IEEE P802.11
Wireless LANs

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| Operating Mode Indication – PART Ⅰ Rx OMI (ROMI)  |
| Date: 2016-07-07 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D0.1 with the following CIDs (**28 CIDs**):

* 2, 60, 61, 184, 185, 207, 445, 446, 655, 685, 775, 856, 1223, 1224, 1562, 1565, 1568, 1569, 1572, 1573, 1574, 2200, 2236, 2238, 2239, 2328, 2330, 2657

Revisions:

* Rev 0: Initial version of the document
* Rev 1: Revised related text - by Young Hoon and Brian (Bule marking)
* Rev 2: Revised related text to specify immediate acknowledgment by Alfred and Young Hoon (Green marking)

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

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

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

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 2200 | Tomoko Adachi | 3.00 | Why not put ROM (Receive Operating Mode) in suclause 3.4? | As in comment. | Revised —Agree in principle with the comment. The proposed resolution describes to add subclause 3.4 to the correct alphabetical order for Operation Mode Indication.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2200 |
| 2328 | Yasuhiko Inoue | 62.10 | ROM should be listed in 3.4 | As in the comment | Revised —Agree in principle with the comment. The proposed resolution describes to add subclause 3.4 to the correct alphabetical order for Operation Mode Indication. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2328. |
| 445 | Brian Hart | 62.41 | Language is confusing: 25.8.1 refers to a first STA, 25.8.2. refers to both a transmitting HE STA and a responding HE STA. Which is which? i.e. is the transmitting STA the STA that transmits the ROM subfield or the STA that transmits PPDUs compliant with the transmitted ROM field? | Replace "first STA" and "transmitting HE STA" by "ROM initiator" and "ROM responder" | Revised —Agree in principle with the comment. The related text would be ambiguous. The proposed resolution is to clarify that an OMI initiator can change its operating mode. On the other hand, an OMI responder can receive a request from the OMI initiator. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 445. |
| 1565 | Mark RISON | 62.20 | "The dot11ROMIOptionImplemented defines whether the HE AP implements the reception of the ROM setting and the AP transmits according to the ROM setting to the transmitter of the ROM setting. An HE AP shall set dot11ROMIOptionImplemented to true." -- can't the HE STA also support this (i.e. be told by the AP that the AP wishes to change its ROM)? | Either relax this to apply to all STAs, or tighten the "first STA" and "second STA" stuff here to be specifically "AP" and "non-AP STA" | Revised —Agree in principle with the comment. The proposed resolution changes to related text with OMI initiator and OMI responder. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1565. |
| 1569 | Mark RISON | 62.00 | There are a number of "transmitting HE STA"s in this subclause, but it is not clear whether these mean the STA transmitting the ROMI or the one transmitting to a STA that has send a ROMI | Make the terminology clear and unambiguous | Revised —Agree in principle with the comment that it is ambiguous. The proposed resolution changes to related text with OMI initiator and OMI responder. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1569. |
| 1573 | Mark RISON | 62.59 | "The responding HE STA shall use the value indicated by the Channel Width subfield most recently received from the transmitting HE STA as the current maximum operating channel width that the transmitting HE STA indicated as supported for receiving frames." -- I just get lost in the second half of the sentence. Ditto next para | Change to "The responding HE STA shall use the value indicated by the Channel Width subfield most recently received from the transmitting HE STA as the current maximum operating channel width for the transmitting HE STA.". Similarly next para | Revised —Agree with the comment that the sentence would be not readable. The proposed resolution is clarify that an OMI initiator which can change its operating mode setting and an OMI responder receives a request from the OMI initiator. The proposed resolution is to specify related text for clarification.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1573. |
| 2238 | Tomoko Adachi | 62.20 | It says "The dot11ROMIOptionImplemented defines whether the HE AP implements the reception of the ROM setting and the AP transmits according to the ROM setting to the transmitter of the ROM setting."It seems that the ROM indication can be also useful for a non-AP STA. Why is it limited to an AP? | Extend it so that it can be applied also to non-AP STAs. | Revised —Basically a non-AP STA is an OMI initiator and an AP is an OMI responder, however the spec doesn’t have to restrict opposite case. For clarification, the proposed resolution changes to related text with OMI initiator and OMI responder. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2238 |
| 856 | Ju-Hyung Son | 62.33 | It is not clear whether AP can change its operation mode with the ROM indication. In cases where AP includes ROM indication in multiple MPDUs in HE DL MU PPDU format, and only subset of STAs acknowledges the MPDUs, what is the AP's behavior for changing ROM settings?It is unreasonable for AP to change its Receive operation mode by using this field because it should be known to all STAs in a BSS. This can be done by changing HE Operation Element in a broadcast message (e.g. Beacon). The usage of this field should be limited to non-AP STAs. | Clarify the usage of ROM indication for AP and non-AP STAs. | Rejected —In general, HE STA is an OMI initiator and AP is an OMI responder, however it doesn’t have to restrict opposite case in the spec.  |
| 207 | Alfred Asterjadhi | 80.30 | "Unlike 11.41 (Notification of operating mode changes), ROM indication can be signaled in the MAC header of a Data frame as opposed to a management frame exchange": Need to add a reference to the HE-A Control field subclause | As in comment | Revised —Agree in principle with the comment. The proposed resolution specifies related to the OMI A-Control field in the HE variant HT Control field.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 207. |
| 1562 | Mark RISON | 62.16 | "sent in a frame of type Data." -- why this restriction | Remove this restriction | Revised —The proposed resolution is to define an OMI signaling. Basically OMI setting can be signaled using the OMI A-Control field in the HE variant HT Control subfield in QoS Data or QoS Null frame. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1562. |
| 2236 | Tomoko Adachi | 62.16 | The frame of type Data in line 16 should be the one soliciting an immediate acknowledgement. | Add that the frame of type Data is also the one soliciting an immediate acknowledgement. | Revised —Agree in principle with the comment. Proposed resolution is revised with the suggested change. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2236 |
| 2657 | Young Hoon Kwon | 62.25 | There's no additional operation described in the third paragraph. Instead, it only includes possible implementation details which is not the scope of the specification. | Delete the third paragraph of 25.8.1. | Accepted —Agree in principle with the comment. The proposed resolution is revised with commenter’s suggestion. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2657. |
| 60 | Ahmadreza Hedayat | 62.04 | Specify the behavior of a STA that is in association with more than one device, e.g. an AP and a P2P STA, when the STA changes its ROM. It seems that the STA should notify both AP and the P2P STA about its ROM change (unlikely situation that a STA to have two different ROMs). | As in the comment. | Rejected —When a STA associates with multiple links, the STA can request OMI sequentially for each link.  |
| 2330 | Yasuhiko Inoue | 62.33 | Clause 25.8.2 has some TBDs that have to be resolved. | Please resolve TBDs. | Revised —Agree in principle with the comment. The proposed resolution is defined TBD in the subclause. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2330. |
| 685 | Hyunhee Park | 63.12 | Clarify the Outage Time in the draft spec. | 1. Add the definition the Outage Time, and then Modify the text as "If there is a change to the current maximum operating channel width or the maximum number of spatial streams, the transmitting HE STA shall adjust to the most recently sent ROM settings within an time TBD [Outage Time] following the receipt of an immediate acknowledgement response."2. For same reason, modify the text in page 63 line number 12. | Revised —Agree in principle with the comment. The proposed resolution is to define an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules) without the Outage Delay. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 685. |
| 1223 | Liwen Chu | 62.01 | The TBD in the subclause should beremoved. | As in comment. | Revised —Agree in principle with the comment. The proposed resolution is defined TBD in the subclause. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1223. |
| 446 | Brian Hart | 62.44 | "immediately after" at L44 seems to conflict with "within a time TBD" at L49 | Delete the first para, or merge. Ditto paras at P63L6-13 | Revised —Agree in principle with the comment. The proposed resolution revises the related sentence. For clarification in the current description, the proposed resolution defines an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules) without a time TBD.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 446. |
| 2239 | Tomoko Adachi | 62.00 | The paragraphs starting from line 41 and line 47 seems to be conflicting. Reconsider the two paragraphs. | As in comment. | Revised —Agree in principle with the comment. The proposed resolution is to define an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). The proposed resolution is revised with the ROM transaction for clarification. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2239. |
| 1224 | Liwen Chu | 62.01 | Ack to ROM frame may get lost, and ROM frame may get lost. Both of tham can create inconsistant state of operation mode. Slove the problemt. | As in comment. | Revised —Agree in principle with the comment. The proposed resolution is to define an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). As the ROMI transaction is defined, the inconsistent state of OMI operation would be not occurred. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1224. |
| 1572 | Mark RISON | 62.55 | "and can defer from changing to the new ROM settings indicated in the eliciting frame until a successful acknowledgement from the responding STA is received." This is in a NOTE, but is it saying that the STA transmitting the ROMI can change even if its ROMI was not acked? | Clarify | Revised —Agree in principle with the comment. The proposed resolution is to define an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1572. |
| 2 | Ahmadreza Hedayat | 14.38 | A STA assumes that the AP is fine with the ROM changes as long as the AP sends the ACK/BA in response of the frames that carries the ROMI. There could be problem with such assumption since the AP might have pending data for the STA, which a ROM change could affect the delivery of the data. | There should be a acknowlegment subfield in ROMI Control Information subfield so that a STA (e.g. an AP) that has received the ROMI can confirm whether the ROM change is fine. | Revised —Agree in principle with the comment. For clarification in the current description, the proposed resolution defines an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). In addition, the proposed resolution is to define an AP behaviour that the AP (i.e., OMI responder) shall use the values indicated by the most recently received OMI A-Control field sent by the STA (i.e., OMI initiator) to send PPDUs to the STA in subsequent TXOP. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 2. |
| 61 | Ahmadreza Hedayat | 62.47 | This "If there is a change to the current maximum operating channel width or the maximum number of spatial streams, the transmitting HE shall adjust to the most recently sent ROM settings within a time TBD [Outage Time] following the receipt of an immediate acknowledgement response." assumes that the AP is fine with the ROM changes as long as the AP sends the ACK/BA in response of the frames that carries the ROMI. There could be problem with such assumption since the AP might have pending data for the STA, which a ROM change could affect the delivery of the data. | Revise the text so that the ROM-change requuesting STA waits for some acknowlegment from the AP before performing the ROM change. | Revised —Agree in principle with the comment. For clarification in the current description, the proposed resolution defines an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). In addition, the proposed resolution is to define an AP behaviour that the AP (i.e., OMI responder) shall use the values indicated by the most recently received OMI A-Control field sent by the STA (i.e., OMI initiator) to send PPDUs to the STA in subsequent TXOP. TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 61. |
| 185 | Alfred Asterjadhi | 81.09 | Similar observation in this case. The responding STA is generally the AP which has allocated MU resources/TXOP durations under a particular CW/NSS as such it seems that the new ROMI change should apply at least in a new TXOP, satisfying the Outage time as well. | As in comment. | Revised —Agree in principle with the comment. The proposed resolution is to define an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 185. |
| 1574 | Mark RISON | 63.10 | It says "shall not sent" | Change to "shall not send" | Revised —Agree with the comment. It is a typo. Proposed resolution is revised to related text.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 1574. |
| 184 | Alfred Asterjadhi | 80.41 | This ROMI change seems to not be possible immediately after the immediate response. The STA (both transmitter and receiver) needs some time to switch from one BW/SS to a different BW/SS (i.e., the outage time which is TBD) hence the STA cannot be ready to receive immediately after the immediate response. Also does this apply to MU mode as well or only to SU mode? It seems it should apply to both cases. However in a similar way ROMI should also indicate how the STA opts in and out from MU mode as well. As such a bit for this would be needed. For consistency enable the same for OMN (subclause 11.42) as well. | As in comment. | Revised —Agree in principle with the comment. For clarification in the current description, the proposed resolution defines an OMI transaction with the mentioned concepts of 11/16/627r1 (ROM Recovery Rules). Regarding the MU or SU mode to apply OMI, the proposed text doesn’t need to restrict the mode. Naturally OMI can be applied in the MU mode as well as SU mode.In addition, the proposed resolution is to define a UL MU Disable bit with the mentioned concepts of 11/16/657 (In-device Multi-radio Coexistence and UL MU operation) and 11-16-0882-01-00ax-OMI-TOMI. See the proposed text below.TGax editor to make the changes shown in 11-16-0881r2 under all headings that include CID 184. |
| 655 | Huizhao Wang | 14.52 | Signaling Rx NSS & Rx Channel Width in HE varient HT Control field complicates the HE STA's capability signaling process. We already have VHT Cap IE, VHT Op IE & VHT OMN IE to do the Rx NSS, BW signaling. There is no need to introduce yet another mechanism | Remove "Receive operation mode indication" | Rejected —OMI has more functions than existing OMN IE and less signalling overhead.  |
| 775 | Jarkko Kneckt | 62.07 | The RX Operating Mode could benefit if a HE STA could request the BW and NSS for the other STA. This could help to select the RX mode to improve the transmission efficiency. | Please add a request signaling to request the STA to use a specific ROMI settings. | Rejected —Agree in principle with the comment that the OMI could help to improve the transmission efficiency. However, the proposed resolution defines the OMI operation between the OMI Initiator and OMI Responder. The STA likely starts to use the maximum OMI settings to receive data without AP assistance. Also it is not clear what the STA should do with the information. In order to figure out the OMI operation more clearly, normative text is described with OMI Initiator and OMI Responder. |
| 1568 | Mark RISON | 62.09 | What happens if a STA uses both mechanisms? Which one prevails? | Define which one wins if more than one is used (last one? ROM?). Note that for 11ac there was careful discussion of Operating Mode Notification v. Notify Channel Width | Rejected —Basically OMI is allowed in the QoS Data and QoS Null frames. So we don’t need to consider the situation that happens a STA uses both mechanisms simultaneously. But if the STA uses both mechanisms sequentially, the AP may use the most recently received value.  |

**Discussion:** This document also includes motioned concepts passed during the IEEE F2F meeting in May: <https://mentor.ieee.org/802.11/dcn/16/11-16-0627-01-00ax-ROM-Recovery-Rules.pptx>

[https://mentor.ieee.org/802.11/dcn/16/11-16-0657-00-00ax-In-device Multi-radio-Coexistence-and-UL-MU-operation.pptx](https://mentor.ieee.org/802.11/dcn/16/11-16-0657-00-00ax-In-device%20Multi-radio-Coexistence-and-UL-MU-operation.pptx)

## 3.4 Abbreviations and Acronyms

**TGax Editor: *Add the text to the correct alphabetical order:***

OMI operation mode indication *(#CID 2200, 2328)*

## 25.8 Operating Mode Indication

**25.8.1 General**

**TGax Editor: *Change the subclause below as follows:***

An HE STA can change its operating mode setting either using the procedure described in 11.42 (Notification of operating mode changes)(#2327), or the procedure described(#1561) in this subclause. Operating mode indication (OMI) is a procedure used between an OMI initiator and an OMI responder. An HE STA that transmits a frame including an OMI A-Control field is defined as an OMI initiator. An HE STA that receives a frame including an OMI A-Control field is defined as an OMI responder. *(#445, 1565, 1569, 1573, 2238, 856)*

When dot11OMIOptionImplemented is true, an HE STA may send a QoS Data or QoS Null frame that contains the OMI A-Control field to indicate a change in its receive and/or transmit operating parameters. An HE AP shall set dot11OMIOptionImplemented to true and the HE AP shall implement the reception of the OMI A-Control field. *(#1565, 2238)*

The OMI initiator shall indicate a change in its receive operating mode by including the OMI A-Control field in a QoS Data or QoS Null frame(#1563) that solicits an ~~acknowledgement frame~~ ~~immediate response~~ immediate acknowledgement and is intended to the OMI responder. *(#207, 1562, 2236)* The OMI A-Control field indicates that the OMI initiator supports (#444) receiving PPDUs with a bandwidth up to the value indicated by the Rx Channel Width subfield and with a number of spatial streams up to the value indicated by the Rx NSS subfield as defined in 25.8.2(#1564).

The OMI initiator shall indicate a change in its transmit operating mode by including the OMI A-Control field in a QoS Data or QoS Null frame(#1563) that solicits an ~~acknowledgement frame~~ ~~immediate response~~ immediate acknowledgement and is intended to the OMI responder as defined in 25.8.3. *(#2236)*

 *(#2657)*

**25.8.2 Rules for receive operating mode (ROM) indication**

**TGax Editor: *Change the subclause below as follows:***

The ROM indication allows the OMI initiator to adapt the maximum operating channel width and/or the maximum number of spatial streams it can receive from the OMI responder.

*(#685, 1223, 2330)*

An OMI initiator that sent the frame including the OMI A-Control field should change its OMI parameters, Rx NSS and Rx Channel Width, as follows: *(#685, 446, 2239, 1223, 1224, 1572)*

* When the OMI initiator changes an OMI parameter from higher to lower, it should make the change for that parameter only after receiving the ~~acknowledgement frame~~ ~~immediate response~~ immediate acknowledgement from the OMI responder.
* When the OMI initiator changes an OMI parameter from lower to higher, it should make the change for that parameter either after ACK Timeout has expired or after receiving the ~~acknowledgement frame~~ ~~immediate response~~ immediate acknowledgement from the OMI responder.

NOTE—In the event of transmission failure of the frame containing the OMI A-Control field(#1570), the OMI initiator attempts the recovery procedure defined in 10.22.2.7 (Multiple frame transmission in an EDCA TXOP)(#1571). *(#1572)*

If an OMI mode change is reported during a TXOP then the change should occur at least after that TXOP. *(#2, 61, 185)*

The OMI responder shall use the values indicated by the Rx Channel Width and Rx NSS subfields of the most recently received OMI A-Control field sent by the OMI initiator to send PPDUs to the OMI initiator in subsequent TXOP. *(#2, 61, 185)*

After transmitting the ~~acknowledgement frame~~ ~~immediate response~~ immediate acknowledgement for the frame containing the OMI A-Control field, the OMI responder may transmit subsequent SU PPDUs or MU PPDUs that are addressed to the OMI initiator. *(#1574, 184)*

NOTE—A subsequent PPDU is a PPDU that is intended for the ROM Initiator and needs not be the immediately following PPDU. *(#2463, 2469)*

*(#1574)*