IEEE P802.11
Wireless LANs

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| PDT PHY Transmit requirements for PPDUs sent in response to a triggering frame |
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# Revision information

The following is a summary of the important changes that occurred within each revision of this document:

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| **Revision** | **Major changes** |
| 0 | Initial revision |
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# 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 TGbn Draft. The abstract, revision information, introduction, explanation of the proposed changes, and references sections are 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).***

## Explanation of the proposed changes:

*The proposed changes to the 802.11 TGbn draft within this document are based on the following motions adopted by the TGbn task group.*

### Relevant passing motions:

[Motion #42, [1]]:

* Add the following modulation and code rate combinations as the new MCSs for 11bn:
	+ Modulations of {QPSK, 16QAM, 256QAM} with code rate R=2/3
	+ Modulation of 16QAM with code rate R=5/6

[Motion #102, [1]]

* For joint NDP based sounding, one AP will frequency synchronize to the other for both of its NDP transmissions
	+ For both the NDPs, the AP doing the correction brings its frequency within a certain TBD range of the reference AP

[Motion #118, [1]]

* For sequential NDP based sounding, one AP will frequency synchronize to the other for both of its NDP transmissions
	+ For both its NDPs, the AP doing the correction brings its frequency within a certain TBD range of the reference AP.

[Motion #180, [1]]

* UHR sounding sequence uses EHT NDP. I.e., there is no UHR NDP.
	+ UHR COBF sounding sequence is the only UHR sounding sequence

[Motion #189, [1]]

* NDP Announcement Variant subfield shall be set to 3 for COBF NDPA in UHR.

# Text to be adopted begins here:

***TGbn editor: Please add the following subclauses for Transmit requirements for PPDUs sent in response to a triggering frame to the 802.11bn draft D0.1:***

# 38.3.16 Transmit requirements for PPDUs sent in response to a triggering frame

## 38.3.16.1 Introduction

An AP may solicit simultaneous UHR TB PPDU transmissions, or simultaneous non-HT or non-HT duplicate PPDU transmissions from multiple non-AP STAs using a triggering frame. Since there are multiple transmitters (non-AP STAs) in the above simultaneous transmissions, the pre-corrections of transmission time, frequency, sampling symbol clock, and power (in the case of a UHR TB PPDU) by the non-AP STAs are necessary to mitigate synchronization and interference issues at the AP. Frequency and sampling clock pre-corrections are needed to prevent inter-carrier interference. Power pre-correction is necessary to control interference between UHR TB PPDU transmissions from the non-AP STAs. An AP may solicit simultaneous UHR TB PPDU transmissions from both Class A and Class B devices. A non-AP STA that supports UHR TB PPDU transmission shall support power pre-correction as described in 38.3.16.2 (Power pre-correction) and shall meet the pre-correction accuracy requirements described in 38.3.16.3 (Precorrection accuracy requirements).

A sharing AP may solicit simulationeous DL Co-BF MU PPDU transmissions from the sharing and shared APs using a triggering frame...(TBD)

## 38.3.16.2 Power pre-correction

A STA transmits a UHR TB PPDU at the STA’s maximum transmit power for the assigned UHR-MCS if the UL Target Receive Power subfield of the User Info field in the Trigger frame that solicits the UHR TB PPDU or the UL Target Receive Power subfield of the TRS Control field of the frame that solicits a response in a UHR TB PPDU indicates that the maximum transmit power is needed.

Otherwise, the STA calculates the transmit power , in units of dBm, of the UHR TB PPDU for the assigned UHR-MCS using Equation (38-x1).

 (38-x1)

where

*PLDL* is the DL pathloss

*TargetRxpwr* is the expected receive signal power in units of dBm indicated in the UL Target Receive Power subfield in the User Info field in the Trigger frame or the UL Target Receive Power subfield in the TRS Control field.

The STA computes *PLDL* using Equation (38-x2).

 (38-x2)

where(#24414)

 is the AP’s transmit power, normalized to 20 MHz and expressed in dBm/20 MHz, as indicated by the AP Tx Power subfield of the Common Info field in the Trigger frame, the encoding of which is specified in 9.3.1.22 (Trigger frame format), or the AP Tx Power subfield of the TRS Control field, the encoding of which is specified in 9.2.4.7.1 (TRS Control).

*Rxpwr* is the receive signal power, normalized to 20 MHz and expressed in dBm/20 MHz, at the antenna connector of the STA of the triggering PPDU. is an average of the receive signal power over the antennas on which the average is being computed. If the triggering PPDU is a HT-mixed, VHT, HE, EHT, or UHR PPDU, then the receive signal power is measured from the fields prior to the HT-STF, VHT-STF, HE-STF, EHT-STF or UHR-STF, respectively.

NOTE 1— and Rxpwr are normalized to 20 MHz and expressed in dBm/20 MHz, where the normalization only includes nonpunctured channels.  and TargetRxpwr are expressed in dBm without normalization.

A STA that applies beamforming in the UL should take the beamforming gain into account when calculating the transmit power needed to meet the UL target receive power.

NOTE 2—An AP could account for its beamforming gain in or *TargetRxpwr* if the triggering PPDU used beamforming.

The transmit power of the UHR TB PPDU is further subject to a STA’s minimum and maximum transmit power limit due to hardware capability, regulatory requirements and local maximum transmit power levels (see 11.7.5 (Specification of regulatory and local maximum transmit power levels)) as well as non-IEEE 802.11 in-device coexistence requirements.

A STA includes its UL power headroom in the UHR TB PPDU following the rules defined in 26.5.2.4 (AMPDU contents in an HE TB PPDU), where the rules related to HE TB PPDUs also apply to UHR TB PPDUs. See 37.5.2.3 (Non-AP STA behavior for UL MU operation) for details.

## 38.3.16.3 Pre-correction accuracy requirements

A STA that transmits a UHRTB PPDU shall support per chain max (*P*-32, -10) dBm as the minimum transmit power, where *P* is the maximum power, in dBm, that the STA can transmit at the antenna connector of that chain using UHR-MCS 0 while meeting the transmit EVM and spectral mask requirements. A STA transmitting at and above the minimum power, but below $P\_{max,MCS7}$, shall support the EVM requirements for UHR-MCS 7 even if the UHR-MCS used for the transmission is lower than UHR-MCS 7 or is equal to UHR-MCS x1,x2 or x3 where $P\_{max,MCS7}$ is the maximum transmit power supported by the STA for UHR-MCS 7 in a UHR TB PPDU.

A STA that transmits a UHR TB PPDU shall support the absolute and relative transmit power requirements and the RSSI measurement accuracy requirements defined in Table 38-x1 (Transmit power and RSSI measurement accuracy)

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| Table 38-x1 Transmit power and RSSI measurement accuracy  |
| Parameter | Minimum Requirement | Comments |
| Class A | Class B |
| Absolute transmit power accuracy | ±3 dB | ±9 dB | Accuracy of achieving a specified transmit power. |
| RSSI measurement accuracy | ±3 dB | ±5 dB | The difference between the RSSI and the received power.Requirements are valid from minimum receive to maximum receive input power. |
| Relative transmit power accuracy | N/A | ±3 dB | Accuracy of achieving a change in transmit power for consecutive UHR TB PPDU.The relative transmit power accuracy is applicable only to Class B devices. |

The absolute transmit power accuracy is applicable for the entire range of transmit power that the STA is intending to use for the current band of operation. The RSSI accuracy requirements shall be applied to receive signal power level range from –82 dBm to –20 dBm in the 2.4 GHz band and from –82 dBm to –30 dBm in the 5 GHz and 6 GHz bands. The requirements are for nominal (room) temperature conditions. The RSSI shall be measured during the reception of the non-UHR portion of the UHR PPDU preamble.

A STA compensates for carrier frequency offset (CFO) error and symbol clock error with respect to the corresponding triggering PPDU when transmitting the following types of PPDUs:

 — UHR TB PPDU

* Non-HT or non-HT duplicate PPDU with the TXVECTOR parameter TRIGGER\_RESPONDING set to true

NOTE 3—The MU-RTS Trigger frame solicits transmission of a non-HT or non-HT duplicate PPDU and not a UHR TB PPDU. The non-HT or non-HT duplicate PPDU transmitted as a response to an MU-RTS Trigger frame carries a CTS frame.

After compensation, the absolute value of residual CFO error with respect to the corresponding triggering PPDU shall not exceed the following levels when measured at the 10% point of the complementary cumulative distribution function (CCDF) of CFO errors in AWGN at a received power of –60 dBm in the primary 20 MHz channel:

* 350 Hz for the data subcarriers of an EHT TB PPDU
* 2 kHz for a non-HT PPDU or non-HT duplicate PPDU

The residual CFO error measurement on a UHR TB PPDU shall be made after the U-SIG field. The residual CFO error measurement on the non-HT or non-HT duplicate PPDU shall be made after the L-STF field. The symbol clock error shall be compensated by the same ppm amount as the CFO error.

A STA that transmits a UHR TB PPDU, non-HT PPDU, or non-HT duplicate PPDU in response to a triggering PPDU shall ensure that the transmission start time of the UHR TB PPDU, non-HT PPDU, or non-HT duplicate PPDU is within ±0.4 µs + 16 µs from the end, at the STA’s transmit antenna connector, of the last OFDM symbol of the triggering PPDU (if it contains no PE field) or of the PE field of the triggering PPDU (if the PE field is present).

NOTE 4—This end instant is before any signal extension, so this is equivalent to UHR TB PPDU transmission within 0.4 µs of SIFS after the end of the triggering PPDU including signal extension.

# 38.3.17 Transmit requirements for NDPs sent in response to a UHR Co-BF NDP announcement frame

## 38.3.17.1 introductcion

An initiating AP may solicit simulationeous EHT NDP transmissions from the initiating and responding APs using a UHR Co-BF NDP announcement frame in a UHR TB joint NDP sounding for Co-BF (see 37.6.3 (Rules for UHR sounding protocol sequences)). An initiating AP may solicit EHT NDP transmission from the responding AP using a UHR Co-BF NDP announcement frame in a UHR TB sequential NDP sounding for Co-BF (see 37.6.3 (Rules for UHR sounding protocol sequences)). To collect estimate channel state information from the non-AP STAs to compute a steering matrix for DL Co-BF MU PPDU transmission at both APs, the pre-correction of frequency by the TBD AP in the above transmissions is necessary to mitigate synchronization and interferences issues at the non-AP STAs for channel estimation.

## 38.3.17.2 Pre-correction accuracy requirements

An AP compensates carrier frequency offset (CFO) error with respect to the corresponding UHR Co-BF NDP announcement frame when transmitting the EHT souding NDP in UHR sounding process ~~for DL Co-BF MU PPDU transmission.~~

After compensation, the absolute value of residual CFO error with respect to the corresponding NDP announcement frame shall not exceed the following levels when measured at the 10% point of the complementary cumulative distribution function (CCDF) of CFO errors in AWGN at a received power of –60 dBm in the primary 20 MHz channel:

* TBD Hz for an EHT sounding NDP in UHR sounding process ~~for DL Co-BF MU PPDU transmission~~

**References:**

1. 11-24-0171r26: 11-24-0171-26-00bn-tgbn-motions-list-part-1, Alfred Asterjadhi (Qualcomm Inc.)