

FCC TEST REPORT

FCC ID:OXGAL66RG

Product : Laser Light Projector

Model Name : AL66RG

Brand : **show»lights™**

Report No. : PTC-DQ-01170302402E-FC01

Prepared for

Willis Electric CO.,Ltd.

8F, No.310, Sec.4, Zhongxiao E. Rd., Da'an Dist., Taipei, Taiwan

Prepared by

DongGuan Precise Testing Service Co.,Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community

Dongcheng District, Dongguan, Guangdong, China



TEST RESULT CERTIFICATION

Applicant's name : Willis Electric CO.,Ltd.
Address : 8F, No.310, Sec.4, Zhongxiao E. Rd., Da'an Dist., Taipei, Taiwan
Manufacture's name : Kupoint (DongGuan) Electric Co., Ltd
Address : Huai De Industrial Humen Town Dong Guan City Guang Dong
Provience, China
Product name : Laser Light Projector
Model name : AL66RG
Standards : FCC CFR47 Part 15 B
Test procedure : ANSI C63.4:2014
Test Date : Mar.18, 2017 ~May.25, 2017
Date of Issue : May.25, 2017
Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Testing Engineer

August Qiu

Authorized Signatory

Chris Du



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2 Test Summary

Test procedures according to the technical standards:

EMISSION			
Standard	Item	Result	Remarks
FCC 47 CFR Part 15 Subpart B	Conducted Emission	PASS	Meet Class B limit
	Radiated Emission	PASS	Meet Class B limit
Part 15.111	PASS	Pass	N/A

NOTE:

(1) " N/A" denotes test is not applicable in this Test Report



3 General Information

3.1 General Description of E.U.T.

Product Name : Laser Light Projector

Model Name : AL66RG

Model Description : --

Receiving frequency : 433.92MHz

Receiving Modulation : ASK

Antenna installation: : Integrated Antenna

Antenna Gain: : -0.25dBi

Power supply : Input: AC120V, 50/60Hz 0.6A
Output: DC12.0V,1.0A

Hardware Version : AL66RG _V4

Software Version : AL66RG_V10

3.2 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

During the test, the engineering test program was provide and enabled to make EUT in receiver mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Receiving

	For Radiated Emission
Final Test Mode	Description
Mode 1	Receiving

	For Conducted Emission
Final Test Mode	Description
Mode 1	Receiving

3.3 Test Site

Dongguan Precise Testing Service Co., Ltd.

Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China, Dongguan, 523129 China

FCC Registration Number: 371540



4 Equipment During Test

4.1 Equipments List

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	July 15, 2016	July 14, 2017	1 year
2	EMC Analyzer	Agilent	E4407B	MY45109572	Aug.04, 2016	Aug.03, 2017	1 year
3	Trilog Broadband Antenna	SCHWARZ BECK	VULB9160	9160-3355	July 15, 2016	July 14, 2017	1 year
4	Amplifier	EM	EM-30180	060538	July 15, 2016	July 14, 2017	1 year
5	Horn Antenna	SCHWARZ BECK	BBHA9120 D	9120D-1246	July 15, 2016	July 14, 2017	1 year
6	Loop Antenna	SCHWARZ BECK	FMZB1516	9130D-1243	July 15, 2016	July 14, 2017	1 year
7	3m Anechoic Chamber	CHENGYU	966	PTC-002	June 6, 2016	June 5, 2017	1 year
8	Coaxial Cable(below 1GHz)	LARGE	CALB1	-	July 15, 2016	July 14, 2017	1 year
9	Coaxial Cable(above 1GHz)	LARGE	CALB2	-	July 15, 2016	July 14, 2017	1 year
Conducted Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	R&S	ESCI	101155	July 15, 2016	July 14, 2017	1 year
2	LISN	SCHWARZ BECK	NSLK 8128	8128-289	July 15, 2016	July 14, 2017	1 year
3	Cable	LARGE	RF300	-	July 15, 2016	July 14, 2017	1 year

Note : Adapter information

Model:K12F120100U

Input:120V-50/60Hz 0.35A

Output:12V-1A



4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

5 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.107

Test Method: : ANSI C63.4:2014

Test Result: : PASS

Frequency Range: : 150kHz to 30MHz

Class/Severity: : Class B

Limit: : 66-56 dB μ V between 0.15MHz & 0.5MHz
: 56 dB μ V between 0.5MHz & 5MHz
: 60 dB μ V between 5MHz & 30MHz

Detector: : Peak for pre-scan(9kHz Resolution Bandwidth)

5.1 E.U.T. Operation

Operating Environment :

Temperature: : 25.5 °C

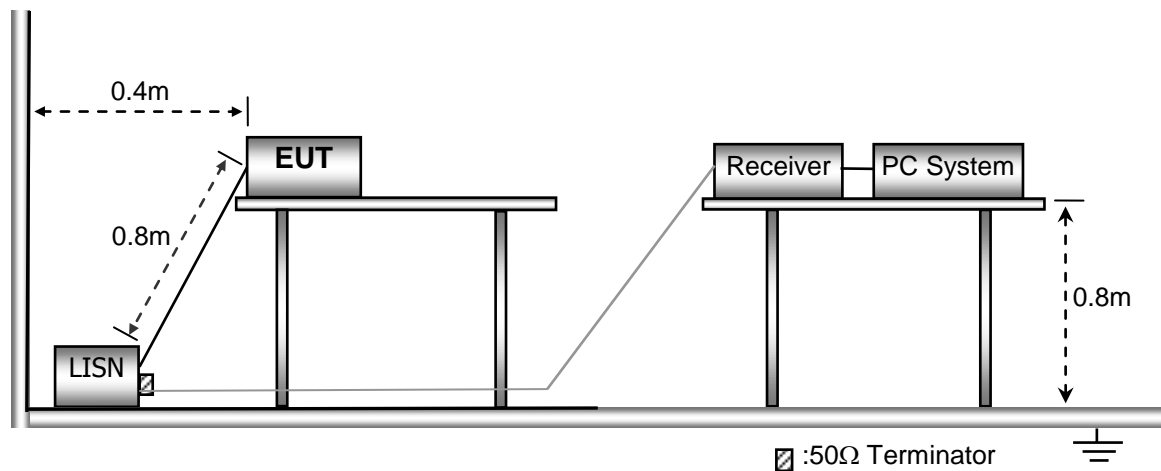
Humidity: : 51 % RH

Atmospheric Pressure: : 101.2kPa

EUT Operation : : Receiver mode
Input: AC 120V 60Hz

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2014.





5.3 Measurement Description

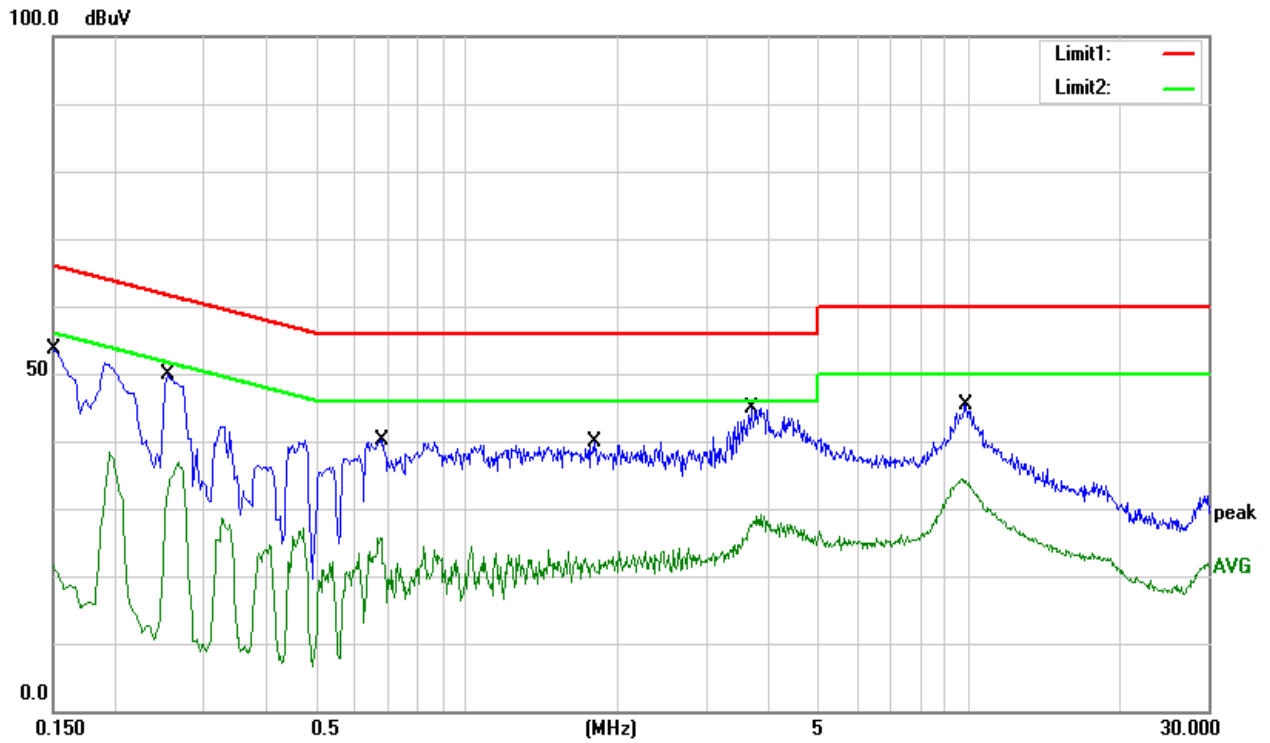
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

Remark: emission level= AMN factor+ Cable Loss +Receiver reading



5.4 Conducted Emission Test Result

N



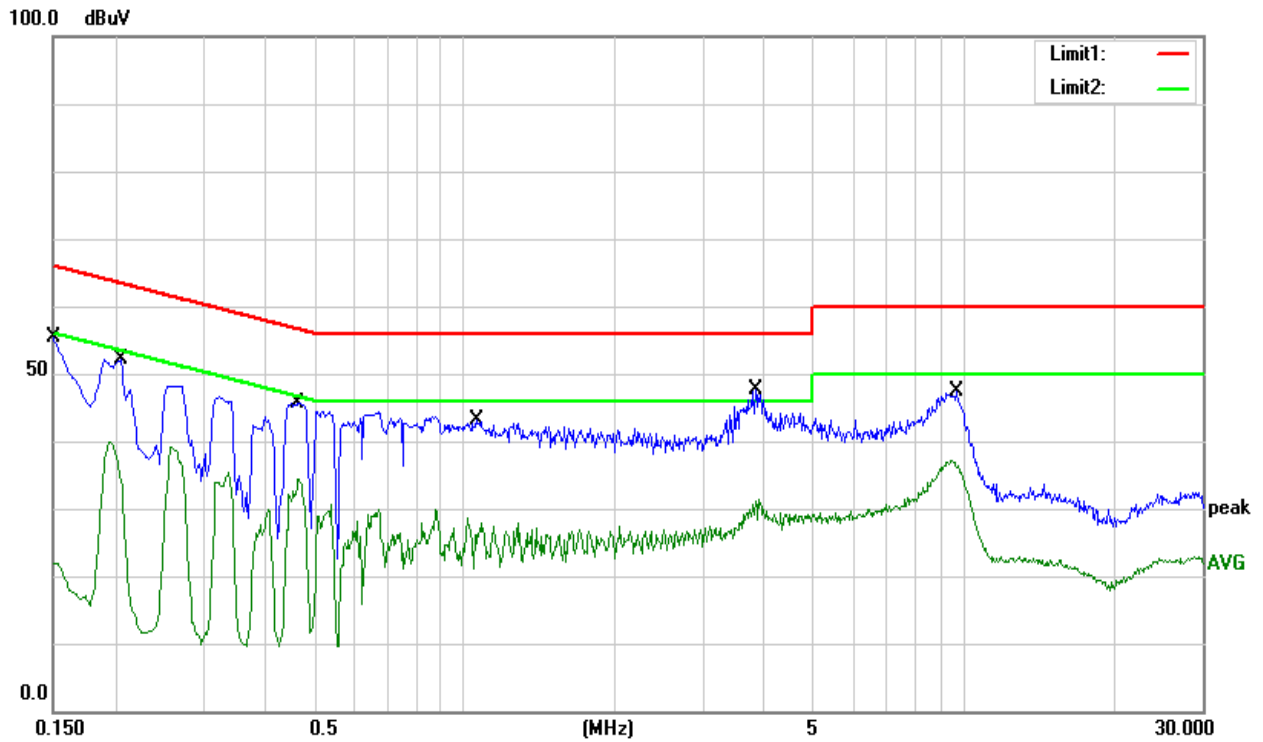
Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) – Limit

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1500	42.40	11.20	53.60	66.00	-12.40	QP
0.1500	10.43	11.20	21.63	56.00	-34.37	AVG
0.2540	39.85	9.95	49.80	61.63	-11.83	QP
0.2540	26.89	9.95	36.84	51.63	-14.79	AVG
0.6820	30.26	9.99	40.25	56.00	-15.75	QP
0.6820	15.61	9.99	25.60	46.00	-20.40	AVG
1.7980	29.76	10.00	39.76	56.00	-16.24	QP
1.7980	12.80	10.00	22.80	46.00	-23.20	AVG
3.6980	34.73	10.19	44.92	56.00	-11.08	QP
3.6980	18.06	10.19	28.25	46.00	-17.75	AVG
9.9100	35.29	10.20	45.49	60.00	-14.51	QP
9.9100	24.11	10.20	34.31	50.00	-15.69	AVG



L



Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) – Limit

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1500	44.13	11.20	55.33	66.00	-10.67	QP
0.1500	10.78	11.20	21.98	56.00	-34.02	AVG
0.2060	42.04	9.99	52.03	63.37	-11.34	QP
0.2060	28.37	9.99	38.36	53.37	-15.01	AVG
0.4660	35.57	10.00	45.57	56.58	-11.01	QP
0.4660	24.31	10.00	34.31	46.58	-12.27	AVG
1.0580	33.23	9.91	43.14	56.00	-12.86	QP
1.0580	17.97	9.91	27.88	46.00	-18.12	AVG
3.8300	37.33	10.20	47.53	56.00	-8.47	QP
3.8300	21.11	10.20	31.31	46.00	-14.69	AVG
9.6860	37.13	10.26	47.39	60.00	-12.61	QP
9.6860	26.99	10.26	37.25	50.00	-12.75	AVG



6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.109
 Test Method: : ANSI C63.4:2014
 Test Result: : PASS
 Measurement Distance: : 3m
 Limit: : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

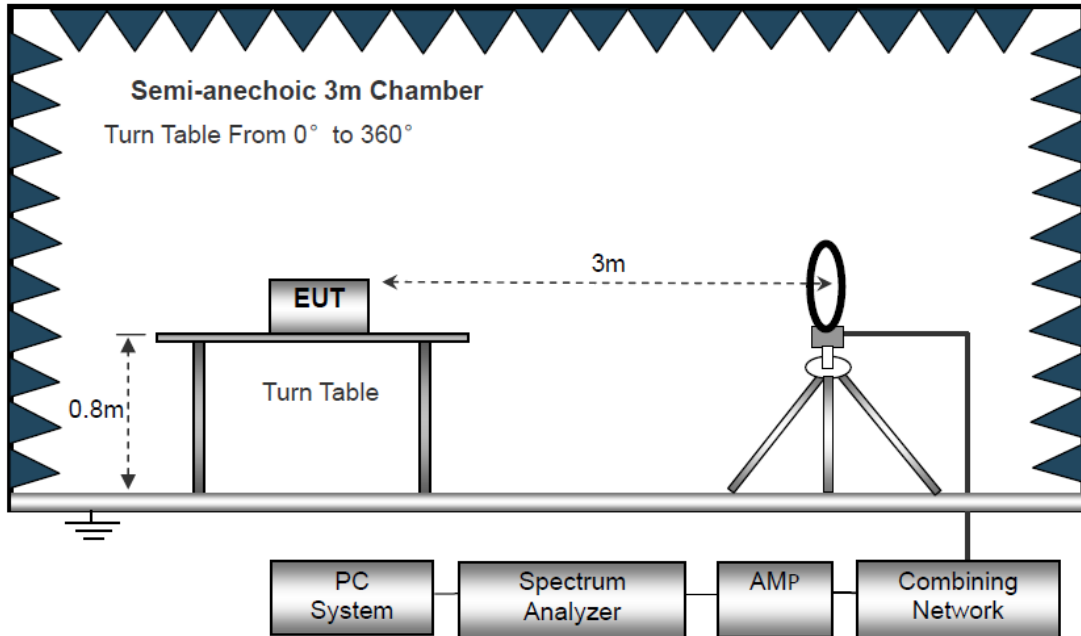
6.1 EUT Operation

Operating Environment :
 Temperature: : 23.5 °C
 Humidity: : 51.1 % RH
 Atmospheric Pressure: : 101.2kPa
 : Receiver mode
 EUT Operation :
 Input: AC 120V 60Hz

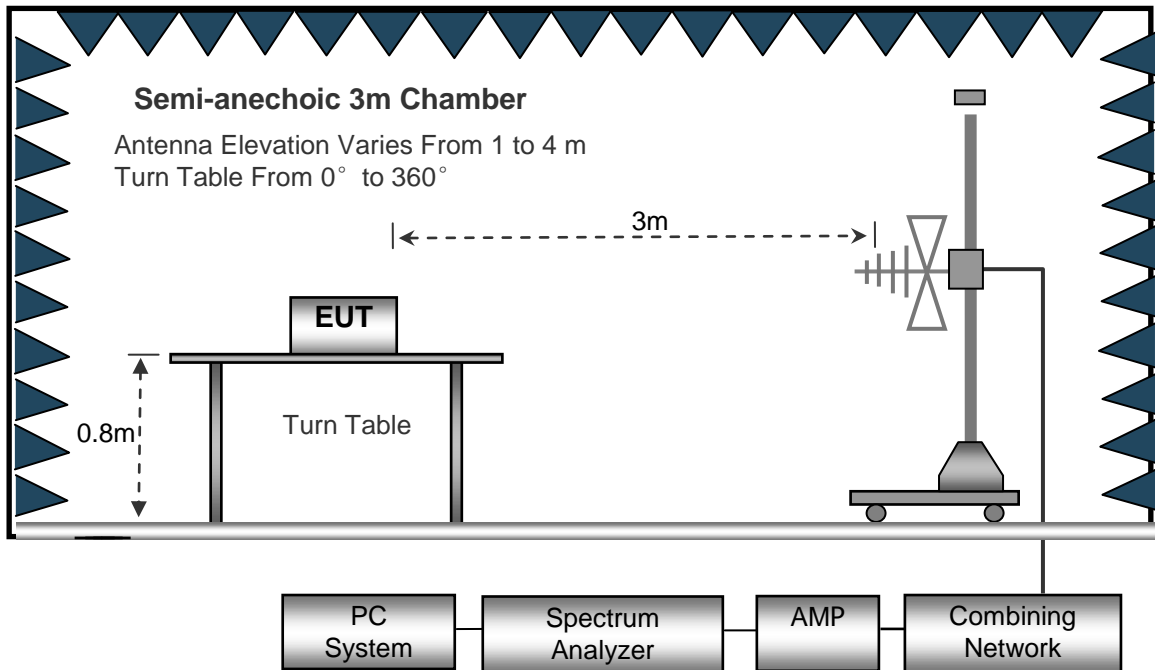
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

The test setup for emission measurement below 30MHz.

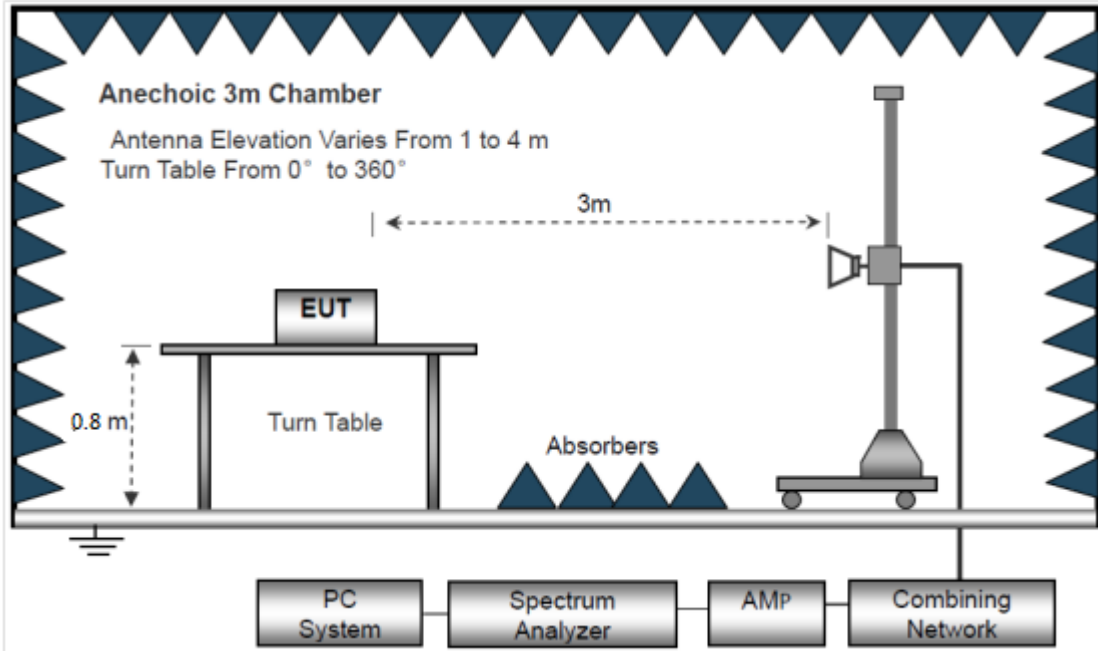


The test setup for emission measurement from 30 MHz to 1 GHz.





The test setup for emission measurement above 1 GHz.





6.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed..... Auto
 IF Bandwidth..... 10kHz
 Video Bandwidth 10kHz
 Resolution Bandwidth 10kHz

30MHz ~ 1GHz

Sweep Speed..... Auto
 Detector..... PK
 Resolution Bandwidth 100kHz
 Video Bandwidth 300kHz

Above 1GHz

Sweep Speed..... Auto
 Detector..... PK
 Resolution Bandwidth 1MHz
 Video Bandwidth 3MHz
 Detector..... Ave.
 Resolution Bandwidth 1MHz
 Video Bandwidth 10Hz



6.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. In the frequency above 1GHz, Place the measurement antenna 3m away from the EUT for each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



6.5 TEST RESULTS

(Radiated Emission<30MHz (9KHz-30MHz, H-field))

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Polarization:	--
Test Mode:	Mode 1		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

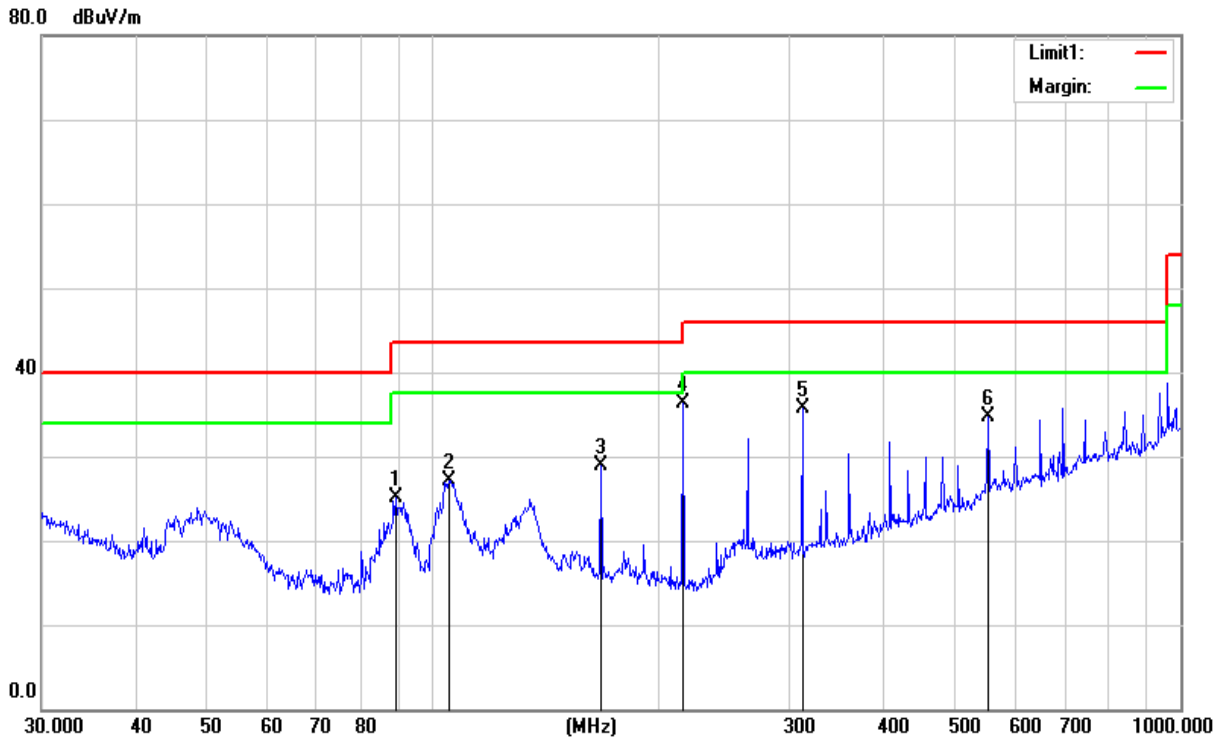
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuV) + distance extrapolation factor.



H



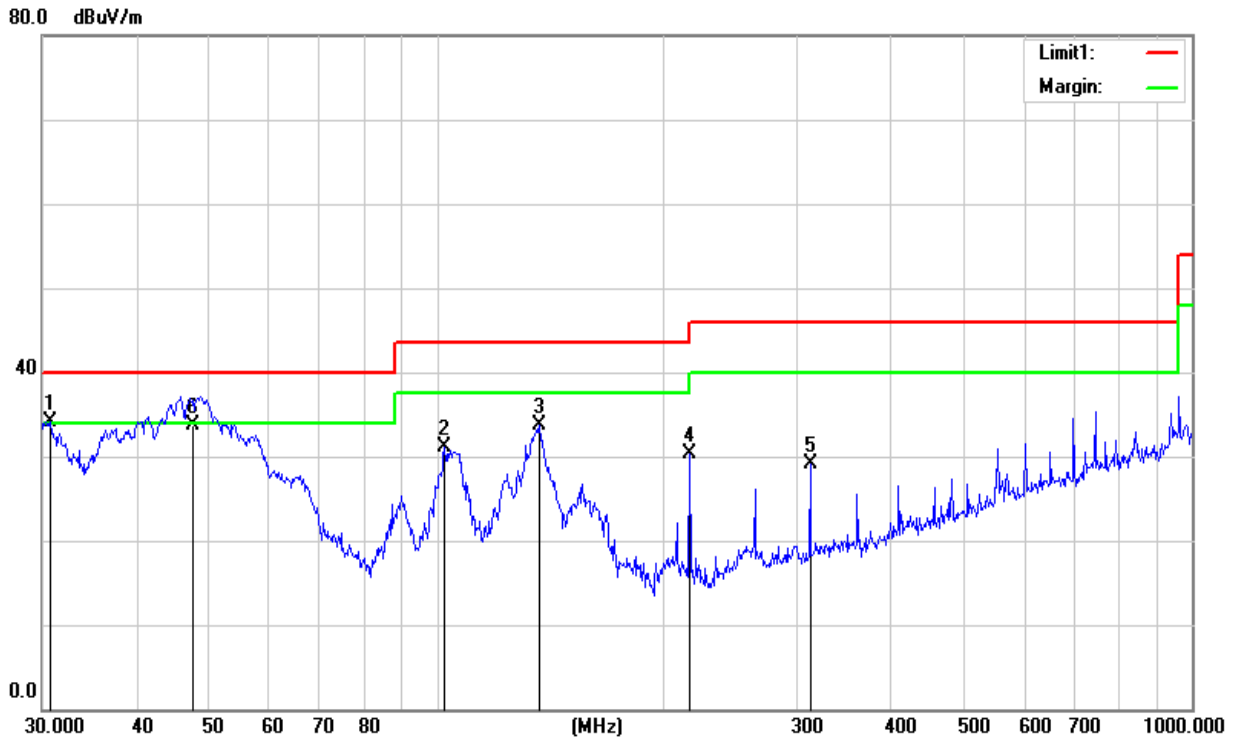
Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
89.2764	15.65	9.43	25.08	43.50	-18.42	QP
105.2718	15.80	11.22	27.02	43.50	-16.48	QP
167.8243	18.15	10.75	28.90	43.50	-14.60	QP
216.0240	26.18	10.09	36.27	46.00	-9.73	QP
312.1794	20.62	15.10	35.72	46.00	-10.28	QP
552.8832	12.20	22.57	34.77	46.00	-11.23	QP



V



Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
30.7455	15.81	18.31	34.12	40.00	-5.88	QP
102.3597	20.11	10.96	31.07	43.50	-12.43	QP
136.4598	21.25	12.55	33.80	43.50	-9.70	QP
216.0240	20.24	10.09	30.33	46.00	-15.67	QP
312.1794	14.00	15.10	29.10	46.00	-16.90	QP
47.5941	24.24	9.38	33.62	40.00	-6.38	QP



Above 1GHz

PK

Freq.	Ant. Pol	Peak	Amplifier	Loss	Antenna Factor	Corrected Factor	Actual Fs	Peak	Peak
(MHz)	H/V	Reading (dBuV)	(dB)	(dB)	(dB/m)	(dB)	Peak (dBuV/m)	Limit (dBuV/m)	margin (dBuV/m)
2062.8	H	57.64	43.8	5.4	25.9	-12.5	45.14	74.00	-28.86
2506.1	H	52.32	44.4	6.0	27.6	-10.8	41.52	74.00	-32.48
3052.2	H	63.85	44.7	6.7	28.2	-9.8	54.05	74.00	-19.95
3533.3	H	52.89	44.4	7.1	28.5	-8.8	44.09	74.00	-29.91
N/A									
2062.8	V	52.76	43.8	5.4	25.9	-12.5	40.26	74.00	-33.74
2506.1	V	49.64	44.4	6.0	27.6	-10.8	38.84	74.00	-35.16
3052.2	V	63.64	44.7	6.7	28.2	-9.8	53.84	74.00	-20.16
3533.3	V	49.69	44.4	7.1	28.5	-8.8	40.89	74.00	-33.11
N/A									

AV

Freq.	Ant. Pol	AV	Amplifier	Loss	Antenna Factor	Corrected Factor		AV	AV
(MHz)	H/V	Reading (dBuV)	(dB)	(dB)	(dB/m)	(dB)	AV (dBuV/m)	Limit (dBuV/m)	margin (dBuV/m)
2062.8	H	41.32	43.8	5.4	25.9	-12.5	28.82	54.00	-25.18
2506.1	H	38.65	44.4	6.0	27.6	-10.8	27.85	54.00	-26.15
3052.2	H	42.53	44.7	6.7	28.2	-9.8	32.73	54.00	-21.27
3533.3	H	38.32	44.4	7.1	28.5	-8.8	29.52	54.00	-24.48
N/A									
2062.8	V	37.73	43.8	5.4	25.9	-12.5	25.23	54.00	-28.77
2506.1	V	33.35	44.4	6.0	27.6	-10.8	22.55	54.00	-31.45



3052.2	V	55.74	44.7	6.7	28.2	-9.8	45.94	54.00	-8.06
3533.3	V	34.53	44.4	7.1	28.5	-8.8	25.73	54.00	-28.27
N/A									

Notes:

1. Measuring frequencies from 1 GHz to 6GHz.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
3. The frequency that above 3GHz is mainly from the environment noise.



7 15.111(a) Required

7.1 APPLIED PROCEDURES / LIMIT

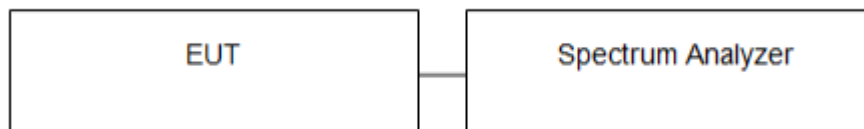
The antenna conducted power of the receiver as defined in §15.111 shall not exceed the values given in the following tables.

Frequency Range	9 KHz to 2.5GHz
Limit	2.0 nW (-57 dBm)

7.2 MEASURING PROCEDURES

1. The receiver antenna terminal connected to a spectrum analyzer.
2. The test data of the worst case condition (mode 1) was reported on the following Data page.

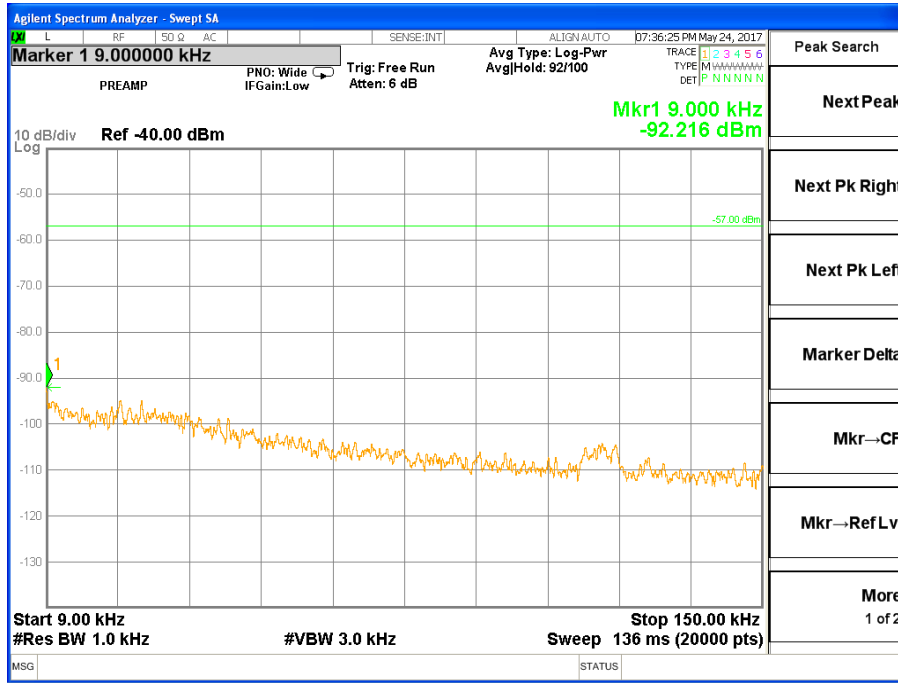
7.3 TEST CONFIGURATION



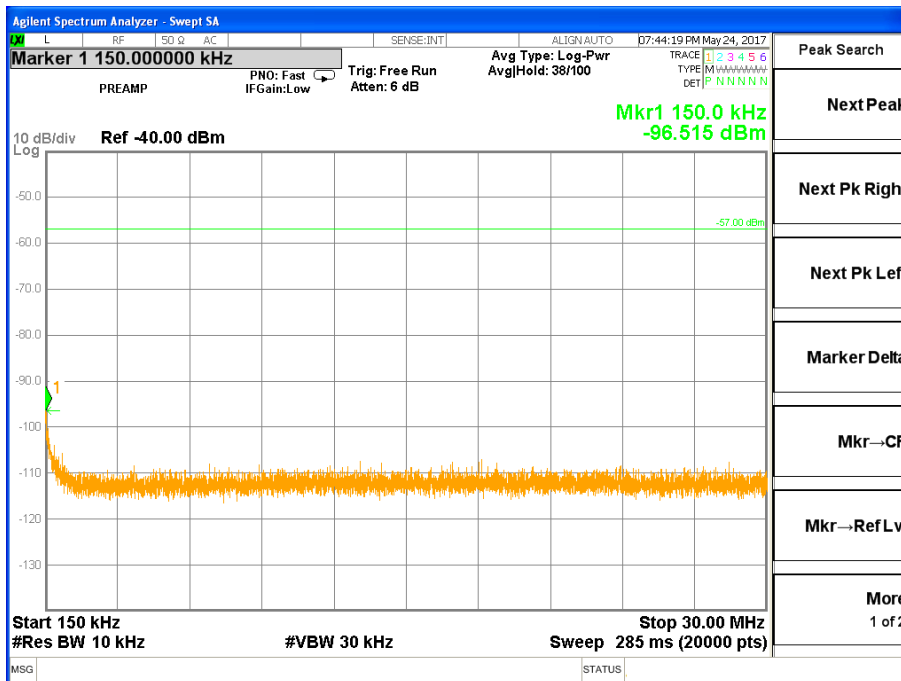


7.4 Test Result

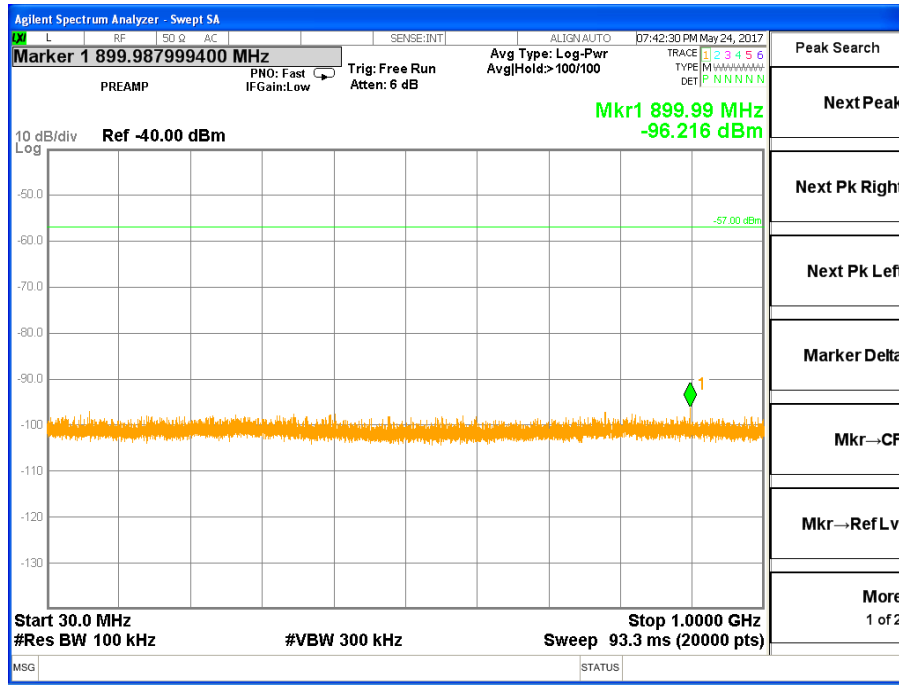
Conducted Measurement (9 KHz to 150 KHz)



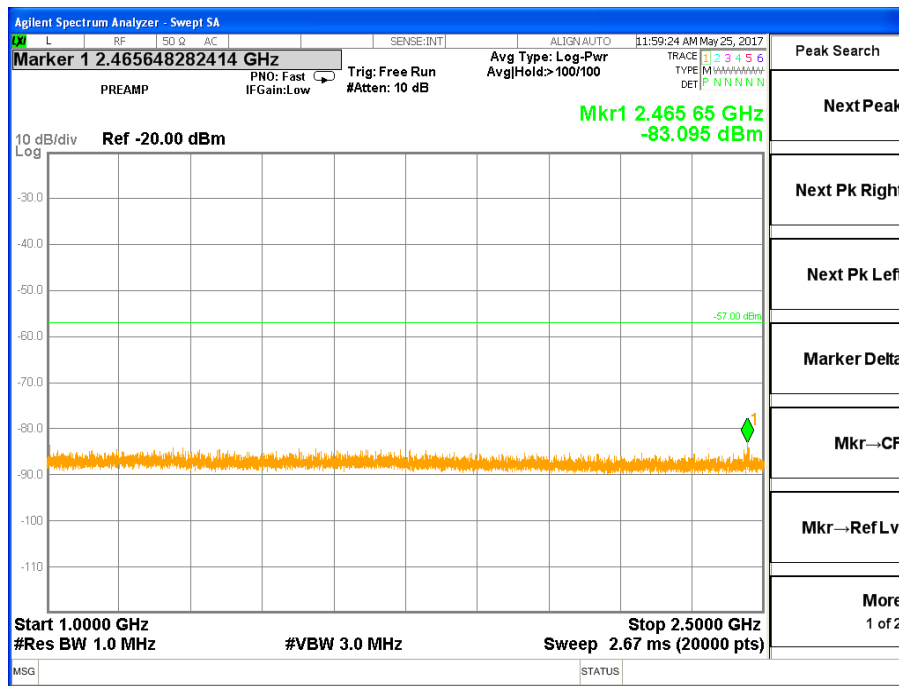
Conducted Measurement (150 KHz to 30 MHz)



Conducted Measurement (30 MHz to 1 GHz)



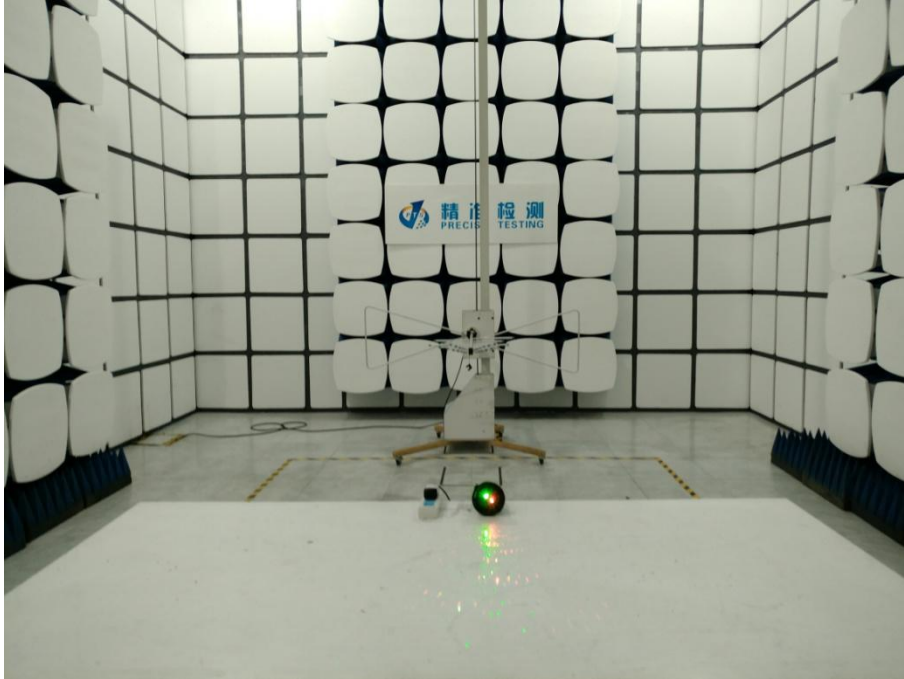
Conducted Measurement (1 GHz to 2 GHz)



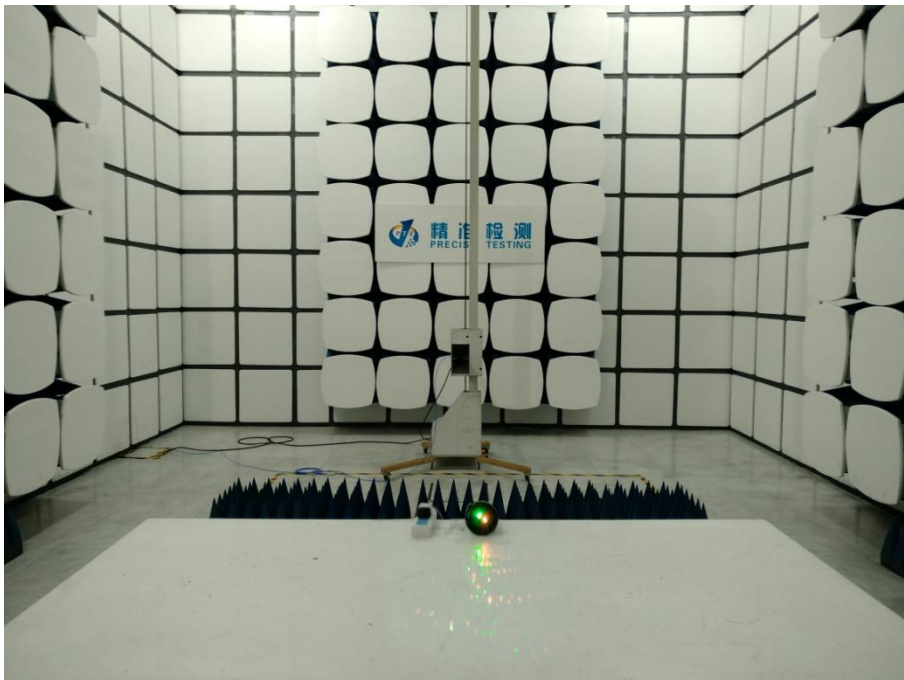


8 Test Setup

Spurious Emissions
From 30MHz-1000MHz

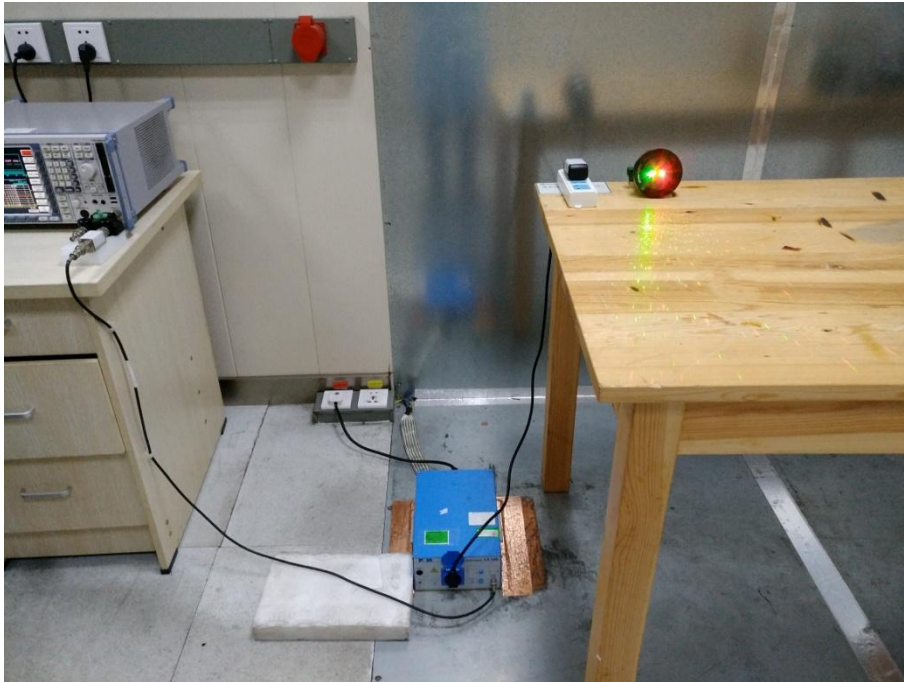


Above 1GHz





Conducted Emissions



*****THE END REPORT*****