

Filed on behalf of: Netgear, Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TP-LINK CORPORATION LIMITED,
Petitioner,

v.

NETGEAR, INC.,
Patent Owner.

Case IPR2023-01393
Patent 7,936,714 B1

**DECLARATION OF ZYGMUNT J. HAAS, PH.D.,
IN SUPPORT OF PATENT OWNER'S
PRELIMINARY RESPONSE**

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I. Introduction and Qualifications

1. I have been retained by Netgear, Inc. (“Patent Owner”) to provide my opinion concerning the validity of U.S. Patent No. 7,936,714 (Ex. 1001).

2. I am a Professor and Distinguished Chair in Computer Science at the University of Texas in Dallas. I am also a Professor Emeritus at the School of Electrical and Computer Engineering at Cornell University. In addition, I have provided technical consulting services on intellectual property matters, during which I have written expert reports and provided deposition and trial testimony involving, among others, wireless communication technologies.

3. My academic credentials include a Bachelor of Science Degree in Electrical Engineering, summa cum laude, from Technion (IIT), Israel, in 1979 and a Master of Science Degree in Electrical Engineering, summa cum laude, from Tel Aviv University, Israel, in 1985. I subsequently authored the thesis titled “Packet Switching in Fiber-Optic Networks” as part of earning my Ph.D. in Electrical Engineering from Stanford University in 1988.

4. I am being compensated at the rate of \$500 with reimbursement for actual expenses for my work related to this matter. My compensation is not dependent on, and in no way affects, the substance of my statements in this Declaration.

5. I have worked or consulted for about 35 years in the fields of Electrical Engineering and Computer Science. My primary focus has been on communication and networking systems, with an emphasis on wireless communication networks. I have authored and co-authored numerous technical papers and book chapters related to wireless communication networks. I hold over twenty patents in the fields of high-speed networking, wireless networks, and optical communication/switching. My employment history following my graduation from Stanford University began at the Network Research Department of AT&T Bell Laboratories in 1988. At AT&T Bell Laboratories, I pursued research on wireless communications, mobility management, fast protocols, optical networks, and optical switching. During my tenure at AT&T, I also worked for the AT&T Wireless Center of Excellence, where I investigated various aspects of wireless and mobile networks.

6. In 1995, I joined the faculty of the School of Electrical & Computer Engineering at Cornell University, and in time I was promoted to a Full Tenured Professor. At Cornell, I headed the Wireless Networks Lab, a research group with extensive contributions in the area of wireless communication systems and networks. In 2013, I retired from Cornell University with the title of Emeritus Professor, and I joined the Computer Science Department at the University of Texas at Dallas with the title of Professor and Distinguished Chair in Computer

Science. At Cornell University and at the University of Texas, I have taught dozens of courses related to computer networking and wireless communications. I have also served on various committees for the benefit of the scientific community.

7. I am a member of a number of professional societies, including the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM). In 2007, I was elevated to an IEEE Fellow, and in 2022, I was elevated to an ACM Fellow, both well-known distinctions. For example, the total number of IEEE Fellows which are selected in any given year does not exceed 0.1% of the total number of voting members of IEEE. With respect to the ACM Fellow grade, ACM states that “ACM’s most prestigious member grade recognizes the top 1% of ACM members for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community.” See <https://awards.acm.org/fellows>.

8. I have delivered numerous tutorials at major IEEE and ACM conferences. I served as editor of several publications including the IEEE Transactions on Networking, the IEEE Transactions on Wireless Communications, the IEEE Communications Magazine, the Springer “Wireless Networks” journal, the Elsevier “Ad Hoc Networks” journal, the “Journal of

High Speed Networks,” and the Wiley “Wireless Communications and Mobile Computing” journal. I was also a guest editor of IEEE Journal on Selected Areas in Communications for the issues on “Gigabit Networks,” “Mobile Computing Networks,” and “Ad-Hoc Networks.” Finally, I served as the Chair of the IEEE Technical Committee on Personal Communications (TCPC), today known as Wireless Communications Technical Committee (WTC).

9. I have received several awards in the field of wireless communications and network technology. In 2016, I received the IEEE ComSoc AHSN Recognition Award “for outstanding contributions to securing ad hoc and sensor networks”. In 2012, I received the IEEE ComSoc WTC Recognition Award, which recognizes individuals “for outstanding technical contributions in the field for their service to the scientific and engineering communities.” In 2021, I received the “Best Paper Award” for coauthoring the paper “Engineering a Network in the Sky” from the 35th International Conference on Information Networking, (ICOIN21). In 2012, I received the “Best Paper Award for co-authoring “Collaborating with Correlation for Energy Efficient WSN” directed at Wireless Sensor Networking. I previously received the “Best Paper Award” for co-authoring “Optimal Resource Allocation for UWB Wireless Ad Hoc Networks” directed at personal indoor and mobile radio communications. Finally, in 2003, I received the “Highly Commended Paper Award” for co-authoring

“Performance Evaluation of the Modified IEEE 802.11 MAC for Multi-Channel Multi-Hop Ad Hoc Network,” directed at advanced information networking and applications.

10. Additional information regarding my education, technical experience and publications, including a list of the U.S. patents of which I am an inventor/coinventor, is included in my *Curriculum Vitae*, which I understand is attached at Exhibit 2002.

II. Summary Of Materials Reviewed And Considered

11. The opinions contained in this Declaration are based on the documents that I reviewed, my knowledge, and professional judgment. In forming the opinions expressed in this Declaration, while drawing on my experience in the field of wireless communications, I reviewed the following documents¹:

¹ The table of the Exhibits and Exhibit numbers were supplied to me by Counsel.

Ex.	Description
1001	United States Patent No. 7,936,714 (“the ’714 patent”)
1002	Declaration of Dr. Zhi Ding (“Ding Declaration”)
1004	File History for the ’714 patent (“’714 FH”)
1005	U.S. Patent Application Publication No. 2002/0045459 (“Morikawa”)
1006	U.S. Patent No. 6,049,721 (“Serizawa”)
1007	“Millimeter Waves for Short-Range Multimedia Communication Systems,” <i>Proceedings of the IEEE</i> , O. Andrisano, V. Tralli, and R. Verdone (“Andrisano”)
1015	Chapters 4 and 5 of <i>RF Microelectronics</i> , Razavi, Prentice Hall (1998) (“Razavi”)
1018	U.S. Patent No. 6,801,519 (“Mangal”)

12. My opinions are additionally guided by my appreciation of how a person of ordinary skill in the art (“POSITA”) would have understood the claims of the ’714 patent at the time of the alleged invention, which I have been asked to assume is March 11, 2002.

III. Understanding of Legal Standards

13. I am not an attorney, and in this Declaration, I do not opine on matters of law. For the purposes of this Declaration, I have been informed about certain aspects of the law that are relevant to my analysis and opinions. My understanding of these principles is set forth below.

14. I have been informed by Counsel that the validity analysis is a two-step process. First, the patent claims are construed to ascertain their proper scope. Second, the construed claims are compared to the identified prior art to determine if the claims are valid over the prior art.

A. Claim construction

15. I have been informed by Counsel that the claims of a patent define the limits of the patentee's exclusive rights. I have been informed by Counsel that to determine the scope of the claimed invention, courts typically construe claim terms, the meaning of which the parties may dispute. I have been informed by Counsel that claim terms should generally be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of filing of the patent application, after reading the patent and its prosecution history. I also have been informed by Counsel that a basic tenet of claim construction presumes that different words in a claim have different meanings, unless there is evidence to the contrary.

16. I have been informed by Counsel that claims must be construed in light of, and consistent with, the intrinsic evidence. In this context, I have been informed by Counsel that intrinsic evidence includes the claims themselves, the written disclosure in the specification, and the patent's prosecution history, including prior art that was considered by the United States Patent and Trademark Office ("USPTO"). I have been informed by Counsel that the specification is always highly relevant to the claim construction analysis and often is the single best guide to the meaning of a disputed term. I have been informed by Counsel that extrinsic evidence may also be considered when

construing claims and may include, for example, technical dictionaries, technical publications and books, treatises, and expert testimony.

B. Obviousness

17. I have been informed by Counsel that patent claims can be deemed invalid if the differences between the claimed subject matter 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 pertinent art. While such conclusions are often based on more than one piece of prior art, only one is required. It is not sufficient that a collection of prior art references merely recites the various elements of a challenged patent claim. Rather, as I have been informed by Counsel, the prior art must present the elements in a manner that is consistent with their arrangement or use in the challenged claims. I have been informed by Counsel that obviousness cannot be based on the hindsight combination of components selectively culled from the prior art.

18. I have been informed by Counsel that a person having ordinary skill in the art (i.e., a POSA) is a hypothetical person who is presumed to have known the relevant art at the time the invention was made. I have been informed by Counsel that the condition “at the time the invention was made” is imposed to rule out impermissible hindsight. I also have been informed by Counsel that an expert is to analyze the prior art from the perspective of a person of ordinary skill

in the art at the time the invention was made, and not simply to provide his/her own personal conclusions.

19. I also have been informed by Counsel that an obviousness determination includes several factual inquiries, including (1) determining the scope and content of the prior art; (2) ascertaining the differences between the claimed invention and the prior art; (3) resolving the level of ordinary skill in the pertinent art; and (4) taking into consideration any objective indicia of nonobviousness.

20. I have been informed by Counsel that obviousness must be determined as of the date of the invention (i.e., the effective filing date or priority date of the patent). Thus, in considering the reason or motivation to combine references, it is essential to avoid using hindsight. For example, the problem examined when considering obviousness is the general problem that confronted the inventor before the invention was made, not the specific problem solved by the invention. Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness. Further, an overly narrow statement of the problem can represent a form of hindsight, because often the inventive contribution lies in defining the problem in a new revelatory way. Similarly, an assertion that a person of ordinary skill could combine the references, rather than that they would have been motivated to do so,

is an impermissible form of hindsight. Moreover, knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed invention.

21. I have been informed by Counsel that a motivation to solve a problem (or issue) is not the same as a motivation to have combined references. I have been informed by Counsel that whether a skilled artisan would be motivated to make a combination includes whether he/she would select particular references in order to combine their elements.

22. I have been informed by Counsel that the analysis of the motivation to combine should be explicit. Additionally, it must include articulated reasoning with rational underpinnings to support the conclusion of obviousness. Providing a full explanation of the motivation to combine the references and the reasonable expectation of success is a necessary component of the obviousness inquiry, as inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. However, conclusory statements fail to adequately explain why a person of ordinary skill would have a motivation to combine the potential prior art references.

23. I have been informed by Counsel that common sense, common wisdom, and common knowledge may be used to support a motivation to

combine, so long as the use of common sense in the analysis is explained with sufficient reasoning. But, common sense can only be used to supply a limitation missing from the prior art where the technology is unusually simple and straightforward.

24. I also have been informed by Counsel that evidence suggesting reasons to combine cannot be viewed apart from evidence suggesting reasons not to combine. In analyzing motivation, both advantages and disadvantages must be considered. Teaching away, for example, is a statement in the prior art that either (i) discourages one from following the path of the claimed invention, or (ii) encourages one to follow a path that diverges from the path of the claimed invention. The concept of teaching away bears directly on whether there was a reason to combine prior art. Known disadvantages in prior art technology or devices which would naturally discourage a search for new inventions may also be taken into account in determining obviousness.

IV. Level of Ordinary Skill in the Art

25. For the '714 patent, a person of ordinary skill in the art ("POSITA") would have a bachelor's degree in a technical field such as electrical engineering, computer engineering, computer science, or physics, and/or 2-3 years of relevant practical experience in data communication, wireless communication, or wireless networking systems.

V. Overview of the '714 patent

26. The '714 patent discloses “[a] dual band spectrum allocation system and method for wireless data communications [that] uses discrete bands for upstream and downstream data communications.” ’714 patent, Abstract.

27. The '714 patent discusses “so-called ‘last-mile’ and ‘last-foot’ data transmission systems which are designed to deliver high speed and/or high data capacity from the internet backbone to an end user or to provide high speed data communications in a campus-like setting.” ’714 patent, 1:14-18. “For example, such a point to multi-point system may broadcast from a central tall building to a number of shorter buildings.” ’714 patent, 1:27-29.

28. The '714 patent discloses that these known systems typically “utilize one frequency band of operation, generally, transmitting and receiving on separate frequencies within the same basic band employing frequency division duplexing (FDD).” ’714 patent, 1:30-33. “Such prior art data communication systems operate entirely within one regulated band.” ’714 patent, 1:33-35.

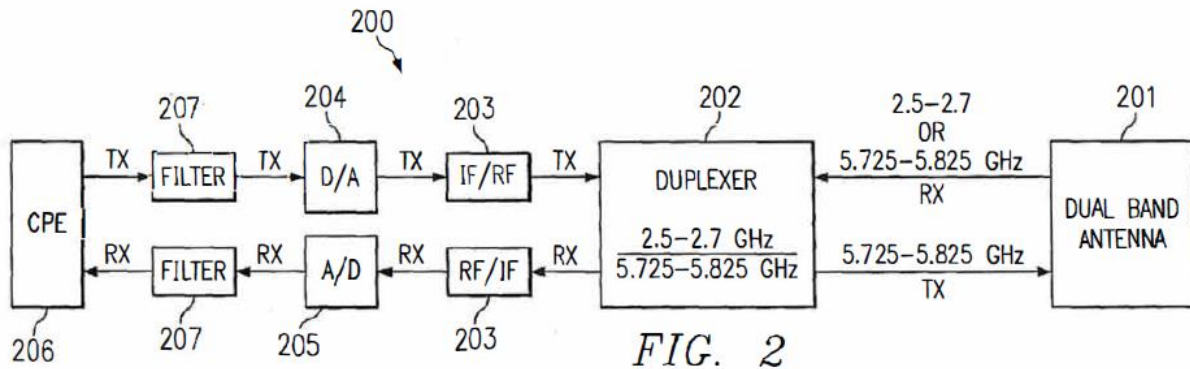
29. The '714 patent discloses “[a]nother technique which is used to enable communications within a band of operation” called “time division duplexing (TDD).” ’714 patent, 1:48-50. With TDD, “a base station or hub transmits part of the time on a frequency, and then a subscriber transmits part of the time on the same frequency, thereby sharing the same frequency.” ’714

patent, 1:48-53. Thus, with TDD, the upstream and downstream transmissions took turns using the same frequency, and thus the same frequency band, rather than transmitting at the same time. And therefore, whether using TDD or FDD, the '714 patent describes prior systems' use of a single frequency band for uplink and downlink.

30. The disclosure in the '714 patent “allows spectrum, which does not have sufficient bandwidth to provide one percent frequency separation between upstream and downstream frequencies, as typically required to use FDD, to be used for broadband data transmission.” '714 patent, 4:37-41. “Typically, in the prior art, FDD frequency separation is less than one percent of frequency. For example prior art FDD transmission frequencies at around one GHz would traditionally be separated by less than ten MHz.” '714 patent, 4:31-36.

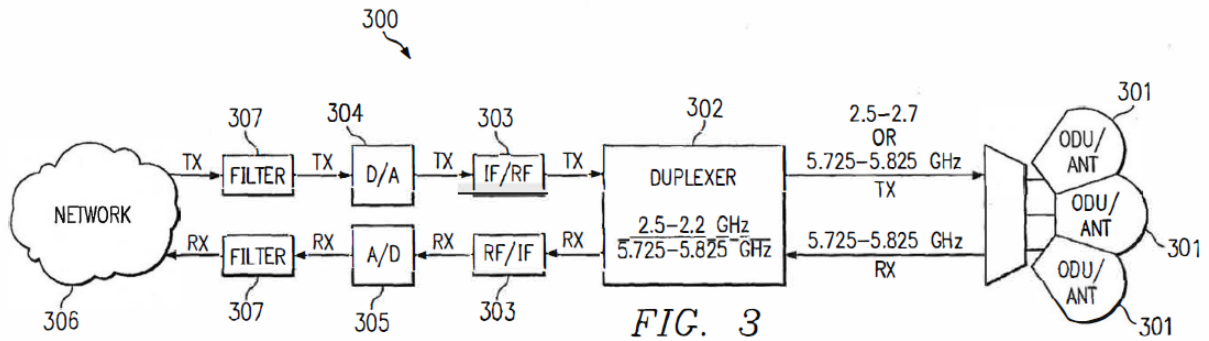
31. Figure 2 of the '714 patent discloses a block diagram for a subscriber station 200. The subscriber station includes a multi-band duplexer 202 that “preferably accommodates upstream and downstream communications on at least two greatly different bands of operation.” '714 patent, 7:49-52. The duplexer “may be made up of discrete circuit components, may be embodied in an integrated circuit, may comprise a rectangular waveguide assembly or may be made up of other combinations of components and elements capable of carrying out duplexing in accordance with the present invention.” '714 patent, 7:56-60.

“Preferably, the duplexer provides low insertion loss while being low in cost and having a small package size.” ’714 patent, 7:64-66.



’714 patent, Figure 2

32. Figure 3 of the ’714 patent, reproduced below, illustrates a block diagram of a hub station 300. The hub station includes a “[h]ub duplexer 302” that “is also a multi-band duplexer enabling use of at least two different transmit and receive bands.” ’714 patent, 8:52-54. “However, base station 300 [also called hub 300] may utilize a more elaborate duplexer 302, e.g. having a greater number of poles, while maintaining low insertion loss.” ’714 patent, 8:54-56. “A preferred embodiment of duplexer 302 operates in separate bands of operation, as opposed to prior art duplexers which transmit and receive on frequencies within a single band of operation.” ’714 patent, 8:56-60.



'714 patent, Figure 3

VI. Claim construction

33. I understand that the Petitioner has not proposed any terms for construction. For the purposes of this declaration, I have applied the ordinary and customary meaning of the claim terms.

VII. Overview of Prosecution of the '714 Patent

34. The '714 patent has a filing date of March 11, 2002. The '714 patent issued May 3, 2011, after nine years of prosecution at the U.S. Patent and Trademark Office.

35. I have been informed by counsel that at the time of the prosecution of the '714 patent, applicants were able to appeal Final Rejections from an Examiner to the Board of Patent Appeals and Interferences ("BPAI"). I have been informed that the applicant of the '714 patent appealed to the BPAI twice during prosecution.

36. In the first appeal, the applicant argued that the references asserted by the Examiner "does not teach or suggest the desirability of transmitting in a

licensed band while receiving signals in an unlicensed band, or the reverse.” Ex. 1004, 137. The BPAI partially affirmed the Examiner’s rejection and noted that the “Appellants do not point to claim language that requires transmitting *while* receiving and [its] review of the [then-pending] claims find[s] no such limitation.” Ex. 1004, 244. The Board also applied the Mangal reference (U.S. 6,801,519; Ex. 1018), as an additional ground for rejection. Ex. 1004, 221, 252.

37. After the first appeal and more rejections from the Examiner based on Mangal, the applicant appealed to the BPAI a second time based on new claims. Ex. 1004, 260-64 (*see, e.g.*, claim 41); 296-97 (amending claim 40 to incorporate claim 41); 370 (second appeal brief). In the second appeal, the BPAI reversed the Examiner and “agree[d] with Appellants” that Mangal did not render the claims unpatentable based on a lack of operating in two bands at the same time. Ex. 1004, 454-55. The Board found that “Mangal, at best, discloses bidirectional communication occurring entirely in only one of a low interference band *or* a high interference band at the same time, and not simultaneously in both bands.” Ex. 1004, 454. After the reversal, the Examiner allowed the claims. Ex. 1004, 458-63. I discuss Mangal below in Section VIII.A.

VIII. Discussion of Cited References

A. Mangal (Exhibit 1018)

38. Mangal was cited during prosecution of the '714 patent.

Specifically, I understand that the U.S. Patent and Trademark Office found that Mangal did not disclose or render obvious the claim features requiring portions of the uplink and downlink communication to occur at the same time. Ex. 1004, 454-55.

39. In my opinion, and as I discuss below, the references cited by Petitioner, including Morikawa and Serizawa, have similarities to Mangal that are relevant to Petitioner's interpretation of those references.

40. Mangal discloses "[a] wireless communication system using a media access control (MAC) layer comprising a subscriber unit system and a base station system." Mangal, Abstract. "The base station system is configured to receive a request for a communication service, dynamically select between a first portion of the MAC layer corresponding to a first wireless transmission link using a licensed radio frequency and a second portion of the MAC layer corresponding to a second wireless transmission link using an unlicensed radio frequency, and exchanges communications for the communication service over the selected one of the first portion and the second portion of the MAC layer." Mangal, Abstract.

41. As shown in Mangal's Figure 2, which is reproduced below, Mangal's system uses a single MAC layer that uses one MAC frame for both licensed and unlicensed transmissions. The MAC frame has a portion 201 devoted to licensed transmission, and a separate portion 202 devoted to unlicensed transmission. Mangal, 5:24-30.

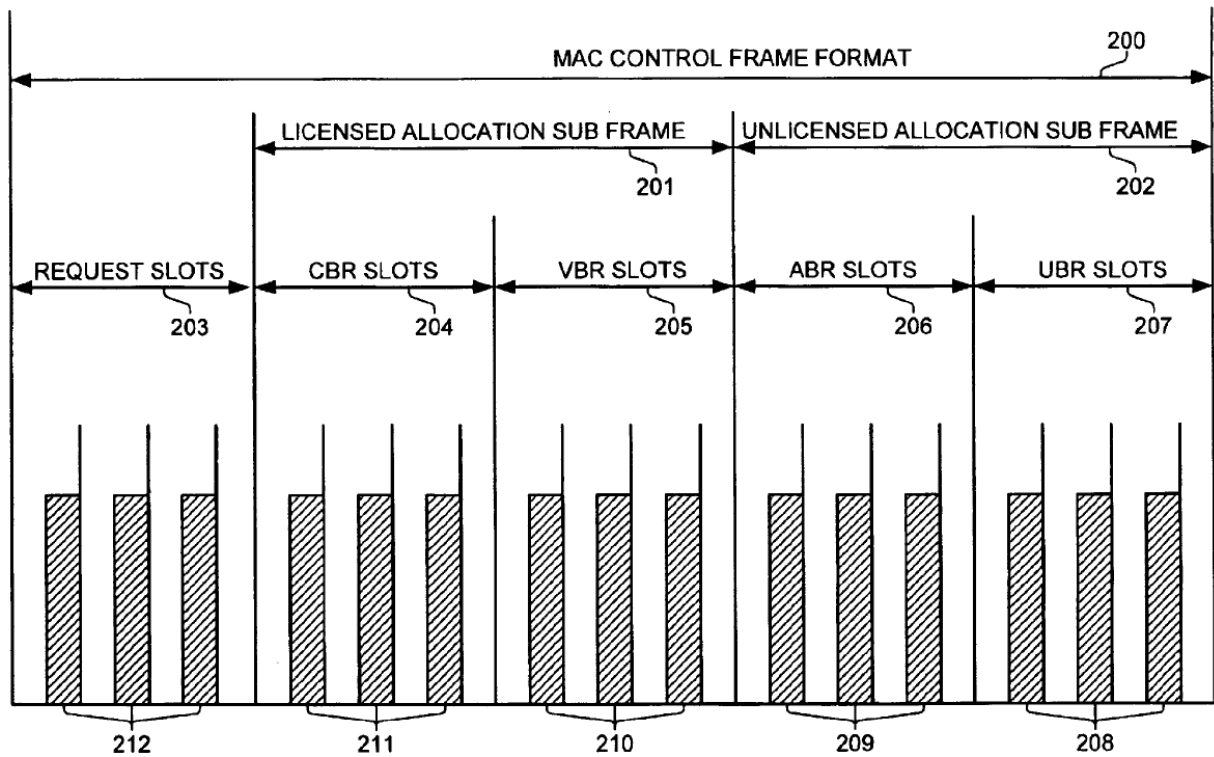


FIG. 2

Mangal, Figure 2

42. By having a single MAC layer frame that controls both licensed and unlicensed transmissions, Mangal's system is able to coordinate the transmissions in a preplanned manner. Specifically, the licensed and unlicensed portions do not overlap even though they use separate bands and separate radios.

43. Mangal further illustrates in Figure 1, which I have annotated below, a subscriber unit system and base station system each having multiple wireless transceivers (i.e., 102, 104 for the subscriber unit system and 108, 110 for the base station system). See Mangal, 2:64-3:30.

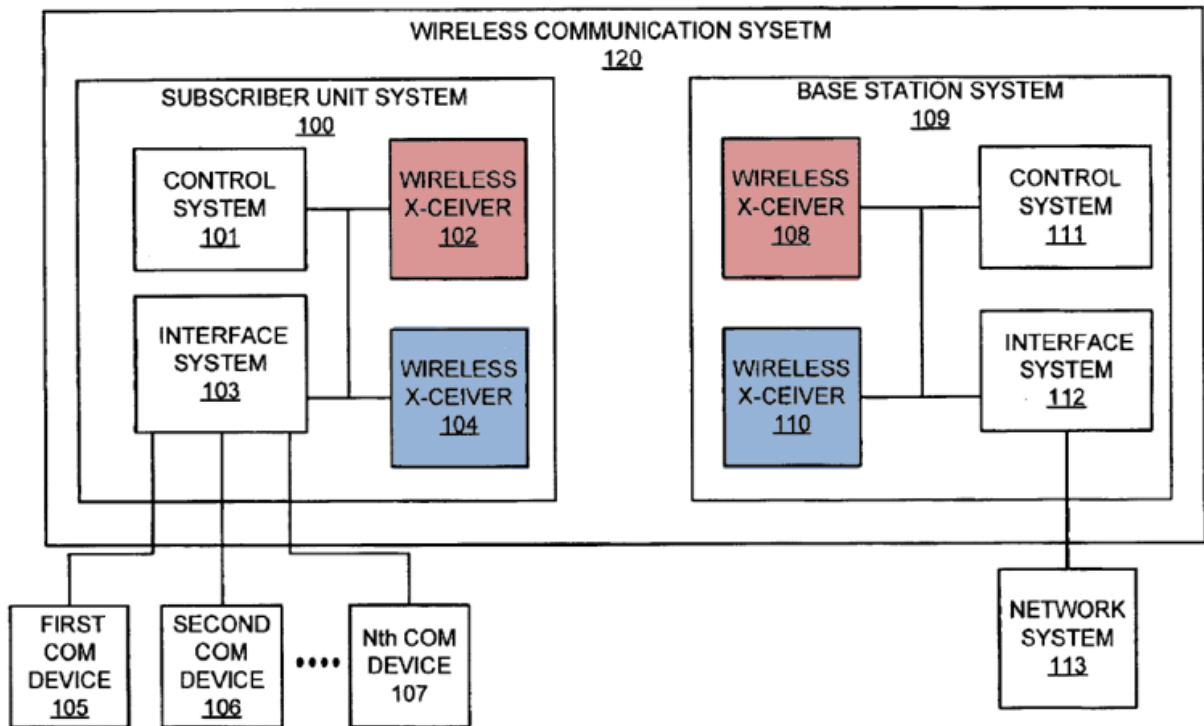


FIG.1

Mangal, Figure 1 with annotations highlighting separate transceivers

B. Razavi (Exhibit 1015)

44. Petitioner cites to Razavi to support various assertions relating to FDD, as well as a secondary reference against dependent claims in Ground III. Petition, 24-25; 46; 59-61.

45. Razavi appears to be Chapters 4 and 5 from a book titled *RF Microelectronics*. Chapter 4 is titled “Multiple Access Techniques and Wireless Standards.” Razavi at 11. In Section 4.2, Razavi discusses “Multiple Access Techniques.” Razavi at 16. Razavi begins this section with a subsection on “Time- and Frequency-Division Duplexing.” Razavi at 16–18.

46. Razavi describes “the problem of two-way communication by a transceiver, a function called ‘duplexing.’” Razavi at 16. Thus, duplexing refers to how the transmitting and receiving operations relate in order to allow two-way communication, without the two directions of communication (which are referred to as uplink and downlink, or alternatively upstream and downstream) interfering with each other. Razavi describes simple walkie-talkies, where a “user would press the ‘talk’ button to transmit while disabling the receive path.” Razavi at 16. Conversely, the user would “release the button to listen while disabling the transmit path.” Razavi at 16. “This can be considered a simple form of ‘time-division duplexing’ (TDD), whereby the same frequency band is utilized for both transmit (TX) and receive (RX) paths” but transmit and receive paths operate at different times. Razavi at 16.

47. Razavi also discloses an “approach to duplexing” that “employ[s] two different frequency bands for the transmit and receive paths.” Razavi at 16. This technique, called frequency-division duplexing or FDD, “incorporates

bandpass filters to isolate the two paths, allowing simultaneous transmission and reception.” Razavi at 16. In a system, where all the devices are to transmit on the same one frequency and to receive on the same another frequency, the FDD technique requires that the TX band of one device be “translated to the RX band” of the receiving device “at some point.” Razavi at 16. “In wireless networks, this translation is performed in the base station.” Razavi at 16. Razavi discloses that “FDD suffers from a number of issues” including signal leakage due to imperfect filtering of transmit signals, duplexer filter loss of potentially 3 dB (or 50% of the transmitted signal power), and spectral leakage to adjacent channels. Razavi at 17-18.

48. Following the subsection on duplexing are two subsections titled “Frequency-Division Multiple Access,” and “Time-Division Multiple Access,” respectively. Razavi at 18. Frequency division multiple access, or FDMA, is related to frequency division multiplexing (FDM). With FDM, multiple streams of data are transmitted on different frequencies (or “channels”) of a band—i.e., the streams are “multiplexed” on different frequencies, hence the name. A single user could employ FDM, sending different streams on different low-data-rate frequencies, to simplify the receiver’s job in recovering the data (e.g., recovering several low-rate signals can be simpler than recovering one high-rate signal).

With FDMA, that multiplexing is across multiple different transmitters in the uplink, or multiple different receivers in the downlink, hence “multiple access.”

49. In a wireless network, the multiple access/multiplexing techniques have to be specified for the uplink and the downlink, though the uplink and downlink often employ the same multiple access scheme. In the uplink, FDMA specifies that users transmit different streams on different frequency channels. In the downlink, FDMA specifies that users receive different streams on different frequency channels. *See Razavi at 105.*

50. A POSITA would have understood the differences between multiplexing, multiple access, and duplexing. *See, e.g., Razavi at 103-06.* Most importantly for interpreting Serizawa (discussed below), a POSITA would have understood the differences between FDMA and FDD. As FDMA specifies splitting the frequency band among users *within* the uplink or the downlink, it does not specify how the available frequency band is shared *between* uplink and downlink. Thus, FDMA does not specify whether any device in the network (base station, user device, or otherwise) is, or is not, transmitting and receiving at the same time. In other words, FDMA does not imply frequency division *duplexing*, which I discussed previously.

51. Razavi’s treatment of FDMA in a separate section from FDD demonstrates that FDMA is not the same as FDD. As Razavi explains, FDMA

“allow[s] simultaneous communication among multiple transceivers” where the available frequency band is “partitioned into many channels, each of which is assigned to one user.” Razavi at 18.

52. Razavi explains that FDMA is “familiar within the context of radio and television [commercial] broadcasting [systems], where the channel assignment does not change with time.” Razavi at 18. For example, different radio stations broadcast on the different frequencies that they are assigned—the multiple transmitters *share the downlink* FM radio spectrum on different frequencies. This is not FDD of course, because there is no duplexing at all (“duplexing” is the second “D” in FDD) in commercial radio broadcast. There is no uplink in such broadcasting systems, as it is one-way communication—FM radio receivers can change channels (because an FM radio antenna receives all of the FM radio channels simultaneously *in the downlink* due to the use of FDMA), but a receiver in such systems cannot transmit back to the radio station because there is no uplink channel and no duplexing, let alone FDD. Conversely, the FM commercial radio transmitters are not receiving anything in the uplink. Thus, in commercial broadcast radio or television, no devices are simultaneously receiving and transmitting.

53. Razavi further specifies that “in FDMA with FDD, two channels are assigned to each user, one for transmit and another for receive.” Razavi at 18.

Thus, FDMA does not equal FDD, nor does FDMA imply FDD. Otherwise, it would be redundant for Razavi to say “FDMA *with FDD*.” Razavi at 18.

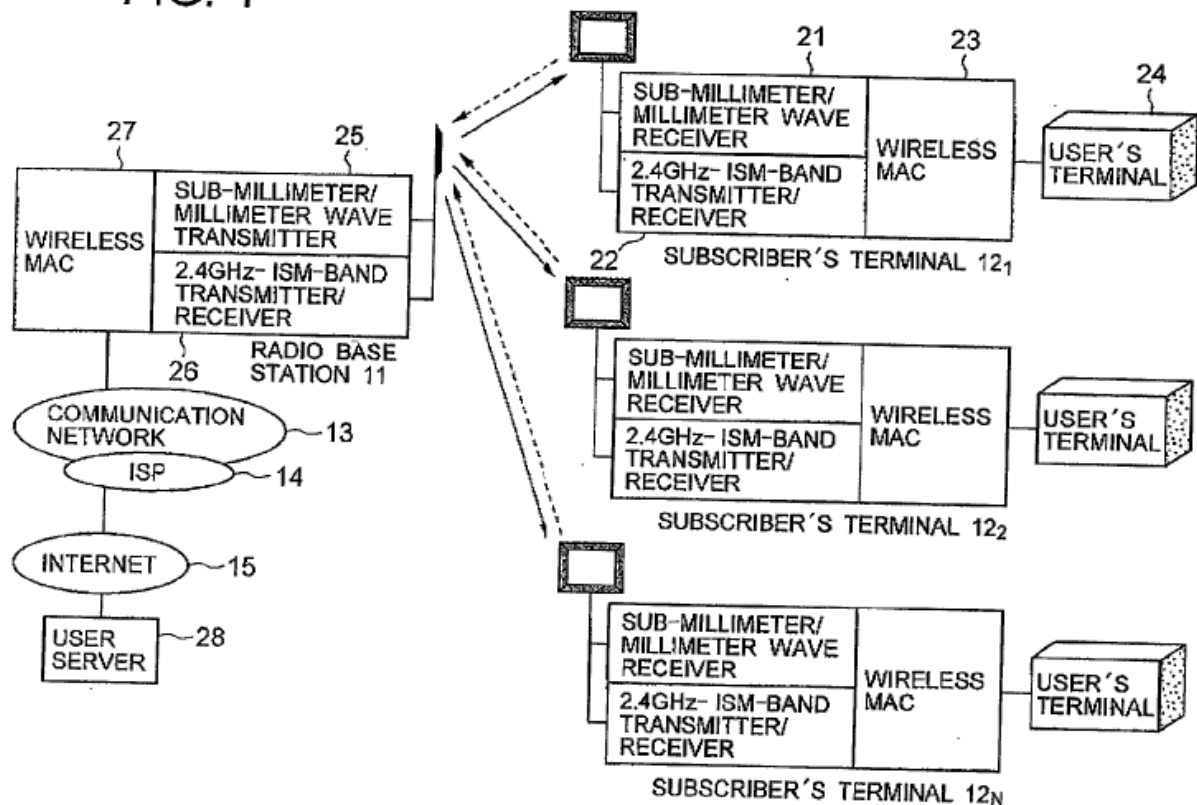
IX. Ground I: Claims 1-5, 11-17, 23-24, 31, and 32 in view of Morikawa (Exhibit 1005)

54. Morikawa is titled “Point-to-Multipoint Wireless Access System.”

Morikawa discloses a system that “includes a wireless base station and a plurality of wireless subscriber’s terminals, wherein the down-link channels from the base station to the respective subscriber’s terminals use a higher frequency band, and the up-link channels from the respective subscriber’s terminals to the base station use a lower frequency band which is exempt of license.” Morikawa, Abstract.

55. Petitioner relies on Figure 1 of Morikawa, which I have reproduced below. However, Petitioner states that it relies on a variation of Figure 1 that is described but not illustrated. Specifically, Petitioner relies on an embodiment where the 2.4 GHz ISM-Band radio 22 in the subscriber’s terminals is transmit-only (and thus uplink-only), and the 2.4 GHz ISM-Band radio 26 in the base station is receive only. Petition, 22 n.6 (citing Morikawa, ¶ 30). According to Petitioner, this embodiment uses the 2.4 GHz communication only for the uplink.

FIG. 1

**Morikawa, Figure 1**

56. Petitioner labels Morikawa's disclosure FDD. Petition, 24-25 (citing Razavi, 103). To the extent that Petitioner asserts that Morikawa discloses or renders obvious simultaneous use of the uplink and downlink channels, I disagree. I note that Petitioner does not cite to any disclosure of FDD or simultaneous use of the uplink and downlink in Morikawa. Petitioner instead cites to Razavi, which I understand is not part of Ground I. Petitioner also cites the '714 patent, which describes FDD as allowing a base station and subscriber station to simultaneously transmit and receive. Petition, 25 (citing '714 patent, 1:65-67). This disclosure explicitly mentions simultaneous transmission and

reception, unlike the Morikawa reference that does not discuss simultaneous transmission and reception on the up-link and the down-link channels.

57. Petitioner then cites to Figure 1 as “confirm[ing]” FDD. Petitioner’s annotation of Figure 1 is reproduced below.

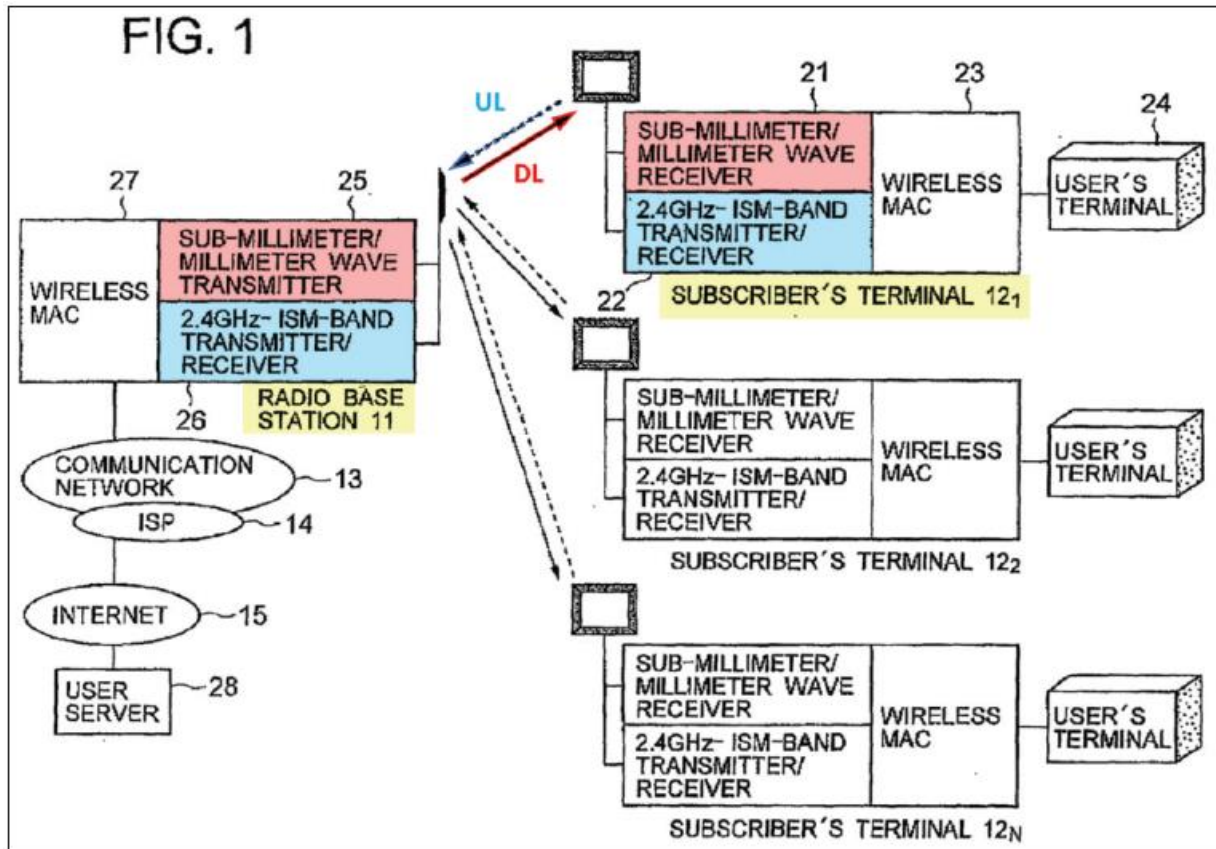


Figure 1 of Morikawa as annotated by Petitioner (Petition, 25)

58. Petitioner points to the use of separate radios in Figure 1 and asserts that “a POSITA would have understood and found obvious that the separate receiver and transmitter units at each subscriber’s terminal allow for concurrent, two-way, uplink and downlink transmissions over separate frequency bands.”

Petition, 26. Petitioner further asserts that this concurrent two-way

communication “is illustrated by the arrows (annotated UL and DL) in Morikawa Figure 1.” Petition, 26.

59. I disagree that Figure 1 teaches “concurrent” uplink and downlink transmissions.

60. The use of separate radios does not disclose or make obvious simultaneous operation. As I discussed in Section VIII.A, Mangal employed separate radios in different bands in a purely sequential, non-overlapping manner. Mangal’s non-overlapping operation was enabled by its use of a single MAC frame that included separate portions for the different bands. *See* Section VIII.A. Contrary to Petitioner’s assertion, and particularly in view of Morikawa’s explicit disclosure of sequential operation, discussed below, a POSITA would not have understood the use of separate radios to disclose or render obvious simultaneous transmission and reception, respectively, on those radios.

61. I further note that Razavi teaches incorporation of “bandpass filters to isolate the two paths, allowing simultaneous transmission and reception” in FDD. Razavi at 103. But Morikawa does not teach any such circuitry or hardware that would suggest to a POSITA that one radio transmits while the other receives.

62. The use of arrows in both uplink and downlink directions in Figure 1 does not disclose or make obvious simultaneous operation of the uplink and downlink. Arrows in wireless system diagrams can indicate communication links

but do not generally indicate timing of communications on those links.

Petitioner's Exhibit 1007² is an example where bidirectional arrows are used in a system diagram, but the description specifies that non-overlapping uplink and downlink are used. Figure 1 of Exhibit 1007, which I have reproduced below, includes bidirectional arrows between blocks in a "highway scenario" where the blocks represent vehicles. The figure illustrates inter-vehicle communications (IVC) and roadside-to-vehicle communications (RVC). Focusing on IVC, Figure 1 shows bidirectional arrows between vehicles on a highway.

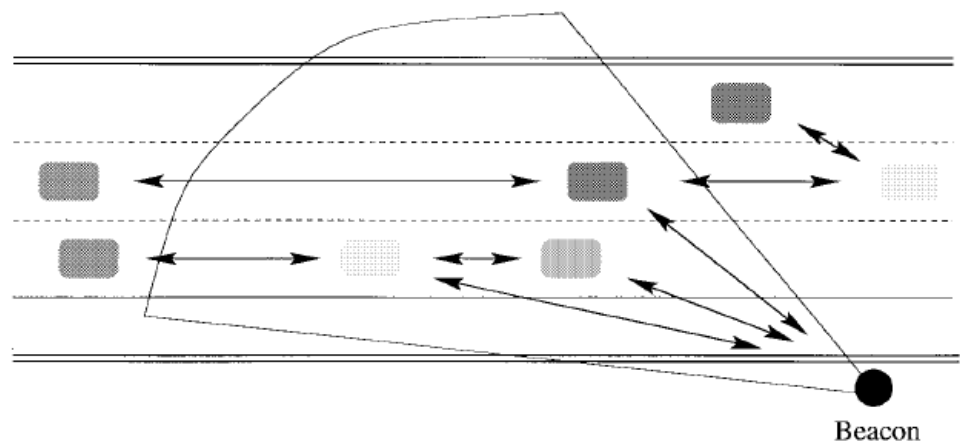


Fig. 1. IVC and RVC in the context of an ITS application (highway scenario).

Ex. 1007, Figure 1

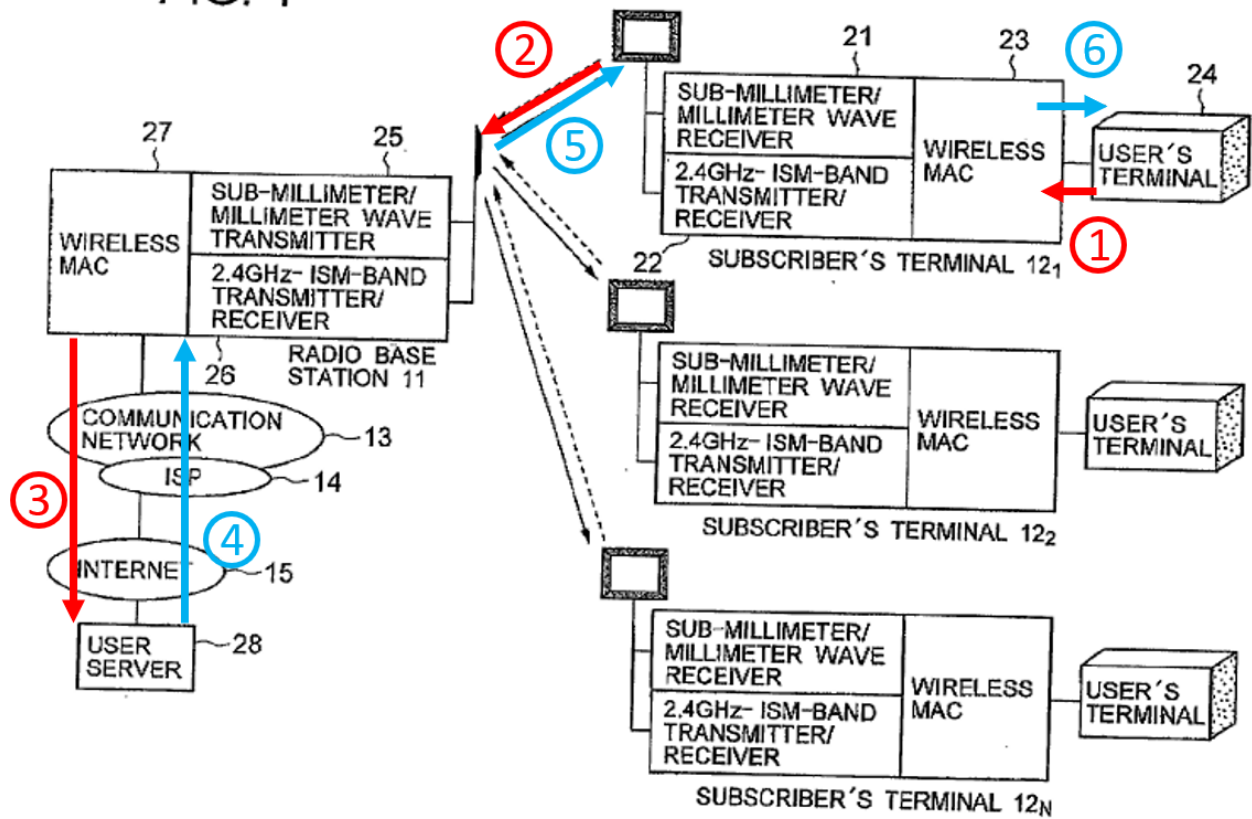
² Exhibit 1007 appears to be a research paper titled "Millimeter Waves for Short-Range Multimedia Communication Systems" with authors Oreste Andrisano et al. I have not formed any opinion as to whether Exhibit 1007 was publicly accessible as of the priority date of the '714 patent.

63. Yet, Exhibit 1007 states that IVC uses “a time division duplexing scheme.” Ex. 1007 at 1391. As I described in Section VIII.B, time division duplexing means that the uplink and downlink share the available frequency band by taking turns and not operating simultaneously.

64. Thus Exhibit 1007 supports that arrows on a diagram do not imply simultaneous transmission and reception.

65. Further, Morikawa’s specification discusses Figure 1 only in terms of sequential operation of uplink and downlink. When describing the “[o]peration of the wireless access system of FIG. 1,” Morikawa provides “an example wherein a user’s terminal 24 accesses the user server 28 on the internet.” Morikawa, ¶ 32. The user’s terminal 24 performs this operation by first transmitting “a request packet to the Ethernet for requesting the user server 28 of transmission of desired data.” Morikawa ¶ 33. I have annotated Figure 1 of Morikawa with a (1) to show this first transmission. The request packet “is converted by the wireless MAC unit 23 into the frame format of the 2.4-GHz wireless link, subjected to modulation and frequency conversion, and then transmitted through the 2.4-GHz transmitter unit 22.” Morikawa, ¶ 35. In other words, the request is transmitted in the 2.4-GHz uplink. I have annotated Figure 1 of Morikawa with a (2) to show this uplink transmission.

FIG. 1



Annotated Figure 1 of Morikawa

66. Next, the packet is received by the base station, “subjected to frequency conversion and demodulation to be restored to the original request packet in the wireless MAC unit 27.” Morikawa, ¶ 36. In other words, the request packet is fully received and recovered in the base station after being received in

the uplink. At this point, the uplink has completed its task of sending the request, and there is no description of further operation of the uplink in this example.³

67. The base station sends the received request to the user server 28 over the Internet 15. Morikawa, ¶¶ 38-39. I have annotated Figure 1 of Morikawa with a (3) to illustrate this transmission. The user server “returns a response packet group” to the wireless base station over the Internet. Morikawa, ¶¶ 39-40. I have annotated Figure 1 of Morikawa with a (4) to illustrate this transmission.

³ I note that paragraph 37 of Morikawa describes an embodiment where “the 2.4-GHz wireless link constitutes a system that requires acknowledge (ACK) signal.” This embodiment relies on downlink transmission by the base station’s 2.4-GHz radio. However, Petitioner stated that it relies only on embodiments where the 2.4-GHz radio is a receive-only radio. Petition, 22 n. 6 (citing Morikawa, ¶ 30). Accordingly, paragraph 37 is not relevant. However, the disclosed ACK does not change my opinions about Morikawa in any event. First, the ACK can only occur after the uplink transmission and therefore does not disclose or make obvious simultaneous uplink and downlink transmissions. Second, the downlink ACK is being sent on the same frequency band as the uplink, and therefore is not relevant to the claims which require the uplink and downlink to be on different frequency bands.

68. At the wireless base station, the response packet group “is converted by the wireless MAC unit 27 into the frame format of the sub-millimeter/millimeter waveband wireless link, subjected to modulation and frequency conversion to be fed to the sub-millimeter/millimeter waveband transmitter unit 25.” Morikawa, ¶ 41. In other words, the response packet group is transmitted in the downlink. I have annotated Figure 1 of Morikawa with a (5) to illustrate this downlink transmission.

69. The downlink transmission (5) necessarily occurs after the uplink transmission (2) of the request, because the downlink transmission (5) occurs in response to the request packet, and because the request is “restored to the original request packet in the wireless MAC unit 27” before it is forwarded to the user server 28. In other words, by restoring the request packet at the base station, the base station must have received the request. The request having been completely transmitted in the uplink, there is nothing left for the subscriber station to transmit and therefore nothing for the base station to receive in the uplink. By the time the base station receives the response packet group from the server, and formats it for transmission on the downlink, the base station’s receiver is not operating in the uplink and therefore when the base station transmits the response packet group in the downlink, that transmission does not overlap even partially with any uplink reception.

70. The response packet group is received by the sub-millimeter/millimeter waveband receiver 21, “subjected to frequency conversion and demodulation to be restored to the original response packet group in the wireless MAC unit 23” before being sent to the user’s terminal 24 through the user’s Ethernet. Morikawa, ¶¶ 42-43. I annotate Figure 1 of Morikawa with a (6) to illustrate this last transmission.

71. In summary, Morikawa’s description of Figure 1 uses the 2.4-GHz uplink first for a request to the user server (step 2), and then uses the sub-millimeter/millimeter waveband downlink to transmit the user server’s response (step 5). This must be a sequential operation, because the user server must receive the request from the base station and process it (thus, the transmission of the request in the uplink is complete) before generating the response for the downlink.

72. Morikawa’s description of sequential uplink and downlink operation is not limited to Figure 1. In fact, Morikawa describes Figure 2 (¶¶ 49-60), Figure 3 (¶¶ 64-74), and Figure 4 (¶¶ 78-88) in a similar way, where the use of uplink does not occur at the same time as the use of the downlink. Indeed, I am not aware of any description in Morikawa of simultaneous operation of uplink and downlink, and the Petition does not identify any such disclosure.

73. Finally, I note that Dr. Ding states that “[i]t would not make sense to view Morikawa as teaching one-way transmission at a time, because that would not support the most basic two-way communication.” Ex. 1002, ¶ 87. I disagree. First, I note that Dr. Ding does not explain why non-overlapping uplink and downlink would not “support the most basic two-way communication” and does not cite any evidence to support this conclusion. Dr. Ding’s assertion is in fact disproven by Petitioner’s exhibits, including 1) Morikawa itself, which describes exactly how the uplink and downlink would be used at non-overlapping times to enable two-way communication in Morikawa’s system, as I described above (*see* Morikawa, ¶¶ 32-43); and 2) Razavi, which describes exactly how time division duplexing enables two-way communication without simultaneous transmission as I described in Section VIII.B (*see* Razavi at 104). Nothing about Morikawa’s system requires operating the uplink and downlink at the same time.

X. Ground II: Claims 1-5, 13-17, 31, and 32 in view of Serizawa (Exhibit 1006)

74. Serizawa is titled “Radio Communication System Including SDL Having Transmission Rate of Relatively High Speed.” Serizawa discloses a transmission system “with good efficiency by means of a high-speed downlink by making transmission rates of an uplink circuit and a downlink asymmetrical.” Serizawa, Abstract. The system includes “a plurality of base stations, a plurality of terminals, an uplink established between each of the base stations and each of

the terminals for the purpose of radio transmission of prescribed information from a terminal to a base station, and a downlink circuit established between each of the terminals and each of the base station [*sic*] for the purpose of radio transmission of prescribed data from a base station to a terminal.” Serizawa, Abstract.

75. The terminals include “a low-speed transmitting means” that “transmits a radio signal at a relatively low transmission rate.” Serizawa, Abstract. The base station, in contrast, includes “a high-speed transmitting means” that “transmits a radio signal at a relatively high transmission rate.” Serizawa, Abstract.

76. Serizawa discloses dozens of numerically-labeled embodiments. Petitioner relies on the fifteenth embodiment, which is illustrated by Figure 19 of Serizawa, which is reproduced below. Petition, 41. In Figure 19, the low-rate uplink occurs on frequencies f_2 , f'_2 , and f''_2 . The high-rate downlink uses frequencies f_1 , f'_1 , and f''_1 .⁴ Serizawa, 19:53-60.

⁴ I notice that there is a typo in Fig. 19, as the frequency of the downlink between base station 501 and rightmost terminal 502 is marked as f'_1 instead of f''_1 . However, it would have been clear to POSITA that this is a typo in light of the correct description in Serizawa at 19:53-56.

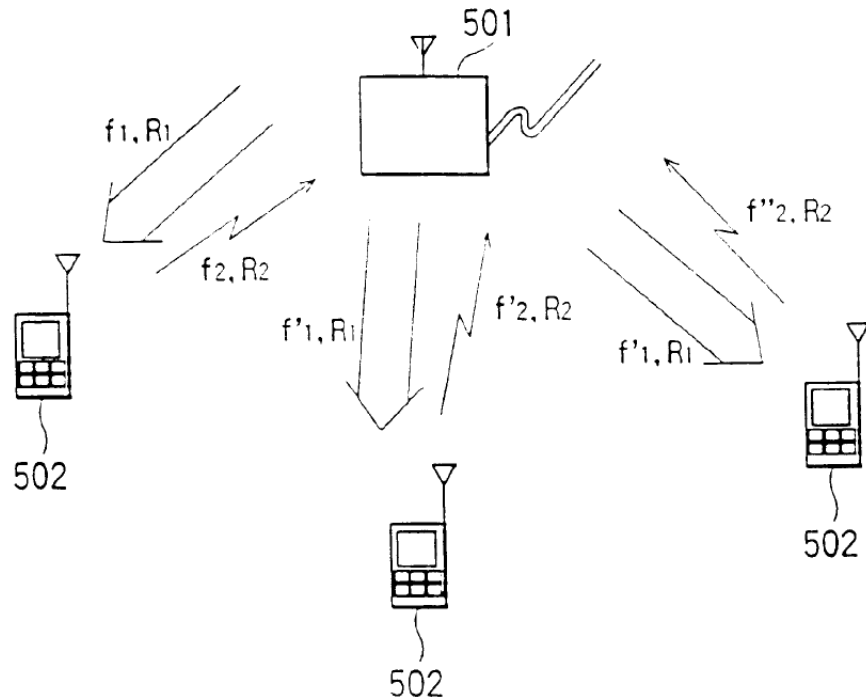


FIG. 19

Serizawa, Figure 19

77. Petitioner asserts that Serizawa discloses that the uplinks and downlinks operate simultaneously. Petition, 46-48. I disagree.

78. Petitioner first cites to Serizawa's disclosure that "frequency multiplexing is used on both the uplink and the downlink." Petition, 46 (quoting Serizawa, 19:66-20:3). Petitioner further cites to Razavi and asserts that frequency multiplexing "also known as frequency division multiple access, is a technique that allows simultaneous transmission and reception over different frequencies." Petition, 46 (citing Razavi at 105). I first note that by "frequency multiplexing," Serizawa appears to be referring to the use of different frequencies

by different users *within a band*. For example, in the uplink, the users transmit on different frequencies f_2 , f_2' , and f_2'' —and therefore perform what Serizawa calls “frequency multiplexing” in the uplink. Similarly, in the downlink, the users receive on different frequencies f_1 , f_1' , and f_1'' —and therefore perform what Serizawa calls “frequency multiplexing” in the downlink. Thus, “frequency multiplexing is used on *both* the uplink *and* the downlink.” Serizawa, 19:66-20:3. This use of “frequency multiplexing” is consistent with frequency division multiple access or FDMA, which I previously described in Section VIII.B. Multiplexing generally relates to sharing of a medium by multiple streams or sources of data. When the streams share the medium by using different frequencies, a POSITA typically uses the term “frequency division multiplexing.” And if the streams originate from multiple users then the multiplexing can be referred to as “multiple access,” and hence “frequency division multiple access” when different users share a wireless medium via different frequencies. This latter scenario is how Serizawa describes its system: multiple users sharing a wireless medium by being assigned different frequencies, as I described above. Thus, a POSITA would have understood Serizawa’s disclosure of “frequency multiplexing” to refer to FDMA—and I note that Petitioner appears to agree with me about this particular interpretation of “frequency multiplexing” meaning “frequency division multiple access” in this

context. See Petition, 46 (“Frequency multiplexing, also known as frequency division multiple access”).

79. However, I disagree that Serizawa’s disclosure of frequency multiplexing discloses or renders obvious use of the uplink and the downlink at the same time for the reasons I discuss in Section VIII.B. FDMA does not disclose the timing of the transmissions on the uplink and the downlink, neither individually on each link nor together on both links. So, to summarize, frequency multiplexing or frequency division multiple access are not FDD. Furthermore, neither FDM nor FDMA disclose or make obvious simultaneous operation of the uplink and downlink. Rather, they allow for simultaneous operation of multiple users on different frequencies *within* the uplink (i.e., users sharing the uplink spectrum with each other), or *within* the downlink (i.e., users sharing the downlink spectrum with each other). This is why Serizawa specifies that frequency multiplexing is used on “*both* the uplink *and* the downlink.” Serizawa, 19:66-20:3. See Section VIII.B.

80. Petitioner further cites to the arrows in Figures 3 and 19 as supporting simultaneous transmission and reception. Petition, 47-49. But Petitioner’s arguments about arrows and the use of separate transmitter and receiver fail for the same reasons that I discussed for Morikawa in Section IX.

XI. Claims 25-30

81. I have been informed by Counsel that the Patent Owner has disclaimed claims 25-30 of the '714 patent such that their patentability will not be at issue if the Petition is instituted. I have not formed any opinions about the patentability of these claims in view of the ground asserted against them (Ground III).

XII. Dependent claims in Grounds I, II, and III

82. In Ground I, the Petition challenges dependent claims 2-5, 11-12, 14-17, and 23-24. These claims depend on either claim 1 or claim 13 and are therefore not obvious for the same reasons that claims 1 and 13 are not obvious. In Ground II, the Petition challenges dependent claims 2-5 and 14-17. These claims depend on either claim 1 or claim 13 and are therefore not obvious for the same reasons that claims 1 and 13 are not obvious. Finally, in Ground III, the Petition challenges claims 6-10 and 18-22. These dependent claims depend on either claim 1 or claim 13 and are therefore not obvious for the same reasons that claims 1 and 13 are not obvious.

XIII. Conclusion

All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

Executed on Dec. 13, 2023 (date), in Richardson, TX (city, state).



Zygmunt J. Haas, Ph.D.