Proposed text with regard to PHY Header Extension part of IEEE802.15.4d Japanese 950MHz PHY amendment

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Author(s):

Name	Company	Address	Phone	email
Shusaku Shimada	Yokogawa Co.	2-9-32 Nakacho Musashinoshi Tokyo, 180-8750 Japan	+81 422-52-5543	shusaku@ieee.org

Abstract

This document presents the proposed text to the editor to include in IEEE802.15.4d standard draft document which is expected to ask the IEEE802.15 membership to its first Letter Ballot.

Following text is the part of consolidated proposal of IEEE802.15.4d Japanese 950MHz PHY amendment, which is regarding to PHY Header Extension for the provisioning of Adaptive Frequency Agility (AFA) functionalities. AFA is expected to be included as an institutional requirement in ECC/ERO regulation according to ETSI recommendation and is also allowed in Japanese regulatory ordinance as a promising strategy for co-existence with passive RFID systems. So far, this proposed text is concerning to Japanese 950MHz band only, while it is divided to 24 sub-channels of 200kHz bandwidth and 24 sub-channels constitute the eight or twelve aggregated 15.4 device channels specified in the channel plan part of proposed text.

6. PHY specification

6.3 PPDU format

This subclause specifies the format of the PPDU packet.

For convenience, the PPDU packet structure is presented so that the leftmost field as written in this standard shall be transmitted or received first. All multiple octet fields shall be transmitted or received least significant octet first and each octet shall be transmitted or received least significant bit (LSB) first. The same transmission order should apply to data fields transferred between the PHY and MAC sublayer.

Each PPDU packet consists of the following basic components:

- A synchronization header (SHR), which allows a receiving device to synchronize and lock onto the bit stream
- A PHY header (PHR), which contains frame length information
- A variable length payload, which carries the MAC sublayer frame

< *insert following* >

		Octets			
		1		4	variable
Preamble	SFD	Frame length (7 bits)	Reserved/PHR-Extension exists (1 bit)	PHR-Extension field (Optional)	PSDU
RHR		PHR			PHY payload

Figure 16-1 - Format of the PPDU with optional PHR-Extension Field

The PPDU packet structure shall be formatted as illustrated in Figure 16. And if the PHR-Extension bit is set, optional PHR-Extension field which consist of 4 octets in length may be included as shown in Figure 16-1.

6.3.5 Reserved/PHR-Extension bit

This 1 bit has been reserved for future and is recommended to be “0” when it is not used. In case of 950 MHz PHY, this bit indicates the presence of PHR Extension field which is 4 octet of fixed length. Refer to 6.3.6 with regard to the extended PHR format of PPDU and 6.3.7 with regard to the meaning of each extension field.

6.3.6 PPDU format with Extended PHR

Optional PHR Extension Field may follow Reserved/PHR-Extension Exist bit of SFD in conventional PHR, and should be 4 Octets in length as illustrated in Figure 16-2.

Octets	
3	1
TX Ch. Table	Definition Field
24ch. X (1bit)	8 bits
PHR Extension Field	

Figure 16-2 - Detailed PHR Extension Field

This PHR Extension Field consists of Transmission Channel Table (3 Octets of TX Ch. Table) and Control Field (1 Octet). The usage of Transmission Channel Table in Japanese 950MHz PHY should be 24bits array of 1bit information each of which correspond to one of available 24 sub-channels Japanese regulatory ordinance specifies. Because every channel plans are to be based on this 24 sub-channels of 200kHz bandwidth, Transmission Channel Table is able to accommodate arbitrary radio channel status information in it. Typical usage of this 1bit entry of Transmission Channel Table is including Channel Clear/Busy status of CCA which is specifically indicated in following Definition Field.
Format of Transmission Control Table and corresponding Definition Field are shown in Figure 16-3, and Figure 16-4 respectively.

Octet Number	1								2								3							
Sub-channel Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Clear/Busy	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit	1bit

Figure 16-3 - Format of the Transmission Channel Table

Std. Control field (1bit)	Control bits (6bit)	Reserved (Further Extension Exist)
0	Standard definition	(1 bit) Usually "0"
1	Reserved	

Figure 16-4 - Format of the Definition Field

The Definition Field include the information in its Control Bits (6bits) which is indicating the meaning of each 1bit entry of Transmission Channel Table corresponding to each of 24 channels, for example a status of Channel-Clear/Busy. This information can be used by any node which are able to overhear without any sort of mutual transaction or node authentication between peer nodes and no relation with MIC.

The rest of 2bits other than Control bits (6bits) are reserved and to be set "0". Usage of this Control bits should be the Meaning which is defined beforehand specifically as listed in Figure 16-4.

Control bits	Meaning
0	Channel clear/Busy
1	Scheduled TX
2	Acknowledged
3-63	Reserved

Figure 16-4 – Control bits of the Definition Field

Most typical usage and meaning of Control Bits is to indicate Channel Clear/Busy status and is intend to facilitate remote CCA functionalities via peer or alien nodes. The indication of Scheduled TX is simply announcing the corresponding channel is expected to occupied by either the node which is transmitting the frame itself or other device, for example, co-located or connected RFID reader/writer device using identical 950MHz band. The intended usage of this Scheduled TX information includes the adjustment of channel selection priority and Adaptive Frequency Agility functions. The last meaning listed in Figure 16-4 is Acknowledge indication without transmitting ACK frame back on received channel. This is the way to perform the Acknowledged transaction between the peer nodes which are both overhear each other on different channel only and are not able to transmit on overhearing channel, for example, in order to protect nearby primary services in use each other, at least in the first step of transaction.