EMC Test Report

Product Name: GPON Terminal

Product Model: EchoLife HG8245H

Report Number: SYBH(E)02421240EB

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Tel: +86 755 28780808 Fax: +86 755 89652518

Notice

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements.
   - The recognition number for the test site located in Shenzhen is 97456
   - The recognition number for the test site located in Shanghai is 684868.
   - The recognition number for the test site located in Chengdu is 216797.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements.
   - The recognition number for the test site located in Shenzhen is 6369A-1;
   - The recognition numbers for the test site located in Shanghai is 6369D, which contains 6369D-1 (3m chamber) and 6369D-2 (10m chamber).
   - The recognition number for the test site located in Chengdu is 6369E-1.
5. The laboratory located in Shenzhen has been listed by the VCCI to perform EMC measurements, the accreditation numbers for the test site No.1 are R-3892, G-415, C-4361, and T-1348.
6. The laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named as “Global Compliance and Testing Center of Huawei Technologies Co., Ltd”; the both names have coexisted since 2009.
7. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
8. The test report is invalid if there is any evidence of erasure and/or falsification.
9. The test report is only valid for the test samples.
10. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name:	GPON Terminal
Product Model:	EchoLife HG8245H

Date of Receipt Sample:	2016-05-17
Start Date of Test:	2016-05-18
End Date of Test:	2016-05-26

Test Result: Pass

Approved by Senior Engineer:	2016-06-13	Ren Huasheng	Ren, Huasheng
	Date	Name	Signature

Prepared by:	2016-06-12	Wang Ying	Wang Ying
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1	N/A	First report
2	SYBH(E)01179233EB	Add new adapter HW-120200U8W, so add new test configuration TC4, refer to section 3.3, 4.3

Content

1 General Information

1.1 Applied Standard	
Applied Product Standard:	FCC CFR47 Part 15 Subpart B:2015 ICES-003 Issue 6:2016
Test Method:	ANSI C63.4:2014
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
1.3 Test Environment Condition	
Ambient Temperature:	20-25°C
Relative Humidity:	45-55%
Atmospheric Pressure:	101kPa

2 Summary of Test Results

Table 1 Test summary

EUT Classification: Class B Digital Device				
Test Items	Test Configuration	Limit	Test Result	Location
Radiated Emissions Enclosure Port	TC1-TC4	Class B	Pass	Location1
Conducted Emissions AC Power Port	TC1-TC4	Class B	Pass	Location1
Note: 1, Measurement taken is within the uncertainty of measurement system. 2, TC = Test configuration				

3 Equipment Specification

3.1 General Description

The EchoLife HG8245H GPON terminal (hereinafter referred to as HG8245H) is an indoor optical network terminal (ONT) designed for home users and small office. The HG8245H uses the gigabit-capable passive optical network (GPON) technology to provide a high-speed data channel through a single optical fiber. In this way, you can use the HG8245H to enjoy the high-speed data service, quality voice service, superior video service, and secure and reliable wireless access service.
As a network terminal, the HG8245H is deployed at the GPON access layer and connects the home users and SOHO users to the Internet through the optical upstream port. On the local area network (LAN) side, the HG8245H provides abundant hardware ports to meet multiple networking requirements of home users.

- Four 10/100/1000 Base-T Ethernet ports that can function as the service ports for service terminals such as PC, set top box (STB), and video phone.
- Two TEL ports that provide superior and cost-effective voice over IP (VoIP), fax over IP (FoIP), and modem over IP (MoIP) services.
- One WLAN port to support a secure and reliable high-speed wireless network.
- One USB port that can be attached with USB disks to provide convenient home network attached storage and file sharing services.

Products may have different colors, antennas and silkscreens. The following shows an example.

3.2 Specification

Table 2 Main equipment specification

Rated Input Voltage	～ 100 V to 240 V, 50/60 Hz
Rated Power (W)	MAX 24 W
Dimensions (W x D x H)	195 mm (W) × 174 mm (D) × 34 mm (H)
Weight (kg)	0.6 kg
Transmit Frequency (MHz)	Wlan Band: 2.4G (2412 MHz - 2472 MHz)
Receive Frequency (MHz)	Wlan Band: 2.4G (2412 MHz - 2472 MHz)
Frequency of the Internal Source (MHz)	25 MHz, 40 MHz, 125 MHz, 480 MHz, 1244 MHz, 2400 MHz–2484 MHz, 2488 MHz

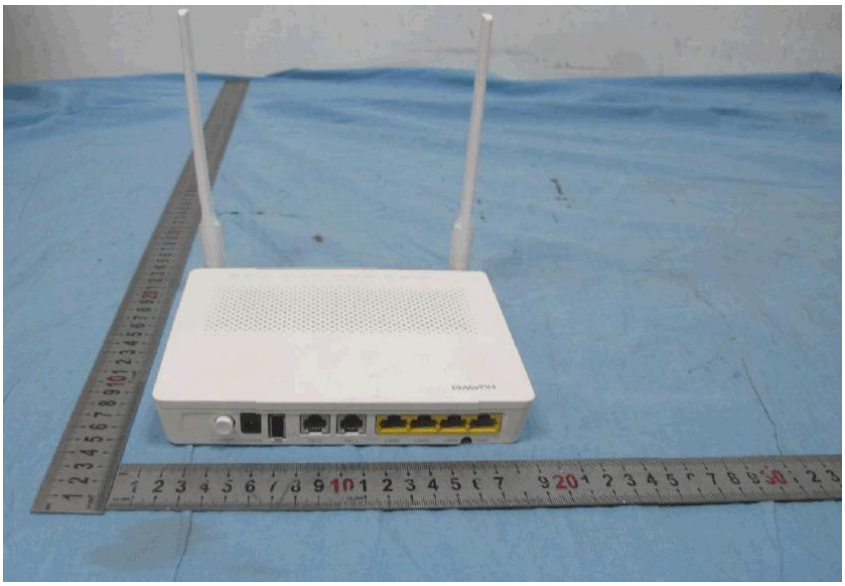


Figure 1.EUT appearance

Figure 2.EUT Appearance (Adapter of HuntKey: HW-120200U3W)

Figure 3.EUT Appearance (Adapter of UE: HW-120200U3W)

Figure 4.EUT Appearance (Battery of HW-Li2Ah-C and HW-Li4Ah-C)

Figure 5.EUT Appearance (Battery charger of UE36-138250SPA or UE36-138250SPA1)

Figure 6.EUT Appearance (Adapter of HW-120200U8W, HuntKey)

3.3 Board and SubAssembly

Table 3 Board list

Board	
Board Name	Description
HG8245XGA	1PON, 4GE, 2POTS, 1USB, 1WIFI

Table 4 Subassembly list

Subassembly			
Subassembly Name	Model	Manufacturer	Description
Adapter	HW-120200U3W	Shenzhen Huntkey Electric Co., Ltd	Input voltage : ～ 100V-150V, 50/60Hz 0.8A Output voltage : ⎓ 12 V 2A
	HW-120200U3W	Dongguan Shilong Fuhua electronic Co.,Ltd	Input voltage : ～ 100V-150V, 50/60Hz 0.8A Output voltage : ⎓ 12 V 2A
	HW-120200U8W	Shenzhen Huntkey Electric Co., Ltd	Input voltage : ～ 100V-150V, 50/60Hz 0.8A Output voltage : ⎓ 12 V 2A
Li-battery charger	UE36-138250SPA	Dongguan Shilong Fuhua electronic Co.,Ltd	Input voltage : ～ 100V-240V 50/60Hz 1.2A Output voltage : ⎓ 13.8V 2.5A
	UE36-138250SPA1	Dongguan City Shilong Fuhua Electronic Co.,Ltd	Input voltage : ～ 100V-240V 50/60Hz 0.9A Output voltage : ⎓ 13.8V 2.5A
Li-Battery HW-Li2Ah-C	HW-Li2Ah-C	SCUD (FU JIAN) ELECTRONIC CO,.LTD	Rating Voltage: ⎓ 11.1V Rating Capacity:2Ah
Li-Battery HW-Li4Ah-C	HW-Li4Ah-C	SCUD (FU JIAN) ELECTRONIC CO,.LTD	Rating Voltage: ⎓ 11.1V Rating Capacity:4Ah

4 System Configuration during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical configuration.

4.1 Ports and Cables

Table 5 Ports and cables

Port	Quantity	Length (m)	Connector	Type of Cable
AC Power Port	1	1.5	N/A	Unshielded
POTS	2	5	RJ11	UTP-CAT3
GE	4	10	RJ45	UTP-CAT5
PON	1	10	SC	Single-mode optical fiber

4.2 Auxiliary Equipment

Table 6 Auxiliary equipment

Equipment	Model	Manufacturer	S/N	Calibration Date	Calibration Interval (month)	Remark
TELEPHONE	TCL 37	TCL	N/A	N/A	N/A	N/A
Data network analyzer	Smartbits600	Spirent	SZ0500038070	2016-04-28	12	N/A
PC	Lenovo M4000	LEGEND	N/A	N/A	N/A	N/A
DSLAM	MA5603T	Huawei	N/A	N/A	N/A	N/A
USB memorizer	NA	Kingston	N/A	N/A	N/A	N/A
Notebook PC	HP 2540p	HP	3105033009	N/A	N/A	N/A

4.3 Test Configurations and Test Mode

4.3.1 Test Configuration

The equipment under test (EUT) was connected to ancillary devices in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment). There were four test configurations. TC1 – TC4 were shown in the following table and figures:

Table 7 Test configuration

Configuration No.	Configuration Description
TC1	Adapter (HuntKey)*: HW-120200U3W
TC2	Adapter (UE)*: HW-120200U3W
TC3	Battery: HW-Li2Ah-C; HW-Li4Ah-C
	Battery charger : UE36-138250SPA; UE36-138250SPA1
TC4	Adapter (HuntKey)*: HW- 120200U8W

Note*: "Huntkey" is the trademark of Shenzhen Huntkey Electric Co., Ltd manufacturer, "UE" is the trademark of Dongguan Shilong Fuhua Electronic Co., Ltd manufacturer.

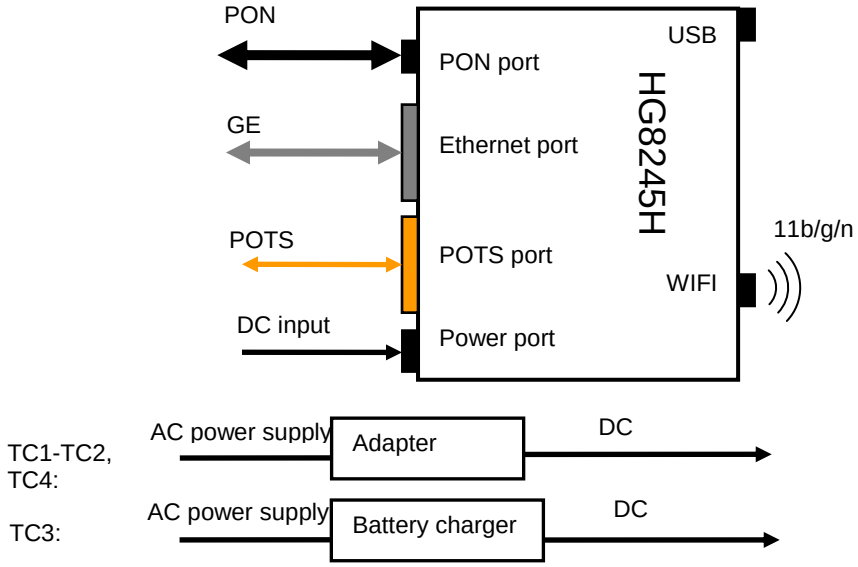


Figure 7.: Test configuration (TC1 ~ TC4)

4.3.2 Test Mode

There were two test Modes. TM1 and TM2 were shown in the table below:

Table 1 Test modes

Test Mode	Mode Describe
TM1	WLAN idle Mode
TM2	WLAN traffic Mode

When the EUT was required to be in the traffic mode for WLAN mode, a call was set up using a series of command and the following conditions should be met:
The EUT should be commanded to operate at maximum transmit power 19 dBm;

When the EUT was in the idle mode, the EUT switched on but didn't transmit power, available for service and available to respond to a request to set up a call.

4.4 Test Conditions and Connections

The HG8245H was connected with the OLT through a single-mode optical fiber and 15–20 dB optical attenuation is added. The Ethernet ports of HG8245H should connect to the SmartBits 600. The data flow rates of each Ethernet port is nearly 250M when the Ethernet port is GE. Data transmission is normal at the Ethernet port with no packet loss or error codes. Each POTS port of HG8245H should connect with a phone. Voice service was configured on the board so that voice connection can be built between phone1 and phone2.

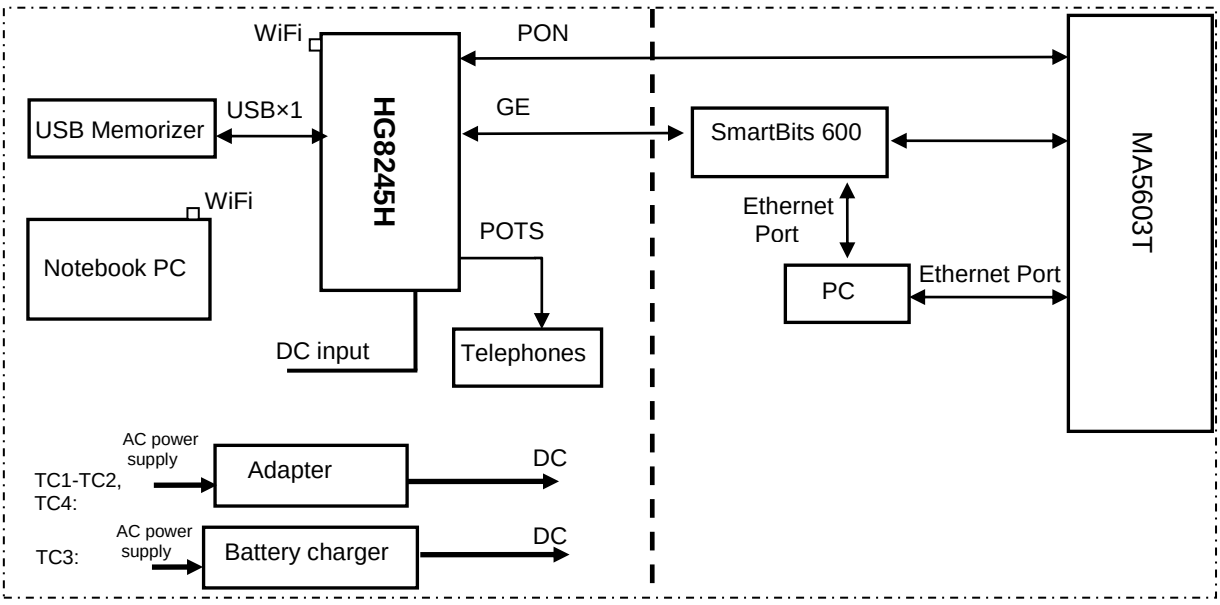


Figure 8.Test connection of TC1 to TC4

5 Details of Test Items

5.1 Radiated Emission 30 MHz to 18 GHz

5.1.1 Test Procedure

The test site semi-anechoic chamber for 30MHz to 1GHz test has met the requirement of NSA tolerance 4 dB according to the standard ANSI C63.4. The test distance was 3m.The set-up and test methods were according to ANSI C63.4.
The test site full-anechoic chamber for above 1GHz test has met the requirement of S_{VSWR} tolerance 6 dB in accordance with the standard ANSI C63.4. The test distance was 3 m for above 1GHz.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 18 GHz by using test script of software; the emissions were measured using Quasi-Peak Detector for 30 MHz to1 GHz, Average and Peak detector for above 1 GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1 m to 4 m, the azimuth range of turntable was 0°to 360°, The receive antenna has two polarizations V and H.

The test set-up is shown in diagram as below:

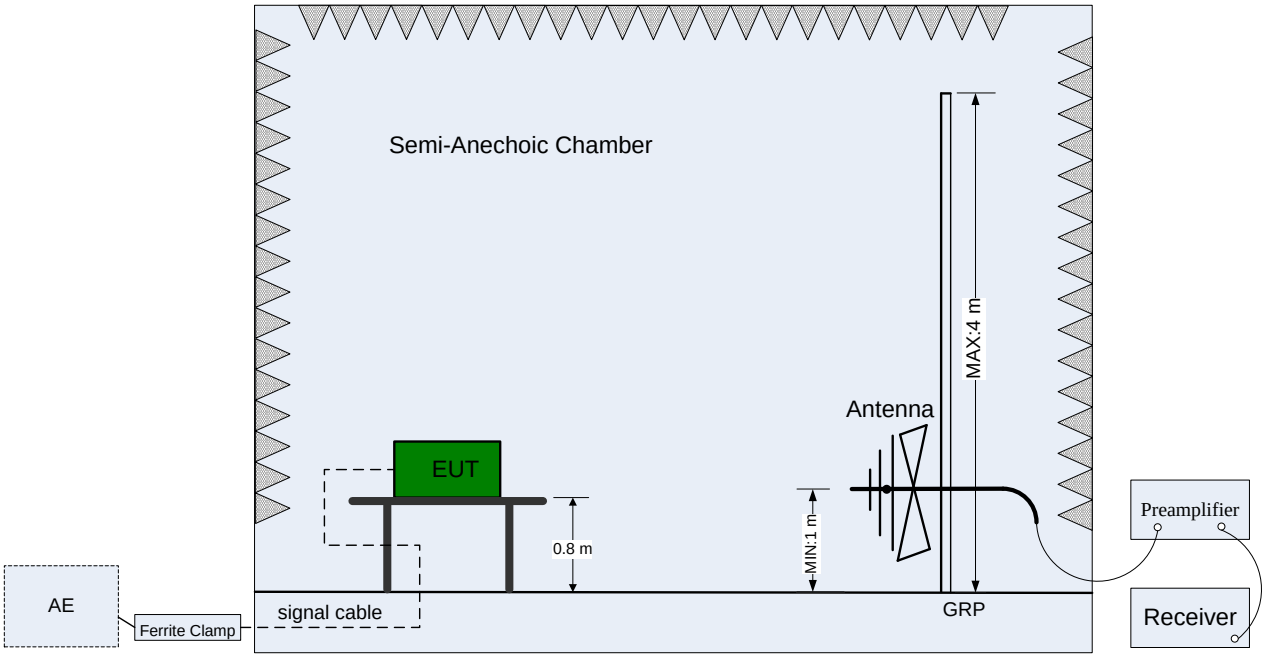


Figure 9.Test set-up of radiated disturbance (30 MHz-1 GHz)

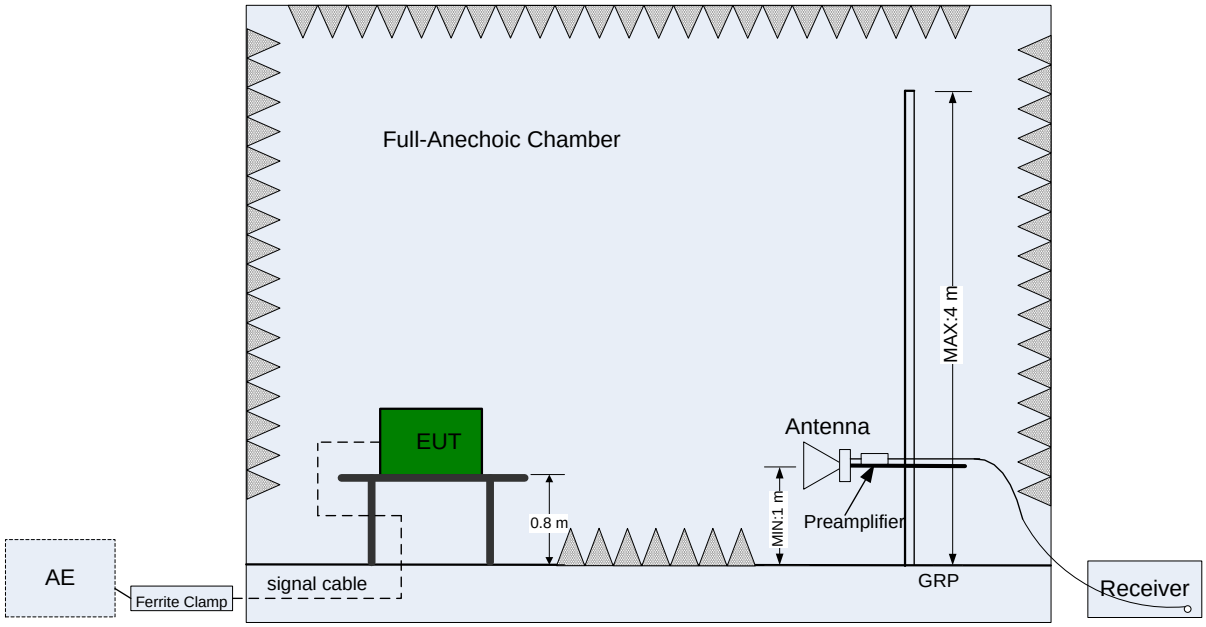


Figure 10. Test set-up of radiated disturbance (above 1 GHz)

5.1.2 Test Results

The EUT has met the requirements for radiated emission of enclosure port.
For the test data, see section 8.1.

Table 2 Test limits for 30MHz to 1GHz at a measuring distance of 3m

Frequency range	30 MHz to 1 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	30 MHz to 88 MHz 88 MHz to 216 MHz 216 MHz to 960 MHz 960 MHz to 1 GHz	40.0 dBµV/m 43.5 dBµV/m 46.0 dBµV/m 53.9 dBµV/m

Table 3 Test limits for above 1GHz at a measuring distance of 3m

Frequency range	1 GHz to 18 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	AV Detector	PK Detector
	53.9 dBµV/m	73.9 dBµV/m

Note: The highest frequency of the internal sources of the EUT is 2488 MHz, the measurement was made up to 18 GHz.

5.2 Conducted Disturbance 0.15 MHz to 30 MHz

5.2.1 Test Procedure

The EUT was configured as described in section 4. The mains cable of the EUT must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

The test set-up is shown in diagram as below:

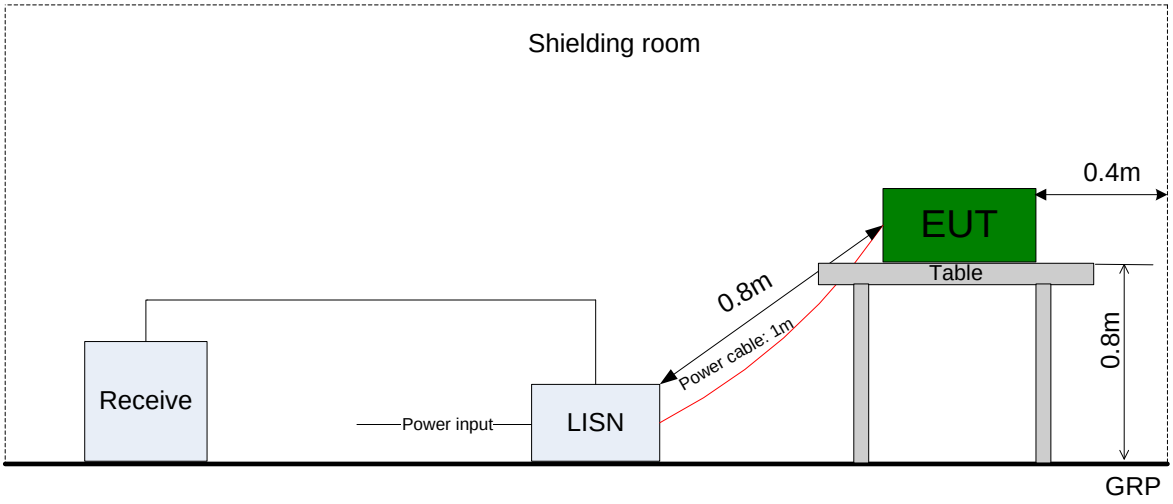


Figure 11. Test set-up of conducted disturbance for AC power port

5.2.2 Test Results

The EUT has met the requirements of FCC Part15 and ICES 003 for Conducted Disturbance of AC Power Port
For the test data, see section 8.2

Table 4 Limits of AC power port

Frequency range	150 kHz to 30 MHz	
Classification	Class B	
Limit(Class B)	Voltage limits (dBµV)	
	QP	AV
0.15 to 0.5 MHz	66 to 56	56 to 46
0.5 to 5 MHz	56	46
5 to 30 MHz	60	50

6 Main Test Instruments

Table 5 Main test instrument

Test Item	Test Instrument	Model	Manufacturer	Calibration Date	Calibration Interval (Month)
Radiated emission (G2 3m chamber)	EMI test receiver	ESU40 (100144)	R&S	2015-10-21	12
	Bilog antenna	CBL 6112B (2536)	Schaffner	2015-08-15	24
	Horn antenna	HF906 (359287/006)	R&S	2014-08-16	24
	Chamber _NSA	3m chamber	Albatross	2015-03-27	36
	Chamber _S_{VSWR}	3m chamber	Albatross	2015-08-25	36
Conducted emission (G2)	EMI test receiver	ESCI (100929)	R&S	2015-10-30	12
	Artificial mains network	ENV4200 (100046)	R&S	2016-03-16	12
Software Information					
Test Item		Software Name	Manufacturer	Version	
Radiated emission (G2 3m chamber)		ES-K1	R&S	V1.7.1	
Conducted emission (G2)		ES-K1	R&S	V1.7.1	

7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Table 6 System measurement uncertainty

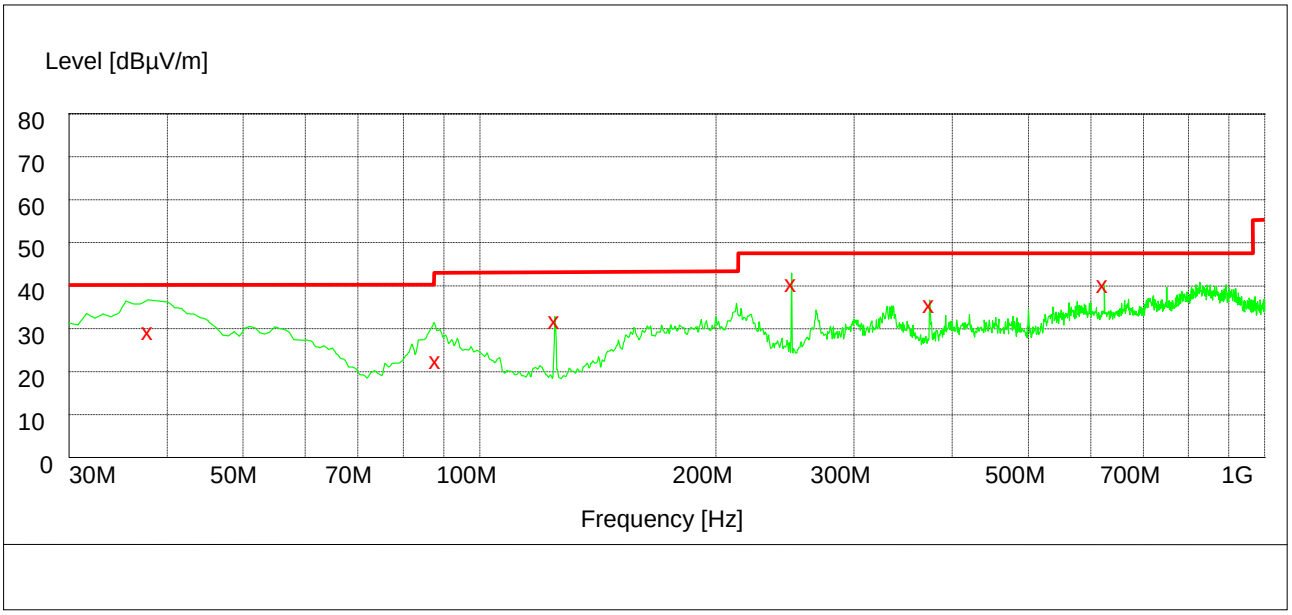
Items		Extended Uncertainty
Radiated emission (G2 3m chamber)	Field strength (dBμV/m)	U=4.15 dB; k=2 (30 MHz-1 GHz)
		U=3.64 dB; k=2 (1 GHz-18 GHz)
Conducted Emission (G2)	Disturbance Voltage (dBμV)	U=3.3 dB; k=2

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

8.1.1 Radiated Disturbance of TC1 ~ TC3 for 30MHz-1GHz

Graph of Test result (30 MHz-1 GHz)



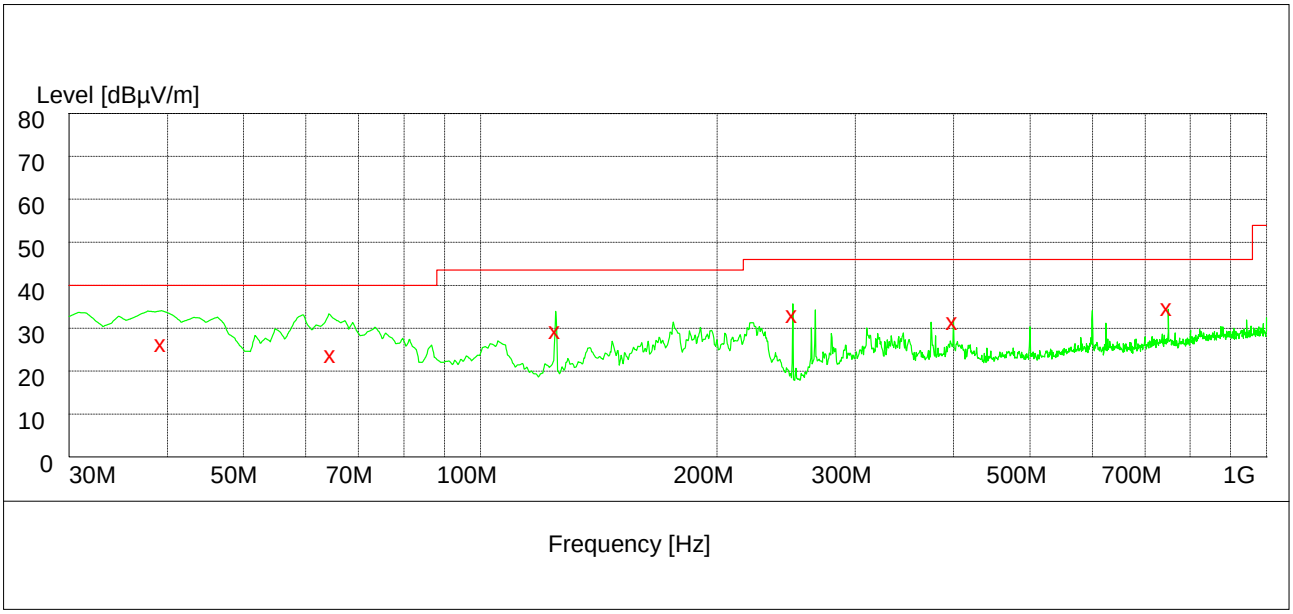
Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
37.980000	30.80	-10.0	40.0	9.2	100.0	10.00	VERTICAL
88.260000	24.10	-16.2	43.5	19.4	108.0	201.00	VERTICAL
124.980000	33.40	-14.1	43.5	10.1	150.0	169.00	HORIZONTAL
250.020000	41.90	-9.8	46.0	4.1	100.0	305.00	HORIZONTAL
375.000000	37.20	-6.3	46.0	8.8	100.0	218.00	HORIZONTAL
625.020000	41.80	-1.5	46.0	4.2	120.0	289.00	HORIZONTAL

Note:
1. Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configurations TC1 ~ TC3 were tested, and the worst test result was supplied.

8.1.2 Radiated Disturbance of TC4 for 30MHz-1GHz

Graph of Test result (30 MHz-1 GHz)



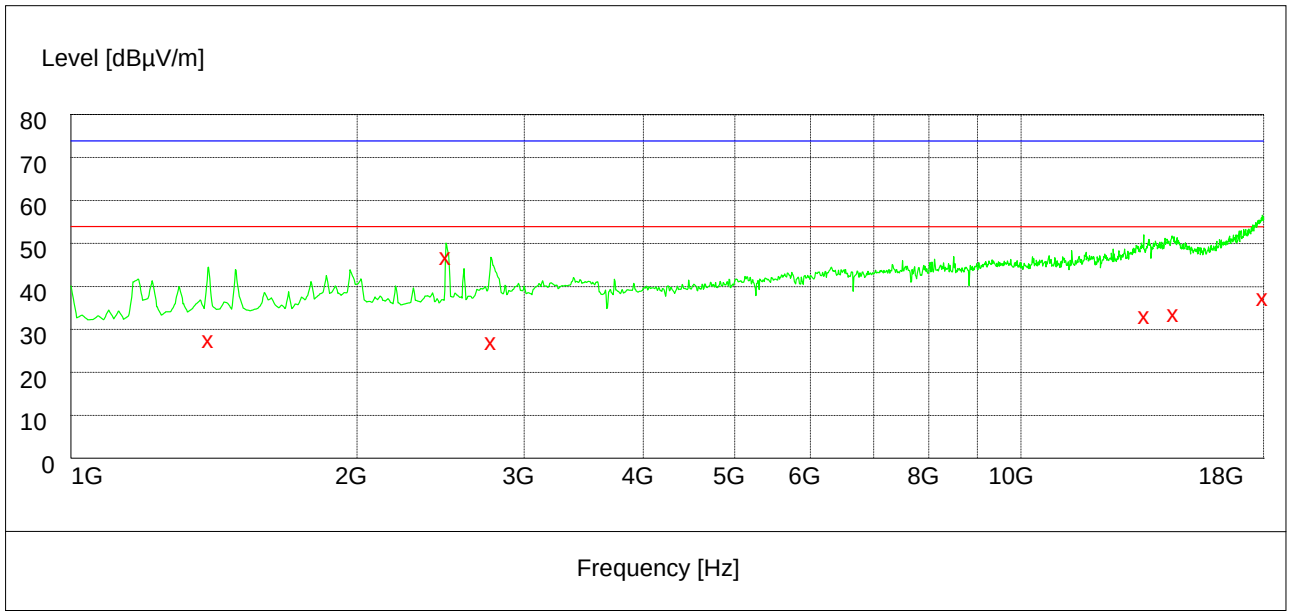
Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
39.420000	28.00	-10.2	40.0	12.0	100.0	226.00	VERTICAL
64.740000	25.40	-16.0	40.0	14.6	100.0	46.00	VERTICAL
124.980000	31.00	-10.0	43.5	12.5	100.0	313.00	VERTICAL
250.020000	34.70	-9.5	46.0	11.3	100.0	105.00	HORIZONTAL
400.020000	32.90	-4.7	46.0	13.1	100.0	138.00	HORIZONTAL
750.000000	36.20	0.6	46.0	9.8	100.0	51.00	HORIZONTAL

Note:
Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

8.1.3 Radiated Disturbance of TC1~TC4 for 1GHz-18GHz

Graph of Test result (above 1 GHz)



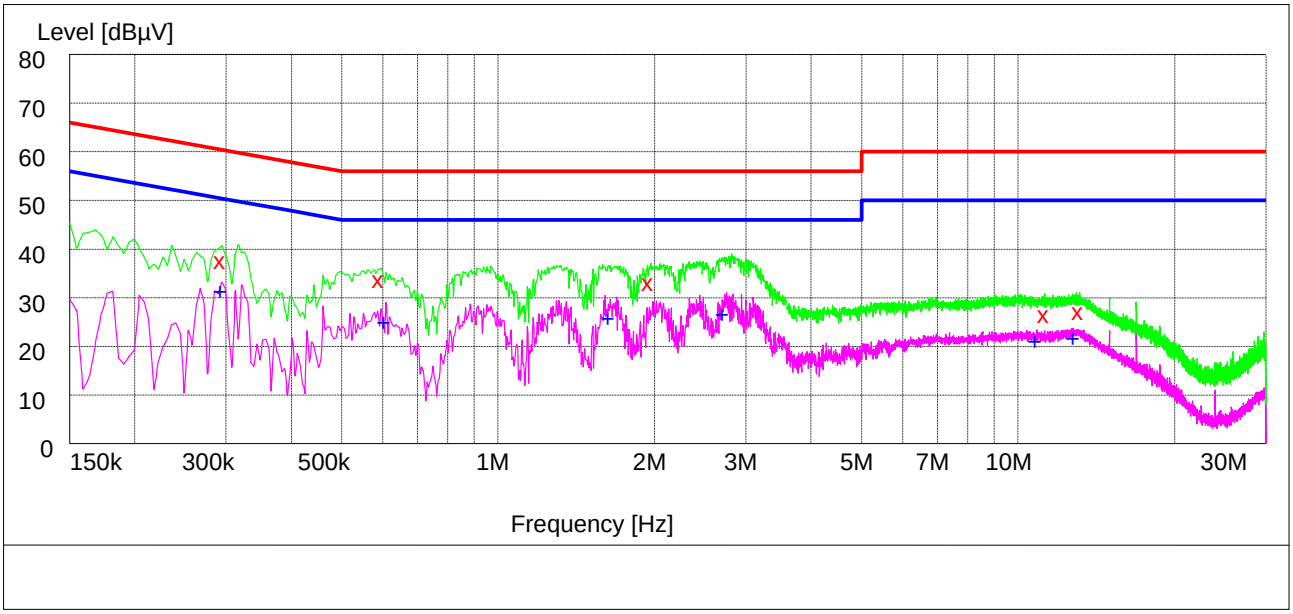
Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
1400.000000	29.20	-5.0	53.9	24.7	100.0	18.00	HORIZONTAL
2488.500000	48.50	0.7	53.9	5.4	100.0	258.00	VERTICAL
2775.000000	28.60	1.8	53.9	25.3	100.0	197.00	HORIZONTAL
13525.500000	34.70	21.3	53.9	19.2	150.0	217.00	HORIZONTAL
14505.500000	35.20	23.1	53.9	18.7	100.0	224.00	HORIZONTAL
17999.500000	38.90	30.9	53.9	15.0	145.0	214.00	VERTICAL

Note:
1. Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
2. The test configurations TC1 to TC4 were tested, and the worst test result was supplied.

8.2 Conducted Disturbance

8.2.1 AC Power Port Test Data of TC1 ~ TC2



Measurement Result: QP Detector

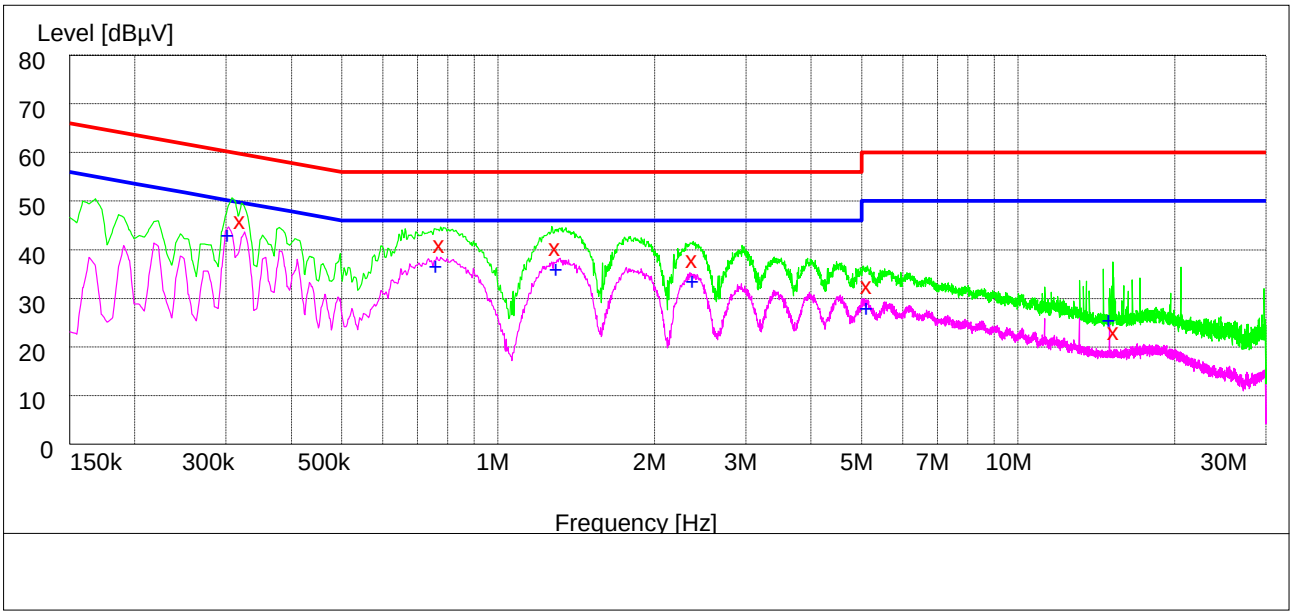
Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.294000	38.70	9.9	60	21.7	N	FLO
0.591000	34.90	9.9	56	21.1	N	FLO
1.954500	34.30	10.0	56	21.7	N	FLO
2.845500	-3.70	10.0	56	59.7	L3	FLO
11.269500	27.60	10.2	60	32.4	L3	FLO
13.150500	28.30	10.4	60	31.7	L3	FLO

Measurement Result: AV Detector

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.294000	32.40	9.9	50	18.0	L3	FLO
0.604500	26.00	9.9	46	20.0	N	FLO
1.635000	26.90	10.0	46	19.1	L3	FLO
2.715000	27.60	10.0	46	18.4	N	FLO
10.819500	22.10	10.3	50	27.9	L3	FLO
12.804000	22.80	10.4	50	27.2	L3	FLO

Note:
1. Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configuration TC1~TC2 were tested, and the worse test result was supplied.

8.2.2 AC Power Port Test Data of TC3



Measurement Result: QP Detector

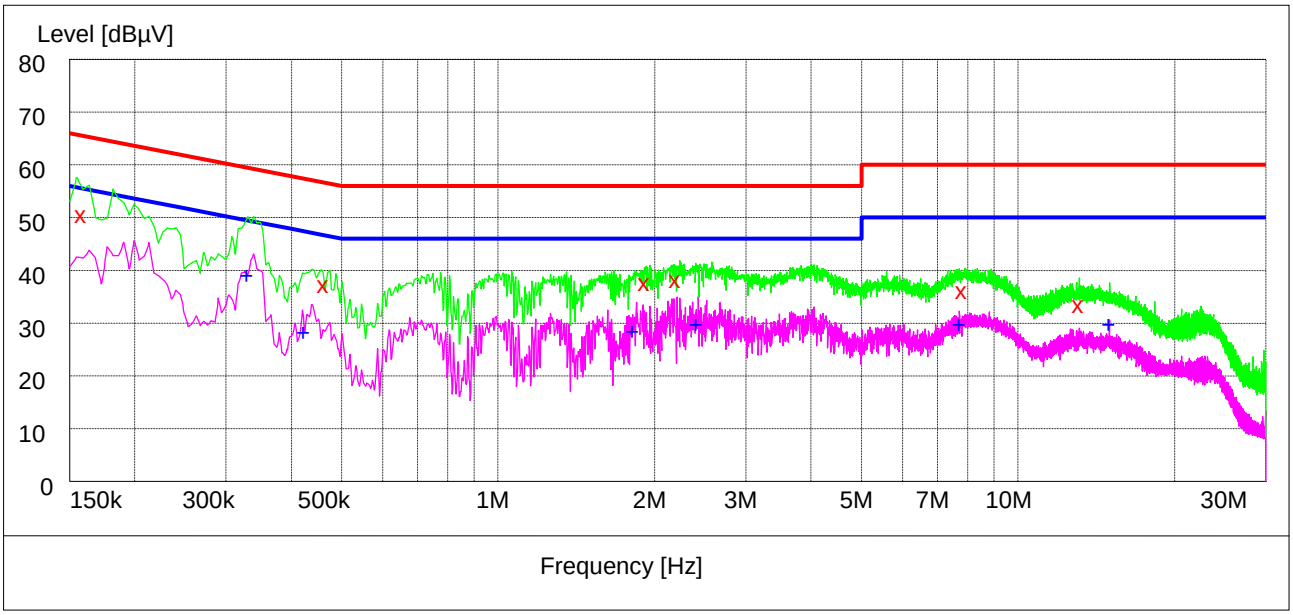
Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.321000	47.20	9.9	60	12.5	N	FLO
0.775500	42.20	9.8	56	13.8	N	FLO
1.293000	41.60	9.8	56	14.4	N	FLO
2.373000	39.10	10.1	56	16.9	N	FLO
5.145000	33.80	10.3	60	26.2	L3	FLO
15.360000	24.20	10.5	60	35.8	L3	FLO

Measurement Result: AV Detector

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.303000	44.10	9.9	50	6.1	L3	FLO
0.762000	37.60	9.9	46	8.4	N	FLO
1.297500	37.10	9.8	46	8.9	N	FLO
2.373000	34.60	10.1	46	11.4	L3	FLO
5.136000	29.00	10.2	50	21.0	L3	FLO
15.018000	26.60	10.5	50	23.4	L3	FLO

Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

8.2.3 AC Power Port Test Data of TC4



Measurement Result: QP Detector

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.159000	51.50	9.9	66	14.0	N	FLO
0.465000	38.10	10.1	57	18.5	L3	FLO
1.923000	38.60	10.2	56	17.4	L3	FLO
2.206500	39.20	10.2	56	16.8	L3	FLO
7.845000	37.10	10.6	60	22.9	L3	FLO
13.137000	34.50	10.7	60	25.5	L3	FLO

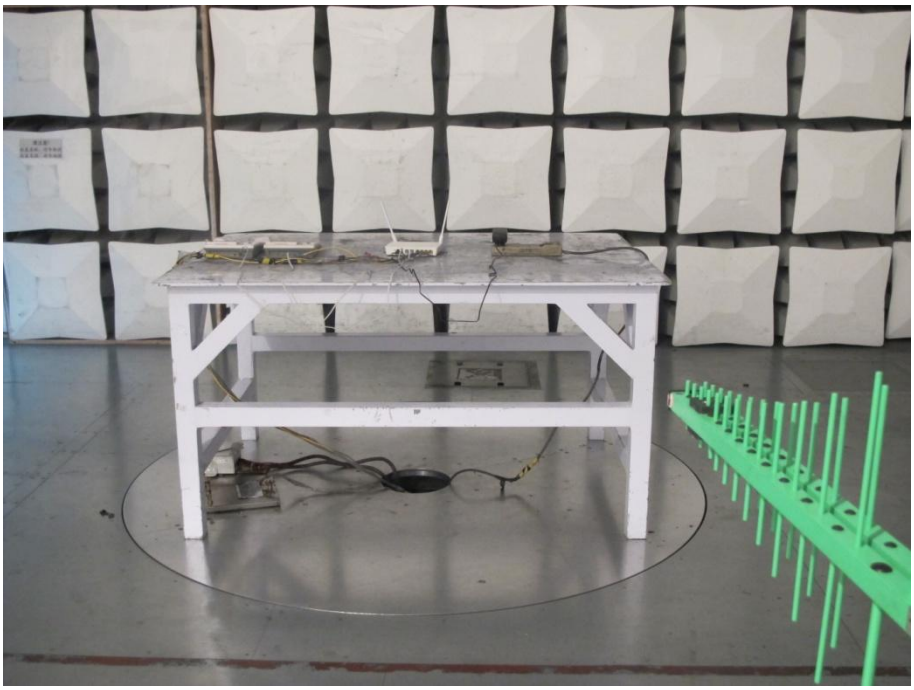
Measurement Result: AV Detector

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.330000	39.90	10.1	49	9.5	L3	FLO
0.424500	29.20	10.1	47	18.2	N	FLO
1.819500	29.40	10.2	46	16.6	L3	FLO
2.418000	30.50	10.2	46	15.5	N	FLO
7.741500	30.50	10.6	50	19.5	L3	FLO
15.013500	30.50	10.7	50	19.5	L3	FLO

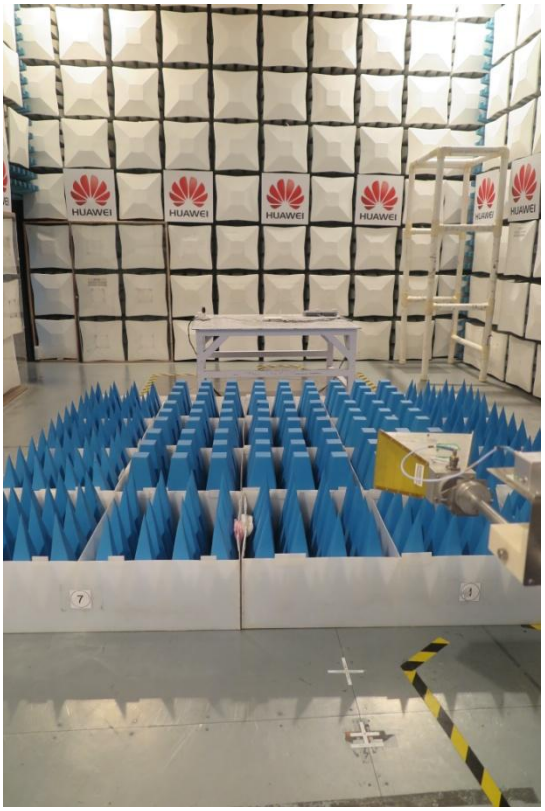
Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

9 Photographs of Test Set-up

9.1 Radiated Emission



Radiated emission for 30 MHz-1 GHz



Radiated emission for 1GHz to 18GHz

9.2 Conducted Emission

Conducted emissions of AC power port

Appendix: Abbreviation

Table 7 Abbreviation

Abbreviation	Full Name
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EUT	Equipment Under Test
AE	Auxiliary Equipment
AC	Alternate Current
DC	Direct Current
NSA	Normalized Site Attenuation
S_{VSWR}	Site Voltage Standing Wave Ratio
LISN	Line Impedance Stabilization Network
TC	Test configuration
N/A	Not Applicable

END