

RADIO FREQUENCY EXPOSURE

According to section 4.3.1 of KDB 447498 D01 General RF Exposure Guidance v06, SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Appendix A.

Appendix A

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note: Manufacturer declared that the maximum antenna gain is 2dBi (Max.).

Conducted Power Results

2.4G Band:

Bluetooth(BDR+EDR)

Test Mode	Antenna	Frequency[MHz]	Result[dBm]
DH5	Ant1	2402	-4.53
DH5	Ant1	2441	-3.76
DH5	Ant1	2480	-3.82
2DH5	Ant1	2402	-2.34
2DH5	Ant1	2441	-1.52
2DH5	Ant1	2480	-1.57
3DH5	Ant1	2402	-2.21
3DH5	Ant1	2441	-1.47
3DH5	Ant1	2480	-1.56

WiFi 2.4GHz Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11B	Ant1	2412	3.63
11B	Ant1	2437	4.69
11B	Ant1	2462	3.37
11G	Ant1	2412	3.85
11G	Ant1	2437	5.02
11G	Ant1	2462	3.50
11N20SISO	Ant1	2412	5.05
11N20SISO	Ant1	2437	5.13
11N20SISO	Ant1	2462	5.23
11N40SISO	Ant1	2422	3.96
11N40SISO	Ant1	2437	4.86
11N40SISO	Ant1	2452	4.42
11AX20SISO	Ant1	2412	3.96
11AX20SISO	Ant1	2437	5.03
11AX20SISO	Ant1	2462	3.54
11AX40SISO	Ant1	2422	3.64
11AX40SISO	Ant1	2437	4.49
11AX40SISO	Ant1	2452	5.48

5G Band

UNII-1 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5180	2.61
11A	Ant1	5200	3.82
11A	Ant1	5240	4.04
11N20SISO	Ant1	5180	2.62
11N20SISO	Ant1	5200	3.55
11N20SISO	Ant1	5240	4.08
11N40SISO	Ant1	5190	2.55
11N40SISO	Ant1	5230	3.29
11AC20SISO	Ant1	5180	2.47
11AC20SISO	Ant1	5200	3.52
11AC20SISO	Ant1	5240	4.15
11AC40SISO	Ant1	5190	2.91
11AC40SISO	Ant1	5230	3.10
11AX20SISO	Ant1	5180	2.76
11AX20SISO	Ant1	5200	3.92
11AX20SISO	Ant1	5240	4.37
11AX40SISO	Ant1	5190	1.88
11AX40SISO	Ant1	5230	1.92

UNII-3 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5745	1.71
11A	Ant1	5785	2.57
11A	Ant1	5825	2.16
11N20SISO	Ant1	5745	1.35
11N20SISO	Ant1	5785	2.12
11N20SISO	Ant1	5825	1.89
11N40SISO	Ant1	5755	1.51
11N40SISO	Ant1	5795	2.10
11AC20SISO	Ant1	5745	0.95
11AC20SISO	Ant1	5785	2.03
11AC20SISO	Ant1	5825	1.92
11AC40SISO	Ant1	5755	1.39
11AC40SISO	Ant1	5795	1.71
11AX20SISO	Ant1	5745	1.09
11AX20SISO	Ant1	5785	2.27
11AX20SISO	Ant1	5825	1.86
11AX40SISO	Ant1	5755	1.46
11AX40SISO	Ant1	5795	1.54

Manufacturing tolerance

Bluetooth(BDR+EDR)

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-5.0	-4.5	-4.5
Tolerance $\pm$ (dB)	1	1	1
$\pi/4$ -DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-3	-2	-2
Tolerance $\pm$ (dB)	1	1	1
8-DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-2.5	-2	-2
Tolerance $\pm$ (dB)	1	1	1

WiFi 2.4GHz Band

IEEE 802.11b(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	3	4	3
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11g(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	3.5	4.5	3
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	4.5	4.5	4.5
Tolerance $\pm$ (dB)	1	1	1

IEEE 802.11n HT40(Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	3.5	4.5	4
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ax HE20(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	3.5	4.5	3
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ax HE40(Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	3	4	5
Tolerance $\pm$ (dB)	1	1	1

UNII-1 Band

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	2	3.5	3.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	2	3	3.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	2	3	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	2	3	3.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	2.5	2.5	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ax HE20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	2.5	3.5	2.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ax HE40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	1.5	1.5	--
Tolerance $\pm$ (dB)	1	1	--

UNII-3 Band

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	1	2	1.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	1	1.5	1.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	1	1.5	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	0.5	1.5	1.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	1	1	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ax HE20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	0.5	2	1.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ax HE40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	1	1	--
Tolerance $\pm$ (dB)	1	1	--

Results**Bluetooth**

Test Mode	Antenna	Frequency [MHz]	Max Conducted Tune Up Power(dBm)	Max Conducted Tune Up Power(mW)	Calculation Value for 1g SAR	Exemption Limit for 1g SAR
DH5	Ant1	2402	-4	0.40	0.12	3
DH5	Ant1	2441	-3.5	0.45	0.14	3
DH5	Ant1	2480	-3.5	0.45	0.14	3
2DH5	Ant1	2402	-2	0.63	0.20	3
2DH5	Ant1	2441	-1	0.79	0.25	3
2DH5	Ant1	2480	-1	0.79	0.25	3
3DH5	Ant1	2402	-1.5	0.71	0.22	3
3DH5	Ant1	2441	-1	0.79	0.25	3
3DH5	Ant1	2480	-1	0.79	0.25	3

WiFi 2.4GHz Band

Test Mode	Antenna	Frequency [MHz]	Max Conducted Tune Up Power(dBm)	Max Conducted Tune Up Power(mW)	Calculation Value for 1g SAR	Exemption Limit for 1g SAR
11B	Ant1	2412.00	4.00	2.51	0.78	3
11B	Ant1	2437.00	5.00	3.16	0.99	3
11B	Ant1	2462.00	4.00	2.51	0.79	3
11G	Ant1	2412.00	4.50	2.82	0.88	3
11G	Ant1	2437.00	5.50	3.55	1.11	3
11G	Ant1	2462.00	4.00	2.51	0.79	3
11N20SISO	Ant1	2412.00	5.50	3.55	1.10	3
11N20SISO	Ant1	2437.00	5.50	3.55	1.11	3
11N20SISO	Ant1	2462.00	5.50	3.55	1.11	3
11N40SISO	Ant1	2422.00	4.50	2.82	0.88	3
11N40SISO	Ant1	2437.00	5.50	3.55	1.11	3
11N40SISO	Ant1	2452.00	5.00	3.16	0.99	3
11AX20SISO	Ant1	2412.00	4.50	2.82	0.88	3
11AX20SISO	Ant1	2437.00	5.50	3.55	1.11	3
11AX20SISO	Ant1	2462.00	4.00	2.51	0.79	3
11AX40SISO	Ant1	2422.00	4.00	2.51	0.78	3
11AX40SISO	Ant1	2437.00	5.00	3.16	0.99	3
11AX40SISO	Ant1	2452.00	6.00	3.98	1.25	3

UNII-1 Band

Test Mode	Antenna	Frequency [MHz]	Max Conducted Tune Up Power(dBm)	Max Conducted Tune Up Power(mW)	Calculation Value for 1g SAR	Exemption Limit for 1g SAR
11A	Ant1	5180.00	3.00	2.00	0.91	3

11A	Ant1	5200.00	4.50	2.82	1.29	3
11A	Ant1	5240.00	4.50	2.82	1.29	3
11N20SISO	Ant1	5180.00	3.00	2.00	0.91	3
11N20SISO	Ant1	5200.00	4.00	2.51	1.15	3
11N20SISO	Ant1	5240.00	4.50	2.82	1.29	3
11N40SISO	Ant1	5190.00	3.00	2.00	0.91	3
11N40SISO	Ant1	5230.00	4.00	2.51	1.15	3
11AC20SISO	Ant1	5180.00	3.00	2.00	0.91	3
11AC20SISO	Ant1	5200.00	4.00	2.51	1.15	3
11AC20SISO	Ant1	5240.00	4.50	2.82	1.29	3
11AC40SISO	Ant1	5190.00	3.50	2.24	1.02	3
11AC40SISO	Ant1	5230.00	3.50	2.24	1.02	3
11AX20SISO	Ant1	5180.00	3.50	2.24	1.02	3
11AX20SISO	Ant1	5200.00	4.50	2.82	1.29	3
11AX20SISO	Ant1	5240.00	3.50	2.24	1.02	3
11AX40SISO	Ant1	5190.00	2.50	1.78	0.81	3
11AX40SISO	Ant1	5230.00	2.50	1.78	0.81	3

UNII-3 Band

Test Mode	Antenna	Frequency [MHz]	Max Conducted Tune Up Power(dBm)	Max Conducted Tune Up Power(mW)	Calculation Value for 1g SAR	Exemption Limit for 1g SAR
11A	Ant1	5745.00	2.00	1.58	0.76	3
11A	Ant1	5785.00	3.00	2.00	0.96	3
11A	Ant1	5825.00	2.50	1.78	0.86	3
11N20SISO	Ant1	5745.00	2.00	1.58	0.76	3
11N20SISO	Ant1	5785.00	2.50	1.78	0.86	3
11N20SISO	Ant1	5825.00	2.50	1.78	0.86	3
11N40SISO	Ant1	5755.00	2.00	1.58	0.76	3
11N40SISO	Ant1	5795.00	2.50	1.78	0.86	3
11AC20SISO	Ant1	5745.00	1.50	1.41	0.68	3
11AC20SISO	Ant1	5785.00	2.50	1.78	0.86	3
11AC20SISO	Ant1	5825.00	2.50	1.78	0.86	3
11AC40SISO	Ant1	5755.00	2.00	1.58	0.76	3
11AC40SISO	Ant1	5795.00	2.00	1.58	0.76	3
11AX20SISO	Ant1	5745.00	1.50	1.41	0.68	3
11AX20SISO	Ant1	5785.00	3.00	2.00	0.96	3
11AX20SISO	Ant1	5825.00	2.50	1.78	0.86	3
11AX40SISO	Ant1	5755.00	2.00	1.58	0.76	3
11AX40SISO	Ant1	5795.00	2.00	1.58	0.76	3

Calculation Value = [(max. power of channel, mW) / (min. test separation distance, mm)] · [√f(GHz)].

Conclusion: The SAR evaluation is not required.