IEEE P802.11
Wireless LANs

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| Comment Resolutions on Clause 9.4.1.63 D2.0 (HE Compressed Beamforming Report field)  |
| Date: 2018-01-10 |
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Abstract

This submission proposes resolutions for the following 12 comments on 9.4.1.63 (**HE Compressed Beamforming Report field**) of TGax D2.0:

11121, 12683, 12684, 12690, 12701, 12702, 12764, 12769, 12771, 12772, 13696, 13697

Revisions:

* Rev 0: Initial version of document
* Rev 1: updated CIDs 12683, 12702 and 13697 based on online and offline discussions.
* Rev 2: Indicated that 11121, 12701 and 12764 have been fixed in Draft 2.1 (See 11-17/1682r5).

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** | **Clause Number** | **Page/****Line** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 12683 | 9.4.1.63 | 113.34 | 9.4.1.63 | Pilot subcarriers should not be included in the list of subcarriers for which BF feedback is given (they were not included for ac either) | Delete the pilot subcarrier indices from Table 9-76e |  RejectPilot subcarriers are skipped only in the case that Ng = 1 (see Table 9-70—Subcarriers for which a Compressed Beamforming Feedback Matrix subfieldis sent back) in IEEE 802.11-2016. For Ng > 1, pilot subcarriers may be fed back. As 802.11ax has Ng = 4 and Ng = 16, then all pilot subcarriers should be fed back.  |
| 12684 | 9.4.1.63 | 114.01 | 9.4.1.63 | There are behavioural requirements in 9.4.1.63, which is a subclause about format not behaviour and it's about what the BFee can't ask for, not what the BFee should provide | Move the last 3 paras of 9.4.1.63 to 27.6.3 |  RevisedThe paragraphs were moved to Pg 266 line 10, under a discussion of rules governing NgTGax editor to make the changes shown in 11-18/0080r2 under all headings that include CID 12684 |
| 12690 | 9.4.1.63 | 109.52 | 9.4.1.63 | "A beamformee may choose to reduce Ns by using a method referred to as grouping" -- in HE the BFer gets to choose sometimes | Change "beamformee" to "beamformee or beamformer, depending on the situation," in the cited text | RevisedTGax editor to make the changes shown in 11-18/0080r2 under all headings that include CID 12690 |
| 12702 | 9.4.1.63 | 114.03 | 9.4.1.63 | "Ng = 16 For SU/MU" -- no such field | Change to "Ng = 16 SU Feedback" and "Ng = 16 MU Feedback" | RejectDid not find the phrase SU/MU in the text so the solution is not applicable |
| 12769 | 9.4.1.63 | 109.52 | 9.4.1.63 | "A beamformee may choose to reduce Ns by using a method referred to as grouping" -- it's not a "may" since Ng is not allowed to be 1 in HE | Change "may choose to reduce" to "reduces" in the cited text |  RevisedTGax editor to make the changes shown in 11-18/0080r2 under all headings that include CID 12769 |
| 12771 | 9.4.1.63 | 110.01 | 9.4.1.63 | "For the left of DC, scidx(i) = scidx(i-1) + Ng, where 1 <= i <= L and scidx(L) = -4.For the right of DC, scidx(i) = scidx(i-1) + Ng, where L + 2 <= i <= Ns -- 2 and scidx(L + 1) = 4." -- the cases where i is L+1 or Ns -- 1 are undefined | Extend the equations to cover these two cases | Revised: The formulas are correct. Subcarriers scidx(0) and scidx(Ns - 1) represent the S (Start)-tone corresponding to the RU Start Index and E (End)-tone corresponding to the RU End Index, respectively. (pg 109 line 57) and as such have been already defined explicitly. All we need to do is define the indices from scidx(1) to scidx(Ns-2).However, some confusion may arise from the fact that the variableL is not explicitly defined. L is the number of subcarriers on the left of DC for which feedback is sent to the beamformer (with scidx(L) = -4 in the case of 80 MHz). In this case, L + 1 is the first fed back subcarrier on the right of DC (scidx (L+1) = +4, in the case of 80 MHz) and is defined explicitly in the specification. As such there is no need to define L+ 1 again. Note: We add text to explicitly define L.TGax editor to make the changes shown in 11-18/0080r2 under all headings that include CID 12771 |
| 12772 | 9.4.1.63 | 109.51 | 9.4.1.63 | There are references to a "Compressed Beamforming Feedback Matrix subfield" but no such subfield is defined | Refer to an defined subfield in 9.3.1.20, 9.4.1.63, |  Revised: It is appropriate to refer to the Feedback field only and not the NDP request (not 9.3.1.20) so only made a reference to 9.4.1.63 TGax editor to make the changes shown in 11-18/0080r2 under all headings that include CID 12772 |
| 13696 | 9.4.1.63 | 114.01 | 9.4.1.63 | Normative expression should not be used in clause 9. Two occurences, may and shall, in the paragraph starting from pp.ll 114.1. | Change the first two sentences starting from pp.ll 114.1 to be a non-normative text. | RevisedMoved to pg 266 line 10 as in comment 12684See resolution to CID 13696 |
| 13697 | 9.4.1.63 | 114.04 | 9.4.1.63 | "... in the Ng = 16 For SU subfield or Ng = 16 For MU subfield, respectively, ..." The two "For" should not start with an upper case. | As in comment. |  RejectedThe two “For” words are part of 802.11ax fields and the editorial rule is to capitalize all words in a defined 802.11ax field. |

*Discussion*

*#12683*

Pilot subcarriers are skipped only in the case that Ng = 1 (see Table 9-70—Subcarriers for which a Compressed Beamforming Feedback Matrix subfield

is sent back) in IEEE 802.11-2016. For Ng > 1, pilot subcarriers may be sent back. As 802.11ax has Ng = 4 an Ng = 16, then the pilot subcarriers are fed back. An excerpt of the table is shown below illustrating the behavior in 20 MHz and 40 MHz for 802.11 prior to 802.11ax.

 

*Changes to D2.0*

***TGax Editor: Please make the following change in red on Pg 110 ln 1 (#12771):***

For 40 MHz and 80 MHz, when the aforementioned S-tone and E-tone indices lie on the same side of DC, *scidx*(*i*) = *scidx*(*i* - 1) + *Ng*, where 1 ≤ *i* ≤ *Ns* - 2. However, when the S-tone and E-tone indices lie on different sides of DC, the following relationships hold separately for the two sides of DC.

For the left of DC, *scidx*(*i*) = *scidx*(*i* - 1) + *Ng*, where 1 ≤ *i* ≤ L, L is the number of subcarriers on the left of DC for which feedback is sent to the beamformer *(#12771)* and*scidx*(*L*) = - 4.

***TGax Editor: Please make the following change in red on Pg 114 ln 1 (#12684) (#13696):***

~~An HE beamformee may support Ng = 16 in the HE Compressed Beamforming Report field for both SU and MU feedback types. A beamformer shall not request Ng = 16 for SU or MU feedback in an HE NDP Announcement frame unless the beamformee indicates support in the Ng = 16 For SU subfield or Ng = 16 For MU subfield, respectively, in the HE PHY Capabilities Information field of the HE Capabilities element it transmits (see 9.4.2.237 (HE Capabilities element)).~~

~~An HE beamformee may support a codebook size (ϕ, ψ) = {4, 2} in the HE Compressed Beamforming Report field for SU feedback type. A beamformer shall not request codebook size (ϕ, ψ) = {4, 2} in an HE NDP Announcement frame unless the beamformee indicates support in the Codebook Size (ϕ, ψ) = {4, 2} SU Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits (see 9.4.2.237 (HE Capabilities element)).~~

~~An HE beamformee may support a codebook size (ϕ, ψ) = {7, 5} in the HE Compressed Beamforming Report field for MU feedback type. A beamformer shall not request the codebook size (ϕ, ψ) = {7, 5} in an HE NDP Announcement frame unless the beamformee indicates support for the Codebook Size (ϕ, ψ) = {7, 5} MU Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities~~

~~element it transmits (see 9.4.2.237 (HE Capabilities element))~~

***TGax Editor: Please make the following change in red on Pg 266 ln 10 (#12684)(#13696):***

**27.6.3 Rules for HE sounding protocol sequences**

…

An HE beamformer that transmits an HE NDP Announcement frame and sets the Feedback Type and Ng subfield of the STA Info field to indicate MU shall indicate *Ng* = 4 or *Ng* = 16 in the Feedback Type and Ng subfield of the STA Info field (see Table 9-25a (Feedback Type And Ng subfield and Codebook Size sub-field encoding)).

An HE beamformee may support Ng = 16 in the HE Compressed Beamforming Report field for both SU and MU feedback types. A beamformer shall not request Ng = 16 for SU or MU feedback in an HE NDP Announcement frame unless the beamformee indicates support in the Ng = 16 For SU subfield or Ng = 16 For MU subfield, respectively, in the HE PHY Capabilities Information field of the HE Capabilities element it transmits (see 9.4.2.237 (HE Capabilities element)).

An HE beamformee may support a codebook size (ϕ, ψ) = {4, 2} in the HE Compressed Beamforming Report field for SU feedback type. A beamformer shall not request codebook size (ϕ, ψ) = {4, 2} in an HE NDP Announcement frame unless the beamformee indicates support in the Codebook Size (ϕ, ψ) = {4, 2} SU Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits (see 9.4.2.237 (HE PHY Capabilities element)).

An HE beamformee may support a codebook size (ϕ, ψ) = {7, 5} in the HE Compressed Beamforming Report field for MU feedback type. A beamformer shall not request the codebook size (ϕ, ψ) = {7, 5} in an HE NDP Announcement frame unless the beamformee indicates support for the Codebook Size (ϕ, ψ) = {7, 5} MU Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities

element it transmits (see 9.4.2.237 (HE Capabilities element)) (#12684)(#13696)

***TGax Editor: Please make the following change in red on Pg 109 ln 52 (#12690) (#12769) (#12772):***

In Table 9-76b (HE Compressed Beamforming Report information), *Ns* is the number of subcarriers for which the Compressed Beamforming Feedback Matrix subfield (9.4.1.63 HE Compressed Beamforming Report field) (#12772) is sent back to the beamformer. A beamformer or (#12690) beamformee, depending which of the two decides on the feedback parameters, (#12690) ~~may choose to~~ reduces (#12769) Ns by using a method referred to as grouping, in which only a single compressed beamforming feedback matrix is reported for each group of *Ng* adjacent subcarriers. For HE Compressed Beamforming Report, *Ns* is a function of the RU Start Index, RU End Index and Grouping subfields in the HE MIMO Control field (see 9.4.1.62 (HE MIMO Control field)). Subcarriers *scidx(0)* and *scidx(Ns -* 1*)* represent the S (Start)-tone corresponding to the RU Start Index and E (End)-tone corresponding to the RU End Index, respectively.

**References:**

1. **IEEE P802.11axTM/D2.0, Nov 2017.**