FCC Test Report

Report No.:	RFBHQC-WTW-P22070414B
FCC ID:	MCLT77H747
Test Model:	T77H747
Received Date:	2023/10/16
Test Date:	2023/10/25 ~ 2023/10/26
Issued Date:	2023/11/20
Applicant:	HON HAI PRECISION IND. CO., LTD.
Address:	5F-1,5 Hsin-An Road Hsinchu, Science-Based Industrial Park Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RFBHQC-WTW-P22070414B	Original release.	2023/11/20

1 Certificate of Conformity

Product:	NFC module
Brand:	FOXCONN
Test Model:	T77H747
Sample Status:	Engineering Sample
Applicant:	HON HAI PRECISION IND. CO., LTD.
Test Date:	2023/10/25 ~ 2023/10/26
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.225) 47 CFR FCC Part 15, Subpart C (Section 15.215) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 2023/11/20

Claire Kuan / Specialist

Approved by : _____ , **Date:** 2023/11/20

Wen Yu / Assistant Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.225, 15.215)			
FCC Clause	Test Item	Result	Remarks
15.207	Conducted emission test	PASS	Minimum passing margin is -8.84 dB at 29.69922 MHz
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS	Minimum passing margin is -68.33 dB at 13.560 MHz
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	PASS	Meet the requirement of limit.
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	PASS	Meet the requirement of limit.
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band below 30MHz	PASS	Minimum passing margin is -24.28 dB at 25.876 MHz
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band above 30MHz	PASS	Minimum passing margin is -0.9 dB at 149.16 MHz
15.225 (e)	The frequency tolerance	PASS	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is ACH not a standard connector.

Note:
Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	NFC module
Brand	FOXCONN
Test Model	T77H747
Status of EUT	Engineering Sample
Power Supply Rating	5Vdc
Modulation Type	ASK
Transfer Rate	106 kbit/s
Operating Frequency	13.56MHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF160629E05C as the following:
   - ◆ Add one antenna – Antenna No. 7

Original

Antenna No.	Brand	Model	Antenna Gain(dBi)	Frequency range (MHz)	Antenna Type	Connecter Type
1	SAA	LX8416-12-000-C	NA	13.56	PCB	ACH connector (with 1.2mm pitch)
2	Dexerials	ANT-M041A	NA	13.56	PCB	ACH connector (with 1.2mm pitch)
3	Dexerials	ANT-M043A	NA	13.56	PCB	ACH connector (with 1.2mm pitch)
4	Dexerials	ANT-M047A	NA	13.56	PCB	ACH connector (with 1.2mm pitch)
5	SAA	LX7828-12-000-C	NA	13.56	PCB	ACH connector (with 1.2mm pitch)
6	Murata	FLANBPA-0715	NA	13.56	PCB	ACH connector (with 1.2mm pitch)

Newly

Antenna No.	Brand	Model	Antenna Gain(dBi)	Frequency range (MHz)	Antenna Type	Connecter Type
7	Huizhou Speed Wireless Technology Co., Ltd	F-0W-JV-0191-001-K0	NA	13.56	PCB	ACH connector (with 1.2mm pitch)

* Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.

2. According to above condition, all test items of new antenna need to be performed. And all data was verified to meet the requirements.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

One channel was provided to this EUT:

Channel	Frequency (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE	PLC	FS	EB	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission **PLC:** Power Line Conducted Emission
FS: Frequency Stability **EB:** 20dB Bandwidth measurement

NOTE: The EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

Radiated Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Frequency Stability:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

20dB Bandwidth:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested By
RE	20deg. C, 70%RH	120Vac, 60Hz (System)	Sampson Chen
PLC	27deg. C, 69%RH	120Vac, 60Hz (System)	Sampson Chen
FS	25deg. C, 60%RH	5Vdc	Kevin Ko
EB	25deg. C, 60%RH	5Vdc	Kevin Ko

3.3 Description of Support Units

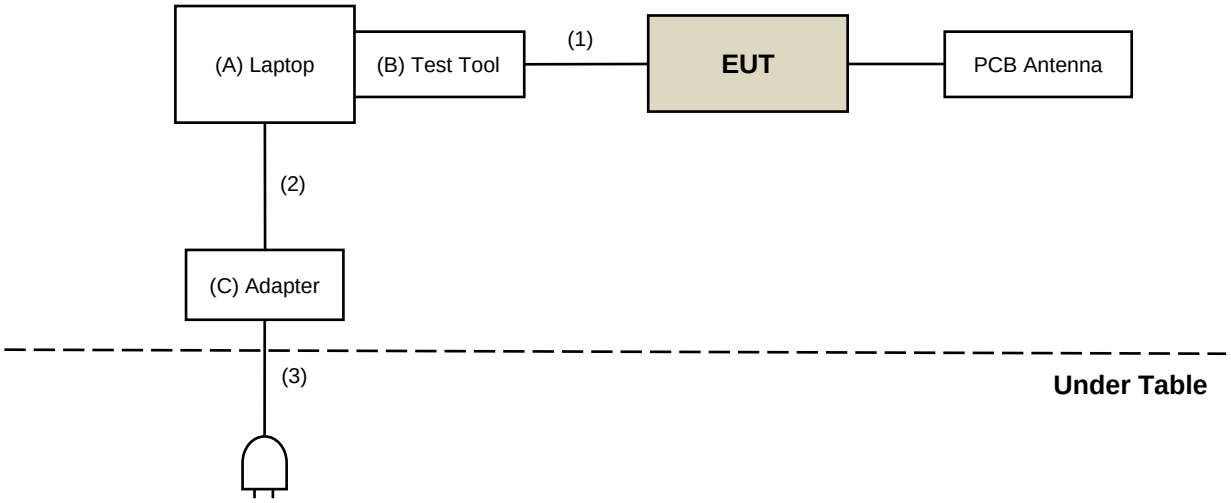
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Lenovo	20U5S01X00 L14	PF-28LKK7	N/A	Provided by Lab
B	Test Tool	FOXCONN	N/A	N/A	N/A	Supplied by applicant
C	Adapter	Lenovo	ADLX45YLC3D	N/A	N/A	Provided by Lab

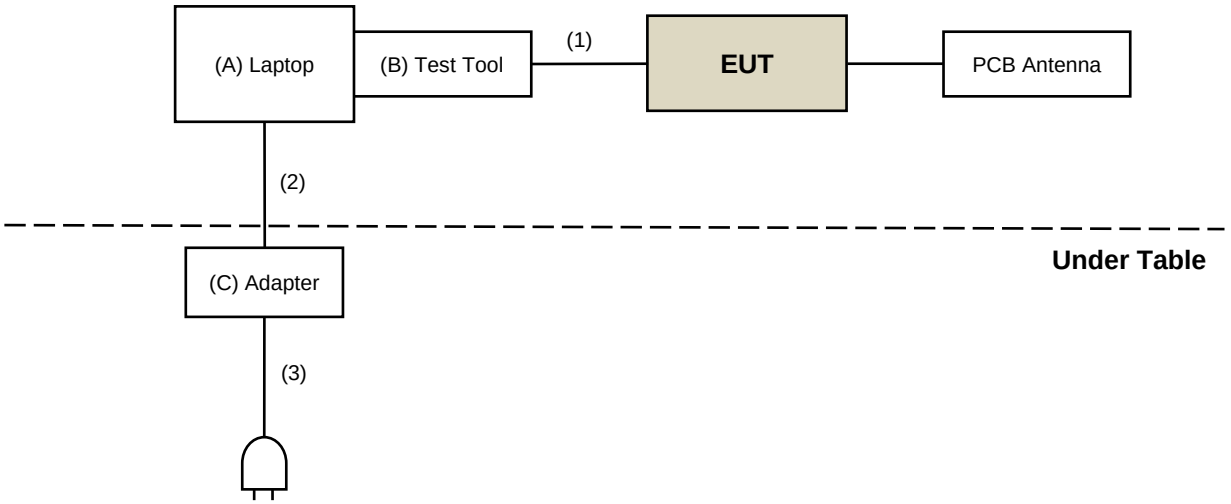
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Data Cable	1	0.1	No	0	Supplied by applicant
2	DC Cable	1	1.8	No	0	Provided by Lab
3	AC Cable	1	1	No	0	Provided by Lab

3.3.1 Configuration of System under Test

For AC Power Conducted Emission test



For Radiated Emission test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.225)
FCC Part 15, Subpart C (15.215)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

(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 as below table:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
4. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

For Radiated Emission test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
Loop Antenna Electro-Metrics	EM-6879	264	2023/2/21	2024/2/20
MXA Signal Analyzer Keysight	N9020B	MY60112408	2023/3/6	2024/3/5
MXE EMI Receiver Keysight	N9038A	MY59050100	2023/6/13	2024/6/12
Preamplifier EMCI	EMC001340	980142	2023/5/8	2024/5/7
RF Coaxial Cable JYEBAO	5D-FB	LOOPCAB-001	2022/12/19	2023/12/18
		LOOPCAB-002	2022/12/19	2023/12/18
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. Tested Date: 2023/10/25

For other test itemis:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	2022/12/26	2023/12/25
DC Power Supply Topward	6603D	795558	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	2023/6/8	2024/6/7
MXA Signal Analyzer Keysight	N9020B	MY60112409	2023/2/18	2024/2/17
Software	ADT_RF Test Software V7.6.5.4	NA	NA	NA

NOTE:
1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2023/10/26

4.1.3 Test Procedures

For Radiated Emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak or Peak / Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth of test receiver/spectrum analyzer is 200Hz at frequency below 150kHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 9kHz at frequency 150kHz~30MHz.

For Radiated Emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

Note:

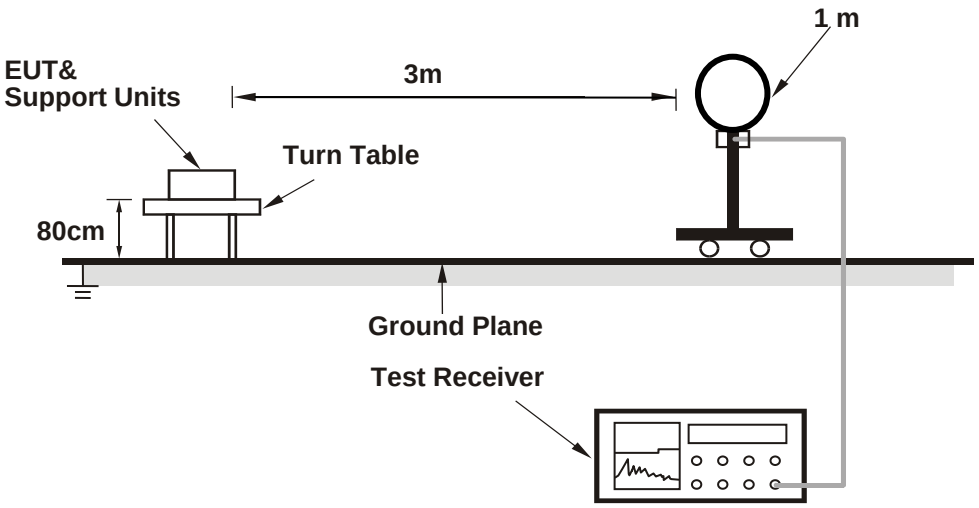
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

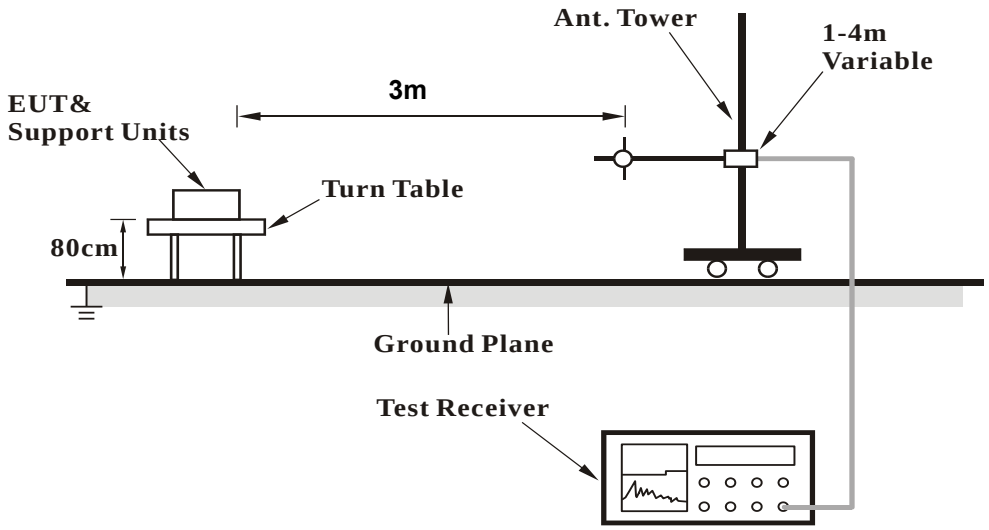
No deviation.

4.1.5 Test Setup

For Radiated Emission below 30MHz



For Radiated Emission 30MHz to 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Controlling software (NPC300_PRBSTTool.exe) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

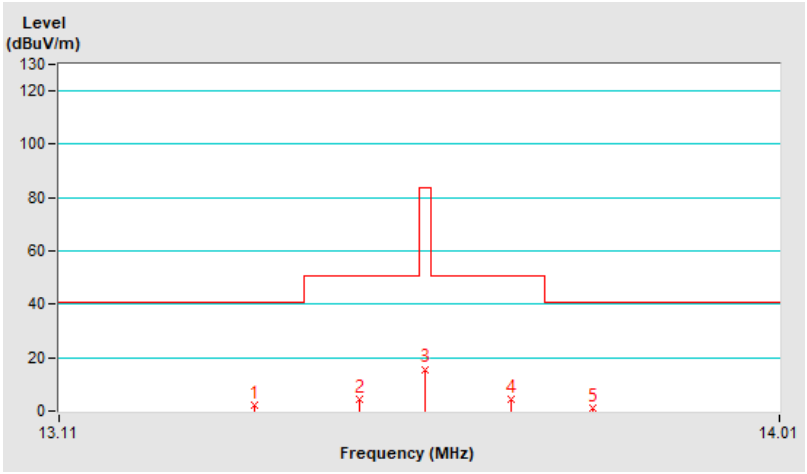
4.1.7 Test Results

Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.348	2.00 QP	40.51	-38.51	1.00	186	44.52	-42.52
2	13.478	4.42 QP	50.47	-46.05	1.00	170	46.97	-42.55
3	*13.560	15.67 QP	84.00	-68.33	1.00	160	58.22	-42.55
4	13.667	4.43 QP	50.47	-46.04	1.00	187	46.99	-42.56
5	13.771	1.20 QP	40.51	-39.31	1.00	186	43.77	-42.57

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

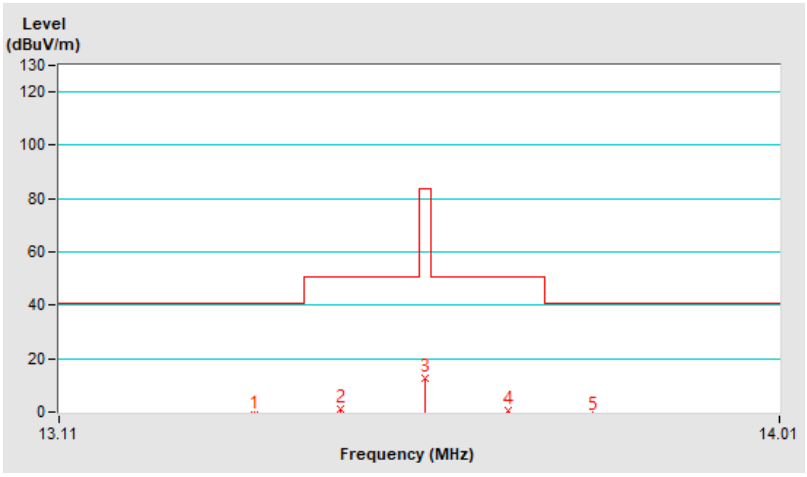


Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.348	-1.23 QP	40.51	-41.74	1.00	264	41.29	-42.52
2	13.454	1.10 QP	50.47	-49.37	1.00	262	43.64	-42.54
3	*13.560	12.69 QP	84.00	-71.31	1.00	261	55.24	-42.55
4	13.665	0.59 QP	50.47	-49.88	1.00	260	43.15	-42.56
5	13.771	-1.63 QP	40.51	-42.14	1.00	254	40.94	-42.57

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

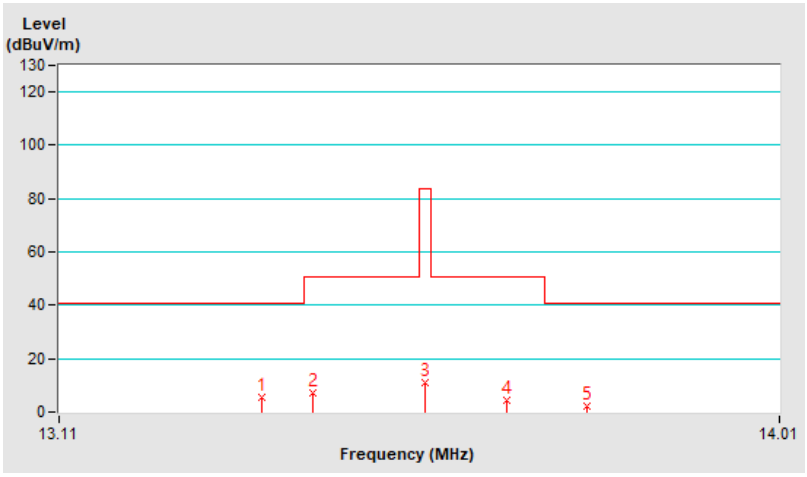


Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**13.358**	**5.68 QP**	**40.51**	**-34.83**	**1.00**	**199**	**48.20**	**-42.52**
2	13.421	6.97 QP	50.47	-43.50	1.00	144	49.50	-42.53
3	*13.560	11.18 QP	84.00	-72.82	1.00	167	53.73	-42.55
4	13.663	4.63 QP	50.47	-45.84	1.00	300	47.19	-42.56
5	13.764	2.37 QP	40.51	-38.14	1.00	72	44.94	-42.57

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

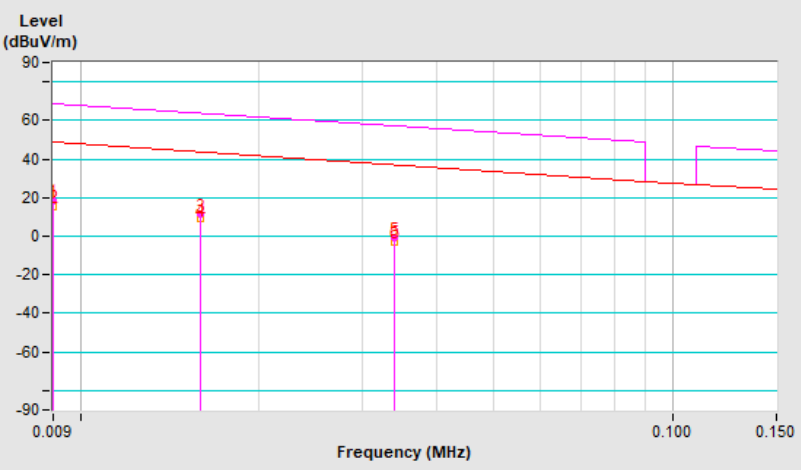


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz

Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.009	18.41 PK	68.52	-50.11	1.00	70	60.84	-42.43
2	0.009	15.60 AV	48.52	-32.92	1.00	70	58.03	-42.43
3	0.016	11.19 PK	63.52	-52.33	1.00	167	57.27	-46.08
4	0.016	8.94 AV	43.52	-34.58	1.00	167	55.02	-46.08
5	0.034	-0.82 PK	56.97	-57.79	1.00	274	51.41	-52.23
6	0.034	-2.92 AV	36.97	-39.89	1.00	274	49.31	-52.23

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

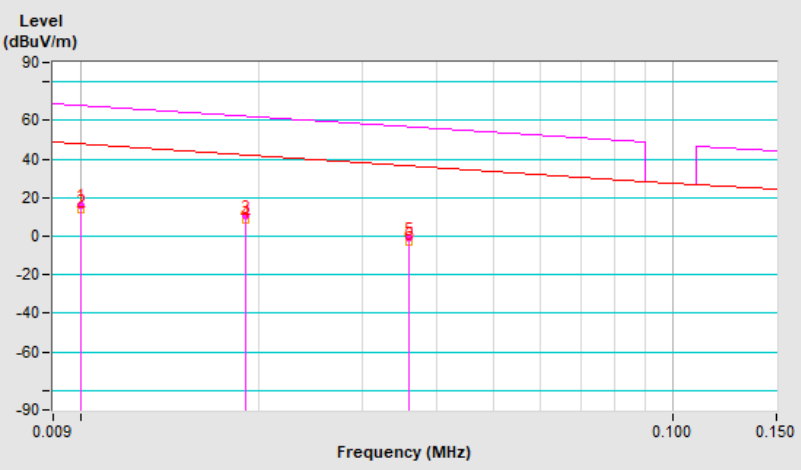


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.010	16.34 PK	67.60	-51.26	1.00	250	60.21	-43.87
2	0.010	13.60 AV	47.60	-34.00	1.00	250	57.47	-43.87
3	0.019	10.60 PK	62.03	-51.43	1.00	37	57.80	-47.20
4	0.019	8.24 AV	42.03	-33.79	1.00	37	55.44	-47.20
5	0.036	-1.09 PK	56.47	-57.56	1.00	57	51.62	-52.71
6	0.036	-3.32 AV	36.47	-39.79	1.00	57	49.39	-52.71

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

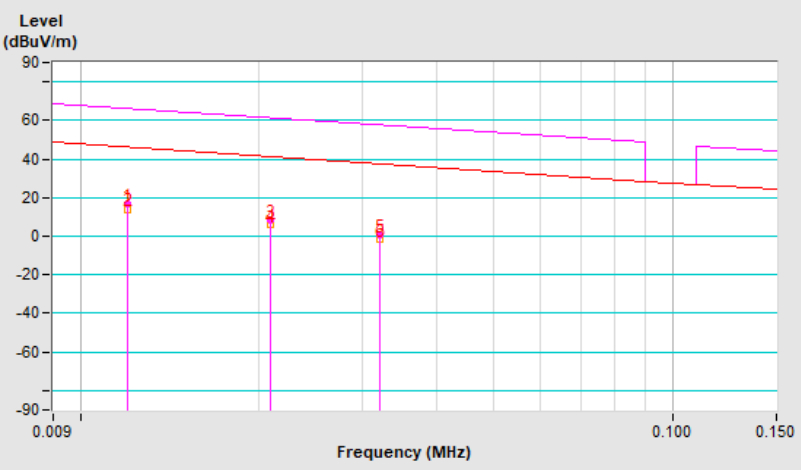


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz

Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.012	16.43 PK	66.02	-49.59	1.00	57	61.04	-44.61
2	0.012	13.80 AV	46.02	-32.22	1.00	57	58.41	-44.61
3	0.021	8.24 PK	61.16	-52.92	1.00	354	56.17	-47.93
4	0.021	6.01 AV	41.16	-35.15	1.00	354	53.94	-47.93
5	0.032	0.41 PK	57.50	-57.09	1.00	259	52.15	-51.74
6	0.032	-1.90 AV	37.50	-39.40	1.00	259	49.84	-51.74

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

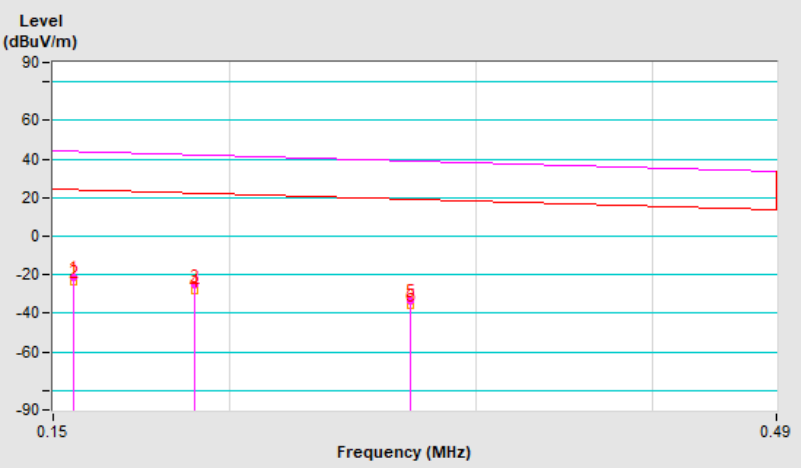


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz

Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.155	-21.37 PK	43.80	-65.17	1.00	344	44.45	-65.82
2	0.155	-23.57 AV	23.80	-47.37	1.00	344	42.25	-65.82
3	0.189	-25.35 PK	42.07	-67.42	1.00	259	41.93	-67.28
4	0.189	-28.07 AV	22.07	-50.14	1.00	259	39.21	-67.28
5	0.269	-33.31 PK	39.01	-72.32	1.00	111	37.25	-70.56
6	0.269	-35.79 AV	19.01	-54.80	1.00	111	34.77	-70.56

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

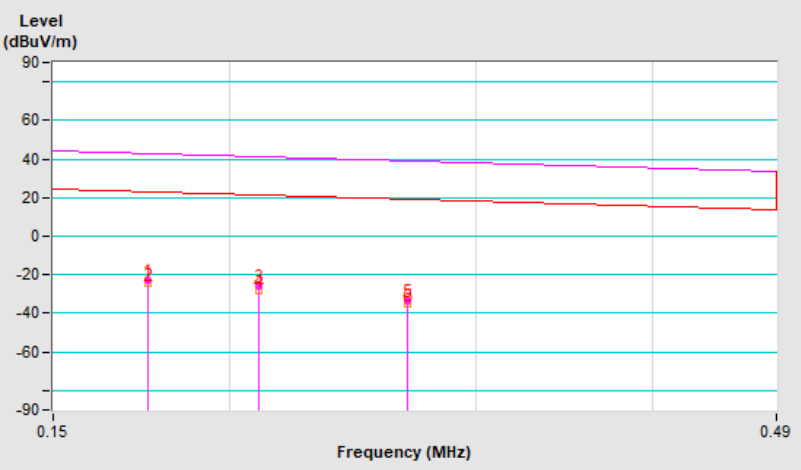


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.175	-22.63 PK	42.74	-65.37	1.00	57	44.05	-66.68
2	0.175	-24.77 AV	22.74	-47.51	1.00	57	41.91	-66.68
3	0.210	-25.96 PK	41.16	-67.12	1.00	76	42.20	-68.16
4	0.210	-28.15 AV	21.16	-49.31	1.00	76	40.01	-68.16
5	0.268	-33.21 PK	39.04	-72.25	1.00	111	37.31	-70.52
6	0.268	-35.46 AV	19.04	-54.50	1.00	111	35.06	-70.52

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

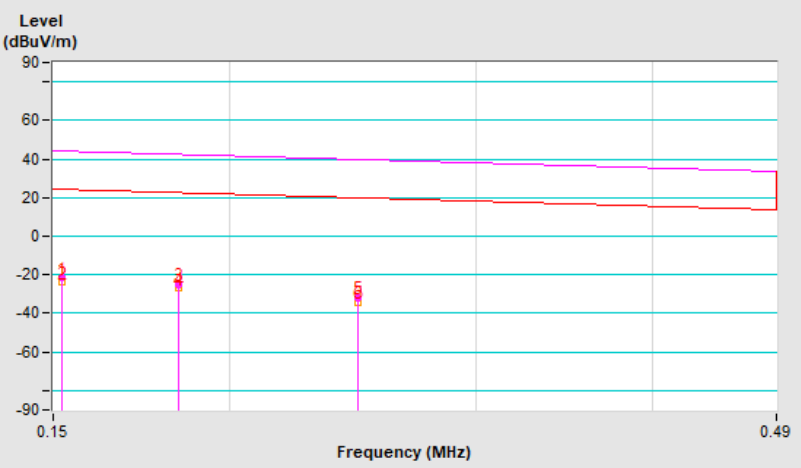


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz

Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.152	-21.54 PK	43.96	-65.50	1.00	321	44.15	-65.69
2	0.152	-23.89 AV	23.96	-47.85	1.00	321	41.80	-65.69
3	0.184	-24.97 PK	42.31	-67.28	1.00	255	42.11	-67.08
4	0.184	-27.05 AV	22.31	-49.36	1.00	255	40.03	-67.08
5	0.247	-31.84 PK	39.75	-71.59	1.00	90	37.83	-69.67
6	0.247	-34.11 AV	19.75	-53.86	1.00	90	35.56	-69.67

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49 MHz is 3 m, extrapolate the measured field strength to a distance of 300 meters.
   Distance factor@3 m = 40*log(3/300) = -80 dB

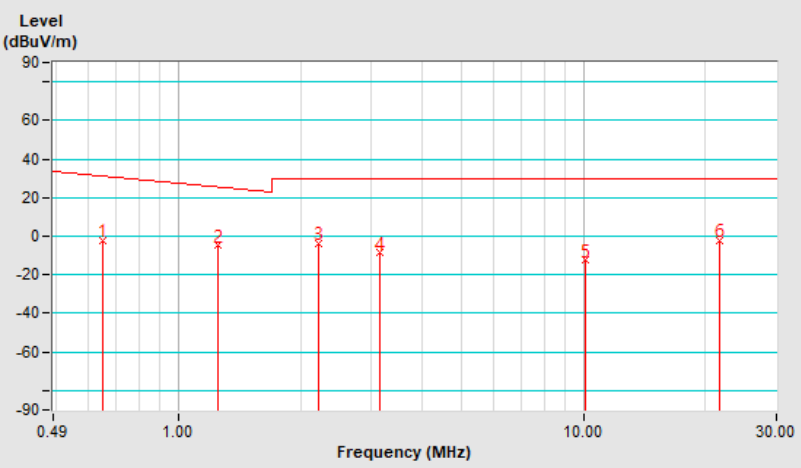


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.652	-2.09 QP	31.32	-33.41	1.00	112	34.21	-36.30
2	1.254	-4.70 QP	25.63	-30.33	1.00	85	34.79	-39.49
3	2.221	-3.56 QP	29.54	-33.10	1.00	74	37.85	-41.41
4	3.134	-8.49 QP	29.54	-38.03	1.00	104	34.57	-43.06
5	10.121	-12.42 QP	29.54	-41.96	1.00	1	29.74	-42.16
6	21.663	-2.01 QP	29.54	-31.55	1.00	307	40.90	-42.91

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

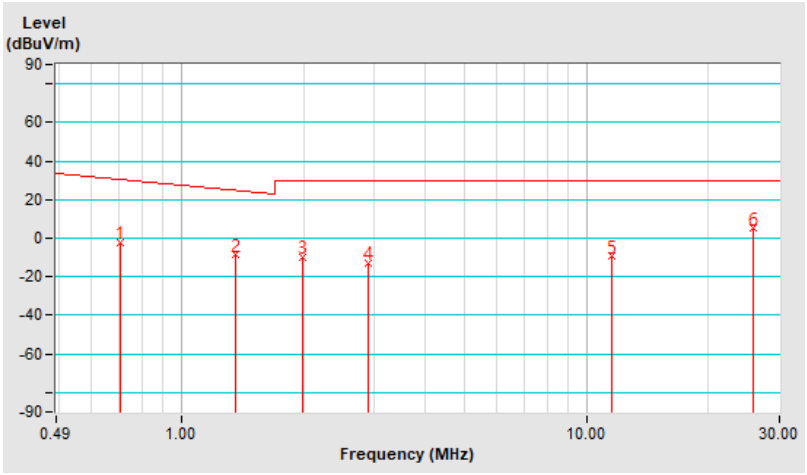


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.705	-2.06 QP	30.64	-32.70	1.00	104	34.65	-36.71
2	1.357	-8.68 QP	24.94	-33.62	1.00	164	31.01	-39.69
3	1.988	-9.72 QP	29.54	-39.26	1.00	85	31.21	-40.93
4	2.883	-12.65 QP	29.54	-42.19	1.00	133	30.13	-42.78
5	11.581	-9.43 QP	29.54	-38.97	1.00	220	32.90	-42.33
6	**25.876**	**5.26 QP**	**29.54**	**-24.28**	**1.00**	**286**	**47.44**	**-42.18**

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

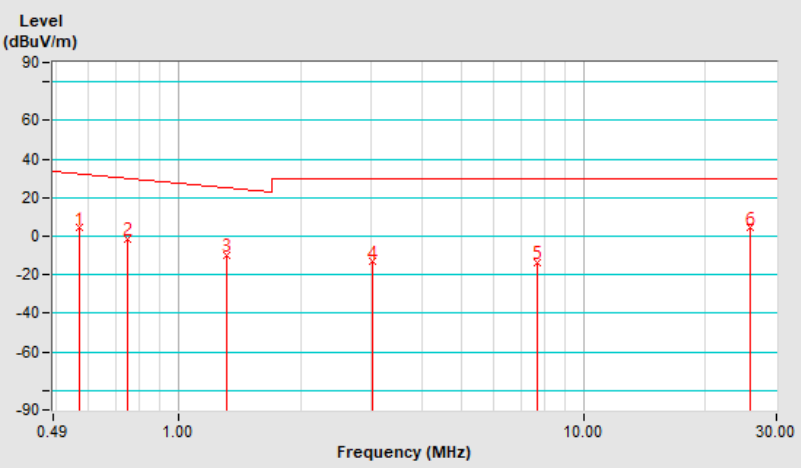


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz

Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.569	4.49 QP	32.50	-28.01	1.00	252	40.14	-35.65
2	0.745	-1.34 QP	30.16	-31.50	1.00	81	35.68	-37.02
3	1.320	-9.87 QP	25.18	-35.05	1.00	59	29.75	-39.62
4	3.020	-13.25 QP	29.54	-42.79	1.00	227	29.79	-43.04
5	7.671	-13.45 QP	29.54	-42.99	1.00	130	29.38	-42.83
6	25.877	4.46 QP	29.54	-25.08	1.00	255	46.64	-42.18

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@3 m = 40*log(3/30) = -40 dB

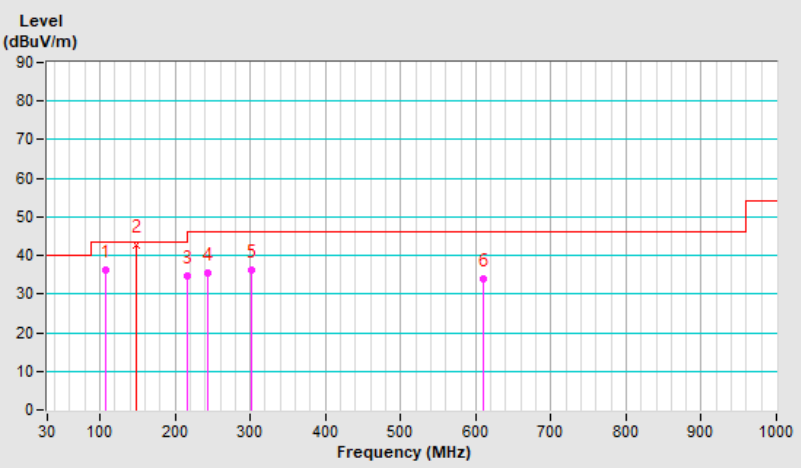


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	108.47	36.2 QP	43.5	-7.3	3.00 H	356	52.2	-16.0
2	**149.16**	**42.6 QP**	**43.5**	**-0.9**	**2.00 H**	**151**	**55.7**	**-13.1**
3	216.97	34.7 QP	46.0	-11.3	1.50 H	172	51.2	-16.5
4	244.08	35.5 QP	46.0	-10.5	1.00 H	45	50.0	-14.5
5	302.45	36.1 QP	46.0	-9.9	1.00 H	81	48.4	-12.3
6	610.21	34.0 QP	46.0	-12.0	1.50 H	116	39.0	-5.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.

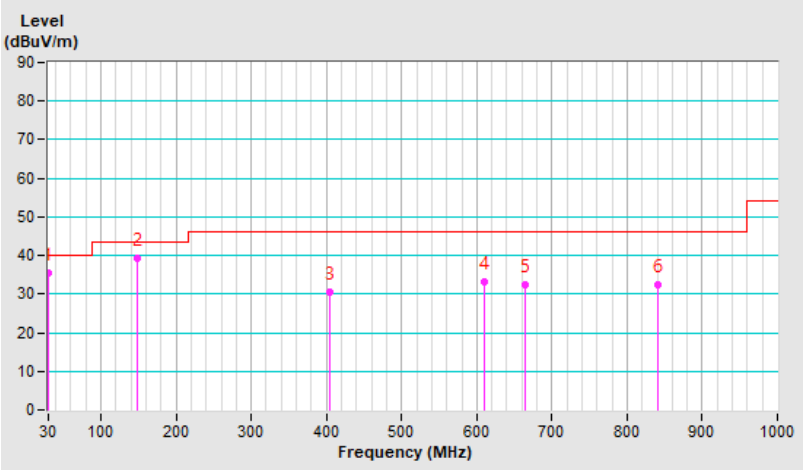


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	30.07	35.5 QP	40.0	-4.5	1.00 V	60	49.3	-13.8
2	149.16	39.3 QP	43.5	-4.2	2.00 V	270	52.4	-13.1
3	404.90	30.5 QP	46.0	-15.5	1.50 V	10	40.5	-10.0
4	610.21	33.1 QP	46.0	-12.9	1.00 V	51	38.1	-5.0
5	664.43	32.5 QP	46.0	-13.5	1.00 V	62	36.8	-4.3
6	840.70	32.5 QP	46.0	-13.5	2.00 V	8	34.6	-2.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance	N/A	EMC-04	2023/10/20	2024/10/19
EMI Test Receiver R&S	ESCS 30	100375	2023/5/17	2024/5/16
Fixed Attenuator STI	STI02-2200-10	005	2023/7/1	2024/6/30
LISN R&S	ENV216	100071	2022/10/26	2023/10/25
RF Coaxial Cable JYEBAO	5D-FB	COCCAB-001	2023/7/1	2024/6/30
Software BVADT	BVADT_Cond_V7.3.7.4	N/A	N/A	N/A
Software BVADT	BVADT_Cond_V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: 2023/10/25

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

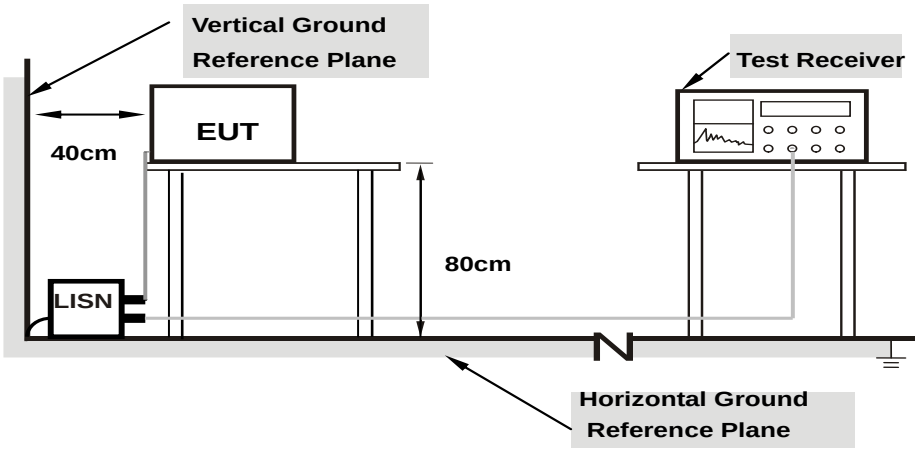
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

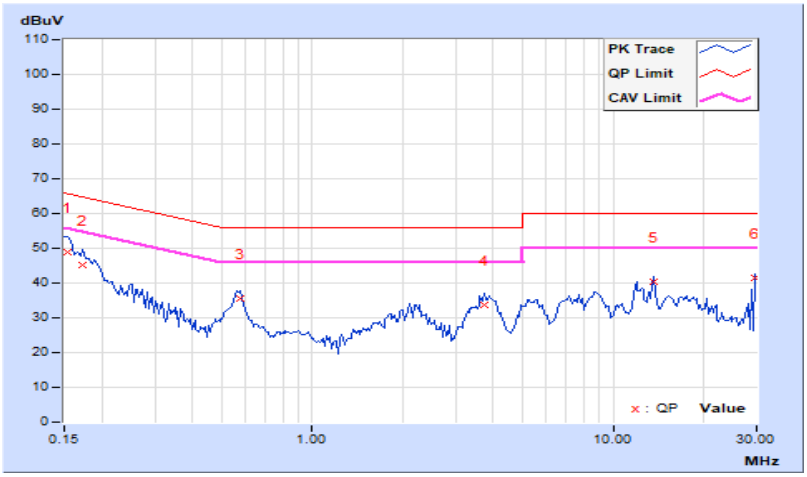
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.93	38.95	22.72	48.88	32.65	65.79	55.79	-16.91	-23.14
2	0.17344	9.93	35.24	18.61	45.17	28.54	64.79	54.79	-19.62	-26.25
3	0.57969	9.95	25.69	18.68	35.64	28.63	56.00	46.00	-20.36	-17.37
4	3.73828	10.10	23.60	15.99	33.70	26.09	56.00	46.00	-22.30	-19.91
5	13.56250	10.70	29.84	27.19	40.54	37.89	60.00	50.00	-19.46	-12.11
6	**29.69922**	**11.53**	**29.89**	**29.63**	**41.42**	**41.16**	**60.00**	**50.00**	**-18.58**	**-8.84**

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

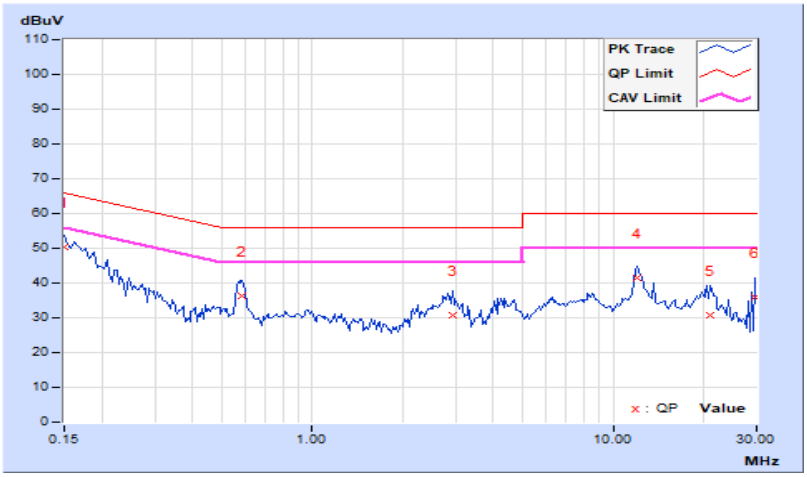


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.00	40.45	24.11	50.45	34.11	66.00	56.00	-15.55	-21.89
2	0.58750	10.01	26.32	19.08	36.33	29.09	56.00	46.00	-19.67	-16.91
3	2.93750	10.10	20.63	15.27	30.73	25.37	56.00	46.00	-25.27	-20.63
4	12.02344	10.50	30.86	24.54	41.36	35.04	60.00	50.00	-18.64	-14.96
5	21.15234	10.91	19.87	15.21	30.78	26.12	60.00	50.00	-29.22	-23.88
6	29.71484	11.10	24.76	18.20	35.86	29.30	60.00	50.00	-24.14	-20.70

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

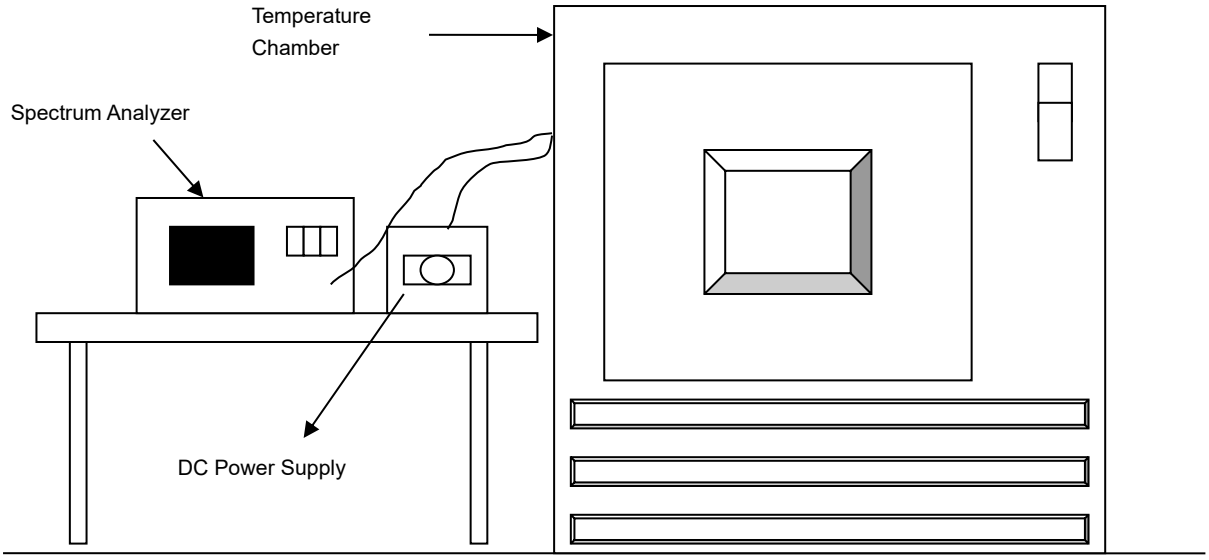


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of 0 degrees to 70 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. 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.

e. Repeat step (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed.

f. 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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

4.3.7 Test Result

Frequency Stability Versus Temp.									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
70	5	13.55996	-0.00029	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029
60	5	13.55993	-0.00052	13.55993	-0.00052	13.55995	-0.00037	13.55993	-0.00052
50	5	13.56005	0.00037	13.56003	0.00022	13.56005	0.00037	13.56005	0.00037
40	5	13.56002	0.00015	13.56002	0.00015	13.56	0.00000	13.56001	0.00007
30	5	13.56002	0.00015	13.56002	0.00015	13.56004	0.00029	13.56004	0.00029
20	5	13.55994	-0.00044	13.55994	-0.00044	13.55992	-0.00059	13.55992	-0.00059
10	5	13.55999	-0.00007	13.55999	-0.00007	13.56	0.00000	13.56	0.00000
0	5	13.56005	0.00037	13.56005	0.00037	13.56003	0.00022	13.56003	0.00022

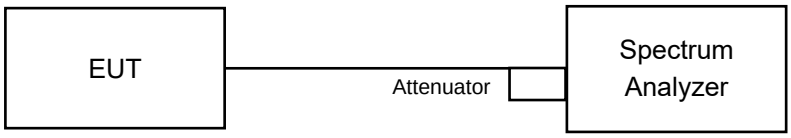
Frequency Stability Versus Voltage									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	5.75	13.56002	0.00015	13.56002	0.00015	13.56	0.00000	13.56001	0.00007
	5	13.56002	0.00015	13.56002	0.00015	13.56	0.00000	13.56001	0.00007
	4.25	13.56002	0.00015	13.56002	0.00015	13.56	0.00000	13.56001	0.00007

4.4 20dB Bandwidth

4.4.1 Limits of 20dB BANDWIDTH Measurement

The 20dB bandwidth shall be specified in operating frequency band.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 10Hz RBW and 30Hz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.4.5 Deviation from Test Standard

No deviation.

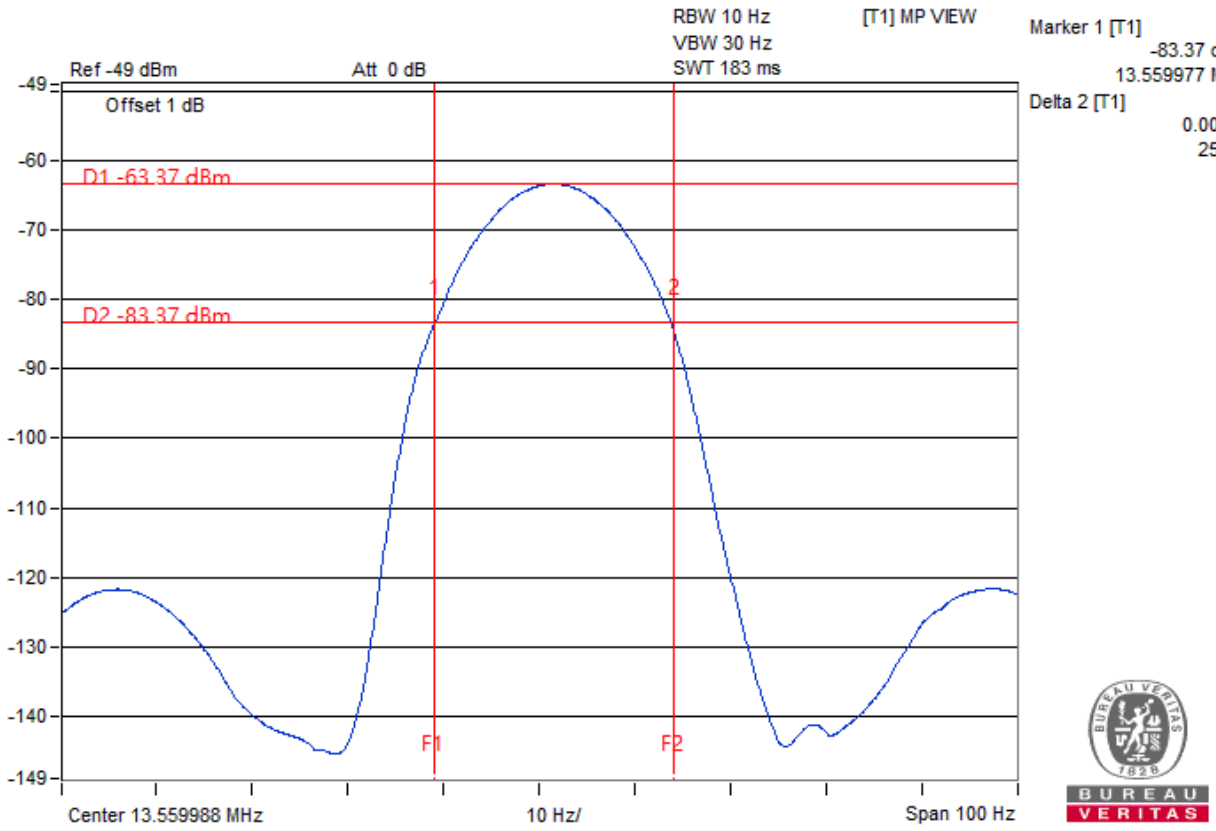
4.4.6 EUT Operating Conditions

Same as Item 4.1.6.

4.4.7 Test Results

20dBc Point (Low) (MHz)	20dBc Point (High) (MHz)	Operating Frequency Band (MHz)	Pass/Fail
13.559977	13.560002	13.11 – 14.01	Pass

Spectrum Plot of Value



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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