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### Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

0 additional set(s) of copies of such documents is (are) enclosed as well.

### Refund of the search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Should you wish to further prosecute this application in the examination phase, your attention is drawn to the provisions of Rule 70a EPC. An invitation to respond to the extended European search report will be issued shortly (R. 70(2) EPC).



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EPO Machine Translation XML

**SUBJECT OF THE INVENTION  
TRANSMISSION METHOD FOR MULTI USER IN WIRELESS LOCAL AREA NETWORK}**

- [0001]** The present invention relates to WLAN technology, and more particularly, to multi-user transmission.
- [0002]** With the development of information and communication technology, various wireless communication technologies are being developed. Wireless local area network (WLAN) is based on radio frequency technology, personal digital assistant (PDA), laptop computer, portable multimedia player (PMP), smart It is a technology for wirelessly accessing the Internet in a home, business, or a specific service providing area by using a portable terminal such as a smart phone or a tablet PC.
- [0003]** The standard for WLAN technology is being developed as an Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard. As the spread of WLAN is activated and applications using the same are diversified, there is an increasing need for new WLAN technologies that support higher throughput than existing WLAN technologies. Very high throughput (VHT) WLAN technology is proposed to support data processing speed of 1Gbps or more. Among them, the WLAN technology according to the IEEE 802.11ac standard is a technology for providing an ultra high throughput in the band below 6GHz, and the WLAN technology according to the IEEE 802.11ad standard is a technology for providing an ultra high throughput in the 60GHz band.
- [0004]** In addition, standards for various WLAN technologies have been defined and technology development is in progress. Typically, the WLAN technology according to the IEEE 802.11af standard is a technology defined for the operation of the WLAN in the TV white space (white space), and the WLAN technology according to the IEEE 802.11ah standard operates at a low power in the band below 1GHz The technology is defined to support a large number of terminals, and the WLAN technology according to the IEEE 802.11ai standard is a technology defined for fast initial link setup (FILS) in a WLAN system. Recently, IEEE 802.11ax standardization for the purpose of improving frequency efficiency in a dense environment in which a plurality of base stations and terminals exist.
- [0005]** In a system based on the WLAN technology, multi-user (MU) transmission may be performed. Multi-user transmission may include uplink and downlink transmission based on orthogonal

frequency division multiple access (OFDMA), uplink and downlink transmission based on multi-user-multiple input multiple output (MU-MIMO), and the like. When multi-user transmission is performed between stations, information necessary for multi-user transmission may be signaled to the corresponding station.

- [0006] An object of the present invention for solving the above problems is to provide a method for operating a station supporting multi-user transmission in a WLAN.
- [0007] A method of operating a first station in a WLAN according to an embodiment of the present invention for achieving the above object includes generating a PPDU including a legacy preamble, a HE preamble, and a payload, and transmitting the PPDU. The HE preamble includes an HE-SIG-A field, an HE-SIG-B field, an HE-STF, and an HE-LTF, and the HE-SIG-A field includes the number of symbols in the HE-SIG-B field. It contains information indicating.
- [0008] Here, the number of symbols in the HE-SIG-B field may be indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field.
- [0009] Here, the number of symbols in the HE-SIG-B field may be indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field and resource size information allocated to a station receiving the PPDU.
- [0010] Here, the number of symbols in the HE-SIG-B field may be indicated based on the number information of stations that receive the PPDU included in the HE-SIG-A field.
- [0011] Here, the HE-SIG-A field may further include information indicating MCS of the HE-SIG-B field.
- [0012] Here, the HE-SIG-B field may be repeated on the time axis.
- [0013] Here, the HE-SIG-B field may include resource allocation information of a station that receives the PPDU.
- [0014] According to another aspect of the present invention, there is provided a method for operating a first station in a WLAN, the method comprising: acquiring a legacy preamble included in a PPDU received from a second station, a HE preamble included in the PPDU; Acquiring a payload included in the PPDU based on information included in the HE preamble, wherein the HE preamble includes an HE-SIG-A field, an HE-SIG-B field, and an HE- It includes the STF and HE-LTF, the HE-SIG-A field includes information indicating the number of symbols of the HE-SIG-B field.

- [0015] Here, the number of symbols in the HE-SIG-B field may be indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field.
- [0016] Here, the number of symbols in the HE-SIG-B field may be indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field and resource size information allocated to a station receiving the PPDU.
- [0017] Here, the number of symbols in the HE-SIG-B field may be indicated based on the number information of stations that receive the PPDU included in the HE-SIG-A field.
- [0018] Here, the HE-SIG-A field may further include information indicating MCS of the HE-SIG-B field.
- [0019] Here, the HE-SIG-B field may be repeated on the time axis.
- [0020] Here, the HE-SIG-B field may include resource allocation information of a station that receives the PPDU.
- [0021] According to the present invention, when multi-user transmission is performed, resource allocation information may be included in the HE-SIG field (eg, the HE-SIG-A field, the HE-SIG-B field, etc.) of the PPDU. Based on the allocation information, it is possible to identify resources allocated to itself and to decode a signal received through the identified resources. Among the information required for multi-user transmission (eg, resource allocation information, etc.), common information may be transmitted through the entire frequency band, and user-specific information may be assigned to the frequency band (or , Spatial stream). Information required for transmission may vary according to a transmission method (eg, OFDM, OFDMA, SU-MIMO, MU-MIMO, etc.) of the PPDU, and thus, the structure of the preamble included in the PPDU may also be changed. Through this, the performance of the WLAN can be improved.
- [0022] 1 is a block diagram showing the structure of a WLAN device. 2 is a schematic block diagram illustrating a transmission signal processor in a WLAN. 3 is a schematic block diagram illustrating a reception signal processor in a WLAN. 4 is a diagram illustrating an interframe space relationship. FIG. 5 is a conceptual diagram illustrating a frame transmission procedure according to a CSMA / CA scheme for avoiding collision between frames in a channel. 6 is a conceptual diagram illustrating an embodiment of a topology of a WLAN. 7 is a flowchart illustrating an embodiment of downlink transmission in a WLAN. 8 is a block diagram illustrating a first embodiment of a PPDU. 9 is a block diagram illustrating a second embodiment and a third embodiment of a PPDU. 10 is a block diagram illustrating a fourth embodiment of a PPDU. 11 is a flowchart illustrating an

embodiment of uplink transmission in a WLAN. 12 is a block diagram illustrating a fifth embodiment of a PPDU.

- [0023] DETAILED DESCRIPTION Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings so that those skilled in the art may easily implement the present invention. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present invention. In the drawings, parts irrelevant to the description are omitted for simplicity of explanation, and like reference numerals designate like parts throughout the specification.
- [0024] In a wireless local area network (WLAN) (hereinafter referred to as "wireless LAN"), a basic service set (BSS) includes a plurality of WLAN devices. The WLAN device may include a medium access control (MAC) layer and a physical (PHY) layer according to the Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard. At least one of the plurality of WLAN devices may be an access point (AP), and the other WLAN device may be a non-AP station (non-AP station, non-AP STA). Or in ad hoc networking, the plurality of WLAN devices may all be non-AP stations. In general, a station (STA) is also used as a case of collectively an access point (AP) and a non-AP station, but for convenience, a non-AP station may be referred to as a station (STA).
- [0025] 1 is a block diagram showing the structure of a WLAN device.
- [0026] Referring to FIG. 1, the WLAN device 1 includes a baseband processor 10, a radio frequency (RF) transceiver 20, an antenna unit 30, a memory 40, and an input interface unit 50. , An output interface unit 60 and a bus 70. The baseband processor 10 performs baseband related signal processing described herein, and may include a MAC processor 11 and a PHY processor 15.
- [0027] In one embodiment, the MAC processor 11 may include a MAC software processor 12 and a MAC hardware processor 13. In this case, the memory 40 includes software including some functions of the MAC layer (hereinafter referred to as 'MAC software'), and the MAC software processor 12 drives the MAC software to implement some functions of the MAC. The MAC hardware processor 13 may implement the remaining functions of the MAC layer as hardware (MAC hardware), but is not limited thereto. The PHY processor 15 may include a transmit signal processor 100 and a receive signal processor 200.
- [0028] The baseband processor 10, the memory 40, the input interface unit 50 and the output interface unit 60 may communicate with each other via the bus 70. The RF transceiver 20 may include an RF transmitter 21 and an RF receiver 22. The memory 40 may store an operating system, an application, and the like in addition to the MAC software, and the input interface unit 50 obtains

information from the user, and the output interface unit 60 receives information from the user.

Output

- [0029] The antenna unit 30 may include one or more antennas. When using a multiple-input multiple-output (MIMO) or a multi-user MIMO (MU-MIMO), the antenna unit 30 may include a plurality of antennas.
- [0030] 2 is a schematic block diagram illustrating a transmission signal processor in a WLAN.
- [0031] Referring to FIG. 2, the transmission signal processing unit 100 includes an encoder 110, an interleaver 120, a mapper 130, an inverse Fourier transformer 140, and a guard interval (GI) inserter 150. can do.
- [0032] The encoder 110 encodes input data and may be, for example, a forward error correction (FEC) encoder. The FEC encoder may include a binary convolutional code (BCC) encoder, in which case a puncturing device may be included therein. Alternatively, the FEC encoder may include a low-density parity-check (LDPC) encoder.
- [0033] The transmission signal processing unit 100 may further include a scrambler that scrambles before encoding the input data in order to reduce the probability of generating the same long sequence of zeros or ones. When a plurality of BCC encoders are used as the encoder 110, the transmission signal processing unit 100 may further include an encoder parser for demultiplexing the scrambled bits into the plurality of BCC encoders. When the LDPC encoder is used as the encoder 110, the transmission signal processing unit 100 may not use the encoder parser.
- [0034] The interleaver 120 changes the order by interleaving the bits of the stream output from the encoder 110. Interleaving may be applied only when a BCC encoder is used as the encoder 110. The mapper 130 maps the bit string output from the interleaver 120 to constellation points. When the LDPC encoder is used as the encoder 110, the mapper 130 may further perform LDPC tone mapping in addition to constellation point mapping.
- [0035] When using MIMO or MU-MIMO, the transmission signal processing unit 100 may use the plurality of interleavers 120 and the plurality of mappers 130 corresponding to the number NSS of the spatial streams. In this case, the transmission signal processing unit 100 may further include a stream parser that divides the outputs of the plurality of BCC encoders or LDPC encoders into a plurality of blocks to be provided to different interleavers 120 or mappers 130. In addition, the transmission signal processing unit 100 transmits a space-time block code (STBC) encoder and a space-time stream that spread constellation points from NSS spatial streams to NSTS space-time

streams. It may further include a spatial mapper that maps to chains). The spatial mapper may use methods such as direct mapping, spatial expansion, beamforming, and the like.

- [0036] The inverse Fourier transformer 140 uses an inverse discrete Fourier transform (IDFT) or an inverse fast Fourier transform (IFFT) to time the constellation block output from the mapper 130 or the spatial mapper. Convert to an area block, that is, a symbol. In case of using STBC encoder and spatial mapper, inverse Fourier transformer 140 may be provided per transmission chain.
- [0037] When using MIMO or MU-MIMO, the transmission signal processing unit 100 may insert cyclic shift diversity (CSD) before or after inverse Fourier transform in order to prevent unintended beamforming. CSD may be specified per transport chain or per space-time stream. Or the CSD may be applied as part of the space mapper. In addition, when using MU-MIMO, some blocks before the space mapper may be provided for each user.
- [0038] The GI inserter 150 inserts the GI in front of the symbol. The transmission signal processing unit 100 may smoothly window the edge of the symbol after inserting the GI. The RF transmitter 21 converts a symbol into an RF signal and transmits it through an antenna. When using MIMO or MU-MIMO, the GI inserter 150 and the RF transmitter 21 may be provided for each transmission chain.
- [0039] 3 is a schematic block diagram illustrating a reception signal processor in a WLAN.
- [0040] Referring to FIG. 3, the received signal processor 200 may include a GI remover 220, a Fourier transformer 230, a demapper 240, a deinterleaver 250, and a decoder 260. The RF receiver 22 receives an RF signal through an antenna and converts the RF signal into a symbol, and the GI remover 220 removes the GI from the symbol. When using MIMO or MU-MIMO, RF receiver 22 and GI canceller 220 may be provided per receive chain.
- [0041] The Fourier transformer 230 converts a symbol, that is, a time domain block, to a constellation point in the frequency domain using a Discrete Fourier transform (DFT) or fast Fourier transform (FFT). The Fourier transformer 230 may be provided for each reception chain. If you use MIMO or MU-MIMO, you can include a spatial demapper that transforms Fourier transformed receive chains into constellation points in the space-time stream, and STBC decoders that despread the constellation points from the space-time stream to the spatial stream. have.
- [0042] The demapper 240 demaps the constellation block output from the Fourier transformer 230 or the STBC decoder into a bit stream. When the received signal is LDPC encoded, the demapper 240 may further perform LDPC tone demapping before constellation point demapping.

The deinterleaver 250 deinterleaves the bits of the stream output from the demapper 240. Deinterleaving can be applied only when the received signal is BCC encoded.

- [0043] When using MIMO or MU-MIMO, the reception signal processing unit 200 may use a plurality of demappers 240 and a plurality of deinterleavers 250 corresponding to the number of spatial streams. In this case, the reception signal processing unit 200 may further include a stream deparser for combining the streams output from the plurality of deinterleavers 250.
- [0044] The decoder 260 decodes the stream output from the deinterleaver 250 or the stream parser, and may be, for example, an FEC decoder. The FEC decoder may include a BCC decoder or an LDPC decoder. The received signal processor 200 may further include a descrambler that descrambles the data decoded by the decoder 260. When a plurality of BCC decoders are used as the decoder 260, the reception signal processing unit 200 may further include an encoder deparser for multiplexing the decoded data. When the LDPC decoder is used as the decoder 260, the reception signal processor 200 may not use the encoder parser.
- [0045] 4 is a diagram illustrating an interframe space (IFS) relationship.
- [0046] Referring to FIG. 4, a data frame, a control frame, and a management frame may be exchanged between WLAN devices. The data frame is a frame used for transmission of data forwarded to a higher layer. The data frame is transmitted after a backoff is performed after a distributed coordination function (IFS) has elapsed from when the medium is idle.
- [0047] The management frame is a frame used for exchanging management information that is not forwarded to a higher layer. The management frame is transmitted after a backoff is performed after an IFS such as DIFS or point coordination function IFS (PIFS). Subtype frame of management frame includes Beacon, Association request / response, probe request / response, authentication request / response. A control frame is a frame used to control access to a medium. Subtype frames of control frames include RTS, CTS, and ACK. If the control frame is not a response frame of another frame, the control frame is transmitted after the backoff is performed after the elapse of DIFS. If the control frame is a response frame of another frame, the control frame is transmitted without the backoff after the short IFS (SIFS). The type and subtype of the frame may be identified by a type field and a subtype field in the frame control field.
- [0048] On the other hand, a Quality of Service (QoS) STA may transmit a frame after performing the backoff after passing the arbitration IFS (AIFS), ie, AIFS [AC], for the access category (AC) to which the frame belongs. In this case, the frame in which AIFS [AC] may be used may be a control frame rather than a data frame, a management frame, and a response frame.

- [0049] 5 is a conceptual diagram illustrating a frame transmission procedure according to a carrier sense multiple access (CSMA) / collision avoidance (CA) scheme for avoiding collision between frames in a channel.
- [0050] Referring to FIG. 5, a first station STA1 means a transmitting station to which data is to be transmitted, and a second station STA2 means a receiving station which receives data transmitted from the first station STA1. The third station STA3 may be located in an area capable of receiving a frame transmitted from the first station STA1 and / or a frame transmitted from the second station STA2.
- [0051] The first station STA1 may determine whether a channel is used through carrier sensing. The first station STA1 may determine the occupancy state of the channel based on the amount of energy present in the channel or the correlation of the signal, or may use a network allocation vector (NAV) timer to The occupancy state can be determined.
- [0052] The first station STA1 transmits a request to send (RTS) frame after performing a backoff when it is determined that the channel is not used by another station during DIFS (that is, when the channel is in an idle state). Can be sent to (STA2). When the second station STA2 receives the RTS frame, the second station STA2 may transmit a clear to send (CTS) frame, which is a response to the RTS frame, to the first station STA1 after SIFS.
- [0053] Meanwhile, when receiving the RTS frame, the third station STA3 uses the duration information included in the RTS frame to transmit frame frames continuously transmitted (for example, SIFS + CTS frame + SIFS + data). Frame + SIFS + ACK frame). Alternatively, when the third station STA3 receives the CTS frame, the third station STA3 uses the duration information included in the CTS frame in a subsequent frame transmission period (eg, SIFS + data frame + SIFS + ACK frame). You can set the NAV timer for. If the third station STA3 receives a new frame before the NAV timer expires, the third station STA3 may update the NAV timer using duration information included in the new frame. The third station STA3 does not attempt channel access until the NAV timer expires.
- [0054] When the first station STA1 receives the CTS frame from the second station STA2, the first station STA1 may transmit the data frame to the second station STA2 after SIFS from the time when the reception of the CTS frame is completed. When the second station STA2 successfully receives the data frame, the second station STA2 may transmit an ACK frame, which is a response to the data frame, to the first station STA1 after SIFS.
- [0055] When the NAV timer expires, the third station STA3 may determine whether the channel is used through carrier sensing. When it is determined that the channel is not used by another station

during the DIFS from the expiration of the NAV timer, the third station STA3 may try to access the channel after the contention window CW due to the random backoff has passed.

- [0056] 6 is a conceptual diagram illustrating an embodiment of a topology of a WLAN.
- [0057] Referring to FIG. 6, the first station 610, the second station 620, the third station 630, and the fourth station 640 may be located within cell coverage of the access point 600. And may be associated with the access point 600. The access point 600 and stations 610, 620, 630, and 640 may perform single user (SU) transmission or multi user (MU) transmission. Single user transmission includes uplink / downlink transmission based on orthogonal frequency division multiplexing (OFDM), uplink / downlink transmission based on "multi-input multiple output (SU-MIMO) and OFDM" can do. Multi-user transmission includes uplink / downlink transmission based on orthogonal frequency division multiple access (OFDMA), uplink / downlink transmission based on "SU-MIMO and OFDMA", and uplink / downlink based on "MU-MIMO and OFDM" It may include a link transmission, uplink / downlink transmission based on "MU-MIMO and OFDMA".
- [0058] The access point 600 and the stations 610, 620, 630, and 640 may perform single user transmission or multi-user transmission in units of 20 MHz bandwidth (eg, 20 MHz, 40 MHz, 80 MHz, 160 MHz, etc.) of bandwidth. Alternatively, single user transmission or multi-user transmission may be performed in a unit having a bandwidth less than 20 MHz (eg, a bandwidth of 10 MHz, 5 MHz, 2.5 MHz, etc.). If the subcarrier spacing is 312.5 kHz, 156.25 kHz, or 78.125 kHz, a frequency band of 20 MHz bandwidth can include 64, 128, or 256 subcarriers, respectively, and multiple bandwidths in 10 MHz, 5 MHz, or 2.5 MHz units. User transmission may be performed.
- [0059] Next, an OFDM based downlink transmission method, a "SU-MIMO and OFDM" based downlink transmission method, and a "MU-MIMO and OFDM" based downlink transmission method will be described.
- [0060] 7 is a flowchart illustrating an embodiment of downlink transmission in a WLAN.
- [0061] Referring to FIG. 7, the access point AP may be the access point 600 described with reference to FIG. 6, and the stations STAs may include the stations 610, 620, 630, described with reference to FIG. 6. 640). Access points (APs) and stations (STAs) may configure the WLAN topology described with reference to FIG. 6. The AP may perform OFDM-based downlink transmission, "SU-MIMO and OFDM" -based downlink transmission, "MU-MIMO and OFDM" -based downlink transmission, and stations (STAs). May perform an operation corresponding to the operation of the access point (AP). The AP may generate a PPDU (Physical Layer Convergence Procedure)

protocol data unit (PPDU) (S700). The PPDU may have a structure as follows. The structure of the PPDU is not limited to the following description, and the PPDU may have various structures.

- [0062] 8 is a block diagram illustrating a first embodiment of a PPDU.
- [0063] Referring to FIG. 8, the PPDU 800 may include a legacy preamble, a high efficiency (HE) preamble, and a payload. The legacy preamble may include a legacy-short training field (L-STF), a long training field (L-LTF), and an L-SIG (signal) field. When the transmission bandwidth of the PPDU 800 is 80 MHz, the fields included in the legacy preamble may be duplicated in units of 20 MHz bandwidth. The HE preamble may include a HE-SIG-A field, a HE-STF, HE-LTF, and a HE-SIG-B field. When the transmission bandwidth of the PPDU 800 is 80 MHz, the HE-SIG-A field may be duplicated in units of 20 MHz bandwidth, and the HE-STF, HE-LTF, and HE-SIG-B fields may be transmitted through the 80 MHz bandwidth. The HE-SIG-A field may include at least one of information elements described in Table 1 below.
- [0064] [pat00001.jpg]
- [0065] The bandwidth indicator may indicate the transmission bandwidth (eg, 20 MHz, 40 MHz, 80 MHz, 160 MHz, etc.) of the PPDU 800. The bandwidth indicator included in the HE-SIG-A field of the PPDU 800 may indicate a bandwidth of 80 MHz. For example, if the bandwidth indicator is set to binary "00", "01", "10" or "11", it may indicate the bandwidth 20MHz, 40MHz, 80MHz or 160MHz, respectively. If the frequency band over which the PPDU 800 is transmitted is non-continuous, the bandwidth indicator may indicate the bandwidth of the non-continuous frequency band. The UL / DL indicator may indicate that transmission of the PPDU 800 is uplink (UL) transmission or downlink (DL) transmission. The UL / DL indicator included in the HE-SIG-A field of the PPDU 800 may indicate downlink transmission. For example, when the UL / DL indicator is set to binary "0" or "1", this may indicate uplink transmission or downlink transmission, respectively.
- [0066] The OFDM / OFDMA indicator may indicate that the transmission of the PPDU 800 is an OFDM based transmission or an OFDMA based transmission. The OFDM / OFDMA indicator included in the HE-SIG-A field of the PPDU 800 may indicate OFDM based transmission. For example, if the OFDM / OFDMA indicator is set to binary "0" or "1", this may indicate OFDM based transmission or OFDMA based transmission, respectively. When OFDM-based transmission is indicated by the OFDM / OFDMA indicator, the HE-SIG field consecutive to the HE-SIG-A field in the PPDU 800 (eg, between the HE-SIG-A field and the HE-STF). HE-SIG field located at) may not exist. That is, since OFDM-based transmission does not require resource allocation information, the resource allocation information or the HE-SIG field including the same may not exist in the PPDU 800. The SU / MU indicator may indicate that the transmission of the PPDU 800 is a single user transmission or a multi-user transmission. If the PPDU 800 is transmitted based on OFDM or "SU-

MIMO and OFDM", the SU / MU indicator may indicate single user transmission. If the PPDU 800 is transmitted based on "MU-MIMO and OFDM", the SU / MU indicator may indicate multi-user transmission. For example, if the SU / MU indicator is set to binary "0" or "1", this may indicate either single user transmission or multiple user transmission, respectively. Also, if the SU / MU indicator is set to binary & quot; 1 & quot; , this may indicate that MU-MIMO is applied to the full bandwidth of the PPDU 800. The SU / MU indicator may be present in the HE-SIG-A field of the PPDU 800 when the OFDM / OFDMA indicator indicates OFDM-based transmission, and the PPDU 800 when the OFDM / OFDMA indicator indicates OFDMA-based transmission. ) May not be present in the HE-SIG-A field.

- [0067] The STA identifier may indicate at least one station that receives the PPDU 800. When the PPDU 800 is transmitted based on OFDM or "SU-MIMO and OFDM," an association identifier (AID) or a partial AID (PAID) may be used as the STA identifier. When the PPDU 800 is transmitted based on "MU-MIMO and OFDM", a group ID may be used as the STA identifier. The group ID may indicate a group including a plurality of stations. The STA identifier is not limited to the above description and may be variously set. For example, the STA identifier may be joint encoded with information included in the HE preamble (eg, the HE-SIG-A field or the HE-SIG-B field).
- [0068] The BSS identifier may indicate a BSS to which the access point (AP) that transmitted the PPDU 800 belongs. Alternatively, the BSS identifier may be used by the station that receives the PPDU 800 to distinguish whether the BSS to which the access point (AP) to which the PPDU 800 belongs is a BSS to which it belongs, or an overlapping BSS. For example, the BSS identifier may be a BSSID (BSSID) or a BSS color.
- [0069] Here, the BSS color may include a value indicating a BSS to which the access point (AP) that transmitted the PPDU 800 belongs. A communication entity (eg, an access point or a station) may set one value as a value of a BSS color representing a BSS to which it belongs. For example, when the BSS color is represented by three bits, eight BSSs can be distinguished by the BSS color. The value of the BSS color may be set to one of 0 to 7 through negotiation between access points (APs) belonging to the BSS, and the value of the set BSS color may be maintained while the corresponding BSS is present. Communication entities (eg, access points, stations) belonging to the same BSS may have values of the same BSS color. That is, the value of the BSS color included in the HE-SIG-A field of the PPDU generated by the communication entity belonging to the same BSS may be set identically.
- [0070] For example, a station receiving the PPDU 800 may obtain a BSS color from the HE-SIG-A field of the PPDU 800, and may obtain a value of the obtained BSS color (for example, 1) and its BSS color. If the color values (eg, 1) are the same, it may be determined that the BSS to which the access point (AP) that has transmitted the PPDU 800 belongs is the same as the BSS to which it

belongs. On the other hand, if the station has a different BSS color value (for example, 2) and its BSS color value (for example, 1), then the BSS to which the access point (AP) to which the PPDU 800 transmits belongs is determined. It can be determined that it is different from the BSS to which it belongs (ie, OBSS). In this case, the station can operate in the doze mode without decoding subsequent fields (eg, fields after the HE-SIG-A field or fields after the HE preamble), and the PPDU 800 Transition from the doze mode to the awake mode at the end of. The BSS color is not limited to the above description and may be variously set.

- [0071] The NSTS may indicate the number of space-time streams. Space-time block coding (STBC) may indicate the dimensionality of the STBC. That is, the number of spatial streams allocated to the station receiving the PPDU 800 may be indicated by NSTS and STBC. When the PPDU 800 is transmitted based on OFDM, each of the NSTS and STBC may be set to 0, or the NSTS and STBC may not be present in the HE-SIG-A field of the PPDU 800. When the PPDU 800 is transmitted based on "SU-MIMO and OFDM" or "MU-MIMO and OFDM", each of the NSTS and STBC may be set to a non-zero value. When the PPDU 800 is transmitted based on "MU-MIMO and OFDM", NSTS and STBC may be set per station.
- [0072] The HE-SIG-B field may include MCS information of the payload, length information of the payload, and the like. The payload may include at least one data unit. Meanwhile, PPDUs used for OFDM-based uplink transmission, "SU-MIMO and OFDM" -based uplink transmission, and "MU-MIMO and OFDM" -based uplink transmission, respectively, may be described as PPDU (see FIG. 8). 800 and the same or similar structure.
- [0073] Referring back to FIG. 7, the AP may transmit the PPDU 800 (S710). In the case of OFDM-based downlink transmission or "SU-MIMO and OFDM" -based downlink transmission, the AP may transmit the PPDU 800 to one station (STA). In the case of "MU-MIMO and OFDM" based downlink transmission, the access point (AP) may transmit the PPDU 800 to a plurality of stations (STAs).
- [0074] The station STA may acquire a legacy preamble included in the PPDU 800 received from the access point AP (S720), and obtain a HE preamble included in the PPDU 800 (S730). The station (STA) may know the transmission bandwidth of the PPDU 800 based on the bandwidth indicator included in the HE-SIG-A field of the PPDU 800, and may indicate the UL / DL indicator included in the HE-SIG-A field. On the basis of this, it can be confirmed that the transmission of the PPDU 800 is a downlink transmission, and it can be confirmed that the transmission of the PPDU 800 is OFDM based transmission based on the OFDM / OFDMA indicator included in the HE-SIG-A field. . The station STA may confirm that the transmission of the PPDU 800 is a single user transmission or a multi-user transmission based on the SU / MU indicator included in the HE-SIG-A field of the PPDU 800. On the basis of the STA identifier included in the A field, it is possible

to determine whether it corresponds to a station to receive the PDU 800, and the access point which transmitted the PDU 800 based on the BSS identifier included in the HE-SIG-A field. You can check the BSS to which the (AP) belongs. The station STA may identify the spatial stream allocated to it based on the NSTS and the STBC included in the HE-SIG-A field of the PDU 800.

- [0075] In addition, the station (STA) may check the MCS of the payload based on the MCS information included in the HE-SIG-B field of the PDU 800, and the pay station is based on the length information included in the HE-SIG-B field. You can check the length of the rod. The station STA may acquire the payload of the PDU 800 based on the information included in the HE preamble (S740). The station STA may transmit an ACK frame, which is a response to the PDU 800, to the access point AP when the PDU 800 is successfully received.
- [0076] Next, the OFDMA based downlink transmission method, the "SU-MIMO and OFDMA" based downlink transmission method, and the "MU-MIMO and OFDMA" based downlink transmission method will be described.
- [0077] Referring back to FIG. 7, the AP may perform OFDMA based downlink transmission, "SU-MIMO and OFDMA" based downlink transmission, and "MU-MIMO and OFDMA" based downlink transmission. The stations STAs may perform operations corresponding to those of the access point AP. The access point AP may generate a PDU (S700). The PDU may have a structure as follows. The structure of the PDU is not limited to the following description, and the PDU may have various structures.
- [0078] 9 is a block diagram illustrating a second embodiment and a third embodiment of a PDU.
- [0079] 9, the PDUs 910 and 920 may include a legacy preamble, an HE preamble, and a payload. The legacy preamble may include L-STF, L-LTF, and L-SIG fields. When the transmission bandwidth of the PDUs 910 and 920 is 80 MHz, the fields included in the legacy preamble may be copied in units of 20 MHz bandwidth. The HE preamble may include an HE-SIG-A field, an HE-SIG-B field, an HE-STF, an HE-LTF, and an HE-SIG-C field. The field included in the HE preamble is not limited thereto, and the HE preamble may be configured in various ways. For example, the HE preamble may consist of a HE-SIG-A field, a HE-SIG-B field, a HE-STF, and a HE-LTF.
- [0080] When the transmission bandwidth of the PDU 910 is 80 MHz, the HE-SIG-A field and the HE-SIG-B field may be duplicated in units of 20 MHz bandwidth, and the HE-STF and HE-LTF may be transmitted through the 80 MHz bandwidth. have. When the transmission bandwidth of the PDU 920 is 80 MHz, the HE-SIG-A field may be replicated in units of 20 MHz bandwidth, and the HE-SIG-B field, HE-STF, and HE-LTF may be transmitted through a bandwidth of 80 MHz. have. Here, the HE-SIG-B field may be repeated at least once on the time axis, and in this case, a signal to

noise ratio (SNR) of the HE-SIG-B field may be increased at the receiving end. If the HE-SIG-B field is repeated, this may be indicated by a repetition indicator included in the HE-SIG-A field. The HE-SIG-A field may include at least one of the information elements described in Table 2 below.

[0081] [pat00002.jpg]

[0082] Each of the bandwidth indicator, the UL / DL indicator, the OFDM / OFDMA indicator, the STA identifier, and the BSS identifier may be the same as the corresponding information element described with reference to Table 1. Here, the bandwidth indicator may indicate a bandwidth of 80MHz, the UL / DL indicator may indicate downlink transmission, the OFDM / OFDMA indicator may indicate OFDMA transmission, and a group ID may be used as the STA identifier.

[0083] In addition, the HE-SIG-A field may further include a repeating indicator indicating whether to repeat the HE-SIG-B field continuous with the HE-SIG-A field. For example, the repetition indicator may be set to binary "0" or "1", which may indicate that the HE-SIG-B field is not repeated or that the HE-SIG-B field is repeated, respectively.

[0084] The resource allocation structure indicator may indicate the size of resources (eg, time resource, frequency resource, spatial stream, etc.) allocated to the station receiving the PPDU 910 and 920. For example, the resource allocation structure indicator may indicate the minimum size of resources allocated to the station. The number indicator of the STA may indicate the number of stations that receive the PPDU 910 and 920 (that is, the number of stations participating in the multi-user transmission). The symbol indicator may explicitly indicate the number of symbols (eg, the size of the HE-SIG-B field) of the HE-SIG-B field consecutive to the HE-SIG-A field.

[0085] Meanwhile, the HE-SIG-B field may include resource allocation information, and the resource allocation information may include at least one of time resource allocation information, frequency resource allocation information, and spatial stream allocation information for each station. The number of symbols in the HE-SIG-B field may vary depending on the amount of information (eg, resource allocation information, etc.) included in the HE-SIG-B field. In this case, the number of symbols in the HE-SIG-B field may be indicated by at least one of a bandwidth indicator, a resource allocation structure indicator, a number indicator of a STA, and a symbol indicator. In a first method, the number of symbols in the HE-SIG-B field may be preset according to the transmission bandwidth of the PPDU 910 and 920, and the station receiving the PPDU 910 and 920 may receive the PPDU 910 and 920. The number of symbols in the HE-SIG-B field may be checked based on the bandwidth indicator included in the HE-SIG-A field. For example, the number of symbols in the HE-SIG-B field may be proportional to the size of the transmission bandwidth of the PPDU 910 and 920.

- [0086] In the second method, the number of symbols in the HE-SIG-B field may be preset according to the "size of transmission bandwidth and resource allocation structure of the PPDUs 910 and 920", and the station receiving the PPDUs 910 and 920 may be preset. Can identify the number of symbols in the HE-SIG-B field based on the "size of transmission bandwidth and resource allocation structure of PPDUs 910 and 920". For example, when the transmission bandwidth of the PPDUs 910 and 920 is relatively large and a lot of resources are allocated to one station, the resource allocation information to be included in the HE-SIG-B field may be small. In this case, the number of symbols in the HE-SIG-B field may be accurately indicated by considering the resource allocation structure as well as the size of the transmission bandwidth of the PPDUs 910 and 920.
- [0087] In a third method, the number of symbols in the HE-SIG-B field may be preset according to the number of stations receiving the PPDUs 910 and 920, and the station receiving the PPDUs 910 and 920 may be a number indicator of the STA. Based on the number of symbols in the HE-SIG-B field can be confirmed. For example, the number of symbols in the HE-SIG-B field may be proportional to the number of stations indicated by the number indicator of the STA. Alternatively, the number of stations receiving the PPDUs 910 and 920 may be estimated based on the "size and resource allocation structure of the transmission bandwidth of the PPDUs 910 and 920" instead of the number indicator of the STA. In a fourth method, the number of symbols in the HE-SIG-B field may be explicitly indicated by the symbol indicator. The station receiving the PPDUs 910 and 920 may check the number of symbols in the HE-SIG-B field based on the symbol indicator. The method of indicating the number of symbols in the HE-SIG-B field is not limited to the above-described method, and the number of symbols in the HE-SIG-B field may be indicated in various ways.
- [0088] Meanwhile, the MCS of the HE-SIG-B field may vary according to the amount of information (for example, resource allocation information, etc.) included in the HE-SIG-B field, and the HE-SIG-B field (or HE The MCS indicator indicating the MCS of the fields after the -SIG-A field may be included in the HE-SIG-A field. The MCS indicator may indicate MCS using 1 bit. The MCS of the HE-SIG-A field (eg, MCS 0) may be different from the MCS of the HE-SIG-B field (eg, MCS 1). For example, if the MCS indicator is set to binary "0" or "1", this may indicate MCS 0 or MCS 1, respectively. Alternatively, the MCS indicator may indicate MCS using 3 bits. For example, if the MCS indicator is set to binary "000", "001", "010", "011", "100", "101", "110", or "111", this is MCS 0, MCS 1 respectively. , MCS 2, MCS 3, MCS 4, MCS 5, MCS 6 or MCS 7 may be indicated. Here, the MCS of the HE-SIG-B field may be set based on the link having the lowest quality among the links of each of the AP and the STAs. The method of indicating the MCS of the HE-SIG-B field is not limited to the above-described method, and the MCS of the HE-SIG-B field may be indicated in various ways.

- [0089] The HE-SIG-B field may include resource allocation information, subband information, a cyclic prefix length indicator, a subcarrier spacing indicator, an FFT / IFFT structure indicator, and the like. The resource allocation information may include at least one of time resource allocation information, frequency resource allocation information, and spatial stream allocation information. Resource allocation information may be set for each station or subband (for example, a frequency band having a bandwidth of 20 MHz). The time resource allocation information may include time resource information allocated to the group indicated by the STA identifier (ie, group ID) of the HE-SIG-A field, and time resource information allocated to each of the stations belonging to the group. The frequency resource allocation information may include frequency resource information allocated to the group indicated by the STA identifier (ie, group ID) of the HE-SIG-A field, and frequency resource information allocated to each of the stations belonging to the group. The frequency resource may be allocated to the station in units of a bandwidth of 20 MHz, and may be allocated to the station in units of less than 20 MHz of bandwidth (eg, 10 MHz, 5 MHz, 2.5 MHz, etc.). The spatial stream allocation information may include spatial stream information allocated to the group indicated by the STA identifier (ie, group ID) of the HE-SIG-A field, and spatial stream information allocated to each of the stations belonging to the group. Here, the spatial stream may be indicated by STBC and NSTS. Thus, the spatial stream information may include STBC and NSTS per station (or group).
- [0090] The subband information may include common information (eg, restrictions) for each subband (for example, a frequency band having a bandwidth of 20 MHz). For example, common resource allocation information for each subband may exist in the resource allocation information, and such information may be combined into one subband information. If the number of spatial streams allocated to each of the subbands is equal to two, the subband information may indicate that the number of spatial streams allocated to each of the subbands is two.
- [0091] The CP length indicator may indicate a CP length of fields (eg, HE-STF, HE-LTF, HE-SIG-C field, payload, etc.) that are continuous with the HE-SIG-B field. CP length may be 0.4  $\mu$ s, 0.8  $\mu$ s, 1.6  $\mu$ s, 3.2  $\mu$ s and the like. The CP length indicator may explicitly indicate the CP length. Alternatively, the CP length indicator may indicate the CP length using 2 bits. For example, a CP length indicator set to binary "00", "01", "10" or "11" may indicate a CP having a length of 0.4 ms, 0.8 ms, 1.6 ms or 3.2 ms.
- [0092] The subcarrier spacing indicator may indicate the subcarrier spacing of the HE-SIG-B field and the consecutive fields (eg, the HE-STF, the HE-LTF, the HE-SIG-C field, the payload, etc.). The subcarrier spacing may be 312.5 kHz, 156.25 kHz, 78.125 kHz, or the like. The subcarrier spacing indicator may explicitly indicate the subcarrier spacing. Alternatively, the subcarrier spacing indicator may indicate the subcarrier spacing using 2 bits. For example, the subcarrier spacing

indicator set to binary "00", "01", or "10" may indicate that the subcarrier spacing is 312.5 kHz, 156.25 kHz, or 78.125 kHz.

- [0093] The FFT / IFFT structure indicator is the size of the FFT / IFFT used for the HE-SIG-B field and subsequent fields (e.g., HE-STF, HE-LTF, HE-SIG-C field, payload, etc.). Can be indicated. The size of the FFT / IFFT may be 32-point, 62-point, 128-point, 256-point, or the like. The FFT / IFFT structure indicator may explicitly indicate the size of the FFT / IFFT. Alternatively, the FFT / IFFT structure indicator may indicate the size of the FFT / IFFT using 2 bits. For example, an FFT / IFFT structure indicator set to binary "00", "01", "10", or "11", respectively, is a FFT / IFFT having a size of 32-point, 62-point, 128-point, or 256-point. IFFT can be indicated.
- [0094] The HE-SIG-C field may include MCS information of payload, length information of payload, and the like. The payload may comprise a data unit. The HE-SIG-C field and payload may be set to a bandwidth unit (eg, 20 MHz, 10 MHz, 5 MHz, 2.5 MHz, etc.) indicated by resource allocation information included in the HE-SIG-B field. Meanwhile, the PPDU based on "MIMO and OFDMA" is as follows.
- [0095] 10 is a block diagram illustrating a fourth embodiment of a PPDU.
- [0096] Referring to FIG. 10, the PPDU-1 1000-1 transmitted through the first frequency band having a bandwidth of 20 MHz may be transmitted based on "SU-MIMO and OFDMA". For example, L-STF, L-LTF, L-SIG field, HE-SIG-A field, HE-SIG-B field, HE-STF and HE-LTF of PPDU-1 (1000-1) May be transmitted over spatial streams. The HE-SIG-C field and payload allocated to the upper bandwidth 10 MHz of the first frequency band may be transmitted to the first station 610 through two spatial streams, and then the HE-SIG- allocated to the bandwidth 5 MHz The C field and payload can be sent to the second station 620 via one spatial stream, and then the HE-SIG-C field and payload allocated to the bandwidth 5 MHz is transmitted via the third spatial stream to the third station. 630 may be sent.
- [0097] The PPDU-2 1000-2 transmitted on the second frequency band having a bandwidth of 20 MHz may be transmitted based on "MU-MIMO and OFDMA". For example, the L-STF, L-LTF, L-SIG field, HE-SIG-A field, HE-SIG-B field, HE-STF, and HE-LTF of PPDU-2 (1000-2) have four May be transmitted over spatial streams. The HE-SIG-C field and payload for the first station 610 may be transmitted over two spatial streams, and the HE-SIG-C field and payload for the second station 620 may be one space Can be transmitted on a stream, the HE-SIG-C field and payload for the third station 630 can be transmitted on one spatial stream
- [0098] Referring to FIG. 7 again, the AP may transmit PPDUs 910 and 920 (or PPDUs 1000-1 and 1000-2) (S710). The station STA may obtain a legacy preamble included in the PPDUs 910 and

920 received from the access point AP (S720), and may acquire a HE preamble included in the PPDUs 910 and 920 (S720). S730). The stations STA may know the transmission bandwidth of the PPDUs 910 and 920 based on the bandwidth indicator included in the HE-SIG-A field of the PPDUs 910 and 920 and are included in the HE-SIG-A field. It may be confirmed that the transmission of the PPDUs 910 and 920 is downlink transmission based on the UL / DL indicator, and the transmission of the PPDUs 910 and 920 is based on the OFDM / OFDMA indicator included in the HE-SIG-A field. It can be confirmed that the transmission is based on OFDMA.

- [0099]** The station STA may determine whether the station corresponds to a station to receive the PPDUs 910 and 920 based on the STA identifier (ie, the group ID) included in the HE-SIG-A field of the PPDUs 910 and 920. Based on the BSS identifier included in the HE-SIG-A field, the BSS to which the access point (AP) that has transmitted the PPDUs 910 and 920 may be identified. The station (STA) is contiguous with the HE-SIG-A field through at least one of a bandwidth indicator, a resource allocation structure indicator, a number indicator of a STA, and a symbol indicator included in the HE-SIG-A field of the PPDUs 910 and 920. The number of symbols in the HE-SIG-B field may be checked. The station (STA) is a HE-SIG-B field (or HE-SIG-A field) contiguous with the HE-SIG-A field based on the MCS indicator included in the HE-SIG-A field of the PPDUs 910 and 920. MCS of the following fields) can be checked, and it can be checked whether the HE-SIG-B field and the continuous HE-SIG-B field are repeated based on the repetition indicator included in the HE-SIG-A field.
- [0100]** The station STA may obtain the HE-SIG-B field based on information included in the HE-SIG-A field of the PPDUs 910 and 920. The station STA may identify time resources, frequency resources, spatial streams, etc. allocated to itself based on resource allocation information included in the HE-SIG-B field of the PPDUs 910 and 920, and the HE-SIG-B Based on the CP length indicator included in the field, the CP length of the HE-SIG-B field and the consecutive fields (HE-STF, HE-LTF, HE-SIG-C field, payload, etc.) may be checked. Based on the subcarrier spacing indicator included in the SIG-B field, the subcarrier spacing of the fields consecutive to the HE-SIG-B field (HE-STF, HE-LTF, HE-SIG-C field, payload, etc.) is checked. And successive fields (HE-STF, HE-LTF, HE-SIG-C field, payload, etc.) based on the FFT / IFFT structure indicator included in the HE-SIG-B field. You can check the FFT / IFFT size.
- [0101]** The station STA may acquire the HE-STF, HE-LTF, and HE-SIG-C fields based on the information included in the HE-SIG-B fields of the PPDUs 910 and 920. The station STA may identify the MCS applied to the payload based on the MCS information included in the HE-SIG-C fields of the PPDUs 910 and 920 and based on the length information included in the HE-SIG-C field. You can check the payload length. The station STA may acquire a payload based on information included in the HE-SIG-A field, the HE-SIG-B field, the HE-SIG-C field, and the like (S740). The station STA

may transmit an ACK frame, which is a response to the PPDU 910 and 920, to the access point when the PPDU 910 and 920 are successfully received.

- [0102] Next, an OFDMA-based uplink transmission method will be described.
- [0103] 11 is a flowchart illustrating an embodiment of uplink transmission in a WLAN.
- [0104] Referring to FIG. 11, the access point AP may be the access point 600 described with reference to FIG. 6, and the stations STAs may include the stations 610, 620, 630, described with reference to FIG. 6. 640). Access points (APs) and stations (STAs) may configure the WLAN topology described with reference to FIG. 6. The access point (AP) may generate a trigger frame for triggering (triggering) the OFDMA-based uplink transmission (S1100). The trigger frame includes information (eg, resource allocation information, subband information, CP length indicator) included in the HE-SIG-A field, the HE-SIG-B field, and the HE-SIG-C field described with reference to FIG. 9. , Subcarrier spacing indicator, FFT / IFFT structure indicator), and the like. The access point AP may transmit a trigger frame in operation S1110.
- [0105] The station STA may receive a trigger frame from the access point AP, and may determine whether the station STA participates in OFDMA-based uplink transmission based on information included in the trigger frame. When it is determined that the station STA participates in the OFDMA-based uplink transmission, the station STA may identify resources allocated to the base station based on the information included in the trigger frame. The station STA may generate a PPDU based on the allocated resource (S1120). The first station 610, the second station 620, and the third station 630 participate in OFDMA-based uplink transmission, and sequentially each of the stations 610, 620, and 630 participating in the uplink transmission. When bandwidths of 40 MHz, 20 MHz, and 20 MHz are allocated, the stations 610, 620, and 630 participating in uplink transmission may generate the following PPDU.
- [0106] 12 is a block diagram illustrating a fifth embodiment of a PPDU.
- [0107] Referring to FIG. 12, each of the PPDU-1 1200-1, the PPDU-2 1200-2, and the PPDU-3 1200-3 is a first station 610, a second station 620, and a third station. May be generated by the station 630. The PPDU 1200-1, 1200-2, and 1200-3 may be transmitted through the same frequency band having a bandwidth of 80 MHz. Each of the PPDU 1200-1, 1200-2, and 1200-3 may include a legacy preamble, an HE preamble, and a payload. The legacy preamble may include L-STF, L-LTF, and L-SIG fields, and the fields included in the legacy preamble may be copied in units of bandwidth 20 MHz. The HE preamble may include a HE-SIG-A field, a HE-STF, HE-LTF, and a HE-SIG-B field. The HE-SIG-A field may include information elements described with reference to

Table 1, and the HE-SIG-B field may include information included in the HE-SIG-B described with reference to FIG. 8 (eg, Payload MCS, payload length information, etc.).

- [0108] Legacy preamble and HE-SIG-A fields may be transmitted over a full bandwidth of 80 MHz, with the HE-STF, HE-LTF, HE-SIG-B fields and payload assigned to each station 610, 620, 630 It can be transmitted over bandwidth. For example, the first station 610 may transmit the HE-STF, HE-LTF, HE-SIG-B field and payload over a bandwidth of 40 MHz, and the second station 620 may transmit the HE-STF, HE-LTF, HE-SIG-B field and payload may be transmitted over a bandwidth of 20 MHz, and the third station 630 may transmit HE-STF, HE-LTF, HE-SIG-B field and payload over a bandwidth of 20 MHz Can be.
- [0109] Referring back to FIG. 11, the station STA may transmit PPDU 1200-1, 1200-2, and 1200-3 to the access point AP (S1130). The access point AP may receive PPDU 1200-1, 1200-2, 1200-3 from stations STAs, and may include payloads included in the PPDU 1200-1, 1200-2, 1200-3. Obtain a load. The AP may transmit an ACK frame that is a response to the PDU 1200-1, 1200-2, or 1200-3 when the APDU 1200-1, 1200-2, or 1200-3 are successfully received. STAs) may be transmitted to each of the STAs.
- [0110] Although described with reference to the embodiments above, those skilled in the art will understand that the present invention can be variously modified and changed without departing from the spirit and scope of the invention as set forth in the claims below. Could be.
1. A method of operating a first station in a wireless local area network, comprising: a physical layer convergence procedure (PPDU) including a legacy preamble, a high efficiency (HE) preamble, and a payload generating a protocol data unit); And transmitting the PPDU, wherein the HE preamble includes a HE-SIG (signal) -A field, an HE-SIG-B field, a HE-STF (short training field), and a HE-LTF (long training field). And the HE-SIG-A field includes information indicating the number of symbols of the HE-SIG-B field.
  2. The method of claim 1, wherein the number of symbols in the HE-SIG-B field is indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field.
  3. The method according to claim 1, The number of symbols in the HE-SIG-B field is indicated based on the transmission bandwidth information of the PPDU included in the HE-SIG-A field and resource size information allocated to the station receiving the PPDU , Operating method of the first station.
  4. The method according to claim 1, wherein the number of symbols in the HE-SIG-B field is indicated based on information on the number of stations that receive the PPDU included in the HE-SIG-A field.
  5. The method of claim 1, wherein the HE-SIG-A field further includes information indicating a modulation and coding scheme (MCS) of the HE-SIG-B field.
  6. The method of claim 1, wherein the HE-SIG-B field is repeated on a time axis.

7. The method of claim 1, wherein the HE-SIG-B field includes resource allocation information of a station that receives the PPDU.
8. A method of operating a first station in a wireless local area network, the method comprising: obtaining a legacy preamble included in a physical layer convergence procedure (PPDU) protocol data unit (PPDU) received from a second station; Obtaining a high efficiency (HE) preamble included in the PPDU; And obtaining a payload included in the PPDU based on the information included in the HE preamble, wherein the HE preamble includes a HE-SIG (signal) -A field, a HE-SIG-B field, And a short training field (HE-STF) and a long training field (HE-LTF), wherein the HE-SIG-A field includes information indicating the number of symbols of the HE-SIG-B field. Method of operation of the first station.
9. The method of claim 8, wherein the number of symbols in the HE-SIG-B field is indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field.
10. The method according to claim 8, wherein the number of symbols in the HE-SIG-B field is indicated based on transmission bandwidth information of the PPDU included in the HE-SIG-A field and resource size information allocated to a station receiving the PPDU. , Operating method of the first station.
11. The method according to claim 8, wherein the number of symbols in the HE-SIG-B field is indicated based on the number information of stations that receive the PPDU included in the HE-SIG-A field.
12. The method of claim 8, wherein the HE-SIG-A field further includes information indicating a modulation and coding scheme (MCS) of the HE-SIG-B field.
13. The method of claim 8, wherein the HE-SIG-B field is repeated on a time axis.
14. The method of claim 8, wherein the HE-SIG-B field includes resource allocation information of a station receiving the PPDU.

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Sheet 1  
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Application No: 18 736 375.9  
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The examination is being carried out on the **following application documents**

**Description, Pages**

1-60 filed with entry into the regional phase before the EPO

**Claims, Numbers**

1-16 received on 04-02-2020 with letter of 04-02-2020

**Drawings, Sheets**

1/12-12/12 filed with entry into the regional phase before the EPO

1 The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

- D1 "High Efficiency (HE) PHY specification",  
IEEE DRAFT; TGAX\_CL\_26, IEEE-SA, PISCATAWAY, NJ USA  
,  
vol. 802.11ax drafts, no. D0.5 1 October 2016 (2016-10-01), pages  
1-207, XP068137445,  
Retrieved from the Internet:  
URL:www.ieee802.org/11/private/Draft\_Standards/11ax/  
TGax\_CI\_26.rtf  
[retrieved on 2016-10-01]
- D2 WO 2016/087917 A1 (NEWRACOM INC [US]) 9 June 2016  
(2016-06-09); -& EP 3 226 641 A1 (NEWRACOM INC [US]) 4  
October 2017 (2017-10-04)
- D3 US 2016/330300 A1 (JOSIAM KAUSHIK M [US] ET AL) 10  
November 2016 (2016-11-10)
- D4 KR 2016 0063282 A (NEWRACOM INC [US]) 3 June 2016  
(2016-06-03)

- 2 The application does not meet the requirements of Article 84 EPC, because claims 1, 5, 6, 8, 13 and 14 are not clear.
- 2.1 Claims 1, 5, 6, 8, 13 and 14 contain features set in brackets () thus leaving unclear whether these form part of the definition of the claim or not (Article 84 EPC).
- 3 The present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of independent claims 1 and 9 is not new in the sense of Article 54(1) and (2) EPC.
- 3.1 Document D1 discloses (the references in parentheses applying to this document):

A wireless communication terminal, the terminal comprising:  
a communication unit; and  
a processor configured to process signals transmitted and received through the communication unit, wherein the processor is configured to:  
receive, through the communication unit, a high efficiency multi-user PHY protocol data unit, HE MU PPDU, wherein a preamble of the HE MU PPDU includes high efficiency signal A field, HE-SIG-A, and high efficiency signal B field, HE-SIG-B (see section 26.3.3.7.4), and  
decode the received HE MU PPDU based on information obtained from the HE-SIG-A (see section 26.3.3.7.4),  
wherein a configuration of the HE-SIG-B is identified based on information obtained from at least one subfield of the HE-SIG-A (see section 26.3.3.7.4 "if the value of SIGB Compression field in HE-SIG-A is 0, the RU allocation signaling in the HE-SIG-B common field indicates the combination of RUs in current PPDU bandwidth and the number of STAs on each RU for SU/MU-MIMO").

The subject-matter of independent claim 1 is therefore not new (Article 54(1) and (2) EPC).

- 3.2 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claim 9, which is therefore also considered not new (Article 54(1) and (2) EPC) and, hence, said claim is not allowable.
- 3.3 Furthermore the applicant is also made aware that, having regard to the disclosure of documents D2-D4 (see references in the search report), the subject-matter of independent claims 1 and 9 is not new (Article 54(1) and (2) EPC).
- 4 Furthermore, dependent claims 2-8 and 10-16, insofar as they can be understood, do not contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC in respect of novelty (Article 54(1) and (2) EPC) and/or inventive step (Article 56 EPC), for the following reasons:
- Claims 2-5, 7, 8, 10-13, 15, 16 : not new, see document D1, see section 26.3.3.7.4;
  - Claims 6, 14 : not new, see document D1, see section 26.3.2.1;
- 5 The applicant is invited to file amendments.
- It is however not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable, then
- the attention of the applicant is drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC);
  - in order to comply with the requirements of Rule 137(4) EPC, the applicant should clearly identify the amendments made and indicate the passages of the application as filed on which these amendments are based (see Guidelines H-III, 2.1);
  - when filing amended claims the applicant should at the same time bring the description into conformity with the amended claims (Rule 42 (1) (c) EPC);
  - the applicant should indicate in the letter of reply the difference of the subject-matter of the new independent claim vis-à-vis the state of the art and the significance thereof; any argument supporting the presence of an inventive step should be given in the letter of reply;

- for reasons of conciseness (Article 84 EPC) and to reinforce unity of the invention (Article 82 EPC) a single independent claim per category should be filed (Rule 43 (2) EPC), with dependent claims as appropriate, Rule 43 (4) EPC;
- the independent claims should be drafted in two-part form (Rule 43 (1) EPC), delimited against D1;
- reference signs should be inserted in the claims (Rule 43 (7) EPC);
- possible use of the word "embodiment" in the description should be reserved to indicate a particular realisation of the invention as defined in dependent claims, R. 43(3) EPC. Possible use of the word "preferable" or "option", "optional" must be avoided for essential features of the claims. Inappropriate use of said formulations in the description should therefore be avoided or brought into conformity to avoid lack of clarity in the definition of the invention given by the claims;
- the statement in the description page 60 lines 11-14 which implies that the extent of protection may be expanded in some vague and not precisely defined way should be deleted in order to comply with the requirements of Article 84 EPC (see Guidelines F-IV, 4.4); and
- the prior art documents cited in this communication should be acknowledged in the description (Rule 42 (1)(b) EPC).

**Information on Search Strategy - Pilot phase (see OJ 2015, A86)**  
The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number

EP 18 73 6375

TITLE: WIRELESS COMMUNICATION METHOD AND WIRELESS COMMUNICATION TERMINAL FOR SIGNALING MULTI-USER PACKET

APPLICANT: Wilus Institute of Standards and Technology Inc.

IPC CLASSIFICATION: H04W28/06, H04W74/08, H04W84/12, H04W72/04, H04B7/0452, H04L27/00

EXAMINER: Brezmes Alonso, J

CONSULTED DATABASES: DOSYS, INET, WPI, XP3GPP, NPL

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: H04B7/0452, H04L27/00

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:  
high efficiency multi-user PHY protocol data unit (HE MU PPDU)  
HE SIG-A and HE SIG-B  
MU MIMO



**SUPPLEMENTARY  
EUROPEAN SEARCH REPORT**

Application Number  
EP 18 73 6375

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	"High Efficiency (HE) PHY specification", IEEE DRAFT; TGAX_CL_26, IEEE-SA, PISCATAWAY, NJ USA  , vol. 802.11ax drafts, no. D0.5 1 October 2016 (2016-10-01), pages 1-207, XP068137445, Retrieved from the Internet: URL:www.ieee802.org/11/private/Draft_Stand ards/11ax/TGax_Cl_26.rtf [retrieved on 2016-10-01] * section 26.3.2.1 section 26.3.3.7.4 *	1-16	INV. H04W28/06 H04W74/08 H04W84/12 H04W72/04 H04B7/0452 H04L27/00
X	WO 2016/087917 A1 (NEWRACOM INC [US]) 9 June 2016 (2016-06-09) * the whole document * -& EP 3 226 641 A1 (NEWRACOM INC [US]) 4 October 2017 (2017-10-04) * paragraph [0080] - paragraph [0092] * * paragraph [0126] - paragraph [0161] *	1-16	TECHNICAL FIELDS SEARCHED (IPC)
X	US 2016/330300 A1 (JOSIAM KAUSHIK M [US] ET AL) 10 November 2016 (2016-11-10) * paragraph [0094] - paragraph [0111] *	1-16	H04B H04L
X	KR 2016 0063282 A (NEWRACOM INC [US]) 3 June 2016 (2016-06-03) * paragraph [0005] - paragraph [0014] * * paragraph [0066] - paragraph [0082] *	1-16	
The supplementary search report has been based on the last set of claims valid and available at the start of the search.			
Place of search <b>The Hague</b>		Date of completion of the search <b>16 July 2020</b>	Examiner <b>Brezmes Alonso, J</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.02 (P04C04)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 73 6375

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-07-2020

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82