

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

Case IPR2024-00435
Patent 11,381,866

**PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE
UNDER 37 C.F.R. § 42.23**

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EXHIBITS

Previously Filed:

- Ex. 1001: U.S. Patent No. 11,381,866 (“the ’866 patent”)
- Ex. 1002: Expert Declaration of David B. Lett
- Ex. 1003: Curriculum Vitae of David B. Lett
- Ex. 1004: Certified Prosecution History of the ’866 patent
- Ex. 1005: Certified Prosecution History of U.S. Patent No. 9,100,622
- Ex. 1006: Certified Prosecution History of U.S. Patent No. 8,526,898
- Ex. 1007: Certified Prosecution History of U.S. Provisional App. No. 61/170,526 (“’526 provisional”)
- Ex. 1008: Reserved
- Ex. 1009: Reserved
- Ex. 1010: Reserved
- Ex. 1011: Reserved
- Ex. 1012: Reserved
- Ex. 1013: U.S. Pub. No. 2003/0056221 (“Zhang”)
- Ex. 1014: U.S. Patent No. 7,237,214 (“Pandey”)
- Ex. 1015: Excerpts of “IEEE Std 100-2000, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition” (IEEE Press. 2000) (“IEEE Std 100”)
- Ex. 1016: Excerpts of Jan M Rabaey, “Digital Integrated Circuits: A Design Perspective” (Pearson, 2nd ed. 2002) (“Rabaey”)
- Ex. 1017: 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. 1018: S. Mirabbasi and K. Martin, “Classical and Modern Receiver Architectures,” IEEE Communications Magazine, vol. 38, no. 11, pp. 132-139, November 2000 (“Mirabbasi”)
- Ex. 1019: U.S. Patent No. 6,061,406 (“Carson”)
- Ex. 1020: U.S. Pub. No. 2006/0233147 (“Karabinis”)
- Ex. 1021: Data-Over-Cable Service Interface Specifications, DOCSIS 2.0, Radio Frequency Interface Specification, CM-SP-RFIV2.0-I11-060602
- Ex. 1022: Certified File History (as of February 2, 2024) for *Ex Parte* Reexamination No. 90/019,255
- Ex. 1023: Certified Prosecution History of U.S. Patent No. 9,100,363
- Ex. 1024: Reserved
- Ex. 1025: 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. 1026: U.S. Pub. No. 2007/0027943 (“Jensen ’943”)
- Ex. 1027: U.S. Patents and Patent Applications Family Tree for U.S. Patent No. 11,381,866
- Ex. 1028: Reserved
- Ex. 1029: Entropic Communications, LLC v. Charter Communications, Inc., No. 2:22-cv-00125-JRG (E.D. Tex. June 26, 2023) (Claim Construction Memorandum Opinion and Order)
- Ex. 1030: Reserved
- Ex. 1031: Reserved

- Ex. 1032: Reserved
- Ex. 1033: Excerpts of W. Ciciora, J. Farmer, D. Large, and M. Adams, “Modern Cable Television Technology: Video, Voice, and Data Communications” (2nd ed. 2004) (“Ciciora”)
- Ex. 1034: Excerpts of J. Crols and M. Steyaert, “CMOS Wireless Transceiver Design” (1997)
- Ex. 1035: U.S. Patent No. 7,340,230 (“Khoini-Poorfard”)
- Ex. 1036: U.S. Pub. No. 2003/0217866 (“Summers”)
- Ex. 1037: U.S. Pub. No. 2006/0256799 (“Eng”)
- Ex. 1038: U.S. Pub. No. 2006/0083335 (“Seendripu”)
- Ex. 1039: Excerpts of Chris Bowick, “RF Circuit Design” (2nd ed. 2008)
- Ex. 1040: Reserved
- Ex. 1041: Excerpts of Roland Priemer, “Introductory Signal Processing” (1991)
- Ex. 1042: U.S. Patent No. 7,272,375 (“Tuttle”)
- Ex. 1043: U.S. Patent No. 7,130,576 (“Gurantz”)
- Ex. 1044: U.S. Patent No. 5,278,837 (“Kelley”)
- Ex. 1045: Jeffrey Hugh Reed, “Software Radio: A Modern Approach to Radio Engineering” (2002)
- Ex. 1046: U.S. Patent No. 7,213,042 (“Cannon”)
- Ex. 1047: Reserved
- Ex. 1048: Excerpts of William Buchanan, “Computer Busses” (2000) (“Buchanan”)
- Ex. 1049: U.S. Patent No. 7,079,528 (“Ziegler”)

Ex. 1050: Excerpts of “Software Defined Radio: Enabling Technologies”
(Walter H.W. Tuttlebee ed., 2003)

Exs. 1051-1072: Reserved

Ex. 1073: Expert Declaration of Dr. Sylvia Hall-Ellis

Ex. 1074: Reserved

Ex. 1075: U.S. Patent No. 6,791,995 (“Azenkot”)

Ex. 1076: U.S. Patent No. 6,542,203 (“Shadwell”)

Served (Not Filed):

Ex. 1077: Second Expert Declaration of Sylvia Hall-Ellis, Ph.D

Filed Herewith:

Ex. 1078: Second Expert Declaration of David B. Lett

Ex. 1079: Transcript of Deposition of Dr. Russ

Comcast Cable Communications, LLC (“Petitioner”) respectfully submits this reply brief in support of its petition for *inter partes* review of claims 1-82 of U.S. Patent No. 11,381,866 (“the ’866 patent”).

I. INTRODUCTION

Every claim of the ’866 patent is invalid based on the Zhang grounds put forth in the Petition. Patent Owner’s Response (“POR”) asserts only that Zhang does not teach the element [1C] requirement of “*wherein the DFE is configured concurrently select and provide each of the plurality of desired channels, via a serial interface, without providing any of the plurality of undesired channels*” and the element [14C] requirement of “*wherein each digital down converter, of the plurality of digital down converters, is operable to generate a digital channel output corresponding to each desired channel, of the plurality of desired channels.*”¹ PO’s sole argument for each of claims 1 and 14 is wrong for the following reasons.

First, PO’s arguments are tacitly based on an improper claim construction that imports the negative limitation “and not select any undesired channels” into element

¹ The POR relies on discussion of element [1C] for elements [27C] and [55C], which are identical to element [1C] except for lacking “via a serial interface,” and relies on the discussions of element [14C] for identical elements [41C] and [69C]. POR, 10, 29. The discussions of elements [1C] and [14C] going forward apply.

[1C] and “and not generate a digital channel output corresponding to an undesired channel” into element [14C]. Neither the claim language (which uses the open-ended “comprising” transition) nor the specification (which discloses the selection of undesired channels) supports rewriting the claims in this fashion. However, given the breadth of Zhang’s teachings and its startling similarity to the circuitry disclosed in the ’866 patent, Zhang teaches elements [1C] and [14C] even under PO’s tacit narrowing of the claim. In short, the claims are not patentable regardless of PO’s claim constructions.

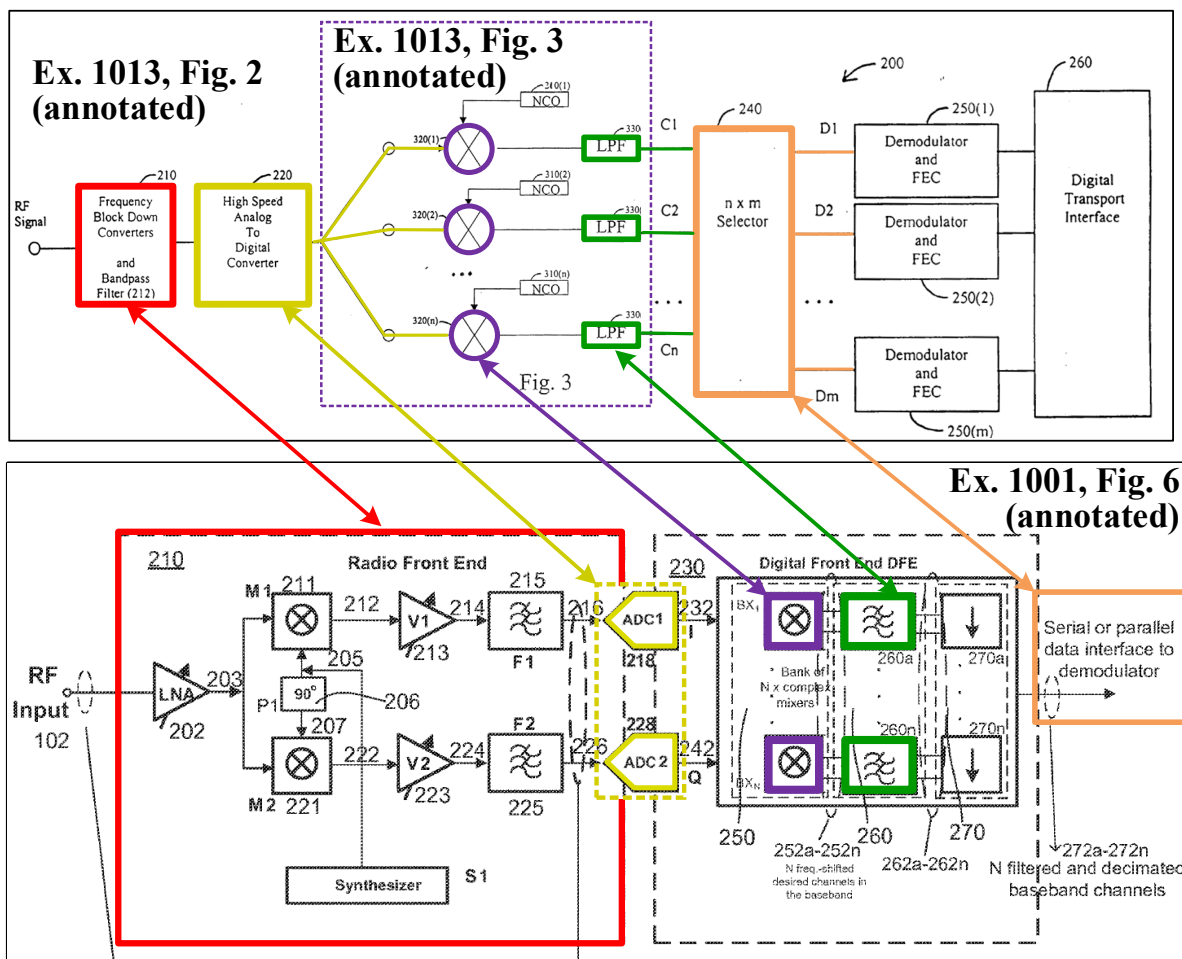
Second, PO misapprehends Zhang and the circuitry relied upon in the Petition as meeting element [1C]. The Petition identified Zhang’s demultiplexer 230 combined with selector 240 for teaching the “DFE” and “serial interface” in element [1C]. The input of Zhang’s circuit (i.e., 230 and 240) is “*coupled to the wideband ADC*” to receive the “*contiguous band of frequencies*” and its output includes only the “*plurality of desired television channel*” on a “*serial interface.*” This circuitry is thus configured to select and provide the desired channels, via a serial interface, without providing undesired channels as required by element [1C]. Further, it does so “*concurrently*” using the same circuitry that is set forth in the ’866 patent.

As set forth below and in the Petition, all claims should be canceled. Ex. 1078, ¶¶ 1-32.

II. THE PETITION EXPLAINED HOW ZHANG TAUGHT SELECTING DESIRED CHANNELS AND GENERATING DIGITAL CHANNEL OUTPUTS USING THE SAME CIRCUITS SET FORTH IN THE '866 PATENT

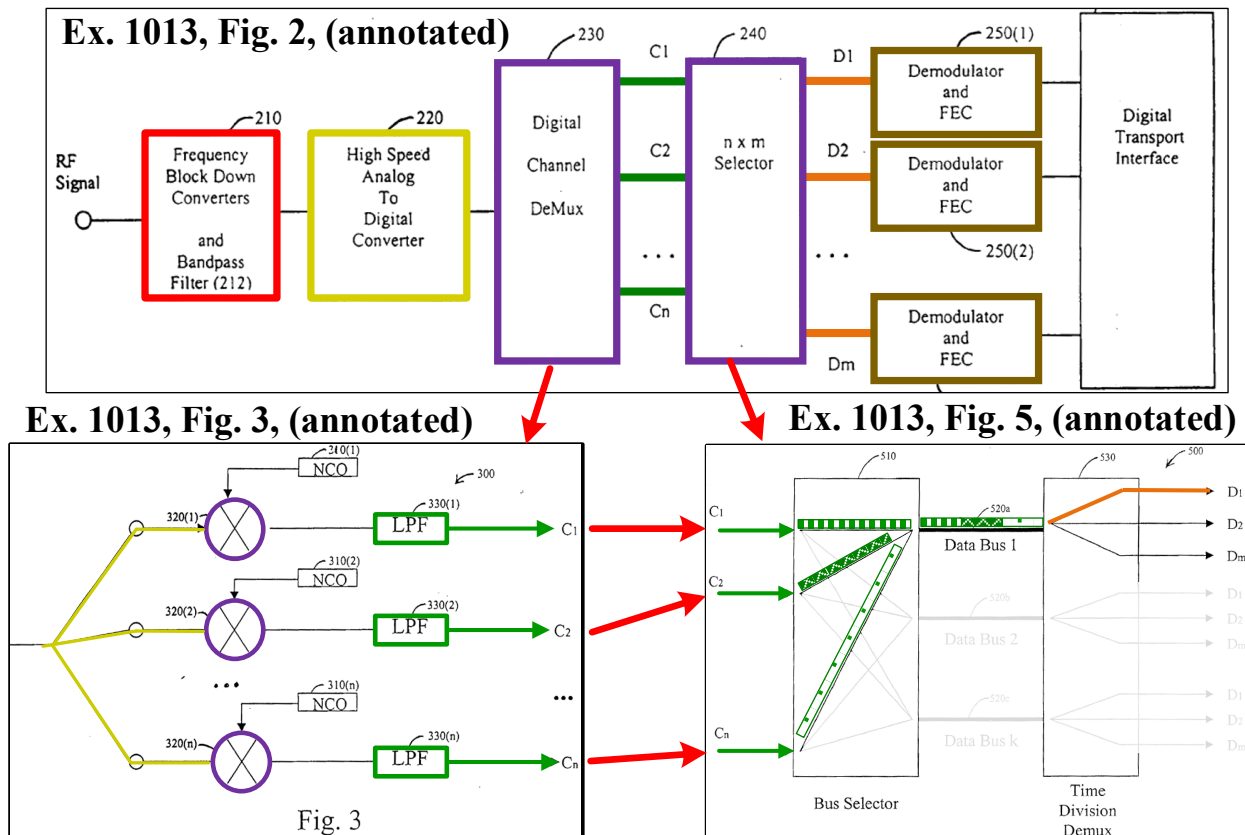
Zhang's features map precisely to the features of Figure 2 of the '866 patent.

Like that of the '866 patent, Zhang's system receives a wideband signal, down converts (**red**) and digitizes the signal (**gold**), selects desired channels from the digitized signal (**purple/green**), and transmits the selected channels as digital channel outputs to a demodulator via a serial interface (**orange**). Petition, 4-7, 22-34, 52, 54-55.



Petition, 7 (annotating Ex. 1001, Fig. 6 and Ex. 1013, Figs. 2, 3)

For claim 1, the Petition showed that Zhang disclosed the claimed “*digital frontend (DFE)*” (element [1C]) as demultiplexer 230 (as detailed in Figure 3) and a portion of digital selector 240 (as detailed in Figure 5). Petition, 4-7, 22-28. Within demultiplexer 230, Zhang’s complex mixers (**purple**), and low pass filters (**green**) are identical to those in the ’866 patent’s DFE 230. Within selector 240, Zhang’s serial interface (**orange**) is the same as the ’866 patent’s serial interface. *Id.*



By filtering out undesired channels, demultiplexer 230 and selector 240 do not provide any undesired channels (either as C_1 - C_n or as D_1 - D_m) as further recited in element [1C]. *Id.*, 6, 22, 25.

For claim 14, the Petition showed that Zhang disclosed the claimed “*plurality of digital down converters*” (element [14C]) as a plurality of signal paths, each including a multiplier 320 and filter 330 within demultiplexer 230 which generate digital channel outputs C_1 - C_n , and which provide each digital channel output via a serial interface (element [14D] in selector 240. Petition, 28-34.

In addition to Zhang alone, the Petition explained how Zhang teaches these elements in view of the applicant’s admitted prior art (AAPA), knowledge of a POSITA, and Pandey. Petition, 26-27, 32-33, 73-78. PO does not dispute these combinations.

PO raises three counterarguments.

First, regarding claims 1 and 14, PO argues that Zhang’s channels C_1 - C_n allegedly *must* include all channels, desired and undesired. POR, Sections II, III.A, III.C, IV.A. PO reasons that Zhang does not “*select*” any channels as required in element [1C] and each of Zhang’s “*digital channel output[s]*” does not correspond to “*each desired channel*” as required in element [14C]. POR, Sections III.B, IV.A. This is wrong for two reasons. *First*, Zhang does not mandate that C_1 - C_n include all channels. Zhang calls each of C_1 - C_n a “desired channel,” and the selected number “n” of them is a variable disclosed as being less than the number of channels in the digitized input signal. Ex. 1013, ¶¶ [0028], [0030], [0032]-[0033], [0042], claims 17, 21. *Second*, PO’s tacit claim constructions are wrong because the claims are

open-ended and allow for the selection of undesired channels and the generation of digital channel outputs corresponding to undesired channels. Claim 14 provides no negative limitation regarding undesired channels and claim 1 requires only that the undesired channels not be “provid[ed]” to the demodulator.

Second, with respect to element [1C], PO argues that the Petition relies on Zhang’s selector 240 for the claimed “‘digital front end (DFE)’ that ‘provide[s] a plurality of desired channels ... without providing any of the plurality of undesired channels,’” but that the Petition failed to explain why or how selector 240 discloses a DFE. POR, Section IV.B. This argument simply misrepresents the Petition in order to attack a strawman. The Petition asserted that Zhang’s digital demultiplexer 230 in combination with part of digital selector 240 is “*a digital frontend (DFE) coupled to the wideband ADC [and] configured to concurrently select and provide each of the plurality of desired channels, via a serial interface, without providing any of the plurality of undesired channels.*” The Petition did not rely on 240 alone as being the DFE. The input of the relied-upon combined digital circuit is undisputedly coupled to Zhang’s ADC 220, and the output provides D_1 - D_m , which are undisputedly desired channels, via a serial interface.

Third, also with respect to element [1C], PO contends that Zhang’s demultiplexer 230 and selector 240 process data sequentially and, therefore, do not disclose a DFE configured to “*concurrently select and provide the plurality of*

desired channels.” POR, Section IV.C. This argument fails for two reasons. *First*, PO’s tacit construction of “concurrently” to mean “select” and “provide” must occur at the same instant in time is wrong because it ignores that element [1C] also requires “select and provide” to be “via a serial interface,” which by definition operates sequentially. It also ignores the inherent delay that occurs in all signals that propagate through a digital circuit. The same delay and sequential outputting of desired channels that PO criticizes in Zhang also occurs in the DFE and serial interface described in the ’866 patent. *Second*, Zhang teaches “concurrently” even under PO’s incorrect construction. Just as in the ’866 patent, the desired channels are digital data streams that are simultaneously being received at the input of demultiplexer 230 and being output from the serial interface of selector 240. Thus, the selection and providing of the digital stream is occurring concurrently.

III. ZHANG’S C₁-C_n ARE SELECTED DESIRED TELEVISION CHANNELS UNDER EITHER THE CORRECT CONSTRUCTION OR THE INCORRECT CONSTRUCTION TACITLY ARGUED BY PO

The Petition explains that Zhang’s demultiplexer 230 in combination with selector 240 discloses element [1C]’s “*digital frontend (DFE) ... configured to concurrently select and provide each of the plurality of desired channels, via a serial interface, without providing any of the plurality of undesired channels.*” The Petition also explains that demultiplexer 230 discloses element [14C]’s “*plurality of digital down converters [each] operable to generate a digital channel output corresponding*

to each desired channel.” Despite these elements being silent about undesired channels being selected or generated, PO argues that the claims exclude Zhang’s system because Zhang’s channels C_1 - C_n (the output of demultiplexer 230) allegedly must include both desired and undesired channels.

This argument fails for two reasons. *First*, the factual premise is wrong; Zhang does not require C_1 - C_n to include undesired channels. Thus, even if PO were reading the claims correctly, Zhang still renders those claims unpatentable. *Second*, PO’s implicit constructions of “select ... each of the plurality of desired television channels” in element [1C] and “generate a digital channel output corresponding to each desired channel” in element [14C] are wrong—nothing in the claims exclude the additional selection of undesired channels or generation of digital channel outputs corresponding to undesired channels. Thus, whether or not C_1 - C_n includes some undesired channels is irrelevant. These two issues are discussed separately, below.

- A. Zhang Discloses that Channels C_1 - C_n are “desired channels” even under PO’s Construction**
 - 1. Zhang Expressly Identifies C_1 - C_n as “desired channels” and that the Number of Them May Be Less Than the Number of Channels Received**

The Petition explained how Zhang’s demultiplexer 230 receives a digitized version of the multi-Channel RF signal from ADC 220 and selects from this signal a number “n” of desired channels C_1 - C_n (**green**), each at a unique “target” RF

channel. Petition 5-7, 22-24, 28-30; Ex. 1002, ¶¶ 36-38, 78-80, 105-112, 125-128; Ex. 1013, ¶¶ [0028], [0030]-[0032], [0042], claims 1, 2-4, 8-11, 21, 28, 30-32, 34, 36-37, Figs. 2-3.

Any dispute as to whether channels C_1 - C_n are desired channels should be resolved by the fact that Zhang refers to each target RF channel that becomes one of channels C_1 - C_n as either a “desired RF channel” or “desired channel,” and refers to other channels filtered out by the demultiplexer as “undesired.” Ex. 1013, ¶ [0032], claim 34, 36, 37; Petition 6, 22-24, 29-30; Ex. 1002, ¶¶ 79-80, 106, 111, 126-127; Ex. 1078, ¶ 1-5. Zhang further states that “ C_1 - C_n contain content channels that are selected or used by a subscriber,” and that each of C_1 - C_n is output for demodulation via D_1 - D_m (though not all at the same time when $m < n$).² Petition 5, 24, 30; Ex. 1013, [0028]-[0029], [0038]-[0039], claims 3; Ex. 1002, ¶¶ 78-79, 111-113, 126, 130; Ex. 1078, ¶¶ 6-7. It defies common sense for a POSITA to read Zhang’s reference to C_1 - C_n as “desired channels,” and believe that they must include undesired channels as PO argues. Ex. 1078, ¶ 6.

The Petition also cites Zhang’s claims as supporting the teaching that C_1 - C_n

² When $m=n$, C_1 - C_n and D_1 - D_m are the exact same and all of C_1 - C_n can be output simultaneously as D_1 - D_m . PO concedes that channels “ D_1 - D_m ” are desired channels. POR, 2; Ex 1079, 68:21-69:9; Ex. 1078, ¶ 7.

disclose the claimed selecting of desired channels. Petition, 22-24, 29-30 (citing Zhang's claims 1, 2-4, 8, 10-11, 21, 28, 30, 32, 34-37). Ex. 1002, ¶¶ 106-107, 110-112, 126-127, 129-130. For example, claim 21 recites that "at least one complex multiplier receives a multi-channel digital RF signal." In this claim, the number of channels demultiplexed from a multi-channel digital RF signal can be a single channel (e.g., demultiplexed by "one complex multiplier"). Claim 34 is another example that refers to a "plurality of select frequencies" used to demultiplex separate RF channels (e.g., C_1 - C_n) from "at least one multi-channel RF signal." Nothing in this claim requires the number of channels in the multi-channel RF signal and the number of separate RF channels to be the same (i.e., the claims do not require C_1 - C_n to include all channels, desired and undesired, from the multi-Channel RF signal). Zhang's claims instead teach a number of channels in the multi-Channel RF signal that is independent from the number of demultiplexer channels C_1 - C_n . *Id.* These claims, like the specification, show that C_1 - C_n can include less than all channels and thus exclude undesired channels. Ex. 1078, ¶ 8.

As Mr. Lett opined during his deposition, Zhang's architecture is flexible, where "n" is a variable that can be equal to *or less than* all channels in the signal band, and the exact number will depend on the specific application. Ex. 2018, 78:2-22, 79:17-80:10, 81:1-20, 83:10-14, 84:11-85:13, 85:24-86:12, 89:5-9; Ex. 1078, ¶ 9. Mr. Lett explained that in the demultiplexer in Figure 3 of Zhang, the purpose of

the numeric controlled oscillators 310 is to tune the channel selection to different frequencies so that for a particular application, the user can decide which channels in the frequency band are desired. Ex. 2018, 86:1-12; Ex. 1078, ¶ 10. Had Zhang demultiplexed all channels, programmable frequencies would not have been needed because those frequencies would have been static values, one for every channel in the band. Ex. 1078, ¶ 10.

All of the above makes clear that Zhang discloses that channels C_1 - C_n may include only desired channels and exclude undesired channels. As discussed below, PO's arguments to the contrary are unconvincing.

2. Contrary to the POR Assertions, Petitioner's Expert Repeatedly Explains that "n" is a Variable Less Than or Equal To the Number of Channels in the Plurality of Frequencies.

Attempting to show that Mr. Lett agrees with PO, the POR cites a single response in his deposition testimony in which he agreed that paragraph 27 of Zhang says "n" channels refers to both desired and undesired channels in the entire signal band from the ADC. POR, 12 (citing Ex. 2018, 78:14-22). The POR leaves out (as noted above) that Mr. Lett goes on to opine (before and after the portion of his deposition testimony cited in the POR) that Zhang discloses that "n" is a variable that can be equal to *or less than* all channels in the signal band. Ex. 2018, 78:2-13, 79:17-80:10, 81:1-20, 83:10-14, 84:11-85:13, 85:24-86:12, 89:5-9; Ex. 1078, ¶ 11.

For example, Mr. Lett clarified that paragraph 0042 of Zhang (referring to

Figure 6) explains “in a different way [from paragraph 28]” that “n” can be any value up to the total number of channels in the signal band. Ex. 2018, 84:11-86:1, Ex. 1013, ¶¶ [0041]-[0042]; Ex. 1078, ¶ 12.

PO also cites Mr. Lett’s declaration in co-pending IPR2024-00432 for the ’362 patent as allegedly supporting that C_1 - C_n include all channels. POR, 14-15 (citing Ex. 2020 (Ex. 1002 in IPR2024-00432), ¶ 79). The paragraph cited is a general background overview of Zhang describing one embodiment. Ex. 1078, ¶ 13. In his more detailed analysis in that IPR and in this one, Mr. Lett explains that n can be less than all channels that are in the multi-channel input, which Mr. Lett reiterated during his deposition. Ex. 1002, 111-112; Ex. 2020, ¶¶ 104-106; Ex. 2018, 87:24-91:4; Ex. 1078, ¶ 13.

3. PO’s Expert did not Consider Zhang’s Express Disclosures Where “n” is Less Than All Channels in the Plurality of Frequencies, and Remains Willfully Blind to Them

As discussed above, Zhang’s claim 21 is an example where the number of desired channels demultiplexed (e.g., C_1 - C_n) may be less than the number of channels in the RF multi- channel input signal. When asked about claim 21, PO’s expert first acknowledged that the elements of claim 21 correspond to the elements of demultiplexer 300 in Figure 3 of Zhang, but then he hedged, indicating: “I haven’t looked at Claim 21 in detail,” and “it’s not something I’m basing an opinion on, and it’s not something I’m prepared to issue an opinion on at the moment.” Ex. 1079,

49:3-51:3. If Dr. Russ was correct with his initial response, confirming that Zhang's Figure 3 demultiplexer corresponds to claim 21, he thus confirmed that the demultiplexer can select fewer than all channels. If Dr. Russ was correct with his second response that he had not considered (and would not consider) claim 21, it becomes clear his testimony is based on an incomplete analysis of Zhang and thus should be accorded little to no weight. 37 C.F.R. 42.65(a); Fed. R. Evid. 702(b); *Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000) ("Lack of factual support for expert opinion ... may render the testimony of little probative value")

4. The Presence of Selector 240 Does Not Require that C_1 - C_n Include All Channels, Desired and Undesired

Dr. Russ also opines that Zhang's selector 240, which selects and outputs channels D_1 - D_m , is only needed because C_1 - C_n necessarily includes all channels. POR, 8-9, 20-21. This is incorrect.

PO notes that paragraph 28 of Zhang states that selector 240 provides fast channel search capabilities. POR, 26. However, this does not mean that C_1 - C_n necessarily includes all channels. Ex. 1078, ¶¶ 14-15. Selector 240 is equally beneficial for allowing fast channel searching where C_1 - C_n includes all or less than all of the channels in the input, but more channels than the demodulator is capable of decoding at one time. *Id.*, ¶¶ 16-17. By extracting the channels C_1 - C_n the user desires to watch at different times (each a desired channel, but collectively less than

all channels), the user is able to quickly switch between these desired channels using selector 240. *Id.*, ¶ 18.

In short, the presence of selector 240 in Zhang does not mean that Zhang requires C₁-C_n to include undesired channels, particularly since Zhang refers to these channels as “desired channels” and describes them as including less than all channels. Ex. 1013, ¶¶ [0028], [0030], [0032]-[0033], [0042], claims 34, 36-37, 21.

5. The Prosecution History of Zhang’s European Patent Does Not Require that C₁-C_n in Zhang Include All Channels

PO cites the prosecution history in Zhang’s related EPO application (POR, 15-16) but does not provide the related EPO patent application or the prior art that was allegedly being distinguished. Thus, Dr. Russ’s opinion on this point is without support and should be accorded no weight. 37 C.F.R. § 42.65; Fed. R. Evid. 702(b); *Upjohn Co.*, 225 F.3d at 1311. Moreover, the discussion in the EPO application is irrelevant. It apparently relates to selector 240 and why selecting channels D₁-D_m was distinguishable over the cited art in Europe. Ex. 1078, ¶ 19. However, the operation of how selector 240 selects channels D₁-D_m says nothing about whether C₁-C_n in Zhang includes undesired channels. *Id.*

For all of these reasons, it is simply not true that C₁-C_n must include undesired channels. Accordingly, even if the claims included a negative limitation that the DFE is configured to not select undesired channels (element [1C]) and each digital down converter is not operable to generate a digital channel output corresponding to

an undesired channel (element [14C]), as PO suggests, the claims are still unpatentable.

B. PO Misconstrues “select ... each of the plurality of desired channels” and “to generate a digital channel output corresponding to each desired channel” to also Require Not Selecting Any Undesired Channels or Generating Digital Channel Outputs Corresponding to them.

As explained above, Zhang discloses selecting and generating desired channels C_1 - C_n without selecting undesired channels. Moreover, PO’s assertion that elements [1C] and [14C] require this is wrong. PO alleges that extracting all channels is excluded from the claims because the ’866 patent allegedly “selects and downconverts *only* the desired channels from the digitized input RF signal without selecting or down converting any undesired channels.” POR, 4. But the only requirement regarding undesired channels is in element [1C], which says they are not to be *provided*. Element [1C] places no requirement on *selecting* undesired channels and Element [14C] places no requirement regarding undesired channels in any respect. Ex. 1078, ¶ 20. PO’s argument that “not selecting any undesired channels” and “not generating digital channel outputs corresponding to undesired channels” should be written into the claims is incorrect.

To begin, the claim language itself does not support PO. Claims 1 and 14 use the open-ended transition “comprising,” and thus should not be interpreted as excluding additional, unrecited steps, such as selecting undesired channels. *Vivid*

Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 811 (Fed. Cir. 1999). Moreover, element [1C], reciting “without providing any of the plurality of undesired channels,” makes clear that PO knew how to insert explicit negative limitations into claims when desired. While element [1C] excludes “providing” undesired channels, no such limitation appears with respect to “selecting” undesired channels.

The patent specification also does not support importing negative claim limitation. In this respect, PO’s expert misrepresents the ’866 patent disclosure. Dr. Russ states that in ’866 patent, there is a bank of N mixers, allegedly for selecting and down converting “N desired channels, without selecting or down converting any undesired channels.” POR, 5; Ex. 2009, ¶ 34 (citing Ex. 1001, 5:55-51, 5:63-6:6). However, the ’866 patent does not contain the “without selecting or down converting any undesired channels” language. While Dr. Russ describes one alleged embodiment, he conveniently skips over other embodiments described *in the same paragraph* in which N is “equal to the number of *all* available channels that exist in the licensed frequency spectrum” or “*all* receivable channels within a geographic area.” Ex. 1001, 5:56-61 (emphasis added), Fig. 2. “All” channels include the undesired channels shown in Figure 2. *Id.*; Ex. 1078, ¶ 21. In short, the ’866 patent specification explicitly discloses the selection and down-conversion of undesired and desired channels.

Moreover, when pressed on the range of values of N during his deposition,

Dr. Russ claimed ignorance, stating: “I haven’t formed an opinion on the range of capital N.” Ex. 1079, 27:5-17. A POSITA could not have concluded (as Dr. Russ does) that “N” did not include undesired channels without considering the possible range of “N.” And a POSITA definitely would not have come to that conclusion if they read the two sentences following the sentence cited by Dr. Russ, where N includes “all” channels. Dr. Russ’s testimony, by its omissions and his admitted failure to consider all of the ’866 patent, lacks a factual foundation and should be given little or no weight. 37 C.F.R. 42.65(a); Fed. R. Evid. 702(b); *Upjohn Co.*, 225 F.3d at 1311.

Excluding from the scope of the ’866 patent claims the embodiments where N includes all channels undermines PO’s entire argument. *Nobel Biocare Servs. AG v. Intradent U.S., Inc.*, 903 F.3d 1365, 1381 (Fed. Cir. 2018) (“[T]here is a strong presumption against a claim construction that excludes a disclosed embodiment.”). Thus, without support in the claims or the specification, PO’s reading of “without selecting [or generating] any undesired television channels” into the claims is improper.

The Board should instead apply the plain and ordinary meaning of “select ... each of the plurality of desired television channels ...” and “each digital down converter ... operable to generate a digital channel output corresponding to each desired channel.” *Superguide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 874-

875 (Fed. Cir. 2004). Selection and generation of a digital channel output is simply extracting a channel from the plurality of frequencies in the digitized RF signal. This is exactly what each signal path (digital down converter) shown in Figure 2 in the '866 system does. Ex. 1078, ¶ 22. Each path includes a mixer 250 and filter 260 that picks out one channel from the plurality of frequencies in the digitized RF signal by frequency shifting it down to baseband and filtering it to provide that channel on its own output path 272. Ex. 1001, 6:3-18, 6:64-7:9; Ex. 1078, ¶ 22.

Thus, in the '866 patent, a plurality of desired channels are selected as required by element [1C] as long as two of the output paths include desired channels, irrespective of what the other paths include. Ex. 1001, 5:55-61, Fig. 2. Ex. 1078, ¶ 22. Likewise, each digital down converter, of the plurality of digital down converters, is operable to generate a digital channel output corresponding to each desired channel as required by element [14C], as long as two of the digital down converters generate an output corresponding to two desired channels. Ex. 1078, ¶ 22.

This plain and ordinary meaning of “select” and “generate” is entirely consistent with the '866 patent disclosure.

C. It is Undisputed that Zhang's Channels C_1 - C_n Are Selected Desired Channels under the Proper Claim Construction

PO's entire argument with respect to channels C_1 - C_n is based on its improper reading of a negative limitation regarding undesired channels into the claims. If the

Board refuses to rewrite the claims to include this limitation, PO has effectively conceded that Zhang's demultiplexer 230 and selector 240, which selects and provides desired channels C_1 - C_n , meet element [1C] and that Zhang's demultiplexer 230, which generates C_1 - C_n as down converted digital channel outputs, meets element [14C].

Zhang's demultiplexer 230 receives a digitized wide-band signal having a plurality of frequencies on which channels C_1 - C_n are modulated. Petition, 21-24; Ex. 1013, ¶¶ [0027]-[0028], [0030]-[0032], [0042], claim 8, Figs. 2-3. Ex. 1078, ¶ 23; Ex. 1079, 38:16-39:2. The demultiplexer 230 down converts and outputs only channels C_1 - C_n , each at baseband and each isolated on its own path, thus enabling the demodulator to decode them. Ex. 1078, ¶ 23; Ex. 1079, 39:3-40:19. Even PO's expert acknowledges this basic point, that each of channels C_1 - C_n is picked out from the plurality of frequencies in the wideband signal. POR, 20-23, Ex. 2009, ¶¶ 57-61; Ex. 1079, 39:3-11. Selector 240 further outputs some or all of C_1 - C_n as digital channel outputs D_1 - D_m from a serial interface. POR, 7, 20-21; Ex. 1079, 55:21-56:9, 68:21-69:9.

Simply put, this is “select[ing] ... each of the plurality of desired channels” and down converting to “generate a digital channel output corresponding to each desired channel” under the plain and ordinary meaning of these limitations, and is identical to how each path in the '866 patent works to select and provide a channel.

Ex. 1078, ¶ 23; Petition, 29-30.

**IV. ELEMENT [1C] DOES NOT LIMIT WHAT MAKES UP A “DFE”
AND PO DOES NOT DISPUTE THAT ZHANG’S CIRCUITS 230/240
PERFORM THE DFE’S CLAIMED FUNCTIONS**

Element [1C] recites “a digital frontend (DFE) ... configured to concurrently select and provide each of the plurality of desired channels, via a serial interface, without providing any of the plurality of undesired channels.” PO argues (falsely) that the Petition relies on Zhang’s selector 240 for the claimed “‘digital front end (DFE)’ that ‘provide[s] a plurality of desired channels ... without providing any of the plurality of undesired channels,’ POR, 35. PO misapprehends Petitioner’s argument.

The Petition identified Zhang’s demultiplexer 230 combined with selector 240 for teaching the “DFE” and “serial interface” in element [1C]. Petition, 22-26. PO does not dispute that Zhang’s demultiplexer 230 and selector 240 are “digital” or that together they perform the DFE function of “select and provide each of the plurality of desired channels, via a serial interface, without providing any of the plurality of undesired channels.” PO’s only apparent quibble is that the Petition allegedly did not explain why or how selector 240 is part of a “front-end.” POR, 38-39. However, it is clear from the Petition that Zhang’s demultiplexer 230 and selector 240 together are a DFE with a serial interface *because* they are the same as

the DFE with the serial interface disclosed in Figure 2 of the '866 patent. Petition, 22-26.

Zhang's circuits (in the red box below) that concurrently select and provide desired channels D_1 - D_m via a serial interface without providing undesired channels matches the '866 patent's Figure 2 circuitry that selects and provides desired channels 272a-272n via a serial interface. Petition, 4-7, 22-26, 28-33; Ex. 1013, ¶¶ [0028], [0030]-[0032], [0038]-[0039], [0042], [0048], claims 21, 34, 36-41; Ex. 1002, ¶¶ 79, 108-116; Ex. 1078, ¶¶ 24-25.

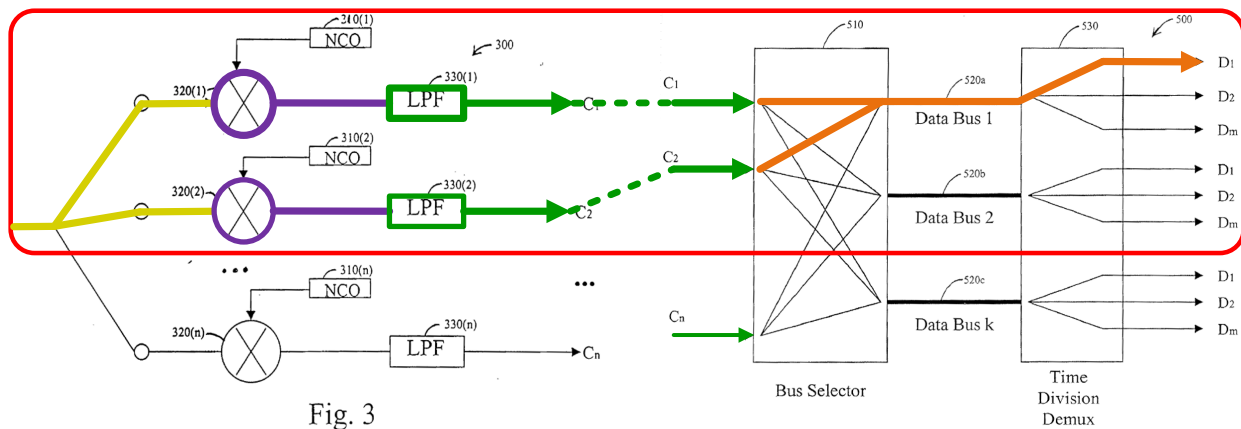
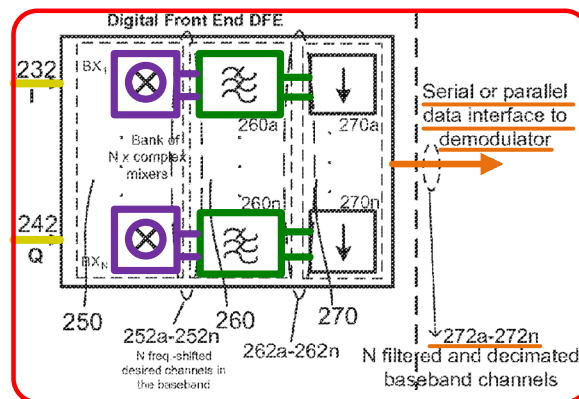


Fig. 3

Ex. 1013, Figs. 3, 5 (annotated)



Ex. 1001, Fig. 2 (annotated)

Nothing in the claim language excludes the DFE from including Zhang's demultiplexer 230 and selector 240, or any other digital circuit that performed the functions recited in element [1C]. The '866 patent also does not define or describe a DFE differently from Zhang's demultiplexer 230 and selector 240.

Moreover, in addition to Zhang alone, the Petition explained how Zhang in view of the applicant's admitted prior art (AAPA), the knowledge of a POSITA, and Pandey teach the claimed "DFE configured to concurrently select and provide ... via a serial interface." Petition, 24-27, 32-33, 73-78. To the extent Zhang alone does not teach a DFE, the POR does not dispute that any of these combinations teach the claimed DFE.

For the reasons above, Zhang alone discloses, and Zhang combined with a POSITA's knowledge, AAPA, or Pandey teaches, both the DFE structure and functions of element [1C].

V. ZHANG CONCURRENTLY SELECTS AND PROVIDES EACH OF THE PLURALITY OF CHANNELS AS REQUIRED IN ELEMENT [1C] IN THE SAME WAY DESCRIBED IN THE '866 PATENT

With regard to "concurrently select and provide each of the plurality of desired channels" in element [1C], the Petition described how Zhang's Figure 3, like the '866 patent's Figure 2, includes multiple parallel signal paths for "concurrently selecting and providing a plurality of desired channels C_1 - C_n ." Petition, 23-24; Ex. 1002, ¶¶ 110-112. That is, Zhang's demultiplexer 230 concurrently selects and then

provides each “C” channel with every other “C” channel. Ex. 1078, ¶ 26. PO does not dispute that this is the plain and ordinary meaning of “concurrently” in element [1C], or that the Petition showed that Zhang disclosed it.

Instead, PO distorts an out-of-context deposition response by Petitioner’s expert to argue that *Petitioner’s* claim construction position is that the claim excludes providing data some time after it has been selected (a construction the Petition and its expert did not adopt, which PO also does not ask the Board to adopt). PO then argues that the Petition admitted that Zhang outputs data “sequentially” after a channel is selected and thus does not meet this strawman construction that nobody has urged on the Board. POR, 42-43. Ex. 1078, ¶ 27.

As noted above, all of this is irrelevant because the plain and ordinary meaning applied in the Petition is not disputed by PO as being correct. Moreover, when reading the entirety of the testimony it is clear that Mr. Lett was not proposing any claim construction, much less one that excludes the way in which the ’866 patent and Zhang (which use the same circuitry) select a channel and output it sequentially using a serial output. Ex. 2019, 72:10-82:21; Ex. 1078, ¶ 28. He repeatedly explained that data travels from left to right in the circuit diagram and would first be selected and then output some brief time later. Ex. 2019, 77:7-79:4; Ex. 1078, ¶ 28. As a result, Mr. Lett did not agree that the claim excluded the outputting of a piece of data after it had been selected: “Q. If I select each of the plurality of desired

channels at one step, and at a later time provide each of the plurality of desired channels, would that disclose claim 27? ... A. Perhaps in another place it says something about the later – you can’t do it later. But to me in this claim element, it doesn’t say anything about timing.” *Id.*, 74:21-75:4; Ex. 1078, ¶ 28. In short, Mr. Lett never interpreted “concurrently” to preclude the manner in which Zhang and the ’866 patent disclose performing element [1C]. Petition, 24-26. Instead, Mr. Lett made two points that support the Petition’s arguments. Ex. 1078, ¶ 29.

First, as noted above, Mr. Lett explained that in the ’866 patent’s system, there is inherently a small amount of delay as a signal propagates from input to output. Ex. 1079, 77:6-79:24; Ex. 1078, ¶ 30. Mr. Lett’s testimony on this point is unrebutted. Adopting a construction of “concurrently” that excludes this delay inherent in all circuits would be improper. *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 904 F.3d 965, 972 (Fed. Cir. 2018). (Finding proposed claim construction of “fixed” switching frequency as excluding natural variation would be inoperable because no real-world controller could operate with an absolutely fixed frequency). It would also be improper because it is contrary to element [1C]’s requirement that “concurrently select and provide” be “via a serial interface.” A serial interface selects between different channels sequentially to transmit them across a serial path. Petition, 24-26, 73-78; Ex. 1079, 32:4-33:11; Ex. 1078, ¶ 30.

Mr. Lett's second point was that, even with the signal propagation delay, Zhang, like the '866 patent, performs the "selecting" concurrently with the "providing" because the desired channels are digital data *streams*, for example, as shown in the Petition passing through the serial interface. Petition, 23-26; Ex. 1078, ¶ 31. Mr. Lett described that when a channel is first selected, there is a time lapse to when the channel starts streaming from the output; however, after that, the channel continues to stream and, thus, it is concurrently being selected and provided. Ex. 1079, 78:16-25; 81:4-11; Ex. 1078, ¶ 31. That is, some data in the channel streams into the input of Zhang's demultiplexer 230 concurrently with other data in the channel streaming out of output from the serial interface of selector 240. Ex. 1078, ¶ 31. Thus, to the extent that the claim requires concurrent selection and provision of the channels, Zhang still teaches it.

VI. CONCLUSION

For the reasons set forth above and in the Petition, all claims of the '866 patent are unpatentable for obviousness and should be canceled.

Respectfully submitted

Dated: April 17, 2025

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petitioner's Reply totals 5593, which is less than the 5,600 allowed under 37 CFR § 42.24(c)(1), as counted by the Word Count feature of Microsoft Word. This total includes 5552 words as counted by the Word Count feature of Microsoft Word and 41 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 **PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE UNDER 37 C.F.R. § 42.23** in connection with IPR2024-00435 to be served via e-mail on April 17, 2025, in its entirety on the following counsel of record for Patent Owner:

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