EN 301 489 Test Report

Product Name : WIRELESS-ABGN 3X3 NETWORK MINI PCIE ADAPTER

Model No. : WLE350NX

Applicant : Compex Systems Pte Ltd

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

Date of Receipt : 04/02/2013

Test Date : 05/02/2013~08/04/2013

Issued Date : 08/04/2013

Report No. : 132S008R-RF-CE-P01V01

Report Version. : V 1.0

Test Report Certification

Issued Date : 08/04/2013
Report No. : 132S008R-RF-CE-P01V01

QuieTek

Product Name	:	WIRELESS-ABGN 3X3 NETWORK MINI PCIE ADAPTER
Applicant	:	Compex Systems Pte Ltd
Address	:	135 Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Manufacturer	:	Compex Systems Pte Ltd
Address	:	135 Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Model No.	:	WLE350NX
EUT Voltage	:	DC: 3.3V
Brand Name	:	COMPEX
Applicable Standard	:	ETSI EN 301 489-1 V1.9.2 (2011-09) ETSI EN 301 489-17 V2.2.1 (2012-04)
Test Result	:	Complied
Performed Location	:	Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech Development Zone., Suzhou, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098

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(Robin Wu)

Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
Germany	**:**	**TUV Rheinland**
Norway	**:**	**Nemko, DNV**
USA	**:**	**FCC, NVLAP**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site :http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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1. General Information

1.1. EUT Description

Product Name	WIRELESS-ABGN 3X3 NETWORK MINI PCIE ADAPTER
Brand Name	COMPEX
Model No.	WLE350NX
Working Voltage	DC 3.3V
Frequency Range	802.11b/g/n(20MHz): 2412 ~ 2472 MHz 802.11n(40MHz): 2422 ~ 2462 MHz
	802.11a/n(20MHz): 5180 - 5320 MHz, 5500 - 5700 MHz 802.11n(40MHz): 5190 - 5310 MHz, 5510 - 5670 MHz
Channel Number	802.11b/g/n(20MHz): 13 802.11n(40MHz): 9
	802.11a/n(20MHz): 19 802.11n(40MHz): 9
Type of Modulation	802.11b: DSSS
	802.11a/g/n: OFDM
Data Rate	802.11a/g: 6/9/12/18/24/36/48/54 Mbps
	802.11b: 1/2/5.5/11 Mbps
	802.11n: up to 450 Mbps
Channel Control	Auto
Antenna Delivery	3*Tx + 3*Rx
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

Channel List

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz	04	2427 MHz
05	2432 MHz	06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz	12	2467 MHz
13	2472 MHz	N/A	N/A	N/A	N/A	N/A	N/A
802.11n(40MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz	N/A	N/A

802.11a/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz	48	5240 MHz
52	5260 MHz	56	5280 MHz	60	5300 MHz	64	5320 MHz
100	5500 MHz	104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz	128	5640 MHz
132	5660 MHz	136	5680 MHz	140	5700 MHz	N/A	N/A

802.11n(40MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz	62	5310 MHz
102	5510 MHz	110	5550 MHz	118	5590 MHz	126	5630 MHz
134	5670 MHz	N/A	N/A	N/A	N/A	N/A	N/A

802.11b/g/n Antenna List

Antenna	Manufacturer	M/N	Peak Gain
Panel Antenna	A*STAR Institute for Infocomm Research	N/A	3dBi for 2.4GHz, 5dBi for 5GHz
Panel Antenna	N/A	N/A	6.5dBi for 2.4GHz, 7dBi for 5GHz
Dipole Antenna	SmartAnt Telecom Co., Ltd.	N/A	4.5dBi for 2.4GHz, 7dBi for 5GHz
Dipole Antenna	Kunshan Wavelink Electronic Co., Ltd.	N/A	2dBi for 2.4GHz and 5GHz

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

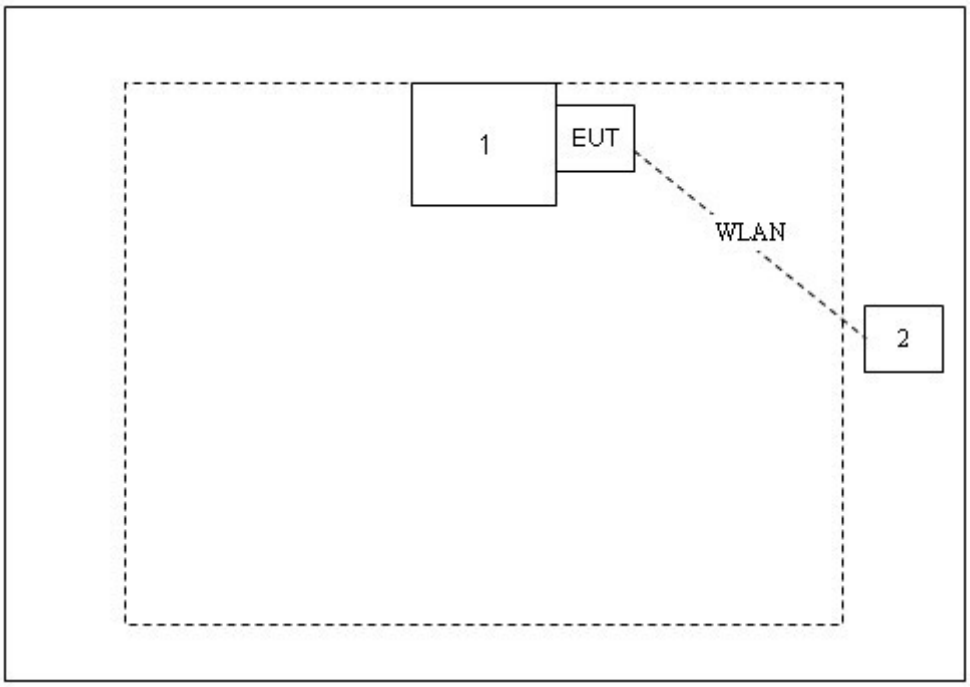
Test Mode	
Emission	Mode 1: Normal Operation
Immunity	Mode 1: Normal Operation Mode 2: Standby

1.3. Tested 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	DELL	E520	N/A	Non-Shielded, 1.8m
2	Router	D-Link	DLR-605	PK11496006143	Non-Shielded, 1.8m

1.4. Configuration of Tested System

Connection Diagram


Signal Cable Type		Signal cable Description
A	N/A	N/A

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Make EUT communicate with AP by WLAN.
4	Start Test.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Emission			
Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	EN 55022: 2010	Yes	No
Radiated Emission	EN 55022: 2010	Yes	No
Harmonic Current Emission	EN 61000-3-2: 2006 + A1: 2009 + A2: 2009	Yes	No
Voltage Fluctuations and Flicker	EN 61000-3-3: 2008	Yes	No

Immunity			
Performed Test Item	Normative References	Test Performed	Deviation
Electrostatic Discharge	EN 61000-4-2: 2009	Yes	No
RF Electromagnetic Field	EN 61000-4-3: 2006 + A1: 2008 + A2: 2010	Yes	No
Fast Transients Common Mode	EN 61000-4-4: 2012	Yes	No
Surges	EN 61000-4-5: 2006	Yes	No
RF Common Mode	EN 61000-4-6: 2009	Yes	No
Voltage Dips and Interruption	EN 61000-4-11: 2004	Yes	No
Transients and Surges	ISO 7637-2: 2004	N/A	N/A

2.2. List of Test Equipment

Conducted disturbance at mains terminals and telecommunication ports / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2014.01.07
Two-Line V-Network	R&S	ENV216	101043	2014.03.30
Two-Line V-Network	R&S	ENV216	101044	2013.09.18
V-Network	R&S	ESH3-Z6	100248	2013.09.17
V-Network	R&S	ESH3-Z6	100249	2013.09.17
Impedance Stabilization Network	Teseq GmbH	ISN T800	30306	2014.02.20
Impedance Stabilization Network	Teseq GmbH	ISN T8-Cat6	29680	2014.02.20
Current Probe	R&S	EZ-17	100255	2014.03.30
50ohm Termination	SHX	TF2	07081401	2013.09.17
50ohm Termination	SHX	TF2	07081402	2013.09.17
50ohm Termination	SHX	TF2	07081403	2013.09.17
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2014.03.01
Coaxial Cable	Suhner	RG 223	TR1-C1	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2014.01.10

Radiated disturbance / AC1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2013.09.17
EMI Test Receiver	R&S	ESCI	100726	2014.03.30
Spectrum Analyzer	Agilent	N9010A	MY48030494	2014.03.30
Preamplifier	Quietek	AP-025C	CHM-0602008	2014.04.11
Preamplifier	Quietek	AP-025C	CHM-0503006	2014.04.11
Bilog Antenna	Schaffner	CBL6112B	2931	2013.10.15
Bilog Antenna	Schaffner	CBL6112B	2933	2013.10.15
DRG Horn	ETS-Lindgren	3117	00123988	2014.01.21
Coaxial Cable	Huber+Suhner	RG 214	AC1-L	2014.03.01
Coaxial Cable	Huber+Suhner	RG 214	AC1-R	2014.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC1-C	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC1-TH	2014.01.09

Radiated disturbance / AC2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100573	2014.03.30
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2013.10.15
Coaxial Cable	Huber+Suhner	RG 214	AC2-C	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC2-TH	2014.01.09

Radiated disturbance / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100176	2013.09.17
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2013.10.15
Coaxial Cable	Huber+Suhner	RG 214	AC3-C	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC3-TH	2014.01.11

Radiated disturbance / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2014.03.30
Preamplifier	Miteq	NSP1800-25	1364185	2013.05.04
DRG Horn	ETS-Lindgren	3117	00123988	2014.01.21
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2014.01.11

Harmonic current emissions / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Power Analyzer	California	PACS-1	72419	2013.11.10
AC Power Source	California	5001iX-208	56741	2013.11.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2014.01.10

Voltage fluctuation and flicker / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Power Analyzer	California	PACS-1	72419	2013.11.10
AC Power Source	California	5001iX-208	56741	2013.11.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2014.01.10

Electrostatic discharge / TR3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
ESD Simulator	EM TEST	Dito	V0616101367	2013.05.15
Barometer	Fengyun	DYM3	0506048	2013.09.19
Temperature/Humidity Meter	zhicheng	ZC1-2	TR3-TH	2014.01.10

Radio-frequency electromagnetic field / AC4

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Signal Generator	R&S	SML03	102324	2013.09.17
Power Meter	Boonton	4231A	144502	2013.09.17
Power Sensor	Boonton	51011-EMC	33859	2013.09.17
Power Meter	Agilent	E4416A	GB41293844	2013.09.17
Power Sensor	Agilent	E9304A	MY41497198	2013.09.17
RF Switch	MF	SW1072	RFSW980005	N/A
Power Amplifier	Schaffner	CBA9413B	43526	NA
Power Amplifier	Schaffner	CBA9428	43516	NA
Directional Coupler	Schaffner	CHA 9652B	0121	N/A
Directional Coupler	A&R	DC7144A	312249	N/A
E-Field Probe Type 8.3	Narda	2244/90.21	AZ-0030	2014.03.28
EMR-20C Radiation Meter	Narda	BN 2244/70	AW-0074	2014.03.28
Bilog Antenna	Schaffner	CBL6141A	4278	N/A
Horn Antenna	A&R	AT4002A	312312	N/A
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC4-TH	2014.01.11

Electrical fast transients / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	1384	2014.03.30
Automatic Steptransformer	Teseq GmbH	INA6502-CIB	167	2014.03.30
CDN	Teseq GmbH	CDN 3061	1360	2014.03.30
CDN	Teseq GmbH	CDN 3063	1997	2014.03.30
CDN	Teseq GmbH	CDN 8014	32791	2014.02.20
Burst / EFT pulse verification kit	Teseq GmbH	CAS3025	32093	2014.01.07
Temperature/Humidity Meter	zhicheng	ZC1-2	TR2-TH	2014.01.11

Surges / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	1384	2014.03.30
Automatic Steptransformer	Teseq GmbH	INA6502-CIB	167	2014.03.30
CDN	Teseq GmbH	CDN 3061	1360	2014.03.30
CDN	Teseq GmbH	CDN 3063	1997	2014.03.30
CDN	Teseq GmbH	CDN 118	37349	2014.02.20
Signal Line Coupling Network	Teseq GmbH	CDN 117	31806	2014.02.20
Telecom Surge Module	Teseq GmbH	TSM3751	0078	2014.03.30
Temperature/Humidity Meter	zhicheng	ZC1-2	TR2-TH	2014.01.11

Radio-frequency continuous conducted / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
RF-Generator	Schaffner	NSG2070	1120	2013.09.18
Attenuator	Schaffner	INA2070-1	2120	2013.09.18
Coupling / Decoupling Network	Schaffner	CDN M016	21249	2013.09.17
Coupling / Decoupling Network	Teseq GmbH	CDN M016	24484	2013.09.17
Coupling / Decoupling Network	Schaffner	CDN T400	19083	2013.09.17
Coupling / Decoupling Network	Teseq GmbH	CDN T400	22461	2013.09.17
Coupling / Decoupling Network	Teseq GmbH	CDN T800	26167	2014.01.07
Coupling / Decoupling Network	Teseq GmbH	CDN M525	31021	2014.01.07
EM Clamp	Schaffner	KEMZ 801	21041	2013.09.18
Temperature/Humidity Meter	zhicheng	ZC1-2	TR2-TH	2014.01.11

Power-frequency magnetic field / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	1384	2014.03.30
Automatic Steptransformer	Teseq GmbH	INA6502-CIB	167	2014.03.30
CDN	Teseq GmbH	CDN 3061	1360	2014.03.30
Magnetic field Coil	Teseq GmbH	INA 702	224	2014.01.10
Magnetic Field Generator	Teseq GmbH	MFO 6502	134	2014.01.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR2-TH	2014.01.11

Voltage dips and interruptions / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	1384	2014.03.30
Automatic Steptransformer	Teseq GmbH	INA6502-CIB	167	2014.03.30
CDN	Teseq GmbH	CDN 3061	1360	2014.03.30
Temperature/Humidity Meter	zhicheng	ZC1-2	TR2-TH	2014.01.11

*Transients and Surges / No.4 Shielded Rom

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Schaffner NSG 2050 System Mainframe	Schaffner	N/A	N/A	2013.06.18
EMC immunity system	Thermo	EMCPRO PLUS	0411225	2013.08.15
TRANSIENT TEST SYSTEM	EMC PARTNET	TRA2000IN6	1138	2013.11.30

Note: “*” means this test item is performed in LinKou EMC Testing Laboratory of Quietek.

2.3. Measurement Uncertainty

Conducted disturbance / TR1
The maximum measurement uncertainty is evaluated as: 9kHz~30MHz: ±3.35dB
Radiated disturbance / AC1
The maximum measurement uncertainty is evaluated as: 30MHz~1GHz: ±4.24dB Above 1GHz: ±5.11dB
Radiated disturbance / AC2
The maximum measurement uncertainty is evaluated as : 30MHz~1GHz: ±4.04dB
Radiated disturbance / AC3
The maximum measurement uncertainty is evaluated as: 30MHz~1GHz: ±4.23dB
Radiated disturbance / AC5
The maximum measurement uncertainty is evaluated as: 30MHz~1GHz: ±4.20dB Above 1GHz: ±5.58dB
Harmonic current emissions / TR1
The maximum measurement uncertainty is evaluated as ± 0.2%.
Voltage fluctuation and flicker / TR1
The maximum measurement uncertainty is evaluated as d_c and d_{max}: ± 0.095%, P_{st} and P_{lt}: ± 4%, $d_{(t)}$: ± 1.5%
Electrostatic discharge / TR3
The maximum measurement uncertainty is evaluated as Voltage: ± 1.63%, Time: ± 2.76%.
Radio frequency electromagnetic field / AC4
The maximum measurement uncertainty is evaluated as ± 2.72dB.
Fast transients common mode / TR2
The maximum measurement uncertainty is evaluated as Voltage: ± 1.63%, Frequency: ± 2.8 x 10^{-10}, Time: ± 2.76%.
Surges / TR2
The maximum measurement uncertainty is evaluated as Voltage: ± 1.63%, Time: ± 2.76%.
Radio frequency common mode / TR2
The maximum measurement uncertainty is evaluated as ± 3.72dB.
Voltage dips and interruptions / TR2
The maximum measurement uncertainty is evaluated as Voltage: ± 1.63%, Time: ± 2.76%.

Transients and surges / SR4
The maximum measurement uncertainty is evaluated as Voltage: ± 1.60%, Time: ± 2.60%.

2.4. Test Environment

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	15-35	23
	Humidity (%RH)	25-75	50
	Barometric pressure (mbar)	860-1060	950-1000
Radiated Emission	Temperature (°C)	15-35	23
	Humidity (%RH)	25-75	50
	Barometric pressure (mbar)	860-1060	950-1000
Harmonic Current Emission	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000
Voltage Fluctuations and Flicker	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000
Electrostatic Discharge	Temperature (°C)	15-35	22
	Humidity (%RH)	30-60	43
	Barometric pressure (mbar)	860-1060	950-1000
RF Electromagnetic Field	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000
Fast Transients Common Mode	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000
Surges	Temperature (°C)	15-35	22
	Humidity (%RH)	10-75	43
	Barometric pressure (mbar)	860-1060	950-1000
RF Common Mode	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000
Voltage Dips and Interruption	Temperature (°C)	15-35	22
	Humidity (%RH)	25-75	43
	Barometric pressure (mbar)	860-1060	950-1000

Transients and Surges	Temperature (°C)	15-35	--
	Humidity (%RH)	25-75	--
	Barometric pressure (mbar)	860-1060	--

2.5. Immunity Performance criteria

General Requirements (ETSI EN 301489-1):

The performance criteria 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 [22] dealing with the particular type of radio equipment.

(1) 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 [22] 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.

(2) 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 [22] 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.

(3) 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 V1.8.1 (2008-04) 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).

(4) 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 V1.8.1 (2008-04) 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.

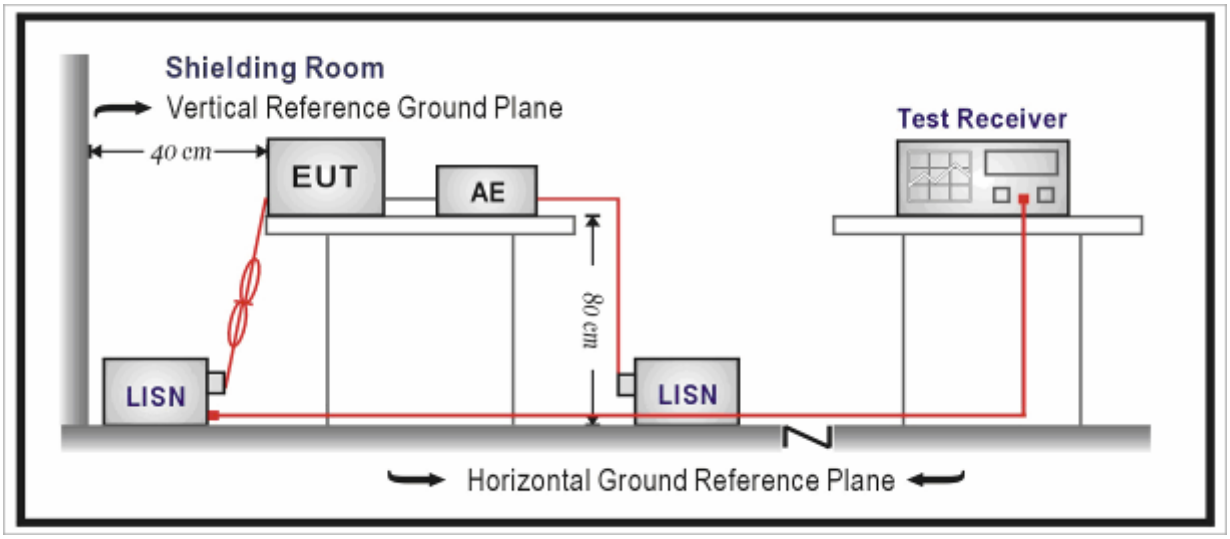
NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. 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.

3. Conducted Emission (AC input/output Ports)

3.1. Test Specification

According to EMC Standard: EN 55022 Class B

3.2. Test Setup



3.3. Limit

Limits for Conducted Emissions		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

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

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
(Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Deviation from Test Standard

No deviation.

3.6. Test Result

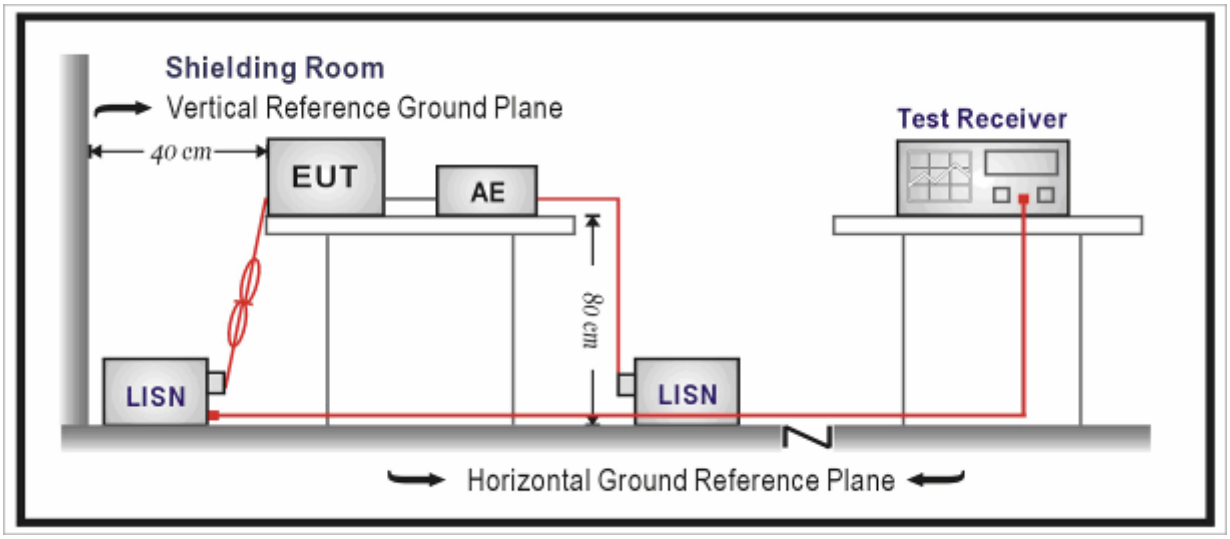
Not applicable.

4. Conducted Emission (DC input/output Ports)

4.1. Test Specification

According to EMC Standard: EN 55022 Class B and CISPR 25

4.2. Test Setup



4.3. Limit

Limits for conducted emissions of equipment intended to be used in telecommunication centers only		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	79	66
0.50 - 30	73	60

Note: The lower limit shall apply at the transition frequencies.

Limits for Conducted Emissions		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

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

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

4.4. Test Procedure

The EUT and simulators are connected to the main power through a Artificial Mains Networks (AMN). For radio and ancillary equipment for fixed use, the Artificial Mains Networks (AMN) shall be used and be connected to a DC power source. For mobile radio and ancillary equipment intended to be connected to the vehicles's onboard DC mains, an Artificial Network (AN) shall be used and be connected to a DC power source.
(Please refers to the block diagram of the test setup and photographs.)
Both sides of D.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

4.5. Deviation from Test Standard

No deviation.

4.6. Test Result

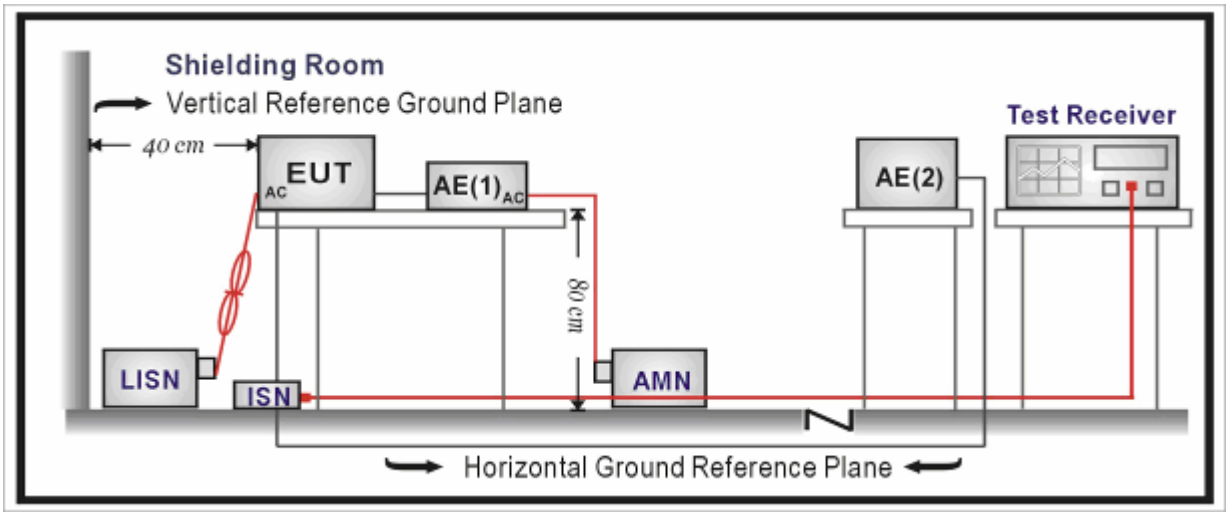
Not applicable.

5. Conducted Emissions (Telecommunication Ports)

5.1. Test Specification

According to EMC Standard: EN 55022 Class B

5.2. Test Setup



5.3. Limit

Limits for conducted emissions from telecommunication ports of equipment intended for use in telecommunication centers only				
Frequency (MHz)	Voltage		Current	
	QP (dBuV)	AV (dBuV)	QP (dBuA)	AV (dBuA)
0.15 - 0.50	97 - 87	84 - 74	53 - 43	40 - 30
0.50 - 30	87	74	43	30

Note 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an Impedance Stabilization Network (ISN), which presents a common mode (asymmetric mode) impedance of 150 ohm to the telecommunication port under test (conversion factor is 20 log150/I = 44 dB).

Limits for conducted emissions from telecommunication ports				
Frequency (MHz)	Voltage		Current	
	QP (dBuV)	AV (dBuV)	QP (dBuA)	AV (dBuA)
0.15 - 0.50	84 - 74	74 - 64	40 - 30	30 - 20
0.50 - 30	74	64	30	20

Note 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an Impedance Stabilization Network (ISN) which presents common mode (asymmetric mode) impedance of 150 ohm to the telecommunication port under test (conversion factor is 20 log150/I = 44 dB).

Note 3: The emission requirement only applies to telecommunication ports. The provisional relaxation of 10 dB will be reviewed no later than 3 years after the date of withdrawal based on the results and interference cases seen in this period. Wherever possible it is recommended to comply with the limits without the provisional relaxation.

5.4. Test Procedure

The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN, which is 150 ohm impedance.
Both alternative cables are tested related to the LCL requested. The measurement range is from 150kHz to 30MHz. The bandwidth of measurement is set to 9kHz.

5.5. Deviation from Test Standard

No deviation.

5.6. Test Result

Not applicable.

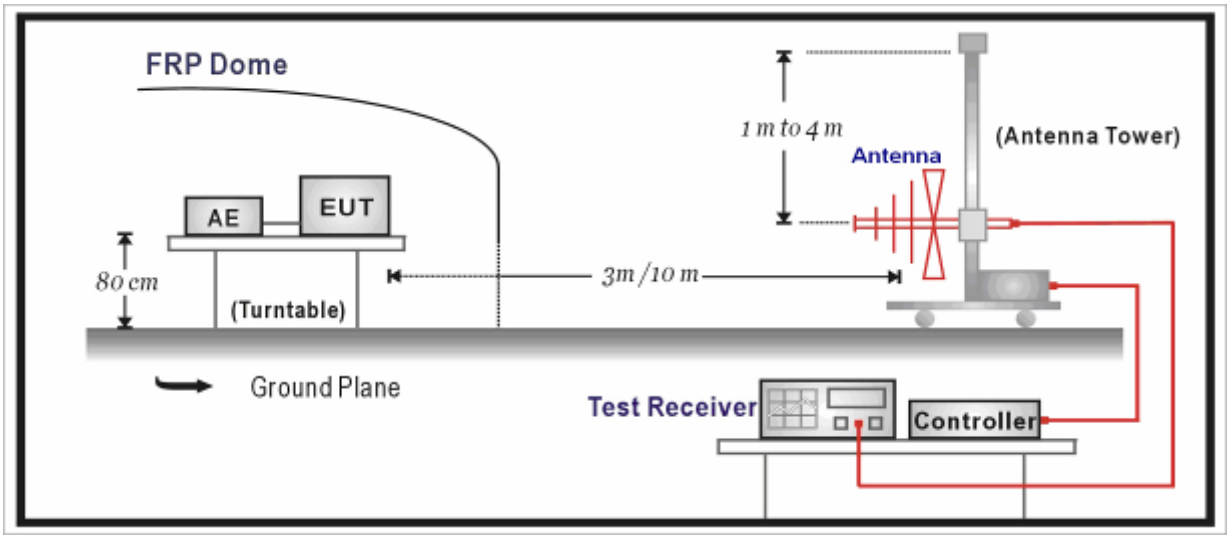
6. Radiated Emission

6.1. Test Specification

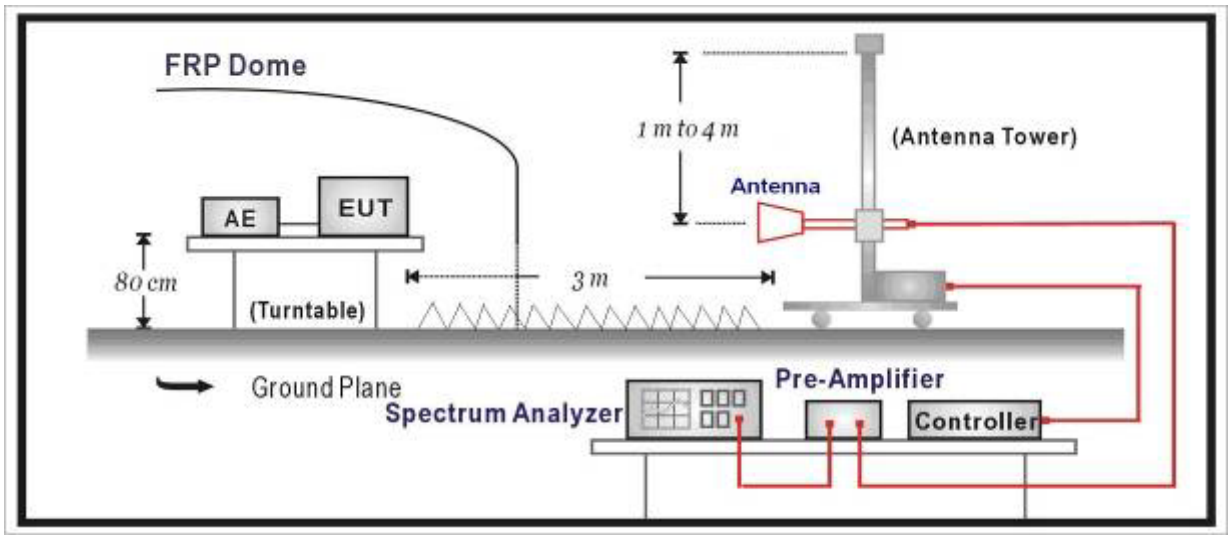
According to EMC Standard: EN 55022 Class B

6.2. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.3. Limit

Limits for radiated emissions from ancillary equipment intended for use in telecommunication centers only, and measured on a stand alone basis		
Frequency (MHz)	Distance (m)	QP (dBuV/m)
30 - 230	10	40
230 - 1000	10	47

Limits Above 1GHz for radiated emissions from ancillary equipment intended for use in telecommunication centers only, and measured on a stand alone basis			
Frequency (GHz)	Distance (m)	Average (dBuV/m)	Peak (dBuV/m)
1 - 3	3	56	76
3 - 6	3	60	80

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

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Limits for radiated emissions from ancillary equipment, measured on a stand-alone basis		
Frequency (MHz)	Distance (m)	QP (dBuV/m)
30 - 230	10	30
230 - 1000	10	37

Limits for radiated disturbance			
Frequency (GHz)	Distance (m)	Average (dBuV/m)	Peak (dBuV/m)
1 - 3	3	50	70
3 - 6	3	54	74

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

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

6.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters for below 1GHz and 3 meters for above 1GHz.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

For above 1GHz radiation test procedures, refer to CISPR16-2-3: 2006.

Conditional testing procedure:

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
< 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 6 GHz, whichever is less

6.5. Deviation from Test Standard

No deviation.

6.6. Test Result

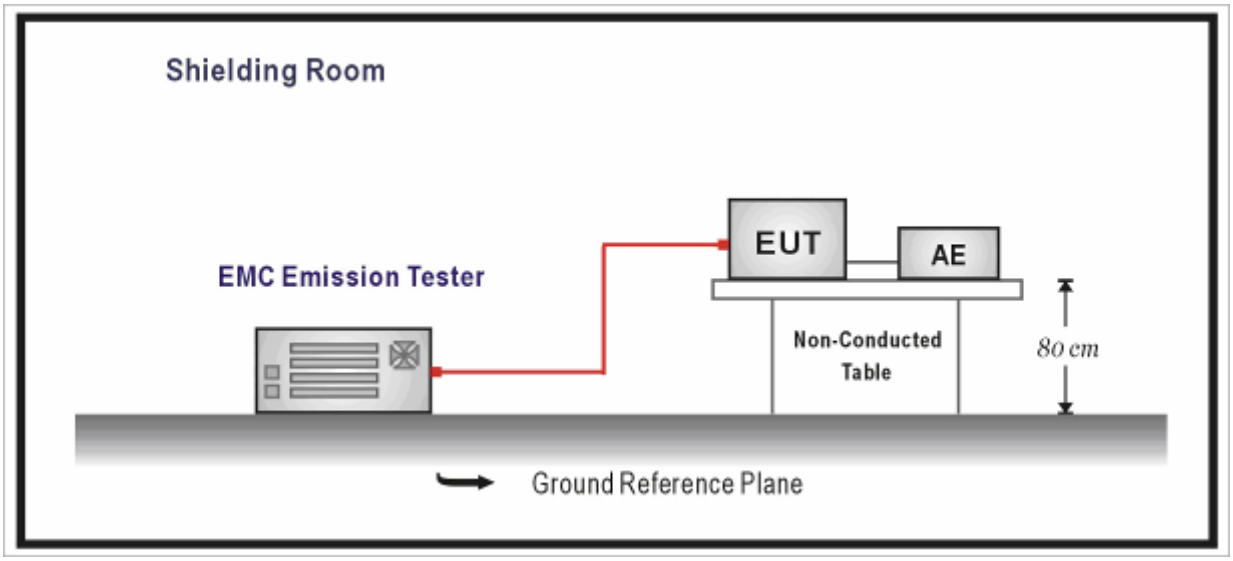
Not applicable.

7. Harmonic Current Emission

7.1. Test Specification

According to EMC Standard: EN 61000-3-2

7.2. Test Setup



7.3. Limit

(a) 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	$8 \le n \le 40$	0.23 * 8/n
11	0.33		
13	0.21		
$15 \le n \le 39$	0.15 * 15/n		

(b) Limits of Class B Harmonics Currents

For Class B equipment, the harmonic of the input current shall not exceed the maximum permissible values given in table that is the limit of Class A multiplied by a factor of 1.5.

(c) Limits of Class C Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current Expressed as a percentage of the input current at the fundamental frequency %
2	2
3	30 · λ*
5	10
7	7
9	5
11 ≤ n ≤ 39 (odd harmonics only)	3
∗λ is the circuit power factor	

(d) Limits of Class D Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current per watt mA/W	Maximum Permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
11 ≤ n ≤ 39 (odd harmonics only)	3.85/n	See limit of Class A

7.4. 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 0.94 times and 1.06 times shall be performed.

7.5. Deviation from Test Standard

No deviation.

7.6. Test Result

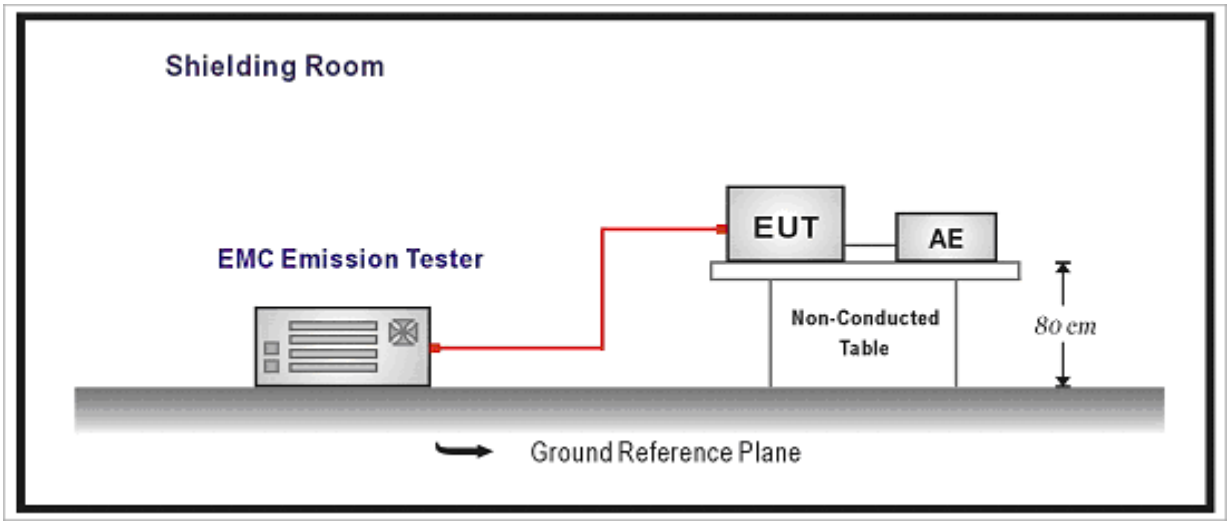
Not applicable.

8. Voltage Fluctuation and Flicker

8.1. Test Specification

According to EMC Standard: EN 61000-3-3

8.2. Test Setup



8.3. Limit

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 500 ms;
- 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_{1t} limit.

For example: a d_{max} of 6%producing a rectangular voltage change characteristic twice per hour will give a P_{1t} 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_{1t} requirements shall not be applied to voltage changes caused by manual switching.

8.4. 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 0.94 times and 1.06 times shall be performed.

8.5. Deviation from Test Standard

No deviation.

8.6. Test Result

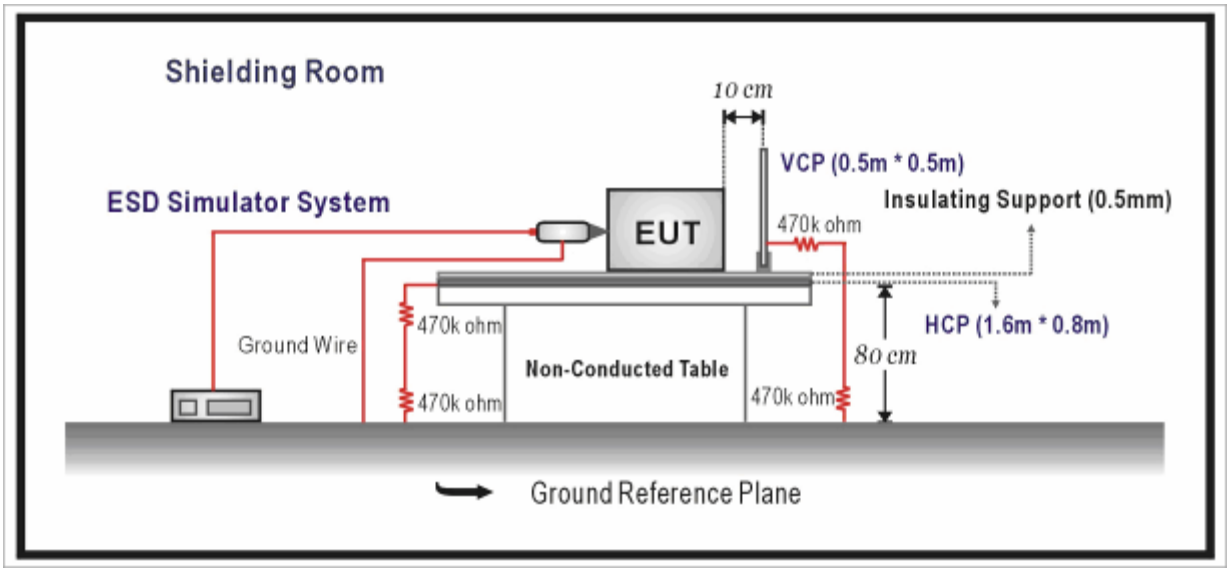
Not applicable.

9. Electrostatic Discharge

9.1. Test Specification

According to Standard: EN 61000-4-2

9.2. Test Setup



9.3. Limit

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Electrostatic Discharge	kV(Charge Voltage)	±8 Air Discharge ±4 Contact Discharge	TT, TR (B)

9.4. 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 ten 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 ten 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 ten single discharges with positive and negative at the same selected point.

9.5. Deviation from Test Standard

No deviation.

9.6. Test Result

Test Mode	Mode 1: Normal Operation	Test Condition	AC 230V/50Hz
Test Site	TR-3	Date of Test	2013/03/02
Temperature	22°C	Humidity	43%RH
Barometric Pressure	101kPa	Test Engineer	Brgant
EUT	WIRELESS-ABGN 3X3 NETWORK MINI PCIE ADAPTER		

Horizontal Coupling			
Test Location	Test Level	Observation	Result
Front	± 4	Note	Pass
Rear	± 4	Note	Pass
Left	± 4	Note	Pass
Right	± 4	Note	Pass

Vertical Coupling			
Test Location	Test Level	Observation	Result
Front	± 4	Note	Pass
Rear	± 4	Note	Pass
Left	± 4	Note	Pass
Right	± 4	Note	Pass

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

Test Mode	Mode 2: Standby	Test Condition	AC 230V/50Hz
Test Site	TR-3	Date of Test	2013/03/02
Temperature	22°C	Humidity	43%RH
Barometric Pressure	101kPa	Test Engineer	Brgant
EUT	WIRELESS-ABGN 3X3 NETWORK MINI PCIE ADAPTER		

Horizontal Coupling			
Test Location	Test Level	Observation	Result
Front	± 4	Note	Pass
Rear	± 4	Note	Pass
Left	± 4	Note	Pass
Right	± 4	Note	Pass

Vertical Coupling			
Test Location	Test Level	Observation	Result
Front	± 4	Note	Pass
Rear	± 4	Note	Pass
Left	± 4	Note	Pass
Right	± 4	Note	Pass

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

9.7. Test Photograph

Test Mode: Mode 1~2

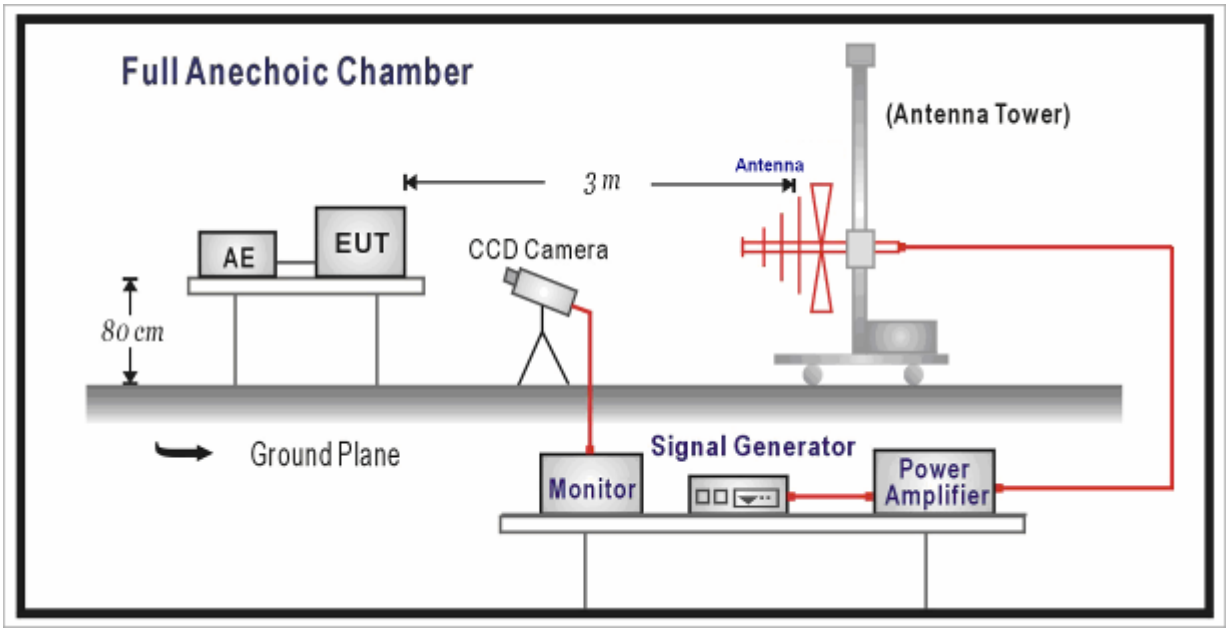
Description: Electrostatic Discharge Test Setup

10. RF Electromagnetic Field

10.1. Test Specification

According to Standard: EN 61000-4-3

10.2. Test Setup



10.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Radio frequency electromagnetic field	80 - 1000, 1400 - 2700 3 80	MHz V/m (unmodulated, r.m.s) % AM (1kHz)	A
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 V1.8.1 (2008-04)], as appropriate.			

10.4. 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 2.1 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	3 V/m Level 2
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	80 - 1000MHz, 1400 – 2700MHz
4	Dwell Time	3 Seconds
5.	Frequency step size Δf	1%
6.	The rate of Swept of Frequency	1.5 x 10^{-3} decades/s

10.5. Deviation from Test Standard

No deviation.

10.6. Test Result

Test Mode	Mode 1: Normal Operation	Test Condition	AC 230V/50Hz
Test Site	AC-4	Date of Test	2013/03/02
Temperature	22°C	Humidity	43%RH
Barometric Pressure	101kPa	Test Engineer	Toms

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

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

Test Mode	Mode 2: Standby	Test Condition	AC 230V/50Hz
Test Site	AC-4	Date of Test	2013/03/02
Temperature	22°C	Humidity	43%RH
Barometric Pressure	101kPa	Test Engineer	Toms

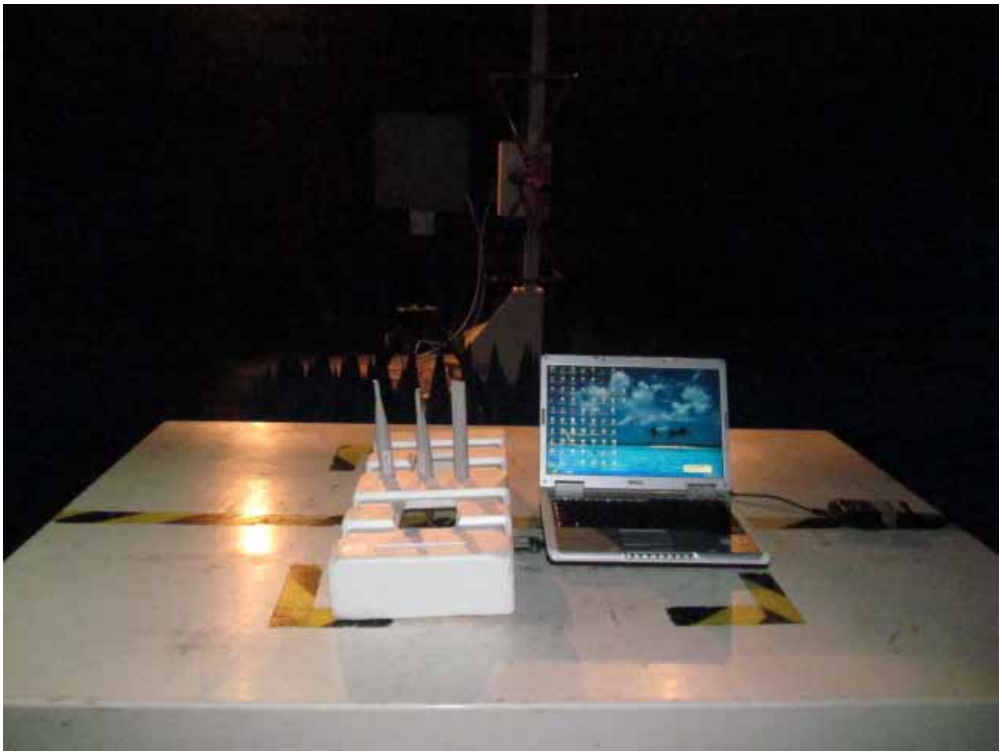
Frequency (MHz)	Polarity	Position	Field Strength (V/m)	Observation	Result
80-1000 1400-2700	Horizontal	Front	3	Note	Pass
80-1000 1400-2700	Vertical	Front	3	Note	Pass
80-1000 1400-2700	Horizontal	Rear	3	Note	Pass
80-1000 1400-2700	Vertical	Rear	3	Note	Pass
80-1000 1400-2700	Horizontal	Left	3	Note	Pass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

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

10.7. Test Photograph

Test Mode: Mode 1,2

Description: Test Setup

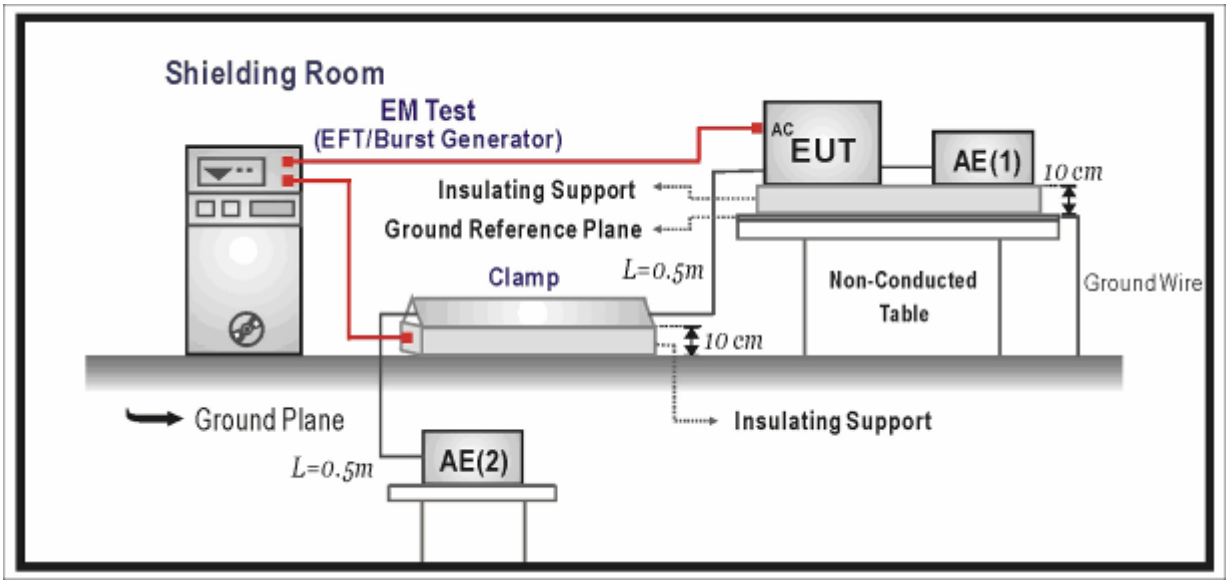


11. Fast Transients Common Mode

11.1. Test Specification

According to Standard: EN 61000-4-4

11.2. Test Setup



11.3. Limit

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Signal Ports and Telecommunication Ports (See Note)				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±0.5 5/50 5	B
Input D.C. Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±0.5 5/50 5	B
Input A.C. Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±1 5/50 5	B

Note: Applicable only to cables which according to the manufacturer's specification supports communication on cable lengths greater than 3m.

11.4. 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 signal and telecommunication ports:
The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 1minute.

For input A.C. and D.C. 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 and Neutral conductors is impressed with burst noise for 1 minute.

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

11.5. Deviation from Test Standard

No deviation.

11.6. Test Result

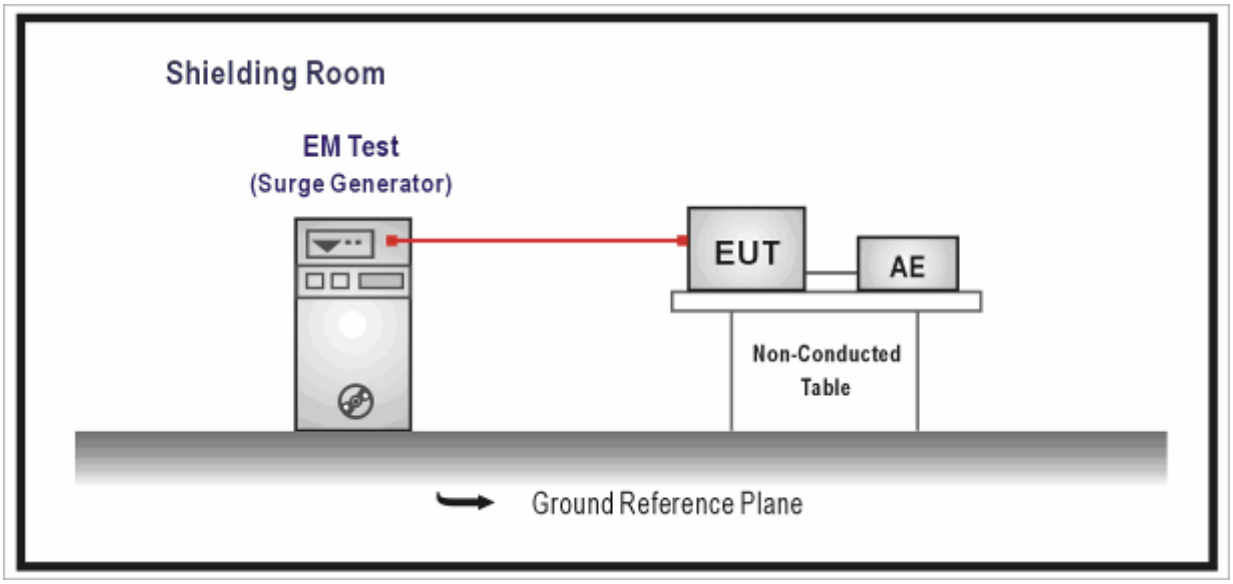
Not applicable.

12. Surges

12.1. Test Specification

According to Standard: EN 61000-4-5

12.2. Test Setup



12.3. Limit

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Telecommunication ports directly connected to outdoor cables				
	Surges Line to Ground	Tr/Th us kV	1.2/50 (8/20) ± 1	B
Telecommunication ports directly connected to indoor cables (See Note(2))				
	Surges Line to Ground	Tr/Th us kV	1.2/50 (8/20) ± 0.5	B
AC Power Ports (See Note(3))				
	Surges Line to Line Line to Ground	Tr/Th us kV kV	1.2/50 (8/20) ± 1 ± 2	B

Note 1: Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no immunity test shall be required.

Note 2: In telecommunications centres 0.5 kV line to ground shall be used.

Note 3: In telecom centres 1 kV line to ground and 0.5 kV line to line shall be used.

12.4. Test Procedure

The EUT and its load are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. 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 A.C. and D.C. 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 0^0, 90^0, 180^0, 270^0 and the peak value of the a.c. voltage wave. (Positive and negative)

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

12.5. Deviation from Test Standard

No deviation.

12.6. Test Result

Not applicable.

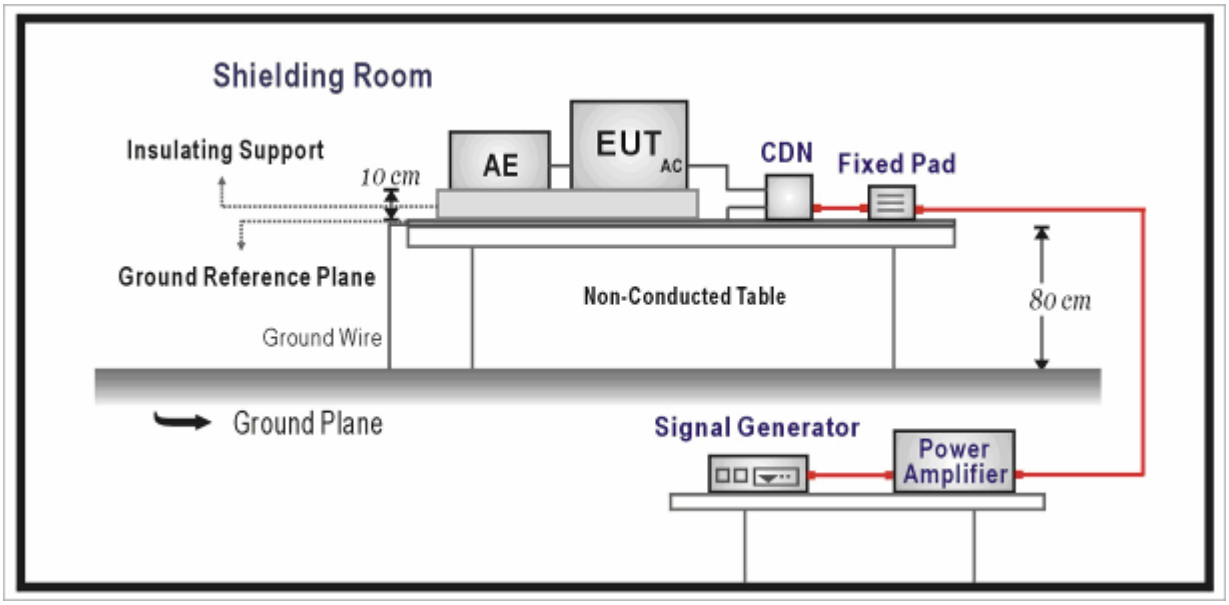
13. RF Common Mode

13.1. Test Specification

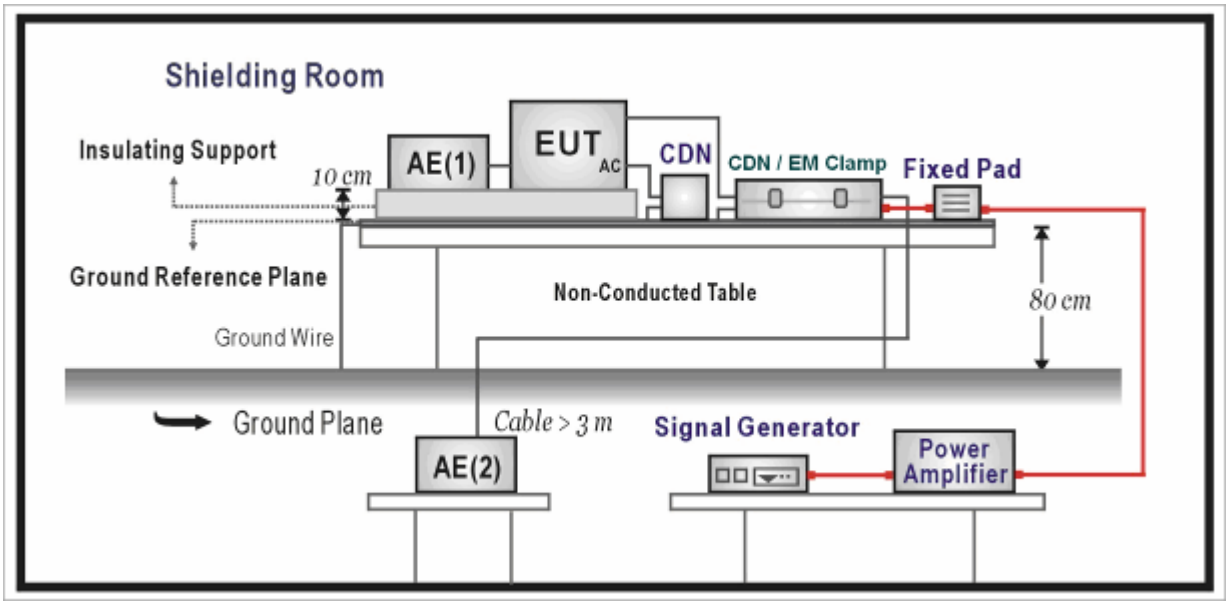
According to Standard: EN 61000-4-6

13.2. Test Setup

CDN Test Setup



EM Clamp Test Setup



13.3. Limit

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Signal Ports, Telecommunication Ports, Control Ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 3 80	A
Uplink speech level<reference level-35dB Downlink speech level<reference level-35dB RXQUAL≦3				
DC Power Ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 3 80	A
Uplink speech level<reference level-35dB Downlink speech level<reference level-35dB RXQUAL≦3				
AC Power Ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 3 80	A
Uplink speech level<reference level-35dB Downlink speech level<reference level-35dB RXQUAL≦3				

13.4. Test Procedure

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

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.

For input D.C. and A.C. 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.
Used CDN-M2 for two wires or CDN-M3 for three wires.

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	3V Level 2
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%
6.	The rate of Swept of Frequency	1.5×10^{-3} decades/s

13.5. Deviation from Test Standard

No deviation.

13.6. Test Result

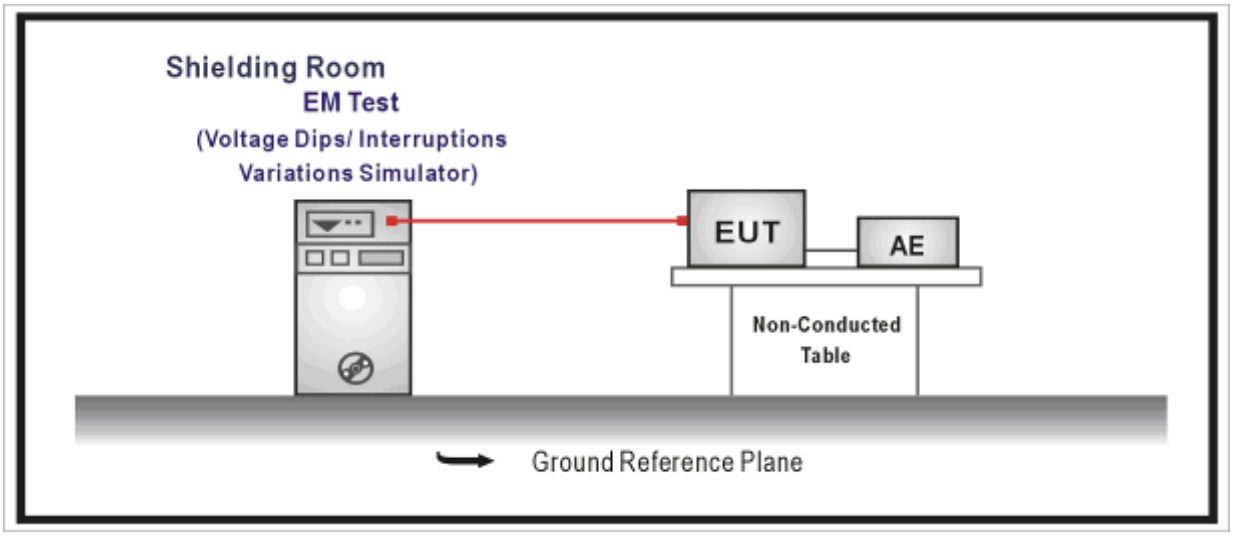
Not applicable.

14. Voltage Dips and Interruption

14.1. Test Specification

According to Standard: EN 61000-4-11

14.2. Test Setup



14.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
AC mains power input ports			
Voltage dips	0 0.5	% residual cycle	B
	0 1	% residual cycle	B
	70 25	% residual cycle	C
Voltage interruptions	0 250	% residual cycle	C
Note 1: Changes to occur at 0 degree crossover point of the voltage waveform.			

14.4. Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. 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/ 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.
Voltage phase shifting are shall occur at 0^0, 45^0, 90^0, 135^0, 180^0, 225^0, 270^0, 315^0 of the voltage.

14.5. Deviation from Test Standard

No deviation.

14.6. Test Result

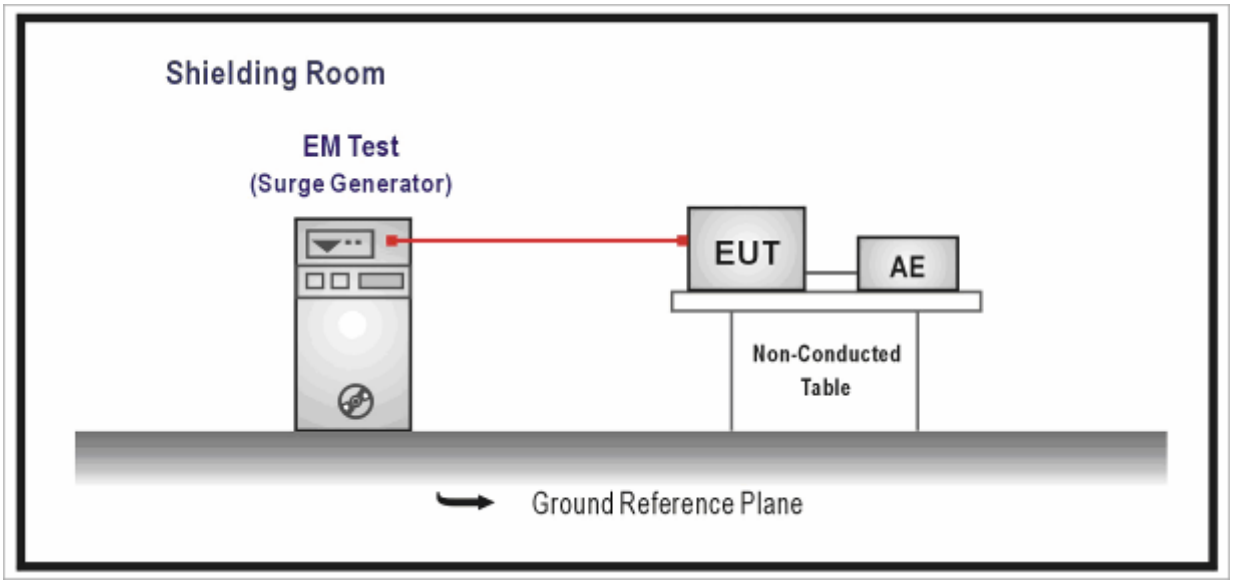
Not applicable.

15. Transients and surges

15.1. Test Specification

According to Standard: ISO 7637-2

15.2. Test Setup



15.3. Limit

EUT applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level III. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.

15.4. Test Procedure

Test requirements for 12 V DC powered equipment:

Where the manufacturer in his installation documentation requires the radio equipment to have a direct connection to the 12 V main vehicle battery the requirements in a) shall apply.

Where the manufacturer does not require the radio equipment to have a direct connection to the 12 V main vehicle battery the requirements in a) and b) shall apply:

Pulse 3a and 3b, level II, with the test time reduced to 5 min for each;

Pulse 4, level II, 5 pulses, with the characteristics as follows:

Vs = -5 V; Va = -2.5 V; t6 = 25 ms; t7 = 50 ms; t8 = 5 s; tf = 5 ms; pulse cycle time: 60 s

Pulse, level II: t1 = 2.5 s; 10 pulses;

Pulse 2, level II: t1 = 2.5 s; 10 pulses;

Pulse 7, 5 pulses.

Where the manufacturer declares that the radio equipment requires a direct connection to the main vehicle battery, and therefore the tests in accordance with the requirements b) are not carried out, this shall be stated in the test report.

Test requirements for 24 V DC powered equipment:

Where the manufacturer in his installation documentation requires the radio equipment to have a direct connection to the 24 V main vehicle battery the requirements in c) shall apply.

Where the manufacturer does not require the radio equipment to have a direct connection to the 24 V main vehicle battery the requirements in c) and d) shall apply:

c) Pulse 3a and 3b, level II, with the test time reduced to 5 min for each;

Pulse 4, level II, 5 pulses, with the characteristics as follows:

Vs = -10 V; Va = -5 V; t6 = 25 ms; t7 = 50 ms; t8 = 5 s; tf = 10 ms; pulse cycle time: 60 s

d) Pulse 1a, level II: t1 = 2.5 s; Ri = 25 Ω; 10 pulses;

Pulse 2b, level II: t1 = 2.5 s; Ri = 100 Ω; 10 pulses;

Pulse 2, 10 pulses.

Where the manufacturer declares that the radio equipment requires a direct connection to the main vehicle battery, and therefore the tests in accordance with the requirements d) are not carried out, this shall be stated in the test report.

Radio and ancillary equipment designed to operate at both DC power voltages shall be tested in both configurations.

15.5. Deviation from Test Standard

No deviation.

15.6. Test Result

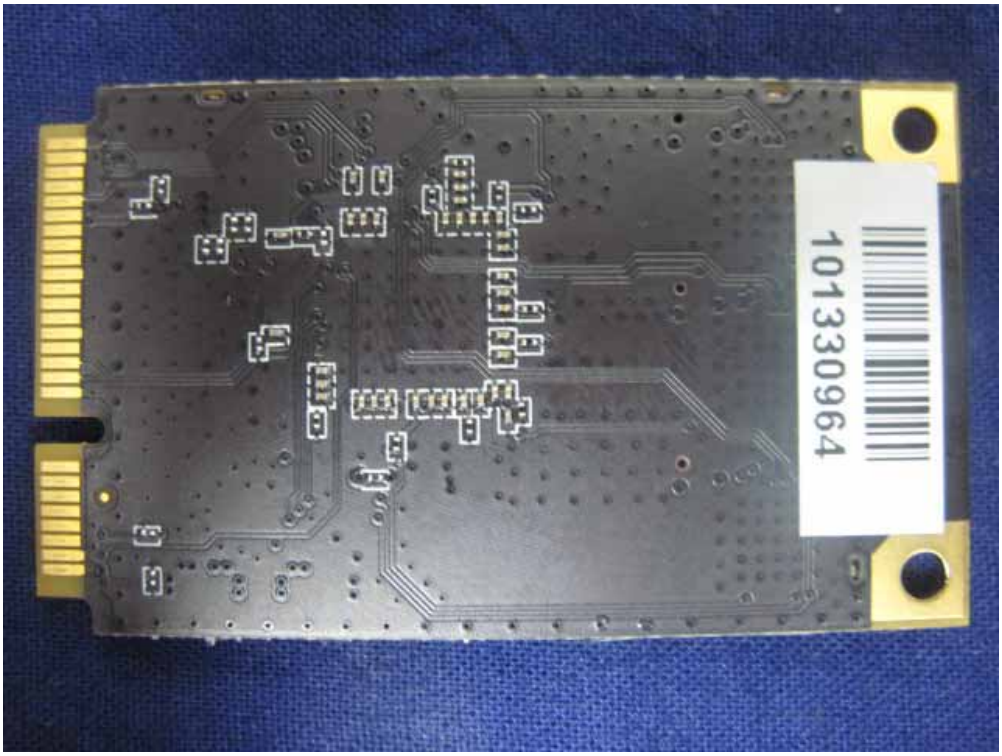
Not applicable.

16. Attachment

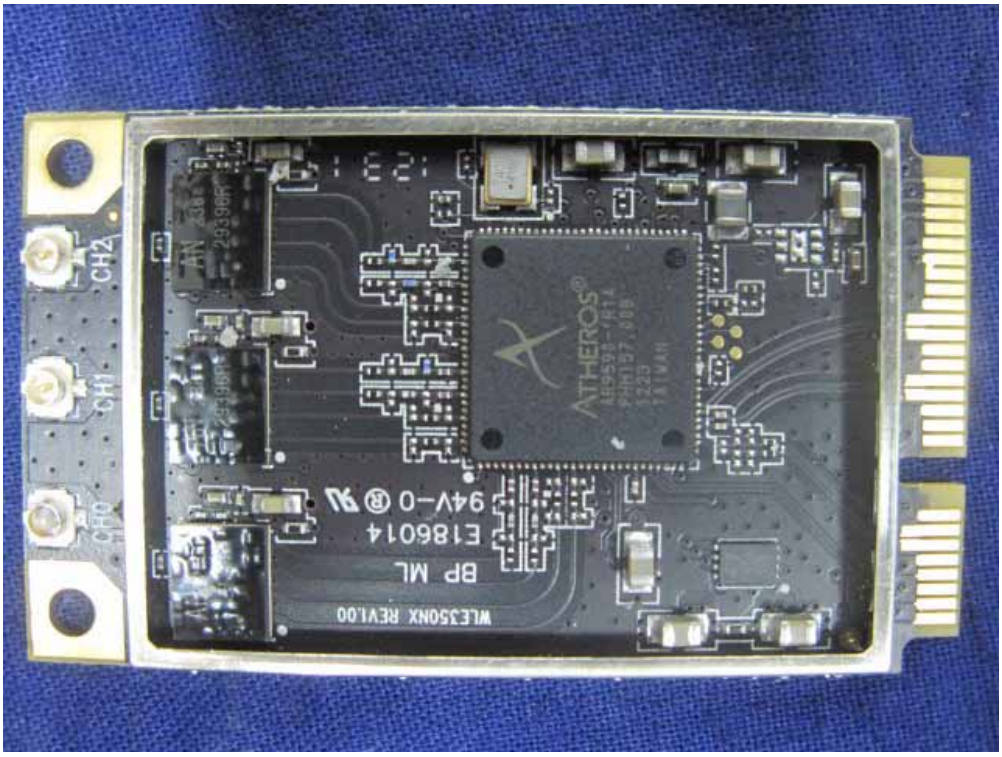
➢ EUT Photograph

(1) EUT Photo

(2) EUT Photo

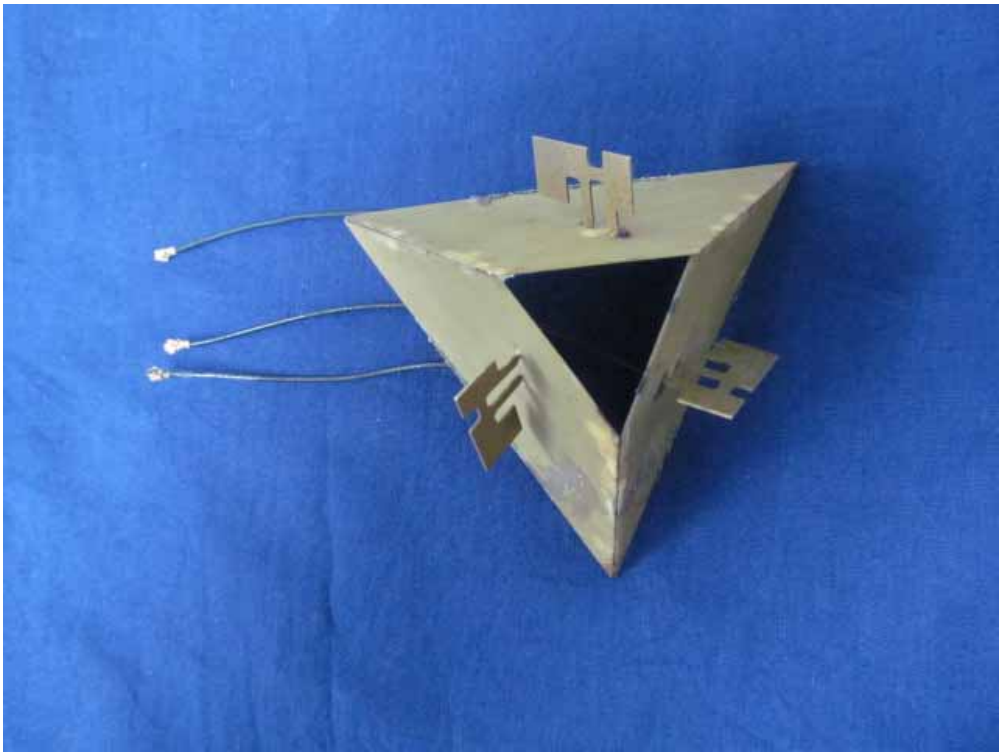


(3) EUT Photo



(4) EUT Photo

(5) EUT Photo



(6) EUT Photo

The End