IEEE P802.11  
Wireless LANs

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| Comment Resolution on OFDM DC relative shift | | | | |
| Date: 2018-2-27 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Hiroyuki Motozuka | Panasonic | 600 Saedo-cho, Tsuzuki-ku, Yokohama, Kanagawa, Japan |  | motozuka.hiroyuki@jp.panasonic.com |
| Takenori Sakamoto |  |  | sakamoto.takenori@jp.panasonic.com |
| Yutaka Murakami |  |  | murakami.ytk@jp.panasonic.com |
| Lei Huang |  |  | lei.huang@sg.panasonic.com |
| Gaius Wee |  |  | yaohuang.wee@sg.panasonic.com |
| Kazu Takahashi |  |  | takahashi.kazu@jp.panasonic.com |

Abstract

This submission proposes resolution of comments on 30.6.1.3 DC relative shift to carrier frequency and related subclauses received from LB# 231 (TGay Draft 1.0).

5 CIDs: 1520, 1521, 1539, 2092 and 2138

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2092 | 30.6.1.3 | 329.10 | Unclear why DC needs to be shifted, please add a note to explain to the reader the reason for the shift | Add text to explain why the DC needs be shifted relative to the carrier frequency | **Revised**  TGay editor to make the changes shown in 11-18/0275r0 under all headings that include CID 2092. |
| 1520 | 30.6.1.3 | 329.11 | Dc relative shift should be applied to the TRN field as well since the TRN field for the OFDM PPDU consists of OFDM symbols. | "The DC relative frequency shift is applied in digital domain for EDMG-STF, EDMG-CEF, Data and TRN fields of an EDMG OFDM mode PPDU." | **Accepted**  TGay editor to make the changes shown in 11-18/0275r0 under all headings that include CID 1520. |
| 1521 | 30.6.1.3 | 329.11 | There's no text to mention or define the parameter F\_DC, which appears in Table 72. | Mention it in the text. e.g. "The DC relative shift, F\_DC, is frequency channel dependent and defined in Table 72." | **Revised**  TGay editor to make the changes shown in 11-18/0275r0 under all headings that include CID 1521. |
| 2138 | 30.6.1.3 | 330.07 | Since FCC only approved up to 71 GHz, we should remove rows 7 and 8 from NCB=1 category from Table 72. Similar action should be taken for NCB>1. | As in comment | **Accepted**  TGay editor to make the changes shown in 11-18/0275r0 under all headings that include CID 2138. |
| 1539 | 30.6.9.3.3 | 364.29 | DC relative shift on the EDMG-STF, EDMG-CEF, Data and TRN fields shall be described explicitly in this section as an equation. | apply exp(j 2pi (F\_DC - Fc) nTs) to r\_EDMG-STF, r\_EDMG-CEF, r\_Data and r\_TRN. | **Revised**  TGay editor to make the changes shown in 11-18/0275r0 under all headings that include CID 1539. |

**Discussion**

The parameter *fDC*(see Note 1), defined in Table 72, shall be the DC subcarrier frequency, and the value, (*fDC* – *fc*) where  *fc* is the center frequency of the carrier, shall be the DC relative shift. The draft spec shall define the meaning of the parameter *fDC* (CID #1521).

**Note 1: We replaced *F****c* **and *F****DC* **with** *fc* **and** *fDC* **respectively to align with the parameter definitions in clause 20. In clause 20, the parameter *fc* is used to indicate the center frequency of the carrier while *Fc* represents the SC chip rate.**

**Table 72 of Draft D1.0 defines DC relative shift values for channels 1-8 as well as 4.32 GHz or wider channels composed of the channels. As any tables in Annex E don’t include channels 7, 8 and related wider channels, Table 72 should not include the specification for them. We propose to accept the comment and remove the related rows. (CID #2138)**

**The DC relative shift should apply to the OFDM symbols, while not to apply to the PHY fields with SC modulation. In D1.0, OFDM-modulated fields are the EDMG-STF, EDMG-CEF, Data and TRN fields. The DC relative shift should apply to the TRN field as well. (CID #1520)**

By applying the DC relative shift, each of the subcarrier frequencies for any channel numbers can be denoted as 64.8+∆*F*×*n* GHz, where *n* is an integer. This makes the space between DC subcarrier frequencies of any two channels an integer multiple of the OFDM subcarrier spacing, and the subcarrier frequencies for 4.32 GHz or wider channels are aligned with the subcarriers in 2.16 GHz channels. – The reason for applying the DC relative frequency shift should be mentioned in the Note. (CID #2092)

**Since the DC relative shift is applied in digital domain, we propose to include the DC relative shift to the PPDU transmission related subclauses (CID #1539).**

**Proposed changes to D1.0**

***Editor: modify the text in subclause 30.6.1.3 of D1.0 as follows: (P329L10-P330L2) (CID #1520, #1521, #1539, #2092)***

* + - 1. DC relative shift to carrier frequency

The DC relative frequency shift is applied in digital domain to the EDMG-STF, EDMG-CEF, Data and TRN fields (CID#1520) of an EDMG OFDM mode PPDU. The DC relative shift is frequency channel dependent, and denoted as (*fDC – fc*), where *fc* is the center frequency of the carrier and *fDC* is the DC subcarrier frequency (CID#1521). *fDC* and the DC relative shift are defined in Table 72.

NOTE—By applying the DC relative shift, each of the subcarrier frequencies for any channel numbers can be denoted as 64.8+∆*F*×*n* GHz, where *n* is an integer. This makes the space between DC subcarrier frequencies of any two channels an integer multiple of the OFDM subcarrier spacing, and the subcarrier frequencies for 4.32 GHz or wider channels are aligned with the subcarriers in 2.16 GHz channels.(#2092) In all cases, the relative shift between the DC subcarrier frequency and the center frequency of the carrier does not exceed half of the subcarrier spacing.

***Editor: remove the rows relate to channel numbers 7, 8, 14, 15, 21, 22, 28, 29 in Table 72 as follows: (P330L1) (CID #2138)***

1. —DC relative shift to carrier frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of contiguous 2.16 GHz channels (NCB) | Channel number | Center frequency of the carrier, *fc*, GHz | DC subcarrier frequency, *fDC*, GHz | DC relative shift, (*fDC – fc*), MHz |
| 1 | 1 | 58.32 | 64.8 - ∆*F*×3×419 | -1.4063 |
| 2 | 60.48 | 64.8 - ∆*F*×2×419 | -0.9375 |
| 3 | 62.64 | 64.8 - ∆*F*×419 | -0.4688 |
| 4 | 64.8 | 64.8 | 0 |
| 5 | 66.96 | 64.8 + ∆*F*×419 | 0.4688 |
| 6 | 69.12 | 64.8 + ∆*F*×2×419 | 0.9375 |
| 2 | 9 | 59.4 | 64.8 – ∆*F*×1047 | 1.4062 |
| 10 | 61.56 | 64.8 – ∆*F*×628 | 1.8750 |
| 11 | 63.72 | 64.8 – ∆*F*×209 | 2.3438 |
| 12 | 65.88 | 64.8 + ∆*F*×209 | -2.3437 |
| 13 | 68.04 | 64.8 + ∆*F*×628 | -1.8750 |
| 3 | 17 | 60.48 | 64.8 – ∆*F*×2×419 | -0.9375 |
| 18 | 62.64 | 64.8 – ∆*F*×419 | -0.4688 |
| 19 | 64.8 | 64.8 | 0 |
| 20 | 66.96 | 64.8 + ∆*F*×419 | 0.4688 |
| 4 | 25 | 61.56 | 64.8 – ∆*F*×628 | 1.8750 |
| 26 | 63.72 | 64.8 – ∆*F*×209 | 2.3438 |
| 27 | 65.88 | 64.8 + ∆*F*×209 | -2.3437 |

* + - * 1. EDMG preamble, Data and TRN fields transmission

***Editor: modify the 3rd paragraph of subclause 30.6.9.3.3 of D1.0 as follows: (P365L25-P366L2) (CID #1539)***

The EDMG OFDM mode SU PPDU waveform for the iTXth transmit chain concatenates the pre-EDMG, EDMG preamble, Data field and TRN field, with DC relative shift applied to the EDMG modulated fields as described in **30.6.1.3**, and shall be defined as follows:



where:

 is the total duration of the L-STF, the L-CEF, the L-Header, and the EDMG-Header-A fields of the PPDU

 is the center frequency of the carrier

 is the DC subcarrier frequency defined in **30.6.1.3**

* + - * 1. EDMG preamble, Data and TRN fields transmission

***Editor: modify the 3rd paragraph of subclause 30.6.9.4.3 of D1.0 as follows: (P367L8-P367L13) (CID #1539)***

The EDMG OFDM mode MU PPDU waveform for the iTXth transmit chain concatenates the pre-EDMG, EDMG preamble, Data field and TRN field, with DC relative shift applied to the EDMG modulated fields as described in **30.6.1.3**, and shall be defined as follows:



where:

 is the total duration of the L-STF, the L-CEF, the L-Header, and the EDMG-Header-A fields of the PPDU

 is the center frequency of the carrier

 is the DC subcarrier frequency defined in **30.6.1.3**

**Straw Poll:**

* **Do you agree to accept the comment resolution for CIDs 1520, 1521, 1539, 2092 and 2138 as proposed in 18/0275r0?**

**References**

[1] Draft P802.11ay D1.0