

# FCC TEST REPORT

For

**Rectifier**

**Model Number: R48-2000C2**

**FCC ID: 2AZ96-ESR48B**

**Report Number : WT218001320**

Test Laboratory : Shenzhen Academy of Metrology and Quality Inspection  
Site Location : NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China  
Tel : 0086-755-86928965  
Fax : 0086-755-86009898-31396  
Web : [www.smq.com.cn](http://www.smq.com.cn)  
E-mail : [emcrf@smq.com.cn](mailto:emcrf@smq.com.cn)

## TEST REPORT DECLARATION

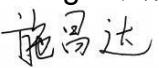
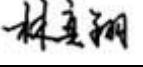
Applicant : Vertiv Tech Co., Ltd  
Address : 1-4F, 6-10F, Block B2, Nanshan I Park, No.1001 Xueyuan Road, Nanshan District, Shenzhen, Guangdong, China  
Manufacturer : Vertiv Tech Co., Ltd  
Address : 1-4F, 6-10F, Block B2, Nanshan I Park, No.1001 Xueyuan Road, Nanshan District, Shenzhen, Guangdong, China  
EUT Description : Rectifier  
Model No. : R48-2000C2  
Trade mark : /  
Serial Number : /  
FCC ID : 2AZ96-ESR48B

Test Standards:

### FCC Part 15 Subpart B (2020)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer:		Date:	Mar.11, 2022
	(Zhou Fangai 周芳媛)		
Checked by:		Date:	Mar.11, 2022
	(Shi Changda 施昌达)		
Approved by:		Date:	Mar.11, 2022
	(Lin Yixiang 林奕翔)		

## TABLE OF CONTENTS

<b>TEST REPORT DECLARATION.....</b>	<b>2</b>
<b>1. TEST RESULTS SUMMARY.....</b>	<b>4</b>
<b>2. GENERAL INFORMATION .....</b>	<b>5</b>
2.1. Report information.....	5
2.2. Laboratory Accreditation and Relationship to Customer .....	5
2.3. Measurement Uncertainty .....	5
<b>3. PRODUCT DESCRIPTION.....</b>	<b>7</b>
3.1. EUT Description .....	7
3.2. Block Diagram of EUT Configuration.....	7
3.3. Operating Condition of EUT .....	7
3.4. Support Equipment List .....	7
3.5. Test Conditions .....	7
3.6. Modifications .....	7
<b>4. TEST EQUIPMENT USED.....</b>	<b>9</b>
4.1. Test Equipment Used to Measure Conducted Emission .....	9
4.2. Test Equipment Used to Measure Radiated Emission .....	9
<b>5. CONDUCTED EMISSION TEST.....</b>	<b>10</b>
5.1. Test Standard and Limit .....	10
5.2. Test Procedure.....	10
5.3. Test Arrangement.....	10
5.4. Test Data.....	10
<b>6. RADIATION EMISSION TEST.....</b>	<b>13</b>
6.1. Test Standard and Limit .....	13
6.2. Test Procedure.....	13
6.3. Test Arrangement.....	13
6.4. Test Data.....	14

## 1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	FCC Rules	Test Results
Conducted Emission	15.107	Pass
Radiation Emission	15.109	Pass

Remark: "N/A" means "Not applicable."

## **2. GENERAL INFORMATION**

### **2.1. Report information**

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

The lab will not be liable for any loss or damage resulting for false, inaccurate, inappropriate or incomplete product information provided by the applicant/manufacturer.

### **2.2. Laboratory Accreditation and Relationship to Customer**

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Innovation, Science and Economic Development (ISED), and the registration number is 11177A.

The Laboratory is registered to perform emission tests with VCCI, and the registration number are C-20048, G20076, R-20077, R-20078 and T-20047.

The Laboratory is Accredited Testing Laboratory of American Association for Laboratory Accreditation (A2LA) and certificate number is 3292.01.

### **2.3. Measurement Uncertainty**

Conducted Emission

9 kHz~150 kHz U=3.7dB k=2  
150 kHz~30MHz U=3.3dB k=2

Radiated Emission  
30MHz~1000MHz U=4.3dB k=2  
1GHz~6GHz U=4.6 dB k=2  
6GHz~40GHz U=5.1dB k=2

### 3. PRODUCT DESCRIPTION

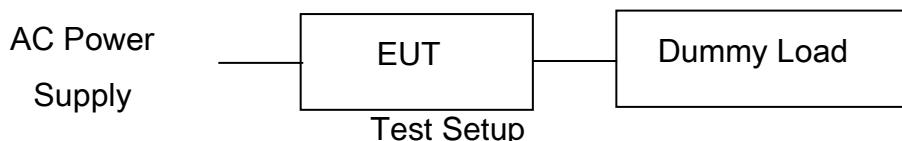
NOTE: The extreme test conditions for temperature and antenna gain were declared by the manufacturer.

#### 3.1. EUT Description

Description : Rectifier  
Manufacturer : Vertiv Tech Co., Ltd  
Model Number : R48-2000C2  
Operating voltage : AC100V-250V,50/60Hz Max 17A  
DC150V-380V Max 15A  
Test voltage : AC 120V/60Hz  
Software Version : V6.0  
Hardware Version : A01  
Frequency : BT:2402MHz~2480MHz  
Type(s) of Modulation : Bluetooth: GFSK  
Antenna Type : FPC Antenna: 3.4dBi

Remark: --

#### 3.2. Block Diagram of EUT Configuration



#### 3.3. Operating Condition of EUT

Test mode 1: Full load

EUT has more than one typical operation, only the worst test mode will be recorded in this report.

The Radiated emission measurements were carried out in semi-anechoic chamber with 10-meter and full-anechoic with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission (X plane).

#### 3.4. Support Equipment List

Table 2 Support Equipment List

Name	Model No.	S/N	Manufacturer
---	---	---	---

#### 3.5. Test Conditions

Date of test : Feb.26, 2022

Date of EUT Receive : May.07, 2021

Temperature: 20°C

Relative Humidity: 48-50%

### **3.6. Modifications**

No modification was made.

## 4. TEST EQUIPMENT USED

### 4.1. Test Equipment Used to Measure Conducted Emission

Table 3 Conducted Emission Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB9058/05	Test Receiver	R&S	ESCI 3	Sep.24,2021	1 Year
SB4357	AMN	R&S	ENN216	Aug.25,2021	1 Year
SB9549	Shielded Room	Albatross	SR	Sep.24,2021	1 Year

### 4.2. Test Equipment Used to Measure Radiated Emission

Table 4 Radiated Emission Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB18806	EMI Test Receiver	R&S	ESW8	Mar.30,2021	1 Year
SB9054/07	Broadband Antenna	Schwarzbeck	VULB 9163	Dec.30,2021	1 Year
SB9054/09	Horn Antenna	R&S	HF907	Aug.25,2021	1 Year
SB9557	Anechoic Chamber	Albatross	22*13.3*8.5 5(m)	Aug.25,2021	1 Year

## 5. CONDUCTED EMISSION TEST

### 5.1. Test Standard and Limit

#### 5.1.1. Test Standard

FCC Part 15: Section 15.107

#### 5.1.2. Test Limit

Table 5 Conducted Emission Test Limit (Class B)

Frequency	Power Port limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15MHz ~ 0.5MHz	66~56*	56~46*
0.5MHz ~ 5 MHz	56	46
5 MHz ~ 30MHz	60	50

\* Decreasing linearly with logarithm of the frequency

### 5.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver is used to test the emissions from both sides of AC line. The bandwidth of EMI test receiver is set at 9kHz.

### 5.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

### 5.4. Test Data

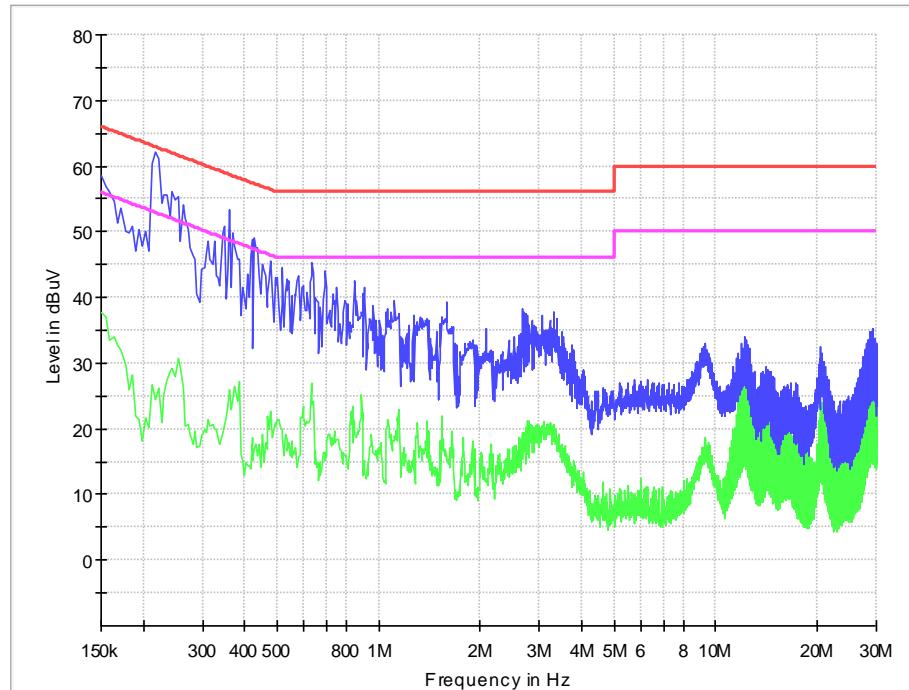
The emissions don't show in below are too low against the limits. Refer to the test curves.

Table 6 Conducted Emission Test Data at mains Port

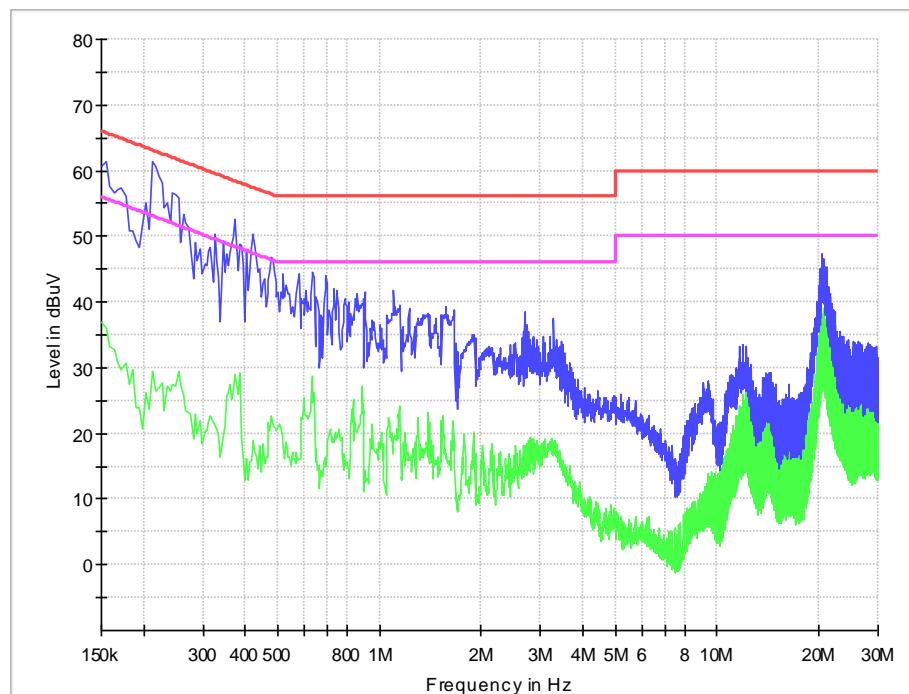
Test mode: 1								
	Frequency (MHz)	Correction Factor (dB)	Quasi-Peak			Average		
			Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)	Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)
Line	0.150	9.7	46.4	56.1	66	28.0	37.7	56
	0.217	9.7	44.1	53.8	62.9	15.0	24.7	52.9
	0.361	9.7	32.6	42.3	58.7	14.5	24.2	48.7
	0.429	9.7	29.6	39.3	57.3	6.1	15.8	47.3
	0.636	9.8	26.6	36.4	56	15.2	25.0	46
	0.852	9.8	25.0	34.8	56	9.1	18.9	46
Neutral	0.154	9.7	42.5	52.2	65.8	24.8	34.5	55.8
	0.213	9.7	43.8	53.5	63.1	18.1	27.8	53.1
	0.244	9.7	39.5	49.2	62.0	17.4	27.1	52.0
	0.370	9.7	31.2	40.9	58.5	17.5	27.2	48.5
	0.482	9.7	30.6	40.3	56.3	11.6	21.3	46.3
	20.636	10.2	30.7	40.9	60	26.5	36.7	50

REMARKS: 1. Emission level (dB $\mu$ V) =Read Value (dB $\mu$ V) + Correction Factor (dB)  
 2. Correction Factor (dB) =LISN Factor (dB) + Cable Factor (dB) +Limiter Factor (dB)  
 3. The other emission levels were more than 20dB below the limits.

## Line



## Neutral



## 6. RADIATION EMISSION TEST

### 6.1. Test Standard and Limit

#### 6.1.1. Test Standard

FCC Part 15: Section 15.109

#### 6.1.2. Test Limit

Table 7 Radiation Emission Test Limit for FCC (Class B)

Frequency	Test distance	Limit dB( $\mu$ V/m)		
		Quasi-peak	Average	Peak
30MHz~88MHz	<b>10m</b>	30		
88MHz~216MHz	<b>10m</b>	33.5		
216MHz~960MHz	<b>10m</b>	36		
960MHz~1000MHz	<b>10m</b>	44		
>1000MHz	<b>3m</b>		54	74

Conditional testing procedure for above 1 GHz :

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705~108	1000
108~500	2000
500~1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

\* The lower limit shall apply at the transition frequency.

### 6.2. Test Procedure

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set **3 meters or 10 meters** away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

RBW = 100 kHz (less than or equal to 1 GHz); 1 MHz (above 1 GHz)

VBW  $\geq$  3 x RBW

Detector = Peak & Quasi-Peak (frequency range 30 MHz to 1 GHz);

Peak & Average (frequency range above 1 GHz);

Changing VBW to 10 Hz for average measurement

The use of a higher-than-specified video bandwidth produces a conservative measurement result.

### 6.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in

a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

#### 6.4. Test Data

The emissions don't show in below are too low against the limits. Refer to the test curves.

Table 8 Radiated Emission Test Data

Test mode: 1								
Frequency (MHz)	Cable Loss +preamp (dB)	Antenna Factor (dB)	Reading (dB $\mu$ V/m)	Level (dB $\mu$ V/m)	Polarity (Horizontal/Vertical)	Limits (dB $\mu$ V/m)	Margin (dB)	Note
40.767	0.7	13.6	3.2	17.5	Horizontal	30	12.5	QP
46.150	0.8	13.6	4.3	18.7	Horizontal	30	11.3	QP
76.705	1.0	7.8	9.3	18.1	Horizontal	30	11.9	QP
299.999	2.1	12.7	11.8	26.6	Horizontal	36	9.4	QP
519.995	2.8	16.6	6.9	26.3	Horizontal	36	9.7	QP
599.972	3.1	16.6	13.0	32.7	Horizontal	36	3.3	QP
46.684	0.8	13.6	7.1	21.5	Vertical	30	8.5	QP
76.899	1.0	7.8	19.7	28.5	Vertical	30	1.5	QP
159.980	1.4	8.3	18.8	28.5	Vertical	33.5	5.0	QP
279.699	1.9	12.1	14.0	28.0	Vertical	36	8.0	QP
319.981	2.0	13.1	12.0	27.1	Vertical	36	8.9	QP
599.972	3.1	16.6	13.6	33.3	Vertical	36	2.7	QP
1123.420	-41.1	24.4	34.8	18.1	Vertical	74	55.9	PK
1533.120	-40.6	25.1	33.4	17.9	Vertical	74	56.1	PK
2400.460	-40.3	28.6	32.6	20.9	Vertical	74	53.1	PK
4386.060	-39.4	33.6	31.7	25.9	Vertical	74	48.1	PK
6393.420	-34.7	34.7	25.1	25.1	Vertical	74	48.9	PK
17766.800	-31.4	43.1	29.7	41.4	Vertical	74	32.6	PK
1049.980	-41.2	24.4	33.3	16.5	Horizontal	74	57.5	PK
1599.930	-40.6	25.1	34.1	18.6	Horizontal	74	55.4	PK
2405.050	-40.3	28.6	33.5	21.8	Horizontal	74	52.2	PK
3084.030	-39.2	30.4	29.7	20.9	Horizontal	74	53.1	PK
4413.770	-39.2	33.7	31.2	25.7	Horizontal	74	48.3	PK
17729.700	-31.4	43.1	29.8	41.5	Horizontal	74	32.5	PK
1123.420	-41.1	24.4	26.6	9.9	Vertical	54	44.1	AV
1533.120	-40.6	25.1	22.8	7.3	Vertical	54	46.7	AV
2400.460	-40.3	28.6	20.5	8.8	Vertical	54	45.2	AV
4386.060	-39.4	33.6	18.4	12.6	Vertical	54	41.4	AV
6393.420	-34.7	34.7	11.0	11.0	Vertical	54	43.0	AV
17766.800	-31.4	43.1	14.6	26.3	Vertical	54	27.7	AV
1049.980	-41.2	24.4	24.4	7.6	Horizontal	54	46.4	AV

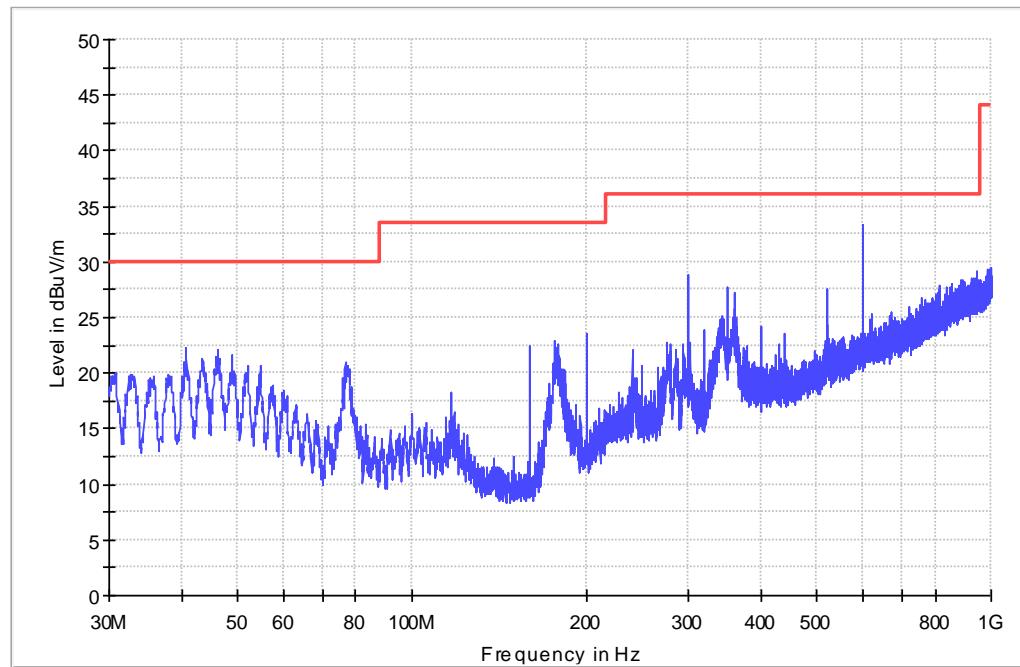
1599.930	-40.6	25.1	24.1	8.6	Horizontal	54	45.4	AV
2405.050	-40.3	28.6	21.7	10.0	Horizontal	54	44.0	AV
3084.030	-39.2	30.4	18.1	9.3	Horizontal	54	44.7	AV
4413.770	-39.2	33.7	18.5	13.0	Horizontal	54	41.0	AV
17729.700	-31.4	43.1	15.9	27.6	Horizontal	54	26.4	AV

Emission level (dBuV) =Read Value (dBuV/m) + Antenna Factor (dB) + Cable Loss +preamp (dB)

30MHz-1GHz

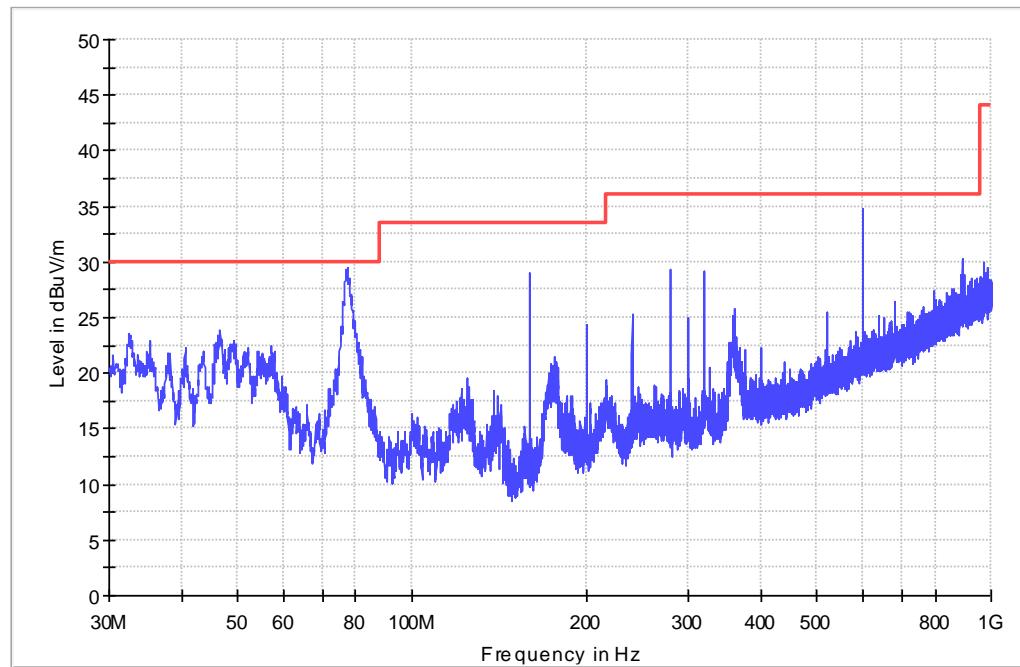
Horizontal

ESR 26 Normal Sweep\_6mTT 10m distance



Vertical

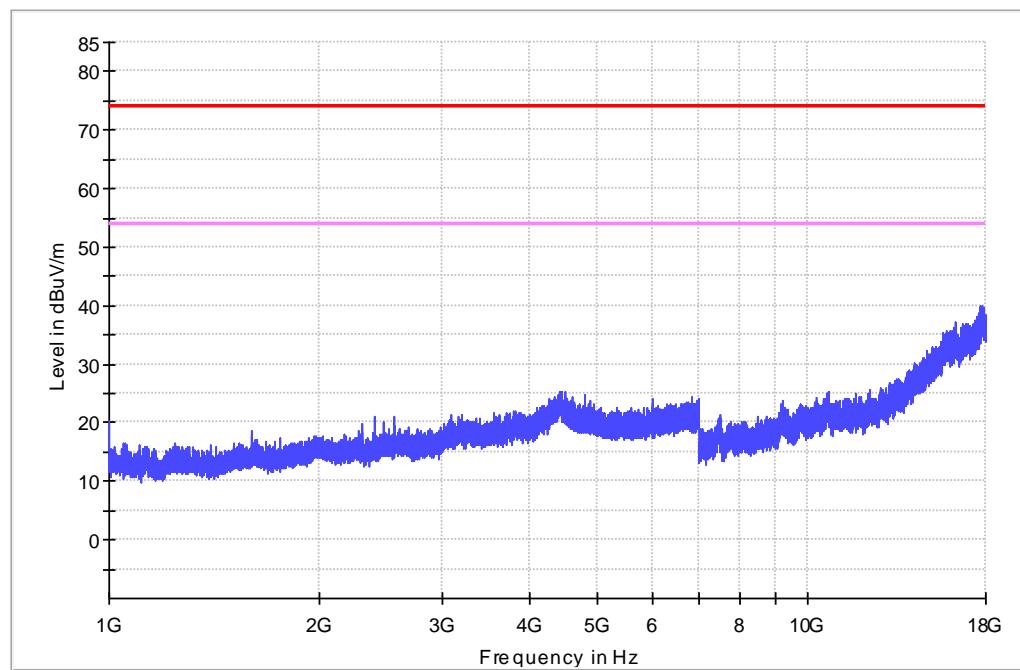
ESR 26 Normal Sweep\_6mTT 10m distance



1GHz-18GHz

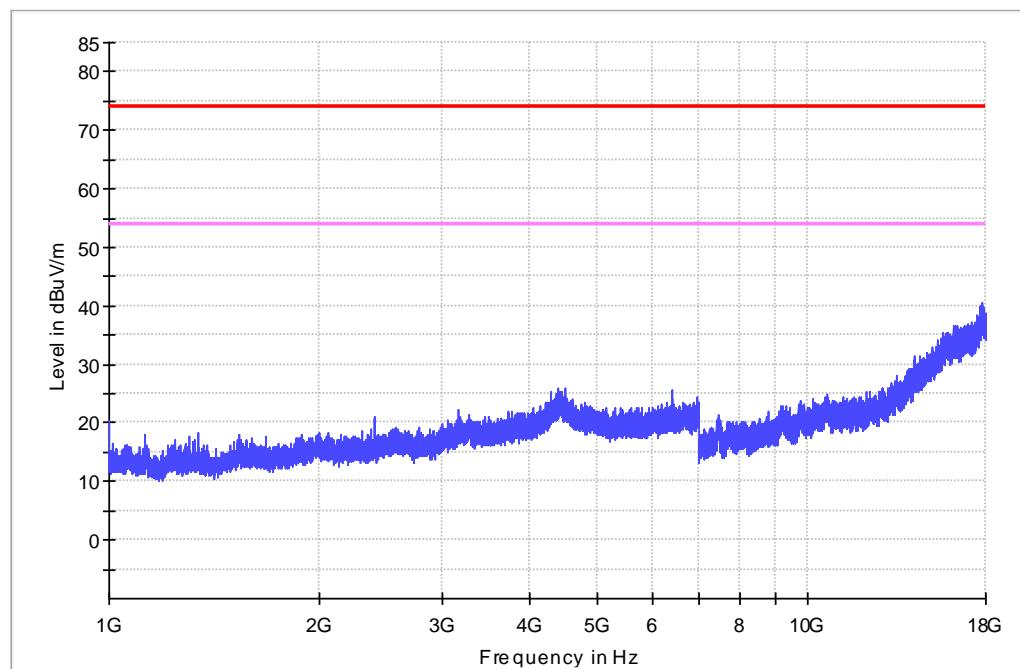
Horizontal

ESR 26 Normal Sweep\_6mTT\_1G-18GHz



Vertical

ESR 26 Normal Sweep\_6mTT\_1G-18GHz



-----End of Report-----