



TEST REPORT nr. R14137801

Federal Communication Commission (FCC)

Test item

Description.....: R1270C – QUARK UP - 500 mW UHF RFID ULTRA COMPACT MODULE

Trademark.....: CAEN RFID

Model/Type: R1270C

Test Specification

Standard: FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 204, 207, 209 and 247

Client's name: CAEN RFID S.r.l.

Address: Via Vetraila, 11 – 55049 Viareggio (LU) – ITALY

Manufacturer's name : Same as client

Address: --

Report

Tested by: G. Gandini – Technician

Approved by: R. Beghetto – Laboratory Manager

Date of issue: 03.10.14

Contents.....: 58 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

<i>Test specifications</i>	<i>Environmental Phenomena</i>	<i>Tests sequence</i>	<i>Result</i>
Part 15.203	Antenna requirements	1	Complies
Part 15.207	Conducted emissions	2	Complies
Part 15.209	Radiated emissions	3	Complies
Part 15.247	20dB 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 15.209 and 15.247	Peak Output Power	8	Complies
Part 15.247	Band edge	9	Complies
Part 15.209	Spurious emission	10	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



Power supply : 5 Vdc from USB port

Serial Number..... : --

Type of equipment : ☒ Transceiver Unit

Type of station : ☐ Fixed station
 ☒ Portable station
 ☐ Mobile station

Frequency band : 902 – 928 MHz

FCC ID : UVECAENRFID015

Company..... : CMC Centro Misure Compatibilità S.r.l.
Address : Via dell'Elettronica, 12/C
36016 Thiene (VI) – ITALY

Date of receipt of test item	: 08.07.14
Testing start date	: 25.07.14
Testing end date	: 29.09.14
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 P140778

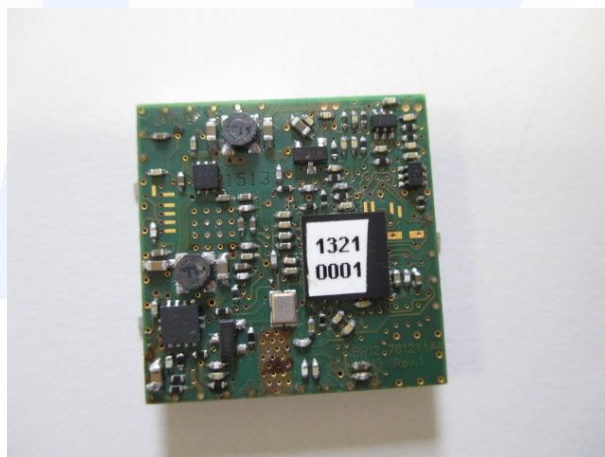
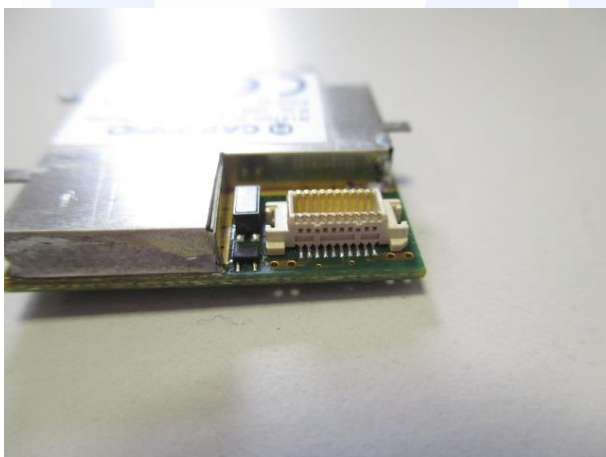
EUT exercising : EUT in continuous transmission at maximum power

Auxiliary Equipment : - USB interface model R1270CEVB
- Personal computer



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 S129	Rohde & Schwarz	ESPI7	Receiver	836.914/004	January '14	January '15
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
Discontinuous Conducted 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	--
ANSI C63.4	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.

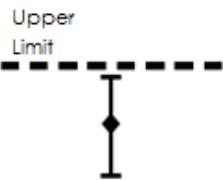
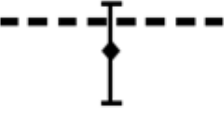
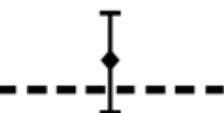


11. Results

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
			
The sample is Complies.	The sample is Complies.	The sample is Not Complies.	The sample is Not Complies.
The measurement results is within the specification limit when the measurement uncertainty is taken into account.	It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty although the measurement result is below the limit.	It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty also the measurement result is upper the limit.	The measurement results is outside the specification limit when the measurement uncertainty is taken into account.

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
- 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 (%)
22	100	45

Result

Antenna Type	External R.F. power amplifier	Gain	Remarks	Results
External antenna	Not Present	0,7dBi	--	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 S206
Measurement uncertainty: See clause 7 of this test report

Test specification

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

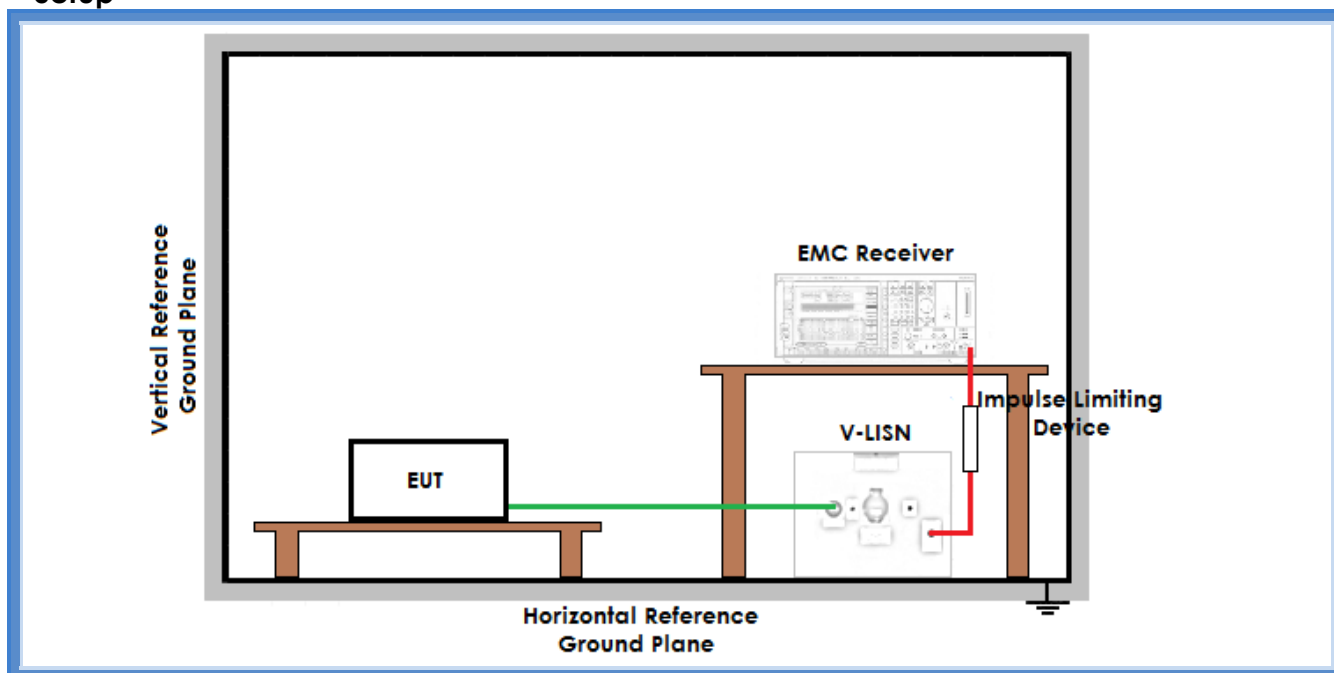
Environmental conditions

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

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
USB -	G14137843	--	Complies
USB +	G14137844	--	Complies
Remarks: --			

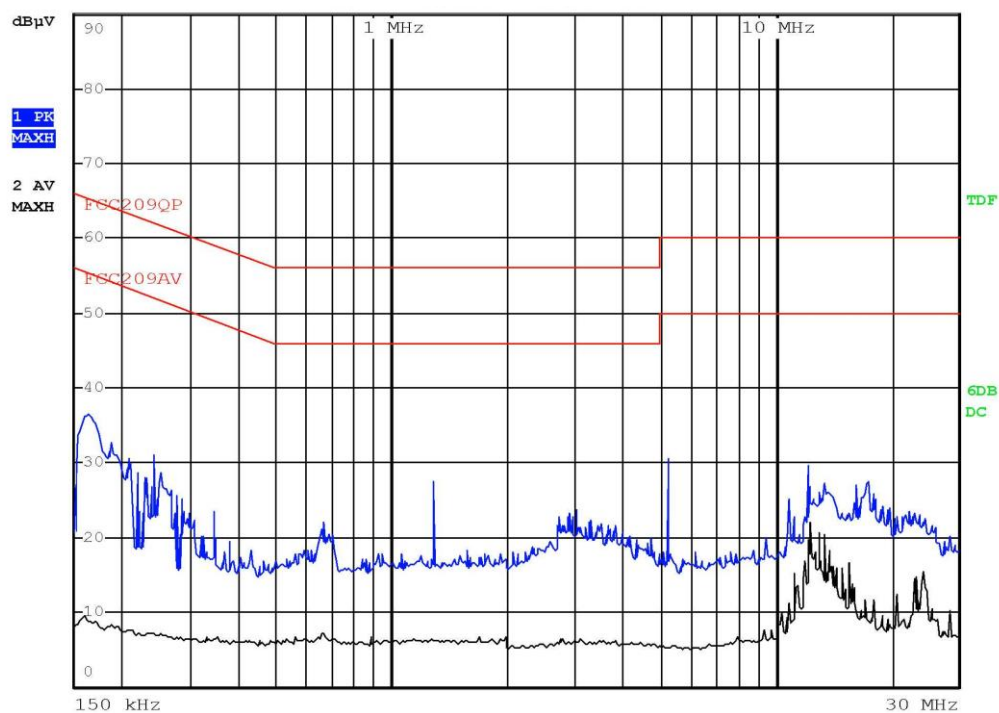
Graphs Legend

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

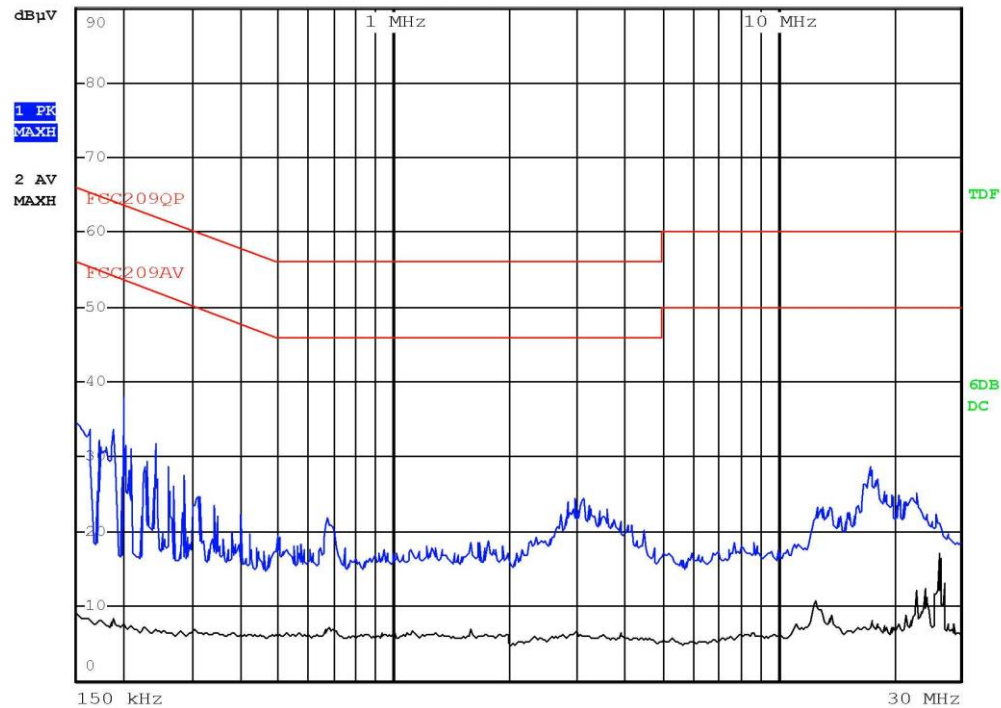
G14137843



Gandini 14137843-Line L-Tx



G14137844



Gandini 14137844-Line N-Tx

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

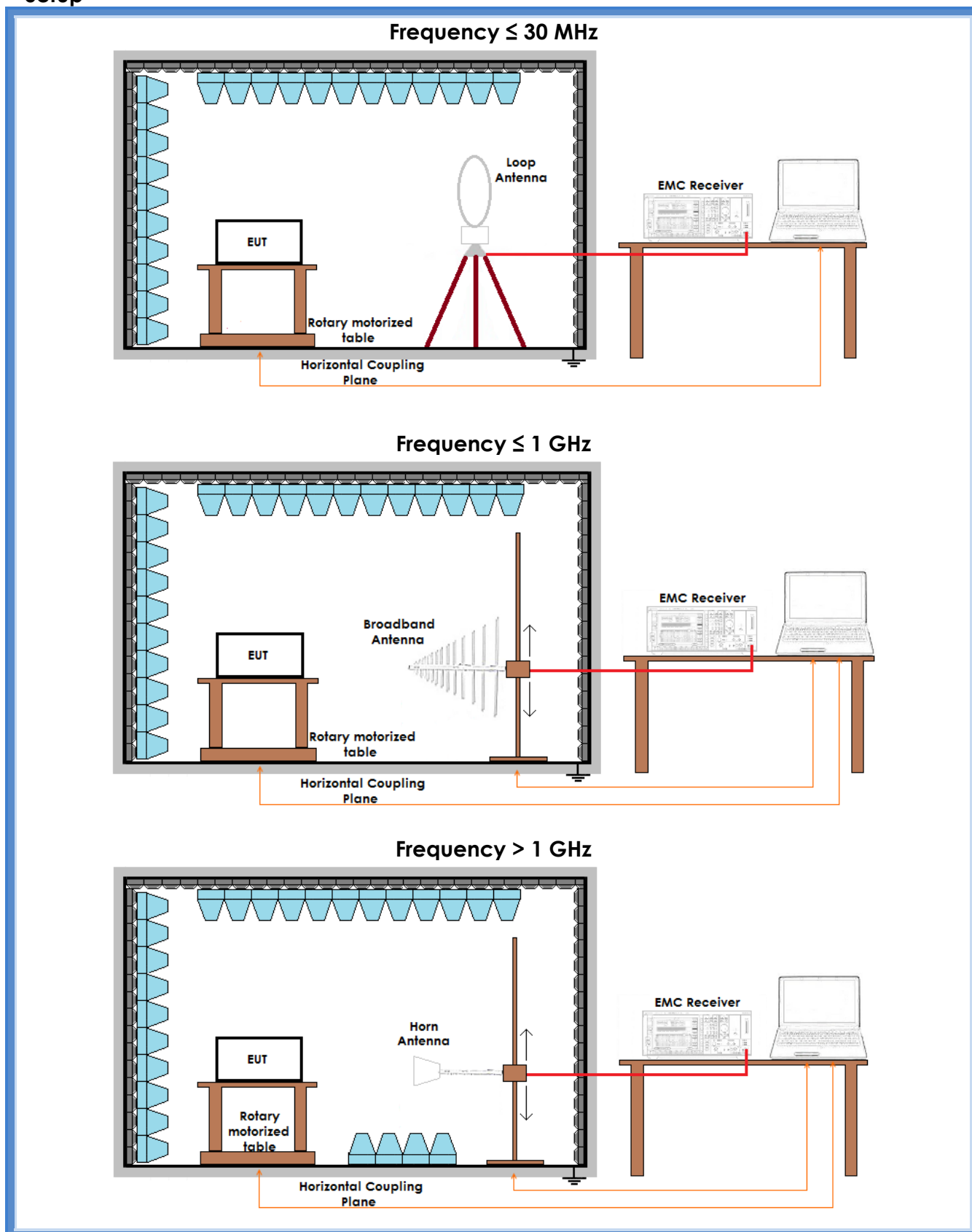
Acceptance limits

Frequency range (MHz)	Limits [dB(μV/m)]
0,009 to 0,490	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
--	H	1000 – 10000	G14137826	--	Complies
--	V	1000 – 10000	G14137827	--	Complies
927,25 MHz	V	30 – 1000	G14137836	--	Complies
927,25 MHz	H	30 – 1000	G14137837	--	Complies
914,75 MHz	H	30 – 1000	G14137838	--	Complies
914,75 MHz	V	30 – 1000	G14137839	--	Complies
902,75 MHz	V	30 – 1000	G14137840	--	Complies
902,75 MHz	H	30 – 1000	G14137841	--	Complies
--	Loop	0,009 – 30	G14137842	--	Complies

Remarks: --

Graphs Legend

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

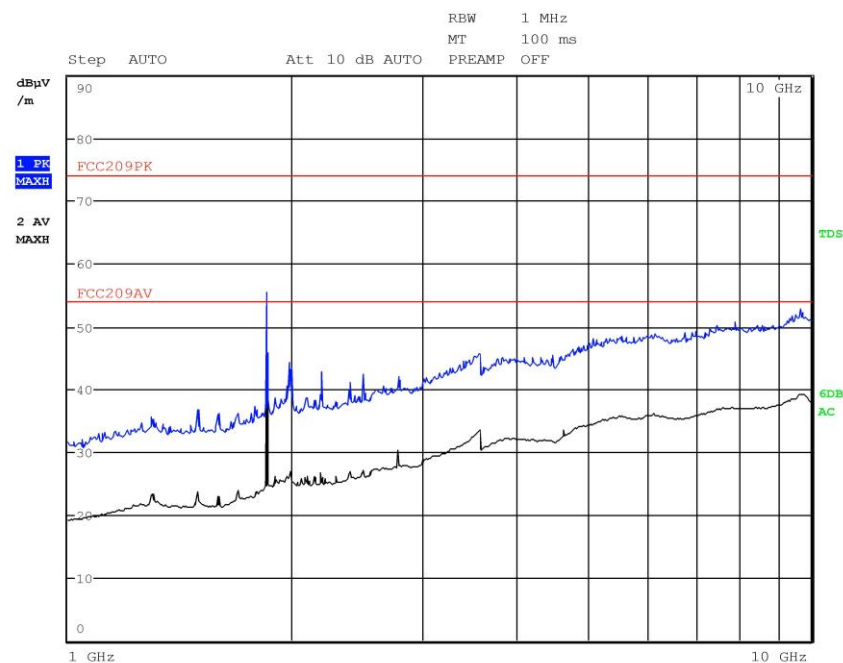
AV: Average; AV [1s] (average at 1 second) values are marked with a x



Graphs

G14137826

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx
Operator Gandini 14137826
Test Spec
Horiz



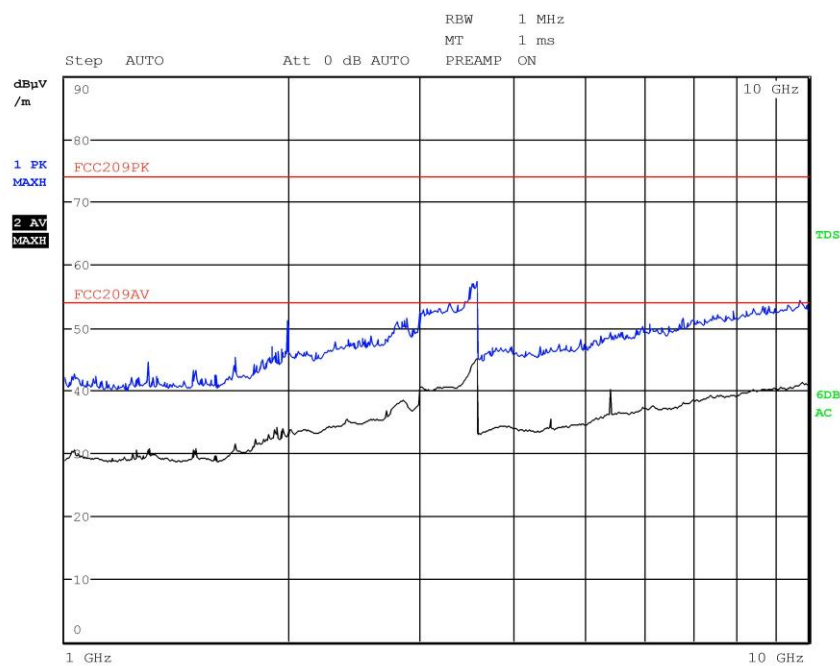
Final Measurement

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



G14137827

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx
Operator Gandini 14137827
Test Spec
Vert



Final Measurement

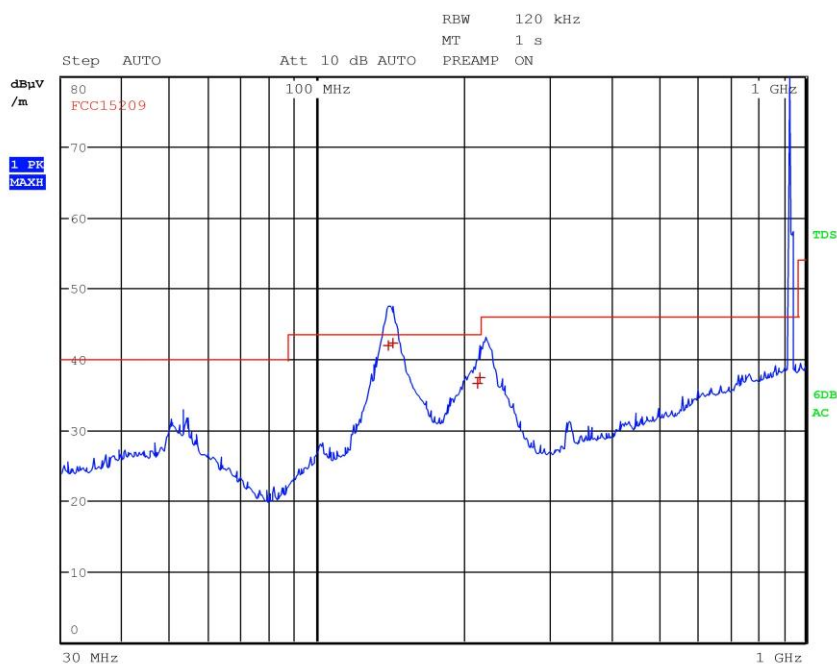
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	140.200000000 MHz	43.03	Quasi Peak	3.03
1	141.600000000 MHz	42.95	Quasi Peak	2.95
1	222.160000000 MHz	37.38	Quasi Peak	-2.62



G14137836

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx - Fmax
Operator Gandini 14137836
Test Spec
Vert



Final Measurement

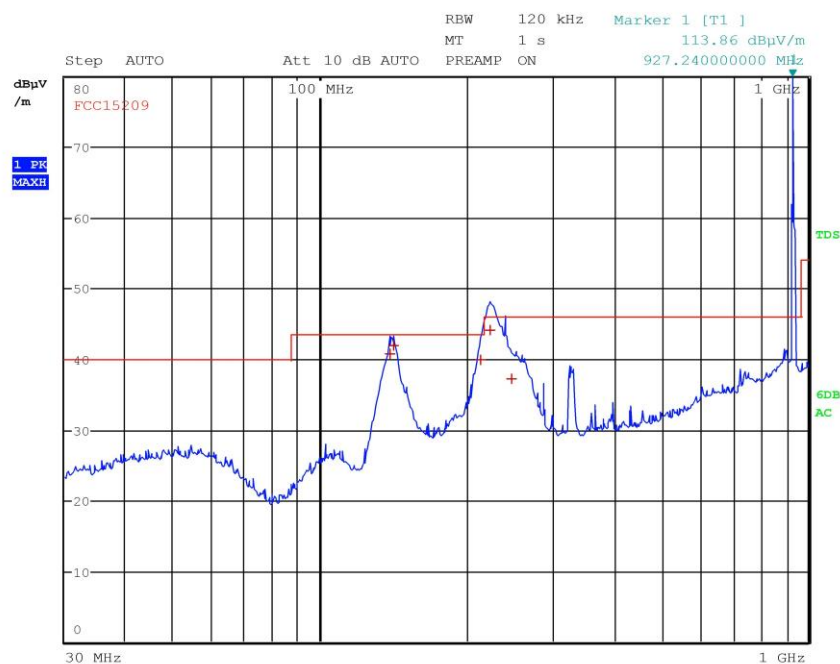
Meas Time: 1 s
Margin: 6 dB
Subranges: 4

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	140.200000000 MHz	41.99	Quasi Peak	-1.53
1	142.760000000 MHz	42.27	Quasi Peak	-1.25
1	213.640000000 MHz	36.55	Quasi Peak	-6.97
1	215.360000000 MHz	37.32	Quasi Peak	-6.20



G14137837

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx - Fmax
Operator Gandini 14137837
Test Spec
Horiz



Final Measurement

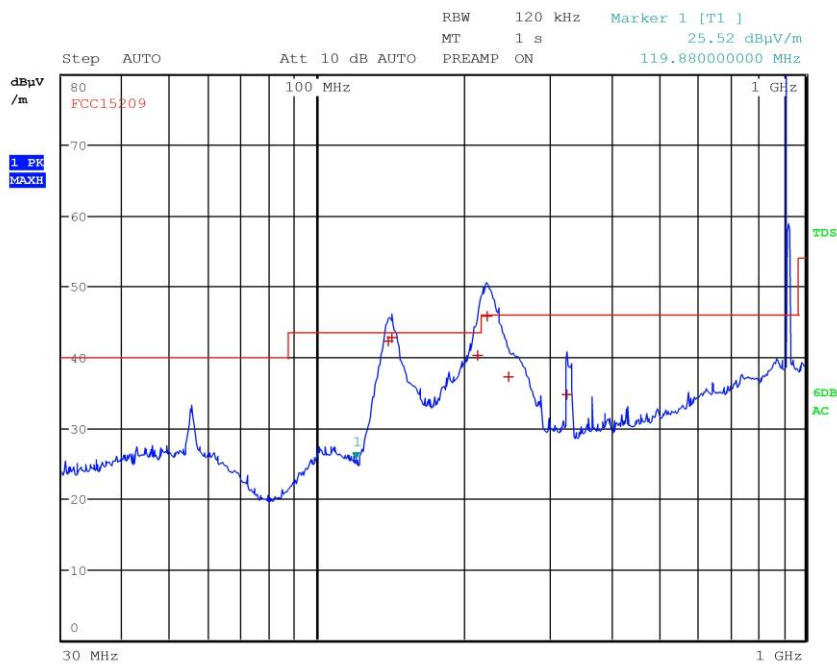
Meas Time: 1 s
Margin: 6 dB
Subranges: 5

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	139.120000000 MHz	40.75	Quasi Peak	-2.77
1	141.160000000 MHz	41.87	Quasi Peak	-1.65
1	213.640000000 MHz	39.89	Quasi Peak	-3.63
1	222.600000000 MHz	44.08	Quasi Peak	-1.94
1	247.040000000 MHz	37.25	Quasi Peak	-8.77



G14137838

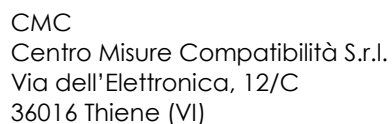
Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx - Fmed
Operator Gandini 14137838
Test Spec
Horiz



Final Measurement

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

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	140.240000000 MHz	42.29	Quasi Peak	-1.23
1	141.920000000 MHz	42.80	Quasi Peak	-0.72
1	213.560000000 MHz	40.30	Quasi Peak	-3.22
1	223.400000000 MHz	45.88	Quasi Peak	-0.14
1	246.920000000 MHz	37.28	Quasi Peak	-8.74
1	325.240000000 MHz	34.65	Quasi Peak	-11.37



3W 120 kHz Marker 1 [T1]
 T 1 s 30.46 dBuV/m
 REAMP ON 457.92000000 MHz

1 GHz

TDS
 6DB
 AC

1 GHz

RBW 120 kHz Marker 1 [T1]
 MT 1 s 30.46 dBμV/m
 Att 10 dB AUTO PREAMP ON 457.92000000 MHz

Step AUTO

dBμV /m

80
 70
 60
 50
 40
 30
 20
 10
 0

1 PK
 MAXH

100 MHz

1 GHz

30 MHz

1 GHz

TDS
 6dB
 AC

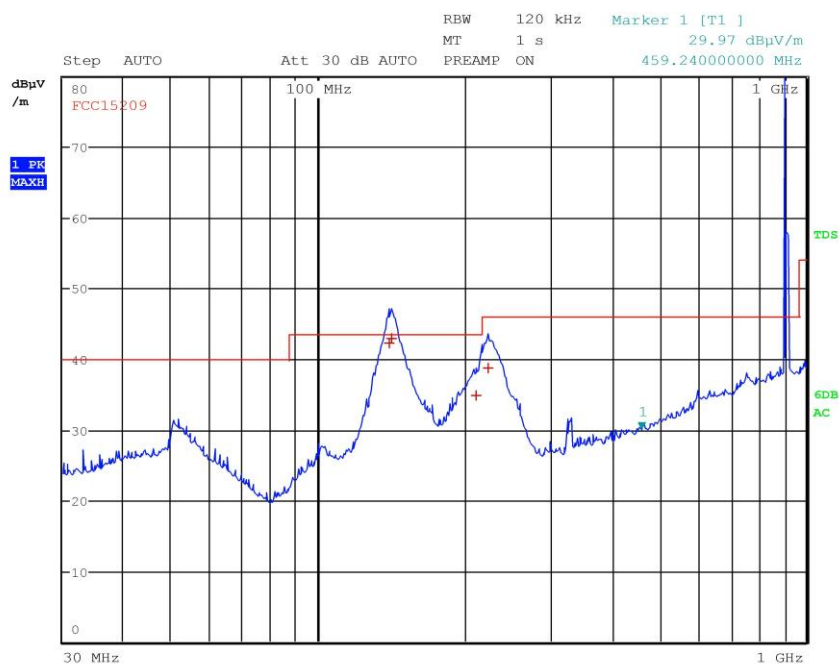
Meas Time: 1 s
Margin: 6 dB
Subranges: 4

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	140.320000000 MHz	43.01	Quasi Peak	-0.51
1	142.080000000 MHz	43.03	Quasi Peak	-0.49
1	213.080000000 MHz	34.11	Quasi Peak	-9.41
1	215.960000000 MHz	36.58	Quasi Peak	-6.94



G14137840

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx - Fmin
Operator Gandini 14137840
Test Spec
Vert



Final Measurement

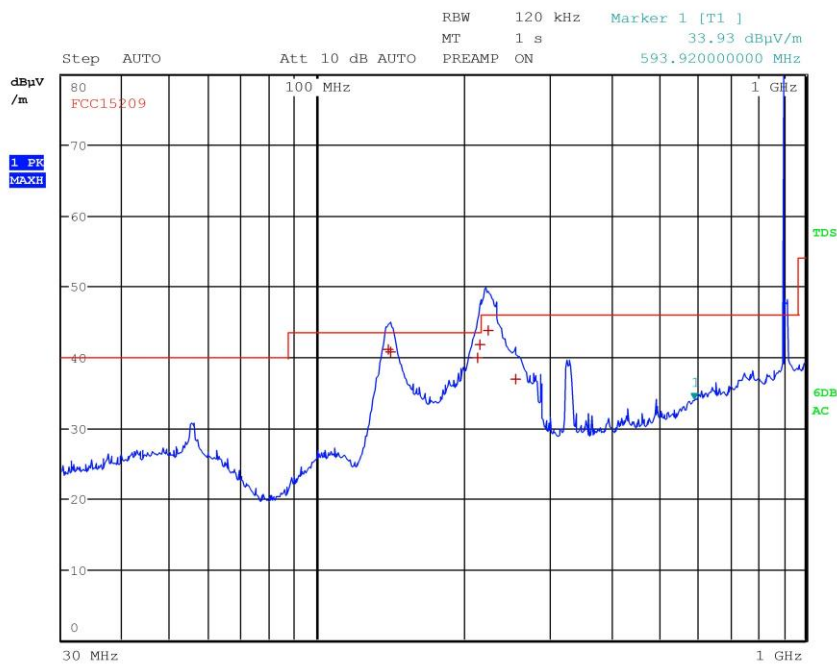
Meas Time: 1 s
Margin: 6 dB
Subranges: 4

Trace	Frequency	Level (dBuV/m)	Detector	Delta Limit/dB
1	139.880000000 MHz	42.23	Quasi Peak	-1.29
1	141.480000000 MHz	42.86	Quasi Peak	-0.66
1	210.680000000 MHz	34.93	Quasi Peak	-8.59
1	223.560000000 MHz	38.69	Quasi Peak	-7.33



G14137841

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx - Fmin
Operator Gandini 14137841
Test Spec
Horiz



Final Measurement

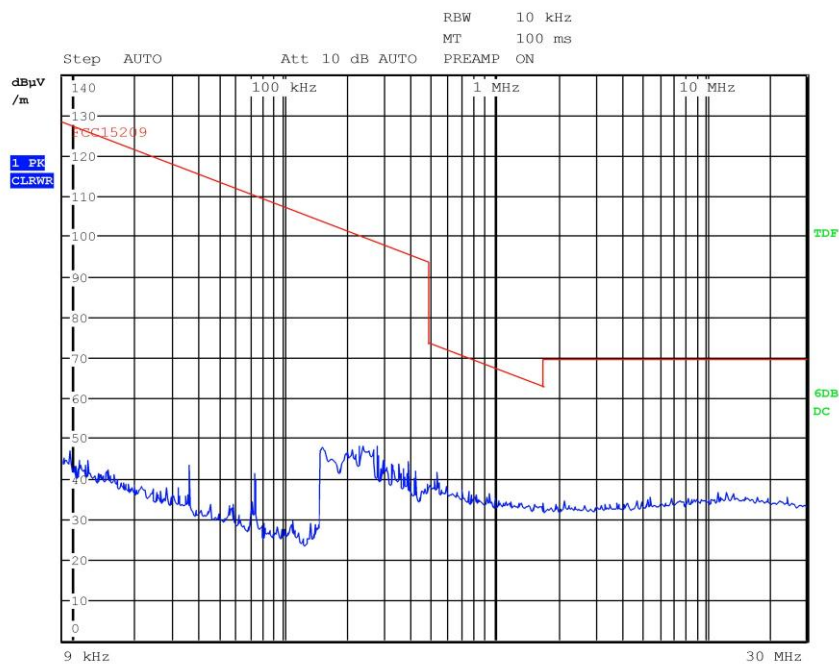
Meas Time: 1 s
Margin: 6 dB
Subranges: 6

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	140.080000000 MHz	41.11	Quasi Peak	-2.41
1	141.600000000 MHz	40.83	Quasi Peak	-2.69
1	213.720000000 MHz	39.85	Quasi Peak	-3.67
1	215.320000000 MHz	41.85	Quasi Peak	-1.67
1	224.160000000 MHz	43.81	Quasi Peak	-2.21
1	255.480000000 MHz	36.84	Quasi Peak	-9.18



G14137842

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx
Operator Gandini 14137842
Test Spec
Loop



Final Measurement

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

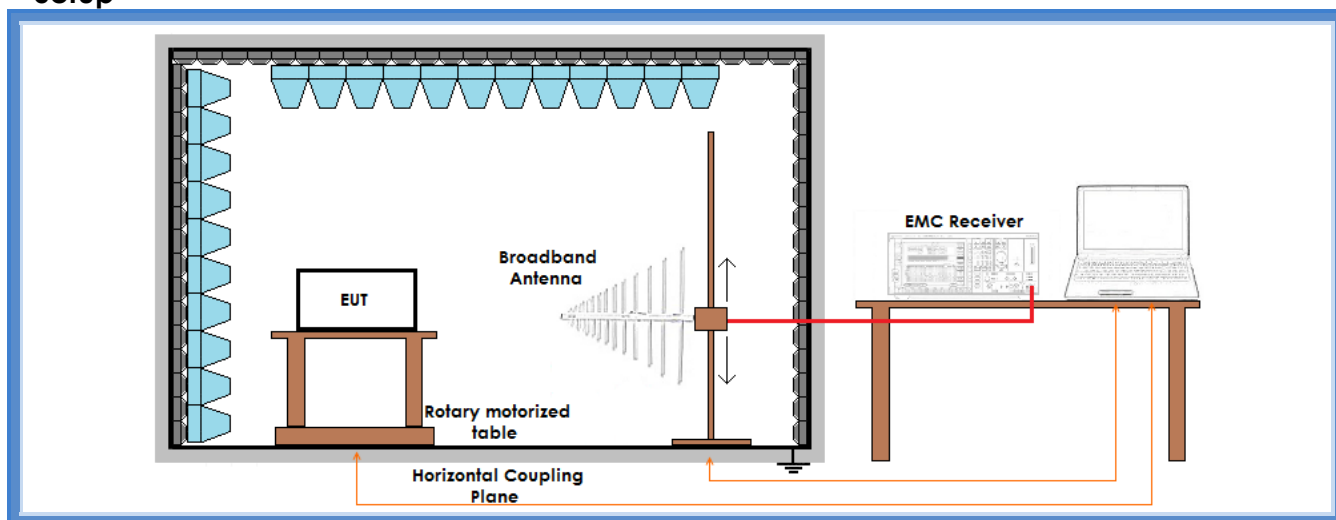
Environmental conditions

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



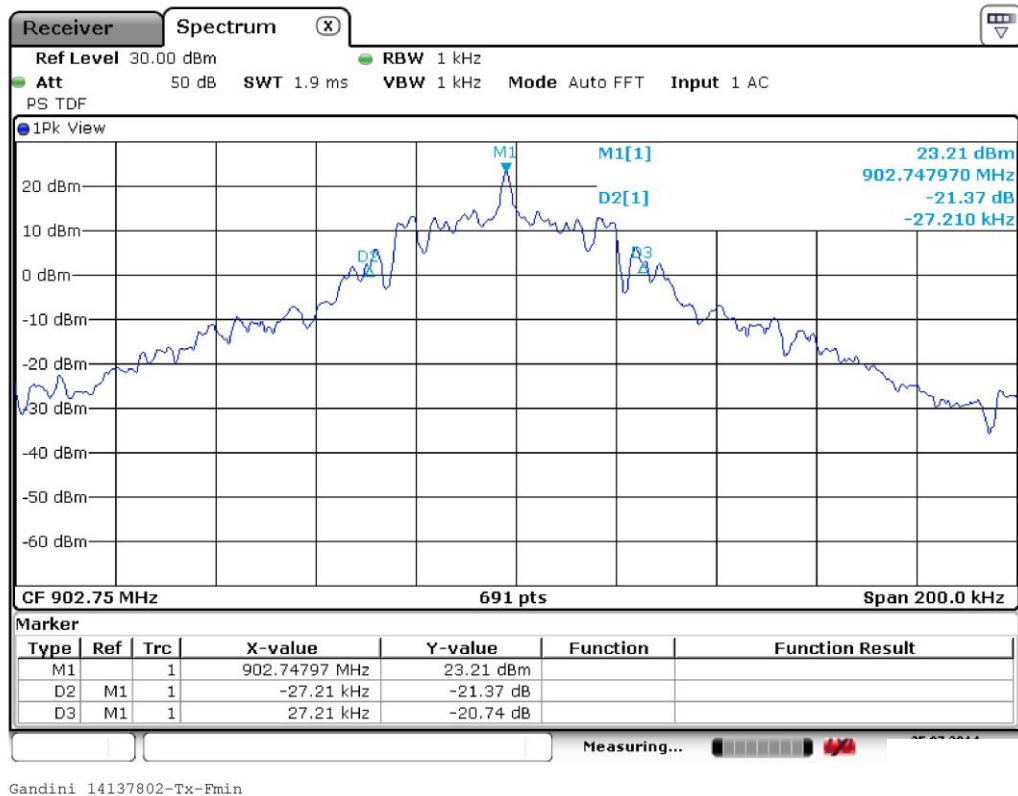
Result

Frequency (MHz)	Graphs	20 dB bandwidth (kHz)	Results
902,75	G14137802	54,42	Complies
914,75	G14137807	58,12	Complies
927,25	G14137815	52,10	Complies



Graphs

G14137802





G14137807



Gandini 14137807-Tx-Fmed



G14137815



Gandini 14137815-Tx-Fmax

Result: The requirements are met