

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Resolutions for new comments received after May 5 and May 9]

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Re: [In response to]

Abstract: [Resolutions for new comments received after May 5 and May 9 are shown.]

Purpose: [To be considered in TG3C baseline document.]

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Resolutions for new comments received after May 5 and May 9

NICT

14/05/2008

Summary

- Total number of comments received after May 5 and May 9 is **26**.
 - SC: **16 (PHY:14, MAC: 2)**
 - HSI OFDM: 10 (PHY: 10)
 - AV OFDM: 0
- 14 SC PHY comment resolutions are categorized into
 - No change: 1
 - Editorial change: 5
 - Addition or modification of description : 7
 - Resolution to technical comment: 1
- 1 SC MAC comment resolutions are categorized into
 - Resolution to technical comment: 1
 - not resolved: 1 (SC#16)
- 10 HSI OFDM PHY comment resolutions are categorized into
 - Technical: 1
 - Addition or modification of description : 4
 - Editorial: 5
- **This document includes only SC comment resolutions.**

Comment 1 (SC PHY, editorial)

- There are 4 possible PW lengths, how to signal this info in PHY header?
- HZ proposal: Use 2 bits to specify PW lengths.
- **Our Resolution: Two (2) bits were assigned in DF2 in the PHY header to specify the PW lengths of current frame. They should appear as well.**

Comment 2 (SC PHY, editorial)

- Here the spec mentions "with an option to substitute PW with CP", but CP is SC mode is not specified in DF3 at all, it was removed in DF3 .
- HZ proposal: remove this sentence
- **Resolution: This sentence shall be removed from the draft.**

Comment 3 (SC PHY, document modification)

- The description on $\pi/2$ BPSK and $\pi/2$ QPSK is unclear, better to give math expressions. Also, is the rotation initiated from 1 or j ? Current text can have multiple interpretations.
- HZ proposal: Clarify
- **Resolution: Same as comment #66, has been answered on May 13 in 15-08-0322-00-3c.**

Comment 4 (SC PHY, document modification)

- Figure 189, more description in terms of equations is required to equate $\pi/2$ BPSK modulator and GMSK modulator. For example initial phase of the chip level rotator. Also, the differential operation (xor) as currently specified is incorrect. If g_n is the input to the GMSK modulator then in the real field $g_n = d_n \times d_{(n-1)}$ which is inverse of xor. In general, complete specification through equations would help rule out ambiguity
- **Resolution: Equation shown in the next slide shall be added to equate $\pi/2$ BPSK modulator and GMSK modulator.**

Document modification

Regarding $\pi/2$ BPSK,
the following equation shall
be added in 12.2.2.1.1

$$c_n = \begin{cases} 1, & \text{if } d_n = 1 \\ -1, & \text{if } d_n = 0 \end{cases}$$

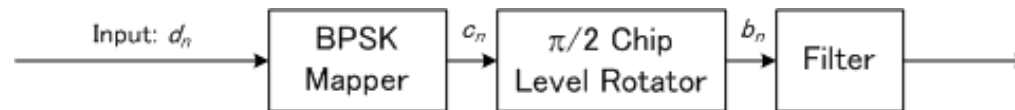
$$b_n = c_n e^{jn\frac{\pi}{2}}, n = 0, 1, 2, \dots$$

Regarding precoded GMSK,
the following equation shall
be added in 12.2.2.1.1

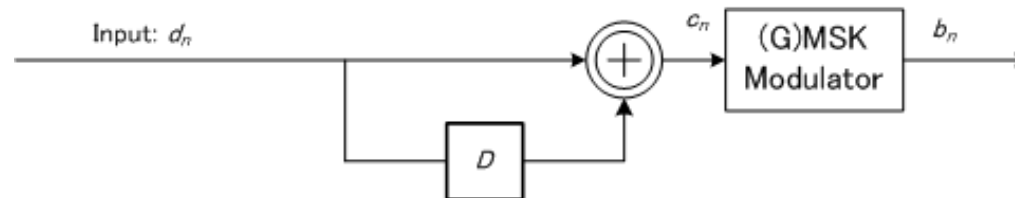
$$c_n = d_{n-1} \otimes d_n$$

$$b_n = b_{n-1} \cdot e^{-j \cdot c_n}, n = 0, 1, 2, \dots$$

$$d_0 = 1, b_0 = e^{-j}$$



a) $\pi/2$ -BPSK Modulator



b) Precoded (G)MSK Modulator

Comment 5 (SC PHY, document modification)

- Would be useful in general to describe all the modulations precisely through equations. Current text has multiple interpretations.
- Resolution: Resolved as stated in 15-08-0322-00-3c and in comment #4 regarding $\pi/2$ BPSK, $\pi/2$ QPSK, and GMSK. DAMI has already modified in 15-08-0311-00. The others are clearly stated.

Comment 6 (SC PHY, no change)

- What are the settings on D and W on generating the Golay codes specified in DF3?
- HZ proposal: Give D and W for all the Golays codes provided in the draft spec.
- **Resolution: Golay code sequences are already specified in the baseline document (p85, p86, p134, p135, and p136 (for SC)). D and W values are not required.**

Comment 7 (SC PHY, document modification)

- In step b) of line 23, "format the frame header into bursts", is PW inserted in each burst in header? If yes, how to specify the PW length of the header. If No, clearly state that PW length=0 for header.
- HZ proposal: as in comment
- **Resolution: The following sentence at the end of 12.2.1.2 (header rate dependent parameters), "With the exception of the base rate, the default pilot word length for the header shall be 64 chips for a burst length of 256 chips." shall be replaced by "PW with length of 0 shall be used for CR, and PW with length of 64 shall be used in the other cases."**

Comment 8 (SC PHY, editorial)

- In Fig 199, Burst builder is before mapper, while in Fig207 (Payload), Burst builder is after mapper.
- HZ proposal: unify, move burst build after mapper
- **Resolution: Fig 199 shall be changed to keep consistency with Fig 207.**

Comment 9 (SC PHY, editorial)

- What does step c) mean? Preamble and PCES are not related to header
- HZ proposal: remove step c).
- **Resolution: The description of “step c)” shall be removed.**

Comment 10 (SC PHY, document modification)

- For payload construction procedure, should PW and PCES also modulated using $\pi/2$ BPSK before their insertions?
- HZ proposal: add the text saying that PCES and PW are modulated using $\pi/2$ BPSK
- Resolution: YES. The following sentence shall be added in Section 12.2.5.5.1: "PW is modulated with $\pi/2$ BPSK, and also, the following sentence shall be added in Section 12.2.5.5.2: "PCES is modulated in the same manner of PW".

Comment 11 (SC PHY, Editorial)

- There is no definition on the length of subblock.
- HZ proposal: define the length of subblock
- **Resolution: “subblock” shall be removed.**

Comment 12 (SC PHY, document modification)

- Figures 187 and 212 should be drawn with the same convention.
- HZ proposal: Moving from left to right, first SYNC, then SFD, CES.
- Resolution: Fig 187 shall be changed to keep consistency with Fig 212.

Comment 13 (SC PHY, document modification)

- Sec. 12.2.2.2.1 -- Generator polynomials are not narrow-sense. Does not make a difference to performance, but was this specifically intended?
- **Resolution: Narrow-sense generator polynomial shall be also added in 12.2.2.2.1.**

$$g(x) = \prod_{k=0}^{15} (x + \alpha^k)$$

$$= x^{16} + \alpha^{120}x^{15} + \alpha^{104}x^{14} + \alpha^{107}x^{13} + \alpha^{109}x^{12} + \alpha^{102}x^{11} + \alpha^{161}x^{10} + \alpha^{76}x^9 + \alpha^3x^8 + \alpha^{91}x^7 + \alpha^{191}x^6 + \alpha^{147}x^5 + \alpha^{169}x^4 + \alpha^{182}x^3 + \alpha^{194}x^2 + \alpha^{225}x^1 + \alpha^{120}$$

Comment 14 (SC MAC, technical)

- Currently we allow different subframes in the aggregated frame being modulated using different MCSs. That will unnecessarily increase the receiver implementation complexity, and in some cases may lead to catastrophic performance drop regarding error rate, due to the MCS switches over subframes.
- HZ proposal: We may need to reconsider the impact of MCS switching over aggregated subframes, on the receiver designs, and probably use the same MCS all through the aggregated packet (like AMPDU in 802.11n), and only signal the unified MCS by PHY header.
- **Resolution: Since our aggregation is integrated MSB and LSB subframes, switching the MCS over subframes is unavoidable.**

Comment 15 (SC PHY, Technical)

- This paragraph needs elaboration. How is SFD2 defined to indicate CES length. Is it reliable enough to only use SFD1 as delimiter, regarding frame timing reference detection?
- **Resolution:** The following sentence shall be added in line 8 of sub-clause 12.2.3.2 as "If the value of SFD2 is 1, it will be set to long CES. On the other hand, if the value is 0, it will be set to short CES."

Regarding frame timing reference detection using only SFD1, so far no problem has been observed by our simulation.

Comment 16 (SC MAC)

- Provide an alternate means to feedback the beamforming response. In the current text, an index to a beamforming vector is communicated. The alternate method should allow to feedback explicitly the transmit beamforming vector. This provides significant improvement in multipath scenarios.

Thank you!