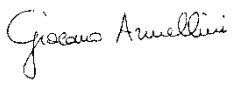
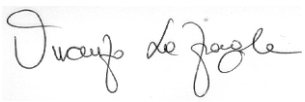
TEST REPORT

APPLICANT:	**MAGNETI MARELLI S.P.A. - LIGHTING & BODY ELECTRONIC** C/O C.F.R. STRADA TORINO 50 - 10043 ORBASSANO - TO - ITALY Phone : +390119083802	
APPLICANT REFEREE:	Mr. Cardelli	
EUT DESCRIPTION	**REMOTE KEYLESS ENTRY**	
EUT MODEL	**RKEL9**	
EUT FCC ID	RX2RKEL9	
EUT TRADEMARK	Jeep	
MANUFACTURER	MAGNETI MARELLI S.P.A.	
REFERENCE STANDARDS	**47 CFR FCC part 15.231**	
TEST REPORT NUMBER	FCCTR_150575-1	
TEST REPORT ISSUE DATE	22/07/2015	
TESTING LABORATORY	Prima Ricerca & Sviluppo S.r.l. Via Campagna, 92 -22020 Faloppio (Co) – Italy FCC test registration number: 421808	
TESTING LOCATION	As Above	
DATE OF TEST SAMPLE RECEIPT	31/03/2015, 28/04/15	
NUMBER OF TESTED SAMPLES	2	
DATE OF TEST	31/03/15, 01/04/15, 28/04/15	
TESTED BY	Giacomo ARMELLINI Responsabile Laboratorio EMC e RADIO/ *EMC and RADIO Laboratory Manager*	
APPROVED BY	Vincenzo LA FRAGOLA Direttore generale / *Managing director*	

The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have be obtained.
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0. CONTENTS

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1. RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_150575-0	Original release	14/07/2015
FCCTR_150575-1	Editorial Change in section 3 Editorial Change in sec. 6 test 3 and test 4	22/07/2015

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2. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

2.1 Identification

Trademark:	Jeep
Manufacturer:	MAGNETI MARELLI S.P.A.
Type of Equipment :	REMOTE KEYLESS ENTRY
Model name:	RKEL9
Serial number :	Sample 1: PC1311Y Sample 2: R22370N
FCC ID :	RX2RKEL9
Country of manufacturer:	ITALY

2.2 Technical data

Product type:	Radio Equipment
Radio type:	Intentional radiators
Product description / application	The EUT is a remote keyless entry using the 433MHz frequency for remote control of vehicle's door (i.e lock door, unlock door/trunck)
Power supply requirements :	3V (CR2032 type)
Operating Frequency:	433.92MHz
Channel bandwidth (20dB)	47.37kHz
Channel spacing	NA
Number of Channel	1
Modulation Type	FSK
Frequency Deviation	2.4kHz
Baud Rate	4.8kbit/s
Antenna Type	Integral Antenna

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2.3 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests. Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	**Enclosure**	Plastic / Metal	Snaps & screw
2	**AC Power Supply**	Port not present	---
3	**DC power supply**	Port not present (powered by 3Vdc internal battery)	---
4	**Signal lines**	Port not present	---
5	**Telecomm. Lines**	Port not present	---
6	**Antenna port**	Port not present	---
Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.			

2.4 Auxiliary equipment

- None

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3. OPERATING TEST MODES AND CONDITIONS

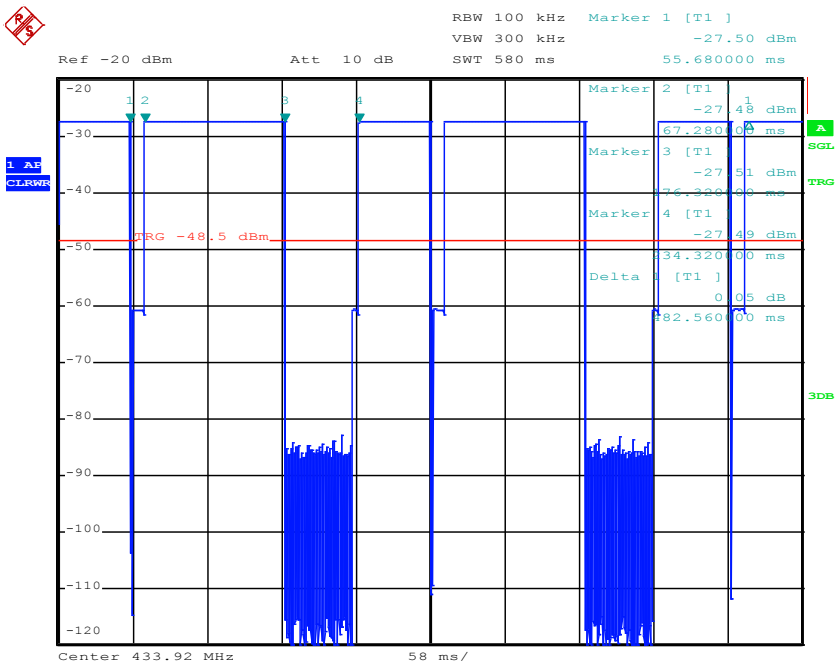
In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test”

Operating condition	*Description*
#1	*Sample 1: Continuous transmission, modulated carrier, duty cycle 100% (see note 1)*
#2	*Sample 2: Standard operating condition, manually operated, duty cycle 100% (see note 1)*

Note:

[1] The timing of the continuous transmission and the usual standard operating condition is the same and it is illustrated in the following measurement:

According to CFR 47 Part 15.35 c) because some of the pulses are longer than 100 ms the duty cycle used to calculate the correction factor for field strength measurements results 100% and so the correction factor is 0dB



Special Test Software: Special software and hardware by the Applicant to operate the EUT at channel frequency continuously.

Transmitter Test Antenna: The EUT has been tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

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4. REFERENCE STANDARD / DOCUMENT FOR PERFORMED TESTS

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz

5. SUMMARY OF TEST RESULTS

Phenomena	Basic standard	Operating condition	Result
Antenna Requirements	FCC Part 15 §15.203	---	Compliant
Conducted Emission	FCC Part 15 §15.207	---	Not applicable The EUT is battery powered
Periodic Operation Characteristics	FCC Part 15 §15.231 (a)	#2	Compliant
Field Strength of Fundamental and Spurious Emissions	FCC Part 15 § 15.231 (b)	#1	Compliant
20 dB Bandwidth	FCC Part 15 § 15.231 (c)	#1	Compliant

6. TEST RESULTS

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TEST 1.

ANTENNA REQUIREMENTS

REFERENCE DOCUMENT

According to §15.203 / 15.204

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna requirement
The RKEL9 have an integrated PCB antenna
RESULT: COMPLIANT

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TEST 2.

PERIODIC OPERATION CHARACTERISTICS

REFERENCE DOCUMENT

According to 15.231 (a): The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:
(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	28 April 2015
TESTED SAMPLE	Sample 2
UNCERTAINTY	

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23°C ± 5°C		24°C
Ambient humidity :	25 – 75 %rH		45%
Pressure :	85 – 106 kPa	(860 mbar – 1060 mbar)	960mbar

OPERATING CONDITION	#2

TEST RESULT	**COMPLIANT**

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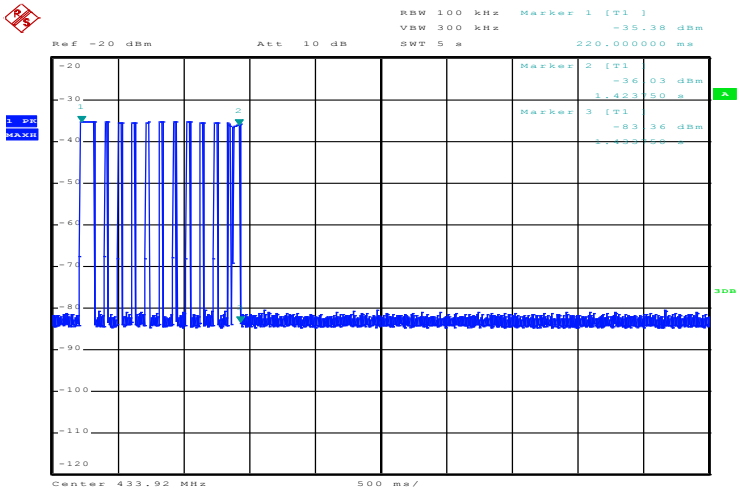
15.231 (a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

COMPLIANT the EUT is immediately deactivated after the release of the push button

Marker 1: push button pressed (start of transmission)
Marker 2: push button released
Marker 3: transmitter deactivation



15.231 (a) (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

NOT APPLICABLE: The EUT is a manually operated transmitter

15.231 (a) (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

NOT APPLICABLE: The EUT is a manually operated transmitter

15.231 (a) (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

NOT APPLICABLE: The EUT is not employed for radio control purposes during emergencies involving fire, security, and safety of life

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data

NOT APPLICABLE: The EUT is not employed for security systems

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TEST 3.

20dB BANDWIDTH

REFERENCE DOCUMENT

According to 15.231©: The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	28 April 2015
TESTED SAMPLE	Sample 1
UNCERTAINTY	±1 KHz

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23°C ± 5°C		24°C
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1

TEST RESULT	**COMPLIANT**

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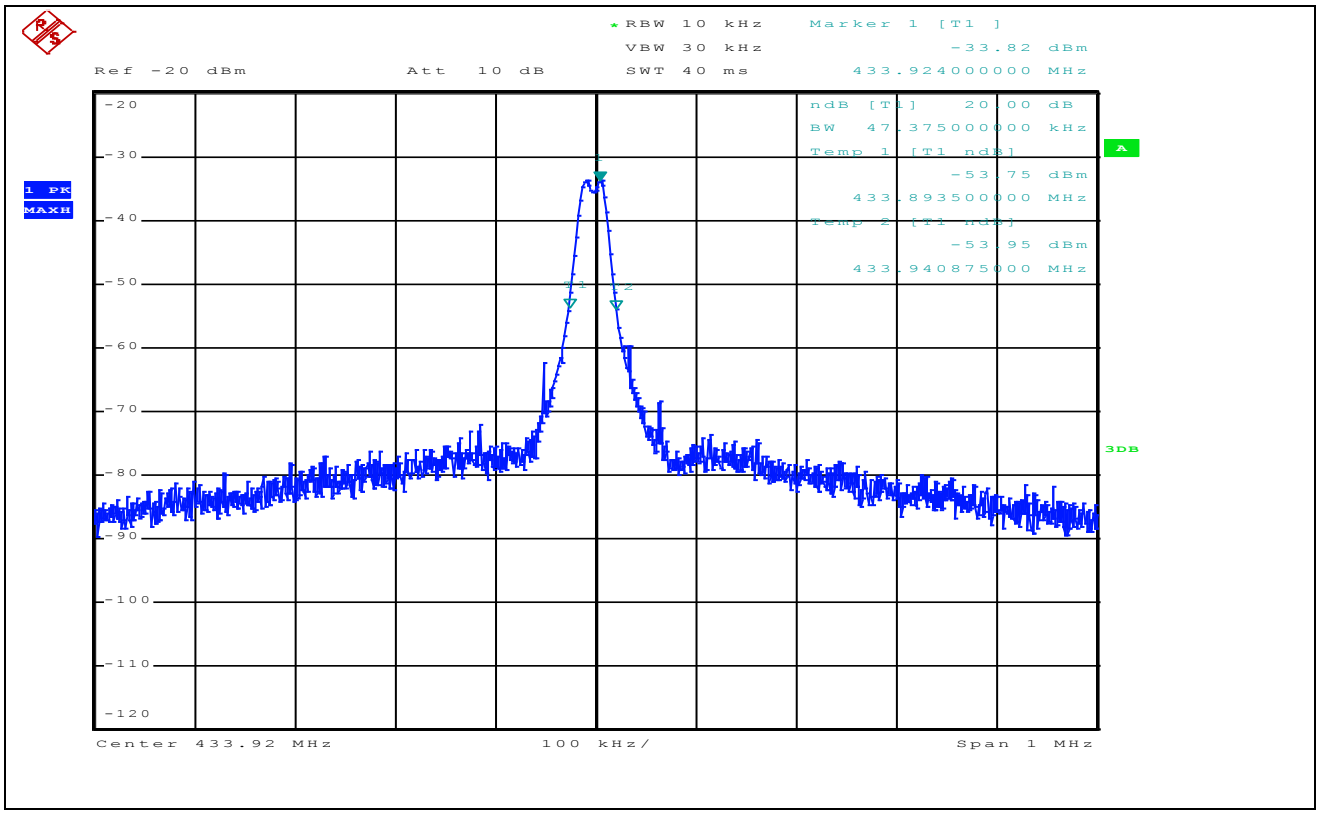
Measurement Result

Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Limit 0.0025* Frequency (kHz)	Result
NA	433.92	47.375	1084.8	WITHIN THE LIMITS
Incertezza di misura / Measurement Uncertainty : ±1 KHz				



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TEST 4.

FIELD STRENGTH OF FUNDAMENTAL AND SPURIOUS EMISSIONS

REFERENCE DOCUMENT

According to 15.231 (b)In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	11,250 to 3,750	1125 to 375
174-260	3,750	375
260-470	13,750 to 12,500	1375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	EMI receiver Rohde & Schwarz Mod, ESU 40 Spectrum Analyzer Rohde & Schwarz Mod, FSP40 Chase Antenna Mod, CBL 6111 C Antenna Rohde & Schwarz mod, HL050 High pass filter Wainwright WHNX 1,3/18G-10SS
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	31 March – 01 April 2015
TESTED SAMPLE	Sample 1
UNCERTAINTY OF MEASURE:	Combined uncertainty = ± 1,75 dB Total uncertainty = (k=2) ± 3,5 dB

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23°C ± 5°C		24°C
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1

TEST RESULT	**COMPLIANT**

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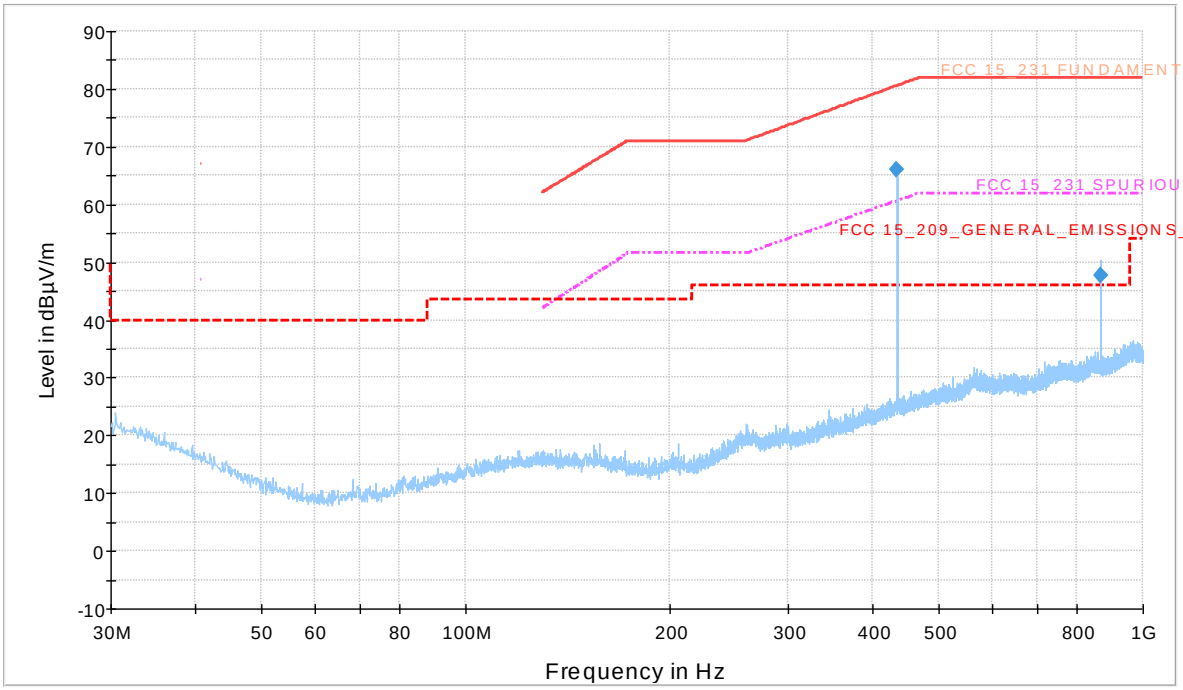
RADIATED MEASUREMENT

FREQUENCY RANGE 30MHz – 1GHz

VERTICAL POLARIZATION



Blue trace Peak detector, Blue Marker Peak detector

Final Result

Frequency (MHz)	Max Peak (dBµV/m)	Duty Cycle correction (dB)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Limit (dBµV/m)	Margin (dB)
433.908000	66.1	0	100.000	104.0	V	0.0	80.0	13.9
867.886000	47.6	0	100.000	259.0	V	88.0	62.0	14.4

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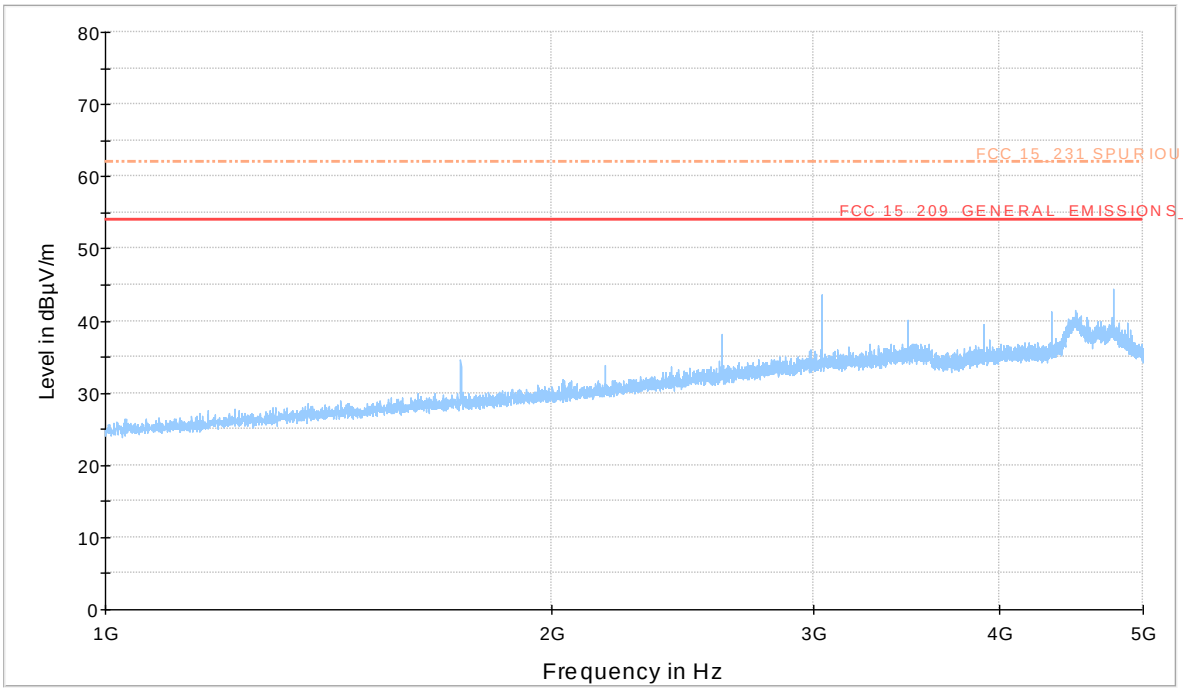
FREQUENCY RANGE 1GHz-5GHz

VERTICAL POLARIZATION



Blue trace peak detector

Duty Cycle correction (dB): 0

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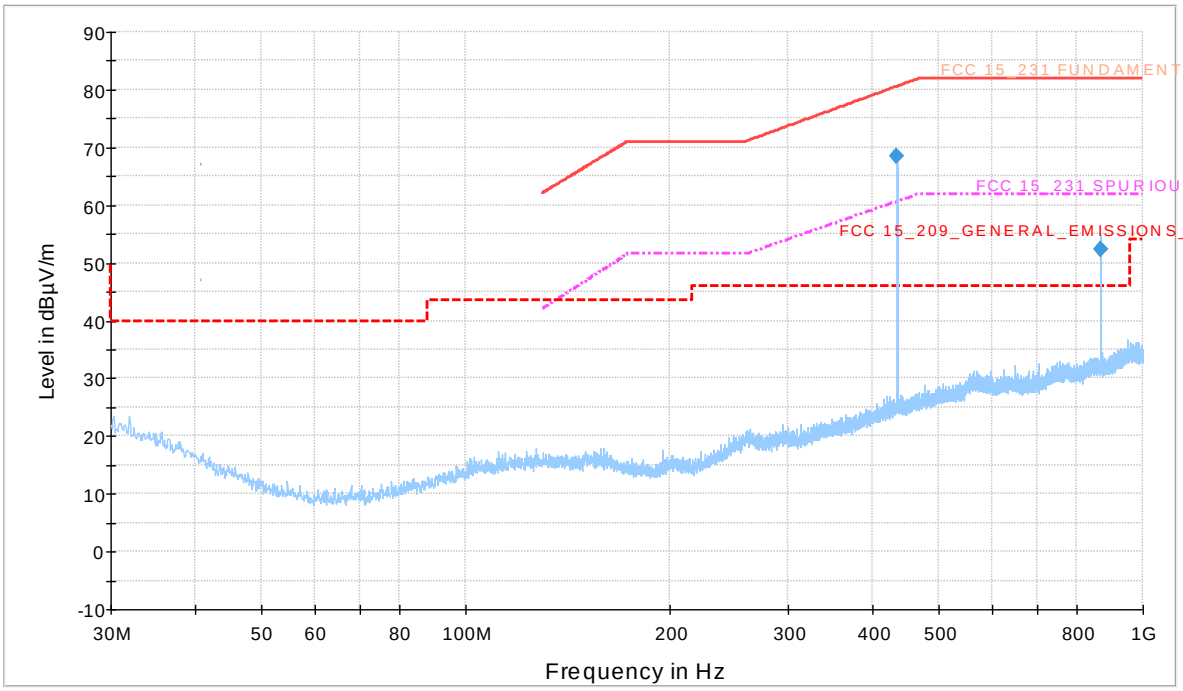
FREQUENCY RANGE 30MHz – 1GHz

HORIZONTAL POLARIZATION



Blue trace Peak detector, Blue Marker Peak detector

Final Result

Frequency (MHz)	Average (dBµV/m)	Duty Cycle correction (dB)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Limit (dBµV/m)	Margin (dB)
433.908000	68.4	0	100.000	259.0	H	180.0	80.0	11.6
867.886000	52.3	0	100.000	104.0	H	180.0	62.0	9.7

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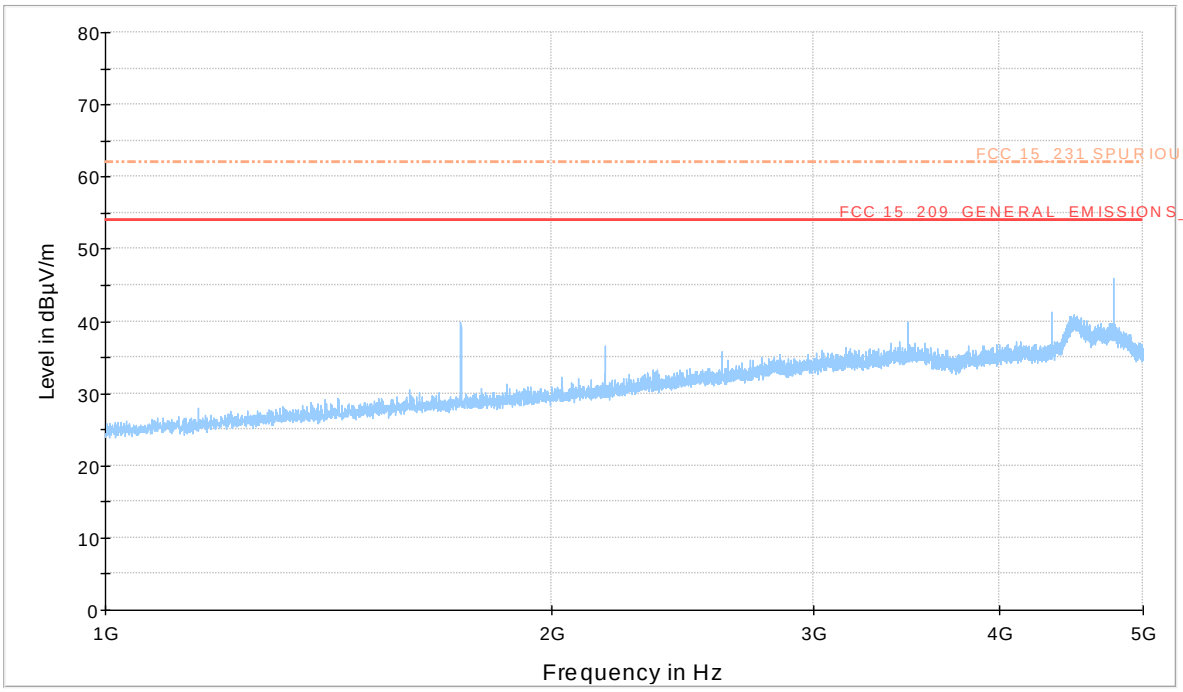
FREQUENCY RANGE 1GHz-5GHz

HORIZONTAL POLARIZATION



Blue trace peak detector

Duty Cycle correction (dB): 0

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7. LIST OF EQUIPMENT USED

EQUIPMENT	MANUFACTURER	MODEL	SERIAL Nr.	CAL. DUE
EMI TEST RECEIVER 20Hz - 40GHz	Rohde & Schwarz	ESU40	100111	04/09/2015
RF SEMI-ANECHOIC CHAMBER (CSSA)	Siemens	B83117-D6019-T232	003-005-134/94C	26/01/2016
BILOG ANTENNA	Chase	CBL6111C	2717	05/05/2016
LOG PERIODIC ANTENNA BROAD BAND 1-26,5GHz	Rohde & Schwarz	HL050	100437	01/04/2016
SPECTRUM ANALYZER	Rohde & Schwarz	FSP40	100038	16/01/2016
SYSTEM DC POWER SUPPLY	HP	6623A	3448A04501	10/01/2016
HIGH PASS FILTER	Wainwright	WHNX 1,3/18G-10SS	1	11/11/2016

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