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

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| Spec Text on MC-OOK Symbol Phase Randomization |
| Date: 2018-07-DD |
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**Abstract**

This document contains text on “MC-OOK Symbol Phase Randomization’ to be adopted into Draft 0.4.

**Discussion**

At the May IEEE meeting [1] it was shown that repeated occurance of the MC-OOK On symbol causes spectral lines in the power spectral density, which prevents meeting FCC requirements. The problem can be elimiated by applying a random phase rotation to the MC-OOK On symbols. A simple linear feedback shift register (LFSR) can be used to generate the pseudo random bit sequence which indicates what phase rotation to apply to the the MC-OOK On symbol before transmission.

This document provides spec text for the MC-OOK Symbol Phase Randomization.

[1] Steve Shellhammer, Bin Tian and Richard van Nee, “WUR Power Spectral Density,” IEEE 802.11/18-824r1, May 2018

**Straw Poll**

Do you support the Spec Text in this document 802.11-18/01194r0?

Yes

No

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***Instructions to 802.11ba Editor***

***Editor Instructions: In Clause 32.2.3 add the text shown in Red.***

… The Sync bit sequence is then used to switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG). The Symbol Phase Randomzier applies a psueduo random phase rotation to the MC-OOK On waveform prior to transmission to remove any spectral lines in the power spectral density.

***Editor Instructions: Replace Figure 32-4 with the following figure.***



***Editor Instructions: Replace Figure 32-5 with the following figure***



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An example of a WUR signal generator for the WUR-Data field is shown in Figure 32-5 (An Example of a WUR signal generator for the WUR-Data field for Antenna $i\_{TX}$). The information bits are mapped by a Manchester-based encoder. Each coded bit is then used to switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG). The Symbol Phase Randomzier applies a psueduo random phase rotation to the MC-OOK On waveform prior to transmission to remove any spectral lines in the power spectral density.

***Editor Instructions: Just before sub-clause 32.2.3.1 add the text shown in Red and the new figure.***

The Symbol Phase Randomzier, shown in Figure 32-XX, uses a linear feedback shift register with a generator polynomial $G\left(z\right)=z^{-7}+z^{-4}+1$ to generate a sequence of psuedo random bits. Those bits are converted to values of +1 or -1 by the BPSK Mapper. The BPSK mapper maps a bit 0 to a value of -1 and a bit 1 to a value of +1. The MC-OOK On Waveform is multiplied by the output of the BPSK Mapper, which is a value of either -1 or +1. At the beginning of each PPDU the LFSR is loaded with all zeros. The symbol phase randomizer is used for both the Sync Field and the Data Field. The LFSR is updated every $T\_{Sync}$ during the Sync Field and updated ever $T\_{Sym}$ during the Data Field.



Figure: 32-XX: Symbol Phase Randomizer