UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZYXEL COMMUNICATIONS CORPORATION AND
ZYXEL NETWORKS CORPORATION,
Petitioner,

v.

ATLAS GLOBAL TECHNOLOGIES LLC,
Patent Owner

Case IPR2023-00877
Patent 9,917,679

DECLARATION OF DR. KONSTANTINOS PSOUNIS IN SUPPORT OF PATENT OWNER'S PRELIMINARY RESPONSE TO PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,917,679

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I. INTRODUCTION

1. My name is Kostantinos Psounis. I am over eighteen years of age, of sound mind, and qualified to make the statements set forth in this Declaration. With the exception of the legal principles counsel has supplied to me, all the facts and statements contained herein are within my personal knowledge and are in all respects true and correct.

2. I have been asked by Atlas Global Technologies, LLC ("Atlas") to submit this declaration in response to a petition filed by Zyxel Communications Corporation and Zyxel Networks Corporation (the "Petition") and declaration submitted by Dr. Paul Min (the "Min Declaration") regarding U.S. Patent No. 9,917,679 ("the '679 Patent").

II. PROFESSIONAL BACKGROUND AND QUALIFICATIONS

3. I have summarized in this section some of my educational background, career history, publications, and other relevant qualifications. My full *curriculum vitae* is attached as Exhibit 2003 to this expert declaration. During the past 4 years, I submitted declarations or expert reports in connection with the following proceedings:

- *Sercomm Corp. v. Atlas Global Technologies, LLC*, IPR2022-01519
- *Sercomm Corp. v. Atlas Global Technologies, LLC*, IPR2022-01520
- *Zyxel Communications Corporation and Zyxel Networks Corporation v. Atlas Global Technologies LLC*, IPR2023-00877
- *Zyxel Communications Corporation and Zyxel Networks Corporation v. Atlas Global Technologies LLC*, IPR2023-00863

- *Atlas Global Technologies LLC v. OnePlus Technology (Shenzhen) Co., Ltd.*, Case No. 6:21-cv-1217-ADA (W.D. Tex.)
- *Atlas Global Technologies LLC v. Sercomm Corp.*, Case No. 6:21-cv-00818 (W.D. Tex.)
- *Atlas Global Technologies LLC v. ASUSTeK Computer Inc.*, Case No. 6:21-cv-00820 (W.D. Tex.)
- *Atlas Global Technologies LLC v. TP-LINK Technologies Co., Ltd., TP-LINK Corporation Limited, TP-LINK International Ltd.*, Case No. 2:21-cv-00430 (E.D. Tex.)
- *Brown vs Google LLC*, Case No. 4:20-CV-03664-LHK (N.D. Cal.)
- *Broadcom vs Netflix*, Case No. 3:20-cv-04677-JD (N.D. Cal.)
- *AVAGO vs Netflix*, No. 2:21-CV-00080-JRG-RSP (E.D. Tex.)

4. I am a Professor and Associate Chair of Electrical and Computer Engineering and Professor of Computer Science at the University of Southern California. I joined the University of Southern California in 2003, after completing my PhD at Stanford University as a Stanford Graduate Fellow.

5. My professional career has spanned more than 20 years. As set forth in Exhibit 2003, I have extensive experience in the field of networked distributed systems, including the Internet and the web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless systems, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems.

6. I have published more than 100 technical papers in these fields, which have been cited tens of thousands of times. I have also been awarded numerous grants and significant funding from the government and industry leaders to advance these

fields. As a result, I have been named an Institute of Electrical and Electronics Engineers (IEEE) Fellow, the highest grade of membership, for "fundamental contributions in the theory and practice of wireless networks", and a Distinguished Member of the Association of Computing Machinery (ACM).

7. Throughout my career, I have analyzed, designed, and developed efficient networked distributed systems for the Internet and the Web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless networks, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems. As such, I have acquired extensive expertise in the analysis and development of those systems and associated products.

8. I have extensive experience with and made contributions specifically towards analyzing and designing efficient Wi-Fi, cellular and other wireless systems. In particular, I have received multiple funding awards from the National Science Foundation (NSF), the leading governmental agency for funding computer engineering and computer science research, to work on wireless systems, including Wi-Fi systems. I have also received multiple funding awards from the industry leaders in the area of networking and in particular wireless networking, to work on these systems. I have published several papers in the most selective academic journals and conferences on wireless systems. I have also been the faculty in charge

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of the entire networking curriculum at the Electrical and Computer Engineering department at USC for more than a decade and teach networking classes and in particular the graduate wireless networking class yearly.

9. I also have extensive practical experience with networked distributed systems. For example, I was a co-founder of SpaceMUX, Inc. (whose IP was later acquired by Quantenna Communications, Inc.), where I designed and developed systems to increase the speed of wireless networked systems using modern wireless networking technologies and techniques. Also, I was the Technology Architect for Fineground Networks (later acquired by Cisco Systems, Inc.), where I designed and developed systems to accelerate the delivery of content over the World Wide Web. In addition, for over 20 years both at Stanford University and at the University of Southern California, I have designed and implemented efficient algorithms, protocols and systems for a variety of distributed networked systems, and I have consulted for industrial leaders, and produced prototype systems. I have also applied for and been granted numerous patents, which are owned by network industry leaders and prestigious academic institutions.

10. In sum, I have extensive experience in and familiarity with the fields of networked distributed systems and in particular with wireless networking systems including Wi- Fi systems, and extensive experience and contributions towards the analysis, design and implementation of such systems.

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III. MATERIALS REVIEWED

11. In forming my opinions in this proceeding, I have reviewed each of the references cited in this Declaration, including the '679 Patent, the Petition, the Min Declaration, and the references that the Petition and Min Declaration rely upon as invalidating prior art.

IV. LEGAL PRINCIPLES

12. I am not a lawyer. In forming my opinions as set forth in this Declaration, I have relied upon legal principles supplied to me by attorneys for Atlas. In forming my opinions, I have not relied upon Atlas' attorneys for any purpose other than the following legal principles.

A. Claim Interpretation

13. I understand that claims are to be interpreted from the perspective of one of ordinary skill in the art at the time of the invention and have considered such an interpretation in forming my opinions on validity. I also understand that claim construction is a matter of law and that claims are to be construed by the Board.

14. It is my understanding that the claims of the patent are construed consistent with the so-called intrinsic evidence, which includes the language of the claim itself, the specification of the patents, other claims of the patent and the relevant prosecution histories from the U.S. Patent and Trademark Office ("USPTO"). Other materials (such as dictionaries) not in the written records of the

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patents, i.e., extrinsic evidence, may also be considered if they are consistent with (and not contradictory to) the intrinsic evidence.

15. I understand that claims are construed from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the purported invention. I understand that in the context of an *inter partes* review proceeding, absent a disclaimer or express definition, claim terms are given their plain and ordinary meaning to a POSITA in view of the specification and file history and the knowledge of a POSITA. Unless otherwise noted, I have applied what I consider to be the plain and ordinary meaning of all terms as understood by a POSITA at the time of the invention, which I understand to be on or around November of 2014.

B. Anticipation

16. I understand that in an *inter partes* review, the challenger must show the claim is invalid by a preponderance of the evidence. I understand the preponderance of the evidence requires the greater weight of evidence in favor of the challenger.

17. I understand that, in general, the anticipation analysis under 35 U.S.C. § 102 is limited to the use of a single reference. I further understand that portions of additional documents may be relied upon as part of the anticipation analysis if the primary reference incorporates the additional documents by reference. In order for the primary reference to incorporate additional documents by reference, the primary

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reference must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the additional documents. A mere reference to another document is insufficient to incorporate that document by reference. Moreover, the referenced document must, itself, be publicly-available to be properly incorporated by reference.

18. I understand that the phrase "printed publication" as used in § 102(a) means sufficiently accessible to the public interested in the art and depends upon dissemination and accessibility. Even a document that has been distributed is not necessarily a printed publication if, for example, distribution is governed by a binding agreement of confidentiality.

19. I understand that, although not expressly disclosed, subject matter may be inherently disclosed in a prior art reference where that subject matter is necessarily present in the subject matter disclosed and would be understood to be so by those of ordinary skill in the art. I understand that the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.

20. I understand that a claim is invalid if each and every element of the claim is disclosed in a single prior art reference with the elements arranged as specified in the claim, either expressly or inherently. I understand that invalidity

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based on the disclosure of a single prior art reference in this manner is called anticipation.

C. Obviousness

21. It is my understanding that a claim is invalid for obviousness under 35 U.S.C. § 103 if, for example, two or more prior art references in combination disclose every claim limitation so to render the claim, as a whole, obvious. The relevant standard for obviousness (from 35 U.S.C. §103, AIA) is as follows:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

22. In determining whether or not a patented invention would have been obvious, the following factors must be considered: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the art; and (d) whatever "secondary considerations" may be present.

23. I understand that certain "secondary considerations" may be relevant in determining whether or not an invention would have been obvious, and that these

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secondary considerations may include commercial success of a product using the invention, if that commercial success is due to the invention; long-felt need for the invention; evidence of copying of the claimed invention; industry acceptance; initial skepticism; failure of others; praise of the invention; and the taking of licenses under the patents by others. And any evidence of secondary considerations must be considered as part of the obviousness analysis.

24. I understand that a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Most, if not all, inventions rely on building blocks of prior art. But multiple prior art references or elements may, in some circumstances, be combined to render a patent claim obvious. I understand that I should consider whether there is an "apparent reason" to combine the prior art references or elements in the way the patent claims. To determine whether such an "apparent reason" to combine the prior art references or elements in the way a patent claims exists, it will often be necessary to look to the interrelated teaching of multiple patents, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a person having ordinary skill in the art. Further, one must consider the prior art as a whole—not just cherry-picking certain disclosures from a prior art reference and ignoring other prior art references or other disclosures from the same prior art references.

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25. I also understand that when the prior art "teaches away" from combining prior art references or certain known elements, discovery of a successful means of combining them is more likely to be non-obvious. A prior art reference may be said to "teach away" from a patent when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent or would be led in a direction divergent from the path that was taken by the patent. Additionally, a prior art reference may "teach away" from a claimed invention when substituting an element within that prior art reference for a claim element would render the claimed invention inoperable.

26. I also understand that it is not permissible to use hindsight in assessing whether a claimed invention is obvious. Rather, I understand that, to assess obviousness, you must place yourself in the shoes of a person having ordinary skill in the relevant field of technology at the time the inventions were made who is trying to address the issues or solve the problems faced by the inventor and ignore the knowledge you currently now have of the inventions. The prior art itself, and not the inventor's achievements, must establish any obviousness. Further, I understand that defining the problem to be solved 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.

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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 method.

D. Person of Ordinary Skill in the Art

27. I understand that the meaning of claim terms and a patent's validity are to be determined from the vantage point of one of ordinary skill in the art at the time of the invention. In determining who would be one of such ordinary skill, I understand it is appropriate to consider criteria such as: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the rapidity with which innovations are made; (d) the sophistication of the technology; and (e) the education level of active workers in the field.

E. Priority Dates

28. I also understand that a later-filed patent may be entitled to the earlier priority date of a provisional application to which it claims priority if that provisional application provides support for both (1) the disclosures in the later-filed patent and (2) at least one claim of the later-filed patent.

V. THE '679 PATENT DISCLOSURE

29. The '679 Patent is titled "Method and Apparatus for Transmitting Response Frame Based On Type In A High Efficiency Wireless LAN." '679 Patent

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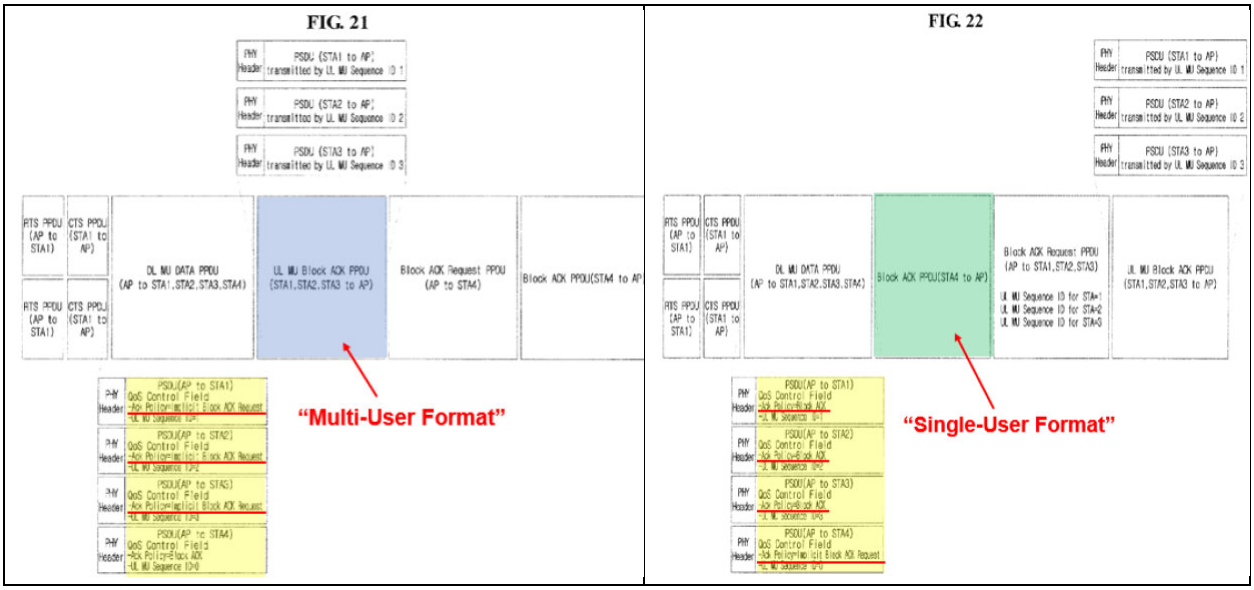
(ZYXEL-1001) at Title Page. It was invented by Yongho Seok while working on the next-generation Wi-Fi 6 802.11ax standard at Newracom. *Id*. The '679 Patent claims priority to November 3, 2014 and November 14, 2014. *Id*. It issued on March 13, 2018. *Id*.

30. The '679 Patent generally relates to 802.11ax MU transmissions, and more specifically to 802.11ax UL acknowledgments transmitted in response to DL MU transmissions: the DL MU transmission indicates whether the UL acknowledgment will be either a single-user (SU) or multi-user (MU) acknowledgment. '679 (ZYXEL-1001) at 2:11-23.

31. Annotated Figures 21 and 22 illustrate a preferred embodiment. In that embodiment, the AP transmits a DL MU PPDU to each of STAs 1-4. That DL MU PPDU includes a QoS Control field with ACK Policy subfields. *See* '679 (ZYXEL-1001) at 34:56-59. Figure 21 shows that when the ACK Policy subfield for STAs 1-3 is set to "Implicit Block ACK Request," each of those STAs 1-3 will simultaneously transmit a UL MU Block ACK PPDU acknowledgment frame in multi-user format (colored blue in the below figure) one SIFS after receiving the DL MU PPDU. *Id*. at 37:3-13. While Figure 22 shows that when the ACK Policy for STAs 1-3 is set to "Block ACK" and the ACK Policy for STA 4 is set to "Implicit Block ACK Request," then STA 4 will transmit a UL SU Block ACK PPDU acknowledgment frame in single-user format (colored green in the below figure) one

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SIFS after receiving the DL MU PPDU. Id. at 37:36-46. Thus, "the PPDU type of an immediate response to a DL MU PPDU (i.e., a UL response transmitted a predetermined IFS (e.g., an SIFS) after reception of a DL MU PPDU) may be of the UL SU transmission type (e.g., a legacy PPDU type) or the UL MU transmission type (e.g., a UL MU PPDU type), and the type of the immediate response to the DL MU PPDU may be determined based on information (e.g., information triggering UL transmission) included in the DL MU PPDU." *Id*. at 37:59-67.



'679 Figs. 21-22 (annotations and highlighting added).

32. The aforementioned procedure "improve[s] the performance of a procedure for performing DL MU transmission and transmitting an ACK in response to the DL MU transmission" so that "the use efficiency of a wireless channel may be increased." '679 (ZYXEL-1001) at 35:43-50; *see also id*. 34:26-31 (noting that if responses to DL MU transmissions could be transmitted in UL MU transmissions,

"system performance such as DL throughput may be significantly increased"). The '679 Patent has two independent claims, claims 1 and 6. Method claim 1 is drafted from the perspective of the 802.11 station, while method claim 6 is drafted from the perspective of the 802.11 access point. I have reproduced these two independent claims below:

1[**pre**]. A method for transmitting an acknowledgement frame for notifying successful data reception by a station (STA) to an access point (AP) in a wireless local area network, the method comprising:

[**1a**] receiving, from the AP, a downlink frame including a quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in a single-user (SU) format or in a multiple-user (MU) format at a Short Inter-Frame Space (SIFS) time after the downlink frame; and

[**1b**] transmitting, to the AP, the acknowledgement frame based on the acknowledgement information at the SIFS time after the downlink frame,

[**1c**] wherein transmitting the acknowledgment frame comprises: when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the MU format and the STA is allocated a resource, transmitting the acknowledgement frame in the MU format on the allocated

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resource simultaneously with transmission of at least one acknowledgement frame from at least one other STA, and

[**1d**] [wherein transmitting the acknowledgment frame comprises:] when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the SU format, transmitting the acknowledgement frame in SU format.

6[**pre**]. A method for receiving an acknowledgement frame for notifying successful data reception by an access point (AP) from a station (STA) in a wireless local area network, the method comprising:

[**6a**] transmitting, to the STA, a downlink frame including a quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in a single-user (SU) format or in a multiple-user (MU) format at a Short Inter-Frame Space (SIFS) time after the downlink frame; and

[**6b**] receiving, from the STA, the acknowledgement frame based on the acknowledgement information at the SIFS time after the downlink frame,

[**6c**] wherein receiving the acknowledgment frame comprises: when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the MU format, receiving the acknowledgement frame in the MU format on an allocated resource simultaneously with

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transmission of at least one acknowledgement frame from at least one other STA, and

[**6d**] [wherein receiving the acknowledgment frame comprises:] when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the SU format, receiving the acknowledgement frame in SU format.

VI. '679 PATENT PROSECUTION HISTORY

33. On November 3, 2015, the Applicant filed the '679 application with 20 initial claims. '679 FH (ZYXEL-1002) at 162-164.

34. On March 21, 2017, the Examiner rejected the pending claims as obvious in view of Cheong (US 2013/0188627) and Kang (US 2015/00085836). '679 FH (ZYXEL-1002) at 85-96.

35. On June 16, 2017, the Applicant and the Examiner had a telephonic interview to discuss the pending claims and the outstanding rejection, as well as a proposed claim amendment. '679 FH (ZYXEL-1002) at 61.

36. On June 21, 2017, the Applicant amended the claims as follows:

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1. (Currently Amended) A method for transmitting an ~~uplink~~ acknowledgement frame for notifying successful data reception by a station (STA) to an access point (AP) in a wireless local area network, the method comprising:

receiving, from the AP, a downlink frame including a quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame ~~related to a type of the uplink frame, the type of the uplink frame including~~ in a single-user (SU) ~~type~~ format or [[and]] in a multiple-user (MU) [[type]] format at a Short Inter-Frame Space (SIFS) time after the downlink frame; and

transmitting, to the AP, the acknowledgement ~~uplink~~ frame ~~having a type determined~~ based on the acknowledgement information at the SIFS time after the downlink frame ~~related to the type of the uplink frame~~,

wherein transmitting the acknowledgment frame comprises:[[,]]

when ~~the type of the uplink frame corresponds to the MU type~~ the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the MU format and the STA is allocated a resource, transmitting the ~~uplink~~ acknowledgement frame in the MU format [[is]]on the allocated resource simultaneously with transmission of at least one acknowledgement frame from ~~transmitted by a plurality of STAs including the STA and~~ at least one other STA; and

when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the SU format, transmitting the acknowledgement frame in SU format.

'679 FH (ZYXEL-1002) at 72; *see also id.* at 73-74 (re claim 11). The Applicant argued that the prior art did not disclose or suggest all the features of the claims, emphasizing the highlighted claim language above. *Id.* at 67-70. Henceforth, on October 31, 2017, the Examiner allowed the claims. *Id.* at 47. The '679 Patent issued on March 13, 2018.

VII. THE ASSERTED REFERENCES

37. I understand that the Petitioner has asserted three grounds of invalidity based on U.S. Patent No. 10,230,497 ("Merlin" or "Merlin 497"), U.S. Patent App. Pub. No. 2016/0065466 ("Abraham" or "Abraham 466"), U.S. Patent No. 10,257,806 ("Chu" or "Chu 806"), and U.S. Patent No. 9,462,607 ("Ma" or "Ma 607"):

Ground	Claims	References	Statutory Basis
1	1-10	Merlin	§103
2	1-10	Abraham	§103
3	1-10	Merlin+Abraham+Chu+Ma	§103

I provide an overview of each of these references below.

A. Merlin

38. Merlin is titled "Protocols for Multiple User Frame Exchanges." Merlin (ZYXEL-1004) at Title Page. Merlin generally relates to the "frame structures and protocols for uplink multiple user (MU) frame exchanges." *Id.* at 1:15-17. It explains that an AP may send a DL MU frame that solicits an immediate response from a plurality of STAs, and those STAs may immediately respond with an UL acknowledgment— either an ACK or a block ACK. *Id*. at 1:63-2:3. The AP's DL MU frame may signal "which STAs are solicited for immediate response (e.g., for immediate BAs), which STAs may use existing ACK policy indications, [and] which

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mode is to be used for the replies (e.g., UL SU-MIMO, UL MU-MIMO, or UL MU FDMA)." *Id*. at 12:60-65. Further, Merlin 497 teaches "a response type indication for each STA may be added [to the DL MU PPDU]. For example 1 or 2 bits may indicate which mode of response is to be used (e.g., UL SU-MIMO, UL MU-MIMO, or UL OFDMA)." *Id*. at 14:26-30. And the "indication may be included in the Quality of Service (QoS) control field," for example. *Id*. at 14:30-32. Merlin also discloses various acknowledgment policies, including "normal ACK," "No ACK," and "delayed BA" policies. *Id*. at 13:11-57.

39. Importantly, unlike the '697 Patent, Merlin never teaches or suggests any acknowledgment information that indicates whether the STAs will use SU or MU format to transmit the ACK that occurs a SIFS after the DL frame. Nor does Merlin teach or suggest the claimed SU or MU format.

B. Abraham

40. Abraham is titled "System and Methods for Signaling Multi-Destination Aggregated Multi-User Media Access Control Protocol Data Units in a Wireless Network." Abraham466 (ZYXEL-1005) at Title Page. Abraham generally relates to ways to "signal[] aggregated multi-user media access control protocol data units ("A-MPDUs") in a wireless network." *Id.* at [0003]. Using A-MPDUs "allows a device to send multiple data frames in a single physical layer frame," which is more efficient. *Id*. at [0050]. And such A-MPDUs may be sent to multiple stations,

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including (a) HEW STAs that support 802.11ax and (b) legacy STAs that support 802.11 a/b/g/n/ac. Importantly, HEW STAs "may require a particular indication that the A-MPDU frame [] is meant for multiple destinations to properly decode the A-MPDU frame." *Id*. at [0052]. So a key aspect of Abraham466 is to "insert[] an indication that the A-MPDU frame is addressed to [multiple devices]." *Id*. at [0008].

41. Annotated Figure 1 illustrates an exemplary wireless communication system with an AP 104 and both (a) HEW STAs 106a-106c and (b) legacy STAs 106d-106f. Abraham466 (ZYXEL-1005) at [0035]-[0037]. The AP may transmit the Multi Destination A-MPDU ("MD-A-MPDU") 304 to STAs 106a and 106b, and the MD-A-MPDU 400 to STAs 106c and 106d. *Id*. at [0037]. But to permit the STAs to properly decode the MD-A-MPDU, the AP inserts an MD indication 140 (highlighted yellow) into the MD-A-MPDU to indicate to the receiving STAs that a MD-A-MPDU is being transmitted. *Id*. at [0035].

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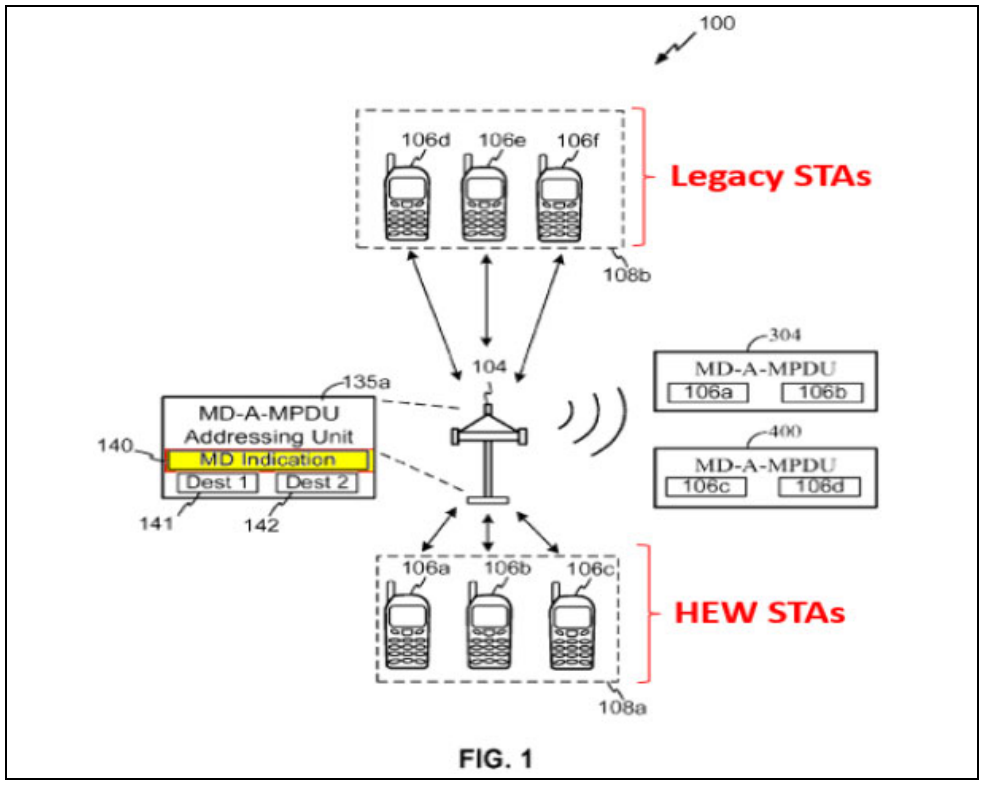


FIG. 1

42. Annotated Figure 4B illustrates a MD-A-MPDU. Abraham (ZYXEL-1005) at [0056]. As can be seen, it includes a PHY header 302 and a data portion 475. *Id.* Within the data portion 475 lies the A-MPDU frame. *Id*. Importantly, the A-MPDU frame includes MD-A-MPDU Indicator 450 (highlighted yellow). *Id*. And within the MD-A-MPDU Indicator 450 lies various ACK Info fields 455a-c, which include information on how the STAs should send their uplink acknowledgments. *Id*. More specifically, the ACK Info fields may include "one or more fields defining an acknowledgment policy (e.g., transmission parameters of acknowledgment frames transmitted form each of the STAs in response to the A-MPDU." *Id*. at [0062]. This "reduce[s] the probability of collisions occurring if each of the MPDU sub-frames [] is acknowledged." *Id*.

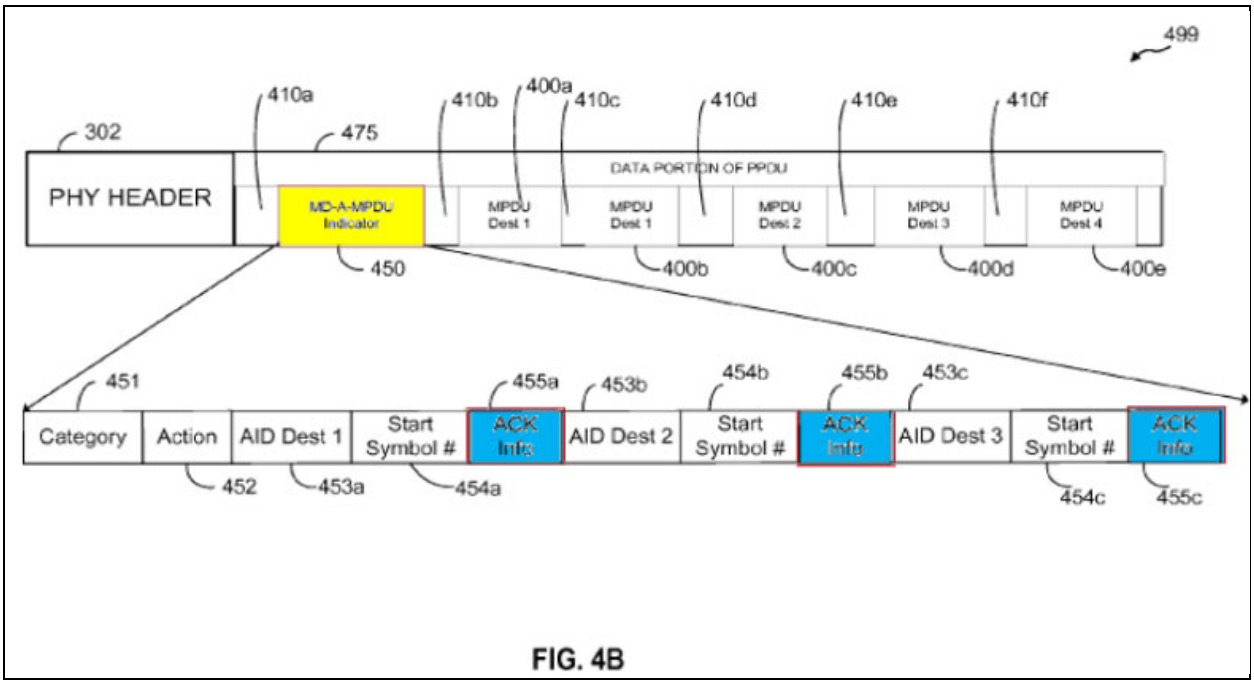


FIG. 4B

43. Annotated Figure 7 shows the structure of a MAC PPDU (MPDU). Abraham466 (ZYXEL-1005) at [0063]. As shown, it may include several fields, including a QoS Control field 755 and an optional Ack Control field 765 (both highlighted yellow). *Id*. The QoS Control field may have a "reserved bit/bit combination" that indicates "the presence of the ACK control field 765." *Id*. at [0064]; *see also id*. at [0072] ("the AP 104 indicates the presence of an acknowledgment (ACK) policy [] in a portion of [] QoS control field 755" in some embodiments"). And the ACK Control field "may indicate to a station receiving the MPDU frame 700 when and how a BA is sent and a time gap (or frequency offset or spatial stream gap) between successive BAs (e.g., transmission parameters of block acknowledgment frames transmitted from each of the STAs in response to the MPDU frame 700)." *Id*. at [0064]. "For example, ACK control field 765 may

indicate that one or more stations should send a BA a Short Interframe Space (SIFS) time period after the PPDU carrying the MPDU frame 700." *Id*. The ACK control field may also include "BA modulation and coding scheme (MCS)." *Id*. In one embodiment, the ACK Control field has 10 bits which are partitioned as follows: "3 bits to indicate a number of spatial streams (e.g., one of 8 spatial stream indices), 4 bits to indicate a number of frequency bands (e.g., one of 16 frequency bands), and 3 bits to indicate a time position for the BA." *Id*. at [0065].

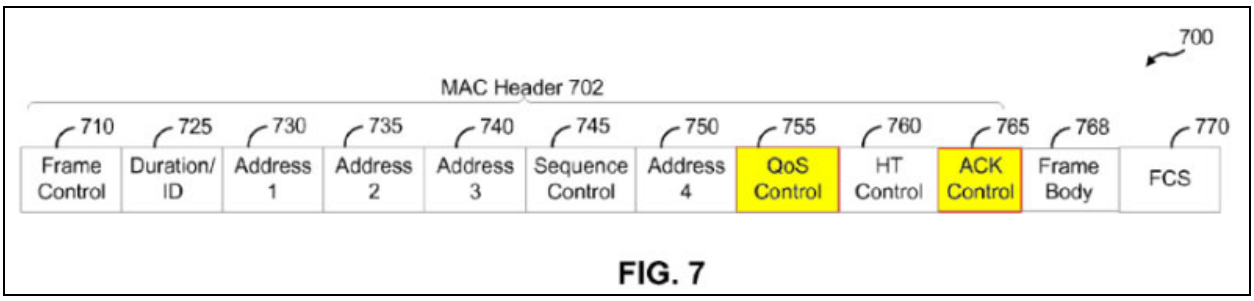


FIG. 7

44. Figure 8 shows an exemplary frame exchange using OFDMA and MD-A-MPDU. Abraham (ZYXEL-1005) at [0067]. The AP transmits a PPDU 807 which comprises a common preamble portion 806 and MD-AMPDU messages 805a-d. *Id*. MD-AMPDU messages 805a-b may be addressed to STAs 1-8 and may have an indication in a MAC header of a MPDU that STAs 1-8 should send the ACK messages over different frequencies a SIFS time after receiving the MD-AMPDU messages. *Id*. Thereafter, STAs 1-8 send uplink BAs 815 over 8 different bandwidths a short time (e.g., SIFS) after receiving the MD-AMPDU. *Id*.

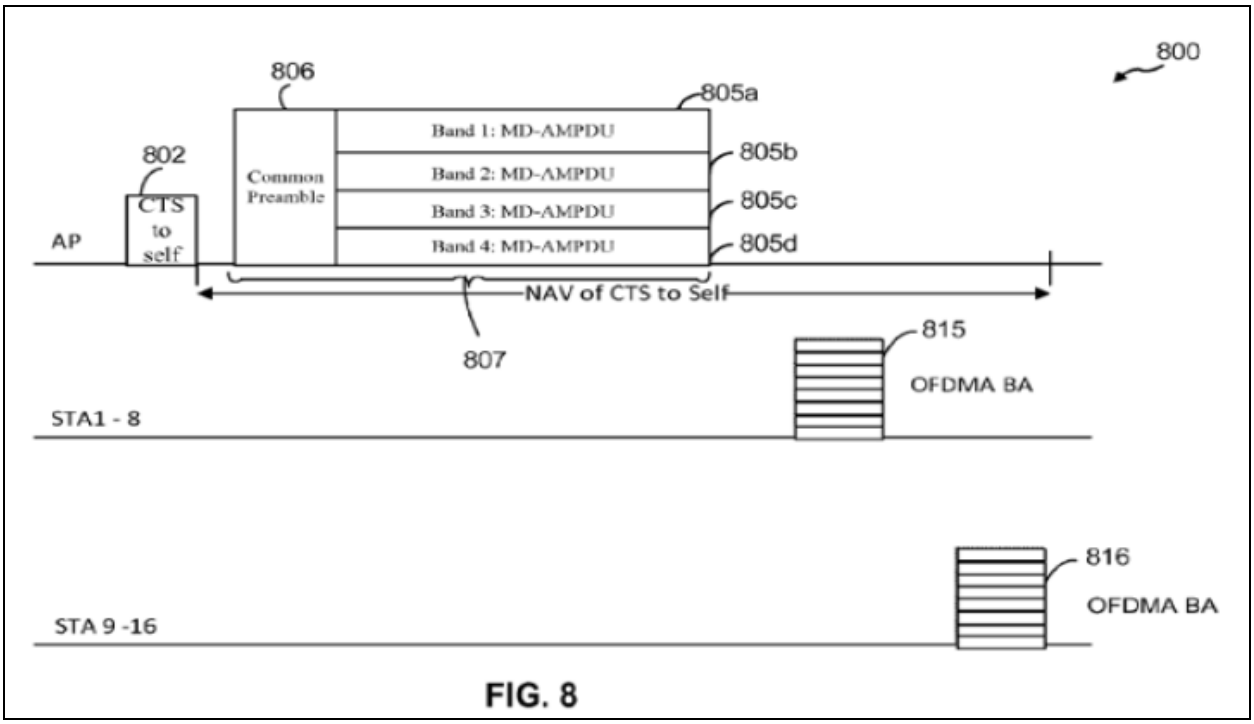


FIG. 8

45. Figure 9 shows another exemplary frame exchange for scheduling acknowledgments in response to a DL MD frame. Abraham (ZYXEL-1005) at [0071]. The AP transmits the DL MD frame 904 (which may comprise a MD-AMPDU) to the STAs 1- 3. *Id*. The DL MD frame 904 comprises the ACK control field 765. *Id*. STAs 1-3 use the information in the ACK control field 765 (e.g., BA MCS, total uplink bandwidth, per STA bandwidth, total uplink spatial streams, BA index, etc.) to know when to send ACK messages 905, 906 and 907 so they do not interfere with each other. *Id*.

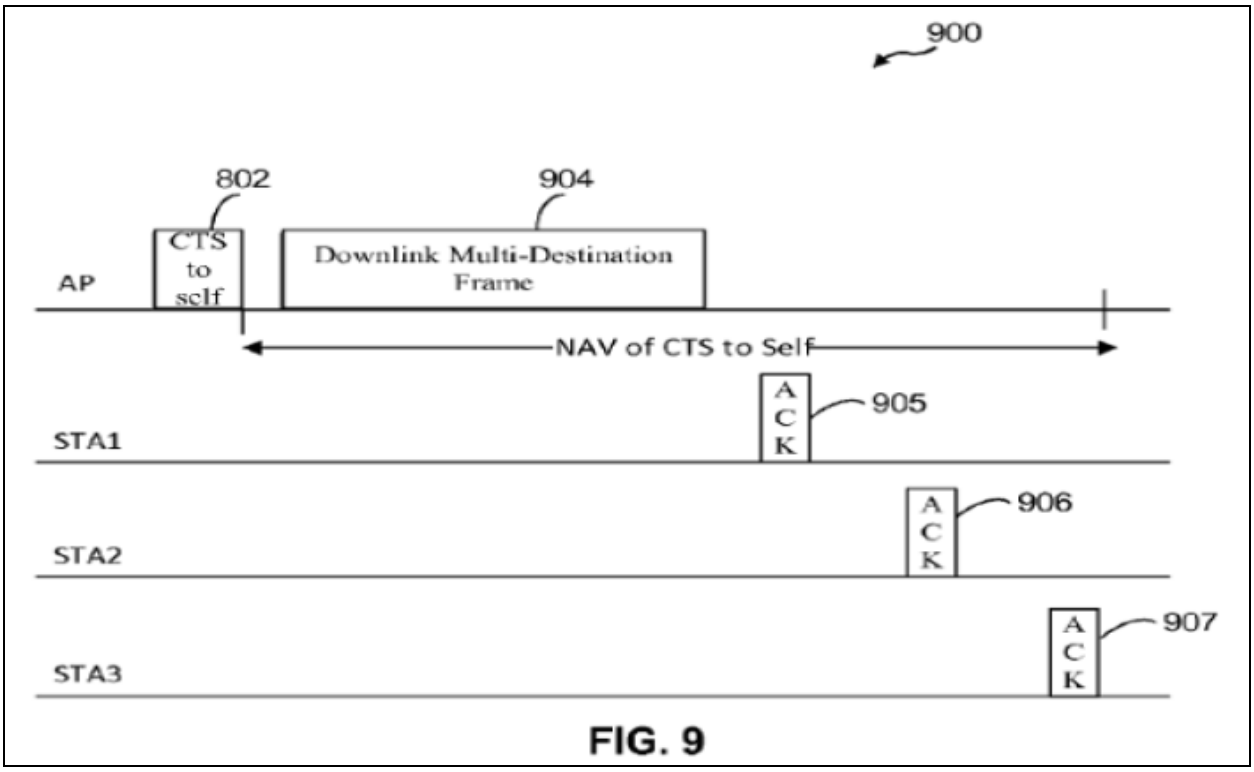


FIG. 9

46. Importantly, unlike the '679 Patent, Abraham never teaches or suggests that the QoS control field includes any acknowledgment information indicating whether the STAs will use SU or MU format to transmit the ACK that occurs a SIFS after the DL frame. Nor does Abraham teach or suggest the claimed SU or MU format.

C. Chu

47. Chu is titled "Medium Access Control for Multi-Channel OFDM in a Wireless Local Area Network." Chu (ZYXEL-1006) at Title Page. Chu characterizes itself as disclosing a "first communication device allocates respective sub-channels of an orthogonal frequency division multiplexing (OFDM) channel to two or more second communication devices for uplink orthogonal frequency division multiple

access (OFDMA) transmission from the two or more second communication devices. A first sub-channel is allocated to a first one of the second communication devices and a second sub-channel is allocated to a second one of the second communication devices. The first communication device provides, to the second communication devices, indications of the respective sub- channels allocated to the second communication devices. The first communication device receives an uplink OFDMA data unit that includes a first OFDM data unit transmitted from the first one of the second communication devices via the first sub- channel, and a second OFDM data unit transmitted from the second one of the second communication devices via the second subchannel." *Id*. at Abstract.

48. As I discuss in more detail below, Chu lacks many key concepts of the '679 Patent claims, such as the claimed SU and MU format limitations. As a result, a combination with Chu would not have resolved similar missing disclosures from both Merlin and Abraham.

D. Ma

49. Ma is titled "Apparatus, Method and System of Multi-User Uplink Transmission." Ma (ZYXEL-1007) at Title Page. Ma teaches embodiments related to multi-user uplink transmissions, and notes "[i]n contrast to the MU downlink transmission, in order to efficiently schedule an uplink transmission from the wireless stations to the AP, the AP may need to receive from the wireless stations

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information regarding uplink data to be transmitted during the uplink transmission." *Id.* at 1:37-41. Ma Figure 7 illustrates a sample multi-user transmission exchange:

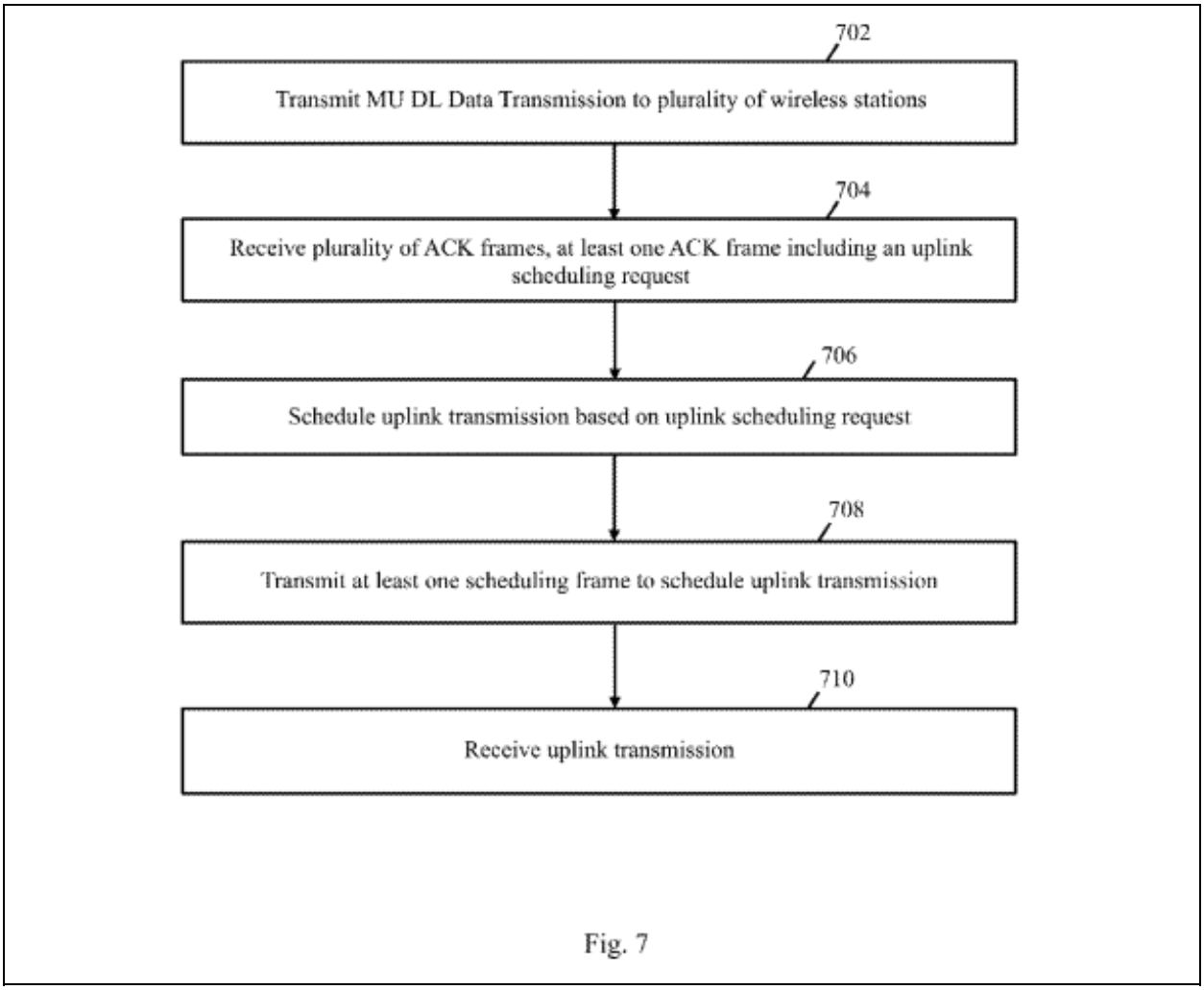


Fig. 7

50. "As indicated at block 702, the method may include transmitting a MU downlink transmission to a plurality of wireless stations." Ma (ZYXEL-1007) at 17:14-16. In response, the wireless communication device 102 "receiv[es] from the plurality of wireless stations a plurality of ACK frames, at least one ACK frame from at least one wireless station including an uplink scheduling request indicating uplink resources requested by the wireless station." *Id.* at 17:20-23. The wireless

communication device 102 then schedules the uplink transmission and transmits a scheduling frame. *Id.* at 17:30-40. The wireless communication device 102 then receives the uplink transmission from the station. *Id.* at 17:41-45.

51. As I discuss in more detail below, Ma lacks many key concepts of the '679 Patent claims, such as the claimed SU and MU format limitations. As a result, a combination with Ma would not have resolved similar missing disclosures from both Merlin and Abraham.

VIII. MERLIN DOES NOT RENDER OBVIOUS THE CHALLENGED CLAIMS

A. Merlin Fails to Render Obvious a "Downlink Frame Including a QoS Control Field Including Acknowledgment Information representing Whether the STA Is Requested to Transmit the Acknowledgment Frame in a Single-User Format Or In A Multiple-User Format At A Short Inter-Frame Space (SIFS) Time After the Downlink Frame" (1A, 6A)

52. Each of the '679 claims require a "downlink frame including a quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in a single-user (SU) format or in a multiple-user (MU) format at a Short Inter-Frame Space (SIFS) time after the downlink frame." '679 (ZYXEL-1001) at 41:41-47 ('679 cl. 1); 42:24-30 ('679 cl. 6). Merlin does not teach or suggest these limitations, as described below. None of the Merlin passages teach the solicited "acknowledgment frame" is to be transmitted "at a Short Inter-Frame Space (SIFS) time after the downlink frame," as claimed.

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53. The '679 Patent uses Figures 21 and 22 to show an example of how the claimed downlink frame uses acknowledgment information in a QoS control field to represent whether the STA should transmit in SU or MU format "at a SIFS time after the downlink frame." For example, the '679 Patent explains that if the ACK Policy in the QoS control field is set to Implicit Block ACK Request for STAs 1-3 and the ACK Policy in the QoS control field is not set to Implicit Block Ack Request for STA 4, then STAs 1-3 will simultaneously transmit an UL MU Block ACK PPDU a SIFS after receiving the DL frame:

> In the example of FIG. 21, the ACK Policy is set to Implicit Block ACK Request for STA1, STA2, and STA3 supporting UL MU transmission (i.e., supporting the UL MU transmission-based response type) in a DL MU DATA PPDU. In this case, **STA1, STA2, and STA3 may transmit a UL MU Block ACK PPDU to the AP a predetermined IFS (e.g., an SIFS) after receiving the DL MU DATA PPDU**. That is, the UL MU transmission supported STAs (i.e., STAs supporting the UL MU transmission-based response type), STA1, STA2, and STA3 may simultaneously transmit block ACK frames in UL MU transmission. Since different channel estimation sequences (e.g., HE-STF and HE-LTF sequences) are used for the plurality of STAs participating in the UL MU transmission, the AP may receive the block ACK frames from the plurality of STAs without collision.

'679 (ZYXEL-1001) at 37:3-35 (emphasis added). Conversely, the '679 Patent explains that if the ACK Policy in the QoS control field is set to Block ACK for

STAs 1-3 and the ACK Policy in the QoS control field is set to Implicit Block Ack Request for STA 4, then STA 4 will transmit an UL SU block ACK PPDU a SIFS after receiving the DL frame:

> Meanwhile, in the example of FIG. 22, the ACK Policy is set to Block ACK for STA1, STA2, and STA3 supporting UL MU transmission (i.e., supporting the UL MU transmission-based response type) and to Implicit Block ACK Request for STA4 that does not support UL MU transmission (i.e., supporting only the UL SU transmission-based response type) in a DL MU DATA PPDU. In this case, **STA4 may transmit a block ACK PPDU (e.g., a legacy block ACK PPDU or a UL SU block ACK PPDU) a predetermined IFS (e.g., an SIFS) after receiving the DL MU DATA PPDU from the AP.**

'679 (ZYXEL-1001) at 37:36-57 (emphasis added).

54. Merlin never has a commensurate disclosure as the '679 Patent. Merlin's teachings regarding an "immediate response" is not the same as the '679 claimed "Short Inter-Frame Space (SIFS) time after the downlink frame."

55. The Petition (at 20-21) relies on Merlin at 11:32-34 and Fig. 4, which I've reproduced below:

> Upon receiving the RTS message 402, the selected STA (e.g., STA1) may transmit a Clear to Send (CTS) message 404 to the AP. **The RTS message 402 and the CTS message 404 may be separated by a short inter-frame space (SIFS)**, a small interval between a data frame or other message and its acknowledgment (ACK). In response to receiving

the CTS message 404, the AP may send DL-MU-MIMO data 406 to STAs selected by the scheduler (typically part of the processing system of the AP, such as scheduler 234 in FIG. 2). The STAs receiving the MU-MIMO data 406 may transmit BAs 408 in the uplink (UL) in series, starting with the BA for STA1 and ending with the BA for STA3 as shown in FIG. 4. **The STA BA transmissions may be separated by SIFS**. The order and timing for the STA BA transmissions may be sent in the DL-MU-MIMO data 406.

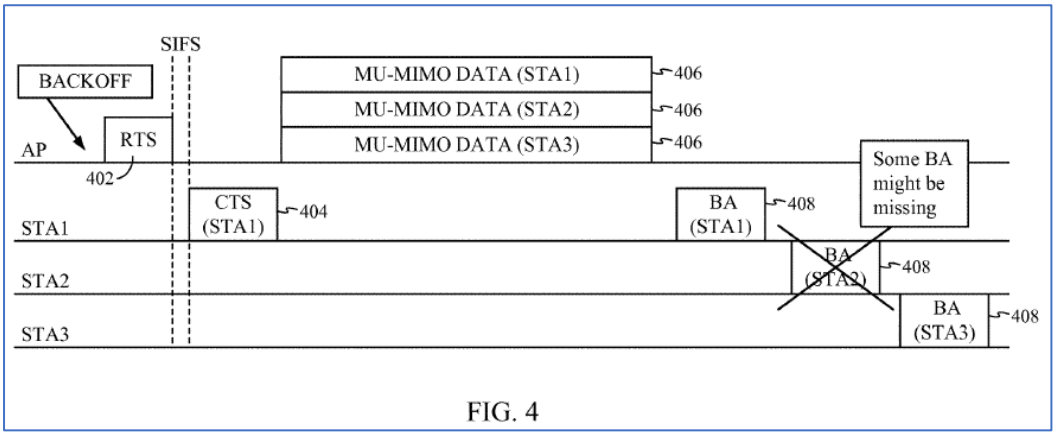


FIG. 4

Merlin (ZYXEL-1004) at 11:20-34, Fig. 4 (emphasis added). However, that disclosure of the term "SIFS" by Merlin is very different than the '679 claims. As the above passage demonstrates, Merlin teaches to separate the RTS and CTS by a SIFS, and also to separate the STAs' BA transmissions by a SIFS (e.g., BA (STA1) from BA (STA2)). But Merlin never teaches to separate the DL frame 406 from the BA (STA1) 408 by a SIFS.

56. The explicit disclosures and figure of Merlin only teach to separate two things by a SIFS: (a) the RTS from the CTS; and (b) the STAs' BA transmissions.

Nor would the spacing in Figure 4 have suggested otherwise to a POSITA. POSITAs know patent figures are not necessarily drawn to exact time scale, and it is improper to infer identical time periods from the figures alone. Moreover, Merlin knows how to clearly indicate when events are separated by a SIFS—e.g., (a) RTS 402 and CTS 404; and (b) BA (STA1) 408 and BA (STA2) 408—and the fact that Merlin does not state that DL frame 406 and BA (STA1) 408 are separated by a SIFS tells a POSITA that those events are may not be separated by a SIFS, but rather by any time interval that Merlin 497 may consider to be "immediate."

57. Furthermore, it does not follow that just because SIFS is used for some spacing that it would be used for all spacing. Indeed, there may be reasons why a DL frame 406 and BA (STA1) 408 would not be separated by a SIFS. In general, the different inter-frame spacing (IFS) values in 802.11 are used for prioritization of frames. There is, for example, a shorter spacing than SIFS, which is referred to as RIFS (reduced inter-frame spacing). Given that Merlin places a lot of emphasis in his text that the uplink multiuser ACKs are sent **immediately** after the downlink multiuser data frames, it is possible that Merlin had in his mind an IFS which is even shorter than SIFS such that the UL MU ACKs take priority. *See, e.g.,* Merlin (ZYXEL-1004) at 12:40-14:18 (discussing the need for an "immediate response" in "Example ACK Protocol Rules"). Regardless, the fact of the matter is: Merlin does not specify this spacing to be SIFS and instead says that it has to be **immediate**.

58. Merlin 497 also discloses Distributed Interframe Space or "DIFS" at 6:29 and Extended Interframe Space or "EIFS" at 6:31. Merlin (ZYXEL-1004) at 6:29-31. This further demonstrates that Merlin's mention of SIFS in one context would not have motivated a POSITA to use it in another context. Merlin disclosed there were multiple different IFS types, and a POSITA would not infer the use of one over another in the absence of an express disclosure.

59. Relatedly, each of the '679 claims also require (at limitation 1B/6B) either transmitting or receiving "the acknowledgement frame based on the acknowledgement information at the SIFS time after the downlink frame." '679 (ZYXEL-1001) at 41:48-50 ('679 cl. 1); 42:31-33 ('679 cl. 6). As discussed above, Merlin 497 does not disclose any "acknowledgment information representing whether the STA is requested to transmit the acknowledge frame in a SU format or in a MU format at a SIFS time after the downlink frame." *See supra*. It therefore follows that Merlin 497 cannot disclose transmitting/receiving an acknowledgment frame that is "based on the [non-existent] acknowledgment information," as claimed in 1B/6B.

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B. Merlin 497 Fails to Render Obvious Transmitting Or Receiving "the Acknowledgement Frame in the MU Format On The Allocated Resource Simultaneously With Transmission of At Least One Acknowledgement Frame From At Least One Other STA" "When The Acknowledgment Information Represents that the STA Is Requested To Transmit the Acknowledgement Frame in the MU Format and The STA is Allocated a Resource" (1C, 6C)

60. Each of the '679 claims require either transmitting or receiving "the acknowledgement frame in the MU format on the allocated resource simultaneously with transmission of at least one acknowledgement frame from at least one other STA" "when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the MU format and the STA is allocated a resource." '679 (ZYXEL-1001) at 41:51-60 ('679 cl. 1); 42:34-41 ('679 cl. 6). Merlin 497 does not teach or suggest these limitations.

61. The '679 Patent teaches "the present invention relates to a Wireless Local Area Network (WLAN)"—in other words 802.11 "Wi-Fi" WLANs. '679 (ZYXEL-1001) at 1:18-23. And the '679 specification distinguishes between so called "legacy 802.11" WLANs (i.e., those specified in prior "legacy" standards like 802.11 a/b/g/n/ac) and current WLANs specified in the new 802.11ax standard. *See id.* at 14:33-36 (disclosing "legacy" standards) and 10:18-23 (disclosing "a new PPDU frame format for the IEEE 802.11ax HEW system."). Importantly, the prior legacy 802.11 standards only provided for single-user uplink transmissions, while 802.11ax was the first standard to introduce multi-user uplink transmissions. Those

new 802.11ax multi-user uplink transmissions could not use the "single user format" from the legacy standards, but rather required a new "multi-user format."

62. The '679 Patent also discloses a "legacy block ACK PPDU" in Figure 22 and a "UL MU block ACK PPDU" in Figure 21. '679 Patent (ZYXEL-1001) at Figs. 21-22, 37:3-57. The legacy block ACK PPDU is amply described in legacy 802.11 standards, for example 802.11ac. These legacy formats are an example of the claimed "single-user format."

63. On the other hand, the new UL MU block ACK PPDU is shown at '679 Fig. 13:

FIG. 13

L-STF	L-LTF	L-SIG	HE-SIG-A	HE-STF	HE-LTF	HE-SIG-B	HE-LTF	HE-LTF	HE-LTF	HE-LTF	HE-SIG-C	PSDU(STA4 to AP)
				HE-STF	HE-LTF	HE-SIG-B	HE-LTF	HE-LTF	HE-LTF	HE-LTF	HE-SIG-C	PSDU(STA3 to AP)
				HE-STF	HE-LTF	HE-SIG-B	HE-LTF	HE-LTF	HE-LTF	HE-LTF	HE-SIG-C	PSDU(STA2 to AP)
				HE-STF	HE-LTF	HE-SIG-B	HE-LTF	HE-LTF	HE-LTF	HE-LTF	HE-SIG-C	PSDU(STA1 to AP)

'679 at Fig. 13 (highlighting added). This is an example of the claimed "multiple user format."

64. Importantly, Merlin 497 never explicitly teaches any such "single-user format" or "multi-user format"—certainly not at any of the passages cited by Petitioner or its expert. For example, a naked reference to "UL SU-MIMO, UL MU-MIMO or UL FDMA" does not teach or suggest the claimed "single-user format" or "multi-user format" of the PPDU used to transmit in either of these "modes."

65. Dr. Min relies on this discussion of "modes" to support his opinions, citing, for example, Merlin at 12:57-65, 14:26-32, 18:11-33. *See* Min Declaration (ZYXEL-1003) at ¶¶ 110, 125, 127, 130, 132, 134. But a "mode" is not a "format." Further, none of those passages (or anywhere else in Merlin 497) teach or suggest that the multiple simultaneous acknowledgments are in the claimed "multiple user format," based on any "acknowledgment information," or transmitted at a SIFS time after the DL MU PPDU.

IX. ABRAHAM466 DOES NOT RENDER OBVIOUS THE CHALLENGED CLAIMS

A. Abraham Fails to Render Obvious a "Downlink Frame Including a QoS Control Field Including Acknowledgment Information representing Whether the STA Is Requested to Transmit the Acknowledgment Frame in a Single-User Format Or In A Multiple-User Format At A Short Inter-Frame Space (SIFS) Time After the Downlink Frame" (1A, 6A)

66. Each of the '679 claims require a "downlink frame including a quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in a single-user (SU) format or in a multiple-user (MU) format at a Short Inter-Frame Space (SIFS) time after the downlink frame." '679 (ZYXEL-1001) at 41:41-47 ('679 cl. 1); 42:24-30 ('679 cl. 6). Abraham does not teach or suggest these limitations, as described below.

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1. QoS Control Field

67. Abraham Figure 7 shows the structure of a MAC PPDU (MPDU). Abraham at [0063]. As shown, it may include several fields, including a QoS Control field 755 and an optional ACK Control field 765 (both highlighted yellow). *Id*. The QoS Control field may have a "reserved bit/bit combination" that indicates "the presence of the ACK control field 765." *Id*. at [0064]; *see also id*. at [0072] ("the AP 104 indicates the presence of an acknowledgment (ACK) policy [] in a portion of [] QoS control field 755" in some embodiments). Thus, rather than actually using the QoS Control field 755 to indicate the actual ACK policy itself, Abraham instead teaches to use the QoS Control field to indicate the presence/absence of a different ACK Control field that actually contains the ACK policy. Consequently, Abraham does not teach or suggest the claimed "quality of service (QoS) control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in a single-user (SU) format or in a multiple-user (MU) format at a Short Inter-Frame Space (SIFS) time after the downlink frame" from '679 claim 1A/6A.

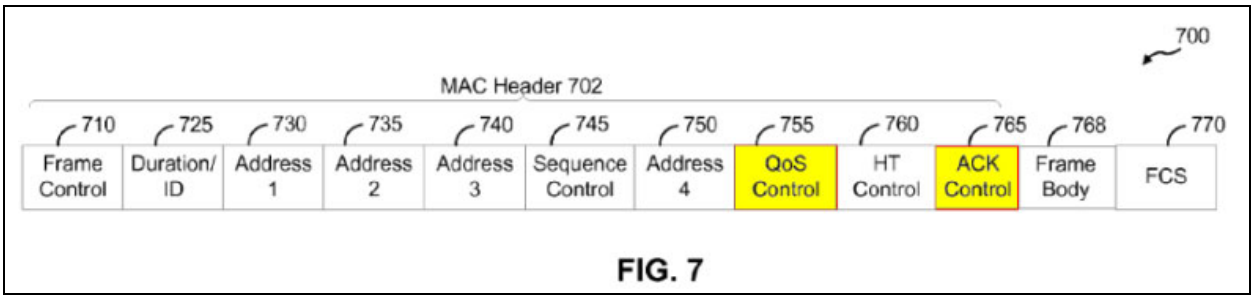


FIG. 7

2. Frame Format

68. The Abraham passages cited by Petitioner and Dr. Min do not teach the acknowledgment information in the DL frame "represent[s] whether the STA is requested to transmit the acknowledgment frame in a single-user (SU) format or in a multiple-user (MU) format," as claimed. For example, Abraham's "type of transmission" does not indicate a "SU format" or "MU format," as claimed. *See, e.g.,* Min Declaration (ZYXEL-1003) ¶ 200.

69. As discussed above in Section VIII.B (and incorporated here by reference), the '679 Patent discloses a new "multi-user format" to be used by the UL MU ACKs. This "multi-user format" for UL frames was not used in prior versions of 802.11. Thus, it is not surprising that Abraham fails to explicitly teach any such "multi-user format." Certainly none of the passages cited by Dr. Min disclose the claimed "multi-user format." *See, e.g.,* Min Declaration (ZYXEL-1003) at ¶¶199-208. A naked reference to "BA, MU-MIMO, FDMA, OFDMA" would not have rendered obvious the claimed "single-user format" or "multi-user format" of the PPDU used to transmit in any of these "types of transmission." *See id.* at ¶200 (citing Abraham (ZYXEL-1005) at [0074]).

70. Dr. Min also cites to Abraham Figs. 8 and 9 for support (ZYXEL-1003 at ¶200), but I disagree that these would render obvious the claimed limitations, either. Figure 8 shows an exemplary frame exchange using OFDMA and MD-A-

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MPDU. Abraham (ZXYEL-1005) at [0067]. The AP transmits a PPDU 807 which comprises a common preamble portion 806 and MD-AMPDU messages 805a-d. *Id.* MD-AMPDU messages 805a-b may be addressed to STAs 1-8 and may have an indication in a MAC header of a MPDU that STAs 1-8 should send the ACK messages over different frequencies a SIFS time after receiving the MD-AMPDU messages. *Id*. Thereafter, STAs 1-8 send uplink BAs 815 over 8 different bandwidths a short time (e.g., SIFS) after receiving the MD-AMPDU. *Id*. While Fig. 8 shows multiple STAs simultaneously transmitting acknowledgments using OFDMA, Figure 8 does not expressly disclose the format of those OFDMA acknowledgments. Figure 8 does not therefore expressly disclose the claimed "MU format" since there are no descriptions of the fields of the frame and their relative position, and thus no description of the format of the frame.

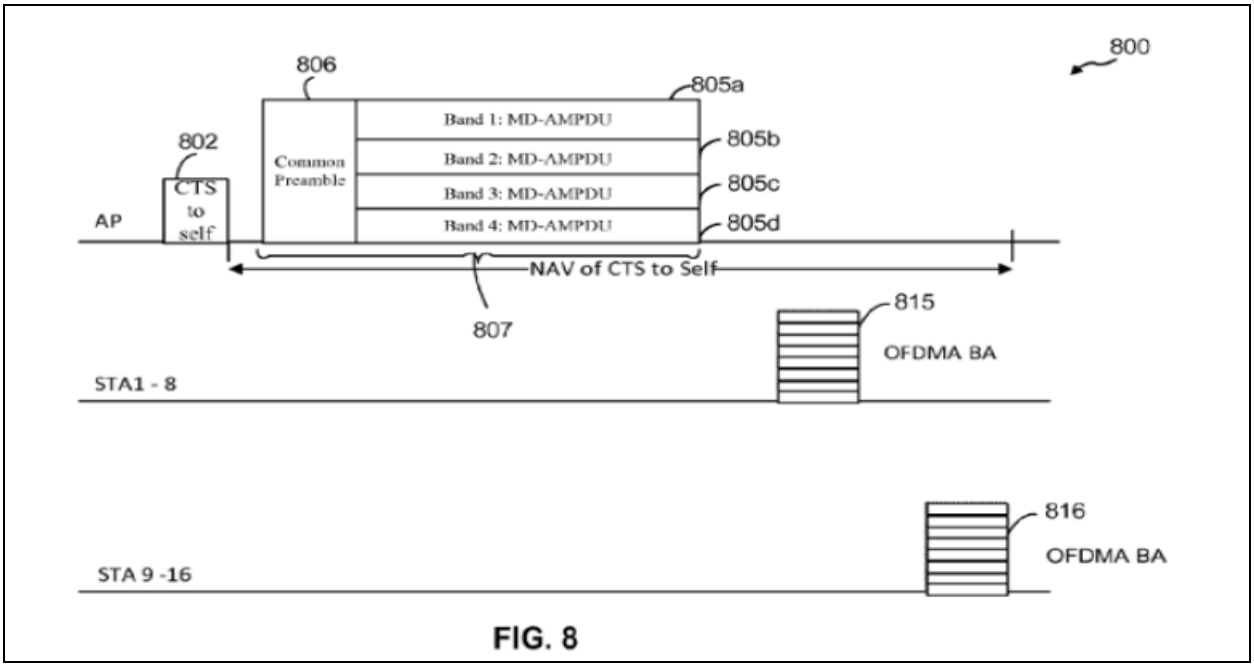


FIG. 8

71. Figure 9 shows another exemplary frame exchange for scheduling acknowledgments in response to a DL MD frame. Abraham (ZYXEL-1005) at [0071]. The AP transmits the DL MD frame 904 (which may comprise a MD-AMPDU) to the STAs 1- 3. *Id.* The DL MD frame 904 comprises the ACK control field 765. *Id.* STAs 1-3 use the information in the ACK control field 765 (e.g., BA MCS, total uplink bandwidth, per STA bandwidth, total uplink spatial streams, BA index, etc.) to know when to send ACK messages 905, 906 and 907 so they do not interfere with each other. *Id*. While Fig. 9 shows multiple STAs sequentially transmitting acknowledgments, Figure 9 does not expressly disclose the format of those acknowledgments. Figure 9 does not therefore expressly disclose the claimed "SU format" as there are no descriptions of the fields of the frame and their relative position, and thus no description of the format of the frame.

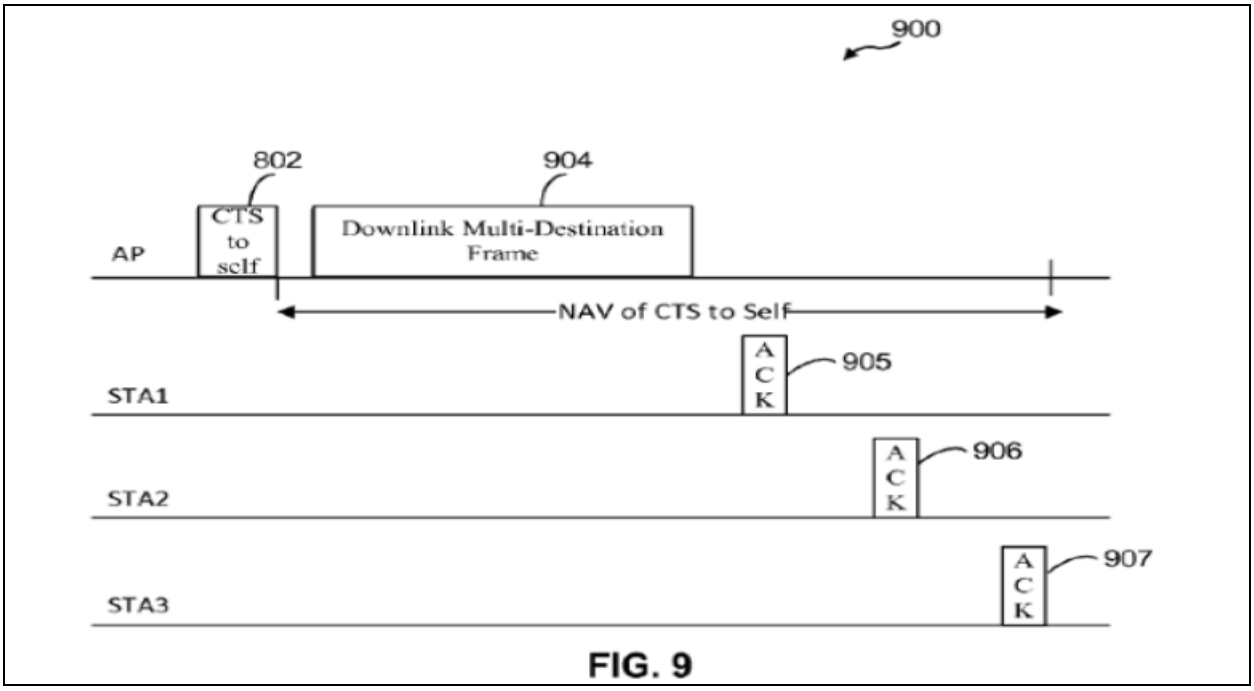


FIG. 9

72. Therefore, as discussed Abraham does not disclose the "acknowledgment information representing whether the STA is requested to transmit the acknowledge frame in a SU format or in a MU format at a SIFS time after the downlink frame" claimed by '679 1A/6A. *See supra*.

73. Relatedly, other '679 claim limitations also recite a "multi-user format." For example, at '679 1C/6C, each of the '679 claims also require either transmitting or receiving "the acknowledgement frame in the **MU format** on the allocated resource simultaneously with transmission of at least one acknowledgement frame from at least one other STA" "when the acknowledgment information represents that the STA is requested to transmit the acknowledgement frame in the **MU format** and the STA is allocated a resource." '679 at 41:51-60 ('679 cl. 1); 42:34-41 ('679 cl. 6) (emphasis added). As discussed above, Abraham does not disclose the claimed "acknowledgement information" or the claimed "multiple-user format." *See supra*. Accordingly, Abraham cannot disclose transmitting/receiving an acknowledgment frame in the non-existent "multiple-user format" based on the non-existent "acknowledgment information."

X. THE GROUND 3 COMBINATION OF MERLIN, ABRAHAM466, CHU806, AND MA DOES NOT RENDER OBVIOUS THE CHALLENGED CLAIMS

A. A POSITA would not have combined Merlin, Abraham, Chu, and Ma.

74. Petitioner and Dr. Min have asserted that a POSITA would have combined Merlin, Abraham, Chu, and Ma to achieve the claimed '679 Patent invention. *See, e.g.,* Min Declaration (ZYXEL-1003) at ¶¶ 260-271. I disagree.

75. First, there is no apparent reason—apart from improper hindsight—that would have motivated a POSITA to combine together these references. Merlin 497 is a Qualcomm patent filed in October 2014 that was primarily invented by Simone Merlin. Merlin 497 (ZYXEL-1004) at title page. Abraham is a Qualcomm patent application filed in August 2015 that was primarily invented by Santosh Abraham. Abraham (ZYXEL-1005) at title page. Chu806 is a Marvell patent filed in November 2014 that was primarily invented by Liwen Chu. Chu806 (ZYXEL-1006) at title page. And Ma is an Intel patent filed in August 2014 that was primarily invented by Yongsen Ma. Ma (ZYXEL-1007) at title page. As shown above, these references were drafted at different times, and have different primary inventors. Dr. Min provides no convincing apparent reason why these references would be combined.

76. Dr. Min suggests a POSITA would have made the combination because the references share some high-level similarities, specifically:

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- "Each of Merlin, Abraham 466, Chu806 and Ma discusses how an AP provide acknowledgement information/policy to STAs in a 802.11 system." Min Declaration (ZYXEL-1003) at ¶ 260.
- "[E]ach of Merlin, Abraham 466, Chu806 and Ma discusses the AP employing OFDMA or MU-MIMO to provide acknowledgement information/policy to STAs." *Id.* ¶ 261.
- "[E]ach of Merlin, Abraham 466, Chu806 and Ma [discusses] how an AP manages UL acknowledgement frames by non-legacy STAs and legacy STAs or different STAs with different capabilities." *Id.* ¶¶ 262-263.
- "Merlin, Abraham 466, Chu806 and Ma discuss dynamic transmission management by an AP to increase uplink efficiency while monitoring or reducing collision." *Id.* ¶ 264.
- "Merlin, Abraham 466, Chu806 and Ma utilize OFDMA to provide DL MU and UL MU transmissions and relate to transmissions according to the IEEE 802.11 protocol." *Id.* ¶ 265.
- "[I]t has been known to arrange the control fields and bits of a DL MU frame by an AP to accommodate different STAs with different capabilities." *Id.* ¶ 270.

77. None of these general observations would have motivated a POSITA to make the specific combination proposed. The '679 does not merely recite

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acknowledgement information/frames or MU transmissions in a vacuum. Instead, it addresses specific problems regarding, e.g., timing and formatting in a specific scenario (an acknowledgement frame based on a downlink frame that indicates specific frame formatting, timing, etc.). None of these high-level observations go to the specific limitations of the claimed invention.

78. Dr. Min further suggests "a POSITA would have been motivated to combine Merlin's DL MU frame with a portion or the DL MU frame of Abraham466 in light of the 'need to more efficiently transmit messages and frames across various communication schemes.'" Min Declaration (ZYXEL-1003) ¶ 267. However, he does not explain why the specific proposed combination would have resulted from that general goal, nor does he explain how it would achieve that goal. I do not agree that the cited general statement from the background section of Abraham would have motivated a POSITA to make the proposed combination.

79. The same is true of Dr. Min's next argument, which suggests "a POSITA would have been motivated to combine Merlin's DL MU frame with a portion o[f] the DL MU frame of Chu806 in light of the additional 'standards [] to provide even greater throughputs.'" Min Declaration (ZYXEL-1003) ¶ 268. Again, such a nonspecific goal statement would not have motivated a POSITA to have changed Merlin in the specific manner proposed. Achieving greater throughput can be accomplished in many different ways unrelated to the claimed invention, such as

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allocating a larger range of frequencies for the wireless devices. Furthermore, the cited portion of Chu806's background refers specifically to "single-user peak throughput." Chu (ZYXEL-1006) at 1:23-38. It is not clear why Dr. Min thinks such statements would have motivated a POSITA to make multi-user specific modifications to Merlin, and in my opinion they would not have provided a POSITA with such motivation.

80. Finally, Dr. Min cites to Ma at 27:32-37 as providing a motivation to combine the references. Min Declaration (ZYXEL-1003) ¶ 269. The cited portion of Ma states "[f]unctions, operations, components and/or features described herein with reference to one or more embodiments, may be combined with, or may be utilized in combination with, one or more other functions, operations, components and/or features described herein with reference to one or more other embodiments, or vice versa." Ma (ZYXEL-1007) at 27:32-37. A POSITA would have understood this to mean just what it says—parts of certain Ma embodiments can be utilized in combination with parts of other Ma embodiments. Dr. Min's conclusion that this would somehow motivate a POSITA to specifically "combine Merlin's DL MU frame with a portion or the DL MU frame of Ma" stretches Ma's general statements much too far and is simply not credible. *See* Min Declaration (ZYXEL-1003) ¶ 269.

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B. Ground 3 Fails to Render Obvious Transmitting Or Receiving "the Acknowledgement Frame in the MU Format On The Allocated Resource Simultaneously With Transmission of At Least One Acknowledgement Frame From At Least One Other STA" "When The Acknowledgment Information Represents that the STA Is Requested To Transmit the Acknowledgement Frame in the MU Format and The STA is Allocated a Resource" (1C, 6C)

81. As I discussed above in Sections VIII.B and IX.A.2 (and incorporate here by reference), neither Merlin nor Abraham466 render obvious this limitation because neither one teaches the claimed "multi-user" format (nor would any combination of Merlin and Abraham466 overcome the fact that neither one teaches the limitation in the first place). I understand that Petitioner and Dr. Min have proposed a combination of Merlin, Abraham466, Ma, and Chu as their Ground 3 in an attempt to overcome the shortcomings of Merlin and Abraham466. However, neither Ma nor Chu teach the claimed "MU format," either. Nor do they teach the downlink frame including a QoS control field including acknowledgement information representing whether the STA is requested to transmit the acknowledgement frame in SU or MU format. Nor does Dr. Min expressly assert that either reference teaches the MU format parts of the limitations. As a result, Ground 3 would not have rendered obvious the challenged claims of the '679 Patent.

82. For example, Dr. Min cites to Ma at 13:65-14:1 and 17:54-57 for its discussion of DL MU data frames and EACK frames. Min Declaration (ZYXEL-1003) ¶¶ 280-281; *see also id.* ¶ 286 (citing Ma 10:1-4 and 14:6-9). But this again

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does not address the possibility/format of SU vs MU frames. Furthermore, even if it did address format, the format of a DL MU frame would not necessarily render obvious the format of an UL MU frame (and the claimed acknowledgement frame would be transmitted in the UL direction).

83. Dr. Min also cites to Chu's Figure 4 as an "diagram of an example OFDMA data unit 350." Min Declaration (ZYXEL-1003) ¶ 278. However, Chu's Figure 4 demonstrates a ***DL*** frame format, rather than an ***UL*** frame format. Chu explains that Figure 4's "OFDMA data unit 350 is similar to the OFDMA data unit 300 of FIG. 3." Chu (ZYXEL-1006) at 9:10-13. Chu's Figure 3 "is a diagram of an example OFDMA data unit 300" which is transmitted in the DL direction from the AP "to different client stations 25 via respective OFDM sub-channels within the OFDMA data unit 300." *Id.* at 7:58-64. Therefore, nothing Dr. Min cites teaches or renders obvious the claimed UL MU frame format.

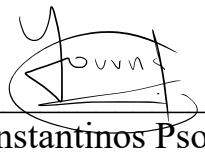
XI. MISCELLANEOUS

84. My work on this matter is being billed at an hourly rate of $700 per hour and is not contingent on the outcome of this proceeding. I am also being reimbursed for reasonable expenses I incur in relation to my services provided for this proceeding.

85. All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. I further

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understand that willful false statement and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Date: August 11, 2023 By: 

Dr. Konstantinos Psounis

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