



TEST REPORT nr. R14155001

Federal Communication Commission (FCC)

Test item

Description: WEARABLE METABOLIC SYSTEM
Trademark: COSMED
Model/Type: K5
FCC ID: SN7-COSMED-K5

Test Specification

Standard: FCC Rules & Regulations, Title 47:2014
Part 15 paragraph(s): 107 and 109

Client's name: COSMED S.r.l.

Address: Viale dei Misenati, 1/A – 00122 Ostia di Lido (RM) – ITALY

Manufacturer's name : Same as client

Address: --

Report

Tested by: A. Bertezolo – Technician

Approved by: R. Beghetto – Laboratory Manager

Date of issue: 25.06.15

Contents: 37 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

Emission Test:

FCC Rules & Regulations, Title 47:2014
Part 15 paragraph(s): 107 and 109

Test specifications	Environmental Phenomena	Port	Tests sequence	Result
Part 15.107 Class B	Continuous disturbance voltage	Mains terminal	1	Complies
Part 15.109 Class B	Radiated disturbance	Enclosure	2	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 : 7,2 Vdc from battery
110 V ~ 60 Hz single-phase + earth
Power cable : Unshielded
Serial Number : --

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 : 271947

3. Testing and sampling

Date of receipt of test item : 30.11.14
Testing start date : 08.01.15
Testing end date : 05.02.15
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 P140448

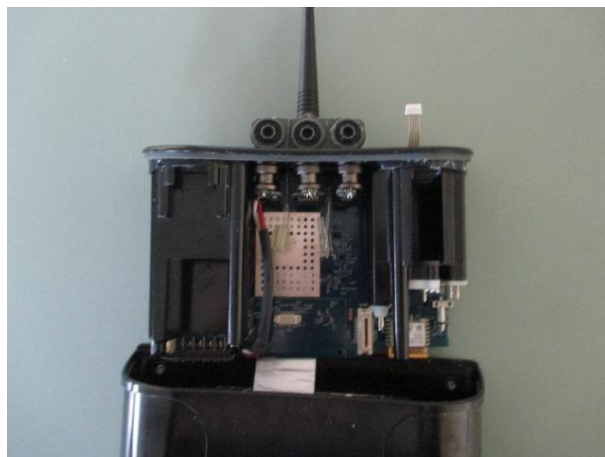
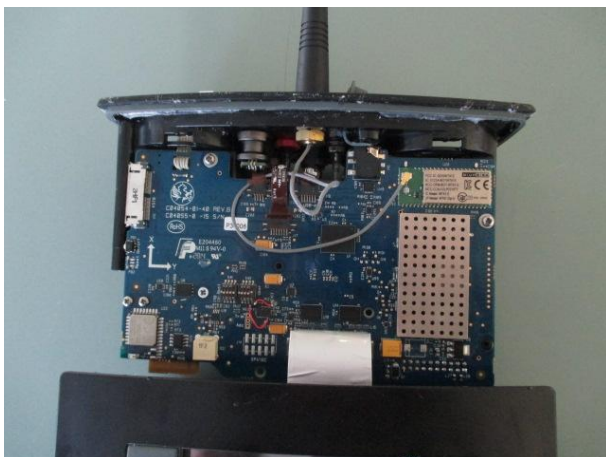
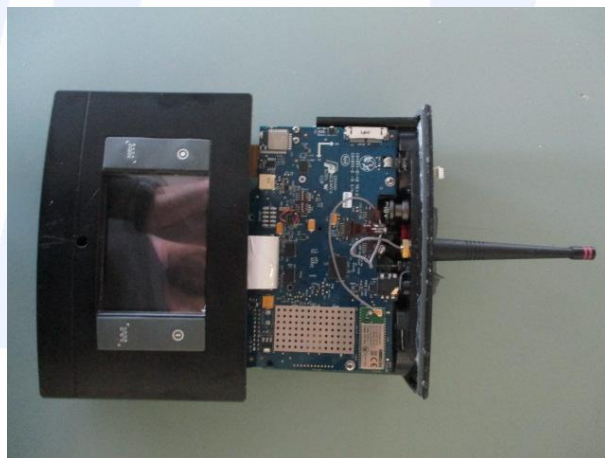
4. Operative conditions

EUT exercising : Three radio are operating all simultaneously:
1. Antenna simulation, radio link between auxiliary PC and EUT;
2. Low energy Bluetooth simulation, radio link between auxiliary board and EUT;
3. Bluetooth simulation, radio link between auxiliary PC and EUT
Auxiliary equipment : None



5. Photograph(s) of EUT

5.1 Photograph(s) of EUT







5.2 Photograph(s) of setup

Continuous disturbance voltage



Radiated disturbance





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 '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 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)	±3.8 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 15:2014	--
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

None

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.

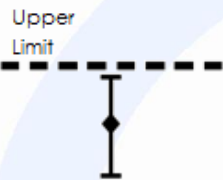
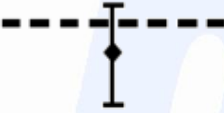
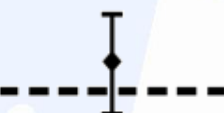


11. Results

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 Continuous disturbance voltage test (150 kHz – 30 MHz)

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.107
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Shielded chamber

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

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

Test specification

Port: Mains terminal
Frequency range: 150 kHz – 30 MHz

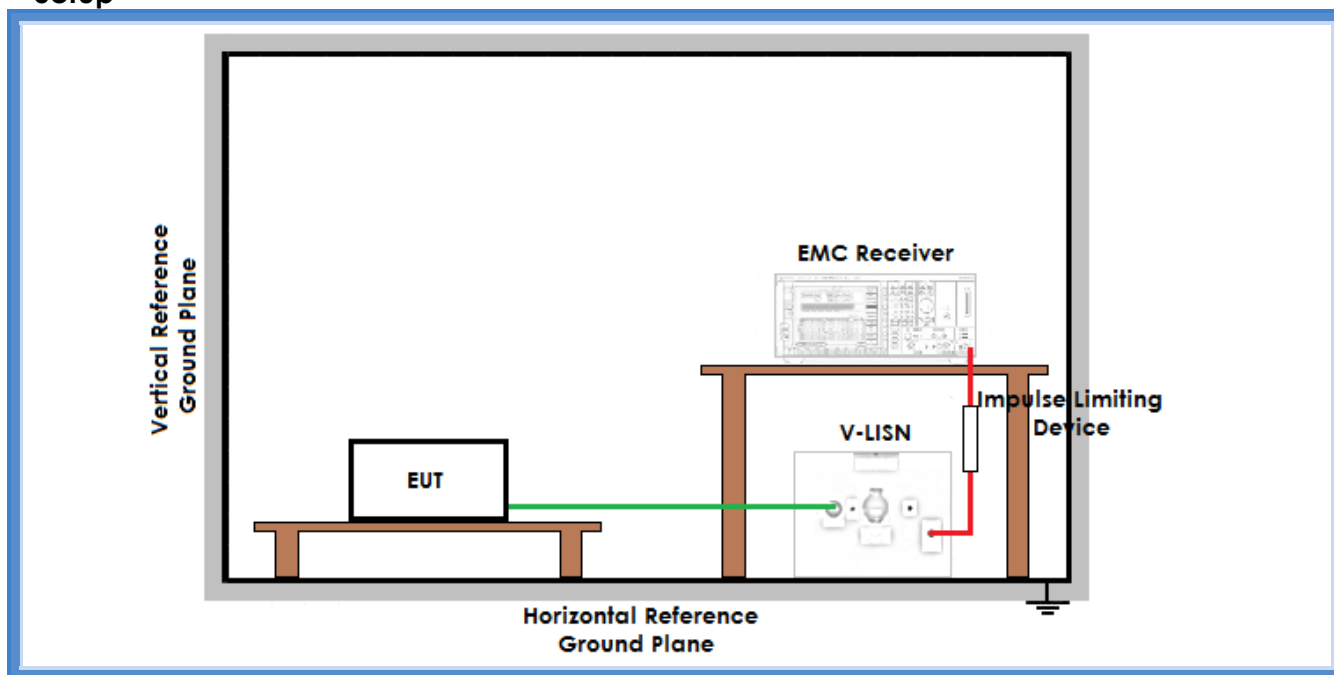
Acceptance limits

Limits for class A equipment		
Frequency range (MHz)	dB(μV) Quasi-peak	dB(μV) Average
0,15 to 0,50	79	66
0,5 to 5	73	60
5 to 30	73	60

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



Setup



Result

Line	Graphs	Remarks	Result
L1	G14155001	EUT side	Complies
N	G14155002	EUT side	Complies
N	G14155003	PC side	Complies
L1	G14155004	PC side	Complies
Remarks: --			

Graphs Legend

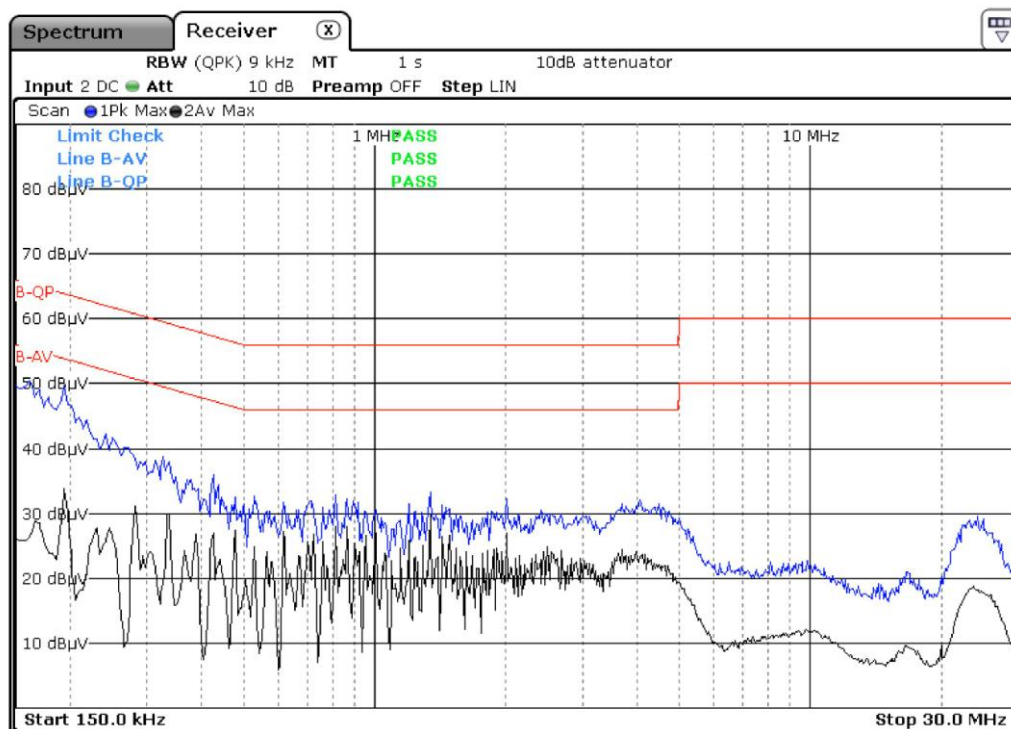
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +

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



Graphs

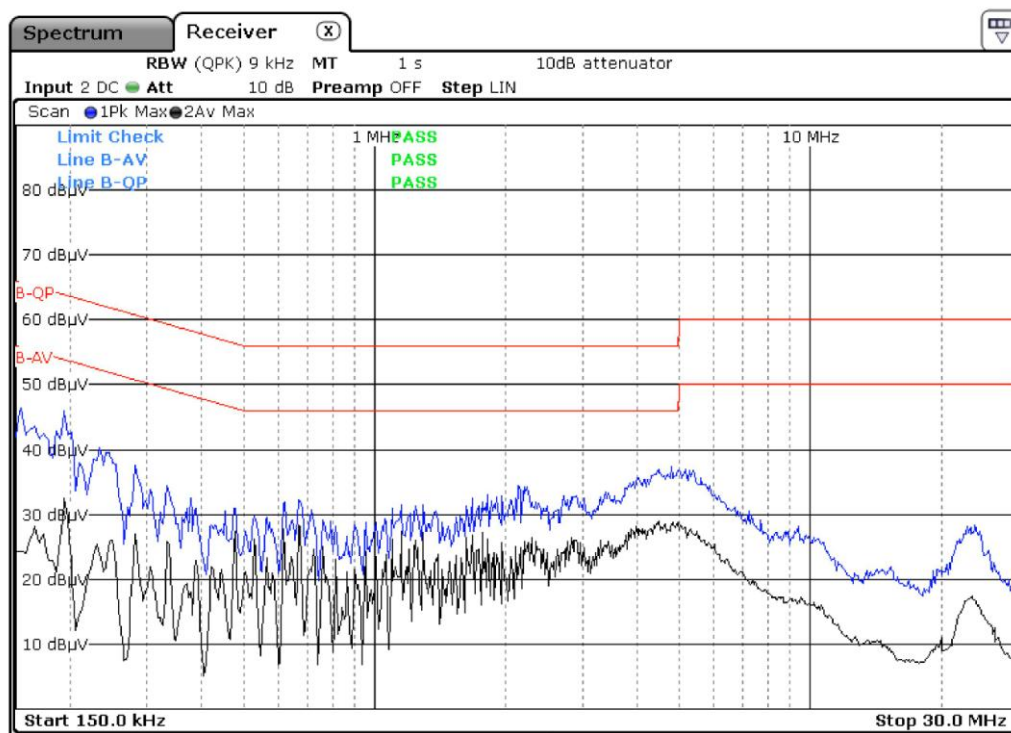
G14155001



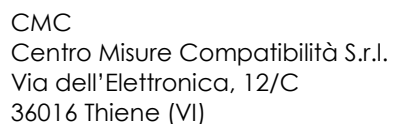
Bertezzo 14155001 Line L 115V



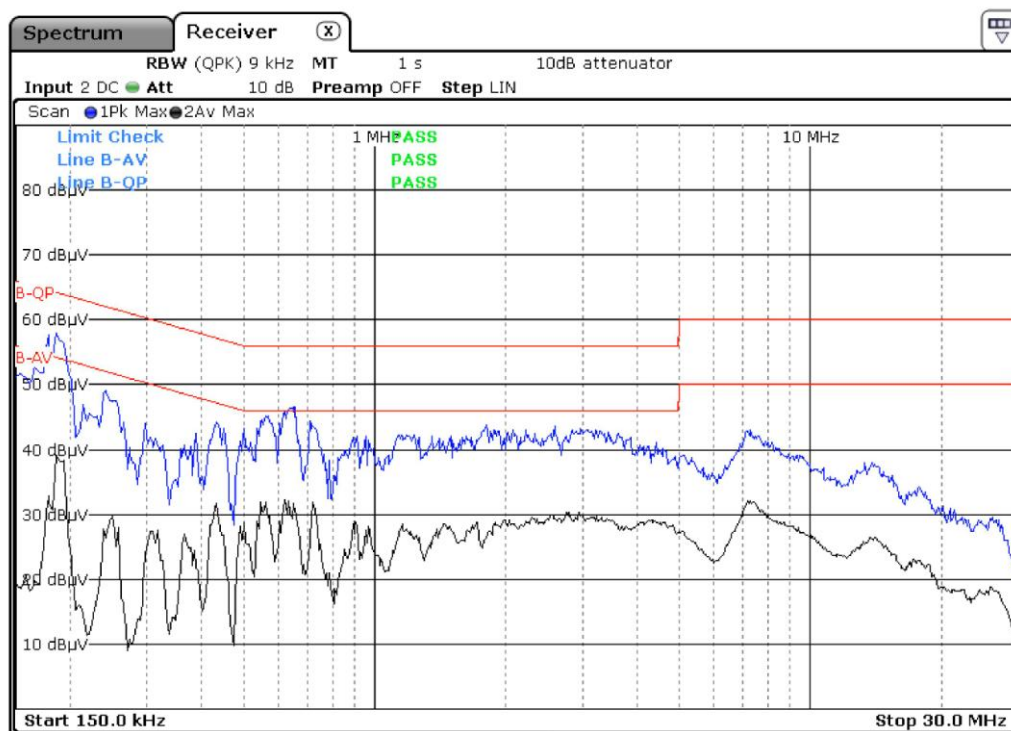
G14155002



Bertezzo 14155002 Line N 115V



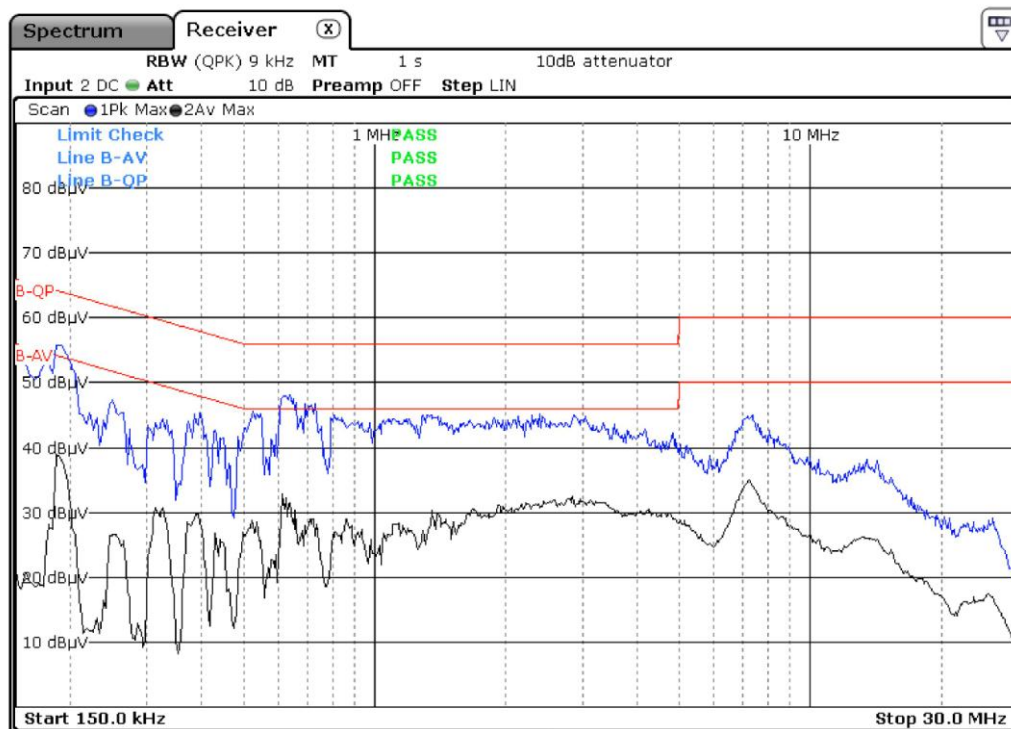
G14155003



Bertezzo 14155003 Line N PC 115V



G14155004



Bertezzo 14155004 Line L PC 115V

Result: The requirements are met



11.2 Radiated disturbance test

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.109
- 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

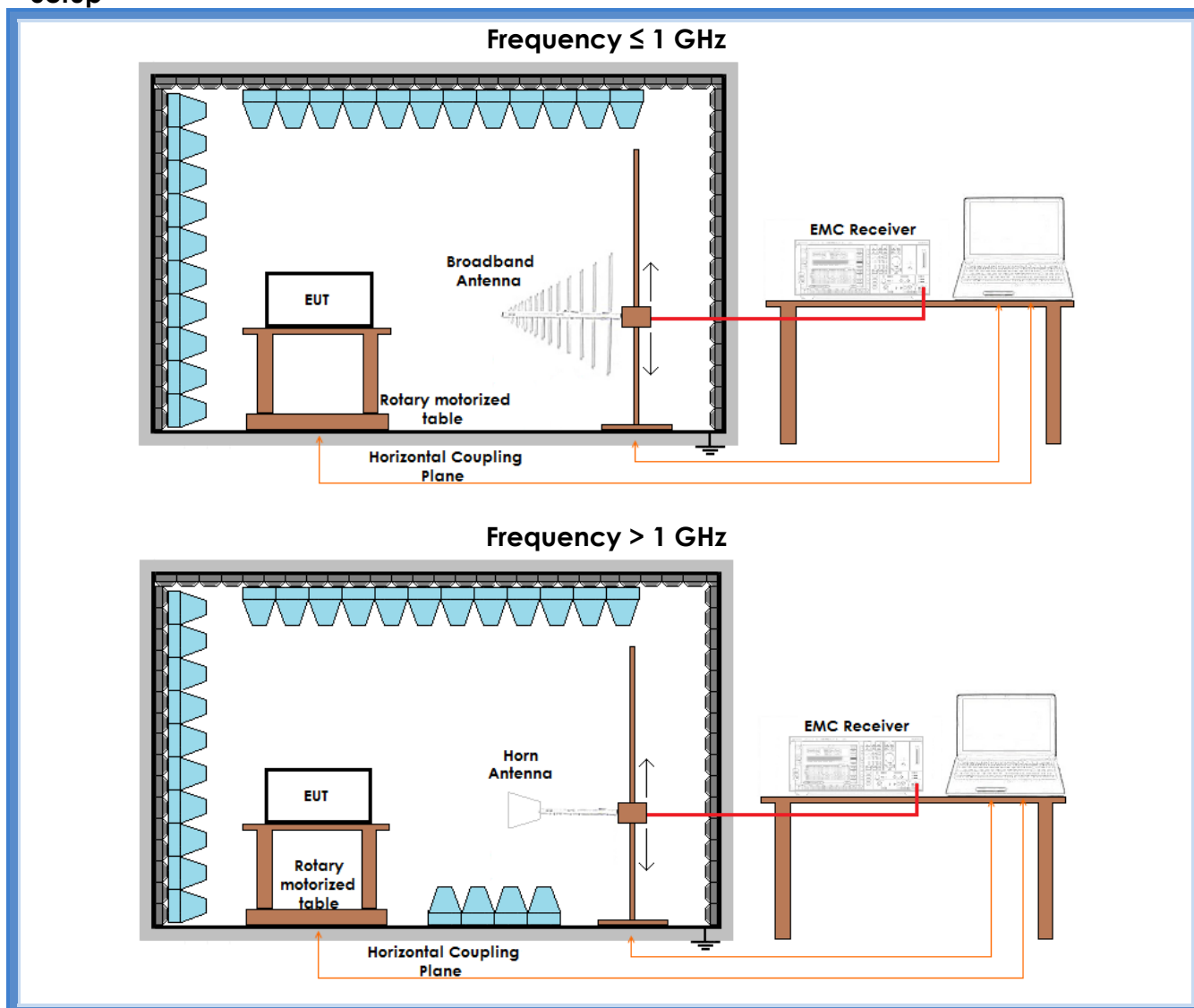
Port: Enclosure
Frequency range: 30 MHz – 24000 MHz
Antenna polarization: Horizontal (H) – Vertical (V)
EUT – Antenna distance: 3 m

Acceptance limits

Limits for class A equipment	
Frequency range (MHz)	Limits [dB(μV/m)]
30 to 88	49,08
88 to 216	53,52
216 to 960	56,44
Above 960	59,54

Limits for class B equipment	
Frequency range (MHz)	Limits [dB(μV/m)]
30 to 88	40
88 to 216	43,52
216 to 960	46,02
Above 960	53,98

Setup



Result

Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
V	30 – 1000	G14155005	--	Complies
H	30 – 1000	G14155006	--	Complies
V	1000 – 6000	G14155007	--	Complies
H	1000 – 6000	G14155008	--	Complies
V	6000 – 18000	G14155015	--	Complies
H	6000 – 18000	G14155016	--	Complies
V	18000 – 24000	G14155022	--	Complies
H	18000 – 24000	G14155021	--	Complies
Remarks: 110 Vac power supply				



Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
V	30 – 1000	G14155009	--	Complies
H	30 – 1000	G14155010	--	Complies
V	1000 – 6000	G14155012	--	Complies
H	1000 – 6000	G14155011	--	Complies
V	6000 – 18000	G14155019	--	Complies
H	6000 – 18000	G14155020	--	Complies
V	18000 – 24000	G14155023	--	Complies
H	18000 – 24000	G14155024	--	Complies
Remarks: 7,2 Vdc from battery power supply				

Graphs Legend

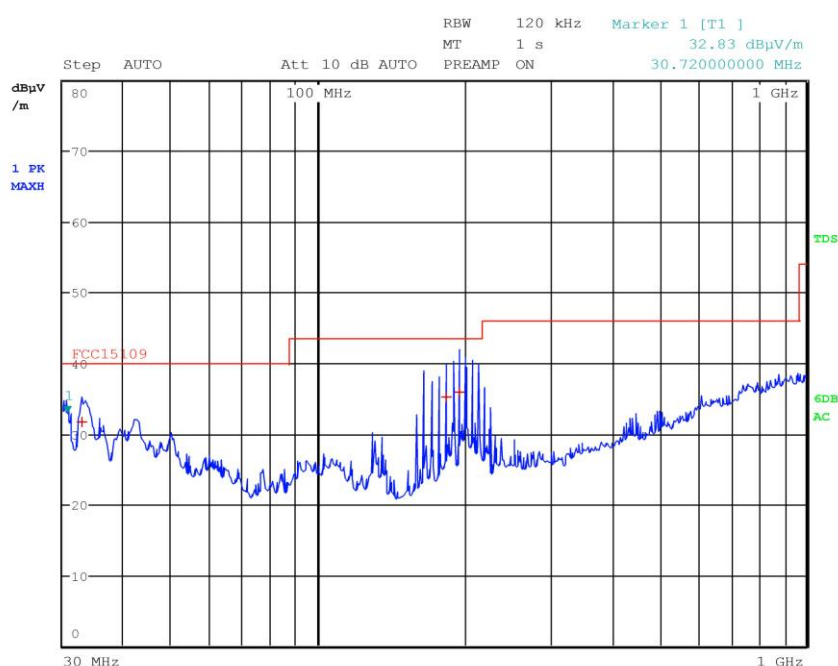
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a x



Graphs

G14155005

Meas Type Emission 30-1000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Alim.115V
Operator Bertezolo 14155005
Test Spec
Vert



Final Measurement

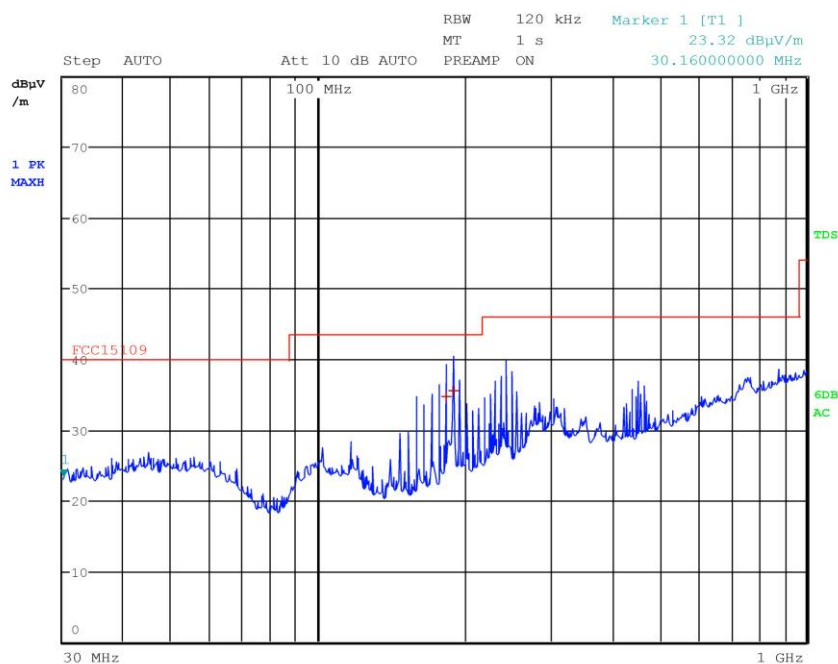
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	32.760000000 MHz	31.60	Quasi Peak	-8.40
1	183.000000000 MHz	35.19	Quasi Peak	-8.33
1	195.040000000 MHz	35.90	Quasi Peak	-7.62



G14155006

Meas Type Emission 30-1000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Alim.115V
Operator Bertezolo 14155006
Test Spec
Horiz



Final Measurement

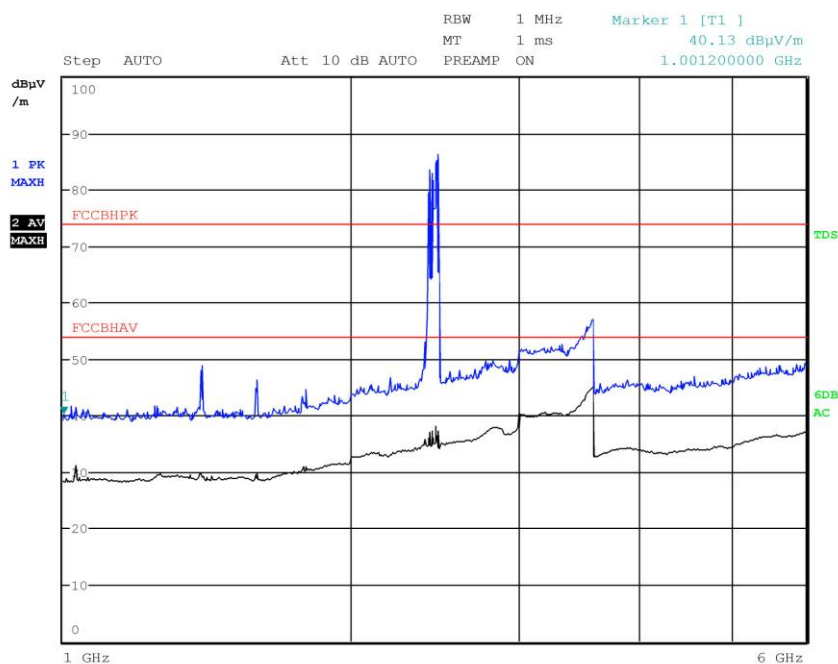
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	183.000000000 MHz	34.69	Quasi Peak	-8.83
1	189.000000000 MHz	35.62	Quasi Peak	-7.90



G14155007

Meas Type Emission 1000-6000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Alim.115V
Operator Bertezolo 14155007
Test Spec
Vert



Final Measurement

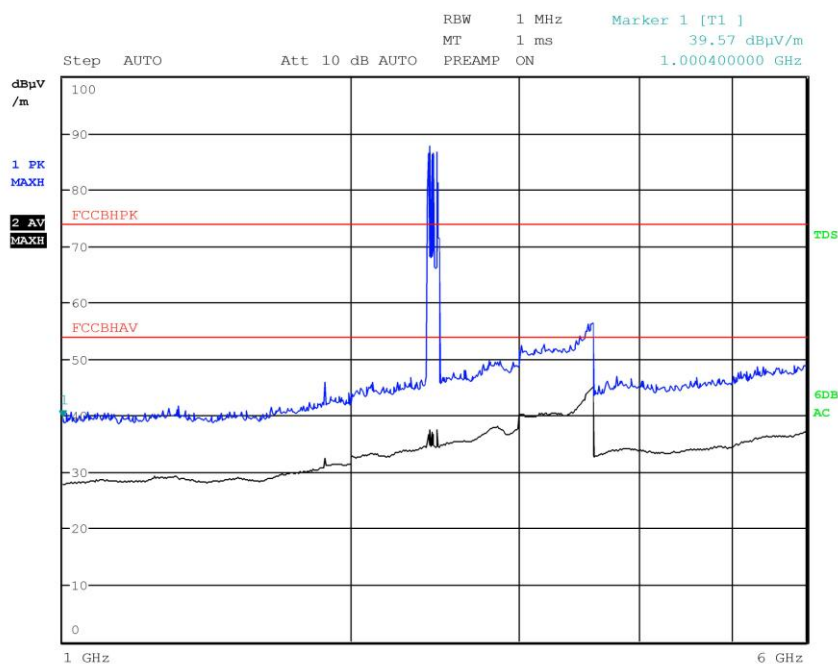
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	32.760000000 MHz	31.60	Quasi Peak	-8.40
1	183.000000000 MHz	35.19	Quasi Peak	-8.33
1	195.040000000 MHz	35.90	Quasi Peak	-7.62



G14155008

Meas Type Emission 1000-6000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Alim.115V
Operator Bertezolo 14155008
Test Spec
Horiz



Final Measurement

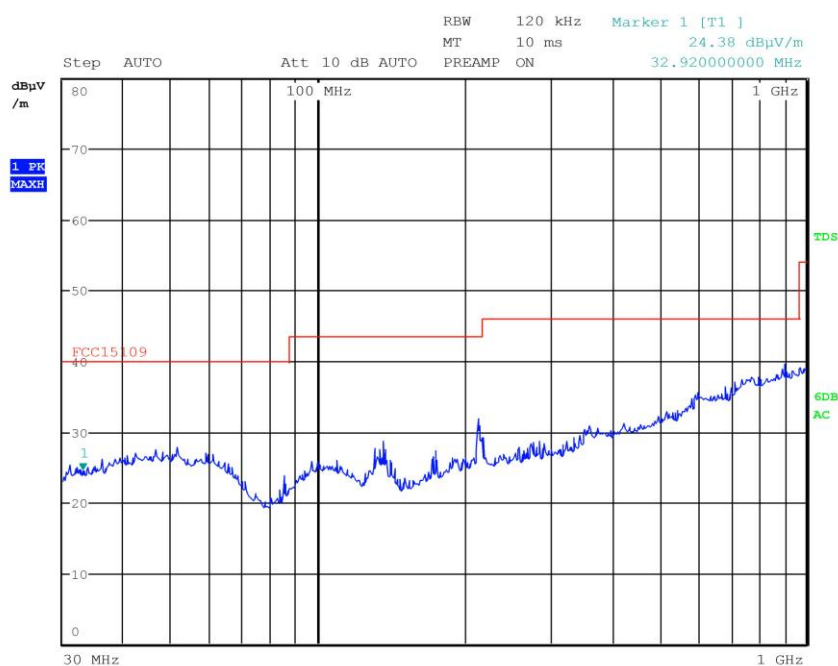
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	32.760000000 MHz	31.60	Quasi Peak	-8.40
1	183.000000000 MHz	35.19	Quasi Peak	-8.33
1	195.040000000 MHz	35.90	Quasi Peak	-7.62



G14155009

Meas Type Emission 30-1000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Batt.
Operator Bertezolo 14155009
Test Spec
Vert



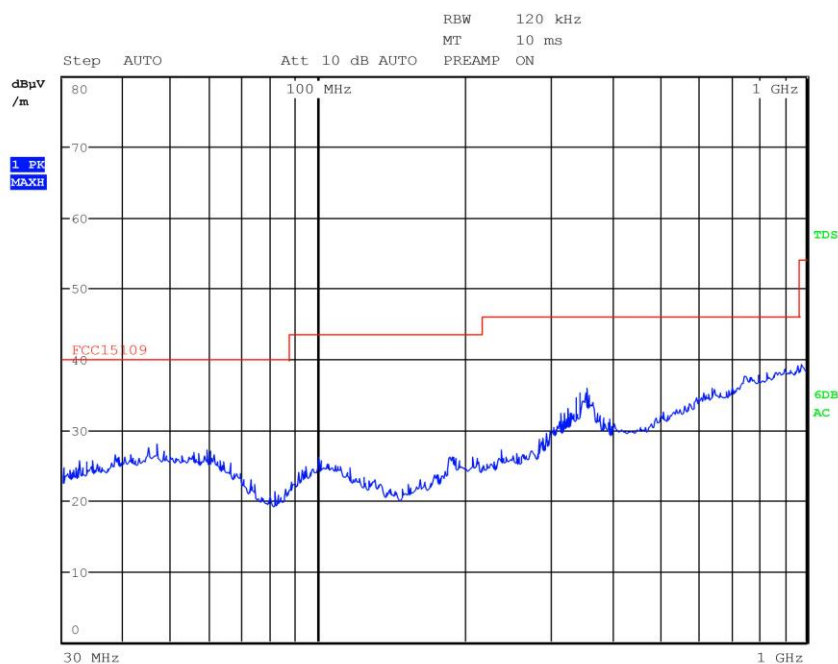
Final Measurement

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



G14155010

Meas Type Emission 30-1000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Batt.
Operator Bertezolo 14155010
Test Spec
Horiz



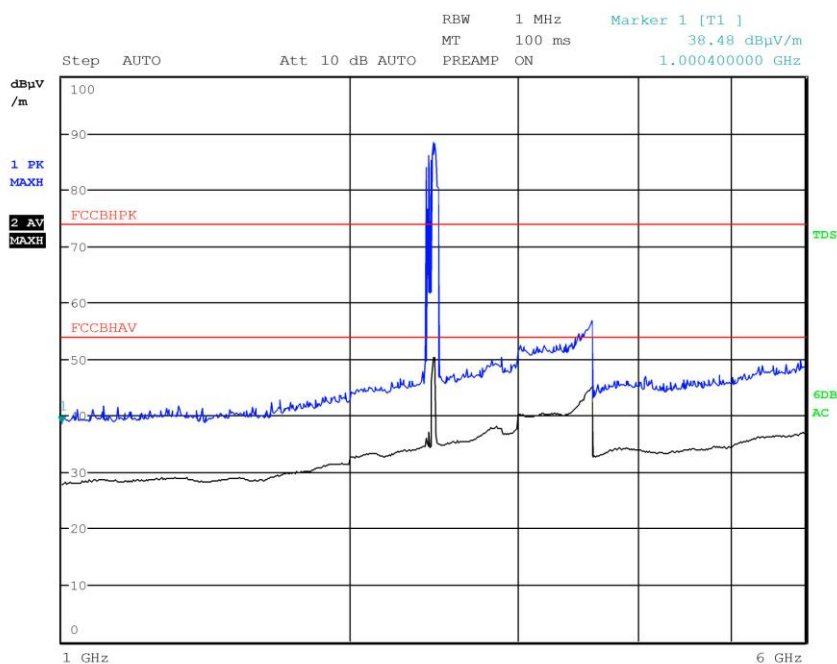
Final Measurement

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



G14155011

Meas Type Emission 1000-6000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Batt.
Operator Bertezolo 14155011
Test Spec
Horiz



Final Measurement

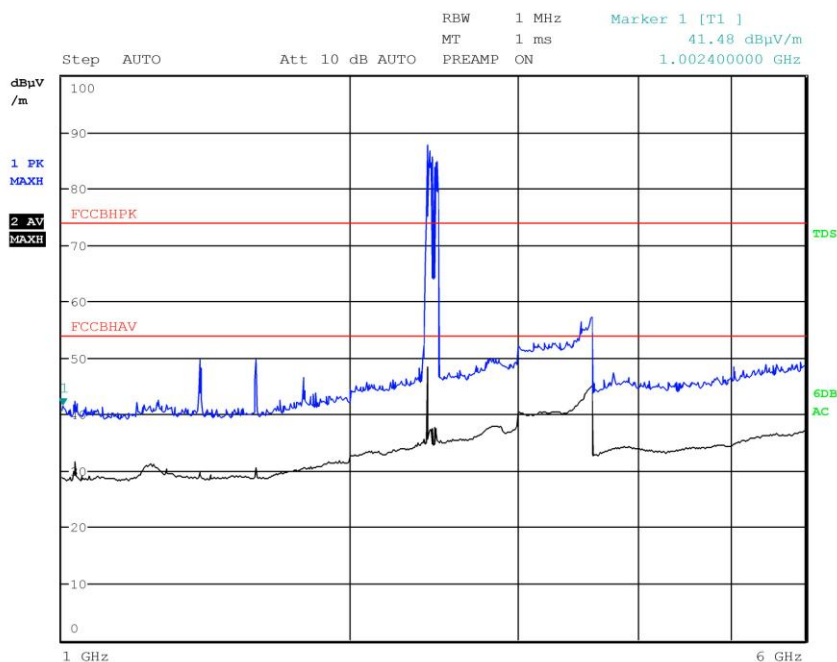
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	32.760000000 MHz	31.60	Quasi Peak	-8.40
1	183.000000000 MHz	35.19	Quasi Peak	-8.33
1	195.040000000 MHz	35.90	Quasi Peak	-7.62



G14155012

Meas Type Emission 1000-6000MHz
Equipment under Test
Manufacturer
OP Condition A regime - Batt.
Operator Bertezolo 14155012
Test Spec
Vert



Final Measurement

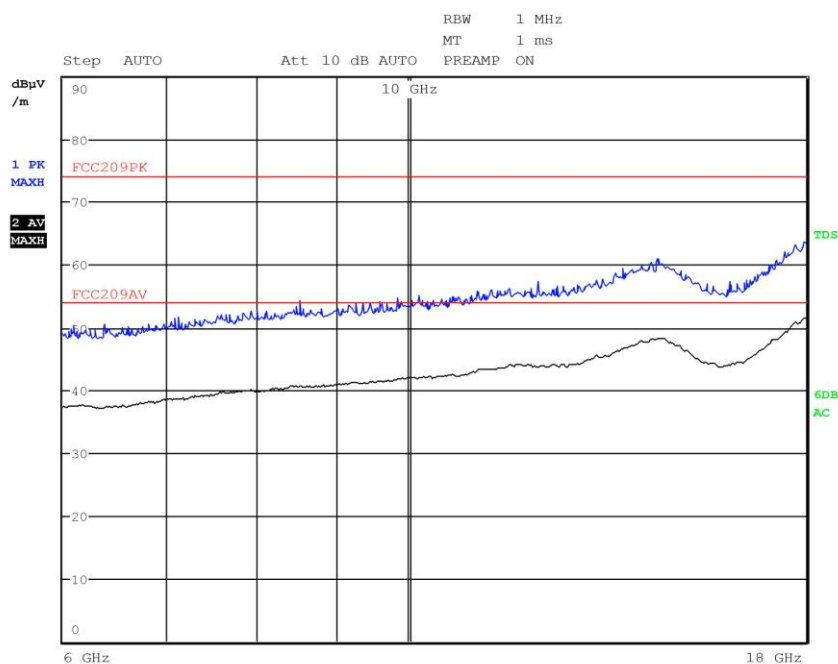
Meas Time: 1 s
Margin: 6 dB
Subranges: 3

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	32.760000000 MHz	31.60	Quasi Peak	-8.40
1	183.000000000 MHz	35.19	Quasi Peak	-8.33
1	195.040000000 MHz	35.90	Quasi Peak	-7.62



G14155015

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Alim. 115V
Operator Bertezolo 14155015
Test Spec
Vert



Final Measurement

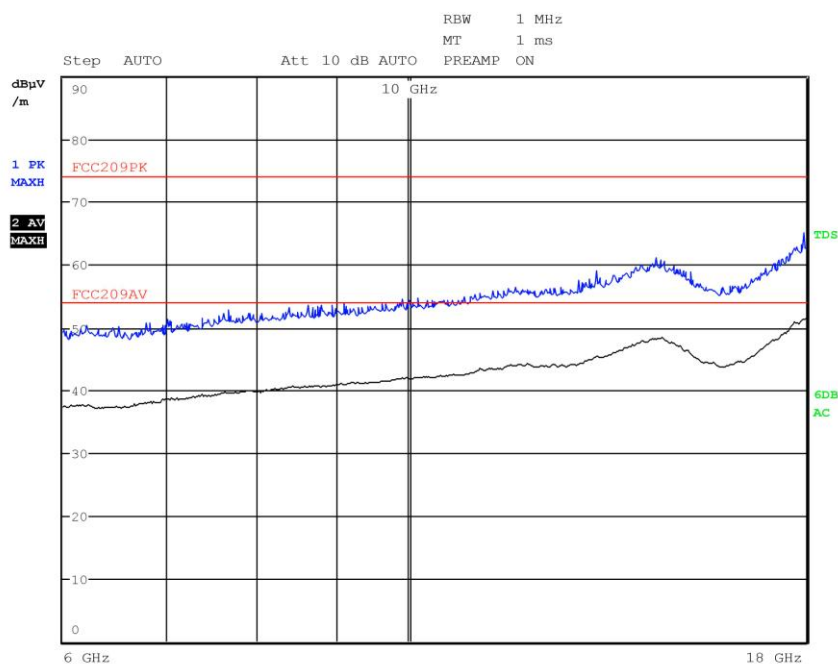
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155016

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Alim. 115V
Operator Bertezzo 14155016
Test Spec
Horiz



Final Measurement

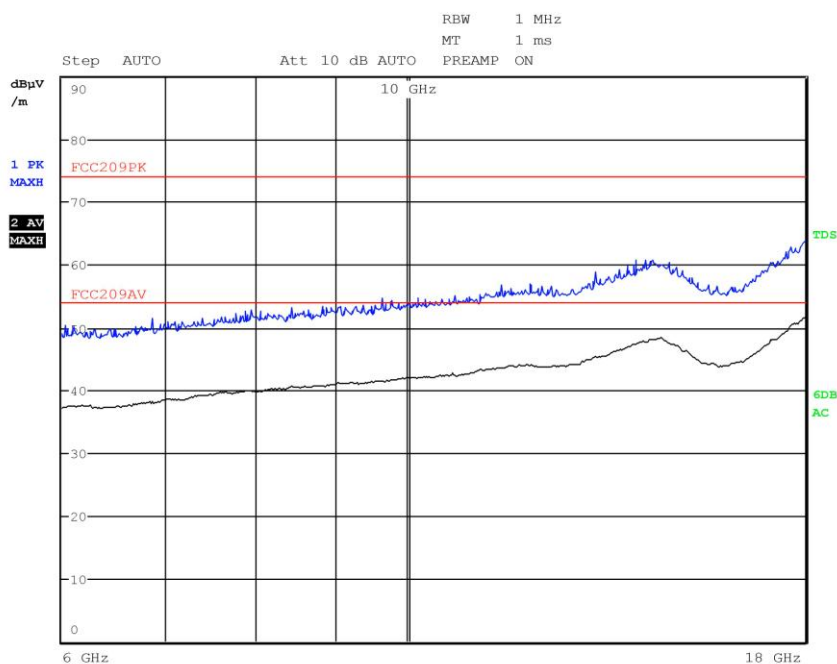
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155019

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Batt.
Operator Bertezolo 14155019
Test Spec
Vert



Final Measurement

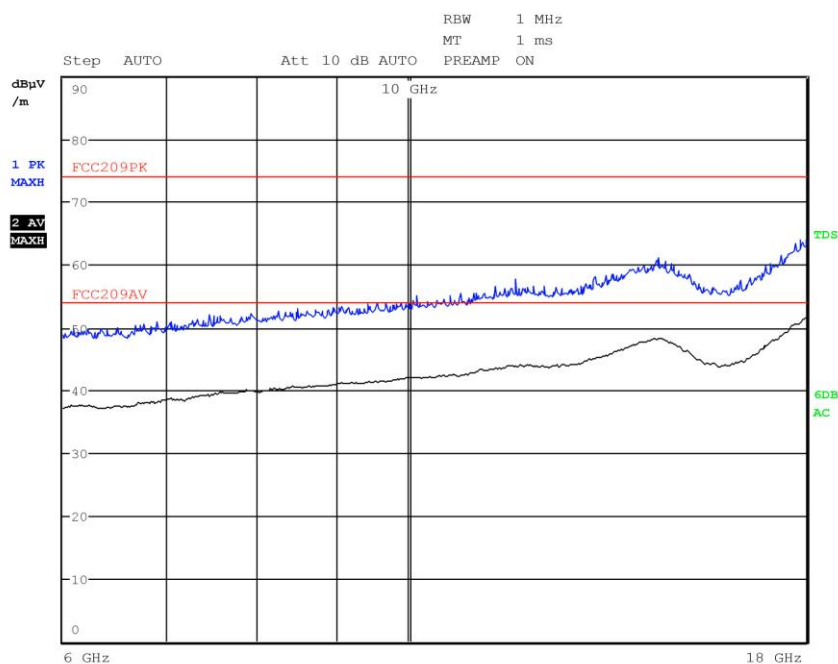
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155020

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Batt.
Operator Bertezolo 14155020
Test Spec
Horiz



Final Measurement

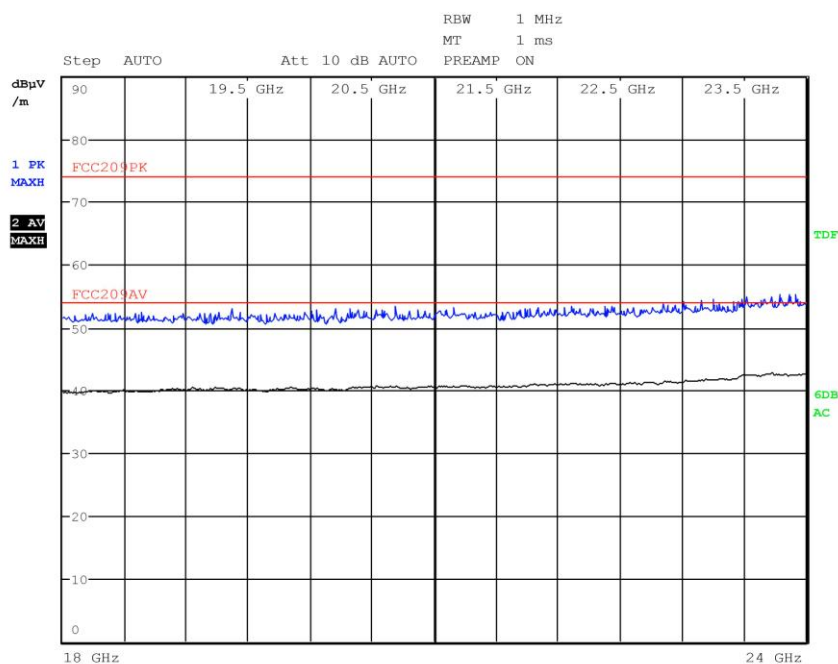
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155021

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Alim. 115V
Operator Bertezzo 14155021
Test Spec
Horiz



Final Measurement

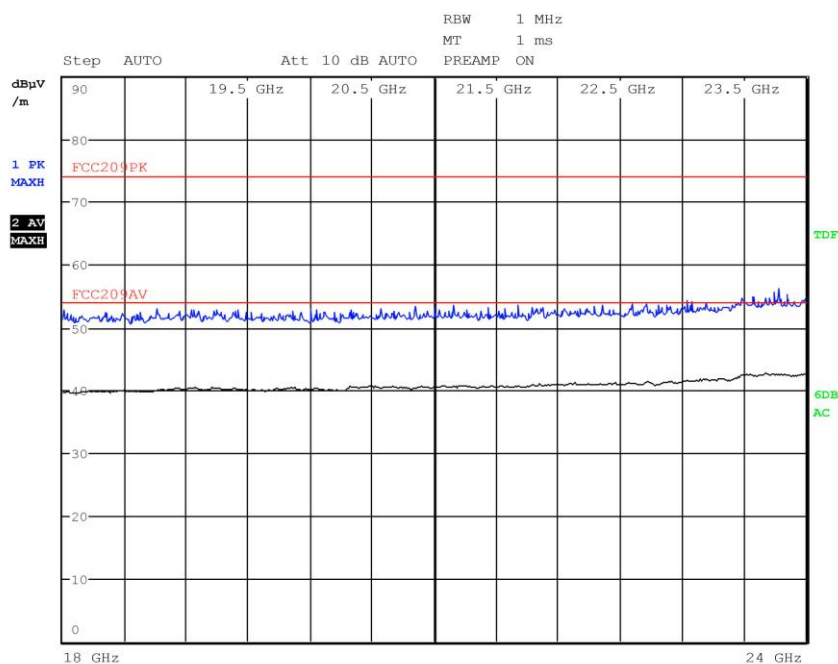
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155022

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Alim. 115V
Operator Bertezzo 14155022
Test Spec
Vert



Final Measurement

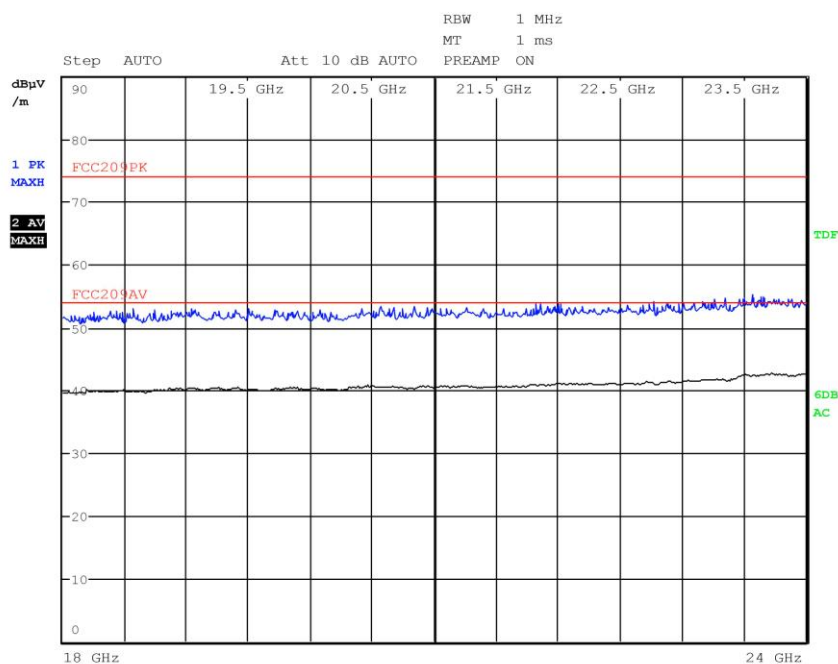
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155023

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Batt.
Operator Bertezzolo 14155023
Test Spec
Vert



Final Measurement

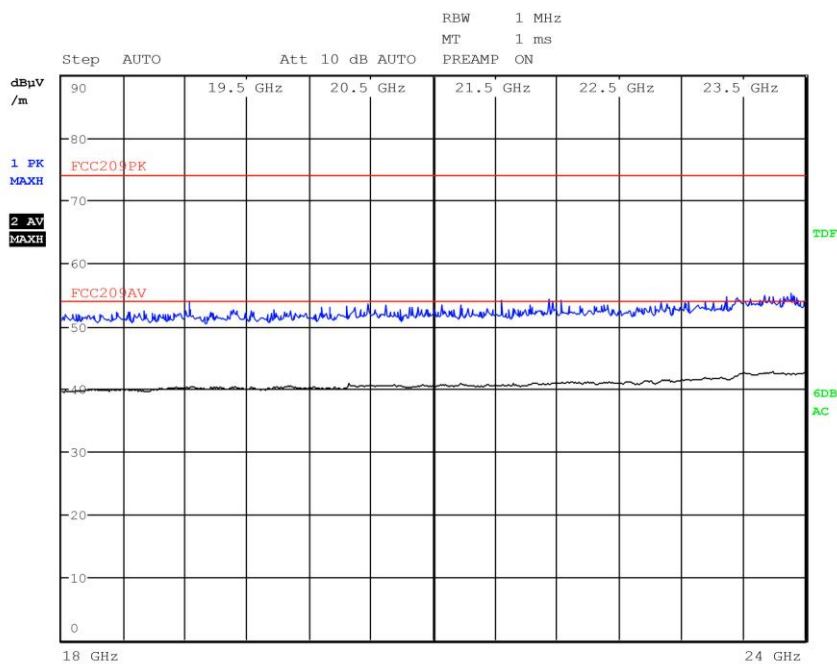
Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04



G14155024

Meas Type Emission
Equipment under Test
Manufacturer
OP Condition A regime – Batt.
Operator Bertezolo 14155024
Test Spec
Horiz



Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 2

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	103.800000000 MHz	30.92	Quasi Peak	-9.08
1	106.040000000 MHz	29.96	Quasi Peak	-10.04

Result: The requirements are met