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:

 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:

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

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

- $f_{(GHz)}$ 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:

Frequency	Exemption Limits (mW)						
(MHz)	At separation	At separation	At separation	At separation	At separation		
	distance of	distance of	distance of	distance of	distance of		
	≤5 mm	10 mm	15 mm	20 mm	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		

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

Frequency	Exemption Limits (mW)							
(MHz)	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.

Fun	ction
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 <i>(Mode 1,3)</i> Throttle Trim <i>(Mode 2,4)</i>



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 e	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 $\,\leqslant\,$ 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	

(3.16Xv2.476)/15=0.33

Test separation distances > 50 mm

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

296x2.5=740

For IC:

Test separation distances \leq 50 mm

EIRP Power of EUT								
Frequency	Power	Antenna gain	EIRP Power	EIRP Power	Test distances	Limit (mW)		
(GHz)	(dBm)	(dBi)	(dBm)	(mW)	(mm)	(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 Power Antenna Antenna gain EIRP Test distances Limit								
(MHz)	(mW)	gain (dBi)	(dB)	Power(mW)	(mm)	(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.