

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,

Petitioner

v.

AX Wireless LLC,

Patent Owner.

IPR 2023-01146

U.S. Patent No. 11,212,146

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,212,146**

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EXHIBIT LIST

Exhibit	Reference
1001	U.S. Patent No. 11,212,146 (“the ’146 patent”)
1002	File History of the ’146 patent
1003	Declaration of Dr. Tom La Porta in Support of Petition for <i>Inter Partes</i> Review of the ’146 patent
1004	Curriculum Vitae of Dr. Tom La Porta
1005	U.S. Patent No. 10,637,706 to Huang et al. (“Huang”)
1006	U.S. Patent No. 10,122,563 to Sun et al. (“Sun”)
1007	Plaintiff AX Wireless LLC’s Preliminary Disclosure of Asserted Claims and Infringement Contentions to Dell, Appendix F, <i>AX Wireless LLC v. Dell Inc., et al.</i> , No. 2:22-cv-00277-RSP (E.D. Tex.)
1008	U.S. Provisional Application 61/235,909 (“the ’909 Provisional”)
1009	Aware, <i>G.hn: PHY-Frame Header Extension</i> , 09CC-046, Concord, CA, as filed in file wrapper of the ’566 patent
1010	CopperGate Communication, <i>G.hn: Using Two Symbols for the Header of a PHY frame on Coax</i> , ITU-T SG15/Q4, 09XC-100, Xian, China July 2009, as filed in file wrapper of the ’566 patent
1011	Intellon Corporation, <i>G.hn: Extended PHY frame header</i> , ITU-T SG15/Q4, 09XC-119, Xian, China, July 2009, as filed in file wrapper of the ’566 patent

TABLE OF ABBREVIATIONS

Abbreviation	Meaning
AP	“access point”
BSS	“basic service set”
ER	“extended range”
FFT	“fast Fourier transform”
GHz	“gigahertz”
HT	“high throughput”
IEEE	“Institute of Electrical and Electronics Engineers”
IFFT	“inverse fast Fourier transform”
MAC	“media access control”
MCS	“modulation and coding scheme”
MHz	“megahertz”
MIMO	“multiple-input multiple-output”
NR	“normal range”
OFDM	“orthogonal frequency division multiplexing”
PHY	“physical layer”
PLCP	“PHY layer convergence protocol”
PPDU	“physical layer protocol data unit”
RX	“receive”
STA	“station”
TX	“transmit”
WLAN	“wireless local area network”

APPENDIX OF CHALLENGED CLAIMS

Challenged Claim	Limitation
[1Pre]	<i>A wireless communication device, comprising:</i>
[1A]	<i>a wireless receiver configured to receive a wireless packet through a communication channel, formats of the wireless packet including a first packet format and a second packet format, the first packet format comprising a first header field carried by a first orthogonal frequency division multiplexing (OFDM) symbol, the second packet format comprising both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which follows the first OFDM symbol, and the second header field being a repetition of the first header field;</i>
[1B]	<i>a demodulator configured to demodulate the received wireless packet,</i>
[1C]	<i>wherein the wireless receiver distinguishes the second packet format from the first packet format by detecting, from the received wireless packet, the second header field which repeats the first header field.</i>
2	<i>The wireless communication device of claim 1, wherein the wireless receiver determines the received wireless packet as the second packet format when the second header field is detected from the wireless packet.</i>
3	<i>The wireless communication device of claim 1, wherein the wireless receiver determines the received wireless packet as the first packet format when the second header field is not detected from the wireless packet.</i>
4	<i>The wireless communication device of claim 1, wherein the first and second header fields contain information for decoding the wireless packet.</i>

Challenged Claim	Limitation
5	<i>The wireless communication device of claim 1, wherein the first and second header fields contain information related to a length of the wireless packet.</i>
[6Pre]	<i>A wireless communication method, comprising:</i>
[6A]	<i>receiving a wireless packet through a communication channel, formats of the wireless packet including a first packet format and a second packet format, the first packet format comprising a first header field carried by a first orthogonal frequency division multiplexing (OFDM) symbol, the second packet format comprising both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which follows the first OFDM symbol, and the second header field being a repetition of the first header field, and</i>
[6B]	<i>demodulating the received wireless packet,</i>
[6C]	<i>wherein the second packet format is distinguished from the first packet format by detecting, from the received wireless packet, the second header field which repeats the first header field.</i>
7	<i>The wireless communication method of claim 6, wherein the received wireless packet is determined as the second packet format when the second header field is detected from the wireless packet.</i>
8	<i>The wireless communication method of claim 6, wherein the received wireless packet is determined as the first packet format when the second header field is not detected from the wireless packet.</i>

Challenged Claim	Limitation
9	<i>The wireless communication method of claim 6, wherein the first and second header fields contain information for decoding the wireless packet.</i>
10	<i>The wireless communication method of claim 6, wherein the first and second header fields contain information related to a length of the wireless packet.</i>

I. INTRODUCTION

Intel Corporation (“Intel” or “Petitioner”) petitions for *inter partes* review (“IPR”) of claims 1–10 of U.S. Patent No. 11,212,146 (“the ’146 patent”) (INTEL-1001). The challenged claims are *not* supported by the specification that the ’146 patent shares with its alleged priority applications and are therefore *not* entitled to their claimed priority. The final limitation of claim 1 requires that the receiver “*distinguishes the second packet format from the first packet format by detecting ... the second header field which repeats the first header field*” in received wireless packets. (INTEL-1001, cl.1.) But the specification does not show possession of a system that distinguishes packet formats based on detecting the presence or absence of a repeated header field in the received wireless packet. Patent Owner (PO) therefore cannot meet its burden to show that the challenged claims are entitled to claim the benefit of an earlier filing date, without which the challenged claims are unpatentable in view of the intervening prior art references set forth in the grounds herein.

II. GROUNDS FOR STANDING

Petitioner certifies the ’146 patent is available for IPR, and Petitioner is not barred or estopped from requesting IPR on the grounds herein.

III. IDENTIFICATION OF CHALLENGE

A. Prior Art

The ’146 patent claims priority to U.S. Application No. 13/376,856, filed on

August 20, 2010 (the “2010 application”), which further claims priority to Provisional Application No. 61/235,909 (“the ’909 provisional”), filed August 21, 2009. But the challenged claims do not have written description support in the alleged priority applications and are therefore not entitled to claim an earlier priority date. *See Aquestive Therapeutics, Inc. v. Neurelis, Inc.*, IPR2019-00451, Paper No. 14 at 4–5 (P.T.A.B. Sept. 27, 2019) (“[T]o gain the benefit of the filing date of an earlier application under 35 U.S.C. § 120, **each application in the chain** leading back to the earlier application must comply with the written description requirement of 35 U.S.C. § 112.” (quoting *Zenon Envtl., Inc. v. U.S. Filter Corp.*, 506 F.3d 1370, 1378 (Fed. Cir. 2007) (emphasis added)).

1. **U.S. Patent No. 10,637,706 to Huang et al.** (“Huang”; INTEL-1005), issued on April 28, 2020, is prior art under pre-AIA §102(b).
2. **U.S. Patent No. 10,122,563 to Sun et al.** (“Sun”; INTEL-1006), issued on November 6, 2018, is prior art under pre-AIA §102(b).

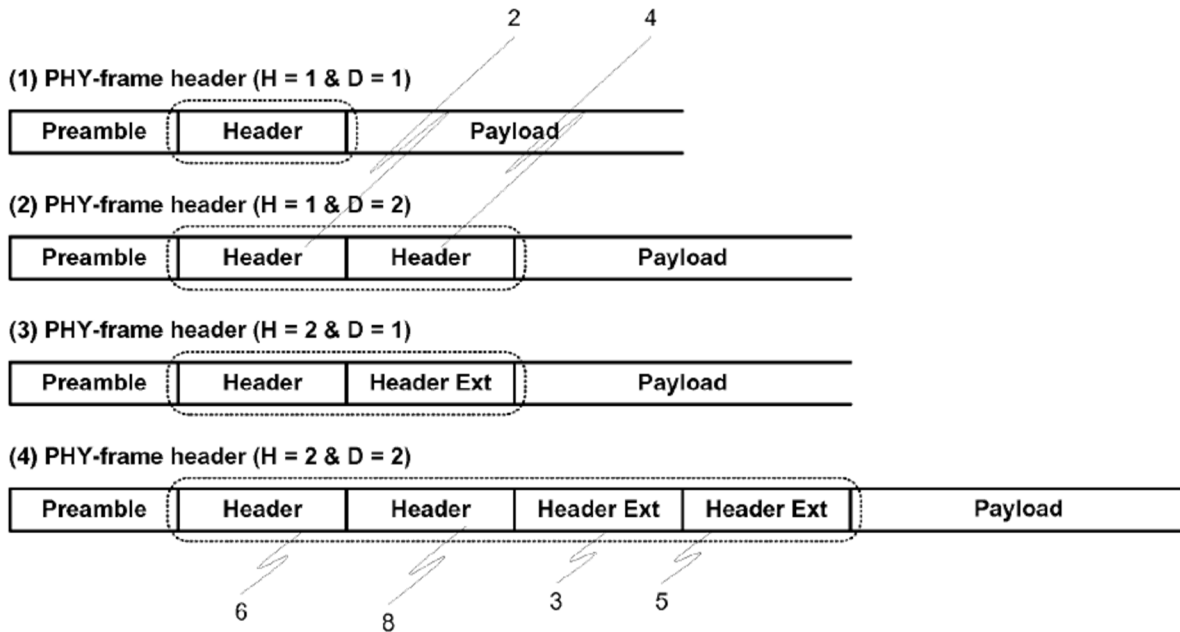
B. Grounds For Challenge

Ground		Claims	Prior Art
1	§103	1–10	Huang
2	§103	1–10	Sun

IV. '146 PATENT OVERVIEW

The '146 patent relates to “exemplary methods [and] systems . . . directed toward header repetition in a communications environment.” (INTEL-1001, 1:33–36.) According to the specification, “[t]he header contains important control information for the receiver to decode the payload properly, and also provides information about the packet length for virtual carrier sensing,” so “it is essential to decode the header reliably.” (INTEL-1001, 1:55–58.) In the prior art, it was known that a “header containing PHY_H bits (header information block) is carried over one or two OFDM symbols ($D=1$ or 2), and within each symbol, multiple header information blocks are repeated over the entire frequency band.” (INTEL-1001, 1:60–64.) It was further known to extend a header to provide more information by “carrying more than PHY_H bits in the header ($H=1$ or 2).” (INTEL-1001, 1:9–10.)

Both prior-art concepts are illustrated in Figure 1 from the '146 patent below, including situations where: (1) a header ($H=1$) is contained within one symbol ($D=1$); (2) a header ($H=1$) is carried in two symbols ($D=2$), where the second symbol repeats the first; (3) a header and a header extension ($H=2$) are each carried in a single symbol ($D=1$); and (4) a header and a header extension ($H=2$) are each carried in two symbols ($D=2$), where the second set repeats the first. (INTEL-1001, 5:56–6:1, Fig. 1.)



The '146 patent discusses “allowing different values of D in a single domain where nodes are operating in different portions of frequency bands” and “the level of frequency diversity is different depending on the bandplan.” (INTEL-1001, 2:18–27.) For example, setting D=2 “increases reliability for the narrowband devices” because “each additional OFDM header symbol provides additional diversity thereby increasing the likelihood of decoding the header information correctly”; however, it “may also unnecessarily increase overhead for the wideband devices.” (INTEL-1001, 2:28–31, 3:8–11.) The patent therefore focuses on “receiver detection of D with variable repetition,” where “the transmitter selects (or determines)[] the at least one D value ... at its own discretion, or [] based on information communicated between the one or more receivers, or based on instructions from one or more other receivers and/or a domain master,” and the

transmitter will “carry, insert or otherwise communicate the value of D in the header so that all nodes know how many OFDM symbols are carrying header information.” (INTEL-1001, 2:51–3:1.) To ascertain the number of header symbols, “[t]he receiver(s) starts processing the header by decoding one OFDM header symbol,” and if successful, “the receiver knows how many more OFDM symbols (D-1) are carrying header information for a given frame.” (INTEL-1001, 3:1–5.) But if unsuccessful “(i.e., the header decoding fails), then the receiver can try to decode two OFDM header symbols, and so on.” (INTEL-1001, 3:5–8.)

In other words, the patent specification teaches explicit signaling of the number of OFDM symbols carrying header information—which indicates the packet format—using a value “D” that the receiver decodes. The claims of the ’146 patent, however, more broadly recite a wireless receiver “configured to receive” first and second packet formats—the first format has one header symbol (D=1), and the second format has two header symbols (D=2), where the second symbol repeats the first—where the receiver “distinguishes the second packet format from the first packet format by detecting, from the received wireless packet, the second header field which repeats the first header field.” (*See, e.g.*, INTEL-1001, cl.1.)

A. Prosecution History

The ’146 patent issued from U.S. Application No. 17/136,801 (“the ’801 application”) after the Examiner rejected the claims once, and in response, the

Applicant cancelled the pending claims and added ten new claims that the Examiner subsequently allowed. The Examiner's "Reason for Allowance" noted that the "prior art of record fails to disclose the second packet format comprising both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which follows the first OFDM symbol and the second header field being a repetition of the first header field." (INTEL-1002, 19.)

B. Level Of Ordinary Skill In The Art

A POSITA at the time of the purported invention would have had at least a master's degree in electrical engineering or similar discipline, and/or two to three years of experience working or conducting research in wireless communication protocols, or an equivalent combination of education and experience. (INTEL-1003, ¶71, 72.)

C. Claim Construction

Claim terms are typically given their ordinary and customary meanings as understood by a POSITA at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-16 (Fed. Cir. 2005) (en banc). Petitioner does not believe it is necessary for the Board to expressly construe any term for the purpose of this IPR proceeding. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

V. Patent Owner Cannot Meet Its Burden to Show §120 Priority to the 2010 Application

Because the specification of the 2010 application does not support the full breadth of the challenged claims, PO will be unable to establish §120 priority to the 2010 application. As a result, intervening references Huang and Sun are available as prior art to the '146 patent's claims.

POs have the burden of production to show that challenged claims have §112 support in the application to which §120 priority is claimed. *In re NTP, Inc.*, 654 F.3d 1268, 1276 (Fed. Cir. 2011), *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008), *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 870 (Fed. Cir. 2010), *see also* 35 U.S.C. §120 (AIA).

“[C]laims in a patent or patent application are not entitled to priority under §120 at least until the patent owner *proves* entitlement to the PTO, the Board, or a federal court.” *Natural Alternatives Int’l, Inc. v. Iancu*, 904 F.3d 1375, 1380–81 (Fed. Cir. 2018) (emphasis in original) (affirming Board finding that chain of claiming priority was broken). Thus, while it is Petitioner’s burden to demonstrate unpatentability, PO has the burden of production to show entitlement to backdate the challenged claims to an earlier filing date. *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1329 (Fed. Cir. 2008); *D Three Enters., LLC v. SunModo Corp.*, 890 F.3d 1042, 1049 (Fed. Cir. 2018).

Once a Petitioner raises the issue by “identifying, specifically, the features,

claims, and ancestral applications allegedly lacking written description support for the claims based on the identified features,” the PO “must make a sufficient showing of entitlement to earlier filing date(s), in a manner that is commensurate in scope with the specific points and contentions raised by the petitioner.” *Lupin Ltd. et al. v. Pozen Inc.*, IPR2015-11775, Paper No. 15 at 11 (P.T.A.B. Mar. 1, 2016). This burden-shifting also applies to continuation applications (see *Research Corp. Techs.*, 627 F.3d at 865; accord *In re NTP*, 654 F.3d at 1271, 1276) and in Patent Office proceedings (see *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379-80 (Fed. Cir. 2015); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375–76 (Fed. Cir. 2016); *Amazon.com, Inc. v. Personalized Media Commc’ns, LLC*, IPR2014-01527, Paper 44 at 18 (P.T.A.B. Aug. 31, 2016)).

A. The Priority Application Must Show That the Applicant Possessed the Full Scope of the Challenged Claims

A patent’s disclosure “must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed” such that “the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*) (internal quotations, brackets, and citations omitted). “[A] claim is entitled to the priority date of an earlier application **only if** the earlier specification provides sufficient written support for the **full scope of the claim.**” *X2Y Attenuators, LLC v.*

ITC, 757 F.3d 1358, 1365 (Fed. Cir. 2014).¹

B. The Challenged Claims are Not Entitled to §120 Priority to the 2010 Application

PO cannot show written description support in the specification² for the full scope of the challenged claims. The '146 patent's claims are not entitled to an earlier priority date because none of the alleged priority applications disclose a receiver that distinguishes packet formats based on detecting the repetition of a header field in received packets (*i.e.*, “*detecting ... the second header field which repeats the first header field*”). *See Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571–72 (Fed. Cir. 1995) (to support a claim limitation, the subject matter in the specification must either “appear in the specification” or be described “in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention”). This breaks the patent's chain of priority and the intervening references to Huang and Sun therefore qualify as prior art to the challenged claims.

1. The Claimed Invention Distinguishes Packet Formats by Detecting a Repeated Header Field

The '146 patent includes two independent claims, both reproduced below:

¹ All bold emphasis herein is added unless noted otherwise.

² The '146 patent and its ancestor applications in the chain of priority share the same specification.

1. A wireless communication device, comprising:	6. A wireless communication method comprising:
a wireless receiver configured to receive a wireless packet through a communication channel, formats of the wireless packet including a first packet format and a second packet format, the first packet format comprising a first header field carried by a first orthogonal frequency division multiplexing (OFDM) symbol, the second packet format comprising both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which follows the first OFDM symbol, and the second header field being a repetition of the first header field; and	receiving a wireless packet through a communication channel, formats of the wireless packet including a first packet format and a second packet format, the first packet format comprising a first header field carried by a first orthogonal frequency division multiplexing (OFDM) symbol, the second packet format comprising both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which follows the first OFDM symbol, and the second header field being a repetition of the first header field; and
a demodulator configured to demodulate the received wireless packet,	demodulating the received wireless packet,
wherein the wireless receiver distinguishes the second packet format from the first packet format by detecting, from the received wireless packet, the second header field which repeats the first header field.	wherein the second packet format is distinguished from the first packet format by detecting, from the received wireless packet, the second header field which repeats the first header field.

Each claim's final limitation requires "*distinguishing*" the packet formats "*by detecting ... the second header field which repeats the first header field.*" In context, this limitation requires the receiver to detect header repetition or the

absence of header repetition, and to distinguish the first and second packet formats on that basis. This conclusion follows for several reasons.

First, a plain reading of the claim language indicates that there are two packet formats, one with a repeated header field and one without, and that the receiver distinguishes between the two by “*detecting ... the second header field which repeats the first header field.*” That is, the receiver determines whether it has received the first or second packet format based on whether it detects the repeated header field in the received wireless packet. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (“Quite apart from the written description and the prosecution history, **the claims themselves provide substantial guidance** as to the meaning of particular terms.”) The phrase “*the second header field which repeats the first header field*” at the end of the independent claims requires that the detected header field repetition is what is used to distinguish between the first and second packet formats. Were it otherwise, the phrase would be stripped of its meaning, effectively reading it out of the claim because the independent claims already recite that the second header field is “*a repetition of the first header field*” in claim limitation 1A.

Second, other claims in the ’146 patent reinforce that the independent claims require detecting the presence or absence of a repeated header field in the received packet. *See Phillips, id.* (“Other claims of the patent in question, both asserted and

unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term.”) For example, dependent claims 2 and 7 add a limitation that requires the receiver to determine a packet format “*as the second packet format when the second header field **is detected** from the wireless packet*” and dependent claims 3 and 8 add a limitation that requires the receiver to determine a packet format “*as the first packet format when the second header field **is not detected** from the wireless packet.*” Consistent with the independent claim, these dependent claims further confirm that the claimed detection involves determining the presence or absence of “*the second header field which repeats the first header field*” in the received wireless packet.

Third, PO’s allegations in the co-pending district court litigation support that the independent claims require detecting the presence or absence of a repeated header field in the received packet. In the litigation, PO alleges that the IEEE 802.11ax-2021 wireless networking standard infringes the independent claims of the ’146 patent based on detecting the existence of a repeated legacy signal field (RL-SIG) and using the detected repeated header field to distinguish between packet formats. For example, in its infringement contentions, PO alleges that the “RL-SIG field is a repeat of the L-SIG field and is used to differentiate an HE PPDU from a non-HT PPDU, HT PPDU, and VHT PPDU” (which are non-

802.11ax packet formats).³ (INTEL-1007 (PO's Prelim. Infring. Conts.), 34 (quoting IEEE Std 802.11ax-2021, 544.) PO also points to the detection method shown in Figure 27-63 of the 802.11ax standard for this limitation. An annotated excerpt of Figure 27-63 is reproduced below. (IEEE Std. 802.11ax, 654.)

³ A POSITA would understand that the PPDU's described in the accused 802.11ax standard are wireless packets. (INTEL-1003, ¶77.) As shown below, a physical layer protocol data unit (PPDU) includes a preamble, header, and data fields, consistent with the usage of the term in the art and in the '146 patent. (INTEL-1001, 1:45–46 (“A packet is usually formed by a preamble, header, and payload.”); IEEE Std. 802.11a-1999, 7 (Fig. 107); INTEL-1003, ¶77.)

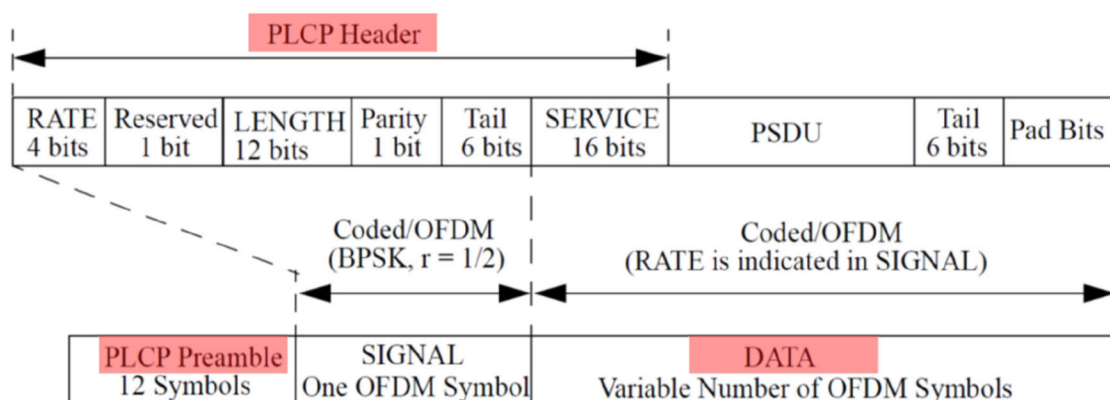


Figure 107—PPDU frame format

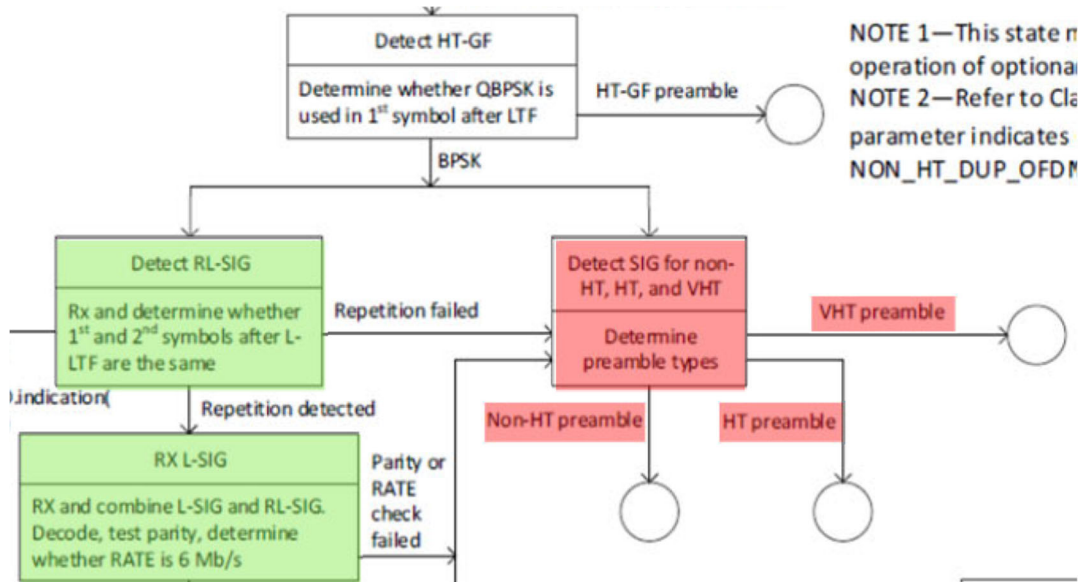


Figure 27-63 provides the mechanism for detecting repeated header fields that is accused of infringement in the litigation, namely detecting RL-SIG by “determine[ing] whether 1st and 2nd symbols after L-LTF are the same.” (IEEE Std. 802.11ax, Fig. 27-63; INTEL-1003, ¶78.) In 802.11ax’s high efficiency (HE) packet formats, the 1st and 2nd symbols following L-LTF are the L-SIG and RL-SIG, as shown below. (IEEE Std. 802.11ax, Figs. 27-8, 27-9, 27-10.)

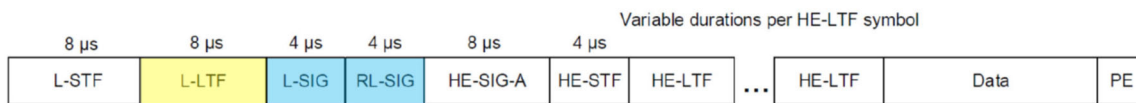


Figure 27-8—HE SU PPDU format

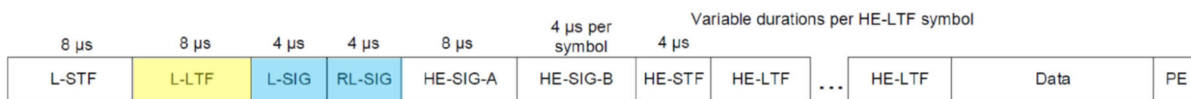


Figure 27-9—HE MU PPDU format



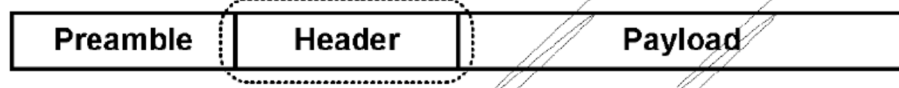
Figure 27-10—HE ER SU PPDU format

Thus, 802.11ax describes repetition detection by determining whether the two symbols L-SIG and RL-SIG following L-LTF “are the same” and distinguishing the 802.11ax High Efficiency (HE) packets from non-HE packet formats on that basis. (INTEL-1003, ¶80.) As a result, consistent with PO’s allegations in district court, the independent claims of the ’146 patent require detecting the presence or absence of a repeated header field at the receiver and distinguishing between packet formats on that basis. (INTEL-1003, ¶80.)

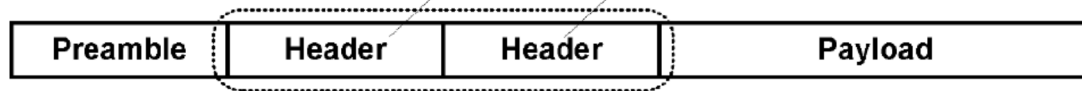
2. Distinguishing Packet Formats by Detecting a Repeated Header Field is Not Disclosed in the ‘146 Patent’s Specification

The ’146 patent does not provide any disclosure of detecting the presence or absence of a repeated header field to distinguish packet formats. (INTEL-1003, ¶81.) The ’146 patent’s specification describes a packet with a single header field carried by a single OFDM symbol and a packet with both a header field and a repeated header field carried by two OFDM symbols, which is shown in the first and second rows of Figure 1 below. (INTEL-1001, 5:57–61, Fig. 1.)

(1) PHY-frame header (H = 1 & D = 1)



(2) PHY-frame header (H = 1 & D = 2)



But the receiver never *detects* the existence of a repeated header field.

(INTEL-1003, ¶82.) Instead, the value of D is explicitly communicated to the receiver by the transmitting device so that “the receiver knows how many more OFDM symbols (D–1) are carrying header information for a given frame.”

(INTEL-1001, 2:65–3:5.) The number of OFDM symbols carrying header information is explicitly communicated to the receiver by encoding the value of D into a bit field of the header that the receiver can then decode to obtain D and learn how many times the header is repeated in the received packet. (INTEL-1001, 3:1–8, 6:60–62, 7:12–13, 7:17–18, 8:1–2, 8:22–24, 8:42–44, 8:65–67, 9:10–14, 9:44–45, 10:4–5, 10:30–32, Figs. 4–5; INTEL-1003, ¶82.)

The specification discusses several variations of how the value D might be communicated to the receiver (*e.g.*, the transmitter may “carry, insert or otherwise communicate the value of D in the header”), but it does not disclose any means by which a receiver might distinguish between packet formats other than by decoding the packet to obtain the value of D. (INTEL-1001, 2:65–66.) Indeed, the fact that the value of D is explicitly communicated to the receiver pervades the specification—it appears in every exemplary embodiment, every figure, and every description of every figure. (INTEL-1003, ¶¶83.)

But the specification does not teach or suggest the idea that a receiver might distinguish packet formats by drawing an inference based on the existence of a repeated header field. (INTEL-1003, ¶¶84.) Explicitly communicating the number of header symbols to the receiver so that the receiver learns the packet format (which requires decoding) does not disclose detecting a repeated header field (which does not require decoding) and distinguishing packet formats on that basis. (INTEL-1003, ¶¶84.) In fact, there would be no need for the receiver to *detect* repeated header fields in cases where the number of header repetitions D is explicitly communicated by the transmitter in the packet header. (INTEL-1003, ¶¶84.) Detecting repeated header fields thus stands in stark contrast to the mechanism disclosed in the specification wherein the transmitter explicitly communicates of the value of D to the receiver “so that all nodes know how many OFDM symbols are carrying header information.” (INTEL-1001, 2:65–3:1.)

PO may assert that determining how many header repetitions D are in the received wireless packet based on decoding the packet header amounts to “detecting” the packet has a repeated header field. But as discussed above in §V.C.1., *supra*, a plain reading of the claims requires the receiver to distinguish packet formats by detecting the existence of a repeated header field. Further, a POSITA would understand detection and decoding to be two different processes disclosed in the ’146 patent and that the claimed detection is performed in addition

to the process of decoding. (INTEL-1003 ¶85.) In the specification, decoding is the process whereby the receiver learns the information contained in the fields of the received wireless packet, whereas the claimed “detecting” is a means by which the receiver differentiates between packet formats. (INTEL-1003 ¶85.) There are numerous places in the specification confirming that the patentee used the word “decode” (not “detect”) to refer to the process of learning the information contained in the header field. (*See, e.g.*, INTEL-1001, 7:11–13; 7:35–38; 8:22–24; 8:49–52; 9:20–21; and 9:54–55; INTEL-1003 ¶85.).

Furthermore, differences among claims can be a useful guide in understanding the meaning of particular claim terms and the terms “detecting” and “decoding” are recited in different claims. *See Laitram Corp. v. Rexnord, Inc.*, 939 F.2d 1533, 1538 (Fed. Cir. 1991). For example, dependent claim 4 recites “decoding” to refer to the process of the receiver learning the information contained in the header field(s) of the received wireless packet, which is different from “detecting” a repeated header field recited in claim 1 upon which claim 4 depends. Thus, under principle of claim differentiation, these terms are assumed to have different meanings. *See Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004).

Accordingly, this claim limitation is not supported by the specification of any of the ’146 patent’s alleged priority applications. (INTEL-1003, ¶¶85.) The

challenged claims are thus not entitled to claim an earlier filing date because a POSITA would not have understood from the specification that the inventors were in possession of the subject matter claimed. The challenged claims therefore cannot properly claim priority to any of the filing dates of the '146 patent's ancestor applications and the challenged claims are unpatentable in view of either of the intervening Huang or Sun references because they predate the December 29, 2020 filing date of the '146 patent by more than a year. *See In re NTP*, 654 F.3d, at 1276 (the date of invention is “presumed to be the filing date of the application until an earlier date is proved.”).

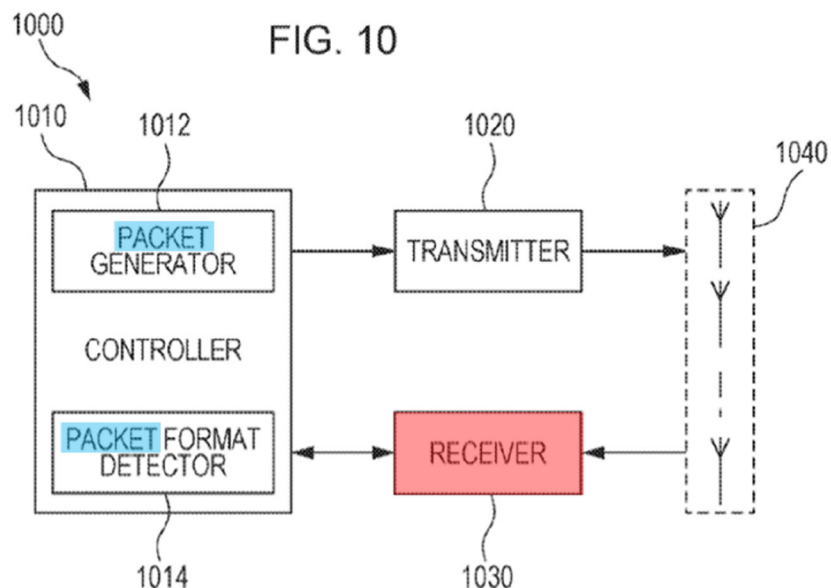
VI. GROUND 1: Claims 1–10 are Obvious Based on Huang

A. Huang Overview

Huang discloses a “wireless communication system” for “detection of different packet formats.” (INTEL-1005, 1:9–11.) Huang was filed during the development of the IEEE 80211.ax standard which uses a High Efficiency (HE) packet format to support “multiuser transmission” and “to achieve substantial increase in the real-world throughput ... in high density scenarios while keeping backward compatibility with legacy 802.11a/g/n/ac standards.” (INTEL-1005, 1:15–21.) With the “packet format detection” disclosed in Huang, “it is possible for a receiver to receive and decode packets in an efficient fashion when the receiver can receive packets in different formats.” (INTEL-1005, 2:7–11.) Thus,

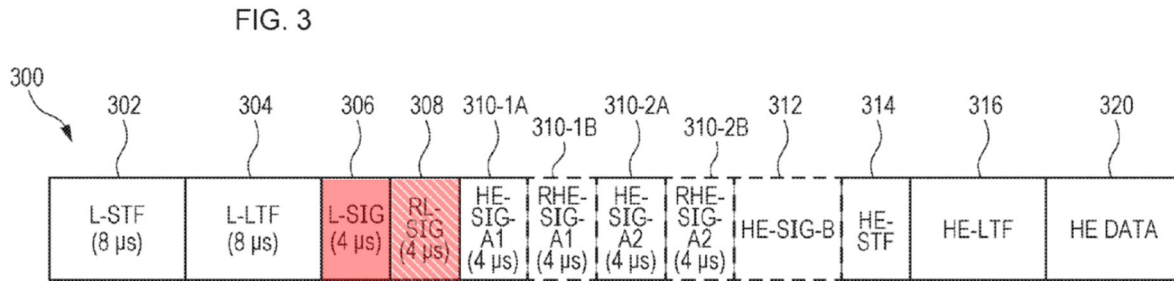
“802.11ax packets may co-exist with legacy 802.11a/g/n/ac packets in a[n] 802.11 wireless network.” (INTEL-1005, 1:54–55.)

As shown in Figure 10 below, Huang describes a “wireless communication apparatus” that “can be an access point in a centralized wireless network, a station in a centralized wireless network, or a node in a peer-to-peer wireless network.” (INTEL-1005, 14:19–24, Fig. 10.) Huang’s apparatus comprises a controller, a transmitter, a receiver, and a plurality of antennas. (INTEL-1005, 14:24–27, Fig. 10.) Huang’s wireless receiver is configured to receive packets in different packet formats sent from both legacy (e.g., 802.11a/g/n/ac) and 802.11ax systems through a wireless OFDM communication channel in the same wireless network. (INTEL-1005, 1:15–32, 2:7–11, 3:6–13, 6:23–31, Figs. 1A–1C, 3.)



However, unlike the legacy packet formats of 802.11a/g/n/ac, Huang’s 802.11ax packet format includes a repeated L-SIG header field referred to as

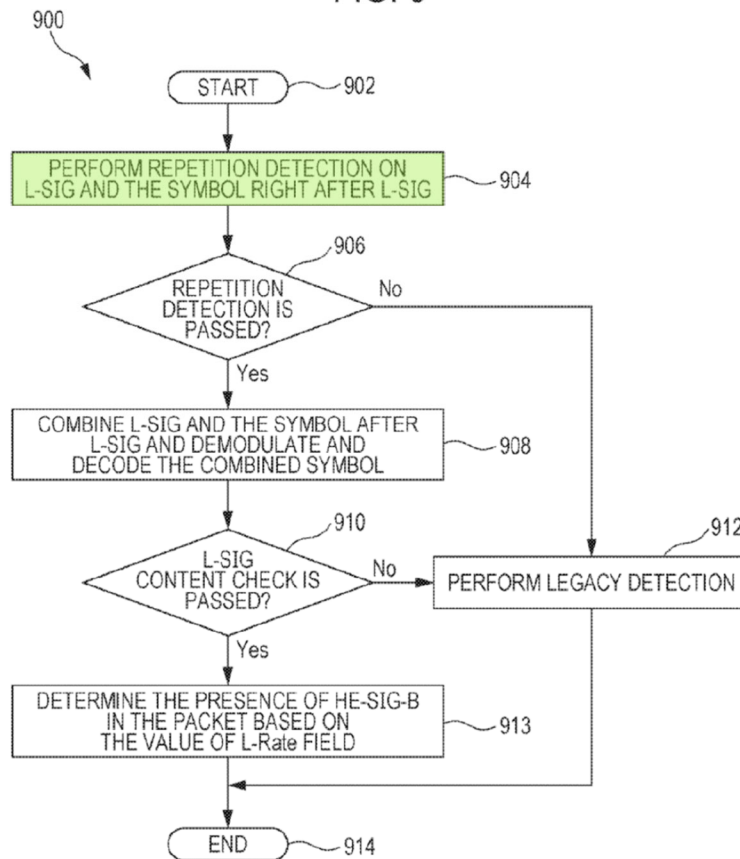
“RL-SIG” (for repeated L-SIG) that, when detected by the receiver in a received wireless packet, indicates that an 802.11ax packet has been received. (INTEL-1005, 3:40–43, 6:23–31, 6:38–42, 8:15–21.) This configuration with RL-SIG following L-SIG is shown in Figure 3.



(INTEL-1005, Fig. 3.) Huang’s wireless receiver performs repetition detection based on determining whether the symbol following L-SIG in the wireless packet is a repetition of L-SIG, *i.e.*, includes the same information, and uses the detection of RL-SIG to distinguish 802.11ac packets from packets of other legacy wireless protocols (*e.g.*, 802.11a/g/n/ac). (See INTEL-1005, 6:38–39 (“The RL-SIG 308 is used to assist in detecting the format of the HE packet 300”).

“FIG. 9 illustrates a method 900 for detecting packet format at a wireless communication apparatus” such as the one shown in Huang’s Figure 10 above. (INTEL-1005, 13:2–3, Fig. 9.)

FIG. 9



As shown, “[a]t step 904, the wireless communication apparatus performs repetition detection to determine whether the symbol right after the L-SIG in an incoming packet has the same content as the L-SIG.” (INTEL-1005, 13:5–8.) Huang teaches that it is preferable to perform the repetition detection using “correlation over data subcarriers between the L-SIG and the symbol right after the L-SIG” (INTEL-1005, 13:8–11.) When RL-SIG is detected (repetition detection passed) at step 906, the receiver determines that the received wireless packet is an 802.11ax packet and the method continues to step 908 where L-SIG and RL-SIG are combined, demodulated, and decoded by the receiver according to

the 802.11ax format. (INTEL-1005, 13:15–18, Fig. 9.) Otherwise, the method continues to step 912 where “the wireless communication apparatus performs the legacy 802.11a/g/n/ac packet detection” (INTEL-1005, 13:21–23.) Huang’s wireless communication apparatus then “checks the content of the decoded L-SIG” to confirm “the parity check is ok,” and then at step 913, “determines that the packet has a[n] 802.11ax format and determines the presence of the HE-SIG-B 312 in the HE packet 300 according to the value of the L-Rate used at step 910.” (INTEL-1005, 13:24–27.)

B. Independent Claims 1 and 6⁴

Huang renders these claims obvious, as set forth below.

1. Preamble [1Pre] and [6Pre]

Petitioner does not acquiesce that the preamble is limiting. Nevertheless, Huang discloses the Preamble. (INTEL-1003 ¶93.)

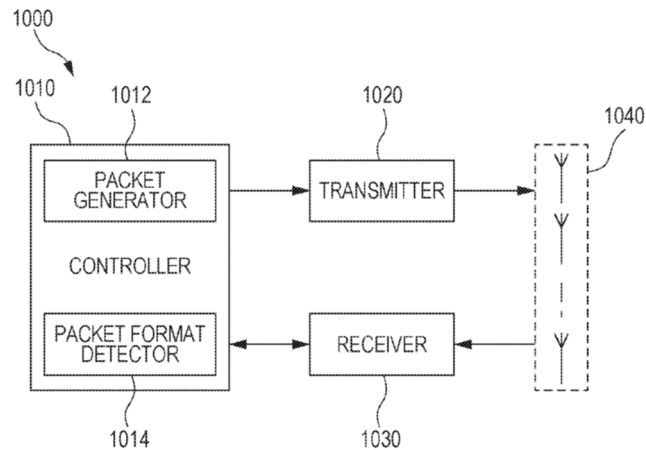
a. *Wireless Communication Device*

Huang discloses a “wireless communication system” that includes a “wireless communication apparatus” such as the one shown in Figure 10 below,

⁴ Given the repeated subject-matter among the claims, this petition addresses overlapping claims together. To the extent there are any substantive differences between claims or the corresponding analysis, that is noted herein.

which is a “*wireless communication device.*” (INTEL-1005, 1:9–11, 2:60–62, 14:19–21, Fig. 10 (below); INTEL-1003 ¶93.)

FIG. 10



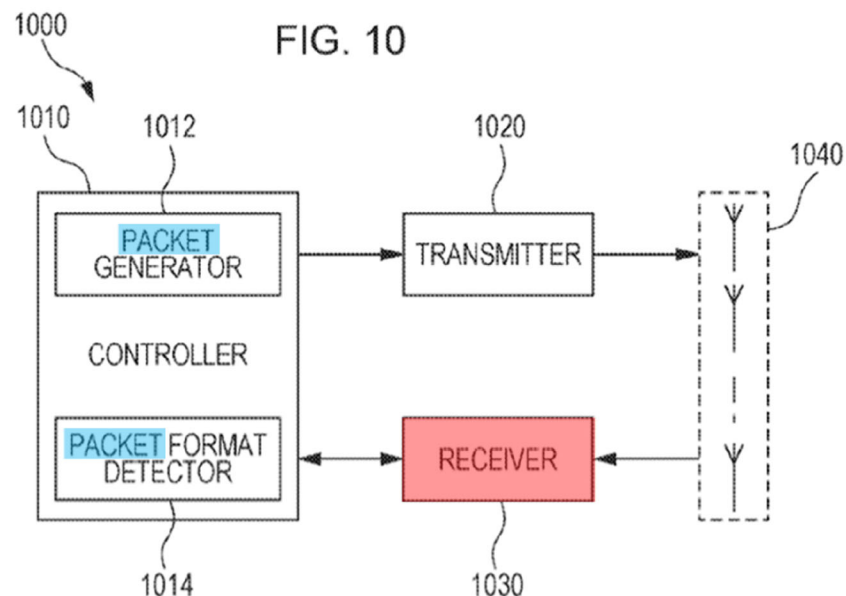
Huang’s wireless communication apparatus “can be an access point in a centralized wireless network, a station,” or “a node in peer-to-peer” networks, and “comprises a controller 1010, a transmitter 1020, a receiver 1030, and a plurality of antennas 1040.” (INTEL-1005, 14:21–27.) The controller is configured to generate packets to be “transmitted through the antenna” by the transmitter via a wireless communication channel to an intended receiver, and to “analyze and process packets which are received through the antenna 1040 after receiver processing by the receiver 1030.” (INTEL-1005, 14:27–42; INTEL-1003 ¶93.)

2. Claim Limitations [1A] and [6A]

Huang discloses this limitation.

a. *A wireless receiver configured to receive a wireless packet through a communication channel*

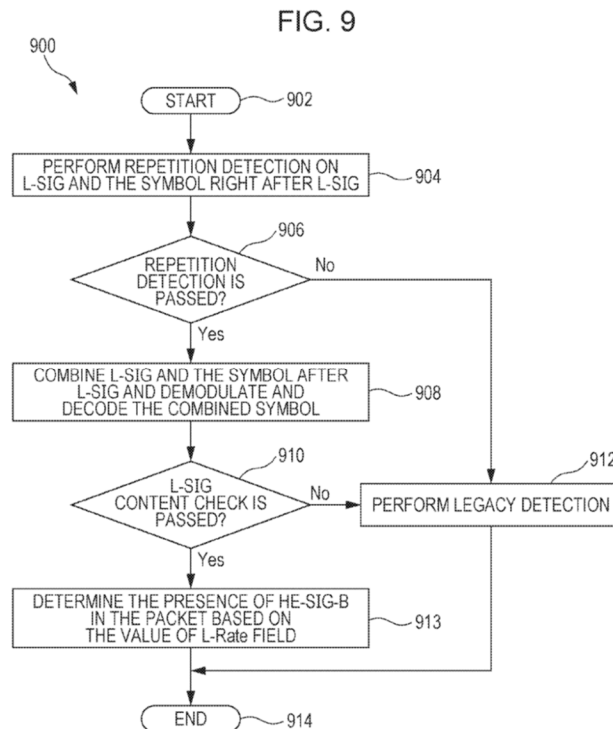
Huang's "wireless communication system" includes a "wireless communication apparatus" operating in an 802.11 standard wireless local area network (WLAN) which is packet-based. (INTEL-1005, Title, 1:9–21, Fig. 10 (below).) As shown in Figure 10 below, Huang's "wireless communication apparatus" includes a wireless OFDM "receiver to receive and decode packets ... in different formats," including 802.11ax standard packet formats, as well as formats for "backward compatibility with legacy 802.11a/g/n/ac standards." (INTEL-1005, 1:15–21, 2:7–11, Figs. 1A, 1B, 1C.)



Huang discloses that the same wireless communications apparatus is

configured to receive both the 802.11ax HE packet format 300 and 802.11a/g/n/ac legacy packet formats. (INTEL-1005, 1:15–21, 2:7–11, Figs. 1A–1C, 3, INTEL-1003, ¶¶96.) The receiver 1030 works with packet format detector 1014 to perform packet format detection. (INTEL-1003, ¶¶96.)

Figure 10 depicts a “block diagram illustrating [an] example architecture of a wireless communication apparatus 1000 according to the present disclosure” that is configured to perform the methods set forth in the disclosed embodiments, including the “method 900 [of Figure 9] for detecting packet format at a wireless communication apparatus according to the third embodiment of the present disclosure.” (INTEL-1005, 14:19–21, 13:2–4, Fig. 9 (below).)



In the method of Figure 9, Huang’s wireless device “performs repetition detection”

to “determine[] that the packet has a[n] 802.11ax format” and processes the received wireless packet accordingly; and if not, Huang’s device performs legacy packet format detection (*e.g.*, 802.11a/g/n/ac packets). (INTEL-1005, 13:4–25; INTEL-1003, ¶97.) Thus, Huang discloses a wireless communications device (HE capable device) configured to receive and perform packet detection on both an 802.11ax HE packet format of the present disclosure as well as 802.11a/g/n/ac legacy packet formats. (INTEL-1003, ¶97.)

Also, as shown in Figure 10 above, Huang’s wireless OFDM receiver is coupled to a “plurality of antennas 1040” and is capable of multiple-input multiple-output (“MIMO”) communications “in order to allow multiple spatial stream transmission through multiple antenna” for HE packets. (INTEL-1005, 6:36–37, 14:26–27; *see also id.*, 4:37–39.) And Huang further discloses that receiver 1030 is operable to “receive and decode packets.” (INTEL-1005, 2:9.) Therefore, in order to facilitate MIMO reception, a POSITA would understand that Huang’s wireless receiver 1030 includes multiple antenna front end blocks coupled respectively to each of the plurality of antennas in order to receive the RF signals associated with an incoming wireless packet. (INTEL-1003, ¶98.)

Notably, Huang describes receiver 1030 in general terms that would include one or more antenna front ends, demodulators and decoders within receiver 1030. (INTEL-1005, 2:7–11 (receiver “receive[s]” and “decode[s]” packets);

INTEL-1003, ¶99.) And Huang’s Figure 10 illustrates packet format detector 1014 and receiver 1030 as separate components, which contrasts with the ’146 patent’s disclosure and independent claims that describe and claim the receiver and demodulator as separate components and do not describe a packet format detector. (See, e.g., INTEL-1001, 6:20–27 (Fig. 2), 9:15–18 (Fig. 5), cl. 1; INTEL-1003, ¶99.)) Petitioner disputes that including the demodulator or other components—such as a packet detector—in the claimed “*wireless receiver*” is consistent with the plain and ordinary meaning of these terms as recited in the claims.

But Huang’s description is nevertheless consistent with PO’s apparent interpretation and application of the claims in the district court case, in which PO points to the same PHY-layer disclosures of the accused 802.11ax wireless standard as satisfying both the “*wireless receiver*” ([1A]/[6A]) and “*demodulator*” ([1B]/[6B]) limitations. (Compare INTEL-1007, 3–15 (relying upon excerpts from §§17.3, 19.3, 21.3, and 27.3 of IEEE Std. 802.11ax as evidence of the claimed “*wireless receiver*”) with *id.*, 31–32 (relying on excerpts from §§17.3, 19.3, 21.3, and 27.3 of IEEE Std. 802.11ax as evidence of the claimed “*demodulator*”).) This indicates that, under PO’s infringement theory, the accused wireless receiver incorporates the entire chain of components in the receive path. Therefore, if the Board adopts PO’s interpretation, Huang’s receiver 1030 and packet format detector 1014 together satisfy the requirements of independent claims 1 and 6.

(INTEL-1003, ¶100.) Huang therefore discloses the “*wireless receiver*” of claim 1 and the “*receiving*” step of claim 6. (INTEL-1003, ¶100.)

Furthermore, it is well known that 802.11 packets are communicated “*through a wireless communication channel.*” (INTEL-1003 ¶101.) Huang teaches 802.11 standard wireless communications using orthogonal frequency division multiplexing (OFDM), which “subdivides” the bandwidth of a communication channel “into a plurality of orthogonal frequency subcarriers.” (INTEL-1005, 1:25–27.) The “input data stream” is correspondingly “divided into several parallel substreams” for transmission over the subcarriers. (INTEL-1005, 1:28–30.) In addition, Huang teaches that the bandwidth of the communication channel to be used for communications is designated in 802.11 packets. For example, the “HE-SIG-A” field in an 802.11ax packet “carries common information required to interpret the remaining HE packet [], e.g., **channel bandwidth**, etc.” (INTEL-1005, 6:43–45.) As discussed, Huang’s wireless communication apparatus includes a controller configured to generate packets to be “transmitted through the antenna” to an intended receiver and to “analyze and process packets which are received through the antenna” at the receiver. (INTEL-1005, 14:27–45; INTEL-1003 ¶101.) A POSITA would understand that a wireless communication channel is formed between the transmitting and receiving antennas such as the ones shown in Huang’s Figure 10 above. (INTEL-1003 ¶101.)

Huang therefore discloses a “*wireless receiver*” (e.g., the 802.11ax receiver of Fig. 10) “*configured to receive a wireless packet*” (e.g., the receiver can receive and decode wireless packets) “*through a communication channel*” (e.g., 802.11 wireless channel). (INTEL-1003, ¶102.)

b. *Formats of the wireless packet include a first and second packet format*

As set forth below, Huang discloses that the same wireless communication device is configured to receive both a “*first packet format*” [802.11a/g/n/ac packet formats] and a “*second packet format*” [802.11ax packet format]. (INTEL-1003, ¶103.) Huang’s wireless communication device is configured to transmit and receive 802.11ax packet formats as well as “various formats of legacy 802.11a/g/n/ac packets.” (INTEL-1005, 3:6–13 (Figs. 1A–1C (below)); 6:23–31(Fig. 3 (below)).) Huang also teaches a method of distinguishing between 802.11ax and legacy packet formats such as 802.11a/g/n/ac. (*See, e.g.*, INTEL-1005, 13:2–21.)

FIG. 1A

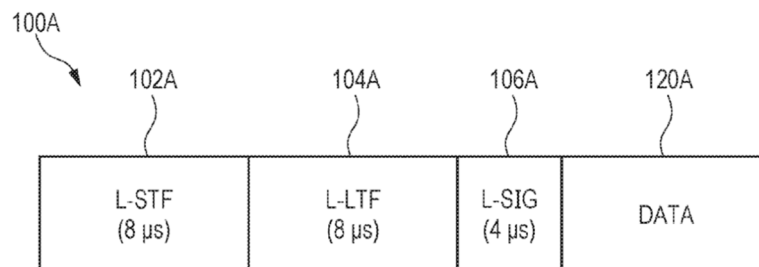


FIG. 1B

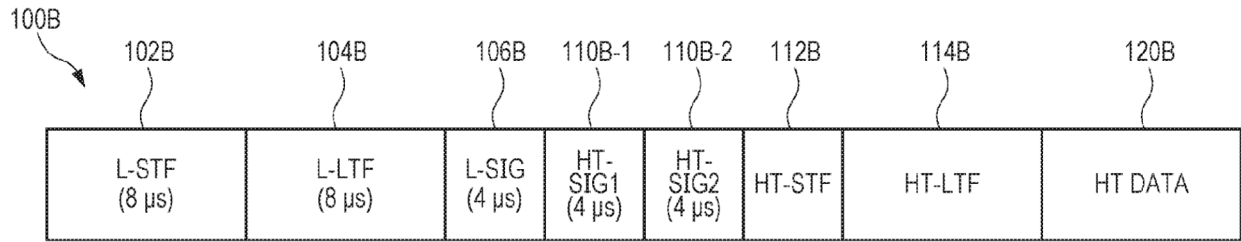


FIG. 1C

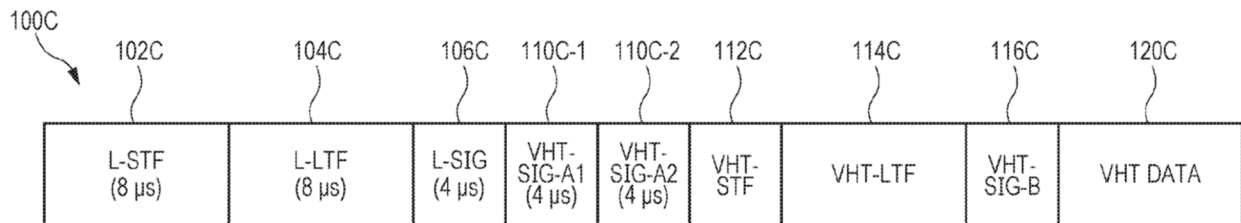
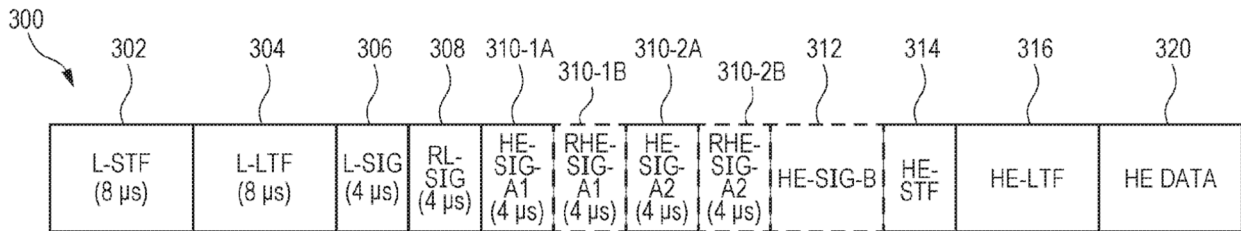


FIG. 3

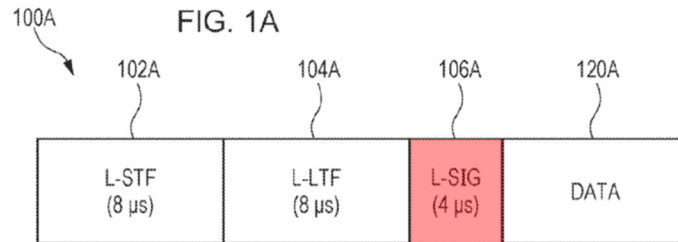


Thus, Huang discloses a wireless communications apparatus (High Efficiency (HE)-capable device) that is configured to receive both the “*first packet format*” (802.11a/g/n/ac packet formats) and the “*second packet format*” (802.11ax packet format). (INTEL-1003, ¶104.)

c. *First packet format comprises a first header field carried by a first OFDM symbol*

Huang discloses a “*first packet format*” that comprises a “first header field” carried by a “first OFDM symbol.” For example, Huang’s disclosure of an

802.11a/g packet format in Figure 1A below includes an “L-SIG” field which is a packet header field carried by one OFDM symbol. (INTEL-1005, 3:14–19, Fig. 1A.)



Other examples include the 802.11n and 802.11ac packet formats, each of which also include an L-SIG field carried by one OFDM symbol. (See INTEL-1005, Figs. 1B–1C.)

FIG. 1B

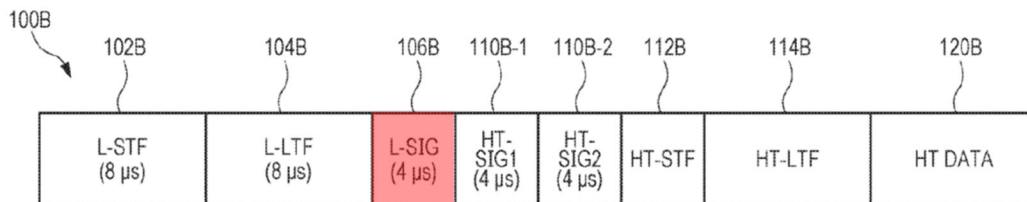
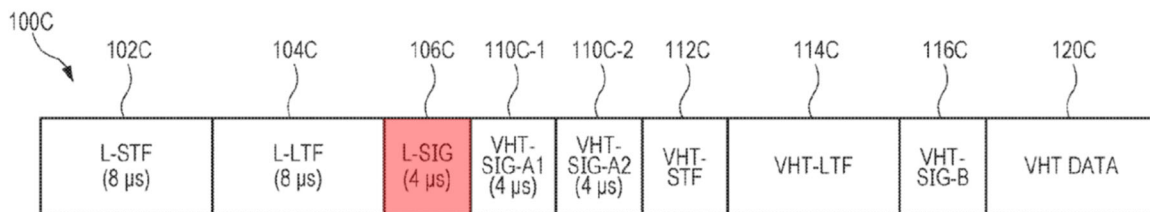


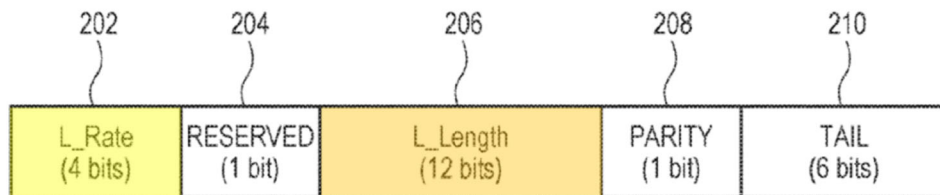
FIG. 1C



Thus, Huang discloses a “*first packet format*” that comprises a legacy 802.11a/g/n/ac packet format, *e.g.*, a format having a legacy signal field L-SIG carried by one OFDM symbol. (INTEL-1003, ¶106.)

A POSITA would understand that L-SIG field is a “*header field*” because, consistent with the description of a “header” in the patent specification, it precedes the packet payload and includes “important control information for the receiver to decode the payload properly, and also provides information about the packet length for virtual carrier sensing.” (INTEL-1001, 1:55–58; INTEL-1003, ¶107.) As shown in Figure 2A below, the L-SIG field has a number of subfields, for example the “L_Length and L_Rate fields,” that include important control information for receiving and correctly decoding the packet. (INTEL-1005, 3:24–27, Fig. 2A; INTEL-1003, ¶107.)

FIG. 2A



“Note that not only is it important for the intended receiver of the packet 100A to correctly decode the L-SIG 106A, but also nearby stations need to correctly decode the L-SIG 106A in order to properly defer the channel access.” (INTEL-1005, 3:40–43.)

According to Huang, the L_Rate field “conveys information about the modulation type and coding rate as used in the data field” and the L-Length field “indicates the amount of data in the data field [] in octets.” (INTEL-1005, 3:27–29,

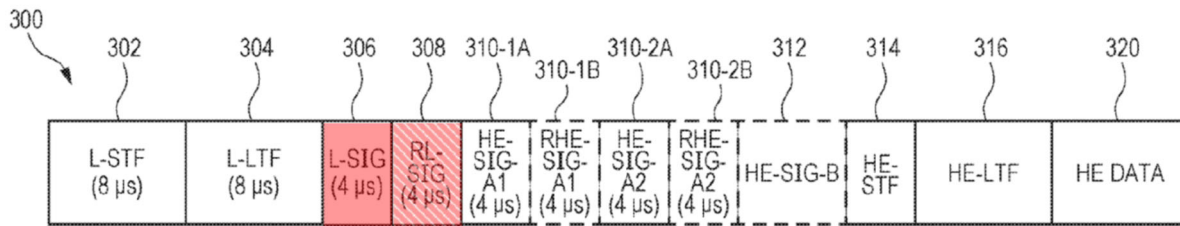
3:30–32.) A POSITA would understand that these field include “information about the packet length for virtual carrier sensing,” and are designed so that an “802.11a/g device receiving the HT packet 100B or the VHT packet 100C will defer [the channel] for the duration indicated by the L_Length and L_Rate fields in the L-SIG.” (INTEL-1005, 6:3–8; INTEL-1001, 1:57–58; INTEL-1003, ¶108.)

In addition, Huang teaches that L-SIG is carried by “*a first OFDM symbol*.” For example, as shown in Figure 2C, Huang’s “transmitter 250 for L-SIG 106A in the 802.11a/g packet 100A ... generates an OFDM symbol which is 3.2 microseconds in length,” which, after prepending “a 0.8 microsecond cyclic prefix into the OFDM symbol,” forms a “4 microsecond OFDM symbol” for L-SIG 106A. (INTEL-1005, 3:44–45, 3:64–4:3.)

- d. *Second packet format comprises both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which repeats the first OFDM symbol***

Huang discloses “an HE packet 300 complying with the IEEE 802.11ax specification framework” (“*second packet format*”) that includes an L-SIG field and a repeated L-SIG field (“RL-SIG” for *repeated* legacy signal field) which follows L-SIG in the packet as shown in Figure 3. (INTEL-1005, Fig. 3, 6:23–31.)

FIG. 3



As discussed in §VI.B.2.c., *supra*, L-SIG is a “*header field*” because it contains important control information for the receiver to decode the packet payload properly, as well as packet length information for virtual carrier sensing. (INTEL-1001, 55–58; INTEL-1003, ¶110.) “L-SIG 306 in the HE packet 300 is defined and transmitted in the similar manner as L-SIG 106A in the 802.11a/g packet 100A as illustrated in FIG. 2A, FIG. 2B and FIG. 2C.” (INTEL-1005, 6:32–35.)

In addition, L-SIG and RL-SIG are each carried by an OFDM symbol. “The RL-SIG 308 repeats the content of the L-SIG 306 and [is] transmitted in the similar manner as the L-SIG 306, resulting that the RL-SIG 308 **is also a 4 microsecond OFDM symbol.**” (INTEL-1005, 6:38–42.)

Therefore, Huang discloses “*a first packet format*” (e.g., legacy 802.11a/g/n/ac packets) and “*a second packet format*” (e.g., 802.11ax packets), “*the first packet format comprising a first header field*” (e.g., L-SIG) “*the second packet format comprising both the first header field ... and a second header field ... which follows the first ..., and the second header field being a repetition of the first header field*” (e.g., L-SIG followed by RL-SIG in 802.11ax HE packets).

These header fields are “*carried by a first OFDM symbol*” and “*a second OFDM symbol which follows the first OFDM symbol*” (L-SIG and RL-SIG are carried by separate OFDM symbols in the 802.11ax HE packets). (INTEL-1003, ¶112.)

3. Claim Limitations [1B] and [6B]

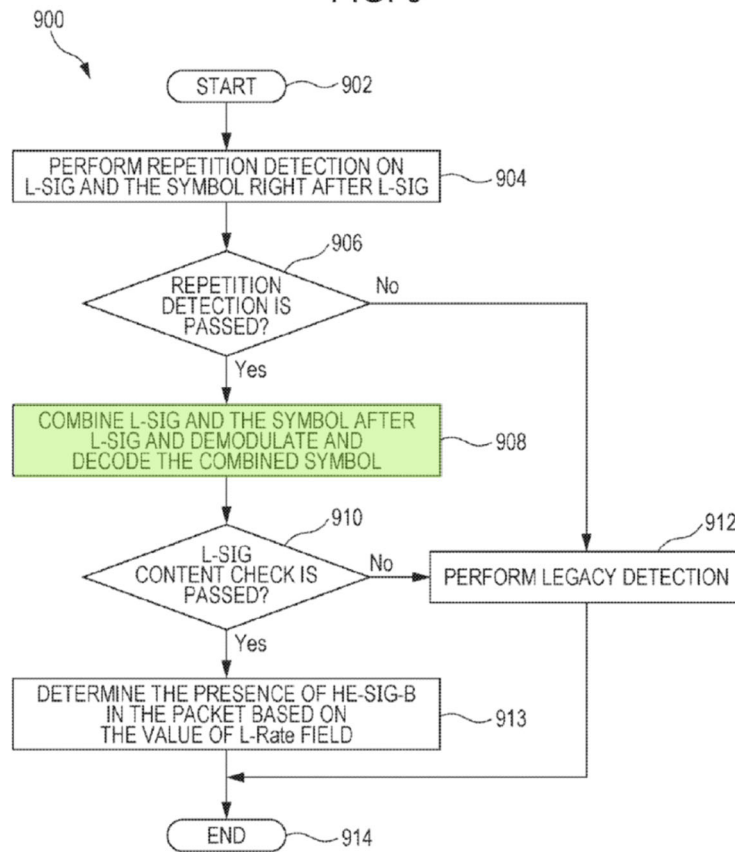
Huang discloses this limitation.

a. *Demodulator to demodulate the received wireless packet*

Huang discloses demodulating the L-SIG and RL-SIG header fields. “[T]he wireless communication apparatus performs [maximal ratio combining] on the L-SIG and the symbol right after the L-SIG, followed by demodulating and decoding the combined L-SIG symbol.” (INTEL-1005, 13:15–18.) Further, Huang’s Figure 9 “according to the third embodiment of the present disclosure” includes a demodulation step 908. (INTEL-1005, 13:2–4, Fig. 9.)

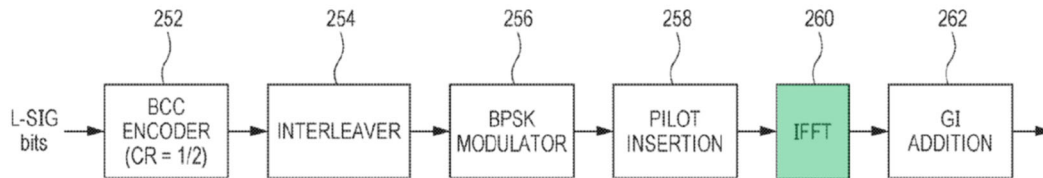
A POSITA would therefore understand that Huang requires a “*demodulator*” in the device hardware to demodulate a received wireless packet—including its header fields—before it can properly decode and process the packet payload. (INTEL-1003 ¶115.) Further, Huang discloses receiving and decoding incoming wireless packets, which a POSITA would understand requires demodulating the packets as well. (INTEL-1005, 2:7–11; INTEL-1003, ¶115.)

FIG. 9



Additionally, Huang discloses transmitting packets via “OFDM modulation” that “may be realized by an efficient IFFT (Inverse Fast Fourier Transform) that makes a plurality of subcarriers usable with little complexity” and is performed by an “IFFT block.” (INTEL-1005, 1:37–39, 3:49, Fig. 2C (below).) The IFFT block “performs IFFT operation on 52 information and pilot symbols and generates an OFDM symbol” (INTEL-1005, 3:64–66.)

FIG. 2C



A POSITA would understand that an IFFT modulated signal transmitted through a wireless channel must be demodulated after reception to recover the original information. (INTEL-1003, ¶116.) A POSITA would further understand that Huang’s system requires a corresponding Fast Fourier Transform (FFT) block in the receive chain which performs the reverse operation to demodulate the received wireless packets for further processing. (INTEL-1003, ¶116.)

In addition, as discussed above in §VI.B.2.a., *supra*, Huang’s wireless OFDM receiver is MIMO-capable, and thus a POSITA would understand it includes a number of demodulator blocks in accordance with the number of MIMO spatial streams that the wireless receiver can receive. (INTEL-1003, ¶117.) These demodulators are the claimed “*demodulator configured to demodulate the received wireless packet.*”

Therefore, a POSITA reading Huang would understand it to disclose the use of a demodulator to demodulate the received wireless packet. (INTEL-1003 ¶118.)

4. Claim Limitations [1C] and [6C]

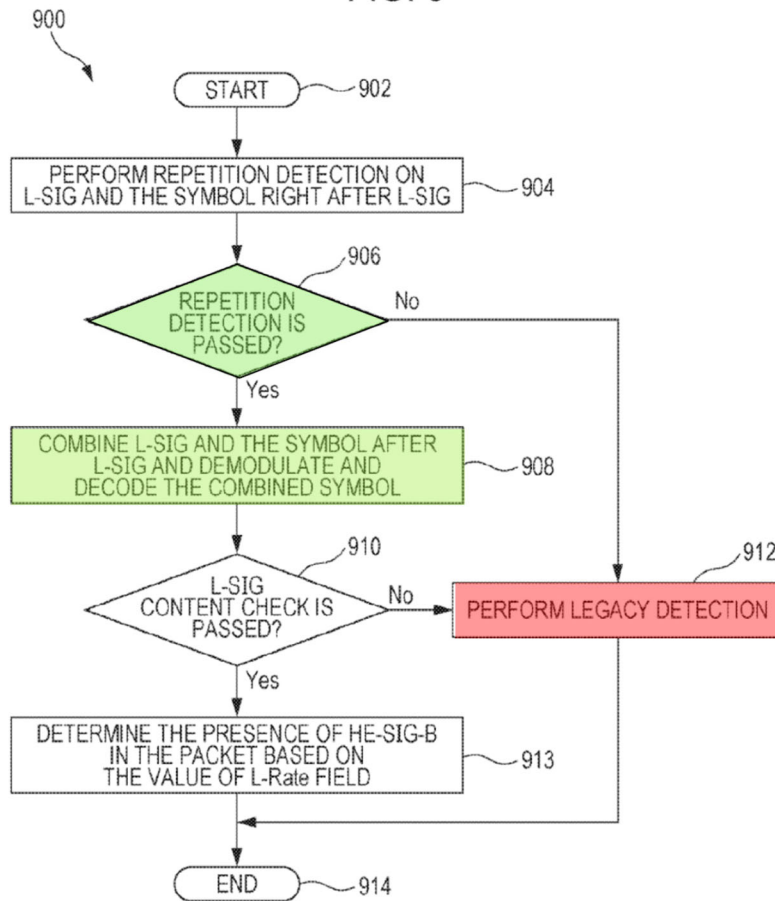
Huang discloses this limitation.

- a. *Receiver distinguishes the packet format by detecting, from the received wireless packet, the second header field which repeats the first header field*

As discussed in §VI.B.2.d., *supra*, Huang discloses a second 802.11ax HE packet format with a repeated legacy signal field RL-SIG. Huang teaches that RL-SIG “is transmitted in a similar manner as L-SIG” and “is used to assist in detecting the format of the HE packet 300.” (INTEL-1005, 6:38–41.) Huang also teaches that “the RL-SIG 308 in the HE packets 300” is “instrumental in differentiating 802.11ax packet[s] from legacy 802.11a/g/n/ac packets” (INTEL-1005, 8:45–47.)

“FIG. 9 illustrates a method 900 for detecting packet format at a wireless communication apparatus according to the third embodiment of the present disclosure.” (INTEL-1005, 13:2–4, Fig. 9.) “At step 904, the wireless communication apparatus “performs repetition detection to determine whether the symbol right after the L-SIG in an incoming packet has the same content as the L-SIG” (which is preferably performed using “correlation over data subcarriers between the L-SIG and the symbol right after the L-SIG ...”). (INTEL-1005, 13:5–11.)

FIG. 9



Huang further teaches that “repetition detection is passed” when “the correlation value is larger than a predefined threshold ...” (INTEL-1005, 13:11–13.) In such cases, the method continues to 908 for HE packet processing. (INTEL-1005, Fig. 9; INTEL-1003, ¶122.) “Otherwise the wireless communication apparatus performs the legacy 802.11a/g/n/ac packet detection at step 912.” (INTEL-1005, 13:21–23.)

“At step 908, the wireless communication apparatus performs [maximal ratio combining] on the L-SIG and the symbol right after the L-SIG, followed by demodulating and decoding the combined L-SIG symbol.” (INTEL-1005, 13:15–

18.) After the “L-SIG content check is passed” at step 910 (*i.e.*, “the parity check is ok”), Huang’s apparatus “determines that the packet has a[n] 802.11ax format”; “[o]therwise the wireless communication apparatus performs the legacy 802.11a/g/n/ac packet detection at step 912.” (INTEL-1005, 13:21–25.)

Thus, Huang discloses a wireless communication device that detects a repeated RL-SIG field and distinguishes an 802.11ax packets format from 802.11a/g/n/ac legacy packet formats on that basis. (INTEL-1003, ¶124.) Based on whether RL-SIG is detected in a received wireless packet, Huang’s wireless device distinguishes 802.11ax packets from legacy packet formats, and demodulates and decodes the received wireless packet accordingly. (*See* INTEL-1005, 2:7–11, 13:4–23, INTEL-1003 ¶124.)

Therefore, Huang distinguished 802.11ax packets from non-802.11ax packet formats. (INTEL-1003, ¶125.) According to PO’s infringement contentions, distinguishing in the manner disclosed in Huang meets the “*distinguish[ing] the second packet format from the first packet format*” limitation because, as alleged, the accused 802.11ax standard distinguishes the 802.11ax packets from non-802.11ax packet formats based on detecting RL-SIG in the header. For example, PO’s contentions quote the 802.11ax standard stating that the “RL-SIG field is a repeat of the L-SIG field and is **used to differentiate an HE PPDU from a non-**

```

graph TD
    A["Detect HT-GF  
Determine whether QBPSS is used in 1st symbol after LTF"] -- "HT-GF preamble" --> B(( ))
    A -- "BPSK" --> C["Detect RL-SIG  
Rx and determine whether 1st and 2nd symbols after L-TF are the same"]
    A -- "BPSK" --> D["Detect SIG for non-HT, HT, and VHT  
Determine preamble types"]
    C -- "Repetition failed" --> D
    C -- "Repetition detected" --> E["RX L-SIG  
RX and combine L-SIG and RL-SIG. Decode, test parity, determine whether RATE is 6 Mb/s"]
    E -- "Parity or RATE check failed" --> D
    D -- "VHT preamble" --> F(( ))
    D -- "Non-HT preamble" --> G(( ))
    D -- "HT preamble" --> H(( ))

```

NOTE 1—This state is the operation of optional HT-GF preamble.

NOTE 2—Refer to Clause 19.3.1.1. The parameter indicates NON_HT_DUP_OFDM.

⁵ A POSITA would understand that PPDU's (physical layer protocol data units) are network "packets," consistent with the usage of the term in the art and in the '146 patent. (See §V.C.1, *supra*.)

Huang's disclosures are nevertheless consistent with PO's apparent interpretation and application of the claims in PO's contentions.

Claim 1 additionally requires that the “*wireless receiver*” performs the “*detecting*” and “*distinguishing*” operations on the “*received wireless packet*.” As noted in §VI.B.2.a, *supra*, Huang discloses a receiver 1030 that a POSITA would understand includes one or more antenna front ends, demodulators, decoders, as well as a “packet format detector 1014” under PO's apparent interpretation of the term “*wireless receiver*” that together perform the packet format detection steps 904–910 of Huang's Figure 9. (INTEL-1005, Figs. 9–10.) This contrasts with claim 1, which claims the receiver and demodulator as separate components and requires the “*wireless receiver*” to perform the “*distinguish[ing]*” step. (INTEL-1001, 6:20–27 (Fig. 2), 9:15–18 (Fig. 5), cl. 1.); INTEL-1003 ¶127.)

Petitioner disagrees that defining the receiver to include the entire chain of components in the receive path (i.e., the demodulator, decoder, and Huang's packet format detector 1014) is consistent with the plain and ordinary meaning of claim 1 or the '146 patent's specification, or that claim 1 permits other components besides the receiver to perform this step. But Huang's description is nevertheless consistent with PO's apparent interpretation and application of the claims in the co-pending district court case, which point to the entire receive chain of the 802.11ax standard as being part of the receiver. (INTEL-1007, 3–15, 31–32.)

Nonetheless, a POSITA would understand that demodulation is part of the receive chain consistent with how PO is reading the claims, and if the Board adopts PO's expansive view that the scope of the claimed "*wireless receiver*" encompasses the entire receive chain, then Huang discloses it. (See §VI.B.2.a, *supra*; INTEL-1003, ¶129.) Huang's wireless communication device includes a demodulator and a decoder in the receive chain that "demodulat[e] and decod[e] the combined L-SIG symbol." (INTEL-1005, 13:15–18, Fig. 9.) Huang likewise discloses that the packet format detector 1040 is used in conjunction with receiving packets. (INTEL-1005, 14:39–45; INTEL-1003, ¶129.)

Thus, if the Board determines the claimed "*wireless receiver*" should be interpreted to cover the entire receive chain of the wireless device, then Huang discloses this limitation of claim 1 because Huang's receiver and packet format detector together perform the claimed function of distinguishing/detecting packet formats based on the existence of the repeated legacy signal field RL-SIG. (INTEL-1003, ¶130.)

Huang therefore discloses a "*wireless receiver*" that "*distinguishes the second packet format*" (e.g., 802.11ax packets) "*from the first packet format*" (e.g., one of the legacy packet formats) "*by detecting, from the received wireless packet, the second header field*" (RL-SIG) "*which repeats the first header field*" (L-SIG). (INTEL-1003, ¶131.)

C. Claims 2 and 7

Huang discloses this additional limitation.

- a. *Receiver determines the received wireless packet as the second packet format when the second header field is detected***

As discussed above in §VI.B.4.a., *supra*, Huang's receiver distinguishes the format of the received wireless packet by detecting the presence or absence of RL-SIG (the repeated L-SIG field), and demodulates and decodes the wireless packet accordingly. (INTEL-1005, 13:4–18; INTEL-1003, ¶133.) When the RL-SIG field (*second header field*) is detected in the received wireless packet (*e.g.*, based on performing “correlation over data subcarriers between the L-SIG and the symbol right after the L-SIG”), the receiver “determines that the packet has a[n] 802.11ax format” (*second packet format*). (INTEL-1005, 13:9–11, 13:24–25.)

D. Claims 3 and 8

Huang discloses this additional limitation.

- a. *Receiver determines the received wireless packet as the first packet format when the second header field is not detected***

As discussed above in §VI.B.4.a., *supra*, Huang's receiver distinguishes the format of the received wireless packet by detecting the presence or absence of a repeated L-SIG field (RL-SIG), and demodulates and decodes the wireless packet accordingly. (INTEL-1005, 13:5–18; INTEL-1003, ¶135.) When RL-SIG (*second header field*) is not detected in the received wireless packet (*e.g.*, based on performing “correlation over data subcarriers between the L-SIG and the symbol

right after the L-SIG”), the receiver “performs the legacy 802.11a/g/n/ac packet detection” to determine that a legacy packet such as an 802.11a/g/n/ac packet (*first packet format*) without a repeated legacy header field RL-SIG has been received. (INTEL-1005, 13:9–11, 13:21–23.)

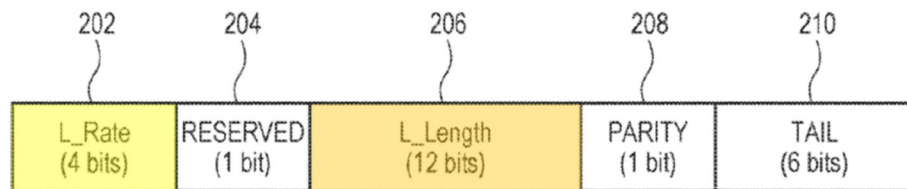
E. Claims 4 and 9

Huang discloses this additional limitation.

a. *The first and second header fields contain information for decoding the wireless packet*

As discussed above in §VI.B.2.c.–d., *supra*, the L-SIG field (and by repetition the RL-SIG field) is a header field precisely because it “*contains important control information for the receiver to decode the payload properly,*” consistent with the description of a “header” in the specification. (INTEL-1001, 1:55–58.) The L-SIG field contains “L_Length and L_Rate fields” that provide information about the modulation type, coding rate and packet length, all of which a POSITA would understand are required for the receiver to decode the payload properly. (INTEL-1005, 3:24–32, Fig. 2A); INTEL-1003, ¶137.)

FIG. 2A



“Note that not only is it important for the intended receiver of the packet 100A to

correctly decode the L-SIG 106A, but also nearby stations need to correctly decode the L-SIG 106A in order to properly defer the channel access.”) (INTEL-1005, 3:40–43.)

F. Claims 5 and 10

Huang discloses this additional limitation.

a. *The first and second header fields contain information related to length of the wireless packet*

As discussed above in §VI.B.2.c.–d., *supra*, the L-Length field in the L-SIG field (and by repetition the RL-SIG field) “indicates amount of data in the data field [] in octets,” which a POSITA would understand is “*information related to a length of the wireless packet.*” (INTEL-1005, 3:30–32; INTEL-1003, ¶139.)

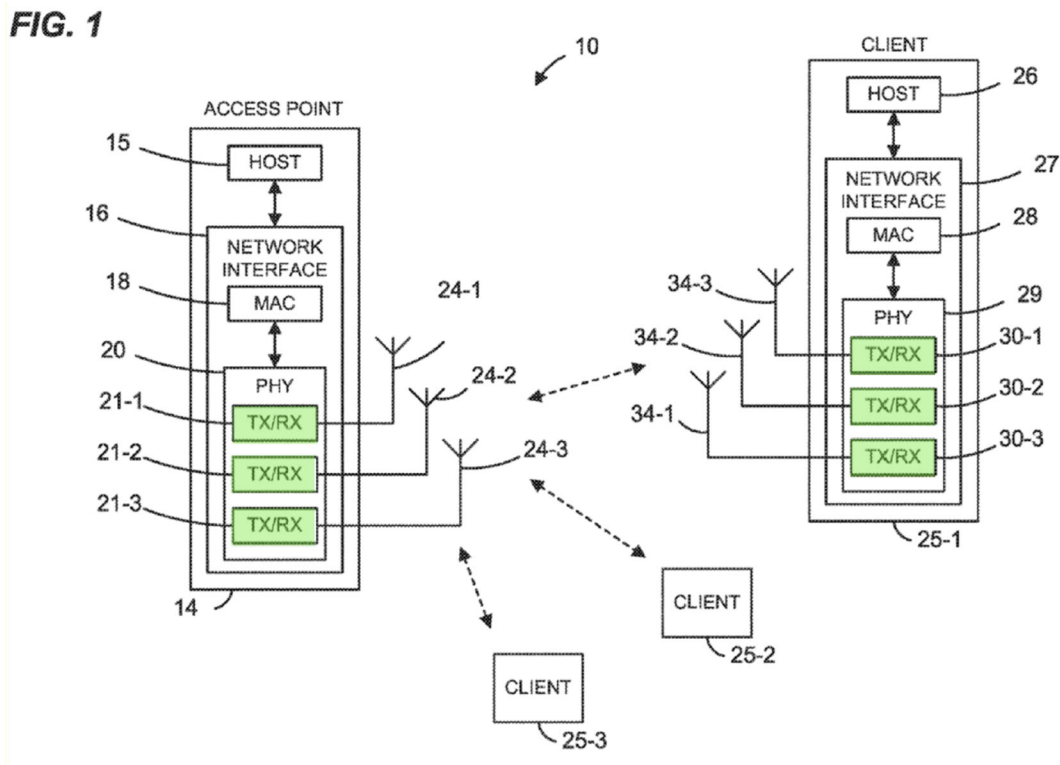
VII. GROUND 2: Claims 1–10 are Obvious Based on Sun

A. Sun Overview

Sun discloses “wireless local area networks that utilize data unit preambles which indicate a communication protocol.” (INTEL-1006, 1:17–19.) Sun further discloses “a wireless network device” such as an access point (AP) or client station (STA) of a wireless local area network (WLAN) that generates an orthogonal frequency division multiplex (OFDM) data unit ...,” which is a “*wireless communication device.*” (INTEL-1006, 2:55–58, Fig. 1.) An example WLAN is shown in Figure 1 below that includes an AP wirelessly communicating with multiple client STAs each having a physical layer (PHY) processor that includes a

plurality of transceivers TX/RX (shaded green) coupled to a plurality of antennas.

(INTEL-1006, 3:30–32, 4:8–11, Fig. 1.) The transceivers are “configured to transmit the generated data units via the antenna(s)” and “to receive data units via the antenna(s) ...,” and thus include both transmitting and receiving capabilities as shown by the arrows in Figure 1 below. (INTEL-1006 5:1–4, 5:33–36, Fig. 1.)



A POSITA would understand that the “data units” referred to in Sun are wireless network “packets.” In several places, Sun refers to “data units” and network “packets” synonymously. (See INTEL-1006, 5:61–63 (“The *data unit* 200 includes a preamble ... generally used for *packet* detection ...”), 7:61–62 (“the *data unit* 600 omits the data portion 616 (e.g., the data unit 600 is a null-data *packet*).”).) This is consistent with the usage of these terms in the art. For example,

a POSITA would understand that data units such as physical layer protocol data units (PPDUs) used in the physical layer (PHY) of 802.11 wireless systems are network packets that include a preamble, header and data fields, consistent with the description of a packet in the '146 patent specification. (INTEL-1001, 1:45–46 (“A packet is usually formed by a preamble, header, and payload.”); *see also* IEEE Std. 802.11a-1999, 7 (Fig. 107); INTEL-1003, ¶141.)

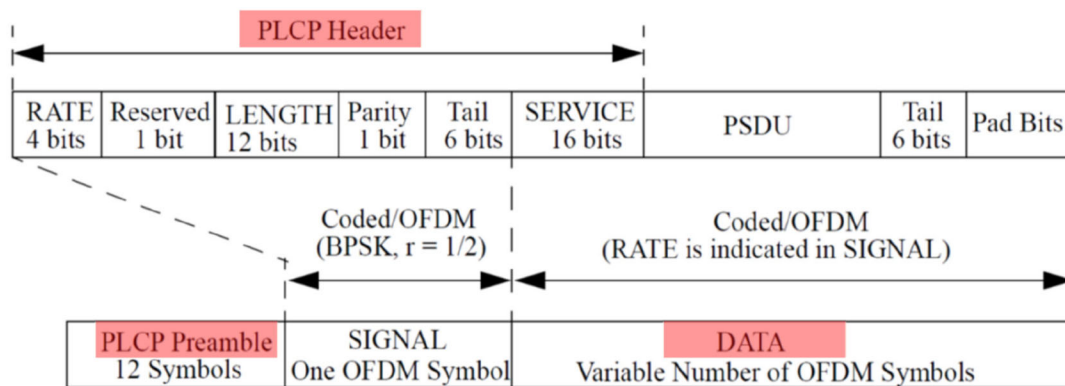
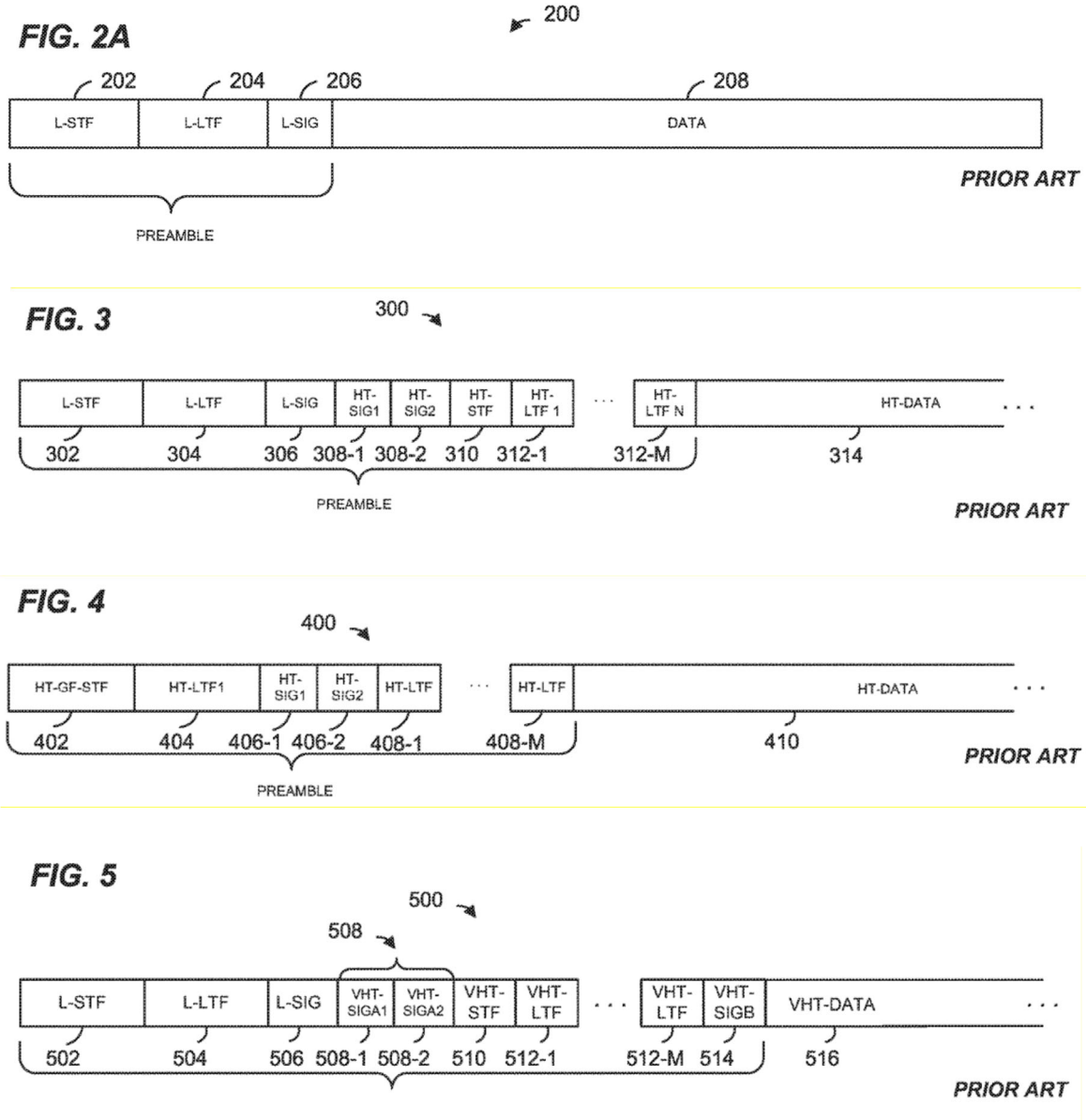


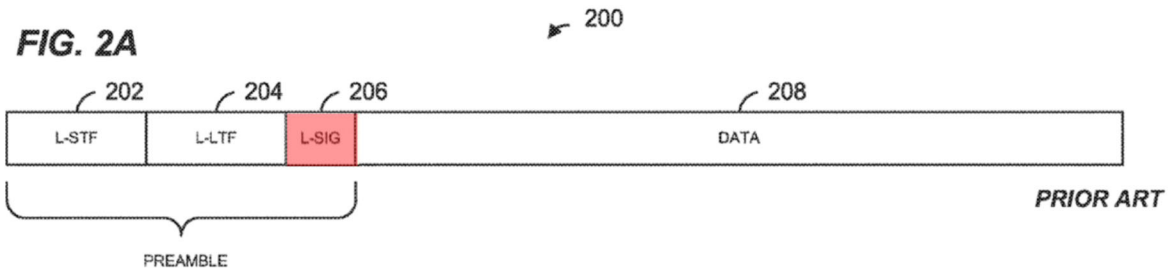
Figure 107—PPDU frame format

Sun discloses communicating wireless packets through a communication channel such as “single input single output (SISO) channel configuration” or a “multiple input multiple output (MIMO) channel configuration.” (INTEL-1006, 6:8–9, 6:25–26.) Sun’s communication device (*e.g.*, AP or STA) is configured to transmit and receive wireless packets (i) “according to a first communication protocol (*e.g.*, a High Efficiency, HE, or 802.11ax communication protocol)” (*see* Figure 7), (ii) “a second communication protocol (*e.g.* according to the IEEE 802.11ac Standard)” (*see* Figure 5), or (iii) “a third communication protocol,

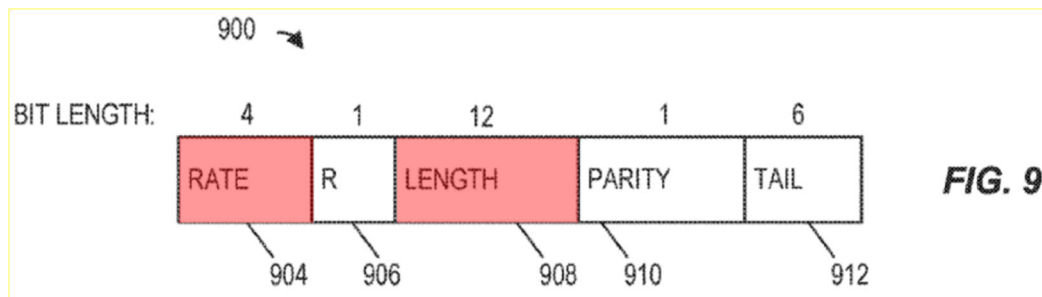
and/or a fourth communication protocol (e.g., according to the IEEE 802.11a Standard and/or the IEEE 802.11n Standard)” (see Figures 2A, 3–4 (below)). (INTEL-1006, 3:44–56.)



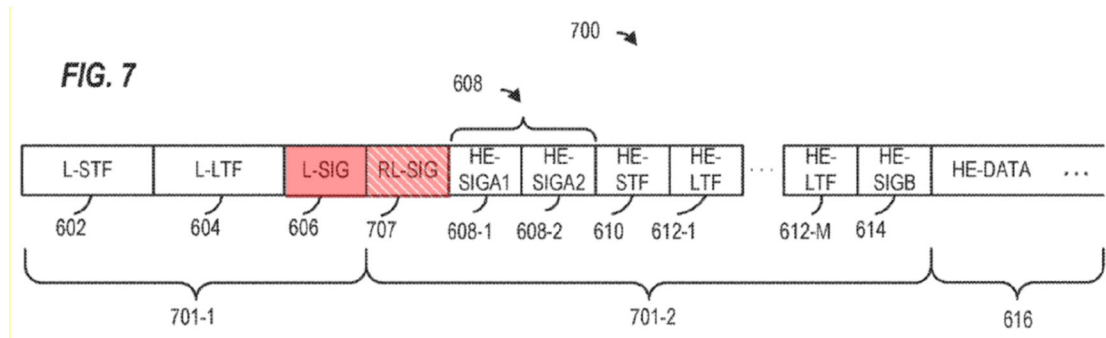
For example, Sun discloses an 802.11a/g packet format shown below that includes a legacy signal field “L-SIG.” (INTEL-1006, 5:53–6:2, Fig. 2A.)



The “legacy signal field (L-SIG)” is “used to carry certain physical layer (PHY) parameters with the data unit [], such as modulation type and coding rate used to transmit the data unit” (INTEL-1006, 5:66–6:2, Fig. 9.) As shown, the L-SIG field includes (i) “a rate subfield 904” for communicating the modulation and coding rate, and (ii) a “length subfield 908” for communicating the packet length. (INTEL-1006, 10:52–53.)



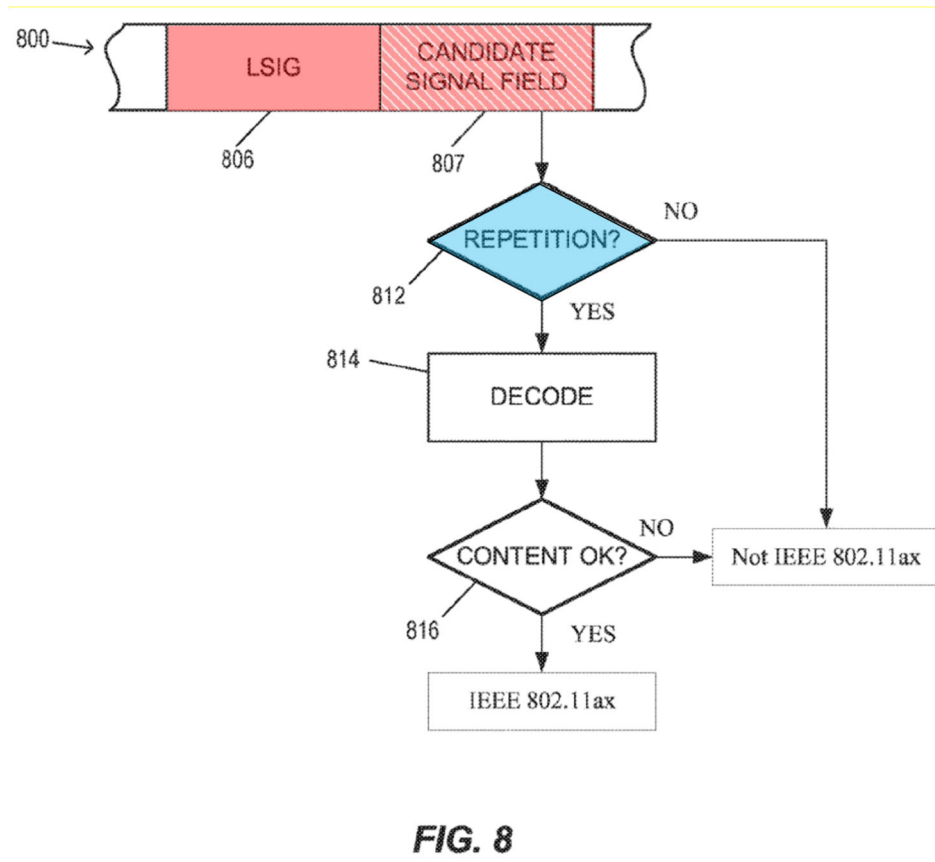
Sun further discloses “OFDM data unit 700” which is an 802.11ax HE packet format that includes an L-SIG field and a repeated legacy signal field (“RL-SIG”) (shaded red) that follows the L-SIG field in the time domain as shown in Figure 7 below. (INTEL-1005, 8:26–46, Fig. 7.)



Both L-SIG and RL-SIG in data unit 700 are carried by one OFDM symbol. (INTEL-1003, ¶146.) For example, “a first OFDM symbol that includes the L-SIG field 806” and a “second OFDM symbol that follows the first OFDM symbol and includes a second field” which includes a “repeated legacy signal field 707 (see FIG. 7).” Sun discloses a method of distinguishing an 802.11ax packet format from non-802.11ax packet formats such as 802.11a/g/n/ac packet formats based on whether the repeated legacy signal field (RL-SIG) is detected in the received data unit. (See INTEL-1006, 8:31–36 (“[T]he preamble 701 is formatted such that a receiving device that operates according to the HEW communication protocol (e.g., 802.11ax) is able to determine that the preamble 701 is a preamble of the HEW communication protocol rather than another preamble.”).) Sun also discloses that the “repeated legacy signal field generally provides for a more reliable auto-detection of the IEEE 802.11ax protocol.” (INTEL-1006, 3:6–8.)

“FIG. 8 is a diagram of an example method for determining whether a received OFDM data unit 800 corresponds to [802.11ax] or another communication protocol” (INTEL-1006, 9:4–7, Fig. 8 (below).) At block 812,

the receiving client STA “determines whether the candidate signal field 807 corresponds to a repetition of the L-SIG field 806” (INTEL-1006, 9:40–43.)



In one embodiment, “to determine whether the candidate signal field 807 corresponds to the repetition,” Sun describes using “time-domain correlation” of the first and second OFDM symbols 806 and 807. (INTEL-1006, 9:43–47.) In another embodiment, the client STA “decodes” the first and second OFDM symbols “to obtain respective first and second bit sequences” and “compares ... the bit sequences to determine whether the candidate signal field 807 corresponds to the repetition.” (INTEL-1006, 9:47–52.)

Based on whether RL-SIG field is detected, Sun’s receiver distinguishes the

802.11ax packet format from non-802.11ax packet formats, and demodulates and decodes the received wireless packet accordingly. (INTEL-1006, 9:17–19, 10:31–34.) “In response to a determination that the candidate signal field 807 does not correspond to a repetition of the L-SIG field 806 (NO at block 812), the client station 25 determines that the received data unit 800 does not correspond to the ... 802.11ax protocol ...”; and “[i]n response to a determination that the candidate signal 807 corresponds to a repetition of the L-SIG field 806 (YES at block 812), the client station 25 proceeds to block 814 and decodes the candidate signal field 807 to obtain the signal field bit sequence” (INTEL-1006, 9:56–67.)

This informs 802.11ax receivers that an 802.11ax packet has been received if a content check on the L-SIG field is passed at step 816. To determine whether the content of the L-SIG field corresponds to 802.11ax or another communication protocol, “[a]t block 816, the client station 25 determines whether the signal field bit sequence has a valid content value” (*i.e.*, a “data rate of six megabits per second,” a “length field ... that cannot be divided by three” and “suitable” parity and tail values). (INTEL-1006, 10:9–11, 10:14–24.) “In response to a determination that the content of the L-SIG field 806 corresponds to the [802.11ax] communication protocol, the client station 25 decodes ... the OFDM symbols of the data unit 800 according to the [802.11ax] communication protocol.” (INTEL-1006, 10:30–34.)

Thus, Sun’s receiver distinguishes the received wireless packet format by detecting the presence or absence of a repeated legacy signal field (RL-SIG), and demodulates and decodes the wireless packet accordingly. (INTEL-1006, 9:17–19, 9:32–67, 10:30–34.) When the RL-SIG field is detected in the received data unit, the receiver determines that an 802.11ax data unit has been received. (INTEL-1006, 9:63–67.) On the other hand, when the RL-SIG field (*second header field*) is *not* detected in the received data unit, the receiver “determines that that the received data unit 800 does not correspond to ... the IEEE 802.11ax protocol.” (INTEL-1006, 9:56–62.)

B. Independent Claims 1 and 6⁶

Sun renders these claims obvious, as set forth below.

1. Preamble [1Pre] and [6Pre]

Petitioner does not acquiesce that the preamble is limiting. Nevertheless, Sun discloses the Preamble. (INTEL-1003 ¶153.)

a. *Wireless Communication Device*

Sun discloses “wireless local area networks that utilize data unit preambles

⁶ Given the repeated subject-matter among the claims, this petition addresses overlapping claims together. To the extent there are any substantive differences between claims or the corresponding analysis, that is noted herein.

which indicate a communication protocol.” (INTEL-1006, 1:17–19.) Sun further discloses a “wireless network device such as an access point (AP) or client station (STA) of a wireless local area network (WLAN)” which is a “*wireless communication device*” that “generates an orthogonal frequency division multiplex (OFDM) data unit” (INTEL-1006, 2:55–58.) An example WLAN is shown in Figure 1 below that includes an AP wirelessly communicating with a number of client STAs, each having a physical layer (PHY) processor that includes a plurality of transceivers TX/RX (shaded green) coupled to a plurality of antennas. (INTEL-1006, 3:30–32, 4:8–10, Fig. 1 (shown below).)

2. Claim Limitations [1A] and [6A]

Sun discloses this limitation.

a. *A wireless receiver configured to receive a wireless packet through a communication channel*

The transceivers in Sun’s APs and STAs include both transmitting and receiving capabilities as shown by the arrows in Figure 1. (INTEL-1006, Fig. 1 (below).) The transceivers are “configured to transmit the generated data units via the antenna(s)” and “to receive data units via the antenna(s)” (INTEL-1006 5:1–4, 33–36.) Sun’s transceivers therefore include a “*wireless receiver*” to perform the receiving functions. Sun further discloses communicating “data units” which, as discussed in §VII.A., *supra*, are network “packets.”

Sun discloses that the same wireless network device is configured to receive

both the 802.11ax HE data unit 700 and non-802.11ax data units such as those complying with the 802.11a/g/n/ac wireless communication protocols. (See INTEL-1006, 5:53–57 (Fig. 2A), 6:10–13 (Fig. 3), 6:35–38 (Fig. 4), 6:50–53 (Fig. 5), 7:16–19 (Fig. 6) & 8:26–27 (Fig. 7); INTEL-1003, ¶157.)

FIG. 1

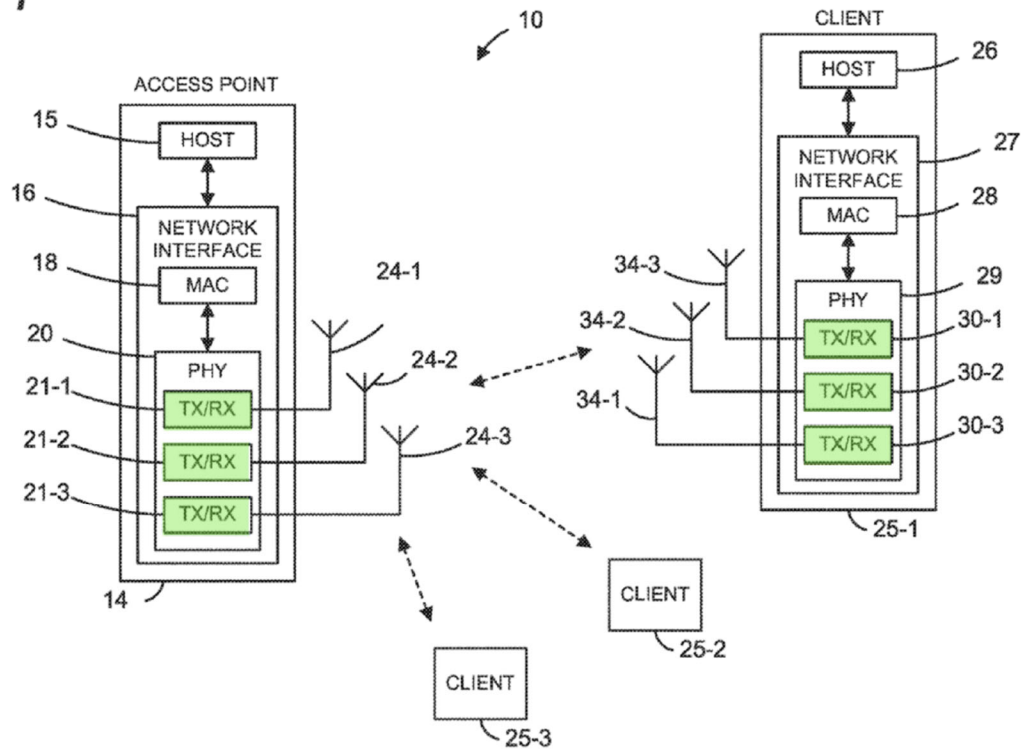


Figure 1 depicts a “block diagram of an example wireless local area network (WLAN), according to an embodiment” that includes an AP communicating with a plurality of client STAs (INTEL-1006, 3:23–24, Fig. 1.) The APs and STAs are “wireless network device(s)” configured to perform the methods set forth in the disclosed embodiments, including the “method for determining whether a received OFDM data unit 800 corresponds to the [802.11ax] protocol or a different

communication protocol” of Figure 8. (INTEL-1006, 2:55–57, 9:4–12, Fig. 8.) “As shown in FIGS. 2A, 3, 5, and 7, various data units [are] generated according to different communication protocols.” (INTEL-1006, 9:19–21.)

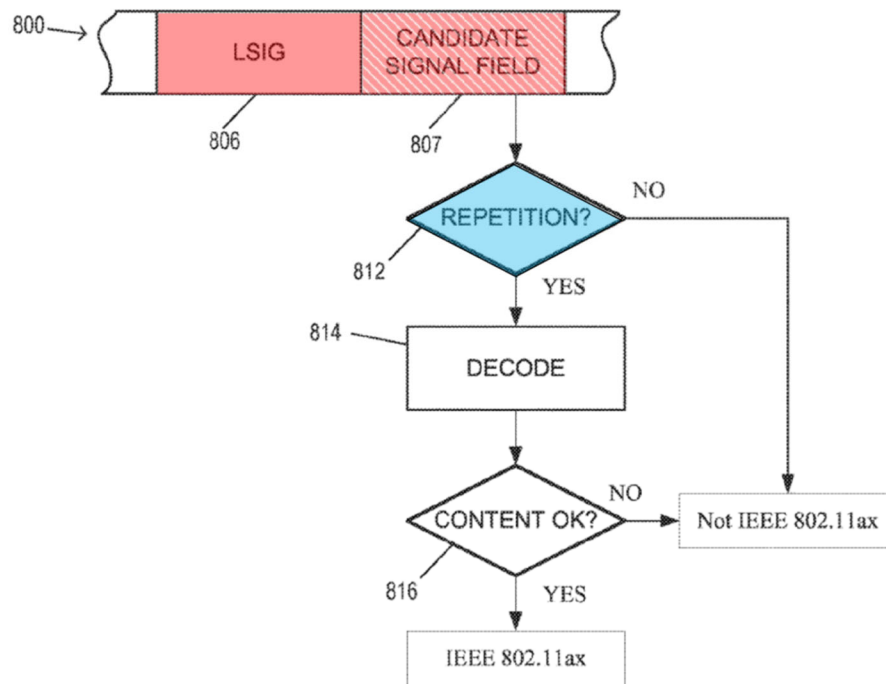


FIG. 8

In the method of Figure 8, Sun’s wireless communication device (*e.g.*, AP or STA) (i) “receives a second OFDM symbol” (candidate signal field 807) “that follows the first OFDM symbol” (L-SIG 806), and (ii) “determines whether the candidate signal field 807 corresponds to a repetition of the L-SIG field 806” (INTEL-1006, 9:28–32, 9:40–43.) “In one scenario, the data unit 800 corresponds to the IEEE 802.11a protocol ... (see FIG. 2A)” and “[i]n another scenario, the data unit 800 corresponds to the ... IEEE 802.11ax protocol” (INTEL-1006,

9:32–37.)

Based on whether candidate signal field 807 is determined to be an 802.11ax HE packet format or a non-802.11ax format (*e.g.*, 802.11a/g/n/ac), Sun’s wireless device performs the appropriate receiving and decoding operations. (INTEL-1006, 9:56–67, 10:30–34; INTEL-1003, ¶160.) Thus, Sun discloses a wireless network device (HE capable device) configured to receive and perform packet detection on both 802.11ax HE packets of the disclosed embodiment of Figure 7, as well as non-802.11ax HE packet formats (*e.g.*, 802.11a/g/n/ac formats) of Figures 2A, 3–5. (INTEL-1003, ¶160.)

Also, as shown in Figure 1 above, Sun’s wireless OFDM receiver is coupled to a “plurality of antennas” to transmit “a number of spatial streams ... in a multiple input multiple output (MIMO) channel configuration.” (INTEL-1006, 3:32, 4:10, 6:24–27.) In order to facilitate MIMO, a POSITA would understand that Sun’s wireless receiver includes multiple antenna front end blocks coupled respectively to each of the plurality of antennas in order to receive the RF signals associated with incoming wireless packets. (INTEL-1003, ¶161.)

Notably, Sun describes transceivers in general terms that a POSITA would understand include one or more antenna front ends, demodulators and decoders that perform the receive operations in the receive chain of the devices. (INTEL-1003, ¶162.) And Sun’s Figure 1 contrasts with the ’146 patent’s

disclosure and independent claims that describe and claim the receiver and demodulator as separate components. (*See, e.g.*, INTEL-1001, 6:20–27 (Fig. 2), 9:15–18 (Fig. 5), cl. 1.) Petitioner disputes that including the demodulator or other components—such as a packet detector—in the claimed “*wireless receiver*” is consistent with the plain and ordinary meaning of these terms as recited in the claims.

But Sun’s description is nevertheless consistent with PO’s apparent interpretation and application of the claims in the district court case, in which PO points to the same PHY-layer disclosures of the accused 802.11ax wireless standard as satisfying both the “*wireless receiver*” ([1A]/[6A]) and “*demodulator*” ([1B]/[6B]) limitations. (*Compare* INTEL-1007, 3–15 (relying upon excerpts from §§17.3, 19.3, 21.3, and 27.3 of IEEE Std. 802.11ax as evidence of the claimed “*wireless receiver*”) with *id.*, 31–32 (relying on excerpts from §§17.3, 19.3, 21.3, and 27.3 of IEEE Std. 802.11ax as evidence of the claimed “*demodulator*”).) This indicates that, under PO’s infringement theory, the accused wireless receiver incorporates the entire chain of components in the receive path.

Therefore, if the Board adopts PO’s interpretation, Sun’s transceiver satisfies the requirements of independent claims 1 and 6. (INTEL-1003, ¶164.) Sun therefore discloses the “*wireless receiver*” of claim 1 and the “*receiving*” step of claim 6. (INTEL-1003, ¶164.)

Furthermore, it is well known that 802.11 wireless data units/packets are communicated “*through a wireless communication channel.*” (INTEL-1003 ¶165.) Sun discloses communicating wireless packets “*through a communication channel*” such as “single input single output (SISO) channel configuration” or a “multiple input multiple output (MIMO) channel configuration.” (INTEL-1006, 6:8–9, 25–26.) In addition, Sun discloses wireless communications according to various 802.11 wireless standards, and it is well known that 802.11 packets are communicated through a “*wireless communication channel.*” (INTEL-1003 ¶165.) Further, a POSITA would understand that a “*wireless communication channel*” is established between transmitting and receiving antennas in a WLAN such as the ones shown in Sun’s Figure 1 above.

Sun therefore discloses a “*wireless receiver*” (e.g., the 802.11ax HE compliant receiver shown in Fig. 1) “*configured to receive a wireless packet*” (e.g. Sun’s wireless receiver receives and decodes wireless packets) “*through a communication channel*” (e.g., 802.11 wireless OFDM channel).

b. *Formats of the wireless packet include a first and second packet format*

As set forth below, Sun discloses that the same wireless network device (e.g., AP or STA) is configured to receive both a “*first packet format*” [802.11a/g/n/ac packet formats] and a “*second packet format*” [802.11ax HE packet format]. (INTEL-1003, ¶167.) Sun’s network device is configured to

transmit and receive wireless packets (i) “according to a first communication protocol (e.g., a High Efficiency, HE, or 802.11ax communication protocol),” (ii) “a second communication protocol (e.g. according to the IEEE 802.11ac Standard),” or (iii) “a third communication protocol, and/or a fourth communication protocol (e.g., according to the IEEE 802.11a Standard and/or the IEEE 802.11n Standard).” (INTEL-1006, 3:44–56.)

Sun teaches a method of distinguishing an 802.11ax packet format from the various legacy packet formats. (*See, e.g.*, INTEL-1006, Figs. 2A, 3–5 (below), 8:31–36 (“[T]he preamble 701 is formatted such that a receiving device that operates according to the HEW communication protocol (e.g., 802.11ax) is able to determine that the preamble 701 is a preamble of the HEW communication protocol rather than another preamble.”).)

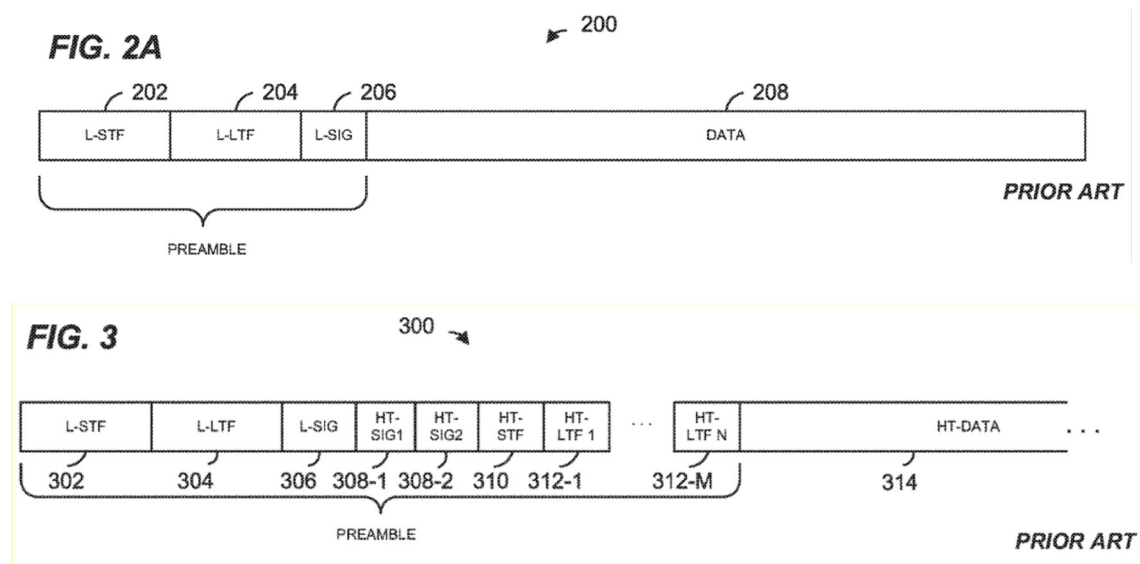


FIG. 4

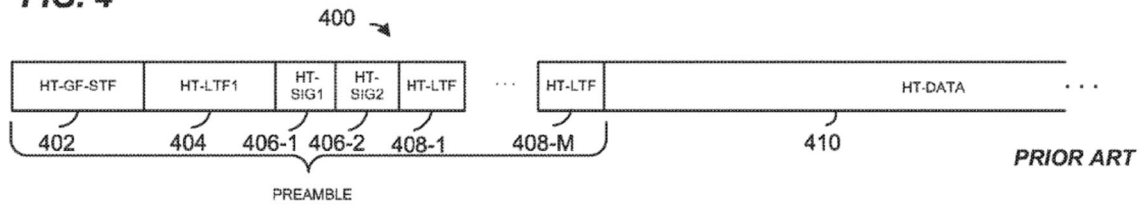
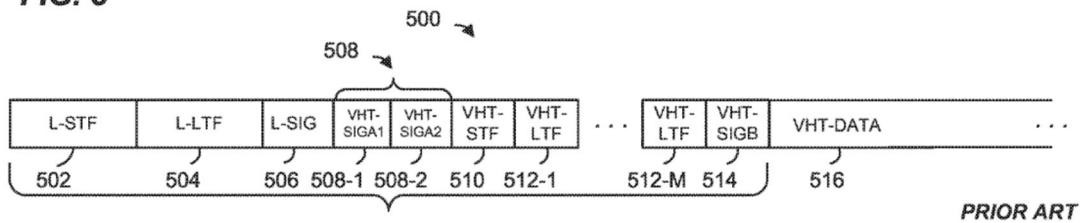


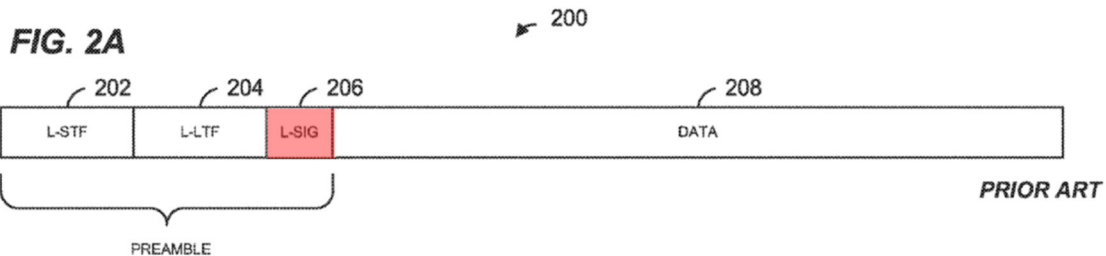
FIG. 5



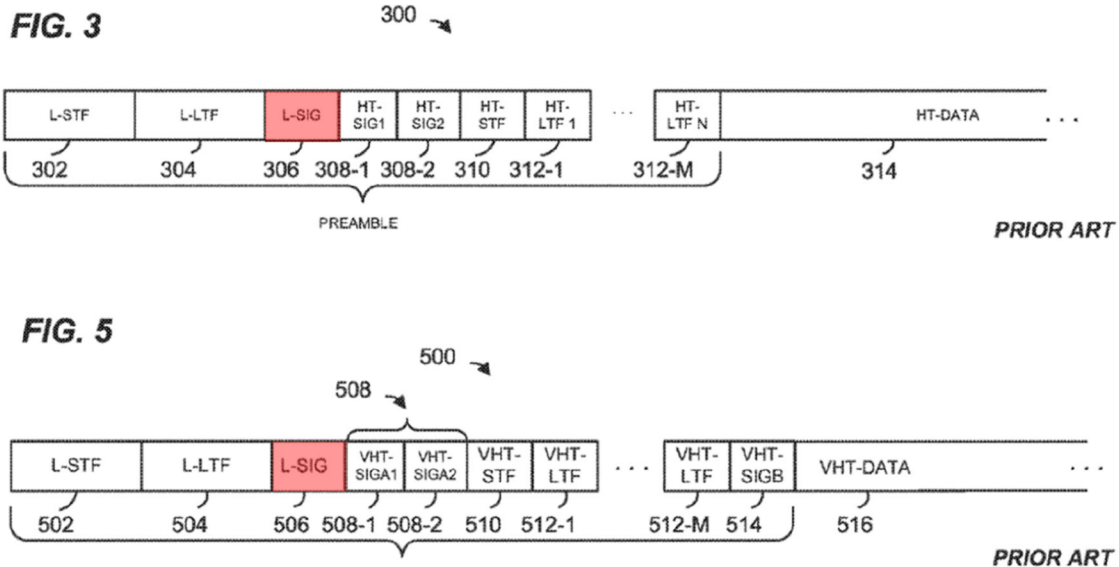
Thus, Sun discloses a wireless network device (High Efficiency (HE)-capable device) that is configured to receive both a “*first packet format*” (802.11a/g/n/ac packet formats) and a “*second packet format*” (802.11ax HE packet format). (INTEL-1003, ¶169.)

c. *First packet format comprises a first header field carried by a first OFDM symbol*

Sun discloses a “*first packet format*” that comprises a “first header field” carried by a “first OFDM symbol.” For example, Sun’s disclosure of an 802.11a/g packet format shown below includes an “L-SIG” field carried by an OFDM symbol. (INTEL-1006, 5:53–6:2, Fig. 2A; INTEL-1003, ¶170.)



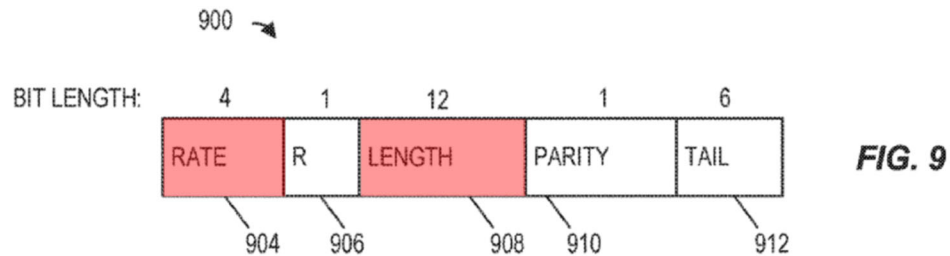
Other examples include the 802.11n and 802.11ac packet formats, each of which also include an L-SIG field carried by one OFDM symbol. (See INTEL-1006, Figs. 3 (802.11n high-throughput (HT) packet format), 5 (802.11ac very high-throughput (VHT) packet format).)



Thus, Sun discloses a “*first packet format*” that comprises a legacy 802.11a/g/n/ac packet format, *e.g.*, a format having a legacy signal field L-SIG carried by one OFDM symbol. (INTEL-1003, ¶171.)

The L-SIG field is a “*header field*” because, consistent with the description of a “header” in the patent specification, it includes “important control information for the receiver to decode the payload properly, and also provides information about the packet length for virtual carrier sensing.” (INTEL-1001, 1:55–58; INTEL-1003, ¶172.) For example, as shown in Figure 9 below, the “legacy signal field (L-SIG)” is “used to carry certain physical layer (PHY) parameters with the

data unit [], such as modulation type and coding rate used to transmit the data unit” (INTEL-1006, 5:66–6:2, Fig. 9.)



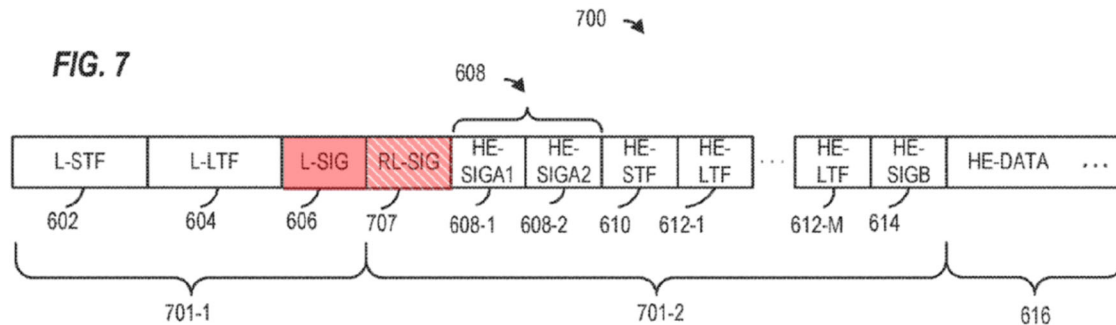
The L-SIG field includes (i) “a rate subfield 904” for the modulation and coding rate, and (ii) a “length subfield 908” which is used to communicate the packet length. (INTEL-1006, 10:52–53.) A POSITA would understand that the modulation and coding rate is information that is required by the receiver to properly receive and decode the packet payload data and that the packet length is required for virtual carrier sensing. (INTEL-1003 ¶173.)

In addition, Sun teaches that L-SIG is carried by “a first OFDM symbol.” For example, “Figure 9 is a diagram of example bits for **an OFDM symbol that includes a legacy signal field**, according to an embodiment.” (INTEL-1006, 2:36–38, Fig. 9 (above).)

- d. *Second packet format comprises both the first header field carried by the first OFDM symbol and a second header field carried by a second OFDM symbol which repeats the first OFDM symbol*

Sun discloses “OFDM data unit 700” (“second packet format”) that includes an L-SIG field and a repeated legacy signal field (“RL-SIG”) (shaded red) which

follows L-SIG in the time domain as shown in Figure 7. (INTEL-1005, 8:26–46, Fig. 7.)



This packet is a high-efficiency (HE) packet in accordance with the IEEE 802.11ax protocol. (See INTEL-1005, 3:6–8 (“The repeated legacy signal field generally provides for a more reliable auto-detection of the IEEE 802.11ax protocol.”), 3:44–47 (“high Efficiency, HE, or 802.11ax communication protocol”); 8:31 – 33 (“the preamble 701 is formatted such that a receiving device that operates according to the HEW communication protocol (e.g., 802.11ax) is able to determine that the preamble 701 is a preamble of the HEW communication protocol”).)

As discussed in §VII.B.2.c., *supra*, L-SIG is a “*header field*” because it contains important control information for the receiver to decode the packet payload properly, as well as packet length information for virtual carrier sensing. (INTEL-1001, 55–58; INTEL-1003, ¶176.) In addition, both L-SIG and RL-SIG are carried by an OFDM symbol—“a first OFDM symbol that corresponds to a legacy signal field followed by a second OFDM symbol that corresponds to a candidate signal field” which, in the case of data unit 700, is “a repetition of the

legacy signal field.” (INTEL-1006, 3:12–17.)

Therefore, Sun discloses “*a first packet format*” (e.g., 802.11a/g/n/ac packets) and “*a second packet format*” (e.g., 802.11ax HE packets), “*the first packet format comprising a first header field*” (non-802.11ax HE packets include one L-SIG field) “*the second packet format comprising both the first header field ... and a second header field ... which follows the first ..., and the second header field being a repetition of the first header field*” (802.11ax packets include L-SIG followed by RL-SIG). These header fields are “*carried by a first OFDM symbol*” and “*a second OFDM symbol which follows the first OFDM symbol*” (each of L-SIG and RL-SIG are carried by an OFDM symbol in 802.11ax). (INTEL-1003, ¶177.)

3. Claim Limitations [1B] and [6B]

Sun discloses this limitation.

a. *Demodulator to demodulate the received wireless packet*

A POSITA would understand that any network device in a wireless LAN such as Sun’s must demodulate the received data units—including its header fields—before they can be properly decoded and processed; and that demodulation requires the use of a “*demodulator*” in the device hardware. (INTEL-1003 ¶179.) Further, Sun does disclose receiving and decoding the data units, which a POSITA would understand requires demodulating the data units as well. (*See, e.g.*, INTEL-

1006, 9:7–12; INTEL-1003 ¶179.)

Moreover, Sun discloses transmitting the data units via “OFDM modulation” (see INTEL-1006, 6:10–13, 6:35–38, 6:50–53, 7:16–19), and using “an inverse discrete Fourier transform (IDFT) processor 1118” to modulate the data units onto a plurality of OFDM subcarriers. (INTEL-1006, 12:6–8.) The IDFT processor “converts a block of constellation points to a time-domain signal” for transmission over the channel. (INTEL-1006, 12:8–9.) A POSITA would understand that an IDFT modulated signal transmitted through a wireless communication channel must be demodulated after reception to recover the original transmitted information. (INTEL-1003 ¶180.) A POSITA would therefore recognize that Sun’s system requires a corresponding discrete Fourier Transform (DFT) processor in the receiver which performs the reverse operation of an IDFT in order to demodulate the received data units for further processing. (INTEL-1003 ¶180.)

In addition, as discussed above in §VII.B.2.a., *supra*, Sun’s wireless OFDM receiver is MIMO-capable, and thus a POSITA would understand it includes a number of demodulator blocks in accordance with the number of MIMO spatial streams that the wireless receiver can receive. (INTEL-1003, ¶181.) These demodulators are the claimed “*demodulator configured to demodulate the received wireless packet.*”

Therefore, a POSITA reading Sun would understand it to teach the use of a

demodulator to demodulate the received data units (“*wireless packet*”). (INTEL-1003 ¶182.)

4. Claim Limitations [1C] and [6C]

Sun discloses this limitation.

- a. *Receiver distinguishes the packet format by detecting, from the received wireless packet, the second header field which repeats the first header field*

As discussed above in §VII.B.2.d., *supra*, Sun discloses a second 802.11ax HE packet format with a repeated legacy signal field RL-SIG. Sun teaches that “[t]he repeated legacy signal field generally provides for a more reliable auto-detection of the IEEE 802.11ax protocol.” (INTEL-1006, 3:6–8.) “FIG. 8 is a diagram of an example method for determining whether a received OFDM data unit 800 corresponds to [802.11ax] or another communication protocol” (INTEL-1006, 9:4–7, Fig. 8.)

At block 812, the receiving client STA “determines whether the candidate signal field 807 corresponds to a repetition of the L-SIG field 806” (INTEL-1006, 9:40–43.) In one embodiment, Sun teaches using the “time-domain correlation” of the first and second OFDM symbols 806 and 807 “to determine whether the candidate signal field 807 corresponds to the repetition.” (INTEL-1006, 9:43–47.) In another embodiment, the client STA “decodes” the first and second OFDM symbols “to obtain respective first and second bit sequences” and

“compares ... the bit sequences to determine whether the candidate signal field 807 corresponds to the repetition.” (INTEL-1006, 9:47–52.)

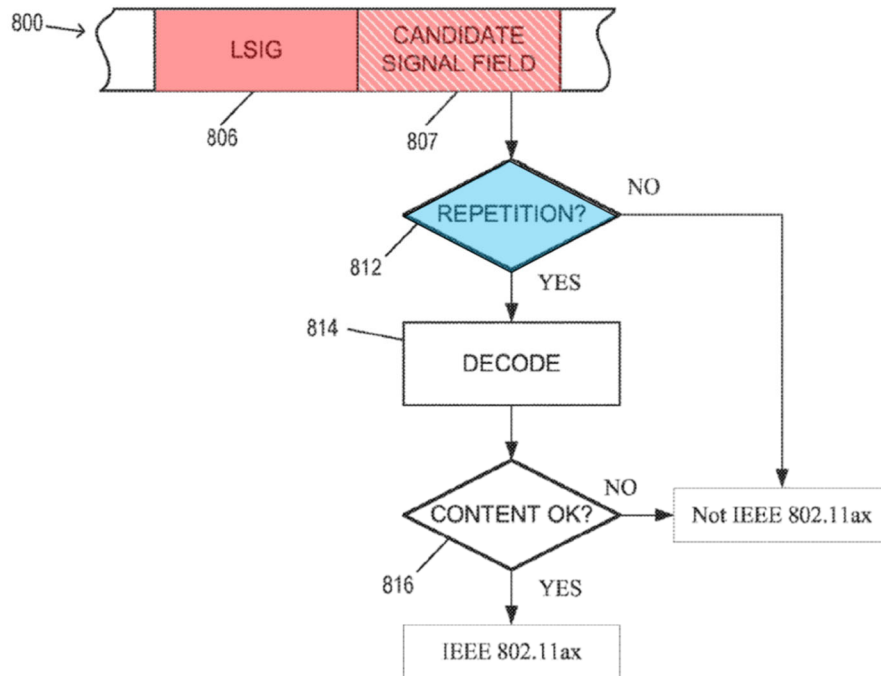


FIG. 8

“In response to a determination that the candidate signal field 807 does not correspond to a repetition of the L-SIG field 806 (NO at block 812), the client station 25 determines that the received data unit 800 does not correspond to the ... 802.11ax protocol ...”; and “[i]n response to a determination that the candidate signal 807 corresponds to a repetition of the L SIG field 806 (YES at block 812), the client station 25 proceeds to block 814 and decodes the candidate signal field 807 to obtain the signal field bit sequence” (INTEL-1006, 9:56–67.) In both instances, the receiver distinguishes an 802.11ax packet format from non-802.11ax

packet formats based on detecting the presence or absence of the repeated legacy signal field RL-SIG. As one specific example packet format, Sun discloses distinguishing between an 802.11ax protocol data unit and an 802.11a protocol data unit. (*See* INTEL-1006, 9:28–39.) Thus, based on whether RL-SIG field is detected, Sun’s receiver distinguishes the 802.11ax HE packet format from non-802.11ax packet formats (*e.g.*, 802.11a/g/n/ac), and demodulates and decodes the received wireless packet accordingly. (INTEL-1006, 9:17–19, 10:31–34.)

Further, Sun describes performing a second check to confirm that the content of L-SIG corresponds to an 802.11ax data unit, “[a]t block 816, the client station 25 determines whether the signal field bit sequence has a valid content value” (*i.e.*, a “data rate of six megabits per second,” a “length field ... that cannot be divided by three” and suitable parity and tail values). (INTEL-1006, 10:9–11, 14–24, Fig. 8.) And “[i]n response to a determination that the content of the L-SIG field 806 corresponds to the [802.11ax] communication protocol, the client station 25 decodes at least some of the OFDM symbols of the data unit 800 according to the [802.11ax] communication protocol.” (INTEL-1006, 10:30–34.)

Sun’s receiver therefore distinguishes 802.11ax HE packets from non-802.11ax HE packets (*e.g.*, 802.11a/g/n/ac packets) based on the existence of the repeated legacy field RL-SIG, and demodulates and decodes the received wireless packet accordingly. (INTEL-1003, ¶187.)

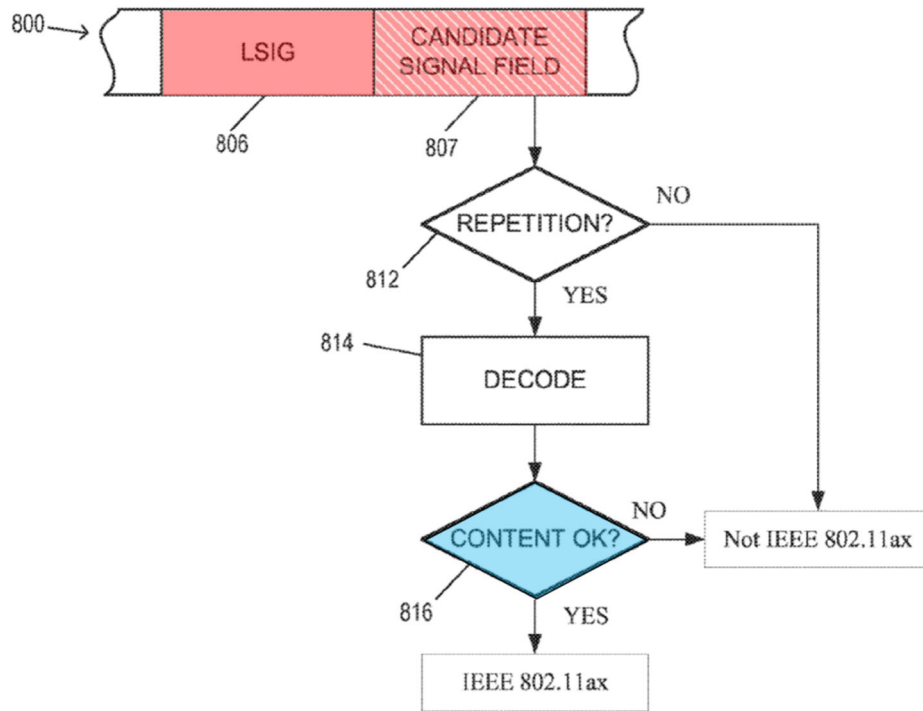


FIG. 8

Claim 1 additionally requires that the “*wireless receiver*” performs the “*detecting*” and “*distinguishing*” operations on the “*received wireless packet*.” As noted in §VII.B.2.a, *supra*, Sun discloses a transceiver that a POSITA would understand includes one or more antenna front ends, demodulators, and decoders under PO’s apparent interpretation of the term “*wireless receiver*” that together perform the packet format detection steps 812–816 of Sun’s Figure 8. (INTEL-1006, Figs. 1, 8.) This contrasts with claim 1, which claims the receiver and demodulator as separate components and requires the “*wireless receiver*” to

perform the “*distinguish[ing]*” step. (INTEL-1001, 6:20–27 (Fig. 2), 9:15–18 (Fig. 5), cl. 1; INTEL-1003 ¶188.)

Petitioner disagrees that defining the receiver to include the entire chain of components in the receive path (*i.e.*, the demodulator, decoder) is consistent with the plain and ordinary meaning of claim 1 or the ’146 patent’s specification, or that claim 1 permits other components besides the receiver to perform this step. But Sun’s description is nevertheless consistent with PO’s apparent interpretation and application of the claims in the co-pending district court case, which point to the entire receive chain of the 802.11ax standard as being part of the receiver. (INTEL-1007, 3–15, 31–32.)

Nonetheless, if the Board adopts PO’s expansive view that the scope of the claimed “*wireless receiver*” encompasses the entire receive chain, then Sun discloses it. (*See* VII.B.2.a, *supra*; INTEL-1003, ¶190.) While Sun does not explicitly describe the “*detecting*” and “*distinguishing*” operations being performed by a “*wireless receiver*,” Sun does teach that the methods of its embodiments such as in Figure 8 are performed by an AP or client STA, and as discussed above in §VII.B.2.a, *supra*, these devices include a wireless receiver “configured to receive data units via the antenna(s)” (INTEL-1006, 9:4–12, 5:1–4, 5:33–36.)

Sun further describes decoding the received data units and a POSITA would

understand that the componentry for decoding data units/packets is associated with the receive chain in wireless network devices. (See INTEL-1006, 9:7–12; INTEL-1003, ¶191.) And since, according to Figure 8, the repetition detection disclosed by Sun is performed before (or during) decoding of the received data units, a POSITA would understand that the packet detection componentry resides in the receive chain of the wireless device as well. (INTEL-1006, 9:40–52, Fig. 8; INTEL-1003, ¶191.)

Sun therefore discloses a “*wireless receiver*” that “*distinguishes the second packet format*” (e.g., 802.11ax) “*from the first packet format*” (e.g., 802.11a/g/n/ac) “*by detecting, from the received wireless packet, the second header field*” (RL-SIG) “*which repeats the first header field*” (L-SIG). (INTEL-1003, ¶192.)

C. Claims 2 and 7

Sun discloses this additional limitation.

a. *Receiver determines the received wireless packet as the second packet format when the second header field is detected*

As discussed above in §VII.B.4.a., *supra*, Sun’s receiver distinguishes the format of the received wireless packet by detecting the presence or absence of a repeated L-SIG field (RL-SIG), and demodulates and decodes the wireless packet accordingly. (INTEL-1006, 9:17–19, 9:32–67, 10:30–34; INTEL-1003, ¶194.)

When the RL-SIG field (*second header field*) is detected in the received wireless

packet, the receiver determines that an 802.11ax packet (*second packet format*) has been received. (INTEL-1006, 9:63–67.)

D. Claims 3 and 8

Sun discloses this additional limitation.

a. *Receiver determines the received wireless packet as the first packet format when the second header field is not detected*

As discussed above in §VII.B.4.a., *supra*, Sun’s receiver distinguishes the format of the received wireless packet by detecting the presence or absence of a repeated L-SIG field (RL-SIG), and demodulates and decodes the wireless packet accordingly. (INTEL-1006, 9:17–19, 9:32–67, 10:30–34; INTEL-1003, ¶196.)

When the RL-SIG field (*second header field*) is **not** detected in the received wireless packet, the receiver “determines that that the received data unit 800 does not correspond to ... the IEEE 802.11ax protocol.” (INTEL-1006, 9:56–62.) That is, the receiver determines the received wireless packet as one of the legacy packet formats 802.11a/g/n/ac when RL-SIG is not detected because, as shown in Figures 2A and 3–5, each of the legacy packet formats only includes an L-SIG field which is not repeated. (INTEL-1003, ¶196.)

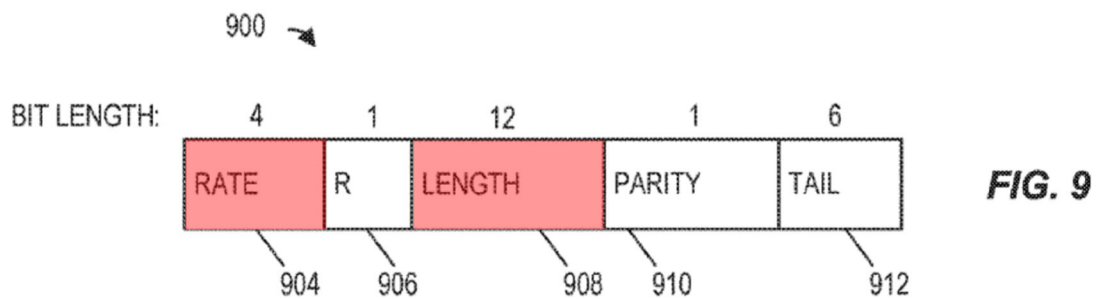
E. Claims 4 and 9

Sun discloses this additional limitation.

a. *The first and second header fields contain information for decoding the wireless packet*

As discussed above in §VII.B.2.c.–d., *supra*, the L-SIG field (and by

repetition the RL-SIG field), is a header fields precisely because it “contains important control information for the receiver to decode the payload properly,” consistent with the description of a “header” in the specification. (INTEL-1001, 1:55–58.) The “legacy signal field (L-SIG)” is “used to carry certain physical layer (PHY) parameters with the data unit [], such as modulation type and coding rate used to transmit the data unit” (INTEL-1006, 5:66–6:2, Fig. 9.)



As shown, the L-SIG field includes (i) “a rate subfield 904” for the modulation and coding rate, and (ii) a “length subfield 908” which is used to communicate the packet length. (INTEL-1006, 10:52–53.) A POSITA would understand that the modulation and coding rate is information that is required by the receiver to properly decode the packet payload data and that the packet length is required for virtual carrier sensing. (INTEL-1003 ¶198.)

F. Claims 5 and 10

Sun discloses this additional limitation.

- a. *The first and second header fields contain information related to length of the wireless packet***

As discussed above in §VII.B.2.c.–d., *supra*, the length subfield 908 in the L-SIG field (and by repetition the RL-SIG field) is used to communicate the packet length, which a POSITA would understand is “*information related to a length of the wireless packet.*” (INTEL-1006, 10:52–55; INTEL-1003, ¶200.)

VIII. DISCRETIONARY DENIAL IS NOT APPROPRIATE

A. 35 U.S.C. §325(d)

The Board should reach the merits in this proceeding because the Petition presents a compelling unpatentability challenge. (*See* Interim Procedure for Discretionary Denials (“Interim Procedure”), 4–5 (“[W]here the PTAB determines that the information presented at the institution stage presents a compelling unpatentability challenge, that determination alone demonstrates that the PTAB should not discretionarily deny institution under *Fintiv.*”).) As set forth herein, the evidence presented in this Petition, “if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.” (Interim Procedure, 4.)

The ’262 patent is “directed toward header repetition in a communications environment.” (INTEL-1001, 1:21-24.) The purported novelty of the challenged

claims lies in “accommodate[ing] different repetition[] schemes ... in a single domain.” (INTEL-1001, 2:33–34.) However, PO acknowledged in its provisional application that the use of repeated headers and extended headers was publicly proposed during development of the ITU-T G.hn standard, prior to the earliest priority date. (See INTEL-1008, 30; INTEL-1009 (09CC-046); INTEL-1010 (09XC-100); INTEL-1011 (09XC-119).) These two concepts were publicly proposed and discussed in the IEEE 802.11 TGn working group years before the earliest priority date of the ’146 patent. The compelling merits of this IPR weigh heavily against discretionary denial.

The *Fintiv* factors also weigh against discretionary denial. No stay has been requested or denied in the co- district court case, rendering *Fintiv* factor 1 neutral. Although the Court has set a trial date in the co-pending district court litigations involving the listed real parties in interest (See §§IX.A.–B.), these dates are tentative considering the pending motion to dismiss for improper venue in the Lenovo Group litigation and transfer motion in the Dell litigation. Given this uncertainty, *Fintiv* factors 2 and 3 weigh against discretionary denial.

IX. MANDATORY NOTICES

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

The real parties in interest include Petitioner, as well as Dell Inc., Dell Technologies Inc., and Lenovo Group Ltd.

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

To the best of Petitioner's knowledge, the '146 patent is involved in the following district court litigations:

- *AX Wireless LLC, v. Dell Inc., and Dell Technologies Inc.*, 2-22-cv-00277 (EDTX).
- *AX Wireless LLC, v. Lenovo Group Ltd.*, 2-22-cv-00280 (EDTX).
- *AX Wireless LLC, v. HP Inc.*, 2-22-cv-00279 (EDTX).
- *AX Wireless LLC, v. Acer Inc.* 2-23-cv-00041 (EDTX).

C. Notice Of Counsel And Service Information

Pursuant to 37 C.F.R. §§42.8(b)(3), 42.8(b)(4) and 42.10(a), Petitioner appoints **Lori A. Gordon** (Reg. No. 50,633) at the address of Perkins Coie LLP, 700 Thirteenth Street, N.W., Suite 800, Washington, DC 20005-3960, telephone number (202) 654-6200, as lead counsel; **Jon R. Carter** (Reg. No. 75,145) at the address of Perkins Coie LLP, 1155 Avenue of the Americas, 20th Floor, New York, NY 10036-2711, telephone number (212) 262-6900; and **Matthew W. Hindman** (Reg. No. 57,396) at the address of Perkins Coie LLP, 3150 Porter Drive, Palo Alto, CA 94304-1212, telephone number (650) 838-4300, as backup counsel.

Petitioner consents to electronic service by email at the email addresses: gordon-ptab@perkinscoie.com, carter-ptab@perkinscoie.com, and hindman-ptab@perkinscoie.com.

X. CONCLUSION

Inter Partes Review of the challenged claims is respectfully requested.

Date: July 7, 2023

Respectfully submitted,

/ Jon R. Carter /

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Backup Counsel, Petitioner

Lori A. Gordon (Reg. No. 50,633)
Lead Counsel, Petitioner

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CERTIFICATE OF WORD COUNT UNDER 37 CFR §42.24(d)

Pursuant to 37 C.F.R. §42.24(a), Intel hereby certifies that portions of the above-captioned Petition for *Inter Partes* Review of U.S. Patent No. 11,212,146, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,810. Pursuant to 37 C.F.R. §42.24(a), this word count is in compliance and excludes the table of contents, table of authorities, mandatory notices under §42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing. This word count was prepared using Microsoft Word.

Respectfully submitted,

/ Jon R. Carter /

Jon R. Carter
Attorney for Petitioner

Date: July 7, 2023

CERTIFICATE OF SERVICE

The undersigned hereby certifies that true copies of the Petition for *Inter Partes* Review of U.S. Patent No. 11,212,146 and supporting materials (Exhibits and Power of Attorney) were served via overnight delivery on the Patent Owner at the correspondence address of record as listed in USPTO records:

Capitol IP Law Group, PLLC
1629 K Street NW Suite 300
Washington, DC

and via email to the attorneys of record for Plaintiff in the concurrent *AX Wireless LLC, v. Dell Inc., and Dell Technologies Inc.*, 2-22-cv-00277 (EDTX), *AX Wireless LLC, v. HP Inc.*, 2-22-cv-00279 (EDTX), and *AX Wireless LLC, v. Lenovo Group Ltd.*, 2-22-cv-00280 (EDTX) litigations:

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Respectfully submitted,

/ Jon R. Carter /

Jon R. Carter
Attorney for Petitioner

Date: July 7, 2023