

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC.,
Patent Owner.

Patent No. 11,399,206

Filing Date: January 28, 2022

Issue Date: July 26, 2022

Title: METHOD FOR RECEIVING A TELEVISION SIGNAL

Inter Partes Review No.: IPR2024-00439

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

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EXHIBITS

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- Ex. 1102: Expert Declaration of David B. Lett
- Ex. 1103: Curriculum Vitae of David B. Lett
- Ex. 1104: Certified Prosecution History of the ’206 patent
- Exs. 1105-1106: Reserved
- Ex. 1107: Certified Prosecution History of U.S. Provisional App. No. 61/170,526 (“’526 provisional”)
- Ex. 1108: U.S. Pub. No. 2009/0290659 (“Petrovic”)
- Ex. 1109: Certified Prosecution History of U.S. Provisional App. No. 61/054,886 (“Petrovic ’886”)
- Ex. 1110: U.S.P.T.O Assignment Record for U.S. Application No. 12/414,892
- Exs. 1111-1113: Reserved
- Ex. 1114: U.S. Patent No. 7,237,214 (“Pandey”)
- Ex. 1115: Excerpts of “IEEE Std 100-2000, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition” (IEEE Press. 2000) (“IEEE Std 100”)
- Ex. 1116: Excerpts of Jan M Rabaey, “Digital Integrated Circuits: A Design Perspective” (Pearson, 2nd ed. 2002) (“Rabaey”)
- Ex. 1117: A. P. Chandrakasan, “Ultra low power digital signal processing,” Proceedings of 9th International Conference on VLSI Design, Bangalore, India, 1996, pp. 352-357 (“Chandrakasan”)
- Ex. 1118: S. Mirabbasi and K. Martin, “Classical and Modern Receiver Architectures,” IEEE Communications Magazine, vol. 38, no. 11, pp. 132-139, November 2000 (“Mirabbasi”)
- Ex. 1119: U.S. Patent No. 6,061,406 (“Carson”)

Ex. 1120:	Reserved
Ex. 1121:	“Data-Over-Cable Service Interface Specifications: Radio Frequency Interface Specification CM-SP-RFIV2.0-I11-060602,” DOCSIS, June 2006
Exs. 1122-1124:	Reserved
Ex. 1125:	J. Crols and M. S. J. Steyaert, “Low-IF topologies for high-performance analog front ends of fully integrated receivers,” IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing, vol. 45, no. 3, pp. 269-282, March 1998 (“Crols”)
Ex. 1126:	Reserved
Ex. 1127:	U.S. Patents and Patent Applications Family Tree for U.S. Pat. 11,399,206
Exs. 1128-1132:	Reserved
Ex. 1133:	Excerpts of W. Ciciora, J. Farmer, D. Large, and M. Adams, “Modern Cable Television Technology: Video, Voice, and Data Communications” (2 nd ed. 2004) (“Ciciora”)
Ex. 1134:	Excerpts of J. Crols and M. Steyaert, “CMOS Wireless Transceiver Design” (1997)
Ex. 1135:	U.S. Patent No. 7,340,230 (“Khoini-Poorfard”)
Ex. 1136:	U.S. Pub. No. 2003/0217362 (“Summers”)
Ex. 1137:	U.S. Pub. No. 2006/0256799 (“Eng”)
Ex. 1138:	U.S. Pub. No. 2006/0083335 (“Seendripu”)
Ex. 1139:	Excerpts of Chris Bowick, “RF Circuit Design” (2 nd ed. 2008)
Ex. 1140:	Reserved
Ex. 1141:	Excerpts of Roland Priemer, “Introductory Signal Processing” (1991)
Ex. 1142:	U.S. Patent No. 7,272,375 (“Tuttle”)

Ex. 1143:	U.S. Patent No. 7,130,576 (“Gurantz”)
Ex. 1144:	U.S. Patent No. 5,278,837 (“Kelley”)
Ex. 1145:	Jeffrey Hugh Reed, “Software Radio: A Modern Approach to Radio Engineering” (2002)
Ex. 1146:	U.S. Patent No. 7,213,042 (“Cannon”)
Ex. 1147:	Reserved
Ex. 1148:	Excerpts of William Buchanan, “Computer Busses” (2000)
Ex. 1149:	U.S. Patent No. 7,079,528 (“Ziegler”)
Ex. 1150:	Excerpts of “Software Defined Radio: Enabling Technologies” (Walter H.W. Tuttlebee ed., 2003)
Exs. 1151-1152:	Reserved
Ex. 1153:	U.S. Pub. No. 2008/0039036 (“Lee”)
Exs. 1154-1157:	Reserved
Ex. 1158:	U.S. Pub. No. 2010/0020794 (“Cholas”)
Ex. 1159:	U.S. Pub. No. 2007/0232088 (“Burris”)
Ex. 1160:	U.S. Patent No. 6,160,443 (“Maalej”)
Ex. 1161:	U.S. Pub. No. 2006/0256216 (“Takahiko”)
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Ex. 1170:	U.S.P.T.O Assignment Record for U.S. Patent No. 8,526,898
Exs. 1171-1172:	Reserved
Ex. 1173:	Expert Declaration of Dr. Sylvia Hall-Ellis
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Ex. 1175:	U.S. Patent No. 6,791,995 (“Azenkot”)
Ex. 1176:	U.S. Patent No. 6,542,203 (“Shadwell”)

MANDATORY NOTICES

Real Parties in Interest (37 C.F.R. § 42.8(b)(1))

The real parties-in-interest for this petition are (i) Comcast Corporation, (ii) Comcast Cable Communications, LLC, and (iii) Comcast Cable Communications Management, LLC. No unnamed entity is funding, controlling, or directing this Petition for *inter partes* review (IPR) of U.S. Patent No. 11,399,206 (“the ’206 patent”), or otherwise has an opportunity to control or direct this Petition or Petitioner’s participation in any resulting IPR.

Related Matters (37 C.F.R. § 42.8(b)(2))

Office Proceedings

This is the second of three petitions for *inter partes* review filed by Petitioner against the ’206 patent. Petitioner is also filing petitions for *inter partes* review against related U.S. Patent Nos. 11,381,866 and 9,210,362.

No other Office proceedings (e.g., *inter partes* review, post-grant review, or covered business method) have been filed against the ’206 patent.

Litigation matters

The ’206 patent has been asserted in *Entropic Communications, LLC v. Comcast Corporation*, No. 2:23-cv-01050 (C.D. Cal. filed Feb. 10, 2023) and *Entropic Communications, LLC v. Cox Communications, Inc.*, No. 2:23-cv-01049 (C.D. Cal. filed Feb. 10, 2023). The ’206 patent was also asserted in *Entropic Communications, LLC v. Charter Communications, Inc.*, No. 2:22-cv-00052-JRG

(E.D. Tex. filed Apr. 27, 2022) (“TX litigation”), which case was dismissed on December 10, 2023.

Continuity

According to Office records, the ’206 patent is a continuation of U.S. Pat. App. No. 17/217,244, filed March 30, 2021 (abandoned), which is a continuation of U.S. Pat. App. No. 16/430,506, filed June 4, 2019 (issued as U.S. Pat. No. 10,972,781), which is a continuation of U.S. Pat. App. No. 15/792,318, filed October 24, 2017 (issued as U.S. Pat. No. 10,313,733), which is a continuation of U.S. Pat. App. No. 14/948,881, filed November 23, 2015 (issued as U.S. Pat. No. 9,819,992), which is a continuation of U.S. Pat. App. No. 14/617,973, filed February 10, 2015 (issued as U.S. Pat. No. 9,210,363), which is a continuation of U.S. Pat. App. No. 13/962,871, filed August 8, 2013 (issued as U.S. Pat. No. 9,100,622), which is a continuation of U.S. Pat. App. No. 12/762,900, filed April 19, 2010 (issued as U.S. Pat. No. 8,526,898), which claims the benefit of U.S. Provisional App. No. 61/170,526, filed April 17, 2009. The ’206 patent is part of a family that includes thirteen additional patents or applications that purport to claim priority, via a chain of continuation applications, from U.S. Pat. App. No. 12/762,900. A family tree is included as Ex. 1127.

Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

Petitioner designates counsel listed below. A power of attorney for counsel is being concurrently filed.

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I. INTRODUCTION

Comcast Cable Communications, LLC (“Petitioner”) petitions for *inter partes* review and cancellation of claims 1-76 of U.S. Patent No. 11,399,206 (“the ’206 patent”) (Ex. 1101).

II. SUMMARY OF ARGUMENT

The ’206 patent generally claims a method for receiving a television signal that comprises digitizing, via a “wideband analog-to-digital converter (ADC),” “all received channels” in the input signal, with those channels comprising “a plurality of desired channels and a plurality of undesired channels,” and then, unsurprisingly, selecting and outputting the desired channels.

These features, and all other features of the ’206 patent claims, are rendered obvious by the prior art, e.g., Cholas (Ex. 1158), Petrovic (Ex. 1108), and other references relied on herein. Accordingly, claims 1-76 of the ’206 patent are unpatentable and should be cancelled.

III. OVERVIEW OF THE ’206 PATENT

A. Brief Description

The ’206 patent describes a wideband receiver system “capable of receiving multiple radio frequency channels located in a broad radio frequency spectrum.” Ex. 1101, 1:27-30; Ex. 1102, ¶ 35. A receiver is “wideband” if it is “designed to concurrently receive several TV channels.” Ex. 1101, 1:36-39; Ex. 1102, ¶ 36.

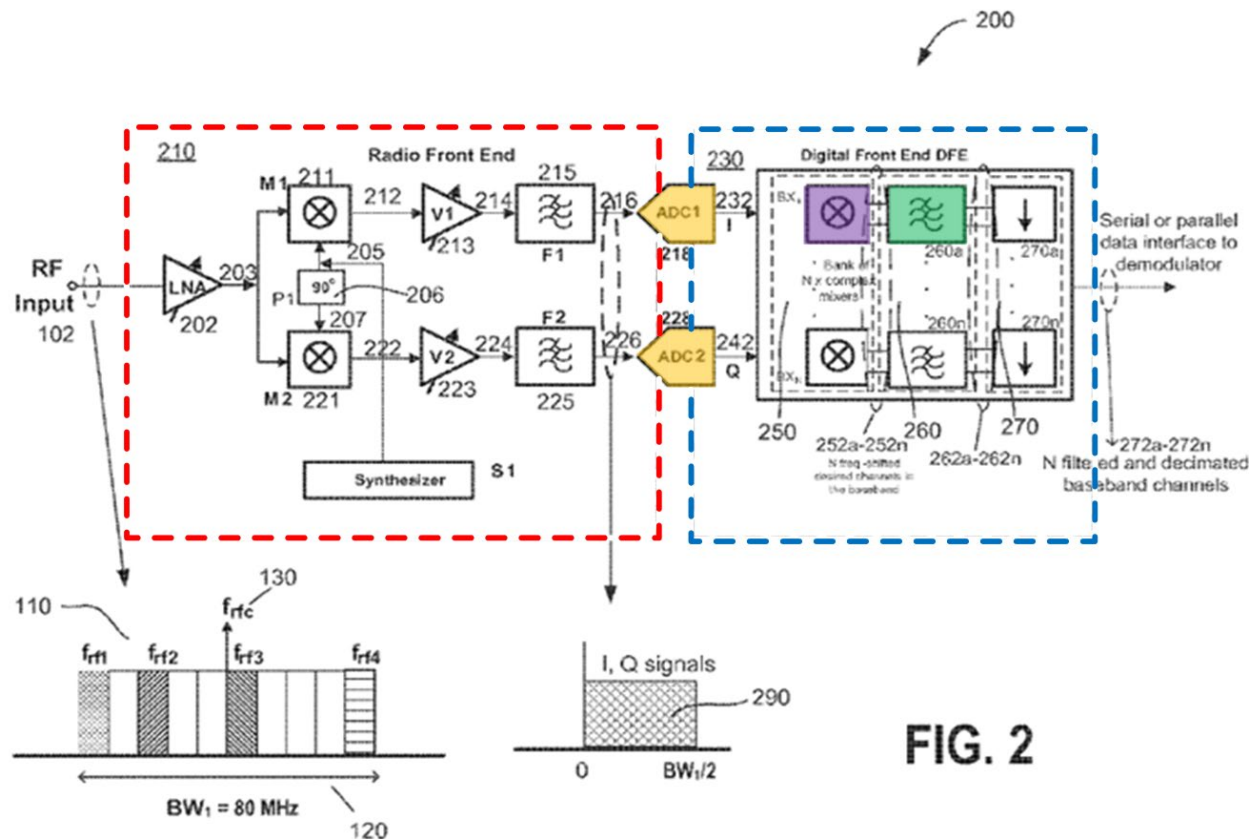


FIG. 2

Ex. 1101, Fig. 2 (annotated)

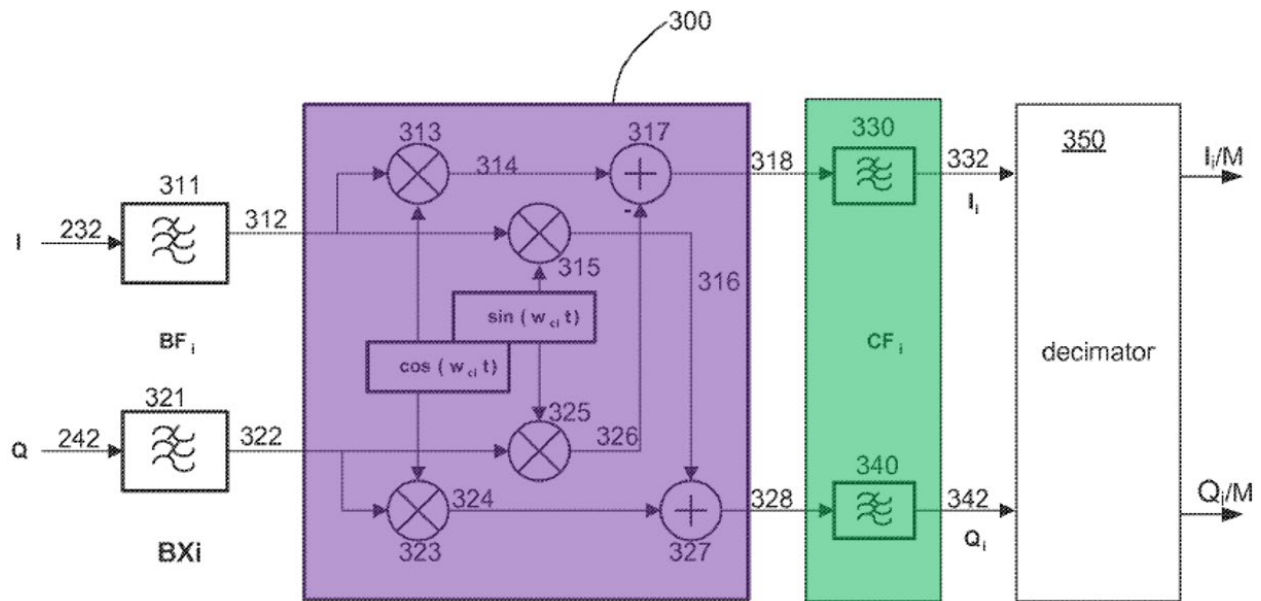
The wideband receiver system 200, shown in Figure 2, receives desired and undesired television channels as frequencies dispersed within a frequency bandwidth BW_1 . Ex. 1101, Abstract, 4:38-51; Ex. 1102, ¶ 37. A radio frontend 210 (**red**) downconverts and outputs the bandwidth of channels as in-phase (I) and quadrature (Q) signals 212, 222 at a low intermediate frequency (IF), then filters the signals, which are then digitized by wideband analog-to-digital converters ADC1, ADC2 (**gold**). Ex. 1101, 2:59-65, 4:61-5:7, 5:20-24, 5:48-51; Ex. 1102, ¶ 37. U.S. Provisional App. No. 61/170,526 (“526 provisional”), which the ’206 patent incorporates by reference, admits the left side of Figure 2 (including ADC1 and

ADC2) “is similar to conventional tuners.” Ex. 1107, p. 5; Ex. 1101, 1:6-23; Ex. 1102, ¶ 37.

ADC1 and ADC2 input digital I, Q signals 232, 242 to a bank of N complex mixers 250 (one annotated in **purple**) in a digital front end 230 (**blue**).¹ Ex. 1101, 5:51-55; Ex. 1102, ¶ 38. “Each of the N complex mixers ... extract[s] a different one of the desired channels” from the I, Q signals 232, 242 and “frequency-shifts the extracted signals to the baseband frequency.” Ex. 1101, 6:3-6; Ex. 1102, ¶ 38. One of filter modules 260a-260n (annotated in **green** in Figure 2, above) filters the frequency-shifted desired channel to remove undesired channels. Ex. 1101, 6:6-8; Ex. 1102, ¶ 38.

Figure 3 shows elements in a row of digital front end 230. Ex. 1101, 6:16-18; Ex. 1102, ¶ 39.

¹ A mixer multiplies an input signal (frequency f_1) by a reference signal (frequency f_2) to produce new signals at the sum and difference frequencies (f_1+f_2 and f_1-f_2). Ex. 1102, ¶¶ 38, 64. Complex mixers multiply signals already separated into their complex I and Q components. *Id.*



Ex. 1101, Fig. 3 (annotated)

Mixer 300 (**purple**), one of the complex mixers 250, includes multipliers and adders that frequency shift the digital I, Q signals 232, 242 so that a desired channel “will be downshifted to the baseband”² in I, Q signals 318, 328. Ex. 1101, 6:28-56; Ex. 1102, ¶ 40. The signals 318, 328 are filtered by filters 330, 340 (**green**), “one of the filters 260a-n” shown in Figure 2. Ex. 1101, 6:64-66; Ex. 1102, ¶ 40. After (optional) decimation, baseband channels from rows of digital front end 230 are sent “to a demodulator using a serial or parallel data interface according to commonly known methods.” Ex. 1101, 7:10-14; Ex. 1102, ¶ 40.

² Shifting a signal to baseband reduces its center frequency to zero. Ex. 1102, ¶¶ 40, 61-63, 66-68.

B. Prosecution History

U.S. Application No. 17/587,462 (“the ’462 application”), which became the ’206 patent, was filed with a preliminary amendment that canceled claims 1-18 and added claims 19-48. Ex. 1104, pp. 2-9. The Office rejected claims 19-48 for non-statutory double patenting over claims 1-27 U.S. Patent No. 9,100,622, and rejected claims 19-27, 29-30, 33-42, 44-45, and 48 as obvious over U.S. Patent No. 6,760,342 (Skones et al.) in view of International Publication No. WO 02/087230 (Uskali et al.), but indicated allowable subject matter in claims 28 and 43 (reciting “a serial interface”), claims 31 and 46 (reciting “a device comprising a digital video recorder (DVR)”), and claims 32 and 47 (reciting “a picture-in-picture display”). Ex. 1104, pp. 119-133.

Applicant filed a terminal disclaimer and amended to add the limitations of claim 28 to claim 19, add the limitations of claim 43 to claim 34, add independent claim 49 based on original claims 19 and 31, add independent claim 63 based on original claims 34 and 46, add independent claim 77 based on original claims 19 and 32, add independent claim 91 based on original claims 34 and 47, and add sets of dependent claims that paralleled existing dependent claims. Ex. 1104, pp. 220-242.

Applicant subsequently amended claims 19, 49, and 77 (’206 patent claims 1, 25, and 51, respectively) to add “receiving an input signal from a cable network,” amended the “digitizing” step: “... wherein the contiguous band of frequencies

comprises all received channels that exist in the input signal and the received channels comprise[[s]] a plurality of desired channels and a plurality of undesired channels” and made comparable changes to claims 34, 63, and 91 (’206 patent claims 13, 38, and 64, respectively) Ex. 1104, pp. 259-272.

The prior art relied upon in this petition—Cholas, Petrovic, Burris, Maalej, Rabaey, Takahiko, and Lee—was not considered during prosecution of the ’462 application. Ex. 1101, cover.

C. Earliest Priority Date for the Claims

The earliest possible priority date for claims 1-9 and 13-21 of the ’206 patent is April 17, 2009, the filing date of the ’526 provisional. Each reference relied on herein is prior art to that date. The earliest possible priority date for the remaining claims is the April 19, 2010, filing date of Application No. 12/762,900; the ’526 provisional is silent regarding a “channel delivered via ... DOCSIS[] protocol,” “DVR,” or “picture-in-picture display.” Ex. 1107, pp. 3-7; Ex. 1102, ¶ 45.

IV. OVERVIEW OF PRIOR ART

A. Cholas

Cholas, a U.S. Patent Application Publication of Application No. 11/754,714, filed May 29, 2007, is pre-AIA 35 U.S.C. § 102(e) prior art. Ex. 1158, cover. Cholas describes a set top box (STB) 1710 (red) with tuner/demodulator/demultiplexer chains 1-N that receive “input signal[s] [blue] ... from the cable network.” Ex. 1158, [0044], [0010]-[0011], [0024], [0059]-[0071], Figs. 4, 6; Ex. 1102, ¶ 77.

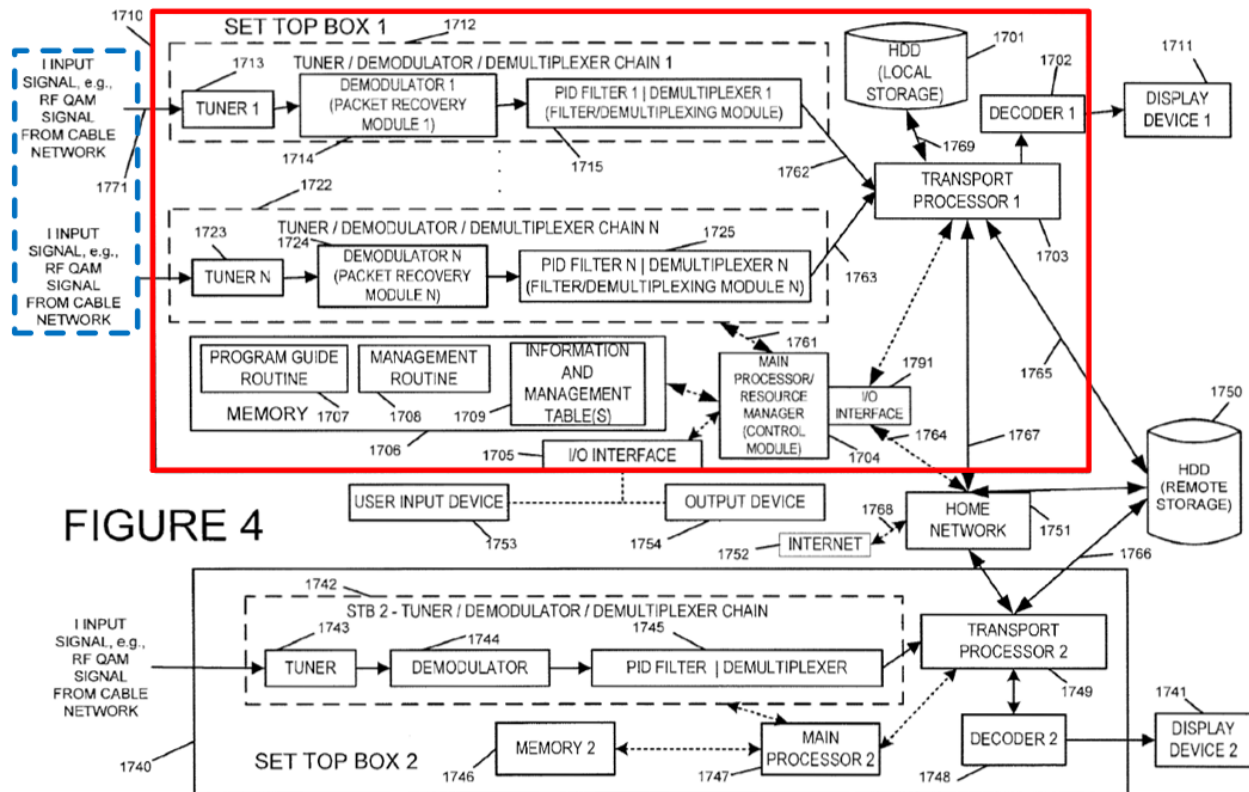


FIGURE 4

Ex. 1158, Fig. 4 (annotated)

Cholas is analogous art, as it is in the same field of endeavor as the '206 patent and reasonably pertinent to problems with which the '206 is concerned. Ex. 1102, ¶ 78. Like the '206 patent, Cholas “relates to wideband receiver systems that are capable of receiving multiple desired television channels.” Ex. 1101, 1:30-32; Ex. 1158, [0001], [0043]-[0045], [0052]-[0057], Figs. 4-5; Ex. 1102, ¶ 78. Cholas also relates to STBs in a cable network, an expected environment for the wideband receiver system of the '206 patent. Ex. 1101, 1:47-49, 5:8-12, claim 1; Ex. 1158, [0043]-[0045], Fig. 4; Ex. 1102, ¶ 78.

B. Petrovic

Petrovic is a U.S. Patent Application Publication of Application No. 12/414,892, filed March 31, 2009, that claims priority to, and incorporates by reference, U.S. Provisional Application 61/054,886 (“Petrovic ’886”).³ Ex. 1108, cover, [0001]. Petrovic is pre-AIA 35 U.S.C. § 102(e) prior art, as explained below. Ex. 1102, ¶¶ 79-80.

Petrovic, like the ’206 patent, describes a wideband receiver system that it calls a “channel stacking system” which receives RF signals 102-106. Ex. 1108, [0028]-[0029], Fig. 4; Ex. 1109, [0008], [0010]-[0013], [0016], [0023], [0026], Fig. 1; Ex. 1102, ¶ 81.

³ The specification and drawings of Petrovic ’886, cited by paragraph and figure numbers, are at pages 6-61 of Ex. 1109.

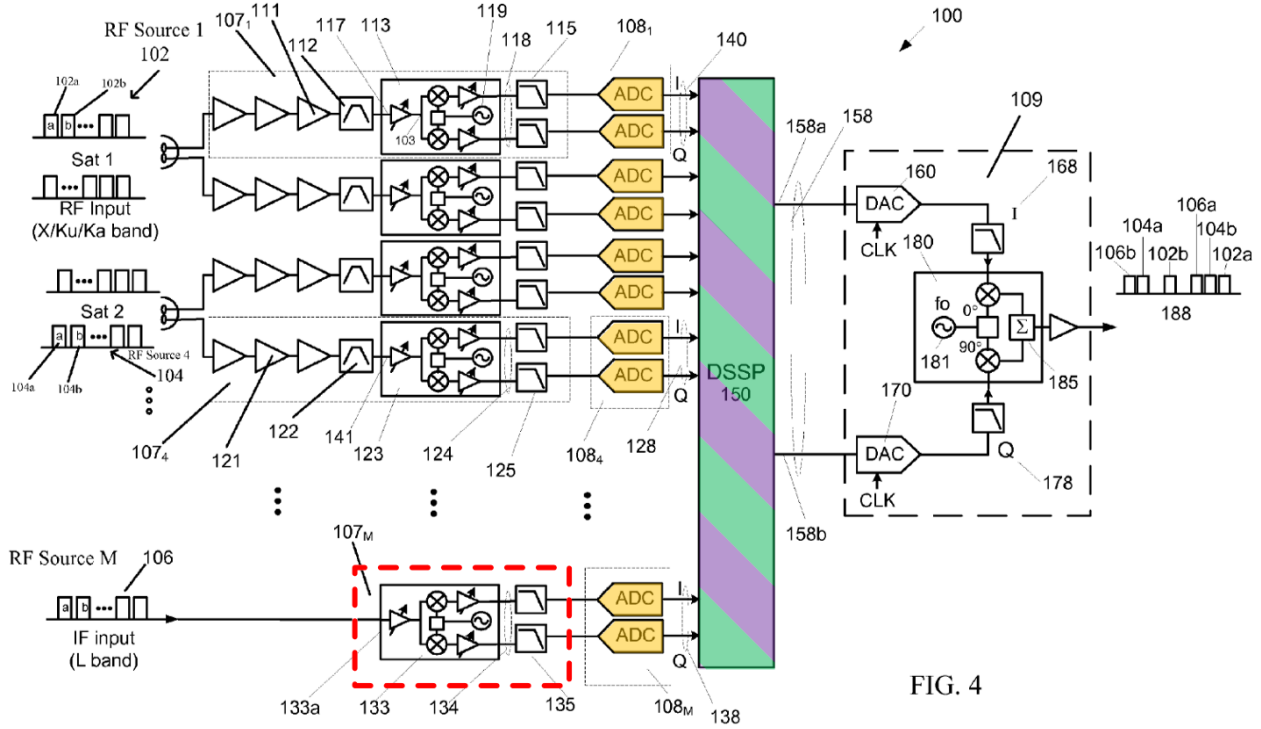
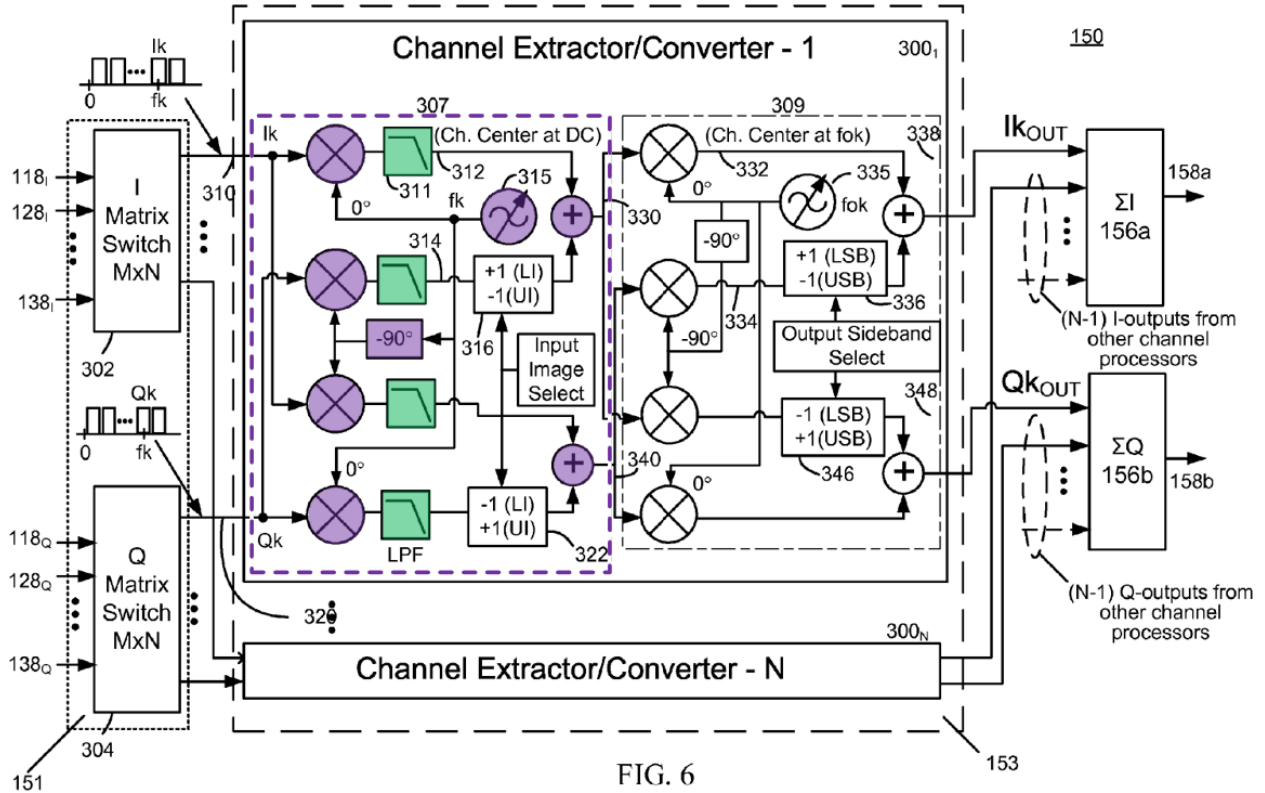


FIG. 4

Ex. 1108, Fig. 4 (annotated)

The received signals are wideband (*i.e.*, comprise multiple channels). Ex. 1108, [0029], Fig. 4; Ex. 1109, [0016], Fig. 1; Ex. 1102, ¶ 82. The signals 102-106 are coupled to respective “analog preprocessing and downconversion (APD) stages 107_{1-M}” (one marked in **red**). Ex. 1108, [0032], Fig. 4; Ex. 1109, [0010], [0013], [0020], Fig. 1; Ex. 1102, ¶ 82. Those APD stages downconvert RF signals into in-phase (I) and quadrature (Q) intermediate frequency (IF) components that are, after filtering, digitized in analog-to-digital converters 108_{1-M} (**gold**). Ex. 1108, [0032]-[0039], [0050]-[0052], Figs. 4-6; Ex. 1109, [0010], [0013], [0018]-[0024], [0031]-[0032], Figs. 1-3A; Ex. 1102, ¶ 82.

A digital signal switching and pre-processing (DSSP) stage 150 (green/purple) receives the digitized components and “extract[s] the channels of interest ... (i.e., remove[s] all the channels that are not of interest).” Ex. 1108, [0040], [0042], Fig. 4; Ex. 1109, [0015], [0025], [0033], Fig. 1; Ex. 1102, ¶ 83. Figure 6 shows additional details of the DSSP 150, including “channel extractor/converter circuit 300.” Ex. 1108, [0058]; Ex. 1109, [0033], Fig. 3A; Ex. 1102, ¶ 83.



Ex. 1108, Fig. 6 (annotated)

As in the '206 patent, a channel is extracted from the digitized I, Q components corresponding to one of the RF sources 102-106 by downconverting

those components in a complex mixer (purple and/or purple broken-line box) of a stage 307 so the desired channel is at baseband, and filtering using low pass filters 311 (green), to create I, Q components 330, 340 for an extracted channel. Ex. 1108, [0060]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 84.

Petrovic, in the same field of endeavor as the '206 patent and reasonably pertinent to problems with which the '206 patent is concerned, is analogous art. Ex. 1102, ¶ 85. Like the '206 patent, Petrovic describes a system and method for receiving a wideband RF signal comprising multiple channels. *Id.*; Ex. 1108, [0029], Fig. 4; Ex. 1109, [0010]-[0011], [0013], [0016], [0020], [0023], Fig. 1. And, Petrovic describes selecting individual channels by conversion to baseband and filtering in the same way as the '206 patent. Ex. 1101, 6:16-7:9, Fig. 3; Ex. 1108, [0042], [0058]-[0077], Fig. 6; Ex. 1102, ¶ 85.

1. Petrovic Priority Date

Petrovic is pre-AIA 35 U.S.C. § 102(e) prior art based on its March 31, 2009, filing date, and based on the May 21, 2008, filing date of Petrovic '886. At least claim 14 of Petrovic is supported by Petrovic '886. Ex. 1102, ¶¶ 86-87; *see Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015).

Petrovic – Claim 14 (Ex. 1108)	Petrovic '886 (Ex. 1109)
14. A method for assembling channels in a composite signal, the method comprising:	<i>E.g.</i> , [0001], [0004], [0008], claim 16

Petrovic – Claim 14 (Ex. 1108)	Petrovic '886 (Ex. 1109)
a) downconverting, in a single frequency translation process, a first input signal comprising a first plurality of channels to a first IF signal comprising said plurality of first channels;	[0005], [0010], [0014], [0029], [0031]-[0032], claim 16, Figs. 1-2
b) converting the first IF signal into a first digital IF signal;	[0010], claim 16, Fig. 1
c) downconverting, in a single frequency translation process, a second input signal comprising a plurality of second channels to a second IF signal comprising said plurality of second channels;	[0005], [0013]-[0014], [0023], [0029], [0031]-[0032], claim 16 Figs. 1-2
d) converting the second IF signal into a second digital IF signal; and	[0005], [0013], [0024], claim 16, Fig.1
e) assembling, in the digital domain, at least one of the first channels and at least one of the second channels into a digital composite signal.	[0015], [0025], [0036]-[0068], [0080], claim 16, Figs. 3A-3B

Parallel citations to Petrovic and Petrovic '886 show that relied-on disclosure is prior art as of the May 21, 2008, filing date of Petrovic '886.

2. Pre-AIA 35 U.S.C. § 103(c) Does Not Apply

Petrovic was assigned to Entropic Communications, Inc. until April 30, 2015. Ex. 1108, cover; Ex. 1110, p. 3. The claimed invention of the '206 patent was not,

at the time made, owned by Entropic Communications, Inc. Ex. 1170, pp. 2-5. Thus, Petrovic cannot be avoided under pre-AIA 35 U.S.C. § 103(c).⁴

C. Burris

Burris, an October 4, 2007, U.S. Patent Application Publication, is pre-AIA 35 U.S.C. § 102(b) art. Ex. 1159, cover. Burris describes coaxial connector assemblies that may be used, e.g., for connection to ports on cable television devices. Ex. 1159, [0005]; Ex. 1102, ¶ 88. Burris is analogous art because it relates to a claimed feature (“cable network connector”) and is reasonably pertinent to problems with which the ’206 patent is concerned. Ex. 1159, [0005]; Ex. 1102, ¶ 88.

D. Maalej

Maalej, a U.S. Patent that issued December 12, 2000, is pre-AIA 35 U.S.C. § 102(b) prior art. Ex. 1160, cover. Maalej discloses a QAM demodulator for, e.g., demodulating 6 MHz CATV channels. Ex. 1160, 1:6-8, 1:28-33, 3:47-52; Ex. 1102, ¶ 89. Maalej is analogous art because it relates to a claimed feature (“demodulating”) and is reasonably pertinent to problems with which the ’206 patent is concerned. Ex. 1160, 1:6-8, 1:28-32, 3:47-52; Ex. 1102, ¶ 89.

⁴ Patent Owner has the burden under pre-AIA 35 U.S.C. § 103(c). *Global Tel*Link Corporation v. Securus Technologies, Inc.*, IPR2014-00825, Paper 36, p. 11 (PTAB Dec. 2, 2015).

E. Rabaey

Rabaey is a textbook on digital integrated circuit design. Ex. 1116, p. 1. Rabaey was published by October 22, 2003, and publicly available to a POSITA by that date, and is pre-AIA 35 U.S.C. § 102(b) prior art. Ex. 1173, ¶¶ 47-54. Rabaey is reasonably pertinent to problems with which the '206 patent is concerned, and is analogous art to the '206 patent on at least that basis. Ex. 1102, ¶ 90. Integrated circuits were widely used to implement digital processing in electronics, which the '206 patent describes at length. Ex. 1101, 5:48-7:19, Figs. 2-3; Ex. 1116, pp. 17 (recognizing “continuous trend towards digital solutions in all other areas of electronics”), 28 (“The purpose of this textbook is to provide a bridge between the abstract vision of digital design and the underlying digital circuit and its peculiarities.”); Ex. 1102, ¶ 90. Rabaey describes the “commonly known methods” of sending “a serial or parallel digital data stream to a demodulator using a serial or parallel data interface” that the '206 patent also references. Ex. 1101, 7:10-14; Ex. 1102, ¶ 90.

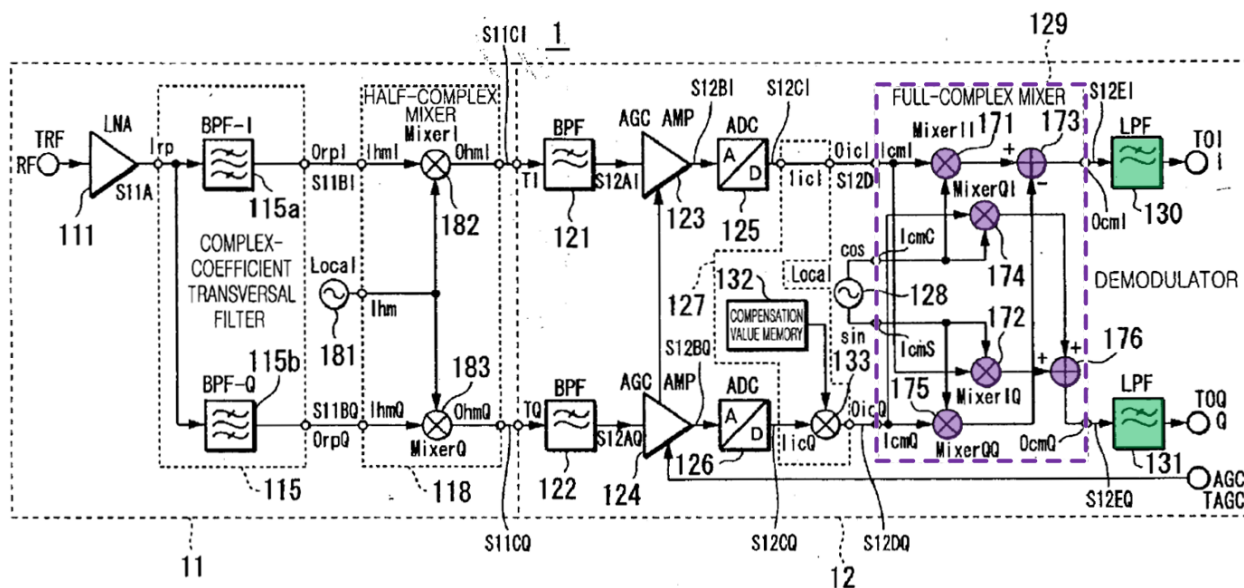
F. Lee

Lee, a February 14, 2008, U.S. Patent Application Publication, is pre-AIA 35 U.S.C. § 102(b) prior art. Ex. 1153, cover. Lee describes a STB that receives cable broadcasting signals. Ex. 1153, [0035]; Ex. 1102, ¶ 91. Lee is analogous art, as it is in the same field of endeavor as the '206 patent (e.g., receiving cable signals) and

describes a STB having claimed features (DOCSIS channels, picture-in-picture display), and is reasonably pertinent to problems with which the '206 patent is concerned. Ex. 1153, [0007], [0031]; Ex. 1102, ¶ 91.

G. Takahiko

Takahiko, a November 16, 2006, U.S. Patent Application Publication, is pre-AIA 35 U.S.C. § 102(b) prior art. Ex. 1161, cover. Takahiko discloses a downconverter of a radio receiver that includes a digital baseband complex mixer (purple) and low pass filters (green) similar to those of the '206 patent. Ex. 1161, [0143], [0153], [0156]; Ex. 1102, ¶ 92.



Ex. 1161, Fig. 1 (annotated)

Takahiko, by describing circuits also described by the '206 patent, and which are used for similar purposes (reception and tuning of RF signals), is reasonably

pertinent to problems with which the '206 patent is concerned, and is analogous art.

Ex. 1161, [0143]-[0156], Fig. 1; Ex. 1102, ¶ 93.

V. IDENTIFICATION OF CHALLENGE PURSUANT TO 37 C.F.R. § 42.104(b)

A. Claims for Which Review is Requested and Grounds on Which Challenge Is Based

Petitioner requests review of claims 1-76 on the following pre-AIA 35 U.S.C.

§ 103 grounds.

Ground	References	Claims Challenged
A	Cholas-Petrovic	25-26, 31, 35, 38-41, 43-44, 48
B	Cholas-Petrovic-Burris	26, 39
C	Cholas-Petrovic-Maalej	31, 43-44
D	Cholas-Petrovic-Rabaey	1-2, 7-9, 11, 13-16, 18-21, 23, 32-34, 45-47
E	Cholas-Petrovic-Takahiko	27-30, 42
F	Cholas-Petrovic-Takahiko-Maalej	30
G	Cholas-Petrovic-Rabaey-Maalej	7-8, 18-20, 32, 45
H	Cholas-Petrovic-Lee	36-37, 49-52, 57, 61-67, 69-70, 74-76
I	Cholas-Petrovic-Lee-Burris	52, 65
J	Cholas-Petrovic-Lee-Maalej	57, 69-70
K	Cholas-Petrovic-Lee-Rabaey	10, 12, 22, 24, 58-60, 71-73
L	Cholas-Petrovic-Lee-Takahiko	53-56, 68

M	Cholas-Petrovic-Takahiko-Lee-Maalej	56
N	Cholas-Petrovic-Lee-Maalej-Rabaey	58, 71
O	Cholas-Petrovic-Rabaey-Burris	2, 14
P	Cholas-Petrovic-Rabaey-Takahiko	3-6, 17
Q	Cholas-Petrovic-Rabaey-Takahiko-Maalej	6

None of the prior art listed in the above table was cited during prosecution of the '206 patent.

A supporting declaration of David B. Lett includes, e.g., a discussion of Mr. Lett's background, the '206 patent, the prior art, and his opinions, and an explanation of the bases for those opinions. Ex. 1102, ¶¶ 1-263. Mr. Lett at least meets the level of skill of a POSITA. *Id.*, ¶¶ 4-16, 31; Ex. 1103.

B. Summary of Claims

The '206 patent has 6 independent claims (1, 13, 25, 38, 51, and 64), with 10-12 dependent claims each. Independent claims 1, 25, and 51 are nearly identical, with each reciting “receiving an input from a cable network,” “digitizing ... via a wideband analog-to-digital converter ... all received channels that exist in the input signal,” “selecting ... desired channels from the input signal without selecting ... undesired channels,” and “providing the plurality of desired channels.” Claims 1, 25, and 51 only differ based on choice of a single, well-known ancillary feature: “a

serial interface” (claim 1), “a digital video recorder” (claim 25), or “a picture-in-picture” display (claim 51).

Independent claims 13, 38, and 64 are also nearly identical, with each reciting “receiving an input signal from a cable network,” “digitizing all received channels in the input signal via a wideband analog-to-digital converter,” and “digitally down converting each desired channel ... to generate a plurality of digital channel outputs.” Claims 13, 38, and 64 only differ based on the same well-known ancillary features: “a serial interface” (claim 13), “a digital video recorder” (claim 38), or “a picture-in-picture” display (claim 64).

Cholas in view of Petrovic teaches the “receiving an input...,” “digitizing...,” “selecting.../“digitally down converting...,” and “providing...” steps of the independent claims, as well as a digital video recorder and numerous other claim features. Rabaey and Lee respectively show that a serial interface (claims 1 and 13) and a picture-in-picture display (claims 51 and 64) were well known features.

The dependent claims are directed to known features such as “communicating ... via at least one of an analog amplifier and an analog filter” (claims 2, 14, 26, 39, 52, 65), generating complex signals having I and Q components (claims 3, 15, 27, 40, 53, 66), baseband I and Q complex signal components (claims 4, 16, 28, 41, 54, 67), filtering complex signals (claims 5, 17, 29, 42, 55, 68), demodulating complex signals/desired channels (claims 6/7, 18/19, 30/31, 43/44, 56/57, 59/70), output via

a parallel interface (claims 8, 20, 32, 46, 59, 71), a cable broadcast channel (claims 9, 21, 35, 48, 61, 74), and a DOCSIS channel (claims 10, 22, 36, 49, 62, 75). To the extent any of these additional features are not also taught by Cholas or Petrovic, the remaining references (Lee, Burris, Rabaey, Maalej, and Takahiko) show such features to be well-known.

C. 314(a) Discretion Does Not Apply

The *Fintiv* factors as set forth in the Director's June 21, 2022, Guidance Memorandum do not warrant discretionary denial.

Factor one appears neutral. Petitioner has filed IPR petitions challenging all eight patents asserted in the District Court in case no. 2:23-cv-01050. If trial is instituted, and the case is not dismissed based on Petitioner's motion to dismiss the Second Amended Complaint, then Petitioner expects to request a stay, as decisions in Petitioner's favor would resolve the dispute in its entirety.

Factor two favors institution. Petitioner has filed a motion to dismiss the District Court case, Patent Owner has filed an Amended Complaint, and Petitioner will renew its Motion to Dismiss in order to seek dismissal of the operative complaint. In addition, no schedule beyond claim construction has been entered, and the Court has not set a trial date.

Factor three favors institution. To date, the investment by the District Court has been limited to considering motions to dismiss on the pleadings.

Factor four strongly favors institution. The petition challenges all claims in the '206 Patent while only claims 13-14, 19, 21, 23, 25-26, 31, 34-35, 38-39, 44, and 47-48 are asserted in the District Court.

Factor five does not warrant denial as Petitioner is a defendant in the District Court case.

Factor six favors institution. Petitioner presents compelling unpatentability challenges that merit institution.

D. 325(d) Discretion Does Not Apply

Considering the two-part framework discussed in *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*, IPR2019-01469, Paper 6, pp. 8-9 (PTAB Feb. 13, 2020), the Board should not exercise its §325(d) discretion to deny institution. The grounds raised by this Petition are not the same or substantially the same as the art and arguments raised during prosecution, and to the extent that they are, the Examiner erred in a manner material to the patentability of the challenged claims by failing to find and consider all of the relevant prior art, including Cholas and Petrovic, that teach the limitations of the independent and dependent claims.

E. Level of Ordinary Skill

A person of ordinary skill in the art (a “POSITA”) at the time of the alleged invention would have had a degree in electrical engineering, or a similar discipline, along with three-to-four years of experience with digital signal processing (DSP)

and RF tuning systems for satellite and/or cable communications. Ex. 1102, ¶¶ 30-32. Additional education may substitute for professional experience, and significant work experience may substitute for formal education. *Id.*

F. Claim Construction

All claim terms herein should be given their ordinary and customary meaning to a POSITA, as they would be given in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b). Petitioner does not contend that the claims include any means-plus-function limitations.

The claims use the term “wideband.” The ’206 patent implicitly defines “wideband” as a band that carries multiple channels. For example, the ’206 patent states that a receiver is “wideband” if it is “designed to concurrently receive several TV channels.” Ex. 1101, 1:36-39. This is consistent with the ordinary and customary meaning of “wideband.” Ex. 1102, ¶¶ 33-34.⁵

⁵ The ’206 patent also states that “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.” Ex. 1101, 1:30-34. This does not change the ordinary meaning above for “wideband,” and in any event the claims only recite a “wideband analog-to-digital converter,” not a “wideband receiver system.”

VI. SPECIFIC GROUNDS FOR UNPATENTABILITY

A. Cholas-Petrovic (Claims 25-26, 31, 35, 38-41, 43-44, 48)

Claims 25-26, 31, 35, 38-41, 43-44, and 48 are obvious over Cholas in view of Petrovic. Ex. 1102, ¶¶ 99-147, *see also* ¶¶ 46-75.

1. Independent Claim 25

a. [25A] “A method for receiving a television (TV) signal comprising:”

Cholas discloses non-limiting preamble [25A].⁶ Ex. 1102, ¶¶ 101-103. Cholas describes a method for a STB 1710 (**red**) to receive a television signal “from the cable network.” Ex. 1158, [0010]-[0011], [0022], [0024], [0044], [0059]-[0071], Figs. 4, 6; Ex. 1102, ¶ 102.

⁶ The limitations of the claims appear and are labelled in the Claims Listing Appendix.

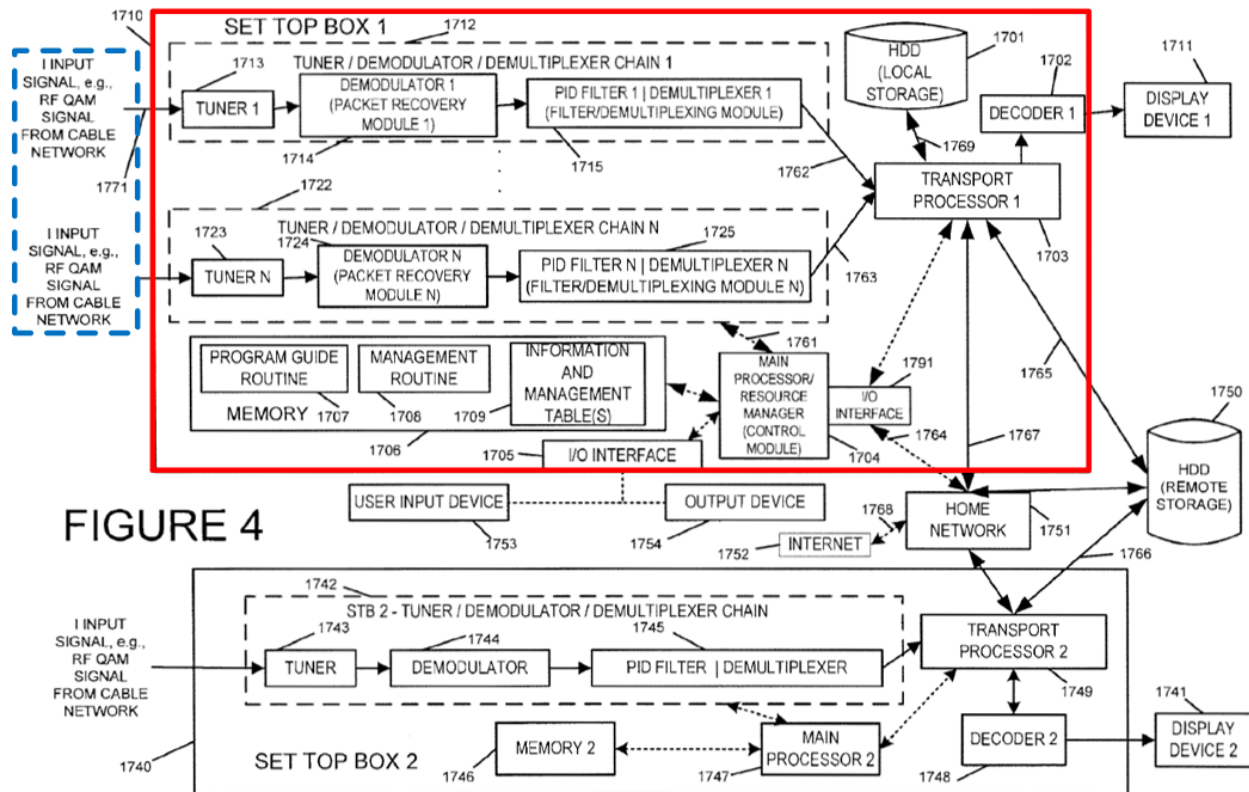


FIGURE 4

Ex. 1158, Fig. 4 (annotated)

The STB receives an input signal (blue) having RF QAM (quadrature amplitude modulation) channels carrying TV programs. Ex. 1158, Abstract, [0001]-[0002], [0004], [0006], [0011]-[0017], [0033], [0044], [0052]-[0057], Fig. 5; Ex. 1102, ¶ 103.

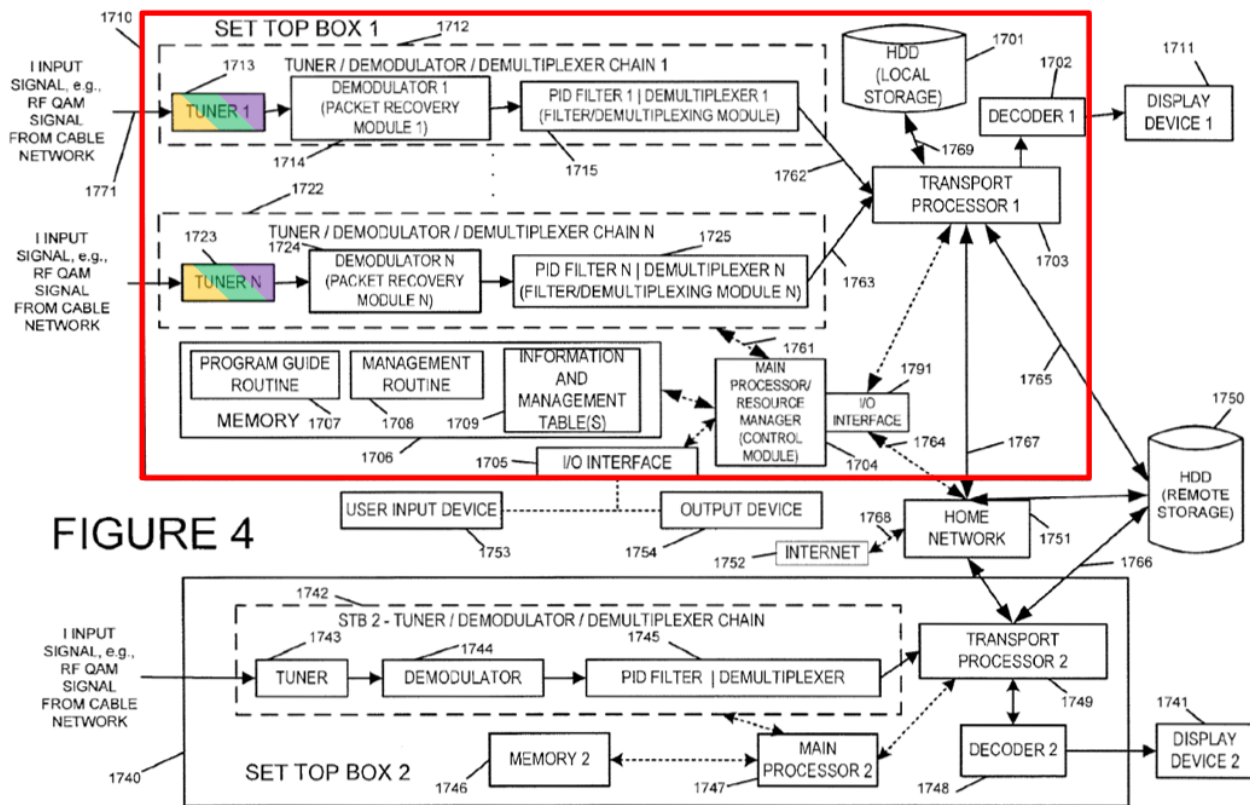
b. [25B] “receiving an input signal from a cable network;”

Cholas discloses limitation [25B]: STB 1710 “receives an input signal ... from the cable network.” Ex. 1158, [0010]-[0011], [0024], [0044], [0059]-[0071], Figs. 4, 6; Ex. 1102, ¶¶ 104-105.

- c. **[25C] “digitizing a contiguous band of frequencies in the input signal via a wideband analog-to-digital converter (ADC), wherein the contiguous band of frequencies comprises all received channels that exist in the input signal and the received channels comprise a plurality of desired channels and a plurality of undesired channels;”**

Cholas in view of Petrovic discloses limitation [25C]. Ex. 1102, ¶¶ 106-120.

Cholas STB 1710 receives an input signal comprising a contiguous band of frequencies comprising all received channels that exist in the input signal, and the received channels comprise desired and undesired channels. Ex. 1102, ¶ 107. According to Cholas, “[a] typical RF signal enters” the STB 1710 “with multiple carriers between, e.g., frequencies 50-1000 MHz.” Ex. 1158, [0045]; Ex. 1102, ¶ 107. Notably, that bandwidth is greater than the 800 MHz “wide bandwidth” of the ’206 patent. Ex. 1101, 2:34; Ex. 1102, ¶ 107. Each of the tuners (gold/green/purple striped) of the STB 1710 “selects a single 6 MHz carrier frequency and passes the signal corresponding to the band” to a demodulator. Ex. 1158, [0045]; Ex. 1102, ¶¶ 108-109.



Ex. 1158, Fig. 4 (annotated)

Because a channel is tuned by one of the tuners 1713-1723 in response to user selection of a program carried on that channel, it is a “desired” channel. Ex. 1158, [0059]-[0063]; Ex. 1102, ¶ 110. In a conventional cable TV system with numerous 6 MHz channels between 50-1000 MHz, such as Cholas describes, there are “undesired” channels that are not tuned by a particular STB. Ex. 1158, [0045]; Ex. 1102, ¶ 110.

Petrovic discloses a channel stacking system 100 that performs tuning functions similar to those described by Cholas, and that includes a wideband ADC that digitizes a contiguous band of frequencies in an input signal. Ex. 1102, ¶ 111.

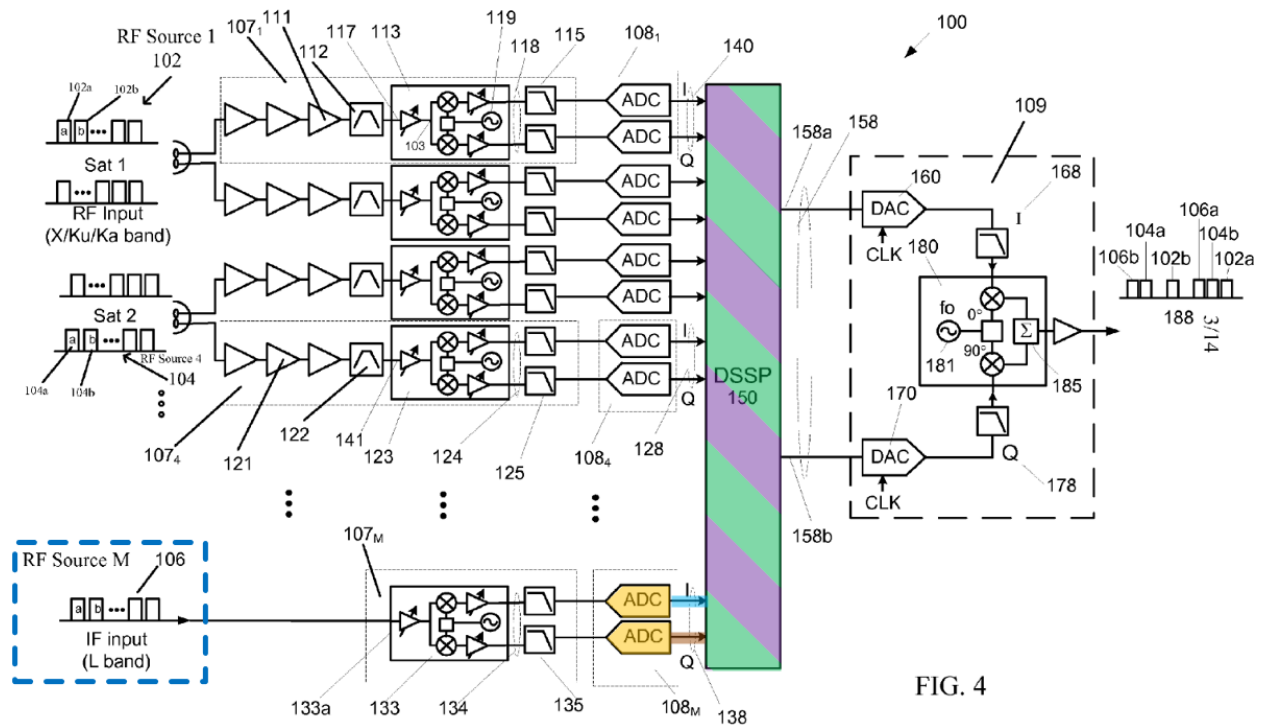


FIG. 4

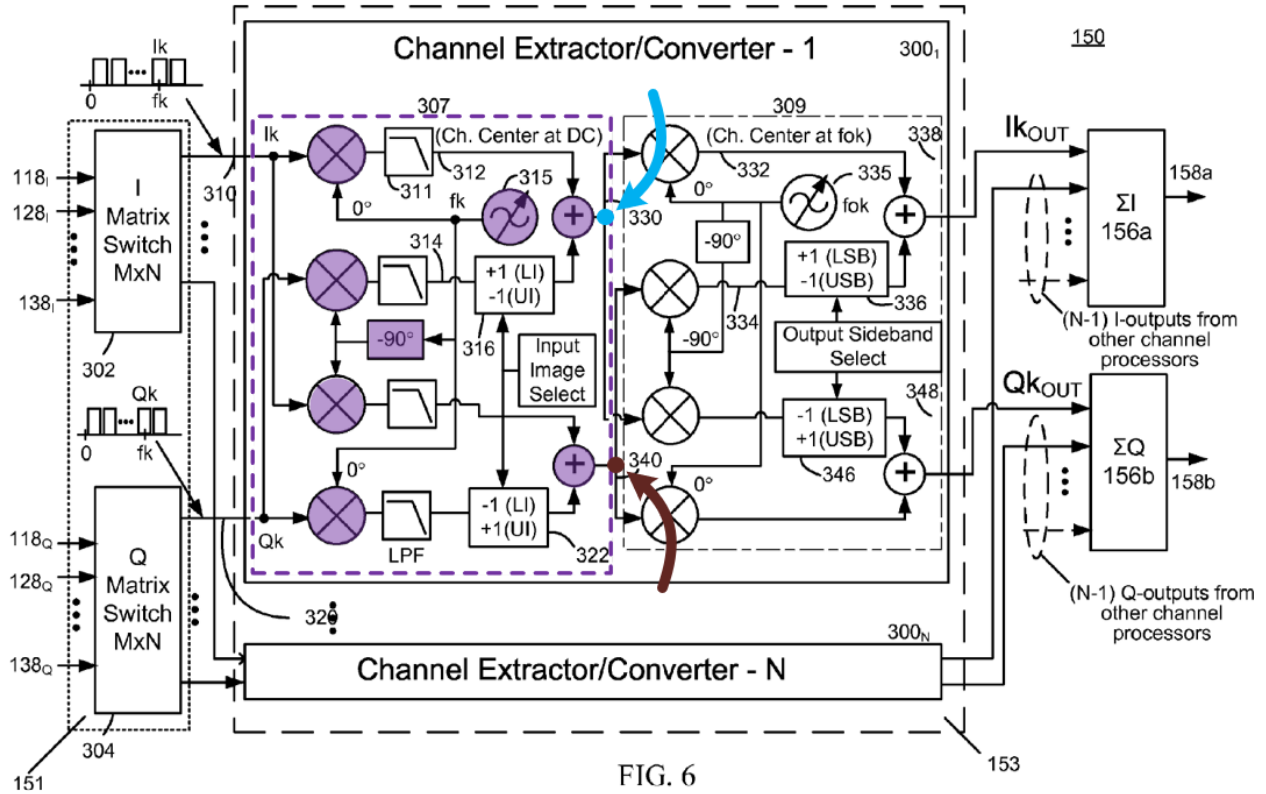
Ex. 1108, Fig. 4 (annotated)

The system 100 receives signal 106 (blue broken-line box) that may be between 950-2150 MHz. Ex. 1108, [0029], [0031], [0050], Fig. 4; Ex. 1109, [0012], [0020], [0028], Fig. 1; Ex. 1102, ¶ 111. Signal 106 is wideband, as it comprises multiple channels. Ex. 1108, [0050], Fig. 4; Ex. 1109, [0028], Fig. 1; Ex. 1102, ¶ 111. Moreover, the bandwidth of the signal 106 is greater than the 800 MHz “wide bandwidth” of the ’206 patent. Ex. 1101, 2:34; Ex. 1102, ¶ 111.

A downconverter in “analog preprocessing and downconversion (APD)” stage 107_M downconverts RF signal 106 into I, Q intermediate frequency (IF) components 134. Ex. 1108, [0032]-[0035], [0050], Figs. 4-5; Ex. 1109, [0020], [0028], [0031], [0032], Figs. 1-2; Ex. 1102, ¶ 112. The downconverted I, Q

components 134 are filtered and then converted to digital form in analog-to-digital converters (ADCs) 108_M (gold). Ex. 1108, [0048], [0050], [0052], Fig. 4; Ex. 1109, [0020], [0022], [0028], Fig. 1; Ex. 1102, ¶ 112. The entire band provided by the APD stage 107_M, which includes all received channels that exist in the signal 106, is digitized by the ADCs 108_M to generate digital I (blue), Q (brown) components 138, and the ADCs 108_M are thus “wideband.” Ex. 1108, [0039], Fig. 4; Ex. 1109, [0029]; Ex. 1102, ¶ 112.

Digital signal switching and pre-processing (DSSP) stage 150 (green/purple) receives the digitized components 138 and “extract[s] the channels of interest ... (i.e., remove[s] all the channels that are not of interest).” Ex. 1108, [0040], [0042], Fig. 4; Ex. 1109, [0015], [0025], [0033], Fig. 1; Ex. 1102, ¶ 113. Figure 6 shows additional details of the DSSP 150. Ex. 1108, [0058]; Ex. 1109, [0033], Fig. 3A; Ex. 1102, ¶ 113.

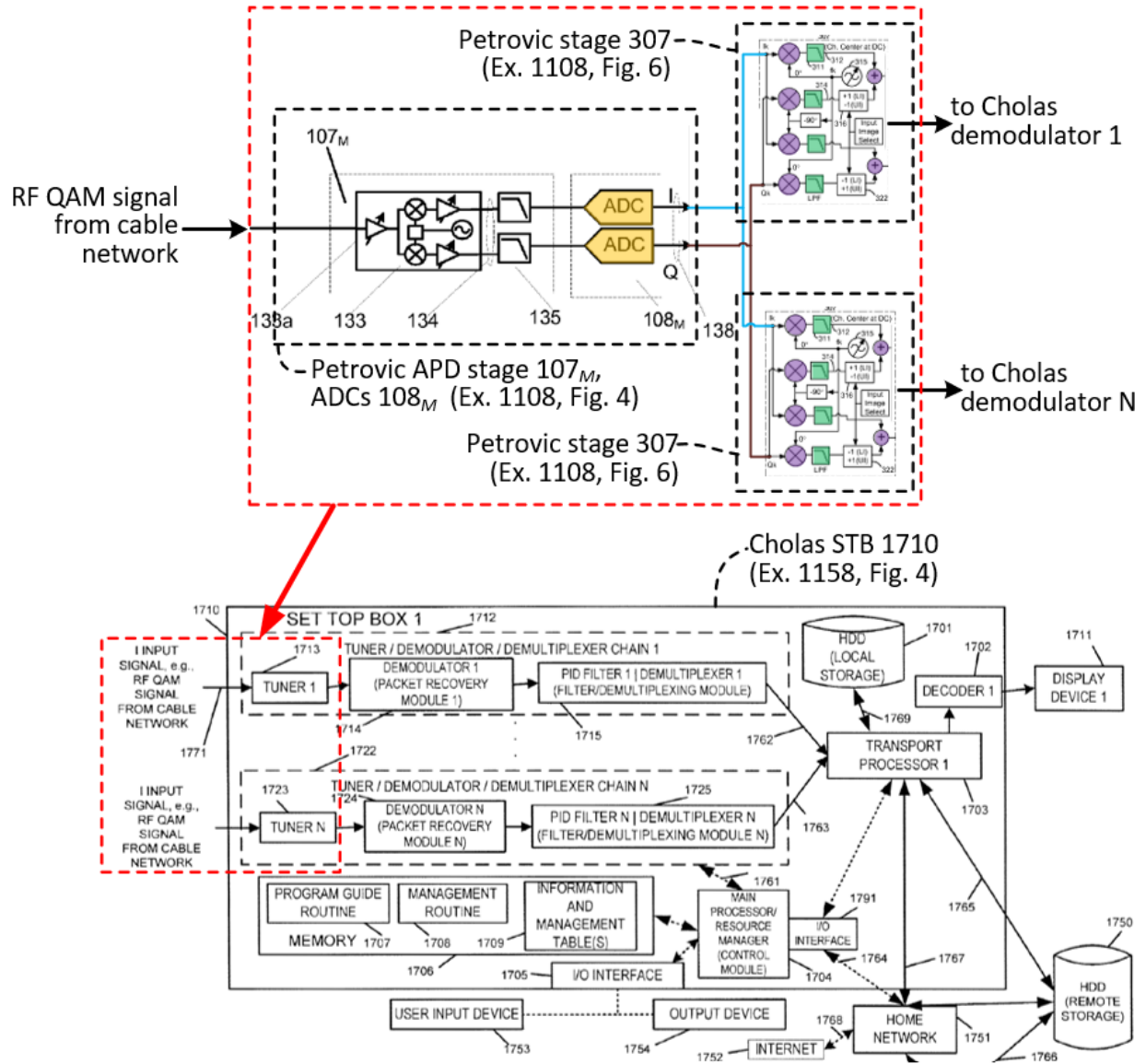


Ex. 1108, Fig. 6 (annotated)

The DSSP 150 includes multiple circuits 300, with each circuit 300 comprising a stage 307, and with each of those stages 307 able to select a different channel. Ex. 1108, [0055], [0059]-[0077], Fig. 6; Ex. 1109, [0033], [0037]-[0054], Fig. 3A; Ex. 1102, ¶ 114. A stage 307 extracts a channel from the digitized I, Q components 138_I, 138_Q corresponding to the RF source 106 by downconverting those components so that a desired channel is at baseband, and filtering, in a complex mixer (**purple** and **purple** broken-line box). Ex. 1108, [0060]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 114. The frequency f_k used for the downconversion is selected based on a frequency corresponding to a desired channel. Ex. 1108, [0066];

Ex. 1109, [0045]; Ex. 1102, ¶ 114. The complex mixer of a stage 307 generates and outputs, from the adders (unnumbered purple “ $\oplus$ ” symbols), a quadrature pair comprising an I component 330 (blue dot and arrow) and a Q component 340 (brown dot and arrow) corresponding to a selected/desired channel. Ex. 1108, [0077]; Ex. 1109, [0054]; Ex. 1102, ¶ 114.

In a Cholas-Petrovic system, the Cholas tuners 1-N (tuners 1713-1723) would have been replaced with a single Petrovic tuner that would have included the Petrovic APD stage 107_M, ADCs 108_M, and multiple stages 307 of the DSSP 150. Ex. 1102, ¶ 115. Each of the stages 307 would, like one of the replaced Cholas tuners 1-N, output a signal (a digital I, Q pair 330, 340) corresponding to a selected “desired” channel. Ex. 1102, ¶ 115. Below is an annotated Figure, prepared using excerpts from Cholas Figure 4 and Petrovic Figures 4 and 6, showing the Cholas-Petrovic system. Ex. 1102, ¶115.



Cholas-Petrovic System

In the Cholas-Petrovic system, the entire received band is output by the Petrovic APD stage 107_M, including all received channels that exist in the input RF QAM signal (desired and undesired). Ex. 1102, ¶ 116. All of these channels would be digitized by the ADCs 108_M, with the desired channels later being selected by stages 307 of Petrovic's DSSP, as explained below with respect to Element [25D].

Ex. 1108, [0039], Fig. 4; Ex. 1109, [0029]; Ex. 1158, [0045], [0052]-[0053], [0055]-[0056], Fig. 5; Ex. 1102, ¶ 116; *see* Section VI.A.1.d.

A POSITA would have been motivated to implement the Cholas STB with a single Petrovic tuner (e.g., the Petrovic APD stage 107_M, ADCs 108_M, and multiple stages 307 of the DSSP 150) instead of multiple separate tuners 1713-1723. Ex. 1102, ¶ 117. Implementing the Cholas STB with a single tuner would have beneficially simplified the STB and reduced the number of components. *Id.* And although Cholas does not disclose the tuners 1713-1723 performing downconversion, downconversion of a received RF signal prior to further processing was a standard technique used in receivers. *Id.*, ¶¶ 62-67, 117. A single downconverter (as part of the APD stage 107_M) would use less power and be less expensive to implement than separate downconverters for each of multiple tuners. *Id.*, ¶ 117.

Using a single Petrovic tuner would also have improved the Cholas STB with digital tuning. Ex. 1102, ¶ 118. For example, selecting channels in the digital domain avoids the need for bandpass filtering and Hilbert transformers, thereby reducing circuit complexity and power consumption. *Id.*; Ex. 1108, [0007], [0096]; Ex. 1109, [0003], [0069].

Implementing the Cholas STB with a Petrovic tuner instead of multiple separate tuners would have been a simple substitution of one known element for

another to obtain predictable results. Ex. 1102, ¶ 118. For numerous reasons, A POSITA would have been able to substitute a Petrovic tuner for the multiple tuners 1713-1723 of the Cholas STB, and the results would have been predictable. Ex. 1102, ¶ 119.

For example, and as explained above, the output of each Petrovic stage 307 is an I, Q pair that corresponds to a selected channel. Ex. 1102, ¶ 119. Cholas shows that the output of each tuner is the input to a dedicated QAM demodulator. *Id.*; Ex. 1158, Fig. 4. Generating I, Q components was a well-known preliminary step in QAM demodulation. Ex. 1102, ¶¶ 53, 119. Indeed, and as discussed in more detail in Section VI.F for dependent claim 30 (which recites “demodulating[] via each demodulator of a plurality of demodulators”), it was known that QAM demodulators may digitize, and create I, Q components for, a signal being demodulated. Ex. 1160, 4:5-19, Fig. 2; Ex. 1102, ¶ 119. A POSITA would thus have recognized that outputs of Petrovic stages 307 usefully serve as inputs to existing demodulators. Ex. 1102, ¶ 119.

Modifying a Cholas STB to replace multiple separate tuners with a Petrovic tuner would also have been use of a known technique to improve a similar device in the same way. Ex. 1102, ¶ 120. For the reasons explained above, a POSITA could have applied the improvement of the Petrovic tuner (digital tuning, reduced

components, reduced power consumption) to the Cholas STB, and the results would have been predictable to a POSITA. Ex. 1102, ¶ 120.

- d. **[25D] “concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels; and”**

Cholas-Petrovic discloses limitation [25D]. Ex. 1102, ¶¶ 121-124. In Cholas, various channels are received in an input signal from a cable network, and multiple channels may be tuned (i.e., “selected”) concurrently. Ex. 1158, [0052]-[0053], [0055]-[0056]; Ex. 1102, ¶ 122; *see also* Ex. 1158, [0007], [0011]. This functionality remains in Cholas-Petrovic, as each of the multiple Petrovic stages 307 may select a channel while another of the stages 307 selects another channel. Ex. 1102, ¶ 122. In particular, the stages 307 operate in parallel to select different channels. Ex. 1108, [0055], [0059]-[0077], Fig. 6; Ex. 1109, [0033], [0037]-[0054], Fig. 3A; Ex. 1102, ¶ 122.

This can be seen in Figure 4 of Petrovic (annotated below), where input RF signal 106 comprises channels 106a (**red**) and 106b (**blue**). These channels are selected and output via parallel stages 307 within DSSP 150. Ex. 1108, [0050], Figs. 4, 6; Ex. 1109, [0020], Figs. 1, 3A; Ex. 1102, ¶ 123.

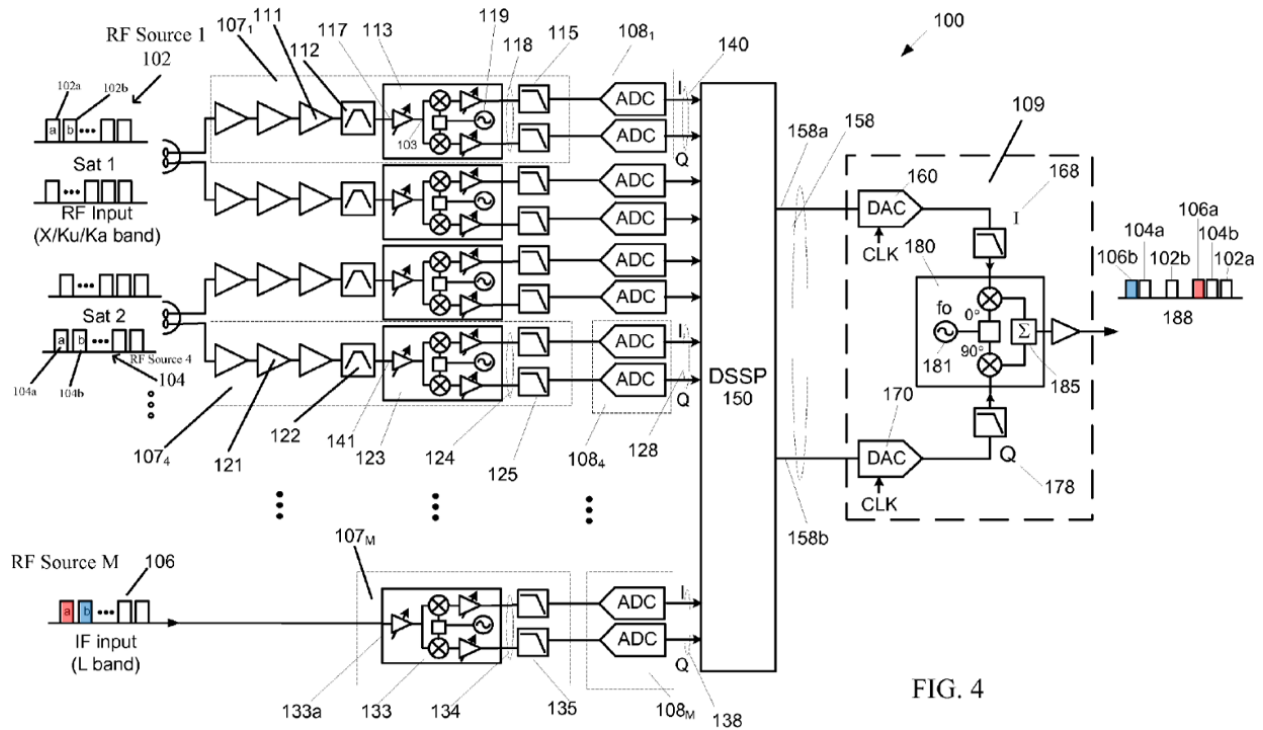


FIG. 4

Ex. 1108, Fig. 4 (annotated)

In the Cholas-Petrovic system, the stages 307 would be configured to concurrently select each of the plurality of desired channels without selecting undesired channels. Ex. 1158, [0052]-[0053], [0055]-[0056], Fig. 5; Ex. 1108, [0042], [0050], [0053], [0055], [0058], Figs. 4, 6; Ex. 1109, [0004]-[0005], [0015], [0020], [0025], [0033], [0036], Figs. 1, 3A; Ex. 1102, ¶ 124; *see also* Ex. 1158, [0007], [0011]. Because the Cholas STB tunes channels in response to user selection of programs carried on those channels, tuned (or selected) channels are “desired.” Ex. 1158, [0059]-[0063]. This would remain true in Cholas-Petrovic, as only the components used to perform tuning (vs. components that cause tuning to be

performed) would change. Ex. 1102, ¶ 124. “Undesired” channels would simply not be tuned. Ex. 1102, ¶ 124.

e. [25E] “providing the plurality of desired channels,”

Cholas-Petrovic discloses limitation [25E]. Ex. 1102, ¶¶ 125-126. In Cholas-Petrovic, and as explained in Section VI.A.1.c for limitation [25C], Petrovic’s stages 307 output (i.e., “provide”) desired channels (e.g., channels 106a and 106b) as I, Q components 330, 340. *Id.*; Ex. 1108, [0050], [0077], Figs. 4, 6; Ex. 1109, [0020], [0054], Figs. 1, 3A. Moreover, Cholas’ demodulators 1-N, which would remain in the Cholas-Petrovic system, would output (i.e., “provide”) tuned channels based on the I, Q components 330, 340 received from corresponding Petrovic stages 307. Ex. 1158, [0044]-[0045], Fig. 4; Ex. 1102, ¶ 126.

f. [25F] “wherein the method is performed by a device comprising a digital video recorder (DVR).”

Cholas discloses limitation [25F]. Ex. 1102, ¶¶ 127-128. STB 1710 comprises a DVR 1701 (**green**), and this DVR remains in the combined Cholas-Petrovic system. Ex. 1158, [0033] (“a digital storage device, e.g., a DVR, ... corresponding to the STB”), [0045] (streams can be directed to “internal HDD (local storage) 1701, typically a hard drive”), [0054]-[0057], Fig. 5; Ex. 1102, ¶ 128.

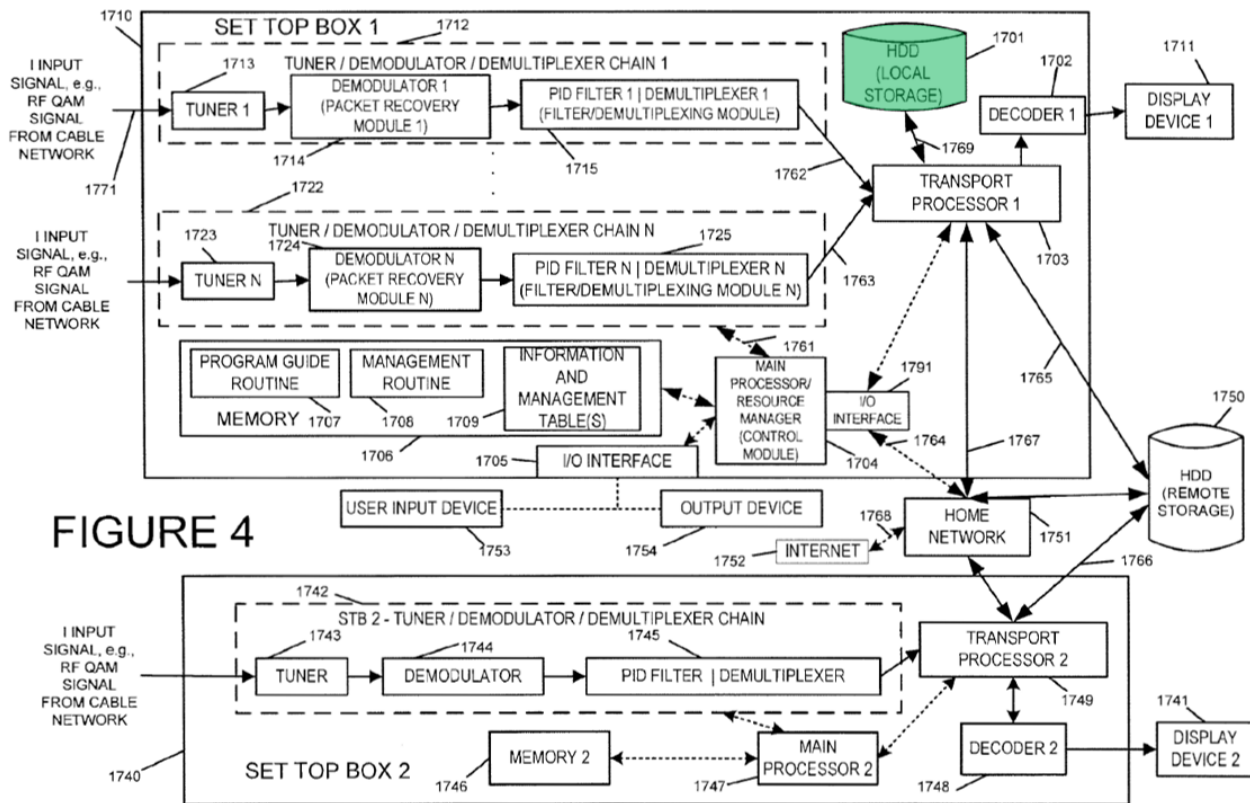


FIGURE 4

Ex. 1158, Fig. 4 (annotated)

2. Independent Claim 38

a. [38A] “A method comprising:”

Cholas-Petrovic discloses non-limiting preamble [38A] for the reasons explained for preamble [25A]. Ex. 1102, ¶¶ 129-130; *see* Section VI.A.1.a.

b. [38B] “receiving an input signal from a cable network;”

Cholas-Petrovic discloses limitation [38B] for the reasons explained for limitation [25B]. Ex. 1102, ¶ 131; *see* Section VI.A.1.b.

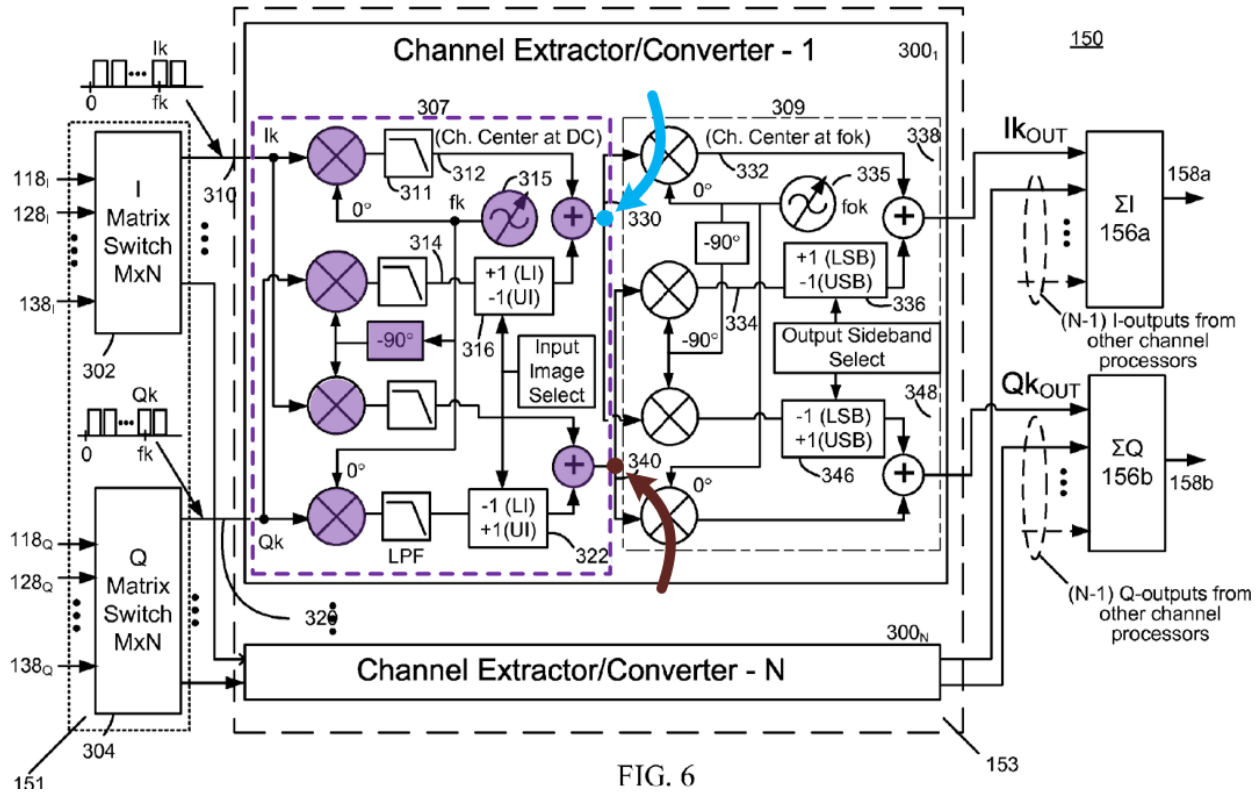
- c. **[38C] “digitizing all received channels in the input signal via a wideband analog-to-digital converter (ADC), wherein the received channels comprise a plurality of desired channels and a plurality of undesired channels; and”**

Cholas-Petrovic discloses limitation [38C] for the reasons explained for limitation [25C]. Ex. 1102, ¶¶ 132-133; *see* Section VI.A.1.c. For the reasons also explained for limitation [25C], a POSITA would have been motivated to implement the Cholas STB to include a single Petrovic tuner (e.g., the Petrovic APD stage 107_M, ADCs 108_M, and multiple stages 307 of the DSSP 150) as described for limitation [25C]. Ex. 1102, ¶ 133; *see* Section VI.A.1.c. To the extent there is any difference between limitation [25C] (“digitizing a contiguous band of frequencies in the input signal,”) and limitation [38C] (“digitizing all received channels in the input signal,”) both limitations are taught. Ex. 1102, ¶ 133. In Cholas-Petrovic, the entire band provided by the Petrovic APD stage 107_M, which includes all received channels (desired and undesired), is digitized by the ADCs 108_M. Ex. 1108, [0039], Fig. 4; Ex. 1109, [0029]; Ex. 1158, [0045], [0052]-[0053], [0055]-[0056], Fig. 5; Ex. 1102, ¶ 133.

- d. **[38D] “digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs,”**

Cholas-Petrovic discloses limitation [38D]. Ex. 1102, ¶¶ 134-136. Each of the Petrovic stages 307 includes a complex mixer (**purple**, broken-line **purple** box) that

digitally downconverts a signal (I, Q components 138_I and 138_Q) so that a desired channel is at baseband. Ex. 1108, [0060]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 135.



Ex. 1108, Fig. 6 (annotated)

Each of those stages also generates and outputs, from the adders (unnumbered purple “ $\oplus$ ” symbols), a digital quadrature pair comprising an I component 330 (blue dot and arrow) and a Q component 340 (brown dot and arrow) corresponding to a selected channel (claimed “plurality of digital channel outputs”). Ex. 1108, [0077]; Ex. 1109, [0054]; Ex. 1102, ¶ 136.

- e. [38E] “wherein the method is performed by a device comprising a digital video recorder (DVR).”

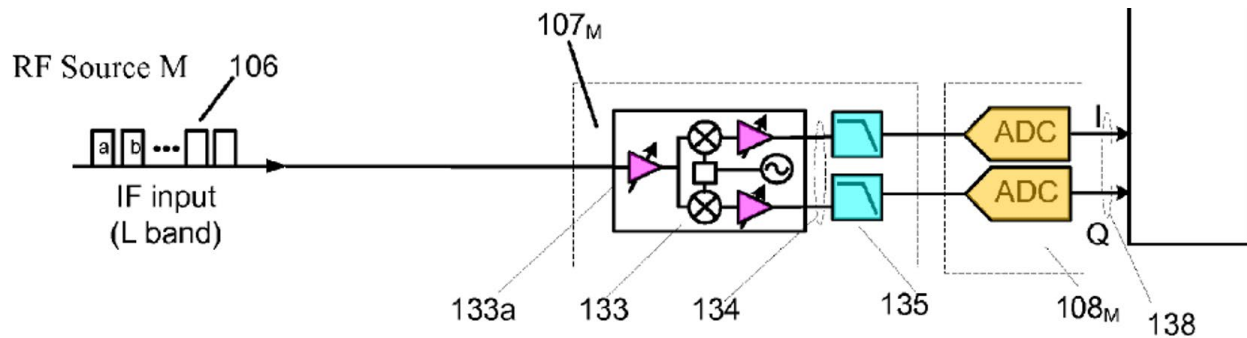
Cholas-Petrovic discloses limitation [38E] for the reasons explained for limitation [25F]. Ex. 1102, ¶ 137; *see* Section VI.A.1.f.

3. Claims 26, 39

[26/39] “The method of claim [25/38], wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.”

Cholas-Petrovic discloses claims 26 and 39. Ex. 1102, ¶¶ 138-140; *see also* Ex. 1102, ¶¶ 46-75. Because the Cholas STB 1710 receives input from a cable network, a POSITA would have known it obviously had a “cable network connector” so that it could connect to that cable network to receive the input signal. Ex. 1158, [0044]; Ex. 1102, ¶ 139. Unless the STB could be connected to the cable network, it would not be able to function properly. Ex. 1102, ¶ 139.

As to the remainder of claims 26 and 39, Petrovic’s stage 107 discloses an analog amplifier (**pink**) and an analog filter (**aqua**) between the RF signal input (which would be received via a cable network connector) and ADCs 108_M (**gold**). Ex. 1108, [0050], [0052], Figs. 4-5; Ex. 1109, [0020], [0031]-[0032], Figs. 1-2; Ex. 1102, ¶ 140.



Ex. 1108, Fig. 4 (excerpted and annotated)

In a Cholas STB implemented with a Petrovic tuner, the Petrovic analog amplifier and analog filter would be located between the cable network connector and the ADC pair 108_M. Ex. 1102, ¶ 140.

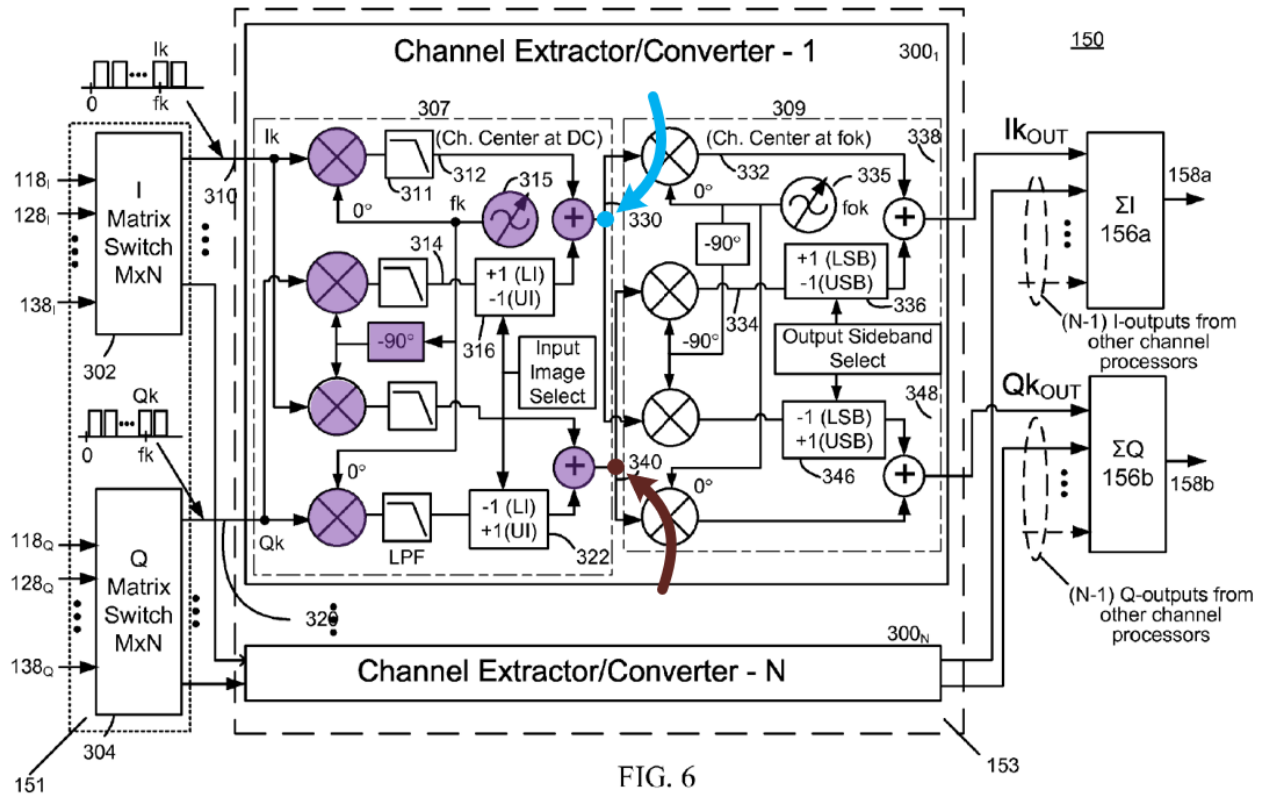
4. Claims 40, 41

[40] “The method of claim 38, wherein: digitally down converting comprises generating a corresponding complex signal for each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.”

[41] “The method of claim 40, wherein: the I and Q components of each corresponding complex signal are at baseband.”

Cholas-Petrovic discloses claims 40 and 41. Ex. 1102, ¶¶ 141-142. As explained in Section VI.A.2.d, each of the Petrovic stages 307 includes a complex mixer that digitally downconverts a signal (I, Q components 138_I and 138_Q) so that a desired channel is at baseband. Ex. 1108, [0060]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 142. Each of those complex mixers generates and outputs, from the adders (unnumbered purple “⊕” symbols) a quadrature pair (claimed

“corresponding complex signal”) comprising an I component 330 (blue dot and arrow) and a Q component 340 (brown dot and arrow) corresponding to a selected channel at baseband. Ex. 1108, [0060]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 142.



Ex. 1108, Fig. 6 (annotated)

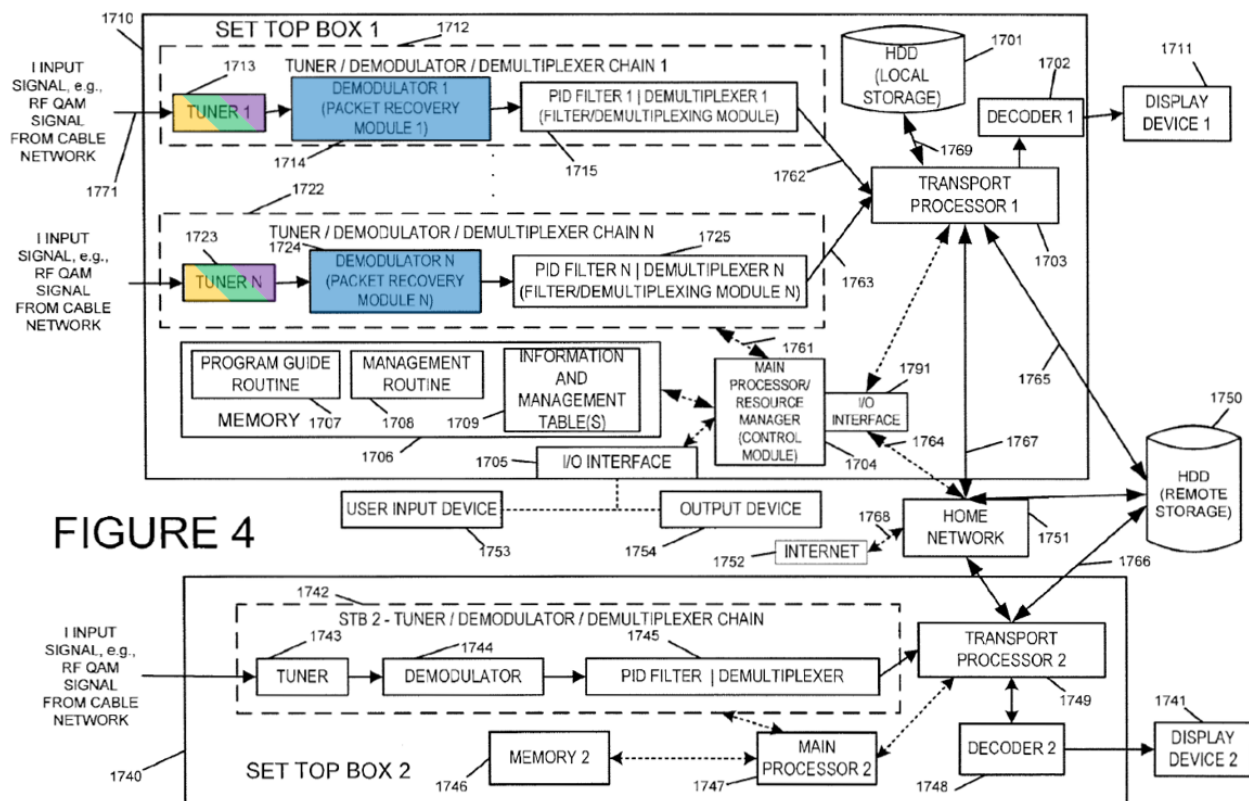
5. Claims 31, 43-44

[31] “The method of claim 25, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, a desired channel, of the plurality of desired channels.”

[43] “The method of claim 40, wherein the method comprises: demodulating the corresponding complex signal to provide a demodulated channel as a digital channel output.”

[44] “The method of claim 38, wherein the method comprises: demodulating each digitally down converted, desired channel to generate a plurality of demodulated channels.”

Cholas-Petrovic discloses claims 31 and 43-44. Ex. 1102, ¶¶ 143-145. Cholas discloses each tuner (gold/green/purple striped) outputting, to a respective demodulator (blue), a selected 6 MHz carrier frequency QAM channel. Ex. 1158, [0044]-[0045], [0050]-[0056], Figs. 4-5; Ex. 1102, ¶ 144.



Ex. 1158, Fig. 4 (annotated)

When implemented with a single Petrovic tuner instead of the multiple Cholas tuners, the Petrovic stages 307 would have outputted, to respective demodulators 1714-1724 of Cholas, I, Q pairs 330, 340 corresponding to selected channels. Ex. 1102, ¶ 145; Sections VI.A.1.c ([25C]), VI.A.2.d ([38D]). Those demodulators would then have demodulated the Cholas, I, Q pairs 330, 340 to provide demodulated channels. Ex. 1158, [0045]; Ex. 1102, ¶ 145.

6. Claims 35, 48

[35/48] “The method of claim [25/38], wherein: the plurality of desired channels comprises at least one cable broadcast channel.”

Cholas-Petrovic discloses claims 35 and 48. Ex. 1102, ¶¶ 146-147. In the combined system, the Cholas STB receives cable broadcast channels. Ex. 1158, [0004]-[0006], [0044]-[0057], Figs. 4-5; Ex. 1102, ¶ 147.

B. Cholas-Petrovic-Burris (Claims 26, 39)

Even if claims 26 and 39 are not obvious over Cholas-Petrovic (they are, as explained in Section VI.A.3), they are obvious over Cholas-Petrovic in view of Burris. Ex. 1102, ¶¶ 149-150, *see also* ¶¶ 46-75. Burris teaches that a cable network connector in the form of a coaxial port was a known feature of STBs. Ex. 1159, [0005]; Ex. 1102, ¶ 150. A POSITA would have included a coaxial port such as that taught in Burris in the Cholas STB 1710 because it was a known, routine way of connecting an STB to a cable network. Ex. 1102, ¶ 150.

C. Cholas-Petrovic-Maalej (Claims 31, 43-44)

Even if claims 31 and 43-44 are not obvious over Cholas-Petrovic (they are, as explained in Section VI.A.5), they are obvious over Cholas-Petrovic in view of Maalej. Ex. 1102, ¶¶ 151-155, *see also* ¶¶ 46-75.

To the extent Patent Owner argues that Cholas’ disclosure of demodulators 1714 and 1724 is insufficient, in view of the implementation of the Cholas STB with a Petrovic tuner, to teach the demodulating of claims 31, 43, and 44, Maalej discloses

a QAM demodulator 99 for, e.g., demodulating 6 MHz CATV channels. Ex. 1160, 1:6-8, 1:27-33, 3:47-52; Ex. 1102, ¶ 153.

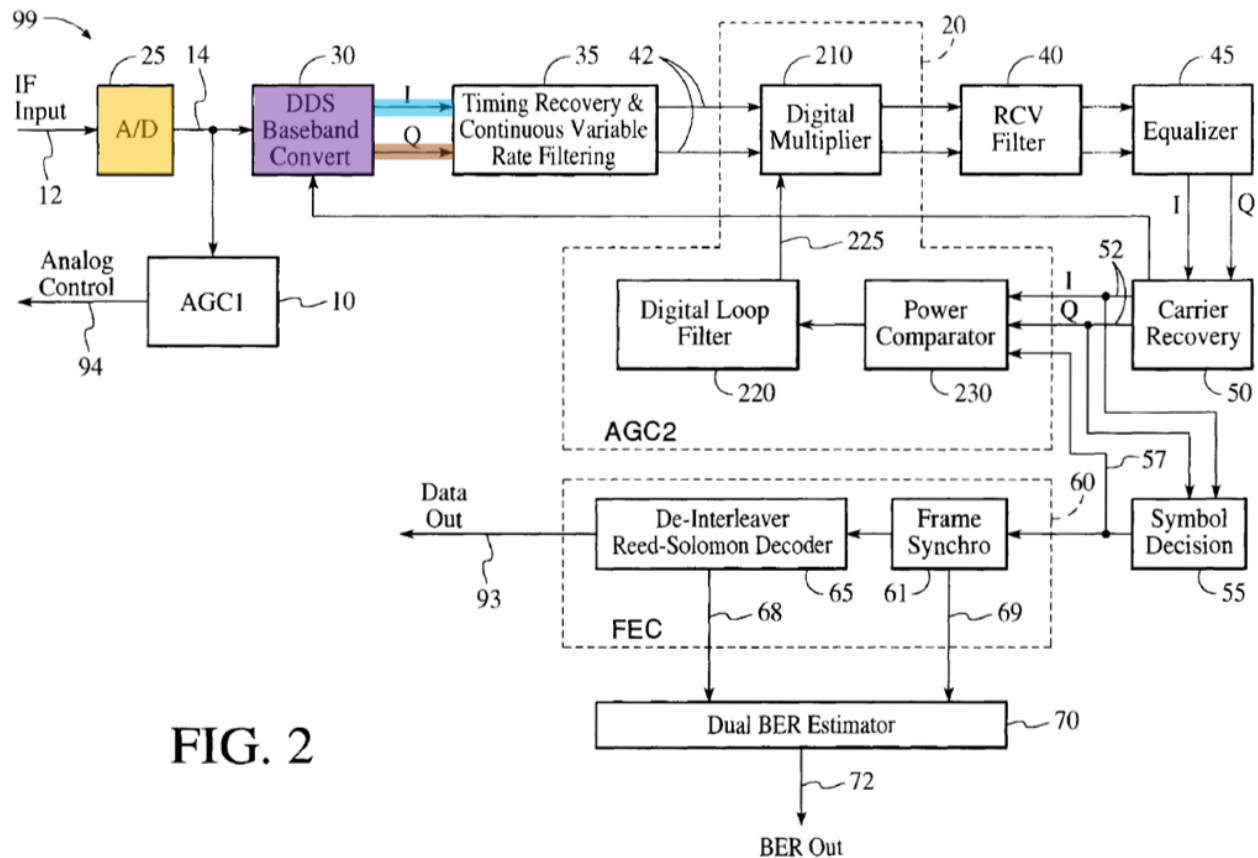


FIG. 2

Ex. 1160, Fig. 2 (annotated)

The demodulator 99 receives, as the signal to be demodulated, an IF signal 12. Ex. 1160, 3:52-4:7; Ex. 1102, ¶ 153. As preliminary steps in the demodulation, the IF signal is digitized in an analog-to-digital (A/D) converter 25 (gold), and a Direct Digital Synthesizer (DDS) 30 (purple) converts the digitized signal to baseband I (blue), Q (brown) components. Ex. 1160, 4:5-21, Fig. 2; Ex. 1102, ¶ 153.

The I, Q components output by the Maalej DDS 30 are functionally equivalent to the Petrovic I, Q components 330, 340 in Cholas-Petrovic, as both sets of I, Q

components comprise baseband digital I, Q components of a signal that is to be demodulated. Ex. 1102, ¶ 154. Moreover, the Maalej demodulator outputs, similar to the Cholas demodulators, MPEG2 Transport System (TS) packets. Ex. 1160, 5:12-15; Ex. 1158, [0045]; Ex. 1102, ¶ 154. Applying Maalej teachings to Cholas-Petrovic, each of the Cholas demodulators would be implemented to include components of the Maalej demodulators (e.g., blocks 35, 210, 40, 45, 50, 230, 220, 55, 61, 65, and 70) that receive I, Q components 330, 340 from a Petrovic stage 307 and that output, to a respective Cholas PID filter, MPEG2 TS packets. Ex. 1102, ¶ 154.

This is merely a combination of known prior art elements according to known methods to yield predictable results. Ex. 1102, ¶ 155. A POSITA would have recognized the functional equivalence of a Petrovic stage 307 output and the output from the Maalej DDS 30, as well as the functional equivalence of the Maalej demodulator output and the inputs to the Cholas PID filters/demultiplexers 1715-1725. Ex. 1102, ¶ 155. A POSITA would also have recognized that if I, Q signals of a QAM-modulated signal were to be demodulated so as to output, e.g., MPEG2 TS packets, the components of the Maalej demodulator could beneficially be used for a demodulator in the Cholas-Petrovic STB so that the signal could be demodulated. Ex. 1102, ¶ 155. A POSITA would thus have easily combined a Petrovic stage 307 and components of the Maalej demodulator, as each would perform the same

function in the combination that would be performed individually prior to the combination to beneficially demodulate the I and Q components. Ex. 1102, ¶ 155. For the same reasons, the results of combining a Petrovic stage 307 with Maalej demodulator components would have been predictable. Ex. 1102, ¶ 155.

D. Cholas-Petrovic-Rabaey (Claims 1-2, 7-9, 11, 13-16, 18-21, 23, 32-34, 45-47)

Claims 1-2, 7-9, 11, 13-16, 18-21, 23, 32-34, and 45-47 are obvious over Cholas- Petrovic in view of Rabaey. Ex. 1102, ¶¶ 156-183, *see also* ¶¶ 46-75.

1. Claims 33-34, 46-47

[33/34] “The method of claim 25, wherein the method comprises: providing the plurality of desired channels via a [parallel/serial] interface.”

[46/47] “The method of claim 38, wherein the method comprises: providing the plurality of digital channel outputs via a [parallel/serial] interface.”

Claims 33-34 and 46-47 are obvious over Cholas-Petrovic in view of Rabaey. Ex. 1102, ¶¶ 157-162. The claims require either a parallel or serial interface via which desired channels (claims 33 and 34) or digital channel outputs (claims 46 and 47) are provided. Choosing either interface would have been an obvious design choice, as explained below. Ex. 1122, ¶¶ 157, 159.

Digital data, such as the I, Q components 330, 340 output by a Petrovic stage 307 in Cholas-Petrovic, is communicated as binary units (“bits”) in the form of electrical signals on wires. Ex. 1102, ¶ 158; Ex. 1116, pp. 23-24, 27-29, 48-51.

Multiple bits can be sent over multiple separate wires, one wire for each bit (“parallel interface”), or one bit at a time over a single wire (“serial interface”). Ex. 1102, ¶ 158; Ex. 1115, pp. 5-6, 8; Ex. 1116, pp. 79-80 (Figure 6.25).

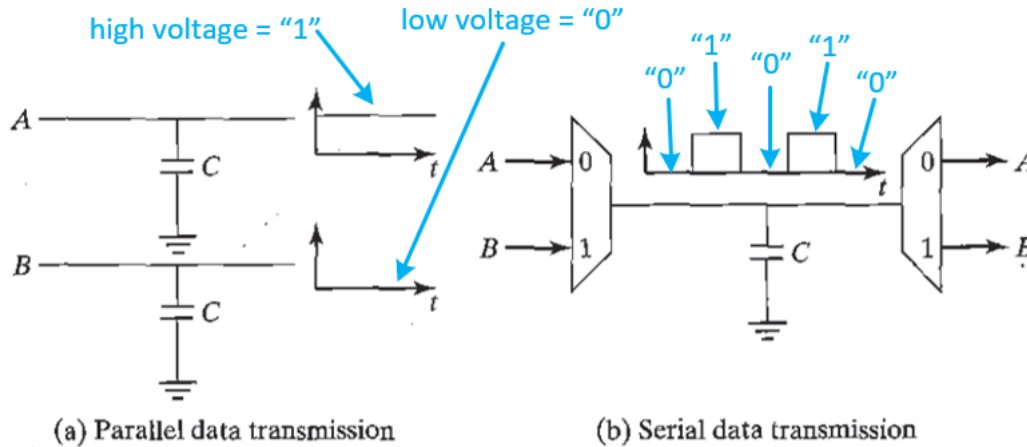


Figure 6-25 Parallel versus time-multiplexed data busses.

Ex. 1116, p. 80 (Figure 6-25) (annotated)

As explained in Sections VI.A.1.c ([25C]) and VI.A.2.d ([38D]), the Petrovic stages 307 output desired channels as digital I, Q pairs 330, 340. The '206 patent concedes that outputs of digital data via both interface types were “commonly known methods.” Ex. 1101, 7:10-14; Ex. 1102, ¶ 159. Basic textbooks and technical papers on digital integrated circuit design at the time confirm that a POSITA would have understood these two interfaces were two common options for outputting digital data. Ex. 1102, ¶ 159 (citing Ex. 1114, 30:31-42, 31:15-22; Ex. 1115, pp. 4-6; Ex. 1116, pp. 79-80; Ex. 1117, pp. 354-355).

For example, Rabaey, a textbook on implementing digital integrated circuits, teaches that both serial and parallel interfaces, as illustrated in the Figure 6-25 above,

were beneficially used in integrated circuits. Ex. 1116, pp. 79-80; Ex. 1102, ¶ 160. Per Rabaey, time-multiplexing (i.e., a serial interface) “is an often used technique to minimize the implementation area” of a design on a chip, but that this “minimum area solution does not always result in the lowest switching activity,” for example, when the data signals have high “temporal correlation.” Ex. 1116, pp. 79-80, *see also* pp. 72-74; Ex. 1102, ¶ 160. Minimizing circuit area minimizes the cost of the integrated circuit, while minimizing the switching activity minimizes the power consumed by the integrated circuit. Ex. 1116, pp. 29-33, 43-44, 72-74, 76-80; Ex. 1102, ¶ 160. Thus, Rabaey teaches selecting between serial and parallel interfaces for transmitting digital data between two points, both of which have advantages over each other, depending upon area and power constraints and the temporal correlation between the signals. *Id.*; Ex. 1102, ¶ 160.

It would have been obvious to apply either of Rabaey’s parallel or serial interfaces as illustrated in Figure 6-25 to interconnections between Petrovic’s stages 307 and demodulators, as the choice of interface would be a basic engineering choice between limited, predictable alternatives enabled by Rabaey. Ex. 1108, [0027], [0040], [0124]; Ex. 1109, [0009], [0115]; Ex. 1116, pp. 76-80; Ex. 1102, ¶ 161. Implementation of either interface would have been nothing more than a combination of prior art elements (Petrovic’s circuit design and Rabaey’s serial or parallel interface interconnects) according to known methods (Rabaey’s process for

implementing circuit designs, including selecting a serial interface to minimize chip area and cost or a parallel interface to minimize switching and power) to yield predictable results (data is sent serially or in parallel). Ex. 1102, ¶ 161.

The resultant combinations of Cholas-Petrovic and Rabaey would have been predictable and a POSITA would have had a reasonable expectation of success, because Rabaey teaches basic techniques used by POSITAs to design integrated circuits, and how those basic techniques relate to design issues, such as meeting area and power constraints, with which a POSITA was very familiar. Ex. 1116, pp. 29-33, 43-44, 72-74, 76-80; Ex. 1102, ¶ 162.

2. Claims 32, 45

[32] “The method of claim 31, wherein the method comprises: providing a plurality of demodulated desired channels via a parallel interface.”

[45] “The method of claim 44, wherein the method comprises: providing the plurality of demodulated channels via a parallel interface.”

Claims 32 and 45 depend from claims 31 and 44, which are obvious in view of Cholas-Petrovic. *See* Section VI.A.5. Claims 32 and 45 add a limitation taught by Rabaey, and are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶¶ 163-164. As explained for claims 33-34 and 46-47, sending data via a parallel interface would have been a routine, obvious design choice. Ex. 1102, ¶ 163; *see* Section VI.D.1.

All of this applies to providing “demodulated [desired] channels via a parallel interface.” Ex. 1102, ¶ 164. Cholas teaches that its demodulators 1714-1724 output

digital data to respective PID filters/demultiplexers 1715-1725. Ex. 1158, [0044]-[0045], Fig. 4; Ex. 1102, ¶ 164. As with the providing of “desired channels” or “digital channel outputs” of Petrovic’s stages 307 to demodulators, and for the reasons explained in Section VI.D.1, the selection of a parallel interface between Cholas’ demodulators and Cholas’ PID filters/demultiplexers would have been a routine design choice, implementing a parallel interface would have been well within a POSITA’s skillset, and a POSITA would have had a high expectation of success. Ex. 1102, ¶ 164. Similarly, implementing a parallel interface between Cholas’ demodulators and Cholas’ PID filters/demultiplexers would have been a combination of prior art elements (Cholas’ demodulators, Cholas’ PID filters/demultiplexers, and Rabaey’s parallel interface interconnects) according to known methods (Rabaey’s process for implementing circuit designs, including selecting a parallel interface to minimize switching and power) to yield predictable results (data sent in parallel). Ex. 1102, ¶ 164.

3. Independent Claim 1

a. [1A]-[1D]

Preamble [1A] and limitations [1B]-[1D] are respectively the same as preamble [25A] and limitations [25B]-[25D] and are disclosed by Cholas-Petrovic for the reasons explained in Sections VI.A.1.a-VI.A.1.d. Ex. 1102, ¶¶ 165-169.

b. [1E] “providing the plurality of desired channels via a serial interface.”

Limitation [1E] is the same as claim 34 and disclosed by Cholas-Petrovic-Rabaey for the reasons explained in Section VI.D.1. Ex. 1102, ¶ 170. Accordingly, Cholas-Petrovic-Rabaey renders claim 1 obvious. Ex. 1102, ¶ 165.

4. Independent Claim 13

a. [13A] “A method comprising:”

Preamble [13A] and limitations [13B]-[13D] are respectively the same as preamble [38A] and limitations [38B]-[38D] and are disclosed by Cholas-Petrovic for the reasons explained in Sections VI.A.1.a-VI.A.1.c and VI.A.2.a-VI.A.2.d. Ex. 1102, ¶¶ 171-175.

b. [13E] “providing the plurality of digital channel outputs via a serial interface.”

Limitation [13E] is the same as claim 47 and disclosed by Cholas-Petrovic-Rabaey for the reasons explained in Section VI.D.1. Ex. 1102, ¶ 176. Accordingly, Cholas-Petrovic-Rabaey render claim 13 obvious. Ex. 1102, ¶ 171.

5. Claims 2, 14

Claims 2 and 14 add the same limitations as claims 26 and 39 and are disclosed by Cholas-Petrovic for the reasons explained in section VI.A.3. Ex. 1102, ¶ 177. Modification of Cholas-Petrovic in view of Rabaey does not affect the Cholas-Petrovic disclosure of the limitations of claims 2 and 14, which are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶ 177.

6. Claims 15, 16

Claims 15 and 16 add the same limitations as claims 40 and 41 and are disclosed by Cholas-Petrovic for the reasons explained in Section VI.A.4. Ex. 1102, ¶ 178. Modification of Cholas-Petrovic in view of Rabaey does not affect the Cholas-Petrovic disclosure of the limitations of claims 15 and 16, which are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶ 178.

7. Claims 7, 18, 19

Claims 7, 18, and 19 add the same limitations as claims 31, 43, and 44 and are disclosed by Cholas-Petrovic for reasons explained in Section VI.A.5. Ex. 1102, ¶ 179. Modification of Cholas-Petrovic in view of Rabaey does not affect the Cholas-Petrovic disclosure of the limitations of claims 7, 18, and 19, which are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶ 179.

8. Claims 8, 20

Claims 8 and 20 add the same limitations as claims 32 and 45 and are obvious over Cholas-Petrovic-Rabaey for the reasons explained in Sections VI.D.1-VI.D.2. Ex. 1102, ¶ 180.

9. Claims 9, 21

Claims 9 and 21 add the same limitations as claims 35 and 48 and are disclosed by Cholas-Petrovic for the reasons explained in Section VI.A.6. Ex. 1102, ¶ 181. Modification of Cholas-Petrovic in view of Rabaey does not affect the

Cholas-Petrovic disclosure of the limitations of claims 9 and 21, which are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶ 181.

10. Claims 11 and 23

[11/23] “The method of claim [1/13], wherein: the method is performed by a device comprising a digital video recorder (DVR).”

Claims 11 and 23 are respectively the same as limitations [25F] and [38E] and disclosed by Cholas-Petrovic for the reasons explained in Sections VI.A.1.f and VI.A.2.e. Ex. 1102, ¶ 182. Modification of Cholas-Petrovic in view of Rabaey does not affect the Cholas-Petrovic disclosure of the limitations of claims 11 and 23, which are obvious over Cholas-Petrovic-Rabaey. Ex. 1102, ¶ 182.

E. Cholas-Petrovic-Takahiko (Claims 27-30, 42)

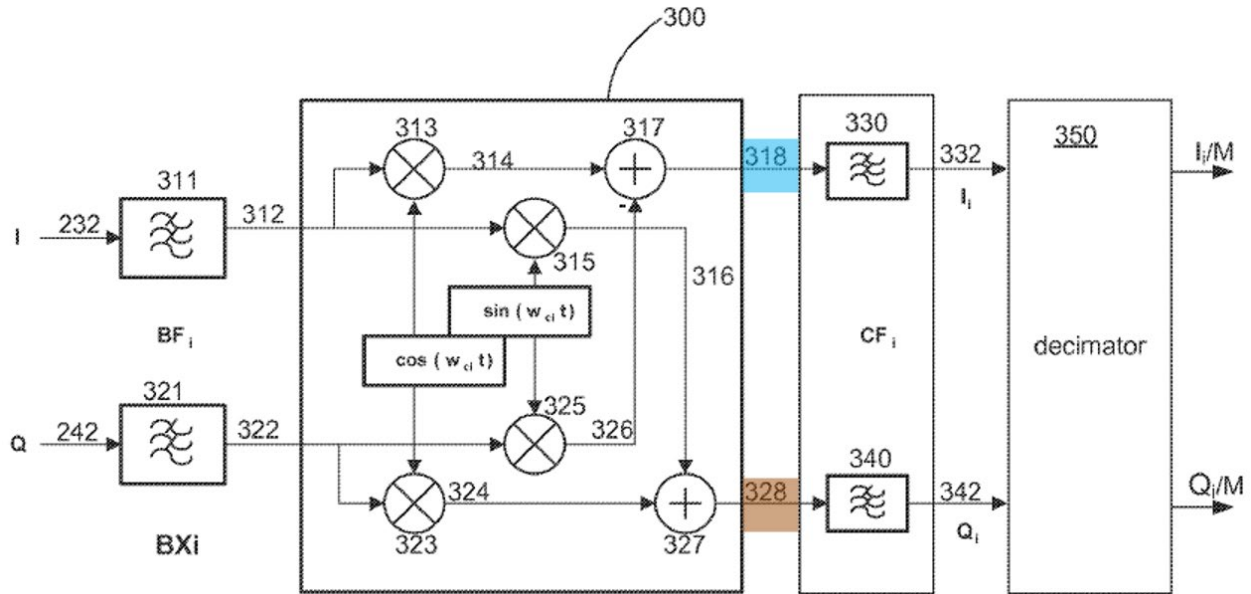
Claims 27-30 and 42 are obvious over Cholas-Petrovic in view of Takahiko. Ex. 1102, ¶¶ 183-199, *see also* ¶¶ 46-75.

1. Claim 27

[27] “The method of claim 25, wherein the method comprises: generating, via each mixer of a plurality of mixers, a complex signal corresponding to each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.”

Under the plain language of claim 27, each mixer must output a complex signal, with each of those complex signals in turn corresponding to *each* (i.e., all) of the desired channels. Ex. 1102, ¶ 185. In the '206 patent, this would correspond to

the I, Q pairs 252a-252n output from the N complex mixer modules of the digital front end, with each of those I, Q pairs being similar to I component 318 (blue) and Q component 328 (brown) of Figure 3. Ex. 1101, 6:3-8, 6:28-62, Figs. 2-3; Ex. 1102, ¶ 185.



Ex. 1101, Fig. 3 (annotated)

Because the components 318 and 328 have not yet been filtered to remove the channels that are not at baseband, the components 318 and 328 may still contain (and in that sense, “correspond to”) all the desired channels (as well as all the undesired channels). Ex. 1101, 6:64-7:9; Ex. 1102, ¶ 186.

The complex mixers (purple, broken-line purple box) of the Petrovic stages 307 include filters (green) *within* the complex mixer (i.e., before the adders “ $\oplus$ ”). Ex. 1108, Fig. 6; Ex. 1109, Fig. 3A; Ex. 1102, ¶ 187.

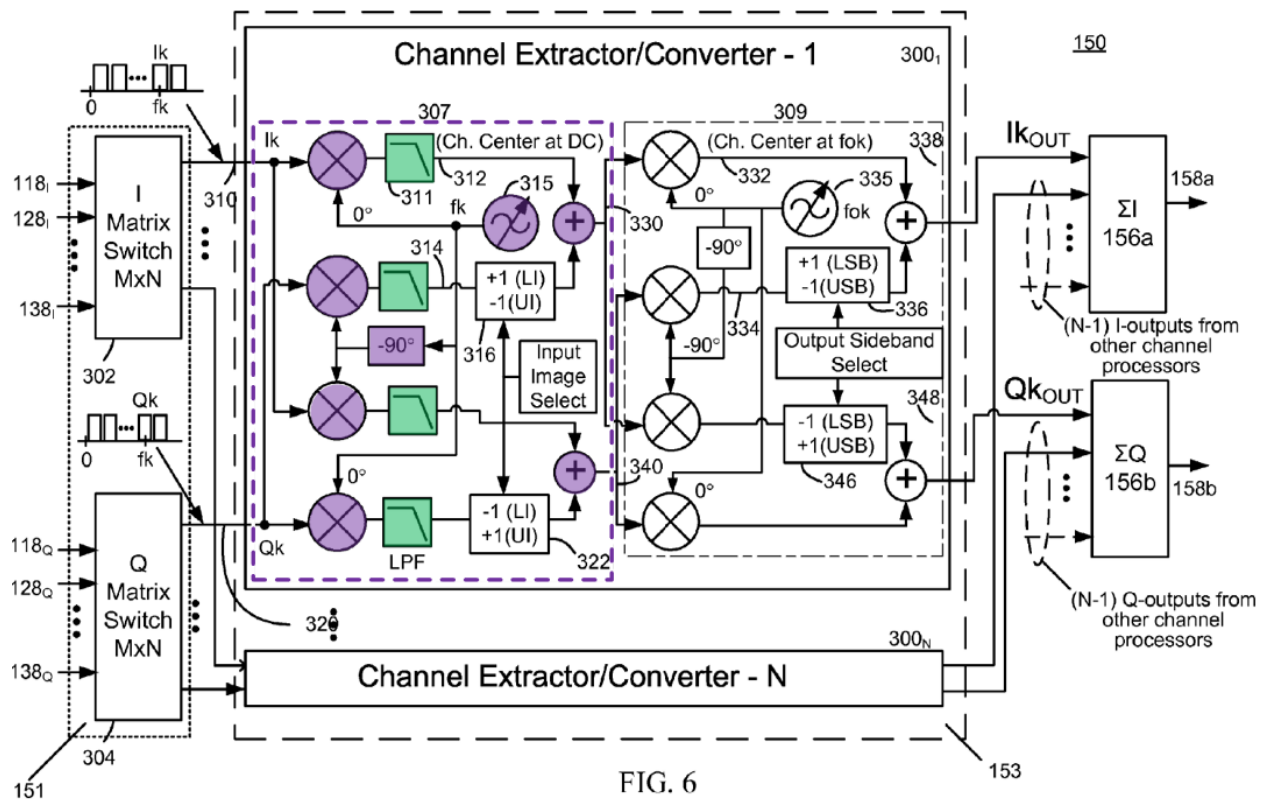
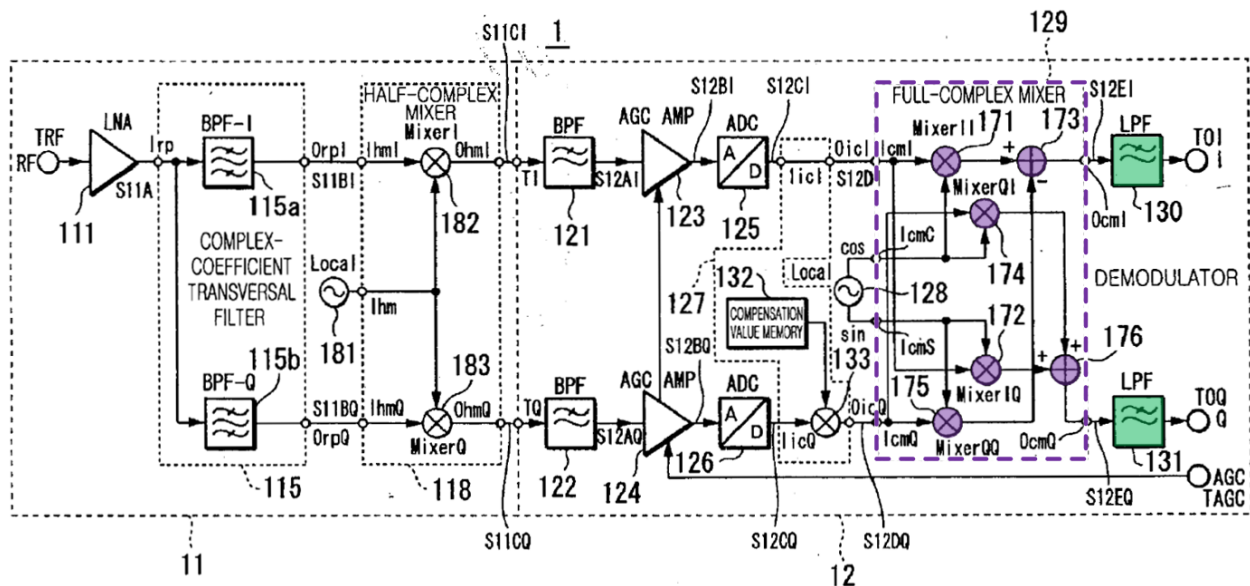


FIG. 6

Ex. 1108, Fig. 6 (annotated)

Because those filters are before the output from the adders, the I, Q components 330, 340 output from the adders would not include channels other than the channel that has been shifted to baseband by the complex mixer. Ex. 1102, ¶ 188. But Takahiko shows that filtering after a complex mixer was well-known. Ex. 1102, ¶ 188.

Takahiko's "downconverter" 1 is used in a radio receiver and is very similar to the receiver of '206 patent Figure 2. Ex. 1161, [0143]; Ex. 1102, ¶ 188.



Ex. 1161, Fig. 1 (annotated)

Takahiko's downconverter 1 has a "full-complex mixer" 129 (purple, broken-line purple box) and low pass filters (green) 130 and 131 that are the same as what is shown in '206 patent Figure 3. Ex. 1102, ¶ 189. Takahiko uses full-complex mixer 129 and filters 130 and 131 in the same way that the '206 patent describes use of complex mixer 300 and filters 330 and 340: downconversion of digital I, Q components so a desired channel is at baseband and removal of unwanted higher frequencies with low-pass filtering. Ex. 1161, [0153], [0156]; Ex. 1102, ¶ 190. Placing four low pass filters before adders of a complex mixer (as shown in Petrovic) or two low pass filters after adders of a complex mixer (as shown in Takahiko) would have been functionally equivalent and a matter of design choice, as both options were well known. Ex. 1102, ¶ 190.

A POSITA would have been motivated to modify the complex mixers of the Petrovic stages 307 to use two low pass filters after the adders of the complex mixer, similar to the configuration of the Takahiko full-complex mixer 129 and filters 130 and 131, instead of four low pass filters within the complex mixer, to make the circuit simpler and less expensive. Ex. 1102, ¶ 191. This is a simple substitution of one known element for another to obtain predictable results. *Id.* Because such a modification would have involved use of known circuit components in known arrangements, because of the similarity between the relevant portions of the Petrovic stages 307 and the Takahiko full-complex mixer 129 and filters 130 and 131, and because the Takahiko full-complex mixer 129 and filters 130 and 131 would have been functionally equivalent to a Petrovic stage 307, a POSITA would have had a reasonable expectation of success and the results of the modification would have been predictable. *Id.*

As modified in view of Takahiko, each Petrovic stage 307 of Cholas-Petrovic would include low pass filters after the complex mixer adders, and the digital I, Q components 330, 340 from the complex mixer would be similar to the I, Q components 318, 328 of the '206 patent (i.e., a desired channel at baseband and other desired and undesired channels not yet filtered out, as taught in Takahiko) and would thus “correspond to each of the plurality of desired channels” in the same way as the I, Q components 318, 328 of the '206 patent. Ex. 1102, ¶ 192.

To the extent that Patent Owner argues claim 27 only requires that each complex mixer generate a complex signal corresponding to one of the desired channels, claim 27 is obvious over Cholas-Petrovic. Ex. 1102, ¶ 193. As explained in Section VI.A.2.d and in Section VI.A.4, each of the Petrovic stages 307 includes a complex mixer that digitally downconverts a signal (I, Q components 138_I and 138_Q) so that a desired channel is at baseband, and that outputs a quadrature pair comprising an I component 330 and a Q component 340 corresponding to a selected channel. Ex. 1108, [0059]-[0077]; Ex. 1109, [0037]-[0054]; Ex. 1102, ¶ 193.

2. Claim 28

[28] “The method of claim 27, wherein: the I and Q components of each corresponding complex signal are at baseband.”

Cholas-Petrovic-Takahiko discloses claim 28. Ex. 1102, ¶¶ 194-195. As explained for claim 27, the digital I, Q components 330, 340 of each Petrovic stage 307, as modified in view of Takahiko, would have a desired channel at baseband and other desired channels not yet filtered out. Ex. 1102, ¶ 195; *see* Section VI.E.1.

To the extent that Patent Owner argues that claim 28 only requires that each complex mixer generate a complex signal corresponding to one of the desired channels, claim 28 is obvious over Cholas-Petrovic. Ex. 1102, ¶ 195; Section VI.E.1.

3. Claim 29

[29] “The method of claim 27, wherein the method comprises: filtering, via each filter of a plurality of filters, the corresponding complex signal, and wherein each corresponding complex signal comprises a 6 MHz channel.”

Cholas-Petrovic-Takahiko discloses claim 29. Ex. 1102, ¶¶ 196-197. As explained for claim 27, each Petrovic stage 307, as modified in view of Takahiko, would include low pass filters after the complex mixer adders, and would thus include a plurality of filters that filter the complex I, Q components from the complex mixer. Ex. 1102, ¶ 197; Section VI.E.1. With regard to the corresponding complex signal comprising a 6 MHz channel, Cholas discloses that signals received by the STB 1710 comprise 6 MHz channels. Ex. 1158, [0045]; Ex. 1102, ¶ 197.

4. Claim 30

[30] “The method of claim 27, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, the corresponding complex signal to generate a demodulated signal as a desired channel output.”

Claim 30 depends from claim 27, which is obvious over Cholas-Petrovic-Takahiko. Ex. 1102, ¶ 198; Section VI.E.1. The additional limitation of claim 30 is taught by Cholas-Petrovic because, as explained in Section VI.A.5, the Petrovic stages 307 of Cholas-Petrovic output, to respective demodulators 1714-1724 of Cholas, I, Q pairs corresponding to selected channels, and those demodulators output demodulated channels. Ex. 1102, ¶ 198. Because modification in view of Takahiko

would not affect the operation of the Cholas demodulators, claim 30 is obvious over Cholas-Petrovic-Takahiko. *Id.*

5. Claim 42

[42] “The method of claim 40, wherein the method comprises: a filtering the corresponding complex signal, wherein a bandwidth of the complex signal is 6 MHz.”

Cholas-Petrovic-Takahiko discloses claim 42 for the reasons explained for claim 29. Ex. 1102, ¶ 199; Section VI.E.3.

F. Cholas-Petrovic-Takahiko-Maalej (Claim 30)

Even if claim 30 was not obvious over Cholas-Petrovic-Takahiko (it is, as explained in Section VI.E.4), it is obvious over Cholas-Petrovic-Takahiko in view of Maalej. Ex. 1102, ¶¶ 200-202, *see also* ¶¶ 46-75. As explained for claims 31, 43, and 44, a POSITA would have implemented the Cholas STB demodulators to include components of the Maalej demodulators that receive I, Q components from a Petrovic stage 307, and that output, to a respective Cholas PID filter, MPEG2 TS packets. Ex. 1102, ¶ 202; *see* Section VI.C. Modification of Cholas-Petrovic in view of Maalej does not affect the modification of Cholas-Petrovic in view of Takahiko. Ex. 1102, ¶ 202.

G. Cholas-Petrovic-Rabaey-Maalej (Claims 7-8, 18-20, 32, 45)

Claims 7, 8, 18-20, 32, and 45 are obvious over Cholas-Petrovic-Rabaey in view of Maalej. Ex. 1102, ¶¶ 203-207, *see also* ¶¶ 46-75.

1. Claims 7, 18-19

Claims 7 and 18-19 add the same limitations as claims 31 and 43-44, which are, in addition to being obvious over Cholas-Petrovic (Section VI.A.5), obvious over Cholas-Petrovic-Maalej (Section VI.C). Claims 7 and 18-19, in addition to being obvious over Cholas-Petrovic-Rabaey (Section VI.D.7), are also obvious over Cholas-Petrovic-Rabaey-Maalej. Ex. 1102, ¶ 204. The reasons it would be obvious to add Maalej to Cholas-Petrovic and render claims 31, 43, and 44 obvious (Section VI.C) are also the reasons it would be obvious to add Maalej to Cholas-Petrovic-Rabaey, and modification in view of Rabaey does not affect modification of Cholas-Petrovic in view of Maalej. Ex. 1102, ¶ 204.

2. Claims 8, 20

Claims 8 and 20 respectively depend from claims 7 and 19, which are obvious in view of Cholas-Petrovic-Rabaey-Maalej. Section VI.G.1. Claims 8 and 20 add a limitation taught by Rabaey, and are also obvious over Cholas-Petrovic-Rabaey-Maalej. Ex. 1102, ¶¶ 205-206. As explained for claims 33-34 and 46-47, sending data via a parallel interface would have been a routine design choice, implementing a parallel interface would have been well within a POSITA's skillset, a POSITA implementing a parallel interface would have had a high expectation of success leading to a predictable result, and implementing a parallel interface would have been nothing more than a combination of prior art elements (Petrovic's circuit design

and Rabaey's parallel interface interconnects) according to known methods (Rabaey's process for implementing circuit designs, including selecting a parallel interface to minimize switching and power) to yield predictable results. Ex. 1102, ¶ 205; *see* Section VI.D.1.

All of this applies to providing “demodulated [desired] channels via a parallel interface.” Ex. 1102, ¶ 206. Maalej teaches digital output (MPEG2 TS packets) from its demodulator 99. Ex. 1160, 5:12-15; Ex. 1102, ¶ 206. As with the providing of “desired channels” or “digital channel outputs” of Petrovic's stages 307 to demodulators, and for the reasons explained in Section VI.D.1, the selection of a parallel interface between Maalej's demodulators and Cholas' PID filters/demultiplexers would have been a routine design choice, implementing a parallel interface would have been well within a POSITA's skillset, and a POSITA would have had a high expectation of success leading to a predictable result. Ex. 1102, ¶ 206. Similarly, implementing a parallel interface between Maalej's demodulators and Cholas' PID filters/demultiplexers would have been a combination of prior art elements (Maalej's circuit design, Cholas' PID filters/demultiplexers, and Rabaey's parallel interface interconnects) according to known methods (Rabaey's process for implementing circuit designs, including selecting a parallel interface to minimize switching and power) to yield predictable results. Ex. 1102, ¶ 206.

3. Claims 32, 45

Claims 32 and 45 respectively depend from claims 31 and 44, which, in addition to being obvious over Cholas-Petrovic (Section VI.A.5), are obvious over Cholas-Petrovic-Maalej (Section VI.C). Ex. 1102, ¶ 207. Claims 32 and 45 add the same limitations to claims 31 and 44 that claims 8 and 20 add to claims 7 and 19, which are obvious over Cholas-Petrovic-Rabaey (Section VI.D.7) and also obvious over Cholas-Petrovic-Rabaey-Maalej (Section VI.G.1). Ex. 1102, ¶ 207. For the reasons explained for claims 8 and 20 (Section VI.G.2), claims 32 and 45 are obvious over Cholas-Petrovic-Rabaey-Maalej. Ex. 1102, ¶ 207.

H. Cholas-Petrovic-Lee (Claims 36-37, 49-52, 57, 61-67, 69-70, 74-76)

Claims 36-37, 49-52, 57, 61-67, 69-70, and 74-76 are obvious over Cholas-Petrovic in view of Lee. Ex. 1102, ¶¶ 208-233, *see also* ¶¶ 46-75.

1. Claims 36, 49

[36/49] “The method of claim [25/38], wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.”

Lee discloses that it was known for STBs to include tuners to receive DOCSIS channel signals. Ex. 1153, [0007]; Ex. 1102, ¶ 210. A POSITA would have configured the Cholas STB, as implemented with a Petrovic tuner, to receive DOCSIS channels so that, e.g., the STB could provide an open cable application platform (OCAP). Ex. 1153, [0006]-[0007], Ex. 1102, ¶ 210. A POSITA would also

have been motivated to configure the Cholas-Petrovic STB to receive DOCSIS channels so that a common 2-way data infrastructure in the cable system could be used for cable modems as well as STB communications. Ex. 1102, ¶ 210.

Using the Cholas-Petrovic STB to receive DOCSIS channels would also have been a use of a known technique (receiving DOCSIS channels in an STB, per Lee) to improve a similar device (a Cholas-Petrovic STB) in the same way. Ex. 1102, ¶ 211. A POSITA could have readily modified the Cholas-Petrovic STB to receive DOCSIS channels, as taught by Lee, because DOCSIS protocols were established and understood. *Id.*, ¶¶ 211, 46. For the same reasons, the results of that modification would have been predictable and POSITA would have had an expectation of success. *Id.*

2. Claims 37, 50

[37] “The method of claim 25, wherein the method comprises: configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.”

[50] “The method of claim 38, wherein the method comprises: providing a picture-in-picture display signal according to the plurality of digital channel outputs.”

Lee discloses that it was known for STBs to tune multiple channels and use the multiple tuned channels to provide picture-in-picture (PIP) functionality. Ex. 1153, [0031]; Ex. 1102, ¶ 213. A POSITA would have configured the Cholas STB, as implemented with a Petrovic tuner, to provide a PIP display so that the STB could

provide beneficial additional functionality for the user. Ex. 1153, [0006], Ex. 1102, ¶ 213.

Using the Cholas-Petrovic STB to provide PIP functionality would also have been a use of a known technique (providing PIP output using an STB, per Lee) to improve a similar device (a Cholas-Petrovic STB) in the same way. Ex. 1102, ¶ 214. A POSITA could have readily modified the Cholas-Petrovic STB to provide PIP functionality, as taught by Lee, because PIP output was established and understood. *Id.*, ¶¶ 214, 69. For the same reasons, the results of that modification would have been predictable and POSITA would have had an expectation of success. *Id.*

3. Independent Claim 51

a. [51A]-[51E]

Preamble [51A] and limitations [51B]-[51E] are respectively the same as preamble [25A] and limitations [25B]-[25E] and are disclosed by Cholas-Petrovic for the reasons explained in Sections VI.A.1.a-VI.A.1.e. Ex. 1102, ¶¶ 215-220.

b. [51F] “configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.”

Limitation [51F] adds the same limitation as claim 37 (taught by Lee) and is taught by Cholas-Petrovic-Lee for the reasons explained in Section VI.H.2. Ex. 1102, ¶ 221.

4. Independent Claim 64

a. [64A] “A method comprising:”

Preamble [64A] and limitations [64B]-[64D] are respectively the same as preamble [38A] and limitations [38B]-[38D] and disclosed by Cholas-Petrovic for the reasons explained in Sections VI.A.1.a-VI.A.1.c and VI.A.2.a-VI.A.2.d. Ex. 1102, ¶¶ 222-226.

b. [64E] “configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.”

Limitation [64E] adds the same limitation as claim 37 (taught by Lee) and is taught by Cholas-Petrovic-Lee for the reasons explained in Section VI.H.2. Ex. 1102, ¶ 227.

5. Claims 52, 65

Claims 52 and 65 add the same limitations as claim 26 and 39 and are disclosed by Cholas-Petrovic for the reasons explained in Section VI.A.3. Ex. 1102, ¶ 228. Modification of Cholas-Petrovic in view of Lee does not affect the Cholas-Petrovic disclosure of the limitations of claims 52 and 65, which are thus obvious over Cholas-Petrovic-Lee. *Id.*

6. Claims 66, 67

Claims 66 and 67 add the same limitations as claims 40 and 41 and are disclosed by Cholas-Petrovic for the reasons explained in Section VI.A.4. Ex. 1102, ¶ 229. Modification of Cholas-Petrovic in view of Lee does not affect the Cholas-

Petrovic disclosure of the limitations of claims 66 and 67, which are obvious over Cholas-Petrovic-Lee. *Id.*

7. Claims 57, 69-70

Claims 57, 69, and 70 add the same limitation as claims 31, 43, and 44 and are disclosed by Cholas-Petrovic for the reasons explained in Section VI.A.5. Ex. 1102, ¶ 230. Modification of Cholas-Petrovic in view of Lee does not affect the Cholas-Petrovic disclosure of the limitations of claims 57, 69, and 70, which are obvious over Cholas-Petrovic-Lee. *Id.*

8. Claims 61, 74

Claims 61 and 74 add the same limitation as claims 35 and 48 and are disclosed by Cholas-Petrovic as explained in Section VI.A.6. Ex. 1102, ¶ 231. Modification of Cholas-Petrovic in view of Lee does not affect the Cholas-Petrovic disclosure of the limitations of claims 61 and 74, which are obvious over Cholas-Petrovic-Lee. *Id.*

9. Claims 62, 75

Claims 62 and 75 add the same limitation as claims 36 and 49 and are obvious over Cholas-Petrovic-Lee for the reasons explained in Section VI.H.1. Ex. 1102, ¶ 232.

10. Claims 63, 76

[63/76] “The method of claim [51/64], wherein: the method is performed by a device comprising a digital video recorder (DVR).”

Claims 63 and 76 depend from claims 51 and 64, which are rendered obvious by Cholas-Petrovic-Lee. Sections VI.H.3, VI.H.4. Claims 63 and 76 add the same limitation as limitations [25F] and [38E] (taught by Cholas, as explained in Sections VI.A.1.f and VI.A.2.e), and therefore also are obvious over Cholas-Petrovic-Lee. Ex. 1102, ¶ 233.

I. Cholas-Petrovic-Lee-Burris (Claims 52, 65)

Claims 52 and 65 add the same limitation as claims 26 and 39 and are disclosed by Cholas-Petrovic-Burris for the reasons explained in Section VI.B. Because of dependency from claims 51 and 64, which are obvious over Cholas-Petrovic-Lee (Sections VI.H.3, VI.H.4), claims 52 and 65 are obvious over Cholas-Petrovic-Lee-Burris, as adding Lee does not affect the modification of Cholas-Petrovic in view of Burris. Ex. 1102, ¶¶ 234-235, *see also* ¶¶ 46-75.

J. Cholas-Petrovic-Lee-Maalej (Claims 57, 69-70)

Claims 57 and 69-70 add the same limitation as claims 31 and 43-44 and are disclosed by Cholas-Petrovic-Maalej for the reasons explained in Section VI.C. Because of dependency from claims 51, 66, and 64, which are obvious over Cholas-Petrovic-Lee (Sections VI.H.3, VI.H.4, VI.H.6), claims 57 and 69-70 are obvious

over Cholas-Petrovic-Lee-Maalej, as adding Lee does not affect the modification of Cholas-Petrovic in view of Maalej. Ex. 1102, ¶¶ 236-237, *see also* ¶¶ 46-75.

K. Cholas-Petrovic-Lee-Rabaey (Claims 10, 12, 22, 24, 58-60, 71-73)

Claims 10, 12, 22, 24, 58-60, and 71-73 are obvious over Cholas, Petrovic, Lee, and Rabaey. Ex. 1102, ¶¶ 238-242, *see also* ¶¶ 46-75.

1. Claims 59-60, 72-73

Claims 59-60 and 72-73 add the same limitations as claims 33-34 and 46-47 and are disclosed by Cholas-Petrovic-Rabaey for the reasons explained in Section VI.D.1. Because of dependency from claims 51 and 64, which are obvious over Cholas-Petrovic-Lee (Sections VI.H.3, VI.H.4), claims 59-60 and 72-73 are obvious over Cholas-Petrovic-Lee-Rabaey, as adding Lee does not affect the modification of Cholas-Petrovic in view of Rabaey. Ex. 1102, ¶ 239.

2. Claims 10, 22

Claims 10 and 22 add the same limitations as claims 36 and 49 and are disclosed by Cholas-Petrovic-Lee for the reasons explained in Section VI.H.1. Ex. 1102, ¶ 240. Because of dependency from claims 1 and 13, which are obvious over Cholas-Petrovic-Rabaey (Sections VI.D.3, VI.D.4), claims 10 and 22 are obvious over Cholas-Petrovic-Lee-Rabaey, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Lee. Ex. 1102, ¶ 240.

3. Claims 12, 24

Claims 12 and 24 add the same limitations as claims 37 and 50 and are disclosed by Cholas-Petrovic-Lee for the reasons explained in Section VI.H.2. Ex. 1102, ¶ 241. Because of dependency from claims 1 and 13, which are obvious over Cholas-Petrovic-Rabaey (Section VI.D.3, VI.D.4), claims 12 and 24 are obvious over Cholas-Petrovic-Lee-Rabaey, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Lee. *Id.*

4. Claims 58, 71

Claims 58 and 71 add the same limitations as claims 32 and 45 and are disclosed by Cholas-Petrovic-Rabaey for the reasons explained in Section VI.D.2. Ex. 1102, ¶ 242. Because of dependency from claims 57 and 70, which are obvious over Cholas-Petrovic-Lee (Section VI.H.7), claims 58 and 71 are obvious over Cholas-Petrovic-Lee-Rabaey, as adding Lee does not affect the modification of Cholas-Petrovic in view of Rabaey. *Id.*

L. Cholas-Petrovic-Lee-Takahiko (Claims 53-56, 68)

Claims 53-56 and 68 are obvious over Cholas in view of Petrovic, Lee, and Takahiko. Ex. 1102, ¶¶ 243-248, *see also* ¶¶ 46-75.

1. Claim 53

Claim 53 adds the same limitation as claim 27 and is disclosed by Cholas-Petrovic-Takahiko (and by Cholas-Petrovic, to the extent Patent Owner argues that claim 53 allows each complex mixer to generate a complex signal corresponding to

one desired channel) for the reasons explained in Section VI.E.1. Ex. 1102, ¶ 244. Because of dependency from claim 51, which is obvious over Cholas-Petrovic-Lee (Section VI.H.3), claim 53 is obvious over Cholas-Petrovic-Takahiko-Lee, as adding Lee does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

2. Claim 54

Claim 54 depends from claim 53, adds the same limitation as claim 28, and is disclosed by Cholas-Petrovic-Takahiko (and by Cholas-Petrovic, to the extent Patent Owner argues that claim 54 allows each complex mixer to generate a complex signal corresponding to one desired channel) for the reasons explained in Sections VI.E.2 and VI.L.1. Ex. 1102, ¶ 245. Claim 54 is obvious over Cholas-Petrovic-Takahiko-Lee, as adding Lee does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

3. Claim 55

Claim 55 depends from claim 53, adds the same limitation as claim 29, and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Sections VI.E.3 and VI.L.1. Ex. 1102, ¶ 246. Claim 55 is obvious over Cholas-Petrovic-Takahiko-Lee, as adding Lee does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

4. Claim 56

Claim 56 depends from claim 53, adds the same limitation as claim 30, and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Sections VI.E.4

and VI.L.1. Ex. 1102, ¶ 247. Claim 56 is obvious over Cholas-Petrovic-Takahiko-Lee, as adding Lee does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

5. Claim 68

Claim 68 adds the same limitation as claim 42 and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Sections VI.E.3 and VI.E.5. Ex. 1102, ¶ 248. Because of dependency from claim 66, which is obvious over Cholas-Petrovic-Lee (Section VI.H.6), claim 68 is obvious over Cholas-Petrovic-Takahiko-Lee, as adding Lee does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

M. Cholas-Petrovic-Takahiko-Lee-Maalej (Claim 56)

Even if claim 56 was not obvious over Cholas-Petrovic-Takahiko-Lee (it is, as explained in Section VI.L.4), it is obvious over Cholas-Petrovic-Takahiko-Lee-Maalej, as a POSITA would have modified Cholas-Petrovic-Takahiko for the reasons explained in Sections VI.C and VI.F. Ex. 1102, ¶¶ 249-250, *see also* ¶¶ 46-75. Because of dependency from claim 51 (via claim 53, Section VI.L.1), which is obvious over Cholas-Petrovic-Lee (Section VI.H.3), claim 56 is obvious over Cholas-Petrovic-Takahiko-Lee-Maalej, as adding Takahiko or Lee does not affect the modification of Cholas-Petrovic in view of Maalej. Ex. 1102, ¶¶ 250.

N. Cholas-Petrovic-Lee-Maalej-Rabaey (Claims 58, 71)

Claims 58 and 71 add the same limitations as claims 8 and 20. Claims 57 and 70 (from which claims 58 and 71 depend) are, in addition to being obvious over Cholas-Petrovic-Lee (Section VI.H.7), obvious over Cholas-Petrovic-Lee-Maalej (Section VI.J). Ex. 1102, ¶ 252, *see also* ¶¶ 46-75. It would be obvious to add Rabaey to Cholas-Petrovic-Lee-Maalej and render claims 58 and 71 obvious for the same reasons, explained in sections VI.G.1-2 (for claims 7 and 19, from which claims 8 and 20 depend), it would be obvious to add Rabaey to Cholas-Petrovic-Maalej. Ex. 1102, ¶ 252. Modification of Cholas-Petrovic-Maalej in view of Lee does not affect modification in view of Rabaey. *Id.*

O. Cholas-Petrovic-Rabaey-Burris (Claims 2, 14)

Claims 2 and 14 add the same limitations as claims 26 and 39 and are disclosed by Cholas-Petrovic-Burris for the reasons explained in Section VI.B. Because of dependency from claims 1 and 13, which are obvious over Cholas-Petrovic-Rabaey (Sections VI.D.3, VI.D.4), claims 2 and 14 are obvious over Cholas-Petrovic-Rabaey-Burris, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Burris. Ex. 1102, ¶¶ 253-254, *see also* ¶¶ 46-75.

P. Cholas-Petrovic-Rabaey-Takahiko (Claims 3-6, 17)

Claims 3-6 and 17 are obvious over Cholas in view of Petrovic, Rabaey, and Takahiko. Ex. 1102, ¶¶ 255-260, *see also* ¶¶ 46-75.

1. Claim 3

Claim 3 adds the same limitations as claim 27 and is disclosed by Cholas-Petrovic-Takahiko (and by Cholas-Petrovic, to the extent Patent Owner argues that claim 3 allows each complex mixer to generate a complex signal corresponding to one desired channel) for the reasons explained in Section VI.E.1. Ex. 1102, ¶ 256. Because of dependency from claim 1, which is obvious over Cholas-Petrovic-Rabaey (Section VI.D.3), claim 3 is obvious over Cholas-Petrovic-Rabaey-Takahiko, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

2. Claim 4

Claim 4 adds the same limitation as claim 28 and is disclosed by Cholas-Petrovic-Takahiko (and by Cholas-Petrovic, to the extent Patent Owner argues that claim 4 allows each complex mixer to generate a complex signal corresponding to one desired channel) for the reasons explained in Section VI.E.2. Ex. 1102, ¶ 257. Because of dependency from claim 1, which is obvious over Cholas-Petrovic-Rabaey (Section VI.D.3), claim 4 is obvious over Cholas-Petrovic-Rabaey-Takahiko, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

3. Claim 5

Claim 5 adds the same limitations as claim 29 and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Section VI.E.3. Ex. 1102, ¶ 258.

Because of dependency from claim 1, which is obvious over Cholas-Petrovic-Rabaey (Section VI.D.3), claim 5 is obvious over Cholas-Petrovic-Rabaey-Takahiko, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

4. Claim 6

Claim 6 adds the same limitation as claim 30 and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Section VI.E.4. Ex. 1102, ¶ 259. Because of dependency from claim 1, which is obvious over Cholas-Petrovic-Rabaey (Section VI.D.3), claim 6 is obvious over Cholas-Petrovic-Takahiko-Rabaey, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

5. Claim 17

Claim 17 adds the same limitation as claim 42 and is disclosed by Cholas-Petrovic-Takahiko for the reasons explained in Sections VI.E.3 and VI.E.5. Ex. 1102, ¶ 260. Because of dependency from claim 13, which is obvious over Cholas-Petrovic-Rabaey (Section VI.D.4), claim 13 is obvious over Cholas-Petrovic-Takahiko-Rabaey, as adding Rabaey does not affect the modification of Cholas-Petrovic in view of Takahiko. *Id.*

Q. Cholas-Petrovic-Rabaey-Takahiko-Maalej (Claim 6)

Even if claim 6 was not obvious over Cholas-Petrovic-Rabaey-Takahiko (it is, as explained in section VI.P.4), it is obvious over Cholas-Petrovic-Rabaey-

Takahiko-Maalej, as it would be obvious to modify Cholas-Petrovic-Takahiko in view of Maalej for the reasons explained in Sections VI.F and VI.C, and modification in view of Rabaey does not affect modification in view of Maalej. Ex. 1102, ¶¶ 261-262, *see also* ¶¶ 46-75.

VII. GROUNDS FOR STANDING & FEE PAYMENT

Petitioner hereby certifies that the '206 patent is available for, and Petitioner is not barred or estopped from requesting, *inter partes* review challenging claims 1-76.

Pursuant to 37 C.F.R. § 42.103, the undersigned authorizes the charge of any required fees to Deposit Account No. 19-0733.

VIII. CONCLUSION

Inter partes review should be instituted and claims 1-76 canceled.

Dated: February 16, 2024

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CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for Inter Partes Review totals 13,706, which is less than the 14,000 allowed under 37 CFR § 42.24(a)(1)(i). This total includes 13,648 words as counted by the Word Count feature of Microsoft Word and 58 words used in annotations.

Pursuant to 37 C.F.R. § 42.24(a)(1), this count does not include the table of contents, the table of authorities, mandatory notices under § 42.8, the certificate of service, this certification of word count, the claims listing appendix, or appendix of exhibits.

BANNER & WITCOFF, LTD

Dated: February 16, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105, I hereby certify that I caused a true and correct copy of this Petition for *Inter Partes* Review in connection with U.S. Patent No. 11,399,206 and supporting evidence to be served via FedEx Priority Overnight on February 16, 2024, on the following:

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Dated: February 16, 2024

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CLAIM LISTING APPENDIX

U.S. Pat. No. 11,399,206

Designation	Claim Language
Claim 1	
[1A]	A method for receiving a television (TV) signal comprising:
[1B]	receiving an input signal from a cable network;
[1C]	digitizing a contiguous band of frequencies in the input signal via a wideband analog-to-digital converter (ADC), wherein the contiguous band of frequencies comprises all received channels that exist in the input signal and the received channels comprise a plurality of desired channels and a plurality of undesired channels;
[1D]	concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels; and
[1E]	providing the plurality of desired channels via a serial interface.
Claim 2	
2	The method of claim 1, wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 3	
3	The method of claim 1, wherein the method comprises: generating, via each mixer of a plurality of mixers, a complex signal corresponding to each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 4	
4	The method of claim 3, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 5	
5	The method of claim 3, wherein the method comprises: filtering, via each filter of a plurality of filters, the corresponding complex signal, and wherein each corresponding complex signal comprises a 6 MHz channel.
Claim 6	

Designation	Claim Language
6	The method of claim 3, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, the corresponding complex signal to generate a demodulated signal as a desired channel output.
Claim 7	
7	The method of claim 1, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, a desired channel, of the plurality of desired channels.
Claim 8	
8	The method of claim 7, wherein the method comprises: providing a plurality of demodulated desired channels via a parallel interface.
Claim 9	
9	The method of claim 1, wherein: the plurality of desired channels comprises at least one cable broadcast channel.
Claim 10	
10	The method of claim 1, wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 11	
11	The method of claim 1, wherein: the method is performed by a device comprising a digital video recorder (DVR).
Claim 12	
12	The method of claim 1, wherein the method comprises: configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.
Claim 13	
[13A]	A method comprising:
[13B]	receiving an input signal from a cable network;
[13C]	digitizing all received channels in the input signal via a wideband analog-to-digital converter (ADC), wherein the received channels comprise a plurality of desired channels and a plurality of undesired channels;
[13D]	digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs; and

Designation	Claim Language
[13E]	providing the plurality of digital channel outputs via a serial interface.
Claim 14	
14	The method of claim 13, wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 15	
15	The method of claim 13, wherein: digitally down converting comprises generating a corresponding complex signal for each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 16	
16	The method of claim 15, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 17	
17	The method of claim 15, wherein the method comprises: a filtering the corresponding complex signal, wherein a bandwidth of the complex signal is 6 MHz.
Claim 18	
18	The method of claim 15, wherein the method comprises: demodulating the corresponding complex signal to provide a demodulated channel as a digital channel output.
Claim 19	
19	The method of claim 13, wherein the method comprises: demodulating each digitally down converted, desired channel to generate a plurality of demodulated channels.
Claim 20	
20	The method of claim 19, wherein the method comprises: providing the plurality of demodulated channels via a parallel interface.
Claim 21	
21	The method of claim 13, wherein: the plurality of desired channels comprises at least one cable broadcast channel.
Claim 22	
22	The method of claim 13, wherein: the plurality of desired channels comprises at least one channel delivered via a Data

Designation	Claim Language
	Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 23	
23	The method of claim 13, wherein: the method is performed by a device comprising a digital video recorder (DVR).
Claim 24	
24	The method of claim 13, wherein the method comprises: providing a picture-in-picture display signal according to the plurality of digital channel outputs.
Claim 25	
[25A]	A method for receiving a television (TV) signal comprising:
[25B]	receiving an input signal from a cable network;
[25C]	digitizing a contiguous band of frequencies in the input signal via a wideband analog-to-digital converter (ADC), wherein the contiguous band of frequencies comprises all received channels that exist in the input signal and the received channels comprise a plurality of desired channels and a plurality of undesired channels;
[25D]	concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels; and
[25E]	providing the plurality of desired channels,
[25F]	wherein the method is performed by a device comprising a digital video recorder (DVR).
Claim 26	
26	The method of claim 25, wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 27	
27	The method of claim 25, wherein the method comprises: generating, via each mixer of a plurality of mixers, a complex signal corresponding to each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 28	

Designation	Claim Language
28	The method of claim 27, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 29	
29	The method of claim 27, wherein the method comprises: filtering, via each filter of a plurality of filters, the corresponding complex signal, and wherein each corresponding complex signal comprises a 6 MHz channel.
Claim 30	
30	The method of claim 27, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, the corresponding complex signal to generate a demodulated signal as a desired channel output.
Claim 31	
31	The method of claim 25, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, a desired channel, of the plurality of desired channels.
Claim 32	
32	The method of claim 31, wherein the method comprises: providing a plurality of demodulated desired channels via a parallel interface.
Claim 33	
33	The method of claim 25, wherein the method comprises: providing the plurality of desired channels via a parallel interface.
Claim 34	
34	The method of claim 25, wherein the method comprises: providing the plurality of desired channels via a serial interface.
Claim 35	
35	The method of claim 25, wherein: the plurality of desired channels comprises at least one cable broadcast channel.
Claim 36	
36	The method of claim 25, wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 37	

Designation	Claim Language
37	The method of claim 25, wherein the method comprises: configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.
Claim 38	
[38A]	A method comprising:
[38B]	receiving an input signal from a cable network;
[38C]	digitizing all received channels in the input signal via a wideband analog-to-digital converter (ADC), wherein the received channels comprise a plurality of desired channels and a plurality of undesired channels; and
[38D]	digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs,
[38E]	wherein the method is performed by a device comprising a digital video recorder (DVR).
Claim 39	
39	The method of claim 38, wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 40	
40	The method of claim 38, wherein: digitally down converting comprises generating a corresponding complex signal for each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 41	
41	The method of claim 40, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 42	
42	The method of claim 40, wherein the method comprises: a filtering the corresponding complex signal, wherein a bandwidth of the complex signal is 6 MHz.
Claim 43	
43	The method of claim 40, wherein the method comprises: demodulating the corresponding complex signal to provide a demodulated channel as a digital channel output.
Claim 44	

Designation	Claim Language
44	The method of claim 38, wherein the method comprises: demodulating each digitally down converted, desired channel to generate a plurality of demodulated channels.
Claim 45	
45	The method of claim 44, wherein the method comprises: providing the plurality of demodulated channels via a parallel interface.
Claim 46	
46	The method of claim 38, wherein the method comprises: providing the plurality of digital channel outputs via a parallel interface.
Claim 47	
47	The method of claim 38, wherein the method comprises: providing the plurality of digital channel outputs via a serial interface.
Claim 48	
48	The method of claim 38, wherein: the plurality of desired channels comprises at least one cable broadcast channel.
Claim 49	
49	The method of claim 38, wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 50	
50	The method of claim 38, wherein the method comprises: providing a picture-in-picture display signal according to the plurality of digital channel outputs.
Claim 51	
[51A]	A method for receiving a television (TV) signal comprising:
[51B]	receiving an input signal from a cable network;
[51C]	digitizing a contiguous band of frequencies in the input signal via a wideband analog-to-digital converter (ADC), wherein the contiguous band of frequencies comprises all received channels that exist in the input signal and the received channels comprise a plurality of desired channels and a plurality of undesired channels;

Designation	Claim Language
[51D]	concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels;
[51E]	providing the plurality of desired channels; and
[51F]	configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.
Claim 52	
52	The method of claim 51, wherein the method comprises: communicating the input signal from a cable network connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 53	
53	The method of claim 51, wherein the method comprises: generating, via each mixer of a plurality of mixers, a complex signal corresponding to each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 54	
54	The method of claim 53, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 55	
55	The method of claim 53, wherein the method comprises: filtering, via each filter of a plurality of filters, the corresponding complex signal, and wherein each corresponding complex signal comprises a 6 MHz channel.
Claim 56	
56	The method of claim 53, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, the corresponding complex signal to generate a demodulated signal as a desired channel output.
Claim 57	
57	The method of claim 51, wherein the method comprises: demodulating, via each demodulator of a plurality of demodulators, a desired channel, of the plurality of desired channels.
Claim 58	

Designation	Claim Language
58	The method of claim 57, wherein the method comprises: providing a plurality of demodulated desired channels via a parallel interface.
Claim 59	
59	The method of claim 51, wherein the method comprises: providing the plurality of desired channels via a parallel interface.
Claim 60	
60	The method of claim 51, wherein the method comprises: providing the plurality of desired channels via a serial interface.
Claim 61	
61	The method of claim 51, wherein: the plurality of desired channels comprises at least one cable broadcast channel.
Claim 62	
62	The method of claim 51, wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 63	
63	The method of claim 51, wherein: the method is performed by a device comprising a digital video recorder (DVR).
Claim 64	
[64A]	A method comprising:
[64B]	receiving an input signal from a cable network;
[64C]	digitizing all received channels in the input signal via a wideband analog-to-digital converter (ADC), wherein the received channels comprise a plurality of desired channels and a plurality of undesired channels;
[64D]	digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs; and
[64E]	configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.
Claim 65	
65	The method of claim 64, wherein the method comprises: communicating the input signal from a cable network

Designation	Claim Language
	connector to the wideband ADC via at least one of an analog amplifier and an analog filter.
Claim 66	
66	The method of claim 64, wherein: digitally down converting comprises generating a corresponding complex signal for each of the plurality of desired channels, and wherein each corresponding complex signal comprises an in-phase (I) component and a quadrature (Q) component.
Claim 67	
67	The method of claim 66, wherein: the I and Q components of each corresponding complex signal are at baseband.
Claim 68	
68	The method of claim 66, wherein the method comprises: a filtering the corresponding complex signal, wherein a bandwidth of the complex signal is 6 MHz.
Claim 69	
69	The method of claim 66, wherein the method comprises: demodulating the corresponding complex signal to provide a demodulated channel as a digital channel output.
Claim 70	
70	The method of claim 64, wherein the method comprises: demodulating each digitally down converted, desired channel to generate a plurality of demodulated channels.
Claim 71	
71	The method of claim 70, wherein the method comprises: providing the plurality of demodulated channels via a parallel interface.
Claim 72	
72	The method of claim 64, wherein the method comprises: providing the plurality of digital channel outputs via a parallel interface.
Claim 73	
73	The method of claim 64, wherein the method comprises: providing the plurality of digital channel outputs via a serial interface.
Claim 74	
74	The method of claim 64, wherein: the plurality of desired channels comprises at least one cable broadcast channel.

Designation	Claim Language
Claim 75	
75	The method of claim 64, wherein: the plurality of desired channels comprises at least one channel delivered via a Data Over Cable Service Interface Specification (DOCSIS) protocol.
Claim 76	
76	The method of claim 64, wherein: the method is performed by a device comprising a digital video recorder (DVR).