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In re Patent of:	Menzo Wentink	Attorney Docket No.: 48642-0018IP1
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Title:	TRANSMIT ANNOUNCEMENT INDICATION	

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 8,594,122 PURSUANT TO 35 U.S.C. §§311–319, 37 C.F.R. §42**

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EXHIBITS

UBIQUITI-1001	U.S. Patent No. 8,594,122 to Wentink (“the ’122 patent”)
UBIQUITI-1002	Excerpts from the Prosecution History of the ’122 patent (“the Prosecution History”)
UBIQUITI-1003	Declaration and Curriculum Vitae of Christopher Hansen, Ph.D.
UBIQUITI-1004	Complaint for Patent Infringement in <i>Intellectual Ventures I LLC v. Ubiquiti Inc.</i> , 1-23-cv-00865 (DDE) filed August 8, 2023
UBIQUITI-1005	’122 Patent Provisional Specification Application Serial No. 60/762,425
UBIQUITI-1006	U.S. Pat. Pub. 2008/0298306 (“Larsson”)
UBIQUITI-1007	U.S. Patent No. 8,374,096 (“Gu”)
UBIQUITI-1008	U.S. Pat. Pub. 2005/0232208 (“Hansen”)
UBIQUITI-1009	GAST, 802.11 WIRELESS NETWORKS: THE DEFINITIVE GUIDE, (O’Reilly 2005)
UBIQUITI-1010	IEEE 802.11-1999 Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications (R2003) (2003 Reaffirmation)
UBIQUITI-1011	U.S. Patent No. 8,200,164 (“Trainin”)
UBIQUITI-1012	Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings With Parallel District Court Litigation (June 21, 2022) (available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf)
UBIQUITI-1013	Scheduling Order, <i>Intellectual Ventures I LLC v. Ubiquiti, Inc.</i> , 1:23-cv-00865-JLH, D.I. 23 (D. Del. June 21, 2024)

UBIQUITI-1014	Order on Motion to Dismiss, <i>Intellectual Ventures I LLC v. Ubiquiti, Inc.</i> , 1:23-cv-00865-JLH, D.I. 19 (D. Del. May 21, 2024)
UBIQUITI-1015	Declaration of June Ann Munford
UBIQUITI-1016	PCT Publication WO 2007/040564
UBIQUITI-1017	802.11e/D6.0 Draft Amendment to STANDARD [for] Information Technology – Telecommunications and Information Exchange Between Systems – LAN/MAN Specific Requirements – PART 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications: Medium Access Control (MAC) Quality of Service (QoS) Enhancements, November 2003
UBIQUITI-1018	<i>Sotera</i> Stipulation
UBIQUITI-1019	IEEE 802.11-04/0889r7, “TGn Sync Proposal Technical Specification”
UBIQUITI-1020	IEEE 802.11e-2005 Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 8: Medium Access Control (MAC) Quality of Service Enhancements
UBIQUITI-1021	IEEE 802.11e-2005 website, https://standards.ieee.org/ieee/802.11e/3131/
UBIQUITI-1022	Archived copy of IEEE Standards Association homepage, https://web.archive.org/web/20051124063223/http://standards.ieee.org:80/ (archived Nov. 24, 2005)
UBIQUITI-1023	Archived copy of IEEE Online Subscription Access homepage, https://web.archive.org/web/20051201224002/http://standards.ieee.org/catalog/olis/about.html (archived Dec. 1, 2005)

UBIQUITI-1024	Archived copy of IEEE Online Subscription Catalog, https://web.archive.org/web/20051130033411/http://standards.ieee.org/catalog/olis/lanman.html (archived Nov. 30, 2005)
UBIQUITI-1025	Archived copy of IEEE Online Subscription Catalog, https://web.archive.org/web/20030619112803/http://standards.ieee.org:80/catalog/olis/lanman.html (archived June 19, 2003)
UBIQUITI-1026	Declaration of Rishi Gupta

LISTING OF CLAIMS

Claim No.	Term
1.pre	A method comprising:
1.1	transmitting a first communication frame from a first station to a second station
1.2	wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame
1.3	that the second communication frame will not include the address of the second station, and
1.4	wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.
2	The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.
3	The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.
4	The method of claim 3, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.
5	The method of claim 4, further comprising transmitting the second communication frame from the first station to the second station, wherein the second communication frame does not include the address of the second station.
6	The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

7	The method of claim 6, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.
8	The method of claim 7, further comprising transmitting the second communication frame associated with the transmit announcement indication.
11.pre	A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:
11.1	transmitting a first communication frame from a first station to a second station;
11.2	wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and
11.3	that the second communication frame will not include the address of the second station, and
11.4	wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.
12	The computer-readable medium of claim 11, wherein the transmit announcement indication comprises a zero-length frame.
13	The computer-readable medium of claim 11, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.
14	The computer-readable medium of claim 13, wherein the operations further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

15	The computer-readable medium of claim 14, wherein the operations further comprise transmitting the second communication frame associated with the transmit announcement indication.
16.pre	A system comprising:
16.1	a transmitter configured to: transmit a first communication frame from a first station to a second station;
16.2	wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and
16.3	that the second communication frame will not include the address of the second station, and
16.4	wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.
17	The system of claim 16, wherein the transmit announcement indication comprises a zero-length frame.
18	The system of claim 16, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.
19	The system of claim 18, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.
20	The system of claim 19, wherein the transmitter is further configured to transmit the second communication frame associated with the transmit announcement indication.
21	The system of claim 16, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA),

	printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.
22	The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header with out a media access control (MAC) portion.
23	The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.
24	The method of claim 23, wherein the bit comprises an high throughput-control field.
25	The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.
26	The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.
27.pre	A method comprising:
27.1	receiving a first communication frame from a first station at a second station,
27.2	wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and
27.3	that the second communication frame will not include the address of the second station; and
27.4	receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.
28	The method of claim 27, wherein the transmit announcement indication comprises a zero-length frame.

29	The method of claim 27, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.
30	The method of claim 29, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.
31	The method of claim 27, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.
32	The method of claim 31, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.
33	The method of claim 27, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.
34.pre	A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:
34.1	receiving a first communication frame from a first station,
34.2	wherein the first communication frame includes an address of a second station and a transmit announcement indication that indicates that a second communication frame will follow the first communication frame and
34.3	that the second communication frame will not include the address of the second station; and
34.4	receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.
35	The computer-readable medium of claim 34, wherein the transmit announcement indication comprises a zero-length frame.

36	The computer-readable medium of claim 34, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.
37	The computer-readable medium of claim 36, wherein the operations further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.
38.pre	A system comprising:
38.1	a receiver configured to: receive a first communication frame from a first station at a second station,
38.2	wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and
38.3	that the second communication frame will not include the address of the second station; and
38.4	receive the second communication frame after a short interframe space (SIFS) that follows the first communication frame.
39	The system of claim 38, wherein the transmit announcement indication comprises a zero-length frame.
40	The system of claim 39, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.
41	The system of claim 40, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.
42	The system of claim 38, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

Ubiquiti Inc. (“Petitioner” or “Ubiquiti”) petitions for *Inter Partes* Review (“IPR”) of claims 1-8, 11-42 (“the Challenged Claims”) of U.S. Patent No. 8,594,122 (“the ’122 patent”).

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the ’122 patent is available for IPR. This petition is being filed within one year of service of a complaint against Ubiquiti. Ubiquiti is not barred or estopped from requesting review of the Challenged Claims on the below-identified grounds.

B. Challenge and Relief Requested

Petitioner requests an IPR of the Challenged Claims on the grounds noted below. Dr. Christopher Hansen provides supporting testimony in his Declaration. UBIQUITI-1003, *passim*.

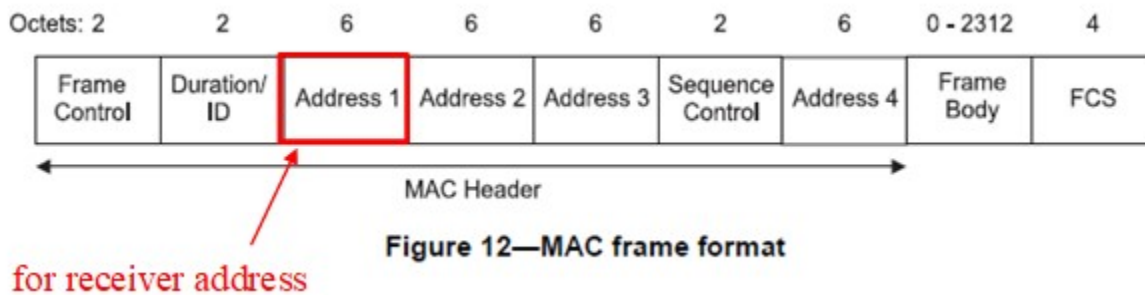
Ground	Claim(s)	35 U.S.C. §102/103
1A	1-5, 16-20, 22-30, 38-41	§103: Gu & Trainin
1B	6-8, 31-33	§103: Gu-Trainin & 802.11e-2005
1C	11-15, 21, 34-37, 42	§103: Gu-Trainin & Hansen

Reference	Filing Date	Publication Date	Prior Art Status
Gu	11/21/2005	02/12/2013	§102(e)
Hansen	10/26/2004	10/20/2005	§§102(a), 102(e)
Trainin	12/1/2005	06/12/2012	§102(e)
802.11e-2005	—	11/11/2005	§102(a)

II. BACKGROUND OF THE TECHNOLOGY

A. MAC and PHY

The WI-FI standard 802.11 defines the frame structure for wireless communications to include a medium access (MAC) layer and a physical (PHY) layer. *See, e.g.*, UBIQUITI-1001, 1:42-46; UBIQUITI-1010, §§7, 15; UBIQUITI-1003, 28-34. A MAC Frame is a MAC Protocol Data Unit (MPDU) that is passed down to the PHY layer. *See, e.g.*, UBIQUITI-1010, §7.1.1 Conventions. A representation of a general MAC frame is reproduced below:



UBIQUITI-1010, §7.1.2, 802.11-1999 MAC Frame (annotated)

As shown, the MAC frame includes a header portion (MAC header), which carries up to four address fields, one of which can be the receiver address (RA). *See, e.g.*,

id.; *see also id.*, §7.3.3.6. Receiver address matching is always performed on the contents of the Address 1 field in received frames. UBIQUITI-1003, 28-34; UBIQUITI-1010, §7.1.3.3. The purpose of the RA is to indicate the intended immediate recipient for the information contained in the frame body field. UBIQUITI-1003, 28-34; UBIQUITI-1010, §7.1.3.3.6. The frame body includes the data for transmission. *See, e.g.*, UBIQUITI-1009, 25. The receiver address of CTS and ACK frames is always obtained from the Address 2 field in the corresponding RTS frame.” UBIQUITI-1003, 28-34; UBIQUITI-1010, §7.1.3.3. The duration field is used to update the NAV timer, which is used in RTS/CTS dialogs. UBIQUITI-1009, 14, 22, 37; UBIQUITI-1003, 28-34; UBIQUITI-1010, §7.1.3.2.

By 2005, the generic MAC frame format had been updated to optionally include additional fields. *See, e.g.*, UBIQUITI-1020, §7.1.2; UBIQUITI-1017, §7.1.2, FIG. 12 (indicating that QoS enhancements were known as early as November 2003). The 802.11e generic MAC frame is shown below:

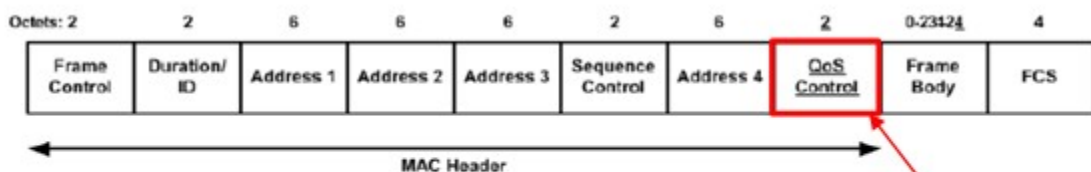


Figure 12—MAC frame format

optional additional field in MAC header

UBIQUITI-1020, FIG. 12 (annotated)

The quality of service (QoS) Control field is used in all QoS data frames, including QoS-null frames. UBIQUITI-1020, 24. Among other things, the QoS Control field defines the ACK policy for a QoS data frame. *Id.*, Tables 3a, 3c. For QoS-null (no data) frames, the “only permissible” ACK policy is “Normal Ack.” *Id.*, Table 3c. Also, the 802.11e MAC frame includes a bitmapping in the Frame Control type and subtype fields for defining the frame as a QoS-null frame. *Id.*, §7.1.3.1.2, Table 1 (type 10, subtype 1100 QoS-null (no data)).

The 802.11-1999 specification and its amendments define different types of MAC layer frames, including data frames, control frames, and management frames. UBIQUITI-1010, §7.1.3.1.2; UBIQUITI-1020, §7.1.3.1.2. In addition, for each type of frame, a subtype can be defined to indicate different classes of frames. *E.g.*, UBIQUITI-1020, §§7.1, 7.1.3.1.2; UBIQUITI-1009, 19-20. Type and subtype fields are carried by the frame control field of a MAC header, as shown below:

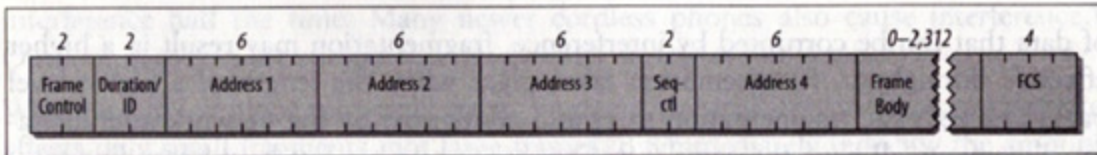


Figure 3-9. Generic 802.11 MAC frame

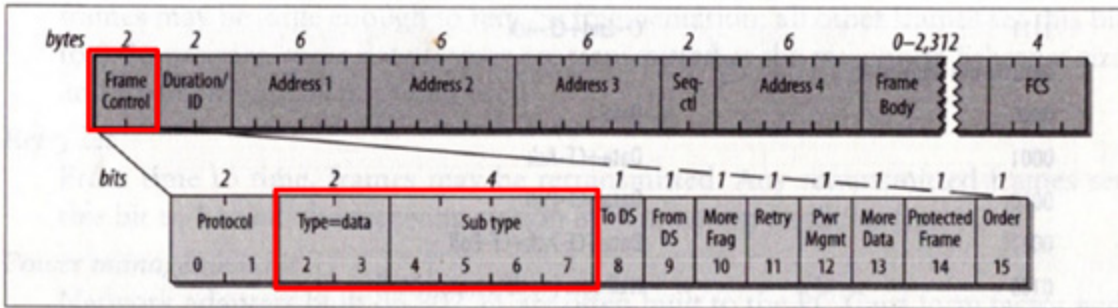


Figure 3-10. Frame control field

UBIQUITI-1009, FIGS. 3-9, 3-10 (showing MAC header and Frame Control Field)

The different control and data subtypes are shown below, including RTS, CTS, ACK, and QoS-null subtypes:

subtype codes
for RTS, CTS,
ACK, and
QoS-null

Table 3-1. Type and subtype identifiers (continued)

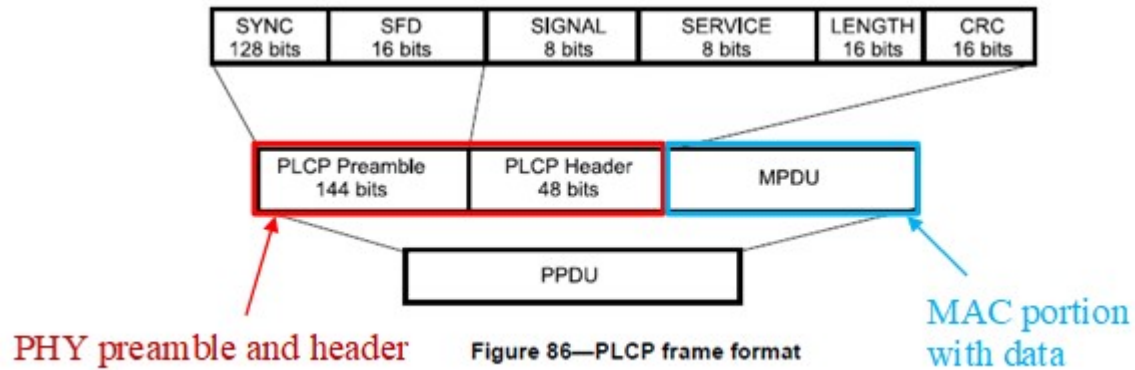
Subtype value	Subtype name
1000	Beacon
1001	Announcement traffic indication message (ATIM)
1010	Disassociation
1011	Authentication
1100	Deauthentication
1101	Action (for spectrum management with 802.11h, also for QoS)
Control frames (type=01 ^h)	
1000	Block Acknowledgment Request (QoS)
1001	Block Acknowledgment (QoS)
1010	Power Save Poll
1011	RTS
1100	CTS
1101	Acknowledgment (ACK)
1110	Contention-Free (CF)-End
1111	CF-End+CF-Ack
Data frames (type=10)	
0000	Data
0001	Data+CF-Ack
0010	Data+CF-Poll
0011	Data+CF-Ack+CF-Poll
0100	Null data (no data transmitted)
0101	CF-Ack (no data transmitted)
0110	CF-Poll (no data transmitted)
0111	CF-Ack+CF-Poll (no data transmitted)
1000	QoS Data
1001	QoS Data + CF-Ack
1010	QoS Data + CF-Poll
1011	QoS Data + CF-Ack + CF-Poll
1100	QoS Null (no data transmitted)
1101	QoS CF-Ack (no data transmitted)
1110	QoS CF-Poll (no data transmitted)
1111	QoS CF-Ack+CF-Poll (no data transmitted)

(Frame type 11 is reserved)

UBIQUITI-1009, Table 3-1, 48 (showing RTS, CTS, ACK, and QoS-null subtypes)

As early as November 2003, the QoS-null subtype was known, and was included in the 802.11e-2005 release. UBIQUITI-1017, §7.1.3.1.2; UBIQUITI-1020, §7.1.3.1.2, Table 1.

During transmission, the MPDU is prepended with a physical layer convergence procedure (PLCP) Preamble and Header to create the physical layer protocol data unit (PPDU). UBIQUITI-1010, §15.2; UBIQUITI-1003, 28-34. The PPDU is shown below:



UBIQUITI-1010, FIG. 86 (annotated), 802.11-1999 PHY Protocol Data Unit

The figure above illustrates a complete transmission or PPDU (PLCP protocol data unit or physical layer convergence protocol data unit) from a device that follows the 802.11-1999 protocol. UBIQUITI-1003, 28-34. The transmission includes a PHY preamble, PHY header, and a MAC frame or MPDU. UBIQUITI-1010, §15.2; UBIQUITI-1003, 28-34; *cf.* UBIQUITI-1009, 48. The MAC frame is contained within the data portion of the PPDU. UBIQUITI-1009, 25; UBIQUITI-1003, 28-34. It will typically contain address information, including a receiver address (RA) and a transmitter address (TA) in the MAC header. UBIQUITI-1010, §7.1.3.3; UBIQUITI-1003, 28-34. If it is a data frame, the data payload from the upper layers will follow the MAC header in the Frame Body. *See, e.g.,* Gast, 53,

FIG. 12-17 (showing PSDU (MAC frame) after PHY preamble and PHY header);¹
see also 802.11-1999, §§7.1, 5.2; UBIQUITI-1003,28-34.

The PPDU (or PHY packet) thus includes a PHY preamble and PHY header, and an MPDU, which includes the receiver address and the data for typical control and data frames (no data for QoS-null frames). UBIQUITI-1003, 28-34. Without the data portion, the PPDU would only include the PHY preamble and PHY header. UBIQUITI-1003, 28-34.

B. Channel Contention

In 802.11-based wireless local area networks, remote stations vie for access to the wireless medium using channel contention. UBIQUITI-1003, 35-36; UBIQUITI-1009, 17. The stations use carrier-sensing to determine whether the medium is available. UBIQUITI-1003, 35-36; UBIQUITI-1009, 13-14. Because multiple stations can vie for channel contention at the same time, a transmitting station can use RTS/CTS to secure the medium for a transaction to avoid collisions with other stations. UBIQUITI-1003, 35-36; *see, e.g.*, UBIQUITI-1009, 12-15. An example

¹ Gast, 802.11 Wireless Networks: The Definitive Guide, UBIQUITI-1009, was published by April 2005. UBIQUITI-1015. It bears the indicia of wide circulation, including a major publisher, ISBN number, copyright date, a publication date, and library markings.

is shown in Figure 3-5 below:

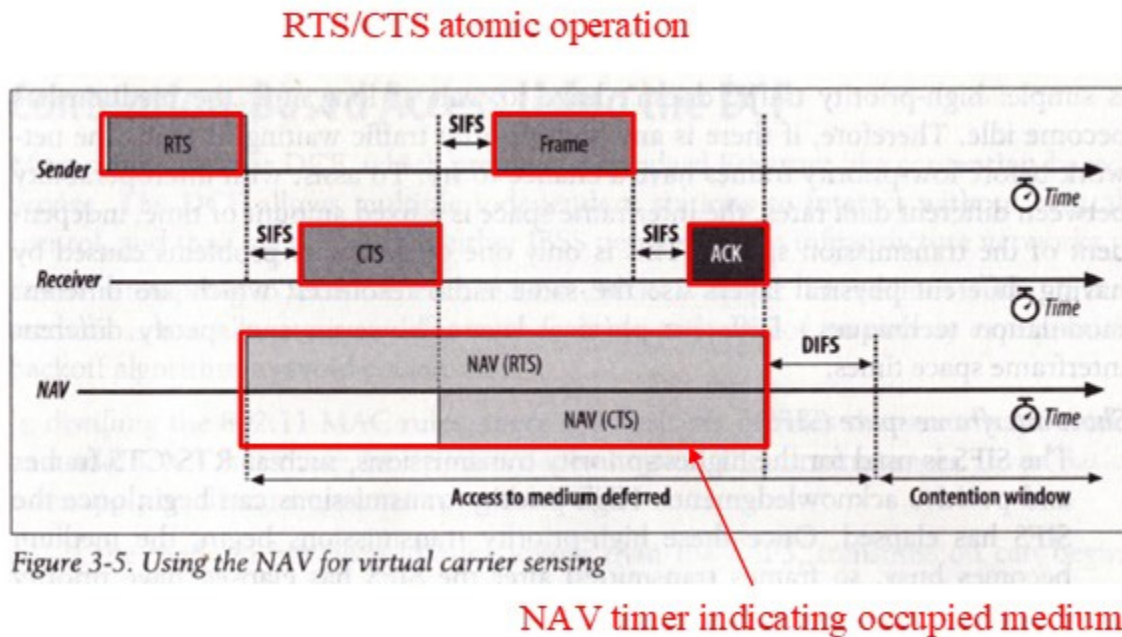


Figure 3-5. Using the NAV for virtual carrier sensing

UBIQUITI-1009, FIG. 3-5 (annotated).

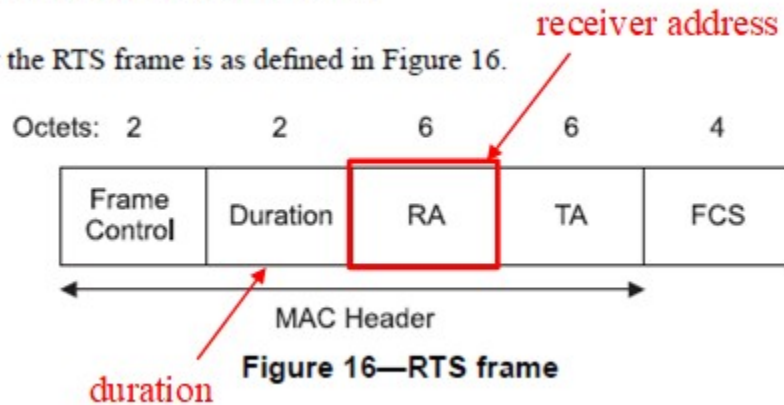
The RTS, CTS, transmitted frame(s), and positive acknowledgement (ACK) are all considered part of the same dialog (or atomic operation). UBIQUITI-1003, 35-36; UBIQUITI-1009, 12-15. A Network Allocation Vector (NAV) is a timer that indicates an amount of time that the medium is occupied. UBIQUITI-1003, 35-36; UBIQUITI-1009, 12-15. The NAV timer is determined based on the amount of time expected to complete the transaction. UBIQUITI-1003, 35; UBIQUITI-1009, 12-15. The after the expiration of the NAV timer, the contention window begins again. UBIQUITI-1003, 35-36; UBIQUITI-1009, 12-15. Thus, during the RTS/CTS dialog, the medium is secured for the transaction of the frame(s) between the sender and the receiver. UBIQUITI-1003, 35-36; UBIQUITI-1009, 12-

15.

The RTS frame is a MAC frame that includes an address of the receiving station, as shown below:

7.2.1.1 Request To Send (RTS) frame format

The frame format for the RTS frame is as defined in Figure 16.



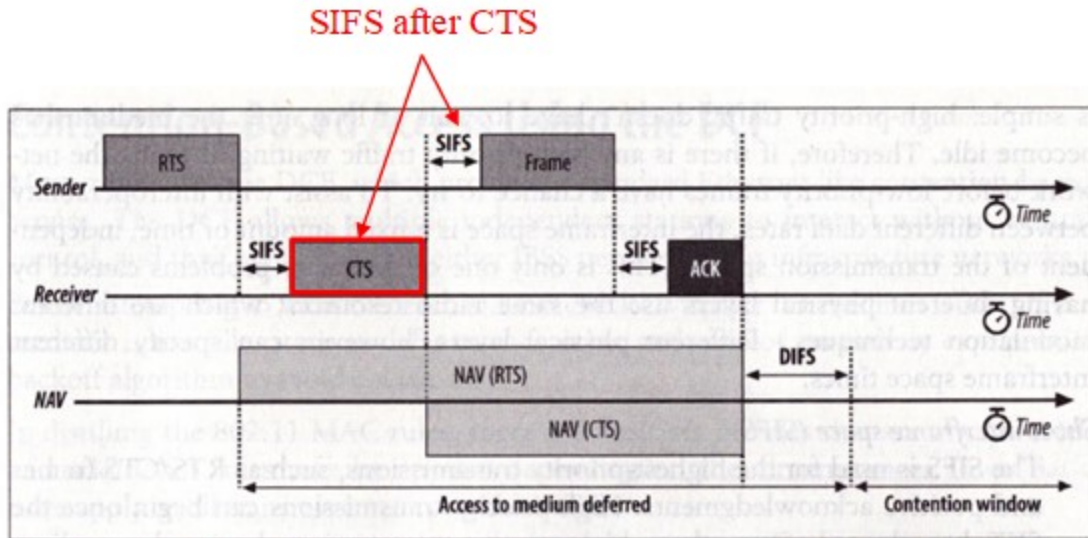
UBIQUITI-1010, FIG. 16 (annotated)

The duration field can be used to set the expected duration for the medium reservation. UBIQUITI-1009, 14, 22; UBIQUITI-1003, 35-36; UBIQUITI-1010, §7.1.3.2. Unaddressed stations can use the duration field to set their own NAV timers so that they are aware of the amount of time the medium is occupied. *See, e.g.*, UBIQUITI-1009, 12-15, 22, 30, 37. Thus, during this amount of time, unaddressed stations would not expect to receive any transmissions (and any transmissions they do receive are discarded). *Id.* A POSITA would have recognized that during the known occupied period, it would not have been necessary for frames to include a receiver address. UBIQUITI-1003, 35-36. This is because the first message (e.g., RTS) indicated that the medium was to be reserved for a single station, which is

alerted to expect the forthcoming transaction(s) and to reserve the amount of time it will take to complete the transactions. *Id.*

C. Interframe Spacing

The 802.11 standard, as early as 1999, defined the time interval between frames, referred to as interframe spacing. UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 37. Short interframe spacing (SIFS) was defined as the shortest of the interframe spaces. UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 37. “SIFS shall be used when STAs have seized the medium and need to keep it for the duration of the frame exchange sequence to be performed.” UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 37. More specifically, “SIFS *shall* be used for an ACK frame [and] a CTS frame.” UBIQUITI-1010, §9.2.3 (emphasis added); UBIQUITI-1003, 37 ; *see also* UBIQUITI-1009, 16 (“The SIFS is used for the highest-priority transmissions, such as RTS/CTS frames and positive acknowledgements.”). The SIFS period is shown in Figure 3-5 below for both RTS/CTS:



UBIQUITI-1009, FIG. 3-5 (annotated)

D. Channel Sounding

The 802.11n amendment introduced MIMO (multiple input multiple output) technology to the 802.11 family of standards. *See, e.g.*, UBIQUITI-1008, [0010], UBIQUITI-1003, 38-39. With MIMO, multiple antennas are used at the transmitter, receiver, or both sides to improve the achievable data rate and reliability of communication. *See, e.g.*, UBIQUITI-1007, 1:22-24; UBIQUITI-1003, 38-39. When the transmitter has multiple antennas, the level of improvement is optimized when the transmitter applies beamforming to its transmissions. *See, e.g.*, UBIQUITI-1008, [0085]-[0108]; UBIQUITI-1003, 38-39. With beamforming, the transmitter employs precise phase and amplitude adjustments that complement the specific transmission paths between each transmit antenna and each receive antenna.

See, e.g., UBIQUITI-1011, 3:4-31; UBIQUITI-1003, 38-39.

To beamform effectively, the transmitter needs knowledge of the radio paths from its antennas to the receiver. *See, e.g.*, UBIQUITI-1011, 2:14-23; UBIQUITI-1003, 38-39. This information is called channel state information and it is determined by channel sounding. *See, e.g.*, UBIQUITI-1011, 6:65-67; UBIQUITI-1003, 38-39. In channel sounding, the transmitter sends a known sounding signal to the receiver. *See, e.g.*, UBIQUITI-1007, 1:40-54; UBIQUITI-1008, [0085]-[0108]; UBIQUITI-1003, 38-39. The receiver then computes the channel state from the received sounding signal and sends that information back to the transmitter. *See, e.g.*, UBIQUITI-1011, 7:1-3; UBIQUITI-1003, 38-39.

III. THE '122 PATENT

A. Brief Description

The '122 patent is directed to “systems and methods for transmission announcement indication” in the context of “wireless network communications.” UBIQUITI-1001, Abstract, 1:13-15, 2:7-8. According to the '122 patent, a transmitting client station (STA) sends a transmission announcement (TxA) indication to a receiving client station to alert the STA that another transmission intended for the STA will follow. *Id.*, 4:49-53. The TxA indication “can be a bit inside a MAC header field, such as *the* HT-control field.” *Id.*, 5:15-16 (emphasis added to show that HT-control field was a known field inside MAC header). A TxA indication

could be present in “data frames, null frames, management frames, control frames, QoS frames, etc.” *Id.*, 6:1-3. In addition, the TxA indication can be sent with an request to send (RTS). *Id.*, 5:18-31. The ’122 patent contemplates the transmitting and receiving client stations to be part of an independent basic service set (IBSS). *Id.*, 4:9-14.

“The transmission indicated by the TxA indication could be a PHY header without MAC portion, which may also be referred to as a zero-length frame (ZLF) or Null Data Packet (NDP).” UBIQUITI-1001, 4:57-61. A ZLF may be transmitted to sound the channel. *Id.* Also according to the ’122 patent, the indicated transmission may start after “a short interframe space (SIFS).” *Id.*, 4:67-5:1. SIFS “is the minimum inter frame space.” *Id.*, 5:4. As was known in the art at the time, SIFS was used to “separate transmissions belonging to a single dialog.” *Id.*, 5:2-3; *see also* UBIQUITI-1006, [0085]; UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 40-44. The ’122 patent describes that the “transmission indicated by the TxA indication may start after the receiver sends a possible response frame to the frame where the TxA indication is included.” UBIQUITI-1001, 4:61-64.

For example, when using RTS, the transmission indicated is sent after the transmitter receives a clear to send (CTS) from the receiver. *Id.*, 5:18-31. This RTS/CTS implementation is illustrated by FIG. 3, reproduced below:

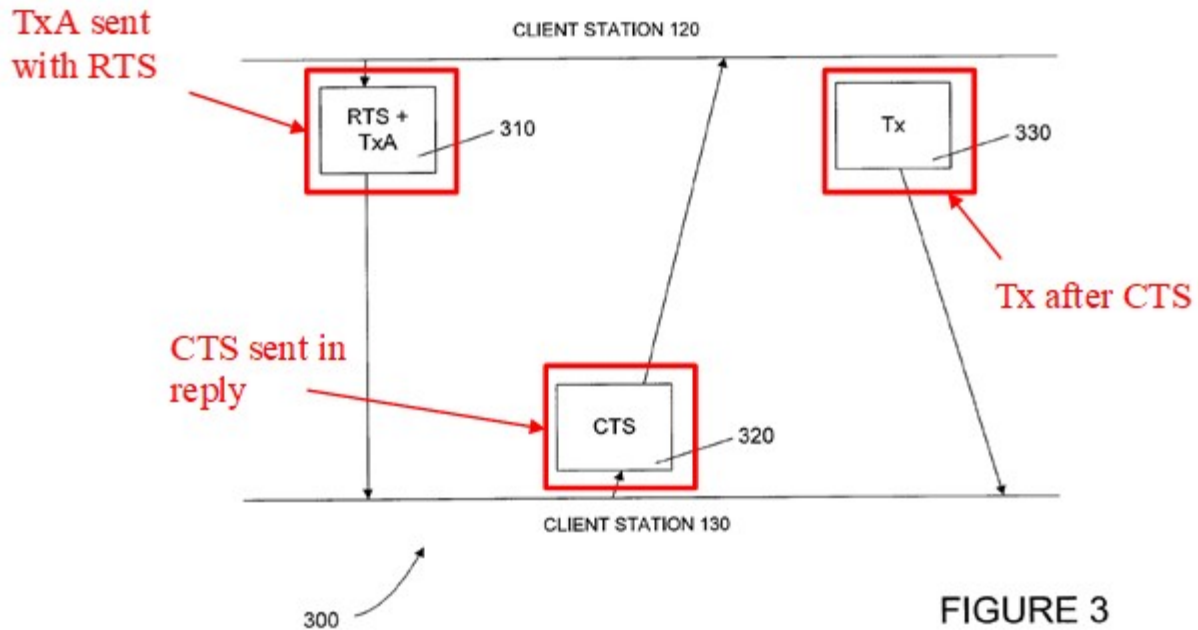


FIGURE 3

UBIQUITI-1001, FIG. 3 (annotated)

In this scenario, a POSITA would have recognized that the announced transmission (TX) was sent after a SIFS *following* the CTS. UBIQUITI-1003, 40-44.

The '122 patent also describes an embodiment where the TxA indication is included with a QoS-null, which is followed by a positive acknowledgement (ACK). UBIQUITI-1001, 5:32-44, FIG. 4. This embodiment is shown in Figure 4:

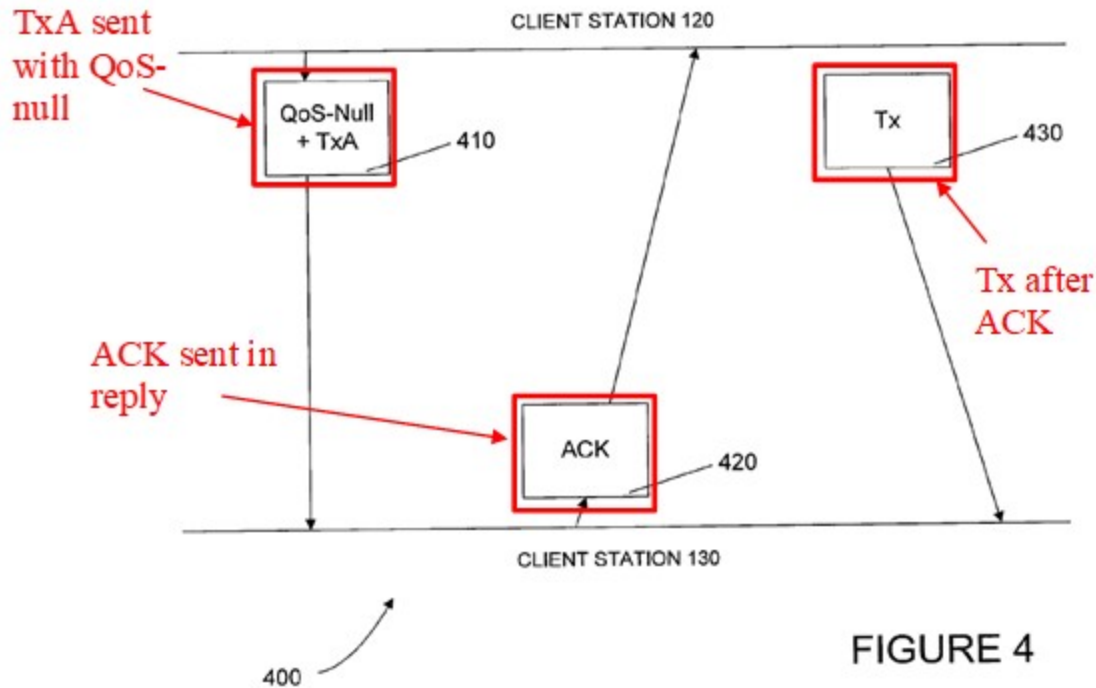


FIGURE 4

UBIQUITI-1001, FIG. 4 (annotated)

When using “a QoS-null with HT-control field,” for the TxA, the “ZLF follows within an SIFS for no ACK or SIFS after the ACK for immediate ACK.” UBIQUITI-1001, 6:19-23 (emphasis added).

B. Prosecution History

The '122 patent claims the benefit of priority to U.S. Provisional Patent Serial No. 60/762,425, filed on January 25, 2006. UBIQUITI-1001, face. The provisional includes an email identified as a disclosure of the claimed concepts on December 21, 2005. UBIQUITI-1005, 3.

The concept of ZLF Announcement was proposed by undersigned in an email to the EWC technical reflector on December 21, 2005:

UBIQUITI-1005, 3.

For the purposes of prior art, this Petition considers January 25, 2006 as the Critical Date. The prior art relied on herein predates both the Critical Date and the December 21, 2005 disclosure date.

During prosecution, the claims were rejected in view of Larsson. UBIQUITI-1002, 665, 560-561. Larsson teaches RTS/CTS and includes a SIFS period. *See, e.g.*, UBIQUITI-1006, [0087], FIG. 5. FIG. 5 shows the RTS/CTS scheme using SIFS:

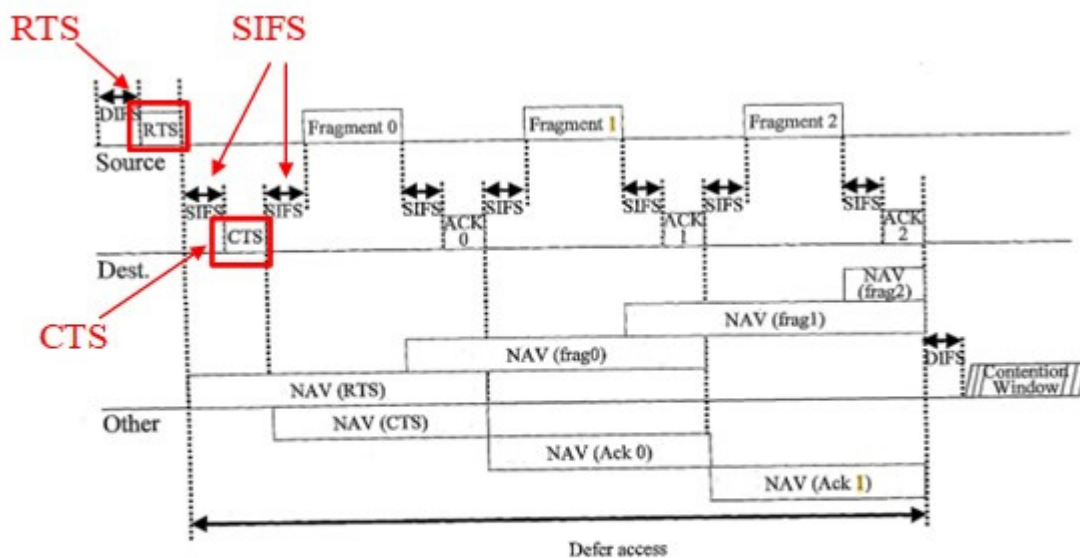


Fig. 5

UBIQUITI-1006, FIG. 5 (annotated)

Despite this teaching of SIFS in Larsson, the examiner erroneously allowed the claims after including SIFS in the independent claims. UBIQUITI-1002, 38-48 (describing examiner's amendment to include SIFS and allowability). The amendment is shown below:

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station, and wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

UBIQUITI-1002, 18 (annotated)

The examiner's amendment did not cancel dependent claims that recite that the TxA indication is transmitted with an RTS frame (e.g., claim 3) and the subsequent reception of a CTS frame (e.g., claim 4). *Id.*; *see, e.g.*, UBIQUITI-1003, 45-49. Likewise, the examiner's amendment did not cancel dependent claims that recite that the TxA indication is transmitted with a QoS-null frame (e.g., claim 6) and the subsequent reception of a positive acknowledgement (ACK) frame (e.g., claim 7). For these dependent claims to make sense, the SIFS limitation should be interpreted to include transmitting the second communication frame following a SIFS after receiving a CTS (e.g., claim 5) or ACK (e.g., claim 8). For example, for

RTS/CTS, three SIFS were discussed by the standard, as early as 1999. UBIQ-UITI-1010, §7.2.1; *see also* UBIQUITI-1009, FIG. 3-5 (showing SIFS for RTS/CTS):

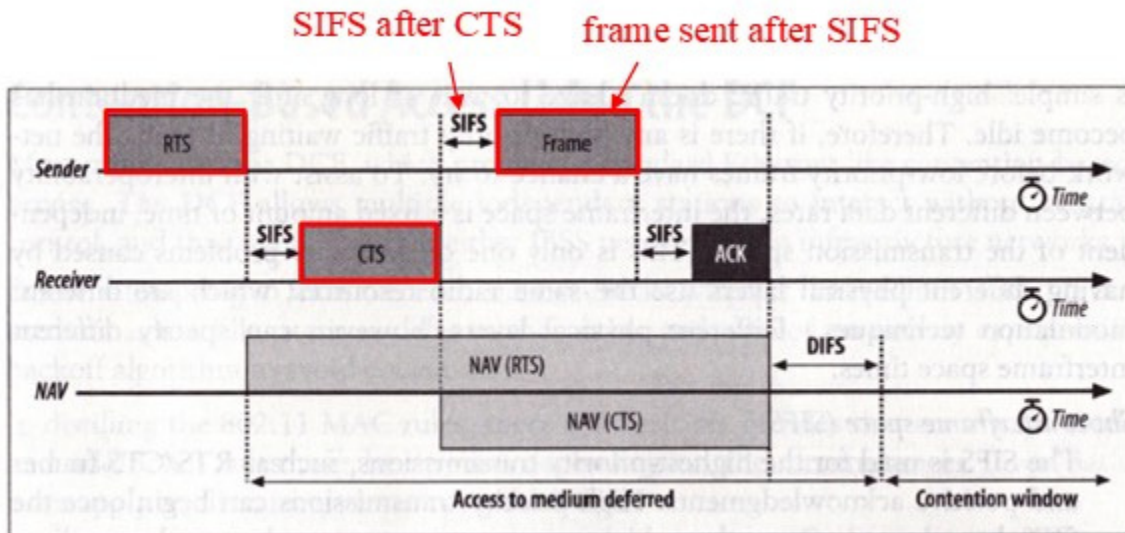


Figure 3-5. Using the NAV for virtual carrier sensing

UBIQUITI-1009, FIG. 3-5 (annotated)

For QoS-null frames, the 802.11e standard required a “Normal ACK” policy. *See, e.g.*, UBIQUITI-1020, §7.1.3.5.3. Therefore, a SIFS was required after the reception of the ACK, as per 802.11-1999 standard. UBIQUITI-1010, §9.2.3 (“SIFS *shall* be used for an ACK frame”) (emphasis added).

C. Claim Construction

All claim terms should be construed according to the Phillips standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.100. Based on the well-established principal that “claim terms need only be construed to the ex-

tent necessary to resolve the controversy,” express constructions are required to institute review and find the Challenged Claims unpatentable. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011).

“the second communication frame follows after a short interframe space (SIFS) after the first communication frame with the transmit announcement indication”

The term “the second communication frame follows after a short interframe space (SIFS) after the first communication frame with the transmit announcement indication” should be construed to have its plain and ordinary meaning in light of the specification. The plain and ordinary meaning is broad enough to encompass claimed embodiments in which the transmission indicated by the transmit announcement indication follows after a response to the frame with the transmit announcement indication. This construction is consistent with the intrinsic record, and is required for the dependent claims to make sense. UBIQUITI-1003, 50-60.

First, the ’122 patent specification expressly states that the “transmission indicated by the TXA indication may start after the receiver sends a possible response frame to the frame where the TXA indication is included.” UBIQUITI-1001, 4:61-64. But more generally, the ’122 patent states that the “indicated transmission may start after a short inter frame space (SIFS), but there is no strict requirement on the timing.” *Id.*, 4:67-5:2. SIFS is used to separate transmissions belonging to a single dialog. *See, e.g., id.*, 5:2-3; UBIQUITI-1006, [0087]; UBIQUITI-1010, §9.2.3. Examples of a “single dialog” include the request-to-send /

clear-to-send dialog and the QoS-null / ACK dialog, both of which are described below. *See, e.g.*, UBIQUITI-1009, 14 (describing RTS/CTS as an atomic operation).

For example, claims 3-5 (among others) recite the request-to-send (RTS) / clear-to-send (CTS) schema illustrated by Figure 3, reproduced below:

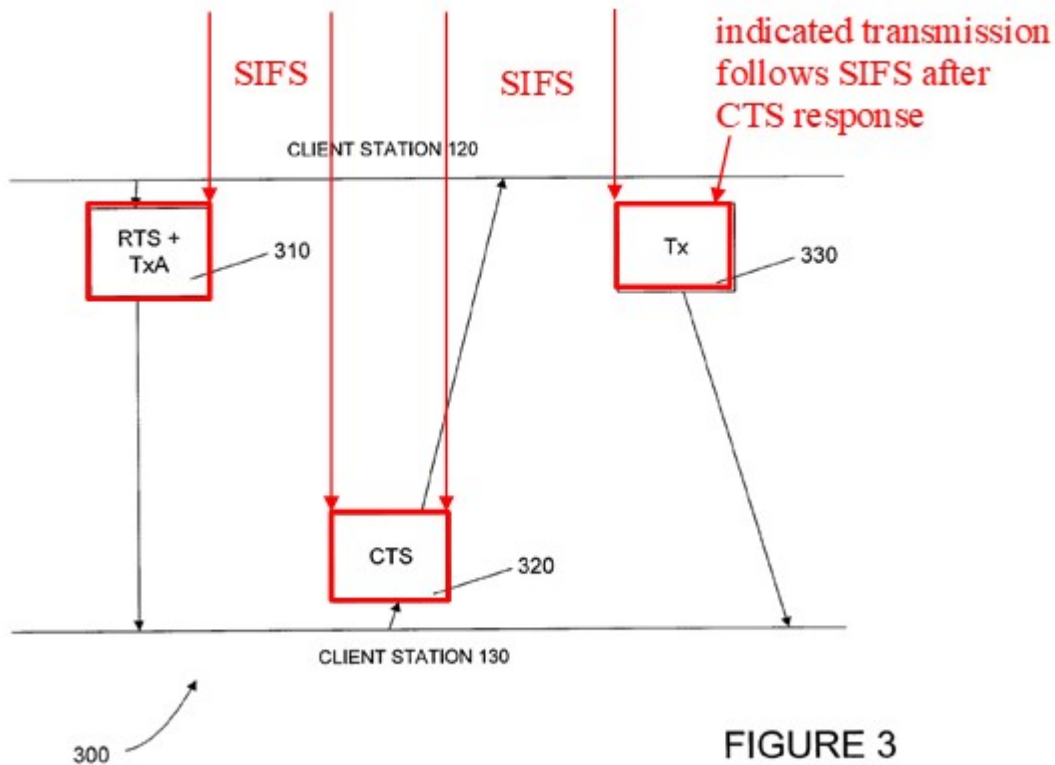


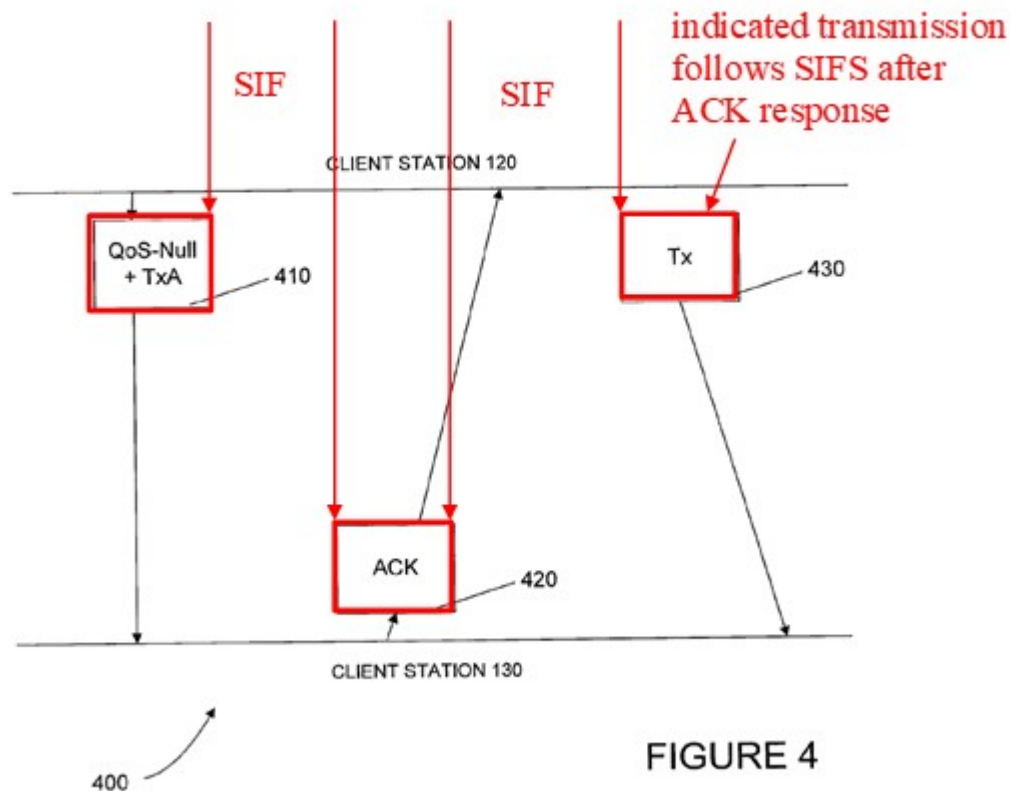
FIGURE 3

UBIQUITI-1001, Figure 3 (annotated)

In Figure 3, RTS and transmit announcement indication is followed by a CTS response, “after which the announced transmission from station 120 to station 130 follows.” UBIQUITI-1001, 5:21-29. As shown in Figure 3 above, to be consistent with independent claim 1 and dependent claims 3-5, the announced transmission

(TX in the figure) follows after a SIFS following the CTS, which is the response to the RTS frame carrying the transmit announcement indication. Note that SIFS is required for RTS/CTS under 802.11. *See, e.g.*, UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 37-39, 45-49, 50-60.

Likewise, claims 6-8 (among others) recite the QoS-null/ACK schema illustrated by Figure 4, reproduced below:



UBIQUITI-1001, Figure 4 (annotated)

Figure 4 represents an embodiment where a “QoS-null with TXA indication is followed by an acknowledgement (ACK) response, after which the announced transmission follows.” UBIQUITI-1001, 5:33-35. In FIG. 4, station 120 sends a QoS-

null with a TxA indication to station 130. *Id.*, 5:38-43. Station 130 sends an ACK in response to the QoS-null. *Id.* Station 130 receives the next transmission 430 as announced by the TxA indication. *Id.* To be consistent with independent claim 1 and claims 6-9, the announced transmission (TX in the figure) follows after a SIFS following the ACK, which is the response to the QoS-null frame carrying the transmit announcement indication. This interpretation is supported by the specification: “a QoS-null with HT-control field . . . is used to indicate that this is a TxA announcement [and] the ZLF follows . . . SIFS *after the ACK* for immediate ACK.” Note that SIFS is required for the ACK under 802.11. UBIQUITI-1010, §9.2.3. And that a QoS-null frame requires an ACK. *See, e.g.*, UBIQUITI-1020, §7.1.3.5.3; UBIQUITI-1003, 50-60.

“RTS frame”

The term “RTS frame” should be construed to include any frame that is used to initiate an RTS/CTS dialog. First, the ’122 patent does not restrict the RTS frame to a specific frame structure. Instead, the ’122 patent merely states that the RTS (also referred to as an RTS frame) and TxA indication “may be followed by a clear to send (CTS)” (also referred to as a CTS frame). UBIQUITI-1001, 5:21-23. The ’122 patent does not provide any restrictions as to how the TxA bit(s) would be included into the RTS frame. UBIQUITI-1003, 45-49, 61-63. At best, the ’122 patent states that the TxA “can be a bit inside the HT-control field,” UBIQUITI-

1001, 5:15-16. A POSITA would have known that, at the time, the 802.11n working group had contemplated redefining the original 802.11 MAC frame structure (including the RTS frame), such as by including an HT-control field. UBIQUITI-1003, 45-49, 61-63; UBIQUITI-1001, 2:22-33; UBIQUITI-1010, §§7.1.3-7.2.1.3; UBIQUITI-1011, 4:20-30, FIG. 3 (discussing HTC field and RTS+HTC frame). Indeed, without a clear teaching from the '122 patent, a POSITA would have known that an TxA bit would not be implemented as part of the existing RTS subtype frame since each bit of the original RTS frame was already used. UBIQUITI-1003, 45-49, 61-63; UBIQUITI-1010, §§7.1.2-7.2.3.1. For the claimed RTS embodiment to make sense to a POSITA, as the definition of the structure of an “RTS frame” was then in flux, the term “RTS frame” should therefore be construed broadly enough to include any frames that were used to initiate an RTS/CTS dialog. UBIQUITI-1003, 45-49, 61-63.

Construing RTS frame broadly to include a frame that initiates an RTS/CTS dialog was consistent with the understanding of 802.11 at that time. For example, Gu incorporates by reference a TGn Sync Proposal Technical Specification that indicates that the LAC frame becomes an RTS frame when the RTS flag is set. *See, e.g.*, UBIQUITI-1019, §6.2.1.2.1; UBIQUITI-1007, 2:7-9, 2:14-21 (LAC mask includes RTS field); UBIQUITI-1003, 61-63.

“CTS frame”

Claim 4, among others, recites “a clear to send (CTS) frame.” The term “CTS frame” should be construed to include any frame that is used to respond to an RTS as part of an RTS/CTS dialog. UBIQUITI-1003, 62. The ’122 patent merely states, “Station 130 sends CTS 320 in response to the RTS+TxA 310.” UBIQUITI-1001, 5:26-27. Indeed, in one claimed embodiment, the ’122 patent includes the TxA in a CTS frame. *See, e.g.*, UBIQUITI-1001, 5:49-51, cl.9. The ’122 patent does not provide any details as to how the TxA bit(s) would be included into the CTS frame. A POSITA at that time would have understood that the standardized CTS frame would not have included an HT-control field, nor any other fields available for adding the TxA. *See, e.g.*, UBIQUITI-1010, §§7.1.2-7.2.3.1; UBIQUITI-1003, 62. Instead, a POSITA would have understood that other frames serving as a CTS frame would have had to perform that function. *See, e.g.*, UBIQUITI-1019, §6.2.1.2.1; UBIQUITI-1007, 2:14-21 (LAC mask includes CTS field); UBIQUITI-1003, 45-49, 64.

“zero-length frame”

The term “zero-length frame” should mean a “PHY frame that does not include a MAC portion.” UBIQUITI-1003, 64. The inventor defined the term: “[T]he TxA indication could be *a PHY header without MAC portion, which may also be referred to as a zero-length frame (ZLF) or Null Data Packet (NDP).*”

UBIQUITI-1001, 6:18-25; *see also* UBIQUITI-1005, 3 (“a PHY header without MAC portion, which is also called a zero-length frame or ZLF.”).

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) relating to the subject matter of the ’122 patent as of January 25, 2006 would have had (1) at least a bachelor’s degree in computer science, computer engineering, electrical engineering, or a related field, and (2) at least two years of industry experience in wireless communications standards and/or product development. UBIQUITI-1003, 25-26. Additional graduate education could substitute for professional experience, and *vice versa. Id.*

IV. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. [GROUND 1A] – Claims 1-5, 16-20, 22-30, 38-41 are obvious in view of Gu & Trainin

1. Gu

Gu is titled, “Method for Selecting Antennas and Beams in MIMO Wireless LANs,” and claims the benefit of priority to PCT/US2005/042358 filed on November 21, 2005. Gu is directed to “selecting antennas and beams” in “multiple-input, multiple-output wireless local area networks.” *See, e.g.*, UBIQUITI-1007, 1:16-18. “To perform antenna/beam selection, the complete channel matrix is estimated by sending training (sounding) frames that enable the antenna selection station to measure the complete channel state information (CSI).” *Id.*, 1:40-47.

Gu was filed within the context of the development of the 802.11n standards. UBIQUITI-1007, 1:55-62 (describing WLAN IEEE 802.11n standard development). By July 2005, a proposal had been submitted to the Task Group n (“TGn”) of the IEEE 802.11 Wireless Local Area Networks (“WLAN”) working group describing a new link adaptation control (LAC) control frame for supporting MIMO training requests and exchange of link adaptation information. *Id.*, 1:55-2:9; UBIQUITI-1019. Gu incorporated by reference this proposal. UBIQUITI-1007, 2:7-9.

Gu describes the proposed structure for the LAC frame. *Id.*, Fig. 2, 2:14-21. Gu proposed an extension of the LAC frame that uses an antenna/beam selection indicator (ASI). *See, e.g.*, UBIQUITI-1007, 6:10-37. FIG. 5C illustrates the LAC frame structure:

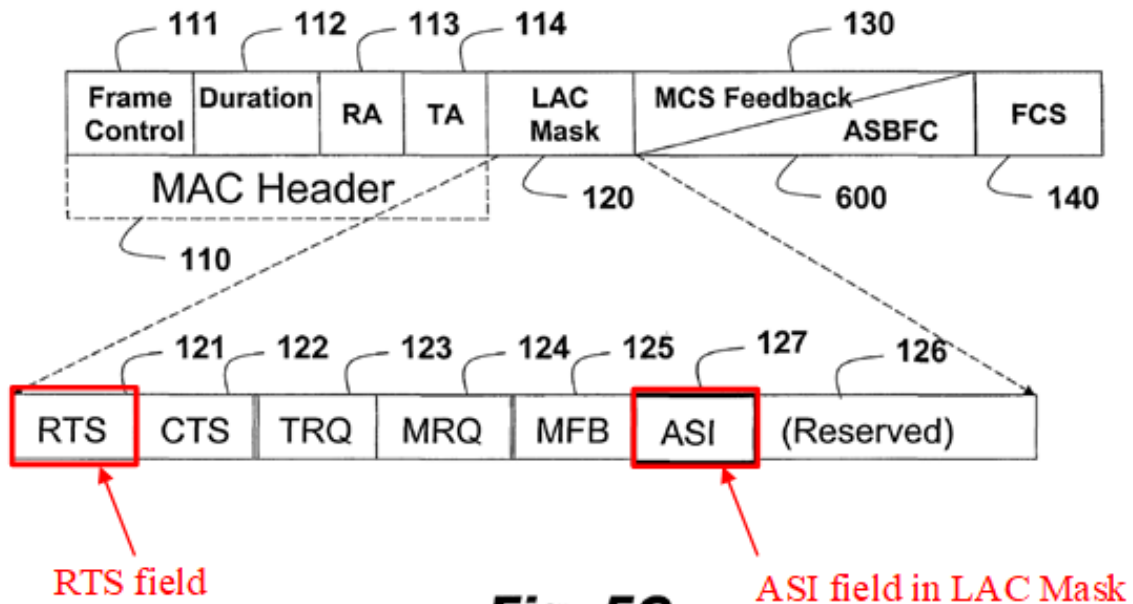


Fig. 5C

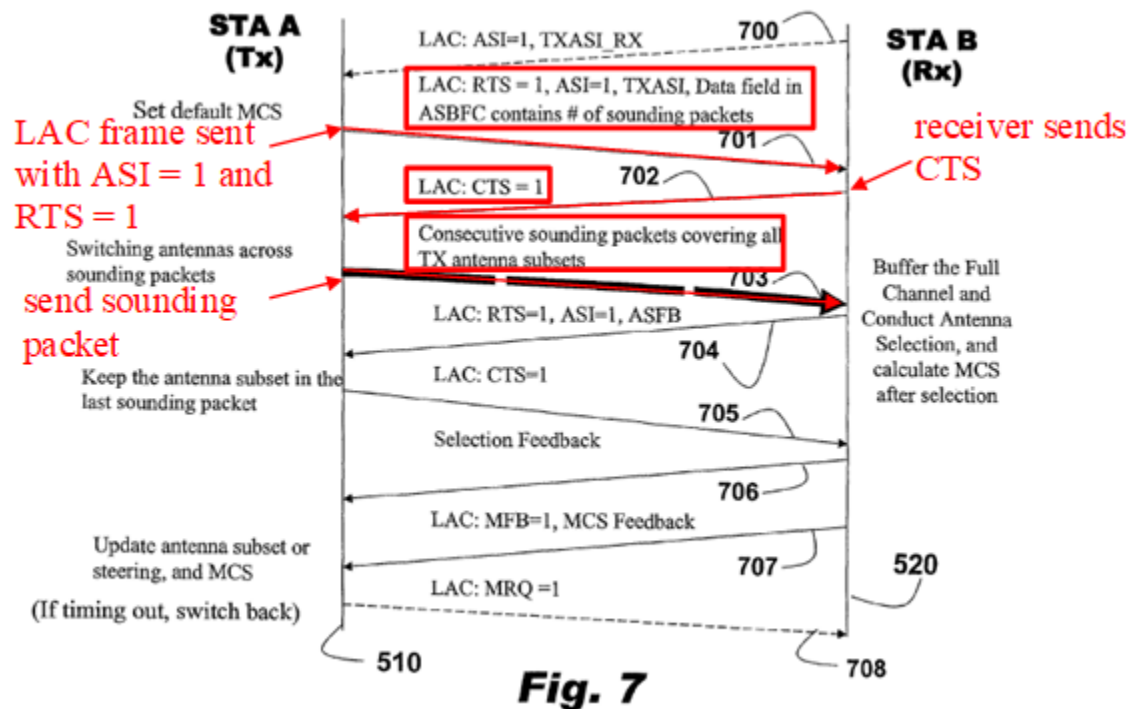
UBIQUITI-1007, FIG. 5C (annotated)

When the ASI bit 127 is set to 1 (and MFB is not set to 1), then field 130 is used for antenna/beam selection transmitter beam forming control (ASBFC). *See, e.g.,* UBIQUITI-1007, 6:11-17.

The ASBFC field 600 includes a command field and a data field. UBIQUITI-1007, 6:24-27. The command field specifies an antenna/beam selection command. *See, e.g., id.*, Table A. “The Data part of the field indicates the number of consecutive sounding packets that will be transmitted for training” *See, e.g., id.*, 7:49-51.

A sounding packet “is a specific PHY layer packet, which contains the training information for all the available data streams in the MIMO channel.” UBIQUITI-1007, 2:49-51. Gu describes that “the sounding packet can be limited to a preamble and header, and exclude any data” so as to “decrease the time required for sounding” by minimizing the size of the sounding packet. *Id.*, 5:9-12. A POSITA would have understood that the absence of data in the sounding packet meant that the sounding packet did not include an address for the receiver because it would include no MAC frame containing addresses. UBIQUITI-1003, 28-34, 70.

Gu’s FIG. 7 shows the details of the training method with LAC frame:



UBIQUITI-1007, FIG. 7 (annotated)

The transmitter (STA A) sets default MCS, and then “sends 701 a LAC frame with ASI=1 and the command TXASI . . . with RTS=1 in the LAC mask field 120” to the receiver (STA B). UBIQUITI-1007, 7:46-51. The receiver sends a LAC frame with CTS=1, which indicates that the receiver is ready for receive the sounding packets. *Id.*, 7:52-54. Upon receiving the LAC frame with CTS=1, the transmitter sends 703 consecutive sounding packets. *Id.*, 7:60-61. Gu teaches that the receiver estimates the channel matrix from the sounding packets and reports feedback to the transmitter. *Id.*, 5:13-15, 8:18-24. Gu teaches that the transmitting station receives feedback from the receiving station pertaining to the channel matrix and the antenna / beam selection, which the transmitter uses. *Id.*, 8:22-35.

Beyond this specific embodiment of a LAC frame, Gu describes that the “LAC functionality can be realized either by a single control frame defined as LAC, or the single control frame can be a High Throughput (HT) Control frame, or a HT-control Field can be incorporated into *any MAC layer frame*.” *See, e.g., id.*, 1:62-65 (emphasis added); *see also id.*, 2:22-35, 6:52-7:10, 13:5-18, FIG. 12. FIG. 12 is reproduced below:

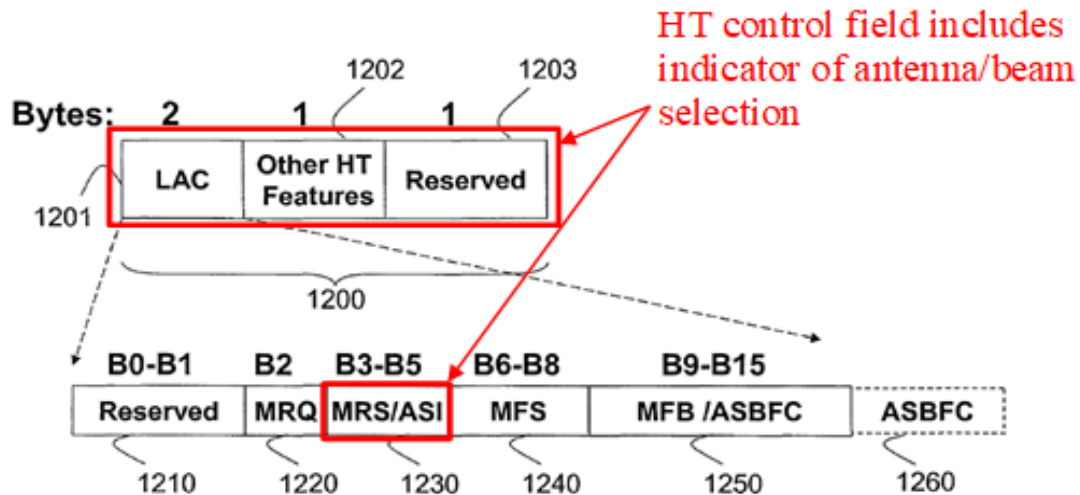
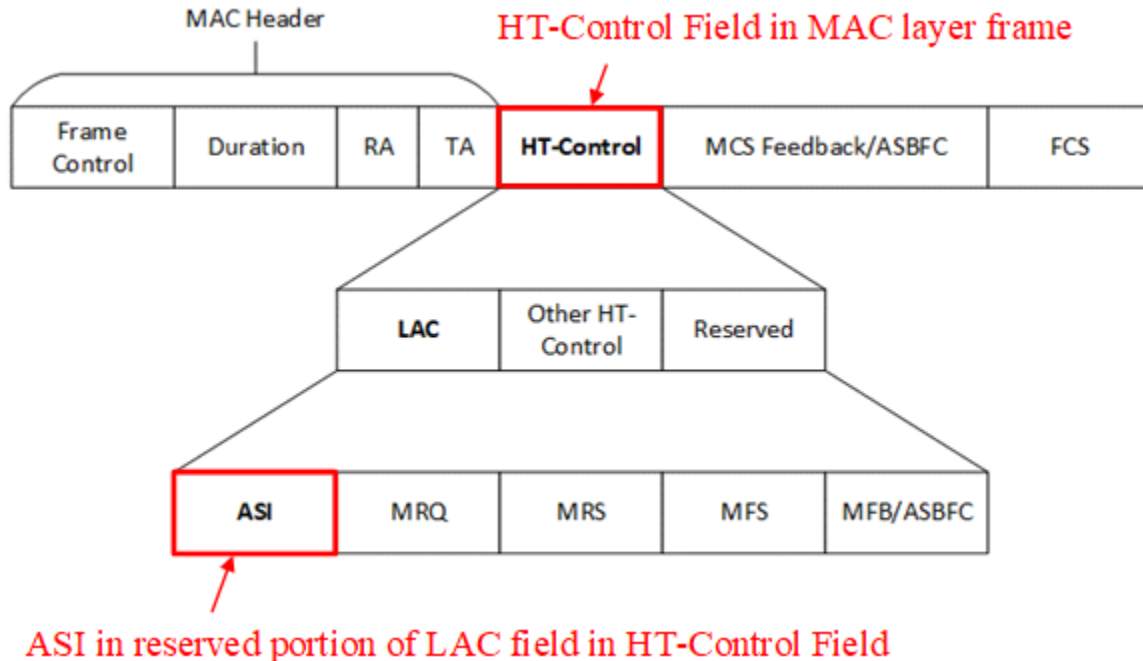


Fig. 12

In one example, when using the HT-control field instead of a LAC frame, in FIG. 7, “‘LAC’ should be replaced by ‘HT-control Field’; ‘ASI=1’ should be replaced by ‘MRS=111’ or ‘ASI = 1’ for the case ASI is used to indicate a reuse of the MFB field.” UBIQUITI-1007, 10:5-8, 7:1-3 (describing using “one reserved bit as ASI, either in the LAC field, or in one of the reserved portions in HT-control Field”). The resulting frame would be structured as follows:



UBIQUITI-1007, MAC Layer Frame with LAC functionality in HT-Control Field, UBIQUITI-1007, 1:60-65, 6:52-7:10, 10:4-8, FIGS. 5C, 7, 12; UBIQUITI-1003, 66-74.

Gu also teaches that the indication of “antenna/beam selection training frame” “can be used for any similarly defined signaling frame in a MAC layer that allows a fast communication between the transmitter and receiver.” UBIQUITI-1007, 13:6-10; *see also* UBIQUITI-1009, 16 (“The SIFS is used for the highest-priority transmissions, such as RTS/CTS frames and positive acknowledgements.”). When other MAC signaling is used, the communication frame need only include “one bit or bit combination is used to indicating an antenna/beam selection training frame, and any suitable field with a length of at least 7 bits in the control frame can be used for exchanging the selection training information.” UBIQUITI-1007, 13:9-12 (emphasis added). (In this way, Gu makes it clear that the ASI bit (or MRS definition)

is an **indication** of forthcoming sounding frames. UBIQUITI-1003, 72.)

Gu incorporates by reference UBIQUITI-1019. UBIQUITI-1007, 2:7-9.

UBIQUITI-1019 teaches that when the RTS flag is set in the LAC frame, the frame becomes an RTS frame. *See, e.g.*, UBIQUITI-1019, §6.2.1.2.1. In addition, UBIQUITI-1019 also discusses SIFS for various implementation purposes, including in the context of RTS/CTS. *Id.*, §7.1.5.1, 44:29-31.

2. Trainin

Trainin, titled, “Wireless Communication System, Associated Methods and Data Structures,” was filed on December 1, 2005. Trainin describes a wireless device and associated method “to establish a wireless communications channel with one or more remote device(s) by generating and/or receiving a protocol data unit(s) (PDU) including a control field including one or more of link adaptation control information.” UBIQUITI-1011, Abstract. Trainin teaches that “[p]erformance improvement in wireless communications systems may be achieved if the channel characteristics are known by the transmitter, or source, of a wireless communication signal.” *See, e.g.*, UBIQUITI-1011, 1:14-23. Trainin also describes that in a “MIMO (or, beamforming) system a data signal is modified by a beamforming matrix” that is “developed from information . . . fed back from a remote receiver.” *See, e.g., id.*, 3:4-32; *see also id.*, 2:67-3:3 (describing MIMO devices).

Trainin describes “a feedback generation mechanism” at a receiver station to

“support the communication of the channel state information” to a transmitter station. *See, e.g.*, UBIQUITI-1011, 3:39-42, 3:66-4:4. According to Trainin, “the feedback generation mechanism uses a data structure to “respond and/or convey channel state information, e.g., in support of dynamic link adaptation, beam forming, etc.” UBIQUITI-1011, 3:43-47.

Trainin describes that the data structure “may be implemented within the physical layer convergence protocol (PLCP), e.g., within PLCP protocol data unit(s) (PPDU).” *See, e.g.*, UBIQUITI-1011, 3:47-50. For example, Trainin describes a data structure with “an HT-control field [that] maybe included in any HT frame except a non-QoS Data frame.” *See, e.g., id.*, 4:19-25. “The presence of the HT-control field in frames carried in a HT physical layer convergence procedure (PLCP) protocol data unit (PPDU) may be indicated by setting an order bit in a MAC header.” *See, e.g., id.*, 4:22-26. Trainin also teaches that the HT-control field “is last in the MAC header.” *Id.*, 4:25-26. Included in the HT-control field is link adaptation control (LAC) information. *See, e.g.*, UBIQUITI-1011, 4:20-67 (B0-B15 of HT-control field for LAC). Tables reproduced below show the LAC definitions in the HT-control field:

30

TABLE

Example HT Control field format

35	B0-B15 Link Adaptation Control	B16-19 Calibration Control	B20-21 Feedback request	B22-31 Reserved
#Bits	16	4	2	10

40

TABLE

Link Adaptation Control field

	B0 XT	B1 TRQ	B2 MRQ	B3-B5 MRS	B6-B8 MFS	B9-15 MFB
45 #Bits	1	1	1	3	3	7

Subfields of the Link Adaptation Control Field May Include:

50

TABLE

Link Adaptation Control Subfields

Field	Meaning	Definition
XT	Extension	'1' = body of QOS data + HTC is used for calibration or CSI feedback.
55 TRQ	Sounding Request	'1' = Request to responder to transmit a sounding PPDU
MRQ	MCS Request	'1' = Request for MCS feedback
60 MRS	MRQ Sequence Identifier	Set by sender to any value in the range '000'-'110' to identify MRQ. Invalid if MRQ = '0'
MFS	MFB Sequence Identifier	Set to the received value of MRS. See note. Set to '111' for unsolicited MFB. Also, set to '111' when MFB is all-ones
MFB	MCS Feedback	Link adaptation feedback containing recommended MCS. Default "all-ones" value indicates no feedback or not available
65		

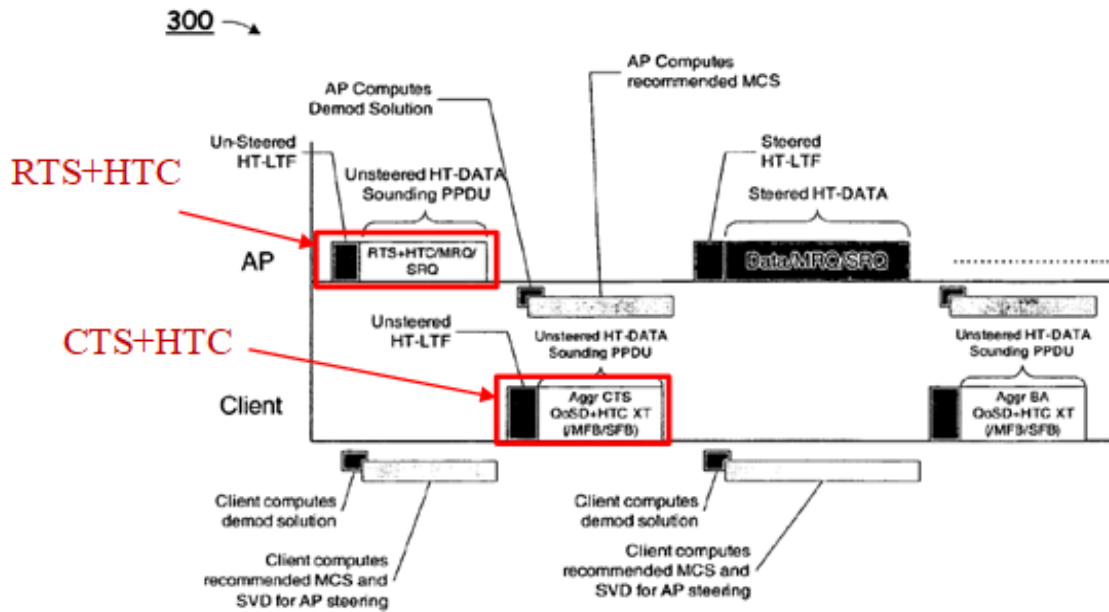
MRS = 111 undefined

UBIQUITI-1011, 4:30-67 (annotated)

Trainin teaches that the LAC field includes an MRS subfield, where MRS=111 is undefined. *Id.*, 4:30-67, above Table.

Among the frames that Trainin teaches as including an HT-control field is an RTS frame. *See, e.g.*, UBIQUITI-1011, FIG. 3. As shown in FIG. 3, a transmitter can send an RTS+HTC frame to a receiver:

FIG. 3



UBIQUITI-1011, FIG. 3 (annotated)

Trainin also teaches that the CTS frame includes an HT-control field. *Id.*

3. The Gu-Trainin Combination

Gu teaches the LAC functionality for indicating forthcoming PHY sounding frames is located in a LAC frame or in the HT-control field of any MAC layer frame. UBIQUITI-1003, 85-86.

In the combination, the HT-control field of Gu, which includes the LAC functionality for indicating forthcoming PHY sounding frames, is located in a MAC header field of any MAC layer frame, in a manner similar to that taught by Trainin. UBIQUITI-1003, 85-86.

In the combination, the HT-control field of Gu, which includes the LAC

functionality for indicating forthcoming PHY sounding frames, is located in a MAC header of an RTS frame, in a manner similar to that taught by Trainin. UBIQUITI-1003, 85-86.

4. Motivation to Combine Gu & Trainin

A POSITA would have been motivated to combine the teachings of Gu with those of Trainin to provide Gu with details for its embodiment including LAC functionality in the HT-control field. UBIQUITI-1003, 88-94. Gu teaches that the LAC field can be in the HT-control field of “any MAC layer frame.” UBIQUITI-1007, 1:62-65. But it does not provide complete details about the HT-control field or disclose specific MAC layer frames that may be useful with the HT-control field for indicating PHY sounding packets. UBIQUITI-1003, 88-94. A POSITA would have recognized that Gu’s teachings of transmitting an indication of the antenna / beam selection sounding frames would have benefited from details disclosed by Trainin. UBIQUITI-1003, 88-94.

A POSITA would have found it obvious to combine Gu and Trainin. UBIQUITI-1003, 88-94. First, both Gu and Trainin are in the same field of endeavor within the context of the development. UBIQUITI-1003, 88-94. Gu describes antenna / beam selection techniques for MIMO wireless LANs, and in particular, methods for indicating and transmitting sounding packets. *See, e.g.*, UBIQUITI-

1007, 1:16-54, 2:36-42, 3:44-4:4, *supra* [1.pre]-[1.4]. Likewise, the devices contemplated by Trainin are MIMO devices that perform beam forming using channel sounding techniques. *See, e.g.*, UBIQUITI-1011, 1:54-61, 2:67-3:31.

A POSITA would have had a reasonable expectation of success combining the indication of PHY sounding of Gu with the HT-control field of Trainin because Trainin also teaches a MAC header with an HT-control field that has a LAC field. UBIQUITI-1011, 4:30-67; UBIQUITI-1003, 88-94. Trainin's LAC field includes an MRS subfield, where MRS=111 is undefined. UBIQUITI-1011, 4:30-67; *see also* UBIQUITI-1007, 6:64-67. Therefore, a POSITA would have been able to define the MRS=111 as the indication of PHY sounding packets, as taught by Gu, into the LAC field of Trainin without any undue experimentation. UBIQUITI-1003, 90. And since Trainin also teaches that the HT-control field is included in "any" HT frame, a POSITA would have understood that the ASBFC payload could have been encoded into the frame body. UBIQUITI-1003, 90. Gu also teaches reuse of the existing MRS field for ASI. *See, e.g.*, UBIQUITI-1007, 6:10-23, 10:4-8; UBIQUITI-1003, 88-94. Thus, a POSITA would have had a reasonable expectation of success reusing the MRS field of either Gu or Trainin to define an ASI bit as an indication of forthcoming PHY sounding frames. *See, e.g.*, 6:10-23; UBIQUITI-1003, 88-94. A POSITA would have found it obvious to implement new functionality by providing a new meaning to reserved bits in a MAC header field.

UBIQUITI-1003, 88-94.

In addition, a POSITA would have reasonable expectation of success implementing the HT-control field in the header of any MAC frame in Gu. UBIQUITI-1003, 88-94. Both Gu and Trainin teach a MAC frame with an HT-control field and LAC functionality. *See, e.g.*, UBIQUITI-1007, 5:51-67, FIGS. 5C, 12; UBIQUITI-1011, 4:19-30. Gu does not specify where the HT-control field is located. A POSITA would have turned to other teachings to identify where the HT-control field bits were in the MAC frame so that they would be decoded accurately. UBIQUITI-1003, 88-94. The MAC frame's payload in Gu was occupied by other information, UBIQUITI-1007, 6:15-16, so a POSITA would have found it obvious to include the HT-control field in the MAC header. UBIQUITI-1003, 93. Adding the HT-control field to the MAC header would have been met with a reasonable expectation of success because that was a bit encoding that was an available and accepted option for constructing the MAC layer frame. UBIQUITI-1003, 88-94; UBIQUITI-1020.

A POSITA would have expected to be successful in adding a field to existing MAC frame headers to support important new functionality like this. UBIQUITI-1003, 88-94. For example, the IEEE 802.11e standard previously successfully incorporated a new "QoS Control" field in the MAC header to support important quality of service (QoS) requirements for the transport of voice, audio, and

video. 802.11e, §§1.2, 7.2.2, FIG. 22; UBIQUITI-1003, 88-94. A focus of the 802.11n working group was modifications to the MAC layer for “supporting MIMO training requests and exchange of link adaptation information.” UBIQUITI-1007, 1:57-62. Thus, as Gu recognizes, by the time of its filing, the addition of an HT-control field to MAC frames (and specifically, MAC headers) to support link adaptation training had already been proposed. *Id.* 2:22-33, 6:64-67 (“prior art HT-control field”); UBIQUITI-1003, 88-94; *see also* UBIQUITI-1011, 4:20-23 (describing that “an HT-control (HTC) field may be included in any HT frame except a non-QoS Data frame”).

A POSITA would have also found it obvious that the “any MAC layer frame” of Gu could specifically be an RTS frame, as taught by Trainin. UBIQUITI-1003, 88-94. A POSITA would have found it obvious to include the transmit announcement indication (ASI bit) of Gu in “any MAC layer frame,” such as an the well-known RTS frame subtype. UBIQUITI-1011, FIG. 3; UBIQUITI-1010, §§7.1-7.2.1.3; UBIQUITI-1009, 36-37; UBIQUITI-1003, 88-94. A POSITA would have recognized an RTS frame to be a well-known MAC layer frame. *See, e.g.*, 802.11, 1999 at 36 (Table 1); UBIQUITI-1003, 88-94. First, Gu already contemplates using RTS/CTS in its antenna/beam selection method. *See, supra*, [3]. Given that Gu already contemplates using RTS/CTS for its antenna/beam selection method, a POSITA would have found it obvious to modify an RTS subtype frame

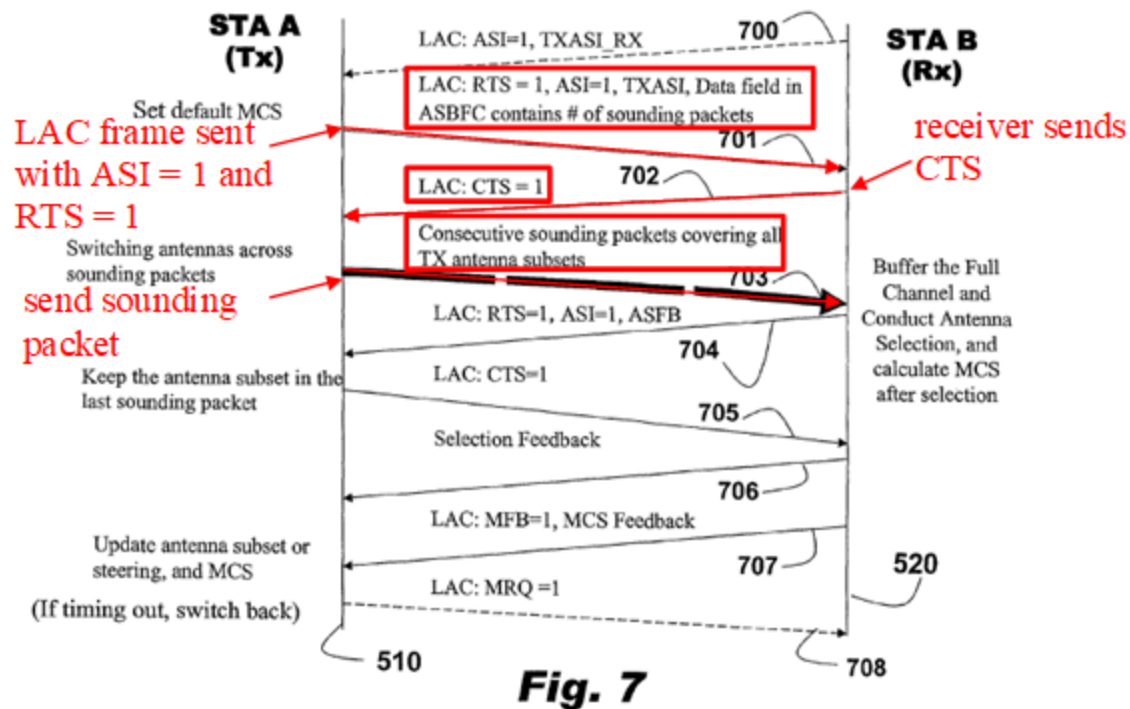
of “any MAC layer frame” to include an HT-control field, as described expressly by Gu. UBIQUITI-1003, 88-94. Gu provides motivation for this modification by an explicit instruction to modify any MAC layer frame. See, e.g., UBIQUITI-1007, 1:62-65, 13:5-18. Trainin likewise teaches that the HT-control field can be in the MAC header of any MAC frame. See, e.g., UBIQUITI-1011, 4:19-29; UBIQUITI-1003, 88-94. Considering the teaching of both Gu and Trainin, a POSITA would have had a reasonable expectation of success including the LAC functionality with the indication of PHY sounding packets of Gu in the RTS+HTC frame of Trainin. UBIQUITI-1003, 88-94.

Gu further teaches that the ASI bit “indicating an antenna/beam selection training frame” can be used in “any similarly defined signaling frame in a MAC layer that allows a fast communication between the transmitter and receiver.” UBIQUITI-1007, 13:6-8. A POSITA would have recognized an RTS frame to be a “highest-priority” transmission. See, e.g., UBIQUITI-1009, 17; UBIQUITI-1003, 88-94. Accordingly, a POSITA would find RTS to be an ideal candidate for Gu’s teaching have and would have found it obvious from the teachings of Gu to include an HT-control field in an RTS frame, as described expressly by Gu. UBIQUITI-1003, 88-94.

5. Analysis

[1.pre]

In the combination, Gu teaches a transmit antenna/beam selection training method. *See, e.g.*, UBIQUITI-1007, 3:44-46, 4:1-4, 7:11-67, FIG. 7. In a specific embodiment, “Figure 7 shows the details of the training method with [fast link adaptation control] LAC frame according to an embodiment of the invention.” *Id.*, 7:38-39; *also id.*, 4:23-25. Gu’s FIG. 7 shows the details of the training method with LAC frame:

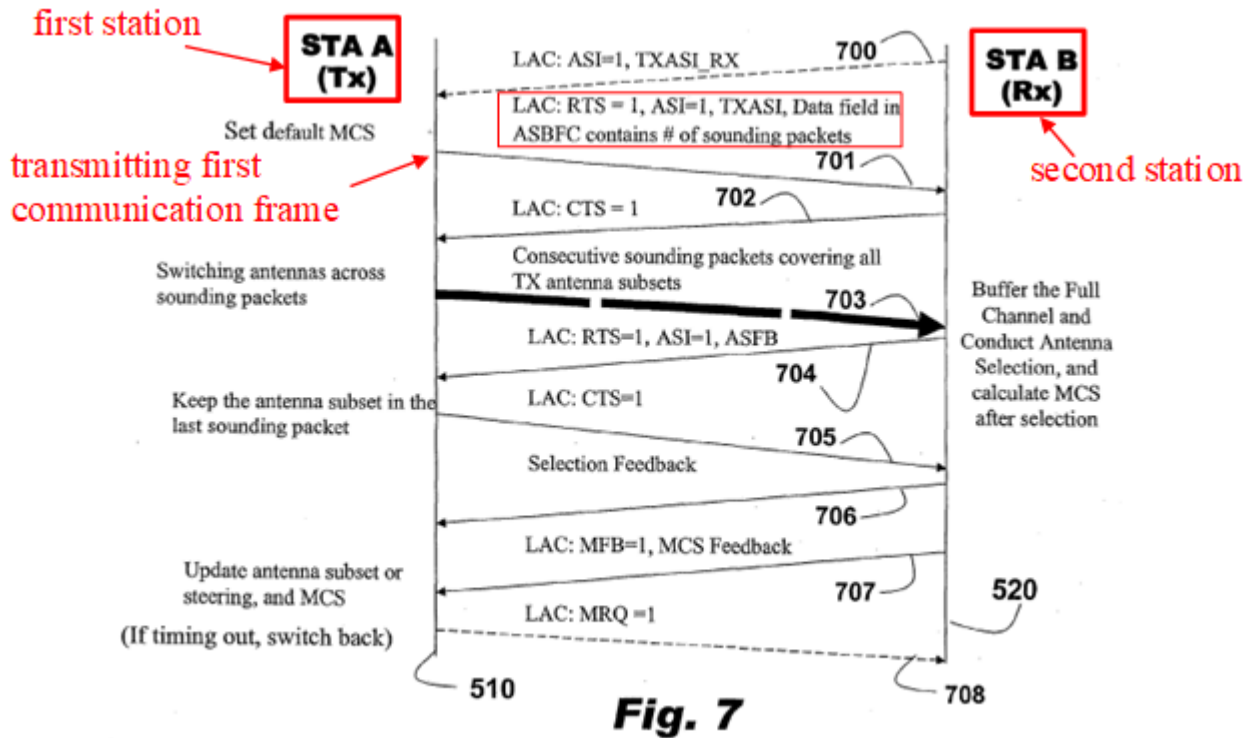


UBIQUITI-1007, FIG. 7 (annotated)

In addition, or in the alternative, in the combination, Gu expressly teaches that the indication of at least one antenna/beam selection training frame can be realized by an HT-control Field in “any MAC layer frame,” and the “extension to training using the HT-control field is straightforward.” UBIQUITI-1007, 1:62-65, 10:4-5. In the context of FIG. 7 above, “‘LAC’ should be replaced by ‘HT-control Field’; ‘ASI=1’ should be replaced by ‘MRS=111’ or ‘ASI=1’ for the case ASI is used to indicate a reuse of the MFB field.” UBIQUITI-1007, 10:4-8. Thus, Gu expressly teaches a transmit antenna / beam selection training method that uses “any MAC layer frame,” where the LAC functionality is encoded in the HT-Control Field.

[1.1]

In the combination, Gu describes transmitting a first communication frame (LAC frame or any MAC layer frame) from a first station (STA A) to a second station (STA B). Specifically, Gu teaches that the transmitter “sends 701 a LAC frame with ASI = 1 and the command TXASI.” UBIQUITI-1007, 7:46-51. “The Data part of the field indicates the number of consecutive sounding packets that will be transmitted for training, with RTS = 1 in the LAC mask field 120.” *Id.*



UBIQUITI-1007, FIG. 7 (annotated)

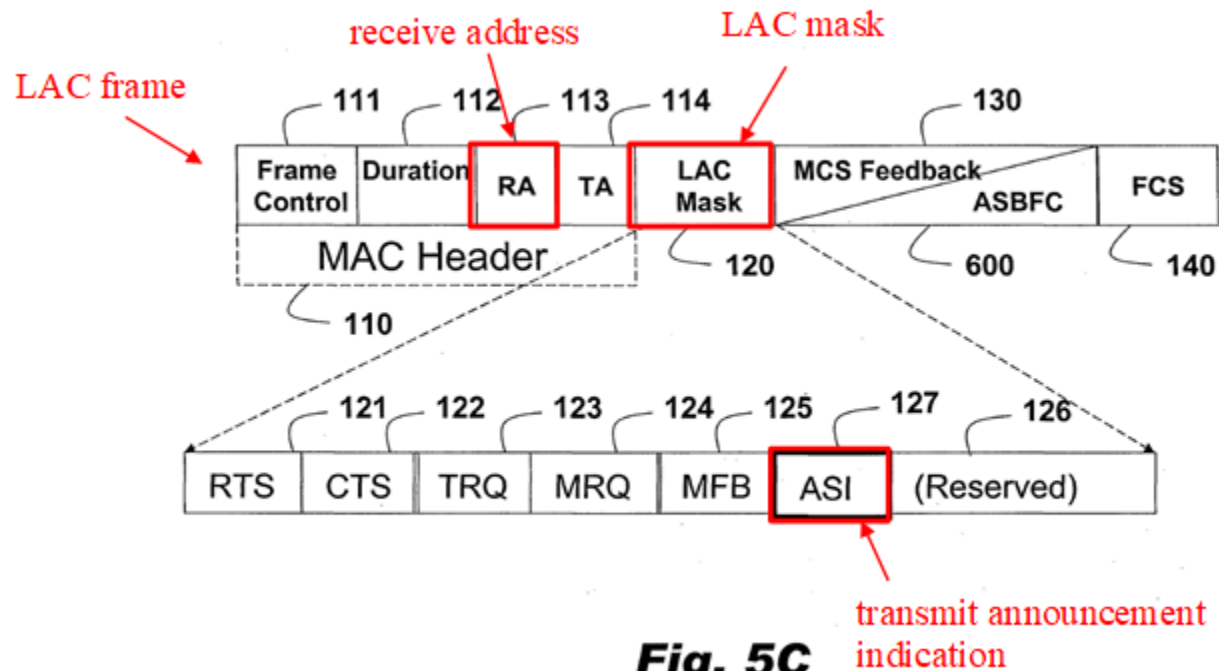
The LAC frame is shown in [1.2], *infra*.

For “any MAC layer frame,” in FIG. 7 above, “‘LAC’ should be replaced by ‘HT-control Field’; ‘ASI=1’ should be replaced by “MRS=111” or ‘ASI=1’ for the case ASI is used to indicate a reuse of the MFB field.” UBIQUITI-1007, 10:4-8.

[1.2]

In the combination, Gu’s transmitter sends a first communication frame (LAC frame or any MAC layer frame). The LAC frame includes a receive address (RA) 113 (address of the second station). According to Gu, “The LAC frame supports control of MIMO training requests and exchange of link adaptation infor-

mation.” UBIQUITI-1007, 2:10-11. “Figure 5C shows the structure of a link adaptation control (LAC) frame according to an embodiment of the invention.” UBIQUITI-1007, 6:10-12. Figure 5C is shown below:



UBIQUITI-1007, FIG. 5C (annotated)

The LAC frame includes a receive address (RA) 113. The receive address (RA) 113 is the address of the second station. UBIQUITI-1003, 100-103.

The transmit announcement indication is the ASI field 127. *See, e.g.*, UBIQUITI-1003, 100-103; UBIQUITI-1007, 7:46-54. When ASI is set to 1, then field 130 is used for antenna/beam selection/transmitter beam forming control (ASBFC). UBIQUITI-1007, 6:14-18. Thus, the ASI bit set to 1 indicates to the second station to expect sounding packets. UBIQUITI-1003, 100-103.

The LAC mask has an ASBFC Command 610 and a Data portion 620, as

shown in FIG. 6 below:

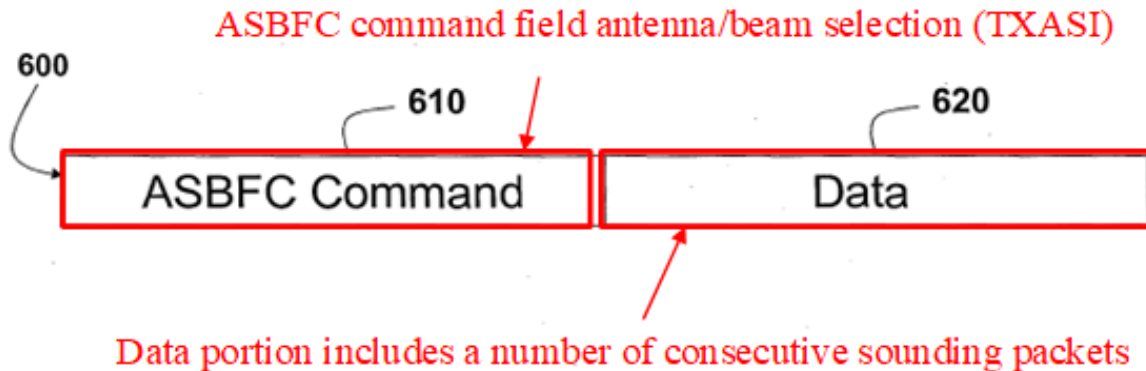
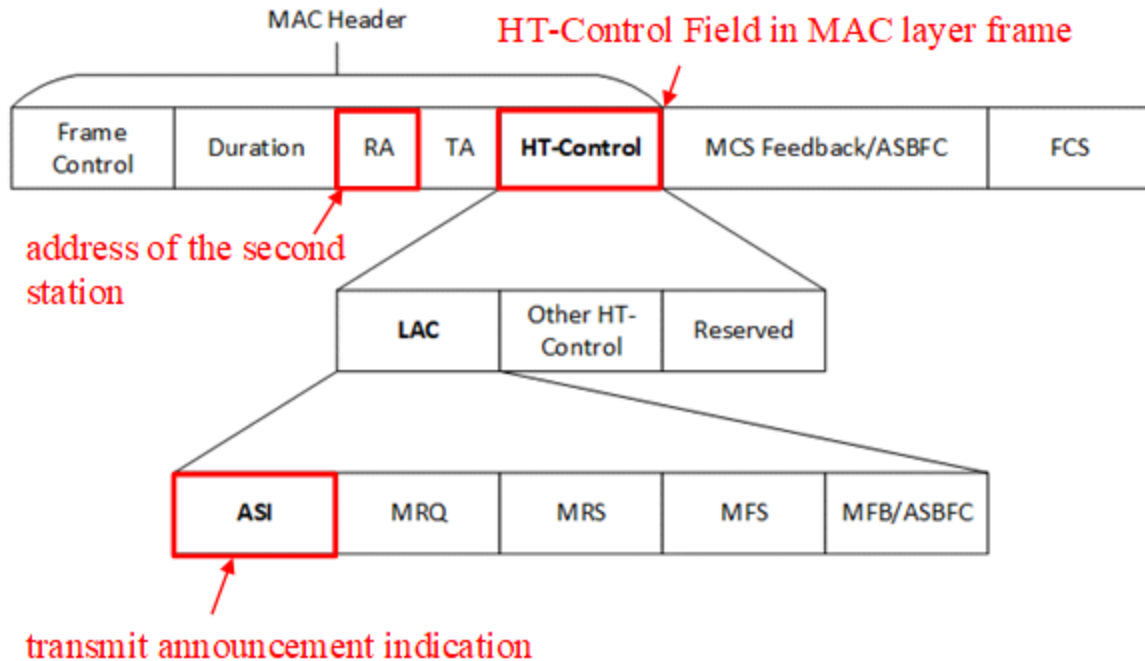


Fig. 6

UBIQUITI-1007, FIG. 6 (annotated).

When ASI is set to 1, the second station (STA B) decodes the ASBFC field, which indicates how many consecutive sounding packets that are forthcoming. *See, e.g.*, UBIQUITI-1007, 6:9-11, 6:14-18, 6:44-46, 7:46-54; UBIQUITI-1003, 100-103. Therefore, ASI set to 1 is a transmit announcement indication indicating that one or more second communication frames intended for the second station will follow the first communication frame. UBIQUITI-1003, 100-103; UBIQUITI-1007, 6:9-11. The data portion of the ASBFC field indicates the number of multiple consecutive sounding packets that the second station will receive. *See, e.g.*, UBIQUITI-1007, 6:9-11, 6:14-18, 6:44-46, 7:46-54.

For any MAC layer frame, the first communication frame can include the following frame structure:



UBIQUITI-1007, MAC Layer Frame with LAC functionality in HT-Control Field, UBIQUITI-1007, 1:60-65, 6:52-7:10, 10:4-8, FIGS. 5C, 7, 12; UBIQUITI-1003, 100-103.

The ASI is set to 1 when reusing the MFB field for the ASBFC. UBIQUITI-1007, 10:4-8. Alternatively, the MRS field set to 111 provides the same indication. *Id.*

The Frame Control field can indicate the RTS subtype. *See, e.g.*, UBIQUITI-1009, 19-20, 36-37; UBIQUITI-1003, 100-103.

[1.3]

In the combination, Gu's teachings render [1.3] obvious. First, the ASI bit being set indicates to the second station (STA B) that a second communication frame (a sounding frame) intended for the second station will follow the first communication frame (the LAC frame or any MAC layer frame). *See, supra*, [1.2]. It would have been obvious to a POSITA from the teachings of Gu that the ASI bit

acting as a transmit announcement indication indicates that the second communication frame will not include the address of the second station (STA B). UBIQUITI-1003, 104-107.

First, as already discussed, the ASI bit being set indicates to the second station to expect sounding packets. *See, supra*, [1.2]. In addition, Gu expressly teaches that the sounding packets can be PHY packets that are limited to a preamble and header without data. *See, e.g.*, UBIQUITI-1007, 5:11-12 (“For example, the sounding packets can be limited to a preamble and a header, and exclude any data.”). A POSITA would have understood that a PHY packet without data would include a PHY header but not include a MAC portion, which is the portion of the packet that included the receiver address. *See, e.g.*, UBIQUITI-1010, §7.3.3.6; *see also*, UBIQUITI-1007, FIGS. 1, 5C; UBIQUITI-1003, 104-107; *see also* UBIQUITI-1001, 4:57-60 (describing a “PHY header without MAC portion . . . may also be referred to as a zero-length frame or Null Data Packet (NDP)). First, because Gu already alerts the second station of sounding, an address is not needed in the sounding packets. UBIQUITI-1003, 104-107. In addition, Gu teaches that such sounding packets (without data) are advantageous for decreasing the time required for sounding by minimizing the size of the sounding packet. UBIQUITI-1007, 5:9-12.

Next, Gu expressly teaches that the sounding packets are PHY layer packets

that are “limited to a preamble and header, and exclude any data.” UBIQUITI-1007, 5:11-12. A POSITA would have understood that a PHY layer packet without a data portion would have excluded a MAC portion, which included the receiver address. UBIQUITI-1003, 104-107. Thus, Gu describes an embodiment where sounding packets are zero-length frames. UBIQUITI-1003, 104-107; UBIQUITI-1007, 9:24-25 (“If the sounding packets contain no data, which is an alternative option”). A POSITA would have understood that in Gu’s embodiment where only zero length frames are transmitted for sounding, the ASI bit set indicates that the sounding packets are zero-length frames, which naturally do not include the address of the receiver. UBIQUITI-1003, 104-107. Sounding frames employ a format that is known to both the transmitter and the receiver, typically as described in a standard. UBIQUITI-1003, 104-107. The transmitter will transmit the sounding frames according to the standard format, and the receiver will use its understanding of the format for interpreting the signals in the received sounding frame. UBIQUITI-1003, 104-107. Thus, the expectation of receiving zero-length frames for sounding could be understood by both the transmitter and receiver from the ASI bit being set. UBIQUITI-1003, 104-107.

In addition, or in the alternative, the “indication” of elements 1.2 and 1.3 is printed matter and the meaning of this indication is not material to patentability.

See IOENGINE, LLC v. Ingenico Inc., 100 F.4th 1395, 1404 (Fed. Cir. 2024)

(printed matter includes “any information claimed for its communicative content, regardless of medium”); *Samsung Bioepis Co. Ltd., v. Regeneron Pharmaceuticals, Inc.*, IPR2023-00442, Paper 55, 19-25 (June 14, 2024); *CR Bard Inc. v. AngioDynamics, Inc.*, 979 F.3d 1372, 1381 (Fed. Cir. 2020); *AstraZeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1064 (Fed. Cir. 2010); *In re Distefano*, 808 F.3d 845, 848 (Fed. Cir. 2015). The “indication” is “matter claimed for what it communicates.” *In re Distefano*, 808 F.3d at 850. Specifically, the indication communicates information about the meaning of a subsequent frame. Second, there is no “functional or structural relation to the substrate.” *Id.* The “indication” “merely informs people of the claimed information [and does not] interact[] with the other elements of the claim to create a new functionality in a claimed device or to cause a specific action in a claimed process.” *Id.* The claim does not require the second station to perform any new behavior or take any specific action after learning about the contents of a second frame. UBIQUITI-1003, 107; *see Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1376 (Fed. Cir. 2001) (language “is only a statement of purpose and intended result” where its “expression does not result in a manipulative difference in the steps of the claim”). Any such behavior that the applicant contemplated is unclaimed.

For claim 1 (and the other independent claims), what matters to patentability is that the second communication frame is a ZLF (e.g., a PHY frame without MAC

portion) and does not include the address of the second station. In Gu, the second communication frame (sounding packet) meets the definition of a ZLF because it teaches an embodiment where sounding packets are PHY frames without a data (e.g., MAC) portion. *See, e.g.*, UBIQUITI-1007, 5:11-12; UBIQUITI-1003, 107. When the second station (STA B) receives the first communication packet (LAC frame in Gu), the second station expects to receive one or more of these sounding packets, which will not include the address of the second station. UBIQUITI-1003, 107.

[1.4]

Gu teaches or renders obvious [1.4]. UBIQUITI-1003, 108-111. In Gu, the LAC frame is transmitted with a request-to-send (RTS) field set. *See, e.g.*, UBIQUITI-1007, 7:46-51, FIG. 5C (RTS 121), FIG. 7 (701 LAC: RTS=1, ASI=1). In response, the second station (STA B) transmits a clear-to-send (CTS) message. *See, e.g., id.*, 7:52-54, FIG. 7 (702 CTS=1). After receiving the CTS=1, “the transmitter sends 703 consecutive sounding packets.” *Id.*, 7:60-63, FIG. 7 (703 consecutive sounding packets).

Because Gu uses RTS/CTS, a POSITA would have known or found it obvious to separate transmissions belonging to the link adaptation dialog using SIFS. *See, e.g.*, UBIQUITI-1006, [0085]; UBIQUITI-1003, 109. Using SIFS in the

RTS/CTS dialog was a well-known, standard practice at the time. *See, e.g.*, UBIQUITI-1006, [0085], UBIQUITI-1010, §9.2.3 (“The SIFS shall be used for . . . a CTS frame”); UBIQUITI-1009, 16-17; UBIQUITI-1003, 109; *Koninklijke Philips NV v. Google LLC*, 948 F. 3d 1330, 1337 (obviousness analysis requires an assessment of background knowledge possessed by a POSITA). Specifically, it was well-known at the time that “SIFS is used for the highest-priority transmissions, such as RTS/CTS frames” UBIQUITI-1009, 16. Thus, a POSITA would have known that the sounding packets (second communication frame) are transmitted after a SIFS following the CTS response to the transmission of the LAC frame (the first communication frame) indicating RTS. UBIQUITI-1003, 50-60, 109.

A POSITA would have also found it obvious to use SIFS for transmitting the second communication frame when the ASI transmit announcement indication was encoded in any MAC layer frame. UBIQUITI-1003, 50-60, 110. As mentioned already, SIFS was a well-known, standard practice at the time. *Id.* Specifically, it was standardized that “SIFS ***shall*** be used when STAs have seized the medium and need to keep it for the duration of the frame exchange sequence to be performed.” UBIQUITI-1010, §9.2.3 (emphasis added). Here, it would have been obvious to a POSITA that the multiple consecutive sounding packets would have

been transmitted after a SIFS following the “MAC layer frame” so that the antenna/beam selection procedure could be completed before another STA would sense the medium and vie for channel contention. UBIQUITI-1003, 110.

In addition, Gu teaches that the “invention can be used for any similarly defined signaling frame in a MAC layer that allows a fast communication between the transmitter and receiver.” UBIQUITI-1007, 13:6-8. “Preferably, the sounding packets are transmitted with a relatively short delay.” UBIQUITI-1007, 5:8-9. Thus, a POSITA implementing such MAC layer signaling would have found it obvious to transmit sounding packets following a SIFS, which a POSITA would have known was “the shortest of the interframe spaces.” UBIQUITI-1010, §9.2.3; UBIQUITI-1003, 111. Thus, the general embodiment where Gu encodes the transmit announcement indication in “any MAC layer frame,” a POSITA would have found it obvious to transmit sounding packets after a SIFS. UBIQUITI-1003, 37, 50-60, 111.

[2]²

² Should the Board determine that this limitation requires that the “indication” itself be a ZLF, claims 2 and similar claims 12, 17, 28, 35, and 39 are indefinite.

The first communication frame cannot include an address of the second station (as

Gu teaches that the frames indicated by the transmit announcement indication comprise zero-length frames because the sounding packets are PHY layer packets that do not include a MAC portion. *See, e.g.*, UBIQUITI-1001, 4:57-60 (defining a ZLF as “a PHY header without MAC portion”); UBIQUITI-1007, 2:49, 5:11-12 (describing the sounding packets as “a specific PHY layer packet” that “can be limited to a preamble and header, and exclude any data”); UBIQUITI-1003, 112.

[3]

See, supra, [1.1]-[1.4]. First, under the Petitioner’s proposed construction of an RTS frame, in the combination, Gu teaches a LAC frame with an RTS field set for transmitting the ASI bit (transmit announcement indication). UBIQUITI-1003, 113-115. Gu teaches that the first station (STA A) sends, and the second station (STA B) receives, the first communication frame (LAC frame) that includes a

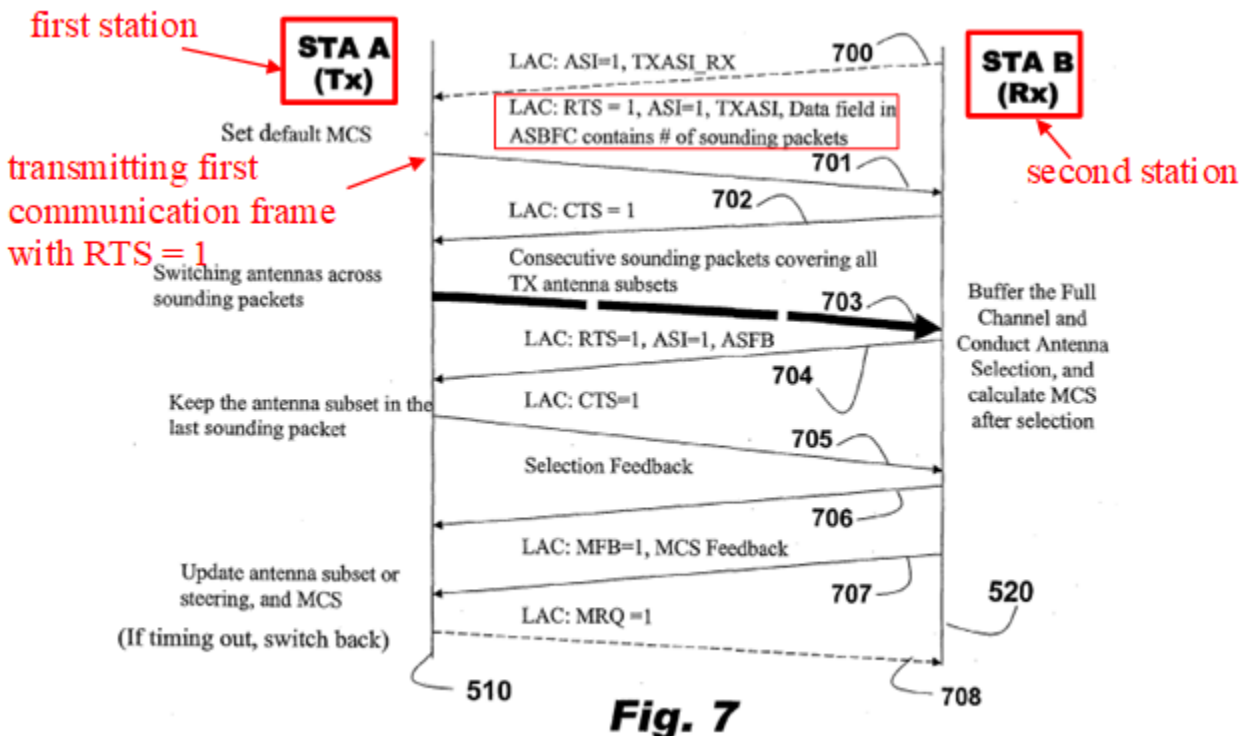
required by the independent claim) and also comprise a ZLF because a ZLF is defined as a PHY header without a MAC portion. *E.g.*, UBIQUITI-1001, 6:18-25; UBIQUITI-1003, 65. The MAC header is where the frame would include the address of the second station that is the intended recipient. UBIQUITI-1003, 65. Petitioner has attempted to address these claims, but reserves the right to challenge definiteness in District Court.

transmit announcement indication (ASI bit set) and a request-to-send (RTS) bit set.

Specifically, Gu teaches that the transmitter “sends 701 a LAC frame with ASI = 1

and . . . with RTS = 1 in the LAC mask field 120.” UBIQUITI-1007, 7:46-51, FIG.

7 (701):



UBIQUITI-1007, FIG. 7 (annotated)

Setting RTS=1 in the LAC frame results in an RTS frame because the RTS field indicates “request to send,” and the RTS being set silences unaddressed stations and causes the second station (STA B) to return a “clear to send” (CTS) message.

UBIQUITI-1007, 2:14-19; 7:52-53, FIG. 7 (702); UBIQUITI-1003, 113. An RTS frame is a frame sent by a transmitter that indicates “ready to send” request, which may be followed by a “clear to send” response (which is a CTS frame), gaining

control over the medium and silencing other stations. UBIQUITI-1003, 113; UBIQUITI-1001, 5:19-31; UBIQUITI-1009, 13; *see also*, UBIQUITI-1019, §6.2.1.2.1 (RTS set turns LAC frame into RTS frame).

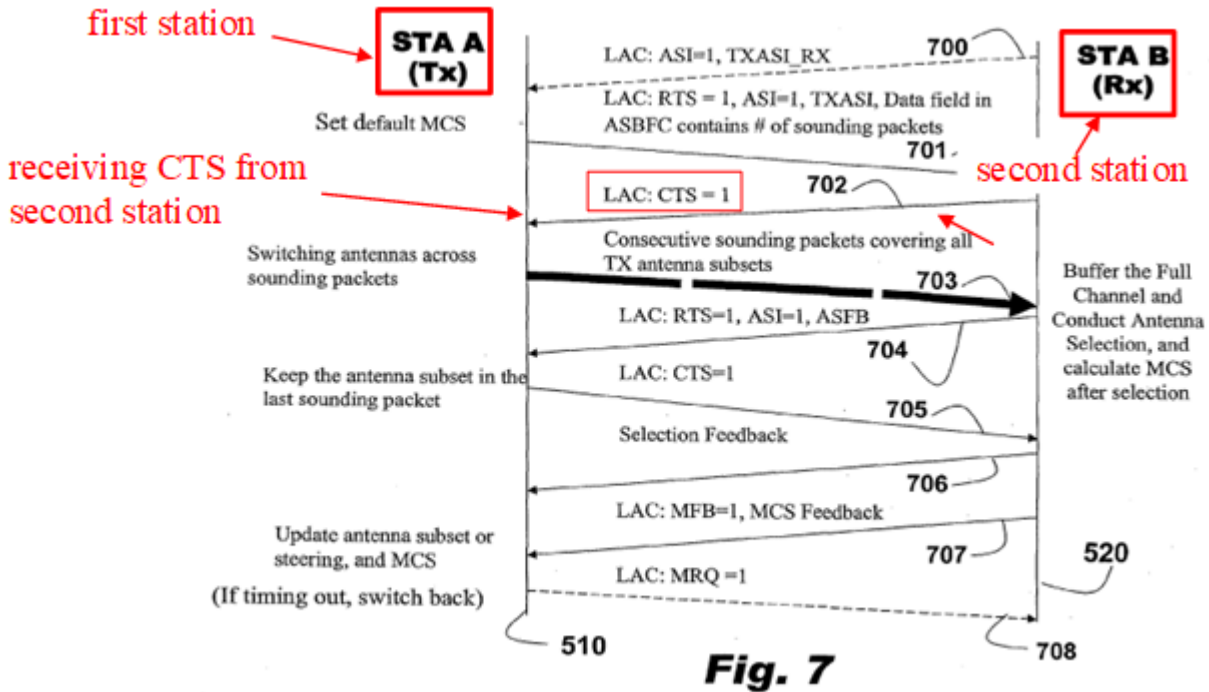
In addition, Gu teaches that the LAC frame (like other MAC layer frames) includes a MAC header with a duration field 112. UBIQUITI-1007, 2:4-9. A POSITA would have recognized that the duration field of a MAC header is used for setting a NAV timer in RTS frames. *See, e.g.*, UBIQUITI-1009, 14. In addition, as mentioned already, the MAC header includes a receive address (RA) field 113. UBIQUITI-1007, 2:4-9. A POSITA would have recognized that the RA field 113 would address a specific station. UBIQUITI-1003, 114. A POSITA would have understood that a frame that includes an RTS bit set that also includes a duration field for the NAV timer and an RA field to identify a receiver were used to initiate an RTS/CTS dialog with the identified receiver. *Id.* In addition, these fields were also sufficient for unaddressed receivers to set their NAV timers and wait for the end of the RTS/CTS dialog before contending for the medium. *Id.*

In addition, or in the alternative, under a narrower construction of RTS frame (in which it is the RTS subtype frame), in the Gu-Trainin combination, the LAC functionality with the indication of PHY sounding packets of Gu is in an HT-control field of a MAC header of an RTS subtype frame, as taught by Trainin.

UBIQUITI-1003, 115. Gu teaches that the “LAC functionality can be realized either by a single control frame defined as LAC, or the single control frame can be a High Throughput (HT) Control frame, or a HT-control Field can be incorporated into any MAC layer frame.” UBIQUITI-1007, 1:60-65. Trainin teaches that the HT-control field “is last in the MAC Header.” UBIQUITI-1011, 4:25-27. Trainin also teaches an RTS subtype frame with an HT-control field. *Id.*, FIG. 3.

[4]

See, supra, [1.1]-[1.4], [3]. Under Petitioner’s construction of a CTS frame, Gu teaches that the first station (STA A) receives a CTS frame sent from the second station (STA B). UBIQUITI-1007, 7:52-53 (“Upon receiving the LAC frame, the receiver sends 702 a LAC frame with CTS=1.”); FIG. 7 (701, 702).



UBIQUITI-1007, FIG. 7 (annotated)

Setting CTS=1 results in a CTS frame because the CTS field indicates “clear to send,” establishing the RTS/CTS dialog for gaining control over the medium.

UBIQUITI-1003, 116-117 ; UBIQUITI-1001, 5:19-31.

In addition, or in the alternative, under a narrower construction, a POSITA would have recognized that, upon receiving the well-known RTS subtype frame from the first station, the second station would have returned the well-known CTS subtype frame. *See, e.g.*, UBIQUITI-1009, 36-39; UBIQUITI-1003, 117. The RTS/CTS dialog schema was well-known at the time for reserving the wireless medium for a transaction. *See, e.g.*, UBIQUITI-1009, 36-39; UBIQUITI-1010, §§9.1-9.2.3; UBIQUITI-1003, 35-36, 116-117.

[5]

See, supra, [1.3]. Gu teaches [5]. In Gu, after receiving the CTS frame from the second station (STA B), the first station (STA A) sends consecutive sounding packets. *See, e.g.*, UBIQUITI-1007, 7:60-63, FIG. 7 (703). As discussed above, Gu expressly teaches an embodiment where sounding packets are PHY packets without data. *See, e.g.*, UBIQUITI-1007, 5:11-12 (“For example, the sounding packets can be limited to a preamble and a header, and exclude any data.”). A POSITA would have understood that a PHY packet without data would not include a MAC portion, which is the portion of the packet that included the receiver address. *See, e.g.*, UBIQUITI-1010, §7.1.3, FIGS. 12, 86; *see also* UBIQUITI-1007, FIGS. 1, 5C; UBIQUITI-1003, 118-119; *see also* UBIQUITI-1001, 4:57-60 (describing a “PHY header without MAC portion . . . may also be referred to as a zero-length frame or Null Data Packet (NDP)). Gu teaches that such sounding packets are advantageous for decreasing the time required for sounding by minimizing the size of the sounding packet. UBIQUITI-1007, 5:9-12.

A POSITA would have recognized that the second communication frame was transmitted after a SIFS. *See, e.g.*, UBIQUITI-1009, 37-39 (describing that RTS/CTS exchange “requires three SIFS periods”), FIG. 3-5; UBIQUITI-1003, 37, 53-60, 118-119.

[16.pre]

Gu teaches a system that includes a transmitter and a receiver. *See, e.g.*, UBIQUITI-1007, 2:10-13 (“The LAC frame supports control of MIMO training requests and exchange of link adaptation information. The LAC frame can be sent by either an initiator station (transmitter) or a recipient station (receiver).”), 7:46-51 (“The transmitter sets its MCS selection to a reliable one, e.g., default MCS, and then sends 701 a LAC frame with ASI=1 and the command TXASI.”), FIG. 7 (showing STA A (transmitter) and STA B (receiver)). UBIQUITI-1003, 121.

[16.1]

See, supra, [1.1], [16.pre]. Gu teaches a transmitter to transmit a first communication frame (LAC frame) from a first station (STA A) to a second station (STA B). *See, e.g.*, UBIQUITI-1007, 7:40-45 (characterizing STA A as a transmitter), 2:10-13, 7:46-51, FIG. 7; UBIQUITI-1003, 122.

[16.2]-[16.4]

See, supra, [1.2]-[1.4].

[17]

See, supra, [2].

[18]

See, supra, [3].

[19]

See, supra, [4].

[20]

See, supra, [5].

[22]

See, supra, [1.3]. Gu teaches [22]. UBIQUITI-1003, 127. For example, Gu expressly teaches that the sounding packets can be PHY packets without data. *See, e.g.*, UBIQUITI-1007, 5:11-12 (“For example, the sounding packets can be limited to a preamble and a header, and exclude any data.”). A POSITA would have understood that a PHY packet without data would not include a MAC portion, which is the portion of the packet that included the receiver address. *See, e.g.*, UBIQUITI-1010, §§7.1.3.3, 15.2; *see also* UBIQUITI-1007, FIGS. 1, 5C; UBIQUITI-1003, 127; *see also* UBIQUITI-1001, 4:57-60 (describing a “PHY header without MAC portion . . . may also be referred to as a zero-length frame or Null Data Packet (NDP)). Gu teaches that such sounding packets are advantageous for decreasing the time required for sounding by minimizing the size of the sounding packet. UBIQUITI-1007, 5:9-12.

[23]

In the Gu-Trainin combination, the transmit announcement indication (ASI bit of Gu in HT-control field) is a bit inside a MAC header field, as taught by Trainin. UBIQUITI-1003, 128. In Trainin, “the HT-control Field is the last in the MAC header.” UBIQUITI-1011, 4:25-26.

[24]

In the combination, the transmit announcement indication (ASI bit of Gu) is in the HT-control field, as taught by Gu. UBIQUITI-1007, 10:4-8; *see, supra*, [1.pre] (discussing ASI bit in HT-control field); UBIQUITI-1003, 129.

[25]

See, supra, [1.2]. In the combination, Gu's LAC frame is a control frame. *See, e.g.*, UBIQUITI-1007, 1:62-65 (In general, the LAC functionality can be realized either by a single control frame defined as LAC, or a the single control frame can be a High Throughput (HT) Control frame"). Gu also teaches that the HT-control field can be "incorporated into any MAC layer frame," and a POSITA would know that MAC frames are defined as data, management or control frames. UBIQUITI-1003, 129-131.

In addition, or in the alternative, in the combination, Trainin teaches an RTS+HTC frame, which is also a control frame. Trainin, FIG. 3; UBIQUITI-1003, 130-131.

[26]

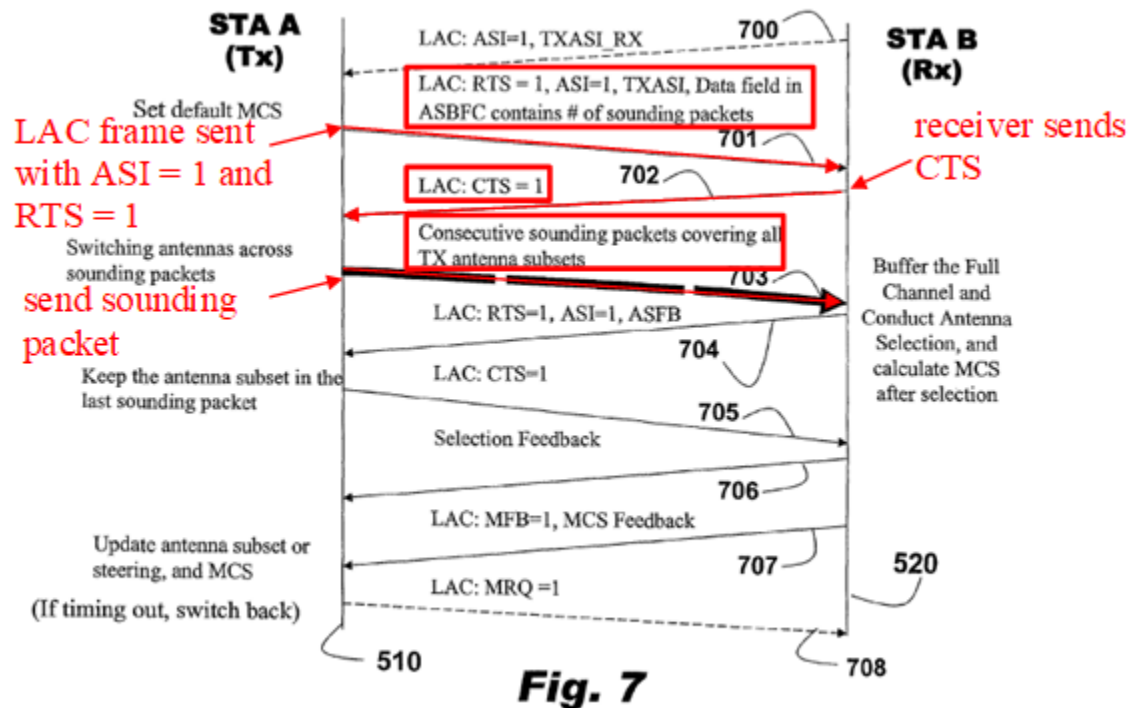
See, supra, [1.3]. In the combination, Gu teaches that the LAC frame or any MAC frame with the HT-control field (transmit announcement indication) precedes the sounding packets (zero-length frame). Gu expressly teaches an embodiment where the sounding packets are PHY packets without data (the so-called

zero-length frame). *See, e.g.*, UBIQUITI-1007, 5:11-12 (“For example, the sounding packets can be limited to a preamble and a header, and exclude any data.”). A POSITA would have understood that a PHY packet without data would not include a MAC header, which is the portion of the packet that included the receiver address. *See, e.g.*, UBIQUITI-1010, §§7.1.3.3, 15.2; *see also*, UBIQUITI-1007, FIGS. 1, 5C; UBIQUITI-1003, 132; *see also* UBIQUITI-1001, 4:57-60 (describing a “PHY header without MAC portion . . . may also be referred to as a zero-length frame or Null Data Packet (NDP)). Gu teaches that such sounding packets are advantageous for decreasing the time required for sounding by minimizing the size of the sounding packet. UBIQUITI-1007, 5:9-12.

[27.pre]

In the combination, Gu teaches a transmit antenna / beam selection training method. *See, e.g.*, UBIQUITI-1007, 3:44-46, 4:1-4, 7:11-67, FIG. 7. “Figure 7 shows the details of the training method with [fast link adaptation control] LAC frame according to an embodiment of the invention.” *Id.*, 7:38-39, 4:23-25; UBIQUITI-1003, 133-134.

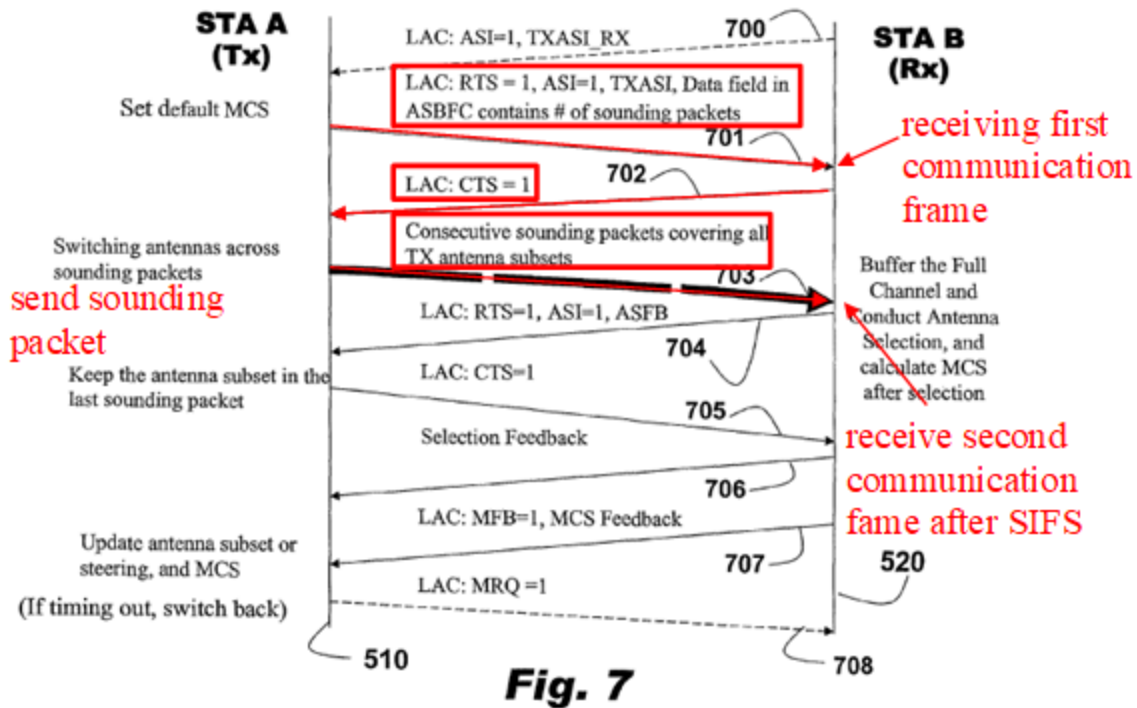
Gu's FIG. 7 shows the details of the training method with LAC frame:



UBIQUITI-1007, FIG. 7 (annotated)

[27.1]

See, supra, [1.1]. Gu teaches receiving a first communication frame (LAC frame) from a first station (STA A) at a second station (STA B). *See, e.g.*, UBIQUITI-1007, 3:44-46, 4:1-4, 7:11-67, FIG. 7; UBIQUITI-1003, 135. Gu's FIG. 7 shows the details of the training method with LAC frame:



UBIQUITI-1007, FIG. 7 (annotated)

[27.2]

See, supra, [1.2].

[27.3]

See, supra, [1.3].

[27.4]

See, supra, [1.4]. Under Petitioner's construction of RTS frame, in the combination, Gu teaches that the LAC frame is received by the second station (STA B) with a request-to-send (RTS) field set. *See, e.g.*, UBIQUITI-1007, 7:46-51, FIG. 5C (RTS 121), FIG. 7 (701 LAC: RTS=1, ASI=1). In response, the second station (STA B) transmits a clear-to-send (CTS) message. *See, e.g., id.*, 7:52-54, FIG. 7

(702 CTS=1). After receiving the CTS=1, “the transmitter sends 703 consecutive sounding packets.” *Id.*, 7:60-63, FIG. 7 (703 consecutive sounding packets). Thus, the second station (STA B) receives the sounding packets (second communication frames) after a SIFS after sending CTS. *Id.*; UBIQUITI-1003, 138-140.

In addition, or in the alternative, under a narrower construction of RTS frame, the Gu-Trainin combination teaches the RTS+HTC frame is received by the second station. *See, e.g.*, UBIQUITI-1011, FIG. 3. In response, the second station transmits a CTS+HTC frame. *Id.* In the combination, after receiving this response, the first station transmits sounding packets, and thus the second station (STA B) receives the sounding packets (second communication frames) after a SIFS after sending CTS. UBIQUITI-1003, 138-140.

Because Gu uses RTS/CTS, a POSITA would have known or found it obvious to separate transmissions belonging to the link adaptation dialog using SIFS. *See, e.g.*, UBIQUITI-1006, [0085]; UBIQUITI-1003, 138-140. Using SIFS in the RTS/CTS dialog was well-known and standard practice at the time. *See, e.g.*, UBIQUITI-1010, §9.2.3; UBIQUITI-1006, [0085]; UBIQUITI-1003, 37, 53-60, 138-140. Thus, a POSITA would have known that the sounding packets (second communication frame) are received after a SIFS following the reception of the LAC frame (the first communication frame). UBIQUITI-1003, 138-140.

[28]

See, supra, [2].

[29]

See, supra, [3], [27.4]. In the combination, under Petitioner's broad construction of RTS frame, Gu teaches that the LAC frame is received with RTS indicated. *See, e.g.*, UBIQUITI-1007, 7:46-51. In addition, or in the alternative, under a narrower construction, the Gu-Trainin combination teaches a receiver receiving an RTS subtype frame that includes an HT-control field in a MAC header that includes the LAC functionality for indication forthcoming PHY sounding packets. UBIQUITI-1003, 142.

[30]

See, supra, [4], [27.4]. The prior art teaches that the second station (STA B) transmits a frame with CTS=1 to the first station (STA A) in response to receiving the frame indicating RTS, whether it be the LAC frame of Gu alone (broader construction) or the CTS frame in the Gu-Trainin combination (narrower construction). *See, e.g.*, UBIQUITI-1007, 7:52-54.

[38.pre]

See, supra, [16.pre].

[38.1]

See, supra, [27.1]. In the combination, Gu teaches a second station (STA B), which is the receiver. *See, e.g.*, UBIQUITI-1007, 7:40-45 (characterizing STA

B as a receiver); UBIQUITI-1003, 145. The first station (STA A / transmitter) sends a LAC frame (or any MAC frame) to the second station (STA B / receiver). *Id.*, 46-53. “Upon receiving the LAC frame, the receiver sends 702 a LAC frame with CTS=1.” *Id.*

[38.2]-[38.4]

See, supra, [1.2]-[1.4].

[39]

See, supra, [2].

[40]

See, supra, [3], [29].

[41]

See, supra, [4], [30].

B. [GROUND 1B] – Claims 6-8 & 31-33 are obvious in view of Gu-Trainin and 802.11e-2005

1. 802.11e-2005

The 802.11e-2005 specification (“802.11e”) was published on November 11, 2005, but was in development dating back to at least November of 2003. UBIQUITI-1020, 1; UBIQUITI-1017, 1; UBIQUITI-1003, 82; UBIQUITI-1003, 79-82. The release of 802.11e included MAC Quality of Service (QoS) enhancements as amendments and additions to 802.11-1999. UBIQUITI-1020, 1; UBIQUITI-1003, 82. The amendments included an additional field in the MAC header for QoS

Control. UBIQUITI-1020, §7.1.2, Figure 12. The QoS Control field would be present in QoS data subtypes. *Id.*, §7.1.3.1.2 (defining QoS data subtypes, including QoS-null (no data)); UBIQUITI-1017, §7.1.3.1.2.

The QoS Control field was an additional 16 bits added to the MAC frame used to identify the traffic category or traffic stream to which the frame belongs. *Id.*, §7.1.3.5. “The QoS Control field is present in all data frames in which the QoS subfield is set to 1.” *Id.* The QoS Control field also included a field for setting ACK policy. *Id.* For QoS-null frames, the “Normal Ack” was the only permissible ACK policy. *Id.*, §7.1.3.5.3.

The *QoS (+)Null frame* refers to all three QoS data subtypes with “no data”: the QoS-null (no data) frame, subtype 1100; the QoS CF-Poll (no data) frame, subtype 1110; and the QoS CF-Ack+CF-Poll frame, subtype 1111. UBIQUITI-1020, §7.1.1.

802.11e-2005 qualifies as prior art under 35 U.S.C. § 102(a). 802.11e-2005 was a well-known and widely used document and was made available to the general public around November 11, 2005. UBIQUITI-1003, 82. Its public accessibility as of November 11, 2005 is evident from the document itself, which bears copyright notices, copyright dates, publication dates, and ISBN numbers. UBIQUITI-1020, 1, 4-5. This publication date is corroborated by, for example, the IEEE Standards Association webpage for the standard. UBIQUITI-1021. It was the

practice of the IEEE Standards Association that, once approved by voting members, it would distribute the approved standard to voting members and make the standard obtainable to the general public through its website promptly upon the indicated publication date. UBIQUITI-1003, 82. Dr. Hansen, who was a voting member of the balloting committee that voted on approval of 802.11e-2005, confirms that he personally obtained an electronic copy of 802.11e-2005 in November 2005 after it was approved. *Id.* The IEEE makes its approved standards including 802.11-1999 and 802.11e-2005 (as well as some unapproved drafts) available for purchase and download by the general public at the home page for the IEEE Standards Association, <http://standards.ieee.org/>. UBIQUITI-1022; UBIQUITI-1003, 82. Except for the requirement of payment, there were no other restrictions on who could obtain a copy of approved standards. UBIQUITI-1003, 82. The IEEE also offered pre-paid online subscription access that allowed any individual to download any approved standard, as well as some unapproved drafts. UBIQUITI-1023. An archived copy of the catalog for accessing online subscription access confirms that 802.11e-2005 was added to its library and available for download by the public in November 2005. UBIQUITI-1024.³

³ By November 2005, 802.11-1999, to which 802.11e-2005 was an amendment, came under revision to combine intervening and earlier amendments. 802.11-1999

2. The Gu-Trainin & 802.11e Combination

In the combination, the HT-control field of the Gu-Trainin combination that includes the LAC functionality to indicate forthcoming PHY sounding frames is in a QoS-null frame, like that described by the 802.11e-2005 specification.

3. Motivation to Combine Gu-Trainin & 802.11e

A POSITA would have found it obvious to combine the teaching of Gu-Trainin with the teachings of the 802.11e standard. UBIQUITI-1003, 151-154. It would have been beyond obvious to a POSITA to consult and conform to adopted standard practices when implementing MAC layer functionality. *Id.* In particular, a POSITA would have consulted and conformed to the 802.11e-2005 standard because of the MAC layer and QoS enhancements to the 802.11 standard described therein. *See, e.g., supra*, §IV.B.1; UBIQUITI-1003, 151.

A POSITA would have been motivated to use a QoS-null frame to “realize” the LAC functionality described by Gu because the QoS-null frame was a frame that contained no data that could be exchanged quickly with the receiving station, and could contain the HT-control field with the LAC functionality, as described by

continued to and was previously made available for download by paying members of the public at the same IEEE catalog shortly after its reaffirmation. UBIQUITI-1026; UBIQUITI-1003, 29.

Gu. UBIQUITI-1003, 152. Recall that Gu expressly teaches that the “invention can be used for any similarly defined signaling frame in a MAC layer that allows a fast communication between the transmitter and the receiver.” UBIQUITI-1007, 13:5-12. A POSITA would have recognized that the QoS-null frame was an ideal choice for realizing the LAC functionality because the QoS-null frame included sufficient space to carry the HT-control field but did not include any data, meaning that the QoS-null frame could be transmitted quickly between the first station and the second station. UBIQUITI-1003, 152.

A POSITA would have had a reasonable expectation of success combining Gu-Trainin with the 802.11e standard to place the HT-control field with LAC functionality into the QoS-null frame. UBIQUITI-1003, 153. First, Gu teaches that the “LAC functionality can be realized either by a single control frame defined as LAC, or the single control frame can be a High Through-put (HT) Control frame, or a HT-control Field can be incorporated into any MAC layer frame.” UBIQUITI-1007, 1:60-65. A POSITA would have recognized that a MAC layer frame included a Frame Control field that included a subtype subfield where the subtype of control field was defined. *See, e.g.*, UBIQUITI-1009, FIGS. 3-9–3-10:

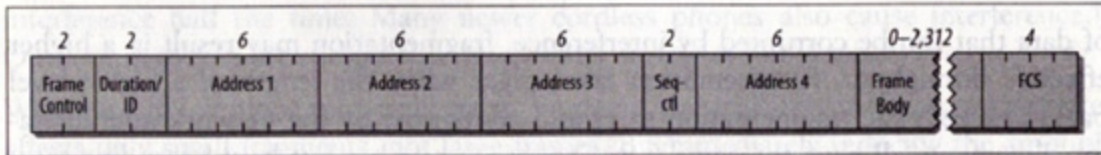


Figure 3-9. Generic 802.11 MAC frame

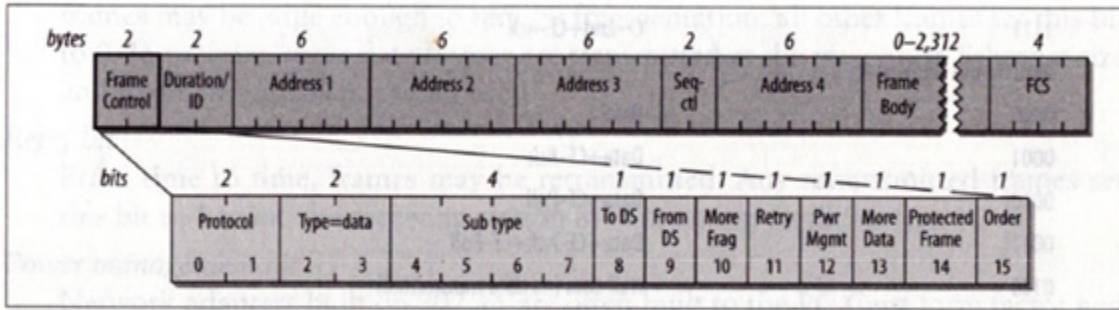


Figure 3-10. Frame control field

UBIQUITI-1009, FIGS. 3-9–3-10 (showing MAC frame with Frame Control Field)

1100	QoS Null (no data transmitted)
1101	QoS CF Ack (no data transmitted)

UBIQUITI-1009, Table 3-1 (showing QoS-null subtype definition)

The QoS-null subtype was defined in 802.11e. *See, e.g.*, UBIQUITI-1020, §§7.1.1-7.1.3.5.4; UBIQUITI-1009, Table 3-1; UBIQUITI-1017, §§7.1.1-7.1.3.5.4; UBIQUITI-1003, 153. The QoS-null data frame included a MAC header with an HT-control field, but did not include data. *See, e.g.*, UBIQUITI-1020, §§7.1.1-7.1.3.5.4; UBIQUITI-1009, FIGS. 3-9–3-10, Table 3-1; *see also* UBIQUITI-1011, 4:20-23 (describing that “an HT-control (HTC) field may be included in any HT frame except a non-QoS Data frame”). A POSITA would have recognized that the HT-control field described by Gu included both the indication of forthcoming PHY sounding frames and the ASBFC payload. *See, e.g.*, UBIQUITI-1007, 6:51-7:10,

13:5-18, FIG. 12; UBIQUITI-1003, 153. Thus, adding the MAC header with HT-control field and LAC functionality, as taught by Gu-Trainin, into a QoS-null field would have been well within the skills of a POSITA and would have been met with a reasonable expectation of success. UBIQUITI-1003, 153.

In addition, Gu expressly teaches using the HT-control field to realize the LAC functionality, so a POSITA would have been able to implement the LAC functionality in a QoS-null frame without undue experimentation. UBIQUITI-1003, 154. Because QoS-null was known for many years prior to Gu, a POSITA would have been familiar with defining a frame as QoS-null by using the frame subtype definitions shown above. UBIQUITI-1003, 154.

4. Analysis

[6]

The Gu-Trainin-802.11e combination renders [6] obvious. In the combination, the MAC header with HT-control field and LAC functionality, as taught by Gu-Trainin, is in a QoS-null frame that was standardized by the 802.11e specification. UBIQUITI-1003, 155.

[7]

The Gu-Trainin-802.11e combination renders [7] obvious. As mentioned above, Gu renders obvious the use of a QoS-null frame for realizing LAC functionality and for transmitting an indication of antenna/beam selection training frame. *See, supra*, [6]. A POSITA would have known that a transmitter of a QoS-null

frame was required by 802.11e to set the QoS Control field in the packet to indicate normal ACK policy. UBIQUITI-1020, §7.1.3.5.3 (Ack Policy subfield); UBIQUITI-1003, 156. For QoS-null (no data) frames, the only permissible value for the ACK policy subfield directs the recipient to return an ACK. UBIQUITI-1020, §7.1.3.5.3 (Ack Policy subfield); UBIQUITI-1003, 156.

[8]

The Gu-Trainin-802.11e combination renders [8] obvious. A POSITA would have found it obvious to transmit the one or more sounding packets (second frame) of Gu after receiving the ACK from the second station to complete the atomic operation. UBIQUITI-1003, 157. A POSITA would have also found it obvious that the one or more sounding packets were transmitted after a SIFS. *Id.* As mentioned previously, as early as 1999, the 802.11 standard required SIFS for ACK frames. UBIQUITI-1010, §9.2.3 (“The SIFS shall be used for an ACK frame”); UBIQUITI-1003, 157. Thus, a POSITA would have known or found it obvious that the one or more sounding packets were transmitted after the first station received the ACK from the second station and after a SIFS. UBIQUITI-1003, 157.

[31]

See, supra, [6].

[32]

See, supra, [7].

[33]

See, supra, [8].

C. [GROUND 1C] – Claims 11-15, 21, 34-37, & 42 are obvious in view of Gu-Trainin and Hansen

1. Hansen

Hansen is titled “Transmitting High Rate Data Within a MIMO WLAN,” and was filed on October 26, 2004. Hansen is directed to wireless communication system that operate in accordance with IEEE 802.11, among other technologies. *See, e.g.*, UBIQUITI-1008, [0005]. Hansen provides a summary of 802.11 technology, and an overview of how wireless communications devices communication with each other in independent basic service set networks. *See, e.g., id.*, [0006]-[0011], [0032]-[0046]. Hansen describes the wireless communications devices (also referred to as host devices 18-32) can be “a cellular telephone, two-way radio, personal digital assistant (PDA), personal computer (PC), laptop computer, home entertainment equipment, etc.” *Id.*, [0006], [0032]. “For each wireless communication device to participate in wireless communications, it includes a built-in radio transceiver” *Id.*, [0007], [0036] (describing that each host device 18-32 includes an associated radio 60, which can be built-in), [0038] (describing radio interface for sending and receiving data by the radio). The radio includes a baseband processing module 64 and memory 66. *See, e.g., id.*, [0039]. “The baseband processing module 64, in combination with operational instructions stored in memory

66, execute digital receiver functions and digital transmitter functions, respectively.” *Id.* Hansen describes the memory device as being “a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, and/or any device that stores digital information.” *Id.*

Hansen describes that part of the evolution of 802.11 devices was the introduction of multiple input / multiple output configurations that employ a number of transceiver antennas. *See, e.g.*, UBIQUITI-1008, [0012]-[0013]. To employ MIMO devices, Hansen describes beam forming considerations and channel sounding. *See, e.g.*, UBIQUITI-1008, [0085]-[0108].

2. The Gu-Trainin-Hansen Combination

Gu teaches a first station that sends a LAC frame (or other MAC layer frame with LAC functionality) to a second station, the LAC or other MAC frame including an ASI field that serves as a transmit announcement indication, alerting a second station of a forthcoming sounding packet that does not include an address of the second station. *See, supra*, [1.pre]-[1.4]. Gu teaches that the antenna selection method is “computer implemented,” implying to a POSITA that one or both of the first station and the second station include a computer or a computer processor. UBIQUITI-1007, Abstract; UBIQUITI-1003, 161. That said, Gu does not expressly state the type of devices the first station and second station could be. Nor

does Gu expressly state that the computer-implemented antenna / beam selection training methods described therein are implemented by instructions stored on a non-transitory, computer-readable medium.

In the combination, the transmission of the LAC or other MAC frame that includes the ASI transmit announcement indication and the subsequent transmission of sounding packets is performed by a wireless communications device that has a radio with a baseband processor and a memory, like that described by Hansen. *See, e.g.*, UBIQUITI-1008, [0039]; UBIQUITI-1003, 161. And as described by Hansen, in the combination, the first station and the second station of Gu are one of a wireless radio, cellular telephone, personal digital assistant, laptop, or personal computer. *See, e.g.*, UBIQUITI-1008, [0032]-[0034]; UBIQUITI-1003, 161.

3. Motivation to Combine

A POSITA would have found it obvious to combine Gu and Hansen. UBIQUITI-1003, 162-165. First, both Gu and Hansen are in the same field of endeavor. Gu describes antenna / beam selection techniques for MIMO wireless LANs, and in particular, methods for indicating and transmitting sounding packets. *See, e.g.*, UBIQUITI-1007, 1:16-54, 2:36-42, 3:44-4:4, *supra* [1.pre]-[1.4]. Likewise, the devices contemplated by Hansen are MIMO devices that perform beam forming using channel sounding techniques. *See, e.g.*, UBIQUITI-1008, [0036], [0085]-

[0108]. A POSITA would have recognized that Hansen’s channel sounding techniques to support MIMO operations would have benefitted from Gu’s teachings of transmitting an indication of the antenna / beam selection training frames. UBIQUITI-1003, 162. A POSITA would have recognized that providing a training request indication, like that of Gu, would have allowed the wireless communications devices of Hansen to perform channel sounding without interrupting normal transmissions and without interference from other stations in the WLAN. *Id.*

Second, Gu describes a “computer-implemented method.” A POSITA would have found it obvious that a computer-implemented method as taught by Gu would have been implemented by a device (such as a personal computer, laptop computer, PDA, etc.) as taught by Hansen. *See, e.g.*, UBIQUITI-1008, [0032]-[0033]. A POSITA would have also immediately recognized that such devices included memory (non-transitory, computer-readable storage media) for storing instructions that when executed, cause a computing device to execute operations, as was standard practice even for “one of *average* skill in the art.” *See, e.g., id.*, [0037], [0039], [0046] (emphasis added).

Third, a POSITA would have recognized that Hansen’s channel sounding process would have benefited from Gu’s teaching of using PHY layer sounding packets excluding data. *See, e.g.*, UBIQUITI-1007, 5:8-12. Gu teaches that preferably, “the sounding packets are transmitted with a relatively short delay,” and

teaches reducing the size of the sounding frames by using PHY preamble and header, and excluding data. *Id.* A POSITA would have found it advantageous to use the PHY sounding packets of Gu that include preamble and header, but exclude data, as sounding packets in Hansen to reduce the time it takes to transfer the sounding packets. UBIQUITI-1003, 164.

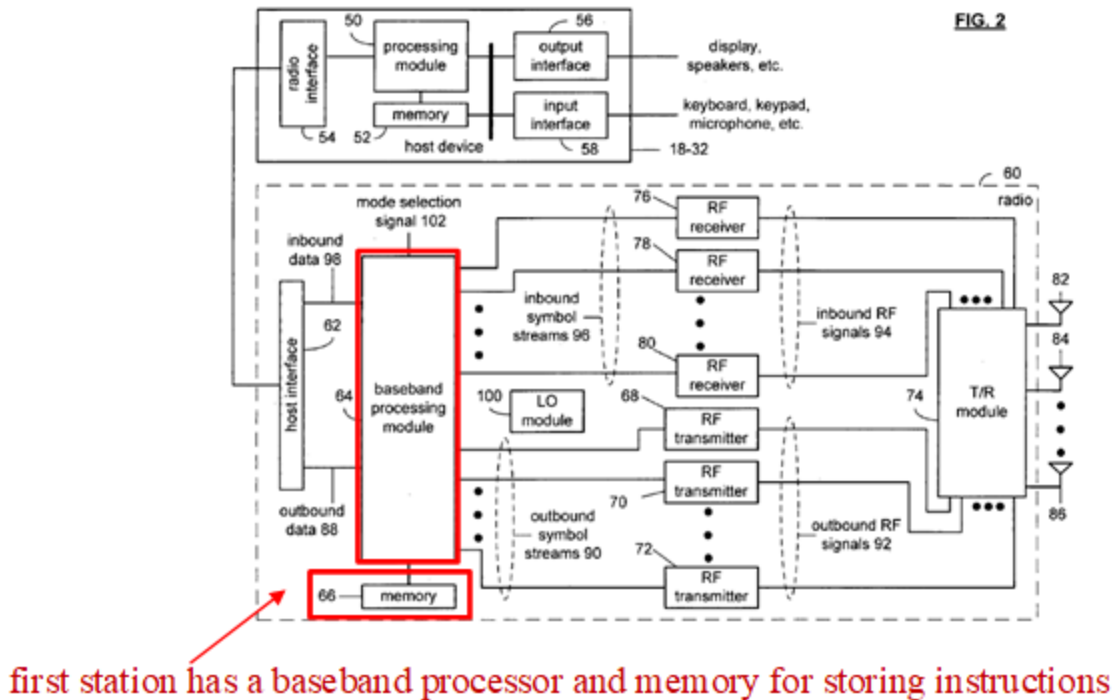
A POSITA would have had a reasonable expectation of success combining the teachings of Gu with the teachings of Hansen. First, Hansen provides sufficient teachings for “one of average skill in the art” to implement an access point and/or a wireless communications device in either a basic service set (BSS) or an independent basic service set (IBSS). *See, e.g.*, UBIQUITI-1008, [0032]-[0046], FIGS.1-2. Likewise, Gu provides sufficient teaches about the MAC frame structure and the process for exchanging MAC layer frames and sounding frames for a POSITA to implement Gu’s teachings into those of Hansen. *See, e.g.*, UBIQUITI-1007, 4:47-10-9, FIGS. 5C, 7, 12; UBIQUITI-1003, 165. In addition, both Gu and Hansen are directed to the same type of technology—namely, channel sounding for MIMO WLAN. *See, e.g.*, UBIQUITI-1007, [3:44-65]; UBIQUITI-1008, [0085]-[0108]; *see also* UBIQUITI-1007, 2:36-42 (discussing 802.11n); UBIQUITI-1008, [0036] (discussing 802.11n).

4. Analysis

[11.pre]

The Gu-Trainin-Hansen combination renders [11.pre] obvious. Gu describes a “computer implemented method” for performing channel sounding. *See, e.g.,* UBIQUITI-1007, Abstract. The channel sounding scheme uses the OSI model, including PHY and MAC layers, which imply that operations are performed by instructions stored on a non-transitory computer-readable medium. UBIQUITI-1007, 3:61-64; UBIQUITI-1003, 166-167.

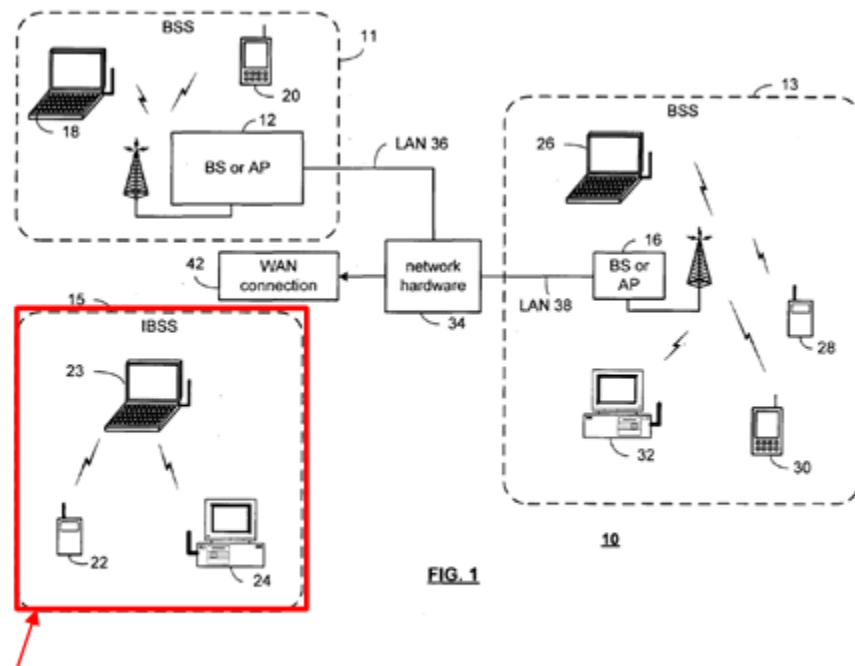
In the combination, the computer-implemented method of Gu is performed by a wireless communications device (first station) that has a baseband processor and memory storing instructions, as taught by Hansen. *See, e.g.,* UBIQUITI-1008, [0036]-[0039], [0046]. Hansen describe that the wireless communications device (first station) has a radio 60 for sending and receiving data. *Id.*, [0036]-[0039]. The radio includes a baseband processor and a memory. *Id.*, [0036]-[0039]. “The baseband processing module 64, in combination with operational instructions stored in memory 66, execute digital receiver functions and digital transmitter functions, respectively.” *Id.* And the “memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, and/or any device that stores digital information.” *Id.* FIG. 2 illustrates the host device 18-32 and radio 60:



UBIQUITI-1008, FIG. 2 (annotated)

[11.1]-[11.4]

See, supra, [1.1]-[1.4]. In the combination, the first station is a wireless communications device (also called host device 22, 23, or 24), as taught by Hansen. In the combination, the wireless communications device transmits the first communication frame to a second station, which is also a wireless communications device. *See, e.g.*, UBIQUITI-1008, [0035], [0039] (describing that baseband processing module performs digital transmitter functions and digital receiver functions); UBIQUITI-1003, 168. Hansen teaches wireless communications devices in communication with each other in an IBSS WLAN. *See, e.g.*, UBIQUITI-1008, [0035], FIG. 1:



first station exchanging wireless messages with a second station

UBIQUITI-1008, FIG. 1 (annotated)

The '122 patent also contemplates the stations 120 and 130 to be part of a “wireless ad hoc network (IBSS).” UBIQUITI-1001, 4:9-14.

In the combination, the wireless communications device (first station) executes instructions stored in memory to send a LAC frame or other MAC layer frame with LAC functionality in an HT-control field to another wireless communications device (second station). *See, e.g.*, UBIQUITI-1008, [0039], [0044]-[0046]; UBIQUITI-1003, 169. Also in the combination, the wireless communications device (first station) sends multiple consecutive PHY layer sounding packets to the other wireless communications device (second station) by executing instructions

stored in memory. *See, e.g.*, UBIQUITI-1008, [0085]-[0108]; UBIQUITI-1003, 169.

[12]

See, supra, [2].

[13]

See, supra, [3].

[14]

See, supra, [4].

[15]

See, supra, [5].

[21]

See, supra, §IV.C.1, [11.pre]-[11.4]. In the Gu-Trainin-Hansen combination, Hansen teaches a wireless communication device that includes a host device and an associated radio. *See, e.g.*, UBIQUITI-1008, [0036]; UBIQUITI-1003, 174. The host device can include a built-in radio. *Id.* The host device can be a personal digital assistant, laptop, or personal computer. *Id.*

[34.pre]

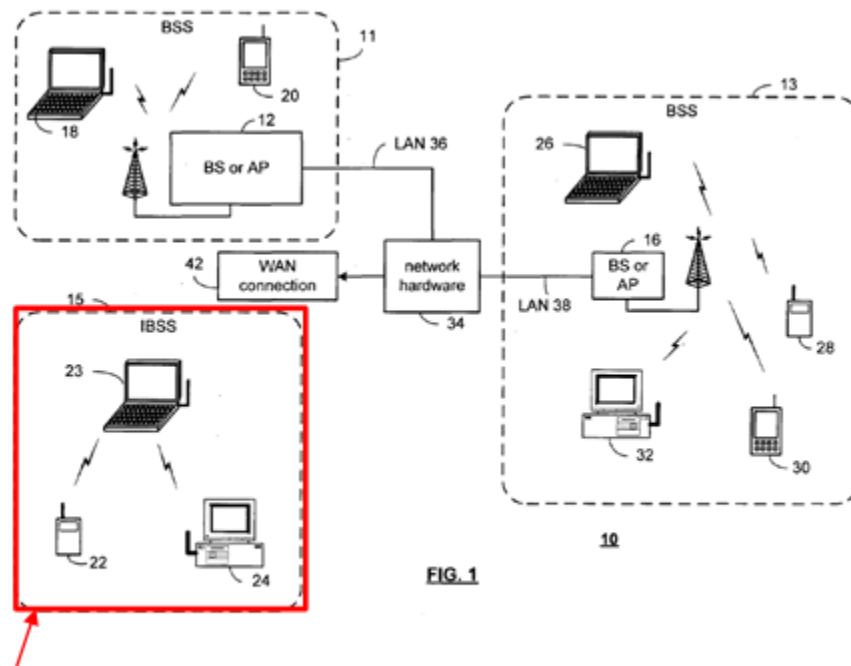
See, supra, [11.pre], [27.pre]. As discussed above, in the Gu-Trainin-Hansen combination, the first station and the second station are wireless communication devices that each include a radio with a baseband processor and a memory. Here, the second station is a wireless device that includes a baseband processor and

a memory for performing “digital receiver functions.” *See, e.g.*, UBIQUITI-1008, [0039]; UBIQUITI-1003, 175.

[34.1]-[34.4]

See, supra, [1.1]-[1.4], [11.pre]-[11.4], [27.1]-[27.4].

In the Gu-Trainin-Hansen combination, the second station is a wireless communications device (also called host device 22, 23, or 24), as taught by Hansen. In the combination, the wireless communications device (second station) receives the first communication frame from another wireless communication device (first station). *See, e.g.*, UBIQUITI-1008, [0035], [0039] (describing that baseband processing module performs digital transmitter functions and digital receiver functions); UBIQUITI-1003, 176-177. Hansen teaches wireless communications devices in communication with each other in an IBSS WLAN. *See, e.g.*, UBIQUITI-1008, [0035], FIG. 1:



first station exchanging wireless messages with a second station

UBIQUITI-1008, FIG. 1 (annotated)

The '122 patent also contemplates the stations 120 and 130 to be part of a “wireless ad hoc network (IBSS).” UBIQUITI-1001, 4:9-14.

In the Gu-Trainin-Hansen combination, the wireless communications device (second station) executes instructions stored in memory to receive a LAC frame or other MAC layer frame with LAC functionality in an HT-control field to another wireless communications device (second station). *See, e.g.*, UBIQUITI-1008, [0039]-[0043]; UBIQUITI-1003, 177. Also in the combination, the wireless communications device (first station) sends multiple consecutive PHY layer sounding packets to the other wireless communications device (second station) by executing

instructions stored in memory. UBIQUITI-1003, 177.

[35]

See, supra, [2].

[36]

See, supra, [3], [29].

[37]

See, supra, [4], [30].

[42]

See, supra, §IV.C.1, [11.pre]-[11.4], [21]. In the Gu-Trainin-Hansen combination, Hansen teaches a wireless communication device that includes a host device and an associated radio. *See, e.g.*, UBIQUITI-1008, [0036]; UBIQUITI-1003,181. The host device can include a built-in radio. *Id.* The host device can be a personal digital assistant, laptop, or personal computer. *Id.*

V. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION

A. Discretionary denial under §325(d) is not warranted

Discretionary denial under the Board’s §325(d) *Advanced Bionics* analysis is not warranted. *See Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6, 8-9 (PTAB Feb. 13, 2020) (precedential) (“*Advanced Bionics*”).

None of the prior art references advanced in this Petition were previously before the Office. Moreover, Petitioner has shown a reasonable likelihood that it would prevail that at least one of the Challenged Claims is unpatentable over the applied art based on the current record. *Supra* §IV.A-C; *see Tokyo Ohka Kogyo Co., Ltd. v. Fujifilm Elec. Materials U.S.A., Inc.*, PGR2022-00010, Paper 9, 8-9 (PTAB June 6, 2022). As such, Petitioner has demonstrated material error by the Office, and discretionary denial is not warranted.

B. Discretionary denial under §314(a) is not merited

In *Apple Inc. v. Fintiv, Inc.*, the Board enumerated factors for assessing whether to exercise discretion to deny institution under §314(a) based on co-pending litigation. IPR2020-00019, Paper 11, 2-3 (PTAB “precedential” Mar. 20, 2020). The USPTO issued updated discretionary denial guidance in view of the *Fintiv* factors and confirmed that “the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” *See* UBIQUITI-1017, 3; *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020). Here, Petitioner has eliminated any risk of duplicated effort by voluntarily presenting a *Sotera* stipulation to Patent Owner. UBIQUITI-1018. For at least this

reason, and considering the compelling merits of the above-detailed Grounds, discretionarily denial is unwarranted and would be unjust.

VI. CONCLUSION AND FEES

The Challenged Claims are unpatentable. Petitioner authorizes charge of fees to Deposit Account 06-1050.

VII. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Ubiquiti Inc. is the real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '122 Patent is the subject of civil action *Intellectual Ventures I LLC v. Ubiquiti Inc.*, 1-23-cv-00865 (DDE) filed August 8, 2023 (UBIQUITI-1004), *Intellectual Ventures I LLC v. Extreme Networks, Inc.*, 1-23-cv-00489 (DDE) filed May 4, 2023 (dismissed) and *Hewlett Packard Enterprise Company v. Intellectual Ventures I LLC et al*, 1-22-cv-00730 (DDE) filed June 2, 2022 (dismissed). Petitioner is not aware of any other disclaimers, reexamination certificates, or IPR petitions addressing the '122 Patent.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR48642-0018IP1@fr.com

(referencing No. 48642-0018IP1 and cc'ing PTABInbound@fr.com, conrad@fr.com and rgupta@fr.com).

Respectfully submitted,

Dated Aug 15, 2024

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CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,968 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated Aug 15, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on August 15, 2024, a complete and entire copy of this Petition for *In-ter Partes* Review and all supporting exhibits were provided by Federal Express, to the Patent Owner, by serving the correspondence address of record as follows:

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