### **IEEE P802.11Wireless LANs**

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| Spec Text on Recommended CSD |
| Date: 2018-09-10 |
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**Abstract**

This document contains text on “Recommended CSD” to be adopted into Draft 1.0.

**Discussion**

A number of people have provided suggestions on the CSD design; however, the draft does not yet include any text on the CSD design. There is interest within the IEEE in providing examples of CSD design.

This document provides spec text for example CSD designs. This includes the necessary text for the Annex AB as well as some text in Clause 32 referring to that Annex.

Simulations for these CSD values are provided in [1-2].

1. Vinod Kristem, Shahrnaz Azizi, Thomas Kenney , Minyoung Park, “CSD recommendations for example sequences,” IEEE 802.11-1562r0, September 2018
2. Steve Shellhammer and Bin Tian, “CSD Simulations,” IEEE 802.11-1556r0, September 2018

**Straw Poll**

Do you support the Spec Text in this document IEEE 802.11-18/1196r1?

Yes

No

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***Instructions to 802.11ba Editor***

***Editor Instructions: In subclause 32.2.8.3.2 add the text shown in Red.***

**32.2.8.3.2 Cyclic Shift for WUR-Sync field**

Recommended cycle shift diversity (CSD) for the Sync Field, which is constructed from 2 µs MC-OOK symbols, are provided in Annex AB.

***Editor Instructions: In subclause 32.2.9 add the text shown in Red.***

**32.2.9.1 Cycle Shift for WUR-Data field**

Recommended cycle shift diversity (CSD) for the HDR Data Field, which is constructed from 2 µs MC-OOK symbols, are provided in Annex AB.

Recommended cycle shift diversity (CSD) for the LDR Data Field, which is constructed from 4 µs MC-OOK symbols, are provided in Annex AB.

***Editor Instructions: For the current text in Draft 0.4 subclause 32.2.9 convert that text to subclause 32.2.9.2.***

***Editor Instructions: In Annex AB add the text shown in Red.***

For the Sync field and the HDR Data field, which are both constructed from 2 µs MC-OOK symbols, Table AB-3 provides recommended CSD values for up to eight transmit antennas, for each of the three recommended MC-OOK symbols from Table AB-1.

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| **Example Sequence** | **Number of Transmit Antennas** | **CSD Values (ns)** |
| Example 1 | 1 | [0] |
| 2 | [0, 1000] |
| 3 | [0, 1000, 500] |
| 4 | [0, 1000, 500, 250] |
| 5 | [0, 1000, 500, 250, 1250] |
| 6 | [0, 1000, 500, 250, 1250, 750] |
| 7 | [0, 1000, 500, 250, 1250, 750, 1000] |
| 8 | [0, 1000, 500, 250, 1250, 750, 1000, 250] |
| Example 2 | 1 | [0] |
| 2 | [0, 1500] |
| 3 | [0, 750, 1500] |
| 4 | [0, 500, 1000, 1500] |
| 5 | [0, 400, 750, 1150, 1500] |
| 6 | [0, 300, 600, 900, 1200, 1500] |
| 7 | [0, 250, 500, 750, 1000, 1250, 1500] |
| 8 | [0, 200, 450, 650, 850, 1050, 1300, 1500] |
| Example 3 | 1 | [0] |
| 2 | [0, 1500] |
| 3 | [0, 750, 1500] |
| 4 | [0, 500, 1000, 1500] |
| 5 | [0, 400, 750, 1150, 1500] |
| 6 | [0, 300, 600, 900, 1200, 1500] |
| 7 | [0, 250, 500, 750, 1000, 1250, 1500] |
| 8 | [0, 200, 450, 650, 850, 1050, 1300, 1500] |

*Table AB-3: Recommended CSD values for the Sync field and HDR Data Fields*

For the LDR Data field, which is constructed from 4 µs MC-OOK symbols, Table AB-4 provides recommended CSD values for up to eight transmit antennas, for each of the three recommended MC-OOK symbols from Table AB-2.

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| **Example Sequence** | **Number of Transmit Antennas** | **CSD Values (ns)** |
| Example 1 | 1 | [0] |
| 2 | [0, 2000] |
| 3 | [0, 2000, 1000] |
| 4 | [0, 2000, 1000, 500] |
| 5 | [0, 2000, 1000, 500, 2500] |
| 6 | [0, 2000, 1000, 500, 2500, 1500] |
| 7 | [0, 2000, 1000, 500, 2500, 1500, 2000] |
| 8 | [0, 2000, 1000, 500, 2500, 1500, 2000, 500] |
| Example 2 | 1 | [0] |
| 2 | [0, 3000] |
| 3 | [0, 1500, 3000] |
| 4 | [0, 1000, 2000, 3000] |
| 5 | [0, 750, 1500, 2250, 3000] |
| 6 | [0, 600, 1200, 1800, 2400, 3000] |
| 7 | [0, 500, 1000, 1500, 2000, 2500, 3000] |
| 8 | [0, 450, 850, 1300, 1700, 2150, 2550, 3000] |
| Example 3 | 1 | [0] |
| 2 | [0, 3000] |
| 3 | [0, 1500, 3000] |
| 4 | [0, 1000, 2000, 3000] |
| 5 | [0, 750, 1500, 2250, 3000] |
| 6 | [0, 600, 1200, 1800, 2400, 3000] |
| 7 | [0, 500, 1000, 1500, 2000, 2500, 3000] |
| 8 | [0, 450, 850, 1300, 1700, 2150, 2550, 3000] |

*Table AB-4: Recommended CSD values for the LDR Data Field*