Template: Release August 13th, 2018

TEST REPORT

N°: 156776-725199-C **Version : 01**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.231 & RSS-210 Issue 9 & RSS-Gen Issue 5**
Issued to	**Valeo Comfort and Driving Assistance** 76 rue Auguste Perret 94046 – CRETEIL Cedex France

Apparatus under test

Product	Foldable key, Transmitter
Trade mark	**VALEO**
Manufacturer	**Valeo Comfort and Driving Assistance**
Model under test	**RFK1A**
Serial number	**E1265 67**
FCC ID	**N5F-RFK1A**
IC	**3248A-FK1A**

Test date	: September 17, 2018 to September 18, 2018
Test location	Fontenay Aux Roses
Test Site	6230B-1
Composition of document	32 pages
Document issued on	April 18, 2019

Written by :
Julien PALARD
Tests operator

Approved by :
Arnaud LAYETTE
Technical manager

This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested. Unless otherwise specified, the decision of conformity takes into account the uncertainty of measurement. This document doesn't anticipate any certification decision.

PUBLICATION HISTORY

Version	Date	Author	Modification
01	September 19, 2018	Julien PALARD	Creation of the document

SUMMARY

1. TEST PROGRAM 4
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER) 5
3. OCCUPIED BANDWIDTH 8
4. 20DB EMISSION BANDWIDTH 11
5. DUTY CYCLE 14
6. LIMIT OF TRANSMISSION TIME 17
7. FIELD STRENGHT OF EMISSION & FIELD STRENGHT OF HARMONICS 20
8. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS 25
9. UNCERTAINTIES CHART 32

1. TEST PROGRAM

References

- **47 CFR Part 15.231**
- **RSS 210 Issue 9**
- **RSS Gen Issue 5**
- **ANSI C63.10-2013**

Radio requirement:

Clause (47CFR Part 15.231 & RSS-249 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
20 dB bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Duty cycle	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Frequency Tolerance	☐ PASS	☐ FAIL	☑ NA	☐ NP(1)
Limit of Transmission Time	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Field strength of fundamental & Field strength of harmonics	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission	☐ PASS	☐ FAIL	☑ NA(2)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated emissions	☐ PASS	☐ FAIL	☑ NA	☐ NP(1)
This table is a summary of test report, see conclusion of each clause of this test report for detail.				

(1): Limited program
(2): EUT not directly or indirectly connected to the AC Power Public Network

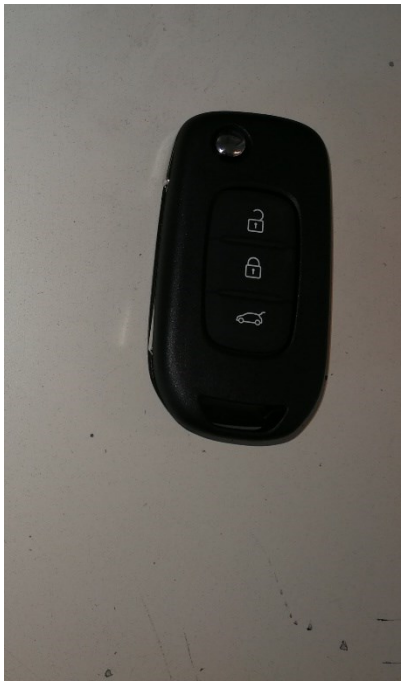
PASS: EUT complies with standard's requirement
FAIL: EUT does not comply with standard's requirement
NA: Not Applicable
NP: Test Not Performed

2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. *HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):*

Equipment under test (EUT):

RFK1A **Serial Number:** E1265 **67**



Equipment Under Test

Inputs/outputs – Cable/:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
-	-	-	☐	☐	☐	-

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
-	-	-	-

Equipment information:

Type:	**Smart Key**		
Frequency band:	[433.92] MHz		
Number of Channel:	1		
Channel bandwidth:	0.14 MHz		
Antenna Type:	☑ Integral	☐ External	☐ Dedicated
Antenna connector:	☐ Yes	☑ No	☐ Temporary for test
Transmit chains:	☑ 1	☐ 2	
Receiver chains	No receiver chain (TX only equipment)		
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty
Equipment type:	☑ Production model	☐ Pre-production model	
Operating temperature range:	Tnom:	20°C	
Type of power source:	☐ AC power supply	☐ DC power supply	☑ Battery
Operating voltage range:	Vnom:	☐ 120V/60Hz	☑ 3 Vdc

CHANNEL PLAN	
Channel	**Frequency (MHz)**
Cnom	433.92

2.2. RUNNING MODE

The EUT is set in the following modes during tests:
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power

2.3. EQUIPMENT LABELLING

No label

2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

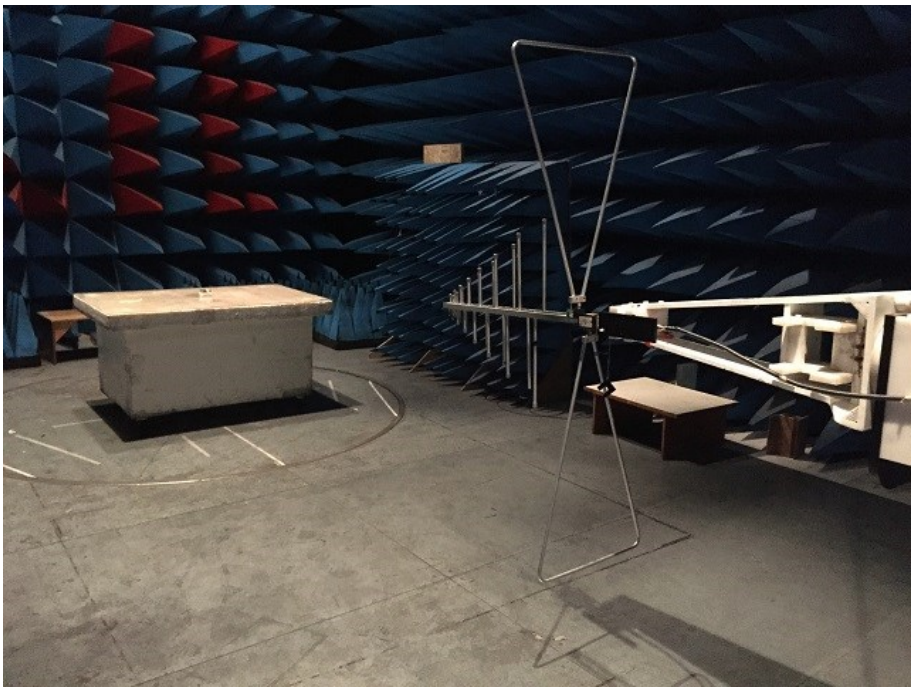
Test performed by : Julien PALARD
Date of test : September 18, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

3.2. TEST SETUP

- The Equipment Under Test is installed:
☐ On a table
☑ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☐ Conducted Method
☑ Radiated Method

- Test Procedure:
☑ RSS-Gen Issue 5 § 6.7



Photograph for Occupied bandwidth

3.1. LIMIT

None

3.2. TEST EQUIPMENT LIST

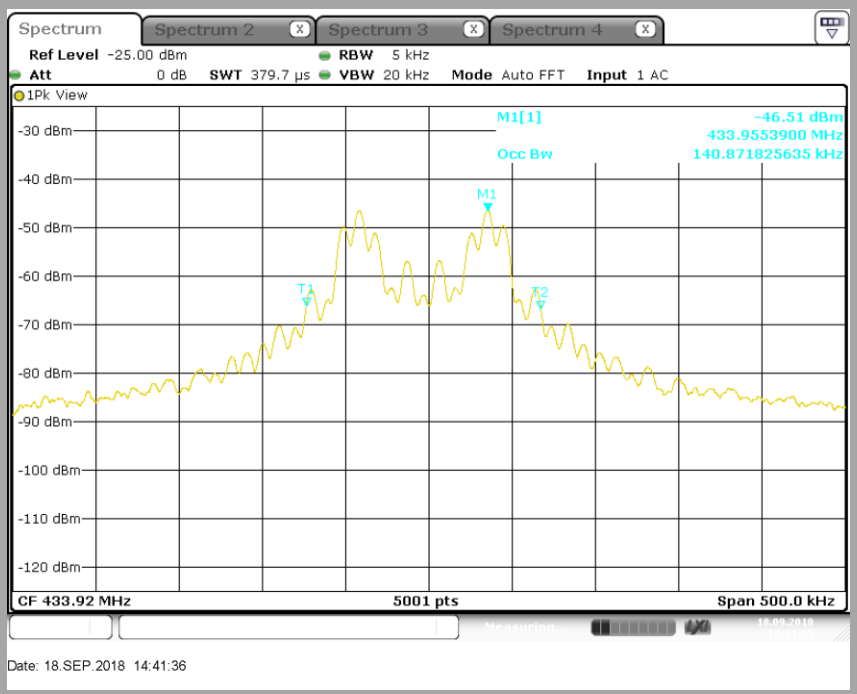
Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06

Note: In our quality system, the test equipment calibration due is more & less 2 months

3.3. RESULTS

Occupied Bandwidth

Cnom = 433.92 MHz



Channel	Occupied Bandwidth (MHz)
Cnom	0.141

3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **VALEO RFK1A**, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the RSS-GEN Issue 5 limits.

4. 20dB Emission Bandwidth

4.1. TEST CONDITIONS

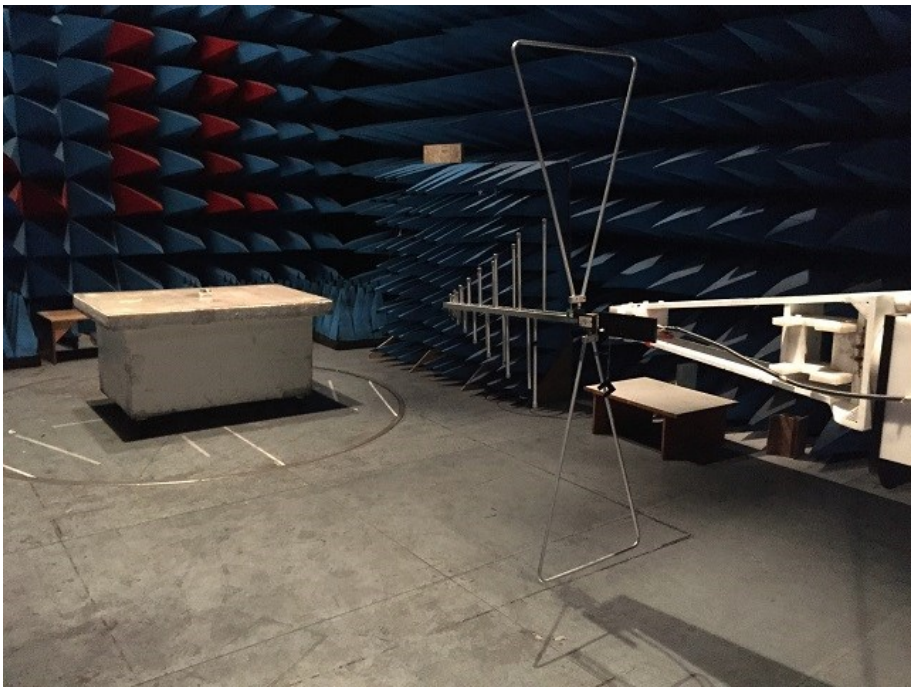
Test performed by : Julien PALARD
Date of test : September 18, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

4.2. TEST SETUP

- The Equipment Under Test is installed:
☐ On a table
☑ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☐ Conducted Method
☑ Radiated Method

- Test Procedure:
☑ ANSI C63.10 § 6.9.2



Photograph for 20dB emission bandwidth

4.1. LIMIT

The bandwidth shall be less than 0.25% of the center frequency (for frequency between 70MHz and 900MHz)
The bandwidth shall be less than 0.50% of the center frequency (for frequency above 900MHz)

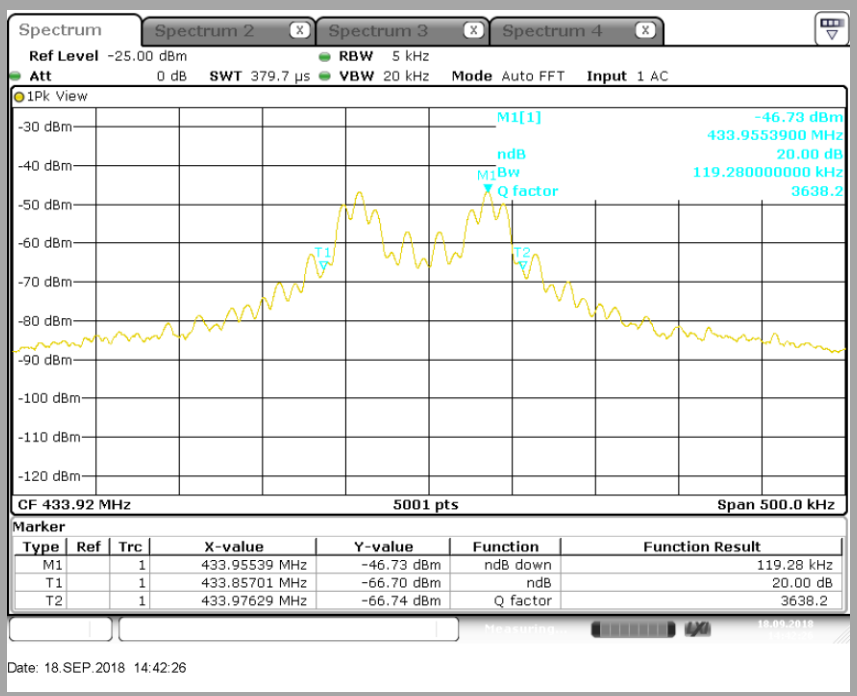
4.2. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06

Note: In our quality system, the test equipment calibration due is more & less 2 months

4.3. RESULTS

Cnom = 433.92 MHz



Channel	20dB Bandwidth (MHz)
Cnom	0.119

4.4. CONCLUSION

20dB Emission Bandwidth measurement performed on the sample of the product **VALEO RFK1A**, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

5. DUTY CYCLE

5.1. TEST CONDITIONS

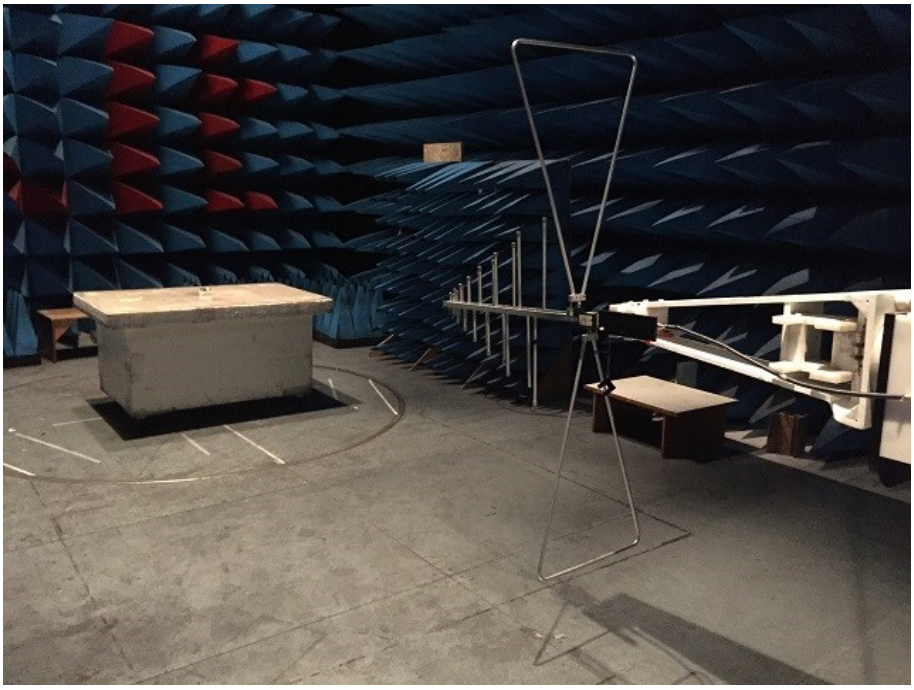
Test performed by : Julien PALARD
Date of test : September 18, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

5.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☐ Conducted Method
☑ Radiated Method

- Test Procedure:
☑ ANSI C63.10 § 11.6



Photograph for Duty Cycle

5.3. LIMIT

None

5.4. TEST EQUIPMENT LIST

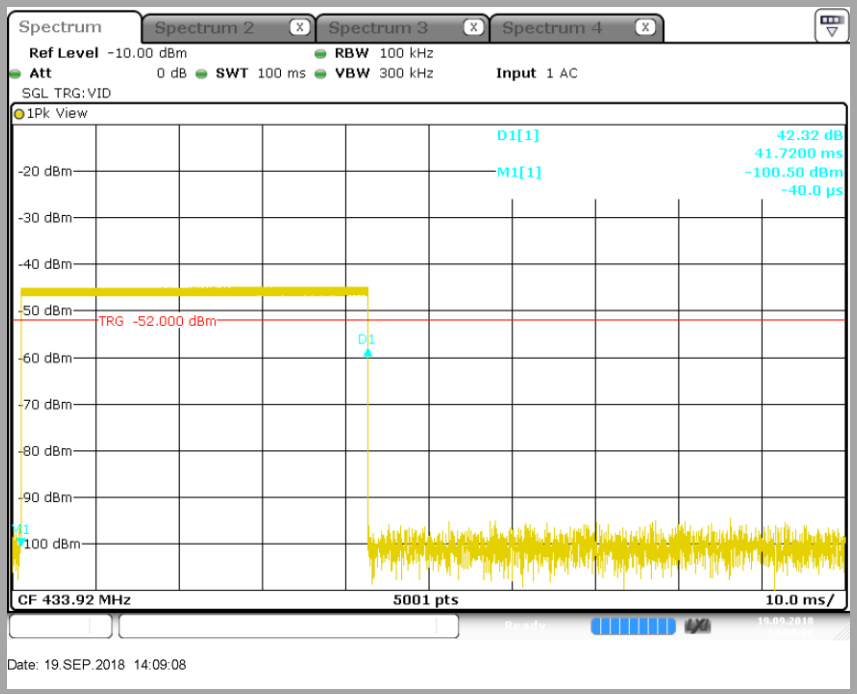
Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06

Note: In our quality system, the test equipment calibration due is more & less 2 months

5.5. RESULTS

Duty Cycle

Cnom



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Cnom	0.417	-7.59

Note:
Duty cycle = Ton/Tperiod average
Duty cycle factor= 20*log(Ton/Tperiod average)

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **VALEO RFK1A**, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

6. LIMIT OF TRANSMISSION TIME

6.1. TEST CONDITIONS

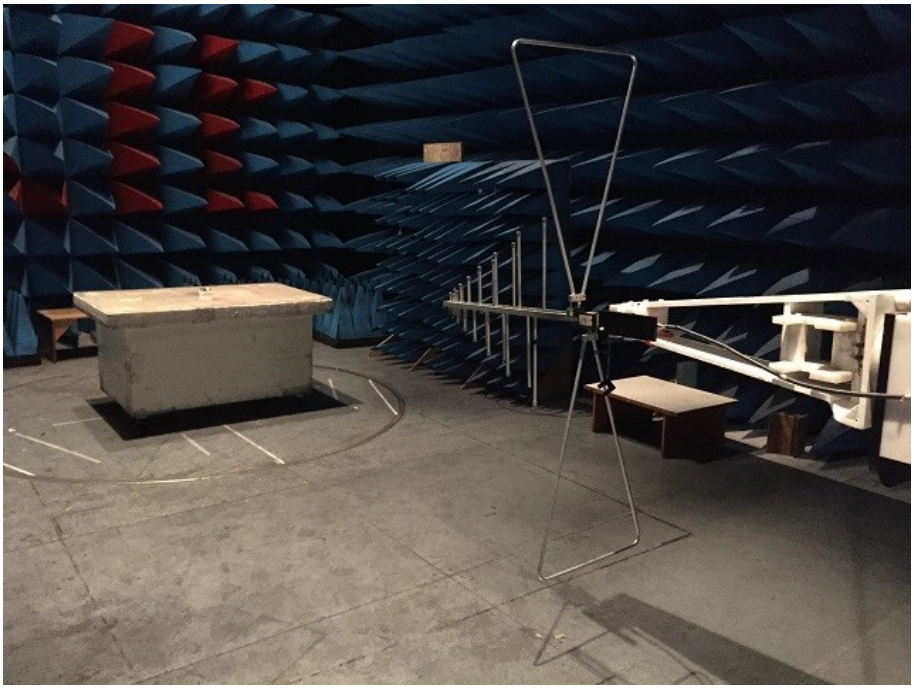
Test performed by : Julien PALARD
Date of test : September 18, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

6.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☐ Conducted Method
☑ Radiated Method

- Test Procedure:
☑ ANSI C63.10 § 11.6



Photograph for Limit of Transmission Time

6.3. LIMIT

According to 15.231, a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.1. *RELEASED.*TEST EQUIPMENT LIST

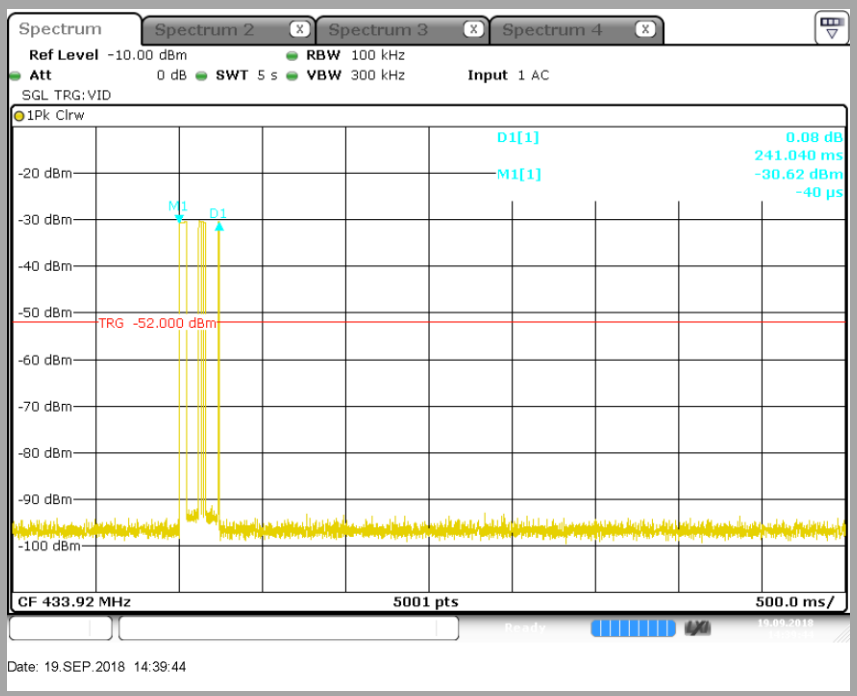
Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06

Note: In our quality system, the test equipment calibration due is more & less 2 months

6.2. RESULTS

Transmission Time

Cnom



Channel	Transmission Time (s)	Limit (s)	Result
Cnom	0.241	5	PASS

6.3. CONCLUSION

Limit of Transmission Time performed on the sample of the product **VALEO RFK1A**, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

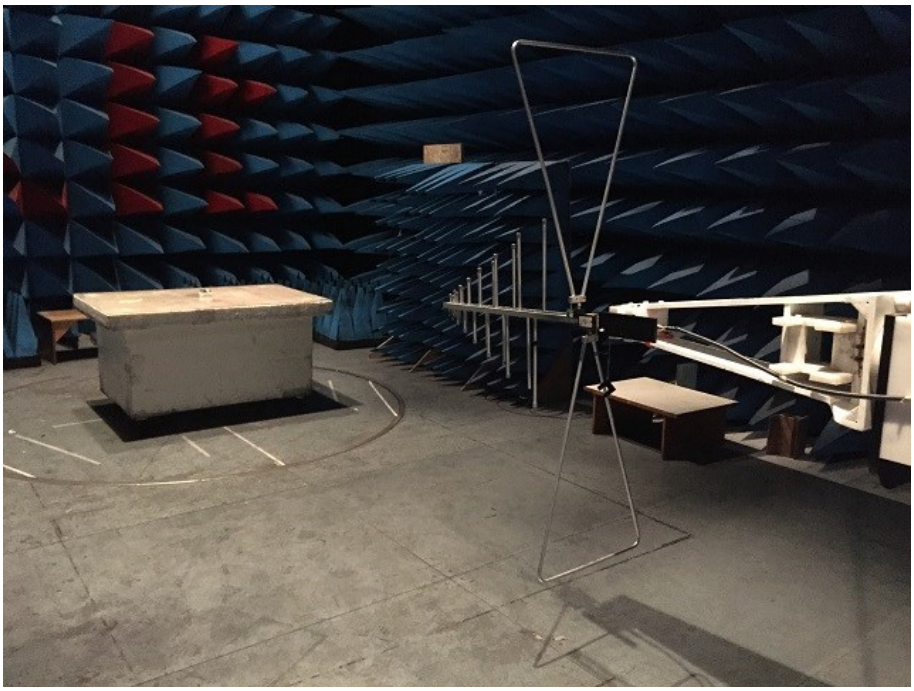
7. FIELD STRENGHT OF EMISSION & FIELD STRENGHT OF HARMONICS

7.1. TEST CONDITIONS

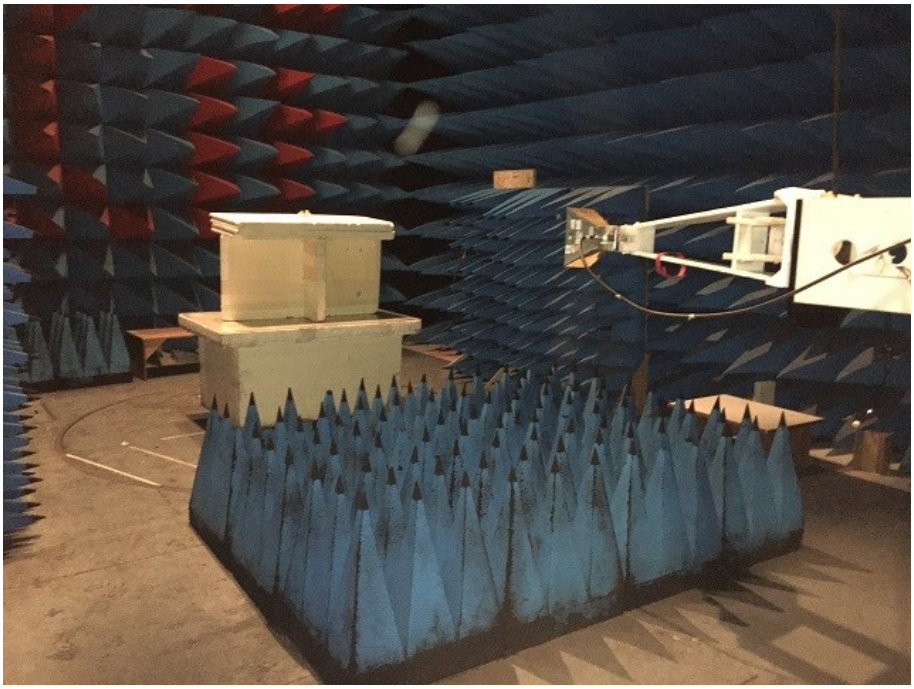
Test performed by : Julien PALARD
Date of test : September 17, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

7.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.



Photograph for Field strength of fundamental & Field strength of harmonics



Photograph for Field strength of fundamental & Field strength of harmonics

7.3. LIMIT

For intentional device, according to § 15.231, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

Fundamental Frequency (MHz)	Field Strength of Fundamental (µV/M)	Field Strength of Spurious Emission
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

Note :

1. " ※※ " linear interpolations.
2. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwantedemission level is 20 dB below the maximum permitted fundamental level.

7.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Horn antenna	EMCO	3115	C2042018	2018/04	2019/04
Preamplifier	LCIE	-	A7086012	2018/03	2019/03
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06

Note: In our quality system, the test equipment calibration due is more & less 2 months

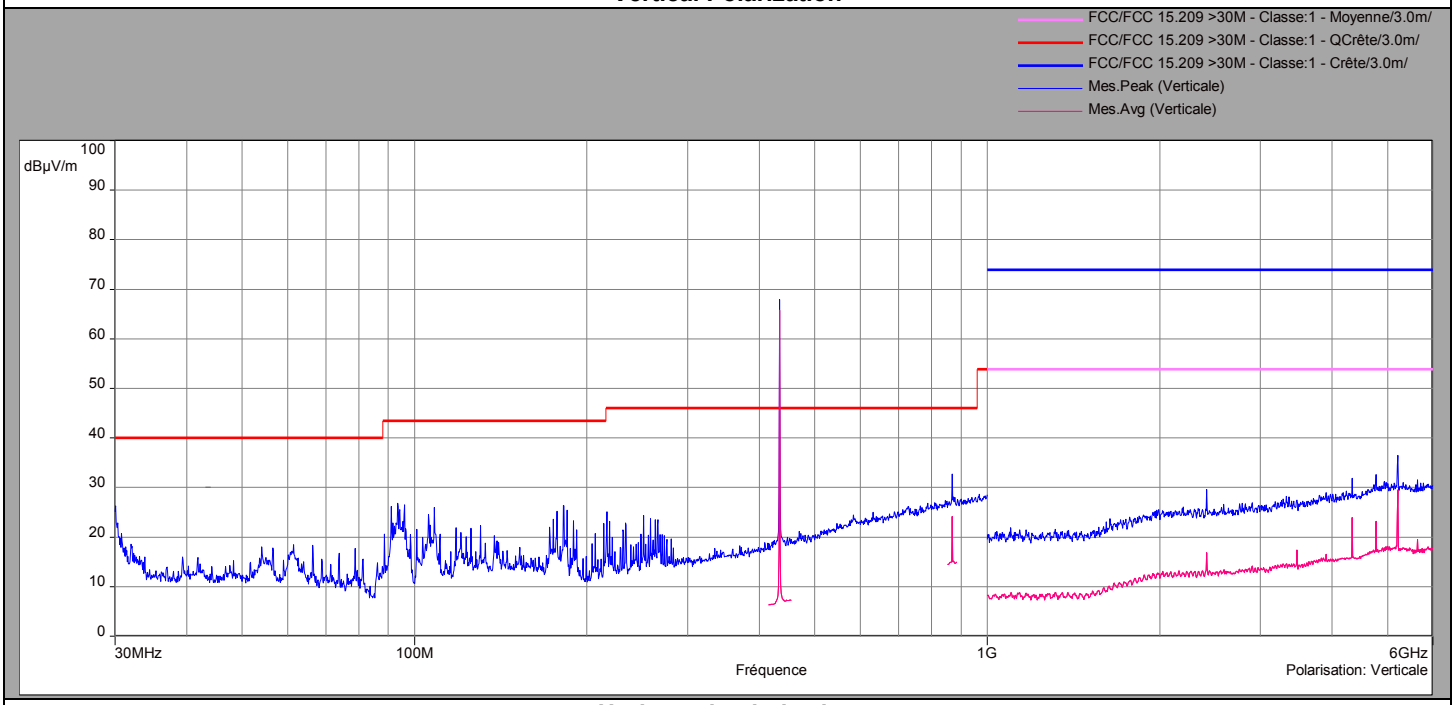
7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

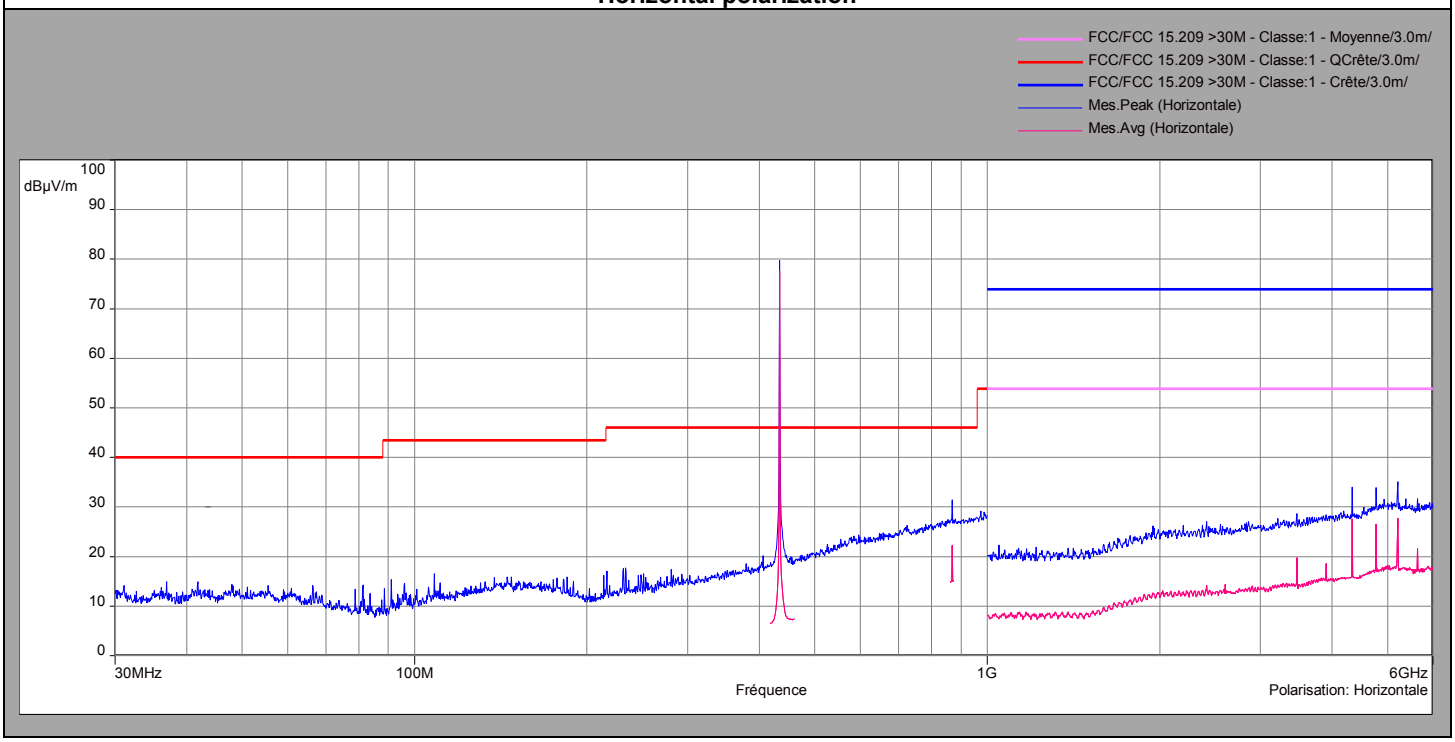
7.6. RESULTS

Cnom

Vertical Polarization



Horizontal polarization



	Field strength of fundamental signal							
	Cnom							
Polarization	Frequency (MHz)	Duty cycle correction (dB)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Average margin (dB)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak margin (dB)
V	433,92	-7,59	58,165	80,83	22,665	67,95	100,83	32,88
H	433,92	-7,59	69,98	80,83	10,85	79,75	100,83	21,08

	Fied Harmonic of fundamental signal below 1GHz							
Polarization	Frequency (MHz)	Duty cycle correction (dB)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Average margin (dB)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak margin (dB)
V	867,74	-7,59	16,52	60,83	44,31	32,73	80,83	48,1
H	867,74	-7,59	14,6	60,83	46,23	31,42	80,83	49,41
V	2415	-7,59	9,25	60,83	51,58	29,61	80,83	51,22
V	3471	-7,59	9,77	60,83	51,06	27,44	80,83	53,39
H	3471	-7,59	12,16	60,83	48,67	28,65	80,83	52,18
V	4339	-7,59	16,35	60,83	44,48	31,85	80,83	48,98
H	4339	-7,59	19,99	60,83	40,84	34,07	80,83	46,76
V	4773	-7,59	15,63	60,83	45,2	32,58	80,83	48,25
H	4773	-7,59	18,92	60,83	41,91	33,9	80,83	46,93
V	5207	-7,59	21,94	60,83	38,89	36,49	80,83	44,34
H	5207	-7,59	20,14	60,83	40,69	35,13	80,83	45,7

7.7. CONCLUSION

Field strength of fundamental & Field strength of harmonics measurement performed on the sample of the product **VALEO** RFK1A, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

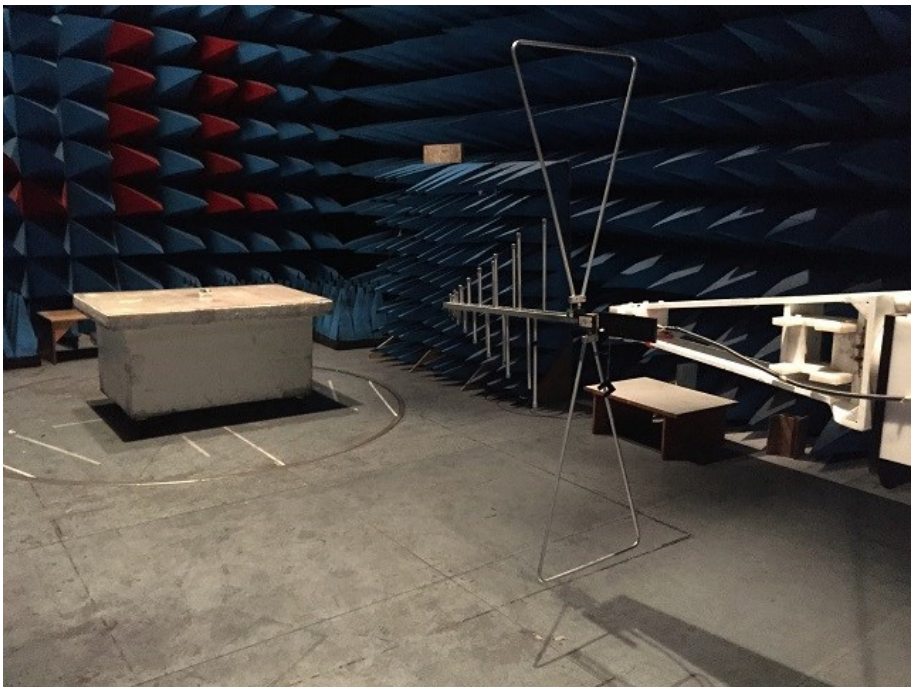
8. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

8.1. TEST CONDITIONS

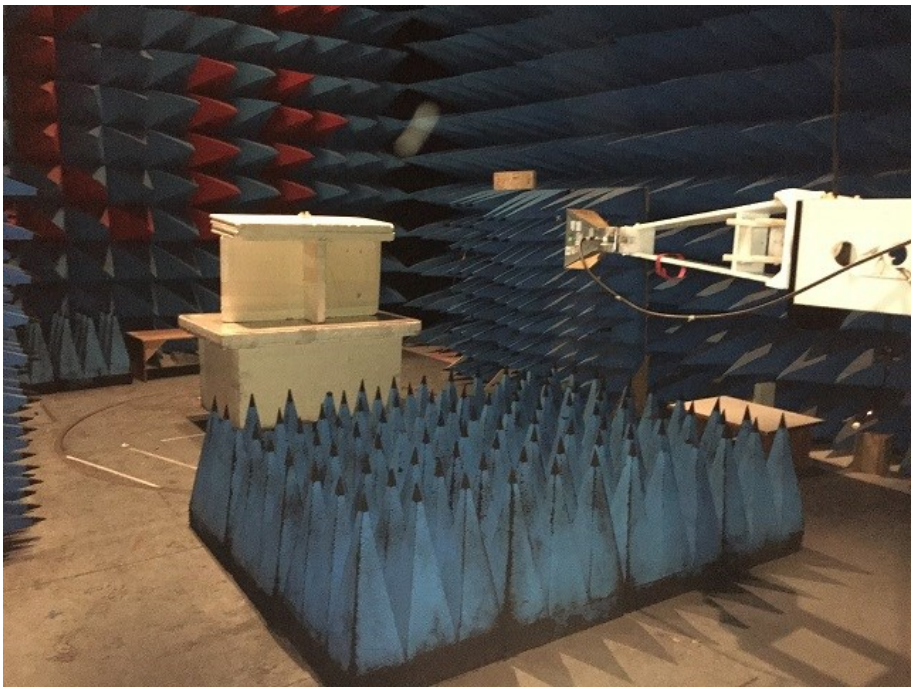
Test performed by : Julien PALARD
Date of test : September 17, 2018
Ambient temperature : 26 °C
Relative humidity : 47 %

8.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m.Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

8.3. LIMIT

Limit at 3m:

9kHz to 0,490MHz: 2400/F(kHz)µV/m (300m) or 20log(2400/F(kHz))dBµV/m (3m) QPeak
0,490MHz to 1.705MHz: 240000/F(kHz)µV/m (30m) or 20log(240000/F(kHz))dBµV/m (3m) QPeak
1.705MHz to 30MHz: 30µV/m (30m) or dBµV/m (3m) QPeak
30MHz to 88MHz: 40dBµV/m QPeak
88MHz to 216MHz: 43,5dBµV/m QPeak
216MHz to 960MHz: 46dBµV/m QPeak
960MHz to 1000MHz: 54dBµV/m QPeak
Above 1000MHz: 74dBµV/m Peak
54dBµV/m Average

Limit at 10m:

30MHz to 88MHz: 29.5dBµV/m QPeak
88MHz to 216MHz: 33dBµV/m QPeak
216MHz to 960MHz: 35.5dBµV/m QPeak
960MHz to 1000MHz: 43.5dBµV/m QPeak
Above 1000MHz: 63.5BµV/m Peak
43.5BµV/m Average

8.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
SEMI ANECHOIC CHAMBER	SIEPEL	ZONE HOMOGENE	D3044008	2018/06	2019/06
EMI receiver	ROHDE & SCHWARZ	ESR7	A2642026	2017/02	2019/02
Loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	201/12	2019/12
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2020/04
Horn antenna	EMCO	3115	C2042018	2018/04	2019/04
Preamplifier	LCIE	-	A7086012	2018/03	2019/03
Cable	-	-	A5329711	2018/06	2019/06
Cable	-	-	A5329436	2018/03	2019/03
Cable	-	-	C2042018	2018/06	2019/06
High Pass Filter 433MHz	WAINWRIGHT	WHKE5-460	A7484071	2017/03	2019/03

Note: In our quality system, the test equipment calibration due is more & less 2 months

8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

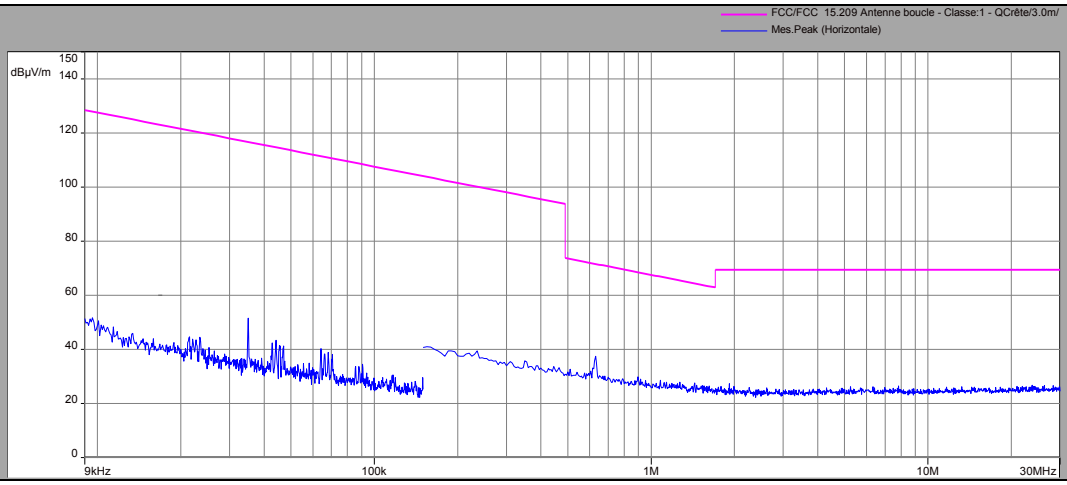
☑ None ☐ Divergence:

8.6. RESULTS

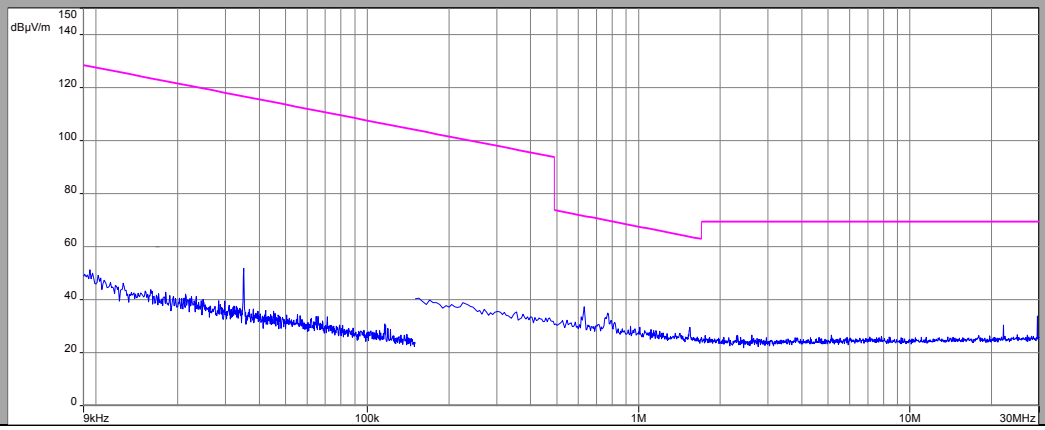
9kHz – 30 MHz

Cmin

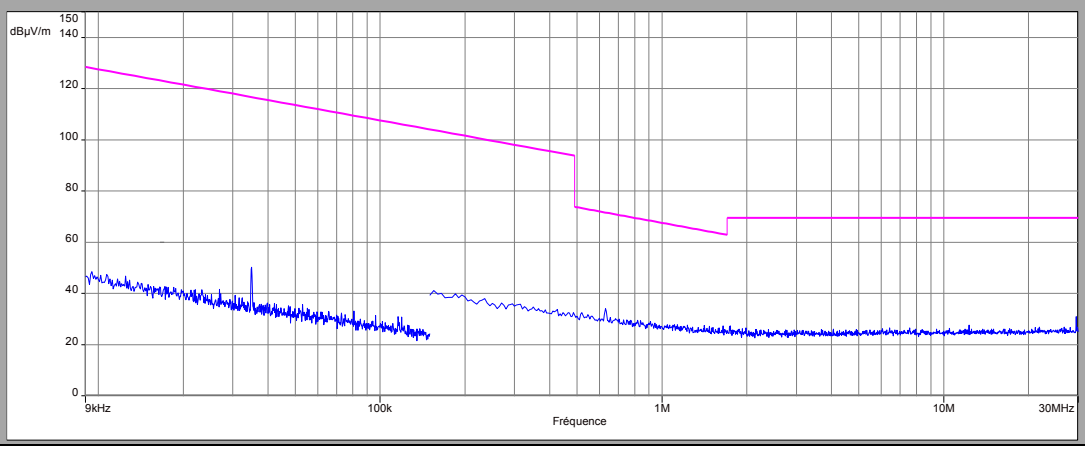
Parallel Polarization



Perpendicular polarization



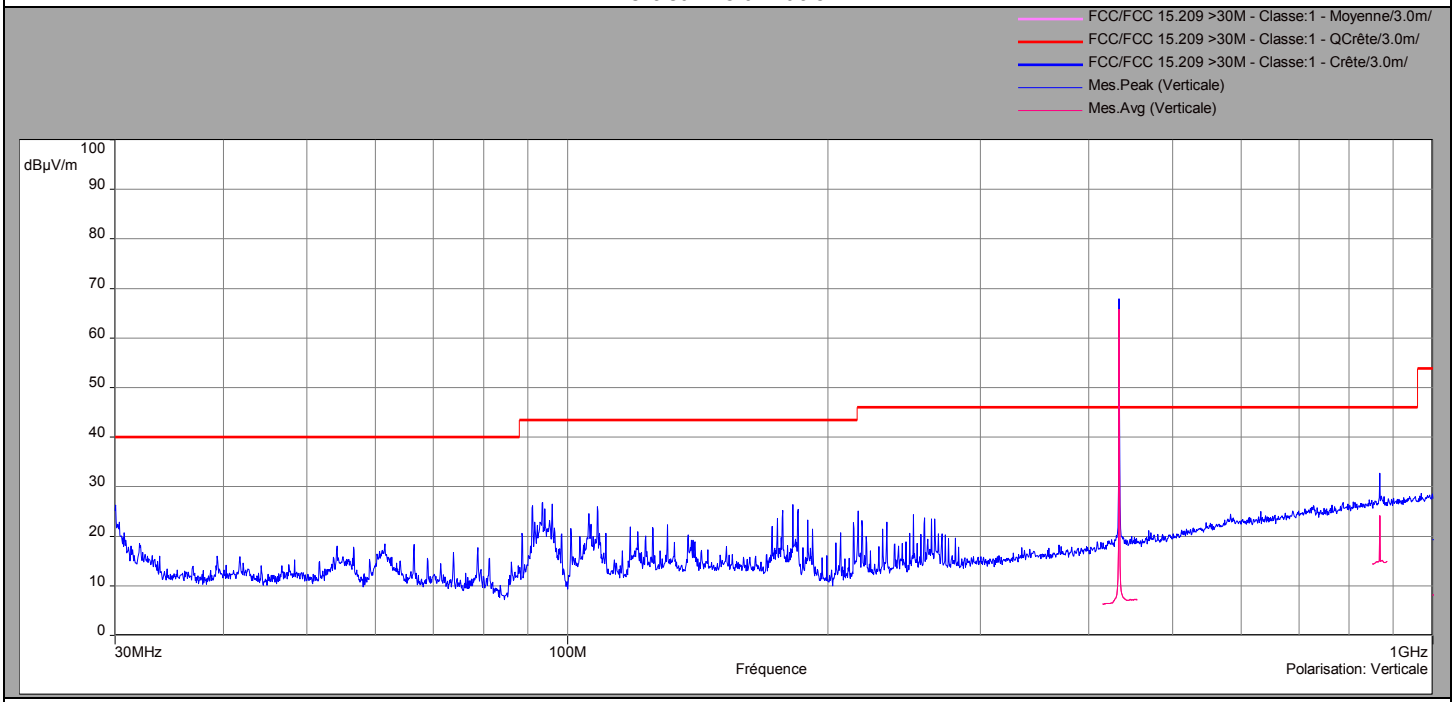
Ground Parallel polarization



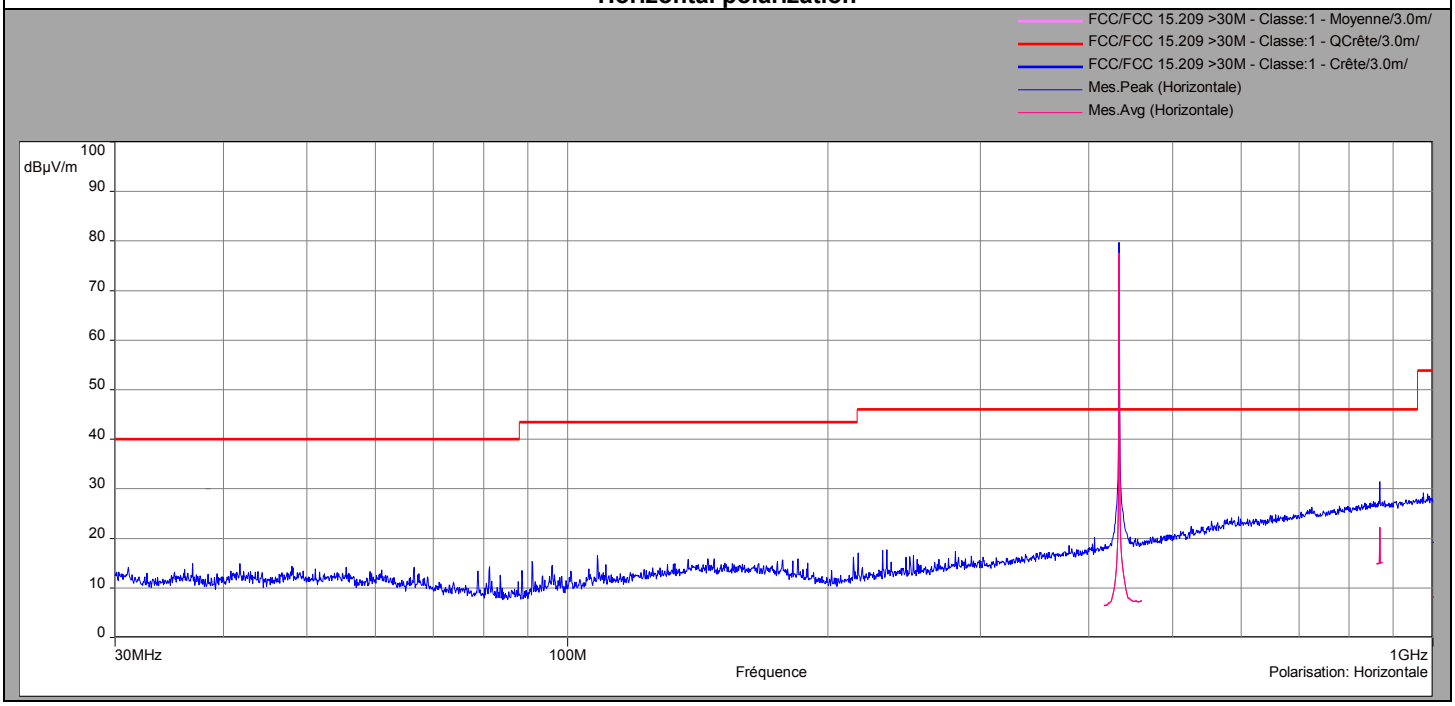
Below 1GHz

Cnom

Vertical Polarization



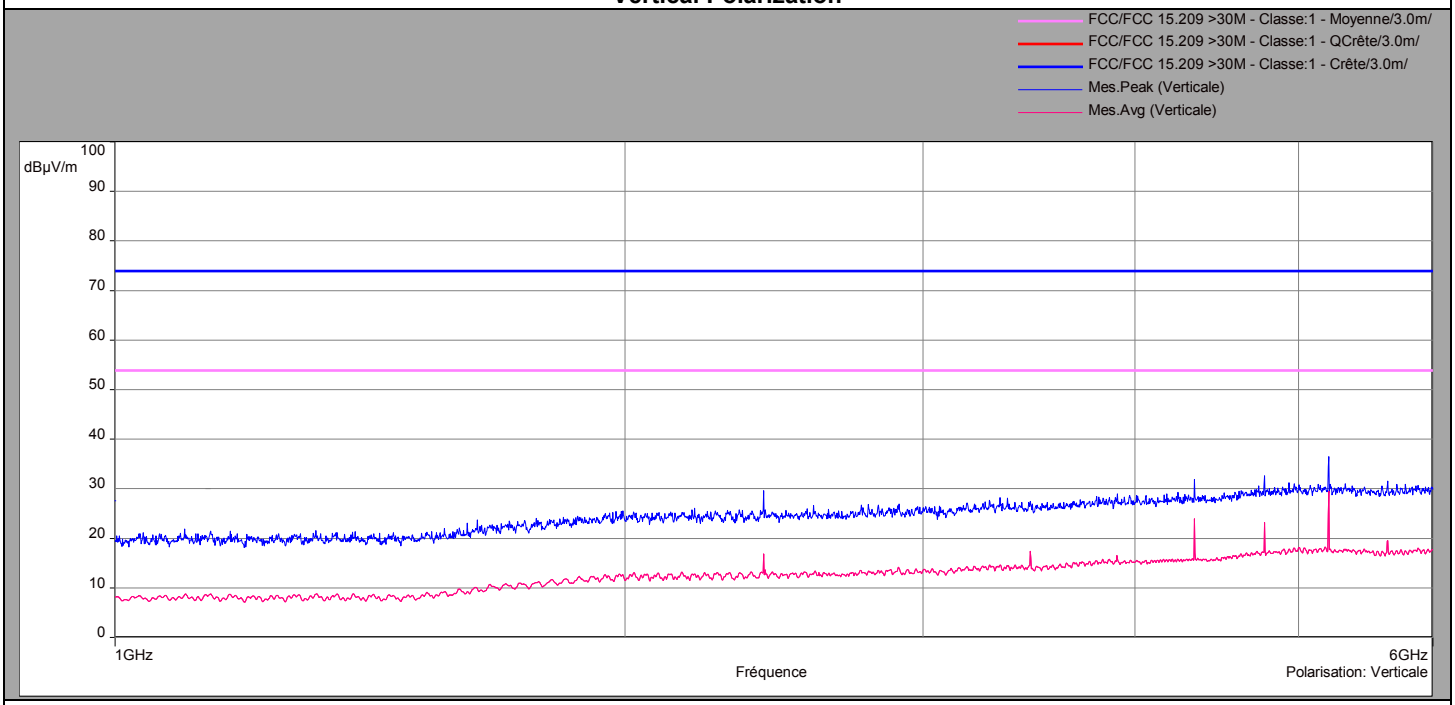
Horizontal polarization



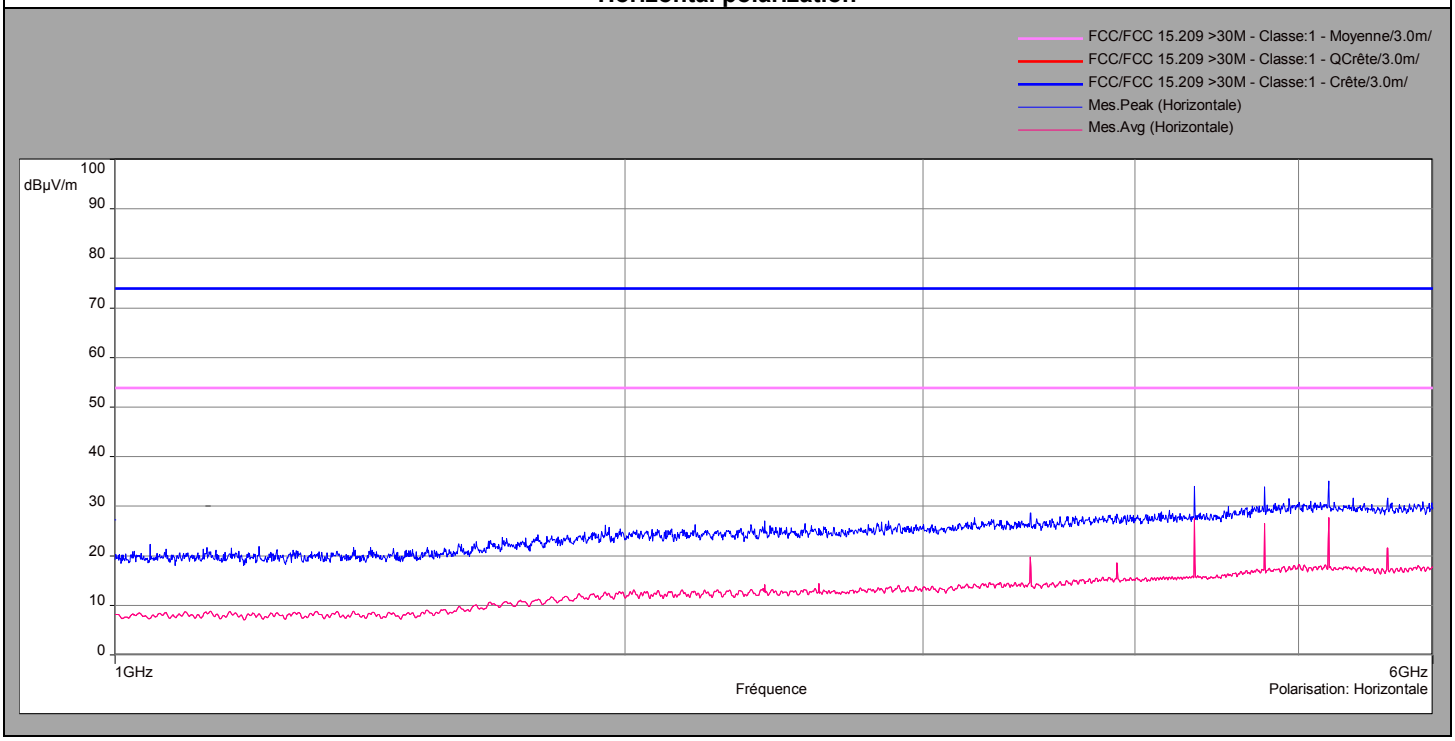
Above 1GHz

Cnom

Vertical Polarization



Horizontal polarization



9kHz – 30 MHz					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dBµV/m)**
all emissions were greater than 20 dB below the limit					

Below 1GHz					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
V	91,1	26,15	-	43,5	17,35
V	93,5	26,86	-	43,5	16,64
V	108,3	25,96	-	43,5	17,54
V	182,1	26,44	-	43,5	17,06
V	216,56	25,07	-	46	20,93
V	251,06	24,98	-	46	21,02

Above 1GHz						
Polarization	**Frequency (MHz)**	**Duty cycle correction (dB)**	**Average Level (dBµV/m)**	**Average Limit (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**
all emissions were greater than 20 dB below the limit *						

*Spurious observed have been already reported in clause 7 - FIELD STRENGHT OF EMISSION & FIELD STRENGHT OF HARMONICS

8.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **VALEO** RFK1A, SN: **E1265 67**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

9. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) ±x(dB) / (Hz)/ ms	Uncertainty limit
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2,67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	2,67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3,67	5.0
Measurement of conducted disturbances in current (current clamp)	2,73	2.9
Measurement of disturbance power	2,67	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4,48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4,48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site	5.16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuelles)	4,99	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01	5,16	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01	5,15	6.3
Measurement of radiated electric field from 1 to 6 GHz C01	5,1	5.2
Measurement of radiated electric field from 1 to 6 GHz V01	4,85	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)	4,48	/

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report