

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T MOBILITY LLC, AT&T SERVICES INC., ERICSSON INC., NOKIA OF
AMERICA CORPORATION, T-MOBILE USA, INC
Petitioners,

v.

DAINGEAN TECHNOLOGIES LTD.,
Patent Owner.

Case No. IPR2024-00644
U.S. Patent No. 11,134,400

DECLARATION OF DR. MARK MAHON

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I, Dr. Mark Mahon, declare as follows:

I. INTRODUCTION

1. I have been retained by Petitioners and their counsel, McKool Smith P.C. (“McKool Smith”), as an independent expert consultant in this proceeding regarding U.S. Patent No. 11,134,400 (“the ’400 Patent”) (Ex. 1001). I have been asked to consider whether certain references disclose or suggest the limitations recited in claims 5, 7, and 8 of the ’400 Patent (“the Challenged Claims”).

2. I am being compensated for my work in this proceeding at a rate of \$500 per hour. I also receive reimbursement for expenses incurred in the course of my work. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

3. This declaration is directed to the Challenged Claims of the ’400 Patent and sets forth certain opinions I have formed, the conclusions I have reached, and the bases for each. The conclusions I present are based on my own judgment. I am not an employee of the Petitioners, McKool Smith, the inventors of the ’400 Patent, or of any affiliated companies.

4. Based on my experience, knowledge of the art at the relevant time, and analysis of prior art references, it is my opinion that the Challenged Claims of the ’400 Patent are unpatentable over the prior art references discussed below.

II. QUALIFICATIONS

A. Overview

5. I am a Teaching Professor in the School of Electrical Engineering and Computer Science at Pennsylvania State University, University Park, PA (“Penn State” or “PSU”). I have worked on telecommunications networks, including AMPS, IS-95, CDMA2000, GSM, EDGE, UMTS/WCDMA, LTE, and 5G cellular systems since 1988.

6. I received my B.S. in Electronics Engineering from the University of Scranton in 1987. I received my M.S. in Electrical Engineering and Ph.D. in Acoustics from Penn State in 1991 and 2001, respectively.

7. In 1988, after I received my bachelor’s degree, I joined the Central Intelligence Agency (CIA) while pursuing my M.S. degree at Penn State part-time. My first job at the CIA involved designing and testing systems to automatically capture and characterize telecommunication signals and emissions from various computer networking devices.

8. I returned to Penn State in early 1990 to pursue graduate research full-time and complete my M.S. degree. My graduate research work focused on wideband beamforming and adaptive signal processing. After completing my M.S. degree in EE in 1991, I accepted a full-time faculty research position at the Applied Research Lab at PSU, primarily working on classified programs, and I began

working on diverse radio frequency and acoustic sensor systems including wireless communications and small wireless networks for acoustic tracking, source localization, and feature extraction.

9. I began pursuing my Ph.D. part-time in 1993 while continuing my faculty research position. In 1997, as part of my faculty research position, I began working on classified programs focused on mathematical analytical modeling of cellular communication networks and the development of hardware and software systems to test against cellular networks. My role was to develop the algorithms and write the code running on a specially developed embedded system. For this work, I received a letter of recognition as the “genius behind the VELA software algorithms” from the Director of National Reconnaissance Office (NRO) Systems Engineering and Technology Office. As part of this same work, I was extensively involved in protocol and signaling analysis as well as researching model-specific performance and unique functional characteristics associated with individual mobile devices. The work involved testing dozens of handsets from many manufacturers in controlled and real-world environments against network simulators and live operational networks for each research project.

10. In 2000 my research extended into utilizing non-orthogonal wavelets for improving detection and localization of cellular handsets from high altitude sensor systems. In 2001, I completed my Ph.D., and my research focused on the

utilization of advanced communication signals for wideband characterization and remote sensing of propagation channels.

11. Beginning in 1997 my cellular communications research work focused on CDMA, GSM, EDGE, UMTS, LTE, and 5G cellular systems primarily under grants sponsored principally by the Department of Defense. This classified research work required 3GPP protocol analysis and development of real-time embedded hardware and software systems capable of interacting with cellular networks and cellular handsets. A large portion of my work was directed at architectures, protocols, software, and signaling.

12. I have been working on classified projects since 1988. Before 1998, because the work was not deemed highly classified, I was able to publish eight journal and conference papers. Between 1999 and 2015, I published and presented about a dozen articles in classified settings, but I was only permitted to publish one article in an unclassified symposium. This is because, during this period, the vast majority of my research was highly classified. As a result, nearly all of my research results were summarized in classified reports and not available to the general public. Further, because the U.S. government owns any intellectual property resulting from the sponsored research work, I did not pursue or file patent applications.

13. In 2015, I transferred to the School of Electrical Engineering and Computer Science at Penn State as a teaching faculty member. In that role, I have

continued teaching graduate and undergraduate courses, guiding Ph.D. and M.S. students in communication and mobile networking (including LTE and 5G cellular networks), and pursuing research in this and related areas. Since 2015, I have been an author on seven refereed papers as listed in my curriculum vitae (CV) (attached as Exhibit 1004).

14. Because of my decades of research and my continuing work at Penn State, I have intimate knowledge of telecommunication networks, including the technology involved in the patents in this case. I have been highly recognized as an expert in such systems within the research community. I was recognized twice by the National Reconnaissance Office with commendation letters for work dealing with detecting cellular signals in low signal to noise ratio environments. The U.S. government awarded me over \$12M in grants between 2003 and 2015 for projects focused on mobile communication devices and networks, in which I served as a Principal Investigator (PI), Co- PI, and/or technical lead.

15. Additionally, during my research career, I interacted extensively with computer scientists and engineers responsible for the design, development, and testing of telephony and data networking systems and testbeds. As a research faculty member, I oversaw engineers and computer scientists who executed many joint projects with development organizations. These interactions exposed me to a wide range of computer scientists and engineers working on telecommunication network

technologies. Since 2011, I have been teaching undergraduate and graduate classes in communication and mobile networking and am familiar with the curricula being taught to electrical engineers and computer scientists. The interactions with a wide range of computer scientists and engineers working on telecommunication network technologies and the familiarity with the classes taught to electrical engineers and computer scientists have allowed me to have a good understanding of the level of skills possessed by a person of ordinary skill in the field of cellular technology.

B. Experience with Cellular Networks

16. I have extensive experience with mobile networks in general and LTE and 5G specifically. While most of my research efforts between 1998 and 2015 are highly classified, I can state that they included detailed investigation of network architectures, signaling, and functional behavior. A typical research effort would involve studying 3GPP, 3GPP2, IEEE, and other protocol standards to fully comprehend all aspects of L1, L2, and L3 requirements including timing, bit-level construction of the control and user plane messages, and timing characteristics for a given standard as well as functional behavior of network components and user equipment.

17. From 2006 through 2015 my research focused specifically on LTE. My research continues to this day, although I am no longer operating in a classified environment. During this time, I investigated the performance and functional

differences of many varied network and handset devices to see how differing signaling and environmental factors influenced the behavior of user equipment in a given network environment. This included how synchronization, timing, and signal to interference plus noise ratio (SINR) for a given device would affect specific functional aspects including elements of the receiver structure, decoding and demodulation performance, calculation of parameters used by the device for making decisions and deriving parameters reported to the network.

18. As part of my research work, I built several custom CDMA, GSM, UMTS, and LTE platforms that implemented specific network-side and user equipment-side functionality including custom signal generation and processing structures, particularly the signal processing chains on both the transmit and receive sides. This equipment was developed using network simulation hardware in a laboratory environment and was later tested with corresponding networks in both controlled and fully operational environments. Implementing the transmit and receive chains for custom built protocol-enabled equipment required me to gain an intimate understanding of the relevant 3GPP protocol specifications and the underlying structures. Since 2015, I have been primarily focused on guiding graduate students pursuing research into multiple-input multiple-output (MIMO) techniques to improve throughput in dense-user environments, optimized distributed

processing algorithms, and the implementation of block chain coding techniques to improve handover security in 4G (LTE)/5G (NR) networks.

III. MATERIALS REVIEWED AND CONSIDERED

19. My findings contained in this declaration are based on my education, research, experience, and background in the field of computer and communication networks, and specifically, in relation to wireless communication systems, as well as on my investigation and study of prior art references and other documents disclosed in this declaration, including the following:

Exhibit No.	Description
1001	U.S. Patent 11,134,400 (“’400 Patent”)
1002	Prosecution History of U.S. Patent 11,134,400 (“’400 File History”)
1003	Declaration of Mark Mahon, Ph.D.
1004	Curriculum Vitae of Mark Mahon, Ph.D.
1005	Ericsson, “SRBs needed for direct RRC from SN,” 3GPP TSG-RAN WG2 #97bis, Spokane, USA (April 2017) (“R2-1702708”)
1006	Screenshot of https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_97bis
1007	Screenshot of https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_97bis/Docs
1008	Dahlman et al. 4G, LTE-ADVANCED PRO AND THE ROAD TO 5G (3rd ed. 2016) (“Dahlman”)
1009	3GPP TS 36.331 V13.0.0 (Jan. 2016) (“TS 36.331”)

IV. MY UNDERSTANDING OF CERTAIN PATENT LAW PRINCIPLES

20. As a technical expert, I am not offering any legal opinions. Rather I am offering technical assessments and opinions. In rendering my analysis, I have been

informed by counsel regarding various legal standards for determining patentability. I have applied those standards in forming my technical opinions expressed in this declaration.

21. I understand that in this proceeding, Petitioners have the burden of proving that the Challenged Claims are invalid by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

22. The patent claims define the invention made by the inventors and define what the patent owner owns and what the owner may prevent others from using. I understand that an independent claim sets forth all the requirements that must be met to be covered by that claim. I further understand that a dependent claim does not itself recite all of the requirements of the claim but refers to another claim and incorporates all of the requirements of the claim to which it refers.

23. I understand that a claim in an issued patent is unpatentable as anticipated if the recited invention is described in a single prior-art reference that discloses each limitation, either expressly or inherently.

24. It is my understanding that a claimed invention is unpatentable 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. Obviousness, as

I understand it, is based on the scope and content of the prior art, the differences between the prior art and the claim, and the level of ordinary skill in the art.

25. I understand that under 35 U.S.C. § 103, “[a] patent for a claimed invention may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented 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 said subject matter pertains.”

26. I understand that a patent claim may be unpatentable as obvious over a single prior art reference or in view of a combination of prior art references. I understand that prior art references may also be combined with the knowledge of a person of ordinary skill in the art. I further understand that a person of ordinary skill in the art is presumed to know the relevant prior art. I understand that the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

27. I understand that when evaluating obviousness, one must not consider whether the claimed invention would have been obvious to a layman or to an expert; not use hindsight when comparing the prior art to the claimed invention; and not consider what was learned from the teachings of the patent. In particular, I understand that it is improper to use the patent claims as a road map for selecting

and combining items of prior art. In other words, one should avoid using the challenged patent as a guide through the prior art references, combining the right references in the right way so as to achieve the result of the claims at issue. Instead, one must put oneself in the place of a person of ordinary skill at the time the invention was made and consider only what was known before the invention was made.

28. I understand that obviousness should be considered in light of the problems known to the person having ordinary skill in the art at the relevant time and the complexity of the alternatives for solving the problem. That individual elements of the claimed invention are disclosed in the prior art is not alone sufficient to reach a conclusion of obviousness.

29. I also understand that when considering the obviousness of a patent claim, one must consider whether a teaching, suggestion, or motivation to combine the references exists so as to avoid impermissibly applying hindsight when considering the prior art. I understand that a teaching, suggestion, or motivation may be found explicitly or implicitly: (1) in the prior art; (2) in the knowledge of those of ordinary skill in the art; or (3) from the nature of the problem to be solved. I also understand that the legal determination of the motivation to combine references allows recourse to logic, judgment, and common sense, but that any such motivation to combine references must still avoid the improper application of hindsight or

reliance on the patentee's disclosure of his invention as found in the patent specification, drawings, and claims. In a similar vein, I understand that one should consider whether a person of ordinary skill in the art would have had a reasonable expectation of success in achieving the purported invention.

30. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of the invention, unexpected results of the invention, any long-felt but unresolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous independent invention by others is a secondary consideration tending to show obviousness.

31. I understand that in determining whether a prior art reference would have been combined with other prior art or with other information within the knowledge of a person of ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” i.e., choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- numerical ranges disclosed in the prior art that overlap with numerical limitations set forth in the challenged claims;
- whether certain aspects of the patented subject matter were result-effective, such that a person of ordinary skill in the art would know that such element is determinative as to the effectiveness of the patent subject matter; and

- 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. I understand that this teaching, suggestion, or motivation may come from prior art references or from the knowledge or common sense of one of ordinary skill in the art.

32. I have been informed by counsel that the Board construes claims according to the so-called “*Phillips*” standard. Under the *Phillips* standard, terms in a claim are given their ordinary and customary meaning, consistent with the patent’s specification, as understood by a POSITA. I have been informed by counsel that what is to be considered includes the claims, the patent specifications and drawings, and the prosecution history, including any art listed by the examiner or the Applicant. I have been informed by counsel that information external to the patent, including expert and inventor testimony and unlisted prior art, are to be considered if ambiguities remain.

V. LEVEL OF ORDINARY SKILL IN THE ART

33. It is my understanding that a person of ordinary skill in the art (“POSITA”) is a hypothetical person who analyzes the prior art without the benefit of hindsight. I have been instructed that the level of ordinary skill may be reflected by the prior art of record, and that a person of ordinary skill in the art to which the

claimed subject matter pertains would have the capability of understanding the scientific and engineering principles applicable to the pertinent art. I have been instructed that there are multiple factors that may be considered in determining the level of ordinary skill in the art, including: (1) type of problems encountered in the prior art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. I also understand that a POSITA is also a person of ordinary creativity, not an automaton. They would be able to fit the teachings of multiple patents together like a puzzle and have the capability of understanding the scientific and engineering principles applicable to the pertinent art.

34. According to the '400 Patent, its purpose is to “solve problems related to occurrence of an SCG failure when RRC signaling configures . . . a dual-connectivity scenario supporting packet duplication.” Ex. 1001 at 1:48-52. In other words, the '400 Patent concerns systems and methods related to the transmission of uplink communications within communication systems that support dual-connectivity. This involves the transmission of data from user equipment (UE) to two base stations simultaneously: a Master Cell Group (MCG) of a master node (MN) and a Secondary Cell Group (SCG) of a secondary node (SN). In situations where it is crucial for the UE's transmission to be successfully decoded on the first attempt, the UE can send the same data to both nodes (*i.e.*, the MN and SN), thereby

increasing the chances that at least one of the nodes will be able to successfully decode the transmission.

35. I have been asked to provide a definition for the level or ordinary skill in the art for a POSITA in the field of the '400 Patent at the time the priority application for the '400 Patent was filed. To that end, I have been asked to assume for purposes of this declaration that the '400 Patent is entitled to claim priority to August 10, 2017, which corresponds to the filing date of CN201710683129.0. *See* Ex. 1001 at Cover.

36. In my opinion, a POSITA in reference to the '400 Patent would possess (1) the equivalent of an undergraduate degree in Electrical Engineering, Computer Science, or Computer Engineering; and (2) at least two years of experience in design, development, and/or testing of cellular networks. In addition, a POSITA would also have familiarity with the wireless standards and well-known protocols for configuring/reconfiguring connections over the air interface (*e.g.*, the Radio Resource Protocol (RRC) used in 3GPP cellular standards). It is also my opinion that this definition is flexible in the sense that additional education (*e.g.*, a PhD in Electrical Engineering, Computer Science, or Computer Engineering) could substitute for professional experience or *vice versa*.

37. I consider myself to have at least the credentials of a POSITA, and I am capable of addressing the issues from the perspective of such a person. As a result

of my education, academic experience, and industrial experience, I am familiar with cellular networks, including the wireless standards on which they are based, and with the state of that technology on or around August 10, 2017.

38. All of my opinions in this declaration are from the perspective of a POSITA, as I have defined it above and during the relevant time frame.

VI. TECHNICAL BACKGROUND

A. Wireless Technology

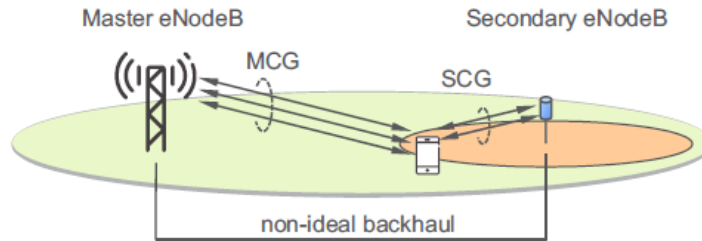
39. Mobile communications were originally developed for military purposes. The idea transitioned to the commercial world primarily through the development of cellular communication systems which were deployed beginning in the early 1980s. In cellular telecommunications systems, user equipment (often abbreviated “UE”) transmit signals to and receive signals from a network of base stations. Over the past 40 years, wireless communication technologies have advanced tremendously with significant new developments appearing approximately every 10 years. To distinguish among the significant evolutions that have occurred over time, wireless communication technologies are generally divided into generations via industry consensus and are typically associated with a new air interface and/or network architecture. The first generation (1G) analog transmission technology emerged in the 1980s, followed by second generation (2G) digital systems in the early 1990s, which were followed by third generation (3G) networks

and fourth generation (4G) systems, culminating with the most recent fifth-generation (5G) of cellular technology, which is also called new radio or “NR.”

40. The technical specifications for cellular standards are developed by an organization called the Third-Generation Partnership Project (“3GPP”). Since its formation, 3GPP has prepared the technical specifications for 3G Wideband Code Division Multiple Access or “WCDMA,” 4G Long Term Evolution or “LTE,” and 5G New Radio or “NR.” These technical specifications are publicly available and can be downloaded from the 3GPP Portal (<https://portal.3gpp.org/>) or 3GPP’s file server (<https://www.3gpp.org/ftp/>). The technical reports (“TRs”) and individual technical contributions on which these technical specifications are based are also publicly available and can be downloaded from the same sources.

B. Dual Connectivity

41. As noted above, the ’400 Patent is directed to methods and systems that support “dual connectivity.” This is a particular network configuration wherein a mobile device (*e.g.*, user equipment or “UE”) connects to two wireless access nodes at the same time. As shown below, in this configuration, the mobile device connects to both a master cell group (MCG) via a master base station and a secondary cell group (SCG) via a secondary base station.

**FIGURE 16.2**

Dual connectivity.

Ex. 1008 at Fig. 16.2.

42. The MN/MCG typically corresponds to the primary serving cell, which manages the connection with the user equipment. As the name implies, the SN/SCG is generally a secondary component in a dual-connectivity setup that works in coordination with the MN/MCG to augment the communication capabilities of UE in dual-connectivity scenarios. For example, depending on the configuration, the UE can transmit and/or receive different information over the UE-MCG link (also called a “leg”) than the UE transmits and/or receives over the UE-SCG link. This effectively increases the amount of data that can be received or sent over the air interface. Alternatively, the UE can transmit and/or receive the same data over both the UE-MCG link and the UE-SCG link. Such redundant transmissions result in a more reliable connection. A system may include multiple MCGs and/or SCGs, depending on its configuration.

C. Radio Bearers

43. A radio bearer is a communication channel established between a UE and a base station in a cellular network. Radio bearers play a crucial role in facilitating the transmission of data between the UE and the network. These channels are categorized based on their purpose and the type of information they carry. There are two main types of radio bearers—Data Radio Bearers and Signal Radio Bearers.

44. Data Radio Bearer (DRB): This type of radio bearer is responsible for carrying user data, such as voice, video, or internet traffic, between the UE and the network. DRBs are used to transmit the actual information that users generate during phone calls, video streaming, web browsing, and other data-related activities.

45. Signaling Radio Bearer (SRB): SRBs are responsible for transmitting control signaling information between the UE and the network. These bearers carry essential signaling messages that manage the establishment, maintenance, and release of connections, handovers, and other control functions. SRBs are critical for the proper functioning and control of the communication link.

46. Both DRBs and SRBs may be “split” in a dual connectivity setup, resulting in DRBs or SRBs that are transmitted to/from different wireless access nodes at the same time. For example, the following figure illustrates a “split bearer” (*i.e.*, green arrows/boxes) in the downlink (*i.e.*, transmissions from the MN and SN to the UE). Ex. 1008 at 377. As shown below, in this configuration, a software entity

in the MN implements a Packet Data Convergence Protocol (“PDCP”), which is responsible for splitting up the data between the MN and SN. The split data is subsequently transmitted to the UE by the MN and SN.

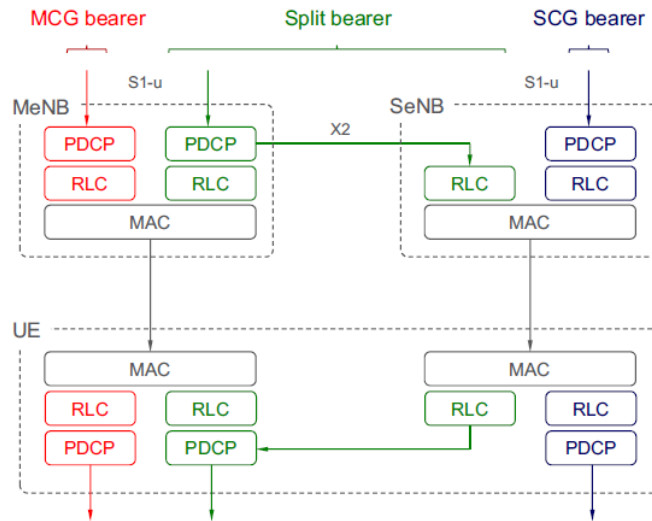


FIGURE 16.4

User-plane architecture.

See Id.; *see also* Ex. 1001 at 1:26-36 (describing various agreements within 3GPP related to the NR-PDCP that predate the '400 Patent).

47. The '400 Patent's alleged invention is directed to a specific type of split SRB, which the applicant refers to as an "MCG duplicated SRB." *Id.* at Claim 5; *see also Id.* at 6:48-53 ("In the embodiments of the present disclosure, an MCG split SRB configured with packet duplication is referred to as an MCG duplicated SRB . . .").

VII. OVERVIEW OF THE '400 PATENT

48. The '400 Patent is titled “User equipment, base station, and related methods.” *Id.* at Cover. As noted above, the alleged invention relates to a method for managing communication in a wireless network, specifically in the context of a Master Cell Group and a Secondary Cell Group that communicate with a UE via duplicated, split SRBs.

49. As illustrated by Figure 5, the alleged invention is a simple, two-step processes involving (1) receiving an SCG failure report from a UE and (2) reconfiguring an MCG duplicated SRB to receive uplink transmissions via the MCG.

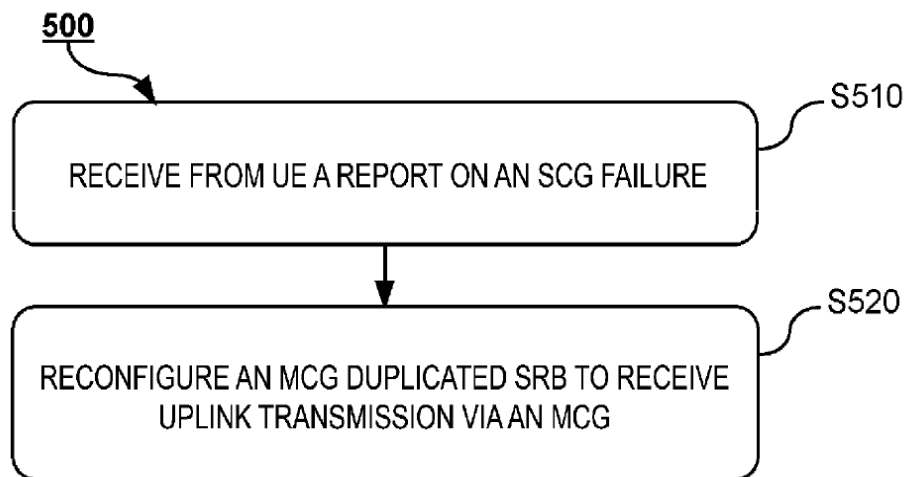


FIG. 5

Id. at Fig. 5.

50. As further explained in the '400 Patent, the two-step process depicted in Figure 5 is used by a “Master Cell Group (MCG) base station” that

“communicates with User Equipment (UE) over an MCG duplicated Signaling Radio Bearer (SRB).” *Id.* at 14:29-34. The “MCG duplicated SRB is associated with the MCG and a Secondary Cell Group (SCG).” *Id.* at 14:35-37. When the MCG base station receives a report on an SCG failure from a UE (*i.e.*, S510 in Figure 5), the MCG base station reconfigures the MCG duplicated SRB such that subsequent uplink transmissions are received via the MCG alone instead of being received via both the MCG and the SCG (*i.e.*, S520 in Figure 5). *See, e.g., Id.* at 14:39-51.

51. Thus, the alleged invention of the '400 Patent merely describes a two-step procedure that encompasses receiving an SCG failure report from the UE and subsequently releasing the failed SCG connection—a well-known concept from the prior art that I describe more fully below.

VIII. CLAIM CONSTRUCTION

52. I have been told that claim terms in an *inter partes* review proceeding are to be given their ordinary and accustomed meaning as understood by a person of ordinary skill in the art. In my analysis of the Challenged Claims, I have applied the plain and ordinary meaning as understood by a person of ordinary skill in the art at the relevant time. In my analysis, it was not necessary to construe any terms because all limitations in the '400 Patent are disclosed in the prior art under any reasonable interpretation of the claim terms.

IX. PRIOR ART

A. R2-1702708

53. R2-1702708 is a technical contribution from Ericsson to 3GPP, presented during the 3GPP TSG-RAN WG2 #97bis session held in Spokane, Washington from April 3 to 7, 2017. Ex. 1005 at Cover. As explained in detail below, this contribution was uploaded to 3GPP's public file server (<https://www.3gpp.org/ftp/>) before the claimed priority date of the '400 Patent.

54. R2-1702708 addresses dual connectivity in the context of "LTE-NR tight interworking scenarios where LTE is the MN [*i.e.*, master node] and NR is the SN [*i.e.*, secondary node]." Ex. 1005 at 1. In this configuration, the UE is connected to the network via two links: (1) an MCG-UE link between the MN and the UE, and (2) an SCG-UE link between the SN and the UE. *See generally Id.* As shown below, R2-1702708 is particularly focused on the SRB structure for LTE-NR interworking.

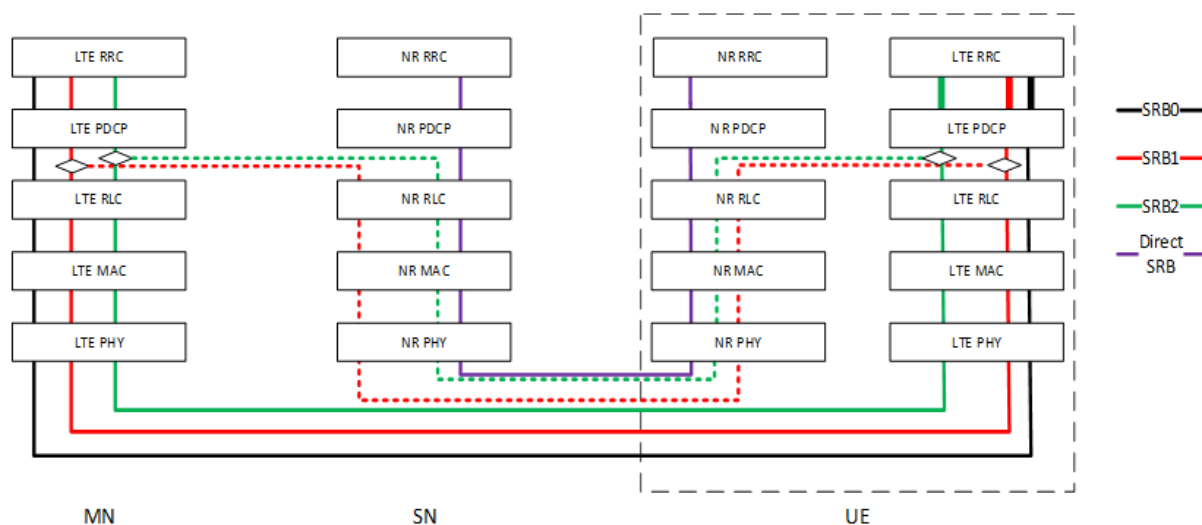


Figure 1: SRBs for LTE-NR tight interworking

Id. at 3. R2-1702708 teaches that at least two of the SRBs depicted in Figure 1, SRB1 and SRB2, “could be optionally split for the sake of faster transmission or increased reliability (i.e. duplication).” *Id.* at 2. That SRB1 and/or SRB2 “could be optionally split” is illustrated in Figure 1 by dashed lines, which are often used in the field of wireless communications to indicate optional configurations. Specifically, the dashed red line between the UE and the SN corresponds to the option of splitting SRB1, while the dashed green line between the UE and the SN corresponds to the option of splitting SRB2.

55. R2-1702708 also teaches a procedure for handling radio link failure between the UE and the SN. As explained in R2-1702708, “if the UE encounters RLF [*i.e.*, radio link failure]” on the SCG-UE link, the UE sends an “SCGFailureInformation message” to the MN to inform the network of the failed

connection. *Id.* at 1. Upon receipt of a message from the UE signaling radio link failure in the SCG, R2-1702708 teaches that the MN “can determine whether to release and/or modify the SN.” *Id.* at 1.

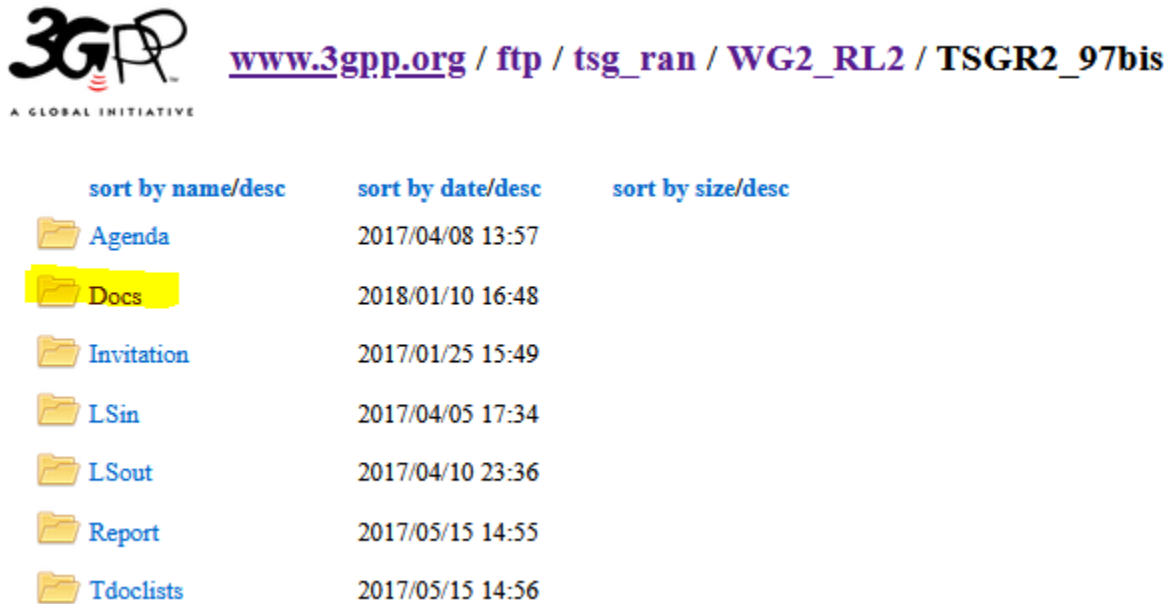
B. Public Availability of R2-1702708

56. As noted above, 3GPP publishes a set of technical specifications that define each generation of cellular technology (*e.g.*, 3G/WCDMA, 4G/LTE, 5G/NR). To create or refine 3GPP technical specifications, 3GPP member companies submit technical proposals to the appropriate “working group.” <https://3gpp.alch.me/about-us/3gpp-faqs>. These working groups are comprised of subject matter experts from the various 3GPP member companies and tasked with discussing, evaluating, and writing technical proposals. *Id.* R2-1702708 is one such technical proposal.

57. Specifically, R2-1702708 is a technical proposal that engineers working for Ericsson submitted to the Second Working Group (“WG2”) of the 3GPP Technical Specifications Group (“TSG”) covering the Radio Access Network (“RAN”) portion of the 5G/NR standard. R2-1702708 was publicly available as of March 25, 2017, when it was uploaded to 3GPP’s public file server. *See* Ex. 1007 at 2.

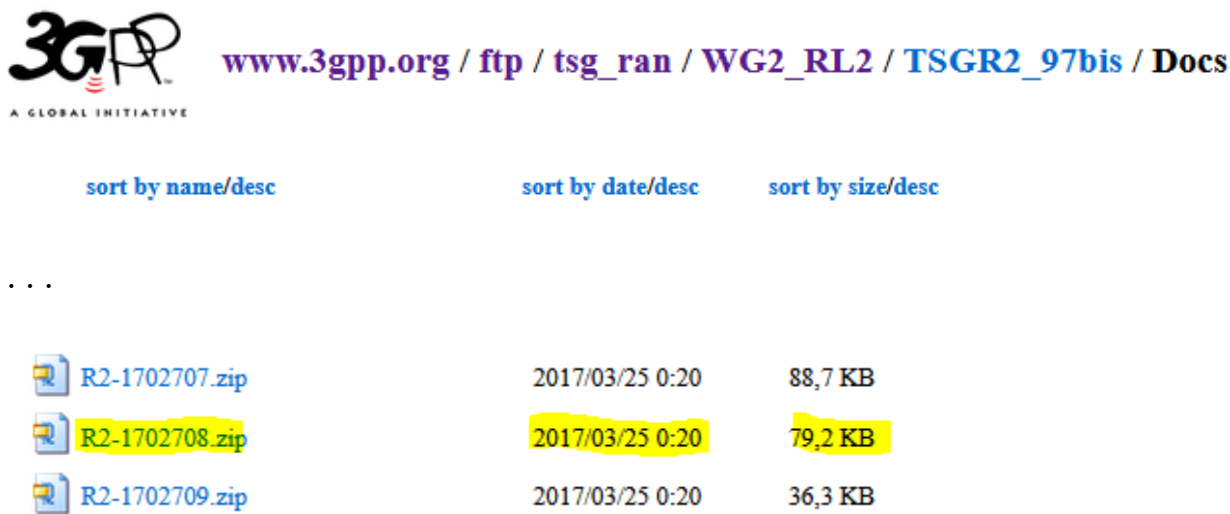
58. To download R2-1702708, one simply navigates to the “TSG_RAN” subfolder of 3GPP’s file server. *See* https://www.3gpp.org/ftp/tsg_ran/. Within the “TSG_RAN” subfolder, the next step is to select the subfolder for WG2 and then to

select the subfolder for the relevant meeting. See https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/. In this case, the relevant meeting occurred in Spokane, Washington from April 3, 2017 to April 7, 2017 and is numbered “97bis.” See https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_97bis. Finally, a copy of every technical proposal submitted for the meeting in Spokane, Washington, including R2-1702708, is available via the “Docs” folder:



Ex. 1006 at 1 (screenshot of https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_97bis) (highlighting added).

59. As shown below, Ericsson uploaded R2-1702708 to 3GPP’s public file server on March 25, 2017. Immediately upon upload, any member of the public could download and access R2-1702708.



Ex. 1007 at 2 (screenshot of https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_97bis/Docs) (excerpted and highlighting added).

60. Thus, R2-1702708 was publicly available to skilled artisans by March 25, 2017.

X. CLAIMS 5, 7, AND 8 ARE UNPATENTABLE

A. Ground #1: The Challenged Claims are Anticipated and/or Rendered Obvious in View of R2-1702708

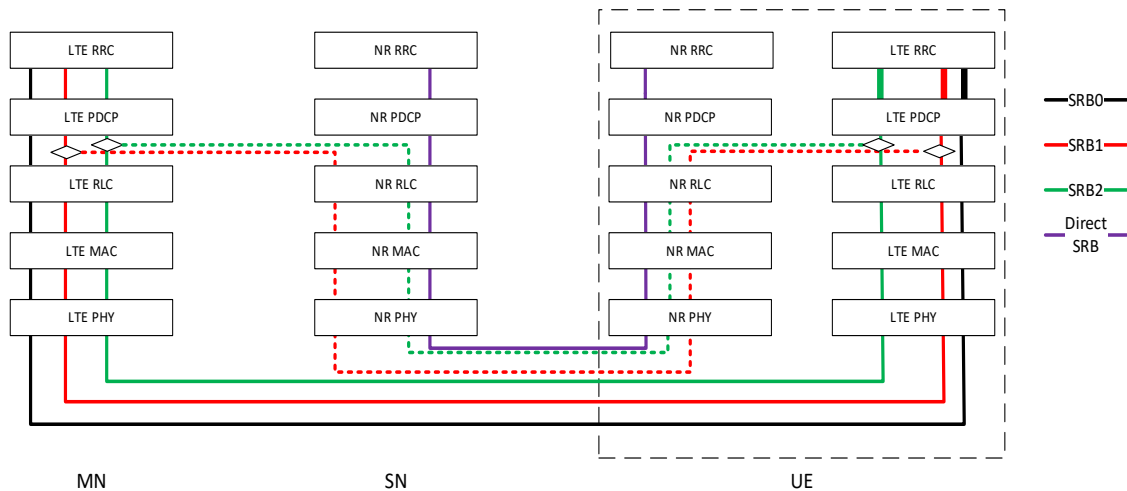
1. Claim 5

- a. Preamble: “A method for a base station, wherein the base station includes a Master Cell Group (MCG) base station and communicates with User Equipment (UE) over a first MCG duplicated Signaling Radio Bearer (SRB) and a second MCG duplicated SRB, and the first MCG duplicated SRB is associated with the MCG and a Secondary Cell Group (SCG) and configured to be used for uplink transmission via the SCG, the method comprising:”**

61. R2-1702708 focuses on “LTE-NR tight interworking scenarios where LTE is the MN [Master Node] and NR is the SN [Secondary Node].” Ex. 1005 at 1. In such a configuration, the LTE MN corresponds to a “Master Cell Group (MCG) base station,” while the NR SN corresponds to a “Secondary Cell Group (SCG).” Ex. 1001 at Claim 5.

62. R2-1702708 also teaches four types of standardized SRBs: “[s]ince LTE-release 8, three SRBs (SRB0, SRB1 and SRB2) have been available for the transport of RRC (used for signaling between the UE and base station) and NAS (used for signaling between the UE and various nodes in the core network) messages between the UE and eNB. A new SRB, known as SRB1bis, was introduced in rel-13 for supporting DoNAS (Data Over NAS) in NB-IoT.” Ex. 1005 at 1. Of the disclosed SRBs, SRB1 and SRB2 correspond to the “first MCG duplicated SRB” and second MCG duplicated SRB,” respectively. Ex. 1001 at Claim 5.

63. For example, Figure 1 (reproduced below) “illustrates the SRB structure for LTE-NR interworking” contemplated in R2-1702708. Ex. 1005 at 2. As reflected in Figure 1, R2-1702708 teaches that “*SRB1 and SRB2 between the MN and UE could be optionally split for the sake of faster transmission or increased reliability (i.e. duplication).*” *Id.* (emphasis added). Figure 1 further shows that split SRB1 and/or split SRB2 are configured to receive uplink transmissions via the SN/SCG, as illustrated by the dashed lines between the UE and the SN/SCG.



Id. at Fig. 1.

64. When SRB1 is “split” and “duplicat[ed]” (as disclosed in R2-1702708), SRB1 is a “first MCG duplicated SRB.” Likewise, when SRB2 is “split” and “duplicat[ed]” (again, as disclosed in R2-1702708), SRB2 is a “second MCG duplicated SRB.”

65. With respect to the phrase “MCG duplicated SRB” in the Challenged Claims, the “MCG” prefix indicates that the software entity responsible for packet

de-duplication, called Packet Data Convergence Protocol (“PDCP”), is located in the MN/MCG rather than the SN/SCG:

If the packet duplication split bearer is an MCG packet duplication split bearer, then a PDCP entity located in a master base station or an MCG is responsible for packet duplication and/or packet discarding; if the packet duplication split bearer is an SCG packet duplication split bearer, then a PDCP entity located in a secondary base station or an SCG is responsible for packet duplication and/or packet de-duplication.

Ex. 1001 at 6:1-8. This is precisely what is shown in Figure 1 of R2-1702708. As shown above, split SRB1 and split SRB2 terminate at the “LTE PDCP” of the MN/MCG, not the “NR PDCP” entity of the SN/SCG. *See* Ex. 1005 at 2-3.

66. Thus, R2-1702708 teaches a master base station (*i.e.*, MN/MCG) that establishes communication with UE through split SRB1 (*i.e.*, a first MCG duplicated SRB) and SRB2 (*i.e.*, a second MCG duplicated SRB) where the MCG duplicated SRBs are linked to both the MN/MCG and the SN/SCG and configured to be used for uplink transmission via the SCG/SN.

b. Element 5.1: “receiving, from the UE, a report of an SCG failure”

67. R2-1702708 teaches that “if the UE experiences RLF [*i.e.*, radio link failure] on the SCG . . . an SCGFailureInformation message is transmitted to the MN and the MN can decide to release or/and change the SN based on [the received SCGFailureInformation message].” *Id.* at 1. Thus, R2-1702708 discloses that the MN/MCG practices the step of “receiving, from the UE, a report of an SCG failure.”

c. Element 5.2: “reconfiguring the first MCG duplicated SRB to receive uplink transmission via the MCG; and”

68. As a threshold issue, the inventors admit that the claimed “reconfiguring” step is background knowledge that would have been known to a POSITA. For example, the “Background” section of the ’400 Patent acknowledges that the process for configuring the MCG duplicated SRB was an agreed part of the 5G/NR standard, which was under development at the time. Ex. 1001 at 1:24-47. In fact, the inventors admit that the specific step recited in Element 5.2 is prior art to the ’400 Patent. *See Ex. Id.* at 1:36-47 (explaining that 3GPP “agreed that in a dual-connectivity scenario, for the MCG duplicated SRB, whether uplink transmission is performed by adopting an MCG, a Secondary Cell Group (SCG), or both the MCG and the SCG in a duplicate transmission mode is configured via RRC signaling” during “the 3GPP NR AdHoc meeting held in June 2017.”).

69. The agreed process for reconfiguring MCG duplicated SRBs discussed in the Background Section of the ’400 Patent is also discussed in R2-1702708. For example, R2-1702708 teaches that the MN/MCG base station performs “SN RRC reconfigurations” by transmitting an “MN RRC message” with an embedded “SN RRC message.” Ex. 1005 at 1. These embedded RRC messages are the means by which the MN/MCG reconfigures split, duplicated SRBs (*i.e.*, SRB1 and SRB2 discussed above) after receiving “an SCGFailureInformation message” from the UE.

See Id. at 1 (explaining that “the MN can decide to release or/and change the SN based on [the SCGFailureInformation message]”).

70. For example, I have annotated Figure 1 to illustrate how releasing the UE-SCG link reconfigures a split SRB such that subsequent uplink transmissions are received via the MN/MCG alone (rather than both the MN/MCG and the SN/SCG). The figure labeled “Figure 1: Pre-SCG1 Failure” depicts split SRB1 which is configured to receive uplink transmissions via the SN/SCG. By contrast, the figure labeled “Figure 1: Post-SCG1 Failure” reflects the configuration of SRB1 after “the UE experiences RLF on the SCG” and the MN “decide[s] to release” the failed SN/SCG. *Id.* at 1. As shown below, the necessary result of the MN’s decision “to release” the failed SN/SCG for split SRB1 is that subsequent transmissions are received at the MN/MCG alone rather than being split between the MN/MCG and the SN/SCG.

Figure 1: Pre-SCG Failure for SRB1

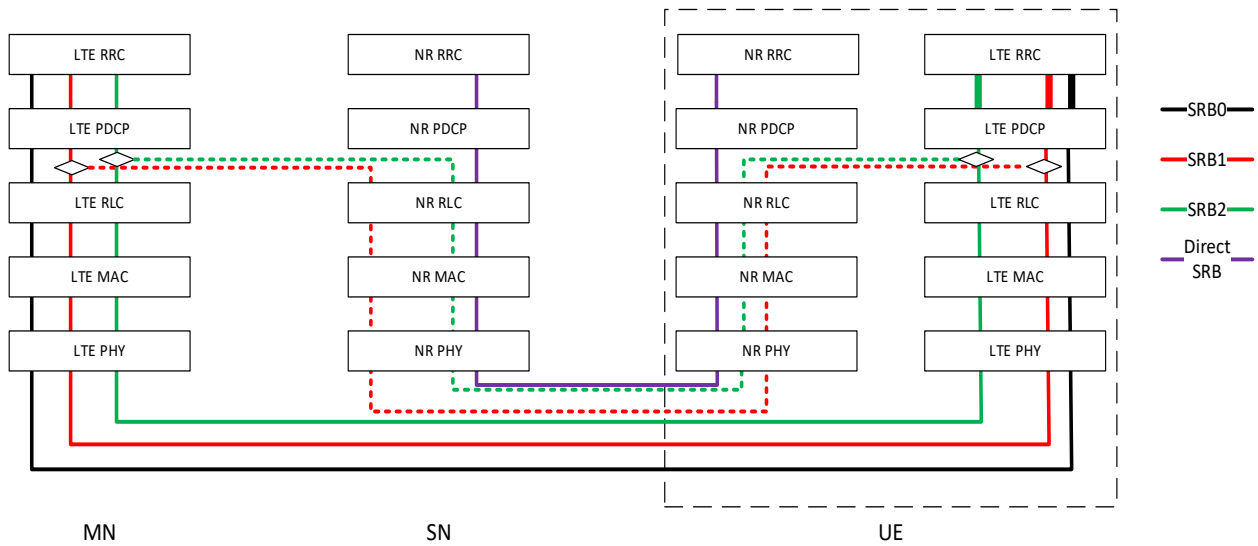
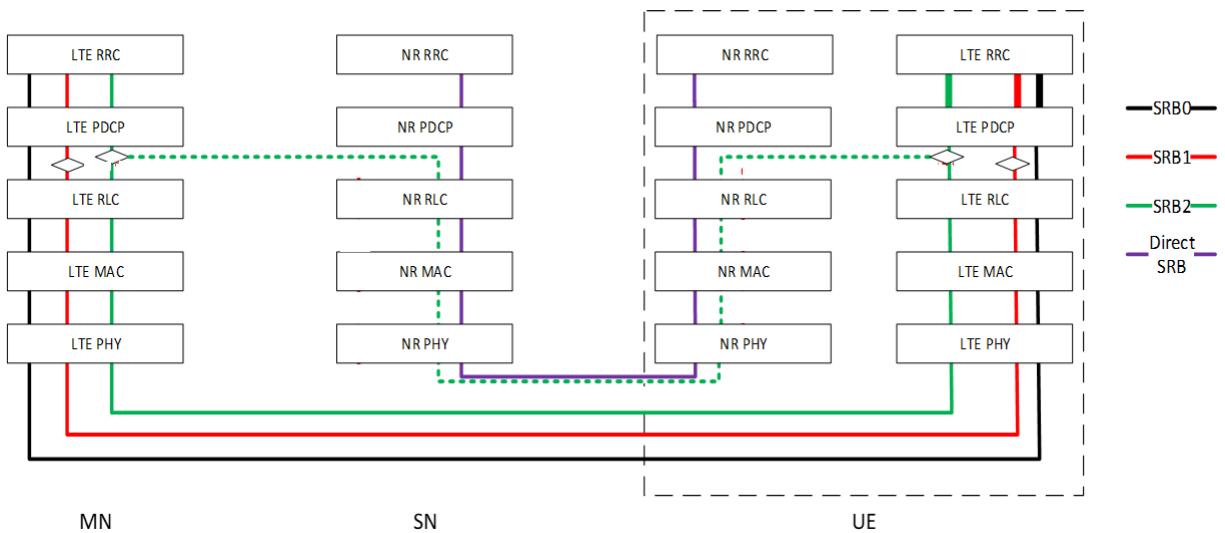


Figure 1: Post-SCG Failure for SRB1



Id. at Fig. 1 (annotations added)

71. Although I believe this limitation is expressly disclosed in R2-1702708, I have been asked to assess whether it would have been obvious for a POSITA to “reconfigur[e] the first MCG duplicated SRB to receive uplink transmission via the

MCG” in light of R2-1702708. To the extent R2-1702708 does not expressly disclose this limitation, it would have been obvious to a POSITA. As described above, R2-1702708 discloses that, if the UE encounters a radio link failure on the SCG, the UE sends an SCGFailureInformation message to the MN. *Id.* at 1. In other words, the SCGFailureInformation message notifies the network that the UE-SCG link has failed in a split SRB configuration, while the UE-MCG link continues to operate.

72. In such situations, the continued transmission of messages by the UE over the failed UE-SCG link becomes both futile and inefficient. This rationale is precisely articulated in R2-1702708, which states that upon receiving the SCGFailureInformation message, “the MN can decide to release or/and change the SN” as a means to address the disrupted connection between the UE and the SN/SCG. *Id.* at 1. It would have been apparent to a POSITA to employ an RRC reconfiguration message, as explicitly instructed in R2-1702708, for the purpose of “releasing . . . the SN” in the event of a radio link failure between the UE and the SN/SCG. *Id.*

d. Element 5.3: “reconfiguring the second MCG duplicated SRB to receive uplink transmission via the MCG”

73. R2-1702708 discloses or renders obvious Element 5.3 for virtually the same reasons discussed above with respect to Element 5.2. The only difference

between these two Elements is the “second MCG duplicated SRB” in R2-1702708 corresponds with SRB2 and the “first MCG duplicated SRB” corresponds with SRB1 in R2-1702708. As explained in relation to Element 5.2, R2-1702708 discloses that “if the UE experiences RLF [*i.e.*, radio link failure] on the SCG . . . an SCGFailureInformation message is transmitted to the MN and the MN can decide to release or/and change the SN based on [the received message].” *Id.* at 1. Thus, if an MN “decide[s] to release” the SCG/SN, the MCG/MN reconfigures the second MCG duplicated SRB (*i.e.*, “SRB2” disclosed in R2-1702708) to receive the uplink transmissions via the MCG/MN. *Id.* at 1.

2. Claim 7

- a. “The method according to claim 5, further comprising: transmitting, to the UE, information instructing the UE whether to perform uplink transmission via the MCG when the SCG failure is detected.”**

74. As explained above, R2-1702708’s disclosures regarding the steps taught in Claim 5 apply equally to Claim 7.

75. R2-1702708 discloses that “if the UE experiences RLF [radio link failure] on the SCG . . . an SCGFailureInformation message is transmitted to the MN and the MN can decide to release or/and change the SN based on [the received message].” *Id.* at 1. The MCG/MN’s “release or/and change [of] the SN” in response to the SCGFailureInformation message is thus accomplished by control information that the MCG/MN (which is not experiencing failure) transmits to the UE.

76. In addition to R2-1702708's explicit teaching, it is also inherent and obvious that the information instructing the UE whether to perform the uplink transmission *must* be transmitted via the MCG in the event of a failure on the SCG link, as it would be impossible for such transmission to take place on the SCG that is experiencing a radio link failure.

77. Additionally, the '400 Patent itself recognizes that, "[i]n the 3GPP NR AdHoc meeting held in June 2017," which occurred before the '400 Patent's claimed priority date, "it was agreed that in a dual-connectivity scenario, *a master base station decides* whether to use a Master Cell Group (MCG) duplicated Signaling Radio Bearer (SRB) and configure the MCG duplicated SRB via Radio Resource Control (RRC) signaling of the master base station" and that "in a dual-connectivity scenario, for the MCG duplicated SRB, whether uplink transmission is performed by adopting an MCG, a Secondary Cell Group (SCG), or both the MCG and the SCG in a duplicate transmission mode *is configured via RRC signaling.*" Ex. 1001 at 1:36-47 (emphasis added).

3. Claim 8

“A base station, wherein the base station includes a Master Cell Group (MCG) base station and communicates with User Equipment (UE) over a first MCG duplicated Signaling Radio Bearer (SRB) and a second MCG duplicated SRB, and the first MCG duplicated SRB is associated with the MCG and a Secondary Cell Group (SCG) and configured to be used for uplink transmission via the SCG, the base station comprising:

a memory storing instructions; and

a processor configured to execute the instructions to cause the base station to:

receive, from the UE, a report of an SCG failure;

reconfigure the first MCG duplicated SRB to receive uplink transmission via the MCG; and

reconfigure the second MCG duplicated SRB to receive uplink transmission via the MCG.”

(emphasis added)

78. Only two differences exist between Claims 5 and 8 of the '400 Patent. First, Claim 5 describes the “method” of a base station communicating with a UE over first and second MCG duplicated SRBs, whereas Claim 8 is directed to the “base station” itself. This distinction is not relevant to my analysis of Claims 5 and 8 in view of the prior art cited in this declaration and does not affect my conclusions. Second, Claim 8 adds a requirement that the base station possess “memory storing instructions” and a “processor configured to execute” each of the claimed

“receiv[ing],” “reconfigur[ing],” and “reconfigure[ing]” functions. The requirement that the base station possess “memory storing instructions” and a “processor” likewise does not affect my conclusions because the base station disclosed in R2-1702708 *must necessarily* possess the memory storing instructions and processor described in Claim 8 to carry out the functions described in R2-1702708. In other words, the MN/MCG disclosed in R2-1702708 could not “decide to release or/and change the” SN/SCG after receiving notification of failure on the SN/SCG *unless* it had memory and a processor configured to execute the described functions. *See* Ex. 1005 at 1. Therefore, this requirement is inherent.

79. Thus, a skilled artisan would recognize that R2-1702708 teaches every element of Claim 8. To the extent that any part of Claim 8 is not taught explicitly in R2-1702708, it would have been obvious to a skilled artisan that the base station described therein would possess “memory storing instructions” and “a processor configured to execute the instructions.”

XI. CONCLUSION

Based on my experience, knowledge of the art at the relevant time, and analysis of prior art references, and the reasons described above, it is my opinion that the Challenged Claims of the '400 Patent are unpatentable over the prior art.

Date: March 27, 2024

Executed: 