

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS INC.,

Petitioner,

v.

PANTECH CORPORATION,

Patent Owner.

Case IPR2023-01269

U.S. Patent No. 9,854,545

PETITION FOR *INTER PARTES* REVIEW

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EXHIBIT LIST

Exhibit ("Ex.")	Description
1001	U.S. Patent No. 9,854,545 ("545")
1002	File History of U.S. Application No. 14/733,068 ("545FH")
1003	Declaration of Dr. Daniel van der Weide in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 9,854,545 ("Weide")
1004	Declaration of Friedhelm Rodermund in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 9,854,545 ("Rodermund")
1005	U.S. Patent Application Publication No. 2011/0158116 ("Tenny")
1006	U.S. Provisional Application No. 61/218769 ("Tenny-Prov.")
1007	R2-100423, <i>Supporting multiple timing advance groups</i> ("Qualcomm")
1008	3GPP Technical Specification 36.300 v8.11.0 (2009-12) ("TS36.300")
1009	3GPP Technical Specification 36.331 v9.0.0 (2009-09) ("TS36.331")
1010	U.S. Patent Application Publication No. 2010/0260136 ("Fan")
1011	File History of U.S. Application No. 13/578,531 ("545 parent FH")
1012	File History of U.S. Application No. 12/818,064 ("Tenny FH")
1013	U.S. Patent Application Publication No. 2012/0008600 ("Marinier")
1014	U.S. Provisional Application No. 61/293,271 ("Marinier-Prov.")
1015	3G Evolution: HSPA and LTE for Mobile Broadband (Second Edition, 2008)

Exhibit ("Ex.")	Description
1016	Claim Construction Expert Report of Peter Rysavy Concerning U.S. Patent No. 9,854,545, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas) (June 23, 2023)
1017	Joint Claim Construction and Prehearing Statement, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas), Dkt. No. 118
1018	Plaintiffs' preliminary proposed constructions and supporting extrinsic evidence pursuant to P.R. 4-2 (dated June 2, 2023)
1019	Third Amended Docket Control Order, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas), Dkt. No. 98
1020	Docket Navigator "Time to Trial" report for Judge Robert W. Schroeder
1021	USCourts.gov "U.S. District Court – Judicial Caseload Profile" for Eastern District of Texas
1022	Transcript of Peter Rysavy, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas) (July 12, 2023)
1023	Declaration of Jonathan Bradford in Support of Petition for <i>Inter Partes</i> Review of United States Patent No. 9,854,545
1024-50	[Reserved]
1051	Webpage, available at https://archive.org/legal/affidavit.php
1052	Internet Archive Capture, available at https://web.archive.org/web/20110509054716/http://3gpp.org/Specification-Groups
1053	Internet Archive Capture, available at https://web.archive.org/web/20090802220720/http://www.3gpp.org/

Exhibit ("Ex.")	Description
1054	Internet Archive Capture, available at https://web.archive.org/web/20130812133550/http://3gpp.org/RAN2-Radio-layer-2-and-Radio-layer
1055	Internet Archive Capture, available at https://web.archive.org/web/20081008035555/http://www.3gpp.org/ftp/tsg_ran/WG2_RL2
1056	Internet Archive Capture, available at https://web.archive.org/web/20080517151142/http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_50/
1057	Webpage, available at ftp.3gpp.org/Specs
1058	Internet Archive Capture, available at https://web.archive.org/web/20130110164645/http://www.3gpp.org/specifications
1059	Internet Archive Capture, available at https://web.archive.org/web/20081201021150/http://www.3gpp.org/Specification-Numbering
1060	Internet Archive Capture, available at https://web.archive.org/web/20081207063329/http://www.3gpp.org/ftp/Specs/html-info/36-series.htm
1061	Internet Archive Capture, available at https://web.archive.org/web/20080513144118/http://www.3gpp.org/ftp/Specs/html-info/TSG-WG--R2.htm
1062	Internet Archive Capture, available at https://web.archive.org/web/20081201154548/http://www.3gpp.org/ftp/specs/html-info/36300.htm
1063	Internet Archive Capture, available at https://web.archive.org/web/20140326141918/http://3gpp.org/DynaReport/TSG-WG--R2.htm

Exhibit ("Ex.")	Description
1064	Internet Archive Capture, available at https://web.archive.org/web/20140217112636/http://www.3gpp.org/DynaReport/36-series.htm
1065	Internet Archive Capture, available at https://web.archive.org/web/20140228134853/http://www.3gpp.org/DynaReport/36300.htm
1066	[Reserved]
1067	3GPP TS 36.300 V8.6.0 (2008-09), retrieved from https://web.archive.org/web/20140704112512/http://www.3gpp.org/ftp/Specs/archive/36_series/36.300/36300-860.zip (36300-860.doc in 36300-860.zip)
1068	Internet Archive Capture, available at https://web.archive.org/web/20081013132816/http://www.3gpp.org/ftp/Specs/latest/Rel-8/
1069	Internet Archive Capture, available at https://web.archive.org/web/20080924051314/http://www.3gpp.org/ftp/Specs/latest/Rel-8/36_series/
1070	Internet Archive Capture, available at https://web.archive.org/web/20060105222647/http://list.etsi.org/scripts/wa.exe?SUBED1=3gpp_tsg_ran_wg2&A=1
1071	Webpage, available at https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Docs
1072	R2-100423, retrieved from https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Docs/R2-100423.zip (R2-100423 Supporting multiple timing advance groups.doc in R2-100423.zip)

Exhibit ("Ex.")	Description
1073	RAN WG2 #68bis skeleton report based on Agenda Proposal from 3GPP TSG RAN WG2 #68bis meeting on 18 - 22 January, Valencia, Spain (R2-10xxxx), retrieved from https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/History/skeleton_report_RAN2_68bis_update.zip (skeleton_report_RAN2_68bis_update.doc in skeleton_report_RAN2_68bis_update.zip)
1074	Webpage, available at https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/History/
1075	Webpage, available at https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/
1076	R2-101881, retrieved from https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/R2-101881.zip (101881_report_RAN2_68bis_Valencia.doc in R2-101881 - R2.zip)
1077	Excel file "Tdoc_List_RAN2_68bis_100221.xls," retrieved from https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/R2-101881.zip
1078	Webpage, available at https://list.etsi.org/scripts/wa.exe?A2=3GPP_TSG_RAN_WG2;758681ee.1001
1079	Internet Archive Capture, available at https://web.archive.org/web/20091210102659/http://list.etsi.org:80/
1080	Internet Archive Capture, available at https://web.archive.org/web/20100115152457/http://list.etsi.org/
1081	Excel file "Participants_list_RAN2_68bis.xls," retrieved from https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/Report/R2-101881.zip (participants_list_RAN2_68bis.xls in R2-101881.zip)

Exhibit ("Ex.")	Description
1082	Webpage, available at https://www.3gpp.org/ftp/Specs/archive/36_series/36.300
1083	Webpage, available at https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/08.11.00_60/
1084	ETSI TS 136 300 V8.11.0 (2010-02), retrieved from https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/08.11.00_60/ts_136300v081100p.pdf
1085	Internet Archive Capture, available at https://web.archive.org/web/20131115195236/http://webapp.etsi.org/key/key.asp?full_list=y
1086	Internet Archive Capture, available at https://web.archive.org/web/20081211052818/http://www.3gpp.org/ftp/Specs/archive/36_series/36.300/
1087	Internet Archive Capture, available at https://web.archive.org/web/20140714052548/http://3gpp.org/ftp/specs/archive/36_series/36.300
1088	Internet Archive Capture, available at https://web.archive.org/web/20150226191038/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.300
1089	3GPP TS 36.300 V8.11.0 (2009-12), retrieved from https://www.3gpp.org/ftp/Specs/archive/36_series/36.300/36300-8b0.zip (36300-8b0.doc in 36300-8b0.zip)
1090	[Reserved]
1091	Internet Archive Capture, available at https://web.archive.org/web/20081113150830/http://www.3gpp.org/ftp/Specs/

Exhibit ("Ex.")	Description
1092	Internet Archive Capture, available at https://web.archive.org/web/20081013132648/http://www.3gpp.org/ftp/Specs/archive
1093	Internet Archive Capture, available at https://web.archive.org/web/20081012223857/http://www.3gpp.org/ftp/specs/archive/36_series/
1094	Internet Archive Capture, available at https://web.archive.org/web/20081201231313/http://www.3gpp.org/ftp/Specs/latest
1095	Internet Archive Capture, available at https://web.archive.org/web/20081208085335/http://www.3gpp.org:80/ftp/Specs/latest/Rel-8/
1096	Internet Archive Capture, available at https://web.archive.org/web/20081209045248/http://www.3gpp.org/ftp/Specs/latest/Rel-8/36_series/
1097	Webpage, available at https://www.3gpp.org/ftp/Specs/archive/36_series/36.331/
1098	Webpage, available at https://www.etsi.org/deliver/etsi_ts/136300_136399/136331/09.00.00_60/
1099	ETSI TS 136 331 V9.0.0 (2009-10), retrieved from https://www.etsi.org/deliver/etsi_ts/136300_136399/136331/09.00.00_60/ts_136331v090000p.pdf
1100	Internet Archive Capture, available at https://web.archive.org/web/20081108042545/http://www.3gpp.org/S pecifications

Exhibit ("Ex.")	Description
1101	Internet Archive Capture, available at https://web.archive.org/web/20081201131034/http://www.3gpp.org/ftp/specs/archive/36_series/36.331/
1102	Internet Archive Capture, available at https://web.archive.org/web/20140713200444/http://3gpp.org/ftp/specs/archive/36_series/36.331/
1103	3GPP TS 36.331 V9.0.0 (2009-09), retrieved from https://www.3gpp.org/ftp/Specs/archive/36_series/36.331/36331-900.zip (36331-900.doc in 36331-900.zip)
1104	Internet Archive Capture, available at https://web.archive.org/web/20081201163652/http://www.3gpp.org/ftp/specs/html-info/36331.htm
1105	Internet Archive Capture, available at https://web.archive.org/web/20140326134320/http://3gpp.org/DynaReport/36331.htm
1106	Internet Archive Capture, available at https://web.archive.org/web/20140621152924/http://www.3gpp.org:80/ftp/specs/archive/36_series/36.331
1107	Internet Archive Capture, available at https://web.archive.org/web/20130110164713/http://www.3gpp.org/ftp/Specs/

TABLE OF ABBREVIATIONS

Abbreviation	Description
'545	U.S. Patent No. 9,854,545 (Ex. 1001)
'545FH	File History of U.S. Application No. 14/733,068 (Ex. 1002)
Claims / Challenged Claims	Claims 2-3 of the '545
Fan	U.S. Patent Application Publication No. 2010/0260136 (Ex. 1010)
IPR	<i>Inter Partes</i> Review
Marinier	U.S. Patent Application Publication No. 2012/0008600 (Ex. 1013)
Marinier-Prov.	U.S. Provisional Application No. 61/293,271 (Ex. 1014)
Petitioner	Petitioner LG Electronics Inc.
PO	Patent Owner Pantech Corporation
POSITA	Person of Ordinary Skill in the Art
PTAB	Patent Trial and Appeal Board
Qualcomm	R2-100423, <i>Supporting multiple timing advance groups</i> (Ex. 1007)
Tenny	U.S. Patent Application Publication No. 2011/0158116 (Ex. 1005)
Tenny-Prov.	U.S. Provisional Application No. 61/218769 (Ex. 1006)
TS36.300	3GPP Technical Specification TS 36.300 v8.11.0 (2009-12) (Ex. 1008)
TS36.331	3GPP Technical Specification TS 36.331 v9.0.0 (2009-09) (Ex. 1009)
USPTO	United States Patent and Trademark Office
Weide	Declaration of Dr. Daniel van der Weide in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 9,854,545 (Ex. 1003)

LIST OF CHALLENGED CLAIMS

[2.pre] A method for establishing an uplink (UL) synchronization by a User Equipment (UE), the method comprising:

[2.a] receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

[2.b] configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs;

[2.c] transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group;

[2.d] receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and

[2.e] applying each TA value to CCs in the respective UL timing group.

[3.pre] A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system, the UE comprising:

[3.a] a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

[3.b] a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,

[3.c] wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group, and

[3.d] wherein the controller applies each TA value to CCs in the respective UL timing group.

Pursuant to §§311-319 and §42.1,¹ LG Electronics Inc. (“Petitioner”) petitions for *inter partes* review (“IPR”) of claims 2 and 3 (“Claims”) of U.S. Patent No. 9,854,545 (Ex. 1001, “’545”), assigned to Pantech Corporation (“PO”). There is a reasonable likelihood—and it is highly likely—that at least one challenged claim is unpatentable as explained herein. Petitioner requests review of the Claims and judgment finding them unpatentable under §§102/103.

I. INTRODUCTION

The ’545 generally concerns a method of establishing uplink synchronization to enable a user equipment (UE) (e.g., mobile phone) to communicate with the base station in an LTE network (evolved NodeB or “eNB”). Uplink synchronization is required to set up the timing of uplink transmissions (from UE to eNB) so that a UE and eNB know when to transmit and receive data, respectively. ’545, 1:29-33, 3:13-14, 5:15-36, 6:12-45, Fig. 2; Ex. 1003 (“Weide”), ¶31. In particular, the synchronization process involves sending timing information from the eNB to the UE. Weide, ¶31. UEs that are located farther away from the eNB may experience

¹ Section cites reference 35 U.S.C. (pre-AIA) or 37 C.F.R. as context indicates. All emphasis/annotations added unless noted. Figure annotations herein generally quote the Claims for reference. Citations herein are exemplary and not meant to be limiting.

longer propagation delays than UEs that are located closer to the eNB. '545, 5:59-64; Weide, ¶31. To account for the transmission delay time, the eNB sends timing information to the UE about when it should send data so that it can be timely received by the eNB. '545, 6:12-45; Weide, ¶31.

The purported “invention” of the '545 is directed to one aspect of this synchronization process involving the selection of resources, called Component Carriers (CCs), used to perform uplink (UL) transmission (from UE to eNB). '545, 4:52-55; Weide, ¶32. To meet user demands for increased data throughput, the '545 proposes using multiple CCs aggregated together to make each UL transmission. '545, 1:34-43, 4:52-64. But because CCs may not be contiguous (e.g., reside near each other in the frequency band), they may have different timing characteristics, causing portions of each data transmission to arrive at different times, impairing timeliness and performance. '545, 7:50-56, Fig. 1; Weide, ¶32. To address this problem, the '545 proposes configuring CCs for UL transmission by grouping together CCs with similar timing characteristics into the same “UL timing group[s]” and selecting a “delegate CC” to request timing information (e.g., “Timing Advance” value (“TA”)) for each UL timing group. '545, 8:12-26, 11:16-21, claim 2; Weide, ¶32.

But the concept of configuring CCs into UL timing groups based on similar timing characteristics was already known in the art. For example, **Tenny** (Ex. 1005),

including Appendix A of its provisional (Ex. 1006, “Tenny-Prov.”), which **Tenny** incorporates by reference (Tenny, ¶1), discloses that a “UE is configured with particular carriers” by “assign[ing] a UE at least one so-called timing group, i.e., a group of carriers with uplink timings that are the same to within some tolerance,” receiving this UL timing group information in an “RRC” signaling message that maps a “group identifier” to the set of CCs, and choosing a “carrier candidate” for each timing group to request and receive timing information on behalf of all CCs in the group. Tenny-Prov., ¶¶35-37, 39-40, Fig. 3, AppxA(1:17-19, 2:7-26, 3:26-4:8, 5:3-10, claim 6); Weide, ¶33. Similarly, **Qualcomm** (Ex. 1007) discloses that “UL component carriers configured for a UE should be divided into timing groups,” where all UL CCs within a timing group “share the same timing,” receiving information about these “configured carriers” through a “RRC signalling,” and choosing a “unique” “UL CC” to request timing information (e.g., “Timing Advance” value) for each UL timing group. Qualcomm, 2-3; Weide, ¶33.

The Claims are directed to this known CC grouping method. And though they recite additional details for implementing this method, these details were also standard, well-known techniques for performing synchronization in LTE. For example, as set forth in LTE specification **TS36.300** (Ex. 1008), it was well-known to use a “Random Access Preamble” (RAP) and “Random Access Response” (RAR) to request and receive timing information to perform synchronization in an LTE

network, and apply that timing information in making subsequent UL transmissions. TS36.300, 44-46, 52-54, Figs. 10.1.5.1-1, 10.1.5.2-1; Weide, ¶34.

Accordingly, Petitioner requests that the Board institute trial and find the Claims unpatentable. Weide, ¶35.

II. MANDATORY NOTICES

A. Real Parties-in-Interest

Petitioner LG Electronics Inc., and LG Electronics U.S.A., Inc. are the real parties-in-interest. No other parties had access to or control over the present Petition, and no other party funded or participated in preparation of the present Petition.

B. Related Matters

The '545 is the subject of the following co-pending civil action:

Pantech Corporation et al. v. LG Electronics Inc. et al., No. 5:22-cv-00113-RWS-JBB (E.D. Tex.) (“LGE Litigation”).

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Petitioner consents to electronic service of documents to the email addresses
of the counsel identified above.

III. PAYMENT OF FEES

The undersigned authorizes the Office to charge the fee required by §42.15(a) and any additional fees that might be due to Deposit Account No. 18-1945, under Order No. 104537-0034-656.

IV. REQUIREMENTS FOR *INTER PARTES* REVIEW

A. Grounds for Standing

Pursuant to §42.104(a), Petitioner certifies that the '545 is available for IPR. Petitioner and any real parties-in-interest are not barred or estopped from requesting IPR challenging the Claims on the grounds identified herein.

B. Identification of Challenge

Pursuant to §§42.104(b)-(b)(1), Petitioner requests IPR of Claims 2-3, and that the Board cancel the same as unpatentable.

1. Specific Art on Which the Challenge Is Based

Petitioner relies on the following prior art (Weide, ¶56):

Name	Ex.	Publication/ Title	Filed	Published/ Issued	Prior art under at least
Tenny	1005	US2011/0158116	6/17/2010 (earliest provisional filing 6/19/2009)	6/30/2011	§102(a),(e)

Name	Ex.	Publication/ Title	Filed	Published/ Issued	Prior art under at least
Qualcomm	1007	R2-100423, “Supporting multiple timing advance groups”	N/A	By 1/22/2010 ²	§102(a),(b)
TS36.300	1008	3GPP Technical Specification 36.300 v8.11.0 (2009-12)	N/A	By 1/5/2010 ³	§102(a),(b)
TS36.331	1009	3GPP Technical Specification 36.331 v9.0.0 (2009-09)	N/A	By 9/29/2009 ⁴	§102(a),(b)
Fan	1010	US2010/0260136	4/10/2009	10/14/2010	§102(a),(e)

Each of **Qualcomm**, **TS36.300**, and **TS36331** was publicly accessible to, and accessed by, POSITAs and interested industry personnel and researchers well before the '545's parent's 2/10/2011 filing date.⁵ Ex. 1004 (“Rodermund”), ¶¶1-143;

² Rodermund, ¶¶83-101.

³ Rodermund, ¶¶102-21.

⁴ Rodermund, ¶¶122-40.

⁵ PO has not established that the '545 Claims are entitled to the 2/10/2010 filing date of the '545's earliest filed foreign application (KR 10-2010-0012564). But even if

Ex. 1051-1107. **Qualcomm** is a proposal submitted by Qualcomm to the 3GPP TSG-RAN Working Group 2 (WG2), part of an organization that developed the Long Term Evolution (“LTE”) standard. Qualcomm, 1; Rodermund, ¶¶2, 8, 21, 83-100. **TS36.300** and **TS36.331** (Ex. 1009) are technical specifications maintained by 3GPP that describe aspects of LTE.

As summarized in the table below, in the prior art time period, each reference was either published and publicly available on 3GPP’s ftp server or distributed on the ETSI mailing list. Rodermund, ¶¶82-140; *Apple et al. v. Uniloc 2017 LLC*, IPR2019-00222, Pap. 28, *13-18; *LG Electronics, Inc. v. Core Wireless Licensing S.A.R.L.*, IPR2015-01986, Pap. 34, *26-31; *Samsung Electronics Co., Ltd. v. Ibex PT Holdings Co., Ltd.*, IPR2018-00011, Pap. 33, *4.

Reference	3GPP Published	ETSI Published	3GPP Meeting Availability	Email Distribution
Qualcomm	1/12/2010 ⁶	N/A	By 1/22/2010 ⁷	1/12/2010 ⁸

they were, these references are still prior art; the Claims would still be invalid based on the grounds set forth in this petition.

⁶ https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_68bis/docs/ (Ex. 1071).

⁷ Rodermund, ¶¶96-100.

⁸ https://list.etsi.org/scripts/wa.exe?A2=3GPP_TSG_RAN_WG2;758681ee.1001
(Ex. 1078).

TS36.300	1/5/2010 ⁹	By 2/9/2010 ¹⁰	N/A	N/A
TS36.331	9/29/2009 ¹¹	By 10/13/2009 ¹²	N/A	N/A

2. Statutory Grounds on Which the Challenge Is Based¹³

Ground	Claims	Basis	References
1	2-3	§§102/103	Tenny
2		§103	Qualcomm in view of TS36.331
3			Tenny in view of TS36.300
4			Qualcomm in view of TS36.331 and TS36.300
5-8	3		Grounds 1-4 in further view of Fan

⁹ https://www.3gpp.org/ftp/Specs/archive/36_series/36.300 (Ex. 1082, 1).

¹⁰ https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/08.11.00_60/ (Ex. 1083).

¹¹ https://www.3gpp.org/ftp/Specs/archive/36_series/36.331 (Ex. 1097, 1).

¹²

https://web.archive.org/web/20131115195236/http://webapp.etsi.org/key/key.asp?full_list=y (Ex. 1085, 2081).

¹³ See Weide, ¶¶57-62.

V. '545 PATENT AND PROSECUTION HISTORY

A. '545

The purported “invention” of the '545 “relates to a method and apparatus for establishing an uplink (UL) synchronization in a wireless communication system,” (e.g., “LTE/LTE-A”) and “more particularly, to a method and apparatus for configuring UL synchronization with respect to at least one “Component Carrier (CC).” '545, 1:23-27, 4:44-64, Fig. 1; Weide, ¶36. Though “conventional wireless communication system[s]” performed synchronization using “a single [CC],” the '545 proposes using “a plurality of CCs” to meet user demands for increased bandwidth. '545, 1:34-43, 4:65-67; Weide, ¶37.

Claims 2-3 generally recite a scheme that employs “one or more...CCs” to establish UL synchronization between a UE and eNB. Weide, ¶38. The “plurality of CCs may be bound and used as a single system band” (referred to as “carrier aggregation (CA)”). '545, 4:62-64. Because these CCs may be “non-contiguous,” the propagation delay times may vary for those CCs, complicating synchronization. '545, 4:67-5:3, 7:50-56, Weide, ¶38. In particular, “[timing advance (TA)] values of the CCs” may be “different from each other when locations of center frequencies of the CCs are significantly distant from each other.” *Id.* When the CCs have highly variant TA values, the UE cannot perform stable UL synchronization for all available CCs. '545, 7:57-61. To purportedly solve this problem, the '545 discloses

grouping CCs with similar timings into the same UL timing groups, such that the same TA value can be applied to all CCs in a given UL timing group. '545, 1:22-27, 5:15-6:33, 8:4-18, 8:23-26, 10:23-26, Fig. 4; Weide, ¶38.

The eNB may assign a set of CCs to a UE by including “CC set information” in a Radio Resource Control (RRC) reconfiguration message to the UE. *See, e.g.*, '545, 9:35-57, 10:3-5, 10:16-22, 17:9-12; Weide, ¶39. The RRC reconfiguration message is used to reconfigure resources allocated to a UE when an existing connection to the eNB is dropped or the UE moves to another cell, e.g., in the case of handover. '545, 9:58-10:2; Weide, ¶39.

The “UE...configure[s] a UL timing group including CCs in the CC set as elements of the UL timing group,” which were received in the RRC message. '545, 8:3-6; 10:3-5, 10:23-25. As part of this configuration process, the UE also “select[s] a delegate CC for each group.” '545, 11:16-17; *see also* 19:27-28, 19:37-39; Weide, ¶40.

Afterwards, the UE “set[s] an [random access preamble (RAP)] through a delegate CC of each group” and “transmit[s] the set preamble by selecting one of the resources defined in SI of each CC.” '545, 12:59-13:3; *see also* 17:29-43, 19:40-43. When synchronization for all CC groups is required, the UE “transmit[s] an RAP through” each group’s delegate CC. '545, 13:45-50; Weide, ¶41.

The UE then receives from the eNB “UL grant information and a TA value of a UL timing group (a delegate CC) through an [random access response (RAR)] message.” ’545, 13:62-64; *see also* 17:44-48, 19:44-47. The “TA value” is calculated by the eNB for each group represented by a delegate CC. ’545, 13:60-62; Weide, ¶42.

The UE finally applies the TA values received through each delegate CC to all CCs in the respective timing group. ’545, 14:1-10; 19:60-61; Weide, ¶43.

B. Prosecution History

The Claims of the ’545 were allowed as originally-filed after the Applicant successfully argued, without amendment, that none of the Examiner’s relied-upon prior art references disclosed “UL timing group information set” or “UL timing group” (corresponding to [2.a]/[3.a], [2.d]/[3.d], and [2.e]/[3.e]). ’545FH, 474-76, 523; Weide, ¶44.

During prosecution, the Applicant overcame the Examiner’s obviousness rejection of then-pending claims 2-3 (same as Claims 2-3) by arguing that Marinier’s “UL control carrier (CC) set” (which refers to “a group of carriers operating with the same TA”) cited by the Examiner (’545FH, 419-20, 423-24), together with the teachings of another reference, does not disclose the claimed “UL timing group information set” or “UL timing group.” ’545FH, 475-76; Weide, ¶¶44-45. The Examiner agreed with these arguments, and issued a Notice of Allowance, stating

that the “Prior Art of Record, singly or in combination” failed to teach each and every limitation of the three allowed claims. ’545FH, 474-75, 528-30; Weide, ¶45.

VI. §325(d) AND §314(a) DISCRETION DOES NOT APPLY

A. §325(d)

Under the two-part *Advanced Bionics* framework, the Board should not exercise discretion.

The grounds raised by this Petition are not the same or substantially the same as the art and arguments raised during ’545’s prosecution. Tenny, TS36.300, TS36.331, and Fan (Ex. 1010) were not considered during prosecution. Though the Applicant identified Qualcomm in an invention disclosure statement (IDS), the Examiner did not substantively discuss or rely on Qualcomm—let alone Qualcomm in view of TS36.331 (and TS36.331 and Fan) in any rejection of the Claims. ’545FH, 346, 428; Sony v. MZ Audio Scis., LLC, IPR2022-01544, Pap. 12, *7 (§325(d) discretion improper where “Examiner did not consider the specific combination of references asserted”). Furthermore, the disclosures that were considered by the Examiner were not substantially similar to any of the references relied upon in the grounds of this Petition. For example, the disclosures from Marinier of “UL CC sets” that were considered by the Examiner (’545FH, 474-75) are different from the “UL timing group information set” that identifies the “UL

timing group” to which these CCs belong, as disclosed in **Tenny** and **Qualcomm**.
See §IX; Weide, ¶45.

Even if the art or arguments were substantially the same, the Examiner erred in a manner material to the patentability of the Claims. Because the Examiner did not issue any rejections based on any of the cited art in this petition it is “impossible ... to determine the consideration the Examiner gave” to any cited reference and, at the second part of *Advanced Bionics*, “the absence of further evidence of the Examiner’s consideration of” the art supports finding that “the Office erred in a manner material to patentability.” *Ecobee Techs. v. Causam Enterprises, Inc.*, IPR2022-01339, Pap. 20, *20-21 (declining to exercise §325(d) discretion). To the extent that any of the art considered by the USPTO was substantially similar to the references identified in the Grounds, the Examiner erred by not rejecting the Claims based on the Grounds for the reasons discussed in §IX. *See also* Weide, ¶45.

B. §314(a)

The co-pending litigation also does not warrant exercising discretion under §314(a) based on the *Fintiv* factors.

1: Following institution, Petitioner intends to seek a stay of the LGE Litigation pending the outcome of this IPR.

2: Though the LGE Litigation trial is currently set for 7/29/2024,¹⁴ based on median time to trial before the presiding judge over the last 5 years, trial is expected 26 months¹⁵ from the 9/2/2022 filing date, in late 11/2024 (median time to trial in the entire district varies between 19 and 24 months).¹⁶

3: The LGE Litigation is in its early stages; the court has not ruled on the initial motion to dismiss and discovery has just begun.

4: After the final written decision, the same grounds and arguments could not be presented in the litigation.

5: The litigation and PTAB parties are the same.

6: The merits of this Petition are compelling as shown herein. Indeed, the concept of configuring CCs into UL timing groups based on similar timing characteristics, including selecting a delegate CC to transmit and receive timing information for each timing group, was well-known in the field. *See* §§I, IX.

¹⁴ Ex. 1019, 1.

¹⁵ Ex. 1020.

¹⁶ Ex. 1021.

VII. LEVEL OF ORDINARY SKILL

For purposes of this Petition only, Petitioner assumes the Claims are entitled to the 2/10/2011 filing date of US 9,054,835, the parent of the '545. Weide, ¶46; *see also* note 5, *supra*.

A person of ordinary skill in the art (“POSITA”) as of the claimed priority date of the '545 would have had a bachelor’s degree in electrical or computer engineering, computer science, or the equivalent thereof, and at least two years of experience with wireless communication systems. Weide, ¶¶47-50. More education can supplement practical experience, and vice-versa. *Id.* Pantech has also taken the similar position that a POSITA “would have a bachelor’s degree in electrical engineering, or equivalent training, and approximately two years of experience working in the field of wireless networking.” Ex. 1016, ¶30. Any purported difference in these definitions is immaterial and need not be resolved: Petitioner does not oppose Pantech’s proposed definition for purposes of this IPR; under either definition, the prior art renders the Claims unpatentable. Weide, ¶50.

VIII. CLAIM CONSTRUCTION

Claim terms subject to IPR are construed using *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005). 37 C.F.R. §42.100(b). Only terms necessary to resolve the controversy need construction. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Because the prior art asserted

herein discloses embodiments within the Claims’ indisputable scope, the Board need not construe the Claims’ outer bounds. All claim terms should be construed according to their plain and ordinary meaning. Weide, ¶¶51-52.

With respect to preambles, regardless of whether they are limiting, the prior art discloses them. *See* §VIII; Weide, ¶53. And while the parties have exchanged proposed constructions for certain claim terms (*see* Ex. 1017, 2-3, 5-6), the Claims are met under any of these constructions for the reasons discussed in §IX. Weide, ¶¶54-55.

IX. GROUNDS OF UNPATENTABILITY

This Petition is supported by the Declaration of Dr. Daniel van der Weide, which describes the prior art’s scope and content at the time of the ’545. *See* Ex. 1003. The prior art renders the Claims unpatentable based on the below Grounds. Weide, ¶¶57-62.

A. Ground 1: Tenny (Claims 2-3)

1. Overview of Tenny¹⁷

Tenny “describes solutions” to problems arising in “maintaining timing synchronisation for a UE in a multicarrier LTE-Advanced (LTE-A) system.” Tenny-

¹⁷ **Tenny** incorporates by reference the full disclosure of **Tenny-Prov.**, which includes “Appendix A” (“AppxA”). Tenny, ¶1; Tenny-Prov., ¶41; Weide, ¶63 n.5.

Prov., AppxA(1:1-3). Like the '545, **Tenny** recognizes that different carriers have “some variation in timing for a number of reasons (e.g., cable delays, distance between the base station site and a remote radio head),” and concludes that “separate timing offsets per carrier” may be “beneficial” or “necessary.” Tenny-Prov., AppxA(1:9-14); Weide, ¶63.

To solve this timing variation problem, **Tenny** discloses grouping carriers with similar “uplink timings” (“same to within some tolerance”) to the same “timing group.” Tenny-Prov., AppxA(1:17-23). For example, as illustrated in Figure 1 of Appendix A below, a “UE” (e.g., mobile phone) is “assigned carriers from multiple timing groups” (e.g., groups A and B). Tenny-Prov., AppxA(1:24-2:6, Fig. 1). Though these groups “originat[e] from the same cell site,” the carriers in these groups come from network components that are distanced from each other, such as the “remote radio head belonging to the eNode B” (“eNB”), which “causes some carriers to have different timing from others.” *Id.* Thus, **Tenny** proposes “maintain[ing] timing separately for each group.” Tenny-Prov., AppxA(1:24-2:6, Fig. 1).

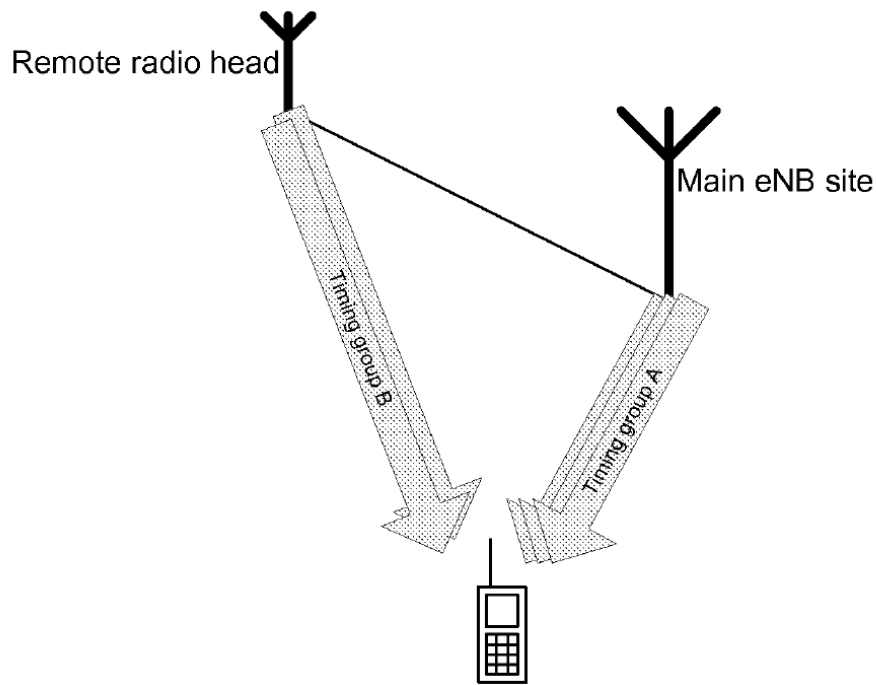


Figure 1: Two timing groups from a single eNode B

Tenny-Prov., AppxA(Fig. 1); Weide, ¶64.

In particular, **Tenny** assigns timing groups to the UE by sending an “explicit signaling” in the “RRC” layer that maps “a group identifier” (representing a UL “timing group”) to the “particular carriers” the UE has been “configured with.” Tenny-Prov., AppxA(5:3-10); Weide, ¶65. To perform synchronization for these timing groups, the UE “perform[s] random access to update its timing” with an eNB using a “random access procedure.” Tenny-Prov., ¶¶37, 40, AppxA(2:7-17, 4:15-20, Fig. 1); Weide, ¶66.

Tenny-Prov. Figure 3 (annotated below) illustrates the components in a “wireless device” (UE) used to perform the steps of this synchronization process. Weide, ¶67.

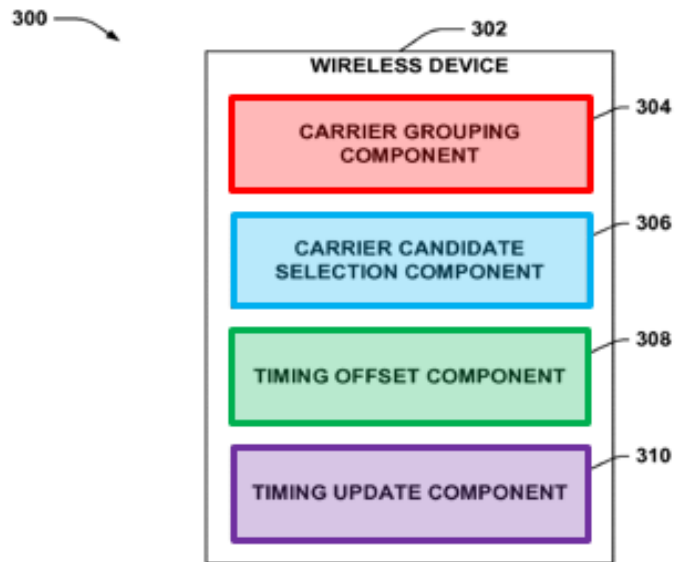


Fig. 3

For example, **“carrier grouping component 304”** “receive[s] one or more groupings” from the “wireless network,” such as the “group identifier[s]” included in the RRC signaling. Tenny-Prov., ¶35, Figs. 3-4, AppxA(5:5-10); Weide, ¶68. The wireless device configures UL timing groups based on the received grouping in several ways. Weide, ¶68. For example, the wireless device “generates the association of the plurality of carriers into one or more timing groups according to [the] grouping received from a base station associated with a subset of the plurality of carriers.” Tenny-Prov., claim 15. Additionally, the wireless device’s **“carrier**

selection component 306” “choose[s] a carrier in the group from which to acquire timing updates.” Tenny-Prov., ¶36; Weide, ¶68.

“Within each timing group,” the “UE performs random access for timing synchronisation” on the “single carrier of the timing group” selected by the **“carrier selection component 306”** to “acquire timing updates.” Tenny-Prov., ¶36, Fig. 3, AppxA(2:7-26, claim 6); Weide, ¶69.

The **“timing offset component 308”** “acquire[s] a timing offset from the candidate carrier” selected by the **“carrier selection component 306”** for “a given group,” where the “timing offset” is received “in response to a random access procedure.” Tenny-Prov., ¶¶36-37, 40, Fig. 3. The “timing offset” is “a single timing advance value” that is “indicated to the UE for use with all carriers in the group.” Tenny-Prov., AppxA(claim 1, 2:8-10). Weide, ¶70.

The **“timing update component 310”** then “updat[es] timing for the group of carriers based on the offset” received from the “candidate carrier” chosen for the respective timing group. Tenny-Prov., ¶37, Fig. 3, AppxA(3:26-4:8, claim 1); Weide, ¶71.

2. Tenny’s Effective Priority Date

Tenny was filed on 6/17/2010 and, based on this date alone, qualifies as prior art under §102(e). **Tenny** also claims priority to **Tenny-Prov.**, filed on 6/19/2009. Though there is no allegation of record that the Claims were invented before the

6/17/2010 filing date of **Tenny**, **Tenny** is also prior art as of the 6/19/2009 filing date of **Tenny-Prov.** because **Tenny-Prov.** provides written description support for: 1) at least claims 1 and 53 of **Tenny**, and 2) the subject matter in **Tenny** that renders Claims 2-3 invalid as obvious (as shown in §IX.A.3 below). *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015); *Ex parte Mann*, 2016 WL 7487271, *3 n.5, *6 (P.T.A.B. Dec. 21, 2016).

As set forth in the tables below, at least claims 1 and 53 of **Tenny** are supported by at least the following disclosures from **Tenny-Prov.** Weide, ¶¶72-74.

Tenny Claims 1 and 53	Exemplary disclosures from Tenny-Prov. (see Weide, ¶74)
[1.pre] A method that facilitates a timing alignment in a multicarrier system, the method comprising:	AppxA(claim 1, 1:1-23), ¶¶34, 39, Figs. 3-4.
[1.a] determining at least one downlink timing associated with at least one downlink carrier;	AppxA(Figs. 2-3, 3:19-4:13); ¶¶34, 37, claims 1, 7, 16.
[1.b] ascertaining an uplink timing associated with an uplink group of carriers, wherein the uplink timing is ascertained based on a processing of at least one downlink timing and a timing offset associated with the uplink group of carriers; and	AppxA(3:19-4:13, Figs. 2-3); ¶¶33-34, 36, claims 1, 5.
[1.c] transmitting each of the uplink group of carriers within a threshold value of the uplink timing.	<i>See [1.b]; see also:</i>

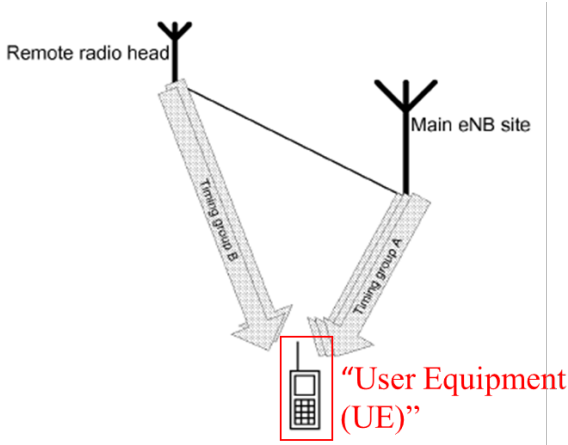
Tenny Claims 1 and 53	Exemplary disclosures from Tenny-Prov. (see Weide, ¶74)
	AppxA(1:17-21; 2:18-22, 3:19-4:13, Figs. 2-3, claim 1); ¶¶34-35, 37, 39, 40, claims 5,14, 23, 32.
[53.pre] A method that facilitates a timing alignment in a multicarrier system, the method comprising:	See [1.pre].
[53.a] transmitting a downlink communication to a wireless terminal via at least one downlink carrier;	See [1.a]; see also: ¶¶16, 33, 34, claim 1, AppxA(3:19-4:13, Figs. 2-3).
[53.b] assigning a timing offset to an uplink group of carriers;	¶¶16, 33, 34, 36-40, claims 1, 8, 9, AppxA(3:26-4:13, Figs. 2-3).
[53.c] providing the timing offset to the wireless terminal via the at least one downlink carrier; and	See [53.a]-[53.b]; see also: ¶¶16, 33, 34, 36-40, claims 1, 8, 9, AppxA(3:26-4:13, Figs. 2-3).
[53.d] receiving an uplink communication via the uplink group of carriers, wherein the uplink group of carriers are received according to the timing offset.	See [53.b]-[53.c], [1.a]-[1.b]; see also: ¶¶13, 16, 33, 35, 39, Fig. 1; AppxA(1:1-14, 3:26-4:13, Figs. 2-3).

3. Claim Chart

As set forth in the below claim chart, the Claims are anticipated or rendered obvious by **Tenny** (including **Tenny-Prov.**). **Tenny-Prov.** (including its AppxA) is incorporated by reference into **Tenny** (Tenny, ¶1) and is therefore part of **Tenny's** disclosure. In addition to §IX.A.1, the following identifies example disclosures

followed by bulleted excerpts that each disclose and/or render obvious the Claims.

Weide, ¶75.

'545 Claim	Tenny
[2.pre] A method for establishing an uplink (UL) synchronization by a User Equipment (UE), the method comprising	Tenny discloses a method for establishing an uplink (UL) synchronization by a User Equipment (UE) (<i>e.g.</i>, “maintaining timing synchronisation for a UE in a multicarrier LTE-Advanced (LTE-A) system” by “assign[ing] a UE” to “a group of carriers with uplink timings”). <u>E.g., Tenny:</u> Tenny discloses “maintaining timing synchronisation for a UE in a multicarrier LTE-Advanced (LTE-A) system.” Tenny-Prov., AppxA(1:2-3, Fig. 1). For example, it discloses “assign[ing] a UE to at least one ... <i>timing group</i>, i.e., a group of carriers with uplink timings that are the same to within some tolerance.” Tenny-Prov., AppxA(1:17-19). Weide, ¶¶76-78. Tenny-Prov., AppxA(Fig. 1)  Figure 1: Two timing groups from a single eNode B Tenny-Prov., AppxA(1:2-3) (“This document describes solutions to several issues that arise in relation to <i>maintaining timing synchronisation for a UE in a multicarrier LTE-Advanced (LTE-A) system.</i>”)

'545 Claim	Tenny
	• Tenny-Prov., AppxA(1:17-19) (“As a general framework, we propose that it should be possible to <i>assign a UE to at least one so-called timing group, i.e., a group of carriers with uplink timings that are the same to within some tolerance.</i>”) • Tenny-Prov., AppxA(claim 6) (“The method of claim 5, wherein the <i>UE performs random access for timing synchronisation on a single carrier of the timing group for which it requires timing information.</i>”) • See also Tenny-Prov., ¶¶13, 16-17, 34- 35, 37-38, 40-41, Figs. 1, 3, AppxA(2:8-10, Figs. 2-3, claims 1, 5); Tenny, ¶¶2-3, 12, 58, Fig. 3.
[2.a] receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);	Tenny discloses receiving a Radio Resource Control (RRC) signaling including a UL timing group information set (e.g., UE receives in a “RRC” signaling “mapping” a “group identifier” representing a UL “timing group” with the “particular carriers” assigned to the UE), which has been set by an evolved NodeB (eNB) (e.g., “the mapping of group identities” is assigned by a network element, such as an “eNode B”). <u>E.g., Tenny:</u> <u>See [2.pre].</u> Tenny discloses that the “network” sends information to a UE that includes a “group identifier” as an “index into the set of timing groups with which the UE was configured,” and that this “mapping” is “established by explicit signalling (in higher layers such as the RRC) at the time the UE is configured with particular carriers.” Tenny-Prov., AppxA(5:3-10). Thus, Tenny discloses that the UE receives in an “RRC” signaling a set of “group identifier[s]” that are “associated with” “the set of timing groups with which the UE was configured.” <i>Id.</i>; Weide, ¶¶79-81. As discussed in [2.pre], each “so-called timing group” assigned to the UE is a UL timing group because it represents “a group of carriers with uplink timings that are the same to within

'545 Claim	Tenny
	some tolerance.” Tenny-Prov., AppxA(1:17-19); Weide, ¶¶80-81. Tenny discloses that the RRC signaling is sent by the “network.” Tenny-Prov., AppxA(5:3-10); Weide, ¶82. This network functionality is implemented by an “eNB” or “eNode B” in Tenny’s “LTE-A” system. Tenny-Prov., AppxA(Fig. 1, 1:2-3, 1:29-32); Weide, ¶80. At minimum, it would have been obvious to perform this network-side synchronization functionality using an eNB, because eNBs were commonly used to perform these functions in a LTE network.¹⁸ Weide, ¶82. Thus, Tenny not only renders obvious, but affirmatively discloses, that the RRC signaling that includes the UL timing group information set has been set by an eNB. Weide, ¶¶79-82. • Tenny-Prov., AppxA(Fig. 1) Figure 1: Two timing groups from a single eNode B • Tenny-Prov., AppxA(1:2-3, 1:17-19) (see [2.pre])

¹⁸ See, e.g., TS36.300, 44-45, 52, 54; Ex. 1015, 299 & n.1; Ex. 1016, ¶35; Ex. 1022, 69:12-15, 65:12-16.

'545 Claim	Tenny
	• Tenny-Prov., AppxA(1:29-32) (“...<i>An example, in which a remote radio head belonging to the eNode B causes some carriers to have different timing from others, is shown in Figure 1.</i>”) • Tenny-Prov., AppxA(5:3-10) (“[T]he network could opt to send only a single timing advance command per MAC element, but <i>indicate which timing group the value is associated with</i>. This approach would minimise the specification impact to the concerned MAC control element, since the existing information only needs to be augmented by <i>a group identifier</i>. It is presumed that <i>such an identifier could be sent with a small number of bits, e.g., as an index into the set of timing groups with which the UE was configured. Such a mapping could be established by explicit signalling (in higher layers such as the RRC)</i> at the time the UE is configured with particular carriers.”) • Tenny-Prov., AppxA(claim 33) (“The method of claim 31, wherein <i>the proper subset is determined by the network.</i>”) • Tenny-Prov., AppxA(claim 35) (“The method of claim 34, wherein <i>the indication of which timing groups are contained in the proper subset relies on a mapping of group identities shared between the network and the UE.</i>”) • Tenny-Prov., AppxA(claim 36) (“The method of claim 35, wherein <i>the mapping of group identities is configured in association with the assignment to the UE of dedicated radio resources on carriers in one or more of the concerned timing groups.</i>”)

'545 Claim	Tenny
	• <i>See also</i> Tenny-Prov., ¶¶16, 27, 32, 34-35, AppxA(claims 27, 31, 34, 37-38); Tenny, ¶¶40, 70, 79, Fig. 3, claims 26, 31, 33-34, 37-38, 62-63, 66-67.
[2.b] configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs;	Tenny discloses configuring one or more UL timing groups (e.g., “generates the association of the plurality of carriers into one or more timing groups according to a grouping received from a base station associated with a subset of the plurality of carriers”; UE’s “carrier grouping component 304” “receive[s] one or more groupings from one or more related access points or the wireless network” and “choose[s] a carrier in the group from which to acquire timing”; “timing groups” are “group[s] of carriers with uplink timings that are the same to within some tolerance”) based on the UL timing group information set (e.g., “mapping” of “multiple carriers” to timing groups via “group identifier[s]” received in the RRC signaling; <i>see</i> [2.a]), the one or more UL timing groups each comprising one or more UL CCs (e.g., “a plurality of carriers can be associated into one or more timing groups”). <u>E.g., Tenny:</u> <i>See</i> [2.pre], [2.a], [2.c] (discussion of candidate carrier below). Tenny further discloses that “wireless device 302” includes a “carrier grouping component 304” that “receive[s] one or more groupings from one or more related access points or the wireless network” (e.g., “mapping” of “multiple carriers” to “group identifier[s]” included in the RRC signaling, <i>see</i> [2.a]). Tenny-Prov., ¶¶35, 39, Figs. 3, 4, AppxA(5:3-10); Weide, ¶¶83-85. Tenny discloses two examples of a UE configuring one or more UL timing groups based on the grouping received from the network. Weide, ¶¶86-87. <i>First</i>, Tenny discloses a “wireless communication apparatus” that “generates the association of the plurality of carriers into one or more timing groups according to a grouping received from a base station associated with a subset of the plurality of carriers.” Tenny-Prov, claim 15; ¶39, Fig. 4,

'545 Claim	Tenny
	AppxA(5:3-10); Weide, ¶86. As discussed in [2.pre]-[2.a], these groupings/“timing groups” are UL timing groups because they represents “group[s] of carriers with uplink timings that are the same to within some tolerance.” Tenny-Prov., AppxA(1:17-19); Weide, ¶¶84-87. Thus, Tenny’s “association” of carriers constitutes configuring UL timing groups. <i>Id. Second</i>, Tenny discloses an additional step of configuration where the “carrier selection component 306” of wireless device 302 “choose[s] a carrier in the group from which to acquire timing updates” by “assigning a candidate carrier” in each “given timing group for receiving timing updates” for all carriers in that respective UL timing group. Tenny-Prov., ¶¶36, 39-40, Fig. 4; <i>see</i> [2.c] <i>infra</i>; Weide, ¶87. Thus, by selecting a candidate carrier to receive timing updates for all carriers in the respective UL timing group, the UE further configures the UL timing group. Weide, ¶87. Tenny discloses that each UL timing group comprises one or more CCs because the UE associates “a plurality of carriers” into “one or more timing groups.” Tenny-Prov., ¶39; Weide, ¶87. • Tenny-Prov., Figs. 3-4 (annotated)

'545 Claim	Tenny
	300 302 WIRELESS DEVICE 304 CARRIER GROUPING COMPONENT 306 CARRIER CANDIDATE SELECTION COMPONENT 308 TIMING OFFSET COMPONENT 310 TIMING UPDATE COMPONENT Fig. 3 400 402 ASSOCIATE A PLURALITY OF CARRIERS INTO ONE OR MORE TIMING GROUPS 404 ASSIGN A CANDIDATE CARRIER IN A GIVEN GROUP FOR RECEIVING TIMING UPDATES 406 RECEIVE A TIMING OFFSET FROM THE CANDIDATE CARRIER DURING A TIMING UPDATE 408 UPDATE TIMING FOR EACH CARRIER IN THE GIVEN GROUP BASED ON THE TIMING OFFSET Fig. 4 • Tenny-Prov., AppxA(1:17-19) (<i>see</i> [2.pre]) • Tenny-Prov., AppxA(5:3-10) (<i>see</i> [2.a]) • Tenny-Prov., ¶¶34-36 (“<i>FIG. 3 illustrates an example system 300 that facilitates grouping carriers by timing to facilitate efficient timing synchronization in multicarrier wireless networks. System 300 includes a wireless device 302, which can be a mobile device.... [¶]...The carrier grouping component 304 can associate carriers having</i>”) (<i>see</i> [2.a])

'545 Claim	Tenny
	<i>similar timing into timing groups....In another example, the carrier grouping component 304 can receive one or more groupings from one or more related access points or the wireless network.... [¶] In an example, carrier candidate selection component 306 can choose a carrier in the group from which to acquire timing updates....”)</i> • Tenny-Prov. ¶39 (“<i>FIG. 4 illustrates an example methodology 400 that facilitates grouping carriers and performing group-based timing updates. At 402, a plurality of carriers can be associated into one or more timing groups...At 404, a candidate carrier can be assigned in a given timing group for receiving timing updates. The candidate carrier can be chosen by...UE....”)</i> • Tenny-Prov. ¶40 (“<i>...At 408, timing can be updated for each carrier in the timing group based on the timing offset...In another example, the offset received from the candidate carrier can be applied to all carriers in the group.</i>”) • Tenny-Prov., Claim 15 (“<i>The wireless communications apparatus of claim 10, wherein the at least one processor generates the association of the plurality of carriers into one or more timing groups according to a grouping received from a base station associated with a subset of the plurality of carriers.</i>”) • <i>See also</i> Tenny-Prov., claims 1, 6, 8, 17, AppxA(1:17-2:6, 2:23-3:17, 4:15-25, Fig. 1, claim 3); Tenny, ¶¶44, 56, 60-61, 70, 78-79, 82, 84, claims 30, 35, Figs. 6-7.
[2.c] transmitting a Random Access	Tenny discloses transmitting a Random Access Preamble (RAP) through one or more UL CCs (<i>e.g.</i>, UE’s “timing offset component 308” uses “a random access procedure” to “acquire a timing offset from the candidate carrier” from the

'545 Claim	Tenny
Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group;	eNB), each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group (e.g., “candidate carrier” chosen by “carrier candidate selection component 306” to “acquire timing updates” “for a given [UL timing] group”). <u>E.g., Tenny:</u> <i>See</i> [2.pre], [2.b], [2.d]-[2.e]. Tenny further discloses that to “maintain[] timing synchronisation” in a “LTE-A” system, the UE “perform[s] random access to update its timing” “[w]ithin each timing group.” Tenny-Prov., AppxA(1:2-3, 2:7-25); Weide, ¶¶89-90. The “UE performs random access for timing synchronisation on a single carrier of the timing group for which it requires timing information.” Tenny-Prov., AppxA(claim 6); Weide, ¶¶89-90. For example, the UE’s “[t]iming offset component 308” “acquire[s] a timing offset from the candidate carrier for a given group using a random access procedure.” Tenny-Prov., ¶37, Fig. 3; Weide, ¶¶88-90. A POSITA would have understood that Tenny’s UE “acquire[s] the timing offset” through the “random access procedure” by transmitting a “Random Access Preamble” (RAP)—and at minimum it would have been obvious to do so as RAPs are used for this purpose.¹⁹ <i>Id.</i>; Weide, ¶¶88-91. As such, and as further discussed in [2.d] below, the candidate carrier is a UL CC because it is used by the UE to transmit the

¹⁹ See, e.g., TS36.300, 52, 54; Ex. 1015, 432-33; Ex. 1016, ¶42; Ex. 1018, 3-4 (Pantech citing to “TS 36.300” to support definition of “transmitting a [RAP]”); Ex. 1022 (Rysavy Tr.), 47:20-22 (“The plain and ordinary meaning of the random access preamble is the particular item used in LTE for performing the random access procedure”); Weide, ¶91.

'545 Claim	Tenny
	RAP to acquire the timing offset from the eNB. Weide, ¶92. As discussed in [2.b], the candidate carrier through which the RAP is transmitted is set as a delegate CC in the respective UL timing group because the candidate carrier is “chosen” by the UE’s “carrier candidate selection component 306” to “acquire timing updates” for its “given group,” which is a UL timing group. Tenny-Prov., ¶¶36, 39, Figs. 3-4; AppxA(1:17-19); Weide, ¶92. Thus, Tenny not only renders obvious, but affirmatively discloses, transmitting a RAP through a single uplink carrier that has been set as a “candidate” carrier for its respective UL timing group. Weide, ¶93. • Tenny-Prov., Figs. 3-4 (annotated) <pre> graph TD 300 --> 302 subgraph 302 [WIRELESS DEVICE] 304[CARRIER GROUPING COMPONENT] 306[CARRIER CANDIDATE SELECTION COMPONENT] 308[TIMING OFFSET COMPONENT] 310[TIMING UPDATE COMPONENT] end </pre> <i>Fig. 3</i>

'545 Claim	Tenny
	<pre> graph TD 400 --> 402[ASSOCIATE A PLURALITY OF CARRIERS INTO ONE OR MORE TIMING GROUPS] 402 --> 404[ASSIGN A CANDIDATE CARRIER IN A GIVEN GROUP FOR RECEIVING TIMING UPDATES] 404 --> 406[RECEIVE A TIMING OFFSET FROM THE CANDIDATE CARRIER DURING A TIMING UPDATE] 406 --> 408[UPDATE TIMING FOR EACH CARRIER IN THE GIVEN GROUP BASED ON THE TIMING OFFSET] </pre> Fig. 4 • Tenny-Prov., ¶¶36, 39 (<i>see</i> [2.b]) • Tenny-Prov., ¶37 (“<i>Timing offset component 308 can acquire a timing offset from the candidate carrier for a given group using a random access procedure and/or the like, and the timing update component 310 can update timing for the group of carriers based on the offset.</i>”) • Tenny-Prov., AppxA(1:2-3, 1:17-19, claim 6) (<i>see</i> [2.pre]) • Tenny-Prov., AppxA(2:7-25) (“<i>3.2. Carrier selection for random access</i> <i>Within each timing group, the UE may need to occasionally perform random access to update its timing By definition, this update only needs to be performed with one carrier of each timing group; and the issue arises of how the UE should decide which carrier this is.... In a UE-based approach, each UE would select a single carrier for random access for timing updates autonomously....</i>”)

'545 Claim	Tenny
	• <i>See also</i> Tenny-Prov., ¶¶2-3, 34, Fig. 4, AppxA(claim 5); Tenny, ¶¶58, 60-61, 80, 82, 84, Fig. 6, claims 2-4, 52.
[2.d] receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and	Tenny discloses receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group (e.g., “timing offset” is received “in response to a random access procedure”; “a single timing advance value can be indicated to the UE for use with all the carriers in the group”), wherein each TA value is transmitted from the eNB for the respective UL timing group (e.g., “this [timing] update only needs to be performed with one carrier of each timing group”; “UE...to receive timing adjustments...[from] the base station,” such as a “eNB”) based on the random access procedure associated with a delegate CC of the respective UL timing group (e.g., “timing offset can be received from the candidate carrier during the timing update...in response to a random access procedure”; <i>see</i> [2.c]). <u>E.g., Tenny:</u> <i>See</i> [2.a]-[2.c], [2.e]. Tenny further discloses that “[t]iming offset component 308” of “wireless device” 302 “acquire[s] a timing offset from the candidate carrier for a given group,” where the timing offset is received “in response to a random access procedure.” Tenny-Prov., ¶¶37, 40, Fig. 3; Weide, ¶¶95-96. The timing offset is “a single timing advance value” that “can be indicated to the UE for use with all the carriers in the group.” Tenny-Prov., AppxA(claim 1). “[T]his [timing] update only needs to be performed with one carrier of each timing group.” Tenny-Prov., AppxA(2:8-10). As discussed in [2.c], the candidate carrier is a delegate CC that receives timing updates/offset for the UL timing group it has been chosen to represent. <i>See</i> [2.c]; Weide, ¶96. Thus, Tenny discloses that the timing offset is a TA value that is received in a Random Access Response because the timing offset is “received...in response to a random access procedure”—and at minimum it would have been obvious to do

'545 Claim	Tenny
	so, as RARs were commonly used for this purpose.²⁰ Tenny-Prov., ¶40; Weide, ¶¶94-98. A POSITA would have understood that Tenny discloses that the UE “receive[s] timing adjustments” from a “base station,” such as an “eNB.” Tenny-Prov., AppxA(1:9-32, 4:15-17, Fig. 1). Thus, the “timing offset” is transmitted from the eNB. Weide, ¶¶99. As discussed in [2.c], Tenny discloses that the timing offset is received “using a random access procedure” over the same “candidate carrier” through which the RAP was transmitted by the UE to acquire “timing offset” for a given UL timing group. Tenny-Prov., ¶¶36-37, 39-40, AppxA(Fig. 2); <i>see</i> [2.c]. Weide, ¶101. Thus, Tenny not only renders obvious, but affirmatively discloses, receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group. Weide, ¶¶94-101. • Fig. 3

²⁰ *See, e.g.*, TS36.300, 52, 54; Ex. 1015, 433; Ex. 1018, 4 (Pantech citing to “TS 36.300” to support definition of “receiving a [RAR]”); Ex. 1022 (Rysavy Tr.), 55:20-23 (“A person of ordinary skill in the art would understand that a random access response is a response from a base station as part of a random access procedure.”); Weide, ¶¶97-98.

'545 Claim	Tenny
	<i>Fig. 3</i> • Tenny-Prov., AppxA(Fig. 2) Figure 2: Ambiguous uplink timing • Tenny-Prov., AppxA(Fig. 1) (<i>see</i> [2.a]) • Tenny-Prov., ¶¶36, 39 (<i>see</i> [2.b]) • Tenny-Prov., ¶37 (<i>see</i> [2.c]) • Tenny-Prov., ¶40 (“At 406, a <i>timing offset can be received from the candidate carrier</i> during the timing

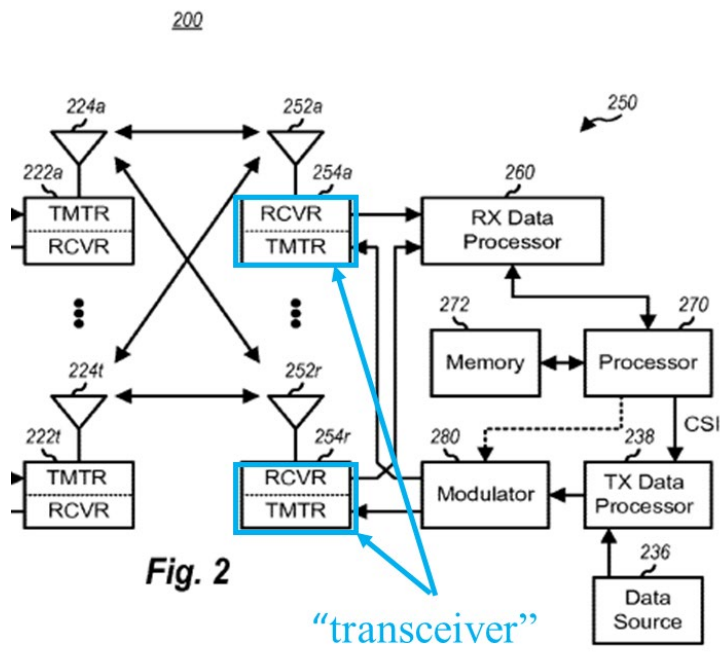
'545 Claim	Tenny
	update. <i>This can be in response to a random access procedure</i>, in one example, and can be related to a timing difference related to the candidate carrier. At 408, <i>timing can be updated for each carrier in the timing group based on the timing offset</i>...In another example, <i>the offset received from the candidate carrier can be applied to all carriers in the group.</i>") • Tenny-Prov. AppxA(1:9-32) (“... separate timing offsets per carrier [are] beneficial or even necessary.... An example, in which <i>a remote radio head belonging to the eNode B causes some carriers to have different timing from others</i>, is shown in Fig. 1.”) • Tenny-Prov., AppxA(2:8-10) (“Within each timing group, the UE may need to occasionally perform random access to update its timing (e.g., if timing is maintained through a separate procedure for each timing group). By definition, <i>this update only needs to be performed with one carrier of each timing group</i>...”) • Tenny-Prov., AppxA(4:15-17) (“In the event that a UE is assigned to several timing groups that are controlled from a common site, it may be able to <i>receive timing adjustments for all groups with a single interaction with the base station.</i>”) • Tenny-Prov., AppxA(claim 1) (“...[A] <i>single timing advance value can be indicated to the UE for use with all the carriers in the group</i>, such that <i>the resulting uplink timing when the UE transmits with this timing advance value towards any carrier in the group</i> will be sufficiently accurate for communication with that carrier”) • Tenny-Prov., AppxA(claim 6) (<i>see</i> [2.pre])

'545 Claim	Tenny
	• <i>See also</i> Tenny-Prov., ¶¶16, 33-34, Figs. 3-4, AppxA(claims 3, 5, 28); Tenny, ¶¶9, 40, 57-58, 61, 65-66, 69-70, 77, 80, 82, claim 27, 48, 56.
[2.e] applying each TA value to CCs in the respective UL timing group.	Tenny discloses applying each TA value to CCs in the respective UL timing group (e.g., “timing update component 310...update[s] timing for the group of carriers based on the offset” received from the “candidate carrier” chosen for the respective timing group; “a single timing advance value can be indicated to the UE for use with all the carriers in the group”; <i>see</i> [2.c]). <i>See</i> [2.c]-[2.d]. <u>E.g., Tenny:</u> Tenny discloses that “timing update component 310” of “wireless device” 302 “updat[es] timing for the group of carriers based on the offset” received from the “candidate carrier” chosen for the respective timing group. Tenny-Prov., ¶37, Fig. 3; <i>see</i> [2.c] (discussion of “delegate CC”); Weide, ¶¶102-04. For example, the UE “appl[ies] the offset,” which is “a single timing advance value...for use with all carriers in the group” to “all carriers in the group.” Tenny-Prov., AppxA(3:26-4:8, claim 1), ¶¶37, 40; Weide, ¶¶102-04. • Tenny-Prov., Fig. 3

'545 Claim	Tenny
	Fig. 3 • Tenny-Prov., AppxA(Fig. 3) Figure 3: UE averaging of uplink timing from two carriers • Tenny-Prov., ¶37 (“In another example, <i>the timing update component 310 can track downlink timing over carriers in a group, add the offset received from the timing offset component 308 to each carrier timing, average the timing differences, and apply the average difference as an offset for use with all carriers in the group.</i>”)

'545 Claim	Tenny
	• Tenny-Prov., ¶40 (“In another example, <i>the offset received from the candidate carrier can be applied to all carriers in the group.</i>”) • Tenny-Prov., AppxA(3:26-4:8) (“The simplest approach is for the UE simply to <i>apply the timing offset to the carrier on which it received it, and assume that the timing of other carriers in the group is ‘close enough’;...the UE can apply the offset separately to each carrier and take an average of the results to provide a ‘happy medium’ uplink timing for use with all carriers in the group.</i>”) • Tenny-Prov., AppxA(claim 1) (“...[A] <i>single timing advance value can be indicated to the UE for use with all the carriers in the group, such that the resulting uplink timing when the UE transmits with this timing advance value towards any carrier in the group will be sufficiently accurate for communication with that carrier....</i>”) • <i>See also</i> Tenny-Prov., ¶¶33-34, Fig. 4, AppxA(Fig. 2); Tenny, ¶¶65-67, Figs. 4, 5.
[3.pre] A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system, the UE comprising:	Tenny discloses a User Equipment (UE) to establish an uplink (UL) synchronization (e.g., <i>see</i> [2.pre], Fig. 2) in a wireless communication system (e.g., “in a multicarrier LTE-Advanced (LTE-A) system”). <u>E.g., Tenny:</u> <i>See</i> [2.pre]. Tenny further discloses “timing synchronisation for a UE in a multicarrier LTE-Advanced (LTE-A) system.” Tenny-Prov., AppxA(1:2-3); Weide, ¶¶105-08. • Tenny-Prov., Fig. 2

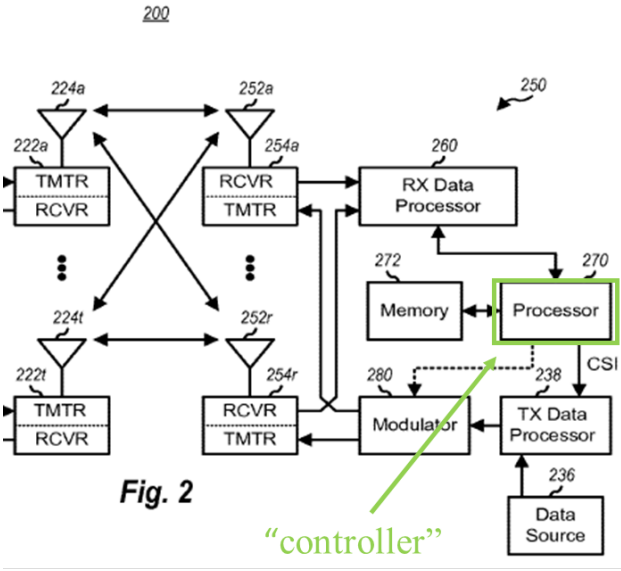
'545 Claim	Tenny
	• Tenny-Prov., AppxA(1:2-3) (see [2.pre]) • Tenny-Prov., ¶17 (“FIG. 2 is a block diagram of an embodiment of a transmitter system 210 (also known as the access point) and <i>a receiver system 250 (also known as access terminal)</i> in a MIMO system 200.”) • Tenny-Prov., ¶16 (“<i>An access terminal may also be called an access terminal, user equipment (UE), a wireless communication device, terminal, access terminal or some other terminology.</i>”) • See also Tenny, ¶¶3, 40, 44, Fig. 2.
[3.a] a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group	Tenny discloses the UE (see [3.pre]) comprising a transceiver (e.g., “receiver (RCVR)” and “transmitters” (“TMTR”)) configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB) (see [2.a]). <u>E.g., Tenny:</u> See [2.a].

'545 Claim	Tenny
information set, which has been set by an evolved NodeB (eNB);	Tenny further discloses that the UE includes “receiver (RCVR)” and “transmitters” (“TMTR”) for receiving and transmitting “modulated signals.” Tenny-Prov., ¶¶20, 22, 25, Fig. 2. Thus, a POSITA would have understood that Tenny discloses a transceiver—and at minimum, found it obvious to use a transceiver in Tenny’s UE—to receive the RRC signaling (<i>see</i> [2.a]), because transceivers were known to be used for such purposes.²¹ Weide, ¶¶109-12. Tenny-Prov., Fig. 2  The diagram illustrates a transceiver system 200 and a receiver system 250. System 200 consists of multiple antenna pairs (224a, 224t, 224r, 224l) connected to TMTR/RCVR blocks. System 250 includes an RX Data Processor (260), Memory (272), Processor (270), TX Data Processor (238), Modulator (280), and Data Source (236). A blue box highlights the RCVR and TMTR blocks in system 200, with a blue arrow pointing to the label 'transceiver'. Tenny-Prov., ¶22 (“At receiver system 250, the transmitted modulated signals are received by N_R antennas 252a through 252r and the received signal from each antenna 252 is provided to <i>a respective receiver (RCVR) 254a through 254r.</i>”)

²¹ See, e.g., Fan, Abstract, ¶¶1, 39, 60, 95, 99, Fig. 2A.

'545 Claim	Tenny
	• Tenny-Prov., ¶25 (“The reverse link message is then processed by a TX data processor 238, which also receives traffic data for a number of data streams from a data source 236, modulated by a modulator 280, <i>conditioned by transmitters 254a through 254r, and transmitted back to transmitter system 210.</i>”) <i>See also Tenny, ¶¶49, 52, Fig. 2.</i>
[3.b] a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,	Tenny discloses the UE (<i>see</i> [3.pre]) comprising a controller (e.g., “processor may be any conventional...controller”) configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs (<i>see</i> [2.b]). <u>E.g., Tenny:</u> <i>See</i> [2.b], [3.a]. Tenny further discloses that the UE includes a “processor” that “may be any conventional...controller.” Tenny-Prov., ¶45, Fig. 2. Tenny discloses that “[t]he methods or algorithms described in connection with the examples disclosed herein may be embodied directly in hardware, in a software module executed by a processor.” Tenny-Prov., ¶46. As such, a POSITA would have understood that Tenny discloses a controller—and at minimum, found it obvious to use a controller in Tenny’s UE—to configure one or more UL timing groups (<i>see</i> [2.b]), because controllers were known to be used for such purposes.²² Weide, ¶¶113-16. • Tenny-Prov., ¶45 (“The various illustrative logical blocks, modules, and circuits described in connection with <i>the examples disclosed herein may be implemented or performed with a general purpose processor...A</i>

²² *See, e.g., Fan, Abstract, ¶¶1, 60, 67, 95, 99, 141, 146, Fig. 2A.*

'545 Claim	Tenny
	general-purpose processor may be a microprocessor, but in the alternative, <i>the processor may be any conventional processor, controller, microcontroller, or state machine...</i>") • Tenny-Prov., ¶46 (“<i>The methods or algorithms described in connection with the examples disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two....</i>”) • Tenny-Prov., Fig. 2  Fig. 2 “controller” • See also Tenny, Fig. 2, ¶¶54, 71-72, 76, 123.
[3.c] wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each	See [2.c]-[2.d], [3.a]-[3.b], [3.d]. As discussed for [3.a], a POSITA would have understood that Tenny discloses a transceiver (see [3.a])—and at minimum, found it obvious to use a transceiver in Tenny’s UE—to transmit a RAP (see [2.c]) and receive a RAR (see [2.d])

'545 Claim	Tenny
of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL	because transceivers were known to be used for such purposes. ²³ Weide, ¶¶117-19.

²³ Fan, Abstract, ¶¶66, 95, 99, 109, 131, Fig. 2A.

'545 Claim	Tenny
timing group, and	
[3.d] wherein the controller applies each TA value to CCs in the respective UL timing group.	Tenny discloses that the controller (see [3.b]) applies each TA value to CCs in the respective UL timing group (see [2.e]). <u>E.g., Tenny:</u> <i>See [2.e], [3.b].</i> As discussed for [3.b], Tenny further discloses that the UE includes a “processor” that is a “conventional...controller.” <i>See [3.b].</i> As such, a POSITA would have understood that Tenny discloses a controller—and at minimum, found it obvious to use a controller in Tenny’s UE—to apply each TA value to CCs in the respective UL timing group, as controllers were known to be used for such purposes.²⁴ Weide, ¶¶120-22.

B. Ground 2: Qualcomm in view of TS36.331 (Claims 2-3)

1. Overview of Qualcomm

Qualcomm proposes a “design” intended to be “adopt[ed]” for an “LTE-A” system that uses “multiple timing advances” for groups of “UL component carriers” (UL CCs) to establish synchronization for uplink (UL) transmissions between a UE and network element. Qualcomm, 1-3; Weide, ¶123. Like the ’545, **Qualcomm** recognizes that “different [CCs]” have “substantially different propagation environments” and proposes “divid[ing]” UL CCs which “share the same timing”

²⁴ *See, e.g.,* Fan, Abstract, ¶¶1, 60, 67, 95, 99, 141, 146, Fig. 2A.

“into groups to reduce the number of separate timings to be maintained by the UE.”

Id.

In particular, **Qualcomm** addresses how CCs are reconfigured “[i]n case of handover,” where a UE moves from one network cell to a new “target cell” and thus needs reconfiguration of CCs in the new cell. Qualcomm, 2; Weide, ¶124. To facilitate handover, **Qualcomm** discloses that the “network” sends “dedicated RRC signaling” via a “handover command” to instruct the UE to “configures multiple timing groups at the target cell.” *Id.* While **Qualcomm** does not provide specifics about how these timing groups are configured by the UE, **Qualcomm** discloses that the network configures the carriers that are assigned to the UE at the target cell, and indicates to the UE in the RRC signaling “if a newly configured UL carrier...belong[s] to a new timing group.” Qualcomm, 2; Weide, ¶124. Each UL timing group may include “more than one CC” that “share the same timing.” *Id.*

To perform UL synchronization for these timing groups, **Qualcomm** discloses that the UE “obtain[s] a timing advance” by performing a random access procedure over the Random Access Channel (“RACH”) on “all the timing groups.” Qualcomm 2; Weide, ¶125. For example, the “UE initiates RACH” by sending a “randomly selected RACH preamble,” where “[a] unique UL carrier is identified to be used for RACH on each timing group.” *Id.*; Weide, ¶125. In response to the RACH preamble, a “timing advance is delivered to the UE” from the network for

each timing group on a “unique DL carrier.” *Id.*; Weide, ¶125. The UE then “calculates uplink timing by adding a timing advance to the received downlink reference timing.” *Id.*

2. Motivation to Apply the TS36.331’s Teachings to Qualcomm

Qualcomm discloses that to facilitate handover, its LTE network sends a “handover command” to a UE to “configure[] multiple timing groups at the target cell” based on information in an “RRC signalling” indicating “[i]f a newly configured UL carrier...belong[s] to a new timing group.” Qualcomm, 2; Weide, ¶126. Thus, while **Qualcomm** recognizes that new carriers need to be reconfigured into new timing groups to perform handover, it is silent on the specific protocol that is used perform such reconfiguration. *Id.*

TS36.331 discloses the specific protocol that is used to reconfigure resources for handover in an LTE system—by establishing, modifying, and releasing resources. TS36.331, 40 (§5.3.5); Weide, ¶127. In particular, Section 5.3.5.4 of **TS36.331** discloses that the “*RRCCConnectionReconfiguration* message” provides information to the UE to “perform the radio resource configuration procedure as specified in 5.3.10.” TS36.331, 40-42. And section 5.3.10 discloses detailed instructions to a UE to reconfigure radio resources, such as the “UE shall...reconfigure the physical channel configuration.” TS36.331, 48(§5.3.10), 39-40; Weide, ¶127.

Qualcomm and **TS36.331** are analogous prior art and in the same field as the '545 and are reasonably pertinent to the alleged problems identified in the '545 of providing a scheme for effective synchronization in a wireless communication. *See, e.g.,* '545, 1:38-43; Qualcomm, 1-2; TS36.331, §5.3.5; Weide, ¶128.

A POSITA would have been motivated to implement **Qualcomm**'s "handover command" according to the teachings of **TS36.331**'s "handover" protocol for several reasons. First, applying **TS36.331**'s teachings would have improved the compatibility of **Qualcomm**'s proposal with LTE, as desired by **Qualcomm**'s "LTE-A" design. Qualcomm, 1; Weide, ¶130. Second, instructing **Qualcomm**'s UE on how to reconfigure timing groups at the target cell based on **TS36.331**'s teachings advantageously reduces the load on a base station that serves multiple UEs in a cell and avoid bottlenecks. Qualcomm, 2; TS.36.331, 42(§5.3.5.4), 48(§5.3.10), 39-40; Weide, ¶130. Third, UE reconfiguration would also improve efficiency and accuracy of handover execution because the UE has a more up-to-date list of UL carriers that are available in the system. Weide, ¶130. To implement **Qualcomm**'s "handover command" to "configure[] multiple timing groups at the target cell," a POSITA would have used the "*RRCCConnectionReconfiguration*" handover message, taught by **TS36.331**, to identify which "new timing group[s]" the "newly configured UL carrier[s]" belonged, as taught by **Qualcomm**. TS36.331, 40-42(§5.3.5.4), 48(§5.3.10), 39-40; Qualcomm, 2; Weide, ¶¶129-30. This modified

“*RRCConnectionReconfiguration*” handover message would be a RRC signaling including an UL timing group information set, which is set by an eNB. TS36.331, 40-42(§5.3.5.4); Weide, ¶130.

A POSITA would have had a reasonable expectation of success in applying these TS36.331 teachings given that **Qualcomm’s** proposal was explicitly designed for “LTE-A,” and doing so would have been straightforward and would have required minimal disruption to the existing LTE infrastructure. Weide, ¶131. It was well-understood to associate CCs with UL timing group identifiers in an RRC message, which is used in LTE. *See, e.g.*, Tenny, ¶70; Marinier, ¶73; Weide, ¶131. Furthermore, it was well-known for a UE to perform reconfiguration of resources based on instructions provided by a base station. *See, e.g.*, Tenny-Prov., ¶¶35-36, claim 15; TS36.331, 39-42, 48; Marinier, ¶65; Weide, ¶129.

3. Claim Chart

In addition to §§IX.B.1-IX.B.2, the following identifies example disclosures followed by bulleted excerpts that each disclose and/or render obvious the Claims. Weide, ¶132.

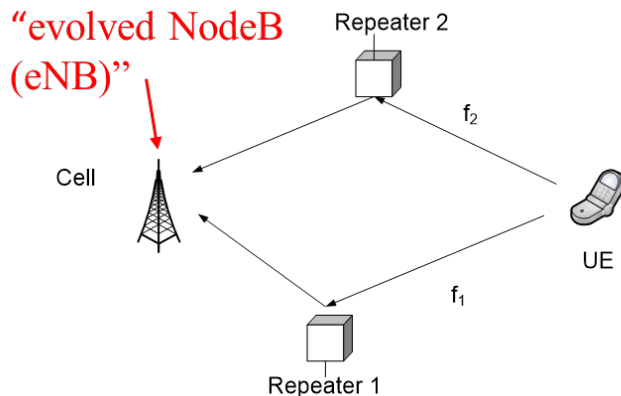
'545 Claim	Qualcomm in View of TS36.331
[2.pre] A method for establishing an uplink (UL) synchronization	Qualcomm discloses a method for establishing an uplink (UL) synchronization by a User Equipment (UE) (e.g., “a design for multiple timing advances,” wherein a “UE has to send a RACH” to “obtain a timing advance” to “calculate[] uplink timing”).

'545 Claim	Qualcomm in View of TS36.331
by a User Equipment (UE), the method comprising	<u>E.g., Qualcomm:</u> Qualcomm discloses a “design for multiple timing advances,” wherein a “UE has to send a RACH” to “obtain a timing advance” for “all the timing groups” and “calculates uplink timing by adding a timing advance to the received downlink reference timing.” Qualcomm, 1-2; Weide, ¶135. In LTE, RACH is used by the UE to establish UL synchronization with an eNB. Weide, ¶135. At minimum, it would have been obvious for Qualcomm’s UE to use RACH to establish UL synchronization, because RACH was commonly used for this purpose.²⁵ <i>Id.</i>; Weide, ¶¶133-35. Thus, Qualcomm not only renders obvious, but affirmatively discloses, a method for establishing UL synchronization by a UE. Weide, ¶135. • 1 (§1) (“In this paper, we describe <i>a design for multiple timing advances, and recommend adoption of this design</i> in case multiple timing advances are adopted in LTE-A.”) • 2 (§2.3) (“The <i>UE calculates uplink timing by adding a timing advance to the received downlink reference timing....</i>”) • 2 (§2.4 Delivery of Timing Advance, ¶3) (“<i>In order to obtain a timing advance, the UE has to send a RACH....</i>”) • 2 (Proposal 6) (“The <i>UE initiates RACH</i> upon configuration of a new timing group. In case of handover, <i>if multiple timing groups are configured, the UE initiates RACH on all the timing groups.</i>”) • <i>See also 3.</i>
[2.a] receiving a Radio Resource	Qualcomm discloses receiving a Radio Resource Control (RRC) signaling including a UL timing group information set (e.g., UE receiving a “dedicated RRC signalling” from the

²⁵ See, e.g., TS36.300, 52, 54; Ex. 1015, 432.

'545 Claim	Qualcomm in View of TS36.331
Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);	“network” which “indicate[s]” “[i]f a newly configured UL carrier...belong[s] to a new timing group”), which has been set by an evolved NodeB (eNB) (e.g., “network” base station in “LTE[]”). <u>E.g., Qualcomm:</u> Qualcomm discloses that “configured carriers are added by dedicated RRC signalling” and that “[t]he UL component carriers configured for a UE should be divided into timing groups,” which are UL timing groups. Qualcomm, 2; Weide, ¶138. “In case of handover,” where a UE moves from one cell to a new “target cell,” the originally configured carriers in the original cell are reconfigured at the target cell. <i>Id.</i>; Weide, ¶¶136-39. Accordingly, Qualcomm discloses that the “network” “indicate[s]” “[i]f a newly configured UL carrier...belong[s] to a new timing group” to the UE via the “handover command.” <i>Id.</i>; Weide, ¶138. Thus, a POSITA would have understood that the “handover command” sent to the UE is an RRC signaling message that provides information about a set of UL timing groups that the UE uses to “configure multiple timing groups at the target cell.” <i>Id.</i>, Weide, ¶138. Qualcomm’s “handover command” is sent by the “network” to the UE. Qualcomm, 2; Weide, ¶139. Because Qualcomm’s proposal is “design[ed]” for “LTE-A,” a POSITA would have understood that the “network” functionality discussed in Qualcomm (<i>see</i> §2.4) is performed by an eNB, which services a cell (<i>see</i> Figure 2), and at minimum, it would have been obvious to perform this network-side synchronization functionality using an eNB, as eNBs were commonly used for this purpose in an LTE network.²⁶ Qualcomm, Fig. 2; Weide, ¶139.

²⁶ *See* n.18.

'545 Claim	Qualcomm in View of TS36.331
	Thus, Qualcomm discloses or at least renders obvious that the “RRC signalling” includes a UL timing group information set, which has been set by an eNB. Weide, ¶¶136-39. <u>E.g., Qualcomm:</u> • Fig. 2  • 1 (§1), 2 (Proposal 6) (see [2.pre]) • 2 (Proposal 1) (“<i>The UL component carriers configured for a UE should be divided into timing groups, where the network controls the grouping of component carriers.</i>”) • 2 (Proposal 2) (“<i>The UL component carriers within a timing group share the same timing</i>”) • 2 (§2.4 Initiating use of timing groups, ¶1) (“<i>It is already agreed that configured carriers are added by dedicated RRC signalling, subsequent to the connection establishment. If a newly configured UL carrier is indicated by the network as belonging to a new timing group, then the UE should perform RACH before starting any other UL transmissions. The same issue arises after handover, in the case where the handover command configures multiple timing groups at the target cell.</i>”)

'545 Claim	Qualcomm in View of TS36.331
	• 1-2 (§2.2) (“In the scenario above, <i>it is possible that f1 and f2 each constitute multiple LTE CCs</i>. ... [T]he <i>configured component carriers can be divided into groups</i> to reduce the number of separate timings to be maintained by the UE.”)
[2.b] configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs;	Qualcomm discloses configuring one or more UL timing groups based on the UL timing group information set (e.g., “handover command configures multiple timing groups” based on “RRC signalling,” which indicates “[i]f a newly configured UL carrier...belong[s] to a new timing group”; <i>see</i> [2.a]), the one or more UL timing groups each comprising one or more UL CCs (e.g., “more than one CC in a timing group”). <u>E.g., Qualcomm:</u> <i>See</i> [2.a]. Qualcomm also discloses that the network sends a “handover command” to the UE to “configure[] multiple timing groups at the target cell.” Qualcomm, 2; Weide, ¶¶140-42. As discussed in [2.a], the handover command is based on “RRC signalling,” which the “network” sends to the UE to “indicate[]” “[i]f a newly configured UL carrier...belong[s] to a new timing group.” <i>Id.</i> Qualcomm’s timing groups are UL timing groups (<i>see</i> [2.a], Qualcomm, 2; Weide, ¶138) that contain “more than one CC,” where all UL CCs within each timing group “share the same timing.” Qualcomm, 2; Weide, ¶142. Because Qualcomm discloses that the handover “command configures multiple timing groups,” a POSITA would have understood that Qualcomm’s network uses the handover “command” to instruct the UE to perform reconfiguration of “timing groups” at the target cell based on the “newly configured UL carriers” identified in the RRC message (<i>see</i> [2.a]). Qualcomm, 2; Weide, ¶142. At minimum, a POSITA would have found it obvious to have the UE perform the reconfiguration of timing groups in handover situations, because it was well-known

'545 Claim	Qualcomm in View of TS36.331
	that resource reconfiguration for handover was performed by UEs based on instructions sent in an RRC message.²⁷ Weide, ¶142. • 2 (§2.4 Initiating use of timing groups, ¶1) (“<i>It is already agreed that configured carriers are added by dedicated RRC signalling</i>, subsequent to the connection establishment. <i>If a newly configured UL carrier is indicated by the network as belonging to a new timing group</i>, then the UE should perform RACH before starting any other UL transmissions. <i>The same issue arises after handover, in the case where the handover command configures multiple timing groups at the target cell.</i>”) • 2 (Proposal 2) (“The UL <i>component</i> carriers within <i>a timing group</i> share the same timing.”) • 2 (§2.4 Delivery of Timing Advance, ¶3) (<i>see</i> [2.pre]) • 2 (Proposal 5) (“<i>A unique UL carrier is identified</i> to be used for RACH on <i>each timing group.</i>”) To the extent further disclosure of the UE performing this step is required, TS36.331 further discloses a UE configuring radio resources based on information for configuring resources transmitted in an RRC signaling (e.g., UE “perform[s] the radio resource configuration procedure” if “the <i>RRCConnectionReconfiguration</i> messages includes the <i>radioResourceConfigDedicated</i>,” which instructs the UE on how to establish, modify, and release radio resources; <i>see</i> [2.a]) <u>E.g., TS36.331:</u> <i>See</i> [2.a]. While Qualcomm discloses that the network sends a “handover command” to a UE that “configures multiple timing groups at the

²⁷ *See, e.g.*, TS36.331, 39-40, 48; Weide, ¶142.

'545 Claim	Qualcomm in View of TS36.331
	target cell” based on new UL carriers identified in an RRC message, Qualcomm does not provide details on how those timing groups are reconfigured. Qualcomm, 2; Weide, ¶144. TS36.331 provides standardized protocols for how reconfiguration of resources is implemented “to perform handover” in an LTE system. TS36.331, 39-40, 48; Weide, ¶145. TS36.331 discloses that “the <i>RRCConnectionReconfiguration</i> messages includes the <i>radioResourceConfigDedicated</i>,” which instructs the UE on how “to establish/modify/release RBs[] to perform handover,” including by performing “radio resource configuration.” TS36.331, 39-40 (§5.3.5), 48 (§5.3.10); Weide, ¶¶143-45. “RB” refers to “radio bearer,” which uses radio resources. TS36.331, 15; Weide, ¶145. In particular, “the <i>RRCConnectionReconfiguration</i> message” specifies that “the UE shall...perform the radio resource configuration as specified in 5.3.10,” which states that “[t]he UE shall” add, modify, release, and/or otherwise reconfigure resources. TS36.331, 40-41 (§5.3.5.4), 48-49 (§5.3.10); Weide, ¶145. As discussed above in §IX.B.2, a POSITA would have been motivated to implement Qualcomm’s “handover command that configures multiple timing groups at the target cell” according to the teachings of TS.36.331’s RRC “handover” protocol to instruct a UE. Qualcomm, 2; TS36.331, 39-40, 48; Weide, ¶¶145-46. • 39-40 (“5.3.5 RRC connection reconfiguration”) (“<i>The purpose of this procedure is to modify an RRC connection, e.g. to establish/ modify/ release RBs, to perform handover....</i>”) • 40-41 (“5.3.5.4 Reception of an <i>RRCConnectionReconfiguration</i> including the <i>mobilityControlInfo by the UE (handover)</i>”) (“If the <i>RRCConnectionReconfiguration</i> message includes the <i>mobilityControlInfo ... the UE shall: ... perform the radio resource configuration as specified in 5.3.10</i>”)

'545 Claim	Qualcomm in View of TS36.331
	• 48-49 (“§5.3.10 ... <i>The UE shall:...perform the SRB addition or reconfiguration...perform DRB release...perform DRB addition or reconfiguration...perform MAC main reconfiguration...reconfigure the physical channel configuration...</i>”) <i>See also</i> TS36.331, 91.
[2.c] transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group;	Qualcomm discloses transmitting a Random Access Preamble (RAP) (e.g., “initiat[ing] RACH (either with a randomly selected RACH preamble, or with a RACH preamble assigned by the network)”) through one or more UL CCs (e.g., “if multiple timing groups are configured, the UE initiates RACH on all the timing groups”; “one UL CC per timing group where the UE sends RACH”), each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group (e.g., “A unique UL carrier is identified to be used for RACH on each timing group”). <u>E.g., Qualcomm:</u> <i>See</i> [2.b], [2.d]-[2.e]. Qualcomm further discloses that “[i]n order to obtain a timing advance, the UE has to send a RACH.” Qualcomm, 2. Specifically, the “UE initiates RACH (either with a randomly selected RACH preamble, or with a RACH preamble assigned by the network).” Qualcomm, 2. A POSITA would have understood that Qualcomm’s “RACH preamble” is a Random Access Preamble (RAP)—and at minimum, it would have been obvious to use a RAP as Qualcomm’s “RACH preamble,” as RAPs were commonly used to obtain timing information as part of a RACH/random access procedure.²⁸ <i>Id.</i>; Weide, ¶¶147-49, 125.

²⁸ *See* n.19.

'545 Claim	Qualcomm in View of TS36.331
	The RAP is transmitted “on all the timing groups”—“one UL CC per timing group.” Qualcomm, 2. Qualcomm further discloses that “[a] unique UL carrier is identified to be used for RACH on each timing group.” Qualcomm, 2. As such, a POSITA would have understood that Qualcomm’s “unique UL carrier” is set as a delegate CC that transmits a RAP to perform RACH “[i]n order to obtain a timing advance” for its respective UL timing group. <i>Id.</i>; Weide, ¶150. Thus, Qualcomm not only renders obvious, but affirmatively discloses, a UE that transmits a RAP through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group. Weide, ¶¶147-50. • 2 (§2.4 Delivery of Timing Advance, ¶3, Proposal 6) (<i>see</i> [2.pre]) • 2 (Proposal 5) (<i>see</i> [2.b]) • 2 (§2.4 Initiating use of timing groups, ¶2) (“There are two options to <i>initiate a RACH for the UE to acquire timing on this carrier</i> [¶] - <i>UE initiates RACH</i> (either with a <i>randomly selected RACH preamble</i>, or with a <i>RACH preamble assigned by the network</i>).”))
[2.d] receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL	Qualcomm discloses receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group (e.g., in response to the initiated RACH (<i>see</i> [2.c]), “timing advance is delivered to the UE” in “[a] unique DL carrier...for each timing group”), wherein each TA value is transmitted from the eNB (e.g., “timing advance[] commands may originate from different nodes in the network”; <i>see</i> 2[a]) for the respective UL timing group (e.g., “A unique DL carrier is identified as the TA-providing carrier for each timing group”) based on the transmitted RAP associated with a delegate CC of the respective UL timing group (“timing

'545 Claim	Qualcomm in View of TS36.331
timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and	advance” requested by “RACH preamble” is delivered” using a “unique DL carrier”; <i>see</i> [2.c]). <u>E.g., Qualcomm:</u> <i>See</i> [2.a]-[2.c], [2.e]. As discussed in [2.c], Qualcomm discloses that, “to obtain a timing advance [TA],” the UE sends a “RACH preamble” (RAP). Qualcomm, 2; [2.c]. The RAP is associated with “[a] unique UL carrier,” which is a delegate CC “identified to be used for RACH on each timing group.” <i>Id.</i> Qualcomm proposes that “[t]he [TA] is delivered to the UE” using “[a] unique DL carrier” that “is identified as the TA-providing carrier for each timing group,” whereby the “timing command received on a given DL CC uniquely addresses a timing group.” Qualcomm, 2; Weide, ¶¶151-53. Because “the timing advance is delivered to the UE” in response to the UE’s transmission of a “RACH preamble,” a POSITA would have understood that the UE receives the timing advance in a Random Access Response (RAR)—and at minimum, it would have been obvious to do so, as RARs were commonly used by eNBs to transmit timing advance information to a UE as part of a RACH/random access procedure in LTE.²⁹ Weide, ¶154. Further, Qualcomm discloses that “the timing advance[] commands may originate from different nodes in the network” “using a DL MAC control element.” Qualcomm, 2. These nodes are evolved NodeBs (eNBs) in Qualcomm’s proposed LTE-A system. <i>See</i> [2.a]; Weide, ¶155. Thus, Qualcomm not only renders obvious, but affirmatively discloses, receiving a RAR including a TA value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the

²⁹ *See* n.20.

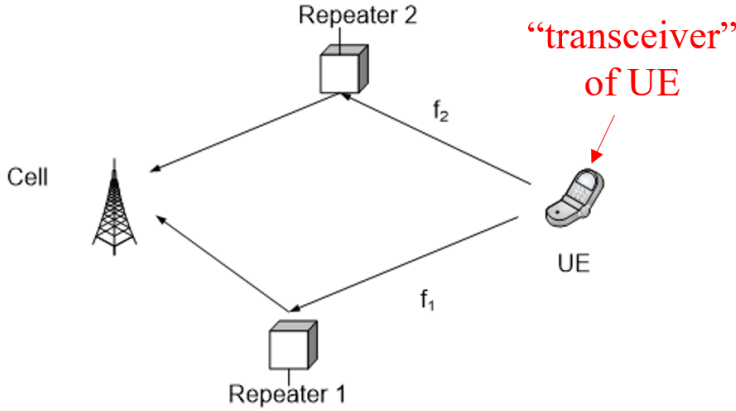
'545 Claim	Qualcomm in View of TS36.331
	transmitted RAP associated with a delegate CC of the respective UL timing group. Weide, ¶¶151-56.³⁰ • 1 (§1), 2 (§2.4, ¶3) (<i>see</i> [2.pre]) • 2 (§2.2 Proposal 2, §2.4 Delivery of Timing Advance, (¶3, Proposal 5)) (<i>see</i> [2.b]) • 2 (§2.3 Calculation of timing reference, ¶3) (“...<i>the timing advances[sic] commands may originate from different nodes in the network</i>, and having group specific references is important.”) • 2 (§2.4 Delivery of Timing Advance, ¶1) (“The timing advance is delivered to the UE using a DL MAC control element. ... in LTE-A, this mapping has to be specified, so that <i>a timing command received on a given DL CC uniquely addresses a timing group.</i>”) • 2 (§2.4 Initiating use of timing groups, ¶2) (<i>see</i> [2.c]) • 2 (§2.4 Proposal 4) (“<i>A unique DL carrier is identified as the TA-providing carrier for each timing group. The signalling formats for TA are as specified in Rel-8.</i>”)
[2.e] applying each TA value to CCs in the	Qualcomm discloses applying each TA value to CCs in the respective UL timing group (e.g., “calculat[ing] uplink timing by adding a timing advance to the received downlink reference

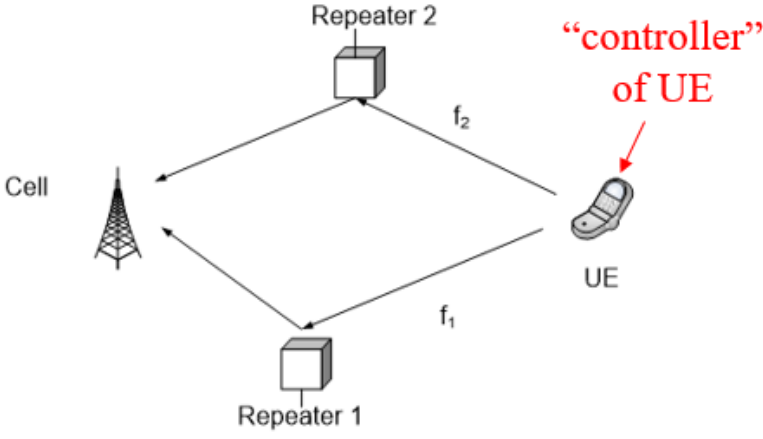
³⁰ To the extent [2.d] requires the same delegate CC to be used to transmit the RAP and receive the TA value in the RAR, it would have been obvious to use the same “unique UL carrier” identified for the timing group to transmit the RAP as the “unique DL carrier” used to receive the TA value in the RAR to advantageously reduce signaling complexity. Weide, ¶157.

'545 Claim	Qualcomm in View of TS36.331
respective UL timing group.	timing,” wherein “[t]he UL component carriers within a timing group share the same timing”). <u>E.g., Qualcomm:</u> <i>See</i> [2.c]-[2.d]. As discussed in [2.d], Qualcomm discloses that the UE receives a timing advance (TA) value for “each timing group.” Qualcomm, 2; Weide, ¶¶158-60. The UE “calculates uplink timing” for each of the UL CCs in a timing group “by adding [the] timing advance to the received downlink reference timing” for each timing group. Qualcomm, 2; Weide, ¶¶158-60. As Qualcomm further discloses, the “UL component carriers within a timing group share the same timing.” Qualcomm, 2. Thus, by “calculat[ing] uplink timing” for each UL timing group using the TA value, each TA value is applied to the CCs in the respective UL timing group. Weide, ¶¶158-60. • 2 (§2.3, §2.4 Delivery of Timing Advance, ¶3) (<i>see</i> [2.pre]) • 2 (Proposal 2) (“The <i>UL component carriers within a timing group share the same timing.</i>”) • 2 (Proposal 4) (<i>see</i> [2.d]) • 3 (Proposal 7) (“A <i>separate timing alignment timer instance</i> should be maintained by the UE <i>for each timing group.</i>”)
[3.pre] A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication	Qualcomm discloses or renders obvious a User Equipment (UE) to establish an uplink (UL) synchronization (<i>see</i> [2.pre]) in a wireless communication system (e.g., “LTE-A”). <u>E.g., Qualcomm:</u> <i>See</i> [2.pre]. Qualcomm further discloses a “design for multiple timing advances” and “recommend[s] adoption of [its] design” for “LTE-

'545 Claim	Qualcomm in View of TS36.331
system, the UE comprising:	A,” which is a wireless communication system. Weide, ¶¶161-63. Thus, Qualcomm discloses or renders obvious a UE to establish an uplink (UL) synchronization in a wireless communication system (<i>see</i> [2.pre]). Weide, ¶163. • 1 (§1) (<i>see</i> [2.pre])
[3.a] a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);	Qualcomm discloses or renders obvious a transceiver (e.g., transceiver of a “UE,” such as a mobile phone, that transmits and receives information from the network) configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB) (<i>see</i> [2.a]). <u>E.g., Qualcomm:</u> <i>See</i> [2.a]. Qualcomm further discloses a “UE,” such as a mobile phone, that transmits and receives timing-related information to/from a network. Qualcomm, 2, Fig. 2; Weide, ¶¶164-67. Thus, a POSITA would have understood Qualcomm’s UE to include a transceiver, and at minimum, would have found it obvious to use a transceiver in Qualcomm’s UE—to receive the RRC signaling (<i>see</i> [2.a]), because transceivers known to be used for such purposes.³¹ Weide, ¶167. • Fig. 2

³¹ *See* n.21.

'545 Claim	Qualcomm in View of TS36.331
	 Figure 2 Frequency Selective Repeaters • 2 (§2.4 Delivery of Timing Advance, ¶1) (<i>see</i> [2.d]) • 2 (§2.4 Delivery of Timing Advance, ¶3) (<i>see</i> [2.pre])
[3.b] a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,	Qualcomm in view of TS36.331 renders obvious a controller (e.g., controller of “UE,” such as a mobile phone) configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs (<i>see</i> [2.b]). <u>E.g., Qualcomm:</u> <i>See</i> [2.b]. Qualcomm further discloses a “UE,” such as a mobile phone, that has a controller, which configures one or more UL timing groups based on the UL timing group information set received in the “RRC signalling” from the eNB. Qualcomm, Fig. 2, 2; <i>see</i> [2.a]. As such, a POSITA would have understood that Qualcomm discloses a controller—and at minimum, found it obvious to use a controller in Qualcomm’s UE—to configure one or more UL

'545 Claim	Qualcomm in View of TS36.331
	timing groups (<i>see</i> [2.b]), because controllers were known to be used for such purposes.³² Weide, ¶¶168-71. Fig. 2  Figure 2 Frequency Selective Repeaters
[3.c] wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the	Qualcomm discloses or renders obvious that the transceiver (<i>see</i> [3.a]) transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group (<i>see</i> [2.c]), and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group (<i>see</i> [2.d]). <u>E.g., Qualcomm:</u> <i>See</i> [2.c]-[2.d], [3.a].

³² *See* n.22.

'545 Claim	Qualcomm in View of TS36.331
respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group, and	As discussed in [3.a], a POSITA would have understood that Qualcomm discloses a transceiver (<i>see</i> [3.a])—and at minimum, found it obvious to use a transceiver in Qualcomm's UE—to transmit a RAP (<i>see</i> [2.c]) and receive a RAR including a TA value (<i>see</i> [2.d]), because transceivers were known to be used for such purposes.³³ Weide, ¶¶172-74.
[3.d] wherein the controller applies each TA value to	Qualcomm discloses or renders obvious that the controller (<i>see</i> [3.b]) applies each TA value to CCs in the respective UL timing group (<i>see</i> [2.e]).

³³ *See* n.23.

'545 Claim	Qualcomm in View of TS36.331
CCs in the respective UL timing group.	<u>E.g., Qualcomm:</u> <i>See</i> [2.e]. A POSITA would have understood that Qualcomm discloses a controller (<i>see</i> [3.b])—and at minimum, found it obvious to use a controller in Qualcomm's UE—to apply each TA value to CCs in the respective UL timing group (<i>see</i> [2.e]), as controllers were known to be used for such purposes.³⁴ Weide, ¶¶175-77.

C. Grounds 3-4: Grounds 1-2 in further view of TS36.300 (Claims 2-3)

Claims 2-3 require the transmission of a RAP and reception of a RAR to establish uplink synchronization. As discussed above in §§IX.A-IX.B, these claimed features are disclosed or rendered obvious by **Tenny** (Ground 1) and rendered obvious by **Qualcomm in view of TS36.331** (Ground 2). To the extent further disclosure is required, **TS36.300** provides explicit teachings of the use of RAP and RAR as claimed. Weide, ¶178.

As discussed in §§IX.A.1, IX.B.1, **Tenny** and **Qualcomm** both disclose a UE that performs a random access procedure to acquire timing information from an LTE network for purposes of establishing uplink synchronization. Weide, ¶179.

TS36.300 sets forth the LTE protocol for performing the random access procedure discussed in **Tenny** and **Qualcomm**. For example, as shown below in

³⁴ *See* n.24.

annotated Figs. 10.1.5.1-1 and 10.1.5.2-1, **TS36.300** discloses the steps of a “random access procedure,” which involves a “UE” sending a **“Random Access Preamble”** on “RACH in uplink” to an evolved Node B or “eNB.” *See, e.g.*, TS36.300, 52-54, 44-46, Figs. 10.1.5.1-1, 10.1.5.2-1. In response to the RAP, the eNB transmits a **“Random Access Response”** that includes timing information, such as “Timing Alignment information” and an “initial UL grant.” *Id.* For example, in case of handover, upon receiving synchronization request via the RAP sent on the RACH, “the target eNB responds with UL allocation and timing advance.” TS36.300, 45-46; Weide, ¶¶180-84.

The contention based random access procedure is outlined on Figure 10.1.5.1-1 below:

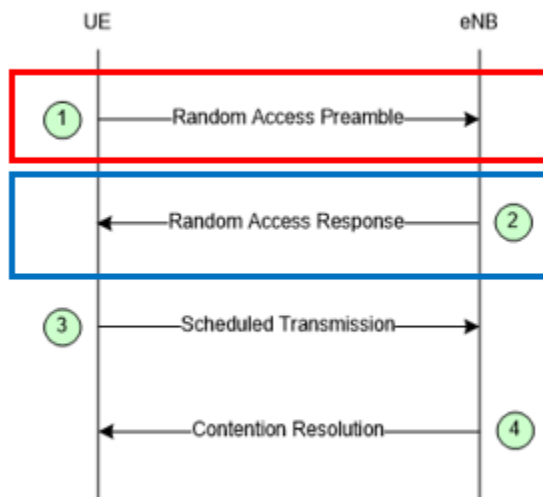


Figure 10.1.5.1-1: Contention based Random Access Procedure

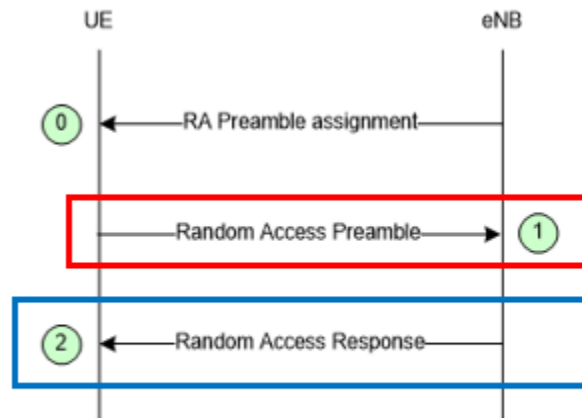


Figure 10.1.5.2-1: Non-contention based Random Access Procedure

Like Tenny, Qualcomm, and TS36.331, **TS36.300** is analogous prior art and in the same field as the '545, and is reasonably pertinent to the alleged problems identified in the '545 of providing a scheme for effective synchronization in a wireless communication. *See, e.g.,* '545, 1:38-43; Tenny, ¶3, Tenny-Prov., AppxA(1:2-3); TS36.300, §10.1.2.1; §IX.B.2; Weide, ¶185.

While **Tenny** and **Qualcomm** do not explicitly state that their UEs use a RAP and RAR to acquire timing information as part of their disclosed LTE random access procedure, **TS36.300** makes express that the "Random Access Procedure" in LTE involves the UE transmitting a RAP and receiving a RAR from the eNB, which includes timing information to synchronize the UE with the eNB. TS36.300, §10.1.5; Weide, ¶¶179-84.

A POSITA would have been motivated to implement **Tenny's** and **Qualcomm's** random access procedure according to the "Random Access

Procedure” specified in LTE specification **TS36.300** because both **Tenny’s** and **Qualcomm’s** systems were designed to operate in an “LTE-A” network, and **TS36.300** provides the LTE protocol for performing the Random Access Procedure. Weide, ¶186. Thus, implementing **Tenny’s** and **Qualcomm’s** UEs to transmit a RAP and receive a RAR to perform random access in an LTE network according to **TS36.300’s** Random Access Procedure would advantageously enable **Tenny’s** and **Qualcomm’s** systems to interoperate with more LTE systems. Weide, ¶186.

A POSITA would have had a reasonable expectation of success in applying these teachings in **TS36.300** given that **Tenny’s** and **Qualcomm’s** system was explicitly designed to provide solutions to several issues arising in a “LTE-A” system and doing so would have been straightforward and would have required minimal disruption to the existing LTE infrastructure. Weide, ¶187. Indeed, Pantech agrees that a POSITA would have understood that the specifications for RAP and RAR are set forth in 3GPP documents, such as **TS36.300**.³⁵ Weide, ¶188.

³⁵ In the LGE Litigation, Pantech cited to “TS 36.300” to support the “plain and ordinary meaning” of “RAP” and “TA value” received in a “RAR.” *See* Ex. 1016, ¶42; Ex. 1018, 3-4; Ex. 1022, 46:12-47:17.

D. Grounds 5-8: Grounds 1-4 in further view of Fan (Claim 3)

Claim 3 requires a “transceiver” and “controller” ([3.a]-[3.d]). As discussed above in Grounds 1 and 2 (§§IX.A-IX.B), these claim elements are disclosed or rendered obvious by **Tenny** (Ground 1) and rendered obvious by **Qualcomm in view of TS36.331** (Ground 2). To the extent further disclosure is required for the claimed “transceiver” and “controller,” **Fan** provides explicit teachings of transceivers and controllers. Weide, ¶189.

Similar to Tenny and Qualcomm, **Fan** discloses a “UE” that performs “Random Access (TA) procedure” in an “LTE-A” network, which involves “select[ing] a CC,” “transmit[ting] a preamble sequence on that CC” using a “Random Access Preamble,” and “receiv[ing] the Random Access response” including a “timing advance (TA) command.” *See, e.g.*, Fan ¶¶38-39, 53, 67, 85, 99, 109, 113, 122, 143; Weide, ¶¶190-91. Furthermore, as shown below in Figure 2A, **Fan’s** “UE 10” comprises “a controller, such as a computer or a data processor (DP) 10A” and a “radio frequency (RF) transceiver 10D for bidirectional wireless communications with the eNB 12.” Fan ¶95, Fig. 2A; Weide, ¶190. The “controller” is “configured to operate with a wireless receiver and wireless transmitter,” such as a transceiver. Fan, ¶¶141, 146; Weide, ¶190.

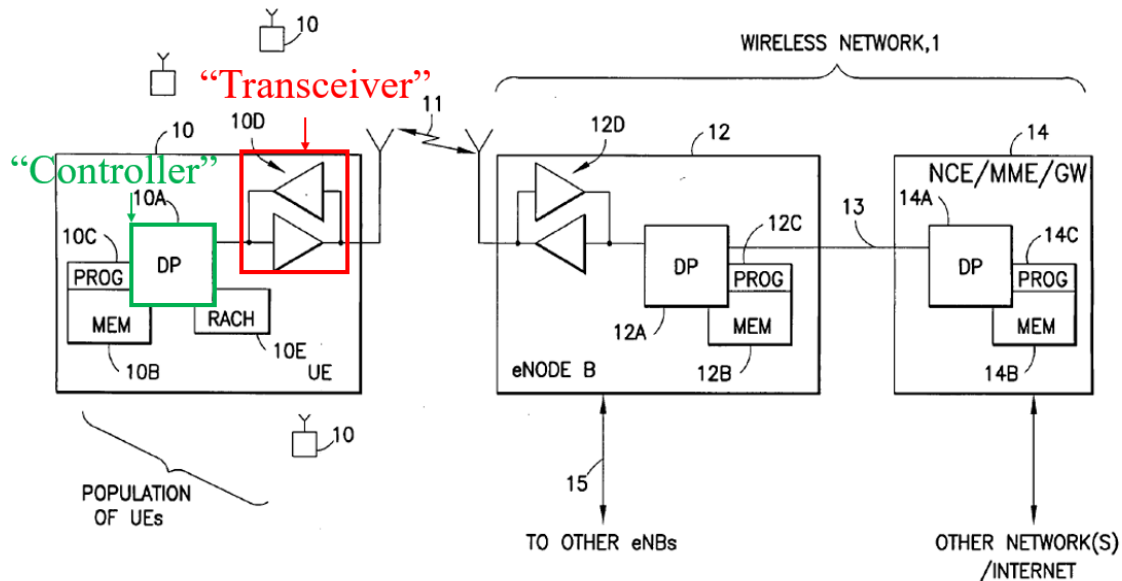


FIG.2A

Like Tenny, Qualcomm, TS36.331, TS36.300, **Fan** is analogous art because it is in the same field as the '545 and is reasonably pertinent to the alleged problems identified in the '545 of providing a “scheme for effective synchronization in a wireless communication.” *See, e.g.,* '545, 1:38-43; Fan, ¶¶48, 67; Weide, ¶192.

A POSITA would have been motivated to implement **Tenny's** and **Qualcomm's** UEs according to **Fan's** teachings of a UE that includes a “transceiver” and “controller” that perform random access functionalities in an LTE network to advantageously enable both **Tenny's** and **Qualcomm's** UEs to perform a “random access” procedure to maintain UL synchronization in an LTE network. Tenny-Prov. ¶¶37, 40, AppxA(Fig. 1, 1:1-3, 1:21-23, 1:29-32); Qualcomm, 1-3, Fan, ¶¶95, 141, 146, Fig. 2A; Weide, ¶193. Because transceivers and controllers are

standard components used by mobile devices to transmit, receive, and process information, a POSITA would have had a reasonable expectation of success using **Fan’s** transceiver and controller in implementing **Tenny’s** teachings (optionally in view of **TS36.300**) and **Qualcomm’s** teachings (in view of **TS36.331** and optionally in view of **TS36.300**)— at minimum rendering obvious the elements reciting a “transceiver” or “controller.” Weide, ¶194.

X. SECONDARY CONSIDERATIONS

There is no evidence in the ’545’s prosecution history or elsewhere supporting any secondary considerations arguments, or evidence of nexus to any challenged Claim. *See generally* ’545FH; Weide, ¶195. Indeed, as demonstrated by the prior art referenced herein, any purported solutions to problems or unexpected results in the ’545 were already well known. Weide, ¶195. To the extent PO asserts the existence of any secondary considerations in its responses, Petitioner reserves the right to address any such evidence.

XI. CONCLUSION

Substantial, new, and noncumulative technical teachings have been presented for ’545 Claims 2-3, which are obvious for the reasons set forth above. Weide, ¶¶196-202. There is a reasonable likelihood that Petitioner will prevail as to the Claims. *Inter partes* review of Claims 2-3 is accordingly requested.

Respectfully submitted,

Dated: August 11, 2023

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CERTIFICATE OF COMPLIANCE

Pursuant to §42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,854,545 contains, as measured by the word-processing system used to prepare this paper, 13,960 words. This word count does not include the items excluded by §42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: August 11, 2023

By: /Daniel W. Richards/
Name: Daniel W. Richards
Registration No. 69,652
Counsel for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on August 11, 2023, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,854,545 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

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A courtesy copy was also sent via electronic mail to the Patent Owner's litigation counsel at the following addresses:

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