

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

TOGAIL TECHNOLOGIES LTD.,
Patent Owner.

IPR2023-00720
U.S. Patent No. 10,791,502

**DECLARATION OF DR. ZHI DING, PH.D.,
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW**

TABLE OF CONTENTS

I.	Introduction	5
II.	Qualifications and Professional Experience.....	7
III.	Level of Ordinary Skill in the Art	12
IV.	Relevant Legal Standards.....	14
V.	Summary of the '502 Patent.....	16
VI.	Prosecution History	18
VII.	Claim Construction	19
VIII.	Identification of How the Claims are Unpatentable.....	19
A.	Ground 1: Claim 1 is obvious under 35 U.S.C. § 103 over Oppo	20
1.	Summary of Oppo	20
2.	Claim 1	21
B.	Ground 2: Claims 5-6 are obvious under 35 U.S.C. § 103 over Oppo in view of Vivo	26
1.	Summary of Vivo	26
2.	Reasons to Combine Oppo and Vivo	27
3.	Claim 5	30
4.	Claim 6	32
C.	Ground 3: Claims 11, 15-16 are obvious under 35 U.S.C. § 103 over Oppo in view of Vivo and Deenoo	34
1.	Summary of Deenoo.....	34
2.	Reasons to Combine Oppo and Vivo with Deenoo.....	35
3.	Claim 11	39
4.	Claim 15	44

5.	Claim 16	44
D.	Ground 4: Claims 1-2, 5-6, 11-12, and 15-16 are obvious under 35 U.S.C. § 103 over Deenoo	44
1.	Summary of Deenoo.....	44
2.	Claim 1	44
3.	Claim 2	50
4.	Claim 5	51
5.	Claim 6	52
6.	Claim 11	53
7.	Claim 12	54
8.	Claim 15	54
9.	Claim 16	54
E.	Ground 5: Claims 3 and 13 are obvious under 35 U.S.C. § 103 over Deenoo in view of Futaki.....	55
1.	Summary of Futaki.....	55
2.	Reasons to Combine Deenoo with Futaki	55
3.	Claim 3	57
4.	Claim 13	59
F.	Ground 6: Claims 4, 7, 14, and 17 are obvious under 35 U.S.C. § 103 over Deenoo in view of Asustek.....	59
1.	Summary of Asustek	59
2.	Reasons to Combine Deenoo with Asustek	59
3.	Claim 4	62
4.	Claim 7	63

5.	Claim 14	64
6.	Claim 17	64
G.	Ground 7: Claims 8-10 and 18-20 are obvious under 35 U.S.C. § 103 over Deenoo in view of Huawei	64
1.	Summary of Huawei.....	64
2.	Reasons to Combine Deenoo with Huawei.....	64
3.	Claim 8	69
4.	Claim 9	71
5.	Claim 10	72
6.	Claim 18	74
7.	Claim 19	75
8.	Claim 20	75
IX.	Conclusion.....	76

I, Dr. Zhi Ding, do hereby declare as follows:

I. INTRODUCTION

1. I am making this declaration at the request of Apple Inc. in the matter of the *Inter Partes* Review of U.S. Patent No. 10,791,502 (“the ’502 patent”) to Chen, *et al.*

2. I am being compensated for my work on this matter and for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony, and I have no other interest in this case or the parties thereto.

3. I have been asked to provide my opinions regarding whether claims 1-20 (“the Challenged Claims”) of the ’502 patent are patentable, or whether they would have been obvious to a person having ordinary skill in the art (“POSITA”) at the time of the alleged invention, in light of the prior art. It is my opinion that all of the limitations of the challenged claims would have been obvious to a POSITA.

4. In the preparation of this declaration, I have studied:

- a. the ’502 patent, Ex.1001;
- b. the prosecution history of the ’502 patent (“’502 File History”),

Ex.1002;

c. 3GPP TSG RAN WG2 Meeting #101 R2-1801795, “Discussion on SI Request Prohibit Timer,” Source: OPPO (“R2-1801795”) Ex.1007;

d. 3GPP TSG RAN WG2 Meeting #101 R2-1802094, “Remaining issues of on demand SI,” Source: Vivo (“R2-1802094”) Ex.1008;

e. U.S. Patent No. 11,357,059 to Deenoo *et al.* (“Deenoo”) Ex.1009;

f. U.S. Patent No. 11,357,059 to Sharma *et al.* (“Sharma”) Ex.1010;

g. U.S. Patent No. 11,252,643 to Futaki *et al.* (“Futaki”) Ex.1011;

h. 3GPP TSG RAN WG2 Meeting #Ad-hoc1891 R2-1800041, “Discussion on On-demand system information request in NR,” Source: ASUSTek (“Asustek”) Ex.1012; and

i. 3GPP TSG RAN WG2 Meeting #99 R2-1708072, “On demand SI acquisition and failure handling,” Source: Huawei, HiSilicon (“Huawei”) Ex.1013.

5. In forming the opinions expressed below, I have considered:

the documents listed above;

the relevant legal standards, including the standard for obviousness, and any additional authoritative documents as cited in the body of this declaration; and

my own knowledge and experience based upon my work in the field of networking as described below, as well as the following materials.

6. Unless otherwise noted, all emphasis in any quoted material has been

added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. I presently hold the title of Distinguished Professor in the Department of Electrical and Computer Engineering at the University of California, Davis. Since my appointment on July 1, 2000, I have held the position of professor for the past 22 years at the present university and have served as a faculty member at several US universities for over 30 years. I am also a private technical consultant on various technologies related to information systems. I have more than three decades of research experience on a wide range of topics related data communications and signal processing.

8. I earned my Bachelor of Science degree in 1982 in wireless engineering from the Nanjing Institute of Technology (later renamed as Southeast University) in Nanjing, China. I earned my Master of Science degree in 1987 in electrical engineering from the University of Toronto in Toronto, Canada. I earned my Ph.D. in 1990 in electrical engineering from Cornell University in Ithaca, New York.

9. My responsibilities as a Professor at University of California, Davis, include classroom instruction on various topics of communication systems and signal analysis, as well as mentoring undergraduate students and supervising graduate students in their research and development efforts on various topics

related to digital communications. I have directly supervised such research and development works ranging from signal detection to wireless networking. As the chief academic advisor, I have also directly supervised the completion of over 20 Master's theses and 30 Ph.D. dissertations on various topics related to digital communications. I have served full time as a faculty member at three major research universities in the United States over the past 30 years, including Auburn University from 1990 to 1998, University of Iowa from 1999 to 2000, and University of California, Davis, from 2000 to present.

10. Since 1990, I have been selected as the principal investigator of multiple highly competitive federal and local research grants, including more than twenty major research projects supported by the National Science Foundation and two research projects funded by the U.S. Army Research Office. These competitive research projects focused on developing more efficient and effective digital communication transceivers, networks, and signal processing tools. I have also participated in several large-scale projects supported by the Defense Advanced Research Projects Agency (DARPA) with teams of researchers. I have applied for, and received support from, other federal, state, and industry sponsors.

11. I have published over 210 peer-reviewed research articles in premier international journals, in addition to over 240 refereed technical articles at top international conferences on communications and information technologies. I

also authored two books on communications technologies. My most recent book, coauthored with B.P. Lathi, is entitled, “Modern Digital and Analog Communication Systems,” 5th edition, and was published by the Oxford University Press in 2018. The 4th edition of this book (published in 2009) had been widely adopted as an introductory textbook to communication systems.

12. In addition to the over 450 published technical papers that have been cited over 16,000 times according to Google Scholar¹, I am also co-inventor of 4 issued U.S. patents on communication technologies.

13. I am a member of the Institute of Electrical and Electronics Engineers (IEEE) and was elevated to the grade of Fellow in January 2003 for contributions made in signal processing for communication. The IEEE is the world’s largest professional society of engineers, with over 400,000 members in more than 160 countries. The IEEE has led the development of many standards for modern digital communications and networking, most notably, the IEEE 802 series of network standards. The IEEE Grade of Fellow is conferred by the Boards of Directors upon a person with an extraordinary record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year does not exceed one-tenth of one percent of the total voting Institute membership.

¹ <https://scholar.google.com>, as of Feb. 24, 2023.

14. I have served the IEEE in the following capacities:

- Chief Information Officer of the IEEE Communications Society from Jan. 2018 to present.
- Chief Marketing Officer of the IEEE Communications Society from Jan. 2020 to present.
- General Chair of the 2016 IEEE International Conference on Acoustics, Speech, and Signal Processing, the flagship conference of the IEEE Signal Processing Society.
- Chair of the Steering Committee for the IEEE Transactions on Wireless Communications from 2008 to 2010.
- Distinguished Lecturer of the IEEE Communications Society from January 2008 to December 2009.
- Technical Program Chair of the 2006 IEEE Globecom, one of two flagship annual IEEE Communication Society conferences.
- Distinguished Lecturer of the IEEE Circuits and Systems Society from 2004 to 2005.
- Associate Editor of the IEEE Transactions on Signal Processing from 1994 to 1997 and from 2001 to 2004.
- Member of the IEEE Statistical Signal and Array Processing for Communications Technical Committee from 1993 to 1998.

- Member of the IEEE Signal Processing for Communications Technical Committee from 1998 to 2004.

15. In 2012, I received the Wireless Communications Technical Committee Recognition Award from the IEEE Communications Society, an award given to a person with a high degree of visibility and contribution in the field of “Wireless and Mobile Communications Theory, Systems, and Networks.” I received the 2020 Education Award from the IEEE Communications Society. According to the Society, this award “recognizes distinguished and significant contributions to education within the Society’s technical scope.”

16. I have also served as a technical consultant for the telecommunication industry. For example, in 1995 I consulted for Analog Devices, Inc., on the development of the first generation DOCSIS cable modem systems. I have also consulted for other companies, including Nortel Networks and NEC US Laboratories. I worked as a visiting faculty research fellow at NASA Glenn Research Center in 1992 and at U.S. Air Force Wright Laboratory in 1993. I have served on multiple review panels of the National Science Foundation to evaluate competitive research proposals in the field of communication. I have also reviewed a large number of research proposals at the request of the National Science and Engineering Research Council (NSERC) of Canada as an expert panelist from 2010 to 2013, and also at the request of the Research Grant Council (RGC) of

Hong Kong as an external reviewer.

17. I have served as an expert witness or consulting expert on a number of matters related to intellectual property, mostly in the arena of telecommunications, including cellular communications, Wi-Fi technologies, Bluetooth, and optical communications. For example, since 2007, I have been engaged to work on various litigations involving cellular, WiFi, Bluetooth, and optical communication networks.

18. Based on my above-described near three decades of experience in communications technologies, and the acceptance of my publications and professional recognition by societies in my field, I believe that I am qualified to be an expert in wireless communication systems, communication networks, and signal processing.

19. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in Exhibit 1004.

III. LEVEL OF ORDINARY SKILL IN THE ART

20. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

21. It is my understanding that the earliest possible priority date for the '502 patent is April 2, 2018. I am familiar with the wireless communications art pertinent to the '502 patent. I am also aware of the state of the art at the time of the alleged priority date. Based on the technologies disclosed in the '502 patent, a person of ordinary skill in the art ("POSITA") in the field of the '502 patent, as of the earliest possible priority date of April 2, 2018, would include someone who had at least a master's degree from an accredited program in electrical engineering, computer engineering, computer science, or a related field, and three years of relevant experience in mobile communications or wireless networks, or a Ph.D. degree in the disciplines listed above and one year of relevant experience. Moreover, I recognize that someone with more advanced technical education, but less experience could have also met this standard. I believe that I possessed and exceeded such experience and knowledge before and at the priority date and that I am qualified to opine on the '502 patent.

22. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the earliest alleged priority date of the '502 patent (i.e., April 2, 2018). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with

the level of a POSITA as of the alleged priority date of the '502 patent.

IV. RELEVANT LEGAL STANDARDS

23. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '502 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

24. I understand that prior art to the '502 patent includes patents and printed publications in the relevant art that predate the priority date of the alleged invention recited in the '502 patent.

25. I have been informed that a claim preamble may or may not limit the claim scope. For the purposes of this *Inter Partes* Review, I have been informed by counsel to include the preamble in the analysis for obviousness in order to follow a conservative approach.

26. I have been informed that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and

the claimed subject matter.

27. I have been informed that a threshold inquiry as to whether a reference can be considered in the obvious analysis is whether the reference is analogous art to the claimed invention. A reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

28. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed

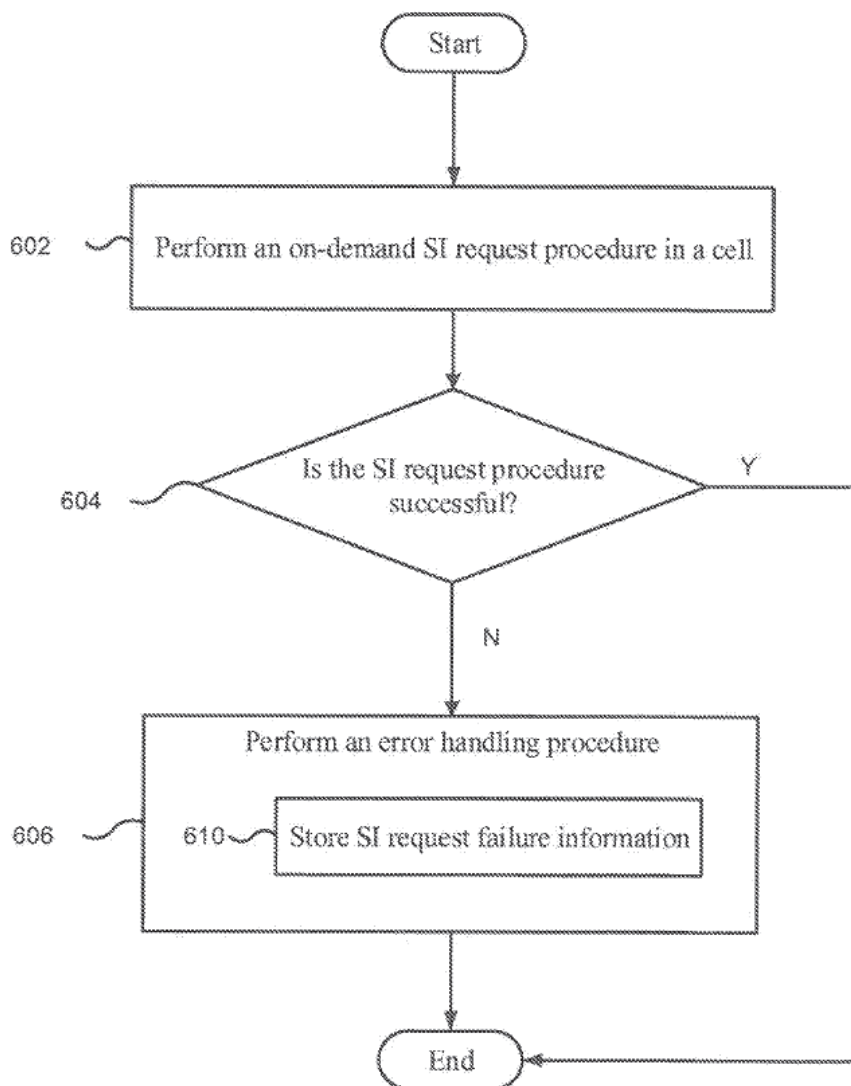
invention.

29. Also, I have been informed and understand that obviousness does not require physical combination or bodily incorporation but rather consideration of what the combined teachings of prior art references would have suggested to a POSITA at the time of the alleged invention.

V. SUMMARY OF THE '502 PATENT

30. The '502 patent generally relates to “an on-demand system information (SI) request procedure.” ‘502 patent, Abstract. The '502 patent explains that “[w]hen a UE finds that a required SI message(s) is not broadcasted ... the UE may perform an on-demand SI request procedure to ask the network [] to broadcast the required SIB(s)” (*i.e.*, system information blocks). ‘502 patent, 1:27-33. A POSITA would have understood that UE refers to user equipment such as a mobile terminal (*i.e.*, mobile phone).

31. Fig. 6 of the '502 patent, shown below, illustrates an “on-demand SI request procedure” performed by a UE. ‘502 patent, 15:33-38. The method includes step 602 a UE’s “on-demand SI request,” step 604 determining if the “SI request procedure is successful,” and step 606 “perform an error handling procedure” with optional step 610 “store the SI request failure information.” ‘502 patent, Fig. 6.

**'502 Patent, Fig. 6**

32. The '502 patent alleges that “the next generation wireless network lacks an efficient mechanism for error handling associated with the on-demand SI request procedure.” ‘502 patent, 1:33-36. The '502 patent proposes that “when the UE considers that the required SIB(s) and/or SI message(s) are not available (e.g., when an RA procedure problem is reported, or when SI request rejection information is received), the UE may activate a prohibit timer.” ‘502 patent, 7:4-8.

Then, “the UE may avoid initiating another on-demand SI request procedure until the prohibit timer expires.” ‘502 patent, 7:9-11.

33. However, as discussed in detail below, it was well known in the prior art for a UE in a 5G network to avoid initiating another on-demand SI request until a prohibit timer expires (OPPO, 1-2; Deenoo, 41:5-10) and store SI request failure information (Huawei, 3, 7).

VI. PROSECUTION HISTORY

34. The ’502 patent was filed in the U.S. on April 1, 2019 as application no. 16/372,389 and claims priority to provisional application no. 62/651,312 filed on April 2, 2018. It is unnecessary to determine whether the ’502 patent is entitled to its earliest alleged priority date of April 2, 2018 because the prior art relied upon herein pre-dates this date.

35. During a brief prosecution, the Patent Office issued a single office action rejecting as obvious the independent claims, which originally recited “*performing an error handling procedure if the on demand SI request [] is unsuccessful [which] comprises: storing SI request failure information.*” ’502 Prosecution History, 187, 320.

36. To overcome the office action, Applicant amended the independent claims to delete all existing limitations and add all new limitations that now included “*activating a prohibit timer,*” “*transmitting a second SI request message*

to the BS only when ... the prohibit timer expires,” and “determining that the UE is in a connected state.” ’502 Prosecution History, 175. These new claims were never rejected. The Patent Office issued a notice of allowance and the ’502 patent issued on September 29, 2020. ’502 Prosecution History, 167-168, 145, 137.

VII. CLAIM CONSTRUCTION

37. It is my understanding that to properly evaluate the ’502 patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term. For the purposes of my analysis below, I believe the terms of the challenged claims should be given their plain and ordinary meaning, and no terms require specific construction.

VIII. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

38. I have been asked to provide my opinion as to whether the Challenged Claims of the ’502 patent would have been obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references identified below teach the limitations of the Challenged Claims of the ’502 patent.

39. As part of my analysis, I have considered the scope and content of the

prior art and any differences between the alleged invention and the prior art. I describe in detail below the scope and content of the prior art, as well as differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claims of the '502 patent.

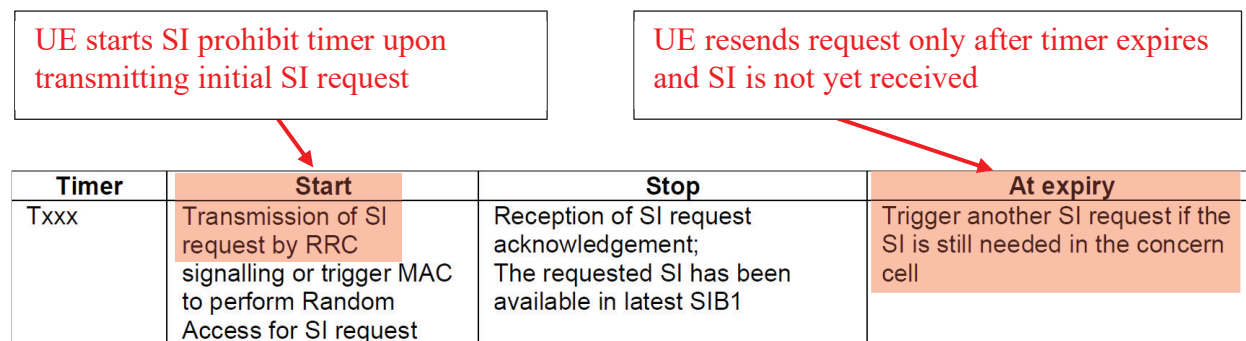
40. As described in detail below, the alleged invention of the Challenged Claims would have been obvious in view of the teachings of the identified prior art references as well as the knowledge of a POSITA.

A. Ground 1: Claim 1 is obvious under 35 U.S.C. § 103 over Oppo

1. Summary of Oppo

41. Oppo describes methods for an “on-demand SI request” by a UE in the context of the 3GPP 5G standard. OPPO, 1. Oppo’s methods are for “RRC_Idle and RRC_Connected UEs”—*i.e.*, UEs in either idle or connected mode. OPPO, 1.

42. Oppo describes a UE using a “prohibit timer” so that after an on-demand SI request, the “UE refrains from retrying until a certain time.” OPPO, 1. Oppo illustrates this prohibit timer in the table below. OPPO, 2.



OPPO, 2 (annotated).

2. Claim 1

[1.0] A method of an on-demand system information (SI) request procedure performed by a user equipment (UE), the method comprising:

43. Oppo describes methods for “on-demand SI request” (“*on-demand [] SI request procedure*”). OPPO, 1. Oppo describes its on-demand SI request procedure in the context of the 3GPP 5G standard. OPPO, 1.

44. Oppo describes a method where a UE uses a “prohibit timer” so that after an on-demand SI request, the “UE refrains from retrying until a certain time” (“*[a] method ... performed by a [] UE*”). OPPO, 1.

45. Thus, Oppo teaches the preamble.

[1.1] transmitting a first SI request message to a base station (BS) after determining that the UE is in a connected state,

46. Oppo teaches sending an “SI request for RRC_Connected UEs.”
OPPO, 1. Oppo explains that “RRC_Connected UEs” have an “RRC connection.”
OPPO, 1. A POSITA would have understood that such UEs having completed RRC establishment and have an “RRC connection” are determined at the UE to be

in connected mode and capable of increased network functionality, *e.g.*, compared to “idle mode” (“*determining that the UE is in a connected state*”).

47. Oppo further describes using each of an “**RRC-based SI request**,” a “**MSG1-based SI request**,” and a “**MSG3-based SI request ... for RRC Connected UEs**” (“*transmitting a first SI request message ... after determining that the UE is in a connected state*”). OPPO, 1.

48. Oppo describes the SI request as being sent to a “cell” or “gNB” (*i.e.*, g-Node B), which a POSITA knew were each also known as “*a base station (BS)*.” OPPO, 1; Deenoo, 4:53-56 (“the base station ... may be referred to as a cell”), 6:40-41 (“base station[] may represent ... a Node-B”).

49. Oppo illustrates the “*first SI request*” in the table below. OPPO, 2.

UE transmits a first SI request message to a cell (base station)



Timer	Start	Stop	At expiry
Txxx	Transmission of SI request by RRC signalling or trigger MAC to perform Random Access for SI request	Reception of SI request acknowledgement; The requested SI has been available in latest SIB1	Trigger another SI request if the SI is still needed in the concern cell

OPPO, 2 (annotated).

50. Thus, Oppo teaches a UE sending an initial SI request message to a cell after determining it is in RRC_Connected mode, which renders obvious “*transmitting a first SI request message to a base station (BS) after determining*

that the UE is in a connected state.”

[1.2] *the first SI request message including at least one requested system information block (SIB);*

51. As discussed at [1.1], Oppo teaches that the UE sends a message to the network for an “SI request” (“*first SI request*”). OPPO, 1. Oppo further describes the UE using a “SI prohibit timer,” which “[d]epends on the SI/SIBs being requested.” OPPO, 1. For instance, “after UE send one SI request to gNB, it should not send another one before check the latest SIB1 to know if the request SIB has been available.” OPPO, 1.

52. Therefore, Oppo describes the initial SI request message as specifying “SIBs being requested” (“*the first SI request message including at least one requested [] SIB*”). Indeed, Vivo also illustrates that it was well known that for “on demand SI” in 5G, “[f]or SI request sent from the RRC CONNECTED UE, the minimum granularity of requested SI is one SIB.” Vivo, 2-3.

53. Thus, Oppo’s teaching of a UE requesting SI/SIBs via an SI request message, in view of Vivo’s teachings that the minimum granularity of requested SI is one SIB, renders obvious “*the first SI request message including at least one requested system information block.*”

[1.3] *activating a prohibit timer; and*

54. Oppo teaches that an “SI prohibit timer is started when SI request is initiated” (“*activating a prohibit timer*”). OPPO, 2.

55. In more detail, Oppo teaches that for an “on-demand SI request,” the “UE refrains from trying until a certain time. **The prohibit timer** [] might be specified or be configurable etc.” OPPO, 1. For instance, the “**SI prohibit timer** is introduced for MSG1, MSG3 and dedicated RRC signalling to suppress UE to generate frequent SI request signalling.” OPPO, 1-2.

56. Oppo therefore teaches that the UE starts the SI prohibit timer (“activating”) upon transmitting the initial SI request to the network as the table below illustrates. OPPO, 2.

UE starts SI prohibit timer upon transmitting initial SI request (*activating a prohibit timer*)



Timer	Start	Stop	At expiry
Txxx	Transmission of SI request by RRC signalling or trigger MAC to perform Random Access for SI request	Reception of SI request acknowledgement; The requested SI has been available in latest SIB1	Trigger another SI request if the SI is still needed in the concern cell

OPPO, 2 (annotated).

57. Thus, Oppo teaches a UE starts a prohibit timer upon sending an initial SI request message, to refrain from resending an SI request message until a certain time, which renders obvious “*activating a prohibit timer.*”

[1.4] transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.

58. First, Oppo renders obvious “*transmitting a second SI request message to the BS only when the at least one requested SIB is not received.*”

OPPO, 2. Oppo teaches that “after UE send one SI request to gNB, **it should not send another one before check the latest SIB1 to know if the request[ed] SIB has been available**, otherwise, there can be frequent SI request which is unnecessary.” OPPO, 2. Indeed, Oppo explains that a second SI request is transmitted to the gNB (*i.e.*, the cell’s base station or “BS”) if “**the SI is still needed** in the [] cell.” OPPO, 2.

59. Second, Oppo renders obvious “*transmitting a second SI request message to the BS only when ... the prohibit timer expires.*” OPPO, 2. Oppo teaches that for “the introduced SI prohibit timer ... the timer is started when SI request is initiated ... **When Timer expires, SI request can be triggered** UE still need the SI on the concern cell.” OPPO, 2.

60. Oppo illustrates in the table below that a second SI request is transmitted to the cell’s base station upon the conditions that (i) the “Timer” is “[a]t expiry” and (ii) “the SI is still needed” (“*transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires*”); and it would have been obvious to a POSITA that the second SI request is transmitted “*only*” when those conditions occur. OPPO, 2.

Second SI request transmitted to BS only if the SI is still needed and the SI prohibit timer is at expiry

Timer	Start	Stop	At expiry
Txxx	Transmission of SI request by RRC signalling or trigger MAC to perform Random Access for SI request	Reception of SI request acknowledgement; The requested SI has been available in latest SIB1	Trigger another SI request if the SI is still needed in the concern cell

OPPO, 2 (annotated).

61. Thus, Oppo teaches that another SI request is sent if both the SI is still needed and the SI prohibit timer has expired, which renders obvious “*transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.*”

B. Ground 2: Claims 5-6 are obvious under 35 U.S.C. § 103 over Oppo in view of Vivo

1. Summary of Vivo

62. Vivo teaches methods for “on demand SI” requests by an “RRC_CONNECTED UE” in 5G. Vivo, 2-3. Vivo explains that “[f]or SI request sent from the RRC_CONNECTED UE, the minimum granularity of requested SI is one SIB” or system information block. Vivo, 2. Vivo further explains that, by contrast, for “MSG1 [or MSG3] based SI request, the minimum granularity of requested SI is one SI message” where one SI message includes multiple SIBs. Vivo, 1-2.

2. Reasons to Combine Oppo and Vivo

63. For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Oppo and Vivo. In particular, before the priority date of the '502 patent, it would have been obvious, beneficial, and predictable to utilize Vivo's teachings regarding the granularity of a SI request message in combination with Oppo's system—for example, for a UE in idle or connected mode to specify the particular SIB(s) or SI message being requested; further, it would have been obvious to apply Vivo's teachings about actually receiving the requested SIBs via dedicated signaling.

64. As an initial matter, one of ordinary skill in the art when considering the teachings of Oppo would have naturally considered the teachings of Vivo as they are analogous prior art to the '502 patent and pertain to the same field of endeavor, namely, cellular telecommunications. *See* OPPO, 1; Vivo, 1. Specifically, both references describe on-demand SI requests in the context of the 5G standard. OPPO, 1; Vivo, 1. Further, both references were submitted to the same 3GPP RAN working group 3 meeting #101 in Athens, Greece on February 26 to March 2, 2018. OPPO, 1; Vivo, 1; Ex.1005, ¶xx. Oppo and Vivo are also reasonably pertinent to the particular problem of the '502 patent. For example, Oppo and Vivo describe UE and BS procedure for initiating and handling on-demand SI requests in 5G. OPPO, 1; Vivo, 1.

65. One of ordinary skill in the art would have also been specifically motivated to incorporate Vivo's technique regarding the granularity of the SI requested in an SI request message into Oppo because doing so would clarify an implementation detail of Oppo's system—*i.e.*, providing UEs with only the system information needed (SIB versus SI message of multiple SIBs) depending on the UE's operating mode (idle or connected), in order to reduce communication overhead. Ex.1007, 1-2. Indeed, Oppo already contemplates that the SI request message would specify "the SI/ SIBs being requested." OPPO, 1. Accordingly, a POSITA would have been motivated to integrate Vivo's technique into Oppo's system, to clarify whether a set of SIB(s) or an SI message can be requested in connected versus idle mode.

66. This combination beneficially allows UEs to request SI, *i.e.*, system information, with finer granularity in connected mode, where only one or a small number of SIBs may be required. *See* Ex.1007, 1-3.

67. In one example implementation of this combination, a POSITA would have found it obvious to augment Oppo's SI request methods such that the SI request message sent by UEs in connected mode would request particular SIB(s) whereas UEs in idle mode would request particular SI messages (*i.e.*, at least multiple or a group of SIBs). OPPO, 1; Vivo, 1-3. This combination would have been obvious because several other POSITAs also suggested the same solution; in

other words, POSITAs understood that there were only a limited number of options for an SI request and specifying the SIB(s) and/or SI message was one option proposed by several POSITAs. Vivo II, 1 (“the network broadcasts the **requested SI messages after MSG1/3 based SI request**”); Peisa, [0010] (“the Physical Random Access Channel (PRACH) preamble and/or PRACH resource specific to **each system information block (SIB) or set of SIBS which the UE needs** to acquire”); Deenoo, 46:23-25 (“The specific [requested] other-SI (e.g., **SIB and/or SI message**) may be determined by the [UE.]”).

68. Not only would utilizing Vivo’s technique in Oppo’s system have been advantageous, but a POSITA would have also found the combination predictable and would have had a reasonable expectation of success, for several reasons. For example, the combination does not change the intended functionality of either Oppo’s timer-based SI request methods or Vivo’s technique. *Id.* In fact, Vivo’s technique was *specifically intended* to be implemented in 5G on-demand SI request methods (such as Oppo’s). *See* Vivo, 1; OPPO, 1. Further, the combination is predictable because other POSITAs at the time already considered Vivo’s technique of UEs specifying the requested system information with the granularity of SIB(s) or SI message. Deenoo, 46:23-25; Peisa, [0010]; Vivo II, 1).

69. Additionally, it would have been obvious to a POSITA that—following the SI request acknowledgment received from the BS, as taught by

Oppo—the UE would actually receive the requested SIB. Indeed, this limitation was obvious to POSITAs, because the purpose of requesting SIBs is to receive them; and for a connected mode UE, it was obvious to send the SIBs reliably and efficiently via dedicated signaling, i.e., utilizing the connected mode channels, as was explicitly taught by Vivo, for example. Vivo, 2. Indeed, Vivo explains, “the requested SI is delivered to RRC_CONNECTED UE via dedicated signaling.” Vivo, 2. The advantage to this implementation was also apparent to POSITAs, as Vivo explains that delivering requested SIBs via dedicated signaling “means it is possible for the network to deliver only the SIBs exactly needed by the UE.” Vivo, 2.

70. Accordingly, a POSITA would have found it obvious to apply Vivo’s teachings to Oppo’s because the combination merely amounts to applying a known SI request message formatting and dedicated signaling technique to an SI request method (Oppo’s) ready for further implementation details.

3. Claim 5

[5.0] *The method of claim 1, further comprising: receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.*

71. First, Oppo teaches “*receiving, from the BS*” an acknowledgment of the SI request “*that is transmitted in response to the first SI request message.*”

OPPO, 2. For instance, Oppo explains that, after the “SI prohibit timer” is activated

by the initial SI request, “[r]egarding the stop condition ... [one] condition is that **UE get the acknowledgement of the SI request.**” OPPO, 2.

72. Oppo further describes the scenario where “not all essential SIBs are ‘regularly’ broadcasted,” which a POSITA would have understood to mean that some SIBs are not broadcasted but instead delivered via dedicated signaling. OPPO, 1. Indeed, Oppo considers the UE requesting SIBs using “dedicated RRC signalling,” and a POSITA would have understood that the SIBs would likewise be delivered via dedicated signaling for these connected-mode UEs. OPPO, 2.

73. To the extent Oppo does not explicitly teach “*receiving [] the at least one requested SIB via dedicated signaling,*” it would have been obvious to a POSITA that—following the SI request acknowledgment received from the BS, as taught by Oppo—the UE would receive the requested SIB. Indeed, this limitation was well known to POSITAs as taught by Vivo, for example. Vivo, 2.

74. **Second**, Vivo teaches that, at a prior meeting of the 3GPP RAN2 working group (the same working group that considered the Oppo document), “[i]t was agreed that **the requested SI is delivered to RRC CONNECTED UE via dedicated signaling.** This means it is possible for the network to deliver only the SIBs exactly needed by the UE.” Vivo, 2. Accordingly, a POSITA would have found it obvious for the UE described in Vivo, which receives from the gNB (BS) an acknowledgment of its SI request, to actually “*receiv[e] the at least one*

requested SIB via dedicated signaling,” as was agreed to by the 3GPP RAN2 working group. See Vivo, 2.

75. Thus, Oppo teaches the UE receiving an acknowledgment of its SI request from the BS, and Vivo teaches the UE receiving the requested SIB via dedicated signaling, which renders obvious “*receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.*”

4. Claim 6

[6.0] *The method of claim 1, further comprising: transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.*

76. First, Oppo teaches “transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state.” Oppo teaches that the “**UE send SI request**” (“fourth SI request message”) for each of “MSG1-” and “MSG3-based SI request for **RRC Idle**” (“UE is not in the connected state”). OPPO, 1. Indeed, Oppo further explains “we discuss the SI prohibit timer for MSG1 and MSG3 based **SI request** especially for **RRC Idle/inactive UEs.**” OPPO, 1.

77. To the extent Oppo does not disclose the details of a UE going from a connected state to not being in a connected state, this functionality was known as described in Deenoo. *See Deenoo, 54:36-39.* Moreover, a POSITA would have

understood that issuing another SI request message after the UE goes from a connected to a not connected state could be a “fourth SI request message.” *See* Oppo, 1. And to the extent Oppo does not explicitly disclose that, for a UE not in connected mode, the SI request “including at least one requested SI message,” this limitation was well known to POSITAs as taught by Vivo, for example. Vivo, 1.

78. Second, Vivo teaches that in “RAN2#98 meeting, it was agreed that for MSG1 based SI request, the minimum granularity of requested SI is one SI message.” Vivo, 1. Vivo also teaches that “[f]or MSG3 based SI request, the minimum granularity of requested SI is one SI message.” Vivo, 1.

79. A POSITA would have found it obvious to apply Vivo’s teachings to Oppo at least for the reasons described above at Section IX.D.2. In the resulting combination, an idle or inactive mode UE transmits an SI request that includes at least one requested SI message. *See* OPPO, 1; Vivo, 1.

80. Thus, Oppo teaches that an idle/inactive mode UE transmits MSG1 or MSG3 based SI request, and Vivo teaches that an MSG1 or MSG3 based SI request includes a minimum of one requested SI message, which renders obvious “transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.”

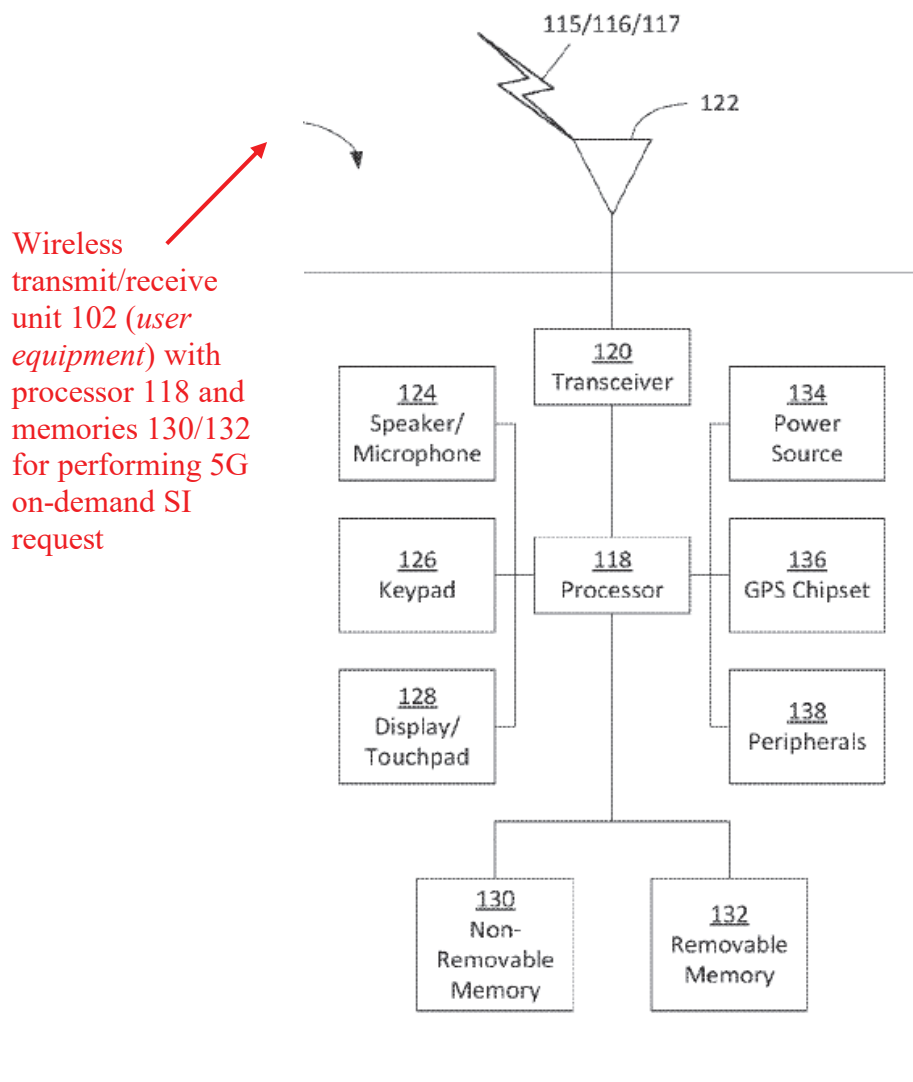
C. Ground 3: Claims 11, 15-16 are obvious under 35 U.S.C. § 103 over Oppo in view of Vivo and Deenoo

1. Summary of Deenoo

81. Deenoo describes a “wireless transmit/receive unit (WTRU)” or UE that is “configured to determine one or more uplink (UL) resources with which to communicate information for the WTRU reception of the one or more on-demand SI messages.” Deenoo, 2:17, 2:29-32.

82. Deenoo further teaches an SI request method where a UE “may start a timer” when an “other-SI request message is transmitted” (*i.e.*, the UE may start a prohibit timer). Deenoo, 41:5-7. The UE may use “timer A and/or a timer B (e.g., where timer A time > timer B time).” Deenoo, 41:5-7. Then, “[u]pon expiry of timer B, a WTRU may retransmit the other-SI request message and/or restart timer B.” Deenoo, 41:9-10. Further, a UE “may be configured with a predefined number of retransmissions to acquire the other-SI until expiry of timer A. Upon expiry of timer A, a [UE] may consider the cell [BS] to be barred.” Deenoo, 41:10-14.

83. Deenoo illustrates example UE hardware and software, including processor 118 and memories 130/132, in Fig. 1B shown below. Deenoo, 6:29. Deenoo explains that the UE “may be configured with one or more rules for transmission of on-demand system information request that may be saved in memory as instructions executable by a processor.” Deenoo, 39:44-47.



2. Reasons to Combine Oppo and Vivo with Deenoo

84. For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Oppo and Vivo with Deenoo. In particular, before the priority date of the '502 patent, it would have been obvious and predictable to utilize Deenoo's teachings regarding UE hardware/software implementation in combination with the system of Oppo and Vivo—for example,

to perform the SI request method of Oppo and Vivo using Deenoo's UE. It would have been plainly obvious to a POSITA to implement a 5G method in a UE designed to implement 5G methods.

85. As an initial matter, one of ordinary skill in the art when considering the teachings of Oppo and Vivo would have naturally considered the teachings of Deenoo as they are analogous prior art to the '502 patent and pertain to the same field of endeavor, namely, cellular telecommunications. *See* OPPO, 1; Vivo, 1; Deenoo, Abstract. Specifically, these references all describe on-demand SI requests in the context of the 5G standard. OPPO, 1; Vivo, 1; Deenoo, Abstract, 37:23. Deenoo is also reasonably pertinent to the particular problem of the '502 patent. For example, Deenoo describes UE and BS procedure for initiating and handling on-demand SI requests in 5G. Deenoo, 37:43-46.

86. One of ordinary skill in the art would have also specifically looked to incorporate Deenoo's technique of programming memory and a processor to execute stored instructions for performing an SI request into the system of Oppo and Vivo—because doing so would address implementation details left out of these 3GPP working group meeting proposals. In other words, Deenoo's teachings describe well-known UE hardware/software design implementation details. Indeed, cellular standard-directed proposals such as Oppo and Vivo routinely leave such details up to device manufacturers—such as Sony Corporation, the assignee of the

Deenoo U.S. patent. A POSITA would have considered Deenoo's UE as a suitable example implementation because Deenoo's UE architecture provides flexibility for the memory and processor to be programmed to execute various functionality of the 5G standard. Deenoo, Abstract. This combination also would have been obvious because Deenoo's general UE architecture was common in the art. Peisa, Fig.2, Fig.7). For instance, another prior art reference, Peisa, illustrates at Fig.2 and Fig.7 the basic and well-known UE architecture—a cellular phone having a processor for processing instructions stored in memory.

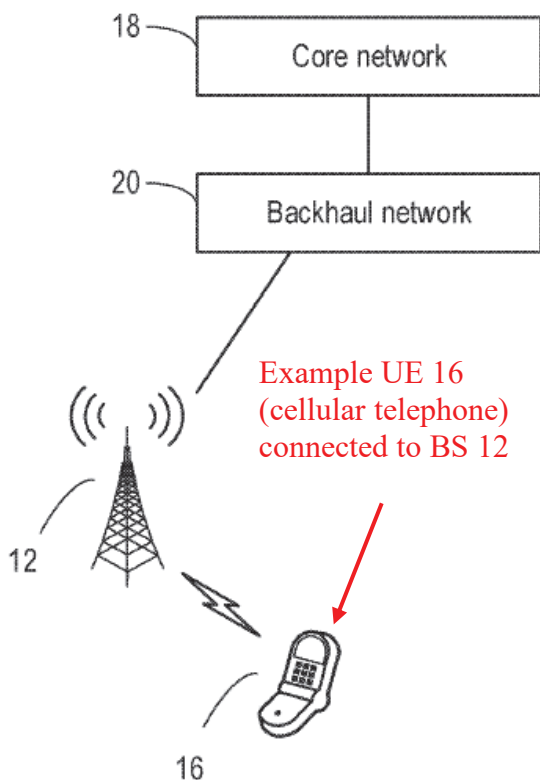


Figure 2

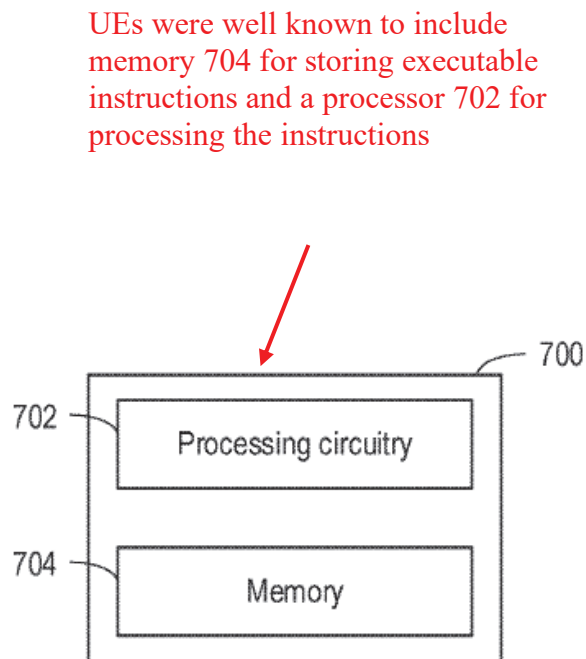


Figure 7

Peisa, Fig.2 (annotated, left), Fig.7 (annotated, right).

87. A POSITA would have also found the combination predictable and would have had a reasonable expectation of success, as the combination does not change the intended functionality of any of Oppo's and Vivo's methods or Deenoo's UE. For instance, a POSITA would have expected success as Oppo's technique was *specifically intended* to be implemented in a UE with 5G capabilities (such as Deenoo's). OPPO, 1. Indeed, like Oppo and Vivo, Deenoo itself describes an SI request technique for requesting on-demand SIBs using a

prohibit timer. Deenoo, 41:5-14.

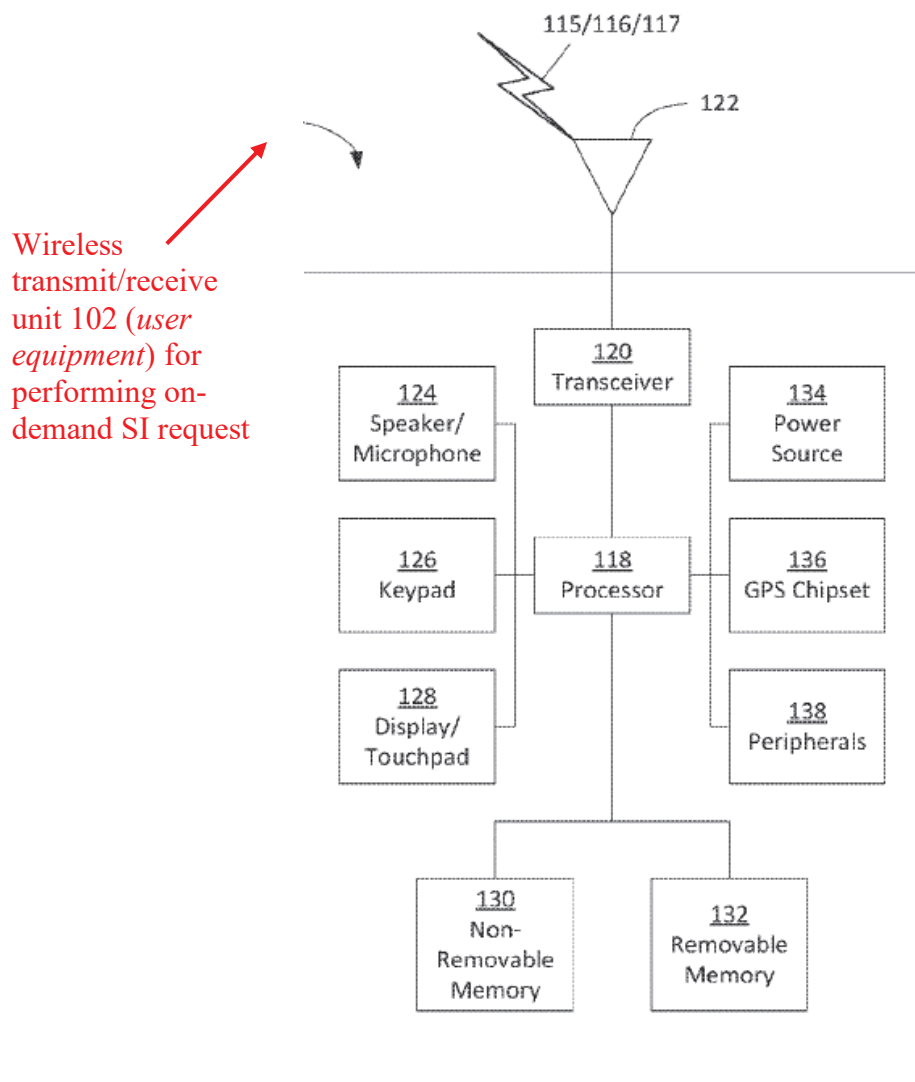
88. Accordingly, a POSITA would have found it obvious to apply Deenoo's teachings to Oppo and Vivo because the combination merely amounts to implementing a known SI request technique in Deenoo's 5G-capable UE ready for improvement.

3. Claim 11

[11.0] A user equipment (UE), comprising:

89. Oppo describes a UE that uses a "prohibit timer" so that, after an on-demand SI request, the "UE refrains from retrying until a certain time" ("*[a] user equipment (UE)*"). OPPO, 1.

90. Deenoo further describes details regarding an example UE configured for on-demand SI requests. For instance, Deenoo describes a "wireless transmit/receive unit (WTRU)" that is "configured to determine one or more uplink (UL) resources with which to communicate information for the WTRU reception of the one or more on-demand SI messages." Deenoo, 2:17, 2:29-32. Deenoo explains that "the WTRUs 102 ... may include user equipment (UE)." Deenoo, 4:26-29. Deenoo illustrates an example WTRU or UE in Fig. 1B shown below. Deenoo, 6:29.



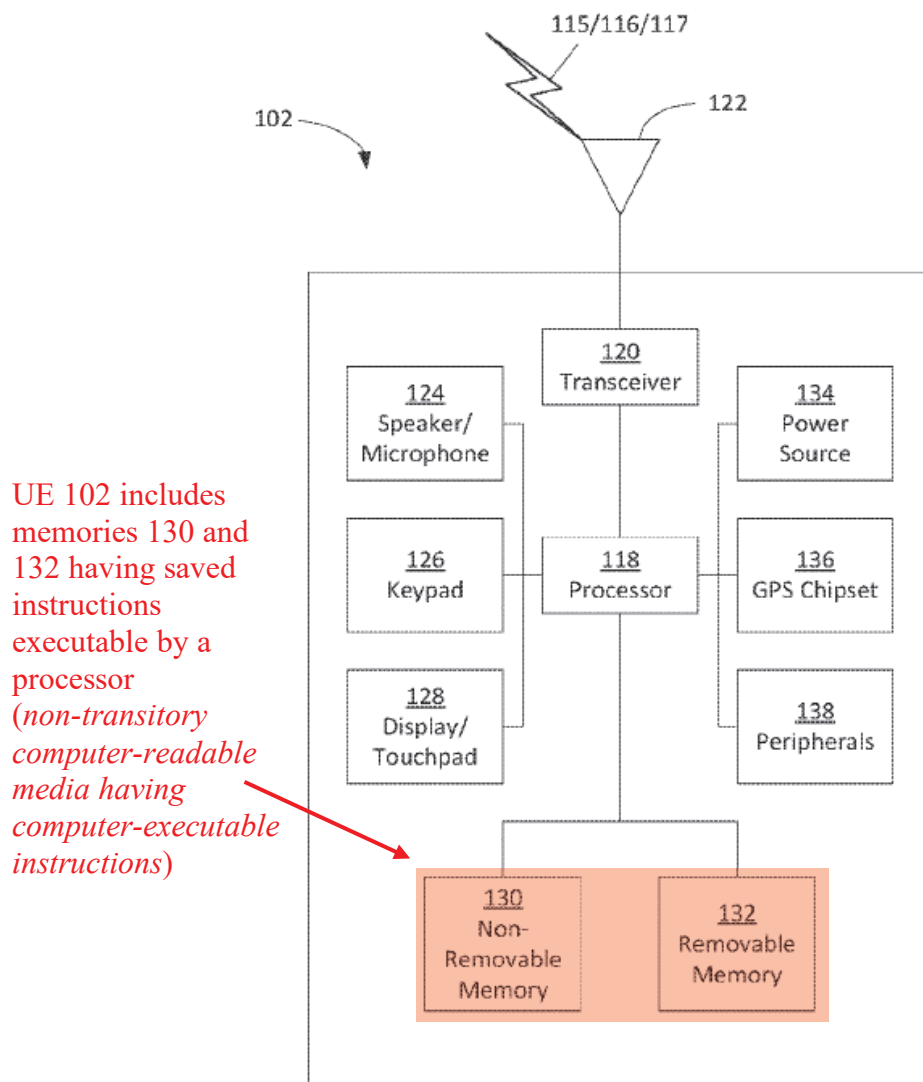
91. Thus, Oppo’s UE that requests on-demand SI, in view of Deenoo’s example UE configured for requesting and receiving messages regarding on-demand SI, renders obvious “*a user equipment.*”

[11.1] *one or more non-transitory computer-readable media having computer-executable instructions embodied thereon; and*

92. As discussed at [11.0], Oppo in view of Deenoo teaches a UE

configured for requesting and receiving messages regarding on-demand SI.

93. Deenoo describes the UE including “non-removable memory 130, removable memory 132” (“*one or more non-transitory computer-readable media*”). Deenoo, 6:33-34. Deenoo further explains that the UE “may have **saved instructions in memory executable by a processor** and/or received from a wireless network via a message (e.g., rules) for triggering a system information (‘SI’) request procedure” (“*non-transitory computer-readable media having computer-executable instructions embodied thereon*”). Deenoo, 1:62-65.



Deenoo, Fig. 1B (annotated).

94. Thus, Oppo's UE that requests on-demand SI, in view of Deenoo's teaching that a UE stores SI request procedure instructions in memory that are executable by a processor, renders obvious "*one or more non-transitory computer-readable media having computer-executable instructions embodied thereon.*"

[11.2] at least one processor coupled to the one or more non-transitory computer-readable media, and configured to execute the computer-executable instructions to perform operations for an on-demand system information (SI)

request procedure, the operations comprising:

95. As discussed at [11.1], Deenoo describes a UE “**may have saved instructions in memory executable by a processor** and/or received from a wireless network via a message (e.g., rules) for triggering a **system information (‘SI’) request procedure**.” Deenoo, 1:62-65. Deenoo further explains that the UE “may be configured with one or more rules for transmission of **on-demand system information request that may be saved in memory as instructions executable by a processor**” (“*at least one processor coupled to the one or more non-transitory computer-readable media to perform operations for an on-demand system information (SI) request procedure*”). Deenoo, 39:44-47.

96. Thus, Oppo’s UE that requests on-demand SI, in view of Deenoo’s UE including saved instructions in memory executable by a processor for performing operations of on-demand SI request procedures, renders obvious “*at least one processor coupled to the one or more non-transitory computer-readable media, and configured to execute the computer-executable instructions to perform operations for an on-demand system information (SI) request procedure.*”

[11.3] transmitting a first SI request message to a base station (BS) after determining that the UE is in a connected state, the first SI request message including at least one requested system information block (SIB); activating a prohibit timer; and transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.

97. Oppo in view of Vivo and Deenoo render obvious this element; see

Ground #1 [1.1]-[1.4] and Ground #3 [11.2] above.

4. Claim 15

[15.0] *The UE of claim 11, wherein the operations further comprise: receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.*

98. Oppo in view of Vivo and Deenoo render obvious this element; see Ground #2 [5.0] above.

5. Claim 16

[16.0] *The UE of claim 11, wherein the operations further comprise: transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.*

99. Oppo in view of Vivo and Deenoo render obvious this element; see Ground #2 [6.0] above.

D. Ground 4: Claims 1-2, 5-6, 11-12, and 15-16 are obvious under 35 U.S.C. § 103 over Deenoo

1. Summary of Deenoo

100. As discussed above at Section IX.E.1, Deenoo describes a UE configured for requesting and receiving messages regarding on-demand SI.

2. Claim 1

[1.0] *A method of an on-demand system information (SI) request procedure performed by a user equipment (UE), the method comprising:*

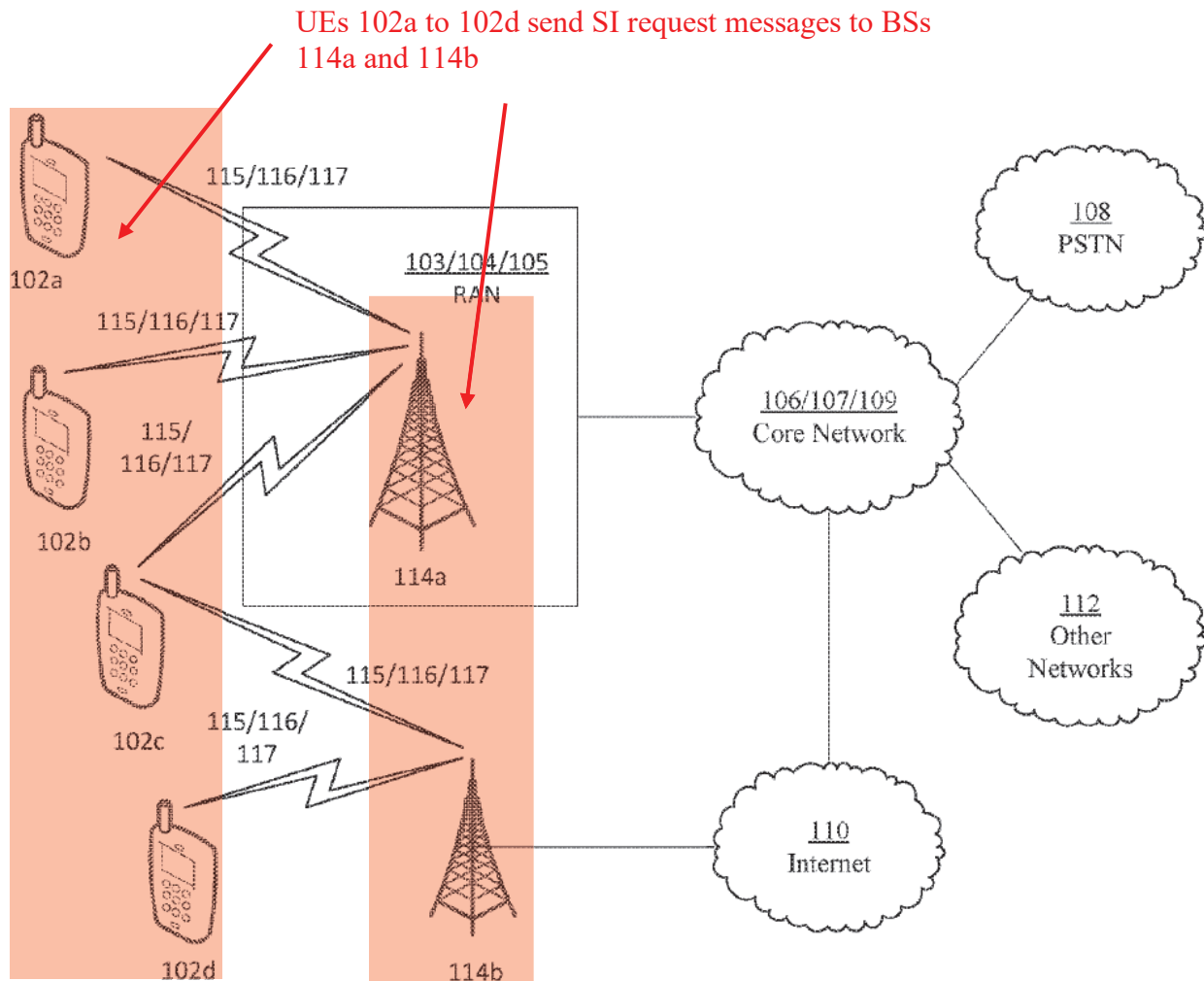
101. Deenoo describes “procedures in a wireless transmit/receive unit (WTRU),” which can “include user equipment (UE).” Deenoo, 76:15-16, 4:28-29.

“A WTRU may initiate a request for on-demand SI in the new cell and/or acquire the on-demand SI” (*“an on-demand [SI] request procedure performed by a [UE]”*). Deenoo, 61:43-45. Thus, Deenoo teaches the preamble.

[1.1] *transmitting a first SI request message to a base station (BS) after determining that the UE is in a connected state,*

102. Deenoo teaches that the UE’s “transceiver may be configured to **send the request for the one or more on-demand SI messages to the communication network** using the one or more UL resources.” Deenoo, 2:36-39. The communications network’s “**base stations**” receive the UE’s on-demand SI messages (*“transmitting a first SI request message to a base station (BS)”*). Deenoo, 4:34-37 (“Each of the base stations 114 a, 114 b may be any type of device configured to wirelessly interface with at least one of the [UEs].”).

103. Fig.1A below illustrates UEs 102a to 102d, which send SI request messages to BSs 114a and 114b. Deenoo, Fig.1A.



Deenoo, Fig. 1B (annotated).

104. Deenoo explains that a UE “may trigger a **system information request procedure in any state (e.g., idle, inactive, and/or connected)**.” Deenoo, 39:38-39. For instance, the UE “may perform a system information request by for example **using a dedicated resource**,” which are only available to connected-mode UEs (“*after determining that the UE is in a connected state*”). Deenoo, 39:39-43.

105. Thus, Deenoo's UE that transmits on-demand SI messages to a base station in a connected state renders obvious "transmitting a first SI request message to a base station (BS) after determining that the UE is in a connected state."

[1.2] *the first SI request message including at least one requested system information block (SIB);*

106. Deenoo teaches that "[s]pecific combinations of preamble and resources may be reserved for the WTRU to request one or more, or multiple other-SI and/or a set of SIBs (e.g., a set of SIBs and/or SI related to a specific feature)" ("*the first SI request message including at least one requested [SIB]*"). Deenoo, 46:19-22.

107. Deenoo explains that the "terms system information request and Other-SI request may be used interchangeably." Deenoo, 38:28-29. Deenoo also uses the terms "on-demand SI" and "other-SI" interchangeably, explaining "[s]ystems may manage [] the impact of on-demand other-SI broadcast on an uninterested WTRU. Multi-stage RACH may be used for other-SI request" ("*first SI request message*"). Deenoo, 13:27-30. In addition to using RACH, the "other-SI request may be an RRC message" (also teaching a "*first SI request message*"). Deenoo, 44:3-4.

108. Thus, Deenoo's teaching of the on-demand SI request message including one or more SIBs renders obvious "*the first SI request message including*

at least one requested system information block.”

[1.3] *activating a prohibit timer; and*

109. Deenoo teaches that a “[UE] may start a timer A and/or a timer B (e.g., where timer A time > timer B time), when the first other-SI request message is transmitted.” Deenoo, 41:5-7. Then, “[u]pon expiry of timer B, a WTRU may retransmit the other-SI request message and/or restart timer B.” Deenoo, 41:9-10.

110. Thus, Deenoo teaches starting a timer B when the on-demand SI request is transmitted, and prohibiting retransmitting the on-demand SI request until the timer B expires, which renders obvious “*activating a prohibit timer.*”

[1.4] *transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.*

111. As discussed above at [1.3], Deenoo’s method includes a UE starting “**timer B**,” *i.e.*, a prohibit timer, “when the first other-SI request message is transmitted.” Deenoo, 41:5-7.

112. Deenoo explains that “**[w]hile timer B is running, a WTRU may monitor for the presence and/or scheduling of other-SI** via a broadcast signaling.” Deenoo, 41:15-17. Deenoo further teaches that the UE “**may stop ... timer B when the WTRU completes the acquisition of other-SI.**” Deenoo, 41:7-10. In other words, if timer B expires, the SI message was never received because timer B stops when the SI message is received. Additionally, Deenoo teaches that “**[u]pon expiry of timer B, a WTRU may retransmit the other-SI request**

message.” Deenoo, 41:7-10. Accordingly, if the SI request message is retransmitted: (i) the prohibit timer B has expired and (ii) the SI message was never received (“*second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires*”). Deenoo, 41:5-10, 41:15-17.

113. Notably, the concept of retransmitting the SI request “*only when the at least one requested SIB is not received and the prohibit timer expires*” was well known to POSITAs. For instance, Sharma² teaches that a “**UE can request the ‘Other SI’ again after the expiry of this backoff timer,**” and “**[b]efore sending the request, UE should know whether a certain SIB is available in the cell.**” Sharma, 9:61-63, 6:17-19. Likewise, Peisa³ teaches that the UE “transmits the second request for the second portion of system information **upon expiry of the second timer [which has] a longer duration than the first timer (used to determine whether the second portion of system information has been received or not).**” Peisa, [0060]; Ex.1015, 11-12.

114. Thus, Deenoo teaches that timer B stops when the requested SIB(s) is received and a second request is only transmitted when timer B expires, which

² U.S. Pat. No. 11,051,235 to Sharma *et al.* (Ex.1010) (“Sharma”).

³ U.S. Pat. Pub. No. 2020/0113011 to Peisa *et al.* (Ex.1014) (“Peisa”).

renders obvious “transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.”

3. Claim 2

[2.0] The method of claim 1, wherein the on-demand SI request procedure is unsuccessful when one of the following conditions is met: a number of times the UE transmits a random access preamble reaches a threshold; and the UE receives SI request rejection information.

115. First, Deenoo teaches that for the “on-demand SI request procedure ... the UE transmits a random access preamble.” As discussed above at [1.2], Deenoo teaches that “**[m]ulti-stage RACH** [i.e., random access channel] may be used for other-SI request.” Deenoo, 13:27-30. Deenoo further explains that a UE “may perform requests for other-SI using transmission of one or more, or multiple **preambles in different RACH resources**.” Deenoo, 47:12-14.

116. Second, Deenoo explains that the UE “may be configured with a **predefined number of retransmissions to acquire the other-SI until expiry of timer A**” (“a number of times the UE transmits a random access preamble reaches a threshold”). Deenoo, 41:11-13. Then, “**[u]pon expiry of timer A, a WTRU may consider the cell to be barred** for a predefined duration (e.g., not use that cell)” (“the on-demand SI request procedure is unsuccessful”). Deenoo, 41:13-14.

117. Indeed, it was well known in the prior art, and described in several references in addition to Deenoo, that a “SI request procedure is unsuccessful when [] a number of times the UE transmits a random access preamble reaches a

threshold.” For instance, Sharma teaches “using Random Access ‘RA’ preamble for ... requesting the SI,” where “**a terminal may decide to try again only for a number of further attempts.**” Sharma, 6:29-31, 9:67-10:5; *see also* Vivo II, 2 (“After the timer is expired, if SI is still requested, UE RRC re-triggers RACH procedure for SI request at the cell. **UE RRC is allowed to trigger RACH procedure at the cell up to N times. ... the UE should re-initiate the request procedure (up to a maximum number of times).**”); LG, 4 (“UE MAC shall not re-transmit RACH preamble if **maximum number of preamble transmissions** is reached.”).

118. Thus, Deenoo teaches that the UE considers a cell barred after a predefined number of RACH preamble retransmissions, which renders obvious “*wherein the on-demand SI request procedure is unsuccessful when one of the following conditions is met: a number of times the UE transmits a random access preamble reaches a threshold; and the UE receives SI request rejection information.*”

4. Claim 5

[5.0] *The method of claim 1, further comprising: receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.*

119. As discussed above at [1.4], Deenoo teaches that the UE (*i.e.*, WTRU) “may stop timer A and/or timer B when **the WTRU completes the acquisition of**

other-SI” requested from the base station. Deenoo, 41:7-9. Deenoo explains that **“system information may be acquired by** splitting information across broadcast and **dedicated transmissions.**” Deenoo, 34:55-57. Deenoo further explains that an “SI request” for “[o]n-demand (dedicated) information may comprise **obtaining remaining system information through dedicated resources.**” Deenoo, 1:62-2:2, 34:50-52.

120. Thus, Deenoo teaches that, in response to an on-demand SI request, the UE receives the requested on-demand SI from the base station through dedicated downlink transmission resources, which renders obvious “*receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.*”

5. Claim 6

[6.0] *The method of claim 1, further comprising: transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.*

121. First, as discussed above at [1.1], Deenoo teaches that a UE “may trigger a **system information request procedure in any state (e.g., idle,** inactive, and/or connected).” Deenoo, 39:38-39. Indeed, a UE in connected mode may “go back to idle mode” and UEs “in Idle mode or Inactive mode can acquire the system information while remaining within the respective state” (“*transmitting a fourth SI request message to the BS after determining that the UE is not in the connected*

state”). Deenoo, 32:47-48, 43:2-4.

122. Second, Deenoo further teaches that the UE may “**request one or more system information (SI) messages** from the communication network.”

Deenoo, 2:7-8. Deenoo explains that a “WTRU may perform **requests for other-SI** using transmission of **one or more**, or multiple **preambles** in different RACH resources” and “may transmit a specific preamble for one or more, or each, of the other-SI (e.g., SIB and/or **SI message**) used (e.g., required) by the WTRU” (“*the fourth SI request message including at least one requested SI message*”). Deenoo, 47:12-18, 60:61-65.

123. Thus, Deenoo teaches that a UE transitions from connected to idle mode and requests an SI message in idle mode, which renders obvious “*transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.*”

6. Claim 11

[11.0] A user equipment (UE), comprising:

124. Deenoo describes this element; see Ground #3 [11.0].

[11.1] one or more non-transitory computer-readable media having computer-executable instructions embodied thereon; and

125. Deenoo describes this element; see Ground #3 [11.1].

[11.2] at least one processor coupled to the one or more non-transitory

computer-readable media, and configured to execute the computer-executable instructions to perform operations for an on-demand system information (SI) request procedure, the operations comprising:

126. Deenoo describes this element; see Ground #3 [11.2].

[11.3] transmitting a first SI request message to a base station (BS) after determining that the UE is in a connected state, the first SI request message including at least one requested system information block (SIB); activating a prohibit timer; and transmitting a second SI request message to the BS only when the at least one requested SIB is not received and the prohibit timer expires.

127. Deenoo teaches this element; see Ground #4 [1.1]-[1.4] above.

7. Claim 12

[12.0] The UE of claim 11, wherein the on-demand SI request procedure is unsuccessful when one of the following conditions is met: a number of times the UE transmits a random access preamble reaches a threshold; and the UE receives SI request rejection information.

128. See Ground #4 [2.0] above.

8. Claim 15

[15.0] The UE of claim 11, wherein the operations further comprise: receiving, from the BS, the at least one requested SIB via dedicated signaling that is transmitted in response to the first SI request message.

129. See Ground #4 [5.0].

9. Claim 16

[16.0] The UE of claim 11, wherein the operations further comprise: transmitting a fourth SI request message to the BS after determining that the UE is not in the connected state, the fourth SI request message including at least one requested SI message.

130. See Ground #4 [6.0].

E. Ground 5: Claims 3 and 13 are obvious under 35 U.S.C. § 103 over Deenoo in view of Futaki

1. Summary of Futaki

131. Futaki describes on-demand SI request procedures in the context of 5G. Deenoo, 5:8-14. Futaki further describes SI requests in dual connectivity mode. Futaki, 12:7-15.

132. In particular, Futaki teaches a UE requesting system information of a secondary node-b base station (NB), describing a “procedure for sending an indication of on-demand system information available in the cell 21 of the secondary gNB (SgNB) 2.” Futaki, 10:43-47. Futaki explains that the system information for the secondary node is sent to the UE from the master node base station (MeNB): “system information of ... SgNB 2 [is sent] to the UE 3 via the master eNB (MeNB) 1 in Inter-RAT dual connectivity.” Futaki, 10:43-47.

2. Reasons to Combine Deenoo with Futaki

133. For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Futaki with the system of Deenoo described above. In particular, before the priority date of the '502 patent, it would have been obvious, beneficial, and predictable to utilize Futaki's teachings regarding SI requests in dual connectivity mode in combination with the SI request method and example 5G-capable UE of Deenoo—for example, to provide implementation details regarding the dual connectivity mode contemplated by Deenoo. Deenoo,

Abstract, 41:5-14, 65:49-51; Futaki, 10:43-46.

134. As an initial matter, one of ordinary skill in the art when considering the teachings of Deenoo would have naturally considered the teachings of Futaki as they are analogous prior art pertaining to the same field of endeavor as the '502 patent, namely, cellular telecommunications. *See* Deenoo, Abstract; Futaki, Abstract. Specifically, both references describe on-demand SI requests in the context of the 5G standard. Deenoo, Abstract, 37:23; Futaki, 5:8-14. Futaki is also reasonably pertinent to the particular problem of the '502 patent, such as UE and BS procedure for initiating and handling on-demand SI requests in 5G. Futaki, Abstract.

135. Deenoo refers to “dual connectivity” mode and the UE connecting to a mater node or “MeNB (Master eNB)” but leaves some implementation details to a POSITA. Deenoo, 65:49-51. One of ordinary skill in the art would have been specifically motivated to incorporate Futaki’s technique for requesting SI from a secondary node into the system of Deenoo because doing so addresses a well-known implementation issue of SI requests in dual connectivity systems—*i.e.*, whether to send SI requests to a primary or secondary node. In other words, Futaki’s technique advantageously solves this problem, such that a POSITA would have been motivated to incorporate Futaki’s teachings into the system of Deenoo. In the combined system, the UE sends to the master node a request for SIBs of the

secondary node, as explained by Futaki. Futaki, 10:43-47.

136. A POSITA would have also found the combination predictable and would have had a reasonable expectation of success, as the combination does not change the intended functionality of Deenoo's dual connectivity system or Futaki's technique. For instance, a POSITA would have expected success as Futaki's technique was *specifically intended* to be implemented in a UE capable of on-demand SI requests and 5G dual connectivity (such as Deenoo's UE). Deenoo, Fig. 2; 41:5-14, 65:49-51; Futaki, 10:43-46.

137. Accordingly, a POSITA would have found it obvious to apply Futaki's teachings to Deenoo's system because the combination merely amounts to implementing a known dual connectivity technique in Deenoo's UE and SI request method to achieve predictable results.

3. Claim 3

[3.0] *The method of claim 1, wherein when the UE is in a dual connectivity mode, the method further comprises: transmitting a third SI request message to a master node when the UE requires on-demand system information of a cell belonging to a secondary node.*

138. First, Deenoo teaches that a UE's "RRC connection for dual connectivity may be associated with a WTRU specific RNTI in the MeNB (Master eNB).” Deenoo, 65:49-51. To the extent Deenoo does not provide details regarding transmitting an SI request when connected to master and secondary nodes, such techniques were well known to a POSITA as taught by Futaki.

139. Second, Futaki describes a UE requesting system information of a secondary Node-B base station (NB or SgNB, “*secondary node*”), including a “procedure for sending an indication of on-demand system information available in the cell 21 of the secondary gNB (SgNB) 2.” Futaki, 12:7-15. Futaki explains that the system information for the secondary node is sent to the UE from the master node base station (MeNB) (“*master node*”): “system information of ... SgNB 2 [is sent] to the UE 3 via the master eNB (MeNB) 1 in Inter-RAT dual connectivity” (“*the UE is in a dual connectivity mode*”). Futaki, 12:7-15.

140. In more detail, Futaki explains that “the UE 3 (i.e., the E-UTRA AS layer) sends [] an SI request in the E-UTRA cell (i.e., Primary Cell (PCell) of the MeNB 1 (Step 904) (“*transmitting a third SI request message to a master node*”). Futaki, 12:7-15. Futaki further explains that the “SI request is a request for transmission of the on-demand system information from the SgNB 2” (“*when the UE requires on-demand system information of a cell belonging to a secondary node*”). Futaki, 12:7-15.

141. Thus, Deenoo teaches a system for on-demand SI requests that includes dual connectivity with a master node, and Futaki teaches dual connectivity including sending an SI request to the master base station (i.e., MeNB) for on-demand SI of the secondary base station, which render obvious “*wherein when the UE is in a dual connectivity mode, the method further*

comprises: transmitting a third SI request message to a master node when the UE requires on-demand system information of a cell belonging to a secondary node.”

4. Claim 13

[13.0] *The UE of claim 11, wherein when the UE is in a dual connectivity mode, the operations further comprise: transmitting a third SI request message to a master node when the UE requires on-demand system information of a cell belonging to a secondary node.*

142. See [3.0] above.

F. Ground 6: Claims 4, 7, 14, and 17 are obvious under 35 U.S.C. § 103 over Deenoo in view of Asustek

1. Summary of Asustek

143. Asustek describes on-demand SI requests in the context of 5G.

Asustek, 1. Asustek explains which signal radio bearers (SRBs) are used to send on-demand SI requests. Asustek, 2. Asustek teaches that a “UE in RRC_CONNECTED transmits a system information request message through SRB1.” Asustek, 2. Asustek further teaches that “a UE in RRC_IDLE/RRC_INACTIVE transmits a system information request message containing a UE identity through SRB0.” Asustek, 2.

2. Reasons to Combine Deenoo with Asustek

144. For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Asustek with Deenoo. In particular, before the priority date of the ’502 patent, it would have been obvious, beneficial, and

predictable to utilize Asustek's teachings regarding transmitting SI requests on various signal bearers in combination with the system of Deenoo—for example, to use SRB0 to perform Deenoo's method in idle mode and SRB1 in connected mode.

145. As an initial matter, one of ordinary skill in the art when considering the teachings of Deenoo would have naturally considered the teachings of Asustek as they are analogous prior art pertaining to the same field of endeavor as the '502 patent, namely, cellular telecommunications. *See* Deenoo, Abstract; Asustek, 1. Specifically, both references describe on-demand SI requests in the context of the 5G standard. Deenoo, Abstract, 37:23; Asustek, 1. Asustek is also reasonably pertinent to the particular problem of the '502 patent, such as UE and BS procedure for initiating and handling on-demand SI requests in 5G. Asustek, 1.

146. The combination would have been predictable with an expectation of success because Deenoo itself contemplates various SRB configurations for control information. *See, e.g.,* Deenoo, 68:4-5. Indeed, Deenoo contemplates using “SRB0, 1, 2, 3, etc. and/or using different sets thereof” but does not explicitly say how they are used in the content of on-demand SI requests. *See* Deenoo, 75:41-42.

Therefore, one of ordinary skill in the art would have been specifically motivated to incorporate Asustek's technique of using SBR0/SRB1 for SI requests into the system of Deenoo because doing so would address a well-known implementation

issue of SI requests—*i.e.*, choosing which signaling bearer to use for the requests.

147. In one example implementation of this combination, a POSITA would have found it obvious that the idle-mode and connected-mode SI requests of Deenoo's system could optionally be transmitted on various signaling bearers. This combination would have been obvious because applying SBR0/SRB1 to deliver idle-mode and connected-mode control messaging was common in the art. Deenoo II, ¶0470 ("A WTRU may apply a different security level for different types of control signaling based on message type (e.g., resume and/or re-establishment) and/or bearer on which the specific control message is transmitted, e.g., SRB0 and/or SRB1.").

148. A POSITA would have also found the combination predictable and would have had a reasonable expectation of success, as the combination does not change the intended functionality of Deenoo's SI request method or Asustek's technique. For instance, a POSITA would have expected success as Asustek's technique was *specifically intended* to be implemented in 5G on-demand SI requests in idle and connected mode (such as Deenoo's). Deenoo, 39:38-39; Asustek, 1.

149. Accordingly, a POSITA would have found it obvious to apply Asustek's teachings to Deenoo's system because the combination merely amounts to implementing a known technique in Deenoo's UE ready for improvement.

3. Claim 4

[4.0] *The method of claim 1, wherein the first SI request message is transmitted on signaling radio bearer 1 (SRB1).*

150. First, Deenoo teaches that a UE configures “signaling radio bearers” or “SRBs” including “to enable transmission of control signaling (e.g. a signaling radio bearer and/or equivalent).” Deenoo, 27:32-33. A UE configures one or more SRBs as a UE “may have one or more, or multiple termination points for control signaling.” Deenoo, 72:21-23. Further, a UE “may (de)multiplex control signaling (e.g. RRC PDUs and/or the like) using different logical connections, bearers (e.g. SRB0, 1, 2, 3, etc. and/or using different sets thereof).” Deenoo, 75:39-41.

151. To the extent Deenoo does not provide details regarding which of SRB0, SRB1, SRB2, SRB3, *etc.* is used for SI requests in connected mode, such techniques were well known to a POSITA as taught by Asustek.

152. Second, Asustek teaches that a “UE in RRC CONNECTED transmits the system information request message through SRB1.” Asustek, 2. A POSITA would have found it obvious to apply Asustek’s teachings to Deenoo at least for the reasons provided above at Section IX.H.2.

153. Thus, Deenoo teaches a UE using bearers SRB0, 1,2, 3, etc. for control signaling, and Asustek teaches that a UE in connected mode sends an SI request on SRB1, which renders obvious “*wherein the first SI request message is transmitted on signaling radio bearer 1 (SRB1).*”

4. Claim 7

[7.0] The method of claim 6, wherein the fourth SI request message is transmitted on signaling radio bearer 0 (SRB0).

154. First, as discussed above at [6.0], Deenoo teaches that a UE “may trigger a system information request procedure in any state (e.g., idle, inactive, and/or connected).” Deenoo, 39:38-39. And as discussed above at [4.0], Deenoo further teaches that a UE “may (de)multiplex control signaling ... using different [] bearers (e.g. SRB0, 1, 2, 3, etc.)” Deenoo, 75:39-41.

155. To the extent Deenoo does not provide details regarding which of SRB0, 1, 2, 3, *etc.* is used for SI requests in idle mode, such techniques were well known to a POSITA as taught by Asustek.

156. Second, Asustek teaches that “a UE in RRC_IDLE/RRC_INACTIVE transmits a system information request message containing a UE identity through SRB0.” Asustek, 2. A POSITA would have found it obvious to apply Asustek’s teachings to Deenoo at least for the reasons provided above at Section IX.H.2.

157. Thus, Deenoo teaches a UE using bearers SRB0, 1, 2, 3, *etc.* for control signaling, and Asustek teaches that a UE in idle mode sends an SI request on SRB0, which renders obvious “*wherein the fourth SI request message is transmitted on signaling radio bearer 0 (SRB0).*”

5. Claim 14

[14.0] The UE of claim 11, wherein the first SI request message is transmitted on signaling radio bearer 1 (SRB1).

158. See Ground #3 [4.0].

6. Claim 17

[17.0] The UE of claim 16, wherein the fourth SI request message is transmitted on signaling radio bearer 0 (SRB0).

159. See Ground #3 [7.0].

G. Ground 7: Claims 8-10 and 18-20 are obvious under 35 U.S.C. § 103 over Deenoo in view of Huawei

1. Summary of Huawei

160. Huawei describes on demand SI requests in the context of 5G.

Huawei, 1. Huawei teaches that if “SI request reaches the maximum number, the on-demand SI request shall be considered failed.” Huawei, 7.

161. For instance, **“[if] the RACH procedure using for SI request failed, UE will send indication to RRC.”** Huawei, 6. Huawei further teaches that if “the requested on-demand SI doesn’t prevent the UE from using regular services, **UE can just label the SI as not available in the cell and mark the function as unavailable. Otherwise, cell reselection can be triggered[.]**” Huawei, 7.

2. Reasons to Combine Deenoo with Huawei

162. For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Huawei with Deenoo. In particular, before

the priority date of the '502 patent, it would have been obvious, beneficial, and predictable to utilize Huawei's teachings in combination with Deenoo's system for handling SI request failure—for example, to provide procedures for storing failure information at the UE.

163. As an initial matter, one of ordinary skill in the art when considering the teachings of Deenoo would have naturally considered the teachings of Huawei as they are analogous prior art pertaining to the same field of endeavor as the '502 patent, namely, cellular telecommunications. *See* Deenoo, Abstract; Huawei, 1. Specifically, both references describe on-demand SI requests in the context of the 5G standard. Deenoo, Abstract, 37:23; Huawei, 1, 6-7. Additionally, both references describe techniques for handling SI request failure—including retransmitting an SI request a maximum number of times before barring the cell (Deenoo) as well as reporting the failure to the UE's RRC layer and storing failure information at the UE (Huawei). Huawei is also reasonably pertinent to the particular problem of the '502 patent, such as UE and BS procedure for initiating and handling on-demand SI requests in 5G. Huawei, 1.

164. One of ordinary skill in the art would have been specifically motivated to incorporate Huawei's techniques for storing SI request failure information into the system of Deenoo because doing so would address a well-known implementation issue with SI request failure methods—*i.e.*, how or even

whether to maintain a record of the failure at the UE. Huawei, 6-7. In other words, Huawei's technique solves this problem—explaining to send failure information to the UE's RRC layer as well as store information about the cell and unavailable SIBs at the UE. Therefore, a POSITA would have been motivated to incorporate Huawei's teachings into the system of Deenoo. Huawei, 1, 6-7.

165. A POSITA would have found the combination particularly advantageous because Huawei's technique provides options in the different cases of "whether the requested SI impacts the service or not." Huawei, 7. Huawei's technique also beneficially specifies that the UE communicates the instance of an SI request failure to the UE's RRC layer—which the UE could then transmit to the network's RRC layer so that the network may coordinate a response if necessary. Deenoo, 6. In one example implementation of this combination, a POSITA would have found it obvious that Deenoo's UE in idle or connected mode would implement the techniques described in Huawei. Deenoo, Fig. 2; Huawei, 6-7).

166. This combination would have been predictable because the SI request failure options described in Deenoo (retransmitting an SI request a maximum number of times) and Huawei (storing SI request failure information at the UE) were common in the art. Sharma, 9:64-10:6 ("UEs attempt to access the SI after the backoff timer expiry. Some UEs can also decide to move to another cell/RAT straightaway while others will decide to use the timer and wait, as directed by the

network.”); Huawei II, 2 (“If SI request reaches the maximum number, the on-demand SI request shall be considered failed.”); Intel, 3 (“In the case the UE request fails during RACH procedure (MAC indicates a RACH failure to RRC for the SI request); Fukuta, 2 (“UE may reselect to another cell from the cell where the requested SI is not received. ... If the RRC SI Request procedure fails and the requested SI has been not received at a cell, UE applies minus offset for the concerned cell when cell selection and reselection.”), ¶0348 (“the UE should inform the MeNB of RACH failures.”); Vivo II, 3 (“[W]e should have such a counter to determine[e] the maximum times the UE could try to acquire the other SI. If the counter reaches its crest value, the UE shou[l]d send an SI request failure to the upper layer.”).

167. The combination of Deenoo with Huawei also would have been predictable because POSITAs were well aware of Huawei’s technique of performing cell reselection in the event of SI request failure. Huawei, 7; ZTE, 1-2 (“Alternative 3: Increase cell selection or reduce re-selection threshold for a period as that scheme introduced in LTE R12. ... Scenario C: There is suitable neighbor cell which can provide similar RSRP/RSRQ. ... UE will re-select to the neighbor cell.”); CATT, 2 (“UE shall treat the cell as barred and perform cell re-selection, when MAC reports random access problem to upper layer for Msg1 based SI request procedure.”).

168. In the resulting combination, a POSITA also would have found it obvious that Deenoo's UE performing SI request failure handling in dual connectivity (DC) (Deenoo, 65:49-51), in view of Huawei's technique of performing reselection after SI request failure (Huawei, 7), would result in a UE reselecting its master node (MeNB) upon secondary node failure. This combination would have been predictable because it was known in the art to perform reselection from a secondary to master node in the context of SI requests with dual connectivity. Jeong, ¶0148 ("[T]he SI request message may contain at least one of an identifier indicating an operation for the dual connectivity, an identifier indicating the type of operation (e.g., ... an operation of modifying the context of an EPS bearer set to the SeNB [i.e., secondary node], and an operation of removing the EPS bearer set to the SeNB and bringing again the EPS bearer to the MeNB)[i.e., master node.]"). This combination also would have been obvious because the UE has a limited number of options after secondary node failure—*e.g.*, reselect the master node or reselect a new master node.

169. A POSITA would have also found the combination predictable and would have had a reasonable expectation of success, as the combination does not change the intended functionality of Deenoo's or Huawei's technique. For instance, a POSITA would have expected success as Huawei's technique was *specifically intended* to be implemented in 5G UEs performing on-demand SI

requests (such as Deenoo's). Deenoo, 41:5-14. Further, a POSITA would have expected success as it was well known in the art to flexibly implement SI request failures depending on, for example, the importance of the SIB(s) or UE implementation options, some of which were already developed for LTE. Vivo III, 2 ("In LTE, how to handle the missing of essential SI is specified, while how to handle the missing of non-essential SI (equivalent to other SI in NR) is left to UE implementation. ... As the principle works well in LTE, we prefer to follow the same principle in NR."); Ericsson, 3-4 ("The content of the SIBs that may be acquired through on-demand requests vary and hence also their importance to a UE's operation. ... The behaviour of the UE upon final failure to acquire a SIB should be independent on whether the SIB is periodically broadcast or acquired through on-demand request and may be specified per SIB.").

170. Accordingly, a POSITA would have found it obvious to apply Huawei's teachings to Deenoo's system because the combination merely amounts to implementing a known technique in Huawei's UE and method ready for improvement.

3. Claim 8

[8.0] *The method of claim 1, further comprising: storing SI request failure information after determining that the on-demand SI request procedure is unsuccessful.*

171. First, as discussed at [1.3], Deenoo teaches that a UE "may start a

timer A and/or a timer B (e.g., where timer A time > timer B time), when the first other-SI request message is transmitted.” Deenoo, 41:5-7. Then, “[u]pon expiry of timer B, a WTRU may retransmit the other-SI request message and/or restart timer B.” Deenoo, 41:9-10. Using timers A and B, the UE “may be configured with a predefined number of retransmissions to acquire the other-SI until expiry of timer A.” Deenoo, 41:9-11-13.

172. Deenoo also teaches, as discussed at [2.0], that “[u]pon expiry of timer A, **a WTRU may consider the cell to be barred for a predefined duration (e.g., not use that cell)**” (*“determining that the on-demand SI request procedure is unsuccessful”*). Deenoo, 41:13-14. To the extent Deenoo does not explicitly teach “*storing SI request failure information*,” this technique was well known to POSITAs as taught by Huawei.

173. **Second**, Huawei teaches that if “SI request reaches the maximum number, the on-demand SI request shall be considered failed.” Huawei, 7. Huawei further teaches that, if “the requested on-demand SI doesn’t prevent the UE from using regular services, **UE can just label the SI as not available in the cell and mark the function as unavailable**.” Huawei, 7. Here, a POSITA would have understood that for a UE to “label the SI as not available” and “mark the function as unavailable” includes storing in memory the information about the unavailable requested SI and functionality (“*storing SI request failure information*”). See

Huawei, 7.

174. Thus, Deenoo teaches a UE determining that requested SI is unavailable after a maximum number of SI request retransmissions, and Huawei teaches that, after a threshold number of unsuccessful SI request attempts, a UE may label the SI as not available and mark the function as unavailable, which render obvious “*storing SI request failure information after determining that the on-demand SI request procedure is unsuccessful.*”

4. Claim 9

[9.0] The method of claim 8, wherein the SI request failure information comprises at least one of the following: the at least one requested SIB; the at least one requested SI message; a cell identifier (ID) associated with the BS; a synchronization signal block (SSB) index for performing the on-demand SI request procedure; a message type of the on-demand SI request procedure; and a timestamp for performing the on-demand SI request procedure.

175. As discussed at [8.0], Deenoo teaches a UE determining that requested SI is unavailable after a predefined maximum number of SI request retransmissions. Deenoo, 41:11-14. And Huawei further teaches a technique for “requested SIB(s)”: if “the requested on-demand SI doesn’t prevent the UE from using regular services, UE can just label the SI as not available in the cell and mark the function as unavailable.” Huawei, 3, 7.

176. A POSITA would have understood that for a UE to “label the SI as not available in the cell,” as taught by Huawei, means that the UE stores information about the requested SIB(s) that is not available (“*wherein the SI*

request failure information comprises at least one of the following: the at least one requested SIB; the at least one requested SI message”). See Huawei, 7. Thus, Deenoo in view of Huawei renders obvious this element.

5. Claim 10

[10.0] *The method of claim 8, further comprising: transmitting the SI request failure information; wherein the SI request failure information is transmitted to a master node when the UE is in a dual connectivity mode.*

177. First, as discussed at [8.0], Deenoo teaches a UE determining that requested SI is unavailable after a predefined maximum number of SI request retransmissions. Deenoo, 41:11-14. Deenoo further teaches that a UE’s “**RRC connection for dual connectivity may be associated with a [UE] specific RNTI in the MeNB (Master eNB).**” Deenoo, 65:49-51. To the extent Deenoo does not explicitly teach that “*the SI request failure information is transmitted to a master node when the UE is in a dual connectivity mode,*” this limitation would have been obvious in view of Huawei.

178. Second, Huawei teaches that “[i]f SI request reaches the maximum number, the on-demand SI request shall be considered failed.” Huawei, 7. “**If the RACH procedure using for SI request failed, UE will send indication to RRC**” (“*SI request failure information*”). Huawei, 6.

179. Huawei further teaches that “the UE behaviour of failure of on-demand SI request may be different depending on whether the requested SI

impacts the service or not.” Huawei, 7. For instance, “[i]f the requested on-demand SI doesn’t prevent the UE from using regular services, UE can just label the SI as not available in the cell and mark the function as unavailable. Otherwise, **cell reselection can be triggered when the request of SI reaches the maximum number.**” Huawei, 7.

180. Therefore, Deenoo teaches a UE configured for on-demand SI requests and dual connectivity mode, and Huawei further teaches that, after an SI request failure, the UE sends an SI request failure indication to its RRC layer and performs cell resection. Deenoo, 41:9-14; Huawei, 6-7. It would have been obvious to a POSITA that a dual-connectivity UE performing cell reselection after an SI request failure would reselect a cell that the UE is already connected to, i.e., the master node, and provide the SI failure indication to the master node. See Deenoo, 41:9-14; Huawei, 7.

181. Indeed, this combination—where a UE reselects and provides an SI request failure indication to the master node—would have been obvious because it was well known in the art to report such secondary node failures to the master node, which controls whether to remove and reselect secondary nodes. Fukuta, ¶¶0218-0219 (“[I]n the dual connectivity scheme, a cell (the eNB 200) that establishes an RRC connection with the UE 100 is called a master cell (master eNB). ... The master eNB performs the processing of the RRC layer.”), ¶0338

(“Although either SeNB or UE may inform the MeNB of the SeNB’s RLF [*i.e.*, radio link failure] status, in case the backhaul latency is excessive, it may be preferable for the UE to provide the SeNB’s RLF status to the MeNB.”), ¶0340 (“MeNB is responsible for the addition/removal/switching of the SeNB.”).

Therefore, a POSITA would have found it obvious that the SI request failure indication sent to the UE’s RRC layer, as described in Huawei, would be sent to the master node (MeNB) in Deenoo’s dual-connectivity system—*e.g.*, to prevent the UE from reconnecting to the failed secondary cell and to aid the UE in finding a new cell having the requested SIB(s). Huawei, 6-7.

182. Furthermore, because the prior art teaches *transmitting an SI request to a master node to request SIBs from a secondary node* as discussed above at [3.0]—it also would have been obvious to *transmit SI request failure information to a master node regarding SIBs requested from a secondary node*.

183. Thus, Deenoo in view of Huawei renders obvious “*transmitting the SI request failure information; wherein the SI request failure information is transmitted to a master node when the UE is in a dual connectivity mode.*”

6. Claim 18

[18.0] *The UE of claim 11, wherein the operations further comprise: storing SI request failure information after determining that the on-demand SI request procedure is unsuccessful.*

184. See Ground #7 [8.0] above.

7. Claim 19

[19.0] *The UE of claim 18, wherein the SI request failure information comprises at least one of the following: the at least one requested SIB; the at least one requested SI message; a cell identifier (ID) associated with the BS; a synchronization signal block (SSB) index for performing the on-demand SI request procedure; a message type of the on-demand SI request procedure; and a timestamp for performing the on-demand SI request procedure.*

185. See Ground #7 [9.0] above.

8. Claim 20

[20.0] *The UE of claim 18, wherein the operations further comprise: transmitting the SI request failure information; wherein the SI request failure information is transmitted to a master node when the UE is in a dual connectivity mode.*

186. See Ground #7 [10.0] above.

IX. CONCLUSION

187. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: Mar. 14, 2023



Zhi Ding

Digitally signed by
Zhi Ding
Date: 2023.03.14
22:21:45 -07'00'