
IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)		
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Re:	TG4md Comment Resolution CID21 proposed resolution		
Abstract	TG4md Comment Resolution CID21 proposed resolution		
Purpose	TG4md comment resolution		
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Table 10-1—Frequency band designations

Band designation	Frequency band (MHz)
169 MHz	169.400–169.475
433 MHz	433.05–434.79
450 MHz	450–470
470 MHz	470–510
780 MHz	779–787
863 MHz	863–870
866 MHz	865–867
867 MHz	866–869
870 MHz	870–876
901 MHz	901–902
915 MHz	902–928
915 MHz-a	902–928(alternate)
915 MHz-b	902–907.5 & 915–928
915 MHz-c	915–928
915 MHz-d	915–921
915 MHz-e	915–918
917 MHz	917–923.5

Table 10-1—Frequency band designations (continued)

Band designation	Frequency band (MHz)
919 MHz	919–923
920 MHz	920–928
920 MHz-a	920.5–924.5
920 MHz-b	920–925
928 MHz	928–960 ^a
1427 MHz	1427–1518 ^a
2380 MHz	2360–2400
2450 MHz	2400–2483.5
HRP UWB sub-gigahertz	250–750
HRP UWB low band	3244–4742
HRP UWB high band	5944–10 234
LRP UWB	6289.6–9185.6

SUN FSK PHY**Table 20-6—SUN FSK modulation and channel parameters^a**

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3
169.400–169.475	Data rate (kb/s)	4.8	2.4	9.6
	Modulation	2-FSK	2-FSK	4-FSK
	Modulation index	0.5	2.0	0.33
	Channel spacing (kHz)	12.5	12.5	12.5

Table 20-6—SUN FSK modulation and channel parameters^a (continued)

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3
450–470	Data rate (kb/s)	9.6	4.8	—
	Modulation	4-FSK	2-FSK	—
	Modulation index	0.33	1.0	—
	Channel spacing (kHz)	12.5	12.5	—
470–510	Data rate (kb/s)	50	100	150
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5
	Channel spacing (kHz)	200	200	200
779–787	Data rate (kb/s)	50	100	200
	Modulation	2-FSK	2-FSK	4-FSK
	Modulation index	1.0	1.0	0.33
	Channel spacing (kHz)	200	400	400
863–870	Data rate (kb/s)	50	100	150
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	100	200	200
865–867	Data rate (kb/s)	50	100	150
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	100	200	200
896–901	Data rate (kb/s)	10	20	40
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	12.5	12.5	12.5
901–902	Data rate (kb/s)	10	20	40
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	12.5	12.5	12.5
902–928	Data rate (kb/s)	50	150	200
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5
	Channel spacing (kHz)	200	400	400

Table 20-6—SUN FSK modulation and channel parameters^a (continued)

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3
917–923.5	Data rate (kb/s)	50	150	200
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5
	Channel spacing (kHz)	200	400	400
928–960 ^b	Data rate (kb/s)	10	20	40
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	25	25	25
1427–1518 ^b	Data rate (kb/s)	10	20	40
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5
	Channel spacing (kHz)	25	25	25
2400–2483.5	Data rate (kb/s)	50	150	200
	Modulation	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5
	Channel spacing (kHz)	200	400	400

^aData rates shown are over-the-air data rates (the data rate transmitted over the air regardless of whether the FEC is enabled).

^bNoncontiguous.

¹ Table 20-7 shows the modulation and channel parameters for the standard-defined PHY operating modes for
² the 867 MHz, 870 MHz, 915 MHz-a, 915 MHz-b, 915 MHz-c, 915 MHz-d, 915 MHz-e, 919 MHz,
³ 920 MHz, 920 MHz-a, and 920 MHz-b bands. For these bands, a device shall support both operating modes
⁴ #1 and #2 and may additionally support operating modes #3, #4, and #5.

Table 20-7—SUN FSK modulation and channel parameters for additional sub-GHz bands^a

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3	Operating mode #4	Operating mode #5
866–869	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	0.5	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	100	200	200	400	400

**Table 20-7—SUN FSK modulation and channel parameters
for additional sub-GHz bands^a (continued)**

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3	Operating mode #4	Operating mode #5
870–876	Data rate (kb/s)	50	100	150	—	—
	Modulation	2-FSK	2-FSK	2-FSK	—	—
	Modulation index	0.5	0.5	0.5	—	—
	Channel spacing (kHz)	100	200	200	—	—
902–928 (alternate)	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	100	200	200	400	400
902–907.5 & 915–928	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400
915–928	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400
915–921	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400
915–918	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400

Table 20-7—SUN FSK modulation and channel parameters for additional sub-GHz bands^a (continued)

Frequency band (MHz)	Parameter	Operating mode #1	Operating mode #2	Operating mode #3	Operating mode #4	Operating mode #5
919–923	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400
920–928	Data rate (kb/s)	50	100	200	400	—
	Modulation	2-FSK	2-FSK	2-FSK	4-FSK	—
	Modulation index	1.0	1.0	1.0	0.33	—
	Channel spacing (kHz) ^b	200	400	600	600	—
920.5–924.5	Data rate (kb/s)	50	100	150	—	—
	Modulation	2-FSK	2-FSK	2-FSK	—	—
	Modulation index	1.0	0.5	0.5	—	—
	Channel spacing (kHz)	200	200	200	—	—
920–925	Data rate (kb/s)	50	100	150	200	300
	Modulation	2-FSK	2-FSK	2-FSK	2-FSK	2-FSK
	Modulation index	1.0	0.5	0.5	0.5	0.5
	Channel spacing (kHz)	200	200	200	400	400

^aData rates shown are over-the-air data rates (the data rate transmitted over the air regardless of whether the FEC is enabled).

^bChannel separation of 200 kHz is used. Channel spacing shows bundling of 200 kHz channels.

PHY Mode Definition

PHY Mode	Symbol Rate (kb/s)	Modulation	Mode Index	Channel Spacing (kHz)
1	2.4	2-FSK	2.0	12.5
2a	4.8	2-FSK	0.5	12.5
2b	4.8	2-FSK	1.0	12.5
3	9.6	4-FSK	0.33	12.5
4	10	2-FSK	0.5	12.5
5	20	2-FSK	0.5	12.5
6	40	2-FSK	0.5	12.5
7a	50	2-FSK	0.5	100
7b	50	2-FSK	1	200
8a	100	2-FSK	0.5	200
8b	100	2-FSK	1	400
9a	150	2-FSK	0.5	200
9b	150	2-FSK	0.5	400
10a	200	2-FSK	0.5	400
10b	200	2-FSK	1	600
10c	200	4-FSK	0.33	400
11	300	2-FSK	0.5	400
12	400	4-FSK	0.33	600

SUN FSK Supporting Operating Modes

Band designation	Operating mode #1	Operating mode #2	Operating mode #3	Operating mode #4	Operating mode #5
169 MHz	PHY Mode #2a	PHY Mode #1	PHY Mode #3	-	-
450 MHz	PHY Mode #3	PHY Mode #2b	-	-	-
470 MHz	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	-	-
780 MHz	PHY Mode #7b	PHY Mode #8b	PHY Mode #10c	-	-
863 MHz	PHY Mode #7a	PHY Mode #8a	PHY Mode #9a	-	-
866 MHz	PHY Mode #7a	PHY Mode #8a	PHY Mode #9a	-	-
869 MHz	PHY Mode #4	PHY Mode #5	PHY Mode #6	-	-
867 MHz	PHY Mode #7a	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
870 MHz	PHY Mode #7a	PHY Mode #8a	PHY Mode #9a	-	-
901 MHz	PHY Mode #4	PHY Mode #5	PHY Mode #6	-	-
915 MHz	PHY Mode #7b	PHY Mode #9b	PHY Mode #10a	-	-
915 MHz-a	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
915 MHz-b	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
915 MHz-c	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
915 MHz-d	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
915 MHz-e	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
917 MHz	PHY Mode #7b	PHY Mode #9b	PHY Mode #10a	-	-
919 MHz	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
920 MHz	PHY Mode #7b	PHY Mode #8b	PHY Mode #10b	PHY Mode #12	-
920 MHz-a	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	-	-
920 MHz-b	PHY Mode #7b	PHY Mode #8a	PHY Mode #9a	PHY Mode #10a	PHY Mode #11
928 MHz	PHY Mode #4	PHY Mode #5	PHY Mode #6	-	-
1427 MHz	PHY Mode #4	PHY Mode #5	PHY Mode #6	-	-

2450 MHz	PHY Mode #7b	PHY Mode #9b	PHY Mode #10a	-	-
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