RF EXPOSURE EVALUATION METHOD

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

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	
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	SAR Test Exclusion Threshold (mW)
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	

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)] • [√f(GHz)] ⩽ 3.0 for 1-g SAR and ⩽ 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
The test exclusions are applicable only when the minimum test separation distance is ⩽ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Maximum measured transmitter power.

BT4.0+EDR The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
GFSK	2.402	3.85	3±1
π/4-DQPSK	2.480	-0.58	-1±1
8DPSK	2.480	-1.77	-2±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(2402)}$= 2.512mw

Tune up Power$_{(2480)}$= 1.000mw

Tune up Power$_{(2480)}$= 0.794mw

[(GFSK power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] • [$\sqrt{}$ f(GHz)]= 2.512/5* $\sqrt{}$ 2.402=0.779≤3.0

[(π/4-DQPSK power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] • [$\sqrt{}$ f(GHz)]= 1.000/5* $\sqrt{}$ 2.480=0.315≤3.0

[(8DPSK power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] • [$\sqrt{}$ f(GHz)]=0.794/5* $\sqrt{}$ 2.480=0.250≤3.0

Threshold at which no SAR required is 0.779≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

BT 4.0 The Worst Case

frequency	Maximum Peak Conducted Output Power	Tune up tolerance
GHz	dBm	dBm
2.402	2.35	2±1
2.440	2.26	2±1
2.480	2.01	2±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(2402)}$= 1.995mw

Tune up Power$_{(2440)}$= 1.995mw

Tune up Power$_{(2480)}$= 1.995mw

BT:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 1.995/5*$\sqrt{2.402}$=0.618≤3.0

[(mid. power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 1.995/5*$\sqrt{2.440}$=0.623≤3.0

[(min. power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 1.995/5*$\sqrt{2.480}$=0.628≤3.0

Threshold at which no SAR required is 0.628≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

2.4G WIFI The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
802.11b	2.412	4.52	4±1
802.11g	2.462	3.48	3±1
802.11 n20	2.412	3.43	3±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(2412)}$=3.162mw

Tune up Power$_{(2462)}$=2.512mw

Tune up Power$_{(2412)}$=2.512mw

WIFI:

[(max. power of channel, including tune-up tolerance, mW)/802.11b test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 3.162/5*$\sqrt{2.412}$=0.982≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11g test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 2.512/5*$\sqrt{2.462}$=0.788≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11n20 test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 2.512/5*$\sqrt{2.412}$=0.780≤3.0

Threshold at which no SAR required is 0.982≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

5G WIFI Band I (5.18-5.24GHz) The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
802.11 a/n/ac(HT20)	5.240	-1.96	-2±1
802.11 n/ac(HT40)	5.190	-2.87	-3±1
802.11 ac(HT80)	5.210	-3.40	-3±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(5240)}$=0.794mw

Tune up Power$_{(5190)}$=0.631mw

Tune up Power$_{(5210)}$=0.631mw

WIFI:

[(max. power of channel, including tune-up tolerance, mW)/802.11b test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.794/5*$\sqrt{5.240}$=0.364≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11g test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.631/5*$\sqrt{5.190}$=0.287≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11n20 test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.631/5*$\sqrt{5.210}$=0.288≤3.0

Threshold at which no SAR required is 2.467≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

5G WIFI Band II (5.26-5.32GHz) The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
802.11 a/n/ac(HT20)	5.300	-1.64	-2±1
802.11 n/ac(HT40)	5.270	-1.66	-2±1
802.11 ac(HT80)	5.290	-4.36	-4±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(5300)}$=0.794mw

Tune up Power$_{(5270)}$=0.794mw

Tune up Power$_{(5290)}$=0.501mw

WIFI:

[(max. power of channel, including tune-up tolerance, mW)/802.11b test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.794/5* $\sqrt{5.300}$=0.366≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11g test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.794/5* $\sqrt{5.270}$=0.365≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11n20 test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.501/5* $\sqrt{5.290}$=0.230≤3.0

Threshold at which no SAR required is 0.366≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

5G WIFI Band III (5.50-5.72GHz) The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
802.11 a/n/ac(HT20)	5.500	-1.59	-2±1
802.11 n/ac(HT40)	5.510	-2.48	-3±1
802.11 ac(HT80)	5.530	-3.93	-4±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(5500)}$=0.794mw

Tune up Power$_{(5510)}$=0.631mw

Tune up Power$_{(5530)}$=0.501mw

WIFI:

[(max. power of channel, including tune-up tolerance, mW)/802.11b test separation distance,mm)] ・ [$\sqrt{f(GHz)}$]= $0.794/5 \ast \sqrt{5.500}$=0.372≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11g test separation distance,mm)] ・ [$\sqrt{f(GHz)}$]= $0.631/5 \ast \sqrt{5.510}$=0.296≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11n20 test separation distance,mm)] ・ [$\sqrt{f(GHz)}$]= $0.501/5 \ast \sqrt{5.530}$=0.236≤3.0

Threshold at which no SAR required is 0.372≤ 3.0 for 1-g SAR, Separation distance is 5mm.

Maximum measured transmitter power.

5G WIFI Band IV (5.745-5.825GHz) The Worst Case

Mode	frequency	Maximum Peak Conducted Output Power	Tune up tolerance
	GHz	dBm	dBm
802.11 a/n/ac(HT20)	5.825	-1.69	-2±1
802.11 n/ac(HT40)	5.795	-2.43	-3±1
802.11 ac(HT80)	5.775	-3.20	-3±1

Remark: The worst case gain of the antenna is 0dBi.

0dBi logarithmic terms convert to numeric result is nearly 1

Tune up Power$_{(5825)}$=0.794mw

Tune up Power$_{(5795)}$=0.631mw

Tune up Power$_{(5775)}$=0.631mw

WIFI:

[(max. power of channel, including tune-up tolerance, mW)/802.11b test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.794/5* $\sqrt{5.825}$=0.383≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11g test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.631/5* $\sqrt{5.795}$=0.304≤3.0

[(max. power of channel, including tune-up tolerance, mW)/(802.11n20 test separation distance,mm)] · [$\sqrt{f(GHz)}$]= 0.631/5* $\sqrt{5.775}$=0.303≤3.0

Threshold at which no SAR required is 0.383≤ 3.0 for 1-g SAR, Separation distance is 5mm.