IEEE P802.11
Wireless LANs

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| Response to Editor Comments on 11-16-220-03 |
| Date: 2016-03-30 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Assaf Kasher | Intel Corporation |  |  | assaf.kasher@intel.com |
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Abstract

[This documents addresses comments place by the editor and others on execuation of the editor instructions in document 11-16-220-03 as a resolution to 7142]

**Discussion**:

Document Draft P802.11REVmc\_D5.3 includes comments by the editor on changes introduced by the execution of the editor instruction on document 11-16-0220-03-000m-clause-20-SC-extended-MCSs as part of the resolution of SB comment 7142.

Many of the editor’s comments are correct and in this document we propose changes to remedy the issues raised by the editor.

***Disucssion:***

The main (non-trivial) issue pointed by the editor is that the concept of regular MCS vs. extended MCS set is confusing for a reader not familiar with the history of the text. We agree with that. The question that remains is how to add MCSs in a way that is compatible with legacy devices and yet clear to the reader. This may be done by doing the following:

1. Separate the MCS (an e-num type) from the MCS indication in the PHY header. This means that we no longer need the extended MCS indication in the PHY service interface. MCSs 9.1, and 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6 will be added to the SC MCS list.
2. Modify the MCS table to include the Extended SC MCS Indication field see below.

*Proposed changes:*

*All changes are in reference to D5.3*

***Editor: Modify the description of the field MCS in table 20-1 (P2478L11) as follows:***

The MCS parameter (#2191) is an enumerated type that indicates the modulation and coding scheme used in the transmission of the packet. Values are integers in the range of 0 to 31 and the values 9.1, 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6.

— An MCS value of 0 indicates the use of DMG control mode (#6270).

— MCS values of 1 to 12 and 9.1, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6 indicate use of single carrier modulations. The value is an index to Table 20-19 (DMG SC mode modulation and coding schemes (#7173)).

— MCS values of 13 to 24 indicates use of OFDM modulations. The value is an index to Table 20-14 (DMG OFDM mode modulation and coding schemes (11ad) (#7173)).

— MCS values of 25 to 31 indicate use of DMG low-power SC mode (#6270). The value is an index to Table 20-23 (Low-power SC modulation and coding schemes (11ad)).

***Editor: remove the line of EXTENDED\_SC\_MCS******from table 20-1 (P2478L27)***

***Editor: modify the name of the MCS field in table 20-17 (DMC SC mode header fields) (P2510L46) to be “Base MCS”***

***Editor: modify the Description of the MCS field in table 20-17 (DMC SC mode header fields) (P2510L46) as follows:***

Modulation and Coding Scheme (see Table 20-20 DMG SC mode modulation and coding schemes)

***Editor: replace the Description of the Extended SC MCS Indication table 20-17 (DMC SC mode header fields) (P2513L7) with the following:***

Combined with the Base MCS field to indicate the MCS and indicate that the length field shall be calculated according to Table 20-18.

***Editor: replace the header of table 20-18 (P2513L31) as follows:***

Length value in SC header when the Extended SC MCS Indication field is set to 1.

***Editor: replace table 20-20 DMG SC mode modulateion and coding scheme with the following table:***

| **MCS** | **Base MCS Field** | **Extended SC MCS Indication Field** | **Modulation** | **NCBPS** | **Repetition** | **Code Rate** | **Data Rate (Mb/s)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | π/2-BPSK | 1 | 2 | 1/2 | 385 |
| 2 | 2 | 0 | π/2-BPSK | 1 | 1 | 1/2 | 770 |
| 3 | 3 | 0 | π/2-BPSK | 1 | 1 | 5/8 | 962.5 |
| 4 | 4 | 0 | π/2-BPSK | 1 | 1 | 3/4 | 1155 |
| 5 | 5 | 0 | π/2-BPSK | 1 | 1 | 13/16 | 1251.25 |
| 6 | 6 | 0 | π/2-QPSK | 2 | 1 | 1/2 | 1540 |
| 7 | 7 | 0 | π/2-QPSK | 2 | 1 | 5/8 | 1925 |
| 8 | 8 | 0 | π/2-QPSK | 2 | 1 | 3/4 | 2310 |
| 9 | 9 | 0 | π/2-QPSK | 2 | 1 | 13/16 | 2502.5 |
| 9.1 | 6 | 1 | π/2-QPSK | 2 | 1 | 7/8 | 2695 |
| 10 | 10 | 0 | π/2-16QAM | 4 | 1 | 1/2 | 3080 |
| 11 | 11 | 0 | π/2-16QAM | 4 | 1 | 5/8  | 3850 |
| 12 | 12 | 0 | π/2-16QAM | 4 | 1 | 3/4 | 4620 |
| 12.1 | 5 | 1 | π/2-16QAM | 4 | 1 | 13/16 | 5005 |
| 12.2 | 10 | 1 | π/2-16QAM | 4 | 1 | 7/8 | 5390 |
| 12.3 | 7 | 1 | π/2-64QAM | 6 | 1 | 5/8  | 5775 |
| 12.4 | 8 | 1 | π/2-64QAM | 6 | 1 | 3/4 | 6390 |
| 12.5 | 9 | 1 | π/2-64QAM | 6 | 1 | 13/16 | 7507.5 |
| 12.6 | 12 | 1 | π/2-64QAM | 6 | 1 | 7/8 | 8085 |

***Editor: Modify the last line of 20.6.3.1.2 (P2514L49) as follows:***

MCS 4 and below are mandatory for each Tx and Rx of a device. Other MCSs are optional.

***Editor: Modify the column header in the first line of table 20-3 from “MCS index” to “MCS”***

***Editor: Modify the column header in the first line of table 20-18 from “value in MCS field” to “value in Base MCS field”***

***Editor: Modify the caption of Table 20-19 from “Setting of the initial scrambler state for extended MCSs” to “Setting of the initial scrambler for MCSs in which the Extended SC MCS indication field is set to 1”***

***Editor: Modify the column header in the first line of table 20-23 from “MCS index” to “MCS”***

*Other Editorial Issues*

The scope subclause does not indicate the correct set of MCSs

***Editor: Modify the text in P2474L13-16 as follows:***

— A single carrier (SC) modulation using MCS 1 to MCS 12, MCS 9.1, 12.1, 12.2, 12.3 ,12.4, 12.5 and 12.6 (the DMG(Ed)SC mode(#6270); see 20.6 (DMG SC mode(#6270))) and MCS 25 to MCS 31 (the DMG(Ed)low-power SC mode(#6270); see 20.7 (DMG low-power SC mode(#6270)))

Indication of the length of the LDPC codeword: There is some obsfucation. Also the length should be the actual length of the packet, and not the one indicated in the header field, which may be different.

***Editor: Modify the text in P2517L12-22 as follows:***

where *LCW*is the LDPC code word length – 624 for code rate *R* of 7/8, 672 for all other code rates. *Length* is the length of the PSDU (in octets), ρ is the repetition factor (1 or 2), and *R* is the code rate. $N\_{CWmin}$ is define for BRP packets in Table 20-24 (Zero filling for DMG SC mode BRP packets (11ad)(#7173)).

Formulas for LDPC encoder – the original text in 11-16-220-03 had the right font faces of P2512L49-55

D5.3-1083 got some of that mixed up. Reprinted here for clarity

1. To each data word, *126* parity bits $\left(p\_{1}^{\left(m\right)},p\_{2}^{\left(m\right)},…,p\_{126}^{\left(m\right)}\right)$ are added to create the code word $\tilde{c}^{\left(m\right)}$**=**$\left(b\_{1}^{\left(m\right)},b\_{2}^{\left(m\right)},…,b\_{546}^{\left(m\right)}, p\_{1}^{\left(m\right)},p\_{2}^{\left(m\right)},…,p\_{126}^{\left(m\right)}\right) $ such that $H\tilde{c}^{\left(m\right)}^{T}=0$**.** The code word $c^{\left(m\right)} is generated from \tilde{c}^{\left(m\right)}$by removing the first 48 parity bits so that $c^{\left(m\right)}=\left(b\_{1}^{\left(m\right)},b\_{2}^{\left(m\right)},…,b\_{546}^{\left(m\right)}, p\_{49}^{\left(m\right)},p\_{50}^{\left(m\right)},…,p\_{126}^{\left(m\right)}\right)$

PHY Header Length field (P2506L57):

***Editor: Remove the last line (***The number of data octets in the PSDU shall not exceed 262 143.) ***from the description of the length field in table 20-17 (P2506L57)***

Extended MCS Capbilities field

***Editor: modify P1033L24 as follows:***

A STA indicates support for transmission of code rate 7/8 by setting the value in the Code Rate 7/8 Tx subfield to 1. If a STA

***Editor: modify P1033L34 as follows:***

A STA indicates support for reception of code rate 7/8 by setting the value in the Code Rate 7/8 Rx subfield to 1. If STA

Definition of Extended MCS set

***Editor: modify P1028L52-58 as follows:***

The Supported MCS Set (#3097)subfield indicates which MCSs a(#2157)STA supports. An MCS is identified by an MCS index, which is represented by an integer in the range of 0 to 31 or by one of the values 9.1, 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6. The interpretation of the MCS index (i.e., the mapping from MCS to data rate) is PHY dependent. For the DMG PHY, see Clause 20 (Directional multi-gigabit (DMG) PHY specification(11ad)). The structure of the Supported MCS Set (#3097)subfield is defined in Figure 9-505 (Supported MCS Set (#3097)subfield format(11ad)(#270)).

***Editor: modify P1029L34-38 as follows:***

The Maximum SC Rx MCS subfield contains the value of the maximum MCS index the STA supports for reception of single-carrier frames. Values 0-3 of this (#3097)subfield are reserved. Possible values for this subfield are shown in Table 20-20 (DMG SC mode modulation and coding schemes(#7173)) (values for MCSs 9.1, 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6 are not valid for this field support for these MCSs is indicated using the Extended SC MCS Capabilities field; see 9.4.2.128.5). (#7142)

***Editor: modify P1029L46-50 as follows:***

The Maximum SC Tx MCS subfield contains the value of the maximum MCS index the STA supports for transmission of single-carrierframes. Values 0-3 of this (#3097)subfield are reserved. Possible values for this subfield are shown in Table 20-20 (DMG SC mode modulation and coding schemes(#7173)) (values for MCSs 9.1, 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6 are not valid for this field, support for these MCSs is inidciated using the Extended SC MCS Capabilities field, see 9.4.2.128.5).(#7142)

***Editor: modify P1032L39-41 as follows:***

The Extended SC MCS Capabilities field (see Figure 9-507 (Extended SC MCS Capabilities field(#7142))) advertises the support of the STA to MCSs 9.1, 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6.

***Editor: Modify the text in PL1032L57-58***

A STA that indicates support for transmission of an extended SC MCS by setting the value in the Maximum Extended SC Tx MCS subfield to *k* supports the subset of MCSs {9.1, 12.1, 12.2, 12.3, 12.4 ,12.5 12.6} that have a data rate lower than or equal to the data rate of the MCS indicated by *k*.

***Editor: Add the following text at the end of P1032L58:***

A STA that indicated support for MCSs with a data rate higher than the data rate of MCS 9.1 in the Maximum Extended SC Tx MCS subfield shall set the value of the Maximum SC Tx MCS subfield of the Supported MCS Set subfield to 12.

***Editor: Add the following text at the end of P1033L31:***

A STA that indicated support for MCSs with a data rate higher than the data rate of MCS 9.1 in the Maximum Extended SC Rx MCS subfield shall set the value of the Maximum SC Rx MCS subfield of the Supported MCS Set subfield to 12.

***Editor: Add the following text before P1033L29:***

The Maximum Extended SC Rx MCS subfield indicates the maximum receive extended SC MCS supported by the STA. The values in the subfield are ordered as shown in Table 9-230 (Mapping of Extended SC MCS to Maximum Supported Rx/Tx MCS subfields values(#7142)).

***Editor: Modify the text in PL1033L34-37***

A STA that indicates support for reception of an extended SC MCS by setting the value in the Maximum Extended SC Rx MCS subfield to *k* supports the subset of MCSs {9.1, 12.1, 12.2, 12.3, 12.4 ,12.5 12.6} that have a data rate lower than or equal to the data rate of the MCS indicated by k

*Link margin element MCS indication*

***Editor Modify the text in P1053L39-48 as follows:***

The MCS field is set to an integer representation of the MCS that the STA sending this element recommends that the peer STA indicated in the RA field of the Link Measurement Report frame use to transmit frames to this STA. The reference PER for selection of the MCS is 10-2 for an MPDU length of 4096 octets. The method by which the sending STA determines a suitable MCS for the peer STA is implementation specific. (#7142)Values of 0-31 indicate MCS 0 to MCS 31. Values of 133, 134, 135, 136, 137, 138, 140 indicate MCS 12.1, 9.1, 12.3, 12.4 , 12.5, 12.2 and 12.6 respectively.

**References:**

[1] Draft P802.11REVmc\_D5.3-1083

[2] 11-16-0220-03-000m-clause-20-SC-extended-MCSs