

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. 11,785,275

Filing Date: September 30, 2022

Issue Date: October 10, 2023

Title: SYSTEM AND METHOD FOR RECEIVING A TELEVISION SIGNAL

Inter Partes Review No.: IPR2025-00182

**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

- Ex. 1201: U.S. Patent No. 11,785,275 (“the ’275 Patent”)
- Ex. 1202: Expert Declaration of David B. Lett
- Ex. 1203: Curriculum Vitae of David B. Lett
- Ex. 1204: Certified Prosecution History of the ’275 Patent
- Ex. 1205: Certified Prosecution History of U.S. Patent No. 11,490,152
- Ex. 1206: Reserved
- Ex. 1207: Certified Prosecution History of U.S. Provisional App. No. 61/170,526 (“’526 provisional”)
- Ex. 1208-1213: Reserved
- Ex. 1214: U.S. Patent No. 7,237,214 (“Pandey”)
- Ex. 1215: Excerpts of “IEEE Std 100-2000, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition” (IEEE Press. 2000) (“IEEE Std 100”)
- Ex. 1216: Excerpts of Jan M Rabaey, “Digital Integrated Circuits: A Design Perspective” (Pearson, 2nd ed. 2002) (“Rabaey”)
- Ex. 1217: 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. 1218: S. Mirabbasi and K. Martin, “Classical and Modern Receiver Architectures,” IEEE Communications Magazine, vol. 38, no. 11, pp. 132-139, November 2000 (“Mirabbasi”)
- Ex. 1219: U.S. Patent No. 6,061,406 (“Carson”)
- Ex. 1220: Reserved
- Ex. 1221: “Data-Over-Cable Service Interface Specifications: Radio Frequency Interface Specification CM-SP-RFiv2.0-I11-060602,” DOCSIS, June 2006

Ex. 1222:	File History (as of December 3, 2024) for Ex Parte Reexamination No. 90/019,255
Ex. 1223:	Reserved
Ex. 1224:	International Pub. No. 2007/145637 (“Pugel”)
Ex. 1225:	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. 1226:	Reserved
Ex. 1227:	U.S. Patents and Patent Applications Family Tree for U.S. Pat. 11,785,275
Ex. 1228-1232:	Reserved
Ex. 1233:	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. 1234:	Excerpts of J. Crols and M. Steyaert, “CMOS Wireless Transceiver Design” (1997)
Ex. 1235:	U.S. Patent No. 7,340,230 (“Khoini-Poorfard”)
Ex. 1236:	U.S. Pub. No. 2003/0217362 (“Summers”)
Ex. 1237:	U.S. Pub. No. 2006/0256799 (“Eng”)
Ex. 1238:	U.S. Pub. No. 2006/008335 (“Seendripu”)
Ex. 1239:	Excerpts of Chris Bowick, “RF Circuit Design” (2 nd ed. 2008)
Ex. 1240:	Reserved
Ex. 1241:	Excerpts of Roland Priemer, “Introductory Signal Processing” (1991)
Ex. 1242:	U.S. Patent No. 7,272,375 (“Tuttle”)

Ex. 1243:	U.S. Patent No. 7,130,576 (“Gurantz”)
Ex. 1244:	U.S. Patent No. 5,278,837 (“Kelley”)
Ex. 1245:	Jeffrey Hugh Reed, “Software Radio: A Modern Approach to Radio Engineering” (2002)
Ex. 1246:	U.S. Patent No. 7,213,042 (“Cannon”)
Ex. 1247:	Reserved
Ex. 1248:	Excerpts of William Buchanan, “Computer Busses” (2000) (“Buchanan”)
Ex. 1249:	U.S. Patent No. 7,079,528 (“Ziegler”)
Ex. 1250:	Excerpts of “Software Defined Radio: Enabling Technologies” (Walter H.W. Tuttlebee ed., 2003)
Ex. 1251:	U.S. Pub. No. 2005/0183015 (“Dunton”)
Ex. 1252:	U.S. Pub. No. 2003/0229900 (“Reisman”)
Ex. 1253-1272:	Reserved
Ex. 1273:	Expert Declaration of Dr. Sylvia Hall-Ellis
Ex. 1274:	Reserved
Ex. 1275:	U.S. Patent No. 6,791,995 (“Azenkot”)
Ex. 1276:	U.S. Patent No. 6,542,203 (“Shadwell”)
Ex. 1277-1278:	Reserved
Ex. 1279:	U.S. Patent No. 3,968,444 (“Tenny”)

I. 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. 11,785,275 (“the ’275 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 third of three petitions for *inter partes* review filed by Petitioner against the ’275 Patent. Petitioner has previously filed petitions for *inter partes* review against related U.S. Patent Nos. 9,210,362 (“the ’362 patent”), 11,381,866 (“the ’866 patent”) and 11,399,206 (“the ’206 patent”), which include similar claims to claims of the ’275 patent. The IPRs against the ’362 patent are assigned case numbers: IPR2024-00432, IPR2024-00433, and IPR2024-00434. The IPRs against the ’866 patent are assigned case numbers: IPR2024-00435, IPR2024-00436, and IPR2024-00437. The IPRs against the ’206 patent are assigned case numbers: IPR2024-00438, IPR2024-00439, and IPR2024-00440. The Board has already instituted IPR2024-00432 (for the ’362 patent), IPR2024-00435 (for the ’866 patent), and IPR2024-00438 (for the ’206 patent). The petitions for the other IPRs

challenging the '362, '866, and '206 patents were discretionarily denied institution without addressing the merits of those petitions.

No other Office proceedings (e.g., *inter partes* review, post-grant review, or covered business method) have been filed against the '275 Patent.

According to the Office's records, a request for *ex parte* reexamination (Control No. 90/019,255) was filed on September 20, 2023, for claims 1 and 11 of the '362 patent, and an Order granting the request was issued on November 1, 2023. The requestor of the *ex parte* reexamination, Unified Patents, LLC, is not a real party-in-interest for this petition.

Litigation matters

Patent Owner has sought leave to assert the '275 Patent 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) (collectively, "CA litigation"). These cases have been consolidated and remain pending.

The related '362 patent, '866 patent, and '206 patent were also asserted in *Entropic Communications, LLC v. Charter Communications, Inc.*, No. 2:22-cv-

00125-JRG (E.D. Tex. filed Apr. 27, 2022) (“TX litigation”), which was dismissed on December 10, 2023.

The ’275 patent, as well as the related ’866 patent and ’206 patent, are asserted in *Entropic Communications, LLC v. Vantiva SA*, No. 2:24-cv-00912 (E.D. Tex. filed Nov. 11, 2024).

Continuity

According to Office records, the ’275 Patent is a continuation of application No. 17/862,946, filed on Jul. 12, 2022, now Pat. No. 11,490,152, which is a continuation of application No. 17/587,462, filed on Jan. 28, 2022, now Pat. No. 11,399,206, which is a continuation of application No. 17/217,244, filed on Mar. 30, 2021, now abandoned, which is a continuation of application No. 16/430,506, filed on Jun. 4, 2019, now Pat. No. 10,972,781, which is a continuation of application No. 15/792,318, filed on Oct. 24, 2017, now Pat. No. 10,313,733, which is a continuation of application No. 14/948,881, filed on Nov. 23, 2015, now Pat. No. 9,819,992, which is a continuation of application No. 14/617,973, filed on Feb. 10, 2015, now Pat. No. 9,210,363, which is a continuation of application No. 13/962,871, filed on Aug. 8, 2013, now Pat. No. 9,100,622, which is a continuation of application No. 12/762,900, filed on Apr. 19, 2010, now Pat. No. 8,526,898, which claims the benefit of Provisional application No. 61/170,526, filed Apr. 17, 2009.

Also, according to Office records, application No. 18/461,104, filed on Sep. 5, 2023, is a continuation of the '275 Patent.

The '275 Patent is part of a family that includes numerous patents or applications that purport to claim priority from application No. 12/762,900. A family tree is included as Ex. 1227.

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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II. INTRODUCTION

Comcast Cable Communications, LLC (“Petitioner”) petitions for *inter partes* review and cancellation of claims 1-20 of U.S. Patent No. 11,785,275 (“the ’275 Patent”) (Ex. 1201).

III. SUMMARY OF ARGUMENT

The ’275 Patent generally claims a television receiver and a method of operating it to select and output desired channels. The receiver comprises a radio front end for processing a radio frequency (RF) input signal that includes desired and undesired channels, an analog-to-digital converter (ADC) that digitizes the RF input signal, and a digital frontend (DFE) that selects the desired channels and outputs them to at least one demodulator.

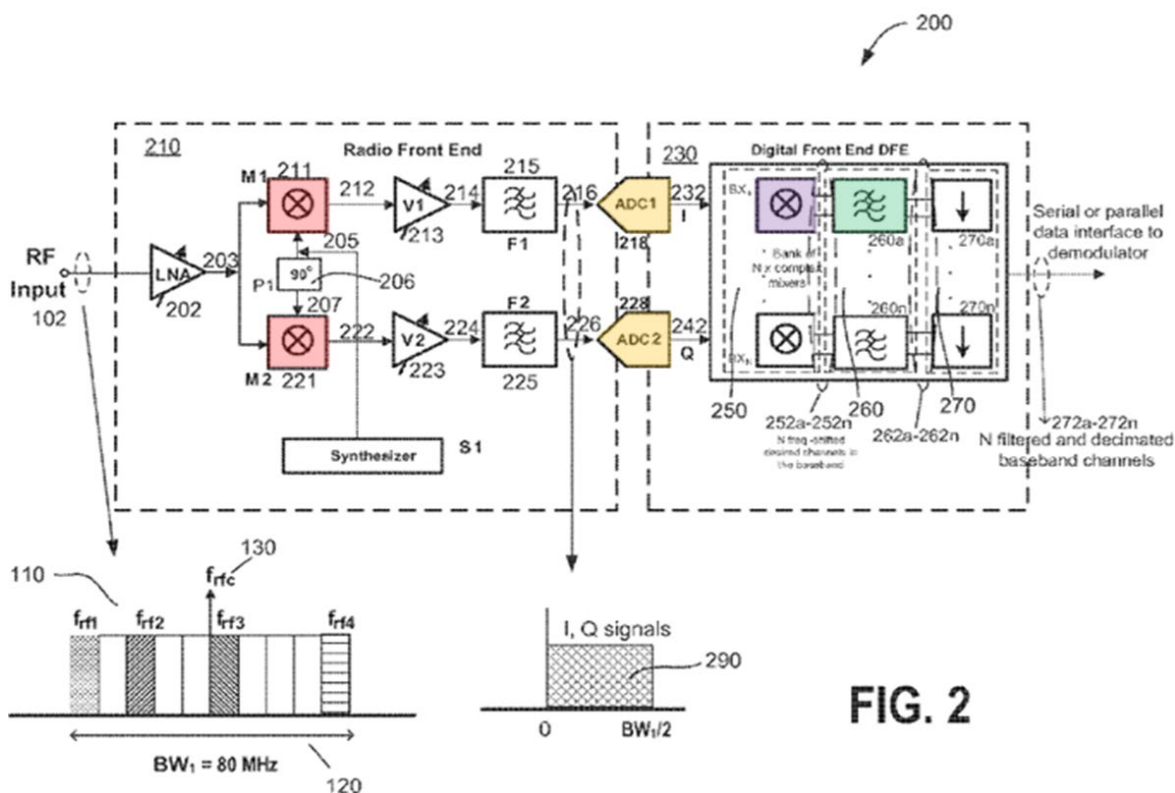
The ’275 Patent admits that the portion of the television receiver, including the radio front end and ADC, “is similar to conventional tuners.” Ex. 1207, 5; Ex. 1201, 1:6-28. The alleged inventive concept—demodulating multiple digitized channels—simply copies well-known digital circuitry for demodulating each channel. The dependent claims add only trivial, well-known features, such as sending data using serial or parallel interfaces, processing cable or satellite broadcast channels, storing recorded video, or picture-in-picture. The ’275 Patent claims are disclosed or rendered obvious by the prior art, e.g., Pugel (Ex. 1224) and other references relied on herein.

Accordingly, claims 1-20 of the '275 Patent are unpatentable and should be canceled.

IV. OVERVIEW OF THE '275 PATENT

A. Brief Description

The '275 Patent describes a wideband receiver system 200 “capable of receiving multiple radio frequency channels located in a broad radio frequency spectrum.” Ex. 1201, 1:32-35; Ex. 1202, ¶¶ 37-38. Figure 2 is a “block diagram of a wideband receiver system 200.” Ex. 1201,, 4:40-42; Ex. 1202, ¶ 38.



Ex. 1201, Fig. 2 (annotated)

The wideband receiver system 200 receives both desired and undesired television channels as frequencies dispersed within a frequency bandwidth BW_1 .

Ex. 1201, Abstract, 4:43-58; Ex. 1202, ¶ 39. A “radio front end” contains mixers M1 and M2 (shown above in **red**) that “generate an in-phase signal 212 and a quadrature signal 222 that have a phase shift of 90° degrees between them” and that have been downconverted to “the baseband or low intermediate frequency (IF) band.”¹ Ex. 1201, 4:65-5:4, 2:64-3:1, *see also* 2:10-12. “[U]nwanted frequency components” are filtered from the in-phase and quadrature signals by respective filters 215 and 225. Ex. 1201, 5:22-29. The filtered signals are then individually digitized by wideband analog-to-digital converters ADC1 and ADC2 (shown above in **gold**) to generate a digital in-phase (I) signal 232 and a digital quadrature (Q) signal 242. Ex. 1201, 3:1-3, 5:53-56. U.S. Provisional App. No. 61/170,526 (“’526 provisional”), which the ’275 Patent incorporates by reference, admits that the left side of Figure 2 (up to and including ADC1 and ADC2) “is similar to conventional tuners.” Ex. 1207, 5; Ex. 1201, 1:6-28; Ex. 1202, ¶ 39.

The digital I and Q signals 232 and 242 are input to a digital front end 230,

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. 1202, ¶ 70. The reduced frequency (f_1-f_2) version is output as the “down converted” complex signal with real (I) and imaginary (Q) components. Ex. 1202, ¶ 70.

containing a bank of N complex mixers 250 (one of which is shown above in **purple**), where N is “the number of desired RF channels.”² Ex. 1201, 5:56-60. “Each of the N complex mixers ... extract a different one of the desired channels” from the I and Q signals 232 and 242 and “frequency-shifts the extracted signals to the baseband frequency.”³ Ex. 1201, 6:8-11. The output of each mixer 250 leads to an associated filter module 260 (one of which is shown above in **green**), which filters the frequency-shifted desired channel. Ex. 1201, 6:11-13; Ex. 1202, ¶ 40.

Figure 3 “is a simplified circuit diagram of one of the signal paths 272a to 272n of digital front end 230” and shows the elements in one of the rows of digital front end 230 in Figure 2. Ex. 1201, 6:21-23; Ex. 1202, ¶ 41.

² Complex mixers multiply signals already separated into their complex I and Q components. Ex. 1202, ¶¶ 70, 73.

³ Signals have a center frequency f that is modulated with data. Shifting the signal to baseband reduces f to zero, enabling filters to easily pass only the modulated data as the output. Ex. 1202, ¶¶ 72, 74.

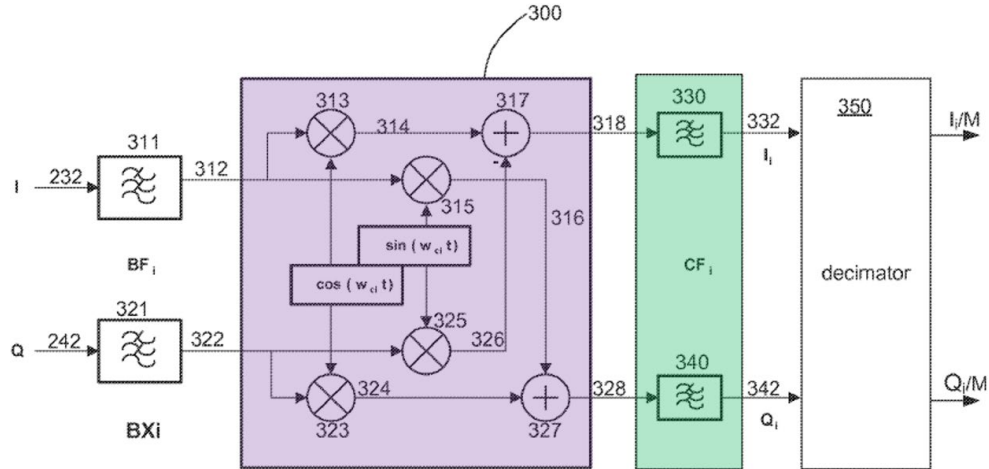


FIG. 3
Ex. 1201, Fig. 3 (annotated)

Mixer 300 represents one of the complex mixers 250 and has multipliers 313, 315, 323, and 325 and adders 317 and 327. Ex. 1201, 6:33-43. “[C]omplex mixer 300 causes a frequency shift of the filtered components 312 and 322 to respective baseband signals 318 and 328 in the digital domain” by multiplying the I and Q signals by a frequency ω_{ci} that is “chosen [so] that each one of the desired channels embedded in the digital signals I 232 and Q 242 will be downshifted to the baseband.” Ex. 1201, 6:43-62. **Filters 330 and 340**, which are one of the filter modules 260a-n in Figure 2, filter baseband signals 318 and 328. Ex. 1201, 7:3-5; Ex. 1202, ¶ 42. This exact structure was a conventional design, simply copied multiple times to downconvert multiple channels, respectively. *See* Ex. 1202, ¶¶ 68-73.

Finally, the '275 Patent describes that the “N desired baseband channels” may be decimated before being sent to an associated demodulator “using a serial or parallel data interface according to commonly known methods.” Ex. 1201, 6:13-19, 7:16-20, Figs. 2-3; Ex. 1202, ¶ 43.

B. Prosecution History

The application which became the '275 Patent was rejected only for nonstatutory double patenting based on its parent (Pat. No. 11,490,152), which had similar claims but did not include the “non-contiguous” limitation. Ex. 1204, 3352-3357; Ex. 1202, ¶¶ 44-47. The Examiner stated (correctly) that such limitation was “an obvious condition.” Ex. 1204, 3356. After a terminal disclaimer was filed, the application was allowed. Ex. 1204, 3384-3406.

In the reasons for allowance, the Examiner alleged that “[t]he prior art made of record do not teach selecting, by a digital frontend (DFE) coupled to the ADC, a plurality of desired channels from the digitized signal and outputting by the DFE, the selected plurality of desired channels to at least one demodulator as a digital datastream.” Ex. 1204, 3405. This was the same reason for allowance given in the parent, which was also allowed with no substantive prosecution and without consideration of any reference relied on herein. *Compare* Ex. 1204, 3405 *with* Ex. 1205, 158; Ex. 1202, ¶ 48. After a Request for Continued Examination (RCE) and two Information Disclosure Statements (IDSs) to cite litigation documents and

references, another notice of allowance was sent, and the '275 Patent was issued. Ex. 1204, 3415-4831, 4857. Pugel, Crols, and Chandrakasan were not considered as independent references during the prosecution of the '275 Patent, though a claim chart citing Pugel was considered. Ex. 1204, 4824-4831; Ex. 1201, pp. 1-3; Ex. 1202, ¶¶ 49-50.

In response to a request filed by third-party Unified Patents, LLC on September 20, 2023, the Office ordered reexamination (Control No. 90/019,255) of independent claims 1 and 11 of the '362 Patent on November 1, 2023. Ex. 1222, 732-743. The reexamination is currently pending. Pugel has been cited in reexamination, but Crols and Chandrakasan have not been cited. Ex. 1222, 412, 415-453. In reexamination, the Office presently maintains that Pugel, as a primary reference, teaches “a wideband receiver system,” “downconverting... a plurality of frequencies that comprises a plurality of desired television channels and a plurality of undesired television channels,” “digitizing, by a wideband analog-to-digital converter (ADC) module of said wideband receiver system, said plurality of frequencies,” “selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels,” and “outputting... said selected plurality of television channels.” Ex. 1222, 1283-1284. The Office relies on a secondary

reference, U.S. Patent No. 8,224,274 to Gomez et al., for teachings of “a mixer module,” which is not recited in the claims of the ’275 Patent.⁴ *Id.*, 1284-1285.

C. Earliest Priority Date for the Claims

The earliest possible effective filing date for the claims of the ’275 Patent is April 17, 2009. Ex. 1202, ¶ 51. For purposes of this proceeding only, this date is used as the time of the alleged invention because each reference relied on herein is prior art to that date.

V. OVERVIEW OF PRIOR ART

A. Pugel

Pugel (Ex. 1224) is a PCT Application published on December 21, 2007. Ex. 1224, 1. As the publication date is more than a year prior to the earliest filing date of the ’275 Patent, Pugel is prior art under pre-AIA 35 U.S.C. § 102(b). Ex. 1202, ¶ 82. Pugel itself was never provided to the Examiner by the Patent Owner and was not considered during the prosecution of the ’275 Patent, even though a claim chart citing Pugel was considered. Ex. 1201, 1-2; Ex. 1202, ¶ 82.

Pugel describes a “digital television receiver capable of simultaneously receiving a plurality of channels ... suitable for use with conventional cable

⁴ Structure consistent with a mixer module is taught by Crols, as is discussed in Ground C herein.

television delivery systems” and “other types of radio-frequency communications systems as well, including reception of digital television channels via satellite and terrestrial television transmission systems.” Ex. 1224, [0008], [0022]; Ex. 1202, ¶ 83. Pugel’s Figure 1 shows a multichannel receiver circuit 100, annotated below with colors referenced in this petition. Ex. 1224, [0022]-[0028], Fig. 1; Ex. 1202, ¶ 83.

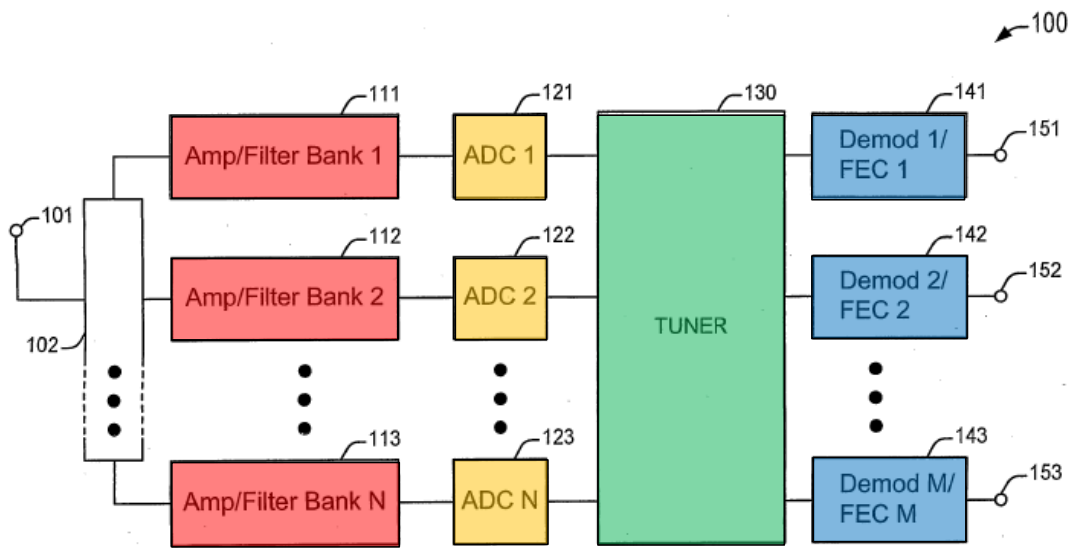


FIG. 1

Ex. 1224, Fig. 1 (annotated)

At input coupler 101, the receiver circuit 100 receives a multichannel analog RF input signal, such as a signal used in a conventional cable television delivery system. Ex. 1224, [0008], [0024]; Ex. 1202, ¶ 84. That signal is wideband, as it may comprise multiple channels. Ex. 1224, [0009], [0020]-[0023]; Ex. 1202, ¶ 84. The signal can be optionally split at splitter 102. Ex. 1224, [0024]-[0025]; Ex. 1202, ¶

84. Regardless of whether a splitter 102 is used, the receiver circuit comprises “a plurality of **amplifier-filter banks or circuits 111, 112, 113**, a plurality of **analog-to-digital converters 121, 122, 123**, a **digital tuner 130**, and a plurality of **demodulator circuits 141, 142, 143**.” Ex. 1224, [0023] (annotated); Ex. 1202, ¶ 84.

The amplifier-filter banks (**red**) “segregate[] the multichannel analog input signal into a plurality of separate analog signals of differing frequency ranges.” Ex. 1224, [0024], [0028]-[0032], [0043]; Ex. 1202, ¶ 85. The plurality of separate signals are undersampled, such that the sampling frequency range of any downstream analog-to-digital converters (ADCs) is reduced. Ex. 1224, [0033]-[0034]; Ex. 1202, ¶ 85. Undersampling, as described in Pugel, is economical because it reduces the need to supply ADCs supporting high-frequency sampling. Ex. 1224, [0034]; Ex. 1202, ¶ 85.

The undersampled signals are then converted to digital form in analog-to-digital converters 121-123 (**gold**) “sufficient for satisfactorily processing digital television signals and associated signals intended for end users in a conventional cable television broadcast system.” Ex. 1224, [0036], *see also* [0033]-[0037], [0044]-[0045]; Ex. 1202, ¶ 86. The digital signals are received by a digital tuner (**green**) such that “a selected set of digital cable television channels” may be demultiplexed from the digital signals. Ex. 1224, [0038], *see also* [0037]-[0039], [0045]; Ex. 1202, ¶ 86. Those demultiplexed channels may then be outputted to one

or more demodulators 141-143 ([blue](#)), which perform a variety of demodulation techniques including quadrature amplitude modulation (QAM) demodulation or quadrature phase shift keying (QPSK) demodulation. Ex. 1224, [0039]-[0040], [0046]; Ex. 1202, ¶ 86.

In Ex Parte Reexamination of the related U.S. Patent No. 9,210,362, Patent Owner itself gave a description of Pugel consistent with that described herein. In that proceeding, Patent Owner stated that:

World Intellectual Property Organization Publication No. WO 2007/145637 ("Pugel") relates to a "multichannel digital cable tuner." (Pugel at Title). In one embodiment, a multichannel receiver circuit includes a plurality of amplifier-filter circuits, a plurality of analog-to-digital converters, a digital tuner, and a plurality of demodulator circuits. (*Id.* at [0023]). Pugel discloses that the plurality of amplifier-filter circuits segregates the analog input signal into a plurality of separate analog signals of differing frequency ranges, or "bands." (*Id.* at [0024]). For example, an arrangement of three amplifier-filter circuits might be used, wherein the three circuits are configured to process frequencies from 5-300 MHz, 300-600 MHz, and 600-900 MHz respectively. (*Id.* at [0028]). Each separate analog signal band is then converted from analog to digital form by an analog-to-digital converter (ADC). (*Id.* at [0024]).

Pugel next discloses that the converted digital signals are coupled to digital tuner 130, which demultiplexes the converted digital signals to generate a plurality of digital channel signals. (*Id.* at [0027]). Pugel notes in particular that "[t]he digital tuner 130 may include a channel selector 315 to permit selection of one or more particular digital channels desired to be recovered." (*Id.* at [0038]). Each digital channel signal is then coupled to a separate demodulator, which performs demodulation and forward-error-correction (FEC) operations appropriate for the content of that digital channel. (*Id.* at [0027]).

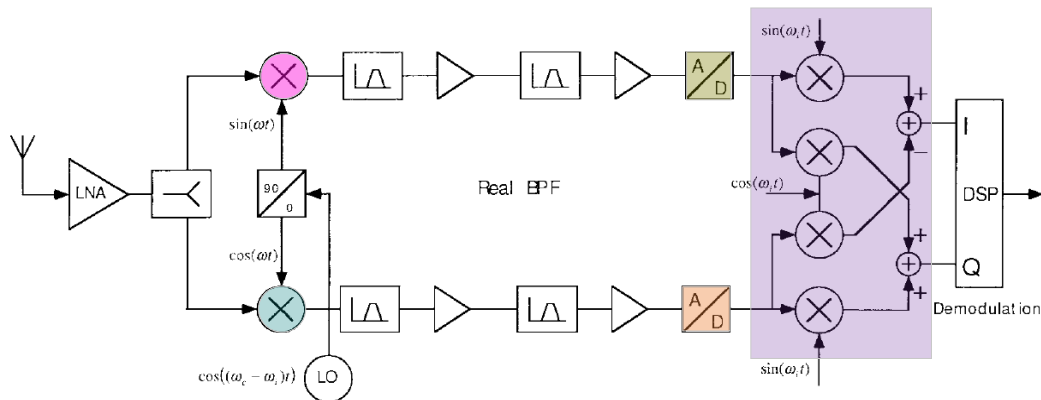
Ex. 1222, 959-960.

Pugel is in the same field of endeavor as the '275 Patent, and thus is analogous art. *Netflix, Inc. v. DivX, LLC*, 80 F.4th 1352, 1358 (Fed. Cir. 2023); Ex. 1202, ¶ 87. For example, the '275 Patent “relates to wideband receiver systems and methods having a wideband receiver that is capable of receiving multiple radio frequency channels located in a broad radio frequency spectrum.” Ex. 1201, 1:32-35; Ex. 1202, ¶ 87. Similarly, Pugel relates to a system and method for receiving a wideband radio frequency signal comprising multiple channels. Ex. 1224, Abstract, [0008]-[0013], [0023]-[0024]; Ex. 1202, ¶ 87. Pugel is also reasonably pertinent to problems with which the '275 Patent is concerned, and is also analogous art on that basis. *Netflix, Inc.*, 80 F.4th at 1358; Ex. 1202, ¶ 87. Pugel describes filtering signals for input to an ADC in the same way as is described by the '275 Patent. *Compare* Ex. 1201, 5:22-6:20, Fig. 3 *with* Ex. 1224, [0029]-[0032], [0042]-[0043], Fig. 2; Ex. 1202, ¶ 87.

B. Crols

Crols (Ex. 1225) is an IEEE journal article (Non-Patent Literature) published in March 1998. Crols was publicly available as of April 3, 1998. Ex. 1273, ¶¶ 86-93. Thus, Crols is prior art under pre-AIA 35 U.S.C. § 102(b). Ex. 1202, ¶ 88. Crols was not considered during the prosecution of the '275 Patent. Ex. 1201, 1-2; Ex. 1202, ¶ 88.

Crols describes various topologies for implementing intermediate frequency (IF) receivers (a type of RF receiver) in a telecommunication environment. Ex. 1225, 269; Ex. 1202, ¶ 89. Crols discusses that IF receivers may create unwanted signals (e.g., a mirror frequency) that must be suppressed in a system before use. Ex. 1225, 270; Ex. 1202, ¶ 89. Further, the paper analyzes techniques to perform downconversion using mixers, such as shown in the annotated figure, below. Ex. 1225, 273-274; Ex. 1202, ¶ 89.



Ex. 1225, Fig. 22 (annotated)

In particular, Crols discusses how RF receivers can avoid the mirror frequency problem during the downconversion of analog RF signals to an intermediate frequency by downconverting the signals once with a first mixer (pink) using a sine

signal and again with a second mixer (**teal**) using a cosine signal as an input.⁵ Ex. 1225, 271; Ex. 1202, ¶ 90. Figure 22 of Crols (reproduced above) shows such an example RF receiver architecture. Ex. 1225, 281; Ex. 1202, ¶ 90. The outputs of the two mixers are digitized separately by two analog-to-digital converters (**olive** and **orange**). Ex. 1225, 280-281; Ex. 1202, ¶ 90. The digitized signals can be further downconverted to baseband frequency by a complex mixing circuit (**purple**) with four mixers and two adders before forwarding the components to the digital signal processor (DSP) for demodulation. Ex. 1225, 280-281; Ex. 1202, ¶ 90.

Crols is reasonably pertinent to problems with which the '275 Patent is concerned, and is analogous art to the '275 Patent on at least that basis. *Netflix, Inc.*, 80 F.4th at 1358; Ex. 1202, ¶ 91. For example, the '275 Patent describes a circuit wherein an RF signal is sent through an amplifier, and then I and Q signals are mixed prior to being sent through an ADC. Ex. 1201, 4:40-6:20, Fig. 2; Ex. 1202, ¶ 91.

⁵ Mixing complex signals in this manner shifts the resultant frequencies, which was a well-known approach to avoid the mirror frequency problem. Ex. 1202, ¶¶ 70-71.

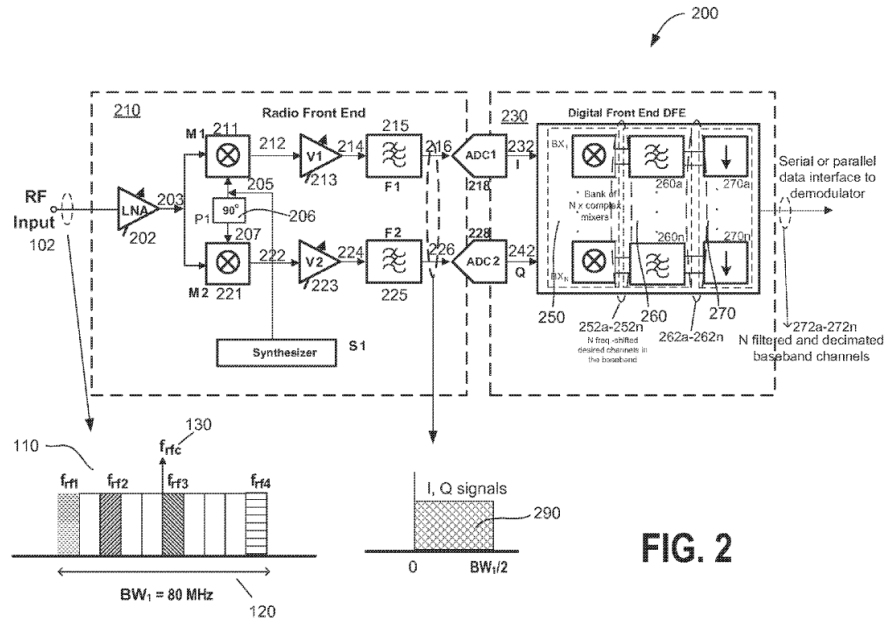


FIG. 2

Ex. 1201, Fig. 2

Similarly, Crols presents circuit diagrams depicting complex bandpass filters that are similar to the '275 Patent's circuit topology:

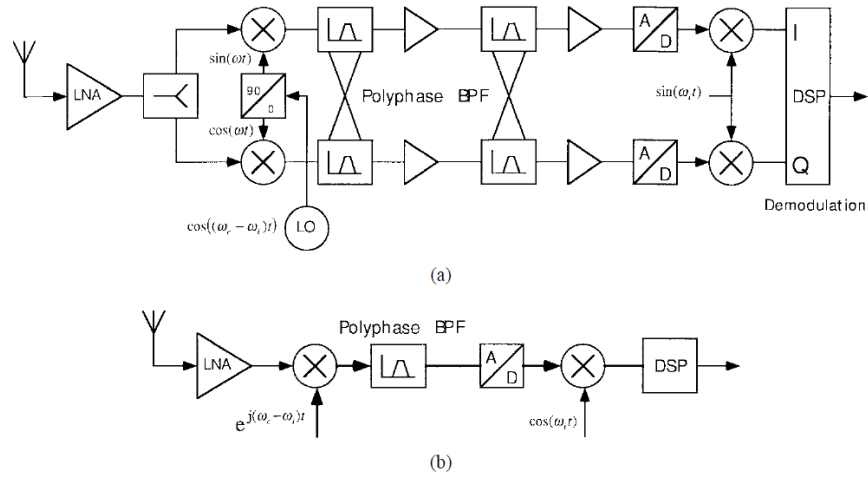


Fig. 21. The topology of a low-IF receiver which uses a complex bandpass filter in the LF part. (a) Full notation and (b) compact notation.

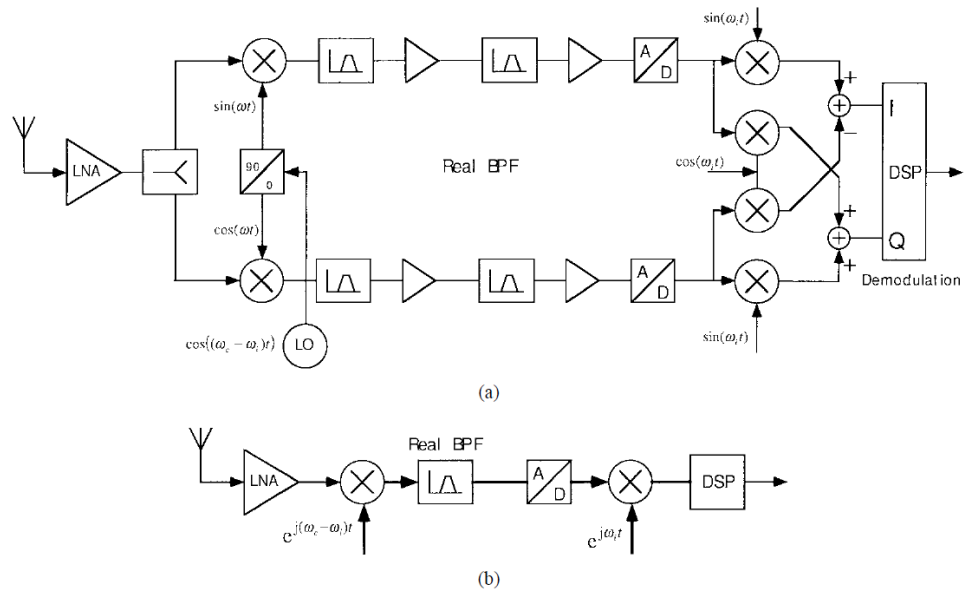


Fig. 22. The topology of a low-IF receiver which uses real filters in the LF part. (a) Full notation and (b) compact notation.

Ex. 1225, Figs. 21-22

Both references provide techniques for suppressing unwanted signals as part of downconversion to IF prior to digital processing, and provide example implementations for a POSITA looking to build systems in real-world applications.

Ex. 1225, 279-280; Ex. 1201, 4:40-6:20; Ex. 1202, ¶ 92.

C. Chandrakasan

Chandrakasan (Ex. 1217) is an IEEE journal article (Non-Patent Literature) published in January 1996. Chandrakasan was publicly available as of April 23, 1996. Ex. 1273, ¶¶ 71-77; Ex. 1202, ¶ 93. Thus, Chandrakasan is prior art under pre-AIA 35 U.S.C. § 102(b). Ex. 1202, ¶ 93. Chandrakasan was not considered during the prosecution of the '275 Patent. Ex. 1201, 1-2; Ex. 1202, ¶ 93.

Chandrakasan describes the trade-offs between using serial interfaces (serial time-multiplex architecture) and parallel interfaces when implementing digital signal processing functions. Ex. 1217, 354-356; Ex. 1202, ¶ 94. Parallel architectures comprise “one to one correspondence between the operations on the signal flow graph” and “requires a small or no controller.” Ex. 1217, 354-355; Ex. 1202, ¶¶ 79-81, 94. However, when there is a constraint in the circuit area, serial time-multiplexed architectures may be preferred where “multiple operations on a signal flowgraph can be mapped onto the same functional hardware unit.” Ex. 1217, 355; Ex. 1202, ¶¶ 80, 94.

Chandrakasan is reasonably pertinent to problems with which the '275 Patent is concerned, and is analogous art to the '275 Patent on at least that basis. *Netflix, Inc.*, 80 F.4th at 1358; Ex. 1202, ¶ 95. Both techniques represent well-known approaches to signal transmissions in digital systems, providing example

implementations for a POSITA looking to build systems in real-world applications.

Ex. 1217, 352; Ex. 1201, 7:16-25; Ex. 1202, ¶ 95.

VI. 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 1-20 on the following grounds.

Ground	References	Basis	Claims Challenged
A	Pugel	§102	1, 5-11, 15-20
B	Pugel	§103	1, 5-11, 15-20
C	Pugel-Crols	§103	1, 4-11, 14-20
D	Pugel-Chandrakasan	§103	2-3, 12-13
E	Pugel-Crols-Chandrakasan	§103	2-3, 12-13

None of the prior art listed above was before the Examiner during prosecution of the '275 Patent. Ex. 1201, cover.

A declaration of David B. Lett in support of this petition includes, e.g., a discussion of Mr. Lett's background (Ex. 1202, ¶¶ 5-17), the '275 Patent (Ex. 1202, ¶¶ 37-51), and the prior art (Ex. 1202, ¶¶ 52-95), as well as his opinions and an explanation of the bases for those opinions. Ex. 1202, ¶¶ 1-214. As set forth in his

attached declaration, David B. Lett at least meets the level of skill of a POSITA. *Id.*, ¶¶ 1-33.

B. 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. The PTAB has instituted IPR on seven of the eight patents originally asserted in the District Court in case no. 2:23-cv-01050, and Petitioner is now filing IPR petitions challenging a patent that Patent Owner seeks to add to the case. Petitioner has also requested a stay, as final written decisions on the instituted IPRs in Petitioner's favor would resolve the majority of the litigation.

Factor two favors institution. Petitioner has filed a motion to dismiss the District Court case, Patent Owner has filed motions for leave to file amended complaints, 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 and hearing arguments on claim construction. The Court has not yet heard claim construction arguments on the '275 patent, and there is presently no schedule in place for claim construction proceedings on the '275 patent.

Factor four strongly favors institution. The petition challenges all claims in the '275 patent while Patent Owner seeks to assert only claims 1, 2, 5, 7, 8, 10-12, 15, 17, 18, and 20 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, relying on prior art that was never discussed and arguments that were never presented or were overlooked during prosecution.

C. 325(d) and 315(d) Discretion Does Not Apply

Considering the two-part framework discussed in *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*, No. IPR2019-01469, Paper 6 *8-9 (PTAB Feb. 13, 2020), the Board should not exercise its §§325(d) or 315(d) discretion to deny institution.

Applicant submitted during prosecution an IDS comprising an invalidity chart, directed to claims 11 and 12 of U.S. Patent No. 9,210,362, that cited to Pugel. Ex. 1204, 125-130, 576-594. This claim chart was included among over 2000 pages of non-patent literature submitted with the IDS, without any additional context from the Applicant to indicate its relevance. *See* Ex. 1204, 125-2282. An initialed IDS alone is insufficient to show that a reference was meaningfully addressed.

[Proposed] Patent Trial and Appeal Board Rules of Practice for Briefing Discretionary Denial Issues, and Rules for 325(d) Considerations, Instituting Parallel and Serial Petitions, and Termination Due to Settlement Agreement, 89 Fed. Reg. 28693, 28705 (proposed Apr. 19, 2024) (“2024 Proposed PTAB Rules”); *Dropbox, Inc. v. Motion Offense, LLC*, IPR2024-00286, Paper 12 *13, 15-16 (PTAB Jul, 25, 2024); *Hanshow America, Inc. et al. v. SES-ImagotagInc.*, IPR2024-00208, Paper 14 *11-12 (PTAB May 20, 2024).

And while the Examiner indicated consideration of the chart, the Examiner did *not* indicate that Pugel itself was ever considered as a reference for the ’275 Patent. Ex. 1201, cover; *see also* Ex. 1204, 3359-3382. So there is no indication that the Examiner ever read Pugel or applied its teachings to the claims that issued in the ’275 Patent, much less that the Office meaningfully addressed Pugel by evaluating and articulating a meaningful consideration. *See* 2024 Proposed PTAB Rules, 89 Fed. Reg. 28693, 28705. Had the examiner meaningfully addressed Pugel, the examiner would have determined that, as explained herein, that Pugel indeed teaches all features of the independent claims and of numerous dependent claims.

Further, while the claim chart citing Pugel was of record in prosecution, that chart did not apply Pugel in combination with Crols or the other secondary

references as presented herein. Ex. 1204, 576-594. For example, the arguments and combinations presented herein regarding all 17 dependent claims are clearly new.⁶

Thus, 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. For example, to any extent that the Examiner considered Pugel, the Office erred by failing to assert Pugel in any grounds of rejection (the lone action asserting only non-statutory double patenting) and by repeating the reasons for allowance from the parent application, in which Pugel was never of record. Ex. 1204, 3352-3357; *compare* Ex. 1204, 3405 *with* Ex. 1205, 158; Ex. 1202, ¶¶ 49-50. For example, and as explained below, Pugel teaches the step of “selecting... a plurality of desired channels,” which the Examiner failed to find in the references of record. Ex. 1204, 3405; *see also* Section VII.A.1.e, *infra*.

⁶ Though claim 12 of the '362 Patent recites additional limitations similar to claim 2 of the '275 Patent, the arguments herein rely on Chandrakasan for those limitations. Chandrakasan was not of record in the '275 Patent and was not cited in the claim chart. Ex. 1204, 590-594.

D. Level of Ordinary Skill

A person of ordinary skill in the art (“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 and RF tuning systems for satellite and/or cable digital communications. Ex. 1202, ¶ 32. Additional education may substitute for professional experience, and significant work experience may substitute for formal education. Ex. 1202, ¶¶ 31-33.

E. 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). No claim constructions should be necessary, and there are no means-plus-function terms. The following constructions are only provided in case some terms are considered means-plus-function terms under pre-AIA 35 U.S.C. §112, paragraph 6.

1. “radio front end”

To the extent “radio front end” of claim 11 is construed to be a means-plus-function term with the function of “process[ing] the input signal” and to the extent the ’275 Patent discloses a corresponding structure for this limitation, that structure is the radio front end 210 or radio front end 410 illustrated in Figures 2 and 4, respectively. Ex. 1201, 4:43-5:47, 7:31-46, Figs. 2, 4; Ex. 1202, ¶¶ 34-35.

2. “digital frontend (DFE)”

To the extent “digital frontend (DFE)” of claims 11-13 is construed to be a means-plus-function term with the functions of “select[ing] the plurality of desired channels from the digitized signal and output[ting] the selected plurality of desired channels to at least one demodulator as a digital datastream,” (limitations [11E]-[11F]), “output[ting] the digital datastream via a serial interface” (claim 12), and “output[ting] the digital datastream via a parallel interface” (claim 13) and to the extent the '275 Patent discloses corresponding structure for this limitation, that structure is the digital front end 230 of Figure 2 (including mixers 250 and filters 260 but not requiring decimators 270). Ex. 1201, 5:56-7:20, Figs. 2-3; Ex. 1202, ¶ 36.

VII. SPECIFIC GROUNDS FOR UNPATENTABILITY

A. Grounds A and B: Claims 1, 5-11, and 15-20 are Anticipated or Obvious in View of Pugel.

As set forth below, claims 1, 5-11, and 15-20 are anticipated or rendered obvious by Pugel. Ex. 1202, ¶¶ 96-169.

1. Independent Claim 1

a. [1A] “A method for operating a television receiver, comprising:”

While the preamble [1A]⁷ is not limiting, Pugel teaches it. Ex. 1202, ¶¶ 98-100. The Pugel multichannel receiver circuit (“a television receiver”) receives a multichannel analog RF input signal for multiple digital channels. Ex. 1224, [0008]-[0013], [0023]-[0024]; Ex. 1202, ¶ 99; *see also* Section IV.A, *supra*. Pugel’s system is “sufficient for satisfactorily processing digital television signals and associated signals intended for end users in a conventional cable television broadcast system.” Ex. 1224, [0036], [0033]-[0037], [0044]-[0045]; Ex. 1202, ¶ 99. For example, Pugel teaches that its system may process multiple signal bands ranging from 5 MHz to 900 MHz. Ex. 1224, [0028]; Ex. 1202, ¶ 99. Thus, Pugel discloses [1A]. Ex. 1202, ¶ 100.

b. [1B] “receiving, by an input terminal, an input signal comprising broadcast channels, the broadcast channels comprising a plurality of desired channels and a plurality of undesired channels, wherein the plurality of desired channels are non-contiguous;”

Pugel discloses “a cable network connector” (“an input terminal”) comprising an input coupler 101, and optionally a splitter 102, for receiving a multichannel

⁷ The limitations of the claims appear and are labelled in the Claims Listing Appendix.

analog RF input signal from a cable or satellite network, wherein the signal is then sent to a plurality of amplifier-filter circuits (**red**), which in turn sends the input signal to a plurality of ADCs (**gold**). Ex. 1224, [0025]-[0026], [0029]-[0031], [0042]-[0044], Figs. 1-2; Ex. 1202, ¶¶ 101-103.

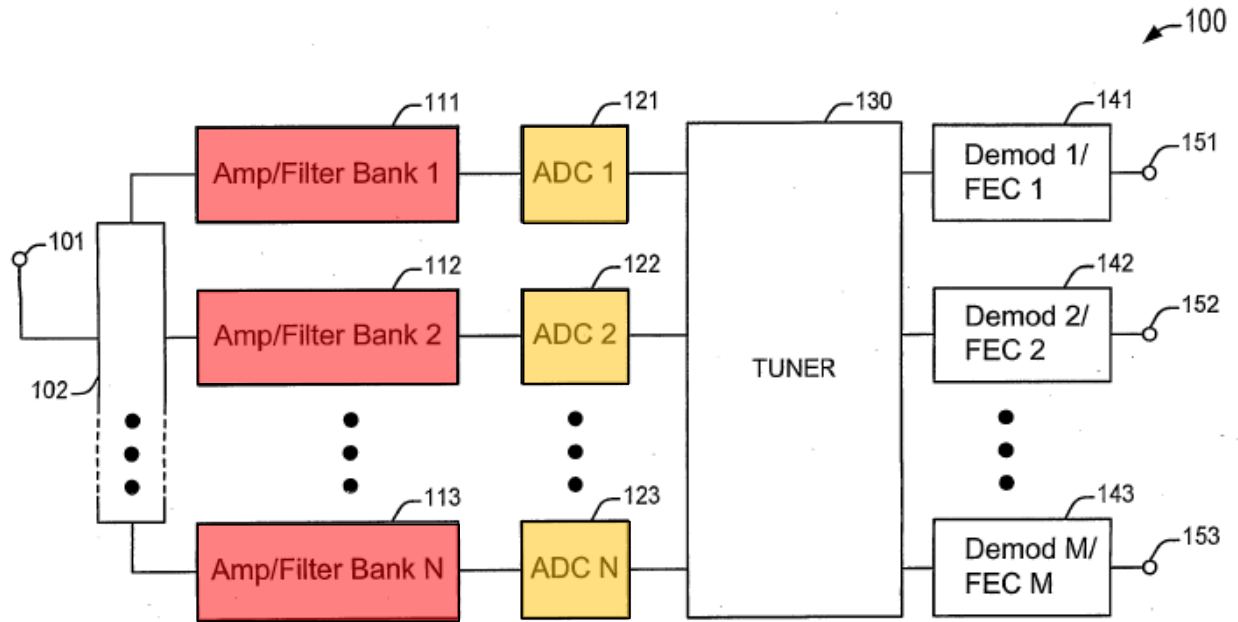


FIG. 1

Ex. 1224, Fig. 1 (annotated)

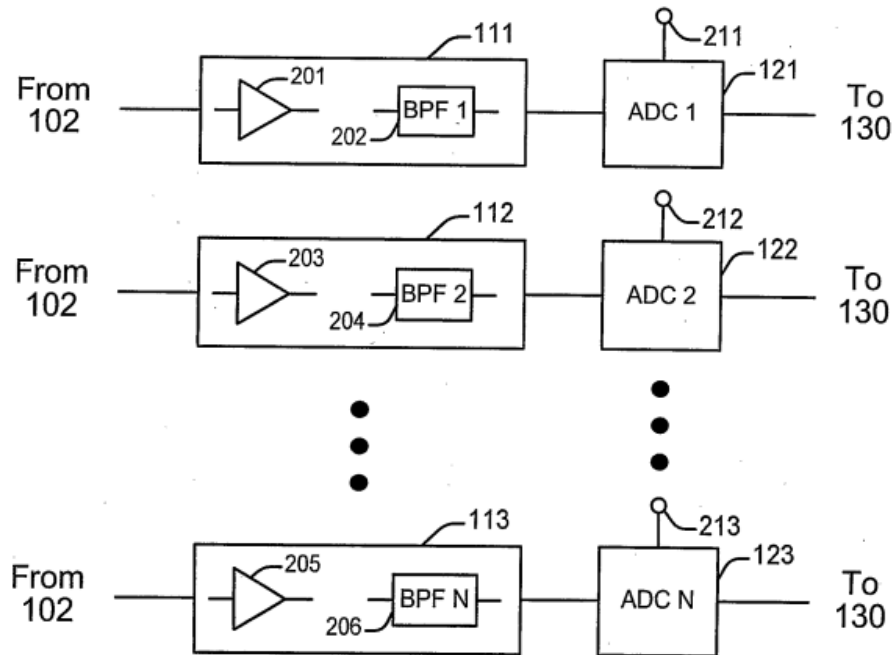


FIG. 2

Ex. 1224, Fig. 2

Pugel discloses that the “plurality of amplifier-filter banks or circuits 111, 112, 113 (**red**) is configured to process frequencies within a specified band.” Ex. 1224, [0028], Figs. 1-2; Ex. 1202, ¶ 104. For example, a first amplifier-filter bank may process a first band comprising a first frequency range of 5 to 300 MHz, and a second amplifier-filter bank may process a second band comprising a second frequency range of 300 to 600 MHz. Ex. 1224, [0026]; Ex. 1202, ¶ 104. The received bands correspond to all received television channels (“an input signal comprising broadcast channels”), including desired and undesired television channels. Ex. 1224, Abstract, [0001], [0008]-[0009], [0011], [0022], [0026]-[0028], [0036]-[0044],

[0048]-[0049]; Ex. 1202, ¶ 105. Pugel further discloses that the bands of frequencies processed by each of the ADCs “may not necessarily be contiguous.” Ex. 1224, [0043]; Ex. 1202, ¶ 106. Across the bands, a channel later selected by the digital tuner is desired, and a channel unselected by the digital tuner is undesired. Ex. 1202, ¶ 105. This is consistent with the use of “desired” and “undesired” in the ’275 Patent. Ex. 1201, Abstract, 1:46-51, 3:29-60, 4:43-58, 5:66-6:7, 6:59-7:2, 7:16-25; Ex. 1202, ¶ 105. As Pugel’s system may select channels from multiple bands, and the bands themselves may be non-contiguous, Pugel thus discloses the resulting selected (“desired”) channels from those bands being non-contiguous. Ex. 1224, [0036]-[0037], [0038] (“digital tuner 130 may include a channel selector 315 to permit selection of one or more particular digital channels”), [0039]-[0042], [0043] (input signal may be separated into “first, second, and third bands of frequencies [that] may not necessarily be contiguous”), [0044]-[0045], [0048]-[0049], Fig. 4; Ex. 1202, ¶¶ 105-107.⁸

To the extent Pugel does not expressly disclose the selected channels being non-contiguous, a POSITA would have found this condition obvious. Ex. 1202, ¶

⁸ In reexamination of the related ’362 Patent, the Office currently maintains that Pugel teaches processing multiple frequency bands comprising both desired and undesired television channels. Ex. 1222, 1284, 1292.

108. Pugel discloses the received RF signal being one of a variety of formats, including cable signals, satellite signals, or terrestrial signals. Ex. 1224, [0022]. A POSITA would have understood that the RF signal used in these systems would, in at least some implementations, include channels in “different frequency bands” that are spaced apart. Ex. 1224, [0044], Abstract; Ex. 1202, ¶ 108. As noted above, Pugel teaches that the received RF signal comprising the channels constitutes frequency bands that “may not necessarily be contiguous.” Ex. 1224, [0043]. Moreover, a POSITA would have understood that subscribers select content channels according to their individual desires and regardless of the underlying frequencies used to carry the content channels. Ex. 1224, [0038], claims 6, 10-11; Ex. 1202, ¶ 108. Thus, a POSITA would have expected a subscriber to select content channels within non-contiguous channels. *Id.* Indeed, it would be mere happenstance (and statistically unlikely, given the volume of available channels) if *all* of the channels the user selected were contiguous. *Id.* To the contrary, the expectation of a POSITA would be that the channels would not be contiguous. *Id.* At a minimum, a POSITA would have immediately recognized that, in at least some instances of operating Pugel’s system, the selected channels—targeted to capture the subscriber’s desired content channels—would obviously have been non-contiguous. *Id.*; Ex. 1224, [0038], [0043]-[0044], claims 6, 10-11.

Further, a POSITA would have been motivated to implement Pugel's system so that the selected channels are non-contiguous because it improves the system's flexibility to access content. Ex. 1202, ¶ 109. A POSITA would not have wanted to be limited to selecting channels within a single frequency band because content would have been (in at least some instances) broadcast in separate frequency bands on non-contiguous RF channels. *Id.* A POSITA would have sought to improve the system's flexibility to increase the number of content channels that are accessible to subscribers. *Id.* For example, if 100 content channels (10 content channels per 10 channels) are in a first frequency band and 30 content channels (6 content channels per 5 channels) are in a second frequency band, a POSITA would have been motivated to implement Pugel such that the selected RF channels are selected from both bands to increase the total number of accessible content channels. *Id.* A POSITA would have wanted to increase the number of accessible content channels to attract subscribers and increase revenue. *Id.*

A POSITA would have had a reasonable expectation of success in implementing Pugel such that the selected channels are non-contiguous because doing so does not involve any structural change to Pugel's system or any additional steps. *Id.*, ¶ 110. Pugel's system already receives an RF signal that, according to Pugel (Ex. 1224, [0043]-[0044]), covers different frequency bands and comprises selected RF channels and unwanted channels that need not be contiguous. Ex. 1202,

¶ 110. Each of the selected channels is selected based on different carrier frequencies or ranges of frequencies. Ex. 1224, [0045]. Whether a given channel is desired is the result of a subscriber's choice. Ex. 1224, [0038]. Pugel's system does not influence the subscriber's choice, and is indifferent as to whether the desired channels are contiguous or not. Ex. 1202, ¶ 110. Pugel's system can select non-contiguous channels just as easily as it can select contiguous channels. *Id.*

Thus, Pugel discloses or teaches limitation [1B]. Ex. 1202, ¶ 111.

- c. [1C] “processing, by a radio front end coupled to the input terminal, the input signal to generate a processed input signal;”

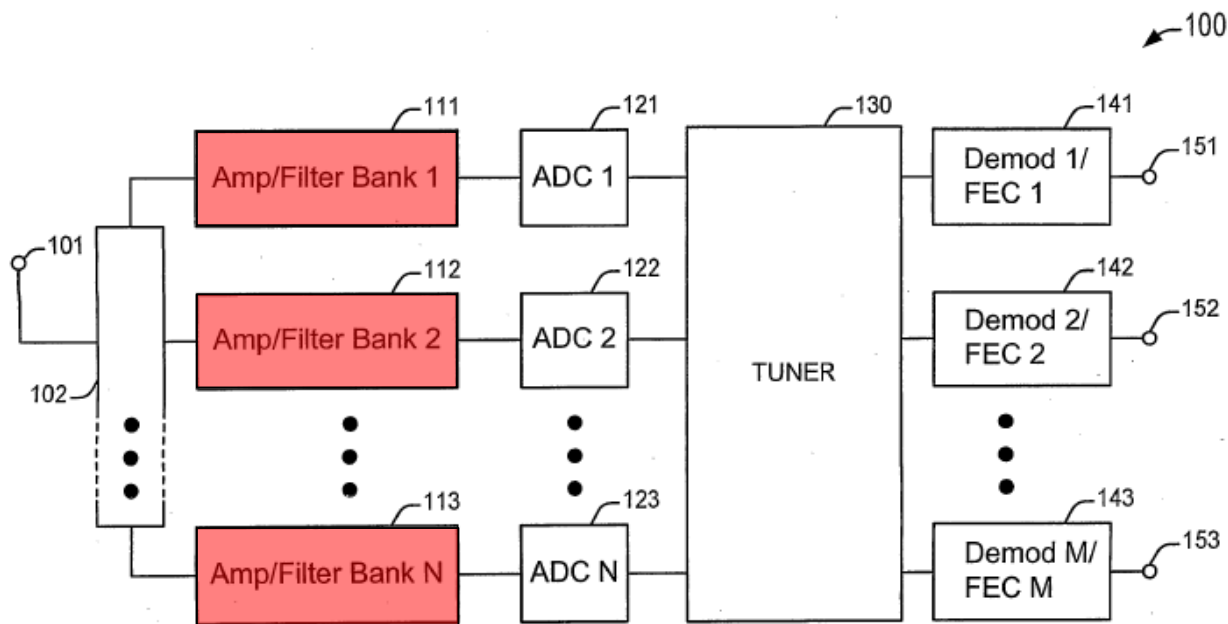


FIG. 1

Ex. 1224, Fig. 1 (annotated)

Pugel's amplifier-filter banks (**red**, collectively "a radio front end") act as bandpass filters that will process limited frequency ranges to generate an input ("a processed input signal") to various ADCs. Ex. 1224, [0025]-[0032], Figs. 1-2; Ex. 1202, ¶¶ 112-117. Pugel's amplifier-filter banks comprise a radio front end because they first receive and process the RF (*radio* frequency) signal before the RF signal is digitized, just as the '275 Patent's radio front end 210 uses filters 215/225 and amplifiers 213/223 to receive and process the RF input signal 102 before digitized. *Compare* Ex. 1224, [0025]-[0032], Fig. 2 *with* Ex. 1201, 4:42-6:19, Fig. 2; Ex. 1202, ¶ 116. For example, Pugel teaches performing undersampling to reduce the bands' frequencies (for example, reducing an upper frequency boundary from 900 MHz to 300 MHz such that the Nyquist criterion can be met with a sampling frequency of 600 MHz). Ex. 1224, [0032]-[0034]; Ex. 1202, ¶¶ 113-114. This advantageously avoids the need for a sampling frequency of 1.8 GHz for sampling a band of 600 MHz to 900 MHz (the Nyquist criterion being tied to the highest frequency in the band). Ex. 1224, [0034]; Ex. 1202, ¶¶ 114-115.

Thus, Pugel discloses or teaches limitation [1C]. Ex. 1202, ¶ 117.

- d. [1D] “digitizing, by an analog-to-digital converter (ADC) coupled to the radio front end, the processed input signal to generate a digitized signal;”

Pugel’s receiver circuit includes analog-to-digital converters 121-123 (gold, collectively, “an analog-to-digital converter”)⁹ that are coupled to the amplifier/filter banks 111-113 (the claimed “radio front end”) and which digitize the processed signal coming therefrom. Ex. 1224, [0036], [0033]-[0037], [0044]-[0045], Fig. 1; Ex. 1202, ¶¶ 118-123.

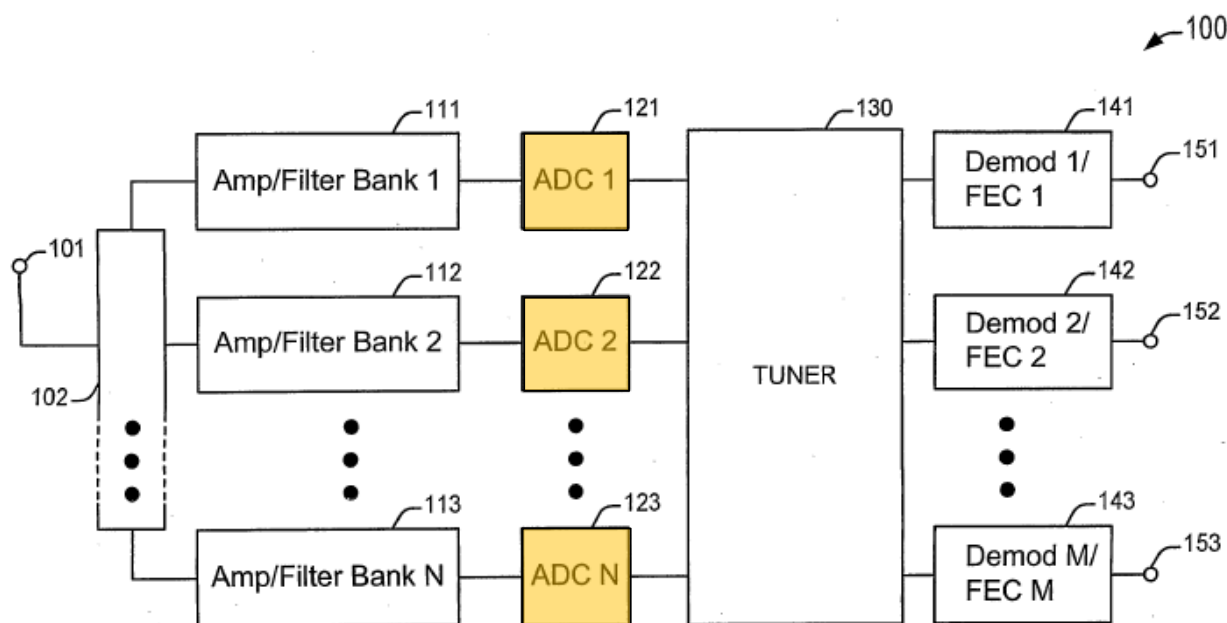


FIG. 1

Ex. 1224, Fig. 1 (annotated)

⁹ The claimed ADC comprising multiple ADCs is consistent with the claims, in view of dependent claim 4. Ex. 1202, ¶¶ 187-192.

As discussed above in Section VII.A.1.c, Pugel teaches a radio front end having amplifier-filter circuits that generate analog signals within a particular, segregated pass-band (collectively, the “processed input signal”). Ex. 1224, Abstract, [0001], [0008]-[0009], [0011], [0022], [0028], [0036]-[0044], [0048]-[0049]; Ex. 1202, ¶¶ 112-117. Each of those pass-bands is then outputted to a given ADC for digitization (“to generate a digitized signal”). Ex. 1224, [0035], [0024], [0034]; Ex. 1202, ¶¶ 119-123.

Thus, Pugel discloses or teaches limitation [1D]. Ex. 1202, ¶ 123.

- e. **[1E] “selecting, by a digital frontend (DFE) coupled to the ADC, the plurality of desired channels from the digitized signal; and”**

Pugel’s receiver circuit comprises a digital tuner (“a digital frontend,” **green**) configured to select a plurality of desired channels from the plurality of frequencies that were digitized by the ADCs such that a selected set of channels may be demultiplexed from the digital signals. Ex. 1224, [0037]-[0039], [0045], Fig. 1; Ex. 1202, ¶¶ 124-128. The digital tuner 130 may include digital multiplexers, demultiplexers, or “a multitude of components configured as is well known in the art to recover a plurality of digital channel signals.” Ex. 1224, [0037]; Ex. 1202, ¶ 125. The digital tuner 130 is “a digital frontend” because it processes digital signals—specifically the digital channels received from the ADCs—before demodulation, just as the ’275 Patent’s digital frontend processes digital signals

before demodulation. Compare Ex. 1224, [0037]-[0039], [0041], [0045], Fig. 1 with Ex. 1201, 5:56-6:19, Fig. 2; Ex. 1202, ¶¶ 126-127.

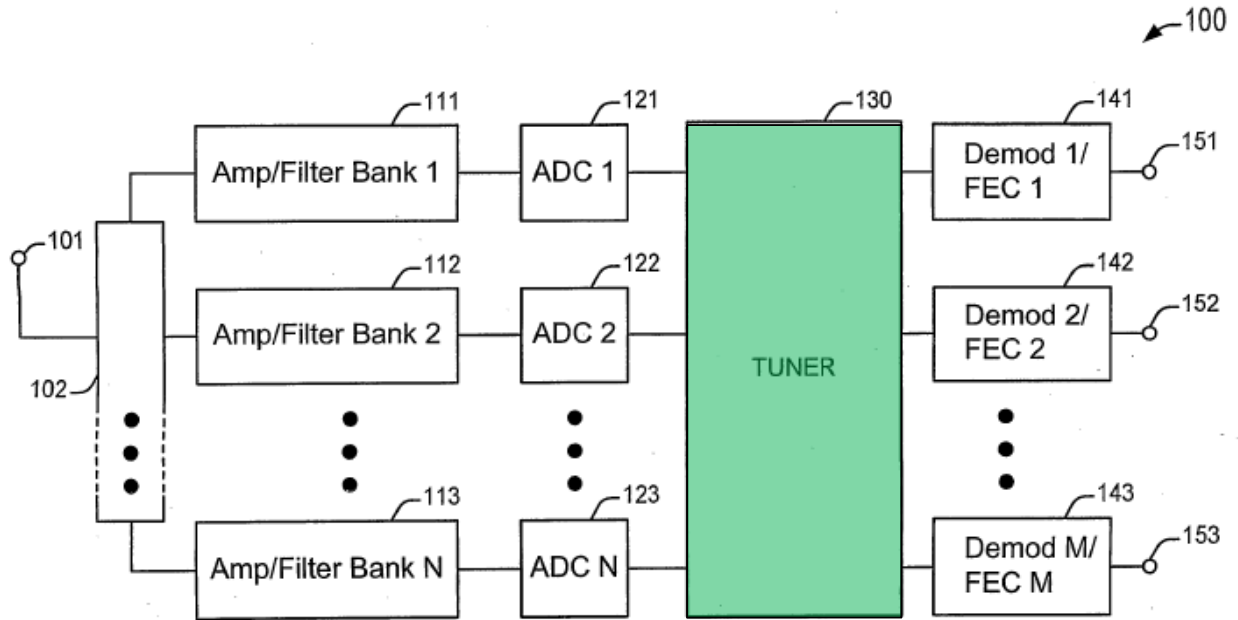


FIG. 1

Ex. 1224, Fig. 1 (annotated)

For example, Pugel teaches that the digital tuner may select and demultiplex only digital channels corresponding to certain pay-per-view selections, or may demultiplex all channels. Ex. 1224, [0038]; Ex. 1202, ¶ 126. In such an example, the selected digital channels are the claimed “desired channels.” Ex. 1202, ¶ 126. The digital tuner may perform a variety of other functions, including “coding, decoding, scrambling, descrambling, rotating, and/or derotating operations prior to passing the digital channel signals to demodulation circuits.” Ex. 1224, [0039]; Ex. 1202, ¶ 126.

The digital tuner 130 may comprise “circuitry for providing additional functions, for example adaptive filters for removing multi-path propagation effects.” Ex. 1224, [0041].

Thus, Pugel discloses or teaches limitation [1E]. Ex. 1202, ¶ 128.

- f. **[1F] “outputting, by the DFE, the selected plurality of desired channels to at least one demodulator as a digital datastream, wherein the demodulator extracts information encoded in the digital datastream.”**

As described above, Pugel’s tuner 130 is the claimed DFE. Ex. 1202, ¶¶ 129-136. Pugel discloses that the digital tuner 130 outputs signals to demodulators 141-143 (**blue**, the claimed “at least one demodulator”) which may perform a variety of demodulation techniques including quadrature amplitude modulation (QAM) or quadrature phase shift keying demodulation (QPSK). Ex. 1224, [0027], [0039]-[0040], [0046], Figs. 1, 3-4; Ex. 1202, ¶¶ 52-67, 75-78, 130-132.

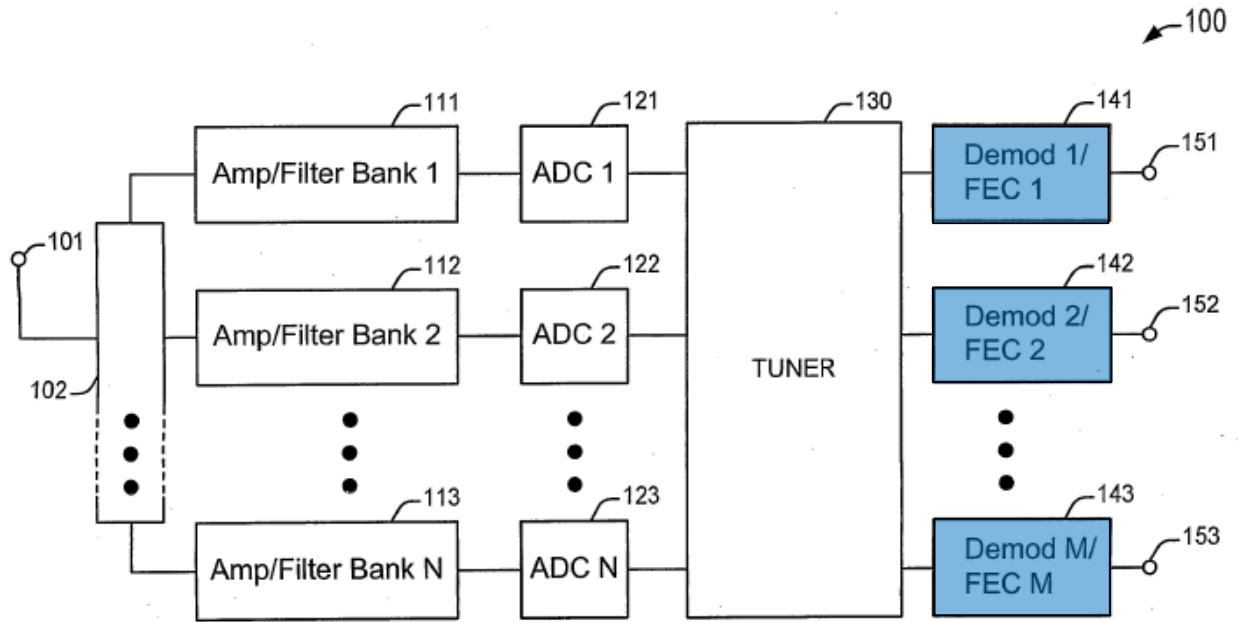


FIG. 1

Ex. 1224, Fig. 1 (annotated)

A POSITA would have understood a demodulator to be a device that extracts data from a digital signal Ex. 1202, ¶¶ 133-134; Ex. 1215, 6-7 (defining demodulation as “[t]he reconversion of a modulated signal back into its original form by extracting the data from the modulated carrier.”). In Pugel, the digital signal comprises a digital RF channel signal that is the result of the digital tuner 130 demultiplexing the digital signals generated by Pugel’s ADCs (the claimed “selected plurality of desired channels”). Ex. 1202, ¶ 134; Ex. 1224, [0045]-[0046]. Any number of demodulators may handle signals from any number of ADCs. Ex. 1224, [0023], [0027], [0040]; Ex. 1202, ¶ 133. Each digital RF channel signal may

comprise a plurality of data streams, and the digital RF channel signal is demodulated to extract data from the data streams. Ex. 1202, ¶ 133. For example, “a first demodulator 301 may be configured to perform [QAM] demodulation of digital cable television signals.” Ex. 1224, [0040]; Ex. 1202, ¶ 133. In doing so, the demodulator extracts digital data (e.g., bits “1” and “0”) from a modulated RF carrier signal according to well-known QAM standards. Ex. 1202, ¶¶ 133-134; *see also* Ex. 1233, 155. In other examples, the demodulators may perform forward-error-correction for coding or decoding information in the received signal, or other functions, such as mitigating radio interference effects. Ex. 1224, [0041], [0046]; Ex. 1202, ¶ 135.

Thus, Pugel discloses or teaches limitation [1F], and claim 1 is anticipated or rendered obvious by Pugel. Ex. 1202, ¶ 136.

2. Dependent Claim 5

- a. [5] “The method of claim 1, wherein the extracted information is stored for use in a digital video recorder (DVR).”**

Pugel teaches that its system may comprise “a PVR device” for receiving the digital channels in the digital video signals and storing them. Ex. 1224, [0005], [0048]-[0049]; Ex. 1202, ¶¶ 137-139. The term “PVR” refers to a personal video recorder, which a POSITA would have understood to be another term for a DVR. Ex. 1224, [0005]; Ex. 1202, ¶ 138. Pugel discloses that the video signals produced

by the system (including the “information” extracted by the demodulator of [1F]) are received by the PVR device. Ex. 1224, [0049]. Pugel also discloses the PVR storing such information, as “information on the recorded channels is then available for later playback or other processing,” which a POSITA would have understood to refer to storage in the PVR such that it is available for later use. Ex. 1224, [0005]; 1202, ¶ 138. Thus, Pugel discloses that the information extracted by the demodulator is stored for use in a DVR. Ex. 1202, ¶ 138.

Thus, claim 5 is anticipated and rendered obvious by Pugel. Ex. 1202, ¶ 139.

3. Dependent Claim 6

a. [6] “The method of claim 1, wherein the extracted information is output for a picture-in-picture display.”

Pugel discloses that its system is designed to support a television displaying multiple channels on the same television using a picture-in-picture (PiP) display. Ex. 1224, [0005], [0048]-[0049]; Ex. 1202, ¶¶ 140-142. To any extent not explicitly disclosed by Pugel, it would have been obvious to a POSITA in view of Pugel’s express teachings that a device, such as Pugel’s multichannel receiver circuit, would be configured to output a plurality of desired channels for use in a PiP display in the home. Ex. 1202, ¶¶ 75, 141. A POSITA would have been motivated to implement a configuration because it would support the display of PiP material from the tuner, as taught by Pugel. Ex. 1202, ¶ 141. This would have been nothing more than applying a known technique (generation of multiple data streams for PiP display) to a known

device (Pugel's receiver circuit) ready for improvement to yield predictable results (the output of the receiver circuit is used for PiP display). Ex. 1202, ¶ 141. A POSITA would have a reasonable expectation of success, as Pugel's multichannel receiver circuit is designed to output a plurality of desired channels, and any necessary modification would have been well within the skill of a POSITA. Ex. 1202, ¶ 141.

Thus, claim 6 is anticipated and rendered obvious by Pugel. Ex. 1202, ¶ 142.

4. Dependent Claims 7-10

a. **[7] "The method of claim 1, wherein the plurality of desired channels comprises at least one television channel."**

[8] "The method of claim 1, wherein the plurality of undesired channels comprises at least one television channel."

[9] "The method of claim 1, wherein the broadcast channels comprise satellite broadcast channels."

[10] "The method of claim 1, wherein the broadcast channels comprise cable broadcast channels."

Pugel teaches the features described in claims 7-10. Ex. 1202, ¶¶ 143-153. Pugel's system is "sufficient for satisfactorily processing digital television signals and associated signals intended for end users in a conventional cable television broadcast system." Ex. 1224, [0036], [0033]-[0037], [0044]-[0045]. This includes television cable broadcast channels from which desired channels are selected, and

undesired channels are not. Ex. 1224, [0037]-[0039], [0045]; Ex. 1202, ¶¶ 144-145. Therefore, Pugel teaches the features of claims 7, 8, and 10. Ex. 1202, ¶ 146.

Furthermore, Pugel teaches that Pugel's multichannel receiver circuit also receives, processes, and demodulates digital television channels from satellite television transmission systems. Ex. 1224, [0022]; Ex. 1202, ¶ 148. Therefore, Pugel teaches the feature of claim 9, as well. Ex. 1202, ¶ 148.

To any extent that Pugel does not explicitly disclose that the broadcast channels comprise satellite broadcast channels, this would have been obvious to a POSITA at the time in view of Pugel's express teachings. Ex. 1202, ¶ 149. A POSITA would have understood that satellite broadcast channels could be received and processed in the same manner as cable broadcast channels. Ex. 1202, ¶¶ 149-150; *see also* Ex. 1201, 9:2-15, 10:55-58. Thus, a POSITA would have found it obvious that Pugel's teachings would also be applied to satellite systems given Pugel's express teaching that "it should be apparent that [Pugel's] invention may be used in other types of radio-frequency communications systems as well, including reception of digital television channels via satellite and terrestrial television transmission systems." Ex. 1224, [0022]; Ex. 1202, ¶¶ 149-150.

Further, modifying Pugel's television receiver circuit to process satellite broadcast channels would have been nothing more than applying a known technique (processing television channels in a satellite frequency range) to a known device

(Pugel’s receiver circuit) ready for improvement to yield predictable results (satellite signal frequency ranges are processed rather than cable broadcast frequency ranges). Ex. 1202, ¶ 152. A POSITA would have a reasonable expectation of success, as Pugel’s multichannel receiver circuit is designed to process signals at a wide range of frequencies, and any necessary modification would have been well within the skill of a POSITA. Ex. 1224, [0035]-[0036]; Ex. 1202, ¶¶ 151-152.

Thus, claims 7-10 are anticipated and rendered obvious by Pugel. Ex. 1202, ¶¶ 146-153.

5. Independent Claim 11

Claim 11 recites a television receiver device with the same components and functions thereof that were recited in method claim 1. Ex. 1202, ¶ 154. Thus, Pugel anticipates and renders obvious [11A]-[11F] for the same reasons discussed above for [1A]-[1F], respectively. *See* Section VII.A.1, *supra*; Ex. 1224, Abstract; Ex. 1202, ¶¶ 155-165.

6. Dependent Claims 15-20

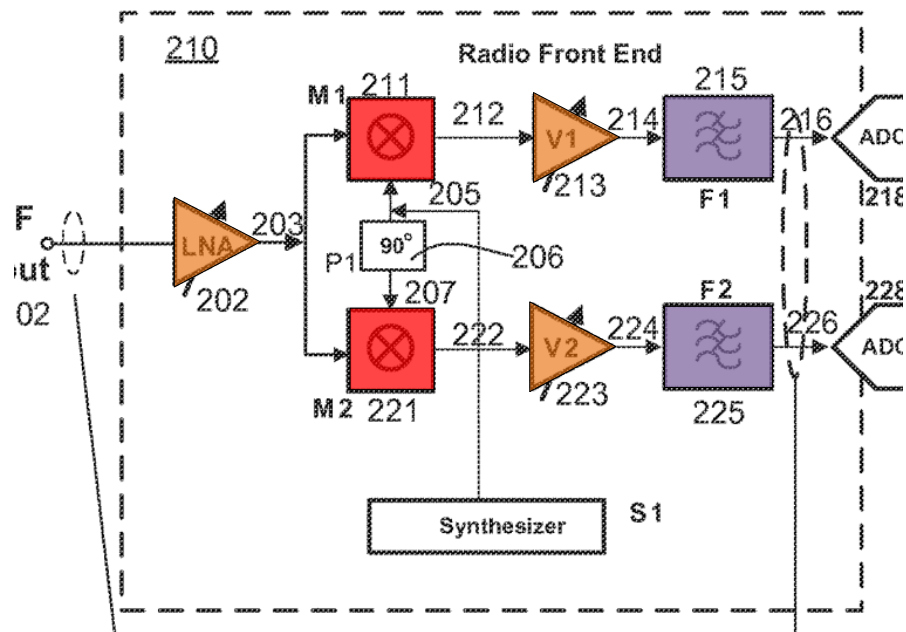
Dependent claims 15-20, aside from their dependency on the “television receiver device of claim 11” instead of the method of claim 1, are identical or nearly identical to dependent claims 5-10, and thus are anticipated and rendered obvious by Pugel for the same reasons discussed above with respect to claims 15-20. *See* Sections VII.A.2-VII.A.4, *supra*; Ex. 1202, ¶¶ 166-169.

B. Ground C: Claims 1, 4-11, and 14-20 are Obvious Over Pugel in view of Crols

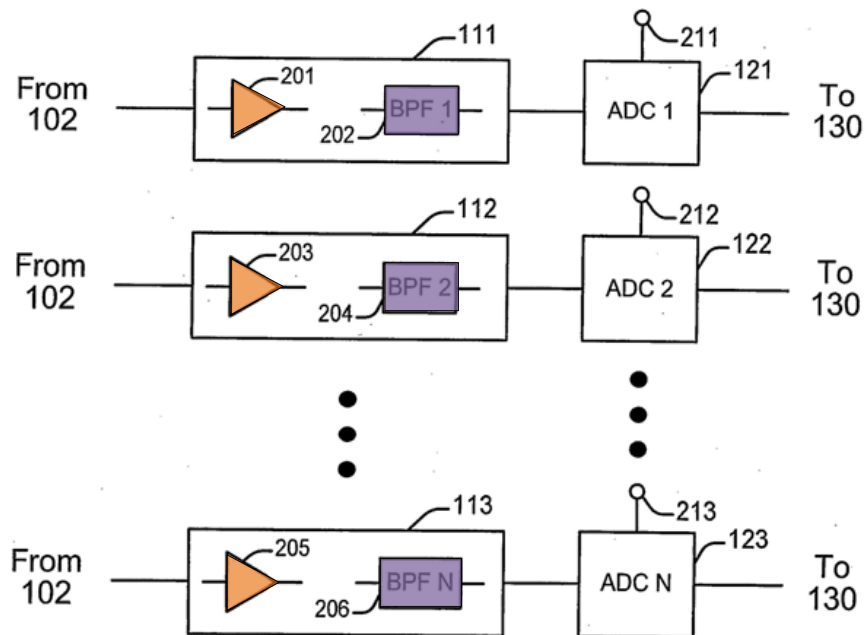
Pugel teaches the limitations of these claims for the reasons set forth above in Section VII.A. But in the event the Board adopts a means-plus-function construction of “radio front end” or “digital frontend,” or otherwise construes these claim limitations as requiring the specific physical components depicted in the ’275 Patent, they are taught by Pugel in view of Crols for the reasons set forth below. Ex. 1202, ¶¶ 170-186.

Radio Front End

As discussed (*see* §VII.A.1.c, §VII.A.5, *supra*), Pugel’s amplifier-filter banks disclose the claimed “radio front end.” But to any extent that a means-plus-function construction of “radio front end” applies, and Pugel’s amplifier-filter banks allegedly are not structurally equivalent to the structure described by the ’275 Patent for performing the function recited in limitations [1C] or [11C], this would have been obvious in view of Pugel-Crols. Ex. 1201, 4:65-5:37; Ex. 1225, 269, 271-274, 279-282; Ex. 1202, ¶ 171. The ’275 Patent discloses a “radio front end” comprising amplifiers (**orange**, 202, 213, and 223), filters (**purple**, 215 and 225), and mixers (**red**, 211 and 221). While Pugel discloses amplifiers (**orange**, 201, 203, and 205) and filters (**purple**, 202, 204, and 206) consistent with the structure of the ’275 Patent, it does not explicitly show mixers. *Compare* Ex. 1224, [0025]-[0032], Fig. 2 *with* Ex. 1201, 4:42-6:19, Fig. 2; Ex. 1202, ¶ 171.



Ex. 1201, Fig. 2 (annotated, excerpted)



Ex. 1224, Fig. 2 (annotated, excerpted)

Crols discusses numerous topologies for signal processing comprising mixers, including a zero-IF receiver topology employing a quadrature downconversion mixer wherein an “RF signal is broadband filtered and then downconverted.... After low-pass filtering, the signal is ready for sampling and demodulation.” Ex. 1225, 275, 279; Ex. 1202, ¶ 172. Crols teaches that, in an example using a complex filter, “downconversion of the IF signal can be done in two ways, both are shown in the full and compact notation in Figs. 21 and 22.” Ex. 1225, 279, Figs. 21, 22; Ex. 1202, ¶¶ 172-173. Crols incorporates mixer modules (**red**), integrated with amplifiers (**orange**) and filters (**purple**), prior to ADC conversion:

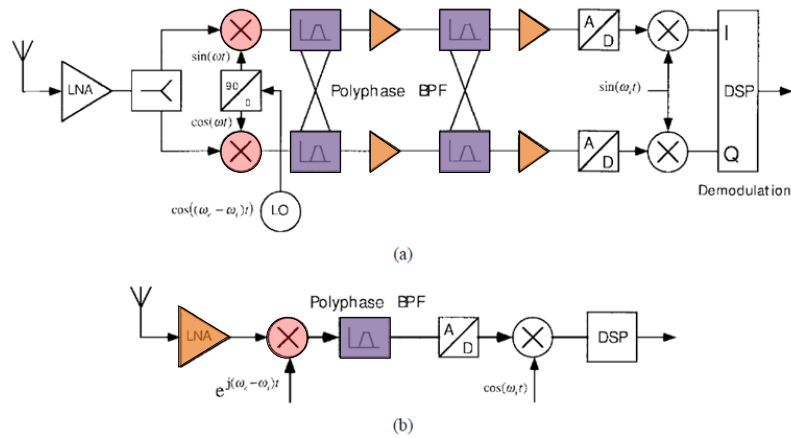


Fig. 21. The topology of a low-IF receiver which uses a complex bandpass filter in the LF part. (a) Full notation and (b) compact notation.

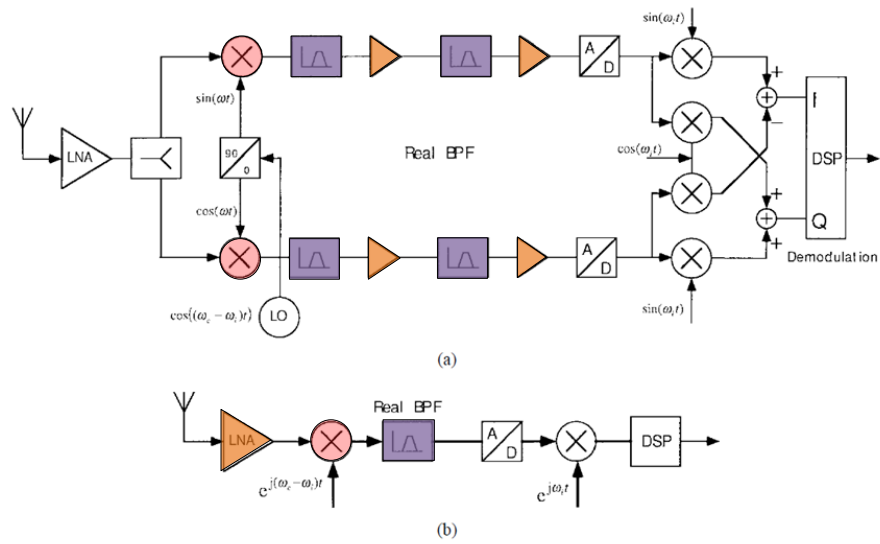


Fig. 22. The topology of a low-IF receiver which uses real filters in the LF part. (a) Full notation and (b) compact notation.

Ex. 1225, Figs. 21, 22 (annotated)

Crols teaches that certain topologies, such as well-known IF receiver topologies, have disadvantages in that “apart from the wanted signal, an unwanted signal (called the mirror frequency) is downconverted to the IF.” Ex. 1225, 270-273; Ex. 1202, ¶¶ 174-175. The topologies shown in Crols’ Figures 21-22 suppress such mirror signals, increasing the reliability of the system. Ex. 1225, 279-280; Ex. 1202, ¶¶ 174-175.

It would have been obvious to a POSITA to modify Pugel's amplifier-filter circuits to include circuit topologies as taught by Crols, because a POSITA would have been motivated to implement Pugel's system with alternative known solutions for reducing problems caused by mirror signals as a simple design choice. Ex. 1202, ¶ 176. Indeed, Pugel expressly teaches that "any number of amplifier-filter circuits, analog-to-digital converters, and/or demodulator circuits may be used in accordance with the present invention," which would include Crols' beneficial circuit. Ex. 1224, [0023]; Ex. 1202, ¶ 176. Further, Pugel states that each amplifier-filter circuit comprises "at least an amplifier... and a filter," and that the amplifier-filter circuits "may include one or more additional components (not shown) for accomplishing segregation of the analog input signal as described above." Ex. 1224, [0029], [0030]; Ex. 1202, ¶ 176. Crols' topologies provide exactly such additional components for that purpose, and use readily available traditional mixer modules. Ex. 1202, ¶ 176.

Applying Crols' topologies comprising mixer modules to Pugel's receiver circuits would have been nothing more than applying a known technique (using mixer module topologies for frequency filtering and mirror signal suppression as taught by Crols) to improve a known device (Pugel's receiver circuits comprising amplifier-filter circuits) ready for improvement to yield predictable results (Pugel's amplifier-filter circuits would more effectively segregate analog input signals for sampling in ADCs). Ex. 1202, ¶ 177.

Further, a POSITA would have understood that Pugel teaches the use of QAM or QPSK demodulation, and that in-phase and quadrature signals are used in those modulation schemes. *Id.*; Ex. 1224, [0040]; Ex. 1202, ¶¶ 178-179. For example, a POSITA would have understood that mixers may be used to create an in-phase signal and a quadrature signal. Ex. 1225, 277 (“Quadrature oscillators often use an RC-CR circuit to obtain the 90° phase shift. The phase shift is a result of comparing the phase shift of a pole and a zero.”), 279-282; Ex. 1234, 42-43, 65-67; Ex. 1202, ¶ 178. It would have been obvious to a POSITA to modify Pugel’s receiver circuit to implement mixers, such as taught by Crols, in order to support QAM and QPSK modulation as taught by Pugel. Ex. 1202, ¶ 179. Thus, applying Crols’ topologies comprising mixer modules to Pugel’s receiver circuits would have been nothing more than applying a known technique (using mixers to generate in-phase and quadrature signals) to improve a known device (Pugel’s receiver which performs QAM or QPSK demodulation) ready for improvement to yield predictable results (the resulting implementation of Pugel-Crols would be capable of performing QAM or QPSK modulation as taught by Pugel). Ex. 1202, ¶ 179.

A POSITA would have had a reasonable expectation of success given the express teachings in Pugel to turn to other systems, Crols’ detailed descriptions of operational effectiveness of its topologies, and the POSITA’s own familiarity with known receiver circuit topologies in the art. Ex. 1202, ¶ 179.

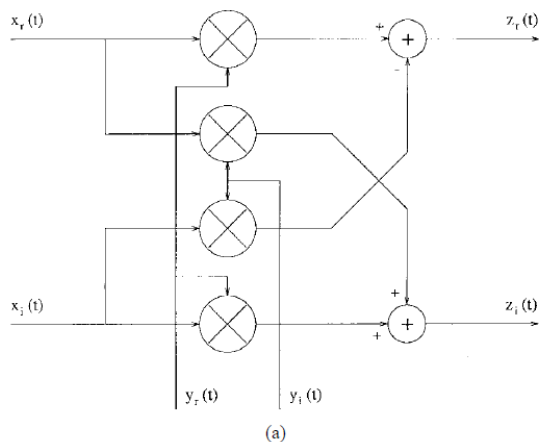
The resultant system of Pugel-Crols thus comprises amplifiers and filters as taught by Pugel, with the addition of mixers as taught by Crols. The resultant system of Pugel-Crols is thus structurally equivalent to, and performs the same function as, the structure described by the '275 Patent for performing the function recited in limitation [1C] of “process[ing] the input signal.” Ex. 1201, 4:65-5:37; Ex. 1202, ¶ 180.

Digital Frontend

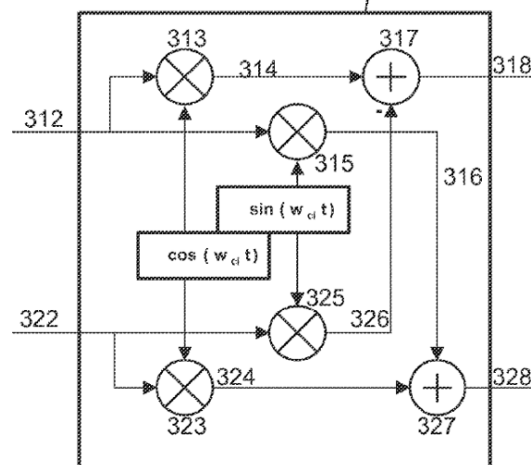
As discussed (*see* §VII.A.1.e-f, §VII.A.5, *supra*), Pugel’s digital tuner 130 is the claimed “digital frontend.” Ex. 1202, ¶¶ 181-185. The digital tuner 130 or demodulators may comprise “circuitry for providing additional functions, for example adaptive filters for removing multi-path propagation effects.” Ex. 1224, [0041]. Pugel teaches that the additional functions include “coding, decoding, scrambling, descrambling, rotating, and/or derotating operations prior to passing the digital channel signals to demodulation circuits.” Ex. 1224, [0039]; Ex. 1202, ¶ 181. A POSITA would have understood this to, for example, include downconversion, or have found it obvious, because the claims of Pugel provide an express teaching that the digital tuner 130 may itself perform downconverting of digital signals. Ex. 1224, claims 14-15, 18, 20-21; Ex. 1202, ¶ 181-182.

But to any extent that a means-plus-function construction of “digital frontend” applies, and Pugel’s tuner 130 allegedly is not structurally equivalent to, or performs

the same function as, the structure described by the '275 Patent for performing the functions of “select[ing] the plurality of desired channels from the digitized signal and output[ting] the selected plurality of desired channels to at least one demodulator as a digital datastream,” ([11E]-[11F]), “output[ting] the digital datastream via a serial interface” (claim 12), and “output[ting] the digital datastream via a parallel interface” (claim 13), this would have been obvious in view of Crols. Ex. 1201, 6:21-7:25; Ex. 1202, ¶ 181. Crols’ complex mixer has the identical structure and performs the identical downconversion (i.e., shifting the frequency of in-phase and quadrature components of the digital complex input signal) as mixer 300 shown in Figure 3 of the '275 Patent. *Compare* Ex. 1225, 273-274, 279-280, Figs. 8(a), 21-22, *with* Ex. 1201, 6:33-7:25, 11:15-24, Fig. 3; *see also* Ex. 1234, 63; Ex. 1202, ¶ 183. Crols further teaches that once a signal is received from an ADC in a low-IF topology, “it has to be filtered further on in order to extract the wanted signal from its neighbors.” Ex. 1225, 270-271, Fig. 3, Fig. 5; Ex. 1202, ¶ 183.



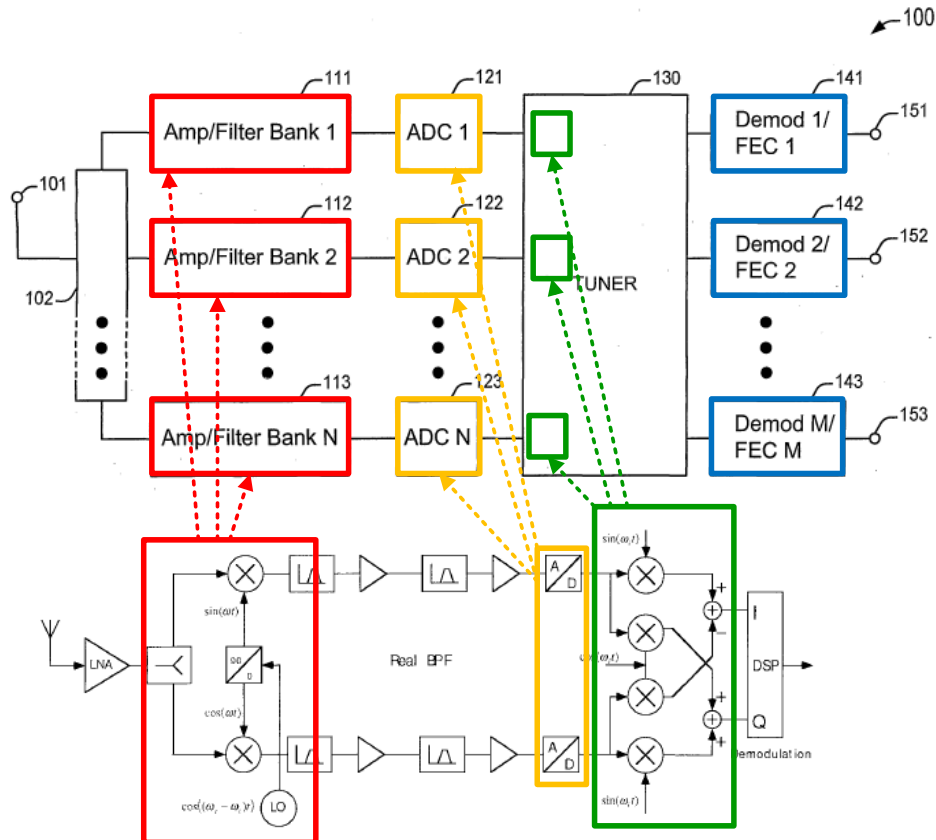
Ex. 1225, Fig. 8(a)



Ex. 1201, Fig. 3 (excerpted)

Crols discloses a complex mixer for processing digital signals output by the ADC. The figures of Pugel and Crols relate as follows, with the corresponding mixer in **green**:

Ex. 1224, FIG. 1 (annotated)



Ex. 1225, FIG. 22 (annotated)

Ex. 1202, ¶ 183. As Crols explains and illustrates, the circuitry outlined in green is a “complex mixer” that is utilized to perform downconversion of the selected (e.g., “desired”) channels received by the digital tuner 130. Ex. 1225, 273-274, 279-280, Figs. 8(a), 21-22; Ex. 1234, 46-47, 75, Fig. 3.3; Ex. 1202, ¶ 183.

It would have been obvious to a POSITA that Pugel’s digital tuner 130 would incorporate a complex mixer for downconversion as taught by Crols in view of Pugel’s express teachings that its digital tuner 130 employs downconversion. Ex. 1224, [0039], claims 14-15, 18, 20-21; Ex. 1202, ¶ 184. A POSITA looking to implement downconversion would have turned to techniques known to the art, such as taught by Crols. Ex. 1202, ¶ 184. Even if not expressly taught, such an implementation would have been obvious to try, as Crols’ complex mixer topology is one of a finite number of identified, predictable solutions to implement downconversion in digital circuitry, such as a digital tuner. *Id.* A POSITA would have had a reasonable expectation of success given the express teachings in Pugel to turn to other systems, Crols’ detailed descriptions of the operational effectiveness of its topologies, and the POSITA’s own familiarity with known receiver circuit topologies in the art. *Id.*

Thus, claims 1, 5-11, and 15-20 are also rendered obvious by Pugel in view of Crols. Ex. 1202, ¶¶ 170-186, 193-194.

1. Dependent Claim 4

a. [4A] “The method of claim 1, wherein the ADC comprises:

[4B] a first ADC configured to generate a digital in-phase signal; and

[4C] a second ADC configured to generate a digital quadrature signal.”

As explained in Section VII.A.1.d for limitation [1D], Pugel’s analog-to-digital converters 121-123 (gold) collectively disclose the claimed “ADC.” Ex. 1202, ¶¶ 118-123.

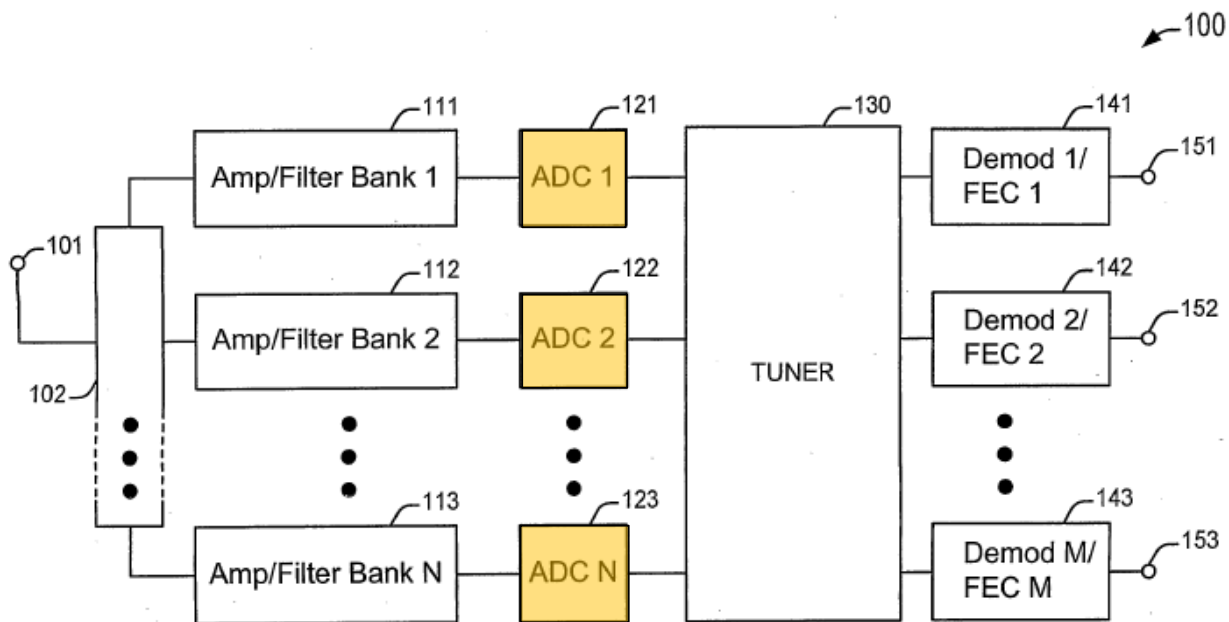
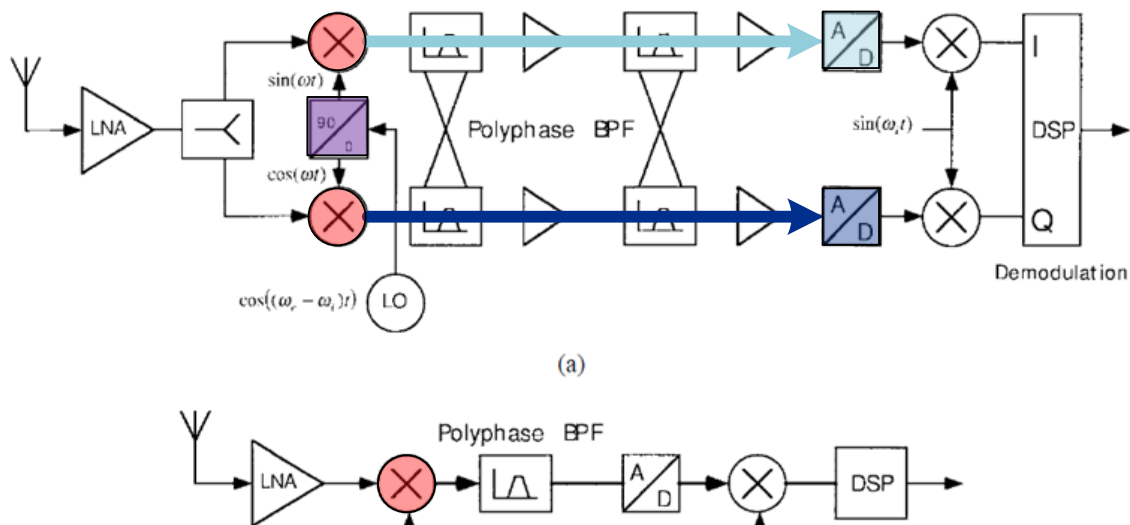
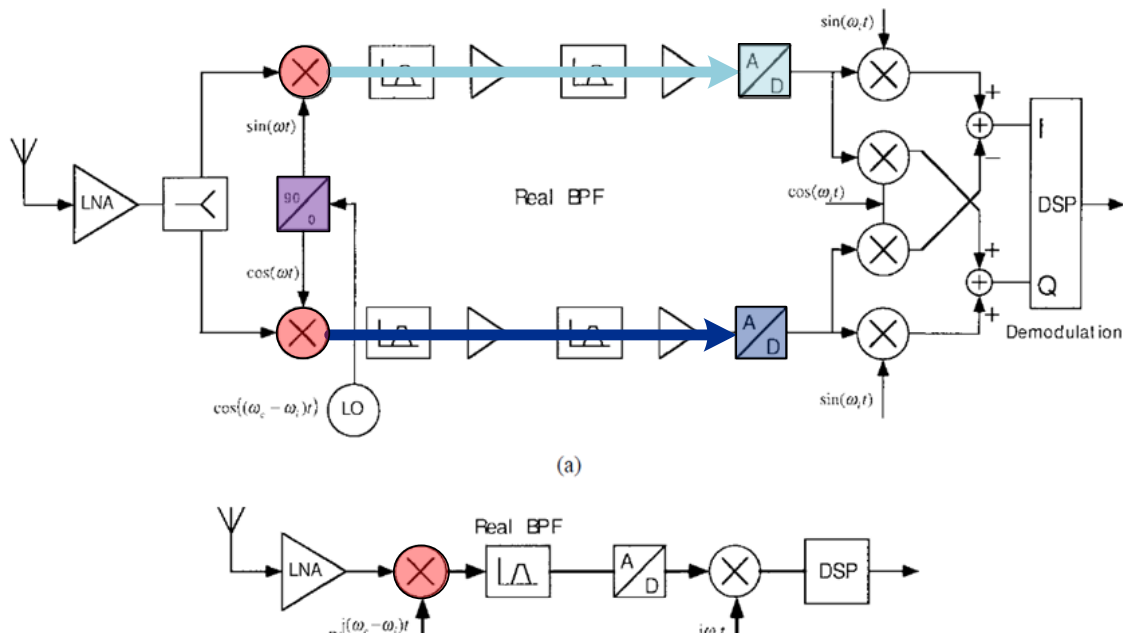


FIG. 1

Ex. 1224, Fig. 1 (annotated)

Further, as explained above regarding the Pugel-Crols combination in Section VII.B, the amplifier-filter banks 111-113 may be implemented using complex mixer modules, as taught by Crols. Ex. 1202, ¶ 175. Those mixer modules (**red**) produce an in-phase and a quadrature signal. Ex. 1225, 273-274, 279-280, Figs. 8(a), 21-22; Ex. 1202, ¶¶ 178-179. In particular, a POSITA would have understood the respective upper mixers of Figures 21-22 receive a signal with a 90-degree phase shift (denoted “90” and “ $\sin(\omega t)$ ”), causing the upper mixers to generate a quadrature signal (**light blue line**), and the respective lower mixers receive a signal with zero phase shift (denoted “0” and “ $\cos(\omega t)$ ”), causing the lower mixers to generate an in-phase signal (**dark blue line**). Ex. 1202, ¶ 188.





Ex. 1225, Figs. 21-22 (annotated)

The respective ADCs in Crols (and the respective ADCs in Pugel, when modified in view of Crols) digitize the signals they receive, and by receiving the in-phase and quadrature signals, they thus generate a digital quadrature signal at the first ADC (**light blue box**) and a digital in-phase sine signal at the second ADC (**dark blue box**). Ex. 1202, ¶ 189. Consistent with claim 4, the resultant combination implements wideband ADCs, as disclosed by Pugel, each using an in-phase or quadrature signal, as taught by Crols. Ex. 1202, ¶ 189.

As stated above, it would have been obvious to a POSITA to modify Pugel's receiver circuit to implement mixers, such as taught by Crols. Ex. 1202, ¶ 189. Further, in doing so, a POSITA would have understood that Pugel teaches the use of QAM or QPSK demodulation, and that in-phase and quadrature signals are used in

those modulation schemes. *Id.*; Ex. 1224, [0040]; Ex. 1202, ¶ 189. Thus, applying Crols' topologies comprising mixer modules to Pugel's receiver circuits would have been nothing more than applying a known technique (using mixers to generate in-phase and quadrature signals) to improve a known device (Pugel's receiver which performs QAM or QPSK demodulation) ready for improvement to yield predictable results (the resulting implementation of Pugel-Crols would be capable of performing QAM or QPSK modulation as taught by Pugel). Ex. 1202, ¶ 189.

Thus, claim 4 is rendered obvious by Pugel in view of Crols. Ex. 1202, ¶¶ 187-190.

2. Dependent Claim 14

a. [14A] “The television receiver device of claim 11, wherein the ADC comprises:

[14B] a first ADC configured to generate a digital in-phase signal; and

[14C] a second ADC configured to generate a digital quadrature signal.”

Claim 14 is substantially identical to claim 4 and is rendered obvious by Pugel in view of Crols for the same reasons set forth in connection with claim 4. *See* Section VII.B.1, *supra*. In particular, claim 14 merely recasts the required functionality of claim 4 as an apparatus claim. Ex. 1202, ¶¶ 191-192.

C. Ground D: Claims 2, 3, 12, and 13 are Obvious Over Pugel in View of Chandrakasan.

1. Dependent Claims 2 and 3

- a. [2] “The method of claim 1, wherein the DFE outputs the digital datastream via a serial interface”;**
- b. [3] “The method of claim 1, wherein the DFE outputs the digital datastream via a parallel interface.”**

Claims 2 and 3 require that the plurality of desired channels of limitation [1E] be output via either a serial or parallel interface, respectively. Both were well-known ways to transfer data, and either option would have been an obvious design choice. Ex. 1202, ¶¶ 195-207.

As explained in Sections VII.A.1.e and VII.A.1.f, Pugel teaches a digital tuner 130 as the limitation [1E] (“selecting, by a digital frontend (DFE)”). Ex. 1202, ¶¶ 124-136. Pugel does not explicitly disclose whether its selected channels are output via a serial interface or via a parallel interface. Ex. 1202, ¶¶ 196-197.

However, as the '275 Patent concedes, outputting a digital data stream via serial (claim 2) and parallel (claim 3) interfaces were “commonly known methods,” i.e., Applicant Admitted Prior Art (AAPA). Ex. 1201, 7:16-20; Ex. 1202, ¶ 198. Indeed, as explained in dictionaries, basic text books and technical papers on digital integrated circuit design at the time, a POSITA would have understood that using these interfaces were two common options for outputting data in standard integrated

circuits. Ex. 1202, ¶¶ 198-200; Ex. 1214, 30:31-42, 31:15-22; Ex. 1215, 5-6, 8; Ex. 1216, 79-80; Ex. 1217, 354-355.

At the most fundamental level, a digital integrated circuit represents data as binary units (referred to as “bits”) in the form of electrical signals on wires (e.g., high and low voltages for binary values “1” and “0” respectively). Ex. 1202, ¶¶ 201-202; Ex. 1216, 23-24, 27-29, 48-51. Pugel teaches that its ADCs output digital signals at varying resolutions with differing numbers of bits. Ex. 1224, [0036]. To output multiple bits (i.e., as a “digital datastream”), the circuit can either transmit the bits over multiple separate wires, one wire for each bit, which was known as a “parallel interface,” or the circuit can transmit the set of bits one at a time as sequential pulses over a single wire, according to a fixed sequence, which was known as a “serial interface.” Ex. 1202, ¶ 201; Ex. 1215, 5-6, 8; Ex. 1216, 79-80 (Figure 6-25).

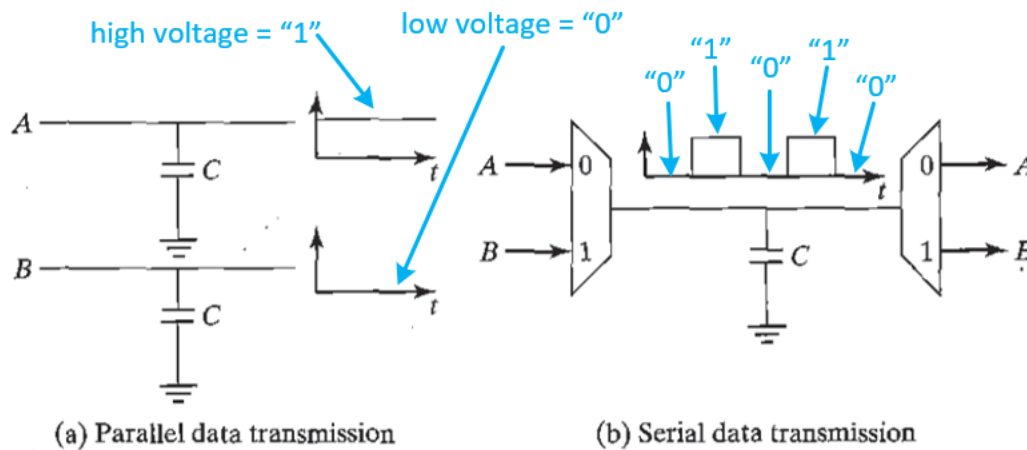


Figure 6-25 Parallel versus time-multiplexed data busses.

Ex. 1216, p. 80 (Figure 6-25) (annotated)

Implementing Pugel's data interface to a demodulator using either option would have been an obvious design choice because both were "commonly known methods," as Applicant admits and as shown in the background art that demonstrates such interfaces were known and used by POSITAs in integrated circuit designs at the time. Ex. 1202, ¶ 203; Ex. 1214, 30:31-42, 31:15-22; Ex. 1215, 5-6, 8; Ex. 1216, 79-80; Ex. 1217, 354-355. For the same reasons, implementing serial and parallel interfaces would have been well within the POSITA's skillset, and thus, a POSITA would have had a high expectation of success, leading to a predictable result. Ex. 1202, ¶ 203.

In addition to the AAPA acknowledging that serial and parallel interfaces were commonly known, each of the background references cited above is prior art and teaches why a POSITA would apply parallel and serial interfaces to Pugel's

digital design. Ex. 1202, ¶ 203; Ex. 1214, 30:31-42, 31:15-22; Ex. 1216, 79-80; Ex. 1217, 354-355.

For example, Chandrakasan, an article on “Ultra Low Power Signal Processing,” teaches that both serial (referred to in Chandrakasan as “time-multiplexed”) and parallel interfaces such as those illustrated in Figure 6-25 above were used in integrated circuits. Ex. 1217, 355; Ex. 1216, 79-80; Ex. 1202, ¶ 204. Specifically, Chandrakasan teaches that time-multiplexing (i.e., a serial interface) is often used “due to area constraints or if very high-throughput is not the goal,” but that “[g]iven that there is a choice between time-multiplexed and fully-parallel architectures... an important question which arises is what architecture will result in the lowest switch activity.” Ex. 1217, 355; Ex. 1202, ¶ 204. Minimizing circuit area minimizes the cost of the integrated circuit, while minimizing the switching activity minimizes the power consumed by the integrated circuit. Ex. 1217, 355-357; Ex. 1202, ¶ 204. Thus, Chandrakasan 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.*

It would thus have been obvious to apply either of parallel data or serial data communication as taught by Chandrakasan to the interconnection between Pugel’s digital tuner 130 and demodulators 141-143. Ex. 1202, ¶¶ 204-206. Pugel teaches

sending a digital RF signal, and the use of either parallel or serial data interfaces as taught in Chandrakasan would have enabled such transmission. Ex. 1224, [0038]-[0041], [0045]-[0046]; Ex. 1217, 354-356; Ex. 1202, ¶ 206.

As such, the modification of Pugel with Chandrakasan that results in a serial interface (claim 2) or parallel interface (claim 3) between Pugel's digital tuner 130 and demodulators 141-143 is nothing more than choosing from a finite number of identified, predictable solutions (using serial or parallel communications as taught by Chandrakasan and known in the art) with a reasonable expectation of success (resulting in Pugel's system implemented with either serial or parallel communication). Ex. 1202, ¶ 206.

The resultant combination of Pugel and Chandrakasan is predictable, and a POSITA would have had a reasonable expectation of success because Chandrakasan teaches basic techniques used by POSITAs to design integrated circuits, and because those techniques are specifically directed to overcoming specific issues, such as meeting area and power constraints, with which a POSITA would be very familiar. Ex. 1217, 355-357; Ex. 1202, ¶ 206.

Thus, claims 2 and 3 are rendered obvious by Pugel in view of Crols and Chandrakasan. Ex. 1202, ¶¶ 195-207.

2. Dependent Claim 12

- a. [12] “The television receiver device of claim 11, wherein the DFE is operable to output the digital datastream via a serial interface.”**

Claim 12 is substantially identical to claim 2 and is taught by Pugel in view of Chandrakasan for the same reasons set forth in connection with claim 2. *See* Section VII.B.1, *supra*. In particular, claim 12 merely recasts the required functionality of claim 2 as an apparatus claim. Ex. 1202, ¶¶ 208-209.

3. Dependent Claim 13

- a. [13] “The television receiver device of claim 11, wherein the DFE is operable to output the digital datastream via a parallel interface.”**

Claim 13 is substantially identical to claim 3 and is taught by Pugel in view of Chandrakasan for the same reasons set forth in connection with claim 3. *See* Section VII.B.1, *supra*. In particular, claim 13 merely recasts the required functionality of claim 3 as an apparatus claim. Ex. 1202, ¶¶ 208, 210.

D. Ground E: Claims 2, 3, 12, and 13 are Obvious Over Pugel in View of Crols and Chandrakasan.

As discussed above in Sections VII.B, Pugel in view of Crols teaches the base claims 1 and 11 from which these claims depend. And for the same reasons set forth above in Section VII.C, Chandrakasan teaches the additional features of these claims. Ex. 1202, ¶¶ 211-213. Modifying Pugel-Crols further in view of Chandrakasan would have been obvious for the same rationales as discussed above,

as the serial and parallel interfaces are equally applicable to Pugel-Crols and to Pugel, and applying them to Pugel-Crols would have presented no additional difficulties to a POSITA. Ex. 1202, ¶¶ 211-213; *see* Section VII.C, *supra*.

VIII. GROUNDS FOR STANDING & FEE PAYMENT

Petitioner hereby certifies that the '275 Patent is available for, and Petitioner is not barred or estopped from requesting, *inter partes* review challenging claims 1-20.

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

IX. CONCLUSION

Inter partes review should be instituted, and claims 1-20 canceled.

Dated: December 6, 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 11,070, which is less than the 14,000 allowed under 37 CFR § 42.24(a)(1)(i). This total includes 11,047 words as counted by the Word Count feature of Microsoft Word and 23 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.

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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. 11,785,275 and supporting evidence to be served via FedEx Priority Overnight on December 6, 2024, on the following:

23446 - MCANDREWS HELD & MALLOY, LTD
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SUITE 3400
CHICAGO, IL 60661
UNITED STATES

Dated: December 6, 2024

By: /Frederic M. Meeker/

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CLAIM LISTING APPENDIX

U.S. Pat. No. 11,785,275

Designation	Claim Language
Claim 1	
[1A]	A method for operating a television receiver, comprising:
[1B]	receiving by an input terminal, an input signal comprising broadcast channels, the broadcast channels comprising a plurality of desired channels and a plurality of undesired channels, wherein the plurality of desired channels are non-contiguous;
[1C]	processing, by a radio front end coupled to the input terminal, the input signal to generate a processed input signal;
[1D]	digitizing, by an analog-to-digital converter (ADC) coupled to the radio front end, the processed input signal to generate a digitized signal;
[1E]	selecting, by a digital frontend (DFE) coupled to the ADC, the plurality of desired channels from the digitized signal; and
[1F]	outputting, by the DFE, the selected plurality of desired channels to at least one demodulator as a digital datastream, wherein the demodulator extracts information encoded in the digital datastream.
Claim 2	
2	The method of claim 1, wherein the DFE outputs the digital datastream via a serial interface.
Claim 3	
3	The method of claim 1, wherein the DFE outputs the digital datastream via a parallel interface.
Claim 4	
[4A]	The method of claim 1, wherein the ADC comprises:
[4B]	a first ADC configured to generate a digital in-phase signal; and
[4C]	a second ADC configured to generate a digital quadrature signal.
Claim 5	

Designation	Claim Language
5	The method of claim 1, wherein the extracted information is stored for use in a digital video recorder (DVR).
Claim 6	
6	The method of claim 1, wherein the extracted information is output for a picture-in-picture display.
Claim 7	
7	The method of claim 1, wherein the plurality of desired channels comprises at least one television channel.
Claim 8	
8	The method of claim 1, wherein the plurality of undesired channels comprises at least one television channel.
Claim 9	
9	The method of claim 1, wherein the broadcast channels comprise satellite broadcast channels.
Claim 10	
10	The method of claim 1, wherein the broadcast channels comprise cable broadcast channels.
Claim 11	
[11A]	A television receiver device, comprising:
[11B]	an input terminal operable to receive an input signal comprising broadcast channels, the broadcast channels comprising a plurality of desired channels and a plurality of undesired channels, wherein the plurality of desired channels are non-contiguous;
[11C]	a radio front end, coupled to the input terminal, operable to process the input signal;
[11D]	an analog-to-digital converter (ADC), coupled to the radio front end, operable to digitize the processed input signal to generate a digitized signal; and
[11E]	a digital frontend (DFE), coupled to the ADC, operable to select the plurality of desired channels from the digitized signal and
[11F]	output the selected plurality of desired channels to at least one demodulator as a digital datastream, wherein the demodulator is operable to extract information encoded in the digital datastream.

Designation	Claim Language
Claim 12	
12	The television receiver device of claim 11, wherein the DFE is operable to output the digital datastream via a serial interface.
Claim 13	
13	The television receiver device of claim 11, wherein the DFE is operable to output the digital datastream via a parallel interface.
Claim 14	
[14A]	The television receiver device of claim 11, wherein the ADC comprises:
[14B]	a first ADC configured to generate a digital in-phase signal; and
[14C]	a second ADC configured to generate a digital quadrature signal.
Claim 15	
15	The television receiver device of claim 11, wherein the extracted information is stored for use in a digital video recorder (DVR).
Claim 16	
16	The television receiver device of claim 11, wherein the extracted information is output for a picture-in-picture display.
Claim 17	
17	The television receiver device of claim 11, wherein the plurality of desired channels comprises at least one television channel.
Claim 18	
18	The television receiver device of claim 11, wherein the plurality of undesired channels comprises at least one television channel.
Claim 19	
19	The television receiver device of claim 11, wherein the broadcast channels comprise satellite broadcast channels.
Claim 20	
20	The television receiver device of claim 11, wherein the broadcast channels comprise cable broadcast channels.