RADIO TEST REPORT

Applicant	:	Willo 32, Inc
Address	:	12 E 33rd Street, 10th Floor, New York NY, 10016
Equipment	:	Powered Toothbrush
Model No.	:	Willo W
Trade Name	:	Willo
FCC ID.	:	2AVNVWILLO-W-3201

I HEREBY CERTIFY THAT :

The sample was received on Jun. 19, 2019 and the testing was completed on Jan. 13, 2020 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Supervisor

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory

Contents

History of this test report

Report No.	Issue Date	Description
TEFO1906034	Jan. 16, 2020	Original

1. Summary of Test Procedure and Test Results

1.1. Applicable Standards

ANSI C63.4:2014

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.225

FCC Rule	Description of Test	Result
15.203	Antenna Requirement	PASS
15.207	AC Power Line Conducted Emission	PASS
15.209 15.225	Radiated Emission	PASS
15.225	20dB Bandwidth	PASS
15.225(e)	Frequency Stability	PASS

*The principle of judgment is made according to the laboratory's reporting control and measurement uncertainty standard procedures.

*This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report(TEFD1906034).

2. Test Configuration of Equipment under Test

2.1. Feature of Equipment under Test

AC Adapter	Model No.: W18-036N1A Input: 100-240V~ 50/60Hz, 1A Output: 12V, 3A
Frequency Range	BT / BLE: 2402MHz~2480MHz 802.11b/g/n: 2412MHz~2462MHz
NFC Frequency Range	13.553MHz~13.567MHz
Modulation Mode	BT: GFSK, π/4-DQPSK, 8DPSK BLE: GFSK NFC:ASK WLAN: 802.11b: CCK, DQPSK, DBPSK 802.11g/n: BPSK, QPSK, 16QAM, 64QAM
Data Rate	BT: GFSK: 1Mbps, π/4-DQPSK: 2Mbps, 8DPSK: 3Mbps BLE: GFSK: 1Mbps WLAN: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS7, HT20/40
Antenna Type	PCB Antenna
Antenna Gain	2400-2483.5MHz: 10dBi BLE: 10dBi Bluetooth: 10dBi NFC: 0dBi

Note:
1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.2. Carrier Frequency of Channels

Channel	Frequency(MHz)
*1	13.56

Note: Channel remarked **"*"** is selected to perform test.

2.3. Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
b. The complete test system included EUT for RF test.
c. Hardware control was executed to transmit and receive data via Bluetooth.
d. The test mode of RF test as follow:

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	NFC TX Mode For Hnadle
2	NFC TX Mode For Host
caused “Test Mode 1,2” generated the worst case, it was reported as the final data.	
Radiation Emissions (9KHz ~ 30MHz)	
Test Mode	Operating Description
1	NFC TX 13.56 MHz For Hnadle
2	NFC TX 13.56 MHz For Host
caused “Test Mode 1,2” generated the worst case, they were reported as the final data.	
Radiation Emissions (30MHz ~ 1GHz)	
Test Mode	Operating Description
1	NFC TX 13.56 MHz For Hnadle
2	NFC TX 13.56 MHz For Host
caused “Test Mode 1,2” generated the worst case, they were reported as the final data.	

2.4. Description of Test System

The EUT was tested alone. No support devices are needed for testing.

2.5. General Information of Test

Test Site	**Cerpass Technology Corporation Test Laboratory** Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881	
	FCC	TW1439, TW1079
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication test C-4663 for Conducted emission test R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	

For Hnadle

Test Item	Test Site	Finish Date	Environmental Conditions	Tested By
Radiated Emissions	3M02-NK	2020/01/12	25℃ / 48%	Leon Huang
AC Power Line Conducted Emission	CON02-NK	2020/01/13	27℃ / 49%	Leon Huang

For Host

Test Item	Test Site	Finish Date	Environmental Conditions	Tested By
Radiated Emissions	3M02-NK	2019/08/05	26℃ / 50%	Spree Yeh
AC Power Line Conducted Emission	CON01-NK	2019/08/05	24℃ / 52%	Leon Huang

2.6. Measurement Uncertainty

Measurement Item	Uncertainty
Radiated Spurious Emission(9KHz~30MHz)	±3.403dB
Radiated Spurious Emission(30MHz~1GHz)	±5.326dB
20dB Bandwidth	±5.493%
Occupied Bandwidth	±4.569%
Frequency Stability	±156.543Hz

3. Test Equipment and Ancillaries Used for Tests

For Hnadle

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	**Manufacturer**	**Model No**	**Serial No**	**Calibration Date**	**Valid Date**
Bilog Antenna	Schwarzbeck	VULB9168	275	2019/09/24	2020/09/23
Bilog Antenna	Schwarzbeck	VULB9168	369	2019/03/29	2020/03/28
Active Loop Antenna	EMCO	6507	40855	2019/05/24	2020/05/23
Horn Antenna	EMCO	3115	31589	2019/04/01	2020/03/31
Horn Anrenna	EMCO	3116	31974	2019/09/17	2020/09/16
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2019/05/14	2020/05/13
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100047	2019/03/28	2020/03/27
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2019/08/02	2020/08/01
Preamplifier	EM Electronics corp.	EM330	60660	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2019/09/20	2020/09/19
Preamplifier	Agilent	8449B	3008A01954	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2019/11/07	2020/11/06
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2019/04/09	2020/04/08
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1316	2019/09/20	2020/09/19
Cable-0.5m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805443/4	2019/05/20	2020/05/19
Cable-3m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805796/4	2019/05/20	2020/05/19
Cable-8m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805795/4	2019/05/20	2020/05/19
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA

Test Item	AC Power Line Conducted Emission				
Test Site	CON02-NK				
Instrument	**Manufacturer**	**Model No**	**Serial No**	**Calibration Date**	**Valid Date**
EMI Receiver	ROHDE & SCHWARZ	ESCI	100821	2019/09/16	2020/09/15
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-516	2019/09/19	2020/09/18
TWO-LINE V-NETWORK	ROHDE & SCHWARZ	ENV216	102185	2019/07/05	2020/07/04
Cable-6m(9k~300M)	NA	EMC5D-BM-BM-6	130606	2019/03/14	2020/03/13
E3	AUDIX	v8.2014-8-6	RK-000536	NA	NA

For Host

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	**Manufacturer**	**Model No**	**Serial No**	**Calibration Date**	**Valid Date**
Bilog Antenna	Schwarzbeck	VULB9168	275	2018/09/17	2019/09/16
Active Loop Antenna	EMCO	6507	40855	2019/05/24	2020/05/23
Horn Antenna	EMCO	3115	31589	2019/04/01	2020/03/31
Horn Anrenna	EMCO	3116	31974	2018/09/07	2019/09/06
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2019/05/14	2020/05/13
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100047	2019/03/28	2020/03/27
Preamplifier	EM Electronics corp.	EM330	60660	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2018/09/18	2019/09/17
Preamplifier	Agilent	8449B	3008A01954	2019/03/11	2020/03/10
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1316	2018/09/12	2019/09/11
Cable-0.5m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805443/4	2019/05/20	2020/05/19
Cable-3m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805796/4	2019/05/20	2020/05/19
Cable-8m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805795/4	2019/05/20	2020/05/19
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA

Test Item	AC Power Line Conducted Emission				
Test Site	CON01-NK				
Instrument	**Manufacturer**	**Model No**	**Serial No**	**Calibration Date**	**Valid Date**
EMI Receiver	ROHDE & SCHWARZ	ESCI	100443	2019/03/29	2020/03/28
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-568	2019/03/15	2020/03/14
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101934	2019/03/12	2020/03/11
Cable-6m(9k~300M)	NA	EMC5D-BM-BM-6	130606	2019/03/14	2020/03/13
E3	AUDIX	v8.2014-8-6	RK-000531	NA	NA

4. Antenna Requirements

4.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2. Antenna Construction and Directional Gain

Antenna Type	PCB Antenna
Antenna Gain	0dBi

5. Test of AC Power Line Conducted Emission

5.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

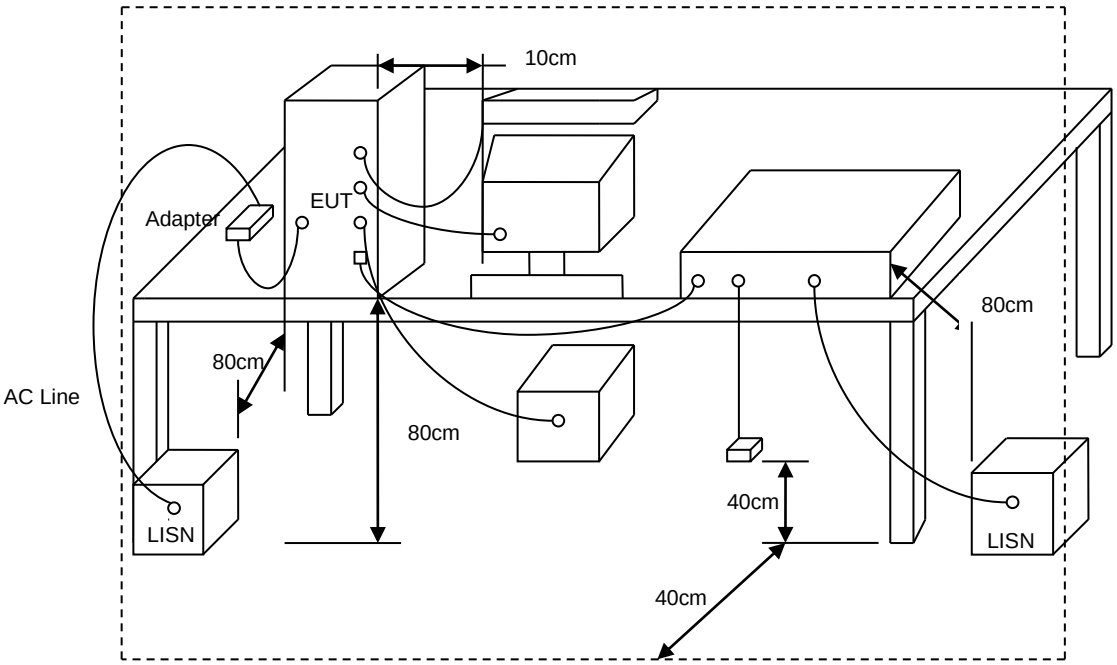
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

5.2. Test Procedures

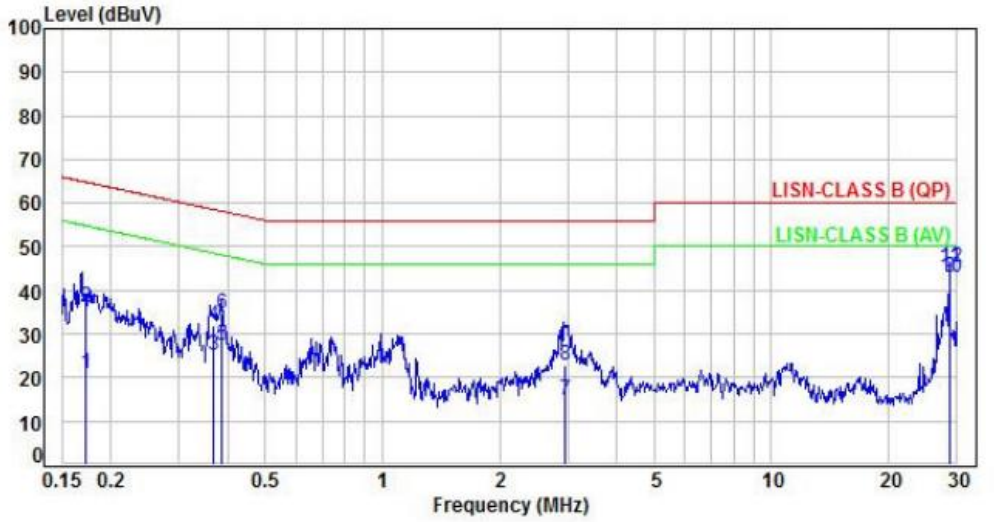
a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.3. Typical Test Setup



5.4. Test Result and Data

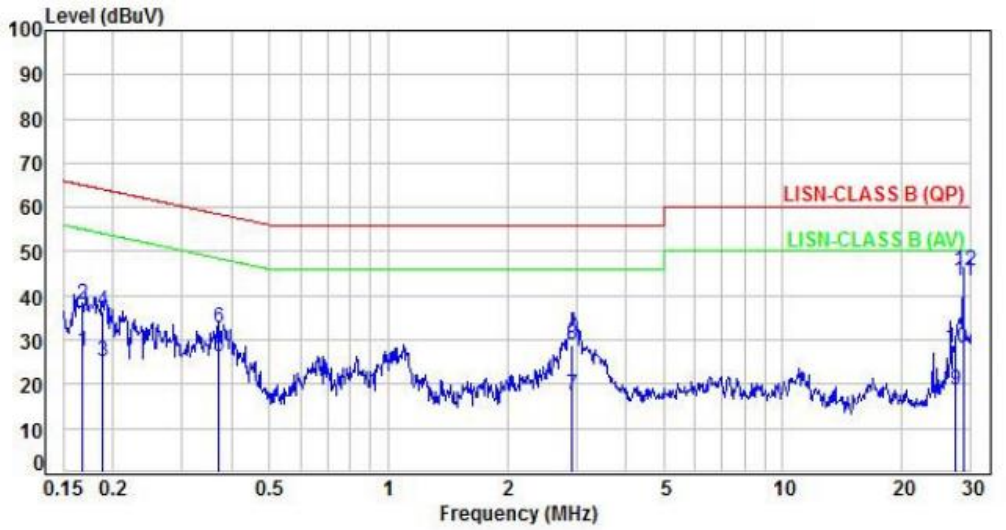
Power	:	AC 120V / 60Hz	Pol/Phase	:	LINE
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.64	11.14	20.78	54.87	-34.09	Average	P
2	0.17	9.64	26.48	36.12	64.87	-28.75	QP	P
3	0.37	9.64	15.43	25.07	48.52	-23.45	Average	P
4	0.37	9.64	22.15	31.79	58.52	-26.73	QP	P
5	0.39	9.64	17.91	27.55	48.15	-20.60	Average	P
6	0.39	9.64	24.82	34.46	58.15	-23.69	QP	P
7	2.94	9.76	4.93	14.69	46.00	-31.31	Average	P
8	2.94	9.76	13.02	22.78	56.00	-33.22	QP	P
9	28.67	9.99	33.00	42.99	50.00	-7.01	Average	P
10	28.67	9.99	33.04	43.03	50.00	-6.97	Average	P
11	28.67	9.99	35.35	45.34	60.00	-14.66	QP	P
12	28.67	9.99	35.33	45.32	60.00	-14.68	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

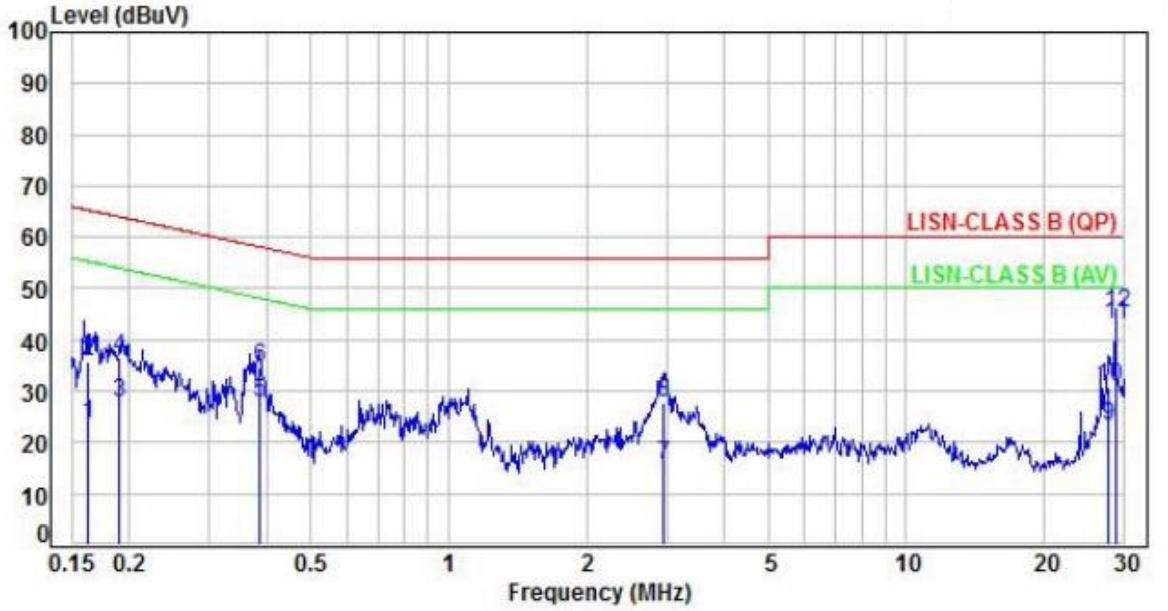
Power	:	AC 120V / 60Hz	Pol/Phase	:	NEUTRAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.64	17.65	27.29	55.11	-27.82	Average	P
2	0.17	9.64	28.32	37.96	65.11	-27.15	QP	P
3	0.19	9.63	15.52	25.15	54.10	-28.95	Average	P
4	0.19	9.63	26.74	36.37	64.10	-27.73	QP	P
5	0.37	9.64	16.78	26.42	48.51	-22.09	Average	P
6	0.37	9.64	23.14	32.78	58.51	-25.73	QP	P
7	2.92	9.75	7.89	17.64	46.00	-28.36	Average	P
8	2.92	9.75	19.25	29.00	56.00	-27.00	QP	P
9	27.43	10.06	8.50	18.56	50.00	-31.44	Average	P
10	27.43	10.06	18.19	28.25	60.00	-31.75	QP	P
11	28.67	10.07	33.13	43.20	50.00	-6.80	Average	P
12	28.67	10.07	35.44	45.51	60.00	-14.49	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

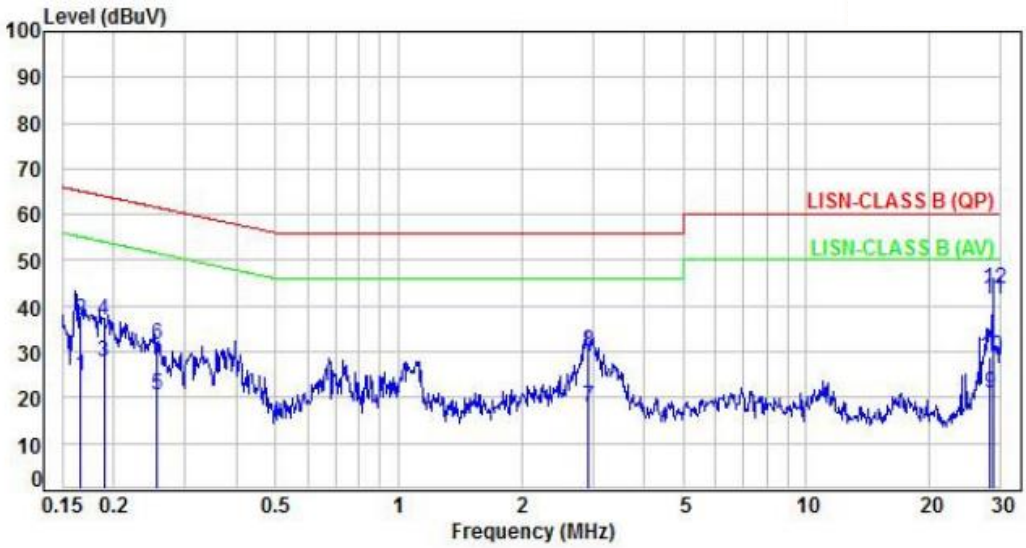
Power	:	AC 120V / 60Hz	Pol/Phase	:	LINE
Test Mode	:	Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.16	9.64	14.06	23.70	55.33	-31.63	Average	P
2	0.16	9.64	26.14	35.78	65.33	-29.55	QP	P
3	0.19	9.64	18.21	27.85	54.01	-26.16	Average	P
4	0.19	9.64	27.00	36.64	64.01	-27.37	QP	P
5	0.39	9.64	18.29	27.93	48.16	-20.23	Average	P
6	0.39	9.64	25.01	34.65	58.16	-23.51	QP	P
7	2.96	9.76	5.91	15.67	46.00	-30.33	Average	P
8	2.96	9.76	17.95	27.71	56.00	-28.29	QP	P
9	27.64	9.98	13.38	23.36	50.00	-26.64	Average	P
10	27.64	9.98	20.65	30.63	60.00	-29.37	QP	P
11	28.67	9.99	33.00	42.99	50.00	-7.01	Average	P
12	28.67	9.99	35.26	45.25	60.00	-14.75	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

Power :	AC 120V / 60Hz	Pol/Phase :	NEUTRAL
Test Mode :	Mode 2	:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.64	15.09	24.73	55.19	-30.46	Average	P
2	0.17	9.64	27.43	37.07	65.19	-28.12	QP	P
3	0.19	9.63	18.31	27.94	54.06	-26.12	Average	P
4	0.19	9.63	27.15	36.78	64.06	-27.28	QP	P
5	0.25	9.63	10.74	20.37	51.60	-31.23	Average	P
6	0.25	9.63	22.02	31.65	61.60	-29.95	QP	P
7	2.93	9.75	8.09	17.84	46.00	-28.16	Average	P
8	2.93	9.75	20.43	30.18	56.00	-25.82	QP	P
9	28.13	10.06	10.93	20.99	50.00	-29.01	Average	P
10	28.13	10.06	18.91	28.97	60.00	-31.03	QP	P
11	28.67	10.07	31.47	41.54	50.00	-8.46	Average	P
12	28.67	10.07	33.83	43.90	60.00	-16.10	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

6. Test of Radiated Emission

6.1. Test 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.

Frequency (MHz)	Distance	Limit (μV/ m)
0.09 ~ 0.490	300m	2400/F(kHz)
0.490 ~ 1.705	30m	24000/ F(kHz)
1.705 ~ 30	30m	30
30 ~ 88	3m	100
88 ~ 216	3m	150
216 ~ 960	3m	200
Above 960	3m	500

15.215 Additional provisions to the general radiated emission limitations.:

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

6.2. Test Procedures

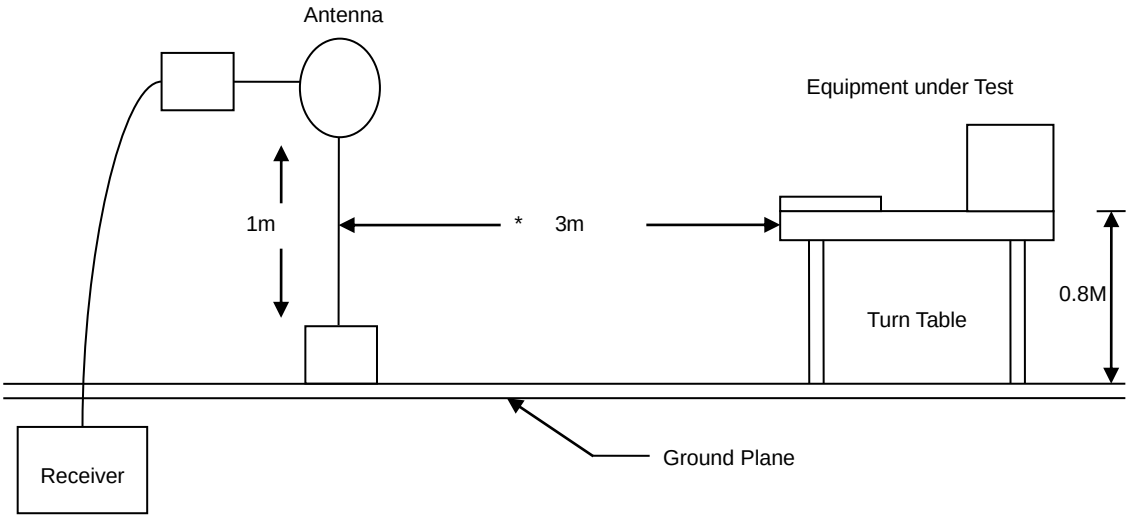
a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. “Cone of radiation” has been considered to be 3dB beamwidth of the measurement antenna.

NOTE:

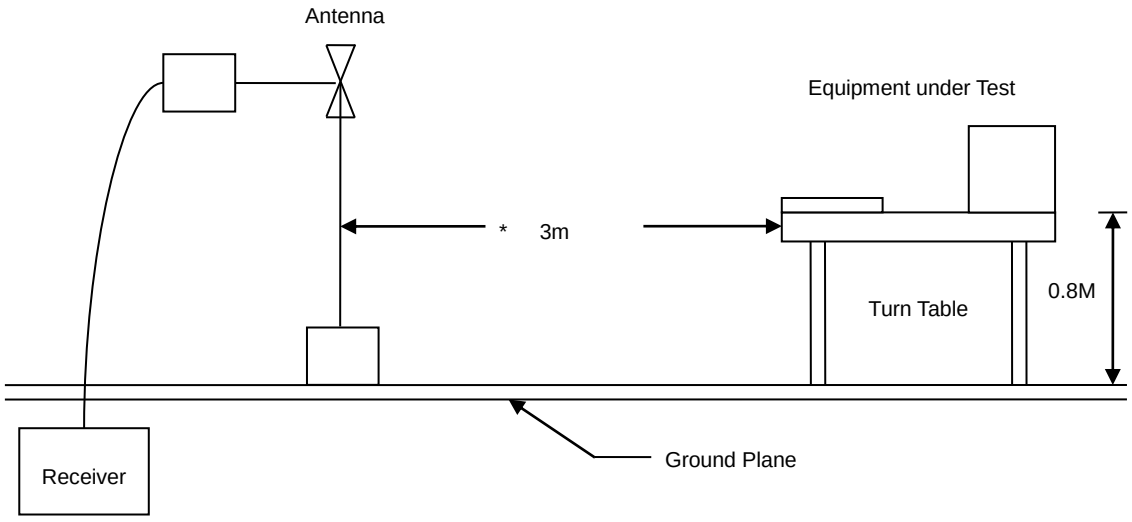
1. The resolution bandwidth of test receiver/spectrum analyzer is 300Hz or CISPS 200Hz(QP detector) at frequency Below 150 kHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 10KHz or CISPS 9KHz(QP detector) at frequency 150 kHz to 30 MHz.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

6.3. Typical Test Setup Layout of Radiated Emission

Below 30MHz test setup



Below 1GHz Test Setup

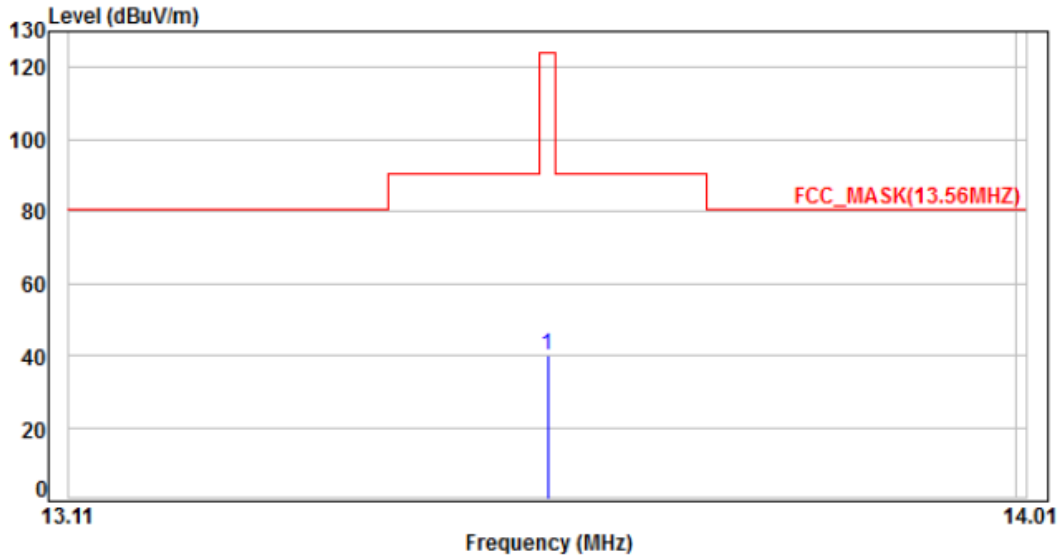


1.5M

6.4. Test Result and Data

6.4.1. Test Result of Fundamental Emission

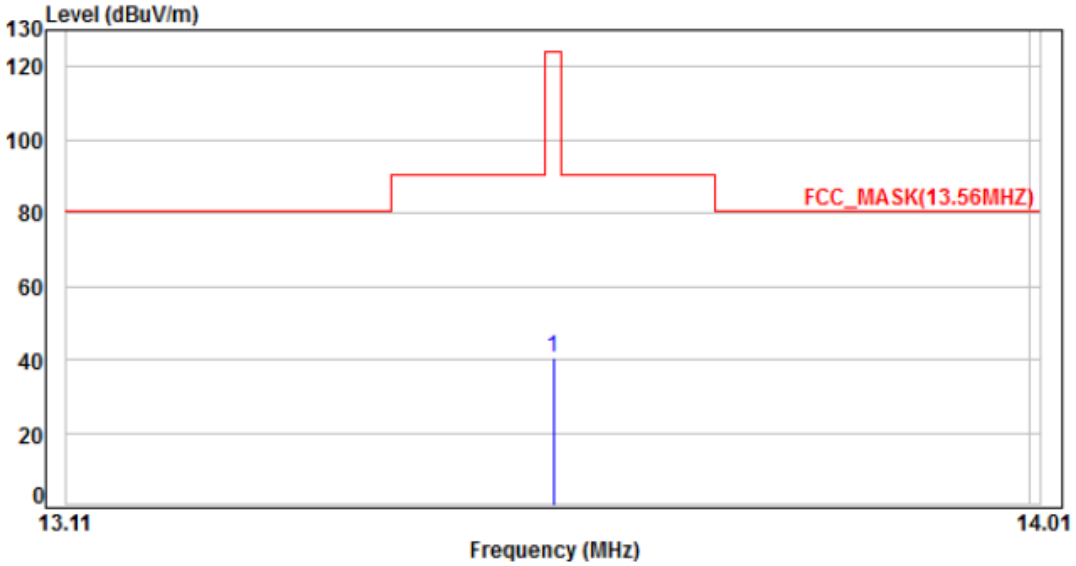
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	16.89	23.30	40.19	124.00	-83.81	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

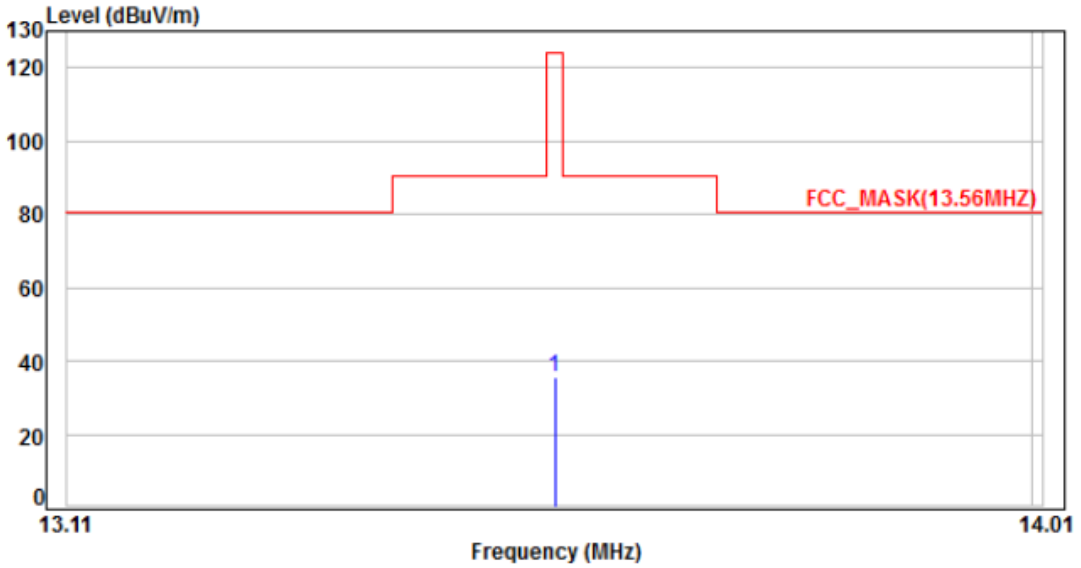
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	16.89	23.63	40.52	124.00	-83.48	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

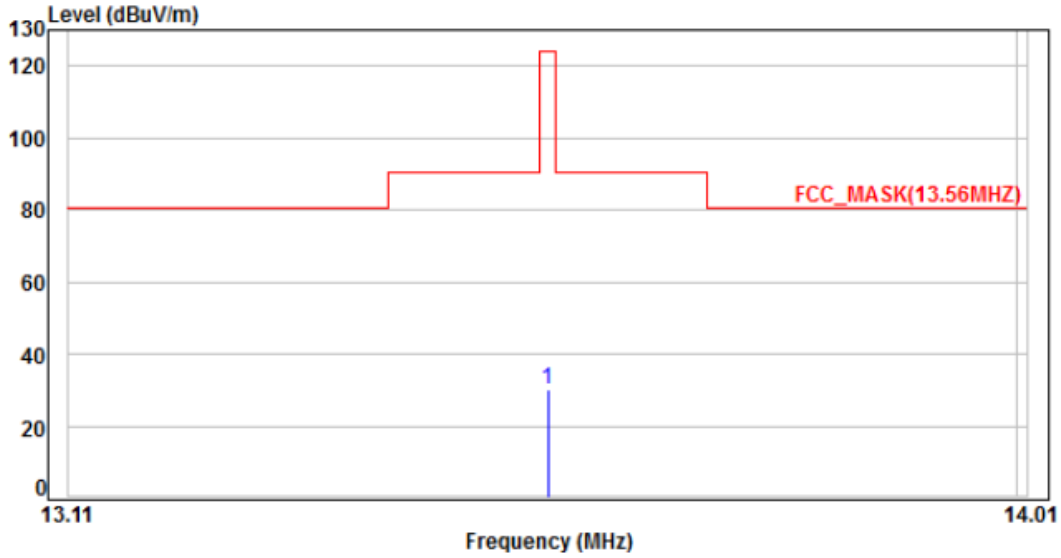
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	16.89	18.50	35.39	124.00	-88.61	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2		:	

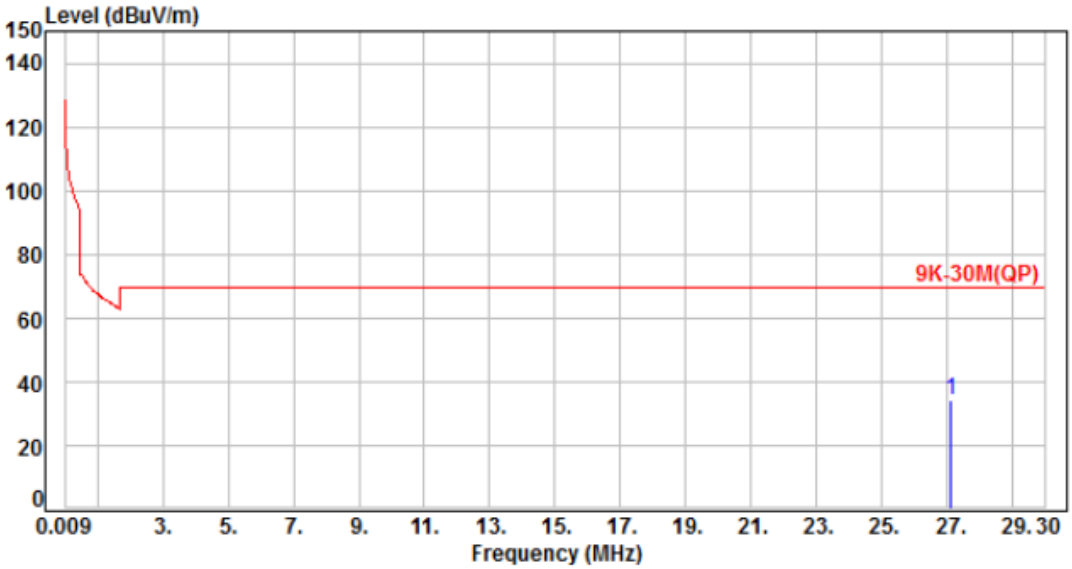


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	16.89	13.24	30.13	124.00	-93.87	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

6.4.2. Test Result of Unwanted Spurious emission (9KHz ~ 30MHz)

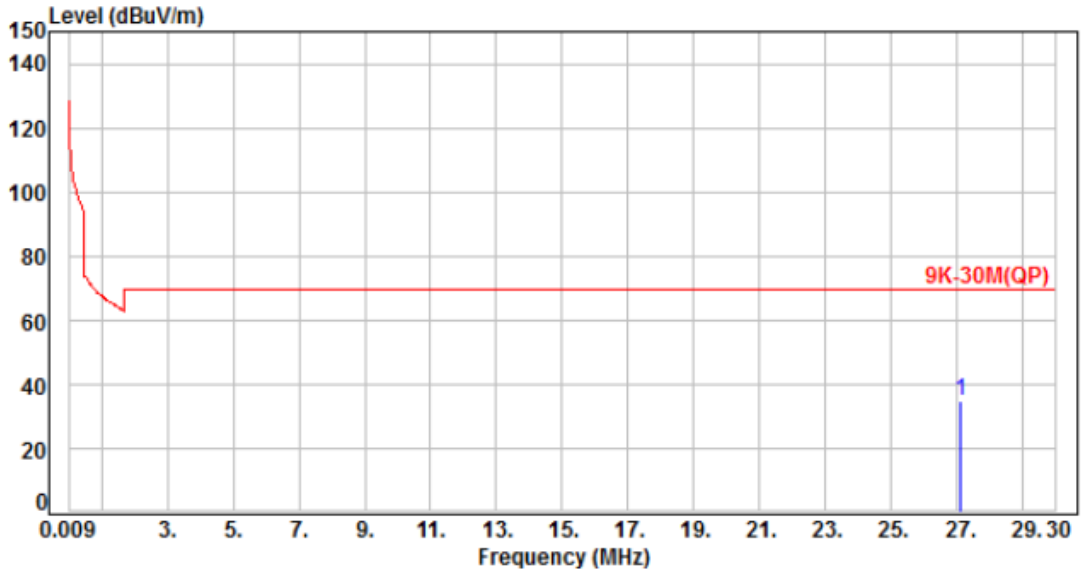
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.06	18.33	34.39	69.54	-35.15	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

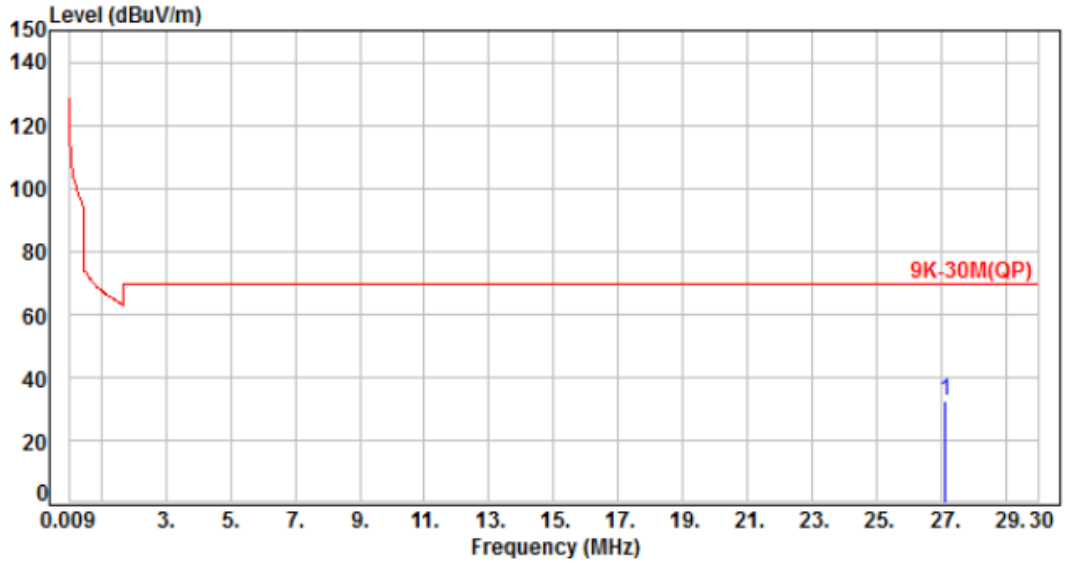
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.06	18.71	34.77	69.54	-34.77	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

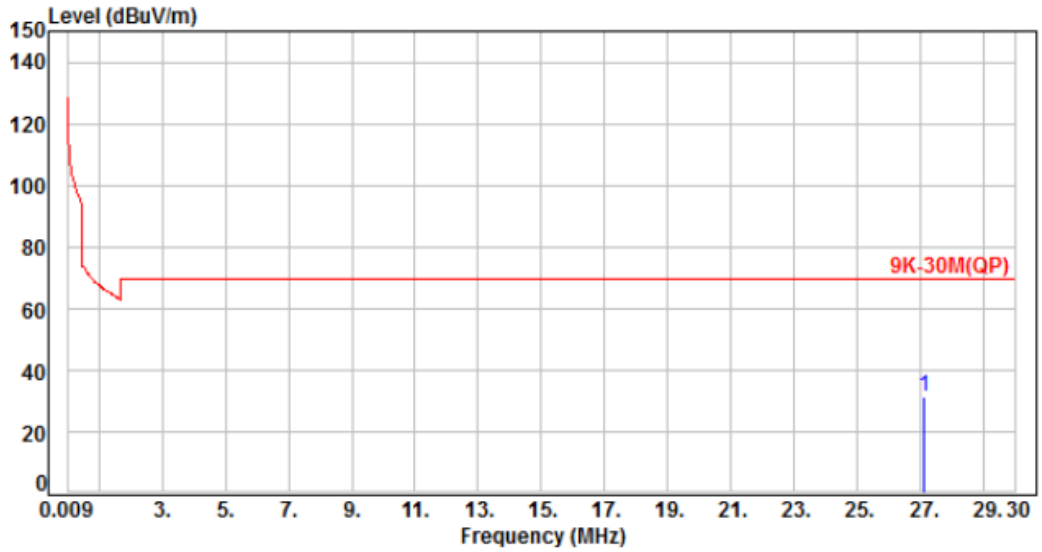
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.06	16.47	32.53	69.54	-37.01	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2		:	

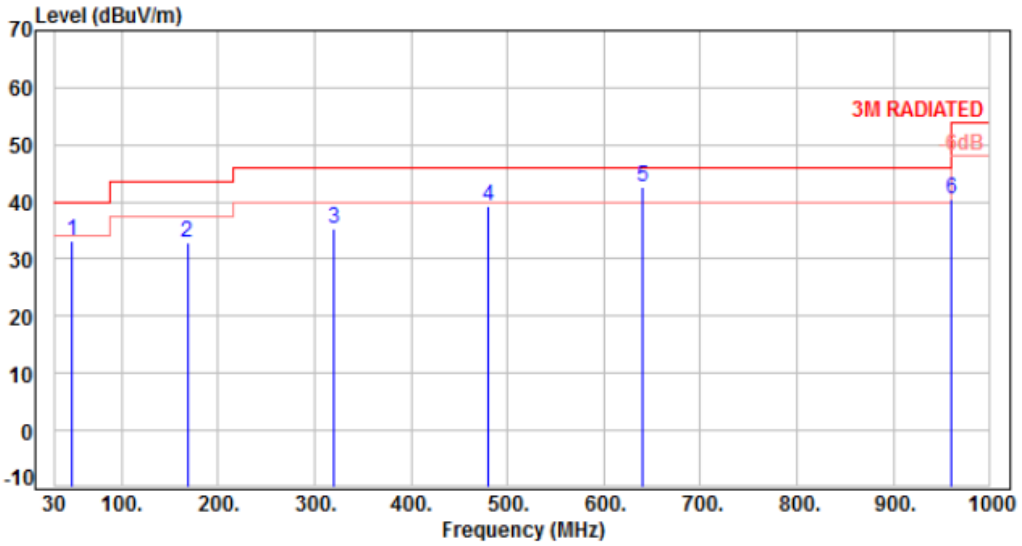


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.06	15.33	31.39	69.54	-38.15	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

6.4.3. Test Result of Unwanted Spurious emission (30GHz ~ 1GHz)

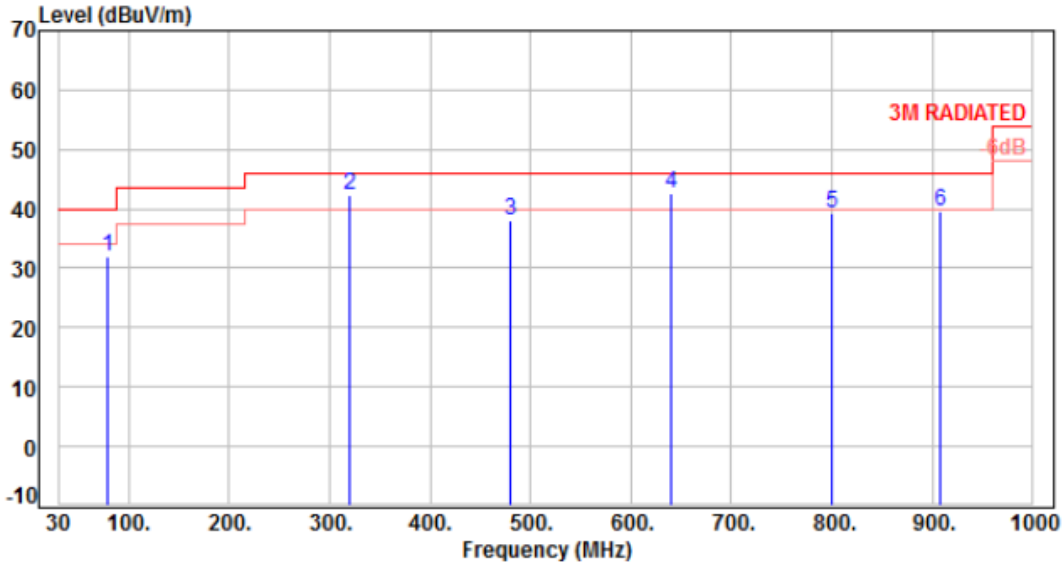
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	47.85	-9.41	42.61	33.20	40.00	-6.80	Peak	400	0	P
2	167.99	-9.47	42.36	32.89	43.50	-10.61	Peak	400	0	P
3	320.44	-8.18	43.52	35.34	46.00	-10.66	Peak	400	0	P
4	480.30	-4.27	43.69	39.42	46.00	-6.58	Peak	400	0	P
5	640.11	-1.26	43.89	42.63	46.00	-3.37	Peak	400	0	P
6	960.50	3.67	36.74	40.41	54.00	-13.59	Peak	400	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

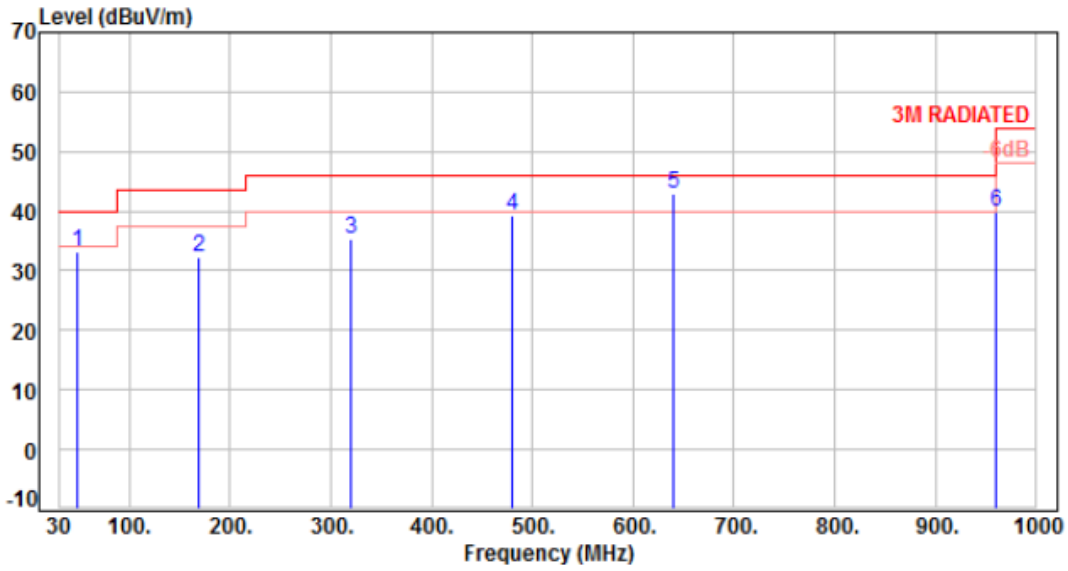
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	79.43	-13.63	45.71	32.08	40.00	-7.92	Peak	100	0	P
2	320.33	-8.19	50.48	42.29	46.00	-3.71	Peak	100	0	P
3	480.46	-4.27	42.41	38.14	46.00	-7.86	Peak	100	0	P
4	640.35	-1.25	43.88	42.63	46.00	-3.37	Peak	100	0	P
5	800.24	1.32	37.99	39.31	46.00	-6.69	Peak	100	0	P
6	907.86	2.84	36.66	39.50	46.00	-6.50	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

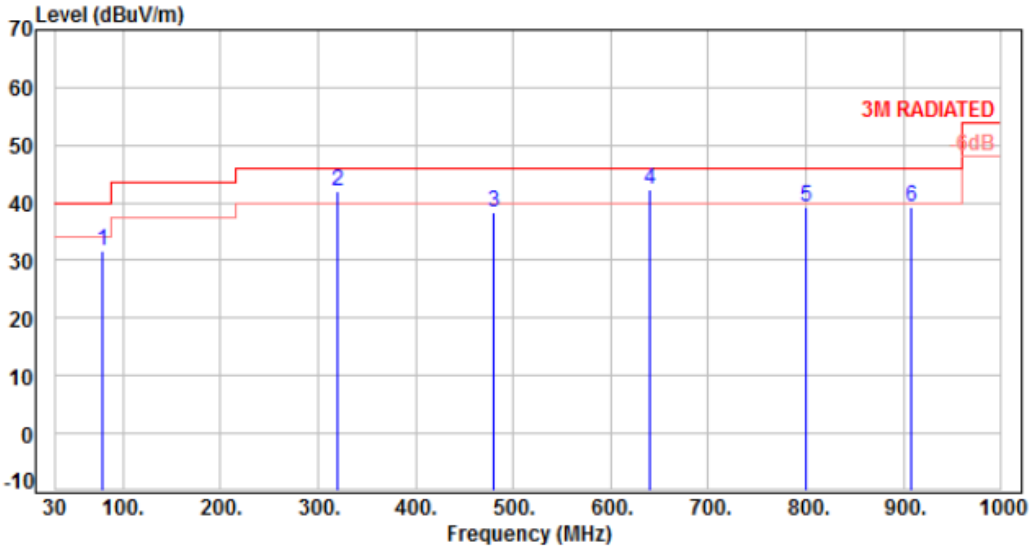
Power :	AC 120V / 60Hz	Pol/Phase :	VERTICAL
Test Mode :	Mode 2	:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	48.11	-9.42	42.48	33.06	40.00	-6.94	Peak	400	0	P
2	168.33	-9.50	41.92	32.42	43.50	-11.08	Peak	400	0	P
3	320.30	-8.19	43.66	35.47	46.00	-10.53	Peak	400	0	P
4	480.25	-4.28	43.48	39.20	46.00	-6.80	Peak	400	0	P
5	640.25	-1.26	44.10	42.84	46.00	-3.16	Peak	400	0	P
6	960.11	3.66	36.35	40.01	54.00	-13.99	Peak	400	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	79.68	-13.70	45.23	31.53	40.00	-8.47	Peak	100	0	P
2	320.18	-8.19	50.26	42.07	46.00	-3.93	Peak	100	0	P
3	480.30	-4.27	42.67	38.40	46.00	-7.60	Peak	100	0	P
4	640.29	-1.25	43.57	42.32	46.00	-3.68	Peak	100	0	P
5	800.26	1.33	37.88	39.21	46.00	-6.79	Peak	100	0	P
6	908.57	2.85	36.51	39.36	46.00	-6.64	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

6.5. 20dB Bandwidth & 99% Occupied Bandwidth

For Handle

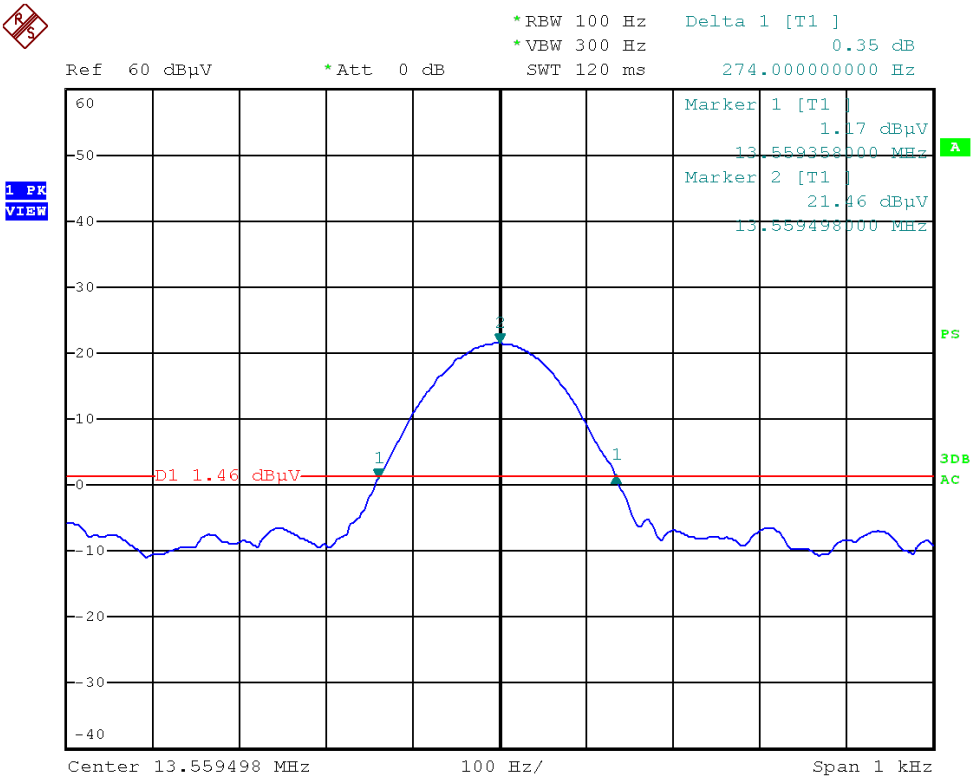
Ch. Freq. (MHz)	20dB Bandwidth (kHz)	FL at 20dB BW (MHz)	FH at 20dB BW (MHz)
13.56	0.274	13.559	13.560
Limit	N/A	13.553	13.567

For Host

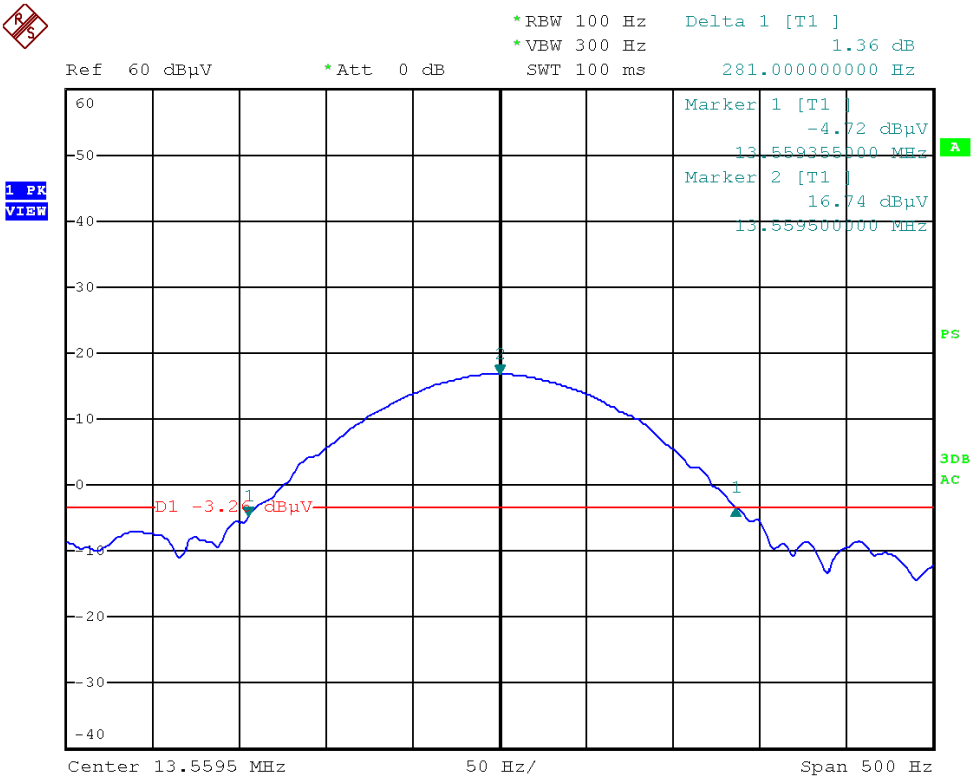
Ch. Freq. (MHz)	20dB Bandwidth (kHz)	FL at 20dB BW (MHz)	FH at 20dB BW (MHz)
13.56	0.281	13.559	13.560
Limit	N/A	13.553	13.567

20dB Bandwidth

13.56 MHz For Handle



13.56 MHz For Host

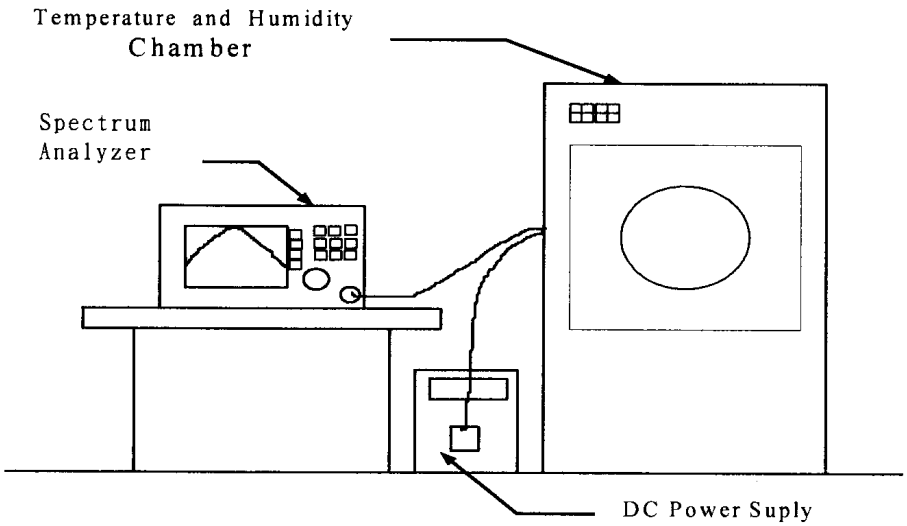


7. Frequency Stability

7.1. Test Procedure

1. The EUT was placed inside the Temperature and Humidity chamber.
2. The transmitter output was connected to spectrum analyzer.
3. Turn the EUT on and couple its output to a spectrum analyzer.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
6. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
7. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

7.2. Test Setup Layout



7.3. Test Result and Data

For Handle

Operating frequency: 13.56 MHz							
Temperature (°C)	Power supply (V)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	102	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	120	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	138	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
40	102	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	120	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	138	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
30	102	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	120	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	138	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
20	102	13.5595	-0.003392	13.5595	-0.003687	13.5595	-0.003982
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
10	102	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
0	102	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
-10	102	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
-20	102	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
-30	102	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	120	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687
	138	13.5595	-0.003687	13.5595	-0.003392	13.5595	-0.003687

For Host

Operating frequency: 13.56 MHz							
Temperature (°C)	Power supply (V)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	102	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	120	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	138	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
40	102	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	120	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	138	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
30	102	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	120	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	138	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
20	102	13.5595	-0.003982	13.5595	-0.003687	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
10	102	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
0	102	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
-10	102	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
-20	102	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
-30	102	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	120	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687
	138	13.5594	-0.004277	13.5597	-0.002212	13.5595	-0.003687