Produkte
Products

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 RSS-102 Issue 5 March 2015

➢ **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 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	Measured Conducted Power		Antenna Gain (dBi)	Measured e.i.r.p		$S_{(mW/cm^2)}= PG/4\pi R^2$	Limit (mW/cm^2)
	(dBm)	(mW)		(dBm)	(mW)		
Bluetooth	9.91	9.79	1.476	11.386	13.76	0.0027	1.0
2.4GHz Wi-Fi	20.49	111.94	1.476	21.966	157.25	0.0313	1.0
WLAN U-NII-1	19.27	84.53	3.747	23.017	200.31	0.0399	1.0
WLAN U-NII-3	18.11	64.71	4.129	22.239	167.46	0.0333	1.0

b) EUT RF Exposure Evaluation simultaneous transmission operations

Test Mode WWAN	Power Density (mW/m2)	Limit (mW/m2)	Test Mode WWAN/BT	Limit (mW/cm2)	Co-location (Σ of MPE ratios)
GSM 850	0.1284	0.55	Worst-case, WLAN 5GHz U-NII (0.0399 mW/m2)	1.0	**0.1683**
PCS 1900	0.0548	1.0			0.0947
WCDMA B 2	0.0907	1.0			0.1306
WCDMA B 4	0.0997	1.0			0.1396
WCDMA B 5	0.1066	0.55			0.1465
LTE Band 2	0.0907	1.0			0.1306
LTE Band 4	0.0997	1.0			0.1396
LTE Band 5	0.1066	0.55			0.1465
LTE Band 7	0.1255	1.0			0.1654
LTE Band 12	0.1333	0.47			0.1732
LTE Band 13	0.1753	0.52			0.2152
LTE Band 25	0.0907	1.0			0.1306
LTE Band 26	0.1126	0.54			0.1525
LTE Band 38	0.1011	1.0			0.1410
LTE Band 41	0.1255	1.0			0.1654

➢ **IC requirements:** The EUT shall comply with the requirement of RSS-102 section 4 Exposure Limits

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{21}$	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

c) EUT RF Exposure Evaluation standalone operations

Test Mode	Measured Conducted Power		Antenna Gain (dBi)	Measured e.i.r.p		$S_{(mW/cm^2)}= PG/4\pi R^2$	Limit (mW/cm^2)
	(dBm)	(mW)		(dBm)	(mW)		
Bluetooth	9.91	9.79	1.476	11.386	13.76	0.0027	0.535
2.4GHz Wi-Fi	20.49	111.94	1.476	21.966	157.25	0.0313	0.537
WLAN U-NII-1	16.05	40.27	3.747	19.797	95.43	0.0190	0.917
WLAN U-NII-3	18.11	64.71	4.129	22.239	167.46	0.0333	0.972

d) EUT RF Exposure Evaluation simultaneous transmission operations

Test Mode WWAN	Power Density (mW/m2)	Limit (mW/m2)	Test Mode WWAN/BT	Limit (mW/cm2)	Co-location (Σ of MPE ratios)
GSM 850	0.1284	0.258	Worst-case, WLAN 2.4GHz (0.0313 mW/m2)	0.537	**0.556**
PCS 1900	0.0548	0.448			0.181
WCDMA B 2	0.0907	0.448			0.261
WCDMA B 4	0.0997	0.425			0.293
WCDMA B 5	0.1066	0.258			0.471
LTE Band 2	0.0907	0.448			0.261
LTE Band 4	0.0997	0.424			0.293
LTE Band 5	0.1066	0.258			0.471
LTE Band 7	0.1255	0.550			0.286
LTE Band 12	0.1333	0.230			0.638
LTE Band 13	0.1753	0.247			0.768
LTE Band 25	0.0907	0.448			0.261
LTE Band 26	0.1126	0.256			0.498
LTE Band 38	0.1011	0.561			0.239
LTE Band 41	0.1255	0.550			0.286

Note: The WWAN information above are reference to SGS test report no.: HR/2019/1001602 and HR/2019/1001604 (Single module FCC ID: XMR201903EG25G, IC: 10224A-201903EG25G).