

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SIERRA WIRELESS, INC. and
THALES DIS AIS DEUTSCHLAND GMBH,¹
Petitioner,

v.

SISVEL INTERNATIONAL S.A.,
Patent Owner.

IPR2020-01099
Patent 6,529,561 B2

Before BARBARA A. PARVIS, AMANDA F. WIEKER, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

ULLAGADDI, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision on Remand
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318

¹ This proceeding was terminated as to ZTE (USA) Inc. and ZTE Corporation (Paper 36), as well as Dell Inc. (Paper 49). On January 18, 2022, the Board issued a Final Written Decision (Paper 51). On March 18, 2022, Petitioner, including Sierra Wireless, Inc., Cradlepoint, Inc., and Thales DIS AIS Deutschland GmbH, cross-appealed (Paper 54). On October 20, 2022, Patent Owner filed an unauthorized Joint Motion to Terminate Cradlepoint, Inc. (Paper 55), which the Board expunged. The Federal Circuit's Decision does not reference Cradlepoint, Inc. as a cross-appellant in its caption. With the Board's authorization, additional briefing was filed subsequent to remand, and this proceeding was terminated as to Cradlepoint, Inc. (Paper 67).

I. INTRODUCTION

This proceeding is before the Patent Trial and Appeal Board (“the Board”) on remand from the United States Court of Appeals for the Federal Circuit (“the Federal Circuit”). We instituted an *inter partes* review in this proceeding and, on January 18, 2022, issued a Final Written Decision concluding that claims 1–3 and 9 of U.S. Patent No. 6,529,561 B2 (“the ’561 patent”) were shown to be unpatentable by a preponderance of the evidence and that claims 4–8 and 10 were not shown to be unpatentable by a preponderance of the evidence. On October 6, 2023, the Federal Circuit vacated our conclusion that Petitioner had not proven unpatentability of claims 5–8 and 10 and remanded the case to us. *Sisvel Int’l S.A. v. Sierra Wireless, Inc.*, 82 F.4th 1355 (Fed. Cir. 2023). On remand, we conclude that Petitioner has shown, by a preponderance of the evidence, that claims 5–7 and 10 are unpatentable, for the reasons discussed herein. We further conclude that Petitioner has not shown, by a preponderance of the evidence, that claim 8 is unpatentable, as discussed in detail below.

II. BACKGROUND

Cradlepoint, Inc., Dell Inc., Sierra Wireless, Inc., Thales DIS AIS Deutschland GmbH, ZTE Corporation, and ZTE (USA) Inc. filed a Petition requesting an *inter partes* review of claims 1–10 of the ’561 patent. Paper 6 (“Pet.”). Several parties were terminated due to settlement. *Supra* n.1. In this Decision, we collectively refer to the remaining entities—Sierra Wireless, Inc. and Thales DIS AIS Deutschland GmbH—as “Petitioner.”

Sisvel International S.A. (“Patent Owner”) filed a Preliminary Response. Paper 10. We instituted an *inter partes* review on all challenged claims on all grounds set forth in the Petition. Paper 11. Patent Owner thereafter filed a Response to Petition (Paper 25, “PO. Resp.”), Petitioner

filed a Reply (Paper 30, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 33, “PO Sur-reply”). An oral hearing was held on October 19, 2021, and a transcript of the hearing (Paper 50, “Tr.”) has been entered into the record.

We issued a Final Written Decision concluding that claims 1–3 and 9 were shown to be unpatentable by a preponderance of the evidence and that claims 4–8 and 10 were not shown to be unpatentable by a preponderance of the evidence. Paper 51 (“Final Dec.”), 60–61. In relevant part for purposes of this remand, and with respect to Petitioner’s asserted anticipation and obviousness grounds based on Chen, our original Final Written Decision concluded that the “means for detecting” limitation recited in independent claims 5 and 10 lacked sufficient identified structure corresponding to the claimed “detecting” function. Final Dec. 41; *infra* n.3. We were “unable to conclude what structure is encompassed by the ‘means for detecting’” and, therefore, we did not “reach a conclusion as to whether Chen teaches or suggests the subject matter of claims 5 or 10.” In particular, we determined that “the record does not show that corresponding structure has been identified and/or exists in Chen.” *Id.* at 41–42. We made a similar determination as to claims 6 and 7 insofar as each of these claims depend from independent claim 5. *Id.* at 42.

We further concluded that now-remanded claim 8 was not shown to be unpatentable over the combination of Chen and Eriksson or over the combination Chen and GSM 03.64. Final Dec. 42, 60–61; *infra* nn.3–5.

Finally, we concluded that Petitioner had met its burden of demonstrating unpatentability of claims 1–3 and 9, as obvious over Chen. Final Dec. 59–61.

Patent Owner filed a Notice of Appeal of the Final Written Decision with the Federal Circuit. Paper 53. Petitioner subsequently filed a Notice of Cross-Appeal. Paper 54. The Federal Circuit rendered its Decision on October 6, 2023 (Paper 58) and entered its mandate on November 29, 2023 (Paper 57). In its Decision, the Federal Circuit vacated our conclusion regarding the “means for detecting” limitation recited in claims 5 and 10. *Sisvel*, 82 F.4th at 1364, 1370. The Court ordered that, on remand, we “must conduct the analysis appropriate for *Noah* group two, including whether any of the protocols are clearly linked or associated with ‘the function recited in the claim,’^[1] and whether they are ‘adequate structure for performing this function.’” *Id.* at 1370 (citing *Noah Systems, Inc. v. Intuit Inc.*, 675 F.3d 1302, 1313 (Fed. Cir. 2012)). The Court further held that “the Board should have considered the knowledge of a skilled artisan,” and specifically, Dr. Kakaes’s expert testimony, “to assess whether the protocol name sufficiently discloses an understood algorithm corresponding to the means-plus-function limitation.” *Id.* at 1369. The Court also held that we “must either (1) determine whether the claim[s] [are] indefinite and then whether such indefiniteness renders it impossible to adjudicate a prior-art challenge on the merits, or (2) resolve the prior art challenge to the patentability of the claims despite the potential indefiniteness of the means-plus-function term.” *Id.* at 1370.

After the Federal Circuit issued its mandate, we ordered the parties to brief these issues including “the supported construction of the ‘means for detecting’ claim term, as well as the attendant patentability issues of indefiniteness and impossibility as relevant to this claim term.” Paper 59, 3. Petitioner filed an Opening Brief on Remand (Paper 63, “Rem. Pet. Br.”). Patent Owner thereafter filed a Response to Petition (Paper 64, “Rem. PO

Resp.”), Petitioner filed a Reply (Paper 65, “Rem. Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 66, “Rem. PO Sur-reply”).

A. Related Proceedings

The parties identify the following matters related to the ’561 patent:

Sisvel International SA et al. v. ZTE (USA), Inc. et al., Case No. 3:19-cv-01694 (N.D. Tex.) (filed July 15, 2019);

Sisvel International SA v. Dell Inc., Case No. 1:19-cv-01247 (D. Del.) (filed July 1, 2019);

Sisvel International SA v. AnyData Corporation, Case No. 1:19-cv-01140 (D. Del.) (filed June 20, 2019);

Sisvel International SA v. Blu Products, Inc., Case No. 1:19-cv-01141 (D. Del.) (filed June 20, 2019, transferred to S.D. Fla. as Case No. 1:20-cv-20813);

Sisvel International SA v. Cradlepoint, Inc., Case No. 1:19-cv-01142 (D. Del.) (filed June 20, 2019);

Sisvel International SA v. Honeywell International, Inc., Case No. 1:19-cv-01143 (D. Del.) (filed June 20, 2019);

Sisvel International SA v. Verifone Systems, Inc., Case No. 1:19-cv-01144 (D. Del.) (filed June 20, 2019);

Sisvel International SA v. Xirgo Technologies, LLC, Case No. 1:19-cv-01145 (D. Del.) (filed June 20, 2019);

Sisvel International SA et al. v. Tesla, Inc., Case No. 1:19-cv-02288 (D. Del.) (filed Dec. 17, 2019);

Sisvel International S.A. v. Blu Products, Inc., Case No. 1:20-cv-20813 (S.D. Fla.) (filed Feb. 25, 2020); and

u-blox AG et al. v. Sisvel International SA et al., Case No. 3:20-cv-00494 (S.D. Cal.) (filed Mar. 16, 2020). Pet. 2; Paper 7, 1–2.

B. The '561 Patent

The '561 patent is titled “Data Transmission in Radio System” and concerns the application of differing puncturing patterns to an original transmission of a coded data block and to a retransmission of the coded data block. Ex. 1001, codes (54), (57). The '561 patent discloses channel-coding a data block to obtain a coded data block “by using a selected channel coding.” *Id.* at 7:21–22. In the example depicted in Figure 4, coded data block 402 has a code rate of 1/3 because each data symbol has three corresponding channel-coded symbols. *Id.* at 7:23–25.

Coded data block 402 is punctured by removing a certain number of channel-coded symbols according to first puncturing pattern 404. *Id.* at 7:34–39. The '561 patent exemplifies first puncturing pattern 404 with bits 011011011. *Id.* at 7:39–40. The '561 patent explains that “[t]he 0 bit denotes that the channel-coded symbol located at the point in question is removed, while the 1 bit is not removed.” *Id.* at 7:40–42. Punctured coded data block 408 punctured by first puncturing pattern 404 is transmitted, in an original transmission, to a receiver. *Id.* at 7:46–48. Thus, the original transmission comprises the second, third, fifth, sixth, eighth, and ninth channel-coded symbols, because the first, fourth, and seventh symbols are removed by the first puncturing pattern (i.e., as denoted by the 0 bits in the puncturing pattern). *Id.* at 7:49–52.

When the receiver is unable to decode coded data block 408, a retransmission request is transmitted to the transmitter. *Id.* at 7:55–56, 60–61. The receiver’s capability to decode is detected “either by an error detection code or by the fact that an error correcting code cannot correct

errors occurring on the channel with sufficient certainty.” *Id.* at 7:56–59. The ’561 patent discloses that “the code rate of the coded data block to be retransmitted is increased . . . by puncturing the coded data block 402” using second puncturing pattern 406. *Id.* at 8:4–8. Second puncturing pattern 406 removes more symbols than first puncturing pattern 404. *Id.* at 8:8–10. The ’561 patent discloses that, “[i]n the example of FIG. 4, the second puncturing pattern 406 comprises bits 100100100,” which determines that “only the first and the third symbol thereafter are retained, while other symbols are removed.” *Id.* at 8:10–13. In the example, “the punctured and coded data block 410 used in this retransmission comprises symbols 101, i.e. the first, fourth, and seventh symbol of the original channel-coded block 402.” *Id.* at 8:17–20.

Next, “the received coded data block 408 punctured by the first puncturing pattern 404 and the received coded data block 410 punctured by the second puncturing pattern 406 are combined,” which is possible because “both [coded] data blocks 408, 410 are punctured versions of the same coded data block 402.” *Id.* at 8:21–26. In the example of Figure 4:

[T]he second, third, fifth, sixth, eighth and ninth symbol of a combined coded data block 412 are obtained from the coded data block 408 punctured by the first puncturing pattern 404, and the first, fourth and seventh symbol are obtained from the coded data block 410 punctured by the second puncturing pattern 406.

Id. at 8:26–32. Finally, combined coded data block 412 is decoded using, for example, a Viterbi decoder. *Id.* at 8:42–43.

C. Challenged Claims

Petitioner challenged claims 1–10 of the ’561 patent. Claims 5–8 and 10 are remanded for further consideration. Of the remanded claims, claims 5 and 10 are independent and reproduced below.

5. [preamble] A radio system comprising:

[5a] a transmitter and a receiver having a radio connection to the transmitter;

[5b] the transmitter comprising a channel coder for channel coding a data block into a coded data block by using a selected channel coding and for puncturing the coded data block by using a first puncturing pattern, and transmission means for transmitting the coded data block punctured by the first puncturing pattern to the receiver; and

[5c] the receiver comprising a channel decoder for decoding the received coded data block, *means for detecting* a need for retransmission of the received coded data block, and means for transmitting a retransmission request of the coded data block to the transmitter;

[5d] wherein:

the channel coder increases the code rate of the coded data block to be retransmitted by puncturing the coded data block coded by the channel coding of the original transmission by using a second puncturing pattern comprising fewer symbols to be transmitted than the first puncturing pattern;

[5e] the transmission means transmit[s] the coded data block punctured by the Second puncturing pattern to the receiver;

[5f] the receiver comprises means for combining a received coded data block punctured by the first puncturing pattern and a received coded data block punctured by the second puncturing pattern; and

[5g] the channel decoder decodes the channel coding of the combined coded data block.

Ex. 1001, 12:1–31 (emphasis and bracketed reference letters added).

10. A radio receiver comprising:

reception means for receiving a coded data block channel coded by a selected channel coding and punctured by a first puncturing pattern;

a channel decoder for decoding the received coded data block;

means for detecting a need for retransmission of the received coded data block; and

means for transmitting a retransmission request of the coded data block to a transmitter;

wherein:

the reception means receive the retransmitted coded data block whose code rate has been increased by puncturing the coded data block coded by the channel coding of the original transmission by using a second puncturing pattern comprising fewer symbols to be transmitted than the first puncturing pattern;

the reception means includes means for combining the received coded data block punctured by the first puncturing pattern and the received coded data block punctured by the second puncturing pattern;

a channel decoder decodes the channel coding of the combined coded data block.

Id. at 13:1–14:12 (emphasis added).

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–10 as follows. *See* Pet. 7. As discussed above, however, only claims 5–8 and 10 are before us on remand.

Claims Challenged	35 U.S.C. §²	Reference(s)/Basis
1–3, 5–7, 9, 10	§ 102	Chen ³
1–3, 5–7, 9, 10	§ 103	Chen
1–10	§ 103	Chen, Eriksson ⁴
1–10	§ 103	Chen, GSM 03.64 ⁵

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), amended 35 U.S.C. § 102 and § 103, effective March 16, 2013. Because the application from which the ’561 patent issued was filed before this date, the pre-AIA version of § 102 and § 103 applies.

³ World Intellectual Property Organization Patent Application No. PCT/US98/24155, filed Nov. 12, 1998, Publication No. WO 99/26371, published May 27, 1999, to Tao Chen et al. (Ex. 1003, “Chen”).

⁴ S. Eriksson et al., “*Comparison of Link Quality Control Strategies for Packet Data Services in EDGE*,” 1999 IEEE 49th Vehicular Technology Conference, May 16–20, 1999 (Ex. 1004, “Eriksson”).

⁵ Special Mobile Group of the European Telecommunications Standards Institute (“ETSI”), Global System for Mobile Communications (GSM) Technical Specification (TS) 101 350 V8.0.0 (1999–07), “Digital cellular telecommunications system (Phase 2+); General Packet Radio Service

Petitioner relies on the First and Second Declarations of Dr. Apostolos Kakaes (Exs. 1002, 1023) as well as the Declarations of Mr. Craig Bishop (Ex. 1007) and Mr. Gerard Grenier (Ex. 1008) in support of the contentions in the Petition.

Patent Owner relies on the First and Second Declarations of Mr. Regis Bates (Exs. 2001, 2005) in support of its contentions.

III. ANALYSIS

A. *Principles of Law*

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

As set forth in 35 U.S.C. § 103(a),

[a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level

(GPRS); Overall description of the GPRS radio interface; Stage 2,” GSM 03.64, Version 8.0.0, Release 1999 (Ex. 1005, “GSM 03.64”).

of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). An obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007); *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). However, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, Petitioner must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. Cir. 2016). The scope of the prior art includes all analogous art. *Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1359 (Fed. Cir. 2020). We analyze the asserted ground of unpatentability in accordance with these principles to determine whether Petitioner has met its burden to demonstrate by a preponderance of the evidence that the challenged claims are unpatentable.

B. Level of Ordinary Skill in the Art

Petitioner does not present a definition for the level of ordinary skill in the art (“POSITA”) in its Petition. *See generally* Pet. In his Declaration, Dr. Kakaes testifies that:

A POSITA [person of ordinary skill in the art] at the time of the alleged invention (September 10, 1999) would have had a degree in electrical engineering or a similar discipline, with at least three years of relevant industry or research experience, including designing or implementing cellular radio systems for data transmission and retransmission. A POSITA would also have

familiarity with the GSM standard and the EGPRS [Enhanced General Packet Radio Service] enhancement.

Pet. 37–38 (citing Ex. 1002 ¶¶ 15–25).

In its Patent Owner’s Response, Patent Owner states:

[A] person having ordinary skill at the time of invention—September 10, 1999—in the relevant art would be one with a bachelor’s degree in electrical engineering or computer sciences and telecommunications networks, along with at least three or more years of practical experience in the field. A combination of more experience in the field and less education or more education and less experience in the field would also suffice.

PO Resp. 7 (citing Inst. Dec. 9; Ex. 2001 ¶ 27). In our original Final Written Decision, we determined that:

Although there are differences between the contentions of the parties as to the level of ordinary skill in the art, the parties have not informed us of a dispute that needs to be resolved. We do not find it necessary to resolve the differences between the contentions of the parties as to the appropriate level of ordinary skill in the art because the findings and conclusions rendered in this Decision do not turn on either proposed definition. We determine, on this record, that the level of ordinary skill proposed by Patent Owner is consistent with the ’561 patent and the asserted prior art. As such, we adopt Patent Owner’s proposed definition for a person of ordinary skill in the art.

Final Dec. 10. Based on our review of the entire record, we are not apprised of nor can we ascertain any reason to deviate from this determination. As such, in this Final Written Decision on remand, we maintain the definition of level of ordinary skill in the art from the original Final Written Decision.

C. Claim Construction

For cases like this one, where the petition for *inter partes* review was filed after November 13, 2018, we interpret claim terms in accordance with

the standard used in federal district court in a civil action involving the validity or infringement of a patent. *See* 37 C.F.R. § 42.100(b) (2019).

Claim limitations that include the terms “means” or “means for” are presumed to invoke 35 U.S.C. § 112 ¶ 6. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc in relevant part). Claims subject to 35 U.S.C. § 112 ¶ 6 are construed in a “two-step process,” whereby we “first identify the claimed function,” and then “determine what structure, if any, disclosed in the specification corresponds to the claimed function.” *Id.* at 1351. Accordingly, the rules governing this *inter partes* review require that Petitioner “identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” 37 C.F.R. § 42.104(b)(3).

It is well established that “the corresponding structure for a § 112 ¶ 6 claim for a computer-implemented function is the algorithm disclosed in the specification.” *Aristocrat Techs. Austl. Pty Ltd. vs. Int’l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008) (quoting *Harris Corp. v. Ericsson Inc.*, 417 F.3d 1241, 1249 (Fed. Cir. 2005)); *see also EON Corp. IP Holdings, LLC v. AT&T Mobility LLC*, 785 F.3d 616, 623 (Fed. Cir. 2015) (“A microprocessor or general purpose computer lends sufficient structure only to basic functions of a microprocessor. All other computer-implemented functions require disclosure of an algorithm.”). The Federal Circuit has held that “[t]he specification can express the algorithm ‘in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure.’” *Noah*, 675 F.3d at 1312 (citing *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008) (internal citation omitted)).

1. Federal Circuit's Holding on "means for detecting"

In relevant part, independent claims 5 and 10 recite a "means for detecting a need for retransmission of the received coded data block." The Federal Circuit held that "the Board erred in analyzing the 'means for detecting' limitation." *Sisvel*, 82 F.4th at 1364. In particular, the Federal Circuit pointed out that the implicit construction of the function corresponding to the "means for detecting" differed from the express construction of the function set forth in the original Final Written Decision. *Id.* at 1370 n.13. Specifically, the Board determined the function of "means for detecting limitation" to be "detecting a need for retransmission of the received coded data block," but also determined that "Petitioner has not shown that the '561 patent presents an algorithm for how the error detection code detects an error, nor explained the circumstances under which the error correcting code cannot correct errors and what constitutes 'sufficient certainty.'" *Compare* Final Dec. 12, *with id.* at 16–17.

We also revisit and reconsider "whether any of the protocols [disclosed in the '561 patent's Specification] are clearly linked or associated with 'the function recited in the claim,'[¶] and whether they are 'adequate structure for performing this function.'[¶]" *Sisvel*, 82 F.4th at 1370. The Federal Circuit indicated that "[i]t is not clear from the Board's decision whether it ever settled on which of the protocols named in the specification (e.g., ARQ [Automatic Repeat Request], hybrid ARQ, etc.) are 'clearly linked' to the 'means for detecting' limitation. *Id.* at n.12. The Federal Circuit also instructed us to "conduct the analysis appropriate for *Noah* group two." *Id.*

In *Noah*, the Federal Circuit held that "our case law regarding special purpose computer-implemented means-plus-functions claims is divided into

two distinct groups: [f]irst, cases in which the specification discloses no algorithm; and second, cases in which the specification does disclose an algorithm but a [party] contends that disclosure is inadequate.” *Noah*, 675 F.3d at 1313 (alterations added). In conducting an analysis consistent with the second group of cases in *Noah*, the Federal Circuit stated that we must “consider[] expert testimony to ‘shed light on’” “the protocols identified in the specification.” *Id.* at 1369 (citing *Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1302 (Fed. Cir. 2005)).

2. *Post-remand Briefing on “means for detecting”*

Although the parties were given the opportunity, on remand, to address matters of claim construction (Paper 59, 3), neither party clearly articulates the entirety of its position on how, specifically, the “means for detecting” should be construed (*see generally* Rem. Pet. Br; Rem. PO Resp.).

Patent Owner contends that, “[i]n this case, the structure referred to is an algorithm employed in the FEC [Forward Error Correction], ARQ, and CRC [Cyclic Redundancy Code or Check] processes.” Rem. PO Resp. 3.

Petitioner points out disclosures in the ’561 patent, contending that “[t]he specification first explains—when discussing Figure 4—that an error detection code is used to detect a need for retransmission.” Rem. Pet. Br. 5 (citing Ex. 1001, 7:53–59)⁶. Petitioner further contends that “[t]he specification then notes that this error detection code is ‘preferably implemented as software,’ although ‘[i]mplementation by hardware is also feasible.’” *Id.* (citing Ex. 1001, 7:53–59, 7:65–8:3, 10:64–11:4, 10:1–2, Fig. 2); *see also id.* (“The claimed function has already been determined by the

⁶ The cited portion of the ’561 patent in column 7 discusses Figure 5.

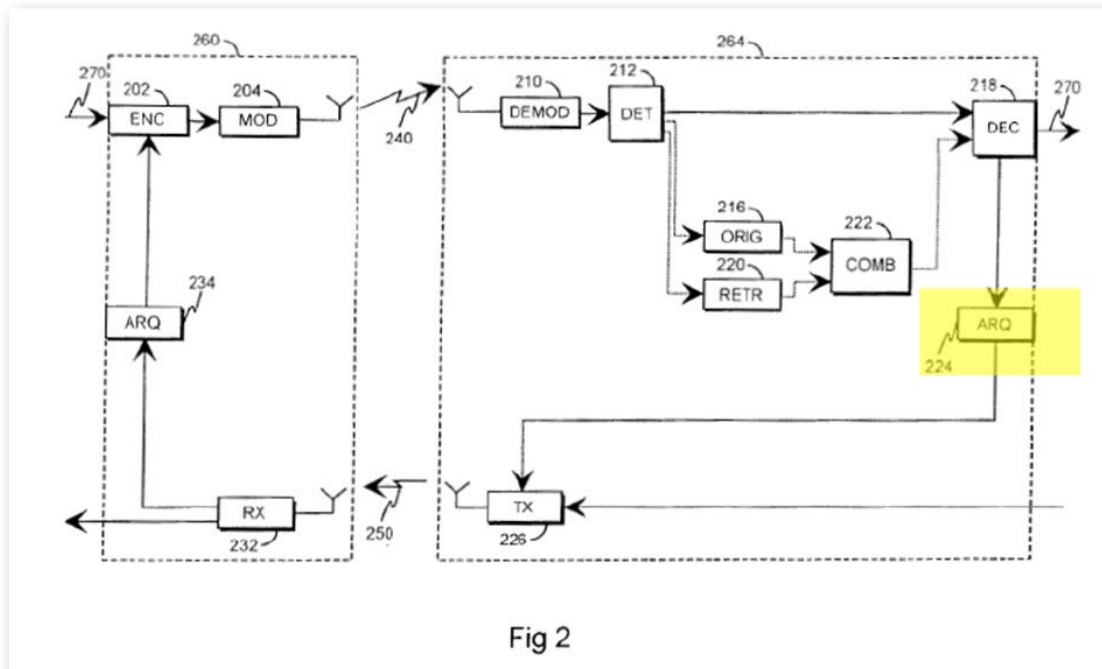
Board to be ‘detecting a need for retransmission of the received coded data block.’”).

a) *Petitioner’s Contentions for Structure Corresponding to “means for detecting”*

Petitioner contends that

the undisputed evidence and testimony is sufficient to support a Board finding that a POSITA would have understood the ’561 patent’s disclosure of the GSM FEC, ARQ, and hybrid ARQ protocols well enough to convey sufficient structure, including an understanding of the necessary algorithm, to implement the claimed “means for detecting” in a telecommunications system.

Rem. Pet. Br. 2. Petitioner further points to its annotated version of Figure 2 of the ’561 patent, reproduced below, in which “highlighting of 224/ARQ block [is] added” to show that “the error correction coding is linked to the ARQ protocol.” *Id.* at 6.



Petitioner’s annotated version of Figure 2 of the ’561 patent.

According to Petitioner, “the specification explicitly links the ‘means for detecting’ with the GSM’s protocols for ARQ and hybrid FEC/ARQ both in its discussion and in Figure 2 above.” *Id.* at 7 (citing Paper 58 (Federal Circuit’s Decision), 24–25).

In support, Dr. Kakaes testifies that “[t]here were . . . a number of robust solutions in the field of error control coding for digital transmissions that addressed this problem by the date of the alleged invention.” Ex. 1002 ¶ 85. In particular, Dr. Kakaes testifies about solutions that were well-known to a POSITA and how they operated: FEC (*id.* ¶ 86); ARQ (*id.* ¶¶ 91–93, 100); and hybrid ARQ (*id.* ¶¶ 94–100). Dr. Kakaes also testifies about the CRC protocol. *Id.* ¶¶ 88, 89.

b) Patent Owner’s Contentions as to Structure Corresponding to “means for detecting”

Patent Owner contends that “Petitioner needs Dr. Kakaes to explain how a POSITA would understand the purported structures (i.e., FEC, ARQ, CRC, and related hybrid systems) to describe how the function of detecting a need for retransmission by an error correction code—or that the error correction code cannot correct an error with sufficient certainty—is carried out.” Rem. PO Resp. 4. Patent Owner claims Petitioner’s showing does not provide such explanation, let alone an explanation as to “how to determine what ‘sufficient certainty’ is in this context—just as the Board originally noted in its Final Written Decision.” *Id.* at 5–6 (citing Final Dec. 17); *see id.* at 8–9 (distinguishing *AllVoice Computing PLC v. Nuance Communs., Inc.*, 504 F.3d 1236 (Fed. Cir. 2007) on the same basis).

Patent Owner also contends that “Petitioner has not met its burden to show any protocols are associated with the function recited in means plus function claim” because Petitioner must also “establish through expert

testimony *how* those structures detect a need for retransmission.” Rem. PO Resp. 1 (citing Paper 58, 24), 3. Patent Owner argues Petitioner’s showing is insufficient because Petitioner allegedly “tak[es] from the background material of the proceedings of an IEEE technical conference.” *Id.* at 6 (citing Paper 63, 10). According to Patent Owner, “[t]his is precisely the kind of implication of structure from background knowledge the Federal Circuit instructed courts to avoid.” *Id.* (citing Rem. Pet. Br. 23–24; *Biomedino, LLC v. Waters Techs. Corp.*, 490 F.3d 946, 952–953 (Fed. Cir. 2007)).

3. *Analysis of the Parties’ Contentions and Declarants’ Testimony*

Of particular relevance to the claimed function of the “means for detecting,” Patent Owner contends Petitioner’s “citations alone, do not describe *how* these protocols determine a need for retransmission by use of error correction coding or *how* the error correcting code determines that it cannot correct errors with ‘sufficient certainty’” and that “[t]hese are the very same deficiencies that the Board recognized in its Final Written Decision.” Rem. PO Resp. (citing Final Dec. 16–17; Paper 58, 22–25). However, Patent Owner does not point us to, nor are we able to discern, a portion of the record that supports importing additional, unclaimed features from the Specification for the function of the “means for detecting”—namely, the circumstances under which the error correcting code cannot correct errors and what constitutes sufficient certainty (that an error cannot be corrected) as we did in the original Final Written Decision. *See* Final Dec. 16–17; *Sisvel*, 82 F.4th at 1370, n.13.

Based on the complete record including post-remand briefing discussed above, we maintain our express construction of the claimed function as “detecting a need for retransmission of the received coded data block.” *See, e.g.*, Ex. 1001, 7:53–59, 10:41–45. We do not require Petitioner

to *also* show the circumstances under which the error correcting code cannot correct errors and what constitutes sufficient certainty (that an error cannot be corrected) as we did in the original Final Written Decision. *See* Final Dec. 16–17; *Sisvel*, 82 F.4th at 1370, n.13.

With regard to Patent Owner’s arguments that Petitioner’s expert does not explain *how* the purported structures perform the function of detecting a need for retransmission, *see supra* Section III.C.2.b, as discussed below, we determine that Dr. Kakaes does explain how the disclosed protocols “detect[] a need for retransmission of the received coded data block,” as claimed.

By way of background, the ’561 patent discloses “a method of transmitting data in a radio system,” preferably used in GSM’s EGPRS. Ex. 1001, 1:11–23, 4:63–65. The ’561 patent discloses a “means (224) for detecting a need for retransmission of the received coded data block,” a “CCU [Channel Coding Unit] [that] is responsible for channel coding, including forward error coding FEC” as well as detecting the “[t]he need for retransmission . . . by an error detection code or by the fact that an error correcting code cannot correct errors occurring on the channel with sufficient certainty.” *Id.* at (57), 2:25, 6:64–65, 7:54–59; *see id.* at Fig. 5, Step 508, 10:41–44. The ’561 patent discloses example protocols such as “hybrid FEC/ARQ . . . , which uses error correction coding in order to decrease the number of retransmissions.” *Id.* at 2:33–37.

As determined in our original Final Written Decision, and as is apparently not now in dispute, the record sufficiently supports a finding that a POSITA would have known of the FEC, CRC, ARQ, and hybrid ARQ protocols. Final Dec. 15, 16. Dr. Kakaes’s testimony as to ARQ, CRC, and hybrid ARQ explains how these protocols “detect[] a need for

retransmission of the received coded data block,” as claimed. Ex. 1002 ¶¶ 86, 88, 89, 91–100; *contra* Rem. PO Resp. 1.

For example, with respect to the CRC protocol, Dr. Kakaes testifies that “CRCs are often referred to as ‘error detecting codes’ as they are typically used¹ to detect whether a received data message is or is not erroneous.” Ex. 1002 ¶ 88. Dr. Kakaes further testifies that

[t]o use a CRC, the transmitter runs a polynomial division of the data block (before forward error correcting code has been applied, if any) to calculate a “remainder” consisting of a predetermined number of bits, for example 16, which are also called “parity bits,” or “check bits,” or “checksum bits,” or “CRC bits” that are attached to the block to be encoded and then transmitted, in whichever way it may or may not be encoded, punctured, etc. After reception and channel decoding (recall that means determining the “maximum likelihood” message), the receiver then runs the same polynomial division of the received decoded data block (which includes the parity bits) and, ***if the result does not match the “remainder,” i.e., the “parity bits” are not consistent with the determined message, the decoded data block “fails” the “check,” i.e., is declared as being erroneous.*** As it turns out such a determination is never wrong. In other words, the “false negative” rate is 0.

Id. (emphasis added).

With regard to the ARQ protocol, Dr. Kakaes testifies that “[i]n an ARQ scheme, the receiver automatically requests retransmission of a data packet if it is detected to be erroneous, such as through the use of CRC, as discussed above.” *Id.* ¶ 91.

With regard to a hybrid ARQ protocol, Dr. Kakaes testifies that “Hybrid ARQ, or ‘HARQ,’ which combines the ARQ protocols with forward error correction.” *Id.* ¶ 94. Dr. Kakaes adds that “[i]f channel conditions are good, the type-I HARQ may send the transmission with less forward error correction redundancy.” *Id.* ¶ 96. Dr. Kakaes also testifies that

“[i]f conditions are poor, the type-I HARQ may adapt by selecting a different modulation and coding scheme that sends more redundancy to decrease the likelihood that an ARQ will be necessary.” *Id.* Dr. Kakaes also testifies about

“type-II” HARQ is another HARQ variation that is particularly relevant to the ’561 patent and, thus, to my opinions below. This variation again uses ARQ and the addition of forward error correction (i.e., HARQ), but it provides for the use of incremental redundancy. Thus, instead of resending the exact same coded data block, the transmitter can instead send a different, incrementally redundant coded data block to be added to the initial coded data block before performing the decoding.

Id. ¶ 97.

The above-cited testimony of Dr. Kakaes sufficiently supports Petitioner’s contentions that the CRC, ARQ, and hybrid ARQ protocols perform the claimed function of “detecting a need for retransmission of the received coded data block.” The above-cited testimony also rebuts Patent Owner’s arguments that Petitioner does not carry its burden “to establish through expert testimony *how* those structures detect a need for retransmission.” Rem. PO Resp. 1 (citing Paper 58, 24), 3; *see, e.g.*, Ex. 1002 ¶¶ 86, 88, 89, 91–100.

Although we determine that Dr. Kakaes’s testimony sufficiently explains how each of the CRC, ARQ, and hybrid ARQ protocols perform the claimed function, we determine that *only* the ARQ protocol is clearly linked to the “means for detecting” as shown in block 224 of Figure 2 of the ’561 patent. CRC and hybrid ARQ explained by Dr. Kakaes are not disclosed in the specification as being linked to the “means for detecting.” *See* Ex. 1001, 2:33–37 (“An example of such a protocol is the hybrid FEC/ARQ (Forward Error Correction/Automatic Repeat Request), which

uses error correction coding in order to decrease the number of retransmissions.”). Other protocols explained by Dr. Kakaes are not disclosed in the specification at all. Accordingly, Petitioner persuasively shows that the Specification of the ’561 patent discloses an algorithm “that provides sufficient structure” for the “means for detecting,” including through expert testimony that describes how this protocol, which Dr. Kakaes testifies would have been well-known to a POSITA, carries out the function of “detecting a need for retransmission of the received coded data block,” as recited in independent claims 5 and 10.

Our determination is supported by Patent Owner’s contention that “[i]n this case, the structure referred to is an algorithm employed in the FEC, ARQ, and CRC processes.” Rem. PO Resp. 3; *see also* Ex. 1024, 106:17–107:16 (Patent Owner’s Declarant testifying that a POSITA would have known that a CRC could be used to “detect whether or not we could accept - ACK [acknowledgment] or NACK [negative acknowledgment] the data”).

4. Summary

We reiterate our determinations for other means-plus-function claim terms from the original Final Written Decision for our analysis of remanded claims 5–8 and 10.

Limitation	Function	Corresponding Structure
“transmission means for transmitting the coded data block punctured by the [first/second] puncturing pattern to [the/a] receiver” (claims 5, 9)	transmitting the coded data block punctured by the first puncturing pattern to [the/a] receiver and transmit[ing] the coded data block punctured by the second puncturing	a modulator modulating digital signals to a radio frequency carrier wave and equivalents thereof

Limitation	Function	Corresponding Structure
	pattern to the receiver	
“means for detecting a need for retransmission of the received coded data block” (claims 5, 10)	detecting a need for retransmission of the received coded data block	the ARQ protocol and equivalents thereof
means for transmitting a retransmission request of the coded data block to [the/a] transmitter” (claims 5, 10)	transmitting a retransmission request of the coded data block to [the/a] transmitter	radio transmitter and equivalents thereof
“means for combining [a/the] received coded data block punctured by the first puncturing pattern and [a/the] received coded data block punctured by the second puncturing pattern” (claims 5, 10)	combining a received coded data block punctured by the first puncturing pattern and a coded data block punctured by the second puncturing pattern	symbol combination software executed in a processor or hardware and equivalents thereof
“means for receiving a retransmission request of the coded data block” (claim 9)	receiving a retransmission request of the coded data block	radio receiver demodulator and equivalents thereof
“reception means for receiving a coded data block channel-coded by a selected channel coding and punctured by a first puncturing pattern”/“reception means [to] receive the retransmitted coded data block” (claim 10)	receiving the coded data block channel-coded by the selected channel coding and punctured by the first puncturing pattern and “receiv[ing] the retransmitted coded data block”	radio receiver demodulator and equivalents thereof

D. Anticipation Based on Chen

Petitioner contends that claims 1–3, 5–7, 9, and 10 are unpatentable as anticipated under 35 U.S.C. § 102 by Chen. Pet. 38–69. Our Final Written Decision with respect to the unpatentability of claims 1–3 and 9 was affirmed. *Sisvel*, 82 F.4th at 1362–3. On remand, we consider only claims 5–7 and 10.

As discussed *infra* in Section II.E, we conclude that Petitioner establishes that remanded claims 5–7 and 10 are unpatentable as obvious under 35 U.S.C. § 103 over Chen. As we determine that Petitioner is successful in its obviousness challenge for these claims, we need not and do not reach Petitioner’s anticipation challenge to claims 5–7 and 10 based on Chen.

E. Obviousness Based on Chen

Petitioner contends that claims 1–3, 5–7, 9, and 10 are unpatentable as obvious under 35 U.S.C. § 103 over Chen. Pet. 38–70. Our decision that claims 1–3 and 9 were shown to be unpatentable as obvious over Chen was affirmed. *Sisvel*, 82 F.4th at 1362–3. On remand, we consider only whether claims 5–7 and 10 would have been obvious over Chen.

Patent Owner does not present any arguments regarding the specific limitations of claim 5 in its briefing on remand beyond that which was discussed above in Section III.C.⁷

⁷ With respect to the challenges applying Chen, Patent Owner presents several arguments in its Patent Owner Response. *See, e.g.*, PO Resp. 9–16. These arguments were addressed in the original Final Written Decision (*see, e.g.*, Final Dec. 26–38) and affirmed by the Federal Circuit (*Sisvel*, 82 F.4th at 1362–63). To the extent that Patent Owner’s arguments are applicable to independent claim 5 (Patent Owner addresses all the claims in challenges

For the reasons that follow, we conclude that Petitioner establishes that remanded claims 5–7 and 10 are unpatentable as obvious under 35 U.S.C. § 103 over Chen.

1. Overview of Chen

Chen is titled “Method and Apparatus for Time Efficient Retransmission Using Symbol Accumulation.” Ex. 1003, code (54). Chen discloses convolutional encoder 314 that channel codes input bits using one or more of generators g0, g1, g2, and g3. *See generally id.* at 13–15. According to Chen, “convolutional encoder 314 is designed for the necessary code rate” and produces code symbols with an exemplary code rate of $\frac{1}{2}$ by using “only two generators (e.g., g0 and g1 from summers 514a and 514b, respectively)” and omitting remaining generators g2 and g3. *Id.* at 13:30–33.

A source device sends a packet to a destination device, which “acknowledges every received packet and sends an ACK message back to the source device if the packet is received correctly or a NACK message if the packet is received in error.” *Id.* at 12:19–22. “For each transmitted packet, the source device monitors the ACK and NACK messages and retransmits the packets received in error the identical code symbols which were transmitted previously.” *Id.* at 13:15–16. In an alternative embodiment, Chen discloses that if the packet from the original transmission, which includes code symbols from generators g0 and g1, is received in error, “the retransmitted packet can comprise the code symbols from other generators

applying Chen, together), we incorporate our analysis from the original Final Written Decision herein.

which have not been transmitted previously (e.g., generators g2 and/or g3).” *Id.* at 14:4–8.

Chen describes how different code rates can be generated by puncturing. *Id.* at 14:25–26. In Chen’s example, the original transmission includes code symbols from generators g0 and g1 for a code rate $\frac{1}{2}$ and the retransmission includes “code symbols from generators g2 and g3 which have been punctured to rate $\frac{3}{4}$.” *Id.* at 14:30–33. In this example, “[t]he accumulated packet from both transmissions would comprise code symbols from generators g0, g1, g2 and g3 having a punctured rate [of] $\frac{3}{10}$.” *Id.* at 14:33–35. Chen discloses that “[p]uncturing reduces the number of code symbols to be retransmitted but also reduces the error correcting capability of the convolutional code.” *Id.* at 14:35–37.

According to Chen, “[a]t the receiver, the code symbols for the retransmitted packets can be combined with the corresponding code symbols from prior transmissions or can replace those prior transmitted symbols.” *Id.* at 13:33–36.

2. *Obviousness of Independent Claim 5*

[preamble] A radio system comprising:

Petitioner contends that “[i]f the preamble is considered limiting, Chen discloses it for the reasons in [Petition] §VIII.A.1.a” regarding claim 1. Pet. 53 (citing Ex. 1002 ¶422). In the cited portion of the Petition, Petitioner contends that “Chen teaches transmission and retransmission of data in a radio system from a transmitter to a receiver.” Pet. 38 (citing Ex. 1003, Title, 3:25–30, 6:4–29, 7:11–13; 8:15–17, Figs. 1–2). According to Petitioner, “Chen’s exemplary communication system transmits data from a base station 4 to a remote station 6.” *Id.* (citing Ex. 1003, 6:4–29, Fig. 1). Petitioner points out that “[t]ransmitter (‘TMTR’) 126 is located at base

station 4, and receiver (‘RCVR’) 206 is located at remote station 6.” *Id.* (citing Ex. 1003, Fig. 2; Ex. 1002 ¶¶ 342–346).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches the subject matter of the preamble of independent claim 5.

[5a] a transmitter and a receiver having a radio connection to the transmitter;

Petitioner contends that “Chen discloses this limitation for the reasons discussed in [Petition] §VIII.A.1.a” regarding claim 1. Pet. 53. Petitioner further contends that “Chen teaches a radio system with a transmitter connected to a receiver.” *Id.* (citing Ex. 1003, Title, 3:25–30, 6:4–29, 7:11–13; 8:15–17, Figs. 1–2). Petitioner explains that “[s]ignal paths 10 and 12 are a radio connection between the transmitter/receiver in base station 4 and receiver/transmitter in remote station 6.” *Id.* (citing Ex. 1003, 6:13–7:15, Figs. 1–2; Ex. 1002 ¶¶ 423–425).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5a] of independent claim 5.

[5b] the transmitter comprising a channel coder for channel coding a data block into a coded data block by using a selected channel coding and for puncturing the coded data block by using a first puncturing pattern, and transmission

means for transmitting the coded data block punctured by the first puncturing pattern to the receiver; and

Petitioner further contends that “Chen discloses or renders obvious this limitation for the reasons in [Petition] §§ VIII.A.1.b-d” regarding claim 1. Pet. 53–54. Petitioner explains that “[i]n short, Chen teaches encoder 112 with convolutional encoder 314 that channel-codes a data block and punctures the resulting coded data block.” *Id.* at 54 (citing Ex. 1002 ¶¶ 426–433).

With respect to the recited “transmission means,” Petitioner contends that “Chen teaches the transmission of the coded data block punctured by the first puncturing pattern from the transmitter to the receiver.” Pet. 54 (citing Ex. 1003, 3:13–15, 7:6–15, 8:15–23, Fig. 2). Petitioner further contends that

Chen teaches the same or an equivalent structure to “a modulator modulating digital signals to a radio frequency carrier wave” when it teaches “[t]he short PN spread data is provided to transmitter (TMTR) 126 (see FIG. 2) which filters, modulates, and amplifies the signal. The modulated signal is routed through duplexer 128 and transmitted from antenna 130 on the forward link through signal path 10.”

Id. (citing Ex. 1003, 7:12–15, 5:23, 7:5–15, 8:15–23, Figs. 2, 3; Ex. 1002 ¶¶ 429–433); *supra* III.C.3 (construction of mean-plus-function terms, including function and corresponding structure).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5b] of independent claim 5, including the function and corresponding structure or equivalents for the claimed “transmission means.”

[5c] the receiver comprising a channel decoder for decoding the received coded data block, means for detecting a need for retransmission of the received coded data block, and means for transmitting a retransmission request of the coded data block to the transmitter;

Petitioner contends that “Chen discloses this limitation for the reasons in [Petition] §§ VIII.A.1.e-f’ regarding claim 1. Pet. 55 (citing Ex. 1002 ¶¶ 434–447). Petitioner also contends that “Chen further teaches that the remote station comprises a channel decoder (decoder 210) for decoding the received coded data block.” *Id.* (citing Ex. 1003, 8:24–28, Fig. 8). Petitioner further contends that “Chen discloses the function of detecting a need for retransmission of the received coded data block.” *Id.* at 56 (citing Ex. 1003, 3:15–21; 8:24–29; 12:12–14). We are persuaded by Petitioner’s contention that Chen teaches the claimed function of “detecting a need for retransmission of the received coded data block” because Chen teaches that

the destination device, the received packet is demodulated and convolutionally decoded with a Viterbi decoder. The decoded data is then checked by a CRC checker to determine if the received packet has been decoded correctly or in error. *The CRC check is only able to determine whether an error within the decoded packet is present. The CRC check is not able to correct the error. Therefore, another mechanism is required to allow correction of the data packets received in error.*

Ex. 1003, 3:15–21 (emphasis added).

With respect to the structure corresponding to the “means for detecting,” Petitioner points out that

Chen explains this function is performed by the structure of a “CRC check element 816” . . . that “performs the CRC check and conditionally provides the checked data to data sink 212.” CRC is an error detection code that is typically executed as software on a processor, and *is the same type of error-detecting code algorithm in the ’561 patent.* Chen thus discloses the same

function and the same or equivalent structure to the “means for detecting” under any reasonable construction.

Id. (citing Ex. 1002 ¶¶ 439–447) (emphasis added).

Chen’s CRC check element 816 is a protocol or structure equivalent to the ARQ protocol corresponding to the claimed “means for detecting” because CRC check element 816 achieves the same result as the ARQ protocol that is the structure corresponding to the “means for detecting” as discussed in Section III.C.3. *See, e.g.*, Ex. 1002 ¶ 443 (“Chen teaches both the same function and the same or an equivalent structure to the ‘means for detecting . . .’ with the structure of ‘error detecting code or error-correcting code software executed in a processor or hardware,’ specifically, a CRC, under any reasonable construction of this term.”).

As Chen discloses, “[t]he CRC check is only able to determine whether an error within the decoded packet is present,” “not . . . correct the error,” “[t]herefore, another mechanism is required to allow correction of the data packets received in error.” Ex. 1003, 3:18–21.

As Dr. Kakaes testifies, “[i]n ARQ scheme, the receiver automatically requests retransmission of a data packet if it is detected to be erroneous, such as through the use of CRC”—that is, Dr. Kakaes testifies that a CRC is used as a part of the disclosed ARQ scheme. Ex. 1002 ¶ 91. Chen’s CRC check element 816 is equivalent to the ARQ protocol disclosed in the ’561 patent because both detect whether there is an error in a received, decoded packet.

Our determination is further supported, in part, by Patent Owner’s acknowledgment that “[i]n this case, the structure referred to [for the “means for detecting”] is an algorithm employed in the FEC, ARQ, and CRC processes.” Rem. PO Resp. 3; *see also* Ex. 1024, 106:17–107:16 (Patent Owner’s declarant testifying that a POSITA would have known that a CRC

could be used to “detect whether or not we could accept -- ACK 13 or NACK the data”).

Petitioner also contends that “Chen also discloses the function and structure of a ‘means for transmitting a retransmission request of the coded data block to the transmitter.’” Petitioner explains that

[a]s set forth in [Petition] §VIII.A.1.f., Chen teaches this function through the use of NACK messages. Chen further teaches the reverse link architecture structure, including “transmitter 236 (see FIG. 2) which filters, modulates, and amplifies the signal” in remote station 6. Chen’s transmitter is the same or equivalent structure to the ’561 patent’s radio transmitter under any reasonable construction.

Id. at 56–57 (citing Ex. 1003, 9:11–25, 3:33–35, 12:19–13:11, Fig. 2; Ex. 1002 ¶ 445).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.3; *see supra* n.7. To the extent that Patent Owner’s arguments address the structure of the “means for detecting,” we address those arguments in Section III.C.3.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5c] of independent claim 5, including the function and corresponding structure or equivalents for the “means for detecting” and “means for transmitting.”

[5d] wherein: the channel coder increases the code rate of the coded data block to be retransmitted by puncturing the coded data block coded by the channel coding of the original transmission by using a second puncturing pattern comprising fewer symbols to be transmitted than the first puncturing pattern;

Petitioner contends that “Chen discloses or renders obvious this limitation for the reasons in [Petition] §§VIII.A.1.g, VIII.A.2.c” regarding

claim 1. Pet. 57 (citing Ex. 1002 ¶¶ 347–373, 426–433, 448–449). In the cited portions, with respect to the increasing limitation, Petitioner contends that “Chen first teaches that two of the four total symbols generated (from g2 and g3) are removed, i.e., punctured, to generate an original transmission having a code rate of 1/2.” *Id.* at 44 (citing Ex. 1003, 14:2–8; Ex. 1002 ¶¶ 386–387). According to Petitioner, “Chen then teaches two examples that puncture the coded data block with a second, different puncturing pattern to increase the code rate for a retransmission.” *Id.* Petitioner contends that, “[i]n each example, Chen . . . teaches that the coded data block for retransmission should be punctured in a different pattern to transmit fewer symbols at an increased code rate.” *Id.* at 45 (citing Ex. 1002 ¶ 396).

Chen presents two embodiments—distinguished from examples—a first, exemplary embodiment and second, alternative embodiment. Petitioner relies on only the second, alternative embodiment. We emphasize that the two examples presented in the following paragraphs are both from Chen’s *second*, alternative embodiment and *not* its first, exemplary embodiment.

Petitioner asserts that, in Chen’s *first* example of its second, alternative embodiment:

The code symbols from g0, g1, and g3 are removed, and “[t]he retransmitted packet can comprise the code symbols from generator g2.” The punctured coded data block for retransmission has 1 user data symbol to 1 code data symbol for an ***increased*** code rate of 1/1.

Id. at 44–45 (citing Ex. 1003, 14:16–17; Ex. 1002 ¶¶ 390–395) (brackets added by Petitioner).

Petitioner asserts that, in Chen’s *second* example of its second, alternative embodiment:

Three input symbols generate a 12-symbol coded data block (formed by 3 symbols output from each of g0, g1, g2, g3). For the original transmission, as described above, all of the symbols from g2 and g3 are punctured, yielding a code rate of 1/2. For the retransmission, all of the symbols from g0 and g1 are punctured and any 2 of the 6 total symbols from g2 and g3 are punctured, yielding an **increased** code rate of 3/4. *Id.* at 45 (citing Ex. 1003, 14:30–33, Fig. 5).

We are persuaded that Chen teaches the concept of puncturing and punctured codes and different code rates obtainable therefrom, as claimed. *See id.* at 14:25–30. In the second example of Chen’s second, alternative embodiment upon which Petitioner relies, Chen discloses that “the original transmission can comprise the code symbols from generators g0 and g1 for rate 1/2 and the retransmission can comprise code symbols from generators g2 and g3 which have been punctured to rate 3/4.” *Id.* at 14:30–33.

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5d] of independent claim 5.

[5e] the transmission means transmit[s] the coded data block punctured by the second puncturing pattern to the receiver;

Petitioner contends that “Chen discloses transmission of the coded data block punctured by the second puncturing pattern for the reasons in [Petition] §§ VIII.A.1.h and VIII.A.3.c&f” regarding claim 1. Pet. 57. Petitioner further contends that “limitations 5[b] and 5[e] both specify ‘transmission means for transmitting the coded data block punctured by the [first/second] puncturing pattern to the receiver.’” *Id.* According to

Petitioner, “Chen teaches this term, as explained in [Petition] §§ VIII.A.1.d, VIII.A.1.h” regarding claim 1. *Id.* (citing Ex. 1002 ¶¶ 450–452).

In cited section VIII.A.1.h of the Petition, Petitioner contends that

Chen teaches that the coded data block punctured by the second puncturing pattern is transmitted to the radio system’s receiver. The retransmitted coded data block is sent from transmitter 126 in base station 4 to receiver 206 in remote station 6 through path 10.

Pet. 49 (citing Ex. 1003, 7:11–15, 8:15–17, 15:17–20, 18:23–24, Fig. 2; Ex. 1002 ¶¶ 398–401).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5e] of independent claim 5.

[5f] the receiver comprises means for combining a received coded data block punctured by the first puncturing pattern and a received coded data block punctured by the second puncturing pattern; and

Petitioner contends that “Chen discloses this limitation for the reasons in [Petition] §VIII.A.1.i” regarding claim 1. Pet. 58. According to Petitioner,

Chen teaches the function of “accumulating” the first punctured and second punctured coded data blocks. As explained in [Petition] §VIII.A.1.i, Chen taught that the coded data blocks are “interleaved,” which describes the same process disclosed and claimed in the ’561 patent as “combining.” Chen’s structure for this “combining means” is “an arithmetic logic unit (ALU), a microprocessor, a digital signal processor (DSP), or other devices programmed or designed to perform” the accumulation of the coded data blocks.

Id. (citing Exhibit 1003, 14:11–13, 14:33–35, 4:2–7, 18:36–19:1, 5:27–28, Fig 8; Ex. 1002 ¶¶ 453–458). Accordingly, Petitioner contends “Chen

teaches the function and the same or equivalent algorithm and structure under any reasonable construction of this term.” *Id.*

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5f] of independent claim 5, including the function and corresponding structure or equivalent for the claimed “means for combining.”

[5g] the channel decoder decodes the channel coding of the combined coded data block.

Petitioner contends that “Chen discloses this limitation for the reasons in [Petition] §VIII.A.1.j” regarding claim 1. Pet. 58 (citing Ex. 1002 ¶459). In the cited portion of the Petition, Petitioner contends that “Chen teaches that the ‘accumulated’ coded data block is decoded with a Viterbi decoder at a combined 1/3 code rate.” *Id.* at 52 (citing Ex. 1003, 14:11–24, 4:4–7, 4:30, 8:24–29, Fig. 8; Ex. 1002 ¶¶ 415–420).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding this limitation. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches limitation [5g] of independent claim 5.

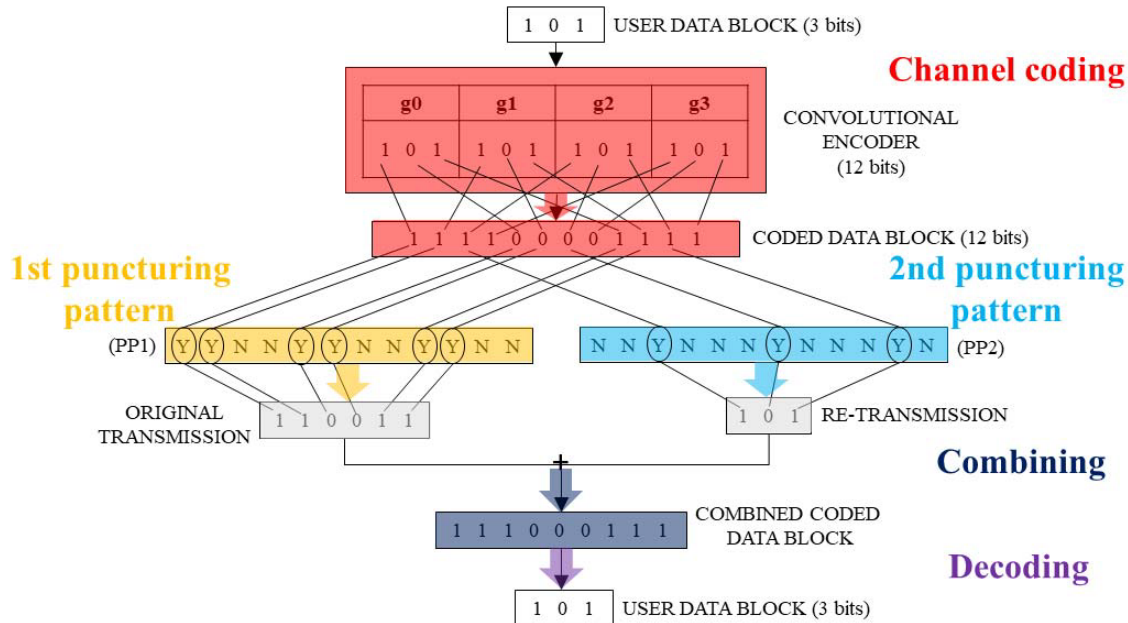
Conclusion as to Independent Claim 5

For the foregoing reasons, we are persuaded that Petitioner establishes unpatentability of independent claim 5 as being obvious over Chen, by a preponderance of the evidence.

3. *Obviousness of Dependent Claims 6 and 7*

Claim 6 depends directly from claim 5 and recites that “the symbols to be transmitted of the first puncturing pattern and the second puncturing pattern together comprise as many of the symbols of the coded data block as possible.” Ex. 1001, 12:32–35.

Petitioner contends that “[a]s explained in greater detail in [Petition] §VIII.A.1.g [regarding claim 1], Chen teaches the use of puncturing patterns that are ‘completely separate’ with no overlap of symbols in the transmitted coded data blocks.” Pet. 67 (citing Ex. 1003, 13:38–14:18). In Petitioner’s diagram corresponding to Chen’s embodiment at column, 13, line 38 through column 14, line 18, reproduced below, “[t]he coded symbols transmitted after the first puncturing pattern (*i.e.*, the symbols generated by g0 and g1) are ‘completely separate’ from the coded symbols retransmitted after the second puncturing pattern (*i.e.*, the symbols generated by g2)” and “there is no overlap in the transmitted and retransmitted symbols, and the transmissions ‘compris[e] as many of the symbols of the coded data block as possible.’” *Id.* at 68 (citing Ex. 1002 ¶¶ 500–502); *see id.* (citing Ex. 1002 ¶¶ 556–62).



Petitioner’s diagram of an embodiment described in Chen. Pet. 67.

Petitioner further contends that

[t]echniques and structures for incremental redundancy were well-known in the art. Chen explains that “[p]uncturing reduces the number of code symbols to be retransmitted but also reduces the error correcting capability of the convolutional code.” To maximize the error-correction capability of the convolutional coder, especially after a need for retransmission is detected and if channel conditions are unfavorable, a POSITA would appreciate the advantages of sending the maximum number of code symbols in the transmission and retransmission, including all symbols, and would be motivated to use the teachings of Chen to transmit as many symbols as possible between the two transmissions. This is reinforced by Chen’s second example in which coded symbols from *g0*, *g1*, *g2*, and *g3* are sent in the transmission and retransmission, and Chen’s teaching that “[o]ther code rates can also be generated.”

Id. at 69 (citing Ex. 1002 ¶¶ 83, 556–562, 625–626; Ex. 1001, 7:36–39; Ex. 1003, 14:25–37) (first alteration added).

Claim 7 depends directly from claim 5 and recites that “the code rate of the punctured coded data block does not exceed 1.” Ex. 1001, 12:36–37.

Petitioner contends that “[n]either claim 1 nor claim 5 uses the phrase ‘punctured coded data block,’ but it does not matter” because “Chen *only* teaches the transmission (and retransmission, for that matter) of coded data blocks at a code rate of 1 or less.” Pet. 70 (citing Ex. 1003, 13:28–14:37 (code rates of 1/2, 3/4, and 1); 14:17–18 (combined code rates of 1/3, 1/4, and 3/10); Ex. 1002 ¶¶ 503–505).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding these claims. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches the limitations recited in claims 6 and 7. For the foregoing reasons, we are persuaded that Petitioner establishes unpatentability of claims 6 and 7 as being obvious over Chen, by a preponderance of the evidence.

4. *Obviousness of Independent Claim 10*

The limitations of independent claim 10 substantially overlap with those of independent claim 5, and as such, Petitioner’s showing for independent claim 10 substantially overlaps with its showing for independent claim 5. Pet. 62–66 (citing Ex. 1002 ¶¶ 473–494). We address the elements and limitations of claim 10 that differ from those of claim 5.

Claim 10 recites, *inter alia*, “reception means for receiving a coded data block channel-coded by a selected channel coding and punctured by a first puncturing pattern.” Ex. 1001, 13:2–4.

Petitioner contends that

Chen discloses or renders obvious a coded data block channel-coded by a selected channel-coding and punctured by a first puncturing pattern for the reasons in [Petition] §§VIII.A.1.b–VIII.A.1.c. This limitation (and 10[e]) use a “reception means” for receiving those coded data blocks punctured with the first

(and, for 10[e], second) puncturing patterns . . . Chen teaches a radio system with a radio receiver that performs the function of receiving the coded data blocks. Remote station 6 contains the structure of a receiver 206, which “filters, amplifies, demodulates, and quantizes the signal to obtain the digitized I and Q baseband signals.”

Id. at 63 (citing Ex. 1003, 6:4–7, 8:15–29, 8:15–23). Accordingly, Petitioner contends, “Chen thus teaches the same function with the same or equivalent structure as the ‘reception means’ of this claim.” *Id.* at 64 (citing Ex. 1002 ¶ 482).

Claim 10 further recites “a channel decoder for decoding the received coded data block.” Ex. 1001, 13:5–6.

According to Petitioner, “[t]his limitation requires a decoder at the receiver to decode the received coded data block” and “Chen teaches a decoder 210 with functionality for decoding the received coded data block.” *Id.* (citing Ex. 1003, 8:24–28, Figs. 2, 8 (“block diagram of an exemplary decoder within the remote station”); Ex. 1002 ¶¶ 483–485).

Claim 10 further recites, “wherein: the reception means receive the retransmitted coded data block whose code rate has been increased by puncturing the coded data block coded by the channel coding of the original transmission by using a second puncturing pattern comprising fewer symbols to be transmitted than the first puncturing pattern.” Ex. 1001, 13:11–14:4.

Petitioner contends that

[t]his limitation combines two limitations previously addressed: (i) the “reception means” in 10[a] for receiving a coded data block channel-coded and punctured by a puncturing pattern; and (ii) a coded data block whose code rate has been increased through the use of a second puncturing pattern that left fewer symbols for transmission than the first puncturing pattern as in

1[f]. Chen teaches the function and structure of the “reception means” under any reasonable construction, as explained in [Petition] §VIII.A.4.b. Chen further discloses or renders obvious the use of a second puncturing pattern to leave fewer symbols and increase the code rate of the retransmission, as set forth in [Petition] §VIII.A.1.g.

Pet. 65 (citing Ex. 1002 ¶¶ 487–490).

Claim 10 further recites that “the reception means includes means for combining the received coded data block punctured by the first puncturing pattern and the received coded data block punctured by the second puncturing pattern.” Ex. 1001, 14:5–8.

Petitioner contends that

[t]his limitation returns to the “reception means” previously discussed in [Petition] §§VIII.A.4.b and VIII.A.4.f. and includes a “means for combining” the first and second punctured coded data blocks. This “means for combining” portion of 10[f] is identical to the “means for combining” presumptive § 112 ¶ 6 limitation 5[f] already addressed in §VIII.A.2.g. The only modification, which does not change the structure or function of the term, is to modify limitation 5[f] from “the receiver comprises means for combining...” to limitation 10[f]’s “the reception means includes means for combining...” Chen discloses this limitation for the reasons in [Petition] §VIII.A.2.g.

Pet. 66 (citing Ex. 1002 ¶¶ 491–493).

As noted above, in its briefing on remand, Patent Owner does not present any argument regarding these limitations of independent claim 10. *Supra* III.C.2; *see supra* n.7.

We have reviewed the cited portions of Chen and Dr. Kakaes’s testimony and are persuaded that Chen teaches the limitations recited in independent claim 10, including the function and corresponding or equivalent structure of the “reception means.” For the foregoing reasons, we

are persuaded that Petitioner establishes unpatentability of claim 10 as being obvious over Chen, by a preponderance of the evidence.

F. Challenges Based on Chen and Eriksson and Chen and GSM 03.64

Petitioner contends that claims 1–10 are unpatentable under 35 U.S.C. § 103 as obvious over Chen and Eriksson and as obvious over Chen and GSM 03.64. Pet. 70–90. For the reasons discussed below, we conclude that Petitioner does not establish unpatentability of remanded claims 5–8 and 10 in view of Chen and Eriksson, nor in view of Chen and GSM 03.64.

Petitioner contends that, “[t]o the extent Chen is found to lack any limitation, it can be combined with either Eriksson or GSM 03.64, which could supply all limitations except for potentially some of the means-plus-function elements, to invalidate the ’561 claims.” Pet. 71. Petitioner addresses the “Chen/Eriksson and Chen/GSM 03.64 grounds . . . *together*.” *Id.* (emphasis added).

The Federal Circuit held that “substantial evidence supports the Board’s finding of a lack of motivation to combine Chen and the GSM references.” *Sisvel*, 82 F.4th at 1363–64. The Federal Circuit refers to Eriksson and GSM 03.64 collectively as “the ‘GSM references.’” *Id.* at 1360 n.7.

Accordingly, we conclude that neither challenge succeeds with respect to remanded claims 5–8 and 10 because, as the Federal Circuit notes, Petitioner has not provided a sufficiently supported motivation to combine Chen with either of Eriksson or GSM 03.64.

IV. CONCLUSION

For the foregoing reasons, we conclude that Petitioner establishes unpatentability of remanded claims 5–7 and 10 of the ’561 patent by a

preponderance of the evidence.⁸ We further conclude that Petitioner does not establish unpatentability of remanded claim 8 by a preponderance of the evidence.

Outcome of original Final Written Decision:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–3, 5–7, 9, 10 ⁹	102	Chen		5–7, 10
1–3, 5–7, 9,	103	Chen	1–3, 9	5–7, 10

⁸ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. §§ 42.8(a)(3), (b)(2).

⁹ In the original Final Written Decision, we did not need to and did not reach whether claims 1–3 and 9 are anticipated by Chen because we determined that these claims were obvious over Chen. In final written decisions both before and after *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018), the Board has declined to reach grounds challenging claims that were already held unpatentable. See, e.g., *Sure-Fire Elec. Corp. v. Yongjiang Yin*, IPR2014-01448, Paper 56 at 25 (PTAB Feb. 22, 2016), *aff’d*, 702 F. App’x 981 (Fed. Cir. 2017); *SK Hynix Inc. v. Netlist, Inc.*, IPR2017-00692, Paper 25 at 40 (PTAB July 5, 2018). The Federal Circuit has acknowledged the Board’s discretion in this regard. See *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, Nos. 2019-1594, -1604, -1605, 2020 WL 2071962, at *4 (Fed. Cir. Apr. 30, 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
10 ¹⁰				
1–10	103	Chen, Eriksson		1–10
1–10	103	Chen, GSM 03.64		1–10
Overall Outcome			1–3, 9	4–8, 10

Outcome of Final Written Decision on Remand:

Claim(s) on Remand	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
5–7, 10	102	Chen		
5–7, 10	103	Chen	5–7, 10	
5–8, 10	103	Chen, Eriksson		5–8, 10
5–8, 10	103	Chen, GSM 03.64		5–8, 10
Overall Outcome			5–7, 10	8

V. ORDER¹¹

In consideration of the foregoing, it is hereby:

ORDERED that claims 5–7 and 10 of the '561 patent are shown to be unpatentable by a preponderance of the evidence;

¹⁰ We need not and do not reach whether claims 5–7 and 10 re anticipated by Chen because we determine that these claims are obvious over Chen. *See supra* n.9.

¹¹ To summarize the dispositions of the Final Written Decision and this Decision on Remand, claims 1–3, 5–7, and 9 of the '561 patent are shown to be unpatentable by a preponderance of the evidence. Claims 4 and 8 of the '561 patent are not shown to be unpatentable by a preponderance of the evidence.

FURTHER ORDERED that claim 8 of the '561 patent is not shown to be unpatentable by a preponderance of the evidence; and

FURTHER ORDERED that, because this a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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