**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 PHY 5 PPDU frame formats** |
| Date Submitted | [September, 2016] |
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| Re: |  |
| Abstract | Details of Resolutions regarding to the submitted Comments on D0 are suggested.PHY 5 modes: PPDU frame formats are presented.  |
| Purpose | D0 Comments Resolutions and Editorial Revision. |
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# **--------------------------- PHY 5 PPDU formats -----------------------------------**

**9.6.7.2 M-FSK PPDU format**

|  |  |  |  |
| --- | --- | --- | --- |
| **Preamble**(see 9.6.7.2.1) | **PHY header**(see 9.6.7.2.2) | **HCS**(see 9.6.7.2.3) | **PSDU**(see 9.6.7.2.4) |
| SHR | PHR | PHY payload |

The M-FSK PPDU frame structure consists of the preamble field, PHR sub-fields, and the PSDU PHY payload.

**9.6.7.2.1** **M-FSK Preamble field**

The preamble field for M-FSK is two symbol times long. Each symbol time is for a specific preamble frequency as follows.

|  |  |  |
| --- | --- | --- |
| Duration | one symbol time | one symbol time |
| Preamble | fSF | f'SF |

* The first preamble : fSF = 200Hz is fixed frequency.
* The second preamble : f’SF = fSF + 33.∆f is variable as a function of ∆f.

**9.6.7.2.2** **M-FSK PHY header**

The PHY header will support the related communication modes those are specified by MAC frame, at least low-overhead beacon mode, bidirectional communications mode, and D2D mode will be supported. The PHY header is TBD, will be clarified along with MAC frame when D1 comes out.

**9.6.7.2.3 M-FSK HSC**

TBD along with PHY header.

9.6.7.2.4 **M-FSK PSDU PHY payload**

The PSDU consists of multiple data frequency symbols, each symbol carries multiple bits data. The amount of bits carried by a frequency symbol depends on the number of frequencies used in modulation. By using 32 frequencies for modulation, 4 data bits along with an asynchronous bit (Ab) is transmitted by a frequency symbol each time. Likewise by using 64 frequencies for modulation, 5 data bits along with an asynchronous bit (Ab) is transmitted by a frequency symbol each time.

|  |  |
| --- | --- |
|  | **PSDU payloads** |
|  | frequency symbol 1 | frequency symbol 2 | **…** | frequency symbol N |
| Mode 1: 32-FSK | (1 Ab + 4 data bits) | (1 Ab + 4 data bits) |  | (1 Ab + 4 data bits) |
| Mode 2: 62-FSK | (1 Ab + 5 data bits) | (1 Ab + 5 data bits) |  | (1 Ab + 5 data bits) |
| Mode 3: 62-FSK/ 2-PSK | (1 Ab + 6 data bits) | (1 Ab + 6 data bits) |  | (1 Ab + 6 data bits) |

During transmission, the symbol rate of transmission must be less than the minimum frame rate of camera to guarantee that every symbol is sampled at least once.

**9.6.7.2 OOK PPDU format**

|  |  |  |  |
| --- | --- | --- | --- |
| **Preamble**(see 9.6.7.2.1) | **PHY header**(see 9.6.7.2.2) | **HCS**(see 9.6.7.2.3) | **PSDU**(see 9.6.7.2.4) |
| SHR | PHR | PHY payload |

The OOK PPDU frame structure consists of the preamble field, PHR sub-fields, and the PSDU PHY payload.

**9.6.7.2.1** **OOK Preamble field**

The preamble field for OOK is the same as the preamble used for M-FSK.

|  |  |  |
| --- | --- | --- |
| Duration | one symbol time | one symbol time |
| Preamble | fSF | f'SF |

* The first preamble : fSF = 200Hz is fixed frequency.
* The second preamble : f’SF = fSF + 33.∆f is variable as a function of ∆f.

**9.6.7.2.2** **OOK PHY header**

The PHY header will support the related communication modes those are specified by MAC frame, at least low-overhead beacon mode, bidirectional communications mode, and D2D mode will be supported. The PHY header is TBD, will be clarified along with MAC frame when D1 comes out.

**9.6.7.2.3** **OOK HSC**

TBD along with PHY header.

**9.6.7.2.4** **OOK PSDU PHY payload**

The OOK PSDU consists of multiple data sub-packets (denoted as DS). Each sub-packet DS consists of its own preamble (DS preamble), Asynchronous bits (front Ab and rear Ab), and body payload.

**Table – PSDU frame format**

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

**Table – Sub-packet**

|  |
| --- |
| **Sub-packet** |
| SF | Ab | payload | Ab |

There are four different PSDU frames supporting four PHY modes as follows. Among them, mode 1 and mode 2 are operating at 2.2 kHz optical clock rate, whereas mode 3 and mode 4 are operating at 4.4 kHz optical clock rate.

**Table – Sub-Packet Structure Specifications**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Mode 1** | **Mode 2** | **Mode 3** | **Mode 4** |
| Preamble (SF) | 6B | 10B | 6B | 10B |
| Ab (front) | 2B | 2B | 4B | 4B |
| Payload (body) | 8 bits | 13 bits  | 33 bits (24B) | 41 bits (62B) |
| Ab (rear) | 2B | 2B | 4B | 4B |