

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 IPR2024-00432
Patent 9,210,362

PATENT OWNER'S RESPONSE

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2002	Table of All Petitions Filed By Comcast (As Petitioner or RPI) (2016-2024) [All-Comcast-Petitions]
2003	PTAB Multiple Petitions Study [Multiple-Petitions-Study]
2004	PTAB Multiple Petitions Study Executive Summary [Executive-Summary]
2005	FreeWheel About Webpage (www.freewheel.com/about)
2006	Declaration of Kenneth K. Wang [Wang-Decl.]
2007	Pro Hac Vice Declaration of Nathan Lowenstein [PHV-L]
2008	Pro Hac Vice Declaration of Colette Woo [PHV-W]
2009	Declaration of Samuel H. Russ, Ph.D. [Russ-Decl.]
2010	Curriculum Vitae of Samuel H. Russ, Ph.D. [Russ-CV]
2011	European Patent Application No. 02759732.7.2415 Communication From Examining Division [EPO-Communication-Annex]
2012	European Patent Application No. 02759732.7.2415 Reply To Communication From Examining Division [Zhang-EPO-Reply]
2013	European Patent Application No. 02759732.7.2415 Intent To Grant European Patent [EPO-Grant-Intent]
2014	Reserved
2015	U.S. Patent 11,381,866 ['866-Patent]
2016	Reserved

2017	Reserved
2018	David Lett 1 st Deposition Volume I [Lett-1 st -Depo.-Volume-I]
2019	David Lett 1 st Deposition Volume II [Lett-1 st -Depo.-Volume-II]

I. INTRODUCTION

Petitioner fails to prove that any of the challenged claims are invalid. Each ground is founded upon Zhang, but Zhang describes a different system and method from that disclosed and claimed in the '362 patent.

While both Zhang and the '362 patent involve systems that receive an RF input signal and output a plurality of desired television channels, the method by which they achieve this result is decisively different. Specifically, in the '362 patent, desired channels are selected and extracted from the digitized RF input signal *without* selecting any of the undesired channels. In contrast, Zhang's system first extracts *both* desired and undesired channels C_1 - C_n from the digitized RF input signal, and then selects the desired channels D_1 - D_m from this extracted collection of channels C_1 - C_n . *See* Section II.

Petitioner fails to prove that Zhang's different system and method discloses or renders obvious the '362 patent's claimed inventions. Claim 1 recites digital circuitry configured to "select said plurality of desired television channels from said digitized plurality of frequencies." Independent claim 11 recites corresponding method steps to claim 1. The Petition alternatively refers to channels C_1 - C_n and D_1 - D_m as the claimed "plurality of desired television channels" that must be "selected" by the claimed digital circuitry. Both alternatives fail.

With respect to channels C_1 - C_n , Zhang's express disclosures, as well as its prosecution history, confirm that channels C_1 - C_n include all channels in the "entire signal band," both desired and undesired. Thus, channels C_1 - C_n cannot be a plurality of desired channels. Similarly, Zhang's digital channel demultiplexer 230 that extracts channels C_1 - C_n does not "select" any channels; rather, it blindly extracts all channels C_1 - C_n . *See* Section III.A.

With respect to channels D_1 - D_m , while they are desired channels, they are not selected "from said plurality of frequencies." Specifically, the claims require that the desired channels be selected in limitation 1[d] "from" the same "plurality of frequencies" that were down converted in limitation 1[b] and digitized in limitation 1[c]. In Zhang, channels D_1 - D_m are selected from demultiplexed channels C_1 - C_n . Channels C_1 - C_n , even if considered collectively, are a different "plurality of frequencies" than the one pointed to by Petitioner as the plurality of frequencies down converted in limitation 1[b] and digitized in limitation 1[c]. Even though both the '362 patent and Zhang may ultimately achieve the same outcome (outputting desired channels), they do so through different methods, and "the very details regarding how" this result is achieved are "at the heart of a process patent." *Amgen, Inc. v. Hoechst Marion Roussel*, 126 F. Supp. 2d 69, 101 (D. Mass. 2001) *aff'd* in relevant part, 314 F.3d 1313, 1346-1347 (Fed. Cir. 2003). *See* Section III.B.

For these reasons and more, Petitioner fails to prove that any of the challenged claims are disclosed or obvious.

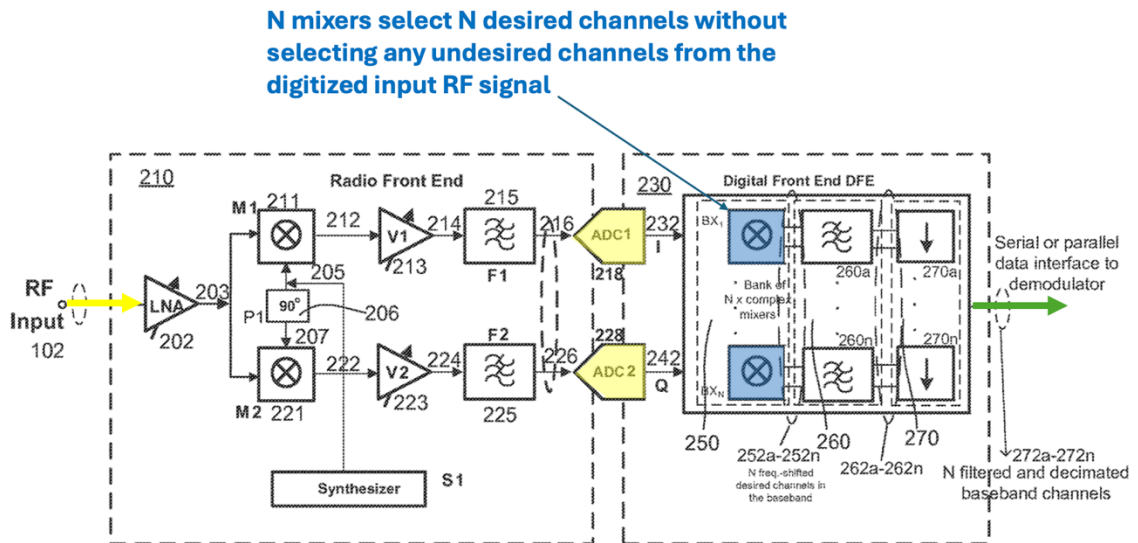
II. ZHANG, UNLIKE THE '362 PATENT, EXTRACTS ALL CHANNELS, BOTH DESIRED AND UNDESIRED, FROM THE INPUT SIGNAL.

Zhang is the cornerstone of each of Petitioner's grounds. Pet., 18. Though both Zhang and the '362 patent involve a digitized RF input signal, and, ultimately, output desired RF channels, the method by which they achieve this result is critically different. Specifically, the '362 patent *only* selects desired channels from the digitized input RF signal without selecting any undesired channels. In contrast, Zhang blindly extracts *all* channels, *both* desired and undesired, from the digitized input RF signal, and only later selects the desired channels from the extracted channels.

As Dr. Russ explains, the '362 patent outputs desired channels by selecting desired channels, without selecting any undesired channels, from the digitized input RF signal:

The Figure 2 embodiment of the '362 patent, annotated below, is illustrative. There, the analog input RF signal (yellow) is first digitized in the analog to digital converters (yellow). Ex. 1001 ['362] 5:28-31. Then, a bank of N mixers (blue) selects N desired channels, without selecting any undesired channels, from the digitized input RF signal. *Id.*, 5:31-37, 5:49-56. Specifically, each of the N mixer paths is

responsible for extracting a desired channel from the digitized input signal. The selected desired channels are then output to demodulators (green). *Id.*, 5:55-60.



'206 Pat. Fig. 2 (modified and annotated)

Ex. 2009 [Russ-Decl.] ¶ 32.

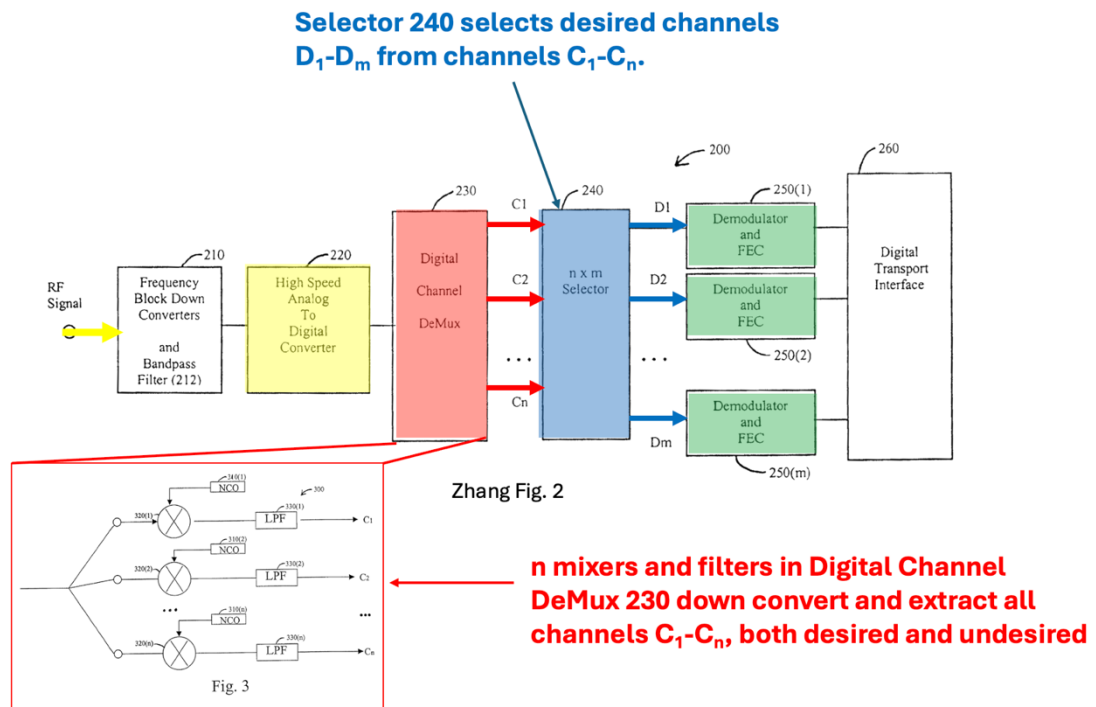
In contrast, Zhang does not select only desired channels from the digitized RF input signal. Per Dr. Russ:

In Zhang, creating an output of desired channels is achieved through a different method, which I explain in the context of Zhang's Figures 2 and 3, annotated below. Similar to the '362 patent, Zhang digitizes an input signal (yellow), consisting of "n" channels, both desired and undesired, in the analog to digital converter 220 (yellow). Ex. 1013 [Zhang] [0027] ("In this specific embodiment, ADC 220 is a high-speed ADC so that an entire signal band with n channels can be converted"). Note that the letter "n" in Zhang denotes the number of

channels in the entire signal band, both desired and undesired, whereas the letter “N” in the ’362 patent denotes the number of desired channels.

Unlike the ’362 patent, however, Zhang’s method then extracts from the digitized RF input signal *all* channels C_1 - C_n in the entire signal band, *both* desired *and* undesired, in the Digital Channel DeMux 230 (red) without making any selection among them. *Id.*, [0028] (“A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C_1 to C_n .”). The exemplary architecture of Zhang’s Digital Channel DeMux 230 is shown in Zhang’s Figure 3, annotated below. Note that though Zhang’s Digital Channel DeMux 230 uses complex mixers similar to the ’362 patent to extract channels, unlike the ’362 patent, it extracts all channels, both desired and undesired.

Once all channels C_1 - C_n are extracted from the digitized input signal, the channels C_1 - C_n are sent as the input to the digital selector 240 (blue). *Id.*, [0028]. Using the channels C_1 - C_n as input, the digital channel selector 240 (blue) then selects the desired channels and outputs them to demodulators (green). *Id.*, [0028] (“an $n \times m$ digital selector 240 receives the demultiplexed digital RF channels C_1 to C_n and then selects one or more of the RF channels D_1 to D_m from one or more of the digital RF channels C_1 to C_n .”); [0039] (“In operation, digital selector 500 digitally selects one or more RF channels D_1 to D_m from the digital RF channels C_1 to C_n and then sends them to appropriate demodulators”).



Ex. 2009 [Russ-Decl.] ¶¶ 33-35.

As Petitioner's expert, Mr. Lett, testified, Zhang's use of a different method from the '362 patent is not coincidental. Rather, Zhang's method allows the user to select a different channel as the desired channel D_1 - D_m from the already extracted channels C_1 - C_n , instead of having to select and extract new desired channels from the digitized input RF signal:

Q. So did I understand correctly that Zhang demultiplexes more channels that at one time may be sent to the demodulator so that the user can switch between the desired channels at a faster speed?

A. Yeah. So Zhang discloses the digital selector provides the subscriber with fast channel search capabilities. That's in paragraph in 28 cited in Zhang.

Ex. 2019 [Lett-1st-Depo-Volume-II] 8:14-22; *see also id.*, 8:4-8 (Petitioner's expert opining that "I don't think it's wasted. It's really—it's there for a quick channel change to the new—to the new desired channel that may be going from an undesired to a desired channel."); Ex. 1013 [Zhang] [0028] ("Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners.").

As explained below, the different methodologies utilized by Zhang and the '362 patent result in the Petition's grounds failing to disclose or render obvious multiple claim limitations.

III. PETITIONER FAILS TO SHOW "DIGITAL CIRCUITRY CONFIGURED TO SELECT SAID PLURALITY OF DESIRED TELEVISION CHANNELS FROM SAID DIGITIZED PLURALITY OF FREQUENCIES" (ALL CLAIMS, ALL GROUNDS).

Limitation 1[d] recites "digital circuitry configured to select said plurality of desired television channels from said digitized plurality of frequencies." Ex. 1001 ['362] cl. 1. Independent claim 11 recites an identical limitation in method form. *Id.*, claim 11 (limitation 11[d]).¹ Petitioner contends that Zhang alone discloses

¹ This POR follows the Petition's claim-limitation conventions.

this limitation for all grounds. Pet., 34 (“Thus, Zhang teaches Element 1[D]”); 42 (limitation 11[d]).² In a set of “alternate” grounds, Petitioner also relies on the combination of Zhang and Mirabbasi to show limitation 1[d]. Pet., 72-74.

However, that combination only modifies how Zhang’s circuitry is implemented and does not affect the arguments presented here, which equally apply to these “alternate” grounds. Further still, Petitioner only presents these “aternate grounds” as an “alternative” and “[t]o the extent” the claimed “digital circuitry” is construed to be a means-plus-function term. Pet., 72, 74. Patent Owner here does not assert that “digital circuitry” is a means-plus-function term, and consequently, these “alternate” grounds on their own terms, are irrelevant.

Petitioner argues either that Zhang’s “Digital Channel Demultiplexer 230” alone, or “in combination with all or part of Digital Selector 240” perform limitation 1[d]. Pet., 28. The Petition presents two alternatives as to how Zhang allegedly discloses the claimed “plurality of desired television channels” that are

² The Petition relies on its discussion of limitation 1[d] for the corresponding limitation 11[d], as claim 11 elements [a]-[e] are the elements of claim 1 [a]-[e] recited as method steps. Therefore, this POR discusses limitation 1[d] with the understanding that the same argument applies to claim 11[d] and dependents thereof.

selected “from said digitized plurality of frequencies.” *See* Ex. 1001 [’362] cls. 1, 11. The Petition first argues that Zhang’s channels C_1 - C_n constitute the claimed “plurality of television desired channels.” Pet., 29 (arguing that “Zhang uses the same technique described in the ’362 patent for selection and outputting of desired channels C_1 - C_n ”). Alternatively, Petitioner argues that Zhang’s channels D_1 - D_m disclose the claimed “desired channels.” Pet., 31 (“Digital Selector 240 selects channels D_1 - D_m which comprise any or all of channels C_1 - C_n .”); Pet. 32 (arguing that “a channel that is both demultiplexed by [demultiplexer] 230 and switched by [selector] 240 to a demodulator is ‘desired.’”).

Ultimately, however, both of Petitioner’s potential alternatives fail. Petitioner’s reliance on Zhang’s channels C_1 - C_n fails because both Zhang and its prosecution history make clear that channels C_1 - C_n constitute all channels in the “entire signal band.” Thus, C_1 - C_n are not a “plurality of desired channels,” and the digital channel demultiplexer 230 that demultiplexes all channels C_1 - C_n in Zhang does not perform any “selection.” Section III.A, *infra*. In the alternative, where Petitioner relies on Zhang’s channels D_1 - D_m for limitation 1[d], that reliance also fails because channels D_1 - D_m are not selected “from” the same “plurality of frequencies” that were down converted and digitized in limitations 1[b] and 1[c], as required by the claims. Section III.B, *infra*.

A. Zhang’s Channels C_1 - C_n Include All Channels In The “Entire Signal Band,” Both Desired And Undesired, Extracted Without Any “Selection.”

Petitioner first argues that Zhang’s channels C_1 - C_n disclose the claimed “plurality of desired television channels” that are “select[ed]” by the claimed “digital circuitry:

Digital Channel Demultiplexer 230 receives the multi-channel digital 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...

... As shown below, Zhang uses the same technique [in demultiplexer 230] described in the ’362 patent for selection and outputting of *desired channels C_1 - C_n* .

Pet., 29. But, as discussed below, both Zhang and its prosecution history confirm that channels C_1 - C_n encompass all channels in the “entire signal band,” both desired and undesired. Therefore, the digital channel demultiplexer 230 that demultiplexes channels C_1 - C_n does not “select” any channels. See Section III.A.1, *infra*. Petitioner’s arguments that Zhang discloses or renders obvious the claims contradict Zhang’s express teachings. See Section III.A.2, *infra*. Moreover, Petitioner’s mapping of Zhang’s channels C_1 - C_n to the claimed “plurality of desired channels” contradicts Petitioner’s mapping in other claim limitations. See Section III.A.3, *infra*.

1. Zhang And Its Prosecution History Expressly Teach That Zhang Extracts All Channels C_1 - C_n , Both Desired And Undesired, Without Performing Any “Selection.”

Both Zhang and its prosecution history make clear that channels C_1 - C_n are all channels in the entire signal band, both desired and undesired, that are extracted without any “selection.” Consequently, Zhang’s Digital Channel Demultiplexer 230 that blindly demultiplexes channels C_1 - C_n from the RF input signal does not “select” any desired channels.

The letter “n” in Zhang denotes the number of channels, both desired and undesired, in the “entire signal band.” For example, Zhang explains:

An ADC 220 then converts the down-converted multi-channel analog RF signal to a multi-channel digital RF signal. In this specific embodiment, ADC 220 is a high-speed ADC so that *an entire signal band with n channels* can be converted.

Ex. 1013 [Zhang] [0027]; Ex. 2009 [Russ-Decl.] ¶ 41.

This is undisputed and Petitioner’s expert agreed that the number of channels “n” includes both desired and undesired channels:

Q. So you agree that in paragraph 27 of Zhang, in the sentence that says, “In this specific embodiments” – “embodiment, ADC 220 is a high-speed ADC so an entire signal band with n channels can be converted,” end quote. So you agree in this sentence, *lower case letter n refers to both desired and undesired channels within the entire band*; correct?

A. It seems to, **yes**.

Ex. 2018 [Lett-1st-Depo.-Volume-I] 78:14-22.

Zhang then explains that its digital channel demultiplexer 230 demultiplexes the input RF signal into channels C_1 - C_n :

A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C_1 to C_n .

Ex. 1013 [Zhang] [0027]. Consequently, because “n” in Zhang denotes the total number of channels, both desired and undesired, the demultiplexed channels C_1 to C_n , therefore, also encompass all channels in the “entire signal band,” both desired and undesired, without any “selection” of desired channels. Ex. 2009 [Russ-Decl.] ¶¶ 42-43.

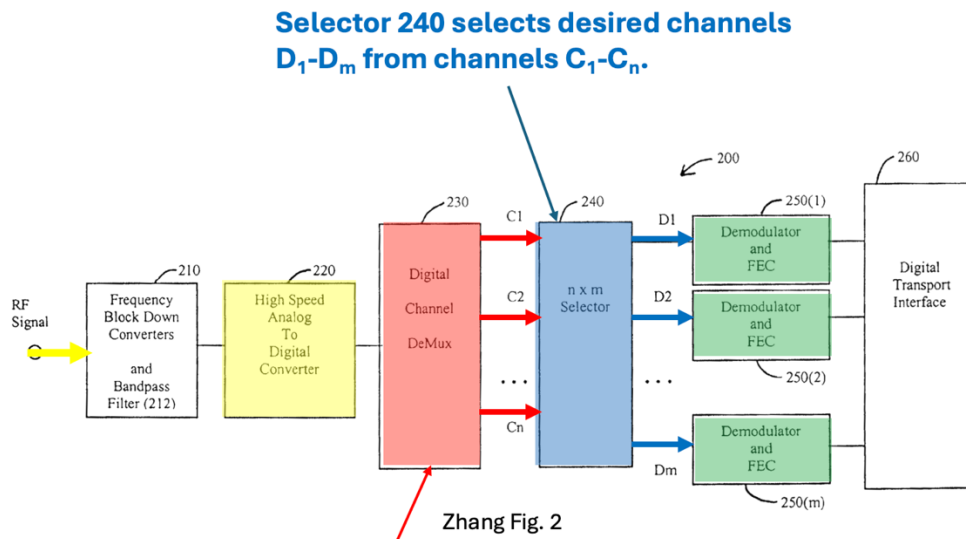
Zhang’s balance further confirms that channels C_1 to C_n include both desired and undesired channels, and that Zhang’s Digital Channel Demultiplexer 230 does not perform any “select[ion].” Specifically, Zhang explains that after channels C_1 - C_n are extracted from the input RF signal, a module actually called a selector, an $n \times m$ ***Selector*** 240, selects the desired channel D_1 - D_m from the total channels C_1 - C_n :

Still referring to FIG. 2, an $n \times m$ digital selector 240 receives the demultiplexed digital RF channels C_1 to C_n ***and then selects one or more of the RF channels D_1 to D_m from one or more of the digital RF***

channels C_1 to C_n [O]nly the selected channels are later demodulated unlike the systems using RF tuners which demodulate all of the RF channels.

Ex. 1013 [Zhang] [0028]; *see also id.*, [0039] (“In operation, digital ***selector 500*** ***digitally selects one or more RF channels D_1 to D_m from the digital RF channels C_1 to C_n and then sends them to appropriate demodulators*** or output ports (not shown) through different data buses (not shown).”); [0042] (“For example, in FIG. 6, there are 35 separate RF channels C_1 to C_{35} . Of those RF channels, 20 RF channels D_1 to D_{20} are selected. Those 20 selected RF channels are sent to a set of demodulators 650(1 ... 20) for demodulation.”).

Zhang’s operation is shown in its Figure 2, annotated below, showing that the digital channel demultiplexer 230 demultiplexes channels C_1 - C_n containing both desired and undesired channels, and $n \times m$ selector 240 selecting desired channels D_1 - D_m for transmission to demodulators 250 (green):



Digital Channel DeMux 230 extracts all channels C_1 - C_n , both desired and undesired, from the digitized input RF signal.

Ex. 2009 [Russ-Decl.] ¶ 44.

In fact, Petitioner's expert, Mr. Lett confirmed that C_1 - C_n constitute "all content channels" in the input signal, from which desired channels D_1 - D_m are later selected:

A digital channel demultiplexer 230 (green/purple) then separates signals of *all the content channels* in the digital RF signals (e.g., channels C_1 to C_n), while a $n \times m$ digital selector 240 selects and forwards only signals for *a subset of content channels selected by a subscriber* (e.g., channels D_1 to D_m) to one or more of demodulators 250(1), 250(2), . . . 250(m) (blue) . . .

Ex. 1002 [IPR2024-00432-Lett-Decl.] ¶ 79.

Zhang's prosecution history also confirms that the digital channel demultiplexer 230 outputs all channels C_1 - C_n , both desired and undesired, and that it is the selector 240 that selects the desired channels D_1 - D_m . As Dr. Russ explains:

Zhang's European Patent Application claims recited "a digital channel demultiplexer ... to demultiplex the digital RF signal into separate digital RF channels ($C_1 \dots C_n$)," and "a selector ... configured to receive the separate digital RF channels and to select one or more separate digital RF channels ($D_1 \dots D_m$)." Ex. 2012 [Zhang-EPO-Reply] 6.

The European Patent Office (EPO) noted that the independent claims "appear to be not new." Exhibit 2011 [EPO-Communication-Annex] 2-3. In response, the applicant explained that it is the selector that distinguished Zhang from its prior art, where all of the channels were demodulated:

The provision of a selector allows the selection of specific RF channels for demodulation dependent on the specific application in which the apparatus is implemented (paragraph 37 of the application) this allows for power consumption to be optimized because only the selected channels are later demodulated *unlike systems which demodulate all of the RF channels* (e.g. [Reference] D1 and [Reference] D2). Thus, the invention provides apparatus which is not only faster, but also dissipates less heat, than systems such as those in D1 and

D2, because fewer resources are required when demodulating only the selected RF channels (paragraph 25).

Ex. 2011 [EPO-Communication-Annex] 2-3. Subsequently, the EPO accepted the Zhang applicant's argument and allowed the claims without any further rejection. Ex. 2013 [EPO-Grant-Intent] 1.

A POSITA reviewing the above would recognize that from Zhang's applicant's own perspective, the digital channel demultiplexer 230, like Zhang's prior art, demultiplexed all channels C_1 - C_n , both desired and undesired, and it was Zhang's selector 240 that, unlike Zhang's prior art, selected desired channels D_1 - D_m to send to demodulators.

Ex. 2009 [Russ-Decl.] ¶¶ 45-47. Thus, Zhang's prosecution history further confirms its express disclosures in its specification that channels C_1 - C_n contain all channels, both desired and undesired, and that its Digital Channel Demultiplexer 230 does not perform any "select[ion]."

2. Petitioner's Arguments Are Inconsistent With Zhang.

Petitioner's arguments for why Zhang's channels C_1 - C_n supposedly contain only desired channels are both contrary to Zhang's express disclosures discussed above (*see infra*), and contrary to Petitioner's own mapping of Zhang to other claim limitations (*see* Section III.A.3, *infra*).

Petitioner first relies on the fact that Zhang's Digital Channel DeMux 230 in an embodiment is implemented through complex mixers and argues that because

the '362 patent also relies on complex mixers to extract channels, it supposedly follows that channels C_1 - C_n are the claimed “desired channels.” Pet., 29-30 (“Zhang uses the same technique described in the '362 patent for selection and outputting of desired channels C_1 - C_n : first using a bank of complex mixers (purple) to frequency-shift a digitized version of the down converted wideband signal....”).

But, as explained above, even though Zhang and the '362 patent both use complex mixers to extract channels from the digitized input RF signal, and unlike the '362 patent's mixers, Zhang's mixers extract all channels, both desired and undesired, from the digitized input RF signal. This is shown below by adding additional annotations (red) to Petitioner's annotation comparing Zhang Figure 3 with the '362 patent Figure 2 (at Pet., 30). As can be seen in the figures and explained in more detail below, in Zhang, the number of complex multipliers 320 (1...n) is the same number “n” as the number of all channels, both desired and undesired, in the entire signal band. In contrast, the number of mixers N in the '362 patent is the number of desired channels.

In Zhang, “n” mixers in Digital Channel DeMux 230 extract all channels C_1 - C_n , both desired and undesired, from the digitized input RF signal.

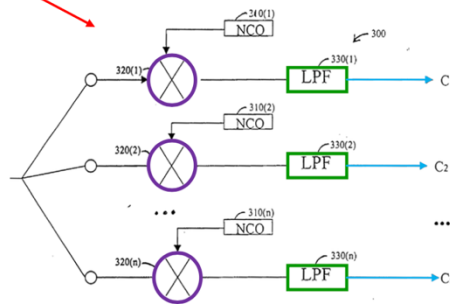
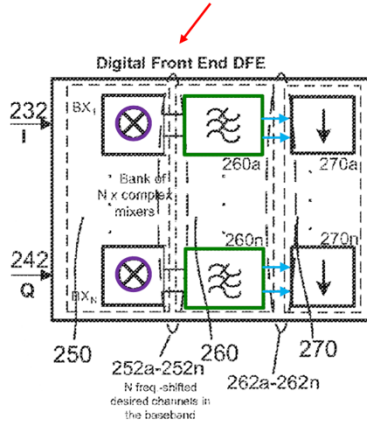


Fig. 3

Ex. 1013, Fig. 3 (annotated)

In the '362 patent, N mixers select N desired channels without selecting any undesired channels from the digitized input RF signal



Ex. 1001, Fig. 2 (excerpted/annotated)

Ex. 2009 [Russ-Decl.] ¶ 50. As Dr. Russ further explains, Zhang’s description of its Figure 3 confirms that its complex mixers down convert both desired and undesired channels C_1 - C_n :

At a high level, if Zhang’s Figure 3 down converted and output only desired channels, there would have been no need for the subsequent channel selector 240 to select desired channels D_1 - D_m from channels C_1 - C_n . This is in contrast to the '362 patent’s Figure 2, where the output of the Digital Front End is sent to demodulators because the down conversion in the Digital Front End is only for the desired channels. Details of Zhang’s Figure 3 confirm this distinction.

Zhang explains that its Figure 3 “can be used to implement digital channel demultiplexer 230 of Fig. 2.” Ex. 1013 [Zhang] [0030] (cited by Pet., 29). Zhang further explains that its Figure 3 contains “complex multipliers 320 (1 ...n).” Ex. 1013 [Zhang] [0030]. These

“complex multipliers 320 (1 ...n)” are the complex mixers relied upon by Petitioner. Pet., 30. It can be readily shown, however, that the complex mixers 320 (1....n) in Zhang extract both desired and undesired channels from the digitized input RF signal. First, Zhang confirms that the output of its Figure 3 circuitry is channels C_1 to C_n . Ex. 1013 [Zhang] [0032] (“Digital tuner circuit 300 then outputs the separated RF channels C_1 to C_n , each RF channel being centered at the baseband.”). As explained above, Zhang is clear that channels C_1 - C_n include both desired and undesired channels.

Second, there are “n” complex multipliers 320 (1...n), each used for extracting a single channel. Ex. 1013 [Zhang] [0030] (“One chain of each of these elements is used for each RF channel.”). As also explained above, Zhang is clear that the number “n” in its disclosure denotes both desired and undesired in “entire signal band.” Ex. 1013 [Zhang] [0027]. Thus, the number of complex multipliers 320 (1...n) further confirms that Zhang’s Figure 3 output both desired and undesired channels.

Ex. 2009 [Russ-Decl.] ¶¶ 51-53.

Petitioner also relies on multiple out-of-context statements from Zhang to imply that channels C_1 - C_n include only desired channels. Petitioner is incorrect.

Petitioner relies on Zhang’s use of the phrase “target channel” in its discussion of its Figure 3, but as Dr. Russ explains, Petitioner’s reliance is misplaced. Pet., 30. The “target channel” is simply the specific one of the n

channels (consisting of both desired and undesired channels) that a particular mixer path is responsible for extracting:

Petitioner attempts to capitalize on Zhang's use of the phrase "target channel" in its discussion of Figure 3 to argue that Figure 3 only outputs desired channels. Pet., 30 (citing Ex. 1013 [Zhang] [0028], [0030]-[0032]). Petitioner is incorrect. As I explained, Zhang is clear that its Figure 3 outputs both desired and undesired channels, and Petitioner is incorrect in its interpretation of Zhang's use of the phrase "target channel."

In Zhang's Figure 3, annotated below, the digitized input RF signal is sent in parallel to multiple data paths, each of which is responsible for extracting one of the channels C_1 - C_n from the digitized input signal. It is in this context that Zhang states that each data path is responsible for extracting its "target channel," which only means the specific one of channels C_1 - C_n that the particular data path is responsible for. "Target channel," thus, does not refer to a "desired" channel but, rather, a particular channel for a particular data path, which may ultimately be desired or undesired.

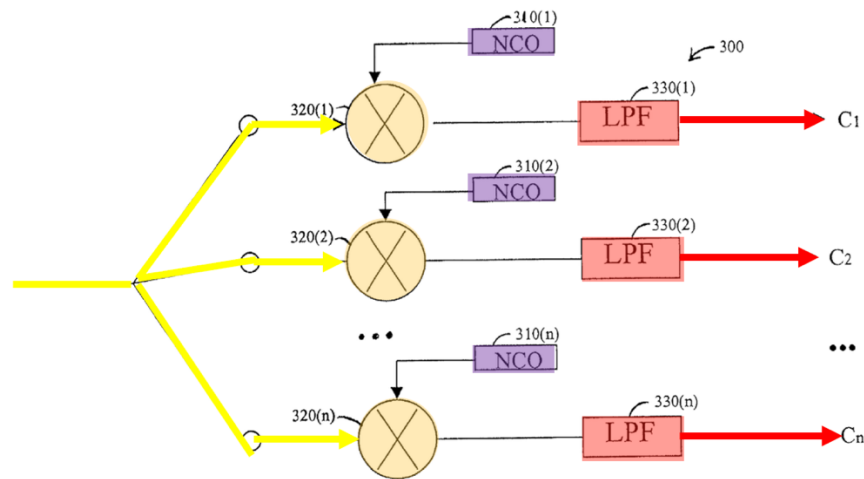


Fig. 3

Notably, if Zhang’s digital channel demultiplexer 230 (as implemented in its Figure 3) demultiplexed only desired channels, that would negate the function of the digital channel selector 240 that follows the digital channel demultiplexer 230. As explained, the digital channel selector 240 takes the output of the digital channel demultiplexer 230 (channels C_1 - C_n) as input, and selects and outputs desired channels D_1 - D_m .

Ex. 2009 [Russ-Decl.] ¶¶ 54-56.

Zhang’s detailed explanation of how its Figure 3 operates readily confirms Petitioner’s misinterpretation of Zhang’s “target channel.” As Dr. Russ further explains:

In Zhang’s Figure 3 above, the digitized input RF signal (yellow) is transmitted in parallel through multiple data paths, each of which is responsible for extracting one of channels C_1 - C_n . Ex. 1013 [Zhang] [0030]-[0031]. In each data path, the way a channel is extracted is that

a numerical local oscillator NLO 310 (purple) provides the frequency for the one of channels C_1 - C_n for which that specific data path is responsible. *Id.*, [0032]. A multiplier 320 (orange) multiplies the digitized input RF signal with the provided frequency to bring the channel to baseband. *Id.* Then a corresponding low pass filter LPF 330 (red) filters out all channels other than the one of C_1 - C_n for that data path. *Id.* In this context, Zhang states that the complex mixer 320 (orange) is provided with the “characteristic frequency of a desired RF channel,” which means the frequency of the one of channels C_1 - C_n for which this specific data path is responsible. Similarly, Zhang states that the LPF (red) only permits the “target RF channel” to pass, which, again, means the specific one of channels C_1 - C_n for which this specific data path is responsible. *Id.* Nothing in Zhang’s discussion of its Figure 3 changes its consistent disclosure that channels C_1 - C_n contain both desired and undesired channels.

Ex. 2009 [Russ-Decl.] ¶ 57.

Petitioner also relies on Zhang’s claims 34 and 36-41 to argue that channels C_1 - C_n contain only desired channels. Pet., 29. But, as Dr. Russ explains, those claims closely follow Zhang’s Figure 3 embodiment discussed above, and Petitioner misapprehends their disclosure—which, of course, cannot claim a system that is different from Zhang’s specification:

Claims 34 and 36-41 depend from independent claim 28. Claim 28 claims the function of Zhang’s digital channel demultiplexer in Zhang’s Figure 3, which extracts both desired and undesired channels

from the input signal, and recites “[a] method for demultiplexing a digital multi-channel RF signal into a plurality of separate content channels.” As detailed in the table below, claims 34, and 36-41 recite various details of Zhang’s digital channel demultiplexer 230 from Zhang’s Figure 3, including functions of the mixers, local oscillators and low pass filters. As noted above, however, Zhang’s discussion of its Figure 3 is the *only* disclosure in Zhang of “target channels” and “target frequencies,” and Zhang’s use of these phrases does not mean selecting only desired channels as the ’362 patent does. Rather, it only refers, in context, to the specific one of channels C_1 - C_n (consisting of both desired and undesired channels) for which a particular data path is responsible for extracting.

Zhang Claims	Zhang Fig. 3 (Annotated)
34. The method of claim 28 wherein the demultiplexing further comprises: providing a plurality of select frequencies, each select frequency being associated with a corresponding and separate RF channel; and multiplying the at least one multi-channel RF signal with each of the select frequencies to obtain separate RF channels. 36. The method of claim 34 further comprising shifting the target RF channel to a baseband. 37. The method of claim 34 further comprising filtering undesired RF channels and passing only the target RF channel. 38. The method of claim 37 wherein the filtering is achieved with a low-pass filter (LPF) 39. The method of claim 38 wherein the LPF is a fine impulse response (FIR) filter. 40. The method of claim 39 wherein the FIR filter is a high-speed filter. 41. The method of claim 34 wherein the select frequencies are generated by numeric control oscillators.	Fig. 3

Thus, as is clear from the above, similar to Zhang's Figure 3, "target RF channel" in Zhang's claims refers to the one of the channels C_1 - C_n for which this path is responsible, and "undesired RF channels" refers to the remaining ones of channel C_1 to C_n other than the one for which this path is responsible. Other claims of Zhang similarly follow its embodiments described above.

Ex. 2009 [Russ-Decl.] ¶¶ 58-59.

Petitioner also relies on Zhang's statement that "RF channels C_1 to C_n contain channels that are selected or used by a subscriber." Pet., 29 (quoting Exhibit 1013 [Zhang] [0028], [0030]-[0032], [0042]). Those portions of Zhang do not state that channels C_1 to C_n contain "only" desired channels. Instead, in context, a representative passage reproduced below, Zhang states simply that the "channels that are selected or used by a subscriber" are contained within the broader set of "RF channels C_1 to C_n ." Consistent with this, Zhang states that channels C_1 to C_n contain all potentially desirable channels from which actual desired channels D_1 to D_m can be selected:

Still referring to FIG. 2, an $n \times m$ digital selector 240 receives the demultiplexed digital RF channels C_1 to C_n and then selects one or more of the RF channels D_1 to D_m from one or more of the digital RF channels C_1 to C_n . RF channels C_1 to C_n contain content channels that are selected or used by a subscriber. Channel-search capabilities of the digital

selector 240 renders it much faster than traditional analog channel switching through RF tuners.

Ex. 1013 [Zhang] [0028]; Ex. 2009 [Russ-Decl.] ¶ 60.

Petitioner also argues that in the incidental situation where all of channels C_1 - C_n separated out by Digital Channel Demultiplexer 230 are subsequently selected by the Selector 240, then the Digital Channel Demultiplexer 230 has extracted (and thus, supposedly selected) all desired channels. Pet., 32 (“Where D_1 to D_m includes all C_1 to C_n , Digital Channel Demultiplexer 230 selects the desired channels and filters out the undesired channels as described above.”). To the extent Petitioner’s argument rests on the theoretical happenstance that sometimes all channels C_1 - C_n may subsequently be selected, and by happenstance channels C_1 - C_n and channels D_1 - D_m would happen to be the same set (*i.e.*, n would happen to equal m), that argument fails for multiple reasons. Ex. 2009 [Russ-Decl.] ¶ 61.

First, Digital Channel Demultiplexer 230 blindly extracts all channels C_1 - C_n in the “entire signal band,” regardless of whether or not they are desired, or whether they will be ultimately selected by the channel selector 240. Thus, the Digital Channel Demultiplexer 230 does not “select” any channels even if all of its extracted channels are subsequently selected by the selector 240. Ex. 2009 [Russ-Decl.] ¶ 62.

Second, Petitioner does not point to any disclosure in Zhang that teaches or suggests that all extracted channels C_1 - C_n could be the desired channels D_1 - D_m . As Petitioner's expert explained, Zhang by design extracts more channels from the input signal than are desired (*i.e.*, Zhang extracts all channels) so that new desired channels can be selected without having to extract them from the input signal. Ex. 2019 [Lett-1st-Depo-Volume-II] 8:408, 8:14-22.

Third, the theoretical happenstance that all extracted channels C_1 - C_n could be the desired channels D_1 - D_m cannot disclose the claimed method; for that would mean that it makes no difference whether all channels are desired, or are not desired, or if no one had ever conceived of using the distinction between desired and undesired channels at all. *In re Facebook, Inc.*, 743 Fed Appx. 998, 1001-1002 (Fed Cir. 2018) (reversing the Board's anticipation and obviousness determination because even if the examples in the prior art "happened to result in" the claimed limitation, "[n]othing about [the prior art's] algorithm required" that outcome); *In re Felton*, 484 F.2d 495, 500 (CCPA 1973) (reversing anticipation and obviousness determinations where "it would be mere happenstance if any structure made according to [the prior art] met the limitations of the claims."). Ex. 2009 [Russ-Decl.] ¶¶ 63-64.

For the foregoing reasons, Petitioner's arguments contradict Zhang's express disclosures.

3. Petitioner's Arguments Are Also Inconsistent With Each Other.

In fact, not only is Petitioner's assertion that Zhang's channels C_1 - C_n disclose the claimed "desired channels" incorrect and contrary to Zhang's disclosure, but it is also inconsistent with Petitioner's mapping of Zhang to other claim limitations. For example, limitation 1[d] recites "output said selected plurality of television channels to a demodulator as a digital datastream." Petitioner relies on Data Bus 1 within Zhang's $n \times m$ selector 240 for this limitation. Pet., 32-33. Zhang's $n \times m$ selector 240 is annotated below:

Figure 5 "selects one or more RF channels D_1 to D_m from the digital RF channels C_1 to C_n and then sends them to appropriate demodulators or outputs ports ... through different data buses ..." Ex. 1013 [Zhang] [0039]

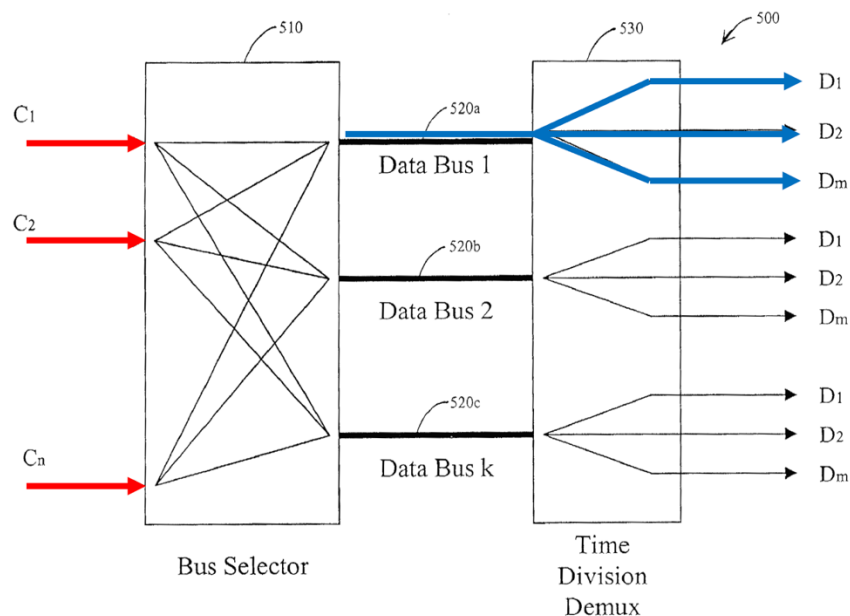


Fig. 5

As is clear from the figure, what is "output" on Data Bus 1 in the selector 240 are channels D_1 - D_m (blue), not channels C_1 - C_n (red). Ex. 2009 [Russ-Decl.]

¶ 67. This is consistent with the balance of Zhang’s disclosure that explains the digital selector in Fig. 5 “selects one or more RF channels D_1 to D_m from the digital RF channels C_1 to C_n and then sends them to appropriate demodulators or outputs ports” Ex. 1013 [Zhang] [0039].

Thus, to the extent Petitioner’s mapping relies on Zhang’s channels C_1 - C_n as the claimed “plurality of desired channels,” that mapping contradicts Petitioner’s reliance on channels D_1 - D_m as “the plurality of desired channels” output on data bus 1. Ex. 2009 [Russ-Decl.] ¶ 68.

For the foregoing reasons, Petitioner’s reliance on Zhang’s channels C_1 - C_n as the “plurality of desired channels” that are “selected” by Zhang’s Digital Channel Demultiplexer 230 is incorrect, contrary to Zhang’s express disclosures, and inconsistent with Petitioner’s mapping elsewhere.

B. Zhang’s Channels D_1 - D_m Are Not Selected “From Said Digitized Plurality Of Frequencies.”

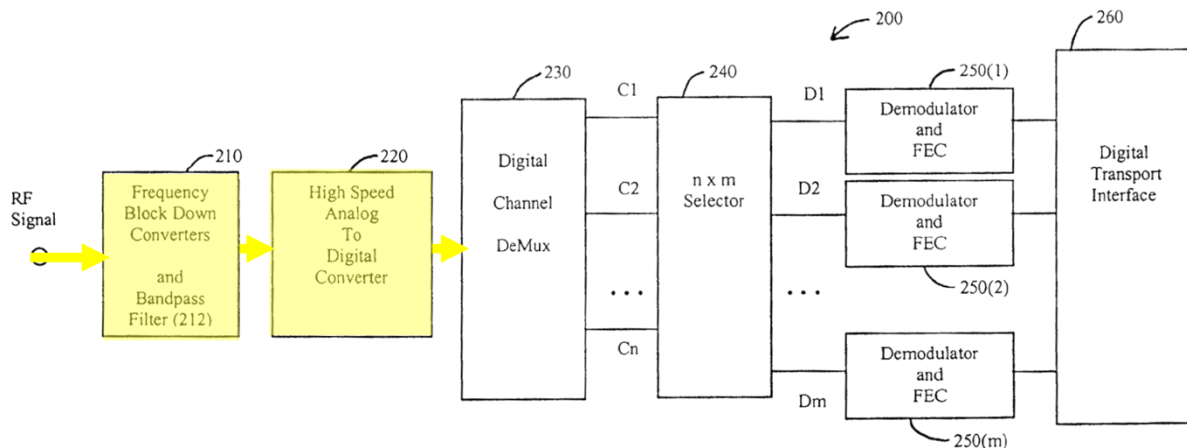
To the extent Petitioner relies on channels D_1 - D_m as the claimed “plurality of desired television channels,” that reliance fails to disclose or render obvious the claims because channels D_1 - D_m are not selected “from” the same “plurality of frequencies” down converted and digitized in limitations 1[b] and 1[c], as required.

Limitation 1[b] recites “a mixer module configured to *downconvert a plurality of frequencies* that comprise a plurality of desired channels and a

plurality of undesired channels.” Limitation 1[c] subsequently recites “a wideband analog-to-digital converter (ADC) module configured to *digitize said plurality of frequencies*” Limitation 1[d] subsequently requires circuitry to select “said plurality of desired television channels *from said digitized plurality of frequencies.*” The antecedent basis for “said digitized plurality of frequencies” in limitation 1[d] is the “plurality of frequencies” that was downconverted in limitation 1[b] and digitized in limitation 1[c]. Thus, limitation 1[d] requires “select[ing] said plurality of desired channels” from the same “plurality of frequencies” that were downconverted in limitation 1[b] and digitized in limitation 1[c]. *Summit 6, LLC v. Samsung Elecs. Co.*, 802 F.3d 1283, 1291 (Fed. Cir. 2015) (“The use of the term ‘said’ indicates that this portion of the claim limitation is a reference back to the previously claimed ‘pre-processing parameters.’”); *Univ. of Mass. v. L’Oréal S.A.*, 36 F.4th 1374, 1380 (Fed. Cir. 2022) (“[the] is the language for invoking an antecedent—for repeating, not departing from, the claim’s prior reference ...”); *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1356 (Fed. Cir. 1999) (“It is clear from the language of the claim itself that the term ‘a discharge rate’ in clause [b] is referring to *the same* rate as the term ‘the discharge rate’ in clause [d].”) (emphasis in original).

Channels D₁-D_m, relied upon by Petitioner as the alternative “desired channels” in limitation 1[d], are not selected “from” the same “plurality of

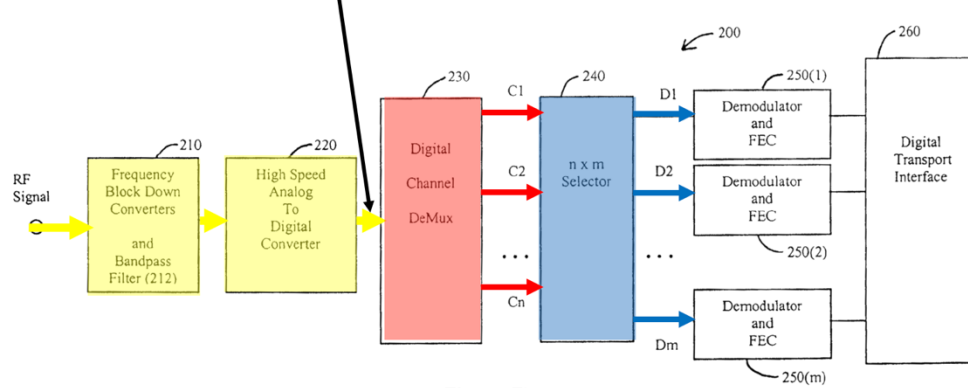
frequencies” relied upon by Petitioner as the downconverted and digitized “plurality of frequencies” in limitations 1[b] and 1[c]. Specifically, Petitioner relies on Zhang’s Frequency Block Downconverters 210 for the disclosure of the claimed mixer module in limitation 1[b], and on Zhang’s Analog to Digital Converter 220 for the disclosure of the claimed analog-digital converter in limitation 1[c]. Pet., 25, 27; Ex. 2009 [Russ-Decl.] ¶¶ 71-72. Petitioner’s mapping is schematically shown below, with Zhang’s down converter 210 and analog-digital converter 220 relied upon by Petitioner highlighted in yellow:



Zhang Fig. 2

As Dr. Russ explains with reference to the following annotated figure, channels D_1 - D_m are not selected “from” the same “plurality of frequencies” relied upon by Petitioner as digitized in limitation 1[c]:

**Down converted and digitized
“plurality of frequencies”**



Zhang Fig. 2

Zhang receives an RF input signal, down converts it in Frequency Block Down Converter 210, and digitizes it in Analog To Digital Converter 220. Ex. 1013 [Zhang] [0024]-[0027]. These elements are shown in yellow. As I explained in paragraphs 42-44, the digital channel demultiplexer 230 (red) then receives this down converted, digitized signal as input, and extracts all channels C_1 - C_n . Ex. 1013 [Zhang] [0028] (“A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C_1 to C_n .”). The output channels C_1 - C_n of the digital channel demultiplexer 230 (red) is then fed into the selector 240 (blue), which selects channels D_1 - D_m from the input channels C_1 - C_n . Ex. 1013 [Zhang] [0028] (“an $n \times m$ digital selector 240 receives the demultiplexed digital RF channels C_1 to C_n and then selects one or more of the RF channels D_1 to D_m from one or more of the digital RF channels C_1 to C_n .”); [0039] (“digital selector 500 digitally selects one or more RF channels D_1 to D_m from the digital RF channels C_1 to C_n .”).

Channels C_1 - C_n , from which channels D_1 - D_m are selected, are not the same “plurality of frequencies” digitized by Zhang in its analog-digital converter 220 (which, in Zhang’s implementation is the entire input). In Zhang, channels C_1 - C_n together are generally only a non-contiguous subset of the digitized input signal. Because of the specific way in which Zhang first extracts all channels in the signal before any selection occurs, there are many frequency ranges that exist in the digitized input signal, including between the channels, that do not exist in the channels C_1 - C_n . These may include frequency guard bands are placed between different RF channels in an input signal to avoid interference between channels or blank frequency ranges that do not contain channels. In the specific architecture of Zhang, none of these exemplary frequency ranges would be included in the demultiplexed channels C_1 - C_n , even though they exist in the digitized input signal and due to the way in which Zhang operates, this means that channels D_1 - D_m are not selected from the same “plurality of frequencies” digitized by Zhang, because Zhang digitizes the entire input.

Ex. 2009 [Russ-Decl.] ¶¶ 74-75. Indeed, it is undisputed that channels C_1 - C_n are generally only a non-contiguous subset of the digitized input signal. Ex. 2018 [Lett-1st-Depo.-Volume-I] 85:20-24 (“Q. So it is your testimony that in Zhang, the number of channels demultiplexed C_1 through C_n does not necessarily have to be the number of channels in the entire signal band; correct? A. That’s correct.”).

A comparison of the claims of the ’362 patent with claims in US 11,381,866, which has a common specification with the ’362 patent, also confirms the

significance of selecting the desired channels “from said digitized plurality of frequencies.” For example, claim 1 of the ’866 patent recites a “digital front end” that is configured to “concurrently select and provide each of the plurality of desired channels without providing any of the plurality of undesired channels,” but does not explicitly recite that the selection must be “from said digitized plurality of frequencies.” Ex. 2015 [’866-Patent] cl. 1. This is shown in the table below:

’362 Patent Limitation 1[d] and 11[d]	’866 Patent Limitation 1[b]
Limitation 1[d] : “select said plurality of desired television channels from said digitized plurality of frequencies” Limitation 11[d]: “selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies”	“a digital frontend (DFE) coupled to the wideband ADC, wherein the DFE is 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.”

Thus, while claim 1 of the ’362 patent recites that the selection of desired channels must be “from the input signal,” claim 1 of the ’866 patent does not explicitly recite the source signal from which the selection must be performed. Ex. 2009 [Russ-Decl.] ¶¶ 76-77. If claim 1 of the ’362 patent were read so broadly as

to cover the selection of Zhang’s channels D_1 - D_m , then the language of the claim requiring that these channels be selected “from the input signal” would be rendered superfluous. *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015) (“This distinction [between two claims] further underscores that ‘second memory’ must be different...because otherwise the additional language... would be redundant.”); *see also Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1381 (Fed. Cir. 2006) (“[C]laim differentiation takes on relevance in the context of a claim construction that would render additional, or different, language in another independent claim superfluous”); *see also Clare v. Chrysler Group LLC*, 819 F.3d 1323, 1330 (Fed. Cir. 2016) (explaining that the doctrine of claim differentiation applies across related patents).

Thus, for all these reasons, to the extent that Petitioner relies on Zhang’s channels D_1 - D_m as the claimed “plurality of desired television channels,” they fail to meet the claims because they are not selected “from said plurality of frequencies” as required.

IV. CONCLUSION

For the foregoing reasons, Petitioner has failed to demonstrate that any of the claims are unpatentable.

Respectfully submitted,

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Date: January 14, 2025

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/ Kenneth Wang /

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Date: January 14, 2025