

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner

v.

ASUS TECHNOLOGY LICENSING INC.,
Patent Owner.

IPR2024-01036
Patent No. 11,291,052

**PETITION FOR *INTER PARTES* REVIEW OF
CLAIMS 1, 5, 7-8, 12, AND 14 OF U.S. PATENT 11,291,052**

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TABLE OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 11,291,052 (“the ’052 patent”)
1002	File history of U.S. Patent No. 11,291,052 (“052FH”)
1003	Declaration of Michael A M Davies
1004	U.S. Patent App. Pub. 2018/0343682 A1 to Tang et al. (“Tang”)
1005	U.S. Patent App. Pub. 2012/0147830 A1 to Löhr et al. (“Löhr”)
1006	U.S. Patent No. 10,743,350 to Tirronen et al. (“Tirronen”)
1007	U.S. Provisional Patent App. No. 62/232,743 (“Tirronen-Prov”)
1008	File history of European Patent Application No. EP17183827.9 (“EPFH”)
1009	File History of U.S. Patent App. No. 15/663,674 (“674FH”)
1010	File History of U.S. Patent App. No. 17/673,985 (“985FH”)
1011	3GPP TS 36.321 v13.2.0 (2016-06) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 13) (July 07, 2016)
1012	3GPP TS 36.321 v8.5.0 (2009-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) Medium Access Control (MAC) protocol specification (Release 8) (March 23, 2009)
1013	3GPP TS 36.213 v13.2.0 (2016-06) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 13) (June 30, 2016)

Exhibit	Description
1014	3GPP TS 36.300 v13.2.0 (2015-12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 13) (January 11, 2016)
1015	U.S. Patent App. Pub. 2016/0366705 A1 (“Mujtaba”)
1016	U.S. Patent App. Pub. 2007/0268812 A1 (“Yoon”)
1017	U.S. Patent App. Pub. 2017/0111933 A1 (“Wu”)
1018	U.S. Patent App. Pub. 2010/0177675 A1 (“Ai”)
1019	3GPP TS 36.321 v13.2.0 (2016-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 13) (July 7, 2016)
1020	Certified Translation of International Patent Application Publication No. WO2017/132848 (“Tang-PCT”) with copy of original PCT application
1021	3GPP TS 36.211 v13.2.0 (2016-06) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) (July 01, 2016)
1022	Samsung <i>Sotera</i> Stipulation letter regarding IPR grounds in District court litigation

TABLE OF AUTHORITIES

Cases

<i>Advanced Bionics LLC v. Med-EL Elektromedizinische Geräte GMBH</i> , IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020)	20
<i>Apple Inc. v. Fintiv, Inc.</i> , IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020).....	19, 20
<i>Apple Inc. v. Motorola, Inc.</i> , 757 F.3d 1286, (Fed. Cir. 2014)	15
<i>Becton Dickinson & Co. v. B. Braun Melsungen AG</i> , IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017)	20
<i>Constant v. Advanced Micro-Devices, Inc.</i> , 848 F.2d 1560 (Fed. Cir. 1988)	5
<i>Hulu LLC v. SITO Mobile R&D, LLC</i> , IPR2021-00298, Paper 11 (May 19, 2021)	19
<i>Qualcomm Inc. v. Apple Inc.</i> , 24 F. 4th 1367 (Fed. Cir. 2022)	5

I. Introduction

Samsung Electronics Co., Ltd. (“Petitioner”) hereby seeks *inter partes* review of claims 1, 5, 7-8, 12, and 14 (the “Challenged Claims”) of U.S. Patent No. 11,291,052 (Ex-1001, the “’052 patent”).

II. Mandatory Notices Under 37 C.F.R. §42.8

A. Real Party-in-Interest Under 37 C.F.R. §42.8(b)(1)

Petitioner certifies that the real parties-in-interest are Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Samsung Research America.

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

The ’052 patent is currently the subject of pending litigation involving Petitioner: *Asus Technology Licensing Inc. et al. v. Samsung Elecs. Co. Ltd. et al.*, Case No. 2:23-cv-00409 (E.D. Tex.) (the “Asus Litigation”).¹ Petitioner is not aware of any other matters involving the ’052 patent.

C. Lead and Back-up Counsel Under 37 C.F.R. §42.8(b)(3) and Service Information under 37 C.F.R. §42.8(b)(4)

Petitioner designates the following lead and back-up counsel:

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¹ Asus filed an amended complaint on March 11, 2024, at which time Asus first asserted the ’052 patent.

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Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, 1144 15th St., Suite 3300, Denver, CO 80202. Petitioner also consents to and prefers electronic service by emailing Samsung-ASUS-IPRs@gtlaw.com and counsel of record.

III. Word Count

Petitioner certifies this Petition is 13,887 words, as counted by the word-processing program (Microsoft Word for Office 365) used to generate this Petition (excluding the table of contents, table of authorities, mandatory notices, certificate

of service, and this certificate). This Petition complies with the 14,000 word limit (37 C.F.R. §42.24(a)(1)(i)).

IV. IPR Eligibility and Fees

Petitioner certifies under 37 C.F.R. §42.104(a) that the '052 patent is available for IPR and Petitioner is not barred or estopped from requesting cancellation of the Challenged Claims on the grounds identified below.

Ground	'052 Patent Claim	Basis
Ground 1	1, 5, 7-8, 12, and 14	Rendered obvious by Tang (Exs-1004 and 1020) alone and/or in view of Löhr (Ex-1005)
Ground 2	1, 5, 7-8, 12, and 14	Anticipated and rendered obvious by Tirronen (Ex-1006)

The IPR Petition fee and any necessary additional fees may be charged to Deposit Account No. 50-2638.

V. The '052 Patent

A. General Overview

The '052 patent relates to random access procedures in 3GPP networks. (Ex-1001 at 1:42-54.) Such networks typically employ user equipment (“UEs”) like mobile phones, network elements like base stations (“BSs” or “eNBs”), and an air interface. (Ex-1001 at 1:32-40.) At the time, the “3GPP standards organization” was considering proposed changes to predecessor networks (e.g., 4G/LTE networks) for

5G. (Ex-1001 at 1:32-40; *see id.* at 2:34-61 (referencing prior art 3GPP standards including LTE, and incorporating documents by reference).)

Random access procedures for user equipment (“UEs”) in a network were admittedly known. For example, the ’052 patent describes the well-known LTE contention-based random access procedure:

“The contention random access procedure consists of 4 steps, including: Msg1, Msg2, Msg3, and Msg4. FIG. 5 is an exemplary embodiment for the contention random access.” (Ex-1001 at 8:32-35.)

FIG. 5 of the ’052 patent is labeled “PRIOR ART” and reproduced below. To facilitate review, Petitioner uses yellow, pink, and blue highlighting to refer to the first (Msg1), second (random access response, RAR, or Msg2), and third (Msg3) messages in random access procedure figures, as below:

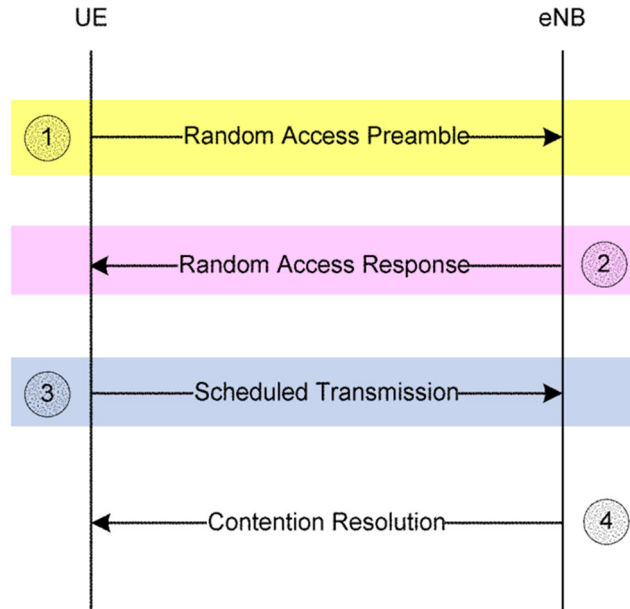


FIG. 5 (PRIOR ART)

(Ex-1001 at FIG. 5 (annotations by Petitioner²).) LTE’s contention-based procedure is applicant-admitted prior art (“AAPA”³), and comprised the same basic steps

² Highlighting herein is Petitioner’s unless otherwise noted.

³ *Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367, 1375 (Fed. Cir. 2022) (“We have held that it is appropriate to rely on admissions in a patent’s specification when assessing whether that patent’s claims would have been obvious in an *inter partes* review proceeding.”); *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988) (“A statement in the patent that something is in the prior art is binding on the applicant and patentee for determinations of anticipation and obviousness.”)

recited in the Challenged Claims: the UE's transmission of a "Msg1" preamble to a base station ("eNB"), the UE's reception of a "Msg2" "random access response" ("RAR") from the base station, and the UE's UL transmission of a "Msg3" to the base station. (*Id.* at 8:31-35.)

The AAPA also contemplated using different transmission time intervals ("TTI") to reduce latency:

"On the other hand, a dynamic TTI adjusting concept is discussed in 3GPP R2-163445, which proposes to set the TTI size per scheduling grant for optimizing TCP (Transmission Control Protocol) transmission case. In particular, short TTI can be used to accelerate TCP slow start process, and long TTI can be used in steady transmission rate state for reduc[ing] control signaling overhead."
(*Id.* at 8:42-48.)

The '052 patent focuses on using such different TTI lengths in a specific context (random access):

"The present application further discusses whether it can also be used to accelerate random access procedure and how to achieve dynamic TTI change in random access. The following discussion mainly focuses on the Msg3 transmission step in a random access procedure." (*Id.* at 8:49-54.)

(*See also* Ex-1001 at Claim 1; §§V.C, VIII.)

B. Effective Filing Date

The '052 patent claims priority to a provisional application filed July 28, 2016. (Ex-1001, (60).) Petitioner applies this date herein without taking a position on the '052 patent's priority claim.

C. Prosecution History

Petitioner discusses the prosecution of four applications below: (1) U.S. Patent Application Nos. 15/663,674 (Ex-1009, the "674FH"); (2) 16/052,505 (Ex-1002-052FH); (3) 17/673,985 (Ex-1010, the "985FH"), and (4) European Patent App. No. EP17183827.9 (Ex-1008-EPFH).

1. Parent Prosecution (Ex-1009)

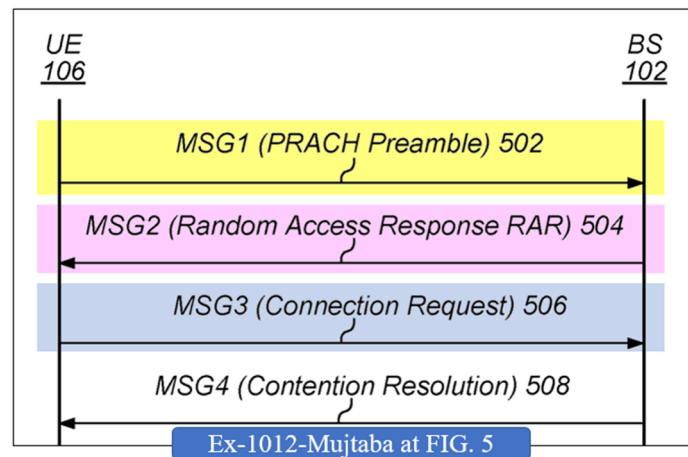
The '052 patent is a Division of Application 15/663,674.⁴ The originally-filed claims set forth in the 674FH are closely related to the Challenged Claims. (*Compare* Ex-1009 at 39 (claim 8) *with* Ex-1001 at claim 1.)

In a first action, the applicant was required to elect one of eight "patentably distinct species" as reflected in FIGS. 12-19. (Ex-1009 at 119-23.) The applicant responded by recharacterizing the application as containing two species, with claims 1-7 and 16-20 representing "Specie I" and the other claims representing "Specie II." (*Id.* at 127.) The applicant elected Specie I and withdrew Specie II; Specie II would

⁴ As explained herein, the '674 application was abandoned.

be prosecuted in the application that would become the '052 patent (discussed below).

Next, the examiner rejected all elected claims as anticipated by Mujtaba (US2016/0366705, Ex-1015). (Ex-1009 at 134-38.) Mujtaba discloses the conventional random access procedure depicted in the '052 patent's "prior art" FIG. 5:



(Ex-1015-Mujtaba at FIG. 5.)

In response, the applicant argued that Mujtaba used TTI bundling "to transmit a transport block (TB) multiple times in consecutive subframes," and that applicant's claims were different because they used "dynamic TTI concept to improve resource efficiency for the transmission." (*Id.* at 154-55.)

The examiner was unpersuaded and again rejecting the claims as anticipated by Mujtaba. (*Id.* at 194-200.) The examiner continued to rely on Mujtaba's TTI disclosures. (*Id.* at 197-99.)

The applicant responded by amending the claims to replace “TTI information” with “numerology”/“numerologies.” (*Id.* at 245-52.) The applicant argued that Mujtaba’s TTI information related to TTI bundling while the applicant’s claims referred to the TTI “of one transmission and the numerology concept.” (*Id.* at 251.)

The examiner then rejected all claims over Mujtaba in view of Yoon (US2007/0268812, Ex-1016). (*Id.* at 327-32.) The examiner stated that Mujtaba does not “explicitly teach...numerology for a message,” but argued that it was obvious to combine Mujtaba with Yoon, which discloses that “a message can contain information of numerology.” (*Id.* at 329.)

The applicant responded by amending the claims to require that the UE receive a “dedicated message” from a network, and that the UE’s preamble transmission be “for a random access procedure.” (*Id.* at 343-49.) The applicant also argued that Yoon’s disclosures were not “related random access procedure” and that Mujtaba and Yoon would not be combined. (*Id.* at 348-49.)

The examiner then issued a final rejection over Mujtaba in view of Yoon and Wu (US2017/0111933, Ex-1017). (*Id.* at 357-64.) The examiner relied on Wu⁵ to

⁵ The examiner mistakenly referred to Wu as “Li” in several places in the Final Rejection. (*Id.* at 357-64.)

address the applicant's claim amendments, in particular with respect to a "dedicated message." (*Id.* at 359-62.)

The applicant responded by amending the claims to refer to a specific channel ("PRACH," or "Physical Random Access Channel"). (*Id.* at 378-85.) The applicant argued that the combination of Mujtaba, Yoon, and Wu did not disclose the amended claims. (*Id.* at 383-84.)

The examiner was unpersuaded and again rejected all of the claims over Mujtaba in view of Yoon and Wu. (*Id.* at 394-401.) The applicant never responded and a notice of abandonment issued. (*Id.* at 409.)

2. '052 patent prosecution (Ex-1002-052FH)

In prosecution of the application that resulted in the '052 patent, the examiner⁶ initially issued a restriction requirement. The applicant responded by arguing claims 1-14 belonged to a "Specie 3" and elected that specie for prosecution. (Ex-1002-052FH at 86-92.)

Next, the examiner rejected the claims as obvious over Mujtaba in view of Ai (US2010/0177675, Ex-1018). (*Id.* at 99-103.) The examiner argued that Mujtaba disclosed most limitations of the claims, and relied on Ai for two allegedly missing

⁶ The same examiner (Pagee Fang) examined the '052 patent and its family members.

limitations: the “TTI duration” and “start timing offset” included in the “TTI information.” (*Id.* at 101.)

In response, the applicant made no claim amendments (*id.* at 115-17) and attempted to distinguish Ai from the claims:

“As disclosed in Ai, the BS repeatedly and continuously transmits same TB for a service in different TTIs; and the start offset is for receiving device to determine when to start the reception, rather for reducing transmitting delay for transmission as recited in the claims. Specifically, Ai discloses that a network determines a transmitting offset of its transmission and sends to a UE for UE determining reception timing. In contrast, as disclosed in the present application and recited in the claims, a network determines a transmitting offset of a UE’s transmission and instructs UE to follow the transmitting offset to transmit.” (*Id.* at 118.)

The examiner disagreed, rejected the applicant’s argument, and again rejection the claims based on Mujtaba and Ai. (*Id.* at 126-34.)

The applicant then amended the claims to require transmission of “a single transport block (TB).” (*Id.* at 149-54.) The applicant argued that Mujtaba’s use of TTI bundling “teaches away” from the claims and that Ai was unrelated to random access procedures. (*Id.* at 153.)

The examiner next rejected all claims as obvious over Mujtaba in view of Ai and Löhr (US2012/0147830, Ex-1005). (*Id.* at 162-67.) The examiner relied on Löhr for the “single transport block (TB)” transmission requirement. (*Id.* at 164.)

In response, the applicant cosmetically amended the claims and argued that Ai does not disclose receiving the claimed TTI information in a Msg2, and that Löhr did not disclose the “single TB” transmission. (*Id.* at 194-203.) As it relates to Löhr, the applicant argued:

“Notably, Lohr seems to be silent as to a UE performing a **single (TB) transport block** of Msg3 transmission to a network according to TTI information of a Msg3.

Rather, Lohr seems to provide for a TTI **bundling** mode via which **multiple redundant versions of a transport block** are transmitted.”

(*Id.* at 201 (emphasis applicant’s.))

Applicant was incorrect.⁷ As shown in §IX and in Ground 1 (§X), below, Löhr discloses an indicator that instructs a UE to use TTI bundling (e.g., flag=1) or not (e.g., flag=0). (*E.g.*, Ex-1005-Löhr at 0175, FIG. 10.) As explained herein, when TTI bundling is not used, a single transport block is conventionally used in LTE’s contention-based random access procedure. (Ex-1003-Davies at ¶¶66-69, 130-39.)

⁷ The examiner was not misled by applicant’s erroneous argument, and maintained that Löhr discloses the “single TB” limitation throughout prosecution.

The examiner was unpersuaded, rejected all claims on the same obviousness combination of Mujtaba, Ai, and Löhr, and also rejected the applicant's arguments. (*Id.* at 211-21.)

Following an applicant-initiated interview, the applicant further amended the claims. (*Id.* at 253-59.) The amendments provided that Msg2 and Msg3 related to downlink and uplink transmissions, respectively, and that “the TTI information” be “contained in the Msg2 associated with downlink.” (*Id.* at 255.) These amendments did not impact the scope of the claims: the claim language already required that “a Msg2 containing a TTI (Transmission Time Interval) information of a Msg3,” and Msg2 is a downlink transmission and Msg3 is an uplink transmission. (*See, e.g.*, Ex-1002-052FH at 195, 254; Ex-1003-Davies at ¶94.)

The examiner next rejected the claims on §112 grounds for lack of written description support. (*Id.* at 448-51.) The applicant responded by explaining that reception by a UE related to “downlink” and transmission by a UE related to “uplink,” and requested that the rejection be withdrawn on this basis. (*Id.* at 479-86.) The examiner then issued a final rejection on the same §112 grounds. (*Id.* at 490-94.)

Following an interview and emails, the applicant amended the claims to remove several instances of “associated with downlink” and asked the examiner to withdraw the §112 rejection. (*Id.* at 514-22.)

A Notice of Allowance followed. (*Id.* at 532-34.) The examiner maintained that Mujtaba, Ai, and Löhr disclosed nearly every limitation of the claims, including the “single TB” limitation:

“...Löhr discloses (Figs. 7-15) perform a single (TB) transport block of Msg transmission to the network according to the TTI information of the Msg [0164, 0120, 0183, 0187]. (*Id.* at 533).

The Examiner then allowed the application with generalized references to the applicant’s prior remarks. (*Id.* (referring to the “Applicant’s Arguments/Remarks filed on 08/04/2020 and 11/03/2021”).)

3. Child Prosecution (Ex-1010)

The ’052 patent has one child application, 17/673,985 (Ex-1010, the “985FH”). Like claim 1 of the ’052 patent, original claim 1 of the ’985 application required “TTI information” that “includes a TTI duration of the Msg3” and “a start timing offset of the Msg3.” (Ex-1010 at 40-42.)

Initially, the examiner proposed an unspecified amendment to the claims. (*Id.* at 267.) The applicant declined to implement the amendment. (*Id.*)

Next, the examiner rejected all claims on double patenting grounds, and for being obvious over Mujtaba in view of Ai. (*Id.* at 259-66.)

The applicant never responded to the rejection, and a Notice of Abandonment issued. (*Id.* at 288.)

4. European Prosecution (Ex-1008-EPFH)

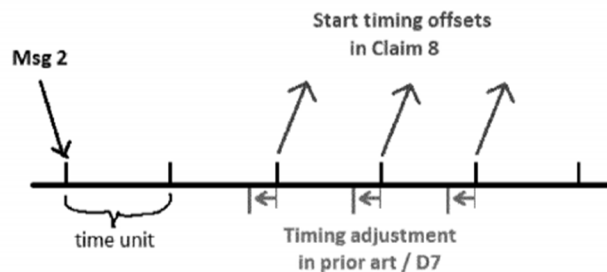
European patent application EP17183827.9 is also related to the '052 patent. (Ex-1008-EPFH at 1.) The '052 patent and this European patent application claim priority to the same priority document, i.e., U.S. Provisional App. No. 62/367,875. (Ex-1008-EPFH at 2.) The provisional is included in the European file history. (*Id.* at 67-109.) Accordingly, Patentee's statements made during prosecution of this European patent are informative as to construction of like terms in the '052 patent. *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1312-13 (Fed. Cir. 2014) (finding District Court properly relied on patentee statements made during prosecution of foreign family member with common specification).

The most pertinent portion of the European prosecution begins with the applicant's December 11, 2018 response to an August 15, 2018 Office Action; then-pending European claim 8 resembles Challenged Claim 1 but did not include the "single TB" limitation. (Ex-1008-EPFH at 155; *id.* at 159 (showing amendments to then-pending claim 8); Ex-1001 at Claim 1.) In an Office Action, the EPO explained that random access procedures involving receiving TTI information relating to a variable TTI length and transmission timing adjustments for a Msg3 were known in the art. (Ex-1008-EPFH at 164-70.)

Applicant responded by arguing that there is a difference between a "timing adjustment" in the prior art and the "start timing offset" set forth in the claims. (*Id.*

at 171-74.) The applicant argued that its “start timing offset” referred to the time unit in which a Msg3 transmission should start (e.g., the slot or symbol), while the “timing adjustment” was a different, “small/tiny adjustment at a specific known time unit,” as shown in the figure below:

Section 2.2 of D7 indeed mentions sending a **timing adjustment** for the UL-SCH transmission in the Msg2. However, said “**timing adjustment**” of D7 cannot be deemed the same as the “**start timing offset**” as claimed in the presently filed new claim 1 of the present application. The reason is that the “**start timing offset**” of the invention is used for the UE to know at which time unit (e.g. slot, symbol, etc.) the Msg3 should be started to send, whereas the “**timing adjustment**” mentioned in section 2.2 of D7 is used for the UE to know how much small/tiny adjustment at a specific known time unit should be done for sending the Msg3. Below is an illustration for showing the difference between the two terms:



(*Id.* at 172.)

The European prosecution history subsequently includes “minutes of an e-mail discussion” between the applicant and EPO representatives. In a September 1, 2020 email, the EPO indicated that the applicant’s arguments and amendments—including arguments related to the “timing adjustment” identified above—were unpersuasive. (*Id.* at 198.) The EPO viewed “starting timing offset” to be fairly broad, and even if interpreted narrowly as requested by the applicant, prior art 3GPP technical specifications disclosed the concept. (*Id.* (citing Ex-1013-36.213 at §6.1.1

In response, the applicant stated:

The applicant gave an example where “start timing offset=7” and “TTI duration=5.”

“In the above example, the UE receives the Msg2 at time unit 2 and the Msg2 carries TTI information of sending Msg3 (i.e. start timing offset=7 and duration=5). Based on the received TTI information, the UE starts sending the Msg3 at time unit 9 (i.e. 2+7) and ends at time unit 13 (i.e. 9, 10, 11, 12, 13 a 5 time units).” (*Id.* at 201-02.)

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subframe thereafter. (*Id.* at 202-03.) The applicant also conceded that the prior art disclosed variable TTI lengths (2ms and 10ms, in particular) but that “according to the invention, the selection of the TTI duration of the Msg3...is not restricted.” (*Id.* at 203.)

The EPO’s response email indicated that the applicant and the EPO were still not in agreement. (*Id.* at 204; *see id.* at 205-16.) The applicant responded by attempting to distinguish over the prior art by arguing:

“[A]ccording to the present invention, two numeric values of time durations are directly indicated in the TTI information for indicating the TTI duration of the Msg3 and the gap period between the Msg2 reception and the Msg3 transmission, respectively.” (*Id.* at 218 (emphasis in original).)

The TTI information set forth in the claims was clarified in a later amendment to refer to this time unit concept:

the TTI information of the Msg3 includes a first number of time units and a second number of time units for indicating a TTI duration of the Msg3 and a start timing offset of the Msg3 gap period between Msg2 reception and Msg3 transmission, respectively.

(*Id.* at 226.)

The EPO subsequently issued an “Intention to grant.” (*Id.* at 340.)

D. The Challenged Claims

Petitioner challenges claims 1, 5, 7-8, 12, and 14, of which claims 1 and 8 are independent.

VI. Discretionary Denial is Unwarranted

A. 35 U.S.C. §314(a) Does Not Favor Denial

In *Apple Inc. v. Fintiv, Inc.*, the Board enumerated six factors to determine whether a petition should be discretionarily denied institution under §314(a). IPR2020-00019, Paper 11 at 2-3 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). In June 2022, the USPTO issued updated guidance and expressly noted that the PTAB will not discretionarily deny institution when, as here, Petitioner presents a *Sotera* stipulation. (Ex-1022.) *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential). For this reason alone, the Board should not discretionarily deny this petition.

The *Fintiv* factors also favor institution. Factor 1 (stay) is neutral because Samsung has not yet moved for a stay. *Hulu LLC v. SITO Mobile R&D, LLC*, IPR2021-00298, Paper 11 at 10-11 (May 19, 2021).

Factor 2 (proximity) does not weigh against institution in view of the *Sotera* stipulation referenced above. Petitioner is filing this Petition in June 2024, which suggests a final written decision around December 2025, which is approximately three months after the trial date in the Court’s current scheduling order.

Factor 3 (investment) heavily favors institution. The Court has not issued any orders regarding the ’052 patent, claim construction has not occurred, and the

invalidity contentions are not due to be served until July 2, 2024. *See Fintiv*, IPR2020-00019, Paper 11 at 10.

Factor 4 (overlap) heavily favors institution. Petitioner's *Sotera* stipulation (Ex-1022) obviates the risk of overlap, as noted above.

Factor 5 (same parties) does not weigh against discretionary denial, because the parties in this IPR are the same as in the Asus Litigation. *See Fintiv*, IPR2020-00019, Paper 11 at 13-14.

Factor 6 (merits) heavily favors institution. The compelling merits of Petitioner's arguments herein warrant institution because the Challenged Claims are unpatentable over references that were not considered by the Office during prosecution.

B. 35 U.S.C. §325(d) Does Not Favor Denial

Non-institution under §325(d) would be improper in view of the *Advanced Bionics* framework and the *Becton Dickinson* factors. *See Advanced Bionics LLC v. Med-EL Elektromedizinische Geräte GMBH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential); *Becton Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017) (precedential).

The primary references of Petitioner's Grounds (Ex-1004-Tang & Ex-1006-Tirronen) were not before the examiner during prosecution and were not cited by the examiner in any Office Action. (Ex-1001 at 1-2.) The secondary reference—Ex-

1005-Löhr—was relied on by the examiner for the “single TB” limitation discussed above. The applicant never overcame that aspect of the examiner’s rejections, and the examiner continued to maintain that Löhr disclosed the “single TB” limitations of the claims throughout prosecution, including the Notice of Allowance. (Ex-1002-052FH at 532-34.) The examiner was correct to do so, and Petitioner relies on Löhr for the same reason herein. (*See* §X (Ground 1).)

As shown above in §V.C, the examiner relied on Mujtaba, Ai, and several other references without considering the Tang and Tirronen references relied on herein. Two related applications were abandoned over the art cited by the examiner, and the applicant amended the claims to repeat the requirement that “TTI information” is “contained in the Msg2” and that Msg3 “is associated with uplink.” (Ex-1002-052FH at 253-59.) These amendments appeared to be the basis for the examiner’s decision to allow the case, as the examiner’s subsequent rejections related to §112 issues. (*E.g., id.* at 448-51.) The examiner erred in this regard, because these amendments did not change the scope of the claims: the claim language already required a Msg2 “containing a TTI (Transmission Time interval) information of a Msg3)” and Msg3 is by definition an uplink transmission. (Ex-1002-052FH at 253-59; Ex-1001 at FIG. 5 & 8:31-41 (AAPA illustrating that Msg3 in the random access procedure is an uplink transmission from the UE to the network); Ex-1003-Davies at ¶94.) The prior art cited herein remedies the

examiner’s error. Furthermore, the examiner did not have the benefit of the Davies declaration, which explains what a POSITA would have understood from the prior art as of the effective filing date of the ’052 patent. (Ex-1003-Davies at §§IV-XI.) Accordingly, discretionary denial under 35 U.S.C. §325(d) would be improper.

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

A POSITA in the field of the ’052 patent, as of its provisional filing date⁸ of July 28, 2016, would have had at least a bachelor’s degree in electrical engineering, familiarity with the relevant 3GPP standards as of this time, and two years of experience working in a field involving wireless communications. Additional education may serve as a substitute for a lack of experience and vice versa. (Ex-1003-Davies, ¶¶35-47.)

VIII. Claim Construction

Petitioner does not believe any claim constructions are required and interprets the claims at issue in accordance with their ordinary and customary meanings. 37 C.F.R. §41.100(b). However, the Challenged Claims include two terms that were disputed during prosecution— “start timing offset” (limitations 1.2.2 and 8.2.2) and “the UE performs a single (TB) transport block of Msg3 transmission to the

⁸ As explained previously, Petitioner does not concede the ’052 patent is entitled to claim priority to its provisional application.

network” (limitations 1.3 and 8.3). Accordingly, Petitioner provides a brief explanation regarding these terms below.

The European Prosecution (§V.C.4) shows that the applicant believed the “inventive concept” pertained to an explicit inclusion of TTI “time unit” information in Msg2, specifically, the TTI duration and start timing offset between Msg2 reception and Msg3 transmission. (Ex-1008-EPFH at 201.) This issue is also briefly addressed below.

A. “start timing offset”

The “start timing offset” phrase appears in claims 1 and 8 and requires “a start timing offset of the Msg3.” This phrase refers to when a UE can begin transmitting Msg3 after receiving Msg2:

“Msg3 start timing offset—In LTE, there is a fixed gap period between Msg2 reception and Msg3 transmission. The fixed gap period is designed for covering UE’s Msg2/3 processing time (e.g., decode, (de-)multiplexing transport block). However, in [New Radio/radio access technology], some possible methods can bring benefits to reduce such fixed gap period. For example, if short TTI is applied to both Msg2/Msg3 transmissions as FIG. 11, the minimum of the fixed gap between Msg2 and Msg3 can be set to short TTI. Otherwise, the minimum gap could only be set to normal sub-frame length like without short TTI case. ...As a conclusion, we think that it could be beneficial for network be capable to decide the length of gap period. For achieving the concept, a UE will need to

know the gap information (or called Msg3 start timing offset) by information provided from network. The possible solutions are listed below.” (Ex-1001 at 13:60-14:10.)

“The Msg3 start timing offset can be indicated in TTI duration, numerology, symbol, slot, microsecond, millisecond or N times of periodicity of periodic behavior. N can be an integer or a decimal number.” (Ex-1001 at 18:48-52.)

“[T]he ‘start timing offset’ of the invention is used for the UE to know at which time unit (e.g. slot, symbol, etc.) the Msg3 should be started to send.” (Ex-1008-EPFH at 172.)

(See also Ex-1003-Davies at ¶¶59-65 (explaining the “start timing offset” of Msg3 as per the ’052 patent).) Additionally, during prosecution of the related Europe patent, the European examiner argued that a conventional “Timing Advance Command” (“TAC”) of a conventional LTE RAR message disclosed the claimed “start timing offset;” the applicant disagreed, but was unable to convince the examiner and ultimately amended the claims. (§V; Ex-1008-EPFH at 164-74, 198-226.) Petitioner takes no position on this issue herein, as Petitioner’s Grounds do not rely on the conventional TAC for the “start timing offset” limitations, and the prior art cited herein disclose and render obvious a “start timing offset” under any reasonable construction of the term.

B. “a single (TB) transport block of Msg3 transmission to the network”

The phrase “single TB” appears in both independent claims. As noted above, the “single (TB) transport block” language was added during prosecution in an attempt to distinguish over TTI bundling. (Ex-1002-052FH at 149-54.) Specifically, the applicant argued that Mujtaba’s bundling, in which its UEs send the same TB “with different error detection and correction bits in 4 consecutive TTIs (represents four TTI lengths)” “teaches away from the intention of reducing transmitting delay for Msg3 transmission....” (Ex-1002-052FH at 153 (emphasis applicant’s).) The applicant further argued that the claimed “single TB” reduced transmission delays because the UE could send one Msg3 transmission and then start monitoring for Msg4 responses:

“In contrast, as recited in claims 1 and 8, if a single transport block (TB) is used for Msg3 transmission, the average random access latency could be reduced due to early start to monitor Msg4.” (*Id.* (emphasis applicant’s); see Ex-1003-Davies at ¶¶66-67.)

The applicant confirmed that its “single TB” requirement was added to distinguish over TTI bundling in response to the examiner’s next rejection, where the applicant highlighted the examiner’s reliance on the Löhrr reference and argued:

“Notably, Lohr seems to be silent as to a UE performing a single (TB) transport block of Msg3 transmission to a network according to TTI information of a Msg3.

Rather, Lohr seems to provide for a TTI **bundling** mode via which **multiple redundant versions of a transport block** are transmitted.”

(Ex-1002-052FH at 201 (emphasis applicant’s).)

These statements mischaracterize Löhr,⁹ but are consistent with the applicant’s position that the “single TB” phrase distinguishes its claims from TTI bundling. (See Ex-1002-052FH at 200-201; Ex-1003-Davies at ¶¶68-69.)

In sum, the “single TB” phrase described by the applicant during prosecution appears to refer to transmitting one transport block (TB) to facilitate immediate monitoring for a Msg4 response. (Ex-1003-Davies at ¶¶70-72.) A POSITA would interpret a “single TB” in view of the applicant’s arguments as precluding transmission of two or more “bundled” TBs in consecutive TTIs; doing so would delay the UE’s ability to receive a Msg4 response. (*Id.* at ¶¶70-72.)

The ’052 patent does not describe the “single TB” requirement of the claims. The word “single” is used once in the specification in reference to an antenna, and the specification is generally silent regarding the single TB versus TTI bundling concepts. (Ex-1003-Davies at ¶¶70-72.)

⁹ As described in §§IX-X, Löhr discloses TTI bundling and single TB transmission modes. (E.g., Ex-1005- Löhr at FIG. 10.) It is improper to interpret Löhr as providing only a TTI bundling mode while being “silent” on a single TB mode. (Ex-1003-Davies at ¶69.)

When the applicant added the “single TB” phrase during prosecution, it pointed to FIG. 7 and ¶51 of the patent application (which became 9:9-18 of the '052 patent), reproduced below:

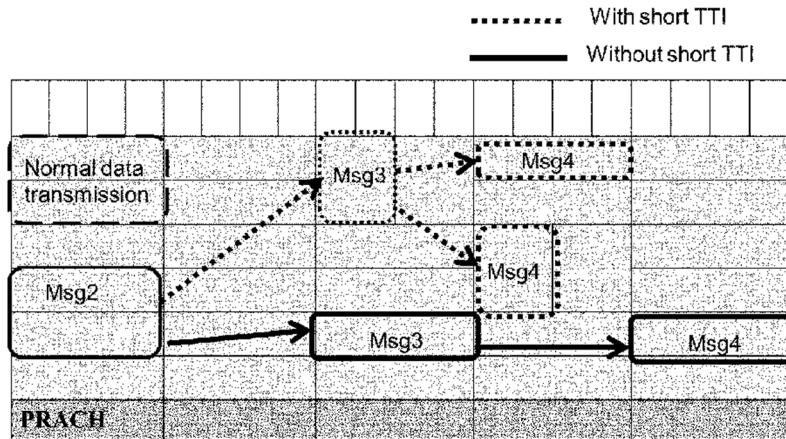


FIG. 7

“If short TTI applies to Msg3 transmission, the average random access latency could be reduced due to early start to monitor Msg4. A possible case for such benefit is shown in FIG. 7. As shown in FIG. 7, although the processing delay is a fixed period, the UE could start to receive Msg4 earlier owing to early Msg3 transmission. Moreover, two possibilities for monitoring Msg4 are shown in FIG. 7. The UE may expect either TTI format if the TTI length information is not be [sic] carried in scheduling control signal. Otherwise, the UE may expect multiple possibilities of TTI length.” (Ex-1001 at 9:9-18.)

These disclosures do not describe the “single TB” phrase, nor does any other portion of the '052 patent. (Ex-1003-Davies at ¶72.) Irrespective of §112 support, the prior art discloses the “single TB” element of the claims, as shown herein.

C. The applicant’s alleged “inventive concept” relative to “time units”

As noted above in §V.C.4, during prosecution at the EPO the applicant argued:

“[T]he inventive concept of the present invention is explicitly including the TTI duration of the Msg3, which is a first number of time units, and the gap period between Msg2 reception and Msg3 transmission, which is a second number of time units, in the Msg2.”
(Ex-1008-EPFH at 201.)

“[A]ccording to the present invention, two numeric values of time durations are directly indicated in the TTI information.” (*Id.* at 218.)

The TTI information set forth in the claims was clarified in amendments so as to refer to this time unit concept:

the TTI information of the Msg3 includes a first number of time units and a second number of time units for indicating a TTI duration of the Msg3 and a start timing offset of the Msg3 gap period between Msg2 reception and Msg3 transmission, respectively.

(*Id.* at 226.)

Petitioner notes the Challenged Claims are different than the European patent claims at least in that the Challenged Claims do not recite the “first/second number of time units” requirements recited by the European patent. Nonetheless, even if the Challenged Claims are read narrowly as Patentee’s arguments to the EPO suggest should be required, Patentee’s alleged inventive concept was already known to a POSITA—the prior art discussed herein discloses TTI information, including both

TTI durations and start timing offsets, in terms of time units such as seconds, symbols, and subframes, all of which are characterized and understood by a POSITA as units of time. (Ex-1003-Davies at ¶¶73-76; Ex-1004-Tang at 0228, 0258-59; Ex-1006-Tirronen at 2:39-47, 11:20-34; Ex-1021-36.211 at page 69, §6.2.)

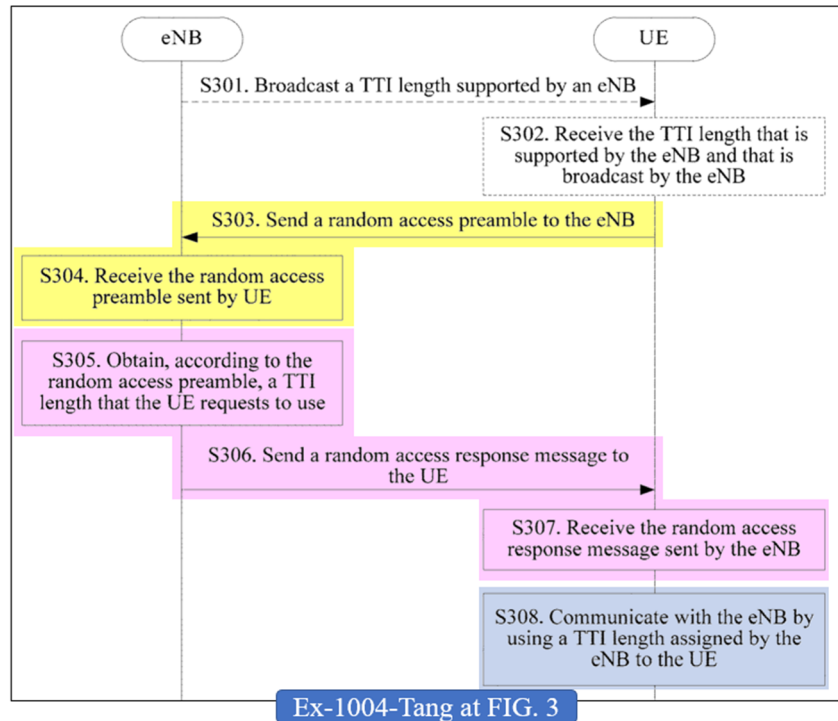
IX. Prior Art Overview

A. Tang (Ex-1004, US2018/0343682 and Ex-1020, WO2017/132848)

Tang is U.S. Patent App. Pub. 2018/0343682, filed August 2, 2018. Tang is a continuation of PCT/CN2016/073234 (published as WO2017/132848, the “Tang-PCT”), filed on February 2, 2016, and thus has an effective filing date at least as early as February 2, 2016, rendering Tang prior art under at least AIA 102(a)(2). *See* 35 U.S.C. §102(d); *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 at 29-32 (March 10, 2023) (precedential). As a continuation of the priority PCT document, Tang is presumptively prior art. Tang-PCT is in Chinese, and Ex-1020 comprises the Tang-PCT and a certified translation of the same. Tang and the translated Tang-PCT describe the same subject matter—indeed, the two documents use the same or virtually the same language throughout the specification. This confirms that the subject matter Petitioner relies on was described in the priority application, as required. *Id.* To facilitate efficient review, Petitioner provides parallel citations to both Tang and the certified translation of the Tang-PCT herein. Both

Tang and Tang-PCT are prior art to the '052 patent and are both cited herein for that purpose. 35 U.S.C. §§102(a)(2) & (d), 122(b), 374; MPEP §901.03.

Tang discloses a random access procedure in FIG. 3, reproduced below.



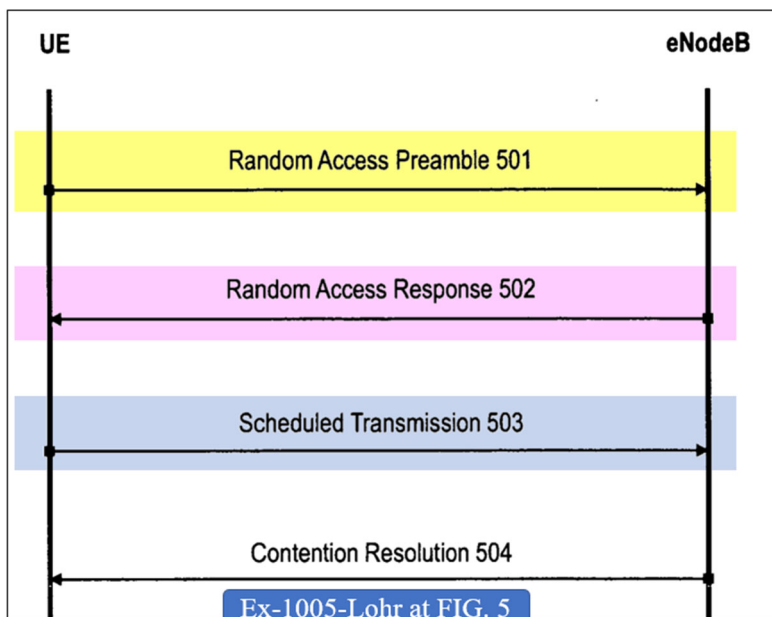
(Ex-1004-Tang at FIG. 3; Ex-1020 at FIG. 3; *see* Ex-1004-Tang at 0244-71; Ex-1020 at 24:29-28:19.) As shown and described, a UE transmits a random access preamble to an eNB (Step S303, yellow), receives a random access response (“RAR”) message with a UL grant (*see* FIG. 5) that includes a TTI length and subframe start location information, where the subframe start location information includes a start subframe number and a symbol index in a subframe (Steps 305-307, pink), and then the UE responds according to the UL grant (Step 308, blue). (Ex-

1004-Tang at 0244-71; Ex-1020 at 24:29-28:19; *see also* Ex-1003-Davies at ¶¶77-80.)

B. Löhr (Ex-1005, US2012/0147830)

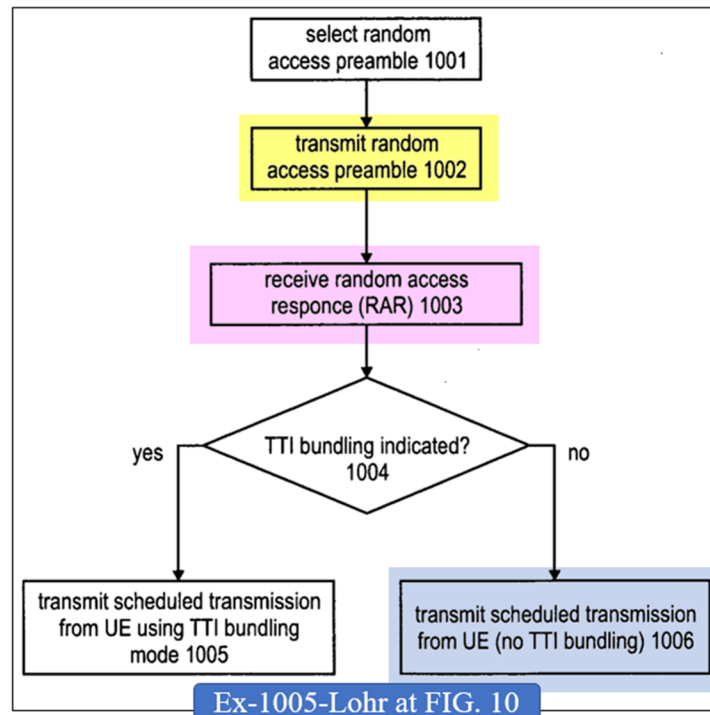
Löhr is U.S. Patent App. Pub. 2012/0147830, filed June 15, 2010 and published June 14, 2012. Löhr is prior art under at least AIA §102(a)(1).

Löhr generally relates to a random access procedure involving communications between a UE and a network (eNB). (Ex-1005-Löhr at 0001; *see id.* at 0002-06.) Löhr describes LTE's "contention based random access procedure," as set forth in 3GPP TS 36.321 v8.5.0 (Ex-1012), which includes the four conventional random access steps (also referred to as Msg1 through Msg4) discussed in §V and the AAPA:



(Ex-1005-Löhr at FIG. 5; *see id.* at 0032-48 (generally describing the random access procedure).) Löhr discloses using a random access procedure in which the network's RAR/Msg2 instructs the UE to use TTI bundling (or not). (Ex-1005-Löhr at 0175.)

FIG. 10 illustrates an example:



(*Id.* at FIG. 10.) When TTI bundling is not indicated, the UE transmits its Msg3 communication to the network “without TTI bundling, i.e. as a transmission in a single TTI.”¹⁰ (Ex-1005-Löhr at 0175.)

¹⁰ As FIG. 10 and the corresponding text show, the applicant’s argument during prosecution that Löhr is silent as to single TB transmission and was instead limited to TTI bundling was without merit. (*See, e.g.*, Ex-1002-052FH at 201.)

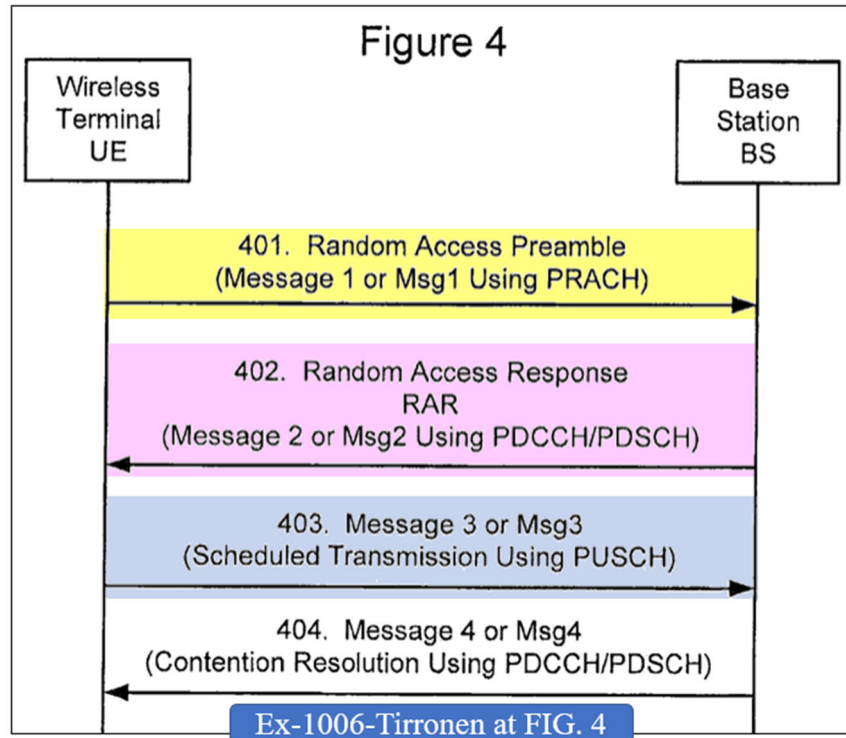
As described in §V.C, the examiner repeatedly cited Löhr during prosecution of the '052 patent in response to the applicant's claim amendments requiring the "single TB" limitation. (*See, e.g.*, Ex-1002-052FH at 149-54, 167-67, 194-203, 211-21, 235-59, 532-34.) The examiner maintained throughout prosecution and in the Notice of Allowance that Löhr—including FIG. 10—disclosed the "single TB" limitation. (*E.g., id.* at 533 (Notice of Allowance stating that "Lohr discloses (Figs. 7-15) perform a single (TB) transport block of Msg transmission to the network according to the TTI information of the Msg [0164, 0120, 0183, 0187]," before allowing the claims based on other arguments.))

C. Tirronen (Ex-1006, US10,743,350) and Tirronen-Prov (Ex-1007, US Provisional App 62/232,743)

Tirronen is U.S. Patent 10,743,350, filed September 8, 2016. Tirronen is entitled to and claims priority to Provisional App. 62/232,743 ("Tirronen-Prov"), filed September 25, 2015. Tirronen-Prov describes the subject matter relied upon in Tirronen for this Ground 2, and does so using the same or virtually the same language as Tirronen.¹¹ Tirronen is thus prior art under at least AIA §102(a)(2) as of its provisional filing date. *Penumbra*, IPR2021-01466, Paper 34 at 32.

¹¹ Petitioner provides parallel citations to Tirronen and Tirronen-Prov herein, which citations show that Petitioner relies on disclosures in Tirronen that are included in Tirronen-Prov.

Tirronen discloses a random access procedure for a UE, including as shown in FIG. 4:



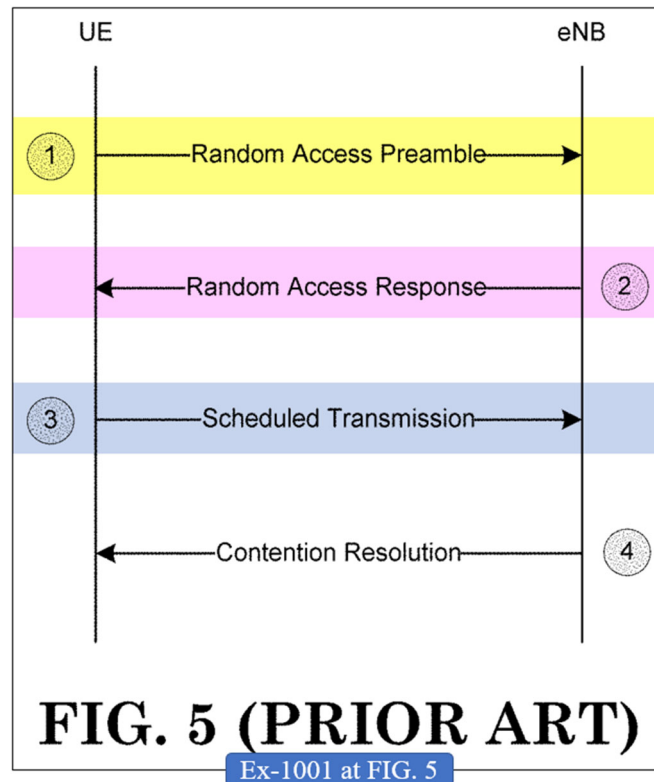
(Ex-1006-Tirronen at FIG. 4; Ex-1007 at FIG. 4.)

Tirronen's process reflects the AAPA's and LTE's prior art random access procedure in which a UE sends a Msg1/preamble to the network (i.e., a BS/eNB) (highlighted yellow), the network responds with a Msg2/RAR containing UL grant information for the UE (highlighted pink), and the UE transmits a Msg3 schedule transmission in accordance with the grant (highlighted blue). (Ex-1006-Tirronen at FIG. 4, 8:58-62; Ex-1007 at FIG. 4, 3:12-14; Ex-1003-Davies at ¶¶86-91.) As explained in Ground 2, Tirronen also discloses that the RAR message contains a TTI

duration and a time location for the UE's Msg3 transmission. (E.g., Ex-1006-Tirronen at 2:39-47, 13:19-35; Ex-1007 at 13:20-27, 7:36-8:3.)

D. Applicant Admitted Prior Art (“AAPA”)

Prior art LTE specifications indisputably disclose a contention-based random access procedure. Patentee admitted that this procedure is outlined in figure 10.1.5.1-1 of 3GPP TS 36.300 v13.2.0 (Ex-1014), which is reproduced as FIG. 5 and labeled “Prior Art” in the '052 patent:



(Ex-1001 at FIG. 5; *see id.* at 2:1-2 (“FIG. 5 is a reproduction of FIG. 10.1.5.1-1 of 3GPP TS 36.300 v13.2.0.”)) The '052 patent describes these prior art steps as follows:

“The four steps of the contention based random access procedures are:

- 1) Random Access Preamble on RACH in uplink:...
- 2) Random Access Response generated by MAC on DL-SCH:...
- 3) First scheduled UL transmission on UL-SCH:
Uses HARQ;
Size of the transport blocks depends on the UL grant conveyed in step 2. ...
- 4) Contention Resolution on DL....” (Ex-1001 at 6:13-7:10.)

The messages associated with each step 1-4 (labeled in the excerpt above and in FIG. 5) are also conventionally called “Msg1, Msg2, Msg3, and Msg4” in LTE. (Ex-1001 at 8:31-41; *see also* Ex-1003-Davies at ¶¶92-95.)

The '052 patent's claims are generally directed to the conventional random access procedure outlined above, plus three known modifications: (1) the RAR/Msg2 includes a TTI duration, (2) the RAR/Msg2 contains a start timing offset, and (3) the UE must perform “a single (TB) transport block of Msg3 transmission.” (*E.g.*, Ex-1001 at claim 1.)

X. GROUND 1: Tang alone and/or in view of Löhr

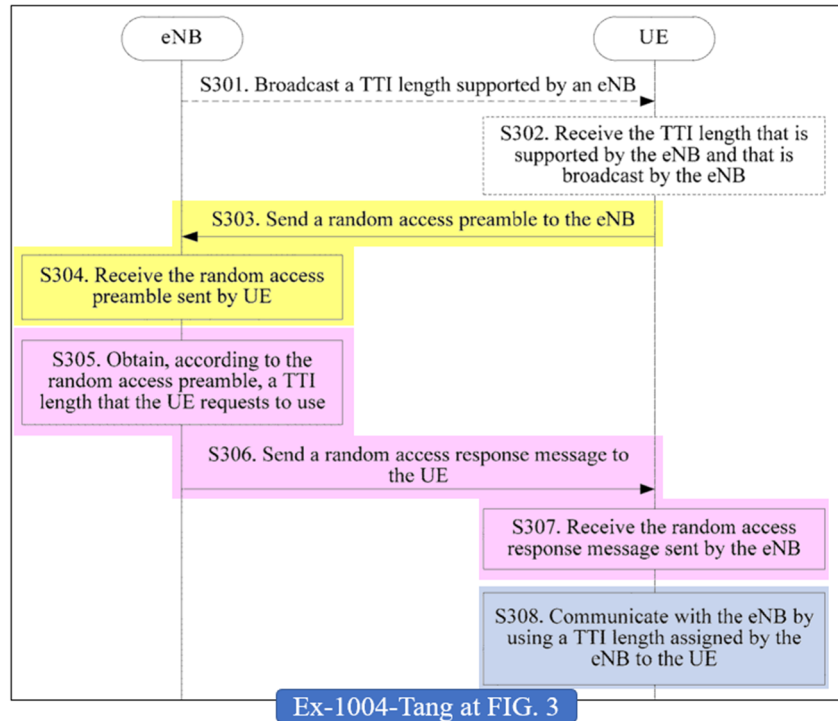
A. Scope, Content, and Rationale for Combining Prior Art

Ground 1 relies on Tang alone and/or Tang in view of Löhr.

Tang is titled “TTI Configuration Method, Device, and System” and discloses the ability to configure different TTI lengths for communications between a UE and

an eNB, including for random access processes. (*See, e.g.*, Ex-1004-Tang at 0001-06, FIG. 3; Ex-1020 at 1:2-28, FIG. 3.) More specifically, Tang discloses a random access process (see FIG. 3) in which a UE transmits (303) a random access preamble (Msg1) to an eNB. (Ex-1004-Tang at 0244-48; Ex-1020 at 24:29-25:6.) The eNB receives the preamble (304), obtains a TTI length that the UE requests to use (305), and then sends (306) a random access response (RAR/Msg2) message comprising an assigned a TTI length. (Ex-1004-Tang at 0252-55; Ex-1020 at 26:5-14.) The TTI length assigned by the eNB may or may not be the TTI length requested by the UE. (Ex-1004-Tang at 0239-42, claim 2; Ex-1020 at 23:30-24:27.) Thus, the eNB makes the determination as to what TTI length will be used and assigns that length when sending Msg2. (Ex-1003-Davies at ¶¶97-100.) As was conventional, Msg2 includes the UL grant that the UE uses for its Msg3 uplink transmission. (Ex-1004-Tang at 0257, 0262-69, FIGS. 4-5; Ex-1020 at 26:18-26, 27:24-28:10, FIGS. 4-5; Ex-1003-Davies at ¶¶94, 97-100.)

The UE receives (307) the RAR message having the assigned TTI length information, and then communicates (308) (Msg3) with the eNB using the TTI length assigned by the eNB. (Ex-1004-Tang at 0270-71; Ex-1020 at 28:11-19.)



(Ex-1004-Tang at FIG. 3 (highlighting Petitioner’s); *see id.* at 0244-71; Ex-1020 at FIG. 3, 24:29-28:19.) As Tang explains, this methodology allows a deviation from the standard TTI length:

“The user equipment requests from the network device to use a TTI length, where the TTI length includes a short TTI, and the network device assigns a corresponding TTI length for the request of the user equipment, **so as to resolve a problem that there is no method for configuring a short TTI.**” (Ex-1004-Tang at 0012; Ex-1020 at 2:10-24.)

According to Tang, a “short TTI” has a duration of less than the 1 ms standard TTI required by LTE. (Ex-1004-Tang at 0004; Ex-1020 at 1:8-17.) To achieve a “short

TTI,” such as 0.1 ms or 0.5 ms, less than a standard number of slots/symbols may be used in the UE-eNB communications:

“To be compatible with a TTI of 1 ms and a short TTI, in the embodiments of the present disclosure, **indications are performed by using different TTI lengths**. A symbol number may be used as a unit of a TTI length. For example, a TTI of 1 ms is divided into two slots, each slot includes seven symbols (ordinary cyclic prefix) or six symbols (extended cyclic prefix). *Therefore, a TTI length of the TTI of 1 ms has a symbol number of 12 or 14, and correspondingly, a TTI length of a short TTI may have a symbol number of two, seven, or the like.* A time length may also be used as a unit of a TTI length. For example, the TTI length of the TTI of 1 ms may be 1 ms, ***and the TTI length of the short TTI may be 0.1 ms, 0.5 ms, or the like.***”
(Ex-1004-Tang at 0228; Ex-1020 at 22:16-24.)

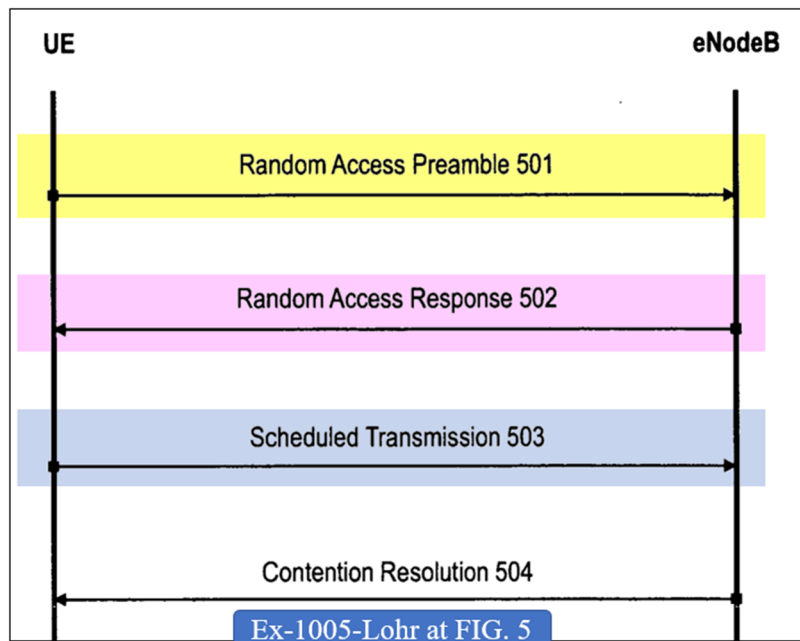
When Tang’s UE sends Msg3, Tang does not state whether the UE would use “TTI bundling” for this transmission, but Tang’s silence on TTI bundling teaches and suggests that Tang was not using TTI bundling, as was conventional. (Ex-1003-Davies at ¶¶101-02.) For example, the standard random access procedure disclosed in Release 13 of the 3GPP standard for LTE expressly notes that “TTI bundling does not apply:”

“For transmission of Msg3 during Random Access (see subclause 5.1.5) **TTI bundling does not apply**. For BL UEs or UEs in enhanced coverage, uplink repetition bundling is used for transmission of Msg3.” (Ex-1011-36.321 at page 30, §5.4.2.1; *see also* Ex-1019-

36.321-v13.1.0 at page 32, §5.4.2.1 (disclosing the same); Ex-1001 at 2:46-61 (incorporating Ex-1019 by reference in its entirety).)

A POSITA would know that a single transport block is used when “TTI bundling does not apply.” In other words, Patentee’s “single TB” phrase is directed to conventional/default behavior, and Tang’s silence with respect to the use of TTI bundling discloses and suggests that such default behavior would have been used and was obvious. (Ex-1003-Davies at ¶102.)

It was also obvious to implement Tang’s devices in view of Löhr’s teachings regarding TTI bundling. In particular, Löhr discloses the conventional random access procedure in FIG. 5:

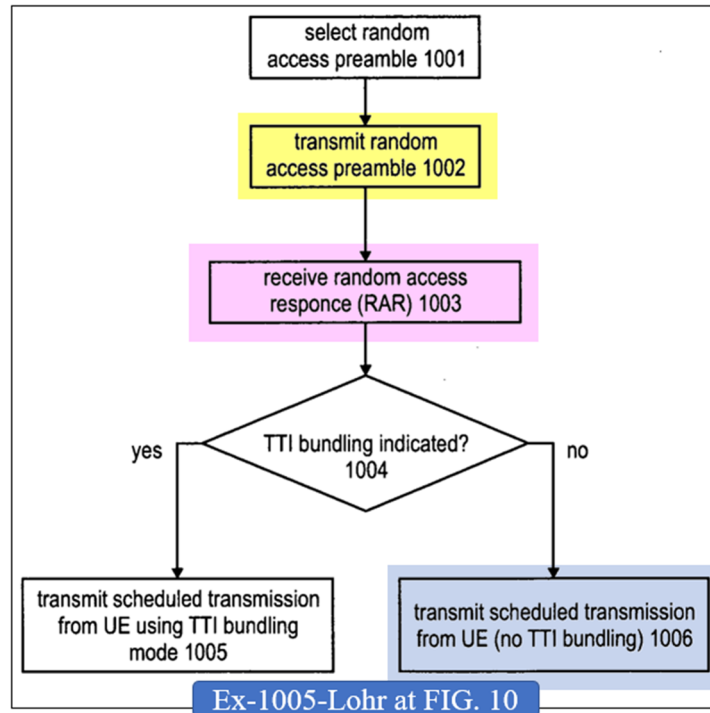


(Ex-1005-Löhr at FIG. 5 (highlighting Petitioner’s); *see id.* at 0041 (noting that a detailed description of LTE’s random access process is found in 3GPP TS 36.321

v8.5.0 [Ex-1012]); *see also id.* at 0041 (noting that “Scheduled Transmission 503” is typically called msg3” in 3GPP TS 36.321.) Löhr also discloses “the operation of a mobile terminal and a base station using an improved random access procedure as described herein will be described in further detail with respect to FIG. 10 and FIG. 11.” (Ex-1005-Löhr at 0174.) Löhr teaches a random access procedure embodiment that includes a TTI bundling indicator in Msg2:

“FIG. 10 shows a flow chart of the exemplary operation of a mobile terminal in a contention based random access procedure according to an embodiment of the invention. [T]he mobile terminal sends 1002 the selected random access preamble to the eNode B to trigger a random access response message from the eNodeB which is received 1003 by the mobile terminal. The random access response message is containing inter alia a resource grant for the first scheduled uplink transmission of the mobile terminal as well as a transmission mode indicator. ... In this exemplary embodiment, the transmission mode indicator is a flag (one bit) that—when set (for example flag=1)—that the mobile terminal should send the scheduled uplink transmission using TTI bundling as described with respect to FIG. 12 previously herein. If the transmission mode indicator is not set (for example flag=0), the mobile terminal is instructed to send the first scheduled transmission without TTI bundling, i.e. as a transmission in a single TTI.” (Ex-1005-Löhr at 0175.)

The flow chart of FIG. 10 is shown below:



(Ex-1005-Löhr at FIG. 10.) As shown, Löhr discloses using the RAR/Msg2 transmission to indicate whether Msg3 is transmitted with or without TTI bundling. (*Id.* at 0174-75, FIG. 10; *see id.* at 0177-78.)

A POSITA would have been motivated and found it obvious to include Löhr's TTI bundling indicator in Tang's RAR/Msg2 transmission. (Ex-1003-Davies at ¶¶103-04.) In particular, Löhr's solution offered desirable flexibility in a communications network by expressly enabling bundling or not using a simple indicator. (*Id.*) Indeed, the 3GPP standard already disclosed that TTI bundling was not used for random access but was used in some scenarios for less capable UEs (e.g., bandwidth limited or enhanced coverage UEs), as noted above. (*Id.* at ¶¶101-02.) Löhr also expressly discloses that TTI bundling was useful in some

circumstances (e.g., to increase the probability of successful decoding while further reducing the retransmission delay when utilizing HARQ for a scheduled transmission). (Ex-1005-Löhr at 0112.) The flexibility disclosed in Löhr was desirable because there were known benefits to bundling in some circumstances while there were benefits to not bundling in other circumstances. (Ex-1003-Davies at ¶¶104-10 (citing, e.g., Ex-1005-Löhr at 0164-65 (explaining that fewer HARQ processes may be needed when using TTI bundling, but roundtrip transmission time would be increased), 0169 (noting that an eNB can instruct UEs to use TTI bundling when at the cell edge, while it may not be necessary to do so at the center of a cell), 0195 (noting that UEs that are incapable of using TTI bundling would not use TTI bundling even if indicated, and would instead use the conventional 3GPP LTE random access procedure).)

A POSITA also would have expected to succeed in implementing Löhr's TTI bundling indicator. UEs were already capable of utilizing TTI bundling in some circumstances, and it would have been trivial to include Löhr's one-bit transmission mode indicator in Tang's Msg2. (Ex-1005-Löhr at 0175.) As Löhr explains:

“[T]he transmission mode indicator is a flag (one bit) that—when set (for example *flag=1*)—that the mobile terminal should send the scheduled uplink transmission using TTI bundling as described with respect to FIG. 12 previously herein. If the transmission mode indicator is not set (for example *flag=0*), the mobile terminal is

instructed to send the first scheduled transmission without TTI bundling, i.e. as a transmission in a single TTI.” (*Id.*)

Mere ordinary skill was needed to add Löhr’s one bit of additional data to Msg2 to enable an eNB to instruct a UE which mode to use. (Ex-1003-Davies at ¶¶111-13.) Indeed, as Tang recognizes, a conventional Msg2 already includes sufficient space for Löhr’s one-bit flag. (Ex-1004-Tang at 0262-69; Ex-1020 at 27:24-28:10.) Enabling this functionality in Tang’s UEs merely required updating eNBs and UEs to send and interpret a simple flag (e.g., 0 or 1), which would have predictably resulted in the UEs being able to send single Msg3 transport block transmissions or bundled Msg3 transmissions, depending on the indicator bit.

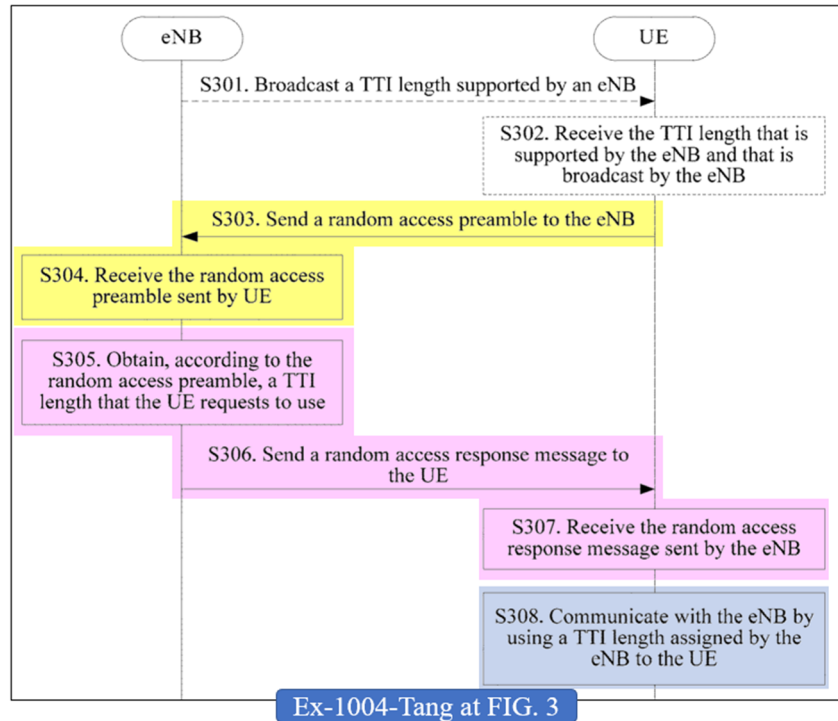
In sum, a POSITA would have understood that Tang’s UE normally did not use TTI bundling for random access communications, and a POSITA further would have been motivated and found it obvious to modify Tang in view of Löhr so that Tang’s UEs could transmit random access Msg3 transmissions in both bundling and non-bundling modes of operation. (Ex-1003-Davies at ¶113.)

B. Challenged Claims

Ground 1 addresses claims 1, 5, 7-8, 12, and 14.

[1.0] A method of a UE (User Equipment) for performing random access procedure, comprising:

Tang teaches the preamble irrespective of whether it is limiting. Specifically, Tang discloses a UE random access procedure, including as disclosed in FIG. 3:



(Ex-1004-Tang at FIG. 3 (highlighting Petitioner’s); *see id.* at 0026, 0244-71 (describing the random access procedure embodiment shown in FIG. 3); Ex-1020 at FIG. 3; *see id.* at 3:19-23, 24:29-28:19.) As shown, Tang discloses a random access procedure for a UE.

Accordingly, Tang teaches the preamble. (Ex-1003-Davies at ¶114.)

[1.1] the UE transmits a preamble to a network;

Tang teaches this limitation. In particular, as shown in the yellow-highlighted “S303” element above, the UE “[s]end[s] a random access preamble to the eNB.”¹²

¹² As Mr. Davies explains, the claimed “network” refers to network elements; “eNB” is conventional shorthand for such elements. (Ex-1003-Davies at ¶¶115-16.)

(Ex-1004-Tang at FIG. 3 & 0248 (“S303. The UE sends a random access preamble to the eNB...”); *see id.* at 0251; Ex-1020 at FIG. 3 & 25:5-6; *see id.* at 25:18-26:4.)

Accordingly, Tang teaches limitation 1.1. (Ex-1003-Davies at ¶¶115-16.)

[1.2] the UE receives a Msg2 containing a TTI (Transmission Timer¹³ Interval) information of a Msg3, associated with uplink, from the network in response to the preamble,

Tang teaches this limitation. Specifically, Tang discloses steps S306-S307 (highlighted pink in Tang’s FIG. 3 above), and these steps disclose receiving a Msg2 (i.e., the “random access response” or “RAR” message) containing TTI information for a Msg3 from the network (“eNB”). (Ex-1004-Tang at FIG. 3 & 0255-70; Ex-1020 at FIG. 3 & 26:10-28:19.) S306 illustrates the network sending the Msg2/RAR transmission to the UE, and S307 illustrates that message’s reception by the UE. (Ex-1004-Tang at FIG. 3 & 0255, 0270; Ex-1020 at 26:10-14, 28:11-19.)

Tang’s RAR message from the network (eNB) to the UE contains TTI information, such as a TTI length assigned by the eNB to the UE and start symbol location information; this information is “associated with uplink” because it is used for the UE’s uplink Msg3 transmission to the network:

¹³ “Timer” in claim 1 appears to be a typographical error, as TTI consistently refers to “Transmission Time Interval” in the ’052 patent and the art. (*See, e.g.*, Ex-1001 at claim 8, 1:47-48, 5:17-18; Ex-1014 at 24.)

“S306. The eNB sends a random access response message (RAR) to the UE, where the random access response message includes TTI indication information, and the TTI indication information includes at least one of the following information: a TTI length assigned by the eNB to the UE, effective moment information, start symbol location information, and enabling confirm information of the TTI length.” (Ex-1004-Tang at 0255; *see id.* at 0253-71 (disclosing Tang’s procedure including the step of using the RAR/Msg2 TTI information in the UE’s Msg3 uplink transmission to the network); Ex-1020 at 26:6-28:19.)

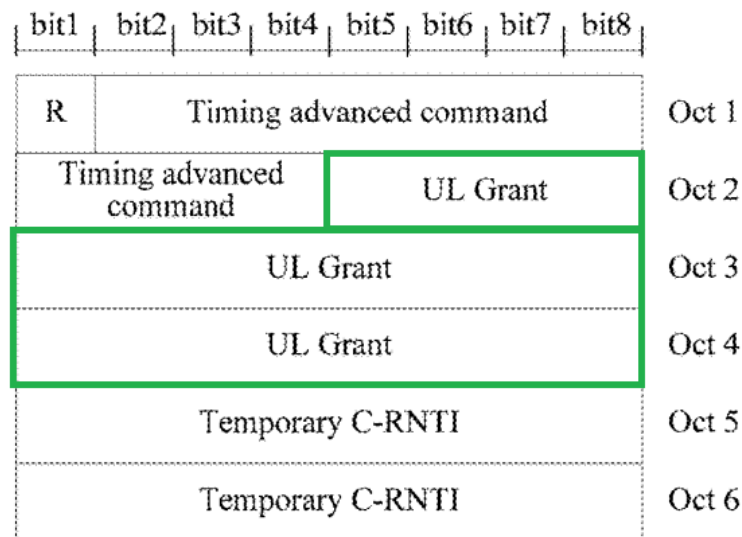


FIG. 5

(Ex-1004-Tang at FIG. 5; Ex-1020 at FIG. 5.)

“FIG . 5 is a schematic structural diagram of a random access response message according to an embodiment of the present disclosure.” (Ex-1004-Tang at 0206; Ex-1020 at 19:9-10).

Accordingly, Tang teaches limitation 1.2. (Ex-1003-Davies at ¶¶117-18.)

[1.2.1] wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes a TTI duration of the Msg3, associated with uplink, and

Tang teaches this limitation. As explained previously, Tang uses short TTIs (less than 1 ms) to achieve benefits such as reduced round trip delay, increased window length at the slow start stage of TCP with increased data throughput, and reduced transmission delays. (Ex-1004-Tang at 0004-05; Ex-1020 at 1:9-24.) Accordingly, Tang discloses adding TTI information, such as an assigned TTI length, to Msg2 (RAR):

“In a system supporting different TTI lengths, a related indication needs to be added to the random access response message, and the related indication may include, but is not limited to, TTI enabling information, a TTI length, and subframe start location information, where the subframe start location information includes a start subframe number and a symbol index in a subframe.” (Ex-1004-Tang at 0258; Ex-1020 at 26:27-32; *see also* Ex-1004-Tang at 0270-71; Ex-1020 at 28:11-19.)

Tang’s “TTI length” is a TTI duration, as its background section confirms. (Ex-1004-Tang at 0003; *see id.* at 0004-05, 0228; Ex-1020 at 1:6-8; *see id.* at 1:9-24, 22:16-24; Ex-1003-Davies at ¶¶119-24.) Specifically, as explained previously, the UE requests a specific, short TTI duration, and the eNB decides what TTI length to assign to the UE in view of that request. (Ex-1004 at 0012 (UE requests a short TTI and “the network device assigns a corresponding TTI length for the request of the

user equipment, so as to resolve a problem that there is no method for configuring a short TTI”), 0239-42 (eNB decides which TTI length to use (the requested one or a different one), 0252-55 (explaining methodology in view of FIG. 3 and sending of Msg2 with the assigned TTI length); Ex-1020 at 2:10-24, 23:30-24:27, 26:5-14.) As explained previously, according to Tang, a “short TTI” has a duration of less than the 1 ms standard TTI required by LTE, and less than a standard number of slots/symbols may be used in the UE-eNB communications to achieve a “short TTI:”

“For example, a TTI of 1 ms is divided into two slots, each slot includes seven symbols (ordinary cyclic prefix) or six symbols (extended cyclic prefix). *Therefore, a TTI length of the TTI of 1 ms has a symbol number of 12 or 14, and correspondingly, a **TTI length of a short TTI may have a symbol number of two, seven, or the like.*** A time length may also be used as a unit of a TTI length. For example, the TTI length of the TTI of 1 ms may be 1 ms, *and the **TTI length of the short TTI may be 0.1 ms, 0.5 ms, or the like.***” (Ex-1004-Tang at 0228; Ex-1020 at 22:16-24.)

Tang further explains that a three-bit sequence indicates one of the eight possible TTI lengths (durations):

“To be compatible with a TTI of 1 ms and a short TTI, in the embodiments of the present disclosure, **indications are performed by using different TTI lengths.** A symbol number may be used as a unit of a TTI length. For example, the TTI enabling information occupies 1 bit, **the TTI length occupies 3 bits (for example, there are**

eight TTI lengths, and optionally, values 1 to 7 respectively correspond to TTIs of lengths of one to seven symbols), and the subframe start location information occupies 4 bits (optionally, used to indicate a start symbol location at which the UE begins to perform data transmission by using an assigned TTI length). Therefore, compared with a random access response message of a TTI of 1 ms in the prior art, there is totally one more byte.” (Ex-1004-Tang at 0258-59; Ex-1020 at 26:27-27:3.)

Because symbols are units of time¹⁴ and the 3-bit sequence indicates how many symbols comprise a TTI, Tang’s TTI length is explicitly defined in terms of time units in the RAR message. (Ex-1003-Davies at ¶¶119-24; *id.* at ¶¶73-76.)

The TTI information in the eNB’s RAR message is then received by the UE:

“S307. The UE receives the random access response message sent by the eNB, where the random access response message includes the TTI indication information, and the TTI indication information includes at least one of the following information: a TTI length assigned by the eNB to the UE, effective moment information, start symbol location information, and enabling confirm information of the TTI length, where the subframe start location information includes a start subframe number and a symbol index in a subframe.”

¹⁴ Ex-1004-Tang at 0228; Ex-1020 at 22:16-24; Ex-1003-Davies at ¶¶119-24; *id.* at ¶¶73-76.

(Ex-1004-Tang at 0270; Ex-1020 at 28:11-17; *see* Ex-1004-Tang at 0271; Ex-1020 at 28:18-19.)

Accordingly, Tang teaches limitation 1.2.1. (Ex-1003-Davies at ¶¶119-24.)

[1.2.2] [wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes] a start timing offset of the Msg3, associated with uplink; and

Tang teaches this limitation. Specifically, in addition to specifying an assigned TTI length, Tang’s TTI information includes starting subframe/symbol location information, which indicates to the UE when it can start sending its Msg3 transmission back to the eNB:

“In a system supporting different TTI lengths, a related indication needs to be added to the random access response message, and the related indication may include, but is not limited to, TTI enabling information, a TTI length, and subframe start location information, where the subframe start location information includes a start subframe number and a symbol index in a subframe. ... the subframe start location information occupies 4 bits (optionally, used to indicate a start symbol location at which the UE begins to perform data transmission by using an assigned TTI length).” (Ex-1004-Tang at 0258-59; Ex-1020 at 26:27-27:3; *see* Ex-1004-Tang at 0270-71; Ex-1020 at 28:11-19.)

“S308. The UE begins to communicate with the eNB at an effective moment and/or a start symbol location by using the TTI length assigned by the eNB to the UE.” (Ex-1004-Tang at 0271; Ex-1020 at 28:18-19.)

Tang discloses the claimed “start timing offset” because Tang’s subframe start symbol location information controls the timing offset (gap) between when Tang’s UE receives the RAR message and when the UE can begin transmitting its scheduled Msg3 transmission in response thereto.¹⁵ (Ex-1003-Davies at ¶¶125-29; §VIII.) Tang also discloses that a subframe start location/symbol occupies 4 bits, which bits are an explicit indication of time units, defined in terms of symbols/subframes, that dictate how long the UE must wait to start Msg3 transmission. (Ex-1004-Tang at 0258-59; Ex-1020 at 26:27-27:3; Ex-1003-Davies at ¶¶125-29; *see also* Ex-1008-EPFH at 172 (characterizing slots of a subframe and symbols as time units).)

Thus, in addition to an assigned TTI length (disclosing 1.2.1), Tang’s RAR/Msg2 may also include “a start timing offset” in the form of “subframe start

¹⁵ As noted in §V.C, Patentee attempted to distinguish start timing offsets from conventional timing advances. (Ex-1008-EPFH at 172 (“the ‘**start timing offset**’ as claimed...is used for the UE to know at which time unit (e.g. slot, symbol, etc.) the Msg3 should be [sic] started to send, whereas the ‘timing adjustment’...is used for the UE to know how much small/tiny adjustment at a specific known time unit should be done for sending the Msg3.”) (emphasis original).) Tang discloses a starting timing offset under Patentee’s interpretation as it discloses the start symbol/subframe location for Msg3. (Ex-1003-Davies at ¶¶125-29.)

location information” dictating when the UE can send a Msg3 transmission back to the network, which information “includes a start subframe number and a symbol index in a subframe” (disclosing 1.2.2). (Ex-1004-Tang at 0258-59 & 0270-71; Ex-1020 at 26:27-27:3 & 28:11-19.)

Accordingly, Tang teaches limitation 1.2.2. (Ex-1003-Davies at ¶¶125-29.)

[1.3] the UE performs a single (TB) transport block of Msg3 transmission to the network according to the TTI information of the Msg3.

Tang alone and in view of Löhr teaches this limitation. As noted above, this limitation appears to be directed to a UE transmitting a Msg3 transmission without TTI bundling. (See §§V.C, VIII.)

Tang discloses and suggests this limitation to a POSITA because Tang is silent on whether TTI bundling should be used and TTI bundling is ***not*** normally used in conventional, contention-based, random access Msg3 transmissions. (Ex-1011-36.321 at §5.4.2.1 [page 32] (“For transmission of Msg3 during Random Access (see subclause 5.1.5) TTI bundling does not apply. For [some less capable UEs], uplink repetition bundling is used for transmission of Msg3”); Ex-1003-Davies at ¶¶130-33 (explaining that 3GPP TS 36.321’s teaching that bundling is not used in the conventional random access procedure, while repetition bundling is used only with respect to less capable UEs, strongly implies that more capable UEs like conventional smartphones use neither bundling nor uplink repetition and thus transmit a single TB as claimed).) Thus, a POSITA would understand that Tang’s

step S308 (the sending of Msg3) would normally **not** include any TTI bundling, i.e., Msg3 of Tang **would normally** be sent as “a single (TB) transport block.” Accordingly, Tang discloses and suggest this limitation. (See §X.A; Ex-1003-Davies at ¶¶130-33; Ex-1004-Tang at FIG. 3 & 0270-71; Ex-1020 at FIG. 3 & 28:11-19.)

Tang in view of Löhr also teaches this limitation. As explained in §V.C, the “single (TB) transport block” aspect of this limitation was added during prosecution to allegedly distinguish over prior art that involved TTI bundling. (§V.C.2; Ex-1002-052FH at 0149-54.) The examiner was not persuaded by the amendment, and relied on Löhr (specifically, Löhr at FIGs. 7-15 as well as related paragraphs) for this limitation. (Ex-1002-052FH at 162-67.) The examiner did not waiver on this issue and, despite incorrect statements made by the applicant regarding Löhr’s use of TTI bundling, the examiner maintained this same position regarding Löhr throughout prosecution. (See §V.C.2; Ex-1002-052FH at 201 (incorrectly arguing that Löhr was directed to TTI bundling and was silent as to using a single transport block); *id.* at 532-34 (Notice of Allowance continuing to state that “Lohr discloses (Figs. 7-15) [sic] perform a single (TB) transport block of Msg transmission to the network according to the TTI information of the Msg [0164, 0120, 0183, 0187]”).)¹⁶

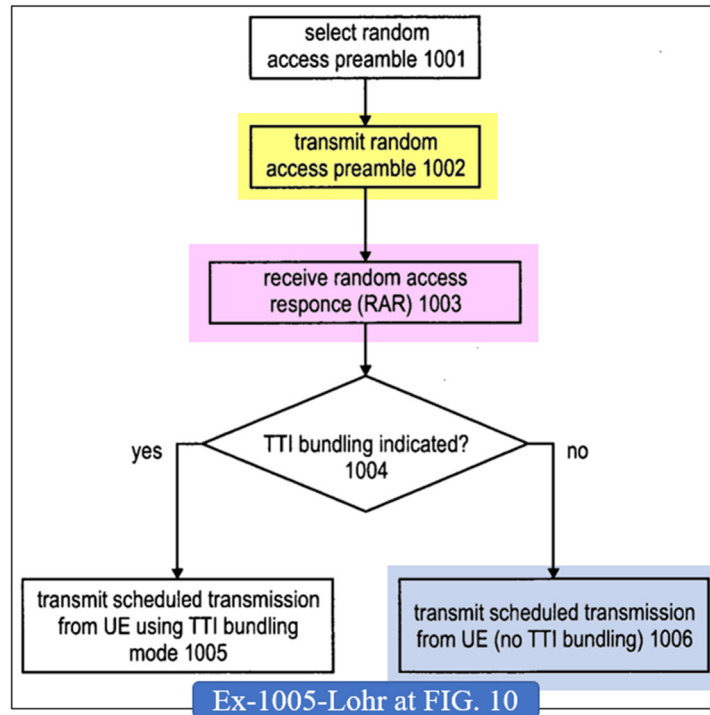
¹⁶ Notably, the examiner granted the case after stating “all cited prior arts of record fail to disclose in claims 1, [sic] and 8 the rationale and reasoning stated in

As explained previously in §X.A, Löhr discloses the use of a one-bit flag in Msg2 to indicate to the UE whether it should send Msg3 as a single transport block or in bundled form:

“FIG. 10 shows a flow chart of the exemplary operation of a mobile terminal in a contention based random access procedure according to an embodiment of the invention. [T]he mobile terminal sends 1002 the selected random access preamble to the eNode B to trigger a random access response message from the eNodeB which is received 1003 by the mobile terminal. The random access response message is containing inter alia a resource grant for the first scheduled uplink transmission of the mobile terminal as well as a transmission mode indicator. ... In this exemplary embodiment, the transmission mode indicator is a flag (one bit) that—when set (for example flag=1)—that the mobile terminal should send the scheduled uplink transmission using TTI bundling as described with respect to FIG. 12 previously herein. If the transmission mode indicator is not set (for example flag=0), the mobile terminal is instructed to send the first scheduled transmission without TTI bundling, i.e. as a transmission in a single TTI.” (Ex-1005-Löhr at 0175.)

Applicant’s Arguments/Remarks filed on 08/04/2020 and 11/03/2021.” (Ex-1002-052FH at 533.) Neither set of filed remarks addresses Löhr or the “single (TB) transport block” limitation.

The flow chart in FIG. 10 is shown below using the same highlighting scheme as used above relative to Tang:



(Ex-1005-Löhr at FIG. 10; *see id.* at 0119-20, 0178.) Accordingly, in the combination of Tang-Löhr, when Msg2 does not include the flag (transmission mode indicator), or when Löhr’s flag included in Msg2 is set to zero (0), the UE would send Msg3 “without TTI bundling, i.e. as a transmission in a single TTI.” (Ex-1003-Davies at ¶¶134-39.)

When TTI bundling is not used, Löhr further explains that a transport block is built and coded, then “one...redundancy version of the transport block within the transmission time interval as allocated by the grant within the random access response message:”

“If the transmission mode indicator is not set, the mobile terminal transmits 1006 transmits the first transmission as scheduled by the grant within the random access without TTI bundling. Accordingly, the mobile terminal builds a transport block and is coding same to obtain one or more redundancy versions of the transport block. Subsequently, the mobile terminal transmits one (advantageously self-decodable) redundancy version of the transport block within the transmission time interval as allocated by the grant within the random access response message.” (Ex-1005-Löhr at 0178; *see id.* at 0177 (indicating that HARQ is merely optional for the first scheduled transmission [i.e., Msg3]).)

Thus, limitation 1.3 is met when TTI bundling is not used because the UE transmits one transport block of Msg3 transmission to the network according to the TTI information of the Msg3. (Ex-1003-Davies at ¶¶0134-39.)

As explained in §X.A, a POSITA would have been motivated to combine the teachings of Tang and Löhr because enabling the flexibility disclosed in Löhr (bundling or not bundling) in Tang’s system was desirable as there were known benefits to bundling in some circumstances while there were benefits to not bundling (using a single transport block) in other circumstances. A POSITA would have been motivated and found it obvious to modify Tang in view of Löhr so that Tang’s UEs could transmit random access Msg3 transmissions in both bundling and non-bundling modes of operation. A POSITA also would have had a reasonable

expectation of success, as explained in §X.A, because adding Löhr’s one bit flag to Tang’s Msg2/RAR would have been trivial. (Ex-1003-Davies at ¶¶97-113, 130-39.)

Thus, Tang in view of Löhr discloses this limitation and renders obvious claim 1.

[Claim 5] The method of claim 1, wherein the TTI information of the Msg3 is included in a RAR (Random Access Response) for responding [sic] the preamble.¹⁷

Tang teaches this limitation for the reasons described above relative to limitation 1.2. Specifically, Tang discloses that the eNB responds to the UE’s preamble (Msg1) with a RAR message (Msg2) that includes TTI information, including “a TTI length assigned by the eNB to the UE, effective moment information, start symbol location information, and enabling confirm information of the TTI length.” (Ex-1003-Davies at ¶¶140-42; Ex-1004-Tang at FIG. 3 & 0255-70; Ex-1020 at FIG. 3 & 26:10-28:19.)

Thus, Tang in view of Löhr renders obvious claim 5.

[Claim 7] The method of claim 1, wherein the Msg2 is a random access response.

Claim 7 recites conventional technology as it was standard for Msg2 to be a RAR. (Ex-1001 at FIG. 5 (prior art); Ex-1005-Löhr at FIG. 5, 0041.) Tang teaches

¹⁷ Petitioner assumes for purposes of this Petition only that this claim should read “...for responding to the preamble.” (Ex-1003-Davis at n.7.)

this limitation for the reasons described above relative to limitation 1.2. Specifically, Tang discloses that the eNB responds to the UE's preamble (Msg1) with a RAR message (Msg2) that includes TTI information. (Ex-1003-Davies at ¶¶0143-45; Ex-1004-Tang at FIG. 3 & 0255-70; Ex-1020 at FIG. 3 & 24:29-28:19.)

Thus, Tang in view of Löhr renders obvious claim 7.

[Claim 8, 8.0] A User Equipment (UE), comprising:

Tang teaches this preamble for the reasons provided above regarding preamble 1.0.

[8.0.1] a control circuit;

[8.0.2] a processor installed in the control circuit; and

[8.0.3] a memory installed in the control circuit and operatively coupled to the processor;

[8.0.4] wherein the processor is configured to execute a program code stored in the memory to:

Tang teaches these limitations, which relate to conventional features of a UE. Specifically, FIG. 18 and the corresponding text (both reproduced below) disclose these UE elements:

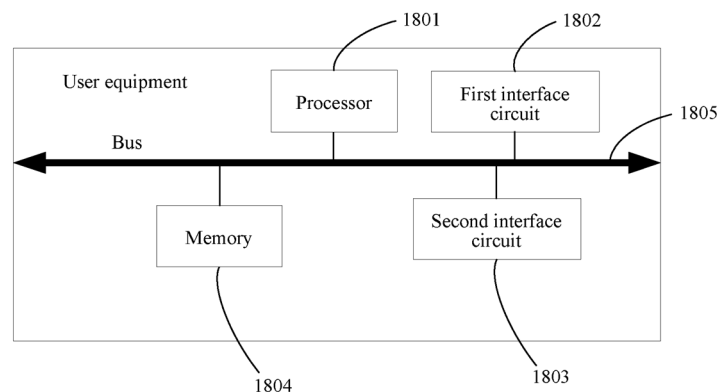


FIG. 18

“Referring to FIG. 18, an embodiment of the present disclosure provides user equipment, configured to implement the foregoing TTI configuration method. The apparatus may be an eNB,¹⁸ and may include: a processor 1801, a first interface circuit 1802, a second interface circuit 1803, a memory 1804, and a bus 1805. The processor 1801, the first interface circuit 1802, the second interface circuit 1803, and the memory 1804 are connected by using the bus 1805 and communicate with each other. ...
The processor 1801 is configured to execute a program in the memory, so as to perform the method provided in the foregoing method embodiment with reference to the first interface circuit 1802 and the second interface circuit 1803.” (Ex-1004-Tang at FIG. 18 & 0417, 0421; Ex-1020 at FIG. 18 & 47:7-12, 47:32-48:3; see Ex-1004-Tang at 0417-22; Ex-1020 at 47:7-48:3.)

As shown, Tang discloses a control circuit comprising a processor and memory coupled together and configured such that the processor executes program code stored in the memory as claimed. (Ex-1003-Davies at ¶¶146-60.)

¹⁸ Tang’s reference to an “eNB” here appears to be a typographical error because FIG. 18 relates to an exemplary UE. (Compare Ex-1004-Tang at 0417 & FIG. 18 (disclosing a UE but referring to an eNB *with id.* at 0408 & FIG. 17 (correctly referring to eNB relative to the base station figure).)

[8.1] transmit a preamble to a network;

Tang teaches this limitation for the reasons provided above regarding limitation 1.1. (Ex-1003-Davies at ¶161.)

[8.2] receive a Msg2 containing a TTI (Transmission Time Interval) information of a Msg3, associated with uplink, from the network in response to the preamble, [8.2.1] wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes a TTI duration of the Msg3, associated with uplink, and [8.2.2] [wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes] a start timing offset of the Msg3, associated with uplink; and

Tang teaches these limitations for the reasons provided above regarding limitations 1.2, 1.2.1, and 1.2.2. (Ex-1003-Davies at ¶162.)

[8.3] perform a single (TB) transport block of Msg3 transmission to the network according to the TTI information of the Msg3.

Tang in view of Löhr teaches this limitation for the reasons provided above regarding limitation 1.3. (Ex-1003-Davies at ¶¶163-64.)

Thus, Tang in view of Löhr renders obvious claim 8.

[Claim 12] The UE of claim 8, wherein the TTI information of the Msg3 is included in a RAR (Random Access Response) for responding the preamble.

Tang in view of Löhr renders obvious claim 12 for the reasons provided above regarding claim 5. (Ex-1003-Davies at ¶165.)

[Claim 14] The UE of claim 8, wherein the Msg2 is a random access response.

Tang in view of Löhr renders obvious claim 14 for the reasons provided above regarding claim 7. (Ex-1003-Davies at ¶166.)

XI. GROUND 2: Tirronen

A. Scope and Content of the Prior Art

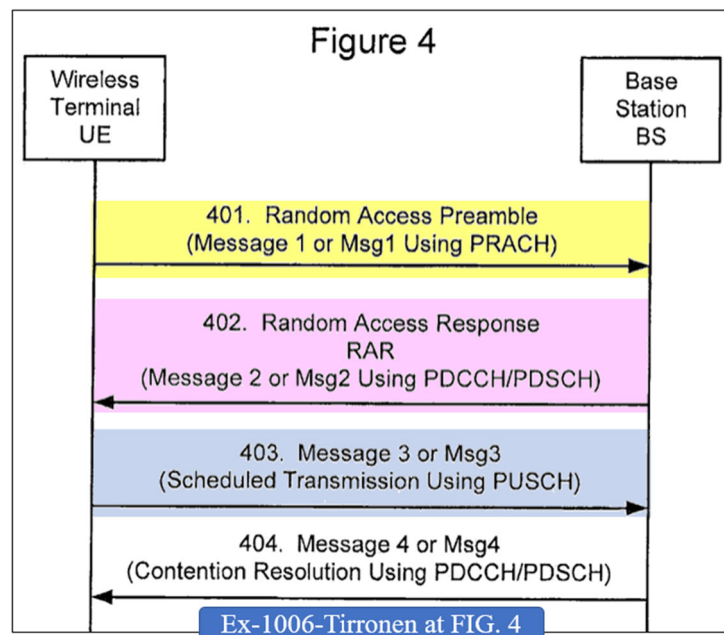
Ground 2 relies on Tirronen. Tirronen claims priority to a provisional application as discussed in §IX.C. To facilitate efficient review, Petitioner provides dual citations to Tirronen (Ex-1006) and the corresponding disclosures in the provisional (Ex-1007).

B. Challenged Claims

Ground 2 addresses claims 1, 5, 7-8, 12, and 14.

[1.0] A method of a UE (User Equipment) for performing random access procedure, comprising:

Tirronen teaches this preamble. Specifically, FIG. 4 illustrates a UE performing a random access procedure:



(Ex-1006-Tirronen at FIG. 4; Ex-1007 at FIG. 4.) Tirronen further explains that its random access procedure may be initiated by a UE:

“FIG. 4 is a message diagram illustrating messages transmitted between a wireless terminal UE and a base station BS for a contention based random access procedure. Such a Random Access Procedure, for example, may be initiated by the wireless terminal UE to initiate attachment before RRC (Radio Resource Control) connection.” (Ex-1006-Tirronen at 8:58-62; Ex-1007 at 3:12-14; *see also* Ex-1003-Davies at ¶¶167-77 (citing Ex-1006 at 7:35-42, 9:55-62, 10:14-25, Abstract; Ex-1007 at 1:29-34, 4:10-14, 4:28-35, 11:11-21 (collectively describing the UEs discussed in Tirronen and the ’052 patent).)

While Tirronen’s disclosures are offered in the context of a particular type of UE, specifically MTC UEs, the claims of the ’052 patent are agnostic as to the type of UE claimed, and the ’052 patent expressly applies to MTC UEs:

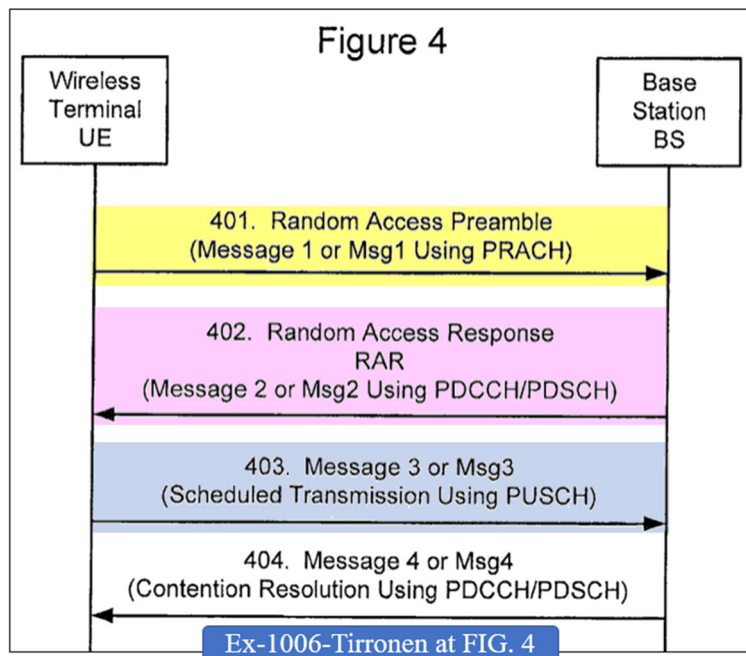
“One of the general objectives of the present application is to study the frame structure used in New RAT (NR) for 5G, to accommodate various type of requirement (discussed in 3GPP TR 38.913) for time and frequency resource, e.g., from ultra-low latency (~0.5 ms) to expected longer TTI (Transmission Time Interval) for MTC (Machine Type Communication), from high peak rate for Embb (enhanced Mobile Broadband) to very low data rate for MTC. An important focus is low latency aspect, while other aspect of mixing/adapting different TTIs can also be considered in the study.” (Ex-1001 at 5:13-20; *see also id.* at 8:58-9:8.)

Thus, the fact that some of Tirronen’s embodiments are described in the context of a particular type of UE does not distinguish Tirronen from the claims. (Ex-1003-Davies at ¶¶170-77.) Indeed, Tirronen describes embodiments having different TTI durations and random access procedures for different types of UEs, just like the ’052 patent contemplates. (Ex-1003-Davies at ¶¶173-74.)

Accordingly, Tirronen teaches this preamble.

[1.1] the UE transmits a preamble to a network;

Tirronen teaches this limitation. Specifically, the yellow-highlighted portion of FIG. 4 illustrates a UE transmitting a preamble to a network (“Base Station BS”):



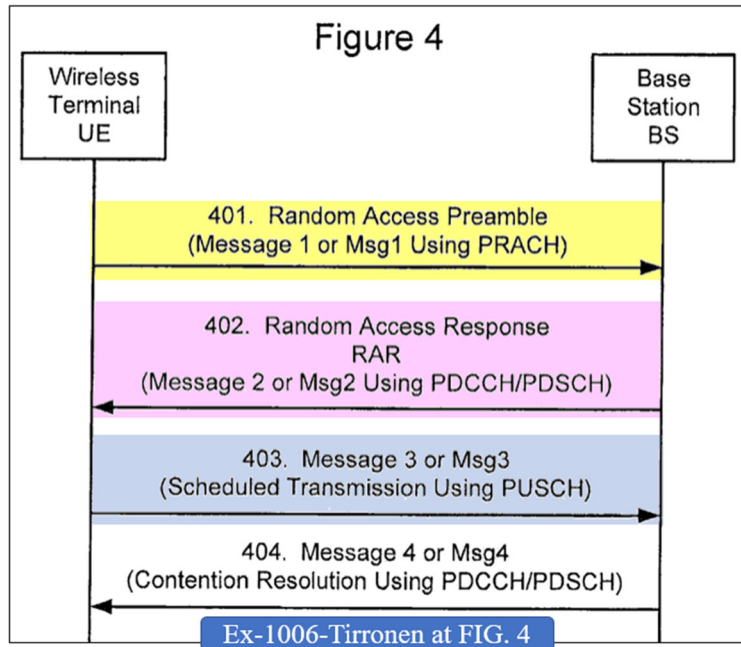
(Ex-1006-Tirronen at FIG. 4; Ex-1007 at FIG. 4.) Tirronen further confirms that the UE transmits a random access preamble (also referred to as “Msg1”) to a network:

“During a random access procedure at operation 401, wireless terminal UE processor 303 may transmit a Random Access Preamble (Msg1) through transceiver 301 using a Physical Random Access Channel (PRACH). The wireless terminal UE processor 303 may randomly select the random access preamble from a set of available random access preambles. Moreover, wireless terminal UE processor 303 may transmit the Random Access Preamble without any prior allocation.” (Ex-1006-Tirronen at 8:64-9:5; Ex-1007 at 3:15-20; Ex-1003-Davies at ¶¶178-80 (citing Ex-1006-Tirronen at 20:22-26; Ex-1007 at pg. 11).)

Accordingly, Tirronen teaches this limitation.

[1.2] the UE receives a Msg2 containing a TTI (Transmission Timer Interval) information of a Msg3, associated with uplink, from the network in response to the preamble

Tirronen teaches limitation 1.2. As FIG. 4 illustrates (step 402, pink), the UE receives a Msg2/RAR from the network in response to the preamble:



(Ex-1006-Tirronen at FIG. 4; Ex-1007 at FIG. 4.)

Tirronen further explains that the Msg2/RAR contains UL (uplink) grant information (“associated with uplink”) for a subsequent Msg3:

“[B]ase station BS processor 203 may transmit a Random Access Response RAR (Msg2) through transceiver 201 at operation 402. More particularly, the Random Access Response RAR may include an uplink grant for a subsequent Message 3 to be transmitted by wireless terminal UE. Responsive to receiving Message [2]¹⁹ of

¹⁹ Tirronen and the Tirronen-Prov contain an obvious typographical error, referring to “Message 4” instead of “Message 2”/“Msg2” when discussing step 402. As FIG. 4 shows, this error was obvious to a POSITA because step 402 of FIG. 4 and the

operation 402 through transceiver 301, wireless terminal UE processor 303 may transmit Message 3 (e.g., an RRC connection request) through transceiver 301 at operation 403 using the uplink grant indicated in the RAR of operation 402. ... [A] format of the RAR of operation 402 may be different for different types of wireless terminals. For a conventional mobile wireless terminal UE (e.g., a cellular radiotelephone, a smartphone, a tablet computer, a laptop computer, etc.), the RAR of operation 402 may include uplink grant information for the subsequent uplink Message 3 of operation 403 without including repetition information for uplink Message 3 of operation 403 and/or without including information regarding the downlink Message 4 of operation 404.” (Ex-1006-Tirronen at 9:6-31; Ex-1007 at 3:22-36.)

As it relates to the limitation “a Msg2 containing a TTI (Transmission Timer Interval) information of a Msg3,” Tirronen discloses including “time domain configuration” information comprising “Transmission Time Interval information for the Message 3 uplink communication” in the RAR message (i.e., “Random Access Response” or “Msg2”):

“After transmitting the random access preamble, a random access response [RAR] of the random access procedure may be received from the node of the radio access network, with the random access

surrounding context of the disclosure indicate that the text should refer to “Message 2”/“Msg2.” (Ex-1003-Davies at n.14.)

response including an Uplink grant for a Message 3 uplink communication of the random access procedure. The UL grant may include a time domain configuration associated with the Message 3 uplink communication. The time domain configuration may include a...Transmission Time Interval information for the Message 3 uplink communication.” (Ex-1006-Tirronen at 1:63-2:7; *see id.* at 3:39-44, 4:62-5:9, 5:23-31, 5:41-49, 6:11-20, 6:29-37, 11:3-12 (repeatedly disclosing the inclusion of TTI information in the RAR message); Ex-1007 at 11:13-21; *see id.* at 14:38-15:18.)

Thus, Tirronen discloses a UE receiving a Msg2 containing TTI (Transmission Timer Interval) information of a Msg3, associated with uplink, from the network in response to the preamble. (Ex-1003-Davies at ¶¶181-84.)

Accordingly, Tirronen teaches this limitation.

[1.2.1] wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes a TTI duration of the Msg3, associated with uplink, and

Tirronen teaches this limitation. Specifically, Tirronen discloses different types of UEs communicating with a base station, such as conventional legacy LTE UEs, “MTC” (“Machine Type Communication”) UEs, and “IoT” (“Internet of Things”) UEs. (Ex-1003-Davies at ¶185 (citing Ex-1006-Tirronen at 11:20-34, 12:4-14, 13:19-35; Ex-1007 at 5:33-41; 6:24-32; 7:36-8:3).) One base station may communicate with different types of UEs that have different capabilities, including by using variable TTI lengths during random access procedures. (*See, e.g.*, Ex-1006-

Tirronen at FIG. 1, 9:55-62 (disclosing a base station Bs-a that communicates with a conventional UE [UE-b] and MTC UEs [UE-a, UE-g]); Ex-1007 at FIG. 1, 4:10-14.) Accordingly, Tirronen discloses that base stations have the flexibility to indicate a “time domain configuration” for Msg3 in the Msg2/RAR. (Ex-1006-Tirronen at 11:3-12; Ex-1007 at 5:22-27; *see also* Ex-1003-Davies at ¶¶185-89.)

Tirronen discloses several pertinent time domain configuration examples. First, with respect to legacy LTE and IoT UEs, Tirronen discloses an example where the time domain configuration may indicate two or more TTI durations:

“The time domain configuration may further include a transmission time interval (TTI) field for Message 3 transmission on the uplink.

The TTI field contains information about the number of UL subframes that a set of code bits of a TB is mapped to. In one alternative (as in legacy LTE system), a TTI is one subframe, i.e., 1 millisecond. In another alternative (as in narrowband IoT system), a TTI (i.e., an extended TTI) is composed of multiple subframes. A typical value in an extended TTI may be composed of six subframes.

If only two possible TTIs are defined in the system, then the TTI field can be 1 bit, for example, TTI field=0 indicates TTI of one subframes, TTI field=1 indicates TTI of six subframes. In general, if Q possible TTIs are defined in the system, then the TTI field is composed of $\text{ceil}(\log_2(Q))$ bits.” (Ex-1006-Tirronen at 11:20-34; Ex-1007 at 5:33-41.)

Stated differently, Tirronen discloses including a TTI duration in its “time domain configuration,” where the duration is explicitly defined in terms of time units and may be, e.g., 1ms (1 subframe), 6ms (6 subframes), or other multiples of the legacy 1ms duration. (Ex-1003-Davies at ¶¶185-89.)

Next, with respect to MTC devices, Tirronen discloses a more specific set of examples of “information elements” that a base station may include in its RAR/Msg2 containing a UL grant:

“[T]he following information elements may be included in the UL grant in RAR for an MTC wireless terminal:

Element 1. Time domain configuration for PUSCH carrying Msg3,

Element 2. Frequency domain configuration for PUSCH carrying Msg3,

Element 3. Time domain configuration for control channel...for Msg4,

Element 4. Frequency domain configuration for control channel for Msg4.

The following sections provide example of possible implementations of the above Elements 1-4 in the UL grant in RAR for an MTC wireless terminal.” (Ex-1006-Tirronen at 12:4-17; Ex-1007 at 6:24-35.)

Tirronen’s third example for Element 1 (“Option 3 for Element 1”) discloses that Element 1 in the RAR message may contain (1) a base 2 number for signaling the

number of repetitions needed and (2) a TTI field indicating the TTI duration of Msg3:

“According to still other embodiments with Element 1 (Option 3 for Element 1), the repetition factor may be directly signaled as a number (e.g., base 2). ...

Element 1 may further contain a transmission time interval (TTI) field for Message 3 transmission on the uplink. If the PUSCH Message 3 is configured with TTI=Q subframes and R repetitions, then one transmission of PUSCH Message 3 takes Q*R subframes.”

(Ex-1006-Tirronen at 13:19-35; Ex-1007 at 7:36-8:3.)

As shown, Tirronen discloses the use of “TTI=Q subframes,” which indicates the TTI duration as an integer multiple (“Q”) of a time period (e.g., the legacy subframe duration of 1ms for 1 subframe; 6ms for 6 subframes) in the RAR/Msg2. (Ex-1003-Davies at ¶¶187-89.) In response to the time domain information of Msg2, a Tirronen UE would send its Msg3 according to the designated TTI duration. (Ex-1006-Tirronen at 13:31-35; Ex-1007 at 8:1-3.)

Accordingly, Tirronen teaches this limitation.

[1.2.2] [wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes] a start timing offset of the Msg3, associated with uplink; and

Tirronen teaches a start timing offset of the Msg3, associated with uplink, as required by sub-limitation 1.2.2. Specifically, Tirronen’s Msg2/RAR includes

information that defines the starting time location for the UE's Msg3 uplink transmission:

“According to some embodiments, the [RAR] of block 603 may include information defining a time and/or frequency location associated with the Message 3 uplink communication. ... Information defining the time and/or frequency location may define a time and/or frequency location in a subframe for the Message 3 uplink communication. *The information defining the time and/or frequency location may define one or more of: a starting subframe among a set of subframes that carries the Message 3 uplink transmission;...*” (Ex-1006-Tirronen at 17:4-22; *see also* 2:39-59, 4:1-13, 6:38-45, 10:45-58, 11:42-51, 18:64-19:17, 21:65-22:21, 24:51-25:7 (disclosing the same); Ex-1007 at 13:28-38, 17:4-17, 5:6-27, 6:6-11, 13:20-38, 17:4-22, 13:20-38, 17:4-22; Ex-1003-Davies at ¶¶190-92; §§VIII.A, V.C; Ex-1008-EPFH at 172.)

Thus, Tirronen discloses a start timing offset (“starting subframe” information” that is defined specifically in terms of time units, e.g., as a specific time location in a subframe). (Ex-1003-Davies at ¶¶190-92.)

Additionally, as part of the same “Option 3 for Element 1” example discussed above regarding TTI duration, Tirronen further discloses that a Msg2/RAR's “Element 1 may further contain a starting subframe among the set of UL subframes that carry the PUSCH.” (Ex-1006-Tirronen at 13:29-30, *see id.* at 17:14-18; Ex-1007 at 7:42-43, *see id.* at 13:28-31.) This, too, discloses a start timing offset because it

specifies the subframe/time in which the UE can start transmitting Msg3. (Ex-1003-Davies at ¶¶193-95.)

Accordingly, Tirronen teaches this limitation.

[1.3] the UE performs a single (TB) transport block of Msg3 transmission to the network according to the TTI information of the Msg3.

Tirronen teaches this limitation. Specifically, Tirronen discloses that RAR/Msg2 includes a UL grant (which includes the TTI information) for the Msg3 uplink communication. The information in the uplink grant (and the time domain configuration the uplink contains) may optionally include a number of repetitions of Msg3:

“[A] format of the RAR of operation 402 may be different for different types of wireless terminals. For a conventional mobile wireless terminal UE (e.g. a cellular radiotelephone, a smartphone, a tablet computer, a laptop computer, etc.), the RAR of operation 402 may include uplink grant information for the subsequent uplink Message 3 of operation 403 without including repetition information for uplink Message 3 of operation 403. ...In contrast, an RAR of operation 402 for a MTC (machine-type communication) wireless terminal UE may include repetition information for uplink message 3 of operation 403.” (Ex-1006-Tirronen at 9:22-36; Ex-1007 at 3:31-39.)

“The random access response may include an uplink grant for a Message3 uplink communication of the random access procedure. The UL grant may include a time domain configuration associated

with the Message 3 uplink communication, and the time domain configuration may include: a repetition factor that defines a number of repetitions across subframes for the Message 3 UL communication; or Transmission Time Interval information for the Message 3 UL communication.” (Ex-1006-Tirronen at 5:56-64; Ex-1007 at 15:7-18.)

The time domain configuration contained within the Uplink grant may optionally indicate how many repetitions are needed:

“The time domain configuration may further include a transmission time interval (TTI) field for Message 3 transmission on the uplink. The TTI field contains information about the number of UL subframes that a set of code bits of a TB is mapped to. In one alternative (as in legacy LTE system) a TTI is one subframe, i.e. 1 millisecond. In another alternative (as in narrowband IOT system), a TTI (i.e., an extended TTI) is composed of multiple subframes. A typical value in an extended TTI may be composed of six subframes. If only two possible TTIs are defined in the system, then the TTI field can be 1 bit, for example, TTI field-0 indicates TTI of one subframe, TTI field-1 indicates TTI of six subframes. In general, if Q possible TTIs are defined in the system, then the TTI field is composed of $\text{ceil}(\log_2(Q))$ bits.” (Ex-1006-Tirronen at 11:20-34; Ex-1007 at 5:33-41.)

A one-bit TTI field indicates whether optional repetitions are used. When the TTI field is set to 1, the TTI is composed of multiple subframes (i.e. repetitions). If the TTI field is set to 0, the TTI is one subframe (i.e. no repetitions). Thus, when the

TTI field is set to 0, Tirronen's UE transmits a single Msg3 transport block to the network according to the TTI information provided in Msg2. (Ex-1003-Davies at ¶¶196-99.)

Tirronen, therefore, anticipates and renders obvious claim 1.

[Claim 5] The method of claim 1, wherein the TTI information of the Msg3 is included in a RAR (Random Access Response) for responding the preamble.

Tirronen teaches this limitation for the reasons described above relative to limitation 1.2. Specifically, Tirronen discloses responding to the preamble with a "RAR"/"Random Access Response" Msg2 that includes TTI information. (Ex-1003-Davies at ¶¶200-201; *see, e.g.*, Ex-1006-Tirronen at FIG. 4, 9:6-31; Ex-1007 at FIG. 4, 3:22-36.)

Thus, Tirronen anticipates and renders obvious claim 5.

[Claim 7] The method of claim 1, wherein the Msg2 is a random access response.

Tirronen teaches this limitation for the reasons described above relative to limitation 1.2. Specifically, Tirronen discloses responding to the preamble with a "RAR"/"Random Access Response" Msg2 that includes TTI information. (Ex-1003-Davies at ¶¶202-03; *see, e.g.*, Ex-1006-Tirronen at FIG. 4, 9:6-31; Ex-1007 at FIG. 4, 3:22-36.)

Thus, Tirronen anticipates and renders obvious claim 7.

[Claim 8, 8.0] A User Equipment (UE), comprising:

Tirronen teaches this preamble for the reasons provided above regarding preamble 1.0.

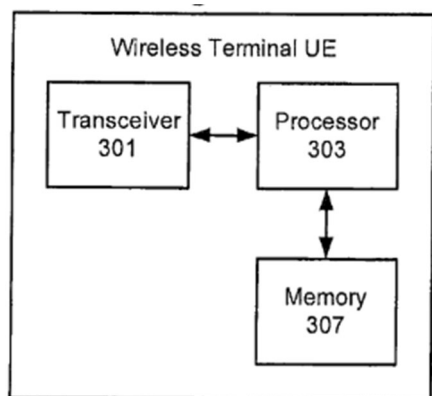
[8.0.1] a control circuit;

[8.0.2] a processor installed in the control circuit; and

[8.0.3] a memory installed in the control circuit and operatively coupled to the processor;

[8.0.4] wherein the processor is configured to execute a program code stored in the memory to:

Tirronen teaches these limitations, which relate to conventional features of a UE. (Ex-1003-Davies at ¶¶204-13.) Specifically, FIG. 3 and the corresponding text disclose these UE elements:



“FIG. 3 is a block diagram illustrating elements of a wireless terminal UE (also referred to as a mobile terminal, mobile station, a UE, a user equipment, a user equipment node, etc.) of FIG. 1. As shown, a wireless terminal UE may include a transceiver circuit 301 (also referred to as a transceiver) configured to provide radio communications with a base station BS, a processor circuit 303 (also referred to as a processor) coupled to the transceiver circuit, and a memory circuit 307 coupled to the processor circuit. The memory

circuit 307 may include computer readable program code that when executed by the processor circuit 403 causes the processor circuit to perform operations according to embodiments disclosed herein.

According to other embodiments, processor circuit 303 may be defined to include memory so that a memory circuit is not separately provided.” (Ex-1006-Tirronen at FIG. 3, 8:36-50; Ex-1007 at FIG. 3, 2:39-3:6.)

As shown, Tirronen discloses a control circuit comprising a transceiver, processor, and memory, all coupled together and configured such that the processor executes program code stored in the memory as claimed. (*Id.*)

[8.1] transmit a preamble to a network;

Tirronen teaches this limitation for the reasons provided above regarding limitation 1.1. (Ex-1003-Davies at ¶214.)

[8.2] receive a Msg2 containing a TTI (Transmission Time Interval) information of a Msg3, associated with uplink, from the network in response to the preamble, [8.2.1] wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes a TTI duration of the Msg3, associated with uplink, and [8.2.2] [wherein the TTI information, contained in the Msg2, of the Msg3, associated with uplink, includes] a start timing offset of the Msg3, associated with uplink; and

Tirronen teaches these limitations for the reasons provided above regarding limitations 1.2, 1.2.1, and 1.2.2. (Ex-1003-Davies at ¶215.)

[8.3] perform a single (TB) transport block of Msg3 transmission to the network according to the TTI information of the Msg3.

Tirronen teaches this limitation for the reasons provided above regarding limitation 1.3. (Ex-1003-Davies at ¶¶216-17.)

Thus, Tirronen anticipates and renders obvious claim 8.

[Claim 12] The UE of claim 8, wherein the TTI information of the Msg3 is included in a RAR (Random Access Response) for responding the preamble.

Tirronen anticipates and renders obvious claim 12 for the reasons provided above regarding claim 5. (Ex-1003-Davies at ¶218.)

[Claim 14] The UE of claim 8, wherein the Msg2 is a random access response.

Tirronen anticipates and renders obvious claim 14 for the reasons provided above regarding claim 7. (Ex-1003-Davies at ¶219.)

XII. Conclusion

For the foregoing reasons, Petitioner respectfully requests cancellation of claims 1, 5, 7-8, 12, and 14.

Respectfully submitted,
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CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of the Petition together with all exhibits identified in the above Table of Exhibits and Petitioner's Power of Attorney, have been served on the Patentee via Priority Mail Express or by means at least as fast and reliable as Priority Mail Express on the below date, at the following address:

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