IEEE P802.11  
Wireless LANs

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| D1 Comment Resolution, brianh, part 7 | | | | |
| Date: 2011-10-10 | | | | |
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##### Baseline is 11ac D1.2. Changes indicated by a mixture of Word track-changes and instructions. For equation changes, Latex notation is sometimes used. E.g. a\_{xyz}^b denotes axyzb

PHY CIDs addressed in r1: 2353

PHY CIDs addressed in r0: 2419, 2420, 3599; 2353

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2419 | Hart, Brian | 143.21 | 22.3.8.2.3 | "with maximim of" but this is a fixed-width field | "for" | **Accept in principle. See changes in 11/1369r0** | PHY |
| 2420 | Hart, Brian | 143.21 | 22.3.8.2.3 | "user u uses bits B(10+3\*u)-..." but for NSTS = [2 0 3 1], user u = 1 uses the "3" subfield | "user u uses bits B(10+3\*USER\_POSITION[u])-...B(12+3\*USER\_POSITION[u])" but for NSTS = [2 0 3 1], user u = 1 uses the "3" subfield | **Accept in principle. See changes in 11/1369r0** | PHY |
| 3599 | Stephens, Adrian | 113.04 | 22.2.2 | USER\_POSITION has no purpose. It does, admittedly, allow an abitrary mapping from "per user" position in the TXVECTOR to on-the-air user. But this flexibility serves no purpose. | Remove this parameter. | **Accept in principle. See CID 2420, which created a purpose for the USER\_POSITION parameter.** | PHY |

***Discussion:***

An example of the purpose of USER\_POSITION is as follows. If the only group that contains STA1 and STA2 defined by Group ID Management frames has STA1 at user position 0 and STA2 at user position 3, then the MAC must signal the PHY to alert the recipients to select the correct STSs. The MAC does this via the NUM\_STS and USER\_POSITION parameters of the TXVECTOR, which are used by the PHY to correctly set the NSTS field in VHTSIGA.

***Change:***

***Table 22-10—Fields in the VHT-SIG-A field***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VHT-SIG-A1 | B10-B21 | NSTS | 12 | For MU: NSTS is divided into 4 user positions of 3 bits each. User position p, where 0 <= p <= 3, uses bits B(10+3p)-B(12+3p) . The space time streams of user u are indicated at user position p = USER\_POSITION[u] where u = 0,1, … NUM\_USERS-1 and the notation A[b] denotes the value of array A at index b. 0 space time streams are indicated at user positions not listed in the USER\_POSITION array.  Set to 0 for 0 space time streams  Set to 1 for 1 space time stream  Set to 2 for 2 space time streams  Set to 3 for 3 space time streams  Set to 4 for 4 space time streams  Values 5-7 are reserved  For SU:  B10-B12  Set to 0 for 1 space time stream  Set to 1 for 2 space time streams  Set to 2 for 3 space time streams  Set to 3 for 4 space time streams  Set to 4 for 5 space time streams  Set to 5 for 6 space time streams  Set to 6 for 7 space time streams  Set to 7 for 8 space time streams  B13-B21  Partial AID: Set to the value of the TXVECTOR parameter  PARTIAL\_AID. Partial AID provides an abbreviated  indication of the intended recipient(s) of the frame (see  9.17a (Group ID and Partial AID in VHT PPDUs)). |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2353 | Hart, Brian | 110.52 | 22.2.2 | "packet" or "transmission" is used, and sometimes even "frame" when the correct term is"PPDU". This usage affects most of clause 22 | Search for packet/frame in clause 22, and replace with PPDU if there is reference to the PHY format, preamble, MU-MIMO-ness, etc rather that the clause 8 frame format. Decide whether "transmission" is OK, or if we're better off with "PPDU" there too | **Accept in principle. See changes in 11/1269r1** | PHY |

***Discussion:***

IEEE dictionary has many definitions of a packet, and the definitions span all layers. The LAN/MAN definition is highlighted, and 802.3 and 802.12 have their own definitions..

**packet (1)** A group of binary digits including data and control

elements which is switched and transmitted as a composite

whole. The data and control elements and possibly error control

information are arranged in a specified format.

(LM/COM) 168-1956w

**(2) (MULTIBUS II)** A block of information that is transmitted

within a single transfer operation in message space.

*See also:* message space; transfer operation.

(C/MM) 1296-1987s

**(3)** A collection of symbols that contains addressing information

and is protected by a CRC. A subaction consists of

two packets, a send packet and an echo packet.

(C/MM) 1596-1992

**(4)** A 17-bit unit of data consisting of a 16-bit word plus 1

parity bit. (TT/C) 1149.5-1995

**(5)** A sequence of N\_chars with a specific order and format.

A packet consists of a destination followed by a payload. A

packet is delimited by an end\_of\_packet marker. *See also:*

destination; payload. (C/BA) 1355-1995

**(6)** A unit of data of some finite-size that is transmitted as a

unit. *Note:* Usually consists of a header containing control

information such as a sequence number, the network address

of the station that originated the packet, and the network address

of the packet’s destination. *See also:* long packet; short

packet. (C) 610.7-1995, 610.10-1994w

**(7)** A serial stream of clocked data bits. A packet is normally

the PDU for the link layer, although the cable physical layer

can also generate and receive special short packets for management

purposes. (C/MM) 1394-1995

**(8)** A collection of symbols that contains addressing information

and is protected by a CRC. A subaction consists of

two packets: a send packet and an echo packet.

(C/MM) 1596.3-1996

**(9)** A block of information that is transmitted within a single

transfer operation. (C/MM) 1596.4-1996

**(10)** A structured field, having a start byte, a two-byte length

field (the first two bytes), a flag byte, a command byte, followed

by the subcommand and/or data fields.

(C/MM) 1284.1-1997

**(11)** Consists of a data frame as defined previously, preceded

by the Preamble and the Start Frame Delimiter, encoded, as

appropriate, for the Physical Layer (PHY) type.

(C/LM) 802.3-1998

**(12) (local area networks)** The total information transmitted

over the link medium, including the preamble, the MAC

frame, and the start of stream and end of stream delimiters.

*See also:* frame. (C) 8802-12-1998

**(13)** A sequence of bits transmitted on Serial Bus and delimited

by DATA\_PREFIX and DATA\_END.

(C/MM) 1394a-2000

**(14)** A group of bytes, including address, data, and control

elements. (C/MM) 1284.4-2000

Interestingly, Wikipedia says that the data link layer (and thus the MAC sublayer) exchanges frames (so far so good) but the network layer exchanges packets (<http://en.wikipedia.org/wiki/Protocol_data_unit>)!!?? So we can use “packet”, but our usage is pretty imprecise.

PPDU is defined by 802.11 to be “PLCP PDU” and so is much more precise.

So in clause 22 let’s change “frame” by PPDU when that is what is meant (e.g. any reference to preamble, subcarriers or OFDM symbols, etc). And let’s change “packet” to “PPDU” broadly

However, we’ll keep three exceptions:

* The P in NDP and NDPA should stand for “PPDU” – e.g. Null Data PPDU – but 11n has already defined NDP, so it is too hard to change in 11ac. So leave that for now.
* Ditto, too late to change “RX\_START\_OF\_FRAME\_OFFSET”.
* Ditto, too late to change “Packet Error Rate”

Meanwhile, in making this change, we see a layer violation in the TX/RXVECTOR language for CHAN\_MAT/DELTA\_SNR so fix this (and align it with 11n at the same time).

***Changes for “frame”:***

22.1.1 Introduction to the VHT PHY

In addition to the requirements in Clause 22, a VHT STA shall be capable of transmitting and receiving

PPDUs that are compliant with the mandatory PHY specifications defined in Clause 20.

22.2.1 Introduction

The TXVECTOR supplies the PHY with per-packet transmit parameters. Using the RXVECTOR, the PHY

informs the MAC of the received packet parameters. Using the PHYCONFIG\_VECTOR, the MAC configures

the PHY for operation, independent of frame (or PPDU) transmission or reception.

Table 22-1—TXVECTOR and RXVECTOR parameters(#3597) (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CHAN\_MAT | FORMAT is VHT | Contains a set of compressed beamforming feedback matrices as defined in 22.3.11.2 (Beamforming Feedback Matrix V) based on the channel measured during the training symbols of the received PPDU. | N | Y |
| DELTA\_SNR | FORMAT is VHT | Contains a set of delta SNR values(#2352) as defined in 8.4.1.48 (MU Exclusive Beamforming Report field) based on the channel measured during the training symbols of the received PPDU. | N | O |
| RCPI |  | Is a measure of the received RF power averaged over all the  receive chains in the Data field of a received PPDU. Refer to  20.3.21.6 (Received channel power indicator (RCPI) measurement)  for the definition of RCPI. | N | Y |
| TIME\_OF\_DEPARTURE\_REQUESTED |  | Boolean value(#2211):  True(#2364) indicates that the MAC entity requests that the  PHY PLCP entity measures and reports time of departure  parameters corresponding to the time when the first PPDU  energy is sent by the transmitting port.  False(#2364) indicates that the MAC entity requests that the  PHY PLCP entity neither measures nor reports time of departure  parameters. | O | N |
| RX\_START\_OF\_FRAME\_OFFSET |  | 0 to 232– 1. An estimate of the offset (in 10 ns units) from the  point in time at which the start of the preamble corresponding to  the incoming frame arrived at the receive antenna port to the  point in time at which this primitive is issued to the MAC. | N | Y |
| PARTIAL\_AID | FORMAT is VHT and NUM\_USERS set to 1 | Provides an abbreviated indication of the intended recipient(s) of the frame (see 9.17a (Group ID and Partial AID in VHT PPDUs)) contained in the PPDU. Integer: range 0-511. | Y | Y |

Table 22-10—Fields in the VHT-SIG-A field

|  |  |  |  |
| --- | --- | --- | --- |
| VHT-SIG-A1 | NSTS | 12 | For MU: 3 bits/user with maximum of 4 users (user u uses  bits B( )-B( ), )  Set to 0 for 0 space time streams  Set to 1 for 1 space time stream  Set to 2 for 2 space time streams  Set to 3 for 3 space time streams  Set to 4 for 4 space time streams  Values 5-7 are reserved  For SU:  B10-B12  Set to 0 for 1 space time stream  Set to 1 for 2 space time streams  Set to 2 for 3 space time streams  Set to 3 for 4 space time streams  Set to 4 for 5 space time streams  Set to 5 for 6 space time streams  Set to 6 for 7 space time streams  Set to 7 for 8 space time streams  B13-B21  Partial AID: Set to the value of the TXVECTOR parameter  PARTIAL\_AID. Partial AID provides an abbreviated  indication of the intended recipient(s) of the frame (see  9.17a (Group ID and Partial AID in VHT PPDUs)) contained in the PPDU. |

22.3.18.5.3 Transmitter constellation error

The relative constellation RMS error, calculated by first averaging over subcarriers, frequency segments,

OFDM PPDUs and spatial streams (see Equation (20-89)) shall not exceed a data-rate dependent value according to Table 22-20 (Allowed relative constellation error versus constellation size and coding rate). The

number of spatial streams under test shall be equal to the number of utilized transmitting STA antenna (output)

ports and also equal to the number of utilized testing instrumentation input ports. In the test, NSS=NSTS

(no STBC) shall be used. Each output port of the transmitting STA shall be connected through a cable to one

input port of the testing instrumentation. The requirements apply to 20, 40, 80 and 160 MHz continuous trans-

22.3.18.5.4 Transmitter modulation accuracy (EVM) test

a) Start of PPDU shall be detected.

h) Compute the average of the RMS of all errors in a PPDU as given by Equation (20-89).

The test shall be performed over at least 20 PPDUs ( as defined in Equation (20-89)), and the average of

the RMS shall be taken. The PPDUs under test shall be at least 16 data OFDM symbols long. Random data

shall be used for the symbols.

22.3.21 PLCP receive procedure

After the PHY-CCA.indication(BUSY, channel-list) is issued, the PHY entity shall begin receiving the training

symbols and searching for L-SIG in order to set the maximum duration of the data stream. If the check of

the L-SIG parity bit is not valid, a PHY-RXSTART.indication is not issued, and instead the(#2496) PHY shall

issue the error condition PHY-RXEND.indication(FormatViolation). If a valid L-SIG parity bit is indicated,

the VHT PHY shall maintain PHY-CCA.indication(BUSY, channel-list) for the predicted duration of the

transmitted PPDU, as defined by RXTIME in Equation (), for all supported modes, unsupported modes, Reserved

VHT-SIG-A Indication, invalid VHT-SIG-A CRC and invalid L-SIG Length field value. An invalid

L-SIG Length field value is defined as a value not following Equation (22-20). Reserved VHT-SIG-A Indication

is defined as a VHT-SIG-A with Reserved bits equal to 0 or NSTS per user for MU set to 5-7 or Short

GI with VHT-SIG-A2 B0 set to 0 and VHT-SIG-A2 B1 set to 1(#2497), or a combination of MCS and NSTS

not included in 22.5 (Parameters for VHT MCSs) or any other VHT-SIG-A field bit combinations that do not

correspond to modes of PHY operation defined in Clause 22. If the VHT-SIG-A indicates an unsupported

mode, the PHY shall issue the error condition PHY-RXEND.indication(UnsupportedRate). If the VHT-SIGA

indicates an invalid CRC or Reserved VHT-SIG-A Indication or if the L-SIG Length field is invalid, the

PHY shall issue the error condition PHY-RXEND.indication(FormatViolation).

**22.6.5.11.2 Semantics of the service primitive**

This primitive shall provide the following parameter: PMD\_CHAN\_MAT.indication (CHAN\_MAT)

The CHAN\_MAT parameter contains the channel response matrices that were measured during the reception

of the current PPDU

22.6.5.12 PMD\_FORMAT.indication

22.6.5.12.1 Function

This primitive, generated by the PMD sublayer, provides the format of the received PPDU to the PLCP and-

MAC entity..

dot11VHTTxSTBCOptionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the device is capable of transmitting

VHT PPDUs using STBC."

DEFVAL { false }

::= { dot11PhyVHTEntry 11 }

dot11VHTTxSTBCOptionActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This attribute, when true, indicates that the entity's capability for

transmitting VHT PPDUs using STBC is enabled."

DEFVAL { false }

::= { dot11PhyVHTEntry 12 }

dot11VHTRxSTBCOptionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the device is capable of receiving

VHT PPDUs using STBC."

DEFVAL { false }

::= { dot11PhyVHTEntry 13 }

dot11VHTRxSTBCOptionActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This attribute, when true, indicates that the entity's capability for

receiving VHT PPDUs using STBC is enabled."

DEFVAL { false }

::= { dot11PhyVHTEntry 14 }

***Changes for “packet”:***

11acD1.2 has 147 instances of “packet”:

(12) Ignore instances that are auto-generated by the Contents/List of Tables/ List of Figures

(7) Ignore all instances of “Null Data Packet”

(2) Replace “MIMO data packet” by “MIMO PPDU”

(1) Ignore all instances of “Packet Error Rate”

(125) Otherwise, replace “packet” by “PPDU”