

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUECTEL WIRELESS SOLUTIONS CO. LTD.,
Petitioner,

v.

KONINKLIJKE PHILIPS N.V.,
Patent Owner.

IPR2021-00561
Patent 8,134,929 B2

Before KEVIN F. TURNER, MICHELLE N. WORMMEESTER, and
RUSSELL E. CASS, *Administrative Patent Judges*.

CASS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background*

In this *inter partes* review, Quectel Wireless Solutions Co. Ltd. (“Petitioner”) challenges the patentability of claims 1, 2, 9–11, 15, 16, 18, 22–24, 31–33, 36, 37, and 39 (the “challenged claims”) of U.S. Patent No. 8,134,929 B2 (Ex. 1001, “the ’929 patent”), which is assigned to Koninklijke Philips N.V. (“Patent Owner”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in this *inter partes* review. For the reasons discussed below, Petitioner has proven by a preponderance of the evidence that claims 1, 2, 9–11, 15, 16, 18, 22–24, 31–33, 36, 37, and 39 are unpatentable.

B. *Procedural History*

In this proceeding, Petitioner relies upon the following references:

Black et al., US 2003/0114180, published Jun. 19, 2003 (Ex. 1004, “Black”);

3GPP2 C.S0024-0, cdma2000 High Rate Packet Data Air Interface Specification (Oct. 27, 2000) (version 2.0) (Ex. 1005, “CDMA2000”);

Dahlman et al., U.S. Patent No. 6,173,162 B1, issued Jan. 9, 2001 (Ex. 1006, “Dahlman”);

Ponnekanti, US 2002/0150065 A1, published Oct. 17, 2002 (Ex. 1007, “Ponnekanti”);

Ylitalo et al., U.S. Patent No. 7,139,324 B1, issued Nov. 21, 2006 (Ex. 1008, “Ylitalo”);

Lee et al., US 2003/0058821 A1, published Mar. 27, 2003 (Ex. 1010, “Lee”).

Petition (“Pet.”) iii, 1–2.

Petitioner submits the declarations from Dr. Robert Akl (Exs. 1003, 1024) and Dr. Raziq Yaqub (Ex. 1011). Patent Owner submits a declaration from Mark Lanning (Ex. 2003).

Petitioner challenges the patentability of claims 1, 2, 9–11, 15, 16, 18, 22–24, 31–33, 36, 37, and 39 of the '929 patent based on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 9–11, 15, 22, 23, 31–33, 36	103(a) ¹	Black, Dahlman
2, 16, 18, 24, 37, 39	103(a)	Black, Dahlman, Lee
1, 9–11, 15, 22, 23, 31–33, 36	103(a)	Ylitalo, CDMA2000
2, 16, 18, 24, 37, 39	103(a)	Ylitalo, CDMA2000, Ponnekanti

Pet. 1–2. Patent Owner filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). We instituted trial on all grounds of unpatentability. Paper 9 (“Inst. Dec.”), 41.

During the trial, Patent Owner filed a Response (Paper 15, “PO Resp.”), Petitioner filed a Reply (Paper 18, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 21, “PO Sur-reply”).

An oral hearing was held on July 14, 2022, a transcript of which appears in the record. Paper 28 (“Tr.”).

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. § 103 that became effective after the filing of the application that led to the '929 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

C. Real Parties in Interest

Petitioner states that “Quectel Wireless Solutions Co. Ltd.” is the real party in interest. Pet. 71. Patent Owner states that “Koninklijke Philips N.V. is the sole assignee of” the ’929 patent. Paper 4, 1.

D. Related Proceedings

The parties identify the following district court case involving the ’929 patent: *Koninklijke Philips N.V. v Quectel Wireless Solutions Co. Ltd.*, No. 6:20-cv-01707 (D. Del.). Pet. 71; Paper 4, 1.

E. The ’929 Patent (Ex. 1001)

The ’929 patent relates to a method for power control in a wireless communication system. Ex. 1001, code (57). The ’929 patent explains that “[v]arious mobile communications systems use transmitter power control (TPC) to adapt transmitted power level to the prevailing channel conditions” in order to “maintain an adequate received signal quality despite variations in the channel conditions.” *Id.* at 1:5–9. For example, if the channel quality degrades, the transmitter power level may be increased to compensate for the degradation, and when the channel quality recovers, the transmitter power may be decreased. *Id.* at 1:10–15. According to the ’929 patent, one problem with such TPC schemes is that, when channel conditions are poor, the transmitter consumes more power and creates additional interference to other users, which can degrade system efficiency. *Id.* at 1:53–58.

The ’929 patent seeks to overcome this problem by decreasing, rather than increasing, the data transmit power when the channel quality degrades below a certain level defined by a first criterion. Ex. 1001, 4:13–19. When the channel quality subsequently increases to an extent defined by a second criterion, the data transmit power is increased. *Id.* at 4:19–23.

This operation is shown in Figure 4, reproduced below.

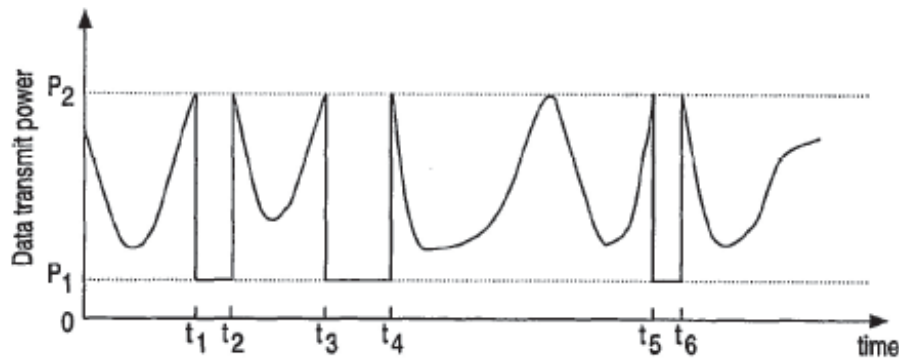


FIG.4

Ex. 1001, Fig. 4. As shown in Figure 4, if the channel quality degrades to an extent determined by a first criterion, then instead of allowing the data transmit power to increase above level P_2 , the transmitter decreases the data transmit power to reduced power level P_1 . *Id.* at 4:10–25. This decrease occurs at times t_1 , t_3 , and t_5 . *Id.* at 4:23–25. When the channel quality subsequently increases to an extent determined by a second criterion, the data transmit power is increased, which occurs at times t_2 , t_4 , and t_6 . *Id.* at 4:19–25.

F. Illustrative Claims

Of the challenged claims, claims 1 and 23 are independent, and are reproduced below.

1. A radio station comprising

[1.1] transmitter means for transmitting over a channel in a predetermined time period (0 to t_F) a data block comprising information symbols (I) and parity check symbols (C);

[1.2] receiving means for receiving a Transmitter Power Control (TPC) command indicating either a reduction or an increase in channel quality; and

[1.3] control means responsive to the indication of a reduction in channel quality according to a first criterion for decreasing the data transmit power and

[1.4] responsive to the indication within the predetermined time period of an increase in channel quality according to a second criterion for increasing the data transmit power;

[1.5] wherein the radio station transmits multiple data signals simultaneously so that data transmit power variation occurs on a subset of the multiple data signals.

23. A method of operating a radio communication system, comprising,

[23.1] at a first radio station, transmitting over a channel in a predetermined time period to a second radio station a data block comprising information symbols (I) and parity check symbols (C),

[23.2] receiving a Transmitter Power Control (TPC) command indicating either a reduction or an increase in channel quality;

[23.3] in response to the indication of a reduction in channel quality according to a first criterion, decreasing the data transmit power, and,

[23.4] in response to the indication within the predetermined time period of an increase in channel quality according to a second criterion, increasing the data transmit power;

[23.5] wherein the radio station transmits multiple data signals simultaneously so that data transmit power variation occurs on a subset of the multiple data signals.

Ex. 1001, 10:2–16, 11:46–63 (bracketed paragraph identifiers added).

II. DISCUSSION

A. Claim Construction

A claim “shall be construed 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).” 37 C.F.R. § 42.100(b) (2020). The parties raise several claim construction issues, which are discussed below.

1. *“Means” Elements*

Petitioner asserts that three “means” elements in claim 1 should be interpreted as “means-plus-function” limitations under 35 U.S.C. § 112, ¶ 6, and identifies certain structures in the ’929 patent Specification that correspond to those “means” elements. Pet. 6–11. Specifically, for the “transmitter means for transmitting over a channel in a predetermined time period (0 to t_F) a data block comprising information symbols (I) and parity check symbols (C)” in claim 1, Petitioner identifies the “transmitter means 110’ as depicted in Figure 1 and described at col. 3:19–37, and that transmits over a channel (e.g., first channel 160) in a predetermined time period (0 to t_F) a data block comprising information symbols (I) and parity check symbols (C) as described at col. 3:43–59, 8:16–17, 9:33–41 [or] equivalents thereof.” *Id.* at 7 (citing Ex. 1003 ¶ 58).

For the “receiving means for receiving a Transmitter Power Control (TPC) command indicating either a reduction or an increase in channel quality” in claim 1, Petitioner identifies “receiving means 120’ as depicted in Figure 1 and described at col. 3:19–37, and that receives a Transmitter Power Control (TPC) command indicating either a reduction or an increase in channel quality as described at col. 1:5–15, 4:1–5, 4:41–43, 10:6–19, or FIGS. 2-3—or equivalents thereof.” Pet. 9 (citing Ex. 1003 ¶ 61).

For the “control means responsive to the indication of a reduction in channel quality according to a first criterion for decreasing the data transmit power and responsive to the indication within the predetermined time period of an increase in channel quality according to a second criterion for

increasing the data transmit power” in claim 1, Petitioner identifies “‘control means 150’ as depicted in Figure 1 and described at col. 3:19–37, and that [is] responsive to an indication of a reduction in channel quality according to a first criterion for decreasing the data transmit power and responsive to an indication within the predetermined time period of an increase in channel quality according to a second criterion for increasing the data transmit power, as described at col. 1:65–2:3, 4:13–64, 8:21–43, 9:42–46, FIGS. 4 or 6—or equivalents thereof.” *Id.* at 10–11 (citing Ex. 1003 ¶ 64).

Patent Owner does not offer constructions of these “means” terms in this proceeding. *See* PO Resp. 10–26; PO Sur-reply 1–16.

For purposes of this Decision, we treat the above “means” terms as “means-plus-function” limitations under § 112, ¶ 6, and we adopt Petitioner’s proposed corresponding structures for those “means” terms.

2. *“Within the Predetermined Time Period” (Claims 1 and 23)*

a) *Whether “within the predetermined time period” means the time period in which a data block is transmitted*

The parties dispute the meaning of the term “predetermined time period” in claims 1 and 23. In its Patent Owner Response, Patent Owner argues that the “predetermined time period” in independent claims 1 and 23 is “a time period in which a data block is transmitted.” PO Resp. 11. More specifically, Patent Owner contends, “the time for transmitting a single data block may be equal or less than [the] duration of a frame, but cannot be longer than a frame.” *Id.* at 14.

Petitioner responds that “[t]he plain language of claim 23 merely recites ‘transmitting . . . in a predetermined time period . . . a data block,’ and is thus satisfied if the data block is transmitted ‘in’ the predetermined time period.” Pet. Reply 1 (citing Ex. 1024 ¶¶ 8–9; Ex. 1003 ¶ 181). “It is

self-evident,” Petitioner asserts, “that a data block can be transmitted ‘in’ the predetermined time period whether the predetermined time period is coextensive with *or longer* than the time period for transmitting the data block.” *Id.* at 1–2 (citing Ex. 1024 ¶¶ 8–9). Petitioner further argues that there is no support for Patent Owner’s contention “that the predetermined time period ‘cannot be longer than a frame.’” Pet. Reply 2 (citing Ex. 1024 ¶¶ 10–12; PO Resp. 14).

The parties agree that the “predetermined time period” can be a frame. As discussed further below, we find that Petitioner has proven that the prior art discloses the claim limitations if the “predetermined time period” is mapped to a frame. *See* § II.D, *infra*. Therefore, for purposes of this Decision, we need not determine whether the “predetermined time period” can also include multiple frames, as Petitioner contends, and we decline to do so. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

b) Whether “increasing” and “decreasing” data transmit power must occur “within the predetermined time period”

Patent Owner argues that one of ordinary skill would understand the plain language of the claims as requiring that, within the same predetermined time period, (1) the data block must be transmitted, (2) the TPC must be received, (3) the data transmit power must be decreased in response to a reduction in channel quality (i.e., a received TPC power up command) according to a first criterion, and (4) the data transmit power must be increased in response to an indication within the predetermined time

period of an increase in channel quality (i.e., a received TPC power down command). PO Resp. 16–17 (citing Ex. 2003 ¶¶ 74–95). Patent Owner asserts that, “[a]lthough ‘the predetermined period’ is not expressly recited in the intervening steps/functions of receiving TPC commands and decreasing power, doing so would be redundant because the order of execution of the functions/steps would be understood from the claims.” *Id.* at 17.

Patent Owner argues that “[t]his understanding of the claims is reinforced, and indeed, required by the specification” because “in *all* disclosed embodiments, data transmit power is first decreased according to a first criterion,” and then “data transmit power is increased according to a second criterion,” and “such decrease and increase in data transmit power occurs within the predetermined time period for a data block transmission.” PO Resp. 17 (citing Ex. 2003 ¶ 76). Specifically, Patent Owner points to Figures 2–4 and the accompanying description at 4:10–25, and Figures 5A–5G at 6:36–8:13 of the ‘929 patent Specification. *Id.* at 17–18.

Additionally, Patent Owner argues that “Fig. 6 illustrates ‘a method of operating a radio communication system 300 in accordance with the invention,’” and shows the decrease and increase of data transmit power occurring only within time t_F , which is “the time period in which a data block is transmitted.” *Id.* at 18 (citing Ex. 1001, 8:14–16; Ex. 2003 ¶¶ 80–95). Petitioner further asserts that the same is shown in Figure 7. *Id.* at 18–19 (citing Ex. 1001, 5:11–49).

According to Patent Owner, “[t]his is not a situation where the claim limitations are illustrated only in a single, non-limiting example,” but rather “the patent characterizes *all* embodiments illustrating the decrease and

increase in power as embodiments ‘*according to the invention*’ or ‘*in accordance with the invention.*’” PO Resp. 19–20 (citing Ex. 1001, 3:4–5 (“FIG. 4 is a graph illustrating variation in transmit power as a function of time according to the invention”), 3:8–9 (“FIG. 6 is a flow chart illustrating a method of operation in accordance with the invention”), 3:10–12 (“FIG. 7 is a graph illustrating variation in transmit power as a function of time according to the invention for three data signals transmitted simultaneously”), 8:14–16 (“FIG. 6 is a flow chart illustrating a method of operating a radio communication system 300 in accordance with the invention”)). Patent Owner also points to the specification’s statement that “[i]f the quality of the first channel 160 degrades to an extent determined by a first criterion, the control means 150, instead of, as in known schemes, increasing the transmit power of the transmitting means 110 above a level denoted P₂ in FIG. 4 in an attempt to restore the received signal quality, *according to the invention decreases the transmit power of the data to a level P₁.*” PO Resp. 20 (citing Ex. 1001, 4:10–25).

Patent Owner contrasts “[t]his characterization of ‘the invention’ as including the decrease and increase within the time for transmitting a data block” with “references to non-limiting features.” *Id.* (citing Ex. 1001, 8:66–9:13 (referring to “one embodiment of the invention,” “another embodiment of the invention,” and “a further embodiment of the invention”)). Patent Owner also argues that “[i]f data transmit power were decreased in contradiction to standard closed-loop power control as recited in elements 23.3 and 1.3 at some unspecified time having no relation to the ‘predetermined time period’ in which a data block is transmitted and no relation to the mechanism for restoring data transmission power as reflected

in elements 23.4 and 1.4, then the radio station would not be able to control power and transmit data efficiently,” which is “the stated purpose of the invention.” *Id.* at 24 (citing Ex. 2003 ¶¶ 87, 94; Ex. 1001, 1:59–60) (footnote omitted).

Petitioner argues that “the claims do not require that either the increase or the decrease in data transmit power occur ‘within the predetermined time period,’” but instead only require that the “indication . . . of an increase in channel quality according to a second criterion” occur “within the predetermined time period.” Pet. Reply 4–5 (citing Ex. 1024 ¶ 14) (emphasis omitted). Additionally, Petitioner asserts, the claims’ “indications of a reduction/increase in channel quality according to a first/second criterion are distinct from the responsive actions of decreasing/increasing data transmit power.” *Id.* at 5 (citing Ex. 2003 ¶ 95). “Hence,” Petitioner contends, “the patentee’s selective use of the term ‘predetermined time period’ in the clause that describes an ‘indication . . . of an increase in channel quality according to a second criterion’ reflects a deliberate choice of the drafter to claim broader with respect to the timing of the other three clauses in Elements [23.3]–[23.4] (and corresponding Elements [1.3]–[1.4]).” *Id.* Patent Owner’s position, according to Petitioner, “unjustifiably disregards differences in claim language between the respective clauses of these claim elements, and improperly renders the use of ‘predetermined time period’ language in the ‘indication . . . of an increase’ clause redundant or meaningless.” *Id.* (citing Ex. 1025, 63:1–11, 62:8–25).

Petitioner acknowledges that the “responsive to” (claim 1) and “in response to” (claim 23) language “describes a causal relationship between

the ‘indication . . . of an increase’ and ‘increasing the data transmit power,’” but argues that this language “does not demand an immediate power increase that necessarily occurs in the predetermined time period.” Pet. Reply 5–6 (citing Ex. 1024 ¶ 16). Petitioner also asserts that neither the claim language nor the specification requires that the steps in elements [1.3]/[23.3] must occur before the steps in Elements [1.4]/[24.4]. *Id.* at 6–7 (citing Ex. 1024 ¶¶ 15, 19; Ex. 2003 ¶¶ 75, 82; Ex. 1001, Figs. 2, 4, 5G; Ex. 1025, 45:13–48:11, 50:10–51:19, 75:5–15, 71:25–75:15).

Additionally, Petitioner argues that the “statements in the specification about the alleged ‘invention’ of the ’929 patent do not support [Patent Owner’s] overly narrow construction.” Pet. Reply 7. According to Petitioner, these portions of the specification “are not specifically directed to the alleged requirement to increase/decrease data transmit power within the predetermined time period of a single data block,” but instead “merely identify each figure as an embodiment ‘according to’ or ‘in accordance with’ the invention.” *Id.* at 8 (citing Ex. 1024 ¶ 18; Ex. 1001, 3:4–12; PO Resp. 19). Petitioner argues that Patent Owner “identifies no nexus between the specification’s brief descriptions of these figures and the ‘predetermined time period’ limitations that it now seeks to import,” and Patent Owner “fails to explain why it would be justifiable or proper to limit the claims based on these specific aspects of the figures rather than any others.” *Id.* (citing PO Resp. 19). “In truth,” Petitioner contends, “it would not even be possible to implement all features of Figures 4–7 at once since these figures include features directed to *alternative* embodiments” (such as those of Figures 5B–5F), and the specification “elsewhere discloses alternative solutions as both being ‘in accordance with’ the invention, thereby reinforcing how the ’929

patent does not use this phrase to identify essential features.” *Id.* (citing Ex. 1001, 2:37–42, 8:66–9:20).

Petitioner further asserts that Patent Owner “cites no evidence that both increasing and decreasing the data transmit power within the predetermined time period is essential to the claimed invention,” and argues that Dr. Akl’s testimony shows that “such features are not essential—especially where the objects and advantages of the alleged invention could still be achieved even without [Patent Owner’s] imported timing limitations.” Pet. Reply 7–8 (citing Ex. 1024 ¶¶ 17–20).

Patent Owner responds that limitations 1.2/23.2 and 1/3–23.3 “follow the initial recitation of ‘predetermined time period’ in limitations 1.1/23.1 and precede the recitation of the predetermined time period in limitations 1.4/23.4,” and therefore “[r]epeatedly stating ‘within the predetermined time period’ in limitations 1.2/23.2 and 1.3/23.3 would be redundant.” PO Sur-reply 7–8 (citing Ex. 2003 ¶¶ 74–94). Patent Owner also asserts that the recited order of steps is supported by the fact that one of ordinary skill would recognize that “an increase following the decrease is required to re-establish conventional closed loop power control.” *Id.* (citing Ex. 2003 ¶¶ 74–94). Patent Owner also reiterates that “[i]n *all embodiments*” of the ’929 specification, “data transmit power is first decreased in response to an indication of a reduction in channel quality according to a first criteria,” and “then increased in response to an indication of an increase in channel quality according to a second criteria, within the time period for transmitting a data block.” *Id.* at 8–9 (citing PO Resp. 17–20; Ex. 2003 ¶¶ 74–91) (emphasis added). Patent Owner also cites *Luminara Worldwide, LLC v. Liown Elecs. Co.*, 814 F.3d 1343, 1353 (Fed. Cir. 2016) and *Regents of the Univ. of Minn.*

v. AG Med. Corp., 717 F.3d 929, 936 (Fed. Cir. 2013) for the proposition that “where a patentee describes the features of ‘the present invention,’ he implicitly alerts the reader that ‘this description limits the scope of the invention.’” *Id.* at 5.

Based on the full trial record, we disagree with Patent Owner that claims 1 and 23 should be construed to require that the “increasing” and “decreasing” of the data transmit power must occur within the same “predetermined time period.” Turning first to the claim language, claims 1 and 23 only require that a data block be transmitted “in a predetermined time period” (elements 1.1/23.1) and that “the indication . . . of a reduction in channel quality according to a first criterion” be “within the predetermined time period.” Elements 1.3 and 23.3, which recite “decreasing the data transmit power,” do not say anything about whether this decrease must occur within the “predetermined time period.” Elements 1.4 and 23.4 similarly recite “increasing the data transmit power,” but do not say anything about whether that increase must be within the “predetermined time period.” The use of the term “predetermined time period” in elements 1.4 and 23.4 modify “indication . . . of an increase in channel quality according to a second criterion,” not “increasing the data transmit power.” Thus, the plain and ordinary meaning of the claim language does not support Patent Owner’s construction. Because the plain meaning of the claim language does not require the increasing and decreasing of the data transmit power during the same predetermined time period, we do not agree with Patent Owner’s argument that adding “within the predetermined time period” to these limitations would be “redundant.” See PO Resp. 17; PO Sur-reply 7–8.

Turning to the '929 specification, we do not find that the specification supports reading into claims 1 and 23 a requirement that the increase and decrease in data transmit power occur within the same “predetermined time period.” Although the specification states that Figures 4–7 illustrate embodiments “according to the invention” or “in accordance with the invention,” these statements are made within the brief description of the drawings portion of the specification and broadly relate to the figures as a whole, rather than focusing on the increase and/or decrease of data transmit power within the same “predetermined time period.” Ex. 1001, 3:4–12. Similarly, when describing the embodiments in more detail, the specification states that Figure 6 “is a flow chart illustrating a method of operating a radio communication system 300 in accordance with the invention,” but does not call out any particular part of the figure that is essential to the invention. *Id.* at 8:14–43. In column 4, the specification also states that, if the quality of the first channel degrades sufficiently, the system “according to the invention decreases the transmit power of the data to a level P_1 ,” but this statement does not require that the decrease in transmit power occur during the same “predetermined time period” as the indication of a reduction in channel quality or the increasing of the data transmit power. *Id.* at 4:13–19.

Patent Owner’s argument that the invention must be limited to the embodiments in the specification is also undercut by the specification’s statement, before describing the figures, that “[t]he invention will now be described, by way of example only, with reference to the accompanying drawings.” Ex. 1001, 2:62–63. This statement indicates that the figures are preferred embodiments which do not necessarily limit the claimed invention.

We also are not persuaded by Patent Owner's reliance on *Luminara* and *Regents of the Univ. of Minn.* See PO Sur-reply 5. The Federal Circuit in *Luminara* explained that "[a]bsent lexicography or disavowal, we do not depart from the plain meaning of claims," and that the standard for disavowal is "exacting" and "must be clear and unmistakable." *Luminara*, 814 F.3d at 1353. Indeed, in *Luminara*, the court found that the standard for disavowal was not met. *Id.* Moreover, in *Regents*, unlike the present case, the court found that the "separateness" requirement described as part of the "present invention" was "fully support[ed]" by the claim language and was "faithful to the ordinary meaning of the language of" the claim. *Regents*, 717 F.3d at 937. Here, by contrast, the ordinary meaning of the claim language includes no requirement that the "increasing" and "decreasing" data transmit power must occur "within the predetermined time period," and such a requirement would have to be read into the claims from the specification under Patent Owner's proposed construction. In light of the specification's directive that the invention is described in the specification and drawings "by way of example only" (Ex. 1001, 2:62–63) and the fact that the specification does not specifically identify the increasing and decreasing of the data transmit power within the same "predetermined time period" as "the present invention," we do not find a "clear and unmistakable" disavowal in the specification of all embodiments that do not increase and decrease the data transmit power within the same "predetermined time period."

Indeed, because the specification broadly describes multiple figures as being "according to" or "in accordance with" the invention (Ex. 1001, 3:4–12, 8:14–16), we would either have to read all of the features of these figures

into the claim, or attempt to discern which ones should be read in and which ones would not without sufficient guidance in the '929 patent. This would be particularly difficult because the figures described as being “in accordance with the invention” include multiple conflicting embodiments, such as Figures 5B–5F, which illustrate different data block configurations that can be transmitted over different time periods. Ex. 1001, Figs. 5B–5F, 3:6–7, 6:36–8:13.

We also are not persuaded by Patent Owner’s argument that the order of steps in claims 1 and 23 requires that the increasing and decreasing of the data transmit power must occur within the same “predetermined time period.” Even if the “indication within the predetermined time period of an increase in channel quality” in step 1.4/23.4 occurs after the “decreasing the data transmit power” in step 1.3/23.3, there is nothing in the claim that requires that the “decreasing” occur within the same “predetermined time period” as the indication of an increase in channel quality. To the contrary, the claim language would allow the decreasing of the data transmit power to occur during the preceding “predetermined time period.” Similarly, there is nothing in the claim that requires that the “increasing the data transmit power” occur within the same time period as the indication of an increase in channel quality. Here too, the data transmit power increase could occur in the “predetermined time period” following the one in which the indication of an increase in channel quality occurs.

Consequently, we do not interpret claims 1 and 23 to require that the increasing and decreasing of the data transmit power must take place within the same “predetermined time period.”

- c) *Whether the “suspending” and “resuming” of the transmission of the data block must occur “within the predetermined time period” (claims 2 and 24)*

Claim 24 depends on claim 23 and recites

suspending transmission of the data block in response to the indication of a reduction in channel quality according to the first criterion and resuming transmission of the data block in response to the indication within the predetermined time period of an increase in channel quality according to the second criterion.

Ex. 1001, 11:64–12:3. Claim 2 includes a similar limitation. *Id.* at 10:17–22.

Patent Owner argues that in claims 2 and 24 “the suspension of the transmission of the data block in response to the satisfaction of the first criterion and the resumption of the transmission of the block in response to the satisfaction of the second criterion, as recited in claims 2 and 24, would also occur within the predetermined time period.” PO Resp. 41 (citing Ex. 2003 ¶¶ 200–207). For similar reasons as discussed with respect to the limitations reciting “increasing” and “decreasing” the data transmit power in claims 1 and 23, we disagree. Nothing in the language of claims 2 and 24 states that the “suspending” and “resuming” of the transmission of the data block must occur “within the predetermined time period.” Indeed, claims 2 and 24 do not mention the “predetermined time period” at all. Patent Owner also does not point to anything in the specification or the file history that would require the “suspending” and “resuming” of the transmission of the data block to occur within the predetermined time period, and relies only on the portions of the specification that it did for claims 1 and 23 which, as we discussed above, are not sufficient to show a clear and unmistakable disavowal of claim scope.

Consequently, we do not interpret claims 2 and 24 to require that the “suspending” and “resuming” of the transmission of the data block must take place within the same “predetermined time period.”

3. *Other Terms*

We determine that it is not necessary to provide an express interpretation of any other claim terms for purposes of this Final Written Decision. *See Nidec*, 868 F.3d at 1017; *Vivid Techs*, 200 F.3d at 803 (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

B. *Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103 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.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). 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 of skill in the art; and (4) where in evidence, objective evidence of non-obviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior

² Patent Owner has not presented objective evidence of non-obviousness in this proceeding.

art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention would have had “at least a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and 2–3 years of experience related to the design or development of wireless communication systems, or the equivalent,” and that “[a]dditional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” Pet. 5 (citing Ex. 1003 ¶¶ 17–19). Patent Owner states that “[f]or purposes of this proceeding only,” it “does not dispute Petitioner’s identification of the level of ordinary skill in the art.” PO Resp. 10.

For purposes of this proceeding, we adopt Petitioner’s assessment of the level of ordinary skill in the art, which is consistent with the ’929 patent and the asserted prior art of record.

D. Ground 1(A): Obviousness of Claims 1, 9–11, 15, 22, 23, 31–33, and 36 Based on Black and Dahlman

Petitioner contends that claims 1, 9–11, 15, 22, 23, 31–33 would have been obvious over the combination of Black and Dahlman. Pet. 1, 11–37. Patent Owner disagrees, arguing that the Black-Dahlman combination does not teach (1) decreasing the data transmit power in response to an indication of a decrease in channel quality according to a first criterion (elements 1.3 and 23.3), (2) increasing the data transmit power in response to an indication of an increase in channel quality according to a second criterion within the predetermined time period (elements 1.4 and 23.4), and (3) transmitting multiple data signals simultaneously so that data transmit power variation occurs on a subset of the multiple data signals (elements 1.5 and 23.5). PO Resp. 26–42; PO Sur-reply 17–22.

1. Overview of Black (Ex. 1004)

Black relates to systems and techniques for controlling transmission power in a wireless communications system. Ex. 1004 ¶ 3. More specifically, Black discloses a code division multiple-access (CDMA) communications system that can increase the number of users that are supported by the system by using gain computation techniques to balance the relative transmission power between channels for users with multi-channel capability. *Id.* ¶ 19. The system can be used to limit the transmission power over both the forward link (from the base station to a subscriber station) and the reverse link (from a subscriber station to the base station) to that necessary to achieve a desired quality of service. *Id.* ¶ 23. Black also states that an exemplary CDMA communications system “is typically designed to conform [to] one or more standards such as the ‘cdma2000 High Rate Packet Data Air Interface Specification,’ 3GPP2

C.S0024, Version 2, Oct. 27, 2000,” the contents of which is “incorporated by reference.” *Id.* ¶ 27.

In Black’s system, power can be controlled using two power control loops, an open loop control and a closed loop control. *Id.* ¶ 24. The closed loop control is used to correct the open loop estimate to achieve a desired signal-to-noise ratio at the base station by measuring the reverse link transmission power at the base station and providing feedback to the subscriber station to adjust the reverse link transmission power. *Id.* ¶ 25. The feedback signal “can be in the form of a reverse power control (RPC) command which is generated by comparing the measured reverse link transmission power at the base station with a power control set point.” *Id.* “If the measured reverse link transmission power is below the set point, then an RPC up command is provided to the subscriber station to increase the reverse link transmission power.” *Id.* “If the measured reverse link transmission power is above the set point, then an RPC down command is provided to the subscriber station to decrease the reverse link transmission power.” *Id.*

In Black’s disclosed embodiment, if “the total transmission power exceeds the power limitations of the user, a systematic back off procedure can be used to reduce the gain of one or more channels.” Ex. 1004 ¶ 19. In such a case, for example, “the reverse link data rate can be lowered to reduce the total reverse link transmission power.” *Id.* ¶ 49.

2. Overview of Dahlman (Ex. 1006)

Dahlman describes methods for controlling the power levels of transmitted signals in a telecommunications system. Ex. 1006, code (57). In Dahlman’s system, a user may be assigned multiple radio bearers associated

with multiple physical channels. *Id.* A fast power control loop monitors a reference channel and adjusts the transmit power in accordance with a signal-to-interference ratio (SIR) target value. *Id.* A plurality of slow power control loops adjust the SIR target value and also provide offset transmit power values associated with each physical channel to adapt the transmit powers in accordance with varying quality requirements between the radio bearers. *Id.*

3. *Analysis of Independent Claim 23*

- a) [23.P]: “[a] method of operating a radio communication system, comprising:”

Petitioner asserts that, to the extent the preamble of claim 23 is limiting, Black teaches the subject matter of the preamble. Pet. 13 (citing Ex. 1004 ¶¶ 7, 19, 20, Fig. 1; Ex. 1003 ¶¶ 83–86. Patent Owner does not present arguments regarding this recitation. PO Resp. 26–42; PO Sur-reply 17–21.

We agree with Petitioner that the cited disclosures of Black teach a method of operating a radio communication system, as recited in the preamble.³

- b) [23.1]: “at a first radio station, transmitting over a channel in a predetermined time period to a second radio station a data block comprising information symbols (I) and parity check symbols (C)”

Petitioner argues that Black discloses this limitation. More specifically, Petitioner argues that Black discloses a subscriber station (first radio station) transmitting information over a reverse link to a base station

³ Because we are persuaded that Petitioner has shown that Black teaches the subject matter recited in the preamble, we need not decide whether the preamble is limiting.

(second radio station) in a CDMA communication system. Pet. 13 (citing Ex. 1004 ¶¶ 22, 23, 66, Fig. 1). According to Petitioner, Black discloses a data channel in the form of a traffic channel “to carry voice and data services to the base station.” *Id.* at 14 (citing Ex. 1004 ¶ 26). Petitioner also argues that CDMA2000, which Black incorporates by reference, discloses the transmission of a “data block” in the form of a “a physical layer packet” that includes Medium Access Control (MAC) Layer data symbols (information symbols (I)) and Frame Check Sequence (FRC)/Cyclic Redundancy Check (CRC) bits (parity check symbols (C)). *Id.* at 14–16 (citing Ex. 1005, 335, 337–338, 357, 364–365; Ex. 1003 ¶¶ 89–90). Additionally, Petitioner argues that “Black’s incorporated teaching of CDMA2000 further confirms that the physical layer packet (data block) is transmitted in a frame having a fixed duration of 26.66 milliseconds (predetermined time period).” *Id.* at 16 (citing Ex. 1005, 55, 357, 361, 367; Ex. 1003 ¶ 92) (emphasis omitted).

Patent Owner does not present arguments regarding this limitation. PO Resp. 26–42; PO Sur-reply 17–21.

We agree with Petitioner that Black teaches this limitation. Specifically, we agree that Black discloses a subscriber station (first radio station) transmitting information over a reverse link to a base station (second radio station), as well as a data channel in the form of a traffic channel “to carry voice and data services to the base station.” Ex. 1004 ¶ 26. We also agree that CDMA2000, which Black incorporates by reference, discloses the transmission of a “data block” in the form of a “a physical layer packet” that includes Medium Access Control (MAC) Layer data symbols (information symbols (I)) and Frame Check Sequence (FRC)/Cyclic Redundancy Check (CRC) bits (parity check symbols (C)), and that the physical layer packet

(data block) is transmitted in a frame having a fixed duration of 26.66 milliseconds, which is a “predetermined time period” as recited in the claim.

- c) [23.2]: “receiving a Transmitter Power Control (TPC) command indicating either a reduction or an increase in channel quality”

Petitioner argues that Black discloses that the subscriber station (first radio station) receives a “Transmitter Power Control (TPC) command” in the form of “a reverse power control (RPC) command” that is “generated by comparing the measured reverse link power at the base station with a power control set point.” Pet. 17 (quoting Ex. 1005 ¶ 25) (emphasis omitted). Petitioner further points to Black’s disclosure that “[i]f the measured reverse link power is below the set point, then an RPC up command is provided to the subscriber station to increase the reverse link transmission power,” and “[i]f the measured reverse link transmission power is above the set point, then an RPC down command is provided to the subscriber station to decrease the reverse link transmission power.” *Id.* Thus, according to Petitioner, Black “discloses that the RPC command indicates either a reduction or an increase in channel quality to at least the same extent as the ’929 patent itself.” *Id.* (citing Ex. 1001, 1:27–38; Ex 1003 ¶ 94). Petitioner further introduces the testimony of Dr. Akl that the measured reverse link transmission power “may be below a set point if the channel quality is poor due to attenuation/fading,” and “may be above the set point if the channel quality is favorable (*e.g.*, due to reduction in attenuation/fading in the channel between subscriber station and base station).” Ex. 1003 ¶ 94.

Patent Owner does not present arguments regarding this limitation. PO Resp. 26–42; PO Sur-reply 17–21.

We agree with Petitioner that Black teaches this limitation. Specifically, we agree that Black discloses an RPC command generated by comparing the measured reverse link power at the base station with a power control set point, and that, if the measured reverse link power is below the set point and RPC up command is sent to increase the reverse link transmission power, and if the measured reverse link power is above the set point, an RPC down command is provided to decrease the reverse link transmission power. We also find that these RPC up and down commands are “Transmitter Power Control (TPC) command[s]” as claimed, and that these commands indicate either a reduction or an increase in channel quality based on Dr. Akl’s testimony that a reverse link transmission power below a set point may indicate a poor channel quality and a reverse link transmission power above a set point may indicate a favorable channel quality. See Ex. 1003 ¶ 94.

d) [23.3]: “in response to the indication of a reduction in channel quality according to a first criterion, decreasing the data transmit power, and,”

Petitioner argues that, as described above with respect to element [23.2], “Black teaches that receipt of an ‘RPC up command’ at the subscriber station indicates a reduction in channel quality and ordinarily causes the subscriber station to increase the reverse link transmission power.” Pet. 17 (citing Ex. 1004 ¶ 25; Ex. 1003 ¶¶ 94–95). “However,” Petitioner asserts, “when the total reverse link transmission power that would result from such an increase exceeds the maximum power capability of the transmitter, the subscriber station systematically reduces the gain of one or more channels (e.g., the traffic, [data rate control (]DRC[)], or [acknowledgement (]ACK[)] channels) until the total reverse link

transmission power is within the limit.” *Id.* at 17–18 (citing Ex. 1004 ¶¶ 19, 33, 49–51).

Petitioner argues that this systematic reduction can begin with the “traffic” (data) channel, pointing to Black’s disclosure that, “[i]f the computed ‘Total Power’ exceeds the power limitations of the transmitter, then the reverse link data rate can be lowered to reduce the total reverse link transmission power.” *Id.* at 18 (citing Ex. 1004 ¶ 49). Petitioner argues that one of ordinary skill in the art would have understood that lowering the reverse link data rate would result in decreasing the transmission power of the traffic/data channel, as supported by the testimony of Dr. Akl and the disclosures of Black and CDMA2000. *Id.* (citing Ex. 1003 ¶ 99).

“Accordingly,” Petitioner asserts, “Black discloses decreasing the power of the traffic/data channel (***decreasing the data transmit power***) in response to receipt of an RPC up command that indicates a reduction in channel quality according to the criterion that the total reverse link power would exceed the maximum power capability of the transmitter (***first criterion***).” Pet. 19 (citing Ex. 1003 ¶ 100).

Patent Owner argues that Black does not teach this limitation because “any reduction in data transmit power according to Black’s technique for *reducing data rate* when total transmission power exceeds a maximum value could only occur in a subsequent frame following that in which Black’s system detected this condition.” PO Resp. 34 (citing Ex. 2003 ¶¶ 174–178). Patent Owner acknowledges that “Black teaches that when the total power of all channels exceeds the maximum power of the transmitter, it first seeks to reduce the data rate,” but argues that “this decrease in the data rate would

only occur outside the predetermined period.” *Id.* at 34–35 (citing Ex. 2003 ¶¶ 175–177).

Patent Owner also argues that “Black does not simply adjust the gain of ‘one or more channels,’ but rather computes a change in the gain based on a ratio of transmission power of the traffic channel relative to the pilot channel, P_T .” PO Resp. 35 (citing Ex. 1004 ¶¶ 33–45; Ex. 2003 ¶ 111). According to Patent Owner, “[t]he transmitter would continue to obey RPC commands until the transmitter reaches the minimum data rate supported by the system (i.e., 9.6 kbs in cdma2000).” *Id.* (citing Ex. 1004 ¶ 50). “Even after Black’s transmitter is adjusted to its minimum data rate and still computes a total power exceeding maximum level,” Patent Owner contends, “it does not decrease the power of the traffic channel in response to an RPC up command; rather, it enables its ‘back off algorithm’ as to the DRC and ACK control channels,” in which “Black first decreases the transmit power of the DRC channel,” and, “[i]f this does not lower the total power below the maximum level, Black then decreases the transmit power of the ACK channel.” *Id.* (citing Ex. 1004 ¶¶ 50–55; Ex. 2003 ¶¶ 120–126).

Based on the full trial record, we find that Petitioner has sufficiently shown that Black teaches decreasing the data transmit power in response to an RPC command indicating a reduction in channel quality according to a first criterion. Black discloses that, ordinarily, “[i]f the measured reverse link transmission power is below the set point” (a first criterion), which can indicate a poor channel quality, “then an RPC up command is provided to the subscriber station to increase the reverse link transmission power.” Ex. 1004 ¶ 25. However, Black also discloses that, when the total reverse link transmission power that would result from such an increase exceeds the

maximum power capability of the transmitter, the subscriber station will decrease the data transmit power. Specifically, in such a case, the subscriber station uses “a systematic back off procedure” to “reduce the gain of one or more channels.” *Id.* ¶ 19; *see id.* ¶¶ 49–51. As Black explains, this reduction can begin by reducing the reverse link data rate which will lower the total reverse link transmission power:

The limiter 304 compares the computed “Total Power” to the maximum power capability of the transmitter. ***If the computed “Total Power” exceeds the power limitations of the transmitter, then the reverse link data rate can be lowered to reduce the total reverse link transmission power.*** . . . This procedure continues until the computed “Total Power” comes within the power capability of the transmitter or the reverse link data rate is reduced to the lowest data rate supported by the communications system.

Ex. 1004 ¶ 49 (emphasis added). We also rely on and find credible Dr. Akl’s testimony that one of ordinary skill “would have recognized that selection of a lower data rate for the traffic/data channel would be paired with a corresponding reduction in the transmission power of the traffic data channel.” Ex. 1003 ¶ 99.

We do not agree with Patent Owner’s argument that Black fails to teach this limitation because any reduction in data transmit power “could only occur in a subsequent frame following that in which Black’s system detected this condition.” PO Resp. 34. This argument relies on Patent Owner’s proposed claim construction requiring that “decreasing the data transmit power” occur within the same “predetermined time period” (frame) as the indication of a reduction in channel quality. However, as discussed in Section II.A.2(b) above, we do not adopt Patent Owner’s proposed construction, and do not interpret the claims to require that “decreasing the

data transmit power” must occur within the same “predetermined time period” as the indication of a reduction in channel quality.

We also are not persuaded by Patent Owner’s argument that “Black does not simply adjust the gain of ‘one or more channels,’ but rather computes a change in the gain based on a ratio of transmission power of the traffic channel relative to the pilot channel.” PO Resp. 35. It is unclear from this argument why Patent Owner believes that Black’s operation fails to meet claim limitation 23.3. Limitation 23.3 requires “decreasing the data transmit power” in response to “the indication of a reduction in channel quality according to a first criterion,” and Black discloses that, in response to an RPC up command indicating a decrease in channel quality, and an indication that the total power exceeds the maximum power of the transmitter, the “reverse link data rate can be lowered” which in turn “reduce[s] the total reverse link transmission power.” Ex. 1004 ¶ 49. Therefore, as discussed above, we find that Black’s operation meets the claim language.

e) [23.4]: *“in response to the indication within the predetermined time period of an increase in channel quality according to a second criterion, increasing the data transmit power”*

As discussed above, Petitioner argues that limitation 23.3 is met by Black because, after the subscriber station receives an RPC command, it estimates the total reverse link transmission power, determines whether that power would exceed the maximum power capability of the transmitter and, if so, reduces the data rate and associated gain of the traffic/data channel until the total power estimate is within the maximum power capability of the transmitter. Pet. 19–20.

Petitioner argues that limitation 23.4 is taught because, at some point after the data rate and data transmit power is reduced, the channel quality will improve, causing Black to increase the data transmit power level. Pet. 20. Citing Dr. Akl's testimony, Petitioner contends that "the channel gains in Black do not perpetually remain in a reduced, backed-off state," but instead "are restored to their preferred levels (or increased toward their preferred levels) as the channel quality improves (e.g., responsive to RPC 'down' commands)." *Id.* (citing Ex. 1003 ¶¶ 102–103). According to Petitioner, "[t]his follows from Black's approach of first setting the pilot channel power (*see* paras. [0042]–[0043]) based on the open- and closed-loop power estimates (including RPC commands), and thereafter setting gains of the traffic/data, DRC, and ACK channels based on predetermined power ratios that define the traffic/data, DRC, and ACK channel gains relative to the pilot channel power." *Id.* (citing Ex. 1004 ¶¶ 35–48).

Petitioner also provides an example based on Dr. Akl's testimony. Dr. Akl presents "a scenario where the subscriber station has significantly increased the pilot channel power in response to a series of RPC up commands and the data rate/gain of the traffic channel has been reduced from their preferred levels to accommodate the higher pilot channel power (while bringing the total reverse link power within the maximum power capability of the transmitter)." Pet. 20–21 (citing Ex. 1003 ¶ 103). Then, in this scenario, "[i]f the channel quality subsequently improves and the base station issues one or more RPC down commands (or the open-loop estimate improves), then according to Black's process the subscriber station will estimate a new, reduced pilot channel power." *Id.* at 21 (citing Ex. 1004 ¶¶ 42–43). "With sufficient reduction in the pilot channel power," Petitioner

argues, “the amount of gain reduction in other channel(s) such as the traffic/data channel will be reduced or eliminated since the total reverse link power can stay within the maximum capability of the transmitter even as the gains of the other channel(s) are increased (e.g., to their preferred levels relative to the new pilot channel power).” *Id.* (citing Ex. 1003 ¶ 103). According to Petitioner and Dr. Akl, “[s]uch increases in the transmit powers of the non-pilot channels would have been apparent to a [person of ordinary skill in the art (]POSITA[)] as the natural result of increasing channel quality (e.g., as indicated by RPC down commands) according to Black’s teachings when the non-pilot channels are in a reduced, backed-off state.” *Id.* (citing Ex. 1003 ¶ 104).

Additionally, Petitioner argues that Black itself suggests these operations by disclosing “that the subscriber station ‘reduce[es] the current closed loop estimate in response to an RPC down command’ (para. [0043]), and that the gains of the non-pilot channels are initially estimated according to their ‘predetermined’ and ‘optimal’ power ratios relative to the pilot channel power.” Pet. 21–22 (citing Ex. 1004 ¶¶ 29, 33, 35, 43, 44, 49). Relying on Dr. Akl’s testimony, Petitioner contends that, “[b]y backing off the non-pilot channels from ‘predetermined’ or ‘optimal’ levels when channel quality decreases, the predictable response of the subscriber station to an increase in channel quality would be to return toward the preferred, optimal levels as channel quality increases.” *Id.* at 22 (citing Ex. 1003 ¶ 104). Again relying on Dr. Akl, Petitioner asserts that, even if Black did not expressly disclose this limitation, one of ordinary skill in the art “would have sought to implement Black’s subscriber station so as return to the faster, preferred data rate as channel quality improves to realize ordinary

benefits of higher data rates such as increased data throughput and better performance for user-facing services such as voice and data services—especially when the channel quality is sufficient to support the higher data rate.” *Id.* at 23 (citing Ex. 1003 ¶¶ 103–104).

Patent Owner argues that Petitioner “mischaracterizes” Black, because “Black does not ‘back-off’ the gain of the traffic channel in response to RPC commands (or any other criteria),” but instead “describes a ‘back-off’ algorithm that is implemented as to the control channels DRC and ACK, only if the data rate of the traffic channel has been lowered to a minimum level and total power still remains too high.” PO Resp. 36–37 (citing Ex. 1004 ¶¶ 50–51; Ex. 2003 ¶¶ 122–126, 179–190). According to Patent Owner, “[t]here is never an initial ‘backed-off state’ as to the traffic channel.” *Id.* at 37. Patent Owner also asserts that “the ‘gains’ of the traffic, ACK and DRC channels are set in a fixed ratio relative to the pilot channel with respect to power control” and thus, “when the ‘gain’ of the pilot channel is adjusted up in response to a DRC up command (combined with an open loop measurement), the ‘gain’ of each other channel is adjusted up and vice versa.” *Id.* (citing Ex. 1004 ¶¶ 33, 35, 44, 45; Ex. 2003 ¶ 111). Patent Owner further asserts that, according to the “back-off algorithm,” “adjustments to the gain reduction of the DRC and ACK power levels would not occur once total power was below maximum power.” *Id.* (citing Ex. 1004, Fig. 4 (steps 408, 420), ¶¶ 53, 55).

Patent Owner also argues that “nothing in Figure 4 or elsewhere in Black explicitly describes increasing data rate or how the system would ‘recover’ from a reduction in data rate.” PO Resp. 37–38 (citing Ex. 2003 ¶¶ 180, 181). “Further,” Patent Owner asserts, “nothing in Black indicates

that the data transmit power would be *increased* when an RPC down command was received as part of its power control algorithm.” *Id.* (citing Ex. 2003 ¶¶ 180–189). Rather, according to Petitioner, “the data transmit power would be adjusted in conjunction with the pilot channel in response to any closed loop power commands.” *Id.* (citing Ex. 1004 ¶¶ 33–51).

Finally, Patent Owner argues that “any change in the data rate in Black’s cdma2000 system would only occur outside the predetermined time period.” PO Resp. 38 (citing Ex. 2003 ¶¶ 180–189).

Petitioner responds that “[a]ny distinction between gain ‘back-off’ as applied to the DRC and ACK channels and gain reduction that occurs in the traffic channel as a result of data rate reductions is immaterial,” especially where Patent Owner “does not dispute the critical point that the transmit power of Black’s traffic channel is ultimately reduced when the maximum power capability of the transmitter is exceeded.” Pet. Reply 14 (citing Ex. 1004 ¶¶ 44–50). Petitioner also argues that Black’s teachings “provide broader suggestions for backing-off the gain of any channel, including the traffic channel,” such as “by applying gain back-off to the traffic channel rather than or in addition to data rate reduction.” *Id.* (citing Ex. 1004 ¶ 19).

Patent Owner responds that “Black is entirely silent as to what happens *after* data rate is decreased to the minimum value,” and that “the Petition relies wholesale on Dr. Akl’s speculation as to how Black’s system would ‘recover’ if it had reduced the traffic data rate and backed-off the DRC and ACK control channels.” PO Sur-reply 20 (citing Pet. 19–24). Patent Owner argues that “Dr. Akl’s attempts to fill this hole in Black’s disclosure is unavailing” because “if Black’s system attempted to adjust from the minimum data rate to a higher rate, such a change could not occur

in Black's system within the 'predetermined time period' that Dr. Akl and Petitioner map to Black (i.e., the 26.66 ms frame)." *Id.* at 20 (citing Ex. 2003 ¶¶ 125, 132–146, 151–152, 175–177, 179–190).

Based on the full trial record, we find that Petitioner has sufficiently proven that one of ordinary skill would have found it obvious to increase Black's data transmit power in response to an indication within the predetermined time period of an increase in channel quality according to a second criterion. Our conclusion is supported by Dr. Akl's testimony, which we find credible, that one of ordinary skill "would have recognized that Black's subscriber station increases the transmit powers of backed-off channels as the closed-loop and open-loop estimates change such that the gain reductions are no longer necessary to ensure that the total reverse link transmission power falls below the maximum power capability of the transmitter." Ex. 1003 ¶ 102. For example, as Dr. Akl testifies, "[g]ain increases to restore channel transmission powers toward their preferred levels relative to the pilot channel would occur" if "the open-loop estimate indicated a sufficient increase in channel quality, if the closed-loop estimate indicated a sufficient improvement in channel quality (*e.g.*, based on receipt of one or more RPC 'down' commands), or both." *Id.* "The restoration of channel gains from their reduced states," according to Dr. Akl, "follows from the recognition that back-off is only necessary for so long as the total reverse link transmission power would otherwise [exceed] the maximum power capability of the transmitter." *Id.*

We also find credible Dr. Akl's testimony that his conclusions are consistent with Black's disclosure that power adjustments "are determined by first setting the pilot channel power based on open- and closed-loop

power estimates,” and then “powers of the traffic/data, DRC, and ACK channels are determined based on predefined power ratios that specify the traffic/data, DRC, and ACK channel gains in relation to the pilot channel power.” Ex. 1003 ¶ 103 (citing Ex. 1004 ¶¶ 35–48). From this disclosure, Dr. Akl testifies, “[i]t follows that gain reductions would be mitigated by following Black’s process if the total power resulting from current loop estimates does not exceed the maximum power capability of the transmitter—even when the predefined (and preferred) power ratios for the traffic/data, DRC, and ACK channels are applied.” *Id.* “For example,” according to Dr. Akl, Black’s subscriber station may first increase power in the pilot channel based on a series of RPC up commands and reduce the data rate and gain of the traffic data/channel to accommodate the higher pilot channel power. *Id.* “If [the] base station then issues RPC down commands based on improvements in the measured signal power level relative to the set power (and thus indicative of an increase in channel quality),” Dr. Akl states, “or the open loop estimate improves, then according to Black’s process the subscriber station applies a new, reduced pilot channel power” and “[t]he transmit power of the traffic/data channel can then be increased relative to its prior backed-off level to or toward its preferred level based on the predefined traffic-to-pilot channel power ratio while the total reverse link power stays within the maximum capability of the transmitter.” *Id.* (citing Ex. 1004 ¶¶ 42–43). Dr. Akl further testifies that “increases in the transmit powers of the non-pilot channels would have been the natural result of increasing channel quality” when “the non-pilot channels initially are in a backed-off state.” *Id.* (citing Ex. 1004 ¶¶ 29, 35, 42–44, 49).

Our conclusion is further supported by Dr. Akl's testimony that, because "Black teaches that the channel gains of non-pilot channels are ordinarily set to their 'optimal' settings," one of ordinary skill "would have found it obvious to increase gain in the data/traffic channel by increasing the data rate as the conditions that previously prompted back-off in the data/traffic channel dissipate." Ex. 1003 ¶ 104. We agree with Dr. Akl that this operation would have been "predictable" because "increasing transmit power in the data/traffic channel through data rate increases applies the same method in reverse of the method taught by Black for decreasing transmit power in this channel (*i.e.*, through data rate decreases)." *Id.* (citing Ex. 1004 ¶¶ 44, 49). Thus, as Dr. Akl testifies, one of ordinary skill "would have been prompted to implement Black's subscriber station in this manner" in order to "revert to preferred channel rates as channel quality improves" which would have resulted in the "predictable benefits" of "increased data throughput and better performance for user-facing services such as voice and data services, particularly when the channel quality is sufficient to support the higher data rates." *Id.* We find this testimony to be credible and to be well-supported by Black's disclosure.

We do not agree with Patent Owner's argument that Black fails to teach this limitation because "any change in the data rate in Black's cdma2000 system would only occur outside the predetermined time period." PO Resp. 38. This argument relies on Patent Owner's proposed claim construction requiring that "increasing the data transmit power" must occur within the same "predetermined time period" (frame) as the indication of a reduction in channel quality and the decreasing of the data transmit power. However, as discussed in Section II.A.2(b) above, we do not adopt Patent

Owner's proposed construction, and do not interpret the claims to require that "increasing the data transmit power" occur within the same "predetermined time period" as the indication of a reduction in channel quality and the decreasing of the data transmit power.

We also are not persuaded by Patent Owner's arguments concerning the operation of the DRC and ACK channels in Black's "back-off" procedure, such as Patent Owner's assertion that the "back-off" procedure "is implemented as to the control channels DRC and ACK, only if the data rate of the traffic channel has been lowered to a minimum level and total power still remains too high." PO Resp. 36–37. Instead, we agree with Petitioner that Patent Owner does not sufficiently show how any distinction between the "back-off" of gain in the DRC and ACK channels and gain reduction in the traffic channel is material to limitation 23.4, and that Patent Owner does not appear to dispute that the transmit power of Black's traffic channel is ultimately reduced when the transmitter's maximum power capability is exceeded. Pet. Reply 14.

We also are not persuaded by Patent Owner's assertion that Black does not "explicitly describe[] increasing data rate or how the system would 'recover' from a reduction in data rate" in response to an RPC down command. PO Resp. 37–38. Petitioner's argument is based on obviousness, not anticipation and, as discussed above, we agree with Petitioner's argument that one of ordinary skill would have found increasing the data rate in response to an indication of an increase in channel quality to have been obvious based on Black's disclosures, based on Dr. Akl's testimony. See Ex. 1003 ¶¶ 101–106. Moreover, although Patent Owner asserts that "Mr. Lanning explain[s] in detail why Dr. Akl's attempts to fill this hole in

Black's disclosure is unavailing" in paragraphs 179–190 of the Lanning Declaration (PO Sur-reply 20), Mr. Lanning only asserts in those paragraphs that Dr. Akl's understanding of Black would result in the increase in data transmit power occurring outside of the "predetermined time period." Ex. 2003 ¶¶ 179–190. This assertion rests on Patent Owner's proposed construction requiring that the increase in data transmit power must occur in a different predetermined time period (frame) than the indication of a reduction in channel quality and decrease of the data transmit power, a construction that we have rejected. See § II.A.2(b), *supra*.

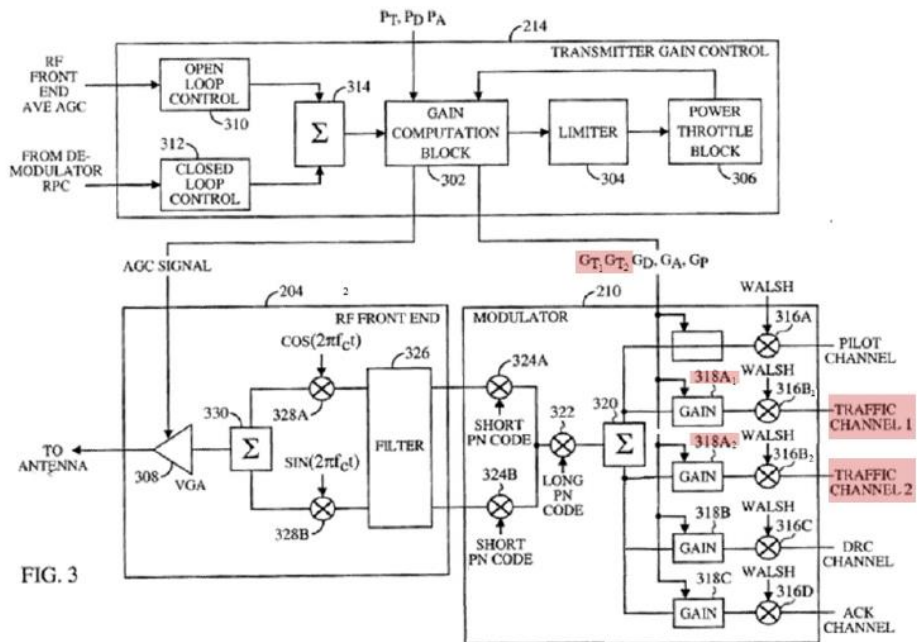
f) [23.5]: *"wherein the radio station transmits multiple data signals simultaneously so that data transmit power variation occurs on a subset of the multiple data signals."*

Petitioner argues that Black "discloses that the subscriber station transmits signals from multiple channels (e.g., the traffic/data, pilot, DRC, and ACK channels) simultaneously, and teaches that 'a systematic back off procedure can be used to reduce the gain of one or more channels.'" Pet. 24–25 (citing Ex. 1004 ¶ 19, Fig. 3). According to Petitioner, "[b]y backing off certain channels to the exclusion of others and applying separate gains to each channel, the result is transmit power variation on a subset of the multiple channel signals transmitted from the subscriber station." *Id.* at 25 (citing Ex. 1003 ¶ 107).

Petitioner further argues that, "[t]o the extent Black does not expressly disclose transmission of multiple **data** signals simultaneously or **data** transmit power variation on a subset of the multiple **data** signals, this feature was well-known in CDMA systems as demonstrated by Dahlman," which "describes a CDMA system having at least two physical data channels (e.g., PDCH₁ and PDCH₂) to simultaneously carry data signals from different

applications or services on radio bearers having different quality of service requirements.” *Id.* (citing Ex. 1003 ¶ 108; Ex. 1006, 5:4–15, Figs. 1B, 2). According to Petitioner, “Dahlman implements two variants of closed-loop power control: (i) a ‘fast’ power control loop that adjusts the transmission power of the composite signal containing the respective signals from all physical channels at once based on conventional power control commands from the base station and (ii) ‘slow’ power control loops that adjust an offset of one or more channels relative to reference channel based on ‘offset power commands’ transmitted from the base station on a less frequent basis.” *Id.* at 25–26 (citing Ex. 1006, 3:34–47, 7:25–8:6, 8:27–46, 9:7–15, Fig. 7).

Relying on testimony from Dr. Akl, Petitioner asserts that “[i]t would have been obvious to implement Black’s system in accordance with Dahlman’s suggestion for providing multiple traffic/data channels with data transmit power variation resulting from defined power offsets.” *Id.* (citing Ex. 1003 ¶ 109). Petitioner relies on a “modified version of Black’s Figure 3 showing a predictable application of Dahlman’s suggestion for multiple traffic/data channels with independent gain control in Black’s subscriber station,” which is reproduced below.



Petitioner’s modified version of Black’s Figure 3 showing how Dahlman’s suggestion of multiple traffic/data channels with independent gain control would be used with Black’s subscriber station. Pet. 26.

Petitioner argues that, as shown in its modified figure, “a predictable Black-Dahlman system would include at least two traffic/data channels in addition to the pilot, DRC, and ACK channels.” Pet. 27 (citing Ex. 1003 ¶ 110). According to Petitioner, “[e]ach traffic/data channel can be mixed with its own spreading code and scaled by its own gain element (e.g., 318A₁, 318A₂) before being combined in a composite signal,” which “is consistent with Dahlman’s independent mixing and scaling of data channels PDCH₁ and PDCH₂ as shown, for example, in Figure 6.” *Id.* at 27–28 (citing Ex. 1003 ¶ 110; Ex. 1006, 7:57–8:6). “The subscriber station in the Black-Dahlman system,” Petitioner contends, “would receive power offset commands from the base station according to Dahlman’s teaching, and the power offsets could be used to apply different/offset scaling factors by gain elements 318A₁ and 318A₂ to each of the traffic/data channels.” *Id.* at 28 (citing Ex. 1006, 7:57–8:6; Ex. 1003 ¶ 110).

Petitioner argues that, “[d]uring normal operation when the total reverse link transmit power does not exceed the maximum power capability of the transmitter, RPC up/down commands for the fast power control loop would, for example, effect an increase or decrease in the pilot channel transmit power,” and “the remaining channels would also increase or decrease with the pilot channel according to predetermined power ratios for each channel as taught by Black or using the variable gain amplifier (e.g., FGA 308),” while “maintaining power offsets/variation according to the power offset commands.” Pet. 28 (citing Ex. 1004 ¶¶ 33–44; Ex. 1006, 7:58–8:6; Ex. 1003 ¶¶ 110–112). “Depending on quality of service requirements and channel conditions,” Petitioner asserts, “it would have been predictable to apply an offset to a subset (e.g., 1) of the traffic/data channels relative to a reference control channel” in order to “boost one data/traffic channel over the other for higher priority data in the boosted channel.” *Id.* at 28–29 (citing Ex. 1006, 2:60–3:30, 4:1–7, 7:25–46, 8:18–27).

“Alternatively,” Petitioner contends, “Dahlman teaches that one of the data/traffic channels can be selected as the reference channel such that power offsets would be applied to just a subset of the data/traffic channels (i.e., the non-reference channel) in the ordinary operation of the resulting Black-Dahlman system.” *Id.* at 29 (citing Ex. 1006, 9:7–15; Ex. 1003 ¶ 113). Petitioner further argues that, based on the teachings of Black and Dahlman, one of ordinary skill would have found it obvious to maintain variation in the transmit power of the channels when the transmit power of one or more of the channels was reduced in order keep the total reverse link transmit power within the transmitter’s maximum power capability,

particularly because doing so “would achieve Black’s objective of balancing channels within the maximum power capability of the transmitter and Dahlman’s objective of selectively scaling data channels according to the relative QoS requirements of each channel.” *Id.* (citing Ex. 1003 ¶ 113).

Petitioner argues that several reasons would have motivated one of ordinary skill to apply to Black’s system Dahlman’s suggestion to use multiple traffic/data channels with varying data transmit power variation due to defined power offsets. Pet. 29. First, Petitioner asserts that providing multiple traffic/data channels as in Dahlman “would have achieved predictable benefits in Black’s system,” such as increasing “the total data rate or data throughput of the subscriber station” due to “the expanded capacity afforded by additional traffic/data channels that are transmitted simultaneously.” *Id.* at 29–30 (citing Ex. 1003 ¶ 115). Second, Petitioner argues that “Dahlman’s suggestion for applying a power offset or other transmit power variation among two or more simultaneously transmitted channels furthers Black’s express teaching that ‘the allocated power should be balanced between the multiple channels in a way that optimizes performance.’” *Id.* at 30 (citing Ex. 1004 ¶ 6; Ex. 1003 ¶ 116). For example, according to Petitioner, “Dahlman’s power offsets allow the transmission powers of data channels carrying data for different applications/services with different QoS requirements to be balanced” so that the gain applied to channels with more stringent QoS requirements can be can be increased relative to a channel with more relaxed QoS requirements. *Id.* (citing Ex. 1006, 8:28–45).

Third, Petitioner argues that Dahlman’s approach of varying transmit power among different traffic/data channels allows certain channels to be

prioritized without raising the power of all the channels, thereby reducing mutual interference among subscriber stations. Pet. 30–31 (citing Ex. 1006, 8:28–45; Ex. 1003 ¶ 117). According to Petitioner, this approach supports Black’s objective of “limit[ing] the transmission power of each user to that necessary to achieve a desired quality of service.” *Id.* at 31 (citing Ex. 1004 ¶ 6). Fourth, Petitioner argues that both Black and Dahlman “relate to similar problems of power control of simultaneously transmitted channels in a CDMA system,” and applying Dahlman’s suggestion to use “multiple traffic/data channels with data transmit power variation resulting from defined power offsets” to Black “would have yielded no more than predictable results.” *Id.* (citing Ex. 1003 ¶ 118).

In response, Patent Owner argues that “Petitioner’s reliance on Black’s pilot, DRC and ACK channels is irrelevant to the claim limitation because they do not carry ‘data signals.’” PO Resp. 39 (citing Ex. 2003 ¶¶ 192–194). Patent Owner also argues that adding traffic channels to Black would involve “a reduction in data rate outside the predetermined time period” and thus “would not disclose the features of the challenged claims.” *Id.* (citing Ex. 2003 ¶ 196).

Patent Owner, however, focuses most of its argument on the assertion that one of ordinary skill would not modify Black in view of Dahlman. PO Resp. 39. Patent Owner argues that “Dahlman’s teachings are directed to the IS-95 2G standard,” while “Black’s implementations are directed to a version of the 3G cdma2000 standard that issued years later.” *Id.* at 30–31 (citing Ex. 2003 ¶¶ 158–160). According to Patent Owner, one of ordinary skill would not have modified Black in view of Dahlman “by simply adding new traffic channels” because doing so “would require consideration of a

host of issues that typically involve[] months or years of analysis and would be well beyond the level of ordinary skill identified by Dr. Akl.” *Id.* at 31 (citing Ex. 2003 ¶¶ 157–173). Patent Owner identifies several such issues.

First, Patent Owner argues that “[a]dding one or more new additional traffic channels beyond the high data rate traffic channel of Black” would “alter the power relationship of the various channels relative to the pilot channel,” and one of ordinary skill “would need to determine the power relationship between the multiple traffic channels and how to implement power control relative to the pilot channel.” *Id.* at 31–32 (citing Ex. 1004 ¶¶ 162, 168–169). Second, Patent Owner argues that “there is only a fixed bandwidth available for the data channel,” so that “[a]dding new traffic channels would take away bandwidth from Black’s existing traffic channel” and “[n]one of the traffic channels would operate at optimal capacity, thereby frustrating the entire purpose of having a high data rate channel in Black.” PO Resp. 32 (citing Ex. 2003 ¶¶ 163, 167).

Third, Patent Owner argues that “adding additional traffic channels impact[s] the power relationships between other components,” which may require noise computations to be recomputed and the power relationships between other channels to be readjusted. PO Resp. 32 (citing Ex. 2003 ¶ 164). Finally, Patent Owner contends, “multiple iterations of simulations may need to be performed to determine the correct relationships between the various channels (e.g., P_T , P_D , P_A) and components” and “repeated until correct and optimal values are obtained.” *Id.* Thus, Patent Owner asserts, “the addition of multiple traffic channels to Black’s system would neither be predictable or feasible.” *Id.* at 32–33.

Petitioner responds that Patent Owner’s “combinability arguments are tainted with flawed assumptions.” Pet. Reply 15. First, Petitioner argues that Patent Owner’s assumption that one of ordinary skill starting with Black’s CDMA2000 (3G) system would not have looked to Dahlman’s teachings related to IS-95 (2G) systems is flawed because: (1) both Black and Dahlman “describe CDMA technology”; (2) “Dahlman expressly suggests that its techniques are also applicable to ‘other types of communication systems’”; and (3) “Dahlman explicitly recognized the benefit of providing multiple data/traffic channels (e.g., radio bearers) ‘to provide various types of . . . services to meet consumer demand’ and to meet users’ expectations to ‘access different types of services at the same time.’” *Id.* at 15–16 (citing PO Resp. 30–31; Ex. 1024 ¶¶ 36–40; Ex. 1006, 2:56–67, 4:55–61, 9:16–21). According to Petitioner, “[t]hese suggested improvements” in Dahlman “were never rigidly restricted to IS-95,” and one of ordinary skill “would have appreciated such benefits of implementing Dahlman’s suggested improvements for multiple data/traffic channels in Black to satisfy a predictably similar set of user demands.” *Id.* at 16 (citing Ex. 1024 ¶¶ 33–35).

Petitioner also argues that Patent Owner erroneously assumes that no new capacity could be added to Black’s system by including additional traffic channels. Pet. Reply 16. And, Petitioner argues, even if total capacity were not increased, one of ordinary skill would have been motivated to add channels to Black in order to “concurrently support transmission of multiple services having different quality of service (Q[o]S) requirements” as “plainly taught in Dahlman.” *Id.* (citing Ex. 1006, 2:56–67, 3:25–30, 8:27–45). Moreover, Petitioner contends, adding multiple

channels would not frustrate “the entire purpose of having a high data rate channel in Black” because Black only discusses a high data rate system “by way of example,” Black’s techniques are not limited to high data rate systems, and allowing channels to be differentiated by QoS requirements “would have outweighed a possibility of some degradation in bandwidth or data rate of any individual channel.” *Id.* at 17 (citing Ex. 1004 ¶ 20; Ex. 1024 ¶¶ 41–43; PO Resp. 32).

Finally, Petitioner argues that Patent Owner “wrongly assume[s] that ordinary simulation/testing/development tasks that were allegedly necessary to develop a system with multiple traffic/data channels would somehow require extraordinary skill or would have dissuaded [one of ordinary skill] from implementing the combination.” Pet. Reply 17–18. According to Petitioner, Patent Owner “improperly discount[s] the ordinary creativity and routine tasks of a [person of ordinary skill], and overlook[s] the fact that systems with multiple traffic/data channels had already been developed long before the Critical Date of the ’929 patent.” *Id.* (citing Ex. 1024 ¶¶ 40–44; Ex. 1025, 13:21–15:14, 16–17–17:10).

Patent Owner responds that Petitioner’s rationale “is premised on the incorrect view that Black adjusts the respective transmit power of the traffic channel and control channels independently.” PO Sur-reply 20–21 (citing Pet. 26–31). However, according to Patent Owner, “the transmit power of all channels, including the traffic channel is adjusted as a ratio to the pilot channel power,” and “[a]dding new traffic channels would require (among other things) extensive experimentation and would hardly be predictable to a person of ordinary skill.” *Id.* at 21 (citing PO Resp. 27, 31–32, 35; Ex. 2003 ¶¶ 157–173, 192–196).

Based on the full trial record, we find that Petitioner has sufficiently demonstrated that one of ordinary skill would have been motivated to combine Black and Dahlman as proposed, and that the combination would not be beyond the level of ordinary skill in the art. To begin with, we find that Dahlman teaches a CMDA system having multiple physical data channels that simultaneously carry data signals from multiple applications or services on radio bearers having different quality of service requirements, and uses power control loops for setting power offsets to allow channels with higher quality of service requirements to be amplified to a greater degree than channels with low quality of service requirements. Ex. 1006, 3:34–47, 5:4–15, 7:25–8:6, 8:27–46. 9:7–15, Fig. 7; Ex. 1003 ¶ 108. We also agree with Dr. Akl that Dahlman’s application of power offsets and variations between multiple channels would have furthered Black’s objective of “balanc[ing]” the “allocated power . . . between the multiple channels in a way that optimizes performance.” Ex. 1004 ¶ 6; Ex. 1003 ¶ 116. Dr. Akl’s testimony is consistent with Dahlman’s disclosure, which states that

In cellular systems in general, and cellular CDMA systems in particular, it is important that the transmit power for each user is not larger than necessary, in order to minimize the interference to the other users. Different types of services, e.g. speech, video and email, have large differences in QoS requirements and coding schemes. Therefore it is desired that different radio bearers assigned to one user can be power controlled individually. Otherwise, the transmit power would have to be adjusted according to the most stringent quality requirement among the different bearers, resulting in unnecessary high transmit powers for the other bearers. By mapping bearers with different QoS requirements onto different [data channels] . . . the total transmit power and the interference

to other users can be lowered. Lower interference spread into the system implicitly raises the system capacity.

Ex. 1006, 8:28–45. *See* Ex. 1003 ¶ 116.

We also agree with Dr. Akl that one of ordinary skill would have been motivated to combine Dahlman with Black because allowing transmit power variation across multiple traffic/data channels would provide the benefit of allowing prioritization among the traffic/data channels. Ex. 1003 ¶ 117. As explained in the quotation from Dahlman reproduced above, channel prioritization can be implemented using variation in the transmit power without raising the power of all the traffic/data channels to the same extent, which can aid in keeping the total reverse link transmit power below the maximum power capability of the transmitter and reduce mutual interference with other radio stations due to the lower transmit power of the lower priority channels. Ex. 1006, 8:28–45; Ex. 1003 ¶ 117. Thus, Dahlman’s approach would support Black’s desire to limit the maximum total power of transmissions from a subscriber station. Ex. 1004 ¶ 6 (describing the desire to “limit the transmission power of each user to that necessary to achieve a desired quality of service”); Ex. 1003 ¶ 117. Additionally, we agree that providing multiple traffic/data channels as taught by Dahlman would allow the cumulative data rate and data throughput across all of the traffic/data channels to be increased because each additional traffic/data channel would add capacity to the subscriber station. Ex. 1003 ¶ 115.

Finally, we agree with Dr. Akl that both Black and Dahlman relate to similar problems of power control of simultaneously transmitted channels in a CDMA system. Thus, adding Dahlman’s suggestion for transmit power variation resulting from defined power offsets to Black’s system would have yielded predictable results, and one of ordinary skill would have had a

reasonable expectation of success in implementing the combination. Ex. 1003 ¶ 118 (citing Ex. 1004 ¶¶ 6, 19–21; Ex. 1006 1:8–46, 2:14–55, 5:15–27).

We do not agree with Patent Owner that adding traffic channels to Black based on Dahlman “would be well beyond the level of ordinary skill” in the art. *See* PO Resp. 31. Regarding Patent Owner’s assertion that Black describes a CDMA2000 (3G) system while Dahlman describes an IS-95 (2G) system, we agree with Dr. Akl that Dahlman does not limit its teachings to an IS-95 system. Ex. 1024 ¶ 34. Dahlman explains that the “invention relates to the control of power levels of transmitted signals in telecommunication systems, in particular spread spectrum systems.” Ex. 1006, 1:5–7. Rather than limiting the invention to the IS-95 standard, Dahlman merely states that “[t]he need for transmit power control in the uplink is recognized in current CDMA systems, as may be seen from” the IS-95 standard, and describes the preferred embodiment as an “exemplary CDMA system.” Ex. 1006, 1:36–42, 5:16. Dahlman further defines the field of the invention broadly, explaining that it “may be used in CDMA communication systems” generally, as well as “other types of communication systems,” and that it “is not limited to the particular embodiments described.” *Id.* at 4:55–61, 9:16–18; Ex. 1024 ¶ 34. In light of these disclosures, we agree with and find credible Dr. Akl’s testimony that one of ordinary skill in the art would have understood that Dahlman’s teachings “were germane to spread spectrum systems generally—including CDMA systems like those disclosed in Black,” including “systems having closed-loop power control and provisions for separately modulating two or

more signals by separate spreading codes for simultaneous transmission at different power levels.” Ex. 1024 ¶ 34 (footnote omitted).

We also are not persuaded by Patent Owner’s arguments that Black-Dahlman combination would have been beyond the level of ordinary skill because a person implementing this combination would need to determine the power relationship between the multiple traffic channels, recompute noise computations, and perform and repeat multiple simulations. PO Resp. 31–32. In this regard, we find credible Dr. Akl’s testimony that “performing noise computations, determining power allocations, running simulations, and the like, were entirely routine and ordinary tasks that would have been well within the capability of” a person of ordinary skill, and that “[t]hese types of tasks are commonly covered in undergraduate courses related to wireless communications.” Ex. 1024 ¶ 40.

We also do not agree with Patent Owner’s argument that “[a]dding new traffic channels would take away bandwidth from Black’s existing traffic channel,” causing none of the traffic channels to “operate at optimal capacity” and “frustrating the entire purpose of having a high data rate channel in Black.” See PO Resp. 32. To the contrary, we agree with and find credible Dr. Akl’s testimony that, in “a system in which increased per-user data rate was prioritized, it would have been obvious to apply Dahlman’s suggestion for multiple reverse link traffic/data channels” in order to “[i]ncreas[e] the total power allocated to a user so that each traffic/data channel in the resulting combination could maintain a high data rate.” Ex. 1024 ¶ 42.

We further agree with Dr. Akl that “[e]ven if no additional power was allocated for the additional traffic/data channel,” the “maximum per-user

power capability already permitted by Black’s original solution would have been sufficient to accommodate a user’s additional traffic/data channel in many cases,” such as “when channel quality is high and there is relatively little fading or noise.” *Id.* ¶ 43. Additionally, “the respective data rates of each traffic/data channel could be reduced,” and “the collective data rate between the two channels could be maintained at a level comparable to that of the single high-data rate channels,” which would “provid[e] additional flexibility to simultaneously transmit different types of user traffic/data with different priorities and meeting different QoS requirements for each type of traffic/data as taught in Dahlman.” *Id.* We also credit Dr. Akl’s testimony that, given certain system design considerations, “the ability to simultaneously transmit different types of user traffic/data with different priorities while meeting different QoS requirements for each type of traffic/data” would have “justified a lower data rate or other design tradeoffs that might result from accommodating an additional traffic/data channel.” *Id.* ¶ 44.

Finally, we do not agree with Patent Owner’s argument that adding traffic channels to Black would involve “a reduction in data rate outside the predetermined time period” and thus “would not disclose the features of the challenged claims.” PO Resp. 39 (citing Ex. 2003 ¶ 196). This argument relies on Patent Owner’s proposed construction that the reduction in data rate must occur in the same “predetermined time period” as the indication of a reduction in channel quality, which we do not adopt.⁴ See § II.A.2(b), *supra*.

⁴ Because we find that the combination of Black and Dahlman teaches limitation 23.5, we need not reach Petitioner’s argument that Black’s

For the foregoing reasons, Petitioner has sufficiently proven that limitation 23.5 would have been obvious to one of ordinary skill based on Black and Dahlman.

g) Summary for Claim 23

Based on the full trial record, Petitioner has proven by a preponderance of the evidence that claim 23 would have been obvious based on Black and Dahlman.

4. Independent Claim 1

Petitioner contends that independent claim 1 is unpatentable based on the combination of Black and Dahlman, relying largely on the same arguments as for claim 23. Pet. 1, 34–36. Patent Owner also relies on the same arguments for claim 1 as for claim 23. PO Resp. 30–39.

Additionally, Petitioner argues that Black discloses the “transmitter means” in limitation 1.1 by disclosing an RF transmitter coupled to antenna 202 for transmitting information from the subscriber station in a CDMA system, that “transmits data like that described at col. 3:43–59, 8:16–17, or 9:33–41 of the ’929 patent, or equivalently.” Pet. 34–35 (citing Ex. 1004 ¶¶ 30–34; Ex. 1003 ¶¶ 137–138). Petitioner also argues that Black discloses the “receiving means” in limitation 1.2 by disclosing an RF receiver coupled to antenna 202 having RF front end 204, demodulator 206, and decoder 208, that “receives data (e.g., TPC commands) like that described at col. 1:5–15, 4:1–5, 4:31–43, 10:6–19, or FIGS. 2–3 of the ’929 patent, or equivalently.” *Id.* at 35 (citing Ex. 1004 ¶¶ 30–31, Fig. 2; Ex. 1003 ¶¶ 139–140). Petitioner

traffic/data channel in combination with the pilot, DRC, and/or ACK channels constitute the “multiple data signals simultaneously” transmitted in this limitation. See Pet. 24–25.

further argues that Black discloses the “control means” in limitations 1.3 and 1.4 by disclosing “a transmitter gain control 214 of the subscriber station that controls the gain elements and variable gain amplifier of the transmitter,” and “thus controls transmission powers of data signals in a CDMA system like the control means 150 described at col. 1:65–2:3, 4:13–64, 8:21–43, 9:42–46, FIGS. 4 or 6 of the ’929 patent, or equivalently.” *Id.* at 36 (citing Ex. 1004 ¶¶ 30, 33–34, Figs. 2–3; Ex. 1003 ¶¶ 141–142).

Patent Owner does not address Petitioner’s arguments that Black discloses these “means” elements. PO Resp. 30–39. We find that Petitioner has sufficiently shown that Black discloses the “transmitter means,” “receiving means,” and “control means” in claim 1.

For these reasons and those discussed above with respect to claim 23, we determine that Petitioner has proven by a preponderance of the evidence that claim 1 would have been obvious over Black and Dahlman.

5. Dependent Claims 9–11, 15, 22, 31–33 and 36

Petitioner contends that claims 9–11, 15, 22, 31–33 and 36, which depend from claims 1 or 23, are unpatentable based on the combination of Black and Dahlman. Pet. 1, 32–34, 36–37. Patent Owner does not provide any separate argument against these dependent claims. See PO Resp. 40.

For claims 9 and 31, Petitioner argues that Black discloses that a “subscriber station can receive an indication,” such as an RPC “up” command, “to increase power in the reverse link above a maximum power capability of the transmitter” (a predetermined threshold (P_2)). Pet. 32, 36. We agree with this argument and find it to be supported by Black’s disclosure and Dr. Akl’s testimony. See Ex. 1004 ¶¶ 25, 33, 43, 49–50; Ex. 1003 ¶¶ 120–122.

For claims 10 and 32, Petitioner argues that “Black discloses that the indication to increase transmit power can be an RPC ‘up’ command” (a received command). Pet. 32, 36. We agree with this argument and find it to be supported by Black’s disclosure and Dr. Akl’s testimony. See Ex. 1004 ¶¶ 25, 43; Ex. 1003 ¶¶ 123–125.

For claims 11 and 33, Petitioner argues that “Black discloses that the indication to increase transmit power can include a measurement of reduced channel quality on a received signal, and that the reduced channel quality can be measured using the automatic gain control (AGC) unit in the receiver according to well-known open-loop power control techniques.” Pet. 32, 37. Petitioner also asserts that, “[w]hen the open-loop measurement indicates reduced channel quality, the pilot channel power is increased, and if the estimated total reverse link power exceeds the maximum power capability of the transmitter with the increased pilot channel power, the gains of one or more other channels including the traffic/data channel are reduced.” *Id.* at 32–33, 37. We agree with this argument and find it to be supported by Black’s disclosure and Dr. Akl’s testimony. See Ex. 1004 ¶¶ 24, 31, 35, 42–43, 49–51, 66, Figs. 2–3; Ex. 1003 ¶¶ 126–129.

For claims 15 and 36, Petitioner argues that “Black discloses that the indication of an increase in channel quality according to the second criterion can be an increase in channel quality measured on a received signal, and that the increased channel quality can be measured using the automatic gain control (AGC) . . . in the receiver according to well-known open-loop power control techniques.” Pet. 33, 37. Petitioner also argues that the “increase in channel quality according to the second criterion can also be an increase above a predetermined level based on the open-loop measurement of the

received signal when the AGC indicates that the channel quality is above that needed to utilize the maximum power capability of the transmitter” (a predetermined level). *Id.* at 33–34, 37. We agree with this argument and find it to be supported by Black’s disclosure and Dr. Akl’s testimony. *See* Ex. 1004 ¶¶ 24, 31, 42–43, 49, 66, Figs. 2–3; Ex. 1003 ¶¶ 130–133.

For claim 22, Petitioner argues that Black discloses a CDMA system (a radio communication system) comprising at least one subscriber station (radio station), and Black in view of Dahlman teaches the subscriber station in such a system configured as in claim 1. We agree with this argument and find it to be supported by the disclosure of Black and Dahlman, as well as Dr. Akl’s testimony. *See* Ex. 1004 ¶ 22, Fig. 1; Ex. 1003 ¶¶ 152–153.

Based on the full trial record, we find that Petitioner has proven by a preponderance of the evidence that claims 9–11, 15, 22, 31–33 and 36 would have been obvious over Black and Dahlman.

E. Ground 1(B): Obviousness of Dependent Claims 2, 16, 18, 24, 37, and 39 Based on Black, Dahlman, and Lee

Petitioner contends that dependent claims 2, 16, 18, 24, 37, and 39 would have been obvious over the combination of Black, Dahlman, and Lee. Pet. 1, 58–82. Patent Owner disagrees, arguing that the Black-Dahlman-Lee combination does not teach the limitations of claims 2 and 24. PO Resp. 41–42; PO Sur-reply 22.

1. Overview of Lee (Ex. 1004)

Lee discloses “[m]ethods and apparatuses for a closed-loop power control in a code-division multiple-access communication system,” in which “both received signal quality and communication channel quality are used to determine appropriate transmitter power.” Ex. 1010, code (57). Lee further

discloses that “transmission may be suspended when a channel quality metric, such as by short-term fading, degrades below a preset minimum threshold, or when a commanded transmitter power exceeds a preset maximum threshold.” *Id.*

2. *Analysis of Claims 2 and 24*

Petitioner argues that “Lee discloses suspending transmission by a transmitter of a subscriber station ‘when a channel quality metric[] . . . degrades below a present minimum threshold, or when a commanded transmitter power exceeds a present maximum threshold.’” Pet. 38 (citing Ex. 1010 ¶¶ 14, 18–22, 45–48, 57, Figs. 3A–3B, 4; Ex. 1003 ¶¶ 154–160). Petitioner also asserts that Lee teaches that “[w]hen the channel quality recovers,” the system can be directed to “resume transmission.” *Id.* (citing Ex. 1010 ¶ 90).

Petitioner argues that it would have been obvious to modify the Black-Dahlman combination in view of Lee “such that, under certain conditions, the subscriber station would suspend transmission of a physical layer packet (***data block***) in response to the indication of a reduction in channel quality (e.g., based on open- and/or closed-loop estimates) when the total estimated power exceeds the maximum capability of the transmitter (***according to the first criterion***),” and “would resume transmission of the physical layer packet in response to the indication within the predetermined time period (e.g., 26.66 milliseconds) of an increase in channel quality (e.g., based on open and/or closed-loop estimates) when the total estimated power no longer exceeds the maximum capability of the transmitter.” Pet. 38–39 (citing Ex. 1003 ¶ 156). For example, Petitioner contends, “if the total estimated power would exceed the maximum capability of the transmitter to

such a degree that severely backing off or gating one or more channels would not bring the estimate within the maximum capability,” it would have been obvious “to suspend transmission of the traffic/data channel(s) or suspend transmissions entirely according to the teachings of Lee.” Ex. 1003 ¶ 156.

Petitioner argues that one of ordinary skill would have been motivated to make this combination for the following reasons: (1) when channel quality is severely degraded, suspending transmission can prevent the subscriber station from causing additional interference to other stations in its vicinity; (2) suspending transmission in power channel conditions can conserve the subscriber station’s battery charge; (3) the combination merely involves application of known techniques (Lee’s suggestion for suspending/resuming transmission based on channel quality) to a known system (Black) to yield predictable results. Pet. 39–40.

Patent Owner argues that because “the decrease in data transmit power and the increase in data transmit power” in claims 1 and 23 “occurs in the predetermined time period,” it “follows that the suspension of the transmission of the data block in response to the satisfaction of the first criterion and the resumption of the transmission of the block in response to the satisfaction of the second criterion, as recited in claims 2 and 24, would also occur within the predetermined time period.” PO Resp. 41 (citing Ex. 2003 ¶¶ 200–207).

Patent Owner also argues that one of ordinary skill “would not have found it ‘predictable’ to apply Lee’s suggestion for suspending and resuming transmissions based on channel quality to the Black-Dahlman system” or established that one of ordinary skill “would be motivated to combine these

three references together.” PO Resp. 41. First, Patent Owner argues, one of ordinary skill would not have combined Black and Dahlman for the reasons previously argued. *Id.* at 42. Second, Patent Owner asserts, “Lee does not disclose any type of predetermined time period or data block, as recited in the challenged claims,” but instead “only focuses on the duration of a ‘control cycle’ that is used for power control.” *Id.* (citing Ex. 2003 ¶ 204; Ex. 1010 ¶¶ 20, 21, 26–27, 49). Additionally, Patent Owner argues that Lee “does not disclose having more than one state for each ‘control cycle’ so it cannot be used or interpreted as a Predetermined Time Period of the claims for this Ground.” *Id.* (citing Ex. 2003 ¶ 204). Finally, Patent Owner argues that Lee fails to disclose suspending and resuming transmission of the data block within the predetermined time period. *Id.*

Based on the full trial record, we find that Petitioner has sufficiently proven that claims 2 and 24 would have been obvious over the combination of Black, Dahlman, and Lee. To begin with, as discussed above, we have not accepted Patent Owner’s proposed claim construction requiring that the “suspending” and “resuming” of the transmission of the data block must both occur within a single “predetermined time period.” See § II.A.2(c), *supra*. Petitioner also does not rely on Lee to disclose the limitations concerning the “predetermined time period.” Pet. 38–40.

Additionally, we find that Petitioner has set forth sufficiently evidence showing a motivation to combine Lee with Black and Dahlman. In this regard, we rely on and find credible Dr. Akl’s testimony that one of ordinary skill would have been motivated to make this combination to enhance overall system capacity and throughput and conserve the subscriber station’s battery charge. Ex. 1003 ¶¶ 157–159. We also find credible Dr. Akl’s

testimony that the combination of Lee with Black and Dahlman involves application of known techniques (Lee's suggestion for suspending and resuming transmission based on channel quality) to a known system (Black) to yield predictable results. *Id.* ¶ 160.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that claims 2 and 24 would have been obvious based on the combination of Black, Dahlman, and Lee.

3. Claims 16, 18, 37, and 39

Petitioner contends that claims 16, 18, 37, and 39, which depend from claims 1 or 23, are unpatentable based on the combination of Black, Dahlman, and Lee. Pet. 1, 40–42. Patent Owner does not provide any separate argument against these dependent claims. See PO Resp. 41–42.

For claims 16 and 37, Petitioner argues that one of ordinary skill would have recognized at least two approaches for suspending transmissions. Pet. 40. First, according to Petitioner, “the transmitter can be deactivated to suspend transmission of all signals from the subscriber station for a period of time.” *Id.* Second, Petitioner asserts, “it would have been predictable to ‘gate’ or ‘suspend’ transmission on particular channels even as transmission on other channels continues,” and Petitioner provides the example of Black's gating off of the DRC and ACK channels “when additional power reduction is necessary to bring the total reverse link transmission power within the maximum power capability of the transmitter.” *Id.* at 40–41. Petitioner further contends that CDMA2000 “confirms that the subscriber station can cease transmission of physical layer packets on the traffic/data channel” and transmit a “zero rate RRI codeword on the RRI channel” (an “indication that the transmission of the data block is

suspended”), and transmit other codewords when packets are not suspended (an “indication that the transmission of the data block is in progress”). *Id.* at 41 (emphasis omitted).

We agree with Petitioner’s contentions concerning claims 16 and 37 and find them to be supported by the disclosures of Black, CDMA2000, and Lee, as well as by Dr. Akl’s testimony. *See* Ex. 1004 ¶¶ 60–62; Ex. 1005, 369; Ex. 1010 ¶ 68, Fig. 5A; Ex. 1003 ¶¶ 161–163.

For claims 18 and 39, Petitioner argues that “Lee teaches a method of decreasing the transmit power from a subscriber station by suspending transmission such that the transmit power is a decrease to zero transmit power.” Pet. 41. According to Petitioner, “[i]t would have been obvious to combine the teachings of Black-Dahlman and Lee as previously described” for claims 2 and 24. *Id.* We agree with Petitioner’s contentions concerning claims 18 and 39 and find them to be supported by the disclosure of Lee, as well as by Dr. Akl’s testimony. *See* Ex. 1010 ¶¶ 44–46, 68, Fig. 5A; Ex. 1003 ¶¶ 164–166.

Based on the full trial record, we find that Petitioner has proven by a preponderance of the evidence that claims 16, 18, 37, and 39 would have been obvious over Black, Dahlman, and Lee.

F. Grounds 2(A) and 2(B): Obviousness Based on Ylitalo and CDMA2000 or Ylitalo, CDMA2000, and Ponnekanti

In Grounds 1(A) and 1(B), we found that claims 1, 2, 9–11, 15–16, 18, 22–24, 31–33, 36–37, and 39 of the ’929 patent are unpatentable. Therefore, we need not separately analyze Petitioner’s challenge to those claims under Grounds 2(A) and 2(B). *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed*,

Inc. v. Cook Grp. Inc., 809 F. App’x 984, 990 (Fed. Cir. 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”).

III. CONCLUSION⁵

For the reasons discussed above, Petitioner has proven, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 9–11, 15, 22, 23, 31– 33, 36	103(a)	Black, Dahlman	1, 9–11, 15, 22, 23, 31–33, 36	
2, 16, 18, 24, 37, 39	103(a)	Black, Dahlman, Lee	2, 16, 18, 24, 37, 39	
1, 9–11, 15, 22,	103(a)	Ylitalo, CDMA2000 ⁶		

⁵ 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).

⁶ As explained above, because we find that claims 1, 9–11, 15, 22, 23, 31–33, and 36 are unpatentable on other grounds, we decline to address those claims in this ground.

23, 31–33, 36				
2, 16, 18, 24, 37, 39	103(a)	Ylitalo, CDMA2000, Ponnekanti ⁷		
Overall Outcome			1, 2, 9–11, 15, 16, 18, 22–24, 31–33, 36, 37, 39	

IV. ORDER

Accordingly, it is

ORDERED that claims 1, 2, 9–11, 15, 16, 18, 22–24, 31–33, 36, 37, and 39 of the '929 patent have been shown to be unpatentable; and

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

⁷ As explained above, because we find that claims 2, 16, 18, 24, 37, and 39 are unpatentable on other grounds, we decline to address this ground.

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