



TEST REPORT nr. R17073101

Federal Communication Commission (FCC)

Test item

Description.....: MIFARE/NFC READER
Trademark.....: GLOBAL DISPLAY SOLUTIONS
Model/Type: BRD02822
FCC ID: XZROWR01147AA

Test Specification

Standard.....: FCC Rules & Regulations, Title 47:2016
Part 15 paragraph(s): 203, 204, 207, 209 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: 26.06.17
Contents.....: 50 pages

Giovanni Gandini
.....
R. Beghetto
.....

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



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1. Summary

Standard:

FCC Rules & Regulations, Title 47:2016
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: 3,7 Vdc from battery

Serial Number: --

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

Test site facility's FCC registration number: 182474

3. Testing and sampling

Date of receipt of test item: 12.04.17

Testing start date: 17.05.17

Testing end date: 26.05.17

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 P170434

4. Operative conditions

EUT exercising: EUT in continuous transmission at maximum power



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	Pulse limiter device	--	January 13 th '17	January '18
CMC S108	EMCO	3115	Horn Antenna	9811-5622	June 21 st '16	June '19
CMC S164	Rohde & Schwarz	ESU26	EMC interference receiver	100052	January 10 th '17	January '18
CMC S190	Spin	AMDR-10180	Horn Antenna (1-18 GHz)	01-309-09	N.C.R.	N.C.R.
CMC S200	Schwarzbeck	NSLK 8128	V-LISN	8128-273	January 11 th '17	January '18
CMC S260	CMC	Wfr_N	Shielded Cable	Wfr_ant10-1	November '16	November '17
CMC S261	CMC	Wfr_N	Shielded Cable	Wfr_ant20-1	November '16	November '17
CMC S262	CMC	Wfr_N_fix	Shielded Cable	Wfr_fix32-1	November '16	November '17
CMC S263	CMC	Wfr_N_fix	Shielded Cable	Wfr_fix31-1	November '16	November '17
CMC S264	CMC	Wfr_N	Shielded Cable	Wfr_ext03-1	November '16	November '17
CMC S271	Schwarzbeck	BBA 9106 + VHBB 9124	Biconical Antenna (30-300MHz)	831	June 21 st , '16	June '19
CMC S287	Schwarzbeck	VUSLP 9111B	Log-periodic Antenna (200 MHz-3GHz)	9111B-203	June 21 st , '16	June '19
CMC S288	CMC	W_sma_white	Joint Shielded Cable	W_001	November '16	November '17



7. Measurement uncertainty

Test	Test Setup	Expanded uncertainty	Note
Conducted emission CISPR 16 LISN 50uH 0,009-0,0150MHz	PE001_01	3,4 dB	1
Conducted emission CISPR 16 LISN 50uH 0,150-30,0MHz	PE001_01	2,8 dB	1
Conducted emission CISPR 16 Voltage Probe 0,15-30MHz	PE001_02	2,6 dB	1
Conducted emission CISPR 16 Current Probe 0,15-30MHz	PE001_03	2,2 dB	1
Conducted emission CISPR 16 ISN 0,15-30MHz	PE001_04	4,5 dB	1
Clic CISPR 16 LISN 50uH 0,150-30,0MHz	PE001_05	2,8 dB	1
Disturbance Power 30-300 MHz	PE002_01	3,4 dB	1
Radiated Emission LAS 0,15-30MHz	PE003_01	1,5 dB	1
Radiated Emission CISPR 16 Loop Ant. 0,15-30MHz	PE004_01	3,8 dB	1
Radiated Emission CISPR 16 Bicon. Ant. 30-300MHz	PE004_02	3,3 dB	1
Radiated Emission CISPR 16 LogP. Ant. 300-1000MHz	PE004_03	3,2 dB	1
Radiated Emission CISPR 16 Horn Ant. 1-18GHz	PE004_04	3,6 dB	1
Human Exposure to electromagnetic fields	PE005_01	10,5 %	1
Harmonic current emissions test	PE006_01	10 mA + 1,6 %	1
Voltage fluctuation and flicker test	PE007_01	3,9 %	1
Radiated Immunity 80MHz-6GHz	PE102_XX	2,1 dB 0,81 V/m a 3V/m	1
Conducted Immunity 0,15-230MHz	PE105_XX	1,2 dB 0,44 V a 3V	1
AC Magnetic field	PE106_01	1,55 % 0,15 A/m a 10A/m	1
Pulse Magnetic field	PE107_01	6,22 % 18,6 A/m a 300A/m	1
Dumped Magnetic field	PE108_01	6,22 % 1,86 A/m a 30A/m	1
Common mode conducted immunity	PE112_01	2,12 % 0,21 V a 10V	1



Test	Test Setup	Expanded uncertainty	Note
Power/Spurious 9kHz-30MHz	PR001_01	3,8 dB	1
Power/Spurious ERP 30-1000MHz d=10m	PR001_02+03	4,3 dB	1
Misura della potenza EIRP 1-18GHz d=3m	PR001_04	4,3 dB	1
Misura della potenza EIRP 18-40GHz d=3m	PR001_05	5,5 dB	1
Frequency error	PR002_01+02	$< 1 \times 10^{-7}$	1
Timing zero span (1001pts.)	PR002_01+02	0,2 % SWT	1
Modulation bandwidth	PR002_01+02	$< 1 \times 10^{-7}$	1
Conducted RF power and spurious emission	PR002_01+02	1,2 dB	1
Adjacent channel power	PR002_01+02	1,2 dB	1
Blocking	PR002_01+02	1,2 dB	1

Test	Test Setup	Expanded uncertainty	Note
Electrostatic discharge immunity test	PE101_0X		2
Electrical fast transients / burst immunity test	PE103_0X		2
Surge immunity test	PE104_0X		2
Short interruption immunity test	PE109_01		2
Rev_17_01 date 20/03/2017			

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 15:2016	--
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. 3.0 (Quality Manual)	Measure Procedure
Internal procedure INC_M rev. 9.0 (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.

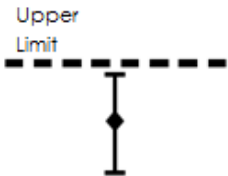
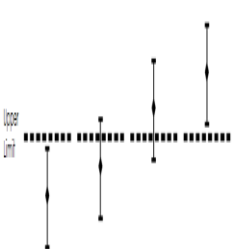
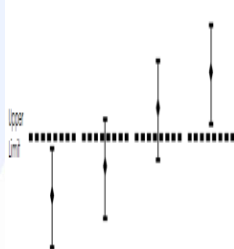
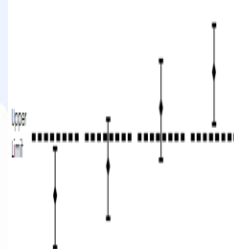


11. Results

In this clause tests results are reported.

Measurement uncertainty is in accordance with document CMC INC_M rev. 9.0.

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	101	45

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

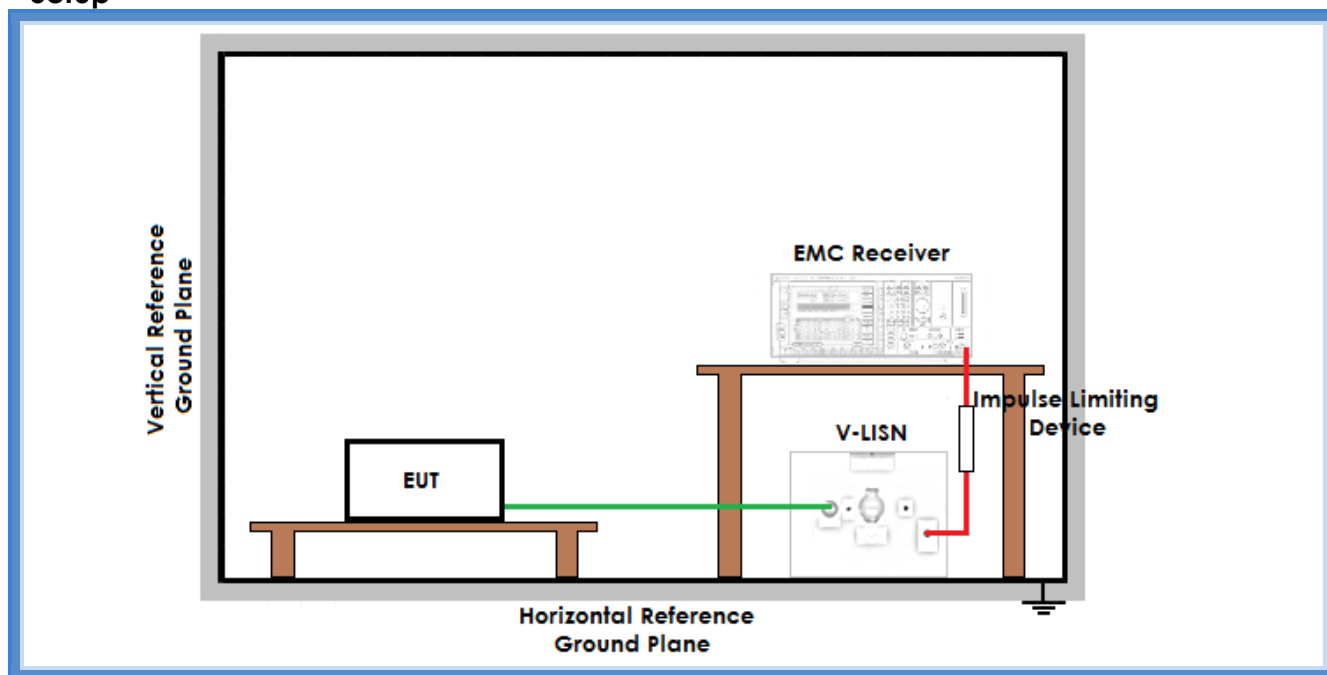
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	101	45

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
+5 Vdc	G17073109	--	Complies
-5 Vdc	G17073110	--	Complies
L1	G17073111	120 Vac side of PC	Complies
N	G17073112	120 Vac side of PC	Complies

Remarks: Peaks above the limits are due to the main transmitting frequency

Line	Graphs	Remarks	Result
N	G17073115	120 Vac side of PC	Complies
L1	G17073116	120 Vac side of PC	Complies
-5 Vdc	G17073117	--	Complies
+5 Vdc	G17073118	--	Complies

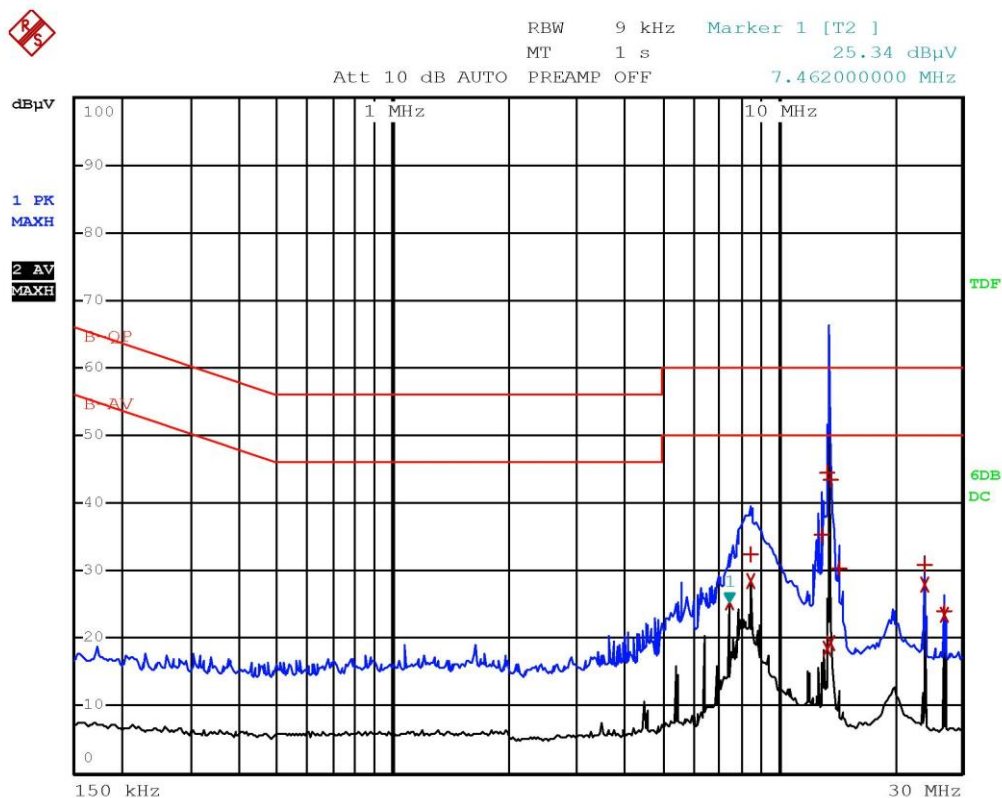
Remarks: Tests repeated closing the RF output with 50 Ω resistance instead of antenna

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

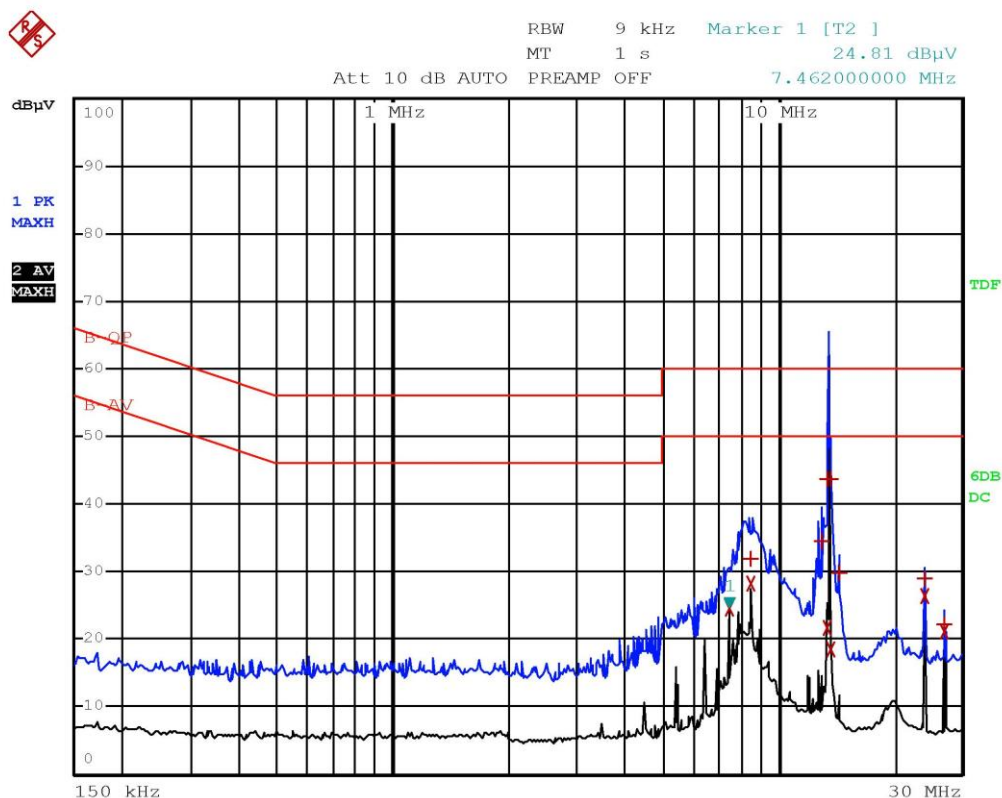


Bertezzo 17073109



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	B-QP			
Trace2:	B-AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
2 Average	7.462 MHz	25.34	-24.65	
2 Average	8.454 MHz	28.45	-21.54	
1 Quasi Peak	8.49 MHz	32.38	-27.62	
1 Quasi Peak	13.03 MHz	35.19	-24.80	
2 Average	13.35 MHz	18.40	-31.59	
1 Quasi Peak	13.458 MHz	44.53	-15.46	
2 Average	13.666 MHz	19.26	-30.73	
1 Quasi Peak	13.666 MHz	43.56	-16.43	
1 Quasi Peak	14.41 MHz	30.44	-29.55	
1 Quasi Peak	23.998 MHz	30.75	-29.24	
2 Average	24.002 MHz	27.91	-22.09	
2 Average	27.122 MHz	23.48	-26.51	
1 Quasi Peak	27.122 MHz	24.11	-35.88	

Bertezzolo 17073109

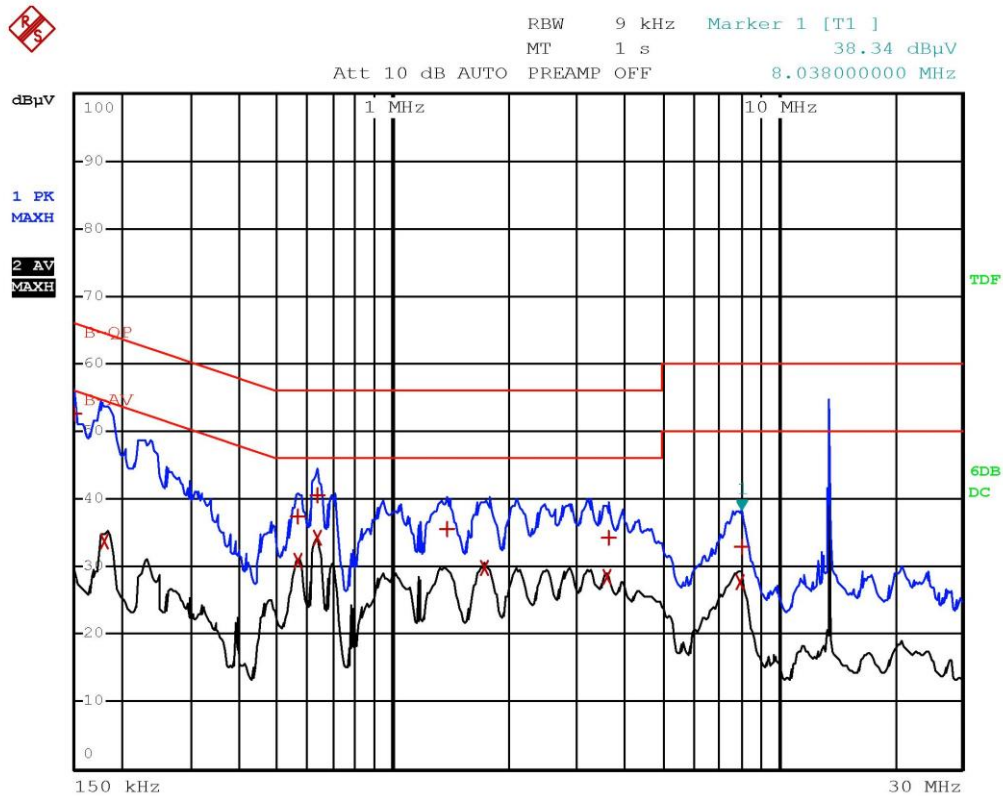


Bertezzolo 17073110



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	B-QP			
Trace2:	B-AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
2 Average	7.462 MHz	24.43	-25.56	
2 Average	8.454 MHz	28.20	-21.79	
1 Quasi Peak	8.49 MHz	31.82	-28.17	
1 Quasi Peak	13.03 MHz	34.59	-25.40	
2 Average	13.35 MHz	21.58	-28.41	
1 Quasi Peak	13.458 MHz	43.57	-16.42	
2 Average	13.666 MHz	18.39	-31.60	
1 Quasi Peak	13.666 MHz	43.72	-16.27	
1 Quasi Peak	14.41 MHz	29.91	-30.08	
1 Quasi Peak	23.998 MHz	29.10	-30.89	
2 Average	24.002 MHz	26.30	-23.69	
2 Average	27.122 MHz	21.13	-28.86	
1 Quasi Peak	27.122 MHz	22.16	-37.83	

Bertezzolo 17073110

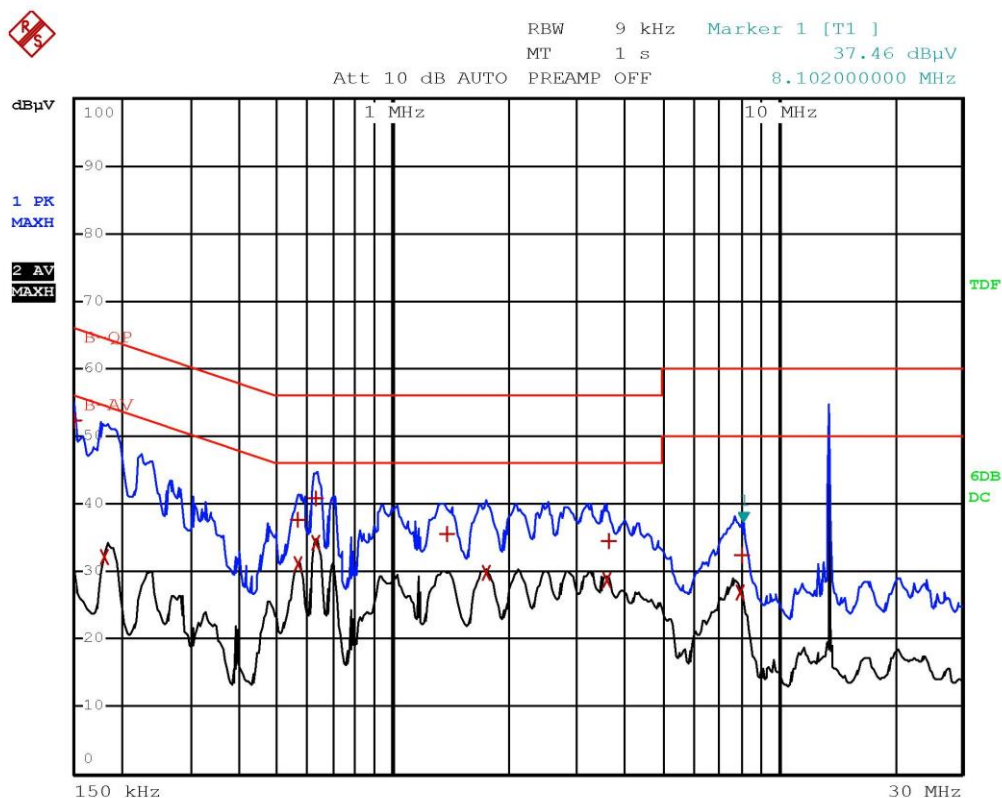


Bertezzolo 17073111



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	B-QP		
Trace2:	B-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	150 kHz	52.62	-13.37
2 Average	182 kHz	33.78	-20.60
2 Average	566 kHz	30.91	-15.08
1 Quasi Peak	566 kHz	37.30	-18.69
1 Quasi Peak	634 kHz	40.54	-15.45
2 Average	634 kHz	34.29	-11.70
1 Quasi Peak	1.386 MHz	35.51	-20.48
2 Average	1.738 MHz	29.70	-16.29
2 Average	3.61 MHz	28.60	-17.39
1 Quasi Peak	3.63 MHz	34.18	-21.81
2 Average	8.002 MHz	27.73	-22.26
1 Quasi Peak	8.038 MHz	32.95	-27.04

Bertezzolo 17073111

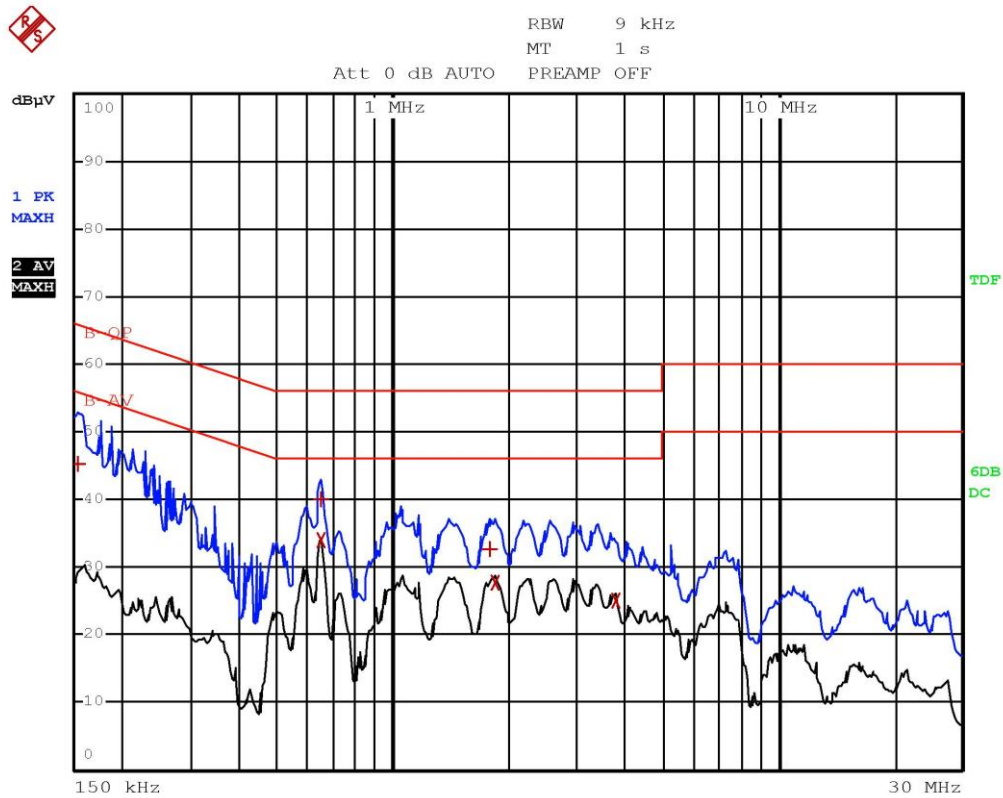


Bertezzolo 17073112



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	B-QP		
Trace2:	B-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	150 kHz	52.25	-13.75
2 Average	182 kHz	32.16	-22.23
2 Average	566 kHz	31.17	-14.82
1 Quasi Peak	566 kHz	37.78	-18.21
1 Quasi Peak	634 kHz	40.89	-15.10
2 Average	634 kHz	34.30	-11.69
1 Quasi Peak	1.386 MHz	35.63	-20.36
2 Average	1.738 MHz	29.86	-16.13
2 Average	3.61 MHz	28.82	-17.17
1 Quasi Peak	3.63 MHz	34.38	-21.61
2 Average	8.002 MHz	26.86	-23.13
1 Quasi Peak	8.038 MHz	32.29	-27.70

Bertezzolo 17073112

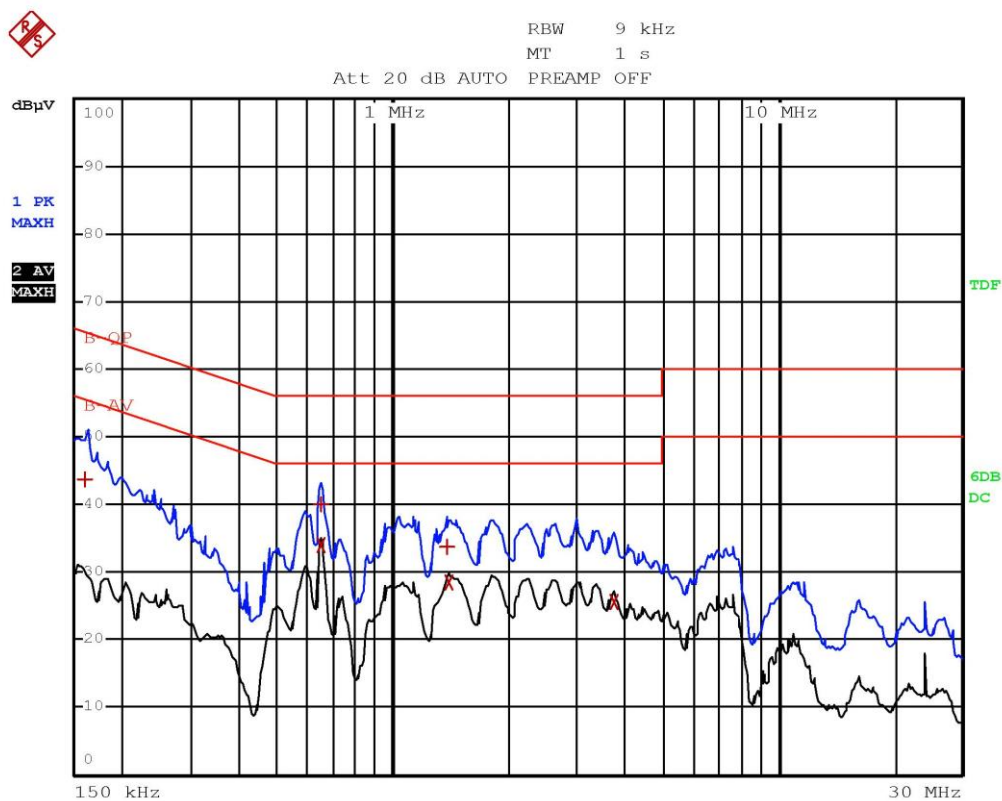


Bertezzolo 17073115



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	B-QP		
Trace2:	B-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	154 kHz	45.19	-20.58
1 Quasi Peak	650 kHz	40.01	-15.98
2 Average	650 kHz	33.89	-12.10
1 Quasi Peak	1.782 MHz	32.68	-23.31
2 Average	1.85 MHz	27.75	-18.24
2 Average	3.786 MHz	25.02	-20.97

Bertezzolo 17073115

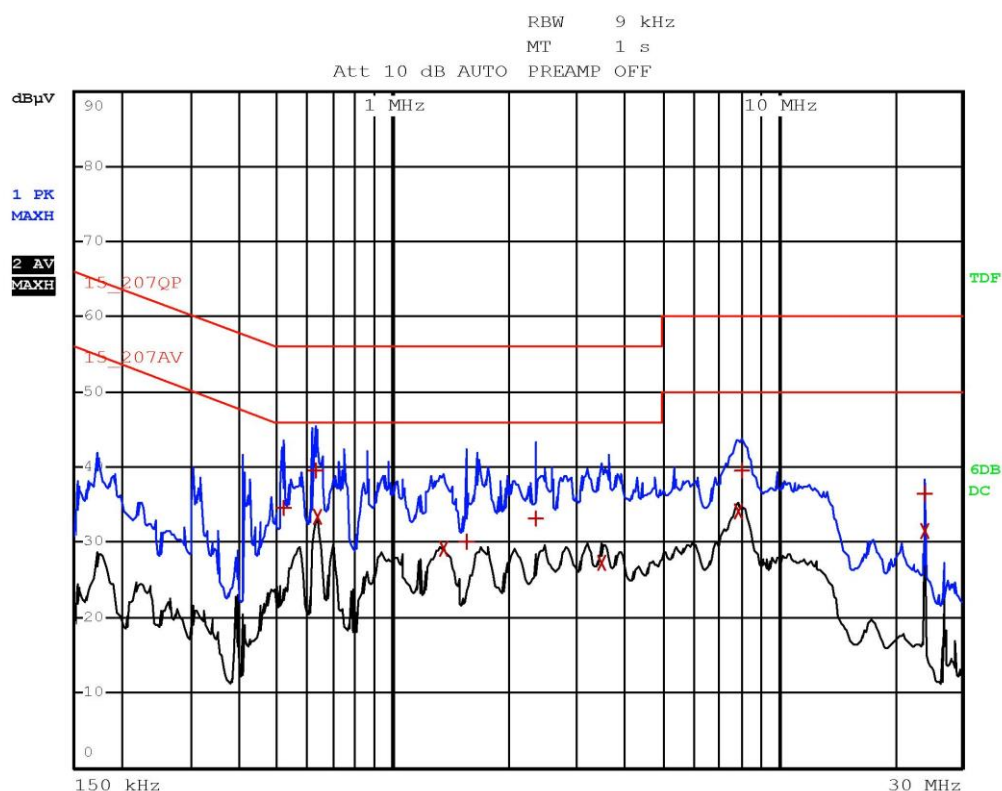


Bertezzolo 17073116



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	B-QP		
Trace2:	B-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	162 kHz	43.72	-21.63
1 Quasi Peak	650 kHz	39.93	-16.06
2 Average	650 kHz	34.03	-11.96
1 Quasi Peak	1.382 MHz	33.66	-22.33
2 Average	1.398 MHz	28.40	-17.59
2 Average	3.738 MHz	25.53	-20.46

Bertezzolo 17073116

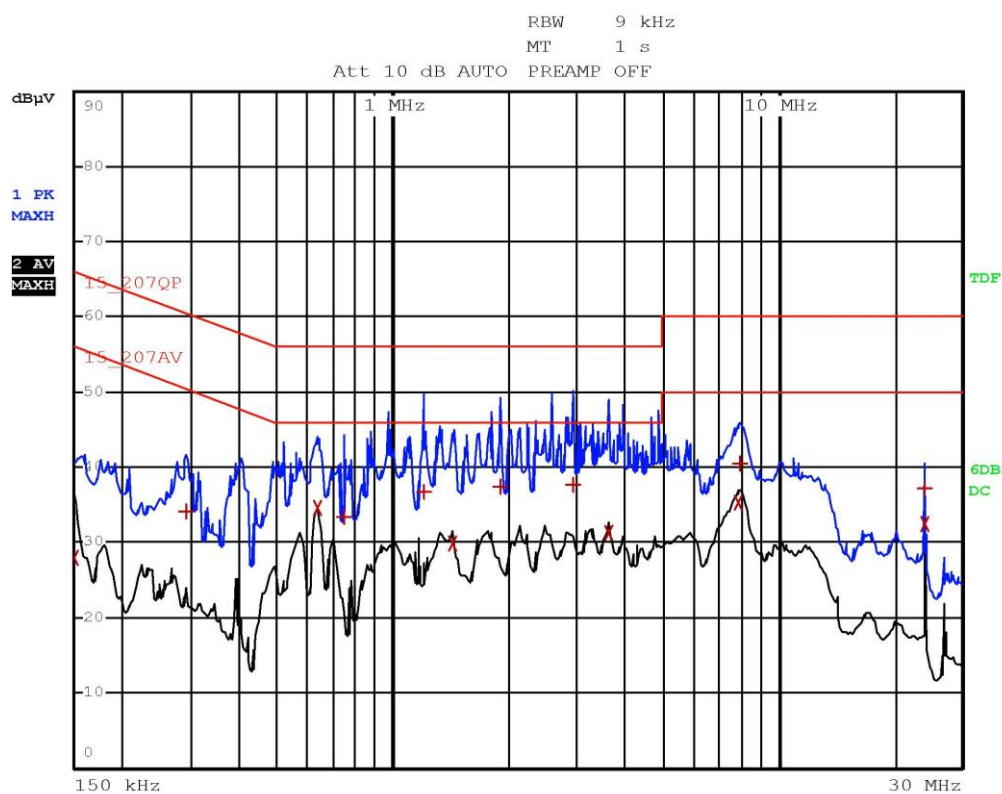


Gandini 17073117-Line (+)-Tx



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	518 kHz	34.65	-21.35
1 Quasi Peak	630 kHz	39.54	-16.45
2 Average	634 kHz	33.51	-12.48
2 Average	1.354 MHz	29.27	-16.72
1 Quasi Peak	1.558 MHz	30.14	-25.85
1 Quasi Peak	2.366 MHz	33.19	-22.81
2 Average	3.486 MHz	27.37	-18.62
2 Average	7.938 MHz	34.05	-15.94
1 Quasi Peak	8.042 MHz	39.47	-20.52
1 Quasi Peak	24.002 MHz	36.41	-23.58
2 Average	24.002 MHz	31.60	-18.39

Gandini 17073117-Line (+)-Tx



Gandini 17073118-Line (-)-Tx



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
2 Average	150 kHz	28.10	-27.89	
1 Quasi Peak	290 kHz	34.17	-26.34	
2 Average	638 kHz	34.63	-11.36	
1 Quasi Peak	746 kHz	33.43	-22.56	
1 Quasi Peak	1.21 MHz	36.84	-19.15	
2 Average	1.43 MHz	29.84	-16.15	
1 Quasi Peak	1.902 MHz	37.55	-18.44	
1 Quasi Peak	2.946 MHz	37.56	-18.44	
2 Average	3.634 MHz	31.36	-14.63	
2 Average	7.958 MHz	35.30	-14.69	
1 Quasi Peak	8.006 MHz	40.62	-19.37	
1 Quasi Peak	24.002 MHz	37.30	-22.70	
2 Average	24.002 MHz	32.57	-17.42	

Gandini 17073118-Line (-)-Tx

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 S022, CMC S108, CMC S127, CMC S164,
CMC S271, CMC S287
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:
10 m for frequencies $\leq$ 1000 MHz
3 m for frequencies $>$ 1000 MHz
EUT height about the floor:
80 cm for frequencies $\leq$ 1000 MHz
1,5 m for frequencies $>$ 1000 MHz

Environmental conditions

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

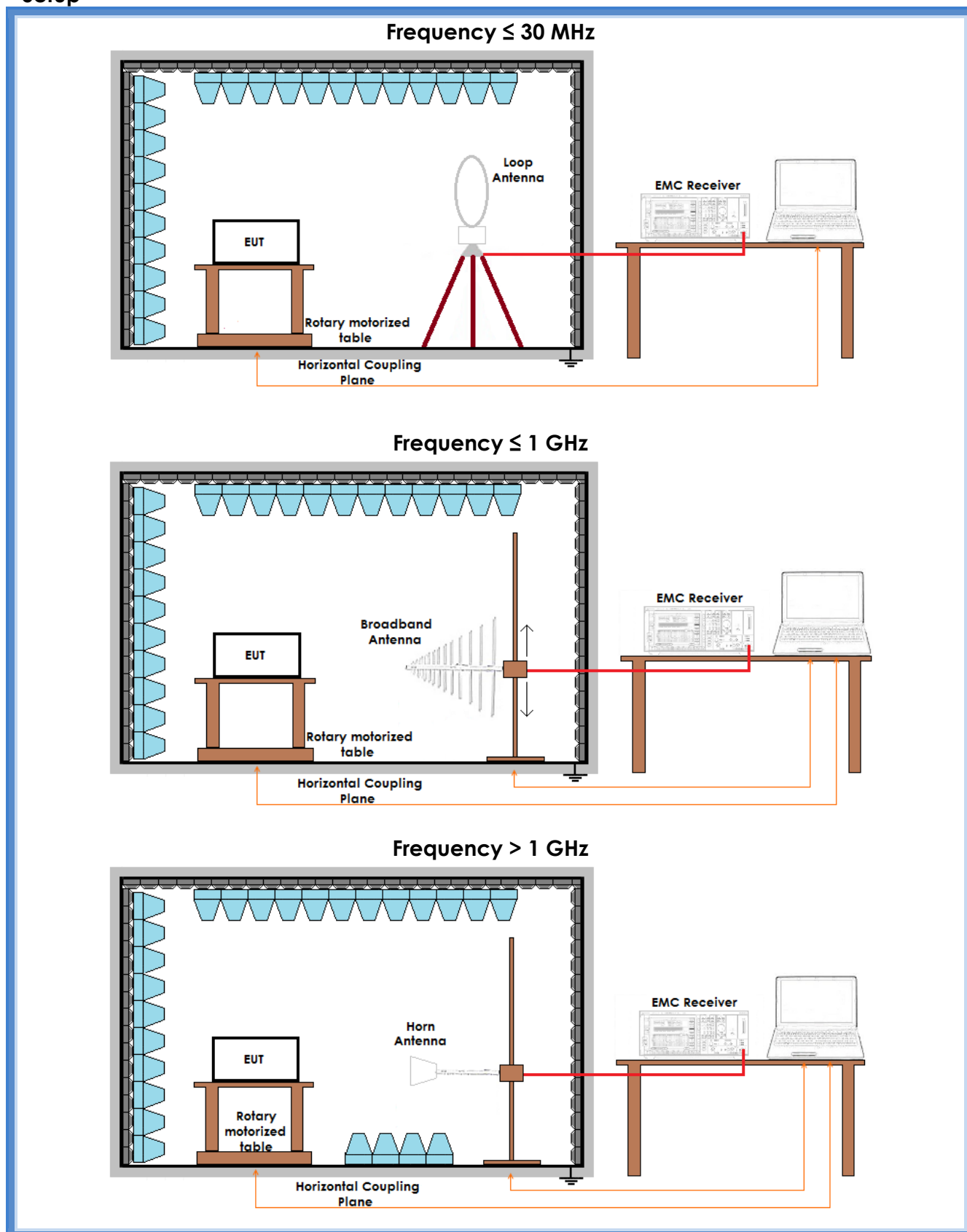


Acceptance limits

Frequency range (MHz)	Test distance (m)	Limits [dB(μV/m)]	
0,009 to 0,490	300	48,5 to 13,8	
0,490 to 1,705	30	33,8 to 22,9	
1,705 to 30	30	29,5	
30 to 88	3	40	
88 to 216	3	43,5	
216 to 960	3	46,0	
Above 960	3	53,9	
	Test distance (m)	Linear average detector [dB(μV/m)]	Peak detector [dB(μV/m)]
Above 1000	3	53,9	73,9

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
V	300 – 1000	G17073101	--	Complies
H	300 – 1000	G17073102	--	Complies
H	30 – 300	G17073103	--	Complies
V	30 – 300	G17073104	--	Complies
V	1000 – 10000	G17073105	--	Complies
H	1000 – 10000	G17073106	--	Complies
Loop	0,009 – 30	G17073108	--	Complies

Remarks: Measurements at frequencies lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with FCC 3A10 factor.

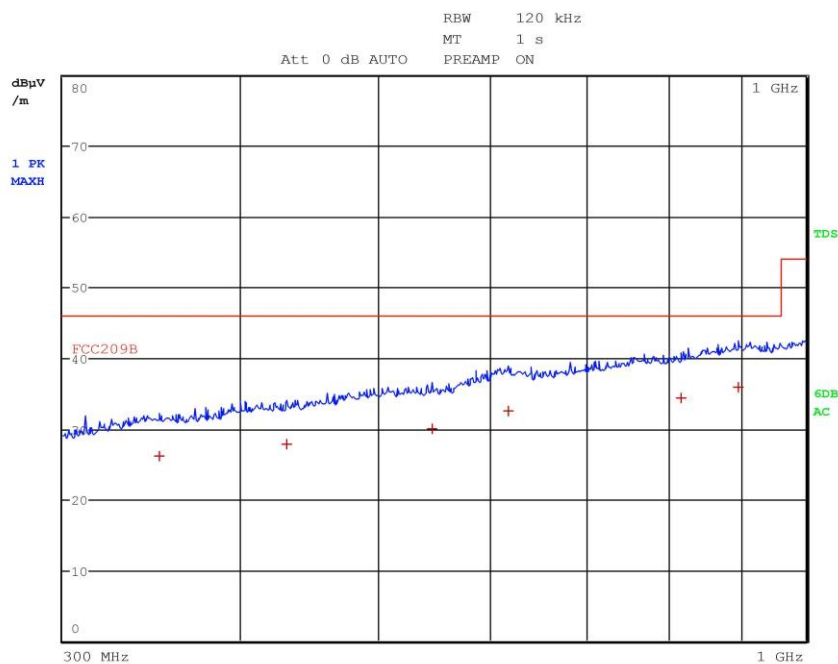
Graphs Legend

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

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073101
Test Spec
Vert



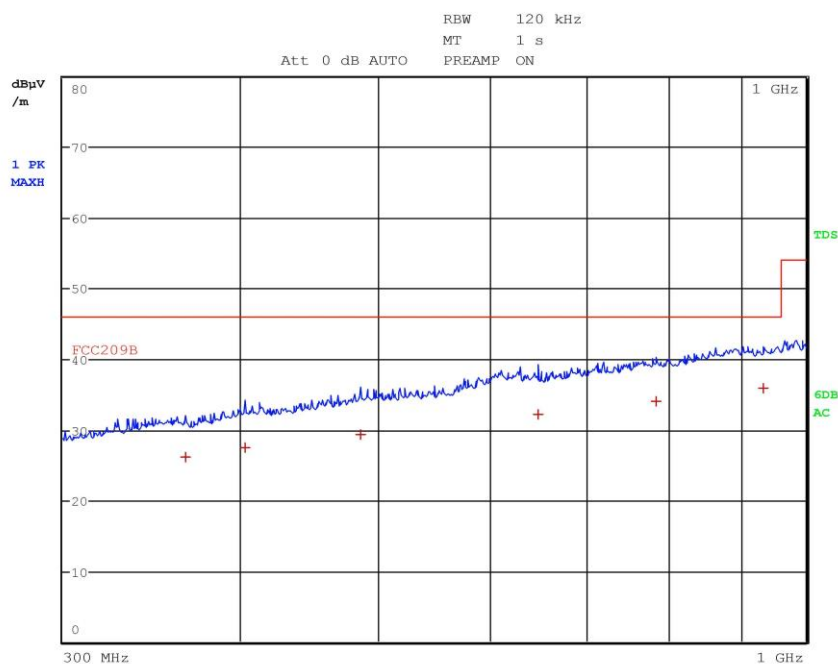
Final Measurement

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

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	350.800000000 MHz	26.13	Quasi Peak	-19.89
1	430.760000000 MHz	27.79	Quasi Peak	-18.23
1	545.360000000 MHz	29.93	Quasi Peak	-16.09
1	617.360000000 MHz	32.52	Quasi Peak	-13.50
1	816.160000000 MHz	34.38	Quasi Peak	-11.64
1	895.880000000 MHz	35.91	Quasi Peak	-10.11



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073102
Test Spec
Horiz



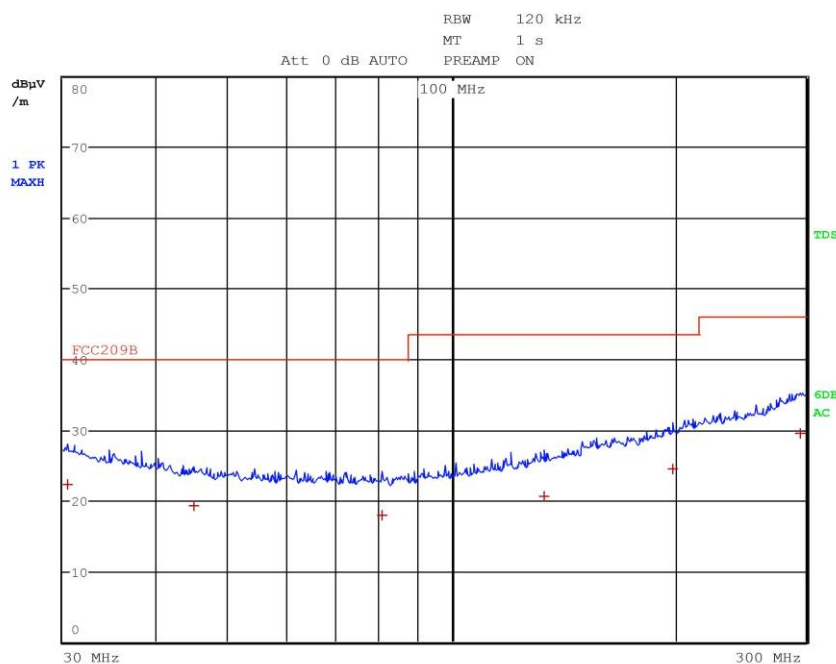
Final Measurement

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

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	366.200000000 MHz	26.17	Quasi Peak	-19.85
1	402.720000000 MHz	27.46	Quasi Peak	-18.56
1	486.080000000 MHz	29.37	Quasi Peak	-16.65
1	648.400000000 MHz	32.21	Quasi Peak	-13.81
1	784.800000000 MHz	34.10	Quasi Peak	-11.92
1	933.040000000 MHz	35.86	Quasi Peak	-10.16



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073103
Test Spec
Horiz



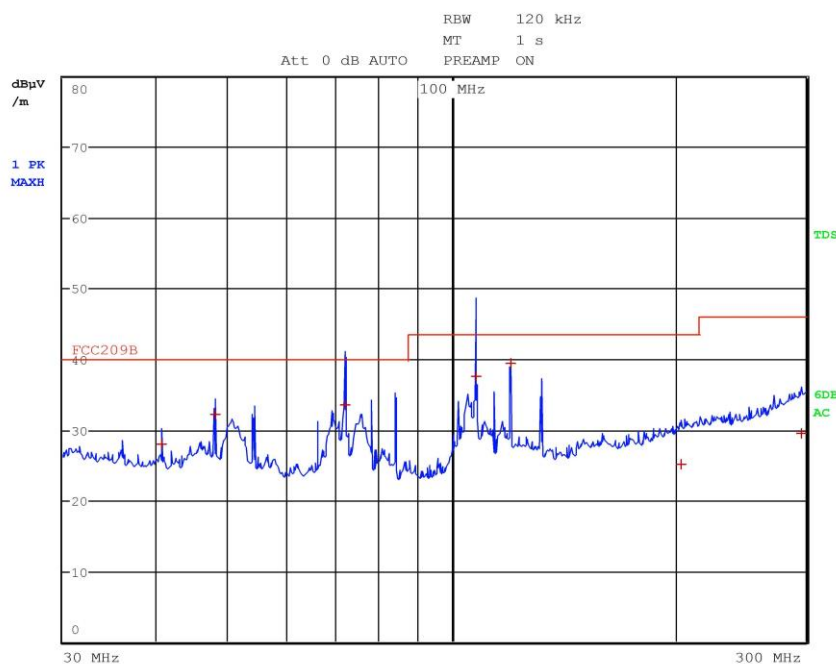
Final Measurement

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

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	30.360000000 MHz	22.31	Quasi Peak	-17.69
1	44.920000000 MHz	19.29	Quasi Peak	-20.71
1	80.640000000 MHz	17.91	Quasi Peak	-22.09
1	133.360000000 MHz	20.52	Quasi Peak	-23.00
1	198.400000000 MHz	24.49	Quasi Peak	-19.03
1	294.720000000 MHz	29.44	Quasi Peak	-16.58



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073104
Test Spec
Vert



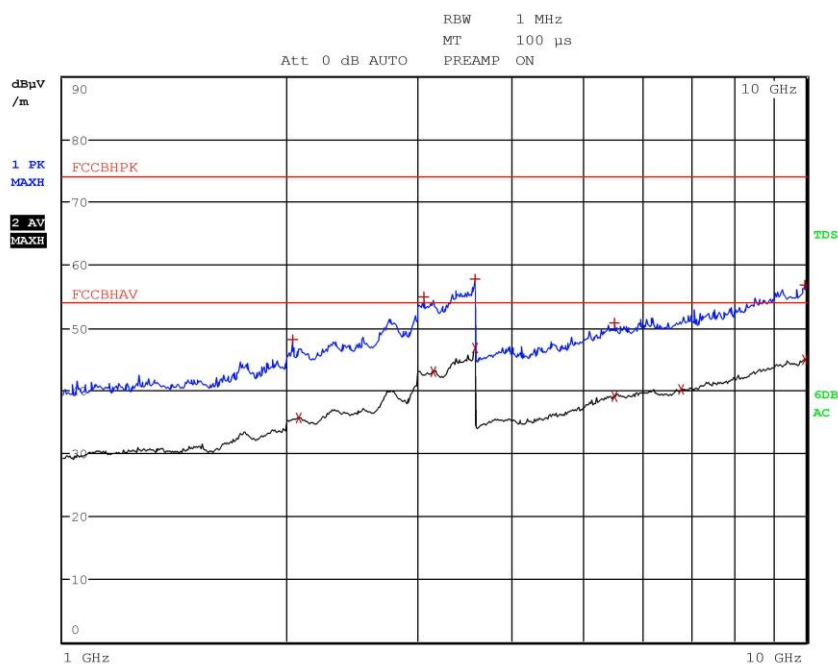
Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 7

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	40.680000000 MHz	28.05	Quasi Peak	-11.95
1	48.000000000 MHz	32.21	Quasi Peak	-7.79
1	72.000000000 MHz	33.49	Quasi Peak	-6.51
1	108.000000000 MHz	37.49	Quasi Peak	-6.03
1	120.006410256 MHz	39.45	Quasi Peak	-4.07
1	203.280000000 MHz	25.16	Quasi Peak	-18.36
1	295.760000000 MHz	29.47	Quasi Peak	-16.55



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073105
Test Spec
Vert



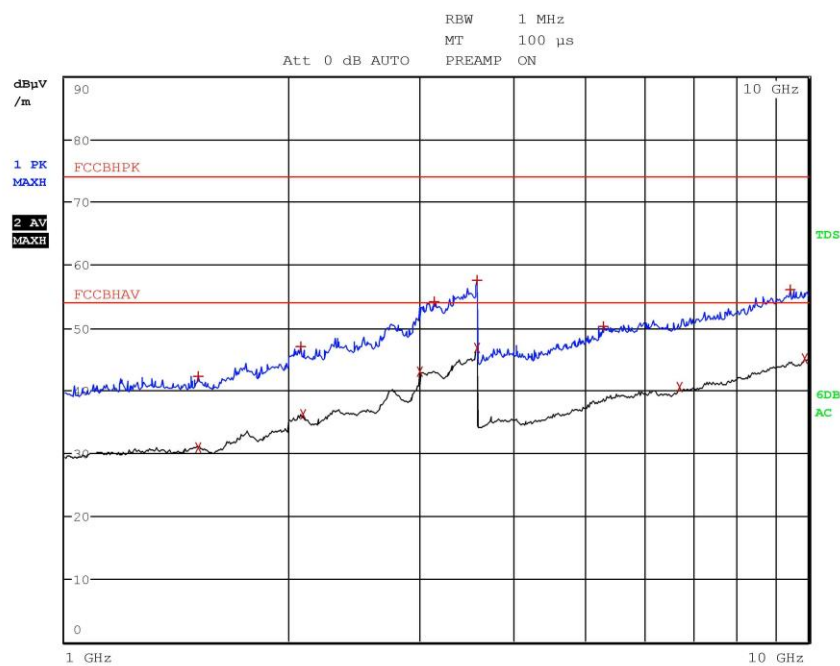
Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 11

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	2.039600000 GHz	48.11	Max Peak	-25.87
2	2.072400000 GHz	35.66	Average	-18.32
1	3.055600000 GHz	54.87	Max Peak	-19.11
2	3.154800000 GHz	43.07	Average	-10.91
1	3.594000000 GHz	57.85	Max Peak	-16.13
2	3.594800000 GHz	46.74	Average	-7.24
2	5.524400000 GHz	39.03	Average	-14.95
1	5.524800000 GHz	50.78	Max Peak	-23.20
2	6.799600000 GHz	40.25	Average	-13.73
2	9.956400000 GHz	44.96	Average	-9.02
1	9.976000000 GHz	56.87	Max Peak	-17.11



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073106
Test Spec
Horiz





Meas Type Emission
Equipment under Test
Manufacturer
OP Condition Tx-RX
Operator Gandini 17073106
Test Spec
Horiz

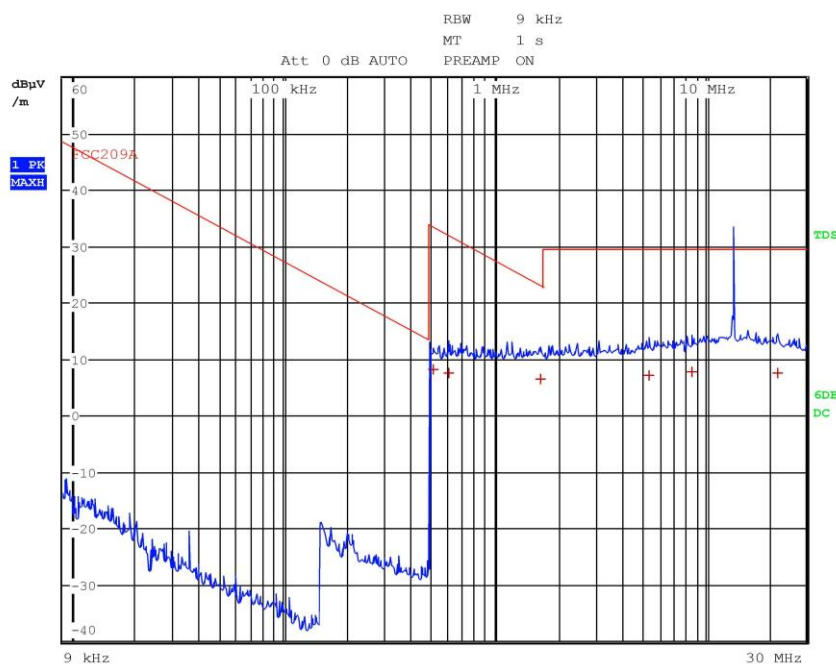
Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 12

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
2	1.509600000 GHz	30.92	Average	-23.06
1	1.510800000 GHz	42.29	Max Peak	-31.69
1	2.078000000 GHz	47.04	Max Peak	-26.94
2	2.090000000 GHz	36.18	Average	-17.80
2	3.003600000 GHz	43.09	Average	-10.89
1	3.141600000 GHz	54.14	Max Peak	-19.84
1	3.581200000 GHz	57.54	Max Peak	-16.44
2	3.600000000 GHz	46.77	Average	-7.21
1	5.299600000 GHz	50.14	Max Peak	-23.84
2	6.722400000 GHz	40.49	Average	-13.49
1	9.452400000 GHz	56.07	Max Peak	-17.91
2	9.907200000 GHz	45.00	Average	-8.98



Meas Type Emission
Equipment under Test
Manufacturer
OP Condition
Operator Gandini 17073108
Test Spec
Loop



Final Measurement

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

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	506.00000000 kHz	8.17	Quasi Peak	-25.36
1	606.00000000 kHz	7.62	Quasi Peak	-24.34
1	1.650000000 MHz	6.56	Quasi Peak	-16.70
1	5.422000000 MHz	7.10	Quasi Peak	-22.44
1	8.594000000 MHz	7.80	Quasi Peak	-21.74
1	21.986000000 MHz	7.67	Quasi Peak	-21.87

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

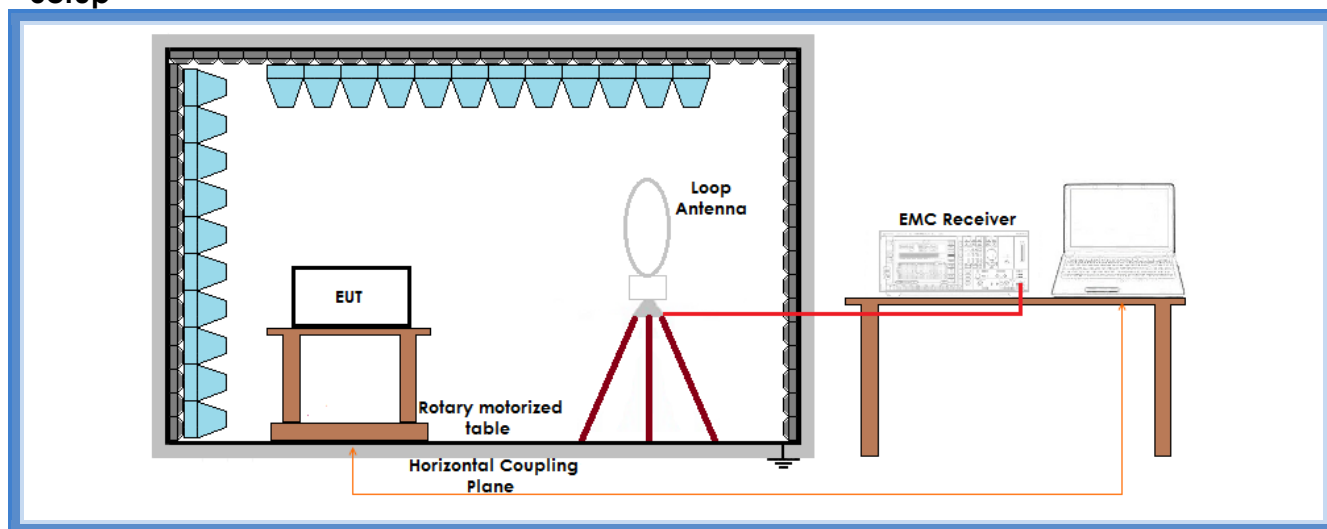
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

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

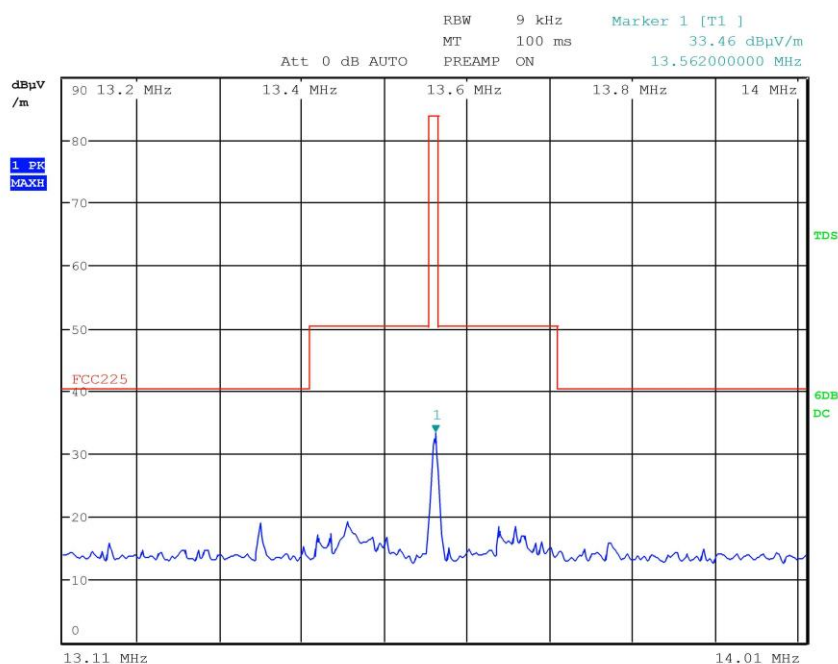
Graphs	Limits (dB μ V/m)	Level (dB μ V/m)	Results
G17073107	84,00	33,46	Complies

Remarks: EUT was tested in 3 orthogonal planes. The results in this table show the highest value.



Graphs

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition
Operator Gandini 17073107
Test Spec
Loop



Final Measurement

Meas Time: 1 s
Margin: 6 dB
Peaks: 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

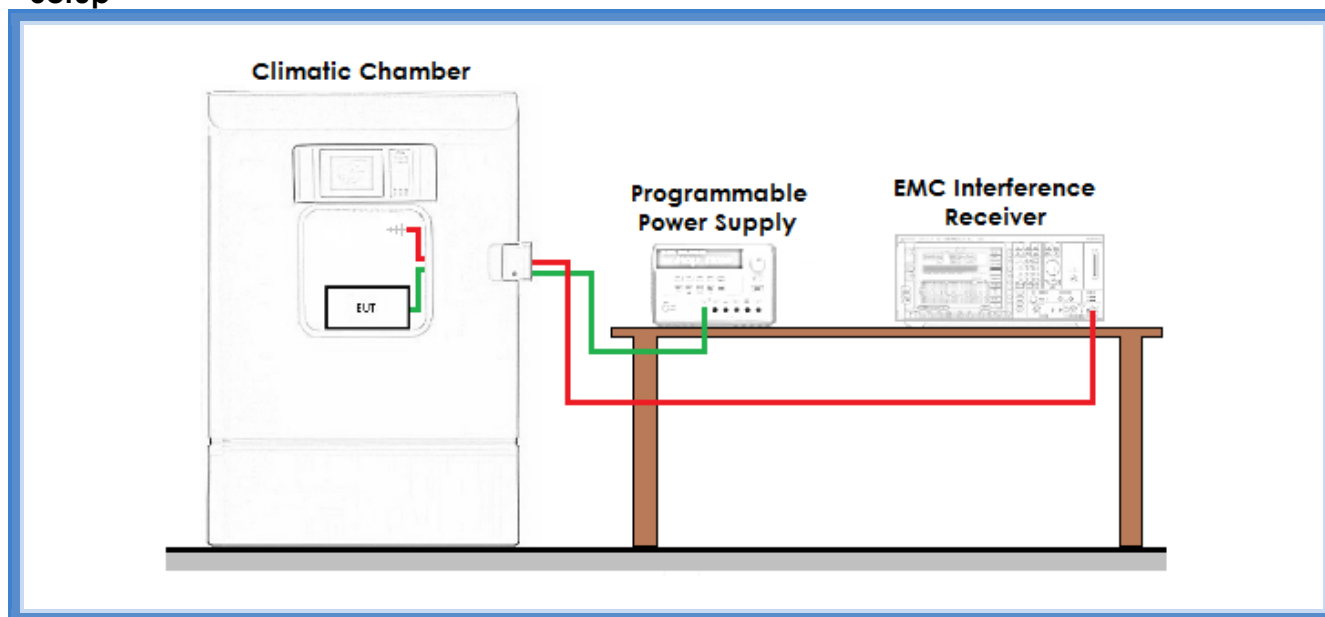
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
23	100	55

Acceptance limits:

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



Setup



Result

Test conditions		Measured frequency	Frequency limits
Temperature (°C)	Voltage level (V)	(MHz)	(MHz)
-20	Normal supply voltage	13,560872	13,55864 – 13,56136
-10	Normal supply voltage	13,560884	13,55864 – 13,56136
0	Normal supply voltage	13,560884	13,55864 – 13,56136
10	Normal supply voltage	13,560868	13,55864 – 13,56136
20	Normal supply voltage	13,560859	13,55864 – 13,56136
30	Normal supply voltage	13,560838	13,55864 – 13,56136
40	Normal supply voltage	13,560830	13,55864 – 13,56136
50	Normal supply voltage	13,560870	13,55864 – 13,56136

Test conditions			Measured frequency	Frequency limits
Temperature (°C)	Voltage level (%)	Voltage level (V)	(MHz)	(MHz)
20	85	4,25	13,560856	13,55864 – 13,56136
20	90	4,50	13,560858	13,55864 – 13,56136
20	95	4,75	13,560858	13,55864 – 13,56136
20	100	5,00	13,560858	13,55864 – 13,56136
20	105	5,25	13,560858	13,55864 – 13,56136
20	110	5,50	13,560858	13,55864 – 13,56136
20	115	5,75	13,560860	13,55864 – 13,56136

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 S206
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

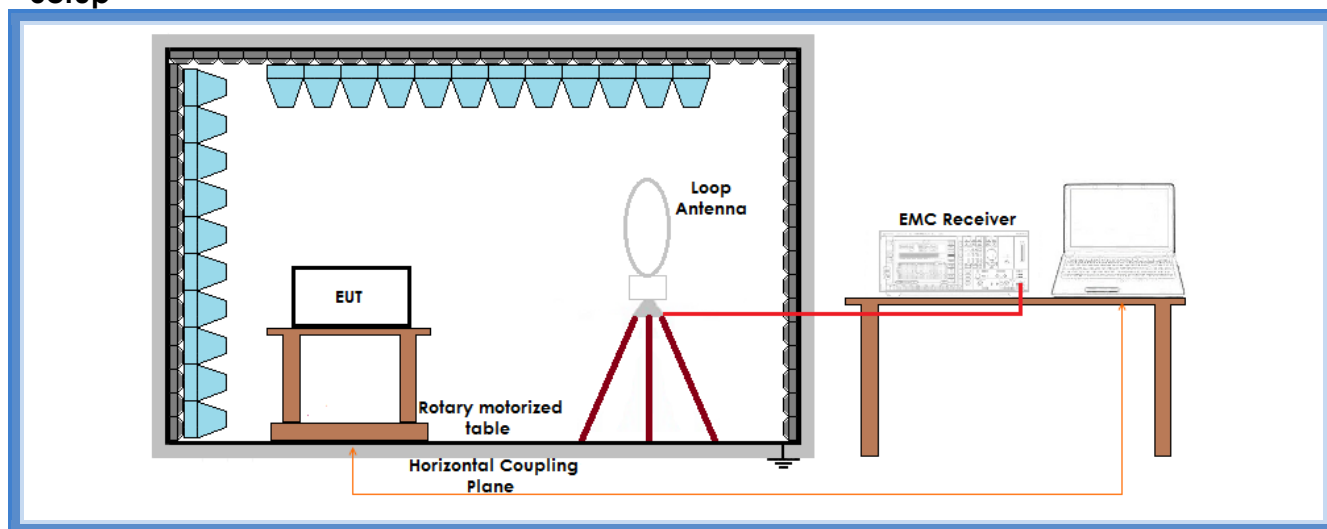
Environmental conditions

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

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



Setup

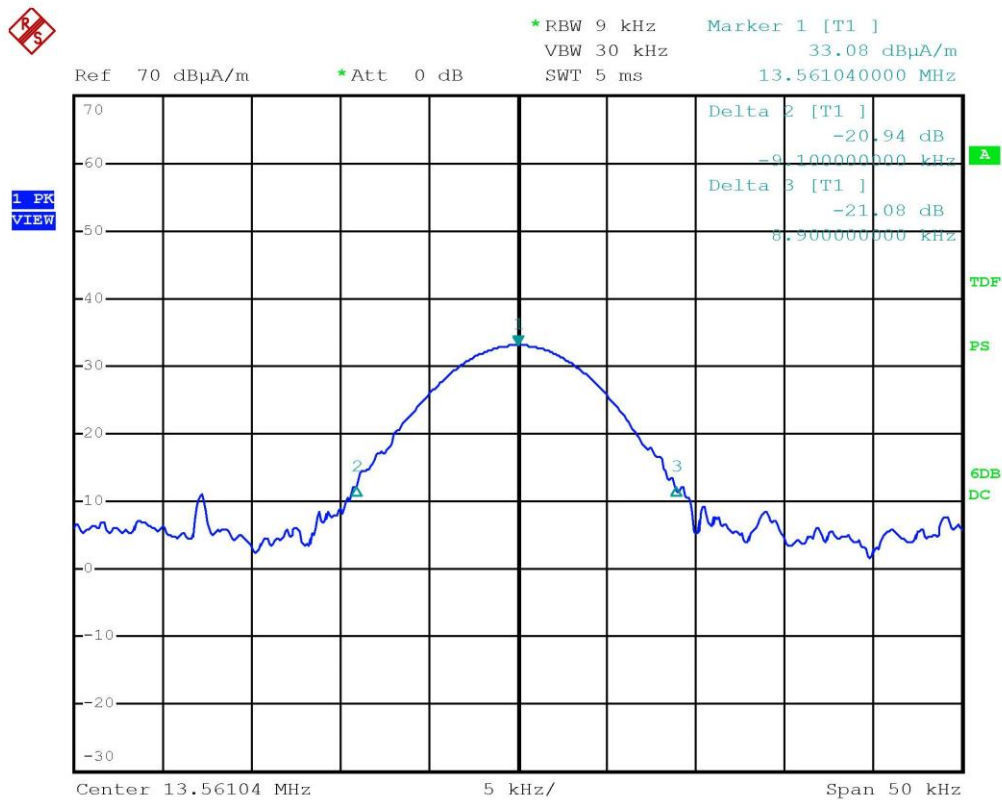


Result

f (MHz)	20 dB bandwidth (MHz)		Graph	Results
	FL	FH		
13,56104	13,55194	13,56994	G17073113	Complies



Graphs



Bertezzo 17073113

Result: The requirements are met