IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PDT and Comment resolutions for Co-TDMA (Part 2) | | | | |
| Date: 2025-05-14 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Sanket Kalamkar | Qualcomm Technologies Inc | 5665 Morehouse Drive, San Diego, CA 92131 |  | sankal@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Technologies Inc | 5665 Morehouse Drive, San Diego, CA 92131 |  | appatil@qti.qualcomm.com |
| Klaus Doppler | Nokia | 520 Almanor Ave, Sunnyvale CA 94085 |  | Klaus.doppler@nokia.com |
| GeonHwan Kim | LG Electronics | 19, Yangjae-daero 11gil, Seocho-gu, Seoul 137-130, Korea |  | geonhwan.kim@lge.com |
| Giovanni Chisci | Qualcomm Technologies Inc | 5665 Morehouse Drive, San Diego, CA 92131 |  | gchisci@qti.qualcomm.com |
| Serhat Erkucuk | Ofinno | 1950 Opportunity Way, Suite 1200, Reston, VA 20190 |  | serkucuk@ofinno.com |

Abstract

This document proposes to amend the draft text on Co-TDMA based on CC50 comments and motions that are passed until March 2025 meeting.

This document also proposes resolutions for following 32 CIDs as part of CC50 comments:

94, 217, 624, 684, 687, 688, 691, 991, 1048, 1049, 1430, 1526, 1541, 1544, 1700, 1702, 1710, 2458, 2815, 2817, 3170, 3256, 3322, 3327, 3336, 3444, 3604, 3790, 3873, 3874, 3877.

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Editorial changes based on offline feedback
* Rev 2: Editorial changes based on offline feedback
  + Added a reference to the PDT on DUO 11-25/437r4 that covers the subclause 9.3.1.22.7 on Feedback User Info field.
  + The text on the Feedback User Info field (after Figure 9-xxx) is changed from “The TXOP Return Needed subfield specifies if the Co-TDMA sharing AP needs the TXOP to be returned from a Co-TDMA coordinated AP.” To “The TXOP Return Needed subfield indicates whether the Co-TDMA coordinated AP is required to return the TXOP, as described in subclause 37.8.2.3.4. (TXOP return phase).”
  + In Subclause 37.8.2.3.2 (Polling phase), the text “as indicated by the Primary AC subfield” is replaced with “compared to the AC indication in the Primary AC subfield.”
  + In subclause 37.8.2.3.3 (TXOP Allocation Phase), the title "Fairness Considerations for Time Sharing in TXOP" is appended to subclause number 37.xx.
  + In subclause 37.8.2.3.4 (TXOP return phase), the following text is added for better clarity “…otherwise the TXOP Return Needed subfield is set to 0.”
* Rev 3: Editorial changes and some changes to make the text for Feedback User Info field consistent with the PDT 11-25/437r6.
  + Added the following text for Feedback User Info field: The Feedback User Info field is identified by setting the AID12 subfield to 2008 and is present in a BSRP Trigger frame transmitted as a Co-TDMA TB ICF by a Co-TDMA sharing AP.
  + Replaced the sentence with editorial changes to simplify the last sentence of 37.8.2.3.4.
* Rev 4: Editorial changes and reorganization were made to move the discussion on BSRP Trigger frame, BSRP NTB Trigger frame, and Multi-STA BlockAck formats to subclause 9.
* Rev 5: Added sentence in 37.8.2.3.4 for behavioral aspect for a Co-TDMA coordinated AP
* Rev 6: Editorial changes
* Rev 7: Added Serhat as an author
* Rev 8: Editorial changes, and based on offline feedback, a sentence is added in 37.8.2.3.4 for NAV-related behavioral aspect for a Co-TDMA coordinated AP
* Rev 9: Editorial change as per the offline feedback

***TGbn editor: The baseline for this document is TGbn D0.2 and 11-25/521r2.***

### Relevant passed motions:

[Motion #46, [1]]

* TGbn shall define a Coordinated TDMA (Co-TDMA) procedure for an AP to share its time resources of an obtained TXOP with a set of APs.
  + Set of APs is TBD.
  + The set can consist of one AP.

[Motion #120, [1]]

* A UHR AP shall indicate to another AP its capability to respond in a TB PPDU or not.

[Motion #121, [1]]

* As part of the Co-TDMA procedure, a sharing AP may solicit a poll response in a TB PPDU from another AP only if the other AP has indicated support for responding via a TB PPDU.

[Motion #135, [1]]

* The sharing AP, that transmits a Trigger frame as part of a transmission sequence in a Multi-AP coordinated transmission scheme, identifies the shared AP via an AP ID carried in the AID12 field of the User Info field of the frame.
  + Note: the name of “sharing AP” and “shared AP” are TBD.
  + Note: Multi-AP coordinated transmission schemes are Co-SR, Co-BF and Co-TDMA.

[Motion #156, [1]]

* A TXOP owner AP announces its intention of sharing a portion of the time resource of its TXOP for Co-TDMA operation, in an Initial Control frame (exact ICF and name TBD) sent at the beginning of the TXOP. The frame polls AP(s) with whom it may share the TXOP to determine their interest
  + A TXOP owner AP that intends to share its TXOP is referred to as a sharing AP.
  + A candidate AP identified (polled) in the ICF is referred to as a polled AP.
  + The Duration field of the frame is set to the length of time required to transmit the solicited response frame plus one SIFS.
  + Whether or not the sharing AP is mandated to send the ICF that announces that intention is TBD.

[Motion #157, [1]]

* As part of the Co-TDMA procedure, a candidate AP that is polled by the sharing AP shall provide, via a response,
  + Its intention not to participate in TXOP sharing during the current TXOP.
    - Note: If the sharing AP doesn’t receive a response from a polled AP, it assumes that the polled AP is not interested in TXOP sharing during the current TXOP.
  + Its intention to participate in TXOP sharing during the current TXOP.
  + Signaling details (including traffic indication) are TBD.

[Motion #159, [1]]

* As part of the Co-TDMA procedure, to share a time portion of its TXOP, a sharing AP shall send a MU-RTS TXS Trigger frame to another non-collocated AP.
  + The Allocation Duration field of the frame indicates the duration of that time portion.
  + The Duration field of the frame is set to the time required to transmit the solicited response frame plus one SIFS.

[Motion #160, [1]]

* As part of the Co-TDMA procedure, TGbn defines a mechanism for an AP, that received a time portion of a TXOP from a sharing AP, to return the remainder of the allocated time (if any) back to the sharing AP.
  + Signaling details and the condition(s) for TXOP return are TBD.

[Motion #205, [2]] Move to incorporate the proposed text changes in 11-24/1961r4 to the latest TGbn draft (TGbn D0.1).

[Motion #268, [2]]

* Do you agree that a TXOP owner AP shall announce its intention of sharing a portion of the time resource of its TXOP for C-TDMA operation, in an Initial Control frame (exact ICF and name TBD) sent at the beginning of the TXOP and that the frame polls AP(s) with whom it may share the TXOP to determine their interest?
  + A TXOP owner AP that intends to share its TXOP is referred to as a sharing AP.
  + A candidate AP identified (polled) in the Initial Control frame is referred to as a polled AP.
  + The Duration field of the frame is set to the length of time required to transmit the solicited response frame plus one SIFS.
  + ~~Whether or not the sharing AP is mandated to send the Initial Control frame that announces that intention is TBD.~~

[Motion #269, [2]]

* The ICF (polling frame) sent as part of Co-TDMA operation shall be a BSRP Trigger frame.

[Motion #270, [2]]

* As part of Co-TDMA operation, a poll response from a polled AP solicited by the ICF shall be carried in an M-BA frame.

[Motion #274, [2]]

* Define a mechanism as part of the procedure of time sharing during a TXOP (e.g. C-TDMA, TXS, …) to support fairness to neighboring STAs (APs and non-APs)?
  + Exact mechanism is TBD

[Motion #277, [2]]

* As part of Co-TDMA operation, TGbn defines a mechanism for a Co-TDMA sharing AP to transmit to a Co-TDMA coordinated AP an indication of whether the Co-TDMA coordinated AP is to return the remainder of the allocated time (if any) back to the Co-TDMA sharing AP.
  + How to signal the indication is TBD
  + Note: This mechanism is to be enabled only if the Co-TDMA sharing AP is capable of receiving the TXOP return.

[Motion #329, [2]]

* The maximum time allocated by a sharing AP in a TXOP to all shared AP for CTDMA is not larger than the TXOP limit it advertised for the minimum between AC\_VI TXOP limit and the TXOP Limit of the AC it obtains the TXOP with to its associated STAs.
  + If TXOP limit for an AC is 0, there is no CTDMA in a TXOP obtained using that AC.
  + The sharing AP shall use at least a TBD portion of the obtained TXOP for data communication with its own associated STAs.
  + Note: similar consideration will apply for TXS mode 2

[Motion #363, [2]]

* The Co-TDMA sharing AP and the Co-TDMA coordinated AP shall have the same primary 20 MHz channel.

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 TGbn Draft. This introduction is not part of the adopted material.

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

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

**CC50 Comments:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 3170 | Yunbo Li | 37.8.2.3.1 | 72.44 | the word "time" is redudent here, because TXOP is a concept in time domain. There are several instances in the following text of CTDMA. | remove the word "time" | **Revised**  Agree with the comment in principle.  The updated text removes the word “time” from “time portion” and replaces “share” with “allocate.”  TGbn Editor: Please apply the changes marked as #3170. |
| 217 | Pei Zhou | 37.8.2.3.1 | 72.47 | As stated in page 74 line 14, ‘the AP may transmit and/or receive one or more PPDUs within the time allocation signaled in the MU-RTS TXS Trigger frame.’ Thereore, receive should be added here, too. | Add ‘and/or receive’ between 'transmit' and ‘one or more PPDUs’. | Revised.  Agreed with the comment in principle.   The updated text now includes “exchange one or more PPDUs.”  TGbn Editor: Please apply the changes marked as #217. |
| 684 | Geon Hwan Kim | 37.8.2.3.2 | 73.55 | A method needs to be designed to signal intent to participate within the M-BA (ICR) frame. | There may be several options to signal its intention to participate/not to participate. e.g., we can define an 1-bit indication (0 or 1) field within the M-BA frame to indicate its intention. | **Revised.**  Agree with the comment in principle.  The newly added provides signaling details that allow a polled AP to indicate its intention to receive a time allocation in the current TXOP.  TGbn Editor: Please apply the changes marked as #684. |
| 624 | Suhwook Kim | 37.8.2.3.2 | 73.55 | In the current document, the information exchange between the sharing AP and the shared AP is very limited in the polling phase. Since Co-TDMA is one of the technologies that can guarantee minimum latency performance in a dense OBSS environment, related information must be exchanged in the polling phase | Define signaling to exchange QoS info (traffic, etc.) | **Revised:**  Agree with the comment in principle.  The newly added text provides signaling details that allow a polled AP to indicate its intention to receive a time allocation in the current TXOP. Also, the signaling is also added to indicate the primary AC in the ICF.   So, the resolution to this CID is the same as those for CID #684 and CID #3256.  TGbn Editor: Please apply the changes marked as #684 and #3256. |
| 1048 | Matthew Fischer | 37.8.2.3.2 | 73.55 | TBD needs to be replaced with behavioral text. | Provide a description of the parameters that are requested by the sharing AP and the possible responses from the responding APs, including fields and frames used for the conveyance of such information. | **Revised**  Agree with the comment in principle.  The resolution to this comment is the same as the resolution for CID #684, where specific signaling details are added for a polled AP to respond to the Co-TDMA sharing AP’s ICF.  TGbn Editor: Please apply the changes marked as #684. |
| 1049 | Matthew Fischer | 37.8.2.3.2 | 73.25 | Be specific and limiting per the TB PPDU response behavior that the responder actually agrees to. | Change "for responding in a TB PPDU." to "for responding to a Co-TDMA request in a TB PPDU" - depending on the resolution of other comments, this might be a more generic response to a broader range of request (e.g. ALL MAP operations), but at least, in such a case, it would still need to be limited to responding to another AP's request (vs a non-AP STA) and only if it also agrees to Co-TDMA behavior and also agrees to participate with this specific sharing AP. There is also the case of polling the other AP to determine its capabilities vs polling for an actual sharing of a TXOP. The conditions for allowing each poll type to occur will be different. It is not clear which of the cases is being described in this paragraph, but all of these questions and details need to be included here. | **Revised**  Agree with the comment in principle.   The text is updated to be specific in that it provides specific conditions under which the poll response is transmitted in a TB PPDU by a polled AP.  TGbn Editor: Please apply the changes marked as #1049. |
| 1526 | Xiandong Dong | 37.8.2.3.2 | 73.26 | clarify that the other AP should have capability of responding in TB PPDU. | as in comment | **Revised**  Agree with the comment in principle.   The resolution to this CID is the same as the one for CID #1049, where the text is updated to be specific in that it provides specific conditions under which the poll response is transmitted in a TB PPDU by a polled AP.  TGbn Editor: Please apply the changes marked as #1049. |
| 691 | Geon Hwan Kim | 38.8.2.3.3 | 74.22 | General sentence can be added. | As in the line 37 on pp.526 of 11be/D7.0. "The time allocation shall start at the end of the PPDU that contains the MU-RTS TXS Trigger frame." | **Revised**  Agree with the comment in principle.  The updated text includes a slightly modified text compared to the proposed text in the comment.  TGbn Editor: Please apply the changes marked as #691. |
| 1430 | Akira Kishida | 37.8.2.3.3 | 73.60 | Regarding the sentence "A Co-TDMA sharing AP may allocate a time portion within its obtained TXOP to another AP that is not colocated with the Co-TDMA sharing AP." Whether the target AP is colocated or not should be defined not in this sentence but in the definition of the "Set of APs." | Delete the sentence "that is not colocated with the Co-TDMA sharing AP." | **Revised**  Agree with the comment in principle.   Rather than deleting the sentence “…that is not colocated with the Co-TDMA sharing AP,” the introduction of Co-TDMA is updated to clarify that the time allocation is given to a non-colocated AP.  TGbn Editor: Please apply the changes marked as #1430. |
| 1702 | Gaius Wee | 37.8.2.3.2 | 73.31 | "if receiving a time allocation" does not make sense in this sentence | Replace with "for receiving a time allocation" | **Revised**  Agree with the comment in principle.  The text is updated to replace “if” with “of.”  TGbn Editor: Please apply the changes marked as #1702. |
| 2817 | Serhat Erkucuk | 37.8.2.3.2 | 73.31 | Please correct the typo: ... the intent of the polled AP(s) if receiving a time allocation ... | The word "if" should be replaced by "of". | **Accepted**  The resolution to this CID is the same as that for CID #1702. |
| 1710 | Gaius Wee | 37.8.2.3.3 | 73.61 | "the AP" may be ambiguous. Sentence can be better worded | Replace sentence beginning with "To share a time portion..." with "To share a time portion of an obtained TXOP, the Co-TDMA sharing AP shall transmit an MU-RTS TXS Trigger frame to the other AP that is not co-located with the Co-TDMA sharing AP" | **Accepted** |
| 2458 | Yanjun Sun | 37.8.2.3.2 | 73.35 | Please use normative text: "shall be" instead of "is" | as in comment | **Accepted**  The resolution to this CID is the same as that for CID #676, which is already applied in the text. |
| 1700 | Gaius Wee | 37.8.2.3.1 | 72.45 | The introduction of "set of APs" seems unnecessary. If MAPC agreement is set up, the AP should be able to share the obtained TXOP with the other AP based on the agreement. Do we really need to define this set of APs? | Clarify what is significant about this set of APs and if it is not needed, remove references to "set of APs". Replace "another AP" directly with "one or more APs" and delete "that belongs to a set of APs (the set is TBD and can consist of one AP)" | **Revised**  Agree with the comment in principle.  The updated text now specifies “one or more non-colocated APs.” Further, the updated text also clarifies that a Co-TDMA sharing AP may share the TXOP with one or more APs in a sequential manner.  TGbn Editor: Please apply the changes marked as #1700. |
| 2815 | Serhat Erkucuk | 37.8.2.3.1 | 72.44 | The draft spec states that "Co-TDMA procedure enables an AP to share a time portion of an obtained TXOP with another AP that belongs to a set of APs (the set is TBD and can consist of one AP) to transmit one or more PPDUs". That emphasizes sharing a time portion of an obtained TXOP with only one AP. However, the passed motion (also as written in the PDT) indicates "TGbn shall define a Co-TDMA procedure for an AP to share its time resources of an obtained TXOP with a set of APs". This sentence implies there may be one or more APs that are shared time portions. This should be reflected to the draft. | The draft spec should be revised to include assigning portions of TXOP to one or more APs as indicated in the motion and the related PDT. The related sentence can be revised as "Co-TDMA procedure enables an AP to share time portions of an obtained TXOP with one or more APs that belong to a set of APs (the set is TBD and can consist of one AP) to transmit one or more PPDUs". | **Revised**  The updated change is similar to the proposed change and is already incorporated as a resolution to CID #1700.  TGbn Editor: Please apply the changes marked as #1700. |
| 3873 | Abhishek Patil | 37.8.2.3.1 | 72.47 | Simplify the language and resolve the TBD. | Replace: "... another AP that belongs to a set of APs (the set is TBD and can consist of one AP) ..." ... as "one or more APs .." | **Revised**  The updated change is similar to the proposed change and is already incorporated as a resolution to CID #1700.  TGbn Editor: Please apply the changes marked as #1700. |
| 3322 | Sanket Kalamkar | 37.8.2.3.1 | 72.45 | As per the motion #159, in Co-TDMA, the Co-TDMA sharing AP shall only share the TXOP with a non-colocated AP, while the current text misses to clarify it. | Add the text "that is not colocated with the Co-TDMA sharing AP." after ".....belongs to a set of APs" | **Revised**  Agree with the comment in principle.   The updated text now mentions that the Co-TDMA sharing AP shall share the TXOP with only a non-colocated AP.  TGbn Editor: Please apply the changes marked as #3322. |
| 3336 | Sanket Kalamkar | 37.8.2.3.2 | 73.25 | A polled AP may lack the capability to respond to the ICF received from a Co-TDMA sharing AP in a TB PPDU. The current text does not explain the mechanism by which a BSRP Trigger frame (the ICF for Co-TDMA) can be used to solicit a poll response from a polled AP that cannot respond in a TB PPDU. | Specify that the BSRP GI3 frame can be used to solicit a poll response in a Multi-STA BlockAck frame in a non-HT (dup) PPDU from a polled AP that cannot respond in a TB PPDU. | **Revised**  Agree with the comment in principle.  The updated text now mentions that the BSRP NTB Trigger frame (earlier referred as BSRP GI3 frame) shall be used to solicit a poll response in a non-TB PPDU.  TGbn Editor: Please apply the changes marked as #3336. |
| 3444 | Muhammad Kumail Haider | 37.8.2.3.3 | 73.57 | The opening sentence in this subclause is redundant and may be omitted | As in comment | **Accepted** |
| 3874 | Abhishek Patil | 37.8.2.3.1 | 72.48 | Clarify that the APs that establish a Co-TDMA agreement have the same primary channel and can have different operating BWs. When they have different BWs, the shared AP can use the TXOP only within the overlapping portion of the BW. | As in comment | **Revised**  Agree with the comment in principle.  The text specifies that a UHR AP shall not initiate a Co-TDMA procedure with another UHR AP if the primary 20 MHz channel for both APs’ BSS is not the same.  TGbn Editor: Please apply changes marked as #3874. |
| 3877 | Abhishek Patil | 37.8.2.3.2 | 73.26 | Append to the sentence "... by setting the AP TB PPDU Response field in the MAPC element to 1" | As in comment | **Accepted** |
| 94 | Xiangxin Gu | 37.8.2.3.2 | 73.25 | add a subclause to say "A Co-TDMA sharing AP may solicit a poll response from another AP that has an Co-TDMA aggrement" | as the comment | **Revised**  Agree with the comment in principle.  The updated text now specifies that the Co-TDMA procedure can occur between two APs that have established a Co-TDMA agreement.  TGbn Editor: Please apply the changes marked as #94. |
| 3790 | Yongho Seok | 37.8.2.3.2 | 73.47 | The ICF should also include the traffic indication so that the polled AP can determine its participation in the TXOP sharing. | As in the comment | **Revised**  Agree with the comment in principle.  The ICF now includes an indication of the primary AC of the Co-TDMA sharing AP.  TGbn Editor: Please apply changes marked as #3790. |
| 1541 | Yajun CHENG | 37.8.2.3.3 | 73.48 | "It" should be lowercase. The same issue in P73L53. | As in comment. | **Revised**  The text was already removed by CID#1708 in 25/0521r2.  TGbn Editor: No further changes are required for the resolution of this CID in this document. |
| 688 | GeonHwan Kim | 37.8.2.3.3 | 73.59 | We can add a subclause. | "obtained TXOP" to "obtained TXOP ((see 10.23.2.4 (Obtaining an EDCA TXOP))" | **Revised**  Agree with the comment in principle.   However, the text referred in the comment is deleted as a resolution to CID #3444.  TGbn Editor: No need to make any changes. |
| 687 | GeonHwan Kim | 37.8.2.3.3 | 73.57 | The TXS mode setting of MU-RTS TXS TF transmitted by Co-TDMA sharing AP should be described. | TXS mode = 2 itself is suitable for Co-TDMA operation. To do this, "Table 9-46n TXS Mode subfield encoding" needs to be modified to include the Co-TDMA case. | **Revised**  Agree with the comment in principle.  Table 9-46n was modified to support Co-TDMA.  TGbn Editor: Please apply the changes marked as #687 in this document. |
| 3604 | Kaiying Lu | 37.8.2.3.3 | 74.10 | Change "the Co-TDMA coordinated AP's AP ID." to "the Co-TDMA coordinated AP's AP ID assigned by the sharing AP." | As in comment. | **Revised**  Agree with the comment in principle.   The updated text is slightly different than the proposed change as follows: **“…**the Co-TDMA coordinated AP's AP ID as assigned by the sharing AP.**”**  TGbn Editor: Please apply changes marked as #3604 in this document. |
| 991 | Arik Klein | 37.8.2.3.3 | 74.17 | The reference to 26.2.6.3 (CTS frame sent in response to an MU-RTS TXS Trigger frame) is inaccurate since section 26.2.6.3 deals only with the case where non-AP STA responds with CTS to the MU-RTS TXS Trigger frame and not for the case where Co-TDMA Coordinated AP responds with CTS to the MU-RTS TXS Trigger frame. | Please modify the 26.2.6.3 to include the case of AP responding with CTS in response to an MU-RTS Trigger frame | **Revised**  Agree with the comment in principle.  Many of the requirements for an AP to transmit a CTS frame will be the same as those described in the 26.2.6.3. So, it is sufficient to clarify that the CTS transmission by an AP shall follow the requirements described in 26.2.6.3 unless there are exceptiona added in 37.8.2.3.  TGbn Editor: Please apply changes marked as #991 in this document. |
| 3327 | Sanket Kalamkar | 37.8.2.3.3 | 74.14 | It is unclear how is the Co-TDMA coordinated AP is identified. | Replace "...that identifies the Co-TDMA coordinated AP" with "...and the AID12 subfield of the User Info field contains the AP ID of the Co-TDMA coordinated AP." | **Revised**  Agree with the comment in principle.  The text is updated to specify how a Co-TDMA coordinated AP is identified.  TGbn Editor: Please apply changes marked as #3327 in this document. |
| 1544 | Yajun CHENG | 37.8.2.3.3 | 74.14 | To avoid confusion, it's better to add "Co-TDMA Coordinated" before "AP". |  | **Accepted** |
| 3256 | GEORGE CHERIAN | 37.8.2.3.1 | 73.02 | Define the frames that are used for C.TDMA exchange | As in the comment | **Revised**  Agree with the comment in principle.  The updated text now defines the frames used in the Co-TDMA procedure. For example, the BSRP Trigger and BSRP NTB Trigger frames are designated as Co-TDMA ICF. For the ICR, the Multi-STA Block Ack frame is defined.  Additionally, the frame used for TXOP return from a Co-TDMA coordinated AP is now defined and is described in subclause 9.6.7.1.  TGbn Editor: Please apply the changes marked as #3256. |

***TGbn Editor: Please add the following definitions to 3.2.***

**coordinated time division multiple access (Co-TDMA) trigger based (TB) initial Control frame (ICF)**: [Co-TDMA TB ICF] The ICF that polls the AP(s) as part of the Co-TDMA procedure and solicits a response from a polled AP in a TB PPDU.

**coordinated time division multiple access (Co-TDMA) non-trigger based (NTB) initial Control frame (ICF)**: [Co-TDMA NTB ICF] The ICF, as part of the Co-TDMA procedure, that solicits a response from a polled AP in a non-HT PPDU or a non-HT duplicate PPDU.

***TGbn editor: Please add the following text to 9.3.1.22.7 (Feedback User Info field), immediately after the description of the “Unavailability” feedback text provided in document 11-25/0437r4. Note that the subclause number 9.3.1.22.7 is based on document 11-25/0437r4. If this subclause number conflicts with any other subclause in D0.2, please update it accordingly.***

The Feedback User Info field is identified by setting the AID12 field to 2008 and is present in a BSRP Trigger frame transmitted as a Co-TDMA TB ICF by a Co-TDMA sharing AP (see 37.8.2.3.2 (Polling phase)).

(#3256)If the Feedback Type field is set to 3, then the format of the Feedback Information field is defined in Figure 9-xxx (Feedback Information field if the Feedback Type field is set to 3).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0   B1 | B2 | B3 B23 |
|  | Primary AC | TXOP Return Solicited | Reserved |
| Bits: | 2 | 1 | 21 |

**Figure 9-xxx— Feedback Information field format if the Feedback Type field is set to 3**

(#3790)The Primary AC field indicates the primary AC of the obtained TXOP by a Co-TDMA sharing AP. The Primary AC field is encoded as the AC index (ACI) defined in Table 9-193 (ACI-to-AC coding).

The TXOP Return Solicited field indicates whether the Co-TDMA sharing AP is soliciting a TXOP return from a Co-TDMA coordinated AP, as described in 37.8.2.3.4 (TXOP return phase). The TXOP Return Solicited field is set to 1 if the Co-TDMA sharing AP is soliciting a TXOP return from a Co-TDMA coordinated AP; otherwise, it is set to 0.

***TGbn editor: Please add the following text to 9.3.1.22.12 (BSRP Trigger frame format), after the text on the BSRP NTB Trigger frame in document PDT 11-25/637r3.***

In a User Info field where the AID12 field is set to the AP ID of an AP participating in a Co-TDMA procedure (see 37.8.2.3.2 (Polling phase)), the User Info field has the format shown in Figure 9-yyy (User Info field format with AID12 field set to the AP ID of an AP participating in a Co-TDMA procedure).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0   B11 | B12  B15 | B16    B39 |
|  | AID12 | Feedback Type | Feedback Information |
| Bits: | 12 | 4 | 24 |

**Figure 9-yyy User Info field format with AID12 field set to an AP ID of an AP participating in a Co-TDMA procedure**

The Feedback Type field indicates the type of feedback carried in the Feedback Information field. The Feedback Type field is set to 3 for a Co-TDMA procedure. Other values are reserved.

The Feedback Information field contains feedback corresponding to the type specified in the Feedback Type field. When the Feedback Type is set to 3, the Feedback Information field has the format defined in Figure 9-xxx (Feedback Information field if the Feedback Type field is set to 3).

***TGbn editor: Please modify the body of subclause 9.6.7 (Public Action frame details) as follows as a resolution to CID #3256:***

9.6.7.1 Public Action field

**Table 9-471—Public Action field values**

|  |  |
| --- | --- |
| **Public Action field value** | **Description** |
| … | … |
| <ANA> | MAPC TXOP Return |
| … | … |

9.6.7.x MAPC TXOP Return frame format

The MAPC TXOP Return frame is transmitted by a Co-TDMA coordinated AP to return the TXOP back to the Co-TDMA sharing AP. The format of the MAPC TXOP Return frame Action field is shown in Figure 9-zzz (MAPC TXOP Return frame Action field format).

|  |  |  |
| --- | --- | --- |
|  | Category | Public Action |
| Octets: | 1 | 1 |

Figure 9-zzz— MAPC TXOP Return frame Action field format

The Category field is defined in 9.4.1.11 (Action field).

The Public Action field is defined in 9.6.7.1 (Public Action field).

***TGbn editor: Please add a new paragraph in “Table 9-46nTXS Mode field encoding” as follows. Please note that the baseline is 11be D7.0 and REVme D7.0.***

**9.3.1.22.9 MU-RTS Trigger frame format**

**Table 9-46n—TXS Mode field encoding**

|  |  |
| --- | --- |
| **TXS Mode field value** | **Description** |
| 0 | MU-RTS that does not initiate TXS procedure. |
| 1 | MU-RTS that initiates TXS procedure wherein a scheduled STA can only transmit MPDU(s) addressed to its associated AP. |
| 2 | MU-RTS that initiates TXS procedure (as per 35.2.1.2) wherein a scheduled STA can transmit MPDU(s) addressed to its associated AP or addressed to another STA (#687)or,  MU-RTS that allocates time as part of a Co-TDMA procedure (as per 37.8.2.3) to a Co-TDMA coordinated AP wherein a Co-TDMA coordinated AP can exchange one or more MPDU(s). |
| 3 | Reserved. |

***TGbn Editor: Please add the underlined text in 9.3.1.8.6 (Multi-STA BlockAck variant) immediately after the following paragraph of 11-25/0438r4.***

If the AID11 subfield of the AID TID Info subfield is not 2045, and if the Ack Type subfield is equal to 0 and the TID subfield is equal to 13 then the Per AID TID Info subfield has the format shown in Per AID TID Info subfield format with Feedback and the Block Ack Starting Sequence Control subfield in the Per AID TID Info subfield has the format shown in Figure 9.xxx Block Ack Starting Sequence Control subfield format if the AID11 subfield is not 2045 and if the Ack Type subfield is equal to 0 and the TID subfield is equal to 13. The Feedback Type subfield defines the type of feedback that is contained in the Feedback field. The Feedback Type field is set to 0 to carry unavailability information as described in 37.11.2 (Dynamic Unavailability Operation (DUO) mode). [#1035]

(#684)The Feedback Type field is set to 3 to carry Co-TDMA information as described in 37.8.2.3 (Coordinated time division multiple access (Co-TDMA)).

If the Feedback Type field is set to 3, the Feedback field has the format defined in Figure 9-60c (Feedback field format if the Feedback Type field is set to 3 for Co-TDMA information).

|  |  |  |
| --- | --- | --- |
|  | B0 | B1    B31 |
|  | TXOP Sharing Solicited | Reserved |
| Bits: | 1 | 31 |

**Figure 9-60c Feedback field format if the Feedback Type field is set to 3 for Co-TDMA information**

The TXOP Sharing Solicited field of the Feedback field is set to 1 if the polled AP intends to receive a time allocation from the Co-TDMA sharing AP during the current TXOP to exchange frames of the same or higher priority ACs compared to the AC indicated in the Primary AC field in the Co-TDMA TB ICF or the Co-TDMA NTB ICF with its associated non-APs, otherwise it is set to 0.

**TGbn Editor: *Please make changes to 37.8.2.3 (Coordinated time division multiple access (Co-TDMA)) as follows. Note that the subclause number 9.3.1.22.7 cited in this document is based on document 11-25/0437r4. If this subclause number conflicts with any other subclause number in D0.2, please update it accordingly.***

* **Coordinated time division multiple access (Co-TDMA)**
* **General**

The coordinated time division multiple access (Co-TDMA)(#111) procedure enables an AP to (#3170) allocate a portion of an obtained TXOP(#1430, #1700, #3322) sequentially to one or more non-colocated APs. (#1700)An AP that receives a time allocation from another AP as part of the Co-TDMA procedure (#217)exchanges one or more PPDUs during the allocated time.

(#3874)An AP shall not initiate a Co-TDMA procedure with another AP if any of the following conditions are true:

* No MAPC agreement on Co-TDMA exists between the APs.
* The primary 20 MHz channels of the two APs’ BSS differ.(M363)
* Both APs are part of the same colocated AP set.

NOTE—An AP can establish a MAPC agreement for Co-TDMA with another AP by following the procedures defined in 37.8.1.3 or via other means out of the scope of the standard.

Figure 37-3 (An Example of a Co-TDMA(#623) procedure between three APs (#3328)) shows an example of a Co-TDMA(#622) procedure that includes a polling phase, a TXOP allocation phase, and a TXOP return phase.



37.3—An Example of the Co-TDMA(#623) procedure between three APs (#3328)

* **Polling phase**

A Co-TDMA sharing AP shall announce(M268) its intention of (#3170)allocating a portion of an obtained TXOP to another AP in an ICF sent at the beginning of the TXOP. The ICF polls one or more APs (#94)that have established MAPC agreements for Co-TDMA with the Co-TDMA sharing AP, in accordance with the procedure defined in 37.8.1.3 (MAPC agreement negotiation procedure), to solicit a response and determine the intent of the polled AP(s) (#1702)of receiving a time allocation from the Co-TDMA sharing AP within the TXOP.

A Co-TDMA sharing AP may solicit a poll response in a TB PPDU from another AP (#94)with which it has a MAPC agreement for Co-TDMA, only if the AP to be polled has indicated support for (#1049)transmitting a poll response in a TB PPDU (#3877)by setting the AP TB PPDU Response Supported field in the MAPC element to 1.

The ICF that polls the(#3879) AP(s) as part of the Co-TDMA procedure (#3878) and solicits a response from a polled AP in a TB PPDU is called a Co-TDMA TB ICF.

The Co-TDMA TB ICF shall be a BSRP Trigger frame.(M269)

(#3336)The ICF, as part of the Co-TDMA procedure, that solicits a response from a polled AP in a non-HT PPDU or a non-HT duplicate PPDU is called a Co-TDMA NTB ICF.

The Co-TDMA NTB ICF shall be a BSRP NTB Trigger frame (see 9.3.1.22.12 (BSRP Trigger frame format)), which has the GI And HE/UHR-LTF Type field set to 3.

The Co-TDMA sharing AP identifies a polled AP in the Co-TDMA TB ICF or the Co-TDMA NTB ICF by setting the AID12 field of a User Info field to the polled AP’s AP ID, as assigned by the Co-TDMA sharing AP(#3599).

The Duration field of the Co-TDMA TB ICF and the Co-TDMA NTB ICF shall be(#676) set to one SIFS plus the time required to transmit the solicited response from the polled AP(s).

(#3256)When a Co-TDMA sharing AP transmits a Co-TDMA TB ICF, the AP shall set the Feedback Type field of the Feedback User Info field (see 9.3.1.22.7 (Feedback User Info field)) of the Co-TDMA TB ICF to 3.

(#3256)When a Co-TDMA sharing AP transmits a Co-TDMA NTB ICF, the AP shall set the Feedback Type field of a User Info field addressed to the polled AP to 3.

(M268)A polled AP shall transmit(#1706), in response to a received Co-TDMA TB ICF or the Co-TDMA NTB ICF that includes a User Info field with an AID12 field set to the AP ID of the polled AP as assigned by the Co-TDMA sharing AP, a Multi-STA BlockAck frame(M270) (#684)with a Feedback Type field set to 3 in a Per AID TID Info field.

(#713)If a Co-TDMA sharing AP does not receive a response from a polled AP, the Co-TDMA sharing AP shall consider that the polled AP does not wish to receive a time allocation from the Co-TDMA sharing AP during the current TXOP.

* **TXOP allocation phase**

(#3444)To (#3170)allocate a portion of (#1710)an obtained TXOP, the Co-TDMA sharing AP shall transmit an MU-RTS TXS Trigger frame (#687)with TXS Mode field equal to 2 to a coordinated AP that is not colocated(#3326) with the Co-TDMA sharing AP.

(#691)The time allocation to the Co-TDMA coordinated AP shall start at the end of the PPDU that contains the MU-RTS TXS Trigger frame.

The Duration field of the MU-RTS TXS Trigger frame shall be(#676) set to one SIFS plus the time required to transmit the solicited CTS response frame.

A Co-TDMA sharing AP identifies the Co-TDMA coordinated AP (#3170)to which a portion of the obtained TXOP is to be allocated by setting the AID12 field of the User Info field of the MU-RTS TXS Trigger frame to the Co-TDMA coordinated AP’s AP ID, (#3604)as assigned by the Co-TDMA sharing AP.

After a Co-TDMA coordinated AP receives an MU-RTS TXS Trigger frame from the Co-TDMA sharing AP that contains a User Info field (#3327)and the AID12 field of the User Info field contains the AP ID of the Co-TDMA coordinated AP, the (#1544)Co-TDMA coordinated AP may exchange one or more PPDUs within the time allocation signaled in the MU-RTS TXS Trigger frame. The first PPDU of this exchange shall carry a CTS frame, which is transmitted as per the rules defined in 26.2.6.3 (CTS frame sent in response to an MU-RTS Trigger frame) (#991)with the exceptions stated in 37.8.2.3 (Coordinated time division multiple access (Co-TDMA)).

The time allocated to a Co-TDMA coordinated AP identified in the MU-RTS TXS Trigger frame is specified in the Allocation Duration field in the MU-RTS TXS Trigger frame.

The Co-TDMA sharing AP shall follow 37.17 (Fairness considerations for TXOP sharing during TXOP) when determining the time allocated to Co-TDMA coordinated AP(s) within an obtained TXOP.

During the allocated time, any frame exchange between a Co-TDMA coordinated AP and its associated non-AP(s) shall be from the same or higher priority ACs as the primary AC of the obtained TXOP indicated in the Primary AC field of the Co-TDMA TB ICF or the Co-TDMA NTB ICF transmitted by the Co-TDMA sharing AP during the polling phase of Co-TDMA.

* **TXOP return phase**

A Co-TDMA coordinated AP may return the remainder of the allocated time (if any) to the Co-TDMA sharing AP if the Co-TDMA sharing AP has indicated support for TXOP return by setting the Rx TXOP Return Support field to 1 in the MAPC element, otherwise the Co-TDMA coordinated AP shall not return the TXOP. A NAV set by the Co-TDMA coordinated AP during the allocated time shall end before this AP returns the TXOP to the Co-TDMA-sharing AP.

As part of Co-TDMA operation, when the Co-TDMA coordinated AP returns the TXOP to the Co-TDMA sharing AP, the TXOP return shall be indicated via a CAS Control field with the RDG/More PPDU field equal to 0. This CAS Control field is carried in an HE variant HT Control field in the MAC header of a MAPC TXOP Return frame (see 9.6.7.x (MAPC TXOP Return frame format)) that includes only the Action field in the frame body.

The Co-TDMA sharing AP shall respond with an Ack frame when it receives the TXOP return indication from a Co-TDMA coordinated AP.

No other MAPC Public Action frame shall carry a CAS Control field in the HT Control field of the frame’s MAC header.

A Co-TDMA sharing AP that has indicated support for TXOP and that is soliciting a TXOP return from a Co-TDMA coordinated AP shall set the TXOP Return Solicited field of the Co-TDMA TB ICF or the Co-TDMA NTB ICF to 1; otherwise, the Co-TDMA sharing AP shall set the TXOP Return Solicited field to 0.(M277)  
  
The Co-TDMA coordinated AP shall return the TXOP after receiving a Co-TDMA TB ICF or a Co-TDMA NTB ICF that has set the TXOP Return Solicited field to 1.