

RADIO FREQUENCY EXPOSURE

Limit

For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g SAR *test exclusion thresholds* are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ 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

Conducted Power Results

WiFi 2.4GHz Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11B	Ant1	2412	16.23
11B	Ant2	2412	12.26
11B	Ant1	2437	15.50
11B	Ant2	2437	11.73
11B	Ant1	2462	16.29
11B	Ant2	2462	11.42
11G	Ant1	2412	16.59
11G	Ant2	2412	13.80
11G	Ant2	2437	12.88
11G	Ant1	2437	16.02
11G	Ant2	2462	12.85
11G	Ant1	2462	16.41
11N20MIMO	Ant1	2412	14.15
11N20MIMO	Ant2	2412	11.26
11N20MIMO	total	2412	15.95
11N20MIMO	Ant1	2437	13.70
11N20MIMO	Ant2	2437	10.01
11N20MIMO	total	2437	15.25
11N20MIMO	Ant1	2462	13.99
11N20MIMO	Ant2	2462	10.16
11N20MIMO	total	2462	15.49
11N40MIMO	Ant1	2422	14.53
11N40MIMO	Ant2	2422	11.00
11N40MIMO	total	2422	16.12
11N40MIMO	Ant1	2437	14.09
11N40MIMO	Ant2	2437	10.68
11N40MIMO	total	2437	15.72
11N40MIMO	Ant1	2452	14.15
11N40MIMO	Ant2	2452	10.26
11N40MIMO	total	2452	15.64

5G Band
UNII-1 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5180	14.37
11A	Ant2	5180	13.83
11A	Ant1	5200	13.69
11A	Ant2	5200	13.33
11A	Ant1	5240	14.89
11A	Ant2	5240	14.49
11N20MIMO	Ant1	5180	13.91
11N20MIMO	Ant2	5180	13.63
11N20MIMO	total	5180	16.78
11N20MIMO	Ant1	5200	11.42
11N20MIMO	Ant2	5200	11.08
11N20MIMO	total	5200	14.26
11N20MIMO	Ant1	5240	12.71
11N20MIMO	Ant2	5240	12.16
11N20MIMO	total	5240	15.45
11N40MIMO	Ant1	5190	11.40
11N40MIMO	Ant2	5190	10.68
11N40MIMO	total	5190	14.07
11N40MIMO	Ant1	5230	12.28
11N40MIMO	Ant2	5230	11.67
11N40MIMO	total	5230	15.00
11AC20MIMO	Ant1	5180	13.99
11AC20MIMO	Ant2	5180	13.51
11AC20MIMO	total	5180	16.77
11AC20MIMO	Ant1	5200	10.06
11AC20MIMO	Ant2	5200	9.70
11AC20MIMO	total	5200	12.89
11AC20MIMO	Ant1	5240	11.63
11AC20MIMO	Ant2	5240	11.39
11AC20MIMO	total	5240	14.52
11AC40MIMO	Ant1	5190	11.51
11AC40MIMO	Ant2	5190	10.91
11AC40MIMO	total	5190	14.23
11AC40MIMO	Ant1	5230	12.37
11AC40MIMO	Ant2	5230	11.74
11AC40MIMO	total	5230	15.08
11AC80MIMO	Ant1	5210	12.13
11AC80MIMO	Ant2	5210	11.46
11AC80MIMO	total	5210	14.82

UNII-3 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5745	16.37
11A	Ant2	5745	15.51
11A	Ant1	5785	15.38
11A	Ant2	5785	14.20
11A	Ant1	5825	14.18
11A	Ant2	5825	13.30
11N20MIMO	Ant1	5745	9.72
11N20MIMO	Ant2	5745	8.82
11N20MIMO	total	5745	12.30
11N20MIMO	Ant1	5785	10.80
11N20MIMO	Ant2	5785	9.67
11N20MIMO	total	5785	13.28
11N20MIMO	Ant1	5825	9.72
11N20MIMO	Ant2	5825	8.70
11N20MIMO	total	5825	12.25
11N40MIMO	Ant1	5755	11.42
11N40MIMO	Ant2	5755	10.60
11N40MIMO	total	5755	14.04
11N40MIMO	Ant1	5795	10.95
11N40MIMO	Ant2	5795	9.26
11N40MIMO	total	5795	13.20
11AC20MIMO	Ant1	5745	10.62
11AC20MIMO	Ant2	5745	9.85
11AC20MIMO	total	5745	13.26
11AC20MIMO	Ant1	5785	9.85
11AC20MIMO	Ant2	5785	8.61
11AC20MIMO	total	5785	12.28
11AC20MIMO	Ant1	5825	8.38
11AC20MIMO	Ant2	5825	7.15
11AC20MIMO	total	5825	10.82
11AC40MIMO	Ant1	5755	8.35
11AC40MIMO	Ant2	5755	7.52
11AC40MIMO	total	5755	10.97
11AC40MIMO	Ant1	5795	10.08
11AC40MIMO	Ant2	5795	9.33
11AC40MIMO	total	5795	12.73
11AC80MIMO	Ant1	5775	11.28
11AC80MIMO	Ant2	5775	9.18
11AC80MIMO	total	5775	13.37

Manufacturing tolerance

WiFi 2.4GHz Band – Antenna 1

IEEE 802.11b(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.5	15.0	16.0
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11g(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.0	12.5	12.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.5	13.0	13.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40(Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	14.0	13.5	13.5
Tolerance $\pm$ (dB)	1	1	1

WiFi 2.4GHz Band – Antenna 2

IEEE 802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	11.0	11.0
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.5	15.5	16.0
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	9.5	9.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	10.5	10.0	10.0
Tolerance $\pm$ (dB)	1	1	1

UNII-1 Band – Antenna 1

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	14	13	14.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	11	12
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	11	12	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	9.5	11
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	11	12	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	--	--
Target (dBm)	11.5	--	--
Tolerance $\pm$ (dB)	1	--	--

UNII-1 Band – Antenna 2

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	13	14
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13	10.5	11.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	10	11	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13	9	11
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	10.5	11	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	--	--
Target (dBm)	11	--	--
Tolerance $\pm$ (dB)	1	--	--

UNII-3 Band – Antenna 1			
IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	16	15	13.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9	10.5	9
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	11	10.5	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10	9.5	8
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	8	9.5	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	--	--
Target (dBm)	11	--	--
Tolerance $\pm$ (dB)	1	--	--

UNII-3 Band – Antenna2

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	15	13.5	13
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	8.5	9	8
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	10	9	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.5	8	6.5
Tolerance $\pm$ (dB)	1	1	1
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	7	9	--
Tolerance $\pm$ (dB)	1	1	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	--	--
Target (dBm)	8.5	--	--
Tolerance $\pm$ (dB)	1	--	--

Results

WiFi 2.4GHz Band – Ant 1

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11b	17.0	50.1187	40	1.970	3
IEEE 802.11g	17.0	50.1187	40	1.970	3
IEEE 802.11n HT20	14.5	28.1838	40	1.108	3
IEEE 802.11n HT40	15.0	31.6228	40	1.243	3

WiFi 2.4GHz Band – Ant 2

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11b	13.0	19.9526	40	0.784	3
IEEE 802.11g	17.0	50.1187	40	1.970	3
IEEE 802.11n HT20	12.0	15.8489	40	0.623	3
IEEE 802.11n HT40	11.5	14.1254	40	0.555	3

WiFi 2.4GHz Band – MIMO

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11n HT20	15.95	39.3550	40	1.547	3
IEEE 802.11n HT40	16.12	40.9261	40	1.609	3

UNII-1 Band – Ant 1

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11a	15.5	35.4813	40	2.031	3
IEEE 802.11n HT20	14.5	28.1838	40	1.613	3
IEEE 802.11ac VHT20	14.5	28.1838	40	1.613	3
IEEE 802.11n HT40	13.0	19.9526	40	1.142	3
IEEE 802.11ac VHT40	13.0	19.9526	40	1.142	3
IEEE 802.11ac VHT80	12.5	17.7828	40	1.018	3

UNII-1 Band – Ant 2

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11a	15.0	31.6228	40	1.810	3
IEEE 802.11n HT20	14.0	25.1189	40	1.437	3
IEEE 802.11ac VHT20	14.0	25.1189	40	1.437	3
IEEE 802.11n HT40	12.0	15.8489	40	0.907	3
IEEE 802.11ac VHT40	12.0	15.8489	40	0.907	3
IEEE 802.11ac VHT80	12.0	15.8489	40	0.907	3

UNII-1 Band – MIMO

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11n HT20	16.78	47.6431	40	2.727	3
IEEE 802.11n HT40	15	31.6228	40	1.810	3
IEEE 802.11ac VHT20	16.77	47.5335	40	2.720	3
IEEE 802.11ac VHT40	15.08	32.2107	40	1.843	3
IEEE 802.11ac VHT80	14.82	30.3389	40	1.736	3

UNII-3 Band – Ant 1

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11a	9.0	7.9433	40	0.479	3
IEEE 802.11n HT20	9.5	8.9125	40	0.538	3
IEEE 802.11ac VHT20	11.0	12.5893	40	0.760	3
IEEE 802.11n HT40	11.0	12.5893	40	0.760	3
IEEE 802.11ac VHT40	10.5	11.2202	40	0.677	3
IEEE 802.11ac VHT80	10.5	11.2202	40	0.677	3

UNII-3 Band – Ant 2

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11a	8.0	6.3096	40	0.381	3
IEEE 802.11n HT20	9.5	8.9125	40	0.538	3
IEEE 802.11ac VHT20	10.5	11.2202	40	0.677	3
IEEE 802.11n HT40	10.5	11.2202	40	0.677	3
IEEE 802.11ac VHT40	10.5	11.2202	40	0.677	3
IEEE 802.11ac VHT80	10.5	11.2202	40	0.677	3

UNII-3 Band – MIMO

Modulation Type	Output power		Test distance (mm)	Calculation Value for 1g SAR (Note 1)	Exemption Limit for 1g SAR
	dBm	mW			
IEEE 802.11n HT20	13.28	21.2814	40	1.284	3
IEEE 802.11n HT40	14.04	25.3513	40	1.530	3
IEEE 802.11ac VHT20	13.26	21.1836	40	1.278	3
IEEE 802.11ac VHT40	12.73	18.7499	40	1.131	3
IEEE 802.11ac VHT80	13.37	21.7270	40	1.311	3

Note:

1. Calculation Value = [(max. power of channel, mW) / (min. test separation distance, mm)] · [√f(GHz)].
f is 2.462 for 2.4G band, 5.24 for UNII band 1 and 5.825 for UNII band 3.

Conclusion: The SAR evaluation is not required.