

TEST REPORT

Application No.: SZEM2012013241CR
Applicant: Sony Mobile Communications Inc.
Address of Applicant: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer: Sony Mobile Communications Inc.
Address of Manufacturer: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Factory: Dong Guan Huabel Electronic Technology Co., Ltd
Address of Factory: No.9 Industrial Northern Road, National High-Tech Industrial Development Zone, SongShan Lake, Dong Guan City

Equipment Under Test (EUT):
EUT Description: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, GPS and NFC
FCC ID: PY7-54955X
Brand Name: Sony
Standard(s) : 47 CFR Part 15, Subpart C 15.225
Date of Receipt: 2020-12-22
Date of Test: 2020-12-23 to 2021-01-25
Date of Issue: 2021-03-18

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-01-31		Original
02		2021-03-11		Updated test condition
03		2021-03-15		Updated test data
04		2021-03-18		Updated test data

Authorized for issue by:			
			
		<hr/> Leo Lai/Project Engineer	
			
		<hr/> Eric Fu/Reviewer	



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2 Test Summary

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



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.87V from internal rechargeable battery which can be charge by AC/DC adapter
Modulation Type:	ASK
Operation Frequency:	13.56MHz
Antenna Type:	Loop antenna
S/N of tested sample:	005213ADNVM2
NFC Type:	Type A, B, F and V
	Remark: The EUT has been pre-scanned in NFC Type A, B, F and V. The worst type (Type A) was recorded in this report if no others remark in the test items.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	Conduction emission	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
5	Radiated Spurious emission test	$\pm 4.5\text{dB}$ (Below 1GHz)
		$\pm 4.8\text{dB}$ (Above 1GHz)
6	Temperature test	$\pm 1^\circ\text{C}$
7	Humidity test	$\pm 3\%$
8	Supply voltages	$\pm 1.5\%$
9	Time	$\pm 3\%$



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHZ, 10m Semi-anechoic chamber for below 1GHZ, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Radiated Emissions (9kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2020-11-02	2021-11-01
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2020-04-09	2021-04-08
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

Radiated Emissions (30MHz-1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2020-11-02	2021-11-01
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-02	2019-05-24	2022-05-23
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2020-04-01	2021-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2020-07-10	2021-07-09

Frequency tolerance					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020-09-23	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2020-05-21	2021-05-20
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2020-03-25	2021-03-24



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Emission Mask					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2020-11-02	2021-11-01
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2020-04-09	2021-04-08
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

Conducted Emissions at Mains Terminals (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12
EMI Test Receiver	Rohde&Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020-07-10	2021-07-09
LISN	Rohde&Schwarz	ENV216	SEM007-01	2020-09-23	2021-09-22
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020-09-23	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2020-05-21	2021-05-20
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2020-03-25	2021-03-24



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General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2020-09-15	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2020-09-15	2021-09-14
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06



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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

Standard 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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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.



7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (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.



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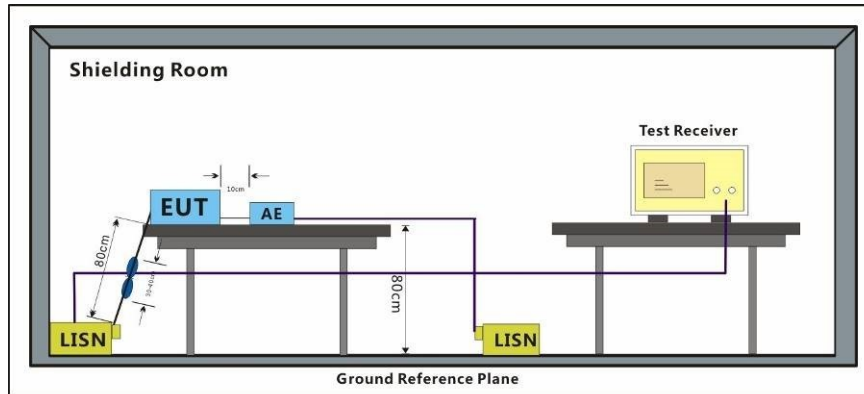
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 55.9 % RH Atmospheric Pressure: 1015 mbar

Test mode 00: TX mode with modulation

7.1.2 Test Setup Diagram



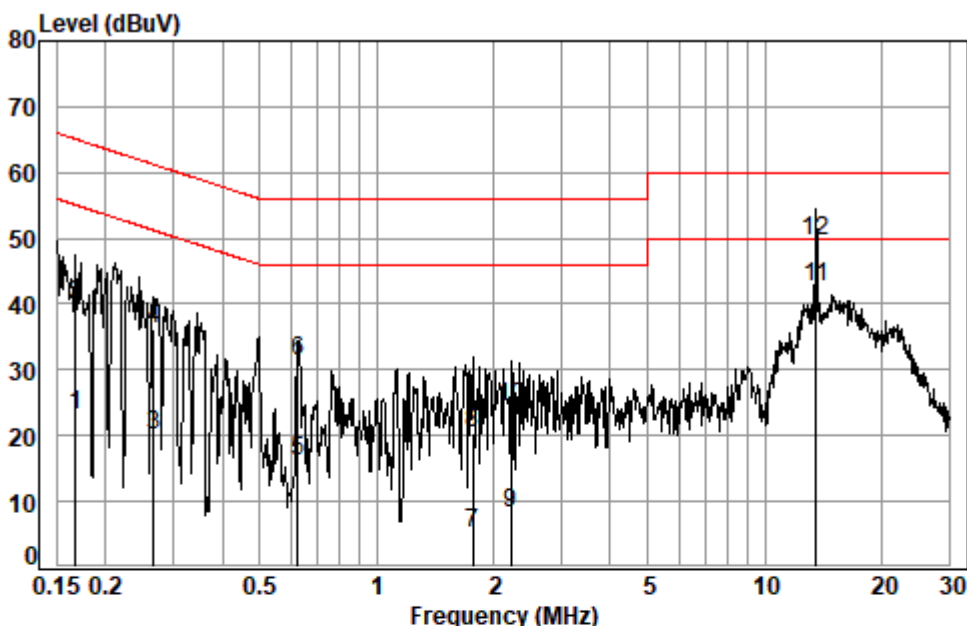
7.1.3 Measurement Procedure and Data

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



Mode: 00; Line: Live Line



Site : Shielding Room
Condition: Line
Job No. : 13241CR
Test mode: 00

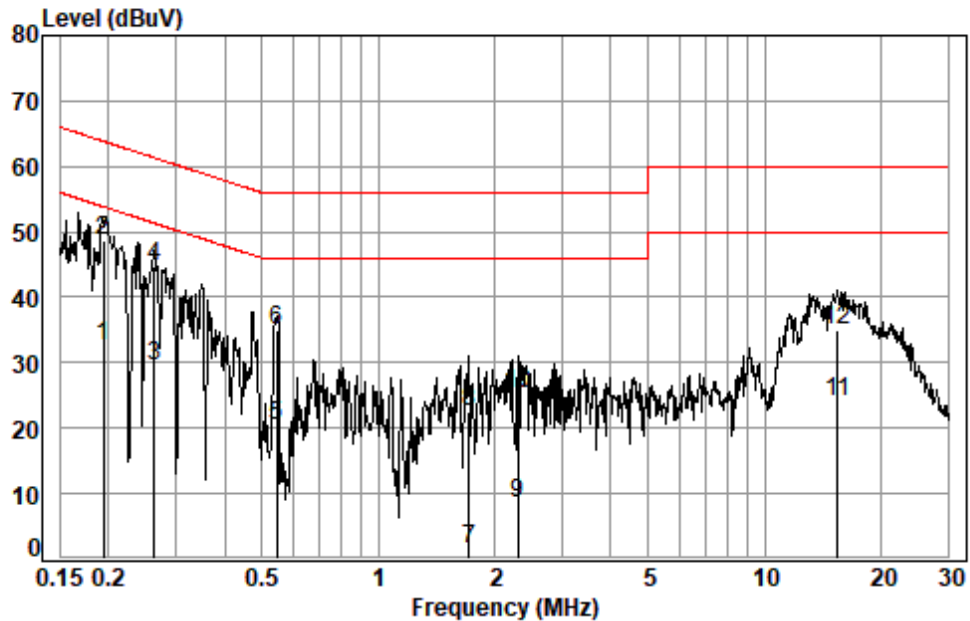
	Freq	Cable Loss	LISN Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1677	0.03	9.71	13.39	23.13	55.08	-31.95	Average
2	0.1677	0.03	9.71	30.25	39.99	65.08	-25.09	QP
3	0.2658	0.05	9.74	10.17	19.96	51.25	-31.29	Average
4	0.2658	0.05	9.74	26.44	36.23	61.25	-25.02	QP
5	0.6271	0.08	9.77	6.22	16.07	46.00	-29.93	Average
6	0.6271	0.08	9.77	21.61	31.46	56.00	-24.54	QP
7	1.7716	0.12	9.81	-4.78	5.15	46.00	-40.85	Average
8	1.7716	0.12	9.81	10.39	20.32	56.00	-35.68	QP
9	2.2132	0.13	9.81	-1.75	8.19	46.00	-37.81	Average
10	2.2132	0.13	9.81	14.53	24.47	56.00	-31.53	QP
11	13.5600	0.16	10.44	32.10	42.70	50.00	-7.30	Average
12	13.5600	0.16	10.44	38.90	49.50	60.00	-10.50	QP

Remark: Line conducted test plot with NFC antenna attached (L1)



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Mode: 00; Line: Live Line



Site : Shielding Room
Condition: Line
Job No. : 13241CR
Test mode: 00

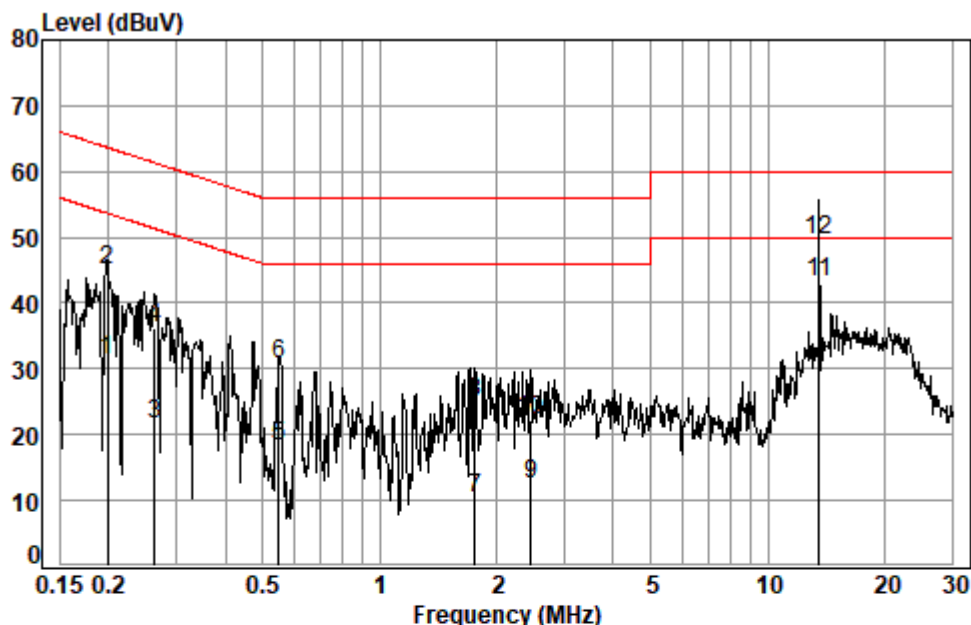
	Freq	Cable Loss	LISN Factor	Read Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.1945	0.04	9.72	22.82	53.84	-21.26	Average
2	0.1945	0.04	9.72	38.97	63.84	-15.11	QP
3	0.2630	0.05	9.74	19.70	51.34	-21.85	Average
4	0.2630	0.05	9.74	34.83	61.34	-16.72	QP
5	0.5464	0.08	9.77	10.45	46.00	-25.70	Average
6	0.5464	0.08	9.77	25.00	56.00	-21.15	QP
7	1.7162	0.12	9.80	-8.34	46.00	-44.42	Average
8	1.7162	0.12	9.80	12.48	56.00	-33.60	QP
9	2.2968	0.13	9.82	-1.34	46.00	-37.39	Average
10	2.2968	0.13	9.82	15.17	56.00	-30.88	QP
11	15.4701	0.16	10.56	13.17	50.00	-26.11	Average
12	15.4701	0.16	10.56	24.17	60.00	-25.11	QP

Remark: Line-conducted test plot with NFC antenna terminated 50ohm (L1)



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Mode:00; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 13241CR
Test mode: 00

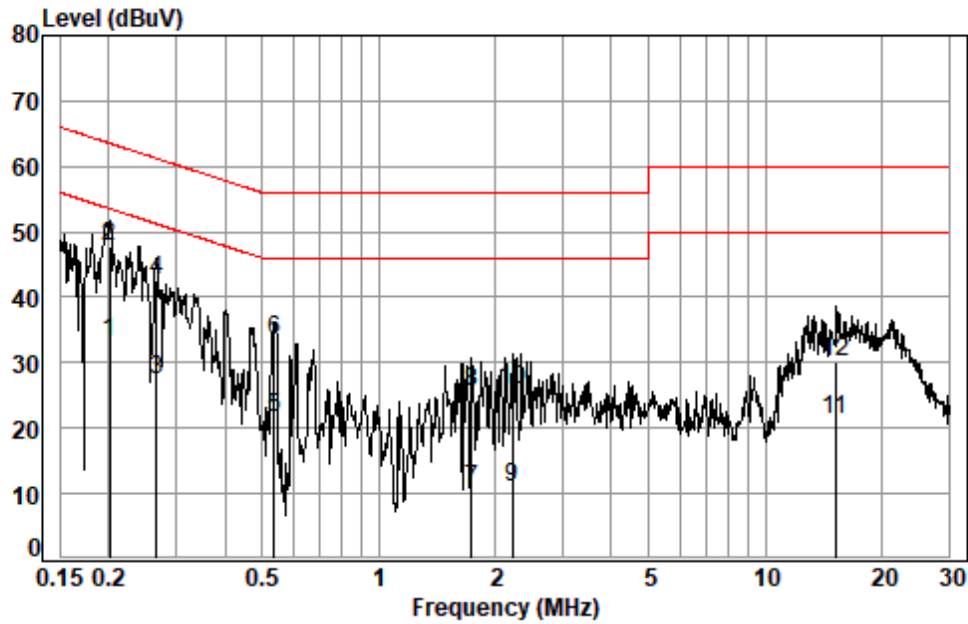
	Freq	Cable Loss	LISN Factor	Read Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.1986	0.04	9.72	21.52	53.67	-22.39	Average
2	0.1986	0.04	9.72	35.32	63.67	-18.59	QP
3	0.2630	0.05	9.73	11.89	51.34	-29.67	Average
4	0.2630	0.05	9.73	26.45	61.34	-25.11	QP
5	0.5493	0.08	9.77	8.35	46.00	-27.80	Average
6	0.5493	0.08	9.77	20.87	56.00	-25.28	QP
7	1.7623	0.12	9.80	0.47	46.00	-35.61	Average
8	1.7623	0.12	9.80	15.10	56.00	-30.98	QP
9	2.4476	0.13	9.82	2.67	46.00	-33.38	Average
10	2.4476	0.13	9.82	12.23	56.00	-33.82	QP
11	13.5600	0.16	10.44	32.50	50.00	-6.90	Average
12	13.5600	0.16	10.44	39.10	60.00	-10.30	QP

Remark: Line-conducted test plot with NFC antenna attached (N)



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Mode:00; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 13241CR
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.2018	0.04	9.72	23.28	33.04	53.54	-20.50	Average
2	0.2018	0.04	9.72	38.04	47.80	63.54	-15.74	QP
3	0.2658	0.05	9.73	17.54	27.32	51.25	-23.93	Average
4	0.2658	0.05	9.73	32.80	42.58	61.25	-18.67	QP
5	0.5378	0.08	9.76	11.76	21.60	46.00	-24.40	Average
6	0.5378	0.08	9.76	23.76	33.60	56.00	-22.40	QP
7	1.7437	0.12	9.80	0.75	10.67	46.00	-35.33	Average
8	1.7437	0.12	9.80	15.76	25.68	56.00	-30.32	QP
9	2.2132	0.13	9.81	0.98	10.92	46.00	-35.08	Average
10	2.2132	0.13	9.81	15.93	25.87	56.00	-30.13	QP
11	15.2261	0.16	10.54	10.58	21.28	50.00	-28.72	Average
12	15.2261	0.16	10.54	19.29	29.99	60.00	-30.01	QP

Remark: Line-conducted test plot with NFC antenna terminated 50ohm (N)



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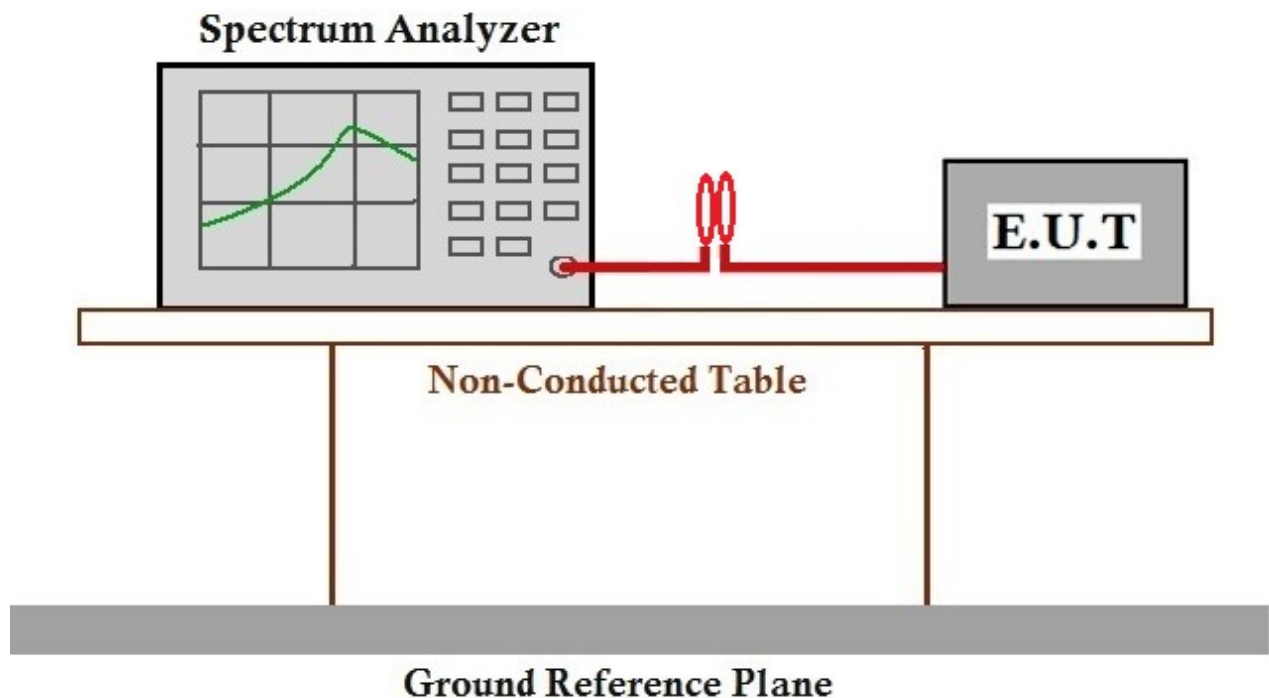
7.2 20dB Bandwidth

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

7.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 25 °C Humidity: 54 % RH Atmospheric Pressure: 1015 mbar
 Test mode 00: TX mode with modulation

7.2.2 Test Setup Diagram



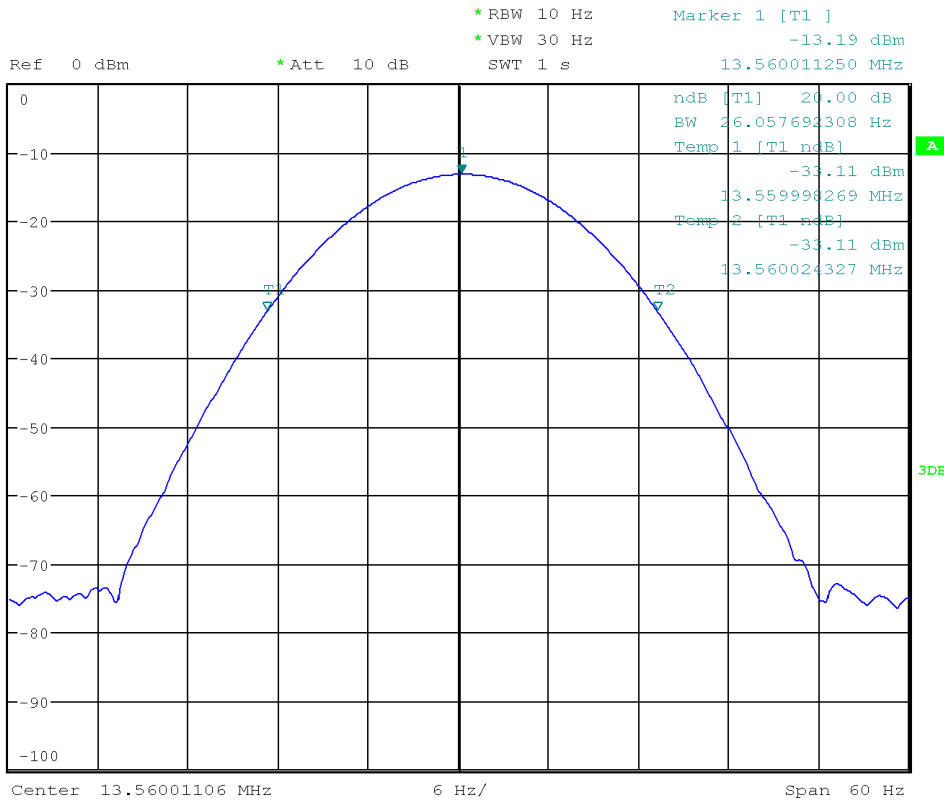
7.2.3 Measurement Procedure and Data

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.

Remark: Because the signal is CW-like, it is not practical to use an RBW setting of 1-5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.



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1 PR
VIEW

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3DB



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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
Measurement Distance: 3m
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.
- (e) According to KDB 414788, we have a site validation between OATS and Semi Chamber for radiated emission measurements below 30 MHz, and the result of 3m Chamber measured is worst case result.

7.3.1 E.U.T. Operation

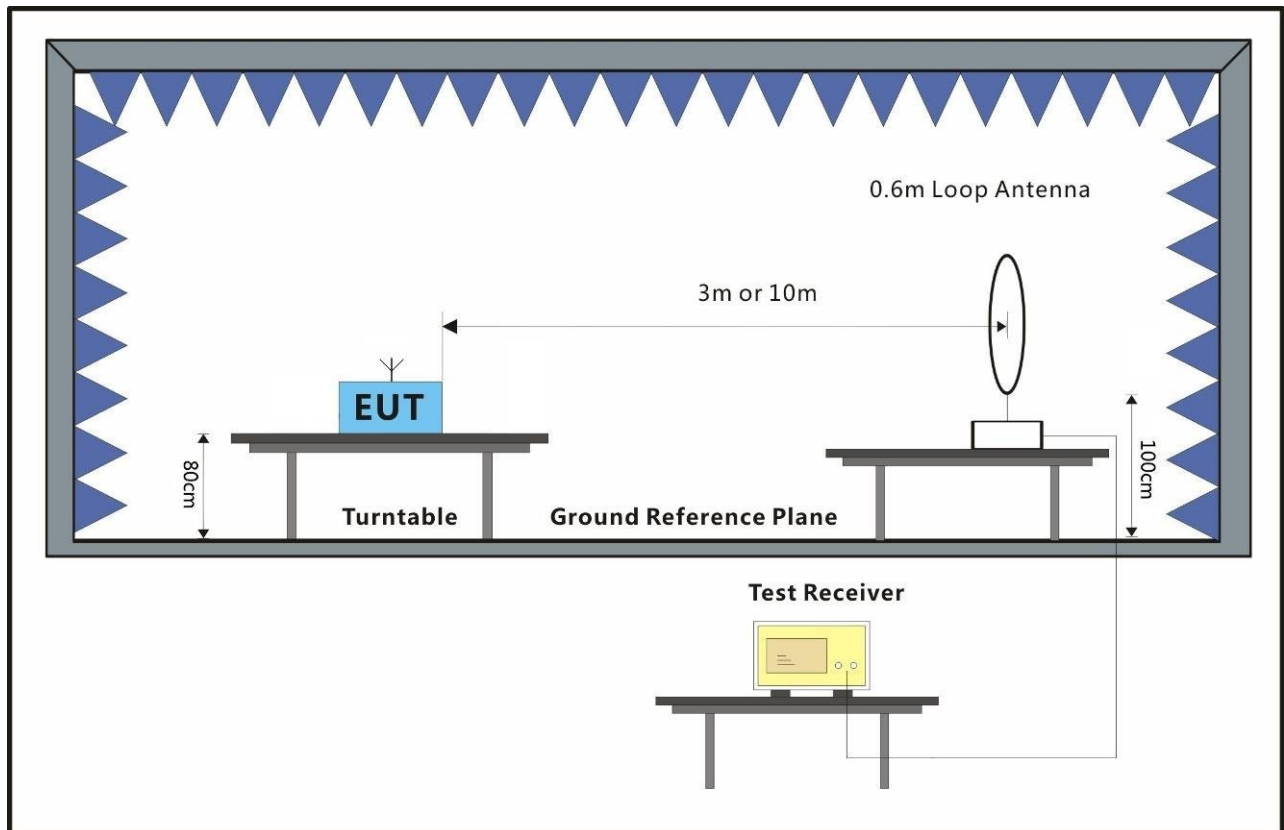
Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar

Test mode 00: TX mode with modulation



7.3.2 Test Setup Diagram

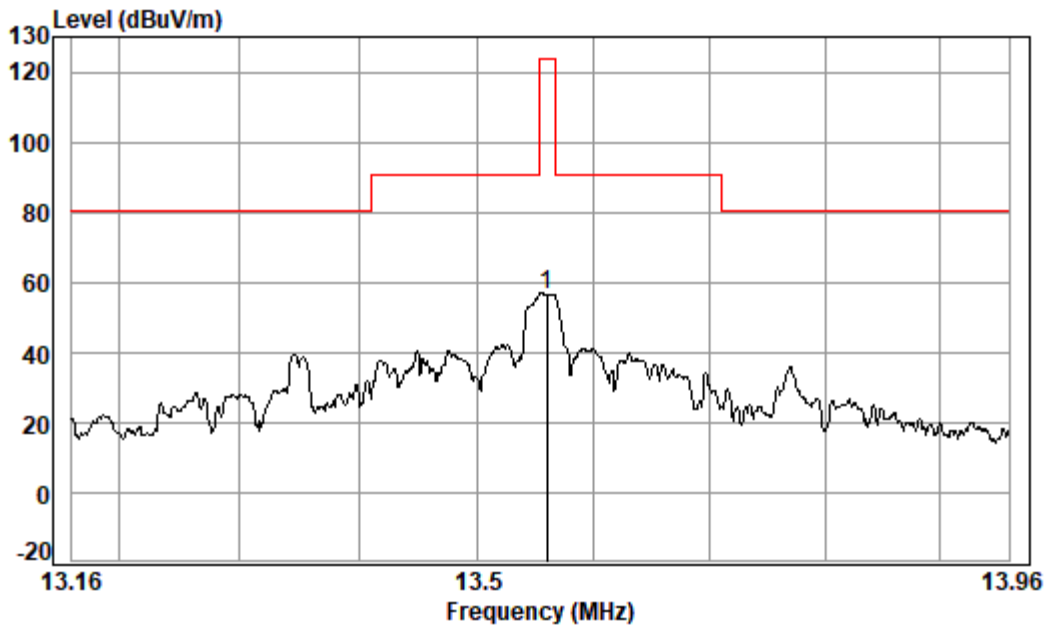


7.3.3 Measurement Procedure and Data

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.



Mode:00 (Detector: QP)



Condition: 3m
Job No. : 13241CR
Test Mode: 00

Frequency (MHz)	Cable loss (dB)	ANT Factor (dB)	Preamp Factor (dB)	Read Level @ 3m (dBuV)	Level @ 3m (dBuV/m)	Level @ 30m (dBuV/m)	Limit @ 30m (dBuV/m)	Margin (dB)
13.56	0.62	8.88	32.5	79.69	56.69	16.69	84	-67.31

Remark: The test is Pass and all emissions were greater than 20 dB below the limit.

Below 30MHz

The test was performed at a 3m test site.

The level at 30m test distance is below:

The factor calculated by the following equation:

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

where

- FS_{limit} is the calculation of field strength at the limit distance, expressed in dB μ V/m
- FS_{max} is the measured field strength, expressed in dB μ V/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



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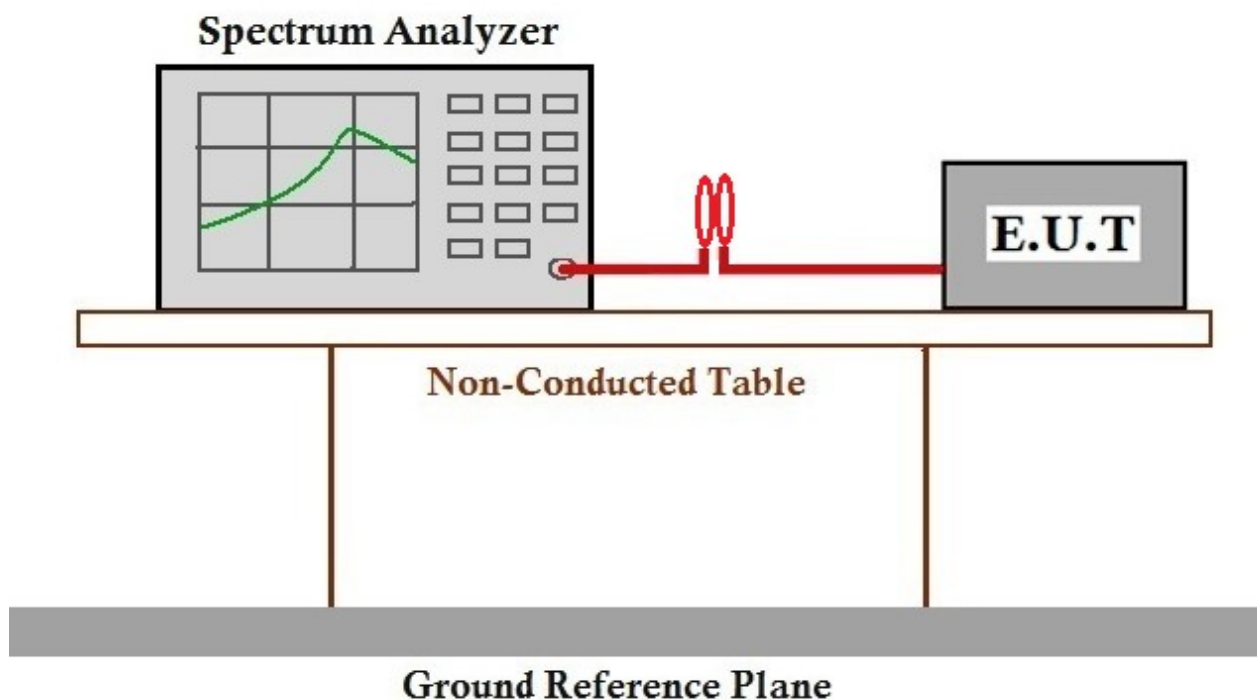
7.4 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)
 Test Method: ANSI C63.10 (2013) Section 6.8
 Limit: $\pm 1.356\text{kHz}(\pm 0.01\%)$

7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar
 Test mode 00: TX mode with modulation

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

During the test, maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.



Declared Frequency (MHz)	13.56MHz	Test start at startup
--------------------------	----------	-----------------------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	3.87	13.560082	0.00061	±0.01	Pass
40		13.560038	0.00028		Pass
30		13.560027	0.00020		Pass
20		13.560011	0.00008		Pass
10		13.560022	0.00016		Pass
0		13.560056	0.00041		Pass
-10		13.560063	0.00046		Pass
-20		13.560689	0.00508		Pass
20	4.45	13.560030	0.00022	Pass	
	3.29	13.560050	0.00037	Pass	

Declared Frequency (MHz)	13.56MHz	Test start at 2 minutes
--------------------------	----------	-------------------------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	3.87	13.560082	0.0006	±0.01	Pass
40		13.560037	0.0003		Pass
30		13.560025	0.0002		Pass
20		13.560009	0.0001		Pass
10		13.560023	0.0002		Pass
0		13.560055	0.0004		Pass
-10		13.560061	0.0004		Pass
-20		13.560690	0.0051		Pass
20	4.45	13.560028	0.0002	Pass	
	3.29	13.560049	0.0004	Pass	



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Declared Frequency (MHz)	13.56MHz	Test start at 5 minutes
--------------------------	----------	-------------------------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	3.87	13.560083	0.0006	±0.01	Pass
40		13.560044	0.0003		Pass
30		13.560026	0.0002		Pass
20		13.560012	0.0001		Pass
10		13.560033	0.0002		Pass
0		13.560081	0.0006		Pass
-10		13.560062	0.0005		Pass
-20		13.560681	0.0050		Pass
20	4.45	13.560035	0.0003	Pass	
	3.29	13.560057	0.0004	Pass	

Declared Frequency (MHz)	13.56MHz	Test start at 10 minutes
--------------------------	----------	--------------------------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	3.87	13.560089	0.0007	±0.01	Pass
40		13.560055	0.0004		Pass
30		13.560024	0.0002		Pass
20		13.560011	0.0001		Pass
10		13.560035	0.0003		Pass
0		13.560059	0.0004		Pass
-10		13.560081	0.0006		Pass
-20		13.560115	0.0008		Pass
20	4.45	13.560024	0.0002	Pass	
	3.29	13.560041	0.0003	Pass	



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7.5 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

Measurement Distance: 3m

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



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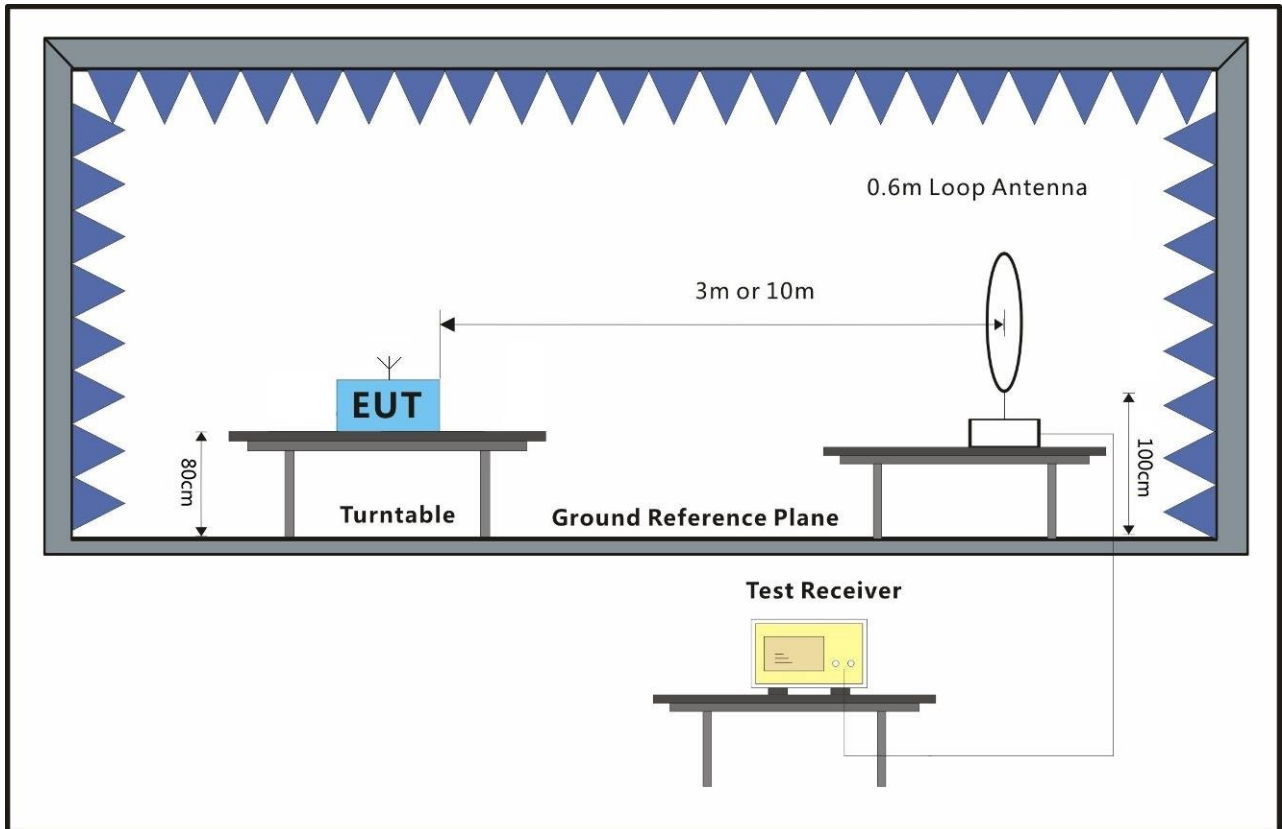
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar

Test mode 00: TX mode with modulation

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

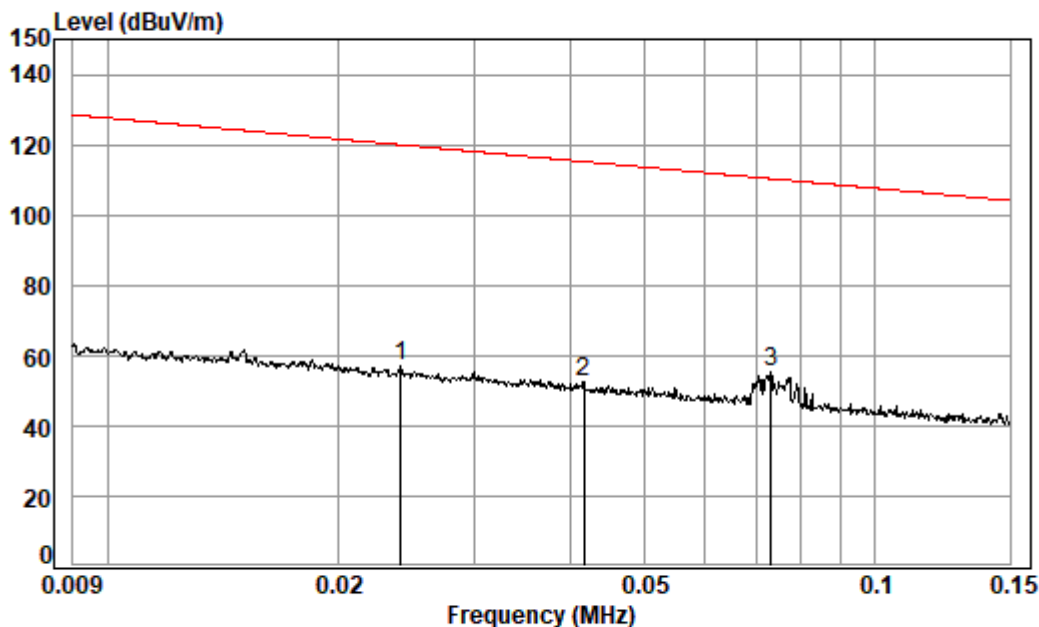
For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated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

According to KDB 414788, we have a site validation between OATS and Semi Chamber for radiated emission measurements below 30 MHz, and the result of 3m Chamber measured is worst case result.



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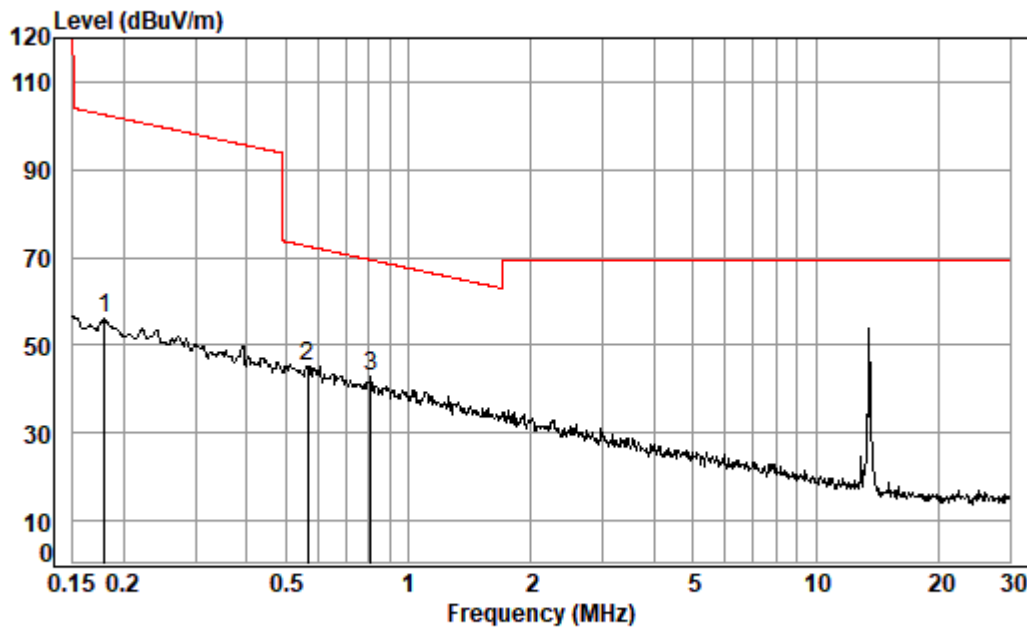
Frequency: 9KHz-150KHz



Condition: 3m
Job No. : 13241CR
Test Mode: 00



Frequency: 150KHz-30MHz



Condition: 3m
Job No. : 13241CR
Test Mode: 00

Frequency (MHz)	Level @ 3m (dBUV/m)	Limit @ 300m (dBUV/m)	Limit @ 30m (dBUV/m)	Factor (dB)	Level @ 300m (dBUV/m)	Level @ 30m (dBUV/m)	Margin (dB)
0.02409	56.82	39.97	-	80.00	-23.18	-	-63.15
0.04170	52.62	35.20	-	80.00	-27.38	-	-62.58
0.07320	55.46	30.31	-	80.00	-24.54	-	-54.85
0.17961	56.10	22.52	-	80.00	-23.90	-	-46.42
0.56709	45.26	-	32.53	40.00	-	5.26	-27.27
0.80876	42.93	-	29.45	40.00	-	2.93	-26.52

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



7.6 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
 Measurement Distance: 10m
 Limit:

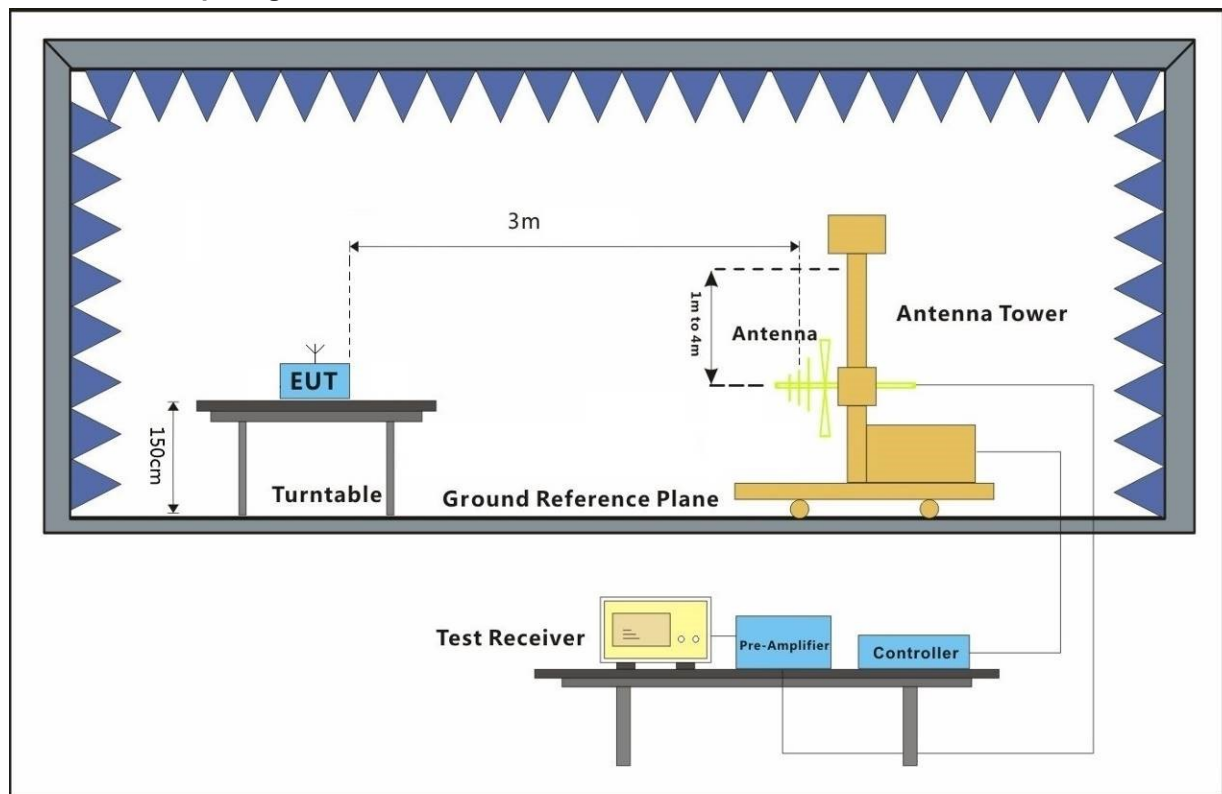
Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar
 Test mode 00: TX mode with modulation

7.6.2 Test Setup Diagram



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7.6.3 Measurement Procedure and Data

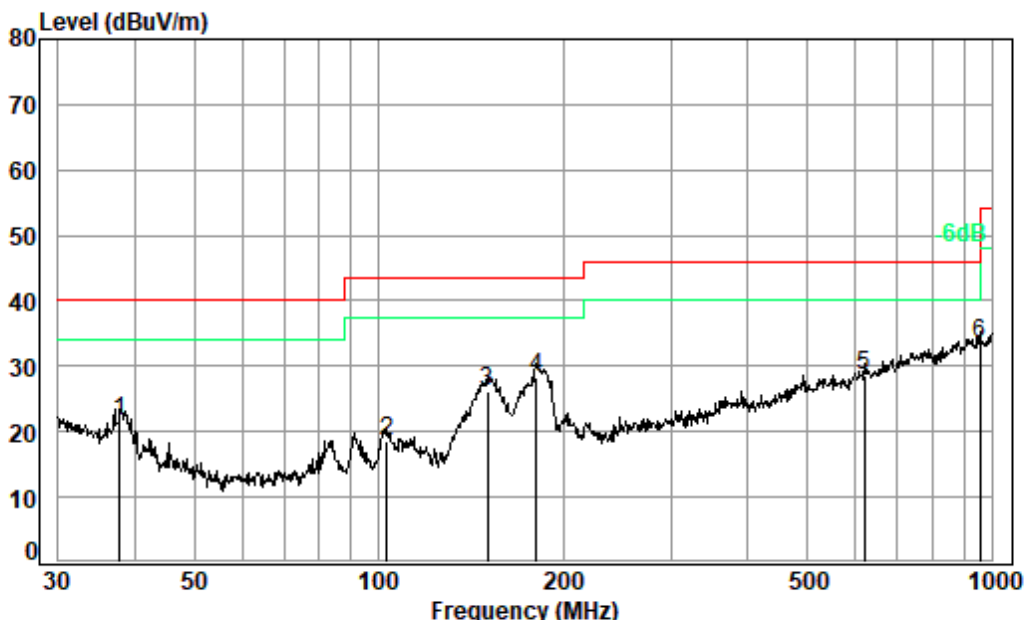
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which 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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Mode:00; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No. : 13241CR

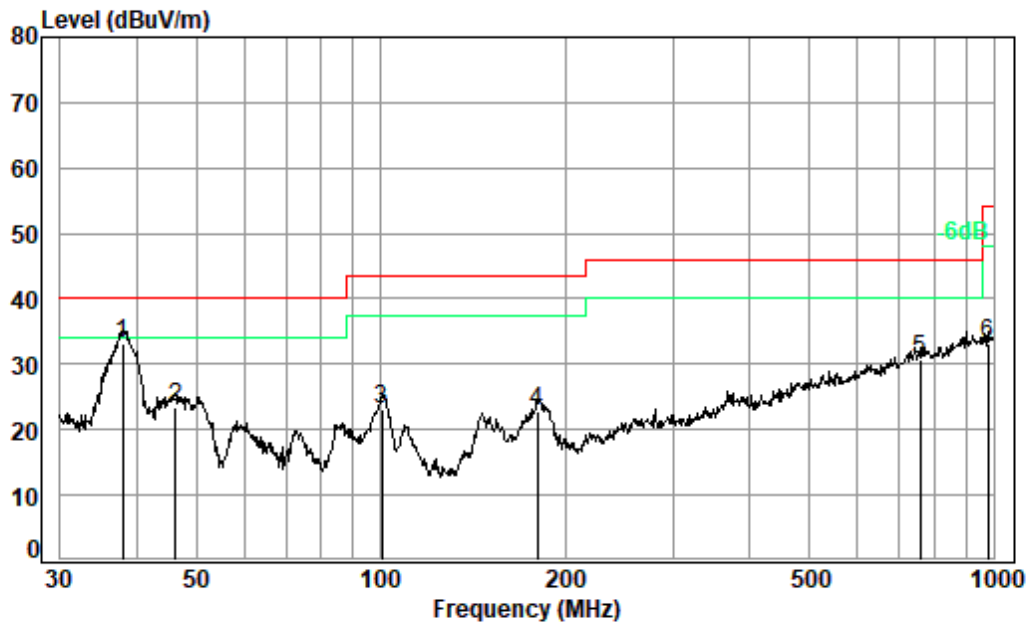
Test Mode: 00

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	37.81	0.68	19.25	27.71	29.34	21.56	40.00	-18.44	QP
2	103.08	1.10	13.90	27.59	31.11	18.52	43.50	-24.98	QP
3	150.54	1.16	14.74	27.33	37.58	26.15	43.50	-17.35	QP
4	180.65	1.19	15.41	27.21	38.91	28.30	43.50	-15.20	QP
5	620.71	2.74	26.69	28.08	27.12	28.47	46.00	-17.53	QP
6 pp	955.44	3.56	29.43	26.88	27.23	33.34	46.00	-12.66	QP



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Mode:00; Polarization:Vertical



Condition: 3m VERTICAL

Job No. : 13241CR

Test Mode: 00

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	0.68	19.21	27.71	41.08	33.26	40.00	-6.74	QP
2	0.70	15.43	27.69	35.12	23.56	40.00	-16.44	QP
3	1.10	13.98	27.61	35.69	23.16	43.50	-20.34	QP
4	1.18	15.40	27.21	33.32	22.69	43.50	-20.81	QP
5	3.14	27.91	27.80	27.43	30.68	46.00	-15.32	QP
6	3.58	29.50	26.76	26.70	33.02	54.00	-20.98	QP



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8 Photographs

8.1 Test Setup

Refer to setup photos.

8.2 EUT Constructional Details (EUT Photos)

Refer to external and internal photos.

- End of the Report -

