



TEST REPORT nr. R13222101
Federal Communication Commission (FCC)

Test item

Description.....: Transceiver unit
Trademark.....: AUTEK
Model/Type: Model: ARX Type NG022

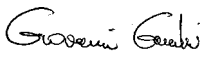

Test Specification

Standard: FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 204, 207, 209 and 247
RSS-210 (2010) – Annex 8

Client's name: AUTEK S.r.l.
Address: Via Pomaroli, 65 – 36030 Caldogno (VI) – ITALY

Manufacturer's name : Same as client
Address: --

Report

Tested by: G. Gandini – Technician 
Approved by: R. Beghetto – Laboratory Manager 
Date of issue: 05.06.14
Contents.....: 84 pages

This test report shall not be reproduced except in full without the written approval of CMC.
The test results presented in this report relate only to the item tested.



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1. Summary

Standard:

FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 204, 207, 209 and 247
RSS-210 (2010) – Annex 8

Test specifications	Environmental Phenomena	Tests sequence	Result
Part 15.203 IC – RSS-210	Antenna requirements	1	Complies
Part 15.207 IC – RSS-210 – Annex 8	Conducted emissions	2	Complies
Part 15.209 IC – RSS-210 – Annex 8	Radiated emissions	3	Complies
IC – RSS-210 – Annex 8	Occupied bandwidth (99% BW)	4	Complies
Part 15.209 and 15.247 IC – RSS-210 – Annex 8	Peak Output Power	5	Complies
Part 15.247 IC – RSS-210 – Annex 8	Band edge	6	Complies
Part 15.209 IC – RSS-210 – Annex 8	Spurious emission	7	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 and IC certification



5. Photograph(s) of EUT

5.1 Photograph(s) of EUT





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 '14	January '15
CMC S108	EMCO	3115	Horn Antenna	9811-5622	May '13	May '16
CMC S127	Schaffner	HLA6120	Loop Antenna	1191	January '13	January '16
CMC S136	Schwarzbeck	VULB 9163	Broadband Antenna	9136-205	May '13	May '16
CMC S164	Rohde & Schwarz	ESU26	EMC interference receiver	100052	January '14	January '15
CMC S200	Schwarzbeck	NSLK 8128	V-LISN	8128-273	January '14	January '15
CMC S227	Rohde & Schwarz	ESR7	EMI Test Receiver 7GHz	101121	January '14	January '15



7. Measurement uncertainty

Test	Expanded Uncertainty	note
Conducted Emission		
(50Ω/50μH AMN) - (9 kHz – 150 kHz)	±3.8 dB	1
(50Ω/50μH AMN) - (150 kHz – 30 MHz)	±3.3 dB	1
(Voltage probe) - (150 kHz – 30 MHz)	±3.3 dB	1
(50Ω/5μH AMN) - (150 kHz – 108 MHz)	±2.8 dB	1
DiscontinuousConducted Emission		
Conducted Emission (50Ω/50μH AMN) - (150 kHz – 30 MHz)	±3.3 dB	1
Disturbance Power (30 MHz – 300 MHz)		
	±3.9 dB	1
Radiated Emission		
(0,150 MHz – 30 MHz)	±4.3 dB	1
(30 MHz – 1000 MHz)	±4.4 dB	1
(1 GHz – 6 GHz)	±4.6 dB	1
Electromagnetic field EMF		
	±15.0 %	1
Harmonic current emissions test		
	±2.7 %	1
Voltage fluctuation and flicker test		
	±2.9 %	1
Insertion loss test		
	±2.7 dB	1
Radiated electromagnetic disturbance test (loop antenna)		
	±2.7 dB	1
Radiated electromagnetic field immunity test		
	0.77 V/m at 3V/m	1
Pulse modulated radiated electromagnetic field immunity test		
	0.77 V/m at 3V/m	1
Injected currents immunity test		
	0.48 V at 3V	1
Bulk current		
	5.3 mA at 60 mA	1
Power frequency magnetic field immunity test		
	0.1 A/m at 10 A/m	1
Effective radiated power (F < 1GHz)		
	±4.4 dB	1
Effective radiated power (F > 1GHz)		
	±3.9 dB	1
Frequency error		
	< 1x10 ⁻⁷	1
Modulation bandwidth		
	< 1x10 ⁻⁷	1
Adjacent channel power		
	±2.6 dB	1
Blocking		
	±2.6 dB	1
Electrostatic discharge immunity test		
		2
Electrical fast transients / burst immunity test		
		2
Surge immunity test		
		2
Pulse magnetic field immunity test		
		2
Damped oscillatory magnetic field immunity test		
		2
Short interruption immunity test		
		2
Voltage transient emission test		
	±2.2 %	1
Transient immunity test		
		2

Notes

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 15:2013 RSS-210 Issue 8 – December 2010	--
ANSI C63.4: 2003	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
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 is Complies.</p> <p>The measurement results is within the specification limit when the measurement uncertainty is taken into account.</p>	<p>The sample is Complies.</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 is Not Complies.</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 is Not Complies.</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.



11.1 Antenna requirements

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.203 and 15.204
- 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 (%)
21	98	48

Result

Antenna Type	External R.F. power amplifier	Gain	Remarks	Results
Dedicated	Not Present	2 dBi	--	Complies

Result: The requirements are met



11.2 Conducted emissions

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.207
- RSS-210 – Annex 8
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Shielded chamber (CMC A001)

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

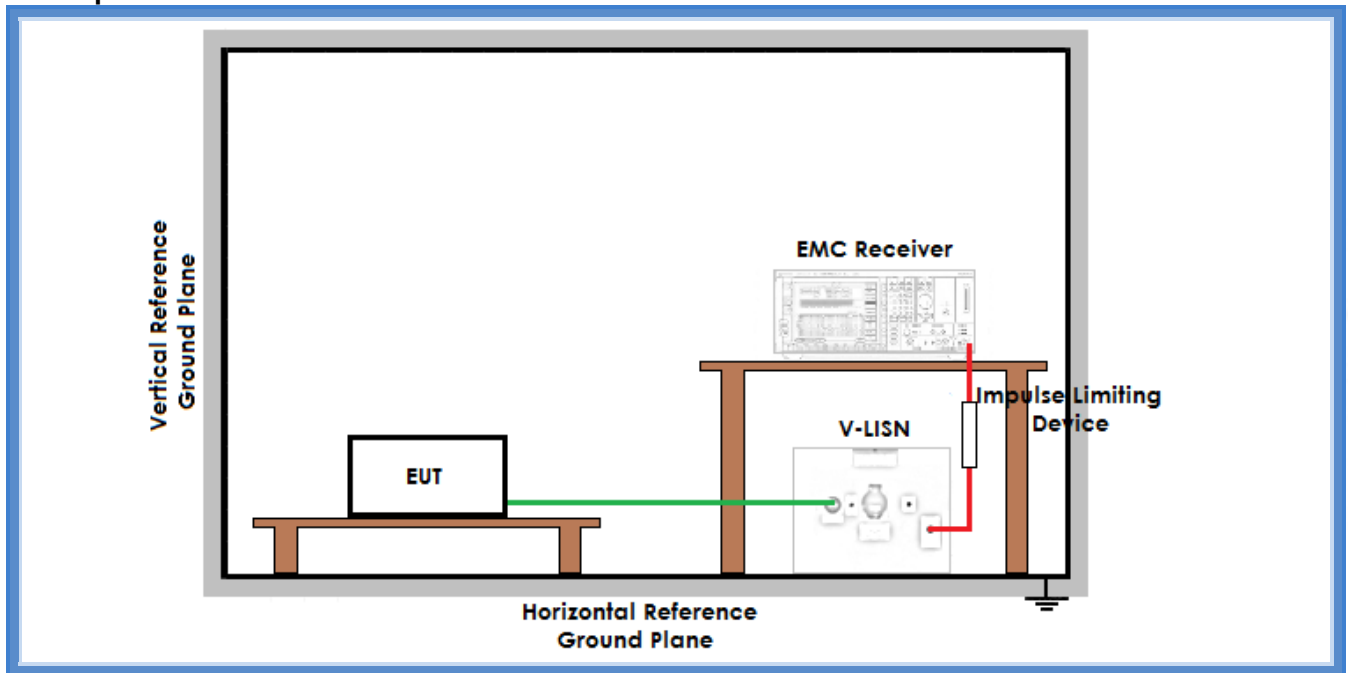
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	98	49

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
Line -	G13222124	--	Complies
Line +	G13222123	--	Complies
Remarks: --			

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



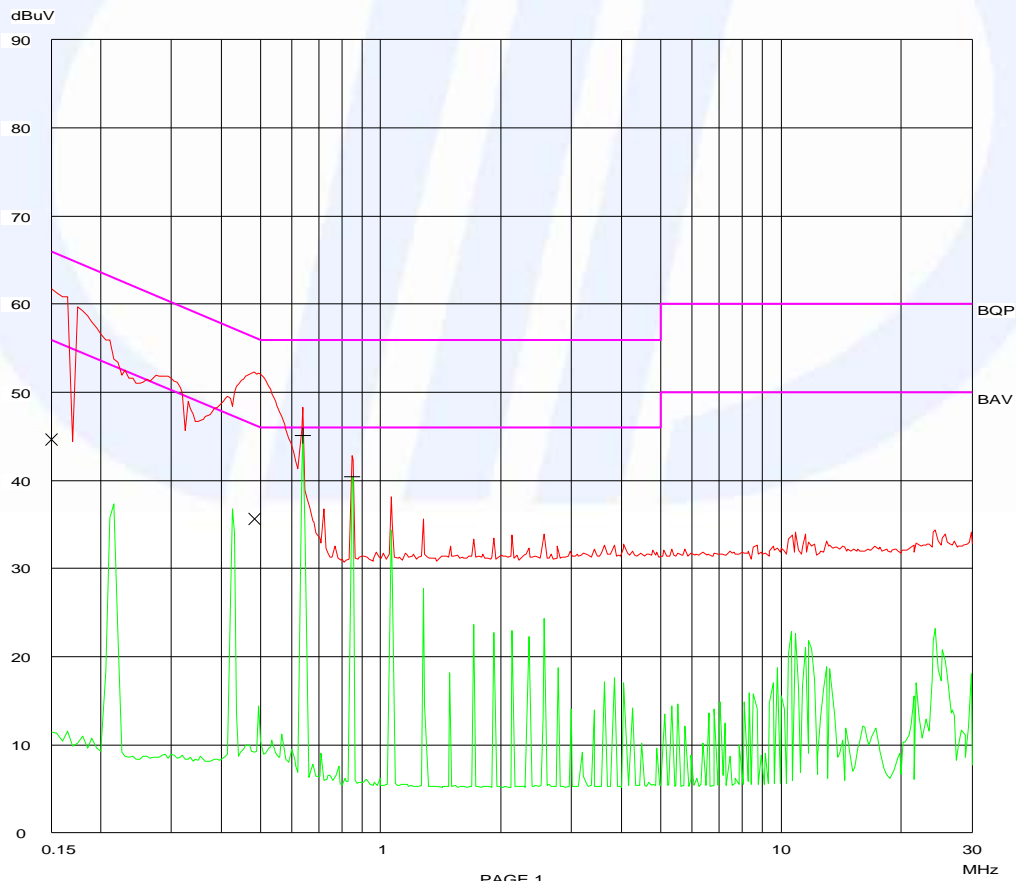
Graphs

G13222123

CMC Centro misure compatibilita srl

Emission 0.15-30MHz

Op Cond: Tx-Rx ANT 5m
Operator: Gandini 13222123
Test Spec: Line +



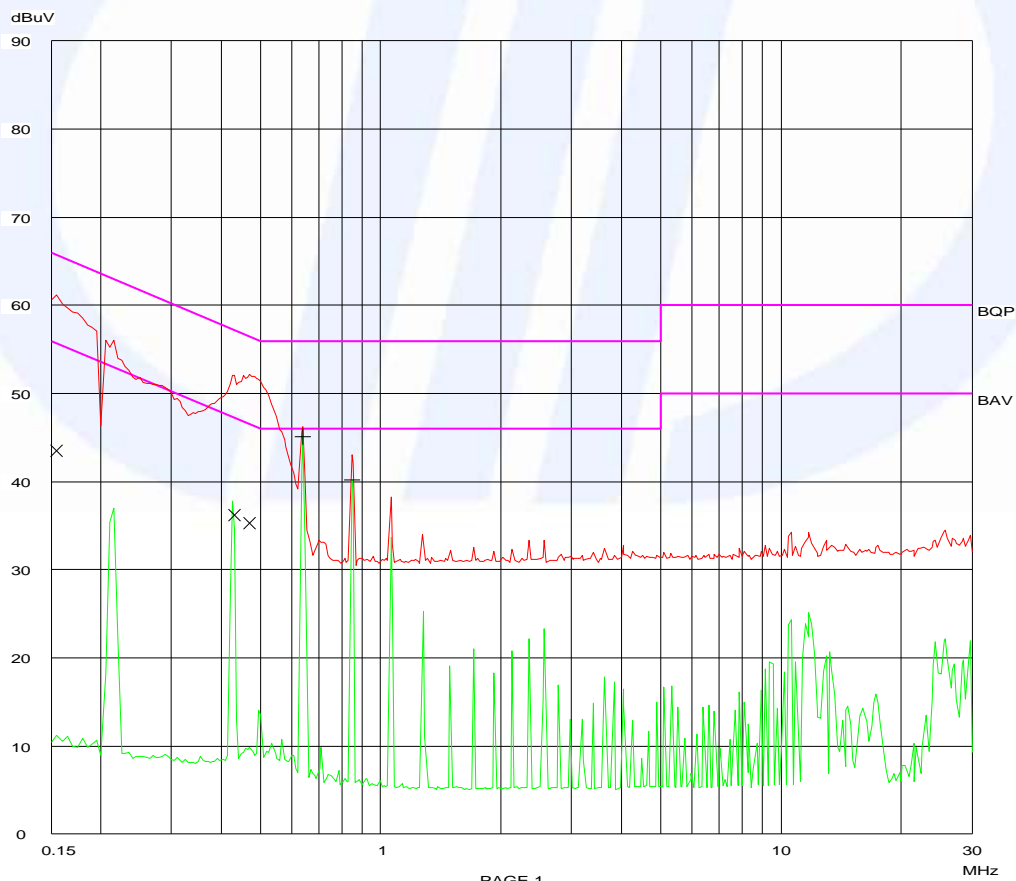


G13222124

CMC Centro misure compatibilita srl

Emission 0.15-30MHz

Op Cond: Tx-Rx ANT 5m
Operator: Gandini 13222124
Test Spec: Line -



Result: The requirements are met



11.3 Radiated emissions

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.209
- RSS-210 – Annex 8
- 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 (%)
21	99	50

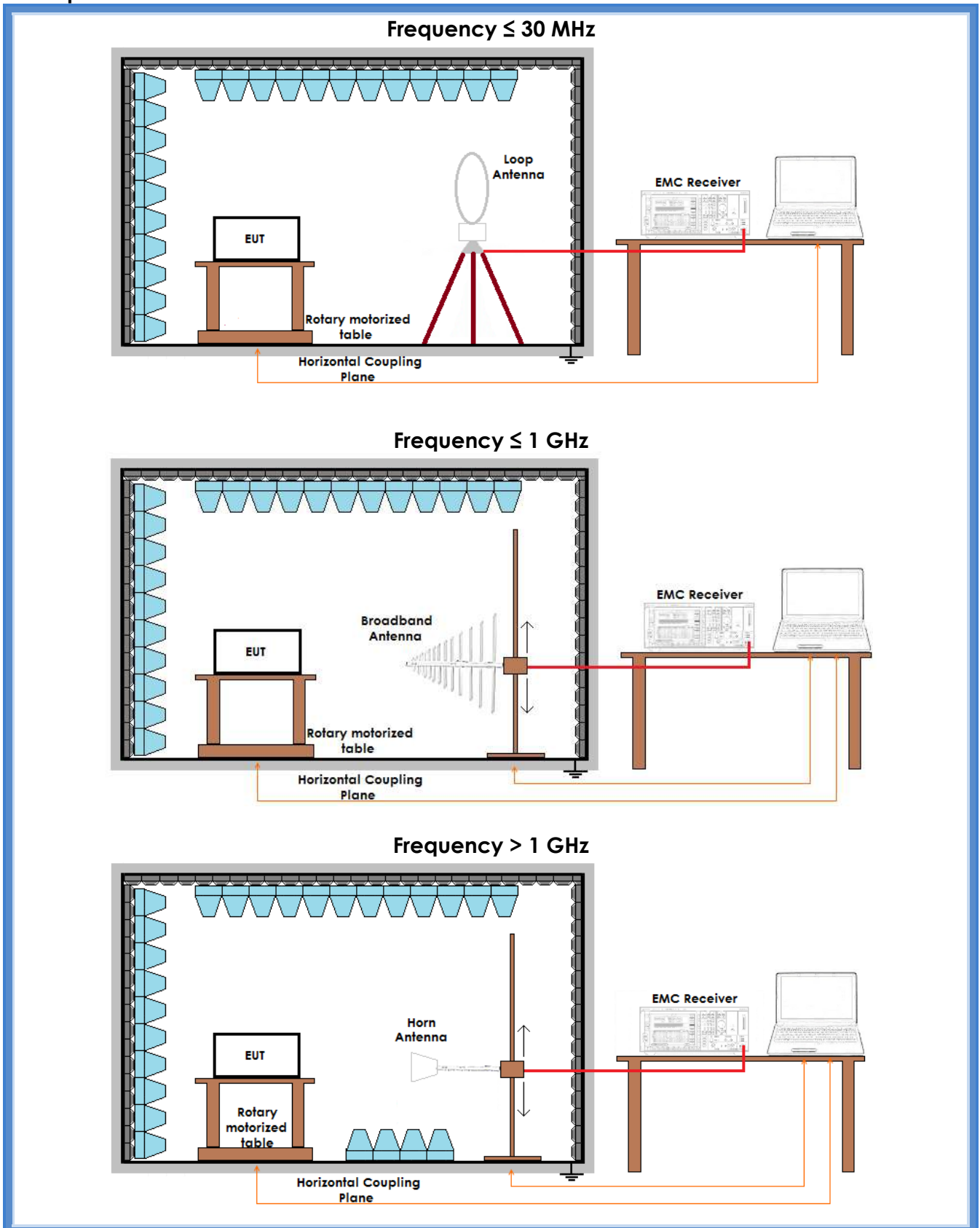
Acceptance limits

Frequency range (MHz)	Limits [dB(μV/m)]
0,009 to 0,490	128,51 to 93,80
0,490 to 1,705	73,80 to 62,97
1,705 to 30	69,54
30 to 88	40
88 to 216	43,52
216 to 960	46,02
Above 960	53,98

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

Channel	Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
--	Loop	0,009 – 30	G13222101	Plug antenna	Complies
915,050	H	30 – 1000	G13222113	Plug antenna	Complies
915,050	V	30 – 1000	G13222114	Plug antenna	Complies
921,000	H	30 – 1000	G13222112	Plug antenna	Complies
921,000	V	30 – 1000	G13222111	Plug antenna	Complies
927,950	H	30 – 1000	G13222109	Plug antenna	Complies
927,950	V	30 – 1000	G13222110	Plug antenna	Complies
915,050	H	1000 – 10000	G13222144	Plug antenna	Complies
915,050	V	1000 – 10000	G13222143	Plug antenna	Complies
921,000	H	1000 – 10000	G13222145	Plug antenna	Complies
921,000	V	1000 – 10000	G13222146	Plug antenna	Complies
927,950	H	1000 – 10000	G13222148	Plug antenna	Complies
927,950	V	1000 – 10000	G13222147	Plug antenna	Complies

Remarks: --



Channel	Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
--	Loop	0,009 – 30	G13222102	Antenna with 5m cable	Complies
915,050	H	30 – 1000	G13222104	Antenna with 5m cable	Complies
915,050	V	30 – 1000	G13222103	Antenna with 5m cable	Complies
921,000	H	30 – 1000	G13222105	Antenna with 5m cable	Complies
921,000	V	30 – 1000	G13222106	Antenna with 5m cable	Complies
927,950	H	30 – 1000	G13222108	Antenna with 5m cable	Complies
927,950	V	30 – 1000	G13222107	Antenna with 5m cable	Complies
915,050	H	1000 – 10000	G13222153	Antenna with 5m cable	Complies
915,050	V	1000 – 10000	G13222154	Antenna with 5m cable	Complies
921,000	H	1000 – 10000	G13222152	Antenna with 5m cable	Complies
921,000	V	1000 – 10000	G13222151	Antenna with 5m cable	Complies
927,950	H	1000 – 10000	G13222149	Antenna with 5m cable	Complies
927,950	V	1000 – 10000	G13222150	Antenna with 5m cable	Complies
Remarks: --					

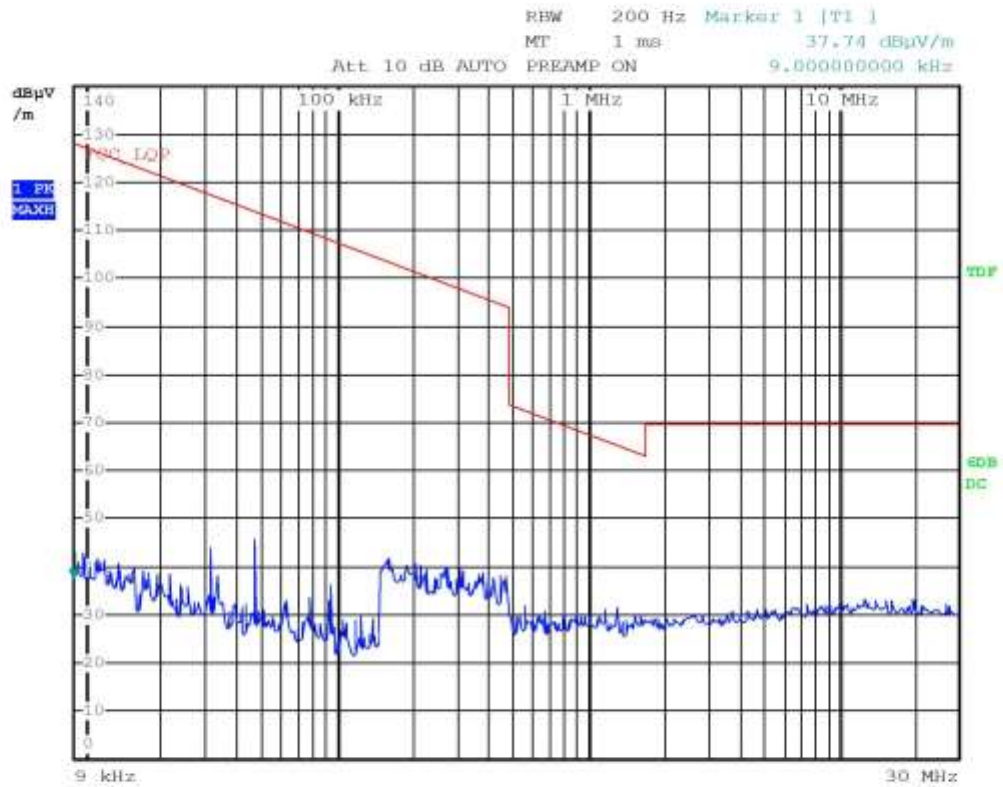
Graphs Legend

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

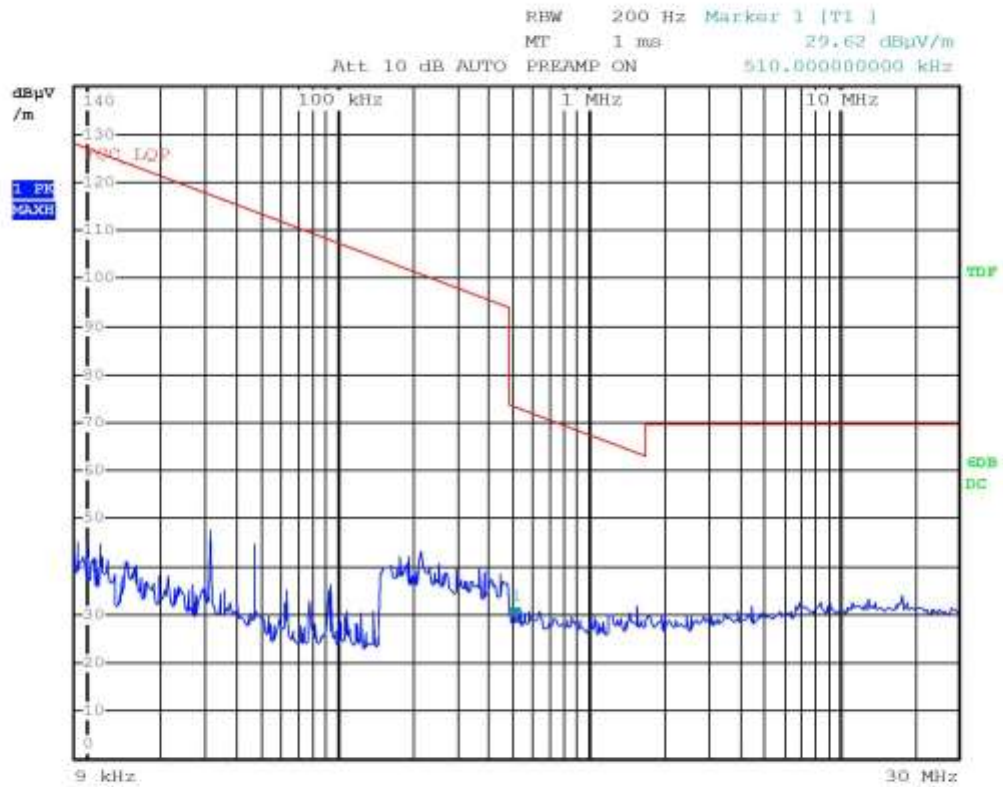
G13222101



Gandini 13222101-Loop-Tx-Rx-ANT DEDICATED



G13222102

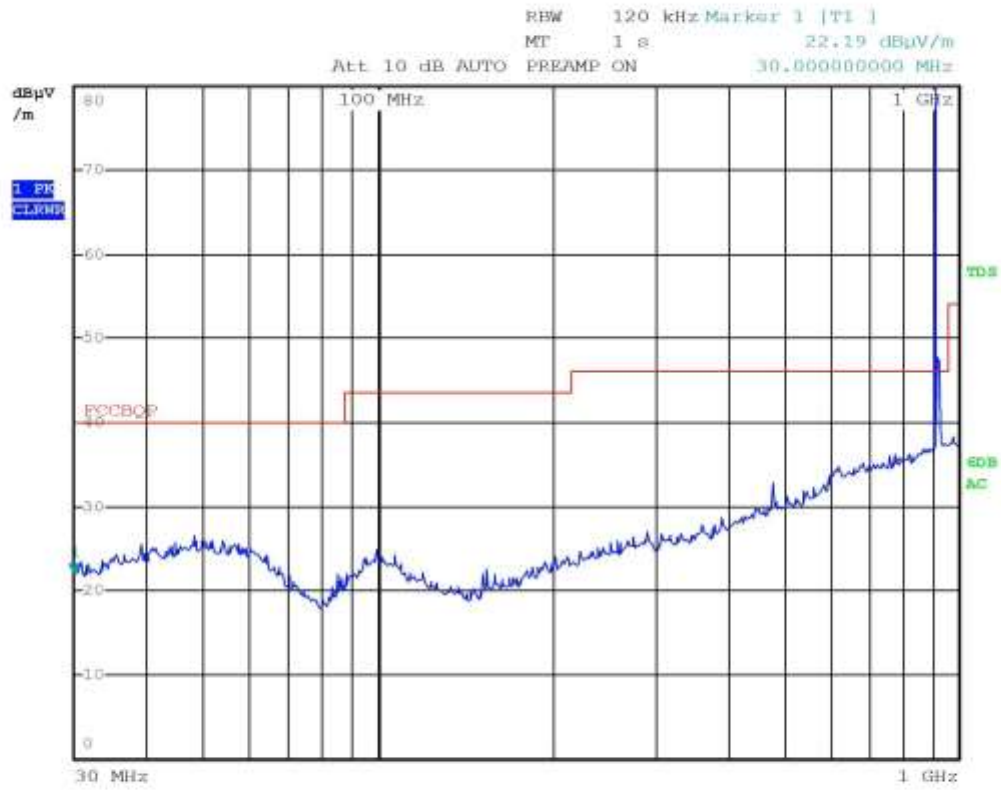


Gandini 13222102-Loop-Tx-Rx-ANT 5m

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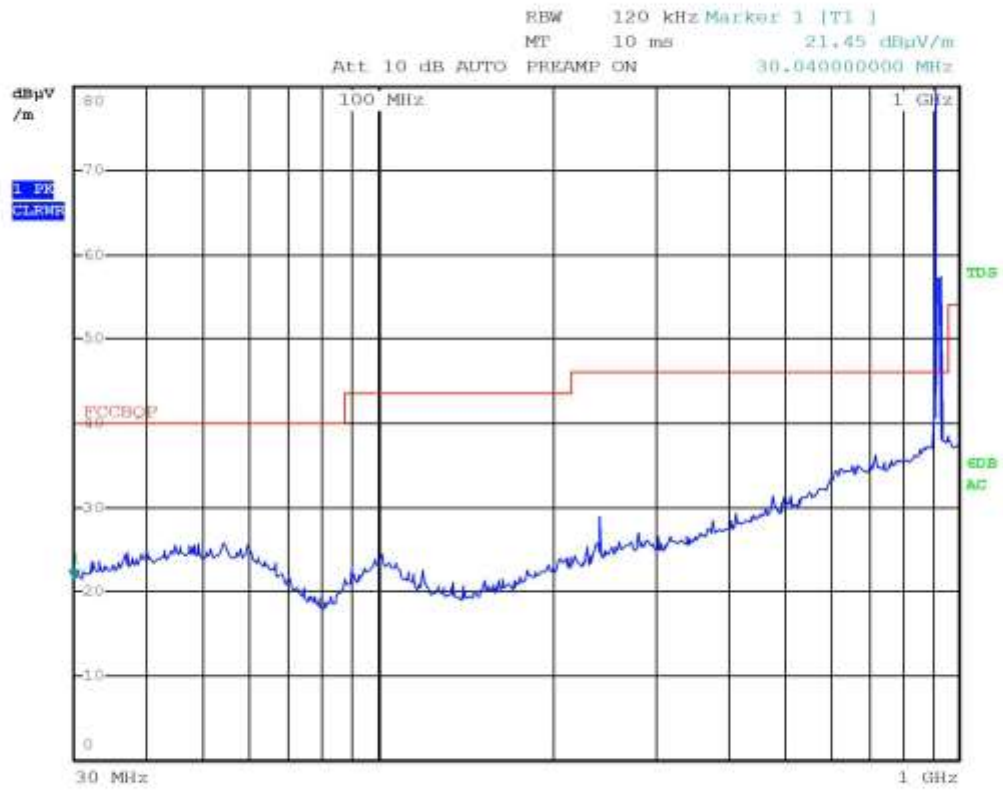
G13222103



Gandini 13222103-Vert-Tx-Rx F MIN-ANT 5m.



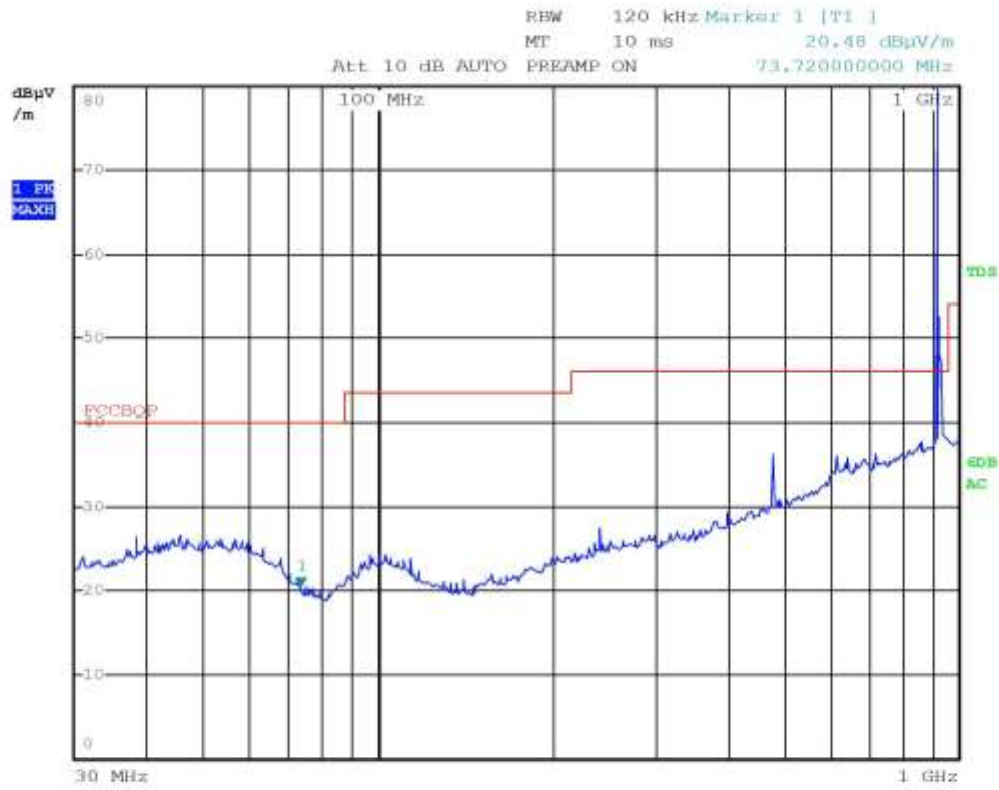
G13222104



Gandini 13222104-Horiz-Tx-Rx F MIN-ANT 5m



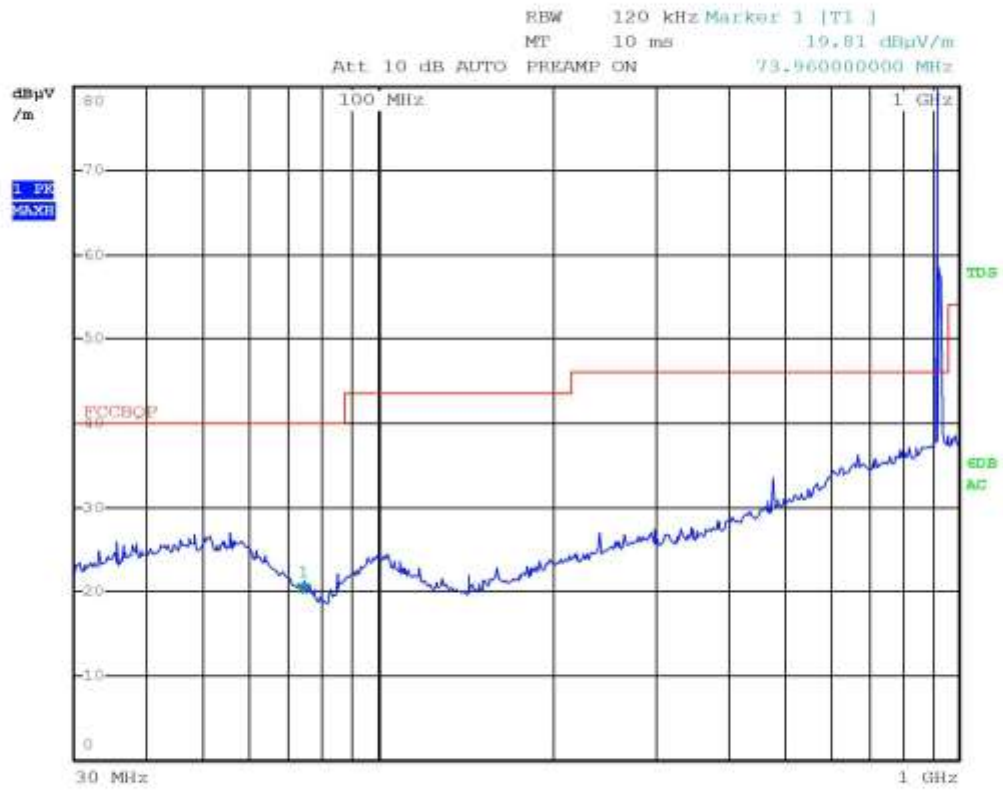
G13222105



Gandini 13222105-Horiz-Tx-Rx F MED-ANT 5m



G13222106

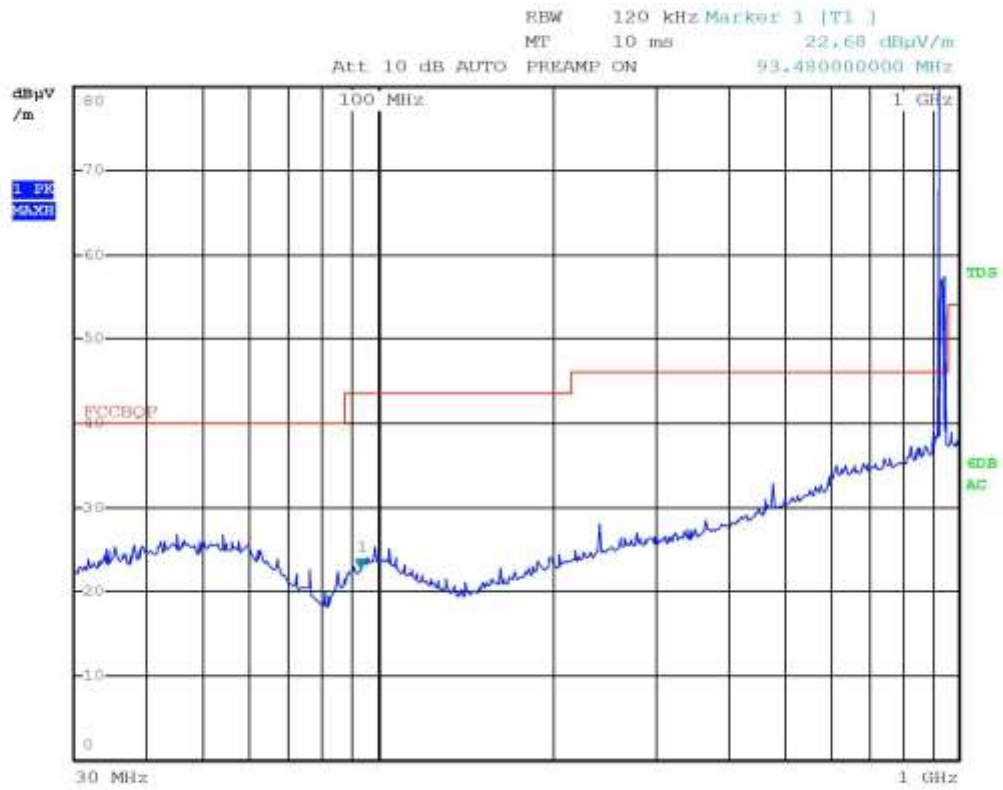


Gandini 13222106-Vert-Tx-Rx F MED-ANT 5m

CMC Centro Misure Compatibilità S.r.l.



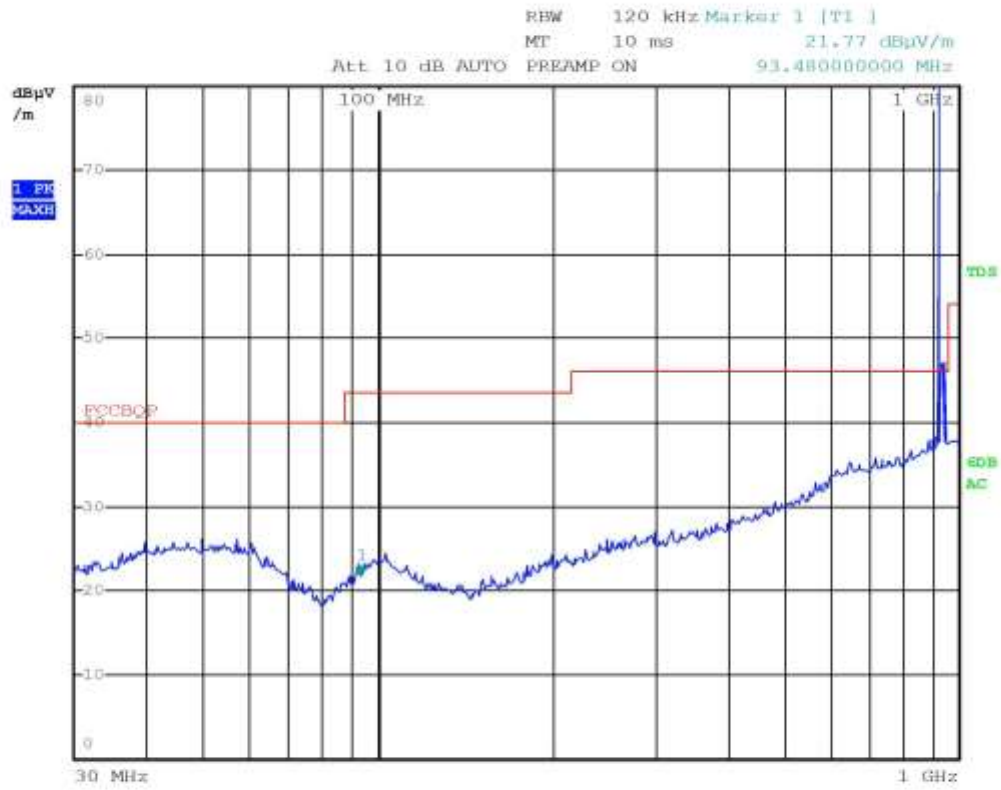
G13222107



Gandini 13222107-Vert-Tx-Rx F MAX-ANT 5m



G13222108

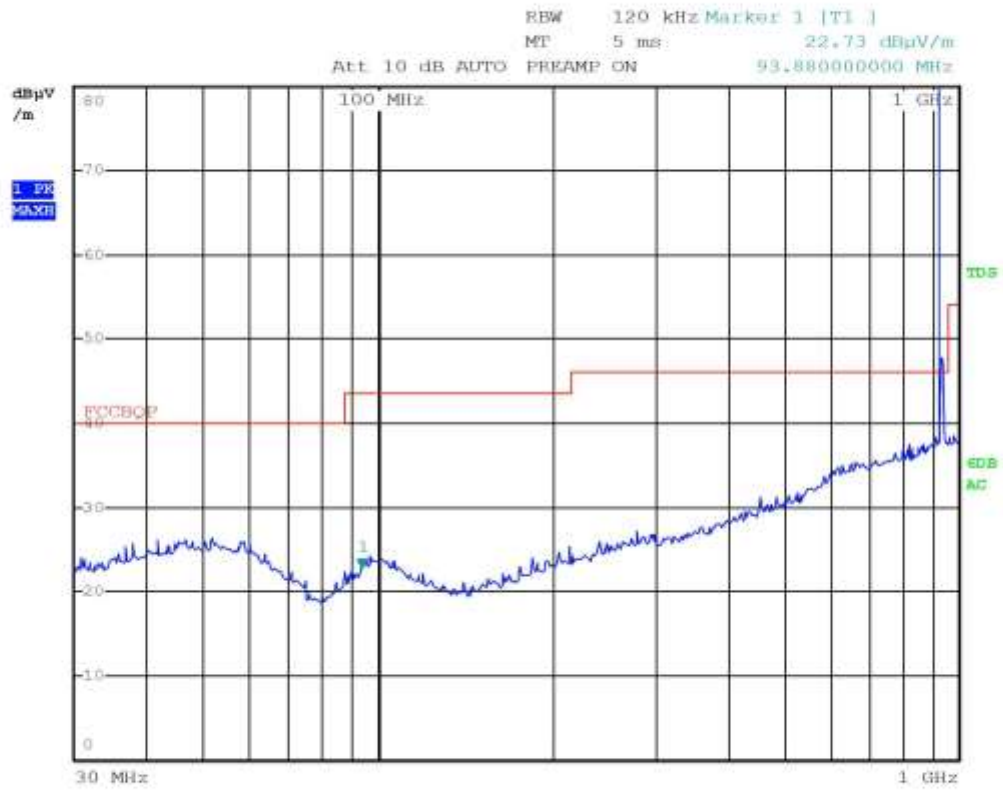


Gandini 13222108-Horiz-Tx-Rx F MAX-ANT 5m

CMC Centro Misure Compatibilità S.r.l.



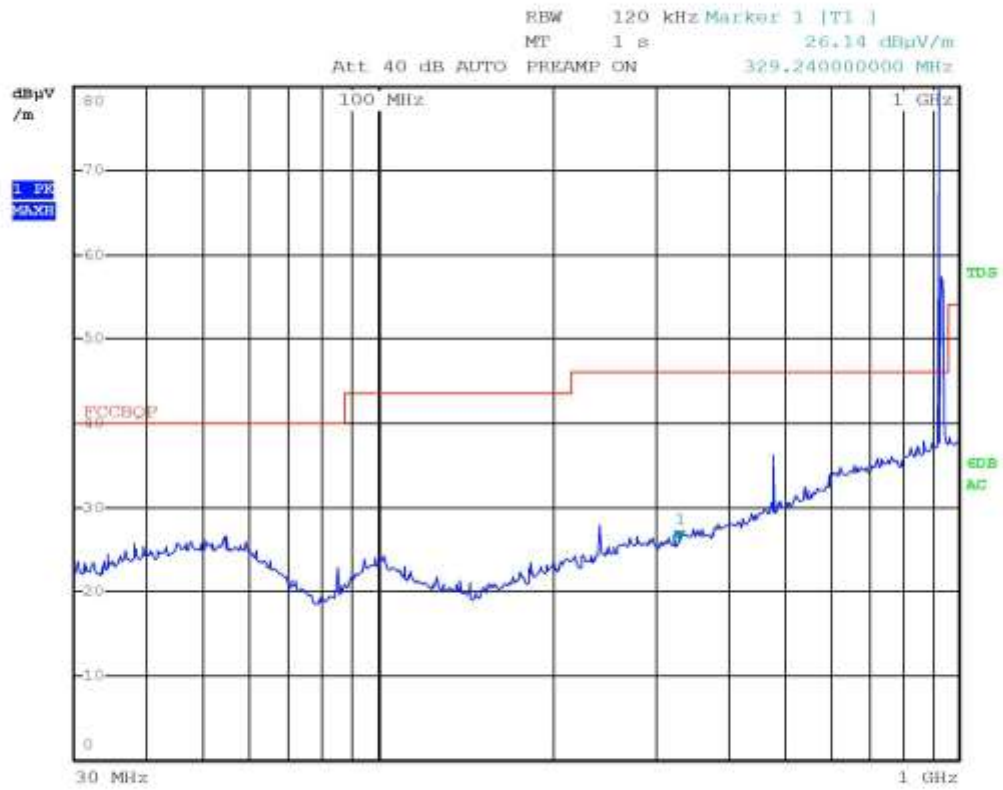
G13222109



Gandini 13222109-Horiz-Tx-Rx F MAX-ANT DEDICATED



G13222110

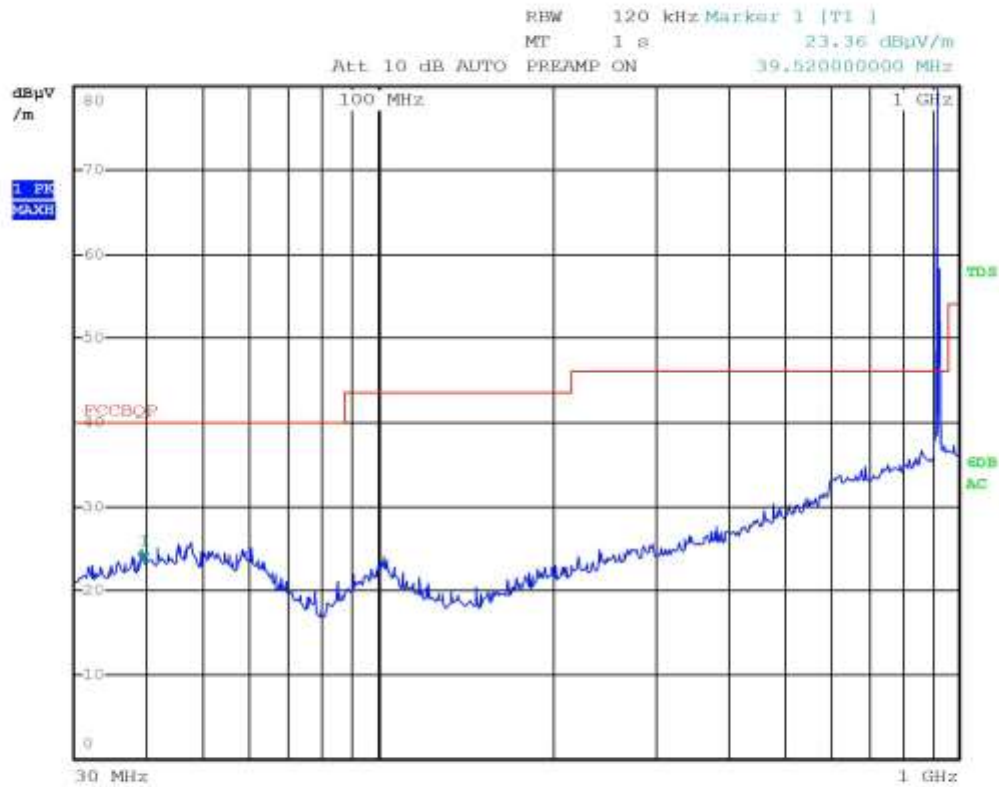


Gandini 13222110-Vert-Tx-Rx F MAX-ANT DEDICATED

CMC Centro Misure Compatibilità S.r.l.



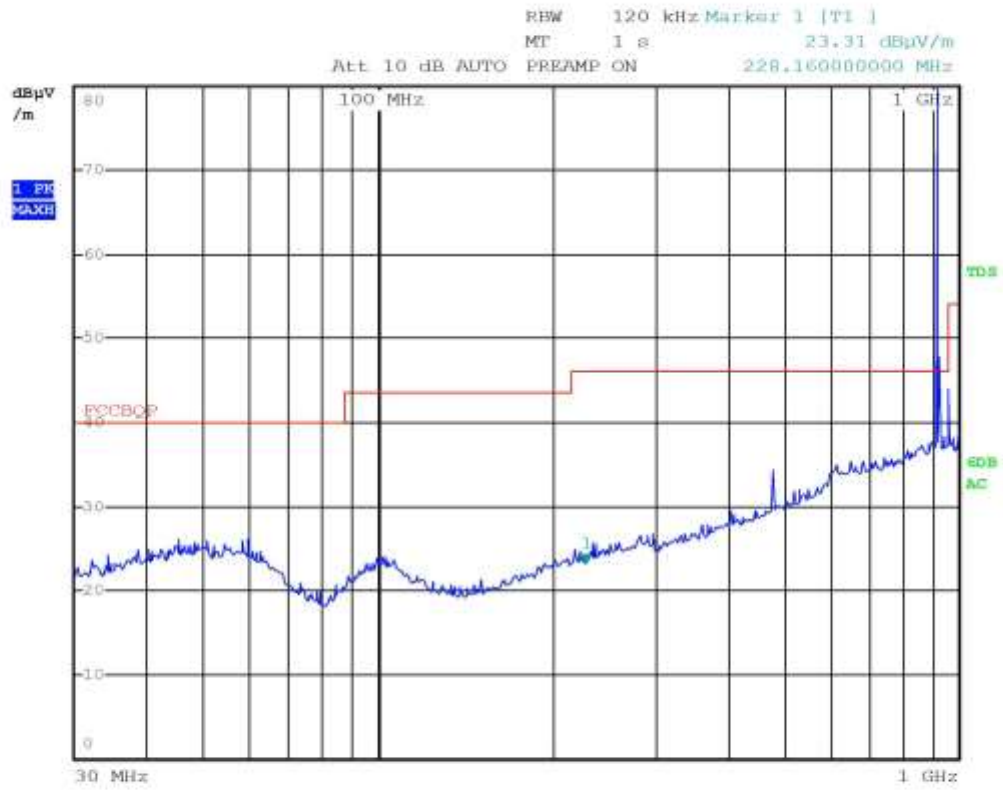
G13222111



Gandini 13222111-Vert-Tx-Rx F MED-ANT DEDICATED



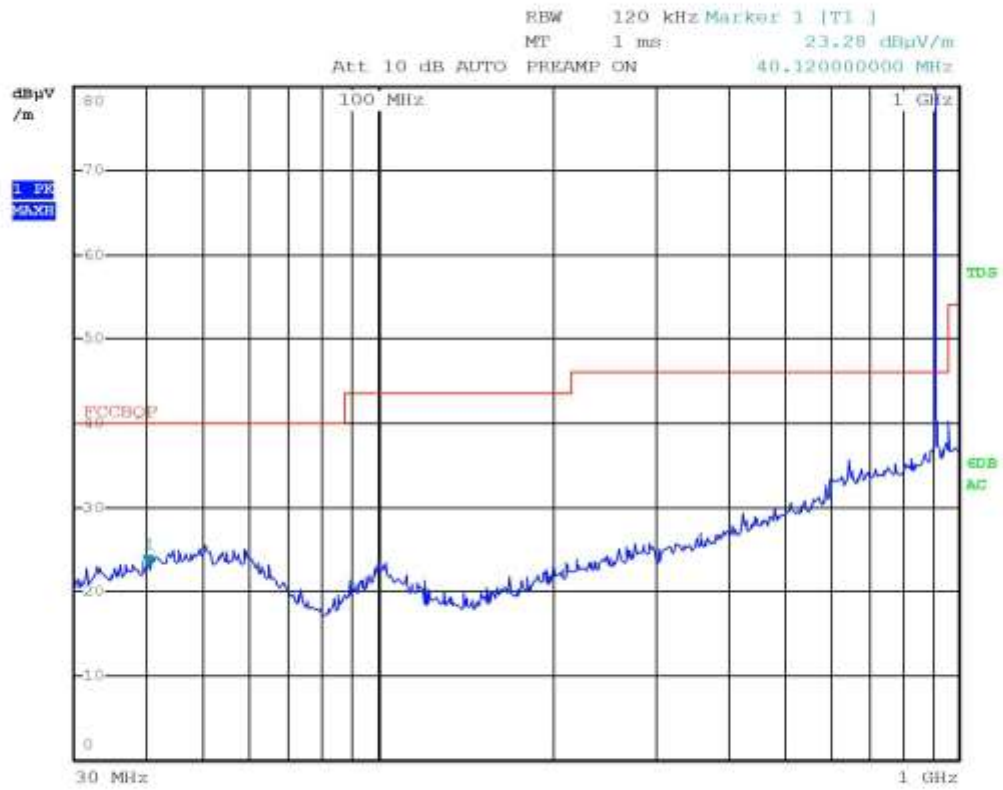
G13222112



Gandini 13222112-Horiz-Tx-Rx F MED-ANT DEDICATED



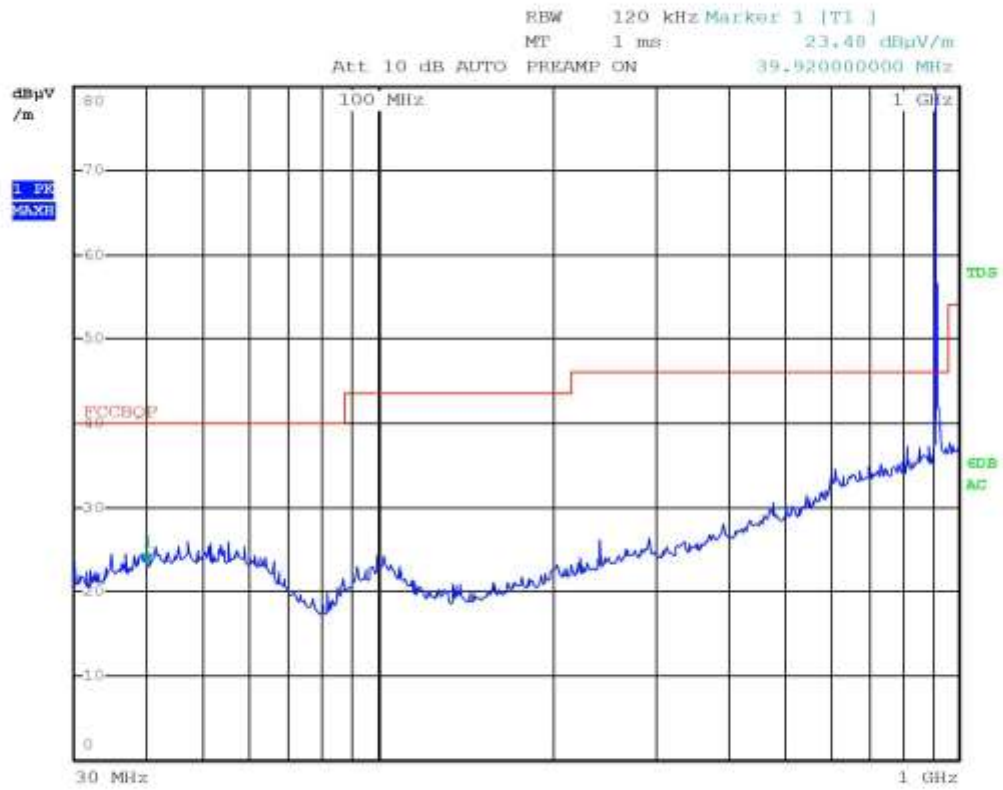
G13222113



Gandini 13222113-Horiz-Tx-Rx F MIN-ANT DEDICATED



G13222114

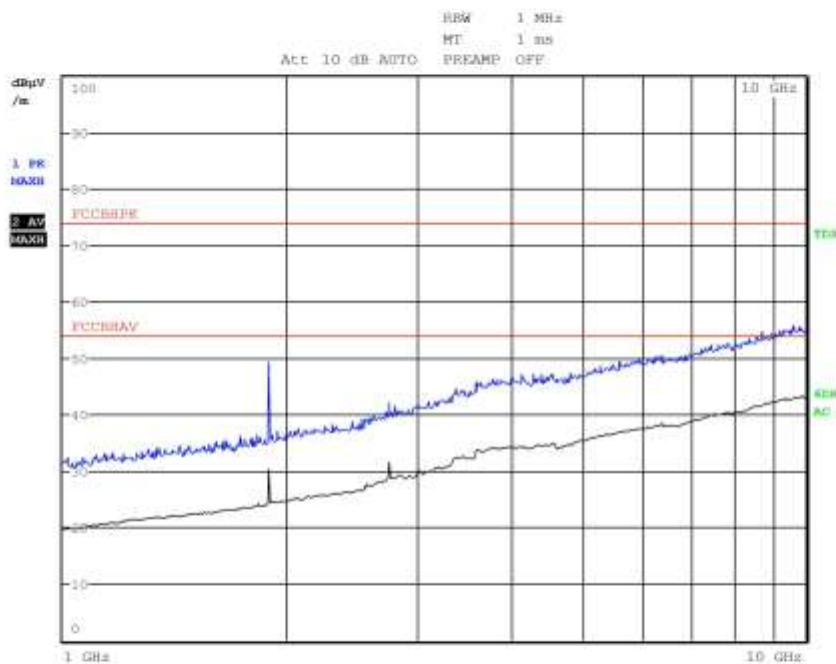


Gandini 13222114-Vert-Tx-Rx F MIN-ANT DEDICATED



G13222143

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MIN - ANT DEDICATED
Operator Gandini 13222143
Test Spec
Vert



Final Measurement

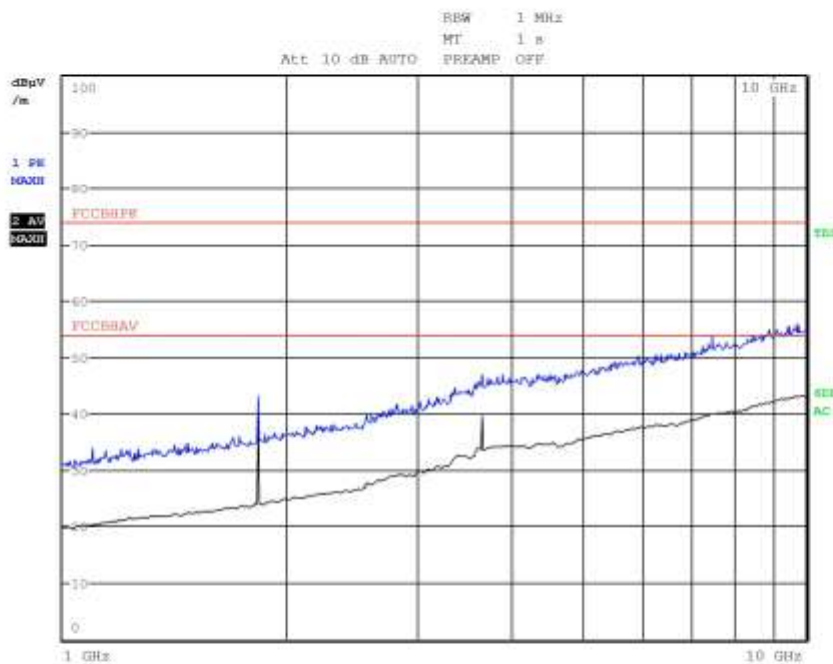
Meas Time: 1 s
Margin: 6 dB
Subranges: 0

CMC Centro Misure Compatibilità S.r.l.



G13222144

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MIN - ANT DEDICATED
Operator Gandini 13222144
Test Spec
Horiz



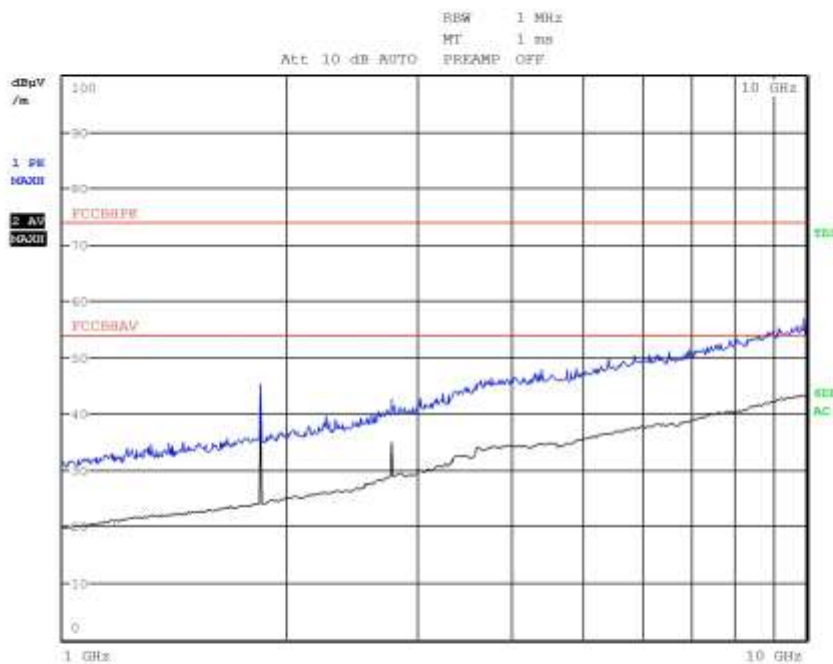
Final Measurement

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



G13222145

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MED - ANT DEDICATED
Operator Gandini 13222145
Test Spec
Horiz



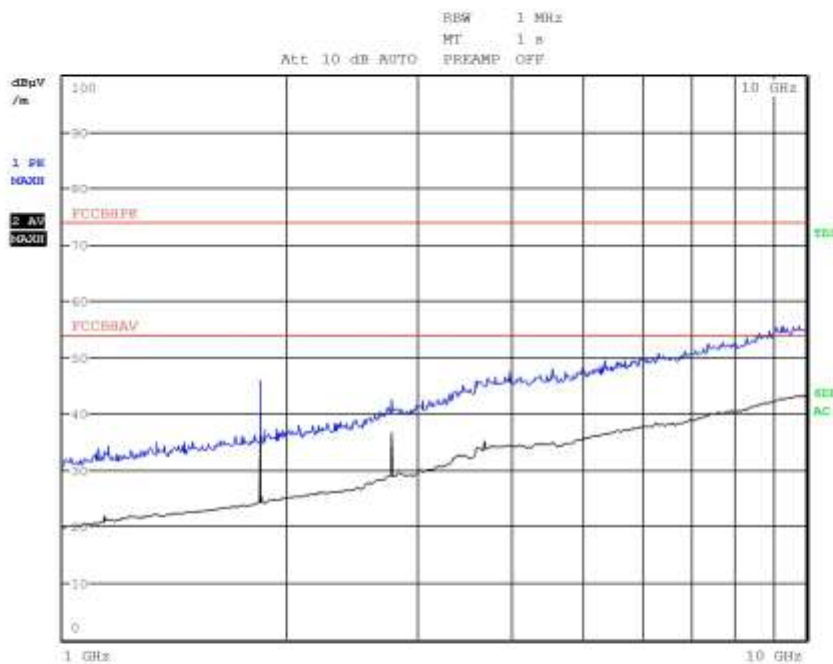
Final Measurement

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



G13222146

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MED - ANT DEDICATED
Operator Gandini 13222146
Test Spec
Vert



Final Measurement

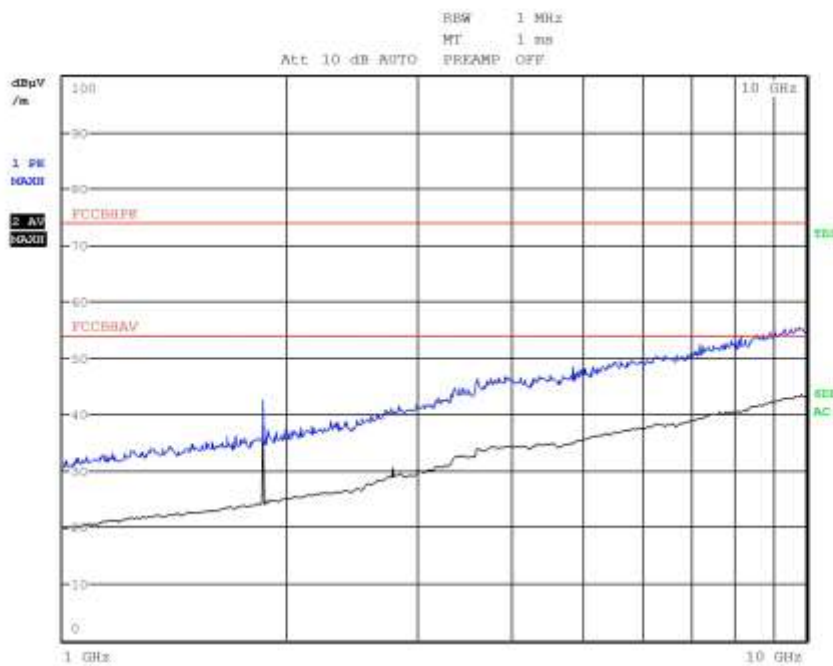
Meas Time: 1 s
Margin: 6 dB
Subranges: 0

CMC Centro Misure Compatibilità S.r.l.



G13222147

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MAX - ANT DEDICATED
Operator Gandini 13222147
Test Spec
Vert



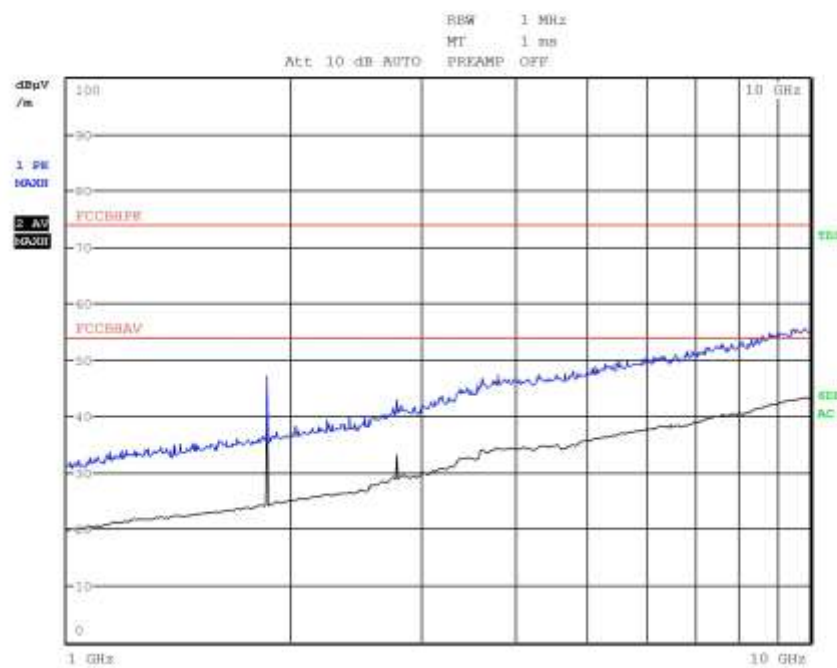
Final Measurement

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



G13222148

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MAX - ANT DEDICATED
Operator Gandini 13222148
Test Spec
Horiz



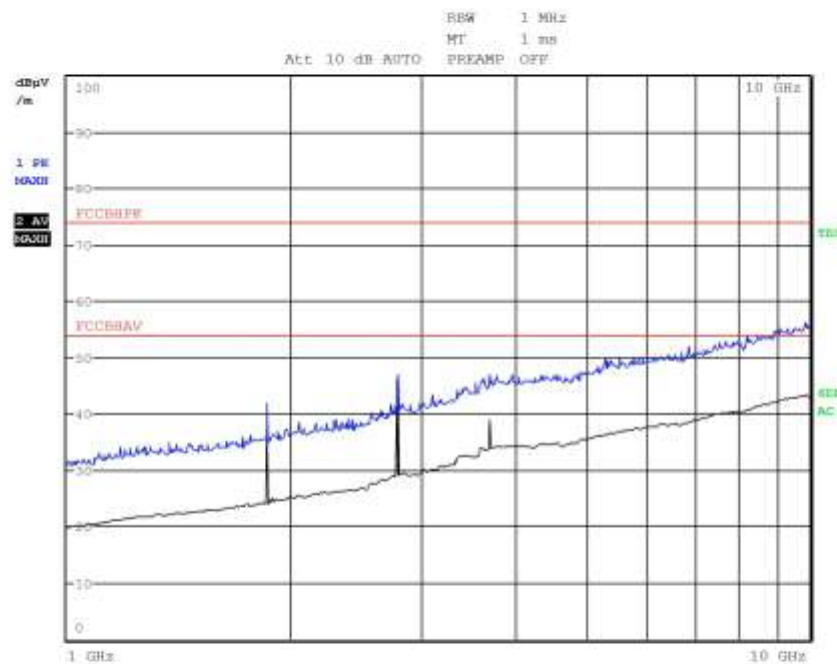
Final Measurement

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



G13222149

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MAX - ANT 5m
Operator Gandini 13222149
Test Spec
Horiz



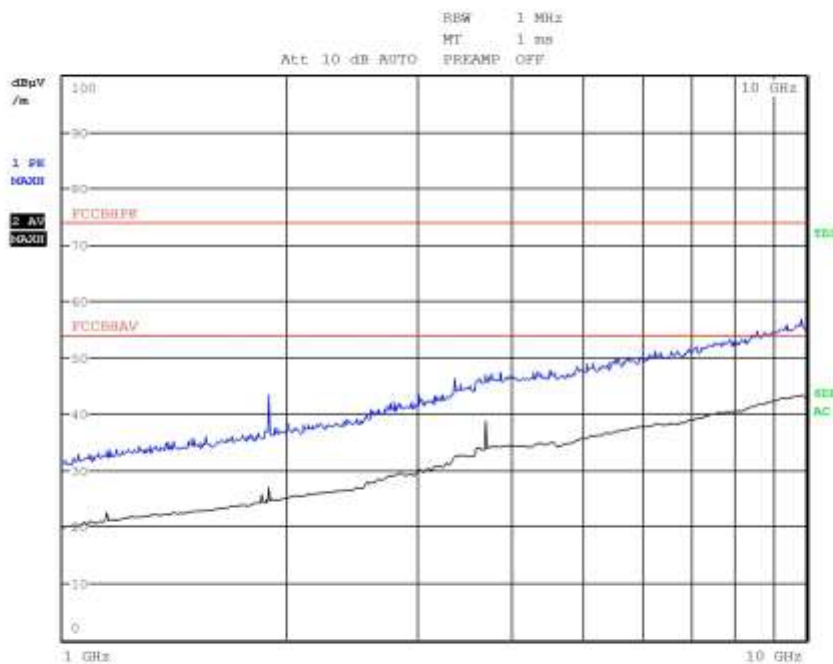
Final Measurement

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



G13222150

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MAX - ANT 5m
Operator Gandini 13222150
Test Spec
Vert



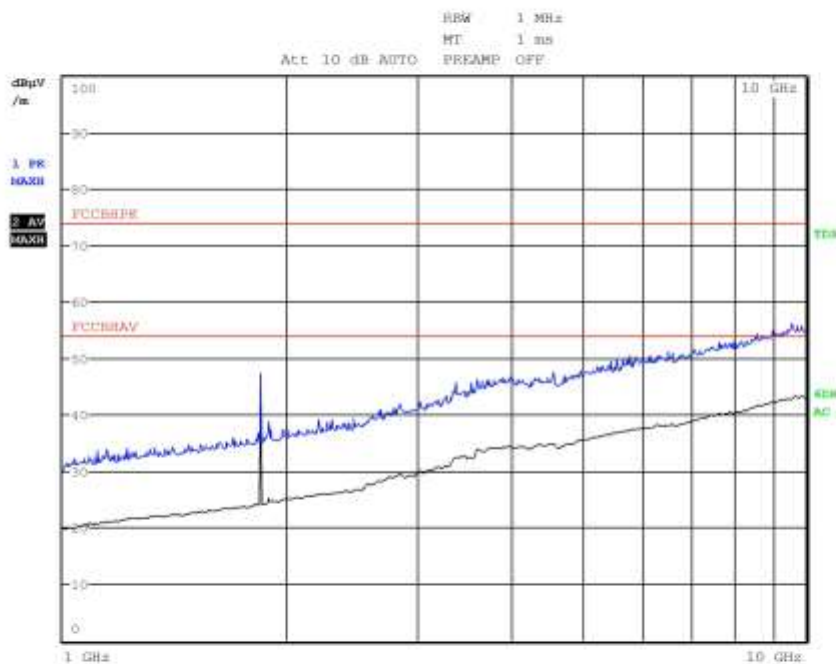
Final Measurement

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



G13222151

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MED - ANT 5m
Operator Gandini 13222151
Test Spec
Vert



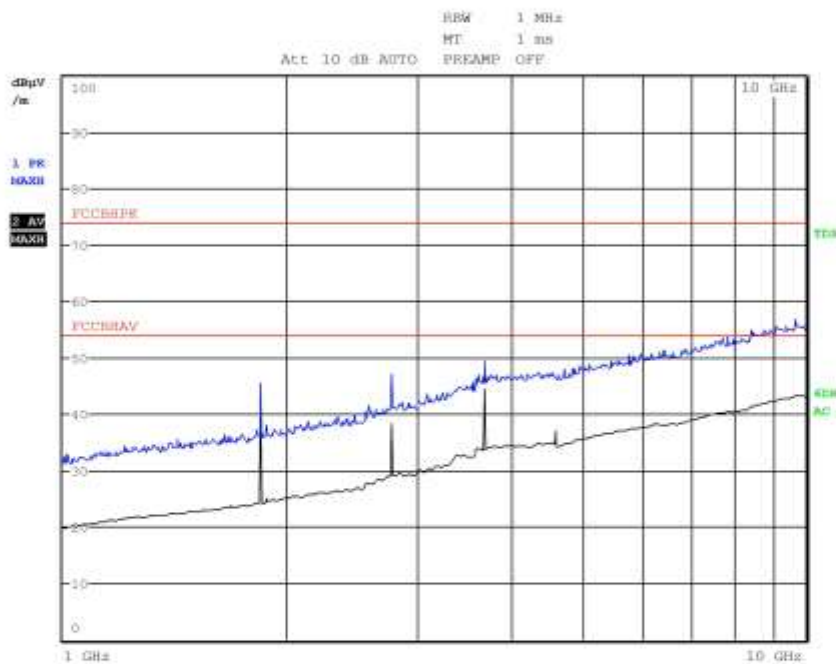
Final Measurement

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



G13222152

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MED - ANT 5m
Operator Gandini 13222152
Test Spec
Horiz



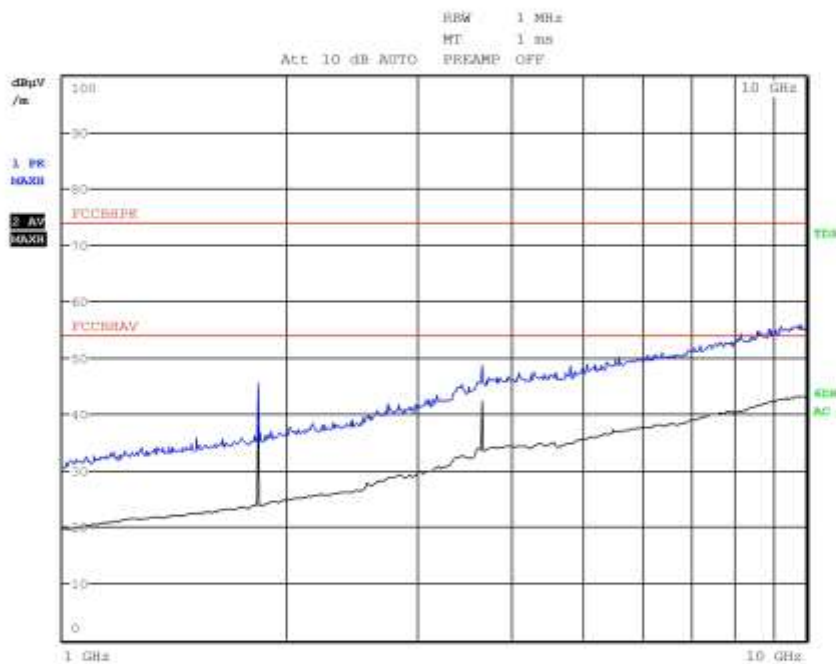
Final Measurement

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



G13222153

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MIN - ANT 5m
Operator Gandini 13222153
Test Spec
Horiz



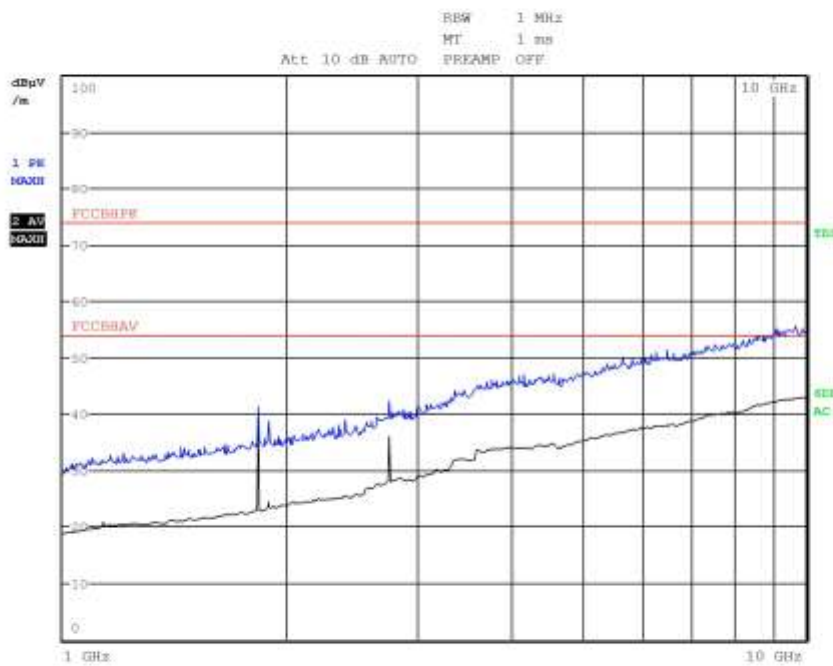
Final Measurement

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



G13222154

Meas Type Emission 1000-10000MHz
Equipment under Test
Manufacturer
OP Condition Tx-Rx - F MIN - ANT 5m
Operator Gandini 13222154
Test Spec
Vert



Final Measurement

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

Result: The requirements are met



11.4 20 dB bandwidth

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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 S164
Measurement uncertainty: See clause 7 of this test report

Test specification

See FCC Part 15.247

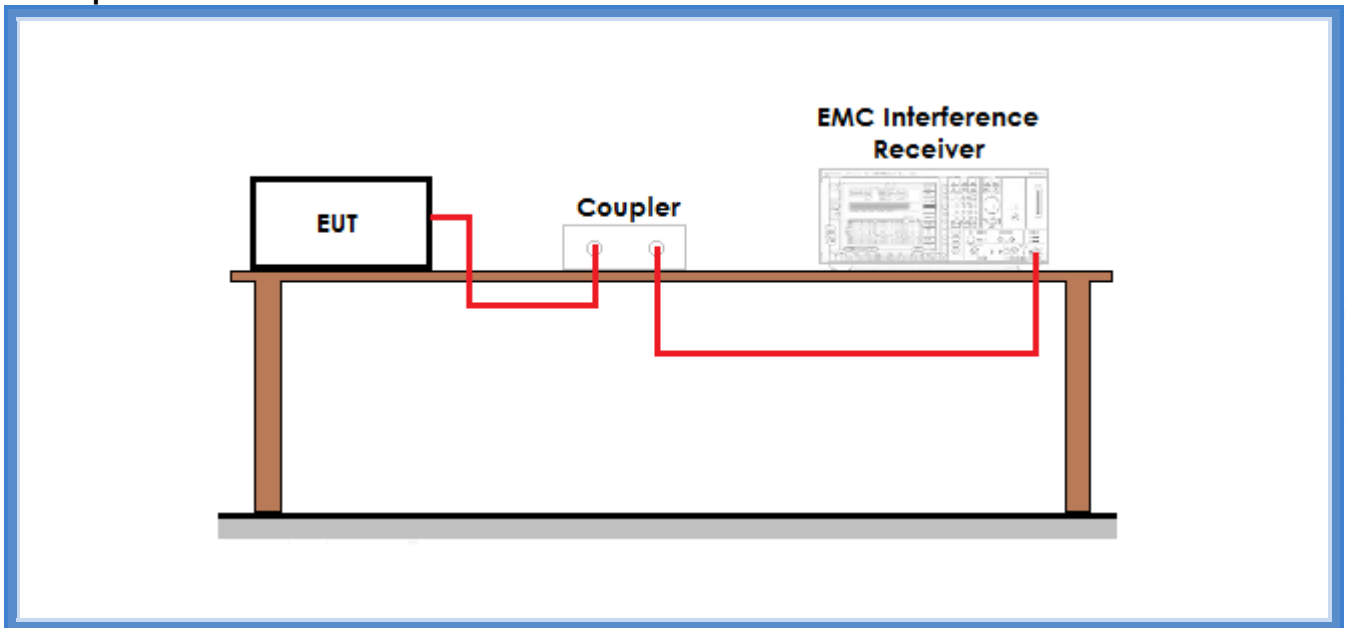
Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	99	50

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



Setup



Result

Frequency (MHz)	Graphs	20 dB bandwidth (kHz)	Results
915,050	G13222127	28	Complies
921,000	G13222128	28	Complies
927,950	G13222131	30	Complies



Graphs

G13222127



*RBW 3 kHz Marker 1 [T1]
VBW 10 kHz 15.67 dBm
SWT 25 ms 915.04320000 MHz

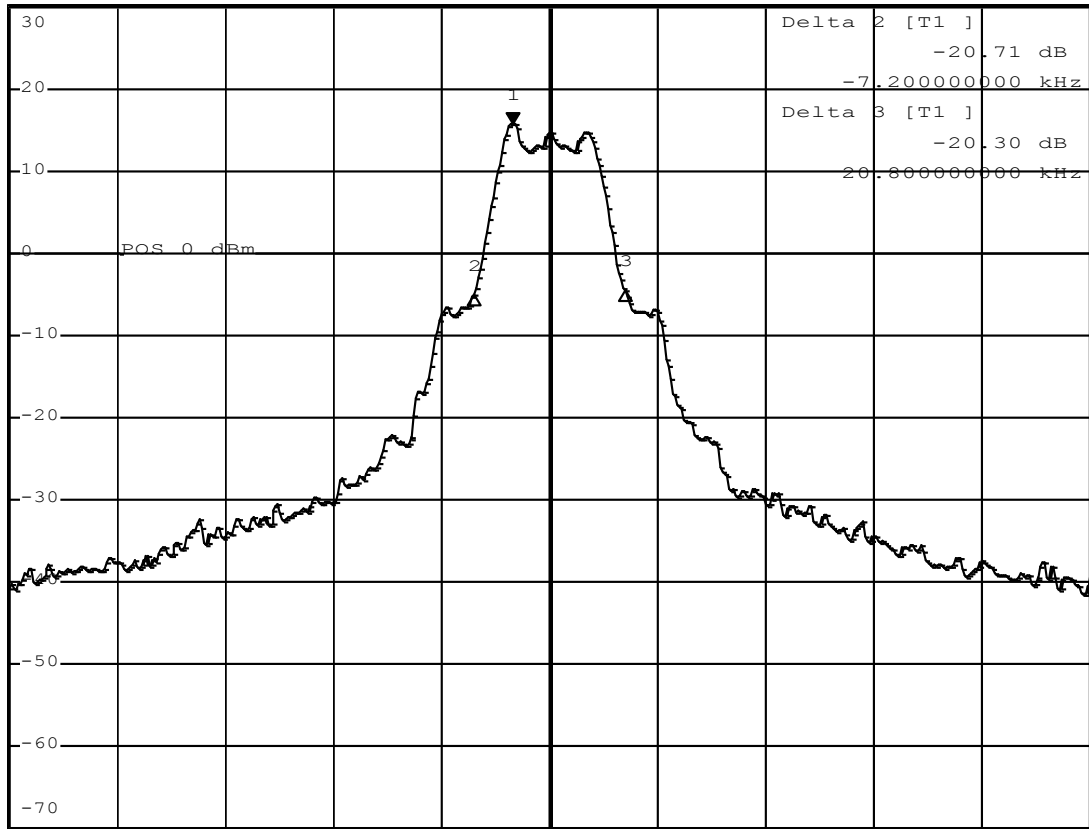
Ref 0 dBm

*Att 10 dB

SWT 25 ms

915.04320000 MHz

1 PK
MAXH



A

TDF

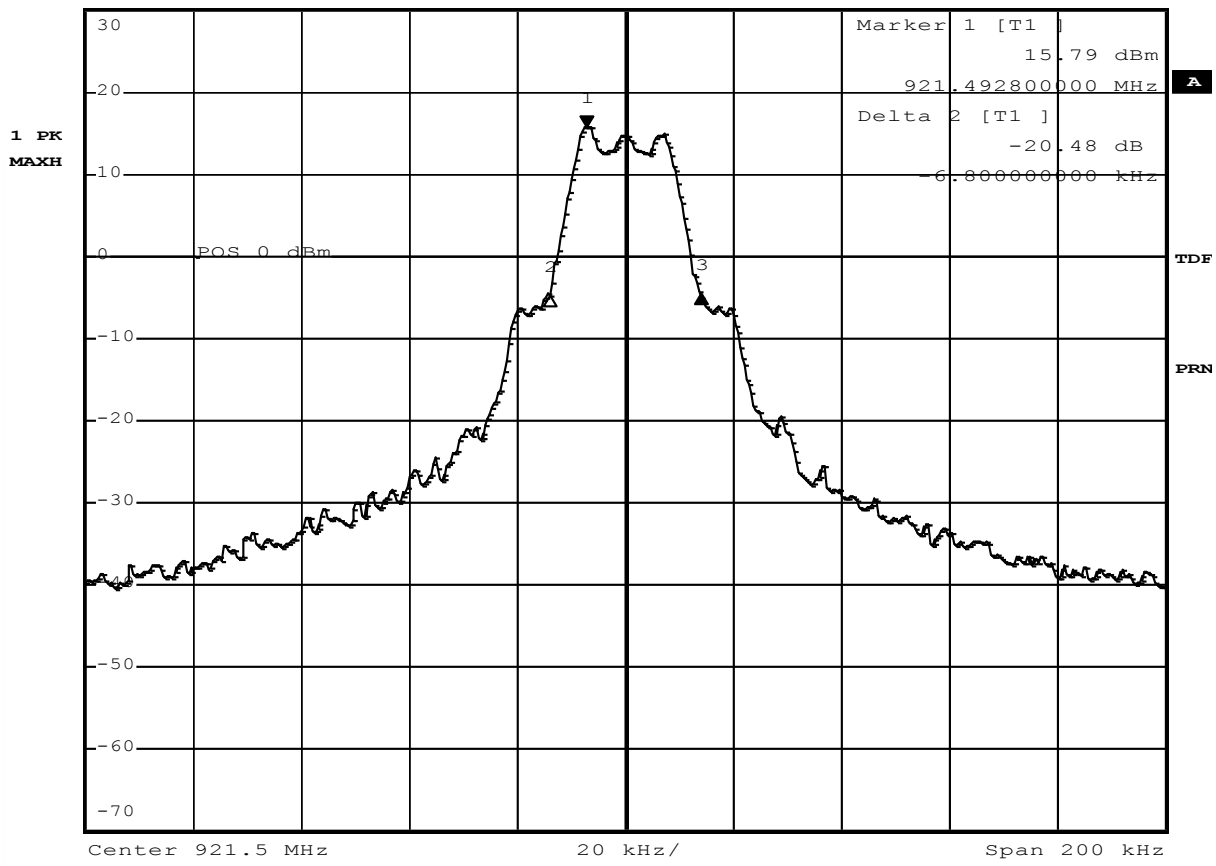
PRN



G13222128



*RBW 3 kHz Delta 3 [T1]
VBW 10 kHz -20.30 dB
Ref 0 dBm *Att 10 dB SWT 25 ms 21.20000000 kHz



CMC Centro Misure Compatibilità S.r.l.



G13222131

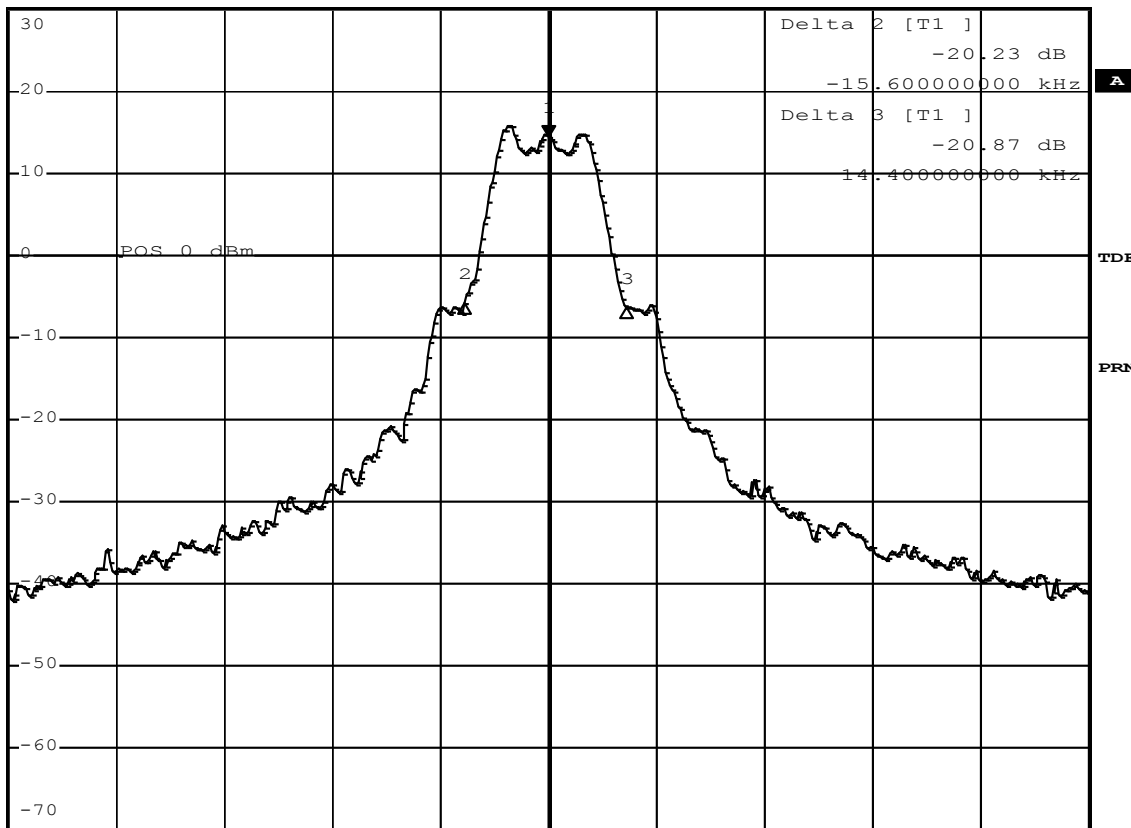


*RBW 3 kHz Marker 1 [T1]
VBW 10 kHz 14.50 dBm
SWT 25 ms 927.95000000 MHz

Ref 0 dBm

*Att 10 dB

1 PK
MAXH



Center 927.95 MHz 20 kHz/ Span 200 kHz

Result: The requirements are met

CMC Centro Misure Compatibilità S.r.l.



11.5 Occupied bandwidth (99% BW)

Test set-up and execution

- RSS 210 Annex 8
- 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 S164
Measurement uncertainty: See clause 7 of this test report

Test specification

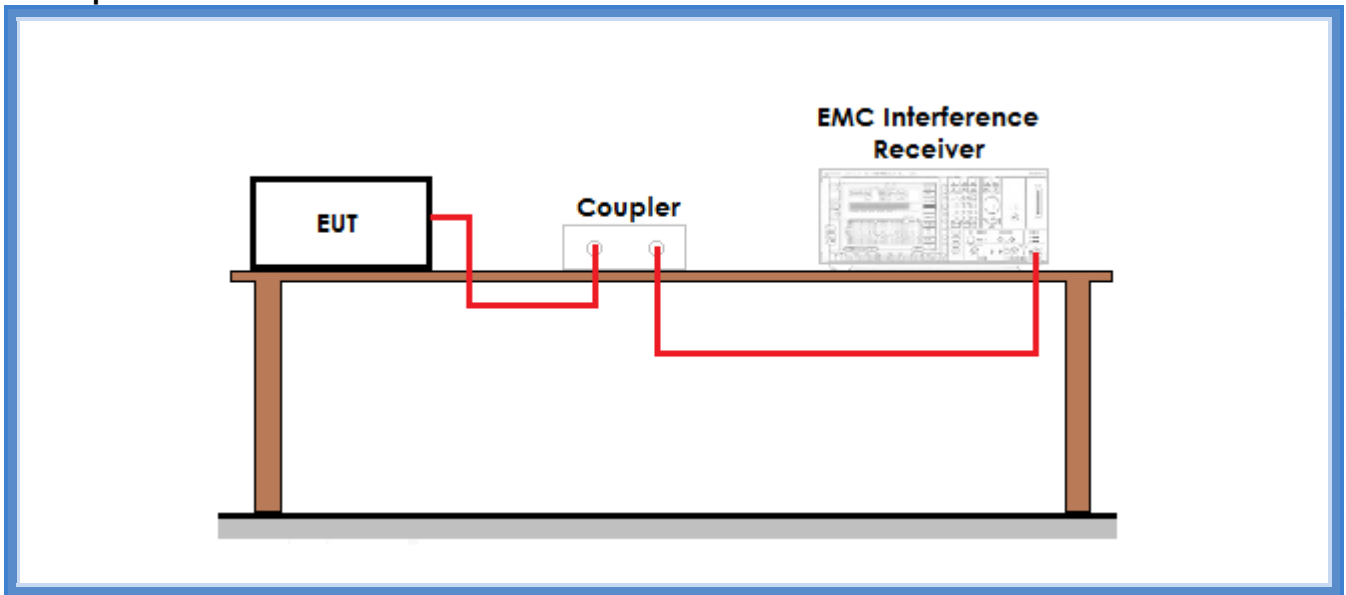
RSS 210 Annex 2 (A2.9)

Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	98	49



Setup



Result

<i>f</i> (MHz)	99% bandwidth (kHz)	Graphs	Results
915,050	25,2	G13222126	Complies
921,000	25,6	G13222129	Complies
927,950	26,0	G13222130	Complies



Graphs

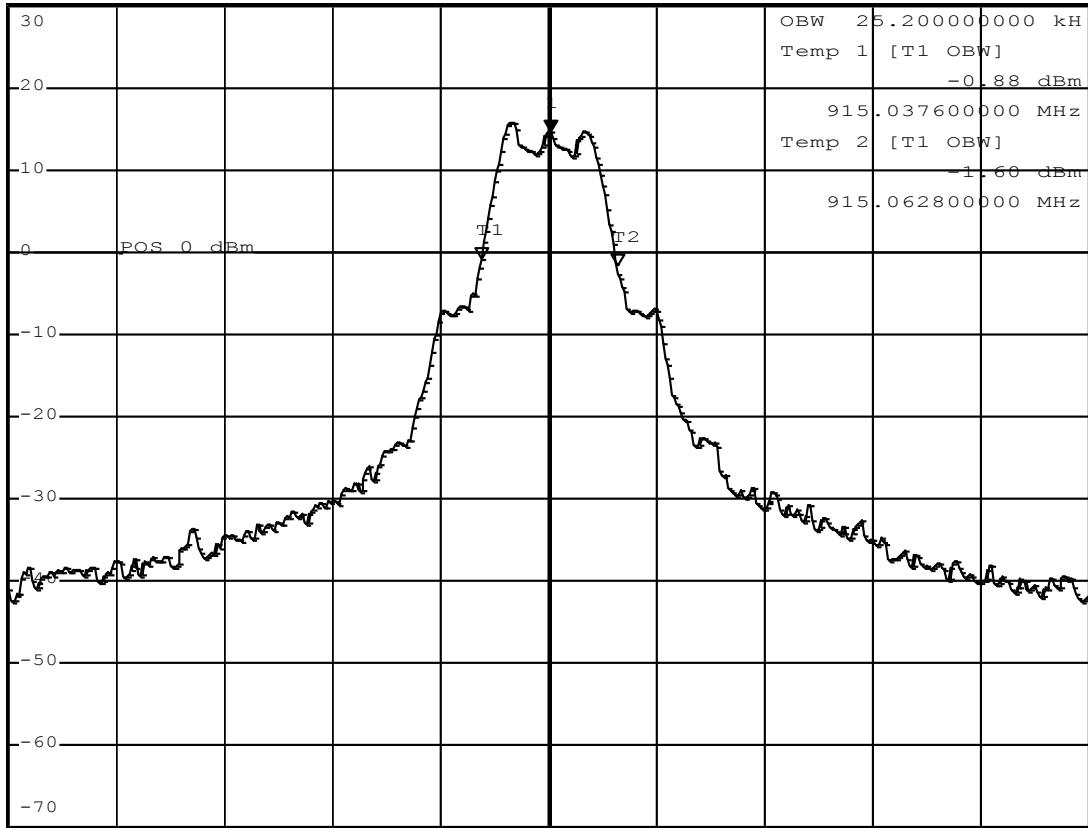
G13222126



*RBW 3 kHz Marker 1 [T1]
 VBW 10 kHz 14.57 dBm
 *Att 10 dB SWT 25 ms 915.050400000 MHz

Ref 0 dBm *Att 10 dB OBW 25.200000000 kHz

1 PK
 MAXH

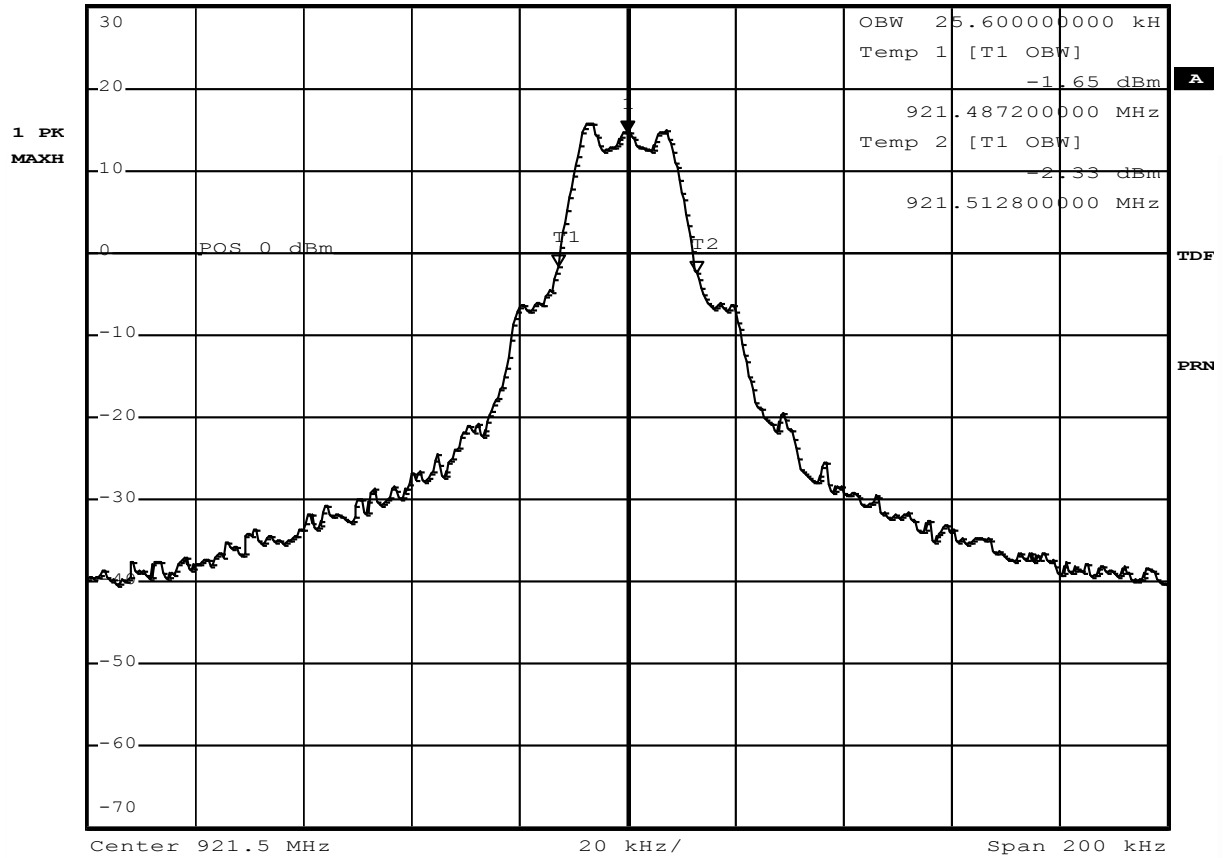




G13222129



Ref 0 dBm *Att 10 dB *RBW 3 kHz Marker 1 [T1] VBW 10 kHz 14.74 dBm SWT 25 ms 921.50000000 MHz



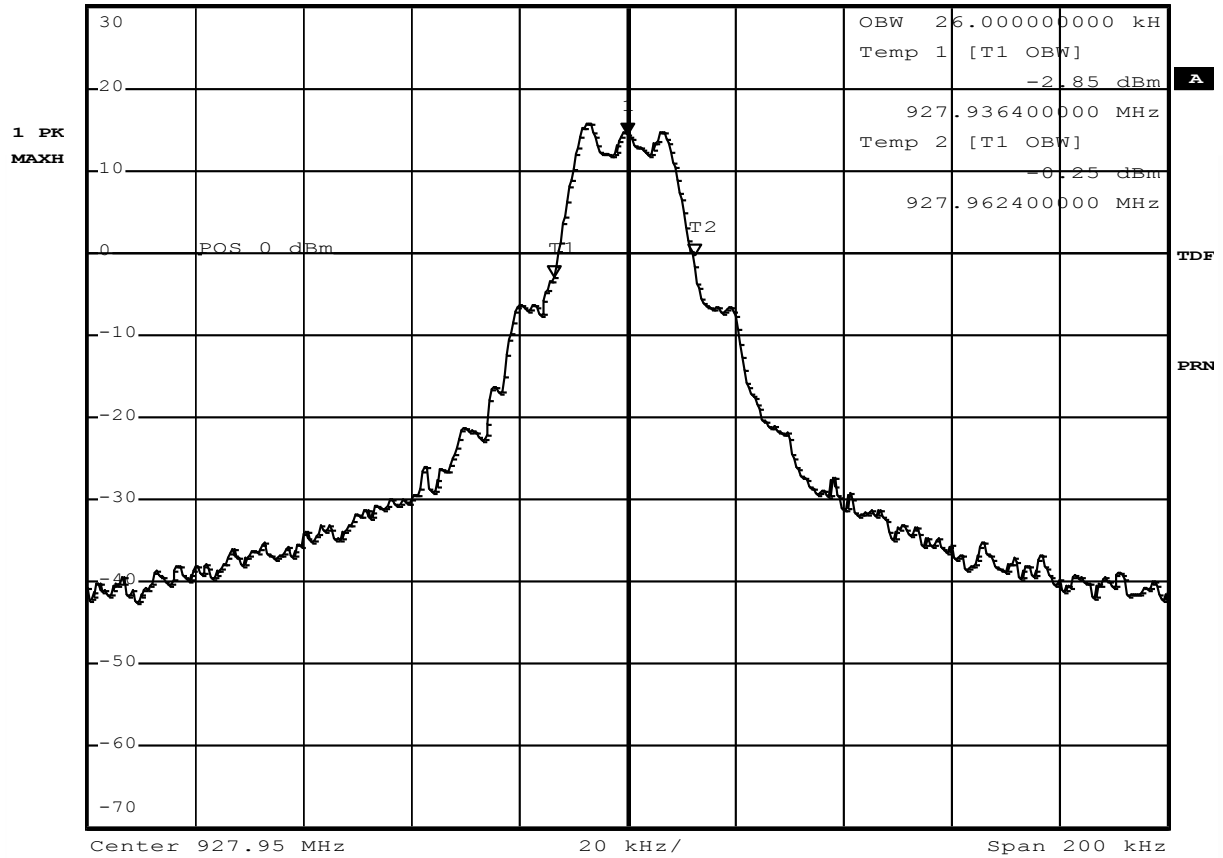
CMC Centro Misure Compatibilità S.r.l.



G13222130



*RBW 3 kHz Marker 1 [T1]
VBW 10 kHz 14.50 dBm
Ref 0 dBm *Att 10 dB SWT 25 ms 927.950000000 MHz



Result: The requirements are met

CMC Centro Misure Compatibilità S.r.l.



11.6 Channel separation

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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 S164
Measurement uncertainty: See clause 7 of this test report

Test specification

See FCC Part 15.247

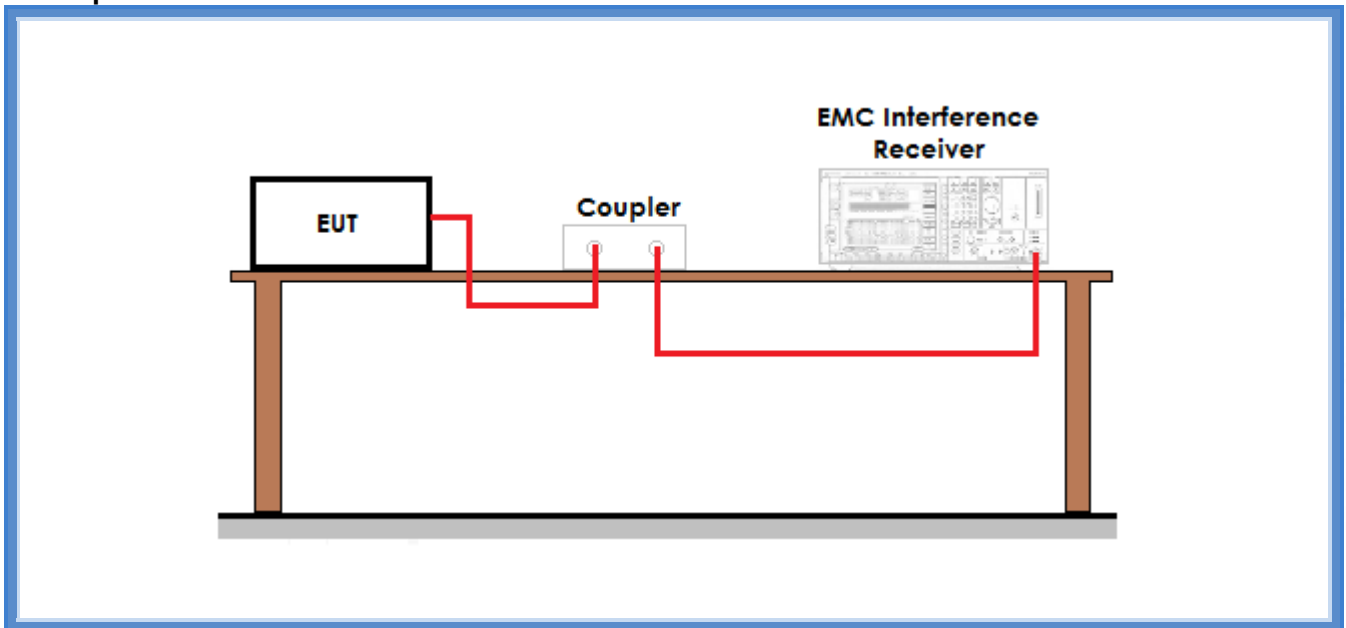
Environmental conditions

<i>Temperature (°C)</i>	<i>Atmospheric pressure (kPa)</i>	<i>Relative humidity (%)</i>
20	98	51

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



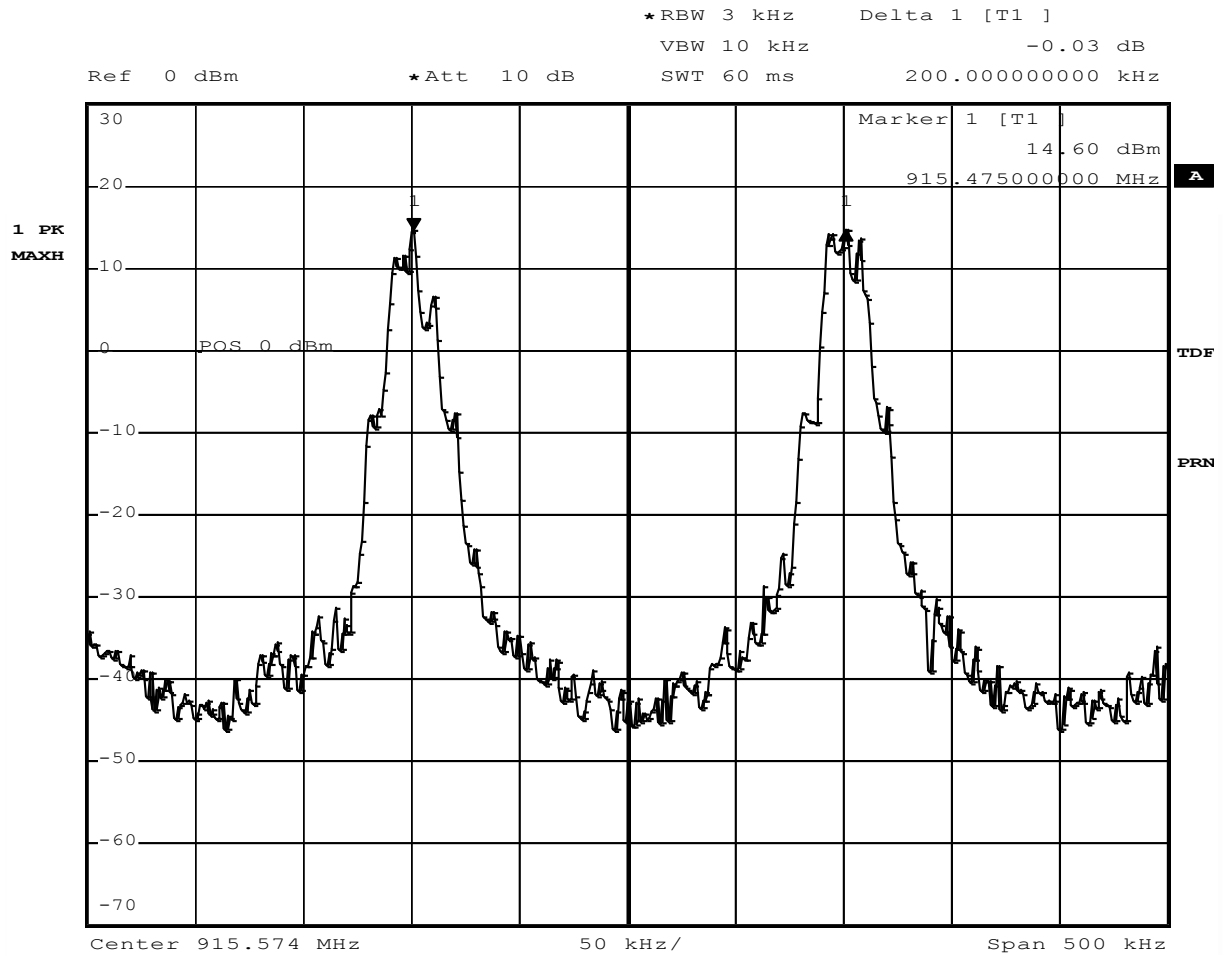
Result

Frequency band (MHz)	Graphs	Channel separation (kHz)	Results
902 – 928	G13222142	200	Complies



Graphs

G13222142



Result: The requirements are met



11.7 Number of hopping channels

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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

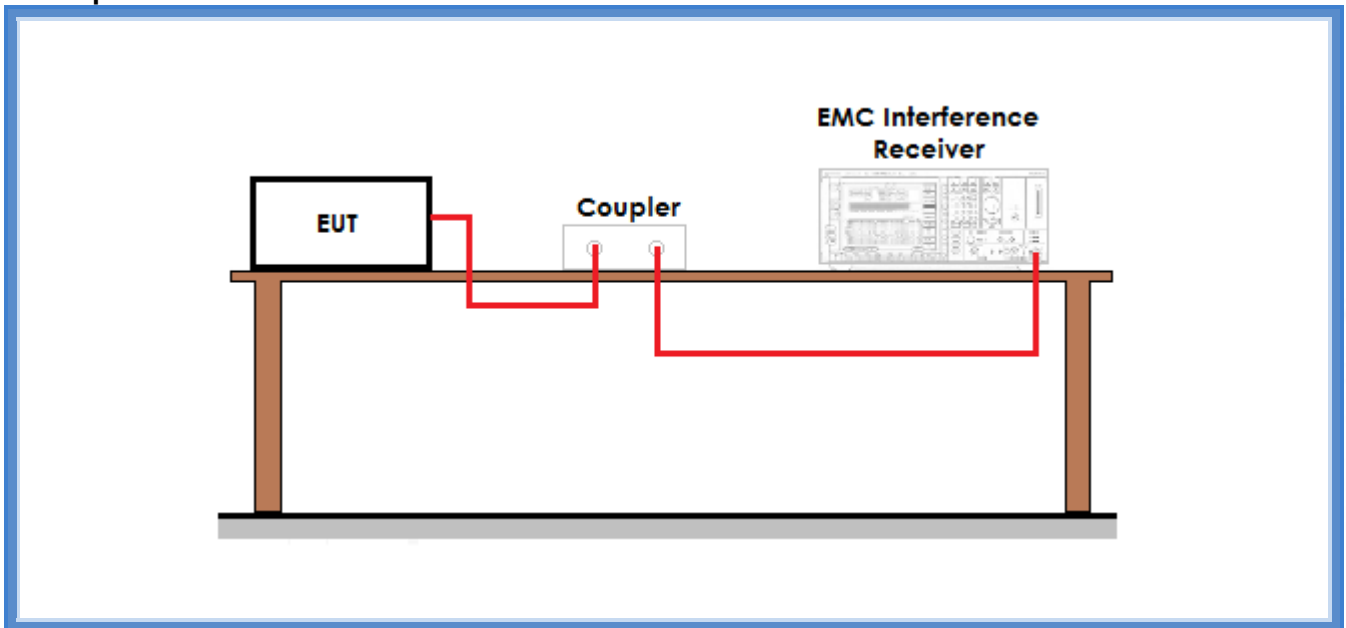
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
20	98	48

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.



Setup



Result

<i>Graphs</i>	<i>Number of hopping channels</i>	<i>Results</i>
G13222125	64	Complies



Graphs



G13222125

*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 15.74 dBm
*Att 10 dB
SWT 2.5 ms 915.04000000 MHz

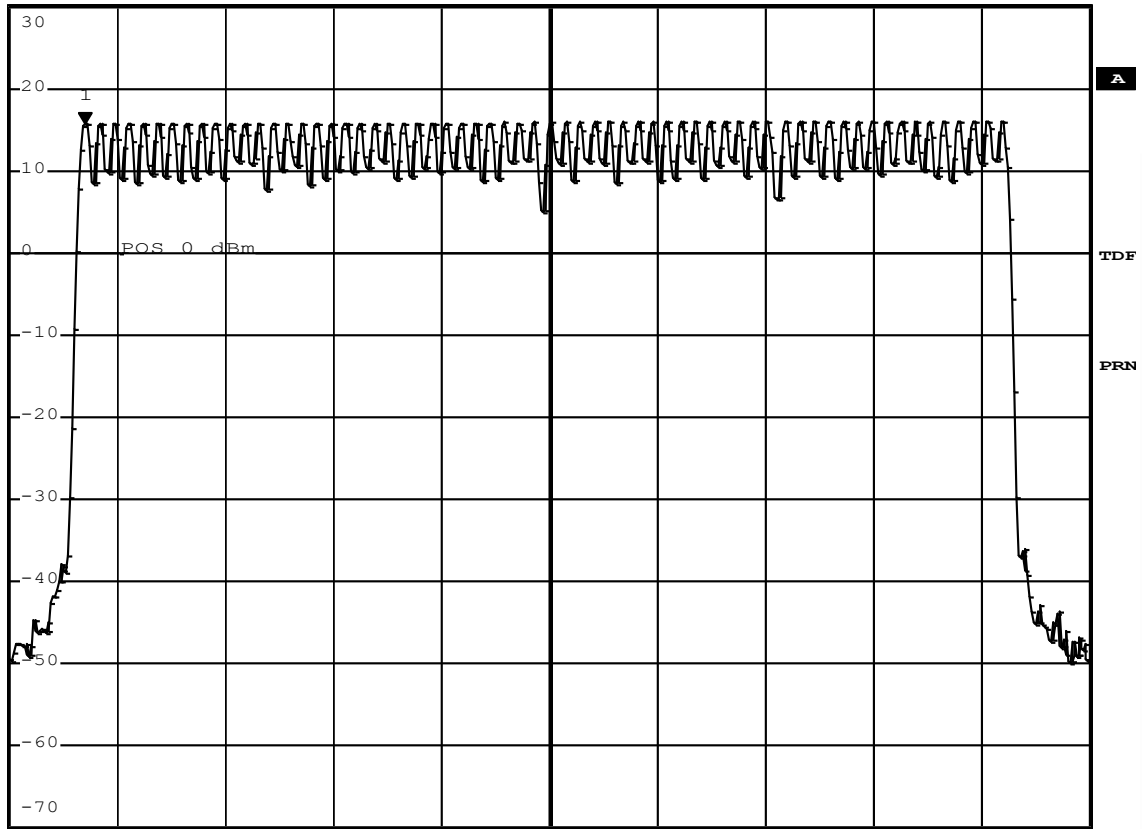
Ref 0 dBm

*Att 10 dB

SWT 2.5 ms

915.04000000 MHz

1 PK
MAXH



Result: The requirements are met



11.8 Time of occupancy

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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 S164
Measurement uncertainty: See clause 7 of this test report

Test specification

See FCC Part 15.247

Environmental conditions

<i>Temperature (°C)</i>	<i>Atmospheric pressure (kPa)</i>	<i>Relative humidity (%)</i>
21	99	48

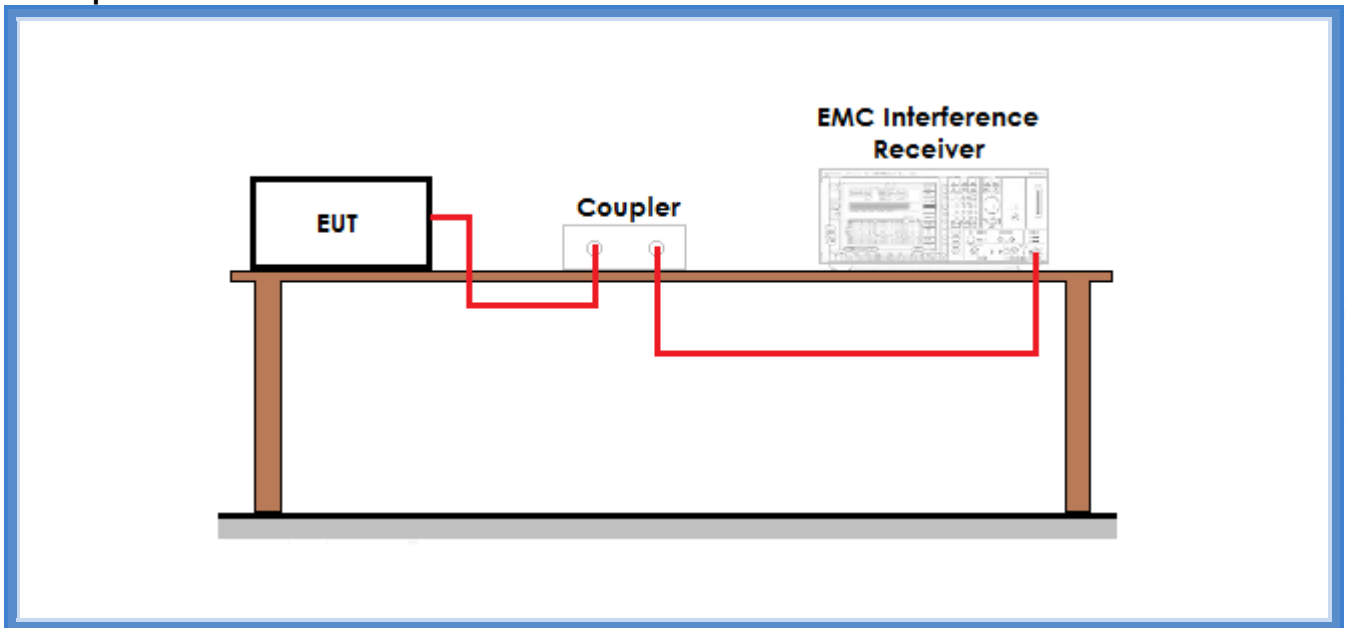
Acceptance limits:

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

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed



Setup



Result

Dwell time of transmission

Frequency (MHz)	Graphs	Dwell time (ms)
915,32	G13222171	14,8

Number of transmissions per period (20s)

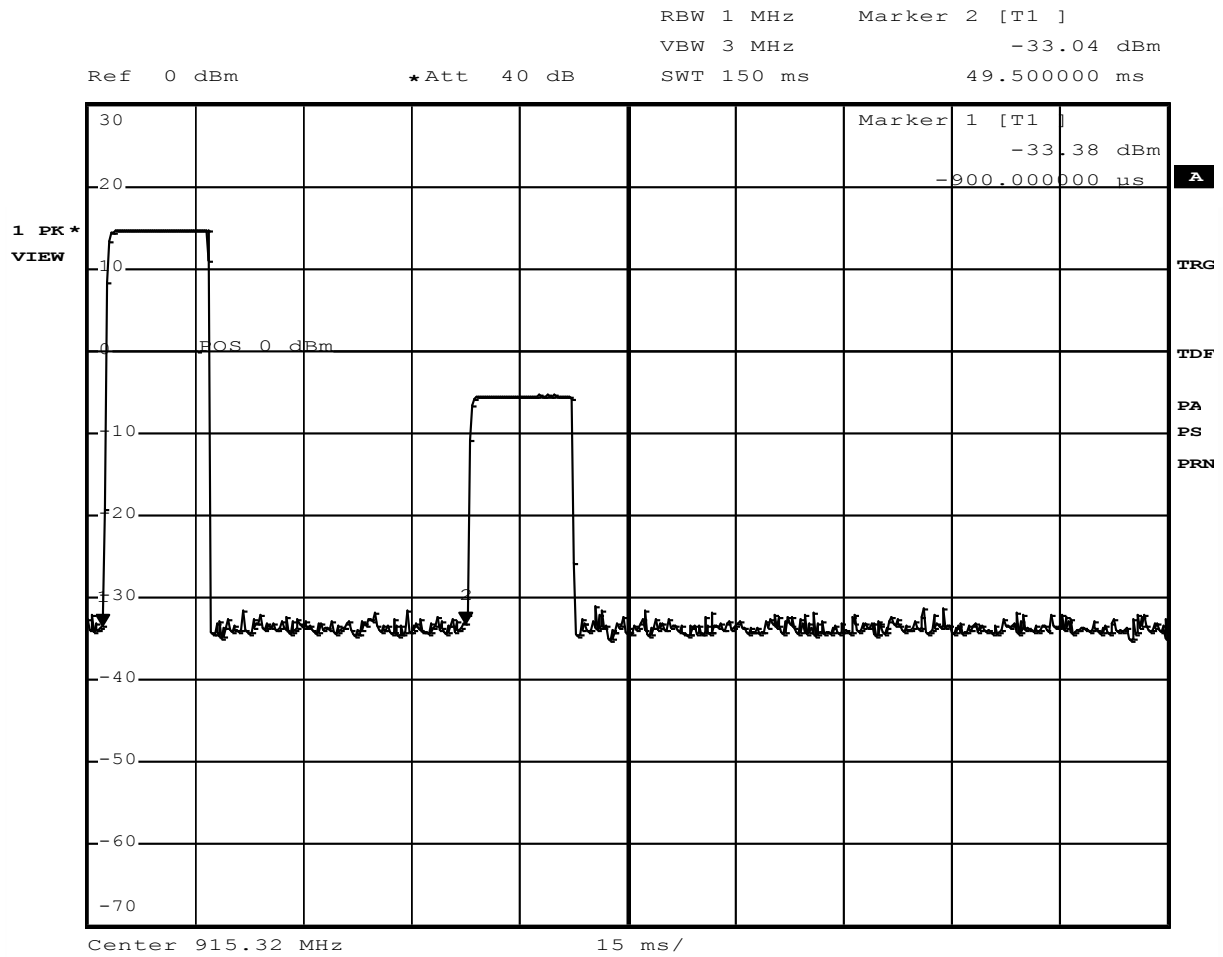
Frequency (MHz)	Time between 2 transmission on different channels	Number of transmission
915,32	G13222170 49,5 ms	$20000 / 49,5 / 64 = 6,3$

Time of occupancy (Dwell time x Nr. of transmission)	$14,8 \times 6,3 = 93,4 \text{ ms}$
--	-------------------------------------



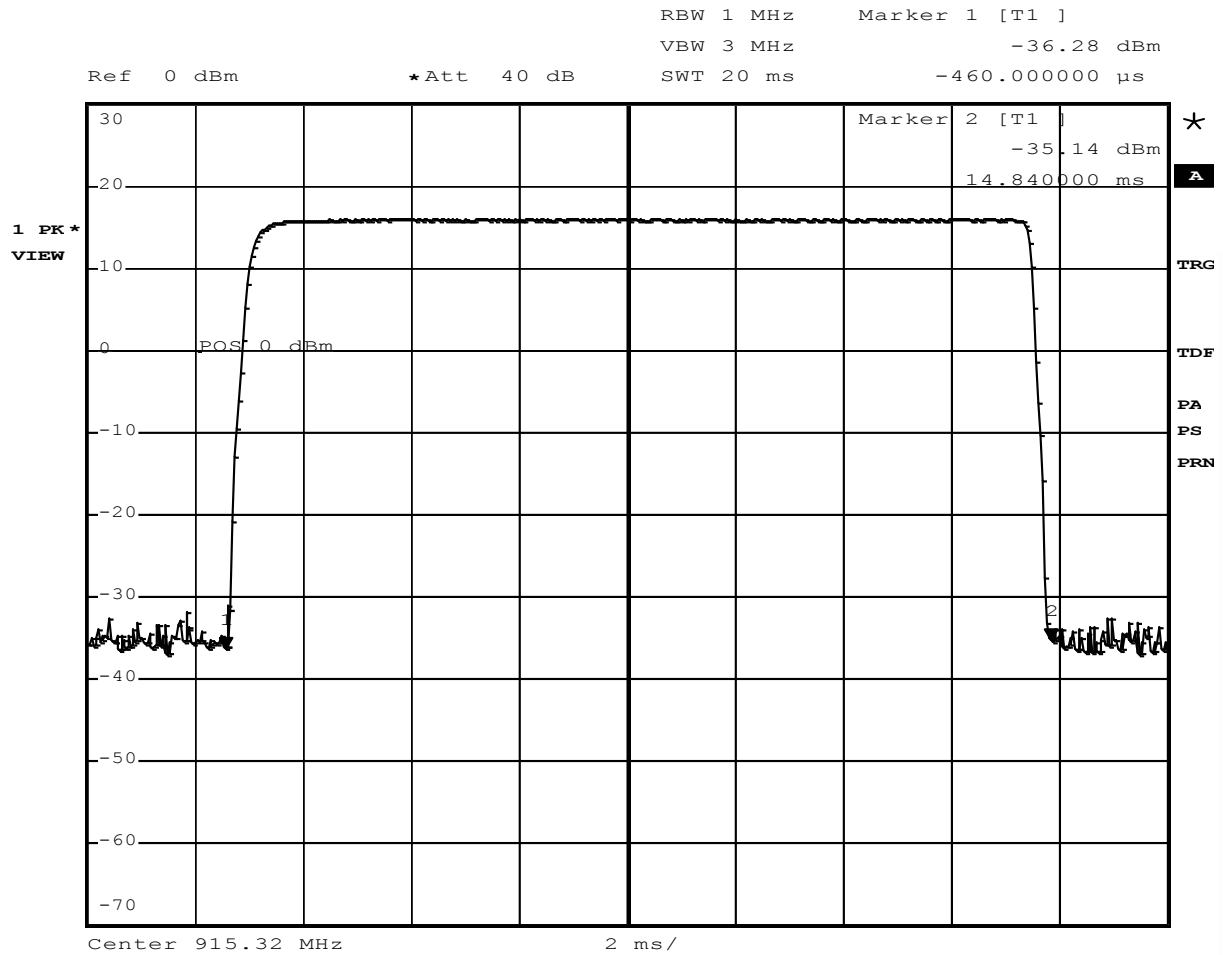
Graphs

G13222170





G13222171



Result: The requirements are met

CMC Centro Misure Compatibilità S.r.l.



11.9 Band edge

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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 S164
Measurement uncertainty: See clause 7 of this test report

Test specification

See FCC Part 15.247

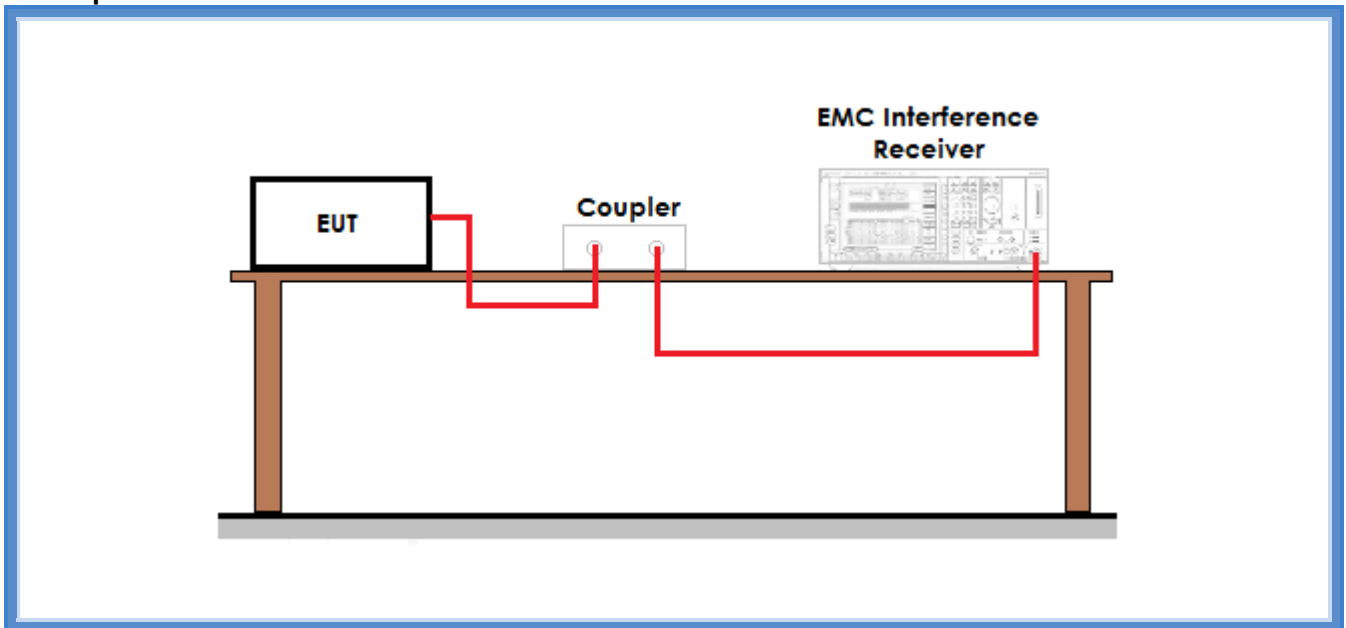
Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	98	50

Acceptance limits: operation within the band 902 – 928 MHz



Setup



Result

Frequency (MHz)	Graph(s) – Hopping	Results	
915,050	G13222133	F _L : 915,036 MHz	Complies
927,950	G13222132	F _H : 927,964 MHz	Complies

Frequency (MHz)	Graph(s) – No hopping	Results	
915,050	G13222134	F _L : 915,060 MHz	Complies
927,950	G13222135	F _H : 927,968 MHz	Complies



Graphs

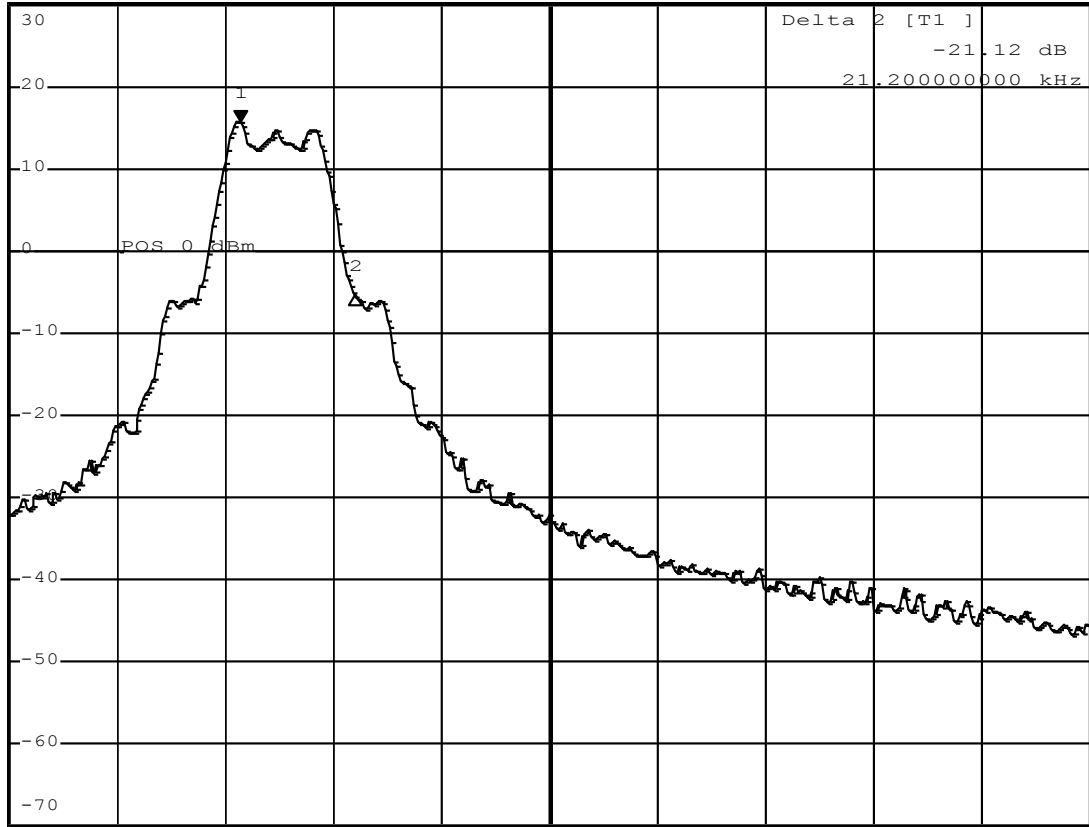
G13222132



*RBW 3 kHz Marker 1 [T1]
VBW 10 kHz 15.82 dBm
*Att 10 dB SWT 25 ms 927.94280000 MHz

Ref 0 dBm POS 0 dBm

1 PK
MAXH





G13222133



*RBW 3 kHz Marker 1 [T1]
VBW 10 kHz 15.74 dBm
SWT 25 ms 915.043200000 MHz

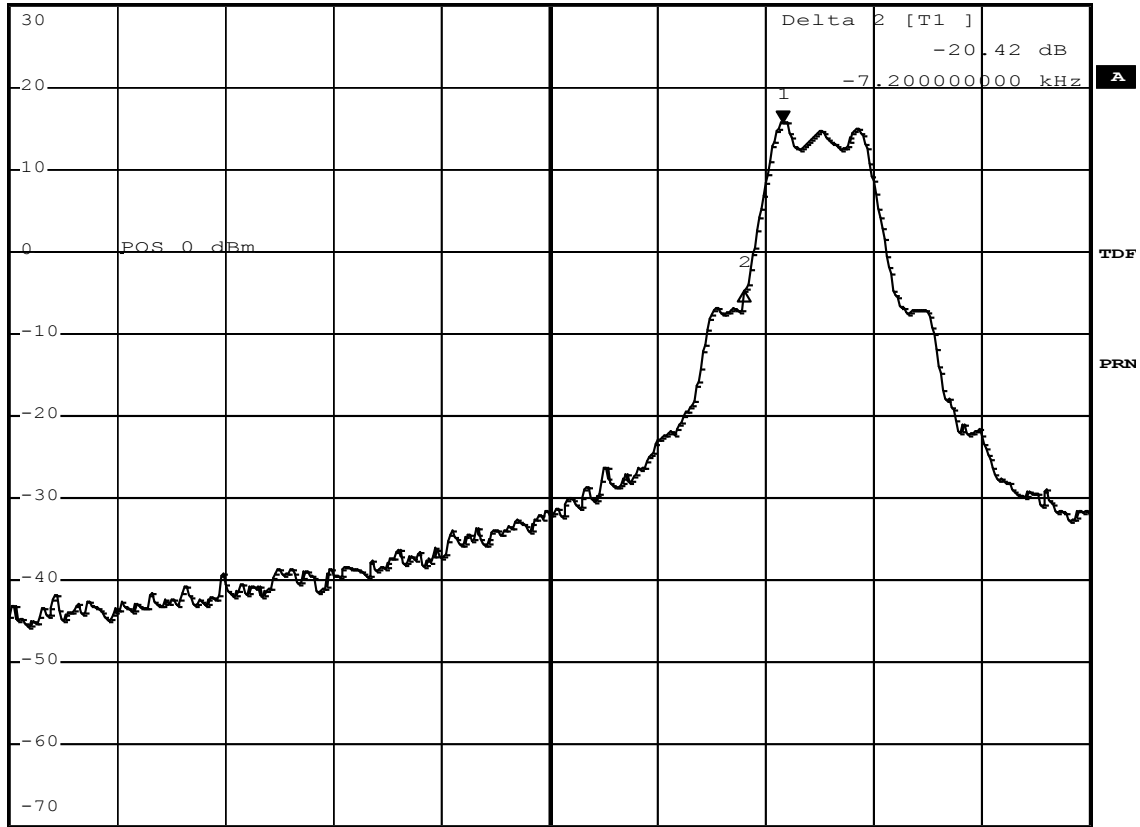
Ref 0 dBm

*Att 10 dB

SWT 25 ms

915.043200000 MHz

1 PK
MAXH



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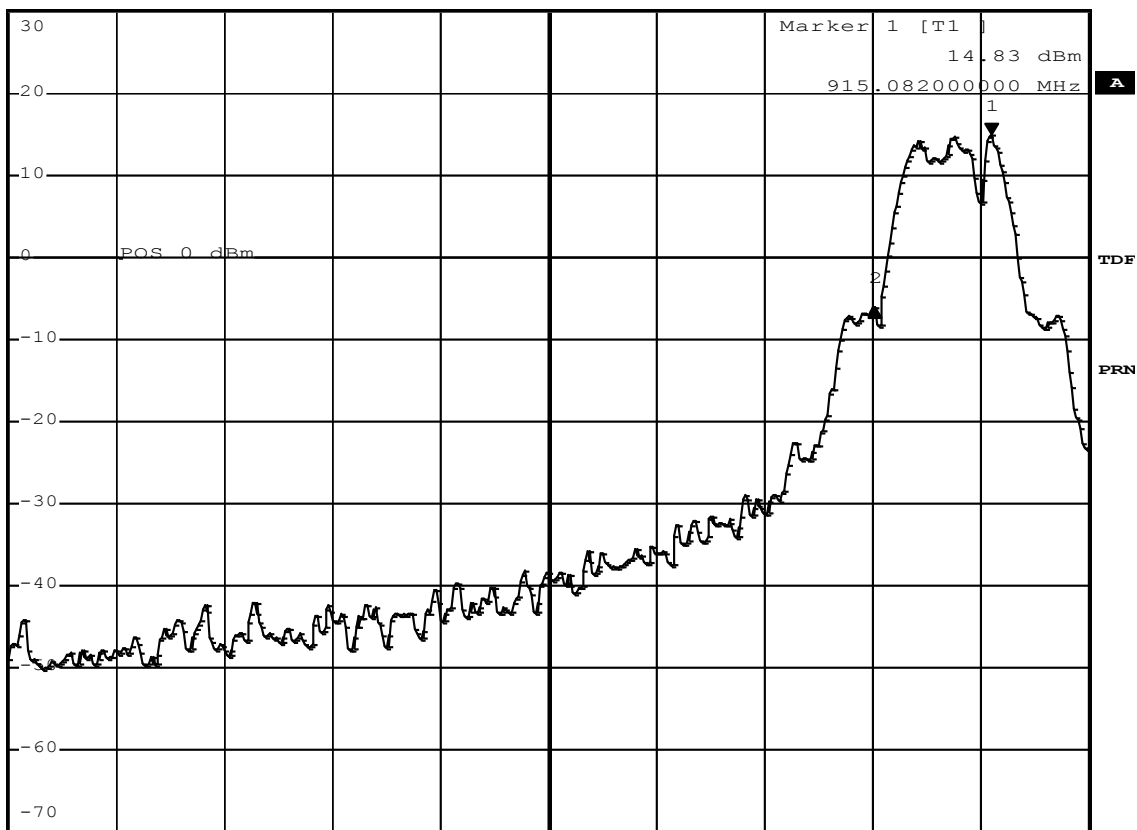


G13222134



*RBW 3 kHz Delta 2 [T1]
VBW 10 kHz -20.89 dB
*Att 10 dB SWT 25 ms -21.60000000 kHz

1 PK
MAXH



CMC Centro Misure Compatibilità S.r.l.



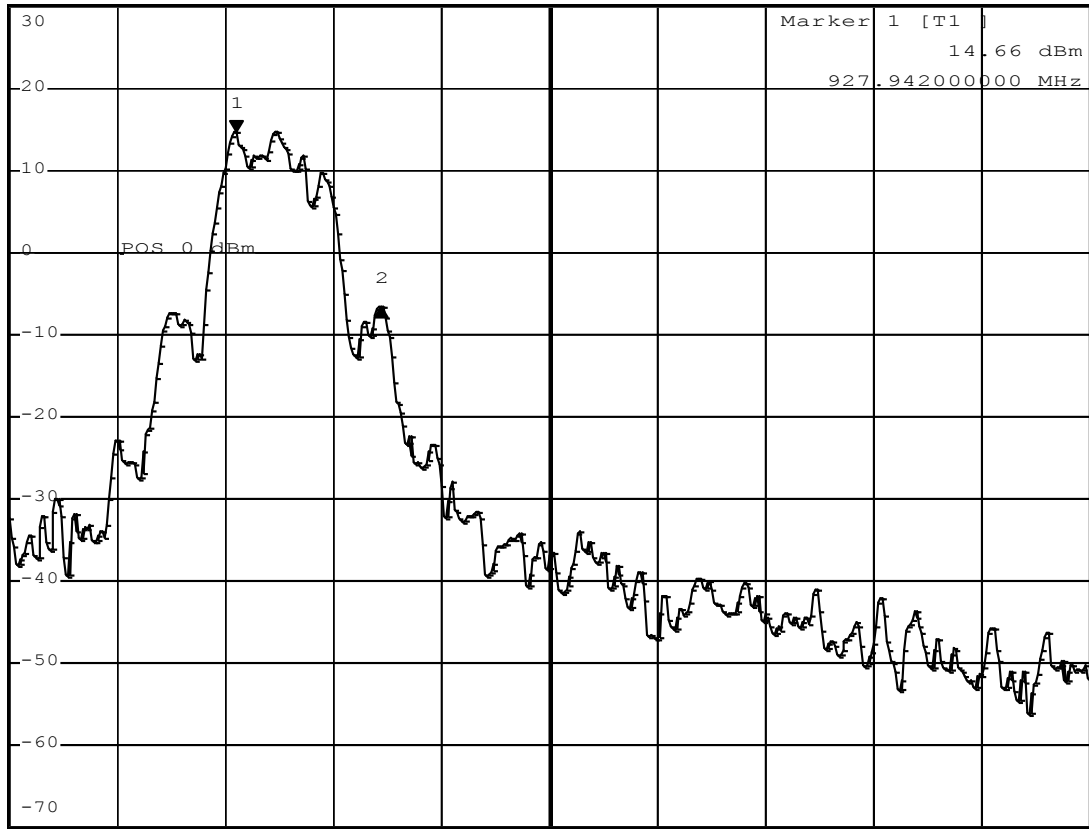
G13222135



*RBW 3 kHz Delta 2 [T1]
VBW 10 kHz -21.24 dB
*Att 10 dB SWT 25 ms 26.80000000 kHz

Ref 0 dBm

1 PK
VIEW



Center 928 MHz 20 kHz/ Span 200 kHz

Result: The requirements are met

CMC Centro Misure Compatibilità S.r.l.



11.10 Peak Output Power

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- RSS 210 Annex 8
- 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

Environmental conditions

Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	99	48

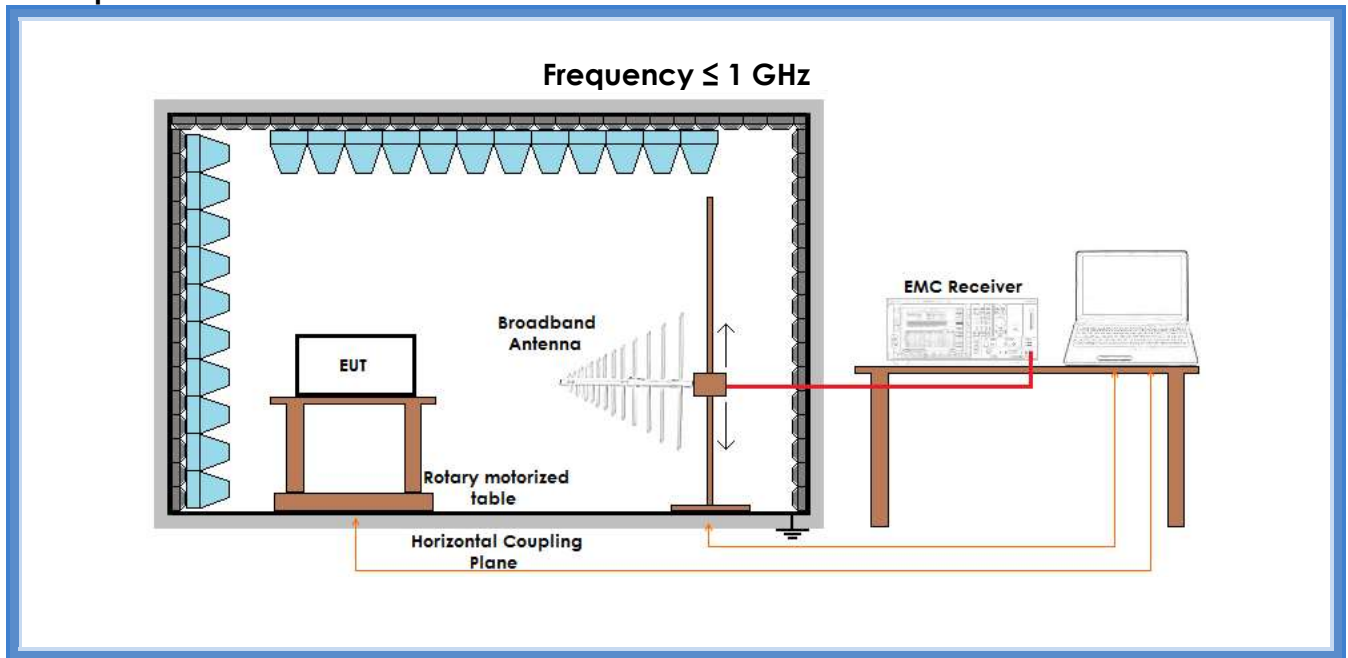
Acceptance limits:

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)	Polarization	Graphs	Measured QP level (dB μ V/m)	Peak Output Power (mW)	Remarks
915,050	Horizontal	G13222118	109,89	18,5	--
915,050	Vertical	G13222117	113,56	43,0	--
921,000	Horizontal	G13222119	110,35	21,2	--
921,000	Vertical	G13222120	113,87	46,1	--
927,950	Horizontal	G13222122	110,64	21,9	--
927,950	Vertical	G13222121	115,01	60,0	--

Remarks: EUT was tested with plug antenna and with antenna with 5m cable. In the table there are the worst case results.

Remarks

$$P = (E \times d)^2 / (30 \times G)$$

Where:

E = the measured maximum fundamental field strength in V/m

G = the numeric gain of the transmitting antenna: 1,58 (2 dBi)

d = the distance in meters from which the field strength was measured (3 m)

P = the power in watts



Graphs

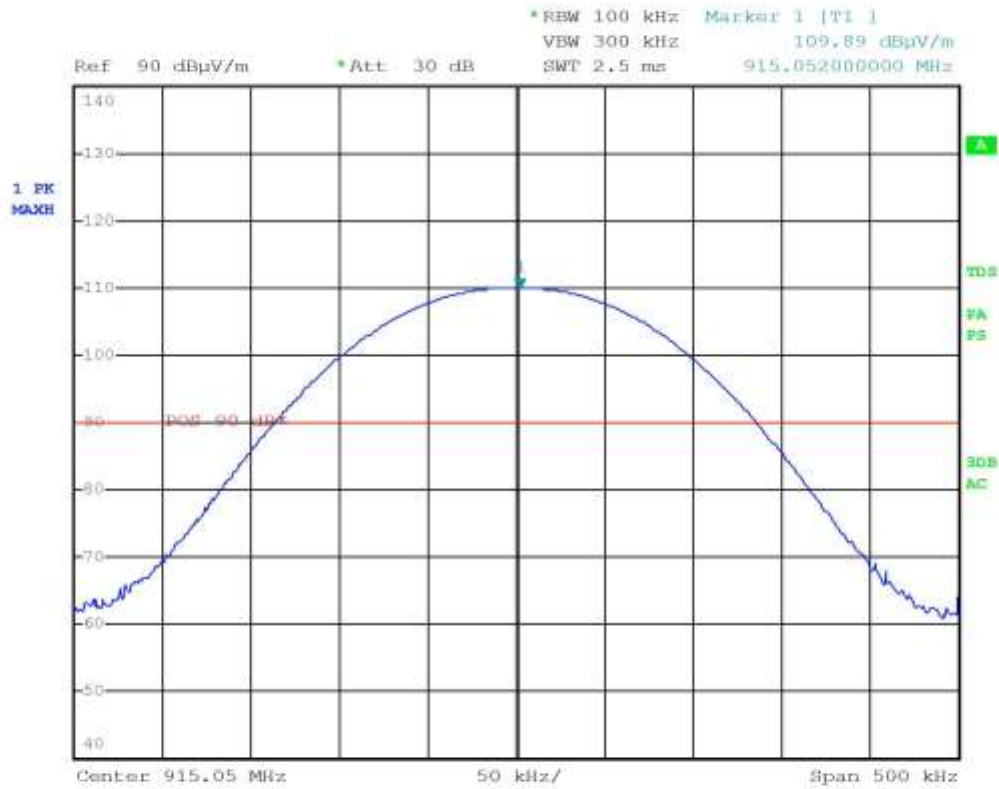
G13222117



Gandini 13222117-Vert-Tx-Rx F MIN-ANT 5m



G13222118

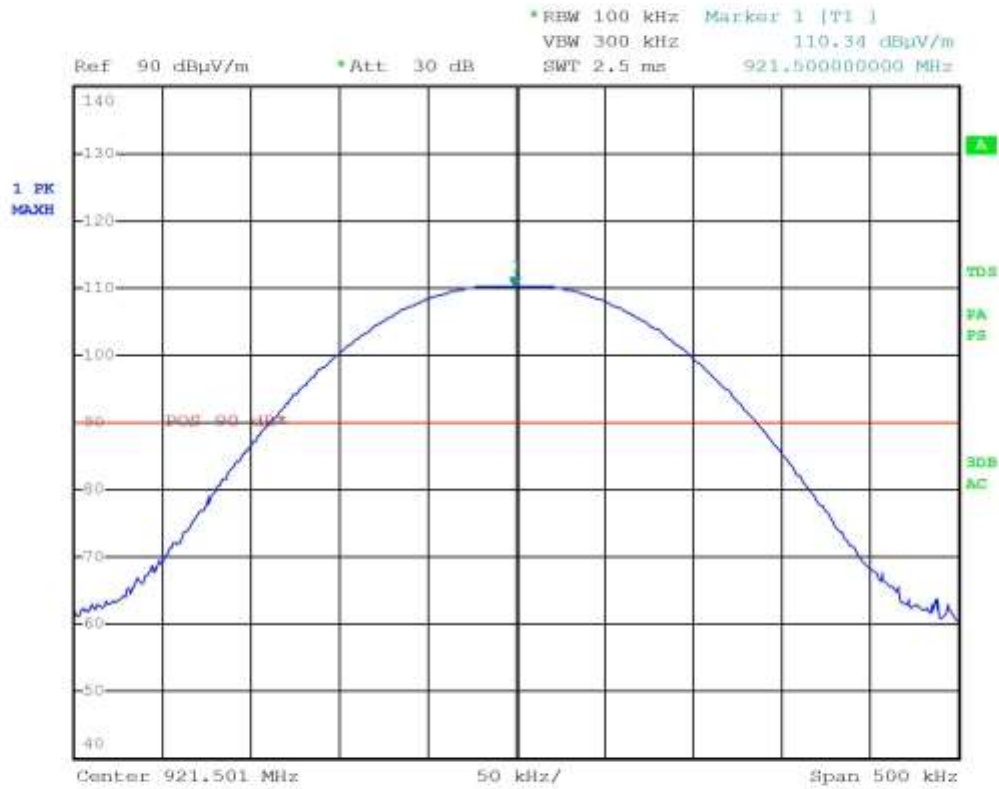


Gandini 13222118-Horiz-Tx-Rx F MIN-ANT 5m

CMC Centro Misure Compatibilità S.r.l.



G13222119



Gandini 13222119-Horiz-Tx-Rx F MED-ANT 5m

CMC Centro Misure Compatibilità S.r.l.



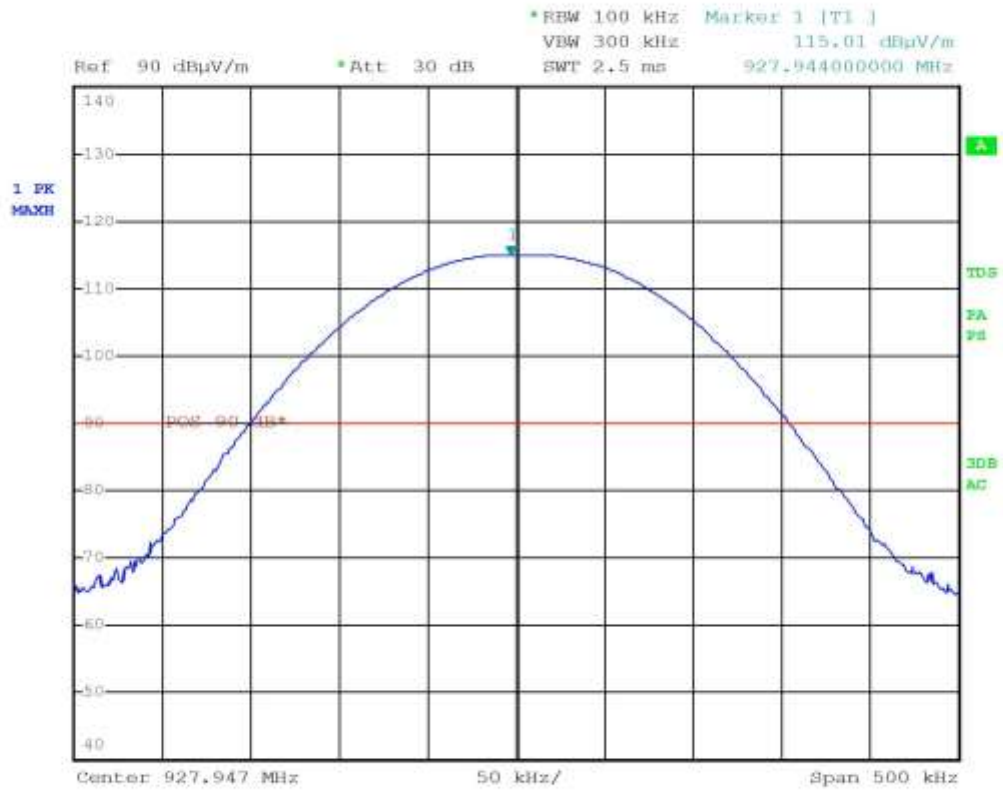
G13222120



Gandini 13222120-Vert-Tx-Rx F MED-ANT 5m



G13222121

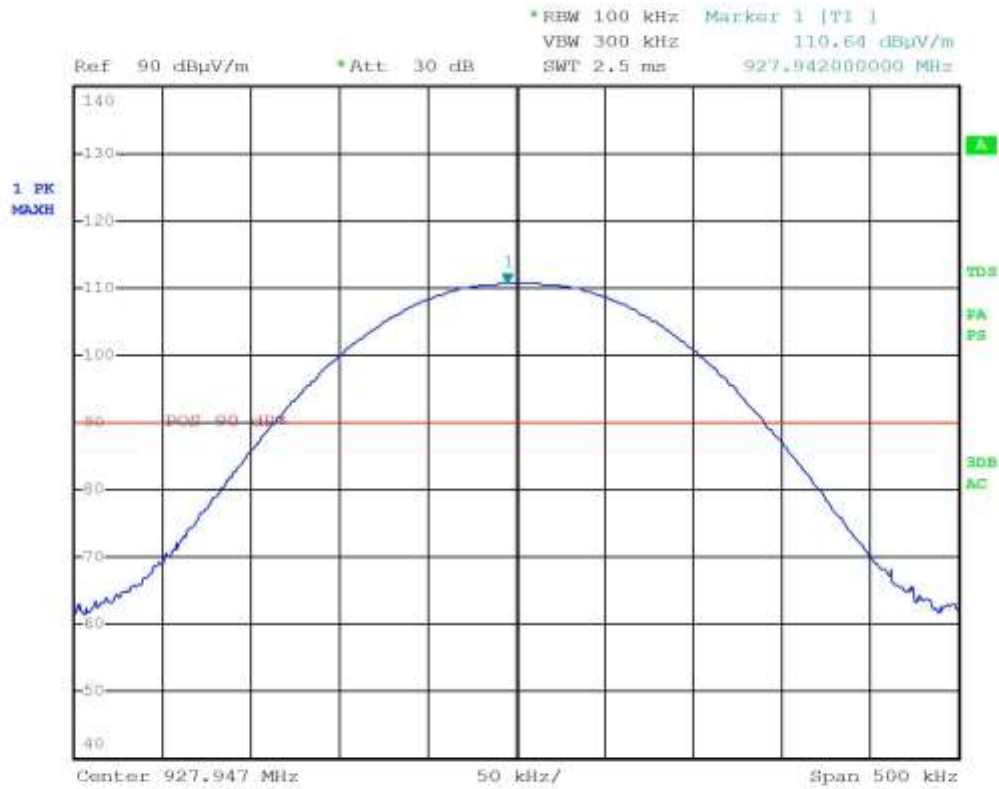


Gandini 13222121-Vert-Tx-Rx F MAX-ANT 5m

CMC Centro Misure Compatibilità S.r.l.



G13222122



Gandini 13222122-Horiz-Tx-Rx F MAX-ANT 5m

Result: The requirements are met



11.11 Spurious Emission

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.209
- RSS-210 – Annex 8
- 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

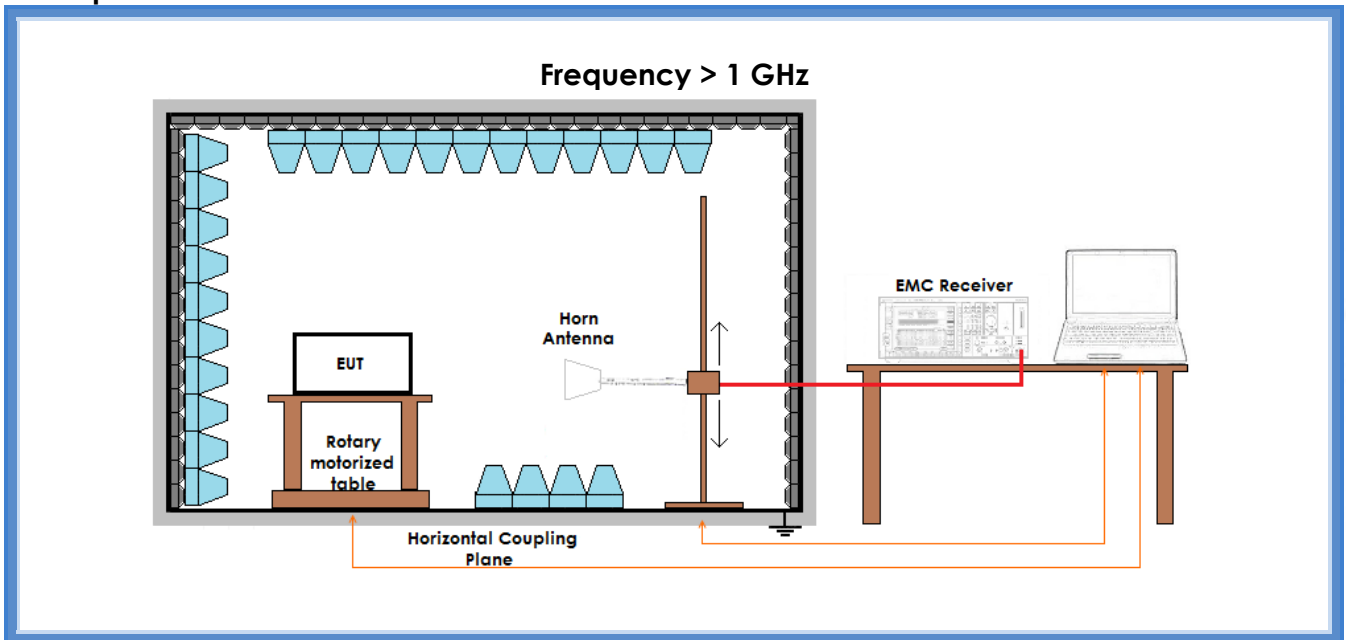
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	99	48

Acceptance limits

Frequency (MHz)	AV limits [dB(μV/m)]	Peak limits [dB(μV/m)]
> 1000	54	74



Setup



Graph:

G13222152



Result – AV detector

Harmonic	Limits (dB μ V/m)	Level (dB μ V/m)			Results
		915,050 MHz	921,000 MHz	927,950 MHz	
II	54	47,8	48,6	49,5	Complies
III	54	48,0	47,6	48,1	Complies
IV	54	51,7	48,1	47,3	Complies
V	54	46,0	46,3	46,2	Complies
VI	54	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
VII	54	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
VIII	54	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
IX	54	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
X	54	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies

Remarks:

EUT was tested in 3 orthogonal planes. The results in this table show the highest values

EUT was tested with plug antenna and with antenna with 5m cable. In the table there are the worst case results.

Result – Peak detector

Harmonic	Limits (dB μ V/m)	Level (dB μ V/m)			Results
		915,050 MHz	921,000 MHz	927,950 MHz	
II	74	50,3	51,3	51,5	Complies
III	74	51,6	51,5	52,1	Complies
IV	74	53,1	51,7	51,9	Complies
V	74	51,1	51,3	51,9	Complies
VI	74	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
VII	74	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
VIII	74	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
IX	74	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies
X	74	More than 15dB below limit	More than 15dB below limit	More than 15dB below limit	Complies

Remarks:

EUT was tested in 3 orthogonal planes. The results in this table show the highest values

EUT was tested with plug antenna and with antenna with 5m cable. In the table there are the worst case results.

Result: The requirements are met



11.12 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 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

Port: Antenna

Acceptance limits	902/1500 mW/cm ² = 0,60 mW/cm ² max at 20cm of distance
--------------------------	---

Result

Power Density Limit (mW/cm ²)	Output Power (mW)	Antenna Gain (G)	Power Density at 20cm (mW/cm ²)	Remarks
0,60	60,0	1,58 (2 dBi)	0,019	Measured
Remarks: Power Density = (P x G) / (4πR ²)				

Result: The requirements are met