

SAR Evaluation for extremity conditions

1. Extremity exposure conditions

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity *SAR Test Exclusion Thresholds* should be applied to determine SAR test requirements.

2. Standalone SAR test exclusion considerations

For FCC:

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot \sqrt{f_{(\text{GHz})}}$$

≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz

- 2) At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B of KDB 447498

- [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) · (f(MHz)/150)] mW, at 100 MHz to 1500 MHz
- [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) · 10] mW at > 1500 MHz and ≤ 6 GHz

For IC:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

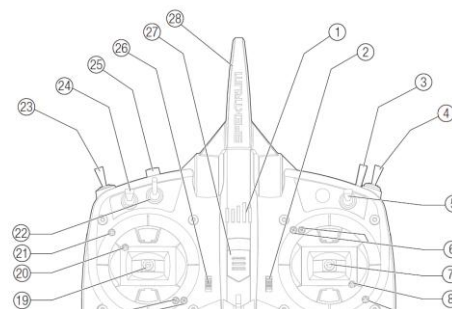
Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥ 50 mm
≤ 300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

Function	
3	Switch H
4	Switch G
5	Switch F
22	Switch D
23	Switch B
24	Switch C
25	Bind/Switch I
26	Elevator Trim (Mode 1,3) Throttle Trim (Mode 2,4)

Note: Switch H/G/F/D/B/C, Bind/Switch I are only used to set up Screen display, These buttons are not used when working normally, such as remote-controlled airplane.



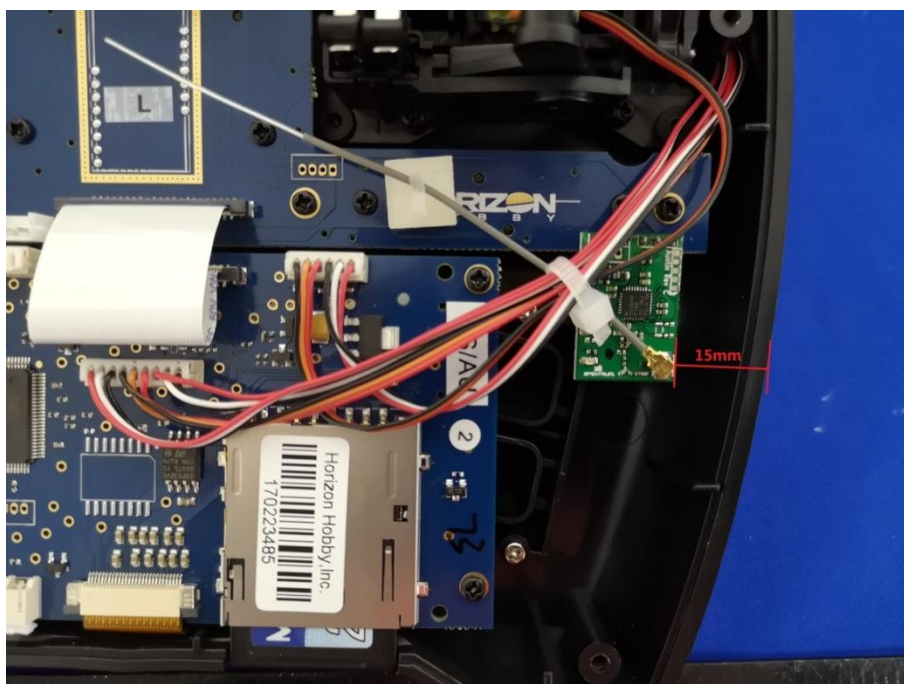
3. UT Description (worst case)



High-power transceiver ANT

Distance of antenna to extremity exposure positions(mm)	
Top button	70

Note : Shortest distance between ANT to the position where the user operates



Low-power transceiver ANT

Distance of antenna to extremity exposure positions(mm)	
Left side	15

Note : Shortest distance between ANT to the position where the user operates

For FCC:

Test separation distances ≤ 50 mm

Conducted Power of EUT							
Frequency (MHz)	Power (dBm)	Power (mW)	Tune-up power (dBm)	Tune-up power (mW)	Test distances (mm)	Result	Limit (10-g SAR)
Low-power transceiver							
2476.00	4.72	2.965	5.00	3.16	15.00	0.33	7.50

$(3.16 \times 2.476) / 15 = 0.33$

Test separation distances > 50 mm

Conducted Power of EUT						
Frequency (MHz)	Power (dBm)	Power (mW)	Tune-up power (dBm)	Tune-up power (mW)	Test distances (mm)	Limit (10-g SAR)
High-power transceiver						
2402-2478	27.10	512	27.50	562.34	70.00	740

$296 \times 2.5 = 740$

For IC:

Test separation distances ≤ 50 mm

EIRP Power of EUT						
Frequency (GHz)	Power (dBm)	Antenna gain (dBi)	EIRP Power (dBm)	EIRP Power (mW)	Test distances (mm)	Limit (mW) (10-g SAR)
Low-power transceiver						
2476.00	4.72	2.00	6.72	4.70	15.00	37.50

Test separation distances > 50 mm

Conducted Power of EUT						
Frequency (MHz)	Power (mW)	Antenna gain (dBi)	Antenna gain (dB)	EIRP Power (mW)	Test distances (mm)	Limit (mW) (10-g SAR)
High-power transceiver						
2402-2478	512	1.5	1.4125	723.2	70.00	772.5

4. Conclusion

SAR test for 10-g extremity is exclusion.