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Report No.: 1408RSU00107
Report Version: V02
Issue Date: 10-27-2014

MEASUREMENT REPORT

EN 301 489-1 & EN 301 489-17

Applicant: Compex Systems Pte Ltd

Address: 135, Joo Seng Road, #08-01 Singapore 368363

Product: WIRELESS-AC 2X2 27DBM NETWORK

Model No.: WLE600V5-27ESD

Brand Name: COMPEX

Standards: ETSI EN 301 489 - 1 V1.9.2 (2011-09)
ETSI EN 301 489 - 17 V2.2.1 (2012-09)

Result: Complies

Test Date: Aug. 03 ~ 24, 2014

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date
1408RSU00107	Rev. 01	Initial report	08-25-2014
1408RSU00107	Rev. 02	Add the ESD test level	10-27-2014

CONTENTS

Description	Page
1. General Information.....	6
1.1. Applicant.....	6
1.2. Manufacturer	6
1.3. Testing Facility	6
1.4. Feature of Product.....	7
1.5. Description of Available Antennas.....	8
1.6. Standards Applicable for Testing	9
1.7. Performance Criteria.....	10
2. Test Configuration of Equipment under Test.....	16
2.1. Test Mode.....	16
2.2. Configuration of Tested System	16
2.3. Test System Details	17
2.4. Test Software.....	17
3. Test Summary	18
4. Conducted Emission	19
4.1. Limit of Conducted Emission	19
4.2. Test Setup	19
4.3. Test Procedure	20
4.4. Test Result.....	21
4.5. Test Photograph	23
5. Radiated Emission.....	24
5.1. Limit of Radiated Emission	24
5.2. Test Setup	24
5.3. Test Procedure	26
5.4. Test Result.....	27
5.5. Test Photograph	31
6. Harmonic Current Emissions.....	32
6.1. Limit of Harmonic Current Emissions.....	32
6.2. Test Setup	32
6.3. Test Procedure	32
6.4. Test Result.....	33
6.5. Test Photograph	35

7. Voltage Fluctuations and Flicker	36
7.1. Limit of Voltage Fluctuations and Flicker	36
7.2. Test Setup	37
7.3. Test Procedure	37
7.4. Test Result.....	38
7.5. Test Photograph	39
8. Electrostatic discharge.....	40
8.1. Limit of Electrostatic discharge	40
8.2. Test Setup	40
8.3. Test Procedure	41
8.4. Test Result.....	42
8.5. Test Photograph	43
9. Radio-frequency electromagnetic field	44
9.1. Limit of Radio-frequency electromagnetic field.....	44
9.2. Test Setup	44
9.3. Test Procedure	45
9.4. Test Result.....	46
9.5. Test Photograph	47
10. Electrical fast transients.....	48
10.1. Limit of Electrical fast transients.....	48
10.2. Test Setup	48
10.3. Test Procedure	48
10.4. Test Result.....	50
10.5. Test Photograph	51
11. Surges	52
11.1. Limit of Surges.....	52
11.2. Test Setup	52
11.3. Test Procedure	53
11.4. Test Result.....	54
11.5. Test Photograph	55
12. Radio-frequency common mode	56
12.1. Limit of Radio-frequency common mode.....	56
12.2. Test Setup	56
12.3. Test Procedure	56

12.4. Test Result.....	58
12.5. Test Photograph	59
13. Voltage dips and interruptions.....	60
13.1. Limit of Voltage dips and interruptions	60
13.2. Test Setup	60
13.3. Test Procedure	60
13.4. Test Result.....	61
13.5. Test Photograph	62
14. Uncertainty Measurement	63
15. List of Measuring Instrument.....	64
EUT Photograph	67

1. General Information

1.1. Applicant

Compex Systems Pte Ltd
135 Joo Seng Road #08-01, Singapore 368363

1.2. Manufacturer

Compex Systems Pte Ltd
135 Joo Seng Road #08-01, Singapore 368363

1.3. Testing Facility

Test Site

MRT Technology (Suzhou) Co., Ltd

Test Site Location

D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Radio-frequency Electromagnetic Field Test Site

CQC Intime (Suzhou) Testing Technology Co., Ltd.

Test Site Location

East Taihu Technology and Finance City, No. 1368, Wuzhong Dadao Road, Wuzhong District, Suzhou, Jiangsu, P.R. China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.
- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (11384A-1).
- MRT facility is an IC registered (11384A-1) test laboratory with the site description on file at Industry Canada.



1.4. Feature of Product

Product Name	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER
Model No.	WLE600V5-27ESD
Brand Name	COMPEX
Frequency Range	802.11a /n-HT20/ac-VHT20: 5500 ~ 5700MHz, 5745 ~ 5825MHz 802.11n-HT40/ac-VHT40: 5510 ~ 5670MHz 802.11ac-VHT80: 5530, 5610MHz
Channel Number	802.11a /n-HT20/ac-VHT20: 16 802.11n-HT40/ac-VHT40: 5 802.11ac-VHT80: 2
Type of Modulation	802.11a/n/ac: OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.6Mbps

1.5. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	Manufacturer	Tx Paths	Max Directional Gain (dBi)
Panel Antenna 1#	5.1 ~ 5.8	Lanbowan Communications Ltd.	2	25
Panel Antenna 2#	5.1 ~ 5.8	Lanbowan Communications Ltd.	2	23
Panel Antenna 3#	5.1 ~ 5.8	Kenbotong Communication LTD	2	19
Panel Antenna 4#	5.1 ~ 5.8	Compex Systems Pte Ltd	2	17
Panel Antenna 5#	5.1 ~ 5.8	Compex Systems Pte Ltd	2	16
Panel Antenna 6#	5.1 ~ 5.8	Compex Systems Pte Ltd	2	15
Panel Antenna 7#	5.1 ~ 5.8	Kenbotong Communication LTD	2	10
Panel Antenna 8#	5.1 ~ 5.8	Smart Ant Inc	2	7
Panel Antenna 9#	5.1 ~ 5.8	Compex Systems Pte Ltd	2	5
Panel Antenna 10#	5.1 ~ 5.8	Compex Systems Pte Ltd	2	5
Dipole Antenna 1#	5.1 ~ 5.8	Kunshan Wavelink Electronic Co., Ltd.	2	2

Note 1: We selected dipole antenna 1# for all EMC testing.

1.6. Standards Applicable for Testing

The EUT complies with the requirements of EN 3014 89-1 V1.9.2 & EN 301 489-17 V2.2.1.

EMI Test:

EN 55022 2010 (Conducted Emission)

EN 55022 2010 (Radiated Emission)

EN 61000-3-2 2006+A1:2009+A2:2009 (Harmonic)

EN 61000-3-3: 2008 (Flicker)

EMS Test:

EN 61000-4-2: 2009 (ESD)

EN 61000-4-3: 2006+A1:2008+A2:2010 (RS)

EN 61000-4-4: 2012 (EFT)

EN 61000-4-5: 2006 (Surge)

EN 61000-4-6: 2009 (CS)

EN 61000-4-11: 2004 (Dips)

1.7. Performance Criteria

General Requirements (ETSI EN 301489-1):

The performance criteria are used to take a decision on whether radio equipment passes or fails immunity tests.

For the purpose of the present document four categories of performance criteria apply:

- performance criteria for continuous phenomena applied to transmitters;
- performance criteria for transient phenomena applied to transmitters;
- performance criteria for continuous phenomena applied to receivers;
- performance criteria for transient phenomena applied to receivers.

Normally, the performance criteria depend on the type of radio equipment. Thus, the present document only contains general performance criteria commonly used for the assessment of radio equipment. More specific and product-related performance criteria for a dedicated type of radio equipment may be found in the part of EN 301 489 series dealing with the particular type of radio equipment.

Performance criteria for continuous phenomena applied to transmitters and receivers

If no further details are given in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, the following general performance criteria for continuous phenomena shall apply.

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for transient phenomena applied to transmitters and receivers

If no further details are given in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, the following general performance criteria for transient phenomena shall apply.

After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for equipment which does not provide a continuous communication link

For radio equipment which does not provide a continuous communication link, the performance criteria described in clauses (1) and (2) are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 of EN 301 489-1 V1.9.2 (2010-09) have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses (1) and (2).

Performance criteria for ancillary equipment tested on a stand-alone basis

If ancillary equipment is intended to be tested on a stand-alone basis, the performance criteria described in clauses (1) and (2) are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 of EN 301 489-1 V1.9.2 (2010-09) have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses (1) and (2).

Special Performance Requirements (ETSI EN 301489-17):

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Performance criteria for Continuous phenomena applied to Transmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

EN 301 489 -17 Performance criteria		
Criteria	During Test	After test
A	Shall operate as intended May show degradation of performance (see note 1) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance (see note 2) Shall be no loss of function Shall be no loss of stored data or user programmable functions
B	May show loss of function (one or more) May show degradation of performance (see note 1) No unintentional transmission	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (see note 2) Shall be no loss of stored data or user programmable functions
C	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance (see note 2)

Note 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

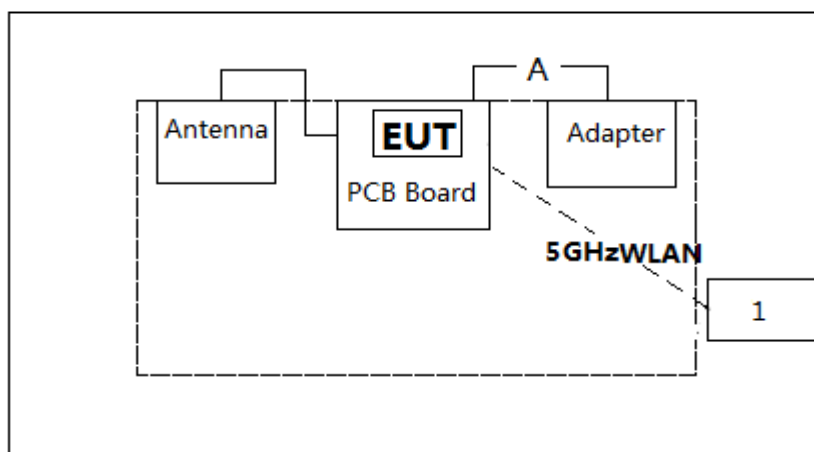
2. Test Configuration of Equipment under Test

2.1. Test Mode

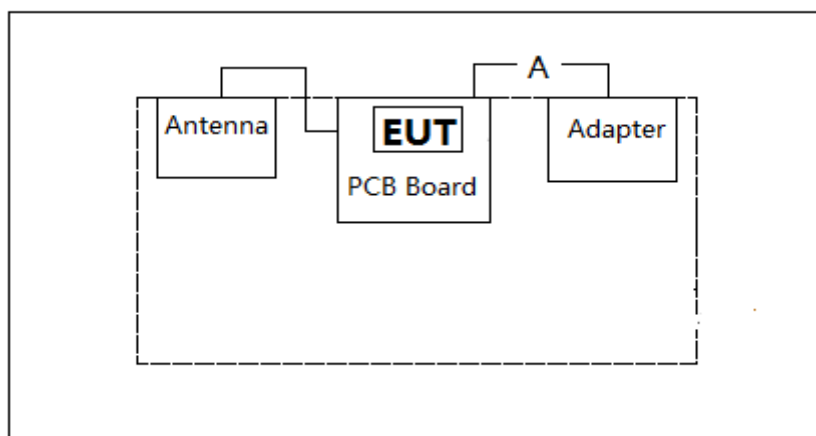
EMI Test Mode	Mode 1: Communication
EMS Test Mode	Mode 1: Communication
	Mode 2: Standby

2.2. Configuration of Tested System

Connection Diagram (Mode 1)



Connection Diagram (Mode 2)



Signal Cable Type		Signal Cable Description
A	LAN Cable	Non-shielding, 0.5m

2.3. Test System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	E430c	MP-4CFX213/10	Non-Shielded, 1.8m

2.4. Test Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Making EUT communicate with notebook by Wi-Fi.

3. Test Summary

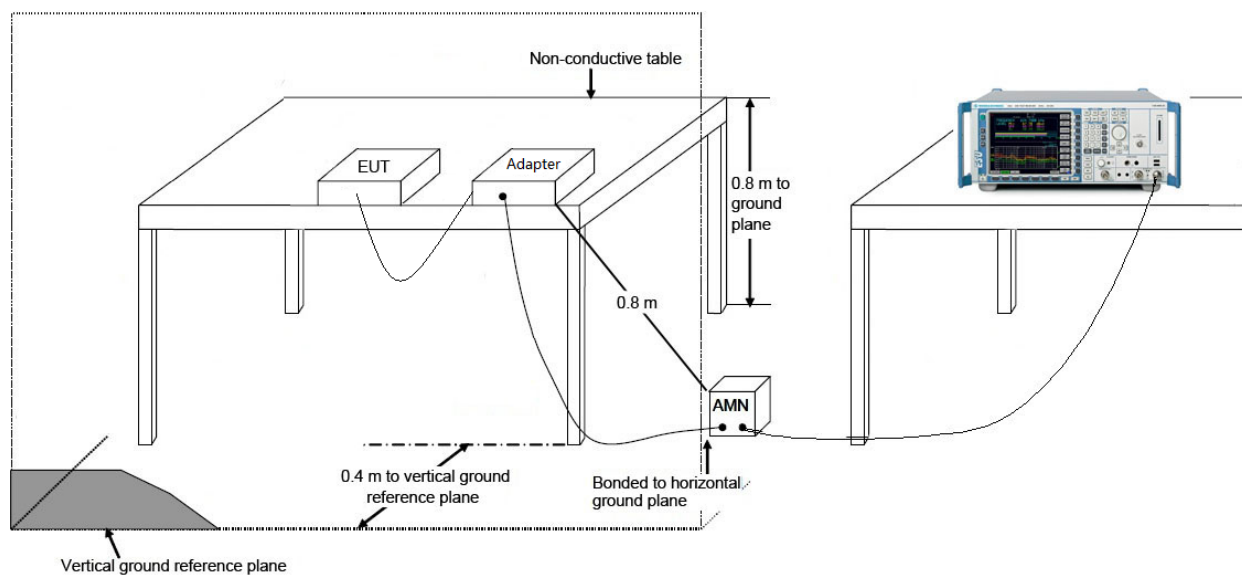
Clause	Test Item	Test Standard	Result (Pass/Fail)	Remark
Emission Measurements				
EN 301489-1 Clause 8.4	Conducted Emission	EN 55022	Pass	---
EN 301489-1 Clause 8.2	Radiated Emission	EN 55022	Pass	---
EN 301489-1 Clause 8.5	Harmonic current emissions	EN 61000-3-2	Pass	---
EN 301489-1 Clause 8.6	Voltage fluctuations and flicker	EN 61000-3-3	Pass	---
Immunity Measurements				
EN 301489-1 Clause 9.3	Electrostatic discharge	EN 61000-4-2	Pass	---
EN 301489-1 Clause 9.2	Radio-frequency electromagnetic field	EN 61000-4-3	Pass	---
EN 301489-1 Clause 9.4	Fast transients, common mode	EN 61000-4-4	Pass	---
EN 301489-1 Clause 9.8	Surges	EN 61000-4-5	Pass	---
EN 301489-1 Clause 9.5	Radio-frequency common mode	EN 61000-4-6	Pass	---
EN 301489-1 Clause 9.7	Voltage dips and interruptions	EN 61000-4-11	Pass	---

4. Conducted Emission

4.1. Limit of Conducted Emission

Limits of conducted emission for AC mains power input/output ports				
Frequency range MHz	Limits dB(μV)			
	Quasi-peak		Average	
0.15 to 0.50	66 to 56		56 to 46	
0.50 to 5	56		46	
5 to 30	60		50	
Limits of conducted emission for telecommunication ports				
Frequency range MHz	Voltage Limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	84 to 74	74 to 64	40 to 30	30 to 20
0.50 to 30	74	64	30	20

4.2. Test Setup



4.3. Test Procedure

The receiver or associated equipment under measurement and the artificial mains network are disposed as shown in 3.2. Measurements shall be carried out using a selective voltmeter having a quasi-peak detector for broadband measurements and an average detector for narrow-band measurements in accordance with CISPR 16-1.

The mains lead shall be arranged to follow the shortest possible path between the receiver and artificial mains network on the ground. The mains lead in excess of 0,8 m separating the equipment under test from the artificial mains network shall be folded back and forth parallel to the lead so as to form a bundle with a length of 0,3 m to 0,4 m.

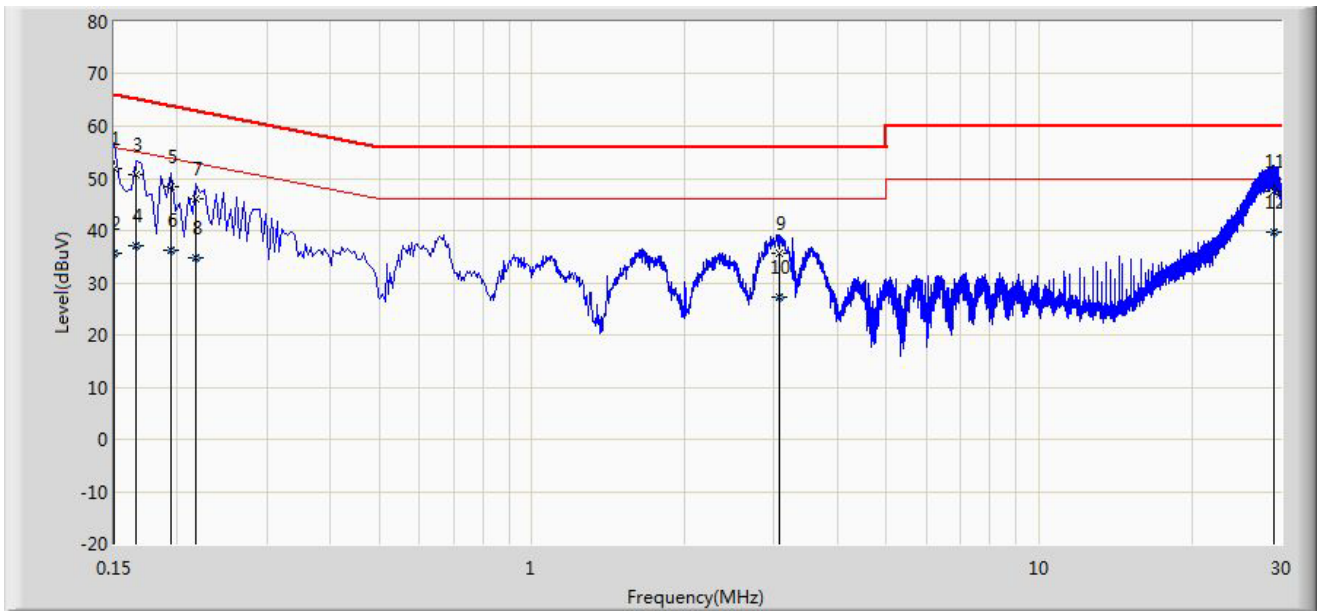
Earthing of the equipment under test if provided with a safety earth connection, shall be made to the earth terminal provided on the artificial mains network with the shortest possible lead.

If the equipment under test has a coaxial RF input connector, tests shall be performed with and without an earth connection made to the outer conductor screen of the coaxial RF input connector. When these tests are being carried out, no other earth connections shall be made to any additional earth terminal whatever.

If the equipment under test has no coaxial RF input connector and if it has an earth terminal, tests shall be performed with this terminal earthed.

4.4. Test Result

Engineer: Milo Li	
Site: SR2	Time: 2014/08/21 - 19:43
Limit: EN55022_CE_Mains_ClassB	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	

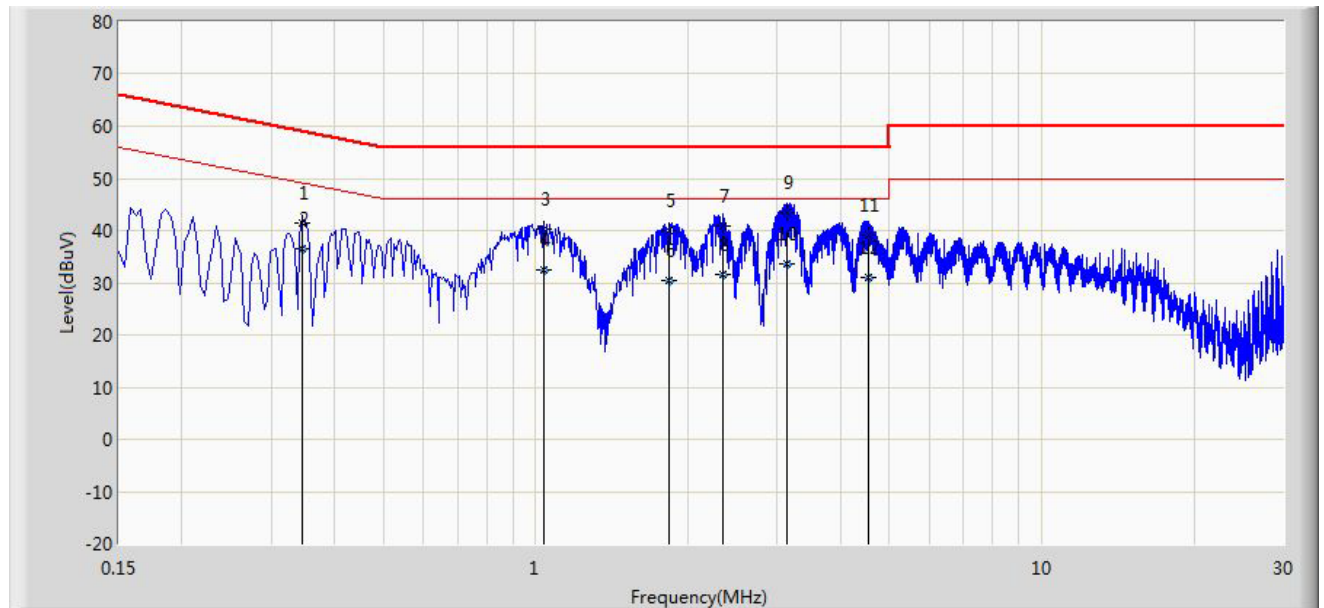


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	51.909	40.767	-14.091	66.000	11.142	QP
2			0.150	35.692	24.550	-20.308	56.000	11.142	AV
3			0.166	50.837	40.766	-14.321	65.158	10.071	QP
4			0.166	37.217	27.146	-17.941	55.158	10.071	AV
5			0.194	48.440	38.419	-15.423	63.864	10.021	QP
6			0.194	36.343	26.322	-17.521	53.864	10.021	AV
7			0.218	45.985	36.004	-16.910	62.895	9.981	QP
8			0.218	34.673	24.692	-18.221	52.895	9.981	AV
9			3.078	35.781	25.915	-20.219	56.000	9.866	QP
10			3.078	27.111	17.245	-18.889	46.000	9.866	AV
11			28.962	47.621	37.183	-12.379	60.000	10.438	QP
12			28.962	39.801	29.363	-10.199	50.000	10.438	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Engineer: Milo Li	
Site: SR2	Time: 2014/08/21 - 20:30
Limit: EN55022_CE_Mains_ClassB	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.346	41.491	31.450	-17.567	59.058	10.041	QP
2			0.346	36.536	26.495	-12.522	49.058	10.041	AV
3			1.038	40.244	30.337	-15.756	56.000	9.907	QP
4			1.038	32.378	22.471	-13.622	46.000	9.907	AV
5			1.830	40.041	30.164	-15.959	56.000	9.877	QP
6			1.830	30.565	20.688	-15.435	46.000	9.877	AV
7			2.346	40.877	31.015	-15.123	56.000	9.862	QP
8			2.346	31.587	21.725	-14.413	46.000	9.862	AV
9			3.130	43.372	33.514	-12.628	56.000	9.858	QP
10			3.130	33.561	23.703	-12.439	46.000	9.858	AV
11			4.542	39.256	29.262	-16.744	56.000	9.994	QP
12			4.542	30.991	20.997	-15.009	46.000	9.994	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

4.5. Test Photograph

Test Mode: Mode 1

Description: Front View Conducted Emission Test Setup for Main Port



Test Mode: Mode 1

Description: Back View Conducted Emission Test Setup for Main Port



5. Radiated Emission

5.1. Limit of Radiated Emission

Frequency range MHz	Quasi-peak limits dB(μ V/m)
30 to 230	40
230 to 1000	47

Note 1: The lower limit shall apply at the transition frequency.

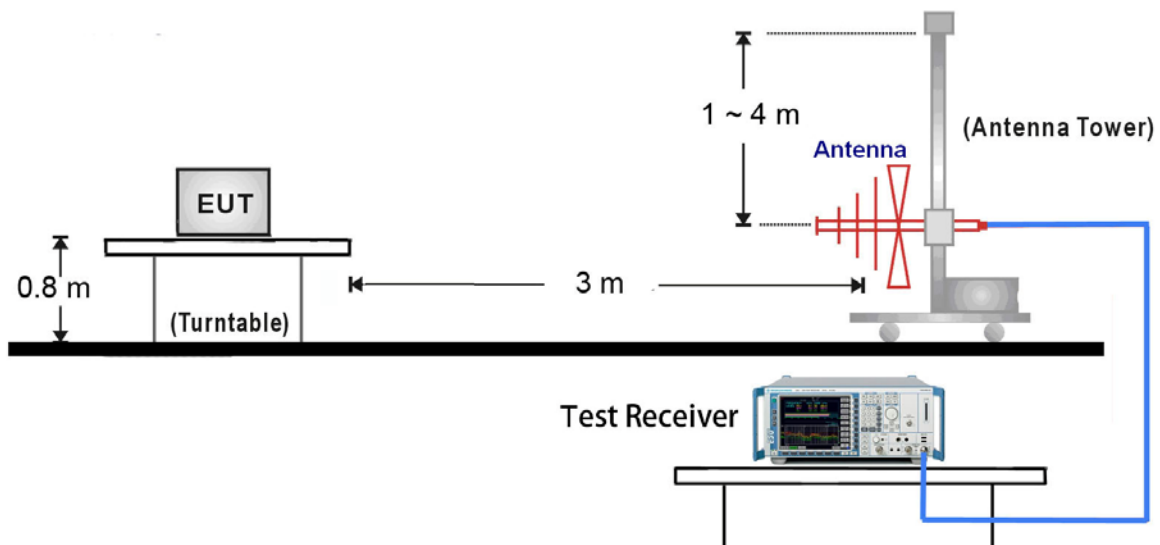
Note 2: Additional provisions may be required for cases where interference occurs.

Frequency range GHz	Average limit dB(μ V/m)	Peak limit dB(μ V/m)
1 to 3	50	70
3 to 6	54	74

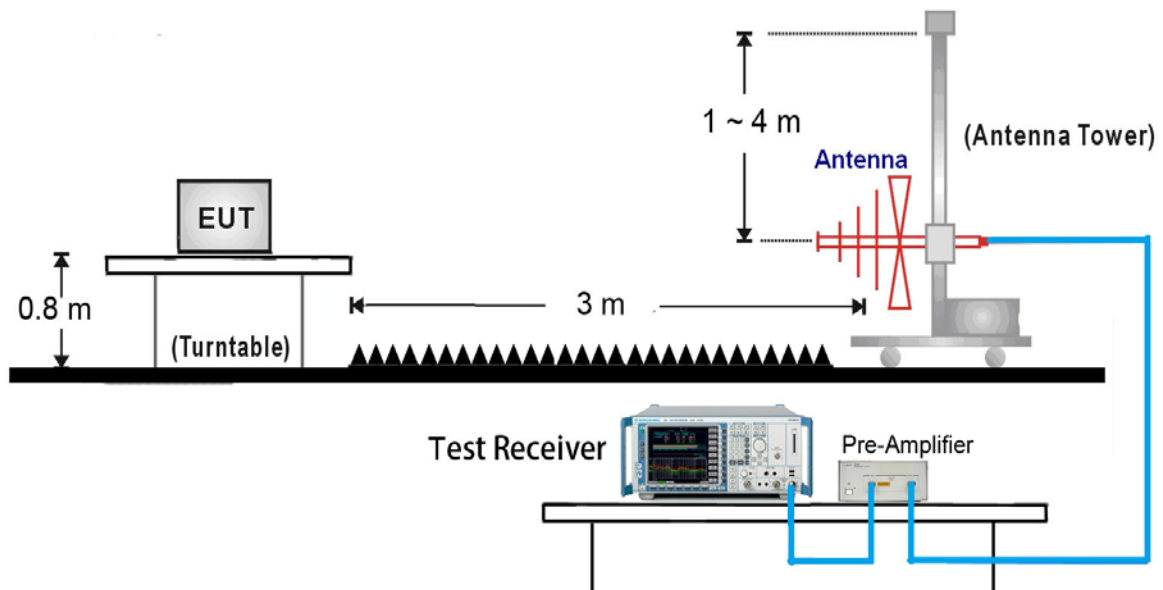
Note: The lower limit applies at the transition frequency.

5.2. Test Setup

30 MHz ~ 1000 MHz



1000 MHz ~ 6000 MHz



5.3. Test Procedure

Starting with the front of the receiver under test facing the measuring antenna, the measuring antenna is adjusted for horizontal polarization measurement and its height varied between 1 m and 4 m until the maximum reading is obtained.

The receiver under test is then rotated about its centre until the maximum meter reading is obtained, after which the measuring antenna height is again varied between 1 m and 4 m and the maximum reading noted.

The procedure is repeated for vertical polarization of the measuring antenna.

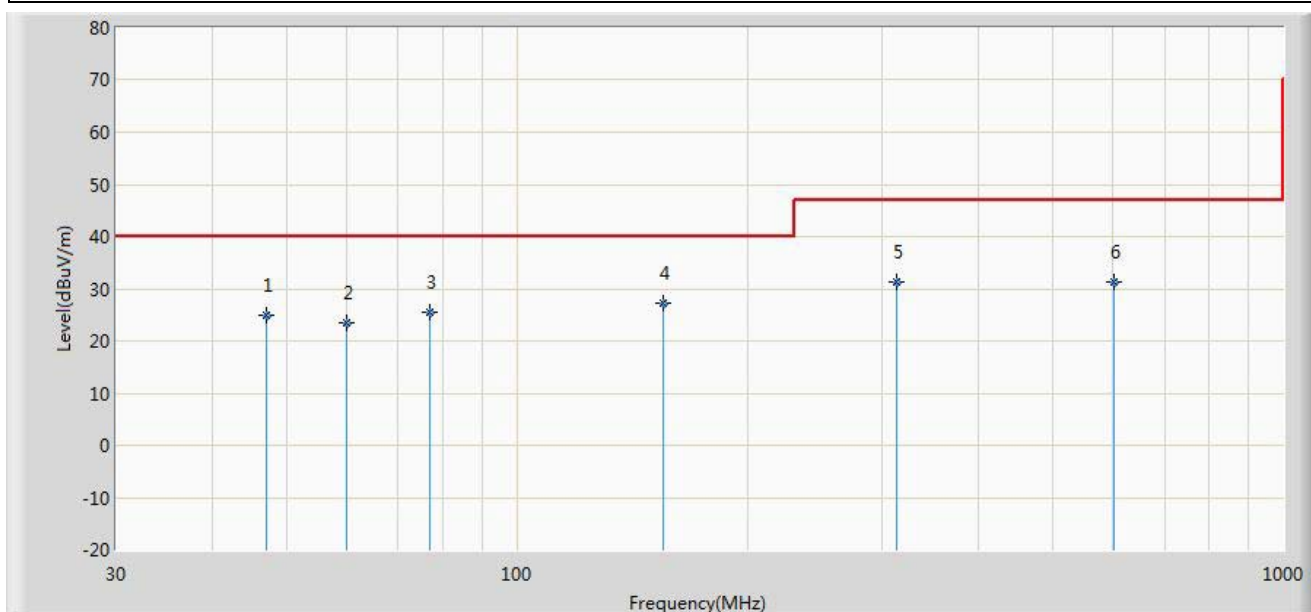
The highest value found, following this procedure, is defined as the radiation figure of the receiver.

If at certain frequencies the ambient signal field strength is high at the position of the receiving antenna, one of the following methods may be used to show compliance of the equipment under test.

- a) For small frequency bands with high ambient signals, the disturbance value may be interpolated from the adjacent values. The interpolated value shall lie on the curve describing a continuous function of the disturbance values adjacent to the ambient noise.
- b) Another possibility is to use the method described in annex C of CISPR 11.

5.4. Test Result

Engineer: Roy Cheng	
Site: AC1	Time: 2014/08/21 - 19:22
Limit: EN55022_RE(3m)_Class B	Margin: 0
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	

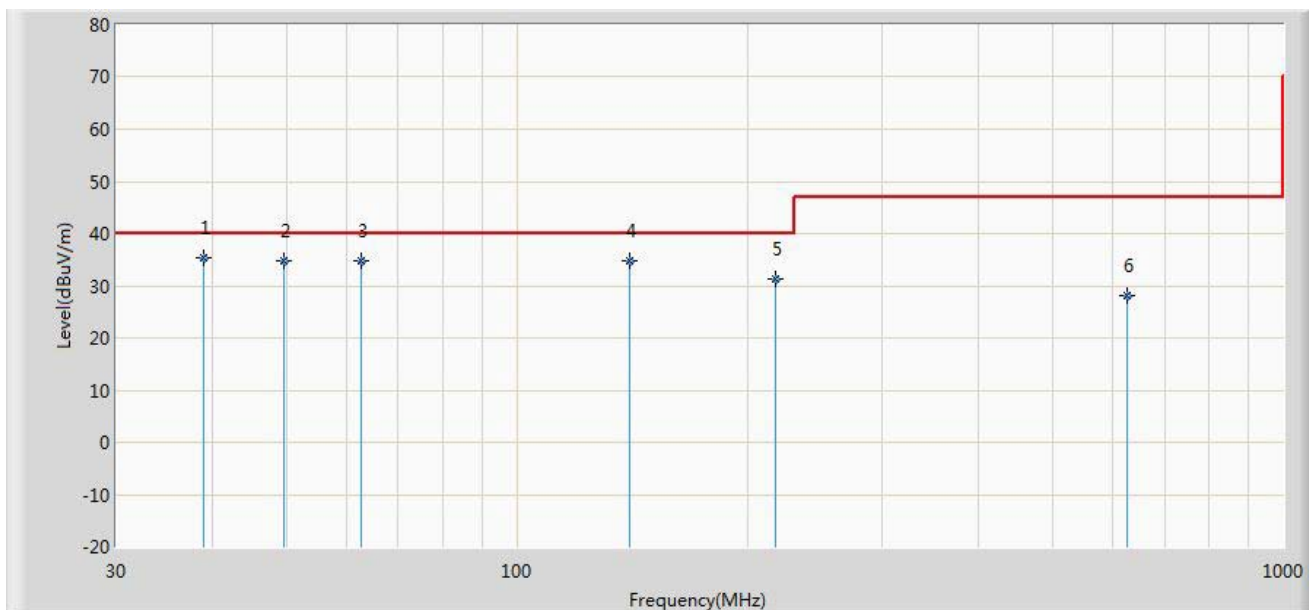


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			47.217	24.880	10.076	-15.120	40.000	14.804	QP
2			60.070	23.571	9.893	-16.429	40.000	13.678	QP
3			76.924	25.454	16.383	-14.546	40.000	9.071	QP
4			155.494	27.380	18.018	-12.620	40.000	9.362	QP
5		*	312.997	31.275	16.837	-15.725	47.000	14.438	QP
6			601.694	31.252	11.790	-15.748	47.000	19.462	QP

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Engineer: Roy Cheng	
Site: AC1	Time: 2014/08/21 - 19:23
Limit: EN55022_RE(3m)_Class B	Margin: 0
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	

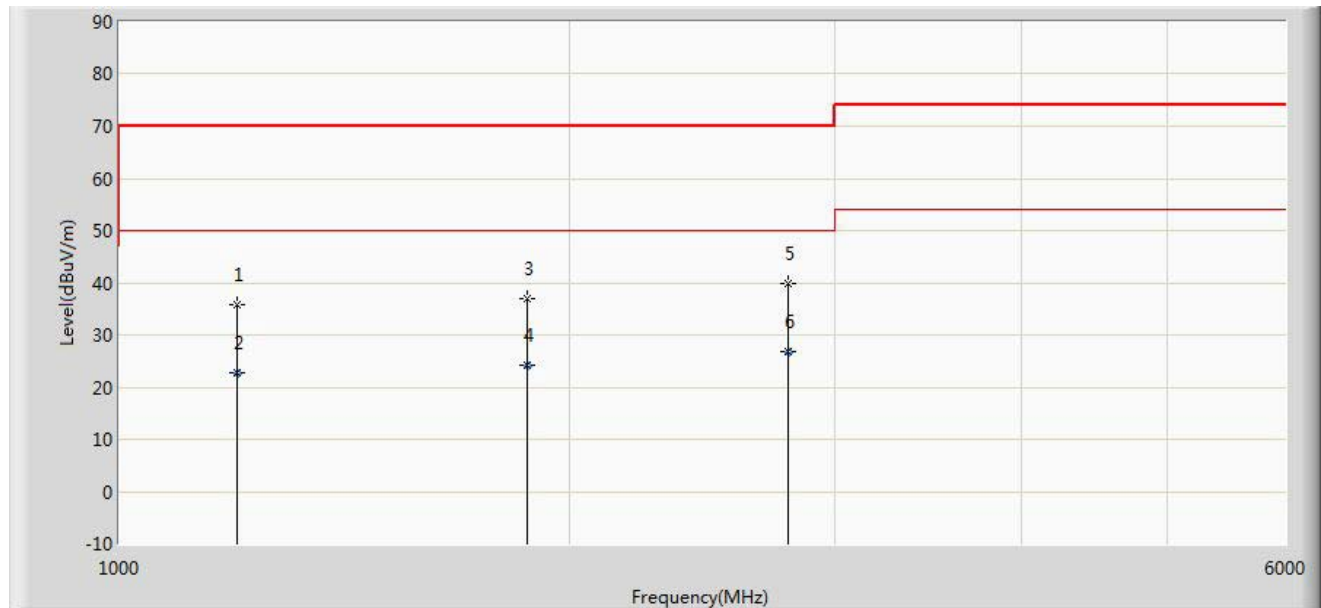


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			38.972	35.336	21.819	-4.664	40.000	13.517	QP
2			49.764	34.706	19.945	-5.294	40.000	14.761	QP
3			62.737	34.890	21.799	-5.110	40.000	13.091	QP
4			140.459	34.650	25.458	-5.350	40.000	9.192	QP
5		*	217.816	31.193	18.963	-8.807	40.000	12.230	QP
6			626.792	28.102	8.358	-18.898	47.000	19.744	QP

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Engineer: Milo Li	
Site: AC1	Time: 2014/08/21 - 19:23
Limit: EN55022_RE(3m)_Class B	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	

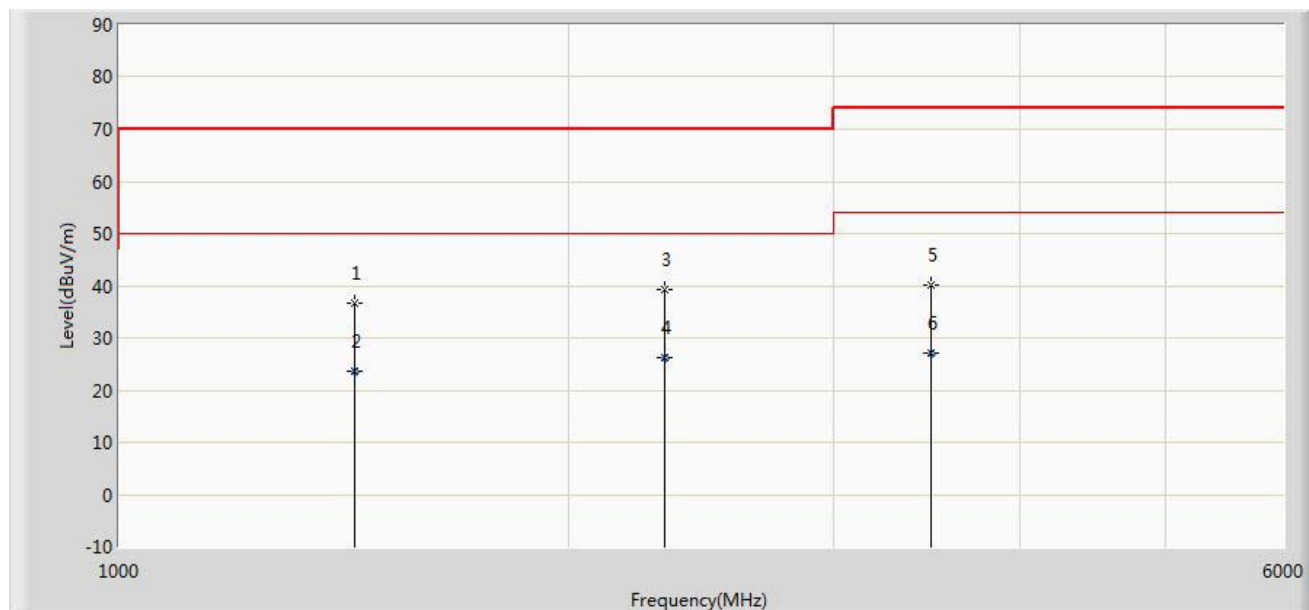


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			1200.000	35.717	38.238	-34.283	70.000	-2.521	PK
2			1200.000	22.779	25.300	-27.221	50.000	-2.521	AV
3			1872.500	37.088	36.616	-32.912	70.000	0.472	PK
4			1872.500	24.071	23.599	-25.929	50.000	0.472	AV
5			2797.500	39.823	36.516	-30.177	70.000	3.307	PK
6		*	2797.500	26.706	23.399	-23.294	50.000	3.307	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB).

Engineer: Milo Li	
Site: AC1	Time: 2014/08/21 - 19:24
Limit: EN55022_RE(3m)_Class B	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Power: AC 230V/50Hz
Note: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			1437.500	36.689	38.124	-33.311	70.000	-1.435	PK
2			1437.500	23.764	25.199	-26.236	50.000	-1.435	AV
3			2317.500	39.161	36.199	-30.839	70.000	2.962	PK
4			2317.500	26.162	23.200	-23.838	50.000	2.962	AV
5			3487.500	40.062	36.254	-33.938	74.000	3.808	PK
6		*	3487.500	27.208	23.400	-26.792	54.000	3.808	AV

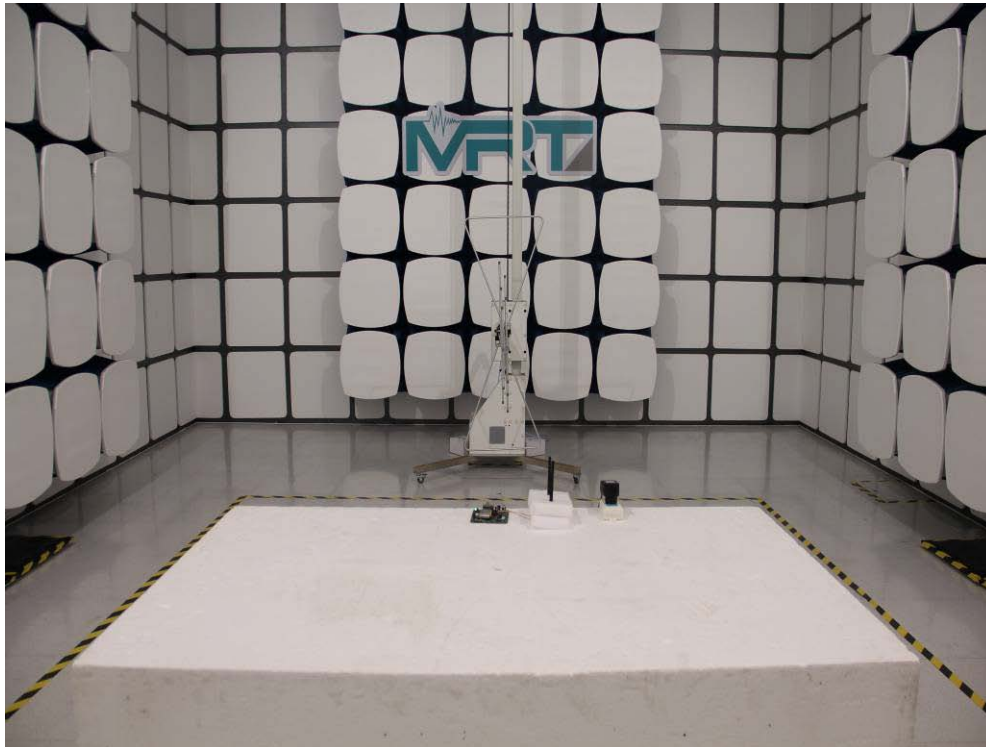
Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB).

5.5. Test Photograph

Test Mode: Mode 1

Description: Radiated Emission Test Setup (30MHz ~ 1GHz)



Test Mode: Mode 1

Description: Radiated Emission Test Setup (1GHz ~ 6GHz)



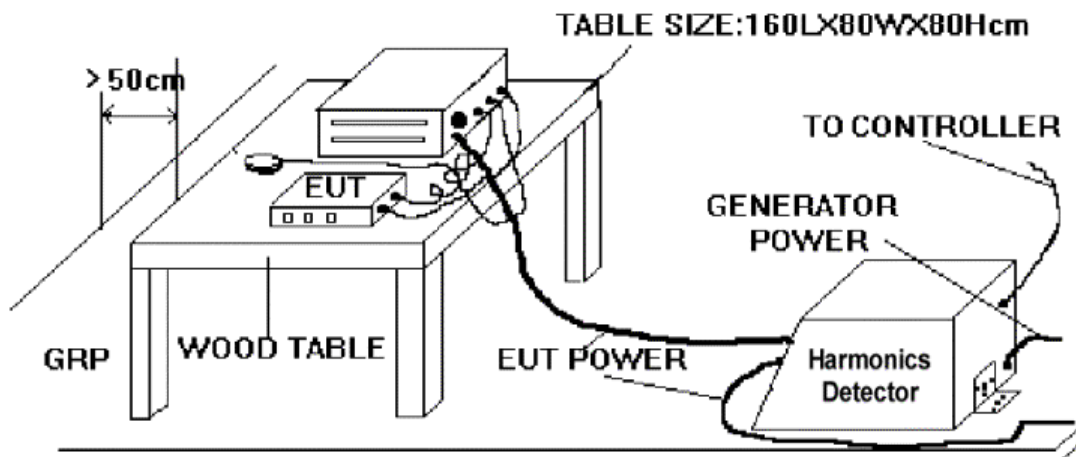
6. Harmonic Current Emissions

6.1. Limit of Harmonic Current Emissions

Limits of Class A Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current A	Harmonics Order n	Maximum Permissible harmonic current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	$8 \leq n \leq 40$	$0.23 * 8/n$
11	0.33	--	--
13	0.21	--	--
$15 \leq n \leq 39$	$0.15 * 15/n$	--	--

6.2. Test Setup



6.3. Test Procedure

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.98 times and 1.02 times shall be performed.

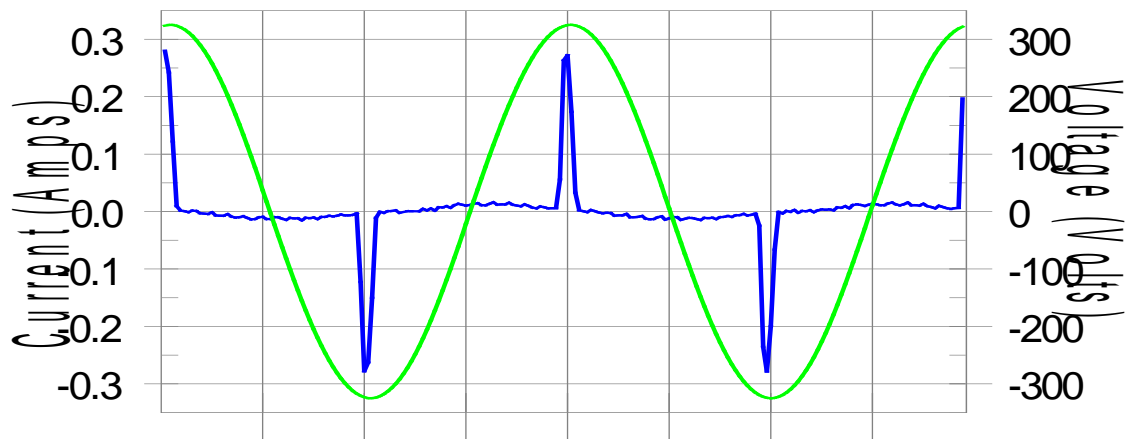
6.4. Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/22

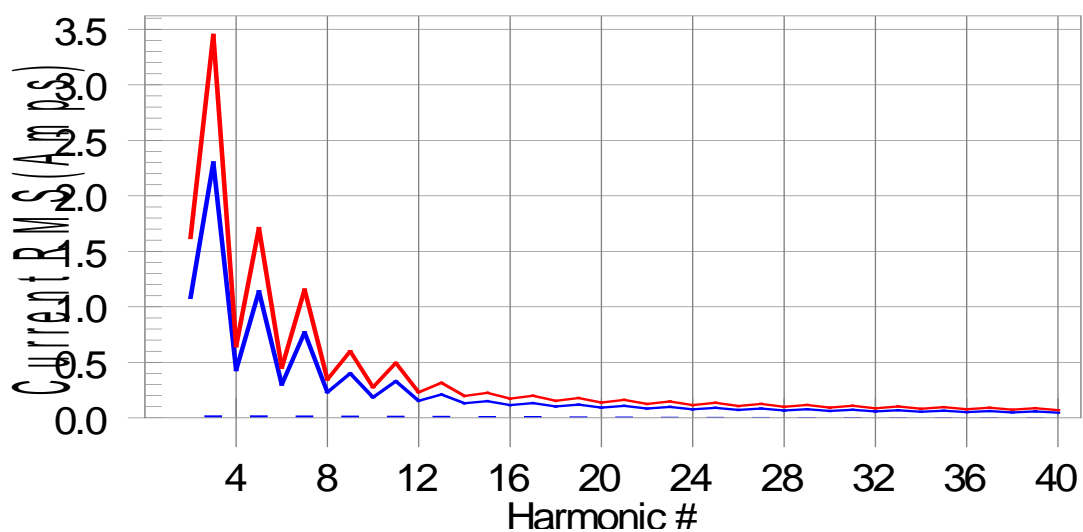
Test Result: Pass

Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass Worst harmonic was #17 with 8.64% of the limit.

Test Result: Pass

Source qualification: Normal

THC(A): 0.05

I-THD(%): 209.93

POHC(A): 0.013

POHC Limit(A): 0.251

Highest parameter values during test:

V_RMS (Volts): 229.90

Frequency(Hz): 50.00

I_Peak (Amps): 0.285

I_RMS (Amps): 0.060

I_Fund (Amps): 0.024

Crest Factor: 5.467

Power (Watts): 5.1

Power Factor: 0.411

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	0.1	0.001	1.620	0.06	Pass
3	0.019	2.300	0.8	0.019	3.450	0.56	Pass
4	0.000	0.430	0.1	0.001	0.645	0.11	Pass
5	0.018	1.140	1.6	0.019	1.710	1.10	Pass
6	0.000	0.300	0.1	0.000	0.450	0.10	Pass
7	0.017	0.770	2.2	0.018	1.155	1.55	Pass
8	0.000	0.230	0.1	0.000	0.345	0.10	Pass
9	0.016	0.400	4.1	0.017	0.600	2.83	Pass
10	0.000	0.184	0.1	0.000	0.276	0.14	Pass
11	0.015	0.330	4.6	0.016	0.495	3.21	Pass
12	0.000	0.153	0.2	0.000	0.230	0.18	Pass
13	0.014	0.210	6.7	0.015	0.315	4.63	Pass
14	0.000	0.131	0.2	0.000	0.197	0.16	Pass
15	0.013	0.150	8.5	0.013	0.225	5.87	Pass
16	0.000	0.115	0.2	0.000	0.173	0.18	Pass
17	0.011	0.132	8.6	0.012	0.199	5.89	Pass
18	0.000	0.102	0.2	0.000	0.153	0.17	Pass
19	0.010	0.118	8.4	0.010	0.178	5.74	Pass
20	0.000	0.092	0.2	0.000	0.138	0.16	Pass
21	0.009	0.107	8.0	0.009	0.161	5.39	Pass
22	0.000	0.084	0.2	0.000	0.125	0.16	Pass
23	0.007	0.098	7.3	0.007	0.147	4.90	Pass
24	0.000	0.077	0.2	0.000	0.115	0.16	Pass
25	0.006	0.090	6.4	0.006	0.135	4.32	Pass
26	0.000	0.071	0.2	0.000	0.106	0.15	Pass
27	0.005	0.083	5.4	0.005	0.125	3.67	Pass
28	0.000	0.066	0.2	0.000	0.099	0.17	Pass
29	0.003	0.078	4.4	0.004	0.116	3.10	Pass
30	0.000	0.061	0.2	0.000	0.092	0.17	Pass
31	0.002	0.073	3.3	0.003	0.109	2.48	Pass
32	0.000	0.058	0.2	0.000	0.086	0.20	Pass
33	0.002	0.068	2.4	0.002	0.102	1.89	Pass
34	0.000	0.054	0.2	0.000	0.081	0.20	Pass
35	0.001	0.064	1.8	0.001	0.096	1.37	Pass
36	0.000	0.051	0.2	0.000	0.077	0.20	Pass
37	0.001	0.061	1.7	0.001	0.091	1.25	Pass
38	0.000	0.048	0.2	0.000	0.073	0.21	Pass
39	0.001	0.058	2.0	0.001	0.087	1.49	Pass
40	0.000	0.046	0.2	0.000	0.069	0.22	Pass

6.5. Test Photograph

Test Mode: Mode 1

Description: Harmonic current emissions Test Setup



7. Voltage Fluctuations and Flicker

7.1. Limit of Voltage Fluctuations and Flicker

The following limits apply:

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- the value of $d(t)$ during a voltage change shall not exceed 3.3% for more than 500ms;
- the relative steady-state voltage change, d_c , shall not exceed 3.3%;
- the maximum relative voltage change, d_{max} , shall not exceed:
 - a) 4% without additional conditions;
 - b) 6% for equipment which is:
 - switched manually, or
 - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

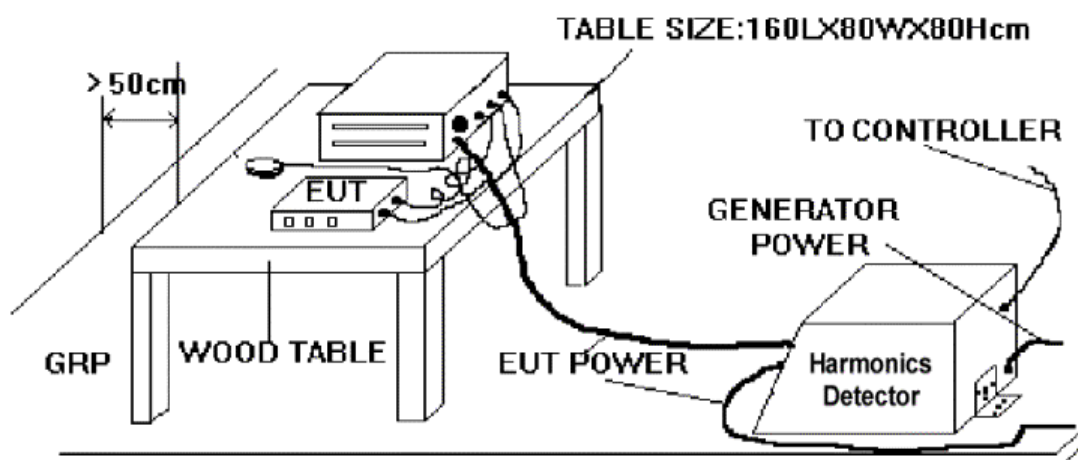
NOTE: The cycling frequency will be further limited by the P_{st} and P_{lt} limit.

For example: a d_{max} of 6% producing a rectangular voltage change characteristic twice per hour will give a P_{lt} of about 0.65.

- c) 7% for equipment which is:
 - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

P_{st} and P_{lt} requirements shall not be applied to voltage changes caused by manual switching.

7.2. Test Setup



7.3. Test Procedure

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.98 times and 1.02 times shall be performed.

7.4. Test Result

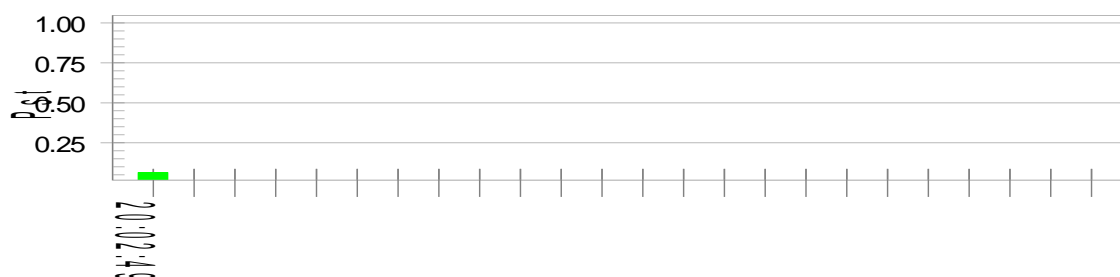
Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/22

Test Result: Pass

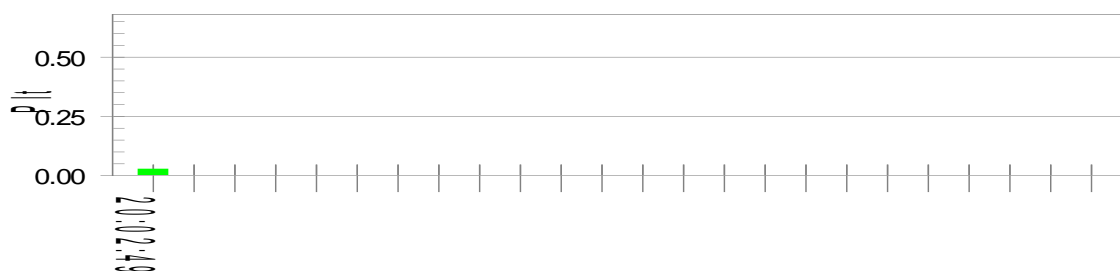
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.86			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650	Pass

7.5. Test Photograph

Test Mode: Mode 1

Description: Voltage Fluctuation and Flicker Test Setup

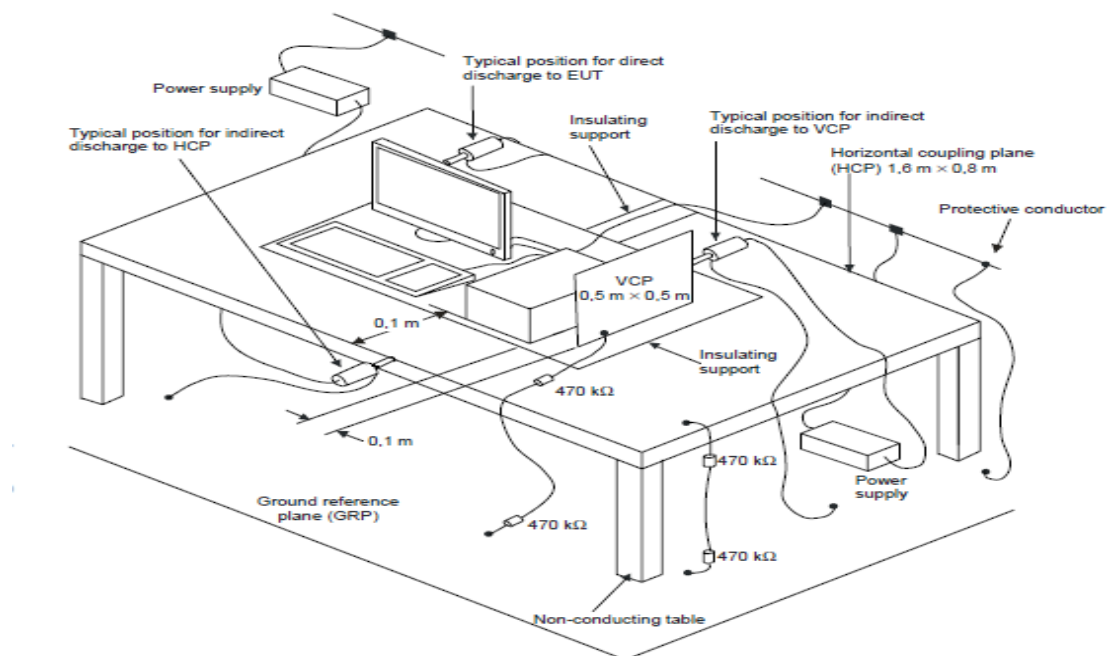


8. Electrostatic discharge

8.1. Limit of Electrostatic discharge

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Electrostatic discharge	± 4 (Contact discharge)	kV (Charge voltage)	B
	± 8 (Air discharge)	kV (Charge voltage)	

8.2. Test Setup



8.3. Test Procedure

Direct application of discharges to the EUT:

Contact discharge was applied only to conductive surfaces of the EUT.

Air discharges were applied only to non-conductive surfaces of the EUT.

During the test, it was performed with single discharges. For the single discharge time between successive single discharges will be keep longer 1 second. It was at least twenty-five single discharges with positive and negative at the same selected point.

The selected point, which was performed with electrostatic discharge, was marked on the red label of the EUT.

Indirect application of discharges to the EUT:

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least twenty-five single discharges with positive and negative at the same selected point.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least twenty-five single discharges with positive and negative at the same selected point.

8.4. Test Result

EUT	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	23°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/18

Direct Application		Test Result	
Test Location	Test Level	Air Discharge	Contact Discharge
N/A	±2kV, ±4kV	Pass	N/A
N/A	±2kV, ±4kV, ±8kV	N/A	Pass

Indirect Application		Test Result	
Test Location	Test Level	Horizontal Coupling	Vertical Coupling
Front, Rear Left, Right	±2kV, ±4kV	Pass	Pass

Note: There is no any degradation of performance and function.

EUT	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	23°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/18

Direct Application		Test Result	
Test Location	Test Level	Air Discharge	Contact Discharge
N/A	±2kV, ±4kV	Pass	N/A
N/A	±2kV, ±4kV, ±8kV	N/A	Pass

Indirect Application		Test Result	
Test Location	Test Level	Horizontal Coupling	Vertical Coupling
Front, Rear Left, Right	±2kV, ±4kV	Pass	Pass

Note: There is no any degradation of performance and function.

8.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Electrostatic discharge Test Setup

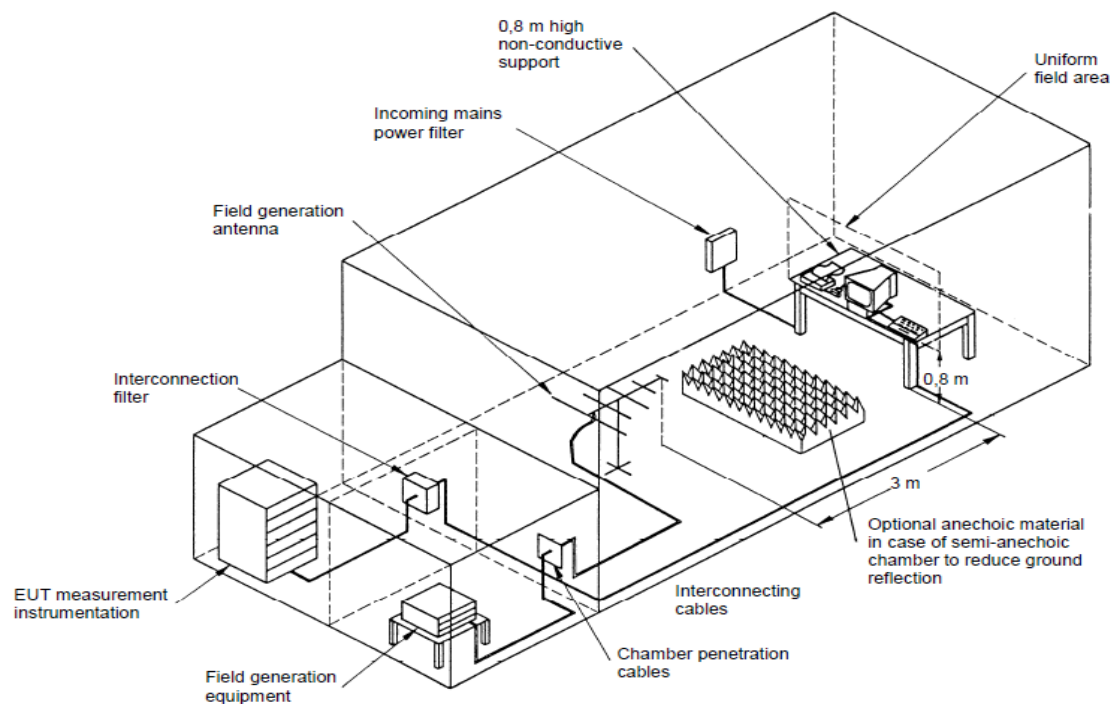


9. Radio-frequency electromagnetic field

9.1. Limit of Radio-frequency electromagnetic field

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Radio frequency electromagnetic field	80 - 1000, 1400 - 2700	MHz	A
	3	V/m (unmodulated, r.m.s)	
	80	% AM (1kHz)	
Note 1: If the wanted signal is modulated at 1000Hz, then an audio signal of 400Hz shall be used. Note 2: The test shall be performed over the frequency range 80MHz to 1000MHz and 1400MHz to 2700MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers [see clause 4 of EN 301 489-1 V1.9.2 (2010-09)], as appropriate.			

9.2. Test Setup



9.3. Test Procedure

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters. Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	3V/m
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	80 - 1000MHz, 1.4GHz - 2.7GHz
4	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

9.4. Test Result

EUT	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	23°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/23

Frequency (MHz)	Polarity	Test Position	Field Strength (V/m)	Test Result
80-1000	Horizontal/Vertical	Front	3	Pass
		Rear		Pass
		Left		Pass
		Right		Pass
1400-2700	Horizontal/Vertical	Front	3	Pass
		Rear		Pass
		Left		Pass
		Right		Pass

Note: There is no any degradation of performance and function.

EUT	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	23°C
Test Engineer	Milo Li	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/23

Frequency (MHz)	Polarity	Test Position	Field Strength (V/m)	Test Result
80-1000	Horizontal/Vertical	Front	3	Pass
		Rear		Pass
		Left		Pass
		Right		Pass
1400-2700	Horizontal/Vertical	Front	3	Pass
		Rear		Pass
		Left		Pass
		Right		Pass

Note: There is no any degradation of performance and function.

9.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Radio-frequency Electromagnetic Field Test Setup (80-1000MHz)



Test Mode: Mode 1 & 2

Description: Radio-frequency Electromagnetic Field Test Setup (1400-2700MHz)

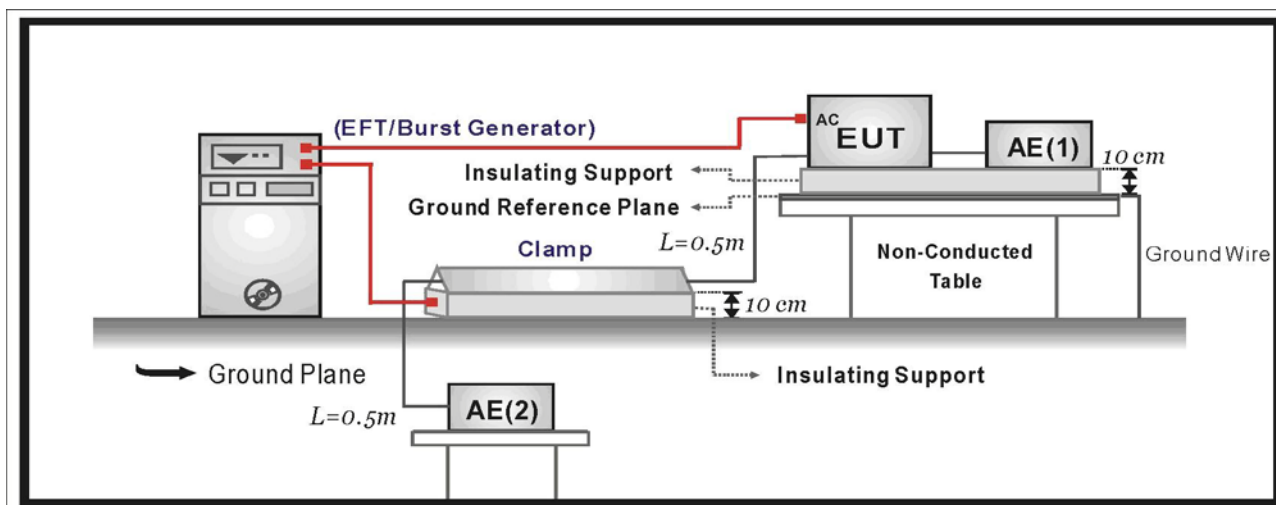


10. Electrical fast transients

10.1. Limit of Electrical fast transients

Environmental phenomenon	Test specification	Units	Performance criterion
Input AC power ports			
Electrical fast transients	±1 5/50 5	kV (open circuit test voltage) Tr/Th (ns) Repetition frequency (kHz)	B
Signal ports, telecommunication ports, and control ports (See Note)			
Fast transients common mode	±0.5 5/50 5	kV (peak) Tr/Th ns Repetition frequency (kHz)	B
NOTE: This test shall be additionally performed on signal ports, telecommunication ports, control ports, and DC power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3m.			

10.2. Test Setup



10.3. Test Procedure

The EUT is placed on a table that is 0.8 meter height. A ground reference plane is placed on the table, and uses a 0.1m insulation between the EUT and ground reference plane.

The minimum area of the ground reference plane is 1m*1m, and 0.65mm thick min, and projected beyond the EUT by at least 0.1m on all sides.

For input AC power ports:

The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.

Each of the line conductors is impressed with burst noise for 1 minute.

The length of the power lines between the coupling device and the EUT is 0.5m.

For signal ports, telecommunication ports, and control ports:

The EFT interference signal is through a coupling clamp device couples to the signal of the EUT with burst noise for 1 minute.

The length of the signal lines between the coupling device and the EUT is 0.5m.

10.4. Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/18

Inject Line	Polarity	Test Level (kV)	Test Duration (second)	Inject Method	Observation	Result
L	+	1	60	Direct	Note	Pass
L	-	1	60	Direct	Note	Pass
N	+	1	60	Direct	Note	Pass
N	-	1	60	Direct	Note	Pass
L+N	+	1	60	Direct	Note	Pass
L+N	-	1	60	Direct	Note	Pass

Note: There is no any degradation of performance and function.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/18

Inject Line	Polarity	Test Level (kV)	Test Duration (second)	Inject Method	Observation	Result
L	+	1	60	Direct	Note	Pass
L	-	1	60	Direct	Note	Pass
N	+	1	60	Direct	Note	Pass
N	-	1	60	Direct	Note	Pass
L+N	+	1	60	Direct	Note	Pass
L+N	-	1	60	Direct	Note	Pass

Note: There is no any degradation of performance and function.

10.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Electrical fast transients Test Setup for Main Port

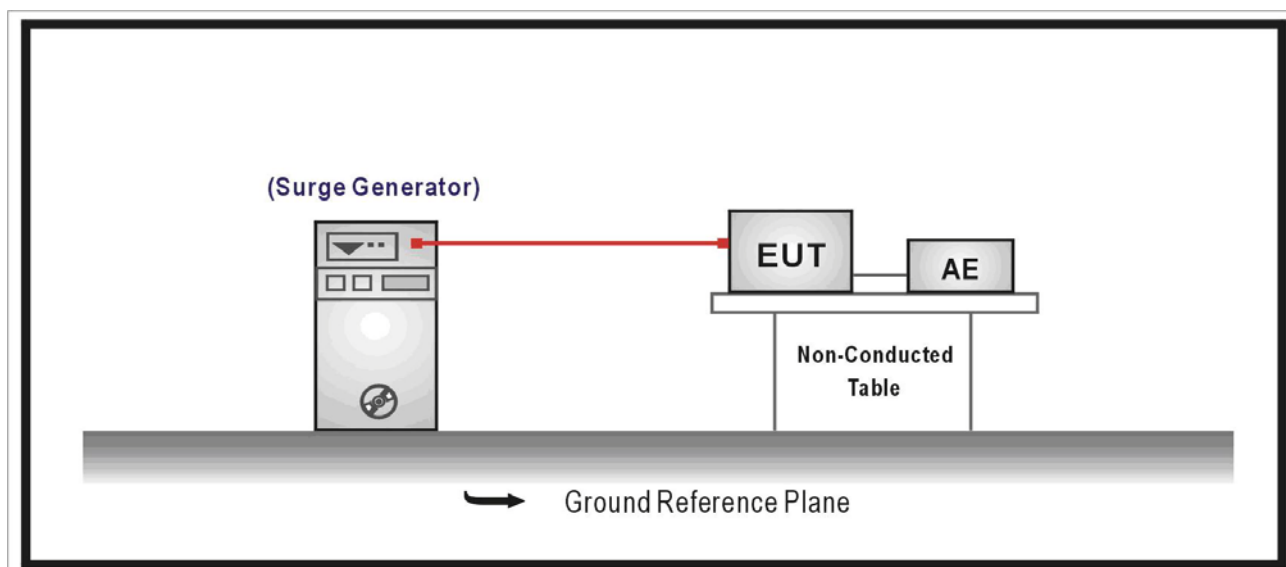


11. Surges

11.1. Limit of Surges

Environmental phenomenon	Test specification	Units	Performance criterion
Input AC power ports (See Note 1)			
Surges	1.2/50 (8/20) ±1 line to line ±2 line to earth	Tr/Th (us) kV (open circuit test voltage) kV (open circuit test voltage)	B
Telecommunication ports directly connected to indoor cables (See Note 1 and 2)			
Surges	1.2/50 (8/20) 0.5 line to ground	Tr/Th us kV (peak)	B
NOTE 1: Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no test shall be required.			
NOTE 2: The test level for telecommunication ports, intended to be connected to indoor cables (longer than 10m) shall be 0.5kV line to ground.			

11.2. Test Setup



11.3. Test Procedure

The EUT is placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m minimum and 0.65mm thick minimum and projected beyond the EUT by at least 0.1m on all sides. The length of power cord between the coupling device and the EUT shall be 2m or less.

For input AC power ports:

The EUT is connected to the power mains through a coupling device that directly couples the surge interference signal.

The surge noise shall be applied synchronized to the voltage phase at 0° , 90° , 180° , 270° and the peak value of the AC voltage wave. (Positive and negative)

Each of Line to Earth and Line to Line is impressed with a sequence of five surge voltages with interval of 1 minute.

For telecommunication ports:

The signal line of EUT is connected to coupling and decoupling network that directly couples the surge interference signal.

Only Line to ground is impressed with a sequence of five surge voltages with interval of 1 minute.

11.4. Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/15

Inject Line	Polarity	Angle (degree)	Test Level (kV)	Test Interval (second)	Observation	Result
L+N	+	0	1	60	Note	Pass
L+N	-	0	1	60	Note	Pass
L+N	+	90	1	60	Note	Pass
L+N	-	90	1	60	Note	Pass
L+N	+	180	1	60	Note	Pass
L+N	-	180	1	60	Note	Pass
L+N	+	270	1	60	Note	Pass
L+N	-	270	1	60	Note	Pass

Note: There is no any degradation of performance and function.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/15

Inject Line	Polarity	Angle (degree)	Test Level (kV)	Test Interval (second)	Observation	Result
L+N	+	0	1	60	Note	Pass
L+N	-	0	1	60	Note	Pass
L+N	+	90	1	60	Note	Pass
L+N	-	90	1	60	Note	Pass
L+N	+	180	1	60	Note	Pass
L+N	-	180	1	60	Note	Pass
L+N	+	270	1	60	Note	Pass
L+N	-	270	1	60	Note	Pass

Note: There is no any degradation of performance and function.

11.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Surge Test Setup for Main Port



12. Radio-frequency common mode

12.1. Limit of Radio-frequency common mode

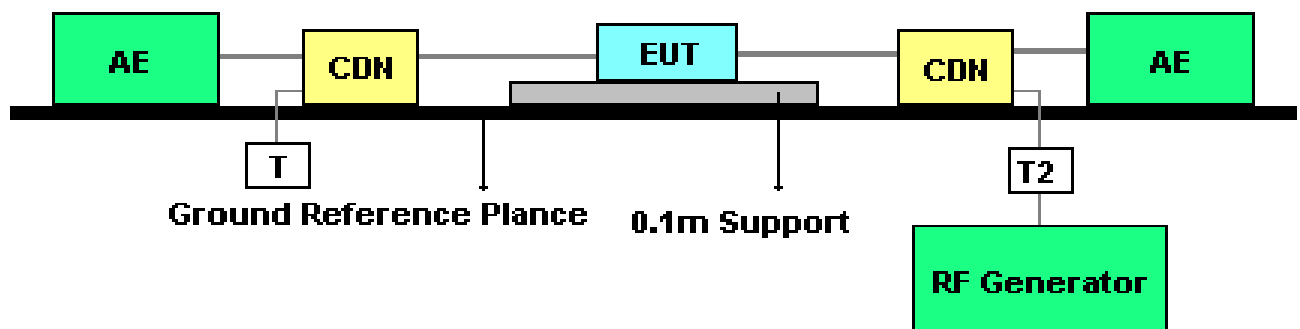
Environmental phenomenon	Test specification	Units	Performance criterion
Input AC power ports (See Note 1 and 2)			
Radio-frequency common mode	0.15 - 80	MHz	A
	3	V (unmodulated, r.m.s)	
	80	% AM (1kHz)	
Signal ports, telecommunication ports, and control ports (See Note 1, 2 and 3)			
Radio frequency common mode	0.15 - 80	MHz	A
	3	V (unmodulated, r.m.s)	
	80	% AM (1kHz)	
NOTE 1: If the wanted signal is modulated at 1000Hz, then an audio signal of 400Hz shall be used. NOTE 2: The test shall be performed over the frequency range 150kHz to 80MHz with the exception of the exclusion band for transmitters, and for receivers and duplex transceivers [see clause 4 of EN 301 489-1 V1.9.2 (2011-09)]. NOTE 3: This test shall be additionally performed on signal ports, telecommunication ports, control ports, and DC power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3m.			

12.2. Test Setup

CDN Test Setup

T : 50 ohm

T2: Power attenuator(6dB)



12.3. Test Procedure

The EUT is placed on a table that is 0.8 meter height, and a ground reference plane on the table, EUT is placed upon table and use 0.1m insulation between the EUT and ground reference plane.

For input AC power ports:

The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

For signal ports, telecommunication ports, and control ports:

The disturbance signal is through a coupling and decoupling networks (CDN) or EM-clamp device couples to the signal and telecommunication lines of the EUT.

	Condition of Test	Remarks
1.	Field Strength	3V
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	0.15 - 80MHz
4	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

12.4. Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/14

Frequency (MHz)	Inject Voltage (V)	Inject Ports	Inject Method	Observation	Result
0.15-80	3	AC Mains	CDN	Note	Pass
0.15-80	3	Signal Cable	CDN	Note	Pass

Note: There is no any degradation of performance and function.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/14

Frequency (MHz)	Inject Voltage (V)	Inject Ports	Inject Method	Observation	Result
0.15-80	3	AC Mains	CDN	Note	Pass
0.15-80	3	Signal Cable	CDN	Note	Pass

Note: There is no any degradation of performance and function.

12.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Radio-frequency Common Mode Test Setup for Main Port

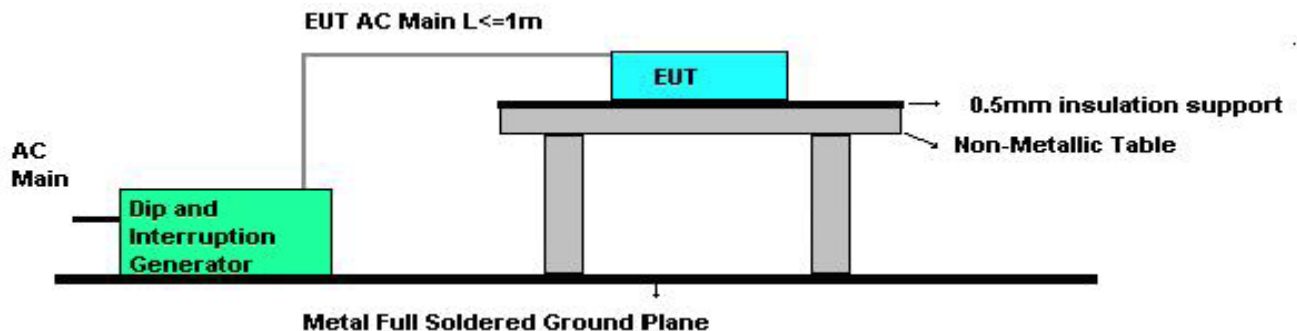


13. Voltage dips and interruptions

13.1. Limit of Voltage dips and interruptions

Environmental phenomenon	Test specification	Units	Performance criterion
Input AC power ports			
Voltage dips	0	% residual	B
	0.5	cycle	
	0	% residual	B
	1	cycle	
	70	% residual	C
	25	cycle	
Voltage interruptions	0	% residual	C
	250	cycle	

13.2. Test Setup



13.3. Test Procedure

The EUT is placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m minimum, and 0.65mm thick minimum, and projected beyond the EUT by at least 0.1m on all sides. The power cord shall be used the shortest power cord as specified by the manufacturer.

For Voltage dips and interruptions test:

The selection of test voltage is based on the rated power range. If the operation range is large than 20% of lower power range, both end of specified voltage shall be tested. Otherwise, the typical voltage specification is selected as test voltage.

The EUT is connected to the power mains through a coupling device that directly couples to the voltage dips and interruption generator.

13.4. Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 1	Date of Test	2014/08/17

Voltage % Residual	Test Duration (ms)	Observation	Result
0	10	Note 1	Pass
0	20	Note 1	Pass
70	500	Note 1	Pass
0	5000	Note 1, 2	Pass

Note 1: There is no any degradation of performance and function.

Note 2: The power consumption of EUT has shut down, but self-recoverable after the test.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Temperature	26°C
Test Engineer	Line Chen	Relative Humidity	54%
Test Mode	Mode 2	Date of Test	2014/08/17

Voltage % Residual	Test Duration (ms)	Observation	Result
0	10	Note 1	Pass
0	20	Note 1	Pass
70	500	Note 1	Pass
0	5000	Note 1, 2	Pass

Note 1: There is no any degradation of performance and function.

Note 2: The power consumption of EUT has shut down, but self-recoverable after the test.

13.5. Test Photograph

Test Mode: Mode 1 & 2

Description: Voltage dips and interruptions Test Setup



14. Uncertainty Measurement

Conducted Emission
<p>The maximum measurement uncertainty is evaluated as:</p> <p>9kHz~150kHz: 3.84dB</p> <p>150kHz~30MHz: 3.46dB</p>
Radiated disturbance
<p>The maximum measurement uncertainty is evaluated as:</p> <p>Horizontal: 30MHz~300MHz: 4.07dB</p> <p>300MHz~1GHz: 3.63 dB</p> <p>Vertical: 30MHz~300MHz: 4.18 dB</p> <p>300MHz~1GHz: 3.60 dB</p>
Radiated disturbance
<p>The maximum measurement uncertainty is evaluated as:</p> <p>Horizontal: 1GHz~18GHz: 4.16 dB</p> <p>Vertical: 1GHz~18GHz: 4.76 dB</p>
Harmonic current emissions
<p>The maximum measurement uncertainty is evaluated as $\pm 0.2\%$.</p>
Voltage fluctuation and flicker
<p>The maximum measurement uncertainty is evaluated as d_c and d_{max}: $\pm 0.095\%$, P_{st} and P_{lt}: $\pm 4\%$, $d_{(t)}$: $\pm 1.5\%$.</p>
Electrostatic discharge
<p>The maximum measurement uncertainty is evaluated as Voltage: $\pm 1\%$, Time: $\pm 6.4\%$.</p>
Radio-frequency electromagnetic field
<p>The maximum measurement uncertainty is evaluated as $\pm 2.72\text{dB}$.</p>
Fast transients
<p>The maximum measurement uncertainty is evaluated as Voltage: $\pm 4\%$, Time: $\pm 3\%$.</p>
Surges
<p>The maximum measurement uncertainty is evaluated as Voltage: $\pm 4\%$, Time: $\pm 2\%$.</p>
Radio-frequency common mode
<p>The maximum measurement uncertainty is evaluated as $\pm 3.72\text{dB}$.</p>
Voltage dips and interruptions
<p>The maximum measurement uncertainty is evaluated as Voltage: $\pm 4\%$, Time: $\pm 1\%$.</p>

15. List of Measuring Instrument

Conducted Emission

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	1 year	2014/11/08
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

Radiated disturbance

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	1 year	2014/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	1 year	2014/11/24
Horn Antenna	Schwarzbeck	BBHA 9120D	1 year	2014/11/24
Preamplifier	MRT	AP01G18	1 year	2015/10/06
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

Harmonic current emissions

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Power Analyzer	California	PACS-1	1 year	2015/01/02
AC Power Source	California	3001iX	1 year	2015/01/02

Voltage fluctuation and flicker

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Power Analyzer	California	PACS-1	1 year	2015/01/02
AC Power Source	California	3001iX	1 year	2015/01/02

Electrostatic discharge

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
ESD Simulator	Teseq GmbH	NSG 435 / INA 402	1 year	2014/11/13
Barometer	BaoPing	DYM3	1 year	2014/11/18
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

Radio-frequency electromagnetic field

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Signal Generator	R&S	SML03	1 year	2015.09.16
Power Meter	Boonton	4231A	1 year	2015.09.16
Power Sensor	Boonton	51011-EMC	1 year	2015.09.16
Power Meter	Agilent	E4416A	1 year	2015.09.16
Power Sensor	Agilent	E9304A	1 year	2015.09.16
RF Switch	MF	SW1072	1 year	N/A
Power Amplifier	Schaffner	CBA9413B	1 year	NA
Power Amplifier	Schaffner	CBA9428	1 year	NA
Directional Coupler	Schaffner	CHA 9652B	1 year	N/A
Directional Coupler	A&R	DC7144A	1 year	N/A
E-Field Probe Type 8.3	Narda	2244/90.21	1 year	2015.03.28
EMR-20C Radiation Meter	Narda	BN 2244/70	1 year	2015.03.28
Bilog Antenna	Schaffner	CBL6141A	1 year	N/A
Horn Antenna	A&R	AT4002A	1 year	N/A
Temperature/Humidity Meter	Zhicheng	ZC1-2	1 year	2015.01.11

Fast transients

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Compact Immunity Test System	3cTest	CCS 600	1 year	2015/04/11
Capacitive coupling clamp	3cTest	EFTC	1 year	2015/04/11
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

Surges

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Compact Immunity Test System	3cTest	CCS 600	1 year	2015/04/11
Combination wave Surge simulator	3cTest	CWS 600T	1 year	2015/04/11
CDN	3cTest	CDN-405T8	1 year	2015/04/11
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

Radio-frequency common mode

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Conducted Immunity Tester	Frankonia	CIT-10/75	1 year	2014/11/08
CDN	Frankonia	CDN M2+M3	1 year	2014/12/14
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15
Audio Analyzer	R&S	UPV	1 year	2015/03/04
Radio Communication Tester	R&S	CMU200	1 year	2014/12/14
Sound Calibration	B&K	4231	1 year	2015/03/11
Conditioning Amplifier	B&K	2690-OS2	1 year	2015/03/11
Microphone	B&K	2669	1 year	2015/03/11
Microphone	B&K	4192	1 year	2015/03/11
Probe Microphone	B&K	4182	1 year	2015/03/11
Mouth Simulator	B&K	4227	1 year	2015/03/11
Telephone Test Head	B&K	4602B	1 year	N/A

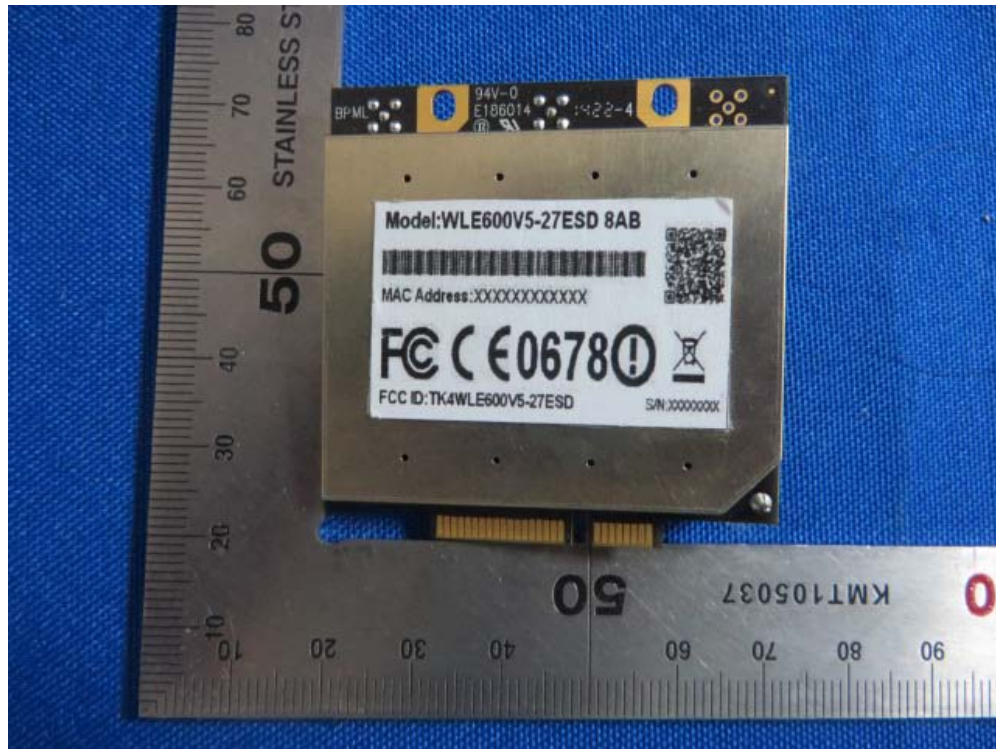
Voltage dips and interruptions

Instrument	Manufacturer	Type No.	Cali. Interval	Cali. Due Date
Compact Immunity Test System	3cTest	CCS 600	1 year	2015/04/11
CDN	3cTest	VMT 2612S	1 year	2015/04/11
Temperature/Humidity Meter	Anymetre	TH101B	1 year	2014/11/15

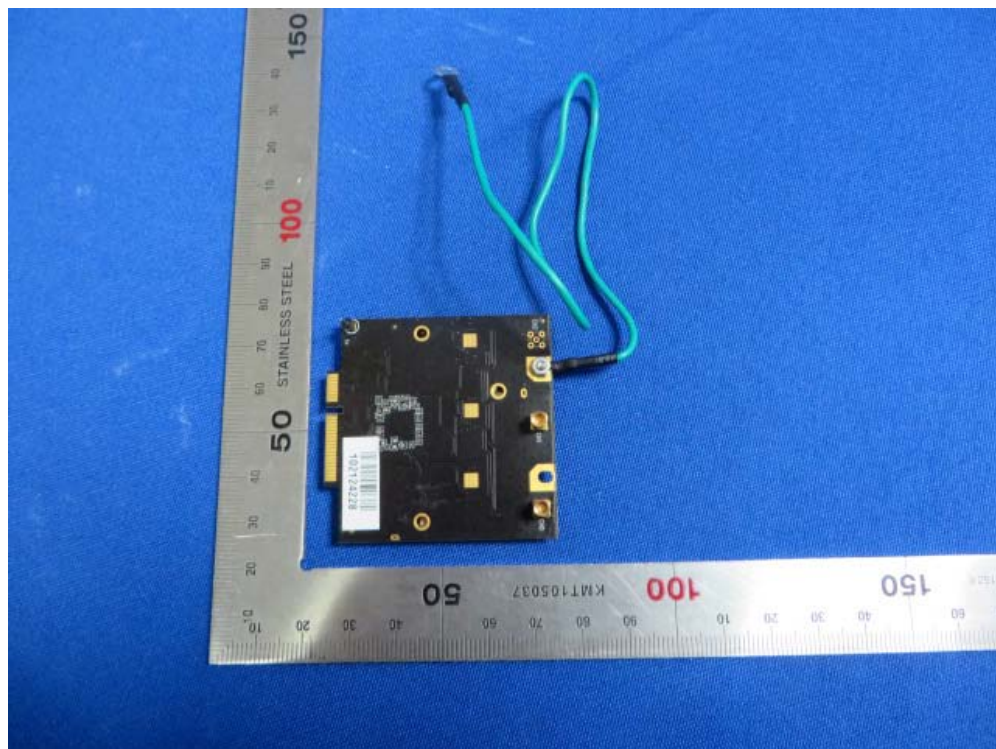
Appendix

EUT Photograph

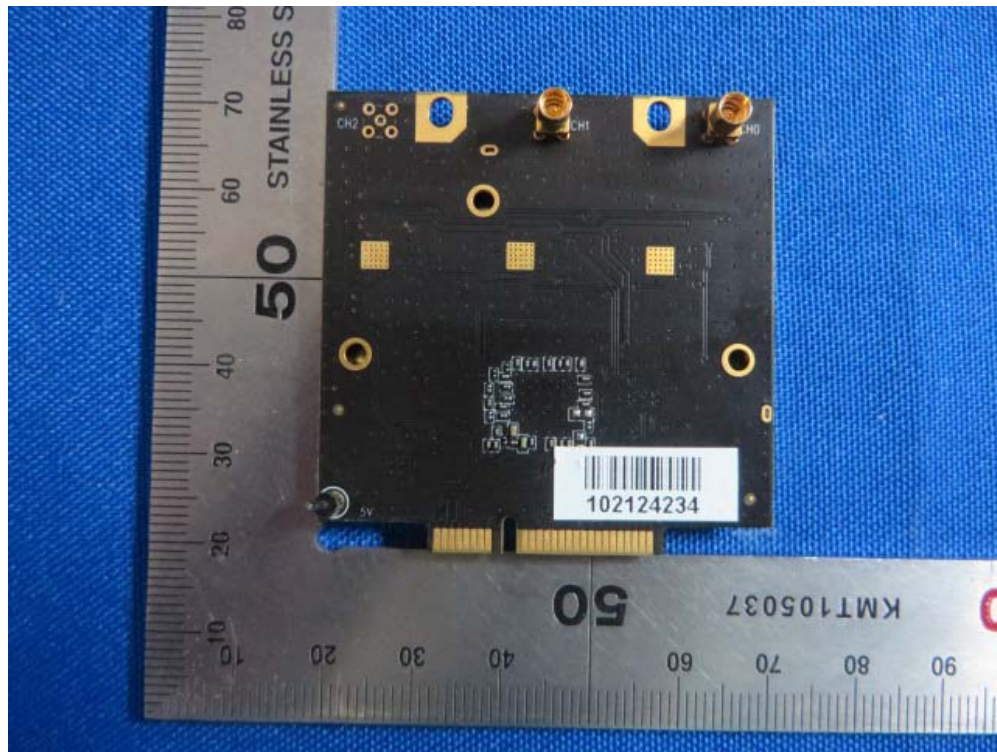
(1) EUT Photo



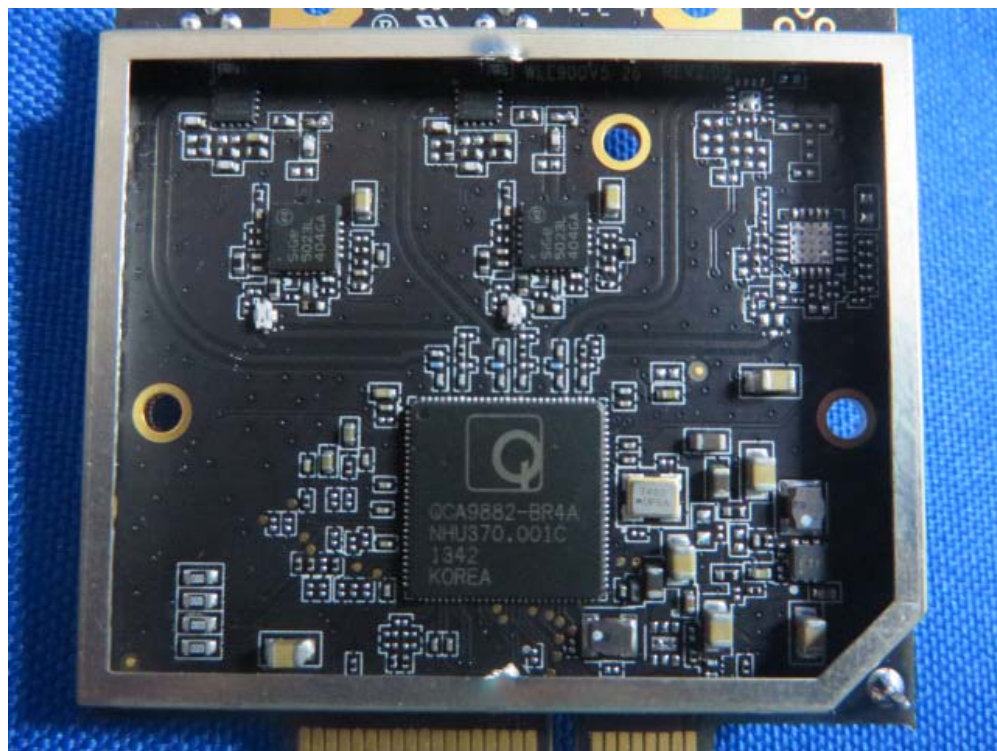
(2) EUT Photo



(3) EUT Photo



(4) EUT Photo



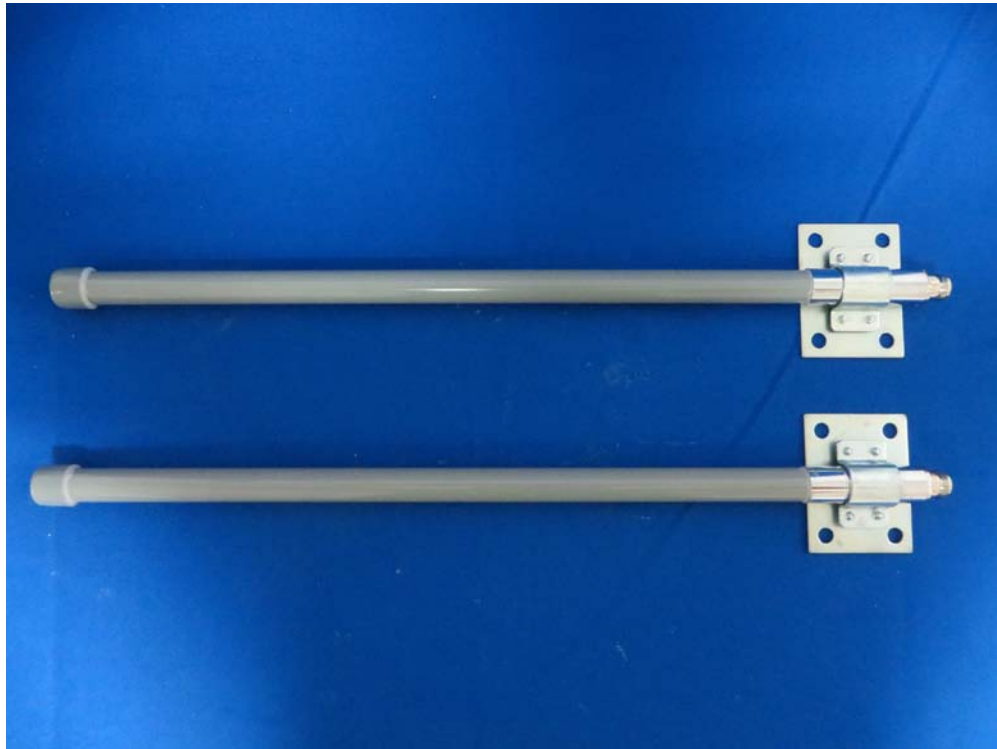
(5) EUT Photo (Dipole Antenna 2dBi)



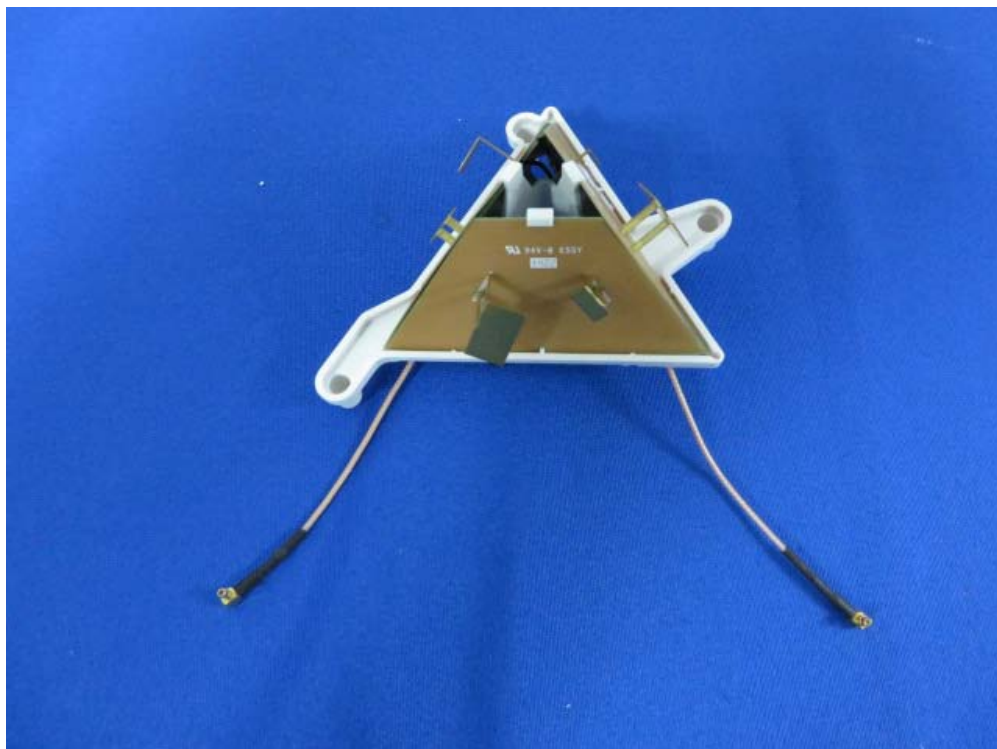
(6) EUT Photo (Panel Antenna 7dBi)



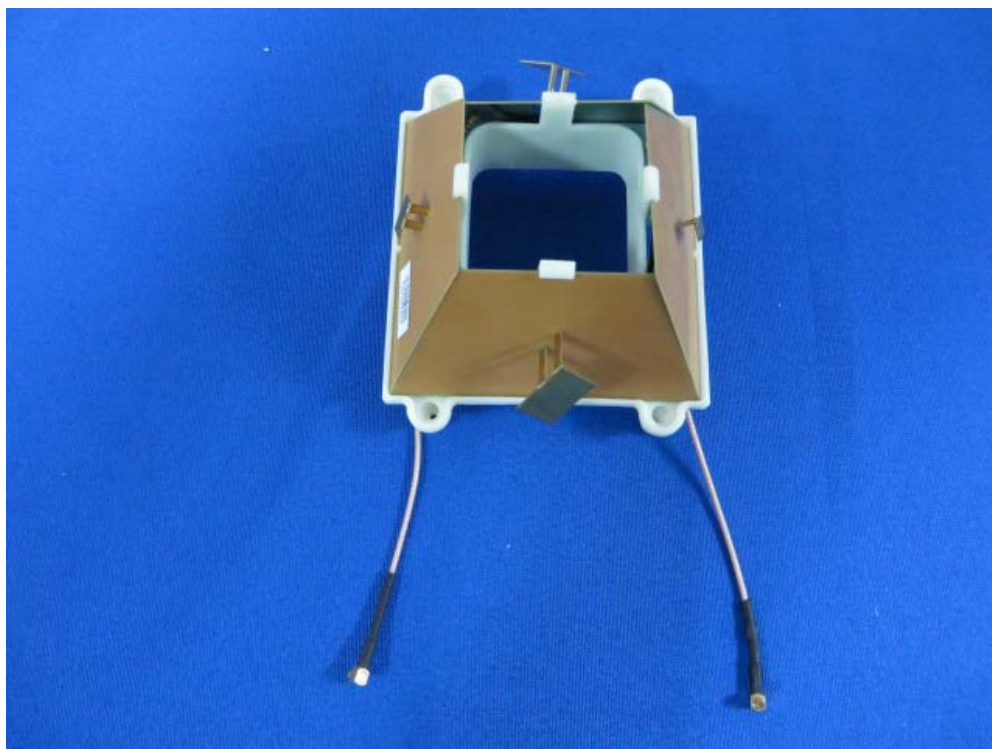
(7) EUT Photo (Panel Antenna 10dBi)



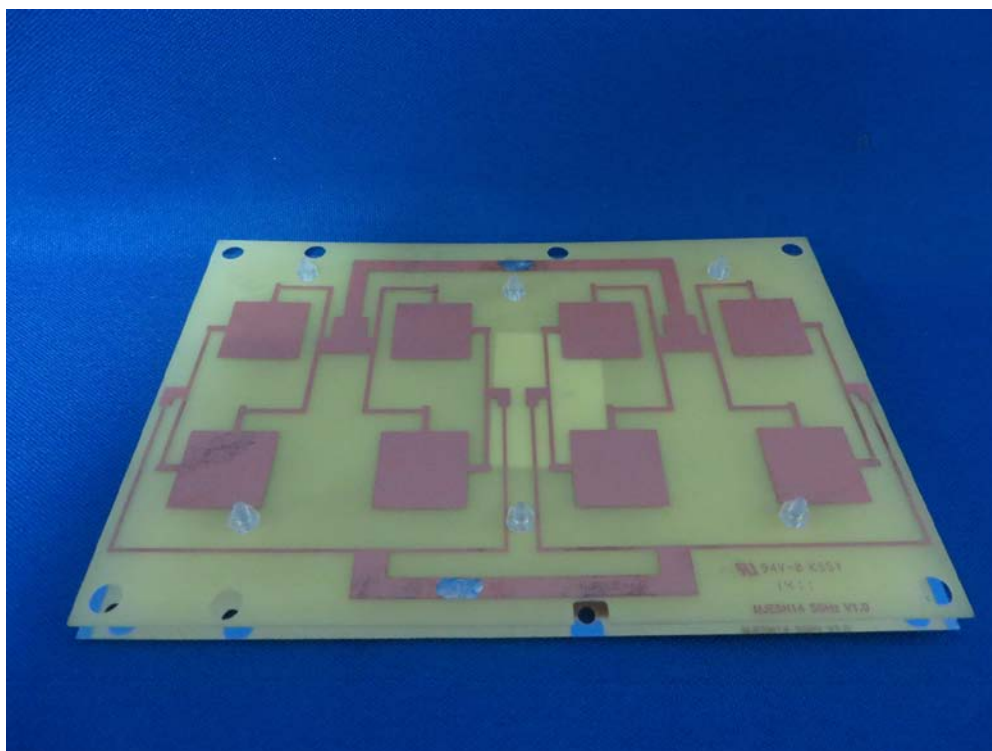
(8) EUT Photo (Panel Antenna 5dBi)



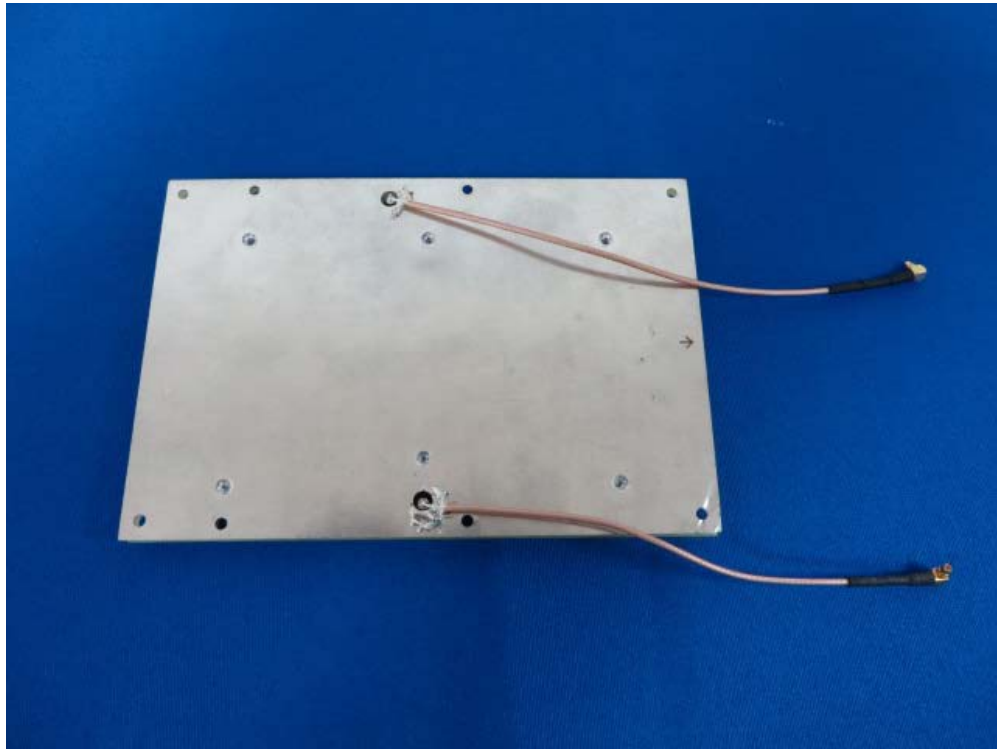
(9) EUT Photo (Panel Antenna 5dBi)



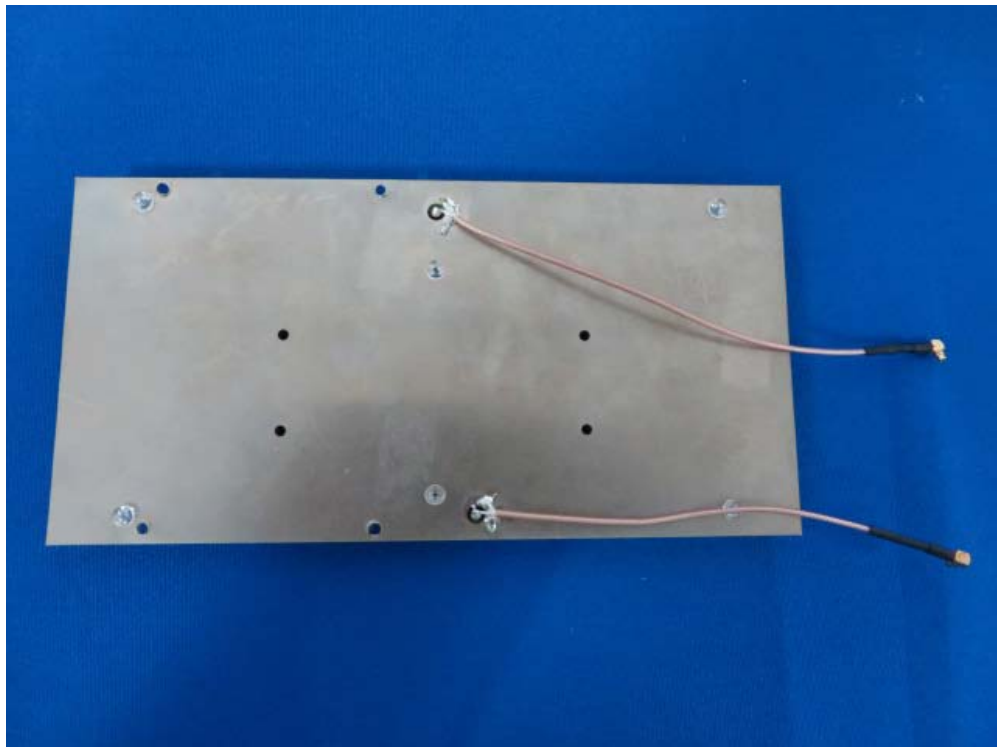
(10) EUT Photo (Panel Antenna 15dBi)



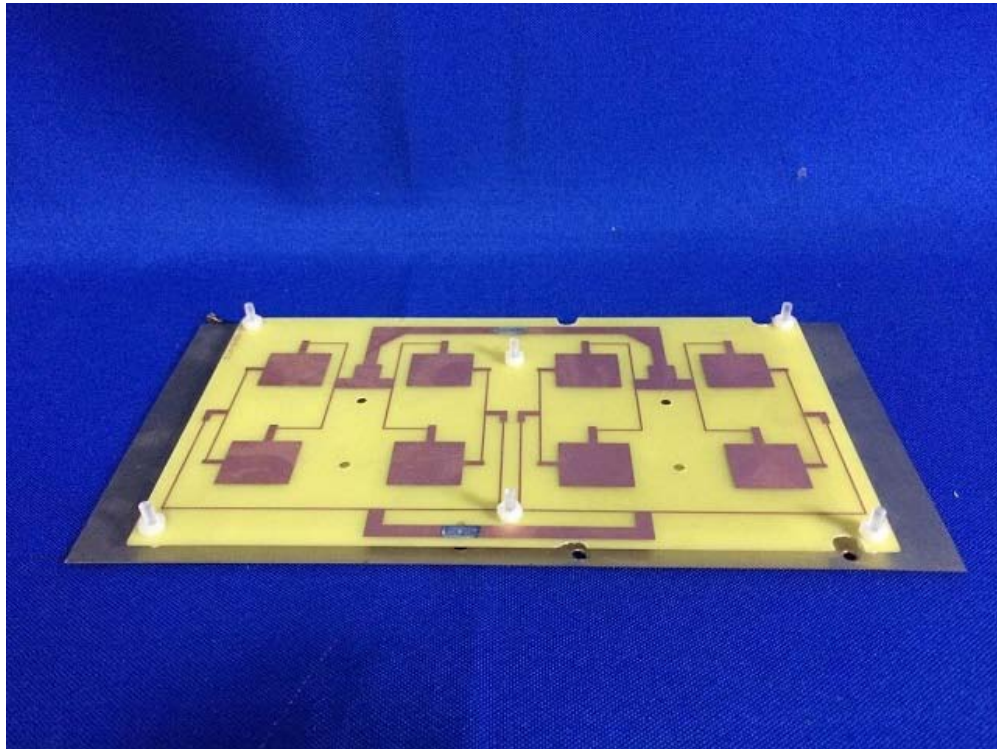
(11) EUT Photo



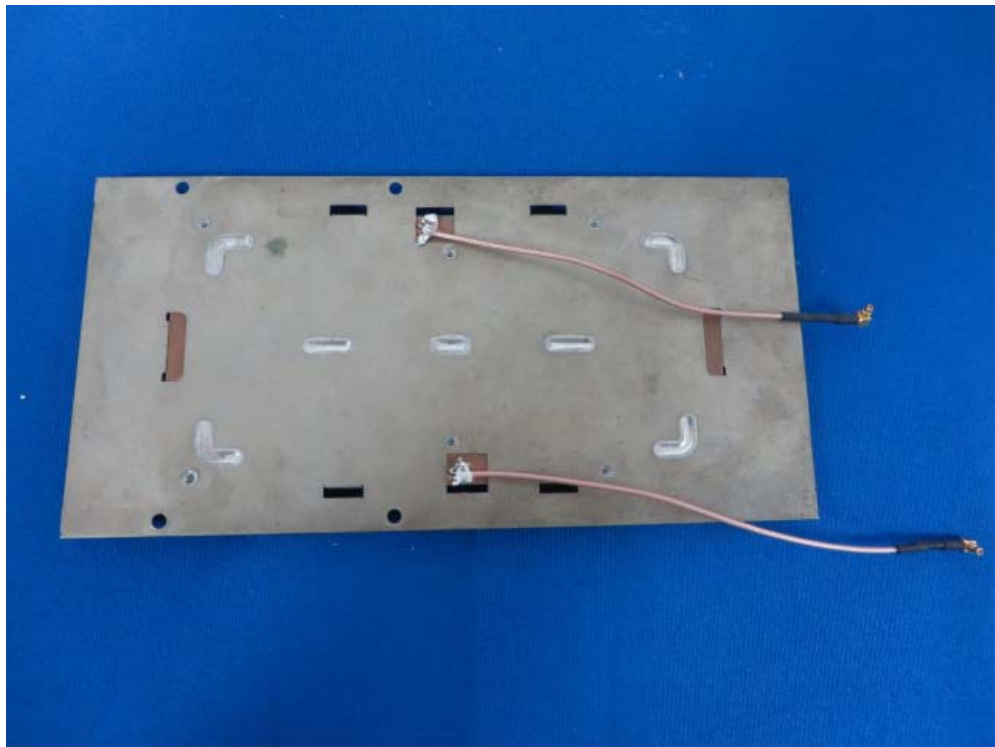
(12) EUT Photo (Panel Antenna 16dBi)



(13) EUT Photo



(14) EUT Photo (Panel Antenna 17dBi)



(15) EUT Photo



(16) EUT Photo (Panel Antenna 19dBi)



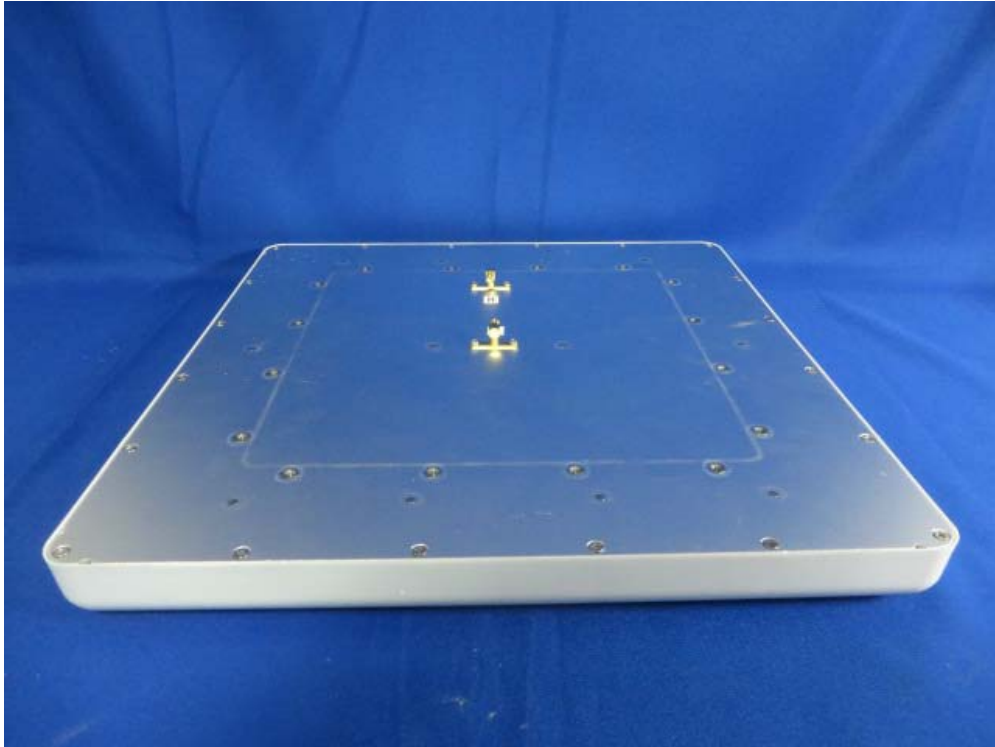
(17) EUT Photo



(18) EUT Photo (Panel Antenna 23dBi)



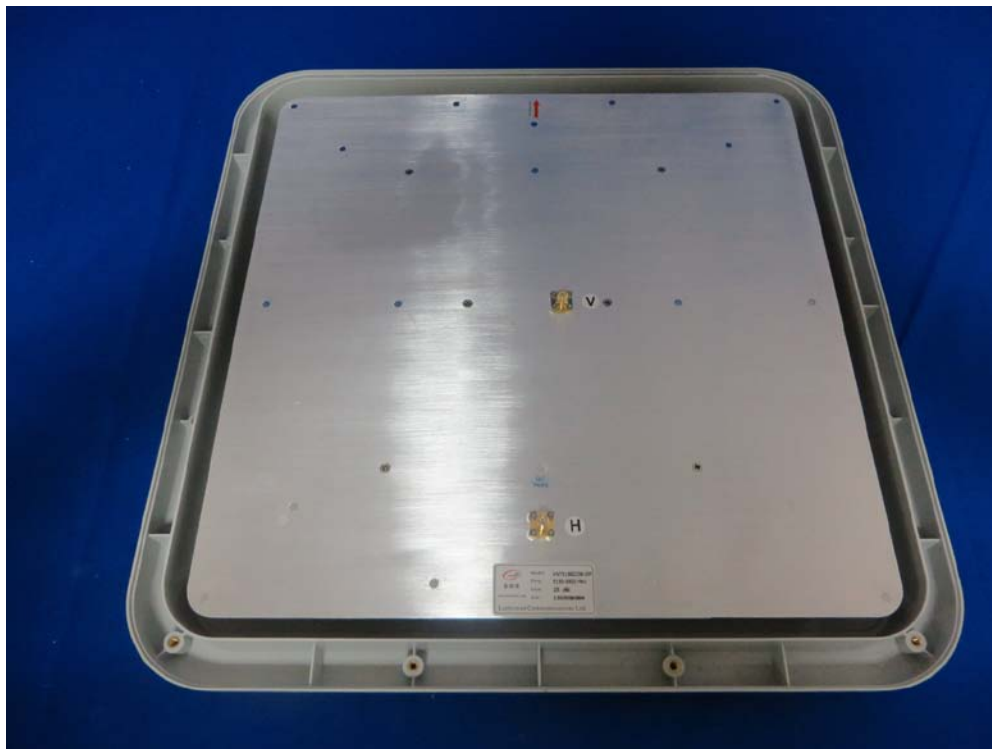
(19) EUT Photo



(20) EUT Photo (Panel Antenna 25dBi)



(21) EUT Photo



The End
