IEEE P802.11
Wireless LANs

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| Proposed Changes to D2.0 Clause 28.3.6 |
| Date: 2018-01-11 |
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Abstract

This submission proposes resolutions for comments of TGax Draft 2.0 with the following CIDs:

CID 11425,11426,11568,11569,11570,11571,11572,11573,11574,11575,11576,11577,11578,11579,11580,11581,11582,11583,11584,11585,11586,11587,11588,11589,12065,13354,13355,13356,13357,13358,13359,13360,13447,13448,13449,13450,13451.

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: updates on CIDs related to beam change

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 11425 | Bo Sun | 386.61 | 28.3.6.10.1 | QPSK DCM,BPSK DCM and 16QAM DCM are missing in mapping step i); | change i) step to "Constellation mapper: Map to BPSK,BPSK DCM, QPSK,QPSK DCM, 16-QAM,16-QAM DCM, 64-QAM, or 256-QAM constellation points as described in 28.3.11.9 (Constellation mapping)." | Accepted- |
| 11426 | Bo Sun | 387.40 | 28.3.6.10.2 | QPSK DCM,BPSK DCM and 16QAM DCM are missing in mapping step h); | change h) step to "Constellation mapper: Map to BPSK,BPSK DCM, QPSK,QPSK DCM, 16-QAM,16-QAM DCM, 64-QAM, or 256-QAM constellation points as described in 28.3.11.9 (Constellation mapping)." | Accepted- |
| 11568 | Dorothy Stanley | 381.61 | 28.3.6.2 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11568. |
| 11569 | Dorothy Stanley | 381.64 | 28.3.6.2 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. Spatial mapping will be the same as the legacy portion in 11ac. |
| 11570 | Dorothy Stanley | 382.03 | 28.3.6.2 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11570. |
| 11571 | Dorothy Stanley | 382.25 | 28.3.6.3 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11571. |
| 11572 | Dorothy Stanley | 382.29 | 28.3.6.3 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. |
| 11573 | Dorothy Stanley | 382.33 | 28.3.6.3 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11573. |
| 11574 | Dorothy Stanley | 383.01 | 28.3.6.4 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11574. |
| 11575 | Dorothy Stanley | 383.05 | 28.3.6.4 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. |
| 11576 | Dorothy Stanley | 383.09 | 28.3.6.4 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11576. |
| 11577 | Dorothy Stanley | 383.44 | 28.3.6.5 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11577. |
| 11578 | Dorothy Stanley | 383.48 | 28.3.6.5 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. |
| 11579 | Dorothy Stanley | 383.52 | 28.3.6.5 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11579. |
| 11580 | Dorothy Stanley | 384.19 | 28.3.6.6 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11580. |
| 11581 | Dorothy Stanley | 384.23 | 28.3.6.6 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. |
| 11582 | Dorothy Stanley | 384.28 | 28.3.6.6 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11582. |
| 11583 | Dorothy Stanley | 385.34 | 28.3.6.7 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11583. |
| 11584 | Dorothy Stanley | 385.38 | 28.3.6.7 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So how do we determine Spatial Mapping for HE MU PPDU or HE TB PPDU? | as in comment | Rejected-BEAM\_CHANGE doesn’t affect the spatial mapping for MU PPDU and TB PPDU. |
| 11585 | Dorothy Stanley | 385.42 | 28.3.6.7 | On Pg 346, line 56, BEAM\_CHANGE is "Not present" for formats other than HE\_SU or HE\_EXT\_SU. So what CSD is applied for HE MU PPDU or HE TB PPDU? | as in comment | Revised-TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 11585. |
| 11586 | Dorothy Stanley | 385.53 | 28.3.6.8 | Describe the per-user component with UL MU. | as in comment | Rejected-After further clarification from the commenter, the commenter suggest to add the per user procedure, e.g. how to decide RU index, SS index, user specific coding procedure, etc. This clause focuses on the **highlights** of the construction instead of details which could be find 28.3.10 and 28.3.11.  |
| 11587 | Dorothy Stanley | 386.10 | 28.3.6.9 | Describe the per-user component with UL MU. | as in comment | Rejected-After further clarification from the commenter, the commenter suggest to add the per user procedure, e.g. how to decide RU index, SS index, user specific coding procedure, etc. This clause focuses on the **highlights** of the construction instead of details which could be find 28.3.10 and 28.3.11. |
| 11588 | Dorothy Stanley | 386.39 | 28.3.6.10.1 | Describe the per-user component with HE TB PPDU. | as in comment | Rejected-After further clarification from the commenter, the commenter suggest to add the per user procedure, e.g. how to decide RU index, SS index, user specific coding procedure, etc. This clause focuses on the **highlights** of the construction instead of details which could be find 28.3.10 and 28.3.11. The TB PPDU encoding also reuse most of the SU PPDU encoding except pre-FEC padding. |
| 11589 | Dorothy Stanley | 387.20 | 28.3.6.10.2 | Describe the per-user component with HE TB PPDU. | as in comment | Rejected-After further clarification from the commenter, the commenter suggest to add the per user procedure, e.g. how to decide RU index, SS index, user specific coding procedure, etc. This clause focuses on the **highlights** of the construction instead of details which could be find 28.3.10 and 28.3.11. The TB PPDU encoding also reuse most of the SU PPDU encoding except pre-FEC padding. |
| 12065 | Jianhan Liu | 385.00 | 28.3.6.7 | There is no beam-change for HE MU PPDU. During the Construction of HE-SIG-B, there is no need to specify the beam-change senarios. | Rewrite the item g) and h) to without beam-change. | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 12065. |
| 12711 | Mark RISON | 386.35 | 28.3.6.10 | There are 2 "packet extension field" | Change each to "Packet Extension field" | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 12711. |
| 12947 | Mark RISON | 255.31 | 28.3.6.11.1 | Resubmitted from D1.0 as spuriously rejected 'in the interest of releasing D2.0' (references and text from D1.0): It would be easier for description purpose to move CSD operation outside per user processing; as CSD operation needs global information, such as spatial and frequency allocation. | As it says in the comment | Rejected-Cannot fine the text in the mentioned P.L. Looked into the clause 28.3.6.11.1 and an exception is already there for the CSD. It’s crystal clear.“In an HE MU transmission, the PPDU encoding process is performed independently in an RU on a per userbasis up to the input of the spatial mapping block, except that CSD is performed with knowledge of thespace-time streams starting index for that user.” |
| 13354 | ron porat | 382.63 | 28.3.6.4 | Duplication over 'each 20 MHz subchannel of the channel bandwidth" is subject to preamble puncturing (HE MU PPDU) and partial preamble (HE TB PPDU). | Add conditions as mentioned in comment. | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13354. |
| 13355 | ron porat | 383.40 | 28.3.6.5 | Duplication over 'each 20 MHz subchannel of the channel bandwidth" is subject to preamble puncturing (HE MU PPDU) and partial preamble (HE TB PPDU). | Add conditions as mentioned in comment. | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13355. |
| 13356 | ron porat | 384.15 | 28.3.6.6 | Duplication over 'each 20 MHz subchannel of the channel bandwidth" is subject to preamble puncturing (HE MU PPDU) and partial preamble (HE TB PPDU). | Add conditions as mentioned in comment. | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13356. |
| 13357 | ron porat | 384.58 | 28.3.6.6 | Item for duplication and phase rotation missing | Insert item for duplication and phase rotation. | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13357. |
| 13358 | ron porat | 385.24 | 28.3.6.7 | Constellation mapper is referring to 17.3.5.8, but this does not have DCM. | Refer to 28.3.1.9 | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13358. |
| 13359 | ron porat | 386.58 | 28.3.6.10.1 | Segment parser is never used when BCC is used in HE PPDU. | remove segment parser | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13359. |
| 13360 | ron porat | 386.64 | 28.3.6.10.1 | Segment deparser is never used when BCC is used in HE PPDU. | remove segment deparser | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13360. |
| 13447 | Sigurd Schelstraete | 384.05 | 28.3.6.6 | Change "convolution encoder" to "convolutional encoder" | See comment | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13447. |
| 13448 | Sigurd Schelstraete | 384.46 | 28.3.6.6 | Change "convolution encoder" to "convolutional encoder" | See comment | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13448. |
| 13449 | Sigurd Schelstraete | 385.17 | 28.3.6.7 | "Obtain for the HE-SIG-B field values from the TXVECTOR". Delete "for" or clarify sentence. | See comment | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13449. |
| 13450 | Sigurd Schelstraete | 385.20 | 28.3.6.7 | Change "convolution encoder" to "convolutional encoder" | See comment | Revised-As suggested.TGax editor to make the changes shown in 11-18/0025r1 under all headings that include CID 13450. |
| 13451 | Sigurd Schelstraete | 386.38 | 28.3.6.10.1 | add a note at the start of this section that BCC is only used for 20 MHz. This will make some of the text below clearer. | See comment | Revised-Resolved in 13359, 13360 |

**Propose:** Revised for CIDs per editing instructions in 11-18/0025r1.

*To the TGax Editor: modify P.L. 382.3 as following (CID 11568, 11570, 11571, 11573, 11574, 11576, 11577, 11579, 11580, 11582, 11583, 11585).*

g) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1 or not present, apply CSD for each transmit chain and frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).

*In addition, modify P.L. 382.33 as following.*

g) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1 or not present, apply CSD for each transmit chain and frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).

*In addition, modify P.L. 383.9 as following.*

k) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1 or not present, apply CSD for each transmit chain and frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields)

*In addition, modify P.L. 383.52 as following.*

k) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1 or not present, apply CSD for each transmit chain and
frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).

*In addition, modify P.L. 384.27 as following.*

j) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1 or not present, apply CSD for each transmit chain and frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).

*To the TGax Editor: modify P.L. 385.34 as following (CID 12065).*

g) CSD: ~~If the TXVECTOR parameter BEAM\_CHANGE is 0, apply CSD for each space-time stream
and frequency segment as described in 28.3.10.2.2 (Cyclic shift for HE modulated fields) before
spatial mapping~~ Apply CSD for each transmit chain and frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).
~~h) Spatial mapping: If the TXVECTOR parameter BEAM\_CHANGE is 0, apply the~~ *~~A~~* ~~matrix and the~~*~~Q~~* ~~matrix as described in 28.3.10.7.4 (Encoding and modulation).~~
~~i~~ h) IDFT: Compute the inverse Fourier transform.
~~j) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1, apply CSD for each transmit chain and
frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).~~
~~k~~ i) Insert GI and apply windowing: Prepend a GI (*TGI*,Pre-HE) and apply windowing as described in
28.3.9 (Mathematical description of signals).
~~l~~ j) Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit
chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to
28.3.9 (Mathematical description of signals) and 28.3.10 (HE preamble) for details.

*To the TGax Editor: modify P.L. 382.63 as following (CID 13354).*

g) Duplication and phase rotation: Duplicate the L-SIG field over each occupied 20 MHz subchannel of the channel bandwidth. Apply appropriate phase rotation for each occupied 20 MHz subchannel as described in 28.3.9 (Mathematical description of signals) and 21.3.7.5 (Definition of tone rotation).

*To the TGax Editor: modify P.L. 383.40 as following (CID 13355).*

g) Duplication and phase rotation: Duplicate the RL-SIG field over each occupied 20 MHz subchannel of the channel bandwidth. Apply appropriate phase rotation for each occupied 20 MHz subchannel as described in 28.3.9 (Mathematical description of signals) and 21.3.7.5 (Definition of tone rotation).

*To the TGax Editor: modify P.L. 384.15 as following (CID 13356).*

f) Duplicate and phase rotation: Duplicate the HE-SIG-A OFDM symbols over each occupied 20 MHz subchannel of the channel width. Apply the appropriate phase rotation for each occupied 20 MHz subchannel as described in 28.3.9 (Mathematical description of signals) and 21.3.7.5 (Definition of tone rotation).

*To the TGax Editor: insert the following paragraph in P.L. 384.58 (CID 13357).*

f) Duplicate and phase rotation: Duplicate the HE-SIG-A OFDM symbols over each occupied 20 MHz subchannel of the channel width. Apply the appropriate phase rotation for each occupied 20 MHz subchannel as described in 28.3.9 (Mathematical description of signals) and 21.3.7.5 (Definition of tone rotation).

~~f~~ g) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 0, apply CSD for each space-time stream
and frequency segment as described in 28.3.10.2.2 (Cyclic shift for HE modulated fields) before
spatial mapping.
~~g~~ h) Spatial mapping: If the TXVECTOR parameter BEAM\_CHANGE is 0, apply the *A* matrix and the
*Q* matrix as described in 28.3.10.7.4 (Encoding and modulation).
~~h~~ i) IDFT: Compute the inverse Fourier transform.

~~i~~ j) CSD: If the TXVECTOR parameter BEAM\_CHANGE is 1, apply CSD for each transmit chain and
frequency segment as described in 28.3.10.2.1 (Cyclic shift for pre-HE modulated fields).
~~j~~ k) Insert GI and apply windowing: Prepend a GI (*TGI*,Pre-HE) and apply windowing as described in
28.3.9 (Mathematical description of signals).
~~k~~ l) Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit
chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to
28.3.9 (Mathematical description of signals) and 28.3.10 (HE preamble) for details.

*To the TGax Editor: modify P.L. 385.24 as following (CID 13358).*

d) Constellation mapper: Obtain MCS\_SIG\_B from the TXVECTOR and use it to modulate the interleaved bits as described in ~~17.3.5.8 (Subcarrier modulation mapping)~~ 28.3.11.9 (Constellation mapping) to form the HE-SIG-B symbols.

*To the TGax Editor: modify P.L. 386.58 as following (CID 13359, 13360).*

~~g) Segment parser (if needed): This block is bypassed for 20 MHz transmissions.~~
~~h~~ g) BCC interleaver: Interleave as described in 28.3.11.8 (BCC interleavers).
~~i~~ h) Constellation mapper: Map to BPSK, QPSK, 16-QAM, 64-QAM, or 256-QAM constellation points
as described in 28.3.11.9 (Constellation mapping).
~~j) Segment deparser (if needed): This block is bypassed for 20 MHz transmissions.
k~~ i) STBC: Apply STBC as described in 28.3.11.10 (Space-time block coding).

~~l~~ j) Pilot insertion: Insert pilots following the steps described in 28.3.11.13 (Pilot subcarriers).
~~m~~ k) CSD: Apply CSD for each space-time stream and frequency segment as described in 28.3.10.2.2
(Cyclic shift for HE modulated fields).
~~n~~ l) Spatial mapping: Apply the *Q* matrix as described in 28.3.11.14 (OFDM modulation).
~~o~~ m) IDFT: In an 80+80 MHz transmission, map each frequency subblock to a separate IDFT. Compute
the inverse discrete Fourier transform.
~~p~~ n) Insert GI and apply windowing: Prepend a GI determined by the TXVECTOR parameter GI\_TYPE
and apply windowing as described in 28.3.9 (Mathematical description of signals).
~~q~~ o) Analog and RF: Upconvert the resulting complex baseband waveform with each transmit chain to an
RF signal according to the center frequency of the desired channel and transmit. Refer to 28.3.9
(Mathematical description of signals) and 28.3.10 (HE preamble) for details.

*To the TGax Editor: modify P.L. 384.05 as following (CID 13447).*

b) BCC encoder: Encode the data by a convolution encoder at the rate of R = ½ as described in 17.3.5.6
(Convolutional encoder).

*To the TGax Editor: modify P.L. 384.46 as following (CID 13448).*

b) BCC encoder: Encode the data by a convolution encoder at the rate of R = ½ as described in 17.3.5.6
(Convolutional encoder).

*To the TGax Editor: modify P.L. 385.20 as following (CID 13450).*

b) BCC encoder: Encode the Common field data and each User Block field data individually by a convolutional encoder as described in 28.3.11.5.1 (Binary convolutional coding and puncturing).

*To the TGax Editor: modify P.L. 385.17 as following (CID 13449).*

a) Obtain ~~for~~ the HE-SIG-B field values from the TXVECTOR. Add the reserved bits, append the calculated CRC, and then append the *Ntail* tail bits as shown in 28.3.10.8 (HE-SIG-B).

*To the TGax Editor: modify P.L. 386.52 as following (CID 12711).*

e) Post-FEC padding: Append the post-FEC pad bits and ~~packet extension~~ Packet Extension field as described in 28.3.11
(Data field).

*In addition, modify P.L. 387.31 as following (CID 12711)*

e) Post-FEC padding: Append the post-FEC pad bits and ~~packet extension~~ Packet Extension field as described in 28.3.11
(Data field)