

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GUANGDONG OPPO MOBILE
TELECOMMUNICATIONS CORP., LTD.,
Petitioner,

v.

NOKIA SOLUTIONS AND NETWORKS OY,
Patent Owner.

IPR2022-00632
Patent 10,701,588 B2

Before MICHAEL R. ZECHER, SCOTT B. HOWARD, and
JASON M. REPKO, *Administrative Patent Judges*.

REPKO, *Administrative Patent Judge*.

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

I. INTRODUCTION

Guangdong OPPO Mobile Telecommunications Corp., Ltd. (“Petitioner”) filed a petition requesting *inter partes* review of claims 1, 3–7, 9, 11–13, 15, and 17–22 of U.S. Patent No. 10,701,588 B2 (Ex. 1001, “the ’588 patent”). Paper 1 (“Pet.”). Nokia Solutions and Networks Oy (“Patent Owner”) filed a Preliminary Response. Paper 6.

On October 5, 2022, we instituted an *inter partes* review of all challenged claims based on all grounds in the Petition. Paper 9. Patent Owner filed a Response. Paper 19 (“PO Resp.”). Petitioner filed a Reply. Paper 21 (“Reply”). Patent Owner filed a Sur-reply. Paper 23 (“Sur-reply”). An oral hearing for this case was held on July 6, 2023. Paper 26.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued under 35 U.S.C. § 318(a). For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1, 3–7, 9, 11–13, 15, and 17–22 are unpatentable.

A. *Related Matters*

Neither party has identified any related matters involving the ’588 patent. Pet. 2; Paper 3, 2 (Patent Owner’s Mandatory Notices); Paper 18, 2 (Petitioner’s Updated Mandatory Notices); Paper 30, 2 (Patent Owner’s Updated Mandatory Notices).

B. *The ’588 Patent*

The ’588 patent relates to segment handling in an LTE¹ Radio Link Control (RLC) Layer. *See* Ex. 1001, 1:18–67. According to the ’588 patent,

¹ LTE refers to the long-term evolution of the Universal Mobile Telecommunications System (UMTS) radio-access technology. Ex. 1001, 1:65–67.

the disclosed methods optimize processing and minimize overhead associated with segmentation. *Id.* at 15:4–7.

In the '588 patent, service data units (SDUs) are allocated to protocol data units (PDUs). *Id.* at 13:43–44, 11:37–38. A PDU has a header and data. *Id.* at 11:37–38. Figure 5, below, is a schematic diagram of SDU-to-PDU allocation. *Id.* at 7:62–63.

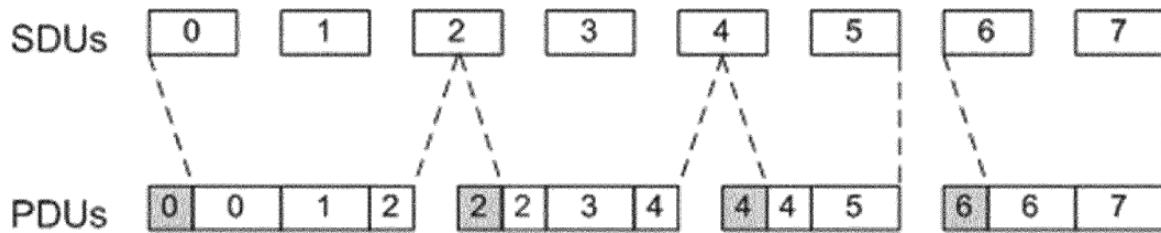


Figure 5, above, shows numbered rectangles representing the SDUs and the corresponding PDUs with sequence numbers (SNs) allocated to PDU headers (shaded in grey). *Id.* For example, SDU 0, SDU 1, and a first SDU 2 segment are allocated to a first PDU. *Id.* at 13:44–46. Five other SDUs and the respective segments are allocated to the other PDUs. *See id.* The PDUs do not contain multiple segments of the same SDU. *Id.* at 14:43–44. The SDUs are in sequential order in the PDU. *Id.* at 14:51–52.

The PDU header contains a length-indicator (LI) field. *Id.* at 14:22–30. The LI field may indicate the SDU's length and segment offset. *Id.* The '588 patent identifies a particular scenario in which the LI field can be omitted from the header. *See id.* at 14:22–30, 15:47–53, 17:62–18:8. The scenario is shown in Figure 9, below.

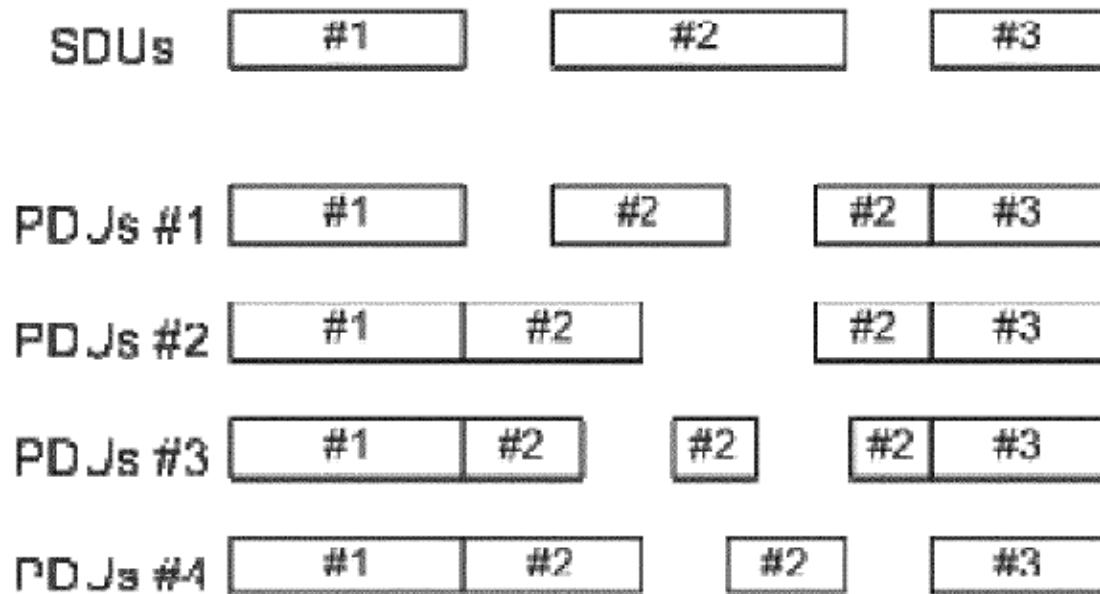


Figure 9, above, shows four segmentation scenarios labeled PDUs #1 through PDUs #4. *Id.* at 8:3–4. Each scenario shows how the SDUs are allocated to PDUs. *Id.* The connected rectangles indicate that multiple SDUs are allocated to a single PDU. *See id.* at 17:1–6. Spaces are inserted between PDUs. *See id.* In the fourth example (PDUs #4), the last segment of SDU #2 fills the entire second PDU. *Id.* at 17:62–18:8. In this case, the receiver can determine the SDU segment’s length by the PDU’s size. *Id.* at 17:62–18:8, 16:28–30. Because the LI field is not needed here, it can be omitted from the second PDU’s header. *Id.*

Figure 13, below, shows a header with the LI field for the middle segment of SDU #2. *Id.* at 17:50–51.

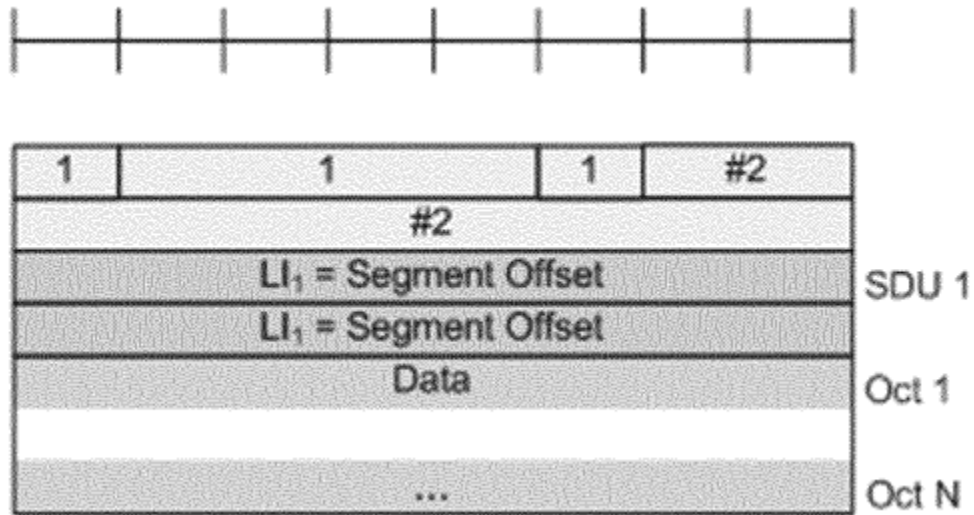


Figure 13, above, shows that the LI field has a segment offset. *Id.* at 17:60–61.

Figure 14, below, shows the PDU structure for the last segment of SDU #2. *Id.* at 17:65–66.

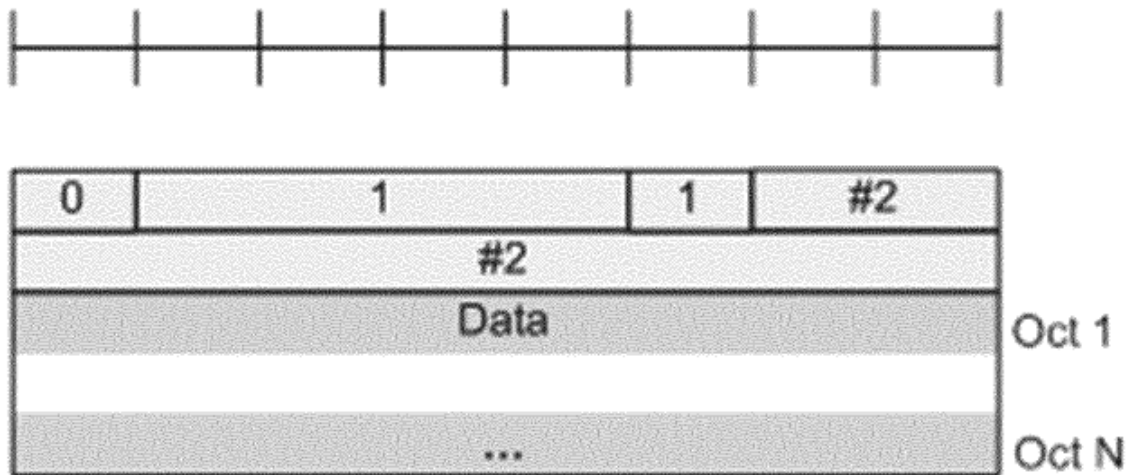


Figure 14, above, shows that the LI field is omitted because the SDU segment is the last segment of the SDU and fills the entire PDU. *Id.* at 18:6–8. According to the '588 patent, omitting the field may reduce overhead. *Id.* at 18:21–28.

C. Claims

Of the challenged claims, 1, 15, 21, and 22 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A method comprising

determining, for a protocol data unit (PDU) to be provided to a receiver entity, whether a segment of a service data unit (SDU) is to be included in the PDU and, if so, determining a position of the segment relative to the SDU, the PDU comprising a header part and a data field part;

determining whether to include information in the header part in dependence on the determining whether the segment of the SDU is to be included in the PDU, and, if so, determining the content of the information in the header part in dependence on the position of the segment relative to the SDU; and

providing the PDU to the receiver entity.

Ex. 1001, 20:38–50.

D. Evidence

Name	Reference	Exhibit No.
Zheng	Chinese Patent Application Publication No. CN101039170 A	1005 ²
Jiang	U.S. Patent Application Publication No. US2008/0101408 to Jiang	1007

Petitioner submitted two declarations of Dr. Robert Akl. Ex. 1003; Ex. 1023.

Patent Owner submitted a Declaration of Dr. Paul S. Min in support of its Response to the Petition. Ex. 2004.

² The Certified English Translation of Zheng is Exhibit 1006.

E. Asserted Grounds

Petitioner asserts that claims 1, 3–7, 9, 11–13, 15, and 17–22 are unpatentable on the following grounds. Pet. 3–5.

Claims Challenged	35 U.S.C. §³	Reference(s)/Basis
1, 3, 4, 6, 7, 9, 12, 13, 15, 17–20	102(a)(1)	Zheng
1, 3–7, 9, 11–13, 15, 17–22	103	Zheng
1, 3–7, 9, 11–13, 15, 17–22	103	Zheng, Jiang

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a “person of ordinary skill in the art (‘POSITA’) at the time of the alleged invention would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and two to three years of experience in the design or development of telecommunication systems, or the equivalent.” Pet. 10 (citing Ex. 1003 ¶ 19).

Patent Owner adopted this definition in its Response. PO Resp. 6.

We determine that Petitioner’s definition is supported by the Akl Declaration, and it is consistent with the asserted prior art and the ’588 patent. *See* Ex. 1003 ¶¶ 18–20. Thus, in this decision, we apply Petitioner’s proposed definition. Pet. 10.

B. Claim Construction

We interpret claim terms 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

³ Congress amended §§ 102 and 103 when it passed the Leahy-Smith America Invents Act (AIA). Pub. L. No. 112–29, § 3(c), 125 Stat. 284, 287 (2011). Here, Petitioner asserts that the amended versions of those sections apply. *See, e.g.*, Pet. 4–5.

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) (2021). We need only construe terms that are in controversy and only to the extent necessary to resolve the dispute. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

The parties disagreed about whether claim 1 recites a step contingent on the occurrence of a condition. *See, e.g.*, Pet. 11; PO Resp. 8. This dispute, however, is relevant to only the grounds based on Zheng alone. Because we determine that Petitioner shows that all the challenged claims are unpatentable under the ground based on Zheng and Jiang, we need not resolve the conditional-limitation issue.

Also, the parties disagree about the meaning of phrase “the content of the information indicates segment offset,” as recited in claim 3 and 17. This issue is discussed in § II.C.5.a of this decision. In that section, we provide a partial claim construction sufficient to resolve the dispute here.

The parties propose different constructions for “the data field part” in their arguments about claims 7 and 20. *See* Pet. 30–34; PO Resp. 25. In § II.C.5.c, we provide a partial claim construction for that term.

In § II.C.5.d of this decision, we discuss the meaning of “field type,” as recited in claims 12 and 13. The parties agree that “a first field type” and “a second field type” should be construed as two different types of fields. Pet. 35; PO Resp. 30.

C. *Obviousness over Zheng and Jiang*

Petitioner asserts that claims 1, 3–7, 9, 11–13, 15, and 17–22 are unpatentable as obvious over Zheng and Jiang. Pet. 44–62.

1. *Zheng*

Zheng relates to RLC segmentation and concatenation functions in LTE Media Access Control (MAC). Ex. 1006, 4:5–7. Zheng’s transmit entity receives an SDU from an upper layer, divides the SDU into one or more PDUs, adds a header to each PDU, and transmits the PDUs. *Id.* at 6:23–24, 6:32–34. A receive entity removes the header of each received PDU, reassembles the PDUs into the SDUs, and transfers each SDU to an upper layer. *Id.* at 6:26–28, 6:34–36. Zheng’s segmentation and concatenation information uses the status-identifier (D) and length-identifier (ELI) fields to map an SDU to a PDU chunk. *Id.* at 13:36–38.

2. *Jiang*

Jiang seeks to reduce the use of a length-indicator (LI) field in the PDU. Ex. 1007 ¶ 10. The LI field indicates an SDU’s ending position in a PDU. *Id.* ¶ 21. But, when an SDU ends at the end of a PDU, Jiang omits the LI field from the PDU’s header to decrease header length. *Id.*

3. *Claim 1*

Petitioner asserts that a person of ordinary skill in the art “would have been motivated to modify Zheng’s segmentation method in view of Jiang’s teaching, such that the modified method can determine *not* to include the ELI field in the PDU header depending on whether the last segment of the SDU is to be included and fills up the PDU.” Pet. 57. That is, according to Petitioner, the Zheng-Jiang combination teaches or suggests “determining whether to include information in the header part in dependence on the determining whether the segment of the SDU is to be included in the PDU.” *Id.* Petitioner asserts that Zheng “discloses all other elements of claim 1.” *Id.* (citing the analysis for claim 1 based on Zheng alone).

For the reasons that follow, Petitioner sufficiently shows that the Zheng-Jiang combination teaches or suggests all limitations of claim 1.

a. Determining whether an SDU segment is to be included in the PDU

Claim 1 recites, in part,

A method comprising determining, for a protocol data unit (PDU) to be provided to a receiver entity, whether a segment of a service data unit (SDU) is to be included in the PDU and, if so, determining a position of the segment relative to the SDU, the PDU comprising a header part and a data field part

Ex. 1001, 20:39–44 (emphasis added). Petitioner asserts that Zheng teaches the emphasized limitation. Pet. 21–23 (analysis of Zheng alone), 57 (incorporating by reference the analysis of Zheng alone).

In particular, Petitioner asserts that Zheng determines “the value of the status identifier (D field) in the header of a PDU, which indicates the form of the SDU in the PDU—a segment of an SDU or a complete SDU.” *Id.* at 22. According to Petitioner, “Zheng discloses that an SDU may be included in a PDU in one of four different forms: a complete SDU, a start segment, a middle segment, or an end segment of the SDU.” *Id.* (citing Ex. 1006, 11:14–29, 15:18–23). Petitioner asserts that, to form a PDU, Zheng needs to determine the SDU segmentation and concatenation information in the PDU’s header. *Id.* (citing Ex. 1006, 11:6–13). This information includes the D field’s value. *Id.* Petitioner asserts that forming the PDU requires determining whether to include an SDU segment or a complete SDU in the PDU. *Id.* (citing Ex. 1003 ¶ 115).

Also, Petitioner asserts that a person of ordinary skill in the art would have understood that, under the Unacknowledged Mode (UM) or Acknowledged Mode (AM), the transmit entity’s RLC segmentation and concatenation functions involve determining whether to segment an SDU

depending on the SDU's length and the PDU's maximum payload. *Id.* at 22–23 (citing Ex. 1003 ¶ 113). Thus, according to Petitioner, “Zheng discloses for a PDU to be provided to a receive entity, the transmit entity determines whether a segment of an SDU, or a complete SDU, is to be included in the PDU.” *Id.* at 23.

Patent Owner does not present arguments specifically directed to these assertions. *See* PO. Resp.; Sur-reply.

We have reviewed Petitioner's arguments and evidence about this limitation (Pet. 21–23) and we find that Zheng teaches the emphasized limitation.

b. Determining the segment's position

Claim 1 recites, in part,

A method comprising determining, for a protocol data unit (PDU) to be provided to a receiver entity, whether a segment of a service data unit (SDU) is to be included in the PDU and, *if so, determining a position of the segment relative to the SDU, the PDU comprising a header part and a data field part*

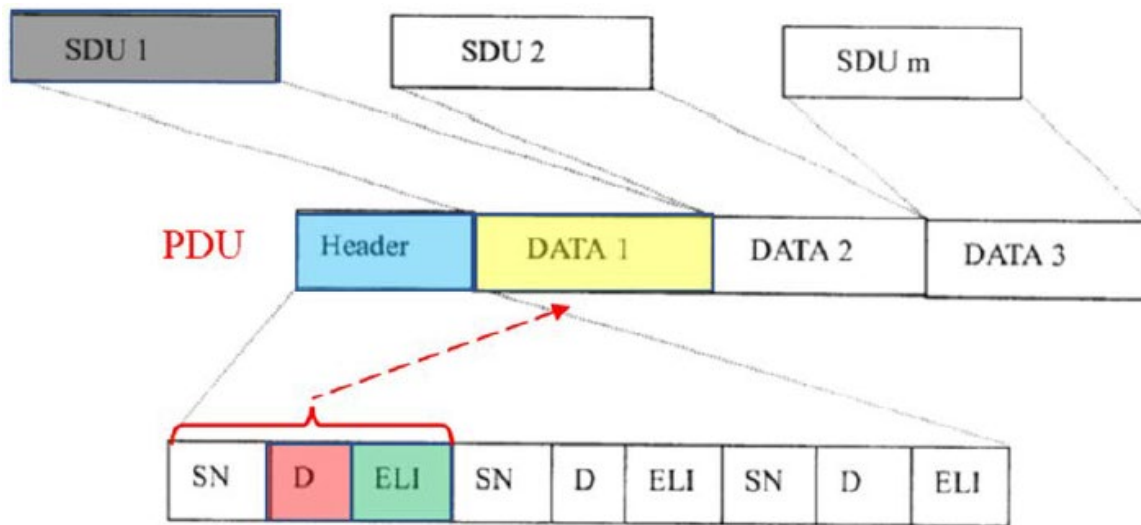
Ex. 1001, 20:39–44 (emphasis added). Petitioner asserts that Zheng teaches the emphasized limitation. Pet. 23–25.

Petitioner asserts that Zheng teaches “if a segment of an SDU, not a complete SDU, is to be included in the PDU (*‘if so’*), whether the segment is a start segment, a middle segment, or an end segment of the SDU (*‘the position of the segment relative to the SDU’*) is further determined.”

Id. at 23–24. Petitioner asserts that Zheng discloses “three forms of SDU segments and their positions relative to the SDU”: a start, middle, and end. *Id.* at 24 (citing Ex. 1006, 11:16–29, 15:18–23). Petitioner asserts that Zheng assigns a value to the D field to indicate the specific position—e.g., 01, 10, or 11. *Id.* (citing Ex. 1008 ¶ 118). In Petitioner's view, “since the position of

an SDU segment has three possibilities (i.e., start, middle, or end) relative to the original SDU, Zheng discloses determining the specific position of an SDU segment from the three possibilities by assigning a value (e.g., 01, 10, or 11) to the D field to indicate the specific position.” *Id.*

Petitioner also asserts that Zheng’s PDUs have “a header part and a data field part.” *Id.* Petitioner’s annotated version of Zheng’s Figure 13 is reproduced below. *Id.* at 25.



The annotated version of Figure 13, above, shows a “Header” in blue and “DATA 1” in yellow, which Petitioner asserts correspond to the recited “header part” and “data field part.” *Id.* (citing Ex. 1006, 13:24–41, 16:27–30; Ex. 1003 ¶ 119).

Patent Owner does not present arguments specifically directed to these assertions. *See* PO Resp.; Sur-reply.

We have reviewed Petitioner’s arguments and evidence about this limitation (Pet. 23–25) and we find that Zheng teaches the emphasized limitation.

c. Determining whether to include information in the header

Claim 1 recites, in part,

determining whether to include information in the header part in dependence on the determining whether the segment of the SDU is to be included in the PDU, and, if so, determining the content of the information in the header part in dependence on the position of the segment relative to the SDU.

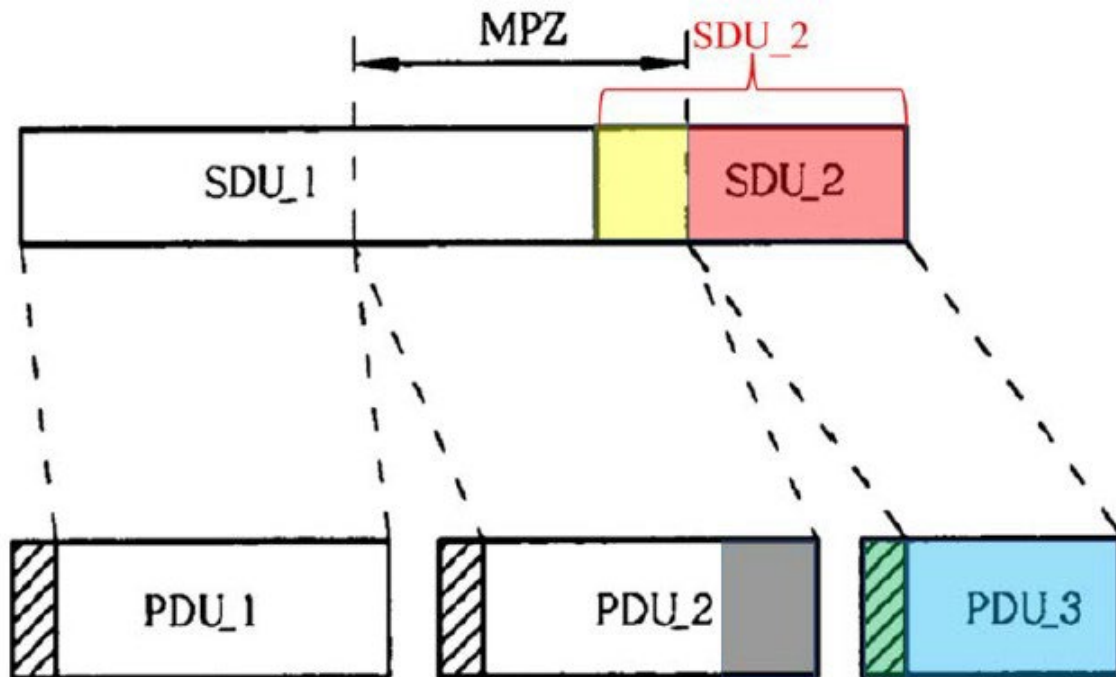
Ex. 1001, 20:45–50. In the analysis that follows, we refer to this as “the second determining step.”

i. The Petition

Petitioner asserts that the Zheng-Jiang combination teaches the subject matter recited in the second determining step. Pet. 57. As for the recited “information in the header part,” Petitioner asserts that Zheng’s PDU header includes a length identifier: the ELI field. *Id.* at 26 (citing Ex. 1006, 11:6–16, 15:16–18, 15:25–27).

According to Petitioner, Zheng uses the ELI and D fields together to indicate the correspondence between the SDU’s parts and the PDU’s data chunks. *Id.* (citing Ex. 1006, 11:11–16, 15:16–18, 15:25–27). So, as for the recited “content of the information in the header part,” Petitioner asserts that the ELI field’s content depends on the SDU segment’s D-field value. *Id.* at 27 (citing Ex. 1003 ¶ 122; Ex. 1006, 11:19–29, 15:29–36, 16:33–39). Petitioner asserts “the type of content in the ELI field in Zheng’s method may change depending on whether the corresponding SDU segment is a start, middle, or end segment relative to the original SDU.” *Id.* at 48 (citing Ex. 1006, 11:14–29, 15:16–36, 16:26–17:5). From this, Petitioner reasons that “it is thus very natural for a [person of ordinary skill in the art] to explore cases that had not been contemplated by Zheng to see if the overhead of the PDU header can be further reduced.” *Id.* (citing Ex. 1003 ¶ 183).

In one of those cases, Petitioner asserts that it would have been “obvious to modify the segmentation method of Zheng in view of Jiang’s header setting techniques, such that in some cases, the special indicator identifier (ELI) field for an SDU segment is *not* included/present in the header of a PDU.” *Id.* at 47. To illustrate this reasoning, Petitioner annotated Jiang’s Figure 1, which is reproduced below. *Id.* at 49.



The annotated version of Figure 1, above, shows an SDU segment (SDU_2 in red) that is an end segment and fills up a PDU (PDU_3 in blue). *Id.* Petitioner asserts that, to save bits in this situation, the ELI field can be omitted from the PDU header for the end SDU segment. *Id.* (citing Ex. 1007 ¶¶ 21, 26). Petitioner asserts that modifying Zheng in this way would reduce overhead and ensure the standard’s competitiveness. *Id.* (citing Ex. 1003 ¶ 183).

Petitioner asserts that applying Jiang’s header setting techniques improve the similar segmentation method of Zheng in the same way.

Id. at 49–52. According to Petitioner, the proposed modification of Zheng has a reasonable expectation of success. *Id.* at 52–55.

ii. *Petitioner’s Reason to Combine Zheng and Jiang*

Patent Owner argues that modifying Zheng with Jiang lacks a reasonable expectation of success, and Petitioner has not provided a sufficient motivation to combine the references. PO Resp. 45–63; Sur-reply 8–24.⁴ We disagree with Patent Owner and determine that Petitioner showing is sufficient. Our reasoning follows.

Patent Owner argues that Zheng already reduces overhead by reusing the ELI (PO Resp. 32–33, 45) and actual omission of the ELI field under Petitioner’s reasoning would be rare (Sur-reply 11 n.5). Patent Owner argues that Petitioner has provided no support for the conclusion that “reducing overhead in limited circumstances would ‘ensure competitiveness’ at all,” and rests on merely whether a person of ordinary skill in the art could implement Jiang in Zheng. Sur-reply 7, 9.

In Patent Owner’s view, Petitioner has not shown that there would be an actual improvement under its obvious improvement theory, nor has Petitioner provided evidence of market pressure or design need. *Id.* at 10–11; PO Resp. 32–34. Rather, Patent Owner contends that Petitioner’s reasoning

⁴ Patent Owner argues that Petitioner introduces new theories in its Reply that “should be struck.” Sur-reply 6. Patent Owner, however, did not file a motion to strike or request further merits briefing. Consolidated Trial Practice Guide, 80 (Nov. 21, 2019), *available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated> (“If a party believes that a brief filed by the opposing party raises new issues, is accompanied by belatedly presented evidence, or otherwise exceeds the proper scope of reply or sur-reply, it may request authorization to file a motion to strike” or further merits briefing.).

is “generic” and based on impermissible hindsight. PO Resp. 33–34, 45; Sur-Reply 7, 9.

We disagree that Petitioner’s rationale is insufficient. The evidence supports Petitioner’s assertion that the teachings of Zheng and Jiang would have led a person of ordinary skill to not include the ELI field in the header in some cases. Pet. 47–49. Both Zheng and Jiang recognize that transmission efficiency can be improved by reducing PDU-header bits. *See* Ex. 1006, 10:30–34, 14:5; Ex. 1007 ¶¶ 21, 26. Also, Zheng’s solution already proposes an ELI field that can take several forms based on the SDU segments. *See, e.g.*, Ex. 1006, 11:14–29. Because Dr. Min does not give sufficient weight to these parts of Zheng and Jiang, we credit Dr. Akl’s testimony (Ex. 1003 ¶¶ 179–183) over Dr. Min’s (Ex. 2004 ¶¶ 75, 82) on this particular issue.

The record does not support Patent Owner’s argument that Petitioner’s modification would be insufficient or lack an improvement. *See* PO Resp. 32–34; Sur-reply 10–11. Rather, Zheng and Jiang support Petitioner’s assertion that Zheng leaves room for improvement. Pet. 48–49. In particular, Petitioner proposes further reducing the number of PDU-header bits. *Id.* at 47–49. In fact, Patent Owner acknowledges elsewhere that “[r]educing header overhead results in transmitting less bits and a more efficient header because you have less control information.” Sur-reply 17 (citing Ex. 2005, 143:16–22). Indeed, Jiang and Zheng both discuss improving the current standard by reducing the number of header bits. *See, e.g.*, Ex. 1006, 10:30–34, 14:5; Ex. 1007 ¶¶ 21, 26. For example, Jiang teaches that decreasing the PDU header’s size improves transmission efficiency. Ex. 1007 ¶¶ 10, 27. Similarly, Zheng seeks to minimize overhead through improvements to the header. Ex. 1006, 10:30–34. In at least these

ways, the record supports Petitioner's assertion that further reducing the number of header bits would lead to additional improvements. *See* Pet. 48–49.

Zheng and Jiang both align with Dr. Akl's testimony that reducing overhead will ensure the LTE standard's competitiveness. Ex. 1003 ¶¶ 182–183. We credit Dr. Akl's testimony on this point. *Id.*

For all reasons discussed above, Petitioner's articulated reasoning for combining the references has rational underpinning and that reasoning is sufficiently supported by the cited evidence.

In addition, Petitioner explains that the Zheng-Jiang combination uses a known header setting technique to improve Zheng's similar segmentation technique in the same way. Pet. 49–52. The techniques in Zheng and Jiang are similar for at least the reason already discussed: Both propose reducing the number of header bits to improve transmission efficiency. *See* Ex. 1006, 10:30–34, 14:5; Ex. 1007 ¶¶ 21, 26. Also, Dr. Akl testifies that reducing PDU-header size was known to reduce transmission overhead. *See* Ex. 1003 ¶ 185 (citing Ex. 1010, 22, 24; Ex. 1012, 23, 25; Ex. 1008 ¶ 42); Pet. 50. The cited evidence supports Dr. Akl's assertion because it describes omitting information from the PDU header in certain circumstances. *See* Ex. 1010, 22, 24; Ex. 1012, 23, 25; Ex. 1008 ¶ 42.

Petitioner identifies other similarities between the references that support its obviousness rationale: “Jiang and Zheng were proposed during the same time period, both directed to SDU segmentation at the same RLC layer, targeted at the same HSDPA and HSUPA⁵ applications, and sharing

⁵ HSDPA stands for High-Speed Downlink Packet Access, and HSUPA stands for High Speed Uplink Packet Access. Ex. 1006, 8:4–5.

common technical features.” Pet. 53 (citing Ex. 1003 ¶ 189). These common features further support Petitioner’s assertions that (1) the Zheng-Jiang combination uses a known header-setting technique to improve Zheng’s similar segmentation technique in the same way, and (2) such a modification has a reasonable expectation of success. *Id.* at 51–55 (citing Ex. 1006, 8:30–33; 1010, 21; Ex. 1012, 22; 1014, 17; Ex. 1003 ¶¶ 186–194).

For these additional reasons, we determine that Petitioner’s articulated reasoning for combining the references has rational underpinning and that reasoning is sufficiently supported by the cited evidence, and we disagree that Petitioner’s rationale is “generic” or insufficient in other ways. *See* PO Resp. 32–34, 45; Sur-reply 8–10.

iii. A PDU with one SDU

Patent Owner argues that Zheng’s receiver cannot determine that a PDU contains only a single segment if Zheng’s transmitter is modified by Jiang under Petitioner’s proposed combination. PO Resp. 54–56. In Patent’s Owner’s view, Zheng’s receiver will fail when trying to process a header without the ELI field even when the PDU has only one SDU. *Id.* at 55; *see also* Sur-reply 22–24 (citing Ex. 2006, 57:11–21; Ex. 2004 ¶¶ 115–116).

Essentially, this argument assumes that Jiang’s teachings would be bodily incorporated into Zheng’s transmitter without changing the receiver. *See* PO Resp. 54–56. Yet it is well settled that “a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.” *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citations omitted). Nor is the test for obviousness whether a secondary reference’s features can be bodily incorporated into the structure of the primary reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); *see also In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (explaining

that whether one prior art reference can be incorporated into another is “basically irrelevant”).

Rather, a person of ordinary skill in the art is also a person of ordinary creativity, not an automaton. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). When evaluating obviousness, one must account for “the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418.

Patent Owner’s arguments are inconsistent with these principles of obviousness. *See* PO Resp. 52–56. Specifically, Patent Owner’s argument is directed to the details of how to bodily incorporate Jiang into Zheng, and does not account for inferences and creative steps that a person of ordinary skill in the art would employ to configure the receiver to account for the omitted ELI in the Zheng-Jiang combination. *See id.*

In its Reply, Petitioner explains how Zheng’s receiver purportedly could recognize whether the ELI field is omitted. *See* Reply 10–17. Even so, we need not, and in fact do not, rely on this analysis in reaching our decision here. Rather, Petitioner’s analysis as originally presented in the Petition is sufficient under the proper test for obviousness. *See* Pet. 53–55.

That is, Petitioner sufficiently explains in the Petition itself that a receiver entity in the Zheng-Jiang combination can still determine the end segment’s length without the ELI field. *Id.* at 53 (citing Ex. 1003 ¶ 190). According to Petitioner, the receiver entity would know the end segment’s end byte and calculate the length:

[T]he end byte of the end segment corresponds to the end byte of the PDU, and the length of the end segment is known from the PDU length The receive entity would still be able to calculate the SDU segment length based on the PDU length,

which is known to the receive entity in both AM and UM modes, either as a fixed length or a variable length.

Id. at 53–54 (citing Ex. 1006, 8:26–28, 8:30–32; Ex. 1001, 14:44–48, 16:28–30). Petitioner explains how the receiver entity would know an end segment’s start byte:

[S]ince RLC SDUs are known to be segmented and placed into PDUs in sequence (*see e.g.*, EX1013, 1), the start byte of an end SDU segment is continuous from the last byte of the preceding SDU segment (*e.g.*, either a middle or start segment) and thus, would also be known by the receive entity from the ELI field of the preceding SDU segment if needed.

Id. at 54 (citing Ex. 1003 ¶ 191). Petitioner explains how the receiver entity would know that the end segment is the PDU’s only data segment:

Zheng discloses including a respective SN field and D field in the header for each data segment included in the PDU. EX1006, 16:27-30. Thus, the number of data segment(s) in the PDU can be determined by the receive entity from the header using the total number of SN/D fields included in the header. EX1003, ¶193. If the header includes only one SN/D field, without any ELI field, the receive entity would know that the PDU includes only an end SDU segment.

Id. at 55 (citing Ex. 1003 ¶ 193). With agree with this analysis because Petitioner has sufficiently explained how the receiver entity would function in the proposed combination, accounting for the inferences and creative steps of a person of ordinary skill.

iv. Zheng’s Figures 7, 8, and 13

Patent Owner also disagrees with Petitioner’s reliance on Zheng’s Figures 7, 8, and 13. *See* PO Resp. 48–51. Figures 7 and 8 show the data-packet formats for the standard in effect at the time. *See* Ex. 1006, 8:2–36; *see also* PO Resp. 48 n.4 (discussing the data-packet formats). Figure 13

shows Zheng's proposed modification to that existing standard, including the addition of an ELI field. Ex. 1006, 14:24–25.

Patent Owner argues that Petitioner's expert testimony introduces a new theory based on Figures 7 and 8. PO Resp. 49 (citing Ex. 2005, 161:13–162:10, 162:20–163:4, 227:4–14). In Patent Owner's view, Petitioner's expert, Dr. Akl, discusses Zheng's Figures 7 and 8, despite explicitly relying on Zheng's modified structure in Figure 13 elsewhere. *Id.* (citing Pet. 19–20, 24–26, 31–32).

It is undisputed, however, that Petitioner relies on the D and ELI fields shown in Figure 13. *See* Pet. 19–20, 24–26, 31–32; PO Resp. 48 n.3; Reply 7. The parties also agree that Zheng adds to the header structure of the existing standard. *See* PO Resp. 45, 47–49; Reply 7. Figures 7 and 8 show the data-packet formats for the unmodified, existing standard. *See* Ex. 1006, 8:2–36; *see also* PO Resp. 48 n.4 (discussing the data-packet formats). Thus, some parts of the unmodified standard described in Figures 7 and 8 may inform a skilled artisan's understanding of the Figure 13 embodiment. *See* Reply 8.

In Figure 13 and elsewhere, Zheng's description focuses on the identifiers needed for segmentation and concatenation and those relevant to the disclosed invention. Ex. 1006, 16:18–22, *cited in* Reply 8. Zheng's data packets, however, may contain other information. *Id.* For example, Zheng retains the indicator bit showing whether a next byte is data or a header. *Id.* Zheng explains that, although the bits are not shown, those skilled in the art would have understood that they are present. *See id.* Thus, we understand Petitioner to rely on Figure 13 in its proposed combination, which incorporates the indicator bit.

v. *Omitting Zheng’s length-identifier (ELI) Field*

In the header structure used in wireless-communication standards, the length-indicator (LI) field can be used to indicate an SDU’s end position. Ex. 1007 ¶ 10. After the LI field, the extension-bit (E) field indicates that the next field is the LI field or data field. *Id.*

Patent Owner argues that Zheng and Jiang have incompatible header structures. PO Resp. 49–51. Patent Owner argues that Zheng replaces the LI and E fields with the status-identifier (D) and length-identifier (ELI) fields. *Id.* at 49–50. Patent Owner argues that Zheng’s ELI field is unlike Jiang’s omitted LI field because the LI field indicates an SDU’s end position. *Id.* at 50 (citing Ex. 2004 ¶¶ 88–92), 51 (Table 3). According to Patent Owner, Petitioner “proposes eliminating Zheng’s new ELI field in its entirety.” *Id.* at 51 (citing Pet. 52–55; Ex. 2005, 228:9–229:15). Patent Owner argues that a person of ordinary skill would not do this because Zheng’s system needs the ELI field. *Id.* (citing Ex. 2004 ¶ 84). Patent Owner argues that Petitioner’s proposed modification to omit the ELI field overlooks Zheng’s intentional addition of that field to the LTE header structure. *Id.* at 45, 47–49; *see also* Sur-reply 9–11 (arguing that Petitioner’s combination undoes Zheng’s modifications to LTE).

Here, Patent Owner mischaracterizes Petitioner’s combination. *See* PO Resp. 45, 47–51. Petitioner proposes omitting the ELI field only when SDU’s end segment fills up the PDU—not in every circumstance. Pet. 49, 53. For example, the ELI would be omitted when the PDU includes only the SDU’s end segment. *See id.* In other cases, the PDU header would have the ELI field, which Petitioner shows would confer the benefits that Zheng describes in those situations. *See id.*; *see also* Reply 8–9 (describing the circumstances when the ELI field would be omitted). Thus, even if Zheng

needs the ELI field to function, as Patent Owner argues (PO Resp. 45, 47–51), Petitioner shows that the ELI would still supply the required information in cases when it is needed (Pet. 49, 53).

Because Dr. Min’s testimony on this point is similarly based on a mischaracterization the obviousness rationale (Ex. 2004 ¶¶ 84, 87–92) and Dr. Akl’s testimony (Ex. 1003 ¶¶ 182–183) is more consistent with Zheng’s teachings (*see, e.g.*, Ex. 1006, 11:14–29), we credit Dr. Akl’s testimony over Dr. Min’s on the issue of omitting Zheng’s ELI field.

vi. ELI field as a Partition

Patent Owner argues that Zheng’s ELI field is a “partition” between the PDU’s header and its data. PO Resp. 52–53 (citing Ex. 2002 ¶ 98; Ex. 2004 ¶ 105); Sur-reply 17. In Patent Owner’s view, Zheng’s receiver would not know what type of information follows the D field when the ELI is missing. PO Resp. 52–54 (citing Ex. 2002 ¶¶ 79–80; Ex. 2004 ¶¶ 104–106). Patent Owner argues that Zheng’s receiver needs the ELI to determine the PDU’s configuration. *Id.* We disagree with Patent Owner’s arguments (*id.* at 50–54) and do not credit Dr. Min’s testimony on this point (Ex. 2002 ¶¶ 79–80, 104–107) because both lack sufficient support.

Rather, Dr. Akl’s testimony is better supported and more consistent with Jiang and Zheng. Ex. 1023 ¶ 30. In particular, Dr. Akl testifies that Zheng’s ELI field is not required to be a partition. *Id.* Consistent with this testimony, Jiang discloses using a single bit to indicate that the SDU ends at the end of the PDU. Ex. 1007 ¶ 26. Also, Zheng’s first embodiment and the existing standard include an “indicator bit.” *See* Ex. 1006, 16:18–22. The indicator bit indicates whether the next byte is data or a header. *See id.* On the other hand, the ELI field indicates length—that is, the start and end bytes. *Id.* at 15:24–36. Thus, we credit Dr. Akl’s testimony that Zheng’s

indicator bit indicates whether the next byte is data or a header (Ex. 1023 ¶ 30⁶) over Dr. Min’s testimony that the ELI bit is a required partition (Ex. 2002 ¶¶ 79–80, 104–107).

Patent Owner argues that Petitioner has not provided a motivation “to modify Zheng *back to the* LTE standard (e.g., by adding an ‘E’ field) when it clearly disclosed a distinct solution.” Sur-reply 9. In Patent Owner’s view, Petitioner does not address the fact that Zheng’s Figure 13 does not show the extension-bit (E) field or other separator fields Jiang requires because the entire header structure of Figures 7 and 8 is replaced. *See* PO Resp. 51; Sur-reply 21 n.12. Patent Owner argues that Zheng’s Figure 13 embodiment has no need for an E field. Sur-reply 9 n.2, 17 (citing Ex. 1022, 64:11–18). Patent Owner argues that an E field would need to be added, which would create additional overhead. *Id.* at 16.

Zheng’s Figures 7 and 8, however, show the E field. *See* Ex. 1006, Figs. 7 and 8. Dr. Akl testifies the E and header-extension (HE) fields are part of the LTE standard. Ex. 1023 ¶¶ 16–17 (citing Ex. 1010, 29; Ex. 1012, 29; Ex. 1014, 31; Ex. 1007 ¶ 10). Dr. Akl explains that the E and HE fields can follow the LI field. *Id.* ¶ 16. This testimony is consistent with Jiang’s teachings (Ex. 1007 ¶ 10) and Zheng’s Figures 7 and 8.

In fact, Patent Owner agrees that Zheng is based on the LTE standard, shown in Zheng’s Figure 7. *See, e.g.*, PO Resp. 48 n.4, 63. Dr. Min testified that the basis for his opinion was that Figure 13 does not show the E field. *See* Ex. 1002, 62:10–64:18. Because Dr. Min does not give sufficient weight

⁶ We emphasize again that, here, we need not rely on Dr. Akl’s explanation about how the Zheng-Jiang combination could be modified to allow the receiver recognize the omission of the ELI field. *See* Reply 10–12; Ex. 1023 ¶ 30.

to Zheng’s disclosure that not all LTE fields are shown (*see* Ex. 1006, 16:18–22), we credit Dr. Akl’s declaration (Ex. 1023 ¶¶ 16–17) over Dr. Min’s testimony on this issue (Ex. 2004 ¶ 84). For at least this reason, we disagree with Patent Owner’s arguments about the E field. *See* PO Resp. 51, 54 n.6.

Patent Owner argues that Petitioner’s reliance on the E bit is a new theory and a modification of its original obviousness rationale. Sur-reply 6–7, 12 n.6, 17–21. We disagree. In its Reply, Petitioner’s arguments and evidence about the E field (Reply 10) fairly respond to Patent Owner’s argument that Zheng uses the ELI field as a partition (PO Resp. 52). That is, Petitioner is arguing that Zheng already uses another bit, called “an indicator bit,” in the embodiments that incorporate the ELI field. Reply 10. Petitioner presents arguments and evidence that the E and HE fields are related to the “indicator bit” Zheng describes. *Id.* Essentially, Patent Owner’s arguments mischaracterize this rebuttal as a modification of the obviousness rationale. Sur-reply 6–7, 12 n.6, 17–21. Thus, for the reasons discussed, we are persuaded by Petitioner’s arguments and evidence about the “indicator bit” and E and HE fields, which are offered to show Zheng does not use the ELI field in the way that Patent Owner describes. Reply 10.

Even without all Petitioner’s arguments and evidence about the “indicator bit,” E field, and HE field (*id.*), we disagree with the entire underlying premise of Patent Owner’s arguments (PO Resp. 50–54; Sur-reply 8–10, 17–21) for reasons similar to those discussed in section II.C.3.c.ii of this decision. Namely, a person of ordinary skill in the art is also a person of ordinary creativity, not an automaton. *KSR*, 550 U.S. at 421. When evaluating obviousness, one must account for “the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at

418. Thus, Petitioner need not specifically describe how Jiang's features could be bodily incorporated in Zheng. *Keller*, 642 F.2d at 425.

To the extent that Patent Owner's argument can be understood to mean that distinguishing between the PDU's header and data without the ELI field would have been beyond the capabilities of one of ordinary skill in the art, we see no support for such an argument. *See* PO Resp. 52; Sur-reply 8–10, 17–21. Here, Petitioner shows that the “indicator bit,” E field, and HE field were known solutions to the issue. Reply 10. So, for this additional reason, we disagree with Patent Owner's arguments. *See* PO Resp. 49–54; Sur-reply 19–20.

vii. Zheng's Retransmission Function

Patent Owner argues that Petitioner's proposed modification adversely affects Zheng's retransmission function. PO Resp. 56–59. To support this argument, Patent Owner contemplates a scenario under which Petitioner's proposed system allegedly fails: The case in which “one or more SDU segments may be missing or may not have been received.” *Id.* at 57 (Ex. 2004 ¶ 11; Ex. 2005, 33:12–14, 34:2–15, 38:12–16, 39:8–9, 40:7–11); *see also* Sur-reply 22–24. Under this hypothetical scenario, Patent Owner argues that omitting the ELI field requires the receiver to recreate the ELI field by calculating both SDU segment's start and end byte, which it is unable to do. PO Resp. 57–58 (citing Ex. 2004 ¶¶ 112–115, Figure S); *see also* Sur-reply 20 (citing Ex. 2005, 229:8–15).

According to Patent Owner, “This situation also results in subsequent issues at the transmitter entity after receiving the status report with the erroneous information for the end SDU segment.” PO Resp. 58–59 (citing Ex. 2004 ¶ 116). Patent Owner argues that the receiver's status report will contain an error, but the transmitter cannot determine what caused the error

or which SDU needs to be transmitted. *Id.* at 59. Patent Owner argues that there will be a continual receiver error that is unsolvable by known techniques for dealing with packet loss and packet errors. Sur-reply 12–13 (citing Ex. 1022, 72:13–73:7; Ex. 2002 ¶¶ 80–81).

We disagree with the underlying premise of Patent Owner’s argument that, essentially, Petitioner is required to provide details of how its proposed combination will handle every issue that may come up when transmitting these segments, including those only tangentially related to the features recited in the claim. *See* PO Resp. 56–59; Sur-reply 12–14. “[T]he expectation of success need only be reasonable, not absolute.” *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364, 1367–68 (Fed. Cir. 2007); *see also Acorda Therapeutics, Inc. v. Roxane Lab., Inc.*, 903 F.3d 1310, 1333 (Fed. Cir. 2018) (“This court has long rejected a requirement of ‘[c]onclusive proof of efficacy’ for obviousness.”).

Also, a person of ordinary skill in the art is also a person of ordinary creativity, not an automaton. *KSR*, 550 U.S. at 42. On this point, we agree with Petitioner that Patent Owner’s “argument fails to consider a POSITA’s capabilities to solve the well-known issue of packet loss and error in designing the Zheng-Jiang combination system.” Reply 15. That is, it is undisputed that packet loss and packet errors are known issues in wireless communication. *See* PO Resp. 57; Reply 15.

The record supports Dr. Akl’s testimony that solutions to these problems are well-known. *See* Ex. 1023 ¶ 45. For example, Dr. Akl asserts that error-checking, timeout, and PDU numbering are possible known solutions. *Id.* (citing Ex. 1006, 6:4–8, 14:6–7; Ex. 1014, 18–19). Dr. Akl asserts that Zheng teaches SDU numbers and segmentation-level buffering, among other approaches. *Id.* ¶ 46 (citing Ex. 1006, 16:27–28, 17:13–16).

Dr. Min also testifies that error checking is “really common in cellular communication,” and that cyclic redundancy checks, for instance, existed many decades before the ’588 patent. Ex. 1022, 72:13–16, *cited in* Reply 15; *Id.* at 73:12–15. We credit Dr. Akl’s testimony about a skilled artisan’s capabilities to address packet loss and errors because it is consistent with the evidence of record. *See* Ex. 1003 ¶¶ 45–46.

As with its arguments about the E field, Patent Owner mischaracterizes Petitioner’s rebuttal about error-checking and correction as a modification to the original obviousness rationale. *See* Sur-reply 12–16. Instead, we determine that Petitioner’s arguments about error-checking and correction are fairly responsive to Patent Owner’s arguments that packet loss and packet errors would be an issue. PO Resp. 56–59; Sur-reply 22–24. That is, Petitioner is not proposing to modify its proposed combination with error checking methods. Rather, Petitioner is merely arguing that packet errors and loss were common issues with known solutions. Reply 14.

Thus, we disagree with Patent Owner’s arguments about Zheng’s retransmission function. PO Resp. 56–59; Sur-reply 14–16.

viii. PDU Size

Patent Owner argues that Zheng and Jiang have incompatible PDU sizes. PO Resp. 59–62; Sur-reply 14–16. According to Patent Owner, Petitioner’s proposed modification requires Jiang’s variable-length PDUs, but Zheng cannot use such PDUs because Zheng’s modified-header structure for identifying SDUs is based on LTE. PO Resp. 59–60 (citing Ex. 2004 ¶¶ 83–84, 93). Patent Owner argues that, in several ways, Jiang’s variable-length PDU scheme “is at odds,” “goes against,” and is incompatible with the existing standard because the existing standard requires predefined PDU lengths and prevents adjusting those lengths on an

SDU-by-SDU basis. *Id.* at 60–62 (citing Ex. 1014, 14, 16, 70–71, 74; Ex. 2004 ¶¶ 97–99); *see also* Sur-reply 15–16 (discussing predefined PDU lengths defined by other layers before transmission). Patent Owner argues that Jiang uses a top-down PDU-sizing approach that is the opposite of Zheng’s bottom-up approach. PO Resp. 62. Patent Owner argues that a person of ordinary skill in the art “would be dissuaded from applying” Jiang’s variable-length PDU scheme to Zheng because it reduces utilization, efficiency, and performance. *Id.* at 60; *see also* Sur-reply 15 (arguing that Jiang’s variable mode cannot be applied to Zheng).

Yet Jiang, like Zheng, is a proposed enhancement to the existing standard’s transmission efficiency. *See* Ex. 1007 ¶ 27. Simply because it proposes a new way does not make it “at odds” with those existing methods. Under Patent Owner’s reasoning, it is not apparent how any method that purports to modify the existing standard would not also be at odds with it. *See* PO Resp. 59–62.

Even so, Patent Owner’s arguments (*id.*) and Dr. Min’s corresponding testimony (Ex. 2004 ¶¶ 83–84, 93, 97–99) do not align with the record as well as Petitioner’s arguments and evidence. According to the Petition, “without the respective ELI field in the received PDU header, the length (indicated by the end byte) of the end segment can still be determined by the receive entity based on the RLC PDU length, regardless of whether the PDU size is fixed or flexible (AM or UM mode).” Pet. 53 (citing Ex. 1003 ¶ 190). Similarly, Zheng explains that “the segmentation and concatenation mechanisms of *the UM and the AM* are related to the present invention.” Ex. 1006, 8:17–19 (emphasis added), *cited in* Reply 14. Patent Owner dismisses this statement as “background.” Sur-reply 14 n.8. But Zheng’s transmitter receives the SDU from an upper layer and segments it into RLC

PDUs with the appropriate size. Ex. 1006, 8:30–33. The transmitter can connect different SDUs to form the RLC PDU. *Id.* Thus, we credit Dr. Akl (Ex. 1003 ¶ 190) over Dr. Min (Ex. 2004 ¶¶ 83–84, 93, 97–99) on this particular issue.

Patent Owner disagrees with Petitioner’s argument that the receiver can determine the end segment’s length from RLC PDU length. PO Resp. 62–63. Patent Owner argues that Petitioner’s statement is based on the assumption that Zheng’s transmitter can guarantee that an end SDU segment will terminate at the PDU’s end. *Id.* at 62. Patent Owner argues that this assumption is incorrect because there are several scenarios in the LTE standard in which this will not be the case: an end SDU segment may be followed by padding bits, a complete SDU, or a start SDU segment. *Id.* at 63 (citing Ex. 2004 ¶¶ 101–103); *see also id.* at 53–54. Patent Owner argues that, without the ELI field, the receiver cannot distinguish between these scenarios. *Id.* at 63, 53–54.

Petitioner, however, is not proposing to omit the ELI field in all scenarios. *See* Pet. 49, 53; *see also* § II.C.3.c.iv *supra* (discussing the ELI field). Under Petitioner’s combination, the ELI field is omitted only when SDU’s end segment fills up the PDU. Pet. 49, 53. In other cases, the PDU header would have the ELI field. *See id.*; *see also* Reply 8–9 (describing the circumstances when the ELI field would be omitted). This includes cases where the end segment does not fill up the PDU. Thus, the ELI field would still supply the required information when it is needed and would be omitted in the specific case when other information can be used. Pet. 49, 53. That is, Patent Owner’s arguments about whether the end byte can be determined when the end SDU segment does not terminate at the PDU’s end (PO Resp. 52–54, 62–63) do not squarely address Petitioner’s rationale because,

in these cases, the ELI field would be present under Petitioner’s combination (*see* Pet. 49, 53; Reply 14).

In Petitioner’s proposed combination, the PDU will include only the end SDU segment when that segment fills up the entire PDU. Pet. 53. In this case, the end segment’s end byte corresponds to the PDU’s end byte. *Id.* (citing Ex. 1003 ¶ 190); *see* Ex. 1007, Fig. 1. Petitioner shows that Zheng’s receive entity will still be able to calculate the SDU segment’s length using the PDU length for at least the reason that the receiver knows the PDU length in both AM and UM modes—either as a fixed length or variable. *See* Pet. 53–54 (citing Ex. 1006, 8:26–28, 8:30–32). We credit Dr. Akl’s testimony on this particular issue (Ex. 1003 ¶¶ 189–193) over Dr. Min’s (Ex. 2004 ¶¶ 101–103) because Dr. Akl’s testimony is consistent with Zheng.

In sum, although not every end SDU segment terminates at the end of a PDU, Petitioner articulates sufficient reasoning with rational underpinnings as to why one of ordinary skill in the art would have omitted the ELI field when that happens. Pet. 49–53.

Thus, Petitioner shows—and we find—that the Zheng-Jiang combination teaches or suggests the second determining step. *See id.*

d. Providing the PDU

Claim 1 recites, in part, “providing the PDU to the receiver entity.” Ex. 1001, 20:50. Petitioner asserts that Zheng discloses this limitation “by disclosing [that] its invention relates to the UM and AM modes, which divide an SDU into segments, form PDUs including the segments, and send the PDUs by a transmit entity to a receive entity.” Pet. 28 (citing Ex. 1006, 6:29–7:8, 8:17–19; Ex. 1003 ¶¶ 125–126).

Apart from the arguments addressed in Section II.C.3.c, *supra*, Patent Owner does not present arguments specifically directed to these assertions. *See* PO Resp.; Sur-reply.

We have reviewed Petitioner’s arguments and evidence about this limitation (Pet. 28) and we find that Zheng teaches this limitation.

e. Conclusion: Claim 1

Petitioner shows that the subject matter of claim 1 would have been obvious over the Zheng-Jiang combination.

4. Independent Claims 15, 21, and 22

Independent claim 15 is similar to claim 1, but requires steps from the receiver’s perspective. Ex. 1001, 22:1–10. Claims 21 and 22 recite the method steps of claims 1 and 15 as functions of an apparatus. *See id.* at 22:31–63.

To address the subject matter of claims 15, 21, and 22, Petitioner refers to the analysis of claim 1 and also explains that “it would have been obvious to a [person of ordinary skill in the art] to modify Zheng to implement its segmentation method (or the modification thereof in view of Jiang) by Jiang’s communications device in the form of program code stored in a memory and executed by a processor.” *See* Pet. 59–60 (discussing claim 11 and the system limitations), 60 (claim 15), 61 (claim 21). Also, as for claim 22, Petitioner asserts that “[e]ither the ‘network units’ of Zheng (EX1006, 5:18-20) or the ‘communications device’ in Jiang (EX1007, ¶¶12, 18) is an ‘*apparatus comprising at least one processor and at least one memory.*’” *Id.* at 61–62.

Patent Owner asserts that its arguments made in connection with claim 1 equally apply to claims 15, 21, and 22 because claims 15 and 22 recite the feature of determining whether information is present in the header

part and claim 21 recites determining whether to include information in the header part. PO Resp. 64. Patent Owner argues that the proposed combination also fails because claims 15 and 22 are claimed from the perspective of the receiver. *Id.*

We disagree with Patent Owner’s arguments for the reasons discussed in Section II.E.3 addressing claim 1. As for subject matter not found in claim 1 that is specific to claims 15, 21, and 22, which is not otherwise specifically argued by Patent Owner, we have reviewed Petitioner’s arguments and evidence, and we find that the Zheng-Jiang combination teaches these additional limitations. Thus, we determine that Petitioner shows that the subject matter of claims 15, 21, and 22 would have been obvious over the Zheng-Jiang combination. *See* Pet. 58–62.

5. *Dependent Claims 3–7, 9, 11–13, and 17–20*

a. *Claims 3 and 17*

Claim 3 recites, “A method according to claim 1, comprising determining that a segment of the SDU is a segment between the first segment and the last segment of the SDU and that *the content of the information indicates segment offset.*” Ex. 1001, 20:56–59 (emphasis added). Claim 17 recites similar limitations. *See id.* at 22:15–19.

Petitioner asserts that Zheng teaches determining that the SDU segment is a middle segment. Pet. 28 (citing Ex. 1006, 11:26–29, 15:21–23, 15:34–36, 16:37–39). Petitioner asserts that, when the ELI field equals “300 700,” the SDU segment starts from bit 300 of the SDU and ends at bit 700. *Id.* at 29 (citing Ex. 1006, 17:3–5). The content of Zheng’s ELI field indicates a segment offset because the start byte (e.g., 300 when the ELI field equals “300 700”) indicates the start position of the SDU segment within the original SDU. *Id.* (citing Ex. 1003 ¶ 128).

Patent Owner argues that “[i]nstead of identifying that ‘the content of the information indicates segment offset,’ Petitioner relies on a disclosure of multiple values.” PO Resp. 19. In Patent Owner’s view, Zheng’s ELI field does not indicate segment offset, as claimed, because it indicates an SDU segments end byte—e.g., 700 when the ELI field equals “300 700.” *Id.* at 21 (citing Ex. 2004 ¶ 53).

Patent Owner argues that these claims are limited to the embodiment in which the LI field indicates a single value that corresponds to the segment offset. *Id.* (citing Ex. 1001, 15:25–28). Patent Owner argues that the same field having the same length—LI or “content of the information”—must be interpreted as indicating the segment offset, not segment length or SDU segment length. *Id.* at 20 (citing claim 2; claim 4; Ex. 2004 ¶ 51; Ex. 2005, 91:7–92:6). In Patent Owner’s view, the ’588 patent supports its construction because an LI field with a fixed length reduces overhead by eliminating the need for offset and length. *Id.* (citing Ex. 1001, 18:24–26). Patent Owner argues that this means that the ’588 patent excludes the case where both offset and length are signaled. *Id.* Patent Owner argues under its construction Zheng does not disclose the claimed “content.” *Id.* at 21.

In interpreting the claims of the ’588 patent, we “us[e] the same claim construction standard that would be used to construe the claim[s] in a civil action under 35 U.S.C. [§] 282(b).” 37 C.F.R. § 42.100(b). Under that standard, claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and extrinsic evidence. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

We disagree with Patent Owner’s narrow construction of the phrase “content of the information.” *See* PO Resp. 19–20. The plain language does not require a particular number of fields. *See* Ex. 1001, 20:56–59 (claim 1); *see also id.* at 22:15–19 (claim 17). Rather, claims 3 and 17 merely recite “content” and “information.” *See id.* Nor do the claims specify how the content of the information indicates the segment offset. *Id.* Thus, we see nothing in the claims themselves that limit the indication to a single field.

Next, we turn to the specification. The specification is the “single best guide” to a disputed term’s meaning. *Phillips*, 415 F.3d at 1315. It “may reveal a special definition given to a claim term.” *Id.* at 1316. Or it may reveal “an intentional disclaimer, or disavowal, of claim scope.” *Id.* “The patentee’s lexicography must, of course, appear ‘with reasonable clarity, deliberateness, and precision’ before it can affect the claim.” *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). The patentee can disavow claim scope with language in the specification or the prosecution history. *Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016). “In either case, the standard for disavowal is exacting, requiring clear and unequivocal evidence that the claimed invention includes or does not include a particular feature.” *Id.*

We disagree that the “content of the information” should be limited to the specific embodiments that Patent Owner identifies. *See* PO Resp. 20 (citing Ex. 1001, 18:24–26), 21 (citing Ex. 1001, 15:25–28). One of the embodiments describes a situation in which the “method *does not* require OFFSET value to be indicated.” Ex. 1001, 18:21–22. But the claims recite the opposite: “the content of the information *indicates* segment offset.” *Id.* at 20:58–59. We disagree that the advantages of the disclosed embodiment that does not require the segment offset also apply to the claimed embodiment

that does. *See* PO Resp. 20. In addition, we do not see any clear and unequivocal evidence that the claimed “content of the information” is limited to a single field, as Patent Owner argues. Patent Owner cites two embodiments among several. *See id.* at 20–21 (citing Ex. 1001, 15:25–28, 18:24–26).⁷ Yet the ’588 patent explains that those embodiments are “non-limiting examples.” Ex. 1001, 20:24–26. Also, the ’588 patent does not otherwise define “content of the information” with the reasonable clarity, deliberateness, and precision required of a patentee’s lexicography.

In fact, as noted by Patent Owner, the phrase “content of the information” also appears in claim 2, and it indicates SDU length. Sur-reply 26. So Patent Owner appears to acknowledge that the phrase “content of the information” does not have a special definition itself. *See id.* This is consistent with the understanding that the “content of the information” can indicate different things in different situations or multiple things in one situation.

Giving the disputed claim terms their ordinary and customary meaning as would have been understood by one with ordinary skill in the art, we determine that the “content of the information” is not limited to a single field and need only indicate the segment offset. In this way, we agree with Petitioner that the claims broadly encompass several ways to indicate segment offset. *See* Reply 21.

Under the proper construction, we agree with Petitioner that the content of Zheng’s ELI field indicates a segment offset because the start byte indicates the start position of the SDU segment within the original

⁷ Patent Owner also cites the language of claims 2 and 4. Sur-reply 26. But claim 3 does not incorporate the limitations of either claim.

SDU. Pet. 29 (citing Ex. 1003 ¶ 128). We credit the Akl Declaration because it is consistent with Zheng’s disclosure (Ex. 1003 ¶ 128) about the ELI field (Ex. 1006, 11:26–29, 15:21–23, 15:34–36, 16:37–39), which is largely undisputed (*see* PO Resp.; Sur-reply).

Apart from the claim-construction argument, Patent Owner argues that Dr. Akl made clear that the first number or start byte was not the start byte of the SDU segment relative to the SDU. PO Resp. 22; Sur-reply 26 (citing Ex. 2005, 185:1–6). Even assuming that this is true, Patent Owner’s argument is rooted in an unstated claim construction that imposes unrecited limitations on the term “segment offset.” *Id.* Contrary to Patent Owner’s argument, claims 3 and 17 merely recite indicating “segment offset,” not indicating segment offset *of the SDU segment relative to the SDU*. *See id.* For all the reasons discussed above, we agree with Petitioner that Zheng’s content indicates the segment offset. *See* Pet. 29.

Thus, Petitioner shows that the subject matter of claims 3 and 17 would have been obvious over the Zheng-Jiang combination.

b. Claims 4 and 18

Claim 4 recites, “A method according to claim 1, comprising determining that a segment of the SDU is the last segment of the SDU and that the content of the information indicates the SDU segment length.” Ex. 1001, 20:60–63. Claim 18 recites a similar limitation. *See id.* at 22:19–22.

Petitioner asserts that Zheng determines that the SDU is an end segment when the SDU segment starts from a byte of the SDU and terminates at the end byte of the SDU. Pet. 29 (citing Ex. 1006, 11:22–26, 15:20–21, 15:31–34, 16:35–37). Petitioner argues that the content of the ELI indicates which two bytes. *Id.* In the example that Petitioner cites, the D

field equals “10,” which means the SDU segment starts at byte 300 of the SDU and terminates at the end of the SDU. *Id.* at 29–30 (citing Ex. 1006, 17:1–3). If the SDU includes 800 total bytes, for example, the ELI field would be “300 800.” *Id.* Petitioner asserts that “the content of the information indicates the SDU segment length,” as recited, because the SDU segment length is the number of bytes between the start byte and the end bytes. *Id.*

Patent Owner’s arguments about claims 4 and 18 rely on a narrow construction similar to the one discussed above in connection with claims 3 and 17. *See* PO Resp. 23 (referring to claims 3 and 17). Patent Owner argues that neither the first nor second values in Zheng’s ELI field “*correspond with* a ‘segment length’ as required by the claims.” *Id.* (emphasis added); *see also* Sur-reply 27 (“two values are indicated [by Zheng] but neither are segment length”).

Contrary to Patent Owner’s argument, the claims do not recite “correspond with.” Rather, claims 4 and 18 recite that the “the content of the information *indicates* the SDU segment length.” Ex. 1001, 20:60–63; *id.* at 22:19–22. Nor do the claims preclude using two values to indicate segment length for the same reasons discussed in section II.C.5.a. That is, the “content of the information” is not limited to a single field.

Commensurate in scope with the claim, Petitioner shows Zheng teaches the recited content because the SDU segment’s length is indicated by the number of bytes between the start and end bytes in Zheng’s ELI field. Pet. 29–30. For example, when the content of Zheng’s ELI field is “300 800,” it indicates that the length is 500 bytes because the byte 300 is the SDU’s start byte and byte 800 is the end byte. *Id.* at 30 (citing Ex. 1003 ¶ 130).

Patent Owner argues that “[n]owhere does Zheng disclose deriving segment length.” PO Resp. 23. But the claim does not recite deriving segment length—only that the content “indicates segment length.” Thus, Patent Owner’s argument here is not commensurate with the scope of claims 4 and 18.

Considering the totality of the record, Petitioner shows that the subject matter of claims 4 and 18 would have been obvious over the Zheng-Jiang combination.

c. Claims 7 and 20

Claim 7 recites, “[a] method according to claim 1, wherein the header part comprises framing information, the framing information comprising a first bit indicative of whether the first byte of *the data field* corresponds to the first byte of a SDU and a second bit indicative of whether the last byte of *the data field* corresponds to the last byte of a SDU.” Ex. 1001, 21:3–8 (emphasis added). Instead of “a data field,” claim 1 recites “a data field *part*.” *Id.* at 20:43–44 (emphasis added). Claim 20 recites a similar limitation with “the data field.” *See id.* at 22:25–30. Claim 20 depends from claim 15, which also recites “a data field part” but only in connection with the last byte. *See id.* at 22:1–11. In claim 20, the first byte refers to “the data field part.” *See id.* at 22:28.

The dispute between the parties turns on whether “the data field” refers to a part of a data field or the entire data field.

i. Part of a Data Field

Specifically, Petitioner interprets the antecedent basis of “the data field” to be “a data field part” recited in claim 1 and proposes construing “data field part” to be a part of a data field. Pet. 30–34. That is, under Petitioner’s proposed construction, the first and second bytes recited in claim

7 and the last byte recited in claim 20 are part of the data field, not the entire data field. *See id.* Petitioner argues that Zheng’s D field indicates the SDU’s form using four combinations of two bits: 00, 01, 10, and 11. *Id.* at 30–33.

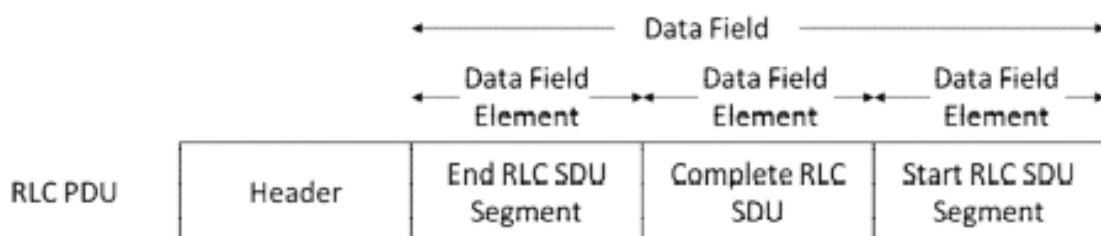
Petitioner’s view of how these combinations meet the claimed bits is summarized in Table 4 of the Petition, reproduced below. *Id.* at 33–34.

The ’588 patent		Zheng	
<i>FI</i>	<i>Description</i>	<i>D</i>	<i>Description</i>
00	First byte of the data field corresponds to the first byte of an SDU. Last byte of the data field corresponds to the last byte of an SDU.	00	The first byte of the data segment of the PDU (“ <i>the data field</i> ”) corresponds to the first byte of the SDU. The last byte of the data segment of the PDU (“ <i>the data field</i> ”) corresponds to the last byte of the SDU.
01	First byte of the data field corresponds to the first byte of an SDU. Last byte of the data field does not correspond to the last byte of an SDU.	01	The first byte of the data segment of the PDU (“ <i>the data field</i> ”) corresponds to the first byte of the SDU. The last byte of the data segment of the PDU (“ <i>the data field</i> ”) does not correspond to the last byte of the SDU.
10	First byte of the data field does not correspond to the first byte of an SDU. Last byte of the data field corresponds to the last byte of an SDU.	10	The first byte of the data segment of the PDU (“the data field”) does not correspond to the first byte of the SDU. The last byte of the data segment of the PDU (“ <i>the data field</i> ”) corresponds to the last byte of the SDU.
11	First byte of the data field does not correspond to the first byte of an SDU. Last byte of the data field does not correspond to the last byte of	11	The first byte of the data segment of the PDU (“ <i>the data field</i> ”) does not correspond to the first byte of the SDU. The last byte of the

	an SDU.		data segment of the PDU (“ <i>the data field</i> ”) does not correspond to the last byte of the SDU.
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According to Petitioner’s Table 4 above, the first bit of Zheng’s D field equals 0 if the first byte of the PDU’s data segment corresponds to the first byte of the original SDU, and 1 if it does not. *Id.* Likewise, the second bit equals 0 if the second byte of the data segment corresponds to the last byte of the original SDU, and 1 if it does not. *Id.* at 34. That is, Petitioner’s analysis is based on the PDU’s data *segment* corresponding to the recited “data field” with the antecedent basis being the “data field part.” *See id.* at 33–34.

Patent Owner’s arguments are based on interpreting “the data field” and “data field part” as the entire data field of a PDU. PO Resp. 25. In Patent Owner’s view, the claims recite two parts of a PDU: a header part and a data-field part. Sur-reply 27. For example, Patent Owner’s Figure M, excerpted below, illustrates its view of a RLC PDU. PO Resp. 26.



This excerpt from Figure M shows the data field spanning three data-field elements. *Id.* The three data-field elements contain an end RLC SDU segment, a complete RLC SDU, and a start RLC SDU segment. *Id.* According to Patent Owner, Zheng’s D field would use the value “01” to identify the start RLC SDU segment in this example because the segment starts from the SDU’s beginning, but it is not a complete SDU. *See id.* at 27–

29. Patent Owner argues that, in contrast to Zheng’s D field, the FI field of the ’588 patent would have a value of 11 because the first byte of the data field does not correspond to an RLC SDU’s first byte. *See id.*

Patent Owner argues that Zheng’s D field does not provide enough information to determine an SDU segment’s location within the PDU’s data field. *Id.* at 25. Patent Owner argues that, for example, Zheng’s D field uses the same value for SDU segments that are in different positions. *Id.* at 27–29; Sur-reply 27–28 (citing Ex. 2004 ¶ 63; Ex. 2005, 170:21–171:10, Ex. 2004 ¶¶ 63–65).

Both parties argue as if the antecedent basis for “the data field” in claims 7 and 20 is “the data field part.” *See* Reply 22; Sur-reply 27.⁸ But Petitioner views the data part as one part of several (Reply 22), and Patent Owner views the data part as one of two parts of the PDU (Sur-reply 27).

We agree with Petitioner that the plain and ordinary meaning of “a data field part” is a “part of a data field,” as that term is used in the ’588 patent. Reply 22. The claim recites the term “comprising,” which does not

⁸ Petitioner states that the lack of antecedent basis for “the data field” renders claims 7 and 20 indefinite. Reply 21. Indefiniteness cannot be a basis for a challenge in a petition for *inter partes* review. *See* 35 U.S.C. § 311(b). But indefiniteness “does not necessarily preclude the Board from addressing the patentability of the claims on section 102 and 103 grounds.” *Samsung Elecs. Am., Inc. v. Prisia Eng’g Corp.*, 948 F.3d 1342, 1355 (Fed. Cir. 2020). So, even assuming that “the data field” lacks a clear antecedent basis, this is not the case where “indefiniteness renders it logically impossible for the Board to reach” a determination of the patentability of a claim on the presented prior-art grounds. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 813 (Fed. Cir. 2021). Rather, to resolve the dispute here, we focus on the disagreement over the meaning of “data field part” because both parties treat that as the antecedent basis for “the data field” recited in claims 7 and 20. Reply 22; Sur-reply 27.

preclude additional unrecited parts. Also, the claim uses the article “a” instead of the quantifier “one,” for example.

The specification does not define “a data field part.” But the ’588 patent does contemplate the data field having multiple parts: “The header part may comprise data field element information, the data field element indicative of the number of data field elements in the data field.” Ex. 1001, 2:48–53. In describing the framing information, the ’588 patent discusses the data field and the data field parts. For example, the patent discusses framing information without mentioning parts:

The header part may comprise framing information, the framing information comprising a first bit indicative of whether the first byte of *the data field* corresponds to the first byte of a service data unit and a second bit indicative of whether the last byte of *the data field* corresponds to the last byte of a service data unit.

Id. at 2:42–47. In discussing the FI field, the ’588 patent refers to a “data field” and “the data field part” in the same sentence:

The method does not require interpretation of FI field’s first bit (information of the first byte of *the data field*) before being able to determine the header size and the start of *the data field part*.

Id. at 16:60–63. So we see no lexicography appearing “with reasonable clarity, deliberateness, and precision.” *Renishaw*, 158 F.3d at 1249. Nor do we find any clear and unequivocal evidence of disavowal that would exclude a “part of a data field” from the claimed invention. *Poly-Am*, 839 F.3d at 1136.

Patent Owner argues that its construction is supported by how the LTE standard uses the term. Sur-reply 27 (citing Ex. 1012, 30 (Section 6.2.2.6); Ex. 1022, 33:19–36:9). We note that extrinsic evidence is “less significant” than the intrinsic record. *Phillips*, 415 F.3d at 1317. Even so,

section 6.2.2.6 of the LTE standard describes the FI field but does not use the term “data field part” or expressly define any terms:

The FI field indicates whether a RLC SDU is segmented at the beginning and/or at the end of the *Data field*. Specifically, the FI field indicates whether the first byte of the *Data field* corresponds to the first byte of a RLC SDU, and whether the last byte of the *Data field* corresponds to the last byte of a RLC SDU. The interpretation of the FI field is provided in Table 6.2.2.6-1.

Ex. 1012, 30 (emphasis added). Although this passage does not discuss parts or elements of the data field, the ’588 patent explains that the data field may comprise multiple parts, each of which could be a data field part. *See* Ex. 1001, 2:48–53. We see no basis in this section of the standard for concluding that the standard “data field part” refers the entire data field. Ex. 1012, 30. So the LTE standard provides little support for Patent Owner’s construction. *See* Sur-reply 27. Thus, we disagree with Patent Owner’s argument (*id.*) and do not credit Dr. Min’s testimony on this particular issue (*see* Ex. 1022, 33:19–36:9). Overall, we find that Dr. Akl’s testimony (Ex. 1003 ¶¶ 134–135) is better supported by the record than Dr. Min’s (Ex. 2004 ¶¶ 63–65), and thus, we credit Dr. Akl over Dr. Min in reaching our conclusion.

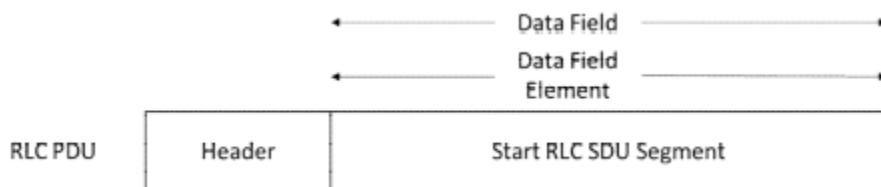
Thus, we agree with Petitioner that the plain and ordinary meaning of “a data field part” is a “part of a data field” as that term is used in the ’588 patent. Reply 22. Under this construction, Petitioner shows Zheng teaches or suggests the framing information in claims 7 and 20 because (1) Zheng’s D field’s first bit equals 0 if the first byte of the PDU’s data segment corresponds to the first byte of the original SDU, and 1 if it does not, and (2) the second bit equals 0 if the second byte of the data segment corresponds to the last byte of the original SDU, and 1 if it does not. Pet. 33–34.

We disagree with Patent Owner that Petitioner’s theory is new. *See* Sur-reply 27. Rather, we determine that the Petition clearly indicates that Petitioner is interpreting “part of a data field” as “the data field.” For example, Petitioner’s Table 4 states: “the data segment of the PDU (*the data field*).” Pet. 33. Here, “the data field” is in parenthesis. *Id.* That notation indicates that Petitioner is mapping the segment to the data field in its analysis. *Id.*

Thus, Petitioner shows that the subject matter of claims 7 and 20 would have been obvious over the Zheng-Jiang combination.

ii. The PDU’s Entire Data Field

Although we agree with Petitioner’s construction, Petitioner would still prevail under Patent Owner’s construction. “[A] prior art product that sometimes, but not always, embodies a claimed method nonetheless teaches that aspect of the invention.” *Hewlett-Packard Co. v. Mustek Sys., Inc.*, 340 F.3d 1314, 1326 (Fed. Cir. 2003). Here, Petitioner shows that Zheng teaches at least one configuration of the D field in which (1) a first bit indicates whether the first byte of the *entire* data field corresponds to the first byte of a SDU, and (2) a second bit indicates whether the last byte of the *entire* data field corresponds to the last byte of an SDU. Pet. 30–33. Patent Owner illustrates one such example in Figure M, below.



One example from Patent Owner’s Figure M, above, shows a start RLC SDU segment occupies the entire data field. PO Resp. 26. In this case, Zheng’s D field value would be “01” to identify a start SDU segment

because “0” indicates that the first byte of the *entire* data field corresponds to the first byte of a SDU,” and “1” indicates that the last byte of the *entire* data field does not correspond to the last byte of an SDU. *See id.* at 27.

Likewise, Patent Owner explains that the FI field in the ’588 patent would be “01” for the same reason. *See id.* In at least this configuration, Petitioner shows that Zheng teaches or suggests “the framing information comprising a first bit indicative of whether the first byte of *the [entire] data field* corresponds to the first byte of a SDU and a second bit indicative of whether the last byte of *the [entire] data field* corresponds to the last byte of a SDU.” Ex. 1001, 21:3–8 (emphasis added).

Thus, even under Patent Owner’s proposed construction, Petitioner shows that the subject matter of claims 7 and 20 would have been obvious over the Zheng-Jiang combination.

d. Claims 12 and 13

Claim 12 recites,

The method of claim 1 wherein the determining the content of the information in the header part comprises: determining, based on the position of the segment relative to the SDU, whether the header part includes a first field type and not a second field type with respect to the segment, or includes a second field type and not a first field type with respect to the segment.

Ex. 1001, 21:26–32. Claim 13 recites, in relevant part, “wherein the determining the content of the information in the header part comprises determining whether the header part includes either a first field type or a second field type but not both the first field type and the second field type.” *Id.* at 21:42–47.

Petitioner argues that “a first field type” and “a second field type” should be construed as two different types of fields in the header part with

respect to the SDU segment. Pet. 35 (citing Ex. 1003 ¶ 139). Petitioner asserts that Zheng teaches a first and second type of ELI field. *Id.* at 35–37. According to Petitioner, the first field type has only the end byte, and the second field type has both the start and end bytes. *See id.* Petitioner asserts that the D field indicates “the position of the segment relative to the SDU,” as recited in the claim. *See id.*

Petitioner asserts that Zheng discloses determining whether the header’s ELI field includes only the end byte (the claimed “first field type”), but not both the start and end bytes (the claimed “second field type”) based on the segment’s position. *Id.* at 36 (citing Ex. 1006, 16:33–17:5). Petitioner provides an example: When the SDU segment is at the start, the transmitter determines that the ELI field includes only the SDU’s end byte—but not both the start and end bytes. *Id.* (citing Ex. 1003 ¶ 14). As for the field values, when the D field equals “01,” the ELI field would be “500”; when the D field equals “10,” the ELI field equals “300 800”; and when the D field equals “11,” the ELI field equals “300 700.” *Id.* (citing Ex. 1006, 16:42–17:5). So, under Petitioner’s reasoning here, the header includes either the first type of ELI field (i.e., “500”) or the second type of ELI field (i.e., “300 and 800” or “300 700”) depending the SDU segment’s position, as defined by the D field. *Id.* As discussed above, the 500, 300, 700, and 800 indicate the byte numbers. *See id.*

Patent Owner agrees that “a first field type” and “a second field type” should be construed as two different types of fields. PO Resp. 30. Patent Owner, though, argues that Zheng provides the same information in each ELI field, not two different fields as in claim 12. *Id.* (citing Ex. 2004 ¶ 72); *see also* Sur-reply 29 (citing Ex. 2005, 91:7–92:21). In Patent Owner’s view, Zheng’s value identifying the SDU’s end byte is always included in the ELI

field, regardless of whether the start SDU is a start, middle, or end segment. PO Resp. 30 (citing Ex. 1006, 16:33–39). Under a similar rationale, Patent Owner argues that Zheng is not configured to “include[] a field type and not a second field type with respect to the segment” as in claim 13. *Id.* at 31.

We disagree with Patent Owner because Zheng’s ELI field of a start SDU segment contains only the end byte, which is different from the middle and end SDU segments because those segments include both the first and end bytes. We see no reason to limit the claims to require how the first and second field types must be different.

Apart from the claims, the ’588 patent does not use the terms “first field type” or “second field type.” *See* Ex. 1001. So we see no lexicography appearing “with reasonable clarity, deliberateness, and precision.” *Renishaw*, 158 F.3d at 1249. Nor do we find any clear and unequivocal evidence of disavowal that would exclude Zheng’s field types from the claimed invention. *Poly-Am*, 839 F.3d at 1136.

We also disagree that the particular types identified by Patent Owner are required for “efficiency.” PO Resp. 30 (citing Ex. 1001, 18:21–22, 18:24–26). Rather, as discussed in connection with the independent claims, Zheng reduces header overhead by omitting information, and the parties agree that this omission improves efficiency. *See* Pet. 48–49; Sur-reply 17 (“Reducing header overhead results in transmitting less bits and a more efficient header because you have less control information.”) (citing Ex. 2005, 143:16–22).

Because Dr. Min’s testimony is based on Patent Owner’s narrow view of the claim, we credit Dr. Akl’s testimony (Ex. 1003 ¶¶ 139–142) over Dr. Min’s (Ex. 2004 ¶¶ 72–73) on this issue.

Thus, Petitioner shows that the subject matter of claims 12 and 13 would have been obvious over the Zheng-Jiang combination.

6. *Claims 5, 6, 9, 11, and 19*

Petitioner asserts that claims 5, 6, 9, 11, and 19 are unpatentable as obvious over Zheng and Jiang. *See* Pet. 4 (table of grounds), 58 (claim 5, citing §§ VIII.B and VIII.C of the Petition), 48 (discussing in § VIII.B not including information when “end SDU segment that fills up the PDU,” as recited in claim 5), 30 (claim 6), 34 (claim 9), 59–60 (claim 11), 43–44 (claim 19), 58, 61 (incorporating by reference the analysis from Ground 1). Patent Owner does not present additional arguments specifically directed to Petitioner’s argument and evidence presented in connection with these claims. *See, e.g.*, PO Resp. 44 (claim 5); Sur-reply.

We have reviewed the challenges to claims 5, 6, 9, 11, and 19 in the Petition, and we find that the Zheng-Jiang combination teaches those additional limitations. *See* Pet. 4 (table of grounds), 58 (claim 5, citing §§ VIII.B and VIII.C of the Petition), 48 (discussing in § VIII.B not including information when “end SDU segment that fills up the PDU,” as recited in claim 5), 30 (claim 6), 34 (claim 9), 59–60 (claim 11), 43–44 (claim 19), 58, 61 (incorporating by reference the analysis from Ground 1); *see also* § II.C.3 *supra* (analyzing claim 1). Thus, Petitioner shows that the subject matter of claims 5, 6, 9, 11, and 19 would have been obvious over the Zheng-Jiang combination.

D. *The Remaining Grounds*

Petitioner asserts that claims 1, 3, 4, 6, 7, 9, 12, 13, 15, and 17–20 are unpatentable as anticipated by Zheng, and claims 1, 3–7, 9, 11–13, 15, and 17–22 are unpatentable as obvious over Zheng alone. *See* Pet. 15–61. Because Petitioner shows that all challenged claims are unpatentable under the Zheng-

Jiang combination, we need not reach the other grounds. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

III. CONCLUSION

Petitioner has met its burden to show that claims 1, 3–7, 9, 11–13, 15, and 17–22 are unpatentable.⁹

Claim(s)	35 U.S.C. §	Reference(s) /Basis¹⁰	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 3, 4, 6, 7, 9, 12, 13, 15, 17–20	102(a)(1)	Zheng		
1, 3–7, 9, 11–13, 15, 17–22	103	Zheng		
1, 3–7, 9, 11–13, 15, 17–22	103	Zheng, Jiang	1, 3–7, 9, 11–13, 15, 17–22	
Overall Outcome			1, 3–7, 9, 11–13, 15, 17–22	

⁹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

¹⁰ Because Petitioner shows that all challenged claims are unpatentable under the Zheng-Jiang combination, we need not reach the other grounds. *See* § II.E *supra*.

IV. ORDER

It is

ORDERED that Petitioner has proven by a preponderance of the evidence that claims 1, 3–7, 9, 11–13, 15, and 17–22 of the '588 patent are unpatentable; and

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

IPR2022-00632
Patent 10,701,588 B2

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