



FCC LISTED, REGISTRATION
NUMBER: 2764.01

Test report No:

ISED LISTED REGISTRATION
NUMBER: 23595-1

2127BERM.004

Test report USA FCC Part 15.209 CANADA RSS-Gen

Identification of item tested.....:	Cluster for Automotive
Trademark	Magneti Marelli
Model and /or type reference	BNF_LL
Other identification of the product	FCC ID:RX2BNFLL IC :4983A-BNFLL
Final HW version	PRS1
Final SW version	SW0508
Features	Cluster for Automotive, containing immobilizer function operating at 125 KHz.
Manufacturer	Magneti Marelli S.P.A. - Electronics Viale A Borletti 61/63 –Corbetta (MI) – 20011 Italy.
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.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC & RF Lab. Manager
Date of issue.....:	06/13/2018
Report template No.....:	FDT08_20

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01.

DEKRA Certification Inc. 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: 2764.01.

DEKRA Certification Inc. 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:23595-1.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. 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 Certification Inc. 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
2127.004	Cluster for Automotive	BNF_LL	MM5_TEP22.02.1807097725	05/13/2018

Auxiliary elements used with the sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
2127.005	Harness	--	200-0718-80	05/13/2018
2127.006	Debug Board	CEM MY16	0718-09	05/13/2018

1. Sample S/01 has undergone following test(s).
OBW Conducted test indicated in appendix A.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2127.001	Cluster for Automotive	BNF_LL	MM5_TEP29 .01.18070976 89	05/13/2018

Auxiliary elements used with the sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
2127.005	Harness	--	200-0718-80	05/13/2018
2127.006	Debug Board	CEM MY16	0718-09	05/13/2018

1. Sample S/02 has undergone following test(s).
All Radiated tests indicated in appendix A.

Test sample description

Cluster for Automotive, containing immobilizer function operating at 125 KHz.

Identification of the client

Magneti Marelli S.P.A. - Electronics

Viale A Borletti 61/63 –Corbetta (MI) – 20011 Italy.

Testing period

The performed test started on 05/17/2018 and finished on 05/17/2018.

The tests have been performed at DEKRA Certification, Inc.

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 %

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

In the chamber for conducted measurements, 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

Remarks and comments

1; The tests have been performed by the technical personnel: Divya Adusumilli, Koji Nishimoto and Victor Acedo Rubio.

2: Used instrumentation:

Conducted Measurements

No.	Description	Last Cal. Date	Cal. Due date
1.	Signal analyzer Rohde & Schwarz FSV40	2017/03	2019/03

Radiated Measurements

No.	Description	Last Cal. date	Cal. due date
1.	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus "L"	N/A	N/A
2.	Active Loop Antenna	2017/02	2020/02
3.	Spectrum analyzer Rohde & Schwarz FSV40	2017/03	2019/03
4.	Rohde & Schwarz EMC32 software	N/A	N/A

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):

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

Type of power supply = DC voltage from internal battery.

Type of antenna = Integral antenna

TEST FREQUENCIES:

Nominal Operating frequency: 125.00 kHz

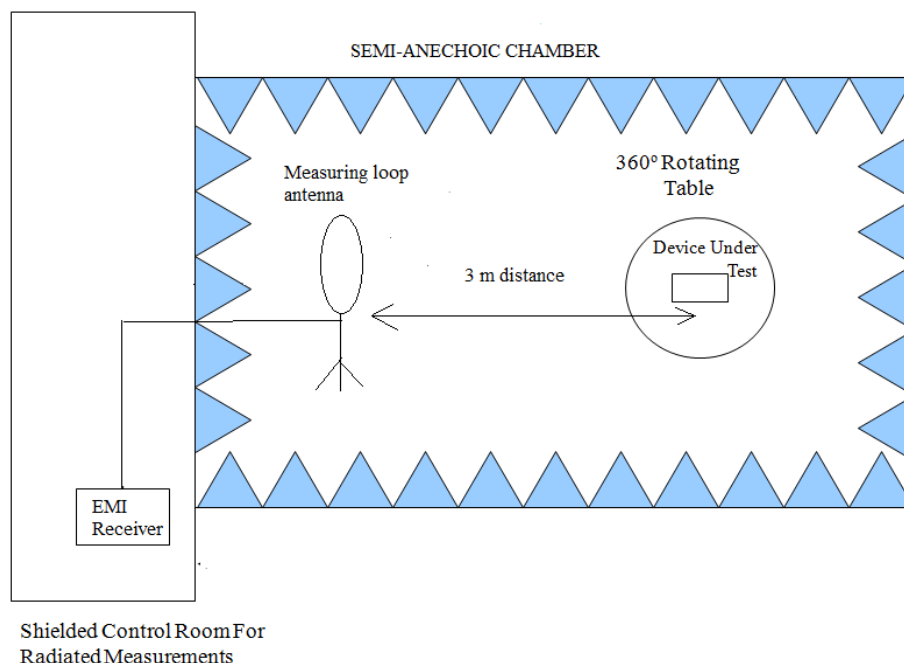
RADIATED MEASUREMENTS

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.

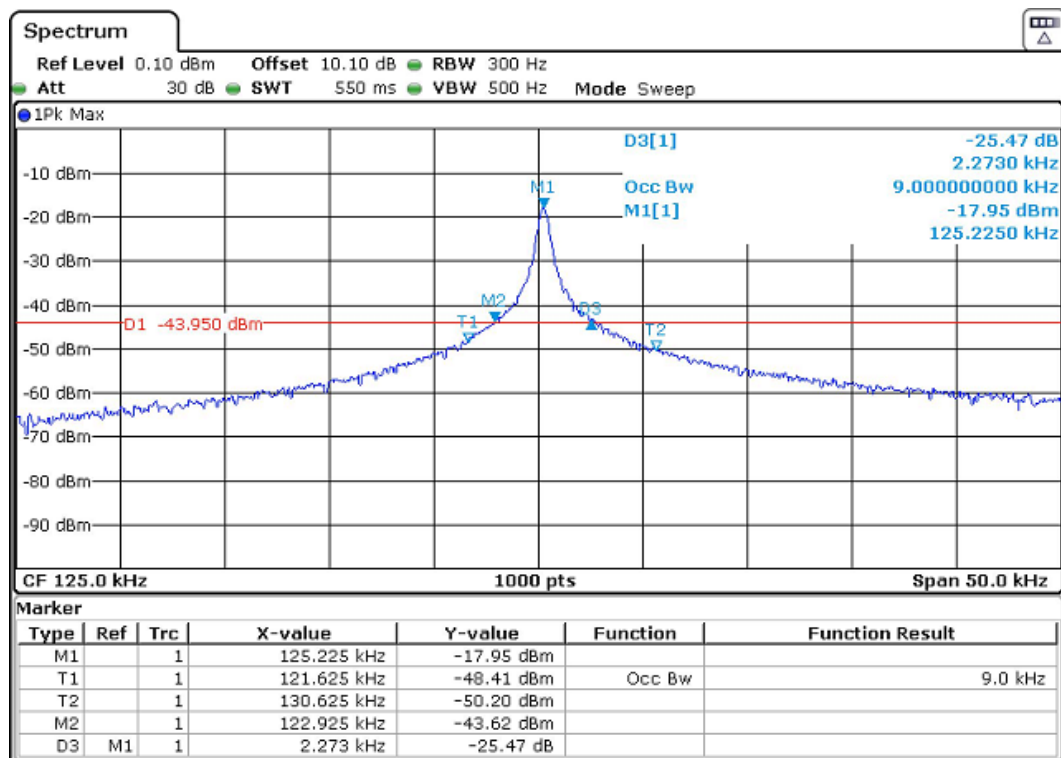


Occupied Bandwidth

RESULTS

(see next plots).

99% bandwidth (kHz)	9.0
-26 dBc bandwidth (kHz)	2.27
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	$2400/F(\text{kHz})$	-	300
0.490-1.705	$24000/F(\text{kHz})$	-	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.

Frequency range 9 kHz-30 MHz.

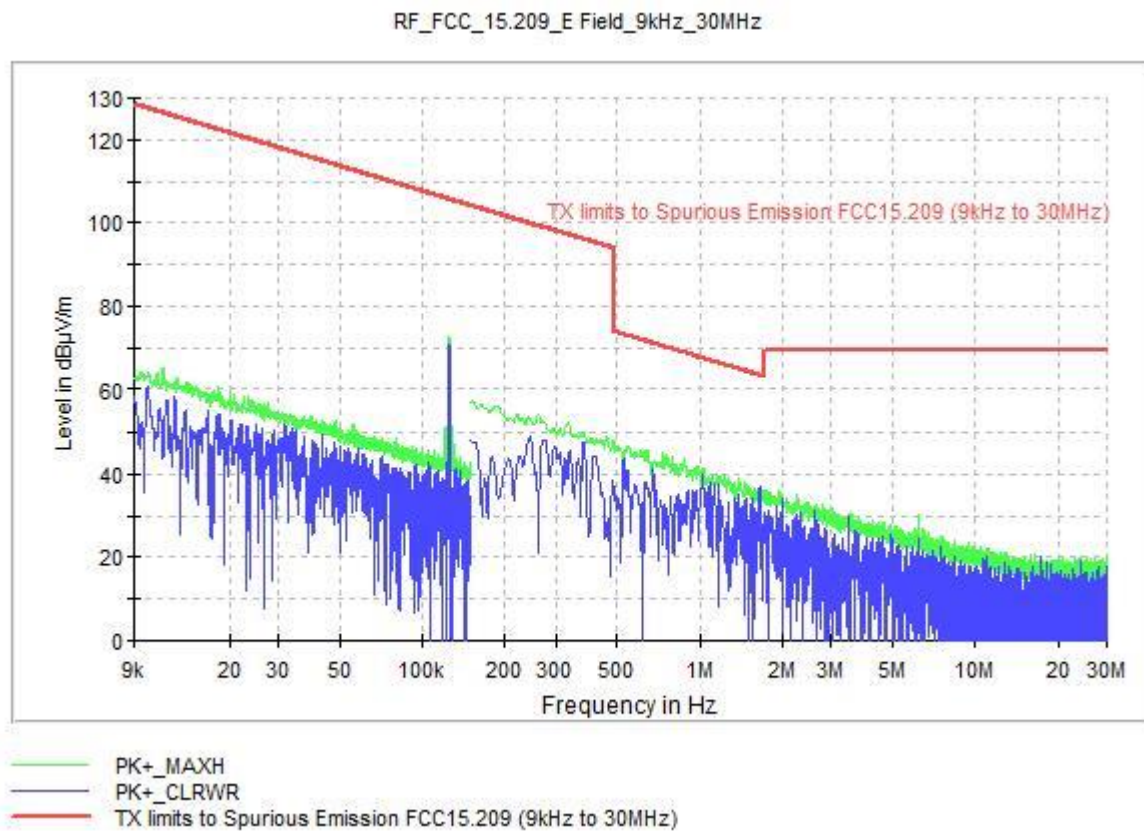
The maximum field strength of fundamental emission:

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 ($\mu\text{V/m}$)
125.34	72.8	-7.18	0.44	19.2
Measurement uncertainty (dB)	< ± 3.61			

No spurious emissions were found at less than 20 dB from the limit.

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.