**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Kookmin - Revised PPDU formats on D3** |
| Date Submitted | [July 2017] |
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| Re: | **Revise from the original document: 16-0460-05** |
| Abstract | Text for D3 comments’ resolution |
| Purpose | Resolution for D3 technical comments |
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# PPDU frame formats

# **8.6.1 Preamble field**

## **8.6.1.2 PHY IV**

### 8.6.1.2.3 S2-PSK preamble field

The preamble field for S2-PSK has four binary states that is equivalent to two data bit times long (see Table X-TBD). Each binary among the binary sequence “1 1 1 1” shall be mapped into waveforms to drive LEDs as described in Section 13.2 “S2-PSK bit-to-symbol mapping”.

**Table X-(TBD)- S2-PSK preamble field**

|  |  |
| --- | --- |
| **Preamble duration** | **Two bit times** |
| S2-PSK preamble | 1 1 1 1 |

### 8.6.1.2.5 HS-PSK preamble field

The preamble field for HS-PSK has two S2-PSK data bit times long (see table 87). This means the binary sequence “1111” shall be transmitted by two S2-PSK bit times via the S2-PSK modulation, while the DS8-PSK modulation transmits no data (i.e. idle pattern).

**Table 87- HS-PSK preamble field**

|  |  |
| --- | --- |
| **Preamble duration** | **Two S2-PSK bit times** |
| S2-PSK bit sequence | 1 1 1 1 |
| DS8-PSK bit sequence | No data (idle patterns) |

## **8.6.1.3 PHY V**

### 8.6.1.3.3 CM-FSK Preamble Field

The preamble field for CM-FSK is two symbol times long that carries two different frequencies (table XY).

**Table XY- CM-FSK preamble**

|  |  |  |
| --- | --- | --- |
| Duration | 1st symbol time | 2nd symbol time |
| preamble | fSF | f'SF |

The second preamble (f'SF) is variable frequency calculated by f'SF= fSF+ 33 *∆f,* where the first preamble (fSF) and the frequency separation (*∆f*) are configurable by *phyCmfskpreamble* and *phyCmfskFrequencySeparation* respectively.

## **8.6.1.4 PHY VI**

### 8.6.1.4.2 A-QL preamble field

The preamble field for A-QL is within a data-block time long. The preamble sequence (1010..10) shall have 64 bits length. The remainder of a block carrying the preamble is for PHR subfields and the training sequence (see Section 15.1 A-QL Specification).

### 8.6.1.4.3 Hidden A-QL (HA-QL) preamble field

The preamble field for HA-QL is one data-block time long (equivalent to two optical clock times), consisting of two blocks. The second block is the inverse form of the first block.

The preamble sequence (1010…10) along with four states of reference cells have 64 bit-length and fill up the entire block of HA-QL code (8x8 HA-QL block for example) as described in Section 15.6 HA-QL Specification.

Deleted S8-PSK preamble

# **8.6.2 PHY header**

## 8.6.2.2 PHY IV

### 8.6.2.2.1 S2-PSK PHY header

Not used

### 8.6.2.2.1 S8-PSK PHY header (deleted)

### 8.6.2.2.2 HS-PSK PHY header

PHY header subfields shall be mandatory configured by PHY PIB attributes. Besides, PHR field shall be optionally used to notice the change of the following PHY header subfields:

**Table – HS-PSK PHR subfields**

|  |  |  |
| --- | --- | --- |
| **PHY header subfields** | **Bit-width** | **Explanation on usage** |
| PSDU length | 16 | PSDU length in byte |
| HSC | 16 | Header check sequence |

## 8.6.2.3 PHY V

### 8.6.2.3.2 CM-FSK PHY header

Not used

### 8.6.2.3.3 C-OOK PHY header

Not used

## 8.6.2.4 PHY VI

### 8.6.2.4.2 A-QL PHY header

PHY header subfields shall be mandatory configured by PHY PIB attributes. Besides, PHR field shall be optionally used to notice the change of the following PHY header subfields:

**Table – A-QL PHR subfields**

|  |  |  |
| --- | --- | --- |
| **PHY header subfields** | **Bit-width** | **Explanation on usage** |
| PSDU length | 16 | PSDU length in byte |
| HSC | 16 | Header check sequence |

### 8.6.2.4.3 HA-QL PHY header

Not used.

# **8.6.3 Header check sequence (HCS)**

## 8.6.3.2 PHY IV

### 8.6.3.2.1 HS-PSK HSC

CRC-16 shall be used as HSC. The generation of CRC-16 (with polynomial generator 0x1021) is described in Annex C.

## 8.6.3.3 PHY V (not use)

Not used

## 8.6.3.4 PHY VI

### 8.6.3.4.1 A-QL HSC

CRC-16 shall be used as HSC. The generation of CRC-16 (with polynomial generator 0x1021) is described in Annex C.

### 8.6.3.4.1 Hidden A-QL HSC

Not used

# **8.6.4 Optional fields**

## 8.6.4.4 PHY VI

### 8.6.4.4.1 A-QL optional field

A channel estimation sequence shall be added as an extended subfield after the PHR subfields to support a receiver dealing with multi-color imbalance or multi-color interference. The channel estimation sequence details are discussed in section “**15.1.4 A-QL Color calibration at the receiver**.”

# **8.6.5 PSDU field**

## 8.6.5.2 PHY IV

### 8.6.5.2.4 S8-PSK PSDU field (delete this)

### 8.6.5.2.5 HS-PSK PSDU field

The PSDU consists of multiple S2-PSK cycle times; each cycle is as a sub-frame that has a low dimming period and a high dimming period that each period also consists of multiple DS8-PSK data symbols. Each symbol carries 3-bits data (see table below).

The number of DS8-PSK symbols (N) that either the low dimming or the high dimming period of S2-PSK carry is equal to the optical clock rates ratio between the DS8-PSK and the S2-PSK.

**Table – HS-PSK PSDU sub-frame format**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S2-PSK Low dimming period | | | | S2-PSK High dimming period | | | |
| DS8-PSK symbol 1 | DS8-PSK  symbol 2 | … | DS8-PSK  symbol N | DS8-PSK  symbol 1 | DS8-PSK  symbol 2 | … | DS8-PSK  symbol N |

The end of the PSDU of HS-PSK is indicated by the presence of another HS-PSK preamble. The configuration of PSDU length is implemented via the PHY PIB *phyHspskPsduLength* and being noticed by sending the updated PSDU length via the PHY header subfield.

## 8.6.5.3 PHY V

### 8.6.5.3.5 C-OOK PSDU field

The C-OOK PSDU consists of multiple data sub-packets (denoted as DS). Each sub-packet DS consists of its preamble (DS preamble) and its payload carrying asynchronous bits (front Ab and rear Ab) and data bits.

The configuration of PSDU length is implemented via the PHY PIB *phyCookPsduLength*.

**Table 102- PSDU frame format**

|  |  |  |  |
| --- | --- | --- | --- |
| PSDU | | | |
| Sub-packet 1 | Sub-packet 2 | … | Sub-packet N |

**Table 103- Sub-packet**

|  |  |  |  |
| --- | --- | --- | --- |
| **Preamble** | **DS payload** | | |
| **Ab (front)** | **data bits** | **Ab (rear)** |

## 8.6.5.4 PHY VI

### 8.6.5.4.1 A-QL PSDU field

The A-QL PSDU consists of multiple payload blocks. The count of payload blocks in PSDU (N) is calculated from the PSDU length that is read from the PHY header.

**Table 105—A-QL PSDU frame format**

|  |  |  |  |
| --- | --- | --- | --- |
| PSDU | | | |
| Data block 1 | Data block 2 | … | Data block N |

The configuration of PSDU length is implemented via the PHY PIB *phyAqlPsduLength*.

### 8.6.5.4.3 Hidden A-QL (HA-QL) PSDU field

The HA-QL PSDU consists of multiple payload blocks. The number of data blocks (N) is counted from a preamble to the next preamble.

**Table 105—HA-QL PSDU frame format**

|  |  |  |  |
| --- | --- | --- | --- |
| PSDU | | | |
| Data block 1 | Data block 2 | … | Data block N |

The configuration of PSDU length shall be implemented via the PHY PIB *phyHAqlPsduLength*.