EMC Test Report

Product Name: GPON Terminal

Product Model: EchoLife HG8245Q

Report Number: SYBH(E)02426392EB

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 HG8245Q

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:	2016-06-15	Ren Huasheng	Ren. Huasheng
	Date	Name	Signature

Prepared by:	2016-06-14	Wang Ying	Wang Ying
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1	N/A	First report
2	SYBH(E)02140528EB	Add new adapter HW- 120200U8W, and new test configuration TC3, 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~TC3	Class B	Pass	Location1
Conducted Emissions AC Power Port	TC1~TC3	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 HG8245Q GPON terminal (hereinafter referred to as HG8245Q) is an indoor optical network terminal (ONT) designed for home users. The HG8245Q 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 HG8245Q 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 HG8245Q is deployed at the GPON access layer and connects the home users to the Internet through the optical upstream port. On the local area network (LAN) side, the HG8245Q provides abundant hardware ports to meet multiple networking requirements of home users.

- 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.
- TEL ports that provide superior and cost-effective voice over IP (VoIP), fax over IP (VoIP), and modem over IP (VoIP) services.
- WLAN port to support a secure and reliable high-speed wireless network.
- 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 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)	25 W
Dimensions(W x D x H)	235 mm (W) × 195 mm (D) × 30 mm (H)
Weight (kg)	0.8 kg
Transmit frequency	2.4G: 2400 MHz – 2483.5MHz 5G: 5150 MHz – 5250 MHz; 5250 MHz – 5350 MHz; 5470 MHz – 5725 MHz.
Receive frequency	2.4G: 2400 MHz – 2483.5MHz 5G: 5150 MHz – 5250 MHz; 5250 MHz – 5350 MHz; 5470 MHz – 5725 MHz.
Maximum output power	2.4G: 2400 MHz–2483.5MHz, 802.11b/g/n: ≤ 20 dBm 5G: 5150 MHz–5250 MHz, 802.11a/n: ≤ 23 dBm 5250 MHz–5350 MHz, 802.11a/n: ≤ 23 dBm 5470 MHz–5725 MHz, 802.11a/n: ≤ 30 dBm
Frequency of the Internal Source (Hz)	25 MHz, 40 MHz, 125 MHz, 480 MHz, 1.244 GHz, 2.488 GHz

Figure 1. EUT Appearance

Figure 2. EUT Appearance (HW-120200U3W, Fuhua)

Figure 3. EUT Appearance(HW-120200U3W, Hunktey)

Figure 4. EUT Appearance(HW-120200U8W, Hunktey)

3.3 Board and SubAssembly

Table 3 Board list

Board	
Board Name	Description
HG8245Q	1PON,4GE,2POTS,1USB, WIFI

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

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

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

4.3 Test Configurations

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 there test configurations. TC1 ~ TC3 were shown in the following table and figures:

Table 7 Test configuration

Configuration No.	Configuration Description
TC1	HW-120200U3W, Fuhua
TC2	HW-120200U3W, HuntKey
TC3	HW-120200U8W, HuntKey

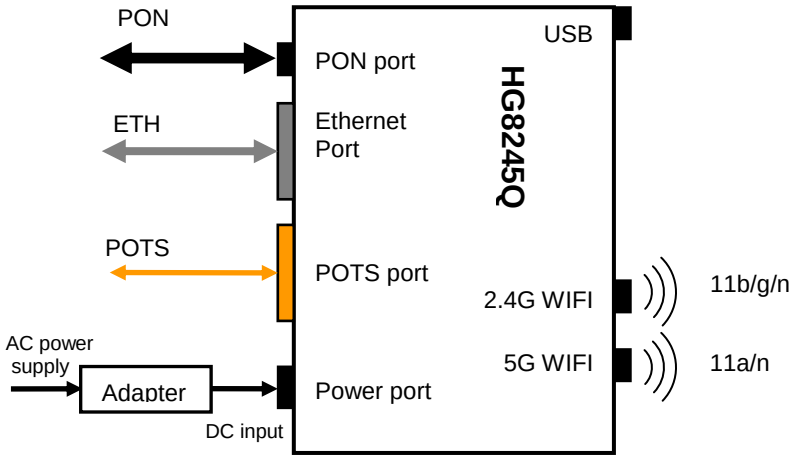


Figure 5. : Test configuration of TC1~TC3

4.4 Test Conditions and Connections

The HG8245Q was connected with the OLT through a single-mode optical fiber and 15–20 dB optical attenuation is added. The Ethernet ports of HG8245Q 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 HG8245Q should connect with a phone. Voice service was configured on the board so that voice connection can be built between phone1 and phone2. USB port was connected with the USB memorizer. The USB port was working at the writing and reading state. WiFi service was configured between the HG8245Q and the Notebook PC.

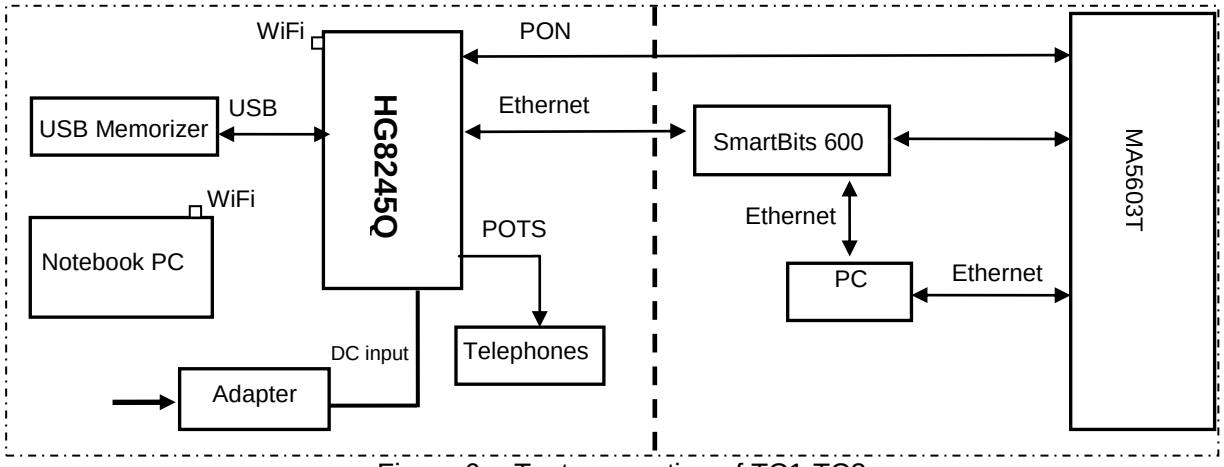


Figure 6. Test connection of TC1-TC3

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:

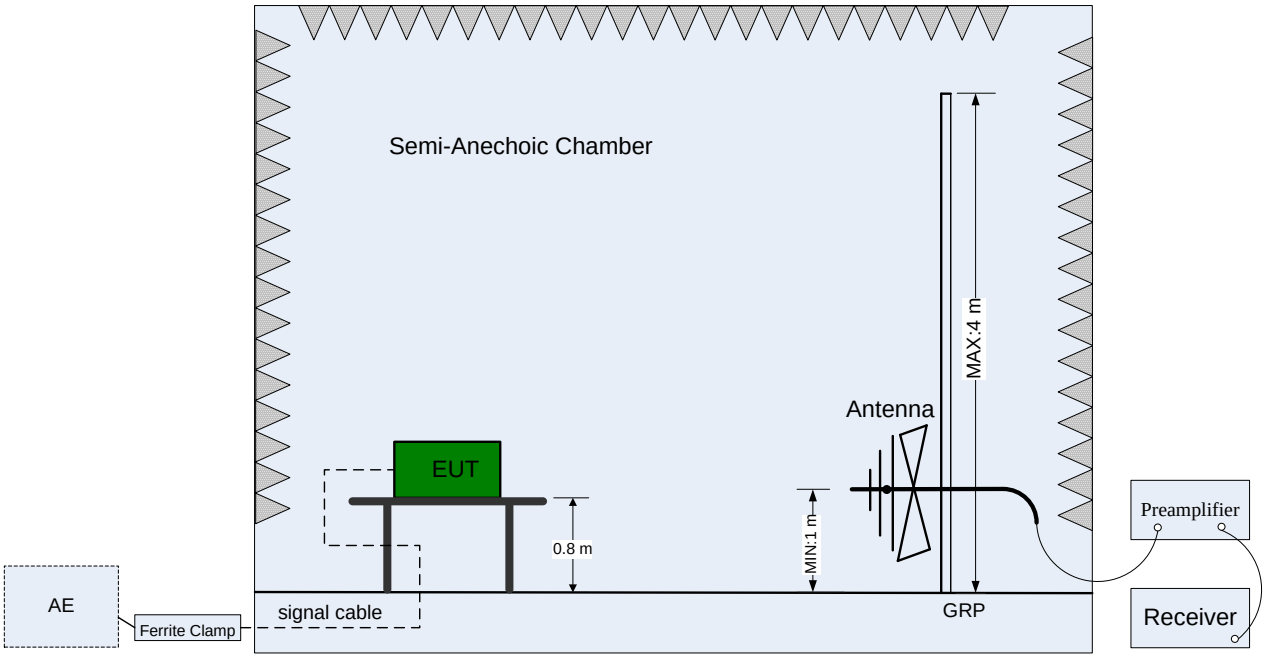


Figure 7. Test set-up of radiated disturbance (30 MHz-1 GHz)

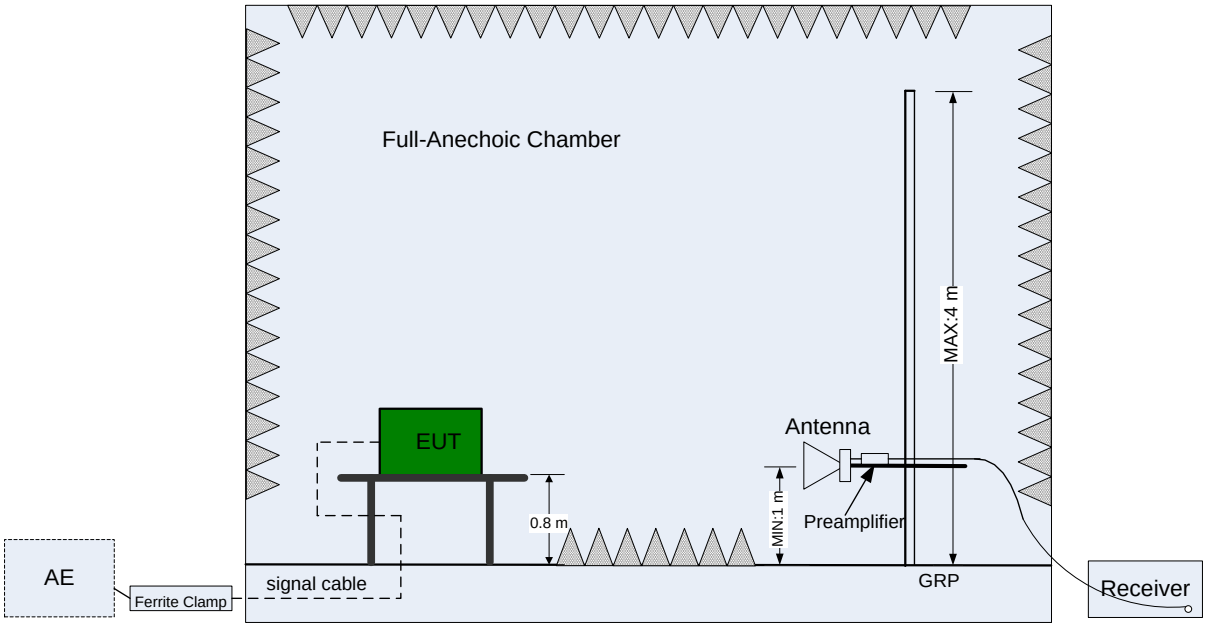


Figure 8. Test set-up of radiated disturbance (above 1 GHz)

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 8 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 40.0 dBµV/m 88 MHz to 216 MHz 43.5 dBµV/m 216 MHz to 960 MHz 46.0 dBµV/m 960 MHz to 1 GHz 53.9 dBµV/m

Table 9 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 2.488 GHz, 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:

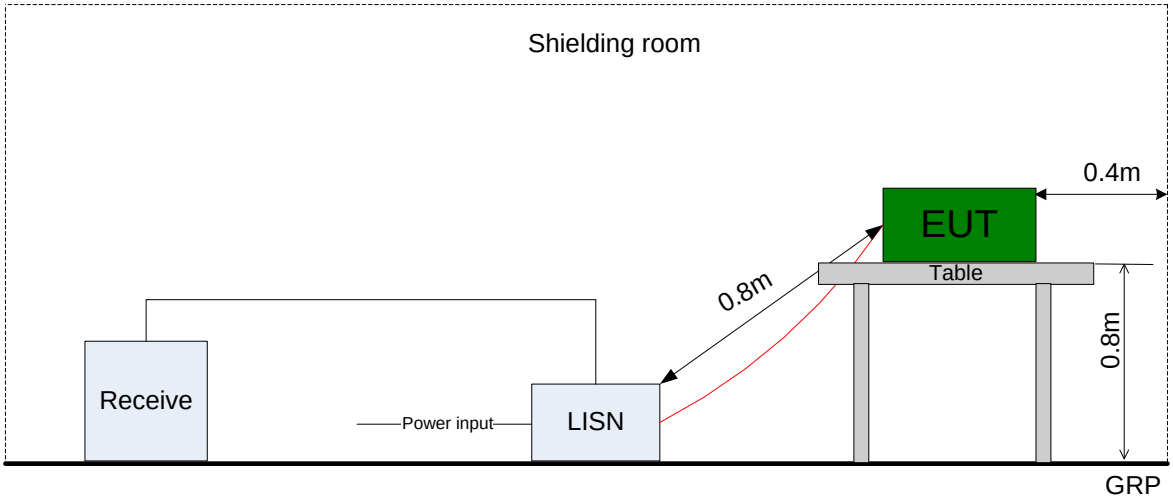


Figure 9. Test set-up of conducted disturbance for AC power port

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 10 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 11 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		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 12 System measurement uncertainty

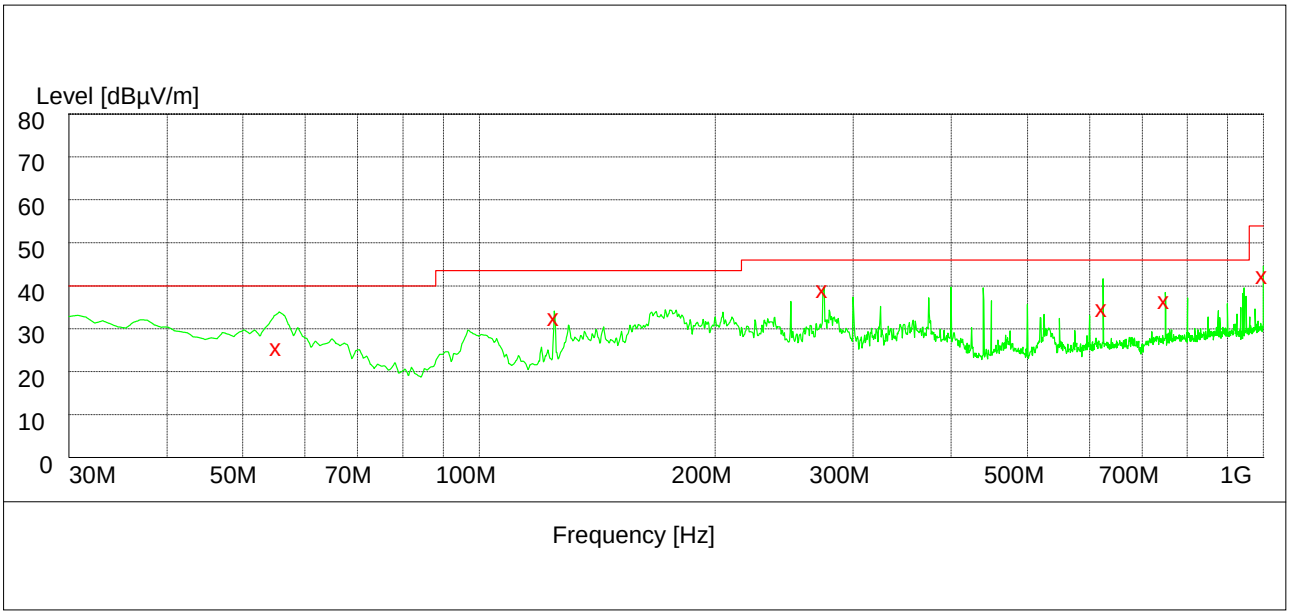
Items		Extended Uncertainty
Radiated emission (G2 3m chamber)	Field strength (dBμV/m)	U=4.15 dB; k=2 (30 MHz-1 GHz)
		U=3.64 dB; k=2 (1 GHz-18 GHz)
Conducted Emission (G2)	Disturbance Voltage (dBμV)	U=3.3 dB; k=2

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

8.1.1 Radiated Disturbance of TC1 ~ TC2

Graph of Test result (30 MHz-1 GHz)

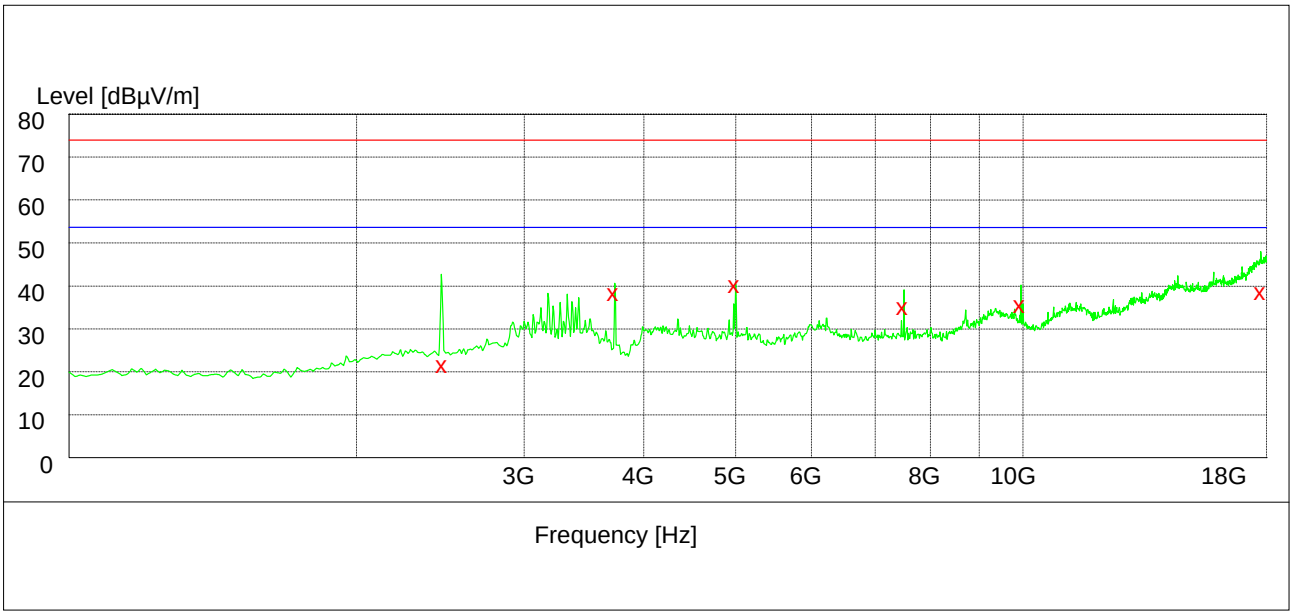


Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
55.260000	27.10	-16.7	40.0	12.9	100.0	208.00	VERTICAL
124.980000	34.20	-14.0	43.5	9.3	100.0	273.00	VERTICAL
274.980000	40.70	-8.8	46.0	5.3	100.0	113.00	HORIZONTAL
625.020000	36.20	-1.3	46.0	9.8	150.0	81.00	HORIZONTAL
750.000000	38.10	0.4	46.0	7.9	100.0	58.00	HORIZONTAL
999.960000	43.70	4.2	53.9	10.2	100.0	345.00	VERTICAL

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~TC2 were tested, but the worse test result was supplied.

Graph of Test result (above 1 GHz)

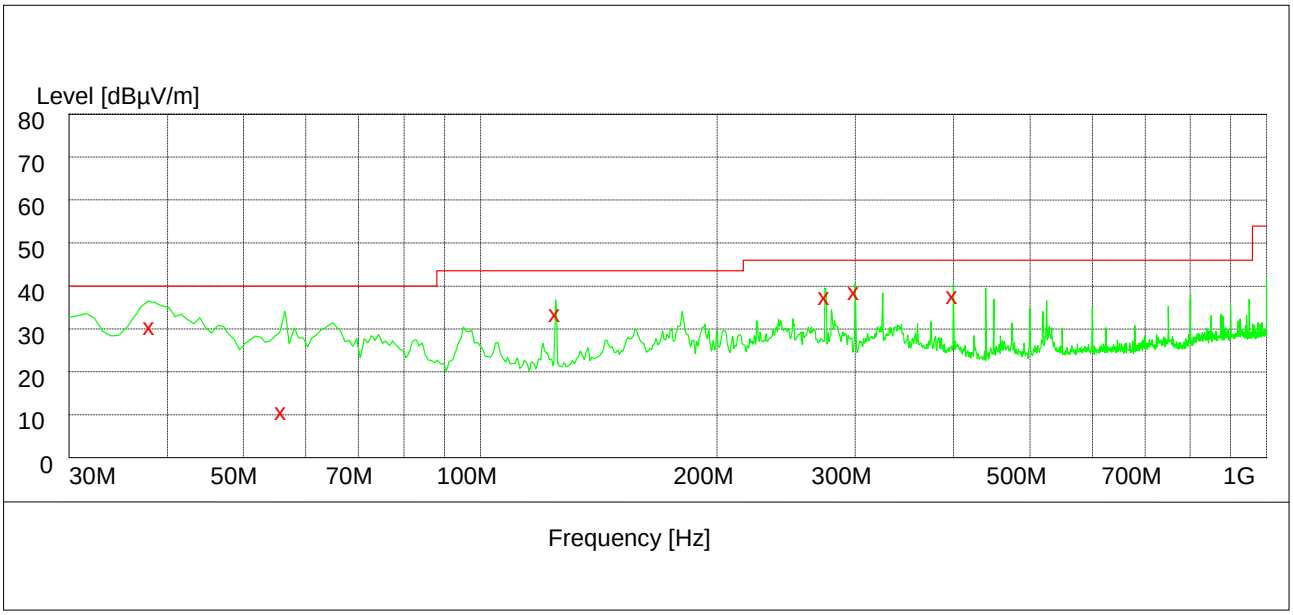


Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
2465.000000	23.20	-3.0	53.9	30.7	100.0	117.00	HORIZONTAL
3732.500000	39.90	1.6	53.9	14.0	149.0	6.00	VERTICAL
5000.000000	41.80	4.8	53.9	12.1	114.0	177.00	VERTICAL
7500.000000	36.60	10.3	53.9	17.3	108.0	220.00	VERTICAL
9953.000000	37.20	14.0	53.9	16.7	100.0	320.00	HORIZONTAL
17788.00000	40.10	31.4	53.9	13.8	100.0	300.00	VERTICAL

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~TC2 were tested, but the worse test result was supplied.

8.1.2 Radiated Disturbance of TC3

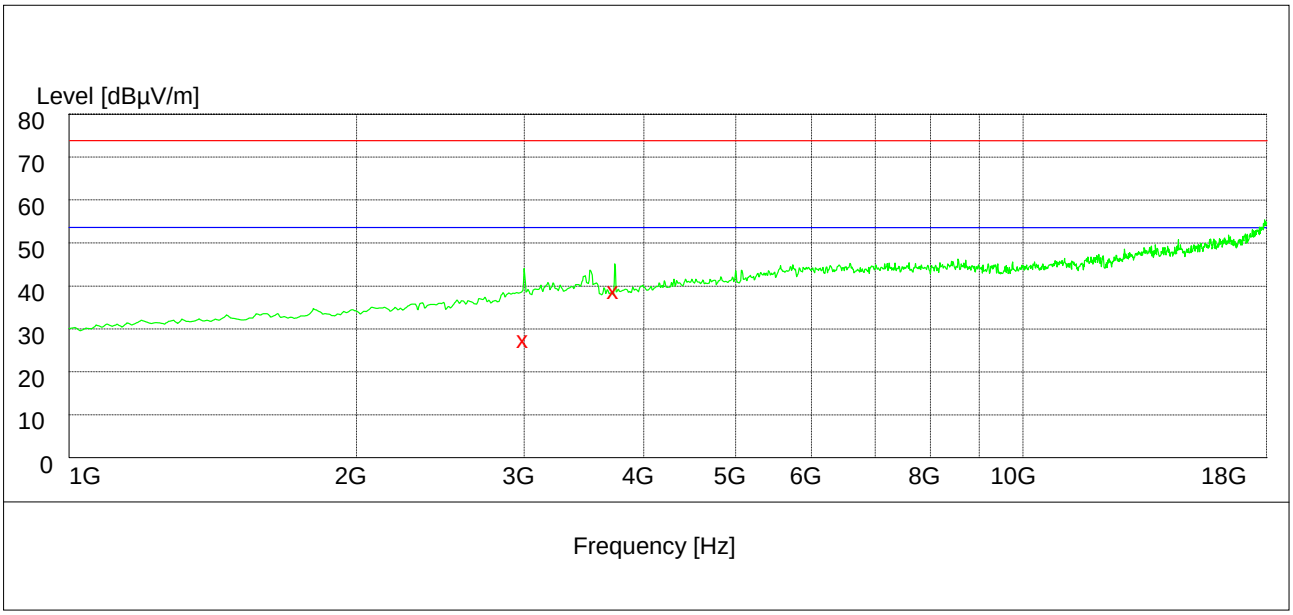


Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
38.100000	32.10	-9.1	40.0	7.9	100.0	150.00	VERTICAL
56.040000	12.40	-16.7	40.0	27.6	100.0	90.00	HORIZONTAL
124.980000	35.00	-10.0	43.5	8.5	100.0	5.00	HORIZONTAL
274.980000	39.00	-9.0	46.0	7.0	100.0	119.00	HORIZONTAL
300.000000	40.20	-7.8	46.0	5.8	100.0	226.00	HORIZONTAL
400.020000	39.10	-4.7	46.0	6.9	100.0	316.00	VERTICAL

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.

Graph of Test result (above 1 GHz)



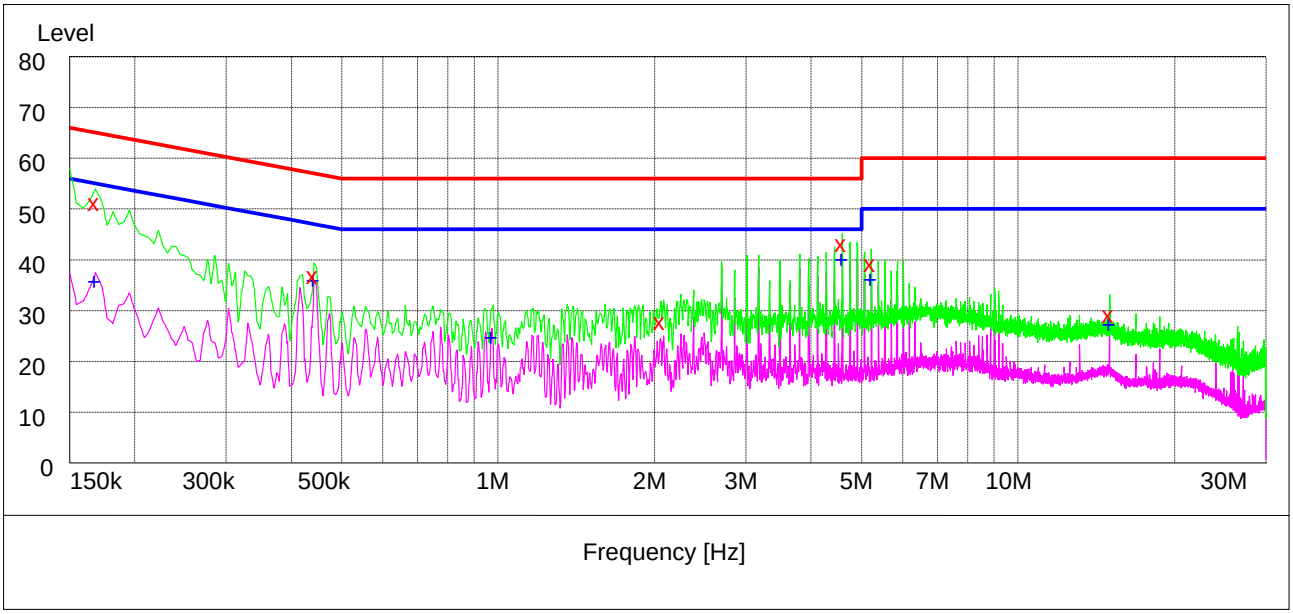
Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
3000.000000	29.10	-3.3	53.9	24.8	165.0	340.00	HORIZONTAL
3732.500000	40.40	-0.8	53.9	13.5	200.0	278.00	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.

8.2 Conducted Disturbance

8.2.1 AC Power Port Test Data of TC1



Measurement Result: QP Detector

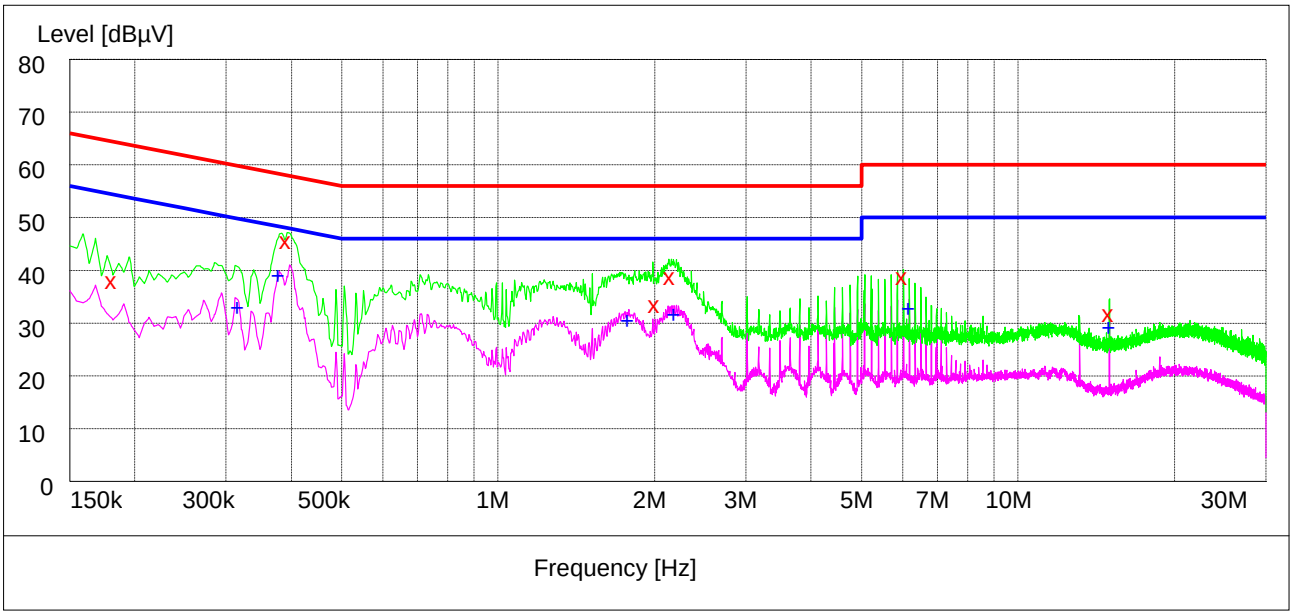
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.168000	52.30	10.5	65	12.8	L3	FLO
0.442500	37.90	10.7	57	19.1	N	FLO
2.058000	28.80	10.6	56	27.2	N	FLO
4.596000	44.20	10.6	56	11.8	N	FLO
5.230500	40.40	10.6	60	19.6	N	FLO
15.018000	30.20	10.8	60	29.8	L3	FLO

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.168000	36.70	10.5	55	18.4	L3	FLO
0.442500	36.80	10.7	47	10.2	N	FLO
0.973500	25.70	10.6	46	20.3	N	FLO
4.596000	41.00	10.6	46	5.0	L3	FLO
5.230500	37.00	10.6	50	13.0	L3	FLO
15.022500	28.20	10.8	50	21.8	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.

8.2.2 AC Power Port Test Data of TC2



Measurement Result: QP Detector

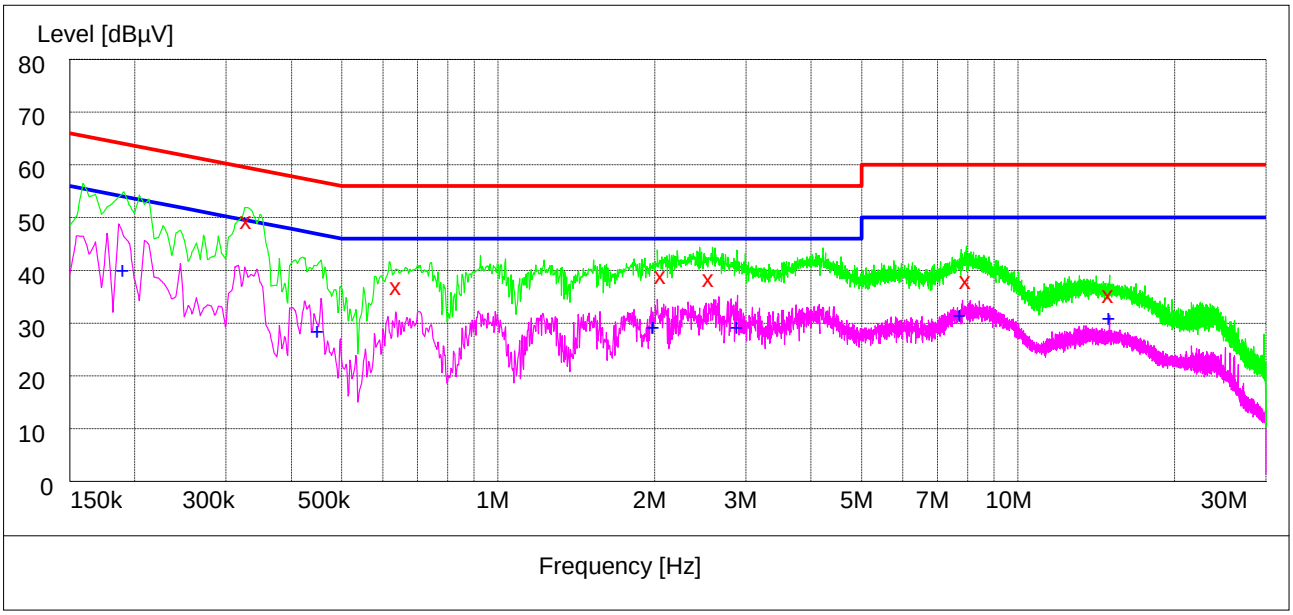
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.181500	38.90	10.6	64	25.5	N	FLO
0.393000	46.60	10.7	58	11.4	N	FLO
2.013000	34.40	10.6	56	21.6	L3	FLO
2.152500	39.70	10.6	56	16.3	L3	FLO
6.022500	39.70	10.6	60	20.3	L3	FLO
15.004500	32.70	10.8	60	27.3	L3	FLO

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.316500	33.80	10.7	50	16.0	N	FLO
0.379500	40.00	10.7	48	8.3	N	FLO
1.779000	31.30	10.6	46	14.7	N	FLO
2.184000	32.60	10.6	46	13.4	L3	FLO
6.184500	33.60	10.6	50	16.4	N	FLO
15.004500	30.20	10.8	50	19.8	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 TC3



Measurement Result: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.330000	50.40	10.1	60	9.1	L3	FLO
0.640500	37.80	10.2	56	18.2	L3	FLO
2.062500	39.90	10.2	56	16.1	L3	FLO
2.553000	39.40	10.2	56	16.6	N	FLO
7.980000	39.10	10.6	60	20.9	L3	FLO
15.018000	36.40	10.7	60	23.6	L3	FLO

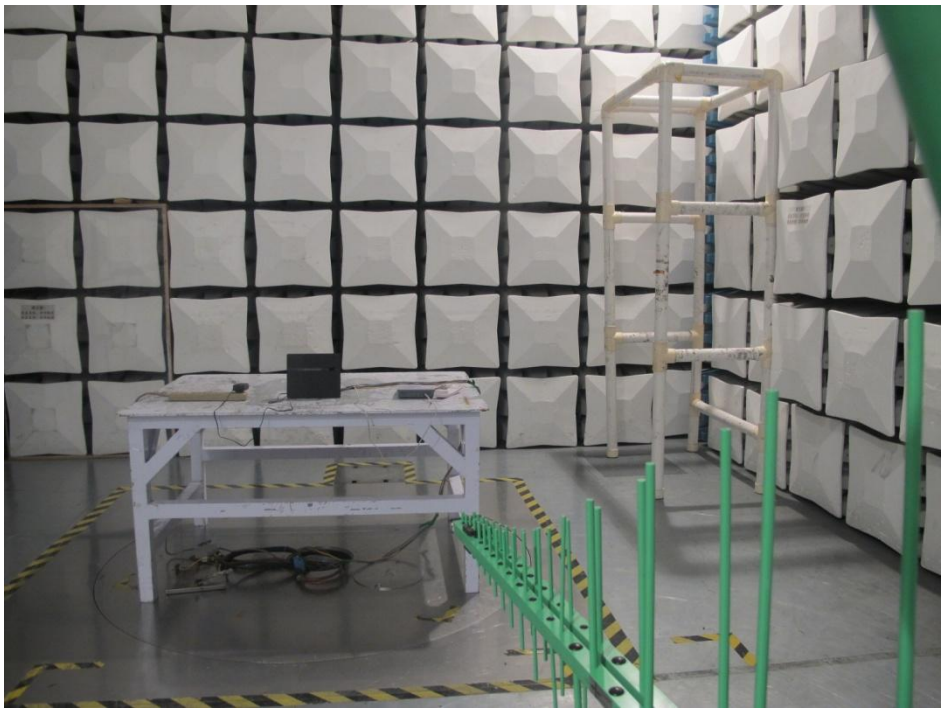
Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.190500	40.90	10.0	54	13.1	N	FLO
0.451500	29.30	10.1	47	17.6	L3	FLO
1.995000	30.20	10.2	46	15.8	L3	FLO
2.890500	30.20	10.2	46	15.8	L3	FLO
7.768500	32.20	10.6	50	17.8	L3	FLO
15.018000	31.80	10.7	50	18.2	L3	FLO

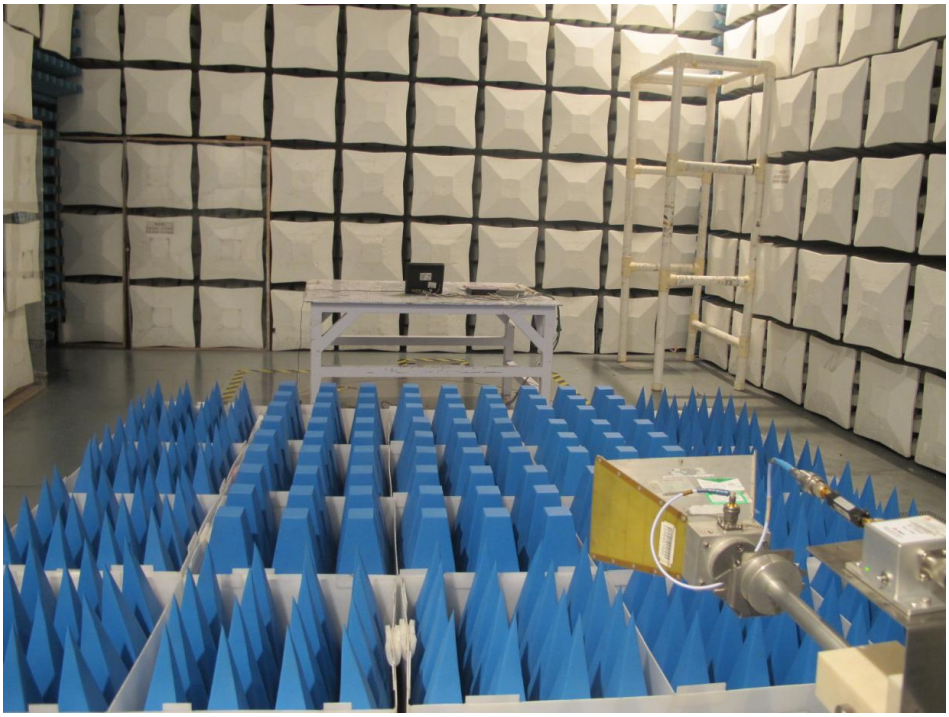
Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

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 13 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