

Assessment report No:

NIE: 52341RAN.002

Assessment report RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091 ISED RSS -102 Issue 5:2015

Identification of item tested.....:	TELEMATICS CONTROL UNIT
Trademark	LDL-TECHNOLOGY
Model and /or type reference	16102
Other identification of the product.....:	FCC ID: T4516102 IC ID: 6450A-16102
Final HW version	314-069-0090-B (NA)
Final SW version	414069191012
Features	Radiofrequency, low frequency, GNSS, GSM/UMTS, Bluetooth Low energy CAN, LIN, RS232
Manufacturer	Company name: LDL-technology Postal Address: 3 rue GIOTTO 31520 RAMONVILLE- SAINTAGNE
Test method requested, standard.....:	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2017-06-20
Report template No.....:	FAN24_01

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Competences and guarantees

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA internal document PODT000.

Usage of samples

Samples under test have been selected by: the Client.

Sample **S/01** is composed of the following elements:

Control N°	Description	Model	Serial number	Reception date
52341/05	Telematics Control Unit	16012	8519E028	2017-04-05

Test sample description

The device under test consists of a telematics control unit.

Identification of the client

Company name: LDL-technology

Postal Address: 3 rue GIOTTO 31520 RAMONVILLE-SAINT-AGNE

Contact person: MATHIEU GUERIN

Telephone: 0534505850

Email: mathieu.guerin@ldl-technology.com

Testing period

The performed test started on 2017-06-06 and finished on 2017-06-06.

The tests have been performed at DEKRA Testing and Certification S.A.U.

Environmental conditions

The following limits were not exceeded during the tests:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %

Used instrumentation

	Last Cal. date	Cal. due date
1. Narda ELT-400 Exposure Level Tester	2015/09	2017/09
2. ETS-LINDGREN HI-6005	2016/04	2018/04

General description of the device under evaluation

The device will be installed on the vehicle, and according to the manufacturer, the minimum separation distance between the antennas and the driver, or anyone inside the vehicle, will be greater than 20 cm.

The equipment specifications declared by the manufacturer for the WWAN supported features are:

Assessment	Band (MHz)	Technology	Band	Maximum RF output power (dBm)	MaximumAverage RF output power (dBm)	Maximum antenna gain (dBi)	Maximum radiated power (E.I.R.P.) (dBm)
1	850	GSM/GPRS	850	33.0*	30.0	-1.2	28.8
2	1900	GSM/GPRS	1900	30.0*	27.0	-1.8	25.2
3	850	WCDMA/HSPA	VIII	24.0	24.0	-1.2	22.8
4	1900	WCDMA/HSPA	I	24.0	24.0	-1.8	22.2

Table 1: WWAN specifications

*Note: For the GSM/GPRS modes, the maximum average RF output power has been calculated according to the supported GPRS slots configuration. As the device has multiclass slot 33 for GPRS technology, there will be up to 4 uplink time slots available for transmission, with its respective average output power for each configuration.

Duty cycle for uplink time slots:

- 1 Uplink: Duty cycle = 1/8 → 12.5%
- 2 Uplink: Duty cycle = 2/8 → 25.0%
- 3 Uplink: Duty cycle = 3/8 → 37.5%
- 4 Uplink: Duty cycle = 4/8 → 50.0%

GSM 850							
Maximum RF Output Power (dBm)				Average Output Power (dBm)			
33.0				23.97			
GPRS 850							
Maximum RF Output Power (dBm)				Average Output Power (dBm)			
1 Slot	2 Slots	3 Slots	4 Slots	1 Slot	2 Slots	3 Slots	4 Slots
33.0	33.0	33.0	33.0	23.97	26.98	28.74	29.99
GSM 1900							
Maximum RF Output Power (dBm)				Average Output Power (dBm)			
30.0				20.97			
GPRS 1900							
Maximum RF Output Power (dBm)				Average Output Power (dBm)			
1 Slot	2 Slots	3 Slots	4 Slots	1 Slot	2 Slots	3 Slots	4 Slots
30.0	30.0	30.0	30.0	20.97	23.98	25.74	26.99

Table 2: GSM average output power values

The device also supports Bluetooth and RF Transmission modes at 433 MHz and 125 kHz, the specifications declared by the manufacturer for these technologies are:

Assessment	Band (MHz)	Technology	Band	Maximum RF output power (dBm)	Maximum antenna gain (dBi)	Maximum radiated power (E.I.R.P.) (dBm)
5	2450	Bluetooth	ISM	8.0	+2.0	10.0
6	450	RF – FSK 433 MHz	RF 450 MHz	6.0	-10.0	-4.0
7	0.125	RF – ASK 125 kHz	RF 125 kHz	43.80	-	-

Table 3: Specifications for Bluetooth and RF transmission modes.

Assessment summary

Radiofrequency radiation exposure limits				
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)				
Assessment	Band (MHz)	Technology	Band	VERDICT (Pass/Fail)
1	900	GSM/GPRS	900	Pass
2	1800	GSM/GPRS	1800	Pass
3	900	WCDMA/HSPA	VIII	Pass
4	2100	WCDMA/HSPA	I	Pass
5	2450	Bluetooth	ISM	Pass
6	450	RF – FSK 433 MHz	RF 450 MHz	Pass
7	0.125	RF – ASK 125 kHz	RF 125 kHz	Pass

Table 4: Assessment summary.

Appendix A – FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	* 100	6
3.0–30	1842/f	4.89/f	* 900/f ²	6
30–300	61.4	0.163	1.0	6
300–1,500			f/300	6
1,500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	* 100	30
1.34–30	824/f	2.19/f	* 180/f ²	30
30–300	27.5	0.073	0.2	30
300–1,500			f/1500	30
1,500–100,000			1.0	30

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

FCC MPE Evaluation Results

In order to perform the assessment, the following equations have been used for the calculations:

$$\text{Power density: } S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\pi R[cm]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\pi S[mW/cm^2]}}$$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

R_{\min} = distance to the center of radiation of the antenna

For the 125 KHz transmitting mode, B-Field, H-Field and E-field measurements have been performed, at the minimum intended use distance declared by the manufacturer, in order to determine if the measured values are in compliance with FCC MPE limits.

Assessment 1 – GSM 850 Band

Maximum output power (dBm):	30.0
Antenna Gain (dBi):	-1.2
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	824.2
Maximum EIRP (dBm):	28.80
Maximum EIRP (mW):	758.58
General public - Power density limit (mW/cm ²):	0.549

Power density at minimum use distance:

Power density (mW/cm ²):	0.15
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	10.48
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 2 – GSM 1900 Band

Maximum output power (dBm):	27.0
Antenna Gain (dBi):	-1.8
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	1850.2
Maximum EIRP (dBm):	25.2
Maximum EIRP (mW):	331.13
General public - Power density limit (mW/cm ²):	1

Power density at minimum use distance:

Power density (mW/cm ²):	0.07
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	5.13
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 3 – WCDMA Band V

Maximum output power (dBm):	24.0
Antenna Gain (dBi):	-1.2
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	826.4
Maximum EIRP (dBm):	22.80
Maximum EIRP (mW):	190.55
General public - Power density limit (mW/cm ²):	0.55

Power density at minimum use distance:

Power density (mW/cm ²):	0.04
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	5.25
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 4 – WCDMA Band II

Maximum output power (dBm):	24.0
Antenna Gain (dBi):	-1.8
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	22.20
Maximum EIRP (mW):	165.96
General public - Power density limit (mW/cm ²):	1

Power density at minimum use distance:

Power density (mW/cm ²):	0.03
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	3.63
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 5 – Bluetooth – 2450 Band

Maximum output power (dBm):	8.0
Antenna Gain (dBi):	2.0
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	2400.0
Maximum EIRP (dBm):	10.0
Maximum EIRP (mW):	10.0
General public - Power density limit (mW/cm ²):	1

Power density at minimum use distance:

Power density (mW/cm ²):	0.002
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.89
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 6 – RF 433 MHz – 450 Band

Maximum output power (dBm):	6.0
Antenna Gain (dBi):	-10.0
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	433.91
Maximum EIRP (dBm):	-4.0
Maximum EIRP (mW):	0.40
General public - Power density limit (mW/cm ²):	0.289

Power density at minimum use distance:

Power density (mW/cm ²):	0.0001
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.33
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 7 – RF 125 kHz – 150 kHz Band

Field measurements were performed at 20 cm distance using the equipment listed in the “Used Instrumentation” paragraph of this document.

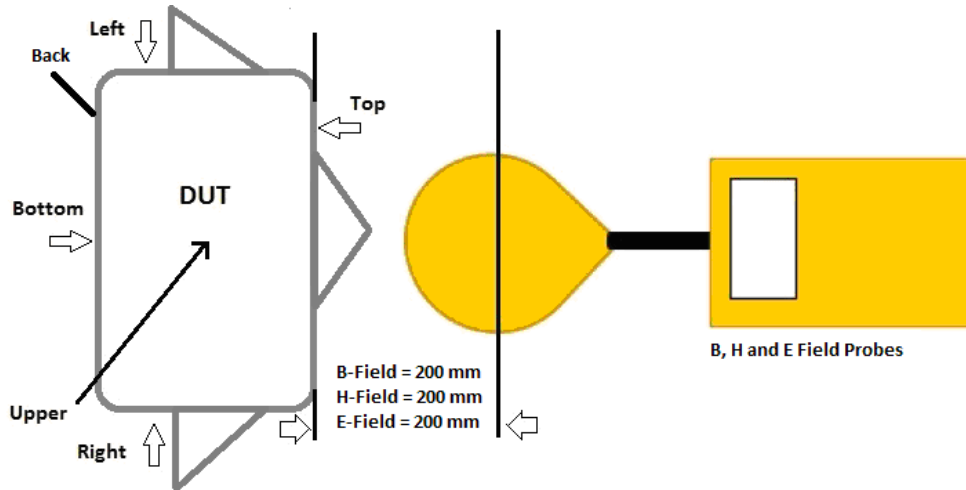


Figure 1: Measurement Setup

Measured values for each configuration are listed in the following tables:

Frequency (MHz)	Antenna	B-Field measurements [μT]						Max [μT]
		Top	Bottom	Left	Right	Upper	Back	
0.125	Internal	1.08	0.64	0.44	0.53	1.08	0.71	1.08
	External 1	0.43	0.50	0.46	0.40	0.50	0.50	0.50
	External 2	0.42	0.47	0.44	0.40	0.49	0.47	0.49

Measured B-Field values were converted into H-Field values using the following formula:

$$H=B/\mu_0, \text{ where } \mu_0=4\pi \times 10^{-7} \text{ (Permeability of free space, H/m)}$$

Frequency (MHz)	Antenna	H-Field measurements [A/m]						Max [A/m]	Limit [A/m]	% Limit	Verdict
		Top	Bottom	Left	Right	Upper	Back				
0.125	Internal	0.86	0.51	0.35	0.42	0.86	0.56	0.86	1.63	52.78	Pass
	External 1	0.34	0.40	0.37	0.32	0.40	0.39	0.40	1.63	24.61	Pass
	External 2	0.34	0.37	0.35	0.32	0.39	0.38	0.39	1.63	23.68	Pass

Frequency (MHz)	Antenna	E-Field measurements [V/m]						Max [V/m]	Limit [V/m]	% Limit	Verdict
		Top	Bottom	Left	Right	Upper	Back				
0.125	Internal	1.59	0.90	0.48	0.89	1.21	1.11	1.59	614.0	0.26	Pass
	External 1	0.79	0.77	0.85	0.77	0.82	0.83	0.85	614.0	0.14	Pass
	External 2	0.78	0.80	0.85	0.83	0.88	0.87	0.88	614.0	0.14	Pass

All H-Field and E-Field values are in compliance with the FCC MPE limits.

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{MPE_i} < 1$$

Where

S_i is the power density of each source;

MPE_i is the power density basic restriction of each source.

The device under test is able to transmit simultaneously using WWAN, Bluetooth, 433MHz and 125 kHz transmitters, therefore the multiple frequencies calculation will be as follow:

$$\frac{0.15}{0.549} + \frac{0.002}{1} + \frac{0.0001}{0.289} + \frac{0.86}{1.63} = 0.80 < 1 \text{ Limit}$$

Appendix B – ISED RF Exposure

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Healths Canada’s RF exposure guideline, Safety code 6:

**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)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

ISED MPE Evaluation Results

In order to perform the assessment, the following equations have been used for the calculations:

$$\text{Power density: } S[W/m^2] = \frac{P_{E.I.R.P.}[W]}{4\pi R[m]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\pi S[W/m^2]}}$$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

R_{\min} = distance to the center of radiation of the antenna

For the 125 KHz transmitting mode, B-Field, H-Field and E-field measurements have been performed, at the minimum intended use distance declared by the manufacturer, in order to determine if the measured values are in compliance with the “RSS-102 Issue 5” RF Field strength limits.

Assessment 1 – GSM 850 Band

Maximum output power (dBm):	30.0
Antenna Gain (dBi):	-1.2
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	824.2
Maximum EIRP (dBm):	28.80
Maximum EIRP (mW):	758.58
General public - Power density limit (W/m ²):	2.576

Power density at minimum use distance:

Power density (W/m ²):	1.51
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	15.31
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 2 – GSM 1900 Band

Maximum output power (dBm):	27.0
Antenna Gain (dBi):	-1.8
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.2
Maximum EIRP (dBm):	25.20
Maximum EIRP (mW):	331.13
General public - Power density limit (W/m ²):	4.476

Power density at minimum use distance:

Power density (W/m ²):	0.66
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	7.67
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 3 – WCDMA Band V

Maximum output power (dBm):	24.0
Antenna Gain (dBi):	-1.2
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	826.4
Maximum EIRP (dBm):	22.80
Maximum EIRP (mW):	190.55
General public - Power density limit (W/m ²):	2.58

Power density at minimum use distance:

Power density (W/m ²):	0.38
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	7.67
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 4 – WCDMA Band II

Maximum output power (dBm):	24.0
Antenna Gain (dBi):	-1.8
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	22.20
Maximum EIRP (mW):	165.96
General public - Power density limit (W/m ²):	4.476

Power density at minimum use distance:

Power density (W/m ²):	0.33
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	5.43
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 5 – Bluetooth – 2450 Band

Maximum output power (dBm):	8.0
Antenna Gain (dBi):	2.0
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2400.0
Maximum EIRP (dBm):	10.0
Maximum EIRP (mW):	10.0
General public - Power density limit (W/m ²):	5.347

Power density at minimum use distance:

Power density (W/m ²):	0.02
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	1.22
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 6 – RF 433 MHz – 450 Band

Maximum output power (dBm):	6.0
Antenna Gain (dBi):	-10.0
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	433.91
Maximum EIRP (dBm):	-4.0
Maximum EIRP (mW):	0.4
General public - Power density limit (W/m ²):	1.661

Power density at minimum use distance:

Power density (W/m ²):	0.0008
Verdict for general public:	PASS

The power density level for this transmission mode is below general public exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.44
Verdict for general public:	PASS

The minimum use distance is larger than general public exposure minimum compliance distance.

Assessment 7 – RF 125 kHz – 150 kHz Band

Field measurements were performed at 20 cm distance using the equipment listed in the “Used Instrumentation” paragraph of this document.

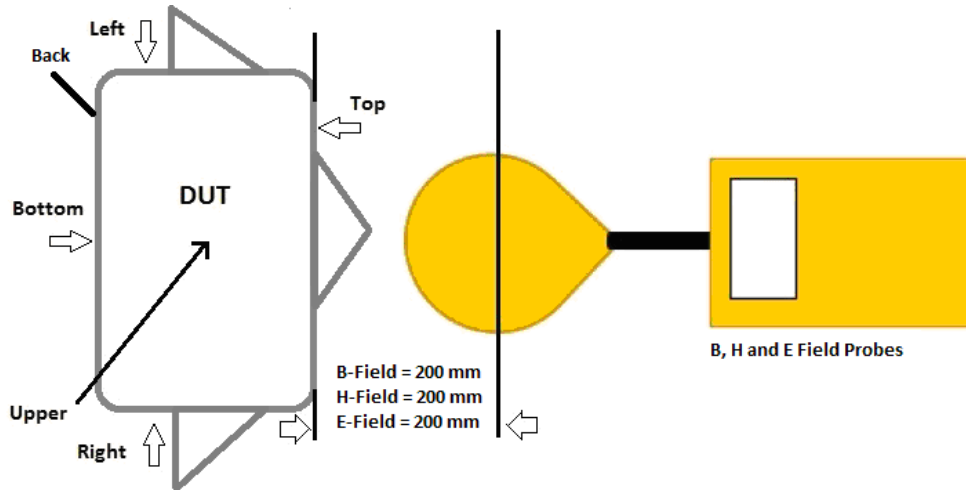


Figure 1: Measurement Setup

Measured values for each configuration are listed in the following tables:

Frequency (MHz)	Antenna	B-Field measurements [μT]						Max [μT]
		Top	Bottom	Left	Right	Upper	Back	
0.125	Internal	1.08	0.64	0.44	0.53	1.08	0.71	1.08
	External 1	0.43	0.50	0.46	0.40	0.50	0.50	0.50
	External 2	0.42	0.47	0.44	0.40	0.49	0.47	0.49

Measured B-Field values were converted into H-Field values using the following formula:

$$H=B/\mu_0, \text{ where } \mu_0=4\pi \times 10^{-7} \text{ (Permeability of free space, H/m)}$$

Frequency (MHz)	Antenna	H-Field measurements [A/m]						Max [A/m]	Limit [A/m]	% Limit	Verdict
		Top	Bottom	Left	Right	Upper	Back				
0.125	Internal	0.86	0.51	0.35	0.42	0.86	0.56	0.86	5.840	14.73	Pass
	External 1	0.34	0.40	0.37	0.32	0.40	0.39	0.40	5.840	6.87	Pass
	External 2	0.34	0.37	0.35	0.32	0.39	0.38	0.39	5.840	6.61	Pass

Frequency (MHz)	Antenna	E-Field measurements [V/m]						Max [V/m]	Limit [V/m]	% Limit	Verdict
		Top	Bottom	Left	Right	Upper	Back				
0.125	Internal	1.59	0.90	0.48	0.89	1.21	1.11	1.59	83.0	1.91	Pass
	External 1	0.79	0.77	0.85	0.77	0.82	0.83	0.85	83.0	1.03	Pass
	External 2	0.78	0.80	0.85	0.83	0.88	0.87	0.88	83.0	1.06	Pass

All H-Field and E-Field values are in compliance with the with the “RSS-102 Issue 5” RF Field strength limits.

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{MPE_i} < 1$$

Where

S_i is the power density of each source;

MPE_i is the power density basic restriction of each source.

The device under test is able to transmit simultaneously using WWAN, Bluetooth, 433MHz and 125 kHz transmitters, therefore the multiple frequencies calculation will be as follow:

$$\frac{1.51}{2.576} + \frac{0.02}{5.347} + \frac{0.0008}{0.44} + \frac{0.86}{5.840} = 0.75 < 1 \text{ Limit}$$

Appendix C – Photographs

- Internal/External antennas, upper/back field measurements, $d=20\text{ cm}$



- Internal/external antennas, edges field measurements, $d=20$ cm

