1842001E-IT-CE-P07V01

EMC Test report for GPON/XG<S>PON ONU

Models: EchoLife EG8084P

Suzhou, date of issue: 2018-04-09

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By order of Huawei Technologies Co., Ltd.

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1 CONCLUSION

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA. As far as the tests were based on certain specifications, these are mentioned in the report.

1.1 Model description

The apparatus as supplied for the test is GPON/XG<S>PON ONU, model EchoLife EG8084P.

Figure 1 Overview

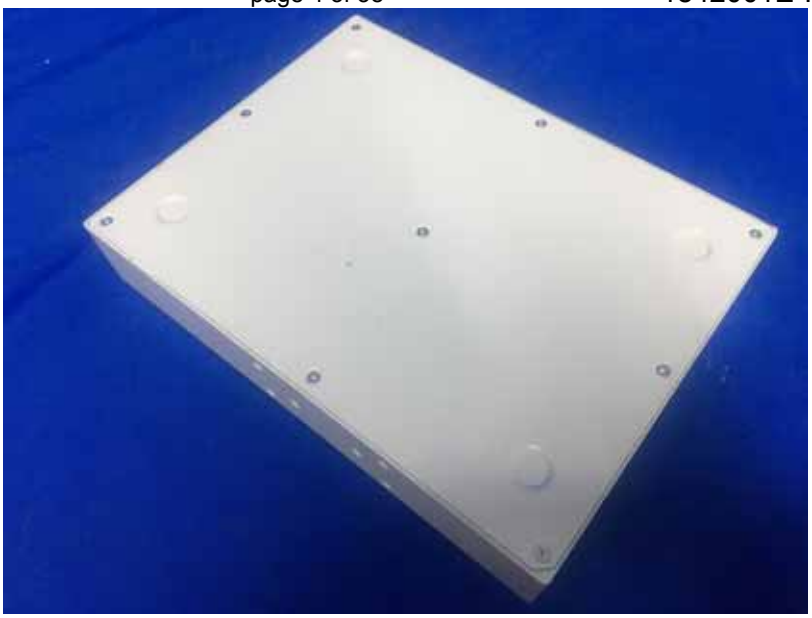


Figure 2 Overview

Figure 3 Overview

2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

2.1 Applied standards

Standard	Year	Title
EN 50121-4	2016	Railway applications — Electromagnetic compatibility Part 4: Emission and immunity of the signalling and telecommunications apparatus

2.2 Overview of results

Emission tests	Result
Conducted Emission	**PASS**
Radiated Emission	**PASS**

Immunity tests	Result
Electrostatic discharge	**PASS**
Radio frequency electromagnetic field	**PASS**
Electrical fast transients	**PASS**
Surges	**PASS**
Radio-frequency continuous conducted	**PASS**
Power frequency magnetic field	**PASS**

3 GENERAL INFORMATION

Equipment under test	GPON/XG<S>PON ONU
Trade Mark	Huawei
Types	EchoLife EG8084P
Ratings	+56Vdc;4.3A

3.1 Customer Information

Applicant	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen 518129 China

Manufacture	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen 518129 China

Factory	CIG Shanghai Co., Ltd., Shanghai Branch.
Address	F/2,3 Building 1,No. 505 Jiangyue Road, Minhang District, Shanghai,P.R.China

3.2 Test data

Location	DEKRA Testing & Certification (Suzhou) Co., Ltd.
Address	No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu,China
Date of receipt of test item	Mar. 2018 (samples provided by applicant)
Date (s) of performance of tests	Apr. 2018
Supervised by	Black Hao

3.3 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

3.4 Measurement Uncertainty

Conducted Emission / TR1
The maximum measurement uncertainty is evaluated as: Mains: 9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Radiated emission / AC3
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~300MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated emission / AC5
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.90 dB 300MHz~1GHz: 3.60 dB 1GHz~18GHz: 5.00 dB Vertical: 30MHz~300MHz: 3.80 dB 300MHz~1GHz: 3.50 dB 1GHz~18GHz: 4.80 dB
Electrostatic discharge / TR3
The maximum measurement uncertainty is evaluated as Rise Time: 6.4 %, Peak Current: 6 %, Current at 30 ns: 6 %, Current at 60 ns: 6 %.
Radio frequency electromagnetic field / AC4
The maximum measurement uncertainty is evaluated as 1.48dB.
Electrical fast transients / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Surges / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Radio-frequency continuous conducted / TR2
The maximum measurement uncertainty is evaluated as CDN: 1.52dB, EM Clamp: 1.92dB.
Power-frequency magnetic field / TR2
The maximum measurement uncertainty is evaluated as 10%.

3.5 Equipment List

Conducted Emission / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2019.03.04
Two-Line V-Network	R&S	ENV216	101189	2018.07.16
Two-Line V-Network	R&S	ENV216	101044	2018.06.15
Impedance Stabilization Network	Teseq GmbH	ISN T800	30306	2019.01.22
Impedance Stabilization Network	Teseq GmbH	ISN T8-Cat6	29680	2019.01.22
Current Probe	R&S	EZ-17	100678	2019.02.28
50ohm Termination	SHX	TF2	07081402	2018.09.03
50ohm Termination	SHX	TF2	07081403	2018.09.03
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A
Coaxial Cable	Suhner	RG 223	TR1-C1	2018.09.11
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR1-TH	2019.01.09

Radiated Emission / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100176	2018.09.03
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2018.07.15
Coaxial Cable	Huber+Suhner	RG 214	AC3-C	2019.02.28
Temperature/Humidity Meter	Ruitesi	RTS-8S	AC3-TH	2019.01.09

Radiated Emission / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Receiver	Agilent	N9038A	MY51210196	2018.07.16
low Noise Amplifier	BXT	NA2651D	LNA17040209	2018.07.17
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2018.07.20
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2019.02.28
Tunable Bandreject filter	Wainwright	WRCG2400/2485-2375/2510-60/11SS	SUA0500285	2018.06.13
Temperature/Humidity Meter	Ruitesi	RTS-8S	AC5-TH	2019.01.09

Electrostatic discharge / TR3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
ESD Simulator	EM TEST	Dito	V0616101367	2018.04.18
Barometer	Fengyun	DYM3	0506048	2018.10.23
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR3-TH	2019.01.09

Radio-frequency electromagnetic field / AC4

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Signal Generator	Keysight	N5171B	MY53051907	2018.05.07
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2019.01.07
Power Meter	Agilent	E4416A	GB41293844	2018.09.03
Power Sensor	Agilent	E9323A	MY44420302	2018.09.03
Power Meter	Boonton	4231A	144502	2018.09.03
Power Sensor	Boonton	51011-EMC	33859	2018.09.03
RF Switch	MF	SW1072	RFSW980005	N/A
Power Amplifier	rflight	NTWPAS-103050	16033031	N/A
Power Amplifier	rflight	NTWPAS-00810250E	16033039	N/A
Directional Coupler	Schaffner	CHA 9652B	121	2018.06.25
Directional Coupler	A&R	DC7144A	312249	2018.06.25
Electric Field Probe	ETS-LINDGREN	HI-6105	00114789	2019.05.15
Bilog Antenna	Schaffner	CBL6141A	4278	N/A
Horn Antenna	A&R	AT4002A	312312	N/A
Temperature/Humidity Meter	Ruitesi	RTS-8S	AC4-TH	2019.01.09

Electrical Fast Transient/Burst / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2018.09.03
CDN	Teseq GmbH	CDN 3061	5010	2018.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2018.09.03
CDN	Teseq GmbH	CDN 3425	2029	2018.12.10
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR2-TH	2019.01.09

Surges / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2018.09.03
CDN	Teseq GmbH	CDN 3061	5010	2018.09.03
CDN	Teseq GmbH	CDN 118	40652	2018.12.10
CDN	Teseq GmbH	CDN 118	40644	2018.12.10
CDN	Teseq GmbH	CDN 117	31806	2019.03.05
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR2-TH	2019.01.09

Radio-frequency continuous conducted / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
RF-Generator	Teseq GmbH	NSG 4070B-80	43711	2018.08.06
Attenuation	Teseq GmbH	ATN 6050	33651	2018.08.01
Coupling / Decoupling Network	Schaffner	CDN M016	21249	2018.10.16
Coupling / Decoupling Network	Teseq GmbH	CDN M016	24484	2018.11.04
Coupling / Decoupling Network	Teseq GmbH	CDN T400	22461	2018.10.16
Coupling / Decoupling Network	Teseq GmbH	CDN T800	26167	2019.01.07
EM Clamp	Schaffner	KEMZ 801	21041	2018.10.16
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR2-TH	2019.01.09

Power-frequency magnetic field / TR20

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Profline 2145 Harmonics & Flicker and power line immunity test system	Teseq GmbH	Profline 2145	1736A02510, 1646A, 01490, 1736A02428, 1736A00944, A41547	2018.09.27
Magnetic field Coil	Teseq GmbH	INA 703	3002	2019.03.22
Induction Coil Interface	Teseq GmbH	INA 2141	1443	2019.03.22
Temperature/Humidity Meter	Ruitesi	RTS-8S	TR20-TH	2019.01.09

4 EMISSION TEST RESULTS

4.1 Conducted emission

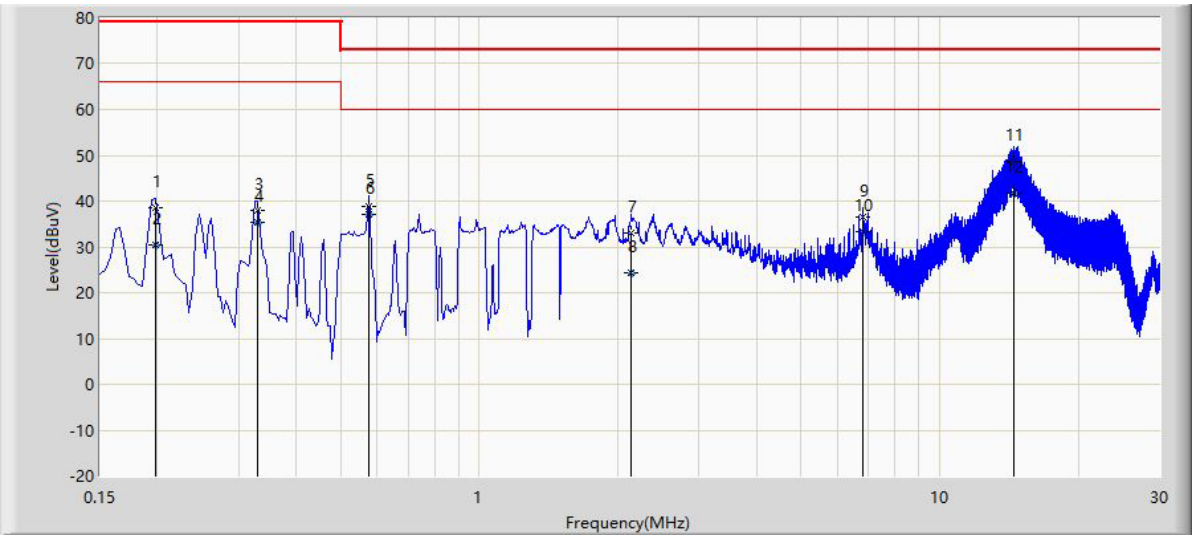
Limits for conducted disturbance at Low voltage AC mains port		
Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60
NOTE: The lower limit shall apply at the transition frequency.		

Remarks:
If the limits for the average detector are met when using the quasi-peak detector, then the limits for the measurement with the average detector are considered to be met.

Port	AC mains
Test method	LISN
Mode	Normal Operation

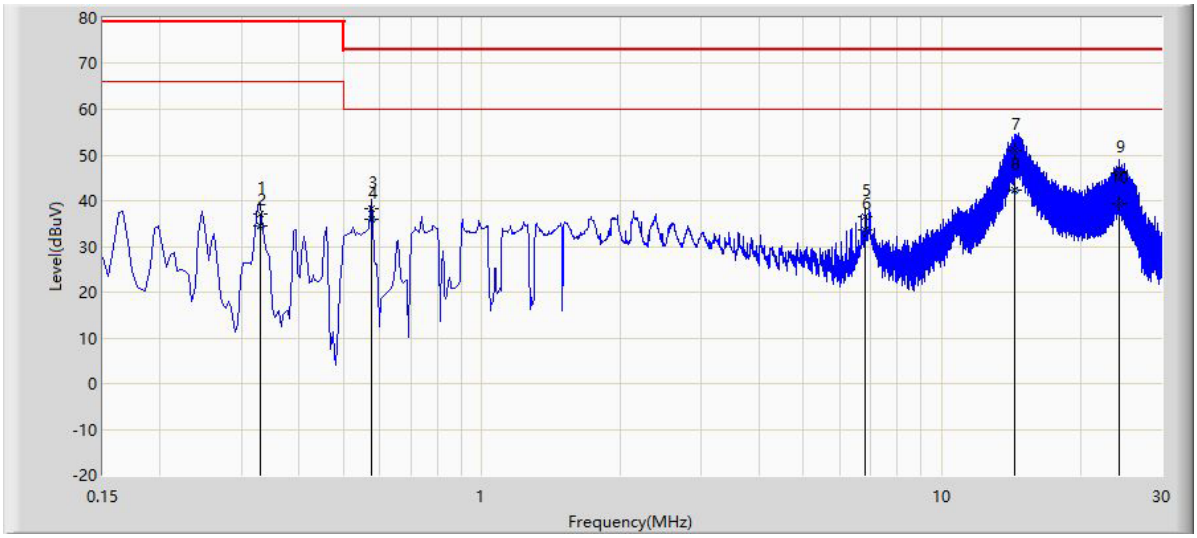
Test Result

Line



Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.198	38.537	28.907	-40.463	79.000	9.601	0.029	0.000	QP
0.198	30.569	20.939	-35.431	66.000	9.601	0.029	0.000	AV
0.330	38.026	28.391	-40.974	79.000	9.600	0.035	0.000	QP
0.330	35.432	25.797	-30.568	66.000	9.600	0.035	0.000	AV
0.574	38.885	29.240	-34.115	73.000	9.600	0.045	0.000	QP
0.574	37.245	27.599	-22.755	60.000	9.600	0.045	0.000	AV
2.134	33.137	23.435	-39.863	73.000	9.612	0.090	0.000	QP
2.134	24.287	14.585	-35.713	60.000	9.612	0.090	0.000	AV
6.814	36.423	26.560	-36.577	73.000	9.696	0.167	0.000	QP
6.814	33.386	23.523	-26.614	60.000	9.696	0.167	0.000	AV
14.506	48.786	38.655	-24.214	73.000	9.887	0.244	0.000	QP
14.506	41.633	31.502	-18.367	60.000	9.887	0.244	0.000	AV

Neutral

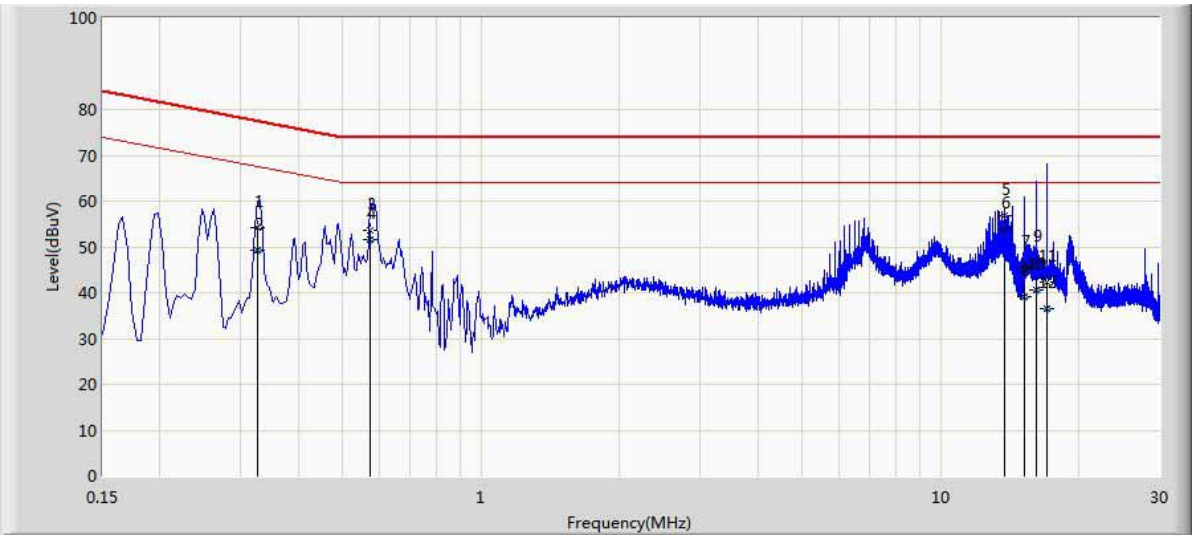


Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.330	37.087	27.457	-41.913	79.000	9.595	0.035	0.000	QP
0.330	34.472	24.841	-31.528	66.000	9.595	0.035	0.000	AV
0.574	38.219	28.584	-34.781	73.000	9.590	0.045	0.000	QP
0.574	36.044	26.409	-23.956	60.000	9.590	0.045	0.000	AV
6.814	36.606	26.744	-36.394	73.000	9.695	0.167	0.000	QP
6.814	33.563	23.701	-26.437	60.000	9.695	0.167	0.000	AV
14.370	50.918	40.736	-22.082	73.000	9.939	0.243	0.000	QP
14.370	42.251	32.069	-17.749	60.000	9.939	0.243	0.000	AV
24.238	46.071	35.165	-26.929	73.000	10.587	0.319	0.000	QP
24.238	39.347	28.442	-20.653	60.000	10.587	0.319	0.000	AV

Refer to chapter 6 for the test set-up.

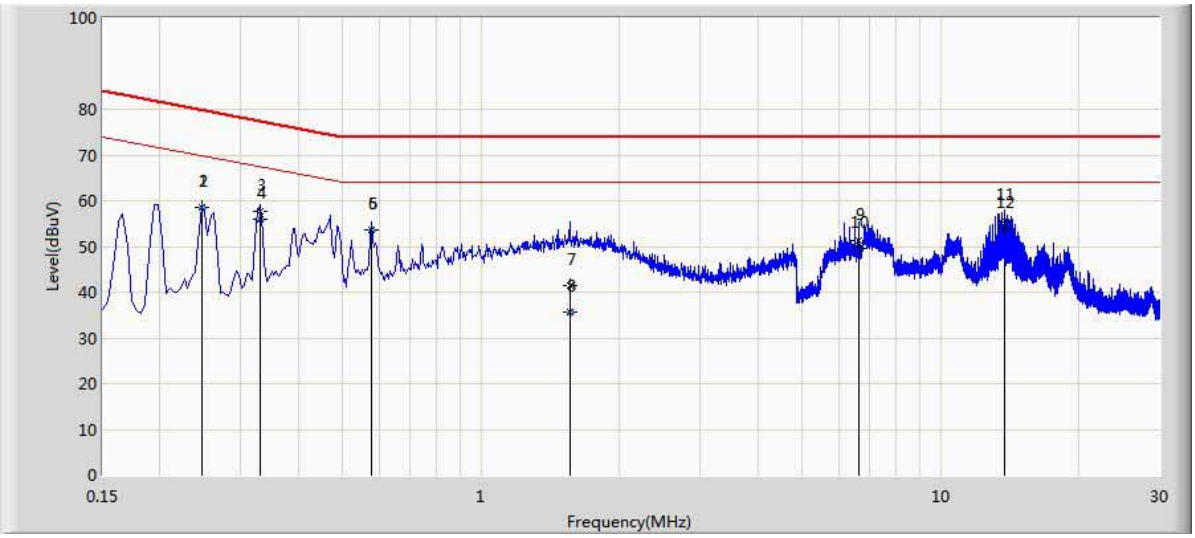
Port	LAN
Test method	ISN
Mode	Normal Operation

Test Result of GE2



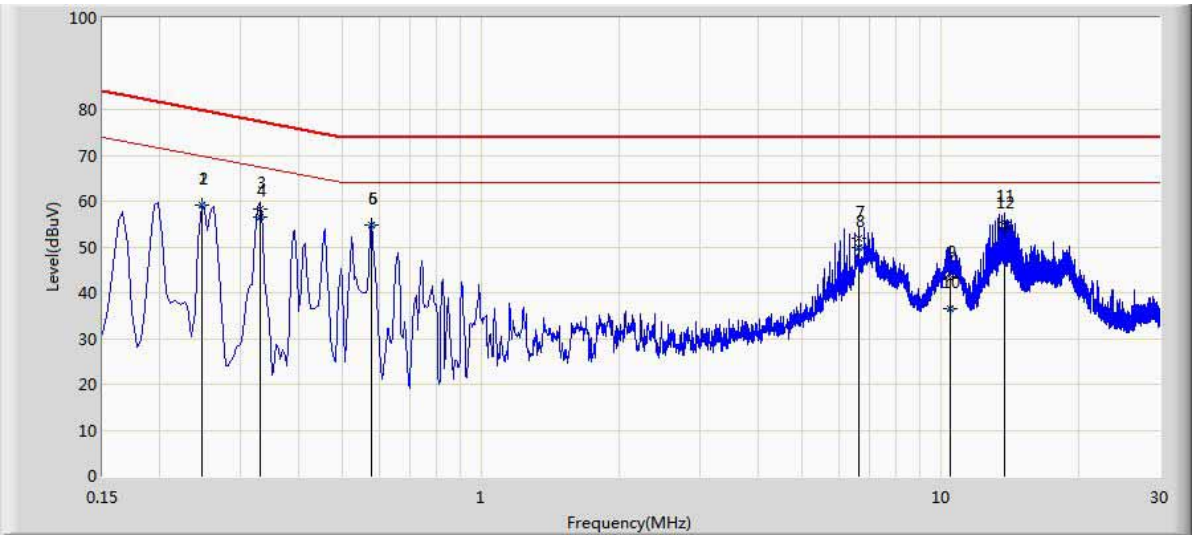
Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.326	54.330	45.204	-23.223	77.552	9.091	0.035	0.000	QP
0.326	49.152	40.026	-18.401	67.552	9.091	0.035	0.000	AV
0.574	53.632	44.495	-20.368	74.000	9.092	0.045	0.000	QP
0.574	51.668	42.531	-12.332	64.000	9.092	0.045	0.000	AV
13.782	56.739	47.330	-17.261	74.000	9.172	0.237	0.000	QP
13.782	53.892	44.483	-10.108	64.000	9.172	0.237	0.000	AV
15.278	45.444	36.009	-28.556	74.000	9.184	0.251	0.000	QP
15.278	39.180	29.745	-24.820	64.000	9.184	0.251	0.000	AV
16.186	46.766	37.319	-27.234	74.000	9.189	0.258	0.000	QP
16.186	40.722	31.275	-23.278	64.000	9.189	0.258	0.000	AV
17.094	42.226	32.773	-31.774	74.000	9.187	0.266	0.000	QP
17.094	36.540	27.087	-27.460	64.000	9.187	0.266	0.000	AV

Test Result of GE4



Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.246	58.461	49.341	-21.430	79.891	9.090	0.031	0.000	QP
0.246	58.462	49.341	-11.430	69.891	9.090	0.031	0.000	AV
0.330	57.598	48.472	-19.853	77.451	9.091	0.035	0.000	QP
0.330	55.902	46.776	-11.549	67.451	9.091	0.035	0.000	AV
0.578	53.694	44.557	-20.306	74.000	9.092	0.045	0.000	QP
0.578	53.527	44.389	-10.473	64.000	9.092	0.045	0.000	AV
1.558	41.440	32.265	-32.560	74.000	9.099	0.075	0.000	QP
1.558	35.628	26.454	-28.372	64.000	9.099	0.075	0.000	AV
6.658	51.297	41.991	-22.703	74.000	9.142	0.164	0.000	QP
6.658	49.532	40.226	-14.468	64.000	9.142	0.164	0.000	AV
13.782	55.600	46.191	-18.400	74.000	9.172	0.237	0.000	QP
13.782	54.012	44.603	-9.988	64.000	9.172	0.237	0.000	AV

Test Result of GE6



Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.246	59.008	49.887	-20.883	79.891	9.090	0.031	0.000	QP
0.246	59.014	49.894	-10.877	69.891	9.090	0.031	0.000	AV
0.330	58.217	49.091	-19.234	77.451	9.091	0.035	0.000	QP
0.330	56.582	47.456	-10.870	67.451	9.091	0.035	0.000	AV
0.578	54.925	45.788	-19.075	74.000	9.092	0.045	0.000	QP
0.578	54.920	45.782	-9.080	64.000	9.092	0.045	0.000	AV
6.658	51.868	42.562	-22.132	74.000	9.142	0.164	0.000	QP
6.658	49.739	40.433	-14.261	64.000	9.142	0.164	0.000	AV
10.478	43.186	33.825	-30.814	74.000	9.155	0.206	0.000	QP
10.478	36.378	27.017	-27.622	64.000	9.155	0.206	0.000	AV
13.782	55.490	46.081	-18.510	74.000	9.172	0.237	0.000	QP
13.782	54.015	44.606	-9.985	64.000	9.172	0.237	0.000	AV

Conclusion:

PASS

4.2 Radiated Emission

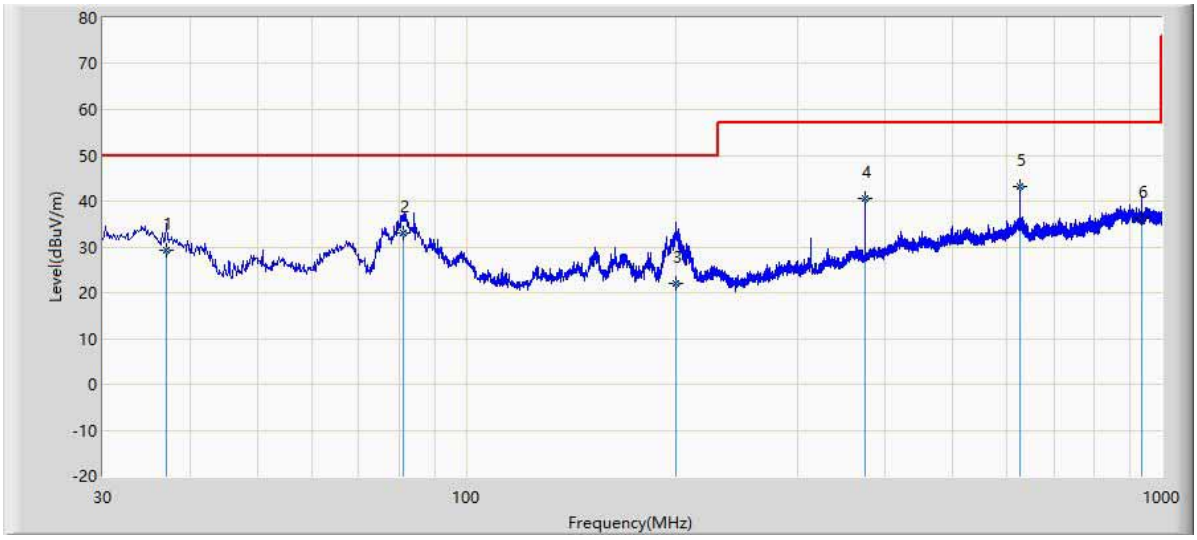
Limits				
Frequency MHz	Distance (m)	Quasi-peak (dBuV/m)	Average dB(μV/m)	Peak-peak dB(μV/m)
30 – 230	3	50	-	-
230 – 1000	3	57	-	-
1000-3000	3	-	56	76
3000-6000	3	-	60	80

Remark:

1. The tighter limit shall apply at the edge between two frequency bands.
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.

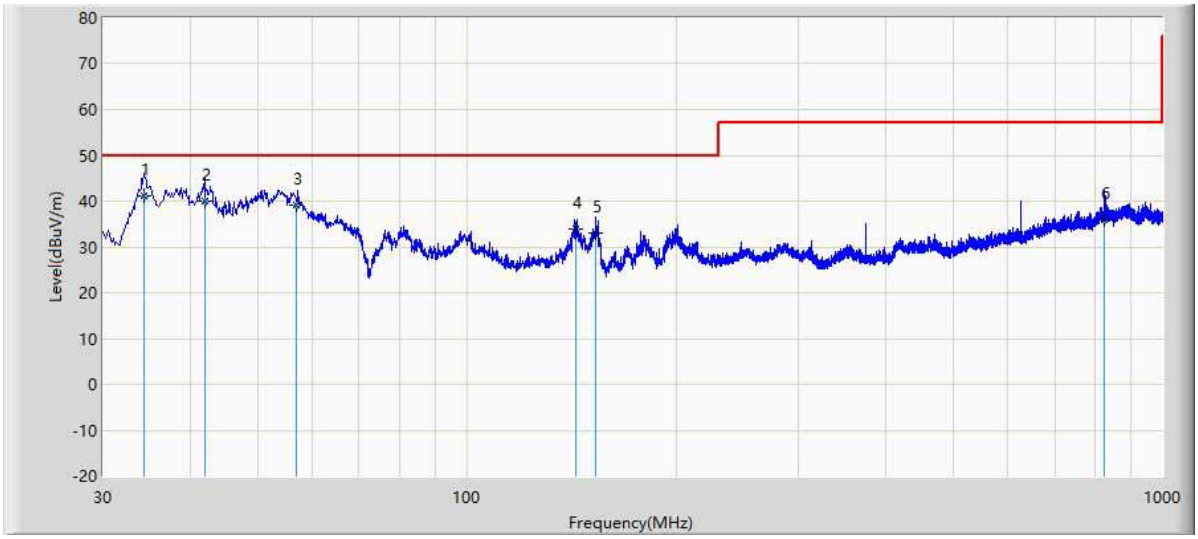
Test Result of Below 1GHz (PON)

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
37.002	29.156	3.800	-20.844	50.000	18.730	6.626	0.000	100	201	QP
80.992	33.186	19.600	-16.814	50.000	6.931	6.656	0.000	200	0	QP
200.001	22.112	4.200	-27.888	50.000	10.571	7.341	0.000	100	235	QP
375.006	40.509	16.500	-16.491	57.000	16.142	7.867	0.000	100	242	QP
625.014	43.297	12.600	-13.703	57.000	22.128	8.569	0.000	200	63	QP
937.510	36.151	4.300	-20.849	57.000	22.526	9.325	0.000	100	12	QP

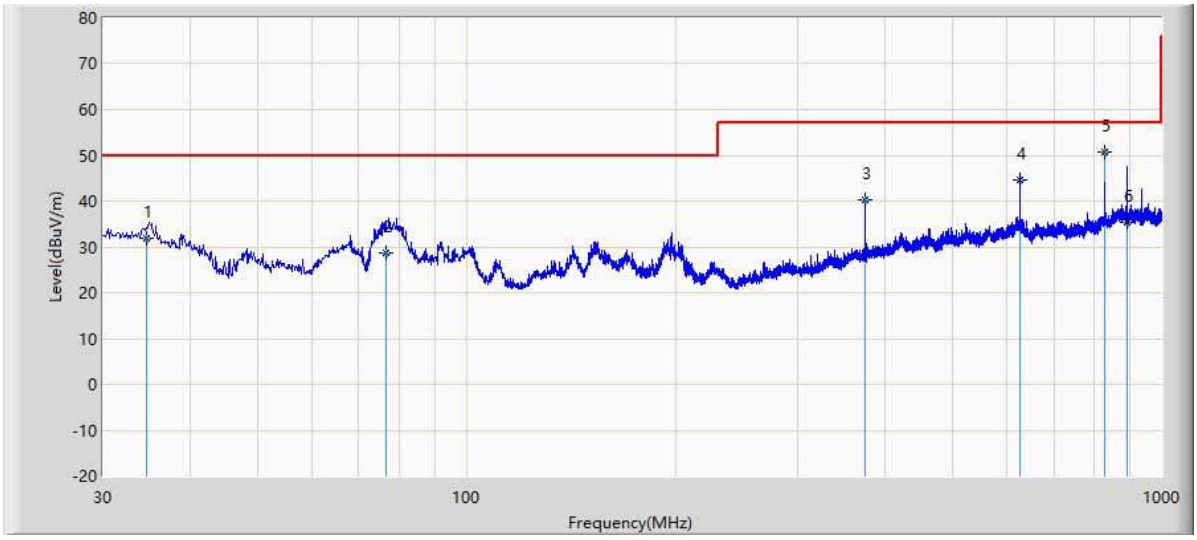
Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
34.404	41.166	18.100	-8.834	50.000	16.401	6.665	0.000	100	263	QP
42.122	39.877	21.300	-10.123	50.000	11.998	6.578	0.000	100	285	QP
56.802	39.179	22.100	-10.821	50.000	10.416	6.663	0.000	100	277	QP
143.357	33.805	15.800	-16.195	50.000	10.867	7.138	0.000	100	263	QP
153.205	32.972	14.600	-17.028	50.000	11.168	7.204	0.000	100	256	QP
825.990	36.043	3.400	-20.957	57.000	23.571	9.072	0.000	200	26	QP

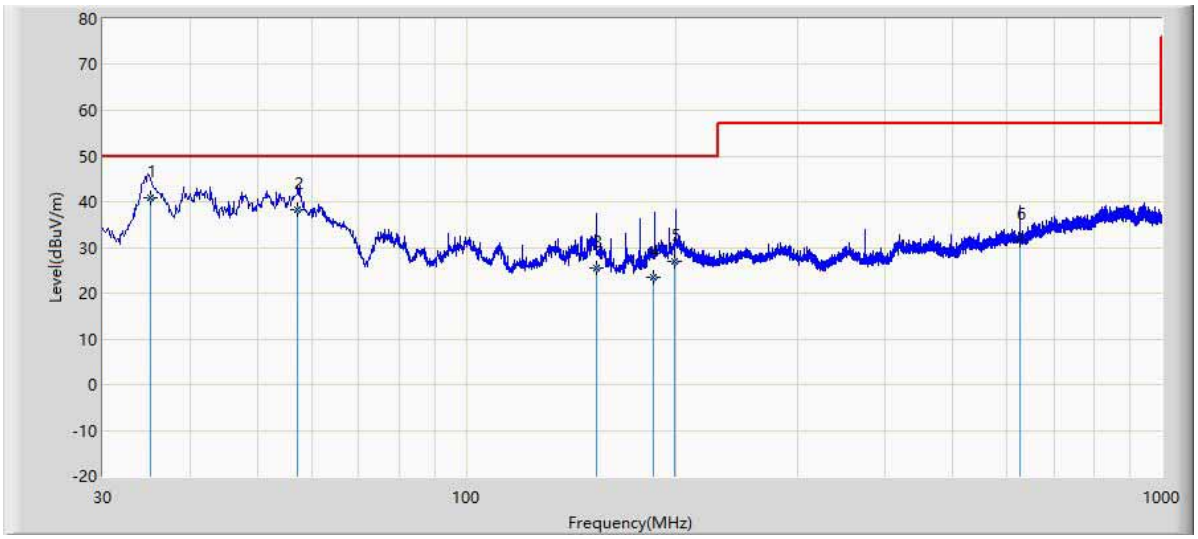
Test Result of Below 1GHz (XGPON)

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
34.709	31.846	4.500	-18.154	50.000	20.678	6.669	0.000	200	277	QP
76.659	28.570	16.100	-21.430	50.000	5.809	6.661	0.000	400	215	QP
375.005	40.409	16.400	-16.591	57.000	16.142	7.867	0.000	100	1	QP
625.019	44.497	13.800	-12.503	57.000	22.127	8.569	0.000	200	33	QP
827.617	50.861	19.100	-6.139	57.000	22.685	9.076	0.000	300	247	QP
893.321	35.485	3.200	-21.515	57.000	23.051	9.234	0.000	200	350	QP

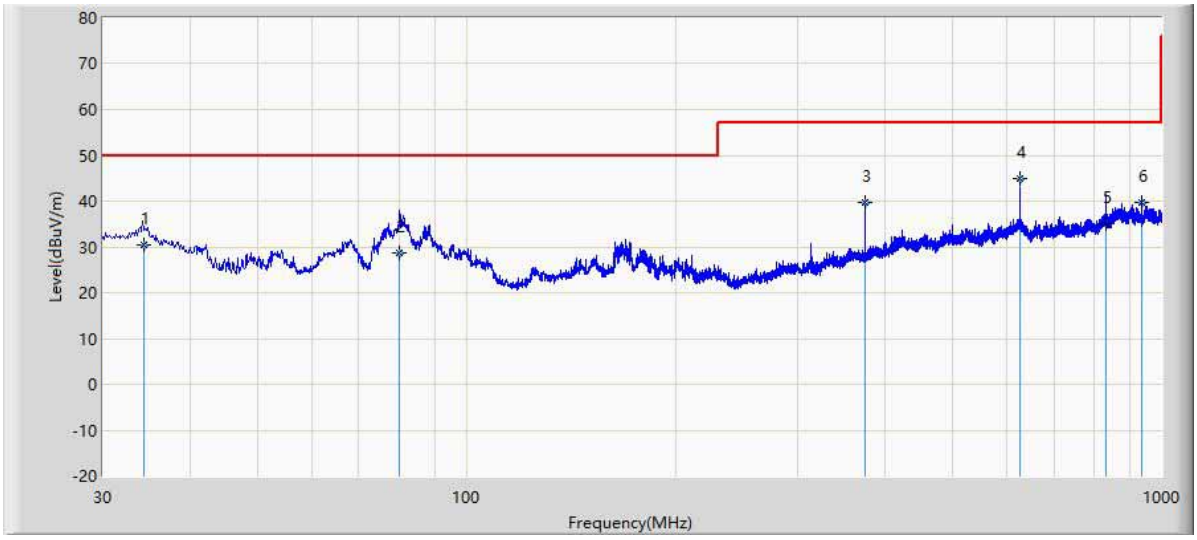
Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
35.138	40.963	18.200	-9.037	50.000	16.099	6.664	0.000	100	300	QP
57.035	38.120	21.100	-11.880	50.000	10.353	6.667	0.000	100	0	QP
153.675	25.623	7.200	-24.377	50.000	11.215	7.208	0.000	200	105	QP
185.867	23.487	3.200	-26.513	50.000	12.976	7.311	0.000	200	265	QP
199.495	26.979	3.500	-23.021	50.000	16.140	7.339	0.000	200	241	QP
625.201	31.464	3.600	-25.536	57.000	19.294	8.570	0.000	100	98	QP

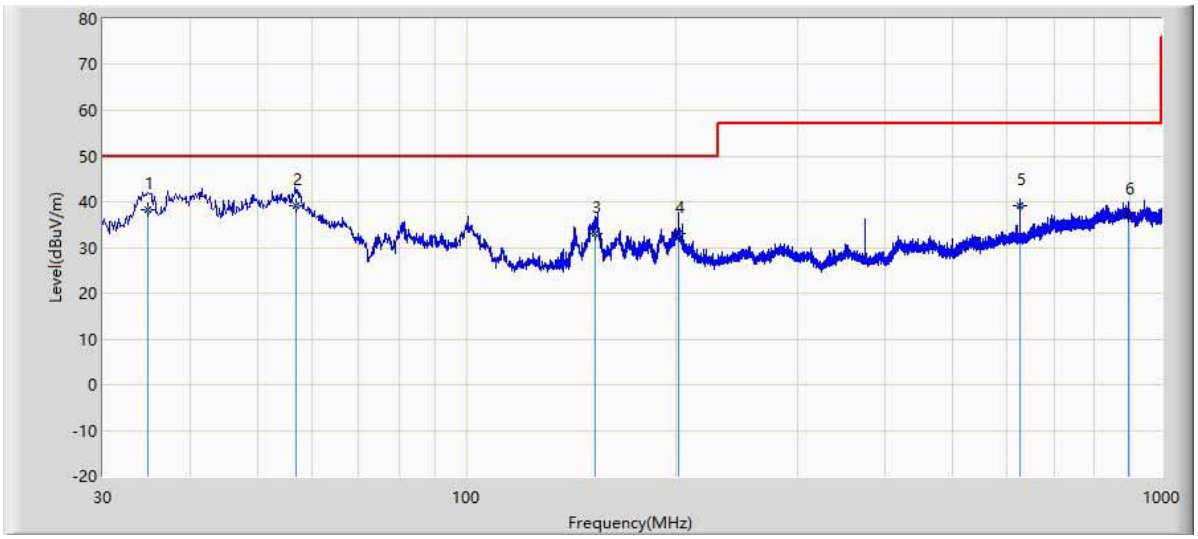
Test Result of Below 1GHz (XGSPON)

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
34.326	30.553	3.200	-19.447	50.000	20.689	6.665	0.000	100	307	QP
80.004	28.770	15.400	-21.230	50.000	6.719	6.651	0.000	400	201	QP
375.013	39.609	15.600	-17.391	57.000	16.142	7.867	0.000	100	249	QP
625.020	44.797	14.100	-12.203	57.000	22.127	8.569	0.000	200	40	QP
831.628	35.168	3.500	-21.832	57.000	22.583	9.086	0.000	120	360	QP
937.554	39.754	7.900	-17.246	57.000	22.529	9.325	0.000	100	7	QP

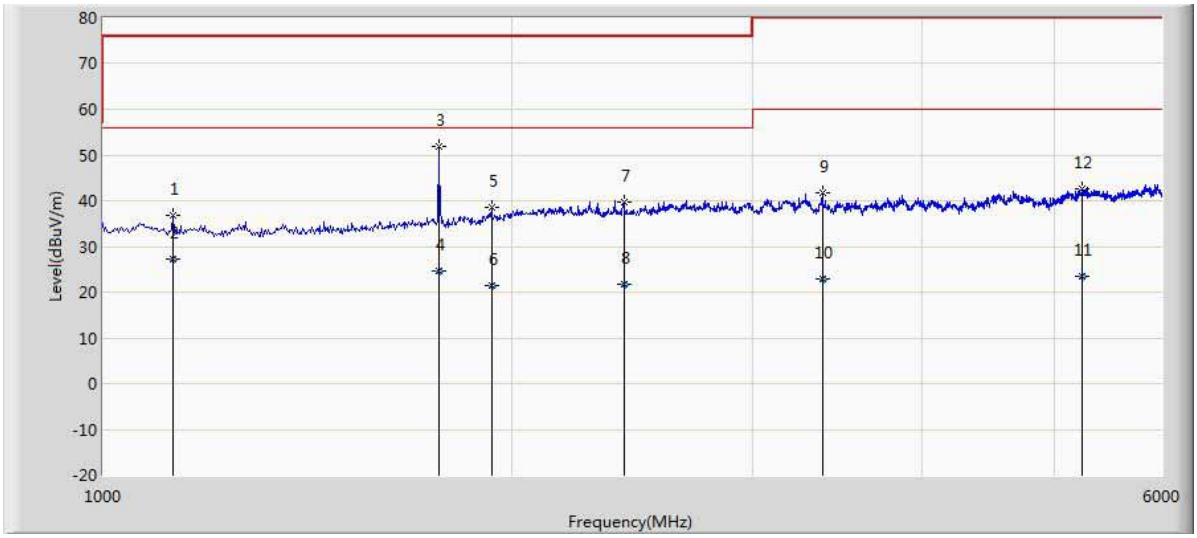
Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
34.778	38.376	15.400	-11.624	50.000	16.307	6.669	0.000	100	25	QP
56.905	39.153	22.100	-10.847	50.000	10.388	6.665	0.000	100	267	QP
153.464	33.100	14.700	-16.900	50.000	11.194	7.206	0.000	100	106	QP
202.282	33.101	9.500	-16.899	50.000	16.250	7.351	0.000	100	1	QP
625.030	39.266	11.400	-17.734	57.000	19.297	8.569	0.000	100	192	QP
895.260	37.207	3.500	-19.793	57.000	24.469	9.238	0.000	200	45	QP

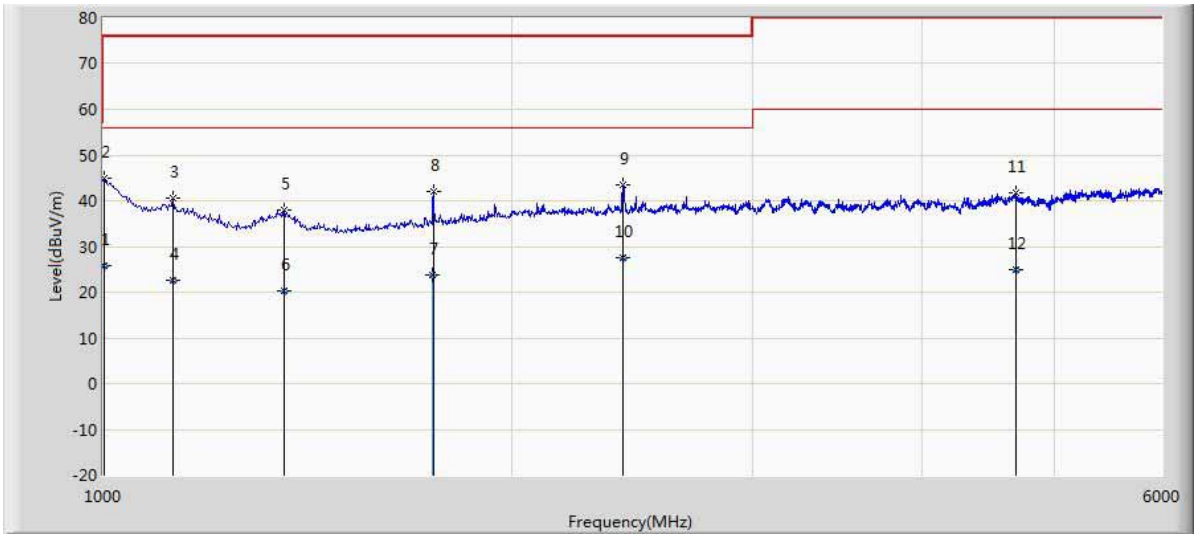
Test Result of Above 1GHz

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1125.000	36.805	46.844	-39.195	76.000	28.525	2.831	41.394	100	267	PK
1125.070	27.358	37.397	-28.642	56.000	28.525	2.831	41.394	100	267	AV
1765.000	51.970	60.249	-24.030	76.000	29.961	3.570	41.810	100	243	PK
1766.190	24.531	32.809	-31.469	56.000	29.970	3.567	41.815	100	243	AV
1930.000	38.690	45.890	-37.310	76.000	31.182	3.724	42.106	100	244	PK
1930.635	21.450	28.649	-34.550	56.000	31.187	3.723	42.109	100	244	AV
2415.000	39.797	45.740	-36.203	76.000	32.198	4.193	42.334	100	96	PK
2415.365	21.710	27.649	-34.290	56.000	32.198	4.198	42.336	100	96	AV
3380.000	41.743	44.661	-38.257	80.000	32.952	5.260	41.130	200	341	PK
3380.646	23.022	25.964	-36.978	60.000	32.952	5.242	41.137	200	341	AV
5247.379	23.405	21.359	-36.595	60.000	34.247	7.192	39.394	200	224	AV
5247.500	42.752	40.706	-37.248	80.000	34.248	7.193	39.395	200	224	PK

Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1002.346	25.748	35.646	-30.252	56.000	28.697	2.659	41.254	100	26	AV
1002.500	44.888	54.786	-31.112	76.000	28.696	2.660	41.254	100	26	PK
1125.000	40.685	50.724	-35.315	76.000	28.525	2.831	41.394	100	75	PK
1125.349	22.607	32.646	-33.393	56.000	28.524	2.832	41.395	100	75	AV
1360.000	37.970	48.220	-38.030	76.000	28.196	3.081	41.526	200	64	PK
1360.456	20.206	30.456	-35.794	56.000	28.195	3.081	41.526	200	64	AV
1746.240	23.771	32.169	-32.229	56.000	29.822	3.586	41.807	100	264	AV
1750.000	42.106	50.450	-33.894	76.000	29.850	3.598	41.792	100	264	PK
2412.500	43.449	49.417	-32.551	76.000	32.195	4.156	42.319	100	263	PK
2413.670	27.485	33.441	-28.515	56.000	32.196	4.173	42.326	100	263	AV
4685.000	41.695	42.038	-38.305	80.000	33.937	6.176	40.456	100	260	PK
4685.349	24.996	25.340	-35.004	60.000	33.937	6.176	40.457	100	260	AV

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

5 IMMUNITY TEST RESULTS

5.1 Electrostatic discharge immunity

Electrostatic discharges (ESD) are the result of persons or objects that accumulate static electricity due to for instance walking on synthetic carpets. The ESD can influence the operation of equipment or damage its electronics, either by a direct discharge or indirectly by coupling or radiation. Both effects are simulated during the tests.

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
Electrostatic Discharge		kV(Charge Voltage)	±8 Air Discharge ±6 Contact Discharge	B

Performed tests

Air discharges	✓	2 kV	✓	4 kV	✓	8 kV		
Contact discharges		2 kV		4 kV	✓	6 kV		
Via coupling planes	✓	Horizontal			✓	Vertical		
Polarity	✓	Positive			✓	Negative		
Set-up	✓	Table-top				Floor standing		
Ambient temperature	24 °C							
Relative Humidity air	48 %							
Mode	Normal Operation							

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.2 Radio frequency electromagnetic field

During the test it is verified if the equipment under test has sufficient immunity against radiated electromagnetic fields. Walkie-talkies, radio transmitters, television transmitters, and telecommunication equipment including cellular telephones and other emitting devices, like industrial electromagnetic sources can generate these fields.

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Radio-Frequency Electromagnetic Field Amplitude Modulated	MHz V/m(Un-modulated, rms) % AM (1kHz)	80-800 10 80	A
	Radio-frequency electromagnetic field, from digital communication devices	MHz V/m(Un-modulated, rms) % AM (1kHz)	800-1000 20 80	A
		MHz V/m(Un-modulated, rms) % AM (1kHz)	1400-2000 10 80	A
		MHz V/m(Un-modulated, rms) % AM (1kHz)	2000-2700 5 80	A
		MHz V/m(Un-modulated, rms) % AM (1kHz)	5100-6000 3 80	A

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	10V/m, 20V/m, 10V/m, 5V/m, 3V/m
2.	Radiated Signal	AM 80% Un-modulated with 1kHz
3.	Scanning Frequency	80 - 800MHz,800-1000MHz,1400-2000MHz, 2000-2700MHz,5100-6000MHz
4.	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

Performed tests

Frequency range	80 - 800MHz, 800-1000MHz, 1400-2000MHz, 2000-2700MHz, 5100-6000MHz
Tested Field strength	10V/m, 20V/m, 10V/m, 5V/m, 3V/m
Dwell time	3 seconds
Test set-up	Full Anechoic Chamber
Mode	Normal Operation

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.3 Fast transients common mode

The EFT immunity test simulates disturbances by bursts of very short transients caused for example by switching off loads such as an AC motor or bouncing relay contacts. The transients are likely to disturb electronics but less likely to cause damage.

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC power ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±2 5/50 5	A
I/O ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±2 5/50 5	A
DC power ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±2 5/50 5	A
Earth ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±1 5/50 5	A

Performed tests

Tested Voltage	2kV; AC input power port 2kV; LAN Port (GE2, GE4, GE6) 1kV; Ground			
Mode	Normal Operation			
Injection method	✓	CDN	✓	Capacitive clamp
Polarity	✓	Positive	✓	Negative
Set-up	✓	Table-top		Floor standing

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.4 Surge

The surge transient immunity test simulates the surges that are caused by overvoltages due to indirect (induced) lightning transients. The pulse is a slow transient with high-energy contents and due to its long duration may cause damage to an unprotected EUT.

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Battery referenced ports (except at the output of energy sources), auxiliary AC power input ports (rated voltage ≤ 400 Vrms)				
	Surges Line to Line Line to Ground	Tr/Th us KV KV Output Impedance Ω Coupling Capacitance μF	1.2/50 (8/20) ± 1 ± 2 42 0.5	B
I/O ports				
	Surges Line to Line Line to Ground (An output impedance of 42 Ω (40 Ω and 2 Ω generator) and a coupling capacitance of 0,5 μF is specified.)	Tr/Th us KV KV Output Impedance Ω Coupling Capacitance μF	1.2/50 (8/20) ± 1 ± 2 42 0.5	B
DC power ports				
	Surges Line to Line Line to Ground (An output impedance of 42 Ω (40 Ω and 2 Ω generator) and a coupling capacitance of 0,5 μF is specified.)	Tr/Th us KV KV	1.2/50 (8/20) ± 1 ± 2	B

Notes:

1) Applicable only to ports which according to the manufacturer's may directly to outdoor cables.
2) Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no immunity test shall be required.

Performed tests

Tested Voltage	1 kV; AC input power port (Line to line) 2 kV; AC input power port (Line to Ground) 1 kV; GE2, GE4, GE6 (Line to line) 2 kV; GE2, GE4, GE6 (Line to Ground)			
Mode	Normal Operation			
Polarity	✓	Positive	✓	Negative

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.5 Radio frequency common mode

During this test the immunity of the equipment for induced or conducted electromagnetic fields is checked. Fields generated by radio and other transmitters cause RF voltages in long cables like the mains network. This test reproduces these induced disturbing voltages by injecting them to the EUT via the cabling.

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC power ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 10 80	A
I/O ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 10 80	A
DC power ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 10 80	A
Earth ports				
	Radio-Frequency Continuous Conducted	MHz V (rms, Un-modulated) % AM (1kHz)	0.15-80 10 80	A

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	10V
2.	Radiated Signal	AM 80% Unmodulated with 1kHz
3.	Scanning Frequency	0.15 - 80MHz
4.	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

Performed tests

Tested level	10 V; AC input power port 10 V; LAN Port (GE2, GE4, GE6) 10 V; Ground			
Mode	Normal Operation			
Frequency range	0,15 – 80 MHz			
Dwell time	3 seconds			
Injection method	✓	CDN-M3	✓	EM clamp

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.6 Power-frequency magnetic field

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port(See Note 1,2)			
Power-frequency magnetic field	16.7 100	Hz A/m (r.m.s)	A
	50 100	Hz A/m (r.m.s)	A
	0 300	Hz A/m (r.m.s)	A
NOTE: 1.Test only applies to apparatus containing devices sensitive to magnetic fields e.g. Hall elements, electro-dynamic microphones etc. Unshielded CRT displays can exhibit interference effects above 1 A/m (rms). Equipment mounted directly on the running rails is not covered as higher field strength may occur. 2. All frequencies have to be tested. Testing time is ≥ 10s			

Performed tests

Mode	Normal Operation					
Tested level	100 A/m		100 A/m		300 A/m	
Frequency	16.7 Hz		50 Hz		0 Hz	
Dwell time	3 seconds					
Test Coil Position	✓	X Axis	✓	Y Axis	✓	Z Axis

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photograph shows the tested device.

Figure 4 Conducted Emission test setup

Figure 5 Radiated Emission test setup (Below 1GHz)

Figure 6 Radiated Emission test setup (Above 1GHz)

----------END----------