

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

Submission Title: [Discussion to facilitate expediting the selection of the PHY specification in TG4m]

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Abstract: Discussion on the PHY specification in TG4m

Purpose: Facilitate expediting the selection of the PHY specification in TG4m

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Outline

- Context of presentation
- A possible way expediting the selection of the PHY specification in TG4m
- Summary
- Propose FSK options that are compatible to 802.15.4g to be included in 4m

Context of Presentation

- This presentation aims at expediting the selection of the PHY specification in TG4m
- It provides a high level description on several key topics for the PHY specification in TG4m
- FSK options that are compatible to 802.15.4g to be included in 4m

How TG4m can move forward

- TG4m PHY proposals derived from the 802.15.4g-2012 standard => 4g standard represents the common ground
- TG4m should consider fully re-using the good work done in 802.15.4g
 - 4g defines a range of modulations and data rates that can meet various application requirements
 - 4g defines multi-region PHYs that have enough flexibility to fit within “any” bandwidth and regulatory requirements
 - Channel spacing ranging from 200 kHz to 600 kHz (25/50 kHz for FSK in very narrow channels)
 - Data rates ranging from 50 kbps (and below) to 800 kbps
 - Variable transmission power limits
 - 4g defines mandatory mode and multiple optional modes that can meet both low cost and “high” cost implementations, while not decreasing the performance
 - 4g supports optional functionalities to increase reliability
 - FEC, data whitening, FHSS
 - 4g supports efficient network operation
 - Common signaling mode, Mode switch

How TG4m can move forward (cont'd)

- We recommend that TG4m fully adopt and specify PHY modes as defined in 802.15.4g-2012 for
 - FSK PHY
 - OQPSK PHY
 - OFDM PHY
- We recommend that the TG4m deviates from 4g specification only when required to ensure regulatory compliance, as specified for the TVWS frequency band e.g.,
 - TV channel access requirements
 - Power levels
 - Out-of-band spurious emissions
 - Adapt channel plan
- We recommend that TG4m focuses on providing extensions to 802.15.4g-2012 to accommodate non SUN application requirements, without affecting the compatibility between the PHYs defined in 4g and PHYs defined in 4m/TVWS

Summary

- 802.15.4g-2012 is an internationally recognized standard
 - Worldwide smart grid deployments using 802.15.4g (+ 802.15.4e MAC)
- The use of 802.15.4g-2012 “as is” in TVWS is one of the critical components for smart grids
 - Simply re-banding the 4g to TVWS would efficiently meet this requirement
- The fully adoption of 4g in TG4m facilitates mass production for chipset vendors
- Defining 4m PHYs that requires extensive re-design of existing 4g chipsets and/or systems will
 - Confuse the smart grid market and may prevent 4m from becoming a successful story
 - Add additional cost coming from FW development, test & validation
 - Add additional time-to-market for 4m technology

Inclusion of FSK Options in 4m

- While the “merged proposal” adopts most of data rates in 802.15.4g, data rate of 150 kbps that is specified in 902-928 MHz, 917-923.5 MHz, and 2400-2483.5 MHz bands of 802.15.4g is missing:
 - Propose to add 2FSK with data rate of 150 kbps, modulation index of 0.5, and channel spacing of 400 KHz to the 4m FSK proposal

Inclusion of FSK Options in 4m (Cont'd)

- The PHR for TVWS FSK PHY:

- The PHR for 4g FSK PHY:

Bit string index	0	1-2	3	4	5-15
Bit mapping	MS	R_1-R_0	FCS	DW	$L_{10}-L_0$
Field name	Mode Switch	Reserved	FCS Type	Data Whitening	Frame Length

- The proposed PHR for TVWS FSK PHY in “merged proposal”:

Bit string index	0-1	2	3	4	5-15
Bit mapping	R_1-R_0	PC	FCS	DW	$L_{10}-L_0$
Field name	Reserved	Parity Check	FCS Type	Data Whitening	Frame Length

- Propose the PHR for TVWS FSK PHY to be as following:

Bit string index	0	1	2	3	4	5-15
Bit mapping	MS	PC	R	FCS	DW	$L_{10}-L_0$
Field name	Mode Switch	Parity Check	Reserved	FCS Type	Data Whitening	Frame Length

- Add one parity bit to improve the error detection of the PHR
- Compatible with the PHR of the 802.15.4g FSK