1 RF Exposure Report

This report is part of main test report no. ULR-TC568819300000027F & ULR-TC568819300000028F, and only valid when referred with main test reports. This report alone shall not be used to define compliance criteria of the product, the RF exposure measurement results specified are referenced from main test reports.

1.1 RF Exposure Measurement

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The gain of the antennas used in the product is extracted from the Antenna data sheets provided and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis Transmission formula is far field assumption, the calculated result of that is an over-prediction for near field power density. It is taken as worst case to specify the safety range.

1. According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b) showed in Table 1.

Table 1: Limits for Maximum Permissible Exposure (MPE) as per FCC

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
Limits for Occupational / controlled Exposures			
300 - 1500	--	--	F/300
1500 – 100000	--	--	5.0
Limits for General population / Uncontrolled Exposure			
300 - 1500	--	--	F/1500
1500 – 100000	--	--	1.0

F or f = Frequency in MHz

Table 2: Limits for Maximum Permissible Exposure (MPE) as per ISED Canada

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)
Limits for Occupational / controlled Exposures			
100-6000	$15.60f$^0.25	$0.04138f$^0.25	$0.6455f$^0.5
Limits for General population / Uncontrolled Exposure			
300-6000	3.142 f^0.3417	$0.008335f$^0.3417	$0.02619f$^0.6834

F or f = Frequency in MHz

1.1.1 Friss Formula

Friss Transmission Formula: Pd = (Pout * G) / (4*pi*r²)

Where
Pd = power density in mW/cm²
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
R = Distance between observation point and the center of radiator in cm

If we know the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know MPE value at distance 20cm.

2) According to RSS 102 Issue 5 Section 2.5.2 The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in Section 2.5.2

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 x 10-2 f^0.6834 W (adjusted for tune-up tolerance), where f is in MHz;

Table 3: Exemption Limits for Routine Evaluation – RSS 102 Issue 5 Section 2.5.2

Mode	Channel Frequency	Antenna Gain	Antenna Gain	Maximum Pout	Duty cycle	Max EIRP	Max EIRP	Exclusion threshold as per RSS-102
	(MHz)	(dBi)	(Linear)	dBm	%	(dBm)	(Watts)	(Watts)
WCDMA Band 2	1852.4	2.8	1.905461	22.27	100	26.07	0.4046	2.2410
WCDMA Band 5	836.4	1	1.258925	23.65	100	25.65	0.3673	1.3015
WCDMA Band 4	1712.4	2	1.584893	21.91	100	24.91	0.3097	2.1238
GSM 850	824.2	1	1.258925	30.5	50	29.49	0.8891	1.2885
GSM 1900	1880	2.8	1.905461	26.07	50	26.86	0.4853	2.2638

From the calculation mentined in the above table, this product is exepmted from RF Exposure Evaluation as per the the requirements of sections 2.5.2 of Radio Standard RSS-102 Issue 5**.**

Note:

1. Manufacturer has declared the tune-up value as ±1 dB is considered in above calculation.
2. Antenna gain details are taken from the antenna data(Part No: TG.09.0113, Penta-band cellular hinged SMA male monopole) sheet.
3. The maximum Pout is the measured conducted peak power taken from test report no. ULR-TC568819300000027F.
4. Considered duty cycle values are taken from Telit module (FCC ID:RI7HE910) RF exposure test report.

1.1.2 EUT Operation condition

EUT was enabled to transmit and receive at lowest, middle and highest channels.

1.1.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance from the antenna should be included in the User manual. So, this device is classified as fixed device.

Test Results

Table 4: GSM & WCDMA RF exposure calculations

Mode	Antenna Gain	Antenna gain in linear scale	Channel Frequency	Pout	Duty cyle	Pout including Duty cycle factor	Maximum Pout incuding Tune-up value	Power Density	FCC Limit	ISED Limit
	(dBi)	(Linear)	(MHz)	(dBm)	(%)	(dBm)	(mW)	(mW/cm²)	(mW/cm²)	(mW/cm²)
WCDMA Band 2	2.8	1.9055	1852.4	22.27	100	22.27	212.3244	0.0805	1.0000	0.4480
WCDMA Band 5	1	1.2589	836.4	23.65	100	23.65	291.7427	0.0731	0.5644	0.2602
WCDMA Band 4	2	1.5849	1712.4	21.91	100	21.91	195.4339	0.0616	1.0000	0.4246
GSM 850	1	1.2589	824.2	30.5	50	27.49	706.2688	0.1769	0.5494	0.2576
GSM 1900	2.8	1.9055	1880	26.07	50	23.06	254.6654	0.0965	1.0000	0.4526

Note:

5. Manufacturer has declared the tune-up value as ±1 dB is considered in above calculation.
6. Antenna gain details are taken from the antenna data(Part No: TG.09.0113, Penta-band cellular hinged SMA male monopole) sheet.
7. The maximum Pout is the measured conducted peak power taken from test report no. ULR-TC568819300000027F.
8. Considered duty cycle values are taken from Telit module (FCC ID:RI7HE910) RF exposure test report.

Table 5: Wi-Fi 2.4GHz RF exposure calculation

Mode	Antenna Gain (dBi)	Antenna gain in linear scale	Channel Frequency (MHz)	Maximum output power (dBm)	Maximum output power incuding Tune-up value (mW)	Power Density (mW/cm²)	FCC Limit (mW/cm²)	ISED Limit (mW/cm²)
802.11g	3	1.99526	2412	18.54	89.94975	0.03570	1	0.5366

Note:

1. Manufacturer has declared the tune-up value as ±1 dB is considered in MPE calculation.
2. Antenna gain details are taken from Wi-Fi antenna(Part No: GW.15.2113, 2.4GHz 3dBi terminal mount dipole antenna) data sheet.
3. All the maximum output power mentioned are taken from test report no. ULR-TC568819300000028F, measured output power is conducted power.

Note: The product does not support simultaneous transmission. Conducted output power measured with respect to each protocol with single transmission chain

********END OF MPE TEST REPORT*********