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/cm2)
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 for BT & Wi-Fi is 2dBi(Max.)

2. Manufacturer declared that the nearest distance between human and the EUT is 20cm.

3. Only record worst case data.

Test Mode	Channel	Frequency (MHz)	Power (dBm, Peak)	Power Tune Up (dBm)
BLE 4.0	Low	2402	-2.69	-3.0±1.0
	Middle	2440	-3.47	-3.0±1.0
	High	2480	-3.44	-3.0±1.0
GFSK	Low	2402	-3.81	-3.0±1.0
	Middle	2441	-3.64	-3.0±1.0
	High	2480	-3.67	-3.0±1.0
Pi/4 DQPSK	Low	2402	-3.86	-3.0±1.0
	Middle	2441	-3.45	-3.0±1.0
	High	2480	-3.91	-3.0±1.0
8-DPSK	Low	2402	-3.37	-3.0±1.0
	Middle	2441	-2.97	-3.0±1.0
	High	2480	-2.95	-3.0±1.0
802.11b	Low	2412	18.82	18.0±1.0
	Middle	2437	18.51	18.0±1.0
	High	2462	18.85	18.0±1.0
802.11g	Low	2412	17.31	17.0±1.0
	Middle	2437	17.95	17.0±1.0
	High	2462	17.61	17.0±1.0
802.11n HT20	Low	2412	17.45	17.0±1.0
	Middle	2437	17.10	17.0±1.0
	High	2462	17.73	17.0±1.0

Test Mode	Channel	Frequency (MHz)	Power (dBm, AV)	Power Tune Up (dBm)
802.11a	Low	5180	15.73	15.0±1.0
	Middle	5220	15.88	15.0±1.0
	High	5240	15.60	15.0±1.0
802.11n(HT20)	Low	5180	15.26	15.0±1.0
	Middle	5220	15.55	15.0±1.0
	High	5240	15.38	15.0±1.0
802.11a	Low	5745	12.80	13.0±1.0
	Middle	5785	12.75	13.0±1.0
	High	5825	13.14	13.0±1.0
802.11n(HT20)	Low	5745	12.72	13.0±1.0
	Middle	5785	12.68	13.0±1.0
	High	5825	13.02	13.0±1.0

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7.2 Test Results

Test Mode	Channel	Max. Tune Up Power (dBm, Peak)	Max. Tune Up Power (mW)	MPE (mW/cm^2)	Limit (mW/cm^2)
BLE 4.0	Low	-2.0	0.63	0.0002	1.0
	Middle	-2.0	0.63	0.0002	1.0
	High	-2.0	0.63	0.0002	1.0
GFSK	Low	-2.0	0.63	0.0002	1.0
	Middle	-2.0	0.63	0.0002	1.0
	High	-2.0	0.63	0.0002	1.0
Pi/4 DQPSK	Low	-2.0	0.63	0.0002	1.0
	Middle	-2.0	0.63	0.0002	1.0
	High	-2.0	0.63	0.0002	1.0
8-DPSK	Low	-2.0	0.63	0.0002	1.0
	Middle	-2.0	0.63	0.0002	1.0
	High	-2.0	0.63	0.0002	1.0
802.11b	Low	19.0	79.43	0.0250	1.0
	Middle	19.0	79.43	0.0250	1.0
	High	19.0	79.43	0.0250	1.0
802.11g	Low	18.0	63.10	0.0198	1.0
	Middle	18.0	63.10	0.0198	1.0
	High	18.0	63.10	0.0198	1.0
802.11n HT20	Low	18.0	63.10	0.0198	1.0
	Middle	18.0	63.10	0.0198	1.0
	High	18.0	63.10	0.0198	1.0

Test Mode	Channel	Max. Tune Up Power (dBm, AV)	Max. Tune Up Power (mW)	MPE (mW/cm^2)	Limit (mW/cm^2)
802.11a	Low	16.0	39.81	0.0125	1.0
	Middle	16.0	39.81	0.0125	1.0
	High	16.0	39.81	0.0125	1.0
802.11n(HT20)	Low	16.0	39.81	0.0125	1.0
	Middle	16.0	39.81	0.0125	1.0
	High	16.0	39.81	0.0125	1.0
802.11a	Low	14.0	25.12	0.0079	1.0
	Middle	14.0	25.12	0.0079	1.0
	High	14.0	25.12	0.0079	1.0
802.11n(HT20)	Low	14.0	25.12	0.0079	1.0
	Middle	14.0	25.12	0.0079	1.0
	High	14.0	25.12	0.0079	1.0

Antenna Gain (typical): BT & Wi-Fi: 2dBi, 1.58 (numeric)

Prediction distance: >=20cm

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

Simultaneous RF exposure evaluation:

This device support simultaneous transmitting when operate at BT3.0+2.4G Wi-Fi, BT4.0+2.4G Wi-Fi, there's no any other mode that support simultaneous transmitting, therefore, simultaneous RF exposure was evaluated for max sum power when operate at BT4.0+2.4G Wi-Fi(b mode)=(-2.69+18.85)dBm=16.16dBm

Simultaneous TX Mode	Power (dBm, Peak)	Power Tune Up (dBm)
BLE 4.0+802.11b	16.16	16.0±1.0

Simultaneous TX Mode	Max. Tune Up Power (dBm, Peak)	Max. Tune Up Power (mW)	MPE (mW/cm^2)	Limit (mW/cm^2)
BLE 4.0+802.11b	17.0	50.12	0.0158	1.0