FCC 47 CFR PART 15 SUBPART C & INDUSTRY CANADA RSS-210

TEST REPORT

For

Mullion Video Intercom with Reader

Model No.: TD33-HW

Trade Name: Verkada

Issued to

FCC: Verkada Inc
405 E. 4th Ave. San Mateo California United States 94401
IC:Verkada, Inc.
405 E. 4th Ave. San Mateo CA 94401 United States Of America
(Excluding The States Of Alaska

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City, Taiwan.
Issued Date: December 4, 2024

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 11, 2024	Initial Issue	ALL	Peggy Tsai
01	December 4, 2024	See the following Note Rev. (01)	P.5	Peggy Tsai

Note:
Rev. (01)
1. Modify antenna specification in section 2.

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

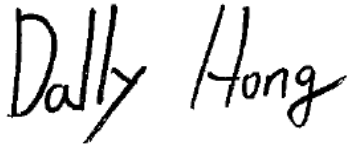
Applicant:	FCC: Verkada Inc 405 E. 4th Ave. San Mateo California United States 94401 IC: Verkada, Inc. 405 E. 4th Ave. San Mateo CA 94401 United States Of America (Excluding The States Of Alaska
Manufacturer:	CHICONY ELECTRONICS (THAILAND) CO., LTD 82 MOO 4 T. THAKHAM A. BANGPAKONG, CHACHOENGSAO, THAILAND 24130
Equipment Under Test:	Mullion Video Intercom with Reader
Trade Name:	Verkada
Model No.:	TD33-HW
Date of Test:	September 23 ~ October 4, 2024

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C & RSS-210 Issue 11 and RSS-GEN Issue 5	Compliance
Statements of Conformity	
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.	

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.
The test results of this report relate only to the tested sample identified in this report.

Approved by:



Dally Hong
Sr. Engineer

2. EUT DESCRIPTION

Product	Mullion Video Intercom with Reader
Trade	Verkada
Model No.	TD33-HW
Model Discrepancy	N/A
Received Date	September 12, 2024
Power Supply	Power from Poe Adapter. ZYXEL / PoE12-60W I/P: 100-240VAC, 2.0A, 50-60Hz O/P: 56.0VDC, 1.161A, 65.1W
Frequency Range	13.56MHz
Modulation Technique	ASK
Number of Channels	1 Channel
Antenna Specification	Type: Loop Antenna SPEED / F-0W-51-6006-006-00
PMN	TD33-HW Mullion Video Intercom Reader
EUT Serial #	YDAK-KEDE-TYDL
HW Version	60-B04001-A
FW Version	5.1.4

Remark:
1. For more details, refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. The manufacturer stated that the PoE adapter will provide corresponding current according to the product.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.215, 15.225.

The tests documented in this report were performed in accordance with IC RSS-210, IC RSS-Gen, and ANSI C63.10: 2013

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.3 RSS GEN SECTION 8.10 RESTRICTED BANDS OF OPERATIONS

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).

(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands Note 1

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	608 - 614	9.0 - 9.2
0.495 - 0.505	16.69475 - 16.69525	960 - 1427	9.3 - 9.5
2.1735 - 2.1905	16.80425 - 16.80475	1435 - 1626.5	10.6 - 12.7
3.020 - 3.026	25.5 - 25.67	1645.5 - 1646.5	13.25 - 13.4
4.125 - 4.128	37.5 - 38.25	1660 - 1710	14.47 - 14.5
4.17725 - 4.17775	73 - 74.6	1718.8 - 1722.2	15.35 - 16.2
4.20725 - 4.20775	74.8 - 75.2	2200 - 2300	17.7 - 21.4
5.677 – 5.683	108 – 138	2310 - 2390	22.01 - 23.12
6.215 - 6.218	149.9 - 150.05	2483.5 - 2500	23.6 - 24.0
6.26775 - 6.26825	156.52475 -	2655 - 2900	31.2 - 31.8
6.31175 - 6.31225	156.52525	3260 – 3267	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3332 - 3339	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3345.8 - 3358	
8.37625 - 8.38675	167.72 - 173.2	3500 – 4400	
8.41425 - 8.41475	240 – 285	4500 - 5150	
12.29 - 12.293	322 - 335.4	5350 - 5460	
12.51975 - 12.52025	399.9 - 410	7250 - 7750	
12.57675 - 12.57725		8025 – 8500	
13.36 - 13.41			

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

3.4 DESCRIPTION OF TEST MODES

The EUT had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

All modes and data rates were investigated and it was determined that ISO 14443A/B and ISO 18092 Type y, 106/212/424/848 kbps.

All data rates were investigated and it was determined that 106 Kbps was considered worst-case. Therefore, all testing was performed in 106 Kbps mode.

3.4.1 The worst mode of measurement

AC Power Line Conduction Emission	
Test Condition	**AC Power line conduction emission for line and neutral**
Power supply Mode	**Mode 1: EUT Power by POE Adapter**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by PoE Adapter**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. AC power line conducted emission were performed the EUT transmit at the highest output power channel as worse case.
3. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Z-Plane) were recorded in this report

4. TEST SUMMARY

FCC Standard Sec.	IC Standard Sec.	Chapter	Test Item	Result
15.203	RSS-GEN Sec. 6.8	2	Antenna Requirement	Pass
15.215	RSS-GEN Sec 6.7	7.1	Occupied Bandwidth (99%) and 20dB Bandwidth	Pass
15.225 (a,b,c,d) 15.209 15.205	Sec B.6, RSS-GEN Sec 8.9 / 8.10	7.2	Radiated Emissions	Pass
15.255 (e)	Sec B.6, b	7.3	Frequency Stability	Pass
15.207	RSS-GEN Sec. 8.8	7.4	AC Power-line Conducted Emission	Pass

5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Conducted_FCC/IC/NCC					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Loop Probe	LANGER EMV-TECHNIK	RF-R 50-1	02-2644	2024-01-02	2025-01-01
Constant Temperature Humidity Chamber	TERCHY	MHG-150LF	930619	2023-10-26	2024-10-25
EXA Signal Analyzer	Keysight	N9010B	MY55460167	2024-01-03	2025-01-02
DC Block	Marvelous Microwave Ine	MVE6411	MVE-001	2024-08-08	2025-08-07
Software	N/A				

966A_Radiated Below 30MHz					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Signal Analyzer	KEYSIGHT	N9010A	MY52220817	2024-03-15	2025-03-14
Active Loop Antenna	SCHWARZBECK	FMZB 1513-60	1513-60-028	2023-12-13	2024-12-12
Thermo-Hygro Meter	WISEWIND	1206	D07	2023-12-07	2024-12-06
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2024-07-12	2025-07-11
Preamplifier	EMEC	EM330	060609	2024-02-21	2025-02-20
Cable	Huber+Suhner	104PEA	20995+21000+182330	2024-02-21	2025-02-20
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Software	e3 V9-210616c				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Request.

AC Mains Conduction					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	100064	2024-06-14	2025-06-13
LISN	TESEQ	LN2-16N	22012	2024-02-29	2025-02-27
Cable	Woken	SFL402	185A	2024-07-08	2025-07-07
Software	e3 V6-110812				

Remark:

1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Request.

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.21 dB
Channel Bandwidth	± 2.79 dB
Freqeuncy Stability	± 2.74 dB
Radiated Emission_9kHz-30MHz	± 3.492 dB
Radiated Emission_30MHz-200MHz	± 3.683 dB
Radiated Emission_200MHz-1GHz	± 3.966 dB

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.4 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.
CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Ben Yang	-
Radiation	Ray Li、Tony Chao	-
RF Conducted	Jerry Chang	-

Remark: The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SUPPORT EQUIPMENT

EUT Accessories Equipment						
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**	**IC**
	N/A					

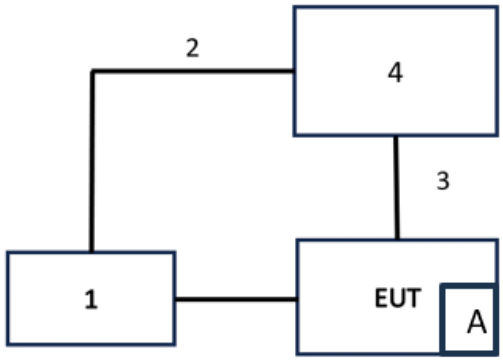
Support Equipment (Conducted)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(B)	Lenovo	X260	N/A	N/A
2	Lan Cable	RASTO REC4	R-PCC004	N/A	N/A
3	Lan Cable	RASTO REC4	R-PCC004	N/A	N/A
4	POE Adapter	ZYXEL	PoE12-60W	N/A	N/A
A	Card	N/A	N/A	N/A	N/A

Support Equipment (RSE)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A
3	PoE Injector	ZYXEL	PoE12-60W	S212L41486914	N/A
4	Ethernet Cable	Rasto	R-PCC004	N/A	N/A
5	Ethernet Cable	Atake	AC6-FL10	N/A	N/A
A	Card	N/A	N/A	N/A	N/A

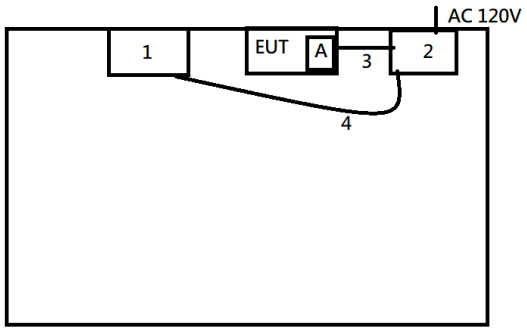
Support Equipment (Conduction)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	PoE Injector	Zyxel	PoE12-60W	S212L41486914	N/A
3	Ethernet Cable	RASTO REC4	R-PCC004	N/A	N/A
4	Ethernet Cable	RASTO REC4	R-PCC004	N/A	N/A
A	Card	N/A	N/A	N/A	N/A

6.2 SETUP CONFIGURATION OF EUT

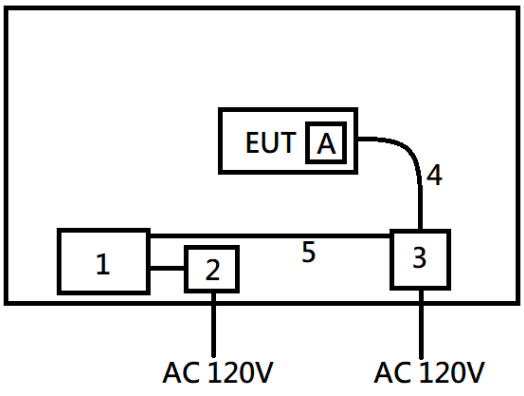
Conducted



Conduction



RSE



6.3 TEST PROGRAM

This EUT uses "Tera term v4.73" software and setup command to set the frequency, modulation, and power to allow the sample to continuously transmit.

7. FCC PART 15.225 REQUIREMENTS & RSS-210 REQUIREMENTS

7.1 OCCUPIED BANDWIDTH(99%) AND 20 dB BANDWIDTH

TEST CONFIGURATION

Refer to section 6.2.

TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW & VBW (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth (VBW) shall not be smaller than three times the RBW value.
4. Record the max. reading.

TEST RESULTS

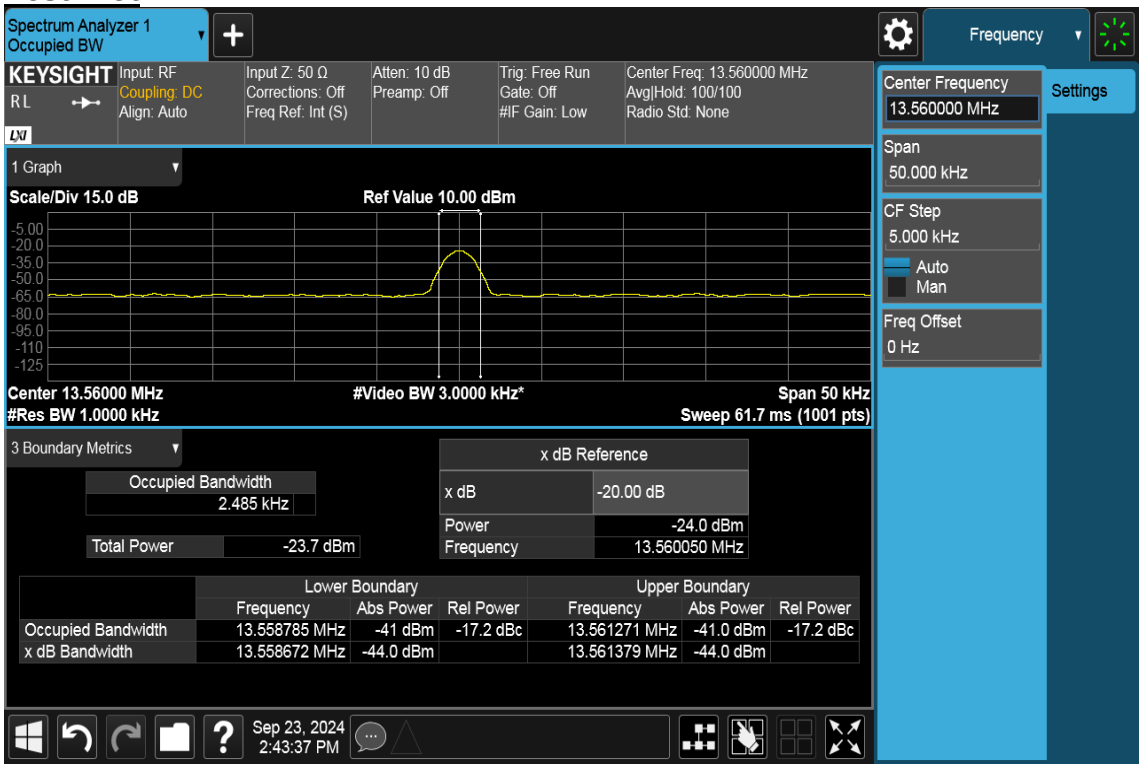
Compliance

Temperature:	20.9℃	**Test Date:**	September 23, 2024
Humidity:	55% RH	**Tested by:**	Jerry Chang

Test Condition	Frequency(MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	2.485	2.707

Note
Because the measured signal adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice ~ three the RBW.

Test Plot



7.2 FUNDAMENTAL AND RADIATED EMISSIONS

LIMIT

According to §15.225

(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 and shall not exceed the general radiated emission limits in §15.209.

According to §15.225, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meter)
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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

According to RSS 210 §B.6

The field strength of any emission shall not exceed the following limits:

(a) 15.848 mV/m (84 dBμV/m) at30 m, within the band 13.553-13.567 MHz;
(b) 334 μV/m (50.5 dBμV/m) at 30 m,within the bands 13.410-13.553 MHz and 13.567‑13.710 MHz;
(c) 106 μV/m (40.5 dBμV/m) at 30 m,within the bands 13.110-13.410 MHz and 13.710‑14.010 MHz; and
(d) RSS-Gen general field strength limits for frequencies outside the band 13.110‑14.010 MHz.

Below 30 MHz

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement Distance (metres)
9-490 kHz Note 1	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

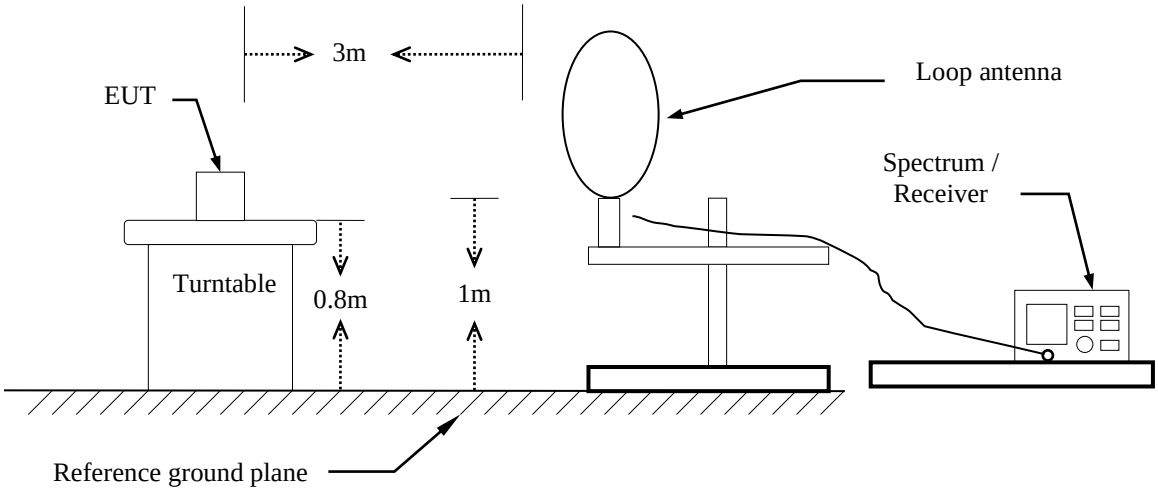
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Above 30 MHz

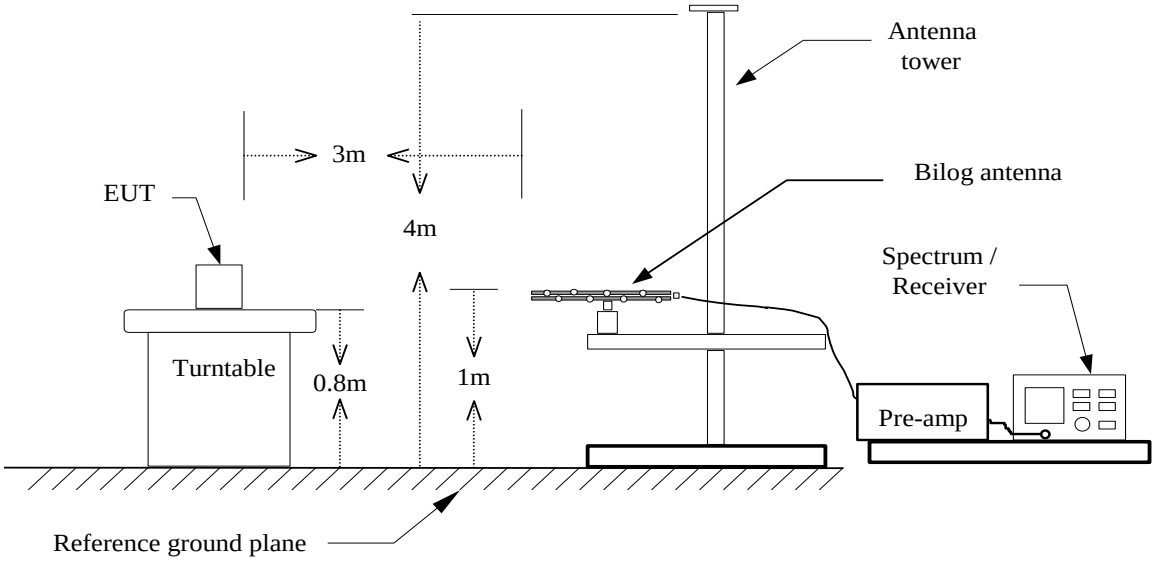
Frequency	Field strength (μV/m at 3 m)
30-88	100
88-216	150
216-960	200
Above 960	500

Test Configuration

9kHz ~ 30MHz



30MHz ~ 1GHz



TEST PROCEDURE

For 9kHz ~ 30MHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, The lower edge of the loop shall be 1 m above the ground then to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Set the spectrum analyzer in the following setting as:
   9KHz-490KHz : RBW=200Hz / VBW=1kHz / Sweep=AUTO
   490KHz-30MHz : RBW=10kHz / VBW=30kHz / Sweep=AUTO
6. Repeat above procedures until the measurements for all frequencies are complete.

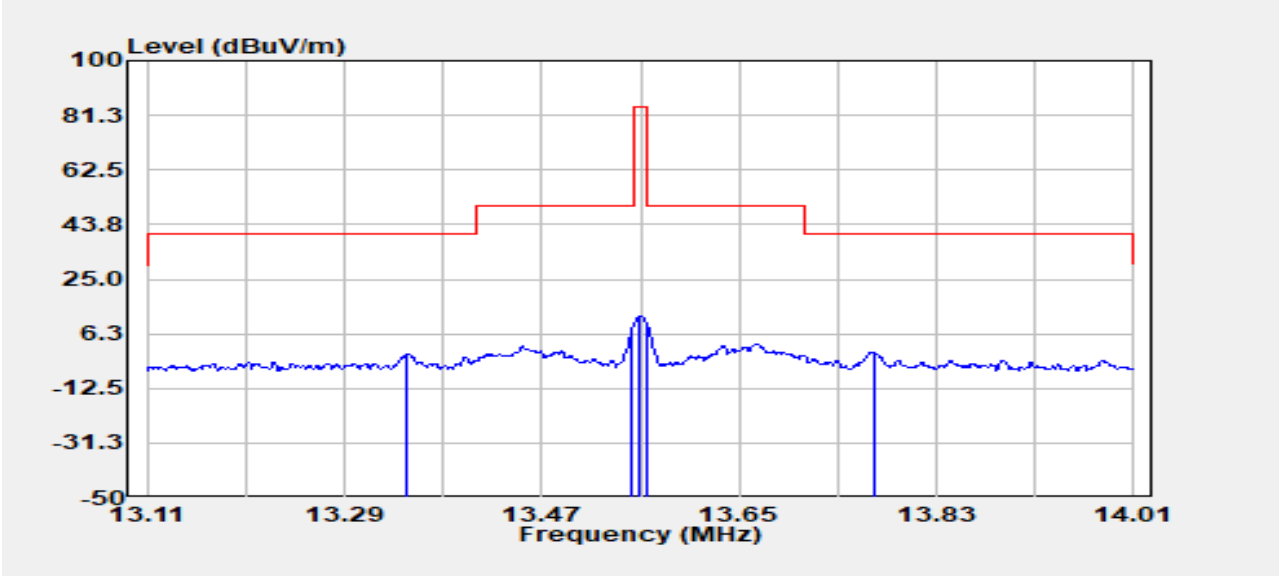
For 30MHz ~ 1GHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving
   antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
   RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

Remark :

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:Horizontal
Operation Mode	:Main	Engineer	:Ray Li
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		

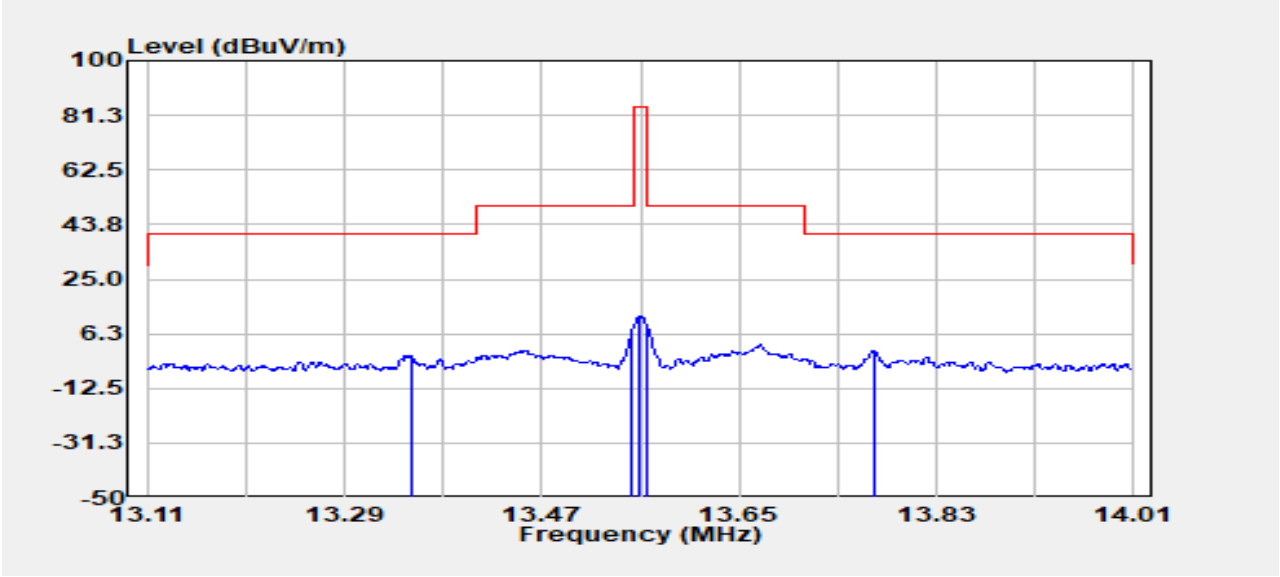


Freq.	Detector Mode	Spectrum Read Level @3m	Factor @3m	Actual FS @3m	Factor @30m&300m	Actual FS @30m	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dB	dBµV/m	dBµV/m	dB
13.35	Peak	17.19	21.98	21.98	-40.00	-0.83	40.51	-41.34
13.55	Peak	25.87	22.00	22.00	-40.00	7.88	50.47	-42.59
13.56	Peak	30.43	22.00	22.00	-40.00	12.44	84.00	-71.56
13.57	Peak	27.29	22.00	22.00	-40.00	9.30	50.47	-41.17
13.77	Peak	17.98	22.03	22.03	-40.00	0.01	40.51	-40.49

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. Result=Read level+Factor@3m-Distance factor
5. Distance factor=40log(30m/3m)
6. Factor=antenna factor+cable loss

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:Vertical
Operation Mode	:Main	Engineer	:Ray Li
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		

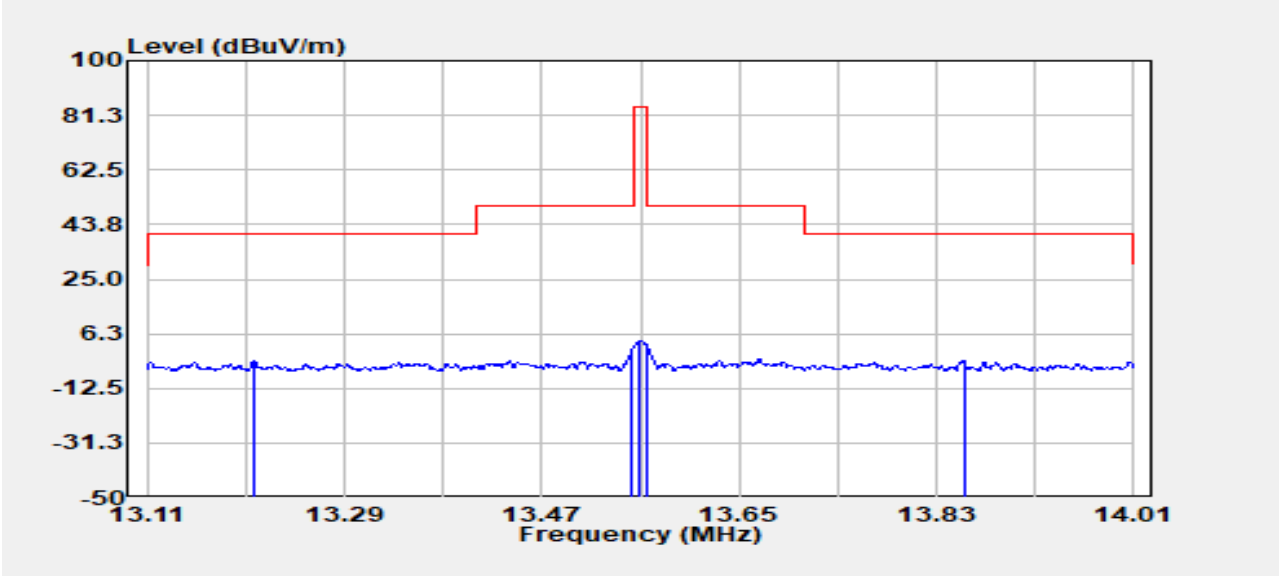


Freq.	Detector Mode	Spectrum Read Level @3m	Factor @3m	Actual FS @3m	Factor @30m&300m	Actual FS @30m	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dB	dBµV/m	dBµV/m	dB
13.35	Peak	16.73	21.98	38.71	-40.00	-1.29	40.51	-41.80
13.55	Peak	25.03	22.00	47.03	-40.00	7.03	50.47	-43.44
13.56	Peak	30.12	22.00	52.13	-40.00	12.13	84.00	-71.87
13.57	Peak	26.44	22.00	48.44	-40.00	8.44	50.47	-42.03
13.77	Peak	18.24	22.03	40.27	-40.00	0.27	40.51	-40.24

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. Result=Read level+Factor@3m-Distance factor
5. Distance factor=40log(30m/3m)
6. Factor=antenna factor+cable loss

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:Ground
Operation Mode	:Main	Engineer	:Ray Li
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		



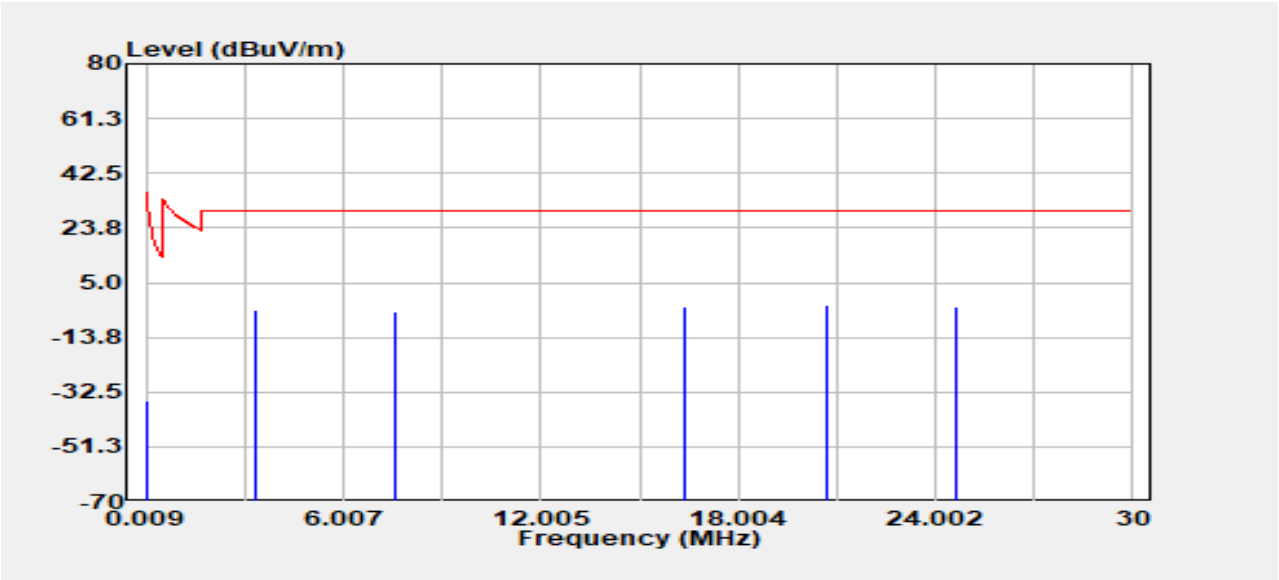
Freq.	Detector Mode	Spectrum Read Level @3m	Factor @3m	Actual FS @3m	Factor @30m&300m	Actual FS @30m	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dB	dBµV/m	dBµV/m	dB
13.21	Peak	14.74	21.97	36.70	-40.00	-3.30	40.51	-43.80
13.55	Peak	18.39	22.00	40.39	-40.00	0.39	50.47	-50.08
13.56	Peak	21.69	22.00	43.70	-40.00	3.70	84.00	-80.30
13.57	Peak	19.92	22.00	41.92	-40.00	1.92	50.47	-48.55
13.86	Peak	14.74	22.04	36.77	-40.00	-3.23	40.51	-43.73

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. Result=Read level+Factor@3m-Distance factor
5. Distance factor=40log(30m/3m)
6. Factor=antenna factor+cable loss

9kHz ~ 30MHz

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray Li
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		



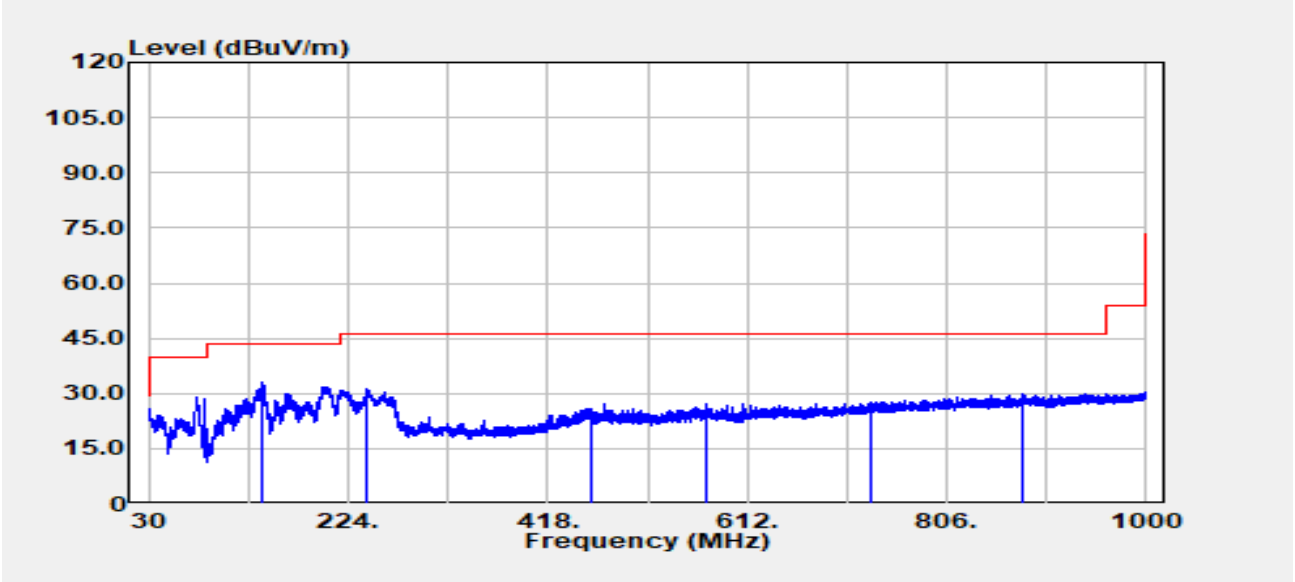
Freq.	Detector Mode	Spectrum Read Level @3m	Factor @3m	Actual FS @3m	Factor @30m&300m	Actual FS @30m&300m	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dB	dBµV/m	dBµV/m	dB
0.06	Peak	24.60	19.67	44.27	-80.00	-35.73	31.43	-67.17
3.36	Peak	15.93	19.58	35.51	-40.00	-4.49	29.54	-34.03
7.58	Peak	14.24	20.76	34.99	-40.00	-5.01	29.54	-34.55
16.36	Peak	14.51	22.31	36.82	-40.00	-3.18	29.54	-32.72
20.72	Peak	14.61	22.68	37.28	-40.00	-2.72	29.54	-32.26
24.63	Peak	14.34	22.56	36.91	-40.00	-3.09	29.54	-32.63

Remark:

1. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)
   490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)
   1.705MHz to 30MHz Limit (@3m) = 29.54
2. Distance factor=40log(300m/3m)@9-490kHz ; 40log(30m/3m)@490kHz-30MHz
3. Result=Read level+Factor@3m-Distance factor

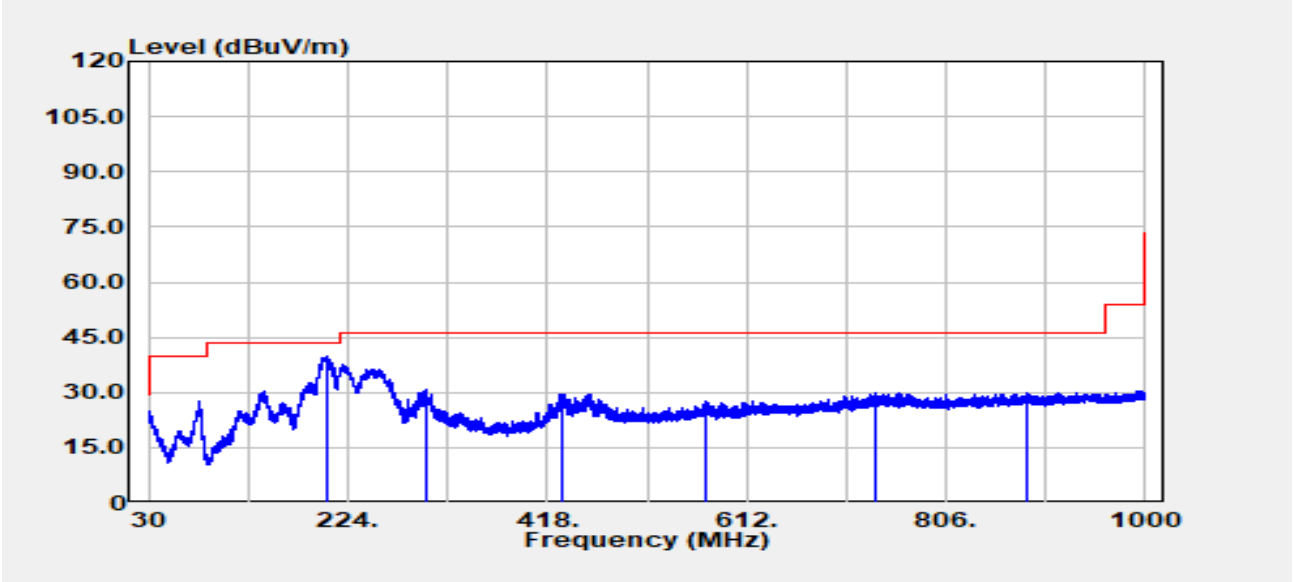
30MHz ~ 1GHz

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
140.70	Peak	43.81	-10.66	33.14	43.50	-10.36
242.43	Peak	42.42	-11.38	31.04	46.00	-14.96
459.71	Peak	31.20	-5.20	26.00	46.00	-20.00
571.75	Peak	30.19	-3.18	27.01	46.00	-18.99
733.49	Peak	28.15	-0.61	27.54	46.00	-18.46
878.51	Peak	28.21	1.58	29.79	46.00	-16.21

Project No	:TM-2409000206P	Test Date	:2024-09-27
Operation Band	:NFC	Temp./Humi.	:24.6/57
Frequency	:13.56 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:H	Test Chamber	: 966A
Setting	:default		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBµV	Factor dB	Actual FS dBµV/m	Limit dBµV/m	Margin dB
204.24	Peak	51.74	-12.10	39.63	43.50	-3.87
299.18	Peak	40.00	-9.36	30.64	46.00	-15.36
432.19	Peak	35.48	-5.82	29.65	46.00	-16.35
571.26	Peak	30.67	-3.18	27.50	46.00	-18.50
738.10	Peak	30.42	-0.53	29.89	46.00	-16.11
885.78	Peak	28.19	1.57	29.77	46.00	-16.23

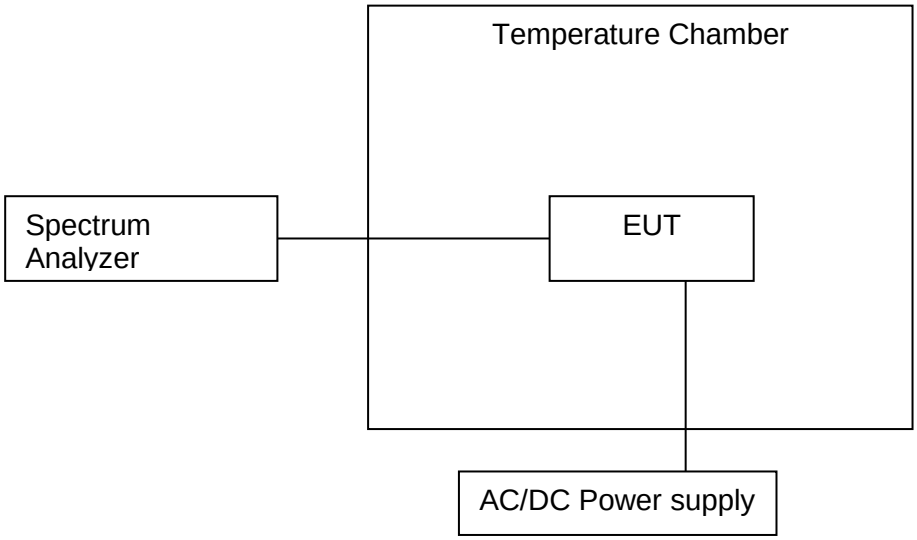
7.3 FREQUENCY STABILITY

LIMIT

According to §15.225(e) and RSS-210, B.6,
The frequency tolerance of the carrier signal shall be maintained within +/- 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. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Turn the EUT off, and place it inside the environmental temperature chamber.
2. Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
3. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
4. Turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized.
5. Switch off the EUT and Lower the chamber temperature by not more than 10 °C and allow the temperature inside the chamber to stabilize.
6. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
7. Repeat step 4 through step 6 down to the specified temperature.

TEST RESULTS

Compliance

Temperature:	20.9℃	**Test Date:**	September 23, 2024
Humidity:	55% RH	**Tested by:**	Jerry Chang

TEST DATA

Startup				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
120	-20	13.5600221	0.02210	+/- 1.356
120	-10	13.5600264	0.02640	+/- 1.356
120	0	13.5600315	0.03150	+/- 1.356
120	10	13.5600279	0.02790	+/- 1.356
120	20	13.5600280	0.02800	+/- 1.356
120	30	13.5600298	0.02980	+/- 1.356
120	40	13.5600337	0.03370	+/- 1.356
120	50	13.5600209	0.02090	+/- 1.356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
138	20	13.5600258	0.02580	+/- 1.356
120	20	13.5600280	0.02800	+/- 1.356
102	20	13.5600265	0.02650	+/- 1.356

Note: Extreme temperatures are declared by the manufacturer

2 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
120	-20	13.5600222	0.02220	+/- 1.356
120	-10	13.5600276	0.02760	+/- 1.356
120	0	13.5600295	0.02950	+/- 1.356
120	10	13.5600361	0.03610	+/- 1.356
120	20	13.5600282	0.02820	+/- 1.356
120	30	13.5600232	0.02320	+/- 1.356
120	40	13.5600361	0.03610	+/- 1.356
120	50	13.5600262	0.02620	+/- 1.356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
138	20	13.5600181	0.01810	+/- 1.356
120	20	13.5600282	0.02820	+/- 1.356
102	20	13.5600287	0.02870	+/- 1.356

Note: Extreme temperatures are declared by the manufacturer

5 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
120	-20	13.5600225	0.02250	+/- 1.356
120	-10	13.5600269	0.02690	+/- 1.356
120	0	13.5600254	0.02540	+/- 1.356
120	10	13.5600273	0.02730	+/- 1.356
120	20	13.5600334	0.03340	+/- 1.356
120	30	13.5600222	0.02220	+/- 1.356
120	40	13.5600371	0.03710	+/- 1.356
120	50	13.5600226	0.02260	+/- 1.356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
138	20	13.5600230	0.02300	+/- 1.356
120	20	13.5600334	0.03340	+/- 1.356
102	20	13.5600363	0.03630	+/- 1.356

Note: Extreme temperatures are declared by the manufacturer

10 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
120	-20	13.5600194	0.01940	+/- 1.356
120	-10	13.5600349	0.03490	+/- 1.356
120	0	13.5600335	0.03350	+/- 1.356
120	10	13.5600281	0.02810	+/- 1.356
120	20	13.5600236	0.02360	+/- 1.356
120	30	13.5600355	0.03550	+/- 1.356
120	40	13.5600263	0.02630	+/- 1.356
120	50	13.5600305	0.03050	+/- 1.356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (℃)	(MHz)		
138	20	13.5600184	0.01840	+/- 1.356
120	20	13.5600236	0.02360	+/- 1.356
102	20	13.5600340	0.03400	+/- 1.356

Note: Extreme temperatures are declared by the manufacturer

7.4 AC POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a) and RSS-Gen §8.8 for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

***** Decreases with the logarithm of the frequency.

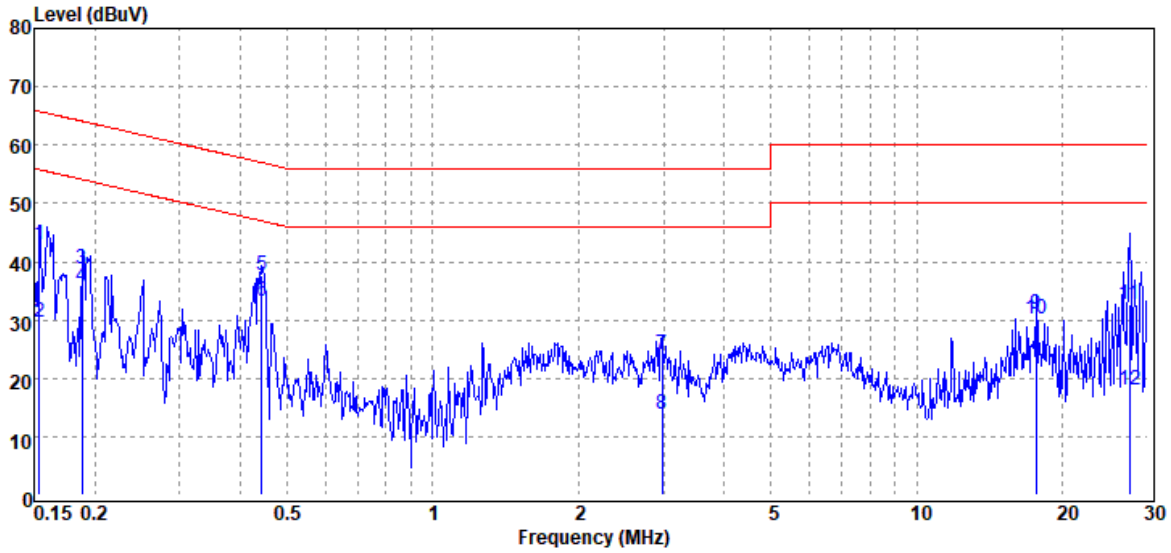
TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked and Average measurement records.

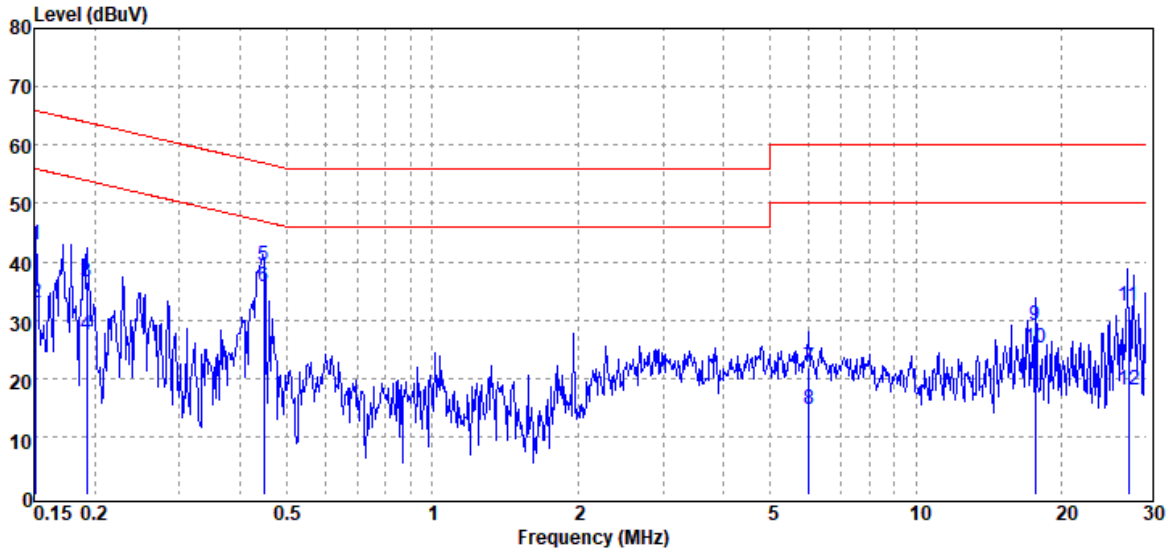
Project No	: TM-2409000206P	Test Date	: 2024-10-04
Operation Mode	: NFC	Temp./Humi.	: 23.4°C / 54%
Test Chamber	: Conduction	Engineer	: Ben Yang
Probe	: LINE	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.154	QP	42.68	0.14	42.82	65.80	-22.98
0.154	Average	29.46	0.14	29.60	55.80	-26.20
0.188	QP	38.30	0.33	38.63	64.11	-25.48
0.188	Average	35.29	0.33	35.62	54.11	-18.49
0.444	QP	37.32	0.38	37.70	56.99	-19.29
0.444	Average	32.84	0.38	33.22	46.99	-13.77
2.976	QP	23.77	0.22	23.99	56.00	-32.01
2.976	Average	13.56	0.22	13.78	46.00	-32.22
17.626	QP	30.49	0.46	30.95	60.00	-29.05
17.626	Average	29.74	0.46	30.20	50.00	-19.80
27.469	QP	32.08	0.59	32.67	60.00	-27.33
27.469	Average	17.48	0.59	18.07	50.00	-31.93

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

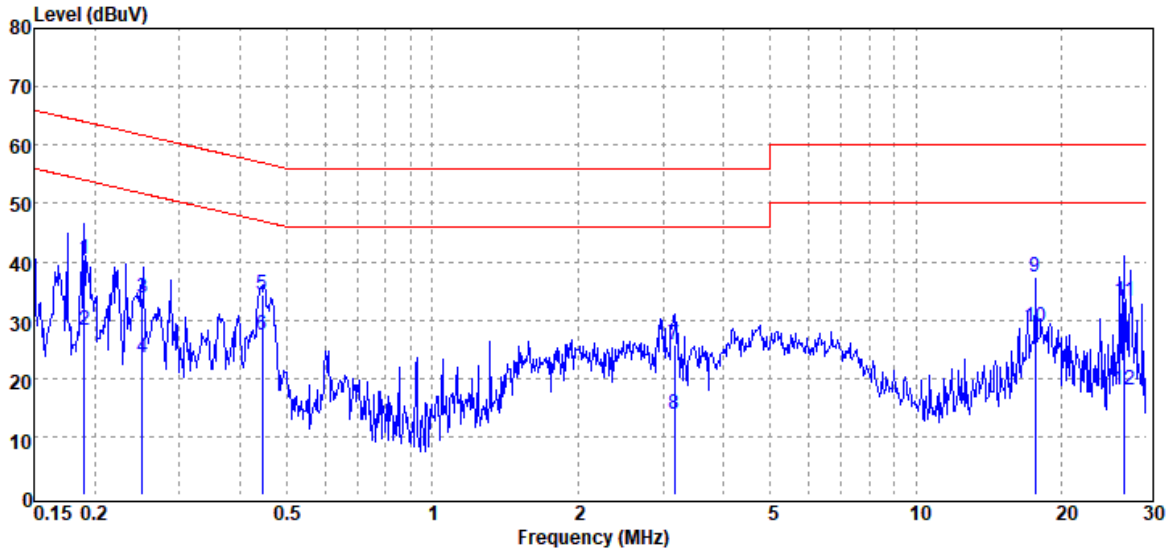
Project No	: TM-2409000206P	Test Date	: 2024-10-04
Operation Mode	: NFC	Temp./Humi.	: 23.4°C / 54%
Test Chamber	: Conduction	Engineer	: Ben Yang
Probe	: NEUTRAL	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.151	QP	42.67	0.11	42.78	65.93	-23.15
0.151	Average	32.78	0.11	32.89	55.93	-23.04
0.193	QP	36.32	0.33	36.65	63.92	-27.27
0.193	Average	26.95	0.33	27.28	53.92	-26.64
0.447	QP	39.00	0.35	39.35	56.92	-17.57
0.447	Average	35.35	0.35	35.70	46.92	-11.22
6.003	QP	21.53	0.27	21.80	60.00	-38.20
6.003	Average	14.32	0.27	14.59	50.00	-35.41
17.622	QP	28.56	0.43	28.99	60.00	-31.01
17.622	Average	24.72	0.43	25.15	50.00	-24.85
27.510	QP	31.88	0.53	32.41	60.00	-27.59
27.510	Average	17.54	0.53	18.07	50.00	-31.93

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

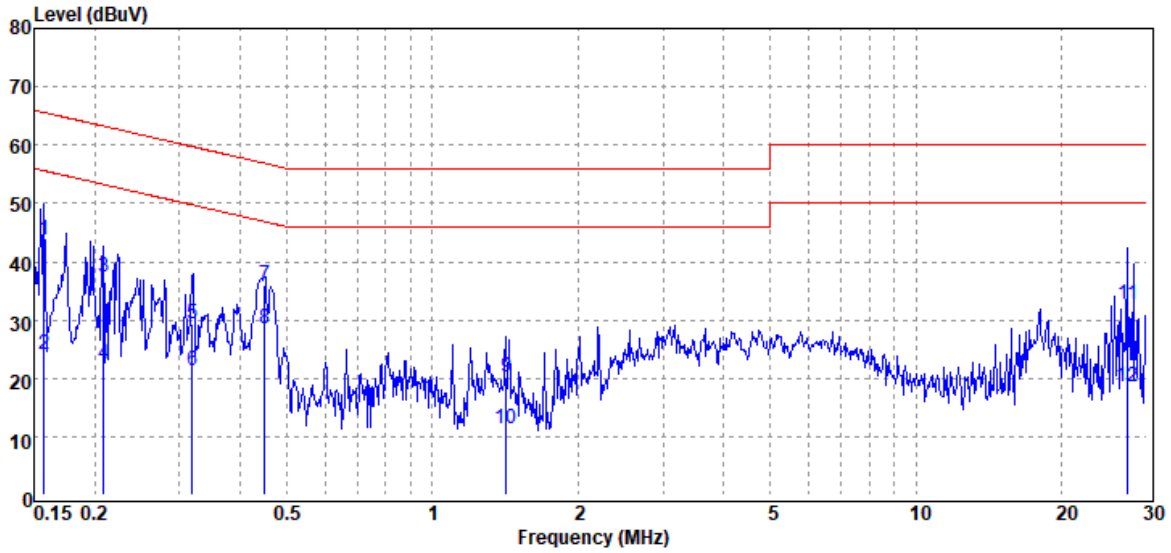
Project No	: TM-2409000206P	Test Date	: 2024-10-04
Operation Mode	: NFC	Temp./Humi.	: 23.4°C / 54%
Test Chamber	: Conduction	Engineer	: Ben Yang
Probe	: LINE	Test Voltage	: AC 230V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.191	QP	40.09	0.34	40.43	64.01	-23.58
0.191	Average	27.77	0.34	28.11	54.01	-25.90
0.252	QP	33.34	0.39	33.73	61.70	-27.97
0.252	Average	23.19	0.39	23.58	51.70	-28.12
0.445	QP	33.90	0.38	34.28	56.97	-22.69
0.445	Average	26.93	0.38	27.31	46.97	-19.66
3.169	QP	25.58	0.22	25.80	56.00	-30.20
3.169	Average	13.69	0.22	13.91	46.00	-32.09
17.624	QP	36.92	0.46	37.38	60.00	-22.62
17.624	Average	28.41	0.46	28.87	50.00	-21.13
27.000	QP	32.76	0.58	33.34	60.00	-26.66
27.000	Average	17.37	0.58	17.95	50.00	-32.05

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

Project No	: TM-2409000206P	Test Date	: 2024-10-04
Operation Mode	: NFC	Temp./Humi.	: 23.4°C / 54%
Test Chamber	: Conduction	Engineer	: Ben Yang
Probe	: NEUTRAL	Test Voltage	: AC 230V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.158	QP	43.51	0.15	43.66	65.59	-21.93
0.158	Average	23.89	0.15	24.04	55.59	-31.55
0.209	QP	36.95	0.36	37.31	63.25	-25.94
0.209	Average	22.19	0.36	22.55	53.25	-30.70
0.319	QP	29.08	0.35	29.43	59.74	-30.31
0.319	Average	20.96	0.35	21.31	49.74	-28.43
0.450	QP	35.55	0.35	35.90	56.87	-20.97
0.450	Average	28.23	0.35	28.58	46.87	-18.29
1.421	QP	20.07	0.15	20.22	56.00	-35.78
1.421	Average	11.08	0.15	11.23	46.00	-34.77
27.383	QP	32.06	0.53	32.59	60.00	-27.41
27.383	Average	18.02	0.53	18.55	50.00	-31.45

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

- End of Test Report -