

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC, CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS, T-MOBILE USA, INC., AT&T SERVICES, INC., NOKIA OF AMERICA, CORP.,
AND ERICSSON INC.

Petitioners

v.

KT CORPORATION (Patent Owner) and
PEGASUS WIRELESS INNOVATION LLC (Exclusive Licensee)

Case No. IPR2025-00293

Patent 10,009,161

**PETITION FOR INTER PARTES REVIEW
OF U.S. PATENT NO. 10,009,161**

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- h. [1.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate $\times$ 1024,” and” 37
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CQI index	modulation	code rate $\times$ 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

” 52

3. Claim 3 (Preamble): “A method for receiving channel state information by a base station, the method comprising:” 54

- a. [3.1]: “creating a reference signal for measuring channel quality;” 54
- b. [3.2]: “transmitting the reference signal to a User Equipment (UE); and” 54
- c. [3.3]: “receiving channel state information including a channel quality indicator (CQI) index selected from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on a measurement result of the channel quality, from the User Equipment,” 55
- d. [3.4]: “wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;” 55
- e. [3.5]: “one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and” 55
- f. [3.6]: “another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and” 56
- g. [3.7]: “wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using “code rate $\times$ 1024,” 56

- h. [3.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and” 56
- i. [3.9]: “a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using ‘code rate×1024.’” 56

- 4. Claim 4: “The method of claim 3, wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in a table below

CQI index	modulation	code rate × 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

- ” 57
- 5. Claim 5 (Preamble): “A User Equipment (UE) for transmitting channel state information, comprising:” 58
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 - b. [5.2]: “a controller configured to measure the channel quality based on the reference signal, and select a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality; and” 60

- c. [5.3]: “a transmitter configured to transmit channel state information including the selected CQI index value to the base station,” 61
 - d. [5.4]: “wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;” 62
 - e. [5.5]: “one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and” 62
 - f. [5.6]: “another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and wherein:” 62
 - g. [5.7]: “wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using ‘code rate $\times$ 1024,’” 62
 - h. [5.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using ‘code rate $\times$ 1024,’ and” 63
 - i. [5.9]: “a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using ‘code rate $\times$ 1024.’” 63
6. Claim 6: “The User Equipment of claim 5, wherein and five CQI index values for 64QAM modulation, respectively, to have a same difference within a

predetermined error rate, as shown in a table below

CQI index	modulation	code rate × 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

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I. INTRODUCTION

Google LLC, Cellco Partnership d/b/a Verizon Wireless, T-Mobile USA, Inc., AT&T Services, Inc., Nokia of America Corp., and Ericsson Inc., (collectively, “Petitioners”) respectfully request *inter partes* review of Claims 1-6 (“the Challenged Claims”) of U.S. Patent No. 10,009,161 (“the ’161 Patent”) (EX1001) under 35 U.S.C. §§311-319 and 37 C.F.R. §42.100 *et seq.*

The Challenged Claims relate to transmitting/receiving channel state information (“CSI”) including a channel quality index (“CQI”) value selected from a predetermined CQI index table of code rates. EX1001, 19:5-22:25, 1:46-51, 2:64-67. The CQI index table is updated to support 256-state quadrature amplitude modulation (“256QAM”) of 5th Generation (5G), in addition to containing values for preexisting modulation schemes (QPSK, 16QAM, 64QAM) associated with legacy Long Term Evolution (LTE) communication (*e.g.*, 3G/4G). *Id.* The ’161 Patent purports to “newly configur[e] a CQI index table in the case of adopting 256QAM as a newly defined modulation method.” *Id.*, 2:13-14, 1:54-57.

However, the ’161 Patent merely applied known techniques for implementing 256QAM code rate values (*e.g.*, approximately equal SINR intervals) to a known LTE CQI index table. The Challenged Claims employ 711 and 948 minimum and maximum code rate values, respectively, and four total entries for 256QAM. EX1001, 14:3-8, 16:4-12. The prior art cited in this Petition discloses the same

approach. *See, e.g.*, EX1027, p.89, Table 6-3 (four entries for 256QAM; CQI index 12=711; CQI index 15=948). The '161 Patent discloses that the intervals for the remaining adjacent 256QAM entries need not be exactly equal. *See* EX1001, 14:3-8, 16:4-12. The prior art discloses the same approach. *See* EX1027, p.84, ll.20-30 (CQI indexes are “an approximately arithmetic progression,” “within a range from a constant minus a present value to the constant plus the preset value”). The claimed intermediate 797 code rate value (between the 711-948 minimum and maximum) would have been obvious given (1) the prior art teachings of using “approximately” constant intervals for 256QAM design, (2) the art-recognized practices for optimizing 256QAM CQI table design, (3) the absence of criticality associated with any specific intermediate code rate value, and (4) the disclosed prior art ranges encompassing the claimed code rate.

3GPP technical submissions relating to 256QAM CQI table design (*see* EX1029 (R1-140034), EX1030 (R1-141366)), which were publicly available before the earliest priority date of the '161 Patent, demonstrate that the claimed 797 code rate value was selected from one of many acceptable options. *See* §VII.A.1.i. The Challenged Claims are unpatentable.

II. MANDATORY NOTICES PURSUANT TO 37 C.F.R. §42.8(a)(1)

A. Real Party-In-Interest

Pursuant to 37 C.F.R. §42.8(b)(1), Petitioners certify that the real parties in interest are Google LLC¹, Cellco Partnership d/b/a Verizon Wireless, Verizon Business Network Services LLC, Verizon Corporate Services Group Inc., TracFone Wireless, Inc., AT&T Corp., AT&T Services, Inc., AT&T Mobility LLC, AT&T Mobility II LLC, New Cingular Wireless PCS, LLC, Cricket Wireless LLC, T-Mobile USA, Inc., Sprint Solutions LLC, Sprint Spectrum LLC, Ericsson Inc., Telefonaktiebolaget LM Ericsson, and Nokia of America Corporation.

Out of an abundance of caution, Petitioners identify all current defendants in the below cases, as well as additional involved parties, as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR. Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners also acknowledge that each petitioner has a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an

¹ Google LLC is a subsidiary of XXVI Holdings Inc. which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. §315(e).

B. Identification of Related Matters Under 37 C.F.R. §42.8(b)(2)

The following is a list of any judicial or administrative matters that would affect, or be affected by, a decision in this proceeding:

Related District Court Matters (“Related Litigations”)

1. *Pegasus Wireless Innovation LLC v. AT&T Inc. et al.*, Civ. Action No. 2:23-cv-00638 (EDTX) filed on December 29, 2023 (consolidated with 2:23-cv-00640) (“the ’638 Litigation”);

2. *Pegasus Wireless Innovation LLC v. T-Mobile US, Inc. et al.*, Civ. Action No. 2:23-cv-00639 (EDTX) filed on December 29, 2023 (consolidated with 2:23-cv-00640) (“the ’639 Litigation”); and

3. *Pegasus Wireless Innovation LLC v. Verizon Communications Inc. et al.*, Civ. Action No. 2:23-cv-00640 (EDTX) filed on December 29, 2023 (pending) (“the ’640 Litigation”).

Related Applications

The ’161 Patent issued from U.S. Patent Application No. 15/454,020, filed on March 9, 2017, which is a continuation of U.S. Patent Application No. 14/664,853, filed on March 21, 2015 (U.S. Patent 9,629,010) and claims priority to Korean Patent

Application No. 10-2014-0175190, filed on December 8, 2014, Korean Patent Application No. 10-2014-0037394, filed on March 31, 2014, Korean Patent Application No. 10-2014-0034955, filed on March 25, 2014, and Korean Patent Application No. 10-2014-0033579, filed on March 21, 2014.

C. Lead and Backup Counsel

Pursuant to 37 C.F.R. §42.8(b)(3) and §42.10(a), Petitioners hereby identify its lead and backup counsel as follows:

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Powers of Attorney are being filed concurrently herewith in accordance with 37 C.F.R. §42.10(b).

D. Service Information Under 37 C.F.R. §42.8(b)(4)

Petitioners consent to electronic service at the email addresses listed above.

III. FEES

The undersigned authorizes the Office to charge Deposit Account 02-4800 for fees required by 37 C.F.R. §42.15(a).

IV. REQUIREMENTS UNDER 37 C.F.R. §42.104

A. Grounds for Standing

Petitioners certify that the '161 Patent is available for IPR and Petitioners are not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein. 37 C.F.R. §42.104(a).

B. Identification of Challenges and Precise Relief Requested

Petitioners challenge Claims 1-6 of the '161 Patent and requests that these claims be found unpatentable for the reasons set forth in Petitioners' Grounds as follows:

Ground	Reference(s)	Basis	Claims
1	PCT International Publication WO 2014/194681 to Xia et al. (“Xia”) (EX1012, EX1027) ² in view of 3GPP TS 36.213 v.10.4 (“3GPP 36.213”) (EX1013)	§103	1-6

Petitioners also rely upon the evidence listed in the Exhibit List, including the Declaration and *Curriculum Vitae* of Dr. Sumit Roy (EX1008, ¶¶1-247; EX1009), the Declaration and *Curriculum Vitae* of Craig Bishop (EX1010, ¶¶1-57; EX1011), and the Declaration and *Curriculum Vitae* of June Ann Munford (EX1023, ¶¶1-28; EX1024).

C. Prior Art Qualification of Asserted References

For this Petition, Petitioners assume the earliest effective filing date of the ’161 Patent is March 21, 2014—the filing date of priority Korean Patent Application No. 10-2014-0033579.³

² International Publication No. WO 2014/194681 is EX1012. The Certified English Translation of WO 2014/194681 is EX1027. Unless otherwise indicated, citations to Xia are to EX1027.

³ Petitioner does not concede that any challenged claim is entitled to an effective filing date of March 21, 2014.

Xia (EX1012, EX1027), published as WO 2014/194681 based on PCT/CN2014/071296 filed on January 23, 2014, constitutes prior art at least under §102(a)(2) as of January 23, 2014.

3GPP 36.213 (EX1013), published at least as early as December 15, 2011, constitutes prior art at least under §102(a)(1). As explained in detail by Craig Bishop (EX1010), 3GPP technical specifications and contributions, including 3GPP 36.213 (EX1013), are publicly accessible as of the date they were uploaded to the 3GPP file server. EX1010, ¶¶25-52. 3GPP 36.213 was uploaded to the publicly available file server as early as December 15, 2011. *Id.*, ¶¶54-60. As a result, 3GPP 36.213 (EX1013) became a “printed publication” and qualifies as prior art under 35 U.S.C. §102(a)(1) as of December 15, 2011. *Id.*, ¶¶54-60. *See, e.g., Samsung Elecs. Co., Ltd. v. Huawei Techs. Co., Ltd.*, IPR2017-01487, Paper 45 (Final Written Decision), pp.13-14 (determining that technical reports/specifications uploaded to a standards organization’s file server before a challenged patent’s priority date qualify as prior art under 35 U.S.C. §102) (P.T.A.B. Dec. 10, 2018).

Chen (EX1014), publicly available at least as early as November 2011 and certainly no later than December 8, 2011 (EX1023, ¶¶1-26), constitutes prior art at least under §102(a)(1).

Ji (EX1015), published on October 3, 2013 and filed on September 4, 2012, constitutes prior art at least under §102(a)(1) and §102(a)(2).

Lee (EX1025), published on September 8, 2011 and filed on March 7, 2011, constitutes prior art at least under §102(a)(1) and §102(a)(2).

V. BACKGROUND

A. The '161 Patent

The '161 Patent discloses methods and a UE for receiving a reference signal, measuring a channel quality based on the reference signal, and selecting a CQI index from a predetermined CQI index table that accounts for higher-order modulation (e.g., 256QAM). EX1001, Abstract. The UE selects the CQI index based on the measurement result of the channel quality. *Id. See id.*, 2:15-38. EX1008, ¶30.

The '161 Patent discloses “a sharp increase in the number of user terminals and in the data usage.” EX1001, 1:54-55. The '161 Patent discloses that “a modulation method that can rapidly process a large amount of data traffic” is needed in order to address the increase in user terminals and data usage. *Id.*, 1:55-57. The modulation method disclosed is 256QAM, and the '161 Patent purports to “newly configur[e] a CQI index table in the case of adopting 256QAM as a newly defined modulation method.” *Id.*, 2:13-14. *See also id.*, 9:34-37, 19:5-22:25. EX1008, ¶¶31-32.

The '161 Patent purports to provide new table entries (e.g., rows) to an existing CQI index table so that the CQI index table supports 256QAM. EX1001, 19:5-22:25. *See also* EX1002, pp.134-136. The '161 Patent's purported novelty is

the inclusion of specific “code rate values”, including a code rate value of “797”, in the table entries for the 256QAM in the CQI table. *Id.* EX1008, ¶¶33-34.

However, such additions of 256QAM to existing CQI tables were not only known before the filing date of the ’161 Patent, but the same methods and tables were used by other individuals (*e.g.*, participants in the 3GPP RAN1 working group) to improve and develop eventual 5G technologies by affording an option for 256QAM by adding entries in the CQI table. *See* EX1027. Indeed, the prior art recognized varying code rates within a range from approximately equal intervals (*see, e.g.*, EX1027, 5:22-34, 39:42-40:10, 84:18-31, 127:8-20). It was well known to optimize CQI tables, *e.g.*, to maximize throughput subject to an acceptable Block Error Rate. *See* EX1015, ¶¶[0003], [0094]; EX1014, pp.2-3. Patent Owner asserts no criticality associated with any specific intermediate code rate, and the prior art discloses ranges encompassing the claimed 797 code rate value, rendering same *prima facie* obvious. *See* §VII.A.1.i. EX1008, ¶¶35-37.

The ’161 Patent assigns no criticality to any particular code rate value, and 797 is merely one example of numerous proposed values. EX1001, 16:10-13 (“The code rate value obtained in such a manner *may be* configured to be 797 as CQI index 13.... That is, the code rate value ... *may be* configured to be 797.”) (emphasis added), 15:57 (For example...), 17:39-41, 3:54-65 (Figs. 18 and 21 illustrate “an example” of a CQI index table). EX1008, ¶38.

B. Examination History

Patent Owner did not demonstrate or even assert criticality of the 797 code rate value during examination. Rather, Patent Owner conceded that the 797 amendment was made “solely for the purpose of expediting prosecution”, not for the purpose of demonstrating criticality. EX1002, pp.134-135. EX1008, ¶41.

The application which matured into the '161 Patent was only subjected to a single Office Action on the merits. EX1002, pp.140-148. The Examiner made a first rejection under §103 based on U.S. 2016/0211904 to Kim et al. (“Kim”, EX1018) in view of U.S. 2016/0249244 to Xia et al. (“Xia '244”, EX1019), in further view of U.S. 2016/0219600 to Li et al. (“Li”, EX1020). The Examiner made a second rejection under §103 based on Kim in view of Xia '244, in view of Li, in further view of ZTE 3GPP TSG RAN WG1 Meeting W7S R1-135348 (“ZTE”, EX1021). EX1008, ¶¶42-44.

In response, Applicant amended the claims to recite specific code rate values for 256QAM, including “711”, “948”, and “797”. EX1002, pp.126-130. Applicant argued against the Office’s application of Xia '244, Kim, and ZTE for the specific code rate values claimed in Applicant’s amended claims. *See id.*, pp.131-136. Applicant asserted that:

the cited parts (i.e., Table 2, Table 3) of [*Xia '244*] merely disclose that ‘code rate x 1024’ for 256QAM may be ‘711.’
The cited part (i.e., Table 32) of *Kim* merely discloses that

‘code rate x 1024’ **for 64QAM** (not ‘256QAM’) may be ‘948.’ See Index 15 in Table 32 of *Kim*. The cited part (i.e., table B. 1) of *ZTE* merely discloses that ‘code rate x 1024’ for 256QAM may be ‘803,’ ‘889,’ or ‘952.’ In summary, *Kim* does **not** disclose or teach the feature of claim 27 and *ZTE* also does **not** disclose or teach the feature (... 794 ...) [sic] of claim 28.

EX1002, p.135 (emphasis in original). Thus, Applicant argued that (1) Kim disclosed the “948” code rate for **64QAM**, not 256QAM; and (2) that ZTE did not disclose the “797” code rate, but only disclosed “803”, “889”, or “952”. *Id.* EX1008, ¶¶45-46.

The Examiner provide no analysis to support combining references, other than to conclude that “[i]t would have been obvious to a person of ordinary skill in the art at the time the invention was made to change the 803 value into 797 value applied to one of the 256QAM modulation of Kim in view [Xia ’244] in view of Li without impacting any tangible difference over the spectrum efficiency.” EX1002, p.147. Applicant traversed the combination. EX1008, ¶47.

The Office subsequently allowed the application noting that the prior art “fails to teach or suggest the subject matter indicated by the Applicants with regard to the Amendment”. EX1002, pp.108-113. However, the art cited in this Petition discloses and suggests the subject matter that led to allowance. EX1008, ¶¶48-49.

C. The Prior Art

1. Xia (EX1012, EX1027)

Xia discloses methods and systems for transmitting channel state information and CQI indices from a UE to a base station. *See* EX1027, 3:12-22. Xia discloses details of a UE determining a CQI index based on a measured channel quality and transmitting the CQI index to a base station. *Id. See also id.*, 3:32-73:28, Figs. 1-4. Xia discloses determining CQI indices for CQI tables including table entries for 256QAM. *See id.*, 75:7-93:13, Tables 5, 6-2 to 6-8. Xia discloses CQI tables including table entries for 256QAM including code rate values of at least “711”, “948”, and “790”. *Id.*, 89:3, Table 6-3. Xia also discloses intervals of code rate values from which representative code rates can be selected. Xia’s ranges include the 797 code rate value. *Id.*, 86:19-88:4, 89:3, Table 6-3. EX1008, ¶¶60-63.

2. 3GPP TS 36.213 (EX1013)

3GPP 36.213 discloses 3GPP LTE standards including physical layer procedures such as CQI definitions, CQI tables, and operations performed by UEs and base stations in channel quality reporting. EX1013, §7.2.3. 3GPP 36.213 provides details and specifications for implementing CQI reporting and explains the use of reference signals transmitted from base stations to UEs for measuring channel quality. *Id.* For example, 3GPP 36.213 provides “CQI indices and their interpretations” for up to 64QAM modulation in the CQI index table reproduced below.

Table 7.2.3-1: 4-bit CQI Table

CQI index	modulation	code rate x 1024	efficiency
0	out of range		
1	QPSK	78	0.1523
2	QPSK	120	0.2344
3	QPSK	193	0.3770
4	QPSK	308	0.6016
5	QPSK	449	0.8770
6	QPSK	602	1.1758
7	16QAM	378	1.4766
8	16QAM	490	1.9141
9	16QAM	616	2.4063
10	64QAM	466	2.7305
11	64QAM	567	3.3223
12	64QAM	666	3.9023
13	64QAM	772	4.5234
14	64QAM	873	5.1152
15	64QAM	948	5.5547

EX1013, p.65; EX1008, ¶¶64-65.

3. Chen (EX1014)

Chen discloses a CQI calculation method and signal-to-noise ratio (SNR) to CQI mapping scheme which is “extensively studied in previous works.” EX1009, Abs. Chen indicates that “calculation algorithms of CQI are numerous” and that “previous works utilize the SNR-CQI mapping to determine CQIs.” *Id.*, p.1, left col. “In this kind of CQI calculation algorithm, SNR is the only reference for CQI selection.” *Id.* Chen discloses that “[e]ach UE tries to find an optimal pair of modulation order and coding rate, which provides the largest throughput when the BLER is less than 10 percent.” *Id.*, pp 2-3. The ’161 Patent uses the same process to

determine SNR-CQI mapping and to subsequently determine CQI table entries for 256QAM. *See* EX1001, 8:5-43, Fig. 2; EX1008, ¶¶66-73.

4. Ji (EX1015)

Ji discloses that “CQI metrics may be used by the BS to determine code rates and modulation scheme” and “[t]he code rates and modulation scheme may be selected not only to maximize the throughput to a particular UE, but also to improve the overall throughput of the base station communication area.” EX1015, ¶[0003]. Ji demonstrates that it was well known to optimize CQI based on receiver throughput. *Id.*, ¶[0094] (“the LTE specification is one way of reporting and using CQI for optimizing the receiver throughput, which sets a fixed BLER target for the UE that can simplify the optimization at the BS”). EX1008, ¶¶74-75.

D. Person of Ordinary Skill in the Art (“POSITA”)

A person of ordinary skill in the art (“POSITA”) pertinent to the ’161 Patent would have had a bachelor’s degree in electrical engineering, computer engineering, or a related discipline, knowledge of the relevant 3GPP standards as of this time, and at least 2 years of experience working in a field involving wireless communications. EX1008, ¶¶38-39. A person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background. *Id.* A person with less than 2 years of experience working in a field involving wireless communications could still qualify if the person

has additional education that compensates for their lesser experience. *Id.* EX1008, ¶¶50-52.

VI. CLAIM CONSTRUCTION

Claim terms are interpreted according to *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*), and its progeny.

The Board only construes the claims when necessary to resolve the underlying controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

In Related Litigation, the parties proposed that certain claim terms should be given their plain and ordinary meaning. *See* EX1016, pp.14-15 (Plaintiff's initial proposed constructions); EX1017, pp.39-44 (Defendants' preliminary claim constructions). Plaintiff proposed that "wherein and five CQI index values for 64QAM modulation, respectively" in claim 6 be construed as "wherein the five CQI index values for 64QAM modulation, respectively." EX1016, p.15. The parties have adopted this construction. Defendants also proposed that the plain and ordinary meaning of "configured to" in claim 5 means "actually configured to and not merely capable of performing the claimed function." EX1017, p.42. Defendants have proposed that the term "to have [a] same difference within a predetermined error rate" is indefinite. EX1017, p.40. Defendants agreed to treat the preambles of claims 1, 3, and 5 as non-limiting.

For purposes of this Petition, Petitioner recognizes that the term “to have [a] same difference within a predetermined error rate” is found within the prior art, although the bounds of the term are unclear. Accordingly, the Grounds show where this phrase may be found in the prior art. Petitioners apply the constructions proposed in the Related Litigation and agreed upon by the parties in the Grounds below. *See* EX1016, EX1017. While the proper metes and bounds of the claims are disputed in the Related Litigation, the cited prior art falls within these bounds whatever they may be. The Challenged Claims are unpatentable under all potential constructions.

VII. PETITIONERS HAVE A REASONABLE LIKELIHOOD OF PREVAILING

The Challenged Claims are unpatentable over the prior art. EX1008, ¶¶76, 245.

A. Claims 1-6 Are Rendered Obvious over Xia and 3GPP TS 36.213 (Ground 1)

Claims 1-6 are rendered obvious over the prior art. EX1008, ¶77.

1. Claim 1 (Preamble): “A method for transmitting channel state information by a User Equipment (UE), the method comprising:”

Xia discloses and suggests the Preamble of Claim 1. EX1008, ¶78.

Xia discloses “a method and device for indicating channel quality [via a CQI] and notifying a modulation and coding scheme.” EX1027, 3:9-10. Xia discloses an “adaptive process of the Physical Downlink Shared Channel (PDSCH)” where a

“User Equipment (UE) estimates the channel information used for measuring Channel State Information (CSI)” and “the UE calculates the Signal to Interference plus Noise Ratio (SINR)” by using the channel information. *Id.*, 3:12-17. Upon estimating the channel information and measuring the CSI, the “UE then derives the corresponding Channel Quality Indicator (CQI) from the SINR and reports the CQI value to the base station”. *Id.*, 3:17-19. *See also id.*, 74:40-75:6. Xia’s UE (*see id.*) includes a “transmitter [] For sending the processor first CQI index to a base station.” *Id.*, 141:31. EX1008, ¶¶79-81.

Xia provides a method and apparatus for transmitting a CQI index by a UE. EX1027, 73:15-20, Fig. 1. Xia’s “terminal device” is a UE. *See id.*, Figs. 1-4, 74:40-75:6.

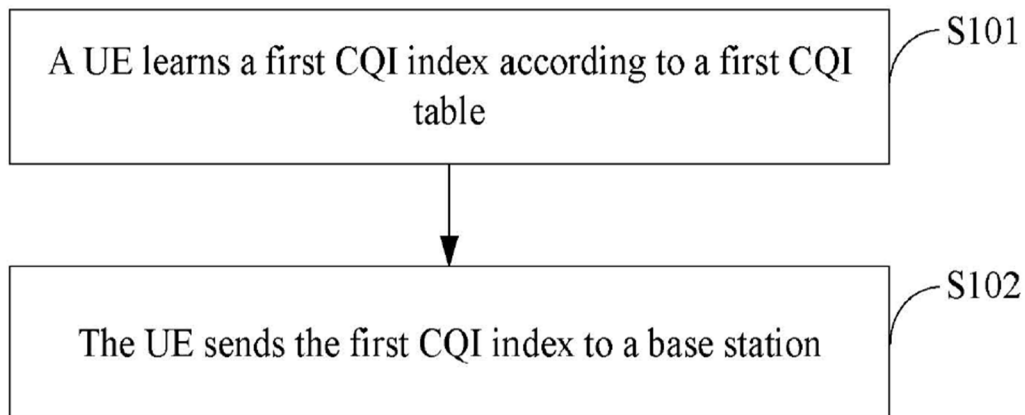


Fig. 1 of Xia

EX1008, ¶82.

a. [1.1]: “receiving a reference signal for measuring channel quality from a base station;”

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [1.1]. EX1008, ¶83.

Xia discloses a method and apparatus for providing a notification, including “channel quality indicator” (CQI), to a base station for selecting a modulation and coding scheme. EX1027, 3:8-10. Xia discloses that a UE “estimates the channel information used for measuring Channel State Information (CSI)” for the purpose of measuring and indicating “channel quality” (e.g., CQI). *Id.*, 3:12-22, 74:40-75:6, 75:30-33. EX1008, ¶¶84-85.

A POSITA would have understood Xia’s disclosed use of “channel information used for measuring Channel State Information (CSI)” as teaching and suggesting the use of a reference signal received from the base station (BS). EX1008, ¶86. Xia’s UE is in communication with the BS and seeks to measure and report “channel quality” in relation to the BS. EX1027, 3:8-22, 3:32-43, 74:40-75:6. As such, it would have been obvious for the reference signal (upon which the CQI value is based) to originate from the BS to which the UE ultimately reports the CQI value. *Id.* EX1008, ¶¶87-88. Transmission of a reference signal (RS) by a BS to a UE for channel measurement is a well-known technique used in CQI methods like Xia’s and does not impart patentability. EX1025, ¶[0166] (“a BS transmits a DL RS for channel measurement to a UE”). *See also id.*, ¶[0014]. EX1008, ¶89. It was well

understood that channel quality reporting techniques like those disclosed by Xia are for the purpose of “improv[ing] communication between a base station (BS) and user equipment (UE)” and involve “received downlink (DL) signals ... in determining the channel quality indicator”. EX1015, ¶¶[0003]-[0004]. EX1008, ¶¶86-90.

Further, Xia’s techniques build upon LTE systems (EX1027, 3:12-29, 96:32-39) which employ “Channel-State Information (CSI) *reference signals (CSI-RS)*,” as evidenced by 3GPP 36.213. *See* EX1013, p.63, §7.2.3 (emphasis added). The ’161 Patent discloses that the claimed “reference signal” is not limited and can be “CSI-RS,” corresponding to 3GPP 36.213’s disclosure. EX1001, 10:51-56, 15:4-8. Again, “CSI-RS” is not patentable. EX1008, ¶91.

If Xia is somehow found not to teach or suggest use of a reference signal received from a BS, it would have been obvious to modify Xia’s “channel information used for measuring Channel State Information” to employ the same (*e.g.*, “CSI-RS”) given the knowledge of a POSITA discussed above and the express teachings and suggestions of 3GPP 36.213. As noted above, 3GPP 36.213 discloses that the CSI determination includes “reference signals” from which channel measurements are derived. *See* EX1013, p.63, §7.2.3 (“the UE shall derive the channel measurements for computing the CQI value reported in uplink subframe *n* based on only the Channel-State Information (CSI) reference signals (CSI-RS)”). 3GPP 36.213 sets forth standards for physical layer procedures (including CQI

definitions) with LTE and thus is directly applicable to Xia. Use of a reference signal from the BS in the manner taught by, *e.g.*, 3GPP 36.213 would have been a straightforward and predictable implementation of Xia's techniques and a POSITA would have had a reasonable expectation of success. EX1008, ¶¶92-94.

A POSITA seeking to implement Xia would have been motivated to look to 3GPP standards (such as 3GPP 36.213) for details on CQI definitions and to verify the standard requirements for implementing CQI reporting in an LTE system such as Xia's, ensuring the system follows 3GPP standards. A POSITA would have looked to §7.2.3 for details on CQI definition and used the reference signals for measuring channel quality taught therein. A POSITA would have had a reasonable expectation of success given that Xia and 3GPP 36.213 expressly teach and suggest use of a reference signal received from the BS in channel quality reporting techniques. EX1008, ¶¶95-97.

- b. [1.2]: “measuring the channel quality based on the reference signal, and selecting a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality; and”**

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [1.2]. EX1008, ¶98.

Xia's terminal device/UE receives a reference signal as explained in §VII.A.1.a. Xia's terminal device/UE measures the channel quality based on the

reference signal by “estimat[ing] the channel information used for measuring Channel State Information (CSI)” and then “calculat[ing] the Signal to Interference plus Noise Ratio (SINR)” by using the channel information. EX1027, 3:14-17, 3:12-22, 74:40-75:6. As explained above, the “channel measurements for computing the CQI value” are “***based on*** only the ... ***CSI-RS***”, *i.e.*, the “channel state information reference signals” as disclosed by 3GPP 36.213. EX1013, p.63, §7.2.3. EX1008, ¶¶99-100.

For the reasons explained above in §VII.A.1.a, Xia teaches and suggests use of the implementation details taught by 3GPP 36.213, and at a minimum, such implementation would have been obvious. 3GPP 36.213 is directly applicable to Xia and a POSITA would have been motivated by the disclosure of Xia describing measuring the channel quality to look to 3GPP standards (such as 3GPP 36.213) for details on the UE procedure for reporting Channel State Information (CSI) (EX1013, §7.2) to ensure a LTE system such as Xia’s follows 3GPP standards and documentation. *See* §VII.A.1.a., *supra*. EX1008, ¶¶101-102.

Xia’s UE “determines a first spectral efficiency based on the measured first SINR, and then acquires a first CQI index corresponding to the first spectral efficiency based on the first spectral efficiency and the first CQI table.” EX1027, 75:30-32. Xia’s acquiring of the first CQI index based on the measured first SINR constitutes “measuring the channel quality based on the reference signal, and

selecting a channel quality indicator (CQI) index value from a predetermined CQI index table . . . based on the measurement result of the channel quality” as claimed. Xia’s selection of the first CQI index corresponding to the first spectral efficiency is “based on” the measurement result of SINR from the reference signal because Xia explains that the first spectral efficiency is determined “based on the measured first SINR”. *Id.* EX1008, ¶¶103-105.

Xia’s CQI index tables include spectral efficiencies that are directly related to code rate. Similarly, the ’161 Patent acknowledges that spectral efficiency is directly related to code rate. *See* EX1001, 8:17-18 (“a transmission efficiency (=modulation order x code rate value)”). A POSITA would understand from Xia that a code rate value can be easily calculated based on a given spectral efficiency, and vice versa. EX1008, ¶¶106-107.

Xia discloses “selecting ... from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation”. Xia discloses that the first CQI table is predetermined and includes CQI index values for 256 QAM. *See* EX1027, 75:7-29 (“first CQI table may be pre-defined by the protocol”); 75:34-35; 88:5-93:1, Tables 6-1 to 6-8. EX1008, ¶¶108-109.

For example, Table 6-3 of Xia provides a predetermined CQI index table including CQI index values for 256QAM modulation, from which a CQI index value is selected based on the measurement result of the channel quality:

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate ×1024 code rate × 1024	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia

EX1027, Table 6-3. EX1008, ¶110.

c. [1.3]: “transmitting channel state information including the selected CQI index value to the base station,”

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [1.3]. EX1008, ¶111.

Xia discloses that the UE includes a “transmitter: For sending the processor first CQI index *to a base station*; to cause the said base station to determine a first

Modulation and Coding Scheme (MCS) index from the first CQI index”. EX1027, 141:31-33 (emphasis added). As evidenced by 3GPP 36.213, “time and frequency resources [] can be used by the UE to report CSI which consists of Channel Quality Indicator (CQI), precoding matrix indicator (PMI), precoding type indicator (PTI), and/or rank indication (RI)”. EX1013, p.43, §7.2. That is, the UE can “transmit periodic CSI reporting on PUCCH [*physical uplink control channel*]” (*e.g., to the base station*) and “transmit periodic CSI reporting on PUSCH [*physical uplink shared channel*]” (*e.g., to the base station*). *Id.* EX1008, ¶¶112-114.

For the reasons explained above in §VII.A.1.a, Xia teaches and suggests use of the implementation details taught by 3GPP 36.213 and at a minimum, such implementation would have been obvious. 3GPP 36.213 is directly applicable to Xia and a POSITA would have been motivated by the disclosure of Xia describing for transmitting the first CQI index to look to 3GPP standards (such as 3GPP 36.213) for details on the UE procedure for reporting Channel State Information (CSI) (EX1013, §7.2) to ensure a LTE system such as Xia’s follows 3GPP standards and documentation. *See* §VII.A.1.a., *supra*. EX1008, ¶115.

d. [1.4]: “wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;”

Xia discloses and suggests Element [1.4]. EX1008, ¶116.

Table 6-3 of Xia is a CQI index table that includes three CQI index values for QPSK modulation (CQI indexes 1, 2, and 3), three CQI index values for 16QAM modulation (CQI indexes 4, 5, and 6), five CQI index values for 64QAM modulation (CQI indexes 7, 8, 9, 10, and 11), and four CQI index values for 256QAM modulation (CQI indexes 12, 13, 14, and 15):

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate $\times 1024$ code rate $\times 1024$	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia

EX1008, ¶117.

Further, Xia discloses the following example satisfying Element [1.4]:

For example, assuming that the modulation method of ***QPSK*** in the first CQI table is **3 entries**, and the corresponding CQI index is 1-3; the modulation method of ***16QAM*** is **3 entries**, and the corresponding CQI index is 4-6; the modulation method of ***64QAM*** is **5 entries**, and the corresponding CQI index is 7-11; and the CQI index range in the first CQI table is 0-15, the modulation method of the first CQI table is **4 entries**, and the corresponding CQI index is 12-15; the entries with the smallest CQI index is 12, and the specific is as shown in the table below. The entries with the CQI index of 12 in the first CQI table 1 corresponds to the CQI index 15 in the second CQI table 1.
[Emphasis added.]

EX1027, 82:37-83:8. Xia discloses that its CQI tables “contain entries with a modulation method higher than 64QAM”. *Id.*, 83:17-18. Xia discloses that “the modulation method included in the first CQI table with a modulation method ***higher than 64QAM*** may be 128QAM and/or ***256QAM***, etc.” *Id.*, 77:6-7 (emphasis added).
See also id., 85:7-93:13. EX1008, ¶¶118-120.

- e. [1.5]: “one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and”

Xia discloses and suggests Element [1.5]. EX1008, ¶121.

Xia teaches two types of CQI index tables: a first CQI table with a highest modulation of 256QAM, and a second, legacy CQI table with a highest modulation of 64QAM (i.e., “a CQI index table that excludes CQI index values for 256QAM modulation”). EX1027, 76:42. Xia’s second CQI table (e.g., Table 1) has a maximum transmission efficiency of 5.5547, associated with CQI index 15 and a code rate value of 948. Xia’s first CQI index table (e.g., Tables 6-1, 6-3, 6-5, 6-6, 6-7, and 6-8) includes four CQI index values for 256QAM, where the CQI index value of 12 has a code rate value (i.e., code rate value of 711) that supports a same transmission efficiency (i.e., 5.5547 spectral efficiency) of a CQI index table that excludes CQI index values for 256QAM (i.e., Xia’s second CQI table). CQI index 15 of Xia’s second (64QAM) CQI table has the same spectral efficiency of 5.5547 as CQI index 12 of Xia’s first (256QAM) CQI table. *Compare* EX1027, Table 1 *with, e.g., id.*, Table 6-3. EX1008, ¶¶122-123.

Table 1

CQI Index (CQI index)	Modulation method (modulation)	Code Rate $\times 1024$ (code rate $\times 1024$)	Spectral Efficiency (efficiency)
0	Out of Range		
1	QPSK	78	0.1523
2	QPSK	120	0.2344
3	QPSK	193	0.3770
4	QPSK	308	0.6016
5	QPSK	449	0.8770
6	QPSK	602	1.1758
7	16QAM	378	1.4766
8	16QAM	490	1.9141
9	16QAM	616	2.4063
10	64QAM	466	2.7305
11	64QAM	567	3.3223
12	64QAM	666	3.9023
13	64QAM	772	4.5234
14	64QAM	873	5.1152
15	64QAM	948	5.5547

Table 1 of Xia (Annotated) (i.e., a “Second” CQI Index Table)

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate $\times 1024$ code rate $\times 1024$	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia (Annotated) (i.e., a “First” CQI Index Table)

EX1008, ¶123.

As shown in Xia’s Tables 1 and 6-3, Xia discloses that “one of the four CQI index values for 256QAM modulation” (i.e., CQI index 12 in Table 6-3) “is configured to have one code rate value” (code rate=711) “that supports a same transmission efficiency” (i.e., 5.5547 in Table 6-3) “as a maximum transmission

efficiency” (i.e., 5.5547 in Table 1) “of a CQI index table that excludes CQI index values for 256QAM modulation” (i.e., legacy CQI Index Table 1 of Xia that does not include 256QAM entries), as claimed. EX1008, ¶124.

- f. [1.6]: “another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and”**

Xia discloses and suggests Element [1.6]. EX1008, ¶125.

Xia’s legacy 64QAM Table 1 (i.e., “a CQI index table that excludes CQI index values for 256QAM modulation”) supports a maximum transmission efficiency of 5.5547 at CQI index 15. The associated code rate value for this maximum spectral efficiency is 948, which is the same as the code rate for CQI index 15 in Xia’s first 256QAM CQI table, which has four CQI index rows for 256QAM modulation (e.g., Table 6-3). *Compare* EX1027, Table 1 *with id.*, Table 6-3. Specifically, Xia’s first CQI index table includes four CQI index values for 256QAM, where the CQI index value of 15 in the first CQI table has a selected code rate value (i.e., code rate value of 948) that is the same as the code rate value (i.e., 948) having a maximum transmission efficiency (i.e., 5.5547 spectral efficiency) of a CQI index table that excludes CQI index values for 256QAM (Xia’s Table 1). As disclosed in Tables 6-1, 6-3, 6-5, 6-6, 6-7, and 6-8, the first CQI index table has a CQI index value of 15 including a selected code rate value (i.e., 948) that is the same as the code rate value

for CQI index 15 in the legacy CQI table (Xia's second CQI table, Table 1) having a maximum spectral efficiency of 5.5547. EX1008, ¶¶126-128.

In Xia's second CQI table (i.e., a legacy table that excludes 256QAM, such as Table 1), there is a CQI index value of 15 having a maximum spectral efficiency of 5.5547 that corresponds to a code rate value of 948 at 64QAM. The 948 code rate value is the same as the code rate value of 948 in the first CQI index table including the 256QAM modulation (e.g., Table 6-3).

Table 1

CQI Index (CQI index)	Modulation method (modulation)	Code Rate $\times 1024$ (code rate $\times 1024$)	Spectral Efficiency (efficiency)
0	Out of Range		
1	QPSK	78	0.1523
2	QPSK	120	0.2344
3	QPSK	193	0.3770
4	QPSK	308	0.6016
5	QPSK	449	0.8770
6	QPSK	602	1.1758
7	16QAM	378	1.4766
8	16QAM	490	1.9141
9	16QAM	616	2.4063
10	64QAM	466	2.7305
11	64QAM	567	3.3223
12	64QAM	666	3.9023
13	64QAM	772	4.5234
14	64QAM	873	5.1152
15	64QAM	948	5.5547

Table 1 of Xia (Annotated) (i.e., a “Second” CQI Index Table)

CQI index 15 having code rate value (948)
having maximum transmission efficiency in
legacy table (i.e., excludes 256QAM)

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate $\times 1024$ code rate $\times 1024$	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia (Annotated) (i.e., a “First” CQI Index Table)

Another CQI index value (e.g., index 15 for 256QAM) having code rate value (948) the same as the code rate value (948 in Table 1) with maximum efficiency in legacy table

EX1008, ¶¶129-130.

As shown in Xia's Table 1, the maximum transmission efficiency of Table 1 is 5.5547 at CQI index 15. The code rate value for this maximum spectral efficiency is 948, which is the same as the code rate value for CQI index 15 in Xia's first CQI table with the four 256QAM index rows (e.g., Table 6-3). EX1008, ¶131.

g. [1.7]: “wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using ‘code rate×1024,’”

Xia discloses and suggests Element [1.7]. EX1008, ¶132.

The recited “the one code rate value” refers to the “one code rate value” recited in Element [1.5] (*see* §VII.A.1.e.). Xia's first CQI table (i.e., including 256QAM) includes a selected code rate value of one of the four CQI index values for 256QAM modulation as 711 using ‘code rate×1024’. EX1027, 88:5-89:3, Table 6-3. Xia selects, from multiple groupings of spectral efficiencies from which code rate values can be calculated, 711 as the code rate value for the lower bounds of the four 256QAM CQI table entries. *See* EX1027, 86:19-88:5.

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate ×1024 code rate × 1024	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia (Annotated)

EX1008, ¶¶133-135.

- h. [1.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and”

Xia discloses and suggests Element [1.8]. EX1008, ¶136.

The recited “the another code rate value” refers to the “another code rate value” recited in Element [1.6] (*see* §VII.A.1.f.). Xia’s Table 6-3 (i.e., including 256QAM) includes a selected code rate value of the another of the four CQI index values for 256QAM modulation as 948 using ‘code rate×1024’. EX1027, 88:5-89:3, Table 6-3.

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate ×1024 code rate × 1024	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia (Annotated)

EX1008, ¶¶137-138.

Xia selects, from multiple groupings of spectral efficiencies from which code rate values can be calculated, 948 as the code rate value for the upper bounds of the four 256QAM CQI table entries. *See* EX1027, 86:19-88:5. EX1008, ¶139.

- i. [1.9]: “a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using ‘code rate×1024.’”

Xia’s Table 6-3 is identical to the claimed CQI index table (both have four CQI index entries for 256QAM modulation with minimum and maximum code rate values of 711 and 948, respectively), except that Xia’s Table 6-3 includes a “different another code rate value” of 790 for CQI index 13, instead of the claimed 797. This difference does not impart patentability as explained below. EX1008, ¶140.

- (i) *Xia discloses selecting “approximately” constant intervals for 256QAM design and thus teaches and suggests the claimed 797 code rate value given its admitted non-criticality*

The ’161 Patent does not require use of precisely constant SNR or spectral efficiency intervals between adjacent 256QAM CQI index values or entries. Nor does the ’161 Patent assign criticality to any specific code rate value—797 is merely one example. EX1001, 16:10-11 (“code rate value ... *may* be configured to be 797”). EX1008, ¶141.

Rather, the ’161 Patent teaches that upon selection of certain 256QAM parameters, *i.e.*, minimum and maximum code rate values (such as 711 and 948,

respectively) and number of entries (four entries) across that range, the two remaining code rate values (between 711 and 948) for CQI indexes 13 and 14 may be selected such that differences of SNRs between adjacent CQI indexes are “almost the same”. EX1001, 14:3-8. *See also id.*, 16:4-12. This flexibility of SNRs and associated code rates for the two intermediate CQI indexes is apparent from Figure 21 of the ’161 Patent (256QAM, CQI indices 12-15), which does not employ exactly constant intervals between adjacent 256QAM entries. The focus is on selecting the lowest code rate value “to have the same transmission efficiency as the typical CQI index that has the highest transmission efficiency”, *i.e.*, 711 in Figure 21, but this was known. *Id.*, 14:43-53. EX1008, ¶¶142-144.

Xia teaches the same general approach to 256QAM design as the ’161 Patent. *See* EX1027, 89:3, Table 6-3 (256QAM with four entries; CQI index 12=711; CQI index 15=948). Xia’s selected endpoints for the new 256QAM CQI entries span the ***exact same*** range of code rate values as claimed in the ’161 Patent. *Id.* *See* EX1001, 14:39-53, Figure 21. Further, like the ’161 Patent, Xia does not require use of precisely constant intervals between 256QAM entries, but instead allows for “approximately” constant intervals. EX1027, 84:18-31 (CQI indexes are “an approximately arithmetic progression”; spectral efficiency is “within a range from a constant minus a present value to the constant plus the preset value”), 86:6-18 (spectral efficiency is directly related to code rate). *See also id.*, 5:22-35, 39:42-

40:11, 127:8-20. Given that Xia teaches the same threshold 256QAM parameters—*i.e.*, the same number of entries (four) and the same minimum and maximum code rate values (711, 948)—all that would remain is the non-critical selection of any two intervening values between 711 and 948 that “approximate” constant intervals. While Xia’s Table 6-3 happens to exemplify a CQI index 13 code rate value of 790, a POSITA would have recognized that selection of this particular exemplified value is not critical and it would have been obvious to employ other “approximate” values such as 797, as taught and suggested by Xia. EX1008, ¶¶145-149.

Further, the ’161 Patent assigns no criticality to any particular code rate value, and 797 is merely one example. EX1001, 16:10-13 (“The code rate value obtained in such a manner *may be* configured to be 797 as CQI index 13.... That is, the code rate value ... *may be* configured to be 797.”) (emphasis added), 15:57 (For example...), 17:39-41, 3:54-65 (Figs. 18 and 21 illustrate “an example” of a CQI index table). The ’161 Patent does not explain how or why the 797 code rate was chosen for inclusion in its claimed CQI table. Nor did Patent Owner demonstrate or even assert criticality during examination. Rather, Patent Owner conceded that the 797 amendment was made “solely for the purpose of expediting prosecution”, not for the purpose of demonstrating criticality. EX1002, pp.134-135. The ’161 Patent does not purport that a code rate value of 797 is better than any other code rate values proposed for CQI index value 13. No single code rate value within each CQI value

is critical and no single code rate value has any more or less advantage over others within a similar range (*e.g.*, 797 versus 790). EX1008, ¶¶150-152.

Further, as evidenced by 3GPP technical contributions and submissions such as EX1028 (“R1-142638”), 797 was a non-critical value for the CQI table. EX1008, ¶153. 3GPP technical contributions relating to 256QAM CQI table design (*see* EX1029 (“R1-140034”), EX1030 (“R1-141366”)), which were publicly available before the earliest priority date of the ’161 Patent, demonstrate that other viable options for the code rate value associated with CQI index value 13 were considered. EX1008, ¶154. *See* EX1010, ¶¶61-75; *see also id.*, ¶¶25-52. For example, Huawei, the same Applicant of PCT International Publication WO 2014/194681 to Xia (EX1012, EX1027), proposed a 790 code rate value and associated 256QAM CQI entries based on equal spectral efficiency gaps between adjacent CQI index values. *See* EX1028; *see also* EX1029 (“R1-140034”). While five RAN1 participants agreed with Huawei’s proposed approach to CQI table design, 10 other participants proposed CQI index tables based on “equal SINR internal [sic] with different [code rate] values” around the time of the purported invention. EX1028, p.3. EX1008, ¶¶155-156. The publicly available technical contributions and proposals demonstrate that no considered code rate was critical. *See* EX1028. As evidenced by R1-142638, the 797 code rate was selected not due to any criticality, but rather because it corresponded to the “average value from the results with equal SINR

interval between [[711], [948]]”. EX1028, p.4. EX1008, ¶¶157-158. A POSITA would have understood that selecting a code rate value as an average of values from various results of determined code rates would have been an obvious design choice given the breadth of acceptable code rate values for each CQI index. EX1008, ¶159. The choice of 790 or 797 was merely a design choice, where either value would have been acceptable for the CQI table. *See* EX1028 (R1-142638). EX1008, ¶160.

While the prior art and Xia relied upon herein based its code rate values on approximately constant intervals of spectral efficiency, EX1027, 40:1-5, publicly available 3GPP technical contributions and submissions demonstrate that both 790 and 797 were within an acceptable tolerance of code rate values considered for CQI index 13, and it would have been obvious to use approximately constant intervals of SNR or SINR. EX1008, ¶161.

For example, R1-141366 (EX1030) proposes a code rate value of 772, determined based on constant SINR intervals, and thus demonstrates there was a range of code rate values considered to be acceptable for CQI index 13 including values from at least 772 to 797. EX1030 (R1-141366). The 797 code rate was deemed within the range of acceptable code rate values. *Id.* A POSITA would have been motivated to use a constant SINR interval because both R1-140034 and R1-141366 teach that constant SINR spacing was a “design principle” of the CQI table. EX1029, pp.1-2; EX1030, p.1. EX1008, ¶¶162-163.

Although Xia used approximately constant intervals of spectral efficiency, the experimental results presented by Huawei (the same Applicant as Xia) in R1-140034 indicated that “[s]ince the curve of efficiency vs. SNR is almost linear, [] the new CQI entries for 256QAM could be samples based on approximately equal step size in spectral efficiency.” EX1029, p.2. *See also* EX1027, 75:30-32. Thus, Xia’s use of approximately constant spectral efficiency intervals is consistent with and suggests the use of approximately constant SINR intervals, and thus there is no criticality associated with selecting equal SINR intervals versus equal spectral efficiency intervals. Selecting a code rate of 797 would have been obvious given Xia’s and Huawei’s adherence to the “design principle” of approximately equal SINR intervals. EX1008, ¶164.

Not only was there no criticality attached to 797, and no criticality associated with the use of approximately equal SINR or spectral efficiency intervals, the difference between the two values of 790 and 797 constitutes an acceptable tolerance of +/- 7 code rate values. *See, e.g., Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985). Additionally, 3GPP technical contributions (EX1030, R1-141366) dated March 21, 2014 demonstrate that values proposed for the first intermediate code rate in the range 711-948 (i.e., corresponding to CQI index 13) were proposed as low as “772.” Thus, as of the earliest claimed filing date of the ’161 Patent, an acceptable range of code rate values for CQI index 13 included

at least values inclusive of 772-797 (i.e., a tolerance of ± 25), and Huawei's and Xia's 790 is squarely within this tolerance. A POSITA would have recognized that any value in this range would be viable. EX1008, ¶165.

Moreover, Petitioners' expert confirms 797 was not critical. EX1008, ¶¶166-167. Dr. Roy confirmed, as shown in R1-142638, that 790 and 797 were two candidates for consideration to include in entry 13 of the CQI tables. In addition, 797 was not even originally considered, rather 797 was presented based on an "average value from the results with equal SINR interval between" the 711 and 948 end point code rates. R1-142638, although not prior art, demonstrates that the selected code rate value of 797 had no criticality to the use and standardization of the CQI table. Not only was 797 non-critical, but 790 was considered as a comparable alternative that would have produced similar results had 790 been included in the CQI table. Indeed, while 10 RAN1 participants proposed various code rate values based on equal SINR intervals, five other participants advocated for a code rate value of 790 for CQI index 13 based on equal spectral efficiency spacing. Thus, although 797 was ultimately selected for the standardized CQI table, R1-142638 shows that 790 was an equivalent alternative to 797 in view of the design principles enunciated. *See* EX1028, p.3. EX1008, ¶¶166-168.

Success of 5G and the updated CQI table including 256QAM did not depend on the 797 code rate value selected for CQI entry 13. No nexus exists between the

code rate of 797, by itself, and any success of 5G. EX1008, ¶169. Success of 5G was driven by overall improvements, including the use of 256QAM modulation as a whole, and not the specific code rates chosen for 256QAM. EX1008, ¶170. As Dr. Roy explains, success of 5G would not have been altered by selection of the code rate value of 797. 5G would have been just as successful had 790 been used in the standardized CQI table. EX1008, ¶171. 5G success was due to, for example, other improvements made to deliver data at faster speeds with lower latency and greater capacity, in part a function of 256QAM modulation, which was already in the public domain as evidenced by Xia. *See* EX1027. EX1008, ¶172.

As explained, Xia's Table 6-3 was a viable alternative to the current standardized CQI table, and would have similarly contributed to the success of 5G, not due to specific code rates, but because of the inclusion of four 256QAM CQI entries ranging from code rates of 711 to 948, of which was agreed upon by 3GPP. *See* EX1028; EX1029; EX1030. EX1008, ¶173.

Thus, Patent Owner cannot demonstrate criticality of the claimed 797 code rate value, and in view of the substantially identical approach to 256QAM CQI table design taught by Xia, use of such a code rate would have been obvious. *See, e.g., Ex Parte Spangler*, Appeal No. 2018-003800 (PTAB Feb. 20, 2019) (informative) (claimed relative lengths and locations were a matter of obvious design choice because the specification did not suggest that the relative lengths or locations were

critical to the claimed invention). The claimed 797 code rate is *prima facie* obvious from the mere fact that it is very close to the 790 code rate value (*i.e.*, within a tolerance of +/- 7 code rate values) exemplified by Xia for CQI index 13. EX1008, ¶¶174-175. “[A] *prima facie* case of obviousness exists where the claimed ranges or amounts do not overlap with the prior art but are merely close.” M.P.E.P. §2144.05 (citing *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985)); *see also Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1341 (Fed. Cir. 2020).

As explained above, the only difference between Xia and claim 1 of the ’161 Patent is that Xia discloses a code rate value of 790 for CQI index 13 in Table 6-3 instead of the 797 value as claimed. This difference cannot impart patentability, as the selection of code rate values for the CQI table is taught and suggested by the prior art and a mere design choice. EX1008, ¶176.

A POSITA would have had a reasonable expectation of success in employing a 797 code rate value in Xia’s 256QAM design at least given (i) the well-understood and predictable nature of code rates used in CQI notification methods, (ii) the art-recognized acceptance of “approximate” constant intervals between adjacent CQI index values, (iii) the art recognized “design principle” of equal SINR/efficiency intervals, and (iv) the disclosed use of the similar code rate of 790 disclosed by Xia (Table 6-3). EX1008, ¶177.

(ii) A POSITA would have applied the art-recognized practice of selecting code rates to maximize throughput to the UE subject to an acceptable error rate in designing Xia's 256QAM entries

As explained above, Xia teaches the general conditions of the Challenged Claims, such as the general approach to 256QAM design and selection of 4 entries and 711 and 948 minimum and maximum code rate values. “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456 (CCPA 1955); *see also Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1341–42 (Fed. Cir. 2020). Selection of the 797 code rate value is not patentable. EX1008, ¶178.

Further, it was well-understood that code rates were selected to strike a balance of maximizing throughput to the UE subject to an acceptable error rate, and a POSITA would have applied this understanding to the design of 256QAM entries. *See, e.g.*, EX1015, ¶[0003] (“The code rates and modulation scheme may be selected not only to maximize the throughput to a particular UE, but also to improve the overall throughput of the base station communication area”), ¶[0094] (“the LTE specification is one way of reporting and using CQI for optimizing the receiver throughput, which sets a fixed BLER target for the UE that can simplify the optimization at the BS”); EX1014, pp.2-3 (“[e]ach UE tries to find an optimal pair of modulation order and coding rate, which provides the largest throughput when

the BLER is less than 10 percent”). This art-recognized relationship between code rate and throughput/error rate would have been considered during both the design of the CQI index table (*e.g.*, selecting/optimizing appropriate spectral efficiencies and corresponding code rates to populate the 256QAM entries) as well as during the use of such table (*e.g.*, selecting a particular CQI index value from the table). Applying such known optimization techniques to the known 256QAM modulation scheme is not patentable. The PTAB has consistently found claimed numerical limitations obvious where they involve no more than routine optimizations of predictable techniques, as is the case here. *See, e.g., Foresight Diagnostics, Inc. v. Personalis, Inc.*, IPR2023-00224, Paper 50 at 52 (PTAB June 12, 2024) (“we agree with Petitioner’s argument ... that [the claim limitation] would have required no more than routine optimizations of predictable and well-known sequencing techniques.”); *Motorola Mobility LLC v. Largan Precision Co., Ltd.*, IPR2022-01022, Paper 59 at 40 (PTAB Dec. 8, 2023) (“one of ordinary skill in the art would have regularly used ZEMAX with pre-existing lens designs as a starting point and performed routine optimizations to reach a desired design”). A POSITA would have had a reasonable expectation of success in employing a 797 code rate given the well-understood and predictable nature of code rates used in CQI notification methods, and given the use of a similar code rate of 790 disclosed in Xia’s CQI Table. EX1027, 89:3, Table 6-3; EX1008, ¶¶179-181.

(iii) *Xia discloses a range of between 711 and 948 which encompasses the two remaining code rates for CQI indexes 12 and 13 for 256QAM, rendering the 797 code rate prima facie obvious*

Xia discloses a minimum code rate value of 711 (CQI index 12) and a maximum code rate value of 948 (CQI index 15). Given that Xia discloses four total entries for 256QAM, the two remaining (intervening) code rate values (only one of which is claimed) would necessarily fall within that range. That is, Xia teaches a range (between 711 and 948) which encompasses the claimed code rate, thus making such code rate value *prima facie* obvious. EX1008, ¶¶182-183.

In this regard, “a *prima facie* case of obviousness exists where the claimed ranges or amounts do not overlap with the prior art but are merely close.” M.P.E.P. §2144.05 (citing *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985)); *see also Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1341 (Fed. Cir. 2020). Here, the claimed 797 value is both within the range between 711 and 948 and also very close to the 790 code rate exemplified by Xia for CQI index 13 in Table 6-3. Additionally, Xia discloses several code rate values for CQI index 13 ranging from 790 to 831, and the claimed 797 code rate also falls within the code rate value range of 790 to 831 for CQI index 13 suggested by Xia. The claimed 797 code rate is therefore *prima facie* obvious given that it is encompassed by the ranges disclosed and suggested by Xia. EX1008, ¶184.

For similar reasons, it would have been obvious to try other integer values within the ranges taught by Xia including code rate value 797. A POSITA would have recognized that in Table 6-3 of Xia, the code rate for CQI index 13 necessarily must fall within the range of CQI index 12 (code rate: 711) and CQI index 14 (code rate: 869). It would have been obvious to try other integer values within the range of 711 to 869 taught by Xia, given that such integers represent a finite number of identified, predictable solutions, particularly given that techniques for adjusting code rate value and determining the impact of said adjustments on the signal-to-noise ratio and spectral efficiency were well understood at the time of the '161 Patent. EX1008, ¶¶185-186.

The grounds in this Petition substantially differ from the issues considered during prosecution. The Examiner did not consider Xia's applicability as a primary reference. Nor did the Examiner consider the additional evidence (e.g., EX1013, EX1014, EX1015) presented in this Petition demonstrating the obviousness of the 797 code rate value. In fact, nowhere in the prosecution history did the Examiner even consider the issue of whether it would have been obvious to adjust the 790 code rate value in Xia, presented with a disclosure of a CQI table including all the other claimed code rates, such as the range of code rate values for the 256QAM CQI entries 711-948. In the Examiner's four-reference combination, only one code rate value was disclosed in each of the cited references, and the CQI tables did not all

include 256QAM entries. This constitutes material error given that such adjustment to the code rate, in an otherwise fully disclosed table of 256QAM entries and code rates, would have been obvious for a number of reasons explained above. *See* §VIII.B.2., *infra*. EX1008, ¶¶187-188.

2. **Claim 2: “The method of claim 1, wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in a table below**

CQI index	modulation	code rate × 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

Xia discloses the method of claim 1. *See* §VII.A.1. Xia discloses wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in the table in claim 2. Xia’s Table 6-3 discloses the exact same five CQI index entries for 64QAM modulation, respectively. EX1027, 89:3, Table 6-3. Table 6-3 discloses all of the same values (including code rate, spectral efficiency, modulation scheme, and CQI index) as the claimed table of claim 2.

Table 6-3

CQI index in the first CQI table	CQI index in the second CQI table	Modulation method modulation	Code Rate ×1024 code rate × 1024	Spectral efficiency efficiency
0	0	out of range		
1	1	QPSK	78	0.1523
2	3	QPSK	193	0.3770
3	5	QPSK	449	0.8770
4	7	16QAM	378	1.4766
5	8	16QAM	490	1.9141
6	9	16QAM	616	2.4063
7	10	64QAM	466	2.7305
8	11	64QAM	567	3.3223
9	12	64QAM	666	3.9023
10	13	64QAM	772	4.5234
11	14	64QAM	873	5.1152
12	15	256QAM	711	5.5547
13	-	256QAM	790	6.1719
14	-	256QAM	869	6.7891
15	-	256QAM	948	7.4063

Table 6-3 of Xia (Annotated)

EX1008, ¶¶189-192.

In Related Litigation, Defendants have proposed that the term “to have same difference within a predetermined error rate” is indefinite. EX1017, p.40. Claim 2 further specifies that this relationship is “as shown in” the table recited in claim 2. Since Xia discloses the exact contents of the table, and in the same order for 64QAM

entries, as explained above, Xia also satisfies the claimed relationship “same difference within a predetermined error rate”. Thus, Xia discloses claim 2. EX1008, ¶¶193-195.

3. Claim 3 (Preamble): “A method for receiving channel state information by a base station, the method comprising:”

Xia discloses and suggests the Preamble of claim 3. *See* §VII.A.1., *supra*. Xia discloses that the CSI, including a CQI index, is received by a base station. EX1027, 93:14-20, 141:27-33. *See also id.*, Figs. 2, 3. *See* §§VII.A.1., VII.A.1.b., *supra*. EX1008, ¶196.

a. [3.1]: “creating a reference signal for measuring channel quality;”

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [3.1]. *See* §VII.A.1.a., *supra*. EX1008, ¶197.

b. [3.2]: “transmitting the reference signal to a User Equipment (UE); and”

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [3.2]. *See* §VII.A.1.b., *supra*. EX1008, ¶198.

- c. [3.3]: “receiving channel state information including a channel quality indicator (CQI) index selected from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on a measurement result of the channel quality, from the User Equipment,”

Xia alone or in combination with 3GPP 36.213 discloses and suggests Element [3.3]. *See* §VII.A.1.c., *supra*. Xia’s base station receives the CQI index. EX1027, 93:14-20, 141:27-33, Figs. 2, 3. EX1008, ¶¶199-200.

- d. [3.4]: “wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;”

Xia discloses and suggests Element [3.4]. *See* §VII.A.1.d., *supra*. EX1008, ¶201.

- e. [3.5]: “one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and”

Xia discloses and suggests Element [3.5]. *See* §VII.A.1.e., *supra*. EX1008, ¶202.

- f. [3.6]: “another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and”**

Xia discloses and suggests Element [3.6]. *See* §VII.A.1.f., *supra*. EX1008, ¶203.

- g. [3.7]: “wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using “code rate×1024,”**

Xia discloses and suggests Element [3.7]. *See* §§VII.A.1.g., VII.A.1.e., *supra*. EX1008, ¶204.

- h. [3.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and”**

Xia discloses and suggests Element [3.8]. *See* §§VII.A.1.f., VII.A.1.h., *supra*. EX1008, ¶205.

- i. [3.9]: “a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using ‘code rate×1024.’”**

Xia teaches and suggests Element [3.9]. *See* §VII.A.1.i., *supra*. EX1008, ¶206.

4. **Claim 4: “The method of claim 3, wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in a table below**

CQI index	modulation	code rate × 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

Xia discloses the method of claim 3. *See* §VII.A.3., *supra*. Xia discloses and suggests the method of claim 4 for at least the reasons discussed above with respect to claim 2. EX1008, ¶¶207-208.

In Related Litigation, Defendants have proposed that the term “to have same difference within a predetermined error rate” is indefinite. EX1017, p.40. Claim 4 further specifies that this relationship is “as shown in” the table recited in claim 4. Since Xia discloses the exact contents of the table, and in the same order for 64QAM entries, as explained above, Xia also satisfies the claimed relationship “same difference within a predetermined error rate”. Thus, Xia discloses claim 4. EX1008, ¶¶209-211.

5. Claim 5 (Preamble): “A User Equipment (UE) for transmitting channel state information, comprising:”

Xia discloses the Preamble of Claim 5. *See* §VII.A.1., *supra*. Xia’s “terminal”/“user equipment” is a UE that performs the method for transmitting channel state information claimed in claim 1. *See id.*; *see* EX1027, Figs. 1-4, 74:40-75:6. EX1008, ¶¶212-213.

Xia uses various terms when referring to the UE used to transmit CSI to the base station including “terminal (UE)” (EX1027, 7:8-9), “CQI notification device” (*id.*, 125:14-15, 141:27-142:43), “device for notifying CQI” (*id.*, 38:2-3, 72:3-4), and “User Equipment (UE)” (*id.*, 75:1-2). *See also id.*, Abs. (“The terminal obtains the first CQI index based on the first CQI table”); 75:16-29, 141:27-33 (a “CQI notification device 90, which comprises: a processor 91 . . . for acquiring a first CQI table; and for acquiring a first CQI index from the first CQI table”), 142:44-143:5 (a base station “receive[s] the first Channel Quality Indicator (CQI) Number ***sent by the terminal (UE)***, and the said first CQI index is determined by the said UE based on the acquired first CQI table”) (emphasis added). The UE/CQI notification device perform the same CQI notification methods described in Xia. *Id.*, 75:13-18, 142:41-43. EX1008, ¶214.

a. [5.1]: “a receiver configured to receive a reference signal for measuring channel quality from a base station;”

Xia alone or in combination with 3GPP 36.213 discloses and suggests a receiver configured to receive a reference signal for measuring channel quality from a base station. *See* §VII.A.1.a., *supra*. Xia’s UE includes at least a receiver configured to receive signals. *See* EX1027, 123:27-125:13, Fig. 5. To the extent Xia does not disclose a UE expressly including a receiver configured to receive a reference signal, 3GPP 36.213 discloses a UE “configured by higher layers” where “the UE shall derive the channel measurements for computing the CQI value reported in uplink subframe n based on only the Channel-State Information (CSI) reference signals defined in [3] for which the UE is configured to assume non-zero power.” EX1013, p.63, §7.2.3. EX1008, ¶¶215-217.

A POSITA would have been motivated to turn to 3GPP 36.213 to ensure Xia’s LTE CQI notifying system complied with the 3GPP standards. A POSITA would thus have recognized that a UE must include a receiver configured to receive reference signals transmitted by a base station, specifically reference signals such that the UE could measure channel quality so that a CQI index could ultimately be determined, as described in Xia. A POSITA would have had a reasonable expectation of success given 3GPP 36.213 discloses UEs configured for various functions, including receiving reference signals for CQI reporting. EX1008, ¶¶218-220.

- b. [5.2]: “a controller configured to measure the channel quality based on the reference signal, and select a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality; and”

Xia alone or in combination with 3GPP 36.213 discloses and suggests a UE including a controller configured to measure the channel quality based on the reference signal, and select a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality. *See* §§VII.A.1.b., VII.A.5., *supra*. EX1008, ¶221.

As explained in §VII.A.5., Xia’s CQI notification device constitutes a UE. Xia discloses a CQI notification device 90 in Figure 9 including a processor 91. The processor 91 of the CQI notification device is configured “for acquiring a first CQI table; and for acquiring a first CQI index from the first CQI table”. EX1027, 141:27-33. Xia’s CQI notifying apparatus learning a first CQI index constitutes selecting a CQI index from the first CQI table. Xia’s first CQI tables includes Table 6-3 including the 256QAM CQI index values. Processor 91 of the CQI notifying apparatus constitutes a controller. EX1008, ¶¶222-225.

To the extent Xia does not disclose a UE expressly including a controller configured to measure the channel quality *based on* the reference signal, 3GPP

36.213 discloses a UE “configured by higher layers” where “the UE shall derive the channel measurements for computing the CQI value reported in uplink subframe n based on only the Channel-State Information (CSI) reference signals”. EX1013, p.63, §7.2.3. EX1008, ¶226.

A POSITA would have been motivated to turn to 3GPP 36.213 to ensure Xia’s LTE CQI notifying system and apparatus complied with the 3GPP standards. A POSITA would thus have recognized that a UE must include a controller/processor configured to measure the reference signal transmitted by a base station and select a CQI index based on the measurements of the reference signal. A POSITA would have had a reasonable expectation of success given 3GPP 36.213 discloses UEs configured for various functions, including receiving and measuring reference signals, and selecting CQI indices from a table for CQI reporting. EX1008, ¶¶227-229.

c. [5.3]: “a transmitter configured to transmit channel state information including the selected CQI index value to the base station,”

Xia discloses and suggests a UE including transmitter configured to transmit channel state information including the selected CQI index value to the base station. *See* §§VII.A.1.c., VII.A.5., *supra*. Xia discloses the CQI notifying apparatus 90 in Figure 9 including a transmitter 92. The transmitter is configured “[f]or sending the

processor first CQI index to a base station”. EX1027, 141:27-33. EX1008, ¶¶230-231.

- d. [5.4]: “wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;”

Xia discloses and suggests Element [5.4]. *See* §§VII.A.1.d., VII.A.5.b., *supra*. EX1008, ¶232.

- e. [5.5]: “one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and”

Xia discloses and suggests Element [5.5]. *See* §§VII.A.1.e., VII.A.5.b., *supra*. EX1008, ¶233.

- f. [5.6]: “another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and wherein:”

Xia discloses and suggests Element [5.6]. *See* §§VII.A.1.f., VII.A.5.b., *supra*. EX1008, ¶234.

- g. [5.7]: “wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using ‘code rate×1024,’”

Xia discloses and suggests Element [5.7]. *See* §§VII.A.1.g., VII.A.5.b., *supra*. EX1008, ¶235.

- h. [5.8]: “the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using ‘code rate×1024,’ and”**

Xia discloses and suggests Element[5.8]. *See* §§VII.A.1.h., VII.A.5.b., *supra*.

EX1008, ¶236.

- i. [5.9]: “a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using ‘code rate×1024.’”**

Xia teaches and suggests Element [5.9]. *See* §§VII.A.1.i., VII.A.5.b., *supra*.

EX1008, ¶237.

- 6. Claim 6: “The User Equipment of claim 5, wherein and five CQI index values for 64QAM modulation, respectively, to have a same difference within a predetermined error rate, as shown in a table below**

CQI index	modulation	code rate × 1024	efficiency
0		out of range	
1	QPSK	78	0.1523
2	QPSK	193	0.3770
3	QPSK	449	0.8770
4	16QAM	378	1.4766
5	16QAM	490	1.9141
6	16QAM	616	2.4063
7	64QAM	466	2.7305
8	64QAM	567	3.3223
9	64QAM	666	3.9023
10	64QAM	772	4.5234
11	64QAM	873	5.1152.

Xia discloses and suggests claim 5. *See* §VII.A.5., *supra*. *See also* §VI. Xia discloses and suggests the method of claim 6 for at least the reasons discussed above with respect to claim 2. EX1008, ¶¶238-239.

In Related Litigation, Defendants have proposed that the term “to have a same difference within a predetermined error rate” is indefinite. EX1017, p.43. Claim 6

further specifies that the relationship “to have a same difference within a predetermined error rate” is “as shown in” the table recited in claim 6. Since Xia discloses the contents of the table, and in the same order for 64QAM entries, as explained, Xia also satisfies the claimed relationship “to have a same difference within a predetermined error rate”. EX1008, ¶240.

VIII. OTHER CONSIDERATIONS

A. Secondary Considerations

Petitioners are not aware of any secondary considerations evidence bearing any nexus to the purported claimed invention. Any purported evidence of secondary considerations that Owner may present in this proceeding would be insufficient to overcome the strong evidence of obviousness of the Challenged Claims. EX1008, ¶¶241-244.

B. Discretion to Institute

1. The Board should not deny this Petition under §314(a)

The '161 Patent has not been challenged in any prior AIA trial proceeding, and this Petition is not a “follow-on” petition. Events in Related Litigations do not warrant denial, and application of the *Fintiv* factors weighs against discretionary denial as explained below.

a. Factor 1: Whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted

Factor 1 weighs against discretionary denial. In the district court litigation, third party defendant and patent owner KT Corporation (“KT”) has disputed jurisdiction. The parties are engaged in jurisdictional discovery, and the Court has granted KT a protective order from non-jurisdictional discovery during the jurisdictional discovery period. EX1022; EX1026. This could extend the district court trial date, which “allays concerns about inefficiency and duplication of efforts” in the PTAB. *Fintiv* at 8.

b. Factor 2: Proximity of the court’s trial date to the Panel’s projected statutory deadline for a final written decision

Factor 2 should be considered at least neutral because jury selection is far in the future and is not set to begin until at least September 8, 2025. Even if jury selection were to proceed on September 8, 2025, jury selection would proceed with respect to only one of the three cases (*e.g.*, the ’638 Litigation, the ’639 Litigation, or the ’640 Litigation). Each of the defendant Petitioners are entitled to separate trials, which will necessarily proceed on separate dates. As such, there are explicit and inherent uncertainties for this case given the number of parties involved and the number of trials regarding this patent. In addition, and because much can change in ten months, the current trial date does not support denial. *See DISH Network v. Broadband iTV*, IPR2020-01280, Paper 17 at 16 (PTAB Feb. 4, 2021) (“We cannot

ignore the fact that the currently scheduled trial date is more than nine months away and much can change during this time”).⁴

Moreover, given the existence of three cases each with multiple parties, to include multiple intervenors, the likelihood that any trials will be scheduled serially, the potential length of the trials given the number of patents at issue (11) and claims at issue, and post-trial motions, it is likely that the district court proceedings will not be complete before the final written decision in this matter. Indeed, these cases additionally will likely be delayed (as explained earlier) because third party defendant and patent owner KT has disputed jurisdiction, has yet to file an Answer, and the Court has granted KT a protective order from non-jurisdictional discovery. EX1026.

Altogether, this factor weighs against discretionary denial.

c. Factor 3: Investment in the parallel proceeding by the court and the parties

Factor 3 weighs against discretionary denial. The district court cases are in their early stages and the district court has not issued any substantive rulings in either

⁴ For these reasons, the “statistics on median time-to-trial for civil actions in the district court in which the parallel litigation resides” are not illuminating, given the number of cases and number of defendants.

case with respect to the '161 Patent. Specifically, infringement contentions were served on March 18, 2024, invalidity contentions were served on May 17, 2024, and the claim construction hearing is not scheduled until March 11, 2025. EX1006; EX1007. In addition, third party defendant and patent owner, KT Corporation has not yet filed an answer, which will likely further delay progress on the merits.

Altogether, there is much work to be done in the district court and most, if not all, of the work will be well in the future. Accordingly, the district court will not invest significant resources related to the challenged patent prior to the issuance of an institution decision. *See Fintiv*, IPR2020-00019, Paper 11 at 9-12; *DISH Network*, IPR2020-01280, Paper 17 at 18-21.

d. Factor 4: Overlap between issues raised in the petition and in the parallel proceeding

Factor 4 favors institution. Indeed, there will not be complete overlap between this IPR and the district court cases because there are 6 claims asserted in this case and a total of 113 asserted in the related district court cases. The district court will likely reduce the asserted claims prior to trial including some of the 6 claims at issue here. This factor thus weighs against the Board exercising its discretion to deny.

e. Factor 5: Whether the petitioner and the defendant in the parallel proceeding are the same party

Factor 5 is neutral as it is “far from an unusual circumstance that a petitioner in inter partes review and a defendant in a parallel district court proceeding are the same.” *Sand Revolution*, IPR2019-01393, Paper 24 at 12-13.

f. Factor 6: Other circumstances that impact the Panel’s exercise of discretion, including the merits

Factor 6 weighs strongly against discretionary denial. As detailed herein, this is a compelling case, and the merits of the Petition are strong. The challenges presented in this Petition are particularly compelling given that Ground 1 is a straightforward obviousness challenge based on Xia and 3GPP 36.213 and express teachings found in the prior art. *See, e.g., Inergy Tech., Inc. v. Force Mos Tech., Co., Ltd.*, IPR2024-00094, Paper 9 (PTAB May 21, 2024) at p. 36 (finding compelling merits where the obviousness ground is “seemingly straightforward” and “Petitioner’s motivation for this modification comes from an express teaching in [the cited reference]”). None of the grounds asserted herein were previously considered by either the Office or the district courts, also favoring institution. *See Comcast Cable Commn’s, LLC v. Rovi Guides, Inc.*, IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019) (obviousness challenges not “previously considered by the Office or any court” weigh in favor of not denying institution). Moreover, the ’161 Patent is

currently asserted in three district court cases. Institution of this IPR would simplify the litigations for the district court.

2. The Board should not deny this Petition under §325(d)

Xia was neither considered nor substantively discussed by the Patent Office during prosecution of the '161 Patent. 3GPP 36.213 was cited in an Information Disclosure Statement dated March 9, 2017 and initialed by the Examiner. However, 3GPP 36.213 was not cited or substantively considered in a rejection by the Patent Office during prosecution. Accordingly, the Board should not exercise its discretion to deny this petition under §325(d).

The *Becton, Dickinson* factors weigh in favor of institution. The Patent Office's lack of consideration of Xia and 3GPP 36.213 constitutes "material error" under *Advanced Bionics* because the Patent Office overlooked the disclosures of such references that impact patentability of the Challenged Claims. The Board has consistently declined to discretionarily deny institution under similar facts. *See, e.g., DISH Network LLC v. Sound View Innovations, LLC*, IPR2020-01041, Paper 13, 22 (PTAB Jan 19, 2021); *Roku, Inc. v. Universal Electronics, Inc.*, IPR2019-01615 (PTAB April 17, 2020); *Trans Ova Genetics, LC v. XY, LLC*, IPR2018-00250, Paper 9, 18-19 (PTAB June 27, 2018).

The grounds in this Petition substantially differ from the issues considered during prosecution. The Examiner did not consider Xia much less its applicability

as a primary reference. Nor did the Examiner recognize that Xia's Table 6-3 expressly discloses all but the single code rate value 797. Nor did the Examiner consider the additional evidence (EX1013, EX1014, EX1015) presented in this Petition demonstrating the obviousness of the 797 code rate value. In fact, nowhere in the prosecution history did the Examiner even consider the issue of whether it would have been obvious to adjust the 790 code rate value in Xia, presented with a disclosure of a CQI table including all the other claimed code rates as set forth in this Petition. In the Examiner's four-reference combination, only one code rate value was disclosed in each of the cited references, and not all of the cited CQI tables included 256QAM entries. This constitutes material error given that such adjustment to the code rate, in an otherwise fully disclosed table of 256QAM entries and code rates, would have been obvious for a number of reasons explained above. *See* §VIII.B.2., *infra*.

The Board's decision in *Trans Ova Genetics, LC. v. XY, LLC.*, IPR2018-00250 (PTAB June 27, 2018) (Paper 9), is also instructive. There, the Petitioner relied on two references cited and extensively considered during prosecution (Factors 1-3). *Id.* at 18-19. Yet, the Board noted that the Petitioner provided substantial evidence indicating the Examiner failed to appreciate the full scope of the prior art's disclosure; the Examiner's appreciation of the prior art's disclosure was fundamental to allowance, and the Petitioner's argument was significantly

different than the Examiner's argument (Factors 4-5). *Id.* Thus, on the basis of Factors 4-5 outweighing Factors 1-3, the Board instituted trial and declined to dismiss on the basis of §325(d), even when faced with prior art the Examiner thoroughly considered during prosecution. *Id.* The case for institution in the case at hand is even stronger than in *Trans Ova* because Factors 1-3 weigh in favor of institution as well.

With respect to factor (f), the Petition is supported by an expert declaration by Dr. Roy explaining how a POSITA would have understood Xia, 3GPP 36.213, and Chen. *See, e.g.*, EX1008, ¶¶76-240. This new evidence also weighs against discretionary denial. *See, e.g.*, *Puma N. Am., Inc. v. Nike, Inc.*, IPR2019-01058, Paper 10, 19 (PTAB Oct. 31, 2019) (instituting where petition presented “new non-cumulative evidence.... probative to issues of patentability and helpful to our consideration of a prior art combination that was not before the Examiner”).

IX. CONCLUSION

Petitioners have shown a reasonable likelihood of success. Therefore, this Petition should be granted and the Board should institute trial.

Date: December 31, 2024

Respectfully submitted,

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APPENDIX A - LIST OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 10,009,161, issued on June 26, 2018 (“the ’161 Patent”)
1002	File History of U.S. Patent Application No. 15/454,020, filed on March 9, 2017(“the ’020 Application”)
1003	<i>Not assigned</i>
1004	<i>Not assigned</i>
1005	<i>Not assigned</i>
1006	Order modifying case deadlines for District Court Case Nos. 2:23-cv-00638, 2:23-cv-00639, 2:23-cv-00640
1007	First Amended Docket Control Order for District Court Case Nos. 2:23-cv-00638, 2:23-cv-00639, 2:23-cv-00640
1008	Declaration of Sumit Roy
1009	<i>Curriculum Vitae</i> of Sumit Roy
1010	Declaration of Craig Bishop
1011	<i>Curriculum Vitae</i> of Craig Bishop
1012	PCT International Publication WO 2014/194681 to Xia et al. (“Xia”)
1013	3GPP TS 36.213 v10.4.0 (2011-12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 10)
1014	Chen, X. <i>et al.</i> , “A Novel CQI Calculation Scheme in LTE\LTE-A Systems”, 2011

Petition for *Inter Partes* Review of U.S. Patent No. 10,009,161

Exhibit No.	Description
1015	US Patent Application Publication No. 2013/0258877 to Ji et al. (“Ji”)
1016	Plaintiff and Counterclaim-Defendant Pegasus Wireless Innovation LLC’s Initial Proposed Constructions dated December 4, 2024, <i>Pegasus Wireless Innovation LLC v. Verizon Communications Inc., et al.</i> , Civ. Action No. 2:23-cv-00640 (E.D. Tex.)
1017	Defendants and Intervenor’s P.R. 4-2 Preliminary Claim Constructions and Extrinsic Evidence dated December 4, 2024, <i>Pegasus Wireless Innovation LLC v. Verizon Communications Inc., et al.</i> , Civ. Action No. 2:23-cv-00640 (E.D. Tex.)
1018	U.S. Patent Application Publication No. 2016/0211904 to Kim et al. (“Kim”)
1019	U. S. Patent Application Publication No. 2016/0249244 to Xia et al. (“Xia ’244”)
1020	U.S. Patent Application Publication No. 2016/0219600 to Li et al. (“Li”)
1021	ZTE 3GPP TSG RAN WG1 Meeting W7S R1-135348 (“ZTE”)
1022	Counterclaim-Defendant KT Corporation’s Motion for Protective Order from Non-Jurisdictional Discovery, filed October 4, 2024 in <i>Pegasus Wireless Innovation LLC v. Verizon Communications Inc., et al.</i> , Civ. Action No. 2:23-cv-00640 (E.D. Tex.)
1023	Declaration of June Ann Munford
1024	<i>Curriculum Vitae</i> of June Ann Munford
1025	U.S. Patent Application Publication No. 2011/0216846 to Lee et al. (“Lee”)

Petition for *Inter Partes* Review of U.S. Patent No. 10,009,161

Exhibit No.	Description
1026	Memorandum Opinion and Order, filed on December 12, 2024 in <i>Pegasus Wireless Innovation LLC v. Verizon Communications Inc., et al.</i> , Civ. Action No. 2:23-cv-00640 (E.D. Tex.)
1027	Certified English translation of PCT International Publication WO 2014/194681 to Xia et al.
1028	3GPP TSG RAN WG1 Meeting #77, R1-142638, WF on 256QAM CQI table design, Seoul, Korea 19 th -23 rd May 2014 (“R1-142638”)
1029	3GPP TSG RAN WG1 Meeting #76, R1-140034, Prague, Czech Republic, February 10-14, 2014 (“R1-140034”)
1030	3GPP TSG RAN WG1 Meeting #76bis, R1-141366, Shenzhen, China, 31 st March-4 th April, 2014 (“R1-141366”)

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. §42.24

The undersigned hereby certifies that the foregoing Petition totals 13,961 words, excluding the parts which are exempted by 37 C.F.R. §42.24(a)(1).

Date: December 31, 2024

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on this 31st day of December, 2024, a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW FOR U.S. PATENT NO. 10,009,161, EXHIBITS 1001, 1002, 1006-1030, and Petitioners' Powers of Attorney** are being served upon the Patent Owner at the following correspondence address of record via USPS Priority Mail:

IP LEGAL SERVICES, LLC
P.O. Box 651325
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