Comment Resolution for the MR-O-QPSK PHY

July 15, 2010

IEEE P802.15
Wireless Personal Area Networks

Title:	Comment Resolution for the MR-O-QPSK PHY
Date Submitted:	July 15, 2010
Source:	Michael Schmidt - Atmel (email: michael.schmidt@atmel.com)
Re:	Task Group 15.4g LB51 comment resolution
Abstract:	Comment resolution for the MR-O-QPSK PHY
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CID 625

- Comment:
  - Different PHY modes should be described in the channel section.
- Response:
  - Reject
- Resolution:
  - no change required
  - For a given frequency band, the chip rate is constant, implying that the bandwidth is (almost) independent of the rate mode and the spreading mode. This is just one of the key advantages of the MR-O-QPSK PHY.

CID 652,655,656

- Comment:
  - For 868 - 870 MHz band, no channel bandwidth is specified. Will the PHY meet regularity requirements to assure maximum output power?
- Response:
  - Accept in principle.
- Resolution:
  - no change required
  - Since the chip rate is 125 kchip/s and RC-0.8 O-QPSK modulation is to be used, the bandwidth is less than 250 kHz. This supports up to 25 mW output power for sub-bands G1 and G2 and up to 500 mW output power for sub-band G3.

CID 893

- Comment:
  - Reference to RateMode is missing.
- Response:
  - Accept.
- Resolution:
  - A cross reference to section 6.12c will be given.

CID 827

- Comment:
  - Consider use of an alternative short preamble.
- Response:
  - Reject
- Resolution:
  - no change required
  - support for two alternative preamble lengths complicates interop

CID 879

- Comment:
  - Replace 8-bit SFD by a 16-bit SFD
- Response:
  - Accept in principle
- Resolution:
  - single[1] SFD

$$(w_0, w_1, ..., w_{15}) = (1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0)$$

During search, distance to the zero-bit preamble is ≥ 9.

[1] SpreadingMode $\in$ {DSSS,MDSSS} will not be indicated by the SFD value.

CID 890,891,912

- Comment:
  - 2 bits for parity check is questionable.
- Response:
  - Accept in principle.
- Resolution:
  - Replace the 2-bit parity bit field by an 8-bit HCS field applying a CRC-8 with generator polynomial $X^8 + X^2 + X + 1$
  - Performance of a CRC-8 is sufficiently good, see doc # 15-10-0435-02-004g.

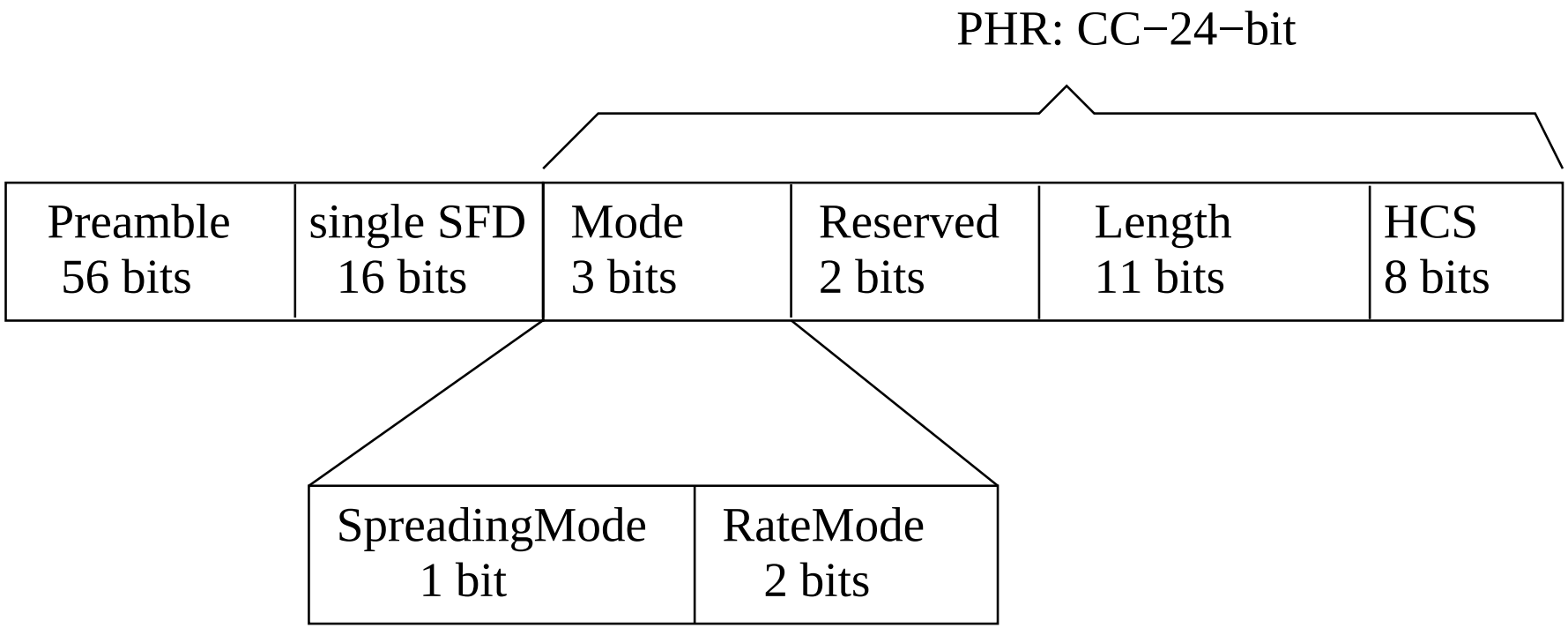
CID 904

- Comment:
  - Consider variable FCS based on CRC-16 and CRC-32.
- Response:
  - Reject
- Resolution:
  - no change required
  - apply CRC-32 only
  - OFDM PHY applies CRC-32 only
  - For both, the OFDM PHY and the MR-O-QPSK PHY this is recommended, since a K=7 convolutional code introduces burst errors in case of decoding failures.

CID 1470

- Comment:
  - During PHR reduce spreading gain but introduce FEC.
- Response:
  - Accept in principle.
- Resolution:
  - FEC based on terminated and interleaved convolutional coding
  - Option B
  - pilots in order to simplify Viterbi decoding
  - For details see doc # 15-10-0435-02-004g

CID 1470


PHR: CC−24−bit
Preamble
56 bits
single SFD
16 bits
Mode
3 bits
Reserved
2 bits
Length
11 bits
HCS
8 bits
SpreadingMode
1 bit
RateMode
2 bits

CID 1465,1475

- Comment:
  - Consider pilot sequences during PSDU part.
- Response:
  - Accept in principle.
- Resolution:
  - see doc # 15-10-0435-02-004g

CID 1485

- Comment:
  - Why is (chip) whitening used for the DSSS mode but not for the MDSSS mode?
- Response:
  - Accept in principle.
- Response:
  - no change required
  - MDSSS applies longer spreading sequences. For MDSSS, chip spreading based on a cover code is applied as described at page 80 of draft P802.15.4g/D1.

CID 1489

- Comment:
  - Equation (33) is wrong, addressing invalid indexes of the chip sequence.
- Response:
  - Accept.
- Resolution:
  - Let $\{c_k\}_0^{N_{PPDU}-1}$ be the discrete-time sequence of consecutive chip samples of the PPDU, where the first chip sample, c_0, is transmitted first in time, and the last chip sample, $c_{N_{PPDU}-1}$, is transmitted last in time. The continuous-time pulse shaped complex baseband signal is given by

$$y(t) = \sum_{n=0}^{N_{PPDU}/2-1} \xi(c_{2n})p(t-2nT_c)+j\xi(c_{2n+1})p(t-(2n+1)T_c)$$

with ...

CID 1495

- Comment:
  - Required receiver sensitivity numbers are too poor. Consider tighter bounds.
- Response:
  - Reject.
- Resolution:
  - no change required
  - Bounds for receiver sensitivity are already more stringent than specified in IEEE-802.15.4-2006.
  - For simulation results, see doc 15-09-0744-00-004g.

CID 1497

- Comment:
  - Required ACI/AACI sensitivity numbers are too poor. Consider tighter bounds.
- Response:
  - Accept in principle.
- Resolution:
  - ACI 10 dB
  - AACI 30 dB

CID 1480

- Comment:
  - It is not clear whether ‘odd parity code’ means the ‘SPC Encoder’ in Figure 65w.
- Response:
  - Accept
- Resolution:
  - Replace ‘odd parity code’ with ‘Single Parity Check(SPC) Encoder’, since ’odd parity code’ of MDSSS mode means the ’SPC Encoder’ in Figure 65w.

CID 1464

- Comment:
  - Specify mandatory modes for the MR-O-QPSK PHY
- Response:
  - Accept in principle
- Resolution:
  - Tg4g targets an amendment of IEEE-802.15.4. So the only mandatory modes are BPSK-20/40 (868/915 MHz) and O-QPSK-250 for 2450 MHz.
  - For the MR-O-QPSK PHY there is actually no need to specify this, since it is a traditional multi rate PHY, where all modes are encoded within the header.

recommended modes:

band (MHz)	chip rate (kchip/s)	spreading	1/2 CC	data rate (kbit/s)
779-787	1000	(16,1)-DSSS	yes	31.25
902-928	1000	(16,1)-DSSS	yes	31.25
868-870	125	(4,1)-DSSS	yes	15.625
2400-2483.5	2000	(32,1)-DSSS	yes	31.25

CID 1486

- Comment:
  - The function in equation (28), $\lceil \cdot \rceil$, is not clearly defined.
- Response:
  - Accept
- Resolution:
  - Replace $\lceil 1/n \rceil$ with floor(1/n). Insert the following paragraph after the last paragraph of 6.12c.4.5: The floor function of a real number x, floor(x), is a function that returns the largest integer less than or equal to x.