

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 IPR2024-00438
Patent 11,399,206

PATENT OWNER'S RESPONSE

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EXHIBIT LIST	
2001	Table Of Parallel Petitions Filed By All Petitioners (July 16, 2019-June 29, 2024) [All-Parallel-Petitions]
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]
2020	IPR2024-00432, Exhibit 1002, Declaration of David Lett [IPR2024-00432-Lett-Decl.]

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 method from that disclosed and claimed in the '206 patent.

While both Zhang and the '206 patent involve systems that receive an RF input signal and output a plurality of desired channels, the method by which they achieve this result is decisively different. Specifically, in the '206 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 all channels C_1 - C_n , which include *both* desired and undesired channels, 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 method discloses or renders obvious the claimed methods of the '206 patent. Independent claims 1, 25 and 51 recite "selecting the plurality of desired channels from the input signal *without* selecting any of the plurality of undesired channels." The Petition inconsistently refers to both C_1 - C_n and D_1 - D_m as the claimed "plurality of desired channels," but both alternatives fail. With respect to channels C_1 - C_n , Zhang's express disclosures, as well as its prosecution history, unambiguously confirm that channels C_1 - C_n encompass all channels within the "entire signal" band, both desired and undesired.

Ex. 1013 [Zhang] [0027]. Thus, channels C_1 - C_n cannot be a plurality of desired channels that are selected “without selecting any of the plurality of undesired channels.” *See* Section III.A. With respect to channels D_1 - D_m , while they are desired channels, they are not selected “from the input signal” as claimed. Instead, they are selected from channels C_1 - C_n , which are not the “input signal” Petitioner identifies in Zhang. Even though both the ’206 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.

Petitioner likewise fails to show that independent claims, 13, 38, and 64 are obvious. *See* Section IV. These claims require “down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs.” The Petition again inconsistently refers to both C_1 - C_n and D_1 - D_m as the claimed “plurality of digital channel outputs,” but both alternatives again fail. With respect to the first alternative, Petitioner’s reliance on Zhang’s channels C_1 - C_n fails because (1) it contradicts Petitioner’s mapping for limitation 13[e], and (2) generating an output by down converting all channels, regardless of whether they are desired or undesired (as Zhang does with its channels C_1 - C_n) does not

teach or suggest the claimed method of generating an output by “digitally down converting each desired channel.” *See* Section IV.A. On the other hand, to the extent Petitioner relies on channels D_1 - D_m as the claimed “plurality of digital channel outputs,” while this plurality of channels are desired channels, they are not “generate[d]” by “down converting each desired channel, of the plurality of desired channels,” as claimed; rather, channels D_1 - D_m are generated by selecting channels D_1 - D_m from the previously down converted channels C_1 - C_n . *See* Section IV.B.

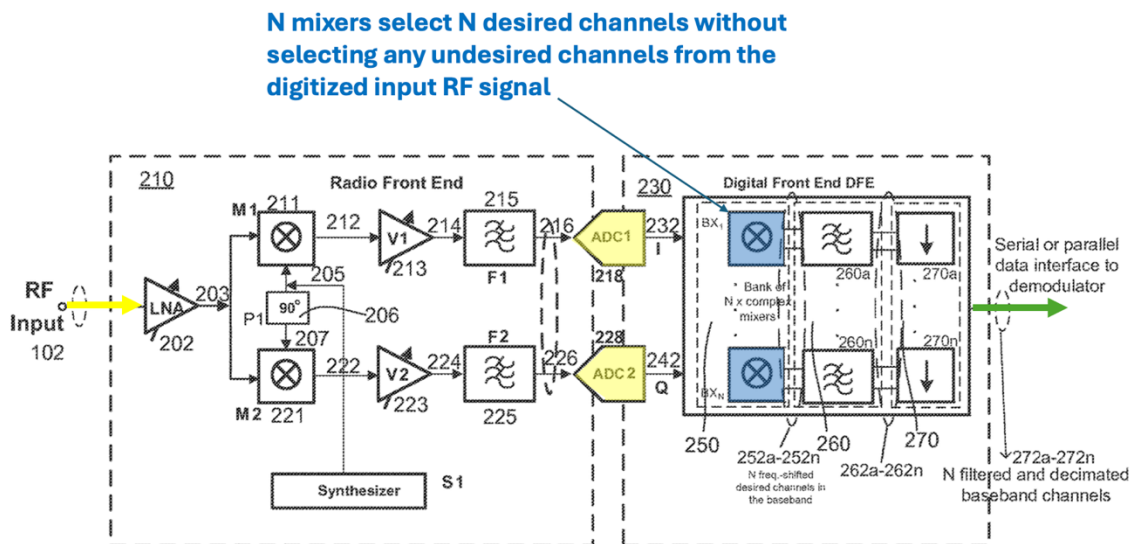
For these reasons and more, Petitioner fails to prove that any claim is disclosed and/or obvious under any of its grounds.

II. ZHANG, UNLIKE THE '206 PATENT, EXTRACTS ALL CHANNELS, BOTH DESIRED AND UNDESIRED, FROM THE INPUT SIGNAL.

Zhang is the cornerstone of each of Petitioner’s grounds. Pet., 12-13. Though both Zhang and the '206 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 '206 patent *only* selects desired channels from the digitized input RF signal without selecting any undesired channels. In contrast, Zhang performs no selection from the digitized input signal. Instead, it blindly extracts *all* channels, *both* desired *and* undesired, from the digitized input RF signal without performing any selection, and only later selects the desired channels from the extracted channels.

As Dr. Russ explains, the '206 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 '206 patent, annotated below, is illustrative. There, the analog input RF signal (yellow) is first digitized in the analog to digital converters (yellow). Ex. 1001 ['206] 5:48-51. Then, a bank of N mixers (blue) selects N desired channels, without selecting any undesired channels, from the digitized input RF signal. *Id.*, 5:51-55, 5:63-6:6. 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.*, 7:10-14.



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

Ex. 2009 [Russ-Decl.] ¶ 32.

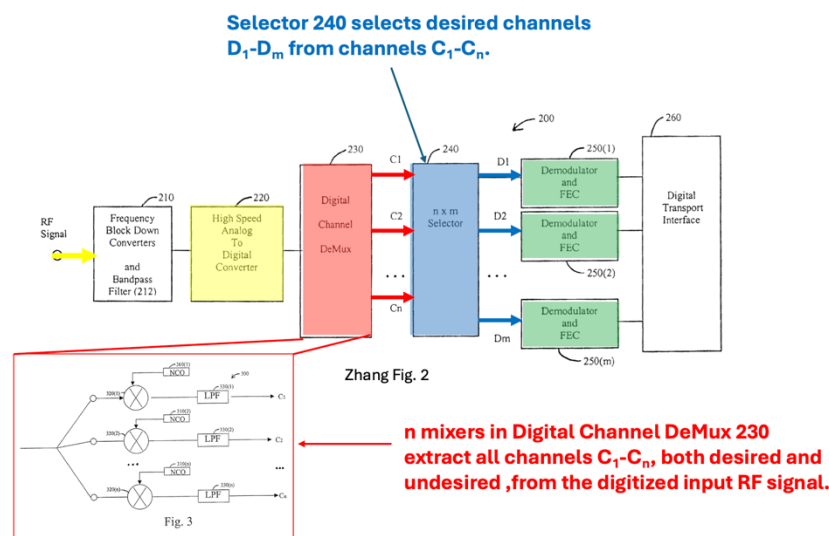
In contrast, Zhang never performs this step. It does not select desired channels, without selecting any undesired channels, from the digitized RF input signal. Per Dr. Russ:

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 '206 patent, Zhang digitizes an input signal (yellow), consisting of "n" desired and undesired channels, 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 total number of channels in the "entire signal band," both desired and undesired, whereas the letter "N" in the '206 patent denotes the number of desired channels.

Unlike the '206 patent, however, Zhang's method then blindly extracts from the digitized RF input signal **all** channels C_1 - C_n , **both** desired **and** undesired, in the Digital Channel DeMux 230 (red) without making any selection. *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, which I have included in the annotation below. Note that even though Zhang's Digital Channel DeMux 230 uses complex mixers similar to the '206 patent to extract channels, it extracts all channels, both desired

and undesired, rather than selecting only the desired ones, unlike the '206 patent.

Once all channels C_1 - C_n , both desired and undesired, 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 the 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 '206 patent is not coincidental. Rather, Zhang's method by design 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 '206 patent result in the Petition's grounds failing to disclose or render obvious multiple claim limitations.

III. PETITIONER FAILS TO SHOW “SELECTING EACH ... DESIRED CHANNEL[] FROM THE INPUT SIGNAL WITHOUT SELECTING ANY ... UNDESIRED CHANNELS” (CLAIMS 1-12, 25-37, 51-63, ALL GROUNDS).

Limitation 1[d] recites “selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels.”

Ex. 1001 [’206] cl. 1. Independent claims 25 and 51 recite identical limitations.

Id., cls. 25 (limitation 25[d]), 51 (limitation 51[d]).¹ Petitioner contends that Zhang alone discloses this limitation. Pet., 26 (“Zhang thus discloses element 1[d]”); 33 (limitation 25[d]); 47 (limitation 51[d]); 69 (limitation 1[d]).²

Petitioner argues that Zhang’s “Demultiplexer 230 and a portion of Digital Selector 240” perform limitation 1[d]. Pet., 23. The Petition is ambiguous as to how Zhang allegedly discloses the claimed “plurality of desired channels” that are selected “from the input signal” “without selecting any of the plurality of undesired channels.” The Petition first appears to argue that Zhang’s channels C_1 - C_n constitute the claimed “plurality of desired channels.” Pet., 24 (arguing that Zhang

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

² The Petition relies on its discussion of limitation 1[d] for the corresponding limitations 25[d] and 51[d]. Therefore, this POR discusses limitation 1[d] with the understanding that the same argument applies to claims 25 and 51.

“includes a plurality of signal paths for concurrently selecting a plurality of desired channels C_1 - C_n ”). Subsequently, however, Petitioner appears to suggest that Zhang’s channels D_1 - D_m may be the claimed “desired channels.” Pet., 26 (“Demultiplexer 230 and Selector 240 output only user selected channels (either all or *a subset of* the user selected ‘C’ channels) ...”); Pet. 24 (“Selector 240 provides ‘m’ channels D_1 - D_m selected from any or all of the channels C_1 - C_n ... for demodulation by one or more demodulators.”).

Ultimately, both of Petitioner’s apparent alternatives fail. Section III.A, *infra*. 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 encompass all channels within the “entire signal band,” both desired and undesired—not just “a plurality of desired channels” that are selected “without selecting any of the plurality of undesired channels,” as the claims require. Section III.A, *infra*. In fact, Petitioner’s reliance on Zhang’s channels C_1 - C_n as the claimed “plurality of desired channels” irreconcilably contradicts the Petition’s mapping of Zhang to other claim limitations. *Id.* To the extent Petitioner relies on Zhang’s channels D_1 - D_m for limitation 1[d], that reliance also fails because those channels are not selected “from the input signal,” as required. Section III.B, *infra*.

A. Zhang's Channels C_1 - C_n Are All Channels In The Entire Signal Band, Both Desired And Undesired.

Petitioner first argues that Zhang's channels C_1 - C_n disclose the claimed "plurality of desired channels" that are selected from the input signal "without selecting any of the plurality of undesired channels":

Digital tuner 300 (an embodiment of demultiplexer 230) (below left) has the same structure as the '206 patent's digital front end 230 (below right), includes a plurality of signal paths for concurrently selecting *a plurality of desired channels C_1 - C_n* (light blue).

Pet., 24. As discussed below, however, both Zhang and its prosecution history confirm that channels C_1 - C_n are all channels in the entire signal band, both desired and undesired. *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 Channels C_1 - C_n Are All Channels In The Entire Signal Band, Both Desired And Undesired.

As explained in this section, the express teachings in Zhang and its prosecution history make clear that channels C_1 - C_n are all the channels in the entire signal band, both desired and undesired.

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-Dec1.] ¶ 41.

This is undisputed. Under cross-examination on this point, Petitioner’s expert conceded 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 also include both desired and undesired channels. Ex. 2009 [Russ-Decl.] ¶¶ 42-43.

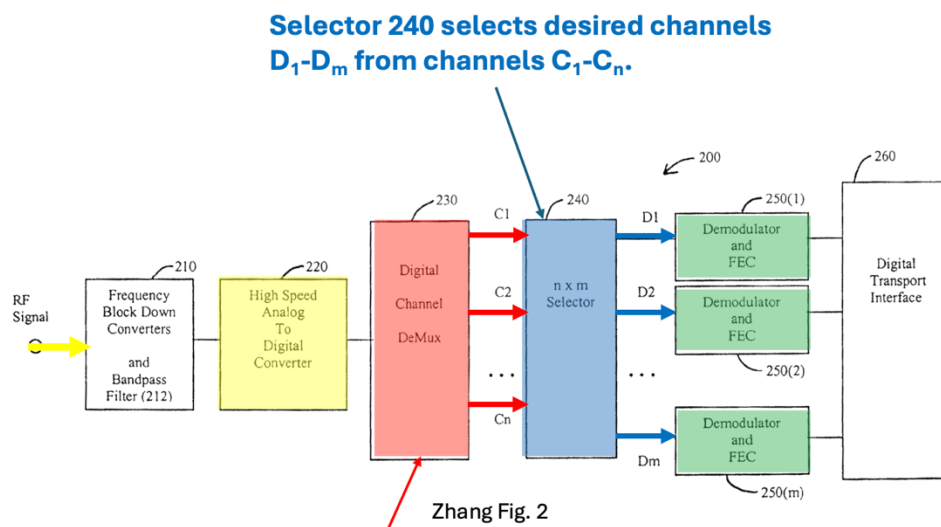
The remainder of Zhang only further confirms that channels C_1 to C_n include both desired and undesired channels. Specifically, Zhang explains that, after channels C_1 - C_n are extracted from the input RF signal, an $n \times m$ selector 240 selects the desired channels D_1 - D_m from the total channels 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.”). Ex. 2009 [Russ-Decl.] ¶ 44.

This aspect of Zhang’s operation is shown in its Figure 2, annotated below, confirming 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 extract all channels C_1 - C_n , both desired and undesired, from the digitized input RF signal.

Ex. 2009 [Russ-Decl.] ¶ 45.

Petitioner’s expert, Mr. Lett, in his declaration relating to IPR2024-00432, when describing Zhang, confirmed the above, stating that C_1 - C_n constitute “all

content channels” in the input signal, from which desired channels D_1 - D_m are 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. 2020 [IPR2024-00432-Lett-Decl.] ¶ 79.

Zhang’s prosecution history also confirms this. It specifically discusses and further confirms that Zhang’s digital channel demultiplexer 230 outputs all channels (not just desired channels) from the input signal without performing any selection, and that it is Zhang’s Selector 240 that takes the extracted channels C_1 - C_n as the input, and selects the desired channels D_1 - D_m from the extracted channels. 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 ... 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 ... 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 (both desired and undesired) without performing any selection, and it was Zhang’s selector that, unlike Zhang’s prior art, only transmitted desired channels to demodulators.

Ex. 2009 [Russ-Decl.] ¶¶ 46-48. Thus, Zhang’s prosecution history confirms its express disclosures in its specification that channels C_1 - C_n encompass all channels in the entire signal band, both desired and undesired.

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 ’206 patent also relies on complex mixers to extract channels, it supposedly follows that channels C_1 - C_n are the claimed “desired channels.” Pet., 24 (“Like the ’206 patent’s DFE, each path includes a complex multiplier 320 ...”); Pet., 25 (“Each separate path concurrently receives the multi-channel digital RF signal from ADC 220 and operates concurrently and in a similar way to select one respective desired channel.”).

But, as explained above, even though Zhang and the ’206 patent both use complex mixers to extract channels from the digitized input RF signal, Zhang’s mixers, unlike the ’206 patent’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 '206 patent Figure 2 (at Pet., 25). 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 '206 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.

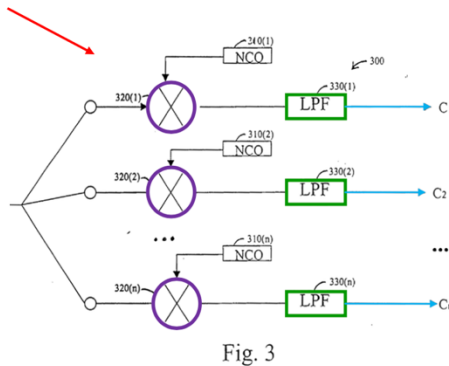
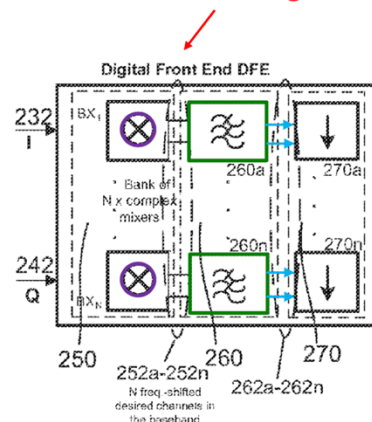


Fig. 3

Ex. 1013, Fig. 3 (annotated)

In the '206 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.] ¶ 51. As Dr. Russ further explains, Zhang's own 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 '206 patent's Figure 2, where

the output of the Digital Front End is sent to demodulators because the down conversion and selection 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., 25). 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., 25. It can be readily shown, however, that Zhang's complex mixers 320 (1....n) 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 I 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 I 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.] ¶¶ 52-54.

Petitioner next relies on multiple out-of-context statements from Zhang to imply that channels C_1 - C_n include only desired channels. Specifically, Petitioner relies on Zhang's use of the phrase "target channel" in its discussion of its Figure 3. Pet., 25. But Petitioner misapprehends Zhang. Zhang's reference to a channel as a "target channel" has nothing to do with whether it is a desired channel. In Zhang, 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.

As Dr. Russ explains:

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., 25 (citing Ex. 1013 [Zhang] [0032]). Petitioner is incorrect. Zhang, again, makes clear that its Figure 3 outputs both desired and undesired channels, and Petitioner's interpretation of Zhang's use of the phrase "target channel" is simply incorrect.

Specifically, in Zhang, as I explain further below with reference to its annotated Figure 3, 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 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.

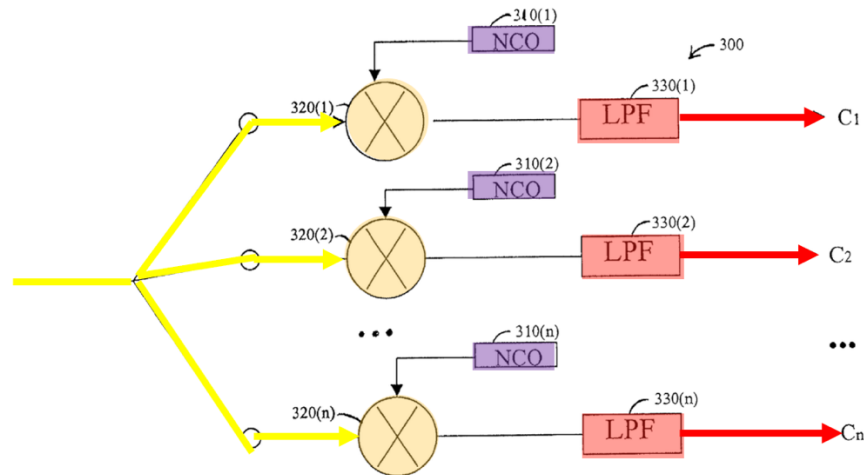


Fig. 3

Further, 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. Again, 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.] ¶¶ 55-57.

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:

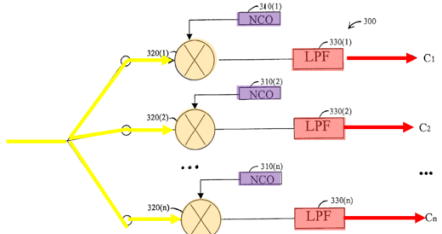
In Zhang's Figure 3 (above), the digitized input RF signal (yellow) is transmitted in parallel through multiple data paths, each of which is responsible for extracting one of channels C_1 - C_n . Ex. 1013 [Zhang] [0030]-[0031]. In each data path, the way a channel is extracted is that a numerical local 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.] ¶ 58.

Petitioner also relies on Zhang's claims 34, and 36-37 to argue that channels C_1 - C_n contain only desired channels. Pet., 25. 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 entirely different from Zhang’s specification:

Zhang’s claims 34, 36, and 37 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 below, claims 34, 36, and 37 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 ’206 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 the specific 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.	 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.

Ex. 2009 [Russ-Decl.] ¶¶ 59-61.

Next, Petitioner relies on Zhang’s statement that “RF channels C_1 to C_n contain channels that are selected or used by a subscriber.” Pet., 25 (quoting Exhibit 1013 [Zhang] [0028]). But this portion of Zhang does not state that channels C_1 to C_n contain “only” desired channels, as the claims require. Instead,

in context (reproduced below in full), this statement in Zhang simply means 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 expressly teaches, as already discussed, that channels C_1 - C_n contain all channels in the entire signal band, from which desired channels D_1 - D_m are 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]; *see also id.*, [0027] (“an entire signal band with n channels can be converted.”).

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

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

Not only is Petitioner’s assertion that Zhang’s channels C_1 - C_n disclose the claimed “desired channels” inconsistent with Zhang’s disclosure, it is also inconsistent with Petitioner’s mapping of Zhang to other claim limitations.

For example, limitation 1[e] recites “providing *the* plurality of desired channels via a serial interface.” “The plurality of desired channels” that is provided in limitation 1[e] is the same “plurality of desired channels” that were “select[ed]” in limitation 1[d]. Ex. 1001 [’206] (“concurrently selecting each of the plurality of desired channel from the input signal without selectin any of the plurality of undesired channels.”). For limitation 1[e], Petitioner relies on Zhang’s Data Bus 1 within its $n \times m$ selector 240 as the “serial interface” that provides the plurality of desired channels. Pet., 27. 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]

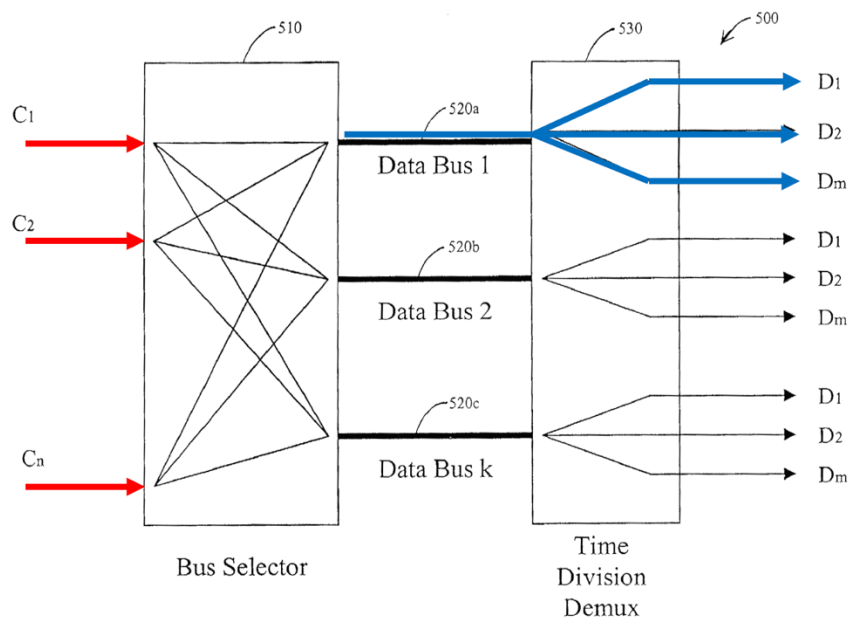


Fig. 5

As is clear from the figure, what is “provided” on Zhang’s Data Bus 1 in the selector 240 are channels D_1 - D_m (blue) shown on the right-hand side output of data bus 1, not channels C_1 - C_n (red). Ex. 2009 [Russ-Decl.] ¶¶ 63-65. This is consistent with Zhang’s disclosure that 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 ... through different data buses” Ex. 1013 [Zhang] [0039].

Thus, to the extent Petitioner’s mapping of limitation 1[d] relies on Zhang’s channels C_1 - C_n as the claimed “plurality of desired channels,” that mapping contradicts Petitioner’s mapping for limitation 1[e], which relies on channels D_1 - D_m as “the plurality of desired channels” provided on a “serial interface.” Petitioner does not even attempt to offer any explanation for this inconsistency.

For all of the foregoing reasons, Petitioner’s reliance on Zhang’s channels C_1 - C_n as the “plurality of desired channels” that are selected “without selecting any of the plurality of undesired channels” is incorrect, contrary to Zhang’s express disclosures, and inconsistent with Petitioner’s other arguments.

B. Zhang's Channels D_1 - D_m Are Not Selected "From The Input Signal."

To the extent Petitioner relies on channels D_1 - D_m as the claimed "plurality of desired channels," that reliance also fails to disclose or render obvious the claims because channels D_1 - D_m are not selected "from the input signal," as required.

Limitations 1[b] and 1[c] recite, respectively, receiving "an input signal," and "digitizing a contiguous band of frequencies in the input signal via a wideband analog-to-digital converter (ADC), wherein the contiguous band of frequencies comprises all received channels that exist in the input signal and the received channels comprise a plurality of desired channels and a plurality of undesired channels."

As shown in Zhang's Figure 2, annotated below, for disclosure of the claimed digitized "input signal," Petitioner relies on the input signal (yellow) in Zhang's Figure 2 that is subsequently digitized and input into the Digital Channel DeMux 230. Pet., 21-23.

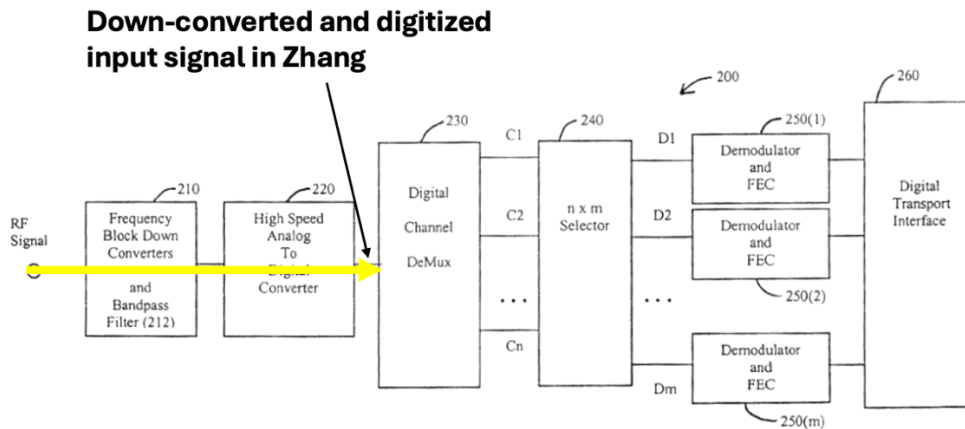
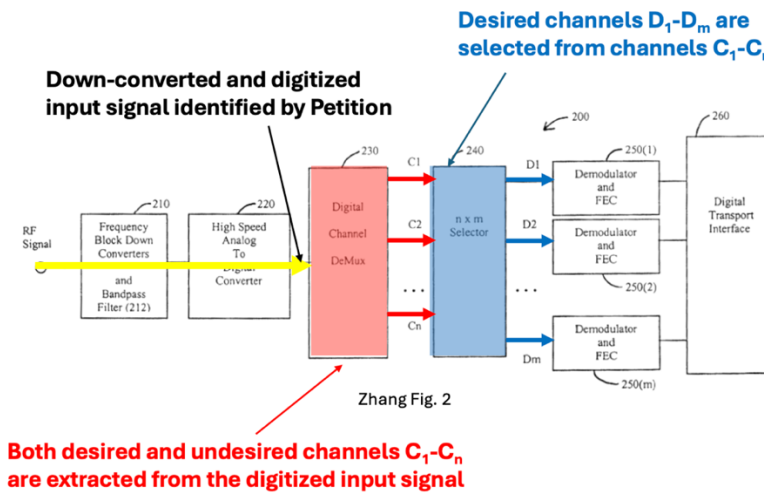


Fig. 2

Limitation 1[d] further requires “concurrently selecting each of the plurality of desired channels *from the input signal* without selecting any of the plurality of undesired channels.” Zhang’s channels D_1 - D_m do not disclose this limitation because they are not selected “from the input signal.”

As Dr. Russ explains below with reference to Zhang’s annotated Figure 2, channels D_1 - D_m (blue) in Zhang are not selected “from the input signal” (yellow) identified by Petitioner as the claimed “input signal;” instead, channels D_1 - D_m (blue) are selected from the extracted channels C_1 - C_n (red):



Again, what is extracted in Zhang from the down-converted and digitized input signal is both desired and undesired channels C_1 - C_n , not just desired channels as required by the claim. 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.”); [0028] (“A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C_1 to C_n .”). Subsequently, Zhang states that the $n \times m$ selector 240 selects the desired channels D_1 - D_m from the extracted channels C_1 - C_n , not from the digitized input signal:

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 .*

Ex. 1013 [Zhang] [0028]; *see also id.*, [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 .*”).

Ex. 2009 [Russ-Decl.] ¶ 73.

As Dr. Russ further explains, the embodiment of Zhang’s *selector* 240 itself (relied upon by Petition at 27) confirms that Zhang selects the desired channels D_1 - D_m from extracted channels C_1 - C_n , not from “the input signal”:

Zhang’s Figure 5 shows an exemplary implementation of Zhang’s selector 240, and confirms that Zhang selects the desired channels D_1 - D_m from extracted channels C_1 - C_n , not from “the input signal.” Ex. 1013 [Zhang] [0038] (“FIG. 5 is a simplified high-level schematic diagram of an $n \times m$ digital selector 500, which in some embodiments of the present invention, can be used to implement digital selector 240 of FIG. 2.”).

In Zhang’s Figure 5, annotated below, channels C_1 - C_n (red), which were extracted from the input signal by the digital channel demultiplexer 230, enter the selector on the left-hand side of the figure. The circuitry within the selector 240 selects and outputs desired channels D_1 - D_m (blue) from the channels C_1 - C_n :

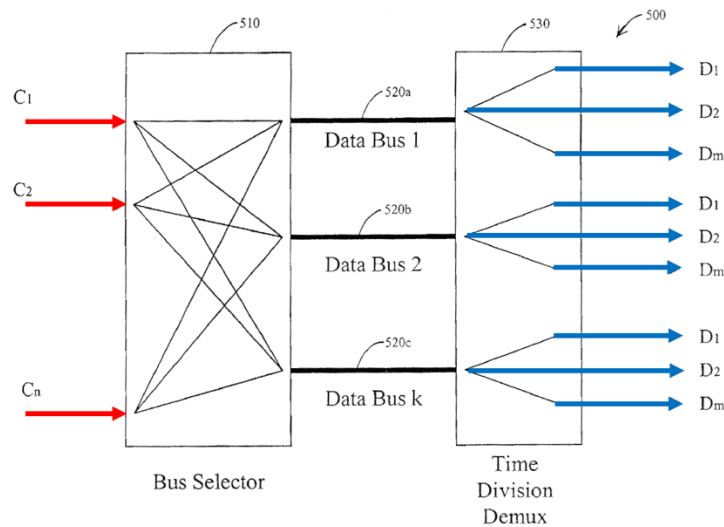


Fig. 5

Zhang’s explanation of Figure 5 also confirms that the desired channels D_1 - D_m are selected from channels C_1 - C_n , not from the input signal. Ex. 1013 [Zhang] [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* and then sends them to appropriate demodulators”).

Ex. 2009 [Russ-Decl.] ¶¶ 74-75.

The demultiplexed channels C_1 - C_n are not the “input signal” identified by Petitioner. As shown above, Petitioner relies on the input signal in Zhang’s Figure 2 that is digitized and input into Digital Channel DeMux 230. Pet., 21-23.

Selecting from the demultiplexed channels C_1 - C_n is not the same as selecting “from the input signal” identified in Zhang by Petitioner. Rather, as Dr. Russ explains, channels C_1 - C_n are extracted, non-contiguous portions (*i.e.*, a subset) of the digitized input signal:

Zhang's channels C_1 - C_n are not the digitized input signal. Rather, channels C_1 - C_n are extracted (*i.e.*, separated out), non-contiguous portions of the digitized input signal, generally with many missing frequency ranges as compared to the input signal.

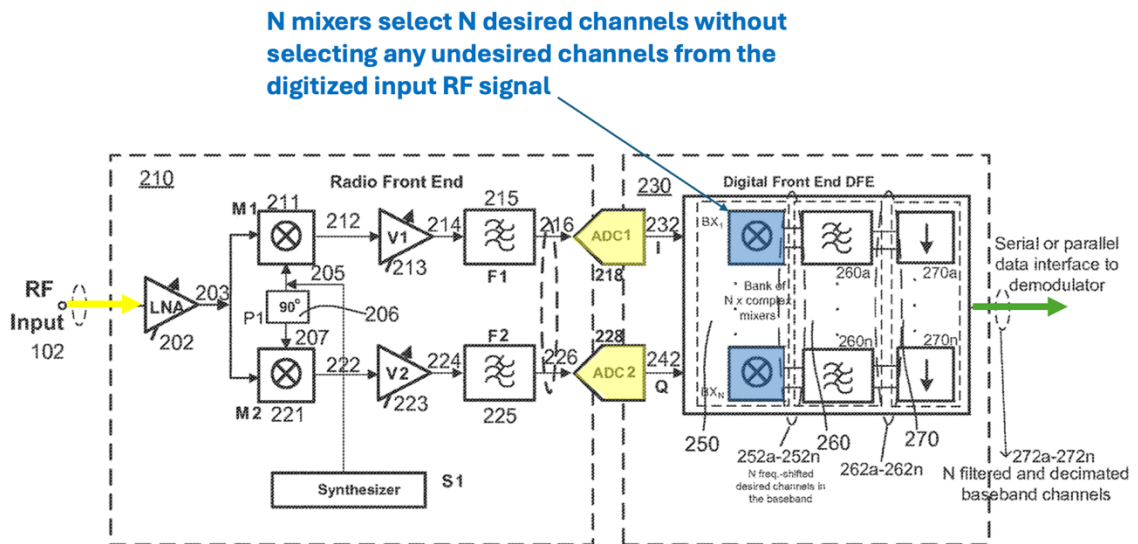
First, C_1 - C_n are channels that are separated out from the digitized input signal. Ex. 1013 [Zhang] [0028] ("A digital channel demultiplexer 230 then demultiplexes the multi-channel digital RF signal into separate digital RF channels C_1 to C_n ."); [0010] ("A digital channel demultiplexer receives the multi-channel digital RF signal from the ADC and demultiplexes the multi-channel digital RF signal into separate digital RF channels.").

Second, channels C_1 - C_n together are generally only a non-contiguous subset of the digitized input signal. This is because 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 . For example, frequency guard bands are generally placed between different RF channels in an input signal to avoid interference between channels. As another example, in many systems, there would be blank frequency ranges that do not contain any data. 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.

Ex. 2009 [Russ-Decl.] ¶¶ 76-79. 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.

Both the '206 patent's specification and its claims confirm that Zhang's selection of desired channels D_1 - D_m from channels C_1 - C_n does not disclose selecting the desired channels "from the input signal." As Dr. Russ explains:

In all embodiments of the '206 patent, the desired channels are selected "from the input signal" without selecting any of the undesired channels. For example, in the '206 patent's Figure 2, annotated below, the input RF signal (yellow) is first digitized in the analog to digital converters (yellow). Ex. 1001 ['206] 5:48-51. Then, a bank of N mixers (blue) selects N desired channels, without selecting any undesired channels, from the digitized input RF signal. *Id.*, 5:51-55, 5:63-6:6. This digitized input RF signal from which the desired channels are selected is the entire digitized frequency bandwidth from the RF input signal. The selected desired channels are then output to demodulators (green). *Id.*, 7:10-14. This is in contrast to Zhang where, as explained above, the digitized input RF signal is demultiplexed into channels C_1 - C_n , typically missing many frequency ranges in between, with those separate outputs C_1 - C_n (without the missing frequency ranges) sent to the digital selector 240. The desired channels are then selected by the digital selector 240 from channels C_1 - C_n , not from the digitized "input signal."



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

Ex. 2009 [Russ-Decl.] ¶ 80.

A comparison of the claims of the '206 patent with claims in US 11,381,866, which has a common specification with the '206 patent, confirms the significance of selecting the desired channels “from the input signal.” 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 expressly recite that the selection must be “from the input signal.” Ex. 2015 ['866-Patent] cl. 1. This is shown in the table below:

'206 Patent Limitation 1[d]	'866 Patent Limitation 1[b]
“concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels”	“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.”

As is shown in the comparison above, while claim 1 of the '206 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.] ¶¶ 81-82. If claim 1 of the '206 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. *See 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).

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

IV. PETITIONER FAILS TO SHOW “A PLURALITY OF DIGITAL CHANNEL OUTPUTS” AS CLAIMED (CLAIM 13-24, 38-50, 64-76, GROUNDS A-H).

Limitation 13[d] recites “digitally *down converting each desired channel*, of the plurality of desired channels, *to generate a plurality of digital channel outputs.*” Ex. 1001 [’206] cl. 13. Independent claims 38 and 64 recite identical limitations. *Id.*, cls. 38 (limitation 38[d]), 64 (limitation 64[d]). The Petition relies on Zhang alone for the disclosure of this limitation in all grounds. Pet. 32 (“Zhang

thus discloses element 13[d]”); 34 (limitation 38[d]); 45 (limitation 38[d]); 50 (limitation 64[d]); 69 (limitation 13[d]).³

Specifically, Petitioner argues that Zhang’s “Demultiplexer 230 and a portion of Digital Selector 240” perform limitation 13[d] “for the same reasons discussed” in connection with limitation 1[d]. Pet., 30. Reminiscent of limitation 1[d], *see* Section III *supra*, the Petition is ambiguous as to what precise disclosure in Zhang allegedly discloses the claimed “plurality of digital channel outputs” that are “generated” by “digitally down converting each desired channel.” Instead, it simply states that the claimed “plurality of digital channel outputs” are C_1 - C_n or D_1 - D_m , without any explanation for why it proposes two inconsistent mappings to the claim. Pet., 32 (“where the ‘outputs’ are $C_1 - C_n$ (light blue) (or $D_1 - D_m$)”).

As with limitation 1[d], notwithstanding the Petition’s ambiguity, both of Petitioner’s potential alternatives fail. Petitioner’s reliance on Zhang’s channels C_1 - C_n fails because (1) it contradicts Petitioner’s mapping for limitation 13[e], and (2) generating an output by down converting all channels, regardless of whether

³ The Petition relies on its discussion of limitation 13[d] for the corresponding limitations 38[d] and 64[d]. Therefore, this POR discusses limitation 13[d] with the understanding that the same argument applies to claims 34 and 68.

they are desired or undesired (as Zhang does with its channels C_1 - C_n) does not teach or suggest the claimed method of generating an output by “digitally down converting each desired channel.” *See* Section IV.A, *infra*. To the extent Petitioner relies on Zhang’s channels D_1 - D_m as the claimed “plurality of digital channel outputs,” that also fails, because the D_1 - D_m “outputs” are not “generated” by “down converting,” but are instead generated by selecting channels D_1 - D_m from the already down converted channels C_1 - C_n . *See* Section IV.B, *infra*.

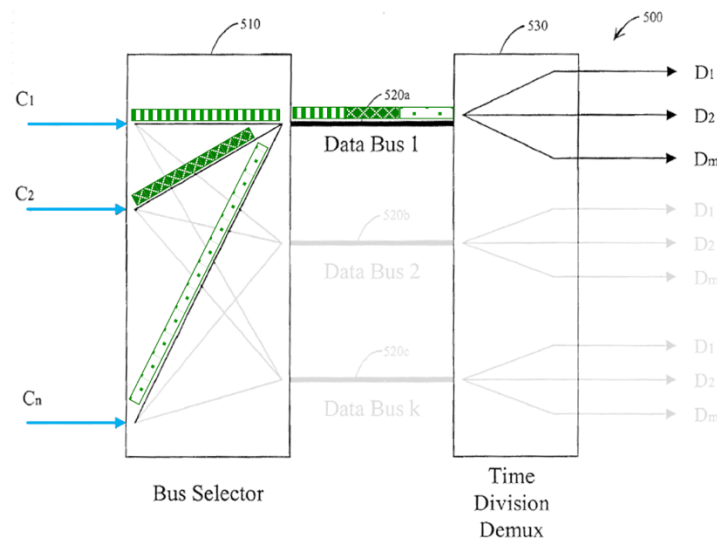
A. Petitioner’s Reliance On Channels C_1 - C_n As The Claimed “Plurality Of Digital Channel Outputs” Fails.

As their first alternative, Petitioner states that Zhang’s channels C_1 - C_n disclose the claimed “plurality of digital channel outputs” in limitation 13[d]. Pet., 32. This alternative fails for two reasons. First, it contradicts Petitioner’s mapping for limitation 13[e], where Petitioner relies on Zhang’s channels D_1 - D_m as the claimed “plurality of digital channel outputs.” Second, Zhang’s output C_1 - C_n is not “generate[d]” by “digitally down converting each desired channel,” but is instead generated by digitally down converting both desired and undesired channels.

Limitation 13[e] recites “providing *the* plurality of digital channel outputs via a serial interface.” The antecedent basis for “the plurality of digital channel outputs” in limitation 13[e] is the “plurality of digital channel outputs” generated in limitation 13[d]. Thus, both limitations 13[d] and 13[e] refer to the same

“plurality of digital channel outputs.” *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 ...”); *see also Proveris Sci. Corp. v. Innovasystems, Inc.*, 739 F.3d 1367, 1373 (Fed. Cir. 2014) (similar); *Eaton Corp. v. Rockwell Int’l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003) (similar) (emphasis in original); *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); *Infernal Tech., LLC v. Activision Blizzard Inc.*, No. 2021-2349, 2023 U.S. App. LEXIS 1711 (Fed. Cir. Jan. 24, 2023) (Finding the term “observer data” cannot refer to different data among steps 1(a), 1(c), and 1(d).).

Yet, the “plurality of digital channel outputs” that are provided “via a serial interface” in limitation 13[e] in Zhang are channels D₁-D_m, not channels C₁-C_n. Specifically, Petitioner relies on data buses within Zhang’s n×m selector 240 for the disclosure of a serial interface (Data Bus 1) that provides “the plurality of digital channel outputs” in limitation 13[e]:



Ex. 1013, Fig. 5 (annotated)

Pet., 27 (annotation Petitioner’s); *see also* Pet. 33 (relying on Petition’s discussion of limitation 1[e] for limitation 13[e]). Ex. 2009 [Russ-Decl.] ¶¶ 87-88. But, as Dr. Russ explains, what is “provided” on data bus 1 in the selector 240 is channels D_1 - D_m shown on the right-hand side output of data bus 1, not channels C_1 - C_n :

Zhang’s Figure 5 shows an exemplary implementation of Zhang’s selector 240. Ex. 1013 [Zhang] [0038] (“FIG. 5 is a simplified high-level schematic diagram of an $n \times m$ digital selector 500, which in some embodiments of the present invention, can be used to implement digital selector 240 of FIG. 2.”).

In Zhang’s Figure 5, reproduced below with annotations, channels C_1 - C_n (red), which were extracted from the input signal by the digital channel demultiplexer 230, enter the selector on the left-hand side of the figure. The circuitry within the selector 240 selects and outputs desired channels D_1 - D_m (blue) from the channels C_1 - C_n . Ex.

1013 [Zhang] [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 and then sends them to appropriate demodulators ...”).

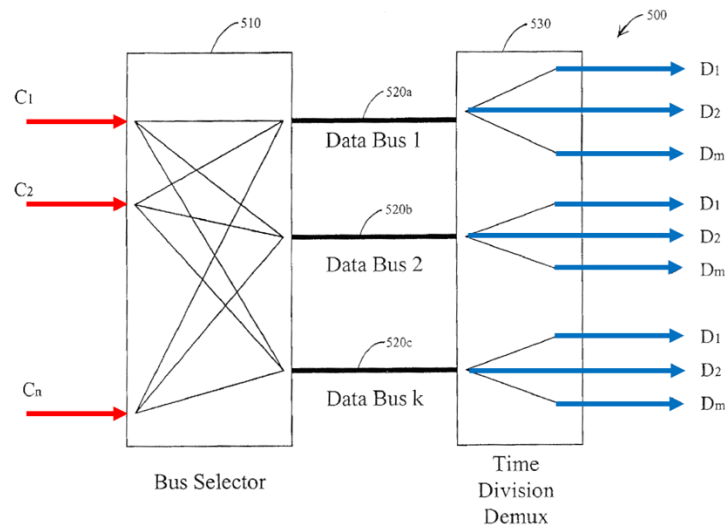


Fig. 5

Consistent with the above, and as Zhang’s own Figure 5 shows, the channels “provided” on data buses (such as Data Bus 1) are channels D_1 - D_m selected from channels C_1 - C_n , not channels C_1 - C_n themselves.

Ex. 2009 [Russ-Decl.] ¶¶ 89-91.

Petitioner appears to state that the data buses in Zhang’s digital selector output either or both of channels C_1 - C_n or channels D_1 - D_m . Pet., 33 (“outputs C_1 - C_n / D_1 - D_m ”). Petitioner does not explain how data buses in Zhang’s selector provide channels C_1 - C_n , which is inconsistent with Zhang’s express disclosure as explained 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.

First, 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. Second, 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.").

Petitioner's reliance on channels C_1 - C_n as the claimed "plurality of digital channel outputs" also fails for a second independently sufficient reason. As discussed, limitation 13[d] recites that the "plurality of digital channel outputs" is "generate[d]" by "digitally down converting each desired channel." Petitioner's mapping of channels C_1 - C_n to limitation 13[d] is based on the misapprehension that channels C_1 - C_n are the claimed "desired channels." Pet., 31 ("a plurality of signal paths for downconverting (i.e., shifting to a lower frequency) a plurality of desired channels C_1 - C_n "). However, as discussed in detail in Section III.A, *supra*, and summarized below, channels C_1 - C_n contain both desired and undesired channels. Furthermore, as discussed below, a method where an output is generated by digitally down converting all channels, both desired and undesired and without regard to whether a specific channel is desired, as in Zhang, does not teach or suggest a method where a plurality of digital channel outputs are generated by "digitally down converting each desired channel" (as claimed).

As Dr. Russ explains, Zhang digitally down converts both desired and undesired channels:

Petitioner relies on Zhang's digital down conversion of channels C_1 - C_n in Zhang's digital channel demultiplexer 230 to meet the limitation "digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs." Ex. 1002 [Lett-Decl.] ¶ 131 ("a plurality of signal paths for

downconverting a plurality of desired channels C_1 - C_n (light blue) selected by the subscriber (the claimed “desired channels.”).

However, as explained, Zhang’s channels C_1 - C_n are not the claimed “desired channels,” but instead contain both desired and undesired channels. Zhang is clear that lower case letter “n” contains both desired and undesired channels. Ex. 1013 [Zhang] [0027]; *see also* Ex. 2018 [Lett-1st-Depo.-Volume-I] 78:14-22 (Mr. Lett agreeing with same). Thus, channels C_1 - C_n include both desired and undesired channels. The balance of Zhang’s disclosure also confirms this because Zhang expressly states that it is the selector 240 that subsequently selects the desired channels D_1 - D_m from channels C_1 - C_n . Ex. 1013 [Zhang] [0028] (“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***”); [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.”).

As also explained above, Zhang’s European prosecution history also confirms that, from the perspective of Zhang’s own applicant, Zhang’s channels C_1 - C_n included both desired and undesired channels.

Ex. 2009 [Russ-Decl.] ¶¶ 93-95.

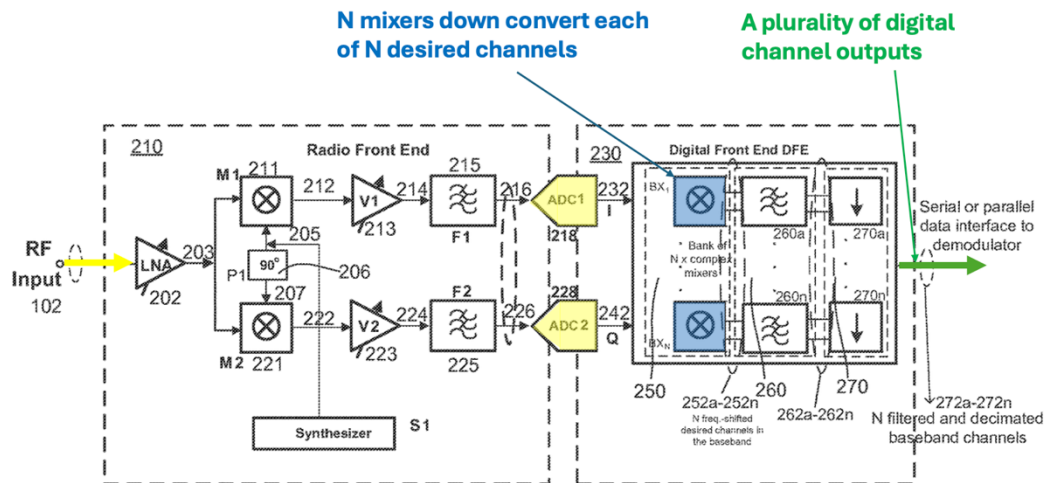
Notably, while Petitioner’s expert in his declaration regarding limitation 13[d] in this IPR states that channels C_1 - C_n are “selected by the subscriber,” he admitted in his declaration in the co-pending IPR2024-00432 that channels C_1 - C_n constitute “all” channels, and that it is channels D_1 - D_m that are “selected by the subscriber”:

Petitioner’s Expert In IPR2024-00438 (Ex. 1002, ¶ 131)	Petitioner’s Expert In IPR2024-00432 (Ex. 1002, ¶ 79)
“Referring to the annotated figures below, Zhang’s Digital Channel Demultiplexer 230 (below left), which has the same or equivalent structure as the ’206 patent’s digital front end 230 (below right), includes a plurality of signal paths for downconverting a plurality of <i>desired channels C_1 – C_n (light blue) selected by the subscriber</i> (the claimed “desired channels”).”	“A digital channel demultiplexer 230 (green/purple) then separates signals of <i>all the content channels</i> in the digital RF signals (<i>e.g., channels C_1 to C_n</i>), while a $n \times m$ digital selector 240 selects and forwards only signals for a <i>subset of content channels selected by a subscriber (e.g., channels D_1 to D_m)</i> to one or more of demodulators 250(1), 250(2), . . . 250(m) (blue) ...”

Furthermore, down converting all channels, both desired and undesired, as in Zhang does not teach or suggest a method of “down converting each desired channel ... to generate a plurality of digital channel outputs.” As Dr. Russ explains:

In all embodiments of the ’206 patent, the “plurality of digital channel outputs” is generated by downconverting each of the desired channels, not by downconverting all channels. For example, in the ’206 patent’s Figure 2, annotated below, the input RF signal (yellow) is first digitized in the analog to digital converters (yellow). Ex. 1001 [’206]

5:48-51. Then, a bank of N mixers (blue) down converts each of the N desired channels for generating a plurality of digital channels output sent to the demodulator (green). *Id.*, 5:51-55, 5:63-6:6, 7:10-14.



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

Ex. 2009 [Russ-Decl.] ¶ 96.

As Dr. Russ further explains, Zhang, by contrast, generates an output by down converting all channels, both desired and undesired:

In contrast to the '206 patent, Zhang generates an output consisting of all channels C_1 - C_n , both desired and undesired. Specifically, as I explained above, Zhang's digital demultiplexer 230, which is the module performing the digital down conversion, digitally down converts and extracts both desired and undesired channels C_1 - C_n , from which desired channels D_1 - D_m are subsequently selected. Zhang's system permits the user to switch the desired channel from one channel to another without having to down convert and extract the new desired channel after it is requested. *See, e.g.,* Ex. 1013 [Zhang] [0029]

(“Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners.”)

Ex. 2009 [Russ-Decl.] ¶ 97. It is undisputed that Zhang’s method is different from the ’206 patent. Ex. 2019 [Lett-1st-Depo-Volume-II] 8:4-22; *see also 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) (“A process patent, however, claims not a structural entity, but rather an operation or series of steps leading to a useful result. Thus, the very details regarding how such ‘useful result’ has come about are at the heart of a process patent, whereas the process by which a patented product is obtained is ordinarily irrelevant to a product patent.”); *see id.*, 314 F.3d at 1346 (“The process patent gives notice to competitors that the steps described therein are not to be repeated to achieve the same result.”); *id.* at 1346-1347 (affirming that “whereas in the product patent context, differences in process are meaningless, here, in the process patent context, these differences mean everything.”) (citation omitted).

For the foregoing reasons, Petitioner’s reliance on Zhang’s channels C₁-C_n for limitation 13[d] fails.

B. Petitioner’s Reliance On Channels D₁-D_m As The Claimed “Plurality Of Digital Channel Outputs” Also Fails.

Petitioner also appears to suggest, but does not explain, that Zhang channels D₁-D_m disclose the claimed “plurality of digital channel outputs” in limitation

13[d], reciting “digitally down converting each desired channel ... to generate a plurality of digital channel outputs.” Pet., 32. This potential alternative also fails because it is the output C_1 - C_n , not D_1 - D_m , that is “generated” by digital down conversion in Zhang.

Petitioner relies on the digital down conversion in Zhang’s Figure 3, which is an implementation of Zhang’s digital channel demultiplexer 230, for the disclosure of “digitally down converting each desired channel.” Pet., 31 (“a plurality of signal paths for downconverting (i.e., shifting to a lower frequency) a plurality of desired channels C_1 - C_n .”). However, Zhang is clear that the circuitry of its Figure 3 outputs channels C_1 - C_n , not channels D_1 - D_m :

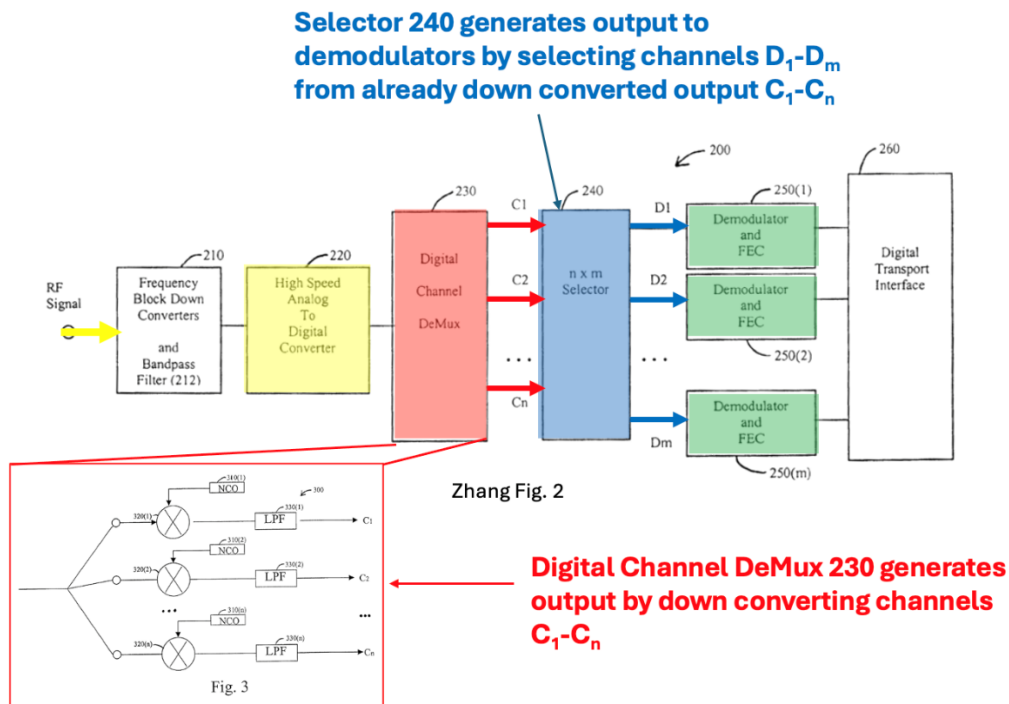
Accordingly, separate RF channels exist digital tuner 300, i.e. the multi-channel RF signal is demultiplexed. Digital tuner circuit 300 then outputs the separated RF channels C_1 to C_n , each RF channel being centered at baseband.

Ex. 1013 [Zhang] [0032]. This is consistent with Zhang’s disclosure, previously discussed, that the digital channel demultiplexer 230 demultiplexes channels C_1 - C_n . *See* Ex. 2009 [Russ-Decl.] ¶¶ 53-54.

Instead, as Dr. Russ explains, the output D_1 - D_m is generated by selecting desired channels from the already down converted channels C_1 - C_n :

Zhang also creates an output D_1 - D_m that it sends to demodulators. *See, e.g.,* Ex. 1013 [Zhang] [0039] (“sends them to appropriate

demodulators or output ports ...”). However, the output D_1 - D_m is not “generate[d]” by “down converting each desired channel” as claimed. Instead, as I explained above, the output D_1 - D_m is generated by selecting desired channels D_1 - D_m from the already down converted channels C_1 - C_n . *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] (“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”); [0042] (“A digital selector 640 digitally selects one or more RF channels D_1 to D_m from the RF channels C_1 to C_n .”). This is shown in the schematic below:



Ex. 2009 [Russ-Decl.] ¶ 101; *see also* Ex. 2009 [Russ-Decl.] ¶¶ 99-101.

For the foregoing reasons, Petitioner's reliance on channels D_1 - D_m to disclose limitation 13[d] also fails.

V. CONCLUSION

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

Respectfully submitted,

/ Parham Hendifar /
Kenneth J. Weatherwax (Reg. No. 54,528)
Nathan Lowenstein, *pro hac vice*
Parham Hendifar (Reg. No. 71,470)
Kenneth Wang (Reg. No. 82,675)

LOWENSTEIN & WEATHERWAX LLP

Date: January 14, 2025

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITS

This Patent Owner Response (the “POR”) consists of 9,639 words, excluding table of contents, table of authorities, certificate of service, this certificate, or table of exhibits. The POR complies with the type-volume limitation of 14,000 words as mandated in 37 C.F.R. § 42.24. In preparing this certificate, counsel has relied on the word count of the word-processing system used to prepare the paper (Microsoft Word).

Respectfully submitted,

/ Kenneth Wang/

Date: January 14, 2025

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The names and addresses of the parties being served are as follows:

Frederic M. Meeker	fmeeker@bannerwitcoff.com
Michael S. Cuvillo	mcuvillo@bannerwitcoff.com
H. Wayne Porter	wporter@bannerwitcoff.com
Paul T. Qualey	pqualey@bannerwitcoff.com
Joshua L. Davenport	jdavenport@bannerwitcoff.com
ComcastIPRService@bannerwitcoff.com	

Respectfully submitted,

/ Kenneth Wang/

Date: January 14, 2025