

FCC Test Report (NFC)

Report No.: RFBBMN-WTW-P21120099-1

FCC ID: HV4-PN9315A

Test Model: PN9315A

Received Date: 2022/1/11

Test Date: 2022/1/19 ~ 2022/2/7

Issued Date: 2022/3/3

Applicant: Wacom Co., Ltd.

Address: 2-510-1, Toyonodai, Kazo-shi Saitama 349-1148 Japan

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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Table of Contents

Release Control Record	3
1 Certificate of Conformity.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information.....	6
3.1 General Description of EUT	6
3.2 Description of Test Modes	7
3.2.1 Test Mode Applicability and Tested Channel Detail.....	7
3.3 Description of Support Units	9
3.3.1 Configuration of System under Test	9
3.4 General Description of Applied Standards	10
4 Test Types and Results	11
4.1 Radiated Emission Measurement	11
4.1.1 Limits of Radiated Emission Measurement	11
4.1.2 Test Instruments	12
4.1.3 Test Procedures.....	14
4.1.4 Deviation from Test Standard	14
4.1.5 Test Setup.....	15
4.1.6 EUT Operating Conditions.....	15
4.1.7 Test Results	16
4.2 Conducted Emission Measurement	30
4.2.1 Limits of Conducted Emission Measurement	30
4.2.2 Test Instruments	30
4.2.3 Test Procedures.....	31
4.2.4 Deviation from Test Standard	31
4.2.5 Test Setup.....	31
4.2.6 EUT Operating Conditions.....	31
4.2.7 Test Results	32
4.3 Frequency Stability.....	34
4.3.1 Limits of Frequency Stability Measurement	34
4.3.2 Test Setup.....	34
4.3.3 Test Instruments	34
4.3.4 Test Procedure	34
4.3.5 Deviation from Test Standard	34
4.3.6 EUT Operating Conditions.....	34
4.3.7 Test Result.....	35
4.4 20dB Bandwidth	36
4.4.1 Limits of 20dB bandwidth Measurement	36
4.4.2 Test Setup.....	36
4.4.3 Test Instruments	36
4.4.4 Test Procedures.....	36
4.4.5 Deviation from Test Standard	36
4.4.6 EUT Operating Conditions.....	36
4.4.7 Test Results	37
5 Pictures of Test Arrangements.....	38
Appendix – Information of the Testing Laboratories	39

Release Control Record

Issue No.	Description	Date Issued
RFBBMN-WTW-P21120099-1	Original release.	2022/3/3

1 Certificate of Conformity

Product: XPS Stylus

Brand: DELL

Test Model: PN9315A

Sample Status: Engineering sample

Applicant: Wacom Co., Ltd.

Test Date: 2022/1/19 ~ 2022/2/7

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 : Phoenix Huang, **Date:** 2022/3/3
Phoenix Huang / Specialist

Approved by : Clark Lin, **Date:** 2022/3/3
Clark Lin / Technical 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	Meet the requirement of limit. Minimum passing margin is -7.95 dB at 0.61875 MHz.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	Pass	Meet the requirement of limit. Minimum passing margin is -59.44dB at 13.56MHz.
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	Pass	Meet the requirement of limit. Minimum passing margin is -9.0 dB at 441.01 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	No antenna connector is used.

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	XPS Stylus
Brand	DELL
Test Model	PN9315A
Status of EUT	Engineering sample
Power Supply Rating	3.7 Vdc from battery or 5 Vdc from Wireless Power Transmission
Modulation Type	ASK
Transfer Rate	106 kbit/s
Operating Frequency	13.56 MHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. There are Bluetooth and NFC technology used for the EUT.
2. The EUT needs to be supplied from battery, the information is as below table:

Brand	Model No.	Spec.
EVE	68200R	DC 3.7V, 45mAH, 0.17Wh

3. The antennas provided to the EUT, please refer to the following table:

Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
BT	Unictron	CW201	2.1	2.4~2.4835 GHz	Chip	NA
WPT (NFC Wireless Charger)	WNC	81EABN15.G02	NA	13.56 MHz	FPC	NA

4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
5. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

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 had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-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 (System)	Tested By
RE	25deg. C, 70~71%RH	120Vac, 60Hz	Sampson Chen; Spencer Liao
PLC	25deg. C, 75%RH	120Vac, 60Hz	Carter Lin
FS	24deg. C, 60%RH	120Vac, 60Hz	Eric Peng
EB	24deg. C, 60%RH	120Vac, 60Hz	Eric Peng

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.

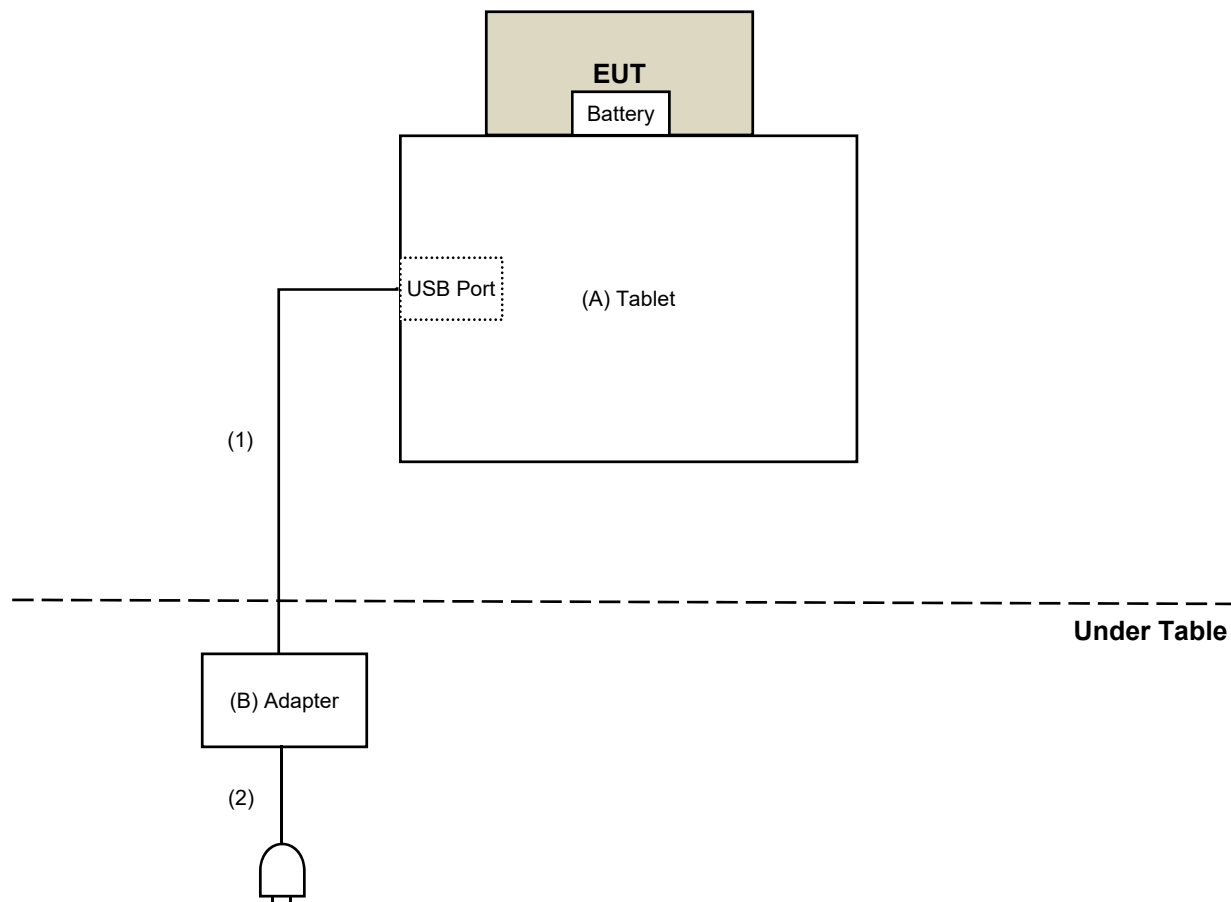
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Tablet	DELL	XPS 13 9315 2-in1	NA	NA	Supplied by applicant
B.	Adapter	DELL	DA45NM210	NA	NA	Supplied by applicant

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB type C	1	1.8	Yes	0	Supplied by applicant
2.	AC power cable	1	0.8	No	0	Supplied by applicant

3.3.1 Configuration of System under 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
Spectrum Analyzer KEYSIGHT	N9030B	MY57142938	2021/4/26	2022/4/25
Test Receiver KEYSIGHT	N9038A	MY59050100	2021/5/3	2022/5/2
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2022/1/6	2023/1/5
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2022/1/6	2023/1/5
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	2021/10/19	2022/10/18
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-361	2021/10/26	2022/10/25
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2021/3/16	2022/3/15
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2021/9/23	2022/9/22

- Note: 1. The test was performed in 966 Chamber No. 3.
 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: 2022/1/27 ~ 2022/2/7

For other test items:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA
DC POWER SUPPLY Topward	6603D	795558	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	2022/1/14	2023/1/13
True RMS Clamp Meter Fluke	325	31130711WS	2021/6/2	2022/6/1

- 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: 2022/1/19

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:

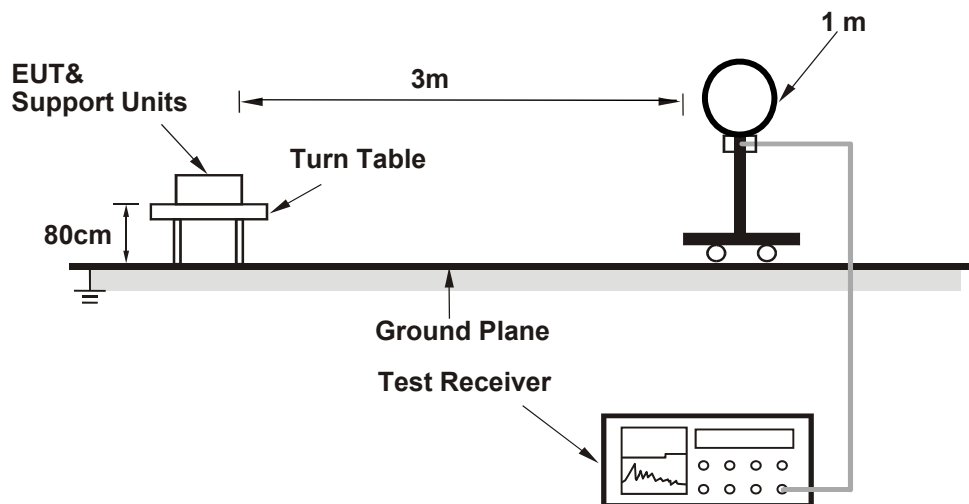
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

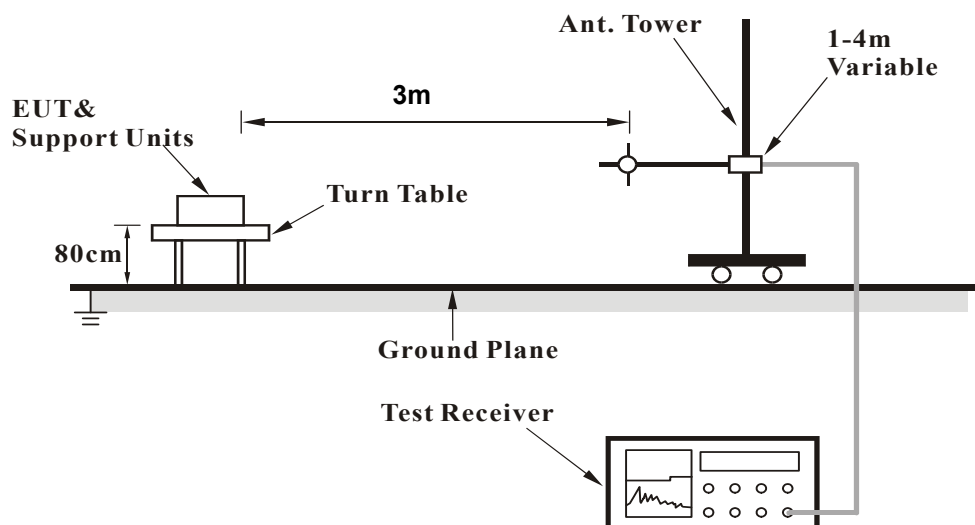
No deviation.

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

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.

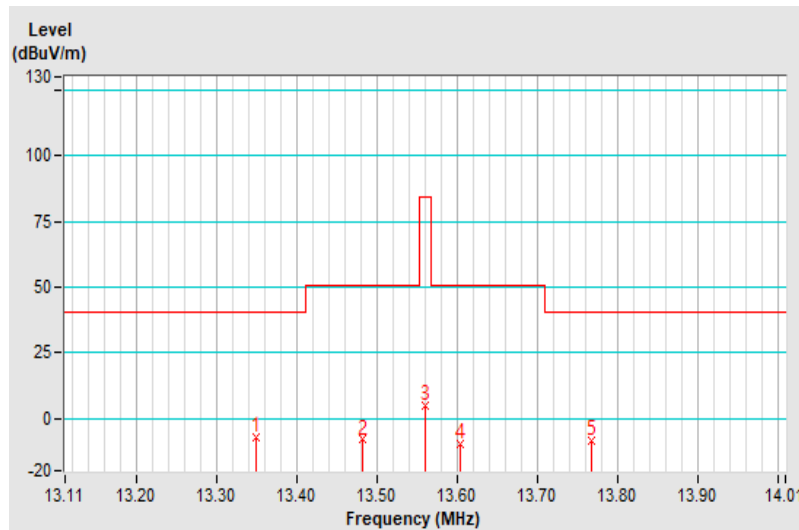
4.1.7 Test Results

Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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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	-7.18 QP	40.51	-47.69	1.00	360	35.57	-42.75
2	13.481	-8.19 QP	50.47	-58.66	1.00	360	34.58	-42.77
3	*13.560	4.95 QP	84.00	-79.05	1.00	360	47.73	-42.78
4	13.604	-9.88 QP	50.47	-60.35	1.00	360	32.91	-42.79
5	13.768	-8.39 QP	40.51	-48.90	1.00	360	34.42	-42.81

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

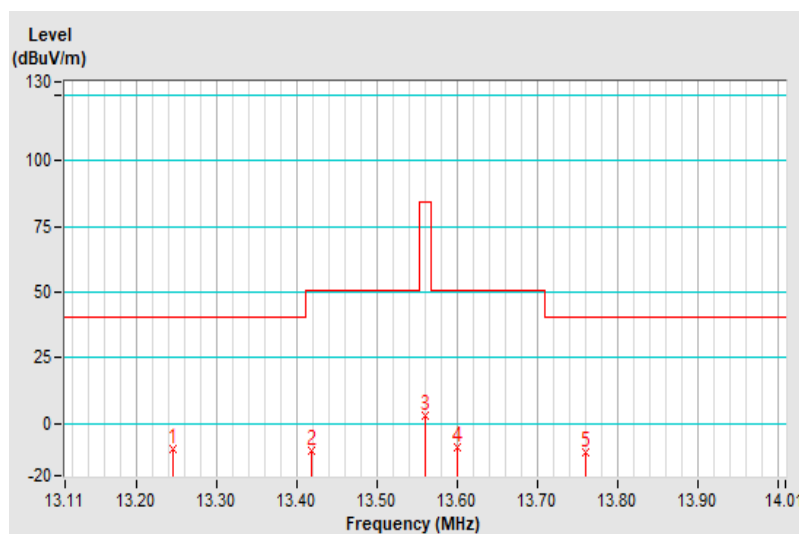


Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.245	-9.75 QP	40.51	-50.26	1.00	259	32.98	-42.73
2	13.418	-10.67 QP	50.47	-61.14	1.00	259	32.09	-42.76
3	*13.560	2.83 QP	84.00	-81.17	1.00	259	45.61	-42.78
4	13.600	-9.41 QP	50.47	-59.88	1.00	259	33.38	-42.79
5	13.761	-11.24 QP	40.51	-51.75	1.00	259	31.57	-42.81

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

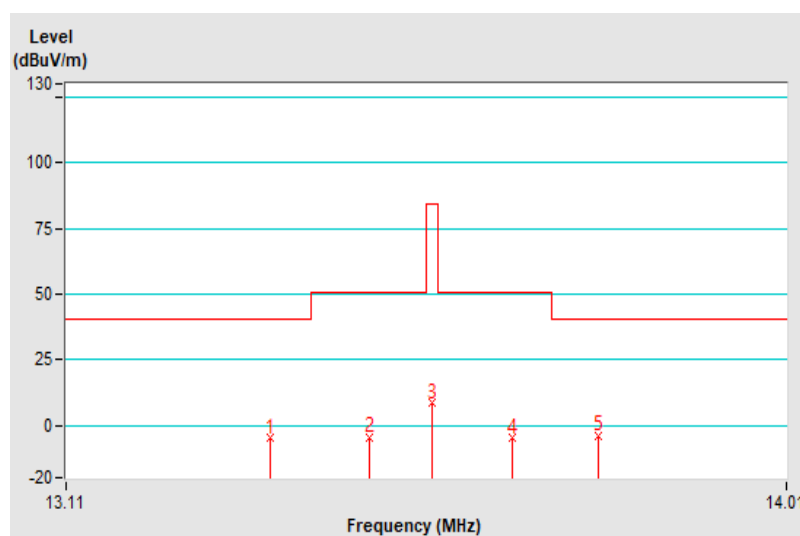


Frequency Range	13.11MHz ~ 14.01MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.359	-5.02 QP	40.51	-45.53	1.00	58	37.73	-42.75
2	13.481	-4.90 QP	50.47	-55.37	1.00	274	37.87	-42.77
3	*13.560	8.29 QP	84.00	-75.71	1.00	360	51.07	-42.78
4	13.661	-5.05 QP	50.47	-55.52	1.00	359	37.74	-42.79
5	13.770	-3.82 QP	40.51	-44.33	1.00	192	38.99	-42.81

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

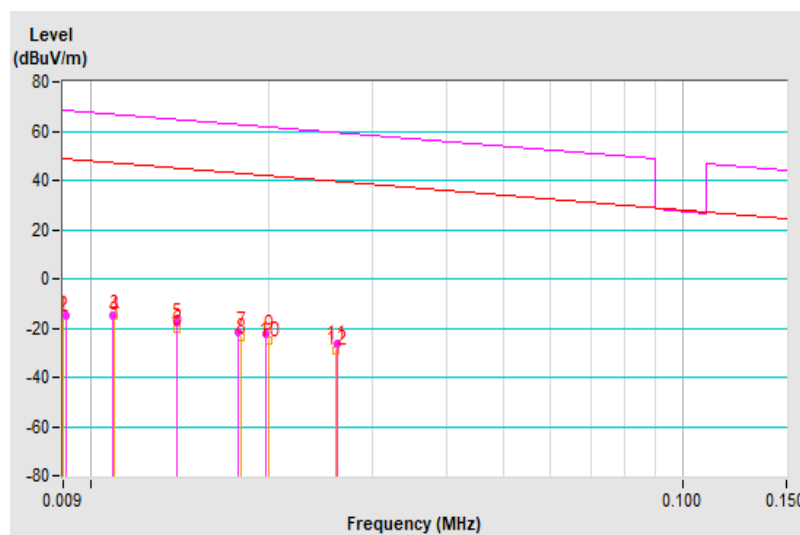


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz
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Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.009	-14.68 PK	68.52	-83.20	1.00	176	28.15	-42.83
2	0.009	-14.93 AV	48.52	-63.45	1.00	176	27.90	-42.83
3	0.011	-14.73 PK	66.78	-81.51	1.00	360	29.65	-44.38
4	0.011	-14.99 AV	46.78	-61.77	1.00	360	29.39	-44.38
5	0.014	-17.92 PK	64.68	-82.60	1.00	34	27.79	-45.71
6	0.014	-20.33 AV	44.68	-65.01	1.00	34	25.38	-45.71
7	0.018	-21.61 PK	62.50	-84.11	1.00	241	25.89	-47.50
8	0.018	-23.98 AV	42.50	-66.48	1.00	241	23.52	-47.50
9	0.020	-22.71 PK	61.58	-84.29	1.00	19	25.68	-48.39
10	0.020	-25.18 AV	41.58	-66.76	1.00	19	23.21	-48.39
11	0.026	-26.53 PK	59.30	-85.83	1.00	82	24.26	-50.79
12	0.026	-28.88 AV	39.30	-68.18	1.00	82	21.91	-50.79

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

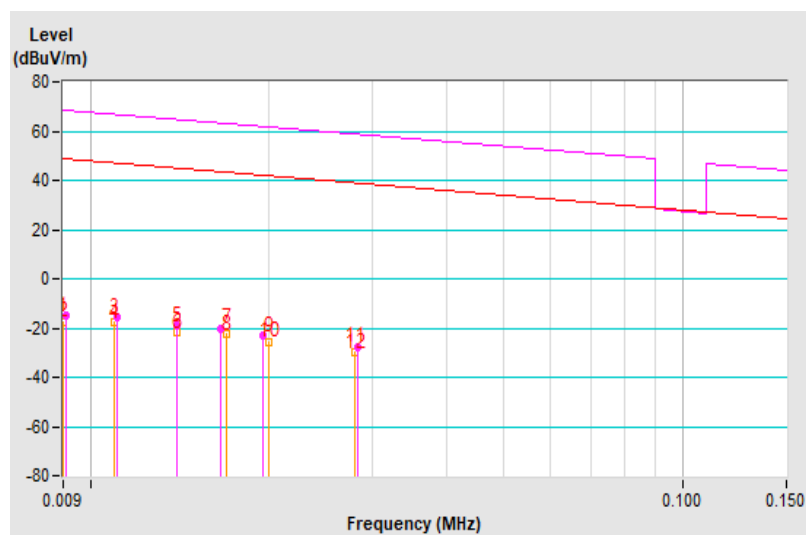


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz
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Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.009	-15.21 PK	68.52	-83.73	1.00	293	27.62	-42.83
2	0.009	-17.49 AV	48.52	-66.01	1.00	293	25.34	-42.83
3	0.011	-15.73 PK	66.78	-82.51	1.00	41	28.65	-44.38
4	0.011	-17.89 AV	46.78	-64.67	1.00	41	26.49	-44.38
5	0.014	-19.32 PK	64.68	-84.00	1.00	68	26.39	-45.71
6	0.014	-21.65 AV	44.68	-66.33	1.00	68	24.06	-45.71
7	0.017	-20.03 PK	62.99	-83.02	1.00	249	27.02	-47.05
8	0.017	-22.55 AV	43.00	-65.55	1.00	249	24.50	-47.05
9	0.020	-23.04 PK	61.58	-84.62	1.00	174	25.35	-48.39
10	0.020	-25.61 AV	41.58	-67.19	1.00	174	22.78	-48.39
11	0.028	-27.46 PK	58.66	-86.12	1.00	48	24.13	-51.59
12	0.028	-29.85 AV	38.66	-68.51	1.00	48	21.74	-51.59

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

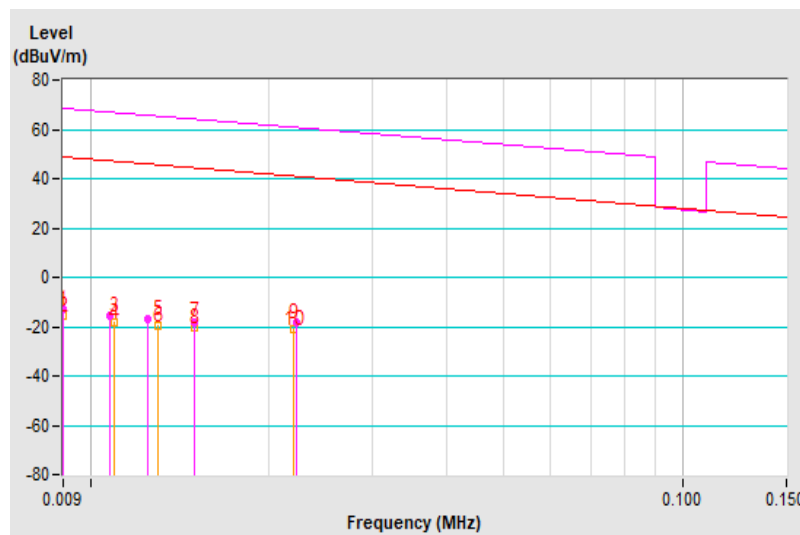


Frequency Range	9kHz ~ 150kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200Hz
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Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.009	-13.12 PK	68.52	-81.64	1.00	360	29.71	-42.83
2	0.009	-15.76 AV	48.52	-64.28	1.00	360	27.07	-42.83
3	0.011	-15.71 PK	66.78	-82.49	1.00	250	28.67	-44.38
4	0.011	-18.35 AV	46.78	-65.13	1.00	250	26.03	-44.38
5	0.013	-16.94 PK	65.32	-82.26	1.00	34	28.33	-45.27
6	0.013	-19.66 AV	45.33	-64.99	1.00	34	25.61	-45.27
7	0.015	-18.10 PK	64.08	-82.18	1.00	232	28.06	-46.16
8	0.015	-20.46 AV	44.08	-64.54	1.00	232	25.70	-46.16
9	0.022	-18.60 PK	60.75	-79.35	1.00	360	30.59	-49.19
10	0.022	-20.97 AV	40.76	-61.73	1.00	360	28.22	-49.19

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

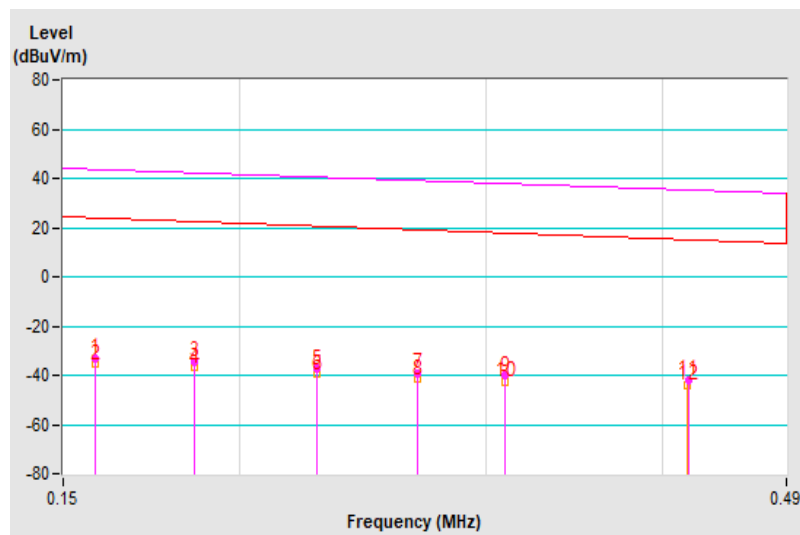


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz
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Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.158	-32.94 PK	43.63	-76.57	1.00	323	33.08	-66.02
2	0.158	-35.43 AV	23.63	-59.06	1.00	323	30.59	-66.02
3	0.186	-34.47 PK	42.21	-76.68	1.00	51	32.65	-67.12
4	0.186	-36.88 AV	22.21	-59.09	1.00	51	30.24	-67.12
5	0.227	-37.26 PK	40.48	-77.74	1.00	360	31.49	-68.75
6	0.227	-39.66 AV	20.48	-60.14	1.00	360	29.09	-68.75
7	0.268	-39.10 PK	39.04	-78.14	1.00	199	31.29	-70.39
8	0.268	-41.49 AV	19.04	-60.53	1.00	199	28.90	-70.39
9	0.309	-40.02 PK	37.80	-77.82	1.00	233	31.80	-71.82
10	0.309	-42.49 AV	17.80	-60.29	1.00	233	29.33	-71.82
11	0.417	-41.70 PK	35.20	-76.90	1.00	10	32.08	-73.78
12	0.417	-43.93 AV	15.20	-59.13	1.00	10	29.85	-73.78

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

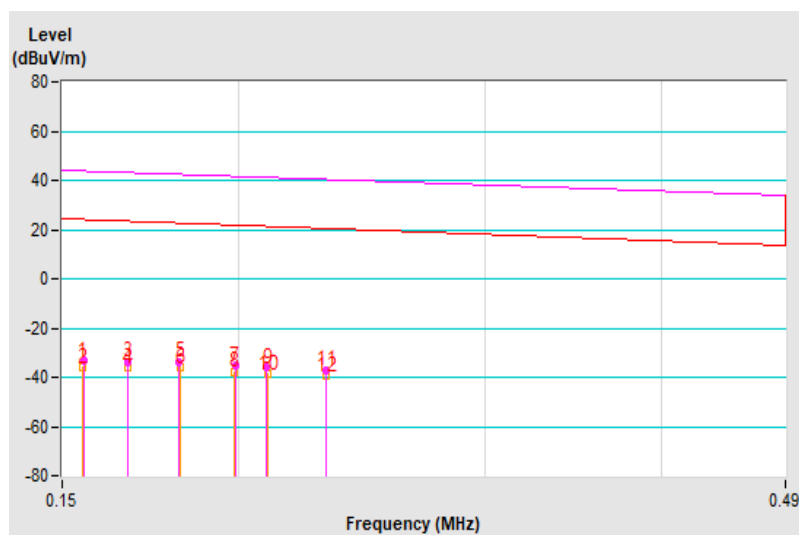


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz
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Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.155	-33.43 PK	43.80	-77.23	1.00	295	32.47	-65.90
2	0.155	-35.86 AV	23.80	-59.66	1.00	295	30.04	-65.90
3	0.167	-33.66 PK	43.15	-76.81	1.00	167	32.72	-66.38
4	0.167	-35.97 AV	23.15	-59.12	1.00	167	30.41	-66.38
5	0.182	-33.74 PK	42.40	-76.14	1.00	289	33.22	-66.96
6	0.182	-36.08 AV	22.40	-58.48	1.00	289	30.88	-66.96
7	0.199	-35.27 PK	41.63	-76.90	1.00	136	32.36	-67.63
8	0.199	-37.66 AV	21.63	-59.29	1.00	136	29.97	-67.63
9	0.210	-36.24 PK	41.16	-77.40	1.00	0	31.83	-68.07
10	0.210	-38.76 AV	21.16	-59.92	1.00	0	29.31	-68.07
11	0.231	-37.16 PK	40.33	-77.49	1.00	360	31.75	-68.91
12	0.231	-39.33 AV	20.33	-59.66	1.00	360	29.58	-68.91

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

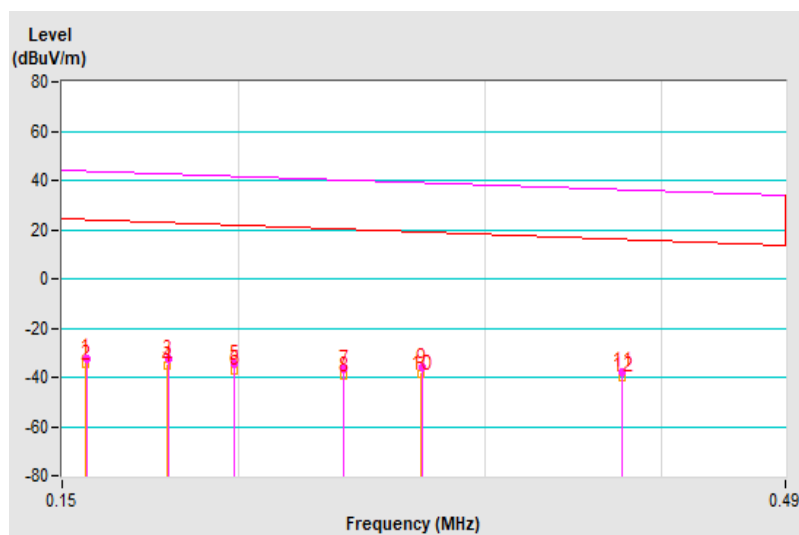


Frequency Range	150kHz ~ 490kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9kHz
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Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.156	-32.38 PK	43.74	-76.12	1.00	268	33.56	-65.94
2	0.156	-34.87 AV	23.74	-58.61	1.00	268	31.07	-65.94
3	0.178	-32.79 PK	42.59	-75.38	1.00	315	34.01	-66.80
4	0.178	-35.47 AV	22.59	-58.06	1.00	315	31.33	-66.80
5	0.199	-34.73 PK	41.63	-76.36	1.00	311	32.90	-67.63
6	0.199	-36.97 AV	21.63	-58.60	1.00	311	30.66	-67.63
7	0.238	-36.89 PK	40.07	-76.96	1.00	316	32.30	-69.19
8	0.238	-39.41 AV	20.07	-59.48	1.00	316	29.78	-69.19
9	0.270	-36.18 PK	38.98	-75.16	1.00	315	34.29	-70.47
10	0.270	-38.66 AV	18.98	-57.64	1.00	315	31.81	-70.47
11	0.375	-37.63 PK	36.12	-73.75	1.00	315	35.39	-73.02
12	0.375	-39.89 AV	16.12	-56.01	1.00	315	33.13	-73.02

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(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for below 0.49MHz is 3m, extrapolate the measured field strength to a distance of 300 meters.
Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$

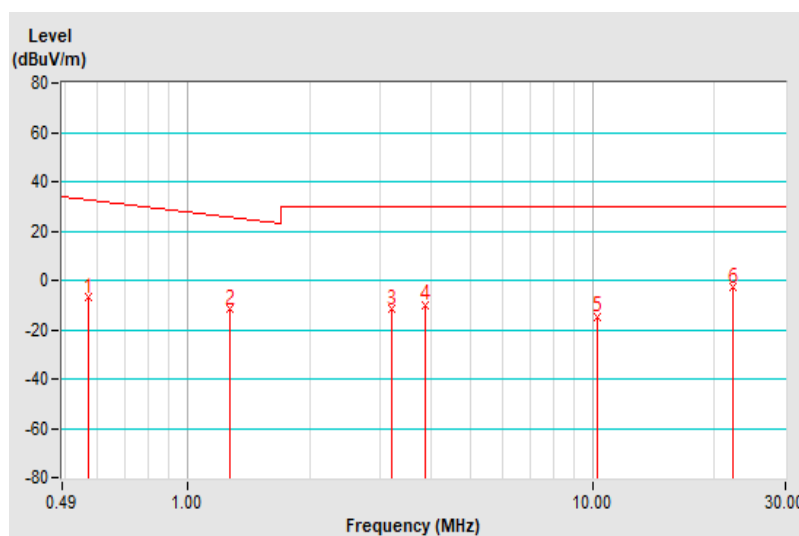


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.567	-6.87 QP	32.53	-39.40	1.00	29	29.01	-35.88
2	1.277	-11.67 QP	25.47	-37.14	1.00	14	28.00	-39.67
3	3.200	-11.86 QP	29.54	-41.40	1.00	255	31.37	-43.23
4	3.865	-9.86 QP	29.54	-39.40	1.00	10	33.57	-43.43
5	10.267	-14.65 QP	29.54	-44.19	1.00	261	27.62	-42.27
6	22.271	-2.89 QP	29.54	-32.43	1.00	152	40.52	-43.41

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

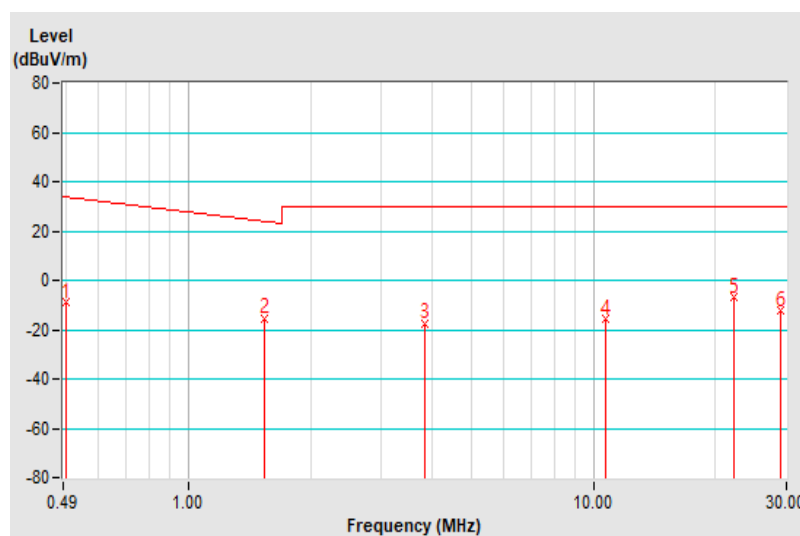


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.499	-9.05 QP	33.64	-42.69	1.00	264	26.30	-35.35
2	1.545	-15.34 QP	23.82	-39.16	1.00	252	24.85	-40.19
3	3.831	-17.37 QP	29.54	-46.91	1.00	2	26.04	-43.41
4	10.733	-15.76 QP	29.54	-45.30	1.00	15	26.58	-42.34
5	22.276	-6.89 QP	29.54	-36.43	1.00	143	36.52	-43.41
6	28.999	-12.24 QP	29.54	-41.78	1.00	234	30.24	-42.48

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

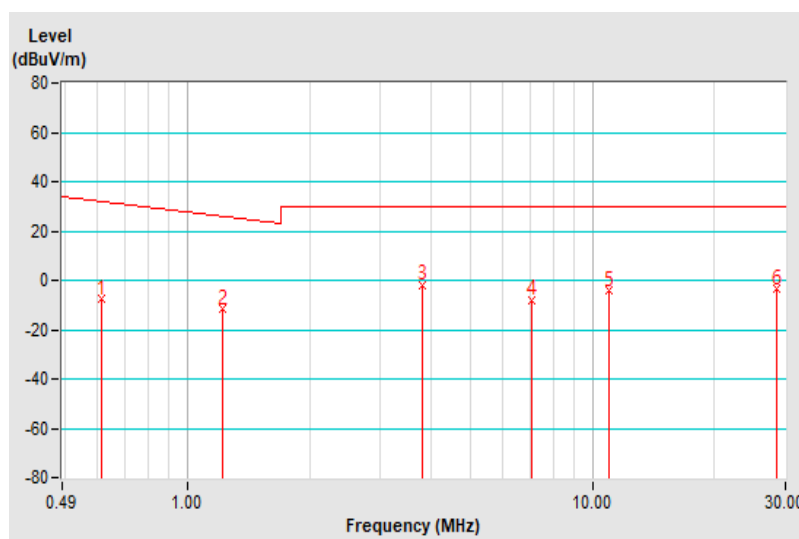


Frequency Range	490kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9kHz
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Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.614	-7.64 QP	31.84	-39.48	1.00	20	28.59	-36.23
2	1.223	-11.62 QP	25.85	-37.47	1.00	146	27.95	-39.57
3	3.811	-1.84 QP	29.54	-31.38	1.00	38	41.56	-43.40
4	7.091	-7.92 QP	29.54	-37.46	1.00	83	35.17	-43.09
5	11.029	-4.12 QP	29.54	-33.66	1.00	66	38.26	-42.38
6	28.479	-3.65 QP	29.54	-33.19	1.00	257	38.91	-42.56

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(dB)
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 ~ 30MHz is 3m, extrapolate the measured field strength to a distance of 30 meters.
Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$

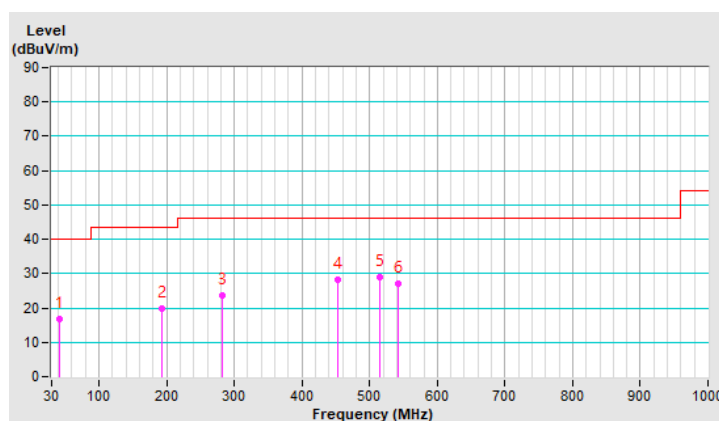


Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	42.08	16.7 QP	40.0	-23.3	1.00 H	80	29.6	-12.9
2	193.84	19.9 QP	43.5	-23.6	1.00 H	20	34.9	-15.0
3	282.02	23.5 QP	46.0	-22.5	1.00 H	300	35.4	-11.9
4	453.86	28.1 QP	46.0	-17.9	2.00 H	350	34.5	-6.4
5	515.27	28.9 QP	46.0	-17.1	1.50 H	0	34.0	-5.1
6	542.43	27.1 QP	46.0	-18.9	1.00 H	360	31.8	-4.7

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 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

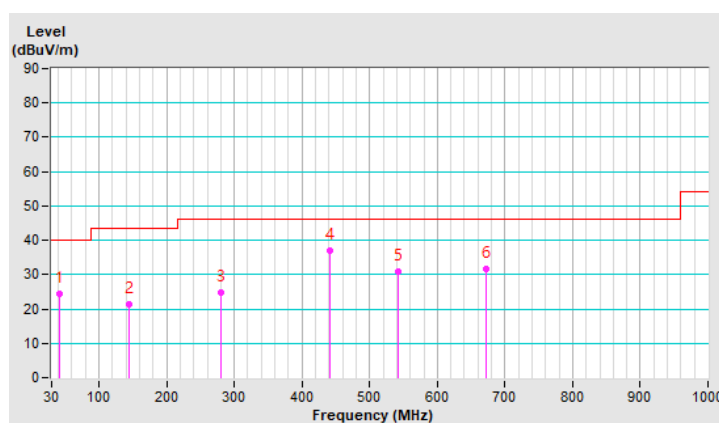


Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.67	24.5 QP	40.0	-15.5	1.00 V	169	37.4	-12.9
2	143.69	21.4 QP	43.5	-22.1	2.00 V	204	33.8	-12.4
3	280.47	24.9 QP	46.0	-21.1	2.00 V	197	36.8	-11.9
4	441.01	37.0 QP	46.0	-9.0	1.50 V	26	43.6	-6.6
5	542.43	30.8 QP	46.0	-15.2	1.00 V	149	35.5	-4.7
6	673.00	31.8 QP	46.0	-14.2	2.00 V	0	33.9	-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 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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
Test Receiver R&S	ESCS 30	847124/029	2021/10/13	2022/10/12
LISN R&S	ESH3-Z5	848773/004	2021/10/29	2022/10/28
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator NA	50	3	2021/10/27	2022/10/26
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2021/9/25	2022/9/24
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
Software BVADT	BVADT_Cond_V7.3.7.4	NA	NA	NA

- Note: 1. The test was performed in Conduction 1.
 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: 2022/1/28

4.2.3 Test Procedures

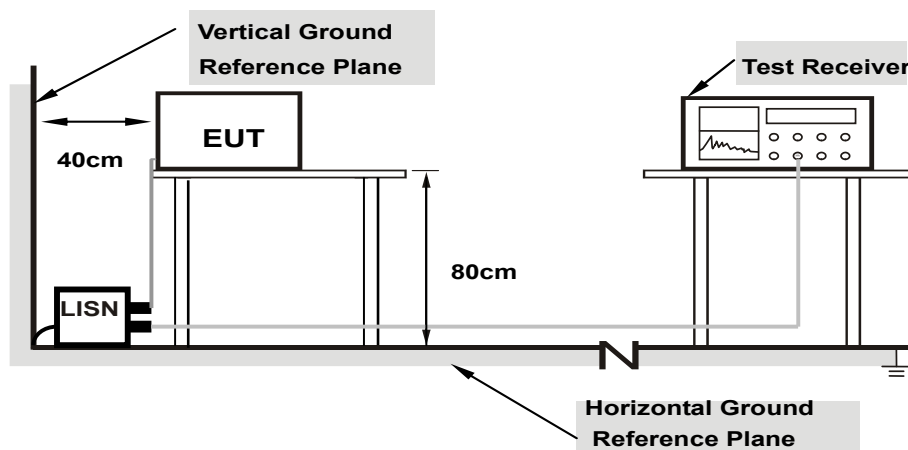
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

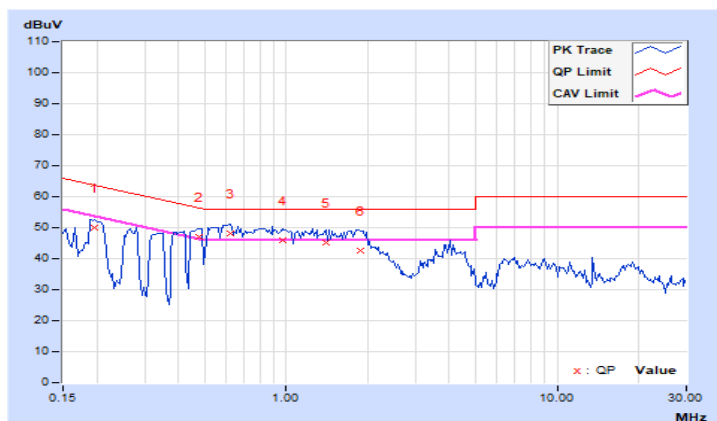
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
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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	0.19687	10.05	40.08	31.98	50.13	42.03	63.74	53.74	-13.61	-11.71
2	0.47422	10.07	37.15	25.71	47.22	35.78	56.44	46.44	-9.22	-10.66
3	0.61875	10.08	37.97	24.93	48.05	35.01	56.00	46.00	-7.95	-10.99
4	0.97031	10.11	35.70	24.80	45.81	34.91	56.00	46.00	-10.19	-11.09
5	1.40234	10.13	35.16	24.36	45.29	34.49	56.00	46.00	-10.71	-11.51
6	1.87109	10.15	32.35	21.89	42.50	32.04	56.00	46.00	-13.50	-13.96

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

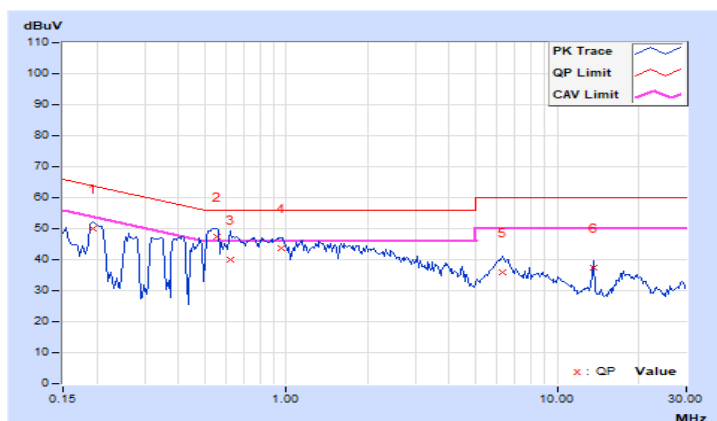


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19297	10.03	39.90	29.84	49.93	39.87	63.91	53.91	-13.98	-14.04
2	0.55234	10.05	37.27	24.46	47.32	34.51	56.00	46.00	-8.68	-11.49
3	0.61875	10.05	29.83	13.66	39.88	23.71	56.00	46.00	-16.12	-22.29
4	0.95469	10.08	33.46	21.75	43.54	31.83	56.00	46.00	-12.46	-14.17
5	6.32422	10.32	25.51	18.43	35.83	28.75	60.00	50.00	-24.17	-21.25
6	13.56250	10.66	26.88	26.60	37.54	37.26	60.00	50.00	-22.46	-12.74

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

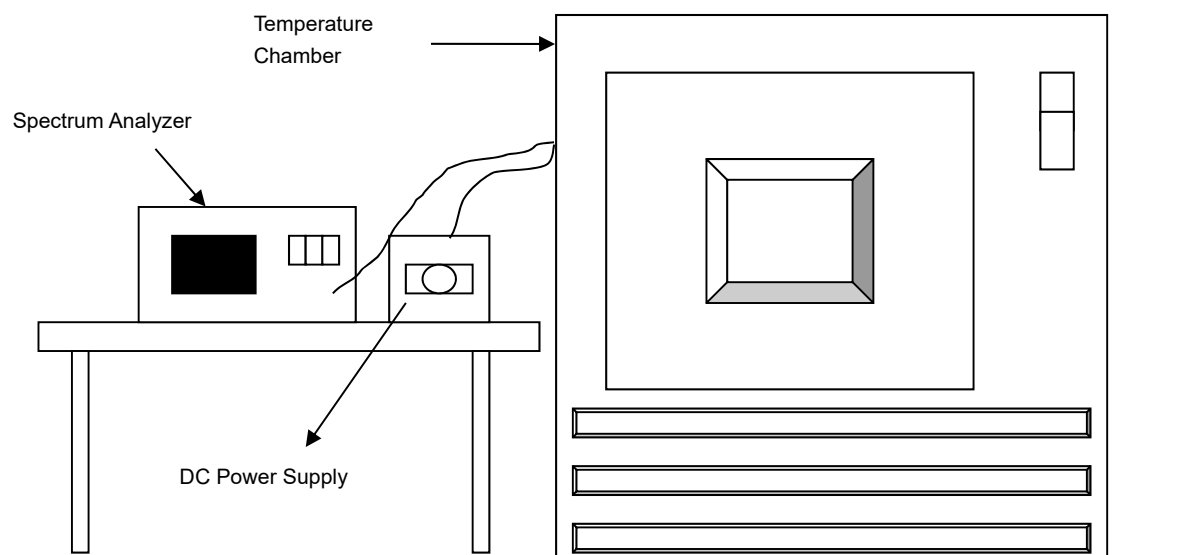


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to 50 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

- The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed.
- 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. (°C)	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)	%
40	3.7	13.55996	-0.00029	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029
30	3.7	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56001	0.00007
20	3.7	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022
10	3.7	13.55994	-0.00044	13.55995	-0.00037	13.55993	-0.00052	13.55994	-0.00044
5	3.7	13.55996	-0.00029	13.55996	-0.00029	13.55997	-0.00022	13.55995	-0.00037

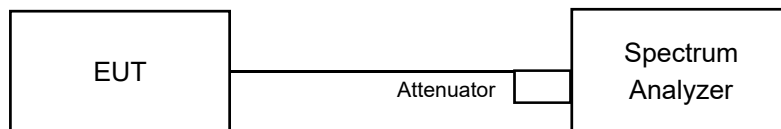
Frequency Stability Versus Voltage									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	4.255	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022
	3.7	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022
	3.145	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022

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

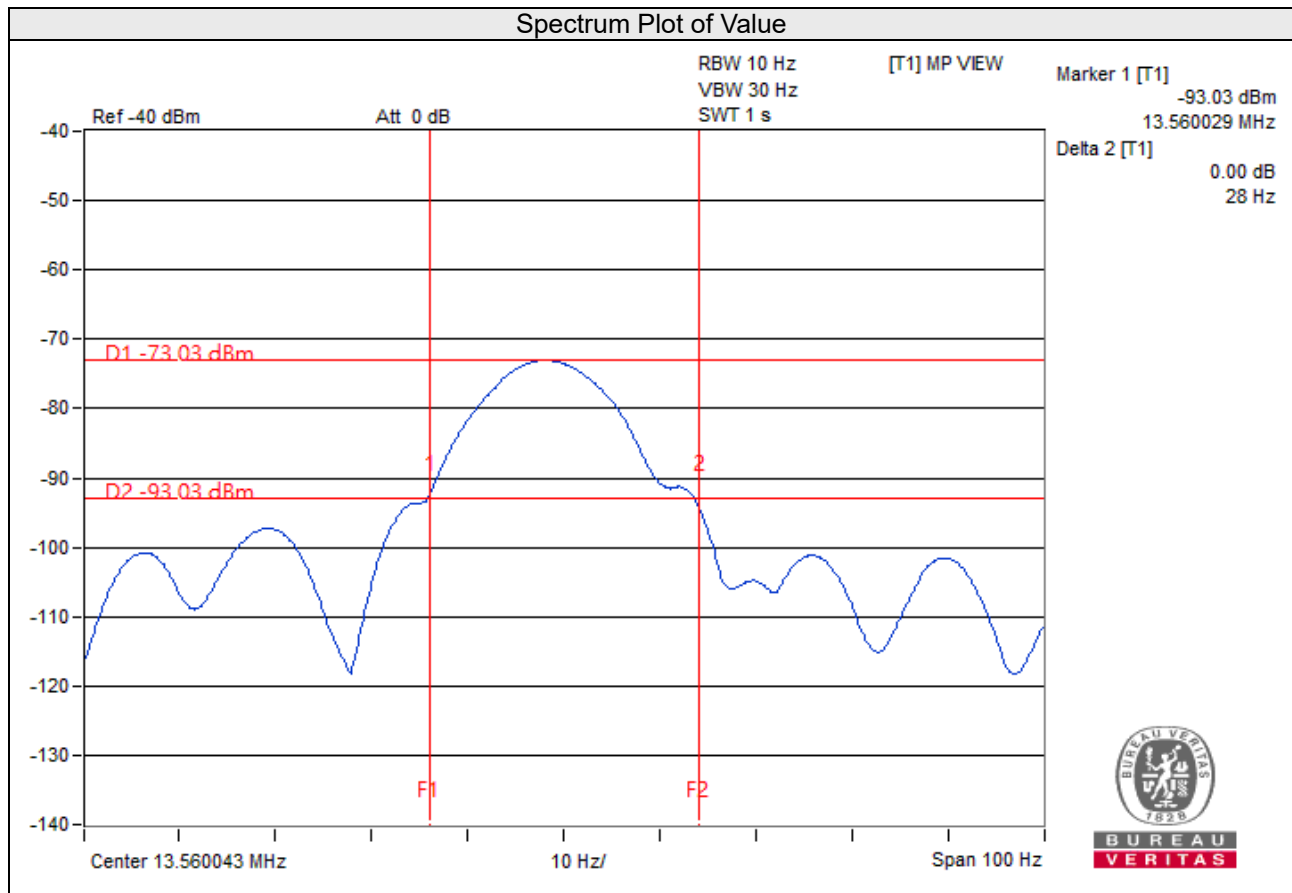
No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.1.6.

4.4.7 Test Results

Operating Frequency Band (MHz)	20dB Bandwidth (MHz)	20dB Point (MHz)		Pass / Fail
		Lowest	Highest	
13.11 – 14.01	0.000028	13.560029	13.560057	PASS



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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