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| EDMG AP or PCP operations in BTI and A-BFT access periods |
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Abstract

This document proposes text for EDMG AP or PCP operations in BTI and A-BFT access periods.

The updates are based on P802.11 D0.5.

*To allow an EDMG AP or PCP to use multiple antennas in BTI and A-BFT of a Beacon Interval discussed in [1], we propose following text changes to 802.11ay D0.5.*

*(the baseline text is from IEEE 802.11-2016 Section 10.38.4 and Section 10.38.5.4)*

**10.38.4 Beamforming in BTI**

***(****Insert following into 11ay D0.5 Line 37, Page 76)*

*Change the third paragraph as follows*

When an AP or PCP has more than one DMG antenna, the TXSS shall cover all of the sectors in all DMG antennas. The TXSS Span field indicates the total number of beacon intervals it takes the AP or PCP to cover all sectors in all DMG antennas. The value of the TXSS Span field shall be lower than dot11MaximalSectorScan. The DMG AP or PCP and the EDMG AP or PCP with single RF chain shall not change DMG antennas within a BTI. The AP or PCP has a regular schedule of transmitting through each DMG antenna (see 10.38.5.4 (Beamforming in A-BFT with multiple DMG antennas)). For an EDMG AP or PCP having multiple RF chains, the EDMG AP or PCP may switch from one RF chain to another RF chain within a BTI. The set of DMG antennas which are used for DMG Beacon transmission in a BTI form a DMG antenna group. The EDMG AP or PCP shall not change DMG antennas for each RF chain within a BTI.



Fig.xxx An example of an EDMG AP or PCP using a DMG antenna group consisting of DMG antenna 0 and 1 in the BTI and the A-BFT of the first BI, and using another DMG antenna group consisting of DMG antenna 2 and 3 in the BTI and the A-BFT of the second BI.

*(Insert following into 11ay D0.5 Line 45, Page 80, after Section 10.38.5.2)*

**10.38.5.4 Beamforming in A-BFT with multiple DMG antennas**

*Change the first paragraph as follows*

An DMG AP or PCP or an EDMG AP or PCP using one RF chain in last BTI shall receive through a quasi-omni antenna pattern from a single DMG antenna throughout an A-BFT unless RXSS is used in the A-BFT, in which case it switches through antenna patterns as described in 10.38.5.2 (Operation during the A-BFT). An EDMG AP or PCP that used multiple RF chains to transmit DMG Beacon frames in last BTI shall simultaneously receive throughout the A-BFT with a quasi-omni antenna pattern from each DMG antenna used in the last BTI.

*Change the second paragraph as follows*

An AP or PCP shall have an A-BFT every *k* beacon intervals, where *k* is the value indicated by the N BIs ABFT subfield in the Beacon Interval Control field. In an A-BFT, the DMG AP or PCP or EDMG AP or PCP using single RF chain in last BTI shall receive in a quasi-omni antenna pattern using the DMG antenna indicated by the value of the DMG Antenna ID subfield within the SSW field transmitted in the DMG Beacon. A DMG AP or PCP or EDMG AP or PCP having a single RF chain with multiple DMG antennas has a regular schedule of receiving through each DMG antenna corresponding to the DMG antenna in which a DMG Beacon frame is transmitted through. The AP or PCP shall switch RX DMG antenna every *l* allocations, where *l* is the value of the N A-BFT in Ant subfield within the Beacon Interval Control field.

In an A-BFT, the EDMG AP or PCP that used multiple RF chains in last BTI shall receive in a quasi-omni antenna pattern using the DMG antenna(s) indicated by each unique value of the DMG Antenna ID subfield within the Sector Sweep fields transmitted in one or multiple DMG Beacon(s) during last BTI. DMG Beacons transmitted from different DMG antennas have different values in their DMG Antenna ID subfields. An EDMG AP or PCP with multiple RF chains and multiple DMG antenna groups has a regular schedule of receiving through each DMG antenna group corresponding to the DMG antennas in which a DMG Beacon frame is transmitted through. The EDMG AP or PCP with multiple RF chains shall switch RX DMG antenna group every *l* allocations, where *l* is the value of the N A-BFT in Ant subfield within the Beacon Interval Control field.

In each DMG Beacon, the A-BFT Count subfield in the Beacon Interval Control field indicates the number of A-BFTs that have passed since the AP or PCP last switched RX DMG antennas.

*Change the section 10.3.2.3.8 and 10.3.2.3.11 as follows*

**10.3.2.3.8 SBIFS**

The SBIFS shall be used to separate:
a) multiple transmissions from a single transmitter during a receive sector sweep or

b) multiple transmissions when each transmission occurs with a different transmit antenna configuration and no SIFS-separated response transmission is expected or

c) multiple transmissions from a single transmitter when each transmission occurs with a different transmit RF chain and no SIFS-separated response transmission is expected.

The duration of SBIFS is determined by the aSBIFSTime PHY characteristic. The SBIFS is the time from the end of the last symbol of the previous frame to the beginning of the first symbol of the preamble of the subsequent frame as seen on the WM. A STA shall not allow the space between frames that are defined to be separated by a SBIFS, as measured on the medium, to be less than aSBIFSTime or to be more than aSBIFSTime + aSBIFSAccuracy. Two frames separated by a SBIFS shall both be DMG PPDUs.

**10.3.2.3.11 LBIFS**

The LBIFS shall be used between two consecutive transmissions which use different antennas, with common RF chain, and when the recipient STA is expected to switch DMG antennas. LBIFS is equal to TXTIME(SSW) + 2×SBIFS. An implementation of a DMG STA shall not allow the space between frames that are defined to be separated by an LBIFS, as measured on the medium, to vary from the nominal LBIFS by more than –0% or +10% × (aSlotTime – aAirPropagationTime).

***Do you agree:***

***to allow an EDMG AP to use multiple antennas in BTI and A-BFT of a Beacon Interval by inserting the text above into D0.5?***

**References:**

[1] 11-17-1582-00-00ay-BTI-and-A-BFT-for-EDMG-AP-with-Multiple-Antennas