### IEEE P802.11 Wireless LANs

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| **11ax D3.0 sounding comments** | | | | |
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Abstract

This document contains proposed resolutions for sounding related comments on 802.11ax draft 3.0 (73 CIDs).

1. 15020, 15138, 15658, 15687, 15688, 15689, 15690, 15692, 15693, 15765,
2. 15767, 15768, 15876, 15922, 15923, 15924, 15927, 15966, 15988, 15989,
3. 16011, 16047, 16054, 16069, 16070, 16165, 16174, 16237, 16257, 16258,
4. 16260, 16272, 16298, 16299, 16300, 16301, 16302, 16303, 16304, 16305,
5. 16310, 16311, 16329, 16330, 16337, 16338, 16350, 16368, 16369, 16508,
6. 16672, 16679, 16680, 16703, 16743, 16756, 16874, 16955, 16956, 16958,
7. 16959, 16960, 16969, 16970, 16974, 16975, 17053, 17057, 17058, 17059,
8. 17060, 17107, 17119

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| **cid** | **commenter** | **p.l** | **clause** | **comment** | **proposed change** | **proposed resolution** |
| 15020 | Abhishek Patil | 120.30 | 9.4.1.62 | The description of Sounding Dialog Token Number is incorrect - it is a copy of the previous row (copy-paste error) | Provide the correct description for Sounding Dialog Token Number field | Revised - change to "Set to the same value as the Sounding Dialog Token Number field in the corresponding HE NDP Announcement frame." |
| 15138 | Albert Petrick | 303.61 | 27.6.2 | An MU beamformer is a also a SU beamformer, it states setting the SU beamformer subfield bit to 1 but doesn't state why. Needs clarification | Change text to read: An MU beamformer is also an SU beamformer and shall set the SU beamformer subfield to 1 when used as a SU beamformer. | Rejected - the cited text requires that an MU beamformer is also an SU beamformer, hence the SU beamformer subfield shall be set to 1. |
| 15658 | Hiroyuki Motozuka | 128.59 | 9.4.1.64 | "The AvgSNR(k,j) in Table 9-76h is found by computing the arithmetic mean of the SNR per subcarrier in decibels ..."  The average SNR should be calculated with the following equation: SNR = mean(signal power) / mean(noise power). The mean in desibels have error especially when the variance is large (i.e. frequency selective channels)  Is there any evidence/simulation result to justify using mean in decibels? | Propose to define the average SNR as "SNR = mean(signal power) / mean(noise power)," and approximation during computation should be left for implementers.  The same comments for P125L55, P127L18, P386L12 | Rejected - the approximation for high SNR of the average Shannon capacity over subcarriers can be shown to be proportional to the arithmetic mean of the SNR per subcarrier in dB, hence the arithmetic mean of the SNR per subcarrier in dB is a good indication for rate control. This has been used since 11n. |
| 15687 | Huizhao Wang | 304.33 | 27.6.2 | Partial or full BW SU feedback has no material relation with whether the sounding sequence is HE non-TB sequence or HE TB sounding sequence | Change the text:"An SU beamformer may solicit full bandwidth SU feedback from an SU beamformee in an HE non-TB sounding sequence. *An SU beamformer shall not solicit partial bandwidth SU feedback in an HE non-TB sounding sequence*. An SU beamformer may solicit partial bandwidth or full bandwidth SU feedback from an SU beamformee in an HE TB sounding sequence if the SU beamformee indicates support by setting the Triggered SU Beamforming Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits to 1."  To:  "An SU beamformer may solicit full bandwidth SU feedback from an SU beamformee in an HE non-TB sounding sequence. An SU beamformer may solicit partial bandwidth or full bandwidth SU feedback from an SU beamformee in an HE TB sounding sequence or HE non-TB sounding sequence if the SU beamformee indicates support by setting the Triggered SU Beamforming Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits to 1." | Rejected - the current text reflects what was decided in the task group. The requested addition of a new mode is considered to add complexity without sufficient technical benefit. |
| 15688 | Huizhao Wang | 304.61 | 27.6.2 | Need to clearify that if all conditions should be met, or any of the conditions should be met to prohibit sending HE TB sounding sequence | As specified in comment | Revised - change as shown in <this document> under CID 15688. The change implements the request by the commenter and makes some editorial improvements. |
| 15689 | Huizhao Wang | 306.16 | 27.6.3 | Partial or full BW SU feedback has no material relation with whether the sounding sequence is HE non-TB sequence or HE TB sounding sequence | Remove the text:  "An HE beamformer shall not initiate an HE non-TB sounding sequence with an HE NDP Announcement frame that has a Partial BW Info field that indicates less than full bandwidth (see Table 27-4 (Settings for BW, RU Start Index, and RU End Index fields in HE NDP Announcement frame))." | Rejected - the current text reflects what was decided in the task group. The requested addition of a new mode is considered to add complexity without sufficient technical benefit. |
| 15690 | Huizhao Wang | 307.04 | 27.6.3 | HE non-TB beamformer may suggest to the beamformee on: Ng, codebook size, Nc. And Beamformee may choose to ignore the suggestion from HE non-TB beamformer | Change the text:  "except when the HE NDP Announcement frame contains only one STA Info field, in which case the subcarrier grouping, Ng, codebook size and the number of columns, Nc, in the compressed beamforming feedback matrix to be used for the generation of the HE compressed beamforming and CQI report shall be determined by the recipient of the HE NDP Announcement frame."  To:  "When the HE NDP Announcement frame contains only one STA Info field, in which case the subcarrier grouping, Ng, codebook size and the number of columns, Nc, in the compressed beamforming feedback matrix to be used for the generation of the HE compressed beamforming and CQI report may be accepted by the recipient of the HE NDP Announcement frame to generate the feedback." | Rejected - the current text reflects what was decided in the task group. The requested addition of a new mode is considered to add complexity without sufficient technical benefit. |
| 15692 | Huizhao Wang | 308.17 | 27.6.3 | Remove the dependancy of HE TB sounding sequence over requesting partial BW feedback | Remove the text:  "and the sequence is an HE TB sounding sequence (see 27.6.2 (Sounding sequences and support))" | Rejected - the current text reflects what was decided in the task group. The requested addition of a new mode is considered to add complexity without sufficient technical benefit. |
| 15693 | Huizhao Wang | 308.23 | 27.6.3 | Beamformer may suggest to beamformee the parameters of: Nc, Ng, feedback type | Remove the text:  "An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc subfield to 0 and the Feedback Type And Ng subfield to 0 except when the HE NDP Announcement frame requests CQI-only feedback." | Rejected - the current text reflects what was decided in the task group. The requested addition of a new mode is considered to add complexity without sufficient technical benefit. |
| 15765 | Jian Yu | 303.10 | 27.6 | An UL sounding mechanism for multiple STAs is needed for UL MU scheduling or user grouping. | Add sounding sequences and related rules for UL MU sounding | Rejected - the comment does not provide a rationale for the requested change and no submission was made. |
| 15767 | Jian Yu | 311.43 | 27.6.4 | The note uses words like: can, cannot. Use words like shall, may to make it clear if it is mandatory or optional. It is better to have a mechanism to collect the missing segments instead of repeating the whole process, which is a big overhead. In VHT, there is BF report poll. 11ax can use that | As in comment | Revised - notes can not contain normative statements, but they reflect or clarify normative statements elsewhere in the draft. Change the note to: "NOTE—When using non-TB sounding, if the HE beamformer does not successfully receive all feedback segments, the HE beamformer cannot use a BFRP Trigger frame to request retransmission of the missing feedback segments. In this case the HE beamformee can only repeat the entire non-TB sounding sequence.". The note reflects that the STA Info field does not convey information other than the AID11 in case of non-TB sounding. |
| 15768 | Jian Yu | 312.03 | 27.6.5 | Use HE sounding NDP transmision, as there are two kinds of HE NDP in 11ax | As in comment | Revised - replace all occurrences of "HE NDP PPDU" with "HE sounding NDP" (~23x) and replace all occurrences of "HE TB NDP PPDU" with "HE feedback NDP" (3x). At 94.31 replace "HE NDP" with "HE sounding NDP". At 121.6 change "NDP" to "HE sounding NDP" (2x), at 121.10 change "NDP" to "HE sounding NDP". At 159.22, 159.23, 159.31, 159.32, 159.43, 159.50, 222.50, 222.52, 222.52 change "HE NDP" to "HE sounding NDP". |
| 15876 | Liwen Chu | 120.29 | 9.4.1.62 | The descripion of Sounding Dialog Token is not right. Fix it. | As in the comment | Revised - change to "Set to the same value as the Sounding Dialog Token Number field in the corresponding HE NDP Announcement frame." |
| 15922 | Lochan Verma | 303.64 | 27.6.2 | "An MU beamformee is a non-AP HE STA (support for the MU beamformee role is mandatory in a non-AP HE STA). An HE AP is not an MU beamformee." -- This text is not precise and needs to be improved. | Change to "A non-AP HE STA shall support operation as an MU beamformee. An HE AP does not support operation as an MU beamformee." | Accepted |
| 15923 | Lochan Verma | 304.58 | 27.6.2 | "An HE beamformer shall not send an HE NDP Announcement frame that initiates an HE TB sounding sequence with a STA Info field addressed to an HE beamformee if the STA Info field and the PHY Capabilities Information field in the HE Capabilities element last received from the HE beamformee meet the following conditions:" --This text seems to be flawed in logic as it is talking about not sending the NDPA under certain conditions and the conditions are dependent on something contained in the NDPA (STA info). | The text should describe what you cannot do in the STA Info field when certain capabilities are not supported. Please make necessary changes to make the logic clear. | Revised - change as shown in <this document> under CID 15688. The change implements the request by the commenter and makes some editorial improvements. |
| 15924 | Lochan Verma | 305.00 | 27.6.2 | "An HE beamformer shall not transmit an HE NDP Announcement frame that initiates an HE TB sounding sequence and that solicits SU feedback, partial bandwidth MU feedback or CQI feedback unless the HE beamformer has set the Trigger SU feedback subfield, Triggered MU Beamforming Partial BW subfield or Triggered CQI Feedback subfield, respectively, to 1." --improve text | Change to "An HE beamformer shall not transmit an HE NDP Announcement frame that initiates an HE TB sounding sequence soliciting an SU feedback, partial bandwidth MU feedback or CQI feedback unless the HE beamformer has set the Trigger SU feedback subfield, Triggered MU Beamforming Partial BW subfield or Triggered CQI Feedback subfield, respectively, to 1." | Revised - delete this paragraph, as it duplicates the requirements above. See also CID 16237. |
| 15927 | Mark Hamilton | 304.58 | 27.6.2 | This list of conditions is mutually exclusive. Assumably, the intent is to not send the Announcement to a beamformee that meets any one (or more) of the conditions. | Insert "any", so the lead-in sentence ends, "... if ... meet any (one or more) of the following conditions:" | Revised - change as shown in <this document> under CID 15688. The change implements the request by the commenter and makes some editorial improvements. |
| 15966 | Mark RISON | 304.13 | 27.6.2 | "Full bandwidth feedback is solicited if the RU Start Index subfield in the Partial BW subfield is 0 and the following conditions apply:" duplicates Table 27-4 | Change "Full bandwidth feedback is solicited if the RU Start Index subfield in the Partial BW subfield is 0 and the following conditions apply:" and the following bullets to "Full bandwidth feedback is solicited if the RU Start Index subfield in the Partial BW subfield is 0 and the RU End Index subfield in the Partial BW subfield is the value shown in Table 27-4 where partial bandwidth is not supported by the HE beamformer, for the bandwidth of the HE NDP Announcement frame" | Revised - change as shown in <this document> under CID 15966. A reference to Table 27-4 is added, but the verbatim description is maintained yet improved. |
| 15988 | Mark RISON | 312.15 | 27.6.5 | "Otherwise, NUM\_STS is set to any value.", well no, only a value in the range 1-8 | Change "NUM\_STS is set to any value." to "NUM\_STS is set to any value in the range 1 to 8." at the referenced location | Accepted. |
| 15989 | Mark RISON | 312.15 | 27.6.5 | "Otherwise, NUM\_STS is set to any value." contradicts " The NUM\_STS parameter may be set to any value, subject to the constraint of the previous sentence" below | Change "Otherwise, NUM\_STS is set to any value." to "See below for additional constraints on NUM\_STS." at the referenced location and change "The NUM\_STS parameter may be set to any value" to " The NUM\_STS parameter may be set to any value in the range 1 to 8" at 312.47 | Revised – change as shown in <this document> under CID 15989. The changes implement along the lines sugested in the comment. |
| 16011 | Mark RISON | 126.32 | 9.4.1.64 | In HE MU Exclusive Beamforming Report field there are references to Equation (9-2) but this doesn't work as Equation (9-2) is specifically about VHT ("the average SNR of space-time stream i reported in the VHT Compressed Beamforming Report information") | At the referenced location change " is computed using Equation (9-2). In Equation (9-2), k is the subcarrier index in the range scidx(0), ..., scidx(Ns - 1)." to " is computed using Equation (9-2) except that k is the subcarrier index in the range scidx(0), ..., scidx(Ns - 1) and <bar>SNR\_i is the average SNR of space-time stream i reported in the HE Compressed Beamforming Report information (Average SNR of Space-Time Stream i field).". In Table 9-76 after every "(9-2)" insert " as modified above" | Revised - change as shown in <this document> under CID 16011. The changes implement what the commenter requests with some minor edits. |
| 16047 | Mark RISON | 306.57 | 27.6.3 | It should be possible to do HE BF to a peer TDLS STA; in this case the AID subfield should be set to 0 (like for IBSS and MBSS peers) | Change the para at the referenced location to "An HE beamformer that transmits an HE NDP Announcement frame to an HE beamformee that is an AP, TDLS peer STA, mesh STA or IBSS STA shall include one STA Info field in the HE NDP Announcement frame and shall set the AID11 field in the STA Info field of the frame to 0. An HE beamformer that is an AP and transmits an HE NDP Announcement frame to one or more HE beamformees shall set the AID11 field in the STA Info field addressed to a non-AP STA to the 11 LSBs of the AID of the non-AP STA. An HE NDP Announcement frame shall not include more than one STA Info field that has the same value in the AID11 subfield." | Revised - change as shown in <this document> under CID 16047. The changes implement what the commenter requests with some minor edits. |
| 16054 | Mark RISON | 306.42 | 27.6.3 | "An HE AP shall not send an HE NDP Announcement frame with STA Info fields that are addressed to STAs from two or more BSSs of a multiple BSSID set to a STA unless the STA has set the Rx Control Frame To MultiBSS subfield" -- which is "a/the STA"? | Change the cited text at the referenced location to "An HE AP shall not send an HE NDP Announcement frame with STA Info fields that are addressed to STAs from two or more BSSs of a multiple BSSID set unless all the STAs have set the Rx Control Frame To MultiBSS subfield" | Revised - change as shown in <this document> under CID 16054. The changes implement what the commenter requests with some minor edits. |
| 16069 | Mark RISON | 306.60 | 27.6.3 | "An HE beamformer that transmits an HE NDP Announcement frame to one or more HE beamformees that are non-AP STAs shall set the AID11 field in the STA Info field addressed to a non-AP STA to the 11 LSBs of the AID of the non-AP STA." contradicts "An HE beamformer that transmits an HE NDP Announcement frame to an HE beamformee that is an AP, mesh STA or STA that is a member of an IBSS, shall include one STA Info field in the HE NDP Announcement frame and shall set the AID11 field in the STA Info field of the frame to 0. " because mesh STAs and IBSS STAs are non-AP STAs | At the referenced location change "An HE beamformer that transmits " to "Otherwise, an HE beamformer that transmits " | Revised - change as shown in <this document> under CID 16069. The changes implement what the commenter requests with some minor edits. |
| 16070 | Mark RISON | 307.19 | 27.6.3 | "An HE beamformer that transmits an HE NDP Announcement frame and sets the Feedback Type And Ng subfield of a STA Info field to indicate MU shall set the Nc subfield of the STA Info field to a value less than or equal to the minimum of" but that subfield contains the actual Nc minus one | In the cited text at the referenced location change "to a value" to "to indicate a value" | Accepted. |
| 16165  updated | Mark RISON | 120.42 | 9.4.1.63 | "For 40 MHz and 80 MHz, [...] 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." -- the case of 160 MHz and 80+80 MHz is missing | Describe how scidx(i) is derived from scidx(i-1) (or otherwise) for 160 and for 80+80, covering both the "S-tone and E-tone indices lie on different sides of DC" and "same sides of DC" cases | Revised - agree with the comment. Modify as shown in <this document> under CID 16165. |
| 16174  updated | Mark RISON | 119.20 | 9.4.1.62 | "Set to 0 for Nr = 1" is not a valid setting for CBF | Change to "0 is reserved" | Rejected - Nr is not reserved for CQI feedback.  D3.2 P324L62: "NUM\_STS indicates two or more space-time streams if the Feedback Type field in the HE MIMO Control field of the preceding HE NDP Announcement frame is set to either SU or MU. Otherwise, NUM\_STS is set to any value."    So, a BFer may send a 1SS NDP when requesting CQI feedback, in which case the only choice for Nr in the MIMO Control field is 1 Nr (Nr value of 0). |
| 16237 | Mark RISON | 305.26 | 27.6.2 | "An HE beamformer shall not transmit an HE NDP Announcement frame that initiates an HE TB sounding sequence and that solicits SU feedback, partial bandwidth MU feedback or CQI feedback unless the HE beamformer has set the Trigger SU feedback subfield, Triggered MU Beamforming Partial BW subfield or Triggered CQI Feedback subfield, respectively, to 1." duplicates the bullets above | Delete the cited para | Accepted |
| 16257 | Mark RISON | 128.19 | 9.4.1.65 | "Ncqi = (RUEndIndex - RUStartIndex) + 1, where RUStartIndex and RUEndIndex are the RU Start Index and RU End Index subfields in the HE MIMO Control field. The RU indices ruidx(0) and ruidx(Ncqi - 1) are equal to the RU Start Index and RU End Index subfields, respectively." -- no need for intermediate variables | Change the cited text to "Ncqi = (ruidx(Ncqi - 1) - ruidx(0)) + 1, where ruidx(0) and ruidx(Ncqi - 1) are equal to the RU Start Index and RU End Index subfields in the HE MIMO Control field, respectively." | Rejected - the current text is currently clear. |
| 16258 | Mark RISON | 122.02 | 9.4.1.63 | "Ns is a function of the RU Start Index, RU End Index and Grouping subfields in the HE MIMO Control field " -- the function needs to be specified | As it says in the comment | Rejected - the sentence conveys what Ns is dependent on, which is useful, but does not imply a requirement to define the function. |
| 16260 | Mark RISON | 122.35 | 9.4.1.63 | "(S, E) for 80 MHz" is unclear, especially when the RU index is different (e.g. at 123.17, with 20M index 1, is the "(S, E) for 80 MHz" the one for the same row (i.e. 80M index 15) or the one for 80M index 1?) | Just give the value directly | Revised - add 122.24, at the end of the first sentence of the first paragraph (after "for Ng = 16"), add ", where the (S, E) references are at the same row". Keeping the (S, E) references does add clarity to the way in which some of the values are derived. |
| 16272 | Mark RISON | 120.42 | 9.4.1.63 | The rules for which subcarriers are in HE CBR is grotesquely complex (e.g. different rules for 20M and 40M+, outside subcarriers not necessarily Ng-separated from adjacent subcarrier, hand-waving for 160/80+80). Needs to be simplified both technically and editorially, especially for partial-BW's sake, otherwise there is essentially zero chance of interoperability | As it says in the comment | Rejected - the comment does not identify a technical deficiency in the draft, other than a conjecture that the rules are too complex. There has been no concrete proposal to simplify the rules. |
| 16298 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding: - To avoid confusion between "addresses" in the context of the RA and in the context of a STA Info field's AID11, the latter should be referred to as "identifies" | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16299 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding: - The wording for non-infrastructure BSSes is self-contradictory | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16300 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding: - The requirement for each STA Info to identify a different STA should be taken out of Clause 9 (it's already in Clause 27) | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16301 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding: - The Codebook Size subfield is ignored in non-TB sounding too, so should (like the Nc and Feedback Type And Ng subfields) be set to 0 | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16302 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding: - HE NDPAs can only be transmitted by HE STAs to HE STAs, so qualifiers like "to/from an HE beamformee" do not need to be constantly repeated (a single statement at the beginning suffices) | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16303 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding:  - TB sounding can be used for SU and CQI feedback, not just MU feedback | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16304 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding:  - It is not clear which of the various fields are N/A or ignored in which contexts | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16305 | Mark RISON | 306.01 | 27.6.3 | There are various issues with the description of HE sounding:  - Some of the wording needs caveats to allow for the case where a STA Info field is a fake that does not actually identify an actual STA | Make the changes indicated in 18/0737 | Rejected - the comment is related to an older version of the draft. The changes in 18/737 can not be made because the draft has changed substantially since. |
| 16310  updated | Mark RISON | 306.01 | 27.6.3 | (Ref 18/0446) Instead of saying:  An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc subfield to 0 and the Feedback Type And Ng subfield to 0 except when the HE NDP Anouncement frame requests for CQI-only feedback (#12699).  The HE beamformee that is the intended receiver of an HE NDP Announcement frame that has only one STA Info field shall  ignore the values of the Nc subfield except when the HE NDP Anouncement frame requests for CQI-only feedback (#12699), Ng subfield (B26 of the STA Info subfield) and Codebook Size subfield.  say something like:  An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall do one of the following:  \* set the Feedback Type And Ng, Codebook Size and Nc subfields to 0  \* set the Feedback Type And Ng and Codebook Size subfields to indicate CQI-only feedback (see Table 9-25a (Feedback Type And Ng subfield and Codebook Size subfield encoding)), if the intended receiver supports this (see 27.6.2)  The HE beamformee that is the intended receiver of an HE NDP Announcement frame that has only one STA Info field shall:  \* if the Feedback Type And Ng and Codebook Size subfields indicate CQI-only feedback, return CQI-only feedback (with the specified Nc), if it supports this  \* otherwise, ignore the values of the Feedback Type And Ng, Codebook Size and Nc subfields and return SU-type feedback (it selects Ng, codebook size and Nc)  Also need changes in:  The HE NDP Announcement frame shall indicate the Ng, codebook and Nc to be used by the intended HE beamformees for the generation of HE compressed beamforming feedback except when the HE NDP Announcement frame contains only one STA Info field, in which case the Ng, codebook and Nc to be used for the generation of the HE compressed beamforming feedback report shall be determined by the recipient of the HE NDP Announcement frame.  to take account of the fact that Nc is specified by the BFer (not determined by the BFee) in the case of non-TB CQI-only FB, and also changes in in:  An HE beamformer that transmits an HE NDP Announcement frame and sets the Feedback Type And Ng subfield of a STA Info field to indicate MU shall set the Nc subfield of the STA Info field to a value less than or equal to the minimum of:  to cover the CQI-only case too. | As it says in the comment | Mark requested input from the editor on where the paragraph went.  Rejected - the cited paragraph appears to be at 309.23, but is quite different from the paragraph cited in the comment. It is not possible to act on the comment.  An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc subfield to 0 and the Feedback Type And Ng subfield to 0 except when the HE NDP Announcement frame requests CQI-only feedback.  The HE beamformee that is the intended receiver of an HE NDP Announcement frame that has only one STA Info field shall  provide SU-type feedback and may use different Nc, Ng, and codebook size parameters from those indicated in the HE NDP Announcement frame (i.e., the HE beamformee ignores the values of the Nc subfield except when the HE NDP Announcement frame requests CQI-only feedback, Ng subfield (B26 of the STA Info subfield), Codebook Size subfield, Partial BW Info subfield).  An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall do one of the following:  \* set the Feedback Type And Ng, Codebook Size and Nc subfields to 0  \* set the Feedback Type And Ng and Codebook Size subfields to indicate CQI-only feedback (see Table 9-25a (Feedback Type And Ng subfield and Codebook Size subfield encoding)), if the intended receiver supports this (see 27.6.2)  The HE beamformee that is the intended receiver of an HE NDP Announcement frame that has only one STA Info field shall:  \* if the Feedback Type And Ng and Codebook Size subfields indicate CQI-only feedback, return CQI-only feedback (with the specified Nc), if it supports this  \* otherwise, ignore the values of the Feedback Type And Ng, Codebook Size and Nc subfields and return SU-type feedback (it selects Ng, codebook size and Nc) |
| 16311 | Mark RISON | 305.36 | 27.6.2 | "An HE beamformee shall set the Beamformee STS <= 80 MHz subfield to indicate a maximum number of HE-LTFs of 4 or greater." is already in Clause 9 | Delete the cited sentence | Accepted. |
| 16329 | Mark RISON | 120.15 | 9.4.1.62 | "Set to 0 if not the first feedback segment or if the HE Compressed Beamforming Report field and HE MU Exclusive Beamforming Report field are not present in the frame." -- so always 0 for CQI feedback? This is counter-intuitive for a field called "First Feedback Segment" | Add a "NOTE---The First Feedback Segment subfield is always set to 0 for CQI feedback." | Revised - add " NOTE---The First Feedback Segment subfield is always set to 0 for CQI feedback  because CQI feedback is always less than 11454 octets.". |
| 16330  updated | Mark RISON | 127.14 | 9.4.1.65 | 9.4.1.63/64 describe the use to which HE Compressed Beamforming Report field and HE MU Exclusive Beamforming Report field can be put ("for use by a transmit beamformer to determine steering matrices Q, as described in 10.32.3 (Explicit feedback beamforming) and 19.3.12.3 (Explicit feedback beamforming)." and "can be used by the transmit MU beamformer to determine the steering matrices Q, as described in 28.3.3.1 (DL MU-MIMO)."), but 9.4.1.65 says nothing about the use to which HE CQI-only Report field can be put | Add some words to the first para to describe what the SNRs can be used for | Revised - agree with the comment.  at 127.20, add "The CQI-only report can be used to obtain information about the quality of the link. ". |
| 16337 | Mark RISON | 309.24 | 27.6.3 | "An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc subfield to 0 and the Feedback Type And Ng subfield to 0" -- the Codebook Size is also not used so should be set to 0 too | Change to "An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc, Feedback Type And Ng and Codebook Size subfields to 0" | Accepted |
| 16338 | Mark RISON | 309.24 | 27.6.3 | "An HE beamformer that transmits an HE NDP Announcement frame that has only one STA Info field shall set the Nc subfield to 0 and the Feedback Type And Ng subfield to 0" -- should reserve, not force to 0 | Change to say the fields are reserved | Rejected - setting these fields to reserved implies that there may be some future use of them when only one STA Info field is present. |
| 16350  updated | Mark RISON | 121.37 | 9.4.1.63 | "Compressed Beamforming Feedback Matrix subfield" -- no such subfield. It is arguable that Table 9-76b implies that there is a set of such subfields (one per subcarrier) but this is certainly not clear and also " the Compressed Beamforming Feedback Matrix subfield " in 9.3.1.20 and 9.4.1.63 is not clear either since "the" has no antecedent | Add a figure showing a "Compressed Beamforming Feedback Matrix" subfield to the referenced subclause | Revised -  At the end of 9.3.1.19 (101.7 in D3.2) change "in the Compressed Beamforming Feedback Matrix subfield" to "in the compressed beamforming feedback matrix".    In 9.4.1.65 (127.62 in D3.2) change "the Compressed Beamforming Feedback Matrix subfield (see 9.4.1.65 (HE Compressed Beamforming Report field))" to "the compressed beamforming feedback matrix" (deliberately deleting xref, since it's to the same subclause).    Fix the xrefs to Table 9-67 in Table 9-94b by changing to Table 9-73, and in third para of 9.4.1.65 (126.65 in D3.2). |
| 16368 | Mark RISON | 122.00 | 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 | Rejected - The case where i=L+1 is defined in the sentence quoted by the commenter: “scidx(L + 1) = 4”.  The case where i=Ns-1 is defined in Table 9-94c in 11ax draft 3.2. Table 9-94c defines scidx() for i=0 and Ns-1 together with the sentence "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. "  The sentences quoted by the commenter are trying to define scidx() for i=1~Ns-2. |
| 16369  updated | Mark RISON | 303.13 | 27.6.1 | The concepts "SU-type" and "MU-type" are never defined | Define these concepts; also have a NOTE that the way in which the feedback is obtained (trigger-based, i.e. UL MU or non-trigger-based, i.e. UL SU) is orthogonal to the feedback type | Revised - given that the baseline sees no need to say "-type" after MU or SU, HE might not need to either. Therefore,  - Delete "-type" in "MU-type" and "SU-type" throughout (Table 9-262aa, 27.6.3, C.3)    - Before the last para of 27.6.1 add the following note:    "NOTE---Use of TB sounding does not necessarily imply MU feedback. TB sounding can be used to obtain SU feedback."  (Note that we don't need to mention the other case, since non-TB sounding cannot be used to obtain MU feedback.) |
| 16508 | Oghenekome Oteri | 304.15 | 27.6.2 | " Full bandwidth feedback is solicited if the RU Start Index subfield in the Partial BW subfield is 0 and the following conditions:"., Does this mean "all" of the following conditions or "any/one" ? Need to clarify. | Make "any/one of the following conditions" | Revised - change as shown in <this document> under CID 16508. This changes "and the following conditions apply" to "and any of the following conditions apply". |
| 16672 | Robert Stacey | 304.42 | 27.6.2 | It is not clear that MU feedback can only be solicited using the TB sounding sequence. | Add a sentence to this paragraph: "An MU beamformer shall not solicit MU feedback in an HE non-TB sounding seqeunce." | Accepted. |
| 16679 | Robert Stacey | 309.34 | 27.6.3 | It is defined as a sequence at P306L4, not as a "protocol". Also, "single HE beamformee" is not part accurate (not part of the definition). | Change to read "An example of an HE non-TB sounding sequence is shown in Figure 27-6." and move anchor to paragraph that defines the sequence (P306L4). | Accepted. |
| 16680 | Robert Stacey | 310.01 | 27.6.3 | It is defined as a sequence at P306L21, not as a "protocol". Also, more than one HE beamformee is not accurate (not part of the definition). | Change to read "An example of an HE TB sounding sequence is given in Figure 27-7." and move anchor to paragraph that defines the sequence (P306L21). | Accepted. |
| 16703 | ron porat | 140.27 | 9.4.1.65 | Tabel 9.76g defines the CQI report format, i.e. 'Average SNR for space-time stream X for RU index k', where X can be 1, 2, ..., Nc. Just like the compress V feedback format, where the columns of V are following eigen modes in the descending order, propose to clearly specify the space-time streams are ordered in descending order of the eigen modes. | add a note for table 9.76g: space-time streams are ordered in descending order of their corresponding eigen values. | Rejected - the term eigen values is not used in the draft, and also not in REVmd draft 1.5. |
| 16743 | Sigurd Schelstraete | 122.14 | 9.4.1.63 | "For the left of DC, scidx(i) = scidx(i-1) + Ng, where 1 Γëñ i Γëñ L, L is the number of subcarriers on the left of DC for which feedback is sent to the beamformer and scidx(L) = -4."  It looks like scidx(L) is defined twice. Once by "scidx(i) = scidx(i-1) + Ng, where 1 <= i <= L" and once explicitly as "scidx(L) = -4". Probably the range of i should be 1 <= i < L. | Change "1 <= i <= L" to "1 <= i < L" | Revised - agree with the comment. Change “1 <= i <= L” to “1 <= i < L”. |
| 16756  updated | Sigurd Schelstraete | 307.11 | 27.6.3 | "An HE beamformer that transmits an HE NDP Announcement frame with more than one STA Info field shall transmit a BFRP Trigger frame a SIFS after the HE NDP to solicit an HE compressed beamforming and CQI report".  SU-style feedback should also be allowed for multiple STA Info fields, similar to the 11ac sounding protocol. | Allow SU feedback of compressed beamforming and CQI report, similar to 11ac. | Rejected – This is already allowed per D3.0 clause 27.6.2, at 304.36:  "An SU beamformer may solicit partial bandwidth or full bandwidth SU feedback from an SU beamformee in an HE TB sounding sequence if the SU beamformee indicates support by setting the Triggered SU Beamforming Feedback subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits to 1." |
| 16874 | Stephen McCann | 308.28 | 27.6.3 | There are CID mark-ups starting with "(#" within the document, which means it's not in a suitable state for sponsor ballot. | Remove CID mark-ups on this line and similar ones throughout the document. | Accepted. |
| 16955 | Xiaofei Wang | 303.63 | 27.6.2 | The sentence "An MU beamformee is a non-AP HE STA (support for the MU beamformee role is mandatory in a non-AP HE STA)." is very strange in stating a mandatory normative behavior | Change the sentence "An MU beamformee is a non-AP HE STA (support for the MU beamformee role is mandatory in a non-AP HE STA)." into "A non-AP HE STA shall support the role of a MU beamformee." | Revised - agree with the comment. Implement changes shown in <this document> under CID 16955. |
| 16956 | Xiaofei Wang | 303.63 | 27.6.2 | Is the support for SU Beamformeee also mandatory? | Please clarify whether support for SU beamformee role is also mandatory? | Rejected - see 303.52: "A non-AP HE STA shall set the SU Beamformee subfield to 1. An HE AP may set the SU Beamformee subfield to 1." |
| 16958 | Xiaofei Wang | 306.21 | 27.6.3 | Since a figure 27-7 is already included in the spec, the text explaining HE TB Sounding should refer to it to further illustrate the procedure. | add a reference to Figure 27-7 | Revised - agree with the comment. At 306.3, at the end of the paragraph, add "See Figure 27-7 (An example of the sounding protocol with more than one HE beamformee)." |
| 16959 | Xiaofei Wang | 306.24 | 27.6.3 | "from an HE beamformee" should be "from HE beamformees" if "An HE beamformer that initiates an HE TB sounding sequence shall transmit the HE NDP Announcement frame with two or more STA Info fields and the RA field set to the broadcast address as the initial frame of the sequence.", meaning that there need to at least two beamformees. | Change "from an HE beamformees" to "from two or more HE beamformees" | Revised - at 306.30 delete "from an HE beamformee". |
| 16960 | Xiaofei Wang | 306.03 | 27.6.3 | Refer to Figure 27-6 to provide further illustration of HE non-TB sounding sequence. It would be strange if such an illustration is included in the spec, but the direct text description is not referring to it. | add a reference to figure 27-6 | Revised - agree with the comment. At 306.3, at the end of the paragraph, add "See Figure 27-6 (An example of the sounding protocol with a single HE beamformee)." |
| 16969 | Xiaogang Chen | 303.10 | 27.6 | sounding for 20MHz operating devices are not defined in spec | define the sounding rule for 20MHz device. e.g. Keep the current RU index in NDPA and the (S,E) tone index unchanged. For the 20MHz operating devices, they only feedback the CSI for the available tones overlapped with the (S,E) tone index. Since AP knows the available tones of 20MHz device, AP can parse the feedback information w/o ambiguity. E.g. 80MHz AP request CSI for RU 9 and RU10 ( -260 : -204), 20MHz device will feedback CSI for tone -204:-250. | Rejected - 20 MHz sounding is defined, see 304.17 (— The RU End Index subfield in the Partial BW subfield is 8 and the bandwidth of the HE NDP Announcement frame is 20 MHz).  Move to PHY |
| 16970 | Xiaogang Chen | 128.64 | 9.4.1.65 | CQI only feedback refer the SNR calculation to HE Compressed beamforming feedback. However, the SNR calculation in HE compressed BF is defined as " Each SNR value per subcarrier in stream i (before being averaged) corresponds to the SNR associated with column i of the beamforming feedback matrix V determined at the beamformee. Each SNR corresponds to the predicted SNR at the beamformee when the beamformer applies all columns of the matrix V." CQI only feedback doesn't feedback V, so which V should be referred for SNR calculation?  Also CQI only feedback cannot guarantee BFer apply the same V as BFee, so the "predicted SNR" is not applicable to CQI only FB. | Replace "The SNR per subcarrier calculation is defined in 9.4.1.63 (HE Compressed Beamforming Report field)", with "The SNR value per subcarrier in stream i (before being averaged) corresponds to the SNR associated with column i of the orthogonal matrix determined at the beamformee." | Rejected - V is indeed not part of the feedback in case of CQI-only feedback, but it can still be used to determine the SNR per subcarrier.  Move to PHY |
| 16974 | Xiaogang Chen | 304.17 | 27.6.2 | The description of full bandwidth feedback need to be refined for 20MHz operating non-AP STA. | as commented. | Rejected - 20 MHz sounding is defined at 304.17 (— The RU End Index subfield in the Partial BW subfield is 8 and the bandwidth of the HE NDP Announcement frame is 20 MHz).  Move to PHY |
| 16975 | Xiaogang Chen | 308.38 | 27.6.3 | If NDPA BW is greater than 20MHz, need to include 20MHz BW in the 2nd column of table 27-4 to support 20mHz device sounding | as commented | Rejected - the Operating channel width of the HE beamformee is always larger than or equal to the bandwidth of the HE NDP Announcement frame.  Move to PHY |
| 17053 | Yongho Seok | 306.23 | 27.6.3 | "The HE beamformer may send additional BFRP Trigger frames to solicit a subset of the HE compressed beamforming and CQI report in the same TXOP as shown in Figure 27-7 (An example of the sounding protocol with more than one HE beamformee)."  What does the subset of the HE compressed beamforming and CQI report mean? Please clarify it.  And, can't additional BFRP Trigger frames be sent in a different TXOP? if it is yes, please include the related normative text. Otherwise, remove "in the same TXOP". | As in comment. | Revised - per changes described in 11-18-1502-02-00ax-differentiating-tb-from-non-tb-sounding, under CID 16676. The text has been updated in to indicate that BFRP Trigger frames cannot be sent in TXOPs different from that containing the corresponding HE NDPA. |
| 17057 | Yongho Seok | 119.18 | 9.4.1.62 | When the Feedback Type is the CQI feedback, Nr Index shall be reserved.  Please add this missing statement. | As in comment. | Rejected - Nr is not reserved for CQI feedback.  D3.2 P324L62: "NUM\_STS indicates two or more space-time streams if the Feedback Type field in the HE MIMO Control field of the preceding HE NDP Announcement frame is set to either SU or MU. Otherwise, NUM\_STS is set to any value."    So, a BFer may send a 1SS NDP when requesting CQI feedback, in which case the only choice for Nr in the MIMO Control field is 1 Nr (Nr value of 0). |
| 17058 | Yongho Seok | 119.33 | 9.4.1.62 | When the Feedback Type is the CQI feedback, Grouping shall be reserved.  Please add this missing statement. | As in comment. | Revised - agree with the comment. At 119.37, in the "Grouping" row, add a new line "Reserved for CQI-only feedback". |
| 17059 | Yongho Seok | 119.38 | 9.4.1.62 | When the Feedback Type is the CQI feedback, Codebook Information shall be reserved.  Please add this missing statement. | As in comment. | Revised - agree with the comment. At 119.45, in the "Codebook Information" row, add a new line "Reserved for CQI-only feedback". |
| 17060 | Yongho Seok | 120.30 | 9.4.1.62 | "The ending RU index indicates the last RU26 for which the HE beamformer is requesting feedback."  Above explantion about the Sounding Dialog Token Number is not correct. | Change as the following: "The sounding dialog token from the VHT/HE NDP Announcement frame soliciting feedback" | Revised - change to "Set to the same value as the Sounding Dialog Token Number field in the corresponding HE NDP Announcement frame." |
| 17107 | Yujin Noh | 120.30 | 9.4.1.62 | Description of Sounding Dialog Token Number is not correct with copy and paste error from the above row |  | Revised - change to "Set to the same value as the Sounding Dialog Token Number field in the corresponding HE NDP Announcement frame." |
| 17119 | Yujin Noh | 310.54 | 27.6.3 | add "otherwise" before The HE beamformee shall not segment an HE compressed beamforming and CQI report that is CQI feedback |  | Revised - the otherwise is not needed at this location, because the normative statement is correct as is. However, at 310.54, change "CQI feedback" to "CQI-only feedback". In Table 9-25a (Feedback Type And Ng subfield and Codebook Size subfield encoding), at 95.39, change "CQI only" to "CQI-only". |

CID 15966, 16508

304.13 change as shown:

The bandwidth (partial or full) of the feedback solicited by an HE beamformer from an HE beamformee depends on the Partial BW subfield in the STA Info field addressed to the HE beamformee in the HE NDP Announcement frame and the bandwidth of the HE NDP Announcement frame. Full bandwidth feedback is solicited if the RU Start Index subfield in the Partial BW subfield is 0 and any of the following conditions apply (see Table 27-4 (Settings for BW, RU Start Index, and RU End Index fields in HE NDP Announcement frame)):

* The RU End Index subfield in the Partial BW subfield is 8 and the bandwidth of the HE NDP Announcement frame is 20 MHz
* The RU End Index subfield in the Partial BW subfield is 17 and the bandwidth of the HE NDP Announcement frame is 40 MHz
* The RU End Index subfield in the Partial BW subfield is 36 and the bandwidth of the HE NDP Announcement frame is 80 MHz
* The RU End Index subfield in the Partial BW subfield is 73 and the bandwidth of the HE NDP Announcement frame is 80+80 MHz or 160 MHz

CID 15688, 15923, 15924, 15927, 15966

304.58 change as shown:

An HE beamformer shall not send an HE NDP Announcement frame that initiates an HE TB sounding sequence with a STA Info field addressed to an HE beamformee, if the STA Info field and the PHY Capabilities Information field in the HE Capabilities element most recently received from the HE beamformee meet any of the following conditions, where FeedbackType refers to the Feedback Type And Ng subfield and the Codebook Size subfield in the STA Info field per Table 9-25a (Feedback Type And Ng subfield and Codebook Size subfield encoding):

* FeedbackType indicates SU and Ng = 16, and the Ng = 16 SU Feedback subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates MU and Ng = 16, and the Ng = 16 MU Feedback subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates SU with codebook resolution (ϕ, ψ) = {4, 2}, and the Codebook Size (ϕ, ψ) ={4, 2} SU Feedback subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates MU with codebook resolution (ϕ, ψ) = {7, 5}, and the Codebook Size (ϕ, ψ) ={7, 5} MU Feedback subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates CQI only feedback, and the Triggered CQI Beamforming Feedback subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates MU, the Partial BW subfield in the STA Info field indicates partial bandwidth, and the Triggered MU Beamforming Partial BW subfield in the HE PHY Capabilities Information field is 0
* FeedbackType indicates SU, and the Triggered SU Beamforming Feedback subfield in the HE PHY Capabilities Information field is 0

CID 16011

126.30 change as shown

For each subcarrier included, the deviation in dB of the SNR of that subcarrier for each column of *V* relative to the average SNR of the corresponding space-time stream is computed using Equation (9-2) except that k is the subcarrier index in the range scidx(0), ..., scidx(Ns - 1) and <SNRi> is the average SNR of space-time stream *i* reported in the Average SNR of Space-Time Stream i field of the HE Compressed Beamforming Report information field.

Note to editor: <> means overbar.

126.41

In Table 9-76f (HE MU Exclusive Beamforming Report information) after every "(9-2)" insert "as modified above".

CID 16047, 16069

306.57 change as shown

An HE beamformer that transmits an HE NDP Announcement frame to an HE beamformee that is an AP, TDLS peer STA, mesh STA or IBSS STA shall include one STA Info field in the HE NDP Announcement frame and shall set the AID11 field in the STA Info field of the frame to 0.

An HE beamformer that is an AP and transmits an HE NDP Announcement frame to one or more HE beamformees shall set the AID11 field in the STA Info field addressed to a non-AP STA to the 11 LSBs of the AID of the non-AP STA.

An HE NDP Announcement frame shall not include multiple STA Info fields with the same value in the AID11 subfield.

CID 16054

306.42 change as shown.

An HE AP shall not send an HE NDP Announcement frame with STA Info fields that are addressed to STAs from two or more BSSs of a multiple BSSID set unless each of the addressed STAs has set the Rx Control Frame To MultiBSS subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits to 1.

CID 16955

303.64 change as shown.

An MU beamformee is a non-AP HE STA that sets the MU Beamformee subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits to 1. A non-AP HE STA shall set the MU Beamformee subfield to 1. An HE AP shall not set the MU Beamformee subfield to 1.

CID 17053

307.10 change as shown.

An HE beamformer that transmits an HE NDP Announcement frame with more than one STA Info field shall transmit a BFRP Trigger frame a SIFS after the HE NDP to solicit an HE compressed beamforming and CQI report from the intended HE beamformees in the same TXOP, as shown in Figure 27-7 (An example of the sounding protocol with more than one HE beamformee). The HE beamformer may send additional BFRP Trigger frames to solicit additional HE compressed beamforming and CQI reports in the same TXOP.

CID 15989

At D3.2 P325L32, change

“The NUM\_STS parameter may be set to any value, subject to the constraint of the previous sentence, regardless of the value of the Supported HE-MCS and NSS Set field of the HE Capabilities element at either the transmitter or recipient of the HE NDP.”

to

"The Supported HE-MCS and NSS Set field of the HE Capabilities element transmitted by the transmitter and the receiver of the HE sounding NDP do not impact what values may be used for the NUM\_STS parameter for the TXVECTOR of an HE sounding NDP."

CID 16165

At 128.19, add

For 80+80 MHz and 160 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 and scidx(L) = -12.

For the right of DC, scidx(i) = scidx(i - 1) + Ng, where L + 2 ≤ i ≤ Ns - 2 and scidx(L + 1) = 12.