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Date: **06/24/2015**

REF: **RF exposure analysis**

Model: **14119** FCC ID: **T4514119** IC: **6450A-14119**

This device is to be used only for mobile applications. This device also integrates a pre-certified 2G/3G WWAN module UL864-NAD (FCC ID: RI7UL865NA; IC: 5131A-UL865NA).

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter except with the integrated pre-certified 2G/3G WWAN module UL864-NAD (FCC ID: RI7UL865NA; IC: 5131A-UL865NA) or under the conditions described KDB 447498 D01 General RF Exposure Guidance.

MPE exposure limits

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1,0	30

The table below is excerpted from RSS-102, Issue 5, 4, titled “Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)”:

Frequency Range (MHz)	Power density (W/m ²)	Averaging time (minutes)
300-6000	0.02619 f ^{0.6834}	6

Maximum output power of pre-certified 2G/3G WWAN module UL864-NAD (FCC ID: RI7UL865NA; IC: 5131A-UL865NA)

Frequency band	Max Output Power dBm	Tolerances	
		-	+
GSM/EDGE 850	32.5	1	1
GSM/EDGE 1900	29.5	1	1
WCDMA/HSPA FDD V	23	1.5	1
WCDMA/HSPA FDD II	23	1.5	1

RF exposure

Using the equation $S = \frac{PG}{4\pi R^2}$ to calculate the exposure to electromagnetic fields

- where: S = power density (in appropriate units, e.g. mW/cm²)
- P = power input to the antenna (in appropriate units, e.g., 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 (appropriate units, e.g., cm)

compliance with FCC/IC MPE and EIRP limits is demonstrated following the calculations shown in the following page.



Mode	Frequency Range (MHz)	Reference frequency (Lowest freq.) (MHz)	Maximum field strength (45955RRF.001test report) (dBμV/m)	Equivalent EIRP (mW)	Evaluation distance for compliance with MPE limits (cm)	$S = \frac{PG}{4\pi R^2}$ (mW/cm ²)	FCC MPE limit (mW/cm ²)	IC MPE limit (mW/cm ²)	COMPLIANCE (S<S _{Limit})	RELATIVE EXPOSURE (S/S _{Limit})
TPMS	433.92	433.9	72.71	0.005596	20	0,00000111	0,289	0,166	COMPLIANT	0,0000067

Frequency Band	Mode	Frequency Range (MHz)	Reference frequency (Lowest freq.) (MHz)	Maximum conducted output power (per tune-up) (dBm)	Multi-slot Class	Maximum number of TX slots	Duty cycle (%)	Antenna gain (dBi)	Evaluation distance for compliance with MPE limits (cm)	$S = \frac{PG}{4\pi R^2}$ (mW/cm ²)	FCC MPE limit (mW/cm ²)	IC MPE limit (mW/cm ²)	COMPLIANCE (S<S _{Limit})	RELATIVE EXPOSURE (S/S _{Limit})
GSM 850	GSM/GPRS/EDGE	824,2 - 848,2	824,2	33,50	10	2	25%	-0,53	20	0,099	0,549	0,258	COMPLIANT	0,3825762
FDD V	UMTS/HSPA	826,4 - 846,6	826,4	24,00	N/A	N/A	100%	-0,53	20	0,044	0,551	0,258	COMPLIANT	0,1713905
GSM 1900	GSM/GPRS/EDGE	1850,2-1909,8	1850,2	30,50	10	2	25%	-0,43	20	0,051	1,000	0,448	COMPLIANT	0,1129061
FDD II	UMTS/HSPA	1852,4 - 1907,6	1852,4	24,00	N/A	N/A	100%	-0,43	20	0,045	1,000	0,448	COMPLIANT	0,1010240

Co-location evaluation

According to KDB 447498 D01 General RF Exposure Guidance v05r1, 7.2:

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 calculated or measured field strengths or power density, is ≤ 1.0.

$$S_{14119}/S_{Limit} = 0,0000067$$

$$S_{UL865-NAD}/S_{Limit} = 0,3825762$$

$$S_{14119}/S_{Limit} + S_{UL865-NAD}/S_{Limit} = 0,0000067 + 0,3825762 = 0,3825829 < 1 \rightarrow \text{COMPLIANT}$$

If you have any doubt please do not hesitate to contact us.

Yours sincerely,

p.a.

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