

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.225)
Report No.: RFBAOZ-WTW-P24080124
FCC ID: RRK-AAAC2361
Product: Arming Station Pro
Brand: AVIGILON
Model No.: 220-4463B
Received Date: 2024/8/7
Test Date: 2024/8/21 ~ 2024/11/8
Issued Date: 2024/12/2
Applicant: Alpha Networks Inc.
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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory
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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / 723255 / TW2022
Designation Number:

Approved by: _____



Wen Yu / Assistant Manager

, Date: _____

2024/12/2

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Prepared by : Phoenix Huang / Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBAOZ-WTW-P24080124	Original release.	2024/12/2

1 Certificate

Product: Arming Station Pro

Brand: AVIGILON

Test Model: 220-4463B

Sample Status: Engineering sample

Applicant: Alpha Networks Inc.

Test Date: 2024/8/21 ~ 2024/11/8

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.225)

**Measurement
procedure:** 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 RF characteristics under the conditions specified in this report.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.225)			
Standard / Clause	Test Item	Result	Remark
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -2.67 dB at 0.38827 MHz
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	Pass	Meet the requirement of limit.
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	Meet the requirement of limit.
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 -2.4 dB at 40.67 MHz
15.225 (e)	Frequency Stability	Pass	Meet the requirement of limit.
15.215 (c)	20 dB 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	Specification	Expanded Uncertainty (k=2) (±)
Conducted Emissions from Power Ports	150 kHz ~ 30 MHz	1.9 dB
Radiated Emissions below 30 MHz	9 kHz ~ 30 MHz	3.1 dB
Radiated Emissions above 30 MHz	30 MHz ~ 1 GHz	5.1 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	Arming Station Pro
Brand	AVIGILON
Test Model	220-4463B
Status of EUT	Engineering sample
Power Supply Rating	48 Vdc from POE
Modulation Type	ASK
NFC Technology Type	NFC-A (ISO/IEC 14443 Type A)
Data Rate	Type A: 106 kbit/s
Operating Frequency	13.56 MHz
Number of Channel	1
Field Strength Of Fundamental	24.43 dBuV/m (Quasi-Peak) at 30 meters

Note:

1. There are NFC and RFID technology used for the EUT.

2. Simultaneously transmission combination.

Combination	Technology	
1	NFC	RFID

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

3. The EUT has below DDR could be chosen as following table:

No.	Vender	Vender Part number	ALPHA Part number
Main source	SKHYNIX	H5AN8G6NDJR-XNC	155651216G05G
2 nd source (No.1)	MICRON	MT40A512M16TB-062E:R	155651216G06G
2 nd source (No.2)	SKHYNIX	H5AG36EXNDX017N	155651216G01G

4. 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 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna NO.	Antenna Type
NFC	printed antenna
RFID	wire loop antenna

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.

3.3 Channel List

1 channel is provided to this EUT:

Channel	Frequency (MHz)
1	13.56

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	The DDR memory has the following sources: Main source/ 2 nd source (No.1)/ 2 nd source (No.2). Pre-scan these sources of DDR and find the worst case as a representative test condition.
Worst Case:	DDR memory worst condition: Main source

Following channel(s) was (were) selected for the final test as listed below:

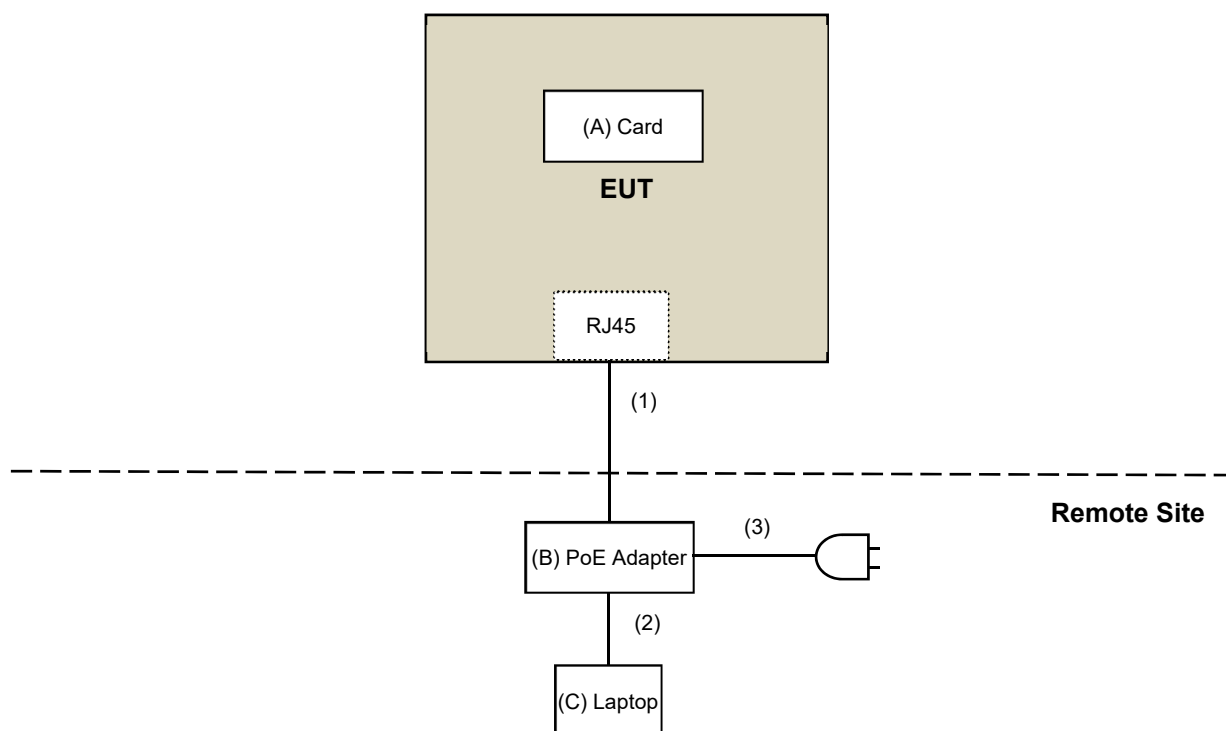
Test Item	Type	Tested Channel	Modulation	Data Rate Parameter
AC Power Conducted Emissions	A	1	100%, ASK	106 kbit/s
Radiated Emissions below 30 MHz	A	1	100%, ASK	106 kbit/s
Radiated Emissions above 30 MHz	A	1	100%, ASK	106 kbit/s
Frequency Stability	-	1	unmodulated	-
20 dB Bandwidth	A	1	100%, ASK	106 kbit/s

3.5 Test Program Used and Operation Descriptions

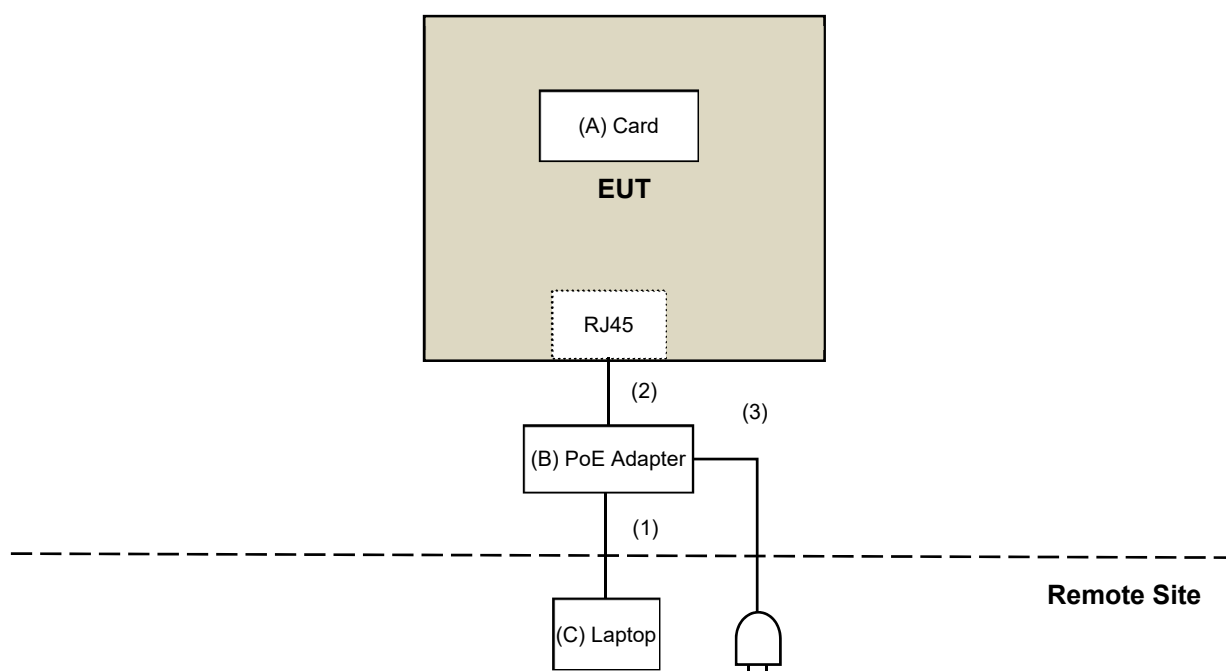
Controlling software (RF Sample with Tag Card) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.6 Connection Diagram of EUT and Peripheral Devices

For Unwanted Emissions Test:



For AC Power Conducted Emission Test:



3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Card	Alpha	N/A	N/A	N/A	Supplied by applicant
B	PoE Adapter	PHIH0NG	POE29U-560	N/A	N/A	Supplied by applicant
C	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	RJ45 Cable	1	10	No	0	Provided by Lab
2	RJ45 Cable	1	1	No	0	Provided by Lab
3	AC Cable	1	1.8	No	0	Supplied by applicant

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance Telegartner	50 ohm	3	2024/11/1	2025/10/31
EMI Test Receiver R&S	ESCS 30	100375	2024/5/20	2025/5/19
Fixed Attenuator STI	STI02-2200-10	005	2024/2/19	2025/2/18
LISN R&S	ESH3-Z5	835239/001	2024/4/3	2025/4/2
		848773/004	2024/10/7	2025/10/6
RF Coaxial Cable JYEBAO	5D-FB	COCCAB-001	2024/2/19	2025/2/18
Software BVADT	BVADT_Cond_V7.3.7.4	N/A	N/A	N/A

Notes:

1. The test was performed in Conduction 1
2. Tested Date: 2024/11/8

4.2 Radiated Emissions below 30 MHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
EMI Test Receiver R&S	ESR7	102026	2024/3/25	2025/3/24
Loop Antenna TESEQ	HLA 6121	63620	2024/10/17	2025/10/16
Preamplifier EMCI	EMC001340	980142	2024/2/19	2025/2/18
PXA Signal Analyzer Keysight	N9030B	MY57141948	2024/5/20	2025/5/19
RF Coaxial Cable JYEBAO	5D-FB	LOOPCAB-001	2024/2/19	2025/2/18
		LOOPCAB-002	2024/2/19	2025/2/18
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 5.
2. Tested Date: 2024/11/7

4.3 Radiated Emissions above 30 MHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-0842	2024/10/8	2025/10/7
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
EMI Test Receiver R&S	ESR7	102026	2024/3/25	2025/3/24
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	2024/3/30	2025/3/29
Loop Antenna TESEQ	HLA 6121	63620	2024/10/17	2025/10/16
Preamplifier EMCI	EMC330N	980538	2024/3/30	2025/3/29
	EMC001340	980142	2024/2/19	2025/2/18
PXA Signal Analyzer Keysight	N9030B	MY57141948	2024/5/20	2025/5/19
RF Coaxial Cable JYBAO	5D-FB	LOOPCAB-001	2024/2/19	2025/2/18
		LOOPCAB-002	2024/2/19	2025/2/18
RF Coaxial Cable PEWC	8D	966-5-1	2024/3/30	2025/3/29
		966-5-2	2024/3/30	2025/3/29
		966-5-3	2024/3/30	2025/3/29
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 5.
2. Tested Date: 2024/11/7

4.4 Frequency Stability

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
DC Power Supply GOOD WILL INSTRUMENT CO. LTD	GPC-3030D	E847076	N/A	N/A
MXA Signal Analyzer Keysight	N9020B	MY60112408	2024/3/7	2025/3/6
Software	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	2023/12/20	2024/12/19
True RMS Clamp Meter FLUKE	325	31130711WS	2024/6/13	2025/6/12

Notes:

1. The test was performed in Oven room 2.
2. Tested Date: 2024/8/21

4.5 20 dB Bandwidth

Refer to section 4.2 to get the tested date and information of the instruments.

5 Limits of Test Items

5.1 AC Power Conducted Emissions

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

Notes:

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 0.50 MHz.

5.2 Radiated Emissions below 30 MHz

- (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:

Frequency (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

Notes:

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 detect or 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, and the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

5.3 Radiated Emissions above 30 MHz

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

5.4 Frequency Stability

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.

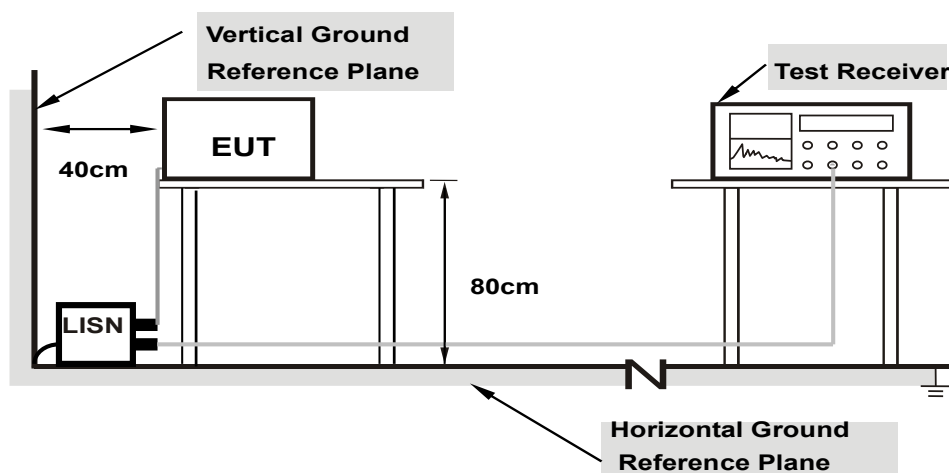
5.5 20 dB Bandwidth

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

6 Test Arrangements

6.1 AC Power Conducted Emissions

6.1.1 Test Setup



Note: 1.Support units were connected to second LISN.

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

6.1.2 Test Procedure

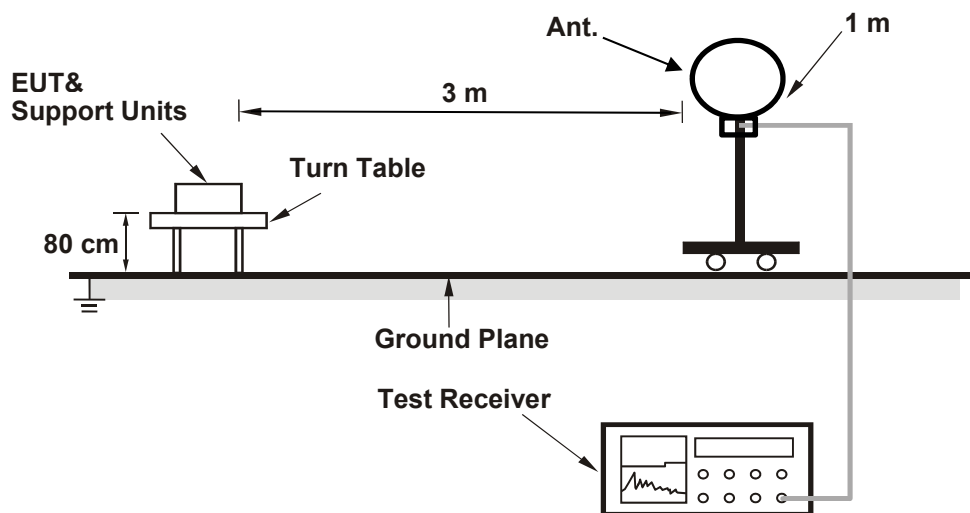
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH 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 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

6.2 Radiated Emissions below 30 MHz

6.2.1 Test Setup

For Radiated emission below 30 MHz



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

6.2.2 Test Procedure

For Radiated emission below 30 MHz

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- 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.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

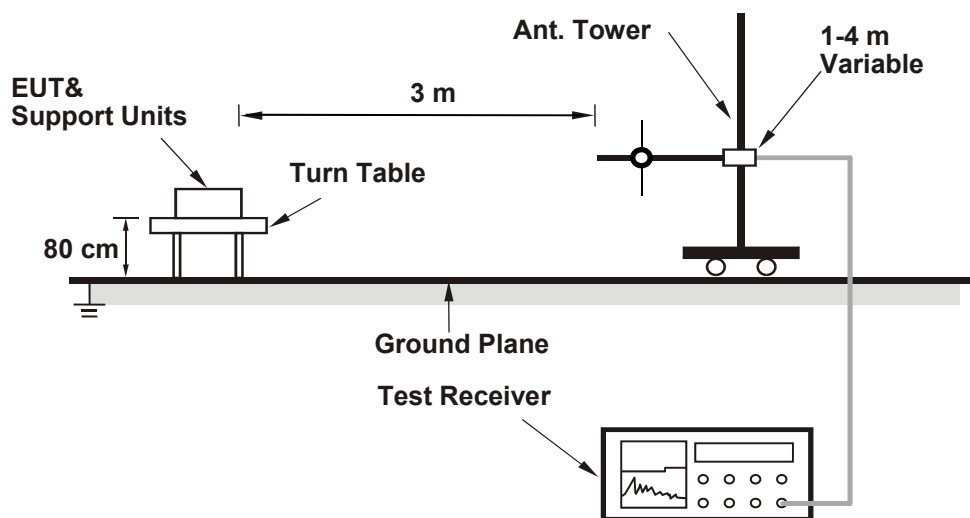
Notes:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
- All modes of operation were investigated and the worst-case emissions are reported.
- KDB 414788 OATS and Chamber Correlation Justification
- Based on FCC 15.31(f)(2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

6.3 Radiated Emissions above 30 MHz

6.3.1 Test Setup

For Radiated emission above 30 MHz



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

6.3.2 Test Procedure

For Radiated emission above 30 MHz

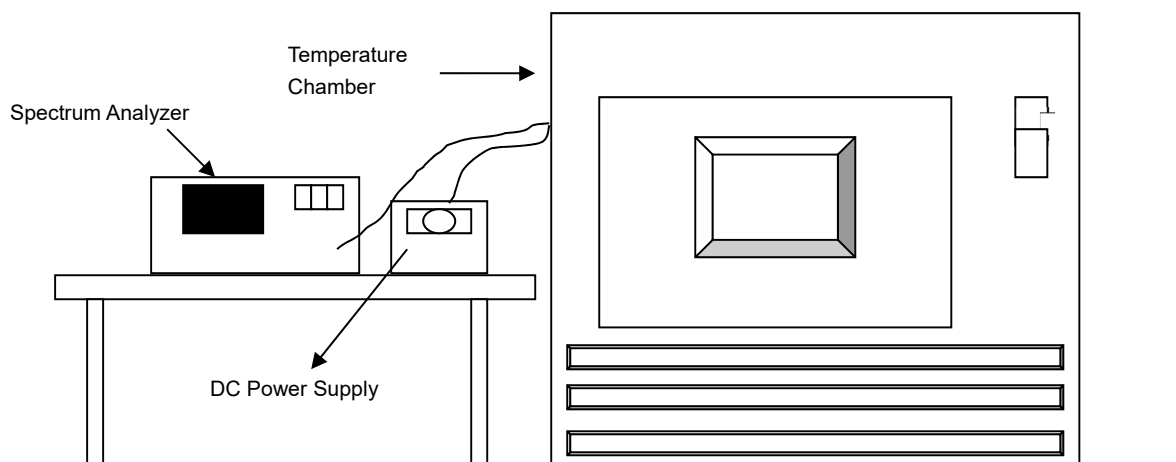
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.

Notes:

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

6.4 Frequency Stability

6.4.1 Test Setup

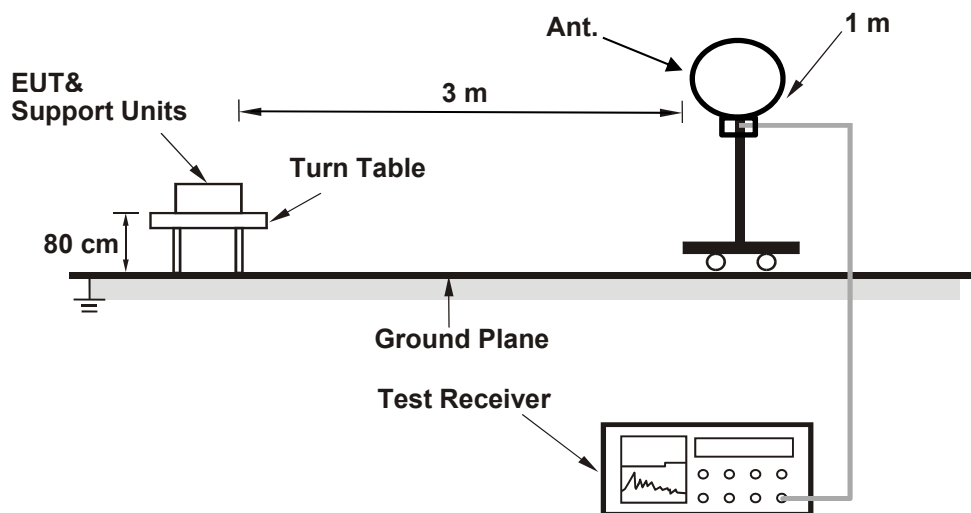


6.4.2 Test Procedure

- 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.

6.5 20 dB Bandwidth

6.5.1 Test Setup



6.5.2 Test Procedure

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- 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.
- The test-spectrum system was set to Peak Detect Function and Maximum Hold.
- Set resolution bandwidth (RBW) = 1% to 5% of the OBW.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

7 Test Results of Test Item

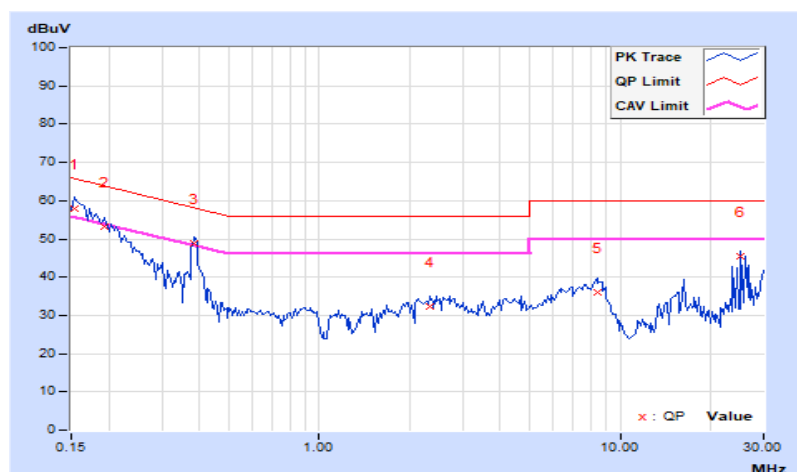
7.1 AC Power Conducted Emissions

RF Mode	NFC	Channel	CH 1 : 13.56 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	24 °C, 76 % RH
Tested By	Andy Ho		

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	0.15390	10.02	47.76	32.54	57.78	42.56	65.79	55.79	-8.01	-13.23
2	0.19295	10.02	43.12	25.03	53.14	35.05	63.91	53.91	-10.77	-18.86
3	0.38437	10.02	38.64	35.02	48.66	45.04	58.18	48.18	-9.52	-3.14
4	2.33205	10.11	22.13	17.42	32.24	27.53	56.00	46.00	-23.76	-18.47
5	8.37110	10.43	25.64	20.51	36.07	30.94	60.00	50.00	-23.93	-19.06
6	25.23826	11.34	34.13	32.74	45.47	44.08	60.00	50.00	-14.53	-5.92

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

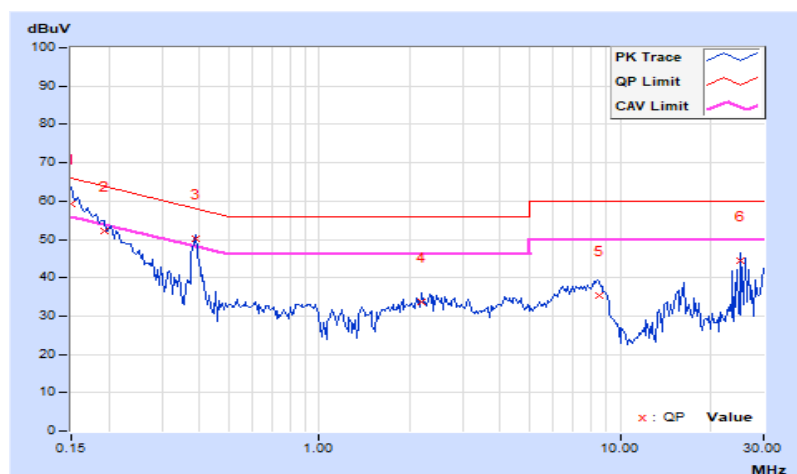


RF Mode	NFC	Channel	CH 1 : 13.56 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	24 °C, 76 % RH
Tested By	Andy Ho		

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	49.24	30.71	59.24	40.71	66.00	56.00	-6.76	-15.29
2	0.19296	10.01	42.03	23.65	52.04	33.66	63.91	53.91	-11.87	-20.25
3	0.38827	10.01	40.12	35.42	50.13	45.43	58.10	48.10	-7.97	-2.67
4	2.17970	10.08	23.54	18.21	33.62	28.29	56.00	46.00	-22.38	-17.71
5	8.50779	10.35	25.01	22.43	35.36	32.78	60.00	50.00	-24.64	-17.22
6	25.23045	10.96	33.41	31.56	44.37	42.52	60.00	50.00	-15.63	-7.48

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



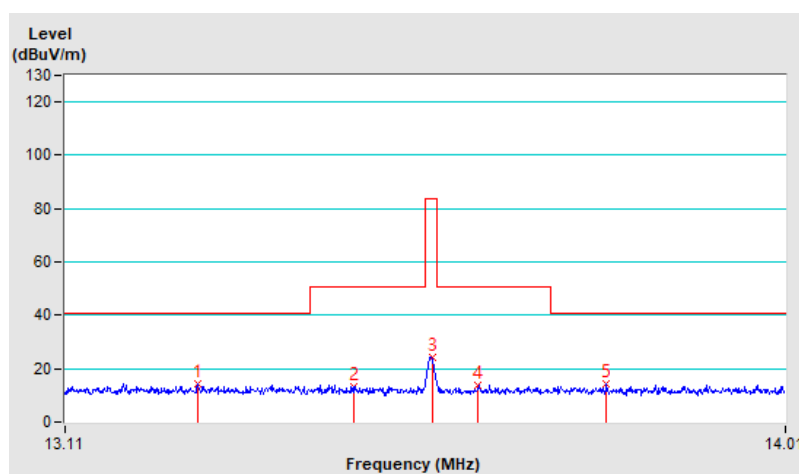
7.2 Radiated Emissions below 30 MHz

Frequency Range	13.11 MHz ~ 14.01 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	13.271	14.33 QP	40.51	-26.18	1.00	204	32.58	-18.25
2	13.464	13.28 QP	50.47	-37.19	1.00	204	31.57	-18.29
3	*13.560	24.43 QP	84.00	-59.57	1.00	204	42.74	-18.31
4	13.619	13.67 QP	50.47	-36.80	1.00	204	31.99	-18.32
5	13.781	14.13 QP	40.51	-26.38	1.00	204	32.49	-18.36

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 = $40 \cdot \log(3/30) = -40$ dB



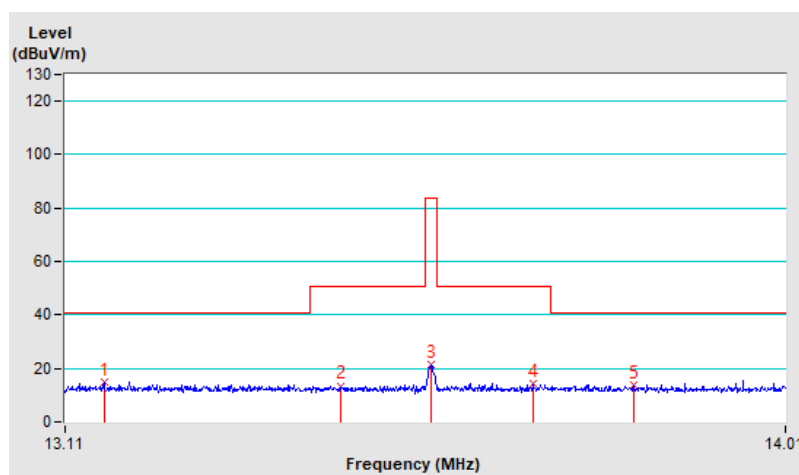
Frequency Range	13.11 MHz ~ 14.01 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	13.158	14.98 QP	40.51	-25.53	1.00	205	33.21	-18.23
2	13.447	13.49 QP	50.47	-36.98	1.00	205	31.78	-18.29
3	*13.560	21.70 QP	84.00	-62.30	1.00	205	40.01	-18.31
4	13.688	14.37 QP	50.47	-36.10	1.00	205	32.71	-18.34
5	13.816	13.78 QP	40.51	-26.73	1.00	205	32.14	-18.36

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 = $40 \cdot \log(3/30) = -40$ dB

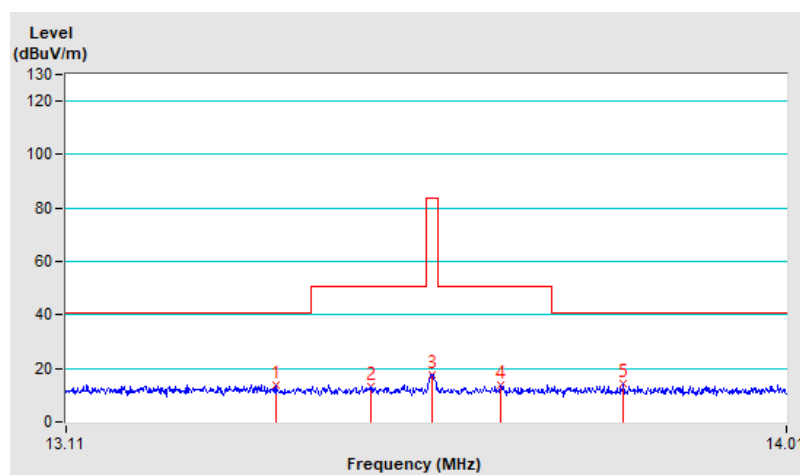


Frequency Range	13.11 MHz ~ 14.01 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	13.366	13.97 QP	40.51	-26.54	1.00	114	32.24	-18.27
2	13.483	13.09 QP	50.47	-37.38	1.00	114	31.39	-18.30
3	*13.560	17.75 QP	84.00	-66.25	1.00	114	36.06	-18.31
4	13.645	13.51 QP	50.47	-36.96	1.00	114	31.84	-18.33
5	13.801	14.13 QP	40.51	-26.38	1.00	114	32.49	-18.36

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 = $40 \cdot \log(3/30) = -40$ dB



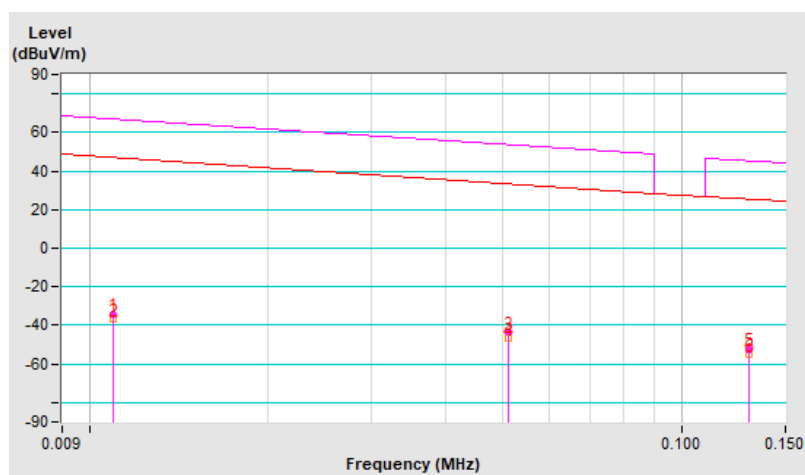
Frequency Range	9 kHz ~ 150 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200 Hz
Input Power (System)	120 Vac, 60 Hz		

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	0.011	-33.96 PK	66.78	-100.74	1.00	105	28.54	-62.50
2	0.011	-36.78 AV	46.78	-83.56	1.00	105	25.72	-62.50
3	0.051	-43.75 PK	53.45	-97.20	1.00	216	18.75	-62.50
4	0.051	-46.69 AV	33.45	-80.14	1.00	216	15.81	-62.50
5	0.130	-52.45 PK	45.32	-97.77	1.00	311	8.34	-60.79
6	0.130	-55.02 AV	25.32	-80.34	1.00	311	5.77	-60.79

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
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 = $40 \cdot \log(3/300) = -80$ dB



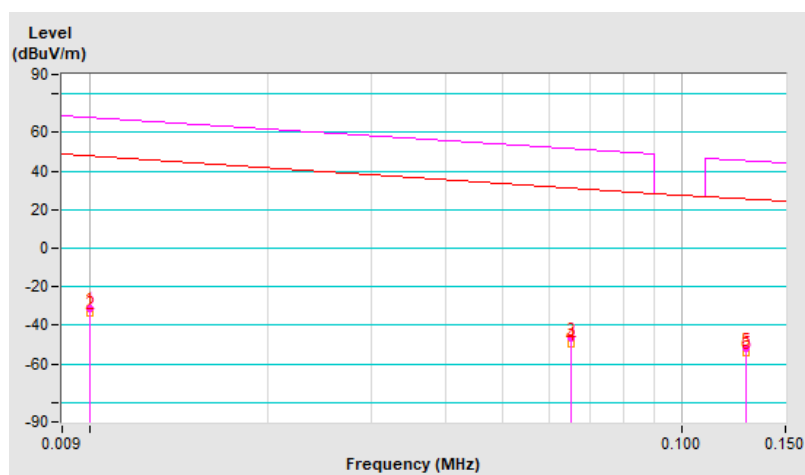
Frequency Range	9 kHz ~ 150 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200 Hz
Input Power (System)	120 Vac, 60 Hz		

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	-30.96 PK	67.60	-98.56	1.00	105	31.54	-62.50
2	0.010	-33.45 AV	47.60	-81.05	1.00	105	29.05	-62.50
3	0.065	-46.66 PK	51.34	-98.00	1.00	211	15.84	-62.50
4	0.065	-49.34 AV	31.34	-80.68	1.00	211	13.16	-62.50
5	0.129	-51.99 PK	45.39	-97.38	1.00	143	8.81	-60.80
6	0.129	-54.02 AV	25.39	-79.41	1.00	143	6.78	-60.80

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 = $40 \cdot \log(3/300) = -80$ dB



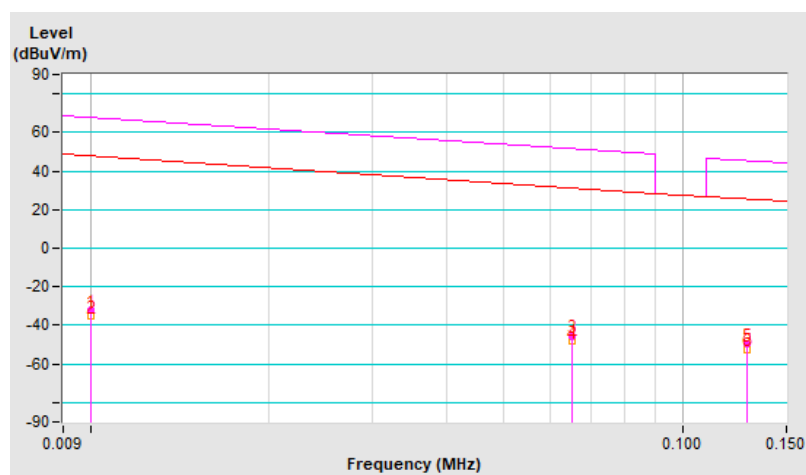
Frequency Range	9 kHz ~ 150 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 200 Hz
Input Power (System)	120 Vac, 60 Hz		

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	0.010	-32.30 PK	67.60	-99.90	1.00	216	-49.80	17.50
2	0.010	-35.41 AV	47.60	-83.01	1.00	216	-52.91	17.50
3	0.065	-45.42 PK	51.34	-96.76	1.00	119	-62.92	17.50
4	0.065	-48.22 AV	31.34	-79.56	1.00	119	-65.72	17.50
5	0.129	-49.66 PK	45.39	-95.05	1.00	221	-68.86	19.20
6	0.129	-52.41 AV	25.39	-77.80	1.00	221	-71.61	19.20

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 = $40 \cdot \log(3/300) = -80$ dB



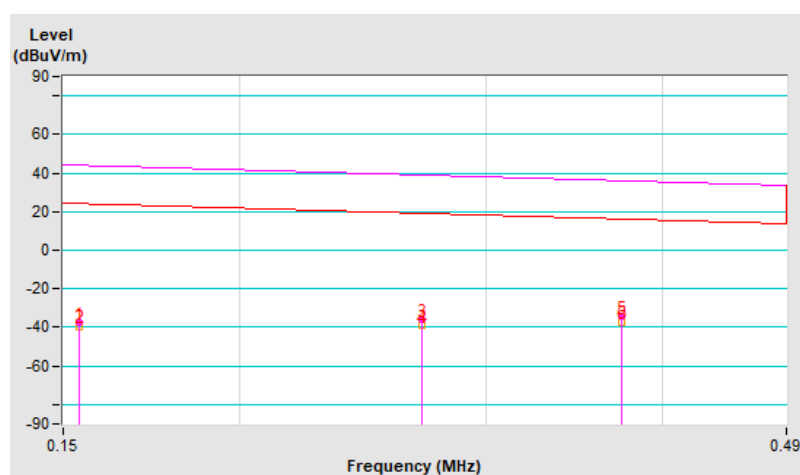
Frequency Range	150 kHz ~ 490 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.154	-37.53 PK	43.85	-81.38	1.00	165	23.09	-60.62
2	0.154	-39.46 AV	23.85	-63.31	1.00	165	21.16	-60.62
3	0.270	-36.00 PK	38.98	-74.98	1.00	113	24.37	-60.37
4	0.270	-39.12 AV	18.98	-58.10	1.00	113	21.25	-60.37
5	0.374	-34.42 PK	36.15	-70.57	1.00	295	26.05	-60.47
6	0.374	-37.41 AV	16.15	-53.56	1.00	295	23.06	-60.47

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 = $40 \cdot \log(3/300) = -80$ dB



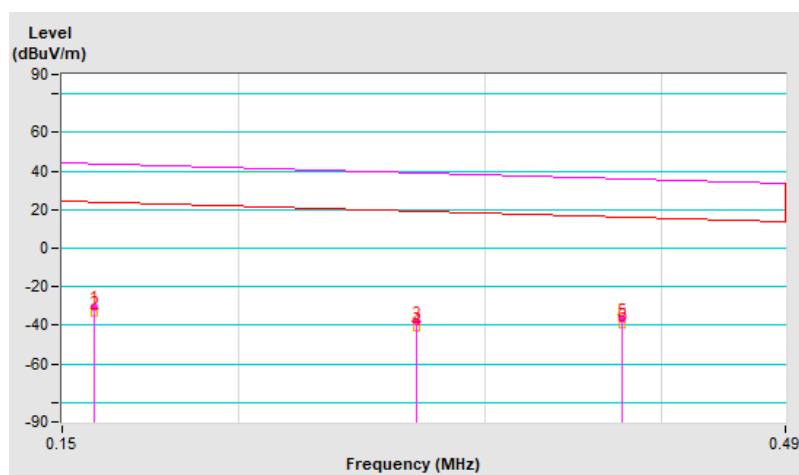
Frequency Range	150 kHz ~ 490 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.158	-30.38 PK	43.63	-74.01	1.00	102	30.21	-60.59
2	0.158	-33.41 AV	23.63	-57.04	1.00	102	27.18	-60.59
3	0.268	-38.32 PK	39.04	-77.36	1.00	336	22.05	-60.37
4	0.268	-41.45 AV	19.04	-60.49	1.00	336	18.92	-60.37
5	0.375	-36.66 PK	36.12	-72.78	1.00	214	23.82	-60.48
6	0.375	-39.65 AV	16.12	-55.77	1.00	214	20.83	-60.48

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
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 = $40 \cdot \log(3/300) = -80$ dB



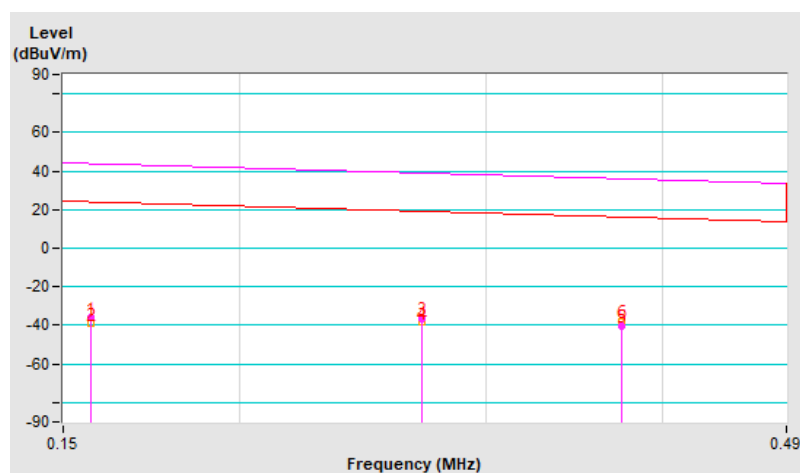
Frequency Range	150 kHz ~ 490 kHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.157	-36.14 PK	43.68	-79.82	1.00	224	24.46	-60.60
2	0.157	-39.05 AV	23.68	-62.73	1.00	224	21.55	-60.60
3	0.270	-36.33 PK	38.98	-75.31	1.00	306	24.04	-60.37
4	0.270	-38.41 AV	18.98	-57.39	1.00	306	21.96	-60.37
5	0.374	-40.07 PK	36.15	-76.22	1.00	295	20.40	-60.47
6	0.374	-38.11 AV	16.15	-54.26	1.00	295	22.36	-60.47

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 = $40 \cdot \log(3/300) = -80$ dB

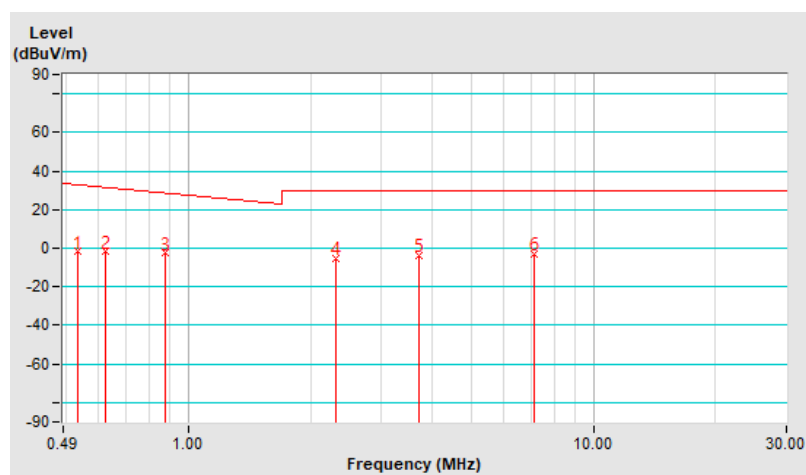


Frequency Range	490 kHz ~ 30 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.533	-1.70 QP	33.07	-34.77	1.00	265	18.60	-20.30
2	0.625	-1.84 QP	31.68	-33.52	1.00	173	18.46	-20.30
3	0.875	-2.48 QP	28.76	-31.24	1.00	295	17.79	-20.27
4	2.317	-5.03 QP	29.54	-34.57	1.00	106	15.31	-20.34
5	3.709	-3.68 QP	29.54	-33.22	1.00	297	16.09	-19.77
6	7.145	-2.73 QP	29.54	-32.27	1.00	145	15.97	-18.70

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 = $40 \cdot \log(3/30) = -40$ dB



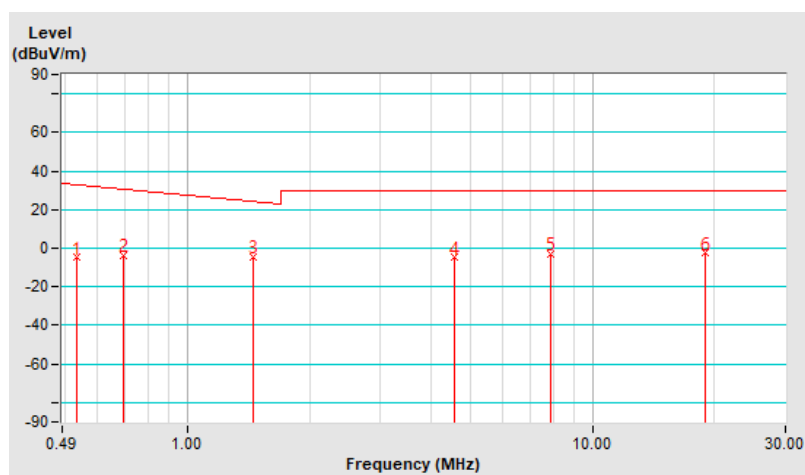
Frequency Range	490 kHz ~ 30 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.534	-4.78 QP	33.05	-37.83	1.00	205	15.52	-20.30
2	0.692	-3.64 QP	30.80	-34.44	1.00	175	16.66	-20.30
3	1.449	-4.35 QP	24.37	-28.72	1.00	216	15.99	-20.34
4	4.571	-4.66 QP	29.54	-34.20	1.00	334	15.17	-19.83
5	7.896	-2.89 QP	29.54	-32.43	1.00	312	15.81	-18.70
6	18.990	-2.36 QP	29.54	-31.90	1.00	106	14.94	-17.30

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 = $40 \cdot \log(3/30) = -40$ dB



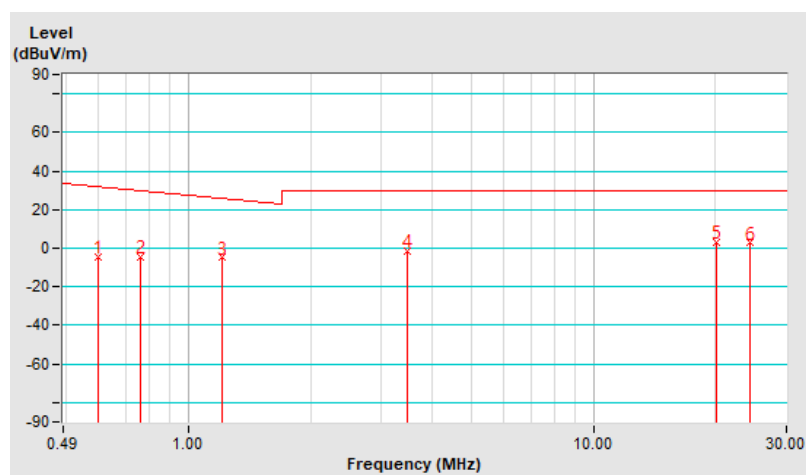
Frequency Range	490 kHz ~ 30 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power (System)	120 Vac, 60 Hz		

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	0.597	-4.21 QP	32.08	-36.29	1.00	116	16.09	-20.30
2	0.759	-4.44 QP	30.00	-34.44	1.00	273	15.80	-20.24
3	1.214	-4.81 QP	25.91	-30.72	1.00	301	15.51	-20.32
4	3.478	-1.28 QP	29.54	-30.82	1.00	145	18.63	-19.91
5	20.173	3.26 QP	29.54	-26.28	1.00	268	20.49	-17.23
6	24.349	2.72 QP	29.54	-26.82	1.00	311	20.31	-17.59

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
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 = $40 \cdot \log(3/30) = -40$ dB



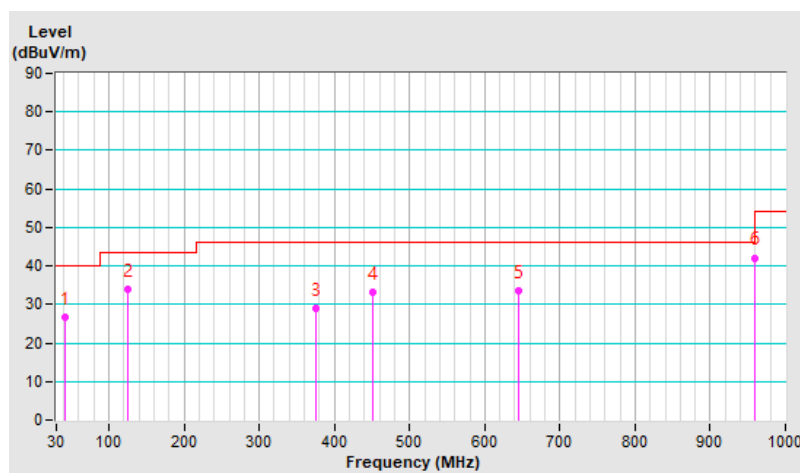
7.3 Radiated Emissions above 30 MHz

RF Mode	NFC	Channel	CH 1 : 13.56 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	23 °C, 71 % RH
Tested By	Andy Ho		

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	40.69	26.6 QP	40.0	-13.4	4.00 H	360	39.5	-12.9
2	125.01	33.9 QP	43.5	-9.6	3.00 H	117	47.8	-13.9
3	375.00	28.9 QP	46.0	-17.1	2.00 H	241	38.8	-9.9
4	450.01	33.3 QP	46.0	-12.7	2.00 H	241	41.0	-7.7
5	644.42	33.6 QP	46.0	-12.4	1.00 H	262	37.3	-3.7
6	959.99	42.1 QP	46.0	-3.9	2.00 H	360	40.6	1.5

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.

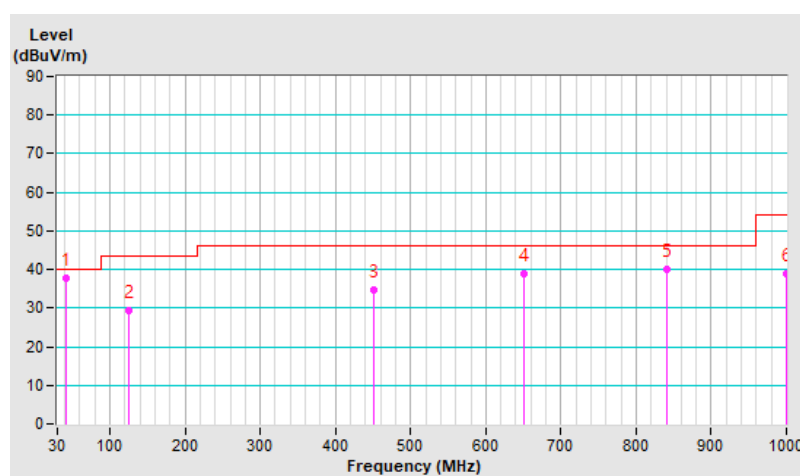


RF Mode	NFC	Channel	CH 1 : 13.56 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	23 °C, 71 % RH
Tested By	Andy Ho		

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	37.6 QP	40.0	-2.4	1.00 V	62	50.5	-12.9
2	124.99	29.3 QP	43.5	-14.2	1.00 V	93	43.2	-13.9
3	450.01	34.7 QP	46.0	-11.3	1.00 V	268	42.4	-7.7
4	650.02	38.8 QP	46.0	-7.2	1.50 V	360	42.4	-3.6
5	840.00	40.1 QP	46.0	-5.9	1.50 V	360	41.3	-1.2
6	999.98	38.8 QP	54.0	-15.2	1.50 V	360	37.8	1.0

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.



7.4 Frequency Stability

Input Power:	48 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Willy Lin
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Frequency Stability Versus Temperature									
Operating Frequency: 13.56 MHz									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	48	13.55995	-0.00037	13.55994	-0.00044	13.55994	-0.00044	13.55995	-0.00037
40	48	13.56003	0.00022	13.56004	0.00029	13.56005	0.00037	13.56005	0.00037
30	48	13.56002	0.00015	13.56003	0.00022	13.56002	0.00015	13.56002	0.00015
20	48	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
10	48	13.55996	-0.00029	13.55996	-0.00029	13.55995	-0.00037	13.55994	-0.00044
0	48	13.55994	-0.00044	13.55995	-0.00037	13.55994	-0.00044	13.55994	-0.00044
-10	48	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029
-20	48	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029	13.55995	-0.00037

Frequency Stability Versus Voltage									
Operating Frequency: 13.56 MHz									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	55.2	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
	48	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
	40.8	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037

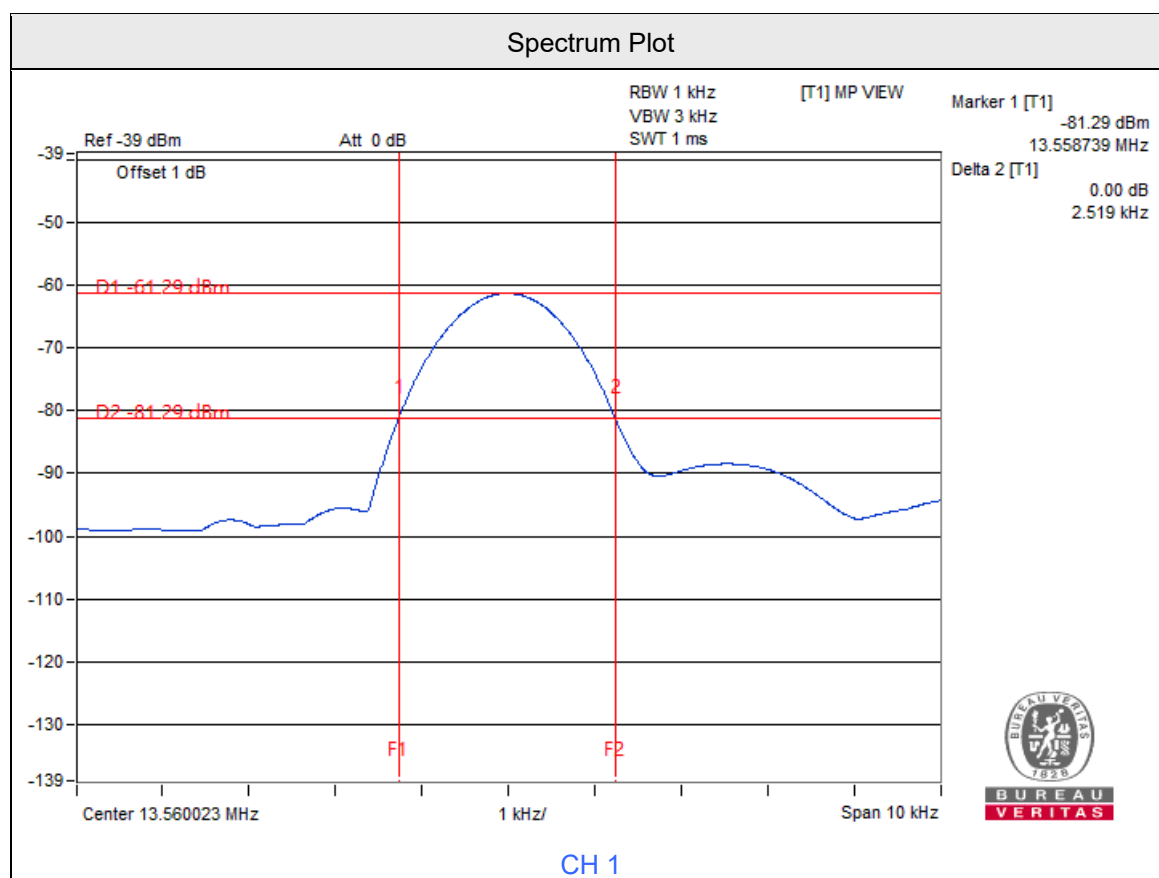
7.5 20 dB Bandwidth

Input Power:	48 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Willy Lin
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Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Measured Frequencies		Operating Frequency Band (MHz)	Test Result
			FL (MHz)	FH (MHz)		
1	13.56	2.519	13.557481	13.562519	13.11 ~ 14.01	Pass

Notes:

1. FL is the lowest frequency of the 20 dB bandwidth of power envelope.
2. FH is the highest frequency of the 20 dB bandwidth of power envelope.



Note: The signal look like CW signal, so RBW can't be match 1~5 % OBW.

8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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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