Proposed Resolution for Several Comments

March 16, 2011

IEEE P802.15
Wireless Personal Area Networks

Title:	Proposed Resolution for several comments
Date Submitted:	March 16, 2011
Source:	Michael Schmidt - Atmel (email: michael.schmidt@atmel.com)
Re:	Task Group 15.4g LB67 comment resolution
Abstract:	[]
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CID 11

Comment:

- MR-O-QPSK/DSSS should define uniform values for the lowest data rate supported in all frequency bands.

Response:
Reject.

CID 11

Resolution:

- For the wide band (WB) DSSS modes, this would introduce considerable preamble overhead and a major revision on the spreading scheme.
- Using narrow-band (NB) and wide band DSSS at the same band is in conflict with the mandatory legacy support of the O-QPSK PHY operating at the 780 MHz, 915 MHz, and 2450 MHz band. The receiver complexity will be increased due to the need for simultaneous receive of a NB and WB signal (higher ADC resolution required, two correlators operating at the same time).

CID 16

Comment:

- Equation 21g is not a parity check.

Response:
Accept in principle
Resolution:
change the “the single parity bit” in sub-clause 16.3.2.10 to “the reference value”

CID 399,457

Comment:

- Section "Operating frequency range" is missing for MR-O-QPSK.
- Add this section

Response:

Accept.

CID 399,457

Resolution:
Add the following section

16.3.4.1 Operating frequency range

The MR-O-QPSK PHY operates in the following bands:

- 470-510 MHz
- 779-787 MHz
- 868-870 MHz
- 902-928 MHz
- 917-923.5 MHz
- 950-958 MHz
- 2400-2483.5 MHz

CID 400

Comment:

- Section "Transmit power spectral density (PSD) mask" is missing for MR-O-QPSK.
- Add this section

Response:
Accept.

CID 400

Resolution:
Add the following section

16.3.4.2 Transmit power spectral density (PSD) mask

The MR-O-QPSK transmit PSD mask shall conform with local regulations.

FCS related CID 83, 381, (449), 451

Comment:

- Zero padding of the MPDU or calculation field is not required.

FCS related CID 83, 381, (449), 451

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Response:

- Accept in principle.

FCS related cont. CID 83, 381, (449), 451 I

Resolution:

- According to the base-line standard, the MPDU contains the FCS field.
- TG4g is not considering an amendment on the definition of the MPDU.
- Hence, the condition in the paragraph will never apply.
- Can we define the FCS for a calculation field with less than 4 octets?
- The answer is yes:
- In the following asume modulo 2 arithmetic.
- Let $F(x) = f_0 x^{k-1} + f_1 x^{k-2} + \cdots + f_{k-1}$ be the polynomial of the message sequence (calculation field) consisting of k bits.
- Let $L(x) = x^{31} + x^{30} + \cdots + 1$ denote the ones sequence of length 32.

FCS related cont. CID 83, 381, (449), 451 II

- Let $G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$ be the generator polynomial.
- Let

$$x^{32}F(x) + x^k L(x) = Q(x) + R(x)/G(x)$$

for some $Q(x)$ and remainder $R(x)$. Then the FCS polynomial is defined as

$$L(x) + R(x)$$

The expression $x^{32}F(x)$ already addresses zero padding of the message sequence with 32 zero bits.

- The author of this document cannot see a need for extending $F(x)$ such that its degree itself is at least 31.

FCS related, CID 380

Comment:

- The FCS sequence for the given example calculation field at line 14 is not correct.
- Correct to 0101 1100 1010 0001 0100 0101 1000 1010

FCS related, CID 380

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- Correct to 0101 1100 1010 0001 0100 0101 1000 1010

Response:

- Accept in principle.

FCS related, CID 380

Resolution:

- The author obtains the sequence given in the draft if the calculation field will be zero padded by a single octet.
- However, according to the text of the current draft, zero padding does not apply, so the example is not correct.
- The resolution of this comment depends on the resolution of 381.
- A cross check by a volunteer is recommended.

CID 422

Comment:

- The statement, "O-QPSK with half-sine shaping is very similar to O-QPSK with raised cosine shaping." is debatable. Raised Cosine OQPSK shaping results in non-constant envelope modulation and, thus, is not the same as O-QPSK with half-sine shaping - which is a constant envelope modulation and is also spectrally identical to MSK.
- As legacy support has been documented as critical, hence, the inclusion of 16.3.3 in the document, either remove the raised cosine requirement or make it optional and provide a 100 percent mechanism that ensures that transmit/receive using (32,4)-DSSS with O-QPSK half-sine shaping is fully compliant with the 15.4g standard. This could be done in the PICS.

CID 422

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Response:

- Accept in principle.

cont. CID 442 I

Resolution:

- Specify impulse response depending on the frequency band.
- Change as follows:
  In the 915 MHz and the 2450 MHz bands, the half-sine pulse shape is used to represent each baseband chip and is given by

$$p(t) = \begin{cases} \sin(\frac{\pi t}{2T_c}) & \text{, for } 0 \leq t \leq 2T_c \\ 0 & \text{, otherwise} \end{cases}$$

  where the chip duration T_c is the inverse of the chip rate (see Table 147 and Table 148).
  In the 470 MHz, 868 MHz, 780 MHz, 917 MHz, and the 950 MHz band, a raised cosine pulse shape with roll-off factor of

cont. CID 442 II

$r = 0.8$ is used to represent each baseband chip and is described by

$$p(t) = \begin{cases} \frac{\sin(\pi t/T_c)}{\pi t/T_c} \cdot \frac{\cos(r\pi t/T_c)}{1-r^2t^2/T_c^2} & , \text{for } t \neq 0 \\ 1 & , \text{for } t = 0 \end{cases}$$

- In 16.3.3, delete the following paragraph:
  O-QPSK modulation is used. O-QPSK with half-sine shaping is very similar to O-QPSK with raised cosine shaping. Since the impulse response of a raised cosine shaping filter satisfies the first Nyquist criteria, the following EVM specification can be easily met: a transmitter shall have EVM values of less than 35 % when measured for 1000 chips.

CID 444

Comment:

- Having an exception for O-QPSK mode is making things more complicated since each SUN device must support also MR-FSK PHY. This wording leads to two different symbol durations for MR-OQPSK devices.
- Replace "the MR-FSK and MR-OFDM PHYs" by "SUN devices". Remove the last sentence, starting with "For the MR-O-QPSK PHY".

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- Replace "the MR-FSK and MR-OFDM PHYs" by "SUN devices". Remove the last sentence, starting with "For the MR-O-QPSK PHY".

Response:

- Reject.

444

Resolution:

- For MR-O-QPSK there is only one definition of the symbol rate, which is given 16.3.2.14. The definition was proposed in the 2011 January meeting and approved by the group.
- The wording "mandatory mode" in the paragraph is probably misleading.
- To the authors understanding it is referring to the mandatory mode of the given sub PHY (MR-FSK, MR-O-OQPSK, MR-OFDM) and not to the common signaling mode based on the MR-FSK PHY.
- Referencing the symbol time of a PHY with respect to another PHY (without even being specific) will cause a lot of confusion. This has never been used in the base line standard.

CID 394,457

Comment:

- The interleaver depth of 176 will introduce a significant number of padding bits for ACK frames.
- Consider using a slightly shorter interleaver depth. A good choice (for PSDU) is 18x 7 = 126 and lambda = 7 (still prime). This will introduce small overhead for the ACK frames with default FCS type.

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- Consider using a slightly shorter interleaver depth. A good choice (for PSDU) is 18x 7 = 126 and lambda = 7 (still prime). This will introduce small overhead for the ACK frames with default FCS type.

Response:

- Accept.

CID 394,457 I

Resolution:

- The outcome of letter ballot LB59 was to have RateMode zero and SpreadingMode DSSS as the mandatory mode for MR-O-QPSK.
- The interleaver depth according to the current draft is based on degree $\lambda = 11$ and $N_{\mathrm{INTRLV}} = \lambda \times 16 = 176$.
- A slightly shorter prime degree of $\lambda = 7$ will reduce overhead to the mandatory mode.
- For $N_{\mathrm{INTRLV}} = 7 \times 18$, the degradation relative to $N_{\mathrm{INTRLV}} = 11 \times 16$ for the optional modes is very low.
- An ACK frame with 7 octets (default FCS type) needs to be zero padded by 7 bits only (already including the 6 zero bits for FEC-trellis termination).

CID 394,457 II

- Required change for the editors:
  - in row PSDU change the entry of column "degree λ" to "7"
  - in row PSDU change the entry of column "depth N_{INTRLV}" to "7 x 18 = 126"
  - leave entries of row PHR unchanged

CID 403

Comment:

- Give Example frame for MR-O-QPSK ANNEX J.
- Use ACK frame with default FSC, Mandatory Mode, chip rate 100 kchip/s

CID 403

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- Use ACK frame with default FSC, Mandatory Mode, chip rate 100 kchip/s

Response:

- Accept in principle.

CID 403

Resolution:

- The solution depends on CID 379 (mapping of MPDU octets to PSDU bit stream) and the resolution of 381 (FCS padding).
- Once the dependencies are resolved, only a rough guideline can be given to the editors.
- A 100 % description (including tables, text, ...) cannot be given to the editors within this week, but within a week after this meeting.