IEEE P802.11
Wireless LANs

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| LB271 CR for TWT |
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Abstract

This submission proposes resolutions of comments received from TGbe comment collection LB271 based on TGbe D3.2.

16059 18182 15819 17354 16998 17355 15629 16995 17372 15627 15571 17357 17358 17281 18057 16199 18229 15612 15709 17955 16060 (21 CIDs)

Revisions:

* Rev 0: Initial version of the document.
* Rev 3: Update the resolution for CID 16199, 18229, 15612, 15709, 17955.
1. **Introduction**

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 TGbe Draft. The introduction and the explanation of the proposed changes are not part of the adopted material.

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

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

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 16059 | 35.3.24.1 | 585.09 | When PMF is negotiated between an EHT AP and a non-AP EHT STA, those entities should also exchange protected TWT action frames for setting up and teardown of TWT agreements and memberships. For this both AP and STA need to set the Protected TWT Operations Support field in the RSNXE it transmits to 1 (per clause 10.47.1 (TWT overview) and 9.4.2.241 (RSNXE)). | Add requirement for EHT APs and EHT STAs to set the Protected TWT Operations Support field in the RSNXE it transmits to 1, to allow exchange of protected TWT action frames when PMF is negotiated. | Revised-Agree with the comment in principle. Add a reference to address it. Apply the changes marked as #16059 in this document. |
| 18182 | 35.3.24.2 | 585.11 | Clarify that the TWT Setup Response frame can be sent on any enabled link (subject to power-save). | As in comment | Revised-Agree with the comment in principle. Apply the changes marked as #18182 in this document. |
| 15819 | 35.3.24.2 | 585.13 | "An MLD may negotiate individual TWT agreements with a peer MLD as defined in 10.47.1 (TWT overview) and 26.8.2 (Individual TWT agreements) via an enabled link.." This is not consistent with Individual TWT operation; the agreements are between two STAs and not MLDs, so they are negotiated between STAs (which may be affiliated with MLDs) and not between MLDs. The NOTE below also states that "The individual TWT agreement is negotiated between the STAs affiliated with the MLDs" | This sentence should be rephrased as "A STA affiliated with an MLD may negotiate individual TWT agreements with another STA affiliated with a second MLD as defined in 10.47.1 (TWT overview) and 26.8.2 (Individual TWT agreements) via an enabled link.." | Revised-Agree with the comment in principle. Apply the changes marked as #15819 in this document. |
| 17354 | 35.3.24.2 | 585.13 | It is not the MLD that negotiates the TWT agreements but rather the STAs affiliated with the MLD. Please amend to make it concise. | As in comment. | Revised-Agree with the comment in principle. Apply the changes marked as #17354 in this document. |
| 16998 | 35.3.24.2 | 585.16 | "Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed TWTinformation frame for individual TWT, which is intended for one STA affiliated with the associated MLDwith a setup link, is transmitted to another STA affiliated with the associated MLD with a setup link and anacknowledgement in response to the TWT information frame is received, then the STA" should be "Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed TWTinformation frame for individual TWT that is intended for one STA affiliated with the associated MLDwith a setup link is transmitted to another STA affiliated with the associated MLD with a setup link and anacknowledgement in response to the TWT information frame is received, the STA" | As it says in the comment. Ditto for paras at line 27 and 39 and 47 | Revised-Agree with the comment in principle. Apply the changes marked as #16998 in this document. |
| 17355 | 35.3.24.2 | 585.16 | More than one element can be present in the TWT request/TWT response. Hence, here it needs to clarify that the links are being provided in the TWT elements. | As in comment. | Rejected-The case of more than one TWT element present in the TWT setup frame is covered by the second paragraph in this subclause. Further clarification is not needed. |
| 15629 | 35.3.24.2 | 585.22 | The sentences are misleading to "if only one link is indicated in link id bitmap subfield..., the target wake time should be in reference to the TSF of the indicated link." | Put the second sentence with a new bullet | Accepted- |
| 16995 | 35.3.24.2 | 585.24 | "A TWT responding STA affiliated with a peer MLD that receives a TWT request that contains aLink ID Bitmap subfield in a TWT element shall respond with a TWT response that indicates thelink(s) in the Link ID Bitmap field of a TWT element. The link(s), if present, in the TWT elementcarried in the TWT response, shall be the same as the link(s) indicated in the TWT element of thesoliciting TWT request." is not clear and is inconsistent | Change to "A TWT responding STA affiliated with a peer MLD that receives a TWT request that contains aLink ID Bitmap subfield in a TWT element shall respond with a TWT response that indicates thesame link(s) in the Link ID Bitmap subfield in a TWT element." | Accepted- |
| 17372 | 35.3.24.2 | 585.25 | Please specify the cases when the link(s) are not present in the TWT element of the response. Such as in the other element that contains the link id (forget what it is called now) and the case of the TWT response actually sent on the link that is indicated in the request. | As in comment. | Rejected-The proposed change contradicts the description in 35.3.14.2 (Identification of the Intended STA) where the MLO Link Information element in the Management frame doesn't apply to the TWT setup frame. It complicates the implementation to add one more parallel way. |
| 15627 | 35.3.24.2 | 585.29 | It is too strict to limit that the link id map subfield in TWT response shall be same as the value in TWT request. | It is proposed that the link(s) in the TWT element carried in the TWT response can be a subset of the link(s) indicated in the TWT element of the soliciting TWT request. | Rejected-Although the proposed change in the comment works, it could complicate the negotiation procedure.  |
| 15571 | 35.3.24.2 | 585.36 | "where each of the Link ID Bitmap subfields in each TWT element indicates different link(s) in the same TWT Setup frame" is confusing. | Change to: where each link shall be indicated at most once in all the Link ID Bitmap subfields of the TWT elements in the same TWT Setup frame. | Revised-Agree with the comment in principle. Apply the changes marked as #15571 in this document. |
| 17357 | 35.3.24.2 | 585.37 | Please add a requirement that the links specified in each bitmap are nonoverlapping for a particular TWT flow unless TWT range is negotiated in which case there can be up to 2. | As in comment. | Revised-Agree with the comment in principle. Apply the changes marked as #17357 in this document. |
| 17358 | 35.3.24.2 | 586.01 | This example is pretty generic and not of much use. It is more interesting to have one example of the negotiation of overlapping TWTs SPs across links and another example for non-overlapping TWT SPs. Of course this can be achieved with already existing functionalities. One might find it useful to see a couple of figures that reflect that. | As in comment. | 　 |
| 17281 | 35.3.24.2 | 586.20 | What does "suspended " mean here? The TWT agreement for the STA of the intended link is not in effect any more? What is the definition of "starting as soon as practical" | Please clarify it | Rejected-The comment fails to identify the technical issue. "suspended" is used in baseline REVme D3.0, with the literal meaning: operation is terminated for a while but the corresponding parameters are kept. "starting as soon as practical" is also a literal meaning, and its starting time depends on implementation. |
| 18057 | 35.3.24.4 | 586.53 | PM mode change is called out on lines 43 and 53, add reference to the subclause where this is described e.g. Figure 9-764 Control field | As commented | Revised-Agree with the comment in principle. Apply the changes marked as #18057 in this document. |
| 16199 | 35.3.24.2 | 0.00 | non-AP MLD that has multiple TWT agreements established across multple links should be able to tear down one or more agreements/schedule on a link while sending the TWT Teardown frame (or its equivalent) on a different link for efficient MLO and TWT operation. However, such mechanism is currently missing in 11be. | Please provide necessary mechanism to enhance the operation of TWT Teardown frame to make it more suitable for MLDs. | Revised-Agree with the comment in principle. Add a note to clarify it. Apply the changes marked as #16199 in this document. |
| 18229 | 35.3.24.1 | 585.03 | A non-AP MLD that has multiple TWT agreements established across multple links should be able to tear down one or more agreements/schedule on a link while sending the TWT Teardown frame (or its equivalent) on a different link for efficient MLO and TWT operation. However, such mechanism is currently missing in 11be. | Please provide necessary mechanism to enhance the operation of TWT Teardown frame to make it more suitable for MLDs. | Revised-Agree with the comment in principle. Add a note to clarify it. Apply the changes marked as #18229 in this document. |
| 15612 | 35.3.24.2 | 585.10 | A TWT teardown procedure for MLD should be defined.1. An MLD should be able to teardown a TWT agreement of the second link through the first link.2. An MLD should be able to teardown the TWT agreements established on the multiple links through a specific link. | As in comment | Revised-Agree with the comment in principle. Add a note to clarify it. Apply the changes marked as #15612 in this document. |
| 15709 | 35.3.24.2 | 585.13 | The iTWT procedure allows multiple TWT setup on different links. The tear-down procedure should have similar procedures by adding the link bitmap. | Complete the multi-link iTWT teardown procedures so that multiple iTWT teardown on different links can be done by similar procedures as the setup | Revised-Agree with the comment in principle. Add a note to clarify it. Apply the changes marked as #15709 in this document. |
| 17955 | 35.3.24.2 | 585.13 | The TWT Teardown frame can be sent by other STA.But, since the Link ID Bitmap is not present in the TWT Teardown frame, it is assumed that the Multi-Link Link Information element indicates the intended STA.For consistency, instead of the Multi-Link Link Information element, the Link ID Bitmap is preferred. Because the the Multi-Link Link Information element can't tear down the TWTs associated with multiple STAs.Please clarify the multi-link TWT teardown procedure. | As in the comment. | Revised-Agree with the comment in principle. Add a note to clarify it. Apply the changes marked as #17955 in this document. |
| 16060 | 35.3.24.2 | 585.20 | If only one link is indicated in the TWT element (which was group's direction in last round), then why include a Link ID Bitmap. The TWT element should just include a Link ID Info field, which will optimize signaling size. Line 38-41 also imply that Link ID Bitmap indicates a single link. | Change the Link ID Bitmap to Link ID Info field in the TWT element for individual TWT Parameter Set field and make related text updates. | Rejected-The comment fails to identify the technical issue. The current text support two cases, one is single link, the other is multiple links. There is no motivation to change the Link ID Bitmap field to a Link ID Info field for now. |

**35.3.24.1 General**

An EHT TWT STA shall follow the rules (#16993)described in 26.8 (TWT operation) and 10.47.1 (TWT overview) (#16059), except that within trigger-enabled SPs, the Trigger frame may be an MU-RTS TXS Trigger frame with response rules defined in 35.2.1.2 (Triggered TXOP sharing procedure).

**35.3.24.2 Individual TWT agreements**

(#15819, 17354) A STA affiliated with an MLD may negotiate individual TWT agreements with a STA affiliated with a peer MLD as defined in 10.47.1 (TWT overview) and 26.8.2 (Individual TWT agreements) via an enabled link except the following:

—A TWT requesting STA affiliated with the MLD may indicate the link(s) that are requested for setting up TWT agreement(s) in the Link ID Bitmap subfield, if present, of a TWT element in the TWT request.

•If only one link is indicated in the Link ID Bitmap subfield of the TWT element, then a single TWT agreement is requested for the STA affiliated with the same MLD (#16994)that is operat­ing on the indicated link. The Target Wake Time field of the TWT element shall be in reference to the TSF time of the link indicated by the TWT element.

—A TWT responding STA affiliated with a peer MLD that receives a TWT request that contains a Link ID Bitmap subfield in a TWT element shall respond with a TWT response that indicates the link(s) in the Link ID Bitmap field of a TWT element. The link(s), if present, in the TWT element carried in the TWT response, shall be the same as the link(s) indicated in the TWT element of the soliciting TWT request. The TWT response may be sent on any enabled link subject to power state (see 35.3.12 (Multi-link power management) and 35.3.7.1 (TID-to-link mapping)). (#18182)

During the negotiation of individual TWT agreements, a TWT requesting STA affiliated with an MLD and a TWT responding STA affiliated with a peer MLD may include multiple TWT elements where each link shall be indicated at most once in all the Link ID Bitmap subfields of the TWT elements in the same TWT Setup frame unless a TWT agreement with a range of TWT parameter values is negotiated for a link in which case the number of TWT elements is two and these two TWT elements shall have Link ID Bitmap subfields of the same values (see 10.46.9 (TWT parameter ranges)) (#15571, 17357). The TWT parameters provided by each TWT element shall be applied and be in reference to the respective link that is indicated by the Link ID Bitmap subfield in that TWT element to setup (#16996)a TWT agreement on that link.

~~NOTE—When a TWT Teardown frame with the MLO Link Information element is successfully transmitted or received, the TWT agreement corresponding to the TWT Flow Identifier field, the MLD MAC address of the MLD with which TWT requesting STA is affiliated, the MLD MAC address of the MLD with which TWT responding STA is affiliated and the Link ID associated with the link indicated by the Link ID Bitmap subfield of the TWT Teardown frame, is deleted. (#16199, 18229, 15612, 15709, 17955)~~NOTE - When a TWT Teardown frame with the MLO Link Information element is successfully transmitted or received through affiliated STAs between two MLDs, the TWT agreement corresponding to the TWT Flow Identifier field, TWT requesting STA MAC address and TWT responding STA MAC address of the TWT Teardown frame is deleted, where the TWT requesting STA MAC address of the TWT teardown frame is the TWT requesting STA MAC address corresponding to the link indicated in the Link ID Bitmap subfield of the MLO Link Information element, and the TWT responding STA MAC address of the TWT teardown frame is the TWT responding STA MAC address corresponding to the link indicated in the Link ID Bitmap subfield of the MLO Link Information element. (#16199, 18229, 15612, 15709, 17955)

35.3.24.3 Broadcast TWT operation

Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed TWT (#15484)Information frame for broadcast TWT with All TWT subfield set to 1 (#16998)that is is intended for one STA affiliated with the associated MLD with a setup link is transmitted to another STA affiliated with the associated MLD with a setup link and an acknowledgement in response to the TWT (#15484)Information frame is received, then the STA of the intended link shall consider all the broadcast TWT schedules as suspended starting as soon as practical after the TWT (#15484)Information frame exchange rather than immediately as described in 26.8.4.3 (TWT Information frame exchange for broadcast TWT).

**35.3.24.4 Flexible wake time operation**

Between an AP MLD and a non-AP MLD associated with the AP MLD (#17000)and for the MLD that is either the AP MLD or the non-AP MLD, if an individually addressed TWT (#15484)Information frame for flexible wake time(#16998)that is intended for one STA affiliated with the MLD with a setup linkis received by another STA affiliated with the MLD with a setup link, then the corresponding PM mode change and power state change (see 11.2 (Power management)) (#18057) for the STA of the intended link shall start as soon as practical after the individually addressed TWT (#15484)Information frame exchange rather than immediately as described in 26.8.4.4 (TWT Information frame exchange for flexible wake time).

Between an AP MLD and a non-AP MLD associated with the AP MLD (#17000)and for the MLD that is either the AP MLD or the non-AP MLD, if an individually addressed TWT (#15484)Information frame for flexible wake time(#16998)that is intended for one STA affiliated with the associated MLD with a setup linkis transmitted to another STA affiliated with the associated MLD with a setup link and an acknowledgement in response to the TWT (#15484)Information frame is received by the transmitting STA affiliated with the MLD, then the corresponding PM mode change and power state change for the STA of the intended link shall start as soon as practical after the individually addressed TWT (#15484)Information frame exchange rather than immediately as described in 26.8.4.4 (TWT Information frame exchange for flexible wake time).