

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

IPR2024-00438
Patent 11,399,206 B2

Before LYNNE H. BROWNE, MICHELLE N. WORMMEESTER, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

WORMMEESTER, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Comcast Cable Communications, LLC (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–76 of U.S. Patent No. 11,399,206 B2 (Ex. 1001, “the ’206 patent”). Entropic Communications, LLC (“Patent Owner”) filed a Preliminary Response (Paper 10, “Prelim. Resp.”).

We have authority under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). Pursuant to 35 U.S.C. § 314(a), an *inter partes* review may not be instituted “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For the reasons that follow, we institute an *inter partes* review as to all the challenged claims of the ’206 patent based on all the challenges raised in the Petition.

II. BACKGROUND

A. *Related Proceedings*

The parties identify various related matters. Pet. viii–ix; Paper 4, 1–4 (Patent Owner’s Mandatory Notices). Petitioner also challenges claims 1–76 of the ’206 patent in IPR2024-00439 and IPR2024-00440, both in which we deny institution. Pet. viii; Paper 4, 1.

B. *The ’206 Patent*

The ’206 patent describes “wideband receiver systems that are capable of receiving multiple desired television channels that extend over multiple non-contiguous portions of the broad frequency spectrum and grouping them into a contiguous, or substantially-contiguous, frequency

spectrum.” Ex. 1001, 1:30–35. To illustrate one exemplary embodiment, Figure 2 of the ’206 patent is reproduced below.

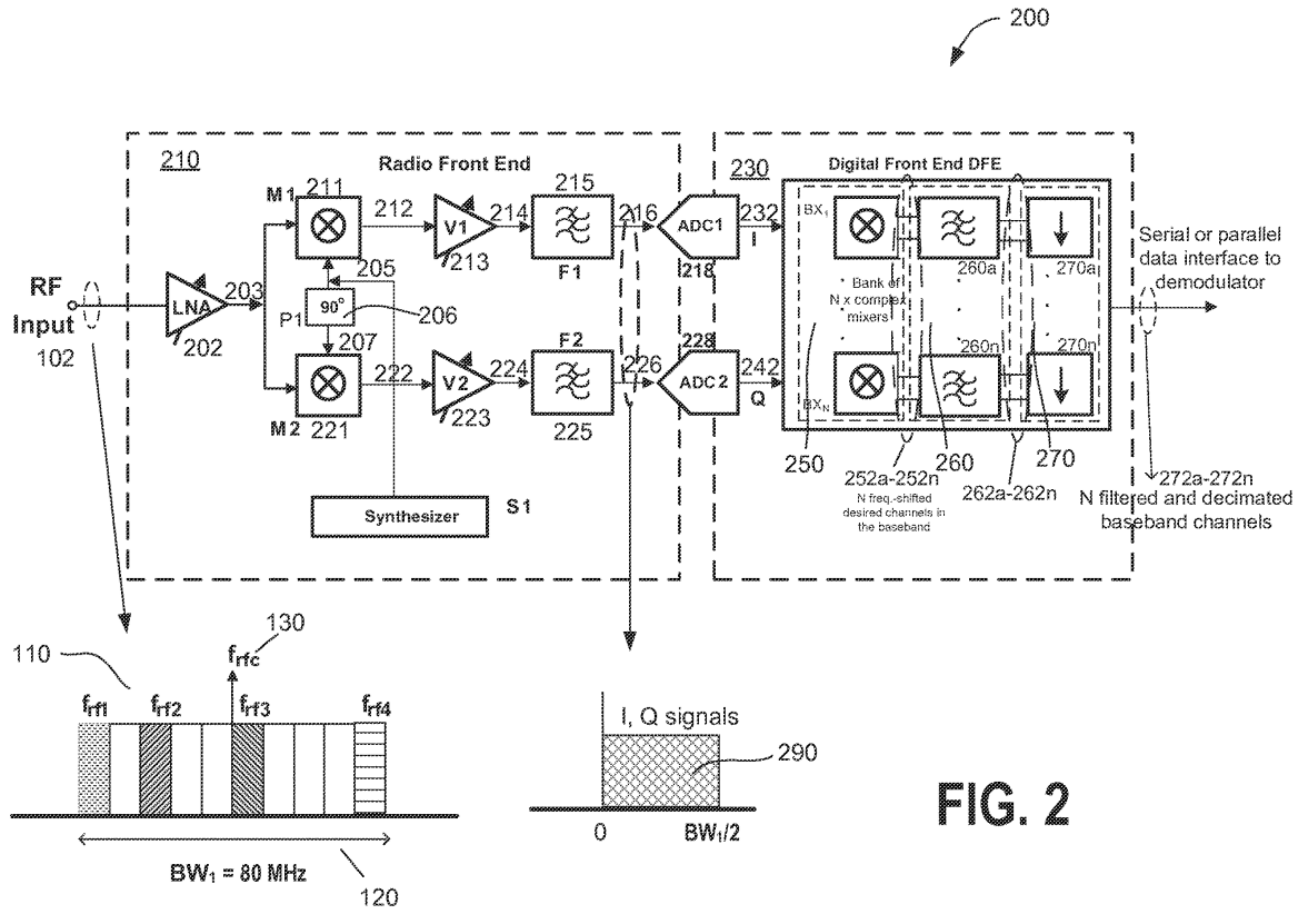


FIG. 2

Figure 2 is a block diagram of wideband receiver system 200 that includes radio front end 210, analog-to-digital convertors 218 (ADC1) and 228 (ADC2), and digital front end 230. *Id.* at 4:35–38, 5:33–35, Fig. 2. System 200 receives and processes channels 110, which are located in a radio frequency (RF) spectrum with frequency bandwidth 120 (BW_1). *Id.* at 2:13–15, 4:39–42. There are ten available channels in bandwidth 120, where each channel occupies 8 MHz of bandwidth for a total of 80 MHz. *Id.* at 4:42–45. Of these available channels, there are four desired channels with respective carrier frequencies f_{rf1} , f_{rf2} , f_{rf3} , and f_{rf4} that are located in noncontiguous portions of bandwidth 120. *Id.* at 4:47–51.

Radio front end 210 is a wideband tuner receiver that includes low noise amplifier 202 (LNA), mixers 211 (M1) and 221 (M2), amplifiers 213 (V1) and 223 (V2), as well as filters 215 (F1) and 225 (F2). Ex. 1001, 4:39–5:32. Digital front end 230 includes N complex mixers 250, where N is the number of desired channels located in the noncontiguous portions of bandwidth 120. *Id.* at 5:51–55, Fig. 2. In Figure 2's example, N represents four desired RF channels. *Id.* at 5:63–65. Digital front end 230 also includes filter modules 260a–260n and demodulators 270a–270n. *Id.* at 6:6–12, Fig. 2.

In operation, radio front end 210's low noise amplifier 202 receives RF input signal 102, which includes the four desired RF channels. Ex. 1001, 4:45–51. Mixers 211 and 221 multiply (mix) amplified RF signal 203 with respective first oscillator frequency signal 205 and second oscillator frequency signal 207 to generate in-phase signal 212 and quadrature signal 222, which have a phase shift of ninety degrees between them. *Id.* at 4:61–66. Signals 212 and 222 are further amplified by respective amplifiers 213 and 223 to generate signals 214 and 224, which are then filtered by respective filters 215 and 225 to generate filtered in-phase signal 216 and filtered quadrature signal 226. *Id.* at 5:17–20, Fig. 2.

After being processed in radio front end 210, filtered signals 216 and 226 are digitized for further processing in digital front end 230. Ex. 1001, 5:20–24. ADC1 218 generates digital in-phase signal 232 (I), which is a digital representation of analog filtered signal 216, and ADC2 228 generates digital quadrature signal 242 (Q), which is a digital representation of analog filtered signal 226. *Id.* at 5:48–51.

In digital front end 230, each complex mixer 250 receives digital signals 232 and 242 from ADC1 218 and ADC2 228 to extract a different desired channel, and then frequency-shifts (downshifts) the extracted signal to the baseband frequency. Ex. 1001, 6:3–6, 6:53–56. Frequency-shifted channels 252a–252n are filtered by associated filter modules 260a–260n. *Id.* at 6:6–8. Next, filtered channels 262a–262n are decimated and sent to associated demodulators 270a–270n that extract the original information transmitted in each desired channel. *Id.* at 6:8–14. The decimated baseband channels may be sent as a serial or parallel digital data stream to a demodulator using a serial or parallel data interface. *Id.* at 7:10–14, Fig. 2.

According to the '206 patent, its approach “eliminates the need of expensive data conversion, filtering and channel selection on the demodulator side,” and “removes undesired channels from the signal path at an early stage, thus reliev[ing] the large dynamic range requirement in the demodulator.” Ex. 1001, 7:14–19.

C. Illustrative Claim

Petitioner challenges claims 1–76 of the '206 patent. Claims 1, 13, 25, 38, 51, and 64 are independent. Claim 1, reproduced below, is illustrative.

1. A method for receiving a television (TV) signal comprising:
receiving an input signal from a cable network;
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;

concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels; and
providing the plurality of desired channels via a serial interface.

D. Asserted Challenges to Patentability

Petitioner asserts the following eight challenges to claims 1–76 of the '206 patent. Pet. 12–13, 19–75.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3–7, 9, 11, 13, 15–19, 21, 23, 25, 27–31, 33–35, 38, 40–44, 46–48	102 ¹	Zhang ²
1, 3–7, 9, 11, 13, 15–19, 21, 23, 25, 27–31, 33–35, 38, 40–44, 46–48	103(a)	Zhang
9–12, 21–24, 25, 27–31, 33–37, 38, 40–44, 46–51, 53–57, 59–63, 64, 66–70, 72–76	103(a)	Zhang, Reisman ³
2–6, 14–18, 26–30, 39–43	103(a)	Zhang, Jackson ⁴
26–30, 39–43, 52–56, 65–69	103(a)	Zhang, Reisman, Jackson
1, 3–9, 11, 13, 15–21, 23, 32–34, 45–47	103(a)	Zhang, Pandey ⁵

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the application from which the '206 patent issued claims the benefit of priority to an application that was filed before this date, the pre-AIA versions of §§ 102 and 103 apply.

² Zhang et al., U.S. Publ’n No. 2003/0056221 A1, published Mar. 20, 2003 (Ex. 1013).

³ Reisman, U.S. Publ’n No. 2003/0229900 A1, published Dec. 11, 2003 (Ex. 1052).

⁴ Jackson et al., U.S. Publ’n No. 2009/0113504 A1, published Apr. 30, 2009 (Ex. 1057).

⁵ Pandey et al., U.S. Patent No. 7,237,214 B1, issued June 26, 2007 (Ex. 1014).

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
9–12, 21–24, 32–34, 45–47, 58–60, 71–73	103(a)	Zhang, Reisman, Pandey
2–6, 14–18	103(a)	Zhang, Pandey, Jackson

In support of its challenges, Petitioner relies on a Declaration of David B. Lett (Ex. 1002).

III. DISCUSSION

A. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner argues that we should exercise our discretion to deny institution under 35 U.S.C. § 314(a), based on Petitioner’s filing of multiple petitions challenging the ’206 patent. Prelim. Resp. 4–30. For the reasons that follow, we decline to exercise our discretion to deny institution on that basis.

As noted above, Petitioner filed three petitions for *inter partes* review of the ’206 patent in IPR2024-00438 (this proceeding), IPR2024-00439, and IPR2024-00440. Pet. viii; Paper 4, 1. Concurrent with the filing of these petitions, Petitioner filed a Petition Ranking and Explanation of Material Differences Between Petitions, ranking its three petitions in accordance with the guidance on parallel petitions in the Board’s November 2019 Consolidated Trial Practice Guide. Paper 3; *see* PTAB Consolidated Trial Practice Guide, 59–60 (Nov. 2019) (hereinafter, “CTPG”).⁶ In that paper, Petitioner ranks the instant Petition first. Paper 3, 1.

Patent Owner responds that the Board should exercise its discretion to deny all three petitions challenging the claims of the ’206 patent. Prelim.

⁶ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

Resp. 4–30. Alternatively, Patent Owner contends that the Board should exercise its discretion to deny two of the three parallel petitions that Petitioner has filed. *Id.* at 4, 30–45. Patent Owner contends in particular,

Even if the Board were to disregard [Petitioner’s] years-long pattern of deliberately abusing the IPR process, it should substantively consider, at most, one of the three petitions challenging the ’206 patent. As should be evident from [Petitioner’s] filing practices, [Petitioner] is not making a good faith case-by-case determination of which patents are the “rare” patents that might require more than one petition. Rather, [Petitioner] indiscriminately files three or more petitions against patents by default.

Id. at 30–31.

We do not agree with Patent Owner that Petitioner’s filing of three parallel petitions is grounds to deny all three petitions on that basis alone. *See* Prelim. Resp. 4–30. As discussed above, Petitioner has complied with our guidance. *See* CTPG 59–60. For reasons given in our concurrent decisions denying institution in IPR2024-00439 and IPR2024-00440, however, we agree with Patent Owner that plural petitions are not warranted and we deny institution in the concurrently filed decisions for these petitions. Given our decisions to deny institution in IPR2024-00439 and IPR2024-00440, Patent Owner’s arguments on the need for more than one petition are unavailing with regard to the instant Petition.

In view of the foregoing, we decline to exercise our discretion to deny institution under 35 U.S.C. § 314(a) in this proceeding.

B. Claim Construction

Turning to Petitioner’s unpatentability challenges, we start with claim construction. In an *inter partes* review proceeding, we construe a claim of a

patent “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” *See* 37 C.F.R. § 42.100(b). That standard involves construing claims in accordance with the ordinary and customary meaning of such claims as would have been understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner asserts that “[a]ll claim terms herein should be given their ordinary and customary meaning to a POSITA, as they would be given in a civil action under 35 U.S.C. § 282(b),” where POSITA stands for “person of ordinary skill in the art.” Pet. 18. Petitioner further notes that “the ’206 patent defines ‘wideband’ as a band that carries multiple channels.” *Id.* at 18–19 (citing Ex. 1001, 1:36–39). Patent Owner does not respond.

At this stage, on the record before us, we determine that no claim term requires express interpretation to resolve any controversy in this proceeding. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

C. Asserted Challenges Based on Zhang Alone

Petitioner asserts that claims 1, 3–7, 9, 11, 13, 15–19, 21, 23, 25, 27–31, 33–35, 38, 40–44, and 46–48 of the ’206 patent are anticipated by Zhang. Pet. 21–57. Petitioner also asserts that these claims would have been obvious over Zhang. *Id.* Patent Owner does not dispute Petitioner’s analysis under either challenge. For the reasons explained below, we determine that Petitioner has demonstrated a reasonable likelihood of showing that claims 1, 3–7, 9, 11, 13, 15–19, 21, 23, 25, 27–31, 33–35, 38,

40–44, and 46–48 are anticipated by Zhang and would have been obvious over Zhang.

Before addressing Petitioner’s arguments, we provide an overview of Zhang.

1. Overview of Zhang

Zhang describes demodulator circuits in broadband communications. Ex. 1013 ¶ 4. To illustrate one embodiment, Figure 2 of Zhang is reproduced below.

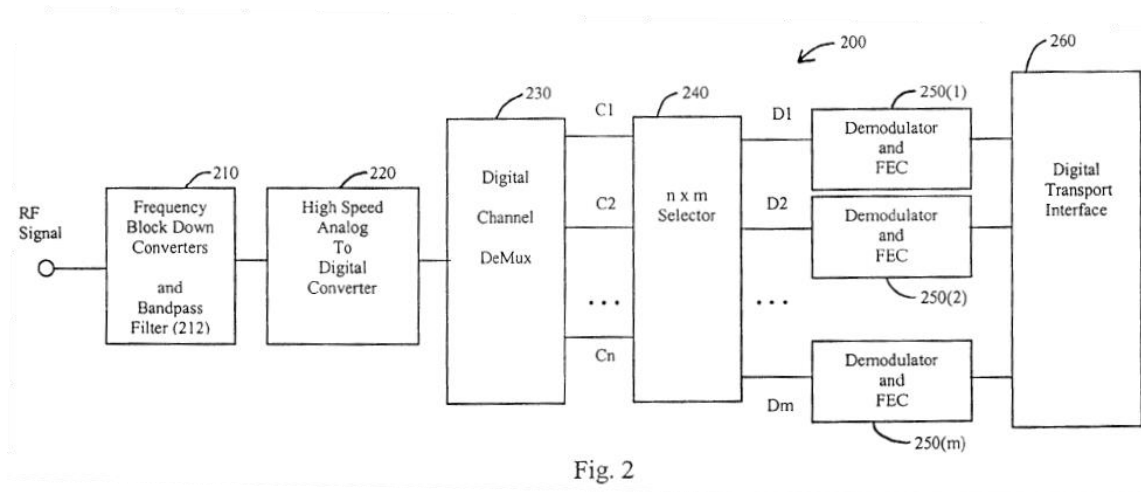


Fig. 2

Figure 2 is a diagram of multi-channel demodulator 200. *Id.* ¶ 23.

Frequency-block down-converter 210 receives a multi-channel analog RF signal that can come from any of various sources such as satellite systems, terrestrial TV systems, and cable systems. *Id.* Down-converter 210 downshifts the multi-channel analog RF signal to a lower frequency band.

Id. ¶ 25. Analog-to-digital converter 220 then converts the down-converted multi-channel analog RF signal to a multi-channel digital RF signal. *Id.*

¶ 27. Digital channel demultiplexer 230 demultiplexes the digital RF signal into separate digital RF channels C_1 to C_n . *Id.* ¶ 28. Digital selector 240

receives the demultiplexed digital RF channels and selects one or more of RF channels D_1 to D_m from one or more of digital RF channels C_1 to C_n . *Id.* The m selected RF channels are fed into respective demodulators 250(1) to 250(m), where they are demodulated. *Id.* ¶ 29. The selected RF channels D_1 to D_m then feed into digital transport interface 260. *Id.*

2. Analysis

We turn now to the claims, starting with independent claims 1, 13, 25, and 38.

a. Independent Claim 1

Claim 1 is directed to a “method for receiving a television (TV) signal” and recites various steps including a “receiving” step, a “digitizing” step, a “selecting” step, and a “providing” step. Petitioner designates the preamble as element 1A and the recited steps as elements 1B through 1E.

Regarding elements 1A through 1D, Petitioner presents the same analysis for both its anticipation and obviousness challenges. Regarding element 1E, Petitioner presents two theories, one for its anticipation challenge and one for its obviousness challenge. We address elements 1A through 1E in turn.

i. Element 1A: “method for receiving a television (TV) signal”

As noted above, the preamble of claim 1 recites “[a] method for receiving a television (TV) signal.” Petitioner asserts that “Zhang describes an RF receiver, for example in a set-top box, that receives digital video channels over a cable system and that incorporates a DOCSIS return

channel, which the '206 patent concedes is a protocol for 'cable networks that carry TV programs.'" Pet. 19–20 (citing Ex. 1013 ¶¶ 5–6, 23–25, 29, 41, 45–47; Ex. 1001, 9:4–8). As support, Petitioner directs us to where Zhang teaches that its "frequency-block down-converter 210 receives one or more multi-channel analog RF signals which can be sourced by a variety of systems such as satellite systems, terrestrial TV systems, cable systems, etc." Ex. 1013 ¶ 23 (cited by Pet. 20). Petitioner also directs us to where Zhang teaches that "[f]or cable services, a wide-band receiver using the invention can incorporate a DOCSIS return channel." *Id.* ¶ 47 (cited by Pet. 20). In addition, Petitioner directs us to where the '206 patent describes "cable networks that carry TV programs . . . according to the Data Over Cable Service Interface Specification (DOCSIS) protocol." Ex. 1001, 9:4–8 (cited by Pet. 20). Lastly, Petitioner directs us to where Zhang teaches that "[s]ystems using the invention are enabled to perform advanced wide-band front-ends for digital set-top boxes, PVRs, home gateways and home media centers." Ex. 1013 ¶ 45 (cited by Pet. 20).

Although we do not determine whether the preamble is limiting, we are persuaded by Petitioner's argument and evidence that Zhang teaches the subject matter of the preamble.

ii. Element 1B: "receiving" step

Claim 1 recites "receiving an input signal from a cable network." For this step, Petitioner provides an annotated version of Figure 2 of Zhang, which is reproduced below. Pet. 20.

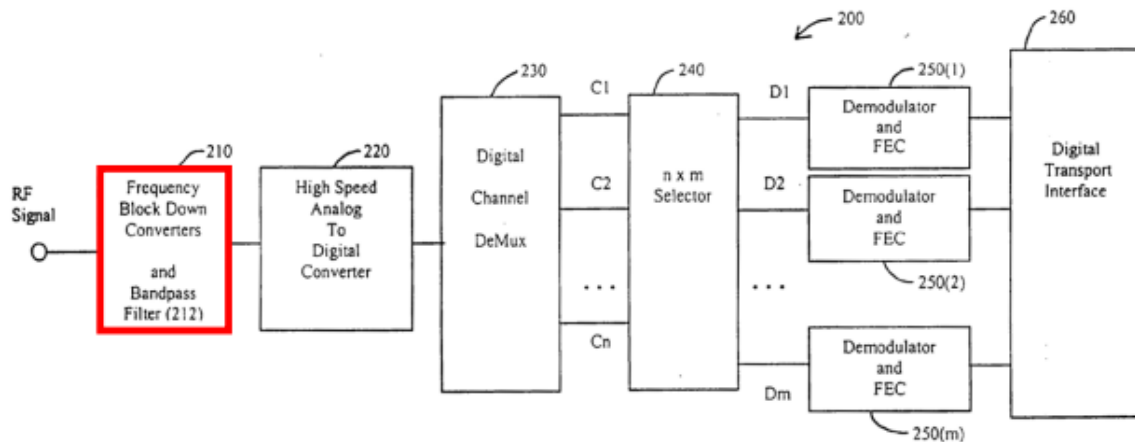


Fig. 2

Figure 2 of Zhang, as annotated by Petitioner, is a diagram of multi-channel demodulator 200. *See* Ex. 1013 ¶ 23. Petitioner asserts that “Zhang discloses receiving a ‘multi-channel analog RF signal’ (the claimed ‘input signal’) from a cable system with a frequency block down converter 210 (red).” Pet. 20 (citing Ex. 1013 ¶¶ 5–6, 23–24, 41, 45–47). According to Petitioner, “[t]he multi-channel analog RF signal is ‘an RF signal in a given frequency band that carries multiple RF channels.’” *Id.* (quoting Ex. 1013 ¶ 24).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Zhang teaches the recited “receiving” step of element 1B. For example, Zhang teaches that its “frequency-block down-converter 210 receives one or more multi-channel analog RF signals which can be sourced by a variety of systems such as satellite systems, terrestrial TV systems, cable systems, etc.” Ex. 1013 ¶ 23 (cited by Pet. 20).

iii. Element 1C: “digitizing” step

Claim 1 recites “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.” For this step, Petitioner provides another annotated version of Figure 2 of Zhang, reproduced below. Pet. 22.

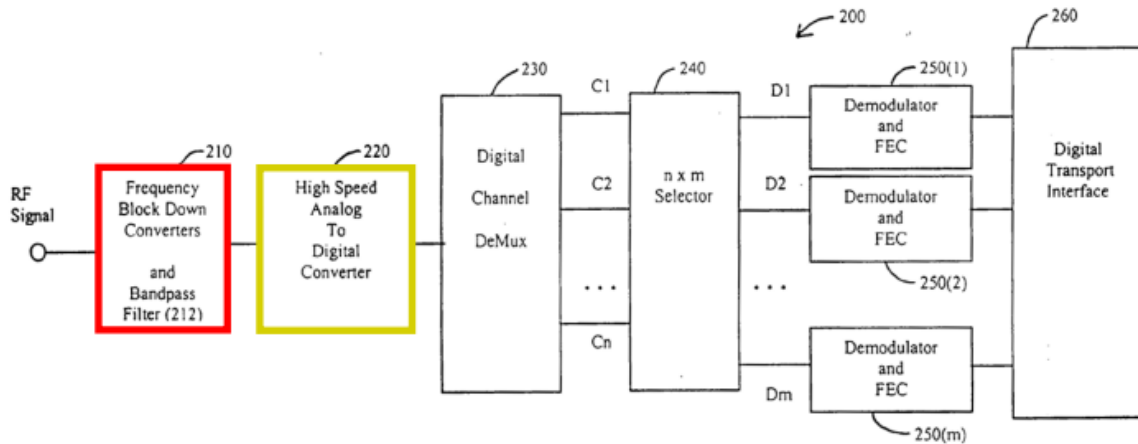


Fig. 2

Figure 2 of Zhang, as annotated by Petitioner, is a diagram of multi-channel demodulator 200. See Ex. 1013 ¶ 23. Petitioner asserts that “Zhang’s Frequency Block Down Converter 210 ‘shifts the multi-channel analog RF signal to a lower frequency band,’ which is then digitized by Zhang’s ADC 220 (gold).” Pet. 21 (citing Ex. 1013 ¶¶ 10, 23–25, 27, 31, 34, 42, 44).

Petitioner contends that “Zhang’s ADC is ‘wideband’ because the digitized multi-channel RF signal includes several channels, and the channels form ‘a contiguous band of frequencies’ because . . . they are spaced next to each other within a frequency band with a ‘precise frequency spacing’ (e.g., 6MHz) that is a fraction of the total bandwidth of the multi-

channel RF signal (e.g., 540–750 MHz divided into 35 channels).” Pet. 21 (citing Ex. 1013 ¶¶ 6, 10, 24–25, 27, 41–42, 47). Petitioner adds, “Zhang expressly discloses that in alternate variations of its system, ‘RF channels need not be contiguous,’ teaching that in the embodiment otherwise described, the RF channels are ‘a contiguous band of frequencies.’” *Id.* at 22 (quoting Ex. 1013 ¶ 48).

Petitioner further contends that Zhang’s “ADC 220 . . . ‘converts an entire signal band . . . including the multi-channel analog RF signal,’” which, according to Petitioner, means “the digitized frequency band ‘comprises all received channels that exist in the input signal.’” Pet. 23 (quoting Ex. 1013, claim 8).

Lastly, Petitioner contends that Zhang’s “digitized multi-channel RF signal includes ‘target’ RF channels that are selected and demodulated in subsequent stages (claimed ‘desired channels’), and undesired RF channels are filtered out (claimed ‘undesired channels’).” Pet. 23 (citing Ex. 1013 ¶¶ 5, 10–12, 27–29, 31–32, 35–36, 41–42, claim 37).

Based on Petitioner’s arguments and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Zhang teaches the recited “digitizing” step of element 1C. For example, Zhang teaches that its ADC 220 “converts the down-converted multi-channel analog RF signal to a multi-channel digital RF signal.” Ex. 1013 ¶ 27 (cited by Pet. 22). Zhang explains that “many modifications, variations, alternatives, and equivalents . . . are intended to be within the scope of [its] invention,” and gives the example that “the RF channels need not be contiguous.” *Id.* ¶ 48 (cited by Pet. 22). We agree with Petitioner that Zhang’s example teaches or suggests that the RF channels may be

contiguous. Zhang further describes “demultiplex[ing] the multi-channel digital RF signal into separate digital RF channels C_1 to C_n ,” which “contain content channels that are selected or used by a subscriber.” *Id.* ¶ 28 (cited by Pet. 22). Zhang describes filtering the RF channels so that “only the target RF channel passes.” *Id.* ¶ 32 (cited by Pet. 23). In addition, Zhang describes “select[ing] 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 ,” where “only the selected channels are later demodulated unlike the systems using RF tuners which demodulate all of the RF channels.” *Id.* ¶ 28.

iv. Element 1D: “selecting” step

Claim 1 recites “concurrently selecting each of the plurality of desired channels from the input signal without selecting any of the plurality of undesired channels.” For this step, Petitioner provides yet another annotated version of Figure 2 of Zhang, reproduced below. Pet. 24.

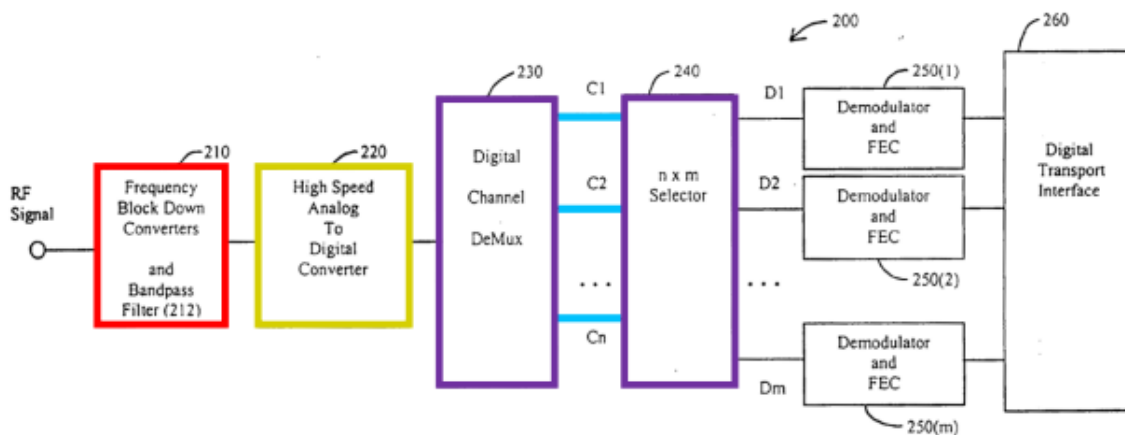


Fig. 2

Figure 2 of Zhang, as annotated by Petitioner, is a diagram of multi-channel demodulator 200. *See* Ex. 1013 ¶ 23. Petitioner asserts that Zhang’s “multi-channel digital RF signal is input to Demultiplexer 230 and a portion of

Digital Selector 240 (collectively **purple**) . . . , which perform Element 1D.”
Pet. 23.

To illustrate, Petitioner also provides an annotated version of Figure 3 of Zhang, which is reproduced below. Pet. 25.

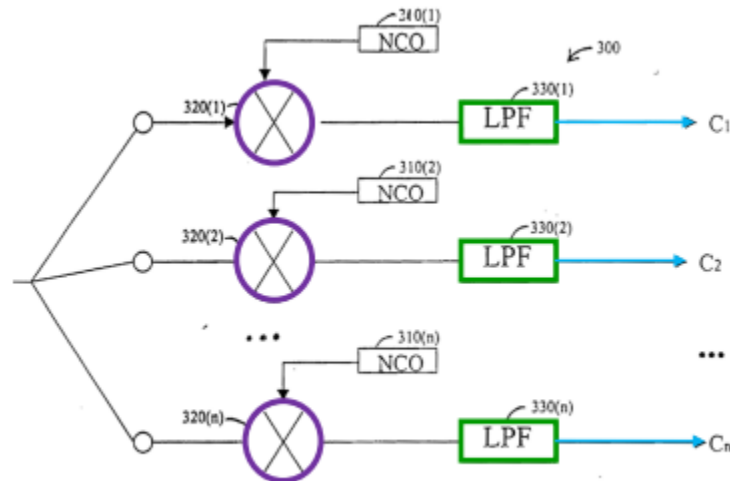


Fig. 3

Figure 3 of Zhang, as annotated by Petitioner, is a diagram of digital tuner 300, which may be used to implement demultiplexer 230 of Figure 2 of Zhang. See Ex. 1013 ¶ 30. Petitioner asserts that Zhang’s “[d]igital tuner 300 . . . includes a plurality of signal paths for concurrently selecting a plurality of desired channels $C_1 - C_n$ (**light blue**),” where “each path includes a complex multiplier 320 (**purple**) followed by a [low pass filter] 330 (**green**).” Pet. 24 (citing Ex. 1013 ¶¶ 30–34). Petitioner further asserts that each “complex multiplier 320 first downconverts (shifts) the multi-channel RF signal frequency so that a different ‘target channel’ selected by the subscriber within the signal is centered at baseband (0 Hz), and then low pass filter 330 filters out all undesired channels, so that one of the ‘n’ target digital channels $C_1 - C_n$ (**light blue**) is output.” *Id.* at 25 (citing Ex. 1013 ¶¶ 28, 31–37). In addition, Petitioner asserts that “[s]elector 240

provides ‘m’ channels D_1 – D_m selected from any or all of the channels C_1 – C_n (light blue) for demodulation by one or more demodulators.” *Id.* at 25–26 (citing Ex. 1013 ¶¶ 5, 28, 38–39, 47). According to Petitioner, Zhang’s “Demultiplexer 230 and Selector 240 output only user selected channels (either all or a subset of the user selected ‘C’ channels) and filter out all other channels from the digitized multi-channel RF signal.” *Id.* at 26 (citing Ex. 1013 ¶¶ 28, 39, 47).

Based on Petitioner’s arguments and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Zhang teaches the recited “selecting” step of element 1D. For example, Zhang teaches that its “LPFs 330(1 . . . n) receive all RF channels and each filters out all RF channels except for its target RF channel,” so that “only the target RF channel passes.” Ex. 1013 ¶ 32 (cited by Pet. 25). Additionally, Zhang teaches selecting RF channels D_1 to D_m from digital RF channels C_1 to C_n , where only the selected channels are later demodulated. *Id.* ¶ 28 (cited by Pet. 25–26).

v. Element 1E: “providing” step

Claim 1 recites “providing the plurality of desired channels via a serial interface.” As noted above, Petitioner presents two theories, one for its anticipation challenge and one for its obviousness challenge.

Under the first theory, for its anticipation challenge, Petitioner provides an annotated version of Figure 5 of Zhang, reproduced below. Pet. 27.

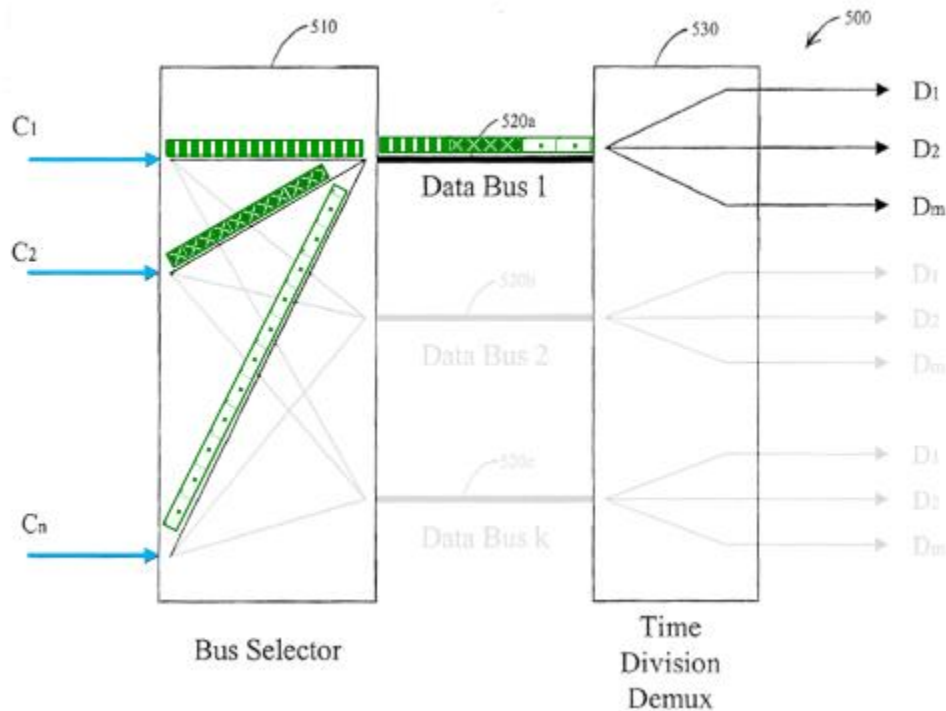


Figure 5 of Zhang, as annotated by Petitioner, is a diagram of digital selector 500, which may be used to implement digital selector 240 of Figure 2 of Zhang. See Ex. 1013 ¶ 38. According to Petitioner, “Selector 240 may have only a single bus (e.g., Data bus 1) that receives channels $C_1 - C_n$ from the Channel Demultiplexer 230 (represented with green blocks with different patterns) and sends them across the bus ‘with the use of time division multiplexing.’” Pet. 26 (citing Ex. 1013 ¶¶ 38–39). Petitioner contends “[a] POSITA would have understood that this sends different channels sequentially (serially) in different time divisions over a single data path as shown, and that such a path is a ‘serial interface’ as claimed in Element [1E].” *Id.* at 27. As support, Petitioner asserts that “digital circuits (such as those like Zhang implemented in CMOS) represent data as binary units (referred to as ‘bits’) in the form of electrical signals on wires,” and that “[t]o output multiple bits (e.g., from multiple channels), the

circuit can either transmit the bits over multiple separate wires, one wire for each bit, which was known as a ‘parallel interface,’ or the circuit can transmit the set of bits one at a time sequentially over a single wire, which was known as a ‘serial interface.’” *Id.* at 27–28. Petitioner further asserts that its annotated version of Zhang’s Figure 5 illustrates “embodiments with a ‘serial interface.’” *Id.* at 28. Petitioner relies on the declaration testimony of Mr. Lett. *Id.* at 27–28 (citing Ex. 1002 ¶¶ 117–119).

Under the second theory, for its obviousness challenge, Petitioner argues that “[t]o the extent Zhang does not disclose a serial interface, implementing Zhang’s circuitry to output the selected channels via a serial interface would have been obvious in light of the POSITA’s general knowledge, creativity, and common sense as one of two common design choices that were well known and used by POSITAs in integrated circuit designs at the time.” Pet. 28. As support, Petitioner reiterates, “Zhang’s circuit is implemented in CMOS, which . . . can either transmit the bits over multiple separate wires, one wire for each bit (via parallel interface), or sequentially over a single wire (via serial interface).” *Id.* at 29. Petitioner adds that “the ’206 patent concedes[that] outputting a digital data stream via serial interface was ‘commonly known.’” *Id.* at 28–29 (citing Ex. 1001, 7:10–13). Petitioner relies on the declaration testimony of Mr. Lett. *Id.* (citing Ex. 1002 ¶ 120).

In sum, Petitioner contends that “Zhang . . . discloses element [1E],” or, alternatively, “Zhang alone, in view of the knowledge of a POSITA (as acknowledged in the ’206 patent) . . . renders obvious Element [1E].” Pet. 28–29. For purposes of this Decision, we are persuaded by Petitioner’s arguments and evidence under both theories.

b. Independent Claim 13

Claim 13 is directed to a “method” and recites various limitations. Petitioner designates the preamble as element 13A and the recited limitations as elements 13B through 13E.

i. Similarly Recited Elements

Elements 13A, 13B, 13C, and 13E are similar to elements 1A, 1B, 1C, and 1E. Thus, Petitioner relies primarily on its analysis for claim 1. Pet. 29–30, 33. On the record before us, and for the reasons given above as to claim 1, we are persuaded that Petitioner’s showing for elements 13A, 13B, 13C, and 13E is sufficient for purposes of this Decision. *See supra* Part III.C.2.a. As such, we do not determine whether claim 13’s preamble (element 13A) is limiting.

ii. Element 13D: “digitally down converting” step

Unlike claim 1, claim 13 recites “digitally down converting each desired channel, of the plurality of desired channels, to generate a plurality of digital channel outputs.” For this step, Petitioner provides an annotated version of Figure 2 of Zhang, reproduced below. Pet. 31.

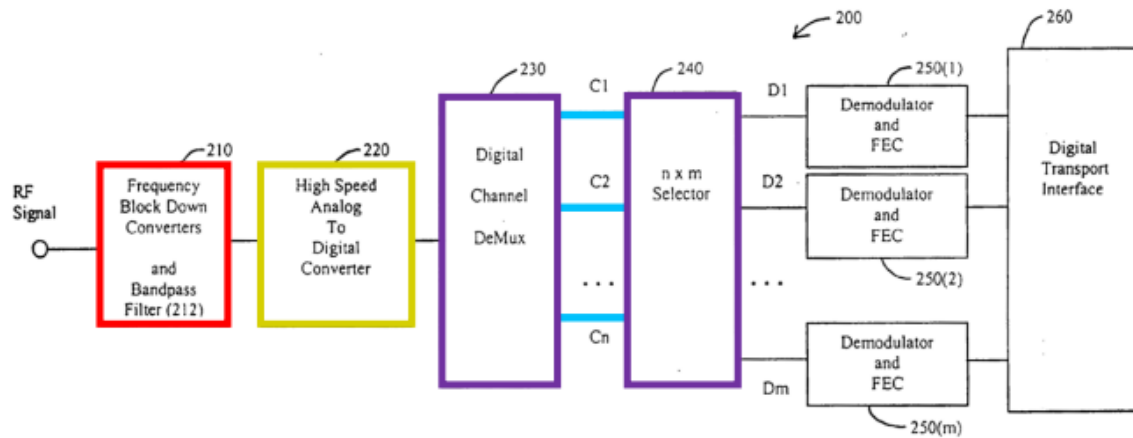


Fig. 2

Figure 2 of Zhang, as annotated by Petitioner, is a diagram of multi-channel demodulator 200. See Ex. 1013 ¶ 23. Petitioner asserts that “Zhang’s Demultiplexer 230 and Digital Selector 240 (collectively **purple**) perform Element [13D].” Pet. 30.

To illustrate, Petitioner also provides an annotated version of Figure 3 of Zhang, which is reproduced below. Pet. 32.

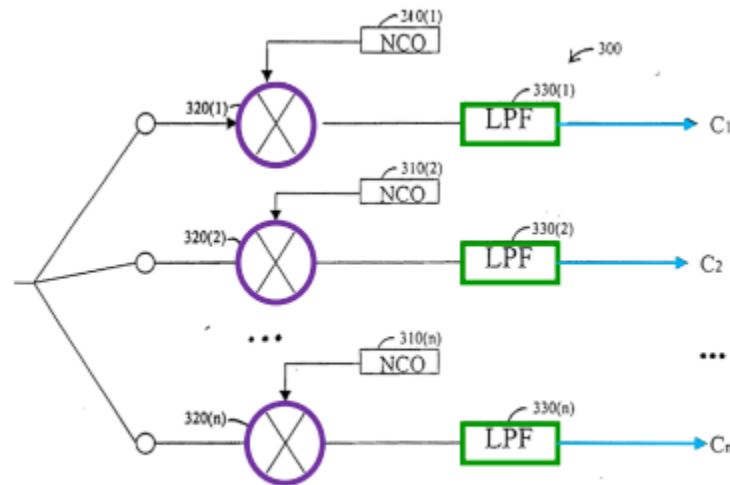


Fig. 3

Figure 3 of Zhang, as annotated by Petitioner, is a diagram of digital tuner 300, which may be used to implement demultiplexer 230 of Figure 2 of Zhang. See Ex. 1013 ¶ 30. Petitioner asserts that Zhang’s “[d]igital

tuner 300 . . . includ[es] a plurality of signal paths for downconverting (i.e., shifting to a lower frequency) a plurality of desired channels $C_1 - C_n$ (light blue),” where “each path includes a complex multiplier 320 (purple) followed by a low pass filter 330 (green).” Pet. 31 (citing Ex. 1013 ¶¶ 30–34, Fig. 3). Petitioner further asserts that each “complex multiplier 320 first downconverts (shifts) the frequency of the multi-channel RF signal so that a different ‘target channel’ selected by the subscriber within the signal is centered at baseband (0 Hz), and then low pass filter 330 filters out all undesired channels, so that one of the ‘n’ target digital channels $C_1 - C_n$ (light blue) is output.” *Id.* (citing Ex. 1013 ¶ 28). In addition, Petitioner asserts that “[s]elector 240 provides ‘m’ channels $D_1 - D_m$ which can be any or all of channels $C_1 - C_n$ (light blue) for demodulation by one or more demodulators.” *Id.* at 32 (citing Ex. 1013 ¶¶ 28, 30–31, 38–39, 42, 47). According to Petitioner, Zhang’s “Demultiplexer 230 and Selector 240 thus perform[] the . . . step of ‘digitally down converting . . . to generate a plurality of digital channel outputs’ where the ‘outputs’ are $C_1 - C_n$ (light blue) (or $D_1 - D_m$).” *Id.* at 32 (citing Ex. 1013 ¶¶ 28, 30–31, 38–39, 42, 47). Petitioner relies on the declaration testimony of Mr. Lett. *Id.* at 30–32 (citing Ex. 1002 ¶¶ 129–134).

Based on Petitioner’s arguments and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Zhang teaches the recited “digitally down converting” step of element 13D. For example, Zhang teaches that “the target RF channel is shifted to a baseband” in tuner 300 (demultiplexer 230). Ex. 1013 ¶ 32 (cited by Pet. 31). Zhang further teaches that “LPFs 330(1 . . . n) receive all RF channels and each filters out all RF channels except for its target RF channel,” so that “only the

target RF channel passes.” *Id.* Zhang teaches that tuner 300 “then outputs the separated RF channels C_1 to C_n , each RF channel being centered at baseband.” *Id.* Lastly, Zhang teaches that its “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 ,” where “only the selected channels are later demodulated.” *Id.* ¶ 28 (cited by Pet. 32).

c. Independent Claim 25

Claim 25 is directed to a “method for receiving a television (TV) signal” and recites various limitations. Petitioner designates the preamble as element 25A and the recited limitations as elements 25B through 25F.

i. Similarly Recited Elements

Elements 25A through 25E are similar to elements 1A through 1E. Thus, Petitioner relies primarily on its analysis for claim 1. Pet. 33. On the record before us, and for the reasons given above as to claim 1, we are persuaded that Petitioner’s showing for elements 25A through 25E is sufficient for purposes of this Decision. *See supra* Part III.C.2.a. As such, we do not determine whether claim 25’s preamble (element 25A) is limiting.

ii. Element 25F: “digital video recorder (DVR)”

Unlike claim 1, claim 25 recites “wherein the method is performed by a device comprising a digital video recorder (DVR).” For this limitation, Petitioner asserts that “Zhang discloses its cable TV device may be integrated as a wide-band front-end of a ‘set-top box/PVR/home media

server.’” Pet. 33 (citing Ex. 1013 ¶45, Fig. 8). Petitioner contends that “[a] POSITA would have understood that ‘PVR’ stands for ‘personal video recorder,’ which is an alternate name for ‘DVR’ or ‘digital video recorder’ for recording audio and video content received by a STB,” which stands for “set-top box.” *Id.* at 33–34. Petitioner relies on the declaration testimony of Mr. Lett. *Id.* (citing Ex. 1002 ¶ 139).

Based on Petitioner’s arguments and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Zhang teaches the recited “digital video recorder (DVR)” of element 25F. For example, Zhang teaches that “[s]ystems using the invention are enabled to perform advanced wide-band front-ends for digital set-top boxes, PVRs, home gateways and home media centers.” Ex. 1013 ¶45 (cited by Pet. 33). Mr. Lett testifies that an ordinarily skilled artisan “would have understood that ‘PVR’ stands for ‘personal video recorder,’ which is an alternate name for ‘DVR’ or ‘digital video recorder.’” Ex. 1002 ¶ 139 (cited by Pet. 33–34). Mr. Lett supports his testimony with references to U.S. patent publications indicating that DVRs are also known as PVRs. *Id.* (citing Ex. 1051 ¶ 18; Ex. 1052 ¶¶ 48, 60).

d. Independent Claim 38

Claim 38 is directed to a “method” and recites similar limitations as claims 1, 13, and 25. Thus, Petitioner relies on its analysis for claims 1, 13, and 25. Pet. 34. On the record before us, and for the reasons given above as to claims 1, 13, and 25, we are persuaded that Petitioner’s showing for claim 38 is sufficient for purposes of this Decision. *See supra* Parts III.C.2.a–III.C.2.c.

e. Dependent Claims

Claims 3–7, 9, 11, 15–19, 21, 23, 27–31, 33–35, 40–44, and 46–48 depend from claims 1, 13, 25, or 38. Having reviewed Petitioner’s arguments and evidence for these dependent claims, we are persuaded that Petitioner’s showing is sufficient for purposes of this Decision. *See* Pet. 35–45.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated a reasonable likelihood of showing that claims 1, 3–7, 9, 11, 13, 15–19, 21, 23, 25, 27–31, 33–35, 38, 40–44, and 46–48 are anticipated by Zhang and would have been obvious over Zhang.

D. Challenge Based on Zhang and Reisman

Petitioner asserts that claims 9–12, 21–24, 25, 27–31, 33–37, 38, 40–44, 46–51, 53–57, 59–63, 64, 66–70, and 72–76 would have been obvious over Zhang and Reisman. Pet. 45–56. Patent Owner does not dispute Petitioner’s analysis under this challenge. For the reasons explained below, we determine that Petitioner has demonstrated a reasonable likelihood of showing that claims 9–12, 21–24, 25, 27–31, 33–37, 38, 40–44, 46–51, 53–57, 59–63, 64, 66–70, and 72–76 would have been obvious over Zhang and Reisman.

Before addressing Petitioner’s arguments, we provide an overview of Reisman. We have already provided an overview of Zhang. *See supra* Part III.C.1.

1. Overview of Reisman

Reisman relates to interactive television (ITV) systems. Ex. 1052 ¶ 2. An ITV includes “self-contained advanced TVs and TVs with set-top boxes.” *Id.* ¶ 43; *see also id.* ¶ 98 (“The TV/ITV 130 is understood to commonly include a set-top box.”). Reisman teaches that “DVRs may in some cases be integrated with the STB.” *Id.* ¶ 281. Reisman also teaches providing its ITV with picture-in-picture (PIP) functionality. *Id.* ¶ 121.

2. Analysis

We turn now to the claims, starting with independent claims 25, 38, 51, and 64.

a. Independent Claims 25 and 38

As discussed above, Petitioner presents anticipation and obviousness challenges to claims 25 and 38 based on Zhang alone, and we are persuaded by Petitioner’s showing for both challenges. *See supra* Part III.C.

Petitioner alternatively challenges claims 25 and 38 based on Zhang and Reisman. Both claims 25 and 38 recite “wherein the method is performed by a device comprising a digital video recorder (DVR).” Petitioner contends “[t]o the extent Patent Owner argues that Zhang’s PVR is not a ‘DVR’ as recited in Elements [25D] and [38D], Reisman discloses this feature.”⁷ Pet. 45. As support, Petitioner asserts that “Reisman teaches that advanced STBs in a cable system may include a digital video recorder

⁷ Although Petitioner references elements 25D and 38D, we note that it is elements 25F and 38E that recite the “DVR” feature.

(DVR).” *Id.* at 45–46 (citing Ex. 1052 ¶¶ 5, 43, 48, 60, 73, 98, 112, 118, 191, 197, 212, 281–285, 296, 546).

Petitioner further contends that “[a] POSITA would have been motivated to include Reisman’s DVR in Zhang’s STB to provide a more feature-filled and individualized user experience, which in the proposed combination still includes Zhang’s wideband front-end receiver components cited for performing Elements [25A]–[25E].” Pet. 46. According to Petitioner, “Reisman’s DVR improves user experience and flexibility by allowing time-shifted and on-demand viewing, and enabling replay and trick-play (fast forwarding, rewinding, and pausing) of live programming.” *Id.* (citing Ex. 1052 ¶¶ 191, 197, 212, 284). Petitioner also notes that “[a]dding Reisman’s DVR to Zhang’s system would have been nothing more [than] applying a known technique of integrating a DVR into a set-top box, as taught in Reisman, to a known STB with a wideband front-end receiver, as taught by Zhang, that was ready for improvement to yield a predictable result (DVR capabilities added to the STB).” *Id.* Petitioner adds that “[a] POSITA would have had a reasonable expectation of success because STBs and DVRs were well-known in cable television systems, and the components . . . making up such systems were well-known to a POSITA,” and, “[t]hus, implementing the combination was well within the ordinary skillset of a POSITA.” *Id.* at 46–47 (citing Ex. 1052 ¶¶ 72, 112, 197).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that the proposed combination of Zhang and Reisman teaches the recited DVR of claims 25 and 38. As discussed above, Zhang teaches that “[s]ystems using

[its] invention are enabled to perform advanced wide-band front-ends for digital **set-top boxes**, PVRs, home gateways and home media centers.”

Ex. 1013 ¶ 45 (emphasis added) (cited by Pet. 33). Reisman further teaches that “DVRs may in some cases be integrated with the STB.” Ex. 1052 ¶ 281 (cited by Pet. 45–46). We also are persuaded that Petitioner’s proffered reasoning for adding Reisman’s DVR to Zhang’s STB, namely, to improve user experience, is sufficient to support institution. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”).

b. Independent Claim 51

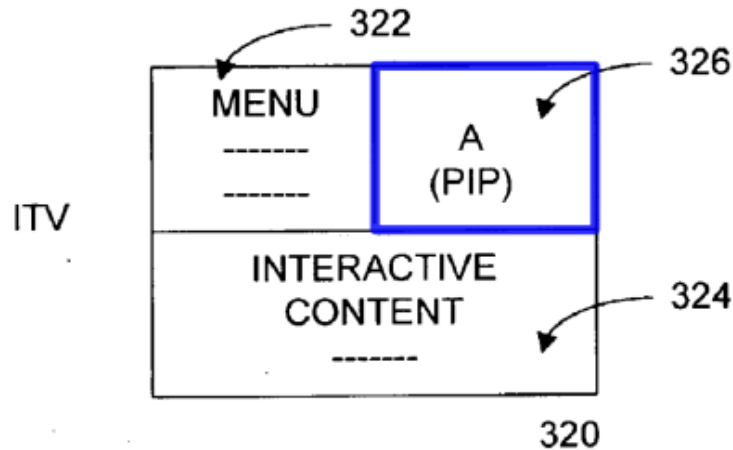
Claim 51 is directed to a “method for receiving a television (TV) signal” and recites various limitations. Petitioner designates the preamble as element 51A and the recited limitations as elements 51B through 51F.

i. Similarly Recited Elements

Elements 51A through 51E are similar to elements 1A through 1E. Thus, Petitioner relies primarily on its analysis for claim 1. Pet. 47. On the record before us, and for the reasons given above as to claim 1, we are persuaded that Petitioner’s showing for elements 51A through 51E is sufficient for purposes of this Decision. *See supra* Part III.C.2.a. As such, we do not determine whether claim 51’s preamble (element 51A) is limiting.

ii. Element 51F: “configuring” step

Unlike claim 1, claim 51 recites “configuring at least some of the plurality of desired channels as an output for a picture-in-picture display.” For this step, Petitioner provides an annotated and truncated version of Figure 3 of Reisman, which is reproduced below.



Petitioner’s version of Figure 3 of Reisman shows an exemplary user interface display layout. *See* Ex. 1052 ¶ 14. Petitioner asserts, “Reisman teaches that . . . advanced set-top boxes in a cable system include a ‘picture-in-picture display’ output for television programming, for example, as shown [in Petitioner’s version of Figure 3 of Reisman] (blue).” Pet. 47–48 (citing Ex. 1052 ¶¶ 73, 98, 118, 120–121, 187, 278, 291, 378, 534, 537, 546).

Petitioner further contends that “[a] POSITA would have been motivated to include Reisman’s ‘picture-in-picture display’ capability in Zhang’s set-top box, which in the proposed combination still has the wideband front-end receiver components cited for performing Elements [51A]-[51E], to allow a user to view different content simultaneously.” Pet. 48 (citing Ex. 1052 ¶¶ 61, 63, 121, 278, 378, 546,

Fig. 3). Referring to its analysis of element 1D, Petitioner adds that “Reisman’s PIP capability and Zhang’s digital front-end receiver provide complementary features, because . . . Zhang’s receiver selects and provides multiple desired channels concurrently to demodulators for simultaneous decoding, and Reisman’s PIP functionality requires and displays two decoded programs simultaneously.” *Id.* at 49 (citing Ex. 1013 ¶¶ 5, 44–45, 11, 29–31, 38–39, 42; Ex. 1052 ¶¶ 378, 534). According to Petitioner,

modifying Zhang with Reisman would have been nothing more than the obvious application of a known technique (configuring with a set-top box desired channels in a picture-in-picture display, as disclosed in Reisman) to a known device (Zhang’s set-top box with a wideband digital front-end receiver) that was ready for improvement to yield a predic[t]able result (PIP capability in the STB).

Id. at 48–49. Petitioner also notes that “[a] POSITA would have had a reasonable expectation of success because STBs with PIP capability were well-known in cable television systems, and assembling and programming the components . . . making up such systems was well within the skillset of a POSITA.” *Id.* at 49 (citing Ex. 1052 ¶¶ 112, 121, 534).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that the proposed combination of Zhang and Reisman teaches the recited “configuring” step of element 51F. For example, Zhang teaches that “[s]ystems using [its] invention are enabled to perform advanced wide-band front-ends for digital set-top boxes, PVRs, home gateways and home media centers.” Ex. 1013 ¶ 45 (cited by Pet. 49). Reisman describes an ITV with “picture-in-picture (PIP) frame 326, which is a region of the screen used to present a reduced scale video image.” Ex. 1052 ¶ 121, Fig. 3 (cited by Pet.

47–48). According to Reisman, its “ITV . . . is understood to commonly include a set-top box.” *Id.* ¶ 98 (cited by Pet. 47–48); *see also id.* ¶ 73 (“STB and TV may be used interchangeably.”) (cited by Pet. 47–48). Thus, Zhang and Reisman together teach or suggest what Petitioner characterizes as an “STB providing desired channels within [a] picture-in-picture display.” Pet. 50 (discussing same PIP limitation with respect to claim 64).

We also are persuaded that Petitioner’s proffered reasoning for adding Reisman’s picture-in-picture display functionality to Zhang’s STB, namely, to allow a user to view different content simultaneously, is sufficient to support institution. *See Kahn*, 441 F.3d at 988.

c. Independent Claim 64

Claim 64 is directed to a “method” and recites similar limitations as claims 1, 13, and 51. Thus, Petitioner relies on its analysis for claims 1, 13, and 51. Pet. 50. On the record before us, and for the reasons given above as to claims 1, 13, and 51, we are persuaded that Petitioner’s showing for claim 64 is sufficient for purposes of this Decision. *See supra* Parts III.C.2.a–III.C.2.b, III.D.2.b.

d. Dependent Claims

As discussed above, we are persuaded by Petitioner’s showing for independent claims 1, 13, 25, 38, 51, and 64. *See supra* Parts III.C.2a–d (discussing claims 1, 13, 25, and 38 with respect to challenges based on Zhang alone); Parts III.D.2.a–c (discussing claims 25, 38, 51, and 64 with respect to challenge based on Zhang and Reisman). Claims 9–12, 21–24, 27–31, 33–37, 40–44, 46–50, 53–57, 59–63, 66–70, and 72–76 depend from

claims 1, 13, 25, 38, 51, or 64. Having reviewed Petitioner's arguments and evidence for these dependent claims, we are persuaded that Petitioner's showing is sufficient for purposes of this Decision. *See* Pet. 47, 51–56.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated a reasonable likelihood of showing that claims 9–12, 21–24, 25, 27–31, 33–37, 38, 40–44, 46–51, 53–57, 59–63, 64, 66–70, and 72–76 would have been obvious over Zhang and Reisman.

E. Remaining Challenges

Petitioner asserts five additional challenges. Specifically, Petitioner asserts that claims 2–6, 14–18, 26–30, and 39–43 would have been obvious over Zhang and Jackson. Pet. 56–69. Petitioner asserts that claims 26–30, 39–43, 52–56, and 65–69 would have been obvious over Zhang, Reisman, and Jackson. *Id.* Petitioner asserts that claims 1, 3–9, 11, 13, 15–21, 23, 32–34, and 45–47 would have been obvious over Zhang and Pandey. *Id.* at 69–75. Petitioner asserts that claims 9–12, 21–24, 32–34, 45–47, 58–60, and 71–73 would have been obvious over Zhang, Reisman, and Pandey. *Id.* Lastly, Petitioner asserts that claims 2–6 and 14–18 would have been obvious over Zhang, Pandey, and Jackson. *Id.* at 75.

As discussed above, Petitioner has already demonstrated a reasonable likelihood that it will prevail on its two asserted challenges based on Zhang alone as well as its asserted challenge based on Zhang and Reisman. *See supra* Parts III.C, III.D. Accordingly, we do not address Petitioner's five additional asserted challenges based on various combinations of Zhang,

Reisman, Jackson, and Pandey. *See SAS Inst. Inc. v. Iancu*, 584 U.S. 357, 359 (2018) (“The agency cannot curate the claims at issue but must decide them all.”); 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

IV. CONCLUSION

For the foregoing reasons, we institute *inter partes* review of all challenged claims based on all asserted challenges in the Petition. *See SAS*, 584 U.S. at 359; 37 C.F.R. § 42.108(a). At this stage of the proceeding, we have not made a final determination with respect to the patentability of any of the challenged claims or the construction of any claim term.

V. ORDER

Accordingly, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, an *inter partes* review is hereby instituted as to claims 1–76 of the ’206 patent on all challenges raised in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which will commence on the entry date of this Decision.

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