IEEE P802.11
Wireless LANs

|  |
| --- |
| D3.0 PHY clarifications |
| Date: 2011-06-22 |
| Author(s): |
| Name | Company | Address | Phone | email |
| Assaf Kasher | Intel Corporation |  |  | assaf.kasher@intel.com |
|  |  |  |  |  |

Abstract

This document proposes clarifications for some PHY subclauses in Draft 3.0 of TGad.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 3037 |  |  | General |  | P | Some subclauses in the spec need clarification | Submissions will be made |

**OFDM EVM**

The OFDM EVM measurement procedure does not match the equation. The procedure implies that EVM is only measured on the data subcarriers, while the summation in the equation, and the normalization in the denominator compute EVM over all NST subcarriers: data, pilots, and nulls. The equation also indicates ideal locations, while the text indicates closest location. It is proposed that the best way to correct this is to modify the equation to prevent the null carriers (including DC offset) from being included in the EVM calculation, and to modify the text to include the pilots. The ideal locations should be used for improved EVM accuracy. This is also a good time to modify the nomenclature to better match SCPHY designations for ideal signals

***TGad Editor: modify lines 12- of Page 470 of D3.0 as follows***

The sampled signal shall be processed in a manner similar to an actual receiver, according to the following steps, or an equivalent procedure:

a) Start of frame shall be detected.

b) Transition from short sequences to channel estimation sequences shall be detected, and fine timing (with one sample resolution) shall be established.

c) frequency offsets shall be estimated and corrected.

d) The frame shall be de-rotated according to estimated frequency offset.

e) The complex channel response coefficients shall be estimated for each of the subcarriers using information contained in the preamble (STF and/or CEF).

f) For each of the OFDM symbols: transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers, derotate the subcarrier values according to estimated phase, and divide each subcarrier value with a complex estimated channel response coefficient.

g) For each subcarrier, compute theEuclidean distance to the ideal location for the symbol, or pilot.

h) Compute the RMS average of all errors in a packet. It is given by:



- number of frames

*i* frame index

*k* carrier index

K set of pilot and data subcarriers {1,2, … (NSR – 1), (NSR + NDC), (NSR+NDC+1),… NST}

*j*- symbol index

 number of symbols

 Total number of subcarriers

*I\*,Q\**the ideal constellation point, for I and Q respectively

P0 the average power of the constellation (, ) computed over the *i*th frame

The measurements shall occur only on the OFDM symbols, the measurement shall be performed on at least 10 frames with 16 symbols at least in each of them. Random data shall be used.

PLME modifications to enable testing:

***TGad Editor Add the following text as part of the PLME subclause:***

**6.5.8 PLME-DBANDTESTMODE.request**

**6.5.8.1 Function**

This primitive requests that the DBand PHY entity enter a test mode operation. The parameters associated with this primitive are considered as recommendations and are optional in any particular implementation.

**6.5.8.2 Semantics of the service primitive**

The primitive parameters are as follows:

PLME-DBANDTESTMODE.request(

 TEST\_ENABLE,

 TEST\_MODE,

 SCRAMBLE\_SEED,

MCS,

LENGTH,

PACKET\_TYPE,

TRN\_LEN,

DATA\_TYPE,

)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| TEST\_ENABLE | Boolean | True, False | If true, enables the PHY test mode according to the remaining parameters. |
| TEST\_MODE | integer | 1, 2 | TEST\_MODE selects one of two operational states:1 = transparent receive2 = continuous packet transmit |
| SCRAMBLE\_SEED | integer | 0 - 0x7f | Selects the scrambling seed to be used for the transmit packets and sets the Scrambler Initialization field in the header. |
| MCS | integer | 0 - 31 | Selects the MCS to be used for the transmit packets and sets the MCS field in the header. |
| LENGTH | integer | 0 - 262143 | Selects the number of payload octets to be transmitted in each packet |
| PACKET\_TYPE | integer | 0,1 | Sets the header Packet type field and determines the encoding of the BRP fields appended to the packet.0 = TRN-R1 = TRN-T |
| TRN\_LEN | integer | 0 - 31 | Determines the number of BRP AGC and TRN-R/T fields that will be appended to the packet and sets the Training Length field in the header.A value of n indicates that the AGC has 4n subfields and that the TRN-R/T field has 4n subfields. When n ≠ 0 the static DBand PHY characteristics aBRPminSCblocks and aBRPminOFDMblocks also apply.  |
| TONE\_PAIRING | integer | 0,1 | For MCS 13-MCS17 selects static or dynamic tone pairing.0 = STP1 = DTP |
| PAYLOAD\_TYPE | integer | 0,1,2,3,4 | Selects one of five data patterns to be used for the transmit portions of the tests.0 = All 01 = All 12 = 8-bit count3 = 32-bit count4 = PN23 |

**6.5.8.3 When generated**

This primitive is generated at any time to enter the DBand PHY test mode.

**6.5.8.4 Effect of receipt**

Receipt of this primitive by the PHY causes the DBand PHY entity to enter the test mode of operation.

**6.5.8.5 Payload Types**

**6.5.8.5.1 All 1**

The payload data shall comprise octets, each with value 0xff.

**6.5.8.5.2 All 0**

The payload data shall comprise octets, each with value 0x00.

**6.5.8.5.3 8-bit Count**

The payload data comprises octets with an incrementing or "counting" value, reset to 0 at the beginning of every packet.

The count is modulo 256. The first 32 octets shall be,

0x000: 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

0x010: 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F

**6.5.8.5.4 32-bit Count**

The payload data comprises 4-octet words with an incrementing or "counting" value, reset to 0 at the beginning of every packet.

The count is modulo 2147483648. The count value is transmitted least-significant octet first. The first 32 octets shall be,

0x000: 00 00 00 00 01 00 00 00 02 00 00 00 03 00 00 00

0x010: 04 00 00 00 05 00 00 00 06 00 00 00 07 00 00 00

**6.5.8.5.5 PN23**

The payload data shall comprise octets drawn, LSB first, from a 223-1 length PRBS sequence generator as defined in ITU REC O.150 section 5.6 and illustrated in Figure 2.



Figure 10-7 PN23 Generator

The PN generator is seeded with a 1 in the first stage and a 0 in all other stages at the beginning of the first packet transmitted after a PLME-DBANDTESTOUTPUT.request. This means, for reference, that the first 64 payload octets (prior to scrambling) shall be,

0x000: 00 00 42 00 08 20 20 84 90 00 00 4A 00 28 24 A0

0x010: 84 92 42 08 43 00 88 20 20 C6 90 08 20 6A 84 B8

0x020: 24 A0 CE 92 6A 2C E3 84 1A 62 28 85 90 80 00 4A

0x030: 42 28 2C 80 A4 16 D2 08 43 4A 88 08 04 66 14 9A

**6.5.9 PLME-DBANDTESTOUTPUT.request**

**Function**

This optional primitive is a request by the LME to enable selected tests signals from the PHY. The parameters associated with this primitive are considered as recommendations and are optional in any particular implementation.

**6.5.9.1 Semantics of the service primitive**

The primitive parameters are as follows:

PLME-DBANDTESTMODE.request(

 TEST\_OUTPUT,

 )

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| TEST\_OUTPUT | Boolean | True, False | If true, enables the selected test signals for testing DBand PHY |

TEST\_OUTPUT enables and disables selected signals for debugging and testing the PHY. The signals that may be available are the received PHY type, MCS, HCS, payload content, uncorrected FEC codeword count, received EVM, RSSI.

The uncorrected FEC codeword count is the number of FEC codewords in the most recently received packet for which the FEC algorithm did not complete successfully due to transmission errors.

**6.5.9.2 When generated**

This primitive is generated at any time to enable the test outputs when in the DBand PHY test mode.

**6.5.9.3 Effect of receipt**

Receipt of this primitive by the DBand PHY causes the DBand PHY entity to enable the test outputs using the modes set by the most recent PLME-DBANDTESTMODE.request primitive.

**TX-TIME calculation correction**

***TGad Editor: modify the TX-TIME formula for SC/OFDM at page 496 line 9 of D3.0***



***TGad Editor: modify the TX-TIME formula for control PHY at page 496 line 15 as follows:***



**BRP Clarification**

***TGad Editor :modify 21.3.6.3, P452L18-27, as follow:***

**21.3.6.3 Transmission of the Preamble and BRP fields in an OFDM packet**

The preamble sequence defined in the above subclauses and the BRP fields defined in subclause 21.10.2.2.4, 21.10.2.2.5 and 21.10.2.2.6 ~~is~~are specified at the SC chip rate (*Tc*). For transmission in the OFDM (nominal) sample rate, the signal is resampled with a 3/2 rate change. The resampling is done by upsampling by a factor of 3, filtering by the filter defined in 21.3.6.3.1, and downsampling by a factor of 2 (see equation below). The resampling is performed using a specific filter since the OFDM receiver needs to know this filter to correct for its response during channel estimation. To define the transmission of the preamble when the packet is an OFDM packet, the preamble waveform is defined below.

***TGad Editor: add following subclause after 21.10.2.2.7:***

**21.10.2.2.8 BRP resampling in an OFDM packet**

The BRP AGC, CE, and Tn/Rn fields are specified at the SC chip rate (). When appended to an OFDM packet the signal is resampled as defined in subclause 21.3.6.3.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 3164 | 485.00 | 21.8 |  |  | There is a PHY-TXPLCPEND.indication primitive defined, but its use is not shown in the PLCP transmit procedure | Add primitive to figure 167. |

Proposed resolution: Accept

**TGad editor: replace figure 167 with the following figure:**

