FCC Part 15.225

TEST REPORT

For

IEI Integration Corp.

No. 29, Zhongxing Rd, Xizhi Dist., New Taipei City 221, Taiwan(R.O.C.)

FCC ID: RFHMODAT-550A

Report Type:	**Product Type:**
Original Report	PDA

Report Producer : **Jane Lee** Jane Lee

Report Number : **RLK181207001-00D**

Report Date : **2019-03-13**

Reviewed By: **Jerry Chang** Jerry.Chang

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RLK181207001	RLK181207001-00D	2019-03-13	Original Report	Jane Lee

TABLE OF CONTENTS

1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	IEI Integration Corp.
	No. 29, Zhongxing Rd, Xizhi Dist., New Taipei City 221, Taiwan(R.O.C.)
Manufacturer	IEI Integration Corp.
	No. 29, Zhongxing Rd, Xizhi Dist., New Taipei City 221, Taiwan(R.O.C.)
Brand(Trade) Name	IEI
Product (Equipment)	PDA
Main Model Name	MODAT-550A-OA53
Series Model Name	MODAT-550A-OA53-ET
Model Discrepancy	MODAT-550A-OA53 with Barcode Reader MODAT-550A-OA53-ET without Barcode Reader
Frequency Range	13.56 MHz
Number of Channels	1 Channel
Field strength	70.23 dBμV/m
Antenna Specification	FPCB Antenna / 0 dBi
Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter: *Brand Name: Asian Power Devices Inc* *Model: WA15IO5R* *I/P: 100-240V 50~60Hz 0.5A* *O/P: 5Vdc, 3A* ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☒ Battery: *Rechargeable Li-polymer Battery* *Brand Name: QIAO XIN TECHOLOGY CO., LTD* *Model: IE-01S02A0* *3.7V ⎓ 4000mAh, 14.8W* ☐ DC Power Supply ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Dec 07, 2018
Date of Test	Dec 07, 2018 ~ Mar 13, 2019

**All measurement and test data in this report was gathered from production sample serial number: 181207001 (Assigned by BACL, Taiwan).*

1.2 Objective

This report is prepared on behalf of *IEI Integration Corp.* in accordance with Part 2- Subpart J, and Part 15-Subparts A and C of the Federal Communication Commission's rules.
The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209 and 15.225.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15.407 NII submission with FCC ID: RFHMODAT-550A

FCC Part 15.247 DTS submission with FCC ID: RFHMODAT-550A

FCC Part 15.247 DSS submission with FCC ID: RFHMODAT-550A

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☐68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

The EUT was configured for testing according to ANSI C63.10: 2013

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The software used "Engineer Mode".

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
Adapter	APD	WA-15105R	R43017	N/A	N/A
Base	iEi	iEi	N/A	N/A	N/A

2.5 External Cable List and Details

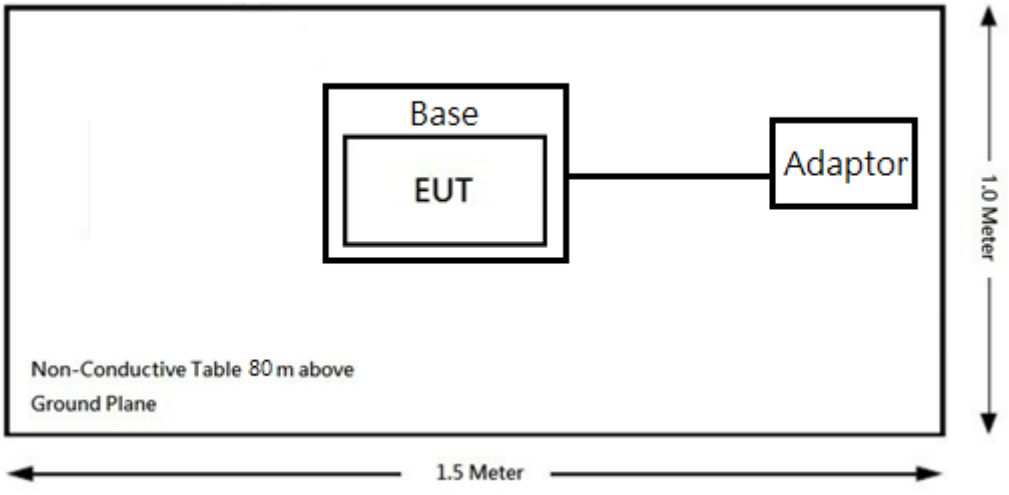
Cable Description	Length (m)	From	To
Micro USB Cable	1.5	Adapter	Base

2.6 Block Diagram of Test Setup

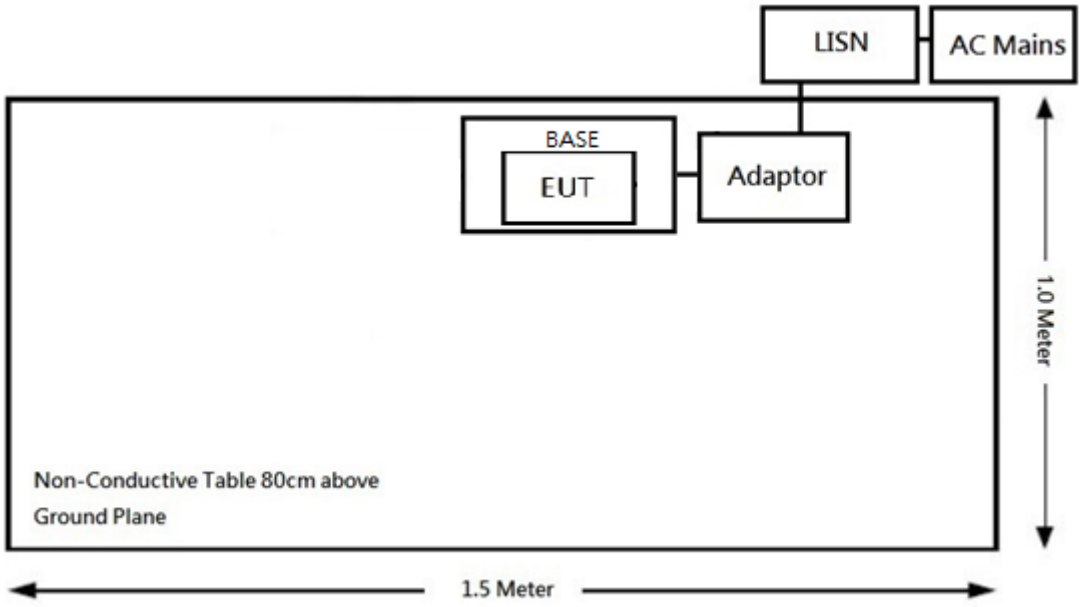
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

Below 1GHz:



Conduction:


LISN
AC Mains
BASE
EUT
Adaptor
1.0 Meter
Non-Conductive Table 80cm above
Ground Plane
1.5 Meter

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.225	Radiated Emissions	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20dB Emission Bandwidth Testing	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2018/07/02	2019/07/01
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	00035796	2018/03/13	2019/03/12
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2018/12/11	2019/12/10
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2019/02/13	2020/02/12
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2018/11/16	2019/11/15
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/06	2019/03/05
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2019/01/16	2020/01/15
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
NSA	BACL	966-A	N/A	2018/07/09	2019/07/08
VSWR	BACL	966-A	N/A	2018/07/16	2019/07/15
Description	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due Date**
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2019/02/11	2020/02/10

Regulated DC Power Supply	KIKUSUI	PMC35-2	MK002127	N.C.R	N.C.R
Temp & Humidity Chamber	BACL	BTH-150	30028	2018/12/17	2019/12/16
Multimeter	Fluke	114	28810152WS	2019/02/11	2020/02/10

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements*

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

5.2 Antenna List and Details

Manufacturer	Type	Antenna Gain	Result
IEI Integration Corp.	FPC Antenna	0 dBi	Compliance

The EUT has one integral antenna arrangement, which was permanently attached; fulfill the requirement of this section.

6 FCC §15.207(a) – AC Line Conducted Emissions

6.1 Applicable Standard

According to §15.207

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 frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

Note 2: A linear average detector is required

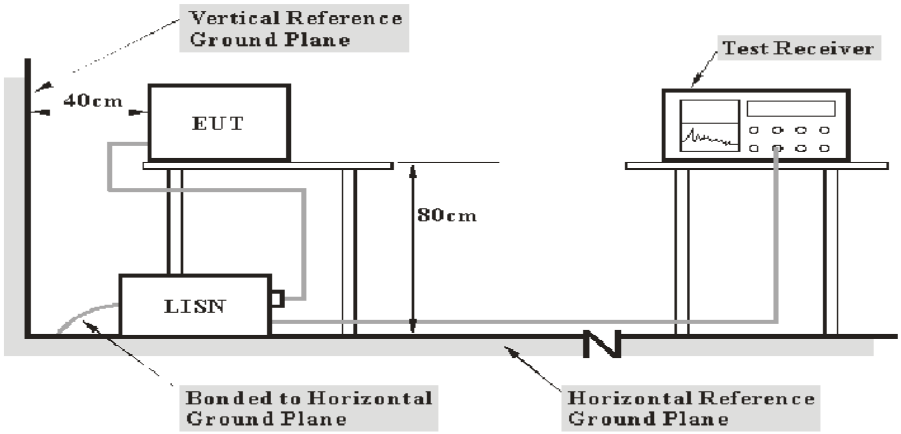
6.2 Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN/ISN and receiver, LISN/ISN voltage division factor, LISN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Taiwan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Expanded Measurement uncertainty
AC Mains	2.71 dB (k=2, 95% level of confidence)

6.3 EUT Setup



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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

6.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

6.5 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

6.6 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "Over Limit" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

6.7 Environmental Conditions

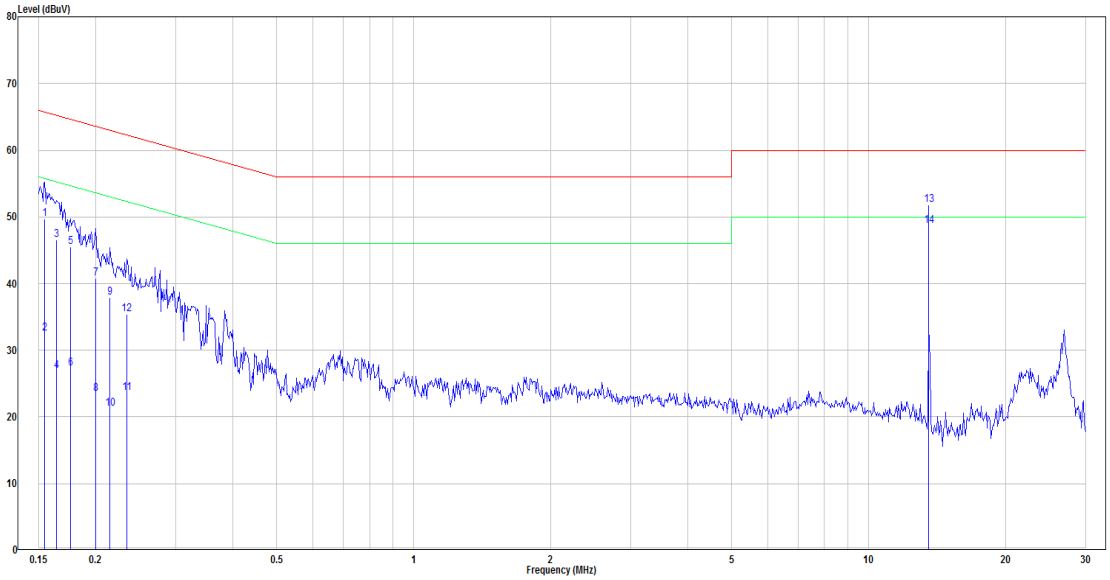
Temperature:	27.7 ℃
Relative Humidity:	68 %
ATM Pressure:	1009 hPa

The testing was performed by Tom Hsu on 2019-01-31.

6.8 Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.155	30.25	19.45	49.70	65.75	-16.05	QP
2	0.155	13.07	19.45	32.52	55.75	-23.23	Average
3	0.164	27.12	19.45	46.57	65.25	-18.68	QP
4	0.164	7.42	19.45	26.87	55.25	-28.38	Average
5	0.176	25.99	19.46	45.45	64.68	-19.23	QP
6	0.176	7.82	19.46	27.28	54.68	-27.40	Average
7	0.200	21.28	19.46	40.74	63.60	-22.86	QP
8	0.200	4.03	19.46	23.49	53.60	-30.11	Average
9	0.215	18.46	19.46	37.92	63.02	-25.10	QP
10	0.215	1.75	19.46	21.21	53.02	-31.81	Average
11	0.234	4.18	19.46	23.64	62.32	-38.68	QP
12	0.234	15.90	19.46	35.36	52.32	-16.96	Average
13	13.560	32.10	19.74	51.84	60.00	-8.16	QP
14	13.560	28.90	19.74	48.64	50.00	-1.36	Average

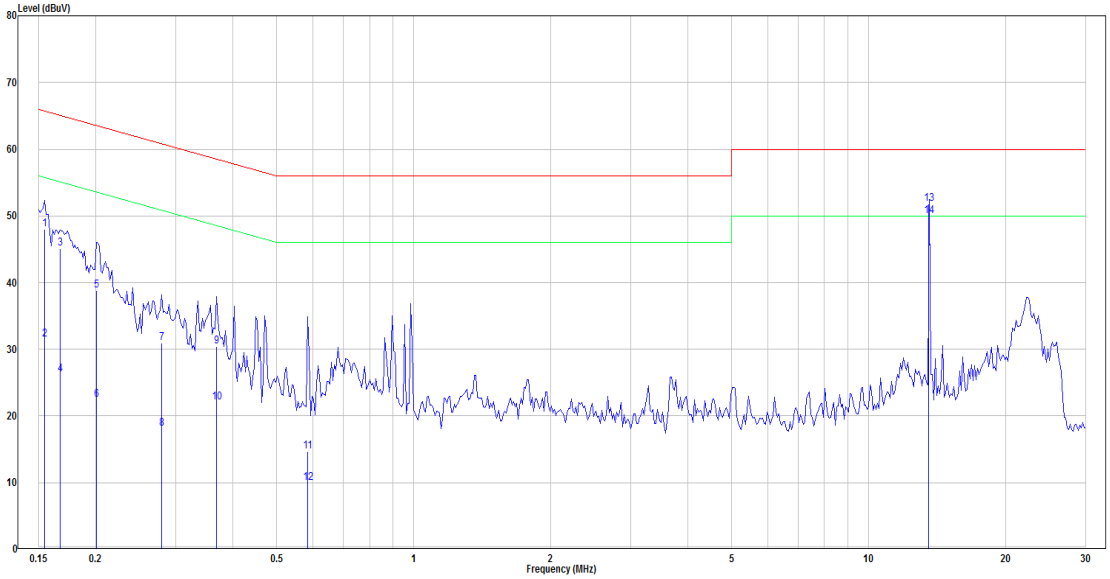
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.155	28.62	19.44	48.06	65.74	-17.68	QP
2	0.155	12.06	19.44	31.50	55.74	-24.24	Average
3	0.167	25.67	19.45	45.12	65.11	-19.99	QP
4	0.167	6.77	19.45	26.22	55.11	-28.89	Average
5	0.201	19.41	19.46	38.87	63.58	-24.71	QP
6	0.201	2.98	19.46	22.44	53.58	-31.14	Average
7	0.279	11.55	19.46	31.01	60.83	-29.82	QP
8	0.279	-1.34	19.46	18.12	50.83	-32.71	Average
9	0.368	10.93	19.46	30.39	58.54	-28.15	QP
10	0.368	2.54	19.46	22.00	48.54	-26.54	Average
11	0.584	-4.83	19.47	14.64	56.00	-41.36	QP
12	0.584	-9.52	19.47	9.95	46.00	-36.05	Average
13	13.560	32.10	19.75	51.85	60.00	-8.15	QP
14	13.560	30.20	19.75	49.95	50.00	-0.05	Average

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

7 FCC §15.209, §15.205 , §15.225 – Radiated Emissions

7.1 Applicable Standard

As Per FCC §15.205(a) except as show 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		
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	4. 5 – 5. 15
2.1735 – 2.1905	25.5 – 25.67	1300 – 1427	5. 35 – 5. 46
4.125 – 4.128	37.5 – 38.25	1435 – 1626.5	7.25 – 7.75
4.17725 – 4.17775	73 – 74.6	1645.5 – 1646.5	8.025 – 8.5
4.20725 – 4.20775	74.8 – 75.2	1660 – 1710	9.0 – 9.2
6.215 – 6.218	108 – 121.94	1718.8 – 1722.2	9.3 – 9.5
6.26775 – 6.26825	123 – 138	2200 – 2300	10.6 – 12.7
6.31175 – 6.31225	149.9 – 150.05	2310 – 2390	13.25 – 13.4
8.291 – 8.294	156.52475 –	2483.5 – 2500	14.47 – 14.5
8.362 – 8.366	156.52525	2690 – 2900	15.35 – 16.2
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.41425 – 8.41475	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.51975 – 12.52025	240 – 285	3.600 – 4.400	31.2 – 31.8
12.57675 – 12.57725	322 – 335.4		36.43 – 36.5
13.36 – 13.41	399.9 – 410		Above 38.6
	608 – 614		

As per FCC §15.209(a): 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 (micro volts/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

** 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.

As per FCC §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 band shall not exceed the general radiated emission limits in §15.209.

7.2 Measurement Uncertainty

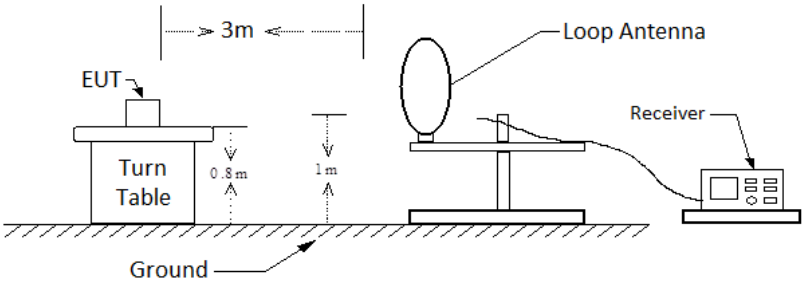
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

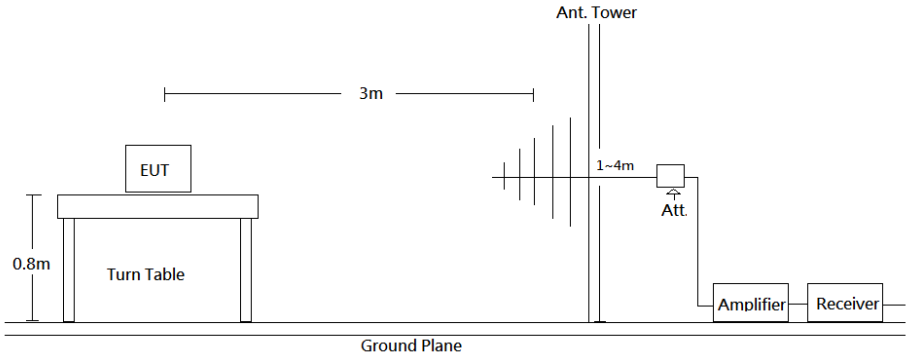
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.75 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.21 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.83 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.18 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.55 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.67 dB (k=2, 95% level of confidence)

7.3 EUT Setup

9 kHz to 30 MHz:



30 MHz to 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.225 Limits.

7.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 KHz to 1 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	IF B/W	Detector
9 kHz - 150 kHz	200 Hz	1 kHz	/	QP
150 kHz - 30 MHz	9 kHz	30 kHz	/	QP
30 MHz - 1000 MHz	120 kHz	/	120 kHz	QP

7.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

7.6 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Result – Limit

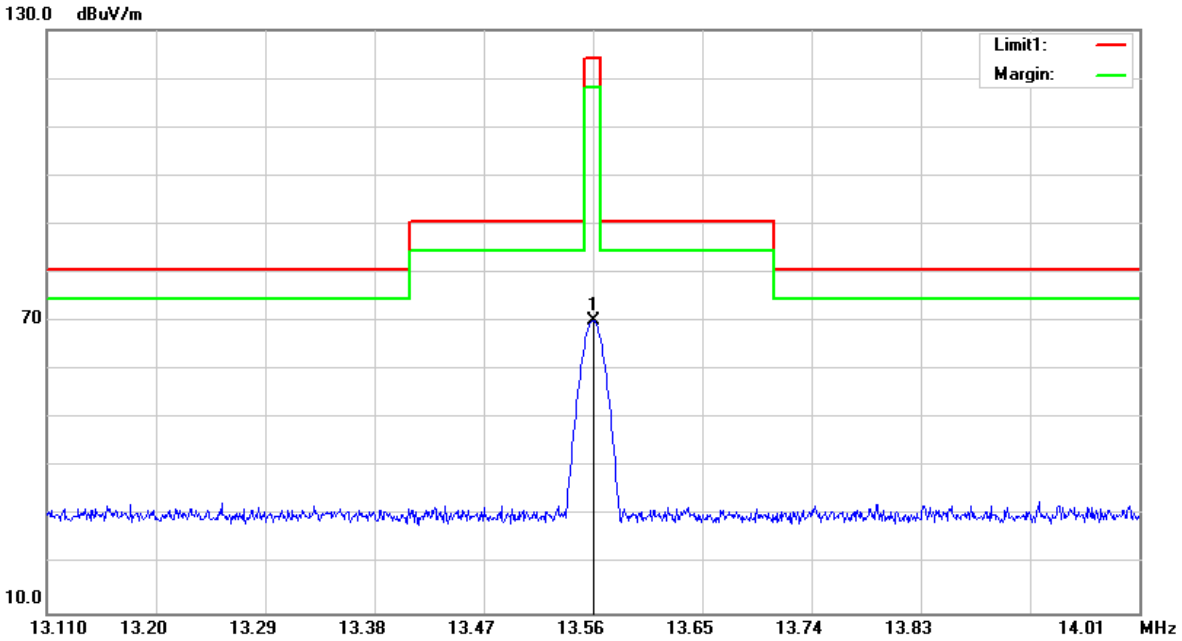
7.7 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-02-13.

7.8 Test Results

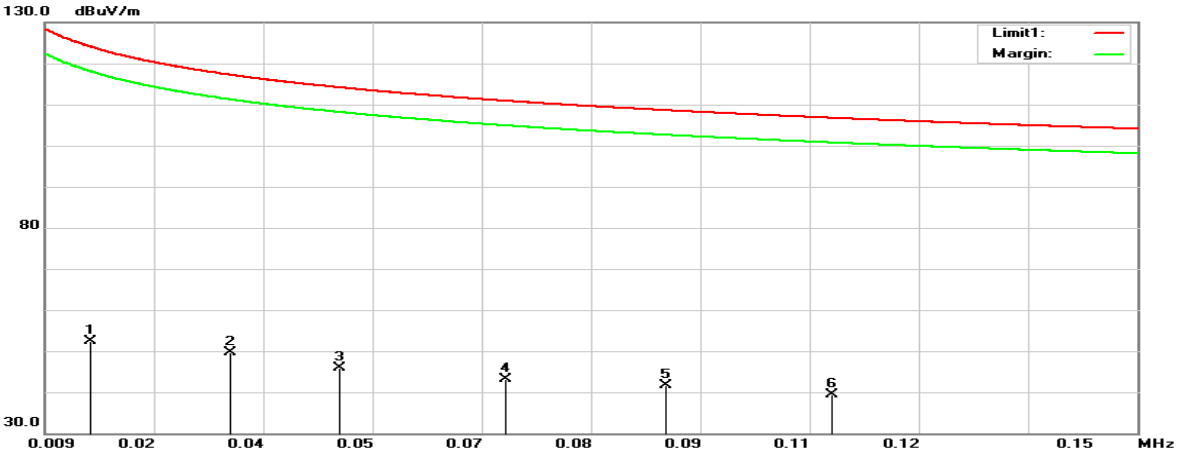
Fundamental:



Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5600	58.14	12.09	70.23	124.00	-53.77	100	70	QP

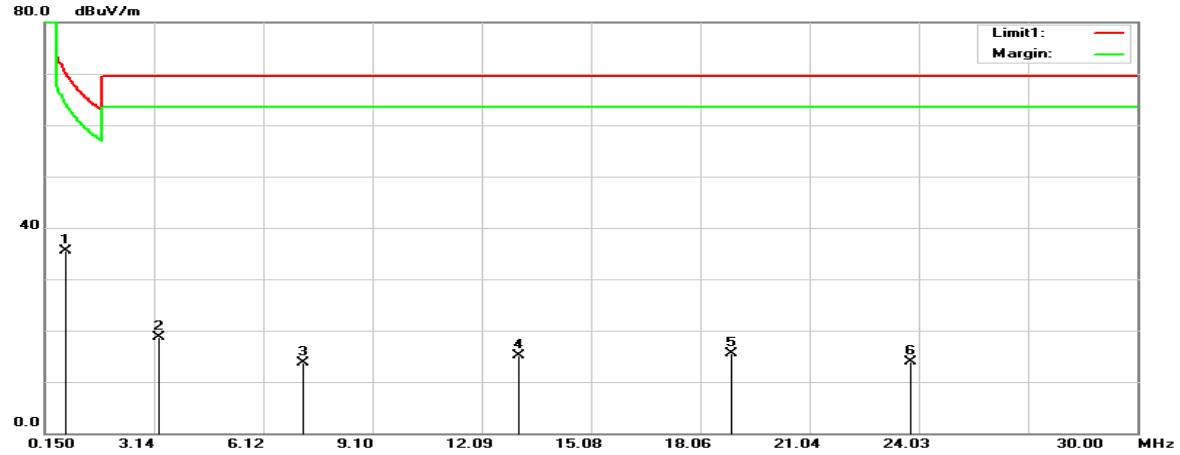
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

9kHz - 150kHz



Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
0.0150	34.93	17.47	52.40	124.07	-71.67	100	354	QP
0.0330	35.75	13.88	49.63	117.22	-67.59	100	155	QP
0.0471	32.84	13.16	46.00	114.13	-68.13	100	6	QP
0.0685	30.71	12.54	43.25	110.88	-67.63	100	136	QP
0.0892	29.71	12.01	41.72	108.59	-66.87	100	114	QP
0.1107	27.64	11.74	39.38	106.71	-67.33	100	41	QP

150kHz - 30MHz

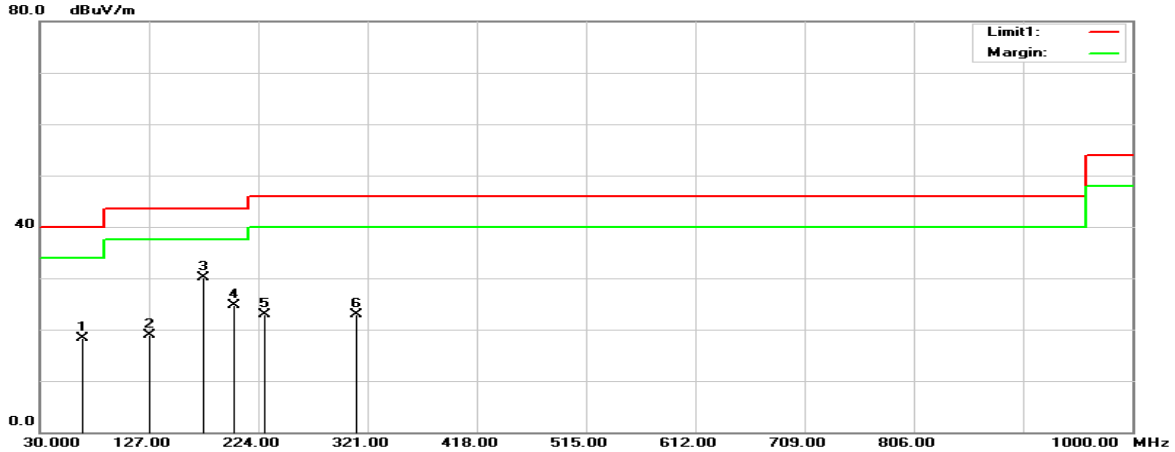


Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
0.7170	23.78	11.74	35.52	70.50	-34.98	100	198	QP
3.2543	8.06	10.61	18.67	69.50	-50.83	100	154	QP
7.1946	2.37	11.37	13.74	69.50	-55.76	100	303	QP
13.1050	3.62	11.52	15.14	69.50	-54.36	100	254	QP
18.9256	4.26	11.20	15.46	69.50	-54.04	100	199	QP
23.8210	3.57	10.43	14.00	69.50	-55.50	100	317	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

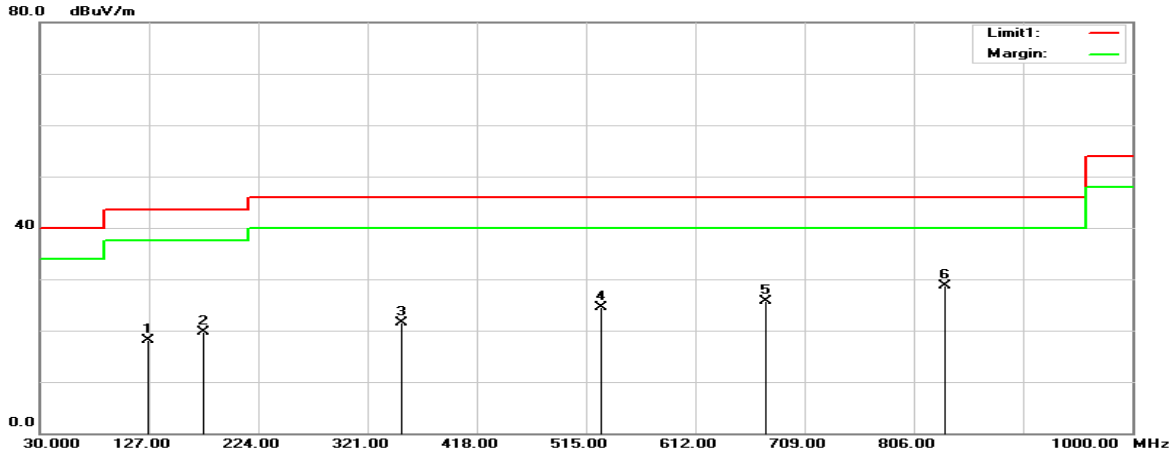
30MHz-1GHz

Horizontal



Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
67.8300	34.29	-16.01	18.28	40.00	-21.72	100	285	QP
127.0000	28.25	-9.26	18.99	43.50	-24.51	100	73	QP
175.5000	41.27	-11.15	30.12	43.50	-13.38	100	57	QP
202.6600	34.08	-9.40	24.68	43.50	-18.82	100	311	QP
229.8200	33.47	-10.58	22.89	46.00	-23.11	100	290	QP
311.3000	30.67	-7.74	22.93	46.00	-23.07	100	91	QP

Vertical



Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
126.0300	27.41	-9.26	18.15	43.50	-25.35	100	270	QP
175.5000	30.76	-11.15	19.61	43.50	-23.89	100	299	QP
351.0700	28.39	-6.93	21.46	46.00	-24.54	100	340	QP
528.5800	28.67	-4.24	24.43	46.00	-21.57	100	30	QP
675.0500	28.27	-2.63	25.64	46.00	-20.36	100	254	QP
834.1300	28.72	-0.10	28.62	46.00	-17.38	100	288	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

8 FCC §15.225(e) –FREQUENCY STABILITY

8.1 Applicable Standard

According to FCC §15.225(e),

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

8.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power.

The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to the end point of the battery. The output frequency was recorded for each voltage.

8.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-03-13.

8.4 Test Results

Test Frequency

Condition			Frequency (MHz)			
Temperature (°C)	Voltage (V)	Test Freq (MHz)	0 min	2 min	5 min	10 min
20	3.15	13.56	13.56072	13.56060	13.56062	13.56085
	4.26	13.56	13.56075	13.56077	13.56062	13.56042
-20	3.7	13.56	13.56053	13.56061	13.56062	13.56080
-10	3.7	13.56	13.56071	13.56041	13.56076	13.56050
0	3.7	13.56	13.56060	13.56072	13.56067	13.56049
10	3.7	13.56	13.56073	13.56062	13.56051	13.56064
20	3.7	13.56	13.56051	13.56079	13.56080	13.56045
30	3.7	13.56	13.56043	13.56076	13.56048	13.56048
40	3.7	13.56	13.56049	13.56055	13.56064	13.56075
50	3.7	13.56	13.56045	13.56055	13.56057	13.56062

Frequency Error

Condition			Freq. Error (ppm)			
Temperature (°C)	Voltage (V)	Test Freq	0 min	2 min	5 min	10 min
20	3.15	13.56	0.00531	0.00442	0.00457	0.00627
	4.26	13.56	0.00553	0.00568	0.00457	0.00310
-20	3.7	13.56	0.00391	0.00450	0.00457	0.00590
-10	3.7	13.56	0.00524	0.00302	0.00560	0.00369
0	3.7	13.56	0.00442	0.00531	0.00494	0.00361
10	3.7	13.56	0.00538	0.00457	0.00376	0.00472
20	3.7	13.56	0.00376	0.00583	0.00590	0.00332
30	3.7	13.56	0.00317	0.00560	0.00354	0.00354
40	3.7	13.56	0.00361	0.00406	0.00472	0.00553
50	3.7	13.56	0.00332	0.00406	0.00420	0.00457
Limit (ppm) = ±0.01 ppm						

9 FCC §15.215(c) – 20 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

9.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

9.3 Environmental Conditions

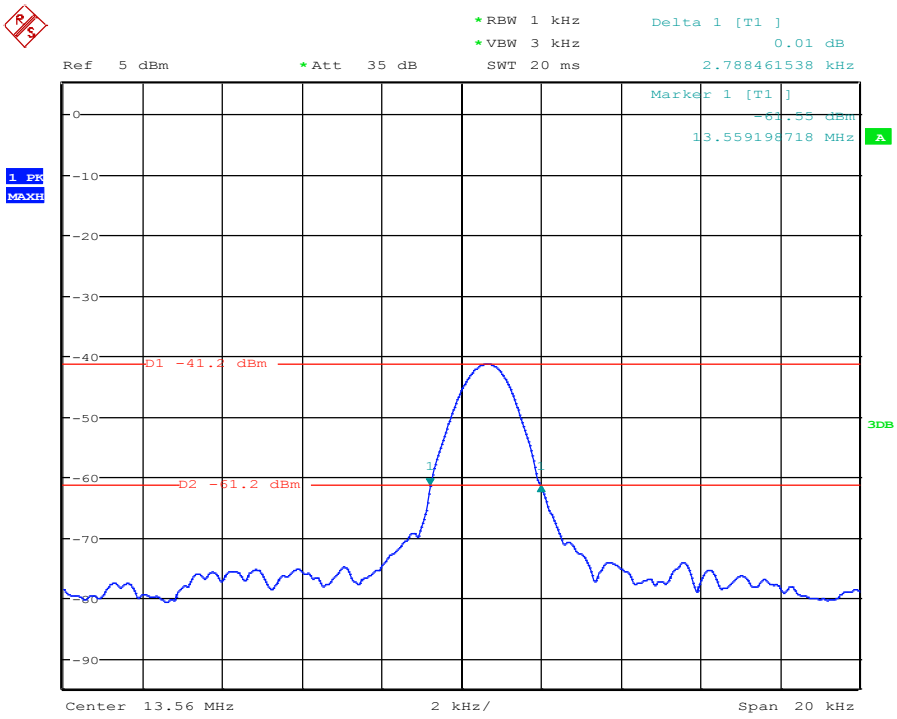
Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-03-13

9.4 Test Results

Frequency (MHz)	20dB Bandwidth (kHz)	Result
13.56	2.788	Compliance

20 dB Emission Bandwidth



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******* END OF REPORT *******