



<b>TEST REPORT nr. R16058101</b>	
<b>Federal Communication Commission (FCC)</b>	
<b>Test item</b>	
Description .....	TRANSCEIVER UNIT
Trademark .....	AUTEC
Model/Type .....	Model FJM Type NF022
FCC ID .....	OQA-FJMNFO22
<b>Test Specification</b>	
Standard .....	FCC Rules & Regulations, Title 47:2014 Part 15 paragraph(s): 203, 204, 207, 209 and 247
<b>Client's name</b> .....	
AUTEC S.r.l.	
Address .....	
Via Pomaroli, 65 – 36030 Caldogno (VI) – ITALY	
<b>Manufacturer's name</b> :	
Same as client	
Address .....	
--	
<b>Report</b>	
Tested by .....	G. Gandini – Technician
Approved by .....	R. Beghetto – Laboratory Manager
Date of issue .....	08.06.16
Contents .....	70 pages

*Giovanni Gandini*  
*R. Beghetto*

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 The test results presented in this report relate only to the item tested.

CMC Centro Misure Compatibilità S.r.l.



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## 1. Summary

Standard:

FCC Rules & Regulations, Title 47:2014  
 Part 15 paragraph(s): 203, 204, 207, 209 and 247

Test specifications	Environmental Phenomena	Tests sequence	Result
Part 15.203	Antenna requirements	1	Complies
Part 15.207	Conducted emissions	2	Complies
Part 15.209	Radiated emissions	3	Complies
Part 15.247	20 dB Bandwidth	4	Complies
Part 15.247	Channel Separation	5	Complies
Part 15.247	Number of Hopping Channel	6	Complies
Part 15.247	Time of occupancy	7	Complies
Part 15.247	Band edge	8	Complies
Part 15.209 and 15.247	Peak Output Power	9	Complies
Part 15.209	Spurious emission	10	Complies
Part 1.1310	Maximum permissible exposure	11	Complies

The Test Report was given to the Client representatives for necessary documentation of ratification of the tested equipment and it is valid for the FCC certification



## 2. Description of Equipment under test (EUT)

Power supply ..... : 8-30 Vdc  
 Tests performed on 30 Vdc power supply

Serial Number ..... : --

Type of equipment ..... :  Transmitter Unit  
 Receiver Unit

Type of station ..... :  Fixed station  
 Portable station  
 Mobile station

Frequency band ..... : FL: 915,05 MHz    FM: 921,00 MHz    FH: 927,95 MHz

### 2.1 Test Site

Company ..... : CMC Centro Misure Compatibilità S.r.l.

Address ..... : Via della Fisica, 20  
 36016 Thiene (VI) – ITALY

Test site facility's FCC registration number ..... : 271947

## 3. Testing and sampling

Date of receipt of test item ..... : 15.03.16

Testing start date ..... : 15.03.16

Testing end date ..... : 25.05.16

Samples tested nr ..... : 1

Sampling procedure ..... : Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion

Internal identification ..... : adhesive label with the product number P160322

## 4. Operative conditions

EUT exercising ..... : EUT in continuous transmission at maximum power



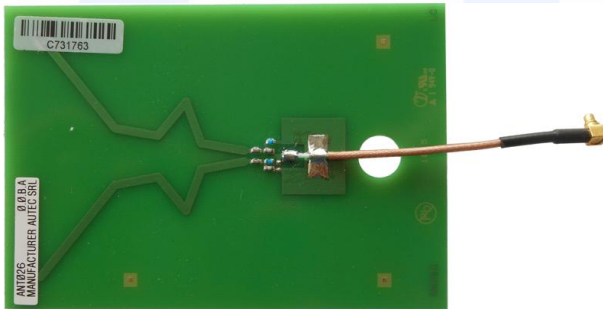
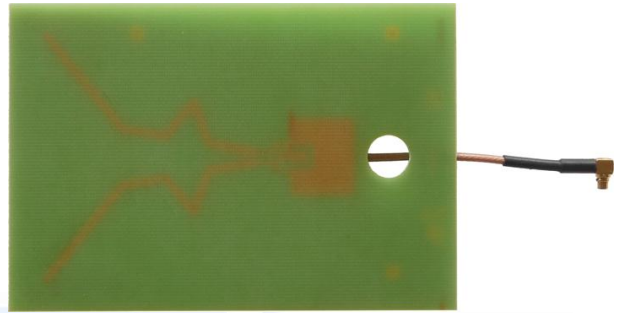
## 5. Photograph(s) of EUT

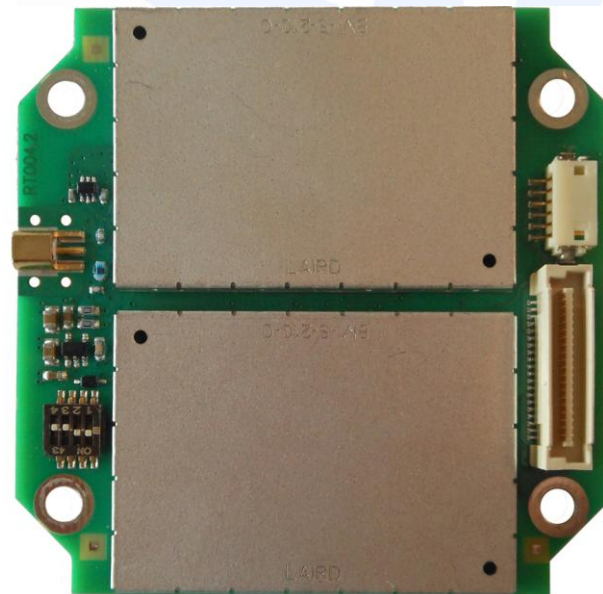
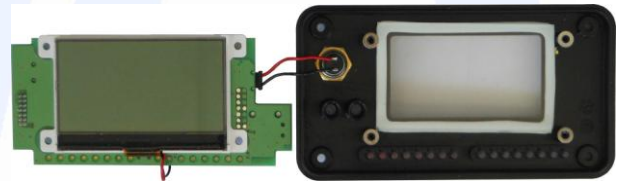
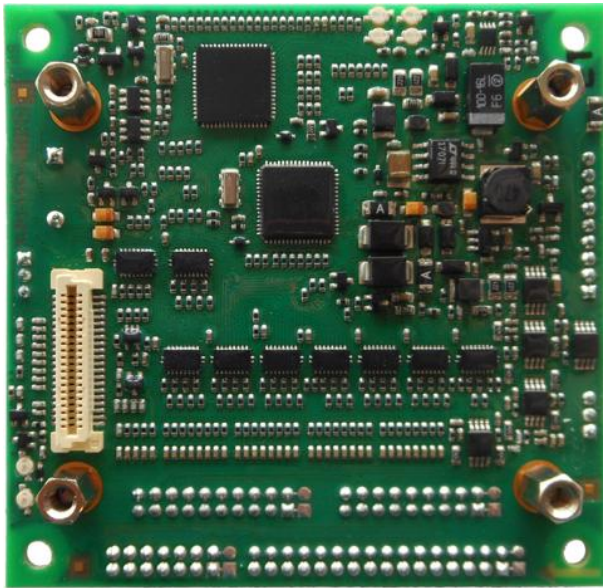
### 5.1 Photograph(s) of EUT



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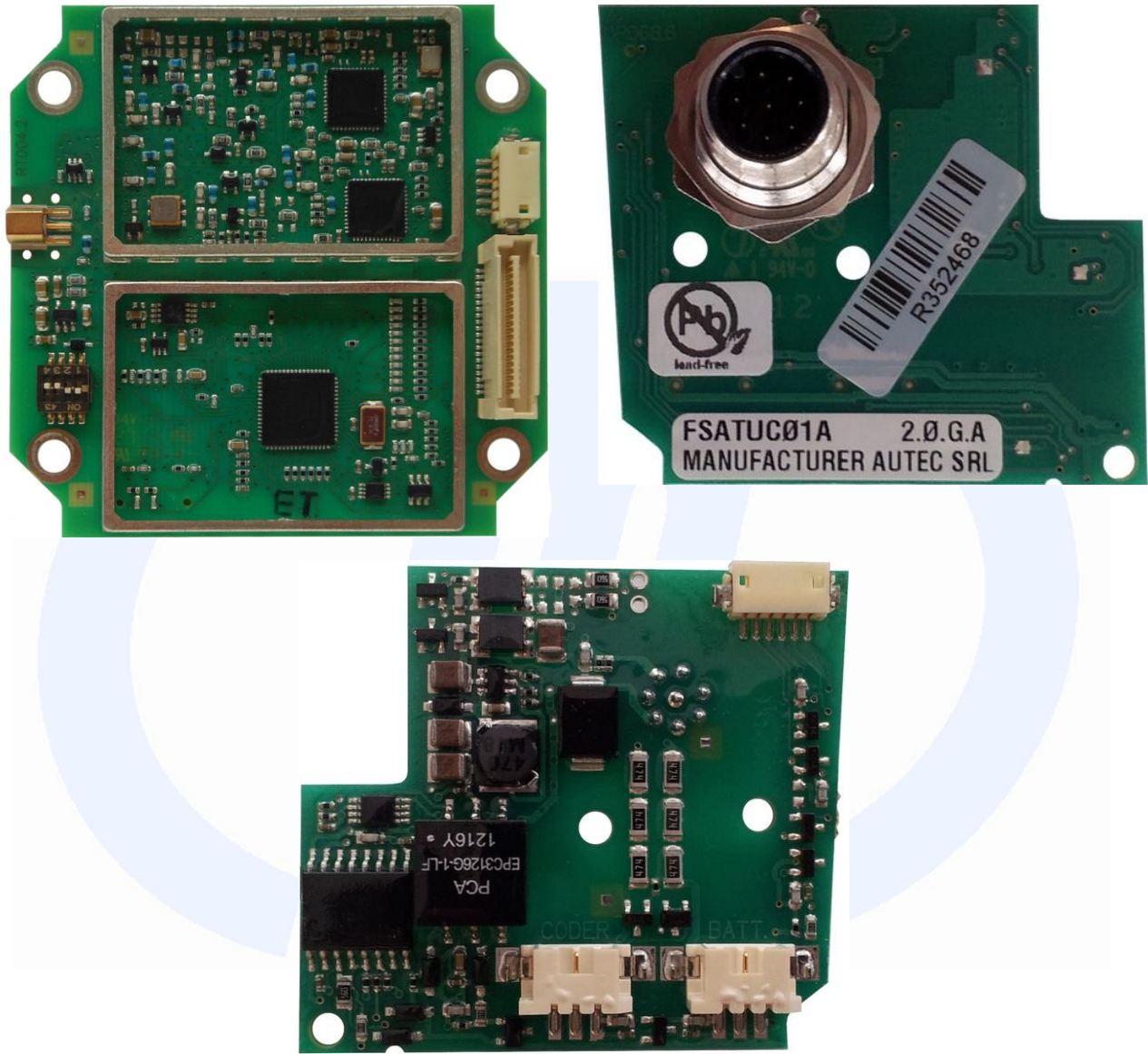






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## 6. Equipment list

<i>Id. number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Serial number</i>	<i>Last calibration</i>	<i>Due date calibration</i>
CMC S010	Rohde & Schwarz	ESH3-Z2	Impulses Limiting Device	---	January '16	January '17
CMC S108	EMCO	3115	Horn Antenna	9811-5622	May '13	May '16
CMC S127	Schaffner	HLA6120	Loop Antenna	1191	January '16	January '19
CMC S129	Rohde & Schwarz	ESPI7	Receiver	836.914/004	January '16	January '17
CMC S136	Schwarzbeck	VULB 9163	Broadband Antenna	9136-205	May '13	May '16
CMC S164	Rohde & Schwarz	ESU26	EMC interference receiver	100052	January '16	January '17
CMC S200	Schwarzbeck	NSLK 8128	V-LISN	8128-273	January '16	January '17
CMC S227	Rohde & Schwarz	ESR7	EMI Test Receiver 7GHz	101121	January '16	January '17



## 7. Measurement uncertainty

Test	Expanded Uncertainty	note
<b>Conducted Emission</b>		
(50Ω/50μH AMN) - (9 kHz – 150 kHz)	±3.6 dB	1
(50Ω/50μH AMN) - (150 kHz – 30 MHz)	±3.0 dB	1
(Voltage probe) - (150 kHz – 30 MHz)	±2.9 dB	1
(50Ω/5μH AMN) - (150 kHz – 108 MHz)	±2.6 dB	1
<b>Discontinuous Conducted Emission</b>		
Conducted Emission (50Ω/50μH AMN) - (150 kHz – 30 MHz)	±3.0 dB	1
<b>Disturbance Power (30 MHz – 300 MHz)</b>		
	±3.4 dB	1
<b>Radiated Emission</b>		
(0,150 MHz – 30 MHz)	±3.8 dB	1
(30 MHz – 1000 MHz)	±3.8 dB	1
(1 GHz – 6 GHz)	±4.3 dB	1
<b>Electromagnetic field EMF</b>		
	±10.5 %	1
<b>Harmonic current emissions test</b>		
	±1.2 %	1
<b>Voltage fluctuation and flicker test</b>		
	±3.8 %	1
<b>Insertion loss test</b>		
	±2.0 dB	1
<b>Radiated electromagnetic disturbance test (loop antenna)</b>		
	±1.5 dB	1
<b>Radiated electromagnetic field immunity test</b>		
	0.81 V/m at 3V/m	1
<b>Pulse modulated radiated electromagnetic field immunity test</b>		
	0.81 V/m at 3V/m	1
<b>Injected currents immunity test</b>		
	0.45 V at 3V	1
<b>Bulk current</b>		
	3.7 mA at 60 mA	1
<b>Power frequency magnetic field immunity test</b>		
	0.23 A/m at 10 A/m	1
<b>Effective radiated power (F &lt; 1GHz)</b>		
	±3.8 dB	1
<b>Effective radiated power (F &gt; 1GHz)</b>		
	±5.5 dB	1
<b>Frequency error</b>		
	< 1x10 <sup>-7</sup>	1
<b>Modulation bandwidth</b>		
	< 1x10 <sup>-7</sup>	1
<b>Conducted RF power and spurious emission</b>		
	±0.7 dB	1
<b>Adjacent channel power</b>		
	±1.2 dB	1
<b>Blocking</b>		
	±1.2 dB	1
<b>Electrostatic discharge immunity test</b>		
		2
<b>Electrical fast transients / burst immunity test</b>		
		2
<b>Surge immunity test</b>		
		2
<b>Pulse magnetic field immunity test</b>		
		2
<b>Damped oscillatory magnetic field immunity test</b>		
		2
<b>Short interruption immunity test</b>		
		2
<b>Voltage transient emission test</b>		
	±2.2 %	1
<b>Transient immunity test</b>		
		2

Rev\_16\_01 date 09/02/2016

**Note 1:**

The expanded uncertainty reported according to EN55016-4-2:2011 is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of p = 95%

**Note 2:**

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence, covering factor k = 2.



## 8. Reference documents

Reference no.	Description
FCC Rules and Regulation Title 47 part 15:2014	--
ANSI C63.4:2014	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Internal Procedure PM001 rev. 2.0 (Quality Manual)	Measure Procedure
Internal procedure INC_M rev. 8.2 (Quality Manual)	Measurement uncertainty calculation





## 9. Deviation from test specification

In agreement with the client, emission tests were performed with peak detector.

At the frequencies where the measures exceed the limit or within 6 dB from it, the test was repeated with quasi-peak detector and/or average detector.

## 10. Test case verdicts

Test case does not apply to the test object..... : N.A.

Test item does meet the requirement..... : Complies

Test item does not meet the requirement..... : Does not comply

Test not performed ..... : N.E.

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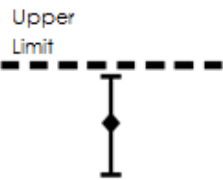
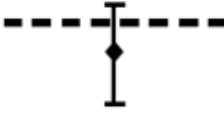
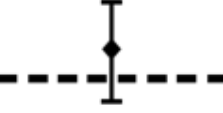



## 11. Results

In this clause tests results are reported.

Measurement uncertainty is in accordance with document CMC INC\_M rev. 8.2.

*Judgement of compliance:*

Case 1	Case 2	Case 3	Case 4
			
<p>The sample complies with the requirement.</p> <p>The measurement results is within the specification limit when the measurement uncertainty is taken into account.</p>	<p>The sample complies with the requirement.</p> <p>It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty although the measurement result is below the limit.</p>	<p>The sample does not comply with the requirement.</p> <p>It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty also the measurement result is upper the limit.</p>	<p>The sample does not comply with the requirement.</p> <p>The measurement results is outside the specification limit when the measurement uncertainty is taken into account.</p>

In agreement with ILAC-G8: 03/2009 Guidelines on the Reporting of Compliance with Specification.

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## 11.1 Antenna requirements

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.203 and 15.204
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

Test site:  
Laboratory

Auxiliary equipment:  
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

--  
Measurement uncertainty: See clause 7 of this test report

### Test specification

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

### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	100	45

### Result

Antenna Type	External R.F. power amplifier	Gain	Remarks	Results
Integral antenna	Not Present	--	--	Complies

**Result:** The requirements are met





## 11.2 Conducted emissions

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.207
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

Test site:  
 Shielded chamber

Auxiliary equipment:  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S010, CMC S200, CMC S227  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Main port  
 Frequency range: 150 kHz – 30 MHz

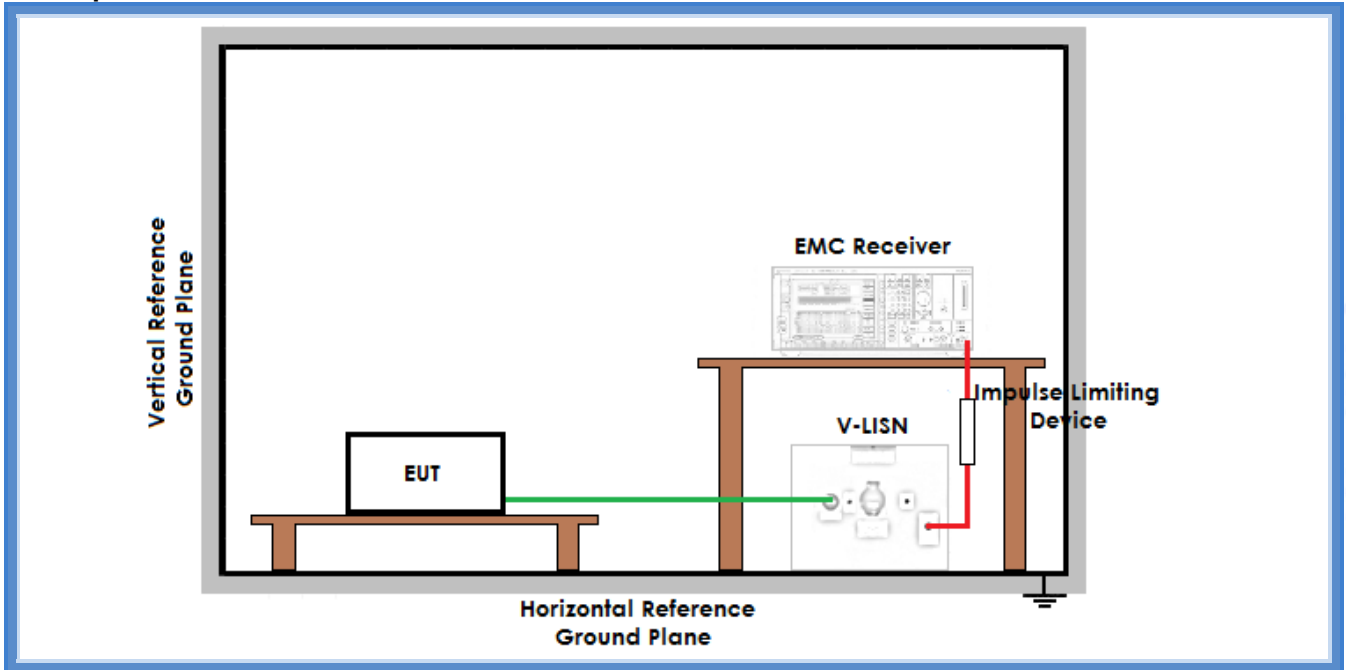
### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
21	98	46

### Acceptance limits

Frequency range (MHz)	dB(μV) Quasi-peak	dB(μV) Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

## Setup



## Result

Line	Graphs	Remarks	Result
+30 Vdc	G16058114	--	Complies
-30 Vdc	G16058115	--	Complies
<b>Remarks:</b> --			

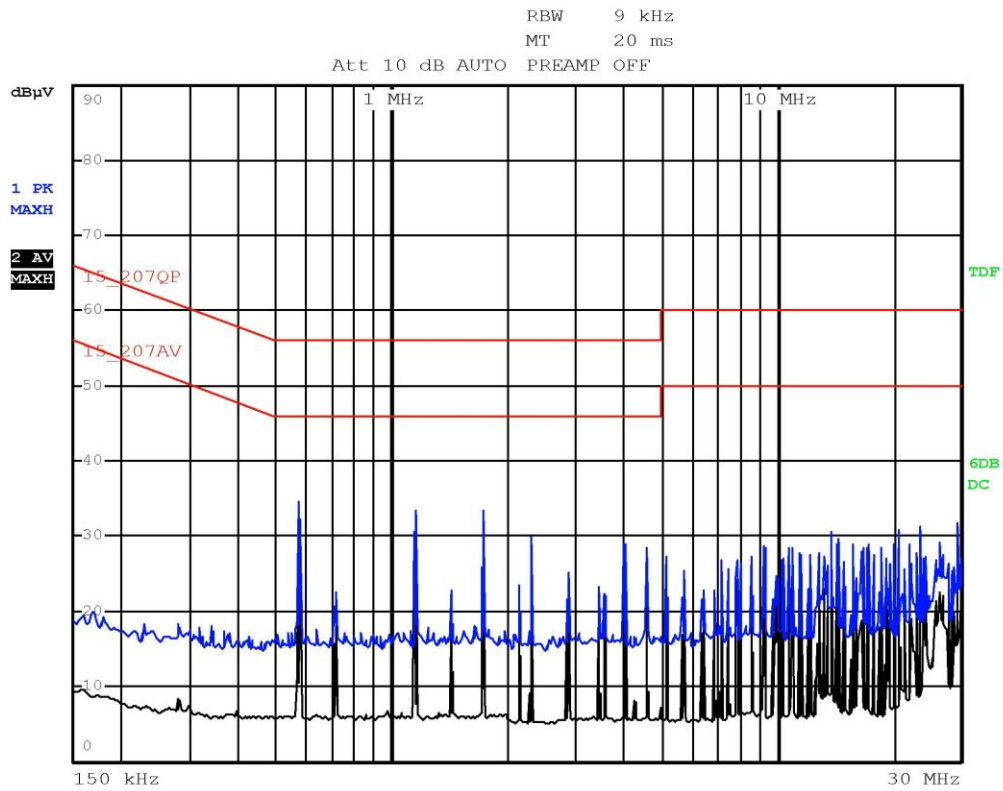
### Graphs Legend

PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +  
AV: Average; AV [1s] (average at 1 second) values are marked with a X



## Graphs

G16058114

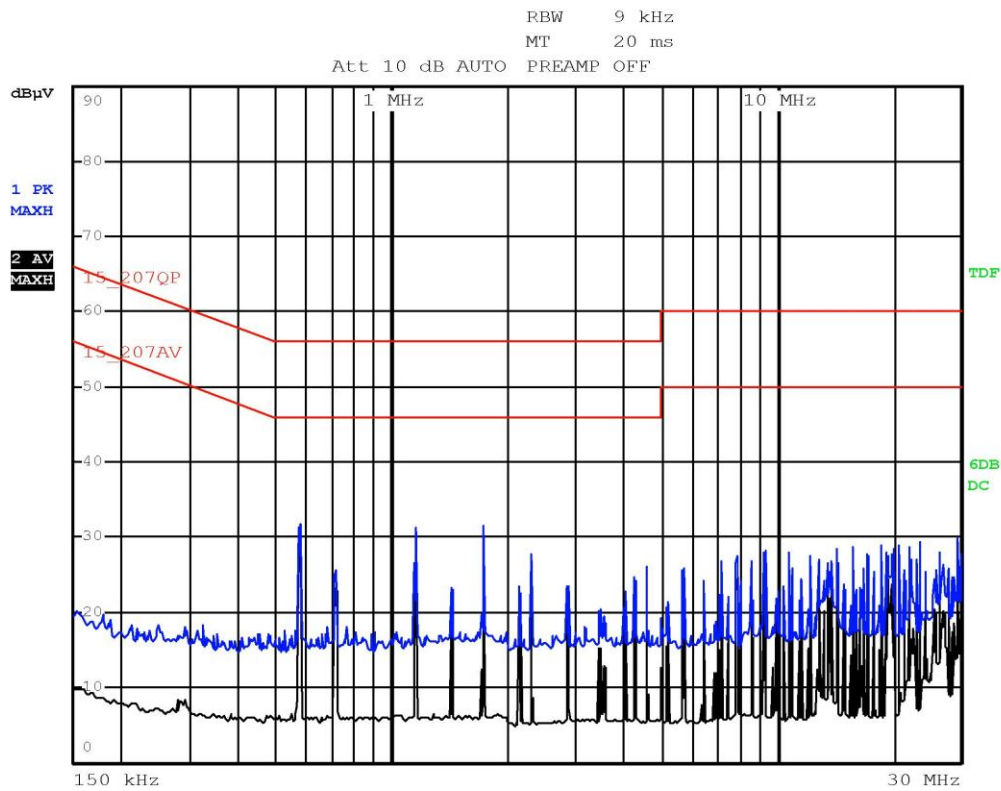


Gandini 16058114-Line (+) - Tx-Rx





G16058115



Gandini 16058115-Line (-) - Tx-Rx

**Result:** The requirements are met



## 11.3 Radiated emissions

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.209
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
Semi-anechoic chamber

*Auxiliary equipment:*  
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S127, CMC S136, CMC S164  
Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Enclosure  
Frequency range: 0,009 MHz – 1000 MHz  
Antenna polarization: Horizontal (H) – Vertical (V)  
EUT – Antenna distance: 3 m

### Environmental conditions

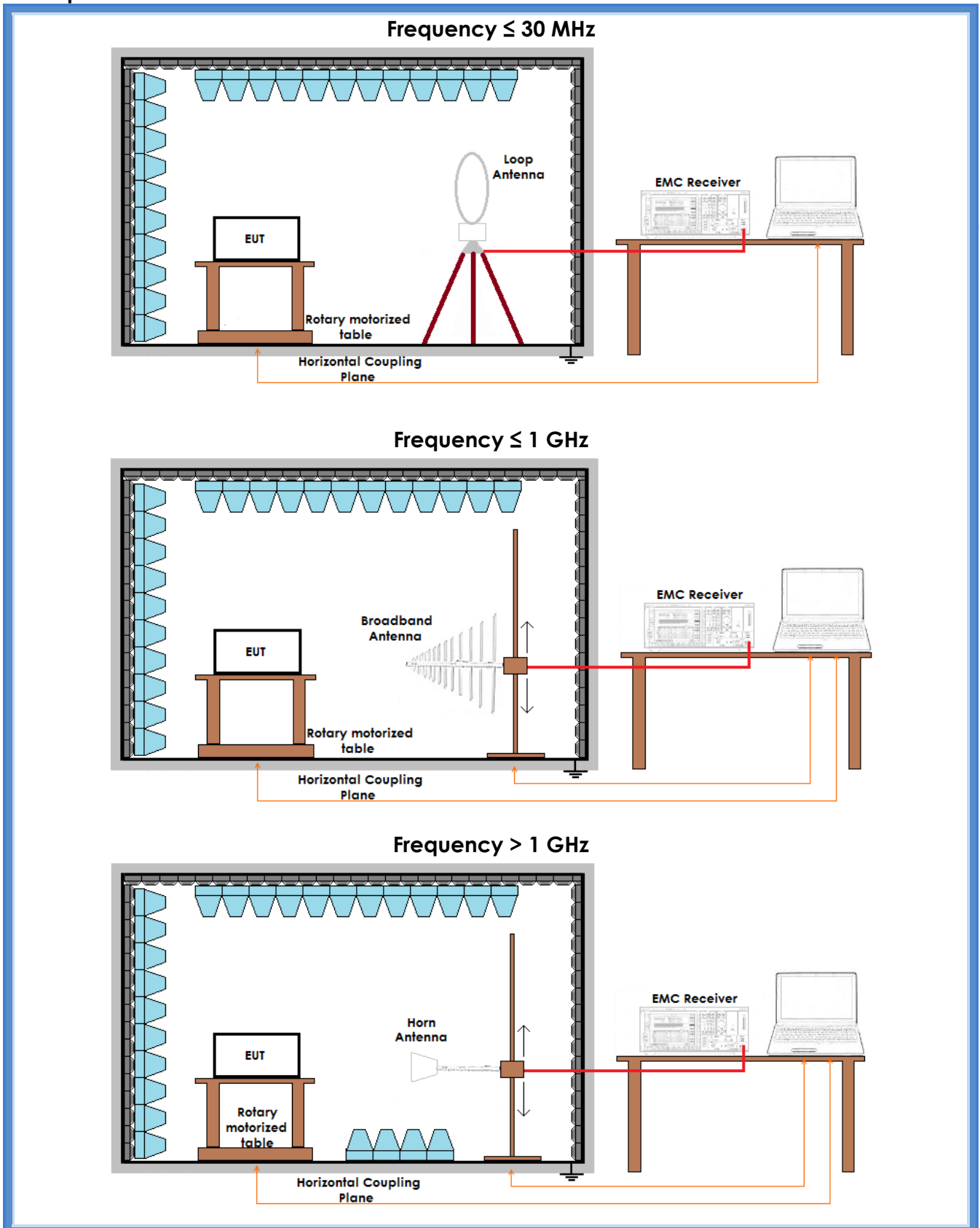
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

### Acceptance limits

Frequency range (MHz)	Limits [dB(µV/m)]
0,009 to 0,490	118,51 to 83,80
0,490 to 1,705	63,80 to 52,97
1,705 to 30	59,54
30 to 88	30
88 to 216	33,52
216 to 960	36,02
Above 960	43,98

**Remarks:** The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

## Setup







## Result

Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
Loop	0,009 – 30	G16058107	Worst case	Complies
V	30 – 1000	G16058106	Lowest frequency	Complies
H	30 – 1000	G16058105	Lowest frequency	Complies
V	30 – 1000	G16058103	Medium frequency	Complies
H	30 – 1000	G16058104	Medium frequency	Complies
V	30 – 1000	G16058102	Highest frequency	Complies
H	30 – 1000	G16058101	Highest frequency	Complies
V	1000 – 10000	G16058108	Worst case	Complies
H	1000 – 10000	G16058109	Worst case	Complies

**Remarks:** Peaks above the limits are due to the main transmitting frequencies

### Graphs Legend

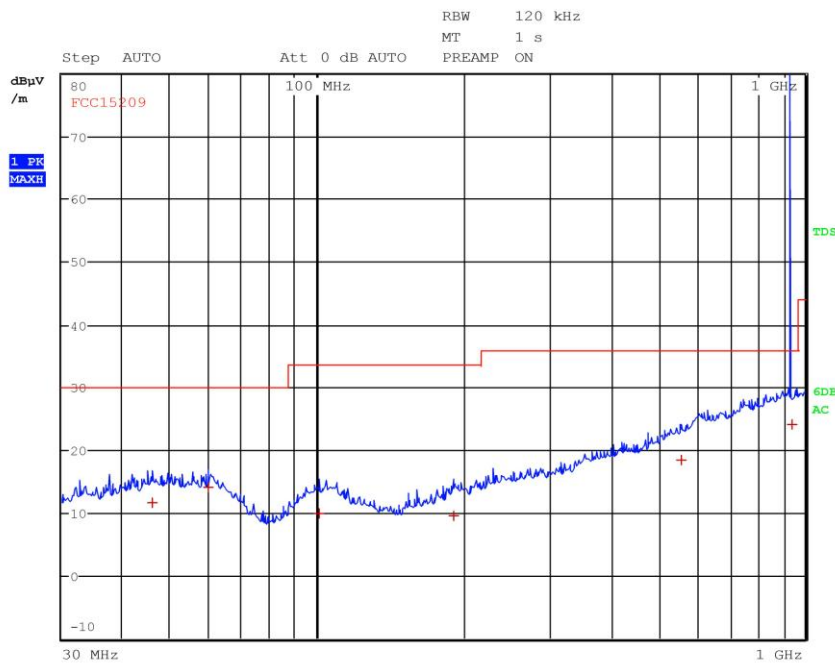
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +  
AV: Average; AV [1s] (average at 1 second) values are marked with a x



## Graphs

G16058101

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmax  
**Operator** Gandini 16058101  
**Test Spec**  
Horiz



### Final Measurement

Meas Time: 1 s  
Margin: 20 dB  
Subranges: 6

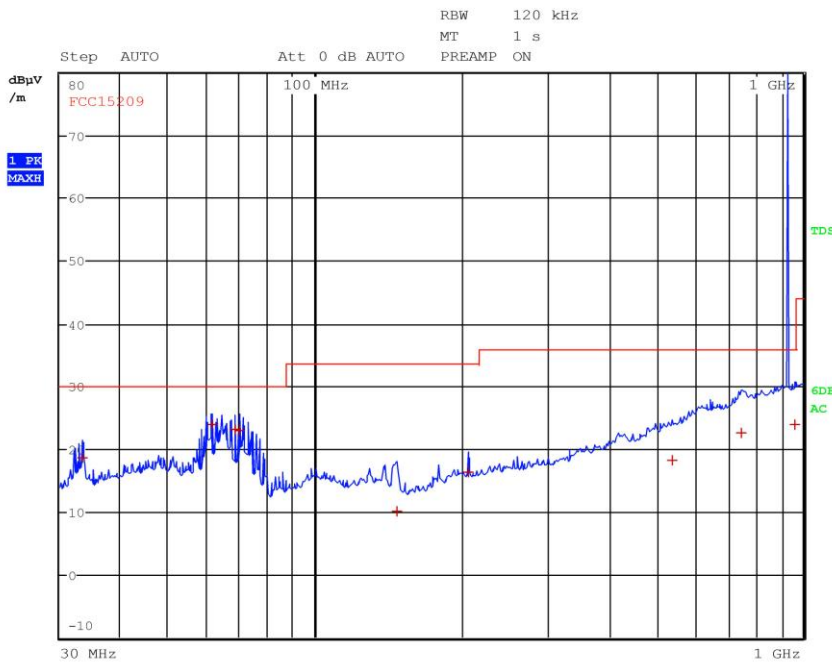
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	46.000000000 MHz	11.65	Quasi Peak	-18.35
1	59.960000000 MHz	14.08	Quasi Peak	-15.92
1	101.040000000 MHz	10.03	Quasi Peak	-23.49
1	190.520000000 MHz	9.63	Quasi Peak	-23.89
1	556.880000000 MHz	18.48	Quasi Peak	-17.54
1	941.000000000 MHz	24.06	Quasi Peak	-11.96

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G16058102

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmax  
**Operator** Gandini 16058102  
**Test Spec**  
 Vert



**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 9

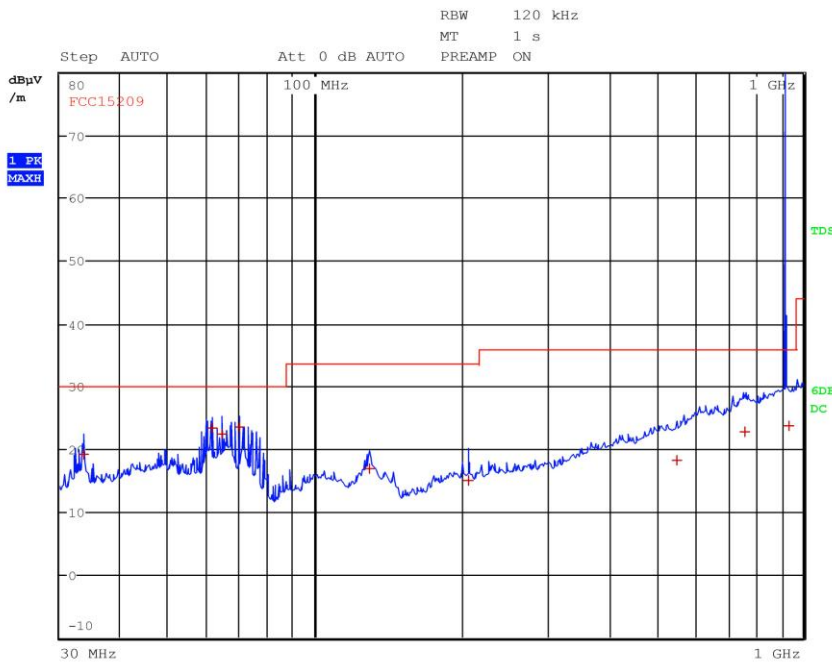
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	33.320000000 MHz	18.71	Quasi Peak	-11.29
1	61.400000000 MHz	23.96	Quasi Peak	-6.04
1	68.560000000 MHz	23.24	Quasi Peak	-6.76
1	70.000000000 MHz	22.92	Quasi Peak	-7.08
1	147.080000000 MHz	10.14	Quasi Peak	-23.38
1	206.600000000 MHz	16.36	Quasi Peak	-17.16
1	537.440000000 MHz	18.32	Quasi Peak	-17.70
1	746.600000000 MHz	22.67	Quasi Peak	-13.35
1	959.000000000 MHz	23.93	Quasi Peak	-12.09

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G16058103

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmid  
**Operator** Gandini 16058103  
**Test Spec**  
 Vert



**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 9

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	33.560000000 MHz	19.12	Quasi Peak	-10.88
1	61.440000000 MHz	23.46	Quasi Peak	-6.54
1	64.320000000 MHz	22.34	Quasi Peak	-7.66
1	69.960000000 MHz	23.63	Quasi Peak	-6.37
1	129.280000000 MHz	17.03	Quasi Peak	-16.49
1	206.680000000 MHz	15.13	Quasi Peak	-18.39
1	551.960000000 MHz	18.34	Quasi Peak	-17.68
1	757.680000000 MHz	22.80	Quasi Peak	-13.22
1	932.680000000 MHz	23.81	Quasi Peak	-12.21

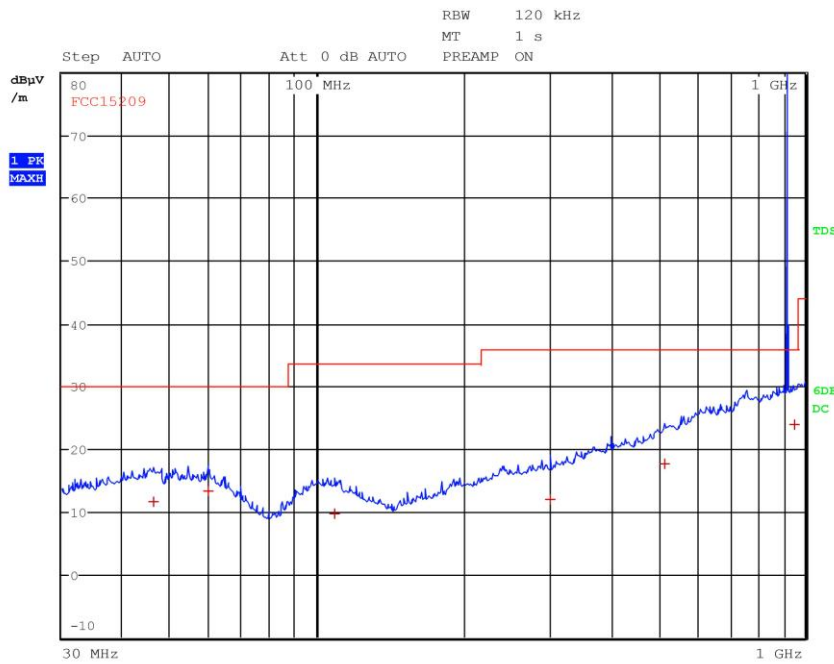
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G16058104

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmid  
**Operator** Gandini 16058104  
**Test Spec**  
 Horiz



**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 6

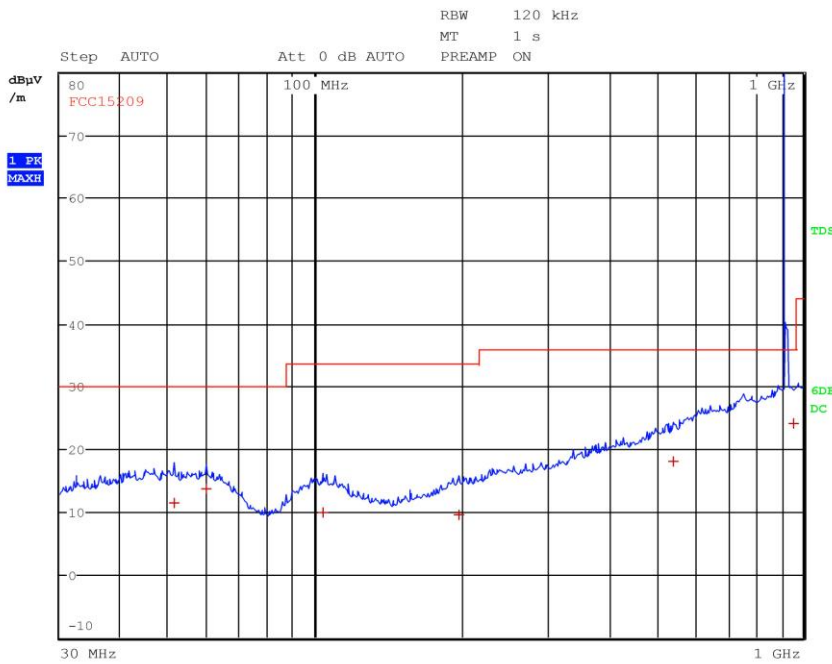
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	46.160000000 MHz	11.71	Quasi Peak	-18.29
1	59.920000000 MHz	13.41	Quasi Peak	-16.59
1	108.840000000 MHz	9.69	Quasi Peak	-23.83
1	300.280000000 MHz	12.04	Quasi Peak	-23.98
1	515.400000000 MHz	17.74	Quasi Peak	-18.28
1	951.440000000 MHz	23.97	Quasi Peak	-12.05

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G16058105

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmin  
**Operator** Gandini 16058105  
**Test Spec**  
 Horiz



**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 6

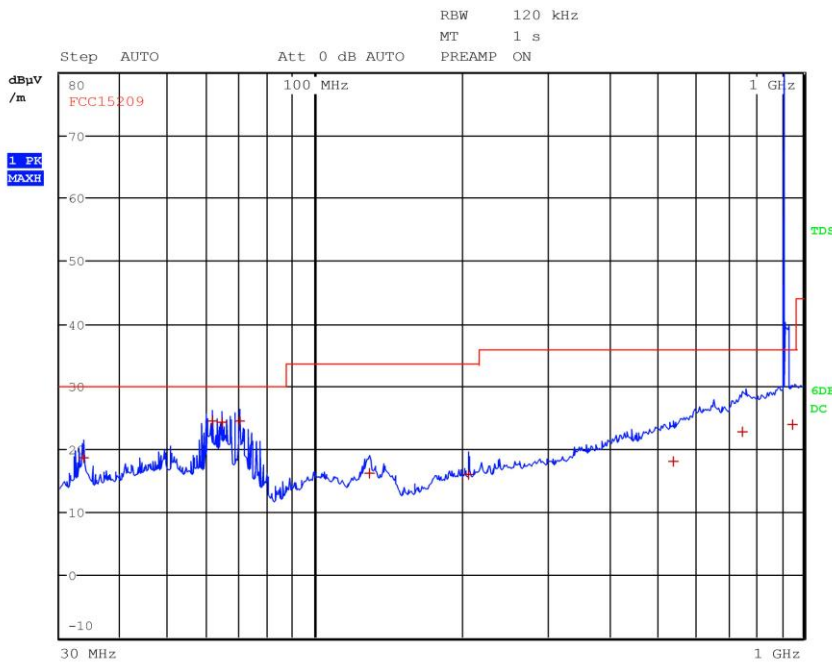
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	51.360000000 MHz	11.47	Quasi Peak	-18.53
1	60.000000000 MHz	13.65	Quasi Peak	-16.35
1	103.880000000 MHz	10.03	Quasi Peak	-23.49
1	197.120000000 MHz	9.58	Quasi Peak	-23.94
1	541.840000000 MHz	18.13	Quasi Peak	-17.89
1	954.640000000 MHz	24.07	Quasi Peak	-11.95

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G16058106

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx - Fmin  
**Operator** Gandini 16058106  
**Test Spec**  
Vert



**Final Measurement**

Meas Time: 1 s  
Margin: 20 dB  
Subranges: 10

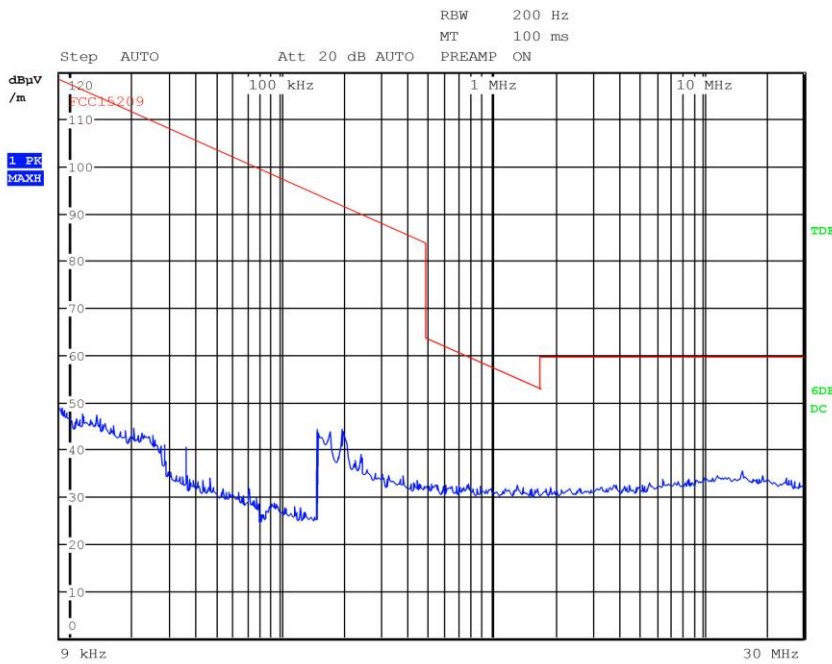
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	33.560000000 MHz	18.63	Quasi Peak	-11.37
1	61.400000000 MHz	24.51	Quasi Peak	-5.49
1	64.280000000 MHz	24.38	Quasi Peak	-5.62
1	69.960000000 MHz	24.49	Quasi Peak	-5.51
1	129.280000000 MHz	16.16	Quasi Peak	-17.36
1	206.640000000 MHz	15.94	Quasi Peak	-17.58
1	541.880000000 MHz	18.09	Quasi Peak	-17.93
1	751.960000000 MHz	22.82	Quasi Peak	-13.20
1	915.000000000 MHz	81.68	Quasi Peak	45.66
1	950.480000000 MHz	23.89	Quasi Peak	-12.13

CMC Centro Misure Compatibilità S.r.l.



G16058107

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx  
**Operator** Gandini 16058107  
**Test Spec**  
 Loop



**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 0

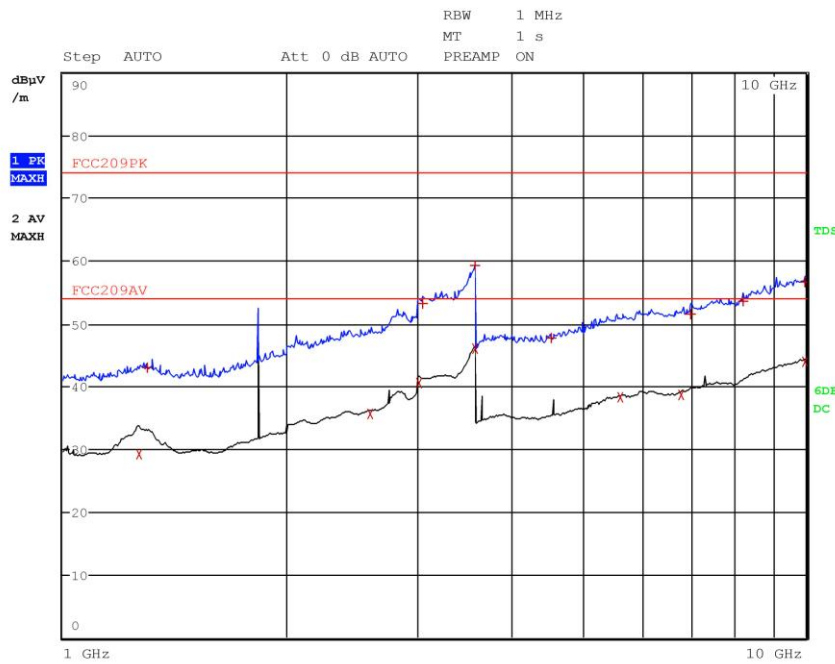
CMC Centro Misure Compatibilità S.r.l.





G16058108

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx  
**Operator** Gandini 16058108  
**Test Spec**  
 Vert



CMC Centro Misure Compatibilità S.r.l.



**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx  
**Operator** Gandini 16058108  
**Test Spec**  
 Vert

**Final Measurement**

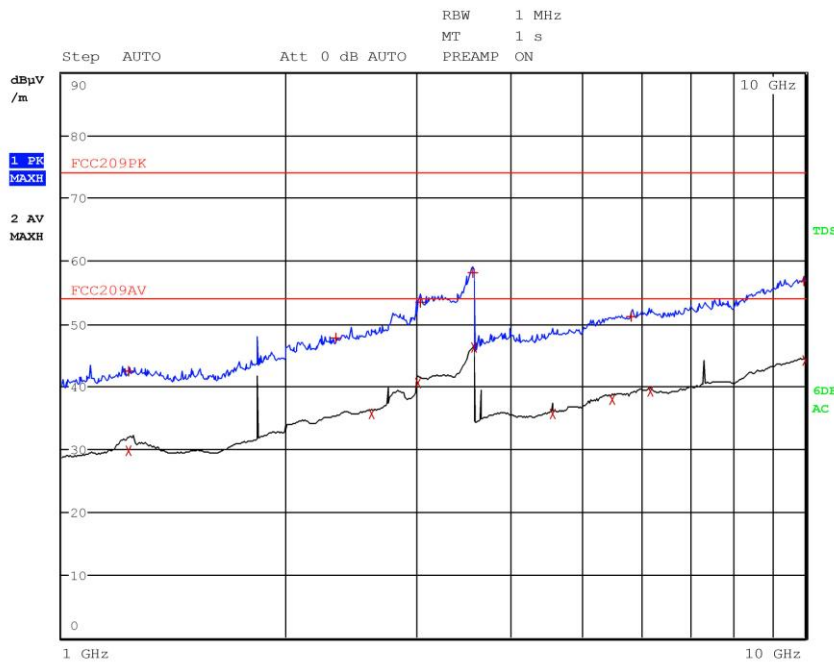
Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 14

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
2	1.265600000 GHz	29.16	Average	-24.84
1	1.298800000 GHz	43.10	Max Peak	-30.90
2	2.591600000 GHz	35.61	Average	-18.39
2	3.018800000 GHz	40.46	Average	-13.54
1	3.042400000 GHz	53.15	Max Peak	-20.85
1	3.595600000 GHz	59.33	Max Peak	-14.67
2	3.597200000 GHz	46.00	Average	-8.00
1	4.538000000 GHz	47.80	Max Peak	-26.20
2	5.613200000 GHz	38.22	Average	-15.78
2	6.787600000 GHz	38.74	Average	-15.26
1	6.990800000 GHz	51.61	Max Peak	-22.39
1	8.229200000 GHz	53.63	Max Peak	-20.37
2	9.961200000 GHz	43.92	Average	-10.08
1	9.974400000 GHz	56.60	Max Peak	-17.40



G16058109

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx  
**Operator** Gandini 16058109  
**Test Spec**  
 Horiz



CMC Centro Misure Compatibilità S.r.l.



**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx-Rx  
**Operator** Gandini 16058109  
**Test Spec**  
 Horiz

**Final Measurement**

Meas Time: 1 s  
 Margin: 20 dB  
 Subranges: 14

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	1.227600000 GHz	42.37	Max Peak	-31.63
2	1.230400000 GHz	29.73	Average	-24.27
1	2.332800000 GHz	47.68	Max Peak	-26.32
2	2.607200000 GHz	35.73	Average	-18.27
2	3.018400000 GHz	40.62	Average	-13.38
1	3.030800000 GHz	53.34	Max Peak	-20.66
1	3.570000000 GHz	58.11	Max Peak	-15.89
2	3.593600000 GHz	46.14	Average	-7.86
2	4.575200000 GHz	35.63	Average	-18.37
2	5.490400000 GHz	37.93	Average	-16.07
1	5.838000000 GHz	51.10	Max Peak	-22.90
2	6.182000000 GHz	39.23	Average	-14.77
1	9.980000000 GHz	56.83	Max Peak	-17.17
2	9.984800000 GHz	44.14	Average	-9.86

**Result:** The requirements are met

CMC Centro Misure Compatibilità S.r.l.



## 11.4 20 dB bandwidth

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Laboratory

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

See FCC Part 15.247

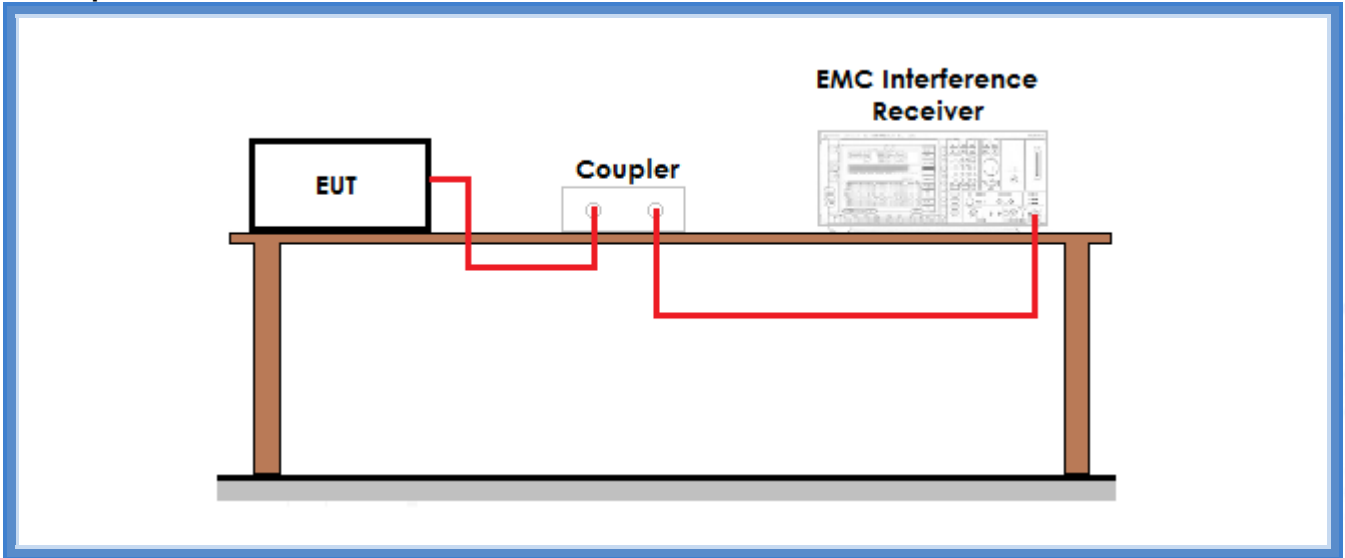
### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

**Acceptance limits:** The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz



### Setup



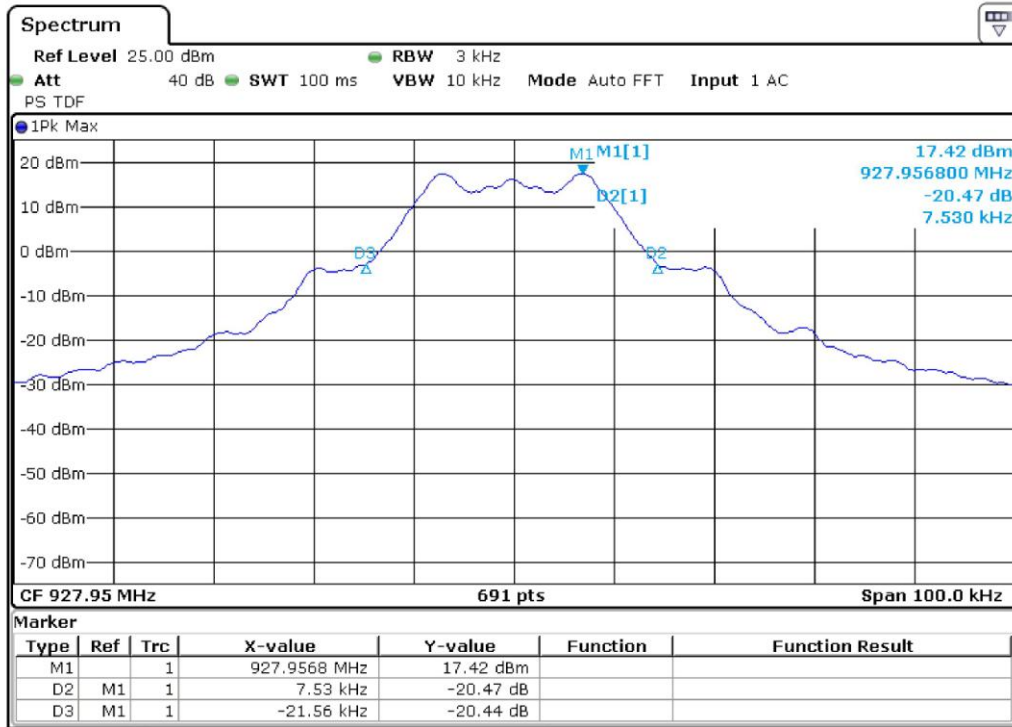
### Result

Frequency (MHz)	Graphs	20 dB bandwidth (kHz)	Maximum 20 dB bandwidth allowed (kHz)	Results
915,05	G16058129	28,64	500	Complies
921,00	G16058134	28,64	500	Complies
927,95	G16058124	29,09	500	Complies



Graphs

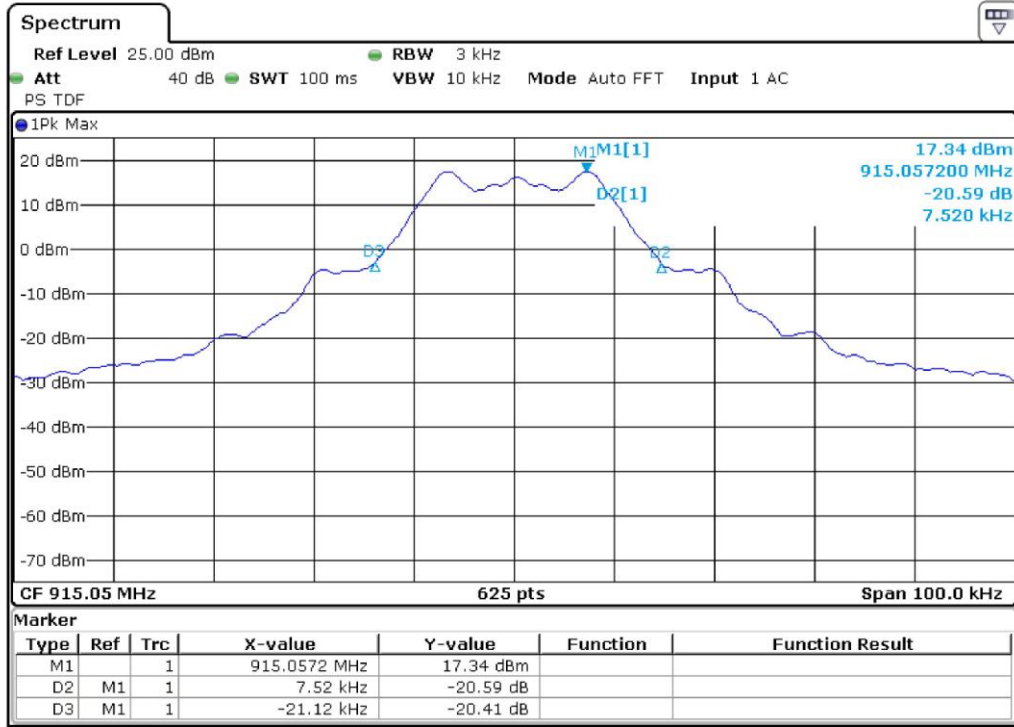
G16058124



Gandini 16058124-FMAX



G16058129

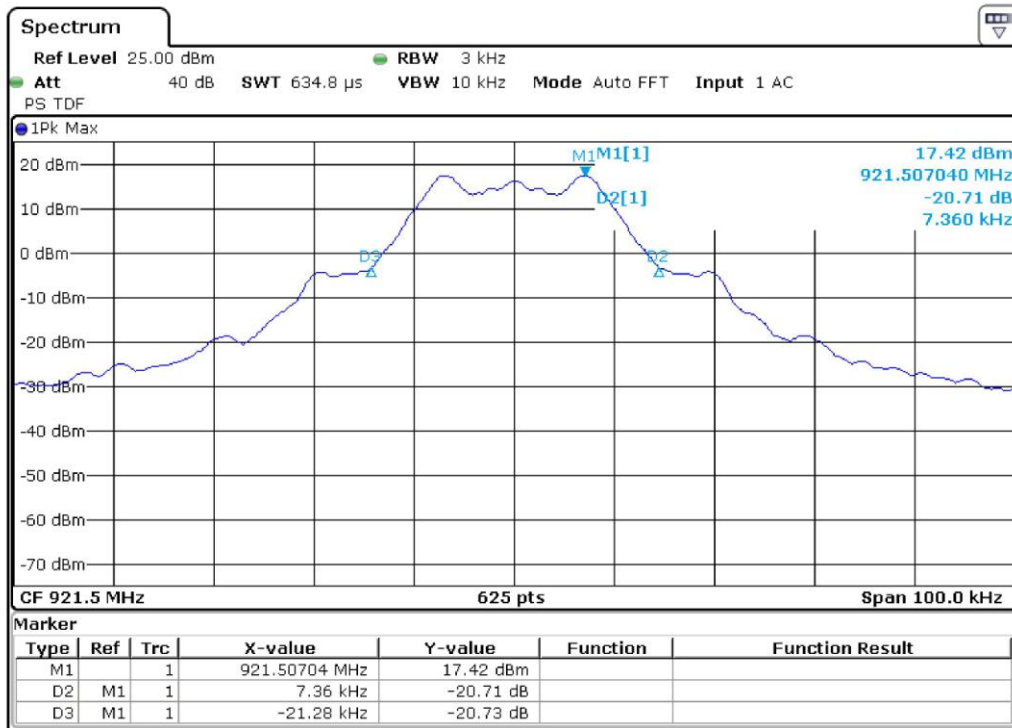


Gandini 16058129-FMIN

CMC Centro Misure Compatibilità S.r.l.



G16058134



Gandini 16058134-FMID

**Result:** The requirements are met

CMC Centro Misure Compatibilità S.r.l.



## 11.5 Channel separation

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
Laboratory

*Auxiliary equipment:*  
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227  
Measurement uncertainty: See clause 7 of this test report

### Test specification

See FCC Part 15.247

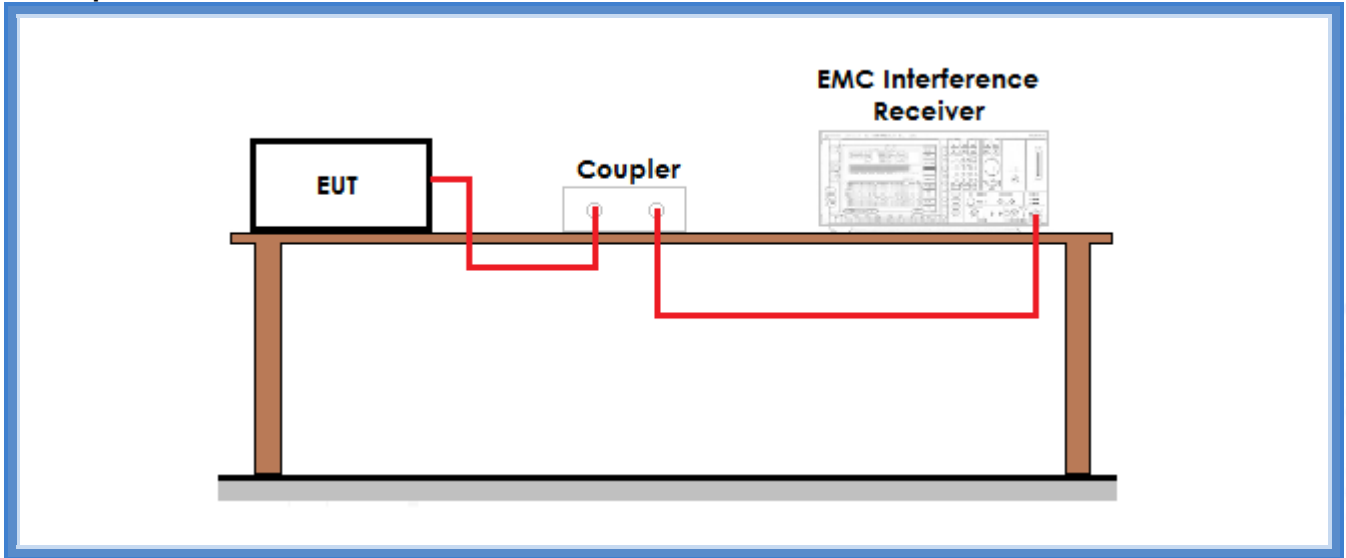
### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	100	42

**Acceptance limits:** frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483,5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW



### Setup



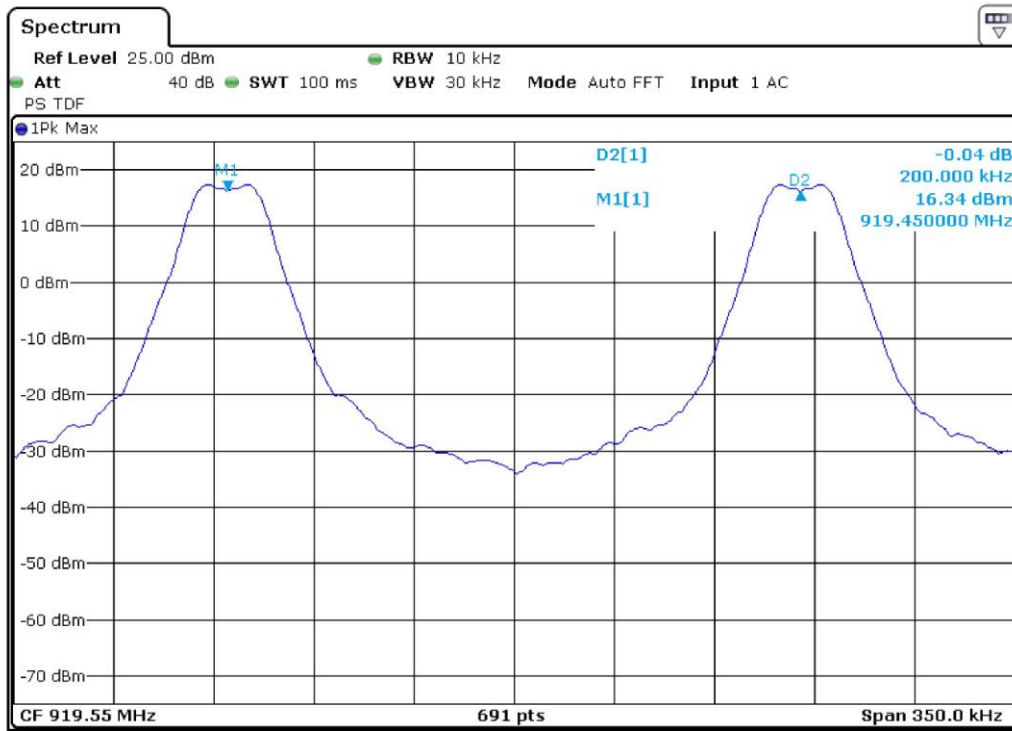
### Result

Frequency band (MHz)	Graphs	Channel separation (kHz)	Minimum channel separation required (kHz)	Results
919,375 – 919,725	G16058119	200	25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater	Complies



## Graphs

G16058119



Gandini 16058119-Flipping

**Result:** The requirements are met



## 11.6 Number of hopping channels

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Laboratory

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

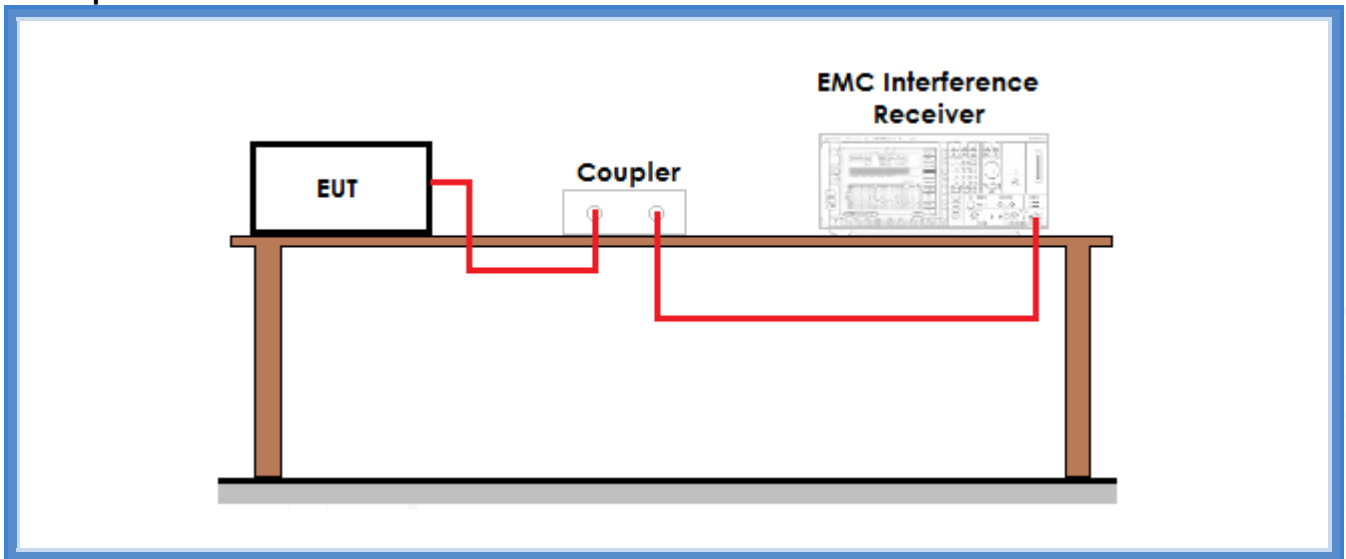
See FCC Part 15.247

### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	100	42

**Acceptance limits:** for frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies. Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

### Setup



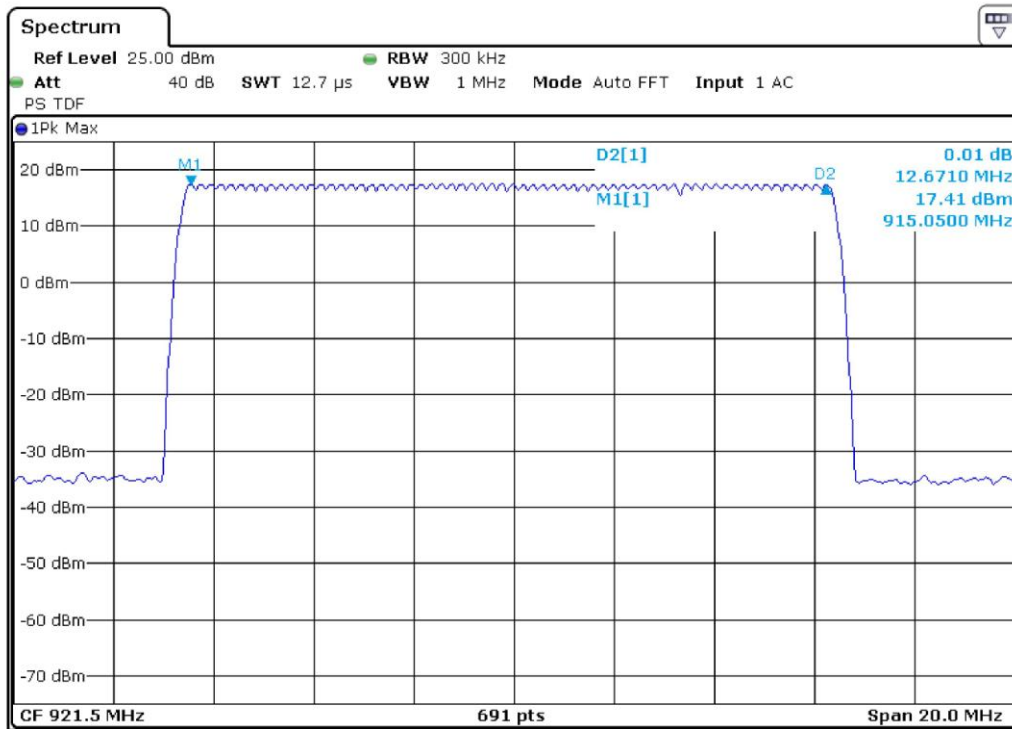
### Result

Graphs	Number of hopping channels	Minimum number of hopping channels required	Results
G16058116	64	50 if the 20 dB bandwidth is less than 250 kHz  25 if the 20 dB bandwidth is 250 kHz or greater	Complies



## Graphs

G16058116



Gandini 16058116-Fhopping

**Result:** The requirements are met





## 11.7 Time of occupancy

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Laboratory

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S164  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

See FCC Part 15.247

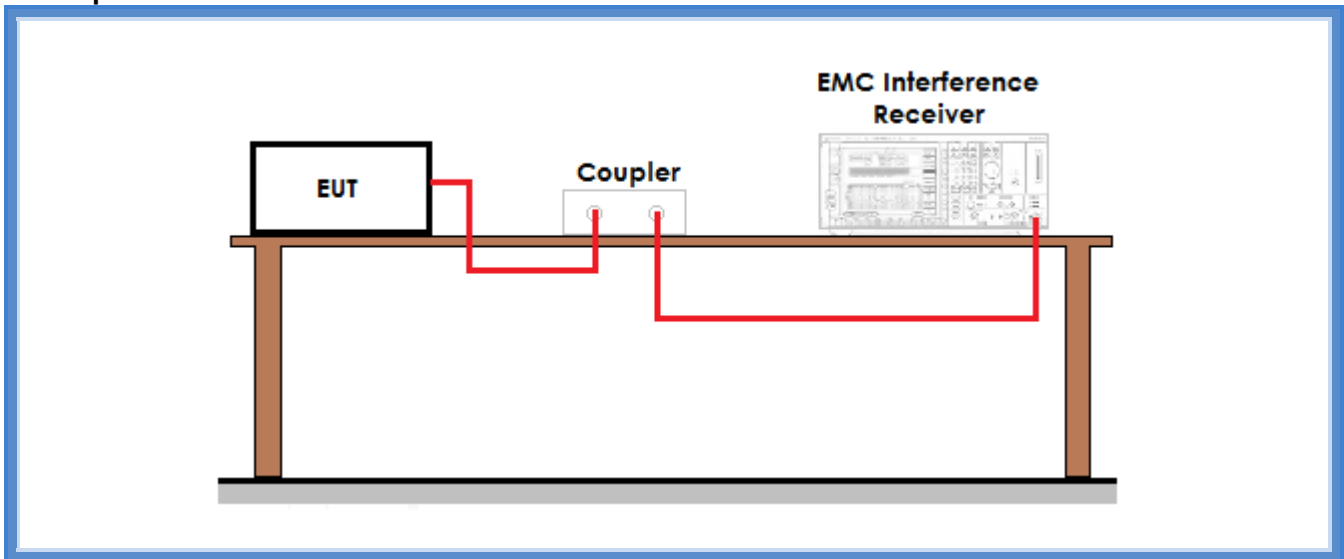
### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	42

### Acceptance limits:

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 10 second period

## Setup



## Result

### Dwell time of transmission

Frequency (MHz)	Graphs	Dwell time (ms)
920,45	G16058117	20,48

### Number of transmissions per period (20 s)

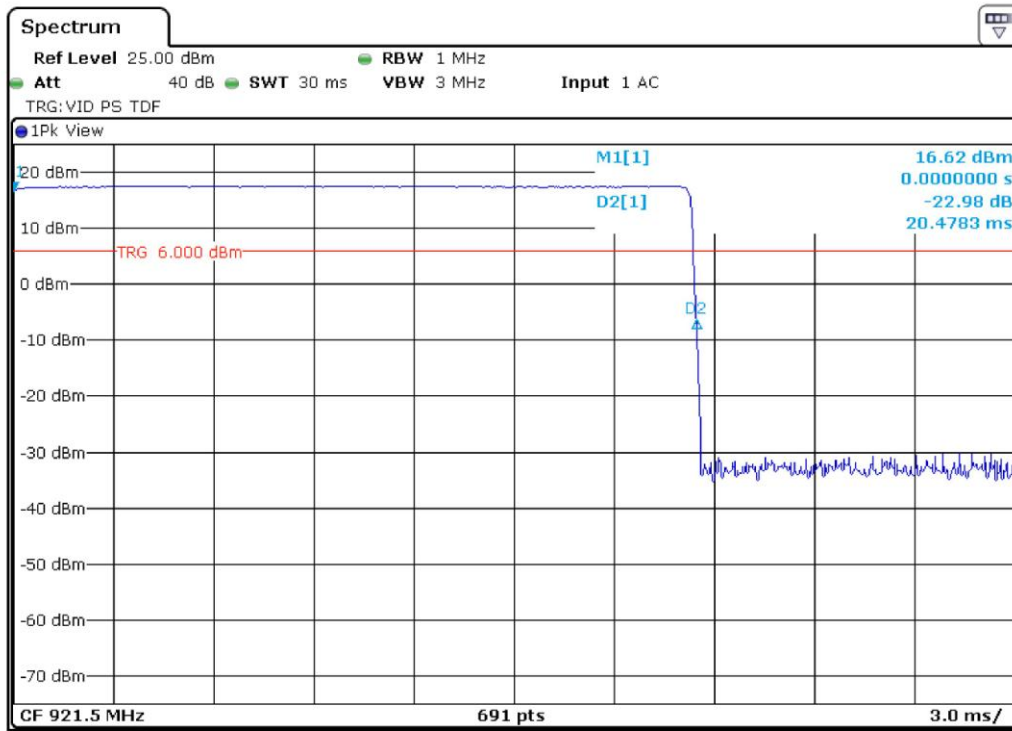
Frequency (MHz)	Time between 2 transmission on different channels		Number of transmissions
920,45	G16058118	50 ms	0,40

<b>Time of occupancy (Dwell time x Number of transmissions)</b>	8,192 ms
---	----------



## Graphs

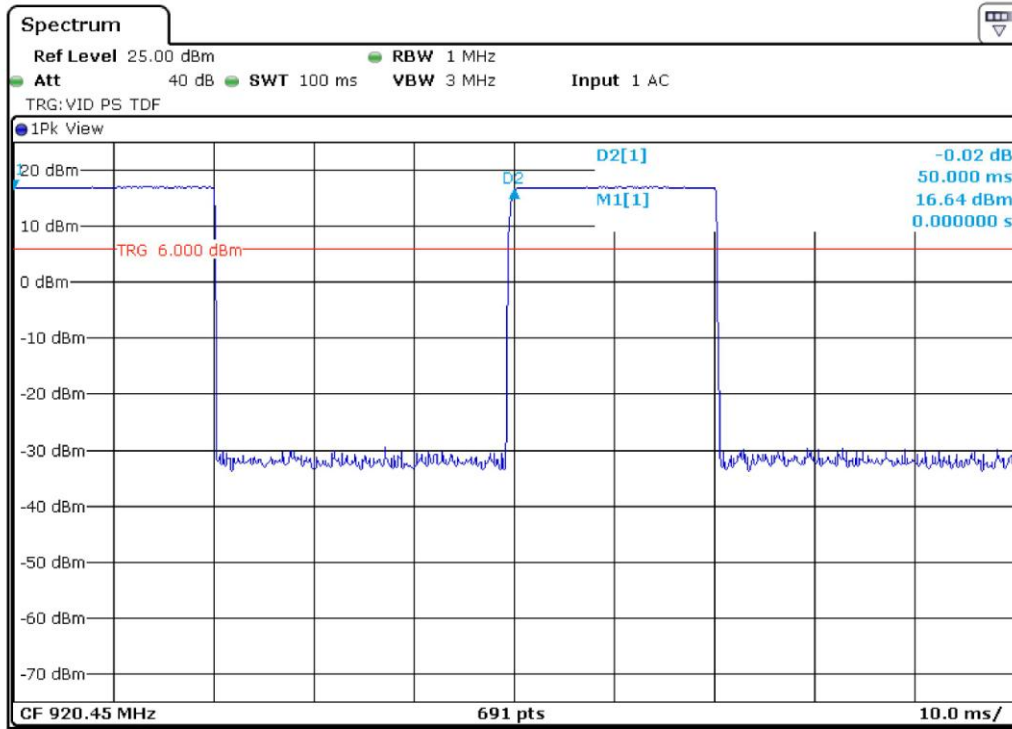
G16058117



Gandini 16058117-Flipping



G16058118



Gandini 16058118-Fhopping

**Result:** The requirements are met



## 11.8 Band edge

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Laboratory

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

See FCC Part 15.247

### Environmental conditions

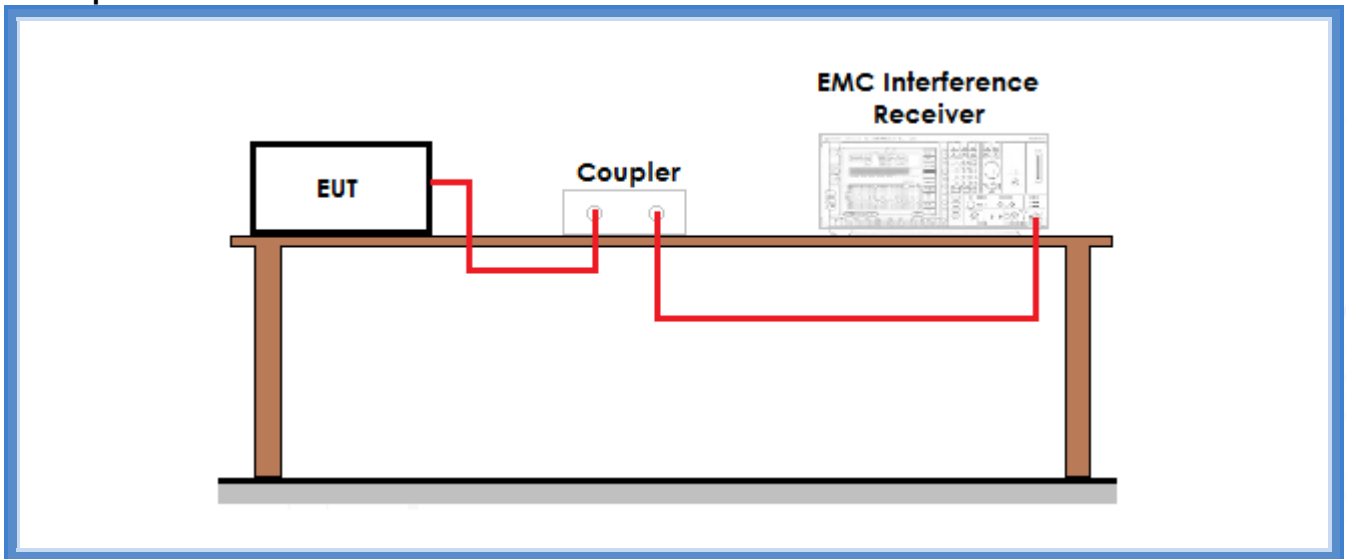
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

**Acceptance limits:** operation within the band 902 – 928 MHz

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## Setup



## Result

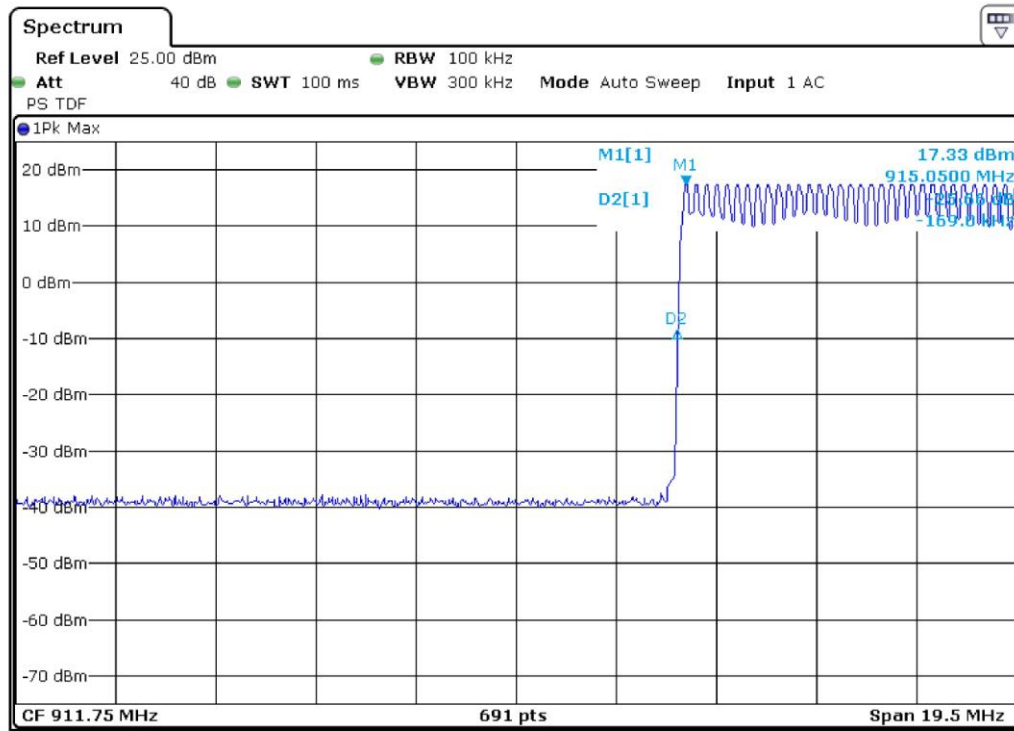
Frequency (MHz)	Graph(s) – Hopping	Results	
915,05	G16058120	F <sub>L</sub> : 915,0255 MHz	Complies
	G16058121		
927,95	G16058122	F <sub>H</sub> : 927,9746 MHz	Complies
	G16058123		

Frequency (MHz)	Graph(s) – No hopping	Results	
915,05	G16058131	F <sub>L</sub> : 915,0351 MHz	Complies
	G16058132		
927,95	G16058126	F <sub>H</sub> : 927,9698 MHz	Complies
	G16058127		



## Graphs

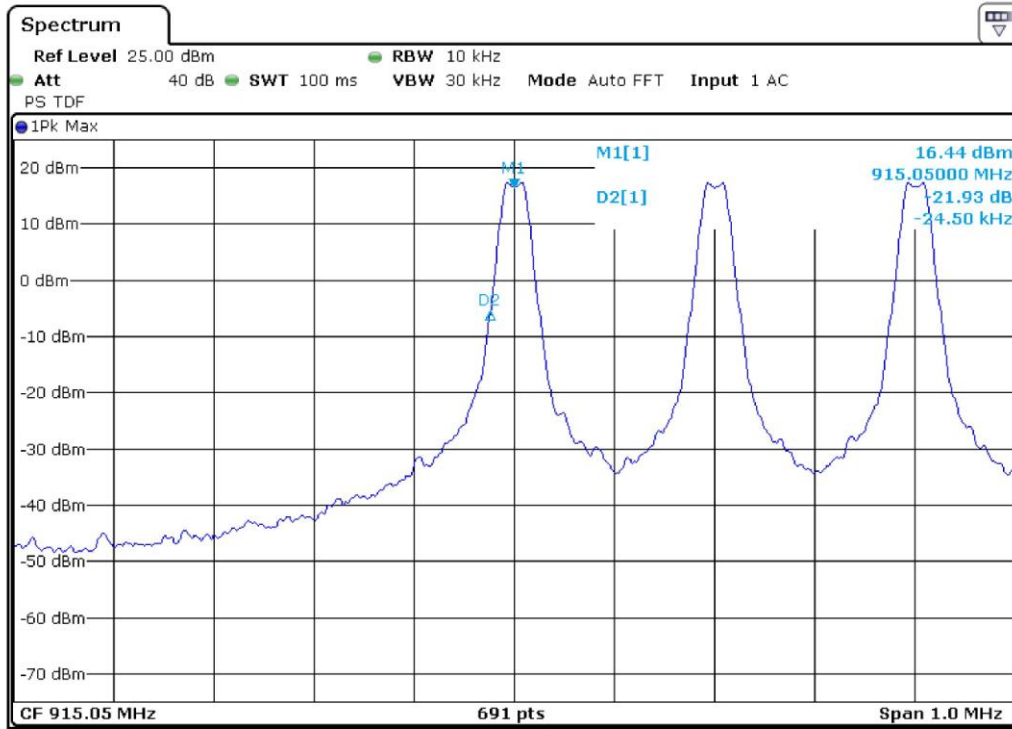
G16058120



Gandini 16058120-Fhopping



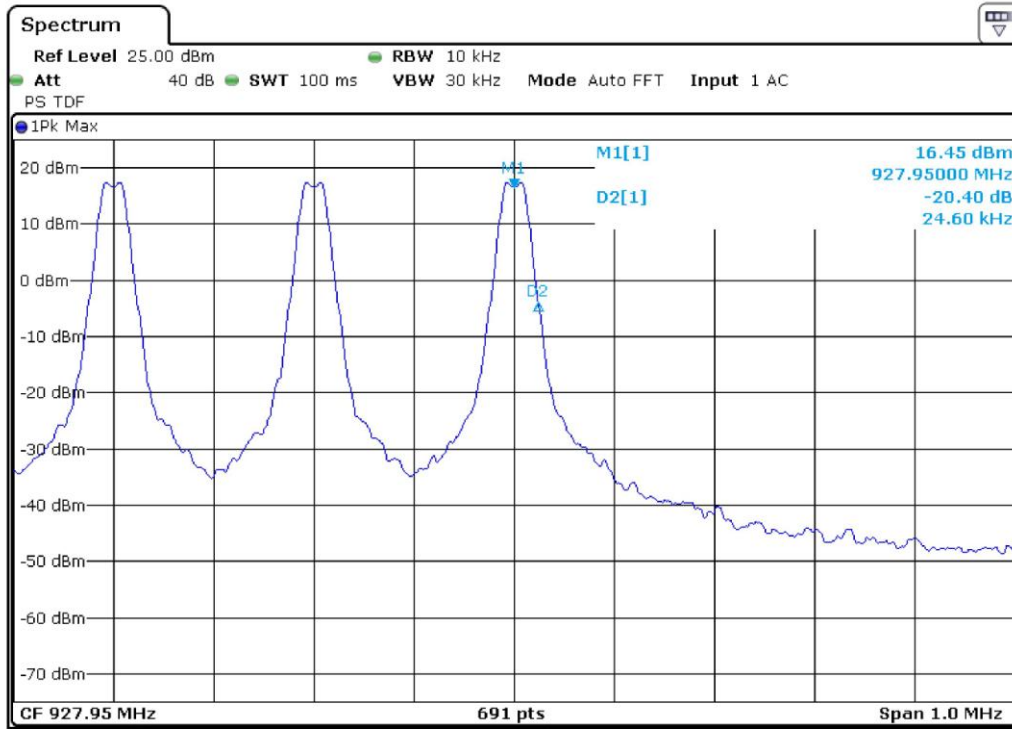
G16058121



Gandini 16058121-Fhopping



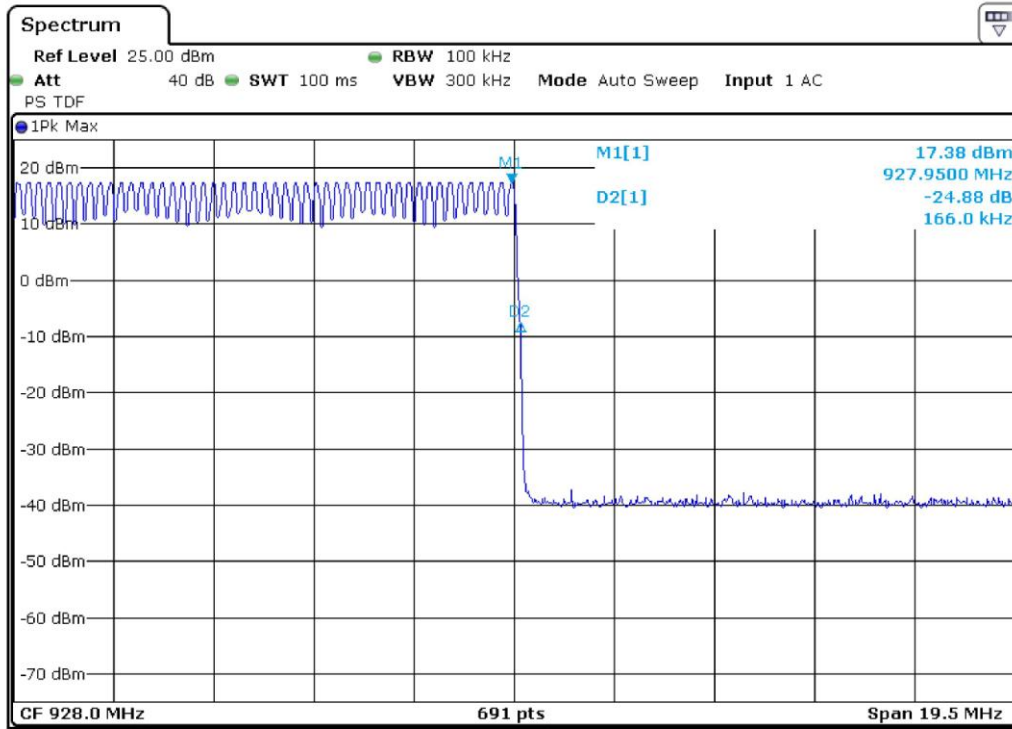
G16058122



Gandini 16058122-Fhopping



G16058123

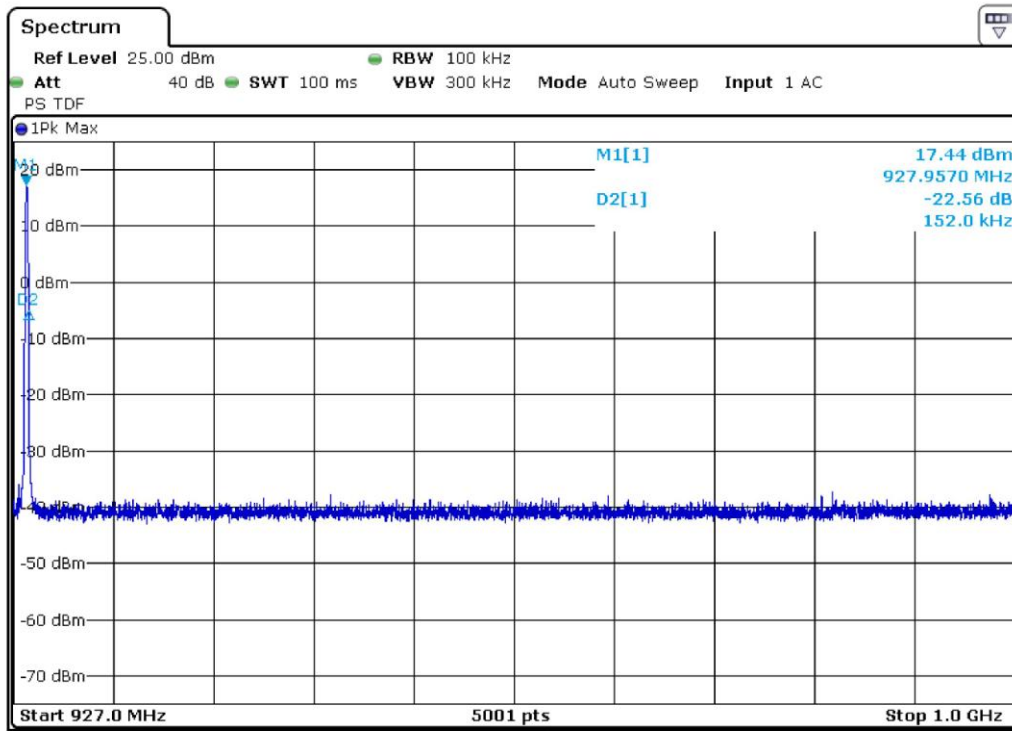


Gandini 16058123-Fhopping

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G16058126

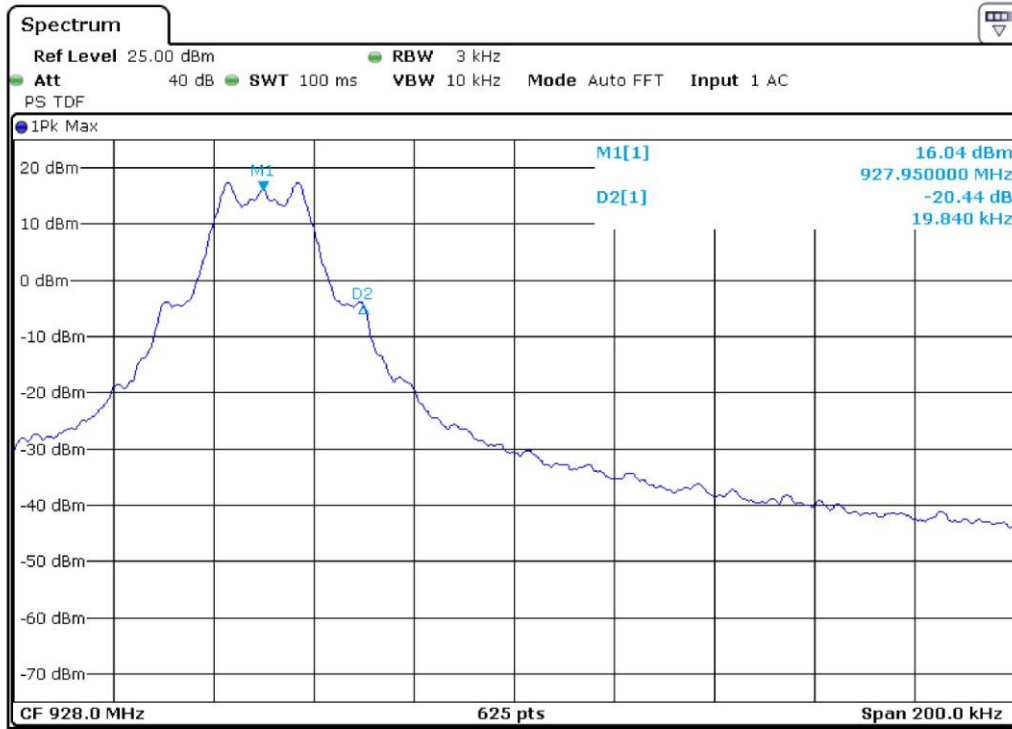


Gandini 16058126-FMAX





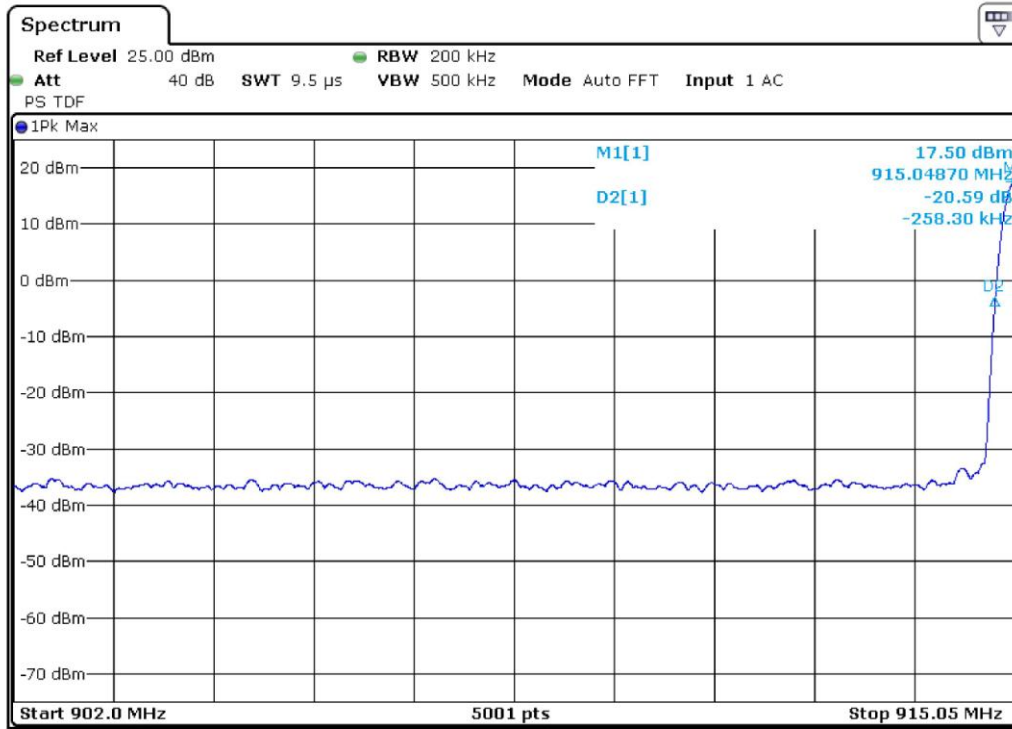
G16058127



Gandini 16058127-FMAX



G16058131

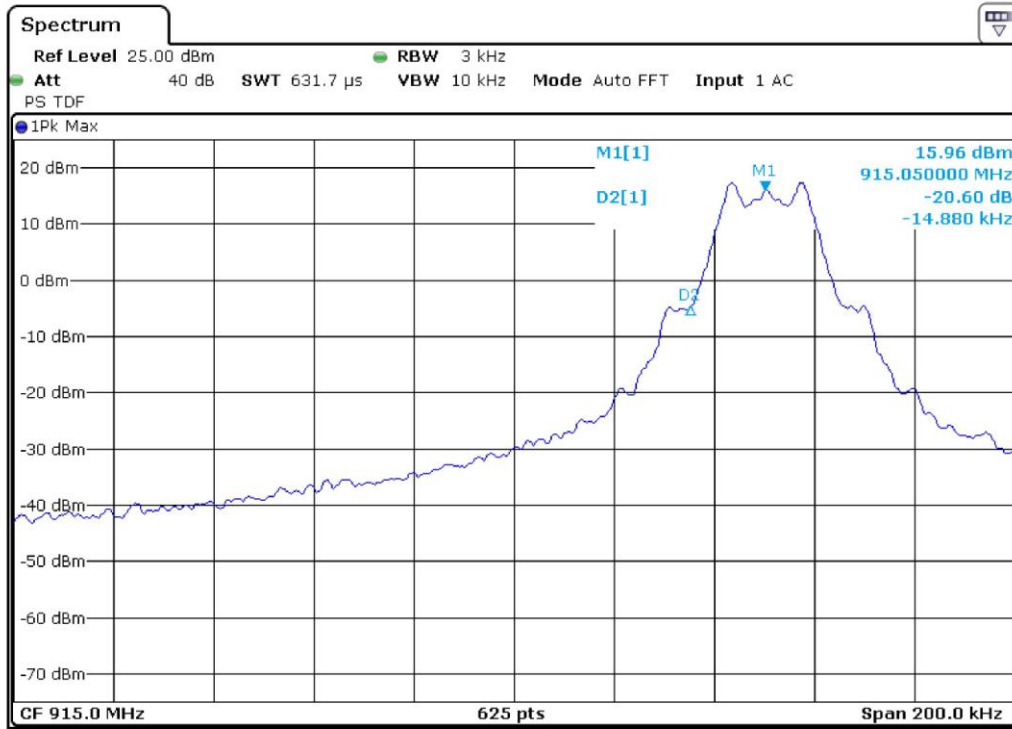


Gandini 16058131-FMIN

CMC Centro Misure Compatibilità S.r.l.



G16058132



Gandini 16058132-FMIN

**Result:** The requirements are met



## 11.9 Peak Output Power

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Laboratory

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

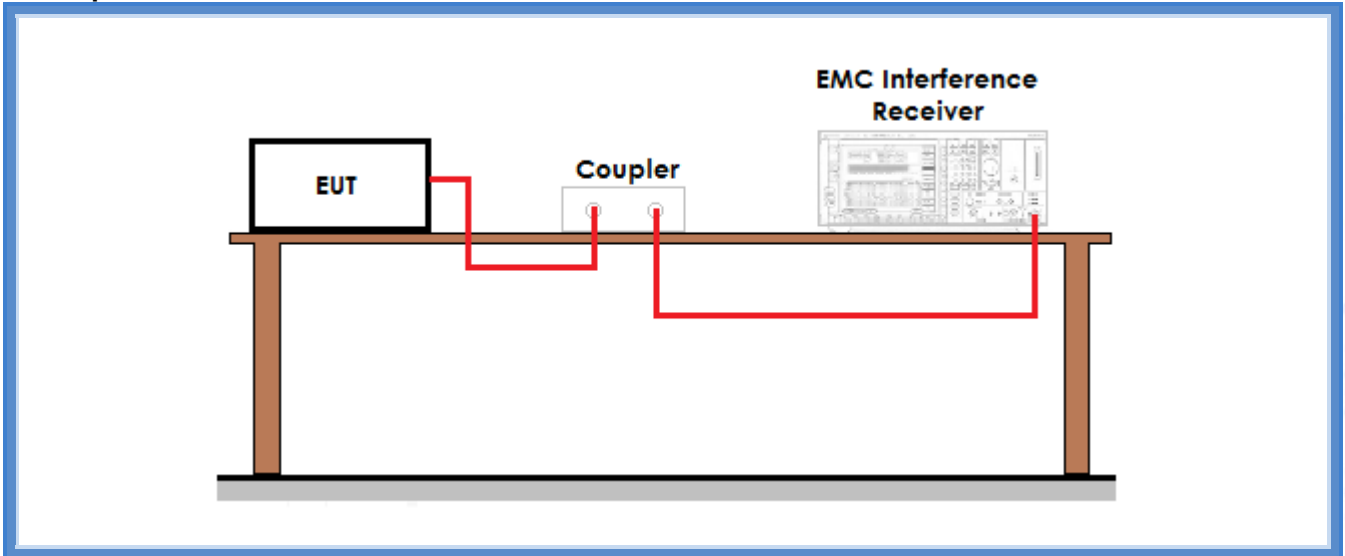
Port: Enclosure  
 Antenna polarization: Horizontal (H) – Vertical (V)  
 EUT – Antenna distance: 3 m

### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	100	45

For frequency hopping systems operating in the 2400–2483,5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483,5 MHz band: 0,125 watts. For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0,25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

## Setup



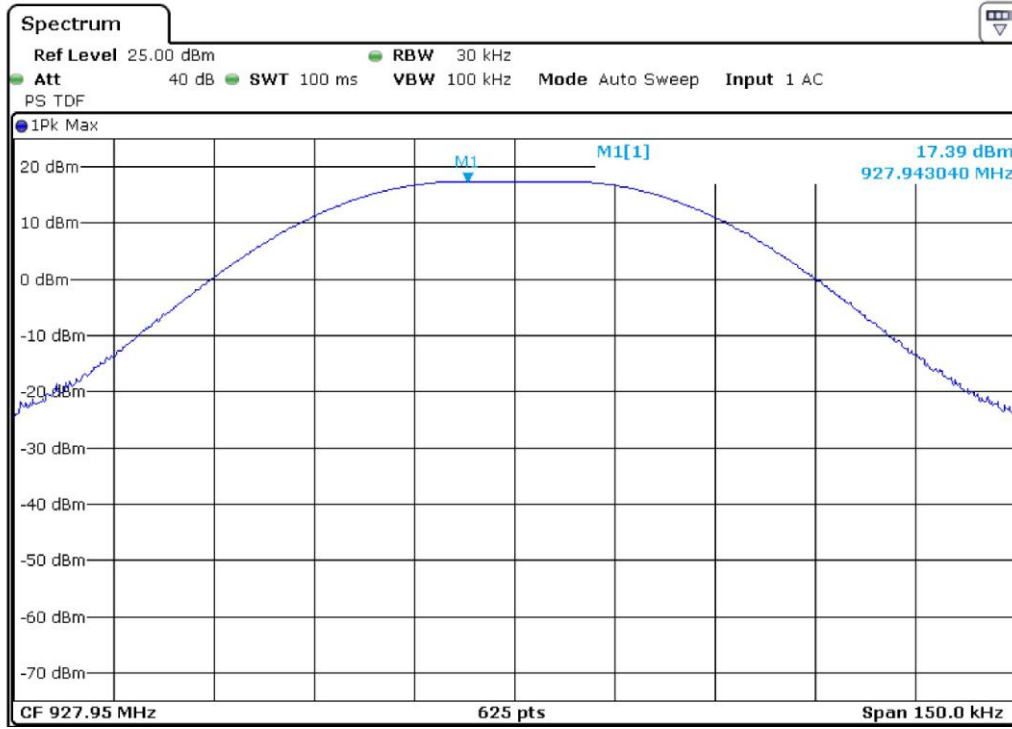
## Result

Frequency (MHz)	Graphs	Measured level (dBm)	Remarks
915,04352	G16058133	17,33	--
921,49304	G16058136	17,42	--
927,94304	G16058128	17,39	--



## Graphs

G16058128

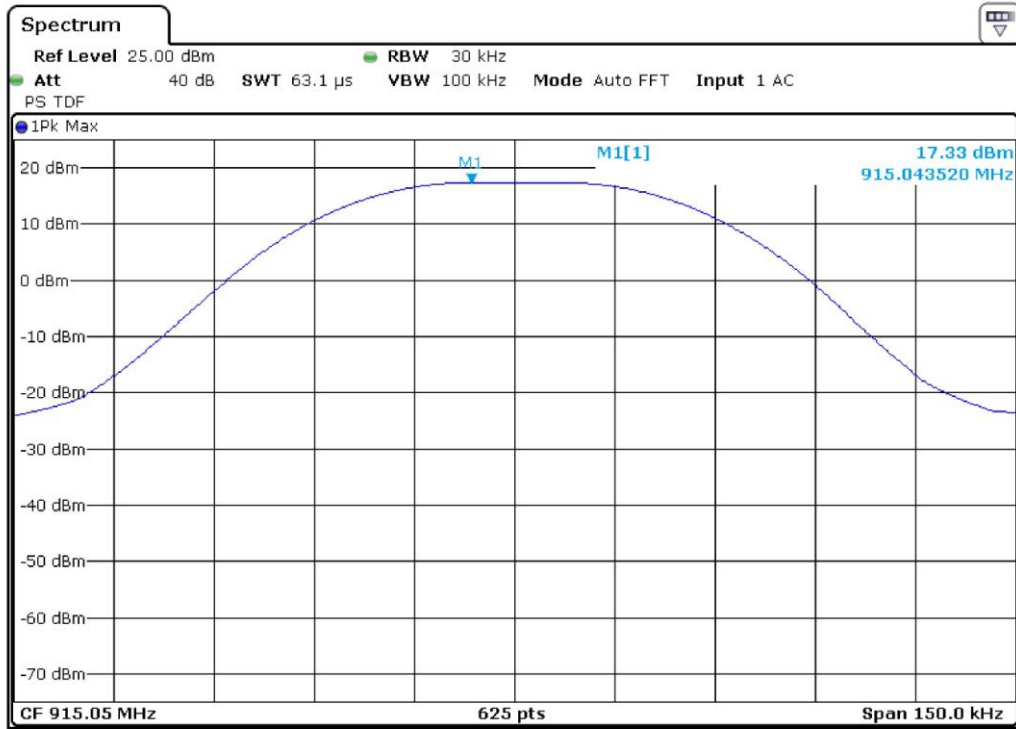


Gandini 16058128-FMAX





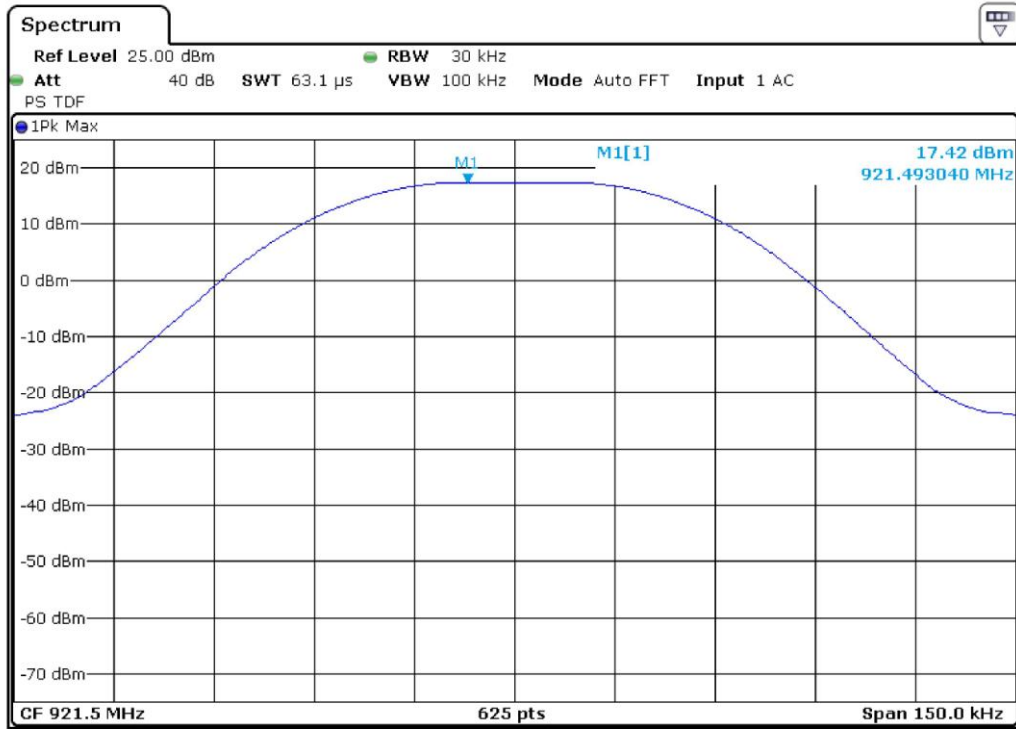
G16058133



Gandini 16058133-FMIN



G16058136



Gandini 16058136-FMID

**Result:** The requirements are met



## 11.10 Spurious Emission

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.209
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*  
 Semi-anechoic chamber

*Auxiliary equipment:*  
 See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S164  
 Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Enclosure  
 Antenna polarization: Horizontal (H) – Vertical (V)  
 EUT – Antenna distance: 3 m  
 Detector AV + Peak

### Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

### Acceptance limits

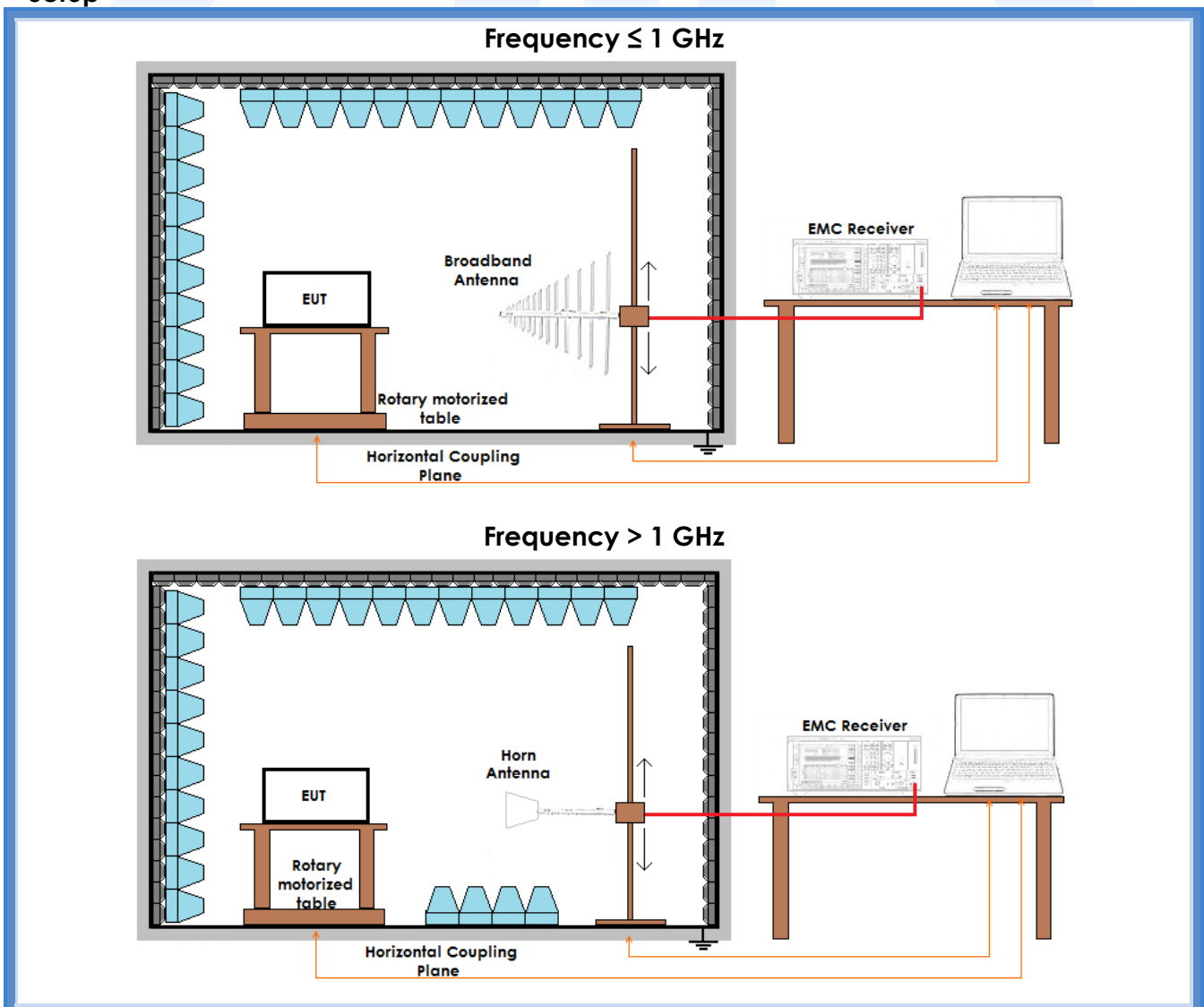
Acceptance limits for emissions in restricted frequency bands		
Frequency (MHz)	AV limits [dB(μV/m)]	Peak limits [dB(μV/m)]
> 1000	54	74

### Acceptance limits for emissions in non-restricted frequency bands

The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

- If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz
- If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.
- In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required

### Setup





### Result – AV detector

Harmoni c	Lowest channel		Medium channel		Highest channel		Results
	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	
II	52,8*	54,00	51,7*	54,00	51,2*	54,00	Complies
III	52,6	54,00	53,0	54,00	53,5	54,00	Complies
IV	52,4	54,00	52,8	54,00	52,4	54,00	Complies
V	53,2	54,00	54,0	54,00	53,5	54,00	Complies
VI	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	Complies
VII	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	Complies
VIII	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	Complies
IX	More than 20 dB below limit*	54,00	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	Complies
X	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	More than 20 dB below limit*	54,00	Complies

**Remarks:** EUT was tested in 3 orthogonal planes. The results in this table show the highest values. The emission values marked with \* have been detected in non-restricted frequency bands. In these bands the limits have been always considered 54 dB $\mu$ V/m as worst case.

<b>Graphs:</b>	G16058137, G16058138 and G16058139
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### Result – Peak detector

Harmoni c	Lowest channel		Medium channel		Highest channel		Results
	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	
II	60,1*	74,00	56,8*	74,00	55,3*	74,00	Complies
III	57,3	74,00	58,1	74,00	50,1	74,00	Complies
IV	57,0	74,00	57,2	74,00	50,2	74,00	Complies
V	58,3	74,00	59,3	74,00	58,5	74,00	Complies
VI	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	Complies
VII	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	Complies
VIII	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
IX	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	More than 20 dB below limit*	74,00	Complies
X	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies

**Remarks:** EUT was tested in 3 orthogonal planes. The results in this table show the highest values. The emission values marked with \* have been detected in non-restricted frequency bands. In these bands the limits have been always considered 74 dB $\mu$ V/m as worst case.

<b>Graphs:</b>	G16058137, G16058138 and G16058139
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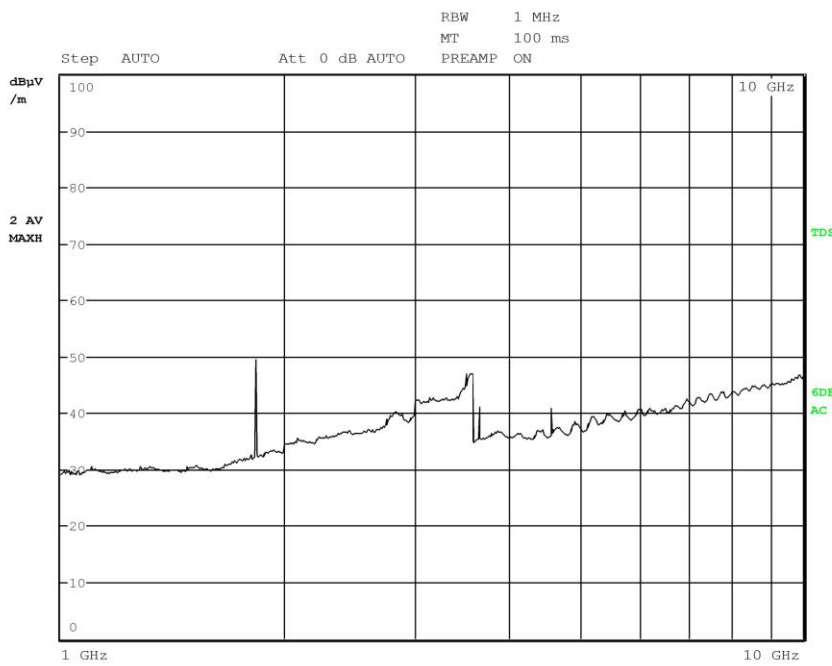




Graphs

G16058137

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx - Fmin  
**Operator** Gandini 16058137  
**Test Spec**



**Final Measurement**

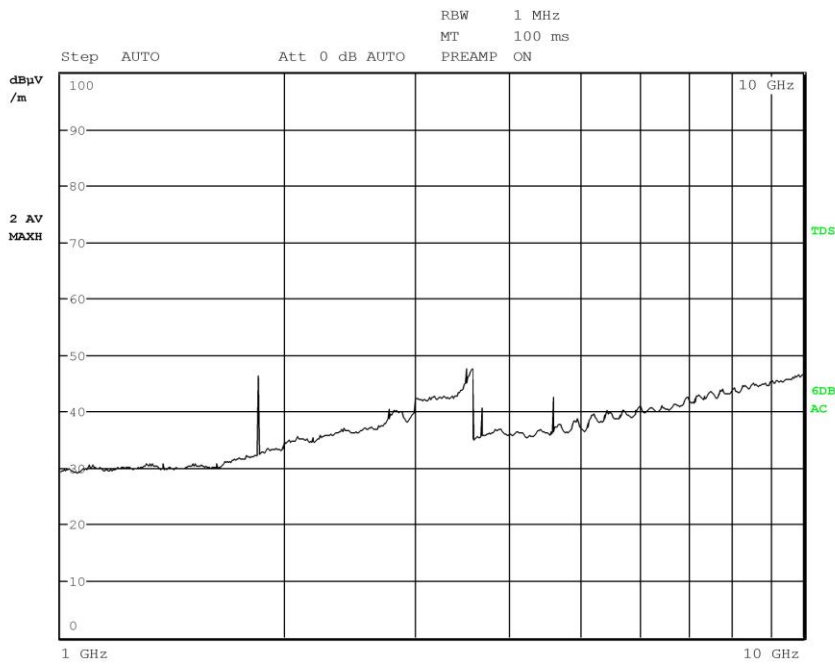
Meas Time: 1 s  
 Margin: 6 dB  
 Peaks: 0

CMC Centro Misure Compatibilità S.r.l.



G16058138

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx - Fmid  
**Operator** Gandini 16058138  
**Test Spec**



**Final Measurement**

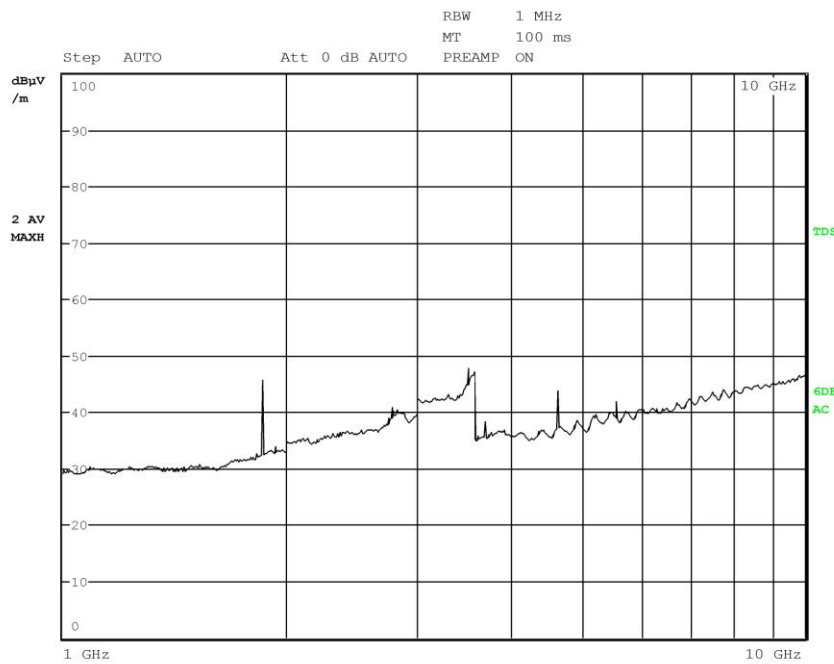
Meas Time: 1 s  
 Margin: 6 dB  
 Peaks: 0

CMC Centro Misure Compatibilità S.r.l.



G16058139

**Meas Type** Emission  
**Equipment under Test**  
**Manufacturer**  
**OP Condition** Tx - Fmax  
**Operator** Gandini 16058139  
**Test Spec**



**Final Measurement**

Meas Time: 1 s  
 Margin: 6 dB  
 Peaks: 0

**Result:** The requirements are met

CMC Centro Misure Compatibilità S.r.l.



## 11.11 Maximum permissible exposure

### Test set-up and execution

- FCC Rules and Regulation;  
Titles 47 Part 1.1310
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration

Test site:  
Laboratory

Auxiliary equipment:  
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S164  
Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Antenna

<b>Acceptance limits</b>	1 mW/cm <sup>2</sup> max at 20 cm of distance
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### Result

Power Density Limit (mW/cm <sup>2</sup> )	Output Power (mW)	Antenna Gain (G)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Remarks
1,00	55,21	--	0,011	Measured

**Remarks:** Power Density =  $(P \times G) / (4\pi R^2)$

**Result:** The requirements are met