TEST REPORT

Application No.:	GZCR2108020745AT
Applicant:	Logistics and Supply Chain MultiTech R&D Centre Limited
Address of Applicant:	Units 1101-1105 and 1109, Level 11 Cyberport 2, 100 Cyberport Road, Hong Kong
Manufacturer:	Logistics and Supply Chain MultiTech R&D Centre Limited
Address of Manufacturer:	Units 1101-1105 and 1109, Level 11 Cyberport 2, 100 Cyberport Road, Hong Kong
Factory:	Jetta (China) Industries Co., Ltd
Address of Factory:	333 Cai Xin Lu, Lan He Zhen, Nan Sha Qu, Guangzhou, China
Equipment Under Test (EUT):	
EUT Name:	Sensing Monitoring
Model No.:	End Device
Trade Mark:	LSCM
Standard(s) :	47 CFR Part 15, Subpart C 15.249
Date of Receipt:	2021-08-11
Date of Test:	2021-08-17 to 2021-09-13
Date of Issue:	2021-09-14
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2021-09-24*		*Original*

Authorized for issue by				
		Jim Li **Jim Li/Project Engineer**		
		Ricky Liu **Ricky Liu/Reviewer**		

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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 15.249	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 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))		ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions (below 1GHz)		ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Radiated Emissions (above 1GHz)		ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	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.

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3V= Size "AA" battery x 2 for main unit.
Cable(s):	Micro USB Port x1 for configure. 3.5mm headphone port x2 for sensor module connection.
Test Voltage:	DC 3V
Operation Frequency:	923MHz
Modulation Type:	LoRaTM
Number of Channels:	1
Antenna Type:	Integral Antenna
Antenna No.:	2 but can not transmit at the same time(ant1 & ant 2)
Antenna Gain:	0dBi for both declared by applicant.
Firmware Version:	V10.9
Hardware Version:	E78030 94V-0
Testing Software:	N/A
Sample NO.:	CU234+003+0020(00-01)
Power Setting:	16dBm can not be change by user.
Function:	Sensor with Lora function.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
LoRaWAN Pico Station	Dragino	LPS8	Lps8j450105

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Field Strength of the Fundamental Signal (15.249(a))	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)
Restricted Band Around Fundamental Frequency	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)
Radiated Emissions (below 1GHz)	± 5.06dB （30MHz-1GHz；3m） ±4.46dB （30MHz-1GHz；10m）
Radiated Emissions (above 1GHz)	± 5.08dB (1GHz-6GHz); ± 5.14dB (above 6GHz)

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4.4 Test Location

All tests were performed at:

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

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No tests were sub-contracted.

4.5 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **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.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **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.

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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**
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
4X4 Power Sensor Unit	TSPS	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software	TSPS	V2.0	GZE100-78	N/A	N/A
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-21	2022-06-20

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Trilog Broadband Antenna(25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Trilog Broadband Antenna(25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

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Radiated Emissions (below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Trilog Broadband Antenna(25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

Radiated Emissions (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
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	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05

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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. The best case gain of the antenna is 0dBi.

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

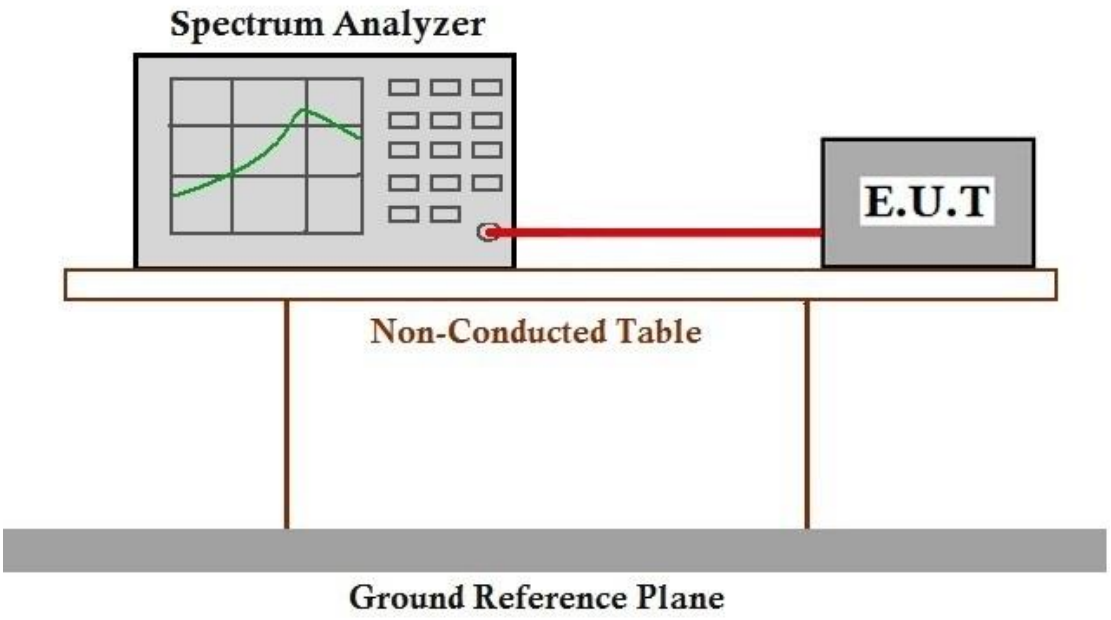
Operating Environment:

Temperature: 26.8 °C Humidity: 55.6 % 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 continuously transmitting mode with FSK modulation(ant 1).
Pre-scan	02	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 2).

7.1.3 Test Setup Diagram



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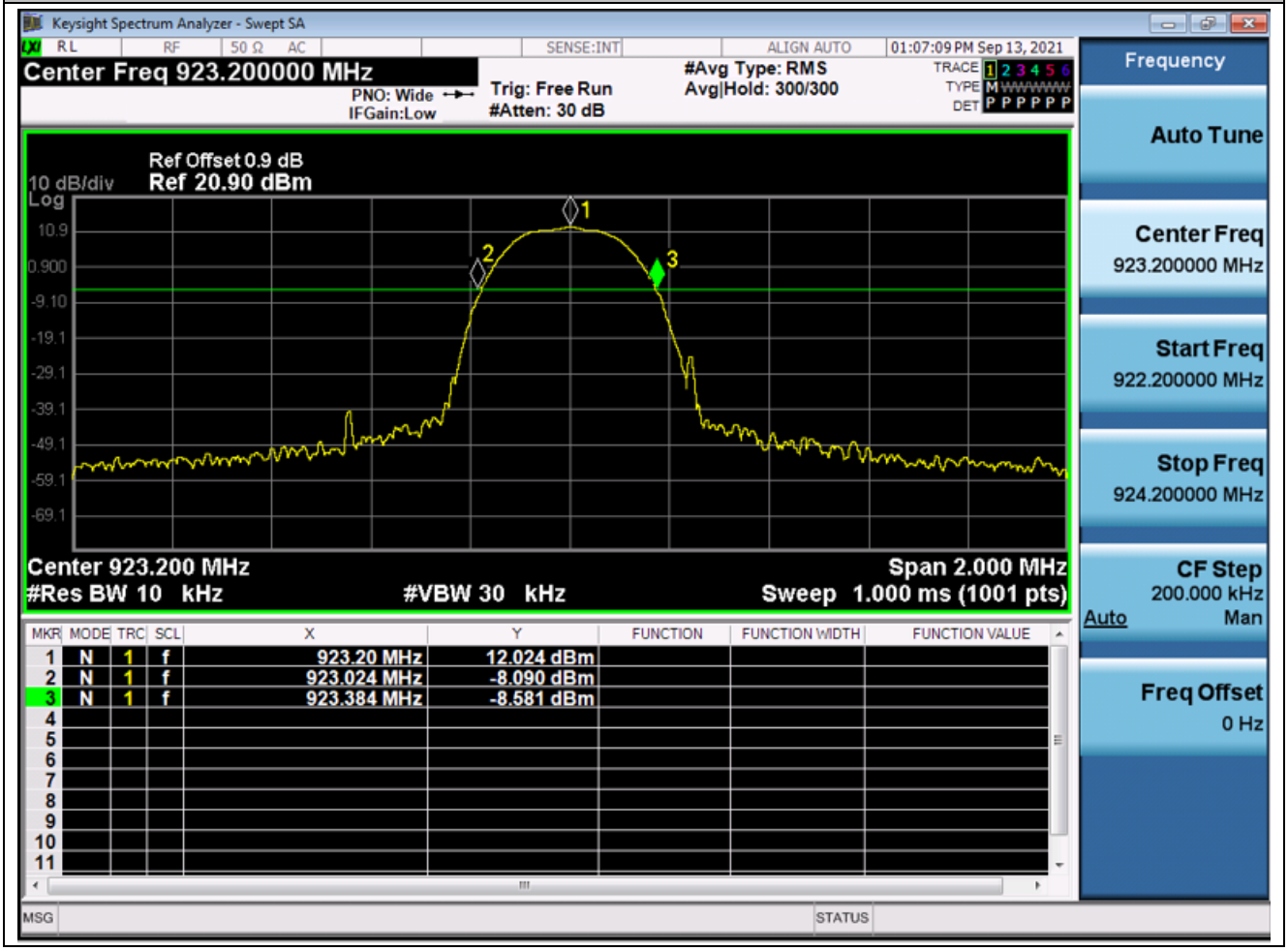
7.1.4 Measurement Procedure and Data

Test Result

Channel	20dB BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
923MHz	0.36	923.024	923.384	- -	PASS

Test Graphs

923MHz



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7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)

Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500
Remark: The frequencies above 1000MHz are based on average limits. However, 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. For fundamental frequency in “902-928MHz”, the field strength of fundamental is based on Quasi-Peak.		

7.2.1 E.U.T. Operation

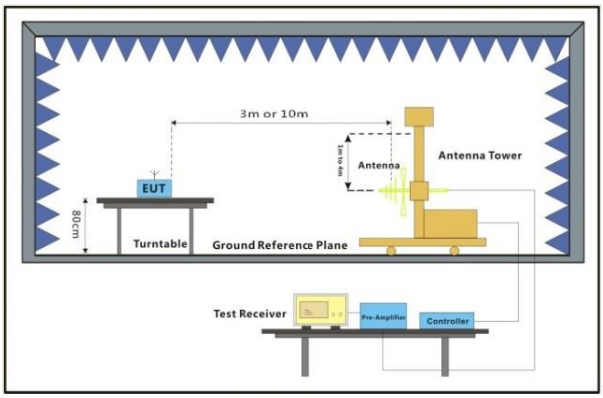
Operating Environment:

Temperature: 24.5 °C Humidity: 57.6 % RH Atmospheric Pressure: 1008 mbar

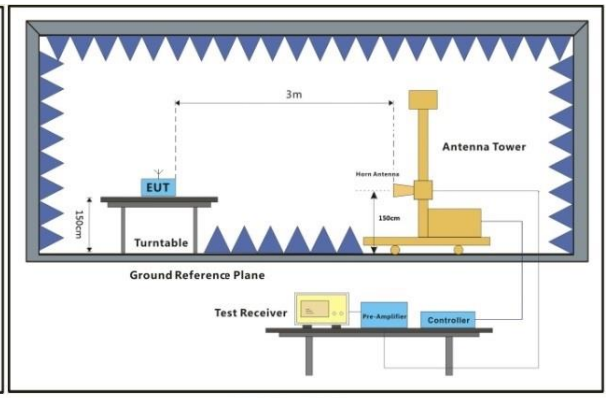
7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 1).
Pre-scan	02	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 2).

7.2.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.2.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c.The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. 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.

e.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.

f.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g.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.

h.Test the EUT in the lowest channel, the middle channel, the Highest channel.

i.The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j.Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

The red line show in graphic is the limit in standard used in this section.

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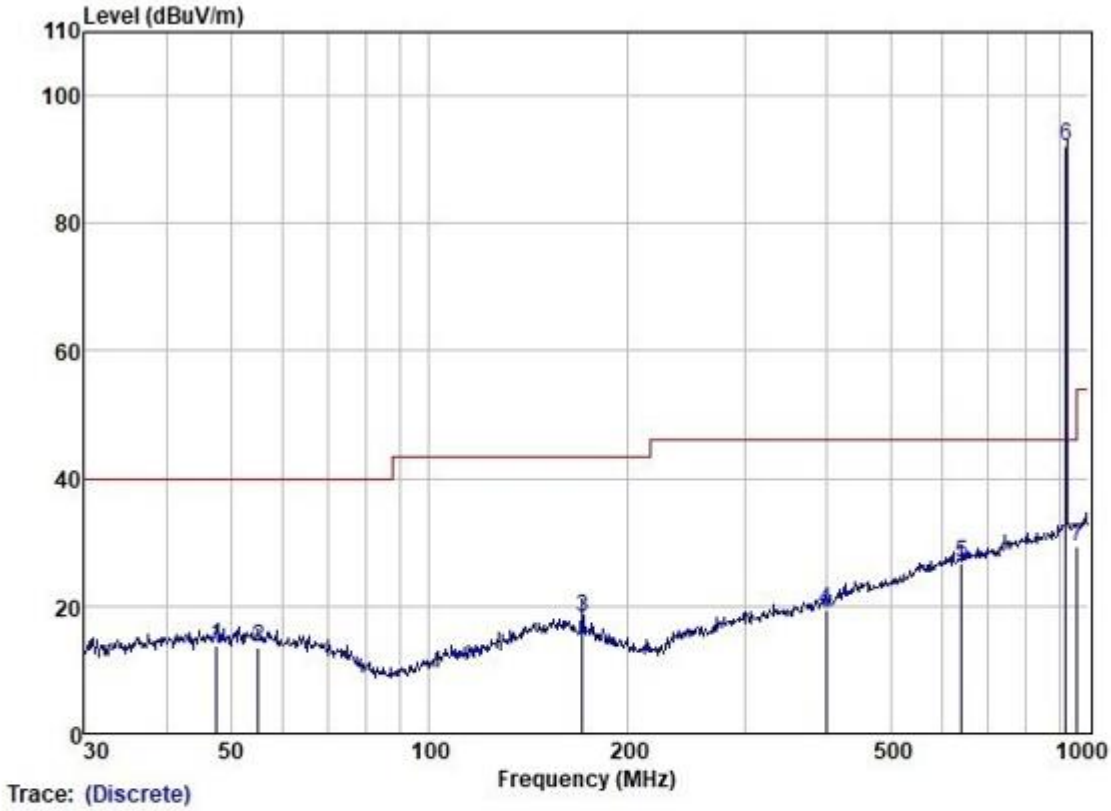
Test Mode: 01; Polarity: Horizontal



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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level
	MHz	dBuV	dB/m	dB	dB	dBuV/m
6*	923.20	89.37	23.67	7.01	27.81	92.24

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
923.20	92.24	94	-1.76	QP

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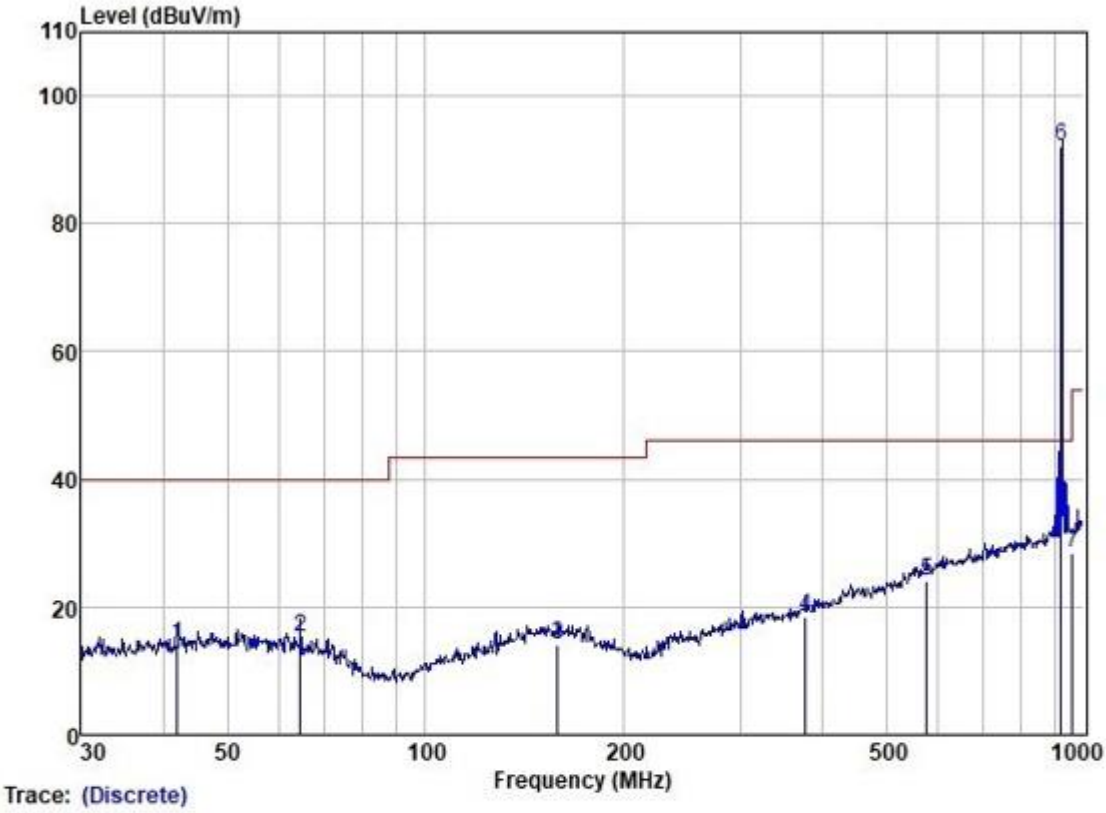
Test Mode: 01; Polarity: Vertical



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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level
	MHz	dBuV	dB/m	dB	dB	dBuV/m
6*	923.20	89.15	23.67	7.01	27.81	92.02

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
923.20	92.02	94	-1.98	QP

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7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value
Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209,whichever is the lesser attenuation.		

7.3.1 E.U.T. Operation

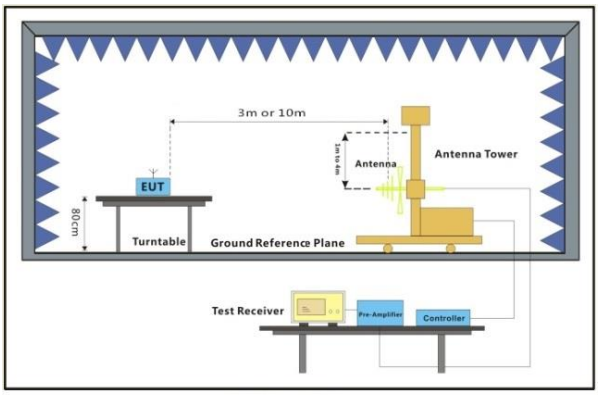
Operating Environment:

Temperature: 24.5 °C Humidity: 57.6 % RH Atmospheric Pressure: 1008 mbar

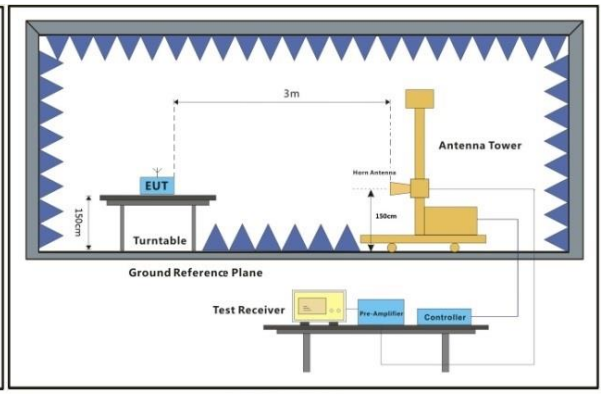
7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 1).
Pre-scan	02	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 2).

7.3.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.3.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. 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.

e. 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.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. 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.

h. Test the EUT in the lowest channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

The red line show in graphic is the limit in standard used in this section.

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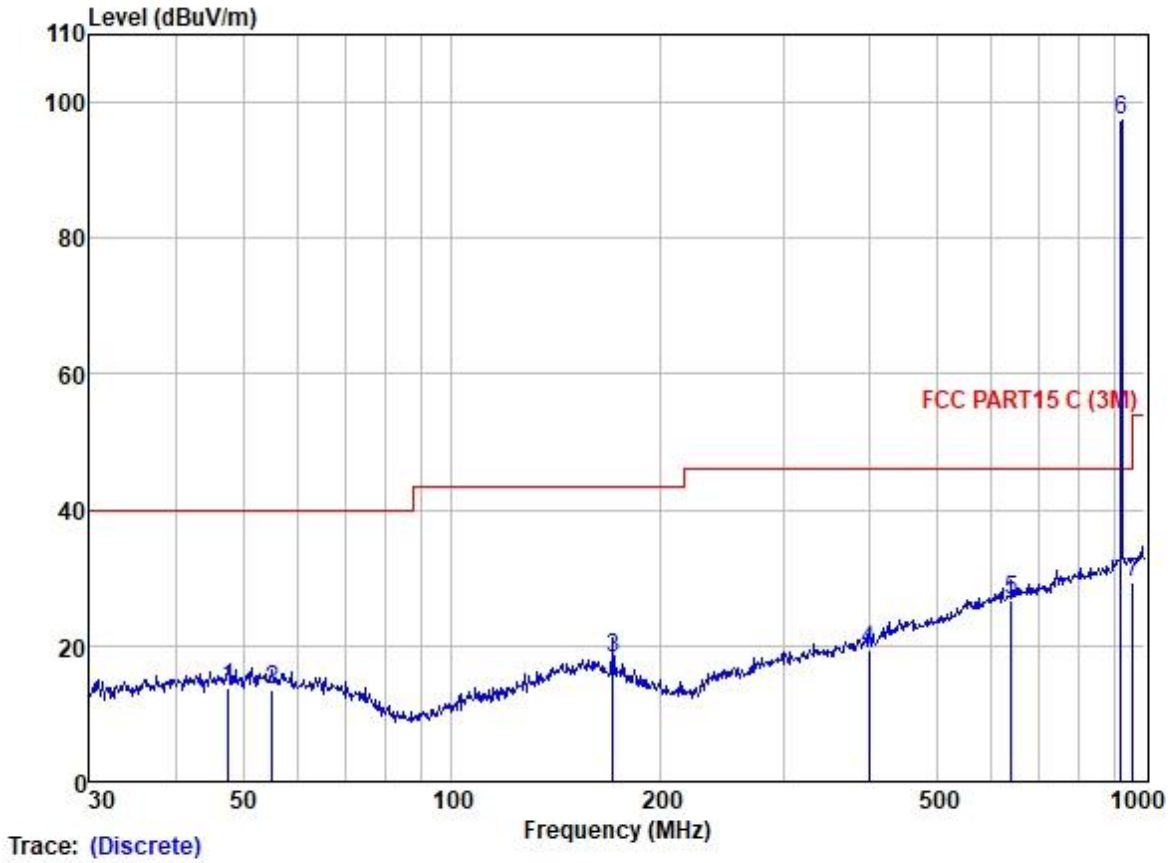
Test Mode: 01; Polarity: Horizontal



Site : SGS
Condition : FCC PART15 C (3M) HORIZONTAL
Job :
Model :
Power :
Test Mode : AC

	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	dBuV		
1	47.66	25.95	13.99	1.13	27.17	13.90	40.00	-26.10	HORIZONTAL	QP
2	55.03	25.66	13.75	1.19	27.16	13.44	40.00	-26.56	HORIZONTAL	QP
3	170.79	29.43	13.07	2.40	26.77	18.13	43.50	-25.37	HORIZONTAL	QP
4	399.03	27.09	15.68	3.93	27.32	19.38	46.00	-26.62	HORIZONTAL	QP
5	640.61	29.07	20.40	5.45	28.19	26.73	46.00	-19.27	HORIZONTAL	QP
6*	923.20	94.37	23.67	7.01	27.81	97.24	46.00	51.24	HORIZONTAL	Peak
7	960.00	25.97	23.90	7.18	27.72	29.33	46.00	-16.67	HORIZONTAL	QP

*Remark: This is the main operating frequency of the EUT.

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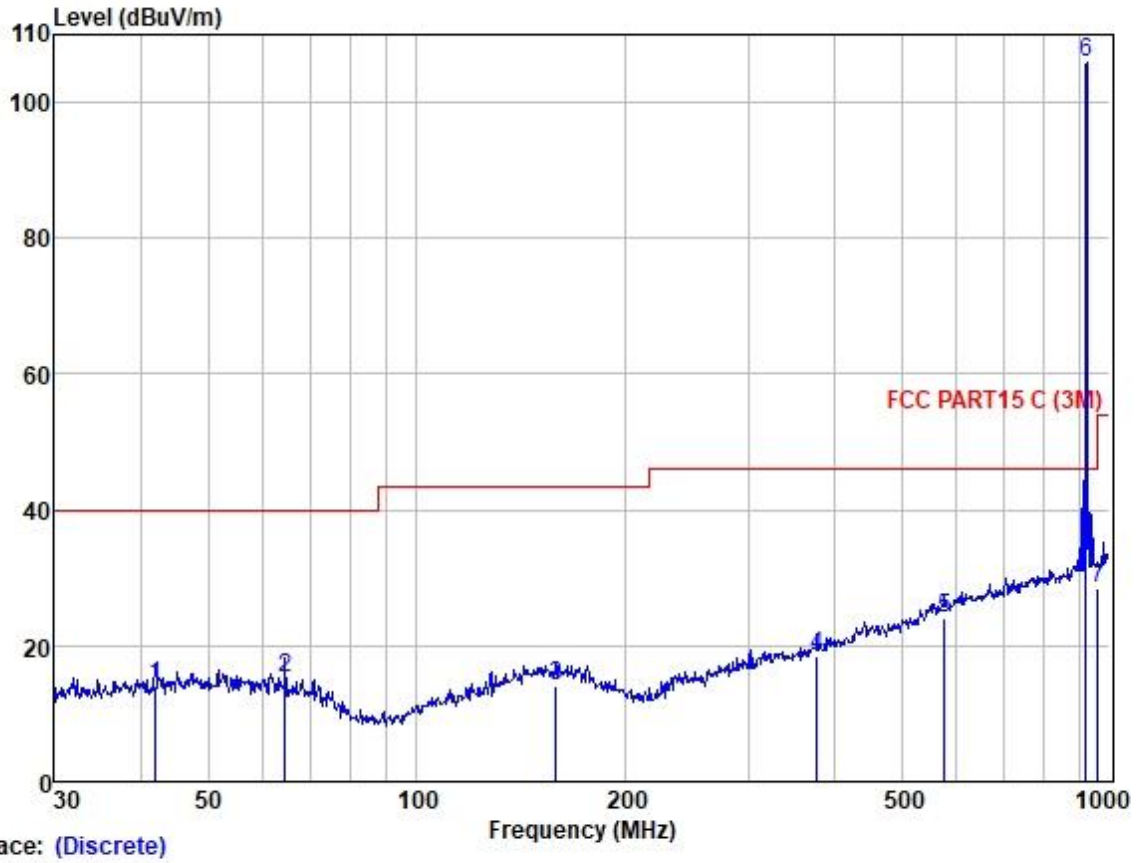
Test Mode: 01; Polarity: Vertical




```
Site         : SGS
Condition    : FCC PART15 C (3M)                                  VERTICAL
Job          :
Model        :
Power        :
Test Mode    : AC
```

	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	dBuV		
1	42.01	26.37	13.70	1.11	27.17	14.01	40.00	-25.99	VERTICAL	QP
2	64.43	28.31	12.83	1.34	27.15	15.33	40.00	-24.67	VERTICAL	QP
3	158.67	25.01	13.67	2.33	26.80	14.21	43.50	-29.29	VERTICAL	QP
4	377.26	26.58	15.45	3.82	27.23	18.62	46.00	-27.38	VERTICAL	QP
5	576.64	28.22	19.10	5.02	28.18	24.16	46.00	-21.84	VERTICAL	QP
6*	923.20	103.15	23.67	7.01	27.81	106.02	46.00	60.02	VERTICAL	Peak
7	960.00	25.14	23.90	7.18	27.72	28.50	46.00	-17.50	VERTICAL	QP

*Remark: This is the main operating frequency of the EUT.

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7.4 Radiated Emissions (below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	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
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

7.4.1 E.U.T. Operation

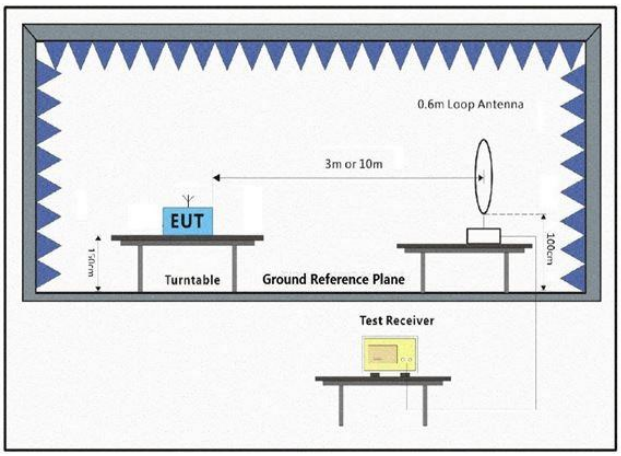
Operating Environment:

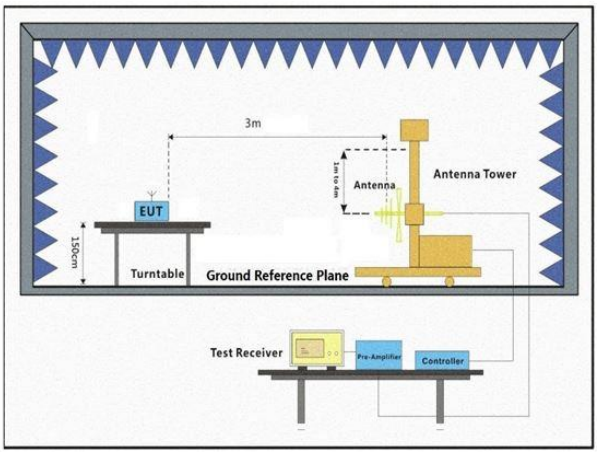
Temperature: 24.5 °C Humidity: 57.6 % RH Atmospheric Pressure: 1008 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 1).
Pre-scan	02	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 2).
		Only record the worse case.

7.4.3 Test Setup Diagram





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7.4.4 Measurement Procedure and Data

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) 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

3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

The red line show in graphic is the limit in standard used in this section.

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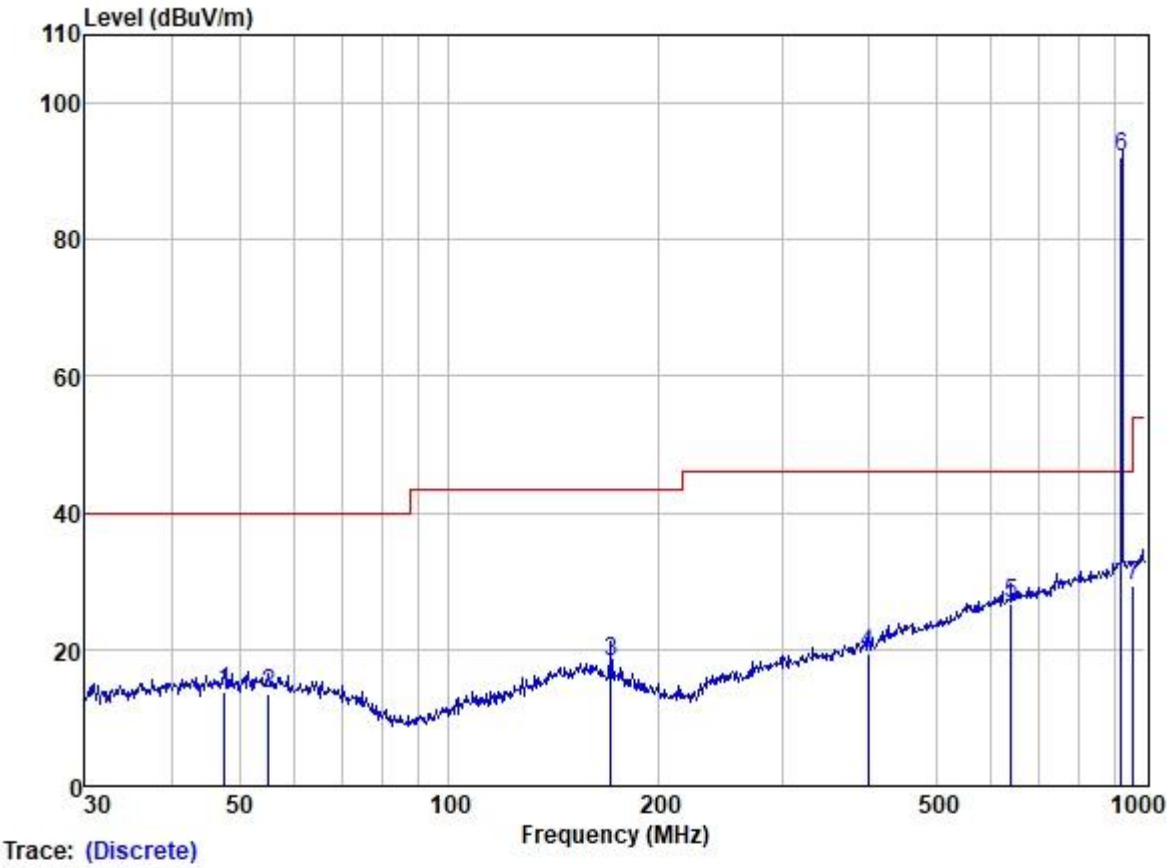
Test Mode: 01; Polarity: Horizontal



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

	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	dBuV		
1	47.66	25.95	13.99	1.13	27.17	13.90	40.00	-26.10	HORIZONTAL	QP
2	55.03	25.66	13.75	1.19	27.16	13.44	40.00	-26.56	HORIZONTAL	QP
3	170.79	29.43	13.07	2.40	26.77	18.13	43.50	-25.37	HORIZONTAL	QP
4	399.03	27.09	15.68	3.93	27.32	19.38	46.00	-26.62	HORIZONTAL	QP
5	640.61	29.07	20.40	5.45	28.19	26.73	46.00	-19.27	HORIZONTAL	QP
6*	923.20	89.37	23.67	7.01	27.81	92.24	46.00	46.24	HORIZONTAL	QP
7	960.00	25.97	23.90	7.18	27.72	29.33	46.00	-16.67	HORIZONTAL	QP

*Remark: This is the main operating frequency of the EUT.

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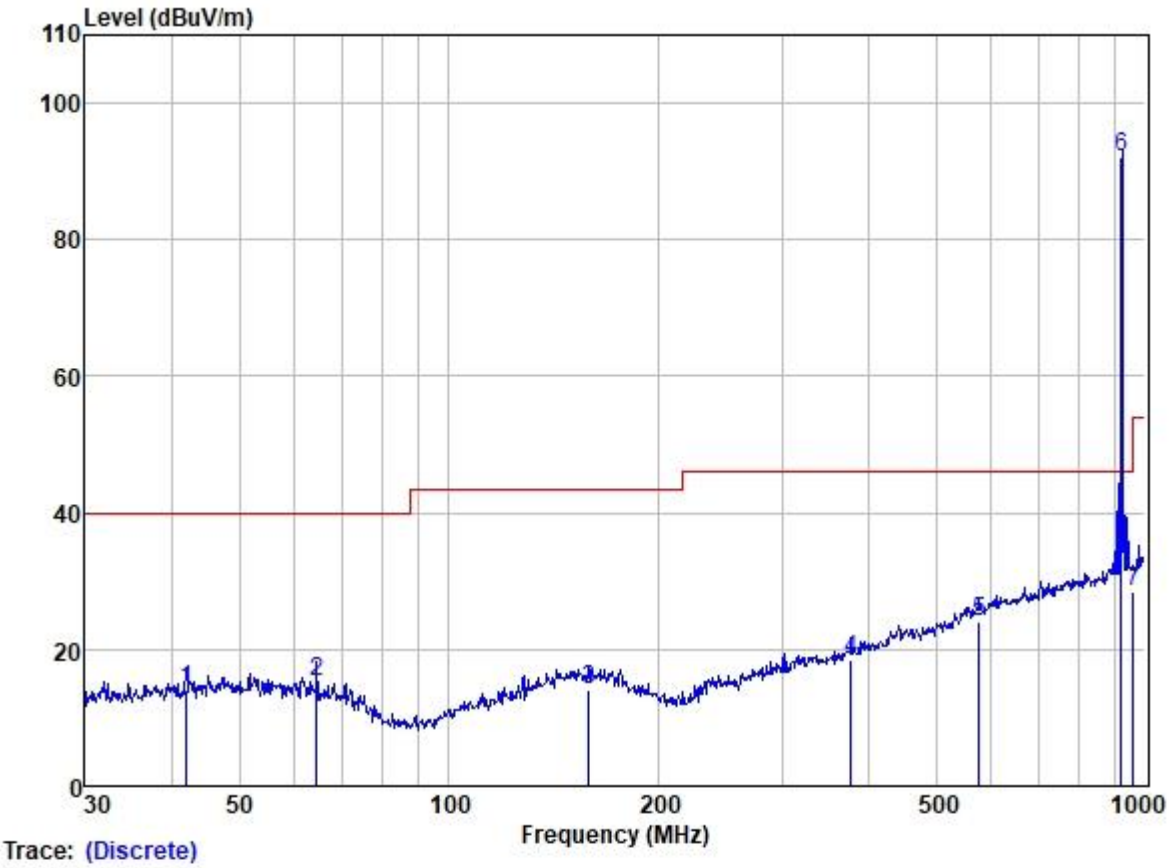
Test Mode: 01; Polarity: Vertical



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

	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	dBuV		
1	42.01	26.37	13.70	1.11	27.17	14.01	40.00	-25.99	VERTICAL	QP
2	64.43	28.31	12.83	1.34	27.15	15.33	40.00	-24.67	VERTICAL	QP
3	158.67	25.01	13.67	2.33	26.80	14.21	43.50	-29.29	VERTICAL	QP
4	377.26	26.58	15.45	3.82	27.23	18.62	46.00	-27.38	VERTICAL	QP
5	576.64	28.22	19.10	5.02	28.18	24.16	46.00	-21.84	VERTICAL	QP
6*	923.20	89.15	23.67	7.01	27.81	92.02	46.00	46.02	VERTICAL	QP
7	960.00	25.14	23.90	7.18	27.72	28.50	46.00	-17.50	VERTICAL	QP

*Remark: This is the main operating frequency of the EUT.

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7.5 Radiated Emissions (above 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	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
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

7.5.1 E.U.T. Operation

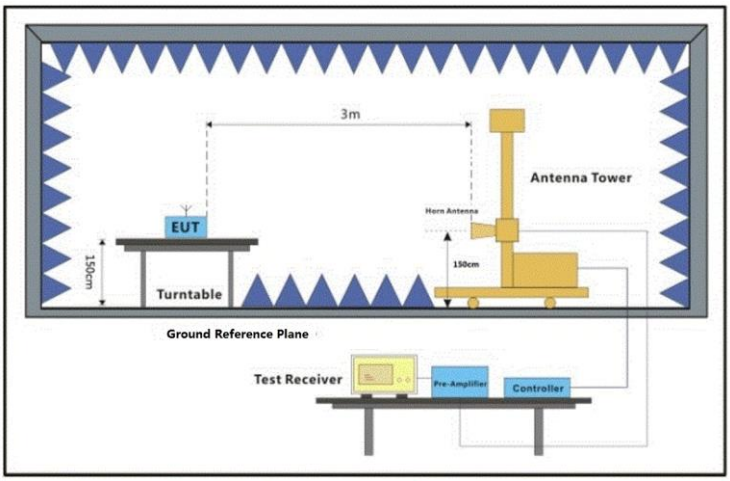
Operating Environment:

Temperature: 24.5 °C Humidity: 57.6 % 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 continuously transmitting mode with FSK modulation(ant 1).
Pre-scan	02	TX mode_Keep the EUT in continuously transmitting mode with FSK modulation(ant 2).
		Only record the worse case.

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 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 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 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

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

2) The field strength limits are based on average limits. However, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

The red line show in graphic is the limit in standard used in this section.

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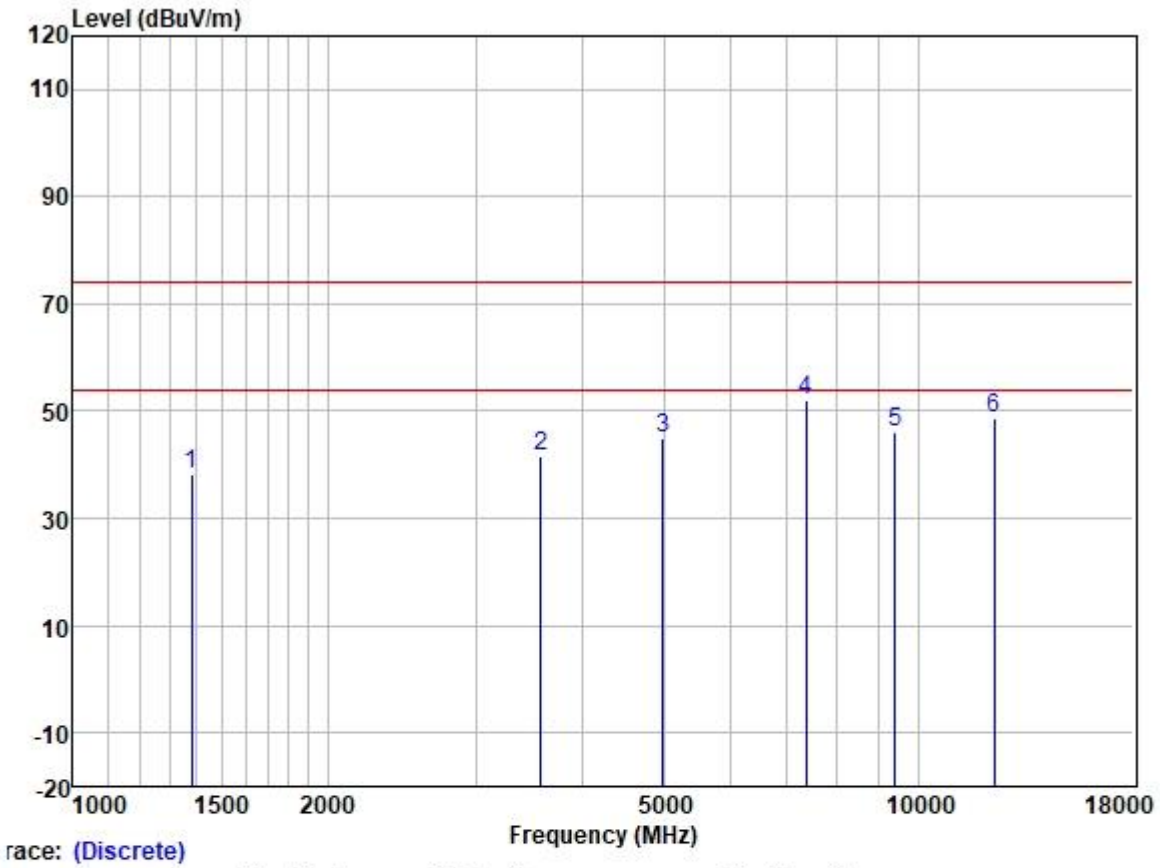
Test Mode: 00; Polarity: Horizontal



race: (Discrete)

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1382.262	48.57	25.37	2.60	38.25	38.29	74.00	-35.71	HORIZONTAL	Peak
2	3579.945	45.16	29.00	4.47	36.92	41.71	74.00	-32.29	HORIZONTAL	Peak
3	4988.058	44.32	31.69	5.68	36.85	44.84	74.00	-29.16	HORIZONTAL	Peak
4	7368.741	47.21	36.12	6.17	37.45	52.05	74.00	-21.95	HORIZONTAL	Peak
5	9393.689	38.33	38.13	7.18	37.44	46.20	74.00	-27.80	HORIZONTAL	Peak
6	12290.700	39.07	38.66	8.03	36.95	48.81	74.00	-25.19	HORIZONTAL	Peak

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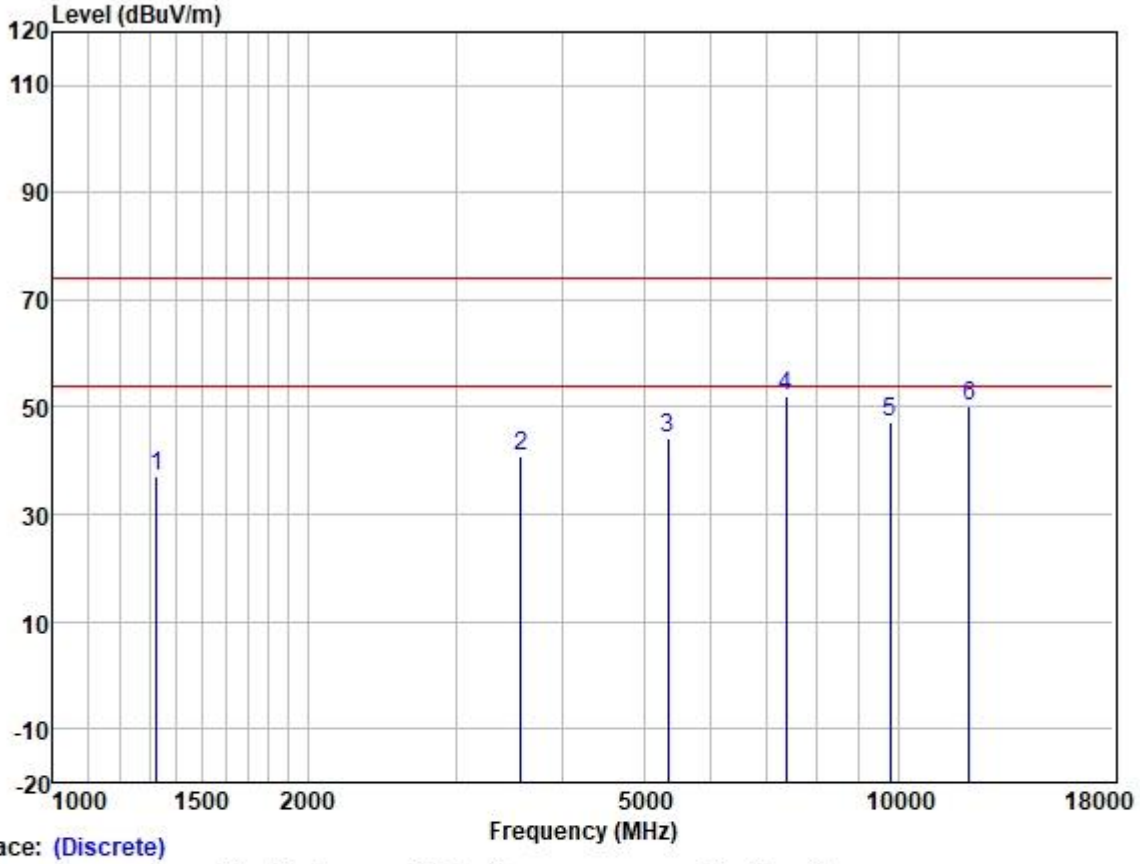
Test Mode: 00; Polarity: Vertical



race: (Discrete)

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1327.446	47.38	25.27	2.60	38.29	36.96	74.00	-37.04	VERTICAL	Peak
2	3579.113	44.25	29.00	4.47	36.92	40.80	74.00	-33.20	VERTICAL	Peak
3	5346.358	43.11	31.77	6.05	36.88	44.05	74.00	-29.95	VERTICAL	Peak
4	7368.741	47.37	36.12	6.17	37.45	52.21	74.00	-21.79	VERTICAL	Peak
5	9781.603	39.04	38.53	7.01	37.41	47.17	74.00	-26.83	VERTICAL	Peak
6	12149.420	40.12	38.80	8.12	37.03	50.01	74.00	-23.99	VERTICAL	Peak

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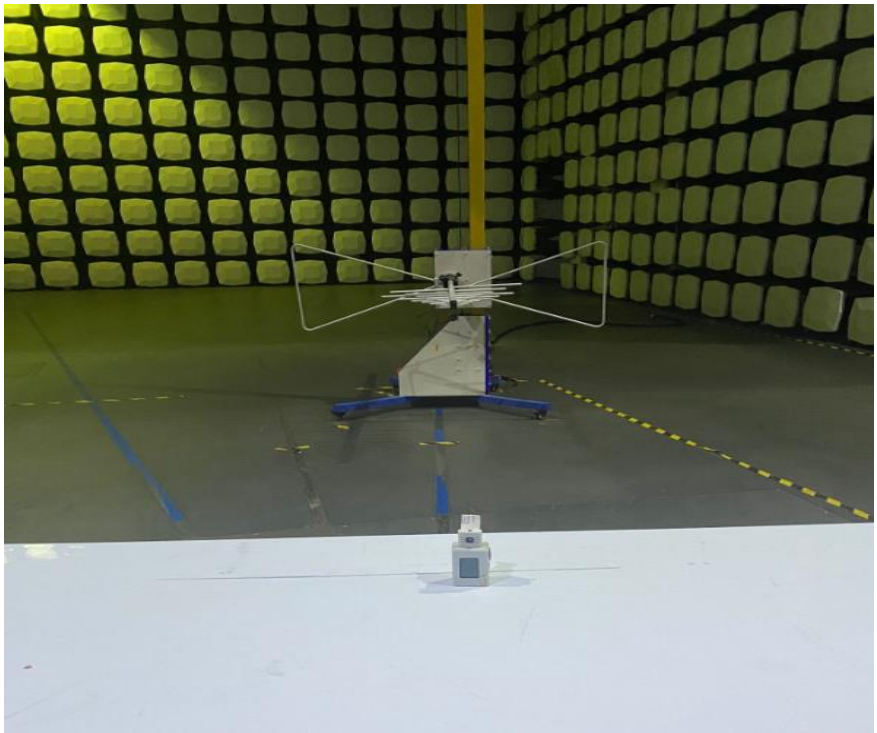
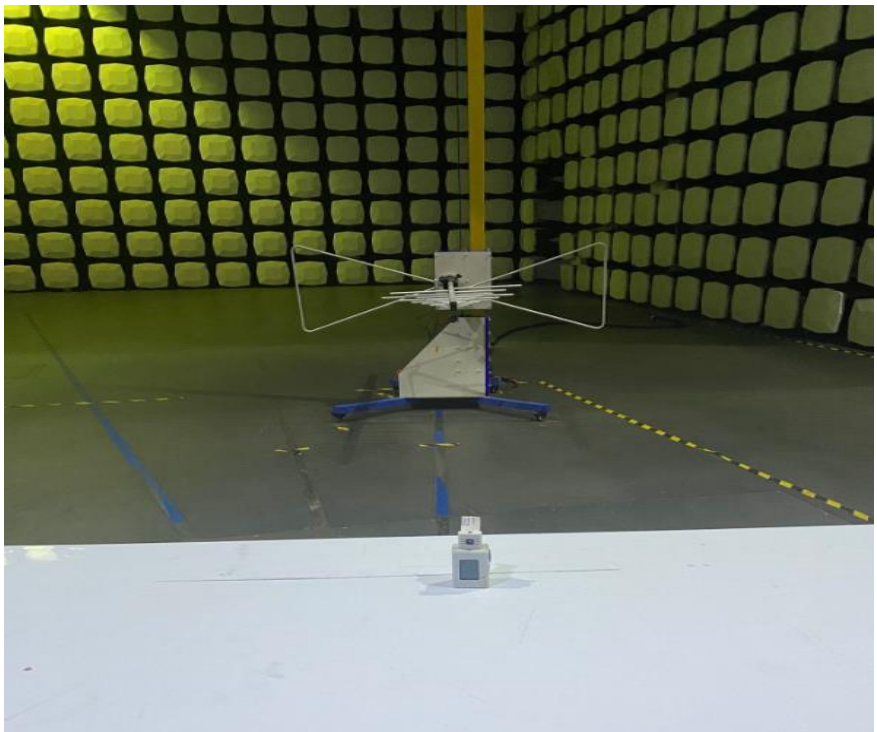
8 Test Setup Photo

Field Strength of the Fundamental Signal (15.249(a)) & Restricted Band Around Fundamental Frequency



Radiated Emissions (Below 1GHz)



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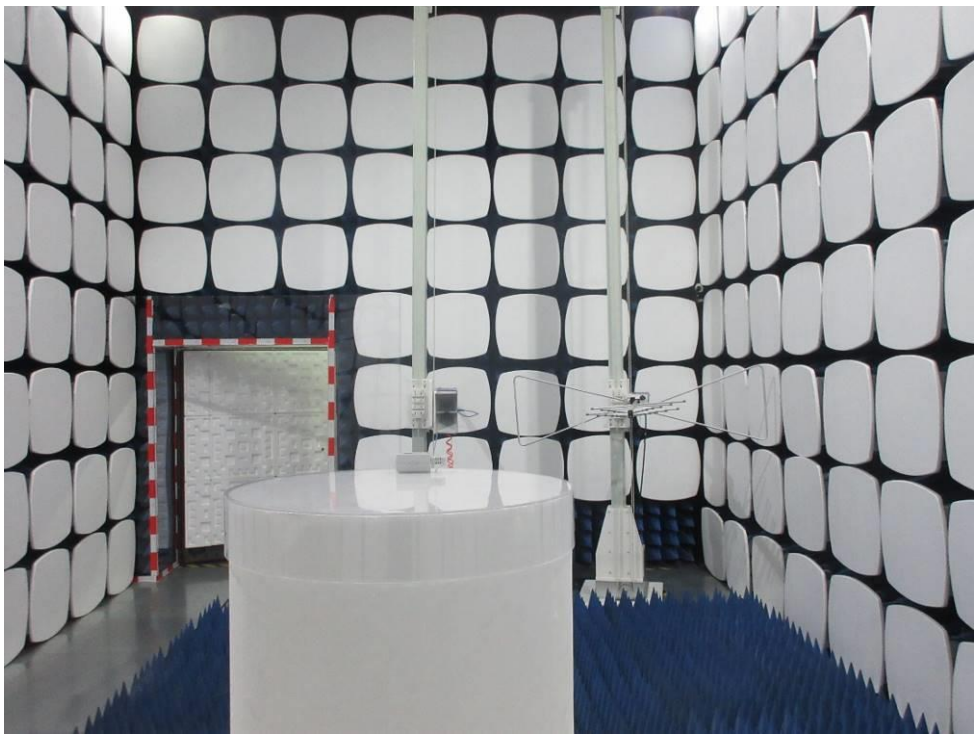
Radiated Emissions (Above 1GHz)



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9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External & Internal Photos for GZCR2108020745AT.

- End of the Report -

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