1 Safety Human Exposure

1.1 Radio Frequency Exposure Compliance

1.1.1 Electromagnetic Fields

RESULT: **Pass**

Test Specification

Test standard	:	CFR47 FCC Part 2: Section 2.1091 CFR47 FCC Part 1: Section 1.1310 FCC KDB Publication 447498 v06, section 7 RSS-102 Issue 5 March 2015, section 2.5.2

- **FCC requirements**

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

MPE Calculation Method according to KDB 447498 v06

Power Density: $S_{(mW/cm^2)} = PG/4\pi R^2$ or $EIRP/4\pi R^2$

Where:

S = power density (mW/cm^2)

P = power input to the antenna (mW)

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 (cm)

From the peak RF output power, the minimum mobile separation distance, d=20 cm, as well as the antenna gain, the RF power density can be calculated as below:

$S_{(mW/cm^2)} = PG/4\pi R^2$

a) EUT RF Exposure Evaluation standalone operations

Test Mode	Maximum Time-average conducted Power (dBm)	Tune up Value in (dB)	Antenna Gain (dBi)	Measured e.i.r.p		$S_{(mW/cm^2)}= PG/4\pi R^2$	Limit $_{(mW/cm^2)}$
				(dBm)	(mW)		
BLE	8.49	2.35	1.0	11.84	15.28	0.0030	1.0
BDR/EDR	5.08	2.35	1.0	8.43	6.97	0.0014	1.0
2.4GHz Wi-Fi	18.82	2.35	1.0	22.17	164.82	0.0328	1.0
5GHz Wi-Fi	12.8	3.37	1.0	17.17	52.12	0.0104	1.0
Only worst-case listed above							

b) EUT RF Exposure Evaluation simultaneous transmission operations

Not supported.

- **IC requirements:** The EUT shall comply with the requirement of RSS-102 section 2.5.2.

Exemption from Routine Evaluation Limits – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

- RF exposure evaluation exempted power for 2.4GHz bands: 2.670 W
- RF exposure evaluation exempted power for NII bands: 4.52 W

The lowest frequency used for exempted power calculation, and the strictest threshold power obtained.

a) EUT RF Exposure Evaluation standalone operations:

Test Mode	Maximum Time-average conducted Power (dBm)	Tune up Value in (dB)	Antenna Gain (dBi)	Measured e.i.r.p		Verdict
				(dBm)	(W)	
BLE	8.49	2.35	1.0	11.84	0.0153	Compliant
BDR/EDR	5.08	2.35	1.0	8.43	0.0070	
2.4GHz Wi-Fi	18.82	2.35	1.0	22.17	0.1648	
5GHz Wi-Fi	12.8	3.37	1.0	17.17	0.0521	
Only worst-case listed above.						

b) EUT RF Exposure Evaluation simultaneous transmission operations

Not supported for simultaneous mode.

The e.i.r.p. are less than the RF exposure evaluation exempted power. So RF exposure evaluation is not required.

"RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons."