CMC Centro Misure Compatibilità S.r.l.
Via dell'Elettronica, 12/C
36016 Thiene (VI) – ITALY
Tel./Fax +39 0445 367702
www.cmclab.it - info@cmclab.it

Independent Testing Laboratory

TEST REPORT nr. R15072101

Federal Communication Commission (FCC)

Test item

Description ..... :	MIFARE/NFC READER
Trademark ..... :	GLOBAL DISPLAY SOLUTIONS
Model/Type ..... :	BRD02267
FCC ID ..... :	XZR0WQ00528

Test Specification

Standard ..... :	FCC Rules & Regulations, Title 47:2014 Part 15 paragraph(s): 203, 204, 207, 209, 215 and 225

Client's name ..... :	GLOBAL DISPLAY SOLUTIONS S.p.A.
Address ..... :	Via Tezze, 20/A – 36073 Cornedo Vicentino (VI) – ITALY
Manufacturer's name :	Same as client
Address ..... :	--

Report

Tested by ..... :	G. Gandini – *Technician*
Approved by ..... :	R. Beghetto – *Laboratory Manager*
Date of issue ..... :	18.06.15
Contents ..... :	38 pages

Index

1. Summary

Standard:

FCC Rules & Regulations, Title 47:2014
Part 15 paragraph(s): 203, 204, 207, 209, 215 and 225

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 15.225	Field strength with the assigned band	4	Complies
Part 15.225 (e)	Frequency tolerance	5	Complies
Part 15.215	20 dB bandwidth	6	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	:	3,3 Vdc
GDS Part Number	:	BRD02267
Customer Part Number	:	0WQ00528
Type of equipment	:	☑ Transmitter Unit
		☑ Receiver Unit
Type of station	:	❑ Fixed station
		❑ Portable station
		☑ Mobile station
Nominal frequency	:	13,56 MHz

2.1 Test Site

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

3. Testing and sampling

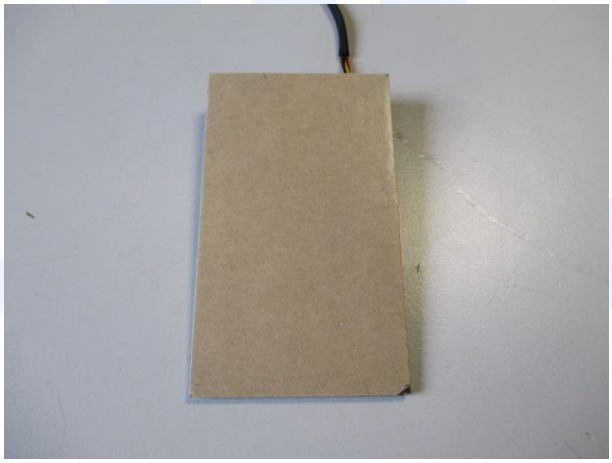
Date of receipt of test item	:	22.04.15
Testing start date	:	30.04.15
Testing end date	:	22.05.15
Samples tested nr.	:	1
Sampling procedure.	:	Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion
Internal identification	:	adhesive label with the product number P150440

4. Operative conditions

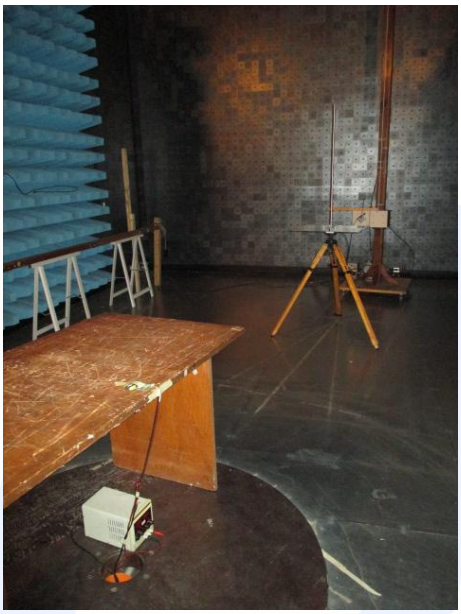
EUT exercising	:	EUT in continuous transmission at maximum power

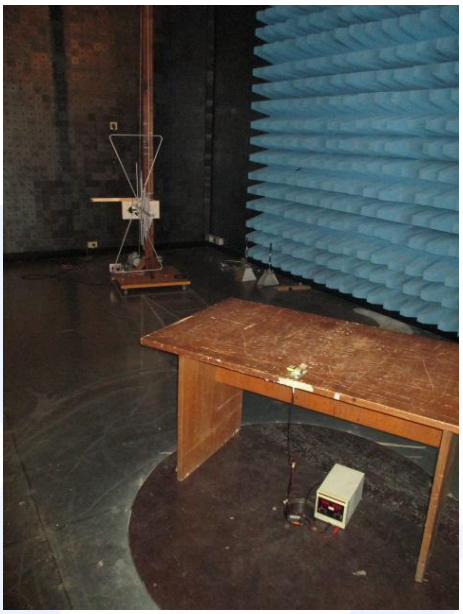
5. Photograph(s) of EUT

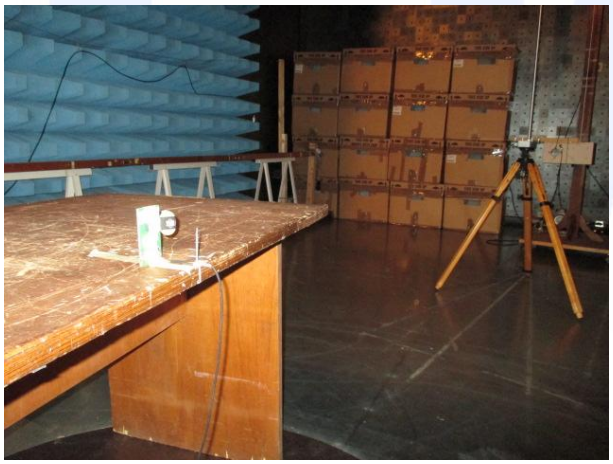
5.1 Photograph(s) of EUT

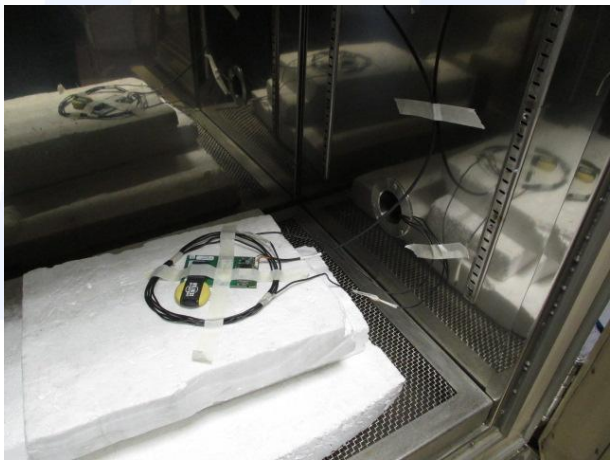


5.2 Photograph(s) of setup









6. Equipment list

Id. number	*Manufacturer*	*Model*	*Description*	*Serial number*	*Last calibration*	*Due date calibration*
CMC S010	Rohde & Schwarz	ESH3-Z2	Impulses Limiting Device	- - -	January '15	January '16
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 '15	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 '15	January '16
CMC S200	Schwarzbeck	NSLK 8128	V-LISN	8128-273	January '15	January '16
CMC S227	Rohde & Schwarz	ESR7	EMI Test Receiver 7GHz	101121	January '15	January '16

7. Measurement uncertainty

Test	Expanded Uncertainty	note
Conducted Emission		
(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)	±2.8 dB	1
(50Ω/5µH AMN) - (150 kHz – 108 MHz)	±2.6 dB	1
Discontinuous Conducted Emission		
Conducted Emission (50Ω/50µH AMN) - (150 kHz – 30 MHz)	±3.0 dB	1
Disturbance Power (30 MHz – 300 MHz)	±3.7 dB	1
Radiated Emission		
(0,150 MHz – 30 MHz)	±4.0 dB	1
(30 MHz – 1000 MHz)	±4.3 dB	1
(1 GHz – 6 GHz)	±4.5 dB	1
Electromagnetic field EMF	±10.5 %	1
Harmonic current emissions test	±1.8 %	1
Voltage fluctuation and flicker test	±2.6 %	1
Insertion loss test	±2.0 dB	1
Radiated electromagnetic disturbance test (loop antenna)	±2.1 dB	1
Radiated electromagnetic field immunity test	0.81 V/m at 3V/m	1
Pulse modulated radiated electromagnetic field immunity test	0.81 V/m at 3V/m	1
Injected currents immunity test	0.45 V at 3V	1
Bulk current	3.7 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)	±4.3 dB	1
Effective radiated power (F > 1GHz)	±3.7 dB	1
Frequency error	< 1x10-7	1
Modulation bandwidth	< 1x10-7	1
Conducted RF power and spurious emission	±0.7 dB	1
Adjacent channel power	±1.2 dB	1
Blocking	±1.2 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 15:2014	--
ANSI C63.4:2009	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

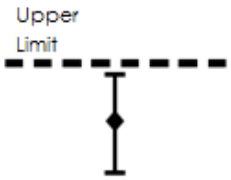
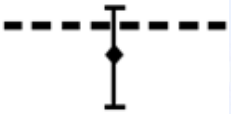
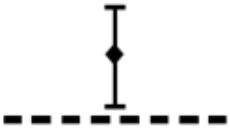
Test case does not apply to the test object ..... : N.A.
Test item does meet the requirement ..... : Complies
Test item does not meet the requirement..... : Does not comply
Test not performed ..... : N.E.

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 complies with the requirement.	The sample complies with the requirement.	The sample does not comply with the requirement.	The sample does not comply with the requirement.
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
- 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	42

Result

Antenna Type	*External R.F. power amplifier*	*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 S206
Measurement uncertainty: See clause 7 of this test report

Test specification

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

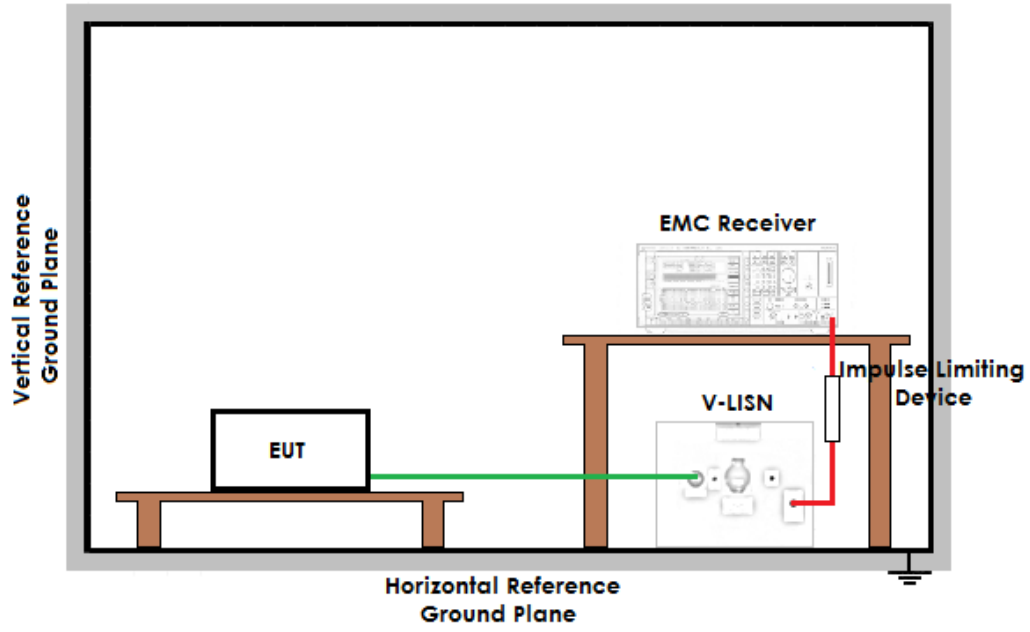
Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	101	45

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

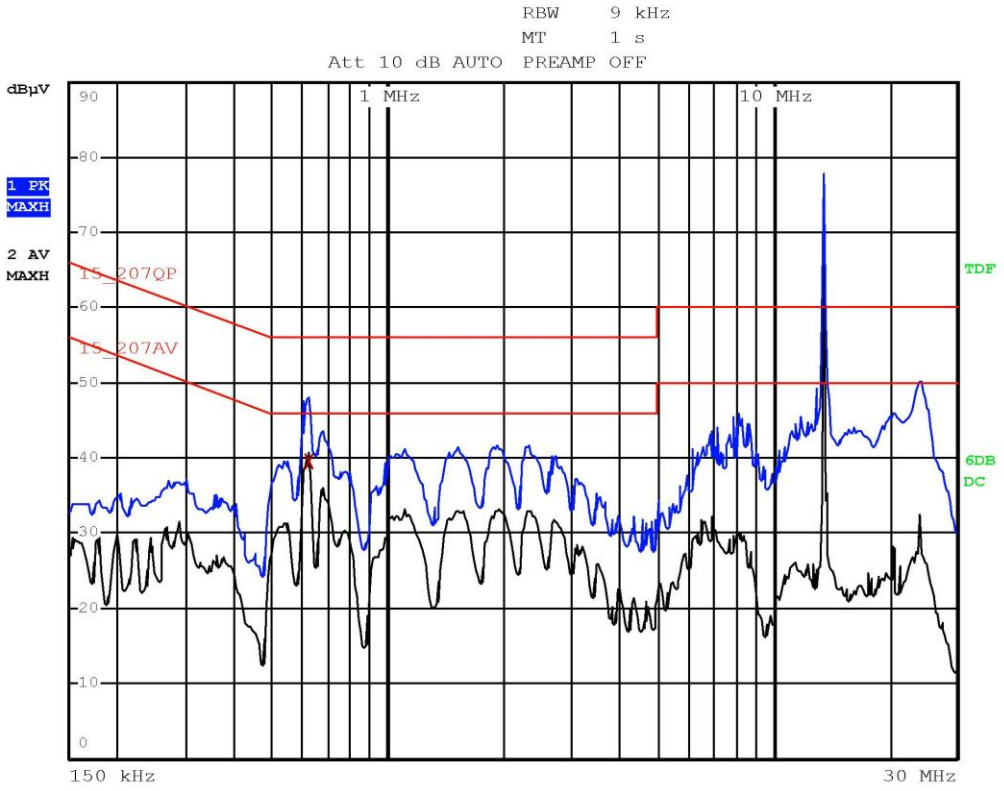
Line	*Graphs*	*Remarks*	*Result*
L1	G15072101	--	Complies
N	G15072102	--	Complies
Remarks:	Peaks above the limits are due to the main transmitting frequency. Tests performed on 110 Vac side of power unit		

Line	*Graphs*	*Remarks*	*Result*
L1	G15072117	--	Complies
N	G15072118	--	Complies
Remarks:	Tests repeated closing the RF output with 50 Ω resistance instead of antenna. Tests performed on 110 Vac side of power unit		

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

G15072101

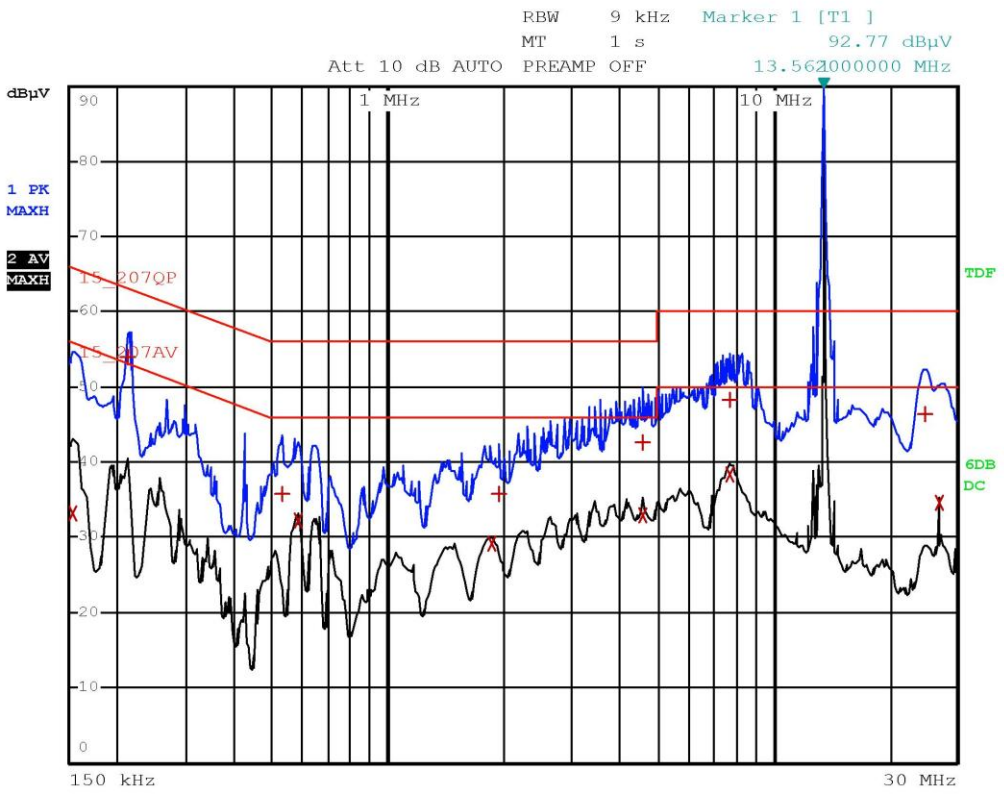


Gandini 15072101-Line L-Continua lettura chiave

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	622 kHz	39.59	-6.40

Gandini 15072101-Line L-Continua lettura chiave

G15072102

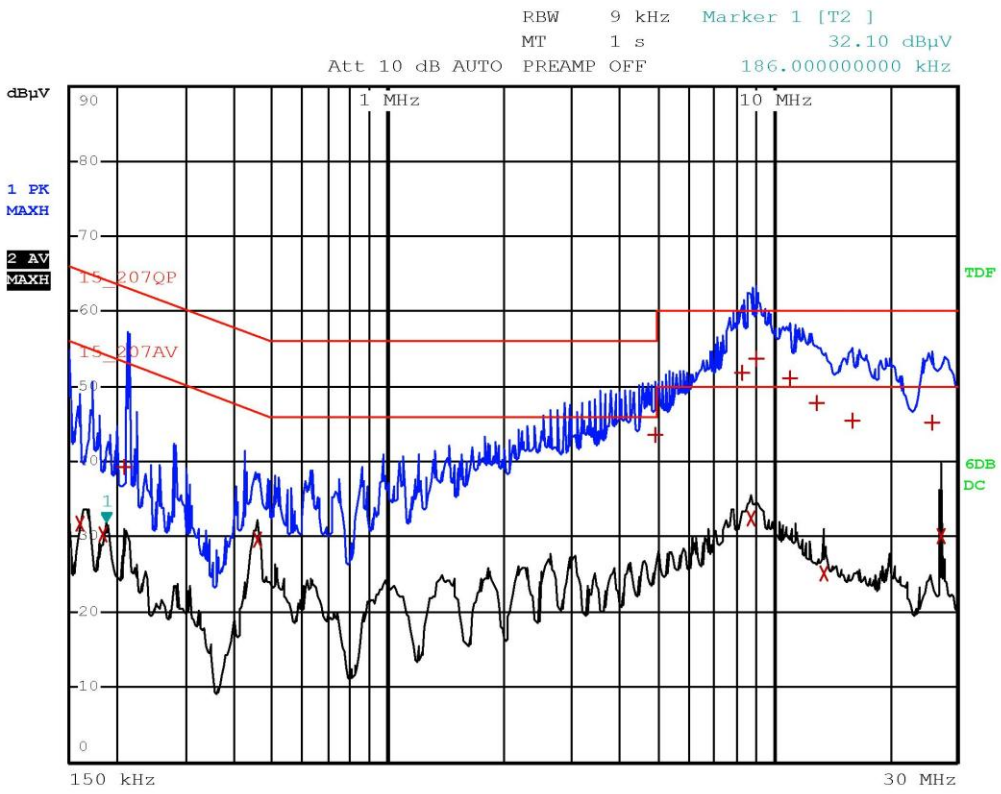


Gandini 15072102-Line (-) - Tx-Rx

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	154 kHz	33.18	-22.59
1 Quasi Peak	214 kHz	53.88	-9.16
1 Quasi Peak	530 kHz	35.67	-20.32
2 Average	582 kHz	32.21	-13.78
2 Average	1.87 MHz	29.25	-16.74
1 Quasi Peak	1.95 MHz	35.77	-20.22
1 Quasi Peak	4.602 MHz	42.62	-13.37
2 Average	4.602 MHz	32.97	-13.02
1 Quasi Peak	7.758 MHz	48.42	-11.57
2 Average	7.758 MHz	38.44	-11.56
1 Quasi Peak	24.77 MHz	46.35	-13.64
2 Average	27.122 MHz	34.63	-15.36

Gandini 15072102-Line (-) - Tx-Rx

G15072117

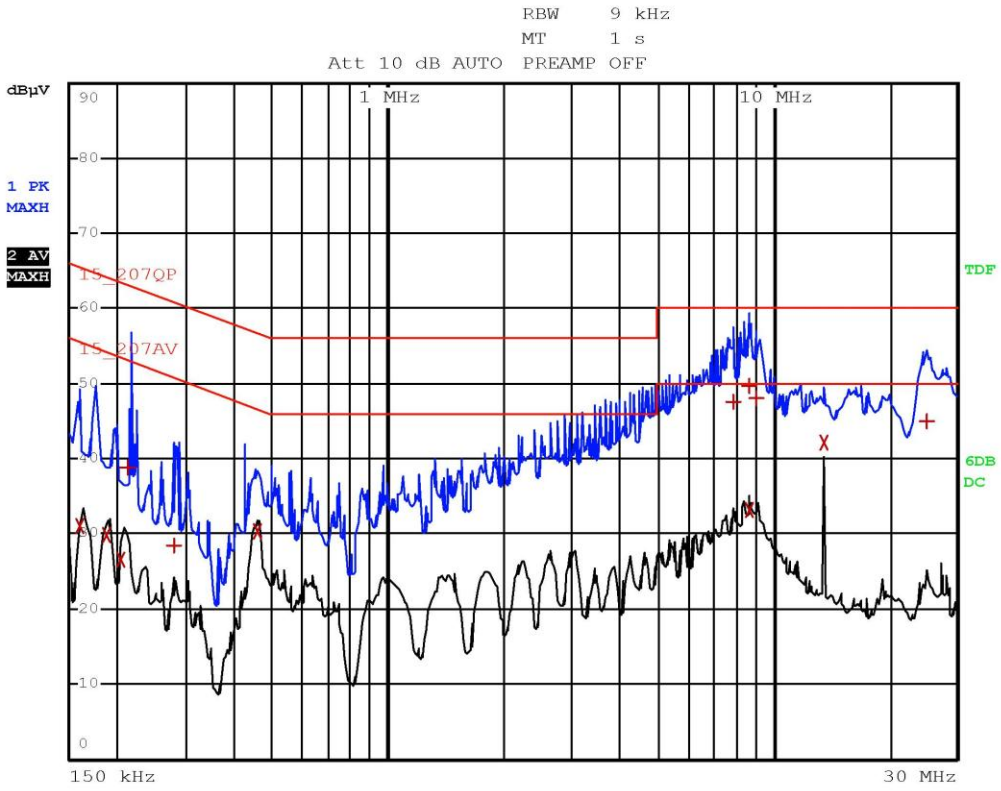


Gandini 15072117-Line L - Tx-Rx

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	162 kHz	31.73	-23.62
2 Average	186 kHz	30.31	-23.90
1 Quasi Peak	210 kHz	39.28	-23.91
2 Average	458 kHz	29.68	-17.04
1 Quasi Peak	4.946 MHz	43.48	-12.51
1 Quasi Peak	8.334 MHz	51.77	-8.22
2 Average	8.79 MHz	32.44	-17.56
1 Quasi Peak	9.022 MHz	53.77	-6.22
1 Quasi Peak	11.03 MHz	51.23	-8.76
1 Quasi Peak	12.982 MHz	47.89	-12.10
2 Average	13.558 MHz	25.07	-24.92
1 Quasi Peak	16.034 MHz	45.52	-14.48
1 Quasi Peak	25.802 MHz	45.27	-14.72
2 Average	27.126 MHz	30.23	-19.77

Gandini 15072117-Line L - Tx-Rx

G15072118



Gandini 15072118-Line N - Tx-Rx

EDIT PEAK LIST (Final Measurement Results)

Trace1:	15_207QP
Trace2:	15_207AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	162 kHz	31.01	-24.34
2 Average	190 kHz	29.97	-24.06
2 Average	206 kHz	26.62	-26.74
1 Quasi Peak	214 kHz	38.75	-24.29
1 Quasi Peak	278 kHz	28.47	-32.39
2 Average	458 kHz	30.40	-16.32
1 Quasi Peak	7.874 MHz	47.53	-12.46
2 Average	8.678 MHz	33.30	-16.69
1 Quasi Peak	8.678 MHz	49.61	-10.38
1 Quasi Peak	9.022 MHz	48.12	-11.87
2 Average	13.558 MHz	42.07	-7.92
1 Quasi Peak	25.114 MHz	45.07	-14.92

Gandini 15072118-Line N - 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
- 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

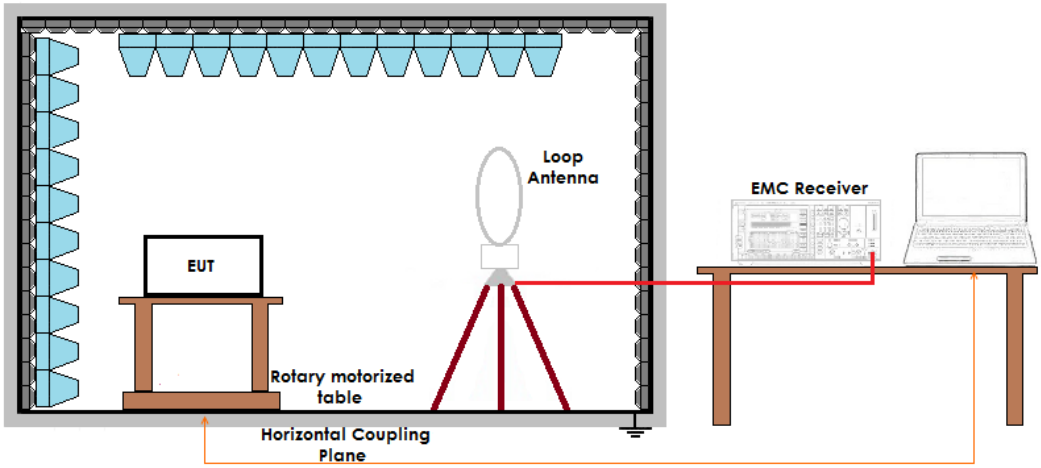
Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	100	42

Acceptance limits

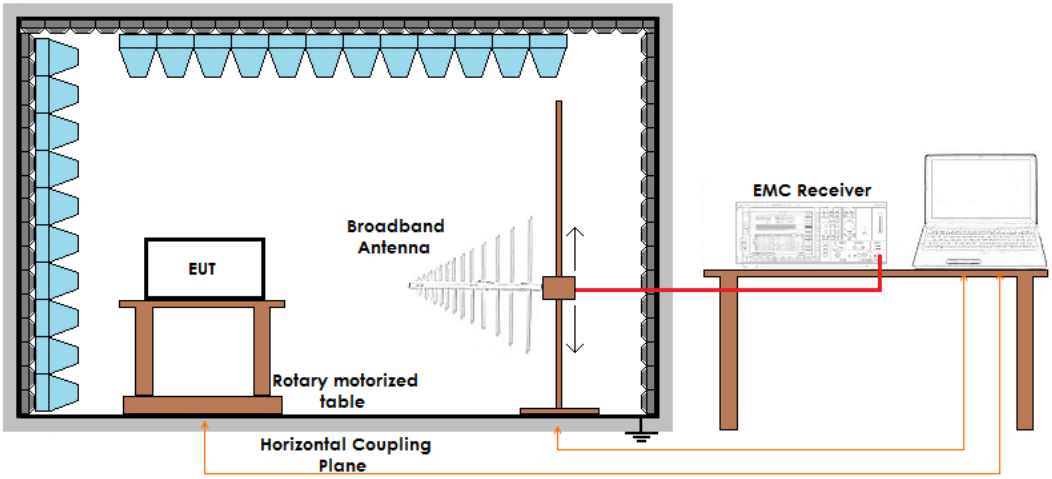
Frequency range (MHz)	*Limits [dB(µV/m)]*
0,009 to 0,490	128,51 to 93,80
0,490 to 1,705	73,80 to 62,97
1,705 to 30	69,54
30 to 88	40
88 to 216	43,52
216 to 960	46,02
Above 960	53,98
Remarks: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except 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

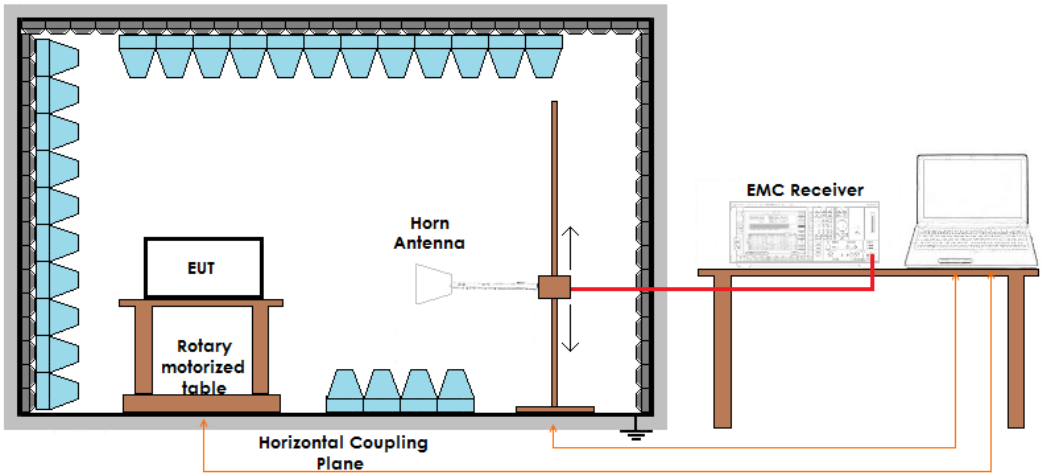
Frequency ≤ 30 MHz



Frequency ≤ 1 GHz



Frequency > 1 GHz



Result

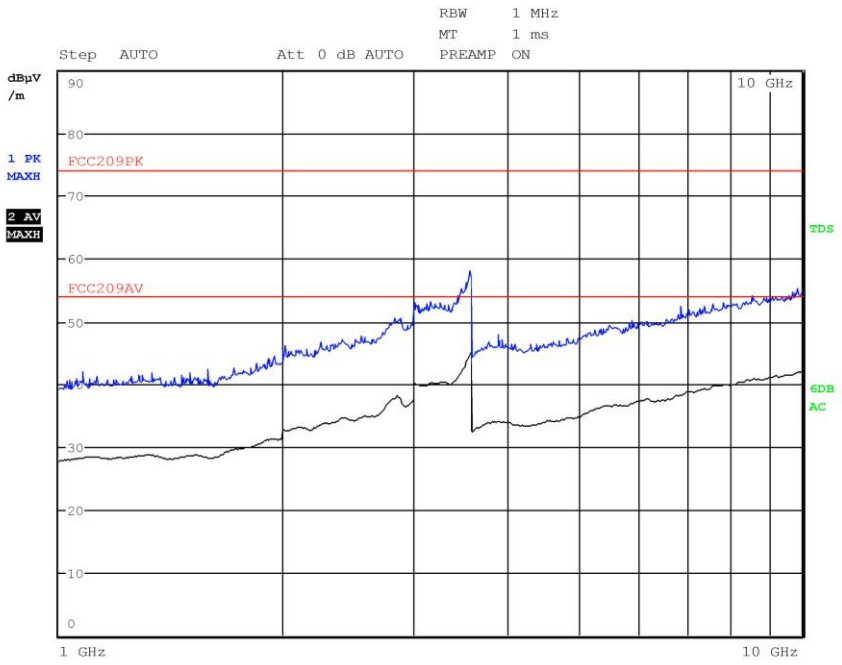
Polarization	*Frequency Range (MHz)*	*Graphs*	*Remarks*	*Result*
Loop	0,009 – 30	G15072107	--	Complies
V	30 – 1000	G15072105	--	Complies
H	30 – 1000	G15072106	--	Complies
V	1000 – 10000	G15072103	--	Complies
H	1000 – 10000	G15072104	--	Complies
Remarks: --				

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

G15072103

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072103
Test Spec
Vert

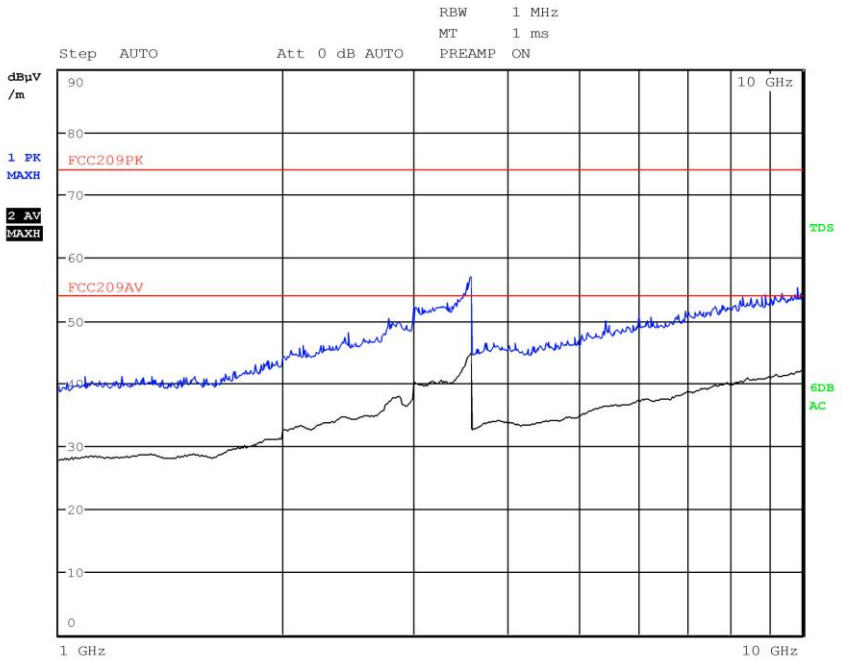


Final Measurement

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

G15072104

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072104
Test Spec
Horiz

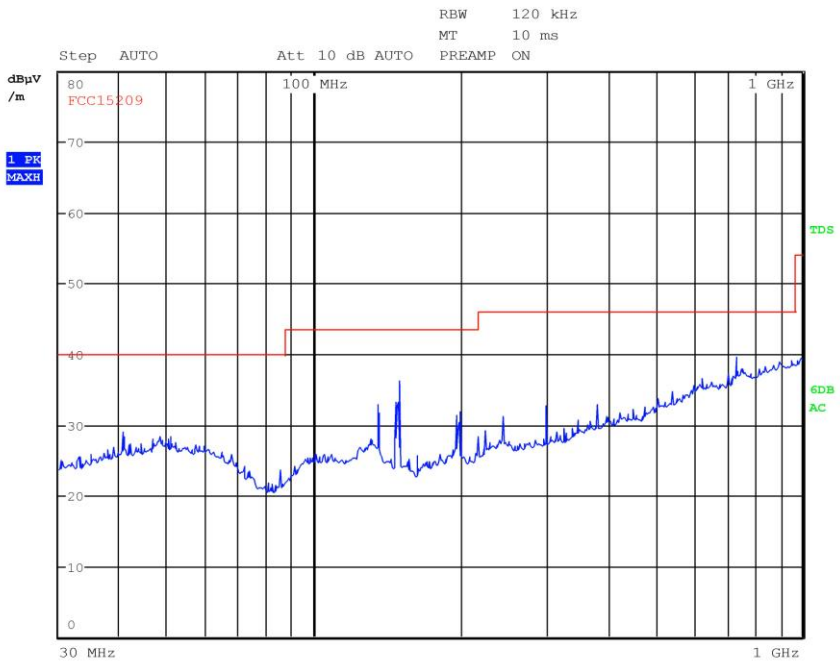


Final Measurement

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

G15072105

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072105
Test Spec
Vert

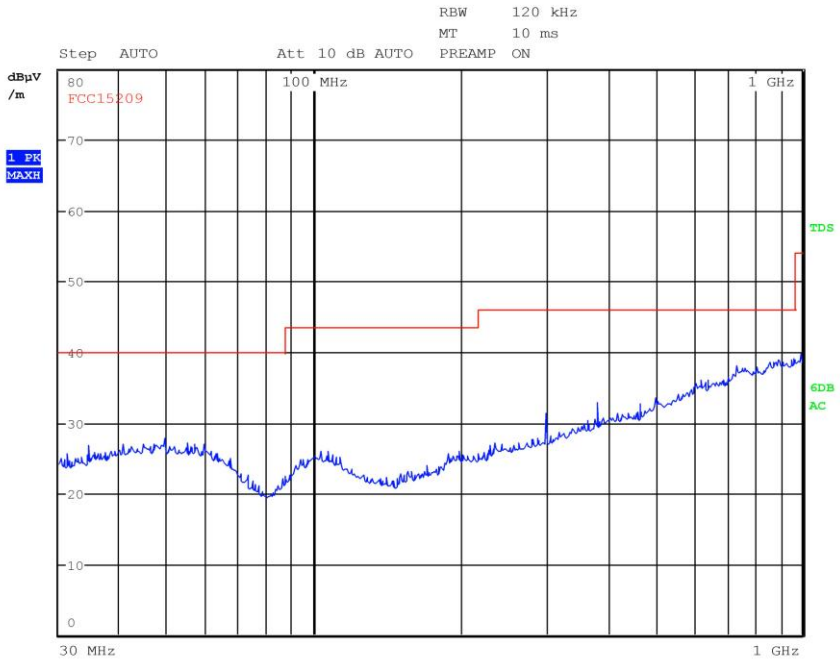


Final Measurement

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

G15072106

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072106
Test Spec
Horiz

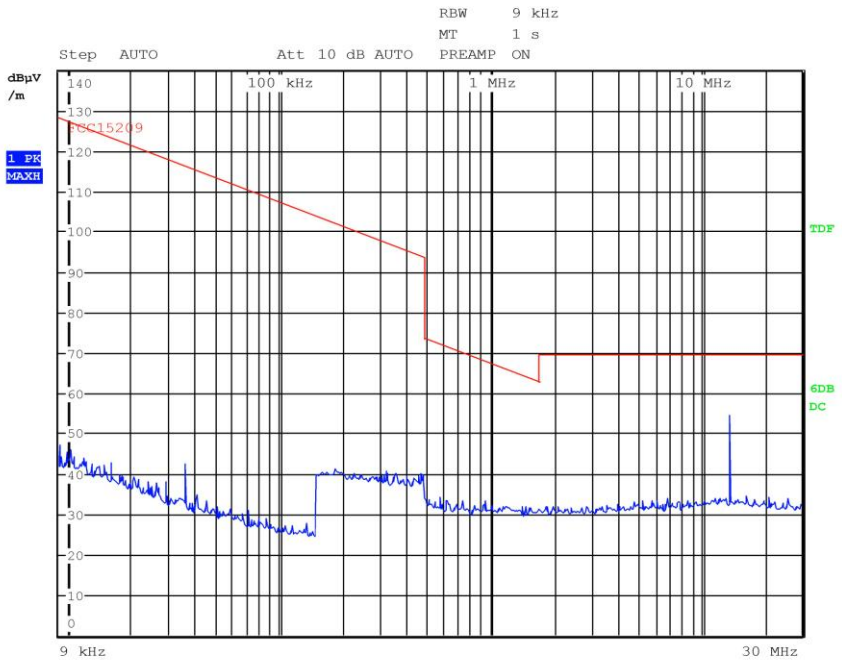


Final Measurement

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

G15072107

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072107
Test Spec
Loop



Final Measurement

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

Result: The requirements are met

11.4 Field strength within the assigned band

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.209 and Part 15.225
- 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 S127, 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

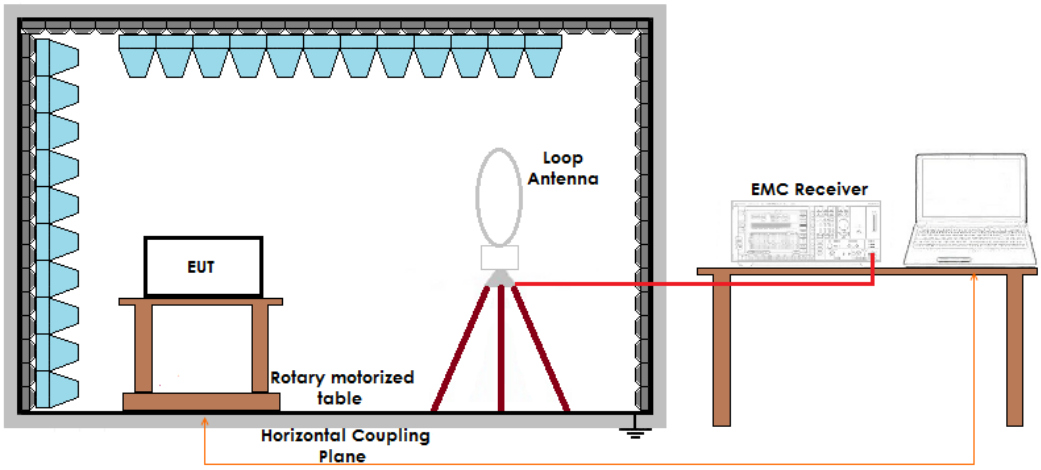
Environmental conditions

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

Acceptance limits

Limits (with antenna distance 3 m)		
cl.	*Frequency range (MHz)*	*dB(µV/m) Quasi-peak*
15.225 (a)	13,553 to 13,567	124
15.225 (b)	13,410 to 13,553 and 13,567 to 13,710	90,5
15.225 (c)	13,110 to 13,410 and 13,710 to 14,010	80,5
15.225 (d)	outside of the 13,110 – 14,010 MHz band	FCC 15.209

Setup



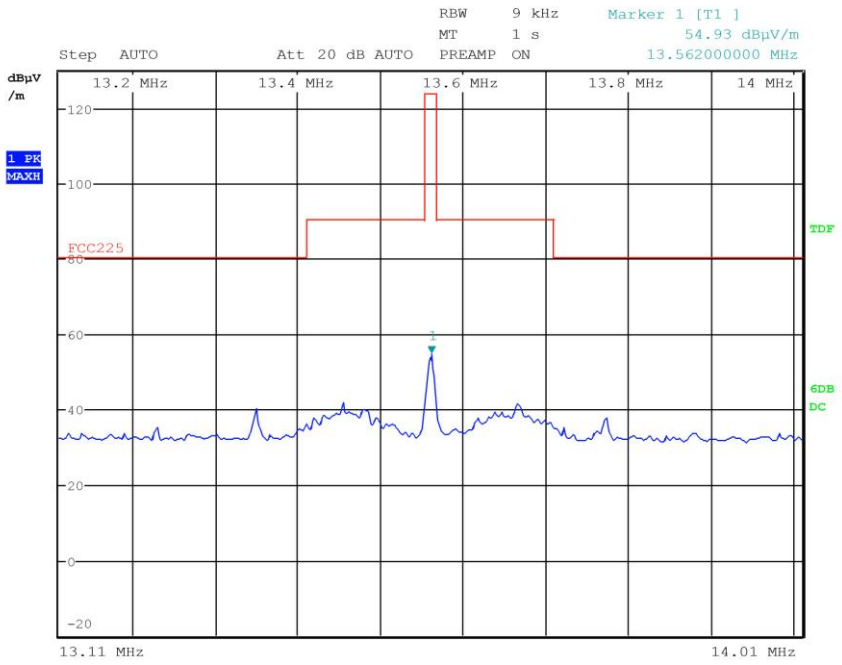
Result

Graph	*Limits (dBµV/m)*	*Level (dBµV/m)*	*Results*
G15072108	124	54,93	Complies
Remarks: EUT was tested in 3 orthogonal planes. The results in this table show the highest value.			

Graph

G15072108

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072108
Test Spec
Loop



Final Measurement

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

Result: The requirements are met

11.5 Frequency tolerance

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.225 (e)
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Climatic chamber

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC B026, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

Port: Enclosure
EUT – Antenna distance: 3 m

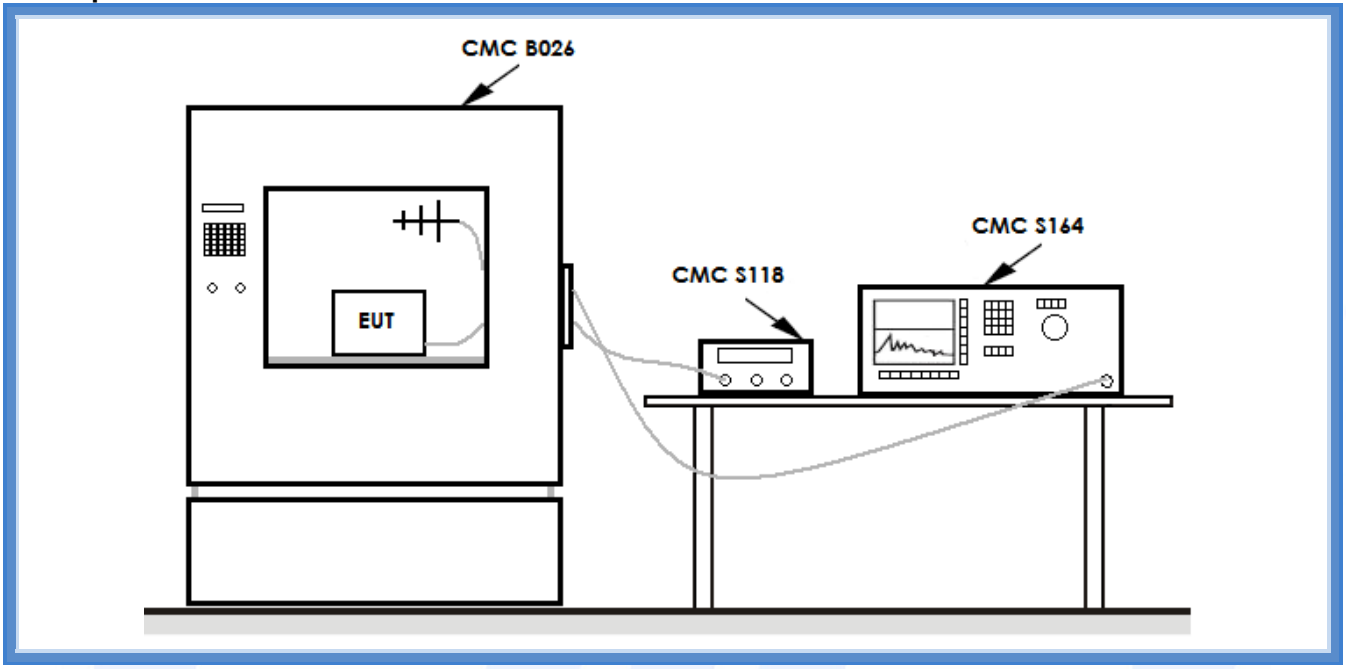
Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	101	42

Acceptance limits:

The frequency tolerance of the carrier signal shall be maintained within ±0,01% of the operating frequency (±1,36 kHz)

Setup



Result

Test conditions		*Measured frequency*
Temperature (°C)	*Voltage level (V)*	*(MHz)*
-20	Normal supply voltage	13,561008
-10	Normal supply voltage	13,561018
0	Normal supply voltage	13,560996
10	Normal supply voltage	13,560972
20	Normal supply voltage	13,560920
30	Normal supply voltage	13,560916
40	Normal supply voltage	13,560882
50	Normal supply voltage	13,560848

Test conditions			*Measured frequency*
Temperature (°C)	*Voltage level (%)*	*Voltage level (V)*	*(MHz)*
20	85	2,805	13,560916
20	90	2,970	13,560918
20	95	3,135	13,560918
20	100	3,300	13,560920
20	105	3,465	13,560922
20	110	3,630	13,560924
20	115	3,795	13,560925

Result: The requirements are met

11.6 20 dB bandwidth

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.215
- 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 S127, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

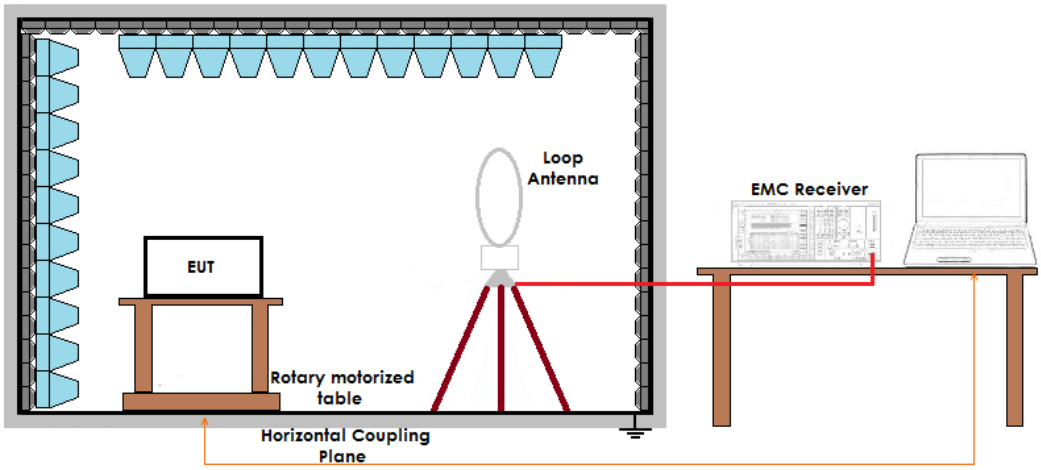
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated

Environmental conditions

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

Acceptance limits: operation within the band 13,110 – 14,010 MHz

Setup



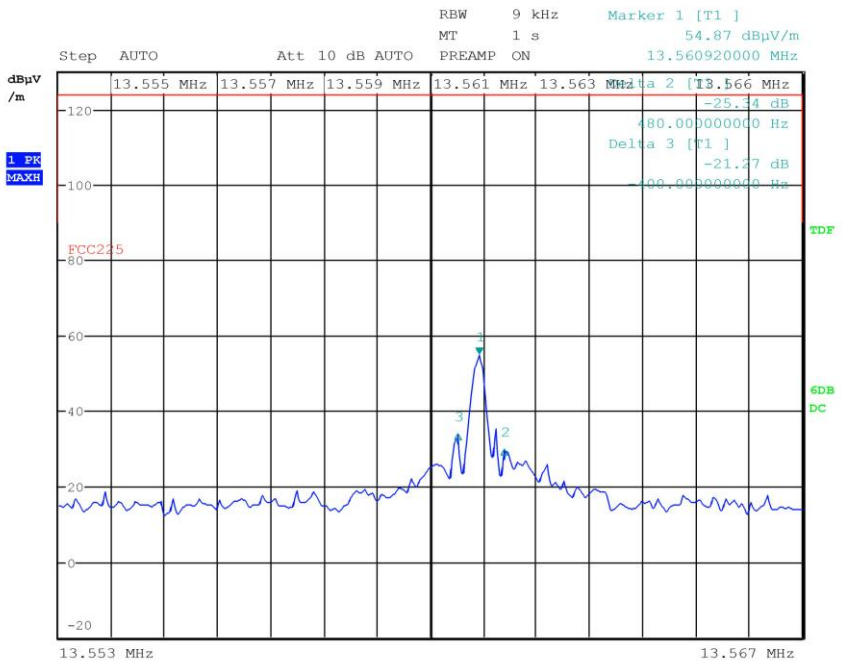
Result

f (MHz)	*20 dB bandwidth (MHz)*		*Graph*	*Results*
	FL	FH		
13,56092	13,56044	13,56132	G15072111	Complies

Graphs

G15072111

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Lettura continua chiave-Tx-Rx
Operator Gandini 15072111
Test Spec
Loop



Final Measurement

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

Result: The requirements are met