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

Submission Title: [Radio Specifications for 802.15.4g]

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Abstract: [This document provides resolutions to comments #375, 460, 465 and 485]

Purpose: [This document provides resolutions to comments of LB59]

Standards and Receiver Specifications

- Some have asked whether receiver specifications should be included in the 802.15.4g draft
- Others are of the option that it is our responsibility to ensure good receiver implementations that meet minimum performance levels
- In consensus, though, we all agree that standards bodies should avoid favoring particular silicon implementations

Radio Specification in TG4g

- Radio specifications for all bands are coupled in current TG4g draft, including for:
  - Receiver sensitivity
  - ACR
- The radio specification in the current draft is appropriate for some bands and some architectures, but it can pose challenges to others
- Draft changes are needed to allow the radio specifications:
  - to be met in all bands
  - with radio architectures that might be different in different bands

The Options

- Option 1: Remove radio specification from the draft
- Option 2: Relax the radio specification numbers to a level that can be met in all implementations
- Option 3: Decouple the radio specification requirements across bands and identify separate requirements that are appropriate for each band

The “Importance” of ACR

- There are system level methods that can minimize the need for superior ACR
- ACR is a static frequency domain specification, and the SUN is a dynamic frequency and time domain system
  - TDMA, DSSS, and FHSS are just three examples of system options that lessen the “importance of ACR”
- The importance of ACR can be even more so diminished:
  - For shared ISM bands like 2.4GHz,
  - For frequency-hopping systems
  - For network-provisioned systems
  - For multi modulation allowed bands

Co-Channel

- If we are going to post receiver specifications for this multiple modulation draft, we should also consider posting co-channel rejection in addition to ACR (Comment #485)
- Be consistent

Radio Specifications at 2.4GHz

- For Options 2 and 3, the development challenges across a wide range of frequencies need to be recognized
- The 2.4GHz band has some different challenges
  - Different applications including baseline 802.15.4 compliant systems – wide BW O-QPSK/DSSS at 250kbps
  - Wide channel modes e.g. channel spacing of 5MHz
  - The noise model at 2.4GHz is challenging
  - There are likely a wider range of modulation types and “unlike” neighbors in this band
  - Generally less granularity is available to control frequency deviation
- In Option 2, specifications, like ACR and modulation index tolerance, may need to be set with the 2.4GHz band in mind

Option 2 Proposal

- Make the adjacent and alternate channel specifications less stringent
- We recommend 0/10dB (Comment #465)
- We recommend a 2-level modulation index tolerance of ± 45% (Comment #460)

Option 3 Proposal

- At subGHz bands, adopt ACR requirements from the latest 802.15.4 FSK standard

Table 29e—Minimum receiver jamming resistance for 950 MHz GFSK PHY

Adjacent channel rejection	Alternate channel rejection
0 dB	24 dB

  - The above is taken from the existing 802.15.4d specification

- Invoke Option 2 proposal solely for 2.4GHz

Option 4 Proposal

- Sub-GHz Receiver Specifications
  - Adjacent Channel Rejection 0dB
  - Alternate Channel Rejection 24dB
  - Co-Channel Rejection -7dB
  - 2-level Modulation index tolerance of ± 30%

- 2.4GHz Receiver Specifications
  - Adjacent Channel Rejection 0dB
  - Alternate Channel Rejection 10dB
  - Co-Channel Rejection -12dB
  - 2-level Modulation index tolerance of ± 45%