



FCC LISTED, REGISTRATION
NUMBER: 720267

ISED LISTED REGISTRATION
NUMBER 4621A-2

Informe de ensayo n°:
Test report No:

NIE: 52341RRF.003

Test report

USA FCC Part 15.209

CANADA RSS-Gen

Identificación del objeto ensayado.....: Identification of item tested	TELEMATICS CONTROL UNIT
Marca Trademark	LDL-TECHNOLOGY
Modelo y/o referencia tipo Model and /or type reference	16102
Other identification of the product	FCC ID: T4516102 IC: 6450A-16102
Final HW version	314-069-0090-B (NA)
Final SW version	414069191012
Características Features	Radiofrequency, low frequency, GNSS, GSM/UMTS, Bluetooth Low energy CAN, LIN, RS232
Solicitante Applicant	LDL-TECHNOLOGY 3 rue GIOTTO 31520 RAMONVILLE-SAINT-AGNE TOULOUSE (FRANCE)
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.209 (10–1–15 Edition): Radiated emission limits, general requirements. CANADA RSS-Gen Issue 4 (November 2014). Transmitter Emission Limits for Licence-Exempt Radio Apparatus. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) Approved by (name / position & signature)	A. Llamas RF Lab. Manager ALEJANDRO LLAMAS RODRIGUEZ Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2017.06.15 11:59:55 +02'00'
Fecha de realización Date of issue	2017-06-15
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Competences and guarantees

DEKRA Testing and Certification 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.

DEKRA Testing and Certification is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

DEKRA Testing and Certification is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-2.

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

DEKRA Testing and Certification 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 Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification..
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

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

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
52341C/005	TELEMATICS CONTROL UNIT	16102	8519E028	2017-04-06

Auxiliary elements used with the sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
52341C/012	HARNESS	---	---	2014-04-06

1. Sample S/01 has undergone following test(s).

All tests indicated in appendix A.

Test sample description

The test sample consists of:

Radiofrequency, low frequency, GNSS, GSM/UMTS, Bluetooth Low energy
CAN, LIN, RS232

Identification of the client

LDL-TECHNOLOGY

3 rue GIOTTO 31520 RAMONVILLE-SAINT-AGNE TOULOUSE (FRANCE)

Testing period

The performed test started on 2017-05-12 and finished on the same day.

The tests have been performed at DEKRA Testing and Certification.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

Remarks and comments

1; The tests have been performed by the technical personnel: Carlos Alberto Contreras.

2: Used instrumentation:

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	Active Loop Antenna 9 kHz-30 MHz HEWLETT PACKARD 11966A	2016/05	2018/05
3.	EMI Test Receiver R&S ESU 26	2015/11	2017/11
4.	Spectrum analyser Agilent E4440A	2015/10	2017/10

Testing verdicts

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

FCC PART 15 PARAGRAPH	VERDICT			
	NA	P	F	NM
15.209 Subclause (a) / RSS-Gen Clause 8.9. Radiated emission limits; general requirements		P		

Appendix A – Test result

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TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 12/24 \text{ Vdc}$$

Type of power supply = DC voltage from external power supply.

Type of antenna = Integral antenna

TEST FREQUENCIES:

Nominal Operating frequency: 125.00 kHz

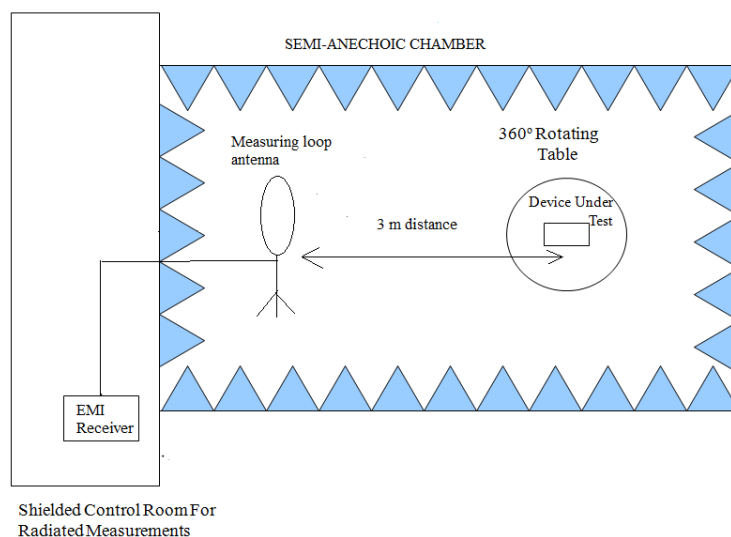
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the range between 9 kHz to 30 MHz) is situated at a distance of 3 m.

For radiated emissions in the range 9 kHz to 30 MHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission.

In the range between 9 kHz and 30 MHz the measurements were made in the three different orientation planes of the loop antenna to determine the maximum received field.



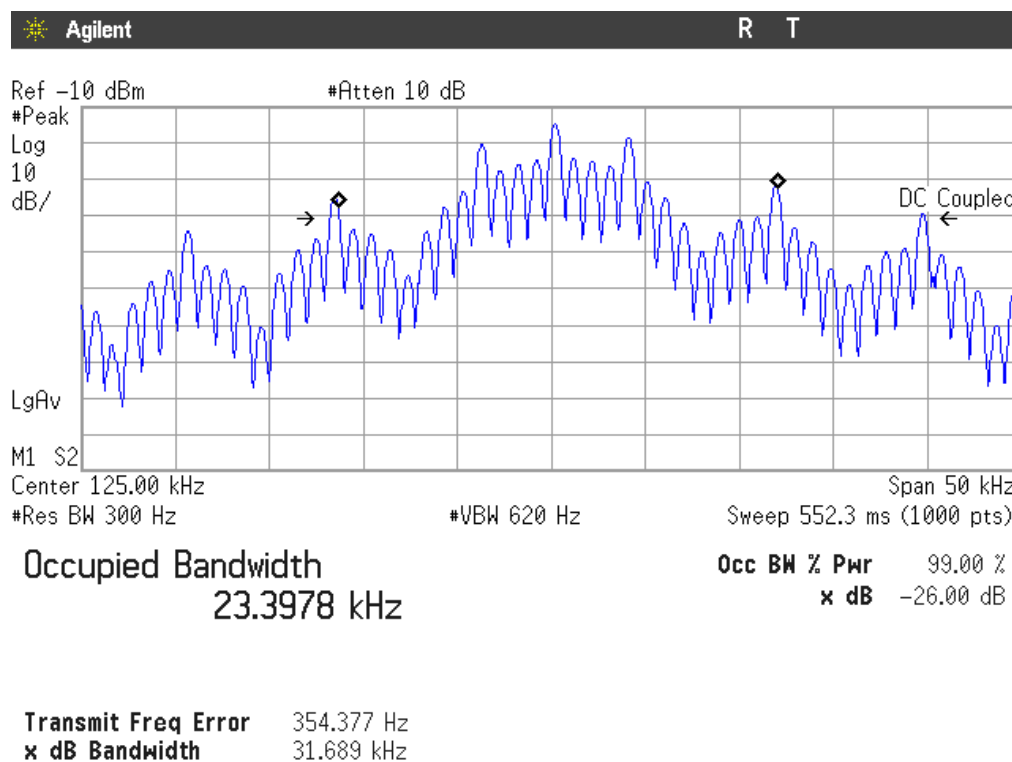
The test was performed with the equipment transmitting first with only the 125 kHz radio and repeated with the 2.4 GHz BT LE and 433.92 MHz radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Occupied Bandwidth

RESULTS

(see next plots).

99% bandwidth (kHz)	23.3978
-26 dBc bandwidth (kHz)	31.689
Measurement uncertainty (kHz)	<±0.17



Section 15.209 Subclause (a) / RSS-Gen Clause 8.9. Radiated emission limits; general requirements

SPECIFICATION

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	29.54	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

RESULTS:

All tests were performed in a semi-anechoic chamber at a distance of 3 m.

The spectrum was inspected from 9 kHz to 30 MHz searching for spurious signals.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor and cable loss.

The equipment under test (EUT) can transmit through 3 antennas but not simultaneously. A preliminary scan was performed for the worst case antenna.

Frequency range 9 kHz-30 MHz.

The maximum field strength of fundamental emission:

Frequency (kHz)	Maximum field strength ($\text{dB}\mu\text{V/m}$) measured at 3 m (average detector)	Maximum field strength ($\text{dB}\mu\text{V/m}$) extrapolated to 300 m (40 dB/decade)	Maximum field strength ($\mu\text{V/m}$) extrapolated to 300 m (40 dB/decade)	Limit ($\mu\text{V/m}$)
125.00	91.18	11.18	3.62	19.2
Measurement uncertainty (dB)	< ± 3.61			

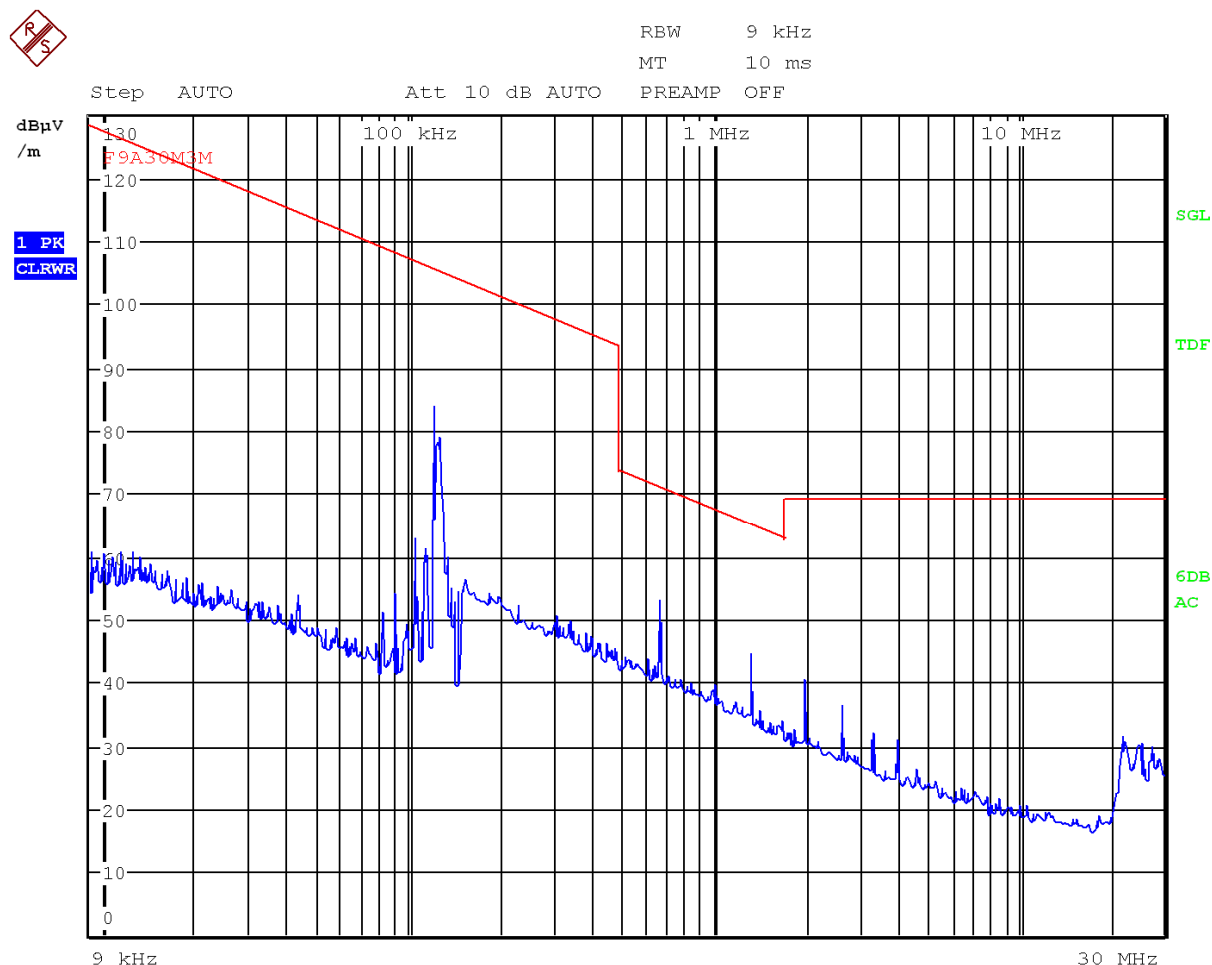
Verdict: PASS

Spurious signals closest to the limit:

Spurious frequency (kHz)	Detector	Emission Level (dB μ V/m) at 3 m	Emission Level (dB μ V/m) extrapolated at 30 m (40 dB/decade)	Emission Level (μ V/m) extrapolated at 300 m (40 dB/decade)	Limit (μ V/m)
662	Quasi-peak	52.75	12.57	0.043	36.25
Measurement uncertainty (dB)	< $\pm$ 3.61				

Verdict: PASS

FREQUENCY RANGE 9 kHz-30 MHz.



Resolution bandwidth:

200 Hz for $9 \text{ kHz} \leq f \leq 150 \text{ kHz}$

9 kHz for $150 \text{ kHz} \leq f \leq 30 \text{ MHz}$

Note: The scan is performed with a peak detector. The peaks closest to the limit are re-measured with the detector type as specified in FCC 15.209.

The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.