IEEE P802.11
Wireless LANs

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| Comment Resolutions on Section 26.3.6 Timing-related parameters |
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Abstract

This document provides PHY resolutions for the following CIDs on Clause 26.3.6. The baseline for this comment resolution document is 802.11ax Draft 0.1.

* CIDs: 279, 280, 282, 283, 839, 872, 1041, 1045, 1188, 1189, 1190, 1191, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 2345, 2364, 2520

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| **CID** | **Clause Number** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 279 | 26.3.6 | 83 | 26 | HE--SIG-A field duration for extended range SU shall be 16us. Remove 8us option and TBD | as in comment | Revised:A technical solution has been provided.Instruction to editor:Please modify the text according to the change indicated under CID 279 in 11-16/0625r2 |
| 839 | 26.3.6 | 83 | 29 | In the repetition mode, HE-SIG-A symbols are repeated once in time. We can remove TBD in HE-SIG-A-R in timing-related constants table. | Modify as "16 μs". | Revised The resolution is the same as CID 279 in IEEE 802.11-16/0625r2 |
| 872 | 26.3.6 | 83 | 29 | The content of the table 26-3 is not correct. The motion is passed that HE-SIG-A duration in an HE extended range SU PPDU is 16us. | Change "8 μs or 16 μs (TBD)" to "16 μs = 4 × 4 μs" in this subclause. | Revised The resolution is the same as CID 279 |
| 1041 | 26.3.6 | 83 | 29 | it has been decided that T HE-SIG-A-R is 16 us | modify it followed comment indication | Revised The resolution is the same as CID 279 in IEEE 802.11-16/0625r2 |
| 1939 | 26.3.6 | 83 | 29 | Duration of HE-SIG-A-R is 8 usec | Delete "or 16 usec (TBD)" | Revised: The passed motion says HE-SIG-A duration in an HE extended range SU PPDU is 16us.Instruction to editor:The same text change as in CID 279 in IEEE 802.11-16/0625r2  |
| 280 | 26.3.6 | 83 |  | The value of TPE: packet extension values have not been defined. | Introduce a row defining the TPE values of 0, 4 μs, 8 μs, 12 μs, 16μs | Accepted: A technical solution has been provided.Instruction to editor:The same text change as in CID 279 in IEEE 802.11-16/0625r2  |
| 282 | 26.3.6 | 86 | 25 | N\_ES and N\_ES,r,u is alwayas 1. Do we still need to define these two parameters? | Remove these two parameters | Accepted: A technical solution has been provided.Instruction to editor:Please modify the text according to the changes indicated under CID 282 in IEEE 802.11-16/0625r2 |
| 1944 | 26.3.6 | 86 | 25 | Remove N\_ES from Table | Since N\_ES is always 1, there is no need to define it as a parameter. | The same resolution as CID 282 in IEEE 802.11-16/0625r2 |
| 283 | 26.3.6 | 86 | 48 | What's the M\_r,u? Need to add some explanation | as in comment | Accepted: A technical solution has been provided.Instruction to editor: The same text changes as in CID 282 |
| 1045 | 26.3.6 | 83 |   | we should clarify HE-SIG-A-R, since it is not present in ppdu format | here we may define a general format as HE-SIG-A which includes 2 types as normal HE-SIG-A and repeat HE-SIG-A | Rejected:The timing variables defined in Timing-related constants do not have 1-to-1 mapping to the PPDU format, rather to make it easier in mathmatical description, see for eaxmple TSYM1, TSYM2, TSYM4, THE-LTF-1X, THE-LTF-2X, THE-LTF-4X, THE-LTF-SYM. So we think the definition of THE-SIG-A and THE-SIG-A-R are clear and consistent with definition of other variables in the table. |
| 1190 | 26.3.6 | 83 | 26 | HE Extended Range PPDU format shown in Figure 26-3 defines HE-SIG-A field only and does not define HE-SIG-A-R field. | 1. Merge two rows regarding "T\_HE-SIG-A" and "T\_HE-SIG-A-R" into a single row as follows:Parameter: T\_HE-SIG-AValues: 8 us = 2 \* 4us for an HE SU PPDU, HE MU PPDU and HE trigger-based PPDU;16us = 4 \* 4us for an HE extended range SU PPDUDescription: HE-SIG-A field duration2. change the expression of t\_HE-STF at Line 55, Page 96 as follows:t\_HE-STF = t\_HE-SIG-A+T\_HE-SIG-A, for an HE SU PPDU, HE trigger-based PPDU and an HE extended range SU PPDU = t\_HE-SIG-B+N\_HE-SIG-B\*T\_HE-SIG-B, for an HE MU PPDU |  Rejected:The same resolution as in 1045. Note to the commenter of CID 1190: your proposed change 2 (red highlighted) is irrelevant to the comment and this section. |
| 1188 | 26.3.6 | 83 | 6 | In Table 26-3, "T\_SYM1" should be equal to "T\_DFT,HE +T\_GI1,Data" instead of "T\_GI,HE-LTF+T\_GI1,Data""Similarly, "T\_SYM2" should be equal to "T\_DFT,HE+T\_GI2,Data" and "T\_SYM4" should be equal to "T\_DFT,HE+T\_GI4,Data" | Change "13.6us = T\_GI,HE-LTF + T\_GI1,Data" to "13.6 = T\_DFT,HE+T\_GI1,Data"Change "14.4us = T\_GI,HE-LTF + T\_GI2,Data" to "14.4 = T\_DFT,HE+T\_GI2,Data"Change "16us = T\_GI,HE-LTF + T\_GI4,Data" to "16 = T\_DFT,HE+T\_GI4,Data" | Accepted: A technical solution has been provided.Instruction to editor:The same text change as in CID 279 in IEEE 802.11-16/0625r2 |
| 1189 | 26.3.6 | 83 | 20 | "T\_L-STF" should be "T\_L-LTF" | Change "T\_L-STF" to "T\_L-LTF" | Accepted: A technical solution has been provided.Instruction to editor:The same text change as in CID 279 in IEEE 802.11-16/0625r2 |
| 1191 | 26.3.6 | 86 | 53 | The HE Extended Range SU PPDU format shown in Figure 26-3 includes HE-SIG-A field and does not include HE-SIG-A-R field. So HE-SIG-A-R field should not be part of Pre-HE modulated fields. | Delete "HE-SIG-A-R," from "Pre-HE modulated fields refer to the L-STF, L-LTF, L-SIG, RL-SIG, HE-SIG-A, HE-SIG-A-R, and HE-SIG-B fields" | Accepted: A technical solution has been provided.Instruction to editor:The same text change as in CID 282 in IEEE 802.11-16/0625r2 |
| 1934 | 26.3.6 | 82 | 42 | There is no definition of "pre-HE portion" | Define | Revised:“Pre-HE portion” here denotes pre-HE modulated fields as defined in Figure 26-21—Timing boundaries for HE PPDU fields. A technical solution has been provided.Instruction to editor:. The same text changes as in CID 279. |
| 1935 | 26.3.6 | 82 | 45 | Use of "HE portion" in definition is wrong | HE portion is defined in 26.3.9.1 as "The HE portion of HE format preamble consists of pre-HE modulated fields and HE modulated fields. The HE modulated fields consist of HE-STF and HE-LTF fields.".Replace "HE portion" with "HE modulated fields and Data". | Revised:HE modulated fields cover data field already. A technical solution has been provided.Instruction to editor: The same text changes as in CID 279 in IEEE 802.11-16/0625r2 |
| 1936 | 26.3.6 | 82 | 49 | Use of "HE portion" in definition is wrong | Replace "HE portion" with "Data". | Accepted:A technical solution has been provided.Instruction to editor:The same text changes as in CID 279 in IEEE 802.11-16/0625r2 |
| 1937 | 26.3.6 | 83 | 7 | Use "Base" or "Normal" consistently | Replace "Normal GI symbol" with "Base GI symbol" | Accepted:A technical solution has been provided.Instruction to editor:The same text changes as in CID 279 in IEEE 802.11-16/0625r2 |
| 1938 | 26.3.6 | 83 | 7 | Meaning of "symbol interval" not clear. | Replace "Symbol Interval" with "symbol duration". Also on lines 10 and 12. | Rejected:Same term is also used in 11ac spec. It is better to keep it consistant with 11ac spec. |
| 1940 | 26.3.6 | 83 | 38 | Move definition of HE-LTF till after definitions of HE-LTF-1X, HE-LTF-2X and HE-LTF-4X | see comment | Accepted:A technical solution has been provided.Instruction to editor: The same text changes as in CID 279 in IEEE 802.11-16/0625r2 |
| 1941 | 26.3.6 | 84 | 44 | Duplicated text and wrong reference | Lines 44-45 are a repetition of lines 1-2. They should give a short description of Table 26-5 instead. |

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| Accepted:A technical solution has been provided.Instruction to editor:Please modify the text according to the changes indicated under CID 1941 in 11-16/0625r2. | Lines 44-45 are a repetition of lines 1-2. They should give a short description of Table 26-5 instead. |

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| 1942 | 26.3.6 | 85 | 52 | Definition of N\_STS for MU PPDU | Do we need an explicit definition of N\_STS for MU? The number will be explicitly included in TXVECTOR and HE-SIG-B anyway. | Rejected:Both Nsts and Nss for MU defined here are used for mathematical description purpose, regardless how the values for these variables can be obtained. Note that they are used in 11ac spec for MU MIMO. |
| 1943 | 26.3.6 | 86 | 10 | Definition of N\_SS for MU PPDU | Do we need an explicit definition of N\_SS for MU? The number can be derived from N\_STS and STBC setting. | Rejected.The same as CID 1942 in IEEE 802.11-16/0625r2 |
| 2345 | 26.3.6 | 85 | 56 | The Table 26-6 should have N\_{HE-SIG-A} entry. | "N\_{HE-SIG-A}" should be defined in Table 26-6 as follow:"The number of OFDM symbols in the HE-SIG-A field" | Accepted:A technical solution has been provided.Instruction to editor:The same text changes as in CID 282 in IEEE 802.11-16/0625r2 |
| 2364 | 26.3.6 | 85 | 41 | Add N\_{user} as the number of users in MU-MIMO transmission which does not have RU index. | As in comment. | Rejected:Nuser is just a special case of Nuser,r. The variables defined in this table should be general variables used in math description.  |
| 2520 | 26.3.5 | 83 | 41 | To be consistent with T\_{DFT,HE}, change T\_{HE--LTF}, T\_{HE-LTF-1X}, T\_{HE-LTF-2X}, T\_{HE-LTF-4x} to T\_{DFT,HE-LTF}, T\_{DFT,HE-LTF-1X}, T\_{DFT,HE-LTF-2X}, T\_{DFT,HE-LTF4X}, respectively in Table 26-3. | Change T\_{HE--LTF}, T\_{HE-LTF-1X}, T\_{HE-LTF-2X}, T\_{HE-LTF-4x} to T\_{DFT,HE-LTF}, T\_{DFT,HE-LTF-1X}, T\_{DFT,HE-LTF-2X}, T\_{DFT,HE-LTF4X}, respectively. Probably need to change other equations in Clause 26 as well. | Rejected:T\_{DFT,HE} is defined for HE data portion only, which is not necessarily correlated with HE-LTF duration. Furthermore, definitions of T\_{HE--LTF}, T\_{HE-LTF-1X}, T\_{HE-LTF-2X}, T\_{HE-LTF-4x} are already clear enough to understand, which have been widely used in the spec writing.  |

**Red Lined Text Change for the Proposed Resolutions:**

**Changes to D0.1 Related to CID 279**

***Instructions for Editor: please modify Table 26-3 Timing related constants as follows:***

Table 26‑3 – Timing related constants

| **Parameter** | **Values** | **Description** |
| --- | --- | --- |
|  | 312.5 kHz | Subcarrier frequency spacing for the pre-HE ~~portion~~ modulated fields. |
|  | 78.125 kHz | Subcarrier frequency spacing for the HE ~~portion~~ modulated fields. |
| *TDFT,Pre-HE* | 3.2 µs | IDFT/DFT period for the pre-HE ~~portion~~ modulated fields. |
| *TDFT,HE* | 12.8 µs | IDFT/DFT period for the HE ~~portion~~ data. |
| *TGI,Pre-HE* | 0.8 µs | Guard interval duration for the legacy preamble, RL-SIG, HE-SIG-A and HE-SIG-B |
| *TGI,HE-LTF* | *TGI1,Data, TGI2,Data* or *TGI4,Data* depending on the GI used for data | Guard interval duration for the HE-LTF field, same as *TGI,Data* |
| *TGI,Data* | *TGI1,Data, TGI2,Data* or *TGI4,Data* depending on the GI used for data | Guard interval duration for the HE-Data field |
| *TGI1,Data* | 0.8 µs | Base guard interval duration for the HE-Data field. |
| *TGI2,Data* | 1.6 µs | Double guard interval duration for the HE-Data field.  |
| *TGI4,Data* | 3.2 µs | Quadruple guard interval duration for the HE-Data field.  |
| *TSYM1* | 13.6 µs ~~=~~ *~~T~~~~GI, HE-LTF~~* ~~+~~ *~~T~~~~GI1.Data~~* = *TDFT,HE* + *TGI1.Data =* 1.0625 *×* *TDFT.HE*  | ~~Normal~~ Base GI symbol interval |
| *TSYM2* | 14.4 µs ~~=~~ *~~T~~~~GI, HE-LTF~~* ~~+~~ *~~T~~~~GI2.Data~~* = *TDFT,HE* + *TGI2.Data =* 1.125× *TDFT,HE* | Double GI symbol interval |
| *TSYM4* | 16 µs = ~~=~~ *~~T~~~~GI, HE-LTF~~* ~~+~~ *~~T~~~~GI4.Data~~* = *TDFT,HE* + *TGI4.Data =* 1.25× *TDFT,HE* | Quadruple GI symbol interval |
| *TSYM* | *TSYM1,TSYM2,* or *TSYM4* depending on the GI used (see Table xx-x (Tone scaling factor and guard interval duration values for PHY fields)) | Symbol interval |
| *TL-STF* | 8 µs = 10 x *TDFT, Pre-HE* /4 | Non-HT Short Training field duration |
| *TL-~~S~~LTF* | 8 µs = 2 x *TDFT,Pre-HE* + *TGI2,Data* | Non-HT Long Training field duration |
| *TL-SIG* | 4 µs  | Non-HT SIGNAL field duration |
| *TRL-SIG* | 4 µs | Repeated non-HT SIGNAL field duration |
| *THE-SIG-A* | 8 µs = 2 × 4 µs | HE-SIG-Afield duration in an HE SU PPDU, HE MU PPDU and HE trigger-based PPDU |
| *THE-SIG-A-R* | ~~8 µs or 16 µs (TBD)~~ 16 μs = 4 × 4 μs | HE-SIG-A field duration in an HE extended range SU PPDU |
| *THE-STF-T* | 8 µs = 5 × 1.6 µs | HE-STF field duration for an HE trigger-based PPDU |
| *THE-STF-NT* | 4 µs = 5 × 0.8 µs | HE-STF field duration for an HE SU PPDU, HE extended range SU PPDU and HE MU PPDU |
| *THE-LTF-1X* | 3.2 µs | Duration of each 1x HE-LTF OFDM symbol without GI |
| *THE-LTF-2X* | 6.4 µs | Duration of each 2x HE-LTF OFDM symbol without GI |
| *THE-LTF-4X* | 12.8 µs | Duration of each 4x HE-LTF OFDM symbol without GI |
| *THE-LTF* | *THE-LTF-1X ,THE-LTF-2X or THE-LTF-4X* depending upon the LTF duration used | Duration of each HE-LTF field OFDM symbol without GI |
| *THE-LTF,SYM* | sum of *THE-LTF* and *TGI,HE-LTF* | Duration of each HE-LTF OFDM symbol including GI |
| *THE-SIG-B* | 4 µs = *TDFT,Pre-HE + TGI,Pre-HE* | Duration of each HE-SIG-B field OFDM symbol |
| *TPE* | 0, 4 µs, 8 µs, 12 µs, 16 µs depending on actual extension duration used | Duration of the Packet Extension field |
| *Nservice* | 16 | Number of bits in the SERVICE field |
| *Ntail* | 6 | Number of tail bits per BCC encoder |
| *TSYML* | 4 µs | Symbol duration including GI prior to the HE-STF field |
| *TPE* | 0, 4 µs, 8 µs, 12 µs, 16 µs depending on actual extension duration used | Duration of Packet Extension field |

**Changes to D0.1 Related to CID 282**

***Instructions for Editor: please remove Nes from the equation at Line 54 Page 136 in Section 26.3.10.4.1 Binary convolutional coding and puncturing***

***Instructions for Editor: please remove Nes from the equation at Line 23 Page 159 in Section 26.4.3 TXTIME and PSDU\_LENGTH calculation***

***Instructions for Editor: please remove the last sentence regarding Nes at Line 59-60 Page 160 in Section 26.5 1 Parameters for HE-MCSs***

***Instructions for Editor: please remove the Nes column in all the MCS tables in Page 160-200 in Section 26.5 1 Parameters for HE-MCSs***

***Instructions for the Editor: please modify the Table 26-6 Frequently used parameters as follows:***

Table 26‑6 - Frequently used parameters

|  |  |
| --- | --- |
| **Symbol** | **Explanation** |
| *NCBPS, NCBPS,r,u* | Number of coded bits per symbol at *r*-th RU for user *u*, r = 0, …, *NRU* – 1, *u* = 0, ..., *Nuser,r* – 1.For an HE SU PPDU, *NCBPS = NCBPS,0,0*For an HE MU PPDU, *NCBPS* is undefined |
| *NCBPSS, NCBPSS,r,u* | Number of coded bits per symbol per spatial stream.For the Data field, *NCBPSS,r,u* equals the number of coded bits per symbol per spatial stream at *r*-th RU for user *u*, r = 0, …, *NRU*-1, *u* = 0, ..., *Nuser,r*–1.For the Data field of an HE SU PPDU, *NCBPSS = NCBPSS,0,0*For the Data field of an HE MU PPDU, *NCBPSS* is undefined |
| *NDBPS, NDBPS,r,u* | Number of data bits per symbol at *r*-th RU for user *u*, r = 0, …, *NRU* – 1, *u* = 0, ..., *Nuser,r*– 1.For an HE SU PPDU, *NDBPS = NDBPS,0,0*For an HE MU PPDU, *NDBPS* is undefined |
| *NBPSCS, NBPSCS,r,u* | Number of coded bits per subcarrier per spatial stream at *r*-th RU for user *u*, r = 0, …, *NRU*– 1, *u* = 0, ..., *Nuser,r*– 1.For an HE SU PPDU, *NBPSCS = NBPSCS,0,0*For an HE MU PPDU, *NBPSCS* is undefined |
| *NRX* | Number of receive chains |
| *NRU* | For pre-HE modulated fields, *NRU* = 1. For HE modulated fields, *NRU* represents the number of RUs in the transmission (equal to the TXVECTOR parameter NUM\_RUS). |
| *Nuse~~t~~r,r* | For pre-HE modulated fields, *Nuse~~t~~r,r* = 1. For HE modulated fields, *Nuse~~t~~r,r* represents the number of users at *r*-th RU in the transmission (summing over all RUs equals to the TXVECTOR parameter NUM\_USERS\_TOTAL). |
| *Nuser\_total* | For pre-HE modulated fields, *Nuser\_total* = 1. For HE modulated fields, *Nuser\_total* represents the number of users in the transmission (equal to the TXVECTOR parameter NUM\_USERS\_TOTAL). |
| *NSTS*, *NSTS,r,u* | For pre-HE modulated fields, *NSTS,r,u* = 1 (see NOTE 2). For HE modulated fields, *NSTS,r,u* the number of space-time streams at *r*-th RU for user *u*, *u =*0*,…, Nuser,r* – 1. In case of STBC, *NSTS,r,u* = 2For an HE SU PPDU, *NSTS* = *NSTS,0,0*For an HE MU PPDU, $N\_{STS}=max\_{r=0}^{N\_{RU}-1}N\_{STS,r,total}$ |
| *NSTS,r,total* | For HE modulated fields, *NSTS,r,total* is the total number of space-time streams at the *r*-th RU in a PPDU.$$N\_{STS,r,total}=\sum\_{u=0}^{N\_{user,r}-1}N\_{STS,r,u}$$For pre-HE modulated fields, *NSTS,r,total* is undefined.Note that *NSTS,r,total* = *NSTS* for an HE SU PPDU. |
| *NSS*, *NSS,r,u* | Number of spatial streams. For the Data field, *NSS,r,u* is the number of spatial streams at *r*-th RU for user *u*, *u* = 0,…,*Nuser,r* – 1 For the Data field of an HE SU PPDU, *NSS* = *NSS,0,0*For the Data field of an HE MU PPDU,$ N\_{SS}=max\_{r=0}^{N\_{RU}-1}N\_{SS,r,total}$ |
| *NSS,r,total* | For HE modulated fields, *NSS,r,total* is the total number of spatial streams at *r*-th RU in a PPDU.$$N\_{SS,r,total}=\sum\_{u=0}^{N\_{user,r}-1}N\_{SS,r,u}$$For pre-HE modulated fields, *NSS,r,total* is undefined.Note that *NSS,r,total* = *NSS* for an HE SU PPDU. |
| *NTX* | Number of transmit chains |
| *~~N~~~~ES~~*~~,~~ *~~N~~~~ES,r,u~~* | ~~The number of BCC encoders. This parameter should be 1 in all BCC cases in 11ax.~~~~For a Data field encoded using BCC,~~ *~~N~~~~ES,r,u~~* ~~is the number of BCC encoders at~~ *~~r~~*~~-th RU for user~~ *~~u~~*~~,~~ *~~u =~~*~~0~~*~~,…, N~~~~user,r~~*~~– 1.~~~~For the Data field encoded using LDPC,~~ *~~N~~~~ES~~*~~= 1 for an HE SU PPDU and~~ *~~N~~~~ES,r,u~~* ~~= 1 for an HE MU PPDU at~~ *~~r~~*~~-th RU for user~~ *~~u~~*~~,~~ *~~u =~~*~~0~~*~~, …N~~~~user,r~~* ~~– 1.~~~~For the Data field of an HE SU PPDU,~~ *~~N~~~~ES~~* ~~=~~ *~~N~~~~ES,0,0~~*~~For the Data field of an HE MU PPDU,~~ *~~N~~~~ES~~*~~is undefined.~~ |
| *NHE-LTF* | The number of OFDM symbols in the HE-LTF field (see 26.3.9.10 (HE-LTF)) |
| *NHE-SIG-B* | The number of OFDM symbols in the HE-SIG-B field |
| *NHE-SIG-A* | The number of OFDM symbols in the HE-SIG-A field.For an HE SU PPDU, HE MU PPDU and HE trigger-based PPDU, *NHE-SIG-A*=2;For an HE extended range SU PPDU, *NHE-SIG-A*=4. |
| *Kr* | Set of subcarrier indices in the *r*-th RU |
| *R, Rr,u* | *Rr,u* is the coding rate at *r*-th RU for user *u*, *u* = 0, ..., *Nuser* – 1.For an HE SU PPDU, *R = R0,0*For an HE MU PPDU, *R* is undefined |
| *Mr,u* | The total number of space-time streams at r-th RU from user 0 to user u-1. For pre-HE modulated fields, *Mr,u* = 0. For HE modulated fields, *Mr,0* = 0 for *u* = 0 and $M\_{r,u}=\sum\_{u^{'}=0}^{u-1}N\_{STS,r,u'}$ for *u =*1*, …Nuser,r* – 1. |
| NOTE 1—Pre-HE modulated fields refer to the L-STF, L-LTF, L-SIG, RL-SIG, HE-SIG-A, ~~HE-SIG-A-R,~~ and HE-SIG-B fields, while HE modulated fields refer to the HE-STF, HE-LTF, and Data fields (see Timing boundaries for HE PPDU fields).NOTE 2—For pre-HE modulated fields, *u* and *r* are zeros only since *Nuser,r* = 1 and *NRU* = 1. |

**Changes to D0.1 Related to CID 1941**

***Instructions for the Editor: please modify the following text in the Table 26-6 at Line 44 Page 84***

Table 26-5 ~~26-4 (Tone allocation related constants for Data field in a non-OFDMA HE PPDU)~~ (Tone allocation related constants for RUs in an OFDMA HE PPDU) defines tone allocation related parameters for an OFDMA HE PPDU.

**References:**

1. **IEEE P802.11ax™/D0.1, March 2016**