



FCC PART 15.249

TEST REPORT

For

Micro Star International Co Ltd

No. 69, Li-De Street, Zhonghe Dist., New Taipei City 235, Taiwan

FCC ID: I4LGM70TXTI

Report Type: Original Report	Product Type: Clutch GM70 GAMING Mouse
Report Producer: Jane Lee	<i>Jane Lee</i>
Report Number: RTWA171113001-00A	
Report Date: 2017-11-28	
Reviewed By: Jerry Chang	<i>Jerry Chang</i>
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan)

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RTWA171113001	RTWA171113001-00A	2017.11.28	Original Report	Jane

TABLE OF CONTENTS

GENERAL INFORMATION	4
Product Description for Equipment under Test (EUT)	4
Objective	4
Related Submittal(s)/Grant(s).....	4
Test Methodology	4
Test Facility.....	5
SYSTEM TEST CONFIGURATION	6
Description of Test Configuration.....	6
EUT Exercise Software.....	6
Equipment Modifications	6
Support Equipment List and Details	6
External Cable List and Details.....	6
Block Diagram of Test Setup.....	7
SUMMARY OF TEST RESULTS	9
FCC §15.203 – ANTENNA REQUIREMENT	10
Applicable Standard	10
Antenna Connector Construction	10
Result: Compliance.	10
FCC §15.207 - AC LINE CONDUCTED EMISSIONS	11
Applicable Standard	11
Measurement Uncertainty	11
EUT Setup	12
EMI Test Receiver Setup	12
Test Procedure.....	12
Corrected Factor & Margin Calculation.....	13
Test Equipment List and Details	13
Test Environmental Conditions.....	13
Test Results: PASS.....	13
FCC§15.209, §15.205 & §15.249 - RADIATED EMISSIONS	16
Applicable Standard	16
Measurement Uncertainty	16
EUT Setup	17
Test Procedure.....	18
Test Equipment List and Details	18
Corrected Amplitude & Margin Calculation.....	19
Test Results Summary.....	19
Test Environmental Conditions.....	19
Test Results	20
FCC§15.215(c) – 20 dB BANDWIDTH TESTING	26
Applicable Standard	26
Test Procedure.....	26
Test Equipment List and Details	26
Test Environmental Conditions.....	26
Test Results	27

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant: Micro Star International Co Ltd
No. 69, Li-De Street, Zhonghe Dist., New Taipei City 235, Taiwan

Manufacturer: Dexin Electronics Co., Ltd.
No.2, Jianye 2 Road, Shitanpu Village. Tangxia Town, Dongguan
Guangdong Province, P.R. China

Product: Clutch GM70 GAMING Mouse

Model: Clutch GM70 GAMING Mouse

Trade Name: 

Frequency Range: 2406~2478MHz

Antenna Specification: PCB Antenna/Gain:2.47 dBi

Voltage Range: 3.7Vdc from Battery or 5Vdc from usb

Date of Test: Nov 13, 2017 ~Nov 28, 2017

**All measurement and test data in this report was gathered from production sample serial number: 171113001*

(Assigned by BACL, Taiwan) The EUT supplied by the applicant was received on 2017-11-13

Objective

This report is prepared on behalf of *Micro Star International Co Ltd* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the test mode of EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.249 DXX submission with FCC ID: I4LGM70RXTI

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

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode, the maximum power output configured by default setting and switched the channels by keys.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2406	3	2478
2	2445	-	-

EUT Exercise Software

No software was used.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID/DOC	S/N
Notebook	DELL	P62G	N/A	PD98260NGU	36113452562

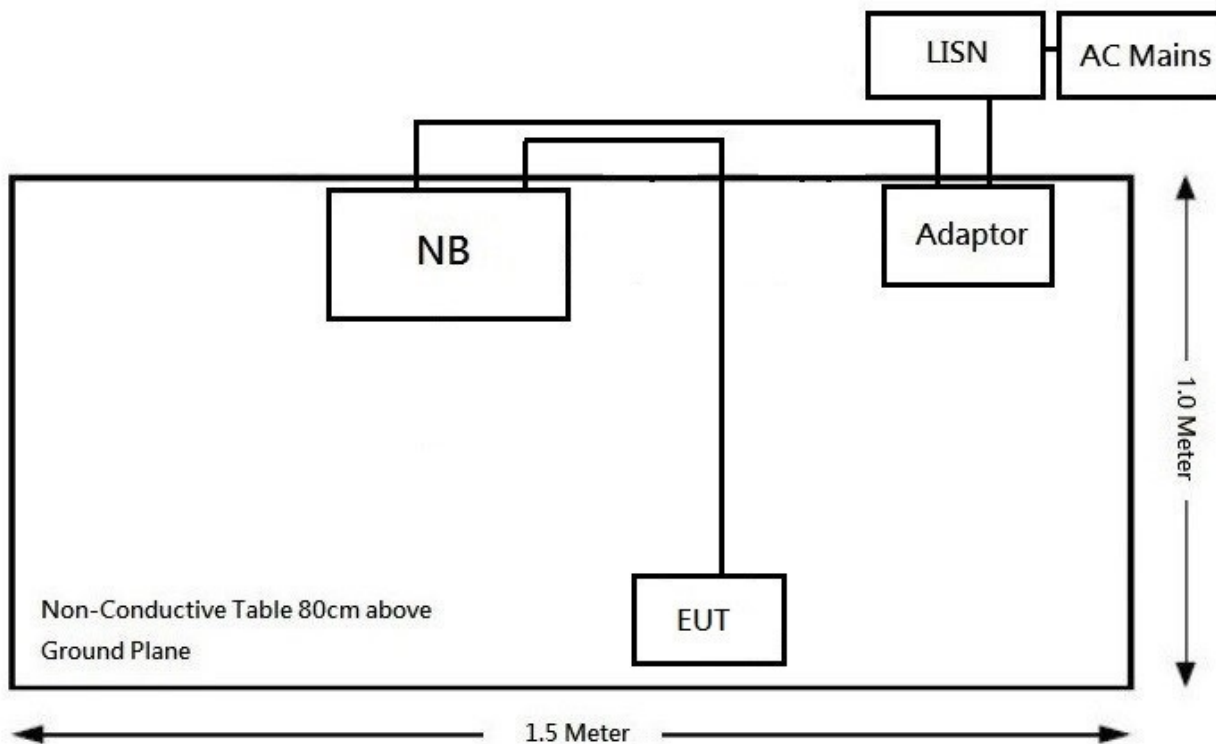
External Cable List and Details

Cable Description	Length (m)	From	To
USB Cable	2m	NB	EUT

Block Diagram of Test Setup

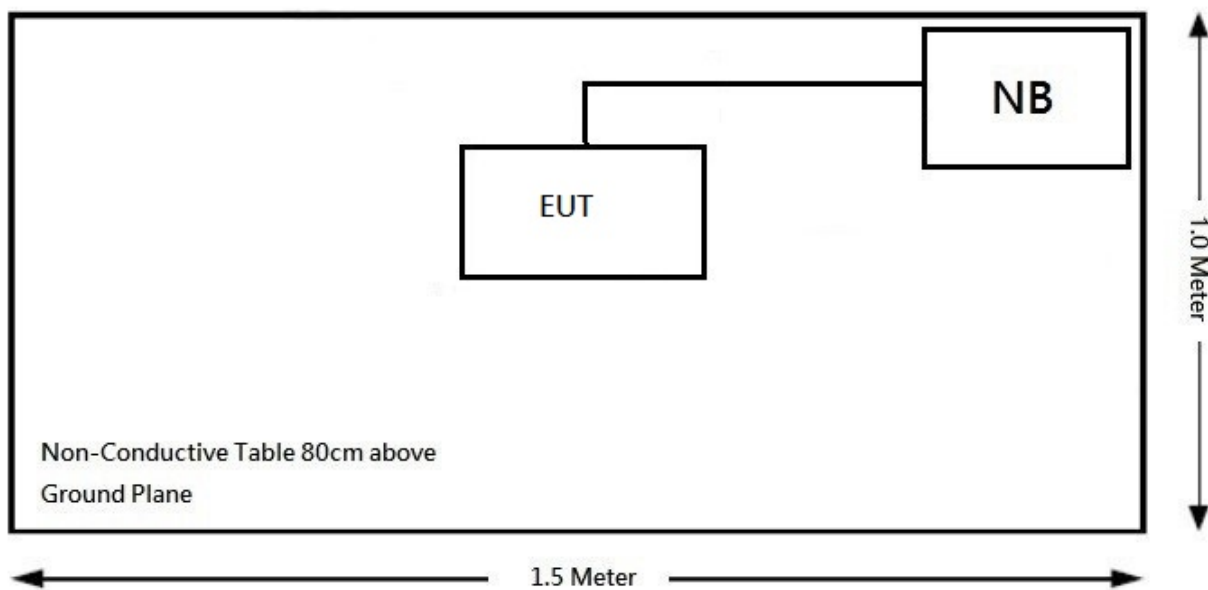
See the below setup block for the actual connections between EUT and support equipment

Conduction:

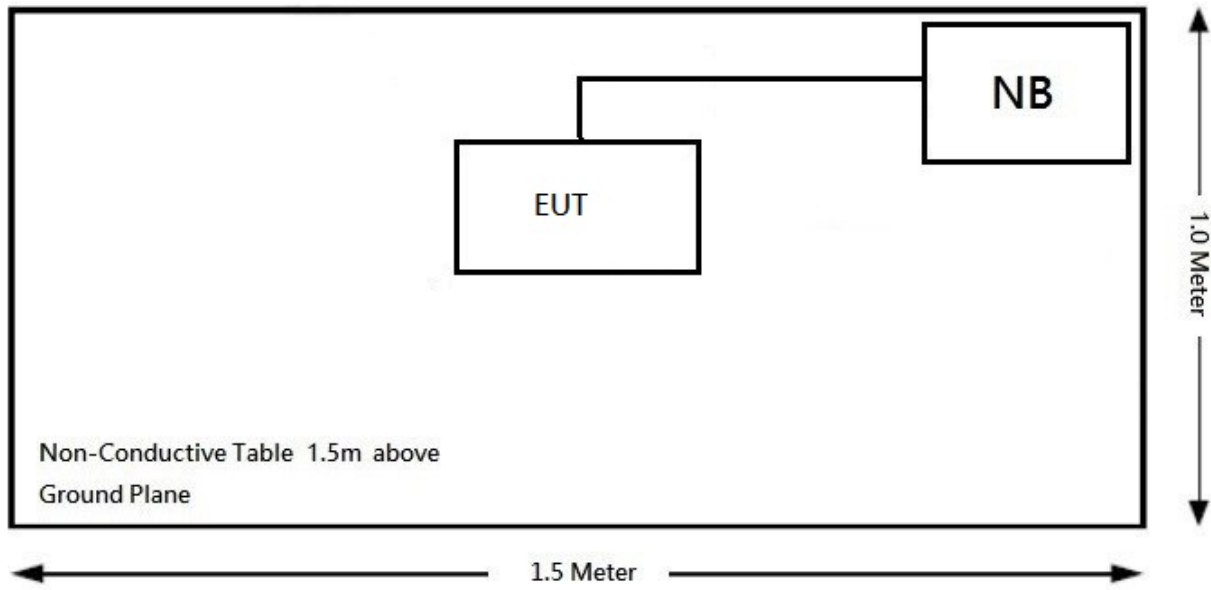


Radiation:

Below 1GHz:



Above 1GHz:



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, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Emission Bandwidth	Compliance

FCC §15.203 – ANTENNA REQUIREMENT**Applicable Standard**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

Manufacturer	Type	Antenna Gain	Result
DEXIN	FPC Antenna	2.47dBi	Compliance

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

Result: Compliance.

FCC §15.207 - AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC §15.207 Conducted limits:

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 μ H/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

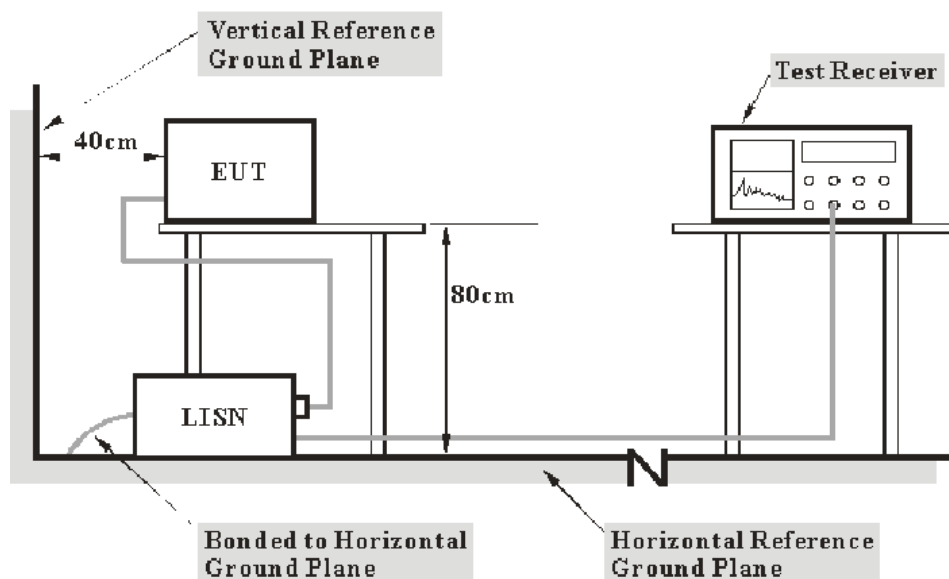
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements may be 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 expanded 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	4.64 dB (k=2, 95% level of confidence)

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.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

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

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.

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:

$$\text{Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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:

$$\text{Over Limit} = \text{Level} - \text{Limit Line}$$

Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Due Date
LISN	Rohde & Schwarz	ENV216	101248	2017/07/20	2018/07/19
LISN	EMCO	3816/2	75848	2017/08/02	2018/08/01
EMI Test Receiver	Rohde & Schwarz	ESCI	100540	2017/05/24	2018/05/23
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM025	2017/08/11	2018/08/10
RF Cable	EMEC	EM-CB5D	001	2017/07/24	2018/07/23
Software	AUDIX	E3	V9.150826k	NCR	N.C.R

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed according to TAF requirements, traceable to the ETC.

Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

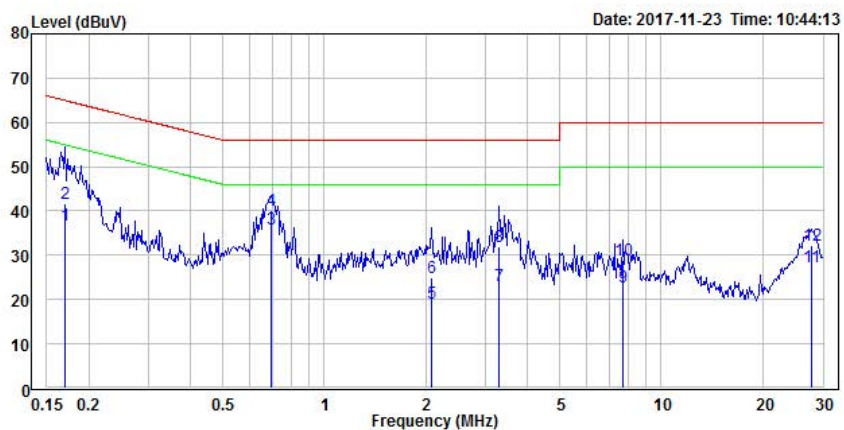
The testing was performed by Tom Hsu on 2017-11-23.

Test Results: PASS

Please refer to the following plots and tables.

Test mode: Transmitting mode

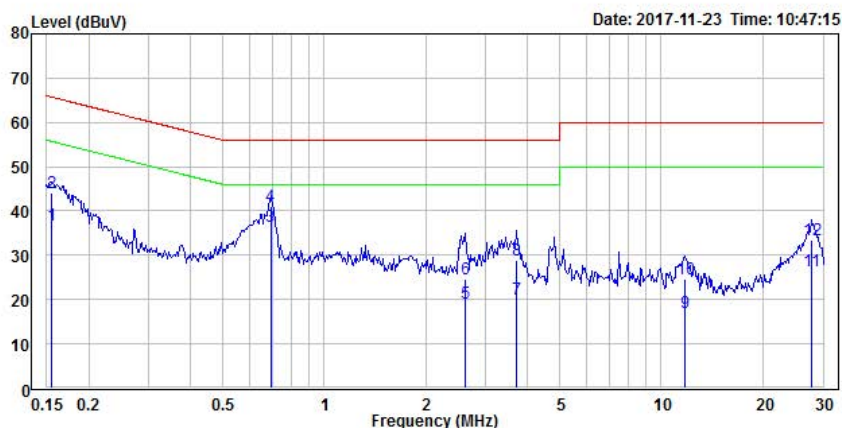
Main: AC 120V/60 Hz, Line



Condition: Line
 EUT :
 Mode :
 Note :

	Freq	Level	Limit	Over	Read		
	MHz	dBuV	dBuV	dB	dB	dBuV	Pol/Phase
1	0.170	36.93	54.94	-18.01	19.51	17.42	Average Line
2	0.170	41.81	64.94	-23.13	19.51	22.30	QP Line
3	0.698	35.75	46.00	-10.25	19.52	16.23	Average Line
4	0.698	40.12	56.00	-15.88	19.52	20.60	QP Line
5	2.079	19.21	46.00	-26.79	19.58	-0.37	Average Line
6	2.079	24.90	56.00	-31.10	19.58	5.32	QP Line
7	3.301	23.14	46.00	-22.86	19.63	3.51	Average Line
8	3.301	31.84	56.00	-24.16	19.63	12.21	QP Line
9	7.681	22.94	50.00	-27.06	19.72	3.22	Average Line
10	7.681	28.75	60.00	-31.25	19.72	9.03	QP Line
11	27.703	27.33	50.00	-22.67	19.87	7.46	Average Line
12	27.703	32.32	60.00	-27.68	19.87	12.45	QP Line

Main: AC 120V/60 Hz, Neutral



Condition: Neutral

EUT :
 Mode :
 Note :

	Freq	Level	Limit	Over	Read			
	MHz	dBuV	dBuV	dB	dB	dBuV	Remark	Pol/Phase
1	0.155	36.70	55.74	-19.04	19.64	17.06	Average	Neutral
2	0.155	44.24	65.74	-21.50	19.64	24.60	QP	Neutral
3	0.693	36.48	46.00	-9.52	19.66	16.82	Average	Neutral
4	0.693	40.99	56.00	-15.01	19.66	21.33	QP	Neutral
5	2.620	19.18	46.00	-26.82	19.73	-0.55	Average	Neutral
6	2.620	24.70	56.00	-31.30	19.73	4.97	QP	Neutral
7	3.720	19.98	46.00	-26.02	19.77	0.21	Average	Neutral
8	3.720	28.76	56.00	-27.24	19.77	8.99	QP	Neutral
9	11.811	16.98	50.00	-33.02	19.94	-2.96	Average	Neutral
10	11.811	24.65	60.00	-35.35	19.94	4.71	QP	Neutral
11	27.703	26.58	50.00	-23.42	20.12	6.46	Average	Neutral
12	27.703	33.40	60.00	-26.60	20.12	13.28	QP	Neutral

FCC§15.209, §15.205 & §15.249 - RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

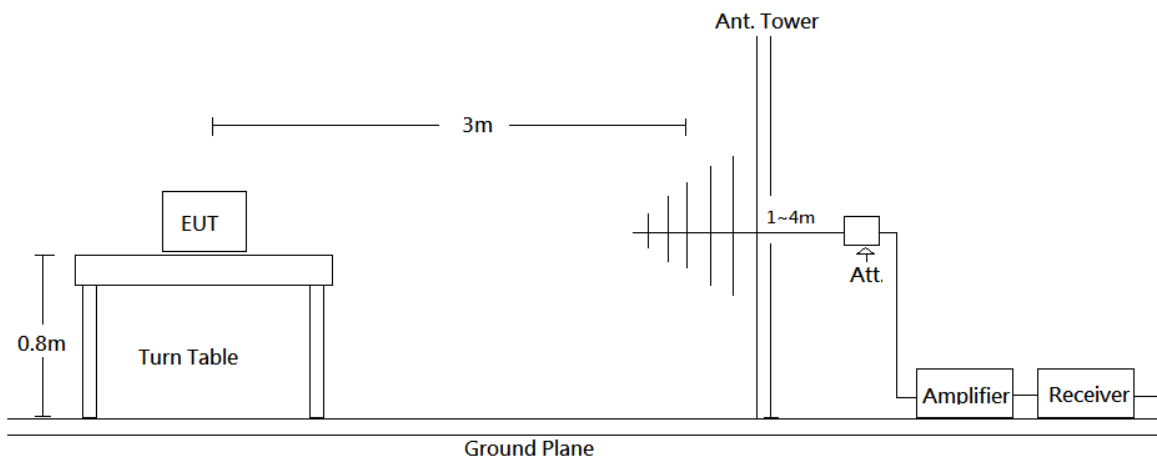
Measurement Uncertainty

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.

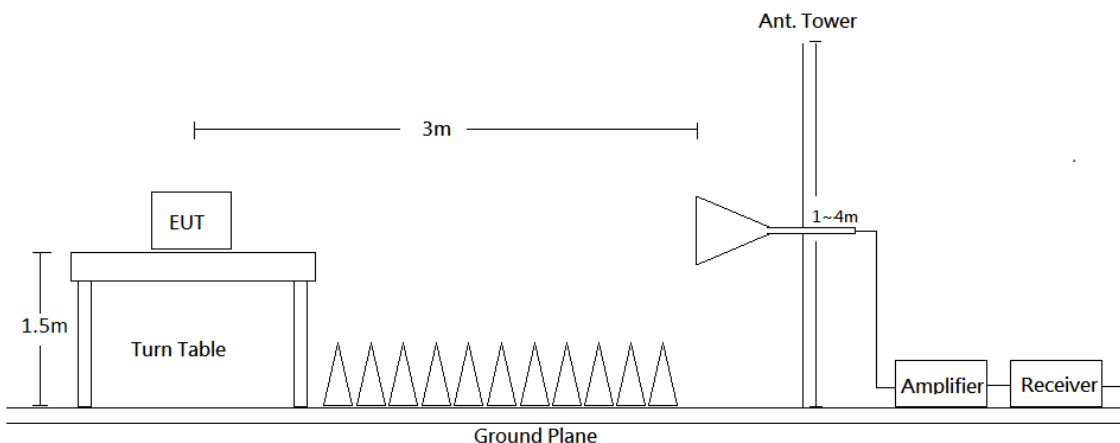
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Frequency	Measurement uncertainty
30 MHz~200 MHz	3.76 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.12 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.84 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.16 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.84 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.30 dB (k=2, 95% level of confidence)

**EUT Setup
Below 1GHz:**



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.249 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

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

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
966A Room					
Bilog Antenna	Sunol & Mini-Circuits	JB6/UNAT-6+	A050115/15542_01	2017/11/10	2018/11/09
Horn Antenna	EMCO	3115	9311-4158	2017/05/31	2018/05/30
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/04	2018/09/03
Preamplifier	Sonoma	310N	130602	2017/07/03	2018/07/02
Preamplifier	EMEC	EM01G18G	60697	2017/04/14	2018/04/13
Preamplifier	EMEC	EM18G40G	060656	2016/12/13	2017/12/12
EMI Test Receiver	R & S	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSV40	101203	2017/07/13	2018/07/12
Microflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2017/10/31	2018/10/30
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/14	2018/11/09
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2017/03/24	2018/03/23
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2017/01/20	2018/01/19
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_EMG	BACL-03A1	N.C.R	N.C.R

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed according to TAF requirements, traceable to the ETC.

Corrected Amplitude & 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:

$$\text{Correct Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain} + \text{Attenuator}$$

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:

$$\text{Margin} = \text{Result} - \text{Limit}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.249.

Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

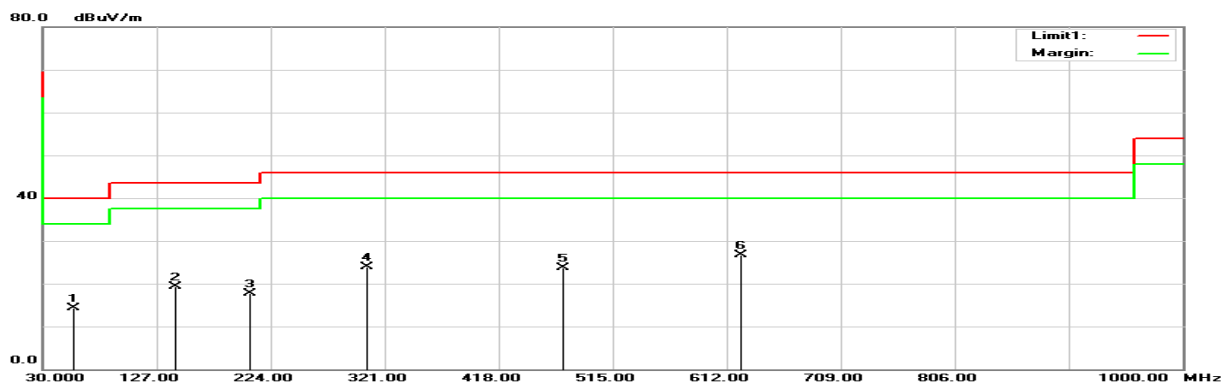
The testing was performed by Tom Hsu on 2017-11-22

Test Results

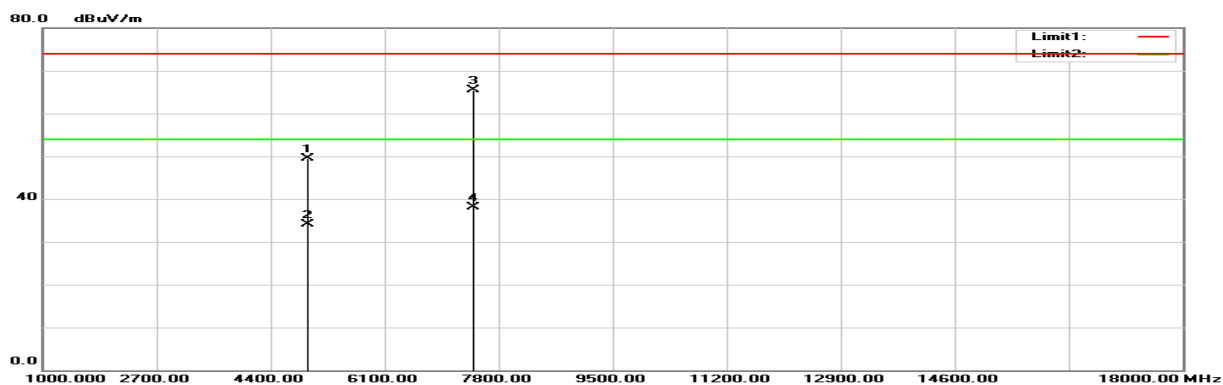
Mode: Transmitting

Horizontal (worst case is High channel)

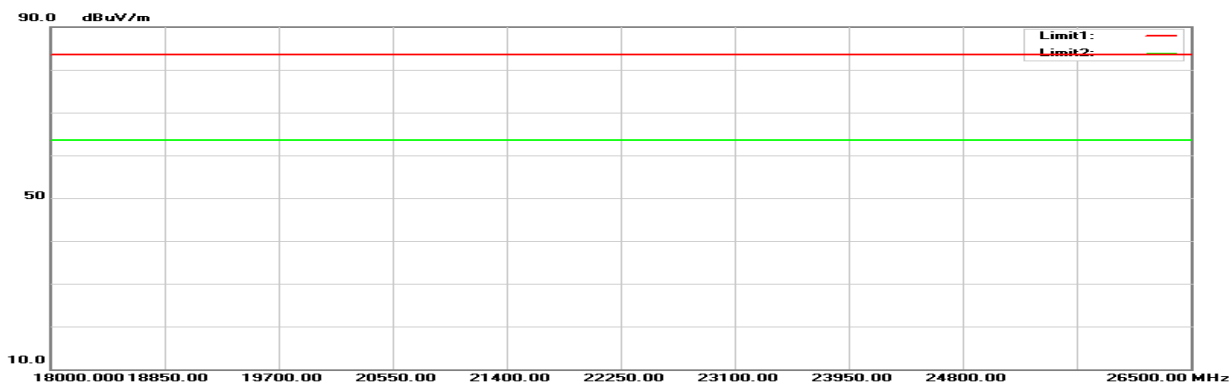
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)	(cm)	(°)	
Low Channel								
78.5000	28.48	-16.74	11.74	40.00	-28.26	100	329	QP
218.1800	28.82	-12.80	16.02	46.00	-29.98	100	294	QP
418.9700	28.53	-7.27	21.26	46.00	-24.74	100	306	QP
628.4900	29.44	-3.62	25.82	46.00	-20.18	100	153	QP
760.4100	29.42	-1.54	27.88	46.00	-18.12	100	44	QP
901.0600	29.08	1.42	30.50	46.00	-15.50	100	51	QP
2390.000	63.55	-4.89	58.66	74.00	-15.34	100	209	peak
2390.000	49.30	-4.89	44.41	54.00	-9.59	100	209	AVG
2400.000	70.24	-4.86	65.38	74.00	-8.62	100	128	peak
2400.000	49.41	-4.86	44.55	54.00	-9.45	100	128	AVG
2406.000	97.95	-4.85	93.10	114.00	-20.90	100	123	peak
2406.000	82.79	-4.85	77.94	94.00	-16.06	100	123	AVG
4812.000	46.51	1.01	47.52	74.00	-26.48	100	11	peak
4812.000	30.98	1.01	31.99	54.00	-22.01	100	11	AVG
7218.000	54.91	6.61	61.52	74.00	-12.48	100	190	peak
7218.000	28.51	6.61	35.12	54.00	-18.88	100	190	AVG
Middle Channel								
46.4900	30.35	-14.63	15.72	40.00	-24.28	100	338	QP
126.0300	29.70	-10.63	19.07	43.50	-24.43	100	42	QP
306.4500	34.04	-9.70	24.34	46.00	-21.66	100	96	QP
415.0900	30.02	-7.37	22.65	46.00	-23.35	100	57	QP
678.9300	30.47	-3.05	27.42	46.00	-18.58	100	331	QP
901.0600	30.28	1.42	31.70	46.00	-14.30	100	161	QP
2445.000	97.74	-4.76	92.98	114.00	-21.02	114	143	peak
2445.000	82.14	-4.76	77.38	94.00	-16.62	114	143	AVG
4890.000	51.15	1.28	52.43	74.00	-21.57	100	161	peak
4890.000	30.56	1.28	31.84	54.00	-22.16	100	161	AVG
7335.000	58.61	7.07	65.68	74.00	-8.32	100	313	peak
7335.000	29.71	7.07	36.78	54.00	-17.22	100	313	AVG

Result = Reading + Correct Factor

Margin = Result – Limit

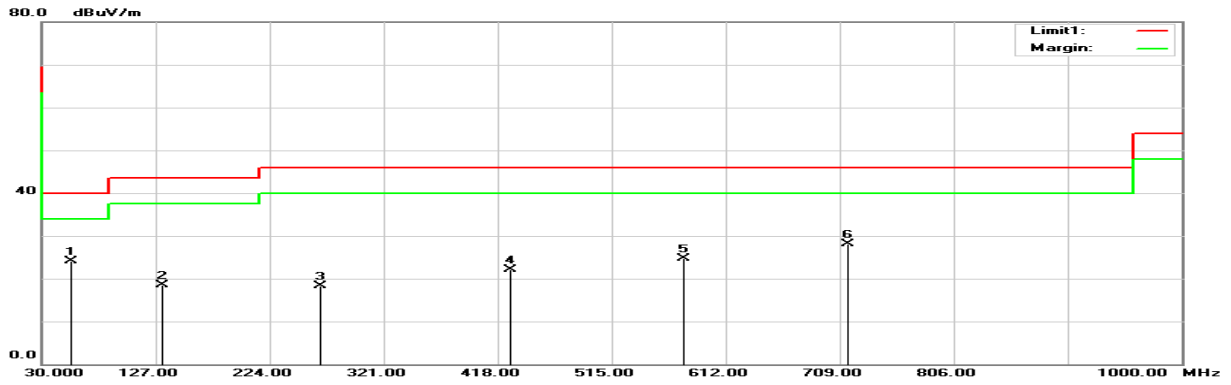
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported.

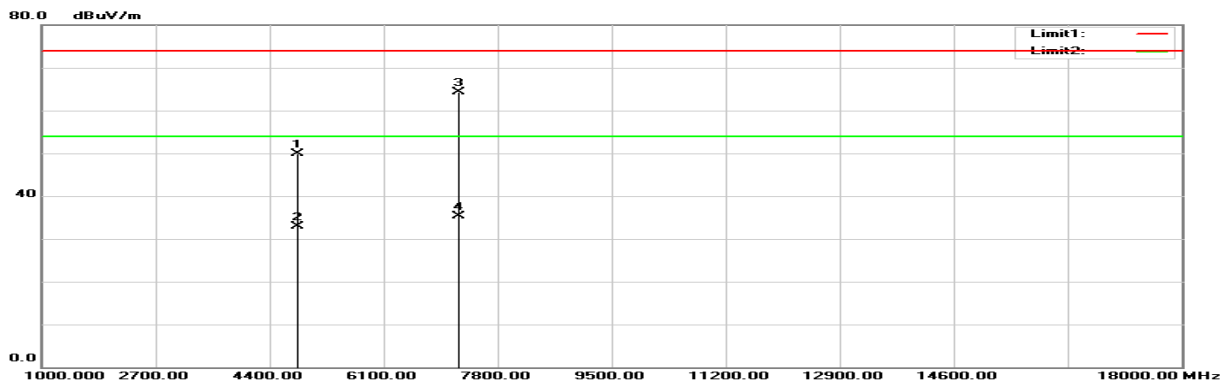
Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)	(cm)	($^{\circ}$)	
High Channel								
56.1900	31.27	-17.03	14.24	40.00	-25.76	100	110	QP
143.4900	30.40	-11.05	19.35	43.50	-24.15	100	0	QP
206.5400	29.86	-12.19	17.67	43.50	-25.83	100	74	QP
305.4800	33.67	-9.72	23.95	46.00	-22.05	100	247	QP
472.3200	29.97	-6.17	23.80	46.00	-22.20	100	259	QP
623.6400	30.42	-3.67	26.75	46.00	-19.25	100	154	QP
2478.000	98.88	-4.69	94.19	114.00	-19.81	118	132	peak
2478.000	84.11	-4.69	79.42	94.00	-14.58	118	132	AVG
2483.500	70.78	-4.69	66.09	74.00	-7.91	100	121	peak
2483.500	49.85	-4.69	45.16	54.00	-8.84	100	121	AVG
4956.000	48.07	1.50	49.57	74.00	-24.43	100	294	peak
4956.000	32.55	1.50	34.05	54.00	-19.95	100	294	AVG
7434.000	58.14	7.46	65.60	74.00	-8.40	100	321	peak
7434.000	30.72	7.46	38.18	54.00	-15.82	100	321	AVG

Vertical (worst case is low channel)

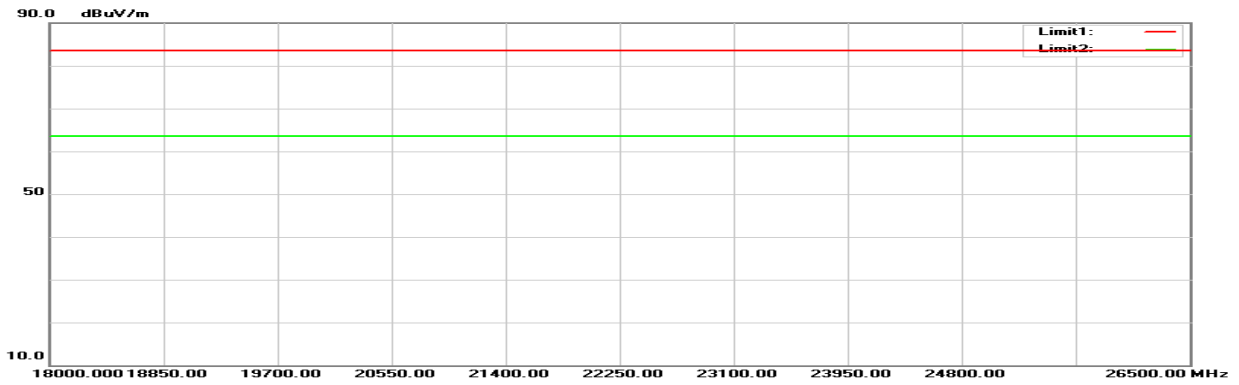
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)	(cm)	(°)	
Low Channel								
55.2200	41.10	-16.90	24.20	40.00	-15.80	100	73	QP
132.8200	29.15	-10.63	18.52	43.50	-24.98	100	309	QP
267.6500	28.80	-10.55	18.25	46.00	-27.75	100	121	QP
428.6700	29.10	-7.05	22.05	46.00	-23.95	100	1	QP
576.1100	29.07	-4.46	24.61	46.00	-21.39	100	29	QP
715.7900	30.69	-2.51	28.18	46.00	-17.82	100	134	QP
2390.000	67.12	-4.89	62.23	74.00	-11.77	100	243	peak
2390.000	49.23	-4.89	44.34	54.00	-9.66	100	243	AVG
2400.000	76.73	-4.86	71.87	74.00	-2.13	100	75	peak
2400.000	49.39	-4.86	44.53	54.00	-9.47	100	75	AVG
2406.000	102.91	-4.85	98.06	114.00	-15.94	121	64	peak
2406.000	82.84	-4.85	77.99	94.00	-16.01	121	64	AVG
4812.000	48.81	1.01	49.82	74.00	-24.18	127	64	peak
4812.000	31.88	1.01	32.89	54.00	-21.11	127	64	AVG
7218.000	57.67	6.61	64.28	74.00	-9.72	200	127	peak
7218.000	28.63	6.61	35.24	54.00	-18.76	200	127	AVG
Middle Channel								
57.1600	43.90	-17.16	26.74	40.00	-13.26	100	281	QP
104.6900	39.11	-13.31	25.80	43.50	-17.70	100	133	QP
166.7700	34.87	-11.98	22.89	43.50	-20.61	100	39	QP
408.3000	30.81	-7.53	23.28	46.00	-22.72	100	358	QP
697.3600	30.22	-2.86	27.36	46.00	-18.64	100	140	QP
847.7100	31.52	0.36	31.88	46.00	-14.12	100	271	QP
2445.000	103.57	-4.76	98.81	114.00	-15.19	119	66	peak
2445.000	83.67	-4.76	78.91	94.00	-15.09	119	66	AVG
4890.000	49.15	1.28	50.43	74.00	-23.57	100	256	peak
4890.000	31.22	1.28	32.50	54.00	-21.50	100	256	AVG
7335.000	53.81	7.07	60.88	74.00	-13.12	100	281	peak
7335.000	29.49	7.07	36.56	54.00	-17.44	100	281	AVG

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.

Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)	(cm)	(°)	
High Channel								
35.8200	34.65	-7.64	27.01	40.00	-12.99	100	1	QP
97.9000	45.73	-15.06	30.67	43.50	-12.83	100	1	QP
232.7300	31.11	-12.24	18.87	46.00	-27.13	100	124	QP
388.9000	30.82	-7.96	22.86	46.00	-23.14	100	184	QP
649.8300	31.03	-3.35	27.68	46.00	-18.32	100	92	QP
861.2900	30.20	0.63	30.83	46.00	-15.17	100	309	QP
2478.000	103.62	-4.69	98.93	114.00	-15.07	122	67	peak
2478.000	84.06	-4.69	79.37	94.00	-14.63	122	67	AVG
2483.500	75.59	-4.69	70.90	74.00	-3.10	100	77	peak
2483.500	49.22	-4.69	44.53	54.00	-9.47	100	77	AVG
4956.000	46.23	1.50	47.73	74.00	-26.27	176	212	peak
4956.000	31.15	1.50	32.65	54.00	-21.35	176	212	AVG
7434.000	56.69	7.46	64.15	74.00	-9.85	186	331	peak
7434.000	29.84	7.46	37.30	54.00	-16.70	186	331	AVG

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.

FCC§15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101203	2017/07/13	2018/07/12
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2017/10/31	2018/10/30

* *Statement of Traceability*: BAACL Corp. attests that all calibrations have been performed according to TAF requirements, traceable to the ETC.

Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2017-11-27.

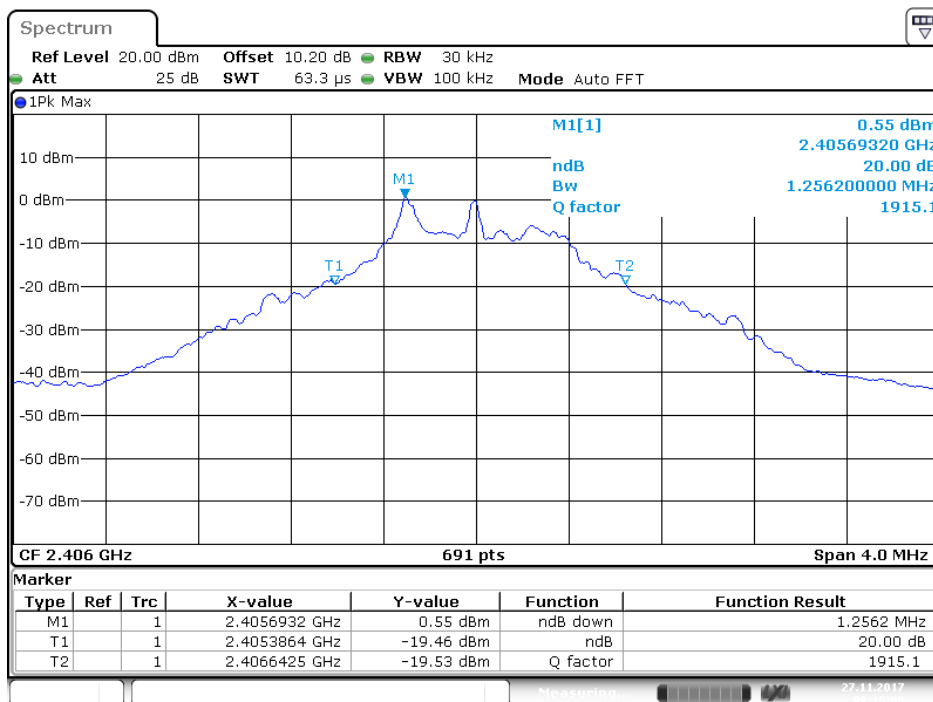
Test Results

Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
Low	2406	1.256
Middle	2445	1.291
High	2478	1.239

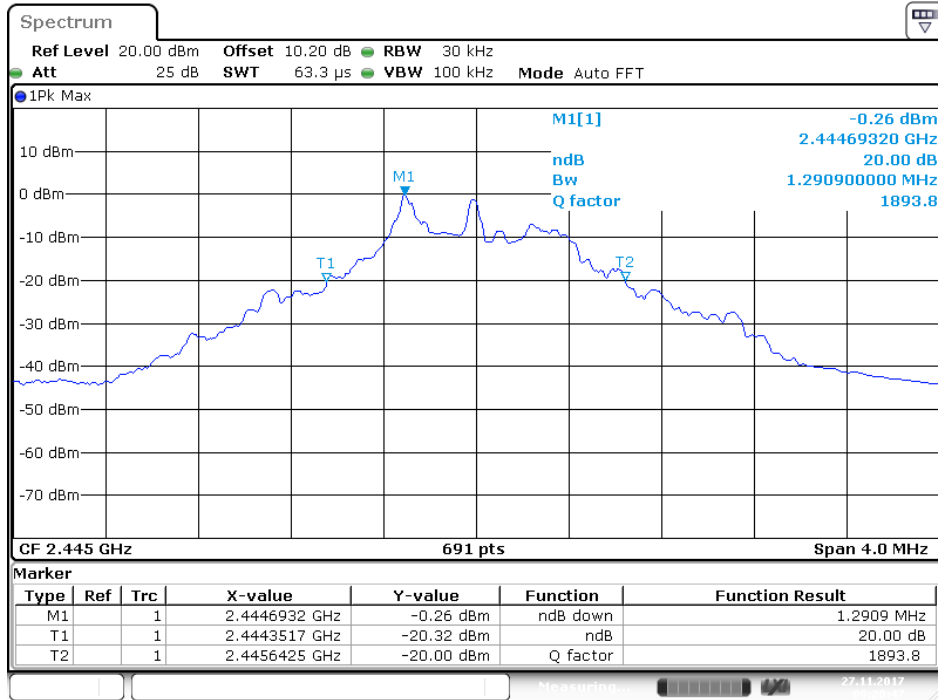
Please refer to the following tables and plots.

Low Channel



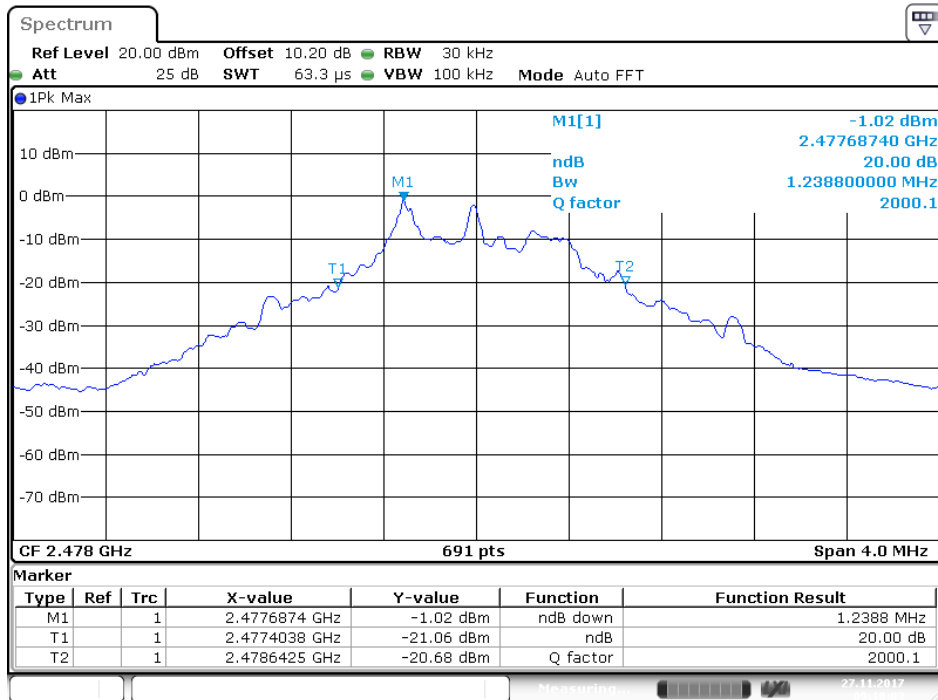
Date: 27 NOV 2017 09:15:01

Middle Channel



Date: 27 NOV 2017 09:20:48

High Channel



Date: 27 NOV 2017 09:18:03

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