

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCL Communication Technology Holdings Limited
TCT Mobile International Limited
TCT Mobile, Inc.
TCT Mobile (US) Inc.
TCT Mobile (US) Holdings Inc.

Petitioners,

v.

Mitsubishi Electric Corporation,

Patent Owner.

Case IPR2023-00957
U.S. Patent No. 10,200,976

EXHIBIT 2011
DECLARATION OF TODOR COOKLEV, PH.D.

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I. INTRODUCTION

1. My name is Todor V. Cooklev. I am an expert in mobile telecommunications and wireless technology. I have been retained as an expert witness to provide my independent opinion regarding certain matters at issue in *inter partes* review of U.S. Patent No. 10,200,976 (“the ’976 patent”) in IPR2023-00997. I have been retained by Mitsubishi Electric Corporation (“MELCO”), the Patent Owner in the above proceedings. Petitioners are TCL Communication Technology Holdings Limited, TCT Mobile International Limited, TCT Mobile, Inc., TCT Mobile (US) Inc., and TCT Mobile (US) Holdings Inc (collectively “Petitioner”).

2. For my work on this case, I am being compensated at my typical consulting rate of \$700 per hour. I am also being reimbursed for reasonable expenses that I incur during the course of this work. My compensation does not depend on the substance of my opinions or the outcome of any issues in this case.

3. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date. I reserve the right to amend or supplement my opinions based on additional documents or evidence I am presented, including without limitation any arguments or expert declarations advanced by Petitioner in this case.

4. I am not a legal expert and offer no opinions on the law. However, I have been informed by counsel of the various legal standards that apply, and I have applied those standards in arriving at my conclusions.

II. QUALIFICATIONS

5. I am currently Professor of Electrical and Computer Engineering at Purdue University in Fort Wayne, Indiana. At the same institution since 2008 I have served in several faculty and administrative positions, including as the Director of the Wireless Technology Center, ITT Associate Professor of Wireless Communication and Applied Research, and subsequently as Harris Professor of Wireless Communication and Applied Research.

6. I graduated from the Technical University of Sofia, Bulgaria in 1988 with a Diploma of Engineering in the field of Electrical Engineering. I graduated from Tokyo Institute of Technology in Tokyo, Japan in 1995 with a Doctor of Philosophy (Ph.D.) degree in Electrical Engineering.

7. I teach several courses related to the hardware and software architectures of wireless systems and wireless devices. My research interests include most aspects of modern wireless systems, including hardware/software architectures. I have given and occasionally continue to give seminars, tutorials, and presentations worldwide.

8. I have received research funding from the National Science Foundation (NSF), the Defense Advanced Research Projects Agency (DARPA), the U.S. Air Force Research Laboratory, the Office of Naval Research, and a number of private companies, including major technology companies.

9. I have authored and co-authored more than 100 peer-reviewed articles. I am also a named inventor on 32 U.S. patents, most of which relate to the hardware or software aspects of communication systems. For part of this work in 2019, I was inducted into the Purdue Inventors Hall of Fame. A list of my publications and patents appears in my *curriculum vitae* attached as Appendix 1.

10. In addition to my academic experience, I have experience in technology and product development in the computer networking and data communications industry. My work has been in the areas of communication protocols, software, digital signal processing, and integrated circuit design for communication systems.

11. I have contributed to the development of several major standards for communication systems and numerous amendments. I have participated in many meetings of standards committees. I have prepared, submitted, and presented documents relating to technical matters considered by these committees. I have chaired some committee meetings and served in other leadership roles.

12. Between 2000-2002 and 2005-2008 I was a Voting Member of the IEEE 802.11 Working Group. Around 2005-2007 I was Chair or a Study Group

within IEEE 802.11. For part of my work I received an award from IEEE Standards Association in 2012.

13. Between 2007-2011 I participated in the work of the Software-Defined Radio Forum (later renamed Wireless Innovation Forum). During 2011-2012 I attended 3GPP standards committee meetings. Around that time, I contributed to and submitted several documents relating to LTE-Advanced.

14. In 2020, I was elected to serve on the Board of Governors of the IEEE Standards Association for one term beginning January 2021. The Board of Governors provides overall leadership of the IEEE Standards Association.

15. Currently, I am a Series Editor for Wireless and Radio Communications of the IEEE Communications Standards Magazine (which is the premier journal in the field of communication standards) and have held that position since 2017. As a member of the Editorial Board I coordinate the review of scholarly manuscripts submitted to the wireless and radio communications series.

16. I am qualified by education and experience to testify as an expert with respect to subject matter in the fields of wireless communications, wireless communications protocols, wireless data transmission, wireless device hardware, data and signal processing hardware and software, and wireless device interoperability.

17. I have attached a current copy of my curriculum *vitae* as Exhibit 2003, which includes a list of my publications. My CV also includes a list of cases during at least the last four years in which I have provided testimony as an expert.

III. LEGAL STANDARDS

18. I am not a lawyer, and I do not intend to offer any opinions as to the interpretation of the law. When considering the '976 patent and stating my opinions, I rely on the following legal standards as described to me by the attorneys for the Patent Owner.

A. Priority Date

19. I understand that the analysis of alleged obviousness of the Patent should be performed from the perspective of a person of ordinary skill in the art (POSITA) as of the priority date of the Patent. The '976 Patent claims priority to January 7, 2011. My opinions in this matter are from the perspective of a POSITA as of that date.

B. Level Of Ordinary Skill In The Art.

20. I understand that the Board has adopted Petitioner's proposal for the level of a person of ordinary skill in the art. As this level is consistent with my own view of the appropriate level of a person of ordinary skill in the art, I have no further opinion on it. As further discussed below, my opinions as stated in this declaration

are valid and in accordance with level of ordinary skill in the art adopted by the Board.

C. Claim Construction.

21. I understand that claims in a patent-at-issue in an IPR are generally interpreted according to the district court-type claim construction.

22. I further understand that claim terms are interpreted as they would have been interpreted by a person of ordinary skill in the art at the time of the invention, in light of the specification and the patent's prosecution history in the patent office.

D. Anticipation Legal Standard.

23. I understand that a patent claim is anticipated if every element of a claim is disclosed expressly or inherently in a single prior art reference. In addition to every element being disclosed expressly or inherently, I also understand that the single prior art reference must disclose every element being arranged or combined in the same way as the claim. I further understand that it is not proper to combine different embodiments in a single prior art reference to show anticipation.

E. Obviousness Legal Standard.

24. I understand that a patent claim is unpatentable if the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention.

25. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious

to a person of ordinary skill in the art at the time of the invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness, including any praise of the invention. Objective indicia of non-obviousness may include, for example, commercial success of an embodiment, a long-felt need, skepticism, failure by others to find the solution provided by the claimed invention, copying by others of the subject matter of the claim invention, unexpected results of the claimed invention, acceptance of others and industry praise, and licensing of the patents.

26. I also understand that obviousness may be established under certain circumstances by combining or modifying the teachings of the prior art. However, I have been informed that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I have been informed that many, if not all, inventions rely on building blocks already previously known, and claimed discoveries almost of necessity will likely be combinations of what is already known. I have been informed that it is important to identify whether a reason existed at the time of the invention that would have motivated a person of

ordinary skill in the art in the relevant field to combine the known elements in the way the claimed invention does. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit but must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge that a person of ordinary skill in the art would have had.

27. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose, but also including teachings that lead away from the invention. I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, although the mere disclosure of alternative designs does not teach away.

28. I further understand that whether there is a reasonable expectation of success in combining references in a particular way is also relevant to the analysis.

29. I understand that it is improper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the invention.

30. I am not offering any legal opinions in this declaration nor am I qualified to do so. I only consider such legal standards in framing my opinions and conclusions as well as placing assertions made by Petitioner in the Petition into the proper context. Additionally, from a subject matter perspective, I understand that the petitioner always has the burden of persuasion regarding a challenge of patentability of an invention under an *inter partes* review.

IV. OVERVIEW OF THE '976 PATENT

31. Based on my review of the '976 Patent, the asserted prior art, and other relevant documents, a POSITA would have understood that 3G and 4G cellular systems used predetermined pairings of downlink and uplink frequency bands as of the '976 Patent priority date. Release 10 of 4G introduced carrier aggregation (CA) and the ability to configure user equipment (UE) with more downlink resources than uplink resources. Nevertheless, the predetermined pairings of frequency bands created inefficiencies, and these inefficiencies are recognized and addressed by inventive features in the '976 Patent. One of those inventive features disclosed in the '976 Patent is configuring a frequency band with downlink resources only. *See* EX1001, 49:46-50:19; Fig. 41. This feature is reflected in substitute claim 3.

A. Predetermined Pairing of Frequency Bands in the Prior Art

32. 4G LTE established and required predetermined pairing of frequency bands, also referred to as operating bands, usable for communication between a cell

and a UE, as shown in TS 36.101. EX1001, 8:33-36. In particular, each downlink (DL) frequency band has a predetermined pairing with an uplink (UL) frequency band, where the UL frequency band differs from the DL frequency band. *Id.*, 8:36-43. As explained in the '976 Patent, predetermined pairing derives from the necessary requirement in conventional communication, such as voice communication, to enable transmission and reception at the same time by splitting the frequencies between downlink and uplink. *Id.*, 8:43-47.

33. The '976 Patent discusses TS 36.101 V10.0.0 (identified as Non-Patent Document 8 in the '976 Patent), which shows the predetermined pairing of frequency bands in 4G LTE. EX2006, 16-17 (§ 5.5 Operating Bands).

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit			Downlink (DL) operating band BS transmit UE receive			Duplex Mode
	$F_{UL, low}$	–	$F_{UL, high}$	$F_{DL, low}$	–	$F_{DL, high}$	
1	1920 MHz	–	1980 MHz	2110 MHz	–	2170 MHz	FDD
2	1850 MHz	–	1910 MHz	1930 MHz	–	1990 MHz	FDD
3	1710 MHz	–	1785 MHz	1805 MHz	–	1880 MHz	FDD
4	1710 MHz	–	1755 MHz	2110 MHz	–	2155 MHz	FDD
5	824 MHz	–	849 MHz	869 MHz	–	894 MHz	FDD
6 ¹	830 MHz	–	840 MHz	875 MHz	–	885 MHz	FDD
7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	FDD
8	880 MHz	–	915 MHz	925 MHz	–	960 MHz	FDD
9	1749.9 MHz	–	1784.9 MHz	1844.9 MHz	–	1879.9 MHz	FDD
10	1710 MHz	–	1770 MHz	2110 MHz	–	2170 MHz	FDD
11	1427.9 MHz	–	1447.9 MHz	1475.9 MHz	–	1495.9 MHz	FDD
12	698 MHz	–	716 MHz	728 MHz	–	746 MHz	FDD
13	777 MHz	–	787 MHz	746 MHz	–	756 MHz	FDD
14	788 MHz	–	798 MHz	758 MHz	–	768 MHz	FDD
15	Reserved			Reserved			FDD
16	Reserved			Reserved			FDD
17	704 MHz	–	716 MHz	734 MHz	–	746 MHz	FDD
18	815 MHz	–	830 MHz	860 MHz	–	875 MHz	FDD
19	830 MHz	–	845 MHz	875 MHz	–	890 MHz	FDD
20	832 MHz	–	862 MHz	791 MHz	–	821 MHz	FDD
21	1447.9 MHz	–	1462.9 MHz	1495.9 MHz	–	1510.9 MHz	FDD
...							
33	1900 MHz	–	1920 MHz	1900 MHz	–	1920 MHz	TDD
34	2010 MHz	–	2025 MHz	2010 MHz	–	2025 MHz	TDD
35	1850 MHz	–	1910 MHz	1850 MHz	–	1910 MHz	TDD
36	1930 MHz	–	1990 MHz	1930 MHz	–	1990 MHz	TDD
37	1910 MHz	–	1930 MHz	1910 MHz	–	1930 MHz	TDD
38	2570 MHz	–	2620 MHz	2570 MHz	–	2620 MHz	TDD
39	1880 MHz	–	1920 MHz	1880 MHz	–	1920 MHz	TDD
40	2300 MHz	–	2400 MHz	2300 MHz	–	2400 MHz	TDD
41	2496 MHz	–	2690 MHz	2496 MHz	–	2690 MHz	TDD

Note 1: Band 6 is not applicable

Table 5.5-1 shows that every UL operating band is paired with a DL operating band. Based on my review of subsequent versions of TS 36.101, I found that this predetermined pairing of UL and DL operating bands remained in effect through at least TS 36.101 V11.2.0 published more than a year after the priority date of the '976 Patent. *See* EX2008, 20-22.

B. Innovation of the '976 Patent to Enable Base Station to Configure Cell with DL Resources Only

34. By requiring a predetermined pairing of UL and DL operating bands as of the '976 Patent priority date, 4G LTE had an inherent inefficiency. To overcome

this inefficiency, the '976 Patent disclosed a new method of assigning frequency bands (i.e., operating bands) that includes establishing a frequency band for DL only, with no paired UL frequency band. EX1001, 49:46-57. Fig. 41, shown below, provides an example of a DL frequency band without a paired UL frequency band.

F I G . 4 1

Band	Uplink (UL) operating Band	Downlink (DL) operating Band	Duplex Mode
	F _{UL_low} — F _{UL_high}	F _{DL_low} — F _{DL_high}	
A	—	FB_DL_l — FB_DL_h	FDD

In Fig. 41, Band A has a designated frequency range between FB_DL_l and FB_DL_h for the downlink but with no frequency range pairing for the uplink. *Id.*

35. This innovative feature in the '976 Patent of establishing a DL frequency band without a paired UL frequency band provides multiple benefits. For example, this configuration eliminates the need to allocate a frequency band for uplink as an actual frequency resource. *Id.*, 49:58-67. This preserves that frequency band for other use and allows for efficient use of frequency resources in a case where there are discrete and narrow-band frequency resources. The system correspondingly can allocate the resource for UL to another cell, another operator, or another system, which improves the efficient use of frequency resources. *Id.*, 32:40-50.

36. Configuring an operating band to have DL frequency resources only also enables a reduction in the amount of necessary information provided to a UE served by the cell. EX1001, 50:1-5. The DL component carrier (CC) configured in the DL frequency band configured by a base station for a cell is included in the information communicated to a UE. *Id.*, 50:6-10. With the frequency band for DL unpaired from UL frequency band, such as shown in Fig. 41 of the '976 Patent, the UE already knows this predetermined arrangement and can recognize the configuration in advance. In other words, the UE can recognize that the frequency band in which that cell is configured has no UL frequency band because of the predetermined arrangement, which enables the UE to recognize that there is no UL CC to be associated with a DL CC of that cell without needing to be informed of that configuration. *Id.*, 50:11-17. As a result, the cell's system information can be reduced, which enables a reduced signaling amount from the cell to the UE. *Id.*, 50:17-19.

37. Moreover, because the frequency band assigned to the cell has only a DL frequency band without a paired UL frequency band, the base station necessarily configures the cell without UL resources. By being able to configure DL resources only, the processing burden of the base station is reduced. In addition, configuring the system to include a frequency band with DL only and no paired UL enables the base station to use that frequency band to configure a "non-associated cell" having

DL resources only. None of the prior art cited in the Grounds discloses or suggests this feature.

V. CLAIM-AT-ISSUE

38. Substitute claim 3 recites the following:

3. A communication terminal device performing radio communication with a base station device, wherein

the communication terminal device performs uplink communication using an associated cell configured by the base station to include a resource for uplink and a resource for downlink, the resource for uplink being included in an uplink frequency band that is paired with a first downlink frequency band and being allocated to the uplink communication to the base station device, the resource for downlink being included in the first downlink frequency band and being allocated to the downlink communication from the base station device, and

the communication terminal device performs downlink communication using the associated cell and a non-associated cell configured by the base station to include only another resource for downlink, the other resource for downlink being included in a second downlink frequency band that is not paired with any uplink frequency band

and being allocated to the downlink communication from the base station device.

I understand that the underlined portions in red represent new limitations present in substitute claim 3 but absent in original claim 2 of the '976 Patent.

VI. OPINIONS

A. Ground 1 – Substitute Claim 3 is Not Obvious Over the Combination of TS 36.300 V10.0.0 in view of R2-104515

39. According to substitute claim 3, the resource for uplink for the associated cell is “included in an uplink frequency band that is paired with a first downlink frequency band,” and the associated cell’s resource for downlink is “included in the first downlink frequency band.” The non-associated cell is configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that *is not paired* with any uplink frequency band.” Appendix A (emphasis added).

1. **The frequency bands used in TS 36.300 and R2-104515 are described in TS 36.101, which shows only predetermined pairings of UL and DL frequency bands as of the priority date of the '976 Patent**

40. In my opinion, it would have been necessary to POSITA to have studied TS 36.101 V10.0.0 (EX2006) to understand how to configure uplink and downlink frequency resources for a cell according to 3GPP Release 10 prior to the '976 Patent priority date. This necessity is recognized by the '976 Patent, which

cites and describes the relevance of TS 36.101 V10.0.0 in relation to the required pairing of UL and DL operating bands used to configure UL and DL resources for a cell. *See* EX1001, 8:33-47; 35:63-36:9. It is also my opinion that a POSITA would have understood the need to consider other 3GPP technical specifications, including TS 36.101, to understand properly how to implement the requirements and recommendations of TS 36.300 10.0.0 (EX1012) and R2-104515 (EX1013).

41. The relevance of TS 36.101 to a POSITA for understanding the required pairing of UL and DL resources in every operating band is actually noted by R2-104515. The R2-104515 reference makes multiple references to implementing its proposal by making changes to TS 36.331, such as Opt 2 with respect to the parameter ‘freqBandIndicator.’ EX1013, 3-4. TS 36.331 V10.0.0 defines “*freqBandIndicator*” as follows:

■ <i>freqBandIndicator</i> [↵] Defined in TS 36.101 [42, table 5.5-1]. [↵]
--

EX2014, 132. Since TS 36.331 V10.0.0 indicates that “*freqBandIndicator*” used in Opt 2 is defined in table 5.5-1 of TS 36.101, a POSITA would have understood that the table is necessarily relevant to understanding operating band assignments in 4G Release 10.

42. Table 5.5-1 of TS 36.101 V10.0.0 in Section 5 “Operating bands and channel arrangement” is reproduced below.

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	$F_{UL,low} - F_{UL,high}$	$F_{DL,low} - F_{DL,high}$	
1	1920 MHz – 1880 MHz	2110 MHz – 2170 MHz	FDD
2	1850 MHz – 1810 MHz	1930 MHz – 1990 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD
12	698 MHz – 716 MHz	728 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
15	Reserved	Reserved	FDD
16	Reserved	Reserved	FDD
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
18	815 MHz – 830 MHz	860 MHz – 875 MHz	FDD
19	830 MHz – 845 MHz	875 MHz – 890 MHz	FDD
20	832 MHz – 862 MHz	791 MHz – 821 MHz	FDD
21	1447.9 MHz – 1462.9 MHz	1495.9 MHz – 1510.9 MHz	FDD
...			
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD
41	2496 MHz – 2690 MHz	2496 MHz – 2690 MHz	TDD

Note 1: Band 6 is not applicable

EX2006, 16-17. Table 5.5-1 plainly shows that every operating band has a predetermined pairing of UL and DL frequency resources. These predetermined pairings in each operating band also confirm that no operating band is defined to have DL frequency resources only. TS 36.101 V10.0.0 therefore confirms to a POSITA that the resources provided by the frequency bands are *always* assigned for both downlink and uplink when the base station configures the cell.

43. Based on my review of the 3GPP Technical Specifications developed prior to the priority date of the '976 Patent, each one required a predetermined pairing of UL and DL frequency resources for every operating band. Even TS

36.101 V11.2.0 (EX2008) published in September 2012, more than a year and a half after the '976 Patent priority date, still required assignment of both uplink and downlink resources across all operating bands including for carrier aggregation. *See* EX2008, 20-22. Thus, from prior to the priority date for the '976 Patent to a period of at least 18 months after the priority date, all versions of 3GPP 4G Release 10 and early versions of Release 11 required pairing of uplink and downlink resources across all operating bands including for carrier aggregation.

2. TS 36.101 did not disclose assigning downlink resources only to an operating band until well after the priority date of the '976 Patent

44. Not until TS 36.101 V11.3.0 (EX2009), published in December 2012, nearly two years after the '976 Patent priority date, did the 3GPP identify for the first time an operating band in which only downlink resources are assigned.

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
6 ¹	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD
12	699 MHz – 716 MHz	729 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
15	Reserved	Reserved	FDD
16	Reserved	Reserved	FDD
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
18	815 MHz – 830 MHz	860 MHz – 875 MHz	FDD
19	830 MHz – 845 MHz	875 MHz – 890 MHz	FDD
20	832 MHz – 862 MHz	791 MHz – 821 MHz	FDD
21	1447.9 MHz – 1462.9 MHz	1495.9 MHz – 1510.9 MHz	FDD
22	3410 MHz – 3490 MHz	3510 MHz – 3590 MHz	FDD
23	2000 MHz – 2020 MHz	2180 MHz – 2200 MHz	FDD
24	1626.5 MHz – 1660.5 MHz	1525 MHz – 1559 MHz	FDD
25	1850 MHz – 1915 MHz	1930 MHz – 1995 MHz	FDD
26	814 MHz – 849 MHz	859 MHz – 894 MHz	FDD
27	807 MHz – 824 MHz	852 MHz – 869 MHz	FDD
28	703 MHz – 748 MHz	758 MHz – 803 MHz	FDD
29	N/A	717 MHz – 728 MHz	FDD ²
...			
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD
39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD
40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD
41	2496 MHz – 2690 MHz	2496 MHz – 2690 MHz	TDD
42	3400 MHz – 3600 MHz	3400 MHz – 3600 MHz	TDD
43	3600 MHz – 3800 MHz	3600 MHz – 3800 MHz	TDD
44	703 MHz – 803 MHz	703 MHz – 803 MHz	TDD
NOTE 1: Band 6 is not applicable			
NOTE 2: Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell.			

EX2009, 21-23. As shown in Table 5.5-1 above, operating band 29 (highlighted in yellow) has only downlink resources assigned. This assignment in operating band

29 in TS 36.101 V11.3.0 provides the exact same kind of configuration as the operating band configuration shown in Fig. 41 of the '976 Patent.

F I G . 4 1

Band	Uplink (UL) operating Band	Downlink (DL) operating Band	Duplex Mode
	F _{UL_low} — F _{UL_high}	F _{DL_low} — F _{DL_high}	
A	—	FB_DL_l — FB_DL_h	FDD

In both cases, no uplink resources are assigned to the operating band.

45. These changes to TS 36.101 over time confirm that the 3GPP standard did not disclose until almost two years after the '976 Patent priority date that an operating band assignment for a “non-associated cell” could be configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band,” as recited in substitute claim 3. In every instance prior to December 2012, the 3GPP standard included assignments pairing uplink and downlink frequency bands for every operating band.

3. TS 36.300 V10.0.0 and R2-104515 fails to disclose or suggest a “non-associated cell” being configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band” as recited in substitute claim 3 of the ’976 Patent

46. With no example in the 3GPP standard for an operating band to have downlink resources without any uplink resources prior to the ’976 Patent priority date, it is my opinion that a POSITA would have concluded that no such operating band was permissible in 3GPP 4G Release 10. Moreover, neither TS 36.300 V10.0.0 nor R2-104515 teach such an operating band as recited in substitute claim 3.

47. The only mentions of “frequency band” in TS 36.300 V10.0.0 are limited and, in my opinion, are irrelevant to a “non-associated cell” being configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band,” as recited in substitute claim 3 of the ’976 Patent. The mentions are limited to mobility issues and searching E-UTRA frequency bands (i.e., the bands listed in § 5 of TS 36.101) for cell selection, which have no relevance to an operating band having downlink resources only. EX1012, 53, 68, 71, 73, 75.

48. R2-104515 has no mention of “frequency band” but does discuss parameter ‘freqBandIndicator,’ which is present in TS 36.331 and defined by TS 36.101. But since TS 36.101 defines all operating bands for this parameter to have

both UL and DL resources prior to the '976 Patent priority date, R2-104515 also has no teaching relevant to an operating band having downlink resources only.

- 4. Even if combinable, substitute claim 3 is not invalid because both TS 36.300 V10.0.0 and R2-104515 fail to disclose or suggest a “non-associated cell” being configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band”**

49. As explained in the immediately preceding sections, both TS 36.300 V10.0.0 and R2-104515 fail to teach a “non-associated cell” being configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band,” as recited in substitute claim 3. Instead, the reference teaches the opposite with all operating bands as of the priority date of the '976 Patent in TS 36.300 V10.0.0 and R2-104515 being configured with both uplink and downlink frequency bands paired together. Accordingly, in my opinion, substitute claim 3 is not invalid over the combination of TS 36.300 and R2-104515.

B. Ground 2: Malladi Does not Anticipate Substitute Claim 3

50. As acknowledged in the ID, “Petitioner has not shown Malladi to disclose a non-associated cell having no uplink carriers.” ID, 21. Ground 2 of the Petition therefore fails to demonstrate a reasonable likelihood that Malladi would have anticipated substitute claim 3 for the same reason. Moreover, based on my review of Malladi, I have confirmed that there is no discussion at all of frequency

(or operating) bands. Without such a discussion, Malladi necessarily fails to teach the other resource for downlink of the “non-associated cell” being “included in a second downlink frequency band that is not paired with any uplink frequency band,” as recited in substitute claim 3.

C. Ground 3: TS 25.319 Cannot Cure the Deficiencies of Malladi

51. The ID acknowledges that Malladi fails to disclose or suggest the “non-associated cell” of claim 2 of the '976 Patent. ID, 21. Malladi therefore fails to disclose or suggest the same limitation in substitute claim 3 for the same reason. Even if combinable, TS 25.319 cannot cure this deficiency of Malladi.

1. Like Malladi, TS 25.319 Fails to Disclose or Suggest a Cell With Downlink Resources Only

52. TS 25.319 has no teachings of a cell having downlink resources only or that a base station configures a cell with downlink resources only. In addition, in my opinion, Petitioner’s evidence to support that TS 25.319 allegedly teaches such a cell misinterprets that evidence.

53. Petitioner first citation to TS 25.319 is provided in the excerpt below. The Petition inaccurately asserts that this excerpt teaches “that the total number of uplink component carriers (*uplink resources*) can be one when the total number of downlink component carriers (*downlink resources*) is two.” Petition, 75 (emphasis in original).

4 Background and introduction

The technical purpose of the Enhanced Uplink feature is to improve the performance of uplink dedicated and common (FDD and 1.28Mcps TDD only) transport channels, i.e. to increase capacity and throughput and reduce delay. This is applicable for UTRA TDD and FDD.

The following techniques are part of the Enhanced Uplink feature:

- Node B controlled scheduling: possibility for the Node B to control, within the limits set by the RNC, the set of TFCs from which the UE may choose a suitable TFC.
- Node B controlled physical resource scheduling (TDD only).
- Hybrid ARQ: rapid retransmissions of erroneously received data packets between UE and Node B.
- Higher order modulation (16QAM) (TDD and FDD).
- Intra-frame code hopping (3.84 Mcps and 7.68 Mcps TDD only).
- Shorter TTI: possibility of introducing a 2 ms TTI (FDD only).
- Enhanced Uplink in CELL_FACH state and Idle mode (FDD and 1.28Mcps TDD only).
- Dual Cell E-DCH (FDD).

EX. 1015, 9 (highlighting by Petitioner). This excerpt teaches that the “technical purpose of the Enhanced Uplink feature is to improve the performance of uplink dedicated and common (FDD and 1.28 Mcps TDD only transport channels, i.e., to increase capacity and throughput and reduce delay,” and that the Enhanced Uplink feature includes Dual Cell E-DCH (FDD). *Id.* But this excerpt has no discussion at all about the number of uplink and downlink component carriers. Rather, as noted in the highlighted portion, it simply discusses improving performance of the uplink channel. There is nothing about the number of uplink channels, carriers, or resources and has no mention of downlinks at all. Asserting that this excerpt teaches one uplink component carrier with two downlink component carriers is wholly unsupported.

54. Petitioner also misinterprets the other cited excerpt from TS 25.319 provided below. Petition, 76-77.

Serving E-DCH cell: Cell from which the UE receives Absolute Grants from the Node-B scheduler. A UE has one Serving E-DCH cell.

[Secondary E-DCH Active Set: In Dual Cell E-DCH operation, the set of cells on the secondary downlink carrier where E-DCH is carried for one UE.

Secondary Serving E-DCH cell: In Dual Cell E-DCH operation, cell from which the UE receives Absolute Grants from the Node-B scheduler on the secondary downlink. A UE can have zero or one Serving E-DCH cell on the secondary uplink carrier.]

EX. 1015, 7 (highlighting by Petitioner). Petitioner asserts that the excerpted passage from TS 25.319 states that “zero or one” refers to the number of secondary uplink carriers on the secondary cell. Petition, 76-77. That is not what is stated. The applicable passage Petitioner highlighted in blue is that a “UE can have zero or one Serving E-DCH cell on the secondary uplink carrier.” The “zero or one” applies to the Serving E-DCH cell being “on the secondary uplink carrier,” not that a secondary cell can have zero or one secondary uplink carriers. Properly interpreted, this means that the Serving E-DCH can be on the secondary uplink carrier in addition to the Secondary Serving E-DCH cell being on the secondary uplink carrier. TS 25-319 confirms that multiple cells can be on the same carrier as the excerpted passage also defines Secondary E-DCH Active Set as “the set of cells on the secondary downlink carrier where E-DCH is carried for one UE.” EX1015, 7.

55. Accordingly, based on my analysis of TS 25.319, there is no evidence to supports Petitioner’s contention that TS 25.319 teaches a base station configuring

a cell to have downlink resources only. It is therefore my opinion that the combination of Malladi and TS 25.319 fails to disclose or suggest a “non-associated cell” as recited in substitute claim 3.

2. TS 25.319 Fails to Disclose or Suggest the “non-associated cell” having the other resource for downlink being “included in a second downlink frequency band that is not paired with any uplink frequency band

56. Just like Malladi, TS 25.319 has no discussion at all of frequency (or operating) bands. Accordingly, in my opinion, TS 25.319 fails to teach the other resource for downlink of the “non-associated cell” being “included in a second downlink frequency band that is not paired with any uplink frequency band,” as recited in substitute claim 3.

57. I also note that, just like TS 36.101, TS 25.101 in relation to TS 25.319 shows that every operating band has a predetermined pairing of both UL and DL resources.

Table 5.0: UTRA FDD frequency bands

Operating Band	UL Frequencies UE transmit, Node B receive	DL frequencies UE receive, Node B transmit
I	1920 - 1980 MHz	2110 -2170 MHz
II	1850 -1910 MHz	1930 -1990 MHz
III	1710-1785 MHz	1805-1880 MHz
IV	1710-1755 MHz	2110-2155 MHz
V	824 - 849 MHz	869-894 MHz
VI	830-840 MHz	875-885 MHz
VII	2500-2570 MHz	2620-2690 MHz
VIII	880 - 915 MHz	925 - 960 MHz
IX	1749.9-1784.9 MHz	1844.9-1879.9 MHz
X	1710-1770 MHz	2110-2170 MHz
XI	1427.9 - 1447.9 MHz	1475.9 - 1495.9 MHz
XII	699 – 716 MHz	729 – 746 MHz
XIII	777 - 787 MHz	746 - 756 MHz
XIV	788 – 798 MHz	758 – 768 MHz
XV	Reserved	Reserved
XVI	Reserved	Reserved
XVII	Reserved	Reserved
XVIII	Reserved	Reserved
XIX	830 – 845MHz	875 – 890 MHz
XX	832 – 862 MHz	791 – 821 MHz
XXI	1447.9 – 1462.9 MHz	1495.9 – 1510.9 MHz

TS 25.101 V9.7.0, the first version published after the '976 Patent priority date, lists the available operating bands as shown in Table 5.0 above and that every operating band has a predetermined pairing of UL and DL resources. EX2013, 17. All prior versions of TS 25.101 also required the predetermined pairings of UL and DL resources for every operating band.

58. Accordingly, even if a POSITA considers TS 25.319 in context with other 3GPP 3G technical specifications including TS 25.101, it would have been clear to a POSITA that 3GPP 3G, including TS 25.319, did not disclose or suggest a “non-associated cell” being configured by the base station to include only another resource for downlink that is “included in a second downlink frequency band that is not paired with any uplink frequency band” as recited in substitute claim 3.

Therefore, for all of this reasons, it is my opinion that substitute claim 3 is valid over the combination of Malladi and TS 25.319.

VII. CONCLUSION

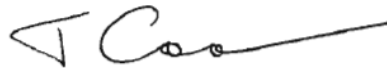
59. For the foregoing reasons, based on my expertise and experience and the record of this case that I have reviewed, it is my opinion that the substitute claim is not shown to be disclosed or obvious.

60. I understand that my opinions discussed above support a legal conclusion that the challenged claim is not anticipated and is nonobvious.

In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

I hereby declare that all statements made herein of my own knowledge are true and all statements made herein on information and belief were and are believed by me to be true, and that all statements herein were and are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that any such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'T Cooklev', with a long horizontal stroke extending to the right.

March 1, 2024

Todor V. Cooklev, Ph.D.