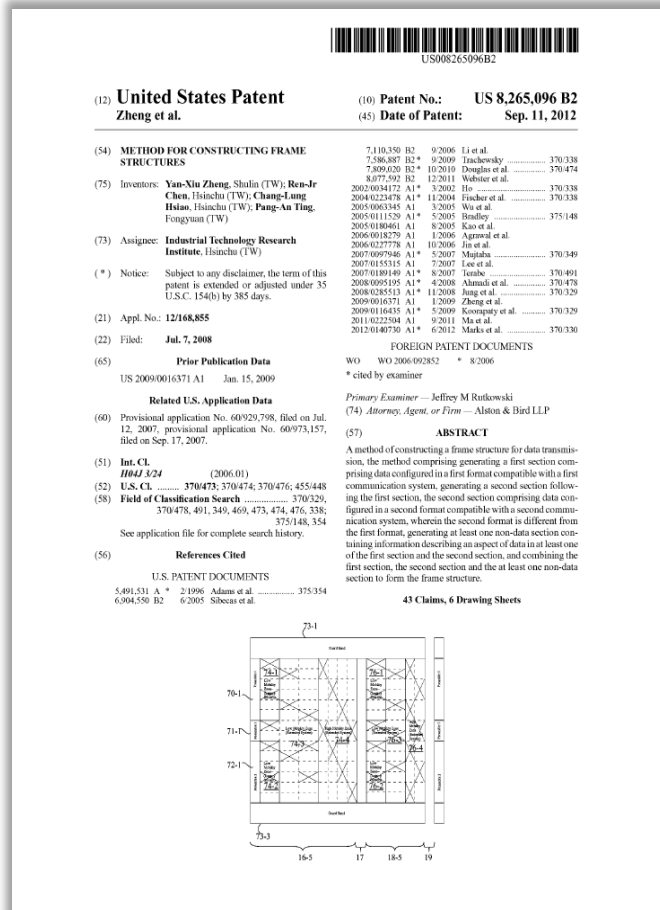

EXHIBIT 12



Title: METHOD FOR CONSTRUCTING FRAME STRUCTURES

Priority Date of all Asserted Claims: Jul. 12, 2007

Filing Date: Jul. 7, 2008

Issue Date: Sept. 11, 2012

Expiration Date: Jul. 27, 2029

Inventors: Yan-Xiu Zheng; Ren-Jr Chen; Chang-Lung Hsiao; Pang-An Ting

Asserted Claim: 8

Asserted Claim

Claim 8

A method of constructing a frame structure for data transmission, the method comprising:
generating a first section comprising data configured in a first format compatible with a first communication system using symbols;
generating a second section following the first section,
the second section comprising data configured in a second format compatible with a second communication system using symbols,
wherein the first communication system's symbols and the second communication system's symbols co-exist in one transmission scheme and
wherein the second communication system has pilot symbols that are denser than those in the first communication system;
generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and
combining the first section, the second section and the at least one non-data section to form the frame structure.

The Accused Instrumentalities include at least the following:

Products	
2022 Toyota Tundra	2023 Toyota RAV4 Hybrid
2022 Toyota Tundra Hybrid	2023 Toyota RAV4 Prime
2023 Toyota bZ4X	2023 Toyota Sequoia Hybrid
2023 Toyota Corolla	2023 Toyota Crown
2023 Toyota Corolla Hybrid	2023 Toyota Tundra
2023 Toyota Corolla Cross	2023 Toyota Tundra Hybrid
2023 Toyota Corolla Cross Hybrid	2023 Toyota Venza Hybrid
2023 Toyota Corolla Hatchback	2024 Toyota Corolla
2023 Toyota Highlander	2024 Toyota Corolla Hybrid
2023 Toyota Highlander Hybrid	2024 Toyota Corolla Hatchback
2023 Toyota Mirai	2024 Toyota Grand Highlander
2023 Toyota Prius	2024 Toyota Grand Highlander Hybrid
2023 Toyota Prius Prime	2024 Toyota Tundra
2023 Toyota RAV4	2024 Toyota Tundra Hybrid

The Accused Instrumentalities include at least the following:

The Accused Instrumentalities are all configured to operate on or with the IEEE 802.11ac wireless local area networking standard. For example, Toyota discloses IEEE 802.11ac in the Owner's Manual (OM43E83U) for the following exemplary product. https://assets.sia.toyota.com/publications/en/omnav-s/OM42E83U/pdf/OM42E83U.pdf?_gl=1*1ezc1lz*_tmna_ga*NDUwODg3NTE0LjE2OTQ0NDc2Njc.*_tmna_ga_EP43E5EFVZ*MTY5NDQ0NzY2Ny4xLjEuMTY5NDQ0ODczMi4zNy4wLjA.

TOYOTA RAV4 PRIME 2023

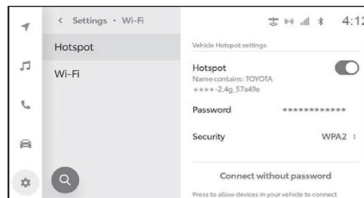
Establishing a connection to Wi-Fi® Hotspot

The Wi-Fi® Hotspot function can be used to set the Wi-Fi® access point and connect to a Wi-Fi® device.

- 1 Turn on the Wi-Fi® function of the Wi-Fi® device.
- 2 Touch [⚙️] from the main menu.
- 3 Touch [Wi-Fi] from the sub menu.
- 4 Touch [Hotspot] from the sub menu.
- 5 Turn on [Hotspot] in the main area.

A message may be displayed depending on the multimedia system settings. Perform the operation according to the screen guidance.

- 6 Connect to Wi-Fi® Hotspot of the multimedia system from the Wi-Fi® device. **112**

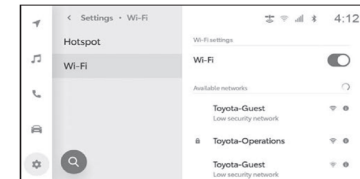


Connecting to a network using Wi-Fi®

The multimedia system can be connected to the Internet by connecting to a Wi-Fi® network.

- 1 Touch [⚙️] from the main menu.
- 2 Touch [Wi-Fi] from the sub menu.
- 3 Touch [Wi-Fi] from the sub menu.
- 4 Set [Wi-Fi] in the main area to on.

- A message may be displayed depending on the multimedia system settings. Perform the operation according to the screen guidance.
- Turning on [Wi-Fi] will display nearby networks that are available.



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Compatible Wi-Fi® communication protocols

IEEE 802.11b/g/n (2.4GHz)

IEEE 802.11a/n/ac (5GHz)

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Owner's Manual

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802.11ac/ax

IEEE 802.11ac was released in 2013 (IEEE 802.11ac-2013) and incorporated into the 2016 release (IEEE 802.11-2016). Both of these versions are referenced by the name “802.11ac” thus, for completeness, evidence of infringement will be presented both with respect to 802.11ac-2013 and 802.11-2016.

IEEE 802.11ax (IEEE 802.11ax-Draft 8.0) currently exists as an approved draft amendment to the 802.11 standard, and the amendment contains changes to the 2020 release of the standard (IEEE 802.11-2020). Evidence of infringement will be presented both with respect to 802.11-2020 and 802.11ax-D8.0.

The following icons will indicate the document from which evidence is drawn:

802.11ac-2013

Evidence is drawn from the ac amendment
to the 802.11 standard

802.11-2016

Evidence is drawn from the 2016 release
of the 802.11 standard

802.11-2020

Evidence is drawn from the 2020 release
of the 802.11 standard

802.11ax-D8.0

Evidence is drawn from the ax amendment
to the 802.11 standard

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802.11ax

IEEE 802.11ax (or Wi-Fi 6) is an approved amendment to the IEEE 802.11 standard, much like 802.11ac before it. Products are designed, certified, and sold according to its specifications. Products labeled “802.11ax” also incorporate functionality (including the accused functionality) from previous amendments such as 802.11ac – that is, they are backwards compatible.

27.2.6 Support for non-HT, HT and VHT formats

27.2.6.1 General

An HE STA logically contains Clause 15 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications), Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification), Clause 18 (Extended Rate PHY (ERP) specification), Clause 19 (High-throughput (HT) PHY specification), Clause 21 (Very high throughput (VHT) PHY specification) and Clause 27 (High Efficiency (HE) PHY specification) PHYs. The MAC interacts with the PHYs via the Clause 27 (High Efficiency (HE) PHY specification) PHY service interface, which in turn interacts with the Clause 15 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications), Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification), Clause 18 (Extended Rate PHY (ERP) specification), Clause 19 (High-throughput (HT) PHY specification) PHY service interfaces and Clause 21 (Very high throughput (VHT) PHY specification) as shown in Figure 27-1

802.11ax

IEEE 802.11ax (or Wi-Fi 6) is an approved amendment to the IEEE 802.11 standard, much like 802.11ac before it. Products are designed, certified, and sold according to its specifications. Products labeled “802.11ax” also incorporate functionality (including the accused functionality) from previous amendments such as 802.11ac – that is, they are backwards compatible.



About Wi-Fi Alliance®

www.wi-fi.org

Wi-Fi Alliance® is the worldwide network of companies that brings you Wi-Fi®. Members of our collaboration forum come together from across the Wi-Fi ecosystem with the shared vision to connect everyone and everything, everywhere, while providing the best possible user experience. Since 2000, Wi-Fi Alliance has **completed more than 50,000 Wi-Fi certifications**. The Wi-Fi CERTIFIED™ seal of approval designates products with **proven interoperability, backward compatibility**, and the highest industry-standard security protections in place. Today, Wi-Fi carries more than half of the internet's traffic in an ever-expanding variety of applications. Wi-Fi Alliance continues to drive the adoption and evolution of Wi-Fi, which billions of people rely on every day.

Source: <https://www.wi-fi.org/news-events/newsroom/wi-fi-certified-6-delivers-new-wi-fi-era>

CableLabs®

Wi-Fi 6 certified devices must also meet 3 prerequisites:

- Wi-Fi CERTIFIED N (Wi-Fi 4) and Wi-Fi CERTIFIED AC (Wi-Fi 5) certifications ensure a backward compatibility with former Wi-Fi standards.
- Wi-Fi CERTIFIED Agile Multiband allows devices to make intelligent access point, band, and channel selection, improving efficiency and consistency on congested wireless networks.
- Wi-Fi CERTIFIED WPA3 improves security standards for authentication, authorization and encryption, resolving some vulnerabilities issues of WPA2 that emerged over the past years.

Source: <https://www.cablelabs.com/wi-fi-alliance-launches-wi-fi-certified-6-certification-program>

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Claim 8

A method of **(A) constructing a frame structure for data transmission**, the method comprising:

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and construct the claimed frame structure for data transmission. An example of the constructed frame structure is the very high throughput (“VHT”) physical layer protocol data unit (“PPDU”) format identified in section 22.3.2 and Figure 22-4 of IEEE 802.11ac-2013 (reproduced below).

22.3 VHT PHY layer

22.3.1 Introduction

This subclause provides the procedure by which PSDUs are converted to and from transmissions on the wireless medium.

During transmission, a PSDU (in the SU case) or one or more PSDUs (in the MU case) are processed (i.e., scrambled and coded) and appended to the PHY preamble to create the PPDU. At the receiver, the PHY preamble is processed to aid in the detection, demodulation, and delivery of the PSDU.

22.3.2 VHT PPDU format

A single PPDU format is defined for this PHY: the VHT PPDU format. Figure 22-4 shows the VHT PPDU format.

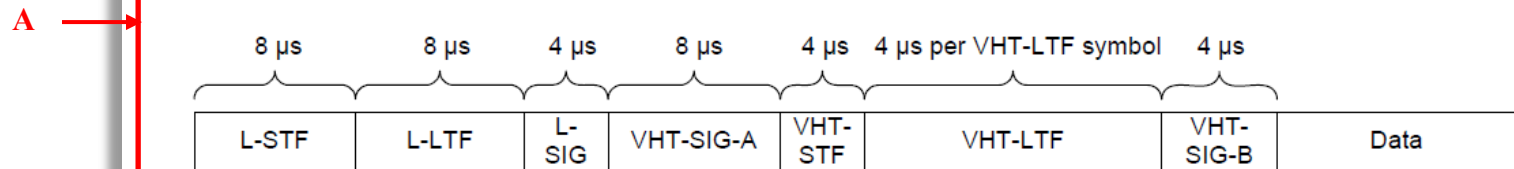


Figure 22-4—VHT PPDU format

Claim 8

A method of **(A) constructing a frame structure for data transmission**, the method comprising:

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and construct the claimed frame structure for data transmission. An example of the constructed frame structure is the very high throughput (“VHT”) physical layer protocol data unit (“PPDU”) format identified in section 21.3.2 and Figure 21-4 of IEEE 802.11-2016 (reproduced below).

21.3 VHT PHY

21.3.1 Introduction

This subclause provides the procedure by which PSDUs are converted to and from transmissions on the wireless medium.

During transmission, a PSDU (in the SU case) or one or more PSDUs (in the MU case) are processed (i.e., scrambled and coded) and appended to the PHY preamble to create the PPDU. At the receiver, the PHY preamble is processed to aid in the detection, demodulation, and delivery of the PSDU.

Pre-VHT modulated fields refer to the L-STF, L-LTF, L-SIG, and VHT-SIG-A fields, while VHT modulated fields refer to the VHT-STF, VHT-LTF, VHT-SIG-B, and Data fields (see Figure 21-17).

21.3.2 VHT PPDU format

A single PPDU format is defined for this PHY: the VHT PPDU format. Figure 21-4 shows the VHT PPDU format.

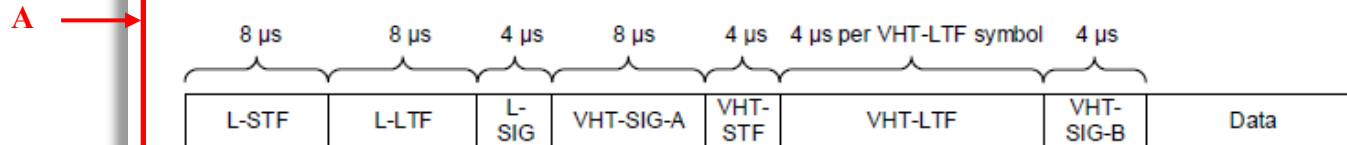


Figure 21-4—VHT PPDU format

Claim 8

A method of **(A) constructing a frame structure for data transmission**, the method comprising:

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and construct the claimed frame structure for data transmission. An example of the constructed frame structure is the very high throughput (“VHT”) physical layer protocol data unit (“PPDU”) format identified in section 21.3.2 and Figure 21-4 of IEEE 802.11-2020 (reproduced below).

21.3 VHT PHY

21.3.1 Introduction

This subclause provides the procedure by which PSDUs are converted to and from transmissions on the wireless medium.

During transmission, a PSDU (in the SU case) or one or more PSDUs (in the MU case) are processed (i.e., scrambled and coded) and appended to the PHY preamble to create the PPDU. At the receiver, the PHY preamble is processed to aid in the detection, demodulation, and delivery of the PSDU.

Pre-VHT modulated fields refer to the L-STF, L-LTF, L-SIG, and VHT-SIG-A fields, while VHT modulated fields refer to the VHT-STF, VHT-LTF, VHT-SIG-B, and Data fields (see Figure 21-17).

21.3.2 VHT PPDU format

A single PPDU format is defined for this PHY: the VHT PPDU format. Figure 21-4 shows the VHT PPDU format.

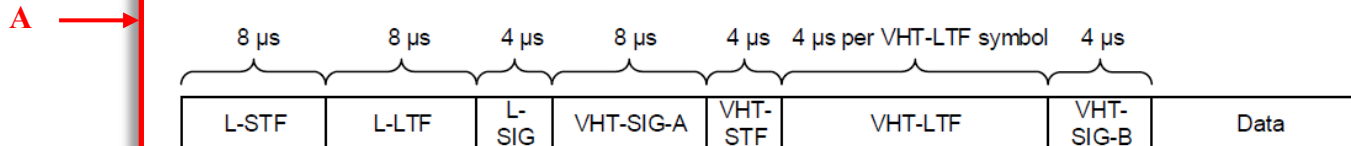


Figure 21-4—VHT PPDU format

Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate the claimed first section. For example, the generated first section includes the Non-HT Short Training field (“L-STF”), Long Training field (“L-LTF”), and Signal field (“L-SIG”) identified in Figure 22-4 and Table 22-4 of IEEE 802.11ac-2013 (reproduced below).

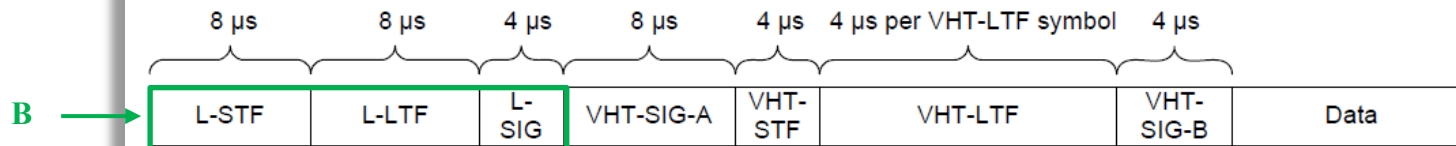


Figure 22-4—VHT PPDU format

Table 22-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carries the PSDU(s)

B →

802.11ac-2013

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Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate the claimed first section. For example, the generated first section includes the Non-HT Short Training field (“L-STF”), Long Training field (“L-LTF”), and Signal field (“L-SIG”) identified in Figure 21-4 and Table 21-4 of IEEE 802.11-2016 (reproduced below).

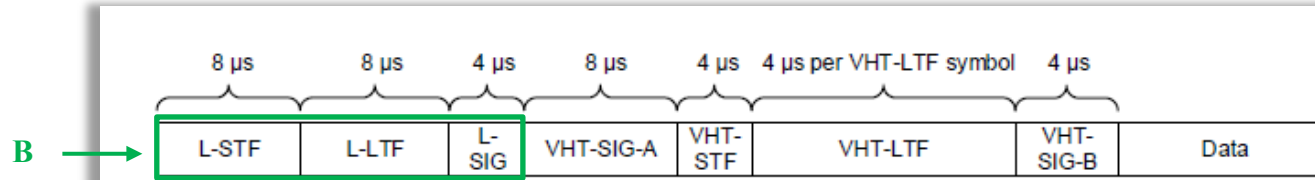


Figure 21-4—VHT PPDU format

Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

802.11-2016

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Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and generate the claimed first section. For example, the generated first section includes the Non-HT Short Training field (“L-STF”), Long Training field (“L-LTF”), and Signal field (“L-SIG”) identified in Figure 21-4 and Table 21-4 of IEEE 802.11-2020 (reproduced below).

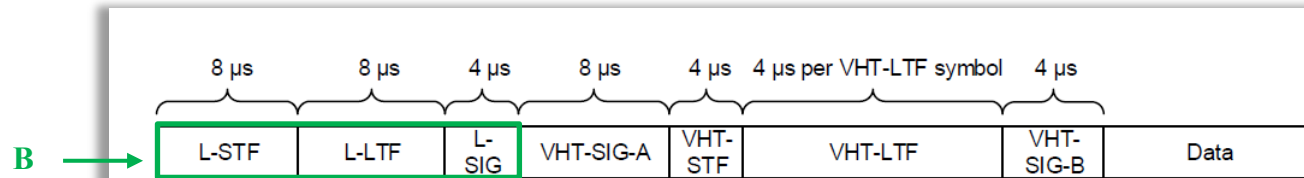


Figure 21-4—VHT PPDU format

Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

A green box highlights the L-STF, L-LTF, and L-SIG rows, with a green arrow labeled 'B' pointing to it.

802.11-2020

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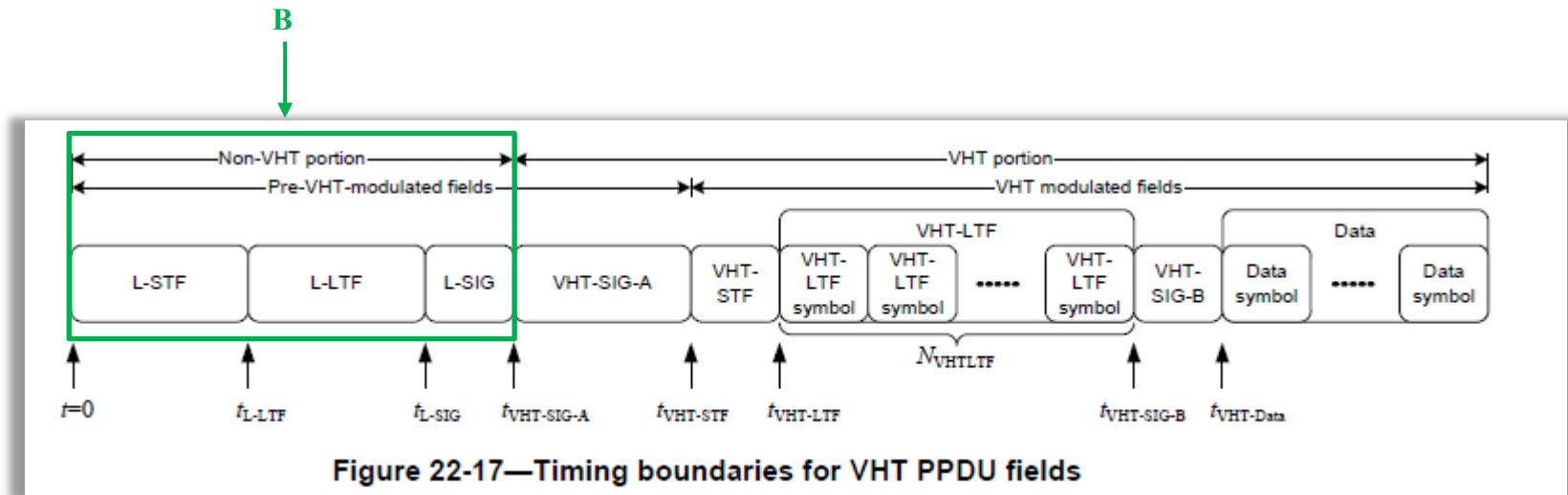
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Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Further, for example, Figure 22-17 of IEEE 802.11ac-2013 (reproduced below) shows the claimed first section, *i.e.*, the Non-VHT portion, includes L-STF, L-LTF, and L-SIG.



802.11ac-2013

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Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Further, for example, Figure 21-17 of IEEE 802.11-2016 (reproduced below) shows the claimed first section, *i.e.*, the Non-VHT portion, includes L-STF, L-LTF, and L-SIG.

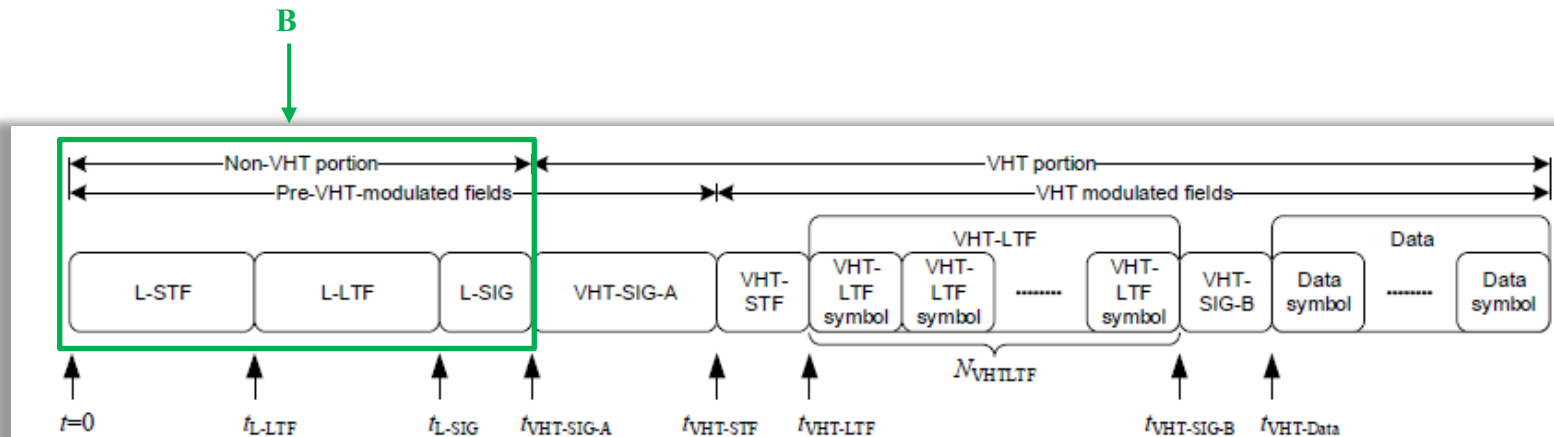
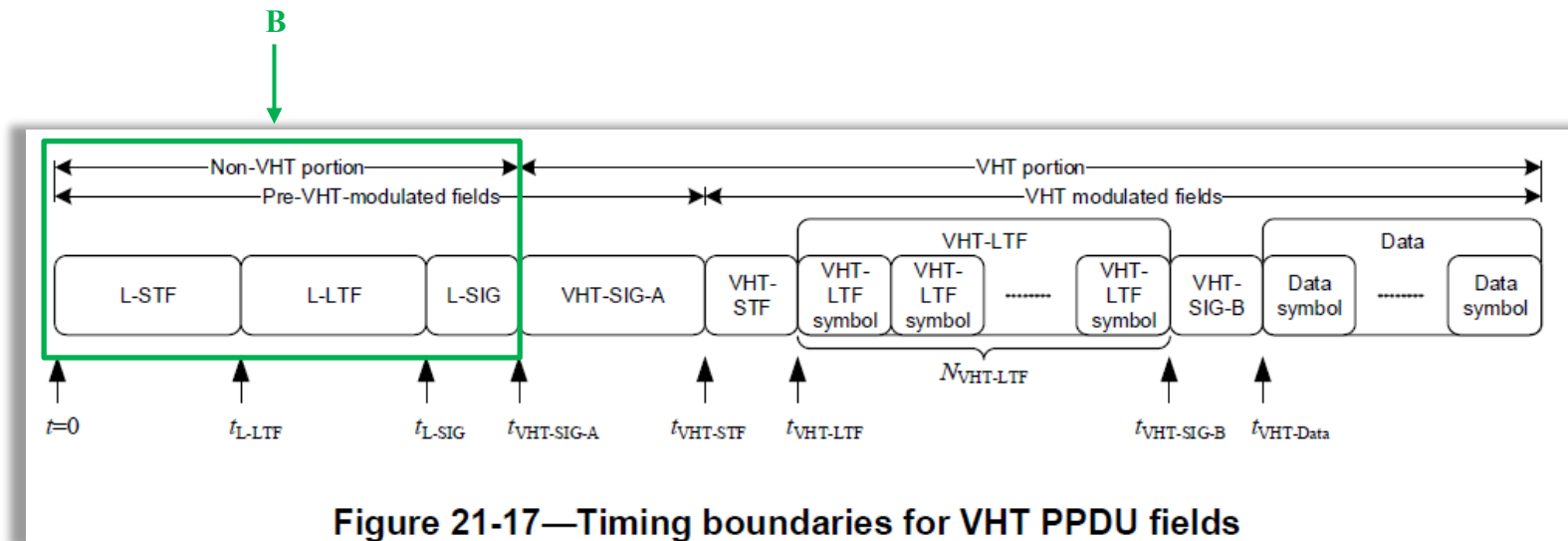


Figure 21-17—Timing boundaries for VHT PPDUs

Claim 8

(B) generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

Further, for example, Figure 21-17 of IEEE 802.11-2020 (reproduced below) shows the claimed first section, *i.e.*, the Non-VHT portion, includes L-STF, L-LTF, and L-SIG.



Claim 8

generating a first section **(C) comprising data configured in a first format compatible with a first communication system** using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section comprises data configured in a first format compatible with a first communication system. Examples of data configured in a first format compatible with a first communication system include L-SIG, which includes data used to “communicate rate and length information” as defined in section 22.3.8.2.4 of IEEE 802.11ac-2013 (reproduced below).

22.3.8.2.4 L-SIG definition

The L-SIG field is used to communicate **C** rate and length information. The structure of the L-SIG field is defined in Figure 18-5.

In a VHT PPDU, the RATE field shall be set to the value representing 6 Mb/s in the 20 MHz channel spacing column of Table 18-6. In a non-HT duplicate PPDU, the RATE field is defined in 18.3.4.2 using the L_DATARATE parameter in the TXVECTOR.

Claim 8

generating a first section **(C) comprising data configured in a first format compatible with a first communication system** using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section comprises data configured in a first format compatible with a first communication system. Examples of data configured in a first format compatible with a first communication system include L-SIG, which includes data used to “communicate rate and length information” as defined in section 21.3.8.2.4 of IEEE 802.11ac-2016 (reproduced below).

21.3.8.2.4 L-SIG definition

The L-SIG field is used to communicate **C** rate and length information. The structure of the L-SIG field is defined in Figure 17-5.

In a VHT PPDU, the RATE field shall be set to the value representing 6 Mb/s in the 20 MHz channel spacing column of Table 17-6. In a non-HT duplicate PPDU, the RATE field is defined in 17.3.4.2 using the L_DATARATE parameter in the TXVECTOR.

Claim 8

generating a first section **(C) comprising data configured in a first format compatible with a first communication system** using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and that the first section comprises data configured in a first format compatible with a first communication system. Examples of data configured in a first format compatible with a first communication system include L-SIG, which includes data used to “communicate rate and length information” as defined in section 21.3.8.2.4 of IEEE 802.11ac-2020 (reproduced below).

21.3.8.2.4 L-SIG definition

The L-SIG field is used to communicate ^Crate and length information. The structure of the L-SIG field is defined in Figure 17-5.

In a VHT PPDU, the RATE field shall be set to the value representing 6 Mb/s in the 20 MHz channel spacing column of Table 17-6. In a non-HT duplicate PPDU, the RATE field is defined in 17.3.4.2 using the L_DATARATE parameter in the TXVECTOR.

Claim 8

generating a first section **(C)** comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section comprises data configured in a first format compatible with a first communication system. The first communication system may also incorporate hardware, for example as outlined in Figure 22-5 of IEEE 802.11ac-2013 (reproduced below).

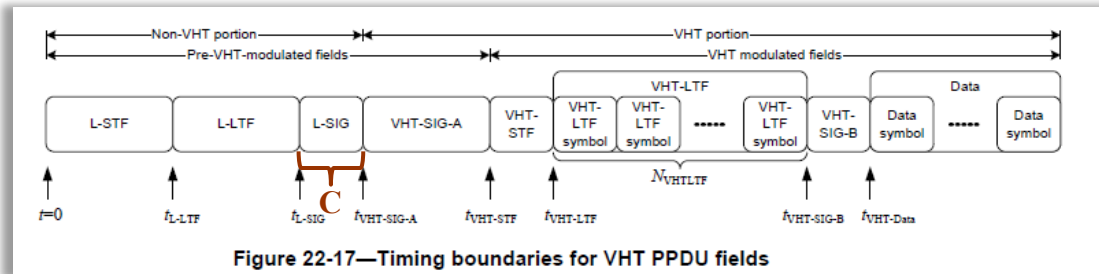
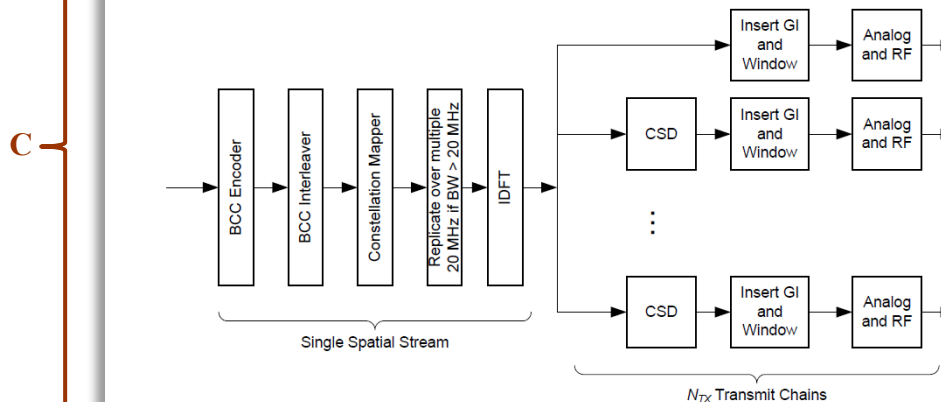


Figure 22-5 to Figure 22-16 show example transmitter block diagrams. The actual structure of the transmitter is implementation dependent. In particular, Figure 22-5 shows the transmit process for the L-SIG and VHT-SIG-A fields of a VHT PPDU using one frequency segment. These transmit blocks are also used to generate the non-VHT modulated fields of the VHT PPDU, except that the BCC encoder and interleaver are not used when generating the L-STF and L-LTF fields.



802.11ac-2013

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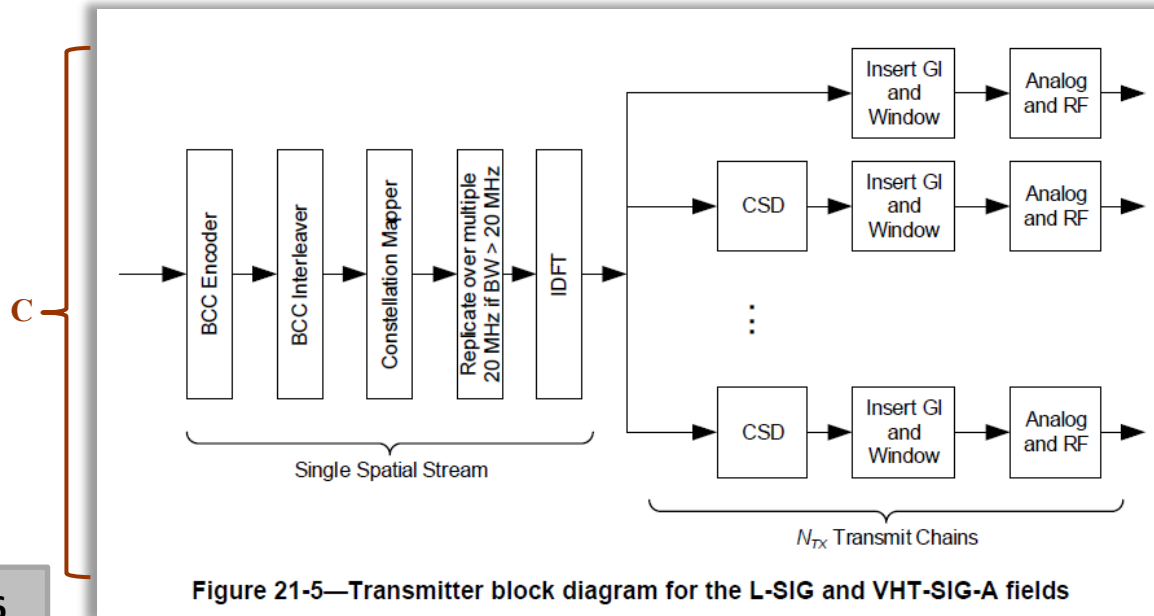
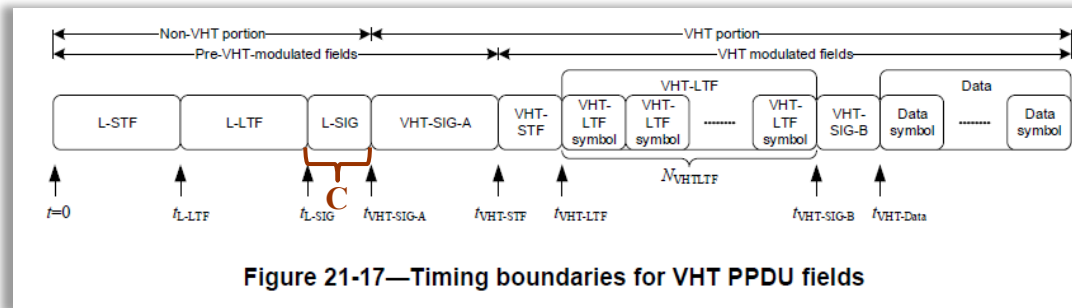
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Claim 8

generating a first section **(C)** comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section comprises data configured in a first format compatible with a first communication system. The first communication system may also incorporate hardware, for example as outlined in Figure 21-5 of IEEE 802.11-2016 (reproduced below).



802.11-2016

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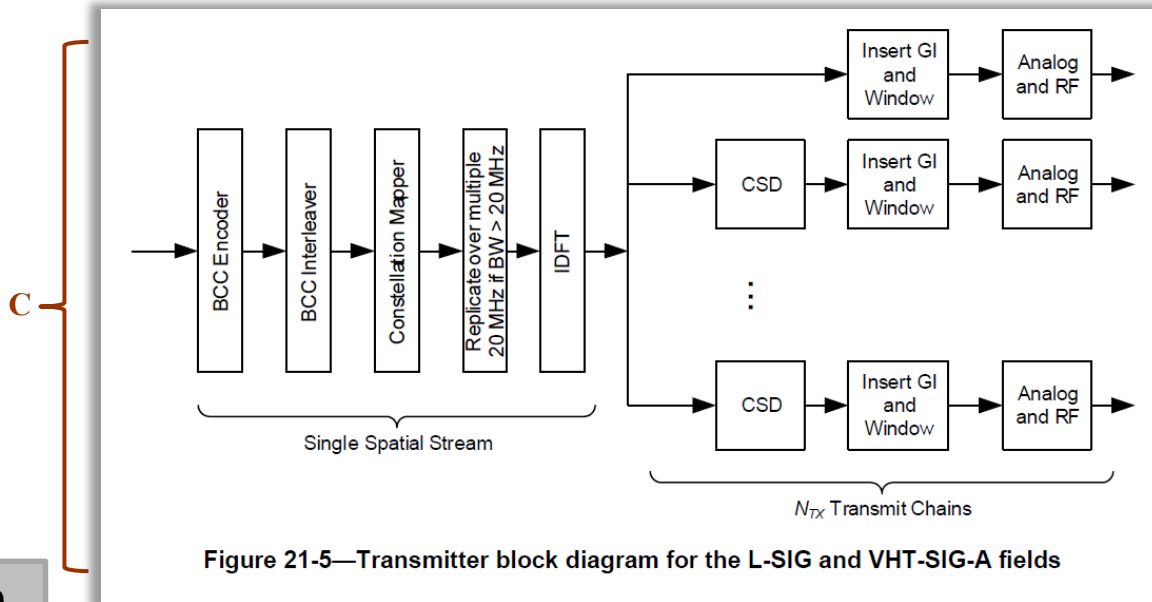
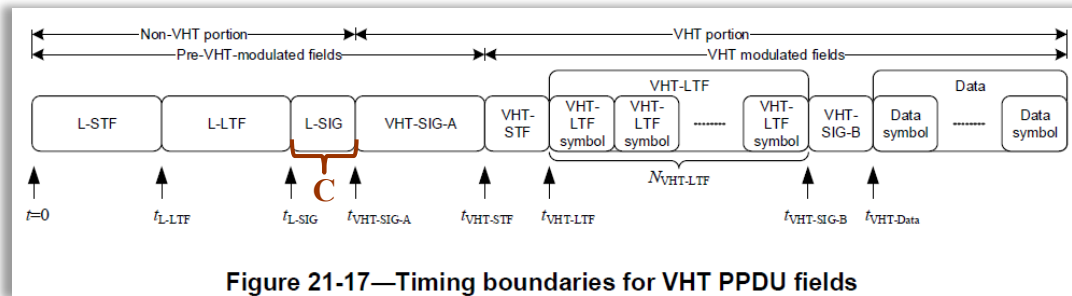
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Claim 8

generating a first section **(C)** comprising data configured in a first format compatible with a first communication system using symbols;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and that the first section comprises data configured in a first format compatible with a first communication system. The first communication system may also incorporate hardware, for example as outlined in Figure 21-5 of IEEE 802.11-2020 (reproduced below).



802.11-2020

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Claim 8

generating a first section comprising data configured in a first format compatible with a first communication system **(D) using symbols;**

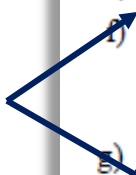
Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate a first section using symbols. For example the L-SIG field which is constructed as described in section 22.3.4.4 of IEEE 802.11ac-2013 (reproduced below) includes symbols, such as the symbols as indicated by the “pilot [symbol] insertion” in step “e” and the use of an “Inverse Discrete Fourier Transform” in step “g.”

22.3.4.4 Construction of L-SIG

Construct the L-SIG field as the SIGNAL field defined by 22.3.8.2.4 with the following highlights:

- a) For a VHT PPDU, set the RATE subfield in the SIGNAL field to 6 Mb/s. Set the Length, Parity, and Tail bits in the SIGNAL field as described in 22.3.8.2.4.
- b) BCC encoder: Encode the SIGNAL field by a convolutional encoder at the rate of $R=1/2$ as described in 22.3.10.5.3.
- c) BCC interleaver: Interleave as described in 22.3.10.8.
- d) Constellation Mapper: BPSK modulate as described in 22.3.10.9.
- e) Pilot insertion: Insert pilots as described in 22.3.10.11.
- f) Duplication and phase rotation: Duplicate the L-SIG field over each 20 MHz of the CH_BANDWIDTH. Apply appropriate phase rotation for each 20 MHz subchannel as described in 22.3.7.4 and 22.3.7.5.
- g) IDFT: Compute the inverse discrete Fourier transform.
- h) CSD: Apply CSD for each transmit chain and frequency segment as described in 22.3.8.2.1.
- i) Insert GI and apply windowing: Prepend a GI (LONG_GI) and apply windowing as described in 22.3.7.4.
- j) Analog and RF: Up-convert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 22.3.7.4 and 22.3.8 for details.

D



802.11ac-2013

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Claim 8

generating a first section comprising data configured in a first format compatible with a first communication system **(D) using symbols;**

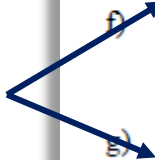
Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate a first section using symbols. For example the L-SIG field which is constructed as described in section 21.3.4.4 of IEEE 802.11-2016 (reproduced below) includes symbols, such as the symbols as indicated by the “pilot [symbol] insertion” in step “e” and the use of an “Inverse Discrete Fourier Transform” in step “g.”

21.3.4.4 Construction of L-SIG

Construct the L-SIG field as the SIGNAL field defined by 21.3.8.2.4 with the following highlights:

- a) In a VHT PPDU set the RATE subfield in the SIGNAL field to 6 Mb/s. Set the Length, Parity, and Tail bits in the SIGNAL field as described in 21.3.8.2.4.
- b) BCC encoder: Encode the SIGNAL field by a convolutional encoder at the rate of $R=1/2$ as described in 21.3.10.5.3.
- c) BCC interleaver: Interleave as described in 21.3.10.8.
- d) Constellation Mapper: BPSK modulate as described in 21.3.10.9.
- e) Pilot insertion: Insert pilots as described in 21.3.10.11.
- f) Duplication and phase rotation: Duplicate the L-SIG field over each 20 MHz of the CH_BANDWIDTH. Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 and 21.3.7.5.
- g) IDFT: Compute the inverse discrete Fourier transform.
- h) CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1.
- i) Insert GI and apply windowing: Prepend a GI (LONG_GI) and apply windowing as described in 21.3.7.4.
- j) Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 and 21.3.8 for details.

D



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generating a first section comprising data configured in a first format compatible with a first communication system **(D)** using symbols;

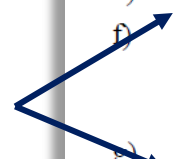
Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and generate a first section using symbols. For example the L-SIG field which is constructed as described in section 21.3.4.4 of IEEE 802.11-2020 (reproduced below) includes symbols, such as the symbols as indicated by the “pilot [symbol] insertion” in step “e” and the use of an “Inverse Discrete Fourier Transform” in step “g.”

21.3.4.4 Construction of L-SIG

Construct the L-SIG field as the SIGNAL field defined by 21.3.8.2.4 with the following highlights:

- a) In a VHT PPDU set the RATE subfield in the SIGNAL field to 6 Mb/s. Set the Length, Parity, and Tail bits in the SIGNAL field as described in 21.3.8.2.4.
- b) BCC encoder: Encode the SIGNAL field by a convolutional encoder at the rate of $R=1/2$ as described in 21.3.10.5.3.
- c) BCC interleaver: Interleave as described in 21.3.10.8.
- d) Constellation Mapper: BPSK modulate as described in 21.3.10.9.
- e) Pilot insertion: Insert pilots as described in 21.3.10.11.
- f) Duplication and phase rotation: Duplicate the L-SIG field over each 20 MHz of the CH_BANDWIDTH. Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 and 21.3.7.5.
- g) IDFT: Compute the inverse discrete Fourier transform.
- h) CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1.
- i) Insert GI and apply windowing: Prepend a GI (LONG_GI) and apply windowing as described in 21.3.7.4.
- j) Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 and 21.3.8 for details.

D



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Claim 8

generating a first section comprising data configured in a first format compatible with a first communication system **(D) using symbols;**

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section uses symbols as shown additionally in Section 22.3.7.4 of IEEE 802.11ac-2013 (reproduced below), which refers the “guard interval duration used for each OFDM **symbol** in the field” such as in L-SIG.

D

$T_{\text{GI, Field}}$ is the guard interval duration used for each OFDM symbol in the field. For L-STF and VHT-STF, $T_{\text{GI, Field}} = T_{\text{GI}}$ but it can be omitted from Equation (22-13) due to the periodic property of L-STF and VHT-STF over every 0.8 μs . For the L-SIG, VHT-SIG-A, VHT-LTF, and VHT-SIG-B fields, $T_{\text{GI, Field}}$ is defined in the “Guard interval duration” column of Table 22-8.

Claim 8

generating a first section comprising data configured in a first format compatible with a first communication system **(D) using symbols;**

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the first section uses symbols as shown additionally in Section 21.3.7.4 of IEEE 802.11-2016 (reproduced below), which refers the “guard interval duration used for each OFDM **symbol** in the field” such as in L-SIG.

D

$T_{\text{GI, Field}}$ is the guard interval duration used for each OFDM symbol in the field. For L-STF and VHT-STF, $T_{\text{GI, Field}} = T_{\text{GI}}$ but it can be omitted from Equation (22-13) due to the periodic property of L-STF and VHT-STF over every 0.8 μs . For the L-SIG, VHT-SIG-A, VHT-LTF, and VHT-SIG-B fields, $T_{\text{GI, Field}}$ is defined in the “Guard interval duration” column of Table 22-8.

Claim 8

generating a first section comprising data configured in a first format compatible with a first communication system **(D)** using **symbols**;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and that the first section uses symbols as shown additionally in Section 21.3.7.4 of IEEE 802.11-2020 (reproduced below), which refers the “guard interval duration used for each OFDM **symbol** in the field” such as in L-SIG.

D

$T_{\text{GI, Field}}$ is the guard interval duration used for each OFDM symbol in the field. For L-STF and VHT-STF, $T_{\text{GI, Field}} = T_{\text{GI}}$ but it can be omitted from Equation (21-13) due to the periodic property of L-STF and VHT-STF over every 0.8 μs . For the L-SIG, VHT-SIG-A, VHT-LTF, and VHT-SIG-B fields, $T_{\text{GI, Field}}$ is defined in the “Guard interval duration” column of Table 21-8.

Claim 8

generating a (E) second section following the (B) first section,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate the claimed second section following the claimed first section. For example Figure 22-17 of IEEE 802.11ac-2013 illustrates the VHT portion following the Non-VHT portion.

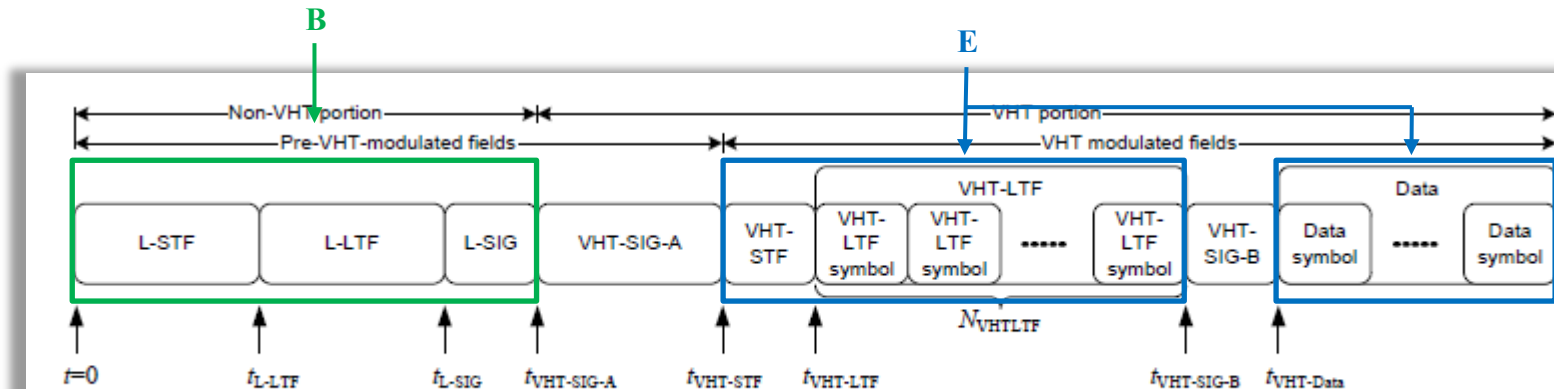


Figure 22-17—Timing boundaries for VHT PPDU fields

Claim 8

generating a **(E) second section following** the **(B) first section**,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate the claimed second section following the claimed first section. For example Figure 21-17 of IEEE 802.11-2016 illustrates the VHT portion following the Non-VHT portion.

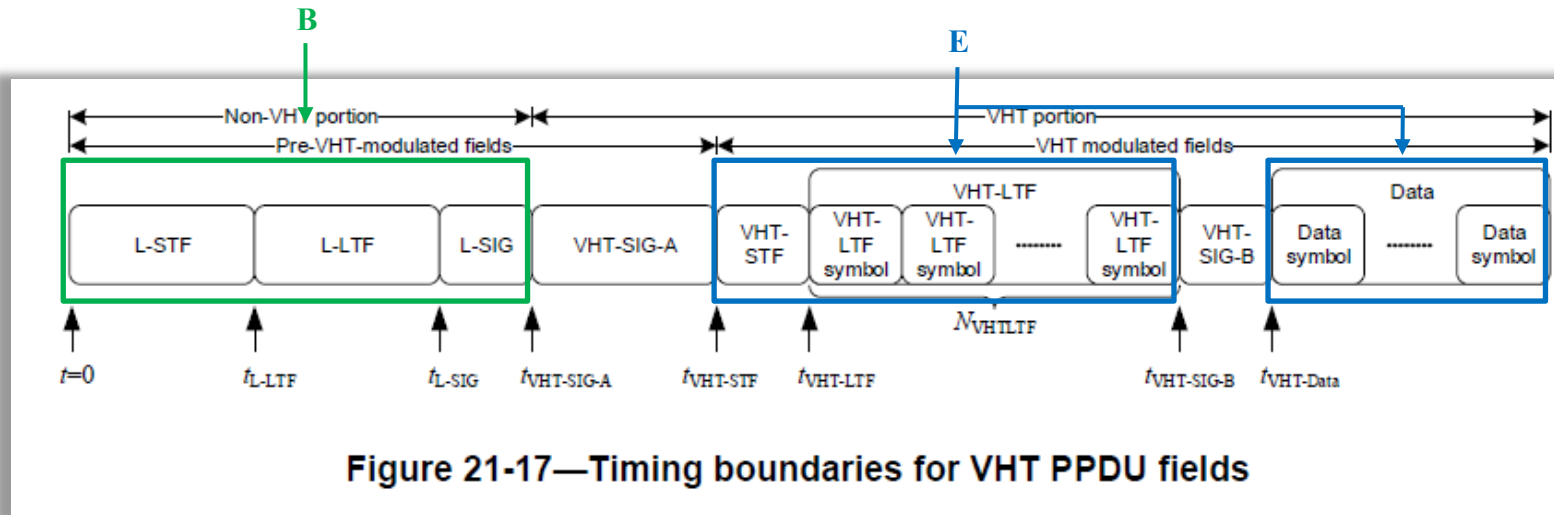


Figure 21-17—Timing boundaries for VHT PPDU fields

Claim 8

generating a **(E) second section following** the **(B) first section**,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and generate the claimed second section following the claimed first section. For example Figure 21-17 of IEEE 802.11-2020 illustrates the VHT portion following the Non-VHT portion.

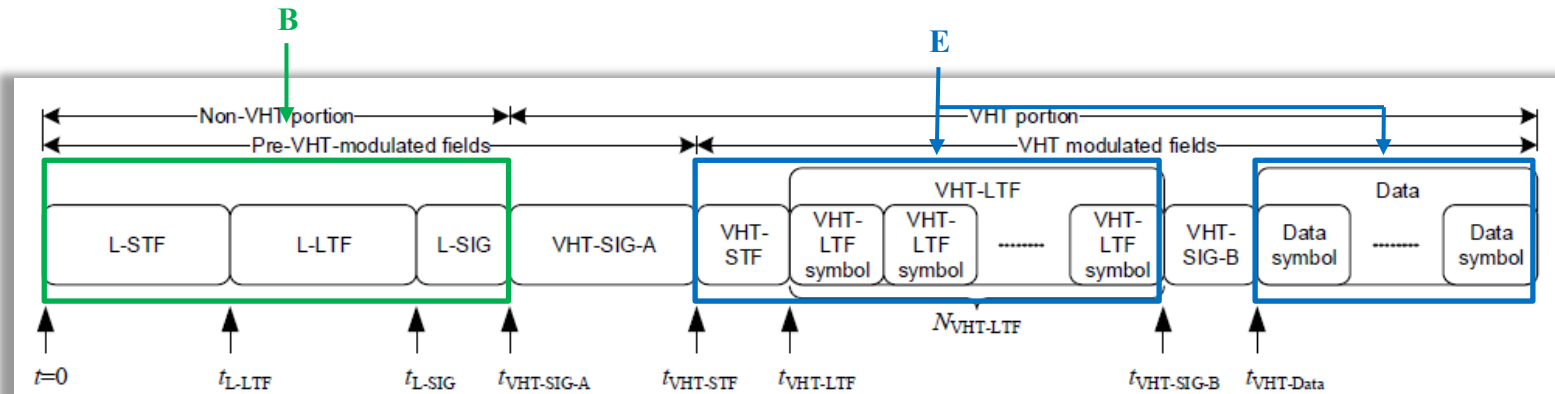
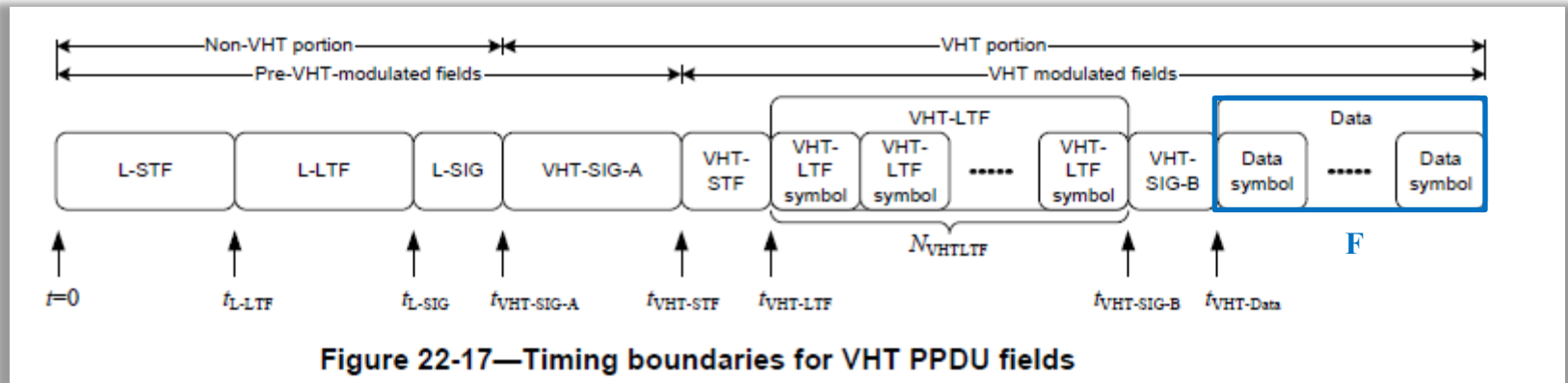


Figure 21-17—Timing boundaries for VHT PPDU fields

Claim 8

the (F) comprising data configured in a second format compatible with a second communication system using symbols,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and the second section comprises data configured in a second format compatible with a second communication system. Examples of data configured in a second format compatible with a second communication system include the Data field identified in Figure 22-17 of IEEE 802.11ac-2013 (reproduced below).



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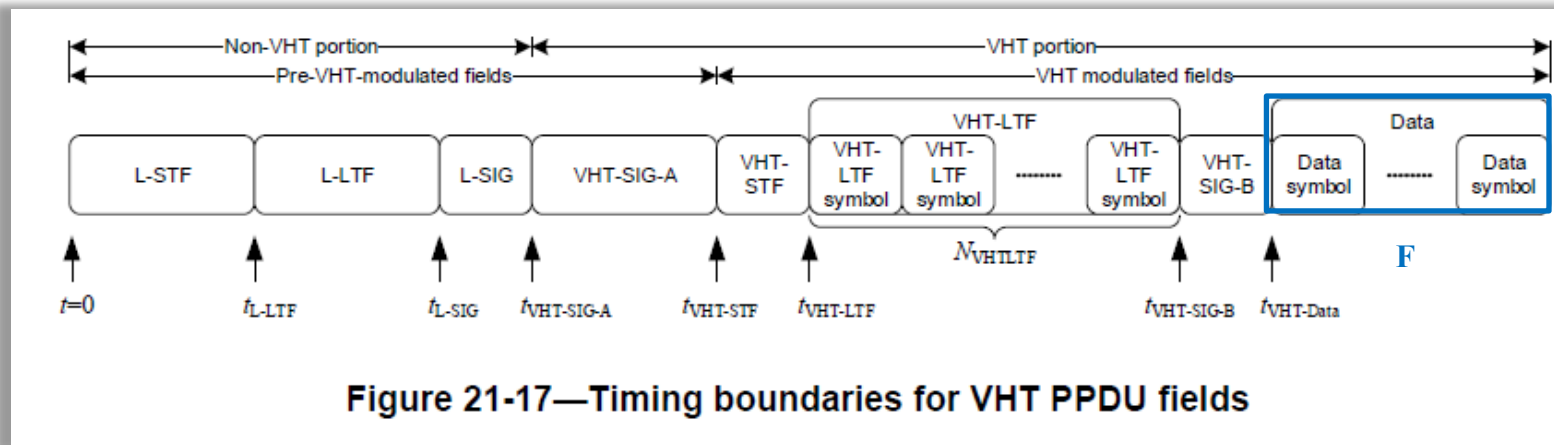
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Claim 8

the (F) comprising data configured in a second format compatible with a second communication system using symbols,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and the second section comprises data configured in a second format compatible with a second communication system. Examples of data configured in a second format compatible with a second communication system include the Data field identified in Figure 21-17 of IEEE 802.11-2016 (reproduced below).



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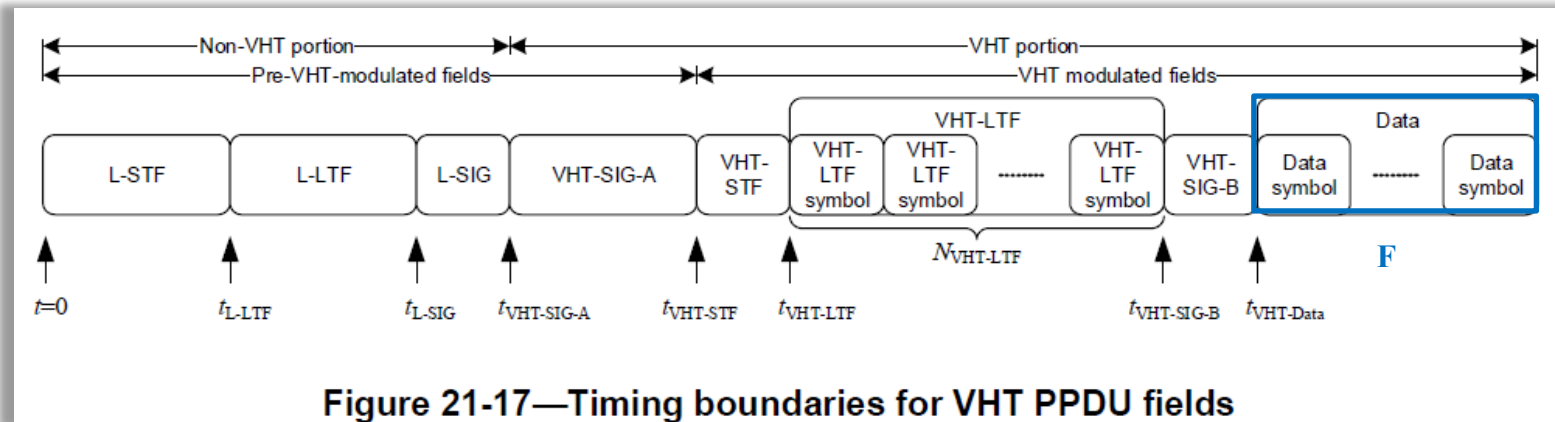
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Claim 8

the (F) comprising data configured in a second format compatible with a second communication system using symbols,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and the second section comprises data configured in a second format compatible with a second communication system. Examples of data configured in a second format compatible with a second communication system include the Data field identified in Figure 21-17 of IEEE 802.11-2020 (reproduced below).



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Claim 8

the second section comprising data configured in a second format compatible with a second communication system **(G) using symbols**,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the second section uses symbols. For example the data field is described as being composed of “OFDM symbols” in section 22.3.10.1 of IEEE 802.11ac-2013 (reproduced below).

22.3.10 Data field ← **G****22.3.10.1 General**

The number of OFDM symbols in the Data field is determined by the Length field in L-SIG (see Equation (22-24)), the preamble duration and the setting of the Short GI field in VHT-SIG-A (see 22.3.8.3.3).

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Claim 8

the second section comprising data configured in a second format compatible with a second communication system **(G) using symbols**,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and that the second section uses symbols. For example the data field is described as being composed of “OFDM symbols” in section 21.3.10.1 of IEEE 802.11-2016 (reproduced below).

21.3.10 Data field ← **G****21.3.10.1 General**

The number of OFDM symbols in the Data field is determined by the Length field in L-SIG (see Equation (21-24)), the preamble duration and the setting of the Short GI field in VHT-SIG-A (see 21.3.8.3.3).

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Claim 8

the second section comprising data configured in a second format compatible with a second communication system **(G) using symbols**,

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and that the second section uses symbols. For example the data field is described as being composed of “OFDM symbols” in section 21.3.10.1 of IEEE 802.11-2020 (reproduced below).

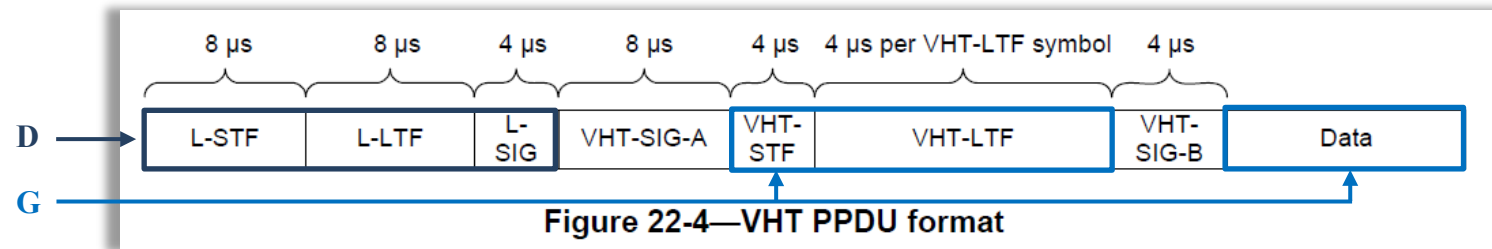
21.3.10 Data field ← **G****21.3.10.1 General**

The number of OFDM symbols in the Data field is determined by the Length field in L-SIG [see Equation (21-24)], the preamble duration and the setting of the Short GI field in VHT-SIG-A (see 21.3.8.3.3).

Claim 8

wherein the **(D) first communication system's symbols** and the **(G) second communication system's symbols** co-exist in one transmission scheme and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac so that the symbols of the first and second communication systems co-exist in a transmission scheme. An example of this co-existence is illustrated by Figure 22-4 of IEEE 802.11ac-2013 (reproduced below).



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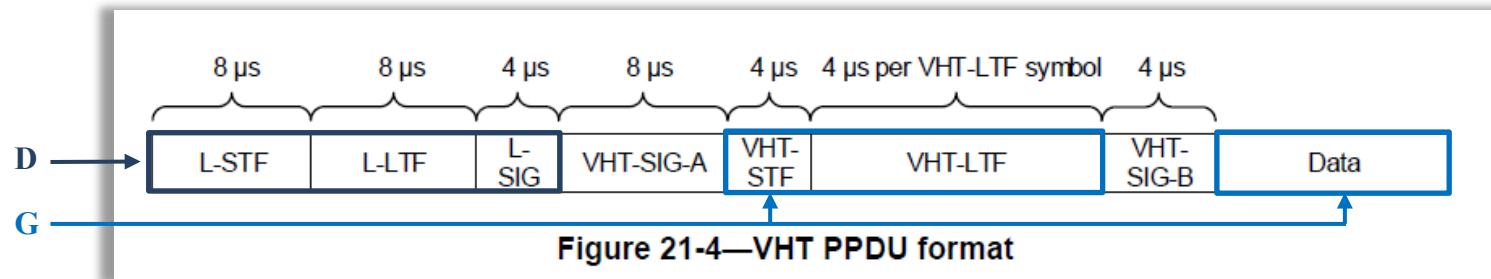
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Claim 8

wherein the **(D) first communication system's symbols** and the **(G) second communication system's symbols** co-exist in one transmission scheme and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac so that the symbols of the first and second communication systems co-exist in a transmission scheme. An example of this co-existence is illustrated by Figure 21-4 of IEEE 802.11-2016 (reproduced below).



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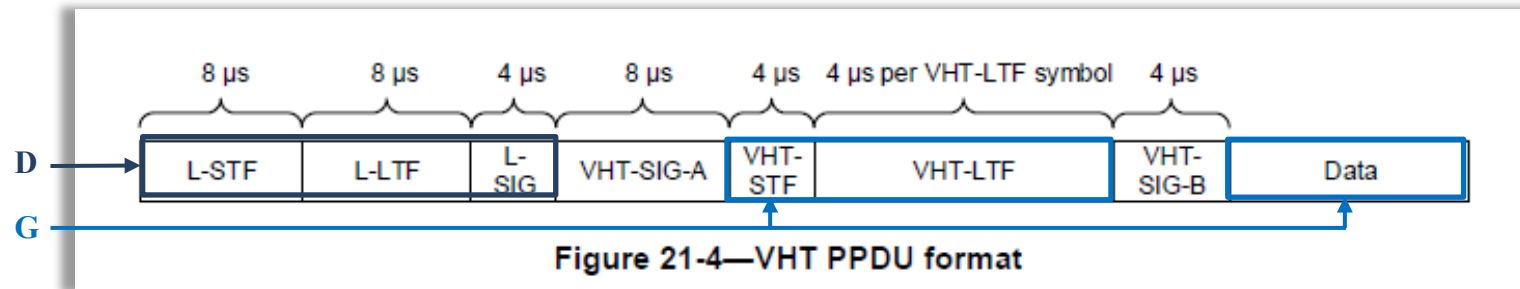
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Claim 8

wherein the **(D) first communication system's symbols** and the **(G) second communication system's symbols** co-exist in one transmission scheme and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax so that the symbols of the first and second communication systems co-exist in a transmission scheme. An example of this co-existence is illustrated by Figure 21-4 of IEEE 802.11-2020 (reproduced below).



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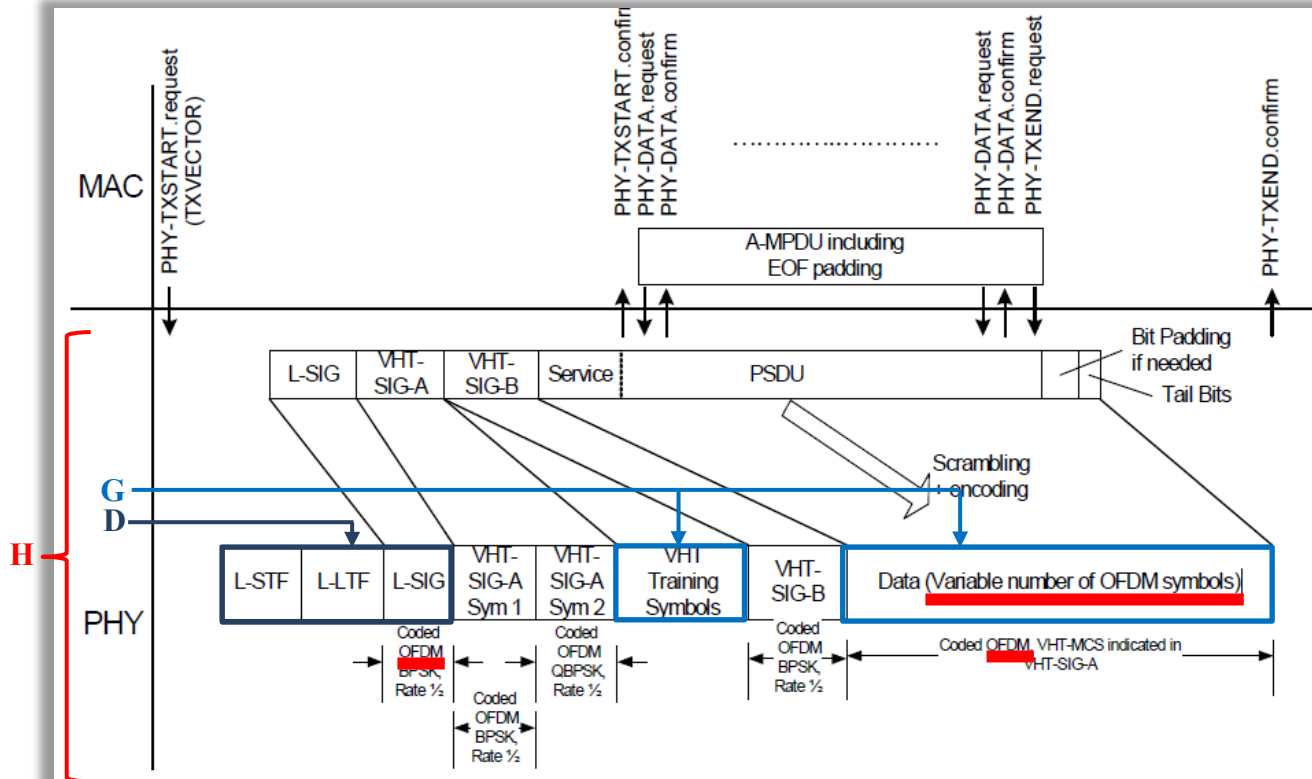
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Claim 8

wherein the **(D)** first communication system's symbols and the **(G)** second communication system's symbols **(H)** co-exist in one transmission scheme and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac so that the symbols of the first and second communication systems co-exist in a transmission scheme. As an additional example of this co-existence, Figure 22-34 of IEEE 802.11ac-2013 (reproduced below) shows that both the first and second communication systems make use of OFDM transmission scheme symbols.



NOTE—This procedure does not describe the operation of optional features, such as MU-MIMO, LDPC or STBC.

Figure 22-34—PHY transmit procedure for an SU transmission

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Claim 8

wherein the **(D)** first communication system's symbols and the **(G)** second communication system's symbols **(H)** co-exist in one transmission scheme and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac so that the symbols of the first and second communication systems co-exist in a transmission scheme. As an additional example of this co-existence, Figure 21-34 of IEEE 802.11-2016 (reproduced below) shows that both the first and second communication systems make use of OFDM transmission scheme symbols.

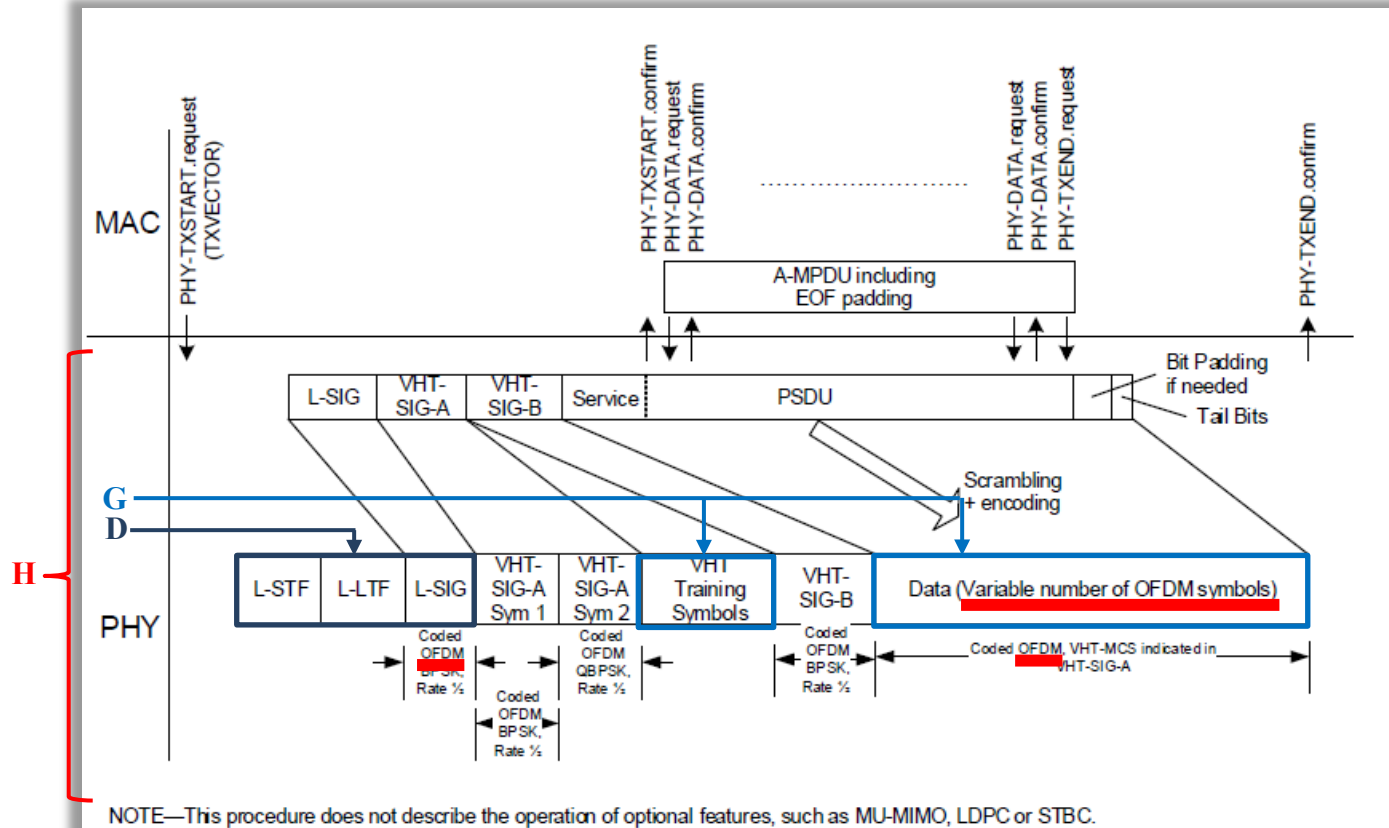


Figure 21-34—PHY transmit procedure for SU transmission

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Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax so that the symbols of the first and second communication systems co-exist in a transmission scheme. As an additional example of this co-existence, Figure 21-34 of IEEE 802.11-2020 (reproduced below) shows that both the first and second communication systems make use of OFDM transmission scheme symbols.



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Claim 8

wherein the **(G) second communication system** has **(J) pilot symbols that are denser** than those in the **(D) first communication system**;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and the period of the symbols in the second communication system is shorter than the period of the symbols in the first communication period as shown in Table 22-5 of IEEE 802.11ac-2013 (reproduced in part below). For example, the first communication system uses a long guard interval, T_{GI} , resulting in a longer symbol interval, or symbol period, of $4\ \mu\text{s}$. Conversely, the second communication system uses a short guard interval, T_{GIS} , resulting in a shorter symbol interval, or symbol period, of $3.6\ \mu\text{s}$.

Table 22-5—Timing-related constants

Parameter	CBW20	CBW40	CBW80	CBW80+80	CBW160	Description
T_{SYML}	$4\ \mu\text{s} = T_{DFT} + T_{GI} = 1.25 \times T_{DFT}$					Long GI symbol interval D
T_{SYMS}	$3.6\ \mu\text{s} = T_{DFT} + T_{GIS} = 1.125 \times T_{DFT}$ J					Short GI symbol interval G
T_{SYM}	T_{SYML} or T_{SYMS} depending on the GI used (see Table 22-8)					Symbol interval

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Claim 8

wherein the (G) second communication system has (J) pilot symbols that are denser than those in the (D) first communication system;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and the period of the symbols in the second communication system is shorter than the period of the symbols in the first communication period as shown in Table 21-5 of IEEE 802.11-2016 (reproduced in part below). For example, the first communication system uses a long guard interval, T_{GI} , resulting in a longer symbol interval, or symbol period, of $4\text{ }\mu\text{s}$. Conversely, the second communication system uses a short guard interval, T_{GIS} , resulting in a shorter symbol interval, or symbol period, of $3.6\text{ }\mu\text{s}$.

Table 21-5—Timing-related constants

Parameter	CBW20	CBW40	CBW80	CBW80+80	CBW160	Description
T_{SYML}	$4\text{ }\mu\text{s} = T_{DFT} + T_{GI} = 1.25 \times T_{DFT}$					Long GI symbol interval D
T_{SYMS}	$3.6\text{ }\mu\text{s} = T_{DFT} + T_{GIS} = 1.125 \times T_{DFT}$ J					Short GI symbol interval G
T_{SYM}	T_{SYML} or T_{SYMS} depending on the GI used (see Table 21-8)					Symbol interval

Claim 8

wherein the (G) second communication system has (J) pilot symbols that are denser than those in the (D) first communication system;

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and the period of the symbols in the second communication system is shorter than the period of the symbols in the first communication period as shown in Table 21-5 of IEEE 802.11-2020 (reproduced in part below). For example, the first communication system uses a long guard interval, T_{GI} , resulting in a longer symbol interval, or symbol period, of 4 μs . Conversely, the second communication system uses a short guard interval, T_{GIS} , resulting in a shorter symbol interval, or symbol period, of 3.6 μs .

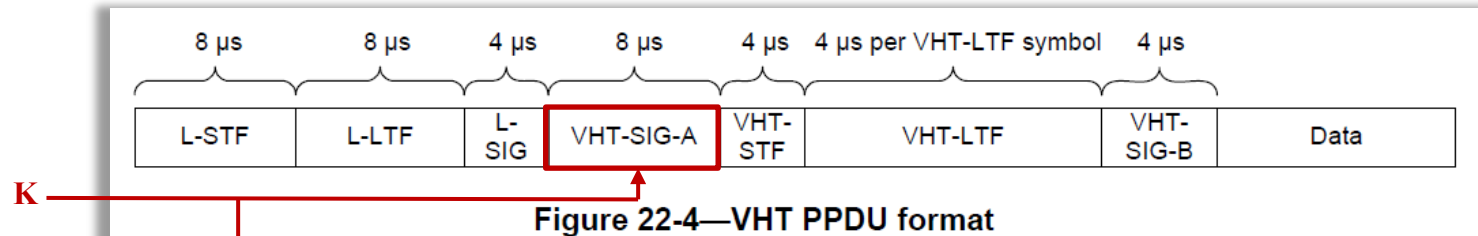
Table 21-5—Timing-related constants

Parameter	CBW20	CBW40	CBW80	CBW80+80	CBW160	Description
T_{SYML}	$4 \mu\text{s} = T_{DFT} + T_{GI} = 1.25 \times T_{DFT}$					Long GI symbol interval D
T_{SYMS}	$3.6 \mu\text{s} = T_{DFT} + T_{GIS} = 1.125 \times T_{DFT}$ J					Short GI symbol interval G
T_{SYM}	T_{SYML} or T_{SYMS} depending on the GI used (see Table 21-8)					Symbol interval

Claim 8

(K) generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate at least one non-data section. An example of this non-data section is the VHT Signal A field (“VHT-SIG-A”), which is illustrated by Figure 22-4 and defined by section 22.3.8.3.3 of IEEE 802.11ac-2013 (reproduced below).



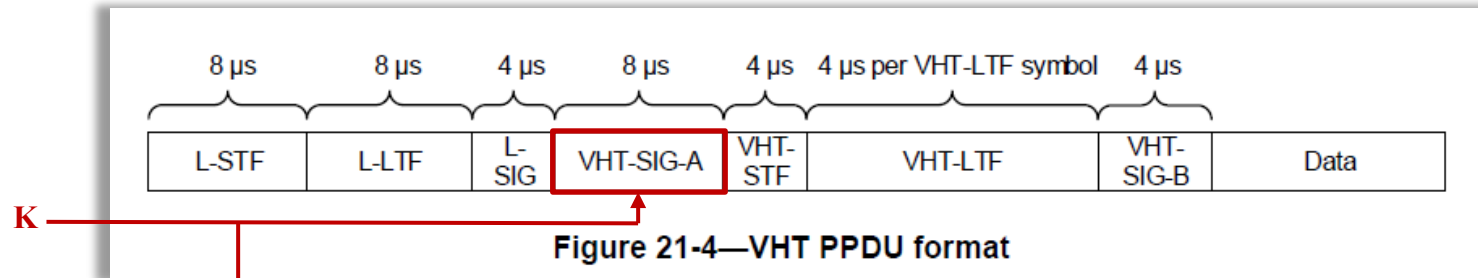
22.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field carries information required to interpret VHT PPDU's. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is shown in Figure 22-19.

Claim 8

(K) generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate at least one non-data section. An example of this non-data section is the VHT Signal A field (“VHT-SIG-A”), which is illustrated by Figure 21-4 and defined by section 21.3.8.3.3 of IEEE 802.11-2016 (reproduced below).



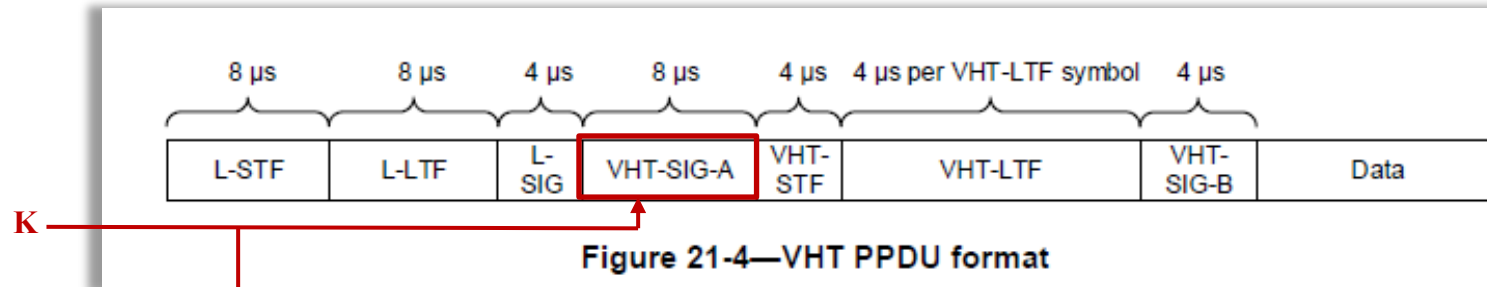
21.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field carries information required to interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 21-18 and for the second part (VHT-SIG-A2) is shown in Figure 21-19.

Claim 8

(K) generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and generate at least one non-data section. An example of this non-data section is the VHT Signal A field (“VHT-SIG-A”), which is illustrated by Figure 21-4 and defined by section 21.3.8.3.3 of IEEE 802.11-2020 (reproduced below).



21.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field carries information required to interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 21-18 and for the second part (VHT-SIG-A2) is shown in Figure 21-19.

Claim 8

generating at least one non-data section **(L)** containing information describing an aspect of data in at least one of the **(B)** first section and the **(E)** second section; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate a non-data section, including VHT-SIG-A, containing information describing an aspect of the data in the first section and an aspect of the data in the second section. For example, VHT-SIG-A, defined in section 22.3.8.3.3 of IEEE 802.11ac-2013 (reproduced below) carries “information required to interpret VHT PPDU, which include the first section and second section as shown in Table 22-4 of IEEE 802.11ac-2013 (reproduced below).

22.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field **L** carries information required to interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is shown in Figure 22-19.

Table 22-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carries the PSDU(s)

B → (points to L-STF, L-LTF, L-SIG)

E → (points to VHT-SIG-A, VHT-STF, VHT-LTF, VHT-SIG-B, Data)

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Claim 8

generating at least one non-data section **(L) containing information describing an aspect of data in at least one of the (B) first section** and the **(E) second section**; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and generate a non-data section, including VHT-SIG-A, containing information describing an aspect of the data in the first section and an aspect of the data in the second section. For example, VHT-SIG-A, defined in section 21.3.8.3.3 of IEEE 802.11-2016 (reproduced below) carries “information required to interpret VHT PPDU, which include the first section and second section as shown in Table 21-4 of IEEE 802.11-2016 (reproduced below).

21.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field **L** carries information required to interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 21-18 and for the second part (VHT-SIG-A2) is shown in Figure 21-19.

Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

B →

E →

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Claim 8

generating at least one non-data section **(L)** containing information describing an aspect of data in at least one of the **(B)** first section and the **(E)** second section; and

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and generate a non-data section, including VHT-SIG-A, containing information describing an aspect of the data in the first section and an aspect of the data in the second section. For example, VHT-SIG-A, defined in section 21.3.8.3.3 of IEEE 802.11-2020 (reproduced below) carries “information required to interpret VHT PPDU, which include the first section and second section as shown in Table 21-4 of IEEE 802.11-2020 (reproduced below).

21.3.8.3.3 VHT-SIG-A definition

The VHT-SIG-A field **L** carries information required to interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-SIG-A1) is shown in Figure 21-18 and for the second part (VHT-SIG-A2) is shown in Figure 21-19.

Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

B → (points to L-STF, L-LTF, L-SIG)

E → (points to VHT-STF, VHT-LTF, VHT-SIG-B, Data)

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Claim 8

combining the **(B) first section**, the **(E) second section** and the **(K) at least one non-data section** to form the **(A) frame structure**.

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and combine the generated first, second, and non-data sections to form the claimed frame structure. For example, the first section, including L-STF, L-LTF, and L-SIG, is combined with the second section, including VHT-STF, VHT-LTF, and Data, which is additionally combined with the non-data section, including VHT-SIG-A, to form the VHT PPDU, as shown by Figure 22-4 and Table 22-4 of IEEE 802.11ac-2013 (reproduced below).

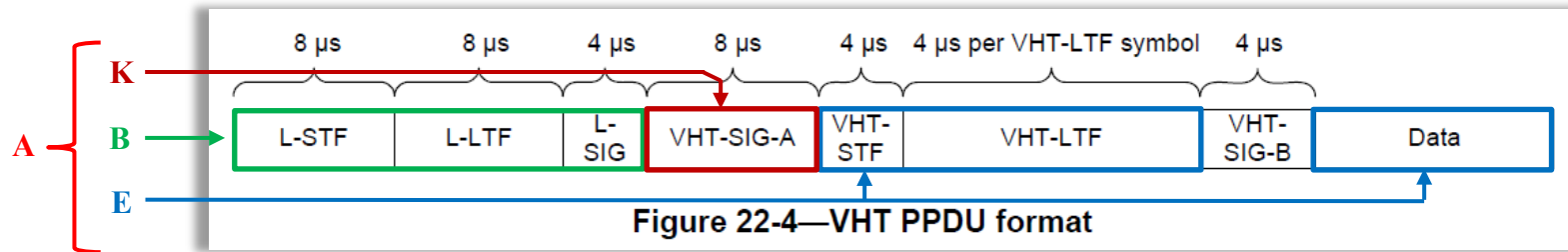


Table 22-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carries the PSDU(s)

802.11ac-2013

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Claim 8

combining the **(B) first section**, the **(E) second section** and the **(K) at least one non-data section** to form the **(A) frame structure**.

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ac and combine the generated first, second, and non-data sections to form the claimed frame structure. For example, the first section, including L-STF, L-LTF, and L-SIG, is combined with the second section, including VHT-STF, VHT-LTF, and Data, which is additionally combined with the non-data section, including VHT-SIG-A, to form the VHT PPDU, as shown by Figure 21-4 and Table 21-4 of IEEE 802.11-2016 (reproduced below).

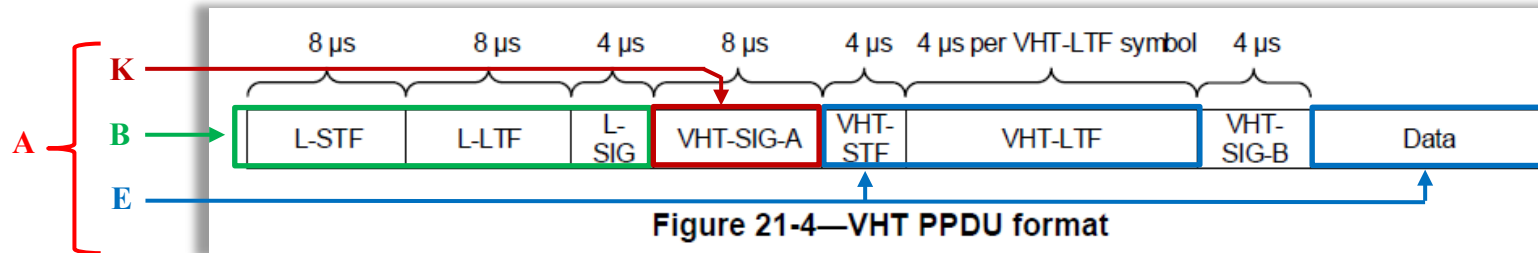


Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

802.11-2016

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Claim 8

combining the **(B) first section**, the **(E) second section** and the **(K) at least one non-data section** to form the **(A) frame structure**.

Plaintiff contends that the Accused Instrumentalities practice IEEE 802.11ax and combine the generated first, second, and non-data sections to form the claimed frame structure. For example, the first section, including L-STF, L-LTF, and L-SIG, is combined with the second section, including VHT-STF, VHT-LTF, and Data, which is additionally combined with the non-data section, including VHT-SIG-A, to form the VHT PPDU, as shown by Figure 21-4 and Table 21-4 of IEEE 802.11-2020 (reproduced below).

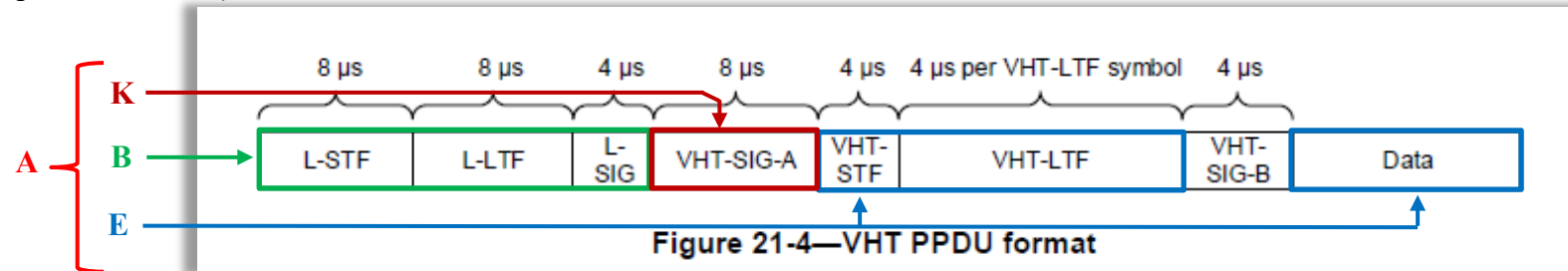


Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

Brackets A, B, K, and E indicate the following groupings:

- B** (Green arrow): L-STF, L-LTF, L-SIG
- K** (Red arrow): VHT-SIG-A
- E** (Blue arrow): VHT-STF, VHT-LTF, VHT-SIG-B, Data

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