

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

IPR2025-00909
Patent 10,986,695 B1

Before JUSTIN T. ARBES, KEVIN W. CHERRY, and
JOHN D. HAMANN, *Administrative Patent Judges*.

ARBES, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Petitioner Apple Inc. filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–20 of U.S. Patent No. 10,986,695 B1 (Ex. 1001, “the ’695 patent”) pursuant to 35 U.S.C. § 311(a). Patent Owner Apex Beam Technologies LLC filed a Preliminary Response (Paper 8, “Prelim.

Resp.”) pursuant to 35 U.S.C. § 313. Patent Owner’s request for discretionary denial was denied and the Petition was forwarded to the Board. Paper 10.

Pursuant to 35 U.S.C. § 314(a), the Director may not authorize an *inter partes* review unless the information in the petition and 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.” *See* 37 C.F.R. § 42.4(a) (“The Board institutes the trial on behalf of the Director.”). For the reasons that follow, we institute an *inter partes* review as to claims 1–20 of the ’695 patent on all grounds of unpatentability asserted in the Petition.

B. Related Matters

The parties indicate that the ’695 patent is the subject of *Apex Beam Technologies LLC v. Apple Inc.*, No. 6:24-cv-00223 (W.D. Tex.), and was the subject of *Apex Beam Technologies LLC v. Samsung Electronics Co., Ltd.*, No. 2:24-cv-00203 (E.D. Tex.), which has been dismissed. *See* Pet. 78; Paper 4, 2.

C. The ’695 Patent

The ’695 patent discloses methods and systems to “enable uplink cancellation indication operation in a wireless device and/or one or more base stations.” Ex. 1001, col. 2, ll. 51–53. Uplink cancellation “may be used by a base station to cancel scheduled uplink transmissions” from a wireless device, and may occur by sending “group common downlink control information comprising a plurality of uplink cancellation

indications.” *Id.* at col. 30, ll. 10–18. According to the ’695 patent, prior art methods for determining uplink cancellation were “inefficient when a serving cell is configured with a plurality of uplink carriers and/or when an uplink carrier is configured with a plurality of [bandwidth parts (BWPs)],” such that there was “a need to enhance the existing uplink cancellation indication technologies” in such circumstances. *Id.* at col. 30, ll. 18–29.

Figure 26 of the ’695 patent is reproduced below.

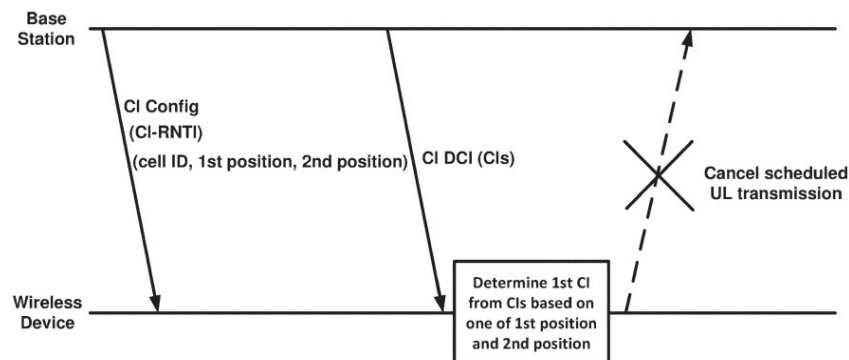


FIG. 26

Figure 26 depicts an exemplary uplink cancellation process. Ex. 1001, col. 2, ll. 34–36. The wireless device first receives “one or more messages comprising configuration parameters” that comprise “uplink cancellation configuration parameters.” *Id.* at col. 40, ll. 7–12. Uplink cancellation configuration parameters can include “a cancellation indication [radio network temporary identifier (RNTI)] (e.g., CI-RNTI)” and “a sequence of serving cell-specific uplink cancellation indication [information elements (IEs)] (e.g., a sequence of CI-ConfigurationPerServingCell IEs).” *Id.* at col. 40, ll. 16–22.

A serving cell-specific uplink cancellation indication IE may comprise an identifier of a serving cell (e.g., a serving cell index), a first parameter (e.g., a positionInDCI parameter) indicating a first position in a DCI (a cancellation indication

DCI) for a serving cell (e.g., a normal uplink (NUL) carrier of a serving cell), [and] a second parameter (e.g., a positionInDCI-ForSUL parameter) indicating a second position in a DCI (a cancellation indication DCI) for a supplementary uplink (SUL) carrier of the serving cell. The first parameter (e.g., the positionInDCI parameter) may indicate a starting position (in number of bit) of a cancellation indication value applicable for this serving cell (servingCellId) within the DCI payload. . . . The second parameter (e.g., the positionInDCI-ForSUL parameter) may indicate a starting position (in number of bit) of a cancellation indication value applicable for SUL of this serving cell (servingCellId) within the DCI payload.

Id. at col. 40, ll. 22–40.

The wireless device later receives a DCI (associated with the CI-RNTI), which can “comprise a plurality of cancellation indications (CIs).” Ex. 1001, col. 40, ll. 47–55. “The wireless device may determine [a] first CI based on the first position when a scheduled uplink transmission is for a NUL of the serving cell” and “may determine the first CI based on the second position when a scheduled uplink transmission is for a SUL of the serving cell.” *Id.* at col. 40, ll. 59–63. The wireless device then cancels the appropriate scheduled uplink transmission (either NUL or SUL) based on the received first CI. *Id.* at col. 29, l. 24–col. 30, l. 54, col. 40, l. 65–col. 41, l. 15, Figs. 16–17.

Figure 19 of the '695 patent is reproduced below.

```
UplinkCancellationIndication ::=          SEQUENCE {
    ci-RNTI                               CI-Value,
    timeFrequencySet                       ENUMERATED {set0, set1},
    dci-PayloadSize                        INTEGER (0..maxINT-DCI-PayloadSize),
    ci-ConfigurationPerServingCell        SEQUENCE (SIZE (1..maxNrofServingCells)) OF
CI-ConfigurationPerServingCell,
    ...
}

CI-ConfigurationPerServingCell ::= SEQUENCE {
    servingCellId                          ServCellIndex,
    positionInDCI                          INTEGER (0..maxINT-DCI-PayloadSize-1)
    positionInDCI-SUL                      INTEGER (0..maxINT-DCI-PayloadSize-1)
}
```

FIG. 19

Figure 19 depicts an exemplary “information element for uplink cancellation indication.” Ex. 1001, col. 2, ll. 16–18. As shown in the figure, the “uplink cancellation configuration parameters” may comprise a cancellation indication RNTI (ci-RNTI) and “a sequence of parameters/information elements (IEs)” including “an identifier of a serving cell” (servingCellId), “a first position, in a downlink control information, for a first uplink carrier of a serving cell” (positionInDCI), and “a second position, in a downlink control information, for a second uplink carrier of the serving cell” (positionInDCI-SUL). *Id.* at col. 30, ll. 55–62.

D. Illustrative Claim

Challenged claim 1 of the '695 patent is independent. Claims 2–20 depend from claim 1. Claim 1 recites the following (with letter designations used in the Petition to refer to the various limitations):

1. [1.pre] A method comprising:
 - [1.a] receiving, by a wireless device, uplink cancellation configuration parameters comprising:

[1.a1] a cancellation indication radio network temporary identifier (RNTI); and

[1.a2] a sequence of serving cell-specific parameters comprising:

an identifier of a serving cell;

a first parameter indicating a first starting position in a downlink control information (DCI) for the serving cell; and

a second parameter indicating a second starting position in a DCI for a supplementary uplink carrier of the serving cell;

[1.b] receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications;

[1.c] determining a first cancellation indication, in the cancellation indications, based on:

[1.c1] the first starting position, in a first number of bit, when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and

[1.c2] the second starting position, in a second number of bit, when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell;

[1.c3] wherein the first number of bit and the second number of bit are based on a payload size of the first DCI; and

[1.d] cancelling the scheduled uplink transmission based on the first cancellation indication.

E. Evidence

Petitioner relies on the following prior art:

U.S. Patent No. 11,930,485 B2, filed Sept. 27, 2019, issued Mar. 12, 2024, provisional application filed Sept. 27, 2018 (Ex. 1004, “Ying”);¹

U.S. Patent Application Publication No. 2022/0217736 A1, filed Apr. 30, 2020, issued July 7, 2022, provisional application filed Aug. 13, 2019 (Ex. 1008, “Boroujeni”);

U.S. Patent Application Publication No. 2020/0359447 A1, filed May 7, 2020, issued Nov. 12, 2020, provisional application filed May 8, 2019 (Ex. 1016, “Yang”); and

International Patent Application Publication No. WO 2019/194589 A1, published Oct. 10, 2019 (Exs. 1006 (original), 1007 (certified translation), “Kim”).²

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–20 of the ’695 patent would have been obvious on the basis of prior art printed publications under 35 U.S.C. § 103:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–20	103	Ying, Yang
1–20	103	Ying
1–20	103	Kim, Boroujeni

¹ Petitioner asserts that Ying, Yang, and Boroujeni are each entitled to the filing date of their respective provisional application(s) (Exhibits 1005, 1010, and 1017), which allegedly contain similar disclosures to the references; Petitioner cites the references and provisional applications “in parallel” throughout the Petition. Pet. 2–3. Patent Owner does not dispute whether the references are prior art in its Preliminary Response.

² We refer to “Kim” as the English translation (Exhibit 1007) of the original patent document in Korean. Petitioner provided a declaration attesting to the accuracy of the translation. See Ex. 1007; 37 C.F.R. § 42.63(b).

II. ANALYSIS

A. *Legal Standards*

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, “the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” *See* 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 “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; and “the level of ordinary skill in the pertinent art.” *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966). Additionally, secondary considerations, such as “commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.”³ *Id.* When conducting an obviousness analysis, we consider a prior art reference “not only for what it expressly teaches, but also for what it fairly suggests.” *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1049 (Fed. Cir. 2019).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. An obviousness determination based on a combination of references requires finding “both ‘that a skilled artisan would have been

³ Patent Owner has not made any arguments regarding objective indicia of nonobviousness at this time. *See generally* Prelim. Resp.

motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (quoting *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012)); *see also KSR*, 550 U.S. at 418 (for an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does”). Also, “[t]hough less common, in appropriate circumstances, a patent can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention.” *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016).

“Although the *KSR* test is flexible, the Board ‘must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to *how* or *why* the references would be combined to produce the claimed invention.” *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (quoting *Kinetic Concepts*, 688 F.3d at 1368). Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation[] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (quoting *In re Lee*, 277 F.3d 1338, 1342 (Fed. Cir. 2002)));

In re Magnum Oil Tools Int’l, Ltd., 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

B. Level of Ordinary Skill in the Art

Petitioner argues that at the time of the ’695 patent (November 2019),⁴ a person of ordinary skill in the art would have had “a bachelor’s degree in electrical engineering, computer engineering, computer science, or a similar field, along with two years of experience designing or developing wireless networks, including long-term evolution LTE/4G or 5G new radio (NR) cellular technology,” where “[a]dditional years of experience could substitute for an advanced-level degree (and vice versa).” Pet. 6 (citing Ex. 1003 ¶¶ 29–32). Patent Owner “utilizes Petitioner’s proposed level of skill in the art” for its Preliminary Response. Prelim. Resp. 2. Based on the record presented, including our review of the ’695 patent and the types of problems and solutions described in the ’695 patent and cited prior art, we agree with Petitioner’s proposed definition of the level of ordinary skill in the art and apply it for purposes of this Decision.

⁴ Petitioner states that November 7, 2019, is the ’695 patent’s “earliest effective date,” but “reserves the right to challenge the ’695 patent’s priority.” Pet. 1 & n.1; *see* Ex. 1001, code (60).

C. Claim Interpretation

We interpret each challenged claim

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), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Petitioner argues that “no claim terms need be construed.” Pet. 6–7. Patent Owner states that “claim construction is not required to resolve any issues.” Prelim. Resp. 2. We conclude that no express interpretation of any claim term is necessary to determine whether to institute an *inter partes* review in this proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“Because we need only construe terms ‘that are in controversy, and *only to the extent necessary* to resolve the controversy,’ we need not construe [a particular claim limitation] where the construction is not ‘material to the . . . dispute.’” (emphasis added) (citation omitted)).

D. Obviousness Ground Based on Ying and Yang

Petitioner contends that claims 1–20 are unpatentable over Ying and Yang under 35 U.S.C. § 103, citing the testimony of Robert Akl, D.Sc., as support. Pet. 7–42 (citing Ex. 1003). Patent Owner responds. Prelim. Resp. 3–5. We are persuaded that Petitioner has established a reasonable likelihood of prevailing on its asserted ground as to claim 1. *See* 37 C.F.R. § 42.108(a).

1. Ying

Ying discloses methods for ultra-reliable low-latency communication (URLLC) “transmission/retransmission management” for fifth generation (5G) New Radio (NR) cellular communication. Ex. 1004, col. 6, ll. 30–33. “In NR, . . . a [physical uplink shared channel (PUSCH)] transmission can be pre-empted (interrupted, punctured, rate-matched, overridden, superposed) by another PUSCH transmission of the same [user equipment (UE)] 102 (intra-UE) or a different UE 102 (inter-UE),” where “the UE 102 may abandon (e.g., omit, skip, drop, withdraw, postpone, cancel) the impacted PUSCH and/or the corresponding grant.” *Id.* at col. 28, ll. 48–64.

Ying explains that

[t]he UE includes receiving circuitry configured to monitor a physical downlink control channel (PDCCH) conveying a pre-emption indication that indicates pre-emption of a physical uplink shared channel (PUSCH) transmission. The receiving circuitry is also configured to receive radio resource control (RRC) signaling that comprises a configuration for a configured grant and a configuration for grant-based PUSCH. . . . The UE further includes transmitting circuitry configured to transmit or skip the PUSCH transmission based on the pre-emption indication.

Id. at col. 3, l. 55–col. 4, l. 3. “Whether the UE follows the configuration for the configured grant or the configuration for the grant-based PUSCH for the scheduled retransmission may be based on a downlink control information (DCI) format used for scheduling the scheduled retransmission.” *Id.* at col. 4, ll. 15–19. Ying describes various DCI formats (e.g., 0_0, 0_1) that can include a “UL/SUL indicator.” *Id.* at col. 11, ll. 13–67.

Listing 6 of Ying is reproduced below.

Listing 6

```
-- ASN1START
-- TAG-ULINKPREEMPTION-START
UplinkPreemption ::= SEQUENCE {
  int-UL-RNTI          RNTI-Value,
  timeFrequencySet_UL  ENUMERATED {set0, set1},
  dci-PayloadSize_UL   INTEGER (0..maxINT-DCI-PayloadSize),
  int-ConfigurationPerServingCell_UL SEQUENCE (SIZE (1..maxNrofServingCells)) OF
  INT-ConfigurationPerServingCell,
  ...
}
INT-Configuration-UL ::= SEQUENCE {
  servingCellId      ServCellIndex,
  ulbwpId            bwp_id
  positionInDCI      INTEGER (0..maxINT-DCI-PayloadSize-1)
}
-- TAG-ULINKPREEMPTION-STOP
-- ASN1STOP
```

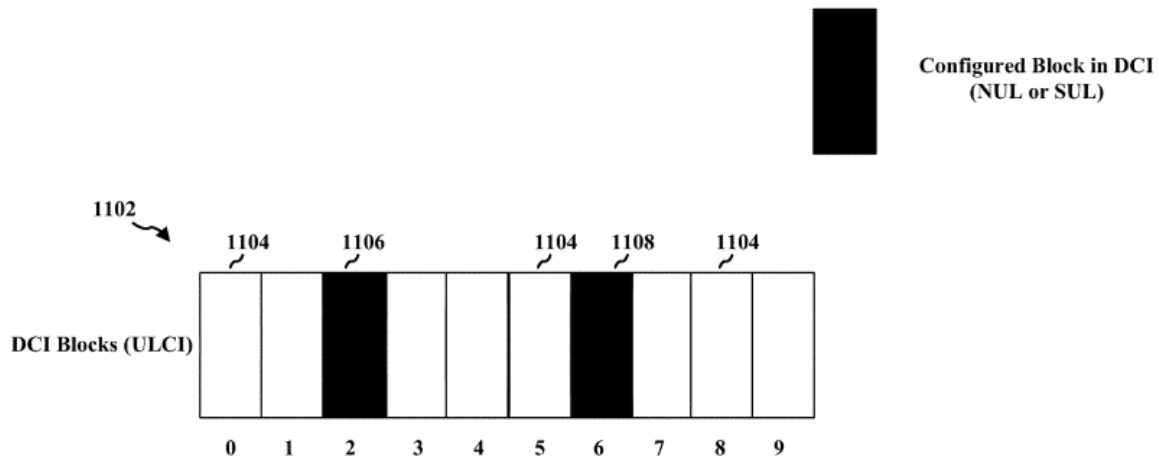
Listing 6 shows “[a]n example of [radio resource control (RRC)] configuration for . . . UL pre-emption.” Ex. 1004, col. 24, ll. 21–23. The UplinkPreemption field of Listing 6 “may be a configuration(s) of uplink preemption indication(s) to be monitored in a serving cell . . . and/or UL bandwidth part(s)” and includes int-UL-RNTI, which is “the RNTI used for pre-emption indication in UL (e.g., int-UL-RNTI is used to scramble the [cyclic redundancy check (CRC)] of PDCCH containing pre-emption indication).” *Id.* at col. 24, ll. 27–33, col. 25, ll. 52–61. “The set [of parameters in UplinkPreemption] determines how the UE interprets the UL preemption DCI payload.” *Id.* at col. 25, ll. 61–62. The INT-Configuration-UL field of Listing 6 includes servingCellId, which identifies the serving cell, and positionInDCI, which is “the starting position (in number of bit) of the X bit INT value applicable for this serving cell . . . and/or this UL BWP . . . within the DCI payload.” *Id.* at col. 25, ll. 63–67.

2. Yang

Yang discloses methods for “selective monitoring of uplink cancellation indication (ULCI) occasions by UEs and allowing UEs to

determine from ULCI whether canceled uplink transmission are carried on non-supplementary uplink (NUL) carriers or supplementary uplink (SUL) carriers.” Ex. 1016, code (57), ¶¶ 10–12. “The base station may configure blocks in downlink control information to indicate the UE should apply ULCI to SUL and/or NUL” and “may configure the UE to perform different behaviors after receiving a ULCI depending on whether the portion of the uplink transmission to be canceled is on SUL or NUL.” *Id.* at code (57).

A portion of Figure 11 of Yang is reproduced below.



The portion of Figure 11 above depicts “an example frame structure 1100 of DCI, comprising ULCI 1102” with “multiple blocks 1104 that may be configured for a particular cell.” Ex. 1016 ¶ 106. “Each block 1104 may correspond to at least one bit associated with a time domain resource granularity (e.g. a number of symbols), where ‘0’ may indicate not to cancel an uplink transmission and ‘1’ may indicate to cancel an uplink transmission (e.g., apply the ULCI), or vice-versa.” *Id.* “The blocks 1104 may be configured to indicate which carrier (SUL or NUL) and resources/symbols the portion of the uplink transmission are to be punctured or canceled.” *Id.* In the example shown, block 1106 corresponds to NUL, such that “the UE would cancel the transmission on the NUL carrier,” and block 1108

corresponds to SUL, such that “[t]he UE would cancel the transmission on the SUL carrier.” *Id.* ¶¶ 106–109, Fig. 12.

3. *Claim 1*

a) Petitioner’s Contentions

Petitioner argues that Ying and Yang collectively teach all of the limitations of claim 1 and a person of ordinary skill in the art would have been motivated to combine their teachings, with a reasonable expectation of success. Pet. 11–28. As to the combination of references, Petitioner asserts that a person of ordinary skill in the art “would have been motivated to include configuration parameters for both the NUL and SUL carriers, as taught in Ying, in a single DCI, as expressly depicted in Yang, to coordinate both normal uplink (NUL) and supplemental uplink (SUL) transmissions in a mobile communication environment.” *Id.* at 12 (citing Ex. 1003 ¶¶ 58–59). According to Petitioner, “[t]he combination involves coordinating both carriers already operating in the mobile communication environment by implementing Ying’s DCI example (e.g., in Listing 6) to provide cancellation indications for both the normal uplink (NUL) and the SUL in one DCI,” achieving the “predictable result” of “improv[ed] communication capacity, speed, flexibility, and/or efficiency.” *Id.* at 12–13 (quoting Ex. 1004, col. 1, ll. 31–41). Petitioner also alleges various other reasons for why a person of ordinary skill in the art would have been motivated to combine the references’ teachings in that manner, including “reduced communication overhead,” simplification of the UE’s decoder operation, and the need to choose from only two options (i.e., “using one

DCI to encode both NUL and SUL carriers . . . or using two DCIs”). *Id.* at 13–17 (citing Ex. 1003 ¶¶ 60–64).

Turning to the limitations of the claim, claim 1 recites:

[1.a] receiving, by a wireless device, uplink cancellation configuration parameters comprising:

[1.a1] a cancellation indication radio network temporary identifier (RNTI); and

[1.a2] a sequence of serving cell-specific parameters comprising:

an identifier of a serving cell;

a first parameter indicating a first starting position in a downlink control information (DCI) for the serving cell; and

a second parameter indicating a second starting position in a DCI for a supplementary uplink carrier of the serving cell.

Petitioner identifies Ying’s “set of configuration parameters for uplink pre-emption,” shown in Listing 6 above, as “uplink cancellation configuration parameters” received by the UE. Pet. 18–19 (citing Ex. 1004, col. 24, ll. 21–37, col. 29, ll. 47–65, col. 30, ll. 50–55,⁵ col. 32, ll. 4–22, Listing 6). Again relying on Listing 6, Petitioner argues that Ying’s int-UL-RNTI parameter is a “cancellation indication radio network temporary identifier (RNTI)” (limitation [1.a1]), the servingCellId parameter is “an identifier of a serving cell” (limitation [1.a2]), and the positionInDCI parameter indicates a “starting position” (in number of bits) in a DCI for the serving cell (limitation [1.a2]). *Id.* at 19–22. Ying, however, only includes a single positionInDCI parameter in Listing 6. *See* Ex. 1004, col. 25,

⁵ The Petition appears to contain a typographical error, citing lines 30–39 of column 30 of Ying, but quoting lines 50–55. *See* Pet. 18, 20.

ll. 33–67. Petitioner, therefore, relies on a combination with Yang, arguing that

Yang describes “configur[ing] separate blocks in [a] DCI to indicate the UE should apply ULICI to either SUL, NUL, or both.” . . . [A person of ordinary skill in the art] would have found it obvious to adapt Ying’s DCI configuration example of Listing 6 (providing, among others, “positionInDCI”) for the normal uplink carrier (NUL) as well as the supplemental uplink carrier (SUL) in one DCI, as expressly depicted in Yang, to pursue the common objective of both Ying and Yang, as well as the known benefits of reduced overhead and simplified decoding.

Pet. 21–22 (quoting Ex. 1016 ¶ 10; citing Ex. 1016 ¶¶ 106, 108–109) (emphasis omitted).

Limitation [1.b] recites “receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications.”

Petitioner cites Ying’s disclosure of UE 102 monitoring the PDCCH for a DCI, where the DCI comprises “uplink preemption indications.” Pet. 22–23 (citing Ex. 1004, col. 24, ll. 21–37, col. 26, l. 61–col. 27, l. 15, col. 29, ll. 47–65).

Limitations [1.c], [1.c1], and [1.c3] recite:

[1.c] determining a first cancellation indication, in the cancellation indications, based on:

[1.c1] the first starting position, in a first number of bit, when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and

[1.c2] the second starting position, in a second number of bit, when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell.

Petitioner argues that UE 102 in Ying receives the DCI and “determines a first cancellation indication (e.g., with regard to specific resource blocks) in the first DCI (including multiple cancellation indications).” Pet. 23–24

(citing Ex. 1004, col. 25, l. 33–col. 32, l. 67, Listing 6) (emphasis omitted). Petitioner further contends when applying the positionInDCI parameter “to both NUL and SUL carriers in one DCI” in the asserted combination, a person of ordinary skill in the art “would have found it obvious to determine the first cancellation indication based on the first starting position (i.e., when ‘positionInDCI’ is applied to the NUL carrier) and the second starting position (i.e., when ‘positionInDCI’ is applied to the SUL carrier).” *Id.* at 24.

Limitation [1.c3] recites that “the first number of bit and the second number of bit are based on a payload size of the first DCI.” Petitioner argues that Ying’s dci-PayloadSize_UL parameter (in the UplinkPreemption field of Listing 6) is the payload size of the DCI, which “can be configured” (up to 126 bits) and thus is “variable (i.e., depending on the actual use case scenario).” Pet. 25; *see* Ex. 1004, col. 25, ll. 52–54, col. 26, ll. 61–63. Ying also discloses that “the length and position of each data field in the DCI can be variable.” Pet. 25 (citing Ex. 1004, col. 18, l. 62–col. 19, l. 4).

Therefore, according to Petitioner, a person of ordinary skill in the art “would have found it apparent, or at least obvious, that each parameter of positionInDCI in Ying would depend on the actual payload size of the DCI,” and “would have predictably used the actual payload size (e.g., versus a maximum payload size which can be larger than the actual size), to facilitate reduced overhead and more accurately encode parameters such as positionInDCI.” *Id.* at 25–26.

Finally, limitation [1.d] recites “cancelling the scheduled uplink transmission based on the first cancellation indication.” Petitioner cites Ying’s disclosure of “cancelling . . . a corresponding PUSCH transmission

. . . after the UE 102 receives the indication of UL . . . cancelation.”

Pet. 27–28 (emphasis omitted); *see* Ex. 1004, col. 34, ll. 44–51.

b) Patent Owner’s Arguments

Patent Owner disputes Petitioner’s showing as to limitations [1.a]–[1.a2], arguing that Petitioner “fails to address, or advance any support for, the limitation that uplink cancellation configuration parameters *comprise* a cancellation indication radio network temporary identifier (RNTI) and a sequence of serving cell-specific parameters.” Prelim. Resp. 3–4. Patent Owner contends that Petitioner maps Ying’s “pre-emption indication[s]” to the recited “uplink cancellation configuration parameters,” Ying’s int-UL-RNTI parameter to the recited “RNTI,” and Ying’s servingCellId parameter and Yang’s “configur[ed] separate blocks in [a] DCI” to the recited “serving cell-specific parameters.” *Id.*

Patent Owner, however, does not account for Petitioner’s asserted combination. Petitioner does not contend that Yang’s “separate blocks” in the DCI are “serving cell-specific parameters.” *See* Pet. 22. Rather, Petitioner argues that, based on Yang’s teaching of using separate blocks in the DCI for the NUL and SUL carriers, a person of ordinary skill in the art would have been motivated to modify Ying’s Listing 6 to provide a positionInDCI parameter “for the normal uplink carrier (NUL) as well as the supplemental uplink carrier (SUL) in one DCI.” *See id.* That modification is supported sufficiently at this stage because, as Petitioner points out, (1) Ying already provides one parameter indicating a starting position in a DCI (the positionInDCI parameter), and (2) Ying’s configuration and cancellation procedure operates “on a mobile network capable of both

conventional uplink and supplemental uplink (SUL) operations.” *See id.* at 9, 11–12, 22; Ex. 1004, col. 25, ll. 63–67, Listings 2–3 (illustrating DCI formats with a “UL/SUL indicator . . . for UEs configured with SUL in the cell,” indicating that Ying’s UE is configured with SUL capabilities).

Petitioner has shown sufficiently on this record that the asserted references collectively teach “uplink cancellation configuration parameters” (i.e., “a set of configuration parameters for uplink pre-emption” as shown in Listing 6) that *comprise* an “RNTI” (i.e., the int-UL-RNTI parameter) and a “sequence of serving cell-specific parameters” (i.e., the servingCellId parameter and a positionInDCI parameter for each of the NUL and SUL carriers). *See* Pet. 18–22; Ex. 1003 ¶¶ 66–72.

Patent Owner also points to a portion of Ying, relied upon by Petitioner, stating that “[i]f a UE 102 is provided [a] higher layer parameter (e.g., UplinkPreemption), the UE 102 may be configured with an RNTI (e.g., INT-UL-RNTI) . . . for monitoring PDCCH conveying DCI . . . which indicates pre-emption information.” Prelim. Resp. 4 (quoting Ex. 1004, col. 29, ll. 47–52). According to Patent Owner, Ying’s “higher layer UplinkPreemption parameter . . . cannot comprise Ying’s RNTI because Ying’s RNTI is only configured when the UE is provided a higher layer parameter, showing that Ying’s UplinkPreemption and RNTI parameters are distinctive from each other.” *Id.*

We disagree based on the current record. Ying discloses that “[i]n the UplinkPreemption field of Listing 6, . . . int-UL-RNTI is the RNTI used for pre-emption indication in UL.” Ex. 1004, col. 25, ll. 52–59. As shown in Listing 6, the UplinkPreemption field includes a sequence of multiple parameters, including int-UL-RNTI, timeFrequencySet_UL,

dc-PayloadSize_UL, and int-ConfigurationPerServingCell_UL. *Id.* at col. 25, ll. 33–61. That “set [of parameters] determines how the UE interprets the UL preemption DCI payload.” *Id.* at col. 25, ll. 61–62. Thus, regardless of the form it takes, the int-UL-RNTI parameter is not distinctive from the UplinkPreemption field, but rather included as a part of it (and used to configure the UE). *See id.* at col. 25, ll. 33–62.

Patent Owner does not dispute Petitioner’s arguments regarding the remaining limitations [1.b]–[1.d] or Petitioner’s asserted motivation to combine Ying and Yang. *See Prelim. Resp.* 3–5.

c) Conclusion

Petitioner’s contentions are supported by the testimony of Dr. Akl and are persuasive based on the current record. *See Pet.* 7–28; Ex. 1003 ¶¶ 58–83. Petitioner has shown a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Ying and Yang. Accordingly, we institute review “on all of the challenged claims and on all grounds of unpatentability asserted for each claim.” *See* 37 C.F.R. § 42.108(a).

4. Claims 2–20

Patent Owner does not argue dependent claims 2–20 separately. *Prelim. Resp.* 3–5. On this record, we disagree with Patent Owner’s arguments regarding parent claim 1 and are persuaded that Petitioner has shown a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Ying and Yang. *See supra* Section II.D.3. Accordingly, we need not determine at this time whether Petitioner also has shown a

reasonable likelihood of prevailing as to any of the other challenged claims.
See 37 C.F.R. § 42.108(a).

E. Obviousness Ground Based on Ying

In addition to its obviousness ground based on the combination of Ying and Yang, Petitioner contends that claims 1–20 are unpatentable under 35 U.S.C. § 103 based on Ying alone, making additional arguments with respect to claims 1 and 10. Pet. 42–48. Patent Owner relies on its arguments regarding Ying, which we disagree with on this record for the reasons explained above. Prelim. Resp. 5. Given our determination as to claim 1 based on the combination of Ying and Yang, we need not determine at this stage whether Petitioner also has shown a reasonable likelihood of prevailing as to its asserted ground based on Ying alone. *See* 37 C.F.R. § 42.108(a).

F. Obviousness Ground Based on Kim and Boroujeni

Petitioner contends that claims 1–20 are unpatentable over Kim and Boroujeni under 35 U.S.C. § 103. Pet. 48–77. Given our determination as to claim 1 based on the combination of Ying and Yang, we need not determine at this stage whether Petitioner also has shown a reasonable likelihood of prevailing as to its other asserted grounds. *See* 37 C.F.R. § 42.108(a).

To provide guidance to the parties, however, we address the arguments made by Patent Owner regarding limitations [1.a]–[1.a2]. Patent Owner argues that Petitioner “fails to specifically identify which of Kim’s disclosure[s] it maps to the claimed ‘uplink cancellation configuration

parameters’” and fails to show that any such parameters *comprise* what Petitioner maps to the recited “RNTI” and “sequence of serving cell-specific parameters.” Prelim. Resp. 5–7.

Regarding limitation [1.a1], Petitioner relies on the combined teachings of Kim and Boroujeni, not Kim alone, and appears to contend that the parameters sent from the base station to the terminal to allow the terminal to later decode the received DCI (including the bitmap) in that combination would be “uplink cancellation configuration parameters” (limitation [1.a1]). *See* Pet. 55 (arguing that a person of ordinary skill in the art “would have found it obvious to parameterize the information identifying resources through which uplink transmissions are cancelled, as taught in Kim, using parameters in accordance with the examples suggested by Boroujeni”), 60–61. As to the “RNTI” of limitation [1.a1], Petitioner points to the RNTI in Kim’s “identification information.” *Id.* at 61 (citing Ex. 1007 ¶¶ 168, 178, 184). As to the “identifier of a serving cell” portion of limitation [1.a2], Petitioner similarly points to Kim’s “identification information,” arguing that because that information can be specific to the serving cell, using an identifier of a serving cell “would have been an operational requirement” for various reasons. *Id.* at 61–62 (citing Ex. 1007 ¶¶ 73, 184).

Those arguments appear on this record to be consistent with the disclosure of Kim. Kim describes “identification information” sent from a base station to a UE for use in decoding the DCI, and discloses that the “identification information” may include an RNTI. *See* Ex. 1007 ¶¶ 168 (“In order to inform the terminals transmitting the UL data channel #1 of the bitmap, the base station may transmit the DL control channel #3 to the

terminals by using identification information” (e.g., “interruption RNTI (INT-RNTI),” “cell-radio RNTI (C-RNTI)”.), 178 (“The identification information (e.g., RNTI) for decoding the DCI may be . . . an INT-RNTI, or another RNTI, and the base station may use a higher layer signaling to transmit the identification information for decoding the DCI to one or more terminals.”). The UE later “use[s] the identification information configured by the base station to perform a detection operation in the specific search space for the DL control channel in order to obtain the UL [preemption indication (PI)].” *Id.* ¶ 184.

Petitioner, however, points to a different disclosure in Kim and relies on a combination with Boroujeni for the “first parameter” and “second parameter” portions of limitation [1.a2], without mentioning the “identification information.” *See* Pet. 57–59 (arguing that a person of ordinary skill in the art “would have found it obvious to encode the starting position for each bitmap of Kim in a DCI using a configuration parameter, in accordance with Boroujeni’s suggestions (e.g., Boroujeni’s positioninDCI)”), 62–64 (citing Ex. 1007 ¶ 171; Ex. 1008 ¶ 179). The parties are encouraged to address Kim’s disclosure regarding “identification information” in their papers during trial.

III. CONCLUSION

Based on the arguments presented in the Petition, we conclude that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the ’695 patent challenged in the Petition. Accordingly, we institute a trial on all claims and all grounds asserted in the

Petition. The Board has not made a final determination under 35 U.S.C. § 318(a) with respect to the patentability of the challenged claims.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the '695 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '695 patent shall commence on the entry date of this Decision, and notice is hereby given of the institution of a trial.

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FOR PETITIONER:

W. Karl Renner
Yao Wang
Craig A. Deutsch
FISH & RICHARDSON P.C.
axf-ptab@fr.com
ywang@fr.com
deutsch@fr.com

FOR PATENT OWNER:

Vincent J. Rubino, III
Peter Lambrianakos
Enrique W. Iturralde
Julian G. Pymonto
Jacob D. Ostling
FABRICANT LLP
vrubino@fabricantllp.com
plambrianakos@fabricantllp.com
eiturralde@fabricantllp.com
jpymonto@fabricantllp.com
jostling@fabricantllp.com