MPE Report

Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Mobile Device
Refer Standard:
ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.

1. Evaluation method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

2. Limits for General Population/Uncontrolled Exposure

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Average Time E^2, H^2 or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100000			1.0	30

Note: f= frequency in MHz; *Plane-wave equivalent power density

3. Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: 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
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the maximum gain of the used antenna is2.0dBi for WLAN, the RF power density can be obtained.

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4. Conducted Power Results

2.4GHzWLAN

Mode	Channel	Frequency(MHz)	Conducted Output Power (dBm)	
			Peak	Average
IEEE 802.11b	1	2412	16.86	15.16
	6	2437	17.63	15.63
	11	2462	17.24	15.34
IEEE 802.11g	1	2412	19.28	13.28
	6	2437	20.37	13.70
	11	2462	19.70	13.44
IEEE 802.11n HT20	1	2412	19.85	11.75
	6	2437	19.92	11.82
	11	2462	20.79	11.96
IEEE 802.11n HT40	3	2422	21.63	11.63
	6	2437	20.32	11.12
	9	2452	21.19	11.39

5. Manufacturing tolerance

2.4GHzWLAN

IEEE 802.11b (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	15.0	15.0	15.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	13.0	13.0	13.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	11.0	11.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Frequency (MHz)	2422	2437	2452
Target (dBm)	11.0	11.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0

6. Measurement Results

6.1 Standalone MPE

Typical Bluetooth (BT 2.1+EDR)

Mode	Average Output Power Including power tolerance		Antenna Gain (dBi)	Antenna gain (numeric)	Duty Cycle	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)	Pass /Fail
	(dBm)	(mW)						
IEEE 802.11b	16.0	31.8107	2.0	1.5849	100%	0.0126	1.0000	Pass
IEEE 802.11g	14.0	25.1189	2.0	1.5849	100%	0.0079	1.0000	Pass
IEEE 802.11n HT20	12.0	15.8489	2.0	1.5849	100%	0.0050	1.0000	Pass
IEEE 802.11n HT40	12.0	15.8489	2.0	1.5849	100%	0.0050	1.0000	Pass

6.2 Simultaneous Transmission

As the sample with only one 2.4GHZWLAN modular and share only one antenna, we not need consider transmit synchronization, more information as follows

Note: The estimation distance is 20cm

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7. Conclusion

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

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