TEST REPORT

N°: 156049-722888 **Version : 01**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5**
Issued to	**SAGEMCOM** 250 ROUTE DE L'EMPEREUR 92500 – RUEIL MALMAISON FRANCE
Apparatus under test	
Product	IOT LORA ENDPOINT
Trade mark	**SAGEMCOM**
Manufacturer	**SAGEMCOM**
Model under test	**ATGHMP915 V2**
Serial number	**proto**
FCC ID	**VW3-ATGHMP915V2**
IC	**9140A-ATGHMP915V2**
Test date	: June 18, 2018 to October 11, 2018
Test location	6230B-1
Composition of document	133 pages
Document issued on	October 18, 2018

Written by :
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Approved by :
Arnaud FAYETTE
Technical manager

PUBLICATION HISTORY

Version	Date	Author	Modification
01	June 29, 2018	Mathieu CERISIER	Creation of the document

SUMMARY

1. TEST PROGRAM

References

- **47 CFR Part 15.247**
- **RSS 247 Issue 2**
- **RSS Gen Issue 5**
- **KDB 558074 D01 DTS Meas Guidance v05**
- **ANSI C63.10-2013**

Radio requirement DTS mode:

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
6dB Bandwidth	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Duty Cycle	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands	☑ 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)
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

Radio requirement Hybrid mode 125kHz :

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
20dB Bandwidth	☐ PASS	☐ FAIL	☑ NA(2)	☐ NP(1)
Number of Hopping Frequency	☐ PASS	☐ FAIL	☑ NA(2)	☐ NP(1)
Carrier Frequency Separation	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Time of Occupancy	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Duty Cycle	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission	☐ PASS	☐ FAIL	☑ NA(3)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands	☑ 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): Not applicable for Hybrid mode
(3): 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

Radio requirement Hybrid mode 500kHz :

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
20dB Bandwidth	☐ PASS	☐ FAIL	☑ NA(2)	☐ NP(1)
Number of Hopping Frequency	☐ PASS	☐ FAIL	☑ NA(2)	☐ NP(1)
Carrier Frequency Separation	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Time of Occupancy	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Duty Cycle	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission	☐ PASS	☐ FAIL	☑ NA(3)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands	☑ 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): Not applicable for Hybrid mode
(3): 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):
SAGEMCOM ATGHMP915 V2 **Serial Number: proto**

Equipment Under Test

Equipment information:

Type:	**DTS**			
Frequency band:	[902 – 928] MHz			
Number of Channel:	8			
Spacing channel:	1.6 MHz			
Channel bandwidth:	500 kHz			
Type:	**Hybrid mode 125 kHz**			
Frequency band:	[902 – 928] MHz			
Number of Channel:	64			
Spacing channel:	200 kHz			
Channel bandwidth:	125 kHz			
Type:	**Hybrid mode 500 kHz**			
Frequency band:	[902 – 928] MHz			
Number of Channel:	8			
Spacing channel:	1,6 MHz			
Channel bandwidth:	500 kHz			
Antenna Type:	☑ Integral	☐ External	☐ Dedicated	
Antenna connector:	☐ Yes	☑ No	☐ Temporary for test	
Transmit chains:	☑ 1	☐ 2		
Receiver chains	☑ 1	☐ 2		
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined	
Ad-Hoc mode:	☐ Yes	☑ No		
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty	
Equipment type:	☑ Production model	☐ Pre-production model		
Operating temperature range:	Tmin:	☑ -20°C	☐ 0°C	☐ X°C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☐ 55°C	☑ 70°C
Type of power source:	☐ AC power supply	☐ DC power supply	☑ Battery	
Operating voltage range:	Vnom:	☐ 120V/60Hz	☑ 3 Vdc	

Antenna Characteristic			
Antenna assembly	**Gain (dBi)**	**Frequency Band (MHz)**	**Impedance(Ω)**
1	-1,5	902-928	50

CHANNEL PLAN (DTS)	
Channel	**Frequency (MHz)**
Cmin	903.0
Cmid	907.8
Cmax	914.2

CHANNEL PLAN (Hybrid mode 125 kHz)	
Channel	**Frequency (MHz)**
Cmin	902.3
Cmid	908.7
Cmax	914.9

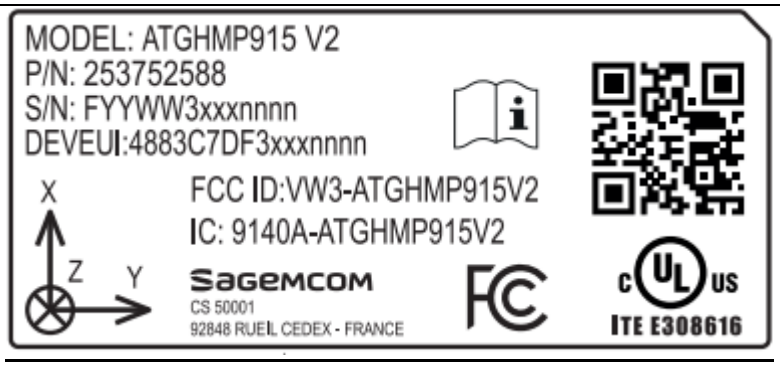
CHANNEL PLAN (Hybrid mode 500 kHz)	
Channel	**Frequency (MHz)**
Cmin	903.0
Cmid	907.8
Cmax	914.2

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
- Permanent emission with modulation on hopping channel in the data rate that produced the highest power

See document : « NE_Endpoint-LoRa-Siconia-V2_Pres-ESSAIS-REGUL-US_edD.docx » for further explanation on test mode.

2.3. EQUIPMENT LABELLING



2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. DTS : OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

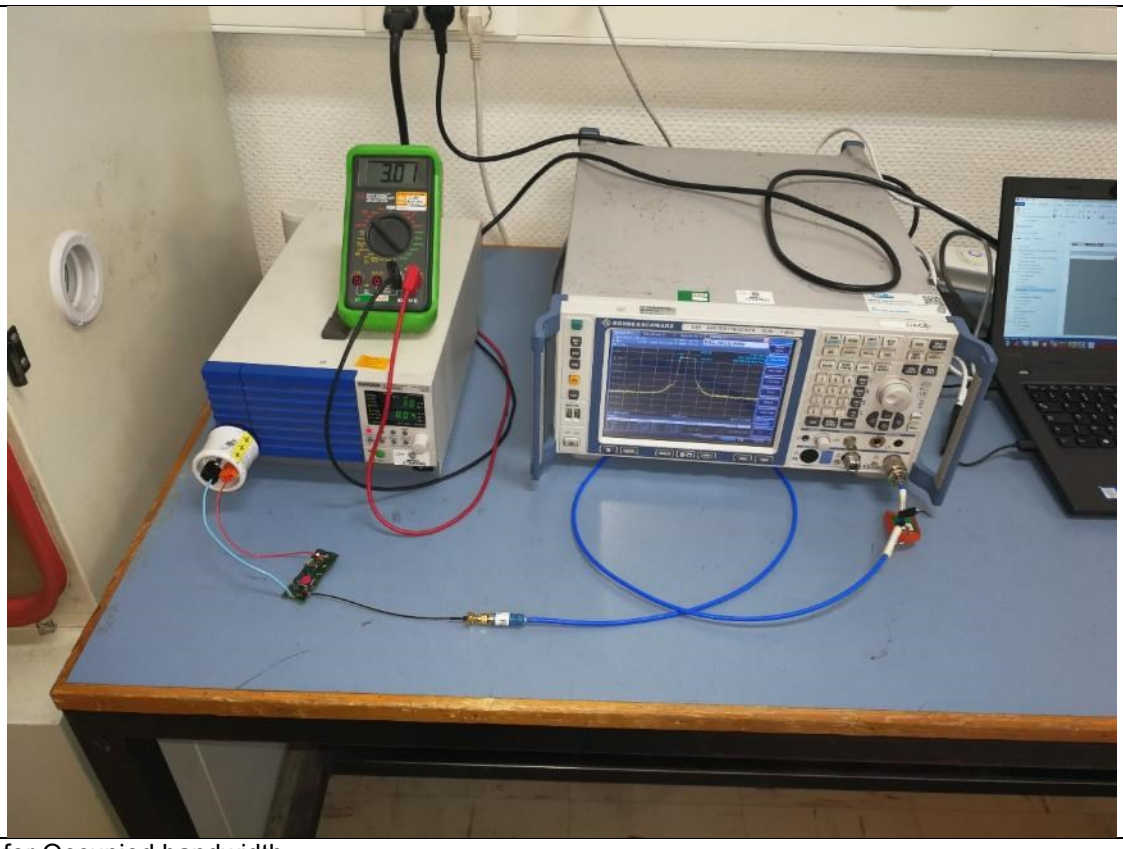
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

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
☑ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth

3.3. *LIMIT*

None

3.4. TEST EQUIPMENT LIST

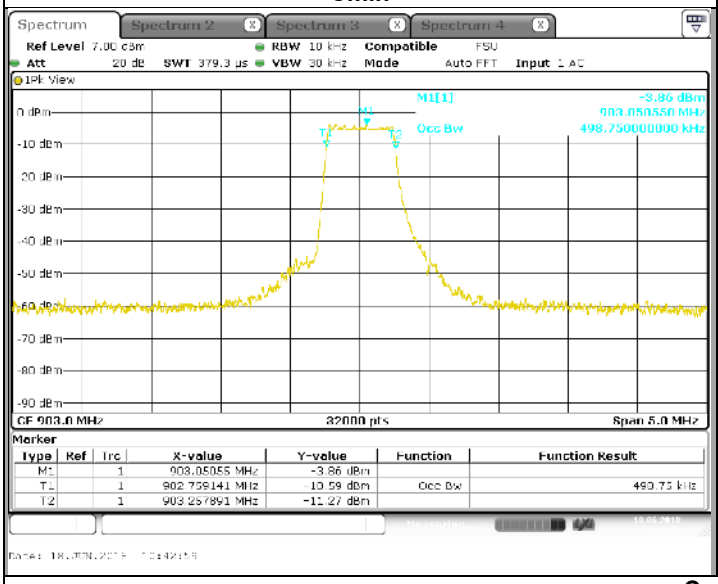
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

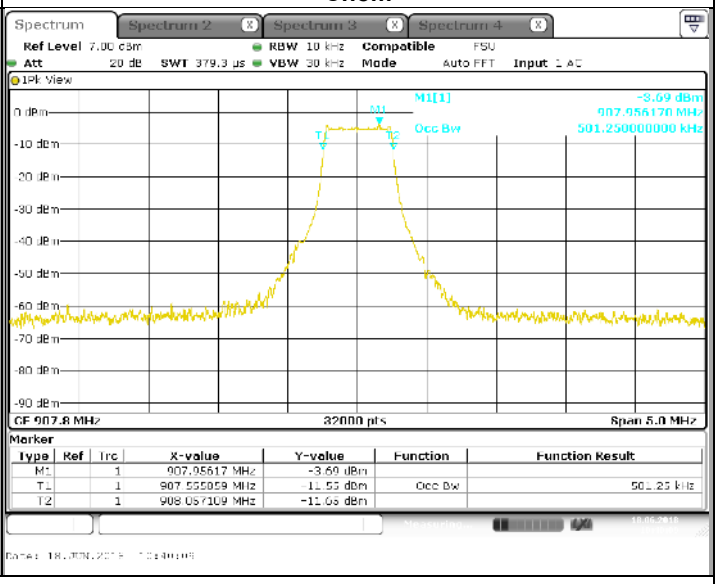
3.5. RESULTS

Occupied Bandwidth

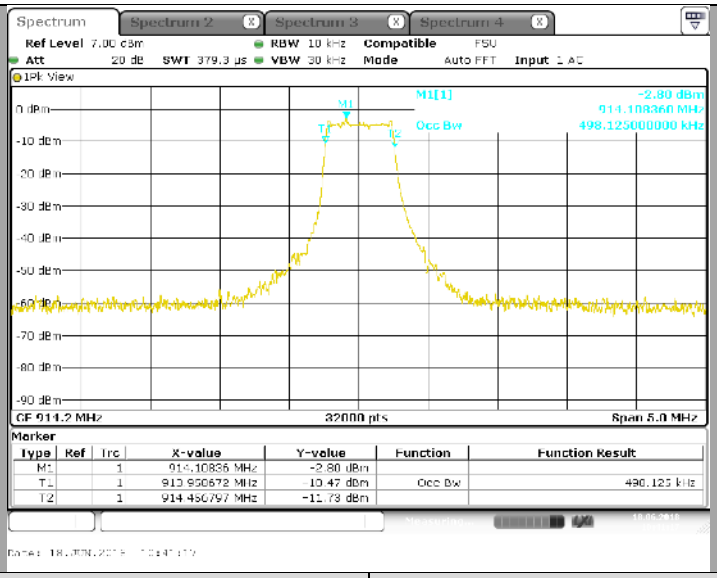
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	0,499
Cnom	0,501
Cmax	0,498

3.6. *CONCLUSION*

Occupied Channel Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

4. DTS : 6DB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

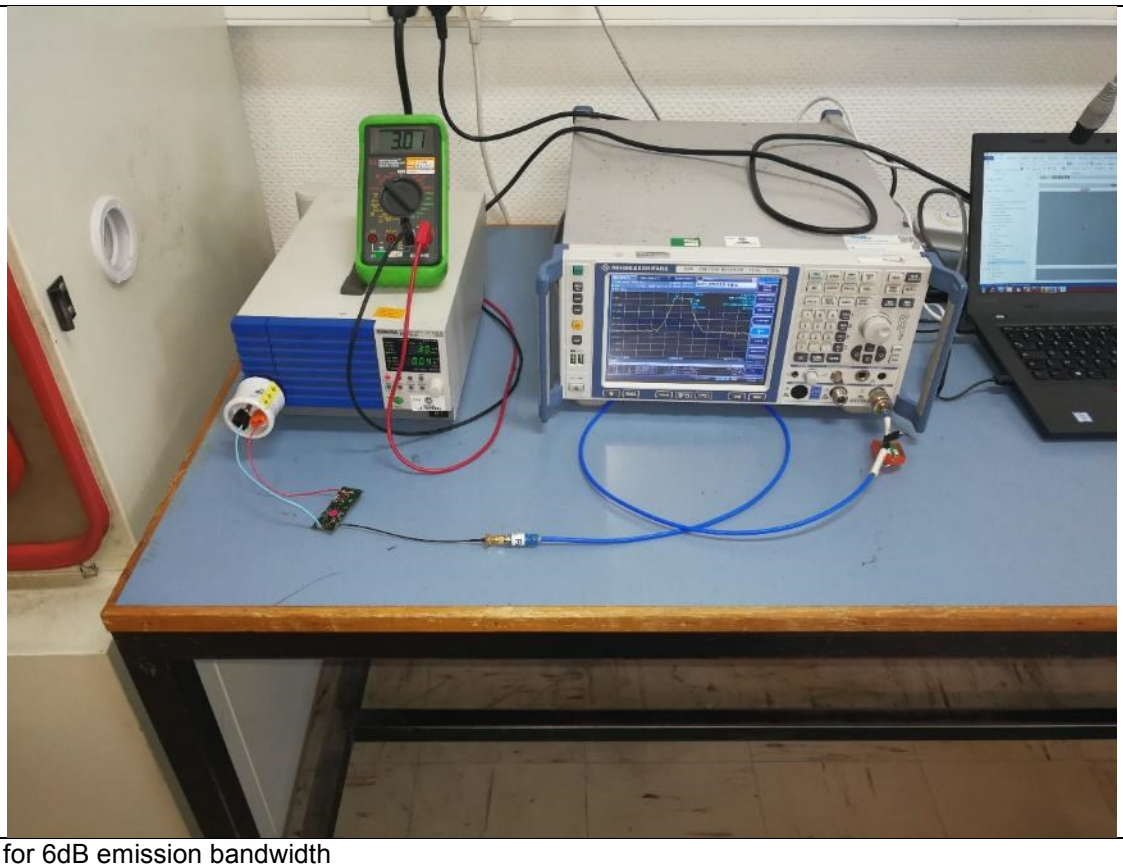
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

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:
☑ KDB 558074 D01 DTS Meas Guidance v05 § 8.1
☐ KDB 558074 D01 DTS Meas Guidance v05 § 8.2



Photograph for 6dB emission bandwidth

4.3. LIMIT

The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

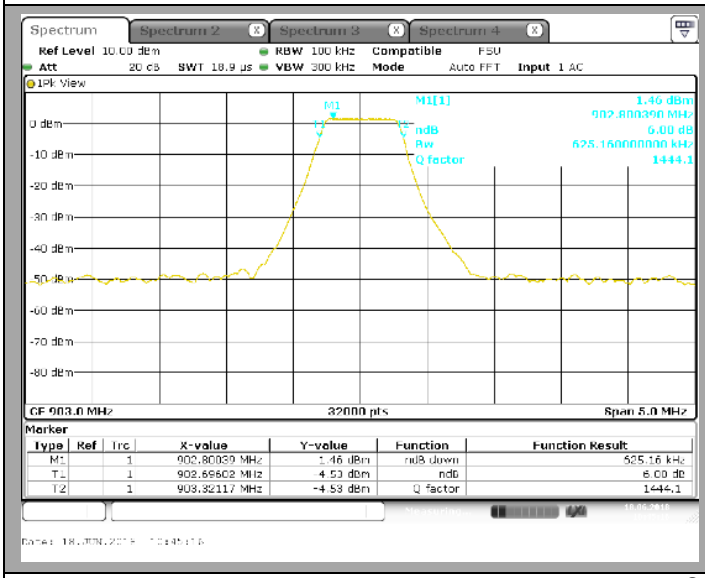
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

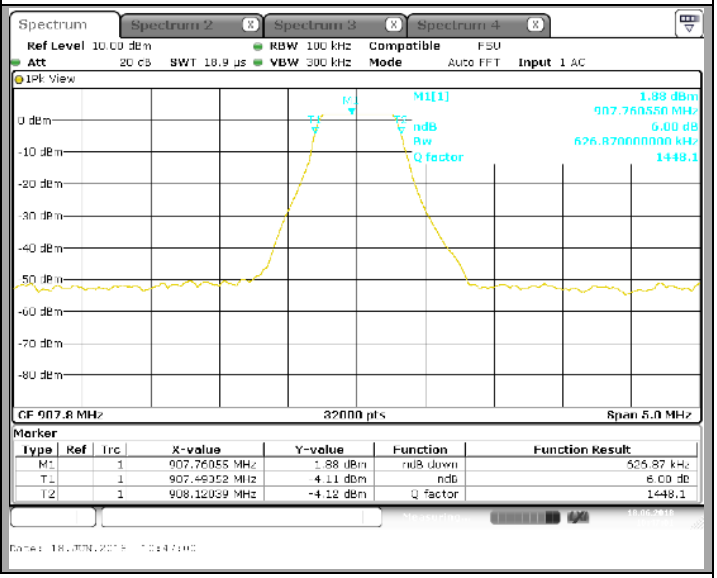
4.5. RESULTS

6dB Emission Bandwidth

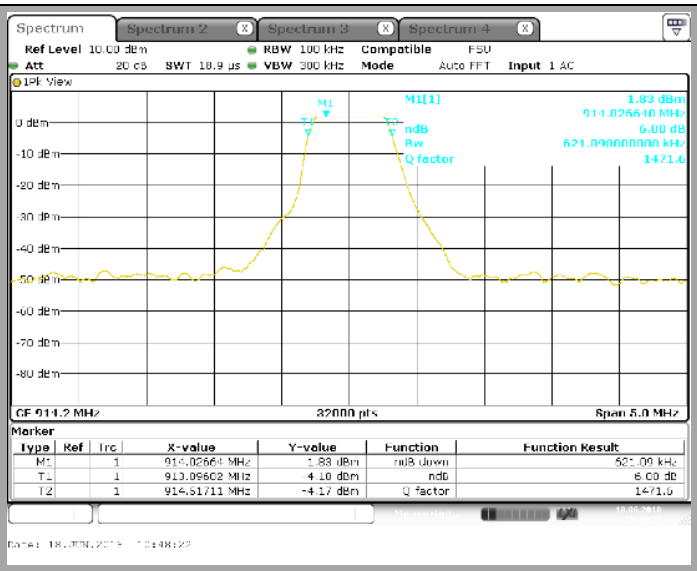
Cmin



Cnom



Cmax



Channel	6dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	0,625	Minimum 0.5
Cnom	0,627	Minimum 0.5
Cmax	0,621	Minimum 0.5

4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

5. DTS : DUTY CYCLE

5.1. TEST CONDITIONS

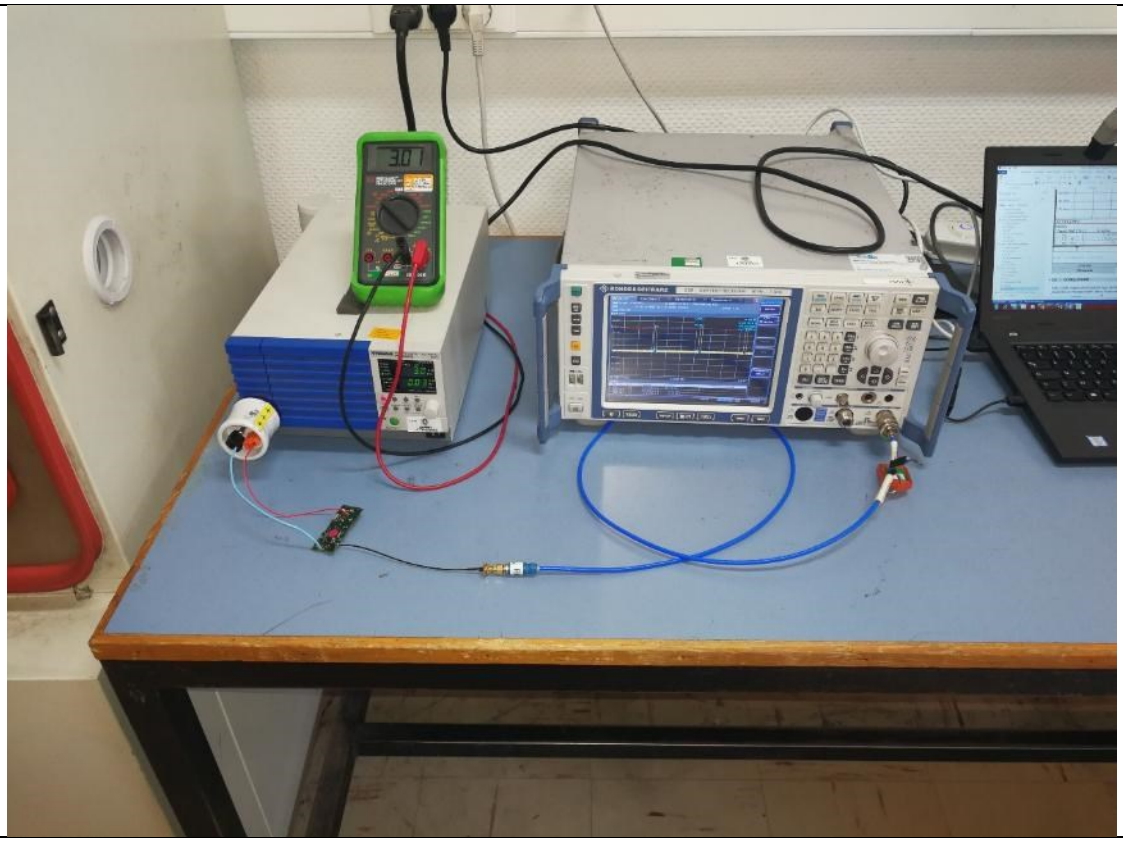
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

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:
☑ KDB 558074 D01 DTS Meas Guidance v05 § 6.0 b)



Photograph for Duty Cycle

5.3. LIMIT

None

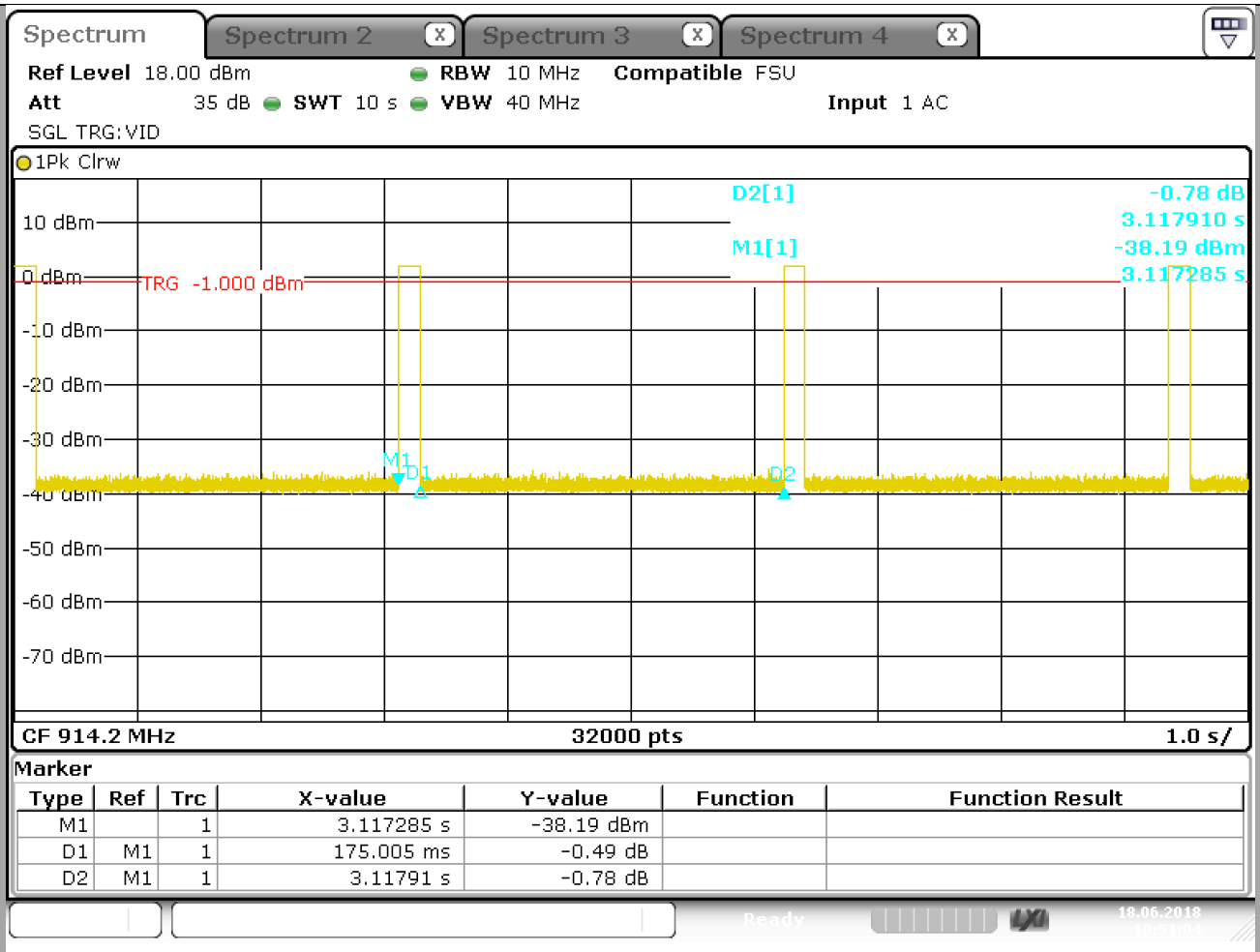
5.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

5.5. RESULTS

Duty Cycle
Cmax



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	5,61	25,02

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

6. DTS : MAXIMUM CONDUCTED OUTPUT POWER

6.1. TEST CONDITIONS

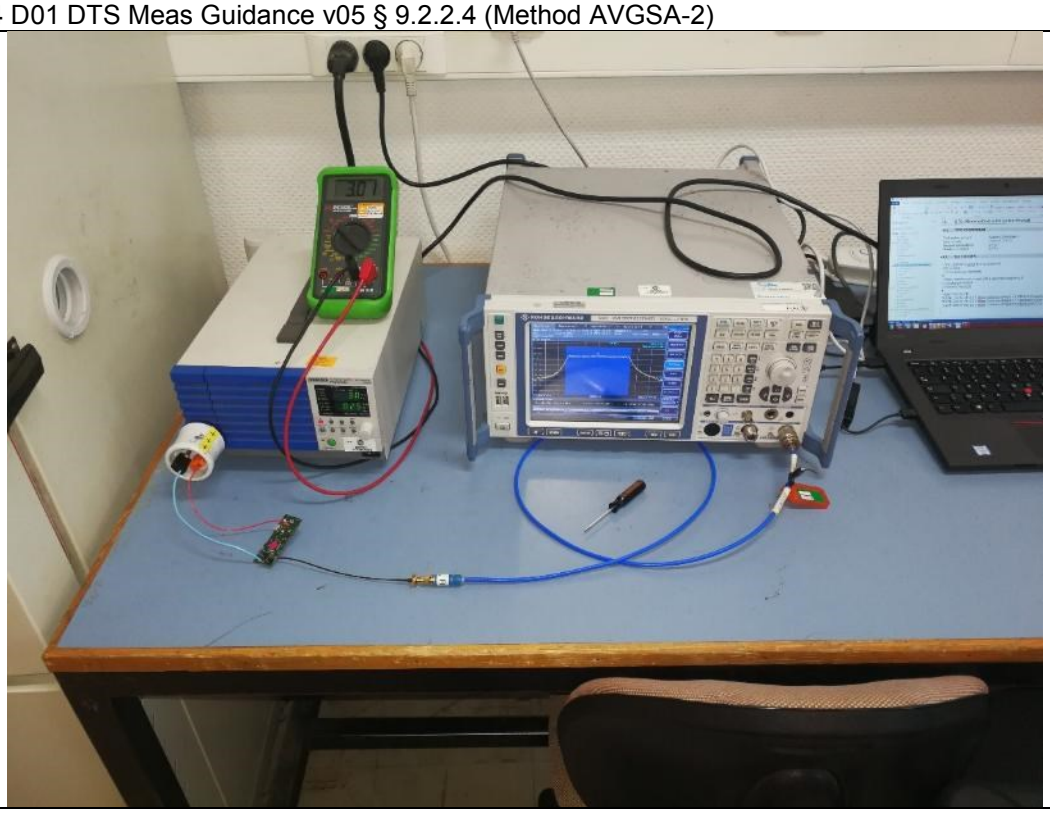
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

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:
☐ KDB 558074 D01 DTS Meas Guidance v05 § 9.1.1 (RBW≥DTS bandwidth)
☑ KDB 558074 D01 DTS Meas Guidance v05 § 9.2.2.2 (Method AVGSA-1)
☐ KDB 558074 D01 DTS Meas Guidance v05 § 9.2.2.4 (Method AVGSA-2)



Photograph for Maximum Conducted Output Power

6.3. LIMIT

Maximum Conducted Output power:
2400MHz-2483.5MHz: Shall not exceed 30dBm
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

6.4. TEST EQUIPMENT LIST

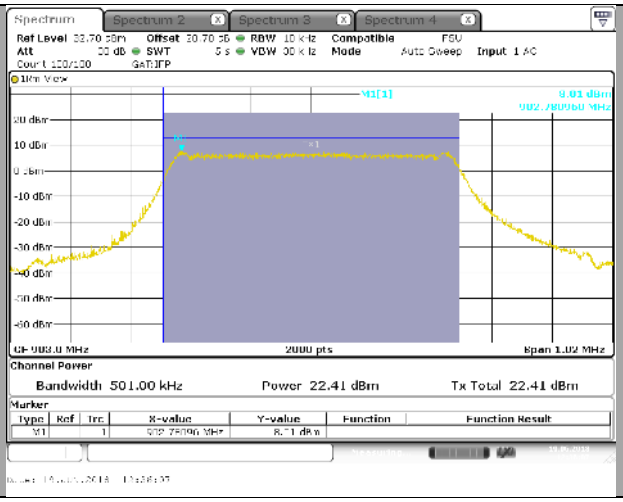
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

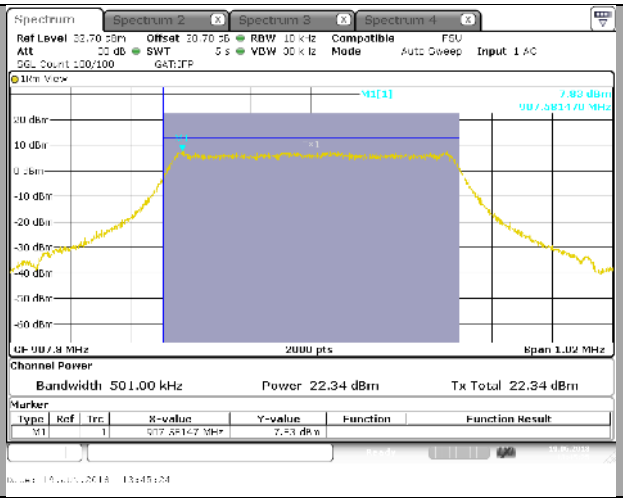
6.5. RESULTS

Maximum Conducted Output Power

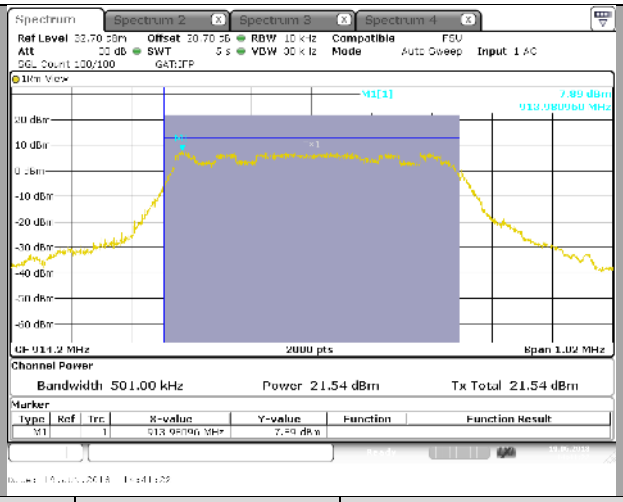
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**20,7**	-1.5	22,41	30
Cnom	**20,7**	-1.5	22,34	30
Cmax	**20,7**	-1.5	21,54	30

6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

7. DTS : POWER SPECTRAL DENSITY

7.1. TEST CONDITIONS

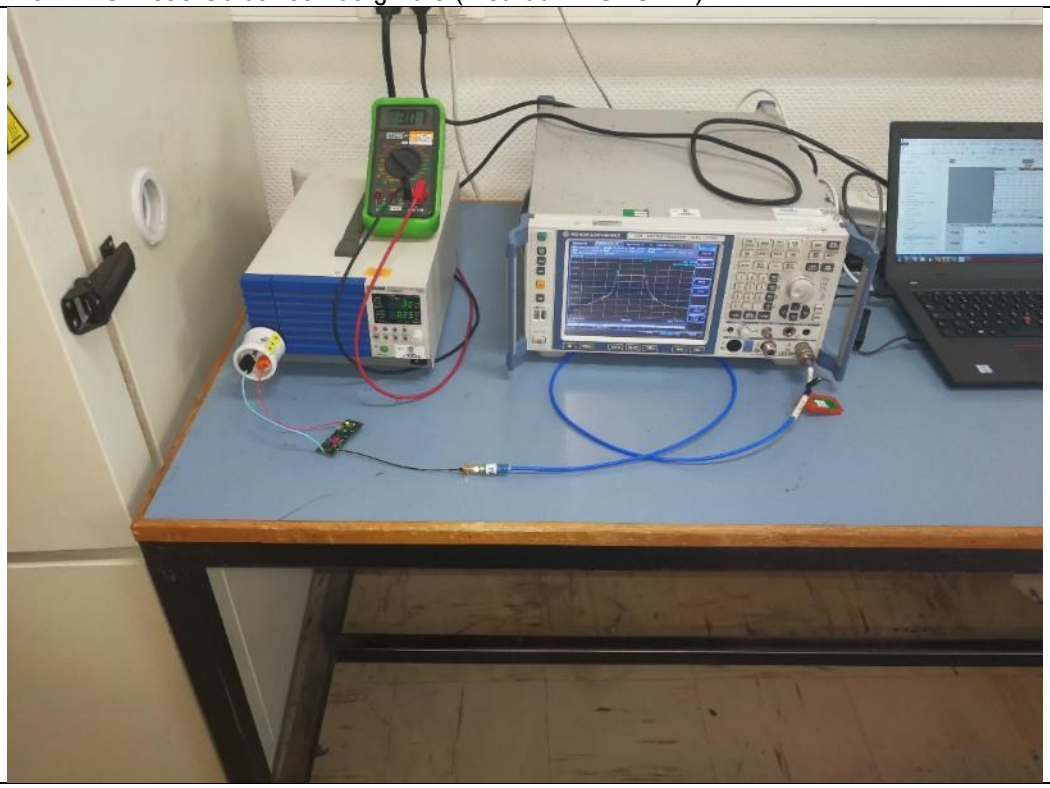
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

7.2. 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:
☐ KDB 558074 D01 DTS Meas Guidance v05 § 10.2 (Method PKPSD)
☑ KDB 558074 D01 DTS Meas Guidance v05 § 10.3 (Method AVGPSD-1)



Photograph for Power Spectral Density

7.3. LIMIT

Power Spectral Density:
2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

7.4. TEST EQUIPMENT LIST

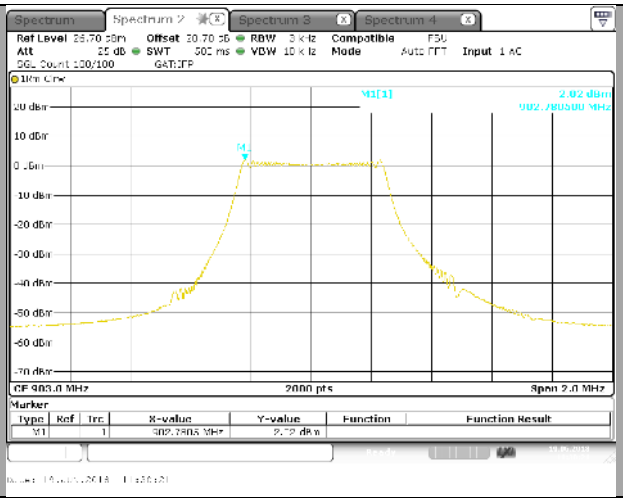
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

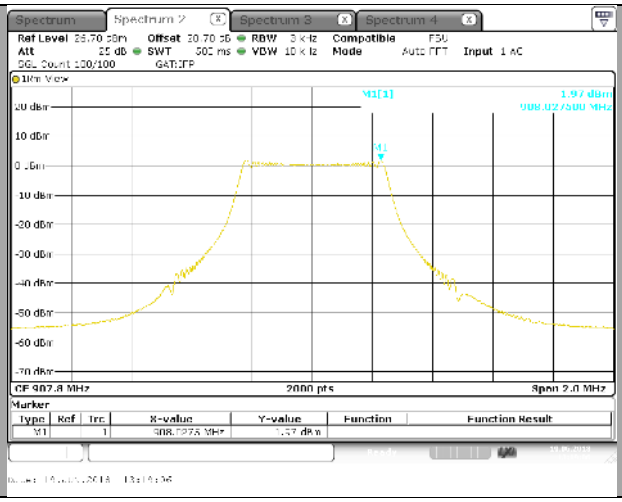
7.5. RESULTS

Power Spectral Density

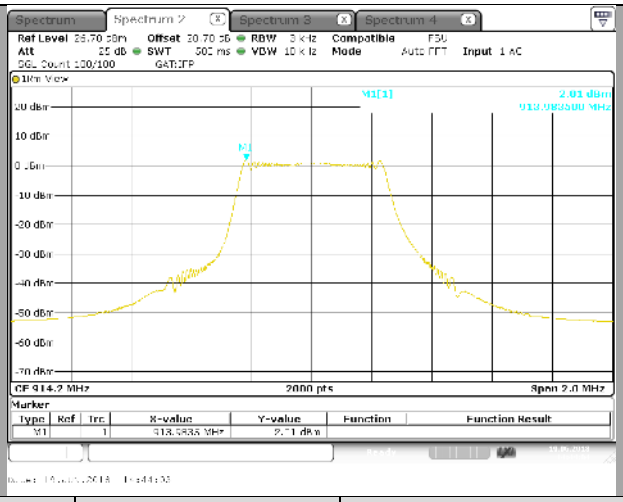
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**20,7**	-1,5	2,02	8
Cnom	**20,7**	-1,5	1,97	8
Cmax	**20,7**	-1,5	2,01	8

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

8. DTS : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

8.1. TEST CONDITIONS

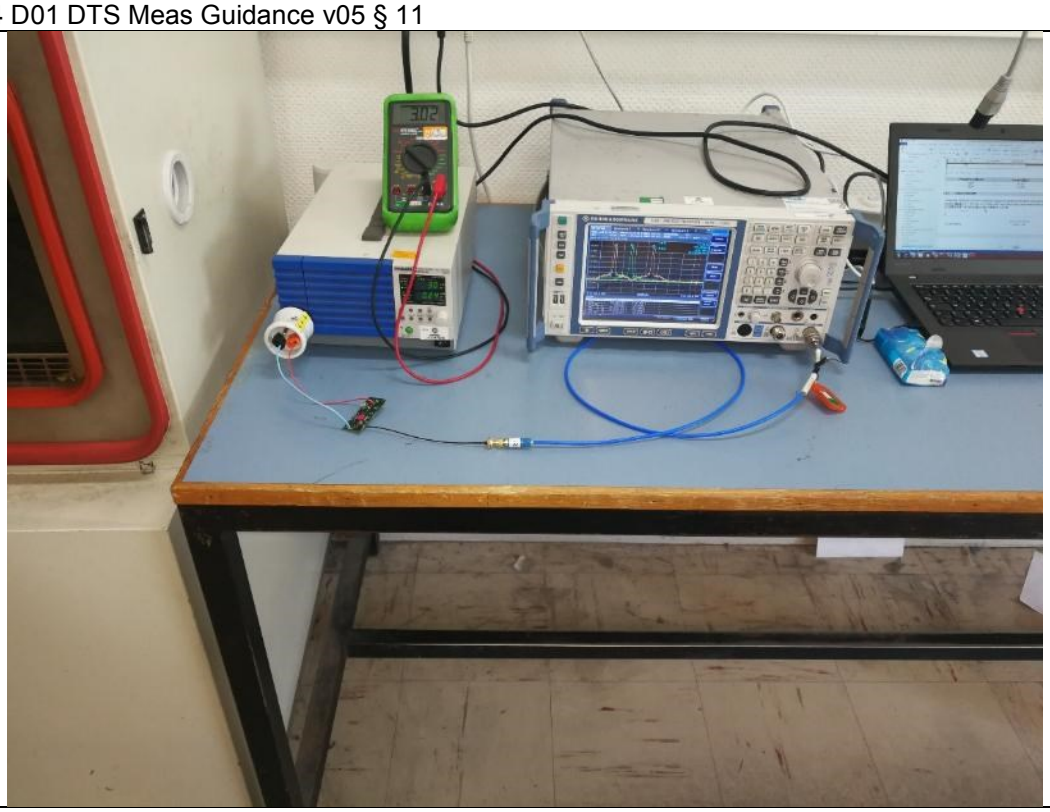
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

8.2. 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:
☑ KDB 558074 D01 DTS Meas Guidance v05 § 11



Photograph for Unwanted Emission into non-restricted frequency bands at the band edge

8.3. LIMIT

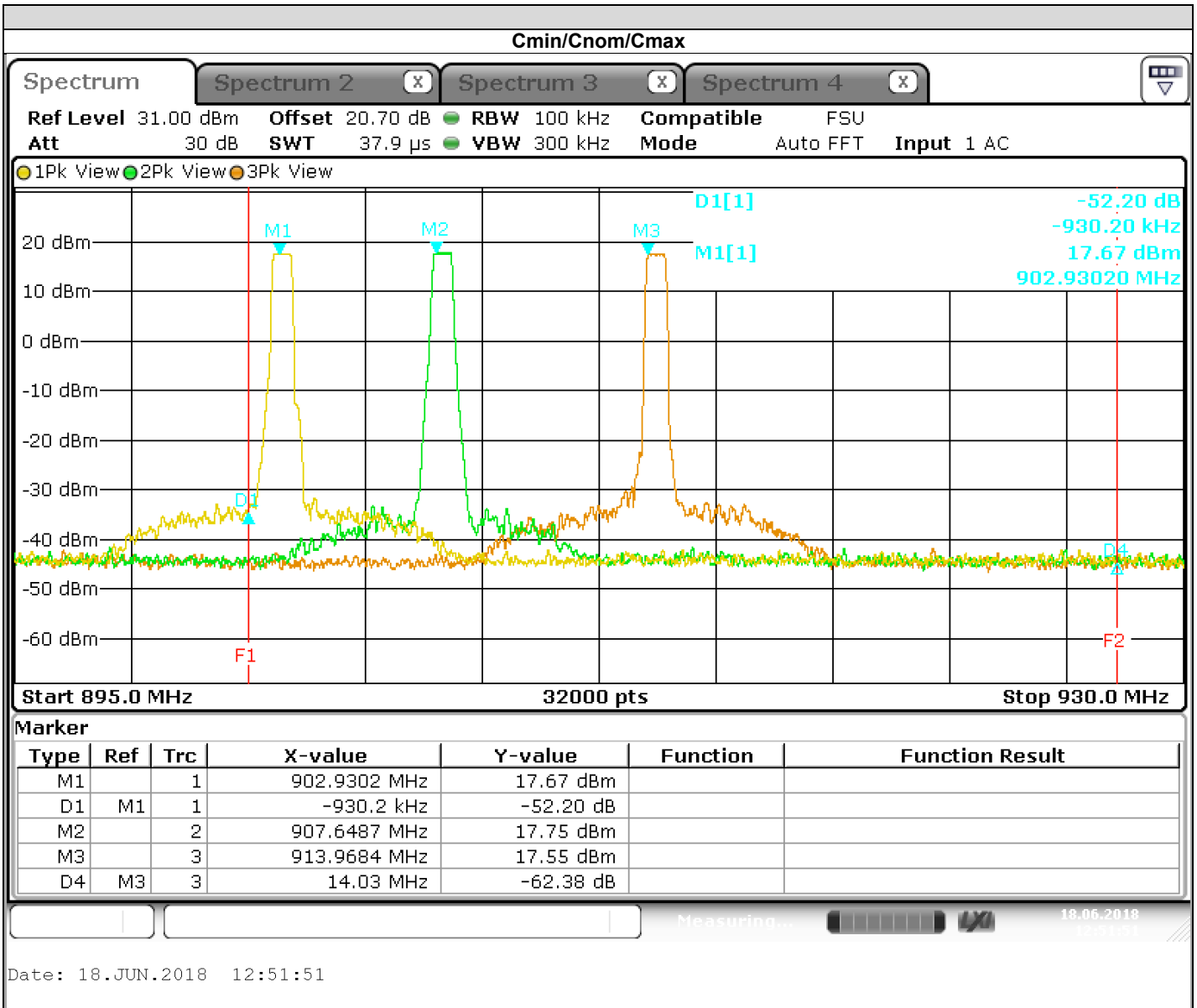
All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz”

8.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

8.5. RESULTS



Frequency (MHz)	Level (dBc)	Limit (dBc)
902	52,2	30
928	62,38	30

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

9. DTS : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

9.1. TEST CONDITIONS

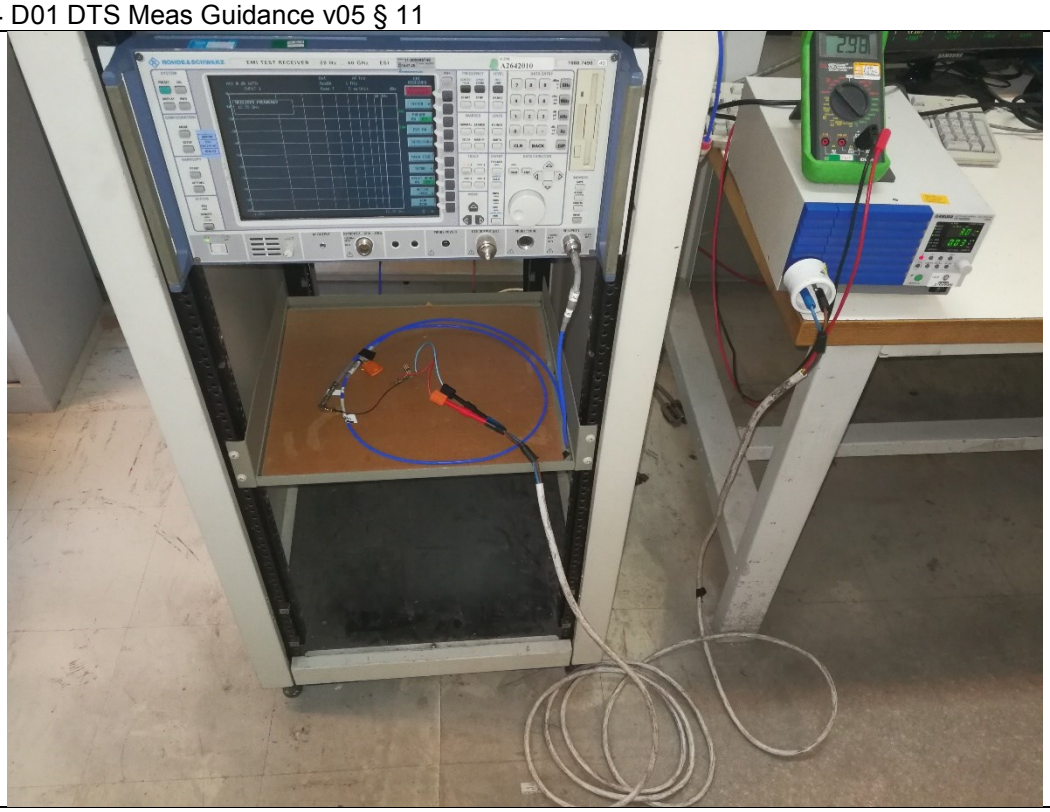
Test performed by : Mathieu CERISIER
Date of test : June 20, 2018
Ambient temperature : 23 °C
Relative humidity : 43 %

9.2. 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:
☑ KDB 558074 D01 DTS Meas Guidance v05 § 11



Photograph for Unwanted Emission into non-restricted frequency bands

9.3. LIMIT

All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level

9.4. TEST EQUIPMENT LIST

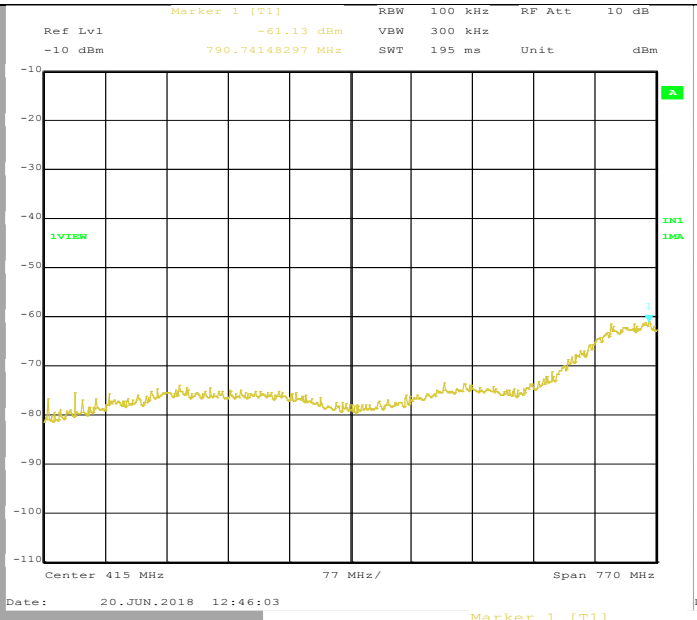
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2016/07	2018/07
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Cable Conducted S36 chamber	TELEDYNE	084-0555-2MTR	A5329758	2017/11	2018/11
Attenuator 3dB Cable Spurious Conducted	-	WA54-3-12	A7122223	2017/11	2018/11
High Pass Filter 868MHz	WAINWRIGHT	WHKX12-935	A7484069	2017/03	2019/03
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

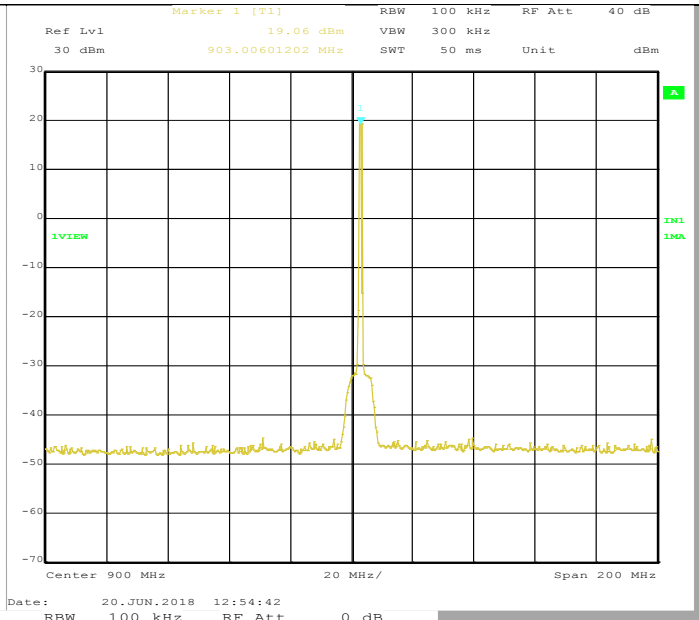
Note: In our quality system, the test equipment calibration due is more & less 2 months

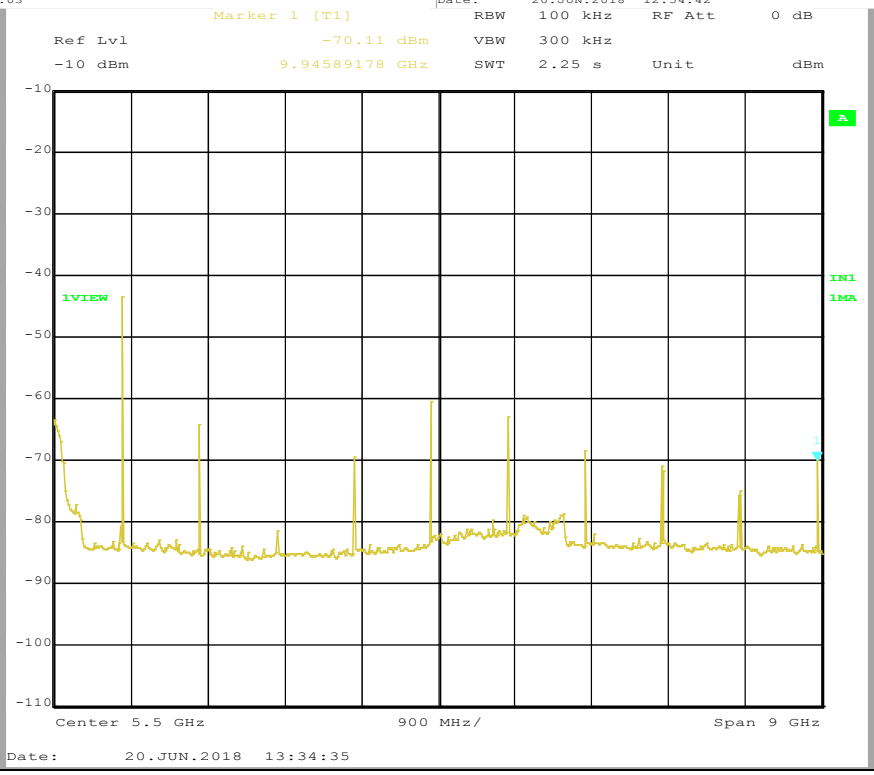
9.5. RESULTS

Conducted Spurious

Cmin

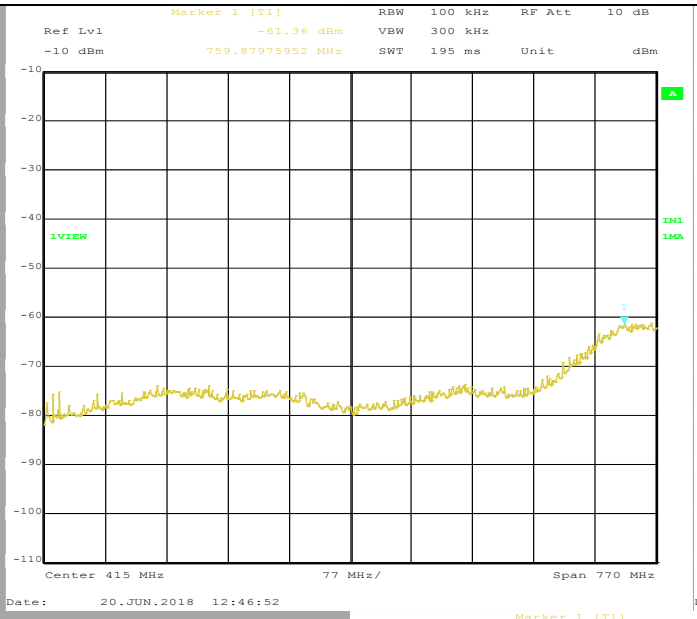


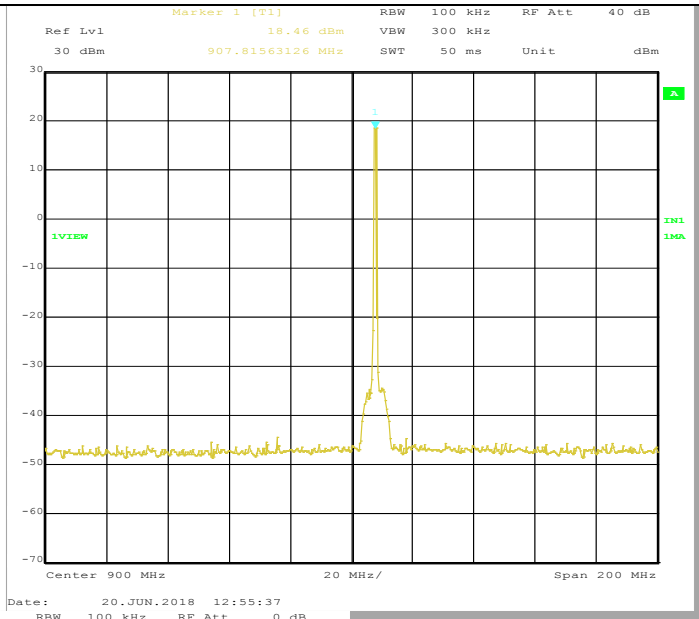


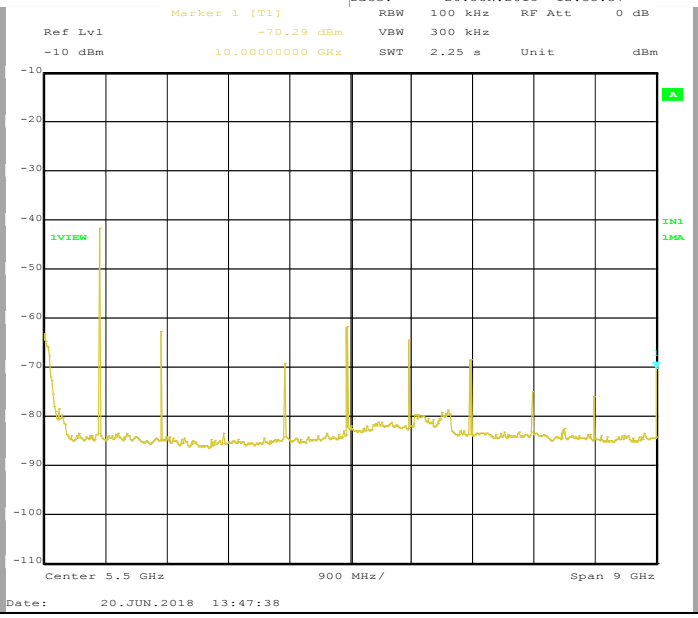


Conducted Spurious

Cnom

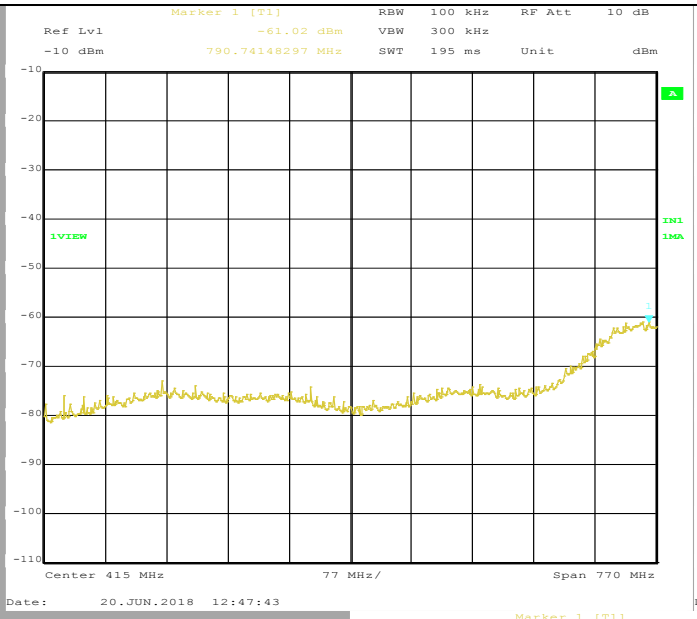


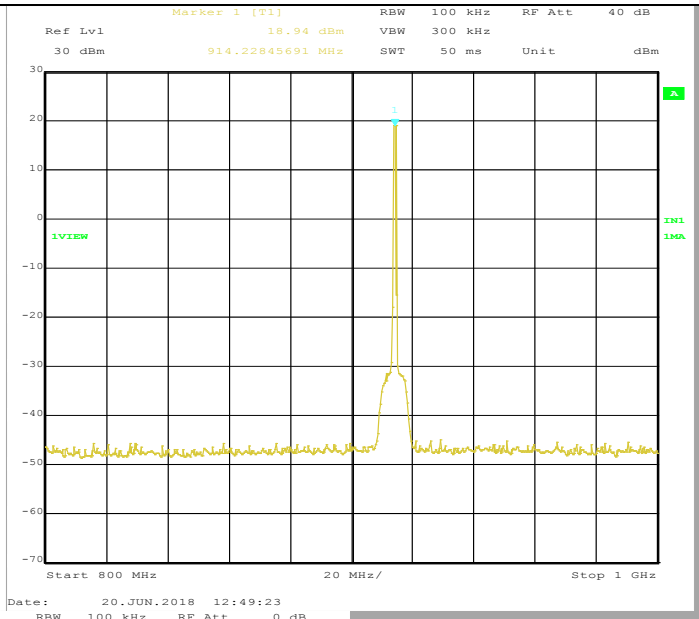


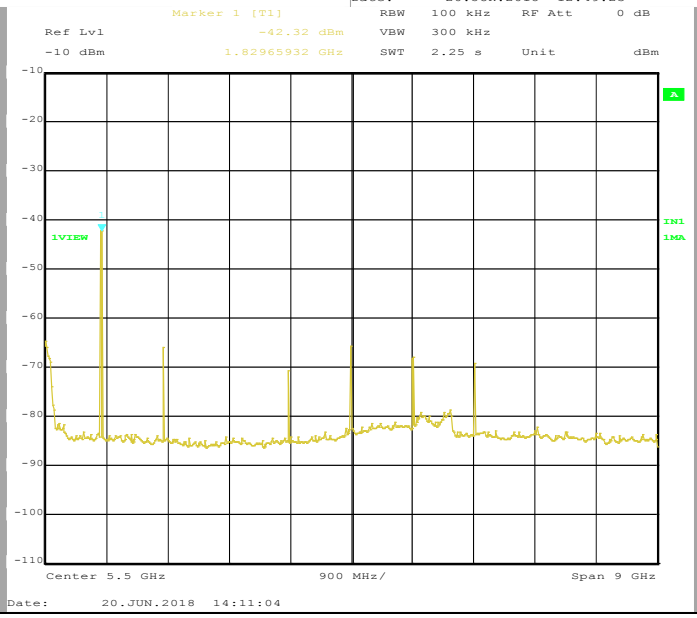


Conducted Spurious

Cmax







Frequency (MHz)	Reading Value (dBm)	Cable Loss (dB)	Final Value (dBm)	Level (dBc)	Limit (dBc)
903	19,06	3,3	22,36		
1794	-43,71	3,7	-40,01	62,37	30
5419	-60,57	4,37	-56,2	78,56	30
6321	-63,07	4,51	-58,56	80,92	30
907,8	18,46	3,3	21,76		
1812	-41,76	3,7	-38,06	60,42	30
2713	-62,98	3,87	-59,11	81,47	30
5455	-61,88	4,37	-57,51	79,87	30
914,2	18,94	3,3	22,24		
1829	-42,32	3,7	-38,62	60,98	30
2731	-66,23	3,87	-62,36	84,72	30
5491	-65,91	4,37	-61,54	83,9	30

9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

10. DTS : UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

10.1. TEST CONDITIONS

Test performed by	: Laurent DENEUX
Date of test	: June 21, 2018
Ambient temperature	: 19 °C
Relative humidity	: 47 %

10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **on an open area test site** below 1GHz and **in a full anechoic chamber** above 1GHz. Distance between measuring antenna and the EUT is **10m** below 1GHz and **3m** above 1GHz and below 30MHz.
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

10.3. 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

10.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Receiver	RHODE & SCHWARZ	ESIB	A2642021	2016/12	2018/12
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2018/04	2020/04
Bilog antenna	CHASE	CBL 6112A	C2040040	2018/04	2019/04
Horn antenna	EMCO	.3115	C2042016	2018/04	2019/04
Loop antenna	SCHWARZBECK	FMZB1513	C2040209	2018/03	2020/03
OATS	L.C.I.E.	-	F2000400	2017/06	2018/06
Cable	-	-	A5329449	2017/09	2018/09
Cable	-	-	A5329368	2017/06	2018/06
cable	-	-	A5329444	2017/09	2018/09
cable	-	-	A5329542	2018/06	2019/06

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

10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

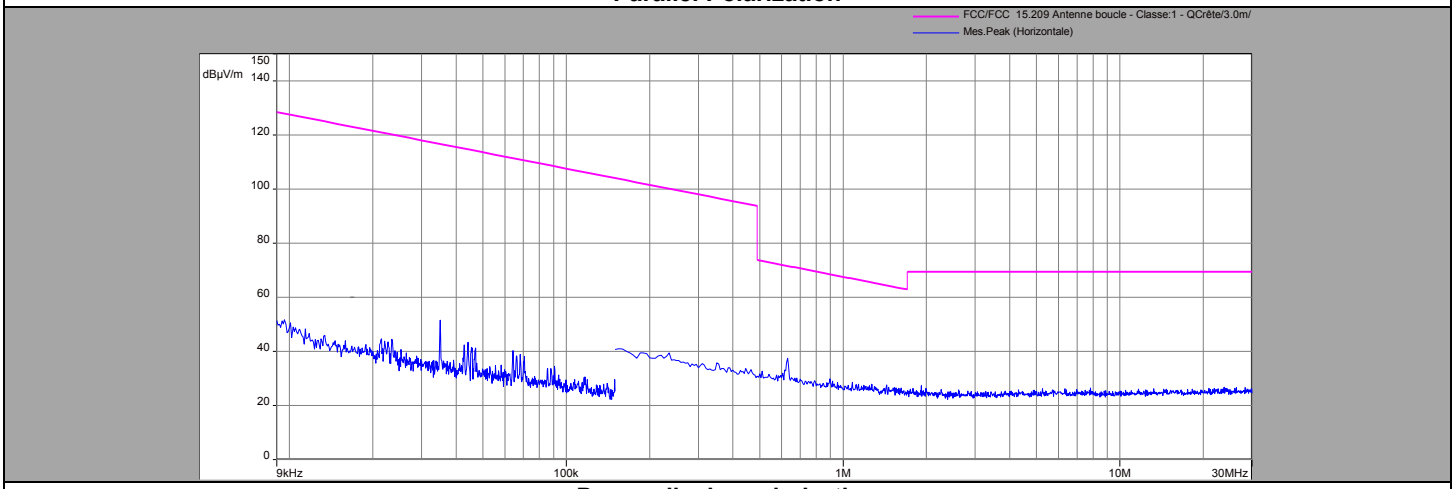
☑ None ☐ Divergence:

10.6. RESULTS

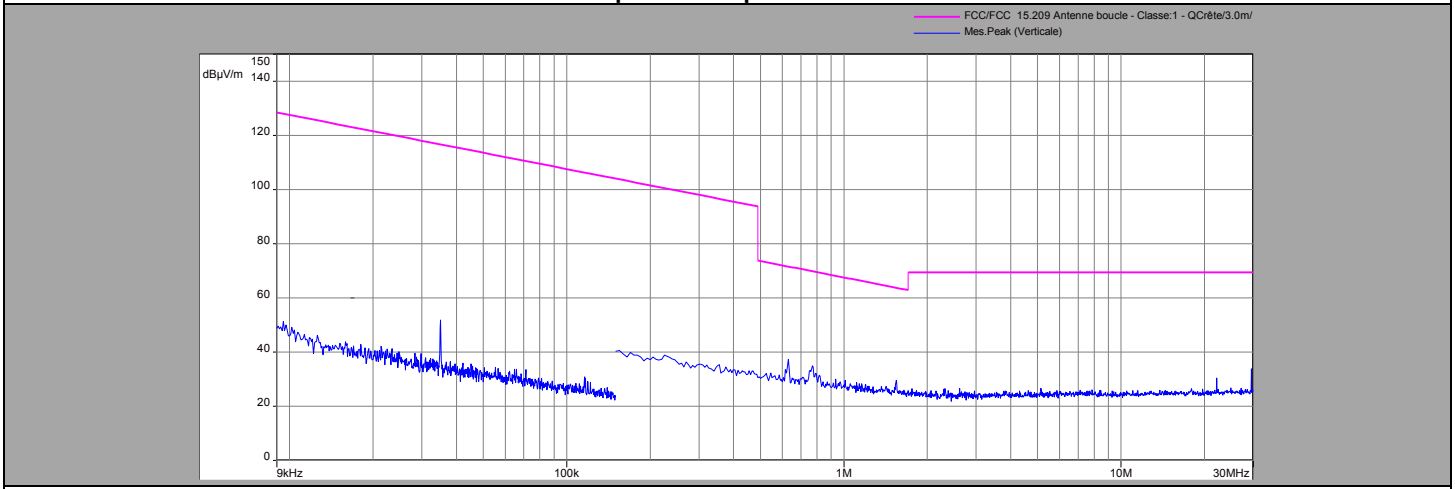
9kHz – 30 MHz

Cmin

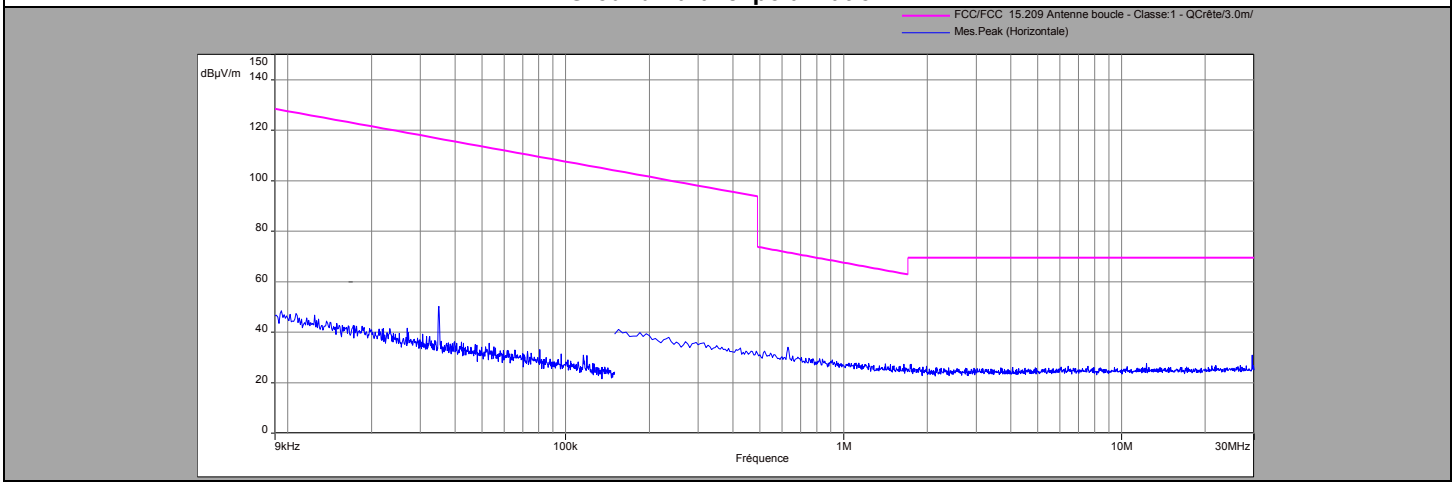
Parallel Polarization



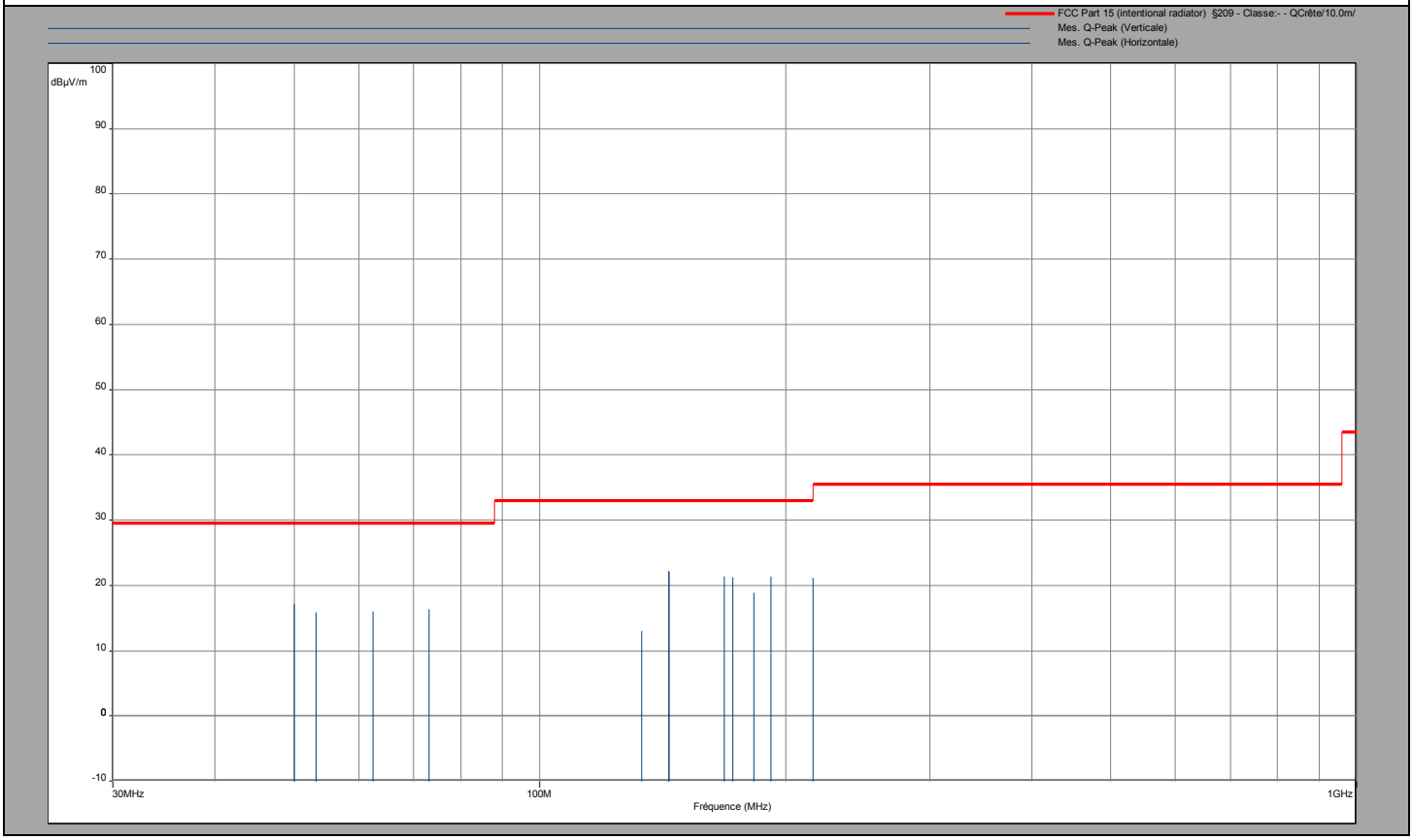
Perpendicular polarization



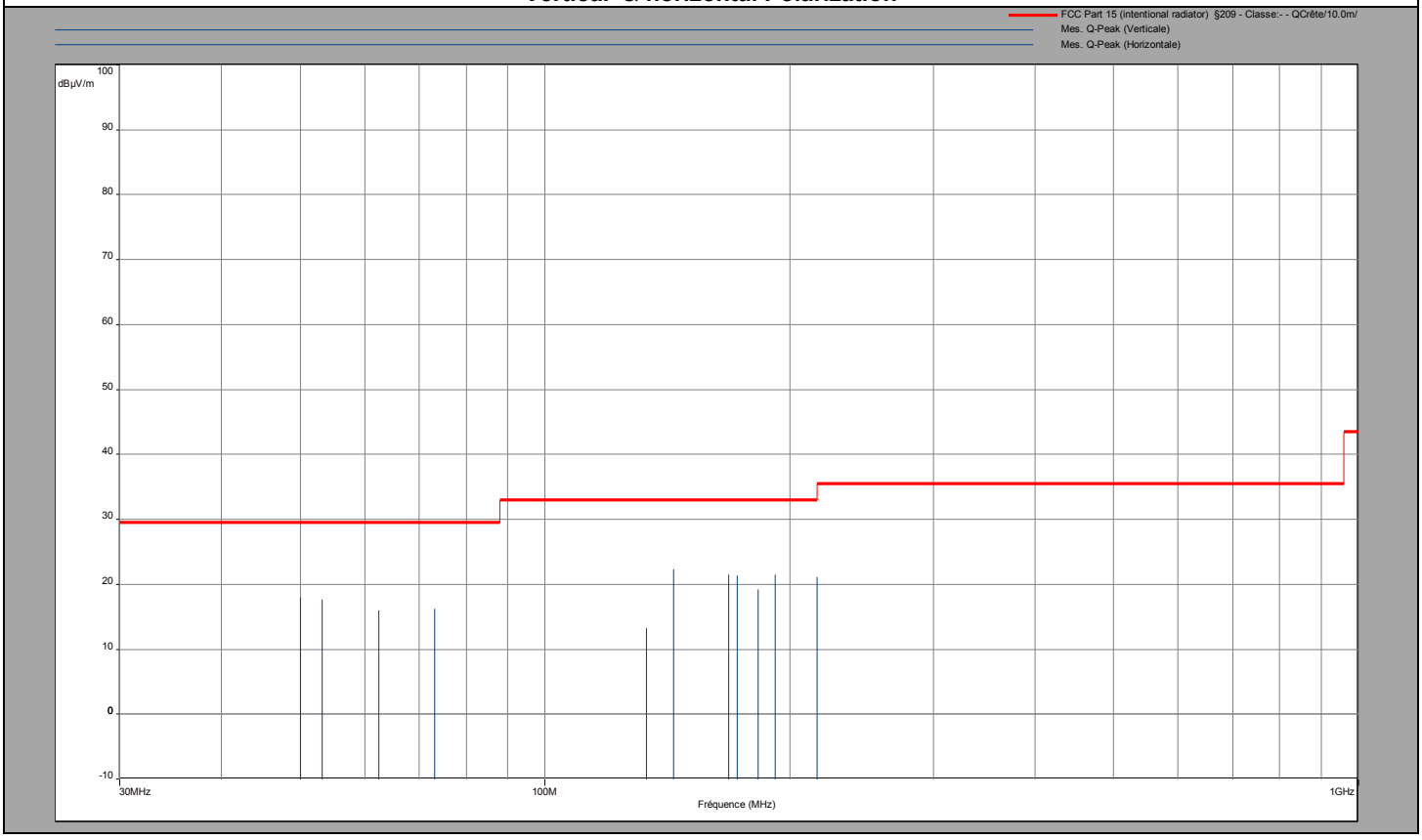
Ground Parallel polarization



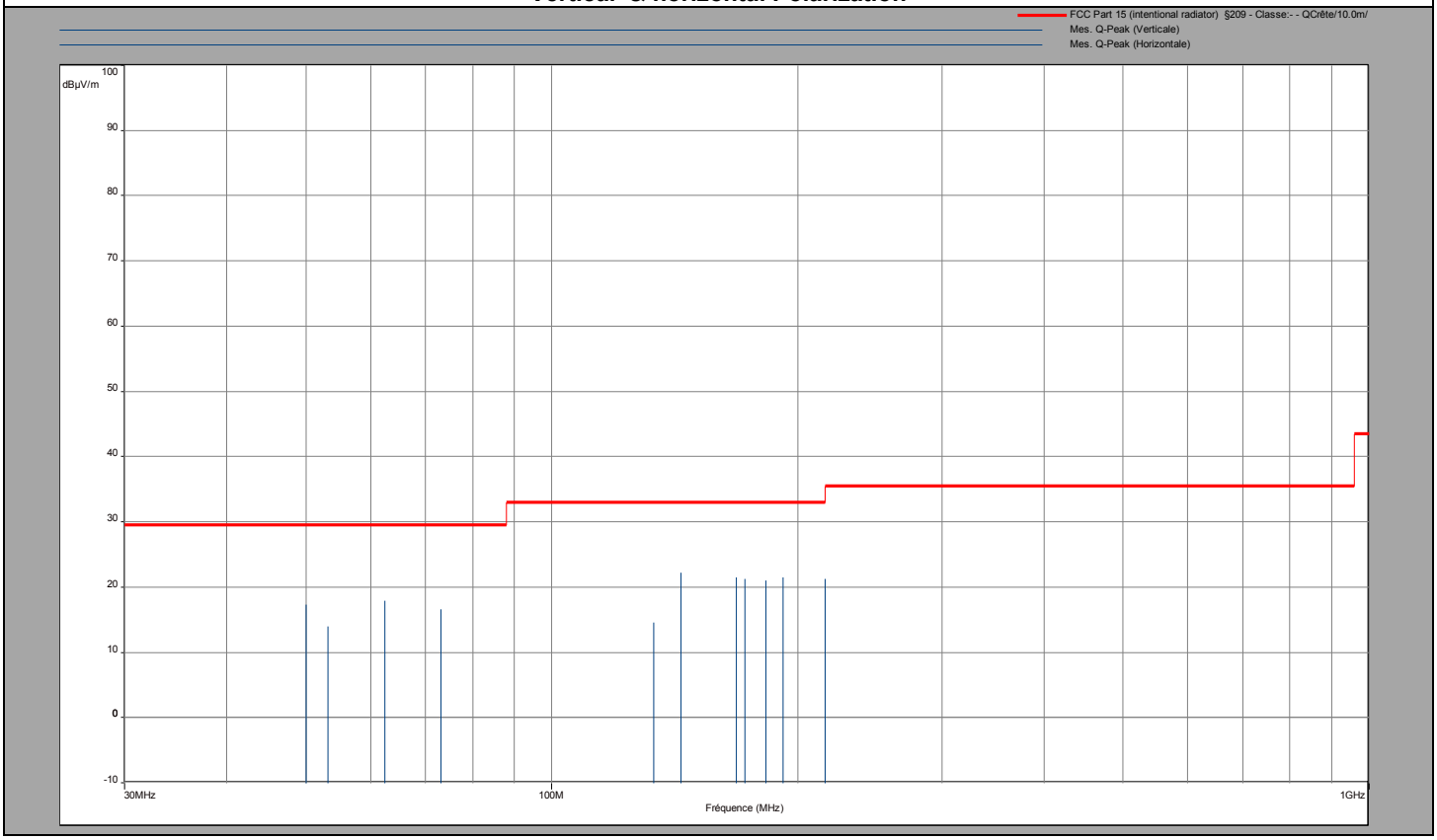
Below 1GHz
Cmin
Vertical & horizontal Polarization



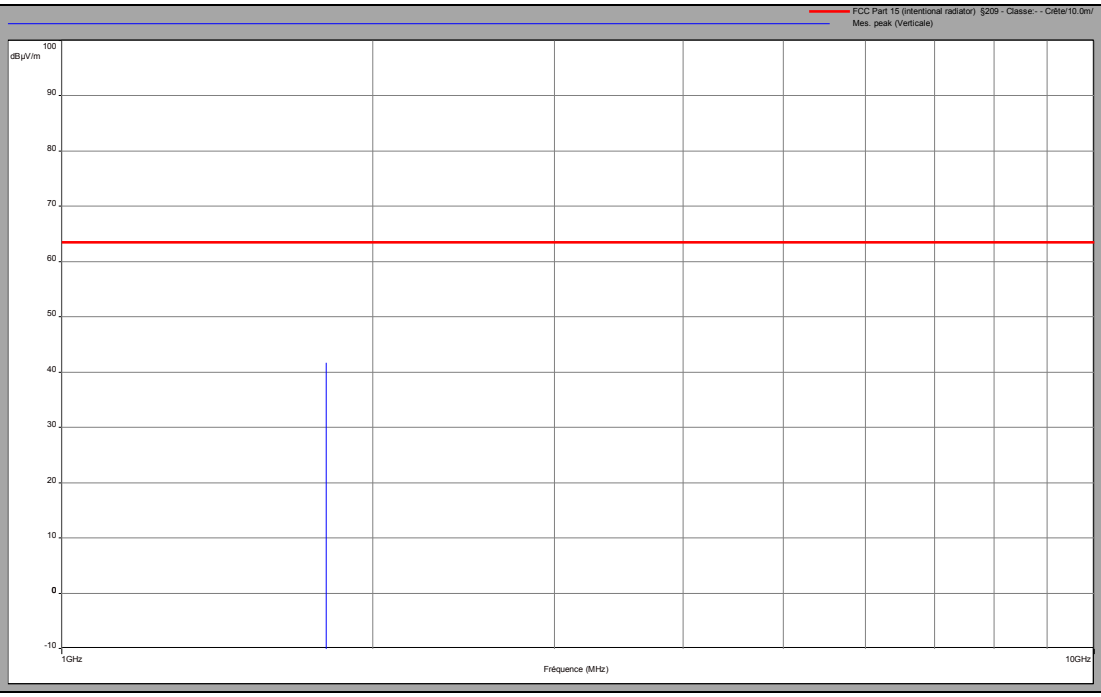
Below 1GHz
Cnom
Vertical & horizontal Polarization



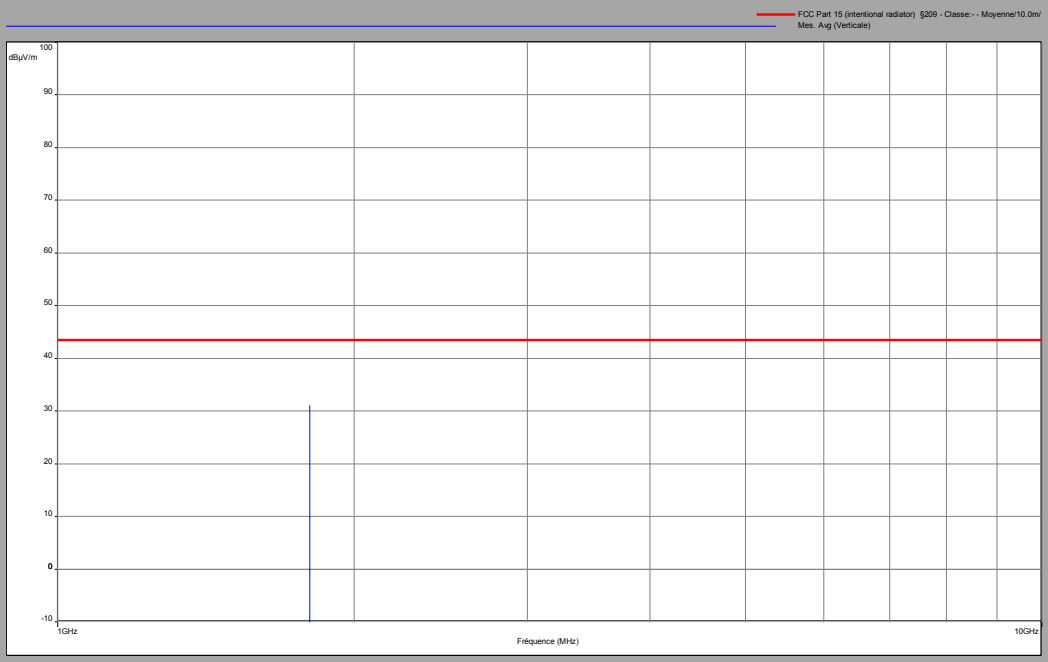
Below 1GHz
Cmax
Vertical & horizontal Polarization



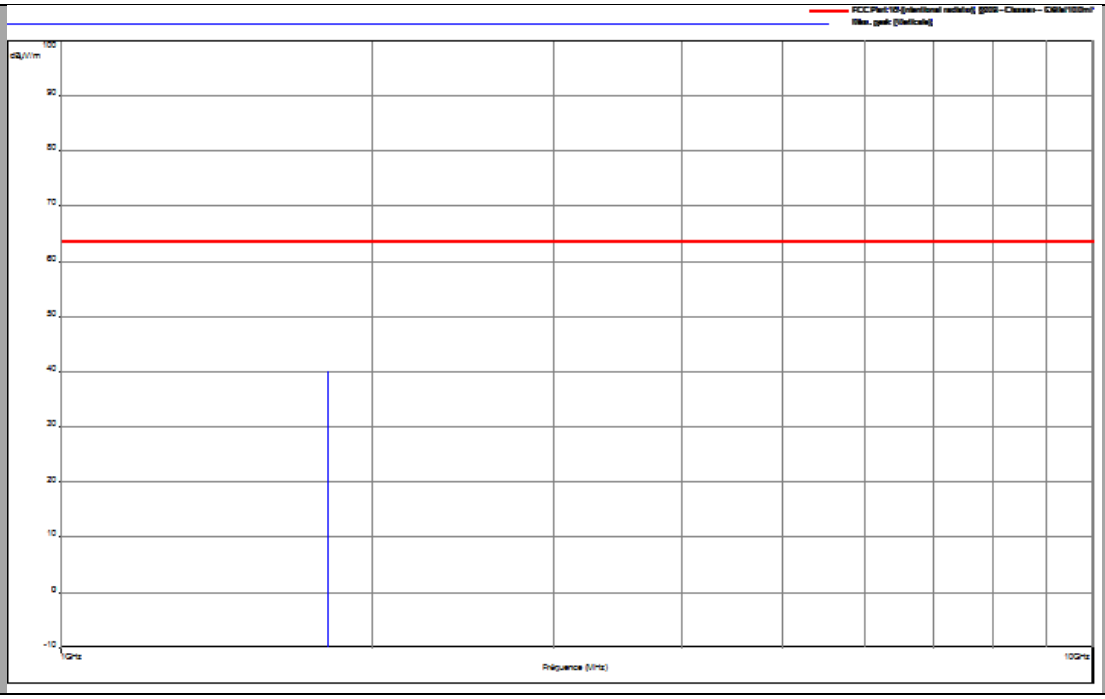
Above 1GHz
Cmin
Vertical & horizontal Polarization Peak measurement



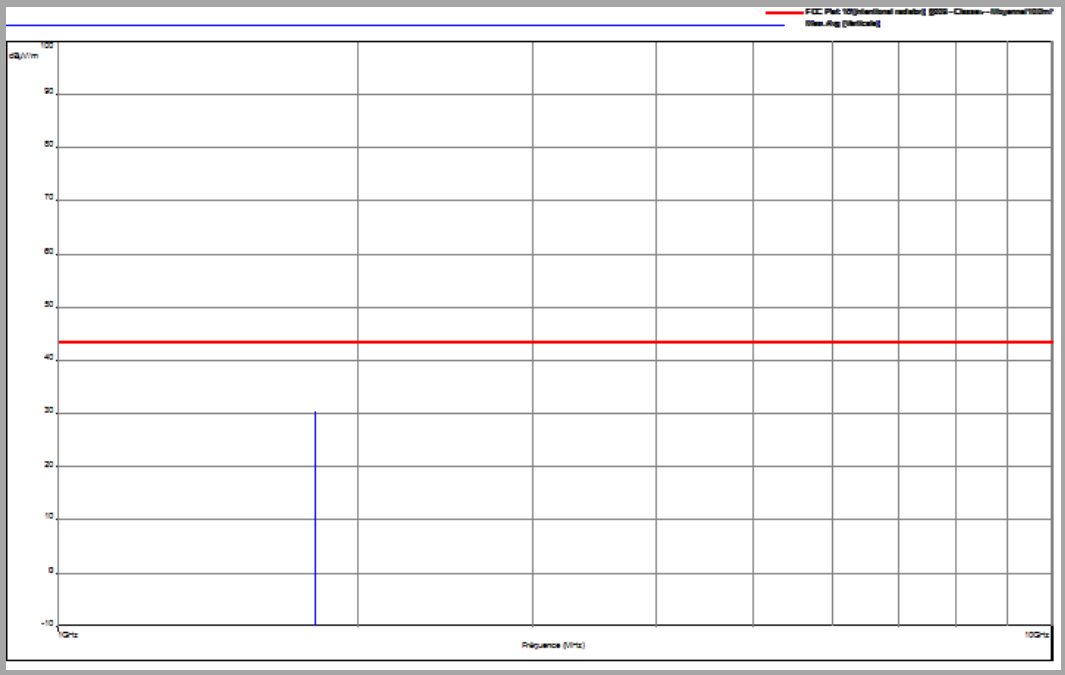
Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



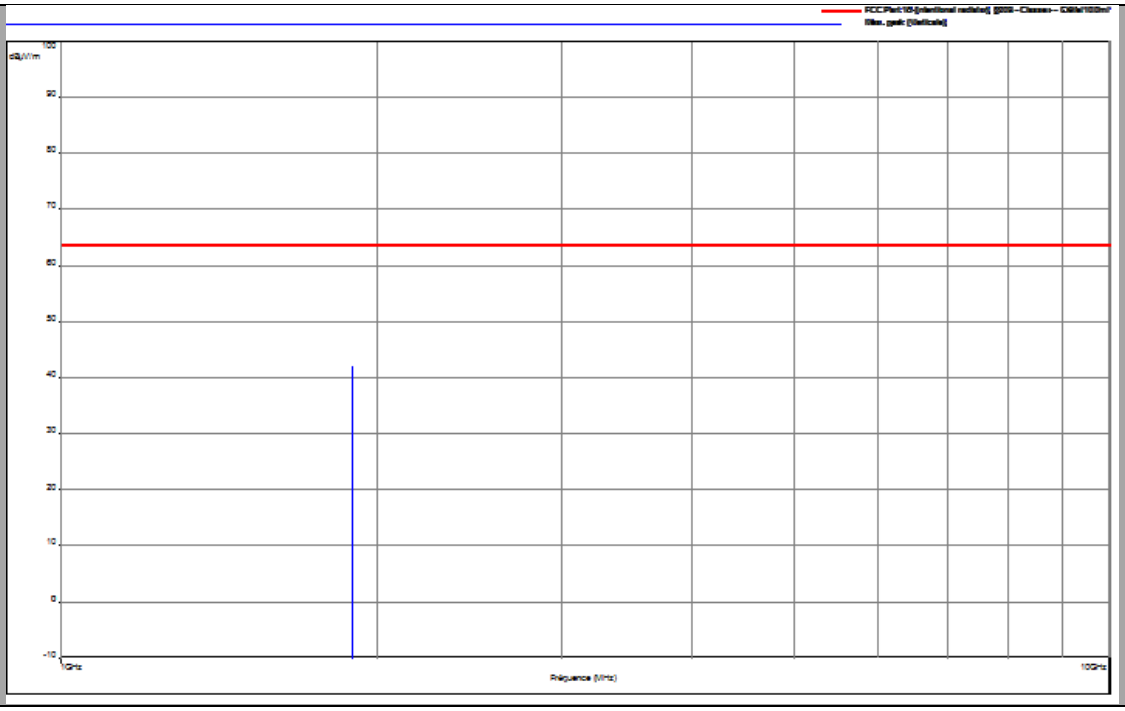
Above 1GHz
Cnom
Vertical & horizontal Polarization Peak measurement



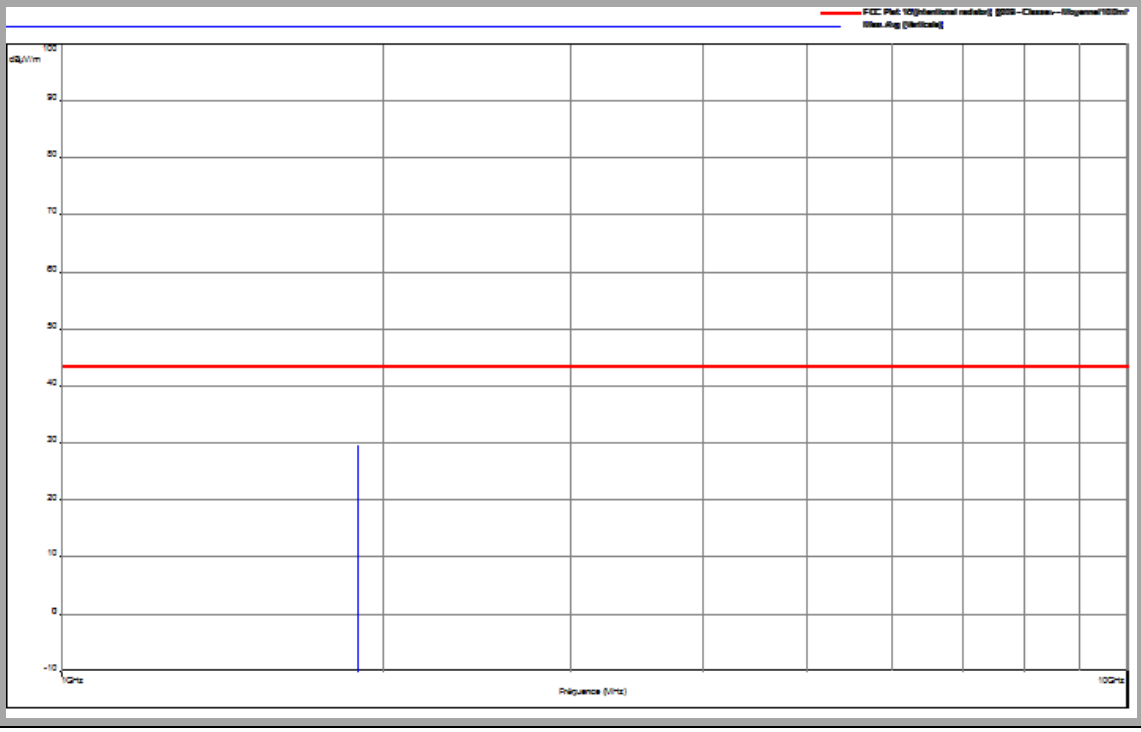
Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



Above 1GHz
Cmax
Vertical & horizontal Polarization Peak measurement



Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



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

Below 1GHz					
Cmin					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	17.2	29.5	12.3
Vertical	53.2	-	15.91	29.5	13.59
Vertical	62.5	-	16.01	29.5	13.49
Vertical	73.1	-	16.37	29.5	13.13
Vertical	133.3	-	13.02	33	19.98
Vertical	144	-	22.29	33	10.71
Vertical	172.4	-	21.32	33	11.68
Vertical	182.8	-	18.94	33	14.06
Horizontal	144	-	22.14	33	10.86
Horizontal	168	-	21.44	33	11.56
Horizontal	192	-	21.4	33	11.6
Horizontal	216	-	21.19	33	11.81

Below 1GHz					
Cnom					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	18.04	29.5	11.46
Vertical	53.2	-	17.66	29.5	11.84
Vertical	62.5	-	16.01	29.5	13.49
Vertical	73.1	-	16.26	29.5	13.24
Vertical	133.3	-	13.23	33	19.77
Vertical	144	-	22.35	33	10.65
Vertical	172.4	-	21.37	33	11.63
Vertical	182.8	-	19.21	33	13.79
Horizontal	168	-	21.54	33	11.46
Horizontal	192	-	21.56	33	11.44
Horizontal	216	-	21.19	33	11.81

Below 1GHz					
Cmax					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	17.39	29.5	12.11
Vertical	53.2	-	14.03	29.5	15.47
Vertical	62.5	-	17.93	29.5	11.57
Vertical	73.1	-	16.59	29.5	12.91
Vertical	133.3	-	14.62	33	18.38

Vertical	144	-	22.23	33	10.77
Vertical	172.4	-	21.32	33	11.68
Vertical	182.8	-	21.03	33	11.97
Horizontal	168	-	21.54	33	11.46
Horizontal	192	-	21.5	33	11.5
Horizontal	216	-	21.26	33	11.74

Above 1GHz								
Cmin								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1806	6.06	31.08	43.5	12.42	41.74	63.5	21.76

Above 1GHz								
Cnom								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	18015.6	5.36	30.38	43.5	13.12	40.24	63.5	23.26

Above 1GHz								
Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1828.5	4.79	29.81	43.5	13.69	42.24	63.5	21.26

10.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

11. HYBRID MODE 125 KHZ : OCCUPIED BANDWIDTH

11.1. TEST CONDITIONS

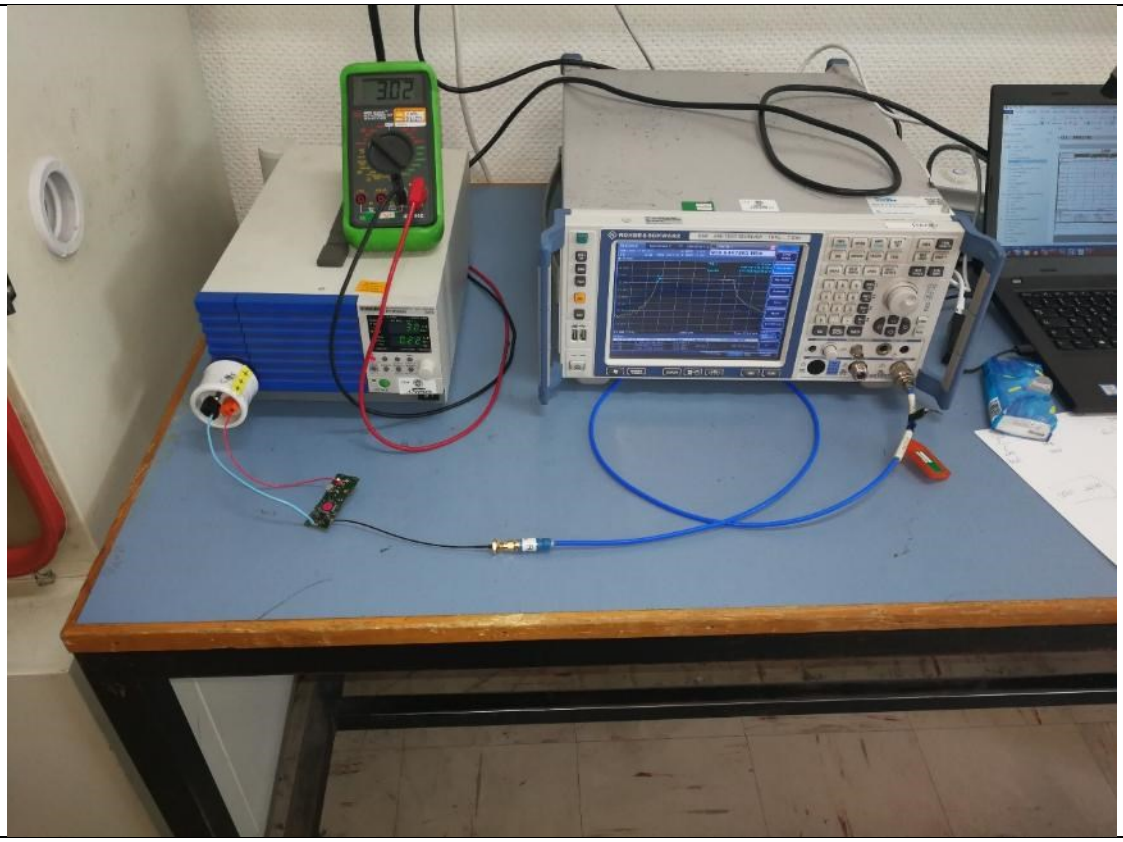
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

11.2. 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
☑ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth

11.3. LIMIT

None

11.4. TEST EQUIPMENT LIST

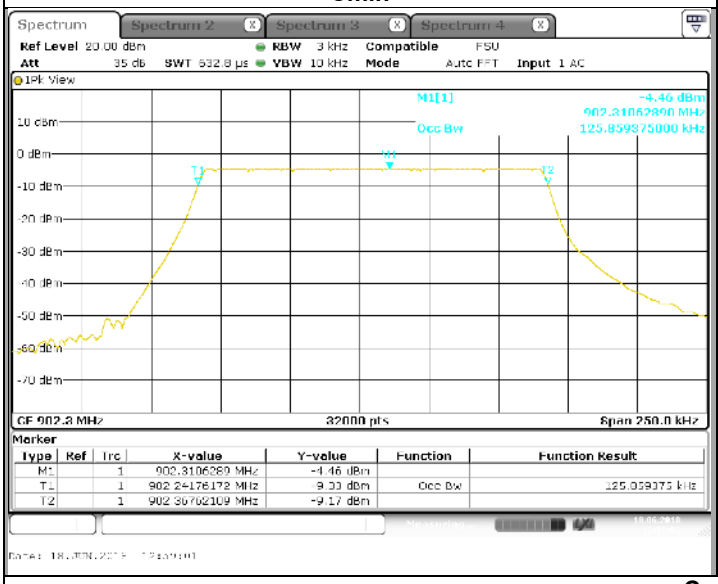
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

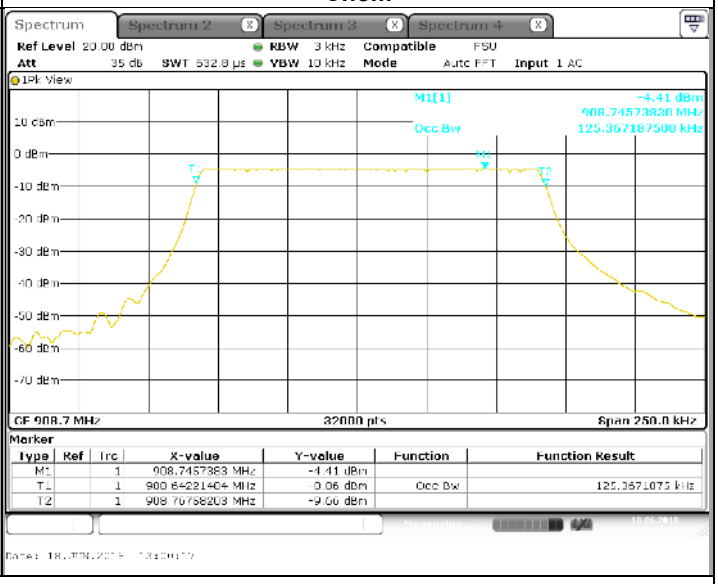
11.5. RESULTS

Occupied Bandwidth

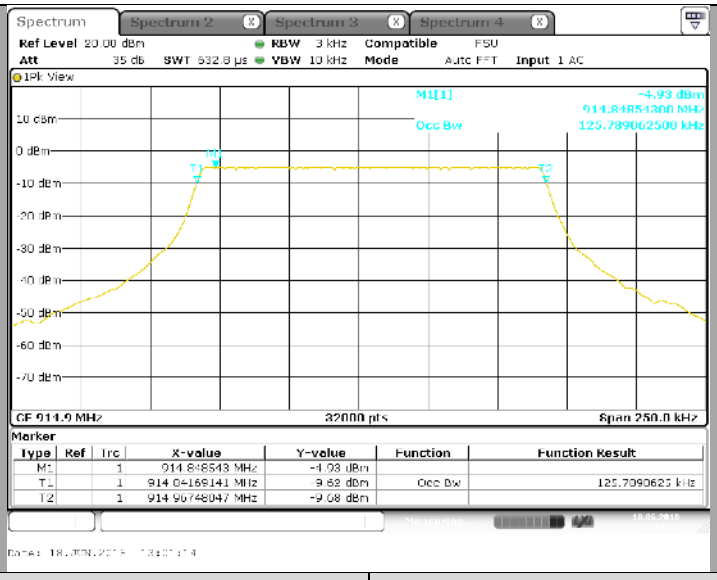
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	0,1259
Cnom	0,1254
Cmax	0,1258

11.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

12. HYBRID MODE 125 KHZ : 20DB EMISSION BANDWIDTH

12.1. TEST CONDITIONS

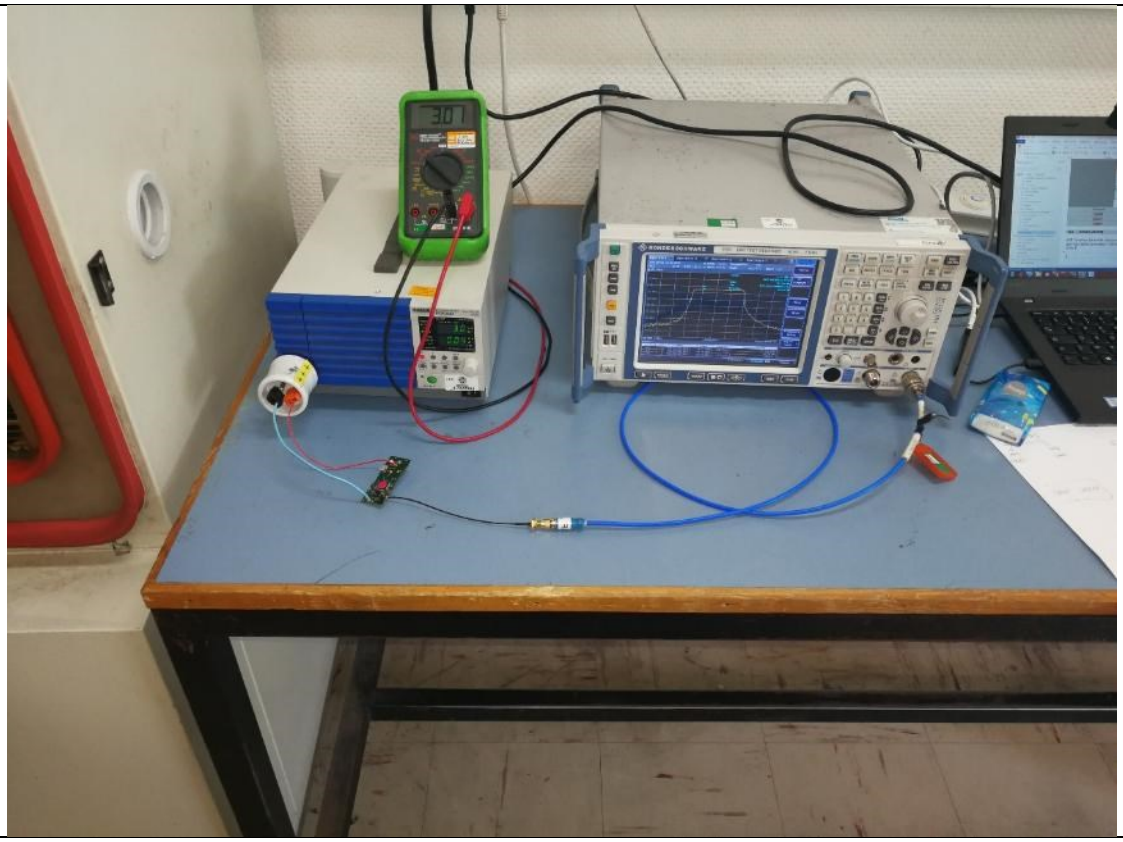
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

12.2. 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 6dB emission bandwidth

12.3. LIMIT

There is no limit for hybrid mode

12.4. TEST EQUIPMENT LIST

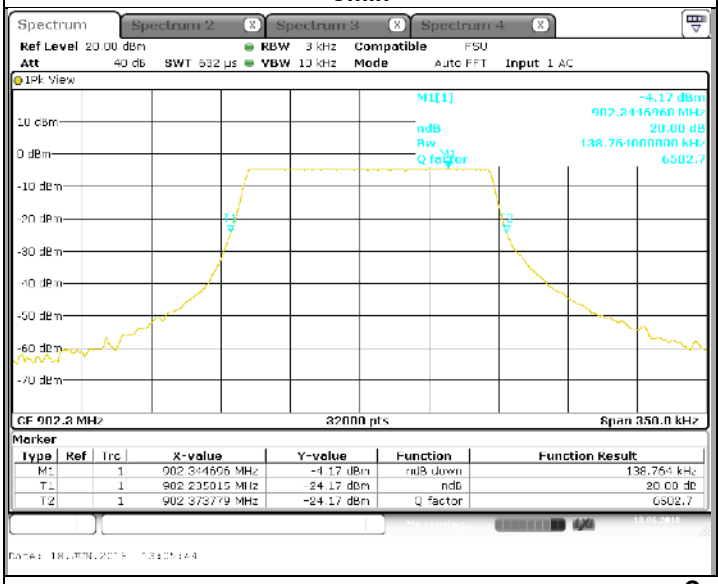
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

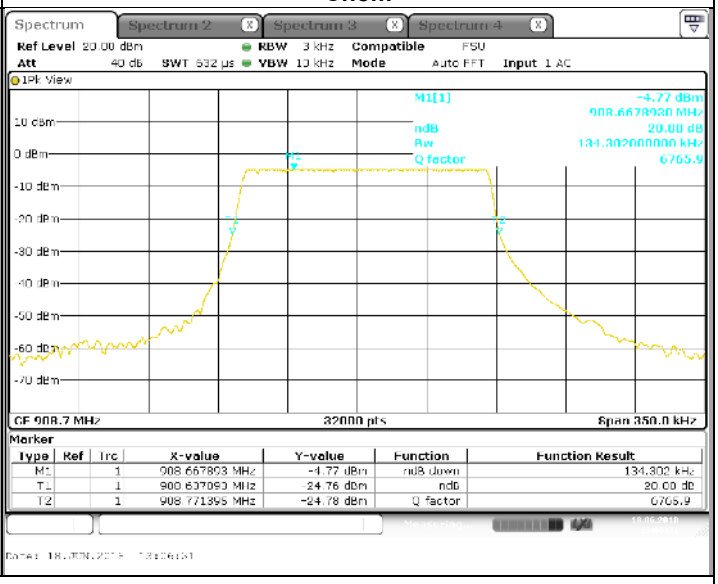
12.5. RESULTS

6dB Emission Bandwidth

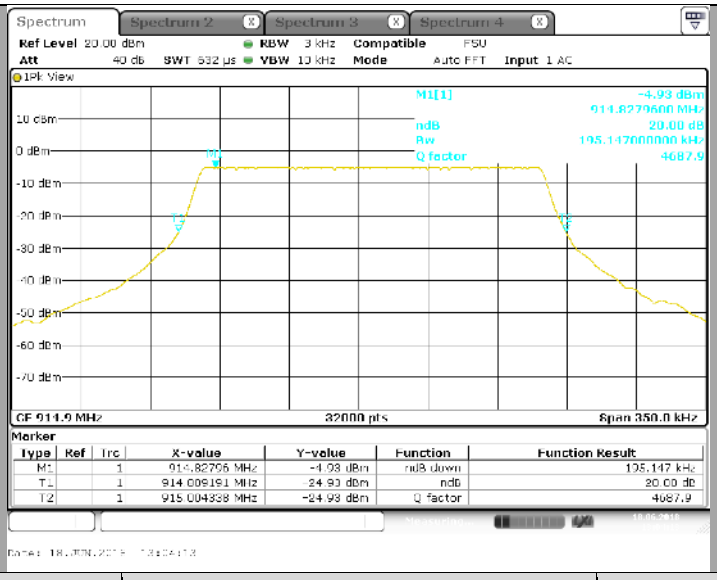
Cmin



Cnom



Cmax



Channel	20dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	0,139	No limit for hybrid mode
Cnom	0,134	No limit for hybrid mode
Cmax	0,195	No limit for hybrid mode

12.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

13. HYBRID MODE 125 KHZ : CARRIER FREQUENCY SEPARATION

13.1. TEST CONDITIONS

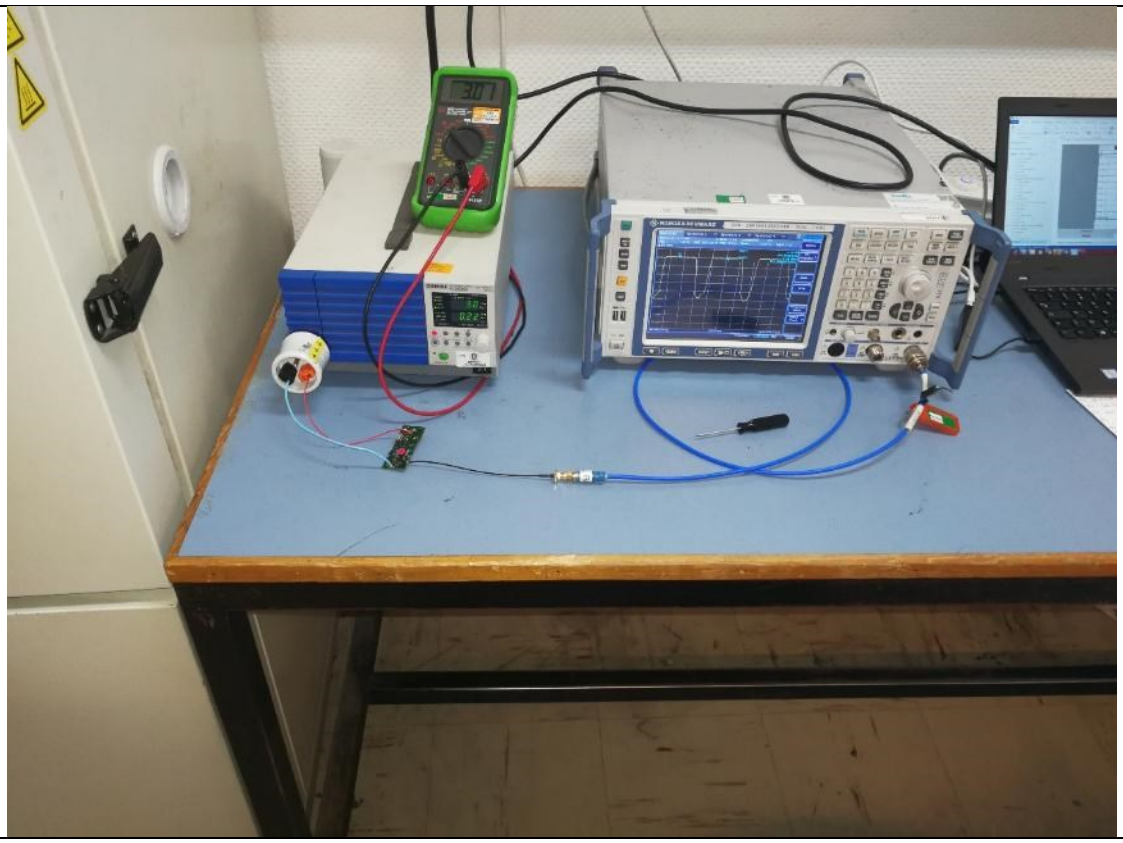
Test performed by : Mathieu CERISIER
Date of test : June 19, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

13.2. 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 § 7.8.2



Photograph for Carrier Frequency Separation

13.1. LIMIT

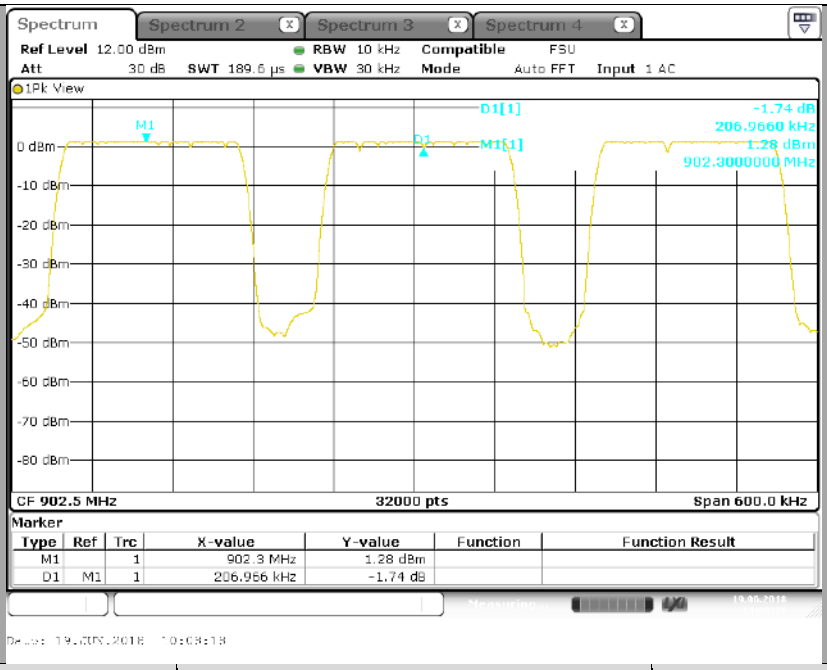
Carrier Frequency Separation shall be at 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

13.2. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

13.3. RESULTS



Channel	Carrier Frequency Separation (MHz)	Limit (MHz)
Cmin	0,207	Minimum 0.195

13.4. CONCLUSION

Carrier Frequency Separation measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

14. HYBRID MODE 125 KHZ : TIME OF OCCUPANCY

14.1. TEST CONDITIONS

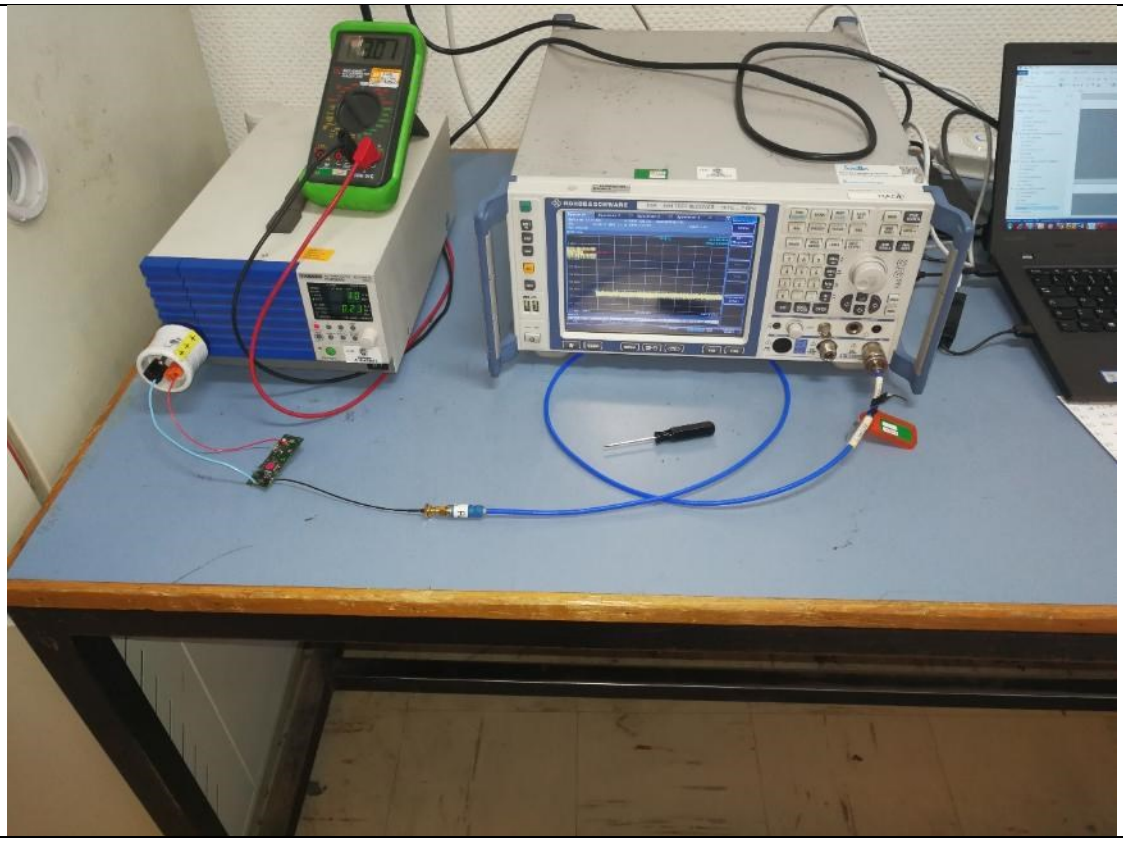
Test performed by : Armand MAHOUNGOU
Date of test : October 18, 2018
Ambient temperature : 23 °C
Relative humidity : 43 %

14.2. 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 § 7.8.4



Photograph for Time of Occupancy

14.3. LIMIT

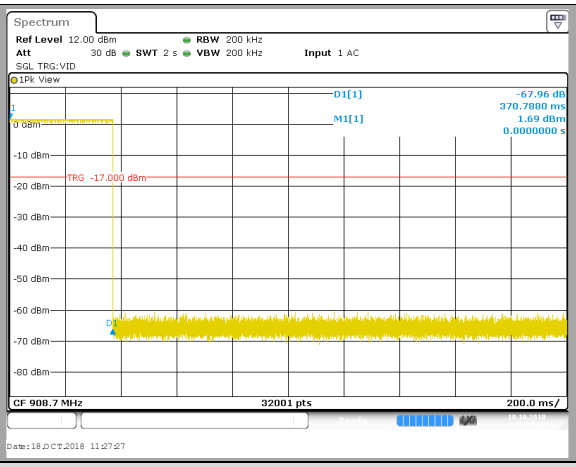
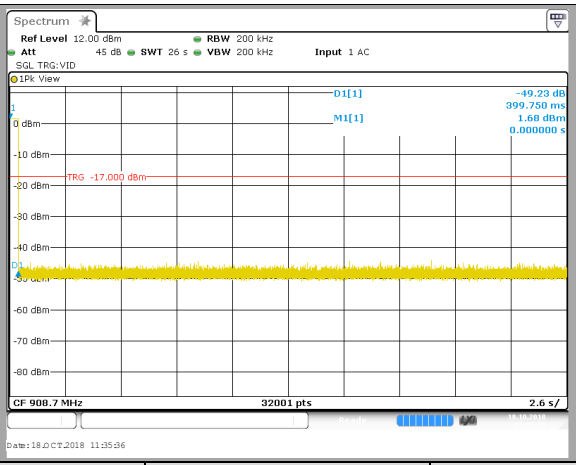
The Time of Occupancy shall not exceed 0.4s within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

14.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

14.5. RESULTS

Burst Length
Cnom

Time of Occupancy
Cnom


Channel	Burst Length (ms)	Number of Hopping during Time of Occupancy	Time of Occupancy (ms)	Limit of Time of Occupancy (ms)
Cnom	370,8	1	370,8	400

14.6. CONCLUSION

Time of Occupancy measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

15. HYBRID MODE 125 KHZ : DUTY CYCLE

15.1. TEST CONDITIONS

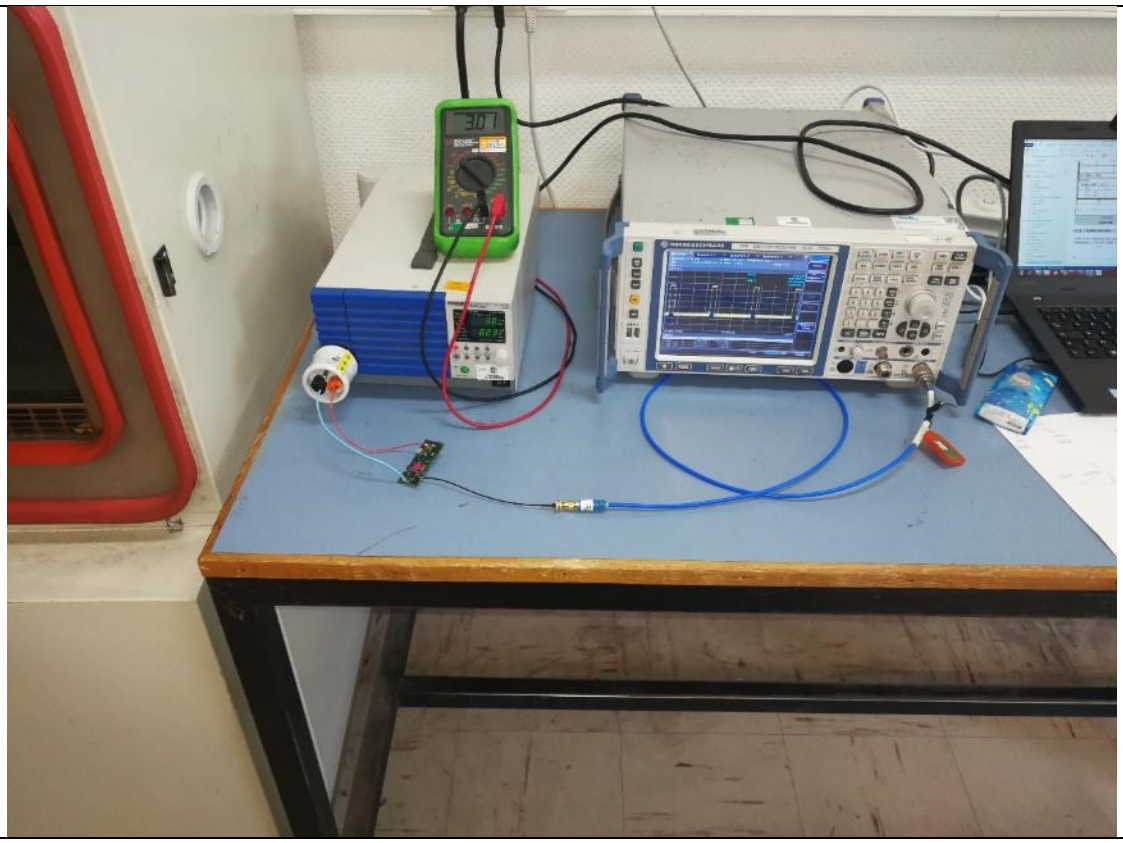
Test performed by : Mathieu CERISIER
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

15.2. 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

15.3. LIMIT

None

15.4. TEST EQUIPMENT LIST

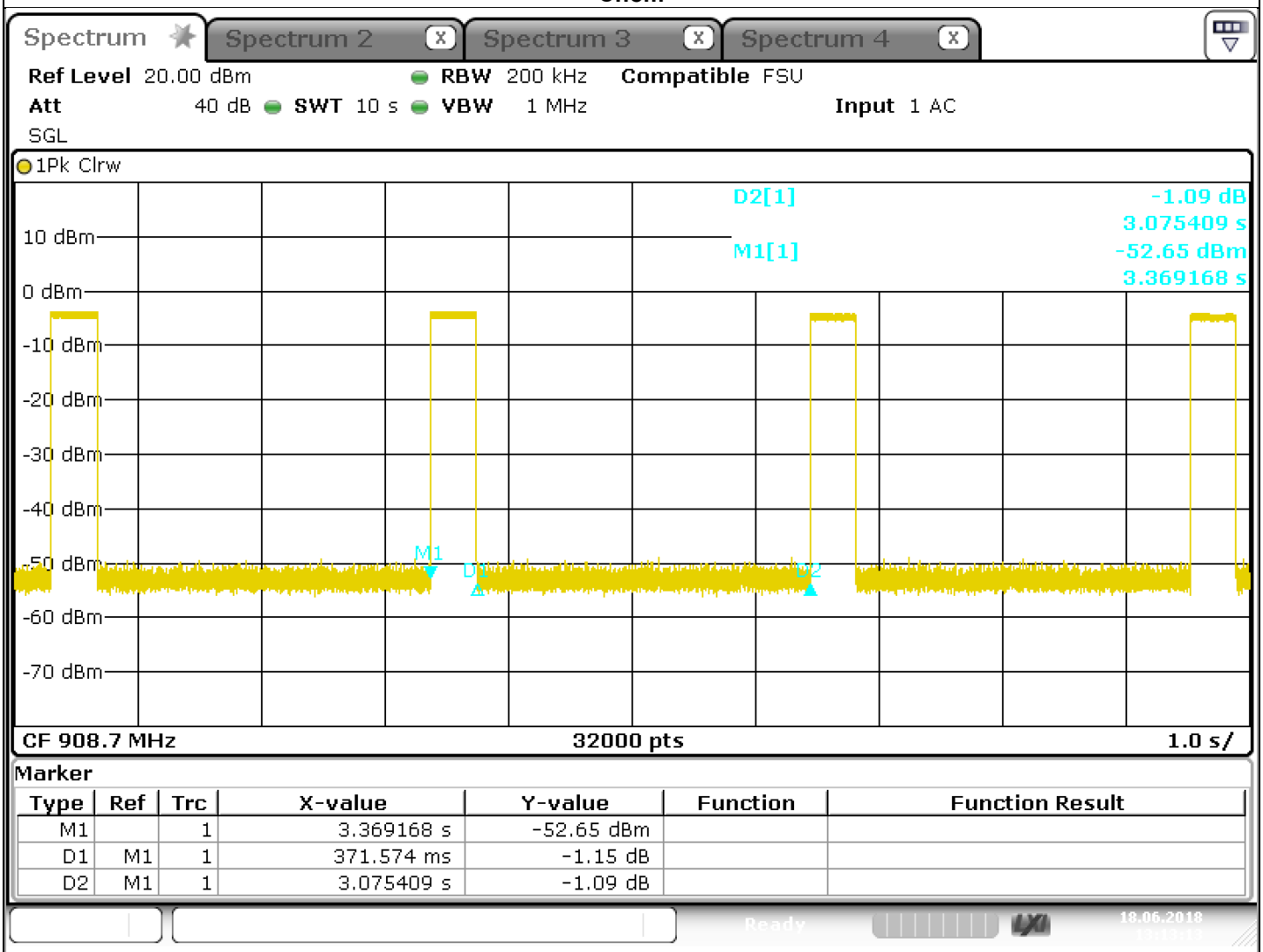
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

15.5. RESULTS

Duty Cycle

Cnom



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	12,08	18,4

15.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

16. HYBRID MODE 125 KHZ : MAXIMUM CONDUCTED OUTPUT POWER

16.1. TEST CONDITIONS

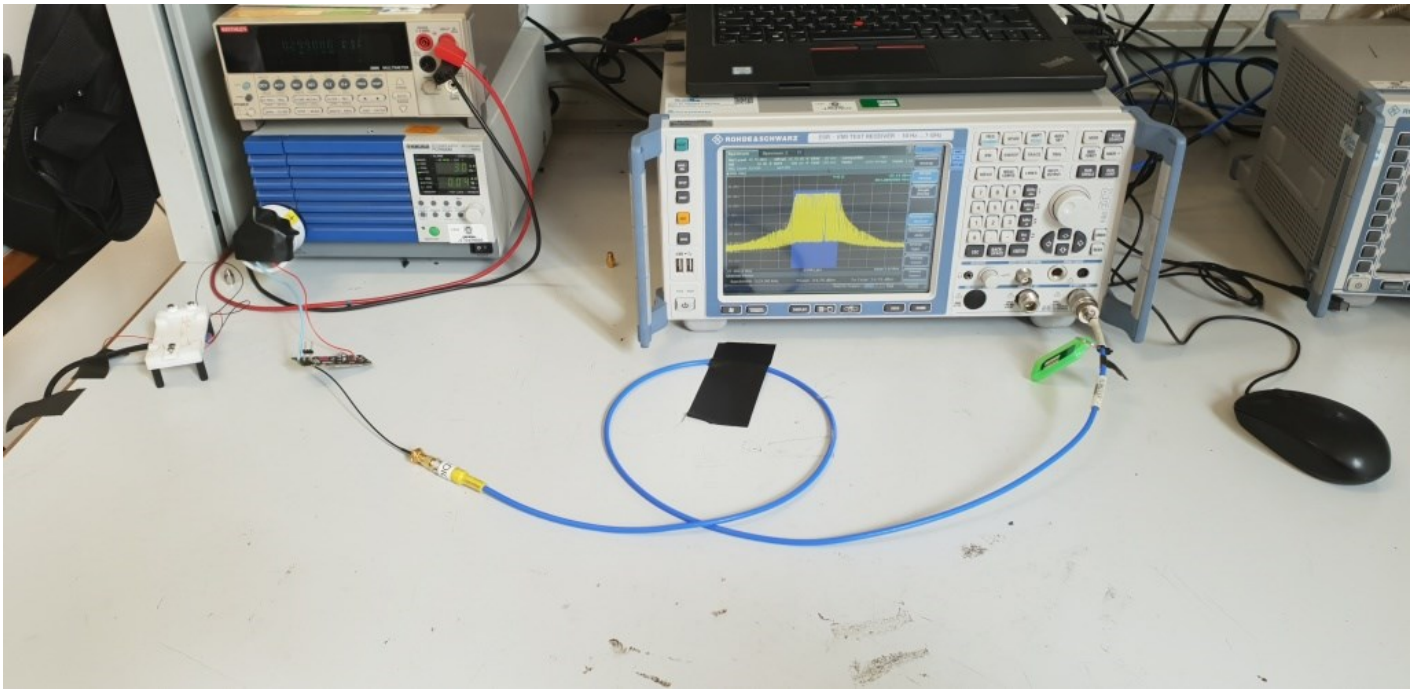
Test performed by : Armand MAHOUNGOU
Date of test : June 18, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

16.2. 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 § 11.9.2.2.2



Photograph for Maximum Conducted Output Power

16.3. LIMIT

Maximum Conducted Output power:
Shall not exceed 30dBm if number of hopping channels is above 50
Shall not exceed 24dBm if number of hopping channels is below 50
Limits are reduced by G-6dBi if Antenna Gain above 6dBi

16.4. TEST EQUIPMENT LIST

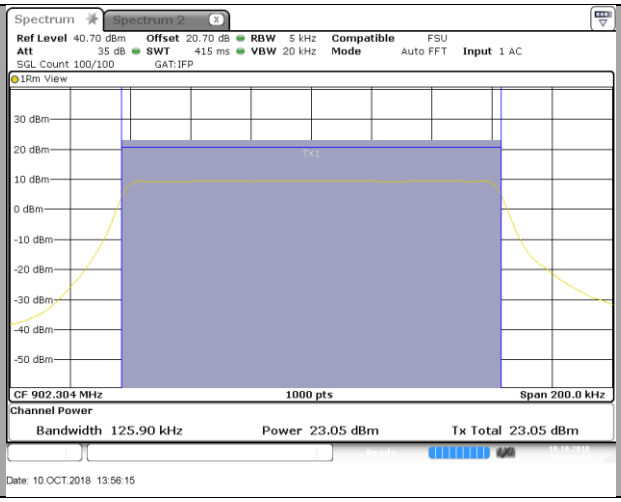
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

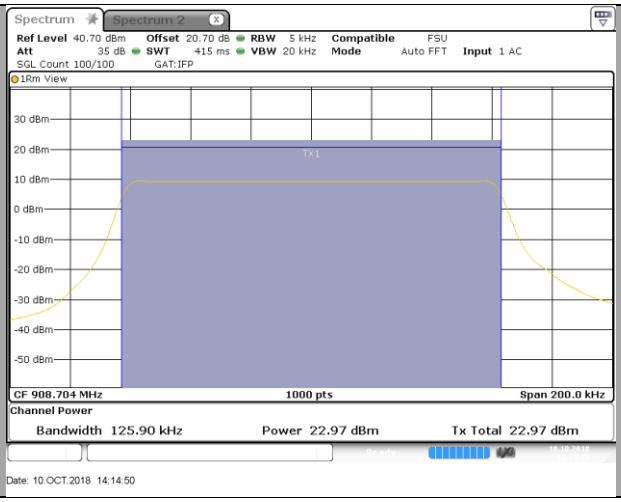
16.5. RESULTS

Maximum Conducted Output Power

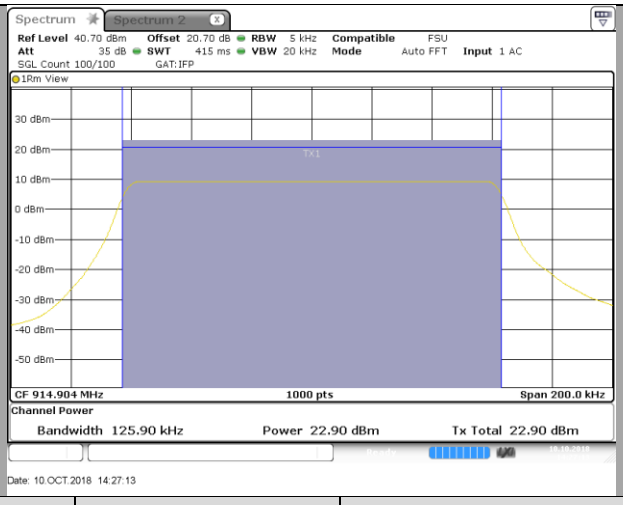
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**20,7**	-1,5	23,05	24
Cnom	**20,7**	-1,5	22,97	24
Cmax	**20,7**	-1,5	22,90	24

16.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

17. HYBRID MODE 125KHZ : POWER SPECTRAL DENSITY

17.1. TEST CONDITIONS

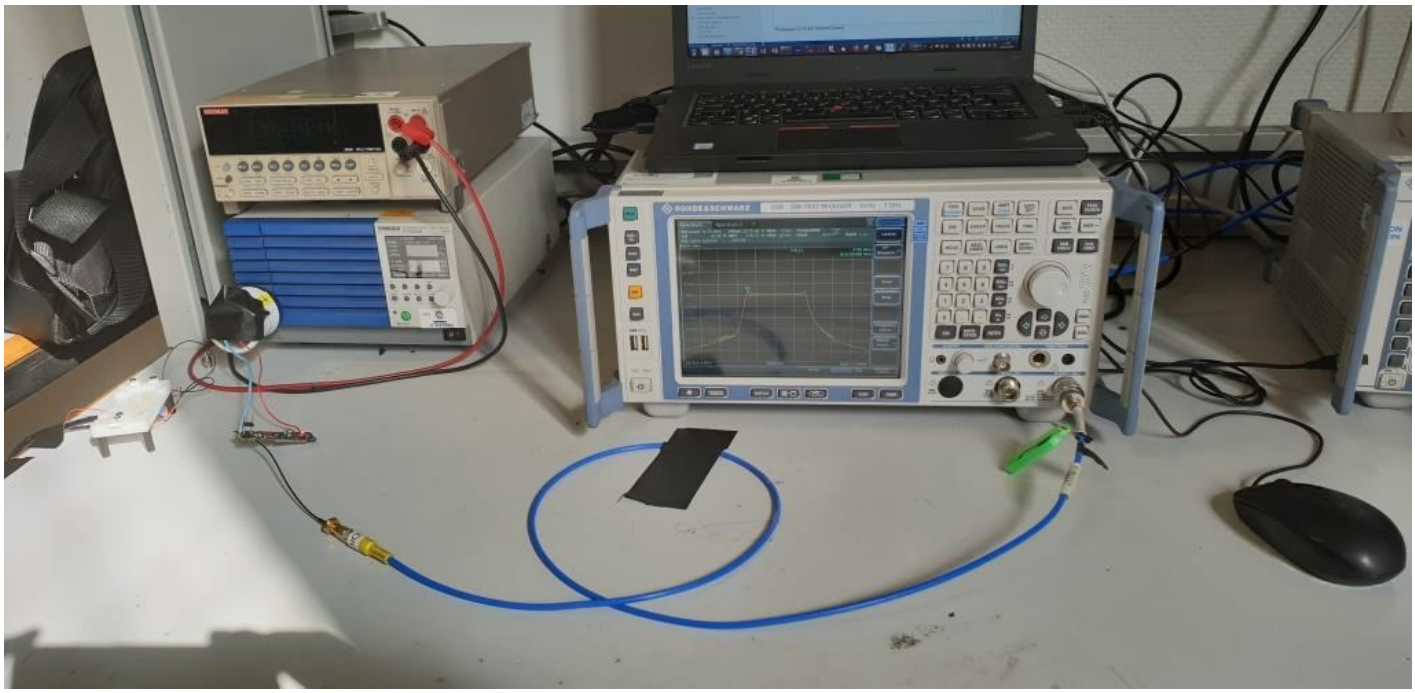
Test performed by : Mathieu CERISIER
Date of test : June 19, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

17.2. 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:
☐ KDB 558074 D01 DTS Meas Guidance v05 § 10.2 (Method PKPSD)
☐ KDB 558074 D01 DTS Meas Guidance v05 § 10.3 (Method AVGPSD-1)
☑ ANSI C63.10 § 11.10.3



Photograph for Power Spectral Density

17.3. LIMIT

Power Spectral Density:
2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

17.4. TEST EQUIPMENT LIST

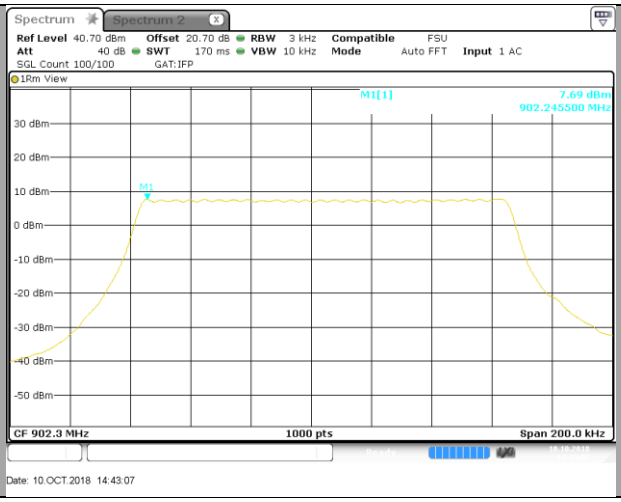
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

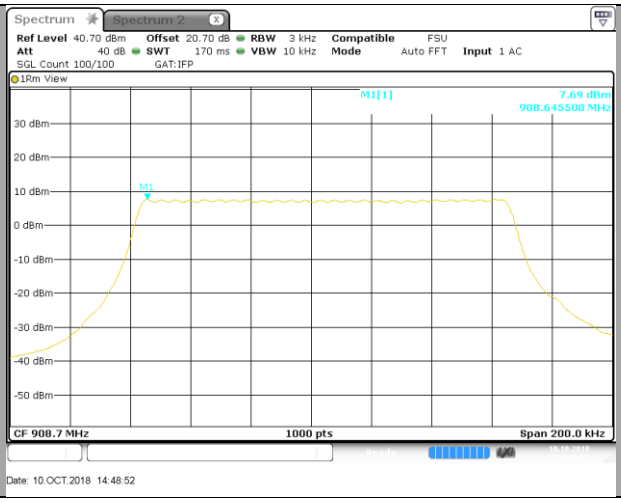
17.5. RESULTS

Power Spectral Density

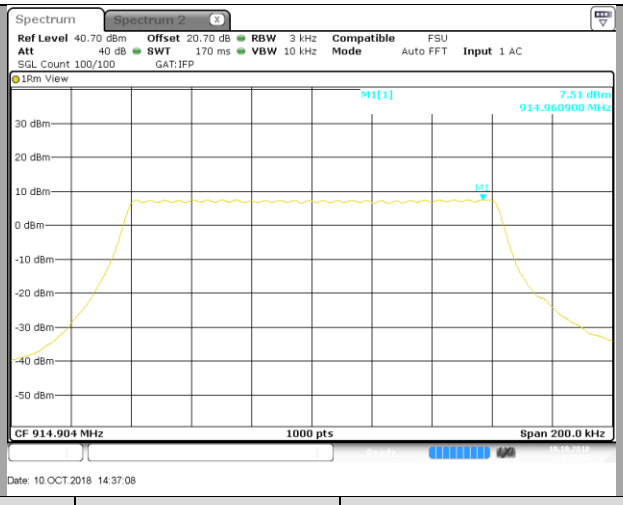
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**20,7**	-1,5	7,69	8
Cnom	**20,7**	-1,5	7,69	8
Cmax	**20,7**	-1,5	7,51	8

17.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

18. HYBRID MODE 125 KHZ : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

18.1. TEST CONDITIONS

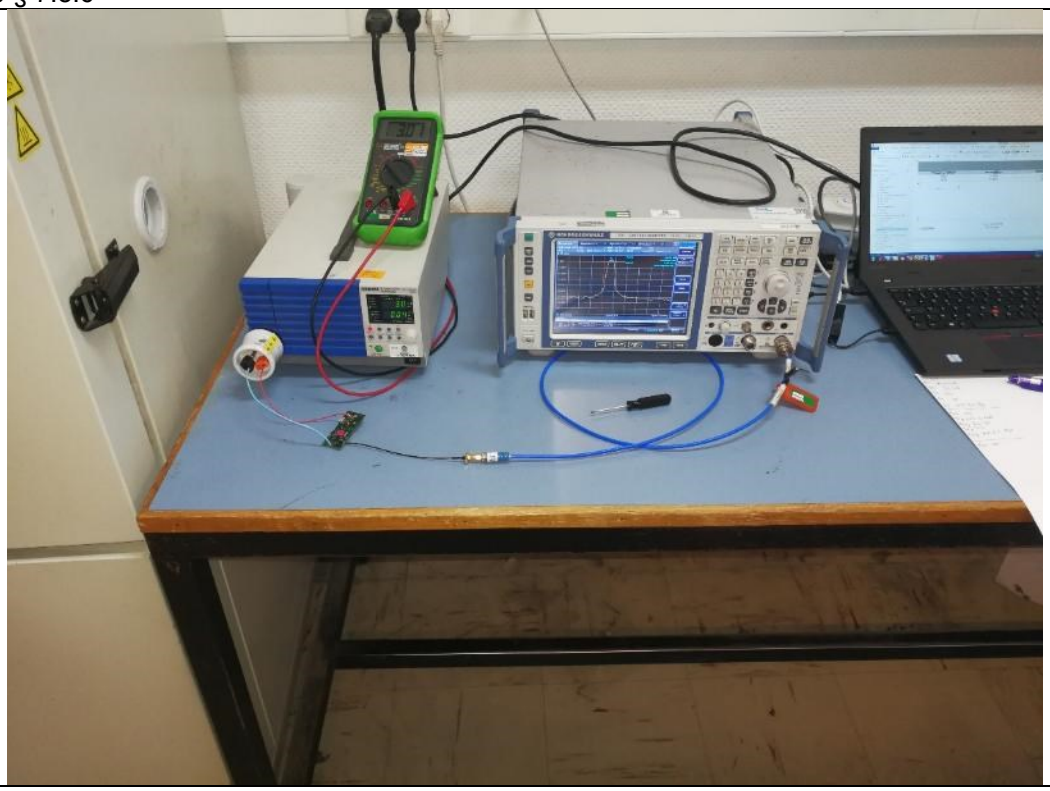
Test performed by : Mathieu CERISIER
Date of test : June 19, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

18.2. 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 § 7.8.6



Photograph for Unwanted Emission into non-restricted frequency bands at the band edge

18.3. LIMIT

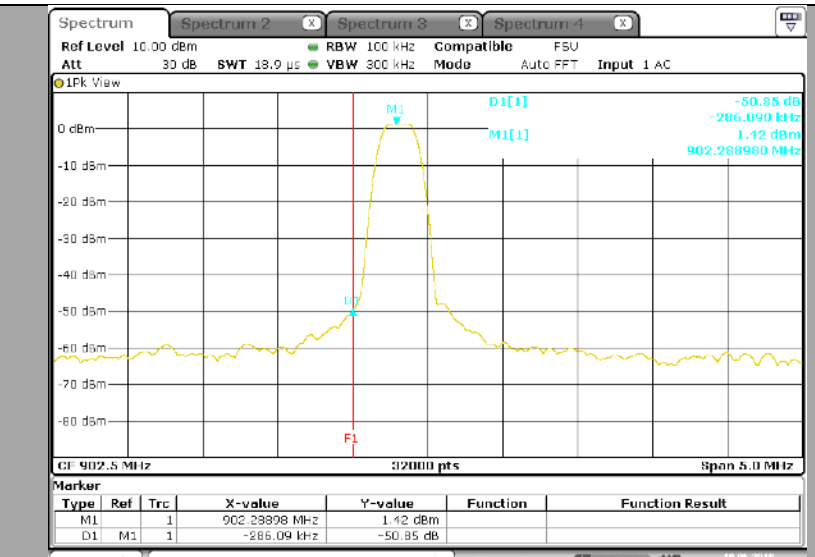
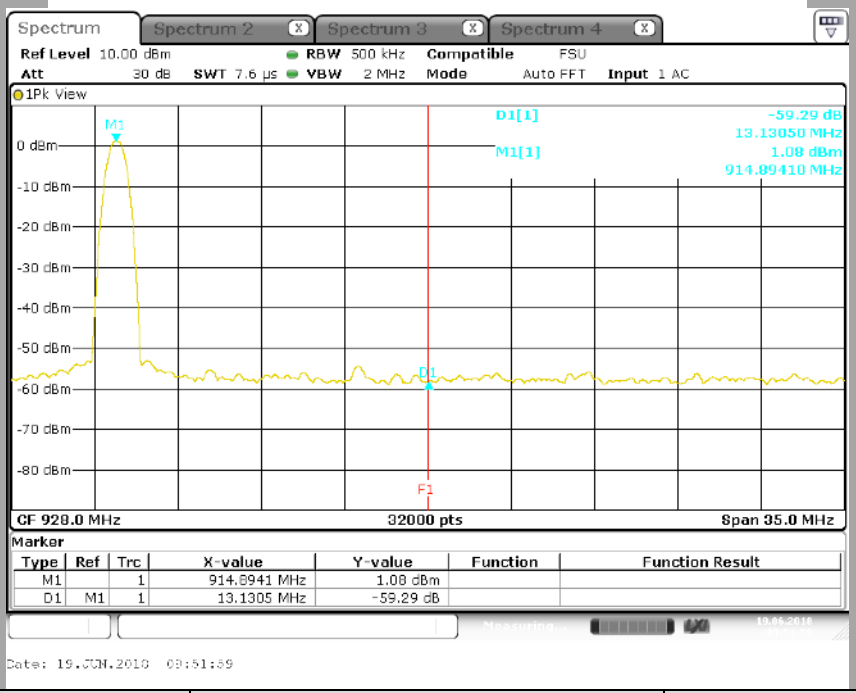
All Spurious Emissions must be at least 30dB below the Fundamental Radiator Level at the Band Edge Edge “902MHz & 928MHz”

18.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09
Cable	TELEDYNE	920-0202-048	A5329675	2017/10	2018/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

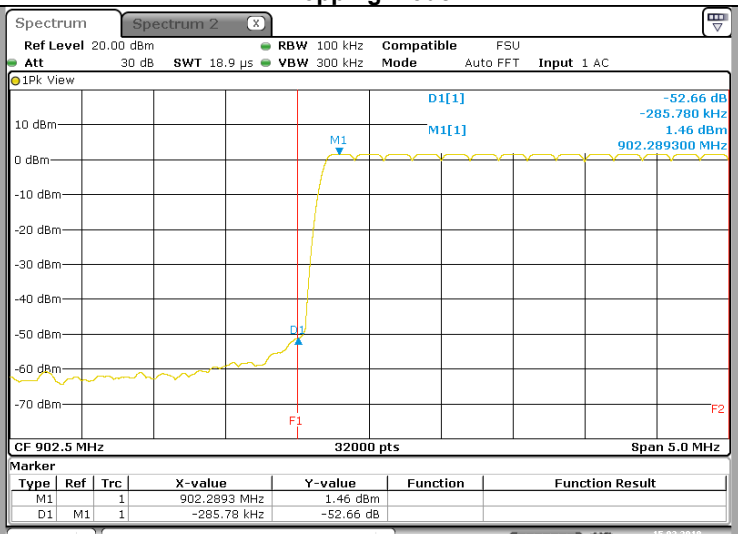
Note: In our quality system, the test equipment calibration due is more & less 2 months

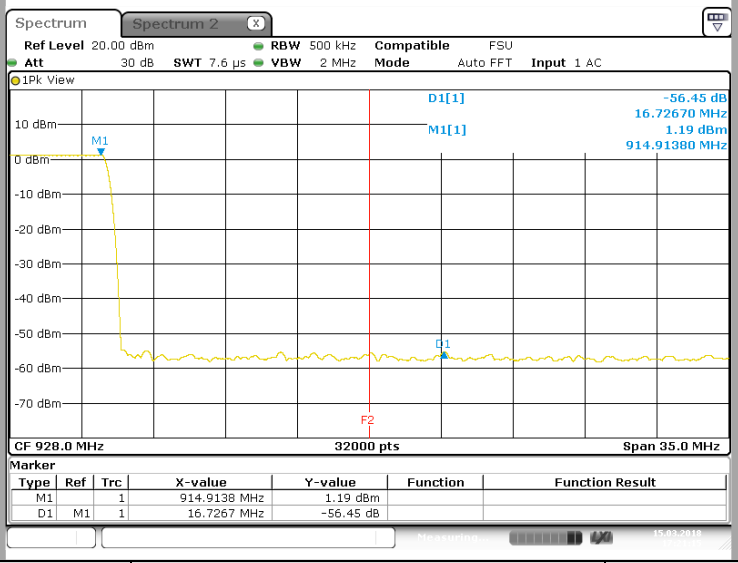
18.5. RESULTS

Single Frequency Cmin/Cnom/Cmax		
 		

Frequency (MHz)	Level (dBc)	Limit (dBc)
902	50,85	30
928	59,29	30

Call
Hopping mode





Frequency (MHz)	Level (dBc)	Limit (dBc)
902	52,66	30
928	56,45	30

18.6. *CONCLUSION*

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

19. HYBRID MODE 125 KHZ : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

19.1. TEST CONDITIONS

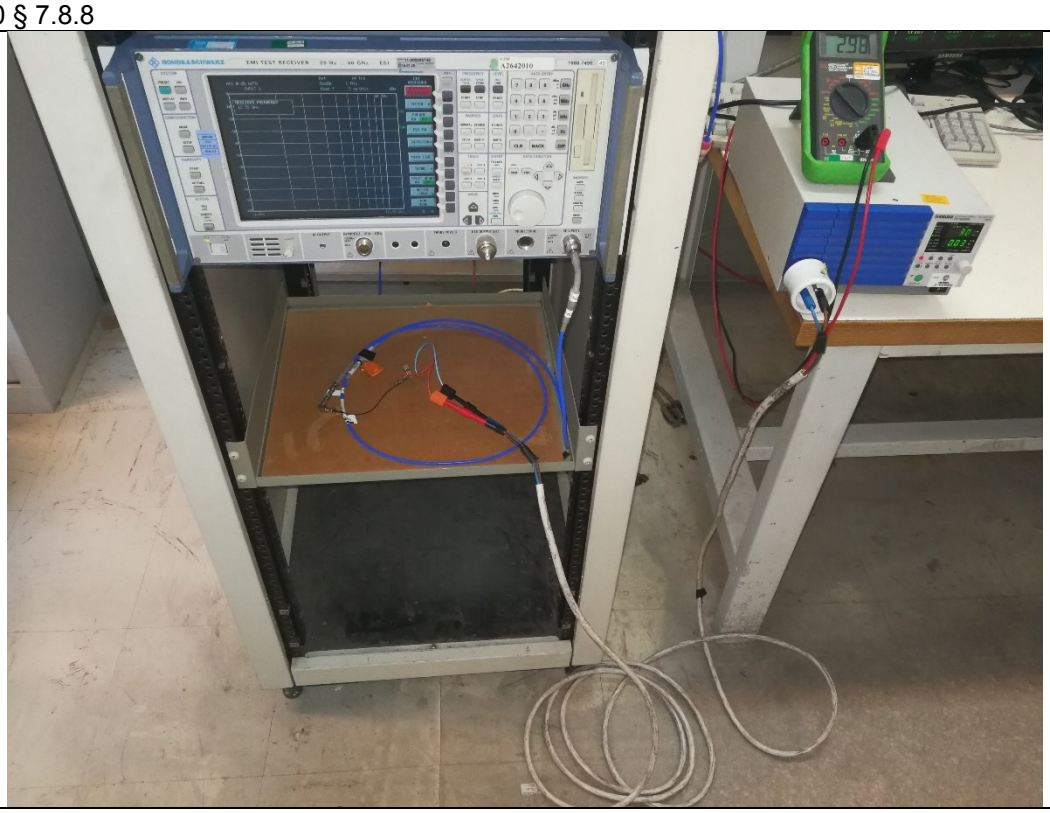
Test performed by : Mathieu CERISIER
Date of test : June 20, 2018
Ambient temperature : 23 °C
Relative humidity : 43 %

19.2. 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 § 7.8.8



Photograph for Unwanted Emission into non-restricted frequency bands

19.3. LIMIT

All Spurious Emissions must be at least 30dB below the Fundamental Radiator Level

19.4. TEST EQUIPMENT LIST

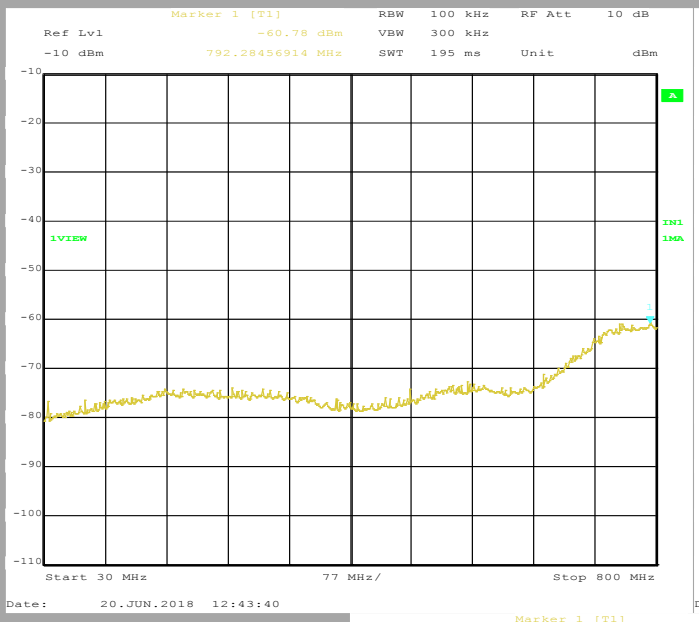
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2016/07	2018/07
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Cable Conducted S36 chamber	TELEDYNE	084-0555-2MTR	A5329758	2017/11	2018/11
Attenuator 3dB Cable Spurious Conducted	-	WA54-3-12	A7122223	2017/11	2018/11
High Pass Filter 868MHz	WAINWRIGHT	WHKX12-935	A7484069	2017/03	2019/03
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

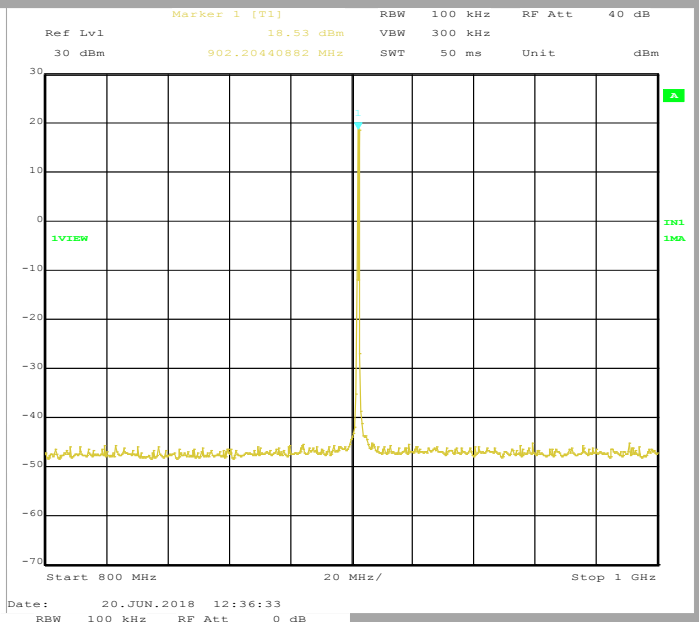
Note: In our quality system, the test equipment calibration due is more & less 2 months

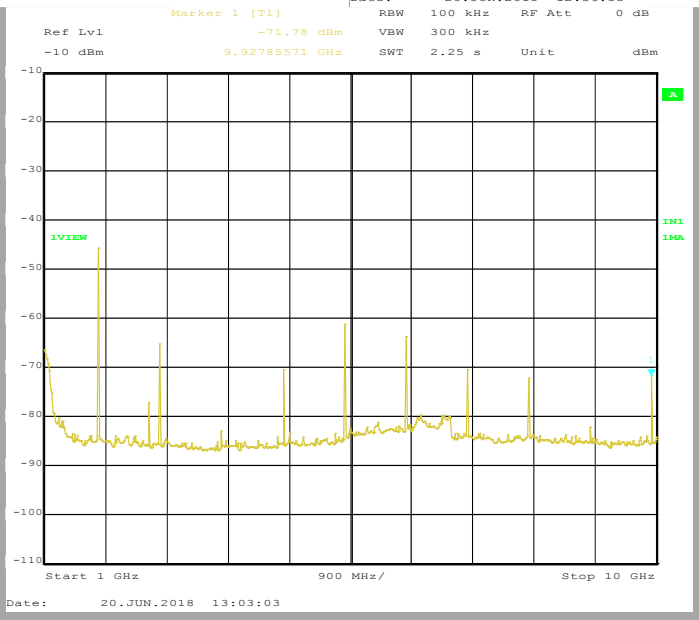
19.1. RESULTS

Conducted Spurious

Cmin

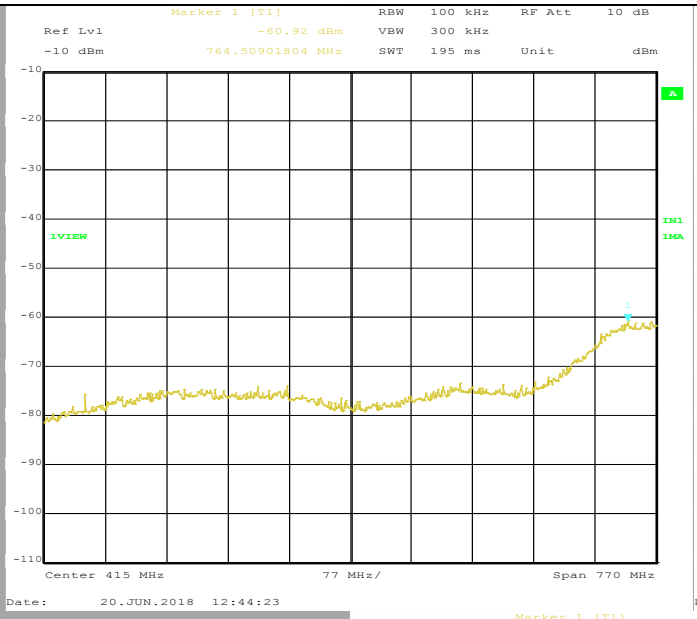


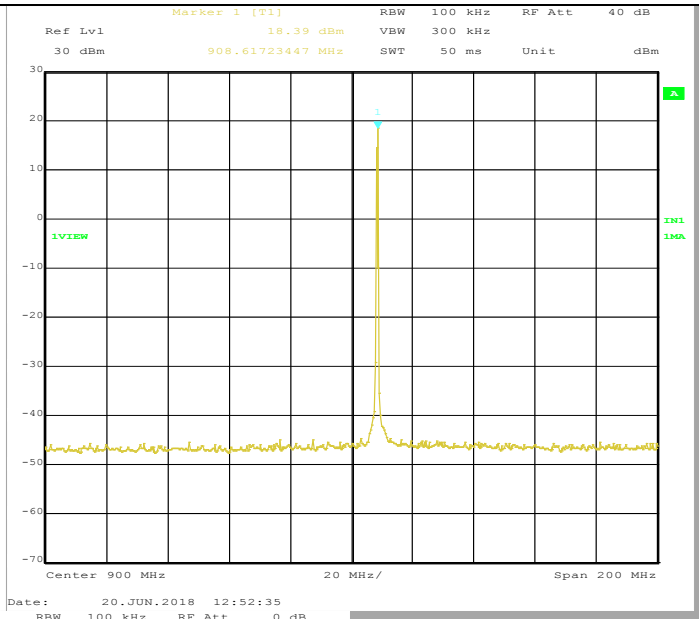


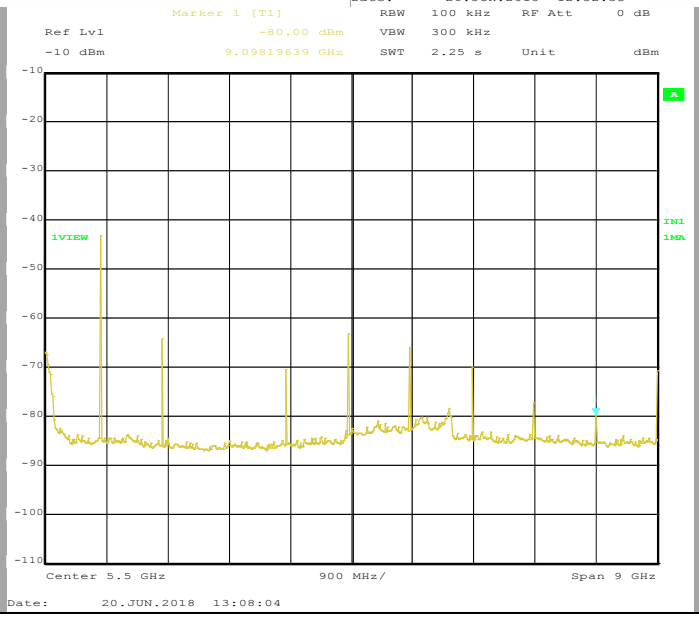


Conducted Spurious

Cnom

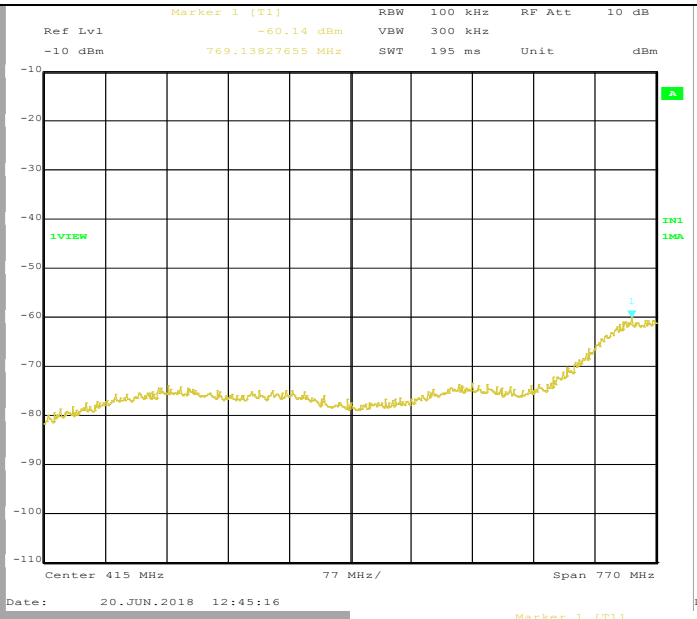


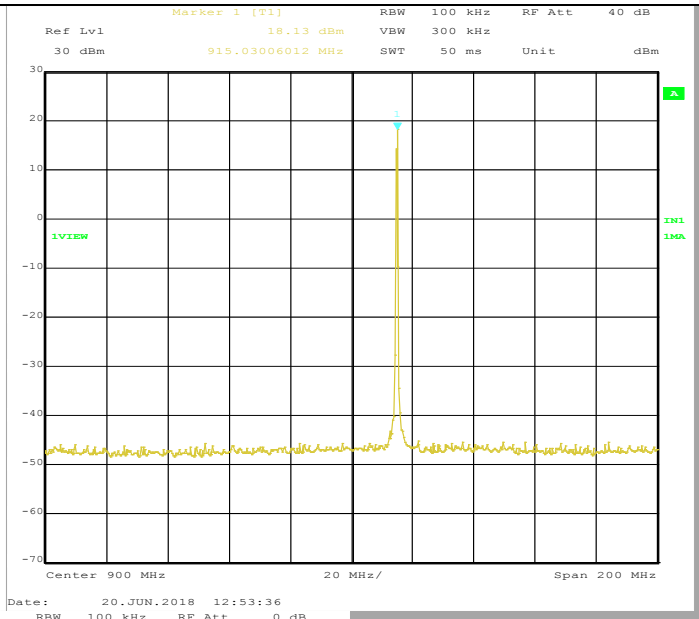


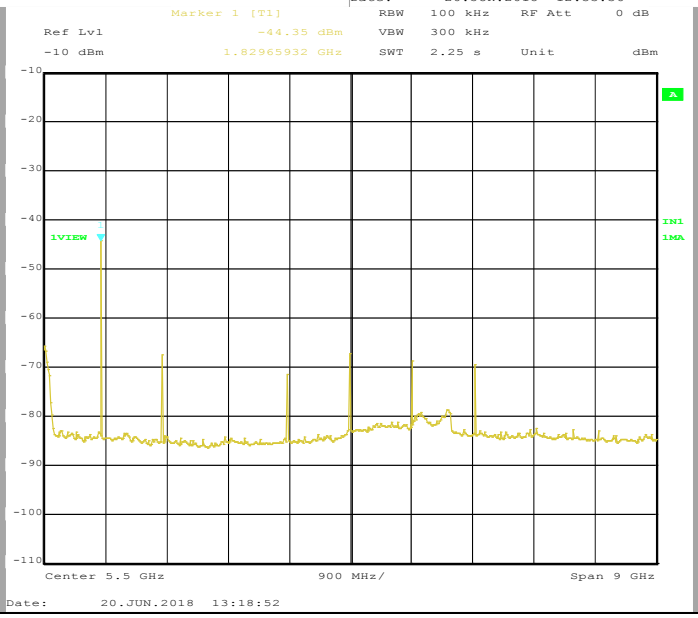


Conducted Spurious

Cmax







Frequency (MHz)	Reading Value (dBm)	Cable Loss (dB)	Final Value (dBm)	Level (dBc)	Limit (dBc)
902,3	18,53	3,3	21,83		
1793	-45,77	3,7	-42,07	63,9	30
5419	-61,46	4,37	-57,09	78,92	30
6321	-64	4,51	-59,49	81,32	30
908,7	18,39	3,3	21,69		
1881	-43,48	3,7	-39,78	61,61	30
2713	-64,44	3,87	-60,57	82,4	30
5455	-63,5	4,37	-59,13	80,96	30
914,9	18,13	3,3	21,43		
1830	-44,35	3,7	-40,65	62,48	30
2731	-67,6	3,87	-63,73	85,56	30
5491	-67,36	4,37	-62,99	84,82	30

19.2. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

20. HYBRID MODE 125 KHZ : UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

20.1. TEST CONDITIONS

Test performed by	: Laurent DENEUX
Date of test	: June 21, 2018
Ambient temperature	: 19 °C
Relative humidity	: 47 %

20.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **on an open area test site** below 1GHz and **in a full anechoic chamber** above 1GHz. Distance between measuring antenna and the EUT is **10m** below 1GHz and **3m** above 1GHz and below 30MHz.
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

Photograph for Unwanted Emission in restricted frequency bands

20.3. 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

20.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Receiver	RHODE & SCHWARZ	ESIB	A2642021	2016/12	2018/12
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2018/04	2020/04
Bilog antenna	CHASE	CBL 6112A	C2040040	2018/04	2019/04
Horn antenna	EMCO	.3115	C2042016	2018/04	2019/04
Loop antenna	SCHWARZBECK	FMZB1513	C2040209	2018/03	2020/03
OATS	L.C.I.E.	-	F2000400	2017/06	2018/06
Cable	-	-	A5329449	2017/09	2018/09
Cable	-	-	A5329368	2017/06	2018/06
cable	-	-	A5329444	2017/09	2018/09
cable	-	-	A5329542	2018/06	2019/06

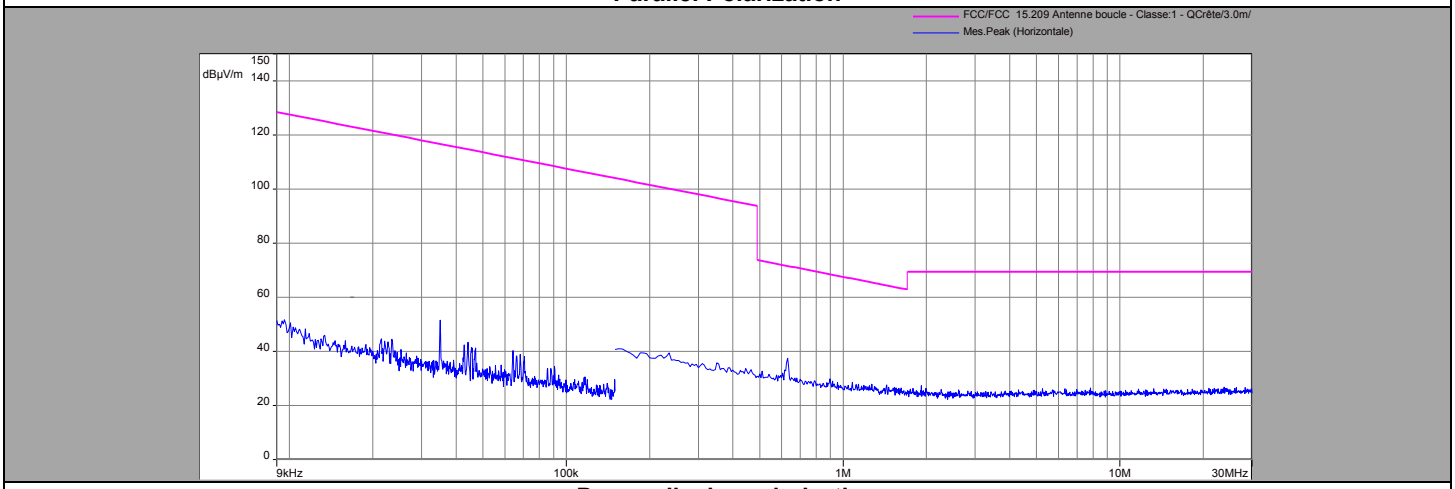
Note: In our quality system, the test equipment calibration due is more & less 2 months

20.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

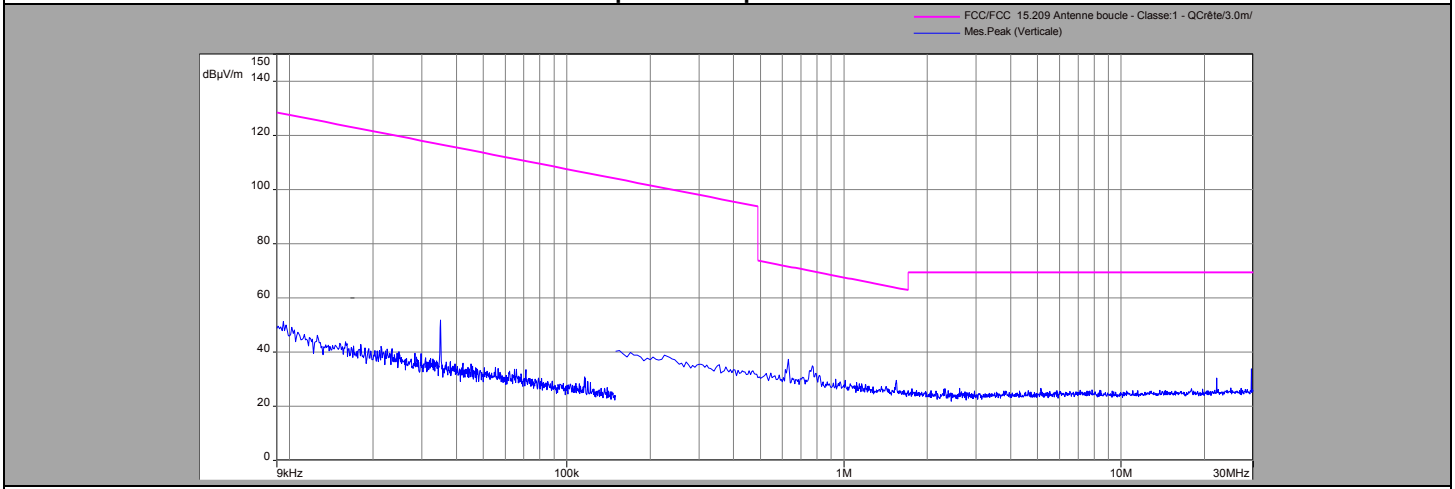
☑ None ☐ Divergence:

20.6. RESULTS

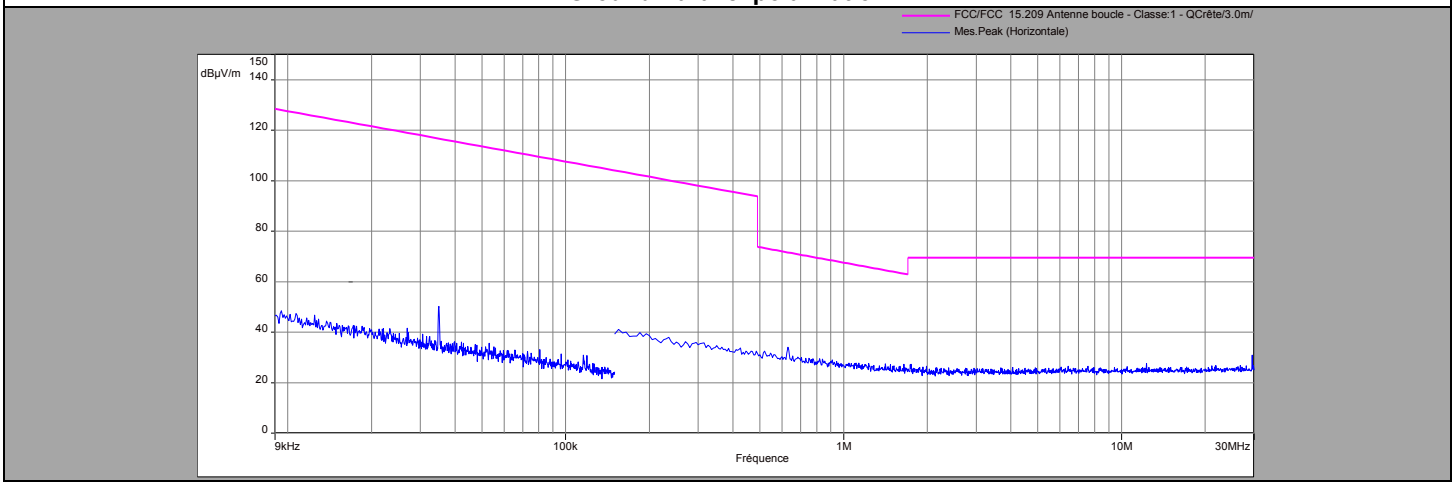
9kHz – 30 MHz
Cmin
Parallel Polarization



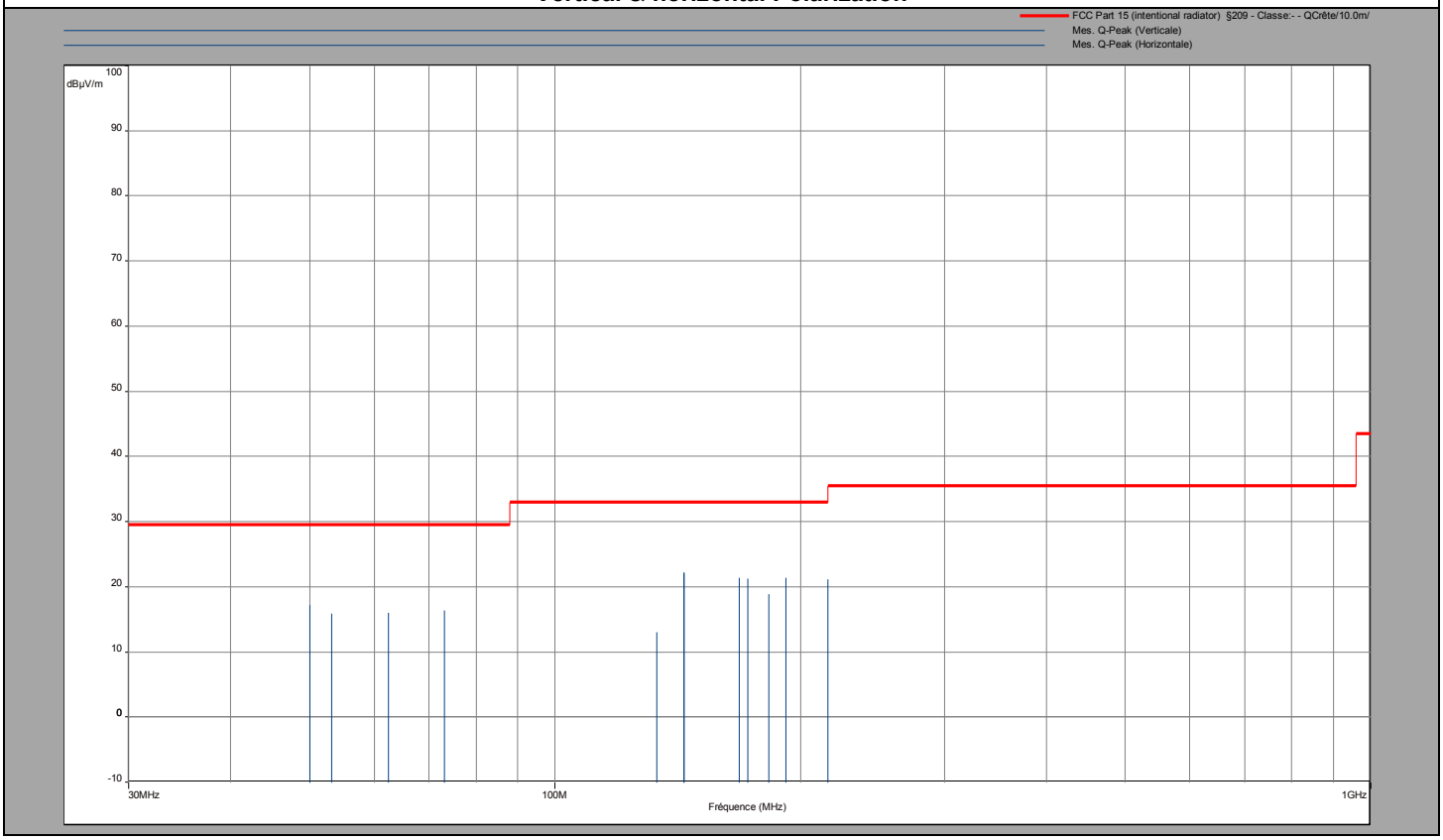
Perpendicular polarization



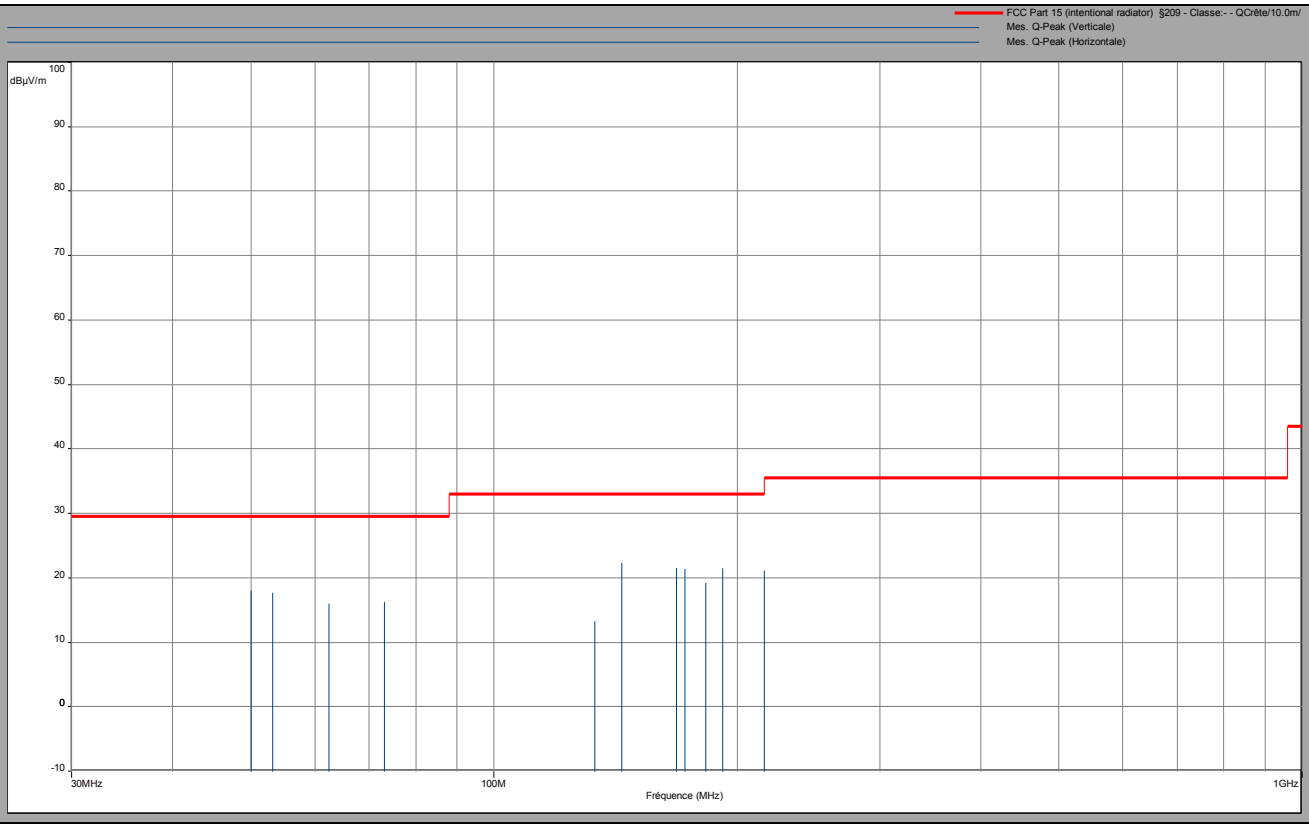
Ground Parallel polarization



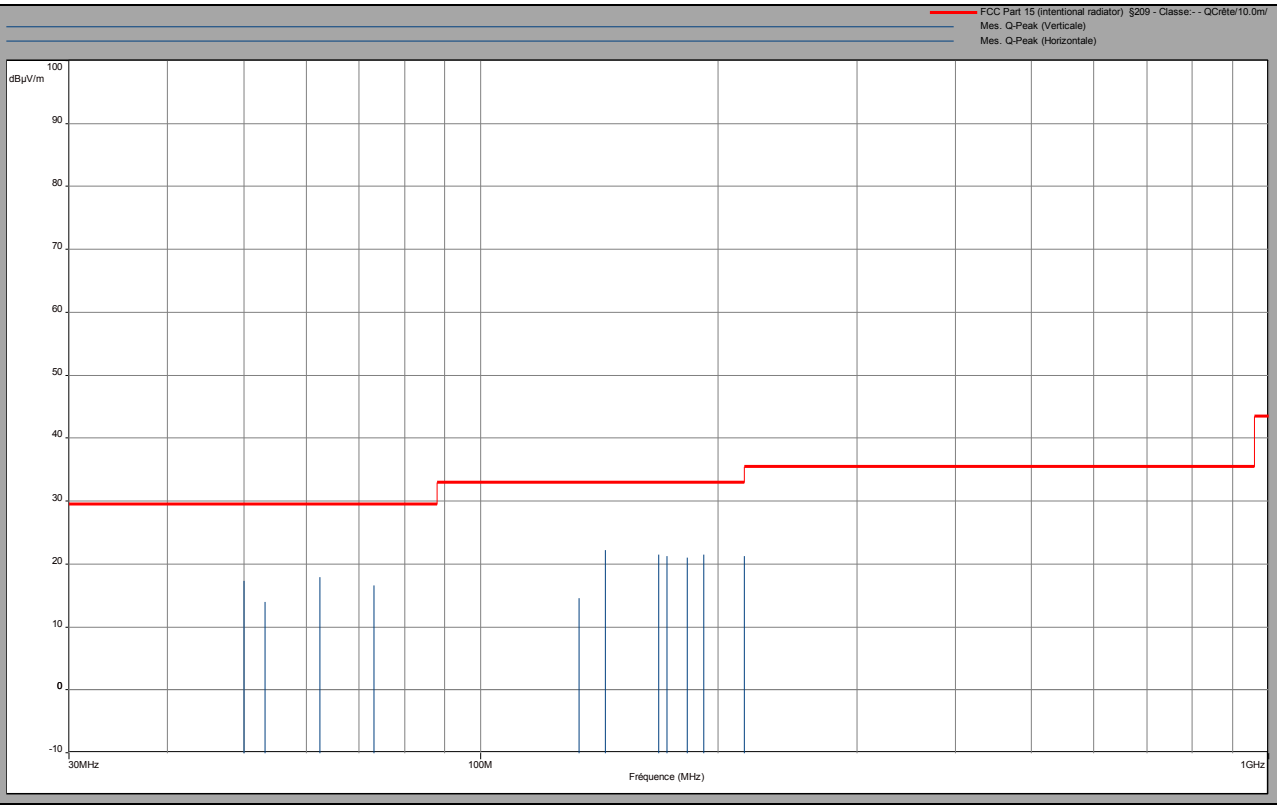
Below 1GHz
Cmin
Vertical & horizontal Polarization



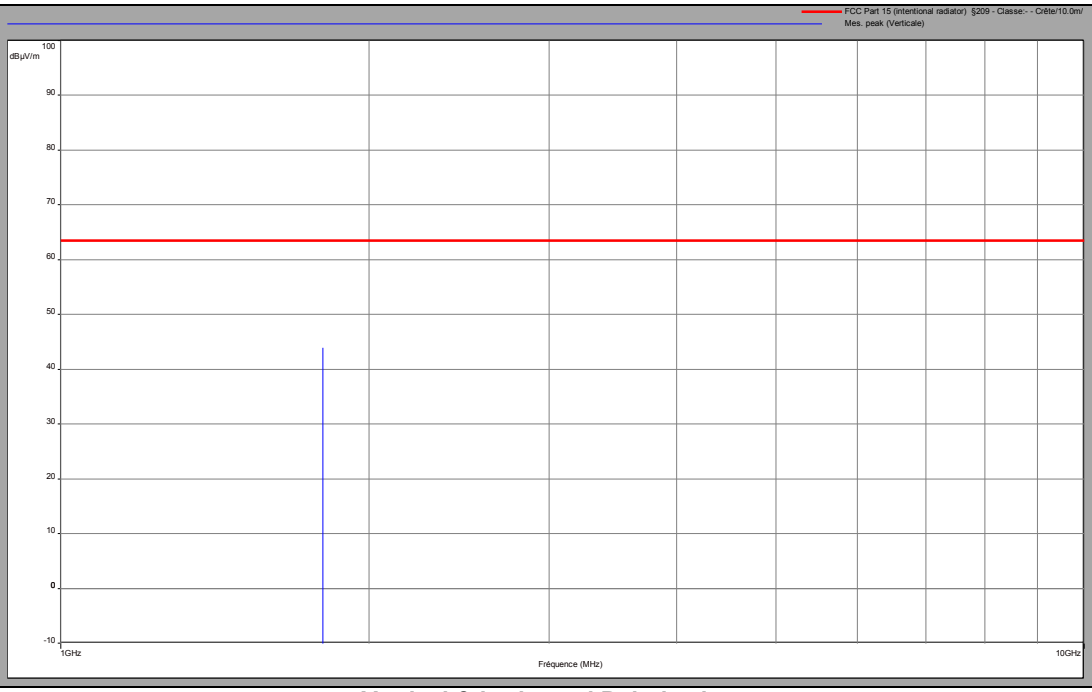
Below 1GHz
Cnom
Vertical & horizontal Polarization



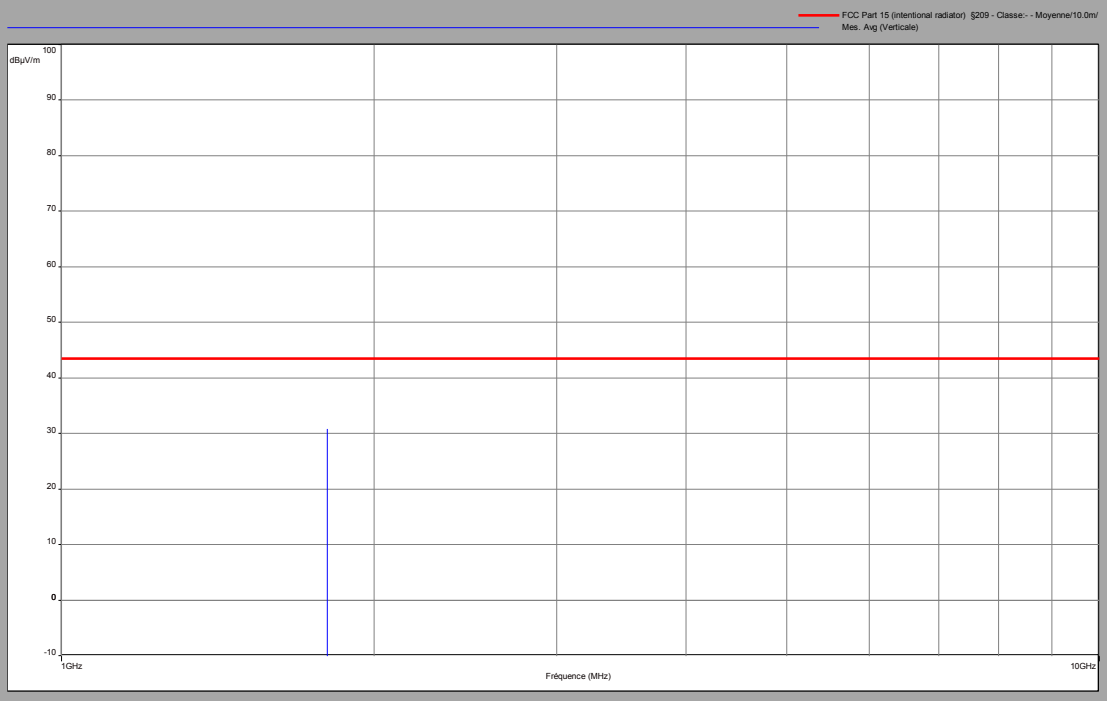
Below 1GHz
Cmax
Vertical & horizontal Polarization



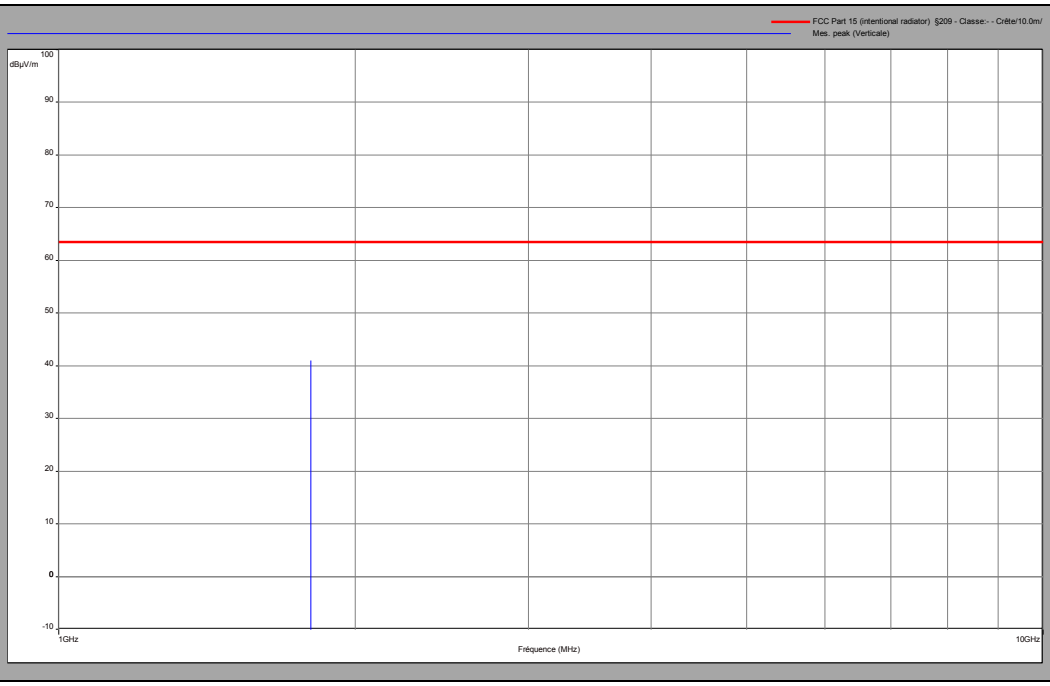
Above 1GHz
Cmin
Vertical & horizontal Polarization Peak measurement



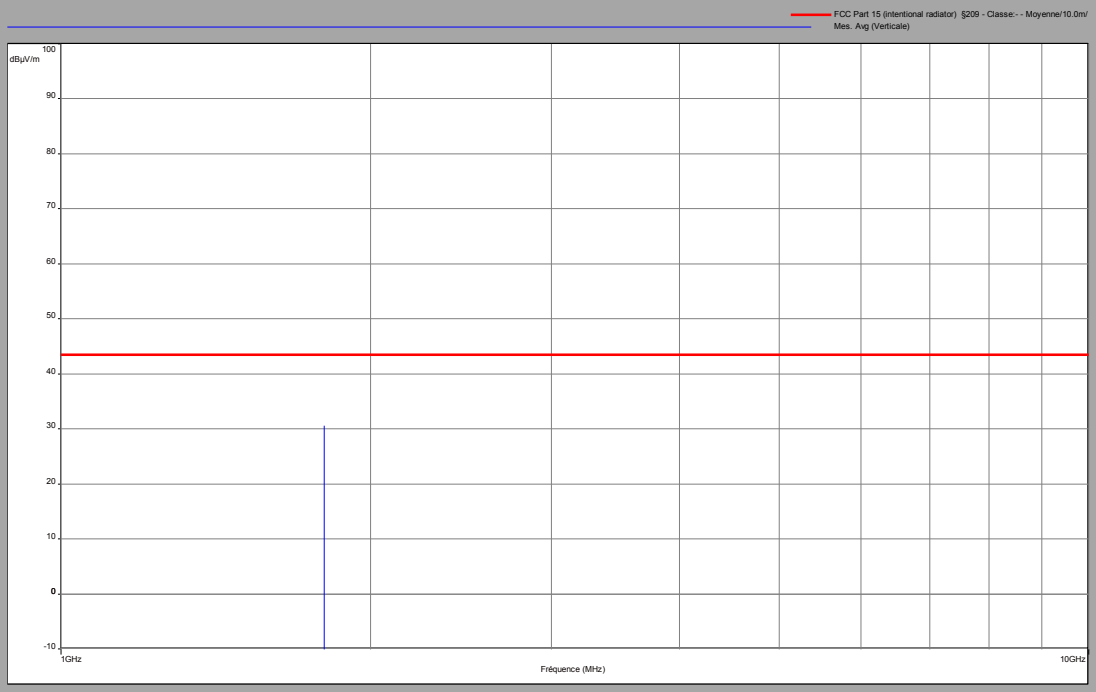
Vertical & horizontal Polarization Average value (with duty cycle correction)



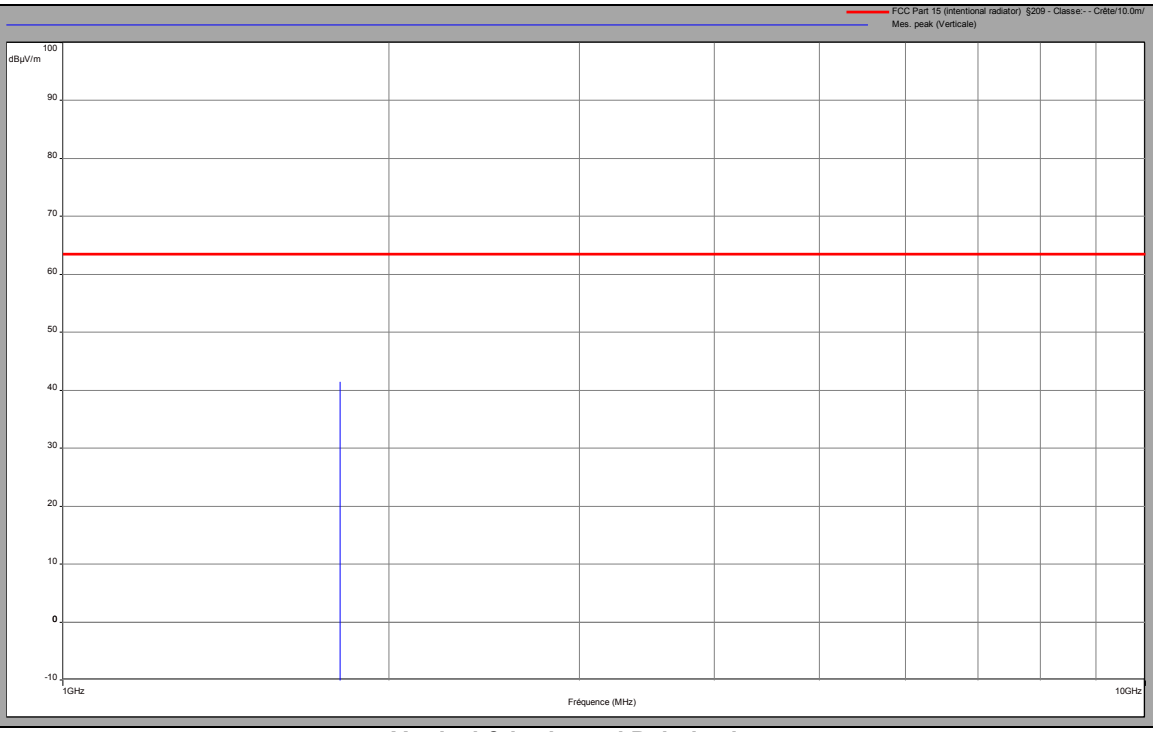
Above 1GHz
Cnom
Vertical & horizontal Polarization Peak measurement



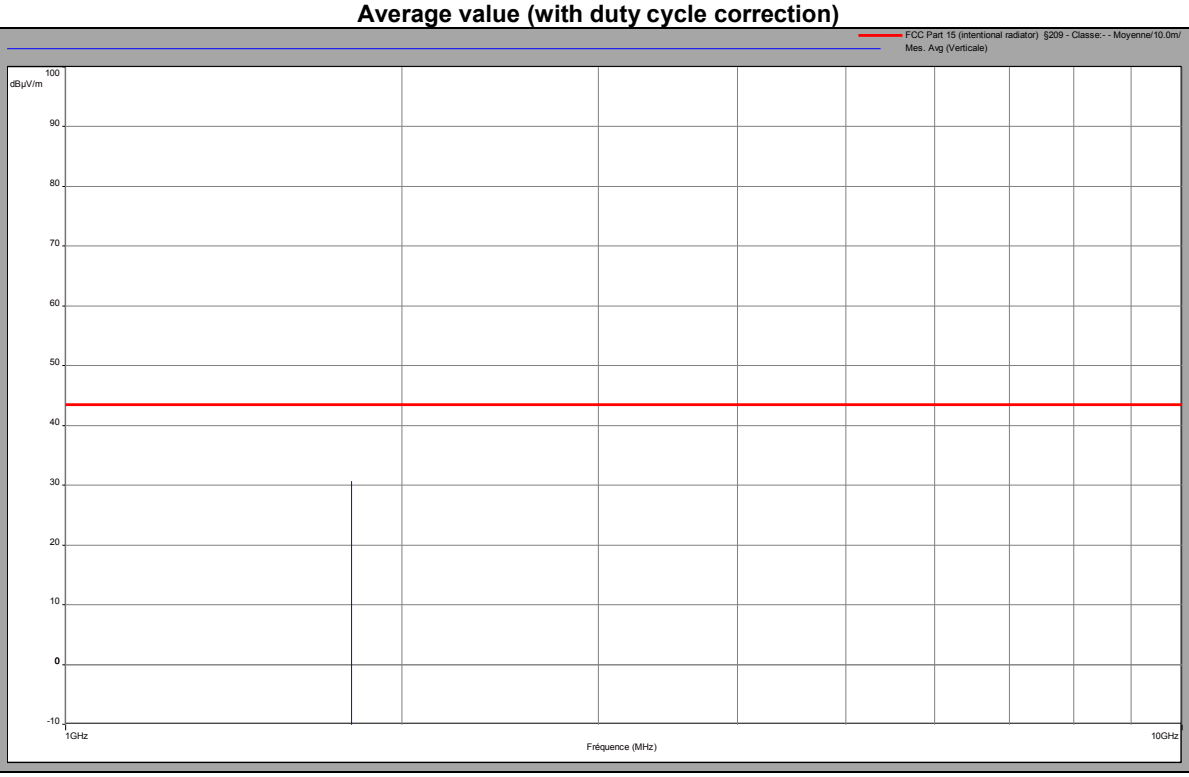
Vertical & horizontal Polarization Average value (with duty cycle correction)



Above 1GHz
Cmax
Vertical & horizontal Polarization Peak measurement



Vertical & horizontal Polarization Average value (with duty cycle correction)



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					
Cmin					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	45.3	-	18.47	29.5	11.03
Vertical	50	-	17.2	29.5	12.3
Vertical	63.5	-	14.8	29.5	14.7
Vertical	72.7	-	15.92	29.5	13.58
Vertical	133.3	-	22.1	33	10.9
Vertical	216	-	21.07	33	11.93
Horizontal	50	-	17.14	29.5	12.36
Horizontal	62.5	-	15.12	29.5	14.38
Horizontal	120	-	22.53	33	10.47
Horizontal	133.3	-	22.04	33	10.96
Horizontal	144	-	22.18	33	10.82
Horizontal	168	-	21.33	33	11.67
Horizontal	192	-	21.45	33	11.55

Below 1GHz					
Cnom					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	45.3	-	18.47	29.5	11.03
Vertical	50	-	17.2	29.5	12.3
Vertical	63.5	-	14.8	29.5	14.7
Vertical	72.7	-	15.92	29.5	13.58
Vertical	133.3	-	22.1	33	10.9
Vertical	216	-	21.07	33	11.93
Horizontal	50	-	17.14	29.5	12.36
Horizontal	62.5	-	15.29	29.5	14.21
Horizontal	120	-	22.41	33	10.59
Horizontal	133.3	-	22.1	33	10.9
Horizontal	144	-	23.17	33	9.83
Horizontal	168	-	21.44	33	11.56

Below 1GHz					
Cmax					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	17.39	29.5	12.11
Vertical	53.2	-	14.03	29.5	15.47
Vertical	62.5	-	17.93	29.5	11.57
Vertical	73.1	-	16.59	29.5	12.91
Vertical	133.3	-	14.62	33	18.38
Vertical	144	-	22.23	33	10.77
Vertical	172.4	-	21.32	33	11.68
Vertical	182.8	-	21.03	33	11.97
Horizontal	168	-	21.54	33	11.46
Horizontal	192	-	21.5	33	11.5

Above 1GHz								
Cmin								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1804.6	12.49	30.89	43.5	12.61	43.95	63.5	19.55

Above 1GHz								
Cnom								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1804	12.26	30.66	43.5	12.84	41.07	63.5	22.43

Above 1GHz								
Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1803	12.34	30.74	43.5	12.76	41.47	63.5	22.03

20.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

21. HYBRID MODE 500 KHZ : OCCUPIED BANDWIDTH

21.1. TEST CONDITIONS

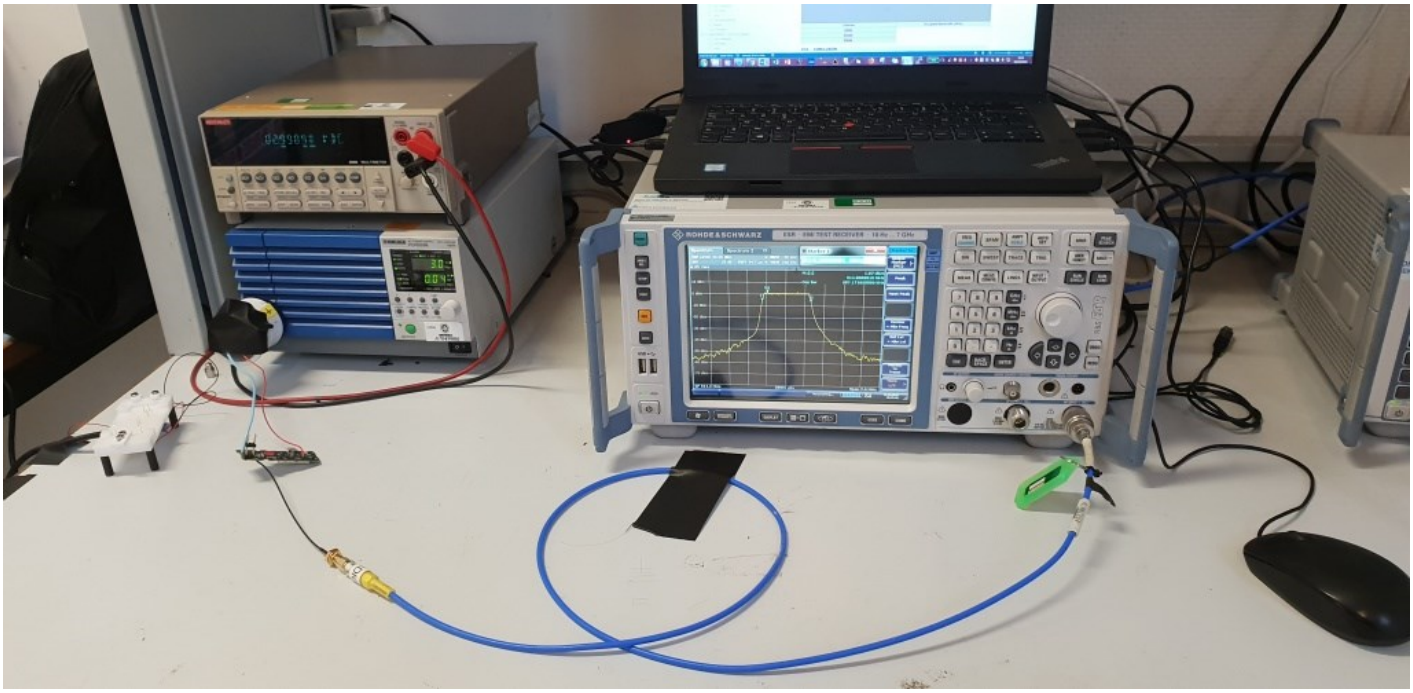
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 23 °C
Relative humidity : 49 %

21.2. 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
☑ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth

21.3. LIMIT

None

21.4. TEST EQUIPMENT LIST

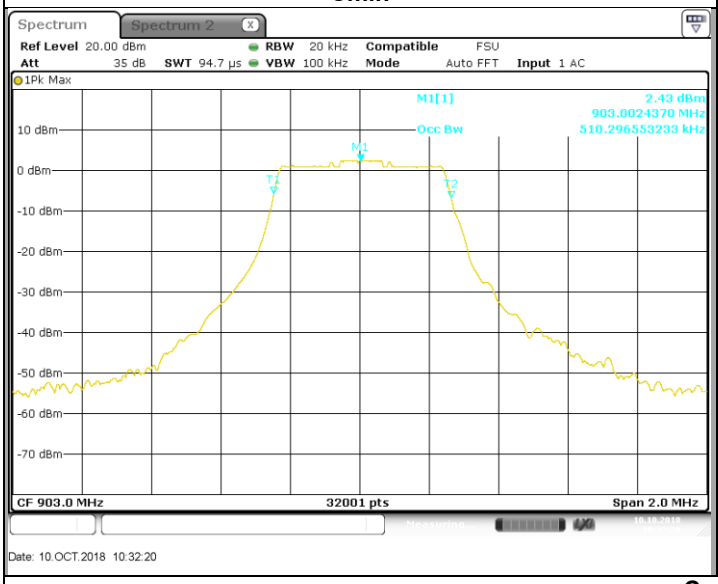
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

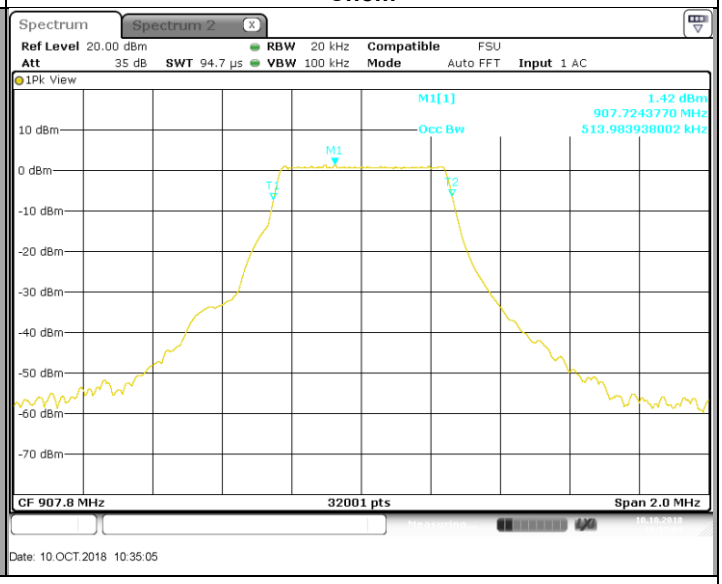
21.5. RESULTS

Occupied Bandwidth

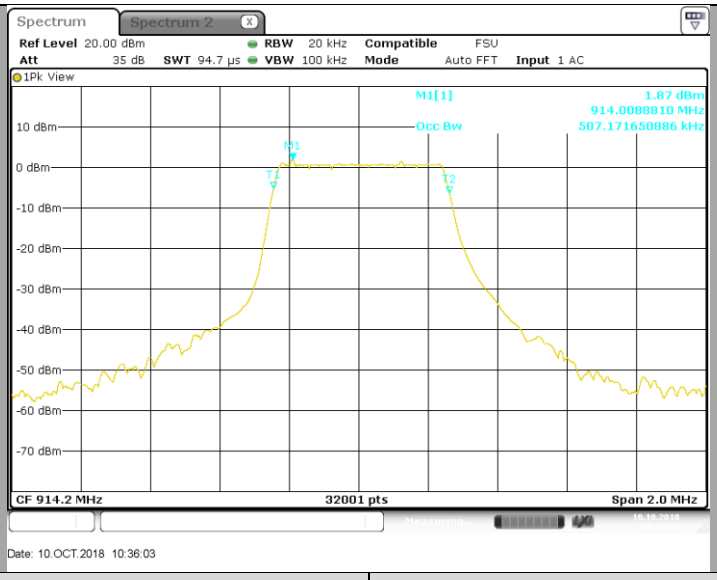
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	0,51030
Cnom	0,51398
Cmax	0,50717

21.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

22. HYBRID MODE 500KHZ : 20DB EMISSION BANDWIDTH

22.1. TEST CONDITIONS

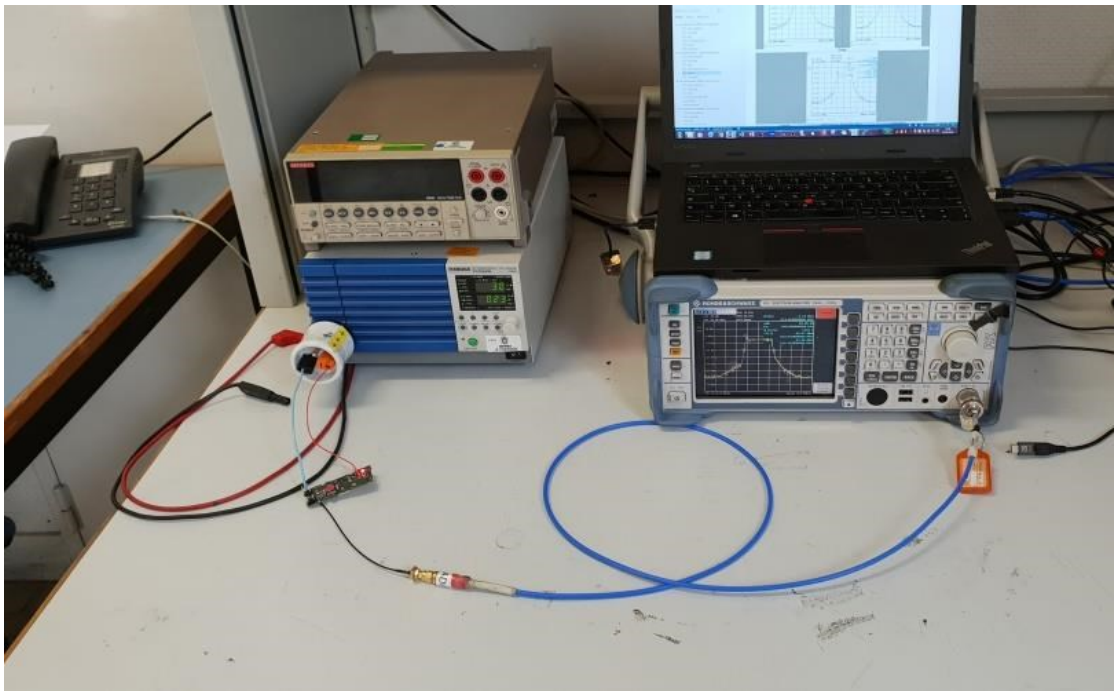
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

22.2. 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:
☐ FCC DA 00-705 (20dB Bandwidth)
☑ ANSI C63.10 § 6.9.2



Photograph for 6dB emission bandwidth

22.3. LIMIT

No limit are applicable for hybrid mode

22.4. TEST EQUIPMENT LIST

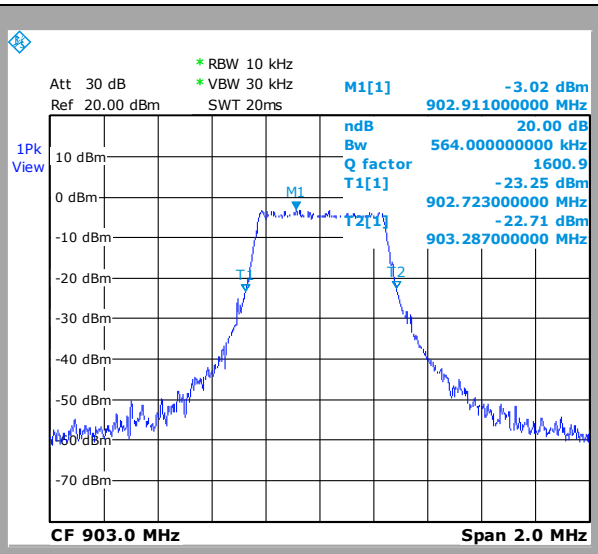
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	FSL	A4060032	2017/10	2019/10
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

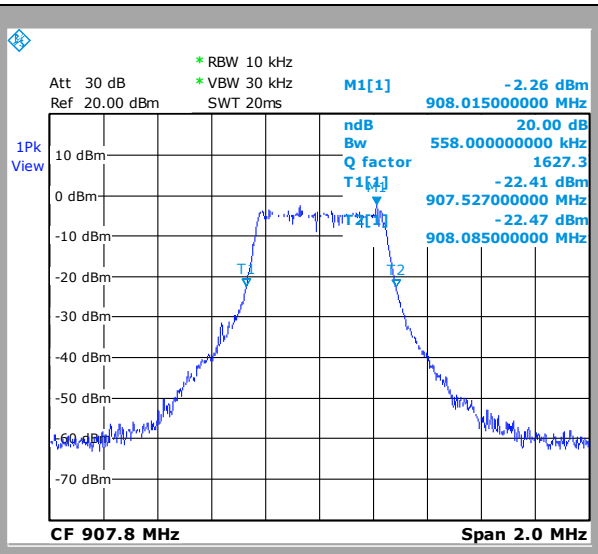
22.5. RESULTS

6dB Emission Bandwidth

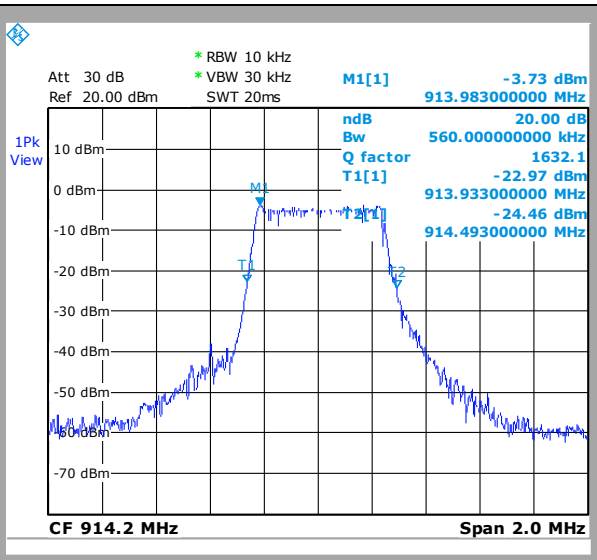
Cmin



Cnom



Cmax



Channel	20dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	0.564	No limit for Hybrid mode
Cnom	0.558	No limit for Hybrid mode
Cmax	0.560	No limit for Hybrid mode

22.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

23. HYBRID MODE 500 KHZ : CARRIER FREQUENCY SEPARATION

23.1. TEST CONDITIONS

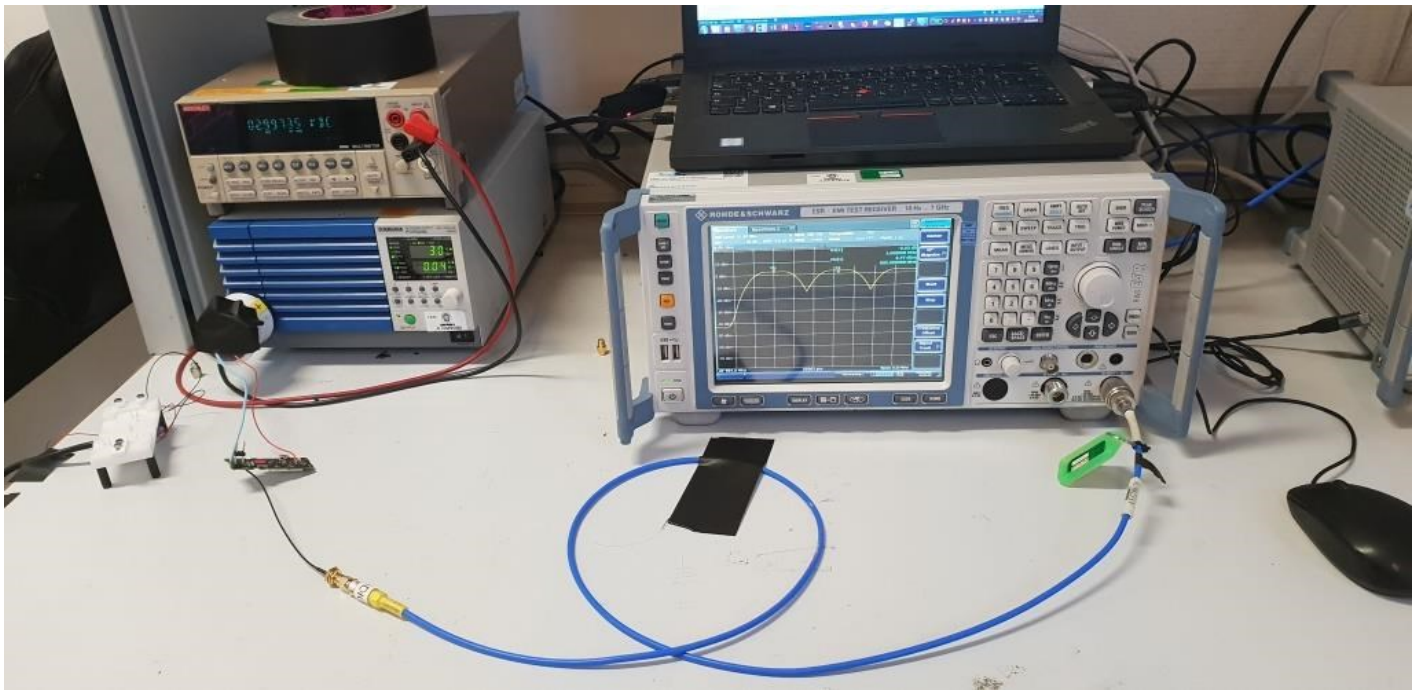
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

23.2. 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 § 7.8.2



Photograph for Carrier Frequency Separation

23.3. LIMIT

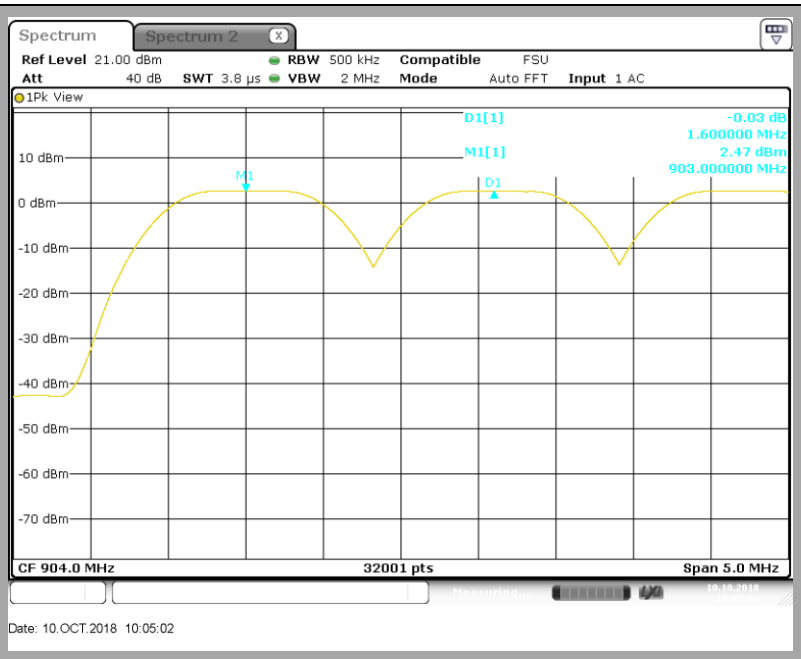
Carrier Frequency Separation shall be at 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

23.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

23.5. RESULTS



Channel	Carrier Frequency Separation (MHz)	Limit (MHz)
Cmin	1,6	Minimum 0.564

23.6. CONCLUSION

Carrier Frequency Separation measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

24. HYBRID MODE 500 KHZ : TIME OF OCCUPANCY 500KHZ

24.1. TEST CONDITIONS

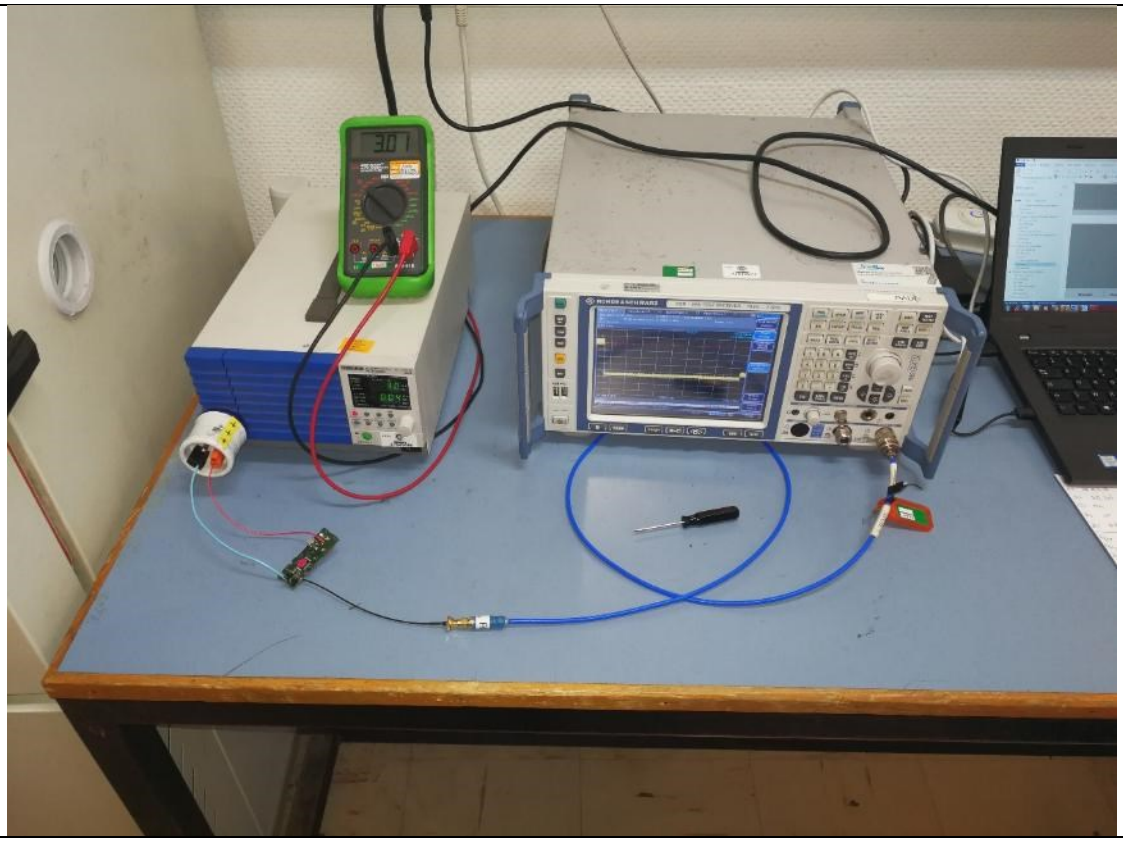
Test performed by : Mathieu CERISIER
Date of test : June 19, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

24.2. 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 § 7.8.4



Photograph for Time of Occupancy

24.3. LIMIT

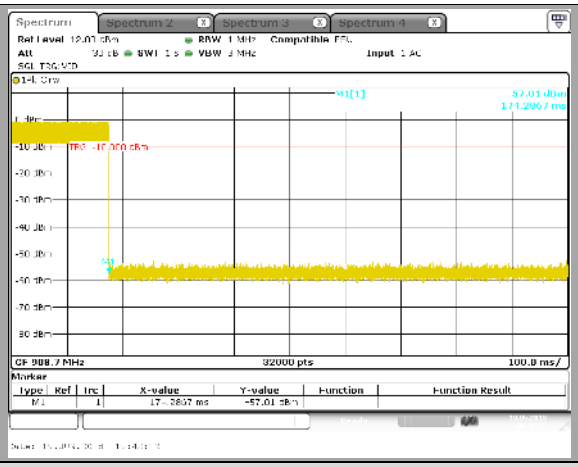
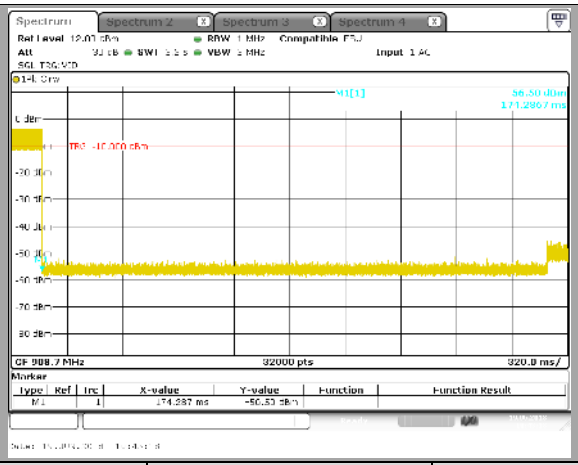
The Time of Occupancy shall not exceed 0.4s within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

24.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

24.5. RESULTS

Burst Length
Cnom

Time of Occupancy
Cnom


Channel	Burst Length (ms)	Number of Hopping during Time of Occupancy	Time of Occupancy (ms)	Limit of Time of Occupancy (ms)
Cnom	174,3	1	174,3	400

24.6. CONCLUSION

Time of Occupancy measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

25. HYBRID MODE 500KHZ : DUTY CYCLE

25.1. TEST CONDITIONS

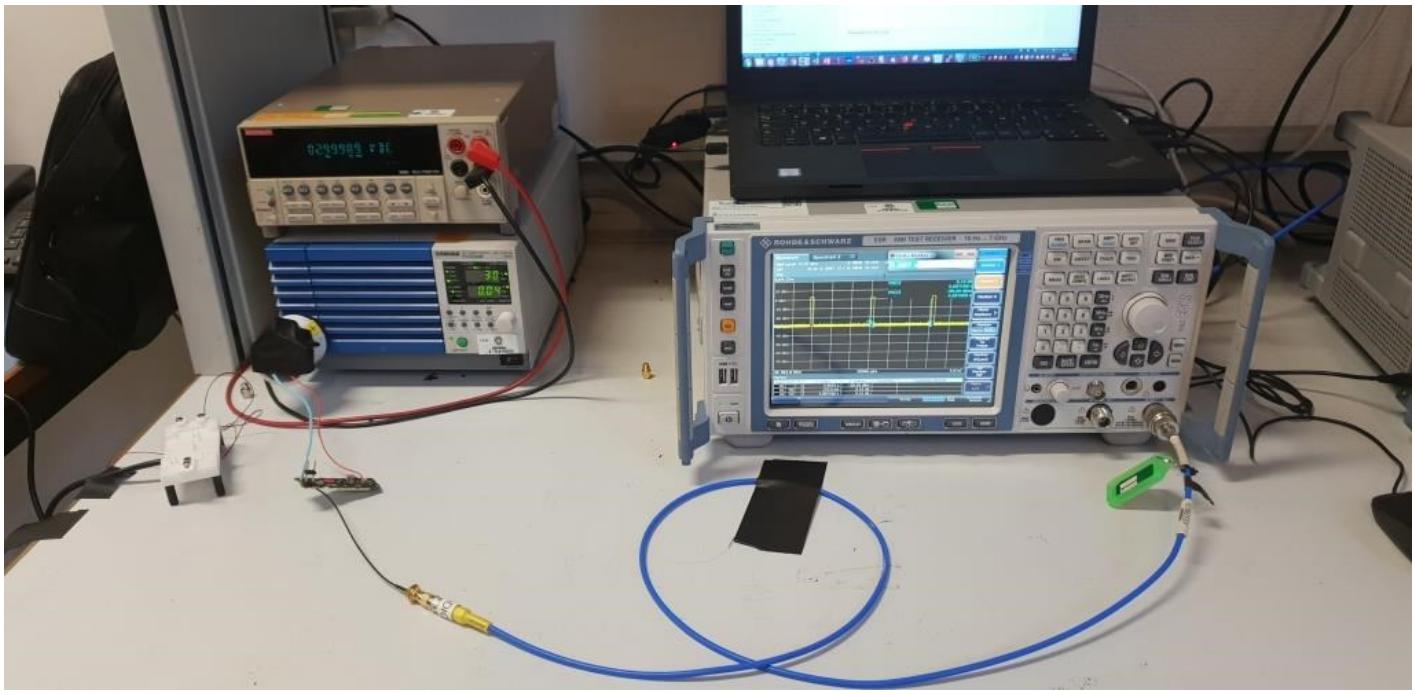
Test performed by	: Armand MAHOUNGOU
Date of test	: October 10, 2018
Ambient temperature	: 23 °C
Relative humidity	: 48 %

25.2. 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

25.3. LIMIT

None

25.4. TEST EQUIPMENT LIST

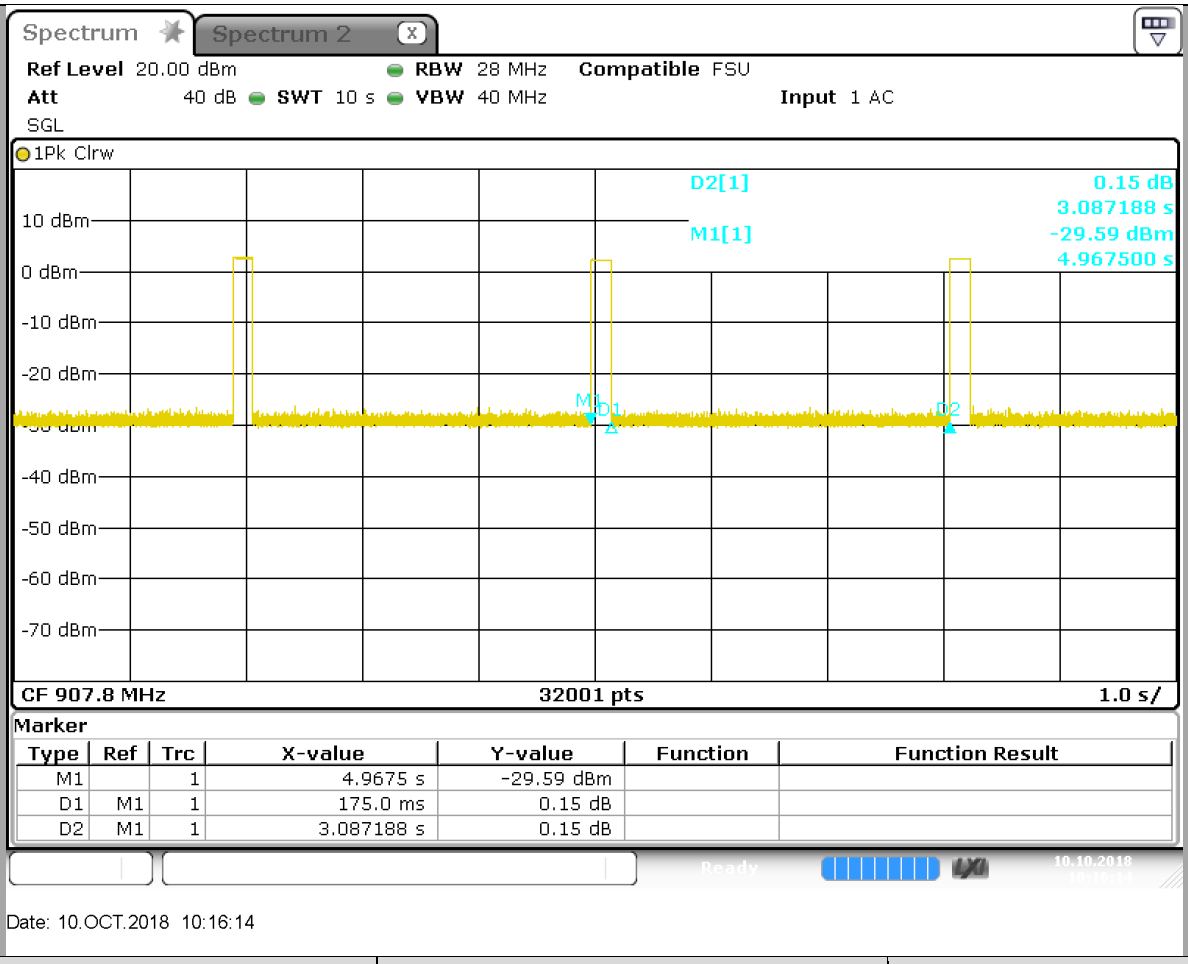
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

25.5. RESULTS

Duty Cycle

Cnom



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	5,668%	24,93

25.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

26. HYBRID MODE 500 KHZ : MAXIMUM CONDUCTED OUTPUT POWER

26.1. TEST CONDITIONS

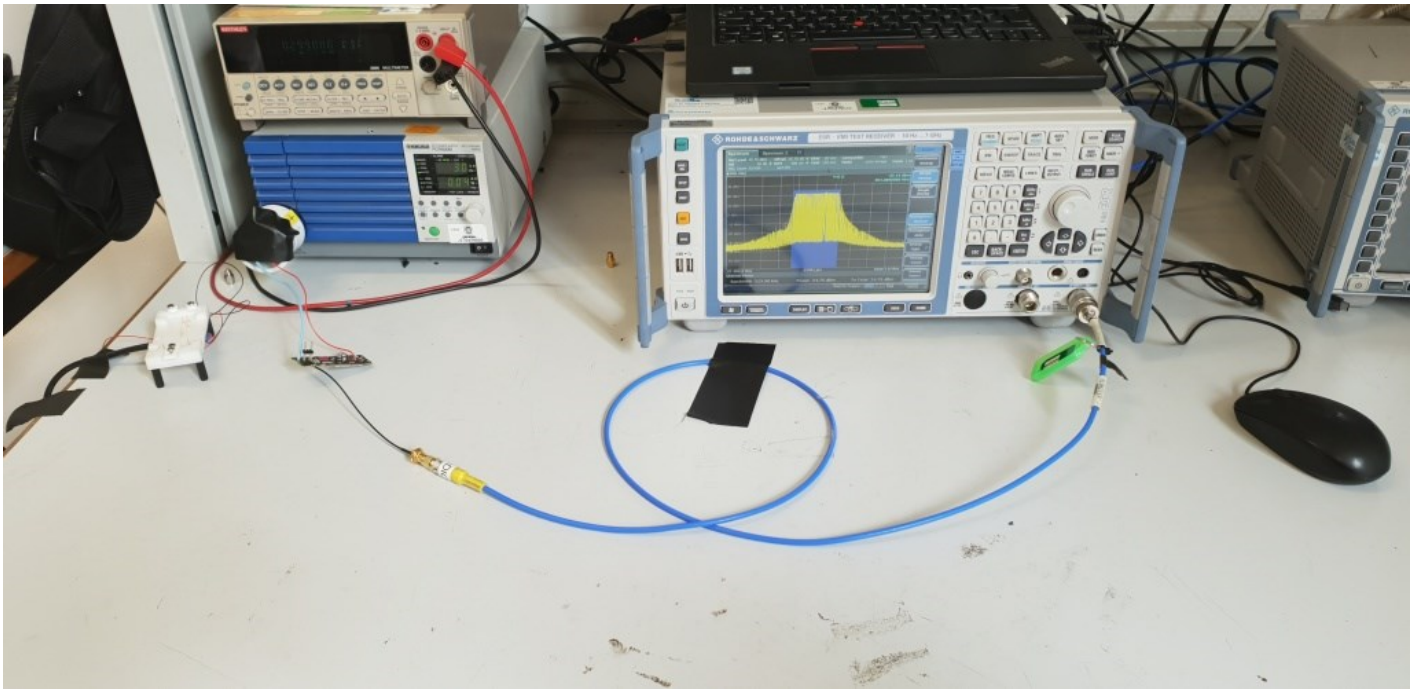
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 23 °C
Relative humidity : 48 %

26.2. 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 § 11.9.2.2.2



Photograph for Maximum Conducted Output Power

26.3. LIMIT

Maximum Conducted Output power:
Shall not exceed 30dBm if number of hopping channels is above 50
Shall not exceed 24dBm if number of hopping channels is below 50
Limits are reduced by G-6dBi if Antenna Gain above 6dBi

26.4. TEST EQUIPMENT LIST

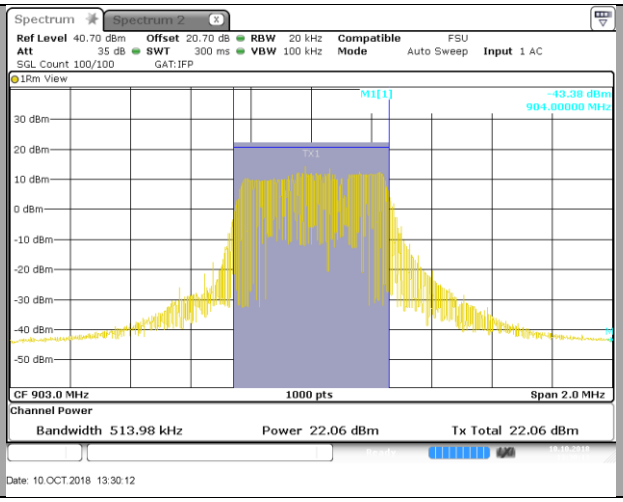
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

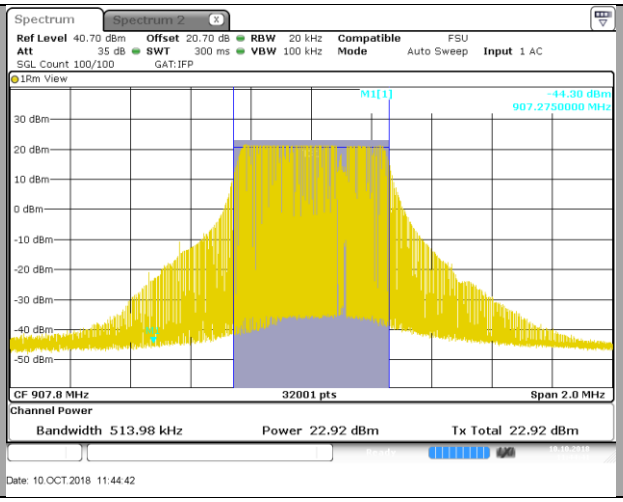
26.5. RESULTS

Maximum Conducted Output Power

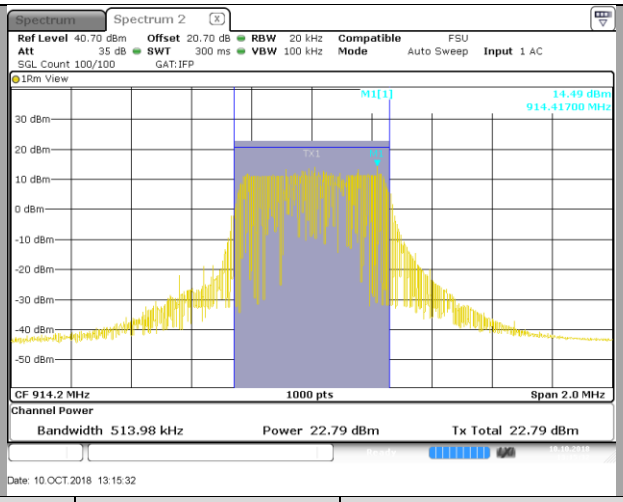
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**20,7**	-1,5	22,06	24
Cnom	**20,7**	-1,5	22,92	24
Cmax	**20,7**	-1,5	22,79	24

26.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

27. HYBRID MODE 500KHZ : POWER SPECTRAL DENSITY

27.1. TEST CONDITIONS

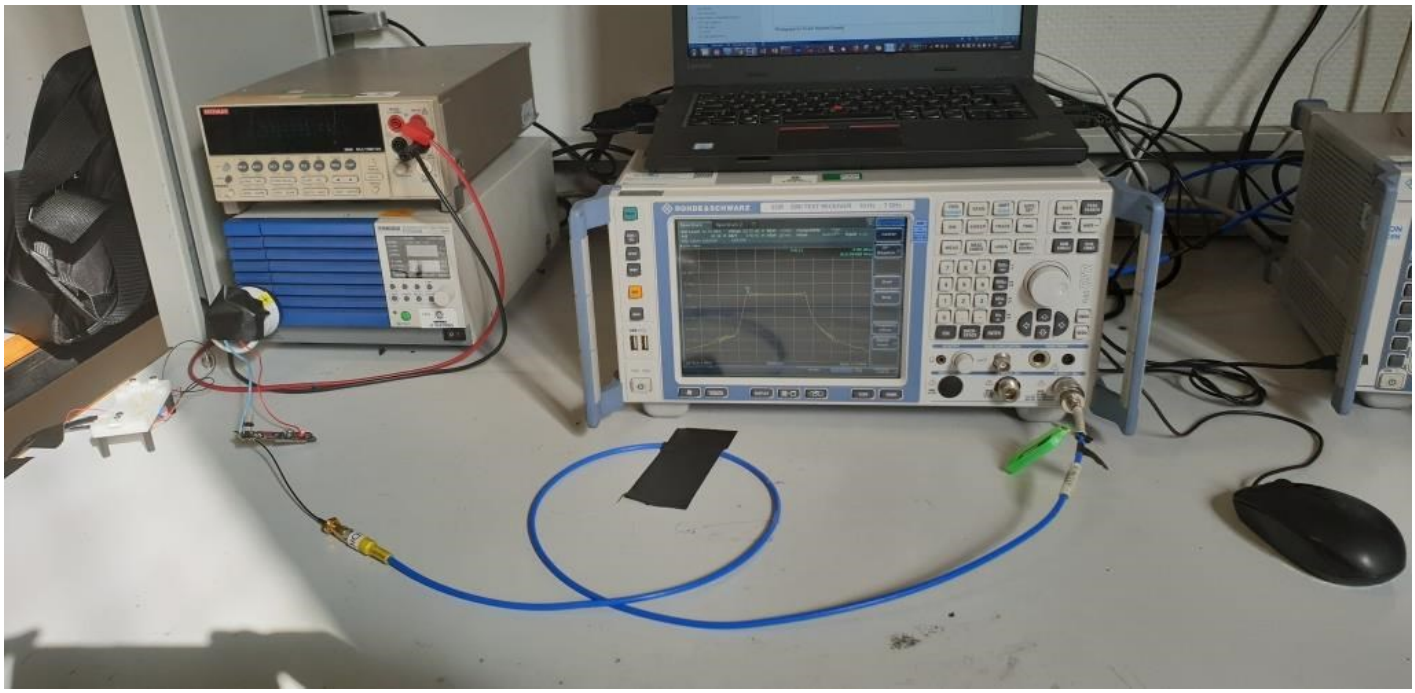
Test performed by : Mathieu CERISIER
Date of test : June 19, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

27.2. 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:
☐ KDB 558074 D01 DTS Meas Guidance v05 § 10.2 (Method PKPSD)
☑ KDB 558074 D01 DTS Meas Guidance v05 § 10.3 (Method AVGPSD-1)
☑ ANSI C63.10 § 11.10.3



Photograph for Power Spectral Density

27.3. LIMIT

Power Spectral Density:
2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

27.4. TEST EQUIPMENT LIST

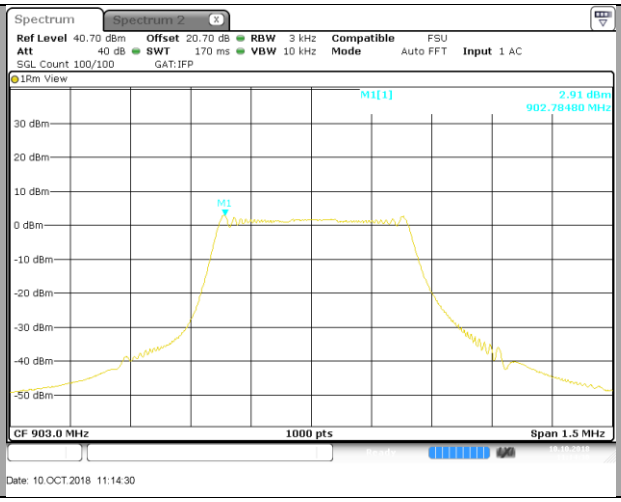
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

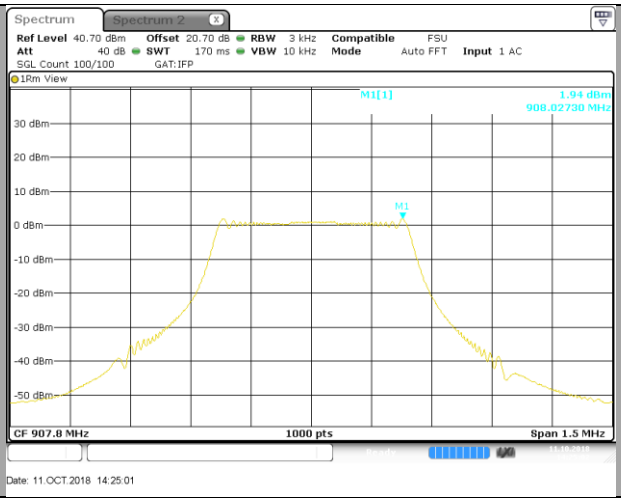
27.5. RESULTS

Power Spectral Density

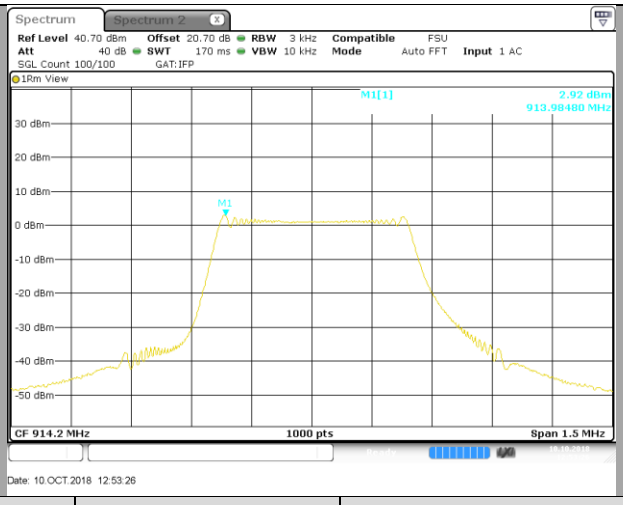
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**20,7**	-1,5	2,91	8
Cnom	**20,7**	-1,5	1,94	8
Cmax	**20,7**	-1,5	2,92	8

27.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

28. HYBRID MODE 500KHZ : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

28.1. TEST CONDITIONS

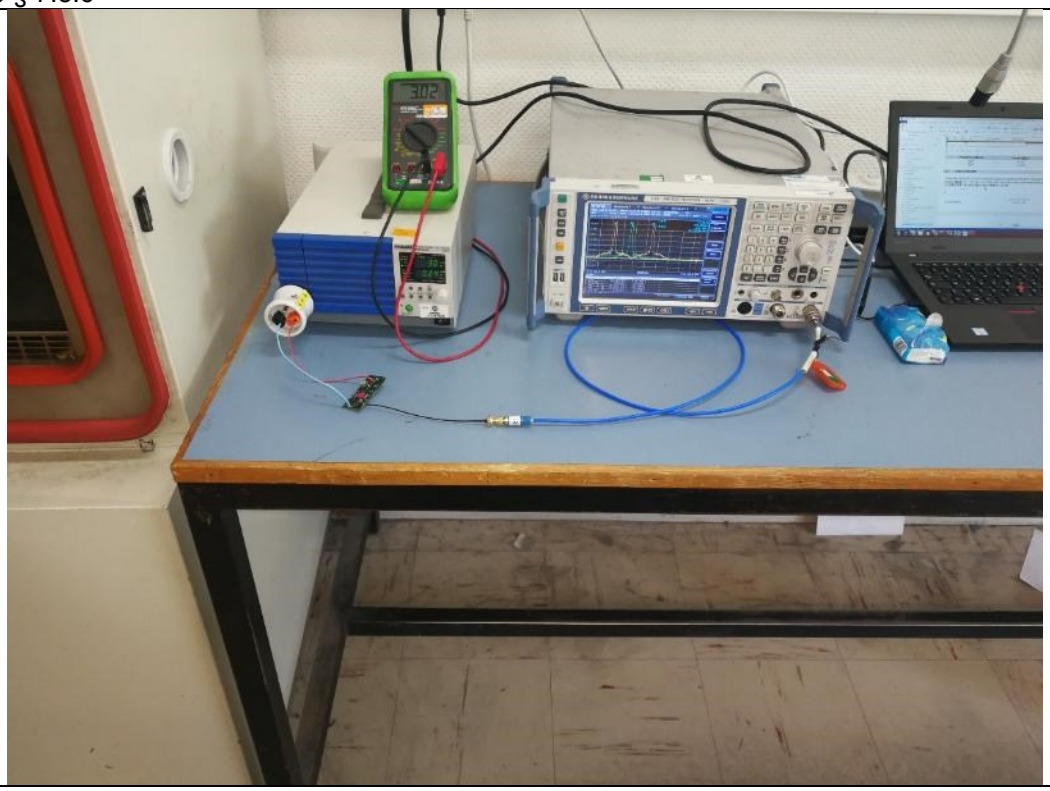
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 22 °C
Relative humidity : 46 %

28.2. 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 § 7.8.6



Photograph for Unwanted Emission into non-restricted frequency bands at the band edge

28.3. LIMIT

All Spurious Emissions must be at least 30dB below the Fundamental Radiator Level at the Band Edge Edge “902MHz & 928MHz”

28.4. TEST EQUIPMENT LIST

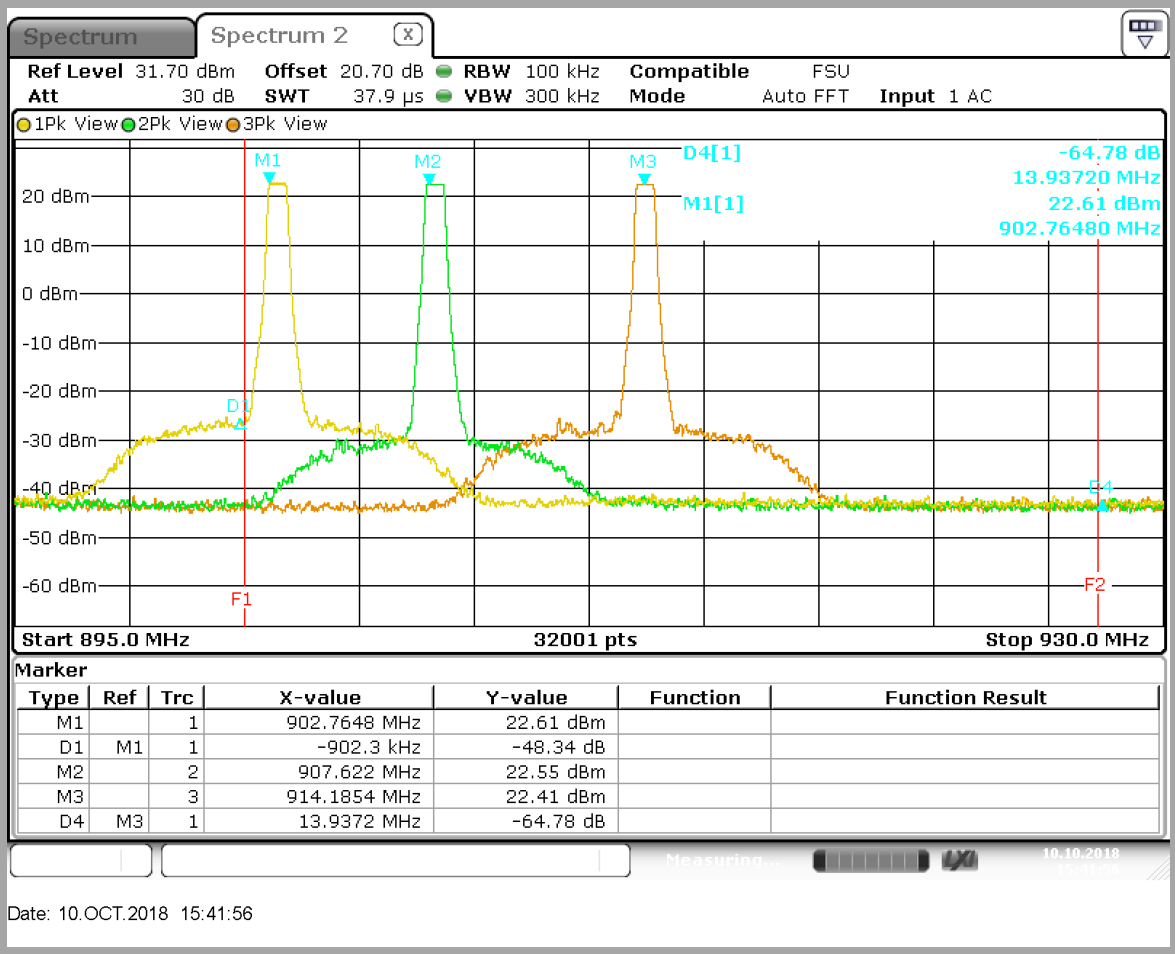
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2017/02	2019/02
Cable	TELEDYNE	920-0202-048	A5329675	2018/10	2019/10
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

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

28.5. RESULTS

Single Frequency

Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBc)	Limit (dBc)
902	48,34	30
928	64,78	30

28.6. *CONCLUSION*

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

29. HYBRID MODE 500 KHZ : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

29.1. TEST CONDITIONS

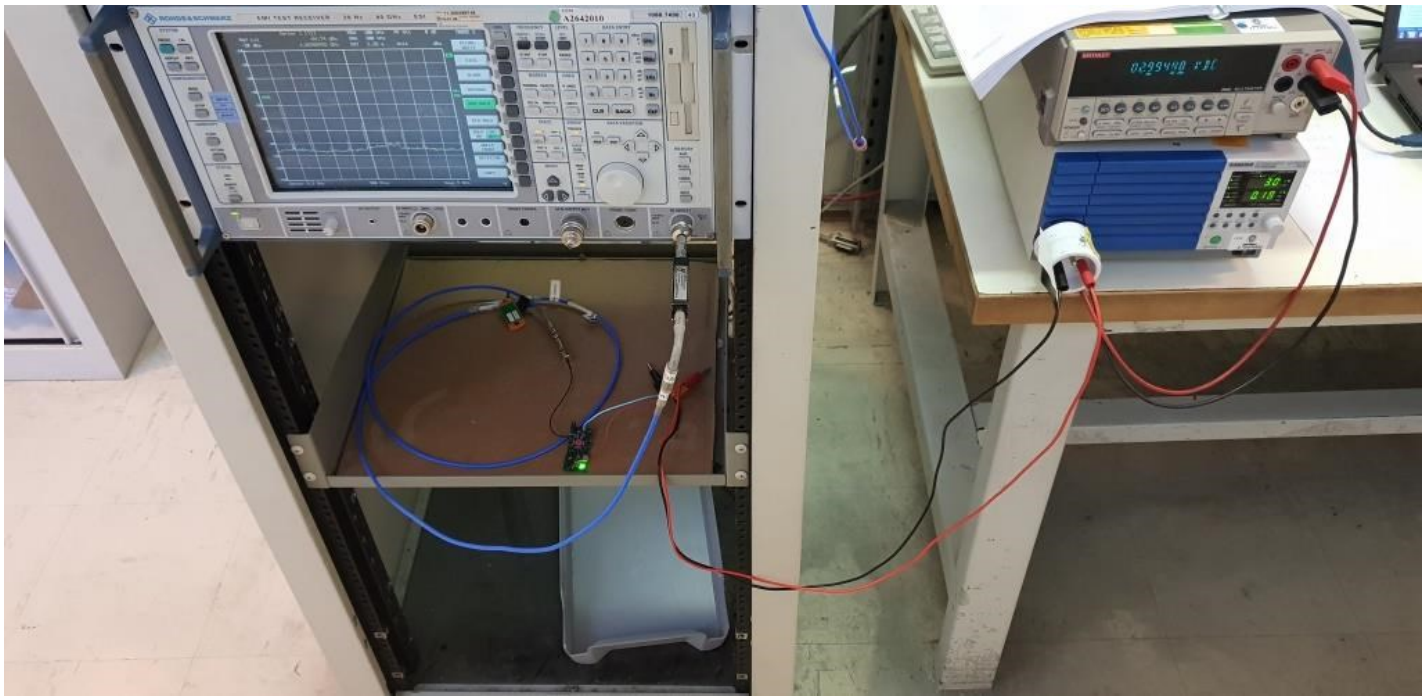
Test performed by : Armand MAHOUNGOU
Date of test : October 10, 2018
Ambient temperature : 23 °C
Relative humidity : 43 %

29.2. 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 § 7.8.8



Photograph for Unwanted Emission into non-restricted frequency bands

29.3. LIMIT

All Spurious Emissions must be at least 30dB below the Fundamental Radiator Level

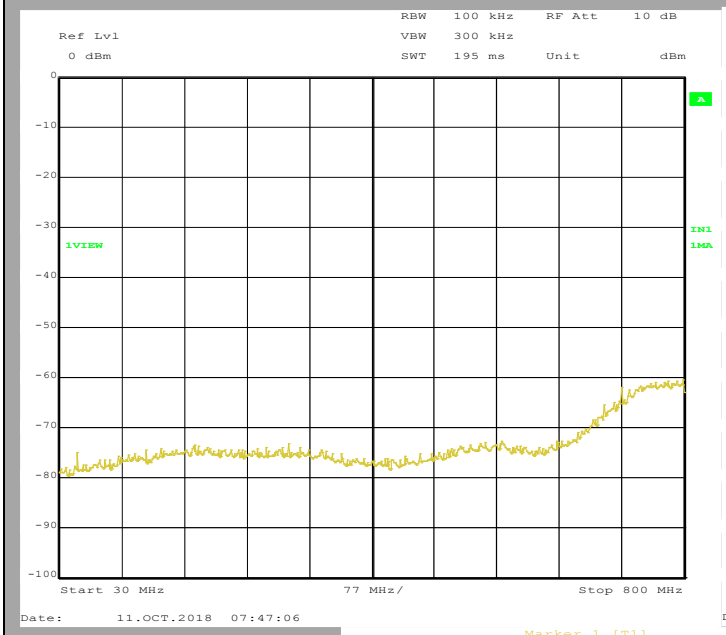
29.4. TEST EQUIPMENT LIST

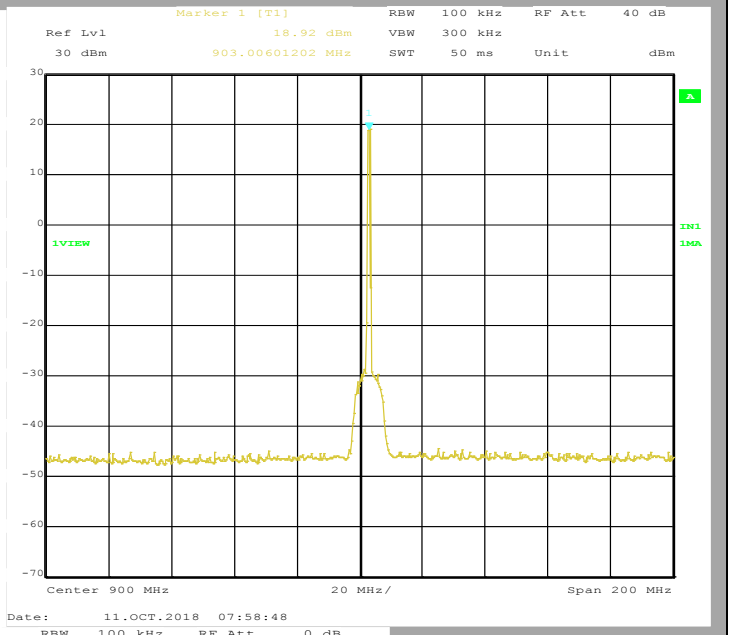
Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2018/09	2020/09
Multimeter	ISO-TECH	-	A1240269	2016/11	2018/11
Cable Conducted S36 chamber	TELEDYNE	084-0555-2MTR	A5329758	2017/11	2018/11
Attenuator 3dB Cable Spurious Conducted	-	WA54-3-12	A7122223	2017/11	2018/11
High Pass Filter 868MHz	WAINWRIGHT	WHKX12-935	A7484064	2017/11	2019/11
Power supply	KIKUSUI	PCR500M	A7049006	Calibrated with Multimeter	

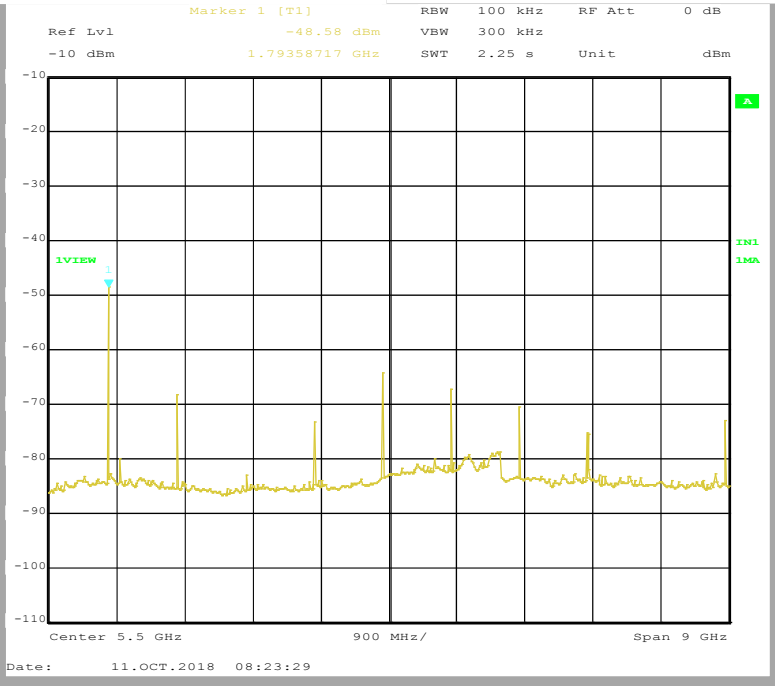
Note: In our quality system, the test equipment calibration due is more & less 2 months

29.5. RESULTS

Conducted Spurious
Cmin

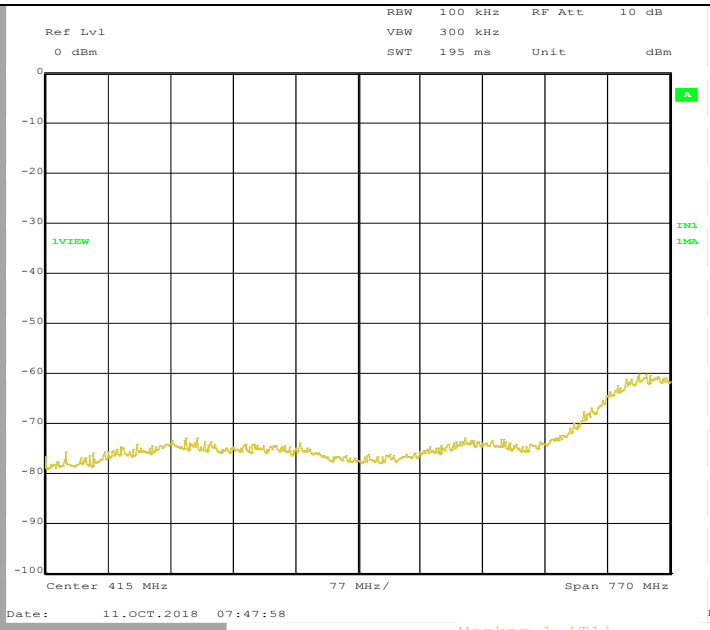


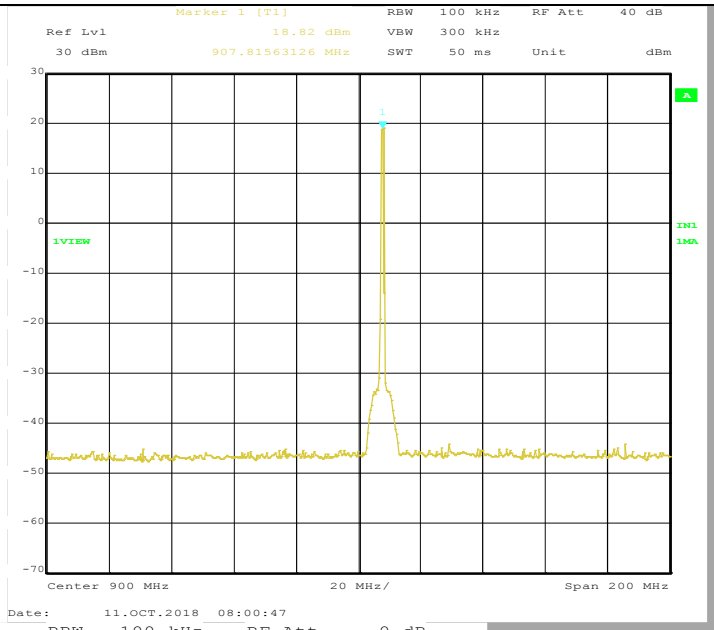


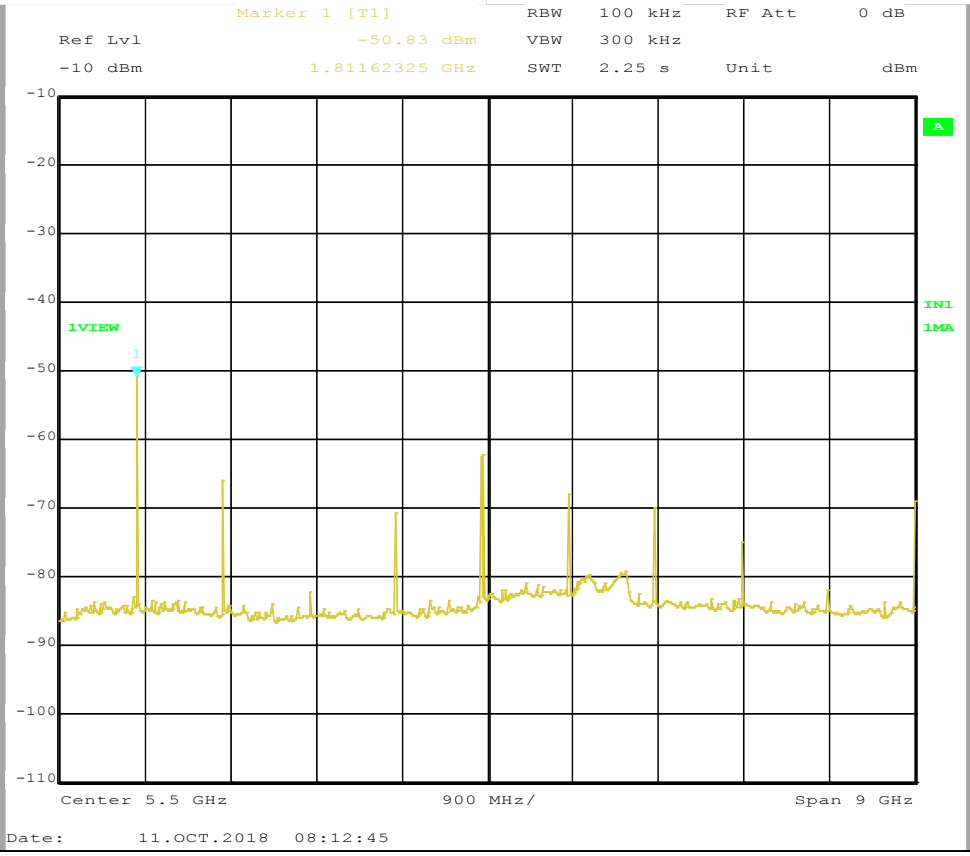


Conducted Spurious

Cnom

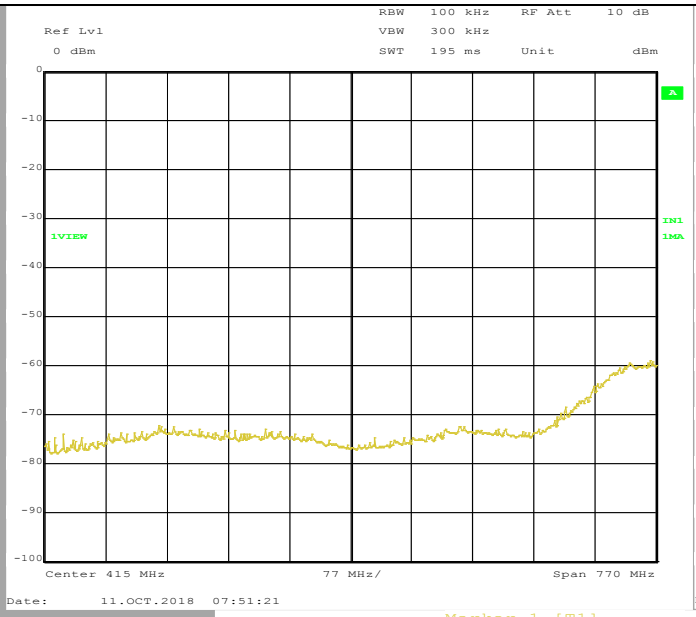


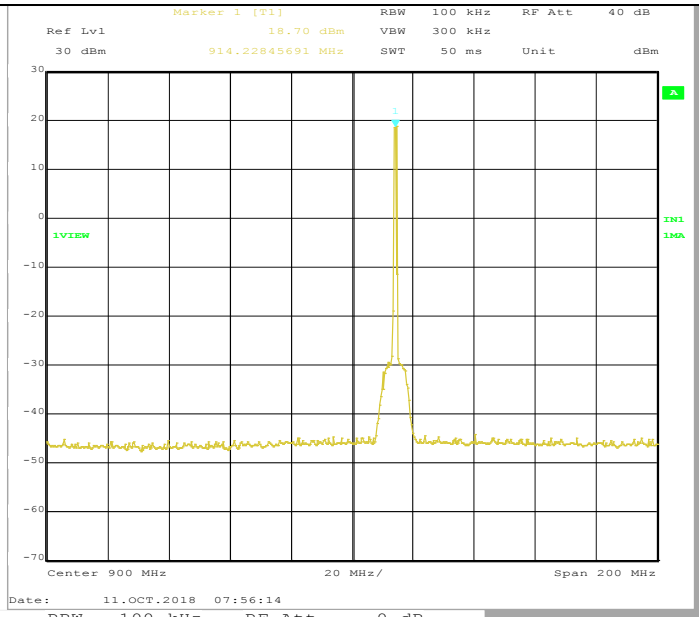


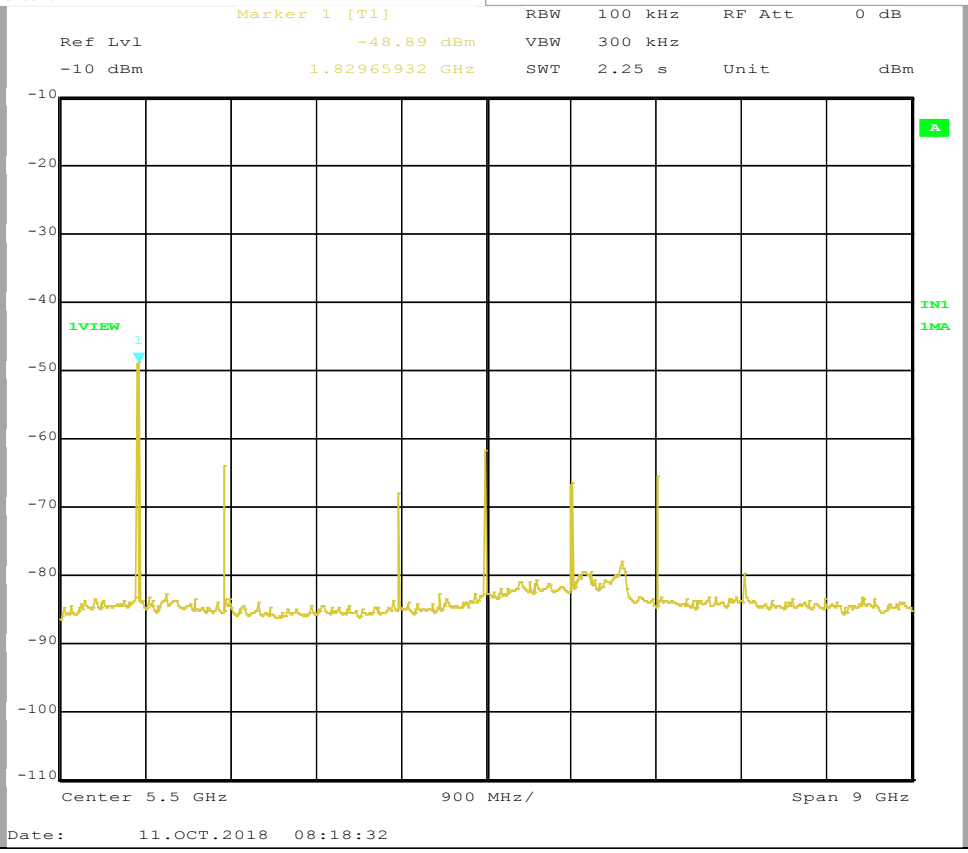


Conducted Spurious

Cmax







Frequency (MHz)	Reading Value (dBm)	Cable Loss (dB)	Final Value (dBm)	Level (dBc)	Limit (dBc)
903,0	18,92	3,3	22,22		
1793,59	-48,58	3,7	-44,88	63,8	30
5418,84	-64,30	4,37	-59,93	78,85	30
6320,64	-67,32	4,51	-62,81	81,73	30
907,8	18,82	3,3	22,12		
1811,62	-50,83	3,7	-47,13	65,95	30
2713,43	-66,17	3,87	-62,3	81,12	30
5454,91	-62,44	4,37	-58,07	76,89	30
914,2	18,70	3,3	22		
1829,66	-48,89	3,7	-45,19	63,89	30
2731,46	-64,14	3,87	-60,27	78,97	30
5490,98	-61,99	4,37	-57,62	76,32	30

29.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

30. HYBRID MODE 500KHZ: UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

30.1. TEST CONDITIONS

Test performed by	: Laurent DENEUX
Date of test	: June 21, 2018
Ambient temperature	: 19 °C
Relative humidity	: 47 %

30.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **on an open area test site** below 1GHz and **in a full anechoic chamber** above 1GHz. Distance between measuring antenna and the EUT is **10m** below 1GHz and **3m** above 1GHz and below 30MHz.
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

Photograph for Unwanted Emission in restricted frequency bands

30.3. 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

30.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Receiver	RHODE & SCHWARZ	ESIB	A2642021	2016/12	2018/12
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2018/04	2020/04
Bilog antenna	CHASE	CBL 6112A	C2040040	2018/04	2019/04
Horn antenna	EMCO	.3115	C2042016	2018/04	2019/04
Loop antenna	SCHWARZBECK	FMZB1513	C2040209	2018/03	2020/03
OATS	L.C.I.E.	-	F2000400	2018/06	2019/06
Cable	-	-	A5329449	2017/09	2018/09
Cable	-	-	A5329368	2017/09	2018/09
cable	-	-	A5329444	2017/09	2018/09
cable	-	-	A5329542	2018/06	2019/06

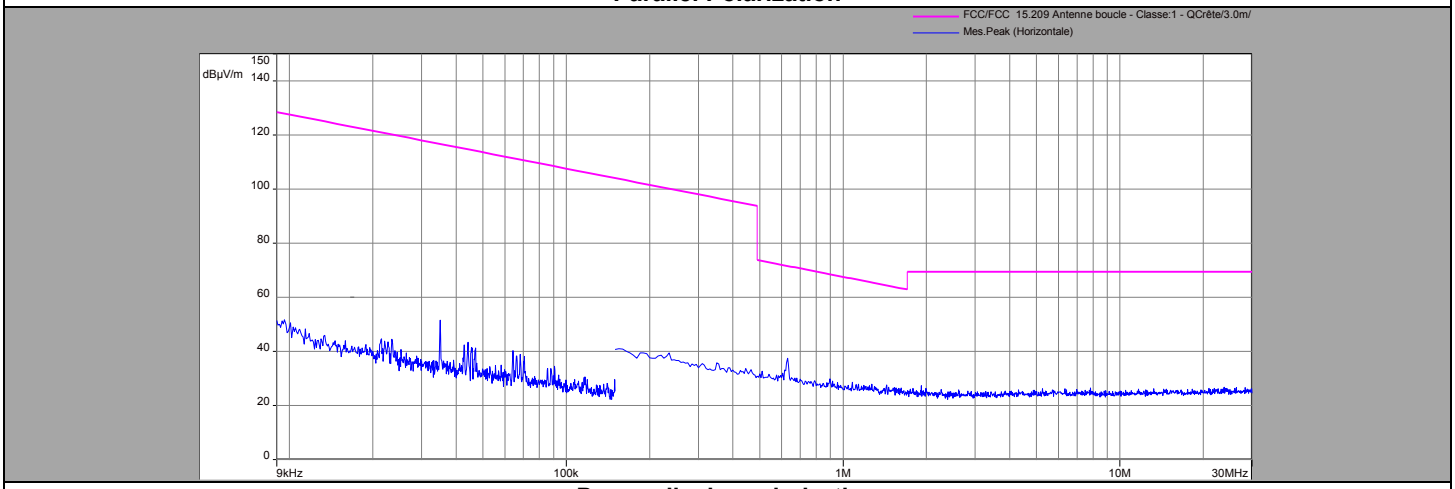
Note: In our quality system, the test equipment calibration due is more & less 2 months

30.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

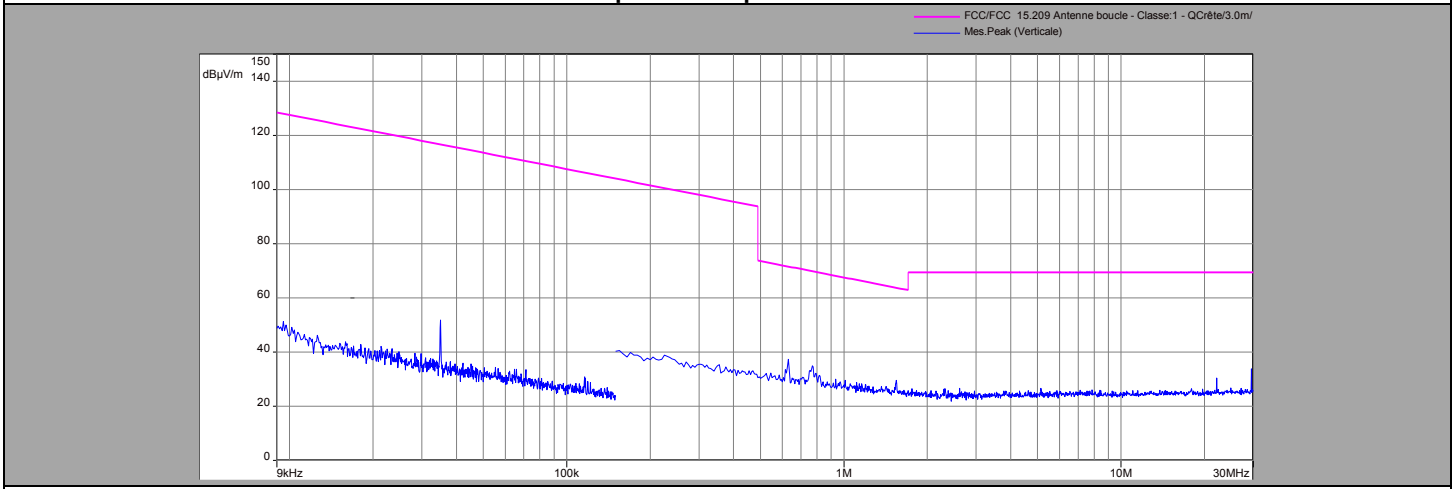
☑ None ☐ Divergence:

30.6. RESULTS

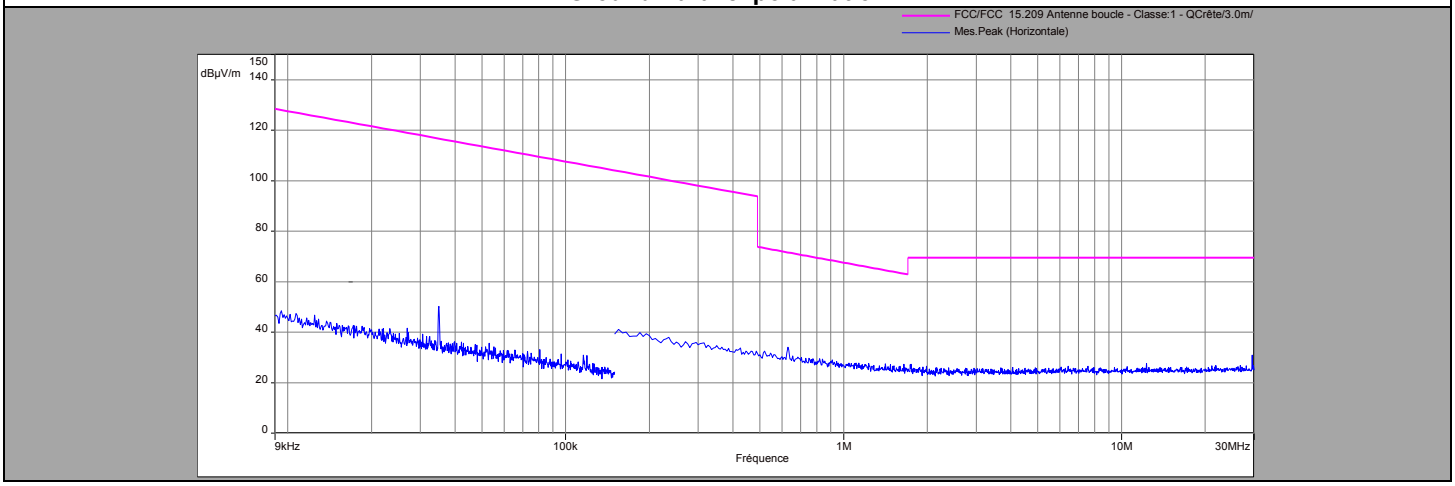
9kHz – 30 MHz
Cmin
Parallel Polarization



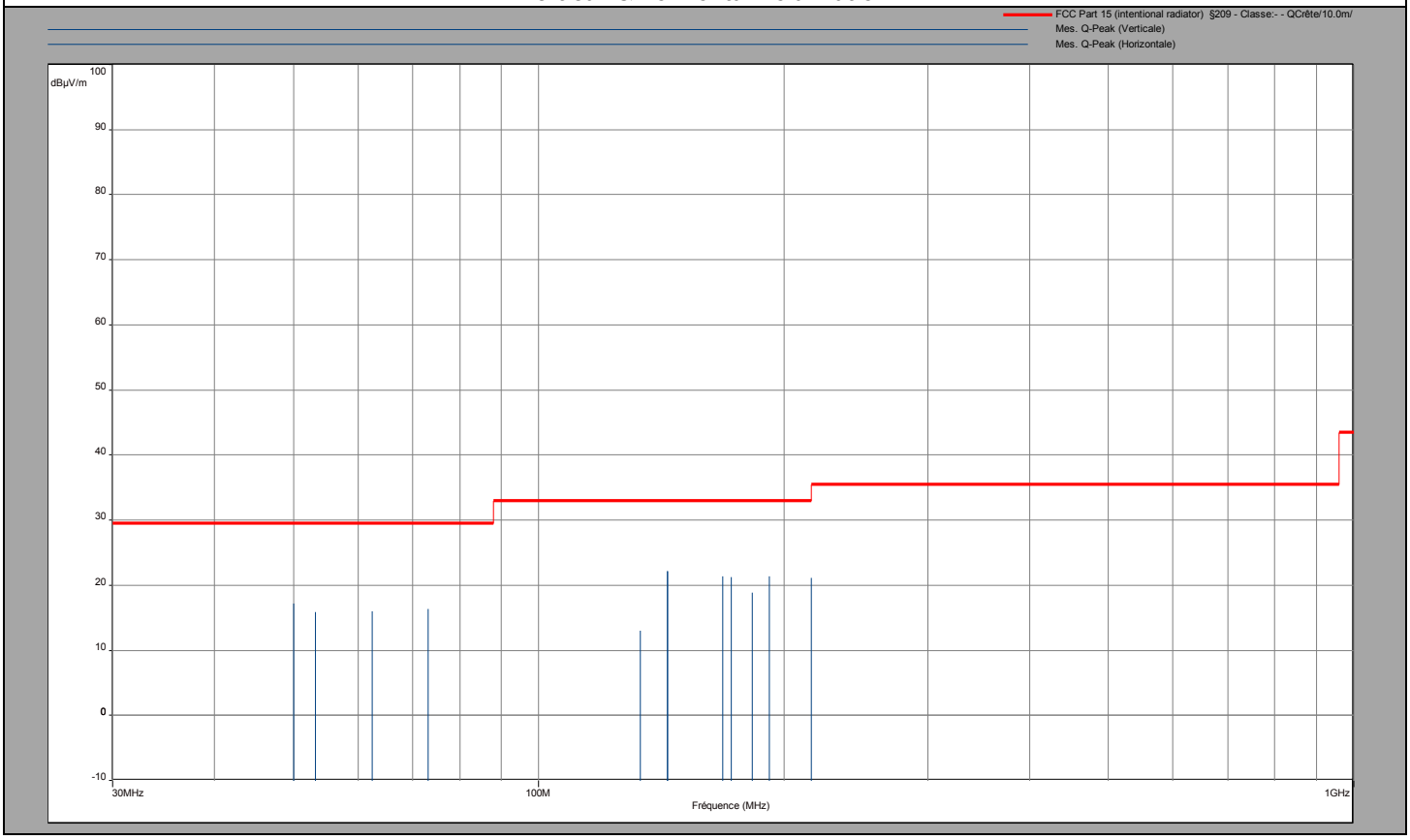
Perpendicular polarization



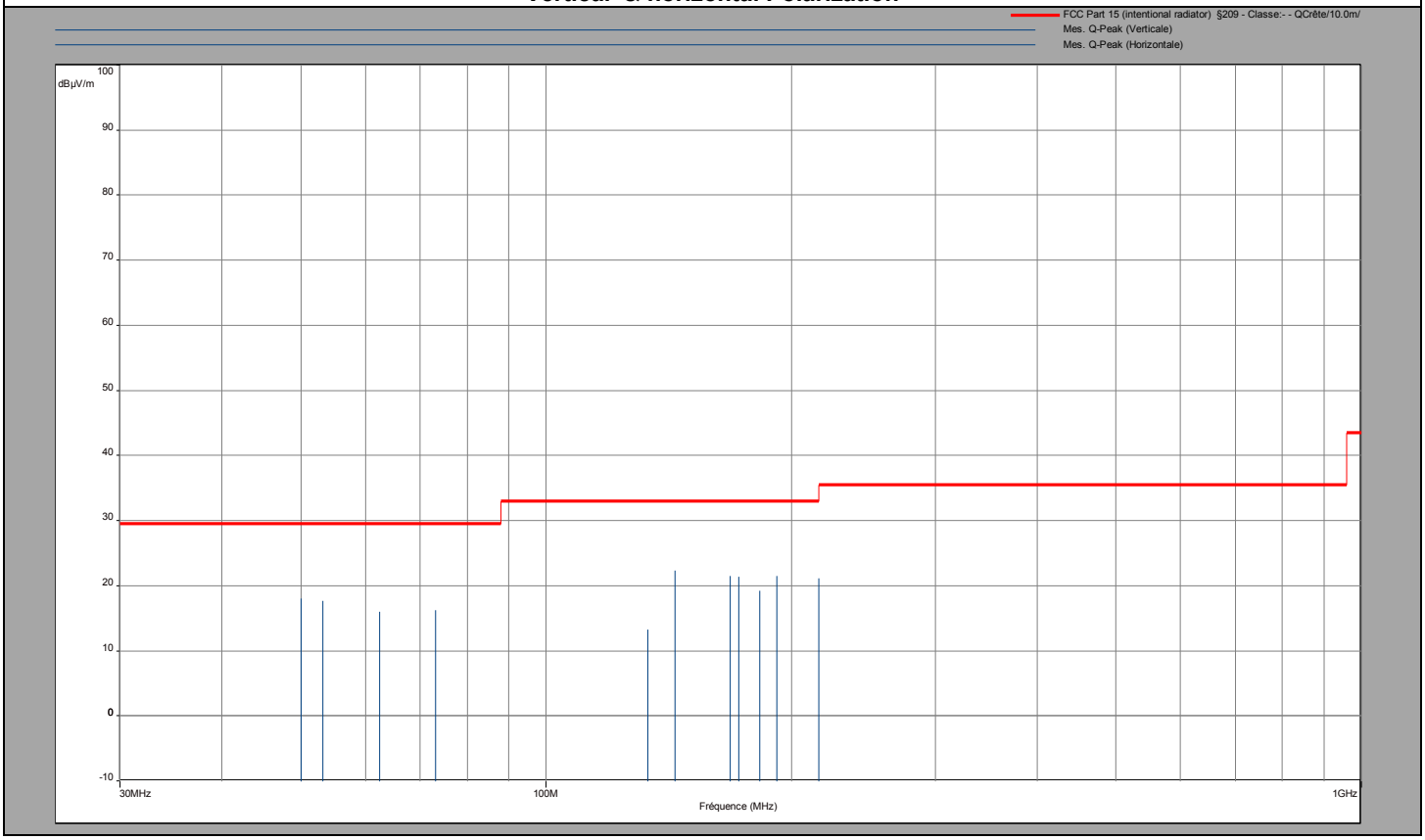
Ground Parallel polarization



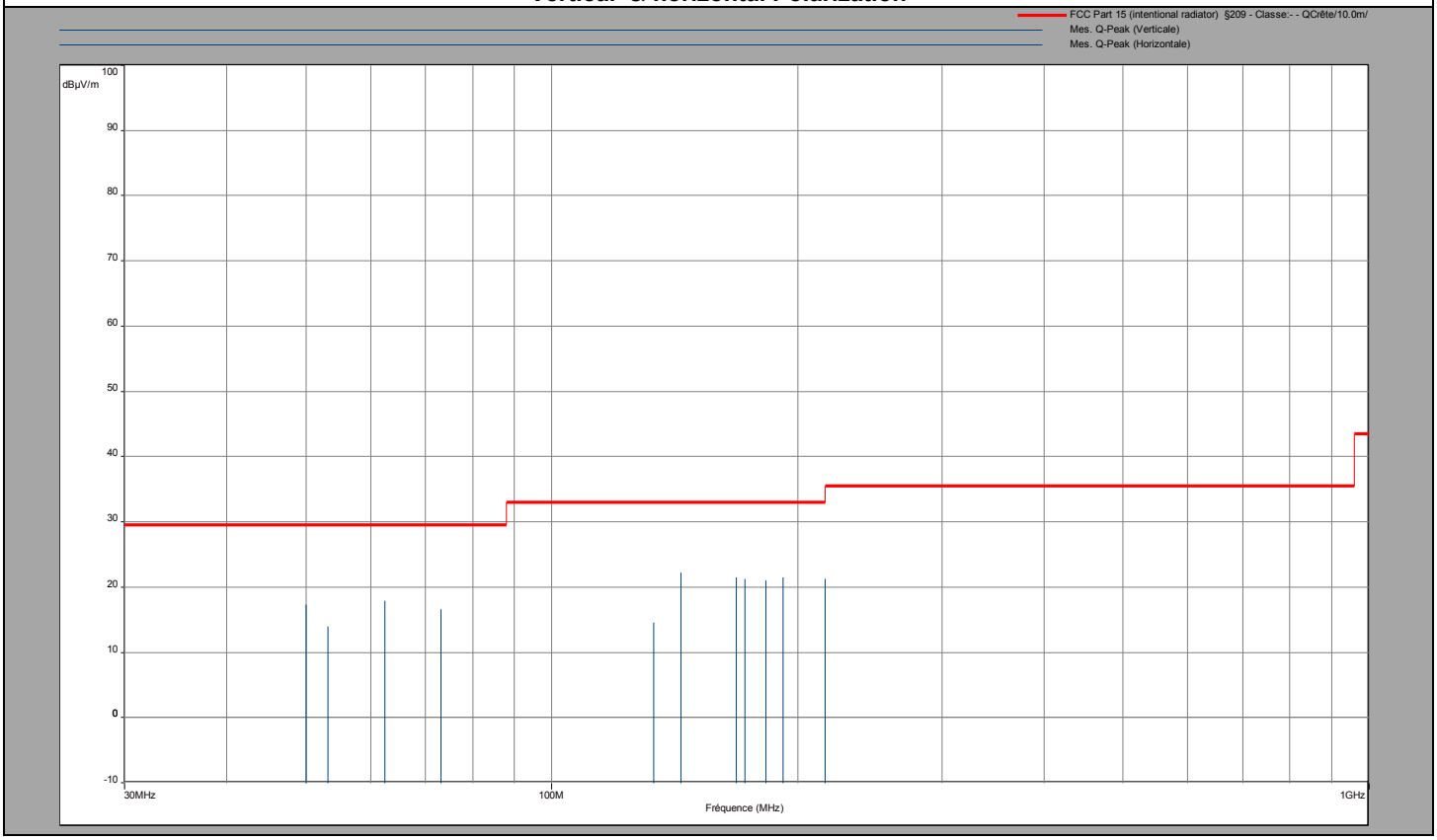
Below 1GHz
Cmin
Vertical & horizontal Polarization



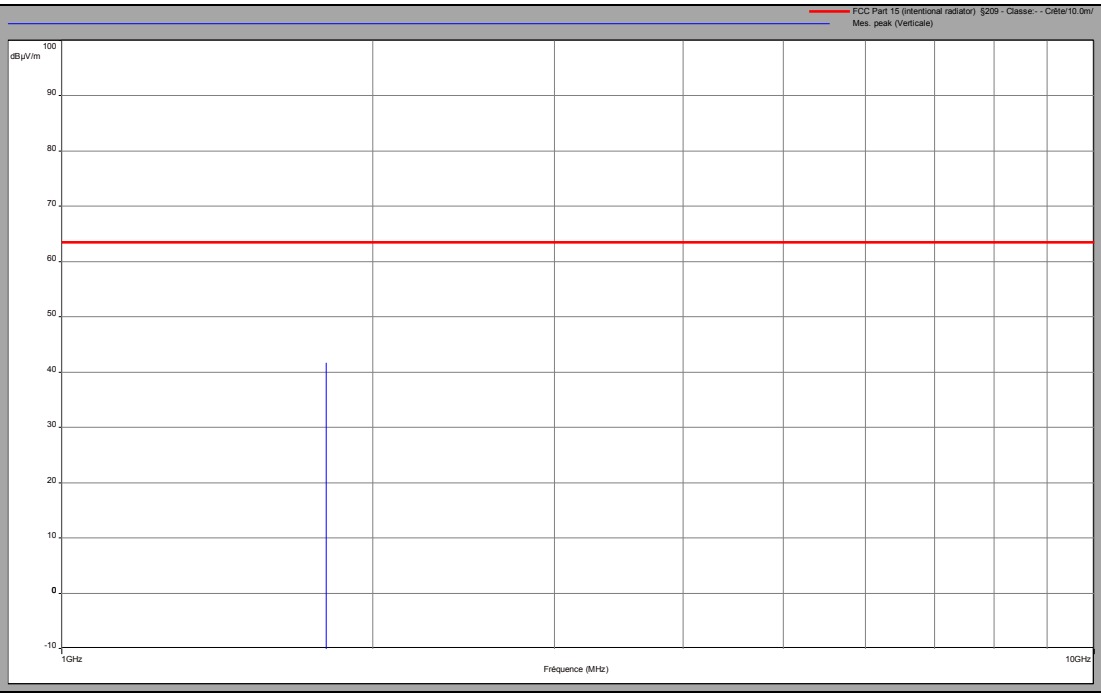
Below 1GHz
Cnom
Vertical & horizontal Polarization



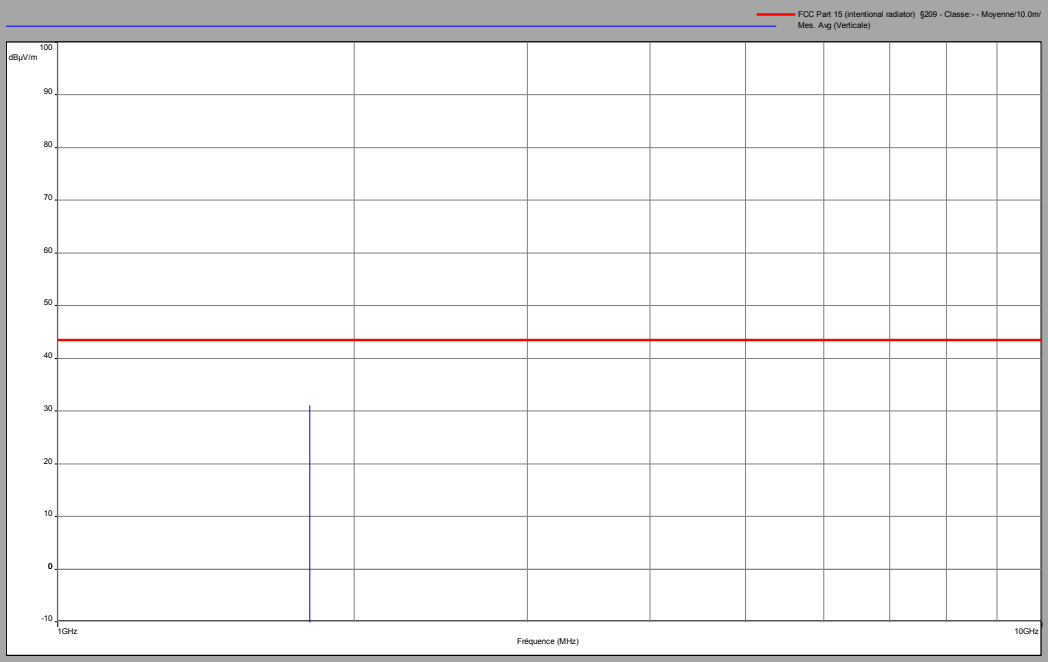
Below 1GHz
Cmax
Vertical & horizontal Polarization



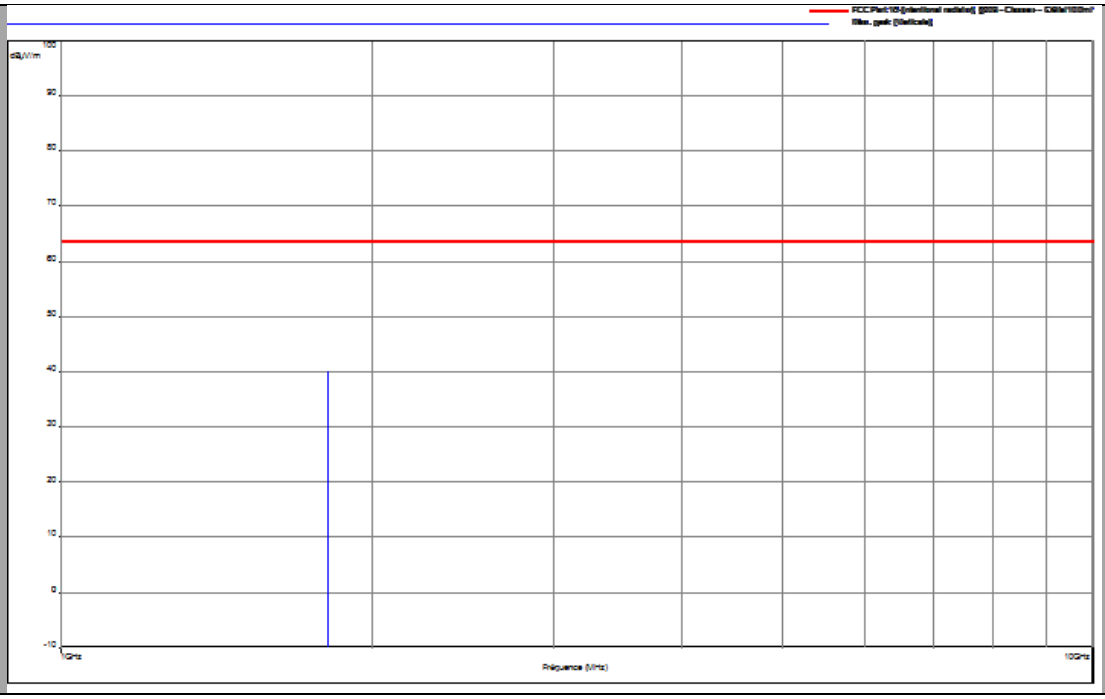
Above 1GHz
Cmin
Vertical & horizontal Polarization Peak measurement



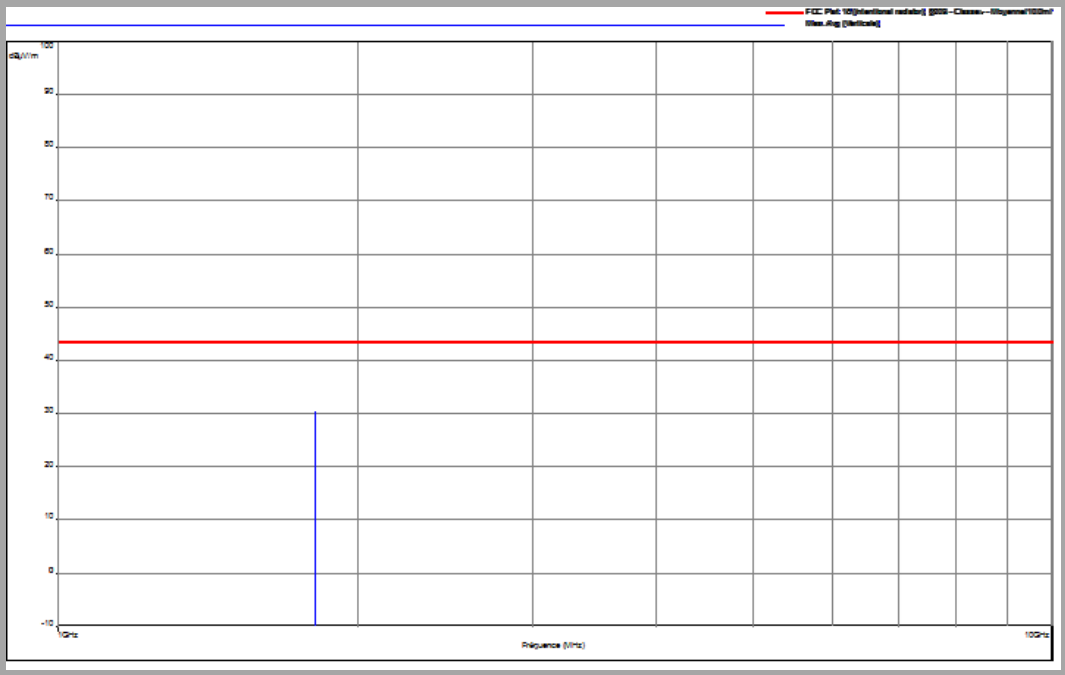
Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



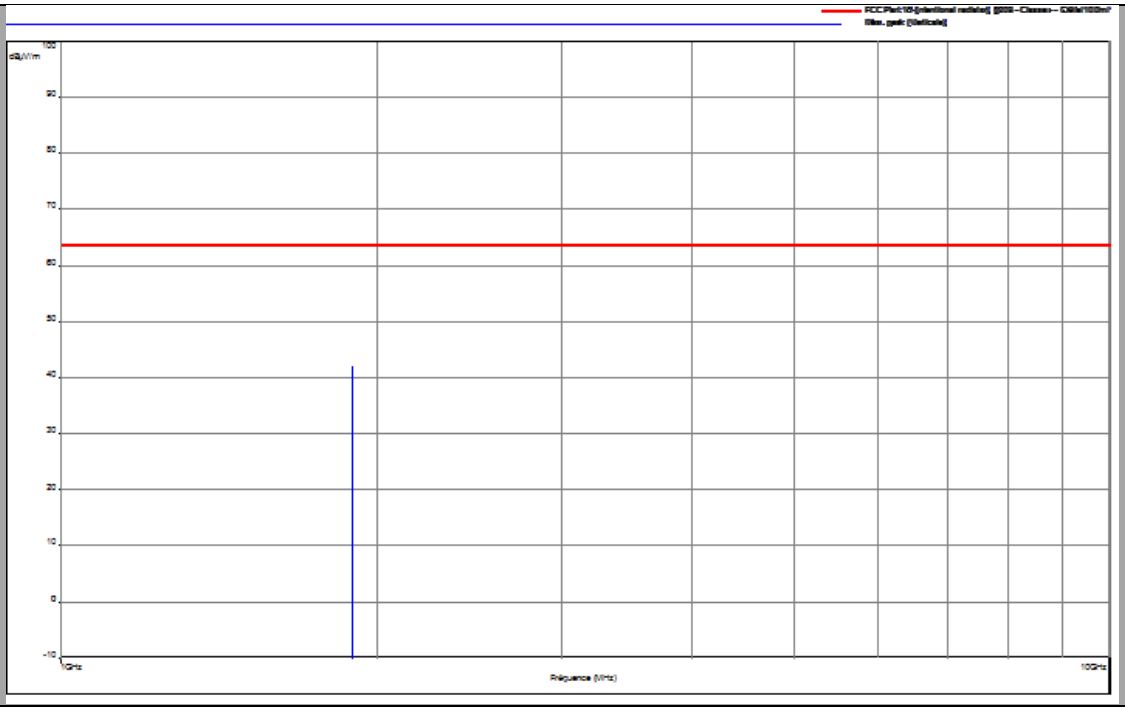
Above 1GHz
Cnom
Vertical & horizontal Polarization Peak measurement



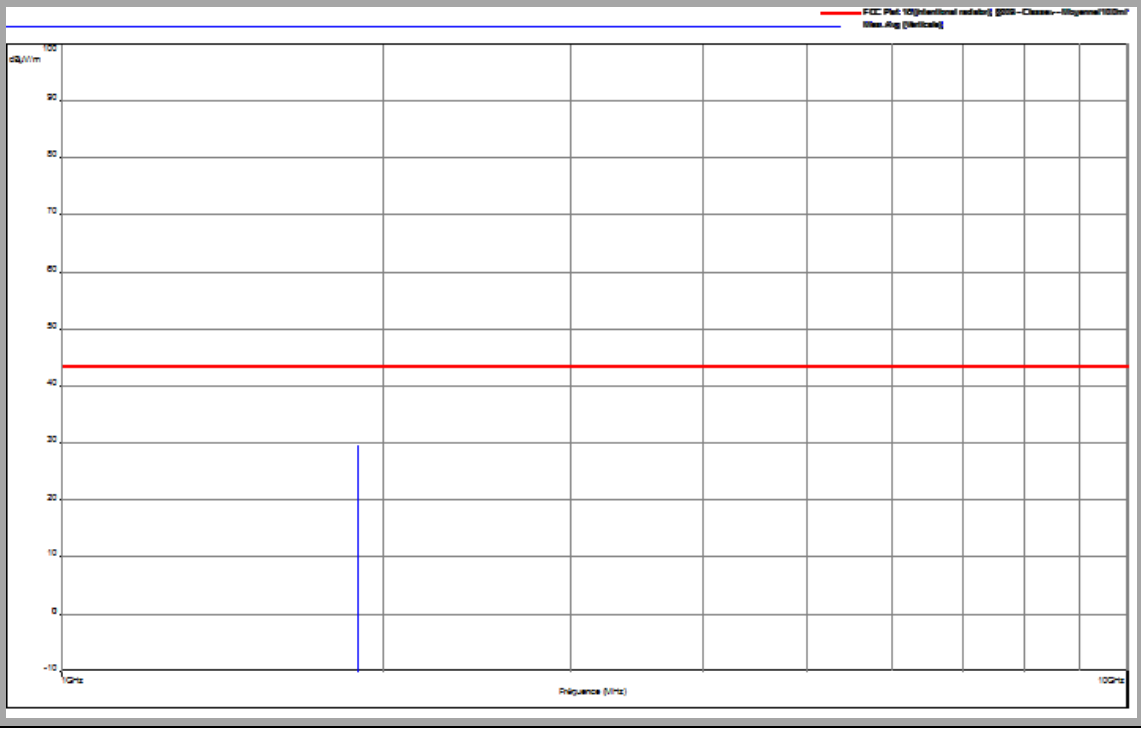
Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



Above 1GHz
Cmax
Vertical & horizontal Polarization Peak measurement



Vertical & horizontal Polarization Average value measurement (with duty cycle correction)



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

Below 1GHz					
Cmin					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	17.4	29.5	12.1
Vertical	144	-	23.5	33	9.5
Vertical	172.4	-	22.6	33	10.4
Horizontal	144	-	21.54	33	11.46
Horizontal	168	-	23.6	33	9.4
Horizontal	192	-	22.5	33	10.5

Below 1GHz					
Cnom					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	50	-	17.56	29.5	11.94
Vertical	144	-	22.75	33	10.25
Vertical	172.4	-	21.69	33	11.31
Horizontal	168	-	20.96	33	12.04
Horizontal	192	-	22.01	33	10.99
Horizontal	216	-	22.6	33	10.4

Below 1GHz					
Cmax					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Vertical	62.5	-	18.50	29.5	11.0
Vertical	144	-	21.96	33	11.04
Vertical	172.4	-	20.58	33	12.42
Horizontal	168	-	21.56	33	11.44
Horizontal	192	-	22.3	33	10.7
Horizontal	216	-	22.84	33	10.16

Above 1GHz								
Cmin								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1806	6.56	31.49	43.5	12.01	42.04	63.5	21.46

Above 1GHz								
Cnom								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	18015.6	5.55	30.48	43.5	13.02	41.25	63.5	22.25

Above 1GHz								
Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Vertical	1828.5	4.89	29.82	43.5	13.68	42.01	63.5	21.49

30.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **SAGEMCOM** ATGHMP915 **V2**, SN: **proto**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

31. 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