TEST REPORT

Application No.:	GZCR2303000307AT
Applicant:	GUANGZHOU HEYGEARS IMC. INC
Address of Applicant:	BLOCK B2, 501 601, ENTERPRISE ACCELERATOR, KAIFA DISTRICT, GUANGZHOU, GUANGDONG, CHINA
Manufacturer:	The same as applicant
Address of Manufacturer:	The same as applicant
Factory:	The same as applicant
Address of Factory:	The same as applicant
Equipment Under Test (EUT):	
EUT Name:	UltraCraft Rapid Production System
Model No.:	UltraCraft Reflex
Trade Mark:	HEYGEARS
Standard(s) :	47 CFR Part 15, Subpart C 15.225
Date of Receipt:	2023-03-23
Date of Test:	2023-04-03 to 2023-05-18
Date of Issue:	2023-06-14
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Ricky Liu
Manager

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Revision Record			
Version	**Report No.**	**Date**	**Remark**
01	GZCR230300030703	2023-06-14	Original

Authorized for issue by:				
		Jim Li **Jim Li/Project Engineer**		
		Vico Cui **Vico Cui/Reviewer**		

通标标准技术服务有限公司广州分公司
检验检测专用章
Inspection & Testing Services
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.225	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
20dB Bandwidth	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Conducted Emissions at Mains Terminals (150kHz-30MHz)		ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Emission Mask		ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)	Pass
Frequency tolerance		ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.225(e)	Pass
Radiated Emissions (30MHz-1GHz)		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass**
Radiated Emissions (9kHz-30MHz)		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

**: The EUT passed Radiated Emissions (30MHz-1GHz) test after modifications.

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4 General Information

4.1 Details of E.U.T.

Power supply:	AC 100-240VAC, 50/60Hz,
Test voltage:	AC 120V, 60Hz
Cable(s):	AC mains, 3 wires, 2.0m, unshielded.
	RJ45 Port x1
	USB Port x1
	4 Pin DC output Port x1(Reserved only, function not developed)
Operation Frequency:	13.56MHz
Modulation Type:	ASK
Antenna Type:	Coil Antenna
Power Setting:	Default.

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Conducted Emissions at Mains Terminals (150kHz-30MHz)	± 2.76dB
Emission Mask	± 3.12dB (below 30 MHz)
Frequency tolerance	± 7.25 E-8
Radiated Emissions (30MHz-1GHz)	± 5.00dB (30MHz-1GHz):3m;±4.38dB (30MHz-1GHz):10m
Radiated Emissions (9kHz-30MHz)	± 3.12dB

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

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4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
MXA Signal Analyzer (10Hz-8.4GHz)	Agilent Technologies	N9020A	SEM004-10	2023-02-20	2024-02-19

Conducted Emissions at Mains Terminals (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Coaxial Cable	HangTianXing	2m	EMC0107	2022-08-24	2023-08-23
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	2022-10-16	2025-10-15
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2022-09-09	2023-09-08
EMI Test Receiver (9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2023-05-19	2024-05-18
Test Software E3r	Audix	Ver.6.11812	GZE100-77	N/A	N/A

Emission Mask					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2023-05-19	2024-05-18
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Frequency tolerance					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	EMC0039	2022-07-04	2023-07-03
MXA Signal Analyzer (10Hz-8.4GHz)	Agilent Technologies	N9020A	SEM004-10	2023-02-20	2024-02-19

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Radiated Emissions (30MHz-1GHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2023-05-19	2024-05-18
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	EMC2174	2022-06-19	2025-06-18

Radiated Emissions (9kHz-30MHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2023-05-19	2024-05-18
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2022-06-24	2023-06-23

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

Antenna location: Refer to Internal photos

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7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
Test Method ANSI C63.10 (2013) Section 6.9

7.1.1 E.U.T. Operation

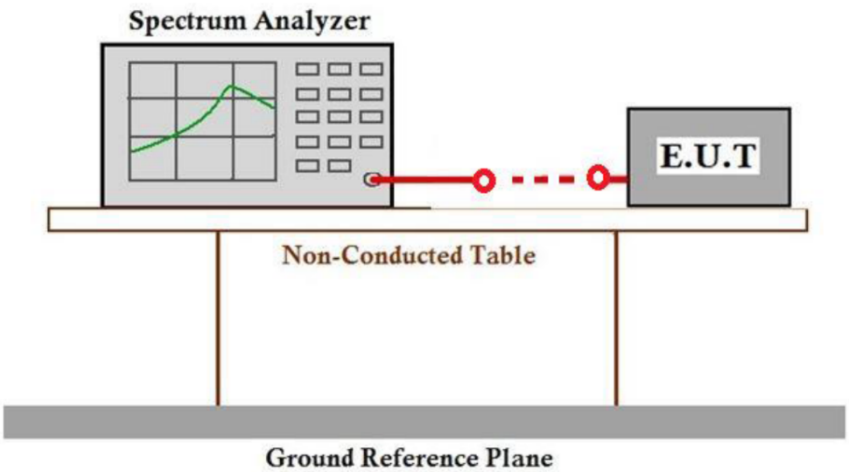
Operating Environment:

Temperature: 24.0 °C Humidity: 58.0 % RH Atmospheric Pressure: 1008 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

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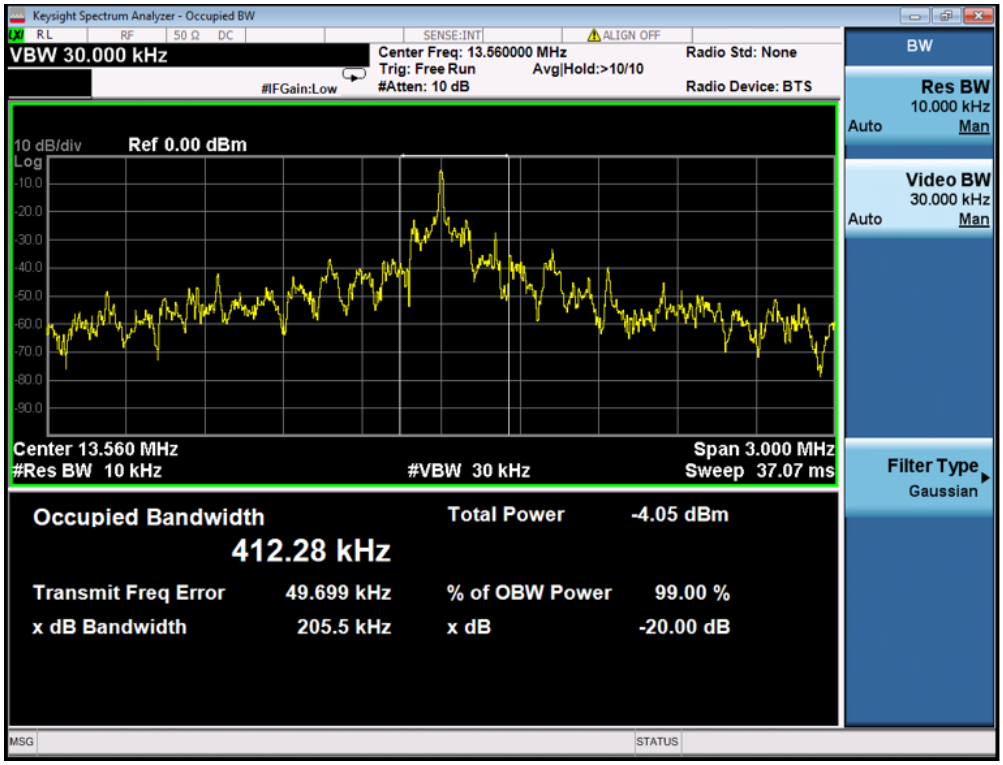

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7.2 Conducted Emissions at Mains Terminals (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.2.1 E.U.T. Operation

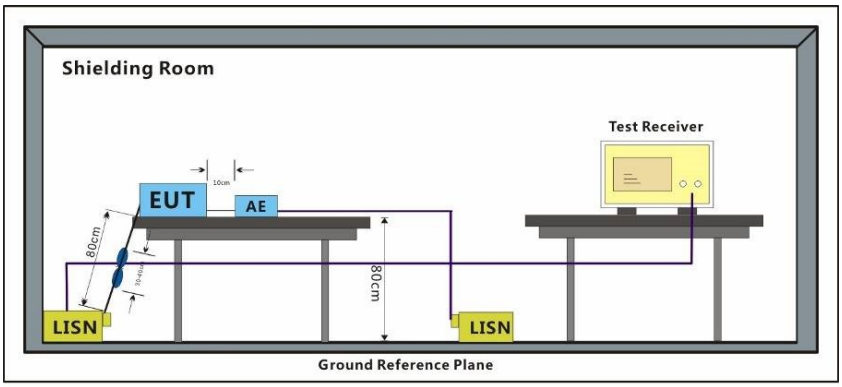
Operating Environment:

Temperature: 24.9 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

7.2.3 Test Setup Diagram



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7.2.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor

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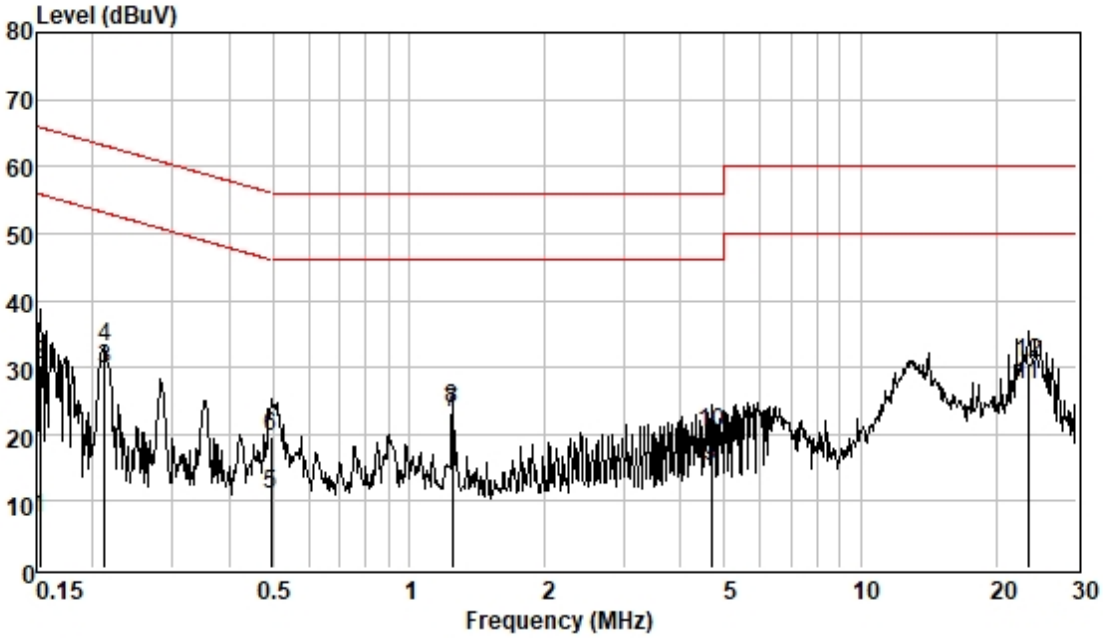
Test Mode: 01; Line: Live line



Pol :LINE
Mode :
Model :
Power :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.152	-2.09	0.06	9.61	7.58	55.87	-48.29	Average
2	0.152	20.76	0.06	9.61	30.43	65.87	-35.44	QP
3	0.213	19.92	0.06	9.61	29.59	53.10	-23.51	Average
4	0.213	23.40	0.06	9.61	33.07	63.10	-30.03	QP
5	0.497	1.25	0.07	9.59	10.91	46.05	-35.14	Average
6	0.497	9.92	0.07	9.59	19.58	56.05	-36.47	QP
7	1.249	13.50	0.09	9.60	23.19	46.00	-22.81	Average
8	1.249	14.14	0.09	9.60	23.83	56.00	-32.17	QP
9	4.672	5.50	0.17	9.64	15.31	46.00	-30.69	Average
10	4.672	10.43	0.17	9.64	20.24	56.00	-35.76	QP
11	23.511	17.46	0.38	9.66	27.50	50.00	-22.50	Average
12	23.511	20.72	0.38	9.66	30.76	60.00	-29.24	QP

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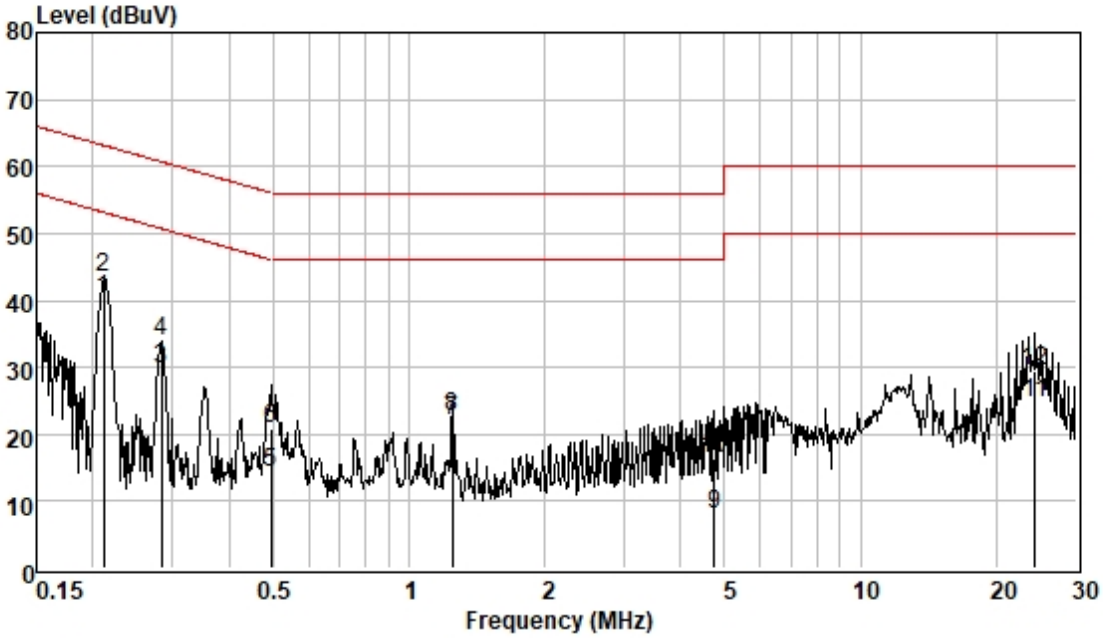
Test Mode: 01; Line: Neutral Line



Pol :NEUTRAL
Mode :
Model :
Power :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.212	30.41	0.06	9.60	40.07	53.14	-13.07	Average
2	0.212	33.68	0.06	9.60	43.34	63.14	-19.80	QP
3	0.283	19.98	0.06	9.59	29.63	50.72	-21.09	Average
4	0.283	24.21	0.06	9.59	33.86	60.72	-26.86	QP
5	0.497	4.52	0.07	9.60	14.19	46.05	-31.86	Average
6	0.497	11.04	0.07	9.60	20.71	56.05	-35.34	QP
7	1.249	12.16	0.09	9.61	21.86	46.00	-24.14	Average
8	1.249	12.80	0.09	9.61	22.50	56.00	-33.50	QP
9	4.746	-1.65	0.17	9.65	8.17	46.00	-37.83	Average
10	4.746	6.57	0.17	9.65	16.39	56.00	-39.61	QP
11	24.271	14.56	0.39	9.88	24.83	50.00	-25.17	Average
12	24.271	19.14	0.39	9.88	29.41	60.00	-30.59	QP

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7.3 Emission Mask

Test Requirement 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)

Test Method: ANSI C63.10 (2013) Section 6.4

Limit:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Below 30MHz

The test was performed at a 3m test site.

The factor calculated by the following equation:

$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

where

FS_{limit}	is the calculation of field strength at the limit distance, expressed in dBμV/m
$FS_{\max}$	is the measured field strength, expressed in dBμV/m
d_{measure}	is the distance of the measurement point from the EUT
d_{limit}	is the reference distance or the distance of the $\lambda/2\pi$ point

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 84dBuV/m at 30 meters.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 56.3 % RH Atmospheric Pressure: 1008 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

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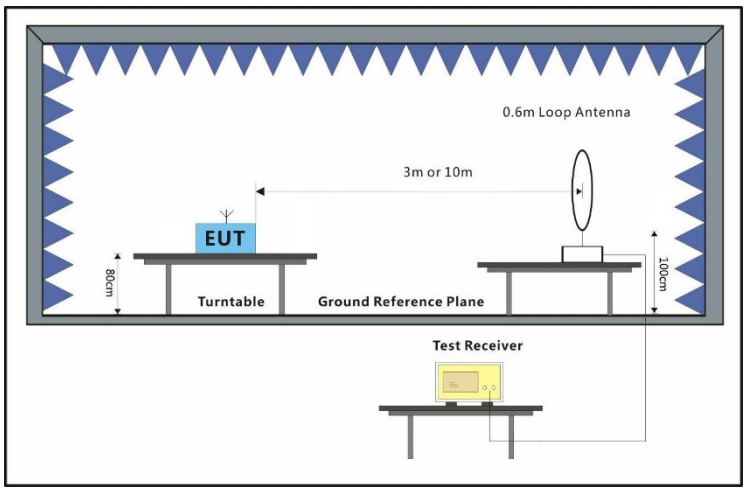
7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

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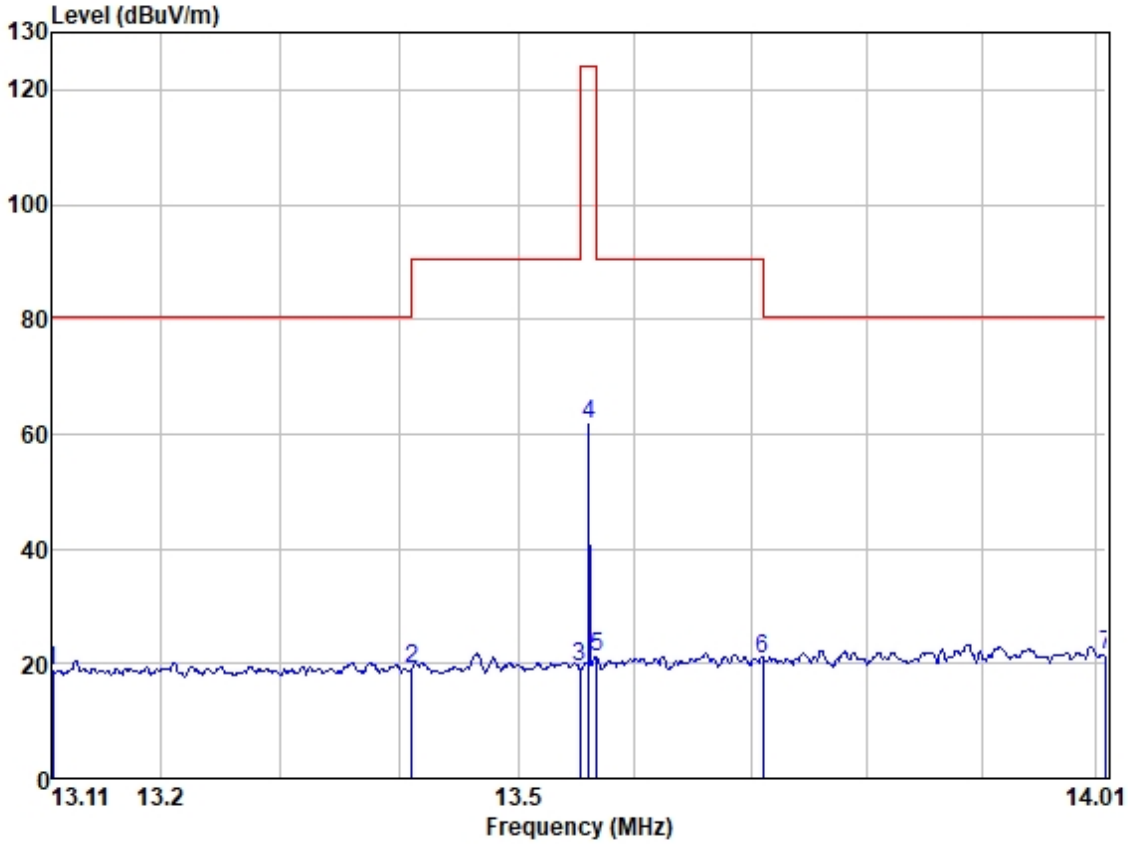
Test Mode: 01; Polarity: Horizontal



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	13.110	37.47	9.97	0.55	29.23	18.76	80.51	-61.75	HORIZONTAL	QP
2	13.410	37.77	9.92	0.56	29.22	19.03	80.51	-61.48	HORIZONTAL	QP
3	13.553	38.15	9.91	0.56	29.22	19.40	90.47	-71.07	HORIZONTAL	QP
4	13.561	80.45	9.91	0.56	29.22	61.70	124.00	-62.30	HORIZONTAL	QP
5	13.567	39.85	9.91	0.56	29.22	21.10	90.47	-69.37	HORIZONTAL	QP
6	13.710	39.70	9.90	0.56	29.22	20.94	80.51	-59.57	HORIZONTAL	QP
7	14.010	40.41	9.86	0.57	29.21	21.63	80.51	-58.88	HORIZONTAL	QP

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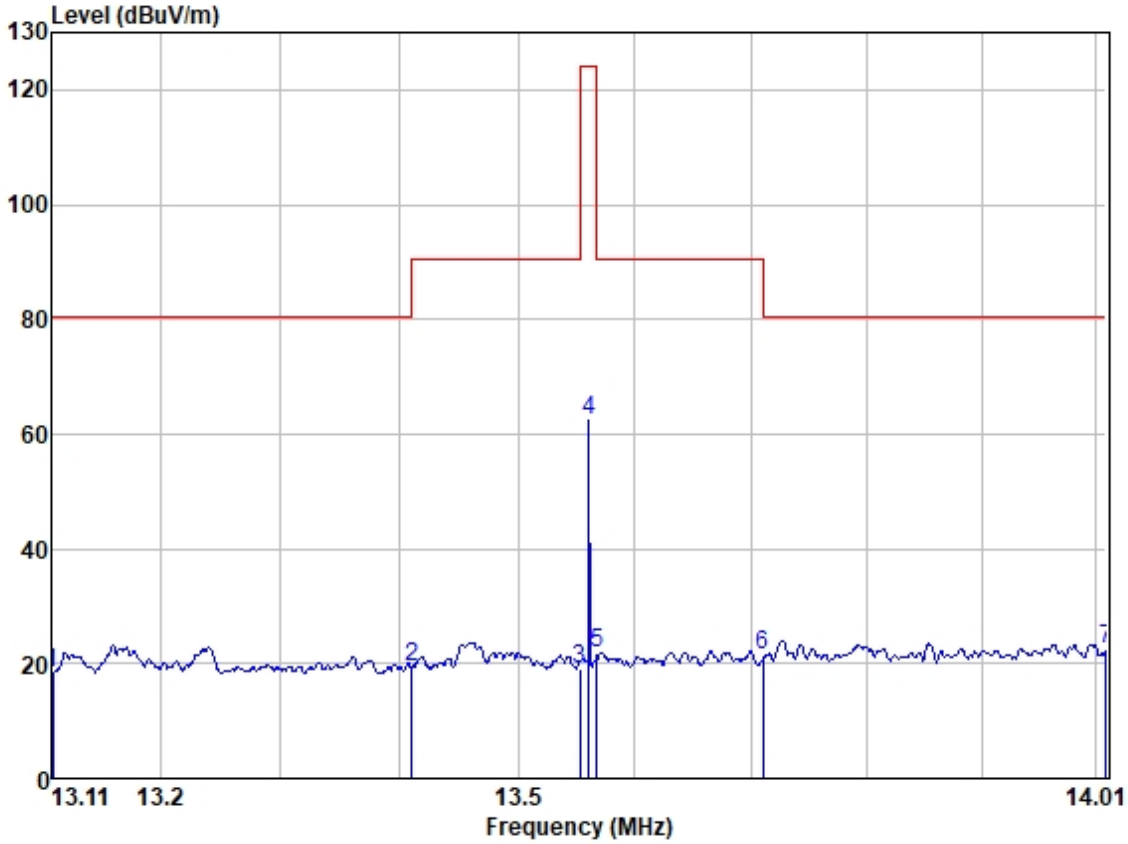
Test Mode: 01; Polarity: Vertical



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	13.110	36.91	9.97	0.55	29.23	18.20	80.51	-62.31	VERTICAL	QP
2	13.410	38.14	9.92	0.56	29.22	19.40	80.51	-61.11	VERTICAL	QP
3	13.553	37.86	9.91	0.56	29.22	19.11	90.47	-71.36	VERTICAL	QP
4	13.561	81.14	9.91	0.56	29.22	62.39	124.00	-61.61	VERTICAL	QP
5	13.567	40.75	9.91	0.56	29.22	22.00	90.47	-68.47	VERTICAL	QP
6	13.710	40.09	9.90	0.56	29.22	21.33	80.51	-59.18	VERTICAL	QP
7	14.010	41.28	9.86	0.57	29.21	22.50	80.51	-58.01	VERTICAL	QP

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7.4 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)
Test Method: ANSI C63.10 (2013) Section 6.8
Limit: Within ±0.01% of the operating frequency

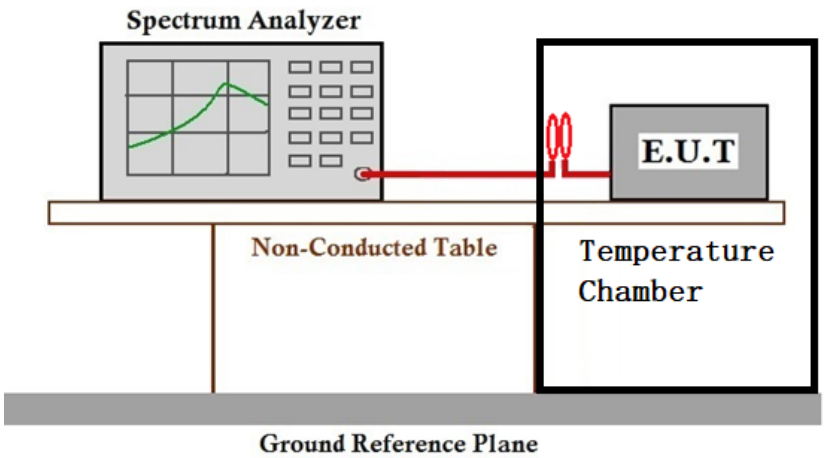
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 24.0 °C Humidity: 58.0 % RH Atmospheric Pressure: 1008 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.

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At startup:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (°C)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : AC 120 V, 60 Hz	-20	13.5612	0.144	PASS
	-10	13.5611	0.267	PASS
	0	13.5618	0.084	PASS
	+10	13.5613	0.139	PASS
	T_{normal} : +20	13.5674	REF	PASS
	+30	13.5649	0.175	PASS
	+40	13.5610	0.126	PASS
	+50	13.5615	0.171	PASS
V_{max} : AC 132 V, 60 Hz	T_{normal} : +20	13.5617	0.099	PASS
V_{min} : AC 108 V, 60 Hz		13.5617	0.104	PASS

At 2 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (°C)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : AC 120 V, 60 Hz	-20	13.5632	0.108	PASS
	-10	13.5615	0.171	PASS
	0	13.5617	0.055	PASS
	+10	13.5613	0.215	PASS
	T_{normal} : +20	13.5614	REF	PASS
	+30	13.5617	0.193	PASS
	+40	13.5618	-0.036	PASS
	+50	13.5617	-0.057	PASS
V_{max} : AC 132 V, 60 Hz	T_{normal} : +20	13.5613	0.109	PASS
V_{min} : AC 108 V, 60 Hz		13.5617	0.083	PASS

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At 5 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (°C)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : AC 120 V, 60 Hz	-20	13.5616	-0.02	PASS
	-10	13.5612	0.004	PASS
	0	13.5612	0.155	PASS
	+10	13.5614	-0.048	PASS
	T_{normal} : +20	13.5617	REF	PASS
	+30	13.5613	0.033	PASS
	+40	13.5617	0.03	PASS
	+50	13.5614	0.245	PASS
V_{max} : AC 132 V, 60 Hz	T_{normal} : +20	13.5615	0.218	PASS
V_{min} : AC 108 V, 60 Hz		13.5614	0.197	PASS

At 10 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (°C)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : AC 120 V, 60 Hz	-20	13.5619	-0.177	PASS
	-10	13.5612	-0.094	PASS
	0	13.5612	-0.065	PASS
	+10	13.5618	-0.188	PASS
	T_{normal} : +20	13.5636	REF	PASS
	+30	13.5614	-0.202	PASS
	+40	13.5616	-0.28	PASS
	+50	13.5618	-0.148	PASS
V_{max} : AC 132 V, 60 Hz	T_{normal} : +20	13.5617	-0.219	PASS
V_{min} : AC 108 V, 60 Hz		13.5606	-0.14	PASS

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7.5 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.5.1 E.U.T. Operation

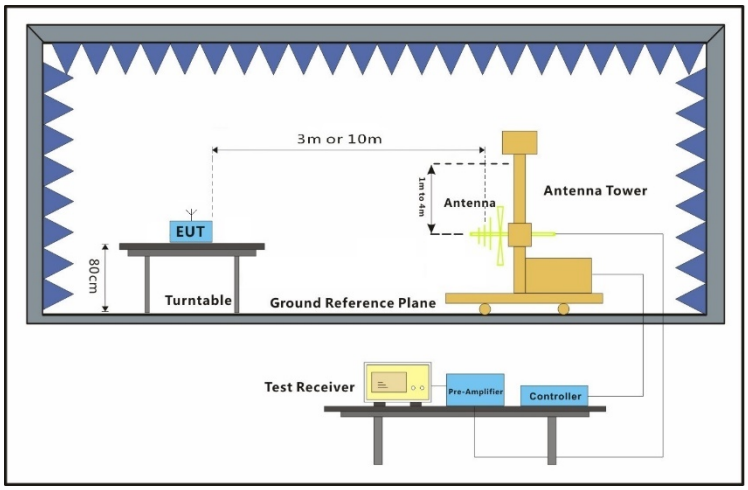
Operating Environment:

Temperature: 23.3 °C Humidity: 56.3 % RH Atmospheric Pressure: 1008 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

7.5.3 Test Setup Diagram



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7.5.4 Measurement Procedure and Data

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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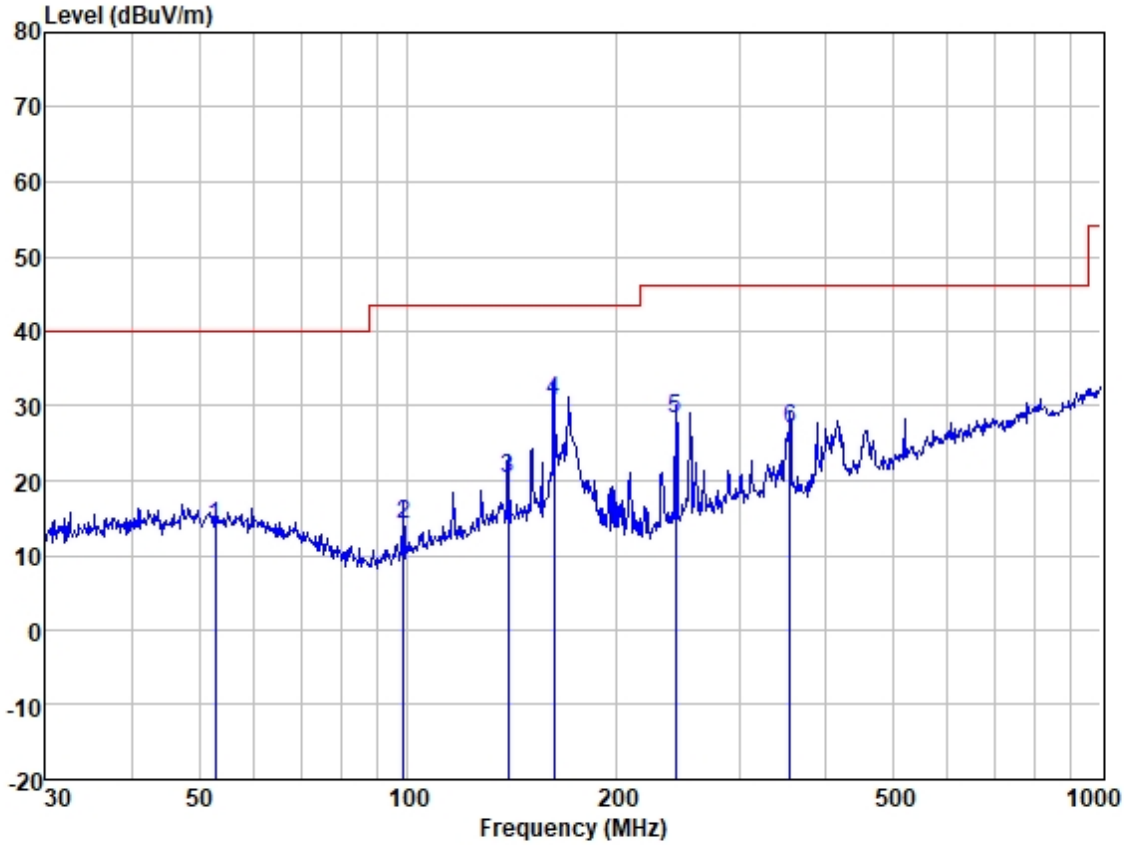

Site : SGS
Job :
Model :
Power :
Test Mode : 01 TX mode

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	52.760	26.38	13.93	1.16	27.60	13.87	40.00	-26.13	HORIZONTAL	QP
2	98.487	31.17	8.80	1.68	27.60	14.05	43.50	-29.45	HORIZONTAL	QP
3	139.361	32.71	13.00	2.05	27.47	20.29	43.50	-23.21	HORIZONTAL	QP
4	162.611	42.02	13.52	2.35	27.35	30.54	43.50	-12.96	HORIZONTAL	QP
5	243.377	40.92	11.66	2.87	27.25	28.20	46.00	-17.80	HORIZONTAL	QP
6	355.427	36.58	14.52	3.65	27.74	27.01	46.00	-18.99	HORIZONTAL	QP

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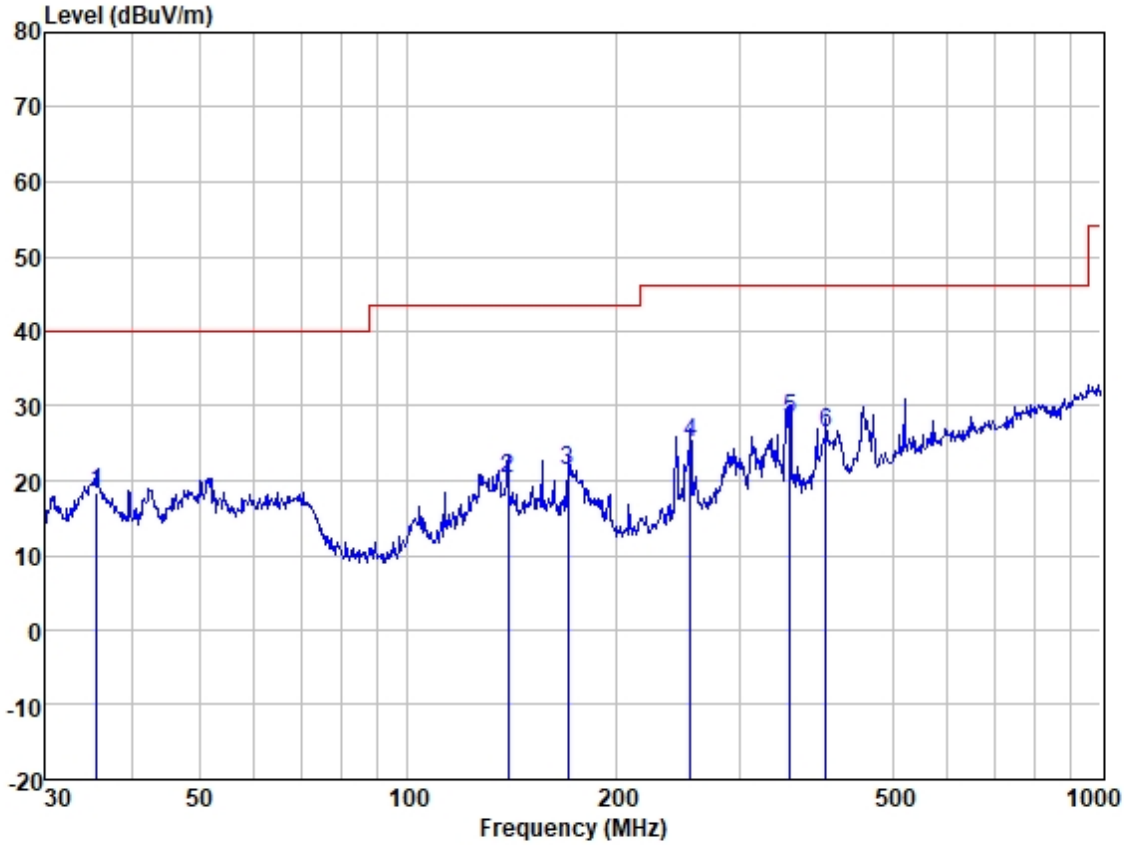
Test Mode: 01; Polarity: Vertical



Site : SGS
Job :
Model :
Power :
Test Mode : 01 TX mode

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	35.624	31.87	13.08	1.06	27.62	18.39	40.00	-21.61	VERTICAL	QP
2	139.361	32.82	13.00	2.05	27.47	20.40	43.50	-23.10	VERTICAL	QP
3	170.195	33.17	13.18	2.40	27.34	21.41	43.50	-22.09	VERTICAL	QP
4	255.623	37.19	11.99	3.01	27.23	24.96	46.00	-21.04	VERTICAL	QP
5	355.427	37.83	14.52	3.65	27.74	28.26	46.00	-17.74	VERTICAL	QP
6	400.432	34.84	15.56	3.88	28.00	26.28	46.00	-19.72	VERTICAL	QP

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7.6 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Test Distance: 3m
Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30

Below 30MHz

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than λ/2π and the limit distance is greater than λ/2π, the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the λ/2π distance, and at a 20 dB/decade of distance rate beyond λ/2π. This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(near\ field)}/d_{(3m)}\} + 20\log\{d_{(30/300m)}/d_{(near\ field)}\} \quad (2)$$

If the single point measured is at a distance greater than λ/2π, then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20\log\{d_{(30/300m)}/d_{(3m)}\} \quad (3)$$

If both the single point and the limit distance are equal to or closer to the EUT than λ/2π, then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(30/300m)}/d_{(3m)}\} \quad (4)$$

Remark:

$$d_{near\ field} = 47.77 / f_{MHz}$$

where f_{MHz} is the frequency of the emission being measured in MHz.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

where

FS_{limit}	is the calculation of field strength at the limit distance, expressed in dBμV/m
$FS_{\max}$	is the measured field strength, expressed in dBμV/m
d_{measure}	is the distance of the measurement point from the EUT
d_{limit}	is the reference distance or the distance of the λ/2π point

7.6.1 E.U.T. Operation

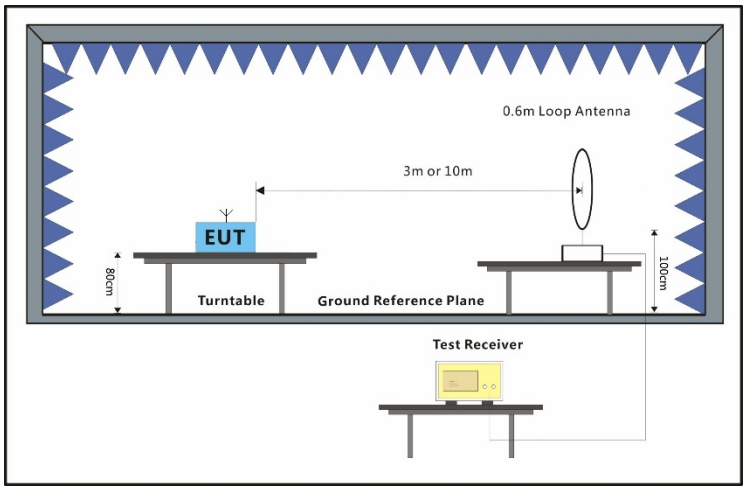
Operating Environment:

Temperature: 23.6 °C Humidity: 56.3 % RH Atmospheric Pressure: 1008 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

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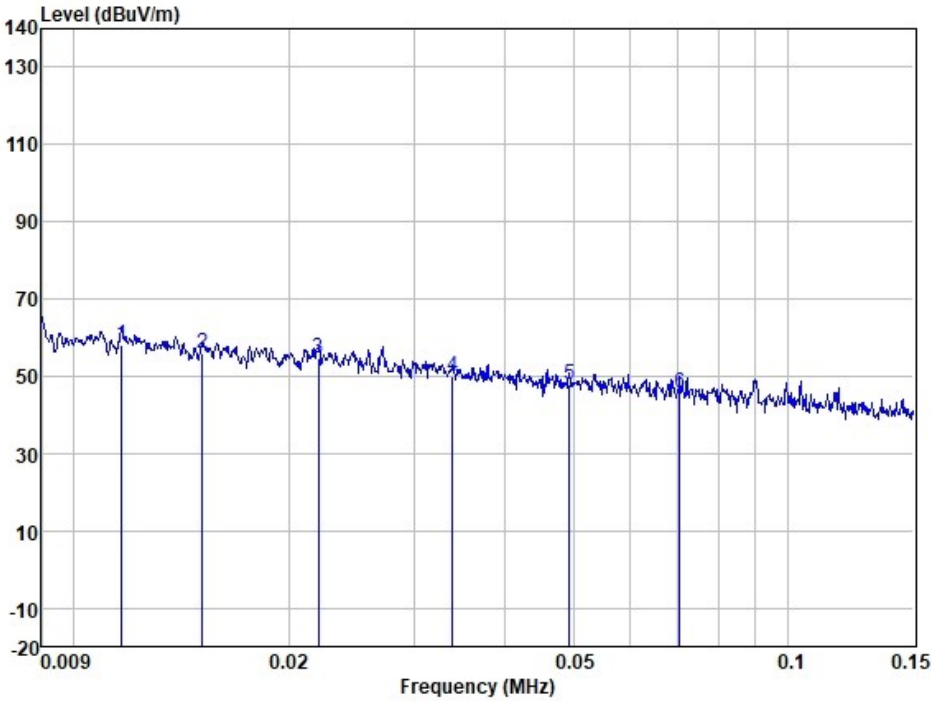
Test Mode: 01; Polarity: Horizontal




```
Site        : SGS
Job         :
Model       :
Power       :
Test Mode   :

              Read   Anterna Cable Preamp  Measured  Pol/
     Freq     Level  Factor  Loss  Factor  Level     Phase
     ______   _____  ______  ____  ______  ________  ________
     MHz      dBuV   dB/m    dB    dB      dBuV/m
1     0.012   68.70  17.91   0.02   28.44   58.19    HORIZONTAL
2     0.015   68.88  15.36   0.02   28.49   55.77    HORIZONTAL
3     0.022   69.45  14.00   0.02   28.62   54.85    HORIZONTAL
4     0.034   66.17  12.76   0.03   29.07   49.89    HORIZONTAL
5     0.049   64.84  12.21   0.03   29.26   47.82    HORIZONTAL
6     0.071   63.09  12.01   0.04   29.34   45.80    HORIZONTAL
```

Frequency (MHz)	Level @3m (dBuV/m)	Limit @300m (dBuV/m)	Convert Factor (dB)	Level @ 300m (dBuV/m)	Over limit (dB)	Remark
0.012	58.19	46.02	80	-21.81	-67.83	AV
0.015	55.77	44.08	80	-24.23	-68.31	AV
0.022	54.85	40.76	80	-25.15	-65.91	AV
0.034	49.89	36.97	80	-30.11	-67.08	AV
0.049	47.82	33.80	80	-32.18	-65.98	AV
0.071	45.80	30.58	80	-34.20	-64.78	AV

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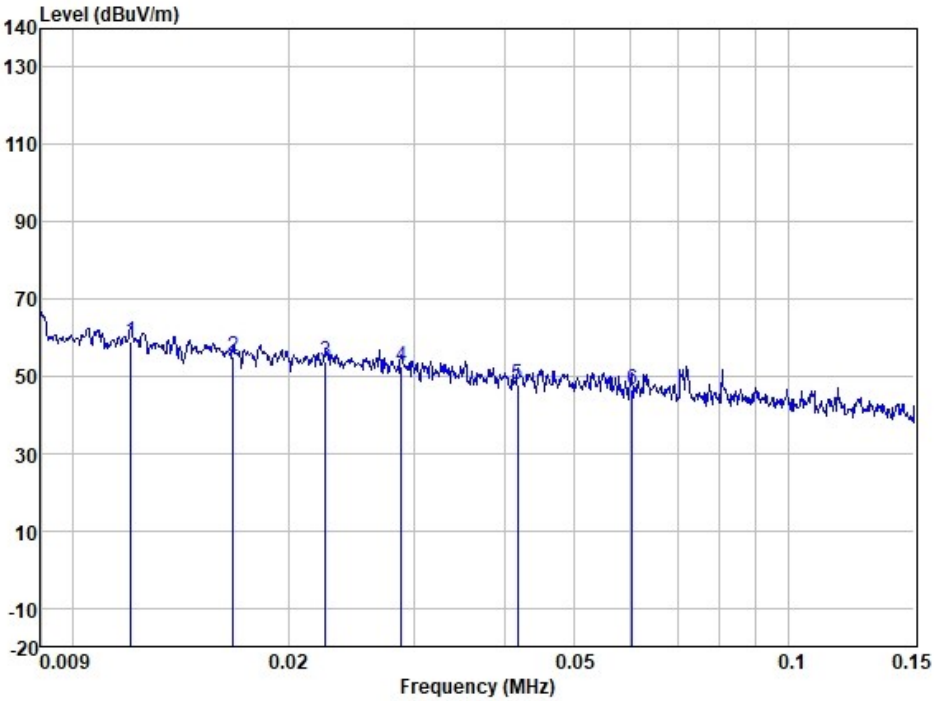
Test Mode: 01; Polarity: Vertical



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Pol/ Phase
	MHz	dBuV	dB/m	dB	dB	dBuV/m	
1	0.012	69.59	17.70	0.02	28.45	58.86	VERTICAL
2	0.017	68.64	14.83	0.02	28.52	54.97	VERTICAL
3	0.023	68.39	13.93	0.02	28.63	53.71	VERTICAL
4	0.029	68.14	13.03	0.03	28.83	52.37	VERTICAL
5	0.042	64.73	12.40	0.03	29.19	47.97	VERTICAL
6	0.060	63.92	12.10	0.04	29.31	46.75	VERTICAL

Frequency (MHz)	Level @3m (dBuV/m)	Limit @300m (dBuV/m)	Convert Factor (dB)	Level @ 300m (dBuV/m)	Over limit (dB)	Remark
0.012	58.86	46.02	80	-21.14	-67.16	AV
0.017	54.97	43.00	80	-25.03	-68.03	AV
0.023	53.71	40.37	80	-26.29	-66.66	AV
0.029	52.37	38.36	80	-27.63	-65.99	AV
0.042	47.97	35.14	80	-32.03	-67.17	AV
0.060	46.75	32.04	80	-33.25	-65.29	AV

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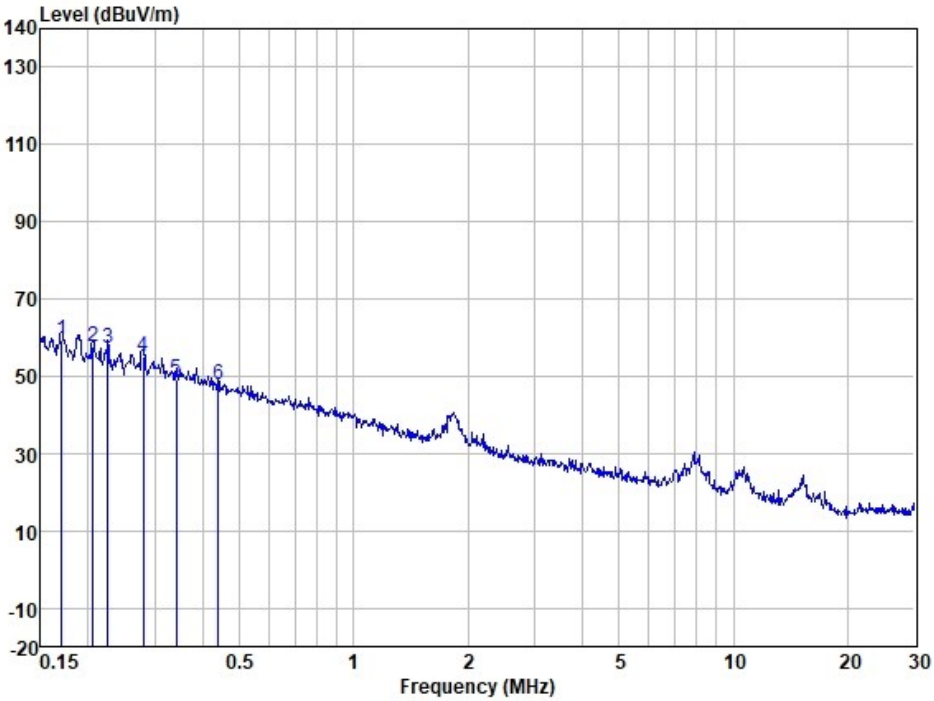
Test Mode: 01; Polarity: Horizontal




```
Site        : SGS
Job         :
Model       :
Power       :
Test Mode   :

              Read   Anterna Cable Preamp  Measured  Pol/
     Freq     Level  Factor  Loss  Factor  Level     Phase
     ______   _____  ______  ____  ______  ________  ________
     MHz      dBuV   dB/m    dB    dB      dBuV/m
1     0.170   77.05  11.86   0.05  29.40   59.56     HORIZONTAL
2     0.206   75.05  11.85   0.05  29.40   57.55     HORIZONTAL
3     0.226   74.71  11.85   0.05  29.40   57.21     HORIZONTAL
4     0.279   72.52  11.87   0.05  29.40   55.04     HORIZONTAL
5     0.341   66.47  11.87   0.05  29.40   48.99     HORIZONTAL
6     0.440   65.19  11.84   0.06  29.40   47.69     HORIZONTAL
```

Frequency (MHz)	Level @3m (dBuV/m)	Limit @300m (dBuV/m)	Convert Factor (dB)	Level @ 300m (dBuV/m)	Over limit (dB)	Remark
0.17	59.56	23.00	80	-20.44	-43.44	AV
0.206	57.55	21.33	80	-22.45	-43.78	AV
0.226	57.21	20.52	80	-22.79	-43.31	AV
0.279	55.04	18.69	80	-24.96	-43.65	AV
0.341	48.99	16.95	80	-31.01	-47.96	AV
0.440	47.69	14.74	80	-32.31	-47.05	AV

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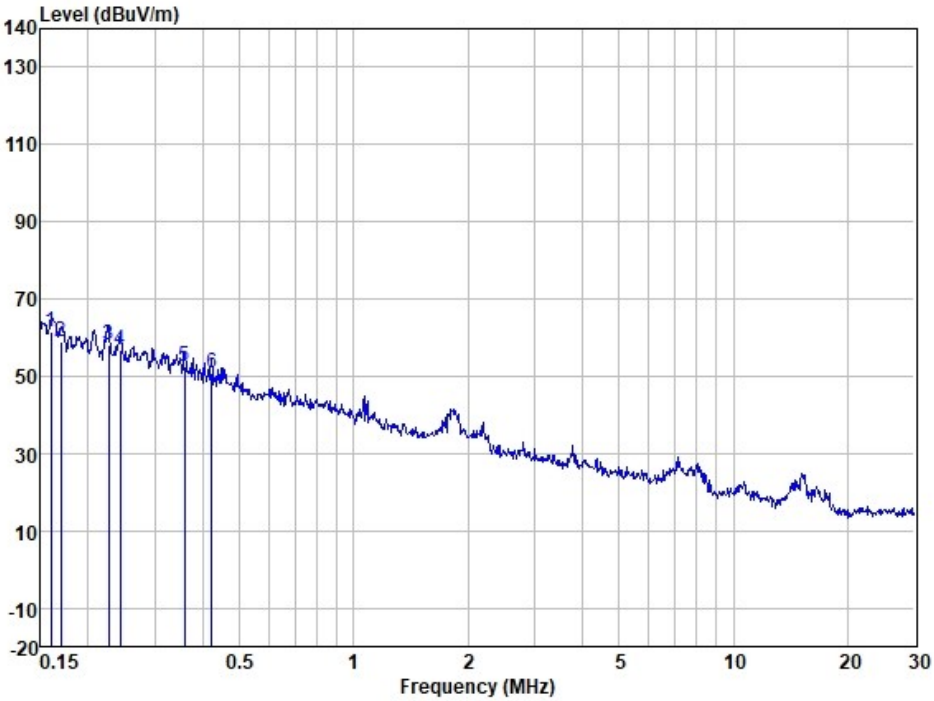
Test Mode: 01; Polarity: Vertical




```
Site        : SGS
Job         :
Model       :
Power       :
Test Mode   :

              Read   Anterna Cable Preamp  Measure    Pol/
     Freq     Level  Factor  Loss  Factor  Level      Phase
     ______   _____  _____   ____  ______  _______    ______
     MHz      dBuV   dB/m     dB    dB     dBuV/m
1     0.160   78.99  11.87   0.05   29.40   61.51     VERTICAL
2     0.169   76.37  11.86   0.05   29.40   58.88     VERTICAL
3     0.227   75.56  11.85   0.05   29.40   58.06     VERTICAL
4     0.243   74.42  11.86   0.05   29.40   56.93     VERTICAL
5     0.360   69.93  11.86   0.05   29.40   52.44     VERTICAL
6     0.424   68.17  11.85   0.06   29.40   50.68     VERTICAL
```

Frequency (MHz)	Level @3m (dBuV/m)	Limit @300m (dBuV/m)	Convert Factor (dB)	Level @ 300m (dBuV/m)	Over limit (dB)	Remark
0.160	61.51	23.52	80	-18.49	-42.01	AV
0.169	58.88	23.05	80	-21.12	-44.17	AV
0.227	58.06	20.48	80	-21.94	-42.42	AV
0.243	56.93	19.89	80	-23.07	-42.96	AV
0.360	52.44	16.48	80	-27.56	-44.04	AV
0.424	50.68	15.06	80	-29.32	-44.38	AV

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR230300030703

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9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2303000307AT

- End of the Report -

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