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IEEE Standard for Low-Rate Wireless Networks

Amendment 1: Physical Layer Utilizing China Medical Bands

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

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USA

IEEE Std 802.15.4n™-2016
(Amendment to
IEEE Std 802.15.4™-2015)

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Approved 29 January 2016

IEEE-SA Standards Board

Abstract: The Ministry of Industry and Information Technology (MIIT) of the People's Republic of China has approved the 174–216 MHz, 407–425 MHz, and 608–630 MHz bands for medical information transmission. China medical band (CMB) devices operating within these bands conform to a set of rules specified in MIIT Doc 423-2005, which restricts use of the band to only medical, non-voice use under direction of a healthcare practitioner, among other requirements. A physical layer (PHY) for devices operating on Chinese approved bands for medical signals is defined in this amendment.

Keywords: amendment, China, IEEE 802.15.4™, IEEE 802.15.4n™, LAN, local area network, MAN, medical services, metropolitan area network, PAN, personal area network, PHY, physical layer, wireless personal area network, WPAN

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*This standard is dedicated to the memory of Dr. Arthur "Art" Astrin, Task Group 802.15.4n Chair and good friend, who died 24 March 2016. His keen intellect, his ability to draw the best out of people, and his ever-present sense of humor will be sorely missed. He leaves a legacy of impressive accomplishments in the field of wireless communications. May he rest in peace.

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Introduction

This introduction is not part of IEEE Std 802.15.4n™-2016, IEEE Standard for Low-Rate Wireless Networks—Amendment 1: Physical Layer Utilizing China Medical Bands.

This amendment to IEEE Std 802.15.4™-2015 defines an alternate physical layer (PHY) in addition to the established IEEE 802.15.4™ PHYs. This alternate PHY is specified for the 174–216 MHz, 407–425 MHz, and 608–630 MHz bands. The amendment also defines the medium access control (MAC) modifications that may be used to support this alternate PHY's implementation.

The Ministry of Industry and Information Technology (MIIT) of the People's Republic of China has approved the 174–216 MHz, 407–425 MHz, and 608–630 MHz bands for medical information transmission.

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(This amendment is based on IEEE Std 802.15.4™-2015.)

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard. The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.[1]

[1]Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

3. Definitions, acronyms, and abbreviations

3.2 Acronyms and abbreviations

Insert the following abbreviation in alphabetical order into 3.2:

CMB	China medical band

5. General description

5.2 Special application spaces

Insert the following subclause (5.2.7) after 5.2.6:

5.2.7 China medical band (CMB)

The Ministry of Industry and Information Technology (MIIT) of the People's Republic of China has approved the 174–216 MHz, 407–425 MHz, and 608–630 MHz bands for medical information transmission.

CMB devices operating within these bands conform to a set of rules specified in MIIT Doc 423-2005 [B9a], which restricts use of the band to only medical, non-voice use under direction of a healthcare practitioner, among other requirements.[2]

This standard defines a PHY for devices operating on Chinese approved bands for medical signals.

10. General PHY requirements

10.1 General requirements and definitions

Insert the following items at the end of the dashed list of the third paragraph ("The PHYs defined in this standard are) in 10.1:

— CMB O-QPSK PHY: DSSS PHY employing O-QPSK modulation, operating in the 195 MHz, 416 MHz, and 619 MHz bands as defined in 30.1.

— CMB GFSK PHY: GFSK PHY operating in the 195 MHz, 416 MHz, and 619 MHz bands as defined in 30.2.

10.1.1 Operating frequency range

Insert the following paragraph and tables (Table 10-4a and Table 10-4b) at the end of 10.1.1:

Table 10-4a shows frequency bands for devices supporting the CMB O-QPSK PHY. Table 10-4b shows frequency bands for devices supporting the CMB GFSK PHY.

[2]The numbers in brackets correspond to the numbers of the bibliography in Annex A.

Table 10-4a—CMB O-QPSK PHY frequency bands and data rates

Band identifier (MHz)	Frequency band (MHz)	Spreading parameters		Data parameters		
		Chip rate (kchip/s)	Modulation	Bit rate (kb/s)	Symbol rate (ksymbol/s)	Symbols
195	174–216	1000	O-QPSK	250 (mandatory)	62.5	16-ary orthogonal
	174–216	1000	O-QPSK	500 (optional)	125	8-ary orthogonal
416	407–425	1000	O-QPSK	250 (mandatory)	62.5	16-ary orthogonal
	407–425	1000	O-QPSK	500 (optional)	125	8-ary orthogonal
619	608–630	1000	O-QPSK	250 (mandatory)	62.5	16-ary orthogonal
	608–630	1000	O-QPSK	500 (optional)	125	8-ary orthogonal

Table 10-4b—CMB GRSK PHY frequency bands and data rates

Band identifier (MHz)	Frequency band (MHz)	Spreading parameters		Data parameters		
		Chip rate (kchip/s)	Modulation	Bit rate (kb/s)	Modulation index	Symbols
195	174–216	—	GFSK (mandatory)	50	1.0	Binary
	174–216	—	GFSK (optional)	100	0.5 or 1.0	Binary
	174–216	—	GFSK (optional)	200	0.5 or 1.0	Binary
416	407–425	—	GFSK (mandatory)	50	1.0	Binary
	407–425	—	GFSK (optional)	100	0.5 or 1.0	Binary
	407–425	—	GFSK (optional)	200	0.5 or 1.0	Binary
619	608–630	—	GFSK (mandatory)	50	1.0	Binary
	608–630	—	GFSK (optional)	100	0.5 or 1.0	Binary
	608–630	—	GFSK (optional)	200	0.5 or 1.0	Binary

10.1.2 Channel assignments

Insert the following subclauses and tables (10.1.2.12 through 10.1.2.12.2 with Table 10-15a and Table 10-15b) after 10.1.2.11:

10.1.2.12 Channel numbering for CMB PHYs

Channel center frequency of CMB PHYs is specified as the next formula:

$$ChanCenterFreq = FreqBandEdge + ChanSpacing \times (phyCurrentChannel + 0.5)$$

where

ChanCenterFreq	is the operational channel center frequency
FreqBandEdge	is the band edge for the frequency band as specified in 10.1.2.12.1 and 10.1.2.12.2
phyCurrentChannel	is the designated channel identifier number as specified in 10.1.2.12.1 and 10.1.2.12.2
ChanSpacing	is the separation between adjacent channels as specified in 10.1.2.12.1 and 10.1.2.12.2

10.1.2.12.1 Channel numbering for CMB O-QPSK PHY

The parameters *FreqBandEdge* and *phyCurrentChannel* and the valid range of *ChanSpacing* for CMB GFSK PHY are listed in Table 10-15a.

Table 10-15a—Band edge, channel identifier, and channel spacing for CMB O-QPSK PHY

Band identifier (MHz)	*FreqBandEdge* (MHz)	*phyCurrentChannel*	*ChanSpacing* (MHz)
195	174	0–20	2
416	407	0–8	2
619	608	0–10	2

10.1.2.12.2 Channel numbering for CMB GFSK PHY

The parameters *FreqBandEdge* and *phyCurrentChannel* and the valid range of *ChanSpacing* for CMB GFSK PHY are listed in Table 10-15b.

Table 10-15b—Band edge, channel identifier, and channel spacing for CMB GFSK PHY

Band identifier (MHz)	*FreqBandEdge* (MHz)	*phyCurrentChannel*	*ChanSpacing* (MHz)
195	174	0–83	0.5
416	407	0–5	0.5
619	608	0–43	0.5

11. PHY services

11.3 PHY PIB attributes

Insert the following row at the end of Table 11-2:

Table 11-2—PHY PIB attributes

Attribute	Type	Range	Description
phyCmbModulation	Enumeration	0, 1	The selected modulation type. This attribute is only valid for the CMB PHY. 0: CMB O-QPSK 1: CMB GFSK

Insert new Clause 30 after Clause 29:

30. CMB PHY

30.1 CMB O-QPSK PHY specification

30.1.1 PPDU format for the CMB O-QPSK PHY

The PPDU shall be formatted as illustrated in Figure 30-1.

Octets: 4	2	3	variable
Preamble	SFD	As defined in 30.1.1.3	PSDU
SHR		PHR	PHY payload

Figure 30-1—Format of CMB O-QPSK PHY PPDU

30.1.1.1 Preamble field

The length of the preamble for the O-QPSK PHYs shall be 8 symbols (i.e., 4 octets), where the bits in the Preamble field are defined in 12.1.1 (in 12.1).

30.1.1.2 SFD field

The SFD field shall be formatted as illustrated in Figure 22-3 (in 22.2.1.2).

30.1.1.3 PHR field

The PHR field is illustrated in Figure 30-2. All multi-bit fields are unsigned integers and shall be processed MSB first.

Bits: 0	1	2–8	9–15	16–23
Spreading Mode	Rate Mode	Reserved	Frame Length	HCS

Figure 30-2—Format of the PHR for CMB O-QPSK PHY

For CMB operation bands, the Spreading Mode field shall be set to one if DSSS is used for PSDU spreading. Otherwise, the Spreading Mode field should be set to zero.

The Rate Mode field indicates the rate mode used to encode the packet and shall contain one of the values in Table 30-1. Table 30-1 shows the mapping of the Rate Mode field to data rate.

Table 30-1—Rate mode mapping of CMB O-QPSK PHY

Rate mode	Data rate (kb/s)
0	250
1	500

The Frame Length field is an unsigned integer and shall be set to the total number of octets contained in the PSDU. The Frame Length field is transmitted LSB first.

The HCS field is calculated over the first 16 PHR bits (b0,b1,…,b15) , where b0 is the PHR bit at bit string index 0 and b15 is the PHR bit at bit string index 15, as illustrated in Figure 30-2. The HCS field is defined in 22.2.2.

30.1.1.4 PSDU field

The PSDU field carries the payload data of the PHY packet.

30.1.2 Modulation and coding for CMB O-QPSK PHY

30.1.2.1 Reference modulator diagram

Figure 30-3 shows a reference modulator diagram for the CMB O-QPSK PHY.

The inputs to the reference modulator are the bit sequences of the SHR field, the PHR field, and the PSDU field.

30.1.2.2 SHR coding and spreading

The SHR spreading is (16,4) DSSS bit-to-chip mapping. The parameters are shown in Table 22-15 in 22.3.9.

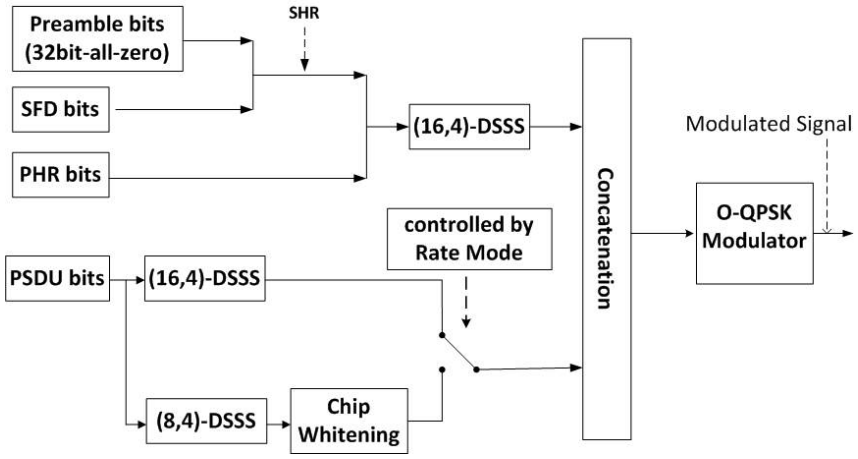

Figure 30-3—Reference diagram of CMB O-QPSK PHY

30.1.2.3 PHR coding and spreading

The PHR field spreading is (16,4) DSSS bit-to-chip mapping. The parameters are shown in Table 22-15 in 22.3.9.

30.1.2.4 PSDU coding and spreading for DSSS

Figure 30-3 shows the signal flow when DSSS is applied to the PSDU, i.e., the spreading mode set to DSSS. The supported PSDU parameters for spreading mode DSSS are shown in Table 30-1.

Depending on the frequency band and rate mode, the output sequence of the bit-to-chip mapper shall be whitened, as described in 30.1.2.6.

The relationship between the rate mode and the data rate parameters of the MCPS-DATA.request primitive is described in Table 8-75 in 8.3.1.

30.1.2.5 DSSS bit-to-chip mapping

DSSS bit-to-chip mapping of (8,4) and (16,4) for CMB O-QPSK PHY shall be specified as Table 22-14 and Table 22-15, respectively, in 22.3.9.

30.1.2.6 Chip whitening

When spreading mode is set to DSSS, the PSDU chip sequence shall be whitened for the frequency bands and rate modes shown in Table 30-2. The PSDU chip sequence shall be whitened according to 22.3.11.

Table 30-2—Chip whitening for DSSS

Frequency band (MHz)	Rate mode
176–214	1
407–425	1
608–630	1

Chip whitening is the modulo-2 addition of a chip of the PSDU at the output of the bit-to-chip mapper with the value of a cyclic *m*-sequence of length for $m = 9$. This shall be performed by the transmitter and is described by 22.3.11.

30.1.2.7 Modulation parameters for CMB O-QPSK

A chip value shall be mapped into a binary real-valued symbol out of {–1, 1} by the following mapping:

$$\zeta(c) = \begin{cases} -1, & c_k = 0 \\ +1, & c_k = 1 \end{cases}$$

In the CMB operation bands (as defined in 10.1), the raised cosine pulse shape with a roll-off factor of $r = 0.8$, as defined in 12.2.6, shall be used.

30.1.3 CMB O-QPSK PHY RF requirements

30.1.3.1 Operating frequency range

The operating frequency ranges of CMB O-QPSK PHY are described in Table 10-4a.

30.1.3.2 Transmit PSD mask

In general, when operating in the 195 MHz, 416 MHz, and 619 MHz bands, the transmitted spectral products shall be less than the limits specified in Table 12-3 (in 12.3.2) and Table 30-3. For both relative and absolute limits, average spectral power shall be measured using a 100 kHz resolution bandwidth. For the relative limit, the reference level shall be the highest average spectral power measured within ± 600 kHz of the carrier frequency f_c.

Table 30-3—PSD limitation among channels

Frequency	Relative limit	Absolute limit
$\|f - f_c\| > 1.2$ MHz	–20 dB	–20 dBm

However, some special limitations for spurious radio emissions for medical signal transmissions exist under Chinese radio regulations. The details of these limitations are described in MIIT Doc 423-2005 [B9a], Li et al. [B8a], and Li et al. [B8b].

30.1.3.3 Receiver sensitivity

Under the conditions specified in Table 10-16 (in 10.1.7), a compliant device shall be capable of achieving the sensitivity values given in Table 30-4.

30.1.3.4 TX-to-RX turnaround time

The CMB O-QPSK PHY shall meet the requirements for TX-to-RX turnaround time as defined in 10.2.1.

30.1.3.5 RX-to-TX turnaround time

The CMB O-QPSK PHY shall meet the requirements for RX-to-TX turnaround time as defined in 10.2.2.

Table 30-4—Required receiver sensitivity (dBm) for two rate mode modulation

Frequency band (MHz)	Rate mode	
	0	1
176–214	–85	–82
407–425	–85	–82
608–630	–85	–82

30.1.3.6 EVM definition

CMB O-QPSK transmitters shall have EVM values of less than 35% when measured for 1000 chips. The EVM measurement shall conform to 10.2.3.

30.1.3.7 Transmit center frequency tolerance

The CMB O-QPSK PHY transmit center frequency tolerance shall be ± 40 ppm maximum.

30.1.3.8 Transmit power

The CMB O-QPSK PHY shall be capable of transmitting at a power level of at least –3 dBm.

30.1.3.9 Receiver maximum input level of desired signal

The CMB O-QPSK PHY shall meet the receiver maximum input level as specified in 12.3.11.

30.1.3.10 Receiver ED

The CMB O-QPSK PHY shall provide the receiver ED measurement as described in 10.2.5.

30.1.3.11 LQI

The CMB O-QPSK PHY shall provide the LQI measurement as described in 10.2.6.

30.1.3.12 CCA

The CMB O-QPSK PHY shall use one of the CCA methods as described in 10.2.7.

The detection time (*aCCATime* as defined in 11.3) for CCA is 8 symbols.

30.2 CMB GFSK PHY specification

30.2.1 PPDU format for CMB GFSK PHY

The CMB GFSK PPDU format shall be as specified in 20.2 except for the PHR. The PHR of the CMB GFSK PPDU shall be as specified in 30.2.1.1.

30.2.1.1 Preamble field

The Preamble field shall contain up to 30 repetitions of the 8-bit sequence “01010101” for CMB GFSK.

30.2.1.2 SFD

The SFD for CMB GFSK shall be a 2-octet sequence selected from the list of values shown in Table 30-5. Devices that do not support FEC shall support the SFD associated with uncoded (PHR + PSDU) and a value of zero for the PIB attribute *phyCmbGfsk*, as defined in 11.3; these devices may also support the SFD associated with uncoded (PHR + PSDU) and a value of one for the PIB attribute *phyCmbGfsk*. Devices that support FEC shall support both SFDs associated with a value of zero for the PIB attribute *phyCmbGfsk*; these devices may additionally support both SFDs associated with a value of one for the PIB attribute *phyCmbGfsk*.

The SFD is transmitted starting from the leftmost bit (i.e., starting with b0).

For CMB GFSK PHY, PIB attribute *phyCmbGfsk* = 0 shall be used, and *phyCmbGfsk* = 1 shall not be used.

Table 30-5—CMB GFSK PHY SFD values for GFSK

	SFD value for coded (PHR + PSDU) (b0–b15)	**SFD value for uncoded (PHR + PSDU) (b0–b15)**
phyCmbGfsk = 0	0110 1111 0100 1110	1001 0000 0100 1110
phyCmbGfsk = 1	Not applicable	Not applicable

30.2.1.3 PHR

The format of the PHR is shown in Figure 30-4. All multi-bit fields are unsigned integers and shall be processed MSB first.

Bits: 0–2	**3**	**4**	**5–8**	**9–15**
Reserved	FCS Type	Data Whitening	Reserved	Frame Length

Figure 30-4—Format of the PHR for CMB GFSK

The format of the FCS Type, Data Whitening, and Frame Length fields shall be as specified in 20.2.2.

30.2.2 Modulation and coding for CMB GFSK PHY

30.2.2.1 Gaussian filter definition

The transmission pulse shape $p(t)$ for CMB GFSK PHY shall be constrained by the shape of a normalized cross-correlation function $\phi(t)$ with a Gaussian filter whose pulse shape $r(t)$ is as follows:

$$r(t) = \frac{1}{\sqrt{2\pi} \times BT} \exp\left(- \frac{t^2}{2 \times (BT)^2} \right)$$

where

BT is 0.7
t is normalized by the symbol duration

where

B is the 3 dB filter bandwidth
T is the bit period of the transmission

The normalized cross-correlation $\phi(t)$ between two waveforms, $p(t)$ and $r(t)$, is defined as follows:

$$\phi(t) = \frac{1}{\sqrt{E_r \times E_p}} \times \int_{-\infty}^{\infty} r(t) \times p(t+\tau) dt$$

where E_r and E_p are the energies of r(t) and p(t), respectively.

In order for the CMB GFSK PHY transmitter to be compliant with this standard, the transmitted pulse $p(t)$ shall have a magnitude of the cross-correlation function $|\phi(t)|$ whose main lobe is greater than or equal to 0.96, when integrated over a period of at least from –0.5 to +0.5 normalized symbol duration time.

$$\phi(t) = \frac{1}{\sqrt{E_r \times E_p}} \times \int_{-0.5}^{+0.5} r(t) \times p(t+\tau) dt$$

The modulation for CMB GFSK PHY shall be a 2-level Gaussian-filtered FSK that meets the transmit spectral mask defined in 30.2.4.5. These requirements can be satisfied automatically when, for all modes (#1 to #5), the BT value of 0.7 is used to generate the Gaussian filter.

Table 30-6 shows the modulation and channel parameters for the standard-defined PHY operating modes for the 195 MHz, 416 MHz, and 619 MHz bands. A device shall support mode #5 and may additionally support modes #1, #2, #3, and #4.

Table 30-6—CMB GFSK modulation and channel parameters

Frequency band	Parameter	Mode #1	Mode #2	Mode #3	Mode #4	Mode #5
174-216 MHz 407-425 MHz 608-630 MHz	Data rate (kb/s)	100	100	200	200	50
	Modulation index	0.5	1.0	0.5	1.0	1.0
	Channel spacing (kHz)	500	500	500	500	500

30.2.2.2 Reference modulator diagram

The functional block diagram in Figure 30-5 is provided as a reference for specifying the CMB GFSK PHY data flow processing functions. The subclause number in each block refers to the subclause that describes that function. Each bit shall be processed using the bit order rules defined in 30.2.1.

When FEC is enabled, the PHR and PSDU shall be processed for coding as a single block of data, as described in 30.2.2.7. When data whitening is enabled, the scrambling shall be only applied over the PSDU, as described in 30.2.3.

All fields in the PPDU shall use the same symbol rate and modulation order, unless otherwise specified elsewhere in this standard.

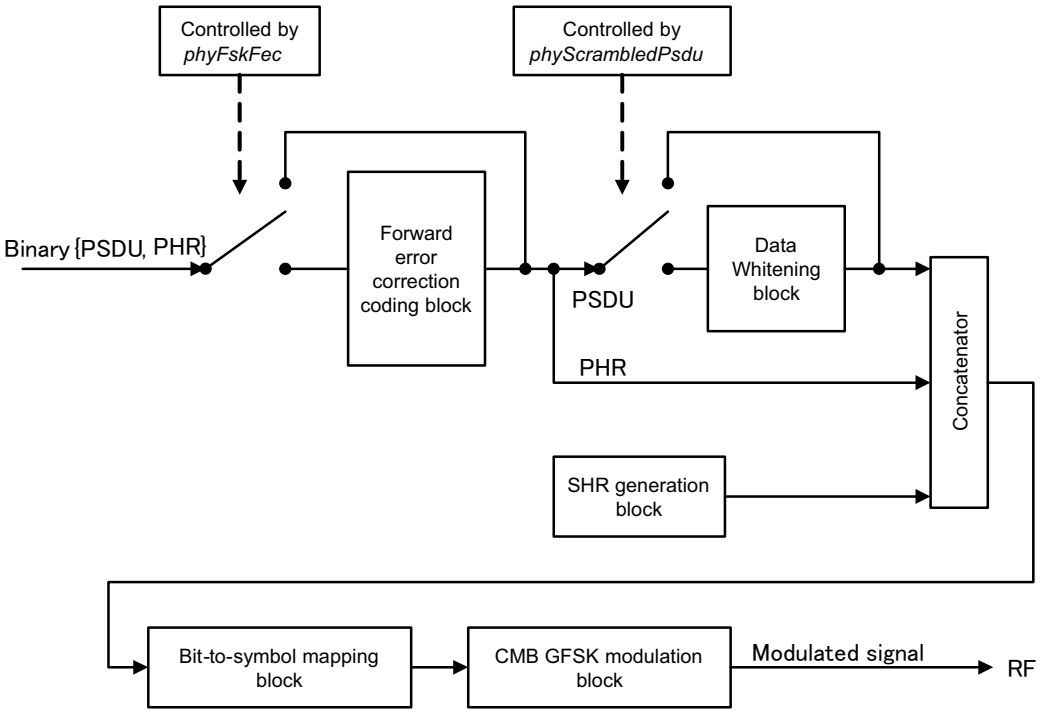

Figure 30-5—CMB GFSK FEC, data whitening, and modulator functions

30.2.2.3 Bit-to-symbol mapping

The nominal frequency deviation, Δf, shall be as follows:

$$\left(\frac{symbol\ rate \times modulation\ index}{2}\right)$$

The symbol encoding for CMB GFSK PHY is shown in Table 30-7, where the frequency deviation, f_{dev}, is equal to Δf for filtered 2-FSK.

Table 30-7—CMB GFSK symbol encoding

2-level	
Symbol (binary)	**Frequency deviation**
0	$-f_{dev}$
1	$+f_{dev}$

30.2.2.4 Modulation quality

The modulation quality for CMB GFSK PHY shall be as specified as 20.3.3.

30.2.2.5 Frequency deviation tolerance

The frequency deviation tolerance of CMB GFSK PHY shall be as specified in 20.3.3.1.

30.2.2.6 Zero crossing tolerance

Zero crossing specification for CMB GFSK PHY shall be as specified as 2-FSK, as described in 20.3.3.2.

30.2.2.7 FEC

FEC is optional. If the SFD indicates that FEC is used, as described in Table 30-5, then the FEC is applied to the PHR and PSDU as a single block of data.

Two types of FEC may be applied: an RSC or an NRNSC. The use of RSC or NRNSC coding shall be controlled by the PIB attribute *phyFskFecScheme*, as defined in 11.3.

When the SFD value indicates a coded packet, FEC as specified in 20.3.4 shall be employed on the PHR and PSDU bits.

30.2.3 Data whitening for CBM GFSK PHY

Data whitening for CMB GFSK PHY shall be as specified as 20.4.

30.2.4 CMB GFSK PHY RF requirements

30.2.4.1 Operating frequency range

The CMB GFSK PHY operates in the bands given in Table 10-15b.

30.2.4.2 RF tolerance

The single-sided clock frequency tolerance at the transmitter shall be ± 20 ppm.

30.2.4.3 Receiver sensitivity

Receiver sensitivity for the CMB GFSK PHY shall be as specified as 20.6.7.

30.2.4.4 Transmitter symbol rate

The transmitter symbol rate tolerance for CMB GFSK PHY shall be as specified in 20.6.5.

30.2.4.5 Transmit spectral mask

NOTE—In the presence of additional regulatory restrictions, the CMB device has to respect both the regulatory requirements and the mask defined in this subclause.

For all CMB GFSK transmit spectral masks, the interim transmit spectral mask shall have

— 0 dBr within ± 1 × symbol rate frequency (in hertz) range of the center frequency
— –10 dBr within a range of from 1.5 × symbol rate frequency (in hertz) to 1 × symbol rate frequency (in hertz) apart from the center frequency

— –25 dBr within a range of from 1.5 × symbol rate frequency (in hertz) to 2 × symbol rate frequency (in hertz) apart from the center frequency
— –35 dBr at frequency offset apart from more than 2 × symbol rate frequency (in hertz) from the center frequency

where dBr is defined as relative power to measured average transmission power within ± 1 × symbol rate frequency (in hertz) range of the center frequency.

Table 30-8 shows this spectral mask for all CMB GFSK PHYs.

Table 30-8—Transmit spectral mask for CMB GFSK PHY

Normalized frequency by symbol rate (frequency [Hz]/ symbol rate [b/s])	PSD (dBr)
–2 and below	–35
from –2 to –1.5	–25
from –1.5 to –1	–10
from –1 to +1	0
from +1 to 1.5	–10
from +1.5 to +2	–25
+2 and above	–35

30.2.4.6 TX-to-RX turnaround time

The CMB GFSK PHY shall meet the requirements for TX-to-RX turnaround time as defined in 10.2.1.

30.2.4.7 RX-to-TX turnaround time

The CMB GFSK PHY shall meet the requirements for RX-to-TX turnaround time as defined in 10.2.2.

30.2.4.8 Transmit power

The CMB GFSK PHY shall be capable of transmitting at a power level of at least –3 dBm.

30.2.4.9 Receiver ED

The CMB GFSK PHY shall provide the receiver ED measurement as described in 10.2.5.

30.2.4.10 LQI

The CMB GFSK PHY shall provide the LQI measurement as described in 10.2.6.

30.2.4.11 CCA

The CMB GFSK PHY shall use one of the CCA methods as described in 10.2.7.

Annex A

(informative)

Bibliography

Insert the following references into Annex A in alphanumeric order:

[B8a] Li, L., A. Astrin, A. Bottomley, and K. Mori, IEEE 802.15 document 15-13-0313-03-004n, 2013.[3]

[B8b] Li, N., S. T. Bupt, L. Li, and L. Z. Vinno, IEEE 802.15 document 15-12-0471-04-4n, 2014.

[B9a] MIIT Doc 423-2005 (translated), IEEE 802.15 document 15-12-0105-02-4n, 2013.

[3] IEEE 802.15 documents are available at https://mentor.ieee.org/802.15/documents.

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