IEEE P802.11
Wireless LANs

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| Comment Resolutions on Clause 32.2.3.4 (Symbol Randomizer)  |
| Date: 2019-01-15 |
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Abstract

This submission proposes resolutions for the following 10 comments on Clause 32.2.3.4 of TGba D1.0 [1]:

155, 225, 297, 298, 299, 300, 321, 323, 444, 499

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: CRs are revised according to the decisions in the TGba PHY AdHoc meeting.

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 TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGba Editor: Editing instructions preceded by “TGba Editor” are instructions to the TGba editor to modify existing material in the TGba draft. As a result of adopting the changes, the TGba editor will execute the instructions rather than copy them to the TGba Draft.***

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| **CID** | **Clause Number** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 155 | 32.2.3.4 | 73.41 | Change 'The symbol randomizer is used to remove any spectral lines in the power spectral density" to "The symbol randomizer is used to reduce the spikes in power spectral density" for accuracy. | See comment. Or simply remove it. | RevisedTGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 155. |
| 225 | 32.2.3.4 | 73.61 | CSD is not related to power spectral density. And, description for CSD in this cluase can occur the miss understanding. thus, CSD has to be described by using the independent clause. | see the comment. | RevisedAgree in principle with commenter. This section is not only described for Symbol Randomizer, but also described for per-Antenna cyclic shift.TGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 225. |
| 297 | 32.2.3.4 | 77.00 | Not clear why symbol randomization needs to be calculated deterministically, while the ON waveform itself can be constructed arbitrarily, given that tone modulation is left to choice of the implementer. By requiring the standardized shifting of an unspecified waveform we shut the door to less complex, or better performing dithering of the transmit signal. Better performance can mean smaller spectral spikes, or better receiver performance. | Leave symbol randomization up to the implementer (obviously spectral requirements must be met). | RevisedTGba Editor to make the changes shown in IEEE 802.11-19/0050r1under the tag with CID 297. |
| 298 | 32.2.3.4 | 77.30 | "The LFSR is updated every Tsync ... every Tsym". It is not specified whether it is updated at the start or at the end of the intervals. So, for instance, is the first On/Off symbol in the sync field using a CSD of -1400 (the reset value) or -1200 (the value of the first iteration of the LFSR). | Specify when the LSFR is updated and which cyclic shift applies to which period. This can be done by referring to table 32-8, and specifying which time step is applied to which On/Off symbol in the sync field. | RevisedTGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 298. |
| 299 | 32.2.3.4 | 77.00 | It may be confusing to an implementer of this standard that a cyclic shift is applied to OFF symbols in the sync field, which (as an OFF symbol consists of all zeroes) is invariant to cyclic shift. | Mention specifically that in the sync field, even when a symbol is 'OFF' the pseudo-random cyclic shift can be ignored (may or may not be applied), but the LFSR still needs to be updated. | RejectedIt is clear that the LFSR is updated every TSync or TSym depending on Sync or Data frame, which is applied regardless of symbol status, ON or OFF.  |
| 300 | 32.2.3.4 | 77.19 | Cyclic shift is obtained from 'a table'. | Refer to table 32-7 specifically. | RevisedThis table does not have to be 32-7, because only the Integer n and its corresponding cyclic shift values are necessary in the Table.TGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 300. |
| 321 | 32.2.3.4 | 73.41 | "The symbol randomizer is used to remove any spectral lines in the power spectral density"--the symbol randomizer is an example block in an example "ON" waveform generator, therefore it is better to use may | Change the text to "The symbol randomizer may be used to remove any spectral lines in the power spectral density" | RevisedThe same resolution as #297.TGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 321. |
| 323 | 32.2.3.4 | 73.46 | With reference to the document IEEE 802.11-18/1567r2 regarding Spec text on MC-OOK Symbol Randomization, the figure 32-9 (Symbol Randomizer) in draft 1.0 about linear feedback shift register (LFSR) is being loaded with all ones. A randomizer seed is also not incorporated. | For the privacy protection, it is recommended to use pseudonyms and pseudonym changing strategies. This research (https://www.bastibl.net/bib/bloessl2015scrambler/bloessl2015scrambler.pdf) clearly highlights the ease with which an eavesdropper can intrude our system if we include scrambler. | RejectedThe LFSR in Symbol Randomizer does not affect the actual information that is being transmitted but only impacts on the spectral response, exactly speaking, on a slim spike in the spectral domain, which has very little to do with a security breach of information that is being transmitted. |
| 444 | 32.2.3.4 | 73.41 | "The symbol randomizer is used to remove any spectral lines in the power spectral density." the specctral lines are in spectrum, not the spectral density. | change the power spectral density with right terminoloogy. | RevisedThe same resolution as (#297, 321)TGba Editor to make the changes shown in IEEE 802.11-19/0050r1 under the tag with CID 444. |
| 499 | 32.2.3.4 | 73.41 | Symbol Randomizer is unnecessarily complex, and we can simplify the design to remove any spectral lines | Include the "Linear Feedback Shift Register", "Convert from a bit to -1 or +1" and "Apply Per Antenna CSD" only to the Symbol Randomizer. Remove "Convert from Bits to an Integer", "Cyclic Shift Lookup", and "Apply Cyclic Shift" from the Figure 32-9 | RejectedThis was discussed enough during the TG meeting, no further discussion necessary. |

***TGba Editor: Please edit D1.0, Pg 73, ln 41 in section 32.2.3.4 as follows:***

~~The symbol randomizer is used to remove any spectral lines in the power spectral density.~~

The spectral lines in the WUR PPDU spectrum are removed by the symbol randomizer. (#155, 297, 321, 444)

***TGba Editor: Please edit D1.0, Pg 73, ln 38-39 in section 32.2.3.4 as follows:***

32.2.3.4 Symbol Randomizer and Per-antenna Cyclic Shift (#225)

***TGba Editor: Please edit D1.0, Pg 73, ln 46 in section 32.2.3.4 as follows:***

~~At the beginning of each PPDU, the LFSR is loaded with all ones.~~

The state of the LFSR is first updated at the end of the first symbol in the WUR-Sync field. (#298)

***TGba Editor: Please delete the following sentence of D1.0, Pg 74, ln 1-3 in section 32.2.3.4 as follows:***

~~The LFSR is updated every T~~~~Sync~~ ~~during the Sync field and updated every T~~~~Sym~~ ~~during the Data field.~~

The state of the LFSR is updated every TSync during the Sync field and updated every TSym during the Data field. (#298)

***TGba Editor: Please edit D1.0, Pg 73, ln 57-58 in section 32.2.3.4 as follows:***

This integer is used to lookup a cyclic shift value, from ~~a table of cyclic shift values~~ a Cyclic Shift Lookup table, which shows cyclic shift values corresponding to the integer n. The pseudo-random cyclic shift values according to the cyclc shift integer n are given in Table 32-5 for the Sync and the HDR Data field, and in Table 32-6 for the LDR Data field. (#300)

**References:**

1. **IEEE P802.11baTM/D1.0, Sep 2018.**