi at 9:4-15: Each of the NIT substitution circuits 48 of the signal processors 32-2 through 32-N substitutes the NITb stored in the memory 46 of the signal processor 32-1 for the NIT. Further, each of the tuner 41 of the signal processors 32-2 through 32-N selects the corresponding digital broadcast signal sent from the second through Nth transponders of the communications satellite 20 out of a plurality of the digital broadcast signals received by the antenna 11 so that said digital broadcast signal is frequency-converted to obtain a QPSK-modulated signal SI. The control unit 31 controls the received frequency of each of the tuner 41 of the signal processors 32-2 through 32-N by the interface 47.

Asserted Claims	Additional References and Disclosure
	Ohishi at 9:38-64: The MPEG2 transport packet S3 successively outputted from the ECC decoder 43 are supplied to the NIT detection circuit 44, where an NITa is detected from the MPEG2 transport packets S3. The detected table NITa is supplied to the memory 45 where it is stored therein. For example, such operation of detection of the NITa by the NIT detecting circuit 44 is carried out at once a day. The control unit 31 reads the corresponding table NITa from the memory 45 and changes a satellite delivery system descriptor (see FIG. 8) in the table NITa to a CATV delivery system descriptor (see FIG. 11). Further, the controller 31 deletes information about a TS (Transport Stream) ID corresponding to each digital broadcast signal unused in CATV in the table NITa, for example to thereby obtain a table NITb applicable to the CATV. Thereafter, the controller 31 causes the memory 46 to store the table NITb therein. Further, the MPEG2 transport packets S3 successively outputted from the ECC decoder 43 are supplied to the NIT substitution circuit 48 where an NIT is detected and the table NITb stored in the memory 46 is substituted for said the NIT. When, in this case, the information about the TS ID corresponding to each digital broadcast signal unused in the CATV in the table NITa is deleted by the controller 31 upon obtaining the table NITb, the NIT substitution circuit 48 inserts dummy bits into a portion related to the deleted information. Ohishi at 10:35-42: For this reason, such CATV digital broadcast signals BS-1 through BS-N changes only NIT out of a PSI (Program Specification Information) in digital satellite broadcasting. Thus, at the STB (Set Top Box) 14-1 through 14-m used as receiving terminals, which are connected to the transmission path 13 of CATV, the same operation for selecting channel as the operation for selecting channel at the receiver of the digital satellite broadcasting may be performed.

Exhibit D1: Invalidity of U.S. Patent No. 9,210,362 in view of US 7,265,792 B2 ("Favrat")

Based upon Plaintiff's Complaint, Amended Complaint, Infringement Contentions, apparent claim constructions, and application of the claims to the accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that concedes or acquiesces to any claim construction implied or suggested by Plaintiff's Complaint, Amended Complaint, or Infringement Contentions. These invalidity contentions are not asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

US 7,265,792 B2 ("Favrat") was filed on July 1, 2004, published on Januay 5, 2006 and issued on September 4, 2007. Favrat is prior art under at least 35 U.S.C. §§ 102(a), 102(b), and 102(e). As described in the following claim chart, the asserted claims of U.S. Patent No. 9,210,362 (the "'362 Patent"), are invalid as anticipated by and/or obvious in view of US 7,265,792 B2, including without limitation as set forth below.

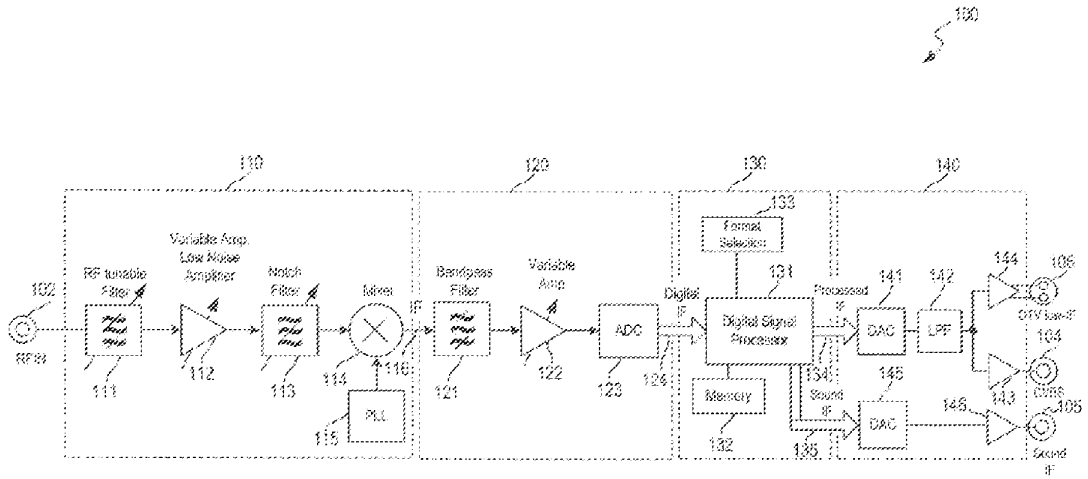
To the extent that Favrat is found not to anticipate one or more of the asserted claims of the '362 Patent, these claims are invalid as obvious in view of Favrat alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions Cover Pleading and accompanying charts, including without limitation as set forth below. Further, to the extent Defendants have not charted any presently unasserted claims of the '362 Patent is not to be construed as an admission that Favrat does not anticipate and/or render such claims obvious in combination with other prior art references. Defendants reserve the right to supplement these invalidity contentions accordingly should Plaintiff assert such claims.

Claim 11

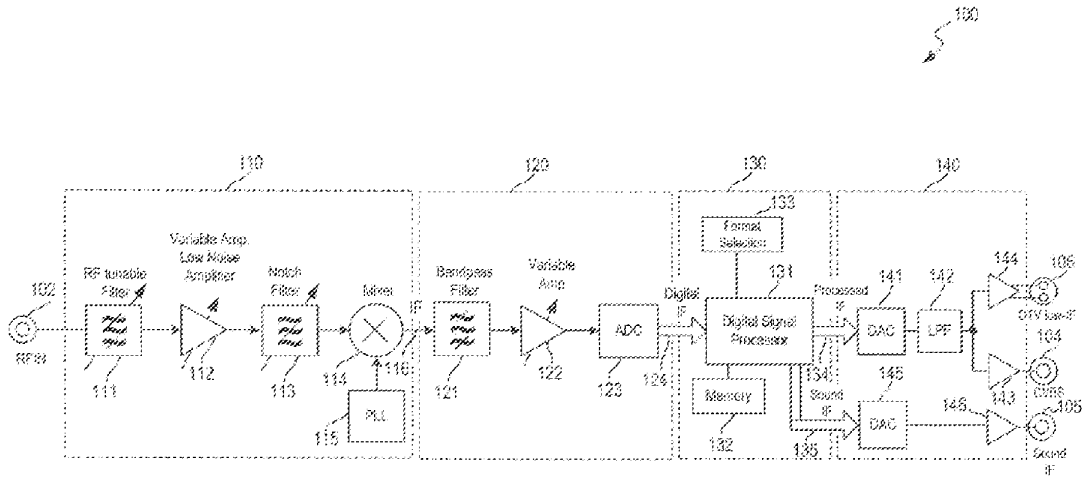
No.	US Pat. No. 9,210,362	US 7,265,792 B2 ("Favrat")
11[pre]	A method comprising:	To the extent the preamble is limiting, Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,* Favrat, 3:10-29: "In accordance with the principles of the present invention, a dual-format television (TV) receiver for receiving analog and digital TV signals uses a single signal processing circuit for processing the received input RF television signal. The dual-format television receiver

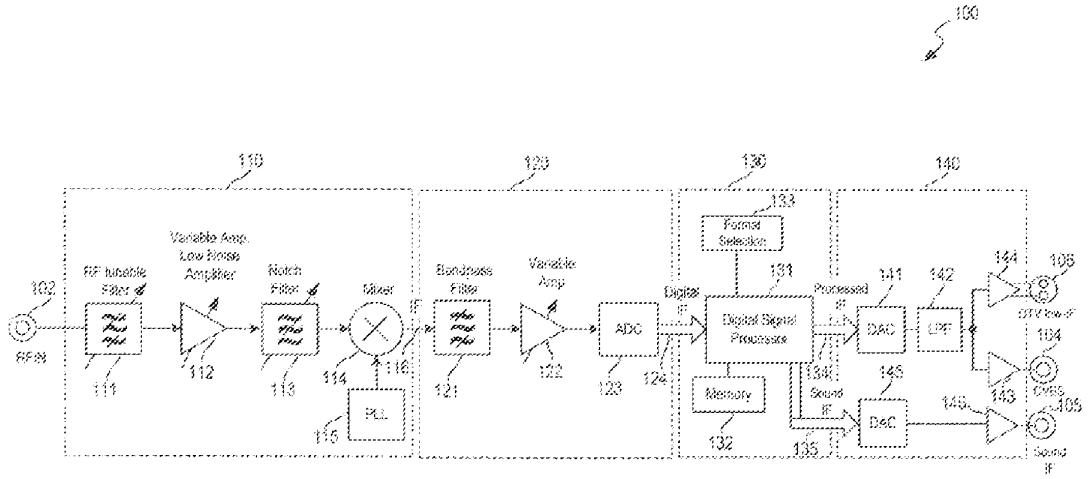
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		provides output signals indicative of the analog or digital television format of the received television signal. The output signals can be coupled to demodulators and/or decoders to generate the baseband signals and subsequently the video/audio signals for display or recording. In one embodiment, the dual-format TV receiver includes a frequency conversion circuit (a tuner), a digitizing IF circuit, a digital signal processor (DSP) circuit and a signal output circuit. In one embodiment, the dual-format TV receiver provides a first output signal that is the video baseband signal for television signals transmitted in the analog format, a second output signal that is the audio baseband signal for television signals transmitted in the analog format, and a third output signal that is the digital television (DTV) low-IF signals for television signals transmitted in the digital format." To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a]	in a wideband receiver system:	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Favrat, 1:6-10: "The present invention relates to a television signal receiver, and in particular, the present invention relates to a broadband television signal receiver for receiving multi-standard analog television signals and digital television signals."

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		 Fig. 1 To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a1]	downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels;	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Favrat, 4:49-5:2: "Referring to FIG. 1, receiver 100 includes a frequency conversion circuit 110 (or tuner circuit 110), a digitizing IF circuit 120, a digital signal processor (DSP) circuit 130 and a signal output circuit 140. Frequency conversion circuit 110 receives input RF signals on

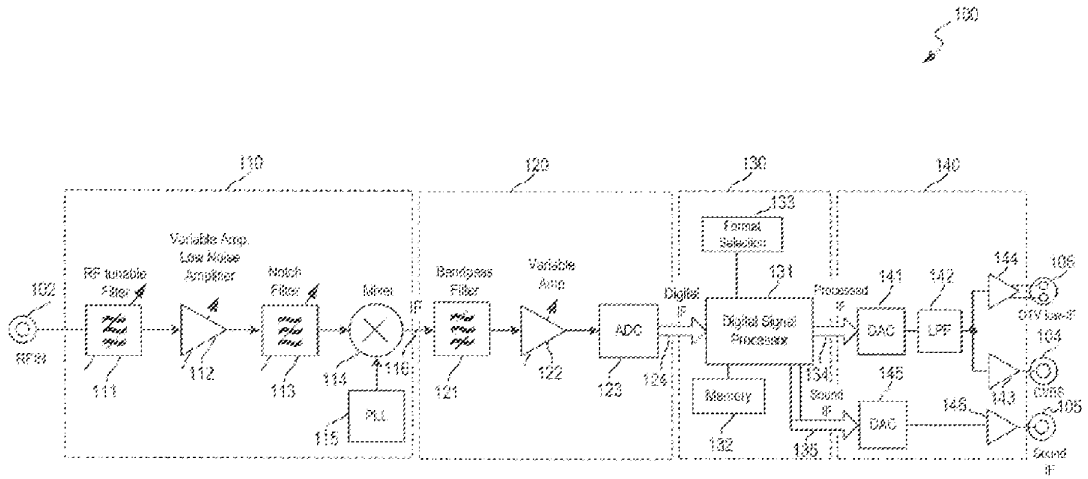
No.	US Pat. No. 9,210,362	US 7,265,792 B2 ("Favrat")
		signal input terminal 102. The input RF signals can be received from terrestrial broadcast or cable transmissions. Frequency conversion circuit 110 operates to convert the input RF signal to an intermediate frequency (IF) signal using one or more frequency conversions. In the present illustration shown in FIG. 1, the input RF signal is first coupled to a RF tunable filter 111 which is a bandpass filter. Then, the filtered signal is coupled to a variable gain low noise amplifier 112. The output signal of amplifier 112 is coupled to a bandstop filter 113 which is also known as a "notch filter." The output signal of bandstop filter 113 is then coupled to a mixer 114, controlled by a phase-locked loop 115. Mixer 114 operates to tune the filtered input RF signal to the desired frequency range in one or more frequency conversions and generate the IF signal. Frequency conversion circuit 110 provides the IF signal on a terminal 116 have a preselected intermediate frequency." Favrat, 5:3-16: "In accordance with the present invention, frequency conversion circuit 110 can be designed to generate IF signals having an intermediate frequency of any values. The IF used by tuner 110 can be the same as or different than the IF specified by the worldwide standards. Furthermore, as receiver 100 uses a single digital signal processor for signal processing, tuner 110 can use the same IF for receiving analog or digital television signals in any standards. The value of the IF in an integrated tuner is a matter of design choice. In one embodiment, the IF is selected to be 20 MHz or higher. The IF signal generated by frequency conversion circuit 110 having a preselected intermediate frequency is provided to digitizing IF circuit 120 of receiver 100."

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		 Fig. 1 To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a2]	digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels;	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Favrat, 5:14-29: "The IF signal generated by frequency conversion circuit 110 having a preselected intermediate frequency is provided to digitizing IF circuit 120 of receiver 100. Digitizing IF circuit 120 includes a bandpass filter 121, a variable gain amplifier 122 and an analog-to-

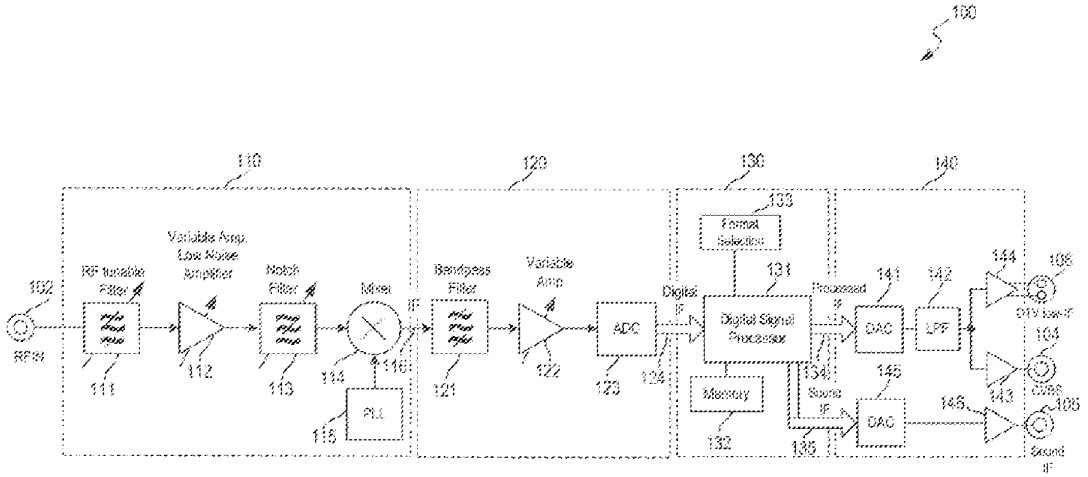
No.	US Pat. No. 9,210,362	US 7,265,792 B2 ("Favrat")
		digital converter (ADC) 123. The IF signal is filtered by bandpass filter 121. Then, amplifier 122 operates on the filtered IF signal for the purpose of regulating the dynamic range of ADC 123. ADC 123 operates to digitize the analog IF signal and provide a digital IF signal on a terminal 124. Receiver 100 thereby performs subsequent processing in the digital domain entirely. By applying the appropriate sampling frequency at ADC 123 and the appropriate signal processing functions at DSP circuit 130, receiver 100 can handle television signals in any format (analog or digital) and in any standard (e.g.: NTSC, PAL, SECAM, DVB or ATSC)."  Fig. 1 To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

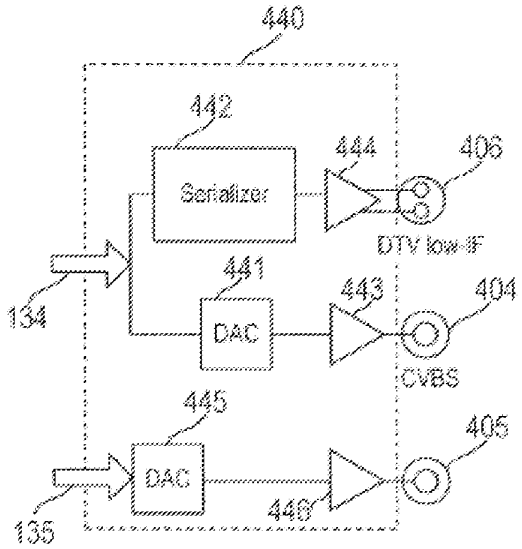
No.	US Pat. No. 9,210,362	US 7,265,792 B2 ("Favrat")
11[a3]	selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Favrat, 1:52-2:3: "The conventional television receiver also includes a channel filter and a demodulator for converting the IF signal to video and audio baseband signals. The channel filter is typically a discrete filter implemented as a SAW (Surface Acoustic Wave) filter. The shape of the SAW filter is designed specifically for the format (analog or digital TV) and the television standard (NTSC, PAL or SECAM) of the television signals being received. The demodulator is typically a dedicated component and designed specifically for a predetermined television signal format and a predetermined television standard. For analog television signal reception, the demodulator is a VIF/SIF module. The VIF/SIF module provides a video output called CVBS (Composite Video Baseband Signal) and audio outputs, such as MPX or A2. For digital television signal reception, the demodulator is a digital demodulator typically including a down-converter, an analog-to-digital converter and other supporting circuitry to perform the demodulation. The digital demodulator outputs data in a MPEG data stream." Favrat, 2:8-15: "For instance, it is known to implement a dual-format television receiver by using a bank of channel filters, each of the channel filters designed for a specific format and standard, and a bank of demodulators, each demodulator receiving filtered signals from a corresponding channel filter. A switch can be used to select the desired signal processing path including the desired channel filter and the associated demodulator." Favrat, 5:48-63: "After the IF signal is filtered and digitized, the digital representation of the signal is processed by a digital signal processor (DSP) 131 in DSP circuit 130. DSP 131 processes the digital IF signal according to the television format and standard to which the input RF signal is encoded. In the present illustration, DSP circuit 130 includes a format/standard selection circuit 133 for selecting between the several analog television standards and the several digital television standards. DSP 131 applies the appropriate filter function, such as

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		an impulse response, to the digital IF signals received on terminal 124 depending on the state of format/standard selection circuit 133. In one embodiment, the coefficients of the filter functions are stored in a look-up table in a memory 132 in DSP circuit 130. DSP 131 retrieves the coefficients from memory 132 to be applied to the incoming digital signals." Favrat, 5:64-6:5: "DSP 131 is a programmable and reconfigurable processor. In the present embodiment, DSP 131 implements a finite impulse response (FIR) filter which is reconfigured based on the TV standard selected. Furthermore, in the present embodiment, DSP 131 includes two computing units to speed up the computation time. Specifically, the filtering operations of the real and imaginary parts in the frequency domain are carried out in parallel. In other embodiments, DSP 131 may include only one computing unit." Favrat, 6:37-48: "When the input RF signal is a digital television signal, DSP 131 applies a filter function to the digitized signals. The filter function can be implemented as a FIR filter. An example is the ATSC-VSB standard where the filter response is specified as raised root cosine with 0.1152 roll-off (refer to the ATSC A-53 specification). Furthermore, additional filter functions, such as an equalizer for echo cancellation (multipath), can also be implemented in DSP 131. The filter response is then derived from the measured channel response. In the present embodiment, DSP 131 also performs a down-conversion function for converting the IF signal into a low IF signal." Favrat, 7:8-16: "The processed digital signals provided by DSP 131 on terminal 134 is coupled to DAC 141 to be converted back to analog format. The analog signal is filtered by low pass filter 142 to smooth out the signal. The filtered analog signal is coupled to a first driver 143 to provide a first output signal for analog television format on output terminal 104 and also to a second driver 144 to provide a third output signal for digital television format on output terminal 106."

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		 Fig. 1 To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a4]	outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream.	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Favrat, 1:52-2:3: "The conventional television receiver also includes a channel filter and a demodulator for converting the IF signal to video and audio baseband signals. The channel filter is typically a discrete filter implemented as a SAW (Surface Acoustic Wave) filter. The shape of the

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		SAW filter is designed specifically for the format (analog or digital TV) and the television standard (NTSC, PAL or SECAM) of the television signals being received. The demodulator is typically a dedicated component and designed specifically for a predetermined television signal format and a predetermined television standard. For analog television signal reception, the demodulator is a VIF/SIF module. The VIF/SIF module provides a video output called CVBS (Composite Video Baseband Signal) and audio outputs, such as MPX or A2. For digital television signal reception, the demodulator is a digital demodulator typically including a down-converter, an analog-to-digital converter and other supporting circuitry to perform the demodulation. The digital demodulator outputs data in a MPEG data stream." Favrat, 3:13-19: "The dual-format television receiver provides output signals indicative of the analog or digital television format of the received television signal. The output signals can be coupled to demodulators and/or decoders to generate the baseband signals and subsequently the video/audio signals for display or recording." Favrat, 4:30-35: "Dual-format TV receiver 100 processes the incoming RF signal and provides output signals depending on the television format of the incoming RF signal. When the incoming RF signal is in the analog television format, receiver 100 provides first and second output signals which can be decoded to generate the video and audio signals for display. When the incoming RF signal is in the digital television format, receiver 100 provides the third output signal which can be demodulated and decoded to generate the video and audio signals for display." Favrat, 7:52-8:2: "In a second alternate embodiment, a signal output circuit 440 includes a digital-to-analog converter (DAC) 441 receiving the processed digital IF signal. The output terminal of DAC 441 is coupled directly to a first driver 443. DAC 441 and first driver 443 form the output signal path for the video baseband signals (CVBS) for analog television. A DAC 445 and a driver 446 form the output signal path for the audio baseband signals for analog television. For the digital television signals, signal output circuit 440 includes a serializer 442 for converting the processed digital IF signal from the DSP circuit into a serial digital data

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		stream. In this manner, the digital signals for digital television can be provided to a digital demodulator through a serial digital interface. In signal output circuit 440, the serial digital data stream is coupled to a second driver 444 which is a differential output driver. In one embodiment, driver 444 is a low voltage differential signaling (LVDS) driver providing the DTV low-IF signal as low voltage differential signals."  Fig. 1

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		 To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Claim 12

No.	US Pat. No. 9,210,362	US 7,265,792 B2 ("Favrat")
12	The method of claim 11, comprising outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface.	Favrat expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*.

		Favrat, 7:52-8:2: "In a second alternate embodiment, a signal output circuit 440 includes a digital-to-analog converter (DAC) 441 receiving the processed digital IF signal. The output terminal of DAC 441 is coupled directly to a first driver 443. DAC 441 and first driver 443 form the output signal path for the video baseband signals (CVBS) for analog television. A DAC 445 and a driver 446 form the output signal path for the audio baseband signals for analog television. For the digital television signals, signal output circuit 440 includes a serializer 442 for converting the processed digital IF signal from the DSP circuit into a serial digital data stream. In this manner, the digital signals for digital television can be provided to a digital demodulator through a serial digital interface. In signal output circuit 440, the serial digital data stream is coupled to a second driver 444 which is a differential output driver. In one embodiment, driver 444 is a low voltage differential signaling (LVDS) driver providing the DTV low-IF signal as low voltage differential signals." Favrat, 8:3-21: "In a third alternate embodiment, a signal output circuit 540 includes a first serializer 541 and a second serializer 542 so that the video signals from the signal output circuit are provided as serial digital interfaces. In this embodiment, first serializer 541 receives the processed digital IF signal and provides a serial digital data stream to a first driver 543. Driver 543 is a differential output driver and drives the serial digital data stream onto an output terminal 504. Serializer 542 and driver 544 form a parallel data path providing a serial digital data stream on an output terminal 506. The serial digital data on output terminal 504 can be coupled to a decoder circuit for decoding into video signals for analog television. An analog-to-digital converter may be included in the decoder circuit to convert the serial digital data into an analog format. The serial digital data on output terminal 506 can be coupled to a digital demodulator and a decoder for demodulating and decoding the digital television signals. A DAC 545 and a driver 546 form the output signal path for the audio baseband signals for analog television."

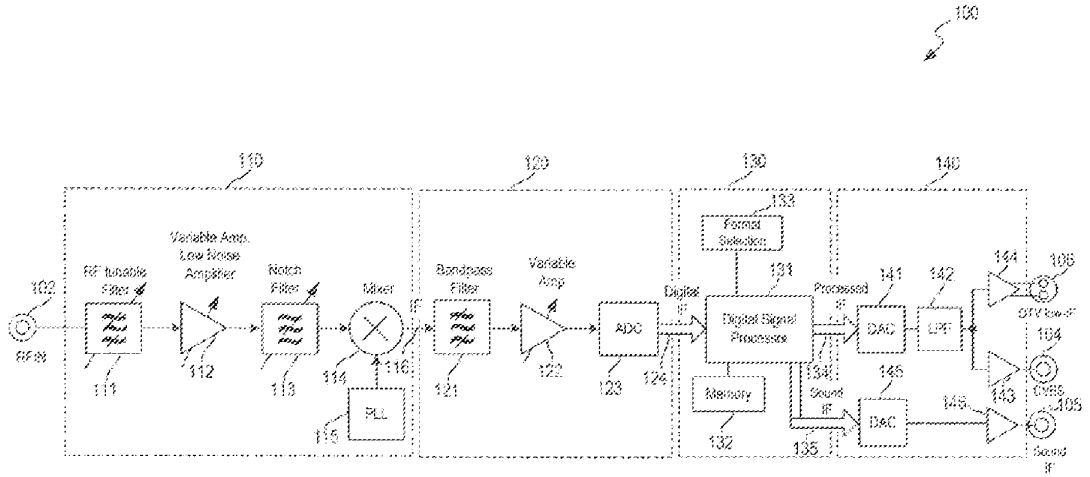
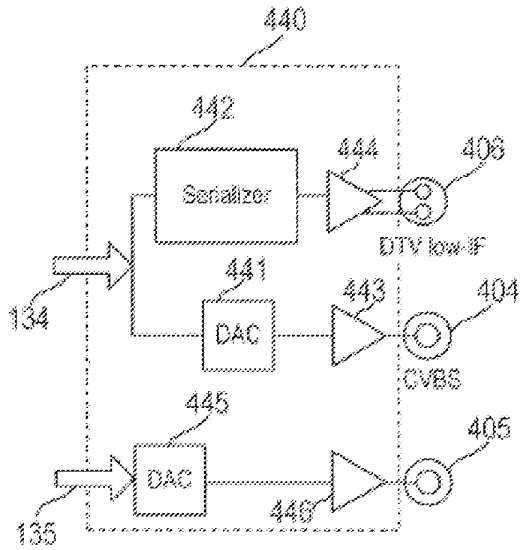
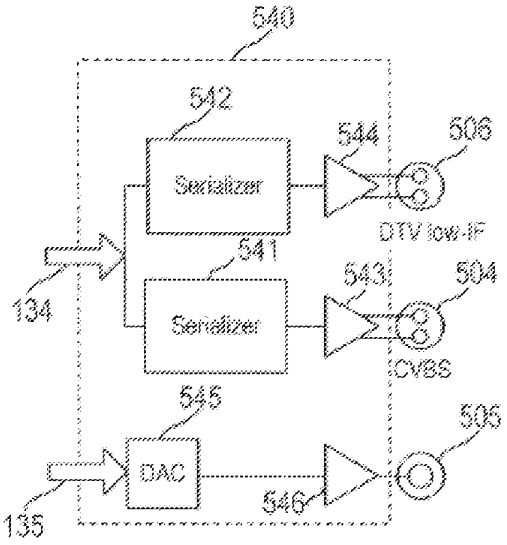

100
110
120
130
140
RF In
102
RF tunable Filter
111
Variable Amp. Low Noise Amplifier
112
Notch Filter
113
Mixer
114
PLL
115
116
Bandpass Filter
121
Variable Amp
122
ADC
123
124
Digital IF
Format Selector
131
Digital Signal Processor
Memory
132
Processed IF
134
Sound IF
135
DAC
141
LPF
142
144
106
OTA Out
104
CVBS
105
Sound IF
DAC
145
143

Fig. 1


440
442
Serializer
444
406
DTV low-IF
134
441
DAC
443
404
CVBS
445
DAC
405
135
446


540
542
Serializer
544
506
DTV low-IF
134
541
Serializer
543
504
CVBS
545
DAC
505
135
546

		To the extent that Plaintiff contends Favrat does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Favrat with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Exhibit D2: Invalidity of U.S. Patent No. 9,210,362 in view of US 2007/0098089 A1 ("Li")

Based upon Plaintiff's Complaint, Amended Complaint, Infringement Contentions, apparent claim constructions, and application of the claims to the accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that concedes or acquiesces to any claim construction implied or suggested by Plaintiff's Complaint, Amended Complaint, or Infringement Contentions. These invalidity contentions are not asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

US 2007/0098089 A1 ("Li") was filed on October 28, 2005 and was published on May 3, 2007. Li is prior art under at least 35 U.S.C. §§ 102(a), 102(b), and 102(e). As described in the following claim chart, the asserted claims of U.S. Patent No. 9,210,362 (the "'362 Patent"), are invalid as anticipated by and/or obvious in view of US 2007/0098089 A1, including without limitation as set forth below.

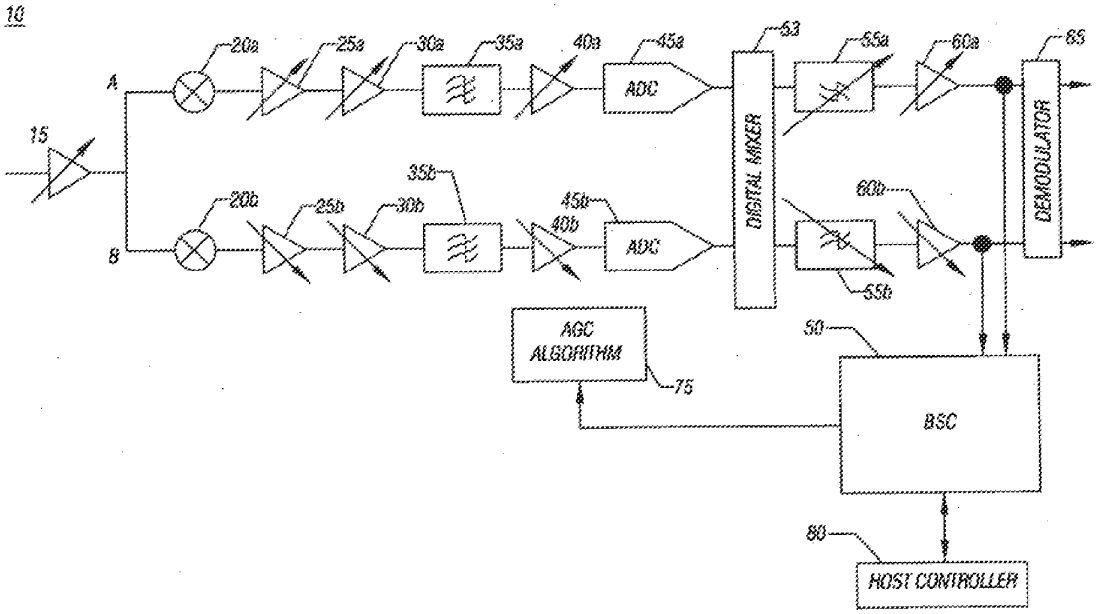
To the extent that Li is found not to anticipate one or more of the asserted claims of the '362 Patent, these claims are invalid as obvious in view of Li alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions Cover Pleading and accompanying charts, including without limitation as set forth below. Further, to the extent Defendants have not charted any presently unasserted claims of the '362 Patent is not to be construed as an admission that Li does not anticipate and/or render such claims obvious in combination with other prior art references. Defendants reserve the right to supplement these invalidity contentions accordingly should Plaintiff assert such claims.

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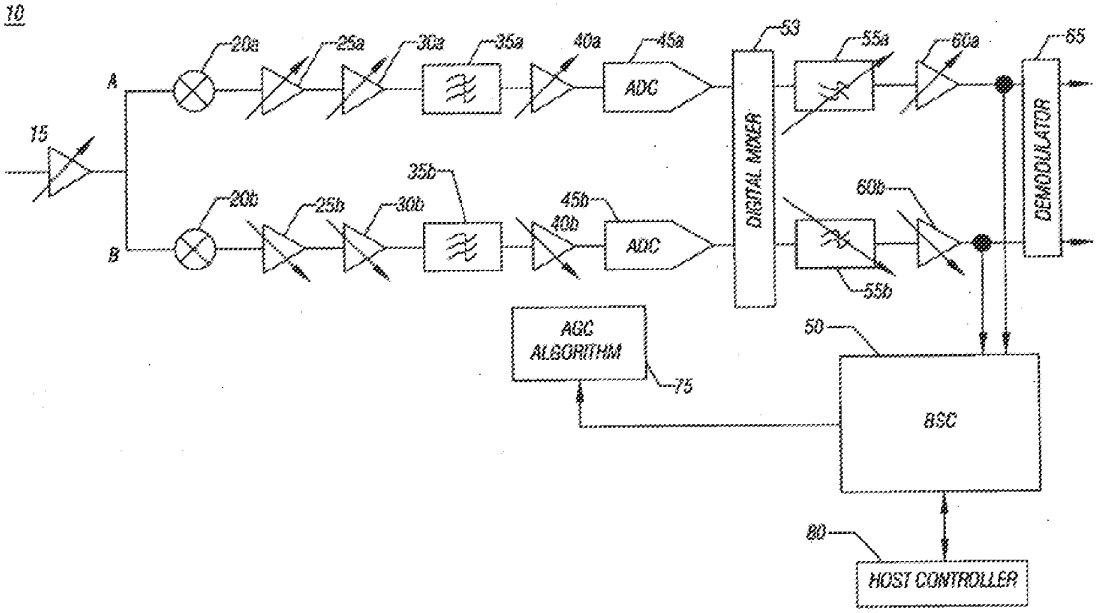
Claim 11

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
11[pre]	A method comprising:	To the extent the preamble is limiting, Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,* Li, Abstract: "In one embodiment, the present invention includes a method for receiving data corresponding to a portion of an incoming radio frequency (RF) spectrum, determining a set of estimates including one or more pairs of a channel frequency estimate and a symbol rate estimate from the data via a linear spectrum analysis, and determining a refined set of estimates from the set of estimates via at least one non-linear spectrum analysis."

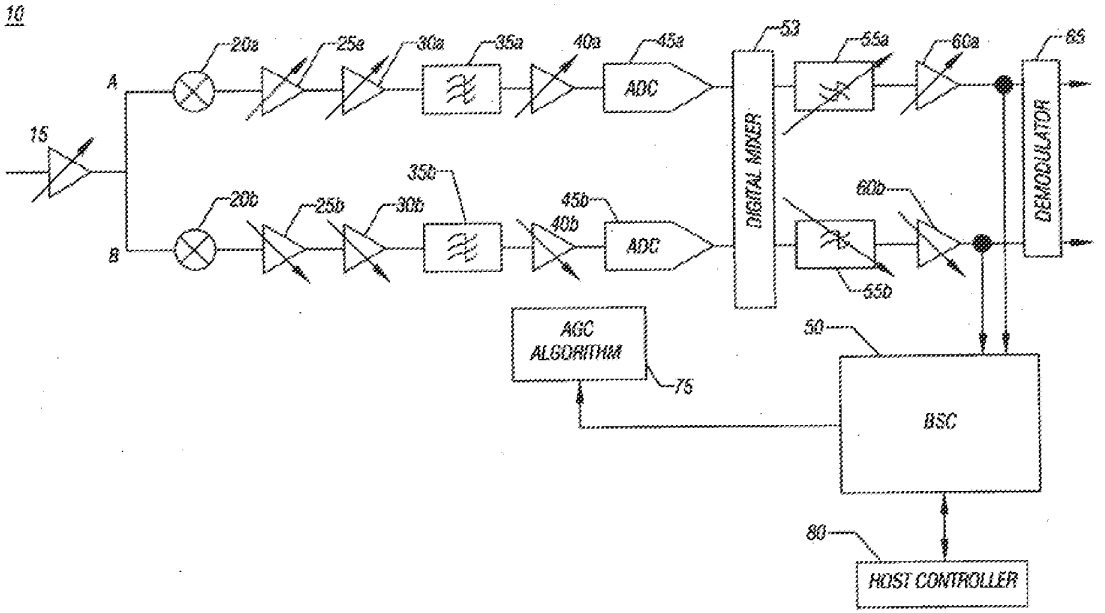
No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		Li, ¶ [0012]: "Methods disclosed herein may further be used during frequency acquisition of a requested channel. In this way, frequency errors due to associated receiver components such as an antenna may be corrected. Thus, a blind scan controller can be used to analyze a portion of an RF spectrum around a desired channel to obtain a correct frequency for acquisition. Then the receiver can be tuned to the correct frequency based on the blind scan controller's analysis." To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a]	in a wideband receiver system:	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Li, ¶ [0013]: "An apparatus consistent with that described above may be implemented in a system such as a receiver system that includes a low-noise amplifier (LNA) to couple to an input signal source. The LNA may be coupled to a mixer to provide I and Q channel signals which may be processed in I and Q channel paths. In turn, the mixer may be coupled to an analog-to-digital converter (ADC) to convert a wideband signal into a digital signal, which is then processed in digital circuitry." Li, ¶ [0025]: "From mixer 20 a, the IF signals are passed through a plurality of gain stages 25 aand 30 a. In one embodiment, gain stages 25 a and 30 a each may be programmable gain amplifiers (PGAs), although the scope of the present invention is not so limited. From gain stage 30 a, the received signals are provided to a filter 35 a, which may be an analog wideband filter having a bandwidth that may span several channels. For example, filter 35 a may be a wideband filter that allows a selected frequency band to be passed."

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		 FIG. 1 To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a1]	downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels;	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Li, ¶ [0003]:

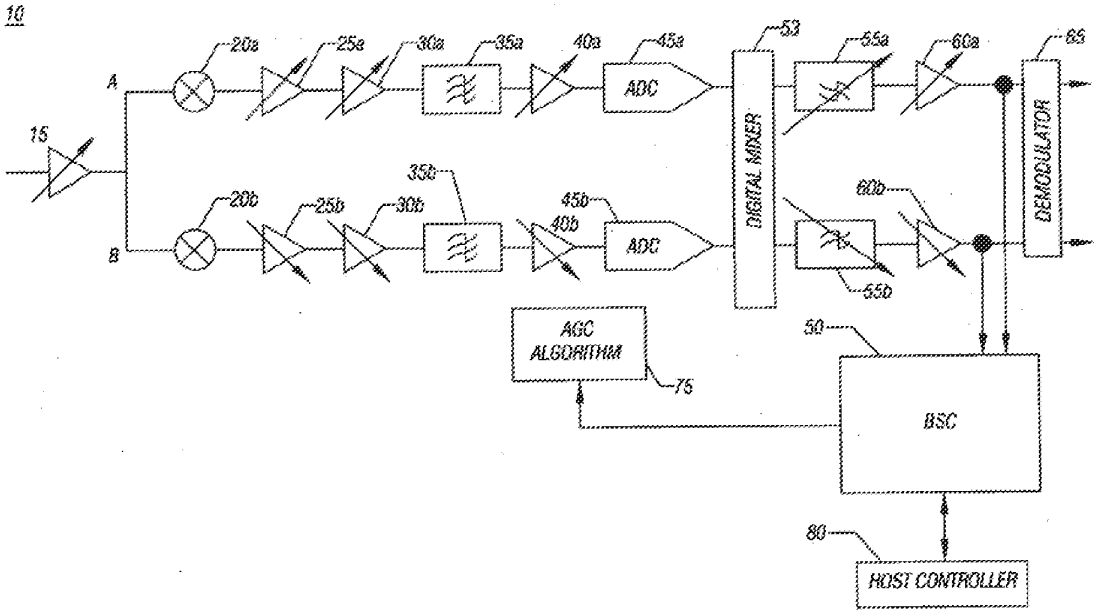
No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		"A receiver is typically coupled to receive incoming RF signals from an antenna and process the signals in various stages, including amplification stages, filtering stages, downconversion stages and the like." Li, ¶ [0024]: "Thus as shown in FIG. 1, the output of LNA 15 is provided to a mixer 20 a, which downconverts the incoming RF signals to an intermediate frequency (IF). While not shown in FIG. 1, it is to be understood that mixer 20 a may mix the incoming signals with a received local oscillator (LO) frequency. In different implementations, a mixer may provide for direct down conversion (DDC) or conversion down to an intermediate frequency signal or a low IF signal. In one implementation, the mixer does not mix a desired channel down to a fixed target IF frequency and then mix the desired channel to DC. Rather, this implementation uses analog coarse tune circuitry to mix the desired channel down to a variable location within a frequency range near DC, and then digital conversion and digital filtering is performed directly on this coarsely tuned channel spectrum." Li, ¶ [0025]: "From mixer 20 a, the IF signals are passed through a plurality of gain stages 25 aand 30 a. In one embodiment, gain stages 25 a and 30 a each may be programmable gain amplifiers (PGAs), although the scope of the present invention is not so limited. From gain stage 30 a, the received signals are provided to a filter 35 a, which may be an analog wideband filter having a bandwidth that may span several channels. For example, filter 35 a may be a wideband filter that allows a selected frequency band to be passed. In one implementation for a satellite receiver, filter 35 a may have a single-side bandwidth of approximately 85 MHz, although other variations are possible. Furthermore, in some implementations filter 35 a may be a constant corner frequency filter. However, in other implementations a variable frequency filter may be provided instead." Li, ¶ [0027]: "In various implementations, filter 55 a may be a variable filter controlled to pass only a desired channel, e.g., corresponding to a selected television channel." Li, cl. 24: "24. A system comprising:

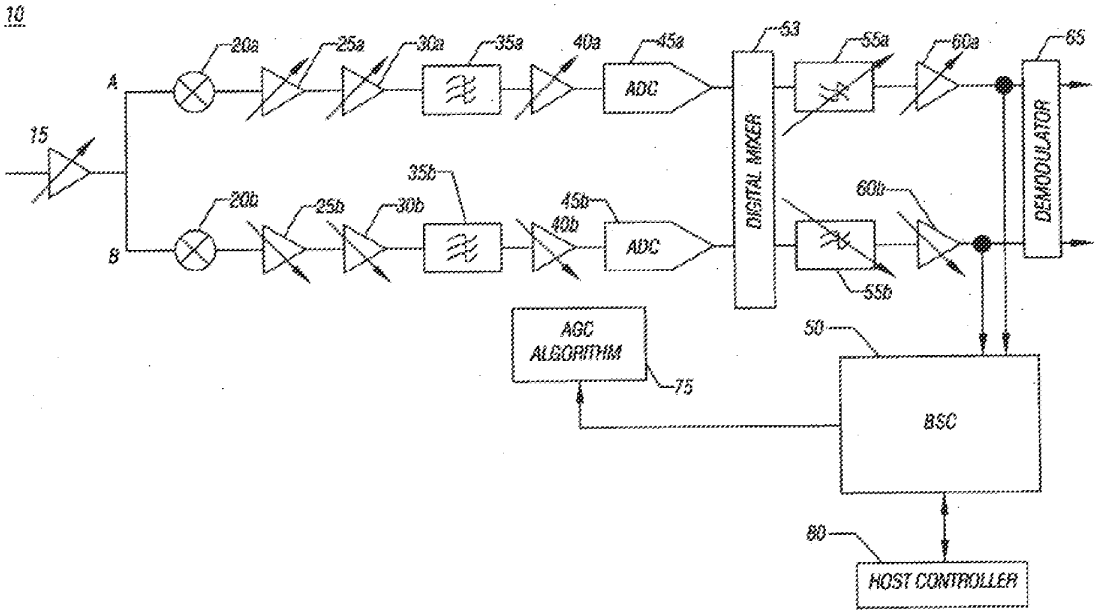
No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		an analog mixer coupled to receive an incoming radio frequency (RF) spectrum and to generate a wideband signal from the incoming RF spectrum;"  FIG. 1 To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a2]	digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.*,.

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
	channels and said plurality of undesired television channels;	Li, ¶ [0013]: "In turn, the mixer may be coupled to an analog-to-digital converter (ADC) to convert a wideband signal into a digital signal, which is then processed in digital circuitry." Li, ¶ [0026]: "Still referring to FIG. 1, after filtering, the filtered signals are amplified in a third gain stage 40 a, which may be another PGA, for example. The amplified signals are then passed to an analog-to-digital converter (ADC) 45 a which converts the signals into a digital representation. In various embodiments, ADC 45 a may be a pipeline converter, although in other implementations a flash or interpolated flash-type converter may be provided. In one embodiment, ADC 45 a may be a wideband 8-bit ADC that operates at 200 megasymbols per second (MS/s)." Li, cl. 24: "24. A system comprising: . . . an analog-to-digital converter (ADC) coupled to the analog mixer to convert the wideband signal into a digital signal;"

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		 FIG. 1 To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a3]	selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Li, ¶ [0027]:

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		"Still referring to FIG. 1, the digitized signals are fine tuned in a digital mixer 53, which may include a numerically controlled oscillator (NCO) (not shown in FIG. 1) that in turn receives a frequency control value (not shown in FIG. 1) to control the amount of fine tuning. After fine tuning, the digitized signals are provided to a digital filter 55 a, which may be a narrowband digital filter. In various implementations, filter 55 a may be a variable filter controlled to pass only a desired channel, e.g., corresponding to a selected television channel. Filter 55 a may support both adjacent channel suppression and decimation for various band rates. While the bandwidth of the narrowband filter may vary, in a DBS implementation, a selected channel having a frequency of between approximately 1.0 and 30.0 MHz may be passed." Li, cl. 24: "24. A system comprising: . . . a digital filter coupled to the ADC to generate a filtered and decimated signal substantially corresponding to a maximum bandwidth of the digital filter from the digital signal; and"

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		 FIG. 1 To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a4]	outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream.	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Li, ¶ [0028]: "Still referring to FIG. 1, after being filtered in filter 55 a, the digitized data may be amplified in a fourth gain stage 60 a, which may be a digital amplifier such as a digital

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
		VGA. The resulting signals are then provided to further processing circuitry of a receiver, for example, demodulation circuitry 65. Demodulator 65 may be used to demodulate incoming signals, which are modulated according to a selected modulation scheme, such as QPSK, BSPK, or another such modulation scheme. Also, the resulting signals, after a proper amplitude adjustment, can be either fed to a FFT engine or can be first non-linear transformed and then fed to the same FFT engine to extract spectrum information, as will be discussed further below."  FIG. 1 To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Claim 12

No.	US Pat. No. 9,210,362	US 2007/0098089 A1 ("Li")
12	The method of claim 11, comprising outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface.	Li expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Li, ¶ [0057]: "FIG. 7 is a block diagram of a system in accordance with one embodiment. As one example, system 672 may be a satellite set-top box that includes receiver circuitry 600 as shown in FIG. 7. Of course, embodiments of the present invention may be used in connection with other systems. An input signal spectrum 607 can be, for example, 32 transponder channels between 950 MHz and 2150 MHz with each transponder channel carrying a number of different program channels. This signal spectrum 607 can be processed by the receiver/tuner 600 to provide digital baseband output signals 612 that represent a tuned transponder channel. These output signals 612 can then be processed by a demodulator 680 that can tune one of the program channels within the tuned transponder channel. The output signal 681 from the demodulator, which represents a tuned program channel within the transponder channel that was tuned by the receiver/tuner 610, can then be processed with a forward error correction decoder 682 to produce a digital output stream. This digital output stream is typically the data stream that is stored by personal video recorders (PVRs) for later use and viewing by a user, as represented by the PVR output stream 688. The output of the decoder 682, or the stored PVR data as represented by PVR input stream 692, can then be processed by video/audio processing circuitry 684 that can include processing circuitry such as an MPEG decoder." Li, ¶ [0058]: "The output of the processing circuitry 684 is typically the digital video data stream that represents the program channel and is used for picture-in-picture (PnP) operations, for example, where system 672 includes two tuners with one tuner providing the primary viewing feed and a second tuner providing the PnP viewing feed. The output of the processing circuitry 684, as well as a PnP input stream 694 from a second tuner if a second tuner is being utilized for PnP operations, can be processed by a video/audio controller 686 to generate a video output signal 676 that can subsequently be utilized, for example, with a TV or VCR. Additional tuners could also be used, if desired."

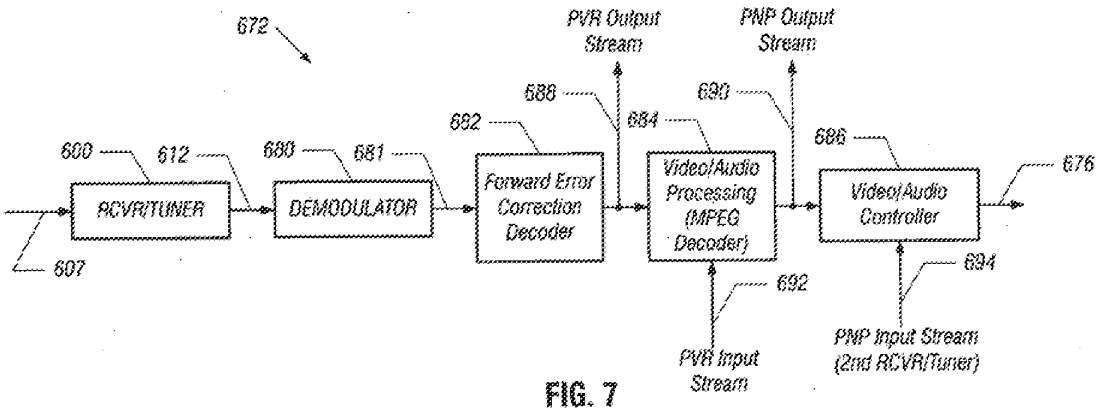


FIG. 7

To the extent that Plaintiff contends Li does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Li with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Exhibit D3: Invalidity of U.S. Patent No. 9,210,362 in view of WO 2006/119489 A2 ("McNeely")

Based upon Plaintiff's Complaint, Amended Complaint, Infringement Contentions, apparent claim constructions, and application of the claims to the accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that concedes or acquiesces to any claim construction implied or suggested by Plaintiff's Complaint, Amended Complaint, or Infringement Contentions. These invalidity contentions are not asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

WO 2006/119489 A2 ("McNeely") was filed as a PCT application on May 4, 2006 and was published in the English language on November 9, 2006. Pugel is prior art under at least 35 U.S.C. §§ 102(a) and 102(b). As described in the following claim chart, the asserted claims of U.S. Patent No. 9,210,362 (the "'362 Patent"), are invalid as anticipated by and/or obvious in view of WO 2006/119489 A2, including without limitation as set forth below.

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To the extent that McNeely is found not to anticipate one or more of the asserted claims of the '362 Patent, these claims are invalid as obvious in view of McNeely alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions Cover Pleading and accompanying charts, including without limitation as set forth below. Further, to the extent Defendants have not charted any presently unasserted claims of the '362 Patent is not to be construed as an admission that McNeely does not anticipate and/or render such claims obvious in combination with other prior art references. Defendants reserve the right to supplement these invalidity contentions accordingly should Plaintiff assert such claims.

Claim 11

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
11[pre]	A method comprising:	To the extent the preamble is limiting, McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,* McNeely, Abstract: "The disclosed embodiments relate to an apparatus (600) and a method (700) for re-synthesizing signals. . . . The method (700) involves receiving a first signal (702) having a

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		plurality of different program streams in different frequency channels, selecting (706) a set of program streams from the plurality of different frequency channels, combining (712) the set of program streams to form a second signal, and transmitting (720) the second signal."

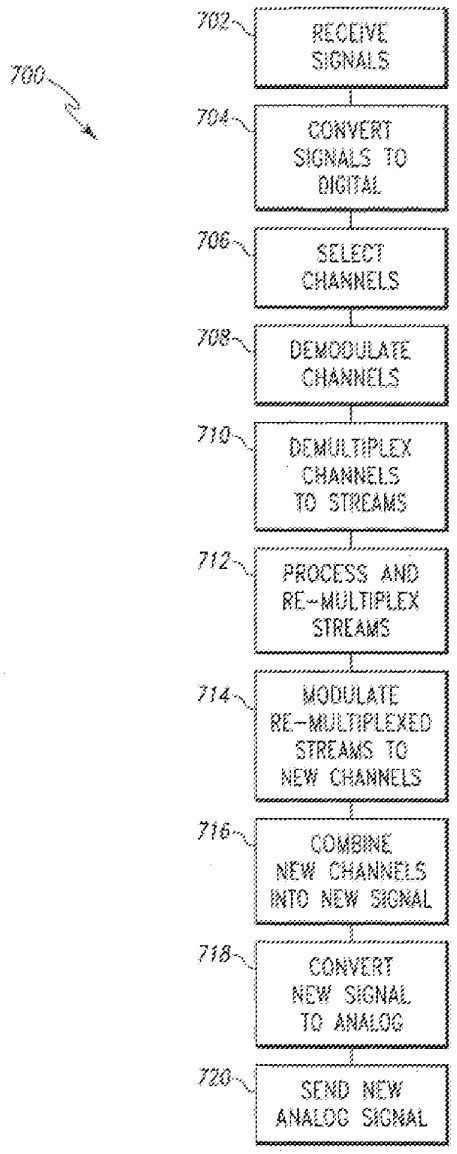
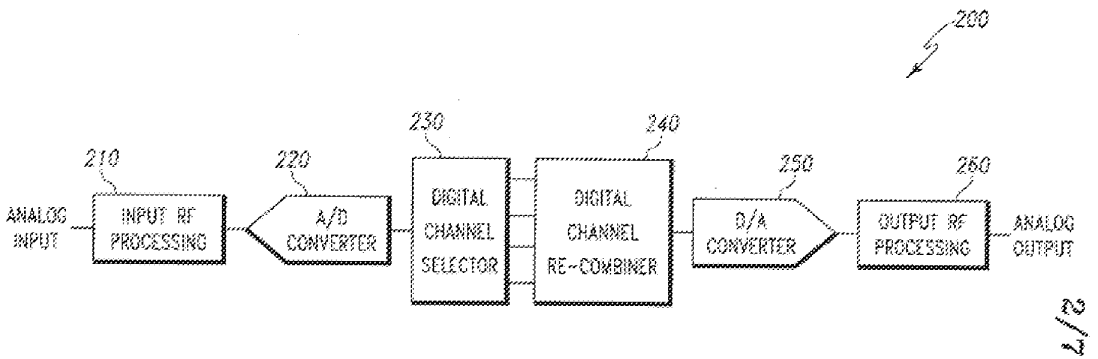

7/7
700
702
RECEIVE SIGNALS
704
CONVERT SIGNALS TO DIGITAL
706
SELECT CHANNELS
708
DEMODULATE CHANNELS
710
DEMULTIPLEX CHANNELS TO STREAMS
712
PROCESS AND RE-MULTIPLEX STREAMS
714
MODULATE RE-MULTIPLEXED STREAMS TO NEW CHANNELS
716
COMBINE NEW CHANNELS INTO NEW SIGNAL
718
CONVERT NEW SIGNAL TO ANALOG
720
SEND NEW ANALOG SIGNAL

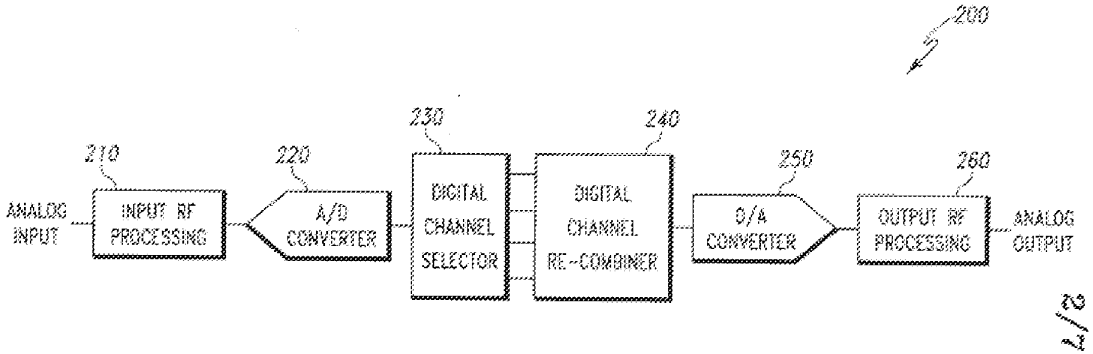
Fig. 7

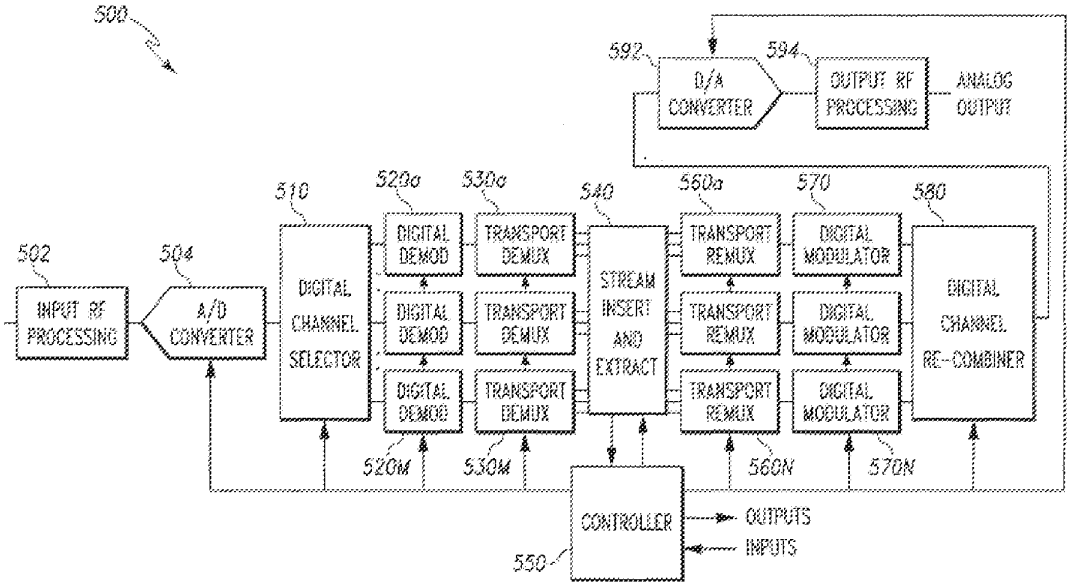
No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a]	in a wideband receiver system:	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. McNeely, page 7, line 21 - page 8, line 8: "Turning now to the drawings and referring initially to FIG. 1 , an overall block diagram 100 of a system using the present invention is shown. . . . The digital data streams are usually called program streams and may be streams of audio, video, or other data including program guide information. The physical channels are often grouped to cover a limited frequency range such as 500 to 1000 MHz of bandwidth. The satellite signals are often located in the microwave frequency range, for instance 11-13 Gigahertz (GHz)." McNeely, page 8, lines 23-25: "As previously described, each L-band signal may occupy 1 GHz of bandwidth, and a typical customer premises cable installation may only support less than 2 GHz of total signal bandwidth." To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a1]	downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*.

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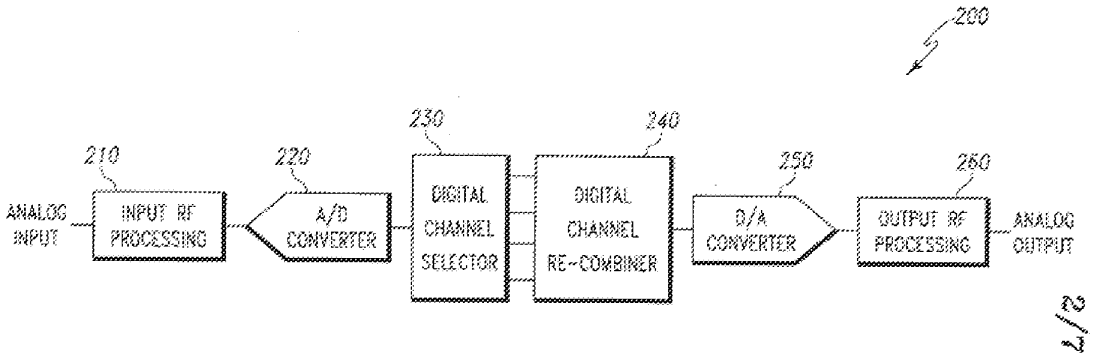
No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
	desired television channels and a plurality of undesired television channels;	McNeely, page 2, lines 21-30: "In today's data communication systems such as used in satellite TV, data of different types often reside in what are known as virtual channels. The data from these virtual channels is separately disassembled into data packets, aggregated within and across different data types into bit streams and conveyed by packet delivery systems. Data consumer appliances, such as satellite receivers, select from physical channels available to them, convert the signals on these channels to digital form (packets) and collect the data packets required to re-assemble the desired virtual channels of information (e.g., audio, video, program guide, transactional data, etc.)." McNeely, page 5, lines 3-7: "The method involves receiving a first signal having a plurality of different program streams in different frequency channels, selecting a set of program streams from the plurality of different frequency channels, combining the set of program streams to form a second signal, and transmitting the second signal." McNeely, page 10, line 27 - page 11, line 12: "Turning now to FIG. 2 a block diagram 200 of an embodiment of the present invention is shown. The diagram shows an implementation of the re-synsthesizer 110 that includes digital signal processing in order to increase the performance and available bandwidth for selected channels. In order to facilitate a further understanding of the invention, a re-synthesizer 110 will be described here using only a single L-band signal as an input. Further, the re-synthesizer 110 described here will include the capabilities only to translate frequency ranges or physical channels from the input to the output. The single L-band signal, as an analog input, is processed through an RF processing block 210. The RF processing block 210 may contain circuitry for filtering undesired energy outside the signal frequency range, may correct for any frequency response errors introduced, and may amplify the signal to a level necessary for input to the analog to digital (A/D) converter 220. The input RF processing block 210 may also contain any mixing circuits necessary to position the L-band signal in the correct frequency range for operation of the A/D converter 220."

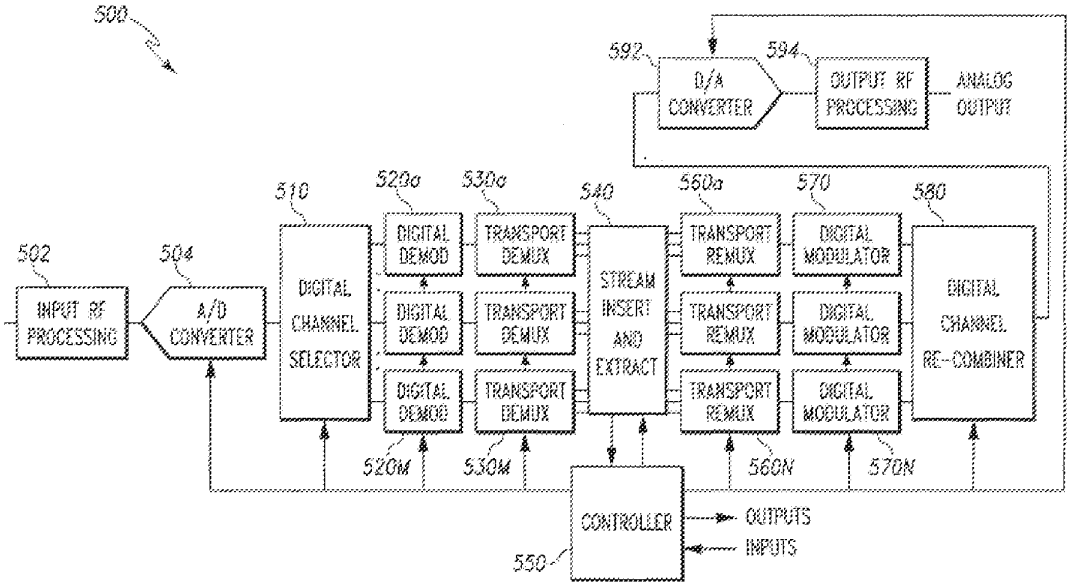
No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 2 To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a2]	digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels;	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.*,. McNeely, page 11, lines 13-27: "The A/D converter 220 digitizes the processed L-band signal into a series of samples, each sample containing a group of bits. In an exemplary embodiment, the processed satellite signal is located between the frequencies of 975 and 1425 MHz. The A/D converter 220 samples the processed L-band signal at a rate of 933 megasamples per second (MSPS) generating a digital signal containing a series of samples, each sample represented by 8 bits. The A/D converter 220 may also generate a translated frequency image of the L-band signal essentially translating the signal from an initial frequency range in the analog domain to a

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		different frequency range based on sampling principles. A clock signal, not shown, is supplied to the A/D converter for performing the sampling. The clock signal may be generated by a crystal or as part of a voltage controlled oscillator. The clock signal may also directly, or through additional multipliers and dividers, supply signals to other blocks within the re-synthesizer 110." McNeely, page 19, lines 13-21: "Turning now to FIG. 5, a block diagram 500 of a further embodiment of the present invention is shown. The diagram shows an implementation of the re-synthesizer 110 that includes digital signal processing and further includes program stream processing in order to increase the performance and available bandwidth for selected channels. In order to facilitate a further understanding of the invention, a re-synthesizer 110 will be described here using only a single L-band signal as an input. An input RF processing block 502 is connected to an A/D converter 504."  Fig. 2

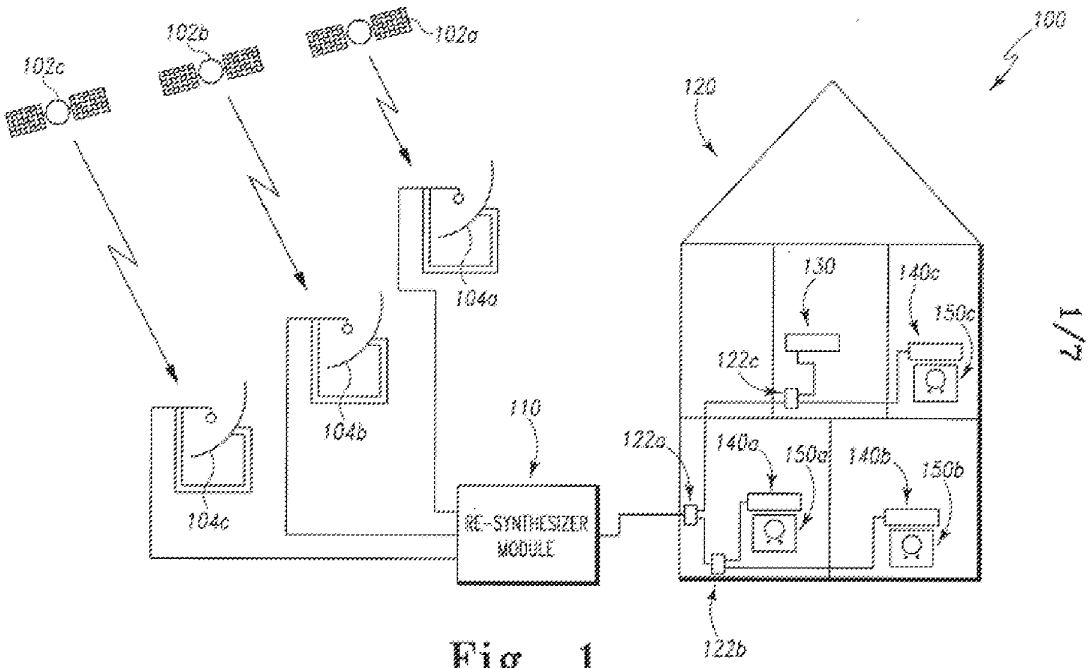
No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 5 5/7 To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a3]	selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*.

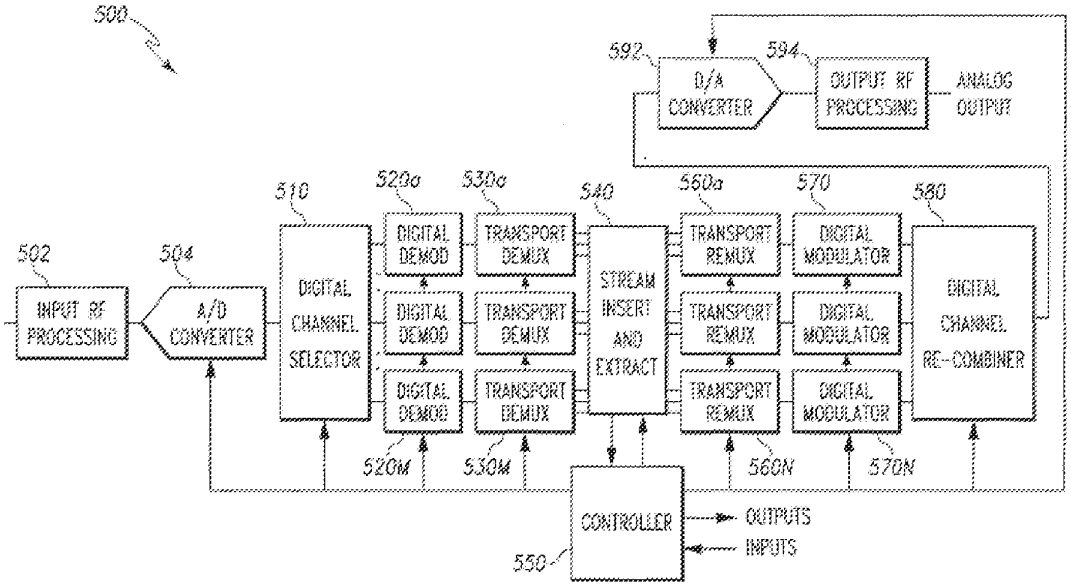
No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		McNeely, Abstract: "The method (700) involves receiving a first signal (702) having a plurality of different program streams in different frequency channels, selecting (706) a set of program streams from the plurality of different frequency channels, combining (712) the set of program streams to form a second signal, and transmitting (720) the second signal." McNeely, page 11, line 28 - page 12, line 7: "The digital channel selector 230 receives the sampled signal and proceeds to select and down-convert each of the individual physical channels that have been selected. After processing, each of the selected individual channels are located within the same frequency range at or near to baseband, but are contained as individual signals on separate signal lines. The number of bits representing each selected individual channel may be different from the original sampled signal based on the processing method employed. The use of digital signal processing and processing of the signal in parallel permits narrower filtering constraints and more efficient channel selection within the re- synthesizer 110." McNeely, page 19, lines 13-23: "Turning now to FIG. 5, a block diagram 500 of a further embodiment of the present invention is shown. . . . The output of the A/D converter is connected to a digital channel selector 510. The outputs of the digital channel selector 510 each individually connect to a digital demodulator (demod) 520a-M."

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 2

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 5 5/7 To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a4]	outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream.	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*.

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		McNeely, page 7, line 21 - page 8, line 5: "Turning now to the drawings and referring initially to FIG. 1 , an overall block diagram 100 of a system using the present invention is shown. . . . Each of the physical channels may in turn represent one or more preferably digital bit streams of information combined together as a digital multiplex, encoded, and modulated using various analog and/or digital modulation techniques. The digital data streams are usually called program streams and may be streams of audio, video, or other data including program guide information." McNeely, page 19, lines 22-25: "The outputs of the digital channel selector 510 each individually connect to a digital demodulator (demod) 520a-M. Each digital demod 520a-M connects to a transport demultiplexer (demux) 530a-M." McNeely, page 20, lines 9-22: "The digital channel selector 510 provides a set of selected channels to the digital demods 520a-M. The digital demods 520a-M contain digital signal processing for the demodulation, transmission equalization, and error correction of the selected channels according to the required transmission standard prescribed for the selected channel. In a preferred embodiment, digital demods 520a-M include processing necessary to demodulate and decode transport streams sent in either Motion Picture Entertainment Group standard MPEG 2 or Joint Video Team (JVT) format using either a Quaternary Phase Shift Keying (QPSK) modulation format or 8-PSK modulation format. The digital demods 520a-N also perform error correction using either Viterbi, Reed Solomon, and/or Low Density Parity Check (LDPC) error correction techniques. Further details regarding the individual detailed operation of the digital demods 520a-M are well known by those skilled in the art." McNeely, page 20, lines 23-28: "Each of the digital demods 520a-M produces a transport stream representing one or more individual program streams multiplexed with additional identification data. As described previously, a transport stream contains one or more program streams usually in multiplexed and packetized form. A program stream may represent an audio or video signal or may represent data such as a program guide."

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 1

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
		 Fig. 5 5/7 To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Claim 12

No.	US Pat. No. 9,210,362	WO 2006/119489 A2 ("McNeely")
12	The method of claim 11, comprising outputting, by said digital circuitry of said	McNeely expressly or inherently discloses this claim element, or renders this clam element obvious.

	wideband receiver system, said digital datastream via a serial interface.	*See, e.g.,*. McNeely, page 19, line 13 - page 20, line 3: "Turning now to FIG. 5, a block diagram 500 of a further embodiment of the present invention is shown. The diagram shows an implementation of the re-synthesizer 110 that includes digital signal processing and further includes program stream processing in order to increase the performance and available bandwidth for selected channels. In order to facilitate a further understanding of the invention, a re-synthesizer 110 will be described here using only a single L-band signal as an input. An input RF processing block 502 is connected to an A/D converter 504. The output of the A/D converter is connected to a digital channel selector 510. The outputs of the digital channel selector 510 each individually connect to a digital demodulator (demod) 52Oa-M. Each digital demod 52Oa-M connects to a transport demultiplexer (demux) 53Oa-M. The outputs of each transport demux 53Oa-M connect to a stream insert and extract block 540. The outputs of the stream insert and extract block connect to a set of transport remultiplexer (remux) blocks 56Oa-N. Each transport remux 56Oa-N connects to a digital modulator 57Oa-N. The outputs of the digital modulators 57Oa-N connect into a digital channel re-combiner 580. The output of the digital channel re-combiner 580 connects into a D/A converter 592. The output of (fie D/A converter 593 connects into an output RF processing block 594. A controller 550 also connects to all of the other blocks including the stream insert and extract block 540." McNeely, page 20, lines 4-22 : "The operation of blocks identified as input RF processing block 502, A/D converter 504, digital channel selector 510, digital channel re- combiner 580, D/A converter 592, and output RF processing block 594 are similar in operation to blocks having the same name described previously. Except as noted, these blocks will not be further described. The digital channel selector 510 provides a set of selected channels to the digital demods 52Oa-M. The digital demods 52Oa-M contain digital signal processing for the demodulation, transmission equalization, and error correction of the selected channels according to the required transmission standard prescribed for the selected channel. In a preferred embodiment, digital demods 52Oa-M include processing necessary to demodulate and decode transport streams sent in either Motion Picture Entertainment Group standard MPEG 2 or Joint Video Team (JVT) format using either a Quaternary Phase Shift Keying (QPSK) modulation format or 8-PSK modulation format. The digital demods 52Oa-N also perform error correction using either Viterbi, Reed Solomon, and/or Low Density Parity

		Check (LDPC) error correction techniques. Further details regarding the individual detailed operation of the digital demods 52Oa-M are well known by those skilled in the art." McNeely, page 20, line 23 - page 21, line 13: "Each of the digital demods 52Oa-M produces a transport stream representing one or more individual program streams multiplexed with additional identification data. As described previously, a transport stream contains one or more program streams usually in multiplexed and packetized form. A program stream may represent an audio or video signal or may represent data such as a program guide.- Each transport stream is provided to one of the transport demuxes 53Oa-M. The transport demuxes 53Oa-M process the transport streams by first recovering and separating the identification data for the transport stream. TFie transport demuxes 53Oa-N use the identification data or program identifiers (PIDs) to separate out the program stream data in the transport stream into packets for each of the individual program streams. The transport demuxes 53Oa-M assemble the packets into separate individual program streams. The output of the transport demuxes 530a- M may supply the individual program streams on separate signal lines as shown, or may alternately provide the program streams along with the PIDs over a communications bus. In addition, stream identifiers are provided. These stream identifiers may include the PIDs supplied originally or may include new identification information sent along with the program streams. The stream identifiers may be used in further processing including reassembling the program streams back into transport streams."

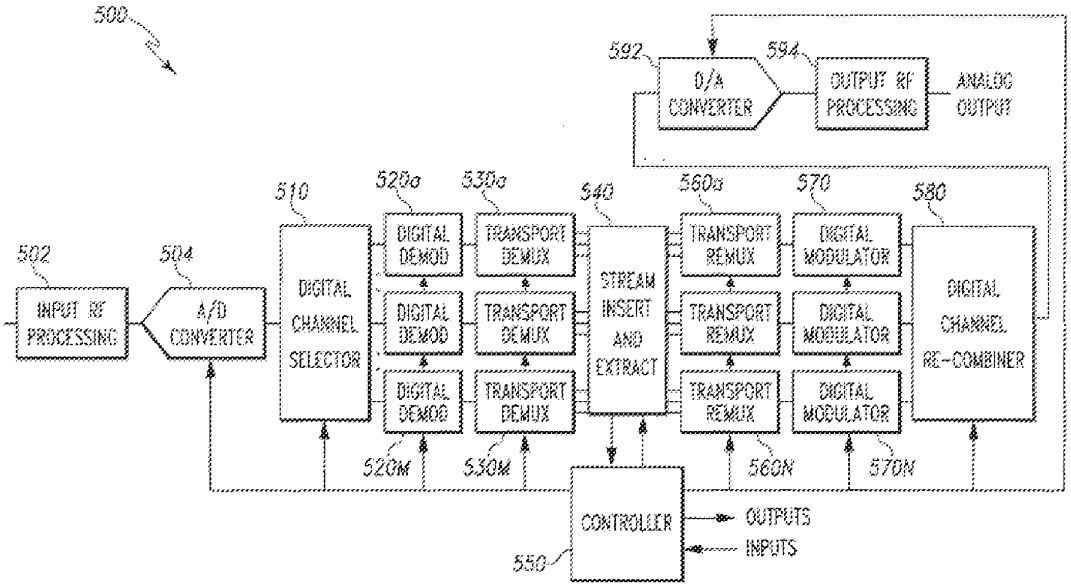


Fig. 5

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To the extent that Plaintiff contends McNeely does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of McNeely with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Exhibit D4: Invalidity of U.S. Patent No. 9,210,362 in view of US 6,704,372 B2 ("Zhang")

Based upon Plaintiff's Complaint, Amended Complaint, Infringement Contentions, apparent claim constructions, and application of the claims to the accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that concedes or acquiesces to any claim construction implied or suggested by Plaintiff's Complaint, Amended Complaint, or Infringement Contentions. These invalidity contentions are not asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

US 6,704,372 B2 ("Zhang") was filed on September 18, 2001, was published on March 20, 2003, and issued on March 9, 2004. Zhang is prior art under at least 35 U.S.C. §§ 102(a), 102(b), and 102(e). As described in the following claim chart, the asserted claims of U.S. Patent No. 9,210,362 (the "'362 Patent"), are invalid as anticipated by and/or obvious in view of US 6,704,372 B2, including without limitation as set forth below.

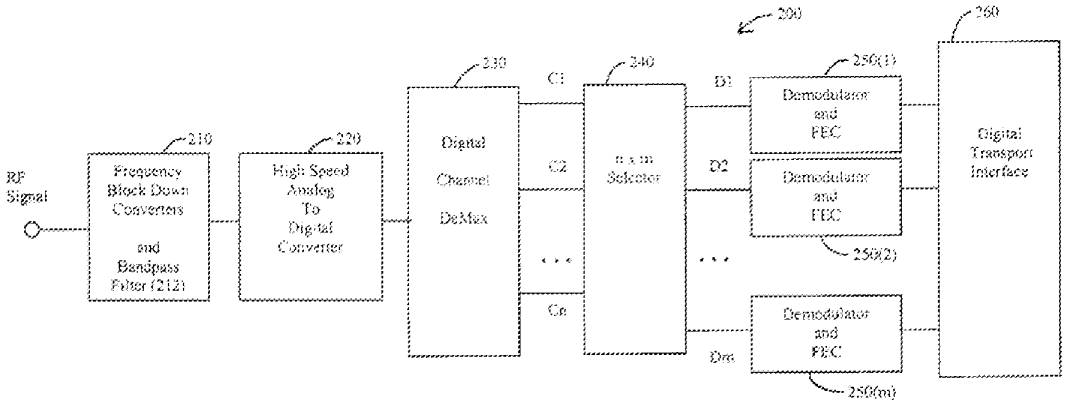
To the extent that Zhang is found not to anticipate one or more of the asserted claims of the '362 Patent, these claims are invalid as obvious in view of Zhang alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions Cover Pleading and accompanying charts, including without limitation as set forth below. Further, to the extent Defendants have not charted any presently unasserted claims of the '362 Patent is not to be construed as an admission that Zhang does not anticipate and/or render such claims obvious in combination with other prior art references. Defendants reserve the right to supplement these invalidity contentions accordingly should Plaintiff assert such claims.

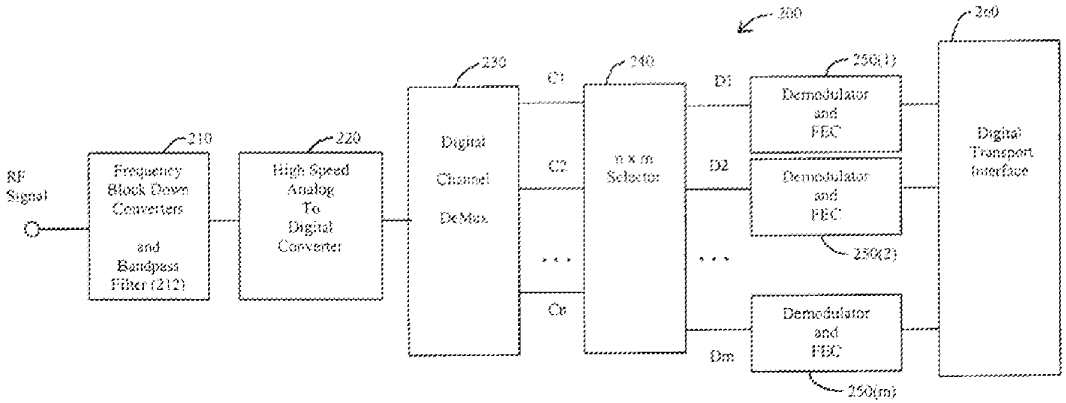
Page 561 of 4862

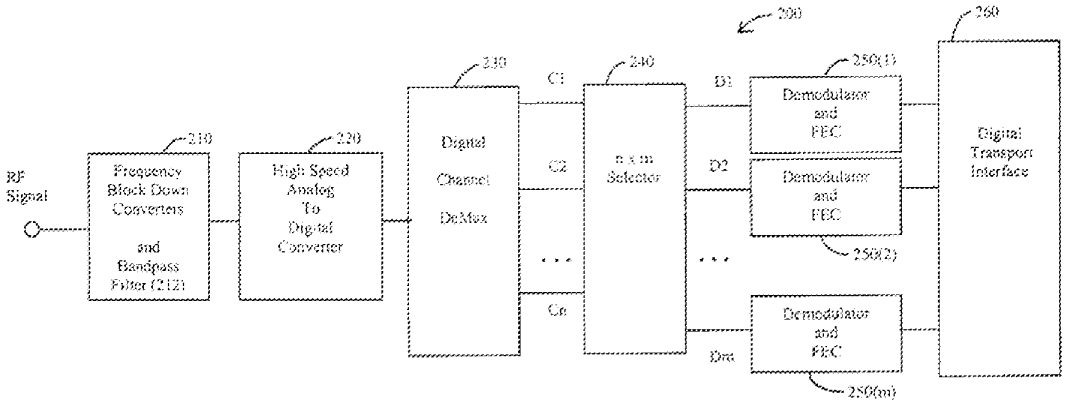
Claim 11

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
11[pre]	A method comprising:	To the extent the preamble is limiting, Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,* Zhang, Abstract: "A method and circuitry for implementing digital multi-channel demodulation circuits. More particularly, embodiments of the present invention provide a digital multi-channel demodulator circuit. The demodulator includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to

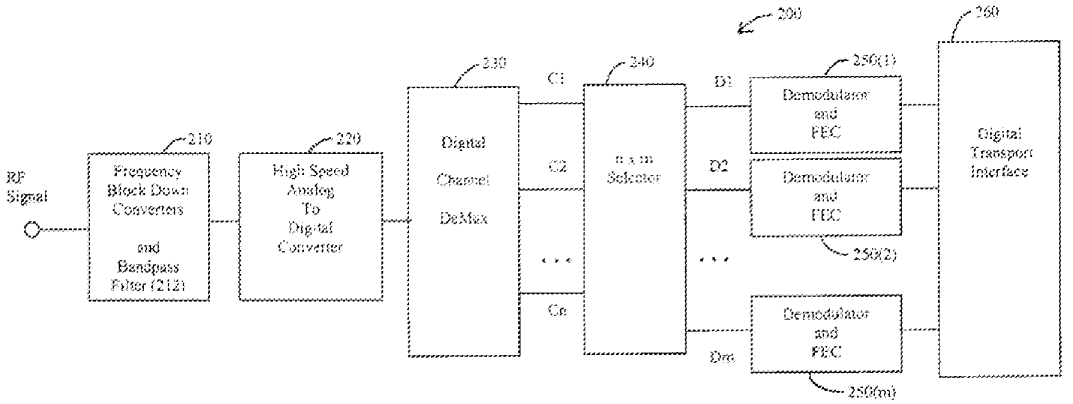
No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		a lower frequency band. An ADC receives the multi-channel analog RF signal from the frequency-block down-converter and converts the multi-channel analog RF signal to a multi-channel digital RF signal. A digital channel demultiplexer receives the multi-channel digital RF signal from the ADC and demultiplexes the multi-channel digital RF signal into separate digital RF channels." To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a]	in a wideband receiver system:	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Zhang, 1:20-22: "The present invention relates generally to broadband communications, and more particularly to a method and circuitry for implementing demodulator circuits." Zhang, 2:3-7: "A digital multi-channel demodulator circuit according to an embodiment of the invention includes a frequency-block down-converter that receives a multi-channel analog RF signal and shifts the multi-channel analog RF signal to a lower frequency band." Zhang, 3:8-13: "FIG. 2 is a simplified high-level block diagram of an exemplary multi-channel demodulator 200 according to an embodiment of the present invention. A frequency-block down-converter 210 receives one or more multi-channel analog RF signals which can be sourced by a variety of systems such as satellite systems, terrestrial TV systems, cable systems, etc."

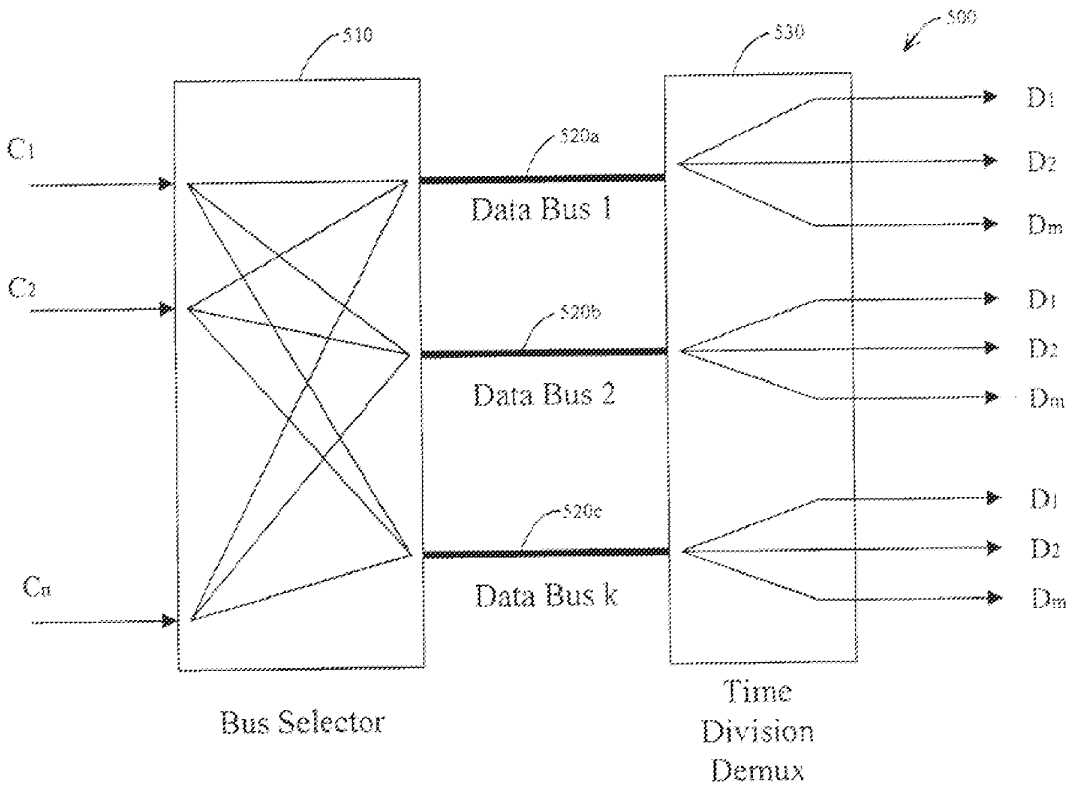
No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		 Fig. 2 To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a1]	downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels;	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Zhang, 1:37-41 : "A multi-channel RF input signal typically includes a plurality of RF channels, each characterized by a different carrier frequency and being modulated in accordance with desired information to be carried on that channel." Zhang, 3:8-13: "FIG. 2 is a simplified high-level block diagram of an exemplary multi-channel demodulator 200 according to an embodiment of the present invention. A frequency-block down-converter 210 receives one or more multi-channel analog RF signals which can be

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		sourced by a variety of systems such as satellite systems, terrestrial TV systems, cable systems, etc." Zhang, 3:20-27: "A given RF channel carries one or more "content" channels, which are data streams that are superimposed on that channel's carrier frequency and intended to be accessed or used by subscribers. As used here, one RF channel can carry one or more content channels. Accordingly, one RF channel can provide a variety of data streams, some of which are selected by a subscriber, e.g., audio, video, etc." Zhang, 3:30-38: "Down converter 210 shifts the multi-channel analog RF signal to a lower frequency band. The frequencies are simply downshifted, i.e., the frequency band of each RF channel and the guard bands remain the same relative to each other, but all are translated down by the same frequency. More specifically, the multi-channel analog RF signal is multiplied by a reference signal to a lower frequency band. Signal components outside the lower frequency band are then filtered out."  Fig. 2 To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary

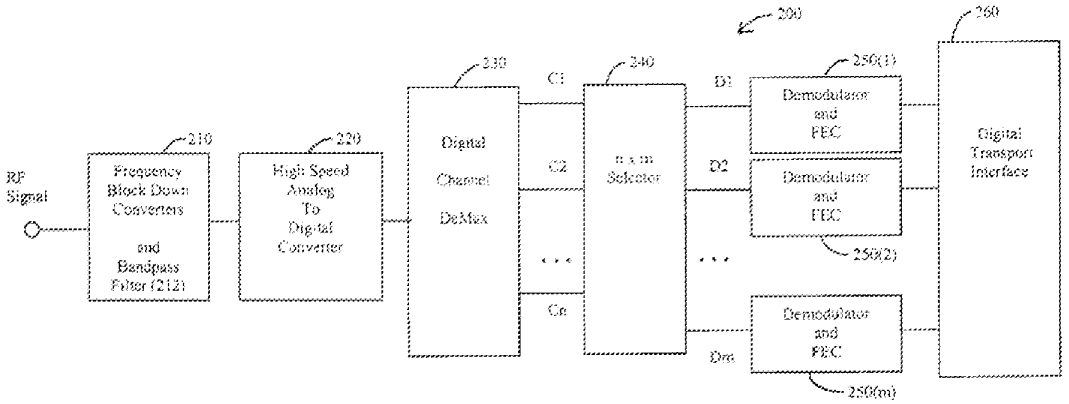
No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a2]	digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels;	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Zhang, 3:55-59: "An ADC 220 then converts the down-converted multi-channel analog RF signal to a multi-channel digital RF signal. In this specific embodiment, ADC 220 is a high-speed ADC so that an entire signal band with n channels can be converted." Zhang, 4:44-51: "In operation, digital tuner 300 receives the RF channels from an ADC, such as ADC 220 of FIG. 2, and then separates the RF channels C1 to Cn, which are in the digital domain. The same multi-channel RF signal from the ADC enters each multiplier, each RF channel having a unique frequency. Because all chains of FIG. 3 operate in a similar same way, only one chain of digital tuner 300 will be described for ease of illustration."  Fig. 2

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a3]	selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Zhang, 3:60-4:4: "A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C1 to Cn. The specific implementation of channel demultiplexer 230 will depend on the specific application and requirements. Alternative channel demultiplexer embodiments are described in more detail below (FIGS. 2 and 3). Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels C1 to Cn and then selects one or more of the RF channels D1 to Dm from one or more of the digital RF channels C1 to Cn. RF channels C1 to Cn contain content channels that are selected or used by a subscriber." Zhang, 5:45-55: "FIG. 5 is a simplified high-level schematic diagram of an n×m digital selector 500, which in some embodiments of the present invention, can be used to implement digital selector 240 of FIG. 2. Digital selector 500 includes a bus selector 510, one or more multiple data buses 520, and a time division demultiplexer 530. In operation, digital selector 500 digitally selects one or more RF channels D1 to Dm from the digital RF channels C1 to Cn and then sends them to appropriate demodulators or output ports (not shown) through different data buses (not shown)."

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		 Fig. 2

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		 Fig. 5 To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a4]	outputting, by said digital circuitry of said wideband receiver system, said selected	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious.

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
	plurality of television channels to a demodulator as a digital datastream.	*See, e.g.,.* Zhang, 3:66-4:4: "Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels C1 to Cn and then selects one or more of the RF channels D1 to Dm from one or more of the digital RF channels C1 to Cn. RF channels C1 to Cn contain content channels that are selected or used by a subscriber." Zhang, 4:13-32: "The m selected RF channels are then fed into respective demodulators 250(1), 250(2), . . . 250(m). The architecture of demodulator 200 enables it to handle multi-channel satellite, terrestrial TV (NTSC, ATSC, DVB-T, etc), and cable downstream signals. In some embodiments demodulators 250(1 . . . m) are shared demodulators because they share resources. Many functional blocks can be shared between different demodulators. Such functional blocks, for example, can include numeric controlled oscillators (NCOs), timing error detection circuitry, carrier recover circuitry, etc. Because of the resource sharing between such demodulators, significant power saving is achieved. Hence, with such embodiments of the present invention, more RF channels can be demodulated in a single chip. In this specific embodiment, demodulators 250(1 . . . m) demodulate only the RF channels that are selected by digital selector 240. In other embodiments, other content channels can be demodulated and which specific content channels that are demodulated will depend on the specific application. After being demodulated, the selected RF channels D1 to Dm then feed into a digital transport interface 260."

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
		 Fig. 2 To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Claim 12

No.	US Pat. No. 9,210,362	US 6,704,372 B2 ("Zhang")
12	The method of claim 11, comprising outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface.	Zhang expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Zhang, 1:50-59: "The function of each tuner 110 is to select an RF channel falling within a specific frequency band. There is one tuner for each RF channel. The input RF signal for a tuner contains many or all RF channels. Each tuner then converts the frequency of its selected RF channel to a lower fixed frequency pass band for cable systems, or to baseband for satellite systems. Each ADC 120 then digitizes the selected RF signal. Then each digital

		demodulator 130 performs signal demodulation and outputs recovered digital bits with error indication signals." Zhang, 3:60-4:11: "A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C1 to Cn. The specific implementation of channel demultiplexer 230 will depend on the specific application and requirements. Alternative channel demultiplexer embodiments are described in more detail below (FIGS. 2 and 3). Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels C1 to Cn and then selects one or more of the RF channels D1 to Dm from one or more of the digital RF channels C1 to Cn. RF channels C1 to Cn contain content channels that are selected or used by a subscriber. Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners. This is because only the selected channels are later demodulated unlike the systems using RF tuners which demodulate all of the RF channels. Embodiments of the present invention are not only faster but they dissipate less heat because fewer resources are required when demodulating only the selected RF channels." Zhang, 4:12-32: "The m selected RF channels are then fed into respective demodulators 250(1), 250(2), . . . 250(m). The architecture of demodulator 200 enables it to handle multi-channel satellite, terrestrial TV (NTSC, ATSC, DVB-T, etc), and cable downstream signals. In some embodiments demodulators 250(1 . . . m) are shared demodulators because they share resources. Many functional blocks can be shared between different demodulators. Such functional blocks, for example, can include numeric controlled oscillators (NCOs), timing error detection circuitry, carrier recover circuitry, etc. Because of the resource sharing between such demodulators, significant power saving is achieved. Hence, with such embodiments of the present invention, more RF channels can be demodulated in a single chip. In this specific embodiment, demodulators 250(1 . . . m) demodulate only the RF channels that are selected by digital selector 240. In other embodiments, other content channels can be demodulated and which specific content channels that are demodulated will depend on the specific application. After being demodulated, the selected RF channels D1 to Dm then feed into a digital transport interface 260." Zhang, 5:45-61:

		"FIG. 5 is a simplified high-level schematic diagram of an n×m digital selector 500, which in some embodiments of the present invention, can be used to implement digital selector 240 of FIG. 2. Digital selector 500 includes a bus selector 510, one or more multiple data buses 520, and a time division demultiplexer 530. In operation, digital selector 500 digitally selects one or more RF channels D1 to Dm from the digital RF channels C1 to Cn and then sends them to appropriate demodulators or output ports (not shown) through different data buses (not shown). Because a bus clock is much faster than the channel-sampling rate, each bus can be used by multiple RF channels with the use of time division multiplexing which occurs before the selected RF channels enter the data buses. Hence, each data bus provides data to multiple demodulators and each output RF signal from a channel demultiplexer (not shown) can be selected to use any data bus." Zhang, 6:18-33: "ADCs 620 a and 620 b convert the multi-channel analog RF signals to multi-channel digital RF signals. A demultiplexer 630 demultiplexes the multi-channel digital RF signal into separate digital RF channels C1 to Cn. A single multi-channel RF signal can have multiple separate RF signals, e.g., 35 RF channels C1 to C35 per multi-channel RF signal. The exact number will depend on the specific application. A digital selector 640 digitally selects one or more RF channels D1 to Dm from the RF channels C1 to Cn. A single separate RF channel can have multiple separate content signals, e.g., 18 content channels per RF channel. The exact number will depend on the specific application. For example, in FIG. 6, there are 35 separate RF channels C1 to C35. Of those RF channels, 20 RF channels D1 to D20 are selected. Those 20 selected RF channels are sent to a set of demodulators 650(1 . . . 20) for demodulation."

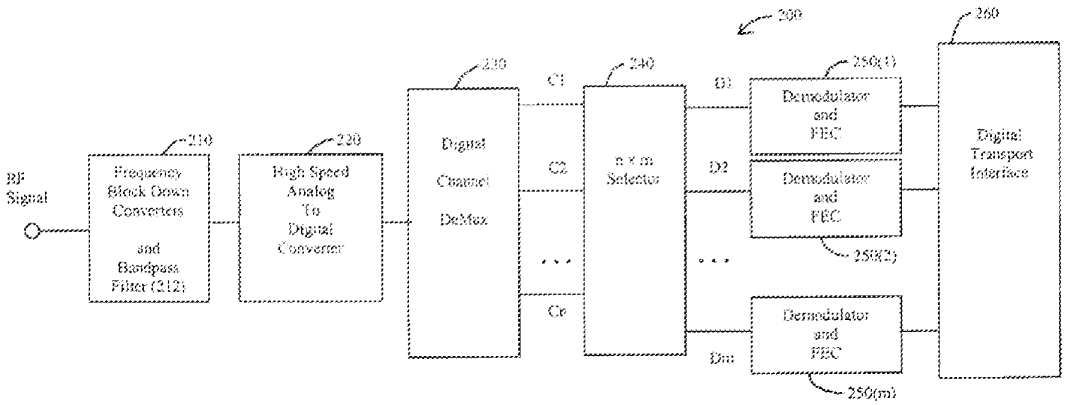

200
260
210
240
250(1)
RF Signal
Frequency Block Down Converters and Bandpass Filter (212)
220
High Speed Analog To Digital Converter
Digital Channel DeMux
C1
C2
Cn
n X m Selector
D1
D2
Dm
Demodulator and FEC
Demodulator and FEC
Demodulator and FEC
250(2)
250(m)
Digital Transport Interface

Fig. 2

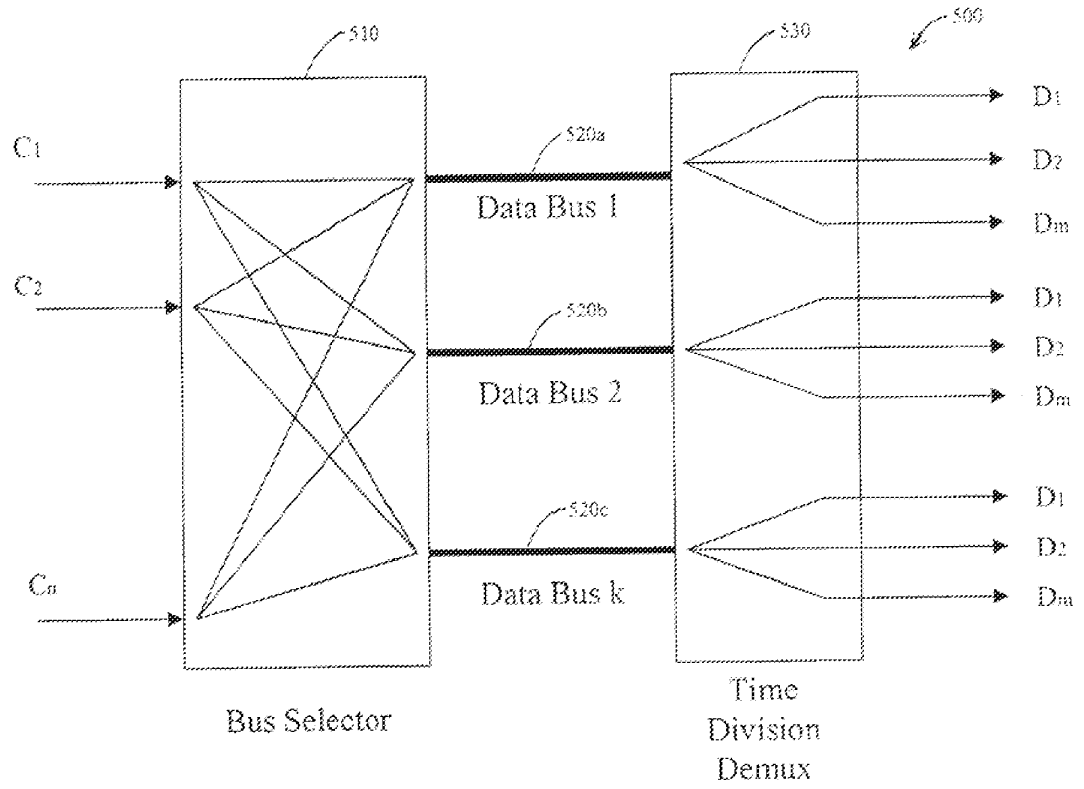

500
510
530
C1
C2
Cn
520a
Data Bus 1
520b
Data Bus 2
520c
Data Bus k
D1
D2
Dm
D1
D2
Dm
D1
D2
Dm
Bus Selector
Time
Division
Demux

Fig. 5

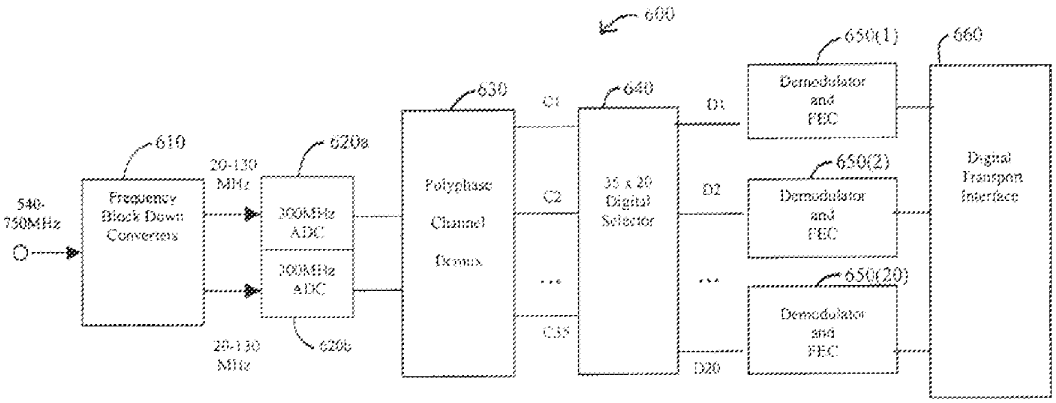


Fig. 6

To the extent that Plaintiff contends Zhang does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Zhang with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Exhibit D5: Invalidity of U.S. Patent No. 9,210,362 in view of WO 2007/145637 A1 ("Pugel")

Based upon Plaintiff's Complaint, Amended Complaint, Infringement Contentions, apparent claim constructions, and application of the claims to the accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that concedes or acquiesces to any claim construction implied or suggested by Plaintiff's Complaint, Amended Complaint, or Infringement Contentions. These invalidity contentions are not asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

WO 2007/145637 A1 ("Pugel") was filed as a PCT application on June 16, 2006 and was published in the English language on December 21, 2007. Pugel is prior art under at least 35 U.S.C. §§ 102(a) and 102(b). As described in the following claim chart, the asserted claims of U.S. Patent No. 9,210,362 (the "'362 Patent"), are invalid as anticipated by and/or obvious in view of WO 2007/145637 A1, including without limitation as set forth below.

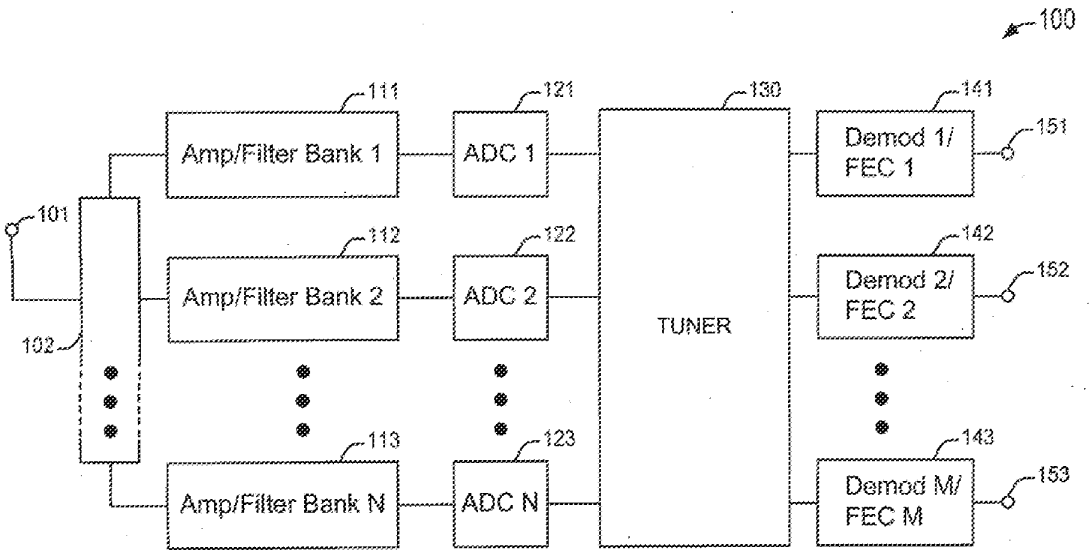
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To the extent that Pugel is found not to anticipate one or more of the asserted claims of the '362 Patent, these claims are invalid as obvious in view of Pugel alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions Cover Pleading and accompanying charts, including without limitation as set forth below. Further, to the extent Defendants have not charted any presently unasserted claims of the '362 Patent is not to be construed as an admission that Pugel does not anticipate and/or render such claims obvious in combination with other prior art references. Defendants reserve the right to supplement these invalidity contentions accordingly should Plaintiff assert such claims.

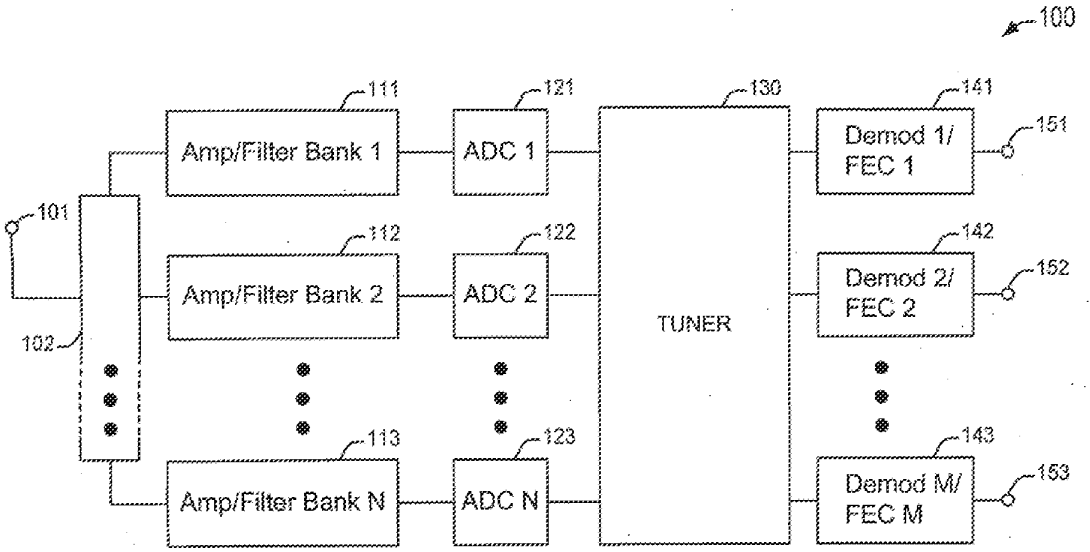
Claim 11

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
11[pre]	A method comprising:	To the extent the preamble is limiting, Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,* Pugel, ¶ [0009]: "The present invention is directed to a method and apparatus for simultaneous reception of a plurality of digital television channels."

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		Pugel, ¶ [0011]: "The method of the present invention includes receiving at least one multichannel analog RF input signal; separating the multichannel analog RF input signal into at least two analog signals including a first analog signal including a first band of frequencies and a second analog signal including a second band of frequencies; converting the at least two analog signals into at least two respective digital signals, including converting the first analog signal into a first digital signal and converting the second analog signal into a second digital signal; and demultiplexing the at least two digital signals to recover the plurality of digital RF channels." To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a]	in a wideband receiver system:	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Pugel, ¶ [0008]: "Given consumer demand for increased flexibility and convenience, there is a need for a digital television receiver capable of simultaneously receiving a plurality of channels, designed for delivery of a variety of digital content, and suitable for use with conventional cable television delivery systems." Pugel, ¶ [0022]: "An exemplary embodiment of the invention will now be described with reference to FIG. 1. Although the invention will be described using the environment of reception of cable television signals, it should be apparent that the invention may be used in other types of radio-frequency communications systems as well, including reception of digital television channels via satellite and terrestrial television fransmissiδn"systems. In contrast to the scheme described above, exemplary embodiments of the present invention provide

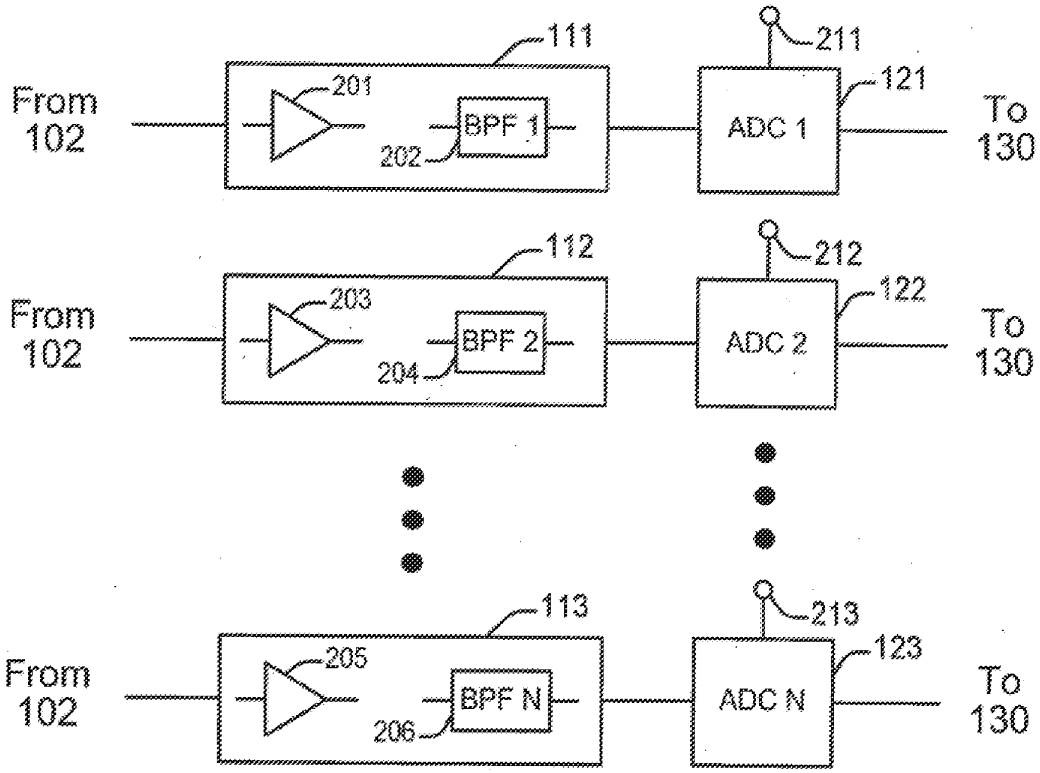
No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		substantially simultaneous recovery of a plurality of digital RF channels within a single multichannel receiver circuit, thereby reducing cost and increasing system flexibility."  FIG. 1 To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.
11[a1]	downconverting, by a mixer module of said wideband receiver system, a plurality of frequencies that comprises a plurality of	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*.

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
	desired television channels and a plurality of undesired television channels;	Pugel, ¶ [0009]: "The present invention is directed to a method and apparatus for simultaneous reception of a plurality of digital television channels." Pugel, ¶ [0011]: "The method of the present invention includes receiving at least one multichannel analog RF input signal; separating the multichannel analog RF input signal into at least two analog signals including a first analog signal including a first band of frequencies and a second analog signal including a second band of frequencies; converting the at least two analog signals into at least two respective digital signals, including converting the first analog signal into a first digital signal and converting the second analog signal into a second digital signal; and demultiplexing the at least two digital signals to recover the plurality of digital RF channels." Pugel, ¶ [0022]: "An exemplary embodiment of the invention will now be described with reference to FIG. 1. Although the invention will be described using the environment of reception of cable television signals, it should be apparent that the invention may be used in other types of radio-frequency communications systems as well, including reception of digital television channels via satellite and terrestrial television fransmissiδn"systems. In contrast to the scheme described above, exemplary embodiments of the present invention provide substantially simultaneous recovery of a plurality of digital RF channels within a single multichannel receiver circuit, thereby reducing cost and increasing system flexibility." Pugel, ¶ [0038]: "The digital tuner 130 may include a channel selector 315 to permit selection of one or more particular digital channels desired to be recovered. For ▪ example, a selected set of digital cable television channels may be communicated to the digital tuner 130 via the channel selector 315 corresponding to a plurality of pay- per-view selections desired by members of a household; the digital tuner 130 may demultiplex only the digital channel signals corresponding to those digital cable television channels. Alternatively, the digital tuner 130 may be configured to demultiplex and recover all of the available digital channel signals."

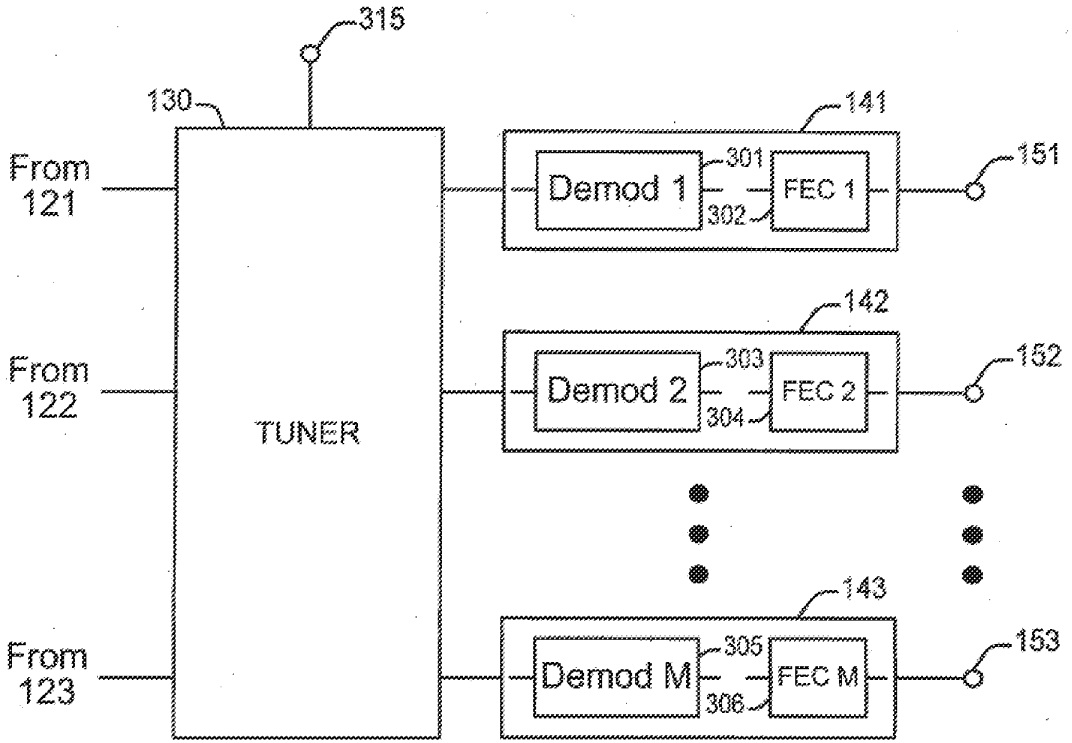
No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		Pugel, cl. 18: "18. A method (400) processing signals comprising the steps of: (a) separating an input signal into a first analog signal and a second analog signal; (b) digitizing said first analog signal to generate a first digital signal; (c) digitizing said second analog signal to generate a second digital signal; (d) downconverting said first digital signal and said second signal; and (e) extracting desired television program information from said downconverted first digital signal and said second digital signal."  FIG. 1 To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
11[a2]	digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies comprising said plurality of desired television channels and said plurality of undesired television channels;	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Pugel, Abstract: "A method and apparatus is presented for simultaneous reception of a plurality of digital RF channels. Specifically, N amplifier-filter circuits (111, 112, 113) are configured to receive and separate a multichannel analog RF input signal into N analog signals, each including a different frequency band. N analog-to-digital converters (121, 122, 123) are provided, each respectively coupled to one of the N amplifier-filter circuits (111, 112, 113) and configured to receive an analog signal and generate a respective digital signal." Pugel, ¶ [0023]: "FIG. 1 shows a simplified block diagram representation of a multichannel receiver circuit generally designated 100 in accordance with an aspect of the present invention. The multichannel receiver circuit 100 includes a plurality of amplifier-filter banks or circuits 111 , 112, 113, a plurality of analog-to-digital converters 121 , 122, 123, a digital tuner 130, and a plurality of demodulator circuits 141 , 142, 143. It should be apparent from FIG. 1 that, although three instances of each plurality are shown, the present invention is not so limited and any number of amplifier-filter circuits, analog-to-digital converters, and/or demodulator circuits may be used in accordance with the present invention. In addition, the number (1 . . . M) of demodulator circuits provided is not necessarily related to the number (1 . . . N) of amplifier-filter circuits and/or analog-to-digital converters provided, and accordingly the present invention should not be so limited." Pugel, ¶ [0024]: "In operation, according to one embodiment, a multichannel analog RF input signal received at input coupler 101 is split into a plurality of substantially identical signals at splitter 102. Splitter 102 may include one or more amplifiers, filters, or other components (not shown) which reduce or overcome insertion loss or other adverse effects of the split, as should be apparent to one of ordinary skill in the art. The plurality of amplifier-filter circuits 111 , 112, 113 then segregates the multichannel analog input signal into a plurality

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		of separate analog signals of differing frequency ranges, or "bands." Each separate analog signal is then converted from analog to digital form in an analog-to-digital converter 121 , 122, 123." Pugel, ¶ [0044]: "In step 403, the first analog signal is converted into a first digital signal using a first analog-to-digital converter. In step 404, the second analog signal is converted into a second digital signal using a second analog-to-digital converter independently of the conversion performed in the first analog-to-digital converter. The first and second analog-to-digital converters may convert different frequency bands from analog to digital form, similar to analog-to-digital converters 121 , 122, 123 described above with reference to FIGS. 1 and 2, and each should have a sampling frequency of at least twice the bandwidth of the respective frequency band in accordance with the Shannon-Nyquist sampling theorem. The first and second analog-to-digital converters should perform such conversions with resolution and linearity characteristics sufficient for satisfactorily processing digital television signals and associated signals intended for end users in a conventional cable television broadcast system."

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		 FIG. 2 To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
11[a3]	selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Pugel, Abstract: "A digital tuner (130) is coupled to receive and demultiplex the N digital signals generated by the N analog-to-digital converters (121, 122, 123), thereby recovering M digital RF channels. M demodulation circuits (141, 142, 143) are provided for performing demodulation and forward-error-correction of the M digital RF channels (see FIG. 1)." Pugel, ¶ [0027]: "The converted digital signals are coupled to the digital tuner 130, which demultiplexes the converted digital signals to generate a plurality of digital channel signals. Each digital channel signal is then coupled to a separate demodulator 141 , 142, 143, which performs demodulation and forward-error-correction (FEC) operations appropriate for the content of that digital channel. Finally, in one embodiment, the resulting digital channel signals are each coupled to a separate output coupler 151 , 152, 153 for further processing including for example MPEG transport processing." Pugel, ¶ [0038]: "The digital tuner 130 may include a channel selector 315 to permit selection of one or more particular digital channels desired to be recovered. For ▪ example, a selected set of digital cable television channels may be communicated to the digital tuner 130 via the channel selector 315 corresponding to a plurality of pay- per-view selections desired by members of a household; the digital tuner 130 may demultiplex only the digital channel signals corresponding to those digital cable television channels. Alternatively, the digital tuner 130 may be configured to demultiplex and recover all of the available digital channel signals."

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		 FIG. 3 To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
11[a4]	outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream.	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,*. Pugel, ¶ [0010]: "In an alternate embodiment, in addition to the above a plurality of demodulator circuits is coupled to the digital tuner, the plurality of demodulator circuits including at least a first demodulator circuit configured to receive and demodulate a first channel of the plurality of digital RF channels and a second demodulator circuit being configured to receive and demodulate a second channel of the plurality of digital RF channels. The plurality of demodulator circuits includes circuitry configured for forward error correction." Pugel, ¶ [0012]: "In an alternative embodiment, in addition to the above steps the method includes demodulating the plurality of digital RF channels, including at least demodulating a first digital RF channel and demodulating a second digital RF channel; and forward-error-correcting the plurality of digital RF channels, including at least performing a first forward-error-correction of the first digital RF channel and performing a second forward-error-correction of the second digital RF channel." Pugel, ¶ [0027]: "The converted digital signals are coupled to the digital tuner 130, which demultiplexes the converted digital signals to generate a plurality of digital channel signals. Each digital channel signal is then coupled to a separate demodulator 141 , 142, 143, which performs demodulation and forward-error-correction (FEC) operations appropriate for the content of that digital channel." Pugel, ¶ [0040]: "Each of the demodulation circuits 141 , 142, 143 may include demodulators 301 , 303, 305 configured to perform a particular demodulation function or set of functions corresponding to the type of digital content expected to be found within a corresponding digital channel signal. For example, a first demodulator 301 may be configured to perform quadrature amplitude modulation (QAM) demodulation of digital cable television signals; a second demodulator 303 may be configured to perform quadrature phase shift keying (QPSK)

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		demodulation of digital audio signals; and a third demodulator 305 may be configured to perform vestigial sideband (VSB) demodulation of high-definition television (HDTV) signals. Of course, it should be appreciated that more than one of the plurality of demodulation circuits 141 , 142, 143 may be configured to perform similar or identical functions or operations on separate digital channel signals substantially simultaneously." Pugel, ¶ [0045]: "In step 405, the first digital signal (converted in the first analog-to-digital converter) and the second digital signal (converted in the second analog-to-digital converter) are demultiplexed to generate a plurality of digital RF channel signals including at least first and second digital RF channel signals. Each of the plurality of digital RF channel signals is typically characterized by a different carrier frequency and a bandwidth or range of frequencies assigned to a particular application or type of content to be carried on that channel. It should be apparent that each digital RF channel signal may in turn carry or provide a plurality of data streams, e.g., audio, video, program information, or interactive content." Pugel, ¶ [0046]: "In step 406, the first digital RF channel signal is demodulated and forward- error-corrected. In step 407, the second digital RF channel signal is demodulated and forward-error-corrected."

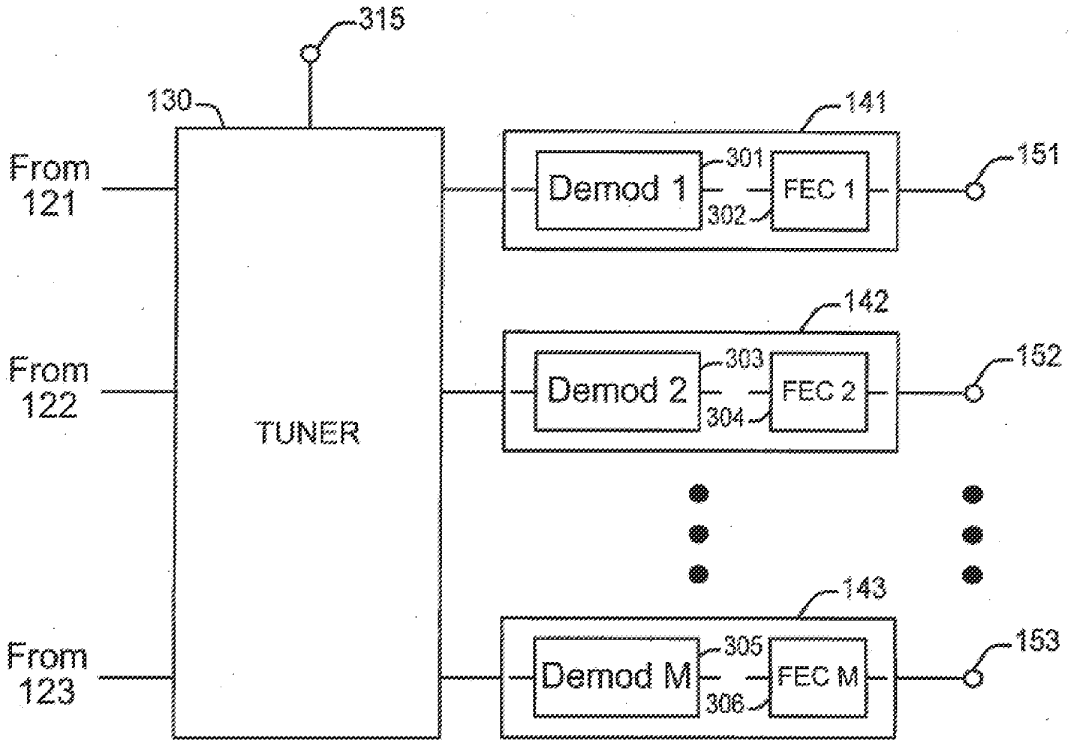
No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		

FIG. 3

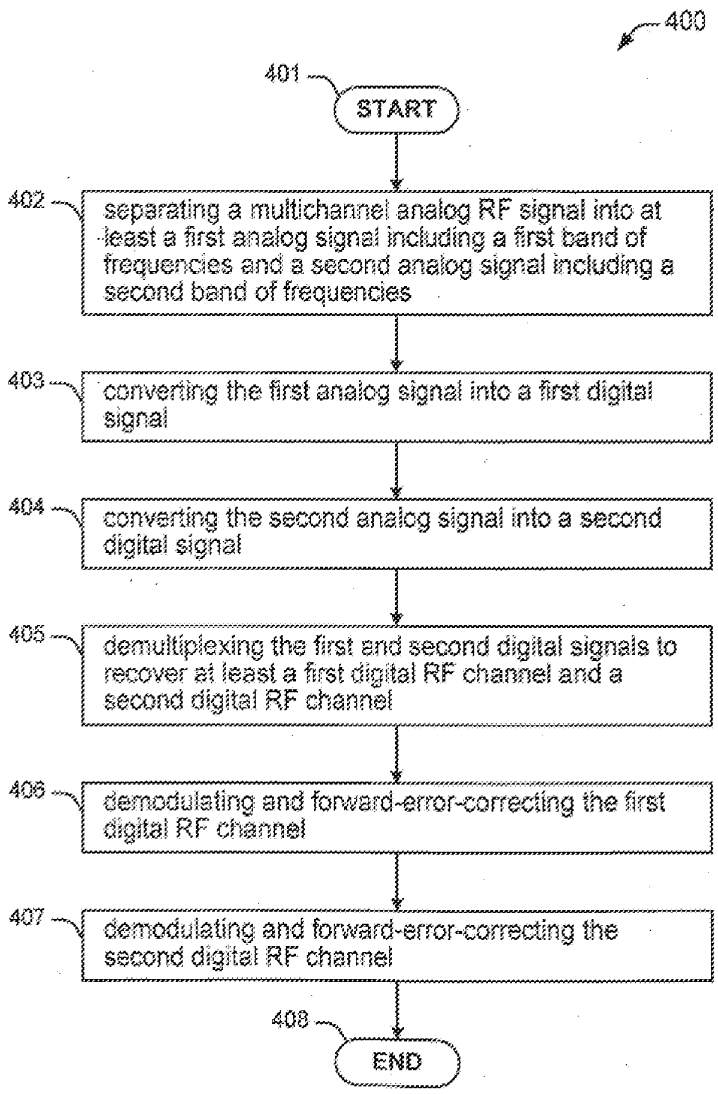

400
401
START
402
separating a multichannel analog RF signal into at least a first analog signal including a first band of frequencies and a second analog signal including a second band of frequencies
403
converting the first analog signal into a first digital signal
404
converting the second analog signal into a second digital signal
405
demultiplexing the first and second digital signals to recover at least a first digital RF channel and a second digital RF channel
406
demodulating and forward-error-correcting the first digital RF channel
407
demodulating and forward-error-correcting the second digital RF channel
408
END

FIG. 4

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
		To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

Claim 12

No.	US Pat. No. 9,210,362	WO 2007/145637 A1 ("Pugel")
12	The method of claim 11, comprising outputting, by said digital circuitry of said wideband receiver system, said digital datastream via a serial interface.	Pugel expressly or inherently discloses this claim element, or renders this clam element obvious. *See, e.g.,.* Pugel, ¶ [0010]: "In an alternate embodiment, in addition to the above a plurality of demodulator circuits is coupled to the digital tuner, the plurality of demodulator circuits including at least a first demodulator circuit configured to receive and demodulate a first channel of the plurality of digital RF channels and a second demodulator circuit being configured to receive and demodulate a second channel of the plurality of digital RF channels. The plurality of demodulator circuits includes circuitry configured for forward error correction" Pugel, ¶ [0021]: "In addition, no particular order is required for the method steps described below, with the exception of those logically requiring the results of prior steps, for example converting of the first and second analog signals into first and second digital signals logically requires the prior generation of first and second analog signals. Otherwise, enumerated steps are provided below in an exemplary order which may be altered. For instance, the several demodulation steps may be rearranged or performed simultaneously." Pugel, ¶ [0023]:

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		"FIG. 1 shows a simplified block diagram representation of a multichannel receiver circuit generally designated 100 in accordance with an aspect of the present invention. The multichannel receiver circuit 100 includes a plurality of amplifier-filter banks or circuits 111 , 112, 113, a plurality of analog-to-digital converters 121 , 122, 123, a digital tuner 130, and a plurality of demodulator circuits 141 , 142, 143. It should be apparent from FIG. 1 that, although three instances of each plurality are shown, the present invention is not so limited and any number of amplifier-filter circuits, analog-to-digital converters, and/or demodulator circuits may be used in accordance with the present invention. In addition, the number (1 . . . M) of demodulator circuits provided is not necessarily related to the number (1 . . . N) of amplifier-filter circuits and/or analog-to-digital converters provided, and accordingly the present invention should not be so limited." Pugel, ¶ [0027]: "The converted digital signals are coupled to the digital tuner 130, which demultiplexes the converted digital signals to generate a plurality of digital channel signals. Each digital channel signal is then coupled to a separate demodulator 141 , 142, 143, which performs demodulation and forward-error-correction (FEC) operations appropriate for the content of that digital channel. Finally, in one embodiment, the resulting digital channel signals are each coupled to a separate output coupler 151 , 152, 153 for further processing including for example MPEG transport processing."

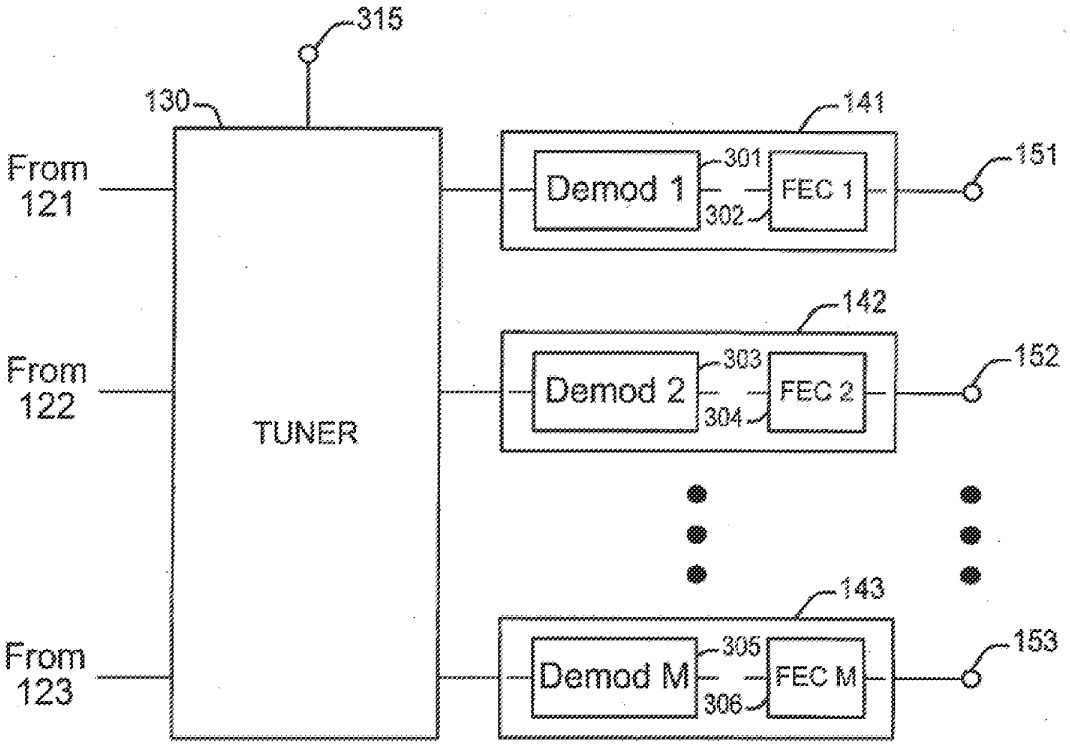

315
130
141
From 121
Demod 1
301
FEC 1
302
151
142
From 122
TUNER
Demod 2
303
FEC 2
304
152
143
From 123
Demod M
305
FEC M
306
153

FIG. 3

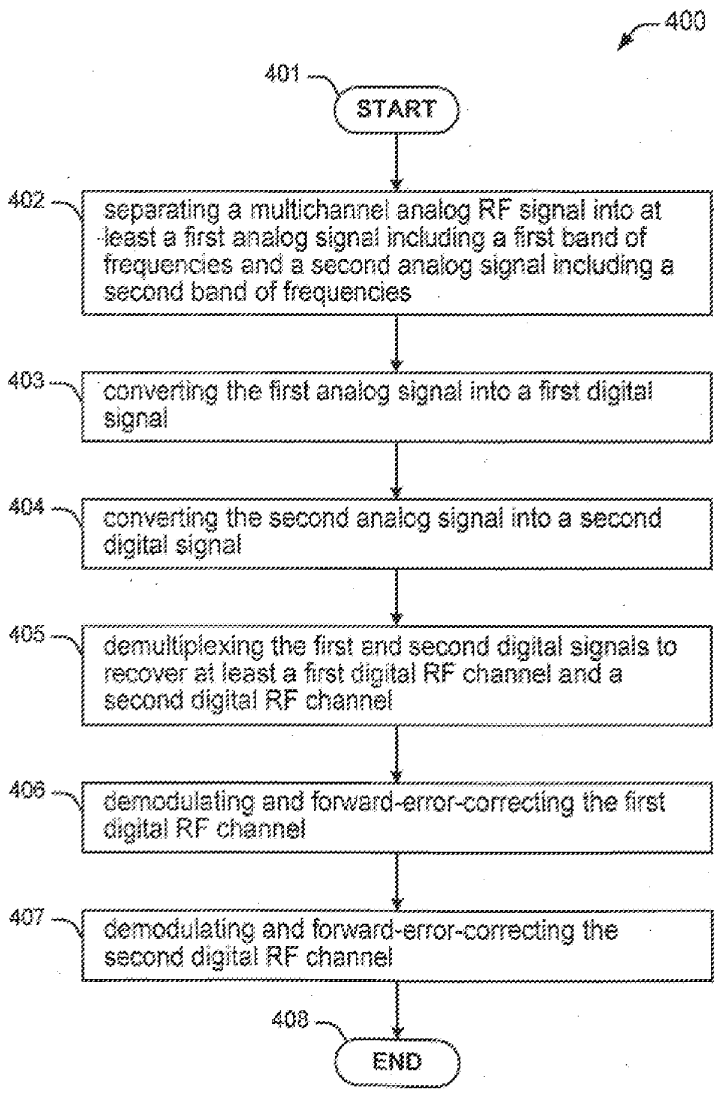

400
401
START
402
separating a multichannel analog RF signal into at least a first analog signal including a first band of frequencies and a second analog signal including a second band of frequencies
403
converting the first analog signal into a first digital signal
404
converting the second analog signal into a second digital signal
405
demultiplexing the first and second digital signals to recover at least a first digital RF channel and a second digital RF channel
406
demodulating and forward-error-correcting the first digital RF channel
407
demodulating and forward-error-correcting the second digital RF channel
408
END

FIG. 4

		To the extent that Plaintiff contends Pugel does not explicitly or inherently disclose this claim element, or demonstrate that this claim element was known to persons of ordinary skill in the art, this claim element is disclosed or known in light of a combination of Pugel with the knowledge of one of ordinary skill in the art or one or more other references. *See, e.g.*, Ex. D1-D5; Defendants' Invalidity Contentions § VI.A.2.

INVALIDITY CLAIM CHART[1]
Invalidity of U.S. Patent No. 7,130,576 in view of Ardemagni

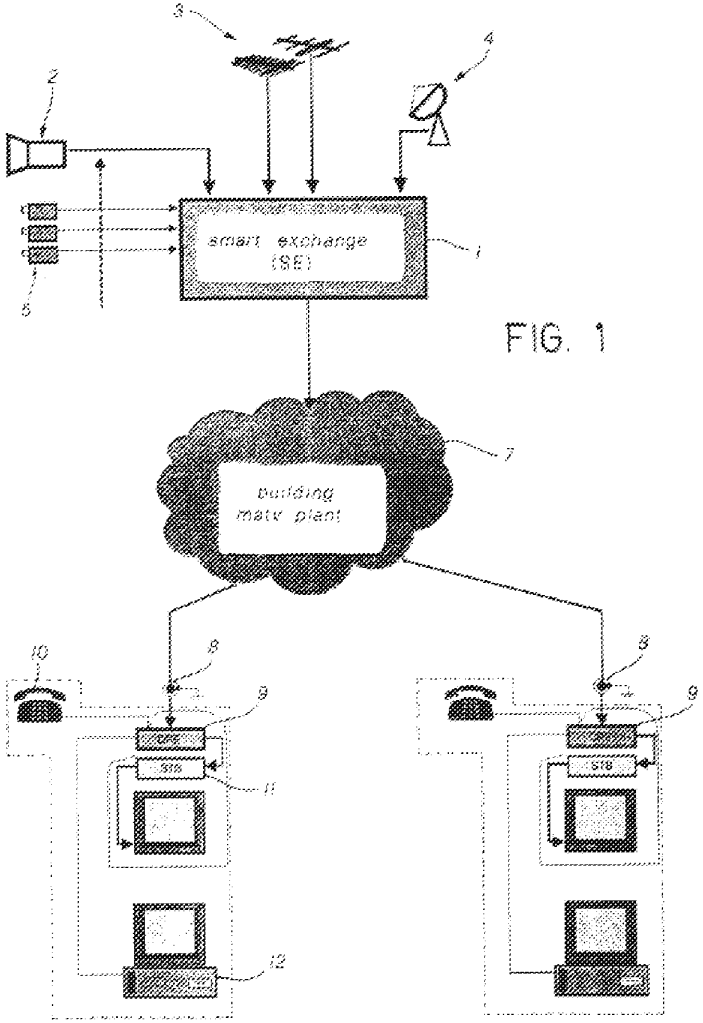
WO 00/03542 ("Ardemagni") was filed on June 18, 1999 and published on January 20, 2000. Ardemagni therefore qualifies as prior art to the '576 patent under, at least, (pre-AIA) 35 U.S.C. § 102(a) and/or (b). For the reasons listed below, Ardemagni invalidates the asserted claims of the '576 patent under 35 U.S.C. §§ 102 or 103 alone, in view of the knowledge of one of skill in the art, in Appendix A, or in combination with various prior art references identified in the chart, as discussed below, or with one or more references identified in Defendants' Invalidity Contentions. References to figures, drawings, and the like refer to the cited items as well as any accompanying or related text.

Asserted Claims	Ardemagni
14[pre] 14. A method of communicating a plurality of transponder signals from a satellite outdoor unit (ODU) that receives a plurality of satellite broadband signals to an integrated receiver decoder (IRD) over a single cable connected to the ODU, the method comprising the steps of:	Defendants take no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Ardemagni discloses, explicitly and/or inherently, a method of communicating a plurality of transponder signals from a satellite outdoor unit (ODU) that receives a plurality of satellite broadband signals to an integrated receiver decoder (IRD) over a single cable connected to the ODU. *See, e.g.*: Ardemagni at Abstract:

[1] Defendants apply the prior art in light of Plaintiff's improper assertions of infringement and improper application of the claims. Defendants do not agree with Plaintiff's application of the claims, or that the claims satisfy 35 U.S.C. § 112. In the invalidity contentions cover pleading, Defendants identified terms in the '576 patent that it contends are governed by 35 U.S.C. § 112(6). While the charts below identify where certain elements are found in the prior art, including the identity of structures, acts or materials in each item of prior art that perform the function for terms governed by 35 U.S.C. § 112(6), Defendants' contentions herein are not, and should in no way be seen as, admissions or adoptions as to any particular claim scope or construction, or as any admission that any particular element is met in any particular way. Defendants object to any attempt to imply claim construction from this chart. Defendants' prior art invalidity contentions are made in a variety of alternatives and do not represent Defendants' agreement or view as to the meaning, definiteness, written description support for, or enablement of any claim contained therein.

Asserted Claims	Ardemagni
	The invention relates to an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals (10, 11, 12) comprising a bi-directional switch exchange (1) connected to said peripheral node, a facility (7) for bi-directional distribution of signals connected to said exchange (1) and at least one user apparatus (9) connected to said user terminals (10, 11, 12), said exchange (1) receiving from said peripheral node the signals belonging to said television and telecommunication services and from said bi-directional distribution facility (7) a local upstream data sequence including the television channel selection signals, said exchange (1) selecting some input signals belonging to television services and reallocating and/or frequency transmodulating them in order to transmit them, in combination with a local downstream data sequence, to said signal bi-directional distribution facility (7), said user apparatus (9) processing said local downstream data sequence and generating said local upstream data sequence to be transmitted to said exchange (1) together with the upstream data and/or voice channels related to said telecommunication services. Ardemagni at 3:5–11: It is an object of this invention, therefore, to enable in simple, economically convenient and reliable way to utilize a single plant for distributing the concerned signals, preferably a conventional, possibly already installed MATV plant, between the peripheral node and the user terminals connected thereto, for contemporaneous distribution of land based television channels as well as other television and/or telecommunication services, also including any interactive services. Ardemagni at 6:33–7:6: By referring now to Figure 1 , the system according to this invention comprises a bi-directional switch exchange 1 , positioned at a building node, which receives all signals belonging to the television and telecommunication services available in network HFC2, in system 3 which receives the land based television radio frequencies, in system 4 which receives the satellite based television radio frequencies as well as in local apparatuses 5 of

Asserted Claims	Ardemagni
	the building, such as, for instance, the Closed Circuit Television systems (CCTV) and the video intercommunication systems. Ardemagni at Fig. 1:

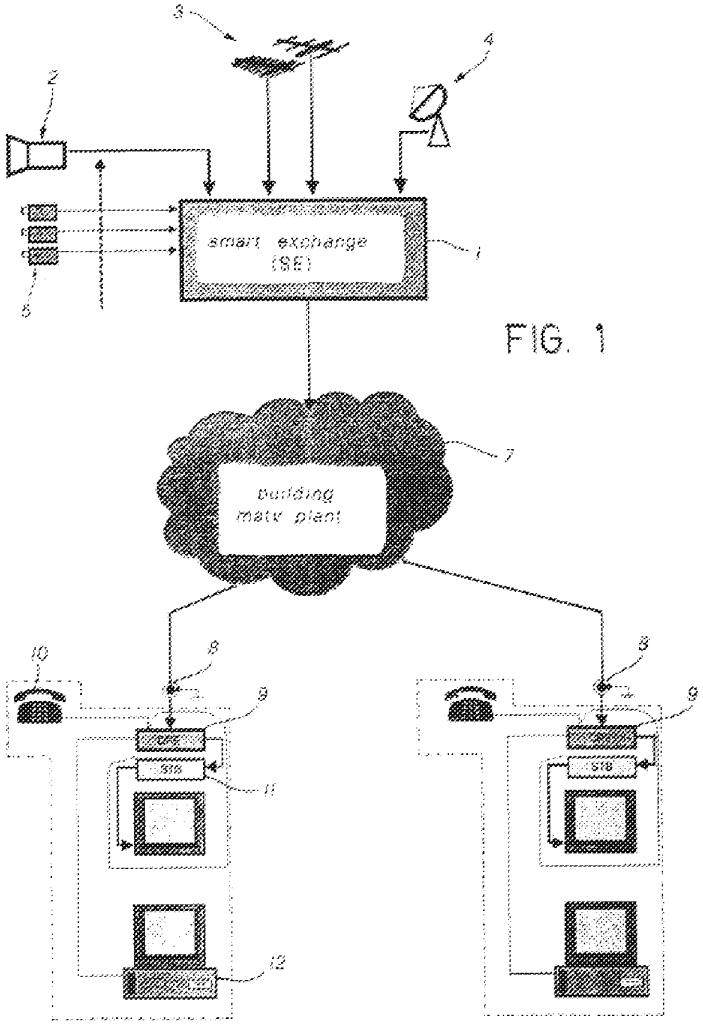
Asserted Claims	Ardemagni
	 FIG. 1

Asserted Claims	Ardemagni
	To the extent Ardemagni does not explicitly and/or inherently disclose this element, it would have been obvious in view of the knowledge of a person of ordinary skill in the art in light of Ardemagni alone or it would have been obvious to combine Ardemagni with one or more prior art references identified in the cover document to which this chart is attached and/or in Appendix A thereto.
14[a] communicating a transponder request signal to the ODU from the IRD;	Ardemagni discloses, explicitly and/or inherently, communicating a transponder request signal to the ODU from the IRD. *See, e.g.*: Ardemagni at 3:5–11: It is an object of this invention, therefore, to enable in simple, economically convenient and reliable way to utilize a single plant for distributing the concerned signals, preferably a conventional, possibly already installed MATV plant, between the peripheral node and the user terminals connected thereto, for contemporaneous distribution of land based television channels as well as other television and/or telecommunication services, also including any interactive services. Ardemagni at 3:12–4:19: Specific subject matter of this invention is an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals, said television services including land based radio frequency broadcast television channels, satellite based radio frequency broadcast television channels and HFC network or cable based broadcast television channels, each of said telecommunication services including a downstream data and/or voice channel and an upstream data and/or voice channel, said system also including a bi- directional switch exchange connected to said peripheral node, a facility for bi-directional distribution of signals connected to said exchange and at least a user apparatus connected to said bi-directional facility as well as to said user terminals,

Asserted Claims	Ardemagni
	said exchange comprising a filter, a frequency filtering and translating unit, a logic control unit, a combiner and a selector, said combiner and selector being connected to said bidirectional distribution facility, the signals belonging to said land based television channels being applied to the input of said combiner, said filter receiving the signals belonging to said cable based television channels and to said downstream data and/or voice channels, said filter separating the signals belonging to said downstream data and/or voice channels from the signals belonging to said cable based television channels, said filter also reallocating the signals belonging to said downstream data and/or voice channels to pre-established frequencies and applying them to the input of said combiner, said filter also applying the signals belonging to said cable based television channels to said frequency filtering and translating unit, the signals belonging to said satellite based television channels being also applied to said frequency filtering and translating unit, said selector being connected to said bi-directional distribution facility in order to receive a local upstream data sequence therefrom and to apply it to said control logic unit and to receive the signals belonging to said upstream data and/or voice channels therefrom and to apply them to said peripheral node, said control logic unit generating the control signals to be applied to said frequency filtering and translating unit and a local downstream data sequence to be applied to the input of said combiner, said frequency filtering and translating unit selecting the input signals and frequency reallocating and/or translating them for applying them to the input of said combiner, said combiner mixing the input signals and applying them to said bi-directional distribution facility, said user apparatus including a demodulator, a logic unit, a modulator and a combiner, said logic unit processing said local downstream data sequence outcoming from said demodulator, said modulator modulating a local upstream data sequence related to said user apparatus, said combiner mixing the signals belonging to said local upstream data sequence as well as the signals belonging to upstream data and /or voice channels related to said user apparatus and applying them to said bidirectional distribution facility. Ardemagni at 6:33–7:6:

Asserted Claims	Ardemagni
	By referring now to Figure 1 , the system according to this invention comprises a bi-directional switch exchange 1 , positioned at a building node, which receives all signals belonging to the television and telecommunication services available in network HFC2, in system 3 which receives the land based television radio frequencies, in system 4 which receives the satellite based television radio frequencies as well as in local apparatuses 5 of the building, such as, for instance, the Closed Circuit Television systems (CCTV) and the video intercommunication systems. Ardemagni at 7:16–31: As it will be detailedly described hereinafter, the system according to this invention allows to utilize a MATV plant or facility for conveying in bi-directional way the signals of all television and telecommunication services to the input of said exchange, thereby supplying them to all active user terminals (10, 11, 12), by means of a selection operation, advanced up to the level of said exchange 1 , among the specific non land based television channels as requested by active STB terminals 11. In particular, when a user selects a specific satellite or cable based television channel on his STB terminal 11 , the selection signal returns to the exchange 1 in order to redefine its switching pattern and to supply the concerned STB terminal 11 with only the selected television channel, rather than all available channels. When it is considered that STB terminal 11 could also receive signals belonging to more than one television services, it evidently appears that a reduction is obtained in terms of occupation of the band of the transmission channel interposed between the building node and the individual socket 8. Ardemagni at 7:32–35: In other words, even if at least three television services are present at each user socket 8 and each service offers a big number of channels, each active user STB terminal 11 will select a single television channel. Ardemagni at 16:1–5:

Asserted Claims	Ardemagni
	In this way, the selection performed by a user is routed to the exchange 1 rather than directly to said STB terminal 1 , through said upstream channel by means of a combination of it with the TELCO data on a local oscillator of a frequency in the band of 5 to 30 MHz allotted to any individual user. Ardemagni at Fig. 1:

Asserted Claims	Ardemagni
	 FIG. 1

Asserted Claims	Ardemagni
	To the extent Ardemagni does not explicitly and/or inherently disclose this element, it would have been obvious in view of the knowledge of a person of ordinary skill in the art in light of Ardemagni alone or it would have been obvious to combine Ardemagni with one or more prior art references identified in the cover document to which this chart is attached and/or in Appendix A thereto.
14[b] in the ODU, digitizing the plurality of satellite broadband signals, selecting and extracting a plurality of transponder signals from the received satellite broadband signals, wherein the selecting is responsive to the transponder request signals;	Ardemagni discloses, explicitly and/or inherently, in the ODU, digitizing the plurality of satellite broadband signals, selecting and extracting a plurality of transponder signals from the received satellite broadband signals, wherein the selecting is responsive to the transponder request signals. *See, e.g.*: Ardemagni at Abstract: The invention relates to an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals (10, 11, 12) comprising a bi-directional switch exchange (1) connected to said peripheral node, a facility (7) for bi-directional distribution of signals connected to said exchange (1) and at least one user apparatus (9) connected to said user terminals (10, 11, 12), said exchange (1) receiving from said peripheral node the signals belonging to said television and telecommunication services and from said bi-directional distribution facility (7) a local upstream data sequence including the television channel selection signals, said exchange (1) selecting some input signals belonging to television services and reallocating and/or frequency transmodulating them in order to transmit them, in combination with a local downstream data sequence, to said signal bi-directional distribution facility (7), said user apparatus (9) processing said local downstream data sequence and generating said local upstream data sequence to be transmitted to said exchange (1) together with the upstream data and/or voice channels related to said telecommunication services. Ardemagni at 3:12–4:19:

Asserted Claims	Ardemagni
	Specific subject matter of this invention is an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals, said television services including land based radio frequency broadcast television channels, satellite based radio frequency broadcast television channels and HFC network or cable based broadcast television channels, each of said telecommunication services including a downstream data and/or voice channel and an upstream data and/or voice channel, said system also including a bi- directional switch exchange connected to said peripheral node, a facility for bi-directional distribution of signals connected to said exchange and at least a user apparatus connected to said bi-directional facility as well as to said user terminals, said exchange comprising a filter, a frequency filtering and translating unit, a logic control unit, a combiner and a selector, said combiner and selector being connected to said bidirectional distribution facility, the signals belonging to said land based television channels being applied to the input of said combiner, said filter receiving the signals belonging to said cable based television channels and to said downstream data and/or voice channels, said filter separating the signals belonging to said downstream data and/or voice channels from the signals belonging to said cable based television channels, said filter also reallocating the signals belonging to said downstream data and/or voice channels to pre-established frequencies and applying them to the input of said combiner, said filter also applying the signals belonging to said cable based television channels to said frequency filtering and translating unit, the signals belonging to said satellite based television channels being also applied to said frequency filtering and translating unit, said selector being connected to said bi-directional distribution facility in order to receive a local upstream data sequence therefrom and to apply it to said control logic unit and to receive the signals belonging to said upstream data and/or voice channels therefrom and to apply them to said peripheral node, said control logic unit generating the control signals to be applied to said frequency filtering and translating unit and a local downstream data sequence to be applied to the input of said combiner, said frequency filtering and translating unit selecting the input signals and frequency reallocating and/or translating them for applying them to the input of said combiner, said combiner mixing the input signals and applying them to said bi-directional distribution facility, said user apparatus including a demodulator, a logic unit, a modulator and a combiner, said logic unit

Asserted Claims	Ardemagni
	processing said local downstream data sequence outcoming from said demodulator, said modulator modulating a local upstream data sequence related to said user apparatus, said combiner mixing the signals belonging to said local upstream data sequence as well as the signals belonging to upstream data and /or voice channels related to said user apparatus and applying them to said bidirectional distribution facility. Ardemagni at 4:28–35: Further according to this invention, said frequency filtering and translating unit comprises a converter unit for conversion of HFC radio frequencies, a converter unit for conversion of satellite based radio frequencies as well as a switch unit, said converter units having N inputs and N outputs, said switch unit having 2*N inputs and N outputs, the homologous outputs of both said converter units being alternatively selected by said switch unit and transferred to said frequency filtering and translating unit. Ardemagni at 7:16–31: As it will be detailedly described hereinafter, the system according to this invention allows to utilize a MATV plant or facility for conveying in bi-directional way the signals of all television and telecommunication services to the input of said exchange, thereby supplying them to all active user terminals (10, 11, 12), by means of a selection operation, advanced up to the level of said exchange 1 , among the specific non land based television channels as requested by active STB terminals 11. In particular, when a user selects a specific satellite or cable based television channel on his STB terminal 11 , the selection signal returns to the exchange 1 in order to redefine its switching pattern and to supply the concerned STB terminal 11 with only the selected television channel, rather than all available channels. When it is considered that STB terminal 11 could also receive signals belonging to more than one television services, it evidently appears that a reduction is obtained in terms of occupation of the band of the transmission channel interposed between the building node and the individual socket 8.

Asserted Claims	Ardemagni
	Ardemagni at 7:32–35: In other words, even if at least three television services are present at each user socket 8 and each service offers a big number of channels, each active user STB terminal 11 will select a single television channel. Ardemagni at 8:26–35: In this respect, the signals conveyed by said facility 7 from the exchange 1 to the various user apparatuses 9, by which the so-called "downstream" flow or channel i? formed, comprise all signals belonging to land based television channels, coming from the receiver system 3 for the land based television radio frequencies, all signals belonging to downstream data and/or voice channels corresponding to telecommunication services, the signals belonging to satellite based and/or cable based television channels as selected by active user STB terminals 11 and lastly signals generated by exchange 1 for controlling said active STB terminals 11. Ardemagni at 9:1–10: On the other hand, the signals conveyed by said facility 7 from the user apparatuses 9 to exchange 1 , by which the so-called "upstream" flow or channel is formed, comprise the signals belonging to upstream data and/or voice channels corresponding to telecommunication services as well as all signals corresponding to the selections performed by active user STB terminals 11. Such selection signals included in said upstream channel are utilized by said exchange 1 to convey at each time only signals belonging to satellite based and/or cable based television channels corresponding to the selections performed by the active user STB terminals 11. Ardemagni at 9:24–28:

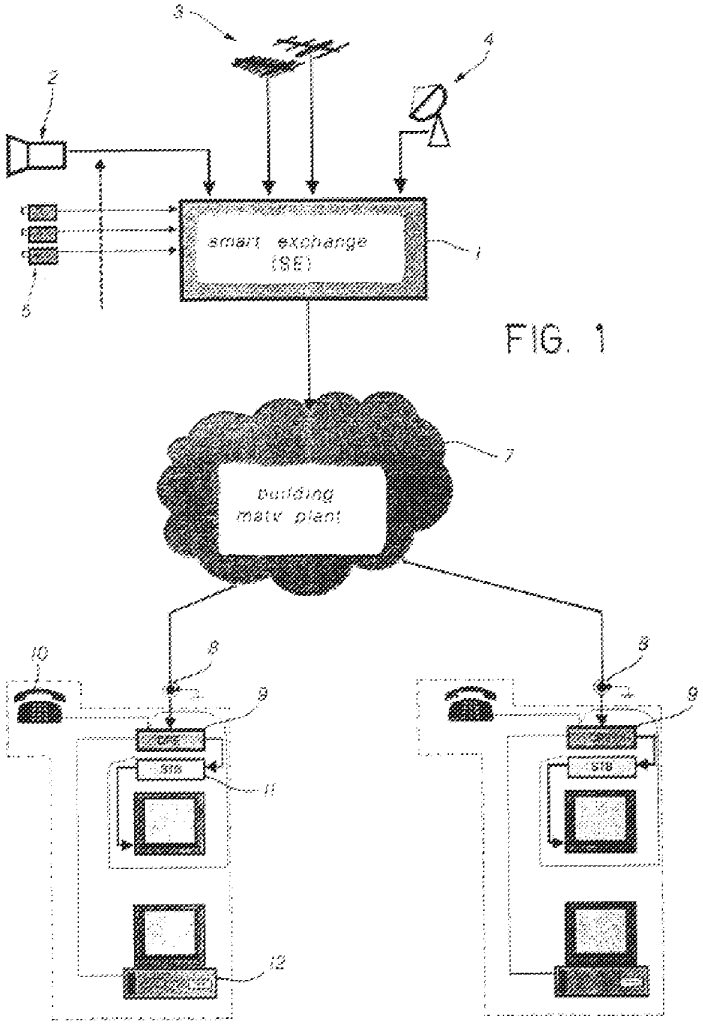
Asserted Claims	Ardemagni
	Therefore, exchange 1 is adapted to allocate signals belonging to satellite based and/or cable based television channels into frequency band 16 variable in the range of 110 to 170 MHz and into frequency band 17 variable in the range of 230 to 470 MHz, as selected by active STB terminals 11. Ardemagni at 12:7–23: By referring to Figure 4a, each radio frequency filter-converter HFC is provided with a constant amplitude pass band and tuneable central frequency tuner 33, which filters the input HFC television signals, as allocated to frequency band extending between 54 and 862 MHz, and allows the HFC television signal selected by a STB terminal 11 to pass to the output. The output television signal is then frequency translated by means of a mixer 34 that mixes it with the signal of a selectable frequency local oscillator 35, as well as a band-pass filter 36, having a constant amplitude pass band and tuneable central frequency. In particular, a logic unit 37 generates the control signals to be used to establish the central frequency of tuner 33, the frequency of oscillator 35 and the central frequency of filter 36. Figure 4b illustrates a schematic diagram showing the frequency distribution of the signal modulated with 64QAM modulation (64 symbol Quadrature Amplitude Modulation) with a band width of 8 MHz, as appearing at the output of the converter-filter of Figure 4a when the frequency translation operation reallocates the selected television signal to band 17 (extended S band). Ardemagni at 12:24–13:10: By referring to Figure 5a, a first embodiment of the satellite radio frequency converter-filters includes a tuner 38, having a pass band of constant amplitude and tuneable central frequency, which filters the input satellite based television signals, as allocated to the frequency band extending from 950 and 2050 MHz, and allows the satellite based television signal selected by STB terminal 11 to pass to the output. In particular, the input satellite based television signals are modulated with Quaternary Phase Shift Keying (QPSK) modulation with a band width of

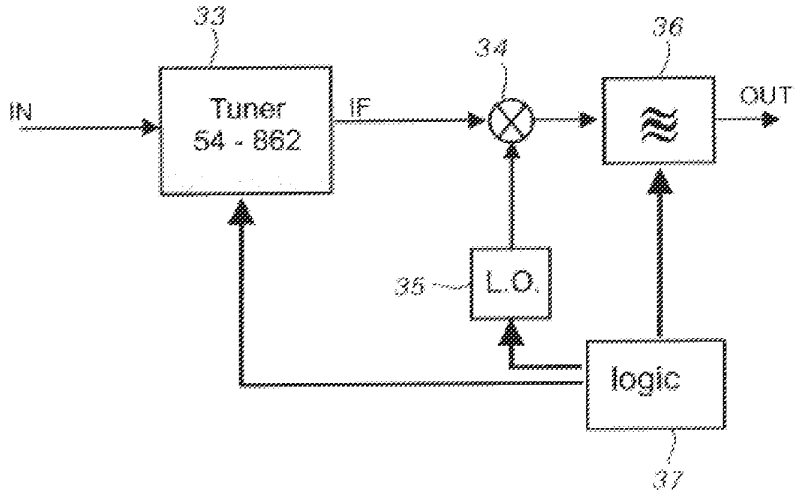
Asserted Claims	Ardemagni
	40 MHz. The television signal outputted by tuner 38 is then frequency translated by means of mixer 39 that mixes it with the signal of a selectable frequency local oscillator 40, as well as a band-pass filter 41, having a constant amplitude pass band and tuneable central frequency. In particular, a logic unit 42 generates the control signals to be used to establish the central frequency of tuner 38, the frequency of oscillator 40 and the central frequency of filter 41. In this case, channel QPSK appears to be reallocated, for instance to band 17, but it still occupies a band of 40 MHz. This means that the satellite radio frequency converter-filter of Figure 5a has a simple and low cost construction, but it still entails a band occupation 5 times larger than the band occupied by a 64QAM modulated signal, thereby reducing the number N of television channels allocable to facility 7. Furthermore, since the QPSK modulation is not compatible with STB terminals 11 for HFC television channels, an additional STB terminal 43 is anyway needed downstream of socket 8 in order to perform the transmodulation from QPSK to 64QAM system. Ardemagni at 13:21–37: As it is shown in Figure 3, each one of said N pairs of homologous outputs of the radio frequency conversion units 31 and 32, respectively, is coupled to one of N switches 46 that form a N output switching unit 47. In particular, each switch 46 corresponds to a STB terminal 11. Obviously, a HFC or satellite based television signal is present at the output of each switch 46, according to the selection of the corresponding STB terminal 11. Anyway, it is also possible to implement the arrangement so that, when the terminals connected at a given time are M, where M < N, the outputs of (N - M) switches 46 are in a high impedance condition. The N outputs (or the M active outputs) of said switching unit 47 are added in combiner 48 to the signals on the VHF output 19 and on the UHF output 20 of said filter unit 18 and to the signals belonging to the downstream data and/or voice channels of the telecommunication services available on output 23 of said filter 22. The output of combiner 48 forms the downstream channel that is conveyed from the exchange 1 through a duplexer 49 as well as the MATV facility 7 to the sockets 8 and to the user apparatuses 9.

Asserted Claims	Ardemagni
	Ardemagni 14:1–10: Upstream channel that is conveyed from said user apparatuses 9 to exchange 1 through said MATV facility 7 is transmitted by duplexer 49 to a selector 50 of local data. Said upstream channel is preferably allocated to frequency band extending from 5 to 30 MHz. Selector 50 separates all those signal corresponding to television channel selections performed by active STB terminals 11 , which form a local upstream data sequence, from signals belonging to upstream data and/or voice channel corresponding to telecommunication services. The signals belonging to upstream data and /or voice channels of telecommunication services are then passed unaltered and are transmitted to said HFC network 2. Ardemagni at 15:18–37: The data and/or voice upstream channels corresponding to telecommunication services outcoming from said telephone set 10, from said STB terminal 11 and from said PC 12 are modulated by a TELCO modulator 65 for telecommunication services. The signal travelling on an IR carrier outcoming from a remote controller 66 for selection of the television program and control of said STB terminal 11 is received by a receiver 67 and sent to a FSK modulator 68 that generates the local upstream data sequence related to the STB terminal 11 connected to the concerned user apparatus 9. The signals outcoming from said TELCO modulator 65 and from said FSK modulator 69 are added together in a combiner unit 69 and relayed to a further modulator 70. Modulator 70 in combination with a local oscillator 71 tuned on the frequency allotted to the specific concerned STB terminal 11 generates the upstream channel related to the considered user apparatus 9 and conveys it through a band pass filter 72 to the MATV facility 7 to enable it to reach the exchange 1. Preferably, the frequency on which said local oscillator 71 is tuned is comprised in the frequency band which extends from 5 to 30 MHz and coincides with the pass band of said filter 72. In particular, said local oscillator 71 can also transmit the signal for acknowledging the address of said STB terminal 11 to logic unit 60.

Exhibit A1 – Ardemagni Invalidity Claim Chart

Asserted Claims	Ardemagni
	Ardemagni at 16:1–5: In this way, the selection performed by a user is routed to the exchange 1 rather than directly to said STB terminal 1 , through said upstream channel by means of a combination of it with the TELCO data on a local oscillator of a frequency in the band of 5 to 30 MHz allotted to any individual user. Ardemagni 17:11–17: Also the simple selection performed by the user of a desired (not land based) television channel in respect of any one of the various available services is "intercepted" and routed through the upstream flow to said exchange 1 where it is compared with other analogous selections and consequently managed. In this case, a local (building) data channel is involved which is possibly a portion of an upstream data flow of greater amplitude. Ardemagni at Fig. 1:

Asserted Claims	Ardemagni
	 FIG. 1 Ardemagni at Fig. 4a:

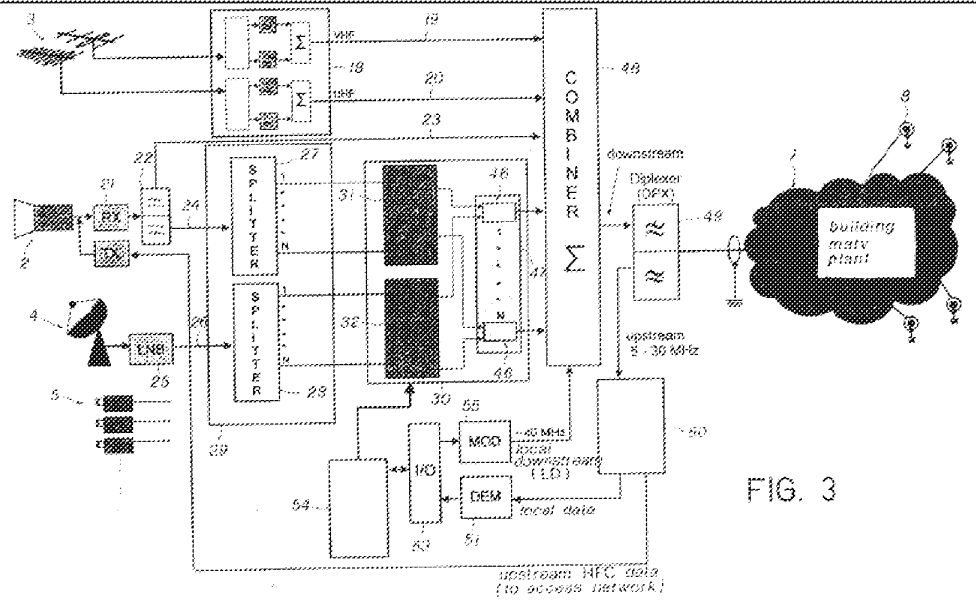
Asserted Claims	Ardemagni
	 FIG. 4a To the extent Ardemagni does not explicitly and/or inherently disclose this element, it would have been obvious in view of the knowledge of a person of ordinary skill in the art in light of Ardemagni alone or it would have been obvious to combine Ardemagni with one or more prior art references identified in the cover document to which this chart is attached and/or in Appendix A thereto.
14[c] combining extracted selected transponder signals into a composite signal;	Ardemagni discloses, explicitly and/or inherently, combining extracted selected transponder signals into a composite signal. *See, e.g.*:

Asserted Claims	Ardemagni
	Ardemagni at Abstract: The invention relates to an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals (10, 11, 12) comprising a bi-directional switch exchange (1) connected to said peripheral node, a facility (7) for bi-directional distribution of signals connected to said exchange (1) and at least one user apparatus (9) connected to said user terminals (10, 11, 12), said exchange (1) receiving from said peripheral node the signals belonging to said television and telecommunication services and from said bi-directional distribution facility (7) a local upstream data sequence including the television channel selection signals, said exchange (1) selecting some input signals belonging to television services and reallocating and/or frequency transmodulating them in order to transmit them, in combination with a local downstream data sequence, to said signal bi-directional distribution facility (7), said user apparatus (9) processing said local downstream data sequence and generating said local upstream data sequence to be transmitted to said exchange (1) together with the upstream data and/or voice channels related to said telecommunication services. Ardemagni at 3:12–4:19: Specific subject matter of this invention is an optimized system for distribution of television and telecommunication services from a peripheral node to user terminals, said television services including land based radio frequency broadcast television channels, satellite based radio frequency broadcast television channels and HFC network or cable based broadcast television channels, each of said telecommunication services including a downstream data and/or voice channel and an upstream data and/or voice channel, said system also including a bi- directional switch exchange connected to said peripheral node, a facility for bi-directional distribution of signals connected to said exchange and at least a user apparatus connected to said bi-directional facility as well as to said user terminals, said exchange comprising a filter, a frequency filtering and translating unit, a logic control unit, a combiner and a selector, said combiner and selector being connected to said bidirectional distribution facility, the signals belonging to said land based television channels being applied to the input of said combiner, said filter receiving the signals

Asserted Claims	Ardemagni
	belonging to said cable based television channels and to said downstream data and/or voice channels, said filter separating the signals belonging to said downstream data and/or voice channels from the signals belonging to said cable based television channels, said filter also reallocating the signals belonging to said downstream data and/or voice channels to pre-established frequencies and applying them to the input of said combiner, said filter also applying the signals belonging to said cable based television channels to said frequency filtering and translating unit, the signals belonging to said satellite based television channels being also applied to said frequency filtering and translating unit, said selector being connected to said bi-directional distribution facility in order to receive a local upstream data sequence therefrom and to apply it to said control logic unit and to receive the signals belonging to said upstream data and/or voice channels therefrom and to apply them to said peripheral node, said control logic unit generating the control signals to be applied to said frequency filtering and translating unit and a local downstream data sequence to be applied to the input of said combiner, said frequency filtering and translating unit selecting the input signals and frequency reallocating and/or translating them for applying them to the input of said combiner, said combiner mixing the input signals and applying them to said bi-directional distribution facility, said user apparatus including a demodulator, a logic unit, a modulator and a combiner, said logic unit processing said local downstream data sequence outcoming from said demodulator, said modulator modulating a local upstream data sequence related to said user apparatus, said combiner mixing the signals belonging to said local upstream data sequence as well as the signals belonging to upstream data and /or voice channels related to said user apparatus and applying them to said bidirectional distribution facility. Ardemagni at 4:20–23: According to this invention, said exchange further comprises, upstream of said combiner, a unit for filtering the signals belonging to said land based television channels, which eliminates all replicated signals having the worst signal-to-noise ratio (SNR). Ardemagni at 4:24–27:

Asserted Claims	Ardemagni
	Still according to this invention, said television services further comprise television channels related to closed circuit television systems (CCTV) that are coupled to the input of said combiner or to said frequency filtering and translating unit. Ardemagni at 5:34–6:9: Still according to this invention, the local upstream or local downstream data sequences are modulated by digital modulation, preferably FSK and/or a PSK and/or QAM modulation and said user apparatus further comprises a digital demodulator arranged upstream of said logic unit, a frequency multiplexer and a TELCO demodulator for telecommunication services, arranged upstream of said user terminals, a TELCO modulator for telecommunication services, arranged downstream of said user terminals, a digital modulator which receives the television channel selection data from at least one user terminal as well as a combiner arranged downstream of said TELCO modulator and of said digital modulator and upstream of said bi-directional distribution facility. Ardemagni at 13:21–37: As it is shown in Figure 3, each one of said N pairs of homologous outputs of the radio frequency conversion units 31 and 32, respectively, is coupled to one of N switches 46 that form a N output switching unit 47. In particular, each switch 46 corresponds to a STB terminal 11. Obviously, a HFC or satellite based television signal is present at the output of each switch 46, according to the selection of the corresponding STB terminal 11. Anyway, it is also possible to implement the arrangement so that, when the terminals connected at a given time are M, where M < N, the outputs of (N - M) switches 46 are in a high impedance condition. The N outputs (or the M active outputs) of said switching unit 47 are added in combiner 48 to the signals on the VHF output 19 and on the UHF output 20 of said filter unit 18 and to the signals belonging to the downstream data and/or voice channels of the telecommunication services available on output 23 of said filter 22. The output of combiner 48 forms the downstream channel that is conveyed from the exchange

Asserted Claims	Ardemagni
	1 through a duplexer 49 as well as the MATV facility 7 to the sockets 8 and to the user apparatuses 9. Ardemagni at 15:18–37: The data and/or voice upstream channels corresponding to telecommunication services outcoming from said telephone set 10, from said STB terminal 11 and from said PC 12 are modulated by a TELCO modulator 65 for telecommunication services. The signal travelling on an IR carrier outcoming from a remote controller 66 for selection of the television program and control of said STB terminal 11 is received by a receiver 67 and sent to a FSK modulator 68 that generates the local upstream data sequence related to the STB terminal 11 connected to the concerned user apparatus 9. The signals outcoming from said TELCO modulator 65 and from said FSK modulator 69 are added together in a combiner unit 69 and relayed to a further modulator 70. Modulator 70 in combination with a local oscillator 71 tuned on the frequency allotted to the specific concerned STB terminal 11 generates the upstream channel related to the considered user apparatus 9 and conveys it through a band pass filter 72 to the MATV facility 7 to enable it to reach the exchange 1. Preferably, the frequency on which said local oscillator 71 is tuned is comprised in the frequency band which extends from 5 to 30 MHz and coincides with the pass band of said filter 72. In particular, said local oscillator 71 can also transmit the signal for acknowledging the address of said STB terminal 11 to logic unit 60. Ardemagni at Fig. 3:

Asserted Claims	Ardemagni
	 FIG. 3 To the extent Ardemagni does not explicitly and/or inherently disclose this element, it would have been obvious in view of the knowledge of a person of ordinary skill in the art in light of Ardemagni alone or it would have been obvious to combine Ardemagni with one or more prior art references identified in the cover document to which this chart is attached and/or in Appendix A thereto.
14[d] transmitting the composite signal over the single cable from the ODU to the IRDs, wherein the modulation of the transponder signal is not altered by the steps of selecting, combining, and transmitting.	Ardemagni discloses, explicitly and/or inherently, transmitting the composite signal over the single cable from the ODU to the IRDs, wherein the modulation of the transponder signal is not altered by the steps of selecting, combining, and transmitting. *See, e.g.*: Ardemagni at Abstract: