

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

COBBLESTONE WIRELESS, LLC,
Patent Owner.

IPR2024-00316
Patent 10,368,361 B2

Before NATHAN A. ENGELS, NORMAN H. BEAMER,
and RUSSELL E. CASS, *Administrative Patent Judges*.

BEAMER, *Administrative Patent Judge*.

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

I. INTRODUCTION

On December 18, 2023, Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd. (“Petitioner”) filed a Petition (“Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 10–13, 15, and 17 of U.S. Patent No. 10,368,361 B2 (Ex. 1001, “the ’361 patent”). Paper 3. On March 28, 2024, Cobblestone Wireless, LLC (“Patent Owner”) filed a Preliminary Response (“Prelim. Resp.”). Paper 7.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and any preliminary response shows that “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

For the reasons explained below, we deny the Petition and do not institute an *inter partes* review.

II. BACKGROUND

A. The ’361 Patent

The ’361 patent, titled “Adaptive Communication Resource Allocation In A Wireless Network,” was filed on August 1, 2014 and issued on July 30, 2019. Ex. 1001, codes (54), (22), (45). The ’361 patent is directed to allocating frequency spectrum resources of wireless communication network nodes to uplink or downlink channels based on the suitability of each frequency spectrum resource for uplink or downlink. *Id.* at code (57). Uplink channels are for receiving data by a network node, such as a base station, from wireless device such as user equipment, and downlink channels are for transmitting data from a base station to user equipment. *Id.*

at Fig. 1, 3:43–45, 3:56–4:3. One measure of suitability of a frequency spectrum resource for uplink is the channel quality indicator (CQI), and for downlink, the received interference power (RIP), both of which are typically measured by systems adhering to such telecommunications standards as LTE (Long Term Evolution). *Id.* at 4:26–30, 5:35, 8:53–60, 8:64–9:2, 10:61–11:3. High CQI indicates suitability for downlink, and low RIP indicates suitability for uplink. *Id.* at 9:8–14.

The '361 patent discloses an “adaptive radio resource allocation” scheme, in which frequency spectrum resource components, such as subcarriers, are dynamically allocated for uplink or downlink to efficiently match time-varying bandwidth demands of components of the network, which can be “bursty” and asymmetric. Ex. 1001, Fig. 2C, 3:13–15, 6:66–7:12. Periodically, the quality status of the currently available uplink and downlink subcarriers are measured and are sorted based on their suitability for uplink and downlink. *Id.* at Fig. 4, 8:42–60, 9:3–5, 10:55–61, 11:39–46. For example, subcarriers with high CQI are well-suited for a downlink channel, and subcarriers with low RIP are well-suited for an uplink channel, and are ranked accordingly. *Id.* at Fig. 4, 9:5–21, 11:47–12:7. Subcarrier resources are assigned for uplink or downlink based on their rank and based on the current directional allocation of resources — *i.e.*, the requested downlink channels requested by wireless devices, and the requested uplink channels requested by network nodes. *Id.* at Fig. 4, 9:30–46, 12:7–34.

Resources not currently assigned for uplink or downlink because they are of lower quality are assigned to a shared resource pool. Ex. 1001, 9:5–8.

Such resources are described in the '361 patent as “sub-optimal.” *Id.* at 11:30. As explained therein:

[A] first frequency spectrum resource may be determined . . . to be less suitable for a downlink channel in response to a CQI of the first frequency spectrum resource being less than a CQI of one or more other frequency spectrum resources. Similarly, the first frequency spectrum resource may be determined . . . to be less suitable for an uplink channel than one or more other frequency spectrum resources in response to an RIP of the first frequency spectrum resource being greater than an RIP of the one or more other frequency spectrum resources. Thus, because the first frequency spectrum resource is determined . . . to currently be a sub-optimal resource for uplink and/or downlink channels, the first frequency spectrum resource may be assigned to [a] shared resource pool.

Ex. 1001, 11:18–33.

If subsequent directional allocations require additional uplink or downlink channels not satisfied by current assignments, frequency spectrum resources assigned to shared resource pool are assigned to uplink and/or downlink channels as needed. *Id.* at Fig. 4, 9:47–10:6, 12:35–13:4. Thus, frequency spectrum resources may be dynamically allocated to satisfy resource requests for network nodes, so that very few or no frequency spectrum resources are idle. *Id.* at 10:5–7.

B. Illustrative Claim

Independent claim 10 is reproduced below (with Petitioner's identifiers of limitations in brackets).

10. A wireless base station for a wireless communication network, the wireless base station comprising:

[10.1] a quality status module configured to determine a respective quality status of a first frequency spectrum

resource and a second frequency spectrum resource, wherein each of the first frequency spectrum resource and the second frequency spectrum resource are associated with an air interface that is available for use by the wireless base station for an uplink channel or a downlink channel;

[10.2] a processor coupled to the quality status module and configured to:

[10.3] determine, based on the quality status of the first frequency spectrum resource, that the first frequency spectrum resource is a sub-optimal resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the wireless base station; and

[10.4] in response to the determination that the first frequency spectrum resource is the sub-optimal resource, assign the first frequency spectrum resource to a shared resource pool; and

[10.5] a scheduler module coupled to the processor and configured to:

[10.6] schedule the second frequency spectrum resource for the uplink channel or the downlink channel based on an initial directional allocation of frequency spectrum resources for the wireless base station;

[10.7] determine an updated directional allocation of frequency spectrum resource for the wireless base station after the second frequency spectrum resource is scheduled for the uplink channel or the downlink channel; and

[10.8] schedule the first frequency spectrum resource based on the updated directional allocation of frequency spectrum resources for the wireless base station.

Ex. 1001, 18:52–19:20; Pet. vi–vii.

C. Asserted Challenges to Patentability and Evidence of Record

Petitioner challenges the patentability of claims 10–13, 15, and 17 of the '361 patent based on the following references:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
10–13, 15, and 17	103 ¹	Gaal ²
10–13, 15, and 17	103	Gaal, Khoryaev ³

Pet. 2–3. In support of its patentability challenge, Petitioner relies on, *inter alia*, the Declaration of James A. Proctor. Ex. 1003 (“Proctor Decl.”).

D. Real Parties in Interest

Petitioner identifies Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd., as well as T-Mobile USA, Inc., AT&T Services Inc., AT&T Corp., AT&T Mobility LLC, and Cellco Partnership d/b/a Verizon Wireless, as real parties in interest. Pet. 73. Patent Owner identifies itself a real party in interest. Paper 5, 2.

E. Related Proceedings

The parties identify the following related proceedings: *Cobblestone Wireless, LLC v. Samsung Electronics Co., Ltd. et al.*, Case No. 2:23-cv-00285 (E.D.Tex.); *Cobblestone Wireless, LLC v. T-Mobile USA, Inc. et al.*,

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 as of March 16, 2013. The application for the '361 patent was filed after March 16, 2013, and therefore we apply the AIA version of 35 U.S.C. § 103.

² Gaal, et al., US 2014/0341051 A1 (Ex. 1004; “Gaal”).

³ Khoryaev, et al., US 9,185,620 B2 (Ex. 1018; “Khoryaev”).

Case No. 2:22-cv-00477 (E.D. Tex.); *Cobblestone Wireless, LLC v. Cellco Partnership d/b/a Verizon Wireless*, Case No. 2:22-cv-00478 (E.D. Tex.); *Cobblestone Wireless, LLC v. AT&T Inc. et al.*, Case No. 2:22-00474 (E.D. Tex.); and *T-Mobile USA, Inc. et al. v. Cobblestone Wireless, LLC*, IPR2024-00138 (PTAB Nov. 30, 2023). Pet. 73–74; Paper 5, 2–3.

III. ANALYSIS OF PETITIONER’S CHALLENGE

A. Legal Standards

To prevail in its challenge, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”). This burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A patent claim is unpatentable under AIA 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious as of the application date to a person having ordinary skill in the art to which said subject matter pertains. AIA 35 U.S.C. § 103, *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 ordinary skill in the art; and (4) when in evidence,

objective indicia of non-obviousness (also called secondary considerations), such as commercial success, long-felt but unsolved needs, and failure of others.⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze grounds based on obviousness in accordance with the above-stated principles (subject at this stage to the “reasonable likelihood” standard of 35 U.S.C. § 314(a)).

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, 35 U.S.C. § 103(a) requires us to resolve the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.*

Petitioner asserts that a person of ordinary skill in the art as of the invention of the ’361 patent:

would have had at least a bachelor’s degree in electrical engineering, computer engineering, computer science, physics, or the equivalent, and at least two years of experience working in the field Relevant working experience would include experience with telecommunications and networking, radio-access networking, and/or service provisioning in wireless

⁴ No evidence of secondary consideration appears in the record for us to consider at this stage of the proceeding.

networks. *Id.* More education can supplement practical experience and vice versa

Pet. 3–4 (citing Proctor Decl. ¶ 42). Patent Owner states that, “[f]or purposes of this preliminary response, Patent Owner does not challenge that definition.” Prelim. Resp. 9.

Petitioner’s proposal is consistent with the level of ordinary skill in the art reflected by the asserted prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *GPAC*, 57 F.3d at 1579. On this record, the level of ordinary skill is neither in dispute nor dispositive of any challenge. For purposes of this Decision, we apply Petitioner’s articulation.

C. *Claim Construction*

The Petition was accorded a filing date of December 18, 2023. Paper 4, 1. In an *inter partes* review for a petition filed on or after November 13, 2018, 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). We apply the claim construction standard from *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Claim terms need only be construed to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

Petitioner maintains that the “quality status module” of claim requirement 10.1 quoted above should be construed as a means-plus-function term, with the required function being “to determine a respective quality status of a first frequency spectrum resource and a second frequency spectrum resource,” and the corresponding structure being a general-purpose

processor programmed to measure quality metrics such as CQI and RIP. Pet. 17–18 (citing Ex. 1001, 4:28–34, 10:56–58; Proctor Decl. ¶¶ 108–109). However, Petitioner contends that its asserted prior art “renders obvious the quality status module regardless of whether the term is construed as [a means-plus-function] limitation.” *Id.* at 18.

Petitioner also maintains that the claim term “sub-optimal” is a term of degree, but Petitioner does not take a position “as to the definiteness of the full scope of this limitation because (according to Petitioner) it is unnecessary for the Board to determine whether the full scope of the claims are definite as, for the reasons stated below, the prior art discloses an example consistent with how the ’361 Patent describes ‘sub-optimal.’” *Id.* at 18.

Patent Owner states that it disagrees with Petitioner’s construction of quality status module, “but does not address it . . . because construing this term is not necessary to address the issues surrounding institution.” Prelim. Resp. 9–10. Patent Owner also states that it is unnecessary to resolve any dispute as to whether or not the term “sub-optimal” is indefinite. *Id.* at 10.

We agree that, for purposes of this Decision, it is not necessary to resolve the construction issues concerning the terms “quality status module” or “sub-optimal.”

D. Alleged Obviousness of Claims 10–13, 15, and 17 Over Gaal

Petitioner challenges claims 10–13, 15, and 17 as obvious over Gaal. Pet. 19–59.

1. Gaal

Gaal, titled “Channel State Information (CSI) Measurement And Reporting For Enhanced Interference Management For Traffic Adaptation (eIMTA) In LTE,” was published November 20, 2014, and applied for on May 13, 2014. Ex. 1004, codes (54), (43), (22). Gaal is directed to techniques for channel state information (CSI) measurement and reporting for enhanced interference management for traffic adaptation (eIMTA) in long term evolution (LTE). *Id.* ¶ 3. LTE is a telecommunications standard, and eIMTA is an enhanced feature added as part of Release 12 of LTE. *Id.* ¶¶ 3, 8, 33, 71. CSI measurement includes measurement of the channel quality indicator (CQI) value (also referenced in the ’361 patent), and is used to monitor the quality of transmission channels. Ex. 1001, 4:26–30; Procter Decl. ¶¶ 80–81. Gaal discloses identifying whether a “flexible subframe” is for uplink or downlink communications, and performing certain measurements (such as CSI measurements) depending on that determination. Ex. 1004 ¶¶ 9, 10, 86. In particular, if the flexible subframe is for uplink, in some cases CSI measurement and reporting is skipped because the measurement would be useless or otherwise would cause measurement and reporting issues. *Id.* at Fig. 8, ¶¶ 32, 71, 85, 103.

By way of background regarding the flexible subframes referred to in Gaal, Gaal explains that the data transmitted in LTE is divided up into 10 millisecond (ms) frames, which are in turn made up of ten subframes, each 1 ms long. Ex. 1004, Fig. 2, ¶ 42. One mode of LTE transmission is time division duplexing (TDD), which has seven predefined configurations, with each configuration specifying a different combination of subframes

dedicated to uplink and downlink. *Id.* ¶ 69. This is depicted in Figure 6, reproduced below.

Uplink-downlink configurations											
Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

FIG. 6

Figure 6 illustrates the seven uplink and downlink subframe configurations, where for a given configuration a subframe labelled “D” handles downlink transmissions, a “U” subframe handles uplink transmissions, and an “S” (“Special”) subframe can split the subframe to handle both uplink and downlink. Ex. 1004 ¶¶ 69–70. The particular configuration being used at any point in time depends on traffic demands— for example, if a large data burst on downlink is desired, the configuration may be changed to a more downlink heavy subframe configuration, such as from configuration #1 (DSUUDDSUUD) having six DL subframes and 4 UL subframes to subframe configuration #5 (DSUDDDDDDDD) having nine downlink subframes and one uplink subframe. *Id.* ¶ 72.

The flexible subframes discussed in Gaal are a further variation of the predefined TDD configurations, as provided for in eIMTA of LTE. Ex. 1004 ¶ 71. Petitioner provides a table that it represents as “[o]f

relevance to the discussion of Gaal,” which illustrates this flexible subframe variation, which table is reproduced below.

Table 5: Additional Flexible Uplink-downlink configurations.

Uplink-downlink configuration	Subframe number									
	0	1	2	3	4	5	6	7	8	9
F0	D	S	U	F	F	D	S	U	F	F
F1	D	S	U	F	D	D	S	U	F	D
F2	D	S	U	D	D	D	S	F	D	D
F3	D	S	U	F	F	D	D	D	D	D
F4	D	S	U	F	D	D	D	D	D	D
F5	D	S	U	D	D	D	D	D	D	D
F6	D	S	U	F	F	D	S	U	F	D

Pet. 10–11 (citing Ex. 1011⁵; Proctor Decl. ¶ 90). The table shows flexible subframes (designated “F”) at varying subframe positions depending on the configuration number. *Id.* The uplink versus downlink direction of flexible subframes, also referred to as dynamic subframes, can be dynamically changed (e.g., managed as UL and DL subframes) — rather than having a fixed direction (e.g., as either a DL subframe or an UL subframe). Ex. 1004 ¶ 71. In such systems, it is possible to dynamically adapt TDD DL/UL subframe configurations based on the actual traffic needs. *Id.* The direction of a subframe may also change due to inter-cell and/or intra-cell interference considerations. *Id.* ¶ 75. In particular, adjacent base station cells typically set the same TDD configurations so that the corresponding fixed subframes are either both uplink or downlink to avoid interference, but that does not guarantee that the dynamic subframes are likewise aligned, and thus may be

⁵ Panasonic, Signaling for Flexible Subframes and Determination of Their Usage, 3GPP TSG-RAN WG1 Meeting 73, R1-132137, May 2013 (Ex. 1011).

subject to interference (e.g., DL-to-UL interference or UL-to-DL interference). *Id.* ¶ 76. Also, because uplink channels do not necessarily include cell-specific reference signals (CRS) or CSI reference signals (CSI-RS), which are used for CSI measurement, attempts to measure CSI in an uplink subframe causes measurement and reporting issues. *Id.* ¶¶ 71, 79. It is in this context that Gaal provides for the above-described technique of detecting if a flexible subframe is for uplink, and if so skipping CSI measurement. *Id.* at Fig. 8, ¶¶ 86, 102–103.

2. *Claim 10*

a) Petitioner's Arguments

Following Petitioner's approach, for economy of presentation we refer to the bracketed identifiers applied to the claim limitations by Petitioner (*see* Section II.C above).

For the wireless base station preamble of claim 10, Petitioner generally relies on the disclosure in Gaal of wireless base stations in a wireless communications network. Pet. 22 (citing Ex. 1004, Figs. 1, 3, ¶¶ 3, 5–6, 34–41, 54–62; Proctor Decl. ¶¶ 135–139).⁶

For claim requirement 10.1 of a quality status module to determine the quality status of frequency spectrum resources for uplink or downlink,⁷ Petitioner relies on the disclosure in Gaal of the LTE subframes as the claimed frequency spectrum resources, which given the wireless system are associated with an air interface, and which can be used for uplink or

⁶ Based on the present record, we make no determination at this stage of the proceeding that the preamble of claim 10 (or of claim 17) is limiting.

⁷ In paraphrasing a claim requirement, we reference the complete language of the requirement, which is the subject of our analysis.

downlink, including via the seven predefined TDD configurations discussed above. Pet. 22–29 (citing Ex. 1004, Figs. 2, 2A, 6, ¶¶ 22, 42, 69, 75, 77; Proctor Decl. ¶¶ 22, 142–151). Petitioner further relies on the disclosure in Gaal that the flexible subframes (provided for in eIMTA Release 12 of LTE as discussed above) may change direction “due to inter-cell and/or intra-cell interference considerations” which, argues Petitioner, would have disclosed to one of skill in the art that a quality status monitor was used to determine such interference via measurement of CSI reference signals, which includes CQI values that measure the quality of the channel. *Id.* at 29–33 (citing Ex. 1004 ¶¶ 22, 75, 81, 84, 109–110; Proctor Decl. ¶¶ 81–84, 153–159).

For claim requirement 10.2 of a processor, Petitioner relies on the disclosure in Gaal of controller/processor 340 in Figure 3. Pet. 33–34 (citing Ex. 1004, Fig. 3, ¶ 58; Proctor Decl. ¶¶ 160–162).

For claim requirement 10.3 of determining that a first frequency spectrum resource is a sub-optimal resource for the uplink channel and the downlink channel, Petitioner relies on the disclosure in Gaal that flexible subframes raise more interference concerns than fixed subframes, and therefore a flexible subframe is the claimed sub-optimal first frequency resource due to the interference caused by its flexibility, as compared to the fixed subframes. Pet. 35–38 (citing Ex. 1004 ¶¶ 71–76; Proctor Decl. ¶¶ 163–168). Petitioner further asserts that “Gaal teaches that subframes can be changed from fixed to flexible,” therefore teaching that “certain cells could have been determined to be configured as either flexible or regular in an effort to mitigate inter-cell interference,” and “a POSITA would have found it obvious that Gaal allows for changing a fixed subframe to a flexible subframe in response to determining interference in that subframe.” *Id.*

at 36–37 (citing Ex. 1004 ¶ 75; Proctor Decl. ¶¶ 167–168). In addition, Petitioner asserts that it would have been obvious that determinations of inter-cell and/or intra-cell interference would include the use of CSI/CQI to measure such interference, and that a frequency spectrum resource with a lower CQI value would be sub-optimal compared to one with a higher value, and therefore the lower valued resource would be assigned as a flexible subframe. *Id.* at 37–38 (citing Ex. 1004 ¶¶ 9–12, 68–75; Proctor Decl. ¶¶ 169–172).

For claim requirement 10.4 of assigning the first frequency spectrum resource to a shared resource pool, Petitioner relies on the disclosure in Gaal that the sub-optimal flexible subframes can be allocated to either uplink or downlink and therefore constitute the claimed shared resources in the shared resource pool. Pet. 39–40 (citing Ex. 1004 ¶¶ 69, 76; Proctor Decl. ¶¶ 173–176).

For claim requirement 10.5 of a scheduler module, Petitioner relies on the disclosure in Gaal of scheduler 344 of Figure 3. Pet. 40–41 (citing Ex. 1004, Fig. 3, ¶¶ 24, 58; Proctor Decl. ¶¶ 177–180).

For claim requirement 10.6 of scheduling a frequency spectrum resource for uplink or downlink, Petitioner relies on the disclosure in Gaal of the selection of one of the seven predefined TDD configurations based on the need for uplink versus downlink resources. Pet. 41–42 (citing Ex. 1004, Fig. 6; Proctor Decl. ¶¶ 181–185).

For claim requirement 10.7 of determining an updated directional allocation of frequency spectrum resource, Petitioner relies on the disclosure in Gaal that flexible subframes are scheduled for uplink or downlink

depending on traffic needs. Pet. 42–45 (citing Ex. 1004 ¶¶ 72, 75; Proctor Decl. ¶¶ 186–196).

For claim requirement 10.8 of scheduling the first frequency spectrum resource, Petitioner relies on the disclosure in Gaal of the operation of scheduler 344 to assign flexible subframes for uplink or downlink as needed. Pet. 45–46 (citing Ex. 1004 ¶ 75; Proctor Decl. ¶¶ 197–200).

b) Patent Owner’s Preliminary Response

With respect to claim requirement 10.3, determining that a first frequency spectrum resource is a sub-optimal resource for the uplink channel and the downlink channel, Patent Owner argues that Petitioner’s assertion that flexible subframes are sub-optimal fails to satisfy the claim requirement that the determination that a frequency spectrum resource is sub-optimal must be based on the quality status of the resource, which in turn (according to claim requirement 10.1) is determined by the quality status module. Prelim. Resp. 14. Patent Owner argues:

The Petition explains that a subframe is determined to be sub-optimal *because* it is designated as a flexible subframe, without *any* determination that the determination would be “based on the quality status [determined by the quality status module]” of that subframe. Instead, the Petition contends that the suboptimality of a flexible subframe is a given, and needs no determination based on any determined quality status (such as CQI). Specifically, the Petition states that *every* flexible subframe is suboptimal, such that once a subframe is identified as suboptimal, no determined “quality status” is necessary to determine suboptimality.

Id. Although, as Petitioner asserts, it was known that existence of interference could be determined using CSI/CQI measurements, Patent Owner argues that, under Petitioner’s theory, there would be no motivation

to rely on CSI/CQI measurements to determine suboptimality, given that flexible subframes were *per se* sub-optimal. *Id.* at 14–15. Patent Owner explains that Gaal discloses the opposite of what is claimed—in Gaal, the CSI measurement is based on the uplink/downlink determination, in contrast to the claim, which requires determination of suboptimality based on a determined quality status. *Id.* at 16, n.5, 20, 24–25 (citing Ex. 1004, Abstr., ¶¶ 9–11; Proctor Decl. ¶¶ 99–101, 107–110). Patent Owner summarizes that in Gaal, “the assignment of a frame as fixed or flexible informs the quality measurement, rather than the other way around as the Petition’s theory would require.” *Id.* at 25.

In addition, Patent Owner argues that Petitioner fails to show that Gaal teaches or suggests the claim 10.3 requirement of determining that a subframe is sub-optimal for the **uplink** channel. Prelim. Resp. 15–16. Patent Owner points out that Gaal teaches that CSI/CQI measurements are “useless” for the uplink channel. *Id.* at 16, 18 (citing Ex. 1004 ¶ 85). Patent Owner also relies on the disclosure in the ’361 patent that CQI measurements are used to determine suitability of a resource for the downlink channel, not the uplink channel. *Id.* at 16–17, 22 (citing Ex. 1001, 9:8–11). Patent Owner argues that Petitioner never alleges that Gaal discloses that any suboptimality determination would be “for the uplink channel **and** the downlink channel.” *Id.* at 17. To the contrary, argues Patent Owner, Gaal “devotes several columns to teaching techniques specifically for *avoiding* inadvertent mismeasurements of the uplink channel using CSI-RS and CQI techniques.” *Id.* at 19–20 (citing Ex. 1004 ¶¶ 87, 93, 95, 96, 101, 110).

With respect to claim requirement 10.4, assigning the first frequency spectrum resource to a shared resource pool based on the determination that the resource is sub-optimal, Patent Owner argues that Petitioner presents no evidence or allegation that a subframe is assigned to a shared resource pool on the basis of any determination that it is sub-optimal, as required by the claim. Prelim. Resp. 23. As Patent Owner points out, Petitioner argues that the designation of a subframe (the claimed first frequency spectrum resource) as flexible *ipso facto* means that it is sub-optimal and also that it is assigned to a shared resource pool. *Id.* at 24 (*see* Pet. 39 (“[t]hese sub-optimal flexible subframes can be allocated to either uplink or downlink and therefore constitute the claimed shared resources in the shared resource pool”); Proctor Decl. ¶ 175). But, argues Patent Owner, the claim requires (i) the alleged first frequency spectrum resource be determined to be sub-optimal **based on** its quality status; and (ii) in turn, the resource be assigned to a shared resource pool **in response to** the determination that it is sub-optimal—neither of which Petitioner shows. *Id.* at 24–25.

Further with respect to claim requirement 10.4, Patent Owner repeats its point that the Petition provides no evidence or argument that assignment of a subframe to the shared resource pool is in response to a determination that that subframe is sub-optimal for **both** the uplink channel **and** the downlink channel as claimed. Prelim. Resp. 25–26.

c) Analysis

Based on the present record, we agree with Patent Owner that Gaal does not teach or suggest the claim 10.3 and 10.4 requirements:

determine, based on the quality status of the first frequency spectrum resource, that the first frequency spectrum resource is a sub-optimal

resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the wireless base station; and

in response to the determination that the first frequency spectrum resource is the sub-optimal resource, assign the first frequency spectrum resource to a shared resource pool.

Ex. 1001, 18:64–19:6.

Petitioner asserts that flexible subframes are sub-optimal because they can be more prone to interference than fixed subframes. Pet. 35 (citing Ex. 1004 ¶ 76; Proctor Decl. ¶ 165). But this simply is the result of the fact that a subframe in one base station cell can be handling uplink while a corresponding subframe in an adjacent base station cell is handling downlink. Proctor Decl. ¶¶ 166–168. There is nothing in Gaal to indicate that a subframe is designated as flexible, or created to be flexible, as the result of any measurement of quality status. Indeed, as the Petition admits, “Gaal does not specifically provide any criteria for designating a subframe as flexible.” Pet. 63. As discussed above in Section III.D.1, for Release 12 of the LTE standard, an eIMTA feature provides for an embellishment of the seven predefined TDD configurations, in which each configuration assigns certain subframes as fixed and others as flexible.

Nor is there any concept in Gaal of a “shared resource pool” to which a flexible subframe is assigned in response to being determined as sub-optimal. Petitioner characterizes the flexible subframes as being assigned to a shared resource pool because they can be allocated to either uplink or downlink. Pet. 38. But this is an inherent property of a flexible subframe — Petitioner does not establish that the flexible subframe is assigned to a

shared resource pool or anything else in response to a determination that it is sub-optimal.

In addition, as Patent Owner argues, nothing in Gaal teaches determining, based on quality status, that a flexible subframe is sub-optimal for both uplink and downlink. The only quality status measurements disclosed in Gaal are CSI measurements, which relate to downlink but which are useless for uplink. Ex. 1001, 9:8–12; Ex. 1004 ¶ 85.

Accordingly, for the reasons set forth above, we determine that the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that claim 10 would have been obvious over Gaal.

3. Claims 11–13, 15, and 17

Claims 11–13 and 15 depend from independent claim 10, and independent claim 17 includes claim requirements 17.2 and 17.4, which are counterparts to claim elements 10.3 and 10.4. Ex. 1001, 19:21–44, 19:51–54, 20:17–22, 20:37–40. Accordingly, for the reasons set forth above, we determine that the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that claims 11–13, 15, and 17 would have been obvious over Gaal.

E. Alleged Obviousness of Claims 10–13, 15, and 17 Over Gaal and Khoryaev

Petitioner alternatively challenges claims 10–13, 15, and 17 as obvious in light of the combination of Gaal and Khoryaev. Pet. 59–71.

Khoryaev is titled “Adaptive Ul-Dl Configurations In A TDD Heterogeneous Network,” issued November 10, 2015 from a November 29, 2012 application. Ex. 1018, codes (54), (45), (22). Khoryaev is directed to

offloading traffic from a macro cell to a flexible subframe of a small cell when a specified traffic loading condition exists. *Id.* at code (57).

Petitioner argues that a person of ordinary skill in the art would have been motivated to combine Gaal's system of assigning subframes as fixed or flexible with Khoryaev's teachings of configuring a subframe as flexible in response to neighboring cell interference. Pet 62–66 (citing Proctor Decl. ¶¶ 258–263). Petitioner argues, *inter alia*, that Gaal does not provide specific details of how subframes are selected as fixed or flexible, and that Khoryaev provides additional details regarding how a subframe can be designated from fixed to flexible in response to interference considerations. Pet. 63–64 (citing Ex. 1004 ¶ 75; Ex. 1018, 6:34–35, 7:26–35, 8:20–9:15, 9:30–55; Proctor Decl. ¶¶ 259–260.)

Based on this combination, Petitioner supplements its arguments that Gaal alone teaches the subject matter of claim requirements 10.2 and 10.3, asserting that Khoryaev “teaches that its methods for converting a subframe to a flexible subframe ‘can take into account inter-cell interference from macro cells’ . . . resulting in ‘effective implementation of adaptive change of UL-DL configuration at pico cells.’” Pet. 67 (citing Ex. 1018, 6:34–35, 7:26–35; Proctor Decl. ¶ 265). Petitioner argues that Khoryaev thus teaches determining that a subframe is sub-optimal for the uplink and downlink channel due to measured inter-cell interference, as determined by use of CSI/CQI measurements. *Id.* at 67–68 (citing Ex. 1018, 5:59–6:5; 7:32–35, 8:20–24, 12:35–40; Proctor Decl. ¶¶ 265–266). Petitioner further argues that “Khoryaev teaches that in response to ‘tak[ing] into account inter-cell interference from macro cells,’ Khoryaev will (1) convert the pico subframe from fixed to flexible, and (2) mute or offload traffic for the macro

subframe.” *Id.* at 68–69 (citing Ex. 1018, Figs. 7, 8, 7:26–35, 8:20–9:15, 9:30–33, 9:39–41, 9:45–58; Proctor Decl. ¶¶ 268–273).

Patent Owner argues that, just as for Petitioner’s reliance on Gaal alone, the Gaal/Khoryaev combination does not teach determining that a subframe is sub-optimal for the **uplink** channel based on the quality status, because Petitioner still relies on Gaal’s use of CSI/CQI measurements, which are useless for determining quality status for uplink channels. Prelim. Resp. 27–28 (citing Ex. 1004 ¶ 85). Patent Owner also argues that the Gaal/Khoryaev combination does not teach that a determination would be made that a single subframe (the alleged “first frequency spectrum resource”), is sub-optimal both “for the uplink channel and the downlink channel” as required. *Id.* at 28–29. Patent Owner characterizes Petitioner’s arguments as alleging that the Gaal/Khoryaev combination teaches using interference measurements of a fixed subframe, which is either allocated to uplink or downlink, to determine whether to assign that subframe to be flexible. *Id.* at 29. But, argues Patent Owner, “[t]he Petition shows no motivation in either Gaal or Khoryaev to determine whether a subframe that is fixedly allocated to the uplink channel is a suboptimal resource for the downlink channel, or vice versa.” *Id.*

Based on the present record, we agree with Patent Owner that the Gaal/Khoryaev combination fails to cure the above-discussed inadequacies of Gaal alone. In particular, the combination does not does not teach determining that a subframe is sub-optimal for the **uplink** channel based on the quality status. Moreover, Petitioner’s premise that Khoryaev provides details, missing from Gaal, of configuring a fixed subframe to be flexible in response to neighboring cell interference, is flawed. We have reviewed the

portions of the record cited by Petitioner and its declarant, and we find no support for this premise. The method disclosed in Khoryaev takes advantage of the presence of flexible subframes when offloading traffic from a macro cell to a flexible subframe of a small cell when a specified traffic loading condition exists. Ex. 1018, Figs. 7, 8. But those subframes are not converted from fixed to flexible, but rather are always available as the result of implementing the eIMTA enhanced feature added as part of Release 12 of LTE, and are provided in preset subframes depending on which predefined TDD configuration is being used (*see* page 13 above). Ex. 1004 ¶ 71; Ex. 1018, 7:11–21.

Accordingly, we determine that the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that claim 10 would have been obvious over the combination of Gaal and Khoryaev. Given that claims 11–13 and 15 depend from independent claim 10, and independent claim 17 includes claim requirements 17.2 and 17.4, which are counterparts to claim elements 10.3 and 10.4, we also determine that the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that claims 11–13, 15, and 17 would have been obvious over the combination of Gaal and Khoryaev.

IV. DISCRETIONARY DENIAL OF INSTITUTION

Patent Owner argues that we should exercise our discretion to deny institution “in light of parallel district court litigation involving the same patent, the same parties, the same claims, and the Petition’s lead reference.” Prelim. Resp. 2. However, because we are denying institution on the merits,

it is unnecessary to determine whether it is appropriate to exercise our discretion to deny institution based on the parallel litigation.⁸

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is denied and no *inter partes* review is instituted.

⁸ In addition, we note that Petitioner “stipulate[s] that if the Board institutes *inter partes* review in this proceeding, IPR2024-00316, then Petitioners will not pursue in the parallel litigation, *Cobblestone Wireless, LLC v. Samsung Electronics Co., Ltd. et al.*, No. 2:23-cv-00285 (E.D. Tex.), the same grounds in the Petition (Paper 3) or any grounds that could have reasonably been raised before the Board.” Paper 9.

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