

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMMSCOPE TECHNOLOGIES LLC,
Petitioner,

v.

DALI WIRELESS, INC.,
Patent Owner.

Case IPR2023-00466
Patent 9,197,358

**PATENT OWNER'S PRELIMINARY RESPONSE
UNDER 35 U.S.C. §§ 311-19 AND 37 C.F.R. § 41.100, ET SEQ.**

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EXHIBIT LIST

Exhibit No.	Exhibit Description
2001	Declaration of Dr. Daniel Foty
2002	Directory listing from 3GPP.org FTP site containing meeting submissions for meeting 42 of the RAN working group, found at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_42/Docs (last visited on April 25, 2023)
2003	CV of Dr. Daniel Foty

I. INTRODUCTION

Petitioner has failed to demonstrate a reasonable likelihood that it will prevail in showing unpatentability of any challenged claims 7, 8, 9, 11, 15, 17, 18, 20 and 21 (the “Challenged Claims”) of U.S. Patent No. 9,197,358 (‘358 Patent) (Ex. 1001) under 35 U.S.C. § 314(a). The ‘358 Patent describes techniques for improving inter-cell interference performance of Digital Antenna Systems by having each remote antenna unit (called “digital remote units” or “DRUs” in the patent) create multiple geographic regions or footprints where the outer footprints among adjacent DRUs operate on unique frequencies, providing less interference among mobile user devices in adjacent footprints. Ex. 1001 at 6:25-29. Petitioner raises a number of references collected into seven Grounds, but none that address intercell interference in a DAS. Rather, Xu, which forms the basis of Grounds 1-3, is a research paper studying the performance differences of using six or twelve remote antennas in the outer ring of a conventional base station cell. Notably, the systems studied in Xu are largely duplicative of a reference already considered by the Board in IPR2021-00492 where the Board found the petition deficient because it did not “address or explain the operation or transmission from any single antenna in Fujii, which describes the operation of multiple antennas per cell” Ex. 1025 at 22. Petitioner’s other Grounds rely on either reference Ericsson, which suggests “for discussion” purposes the use of “Fractional reuse” in E-UTRA systems, or Stratford

which discloses a system for “transporting signals from base station hotel to remote transmitters *using optical fibers*”, neither of which teach or contemplate the use of soft frequency reuse in a DAS. Petitioner has at most shown some similarities to unclaimed embodiments and hindsight combinations of unrelated references. Accordingly, Petitioner has not met its burden to show a *prima facie* case of unpatentability for Grounds 1-7.

II. THE '358 PATENT

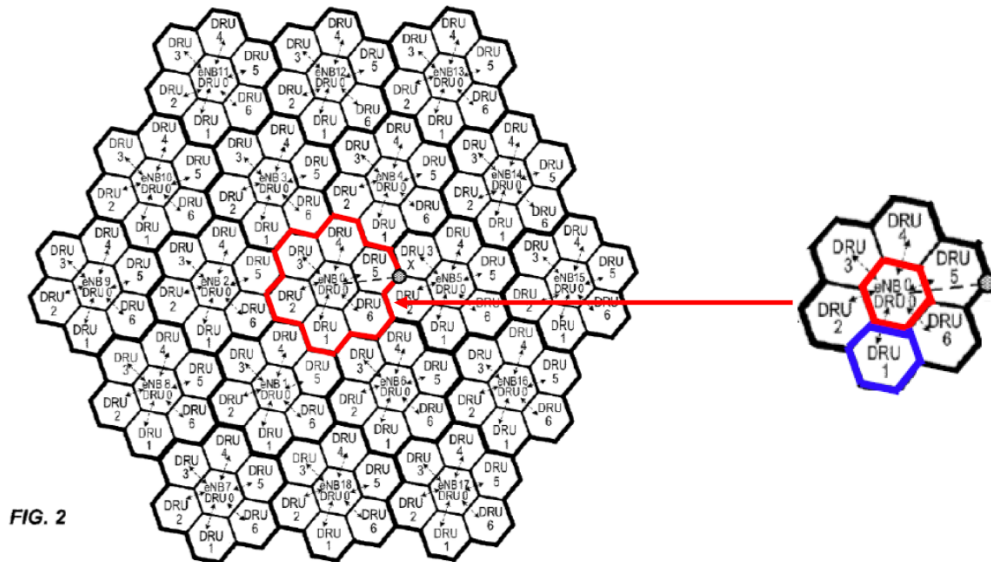
A. Overview

The '358 Patent claims priority to U.S. Provisional Appl. No. 51/649,143 (Method and System for Soft Frequency Reuse in a Distributed Antenna System) ('143 Provisional, Ex. 2002) filed on May 18, 2012. Ex. 1001 at 1:8-12; Exhibit 2001 at ¶ 68. The '358 Patent discloses a new cell architecture by combining a Distributed Antenna System (DAS) with Soft and Fractional Frequency Reuse techniques to mitigate inter-cell interference. Ex. 1001 at 1:39-49, 5:39-43, 6:44-48, 7:51-8:45, 9:5-34; Ex. 1016 at [0001], [0002], [0013]; Exhibit 2001 at ¶¶ 69-72.

For one embodiment, the '358 Patent discloses a DAS architecture such that radio resources are allocated to a digital remote unit (DRU) for users in certain cell areas (e.g., outer cell regions) so that no users in adjoining cells are using the same frequency band. Ex. 1001 at 6:4-9, 7:51-67; Exhibit 2001 at ¶¶ 77-83. And radio resources (such as carrier frequencies) are allocated to the DRU for users in other

areas (e.g., inner cell regions) that can utilize multiple frequency bands or the **entire frequency spectrum** thereby increasing system data rates and capacity. *Id.* at 7:65-57; 8:1-22; 9:5-34; Exhibit 2001 at ¶¶ 77-83.

Referring to Fig. 2 of the '358 Patent (reproduced below with the DRUs surrounding eNB0 blown up), the new DAS architecture includes a central cell referenced as eNB0 including DRUs 0-6 communicating with the base station eNB0 through a digital access unit (DAU)—not shown. Ex. 1001 at 9:42-44; Exhibit 2001 at ¶¶ 84-87.

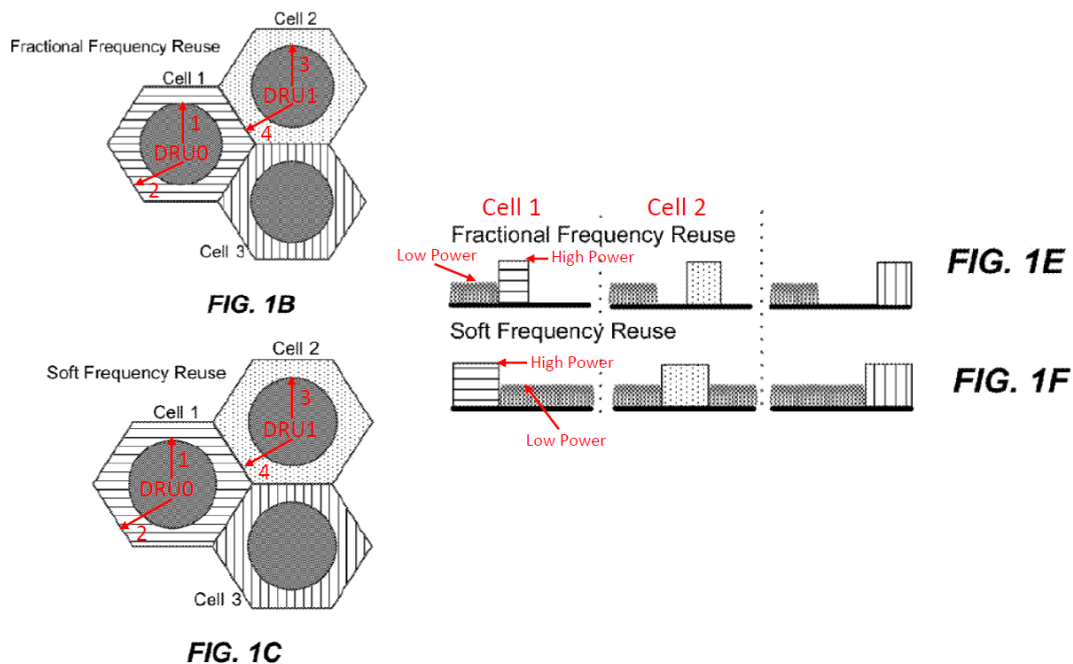


The DAUs are interconnected and connected to multiple sectors of DRUs that allows for virtualization of eNB radio resources at the DRUs. *Id.* at 9:55-57; Exhibit 2001 at ¶¶ 84-87. DRUs are sectorized such that each DRU allocated to a given eNB base sector is simulcast. *Id.* at 11:59-60; Exhibit 2001 at ¶¶ 86-87. The DAUs assign RBs of the various sectors to the independent DRUs. According to the '358 Patent,

for one embodiment, individual DRUs can be considered cells:

DRU0 can be considered to be Cell 1 in FIGS. 1A-1C, **DRU1 can be considered Cell 2** in FIGS. 1A-1C, and DRU2 can be considered to be Cell 3 in FIGS. 1A-1C.

Ex. 1001 at 9:45-47 (emphasis added); *see also*, 8:9-11 (“In this example, each cell utilizes a single DRU . . .”). FIGS. 1B, 1E and 1C, 1F (annotated below) show individual DRU cell architectures implementing fractional frequency reuse (FFR) and software frequency reuse (SFR) techniques, respectively. *See* Exhibit 2001 at ¶¶ 77-82.



For one embodiment, referring to Figs. 1B, 1E, to implement FFR, each DRU (e.g., DRU0 and DRU1 in Cells 1 and 2) transmits and receives data at a first low-power level using frequencies in the grey frequency bands and a second high-power

level using frequencies in the horizontal striped/shaded/vertical striped bands. *Id.* at 10:33-39; Exhibit 2001 at ¶¶ 77-82. For FFR, the entire frequency spectrum is not used. Exhibit 2001 at ¶ 79-80

For another embodiment, referring to Figs. 1C, 1F, to implement SFR, each DRU (e.g., DRU0 and DRU1 in Cells 1 and 2) transmits and receives data at the low-power level frequency band and at the high-power level frequency band. Ex. 1001 at 10:56-61. According to the '358 Patent, “a **single DRU** in Cell 1 **broadcasts at low power** over grey band and at a **higher power** over the horizontal stripe spectrum.” *Id.* at 10:57-59 (emphasis added); Exhibit 2001 at ¶¶ 81-82. In contrast to FFR, for SFR, the **entire allocated frequency spectrum is used** that increases data rate and capacity. *Id.* at 10:55-66.

For FFR and SFR, the low-power frequency bands are used in the inner cell region (grey areas 1 and 3) and the high-power frequency bands are used in the outer cell region (horizontal striped/shaded/vertical striped areas 2 and 4). *Id.* at 7:33-67. Outer cell regions (2 and 4) of adjacent Cells 1-3 use different high-power frequency bands to mitigate interference for cell-edge users. *Id.* Figs. 1B, 1E, 1C, 1F and 2 for a single DRU in a cell using low- and high-power levels to receive and transmit data in inner and outer cell regions (areas 1, 2 in Cell 1 and areas 3, 4 in Cell 2 shown above) embody claims 1-21.

Notably, in addition to creating inner and outer footprints using frequency

bands transmitted at different powers, the '358 Patent also describes a second method of partitioning the cell surrounding a DRU into two separate geographic footprints by assigning mobile devices in those regions to use separate carrier frequencies for the inner footprint and outer footprint. 16:29-55.

B. Claims

Petitioner challenges claims 7, 8, 9, 11, 15, 17, 18, 20, and 21 of the '358 Patent, which includes two independent claims 7 and 15. Claim 7 recites:

7. A method of distributing communications frequencies, the method providing:

providing a set of communications units;

transmitting and receiving, from a first communications unit of the set of communications units:

a first set of frequencies characterized by a first frequency band and a first geographic footprint; and

a second set of frequencies characterized by a second frequency band different from the first frequency band and a second geographic footprint larger than and at least partially surrounding the first geographic footprint; and

transmitting, and receiving, from a second communications unit of the set of communications units:

a third set of frequencies including one or more frequencies in the first frequency band and a third geographical footprint; and

a fourth set of frequencies including one or more frequencies in a third frequency band and a fourth geographical footprint larger than and at least partially surrounding the third geographical footprint.

Ex. 1001 at 21:54-22:8. Notably, the District Court for the Northern District of California recently held in connection with the preamble that “‘distributing’ essentially implicates a DAS.” Ex. 1026 at 38. Claim 15 provides similar scope, but expressly recites “a communication system”, “host unit” and “communication unit[s]” to implicate a DAS:

15. A communications system comprising:

a host unit;

a first communications unit coupled to the host unit and operable to transmit and receive communications using a first set of frequencies in a first frequency range and associated with a first geographical footprint and a second set of frequencies in a second frequency range and associated with a second geographical footprint larger than the first geographical footprint; and

a second communications unit coupled to the host unit and operable to transmit and receive communications using one or more of the first set of frequencies in a region associated with a third geographical footprint and a third set of frequencies in a third

frequency range and associated with a fourth geographical footprint larger than the third geographical footprint.

Ex. 1001 at 22:35-50.

C. Prosecution History

In the 12/31/14 first Office Action, the Examiner alleged claims 1-21 were anticipated by U.S. Patent Appl. Publ. No. 2005/0239403 to *Karabinis* (Ex. 2003). Ex. 1002 ('358 File History) at 237-43; Exhibit 2001 at ¶ 89. In the 5/27/15 Response, Patent Owner made no amendments to the claims, but instead argued successfully that *Karabinis* did not disclose the first, second, third, and fourth geographic footprints recited in claims 1-21. Ex. 1002 at 255; Exhibit 2001 at 89. Patent Owner further argued that *Karabinis* did not disclose at least the third set of frequencies being different from the first and second set of frequencies—i.e., to avoid inter-cell interference. *Id.* In view of these distinctions over *Karabanis*, the Examiner allowed claims 1-21 in the 7/17/15 Notice of Allowance. Ex. 1002 at 266.

III. PERSON OF ORDINARY SKILL IN THE ART (POSA)

Patent Owner proposes and adopts herein the definition of POSA that the Board previously adopted in denying institution of IPR challenging this same patent. Ex. 1025 at 9-10; Exhibit 2001 at ¶ 13. A POSA is someone with (1) a bachelor's degree in electrical engineering; and (2) a minimum of 3–4 years of industry experience in wireless communications networks and engineering but that an

individual with an advanced degree in electrical engineering would require less industry experience (e.g., 1–2 years), and have some knowledge or experience with DAS. *Id.*

IV. CLAIM CONSTRUCTION

Under 37 C.F.R. § 42.104(b)(3), Petitioner has an affirmative burden to set forth how the challenged claims should be construed. *See, e.g., Orthopediatrics Corp. v. K2M, Inc.*, IPR2018-01548, Paper 9 at 10 (PTAB Mar. 1, 2019). In construing challenged claims, the Board follows the standard set by *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). *See also* 37 C.F.R. § 42.100(b). Petitioner must therefore advance a rationale for its proposed claim constructions under *Phillips* to satisfy the requirements of 37 C.F.R. § 42.104(b)(3). Petitioner has failed to do so.

Petitioner seeks to construe terms from claim 7 and 15, “a [first|second] communication unit,” in an unusual way because under the only reasonable interpretation of these terms all Petitioner’s grounds fail. As mentioned briefly above, the Board previously found these claims patentable over a similar reference, Fujii, because Fujii did not create two geographic footprints with a single remote antenna unit. Ex. 1025 at 22. Xu provides a similar disclosure to that of Fujii, as shown in the figures below depicting remote antenna placements:

A Cell Depicted in Fujii using multiple distributed antennas, Ex. 1025 at 12

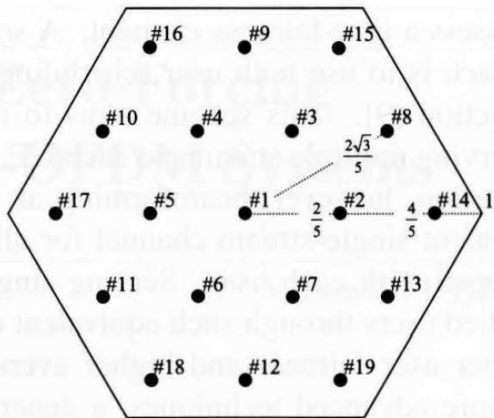


Fig. 5 Distributed antenna geometry.

Cells in Xu (as annotated by Petitioner) showing a central basestation antenna (B_n) and multiple remote antennae (RA), Petition¹ at 22.

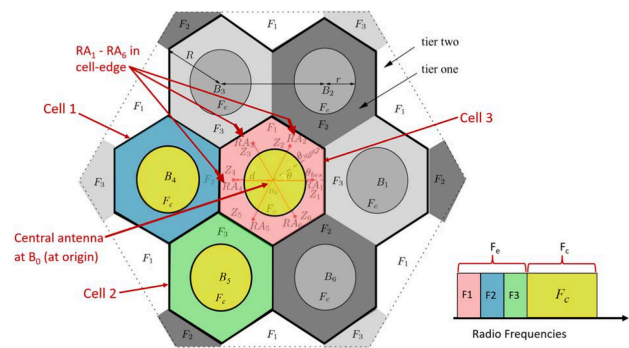


Fig. 1. Topology of two tiers of 19 cells relying on an FFR and DAS arrangement, where $N_r = 6$ RAs are employed. The structure of the cells in tier two is the same as that in tier one.

Yet Petitioner provides only a single sentence in service of its extraordinary claim construction proposal.

As used in the claims, each “communications unit” is required to create two “footprints” using two different frequencies. Exhibit 2001 at ¶ 113. As the claims make clear, a “communications unit” is analogous to a single “remote unit” or

¹ It should be noted that many of illustration in the petition are fabricated by Petitioner and not representative of the references themselves. For example, in the above figure from the Petition at 22 purportedly depicting Fig. 1 of Xu is not only colorized and labelled, but also contains the “Radio Frequencies” chart at the right that is not found in Xu.

“Digital Remote Unit.” For example, claim 7 provides a “set of communications units” that includes “a first” and “a second communication unit.” Claim 8 further recites that the “set of communications units includes a plurality of remote units” Similarly, claim 15 recites “a first” and “a second communications unit” creating two footprints using two different frequencies. Claim 16 recites that these communications units are each a single DRU (digital remote unit). Thus, the first or second communications unit is not “a plurality of” units, but rather the “set of communications units” forms the “plurality of” units referenced in Petitioner’s proposed construction. In contrast, the first or second communications unit is not recited in the claims as being comprised of a “plurality of remote antenna units.”

Finally, the Board should not adopt a construction of “communications unit” that allows multiple “communication units” to create the two footprints at different frequencies as such a construction not only contravenes the plain language of the claims, but also would read on prior art – a position already rejected by the Board. *See, e.g.*, IPR2021-00492, Paper 8 at 21-22.

The claims state that frequencies must be provided from *one* radio unit. Exhibit 2001 at ¶ 113. Claim 7 recites “transmitting . . . from a first communication unit . . . a first set of frequencies . . . and a second set of frequencies.” Petitioner’s construction allowing the frequency to be provided by multiple units collapses “from a first communication unit of the set of communication units” into a collection of

units, which contravenes the claim's plain language. The specification describes this embodiment: "each cell utilizes a single DRU, although other embodiments can utilize multiple DRUs per cell." 8:9-12. Petitioner's assertion that the claims must cover all embodiments is wrong. *Baran v. Med. Device Techs., Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010) ("It is not necessary that each claim read on every embodiment."). "a [first or second] communication unit" is one radio unit.

V. REFERENCES FROM THE GROUNDS

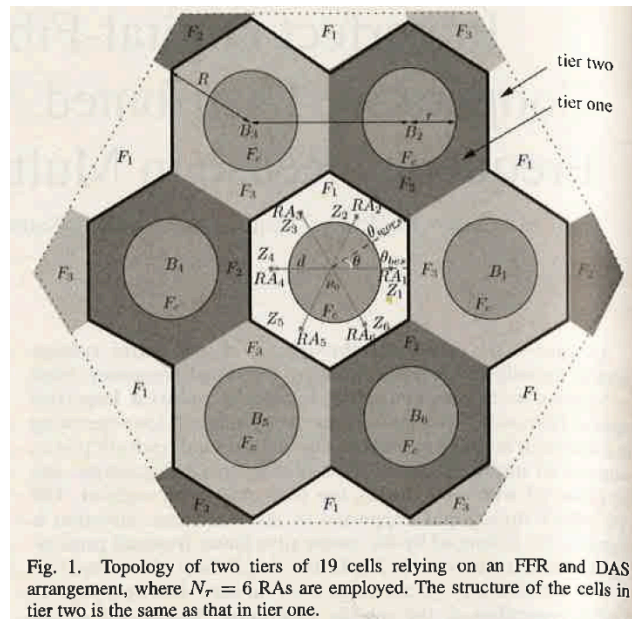
A. Xu

Xu is used as an anticipatory reference in Ground 1 and the base reference for obviousness combinations in Grounds 2 and 3. Xu is an academic study that appears to have been published in the IEEE Transactions on Vehicular Technology in November 2011. Ex. 1005 at 1 (4439); Exhibit 2001 at ¶ 94. Xu analyzes the differences in throughput for cell-edge users by placing a Distributed Antenna System (DAS) in the outer areas of a conventional cell having a base station antenna at its center. *Id.*

"The family of BS [base station] cooperation techniques still relies on the classic architecture of a single centralized BS covering the entire cell where the pathloss- and shadow-fading-induced problem of the cell edge users may not be readily solved. Hence, to achieve a high throughput for the same cellular area, particularly for the cell-edge

terminals, we propose combining DASs with cooperative BS processing techniques.”

Id. As shown in Fig.1 from Xu, the study relies on an architecture where each cell has a center antenna, the base station antenna B_0 , with some number of remote antennae, RA_1 - RA_6 , where the RAs address the above-mentioned signal pathloss and fading issue for the users in the outer edges of the cell.



Ex. 1005 at 7 (4440). The Xu study then focuses on the addressing what it calls the “worse-case direction problem” which occurs when a user’s mobile device mid-way between two adjacent remote antennas. *Id.* at 6 (4439). Xu then provides analysis regarding the effects of increasing the number of remote antennas (*see id.* at 13 (4446), Section IV.D.3) and using cooperative BS frequency techniques (*see id.* at 13, 14, Sections IV.D.2, IV.E.2).

B. Ericsson “R-050764” RAN Working Group Submission

Ericsson is used as a base reference in Grounds 4-6 and a combination reference in Ground 7. This memorandum is a submission to 3GPP's technical specification working group “for discussion” at a meeting. Ex. 1007 at 1; Exhibit 2001 at ¶ 97. The recommendations within Ericsson appear to never have been incorporated into any standard administered by 3GPP.org. Exhibit 2001 at 100. The document itself does not provide any details regarding how to implement frequency reuse techniques, but rather contains only 2 paragraphs suggesting “fractional reuse” to increase performance for edge users in conventional cellular base stations. In fact, it does not describe whether the conventional cell is using multiple base stations to create multiple footprints like in *Fujii*, or whether it is proposing a scheme to include multiple DAS antennas in the outer regions of a conventional cell such as in Xu. Additionally, Ericsson does not even suggest that “frequency reuse” as the technique that will mitigate intercell interference, but rather describes “other possibilities as well.” Ericsson contains no description of key implementation details that a POSA (with as little as 1-2 years of experience in the wireless technology) would need to practice the system described in Ericsson. Exhibit 2001 at ¶¶ 145-6, 148.

Ericsson does not provide sufficient disclosure to enable a POSA to practice the invention of the ‘358 Patent without undue experimentation. *Id.* Ericsson contains no disclosure of how to implement frequency reuse in a DAS. *Id.* It does

not provide any indication of whether it is proposing creating multiple footprints with multiple base stations or whether it is using an array of DAS antennas to supplement the base station antenna. *Id.* Ericsson does not discuss whether a base station or a DAS host unit is distributing the communication frequencies in a manner that will create multiple footprints, each using a particular frequency band. *Id.* Ericsson does not provide any details regarding implementation of fairly complex wireless infrastructure to allow a person with as little as 1-2 years of wireless experience to build and practice the system claimed in the '358 Patent. Exhibit 2001 at ¶¶ 145-6, 148. A POSA would not have the requisite knowledge required to take whatever suggestions are contained within the two scant paragraphs in Ericsson and implement an operational DAS system using FFR or SFR as claimed in the '358 Patent. *Id.* The Petition provides no analysis for this key issue. Because Ericsson is not enabled, the Board should reject Grounds 4-7 because they rely on Ericsson. *Raytheon Techs. Corp. v. GE*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) (reversing PTAB's finding of unpatentability because non-patent reference was not enabled).

Additionally, the Petition fails to demonstrate that Ericsson was a printed publication because it contains no analysis of whether the Ericsson submission was publicly accessible. Petition at 15; Exhibit 2001 at ¶ 136. Instead, it provides a conclusory sentence stating that Ericsson is prior art citing several paragraphs from an expert declaration who opines that because the Ericsson submission was available

on the 3GPP.org website and that POSAs knew the 3GPP.org was “as an organization that brought together different telecommunications organizations to develop and produce technical specifications related to Global System for Mobile Communications (GSM)” that it is a printed publication. Ex. 1022 at ¶ 63. However, thousands of such submissions are available on the 3GPP.org website, and there is no way to search for a particular submission by subject matter. Exhibit 2001 at ¶ 136. Neither Petitioner nor its expert suggest these submissions are searchable or indexed by subject matter. This is not the standard for determining whether a document available in a collection of other electronic documents is a printed publication.

Whether an asserted document qualifies as a “printed publication” under § 102 is a “legal conclusion based on underlying factual determinations.” *Kyocera Wireless Corp. v. Int’l Trade Comm’n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008). “To prevail in a final written decision in an *Inter Partes* Review, the petitioner bears the burden of establishing by a preponderance of the evidence that a particular document is a printed publication.” *Hulu v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (Dec. 20, 2019) (Precedential). Public accessibility is “the touchstone in determining whether a reference constitutes a ‘printed publication.’” *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986). Public availability of an electronic document stored within a collection of other electronically stored documents depends on

whether the document is “meaningfully indexed.” *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772–75 (Fed. Cir. 2018) (Paper indexed by author and year not consider a printed publication because it was not “meaningfully indexed” by subject matter). *See also Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016) (hyperlinked document found to be not meaningfully indexed).

Because the Petition provided no analysis of why Ericsson is prior art, it fails under any of the above tests to show that Ericsson is a printed publication, and no further analysis of Petitioner's expert declaration is required because doing so would improperly incorporate those expert arguments into the Petition. *3M Co. v. Evergreen Adhesives, Inc.*, 860 F. App'x 724, 728 (Fed. Cir. 2021). But even if the Board were to consider the arguments only appearing in Petitioner's expert declaration, those fail too because Petitioner's expert relied on the 3GPP.org website being well-known to POSAs without further analysis. Irrespective of the veracity of that statement, being posted on a well-known website is not enough: the Ericsson submission, and thousands² like it, are stored on an FTP site available through the

² The hyperlink Petitioner's expert includes in footnote 22 contains 361 such submissions like Ericsson, identified only by the “R-050764” style sequential number and this is only for one working group meeting. *See* Exhibit 2002.

3GPP.org website, but neither the 3GPP.org site nor commercial search engines appear to allow searching of the documents on the FTP site. Exhibit 2001 at ¶ 136. There is no way to search for subject matter, author, or any other keyword on the site. *Id.* Not only are these submissions not meaningfully indexed, they are not indexed at all. *Id.* For a person of skill in the art to locate a reference on the 3GPP website they would need to already know the document number, the particular working group name, sub-working group name, and working group meeting number. Even then, a person of skill would need to open and sift through several layers of electronic subfolders, none of which directly indicate where the references would be located. In fact, only knowing the title or subject matter was insufficient to locate documents, as in some cases the searcher would need to already know the internal designation number of the document (e.g. “R1-050764” or “R1-050841”). Thus, under Federal Circuit precedent such as *Blue Calypso*, and *Acceleration Bay*, the Board should reject all grounds relying on Ericsson because Petitioner has not carried its burden to show Ericsson is a printed publication. *See also* IPR2021-00762, Final Written Decision, Paper 37; *Intellectual Ventures II LLC v. Sprint Spectrum, L.P.*, No. 2:17-cv-00662-JRG-RSP, 2019 U.S. Dist. LEXIS 76941, at *11 (E.D. Tex. Apr. 18, 2019) (finding material questions of fact as to whether documents on the 3GPP.org FTP site are publicly available.)

Furthermore, Petitioner's reliance on a date marked on the face of Ex. 1007 is insufficient to establish public availability. The Board has held that "bare testimony . . . is not persuasive evidence that the 'printing date' can be equated to the publication date." *Kinetic Techs., Inc., v. Skyworks Solutions, Inc.*, IPR2014-00690, Paper 43 at 19-20 (PTAB Oct. 19, 2015) ("on this record we are not persuaded that Petitioner has demonstrated by a preponderance of the evidence that [reference] is a printed publication available before the priority date"). Without citing any further evidence or investigation, Petitioner's expert states, "[t]he 3rd Generation Partnership Project provided the 3GPP document on its website on August 25, 2005." Ex. 1022 at ¶ 62. This is insufficient to establish the date the Ericsson submission was made available on 3GPP.org's FTP site. Therefore, the Board should deny all grounds relying on Ericsson because Petitioner has failed to show by a preponderance of evidence that Ericsson was available before the priority date.

C. Stratford

Stratford is used as a base reference in Ground 7. Stratford is a United States Patent discussing systems relating to third generation (3G) cellular systems. Ex. 1009 at 1:15-25. Stratford describes the traditional architecture of cellular systems deploying all the cell site equipment at each remote site as having various drawbacks including expense and upgrade complexity. *Id.* at 1:27-43. Stratford further describes a solution as separating the base station and antenna equipment where the

antenna equipment is placed at the remote location, whereas the base station remains centralized in a base station hotel. *Id.* at 1:44-49. An additional drawback of this separation is that typically the transport between the base station hotel and the remote antenna equipment was limited to RF over fiber optic cables, requiring conversion to and from RF to fiber optic, noting various capacity and other constraints as a result of this conversion. *Id.* at 1:49-2:12.

Stratford notes that while newer methods provide for digital transport between the base station hotel and the remote antenna equipment, those methods typically convert wide swaths of spectrum from RF to digital, transport the broadband digital signals, then convert back to RF at the antenna. Ex. 1009 at 2:13-34; Exhibit 2001 at ¶¶ 106, 107. Stratford proposed an improvement to this digital transport method using narrow band conversion such that only the particular spectrum of interest is converted from RF to digital and back to RF at the antenna unit. *Id.* at 2:37-58; Figs 4-5. Stratford never mentions intercell interference or frequency reuse schemes, and never discusses creating two different frequency footprints from the same antenna unit. Exhibit 2001 at ¶¶ 107, 165.

D. Other Combination References

The Petition also relies on two other combination references for various obviousness grounds. Schwartz is a United States Patent used in Grounds 2 and 3 where it is combined with Xu. Schwartz discloses a sectorization scheme for CDMA

systems in order to address traffic loading issues in traditional, centralized base-station cellular system. Exhibit 1008 at 1:7-11; 2:39-45; Exhibit 2001 at ¶¶ 103-105. As explained in Schwartz, the basic unit of radio resources in a CDMA system is the orthogonal pseudo-random (PN) spreading codes used to separate signals from one another in the system. However, the limit to increasing capacity within a cell using CDMA is not the number of available codes, but the cross-channel interference – i.e., the interference between one CDMA channel using a particular PN code and another CDMA channel using a different PN code *within the same cell*. Exhibit 1008. at 2:4-38. Thus, Schwartz does not deal with interference *between* cells, but rather with interference between signals within the same cell. *Id.* at 2:22-25 (“when CDMA channels belonging to different PN sequences (i.e., different CDMA signals) are used simultaneously in a cell, cross-interference will occur amongst CDMA channels”). Exhibit 2001 at ¶ 104. Similarly, Schwartz does not discuss creating multiple footprints with different frequencies from one remote antenna unit, and does not discuss DAS. *Id.* at ¶¶ 105, 123-4.

Huawei is used as a combination reference only in Ground 3 against claims 17 and 18 to provide the various transmit power levels required by those claims. Huawei is another RAN working group submission similar to Ericsson discussing Soft Frequency Reuse among E-UTRA or standard cellular systems. Exhibit 2001 at ¶¶ 101-102. The Huawei submission is from the same 3GPP.org FTP directory as

the Ericsson submission and is not prior art for the same reasons. Similar to its treatment of Ericsson, the Petition does not analyze the public availability of Huawei and instead incorporates that analysis by reference from Petitioner's expert's declaration. *See* Petition at 17. Petitioner's expert provides the same analysis for Huawei as it did for Ericsson, only changing the Exhibit number and name. *Compare* Ex. 1022 at ¶ 62 with ¶ 66, ¶ 63 with ¶ 67 and ¶ 64 with ¶ 68. Additionally, Petitioner's expert relied on the same statement to establish the date Huawei was publicly available without further citation. *Id.* at ¶ 66 ("The 3rd Generation Partnership Project provided the 3GPP document on its website on August 25, 2005."). Therefore, for the same reasons discussed above for Ericsson, the Board should deny institution of any Grounds using Huawei because Huawei is not prior art. Exhibit 2001 at ¶ 132.

VI. PETITIONER FAILS TO SHOW ANY OF THE CHALLENGED CLAIMS ARE UNPATENTABLE.

Petitioner has failed to carry its burden to show a *prima facie* case of anticipation under 35 U.S.C. § 102 because it has failed to show each limitation of the challenged claim in a single prior art reference, or obviousness under 35 U.S.C. § 103 by not properly addressing the *Graham* factors: (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) objective evidence of non-obviousness,

i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A. Ground 1: Petitioner fails to show that Xu anticipates Claims 7, 8, 9, 11

Using the proper construction of these claims, Xu does not anticipate claims 7, 8 or 11. As discussed above, claim 7 requires “a [first|second] communication unit of the set of communication units”. Below is the key portion of claim 7:

transmitting and receiving, from a first communication unit of the set of communication units:

a first set of frequencies characterized by a first frequency band and a first geographic footprint; and

a second set of frequencies characterized by a second frequency band . . . and a second geographic footprint

Ex. 1001 at 21:57-65. The plain language of claim 7 covers an embodiment where a single communications unit produced two separate geographic footprints using two different frequencies. *See* Section IV, above; Exhibit 2001 at ¶ 113. The specification describes this claimed embodiment: “In this example, each cell utilizes a single DRU, although other embodiments can utilize multiple DRUs per cell as described more fully herein.” *Id.* at 8:9-13.

According to the '358 Patent, in the embodiment covered by claim 7, individual DRUs can be considered cells: “**DRU0 can be considered to be Cell 1**

in FIGS. 1A-1C, **DRU1 can be considered Cell 2** in FIGS.1A-1C, and DRU2 can be considered to be Cell 3 in FIGS.1A-1C.” Ex. 1001 at 9:45-47 (emphasis added). Figs. 1B, 1E and 1C, 1F (below) show individual DRU cell architectures implementing fractional frequency reuse (FFR) and software frequency reuse (SFR) techniques, respectively, in different geographical footprints:

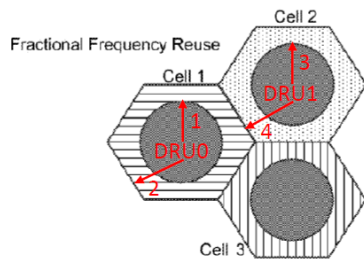


FIG. 1B

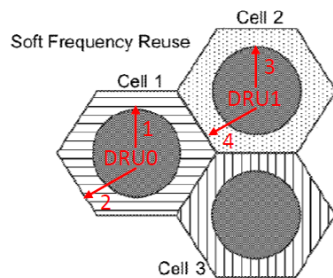


FIG. 1C

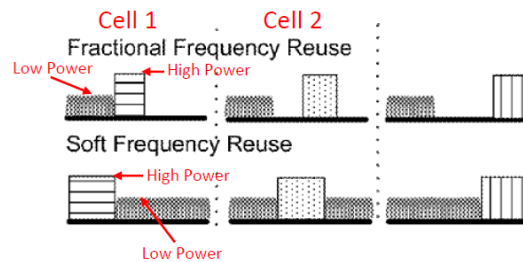


FIG. 1E

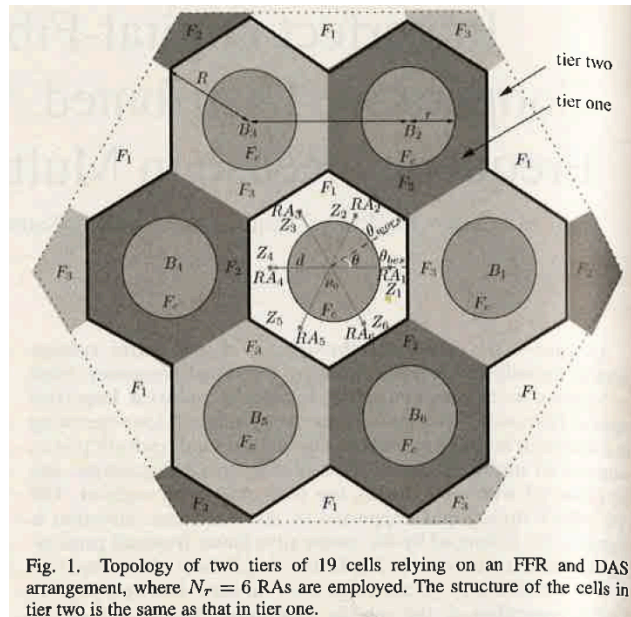
FIG. 1F

Ex. 1001, Fig 1A-1F (red annotations added).

For this claimed embodiment, referring to Figs. 1B, 1E, to implement FFR each DRU (e.g., DRU0 and DRU1 in Cells 1 and 2) transmits and receives data using frequencies in the grey frequency bands and using frequencies in the horizontal striped/shaded/vertical striped bands. Ex. 1001 at 10:33-39. For FFR, the entire frequency spectrum is not used. For another embodiment, referring to Figs. 1C, 1F,

to implement SFR, each DRU (e.g., DRU0 and DRU1 in Cells 1 and 2) transmits and receives data at the low-power level frequency band and at the high-power level frequency band. Ex. 1001 at 10:56-61. According to the '358 Patent, “a **single DRU** in Cell 1 broadcasts at low power over grey band and at a higher power over the horizontal stripe spectrum.” *Id.* at 10:57-59 (emphasis added).

Xu, on the other hand, does not disclose creating multiple geographic footprints with different frequency bands using a single communications unit. Exhibit 2001 at ¶ 115, 118. As discussed above, Xu describes an architecture where each cell has a center antenna, the base station antenna B_0 , with some number of remote antennae, RA_1 - RA_6 , where the RAs address the above-mentioned signal pathloss and fading issue for the users in the outer edges of the cell. Exhibit 2001 at ¶¶ 114-5.



Ex. 1005 at 7 (4440). Nothing in Xu describes any of these single antenna units, either the base station antenna or the surrounding remote antennae (RAs) as each individually transmitting a first and second geographic footprint using a first and second frequency as required by claim 7. Exhibit 2001 at ¶¶ 115-6, 118. Thus, Petitioner has failed to show with particularity the first and second communication units as disclosed and claimed using different first and second frequency sets and bands over first and second geographical footprints. Such a single communication unit per cell is not taught or suggested by Xu. *Id.* This is analogous to the Board's findings in IPR2021-00469 where it found all the claims of the '358 Patent patentable over a similar reference, Xu, for this same reason. Exhibit 1025 at 22. Therefore, the Board should deny institution of Ground 1.

B. Ground 2: Petitioner fails to show that Xu in combination with Schwartz renders Claims 8, 15, 20 and 21 obvious

Claim 8 depends from Claim 7, that requires that a single communication unit create two geographic footprints using two different frequencies as discussed above in connection with Ground 1. Claim 15 recites similar language expressing this same requirement:

a first communication unit . . . operable to transmit and receive communications using a first set of frequencies . . . associated with a first geographical footprint . . .

a second set of frequencies . . . associated with a second geographical footprint

Ex. 1001 at 22:37-43. Claims 20 and 21 depend from claim 15, and therefore contain the same limitations.

As described above in connection with Ground 1, Xu does not disclose or teach transmitting or receiving two different sets of frequencies using two different geographical footprints. Exhibit 2001 at ¶ 122. Additionally, Schwartz does not disclose this limitation either. *Id.* at ¶¶ 123-4.

As described above, Schwartz describes a sectorization scheme for CDMA systems in order to address traffic loading issues in traditional, centralized base-station cellular system. Ex 1008 at 1:7-11; 2:39-45. Schwartz does not deal with interference *between* cells, but rather with interference between signals within the same cell. *Id.* at 2:22-25 (“when CDMA channels belonging to different PN sequences (i.e., different CDMA signals) are **used simultaneously in a cell**, cross-interference will occur amongst CDMA channels”); Exhibit 2001 at ¶123. As such, Schwartz does not discuss creating multiple footprints with different frequencies from one remote antenna unit, and also does not discuss DAS. *Id.*

As a result of both Xu and Schwartz fail to disclose or teach using two footprints with different frequencies from the same antenna unit as described by the claims, the combination fails to so disclose this limitation of claims 7 and 15.

Therefore, the Petition fails to demonstrate a *prima facie* case of obviousness and as such the claim challenged claims and the Board should deny institution of Ground 3.

C. Ground 3: Petitioner fails to show that Xu in combination with Huawei renders Claims 17 and 18 obvious

Claims 17 and 18 depend from claim 15. As described above, claim 15 requires transmitting and receiving from a single communications/antenna unit two different sets of frequencies associated with two different geographical footprints. As demonstrated above, Xu does not disclose or teach such a limitation, and therefore fails to anticipate or render obvious claim 15. In this Ground, Petitioner raises Huawei in combination with Xu to demonstrate that the different transmission powers recited by claims 17 and 18 are rendered obvious. *See* Petition at 45-47. The Petition does not allege that Huawei meets any other portion of claim 15. As a result, the Petition fails to demonstrate a *prima facie* case that Xu in combination with Huawei render claims 17 and 18 obvious, and therefore the Board should deny institution of Ground 3.

Additionally, as discussed above, the Petition fails to demonstrate by a preponderance of evidence that Huawei is prior art because it fails to show that Huawei was publicly available before the priority date. *See* Section V.D above; Ex.

2001 at ¶ 132. Because Ground 3 requires the combination of Xu and Huawei, and Huawei is not prior art, the Board should deny institution of Ground 3.

D. Ground 4: Petitioner fails to show that Ericsson anticipates Claims 7, 9 and 11

As discussed above in Section V.B, the Petition fails to demonstrate by a preponderance of evidence that Ericsson was publicly available before the priority date, and therefore has not established that Ericsson is prior art. As a result, the Board should deny institution of Ground 4.

Using the proper construction of these claims, Ericsson does not anticipate claims 7, 8 or 11. As discussed above, claim 7 requires of “a [first|second] communication unit of the set of communication units”. Below is the key portion of claim 7:

transmitting and receiving, from a first communication unit of the set of communication units:

a first set of frequencies characterized by a first frequency band and a first geographic footprint; and

a second set of frequencies characterized by a second frequency band .

. . and a second geographic footprint

Ex. 1001 at 21:57-65. As discussed in Section V.A the plain language of claim 7 covers an embodiment where a single communications unit produced two separate geographic footprints using two different frequencies. Exhibit 2001 at ¶ 138.

In contrast to the '358 Patent, Ericsson is silent as to how FFR is implemented. Exhibit 2001 at ¶ 145. Ericsson only proposes that using FFR in a traditional base-station cellular environment may address intercell interference (it is one of three such proposed mitigations in Ericsson). Ex. 1007 at 2. It does not describe creating two geographic footprints associated with two frequencies using a single communications unit. Exhibit 2001 at ¶ 145, 148. As such, it does not anticipate the claims, and Petitioner cannot use its expert to fill in portions of Ericsson that are missing. *See Patent Trial and Appeal Board Practice Guide (2019)* at 36 (“expert testimony cannot take the place of disclosure in patents and printed publications.”). Therefore, because Ericsson does not disclose these limitations from claim 7, the Board should deny institution of Ground 4.

Furthermore, Ericsson's lack of any description of how FFR should be implemented in an E-UTRA system raises serious enablement concerns. Exhibit 2001 at ¶ 146. In this Ground, Ericsson is the only asserted reference and as such its disclosure must enable POSA to practice the invention without undue experimentation. *Raytheon Techs. Corp. v. GE*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) (reversing PTAB's finding of unpatentability because non-patent reference was not enabled). Despite this key issue, the Petition does not address whether a POSA would have the requisite knowledge required to take whatever suggestions are contained within the two scant paragraphs in Ericsson and implement an

operational DAS system using FFR or SFR as claimed in the '358 Patent. As discussed further in Section V.B, because the Petition fails to demonstrate that Ericsson is enabled, the Board should reject institution of Ground 4, and other grounds relying on Ericsson. *See also* Exhibit 2001 at ¶ 146.

Finally, by its express language, Ericsson is directed to E-UTRA (“Evolved Universal Terrestrial Radio Access” network) which is the traditional cellular system with base station antennas in the center of each cell. *Id.* at ¶¶ 143-45, 147-48. In contrast the '358 Patent and its claims are directed to a DAS:

The present invention generally related to wireless communication systems employing Distributed Antenna Systems (DAS) as part of a distributed wireless network. More specifically, the present invention relates to a DAS utilizing Soft Frequency Reuse or Fractional Frequency Reuse techniques.

Ex. 1001 at 1:39-43. As shown by the above citation to the '358 Patent, the disclosed invention relates to FFR and SFR in a DAS, not an E-UTRA network. Exhibit 2001 at ¶¶ 143-45, 147-48. The Board has previously noted that the '358 Patent is directed to combining DAS with frequency reuse techniques to mitigate inter-cell interference. IPR2021-00492, Paper 8 at 3. (“In order to mitigate inter-cell interference for users near the cell boundaries, frequency reuse techniques are combined with DAS techniques.”). Additionally, the district court has held that the claims of the '358 patent are directed to a DAS. Ex. 1026 at 38 (the District Court

for the Northern District of California recently held that “‘distributing’ essentially implicates a DAS.”).

However, the Petition does not address how Ericsson discloses a DAS. Ericsson does not disclose, teach or suggest the use of a DAS at all. Ex. 1007 at 2; Exhibit 2001 at ¶¶ 143-45, 147-48. As such, Petitioner has failed to demonstrate that Ericsson anticipates the claims, and the Board should deny institution of Ground 4.

E. Ground 5: Petitioner fails to show that Ericsson in combination with Schwartz renders Claims 7, 8, 9, 11, 15, 17, 18, 20 and 21 obvious

As discussed above in Section V.B, the Petition fails to demonstrate by a preponderance of evidence that Ericsson was publicly available before the priority date, and therefore has not established that Ericsson is prior art. As a result, the Board should deny institution of Ground 4.

As discussed further in Sections V.B and VI.D, the Petition fails to demonstrate that Ericsson is enabled. *See also* Exhibit 2001 at ¶ 154. Schwartz does not discuss or describe using frequency reuse techniques, and in particular does not address how to use a single communications unit to create multiple footprints associated with multiple frequencies, and as such, does not supplement Ericsson with any sort of enabling disclosure. *Id.* at ¶ 155-156. As a result, the Board should reject institution of Ground 5.

The Petitioner raises Schwartz to add a “DAS host unit” to claim limitations 7A and 15B. However, as discussed above in Section V.D, Ericsson does not describe, teach or suggest creating two geographic footprints associated with two frequencies using a single communications unit. Similarly, Schwartz does not teach or suggest that either. Exhibit 2001 at ¶ 155. Because this feature is a limitation of claims 7 and 15, and all other challenged claims depend from claims 7 and 15 and therefore also include this limitation, the combination of Ericsson with Schwartz does not render claims 7, 8, 9, 11, 15, 17, 18, 20 or 21 obvious.

Finally, Schwartz does not disclose a DAS at all. Exhibit 2001 at ¶ 155. Rather, Schwartz discloses a sectorization scheme for CDMA-based traditional cellular networks using a base station as a central antenna for a cell. *See* Section V.D, above. It does not describe DAS features. *Id.* As such, the Petition fails to demonstrate how Schwartz discloses a “DAS host unit” or why combining Schwartz provides a disclosure of DAS at all. As a result, the Board should deny institution of Ground 5.

F. Ground 6: Petitioner fails to show that Ericsson in combination with Stratford renders Claims 7, 8, 9, 11, 15, 17, 18, 20 and 21 obvious

As discussed above in Section V.B, the Petition fails to demonstrate by a preponderance of evidence that Ericsson was publicly available before the priority

date, and therefore has not established that Ericsson is prior art. As a result, the Board should deny institution of Ground 6.

As discussed further in Sections V.B and VI.D, the Petition fails to demonstrate that Ericsson is enabled. Stratford does not discuss or describe using frequency reuse techniques, and in particular, does not address how to use a single communications unit to create multiple footprints associated with multiple frequencies, and as such, does not supplement Ericsson with any sort of enabling disclosure. *See* Section V.C; Exhibit 2001 at ¶¶ 163-64. As a result, the Board should reject institution of Ground 6.

As discussed above in Section V.D, Ericsson does not describe, teach or suggest creating two geographic footprints associated with two frequencies using a single communications unit. Similarly, Stratford does not teach or suggest that either. *See* Section V.C. In fact, the Petition states that the geographic footprints are missing from Stratford. Petition at 78 (“However the specific recited relationship between the geographic footprints would not necessarily be inherent in Stratford’s system.”) Because this feature is a limitation of claims 7 and 15, and all other challenged claims depend from claims 7 and 15 and therefore also include this limitation, the combination of Ericsson with Stratford does not render claims 7, 8, 9, 11, 15, 17, 18, 20 or 21 obvious.

G. Ground 7: Petitioner fails to show that Stratford in combination with Ericsson renders Claims 7, 8, 9, 11, 15, 17, 18, 20 and 21 obvious

Ground 7 is essentially the same combination of Ericsson and Stratford as discussed above in connection with Ground 6. For the same reasons discussed above in Ground 6, the combination of Stratford with Ericsson fails to render the challenged claims obvious because the combination does not disclose creating multiple geographic footprints associated with multiple frequencies as required. Additionally, for the reasons discussed above in connection with Ground 6, the combination fails because the Petition fails to demonstrate Ericsson was publicly available before the priority date, and Ericsson is not enabled. As such, the Board should deny institution of Ground 7.

VII. CONCLUSION

Petitioner has not established a reasonable likelihood that it will prevail on Grounds 1-7 to establish unpatentability of the challenged claims of the '358 Patent, and therefore the Board should deny institution of *inter partes* review of the '358 Patent.

Respectfully Submitted,

Dated: April 26, 2023

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for all portions of the foregoing Patent Owner's Preliminary Response totals 7,532 words per Microsoft Word, which complies with the requirement of 14,000 words allowed under 37 C.F.R. § 42.24(d).

Dated: April 26, 2023

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CERTIFICATE OF SERVICE

As authorized by Patent Owner's Mandatory Notice, I hereby certify that on April 26, 2023, a copy of this document has been served in its entirety by electronic mail on Petitioner's lead and backup counsel.

Dated: April 26, 2023

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