

**IEEE P802.15**  
**Wireless Personal Area Networks**

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	Comment Resolution for some TG4m TVWS-FSK PHY related comments	
Date Submitted	March. 19, 2013	
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Re:	Submission for comment resolution in LB87 of IEEE 802.15.4m draft	
Abstract	Comment Resolution for the TVWS-FSK PHY related comments	
Purpose	Resolve TVWS-NB-OFDM related comments in LB87	
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***CID341:*** Table 133 should spell out Parameter and put parentheses around (h) for modulation index; implication of table is that modulation index 0.5 or 1.0 allows interoperability - is this true?

***Recommend solution:*** Make changes to table 133 for clarity. Ensure that modulation index can truly be grouped as 0.5 or 1.0

***Proposed resolution:*** Accept

**Table 133—TVWS-FSK modulation and channel parameters<sup>a</sup>**

Param	Mode #1		Mode #2		Mode #3		Mode #1	Mode #1
Data rate (kb/s)	50		100		200		300	400
Modulation level	2-level		2-level		2-level		2-level	4-level
Modulation index h	0.5	1	0.5	1	0.5	1	0.5	0.33
Channel spacing (kHz)	400	600	400	600	400	600	600	600

<sup>a</sup>Data rates shown are over-the-air data rates (the data rate transmitted over the air regardless of whether the FEC is enabled).

***CID343:*** Bit to Symbol mapping is the last "function" of Figure 114. The order of these sections seems arbitrary - should they not flow like the reference modulator diagram?

***Recommend solution:*** Reorder the sections to match Figure 114

***CID344:*** Recommend that there be two sub sections in the paragraph: "For 2 level:" and "For 4 level".

***Recommend solution:*** Consider making subsections

***CID345:*** Bit to Symbol mapping is the last "function" of Figure 114. The order of these sections seems arbitrary - should they not flow like the reference modulator diagram?

***Recommend solution:*** Reorder the sections to match Figure 114

***CID355:*** Table 134 should explain the 4-level encoding for the SHR more clearly.

***Recommend solution:*** Show that symbol 01 is 0 for the SHR and 11 is 1 for the SHR

***Proposed resolution:*** Accept. The proposed changes are as follows.

#### **20.1.2.2 Forward error correction (FEC)**

FEC support is optional. The use of FEC is controlled by the PIB attribute *phyFECEnabled*, as defined in 9.3. The FEC scheme shall be according to sub-clause 19.2.2.4.

#### **20.1.2.3 Code-symbol interleaving**

Interleaving support is optional. The use of interleaving is controlled by the PIB attribute *phyInterleavingEnabled*, as defined in 9.3. Interleaving shall be according to sub-clause 19.2.2.5.

#### **20.1.2.4 Data whitening**

Data whitening is optional. The use of data whitening is controlled by the PIB attribute *phyWhiteningEnabled*, as defined in 9.3. The data whitening algorithm shall be as defined in 19.2.3.

#### 20.1.2.5 Spreading

Spreading support is optional. The use of spreading is controlled by the PIB attribute *phySpreadingEnabled*, as defined in 9.3. The spreading method shall be as defined in 19.2.2.6.

#### 20.1.2.6 Bit-to-symbol mapping

The symbol encoding is shown in Table 134.

For 2-level Filtered FSK, the frequency deviation,  $f_{dev}$ , is equal to (symbol rate x modulation index)/2. For 4-level Filtered FSK modulation, the frequency deviation,  $f_{dev}$ , is equal to (3 x symbol rate x modulation index) / 2. Two bits shall be mapped to four frequency deviation levels for the PHR and PSDU.

For both 2-level and 4-level filtered FSK, the SHR shall be encoded in the lowest ( $-f_{dev}$ ) and the highest ( $+f_{dev}$ ) frequency deviations.

**Table 134 -- TVWS FSK Symbol Encoding**

2-level	
Symbol(Binary)	Frequency deviation
0	$-f_{dev}$
1	$+f_{dev}$
4-level	
Symbol(Binary)	Frequency deviation
01	$-f_{dev}$
00	$-f_{dev}/3$
10	$+f_{dev}/3$
11	$+f_{dev}$

#### 20.1.3 Modulation quality

The modulation quality shall be as given in 18.1.2.3.