

TEST REPORT

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EUT DESCRIPTION Radio Equipment for inverter check

EUT TRADEMARK Power-One

EUT MODEL PVI-RADIOMODULE-US

REFERENCE STANDARDS : 47 CFR FCC part 15.249

TEST REPORT NUMBER FCCTR_101470-0

TEST REPORT ISSUE DATE 10/03/2011

TESTING LABORATORY Prima Ricerca & Sviluppo S.r.l.
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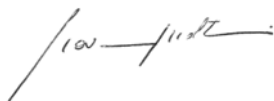
TESTING LOCATION As Above

DATE OF TEST SAMPLE RECEIPT 08/03/2011

DATE OF TEST 08/03/2011

TESTED BY Massimo Maltempi

APPROVED BY Giovanni Molteni

*The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Brand name: POWER-ONE
Manufacturer: POWER-ONE ITALY SPA
Equipment : Transceiver
Serial number : Not present
Model PVI- RADIOMODULE-US
Derived model -----
FCC ID : X6W-MODNOP
Country of manufacturer: ITALY

1.2 *Technical data*

FCC class:	47 CFR FCC Part 15 Subpart C § 15.249	
Product type:	Radio Equipment for inverter check	
Radio type:	Intentional radiators	
Power type :	12 Vdc	
Modulation :	GFSK	
Data Rate (Mbps) :	50 Kbps	
Frequency range :	902 – 928 MHz	
Channel number :	63	
Channel Band Width (20dB) :	344 KHz	
Channel space:	400KHz	
radiated Output Power :	93.4 (46,8mV/m)	
Carrier Frequency:	Channel No.1: 902,65 MHz	Channel No.63: 927,45 MHz
Field Antenna :	Antenna Type: Bondale Industrial Ltd. mod. G-RA0K11165032-1460 Gain 2,15 dBi	

Channel table

N°	frequencies	N°	frequencies
1	902,65	33	915,45
2	903,05	34	915,85
3	903,45	35	916,25
4	903,85	36	916,65
5	904,25	37	917,05
6	904,65	38	917,45
7	905,05	39	917,85
8	905,45	40	918,25
9	905,85	41	918,65
10	906,25	42	919,05
11	906,65	43	919,45
12	907,05	44	919,85
13	907,45	45	920,25
14	907,85	46	920,65
15	908,25	47	921,05
16	908,65	48	921,45
17	909,05	49	921,85
18	909,45	50	922,25
19	909,85	51	922,65
20	910,25	52	923,05
21	910,65	53	923,45
22	911,05	54	923,85
23	911,45	55	924,25
24	911,85	56	924,65
25	912,25	57	925,05
26	912,65	58	925,45
27	913,05	59	925,85
28	913,45	60	926,25
29	913,85	61	926,65
30	914,25	62	927,05
31	914,65	63	927,45
32	915,05		

1.3 **Modifications incorporated in E.U.T.**

The following items are the modifications introduced in the equipment under test :

- None

1.4 **Ports identification**

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests.

Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	Enclosure	Electronic module card	By screws
2	AC power input/output ports	Port no present	
3	DC power input/output ports	12 Vdc - powered from Inverter type PVI-4.2-OUTD-IT	
4	Signals / control lines	Port no present	
5	Telecommunication ports	Port no present	

Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

1.5 **Auxiliary equipment**

- NONE

2. TEST CONDITIONS

2.1 Operating test modes and test conditions

The equipment has been tested according to the operative conditions described in the user/installation manual provided by the manufacturer and by following reference standards :

Reference Standard:

- 47 CFR FCC Part 15 Subpart C § 15.249

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test” of all technical sheets of the tests (see Section 4)

Operating condition	Description
#1	EUT in transmission mode

2.2 Test overview

The appliance is classified as “Intentional radiator” in conformity to FCC Part 15 Subpart C Sec. 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

The application is mainly as monitoring of photovoltaic inverter

3. REFERENCE STANDARD FOR PERFORMED TESTS

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in ANSI C63.4-2003 and 47 CFR FCC Part 15 Subpart C.

4. SUMMARY OF TEST RESULTS

4.1 Emission tests

	Port	Phenomena	Basic standard	Operating condition ¹	Result
1	Enclosure	Antenna requirement	FCC Part 15 §15.203	---	Within the limit
2		Field strength of Fundamental frequency	FCC Part 15 §15.249 (a)	#1	Within the limit
3		Field strength of harmonics	FCC Part 15 §15.249 (a)	#1	Within the limit
4		Restricted Bands	FCC Part 15 § 15.205	#1	Within the limit
6	AC mains Input ports	RF Disturbance voltage: continuous Conducted Emission	FCC Part 15 § 15 207(a)	#1	Within the limit

Note:

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz.....	50	500
2400-2483.5 MHz.....	50	500
5725-5875 MHz.....	50	500
24.0-24.25 GHz.....	250	2500

(b) Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed

transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed.

Fixed, point-to-point operation is permitted in the 24.05-24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(2) The frequency tolerance of the carrier signal shall be maintained within 0.001% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Antenna gain must be at least 33 dBi. Alternatively, the main lobe beamwidth must not exceed 3.5 degrees. The beamwidth limit shall apply to both the azimuth and elevation planes. At antenna gains over 33 dBi or beamwidths narrower than 3.5 degrees, power must be reduced to ensure that the field strength does not exceed 2500 millivolts/meter.

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

(f) Parties considering the manufacture, importation, marketing or operation of equipment under this section should also note the requirement in Sec. 15.37(d).

5. TEST RESULTS

<i>ANTENNA REQUIREMENT</i>	12
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TEST 1.	ANTENNA REQUIREMENT
REFERENCE DOCUMENT	<p>According to §15.203 / 15.204</p> <p>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 Sec. 15.211, Sec. 15.213, Sec. 15.217, Sec. 15.219, or Sec. 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 Sec. 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.</p> <p>And according to § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>

Antenna requirement	
N° of authorized antenna type	1
Antenna type	Dedicated antenna
Total gain	2,15 dBi
External power amplifier	Not present

**TEST
2.**

FIELD STRENGTH OF EMISSIONS - FUNDAMENTAL

REFERENCE DOCUMENT According to §15.249(a) , the field strength of emissions from intentional radiators operated within these frequency bands shall comply with limits on this section

- **TEST SETUP:** In according to manufacturer specifications
- **TEST LOCATION:** Semi-anechoic chamber (CISPR 16-1)
Siemens+Matsushita type B84117-D6019-T232
- **TEST EQUIPMENT USED FOR TEST:** EMI Receiver Rohde & Schwarz Mod. ESU40
Chase Antenna Mod. CBL 6111 A

c) Field strength limits are specified at a distance of 3 meters.

- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.249 of reference document
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
Total uncertainty = $(k=2) \pm 3.5$ dB

modulation:	OFF	
Measurement distance :	3 m	

TEST CONDITIONS:		MEASURED
Ambient temperature :	15 - 35 °C	23,5 \pm 3 °C
Ambient humidity :	25 - 75 %rH	39 \pm 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 \pm 50 mbar

OPERATING CONDITION (Rif. Section. 2) : #1

RESULT: WITHIN THE LIMIT

EMC32 Report

Common Information

Test Description: EMC32 Standard Report Setup
 Operating Conditions:
 Operator Name:

EMI Auto Test Template: Electric Field Strength FCC

Hardware Setup: Electric Field Strength FCC
 Measurement Type: Open-Area-Test-Site
 Frequency Range: 902,0 MHz - 928,0 MHz
 Graphics Level Range: 0 dB μ V/m - 80 dB μ V/m

Preview Measurements:
 Graphics Display: Show separate traces for horizontal and vertical polarization
 Scan Test Template: Electric Field Strength FCC pre

Data Reduction:
 Limit Line #1: FCC Part 15_249 Peak
 Limit Line #2: FCC Part 15_249 AV
 Peak Search: 6 dB , Maximum Results: 6
 Subrange Maxima: 0 Subranges , Maxima per Subrange: 1
 Maximum Number of Results: 6

Adjustment:
 Template for Single Meas.: Electric Field Strength FCC fin

Final Measurements:
 Template for Single Meas.: Electric Field Strength FCC fin

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 1 GHz	40 kHz	PK+; AVG	120 kHz	1 s	20 dB
1 GHz - 18 GHz	400 kHz	PK+; AVG	1 MHz	1 s	0 dB

Receiver: [ESU 40]

Report Settings:
 Report Template: Sample EMI Auto Test Report
 Create Electronic Report: RTF
 Document Name: EMI Report



Measurement Result

Frequency	Output Power in dBuV/m	Electric Field Strength FCC_5GHz	Standard limit mV/m	Result
CH 1	92.8 (43,7mV/m) Antenna polarity Vertical		50	compliant

Frequency	Output Power in dBuV/m	EMI Auto Test 08_03_2011	Standard limit mV/m	Result
CH 31	92.2 (40,7mV/m)		50	compliant

Frequency	Output Power in dBuV/m	EMI Auto Test 08_03_2011	Standard limit mV/m	Result
CH 63	93.4 (46,8mV/m)		50	compliant

LIMIT		
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz.....	50	500
2400-2483.5 MHz.....	50	500
5725-5875 MHz.....	50	500
24.0-24.25 GHz.....	250	2500

**TEST
3.**

FIELD STRENGTH OF EMISSIONS - HARMONIC

REFERENCE DOCUMENT

According to §15.249(a) , the field strength of emissions from intentional radiators operated within these frequency bands shall comply with limits on this section and follows § 15.205 Restricted Bands limit

- TEST LOCATION: Semi-anechoic chamber
- TEST EQUIPMENT USED FOR TEST: EMI receiver Rohde & Schwarz Mod. ESU 40
Chase Antenna Mod. CBL 6111 A
Antenna Rohde & Schwarz mod. HL50
- TESTED PORT: Enclosure
- EMISSION LIMITS: Acc. to Section 15.249 of reference document
- UNCERTAINTY OF MEASURE: Combined uncertainty = 1.75 dB
Total uncertainty = (k=2) 3.5 dB

modulation:	OFF	
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TEST CONDITIONS:	MEASURED
Ambient temperature : 15 - 35 °C	23,5 ± 3 °C
Ambient humidity : 25 - 75 %rH	39 ± 5 %rH
Pressure : 85 - 106 kPa (860 mbar - 1060 mbar)	950 ± 50 mbar

OPERATING CONDITION (Rif. Section. 2) : #1

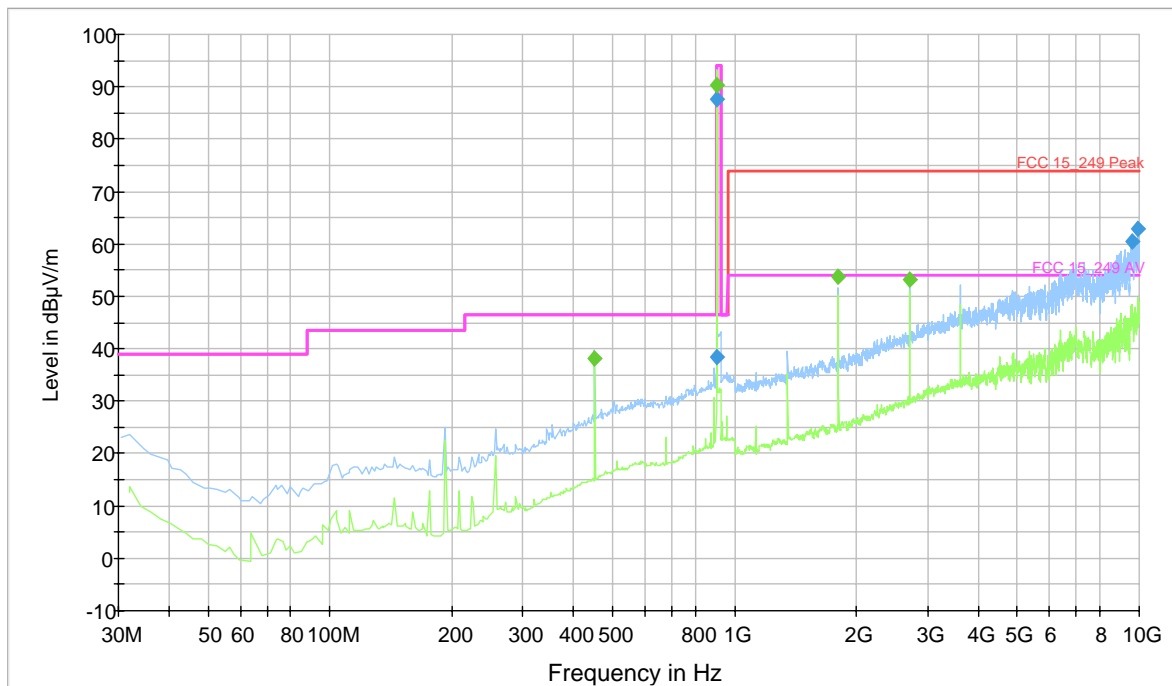
RESULT: WITHIN THE LIMIT

CH1	902,65 MHz
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Vertical Polarization

CH1

EMI Auto Test 08_03_2011



Frequencies measured between 7 to 10Ghz are related to noise floor component

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
901.840000	38.4	1000.0	120.000	121.0	V	29.0	26.9	8.00	46.40
902.680000	87.6	1000.0	120.000	123.0	V	19.0	27.0	6.40	94.00
9629.200000	60.5	1000.0	1000.000	100.0	V	180.0	19.4	13.50	74.00
9948.400000	62.8	1000.0	1000.000	145.0	V	215.0	24.2	11.20	74.00

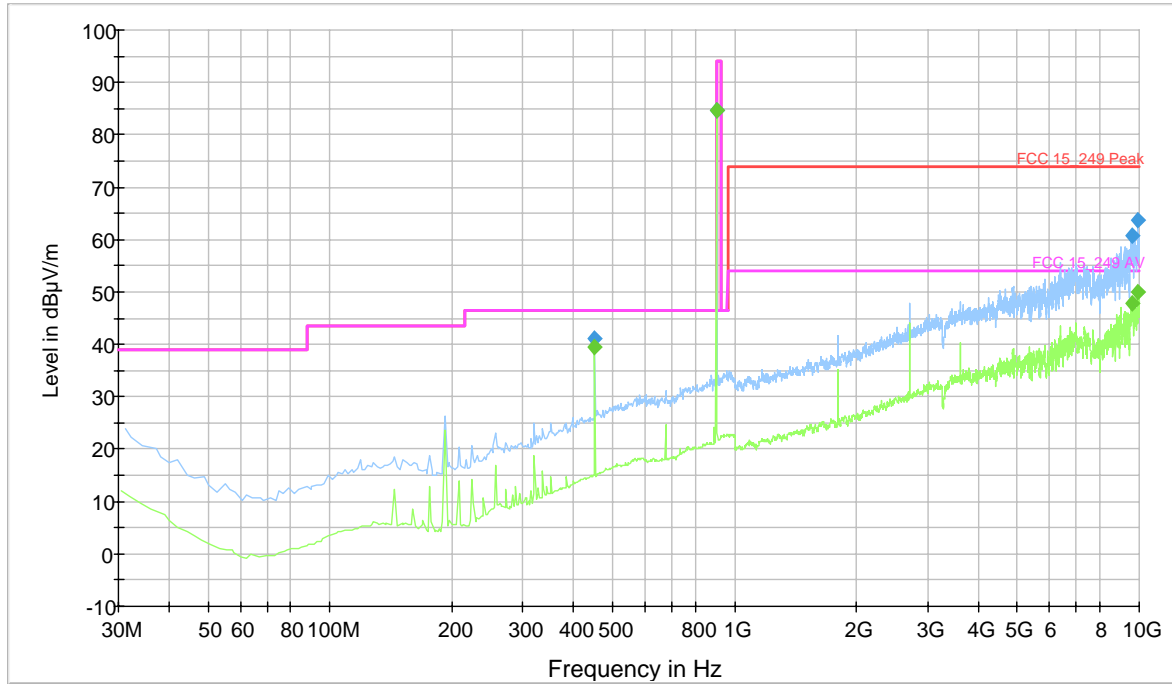
Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
451.320000	38.1	1000.0	120.000	121.0	V	19.0	20.0	8.30	46.40
902.680000	90.3	1000.0	120.000	123.0	V	1.0	27.0	-43.90	46.40
1805.200000	53.8	1000.0	1000.000	145.0	V	1.0	-6.8	-4.80	54.00
2708.000000	53.3	1000.0	1000.000	139.0	V	30.0	-1.9	-4.30	54.00

Horizontal Polarization

CH1

EMI Auto Test 08_03_2011



Frequencies measured between 7 to 10GHz are related to noise floor component

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
451.360000	41.1	1000.0	120.000	100.0	H	204.0	20.0	5.30	46.40
902.680000	84.7	1000.0	120.000	123.0	H	138.0	27.0	9.30	94.00
9635.600000	60.7	1000.0	1000.000	146.0	H	201.0	19.6	13.30	74.00
9948.800000	63.7	1000.0	1000.000	140.0	H	186.0	24.1	10.30	74.00

Final Result 2

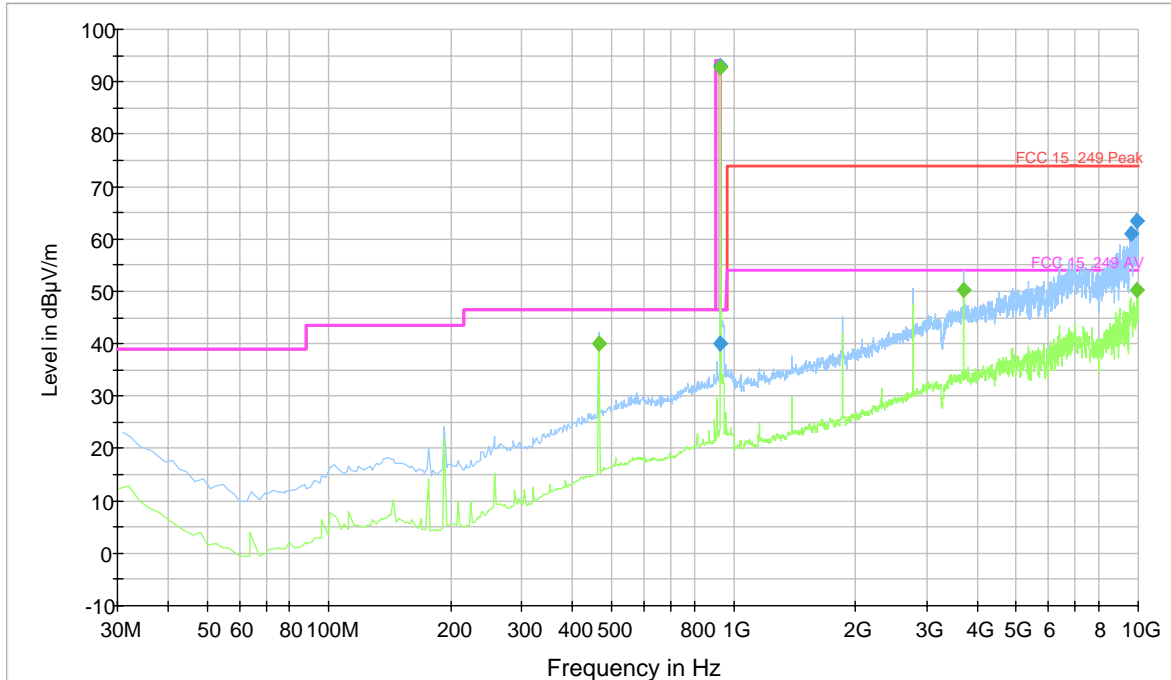
Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
451.320000	39.5	1000.0	120.000	100.0	H	206.0	20.0	6.90	46.40
902.680000	84.6	1000.0	120.000	123.0	H	138.0	27.0	9.40	94.00
9628.400000	47.7	1000.0	1000.000	100.0	H	181.0	19.5	6.30	54.00
9948.000000	50.1	1000.0	1000.000	140.0	H	229.0	24.3	3.90	54.00



Vertical Polarization

CH63

EMI Auto Test 08_03_2011



Frequencies measured between 7 to 10GHz are related to noise floor component

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
927.480000	92.9	1000.0	120.000	121.0	V	228.0	27.9	1.10	94.00
928.160000	40.0	1000.0	120.000	123.0	V	180.0	27.9	6.40	46.40
9628.000000	60.9	1000.0	1000.000	100.0	V	221.0	19.5	13.10	74.00
9948.400000	63.5	1000.0	1000.000	145.0	V	224.0	24.2	10.50	74.00

Final Result 2

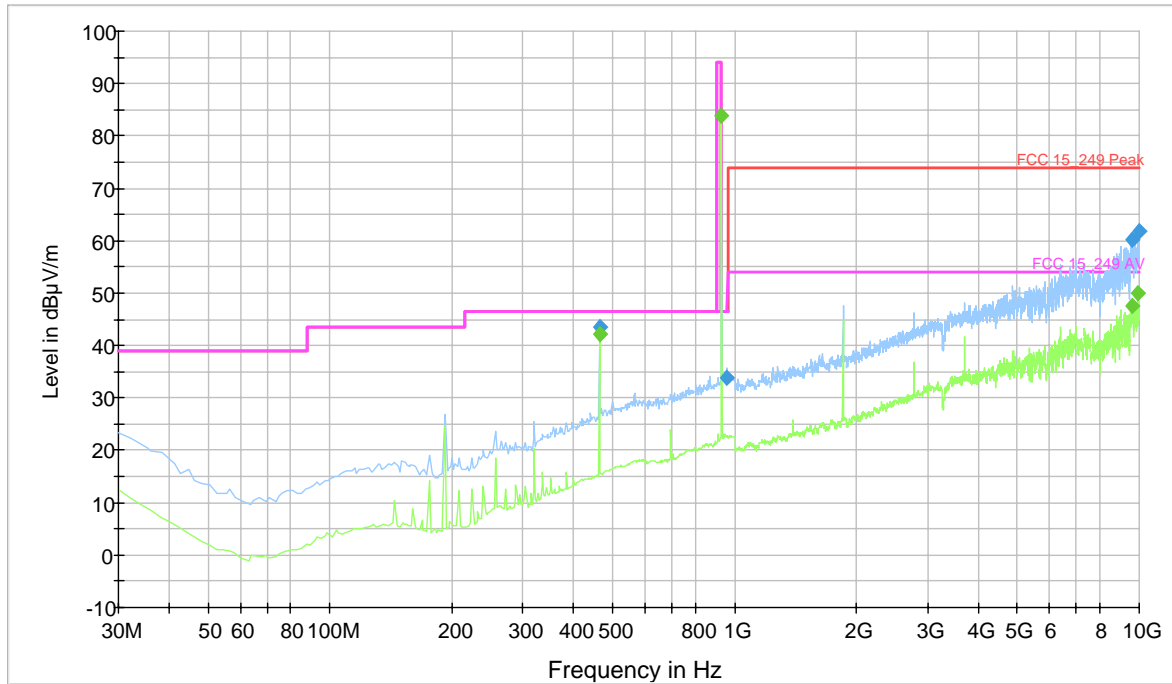
Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
463.760000	40.1	1000.0	120.000	100.0	V	183.0	20.3	6.30	46.40
927.480000	92.8	1000.0	120.000	121.0	V	203.0	27.9	1.20	94.00
3710.000000	50.4	1000.0	1000.000	100.0	V	181.0	1.3	3.60	54.00
9948.000000	50.1	1000.0	1000.000	100.0	V	152.0	24.3	3.90	54.00



Horizontal Polarization

CH63

EMI Auto Test 08_03_2011



Frequencies measured between 7 to 10Ghz are related to noise floor component

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
463.760000	43.6	1000.0	120.000	100.0	H	203.0	20.3	2.80	46.40
957.520000	33.9	1000.0	120.000	100.0	H	137.0	28.4	12.50	46.40
9620.800000	60.1	1000.0	1000.000	145.0	H	218.0	19.9	13.90	74.00
9975.600000	61.9	1000.0	1000.000	124.0	H	222.0	22.7	12.10	74.00

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
463.760000	42.1	1000.0	120.000	100.0	H	203.0	20.3	4.30	46.40
927.480000	83.8	1000.0	120.000	122.0	H	137.0	27.9	10,2	94.00
9628.800000	47.5	1000.0	1000.000	100.0	H	137.0	19.5	6.50	54.00
9948.000000	50.0	1000.0	1000.000	100.0	H	203.0	24.3	4.00	54.00

TEST 4. EMISSIONS OF MAIN TERMINAL DISTURBANCE VOLTAGE (CONTINUOUS DISTURBANCE)

REFERENCE DOCUMENT FCC 47CFR Part 15

- **TEST SETUP:** According to reference standard
- **TEST LOCATION:** Semianechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESU 40
Artificial Network Rohde & Schwarz Mod. ESH3-Z5

- **TESTED PORT:** AC mains : Phase and Neutral Line
- **FREQUENCY RANGE:** 0.15 - 30 MHz
- **EMISSION LIMITS:** Section 15.207 of Standard
- **MEASUREMENT UNCERTAINTY:** Total uncertainty (k=2) \pm 2.5 dB

TEST CONDITIONS:	MEASURED
Ambient temperature : 15 - 35 °C	24 \pm 3 °C
Ambient humidity : 25 - 75 %rH	38 \pm 5 %rH
Pressure : 85 - 106 kPa (860 mbar - 1060 mbar)	975 \pm 50 mbar

Voltage:	Powered from AC/DC adapter 110Vac/12 dc	12Vdc
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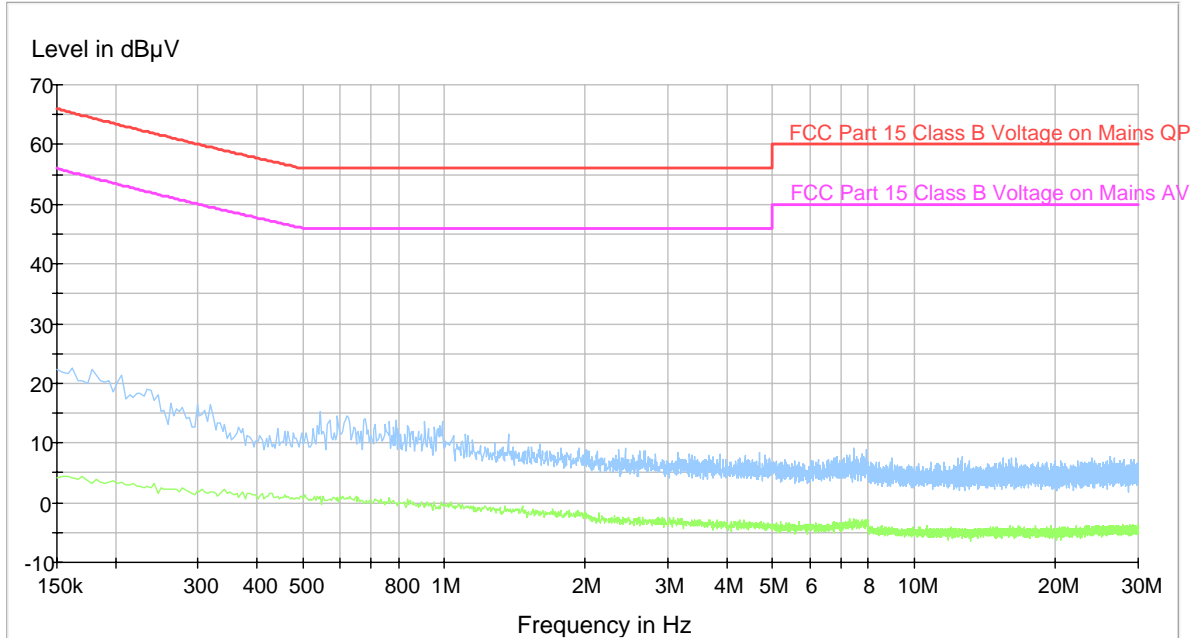
OPERATING CONDITION (Rif. Section. 2) : #1

RESULT: WITHIN THE LIMIT



Neutral

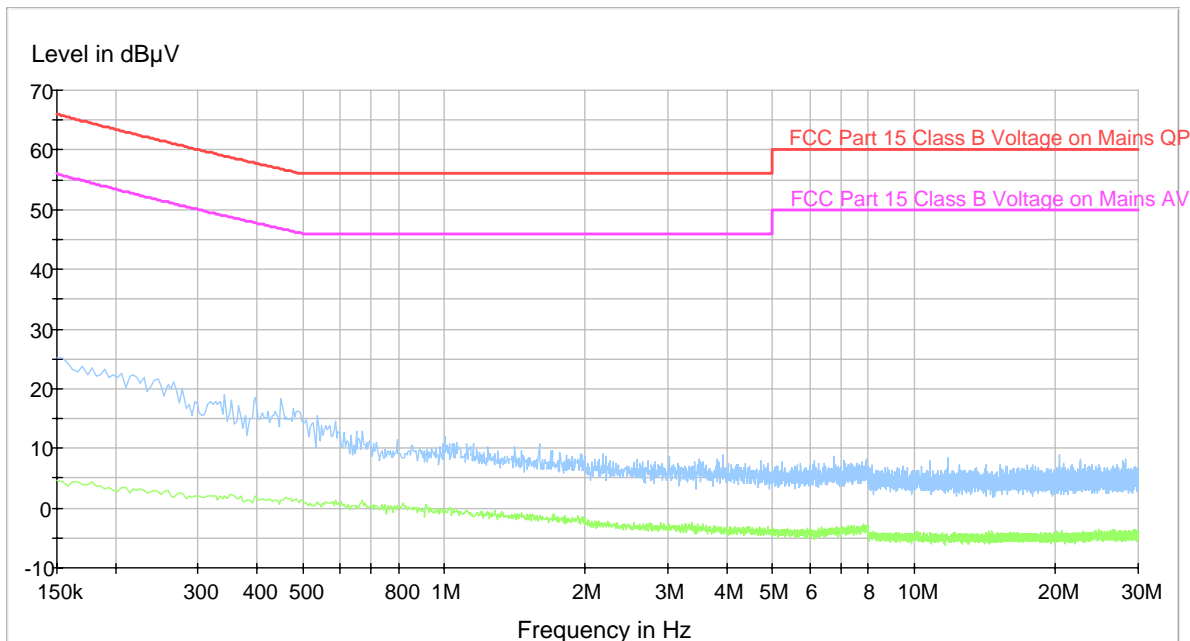
Voltage with 2-Line-LISN



— FCC Part 15 Class B Voltage on Mains QP.LimitLine — FCC Part 15 Class B Voltage on Mains AV.LimitLine
— Preview Result 1 — Preview Result 2

Phase

Voltage with 2-Line-LISN



— FCC Part 15 Class B Voltage on Mains QP.LimitLine — FCC Part 15 Class B Voltage on Mains AV.LimitLine
— Preview Result 1 — Preview Result 2

5.1 Photographic documentation

PHOTO 2 – E.U.T. IDENTIFICATION

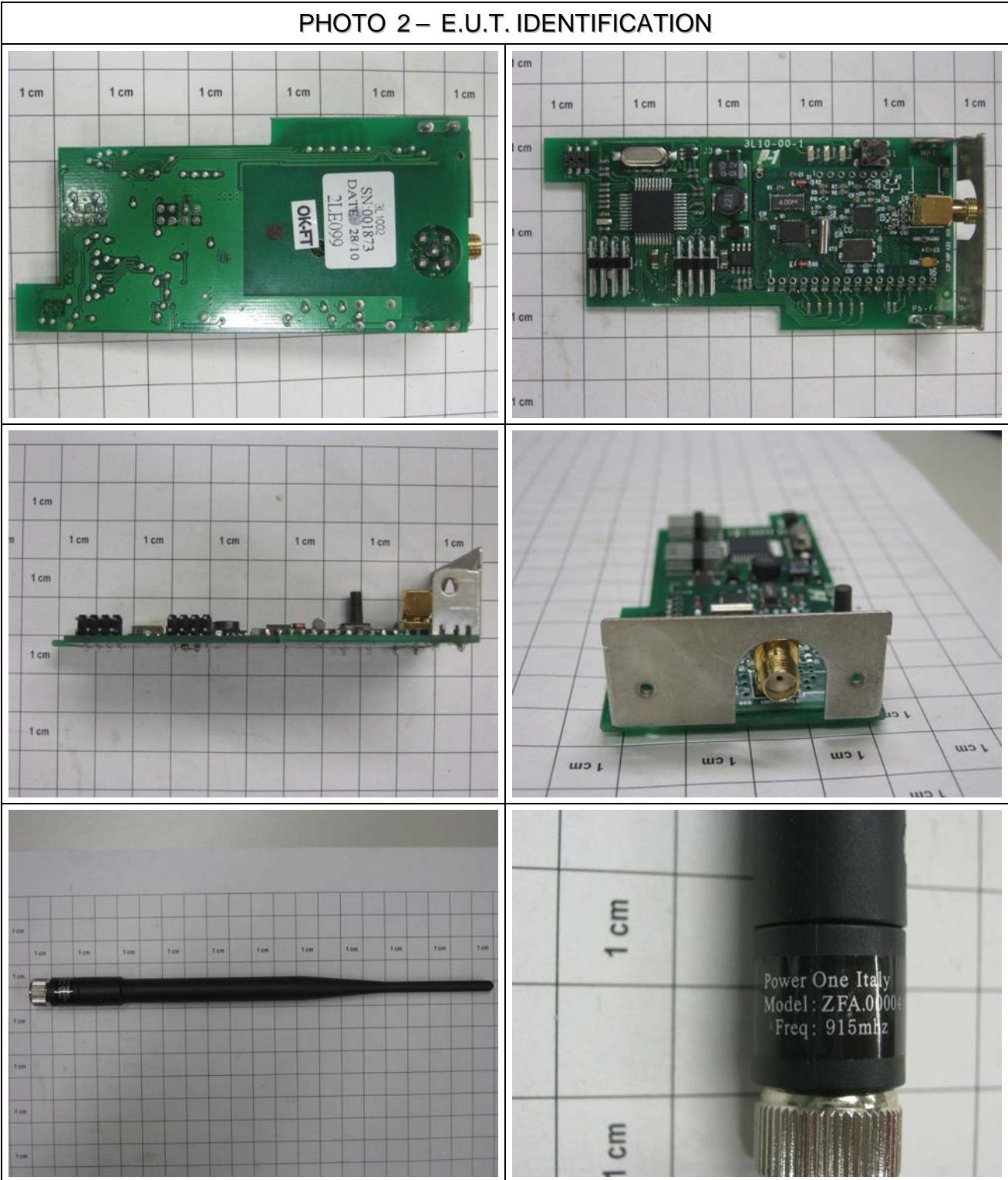


PHOTO 3 – SET-UP FOR EMISSION RADIATED TEST

