

7. RADIO FREQUENCY EXPOSURE

7.1. Limit

According to §1.1310 and §2.1091 RF exposure is calculated.

Table: Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Power Density (S) (mW/cm ²)
0.3–1.34	*(100)
1.34–30	*(180/f ²)
30–300	0.2
300–1500	f/1500
1500–100,000	1.0

F = frequency in MHz

* = Plane-wave equivalent power density

Maximum Permissible Exposure

The MPE was calculated at 20cm to show compliance with the power density limit.

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna.

Note:

1. Manufacturer declared that the maximum antenna gain is 2.0dBi(Max.).
2. Manufacturer declared that the nearest distance between human and the EUT is 20cm.
3. Only record worst case data.

BT:

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Tolerance $\pm$ (dB)
GFSK	00	2402	1.776	1.0 ± 1.0
	39	2441	0.170	0.0 ± 1.0
	78	2480	-1.155	-1.0 ± 1.0
π /4DQPSK	00	2402	0.553	0.0 ± 1.0
	39	2441	-2.459	-2.0 ± 1.0
	78	2480	-4.176	-4.0 ± 1.0
8-DPSK	00	2402	0.477	0.0 ± 1.0
	39	2441	-2.546	-2.0 ± 1.0
	78	2480	-4.247	-4.0 ± 1.0
GFSK	00	2402	-0.142	0.0 ± 1.0
	19	2440	-2.350	-2.0 ± 1.0
	39	2480	-3.880	-3.0 ± 1.0

WIFI:

Test Mode	Channel	Frequency (MHz)	Power (dBm, Average)	Power Tune Up (dBm)
802.11b	Low	2412	10.95	10.0 ± 1.0
	Middle	2437	9.50	9.0 ± 1.0
	High	2462	9.92	9.0 ± 1.0
802.11g	Low	2412	14.36	14.0 ± 1.0
	Middle	2437	13.80	13.0 ± 1.0
	High	2462	13.82	13.0 ± 1.0
802.11n HT20	Low	2412	12.89	12.0 ± 1.0
	Middle	2437	12.52	12.0 ± 1.0
	High	2462	12.47	12.0 ± 1.0

7.2 Test Results

Standalone transmission:

BT:

Band/Mode	f (GHz)	Antenna Distance (cm)	RF output power (including tune-up tolerance)		SAR Test Exclusion Threshold	SAR Test Exclusion
			dBm	mW		
GFSK	2.402	20	2.0	1.58	0.0005 <3.0	Yes
	2.441	20	1.0	1.26	0.0004 <3.0	Yes
	2.480	20	0	1.00	0.0003 <3.0	Yes
π /4DQPSK	2.402	20	1.0	1.26	0.0004 <3.0	Yes
	2.441	20	-1.0	0.79	0.0002 <3.0	Yes
	2.480	20	-3.0	0.50	0.0002 <3.0	Yes
8-DPSK	2.402	20	1.0	1.26	0.0004 <3.0	Yes
	2.441	20	-1.0	0.79	0.0002 <3.0	Yes
	2.480	20	-3.0	0.50	0.0002 <3.0	Yes
GFSK	2402	20	1.0	1.26	0.0004 <3.0	Yes
	2440	20	-1.0	0.79	0.0002 <3.0	Yes
	2480	20	-2.0	0.63	0.0002 <3.0	Yes

WIFI:

Test Mode	Channel	Max. Tune Up Power (dBm, Average)	Max. Tune Up Power (mW)	MPE (mW/cm ²)	Limit (mW/cm ²)
802.11b	Low	11.0	12.59	0.0040	1.0
	Middle	10.0	10.00	0.0031	1.0
	High	10.0	10.00	0.0031	1.0
802.11g	Low	15.0	31.62	0.0099	1.0
	Middle	14.0	25.12	0.0079	1.0
	High	14.0	25.12	0.0079	1.0
802.11n HT20	Low	13.0	19.95	0.0063	1.0
	Middle	13.0	19.95	0.0063	1.0
	High	13.0	19.95	0.0063	1.0

Antenna Gain (typical): 2.0dBi, 1.58(numeric)

Prediction distance: >=20cm

The power density level worst case at 20 cm is below the uncontrolled exposure limit.

Simultaneous transmission:

BT and WIFI can not transmit simultaneously.

Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.