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DEKRA

ENAC ENSAYOS Nº 51/LE147

Test report No:
NIE: 64195RAN.004

Test report

RF EXPOSURE REPORT ACCORDING TO

IEEE Std C95.3-2002
ISED RSS-102 Issue 5:2015
ISED RSS-102-SPR-002 Issue 1:2016

(*) Identification of item tested	Telematics Control Unit for trucks with TPMS support, GSM, BLE, LF. Transmitter and GNSS receiver
(*) Trademark	LDL Technology
(*) Model and /or type reference	19239
(*) Other identification of the product	FCC ID: Contains : RI7ME910C1WW IC: Contains : 5131A-ME910C1WW Hw version: 319-158-2090 Sw version: 414069191013
Features	Bluetooth LE, RF 434, GSM/LTE, GNSS receiver
Manufacturer	LDL TECHNOLOGY Parc Technologique du Canal 3 rue Giotto 31520 Ramonville-Saint-Agne FRANCE
Test method requested, standard	IEEE Std C95.3-2002: "IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz". 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 RSS-102-SPR-002 Issue 1 (2016-09). – Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits (3kHz a 10MHz)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager MIGUEL LACAVE GARCÍA 2020.09.28 12:25:09 +02'00'
Date of issue	2020-09-25
Report template No	FAN39_01 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

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

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Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document FAN40.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. Maximum output power, maximum antenna gains and use distance information.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: the client

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
64195C/005	TCU 1.2 Module	19239	--	2020-03-25
64195C/020	Harness	--	--	2020-03-25

1. Sample M/01 has undergone the test(s) specified in subclause “Test method requested”.

Test sample description

The test sample is a part of a system which aims to offer telematics services and the device acts like gateway, receiving and transmitting data.

Identification of the client

LDL TECHNOLOGY

Parc Technologique du Canal

3 rue Giotto

31520 Ramonville-Saint-Agne FRANCE

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-04-17
Date (finish)	2020-04-17

Document history

Report number	Date	Description
64195RAN.004	2020-09-25	First release

Environmental conditions

Date	Max. Temp. ºC	Min. Temp. ºC	Max. Hum. %	Min. Hum. %
2020-04-17	21.91	21.71	48.61	45.32

Remarks and comments

Testing has been performed by Francisco José Sanchez.

The instrumentation utilized to perform the tests covered in this test report is listed in the following table:

		Last Cal. date	Cal. due date
1.	Narda EHP-200A E and H Field Analyzer	2019/11	2021/11
2.	Low Dielectric Tripod Manfrotto H-491009-01	-	-
3.	Temperature and humidity probe HUMIDIPROBE Pico Technology	2020/04	2021/04

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 & ISED RSS-102-SPR-002 Issue 1	**VERDICT**			
	N/A	**P**	**F**	NM
LF 125 KHz		P		
GSM				NM[1]
LTE				NM[1]
Bluetooth LE				NM[1]
RF 434 MHz				NM[1]
1: Technology not subject to testing. Verdict has been determined through RF Exposure assessment.				

Appendix A: FCC RF Exposure

General description of the device under evaluation

The test sample is a part of a system which aims to offer telematics services and the device acts like gateway, receiving and transmitting data.

The equipment supports GSM/LTE, Bluetooth LE, RF 434 MHz and LF 125 KHz technologies and according to the manufacturer during its normal use, the separation distance between the device and the body of nearby users will be greater than 1 m.

RF Exposure evaluation for LF 125 KHz technology has been conducted through field measurements (see LF 125 KHz evaluation section).

GSM/LTE, Bluetooth LE and RF 434 MHz technologies are not subject to testing and verdict can be determined through RF Exposure assessment (see RF Exposure assessment section). The equipment specifications declared by the manufacturer for these technologies are the following:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power RMS Burst (Incl. Tune-Up) (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBi)	Maximum Averaged E.I.R.P. (dBm)	Maximum Averaged E.I.R.P. (mW)
GSM	850	824 - 849	34.50	12.50	25.47	3.50	28.97	788.70
GPRS 1TX	850	824 - 849	34.50	12.50	25.47	3.50	28.97	788.70
GPRS 2TX	850	824 - 849	34.50	25.00	28.48	3.50	31.98	1577.39
GPRS 3TX	850	824 - 849	30.00	37.50	25.74	3.50	29.24	839.52
GPRS 4TX	850	824 - 849	28.00	50.00	24.99	3.50	28.49	706.27
EGPRS 1TX	850	824 - 849	28.00	12.50	18.97	3.50	22.47	176.57
EGPRS 2TX	850	824 - 849	28.00	25.00	21.98	3.50	25.48	353.13
EGPRS 3TX	850	824 - 849	28.00	37.50	23.74	3.50	27.24	529.70
EGPRS 4TX	850	824 - 849	27.00	50.00	23.99	3.50	27.49	561.01
GSM	1900	1850 - 1910	30.50	12.50	21.47	3.50	24.97	313.99
GPRS 1TX	1900	1850 - 1910	30.50	12.50	21.47	3.50	24.97	313.99
GPRS 2TX	1900	1850 - 1910	30.50	25.00	24.48	3.50	27.98	627.97
GPRS 3TX	1900	1850 - 1910	30.50	37.50	26.24	3.50	29.74	941.96
GPRS 4TX	1900	1850 - 1910	29.00	50.00	25.99	3.50	29.49	889.14
EGPRS 1TX	1900	1850 - 1910	27.00	12.50	17.97	3.50	21.47	140.25
EGPRS 2TX	1900	1850 - 1910	27.00	25.00	20.98	3.50	24.48	280.50
EGPRS 3TX	1900	1850 - 1910	27.00	37.50	22.74	3.50	26.24	420.76
EGPRS 4TX	1900	1850 - 1910	27.00	50.00	23.99	3.50	27.49	561.01
LTE	2	1850 - 1910	24.00	100.00	24.00	3.50	27.50	562.34
LTE	4	1710 - 1755	24.00	100.00	24.00	3.50	27.50	562.34
LTE	5	824 - 849	24.00	100.00	24.00	3.50	27.50	562.34
LTE	12	699 - 716	24.00	100.00	24.00	3.50	27.50	562.34
LTE	13	777 - 787	24.00	100.00	24.00	3.50	27.50	562.34
LTE	26	814 - 849	24.00	100.00	24.00	3.50	27.50	562.34
Bluetooth LE	ISM	2400 - 2483.5	8.00	100.00	8.00	2.20	10.20	10.47
RF 434 MHz	ISM	433.91 - 433.93	3.00	100.00	3.00	-3.00	0.00	1.00

Table 1: Equipment specifications

Evaluation Results

Following results correspond to maximum measured field values with respect to the applicable limit and maximum calculated power density:

Technology	Frequency (MHz)	Max. E-field (V/m)	Max. H-field (A/m)	Max Power Density (mW/cm^2)	E-field Limit (V/m)	H-field Limit (A/m)	Power Density Limit (mW/cm^2)	Verdict
LF 125 KHz	0.125	1.18	0.334	-	614.0	1.63	-	PASS
Cellular	824 - 849	-	-	0.20	-	-	0.55	PASS
Bluetooth LE	2400 - 2483.5	-	-	0.001	-	-	1.00	PASS
RF 434 MHz	433.91 - 433.93	-	-	0.0001	-	-	0.29	PASS

Table 2: Evaluation results summary

LF 125 KHz Evaluation

Measurements have been made from all sides of the device with a separation distance of 20 cm measured from the center of the probe to the edge of the device. Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m.

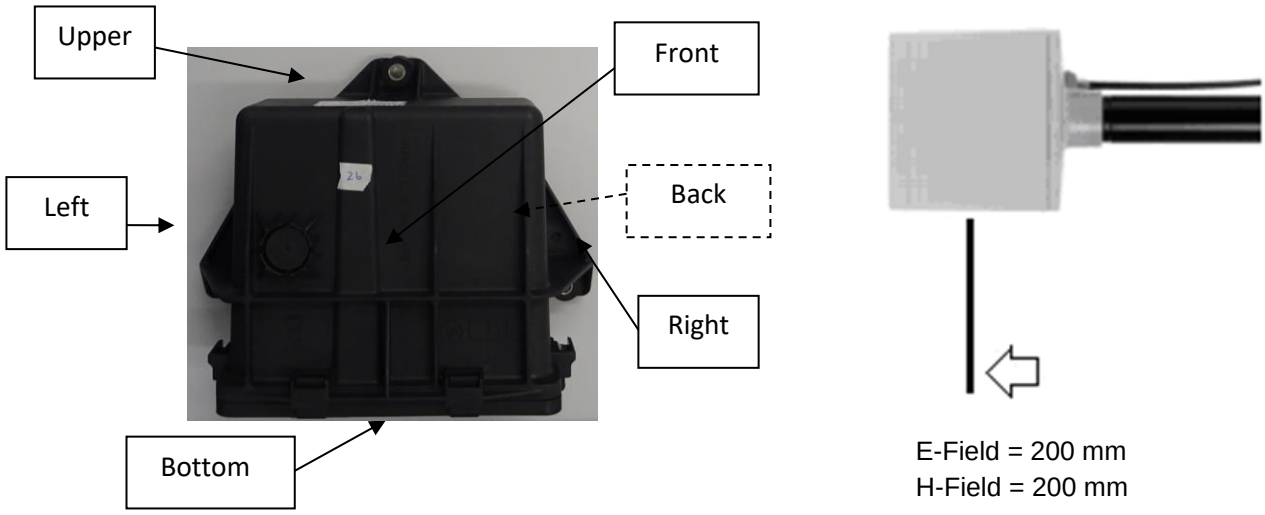


Figure 1: Field measurement setup

The maximum measured values for each transmitting technology are listed in the following tables:

Test side	Distance to DUT (cm)	Frequency (MHz)	H-Field (A/m)	Limit (A/m)	% Limit	Verdict
Upper	20	0.1250	0.199	1.630	12.2	**Pass**
Right	20	0.1250	0.334	1.630	20.5	**Pass**
Bottom	20	0.1225	0.165	1.630	10.1	**Pass**
Left	20	0.1253	0.064	1.630	3.9	**Pass**
Front	20	0.1250	0.112	1.630	6.9	**Pass**
Back	20	0.1255	0.093	1.630	5.7	**Pass**

Table 3: H-field measurement values

Test side	Distance to DUT (cm)	Frequency (MHz)	E-Field (V/m)	Limit (V/m)	% Limit	Verdict
Upper	20	0.1248	0.98	614.00	0.2	**Pass**
Right	20	0.1248	0.47	614.00	0.1	**Pass**
Bottom	20	0.1250	0.63	614.00	0.1	**Pass**
Left	20	0.1250	0.45	614.00	0.1	**Pass**
Front	20	0.1250	1.18	614.00	0.2	**Pass**
Back	20	0.1253	0.48	614.00	0.1	**Pass**

Table 4: E-field measurements values

All H-Field and E-Field values are in compliance to values shown into §1.1310, paragraph (e), “Table 1: limits for Maximum Permissible Exposure (MPE).

RF Exposure assessment

Limits for Maximum Permissible Exposure (MPE) to comply with FCC 47 CFR § 2.1091 are defined in "§1.1310 Radiation Exposure limits, paragraph (e)", a conservative separation distance of 25 cm has been used for the assessment:

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (mW/cm^2)	FCC General Population Limit (mW/cm^2)	Verdict
GSM/GPRS	850	824 - 849	25.00	0.20	0.55	**Pass**
GSM/GPRS	1900	1850 - 1910	25.00	0.12	1.00	**Pass**
LTE	2	1850 - 1910	25.00	0.07	1.00	**Pass**
LTE	4	1710 - 1755	25.00	0.07	1.00	**Pass**
LTE	5	824 - 849	25.00	0.07	0.55	**Pass**
LTE	12	699 - 716	25.00	0.07	0.47	**Pass**
LTE	13	777 - 787	25.00	0.07	0.52	**Pass**
LTE	26	814 - 849	25.00	0.07	0.54	**Pass**
Bluetooth LE	ISM	2400 - 2483.5	25.00	0.001	1.00	**Pass**
RF 434 MHz	ISM	433.91 - 433.93	25.00	0.0001	0.29	**Pass**

Table 5: Assessment result and verdict

Multiple frequencies assessment

Simultaneous technologies and modes	Result	Limit	Verdict
GPRS 2TX 850 + Bluetooth LE + RF 434 MHz	0.37	1	**Pass**

Table 6: Multiple frequency assessment result and verdict

Appendix B: ISED RF Exposure

General description of the device under evaluation

The test sample is a part of a system which aims to offer telematics services and the device acts like gateway, receiving and transmitting data.

The equipment supports GSM/LTE, Bluetooth LE, RF 434 MHz and LF 125 KHz technologies and according to the manufacturer during its normal use, the separation distance between the device and the body of nearby users will be greater than 1 m.

RF Exposure evaluation for LF 125 KHz technology has been conducted through field measurements (see LF 125 KHz evaluation section).

GSM/LTE, Bluetooth LE and RF 434 MHz technologies are not subject to testing and verdict can be determined through RF Exposure assessment (see RF Exposure assessment section). The equipment specifications declared by the manufacturer for these technologies are the following:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power RMS Burst (Incl. Tune-Up) (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBi)	Maximum Averaged E.I.R.P. (dBm)	Maximum Averaged E.I.R.P. (mW)
GSM	850	824 - 849	34.50	12.50	25.47	3.50	28.97	788.70
GPRS 1TX	850	824 - 849	34.50	12.50	25.47	3.50	28.97	788.70
GPRS 2TX	850	824 - 849	34.50	25.00	28.48	3.50	31.98	1577.39
GPRS 3TX	850	824 - 849	30.00	37.50	25.74	3.50	29.24	839.52
GPRS 4TX	850	824 - 849	28.00	50.00	24.99	3.50	28.49	706.27
EGPRS 1TX	850	824 - 849	28.00	12.50	18.97	3.50	22.47	176.57
EGPRS 2TX	850	824 - 849	28.00	25.00	21.98	3.50	25.48	353.13
EGPRS 3TX	850	824 - 849	28.00	37.50	23.74	3.50	27.24	529.70
EGPRS 4TX	850	824 - 849	27.00	50.00	23.99	3.50	27.49	561.01
GSM	1900	1850 - 1910	30.50	12.50	21.47	3.50	24.97	313.99
GPRS 1TX	1900	1850 - 1910	30.50	12.50	21.47	3.50	24.97	313.99
GPRS 2TX	1900	1850 - 1910	30.50	25.00	24.48	3.50	27.98	627.97
GPRS 3TX	1900	1850 - 1910	30.50	37.50	26.24	3.50	29.74	941.96
GPRS 4TX	1900	1850 - 1910	29.00	50.00	25.99	3.50	29.49	889.14
EGPRS 1TX	1900	1850 - 1910	27.00	12.50	17.97	3.50	21.47	140.25
EGPRS 2TX	1900	1850 - 1910	27.00	25.00	20.98	3.50	24.48	280.50
EGPRS 3TX	1900	1850 - 1910	27.00	37.50	22.74	3.50	26.24	420.76
EGPRS 4TX	1900	1850 - 1910	27.00	50.00	23.99	3.50	27.49	561.01
LTE	2	1850 - 1910	24.00	100.00	24.00	3.50	27.50	562.34
LTE	4	1710 - 1755	24.00	100.00	24.00	3.50	27.50	562.34
LTE	5	824 - 849	24.00	100.00	24.00	3.50	27.50	562.34
LTE	12	699 - 716	24.00	100.00	24.00	3.50	27.50	562.34
LTE	13	777 - 787	24.00	100.00	24.00	3.50	27.50	562.34
LTE	26	814 - 849	24.00	100.00	24.00	3.50	27.50	562.34
Bluetooth LE	ISM	2400 - 2483.5	8.00	100.00	8.00	2.20	10.20	10.47
RF 434 MHz	ISM	433.91 - 433.93	3.00	100.00	3.00	-3.00	0.00	1.00

Table 7: Equipment specifications

Evaluation Results

Following results correspond to maximum measured field values with respect to the applicable limit and maximum calculated power density:

Technology	Frequency (MHz)	Max. E-field (V/m)	Max. H-field (A/m)	Max Power Density (W/m^2)	E-field Limit (V/m)	H-field Limit (A/m)	Power Density Limit (W/m^2)	Verdict
LF 125 KHz	0.1250	-	0.334	-	-	5.84	-	PASS
LF 125 KHz (NS)	0.1250	1.35	0.286	-	83.0	90.0	-	
Cellular	824 - 849	-	-	2.01	-	-	2.58	PASS
Bluetooth LE	2400 - 2483.5	-	-	0.01	-	-	5.35	PASS
RF 434 MHz	433.91 - 433.93	-	-	0.001	-	-	1.66	PASS

Table 8: Evaluation results summary

LF 125 KHz Evaluation

Measurements at 20 cm test distance were performed using the equipment listed in the "Used Instrumentation" paragraph of this document to compare the measured H-Field values with the limits shown on table 4 of RSS-102 Issue 5, Paragraph "4.Exposure Limits", Industry of Canada.

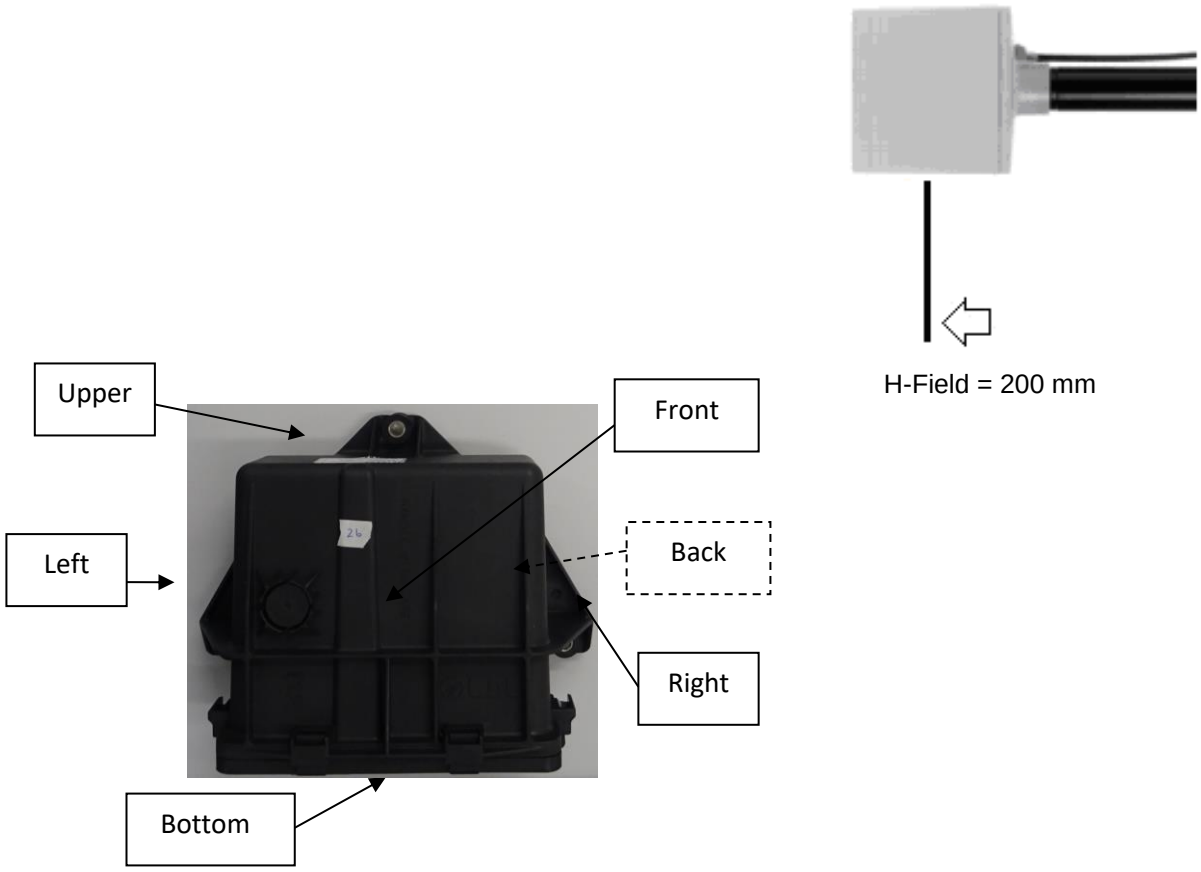


Figure 1: Field measurement setup

The maximum measured values for each transmitting technology are listed in the following tables:

Test side	Distance to DUT (cm)	Frequency (MHz)	H-Field (A/m)	Limit (A/m)	% Limit	Verdict
Upper	20	0.1250	0.199	5.840	3.4	Pass
Right	20	0.1250	0.334	5.840	5.7	Pass
Bottom	20	0.1225	0.165	5.959	2.8	Pass
Left	20	0.1253	0.064	5.826	1.1	Pass
Front	20	0.1250	0.112	5.840	1.9	Pass
Back	20	0.1255	0.093	5.817	1.6	Pass

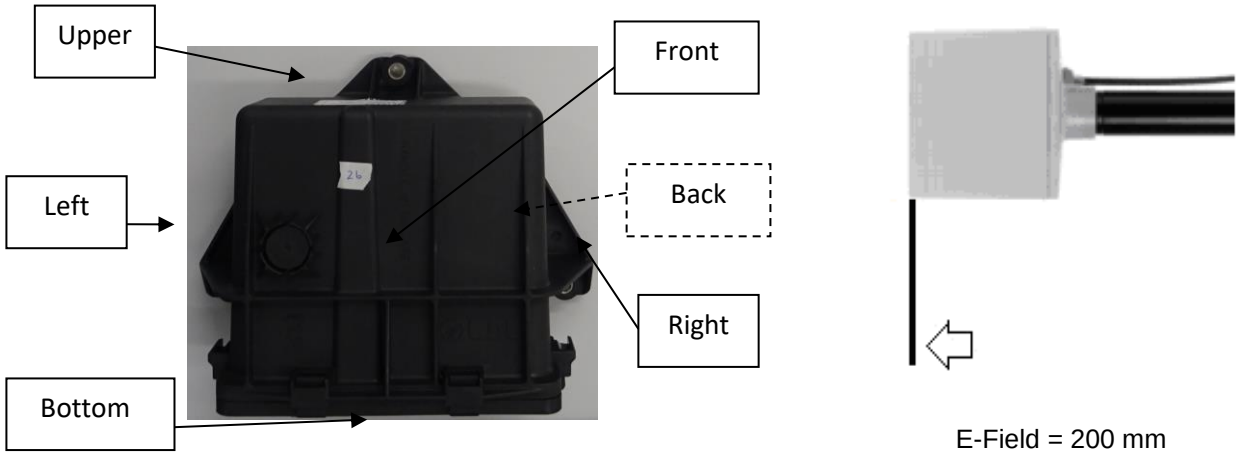
Table 9: H-field measurement values

All H-Field values are in compliance to values shown into "Table 4: RF Field Strength Limits for Devices Used by the General Public" for the frequency range used by the device.

LF 125 KHz Evaluation Nerve Stimulation evaluation

According to RSS-102 Issue 5, Nerve Stimulation exposure limits shall be evaluated for transmission into the frequency range from 0.003 to 10 MHz. Supplementary Procedure SPR-002, Issue 1, for Radio Standards Specification RSS-102 sets out the general test methods to be followed when carrying out an assessment to the nerve stimulation exposure requirements of RSS-102 Issue 5.

Measurements have been performed at a compliance distance of 20 cm from the probe edge to the device edge, placing the device in the edge of the table, using the equipment listed in the "Used Instrumentation" paragraph of this document, and following the measurement method shown in paragraph 6.6.1.1 of "ISED RSS-102-SPR-002 Issue 1":



E-Field = 200 mm
H-Field = 200 mm

Figure 1: Nerve Stimulation measurement setup

The maximum measured values for each transmitting technology are listed in the following tables:

Test side	Distance to DUT (cm)	Frequency (MHz)	H-Field (A/m)	Limit (A/m)	% Limit	Verdict
Upper	20	0.1250	0.143	90	0.2	**Pass**
Right	20	0.1248	0.029	90	0.0	**Pass**
Bottom	20	0.1255	0.127	90	0.1	**Pass**
Left	20	0.1248	0.036	90	0.0	**Pass**
Front	20	0.1250	0.286	90	0.3	**Pass**
Back	20	0.1250	0.145	90	0.2	**Pass**

Table 10: H-field measurement values

Test side	Distance to DUT (cm)	Frequency (MHz)	E-Field (V/m)	Limit (V/m)	% Limit	Verdict
Upper	20	0.1240	0.16	83	0.2	**Pass**
Right	20	0.1250	0.74	83	0.9	**Pass**
Bottom	20	0.1255	0.22	83	0.3	**Pass**
Left	20	0.1248	0.26	83	0.3	**Pass**
Front	20	0.1250	1.35	83	1.6	**Pass**
Back	20	0.1253	0.60	83	0.7	**Pass**

Table 11: E-field measurements values

All H-Field and E-Field values are in compliance to values shown into "Table 4: RF Field Strength Limits for Devices Used by the General Public" for the frequency range used by the device.

RF Exposure assessment

Limits for RF Field Strength to comply with RSS-102 Issue 5 are defined in "Health Canada's RF exposure guideline, Safety code 6", a conservative separation distance of 25 cm has been used for the assessment:

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (W/m^2)	ISED General Public Limit (W/m^2)	Verdict
GSM/GPRS	850	824 - 849	25.00	2.01	2.58	**Pass**
GSM/GPRS	1900	1850 - 1910	25.00	1.20	4.48	**Pass**
LTE	2	1850 - 1910	25.00	0.72	4.48	**Pass**
LTE	4	1710 - 1755	25.00	0.72	4.24	**Pass**
LTE	5	824 - 849	25.00	0.72	2.58	**Pass**
LTE	12	699 - 716	25.00	0.72	2.30	**Pass**
LTE	13	777 - 787	25.00	0.72	2.47	**Pass**
LTE	26	814 - 849	25.00	0.72	2.55	**Pass**
Bluetooth LE	ISM	2400 - 2483.5	25.00	0.01	5.35	**Pass**
RF 434 MHz	ISM	433.91 - 433.93	25.00	0.001	1.66	**Pass**

Table 12: Assessment result and verdict

Multiple frequencies assessment

Simultaneous technologies and modes	Result	Limit	Verdict
GPRS 2TX 850 + Bluetooth LE + RF 434 MHz	0.78	1	**Pass**

Table 13: Multiple frequency assessment result and verdict

Appendix C: RF Exposure Information

FCC RF Exposure evaluation for mobile devices

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/cm²)	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/f²	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/f²	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

In order to perform the MPE assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

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

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

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 Health 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	-	$0.73/f$	-	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	$3.142\,f^{0.3417}$	$0.008335\,f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\,f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

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

ISED MPE Evaluation

In order to perform the MPE assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

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

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)

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:

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

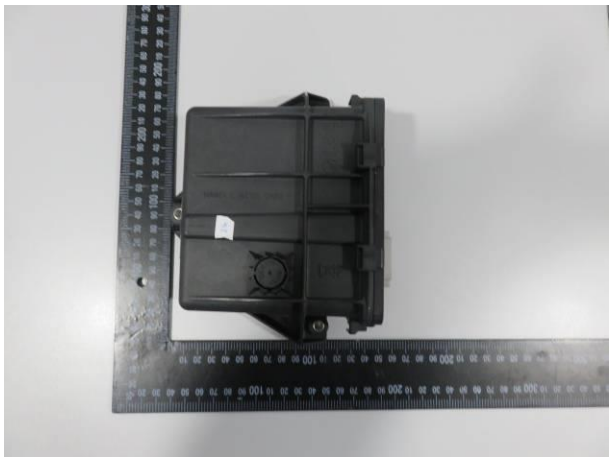
Where

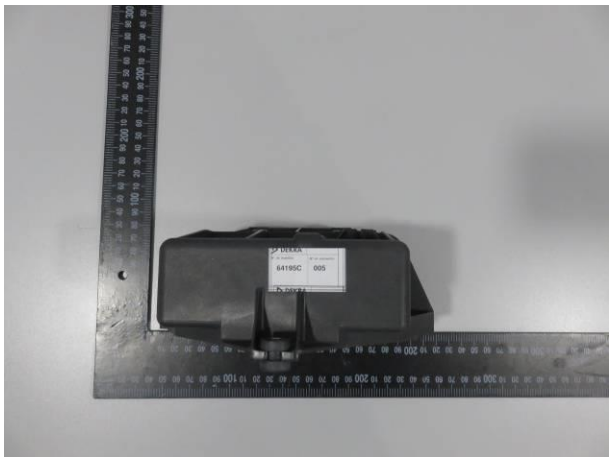
S_i is the power density of each source;

MPE_i is the power density basic restriction of each source.

Appendix D: Photographs

Equipment view





H-Field and E-Field measurement setup views

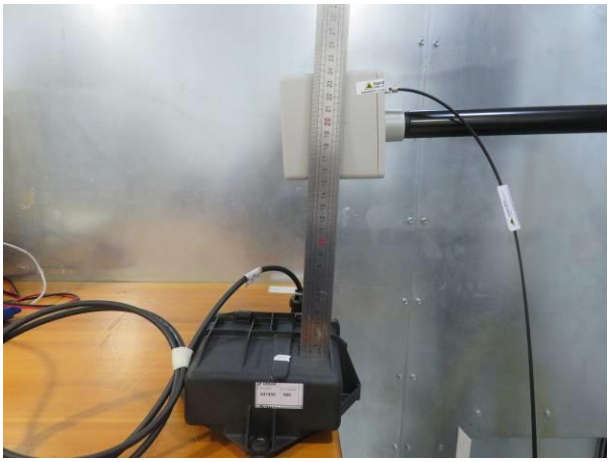
Upper

Right

Bottom

Left

Front



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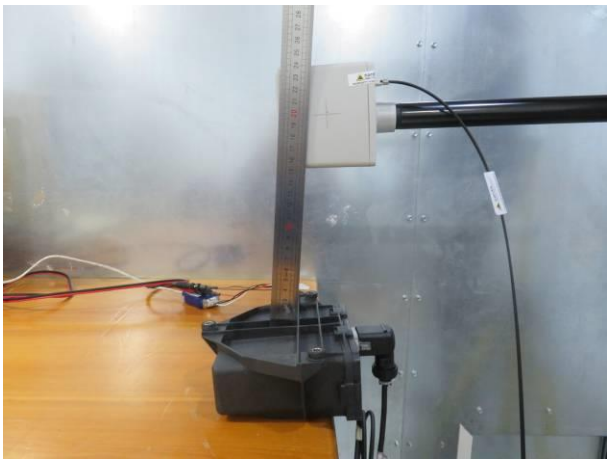
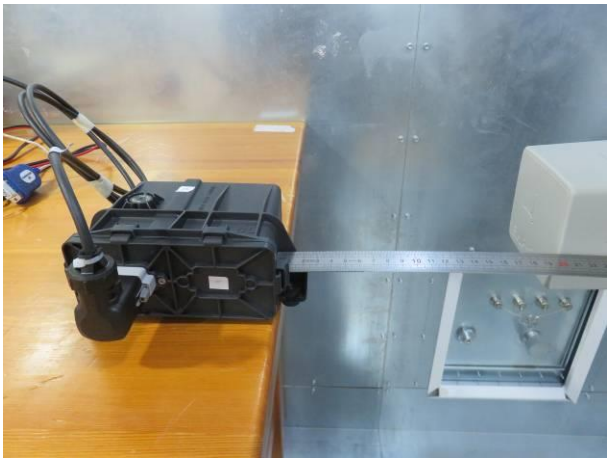


Nerve stimulation H-Field and E-Field measurement setup

Upper

Right



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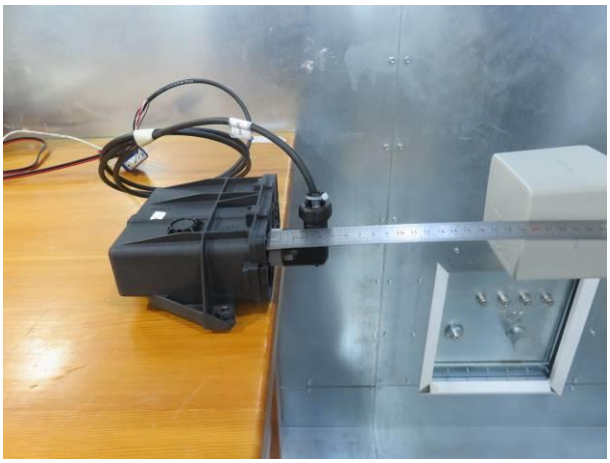

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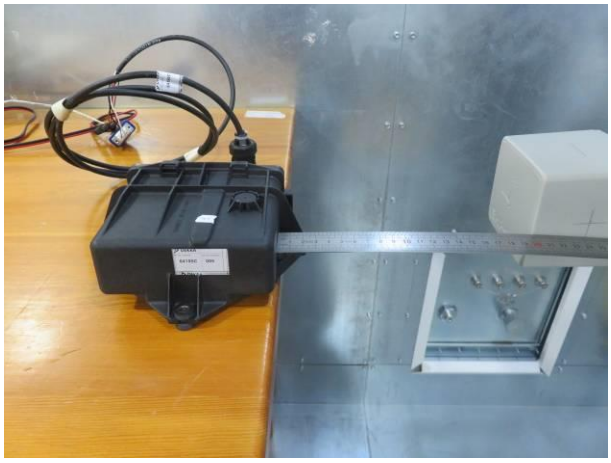
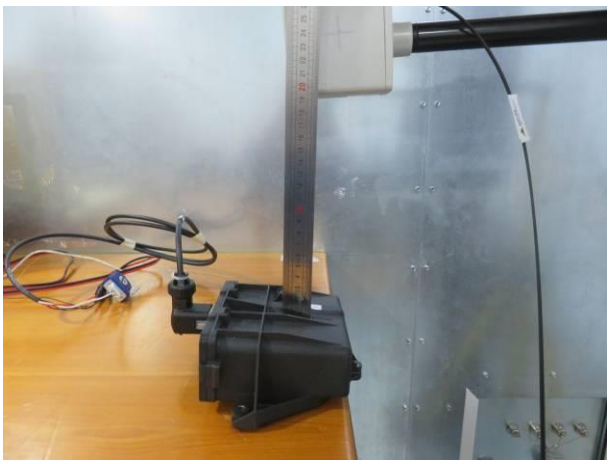
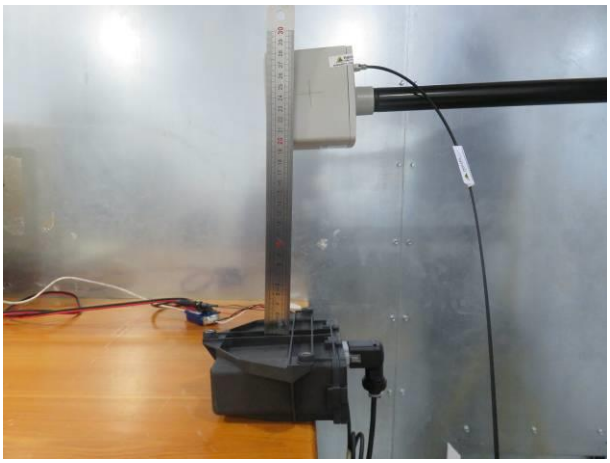


Front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