



Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 1 of 54
Date: Jul. 31, 2017

Product Name: BLE TPMS
Model No.: TP001
Applicant: HUNG SHEN TECHNOLOGY CO., LTD.
No.11, Kailong St., Bade Dist.,
Taoyuan City 334, Taiwan (R.O.C.)
Date of Receipt: May. 18, 2016
Finished date of Test: Jul. 31, 2017
Applicable Standards: 47 CFR Part 15, Subpart C
47 CFR Part 15, Subpart B
ANSI C63.4: 2014

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Tested By : Boris Lin , Date: 07/31/2017
(Boris Lin)

Approved By : [Signature] , Date: 7/31/2017
(Johnson Ho, Director)





**Spectrum Research &
Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong
Rd., Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 2 of 54
Date: Jul. 31, 2017

Revisions History

Report No.	Issue Date	Revisions
FCCA16051805	Jul. 31, 2017	Initial issue



Table of Contents

1. DOCUMENT POLICY AND TEST STATEMENT	5
1.1 DOCUMENT POLICY	5
1.2 TEST STATEMENT	5
1.3 EUT MODIFICATION	5
2. DESCRIPTION OF EUT AND TEST MODE	6
2.1 GENERAL DESCRIPTION OF EUT	6
2.2 DESCRIPTION OF EUT INTERNAL DEVICE	6
2.3 EUT OPERATING CONDITION	6
2.4 DESCRIPTION OF TEST MODE	7
2.5 DESCRIPTION OF SUPPORT UNIT	7
2.6 CHANNEL AND FREQUENCY TABLE	8
3. DESCRIPTION OF APPLIED STANDARDS	9
3.1 SUMMARY OF TEST RESULTS	9
4. TECHNICAL CHARACTERISTICS TEST	10
4.1 RADIATED EMISSION TEST	10
4.1.1 LIMIT	10
4.1.2 TEST EQUIPMENT	11
4.1.3 TEST SET-UP	12
4.1.4 TEST PROCEDURE	13
4.1.5 TEST RESULT	14
4.2 CONDUCTED EMISSION TEST	27
4.2.1 LIMIT	27
4.2.2 TEST EQUIPMENT	27
4.2.3 TEST SETUP	28
4.2.4 TEST PROCEDURE	28
4.2.5 TEST RESULT	29
4.3 6DB BANDWIDTH	33
4.3.1 LIMIT	33
4.3.2 TEST EQUIPMENT	33
4.3.3 TEST SET-UP	33
4.3.4 TEST PROCEDURE	33
4.3.5 EUT OPERATING CONDITION	33
4.3.6 TEST RESULT	34



4.4	PEAK POWER TEST.....	37
4.4.1	LIMIT	37
4.4.2	TEST EQUIPMENT	37
4.4.3	TEST SET-UP.....	38
4.4.4	TEST PROCEDURE.....	38
4.4.5	EUT OPERATING CONDITION.....	38
4.4.6	TEST RESULT	39
4.5	BAND EDGE TEST.....	42
4.5.1	LIMIT	42
4.5.2	TEST EQUIPMENT	43
4.5.3	TEST SETUP.....	44
4.5.4	TEST PROCEDURE.....	45
4.5.5	EUT OPERATING CONDITION.....	45
4.5.6	TEST RESULT	46
4.6	POWER DENSITY TEST.....	49
4.6.1	LIMIT	49
4.6.2	TEST EQUIPMENT	49
4.6.3	TEST SET-UP.....	49
4.6.4	TEST PROCEDURE.....	49
4.6.5	EUT OPERATING CONDITION.....	49
4.6.6	TEST RESULT	50
5.	ANTENNA APPLICATION.....	53
5.1	ANTENNA REQUIREMENT	53
5.2	RESULT	53
6.	TERMS OF ABBREVIATION	54



Spectrum Research & Testing Lab., Inc.

No.167,Ln. 780, Shan-Tong Rd.,Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.:FCCA16051805
FCC ID : 2AIUHTP001
Page: 5 of 54
Date: Jul. 31, 2017

1. DOCUMENT POLICY AND TEST STATEMENT

1.1 DOCUMENT POLICY

- The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.

1.2 TEST STATEMENT

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- DC power source from battery: DC power source 3V, was used during the test.

1.3 EUT MODIFICATION

- No modification in SRT Lab.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 6 of 54
Date: Jul. 31, 2017

2. DESCRIPTION OF EUT AND TEST MODE**2.1 GENERAL DESCRIPTION OF EUT**

PRODUCT	BLE TPMS
MODEL NO.	TP001
POWER SUPPLY	DC power source battery : DC 3.0V
CABLE	NA
FREQUENCY BAND	2.4 GHz (Bluetooth V4.0 Low Energy, no BR/EDR)
CARRIER FREQUENCY	2.402 GHz ~ 2.480 GHz
NUMBER OF CHANNEL	40
RATED RF OUTPUT POWER	-10.33 dBm
MODULATION TYPE	GFSK
MODE OF OPERATION	Duplex
ANTENNA TYPE	Chip Antenna
ANTENNA GAIN	0.50 dBi
OPERATING TEMPERATURE RANGE	-20 ~ 50°C

NOTE:

The EUT operates in single mode Bluetooth Low Energy, therefore, no BR/EDR tests were performed. For more detailed information, please refer to the EUT's specification or user's manual provided by manufacturer.

2.2 DESCRIPTION OF EUT INTERNAL DEVICE

DEVICE	BRAND / MAKER	MODEL #	FCC ID / DOC	REMARK
N/A	N/A	N/A	N/A	N/A

2.3 EUT OPERATING CONDITION

Tx-1, Tx-2, Tx3 and Standby :

1. EUT was connected to PC via a special IC socket which was provided by the customer.
2. A transmission control software from Texas Instruments was downloaded and installed to the support desktop PC.
3. Set the transmitting power level to the highest allowable setting.
4. Record the radiated transmissions readings.

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 7 of 54 Date: Jul. 31, 2017
--	----------------------	---

Link :

1. 4 EUT samples were pre-programmed to transmit every couple of seconds in order to simulate normal operating conditions.
2. Record the radiated transmissions readings.

2.4 DESCRIPTION OF TEST MODE

	Mode	Frequency
1	CH00 (Tx-1)	2402 MHz
2	CH20 (Tx-2)	2442 MHz
3	CH39 (Tx-3)	2480 MHz
4	Standby	NA
5	Link	NA

NOTE: The axis X, Y and Z we evaluate in chamber, the X axis is worst case.

X axis:

Y axis:

Z axis:

2.5 DESCRIPTION OF SUPPORT UNIT

The EUT was configured by the requirement of ANSI C63.4:2003. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

NO	DEVICE	BRAND	MODEL #	FCC ID/DOC	CABLE
1	PC	ASUS	CM6730	DoC	1.8m unshielded power cable
2	LCD Monitor	Dell	U2410Mb	DoC	1.8m unshielded power cable 1.5m shielded data cable
3	Keyboard	WinTEK	WM530	DoC	1.8m shielded data cable
4	Mouse	WinTEK	WSS30	DoC	1.5m shielded data cable
5	Printer	HP	C8991A	DoC	1.5m unshielded power cable 1.5m shielded data cable
6	USB 2.0 HDD	Terasys	F-12U	DoC	1.5m unshielded data cable.

NOTE: For the actual test configuration, please refer to the photos of testing.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 8 of 54
Date: Jul. 31, 2017

2.6 CHANNEL AND FREQUENCY TABLE

Channel	Frequency	Channel	Frequency
CH 00	2402 MHz	CH 20	2442 MHz
CH 01	2404 MHz	CH 21	2444 MHz
CH 02	2406 MHz	CH 22	2446 MHz
CH 03	2408 MHz	CH 23	2448 MHz
CH 04	2410 MHz	CH 24	2450 MHz
CH 05	2412 MHz	CH 25	2452 MHz
CH 06	2414 MHz	CH 26	2454 MHz
CH 07	2416 MHz	CH 27	2456 MHz
CH 08	2418 MHz	CH 28	2458 MHz
CH 09	2420 MHz	CH 29	2460 MHz
CH 10	2422 MHz	CH 30	2462 MHz
CH 11	2424 MHz	CH 31	2464 MHz
CH 12	2426 MHz	CH 32	2466 MHz
CH 13	2428 MHz	CH 33	2468 MHz
CH 14	2420 MHz	CH 34	2470 MHz
CH 15	2432 MHz	CH 35	2472 MHz
CH 16	2434 MHz	CH 36	2474 MHz
CH 17	2436 MHz	CH 37	2476 MHz
CH 18	2438 MHz	CH 38	2478 MHz
CH 19	2440 MHz	CH 39	2480 MHz

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 9 of 54 Date: Jul. 31, 2017
--	----------------------	---

3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a wireless product. According to the specifications provided by the applicant, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

47 CFR Part 15, Subpart B

ANSI C63.4: 2014

All tests have been performed and recorded as the above standards.

3.1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

STANDARD SECTION	TEST TYPE AND LIMIT RESULTS	RESULTS
15.247(a)(2)	6 dB Bandwidth Limit: minimum of 500 kHz	PASS
15.247(b)	Peak Power Test: Limit: 21 dBm	PASS
15.247(d)	Band Edge Measurement: Limit: 20dB less than the peak value of fundamental frequency	PASS
15.247(e)	Power Density: Limit: 8dBm/3kHz	PASS
15.247(d)	Transmitter Radiated Emissions Limit: Table 15.209	PASS
15.203	Antenna requirement Limit: max. 6dBi	PASS

**Spectrum Research & Testing Lab., Inc.**

No.167,Ln. 780, Shan-Tong Rd.,Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 10 of 54
Date: Jul. 31, 2017

4. TECHNICAL CHARACTERISTICS TEST**4.1 RADIATED EMISSION TEST****4.1.1 LIMIT**

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FREQUENCY (MHz)	FIELD STRENGTH (microvolts/meter)	DISTANCE (m)	FIELD STRENGTH (dBμV/m)
0.009 - 0.490	2400/F(kHz)	300	67.6-20log(kHz)
0.490 - 1.705	24000/F(kHz)	30	87.6-20log(kHz)
1.705 - 30	30	30	30
30 - 88	100	3	40.0
88 - 216	150	3	43.5
216 - 960	200	3	46.0
Above 960	500	3	54.0

NOTE:

1. 30 dBuV (in 30m) = 70 dBuV (in 3m).
2. Transmitters that require Crystal Controlled Oscillators with values below 30 MHz requires the Test Report to show "Spurious Radiated Emissions" results below 30 MHz per FCC Part 15.33(a).

FCC Part15, Subpart C Section 15.249 limit of radiated emission for frequency below1000MHz (Average).

FREQUENCY (MHz)	FIELD STRENGTH OF FUNDAMENTAL (millivolts/meter)	FIELD STRENGTH OF HARMONICS (millivolts/meter)
902 - 928	50	500
2400 - 2483.5	50	500
5725 - 5875	50	500
24000 - 24250	250	2500

NOTE:

1. In the emission tables above , the tighter limit applies at the band edges.
2. Distance refers to the distance between measuring instrument, antenna, and the closest point of any part of the device or system.
3. 50mV = 94dBuV

FCC Part 15, Section15.35 (b) limit of radiated emission for frequency above 1000 MHz

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 11 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.1.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	DEC. 16, 2017 ETC
EMI TEST RECEIVER	20 MHz ~ 1000 MHz	ROHDE & SCHWARZ	ESVS30 / 841977/003	DEC. 02, 2017 ETC
SPECTRUM ANALYZER	9 kHz ~ 7GHz	ROHDE & SCHWARZ	FSP7 / 100289	APR. 12, 2018 ETC
SPECTRUM ANALYZER	9 kHz ~ 40GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC 12, 2017 ETC
LOOP ANTENNA	9 kHz ~ 30 MHz	ETS.LINDGREN	HFH2-Z2/ 860605/002 (1162 1/2)	MAR. 06, 2018 ETC
BI-LOG ANTENNA	30 MHz ~ 2 GHz	SCHAFFNER	CBL6141A / 4181	JUN. 25, 2018 ETC
HORN ANTENNA	1 GHz ~ 18 GHz	EMCO	3115/ 9602-4681	DEC. 21, 2017 ETC
HORN ANTENNA	18 ~ 40 GHz	ETS-LINDGREN	3116 /00032255	JAN. 07, 2018 ETC
PRE-AMPLIFIER	1 GHz ~ 26.5 GHz	AGILENT	8449B/ 3008A01995	DEC. 18, 2017 ETC
OPEN AREA TEST SITE	3 – 10 M MEASUREMENT	SRT	A02 / SRT002	MAR. 09, 2018 SRT
ANECHOIC CHAMBER	3 M MEASUREMENT	SRT	A01 / SRT001	MAY 13, 2018 SRT
RF CABLE	UP TO 18 GHz 1.5 m	JYEBAO	A30A30-L 142 / EQF-0035(001)	DEC. 19, 2017 ETC
RF CABLE	UP TO 18 GHz 3.5 m	JYEBAO	A30A30-L 142 / EQF-0036(002)	DEC. 19, 2017 ETC
K-TYPE CABLE	UP TO 40 GHz 3 m	HUBER+SUHNE R	SF102-46/2*11SK 252 /MY2611/2	MAR. 07, 2018 ETC
K-TYPE CABLE	UP TO 40 GHz, 1 m	HUBER+SUHNE R	SF 102-40/2*11 /23934/2	OCT. 24, 2017 ETC
COAXIAL CABLE	30 M	TIMES	LMR-400 / #30M(L1TCAB014)	MAY. 21, 2018 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943 / 869	NCR
CDN	0.15 MHz ~ 300 MHz	LUTHI	CDN L-801 M2/M3 / 2790	MAY. 24, 2018 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



Spectrum Research & Testing Lab., Inc.

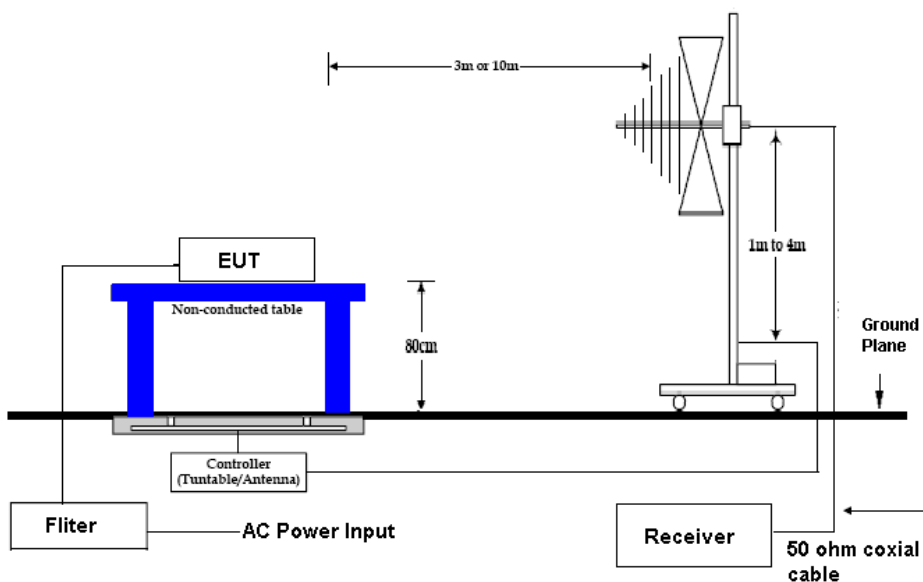
No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

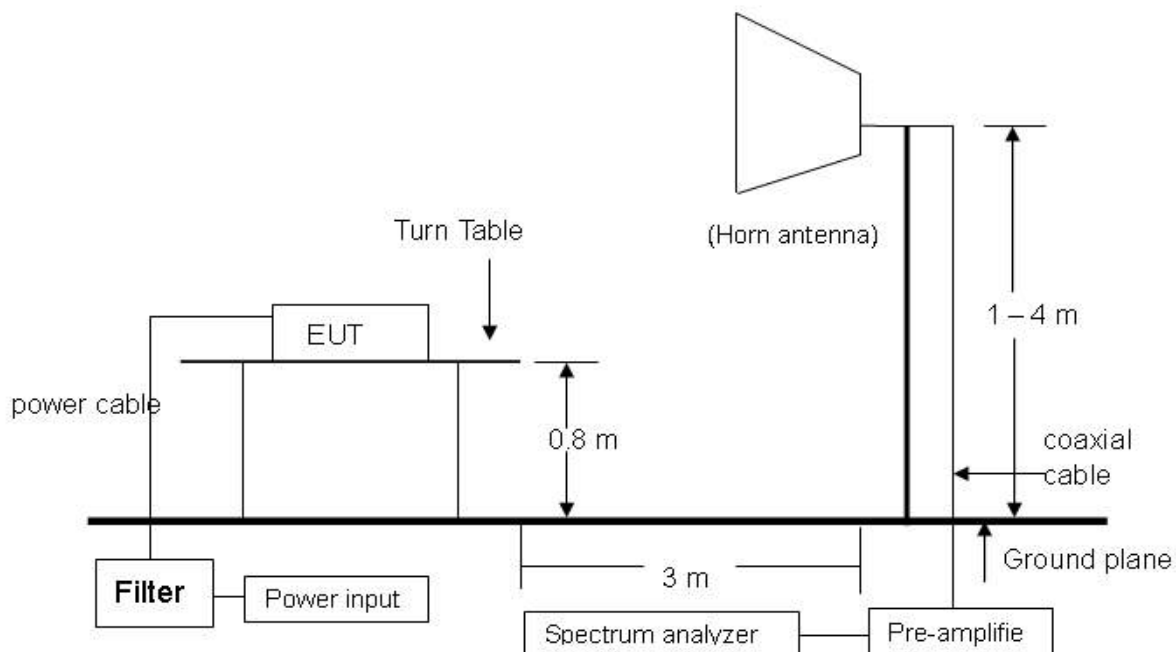
Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 12 of 54
Date: Jul. 31, 2017

4.1.3 TEST SET-UP

30 MHz ~ 1 GHz



Above 1 GHz



NOTE: The EUT system was put on a wooden table with 0.8m heights above a ground plane. For the actual test configuration, please refer to the photos of testing.



Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 13 of 54
Date: Jul. 31, 2017

4.1.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:2003 and CISPR 22:2003.

The measurements were made at an open area test site with a 3 meter measurement distance from the antenna under 1 GHz and a 3m distance from the antenna above 1GHz.

The measured frequencies started from 30 MHz to 1 GHz, and all readings from the receiver were set to quasi-peak values with 120 kHz resolution bandwidth.

At above 1 GHz, the measurements were made at an open area test site with a 3 meter measurement distance from the antenna. All readings from the test receiver were peak or average values with 1 MHz resolution bandwidth settings.

The EUT was operated in all typical methods by users.

The cables connected to EUT and support units were arranged to seek the maximum emission levels for each frequency.

First, we look for the margin or at least 6 higher points by the software, and then we pick the worst data manually.

The procedure is referred on the test procedure of SRT LAB.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 14 of 54
Date: Jul. 31, 2017

4.1.5 TEST RESULT

Temperature:	24 °C	Humidity:	66% RH
Tested By:	Boris Lin	Tested Mode:	Tx-1
Receiver Detector:	Q.P. or AV.	Modulation Type:	GFSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.61	1.56	13.72	46.31	33.55	40	-6.45	125	3.65
76.63	1.71	6.56	52.74	33.08	40	-6.92	202	3.03
117.27	2.04	13.11	45.92	33.30	44	-10.20	284	3.02
196.30	2.56	14.48	42.38	31.98	44	-11.52	239	2.61
306.61	3.31	15.41	46.92	38.58	46	-7.42	156	2.24
317.42	3.40	15.43	45.32	37.01	46	-8.99	125	2.19

Antenna Polarization : Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
49.45	1.58	12.58	45.04	31.17	40	-8.83	45	1.51
77.79	1.72	6.52	51.99	32.30	40	-7.70	143	1.97
136.76	2.22	14.56	43.24	32.33	44	-11.17	231	2.37
196.03	2.56	14.48	41.42	31.02	44	-12.48	176	2.57
306.59	3.31	15.41	42.36	34.02	46	-11.98	40	2.89
516.29	4.68	18.69	38.05	33.15	46	-12.85	74	3.70

NOTE :

1. Measurement uncertainty is 4.20 dB.
2. "": Measurement does not apply for this frequency.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 15 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Tested By:	Boris Lin	Tested Mode:	Tx-2
Receiver Detector:	Q.P. or AV.	Modulation Type:	GFSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.64	1.56	13.72	45.25	32.49	40	-7.51	126	3.58
56.30	1.61	10.22	49.19	33.01	40	-6.99	209	3.34
137.15	2.23	14.62	42.51	31.67	44	-11.83	293	2.86
153.18	2.30	15.23	43.33	33.25	44	-10.25	251	2.74
193.03	2.53	15.74	42.57	33.39	44	-10.11	168	2.02
306.91	3.31	15.41	47.37	39.03	46	-6.97	138	1.91

Antenna Polarization : Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
55.69	1.61	10.55	47.58	31.73	40	-8.28	51	1.72
75.03	1.70	6.60	52.69	33.06	40	-6.94	156	2.26
120.26	2.09	13.50	45.63	33.46	44	-10.04	227	2.37
134.95	2.21	14.44	43.64	32.59	44	-10.91	188	2.44
154.45	2.31	15.24	41.41	31.35	44	-12.15	43	2.74
203.98	2.61	12.65	43.94	31.79	44	-11.71	86	3.65

NOTE :

1. Measurement uncertainty is 4.20 dB.
2. "": Measurement does not apply for this frequency.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 16 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Tested By:	Boris Lin	Tested Mode:	Tx-3
Receiver Detector:	Q.P. or AV.	Modulation Type:	GFSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.63	1.56	13.72	43.49	30.73	40	-9.27	111	3.20
55.59	1.61	10.55	45.87	30.02	40	-9.99	212	3.30
71.15	1.67	6.76	50.46	30.94	40	-9.06	298	2.99
117.35	2.04	13.11	45.37	32.75	44	-10.75	256	2.41
210.39	2.67	12.30	45.79	33.38	44	-10.12	166	2.20
306.79	3.31	15.41	46.48	38.14	46	-7.86	135	1.82

Antenna Polarization : Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.66	1.56	13.72	44.88	32.12	40	-7.88	45	1.72
114.76	2.01	12.72	44.76	31.71	44	-11.79	142	1.99
154.56	2.31	15.24	41.51	31.45	44	-12.05	237	2.30
306.64	3.31	15.41	47.71	39.37	46	-6.63	181	2.23
381.46	3.90	16.31	40.92	33.51	46	-12.49	22	2.59
451.16	4.33	17.81	38.18	32.31	46	-13.69	88	3.58

NOTE :

1. Measurement uncertainty is 4.20 dB.
2. "": Measurement does not apply for this frequency.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 17 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Tested By:	Boris Lin	Tested Mode:	Standby
Receiver Detector:	Q.P. or AV.	Modulation Type:	GFSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.47	1.56	13.72	40.78	28.02	40	-11.98	116	3.31
193.07	2.53	15.74	39.47	30.29	44	-13.21	217	3.10
210.55	2.67	12.30	43.53	31.12	44	-12.38	285	3.09
222.49	2.74	11.88	43.63	30.92	46	-15.08	260	2.51
306.73	3.31	15.41	45.75	37.41	46	-8.59	158	2.34
765.39	5.96	22.12	30.99	31.12	46	-14.88	127	2.08

Antenna Polarization : Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
46.94	1.56	13.72	42.88	30.12	40	-9.88	63	1.51
76.55	1.71	6.56	49.85	30.19	40	-9.81	154	1.99
197.15	2.56	14.06	40.85	30.04	44	-13.46	243	2.28
306.62	3.31	15.41	39.81	31.47	46	-14.53	172	2.72
463.72	4.39	17.98	37.61	31.91	46	-14.09	24	2.67
536.50	4.79	18.93	36.14	31.58	46	-14.42	88	3.32

NOTE :

1. Measurement uncertainty is 4.20 dB.
2. "": Measurement does not apply for this frequency.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 18 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Tested By:	Boris Lin	Tested Mode:	Link
Receiver Detector:	Q.P. or AV.	Modulation Type:	GFSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
55.23	1.61	10.55	28.89	13.04	40	-26.97	131	3.34
356.11	3.70	15.66	26.67	18.59	46	-27.41	206	3.09
498.56	4.58	18.47	32.31	27.11	46	-18.89	290	2.74
499.11	4.58	18.49	24.45	19.27	46	-26.73	242	2.32
515.22	4.67	18.68	35.59	30.67	46	-15.33	154	2.19
740.12	5.83	21.96	25.84	25.61	46	-20.39	125	1.69

Antenna Polarization : Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
32.11	1.33	19.20	25.46	17.91	40	-22.09	66	1.70
80.44	1.73	6.40	38.03	18.24	40	-21.76	151	1.80
459.97	4.37	17.93	28.47	22.71	46	-23.29	250	2.55
499.39	4.58	18.49	30.74	25.56	46	-20.44	191	2.55
687.93	5.53	21.57	24.33	23.25	46	-22.75	36	3.01
786.69	6.05	22.29	24.78	25.24	46	-20.76	68	3.27

NOTE :

1. Measurement uncertainty is 4.20 dB.
2. "": Measurement does not apply for this frequency.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 19 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-1
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2881.60	-31.43	29.87	41.87	32.74	40.31	31.18	74	54	-33.69	-22.82	112	3.39
3356.04	-30.85	30.66	40.73	31.66	40.54	31.47	74	54	-33.46	-22.53	211	3.19
3792.41	-30.44	31.68	39.63	30.28	40.87	31.52	74	54	-33.13	-22.48	303	2.92
4306.61	-29.97	32.18	39.54	29.92	41.75	32.13	74	54	-32.25	-21.87	262	2.71
5301.75	-29.12	33.76	37.83	28.33	42.47	32.97	74	54	-31.53	-21.03	163	2.09
5926.16	-28.95	33.91	38.05	28.39	43.02	33.36	74	54	-30.98	-20.64	135	1.69

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2892.49	-31.42	29.91	41.75	31.88	40.24	30.37	74	54	-33.76	-23.63	45	1.70
3342.26	-30.87	30.64	40.90	31.43	40.67	31.20	74	54	-33.33	-22.80	155	1.97
3806.03	-30.43	31.72	39.87	29.92	41.16	31.21	74	54	-32.84	-22.79	228	2.53
4291.14	-29.99	32.18	39.82	30.01	42.02	32.21	74	54	-31.98	-21.79	181	2.49
5351.25	-29.11	33.82	37.86	28.36	42.57	33.07	74	54	-31.43	-20.93	22	2.77
5862.42	-28.97	33.93	37.35	28.10	42.31	33.06	74	54	-31.69	-20.94	75	3.57

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.: Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F): The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORTReference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 20 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-1(Fundamental)
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2402.00 (F)	-31.72	28.36	80.58	71.38	77.22	68.02	114	94	-36.78	-25.98	127	3.68
4804.00	-29.39	32.89	38.88	29.53	42.38	33.03	74	54	-31.62	-20.97	217	3.26
7206.00	-28.43	35.64	35.07	25.45	42.28	32.66	74	54	-31.72	-21.34	288	3.20
9608.00	-27.79	37.79	34.27	24.60	44.26	34.59	74	54	-29.74	-19.41	262	2.25
12010.00	-26.54	39.19	32.82	23.26	45.48	35.92	74	54	-28.52	-18.08	166	2.09
14412.00	-24.30	41.91	28.83	19.28	46.45	36.90	74	54	-27.55	-17.10	136	1.96

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2402.00 (F)	-31.72	28.36	78.35	68.97	74.99	65.61	114	94	-39.01	-28.39	58	1.45
4804.00	-29.39	32.89	38.25	29.25	41.75	32.75	74	54	-32.25	-21.25	140	2.27
7206.00	-28.43	35.64	35.48	25.70	42.69	32.91	74	54	-31.31	-21.09	229	2.27
9608.00	-27.79	37.79	34.32	24.75	44.31	34.74	74	54	-29.69	-19.26	172	2.25
12010.00	-26.54	39.19	32.22	22.96	44.88	35.62	74	54	-29.12	-18.38	35	2.68
14412.00	-24.30	41.91	28.94	19.02	46.56	36.64	74	54	-27.44	-17.36	65	3.23

NOTE:

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167,Ln. 780, Shan-Tong Rd.,Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 21 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-2
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	May. 25, 2016

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2902.57	-31.42	29.95	42.91	33.66	41.44	32.19	74	54	-32.56	-21.81	124	3.38
3407.98	-30.77	30.71	41.23	31.36	41.16	31.29	74	54	-32.84	-22.71	198	3.37
3846.78	-30.40	31.84	39.24	29.82	40.68	31.26	74	54	-33.32	-22.74	292	3.03
4357.11	-29.92	32.16	39.61	30.56	41.85	32.80	74	54	-32.15	-21.20	249	2.50
5432.43	-29.11	33.92	38.59	29.24	43.40	34.05	74	54	-30.60	-19.95	146	2.15
5942.97	-28.94	33.91	37.11	27.35	42.08	32.32	74	54	-31.92	-21.68	129	1.69

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2941.24	-31.39	30.09	42.70	32.86	41.39	31.55	74	54	-32.61	-22.45	65	1.72
3397.49	-30.79	30.70	40.69	31.39	40.60	31.30	74	54	-33.40	-22.70	157	2.16
3882.80	-30.37	31.95	39.63	29.89	41.20	31.46	74	54	-32.80	-22.54	232	2.40
4376.31	-29.90	32.15	39.60	30.08	41.85	32.33	74	54	-32.15	-21.67	186	2.60
5366.01	-29.11	33.84	37.51	27.92	42.24	32.65	74	54	-31.76	-21.35	39	2.74
5881.74	-28.96	33.92	37.63	27.71	42.59	32.67	74	54	-31.41	-21.33	88	3.60

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORTReference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 22 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-2(Fundamental)
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2442.00 (F)	-31.69	28.42	78.03	69.01	74.76	65.74	114	94	-39.24	-28.26	118	3.37
4884.00	-29.29	33.10	38.29	28.50	42.09	32.30	74	54	-31.91	-21.70	213	3.35
7326.00	-28.35	35.95	35.39	25.39	42.99	32.99	74	54	-31.01	-21.01	303	3.17
9768.00	-27.75	37.91	35.00	25.14	45.16	35.30	74	54	-28.84	-18.70	257	2.34
12210.00	-26.09	39.07	31.19	21.44	44.18	34.43	74	54	-29.82	-19.57	159	2.43
14652.00	-24.32	41.42	26.36	17.30	43.46	34.40	74	54	-30.54	-19.60	148	2.03

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dB μ V)		Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2442.00 (F)	-31.69	28.42	74.84	65.38	71.57	62.11	114	94	-42.43	-31.89	68	1.76
4884.00	-29.29	33.10	37.32	28.32	41.12	32.12	74	54	-32.88	-21.88	140	1.96
7326.00	-28.35	35.95	34.42	24.94	42.02	32.54	74	54	-31.98	-21.46	236	2.12
9768.00	-27.75	37.91	34.02	24.67	44.18	34.83	74	54	-29.82	-19.17	191	2.36
12210.00	-26.09	39.07	30.96	21.83	43.95	34.82	74	54	-30.05	-19.18	26	2.79
14652.00	-24.32	41.42	27.03	17.51	44.13	34.61	74	54	-29.87	-19.39	79	3.57

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.: Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F): The field strength of fundamental frequency.



Spectrum Research & Testing Lab., Inc.

No.167,Ln. 780, Shan-Tong Rd.,Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 23 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-3
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2977.12	-31.37	30.22	41.92	32.45	40.76	31.29	74	54	-33.24	-22.71	119	3.36
3496.49	-30.65	30.80	41.05	31.22	41.20	31.37	74	54	-32.80	-22.63	212	3.10
3992.18	-30.30	32.28	39.88	30.25	41.86	32.23	74	54	-32.14	-21.77	293	2.76
4486.30	-29.78	32.11	39.83	30.29	42.15	32.61	74	54	-31.85	-21.39	256	2.62
5511.97	-29.10	34.00	37.13	27.62	42.03	32.52	74	54	-31.97	-21.48	155	2.47
5987.20	-28.92	33.90	37.46	28.28	42.44	33.26	74	54	-31.56	-20.74	128	1.89

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2966.78	-31.38	30.18	41.44	32.40	40.24	31.20	74	54	-33.76	-22.80	47	1.56
3462.84	-30.69	30.76	40.85	31.83	40.92	31.90	74	54	-33.08	-22.10	156	1.84
3962.41	-30.32	32.19	40.33	30.66	42.20	32.53	74	54	-31.80	-21.47	242	2.49
4457.01	-29.81	32.12	40.05	30.48	42.35	32.78	74	54	-31.65	-21.22	178	2.27
5452.72	-29.10	33.94	37.82	28.34	42.66	33.18	74	54	-31.34	-20.82	23	2.63
5952.07	-28.94	33.91	37.02	27.64	41.99	32.61	74	54	-32.01	-21.39	79	3.33

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 24 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx-3(Fundamental)
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2480.00 (F)	-31.66	28.47	78.06	68.84	74.87	65.65	114	94	-39.13	-28.35	134	3.45
4960.00	-29.20	33.30	37.31	27.65	41.41	31.75	74	54	-32.59	-22.25	218	3.25
7440.00	-28.28	36.24	35.23	25.38	43.20	33.35	74	54	-30.80	-20.65	307	2.74
9920.00	-27.71	38.04	34.44	24.97	44.77	35.30	74	54	-29.23	-18.70	248	2.31
12400.00	-25.66	38.96	31.56	21.89	44.86	35.19	74	54	-29.14	-18.81	148	2.09
14880.00	-24.35	40.56	28.29	19.27	44.50	35.48	74	54	-29.50	-18.52	130	2.13

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2480.00 (F)	-31.66	28.47	79.05	69.62	75.86	66.43	114	94	-38.14	-27.57	66	1.74
4960.00	-29.20	33.30	38.41	28.79	42.51	32.89	74	54	-31.49	-21.11	147	2.19
7440.00	-28.28	36.24	35.11	25.14	43.08	33.11	74	54	-30.92	-20.89	233	2.31
9920.00	-27.71	38.04	33.54	24.52	43.87	34.85	74	54	-30.13	-19.15	175	2.29
12400.00	-25.66	38.96	31.44	21.48	44.74	34.78	74	54	-29.26	-19.22	26	2.81
14880.00	-24.35	40.56	28.35	18.78	44.56	34.99	74	54	-29.44	-19.01	90	3.23

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.: Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F): The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 25 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Standby
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3472.74	-30.68	30.77	40.41	30.60	40.50	30.69	74	54	-33.50	-23.31	121	3.31
4011.70	-30.28	32.30	39.02	29.76	41.04	31.78	74	54	-32.96	-22.22	200	2.95
4491.82	-29.78	32.10	38.70	28.93	41.02	31.25	74	54	-32.98	-22.75	295	3.15
4976.21	-29.18	33.34	37.53	27.85	41.69	32.01	74	54	-32.31	-21.99	237	2.39
5481.86	-29.10	33.98	37.17	28.03	42.05	32.91	74	54	-31.95	-21.09	168	2.31
5957.53	-28.94	33.91	36.25	27.08	41.22	32.05	74	54	-32.78	-21.95	140	2.10

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3477.97	-30.67	30.78	40.44	31.16	40.54	31.26	74	54	-33.46	-22.74	43	1.59
3997.86	-30.29	32.29	39.37	29.39	41.37	31.39	74	54	-32.63	-22.61	134	1.83
4522.18	-29.74	32.16	38.80	28.82	41.21	31.23	74	54	-32.79	-22.77	242	2.46
5002.08	-29.15	33.40	39.12	29.36	43.37	33.61	74	54	-30.63	-20.39	192	2.42
5471.22	-29.10	33.97	37.07	27.30	41.93	32.16	74	54	-32.07	-21.84	24	2.75
5981.25	-28.93	33.90	38.09	28.99	43.07	33.97	74	54	-30.93	-20.03	71	3.71

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.: Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F): The field strength of fundamental frequency.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 26 of 54
Date: Jul. 31, 2017

Temperature:	24 °C	Humidity:	66% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Link
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2997.90	-31.36	30.29	42.49	33.41	41.42	32.34	74	54	-32.58	-21.66	115	3.48
4021.09	-30.27	32.29	40.29	30.43	42.31	32.45	74	54	-31.69	-21.55	204	3.05
4501.30	-29.77	32.10	39.42	30.10	41.75	32.43	74	54	-32.25	-21.57	306	3.20
4996.31	-29.15	33.39	37.91	27.95	42.14	32.18	74	54	-31.86	-21.82	247	2.73
5487.37	-29.10	33.98	37.37	28.31	42.25	33.19	74	54	-31.75	-20.81	166	2.26
5987.99	-28.92	33.90	36.90	27.49	41.88	32.47	74	54	-32.12	-21.53	142	1.98

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3476.50	-30.67	30.78	41.23	31.98	41.33	32.08	74	54	-32.67	-21.92	56	1.76
3987.03	-30.30	32.26	39.92	30.73	41.88	32.69	74	54	-32.12	-21.31	138	2.03
4491.78	-29.78	32.10	39.26	29.53	41.58	31.85	74	54	-32.42	-22.15	248	2.48
5001.06	-29.15	33.40	38.43	29.27	42.68	33.52	74	54	-31.32	-20.48	186	2.69
5481.91	-29.10	33.98	37.24	27.70	42.12	32.58	74	54	-31.88	-21.42	29	2.87
5982.91	-28.93	33.90	36.78	27.29	41.76	32.27	74	54	-32.24	-21.73	84	3.72

NOTE :

1. Measurement uncertainty is 3.85 dB.
2. "": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emission Level = Reading Value + Ant. Factor + Correct Factor (incl.: Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F): The field strength of fundamental frequency.

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 27 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.2 CONDUCTED EMISSION TEST

4.2.1 LIMIT

Frequency (MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 TEST EQUIPMENT

The following test equipment was used for the test:

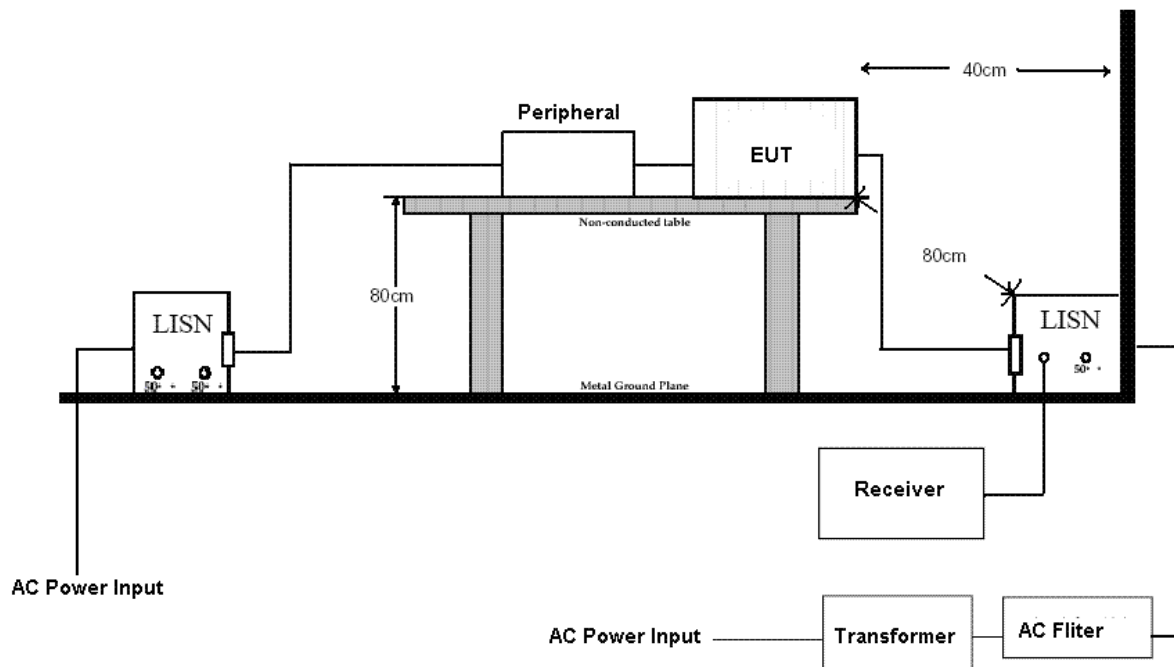
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	JAN. 06, 2018 ETC
EMI TEST RECEIVER	9 kHz ~ 30 MHz	ROHDE & SCHWARZ	ESHS30 / 826003/008	JAN. 12, 2018 ETC
LISN	50 μH, 50 ohm	FCC	FCC-LISN-50-25-2 / 01017	MAY. 27, 2018 ETC
LISN	50 μH, 50 ohm	SOLAR	9252-50-R-24-BNC/ 951315	NOV. 05, 2017 ETC
LISN	50 μH, 50 ohm	SCHWARZBECK	NSLK 8127/ 8127-808	DEC. 17, 2017 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	11593A/ L1TEQU005	NOV. 22, 2017 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	B00-CD-357/ L1TEQU009	MAY. 28, 2018 ETC
COAXIAL CABLE	5 m	HUBER+SUHNER	RG214/U / #5M(L1TCAB013)	MAY. 10, 2018 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943 / 771	NCR
GROUND PLANE	2 m (H) x 3 m (W)	SRT	N/A	NCR
GROUND PLANE	2.5 m (H) x 3 m (W)	SRT	N/A	NCR
THERMO-HYGRO	15 – 40 °C, 0- 100% RH	TOP	20-A / 6644	DEC. 23, 2018 ETC

NOTE:

The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



4.2.3 TEST SETUP



NOTE :

1. The EUT was put on a wooden table with 0.8m heights above ground plane, and 0.4m away from reference ground plane (> 2mx2m).
2. For the actual test configuration, please refer to the photos of testing.

4.2.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:2003 and CISPR22:2003. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm/50 μ H as specified. All readings were quasi-peak and average values with 10 kHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. Both lines of the power mains of EUT were measured and the cables connected to EUT and support units were moved to find the maximum emission levels for each frequency. First, find the margin or higher points at least 6 points by software, then use manual to find the maximum data. The procedure is referred on the test procedure of SRT LAB.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
 Report No.: FCCA16051805
 FCC ID : 2AIUHTP001
 Page: 29 of 54
 Date: Jul. 31, 2017

4.2.5 TEST RESULT

Temperature:	25 °C	Humidity:	50% RH
Frequency Range:	0.15 – 30 MHz	Tested Mode:	TX-1
Receiver Detector:	Q.P. and AV.	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.14	53.47	44.70	53.33	44.56	66.00	56.00	-12.67	-11.44
0.153	-0.14	45.23	33.43	45.09	33.29	65.84	55.84	-20.75	-22.55
2.705	0.02	23.82	17.61	23.84	17.63	56.00	46.00	-32.16	-28.37
12.998	0.39	32.48	22.11	32.87	22.50	60.00	50.00	-27.13	-27.50
13.658	0.42	29.48	22.78	29.90	23.20	60.00	50.00	-30.10	-26.80
27.782	0.89	38.59	28.17	39.48	29.06	60.00	50.00	-20.52	-20.94

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.01	54.03	44.70	54.02	44.69	66.00	56.00	-11.98	-11.31
0.153	-0.01	45.25	33.83	45.24	33.82	65.84	55.84	-20.60	-22.02
2.487	0.17	25.59	21.96	25.76	22.13	56.00	46.00	-30.24	-23.87
13.810	0.49	33.24	25.09	33.73	25.58	60.00	50.00	-26.27	-24.42
14.165	0.50	31.28	27.23	31.78	27.73	60.00	50.00	-28.22	-22.27
17.675	0.56	36.30	24.22	36.86	24.78	60.00	50.00	-23.14	-25.22

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong
Rd., Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 30 of 54
Date: Jul. 31, 2017

Temperature:	25 °C	Humidity:	50% RH
Frequency Range:	0.15 – 30 MHz	Tested Mode:	TX-2
Receiver Detector:	Q.P. and AV.	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.14	54.60	45.59	54.46	45.45	66.00	56.00	-11.54	-10.55
0.153	-0.14	45.23	34.23	45.09	34.09	65.84	55.84	-20.75	-21.75
2.705	0.02	24.18	21.31	24.20	21.33	56.00	46.00	-31.80	-24.67
13.790	0.42	35.74	31.49	36.16	31.91	60.00	50.00	-23.84	-18.09
14.176	0.43	32.44	23.86	32.87	24.29	60.00	50.00	-27.13	-25.71
27.771	0.89	41.76	26.62	42.65	27.51	60.00	50.00	-17.35	-22.49

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.01	54.78	45.42	54.77	45.41	66.00	56.00	-11.23	-10.59
0.153	-0.01	45.21	34.21	45.20	34.20	65.84	55.84	-20.64	-21.64
2.635	0.18	27.16	24.23	27.34	24.41	56.00	46.00	-28.66	-21.59
13.790	0.49	36.20	28.54	36.69	29.03	60.00	50.00	-23.31	-20.97
14.176	0.50	32.96	24.25	33.46	24.75	60.00	50.00	-26.54	-25.25
27.771	0.78	42.51	28.46	43.29	29.24	60.00	50.00	-16.71	-20.76

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 31 of 54
Date: Jul. 31, 2017

Temperature:	25 °C	Humidity:	50% RH
Frequency Range:	0.15 – 30 MHz	Tested Mode:	TX-3
Receiver Detector:	Q.P. and AV.	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.14	55.04	46.24	54.90	46.10	66.00	56.00	-11.10	-9.90
0.153	-0.14	45.11	34.52	44.97	34.38	65.84	55.84	-20.87	-21.46
2.705	0.02	22.90	18.65	22.92	18.67	56.00	46.00	-33.08	-27.33
13.810	0.42	32.78	24.57	33.20	24.99	60.00	50.00	-26.80	-25.01
14.125	0.43	28.05	21.78	28.48	22.21	60.00	50.00	-31.52	-27.79
22.718	0.71	38.20	23.13	38.91	23.84	60.00	50.00	-21.09	-26.16

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.01	54.92	45.71	54.91	45.70	66.00	56.00	-11.09	-10.30
0.153	-0.01	45.19	34.46	45.18	34.45	65.84	55.84	-20.66	-21.39
2.635	0.18	26.69	23.48	26.87	23.66	56.00	46.00	-29.13	-22.34
14.033	0.50	33.50	25.73	34.00	26.23	60.00	50.00	-26.00	-23.77
14.176	0.50	32.90	24.01	33.40	24.51	60.00	50.00	-26.60	-25.49
27.761	0.78	38.17	20.35	38.95	21.13	60.00	50.00	-21.05	-28.87

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong
Rd., Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 32 of 54
Date: Jul. 31, 2017

Temperature:	25 °C	Humidity:	50% RH
Frequency Range:	0.15 – 30 MHz	Tested Mode:	Standby
Receiver Detector:	Q.P. and AV.	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 12, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.14	55.28	46.65	55.14	46.51	66.00	56.00	-10.86	-9.49
0.153	-0.14	45.47	35.01	45.33	34.87	65.84	55.84	-20.51	-20.97
2.715	0.02	23.70	15.78	23.72	15.80	56.00	46.00	-32.28	-30.20
12.998	0.39	32.24	22.20	32.63	22.59	60.00	50.00	-27.37	-27.41
13.881	0.42	34.05	26.37	34.47	26.79	60.00	50.00	-25.53	-23.21
22.718	0.71	38.16	21.65	38.87	22.36	60.00	50.00	-21.13	-27.64

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	-0.01	54.88	45.48	54.87	45.47	66.00	56.00	-11.13	-10.53
0.153	-0.01	44.73	33.97	44.72	33.96	65.84	55.84	-21.12	-21.88
2.635	0.18	26.55	22.94	26.73	23.12	56.00	46.00	-29.27	-22.88
13.881	0.49	31.57	23.48	32.06	23.97	60.00	50.00	-27.94	-26.03
14.176	0.50	30.19	21.97	30.69	22.47	60.00	50.00	-29.31	-27.53
22.718	0.66	39.53	24.06	40.19	24.72	60.00	50.00	-19.81	-25.28

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 33 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.3 6dB Bandwidth

4.3.1 LIMIT

FCC Part15, Subpart C Section 15.247 (a)(2). The minimum 6dB bandwidth shall be at least 500 kHz.

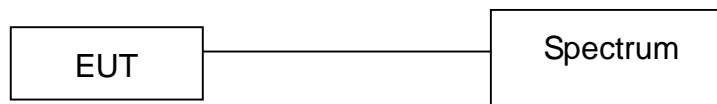
4.3.2 TEST EQUIPMENT

The following test equipment was used during the test :

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM ANALYZER	9 kHz ~ 40 GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC. 12, 2017 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.3.4 TEST PROCEDURE

1. The EUT was operated in hopping mode or any specific channel.
2. The test result was screen captured from the spectrum.

4.3.5 EUT OPERATING CONDITION

1. Set the EUT under continuous transmission condition.
2. The EUT was set to the highest available power level.

**Spectrum Research & Testing Lab., Inc.**

No.167,Ln. 780, Shan-Tong
Rd.,Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 34 of 54
Date: Jul. 31, 2017

4.3.6 TEST RESULT

Temperature: 24 °C

Humidity: 62% RH

Spectrum Detector: PK

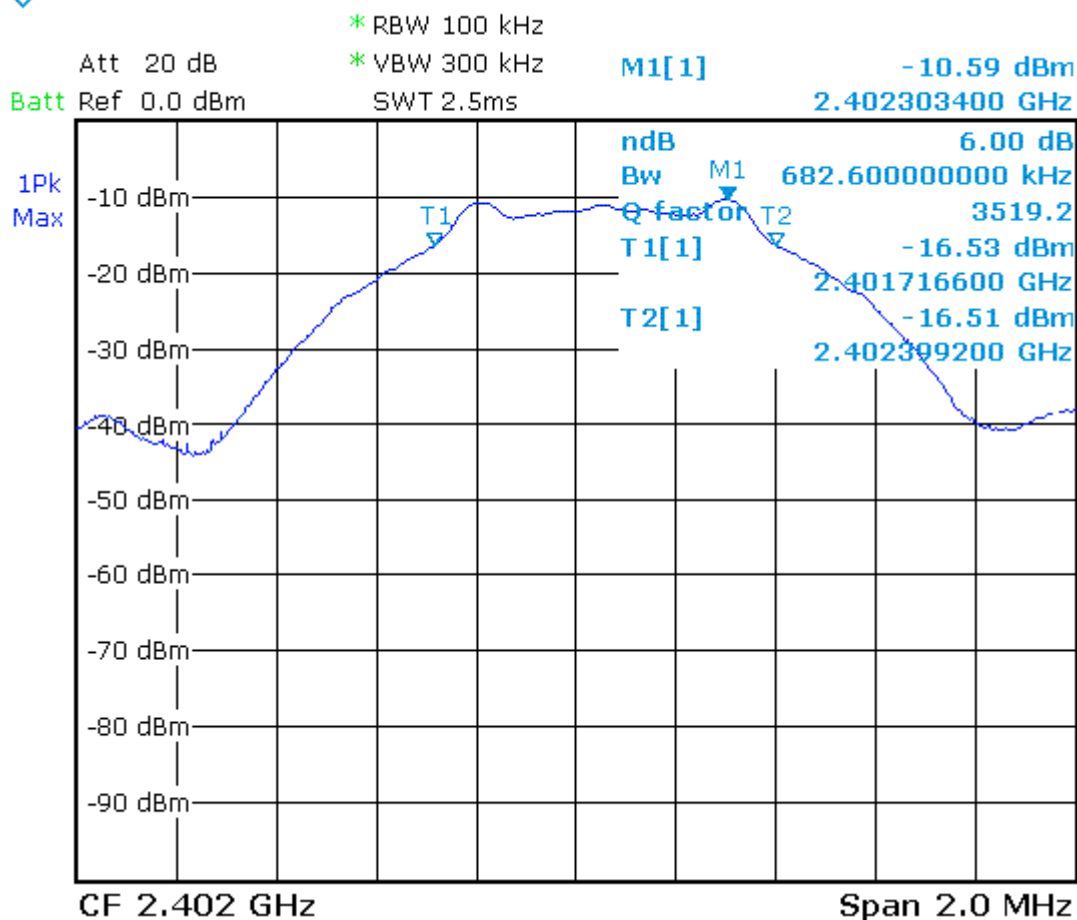
Tested by: Boris Lin

Test Result: PASS

Tested Date: Jul. 13, 2017

Channel Number	Channel Frequency (MHz)	6dB Down Bandwidth (KHz)	Limit	Pass/Fail
CH00	2402	682.6	>500	Pass
CH20	2442	678.6	>500	Pass
CH39	2480	678.6	>500	Pass

CH00 :





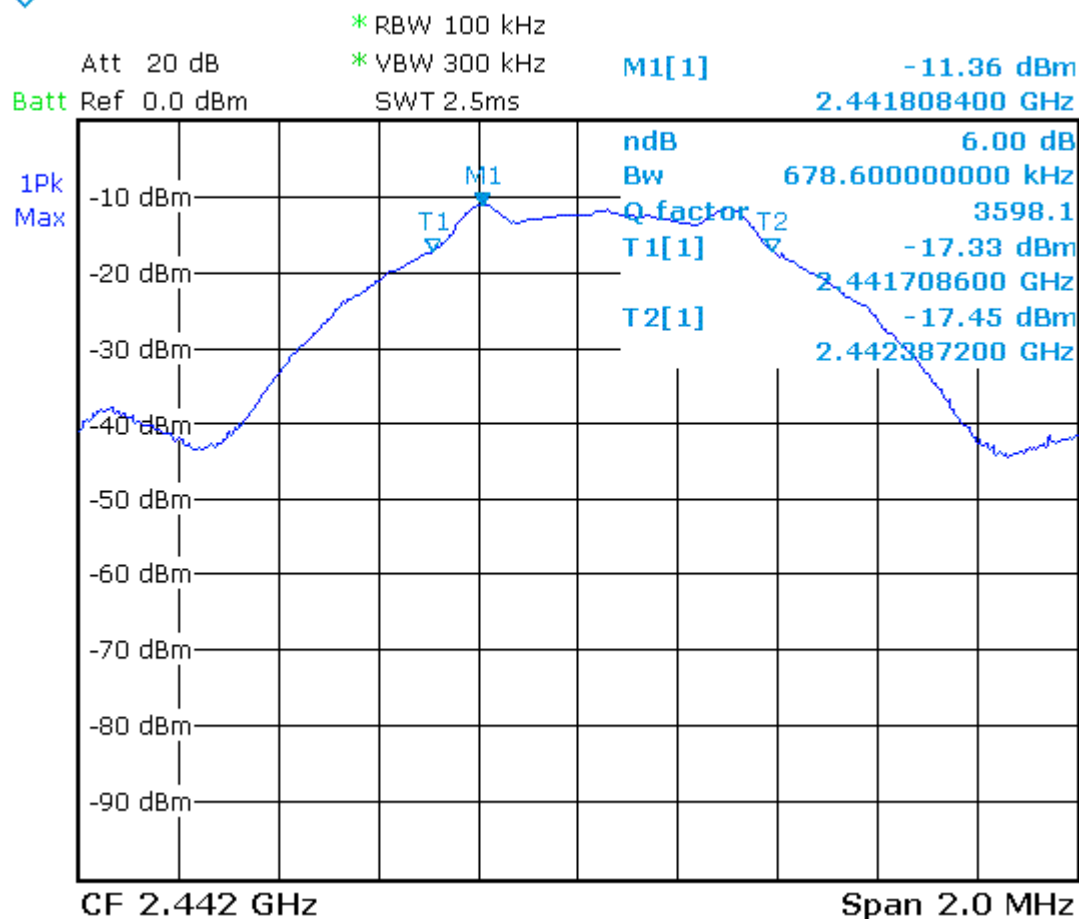
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 35 of 54
Date: Jul. 31, 2017

CH20 :





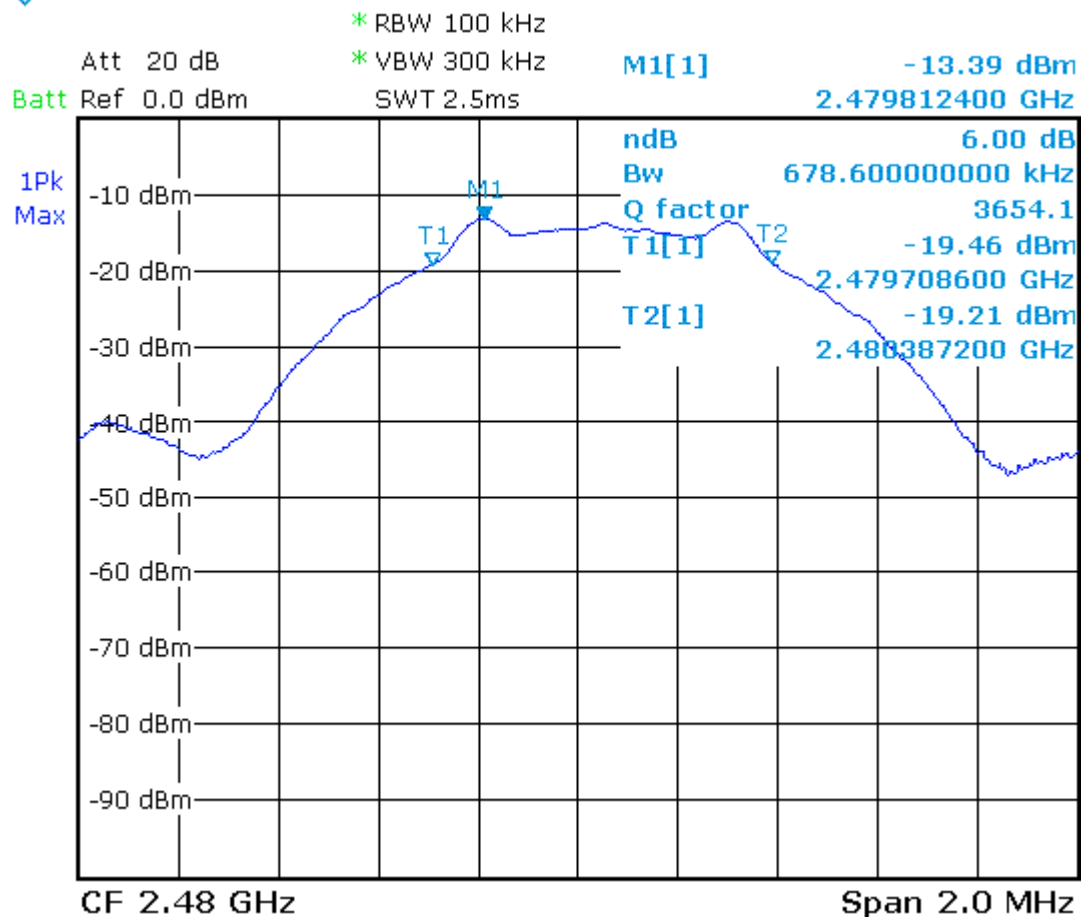
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 36 of 54
Date: Jul. 31, 2017

CH39 :



 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 37 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.4 PEAK POWER TEST

4.4.1 LIMIT

FCC Part15, Subpart C Section 15.247(b).

Frequency Range (MHz)	Limit(W)				
	Quantity of Hopping Channel	50	25	15	75
902-928		1(30 dBm)	0.125(21 dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30 dBm)
5725-5850		NA	NA	NA	1(30 dBm)

4.4.2 TEST EQUIPMENT

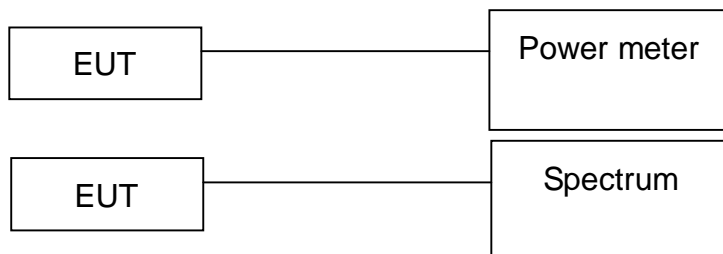
The following test equipment was used during the test :

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
SPECTRUM ANALYZER	9 kHz ~ 40 GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC. 12, 2017 ETC
POWER SENSOR	100 kHz ~ 18 GHz	BOONTON	51015(5E) / 32966	MAR. 08, 2018 ETC
POWER METER	10 kHz ~ 100 GHz	BOONTON	4232A / 115702	NOV. 04, 2017 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



4.4.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.4.4 TEST PROCEDURE

3. The EUT was operated in hopping mode or controlled channels.
4. The test result was screen captured from the spectrum.
5. Data were recorded from the power meter.

4.4.5 EUT OPERATING CONDITION

1. Set the EUT under frequency hopping transmission condition.
2. The EUT was set to the highest available power level.

**Spectrum Research & Testing Lab., Inc.**

No.167,Ln. 780, Shan-Tong Rd.,Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 39 of 54
Date: Jul. 31, 2017

4.4.6 TEST RESULT

Temperature: 24 °C

Humidity: 62% RH

Spectrum Detector: PK

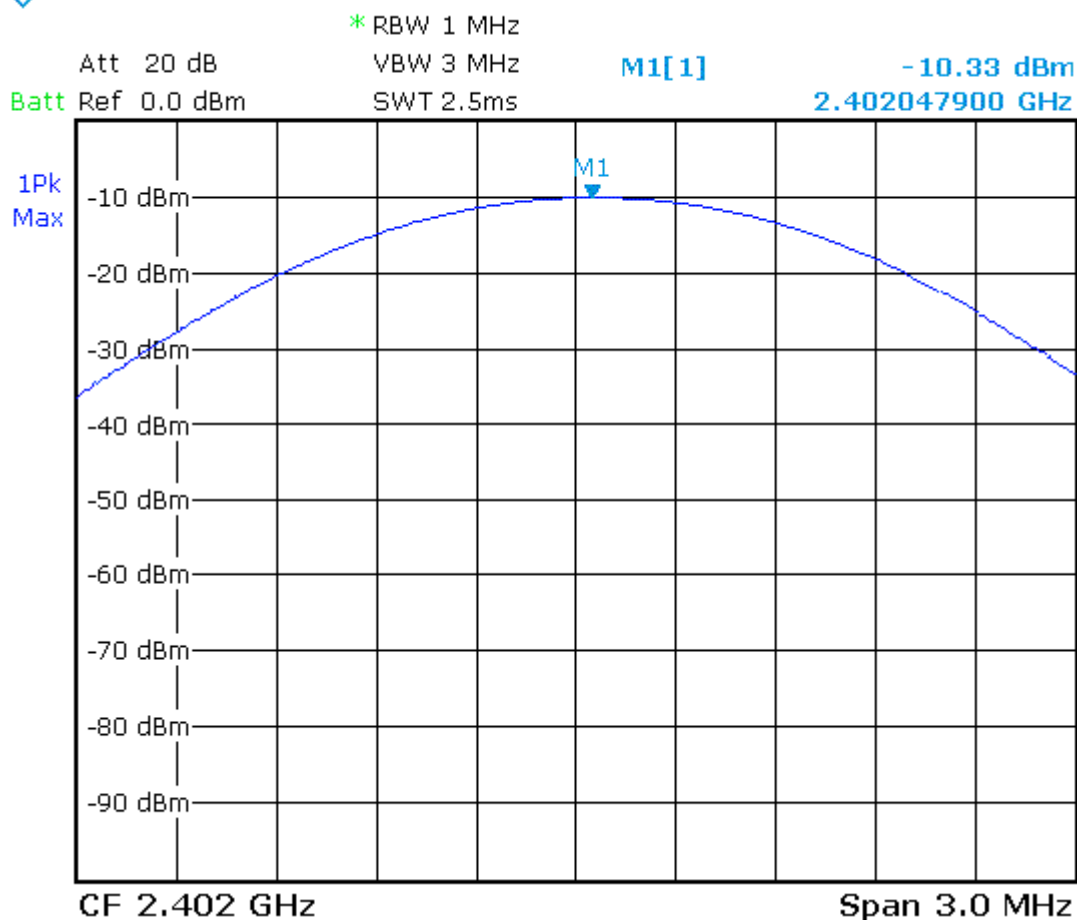
Tested by: Boris Lin

Test Result: PASS

Tested Date: Jul. 13, 2017

Channel Number	Channel Frequency (MHz)	Peak Output Power (dBm)	Peak Power Limit (dBm)
CH00	2402	-10.33	21
CH20	2442	-11.02	21
CH39	2480	-13.13	21

CH00 :





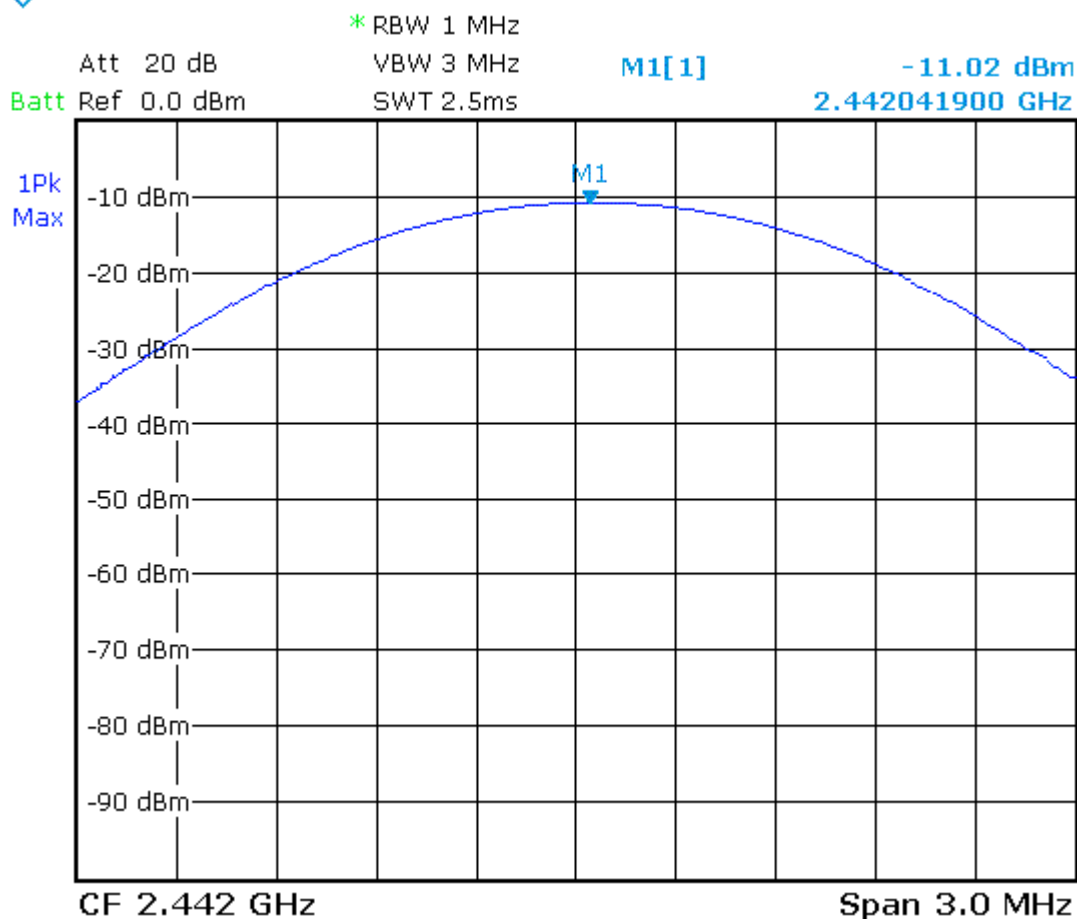
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 40 of 54
Date: Jul. 31, 2017

CH20 :





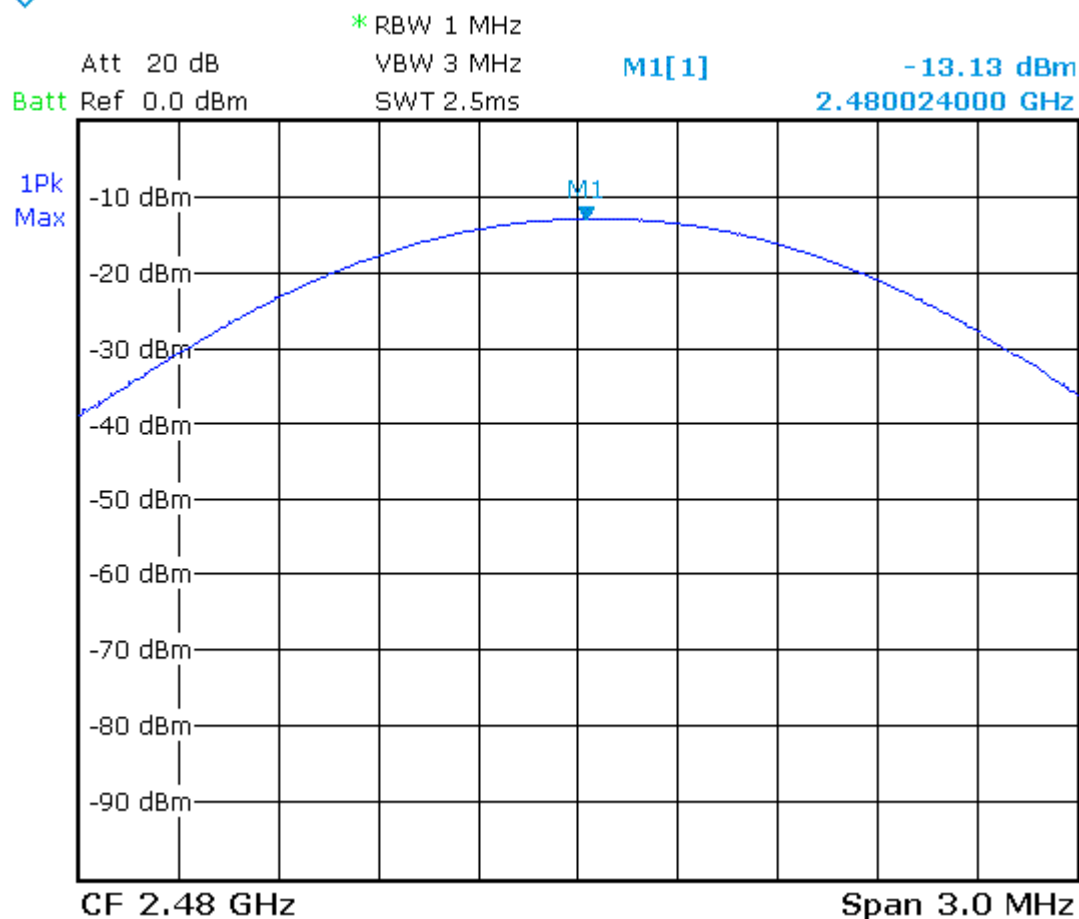
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 41 of 54
Date: Jul. 31, 2017

CH39 :



**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 42 of 54
Date: Jul. 31, 2017

4.5 BAND EDGE TEST**4.5.1 LIMIT**

FCC Part15, Subpart C Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

OPERATING FREQUENCY RANGE (MHz)	SPURIOUS EMISSION FREQUENCY (MHz)	LIMIT	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902 - 928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400 - 2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725 - 5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 43 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.5.2 TEST EQUIPMENT

The following test equipment was used during the test:

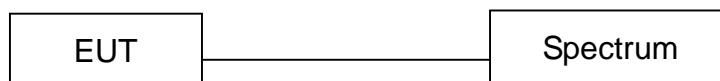
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM ANALYZER	9 kHz ~ 7GHz	ROHDE & SCHWARZ	FSP7 / 100289	APR. 12, 2018 ETC
SPECTRUM ANALYZER	9 kHz ~ 40GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC 12, 2017 ETC
HORN ANTENNA	1 GHz ~ 18 GHz	EMCO	3115/ 9602-4681	DEC. 21, 2017 ETC
PRE-AMPLIFIER	1 GHz ~ 26.5 GHz	AGILENT	8449B/ 3008A01995	DEC. 18, 2017 ETC
OPEN AREA TEST SITE	3 – 10 M MEASUREMENT	SRT	A02 / SRT002	MAR. 09, 2018 SRT
ANECHOIC CHAMBER	3 M MEASUREMENT	SRT	A01 / SRT001	MAY 13, 2018 SRT
RF CABLE	UP TO 18 GHz 1.5 m	JYEBAO	A30A30-L 142 / EQF-0035(001)	DEC. 19, 2017 ETC
RF CABLE	UP TO 18 GHz 3.5 m	JYEBAO	A30A30-L 142 / EQF-0036(002)	DEC. 19, 2017 ETC
K-TYPE CABLE	UP TO 40 GHz 3 m	HUBER+SUHNE R	SF102-46/2*11SK 252 /MY2611/2	MAR. 07, 2018 ETC
K-TYPE CABLE	UP TO 40 GHz, 1 m	HUBER+SUHNE R	SF 102-40/2*11 /23934/2	OCT. 24, 2017 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943/ 869	NCR

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



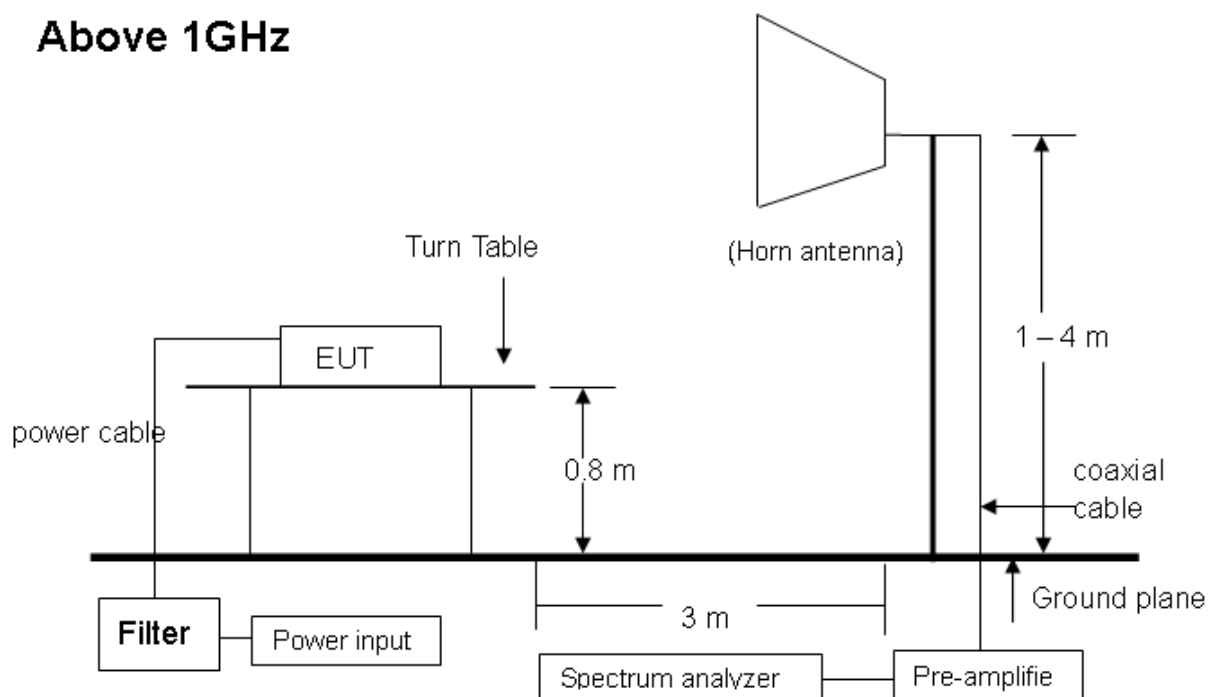
4.5.3 TEST SETUP

FOR RF CONDUCTED TEST (DBC)



The EUT was connected to a spectrum through a 50Ω RF cable.

Above 1GHz



NOTE: The EUT system was put on a wooden table with 0.8m heights above a ground plane. For the actual test configuration, please refer to the photos of testing.



Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 45 of 54
Date: Jul. 31, 2017

4.5.4 TEST PROCEDURE

1. The EUT was operated in hopping mode or controlled channels.

The test result was screen captured from the spectrum.

2. The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22.

The measurements were made at an open area test site with 3 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.5.5 EUT OPERATING CONDITION

1. Set the EUT under continuous transmission condition.
2. The EUT was set to the highest available power level.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 46 of 54
Date: Jul. 31, 2017

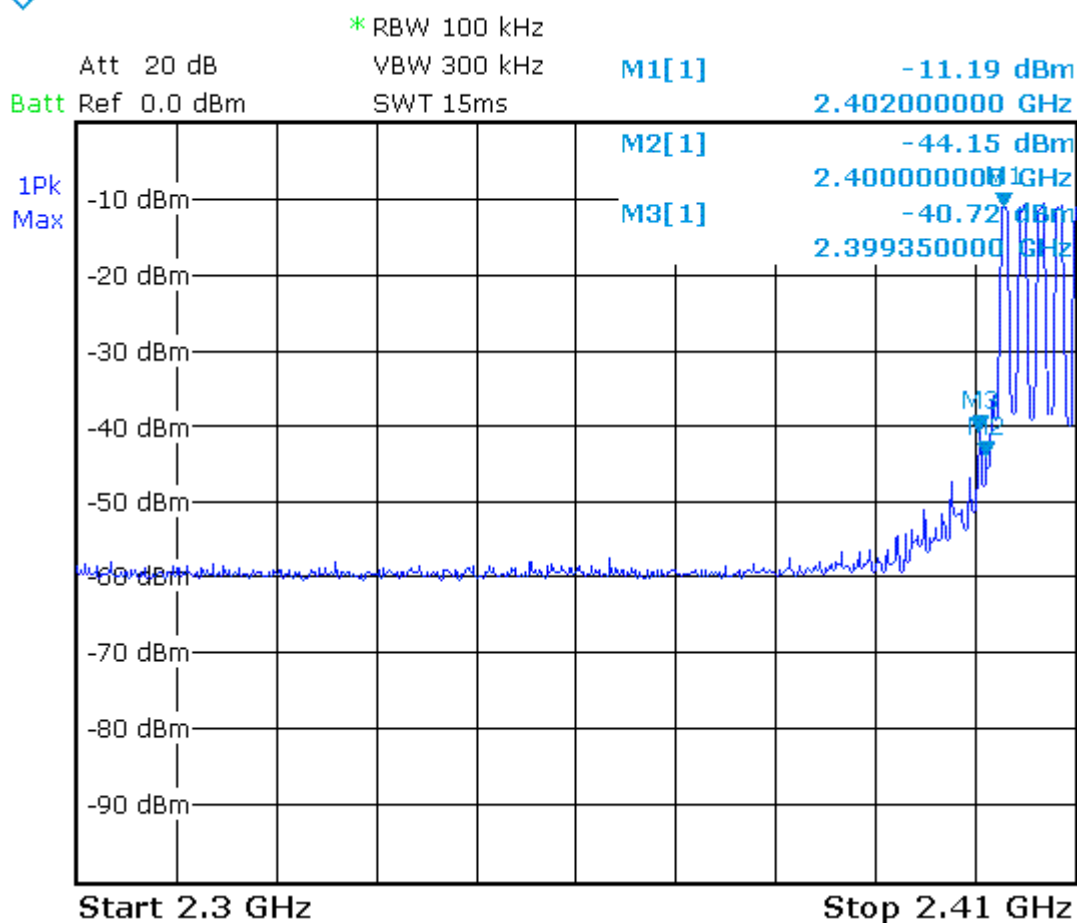
4.5.6 TEST RESULT

Temperature:	24 °C	Humidity:	62 %RH
Receiver Detector:	PK.	Tested Mode:	Tx-1, Tx-3
Frequency Range:	2.3GHz – 2.6GHz	Modulation Type:	GFSK
Tested By:	Boris Lin	Tested Date:	Jul. 13, 2017

1. Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	-11.19	-40.72	29.53	>20dBc
>2483.5	-14.39	-51.70	37.31	>20dBc

Below 2400MHz :





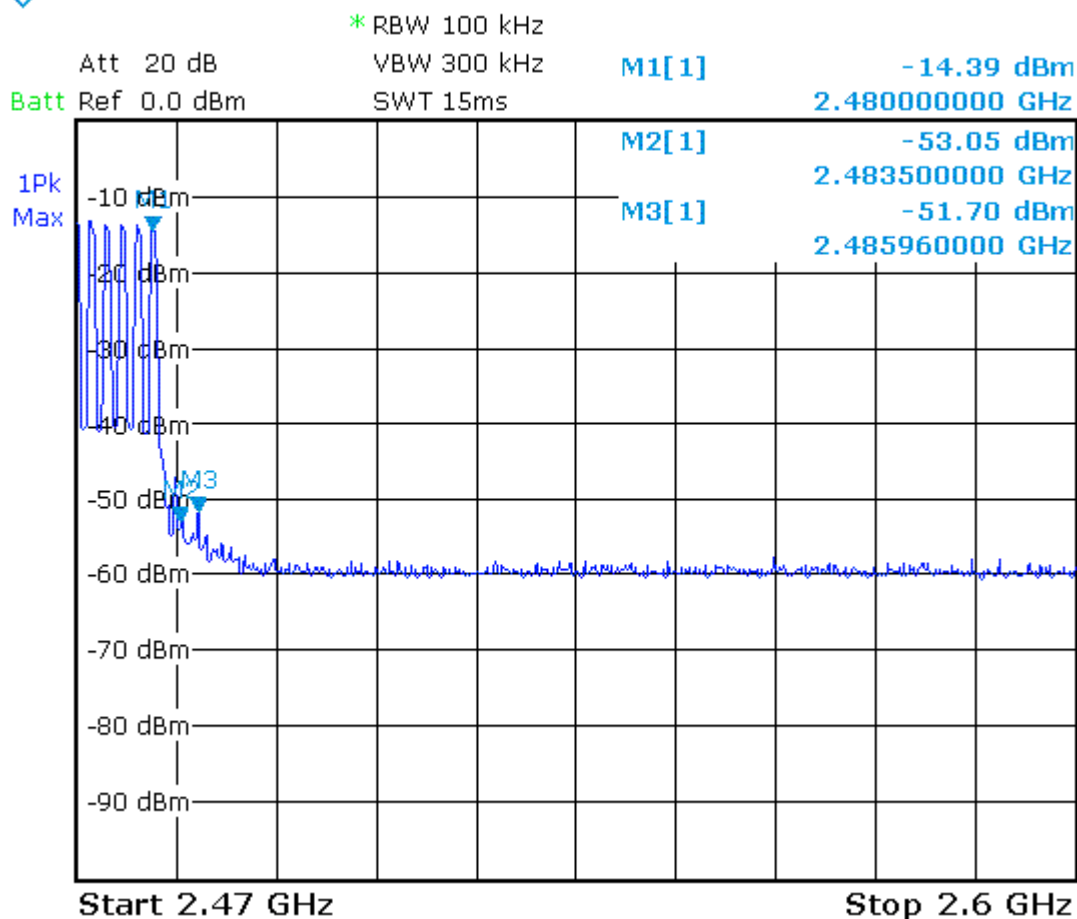
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 47 of 54
Date: Jul. 31, 2017

Above 2483.5 MHz :



**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 48 of 54
Date: Jul. 31, 2017

2. Radiated emission test :

Below 2400MHz (mode 1 of 2402MHz emission)

Frequency (MHz)	Correct Factor (dB)	Ant. Fac. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Over Limit (dBuV/m)	
				PK	AV	PK	AV	PK	AV	PK	AV
2399.90	-31.72	28.36	H	50.85	41.65	47.49	38.29	74.00	54.00	-26.51	-15.71
2399.80	-31.72	28.36	V	46.33	36.47	42.97	33.11	74.00	54.00	-31.03	-20.89
2400.00	-31.72	28.36	H	52.53	43.41	49.17	40.05	74.00	54.00	-24.83	-13.95
2400.00	-31.72	28.36	V	48.98	39.98	45.62	36.62	74.00	54.00	-28.38	-17.38

About 2483.5MHz (mode 3 of 2480MHz emission)

Frequency (MHz)	Correct Factor (dB)	Ant. Fac. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Over Limit (dBuV/m)	
				PK	AV	PK	AV	PK	AV	PK	AV
2483.50	-31.66	28.48	H	41.12	32.10	37.93	28.91	74.00	54.00	-36.07	-25.09
2483.50	-31.66	28.48	V	41.99	32.32	38.80	29.13	74.00	54.00	-35.20	-24.87
2531.50	-31.63	28.61	H	44.16	34.27	41.14	31.25	74.00	54.00	-32.86	-22.75
2491.40	-31.66	28.49	V	43.30	33.37	40.13	30.20	74.00	54.00	-33.87	-23.80

 Spectrum Research & Testing Lab., Inc. No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)	<h1>TEST REPORT</h1>	Reference No.: A16051805 Report No.: FCCA16051805 FCC ID : 2AIUHTP001 Page: 49 of 54 Date: Jul. 31, 2017
--	----------------------	--

4.6 POWER DENSITY TEST

4.6.1 LIMIT

FCC Part15, Subpart C Section 15.247(e)

FREQUENCY RANGE (MHz)	Limit (dBm / kHz)
902-928	8 dBm / 3 kHz
2400-2483.5	
5725-5850	

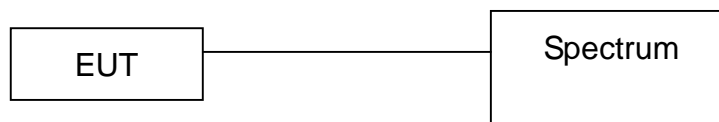
4.6.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM ANALYZER	9 kHz ~ 40 GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC. 12, 2017 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.6.4 TEST PROCEDURE

1. The EUT was operated in transmitting mode or controlled channels.
2. The test result was screen captured from the spectrum.

4.6.5 EUT OPERATING CONDITION

1. Set the EUT under continuous transmission condition.
2. The EUT was set to the highest available power level.

**Spectrum Research & Testing Lab., Inc.**

No.167,Ln. 780, Shan-Tong
Rd.,Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

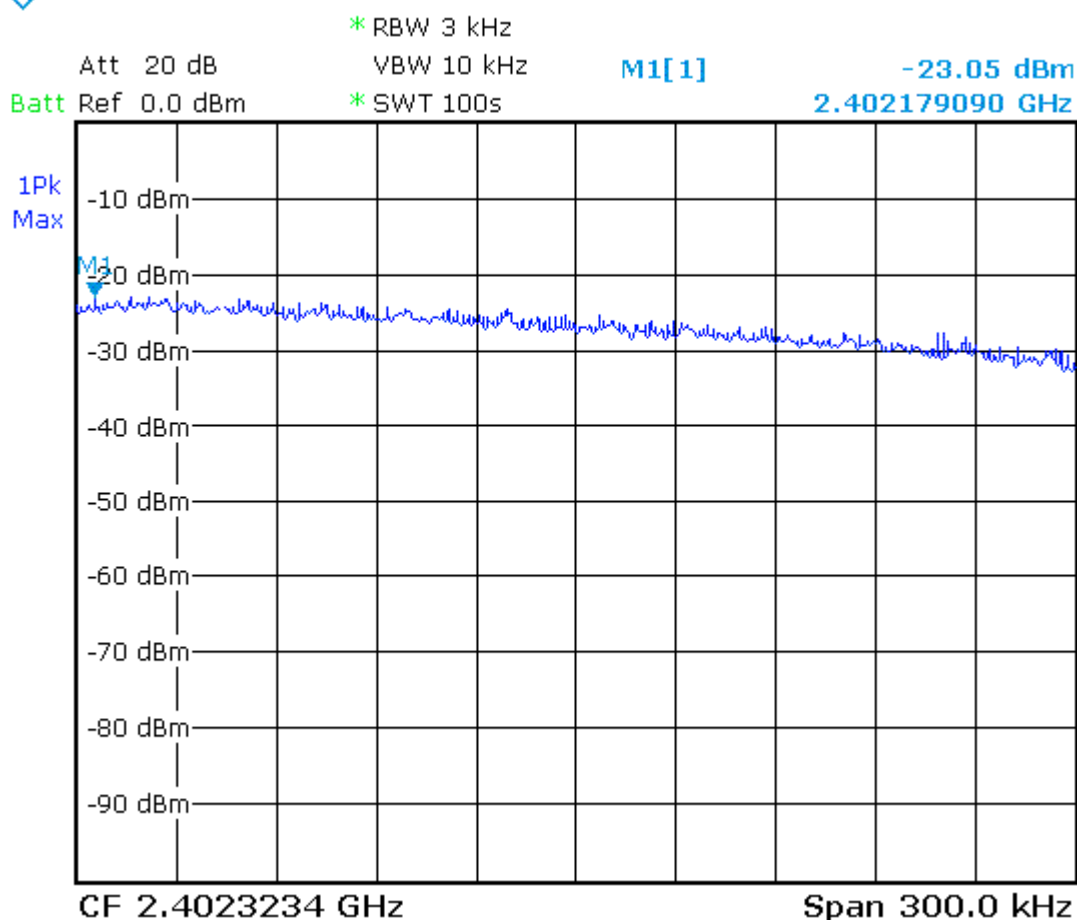
Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 50 of 54
Date: Jul. 31, 2017

4.6.6 TEST RESULT

Temperature:	24 °C	Humidity:	62% RH
Spectrum Detector:	PK.	Test Mode:	Tx-1, Tx-2, Tx-3
Tested By:	Boris Lin	Modulation Type:	GFSK
Test Result:	PASS	Tested Date:	Jul. 13, 2017

Channel Number	Channel Frequency (MHz)	RF Power Level in 3 KHz BW (dBm/3kHz)	Maximum Limit (dBm/3kHz)
CH00	2402	-23.05	8
CH20	2442	-22.94	8
CH39	2480	-26.05	8

CH00 :





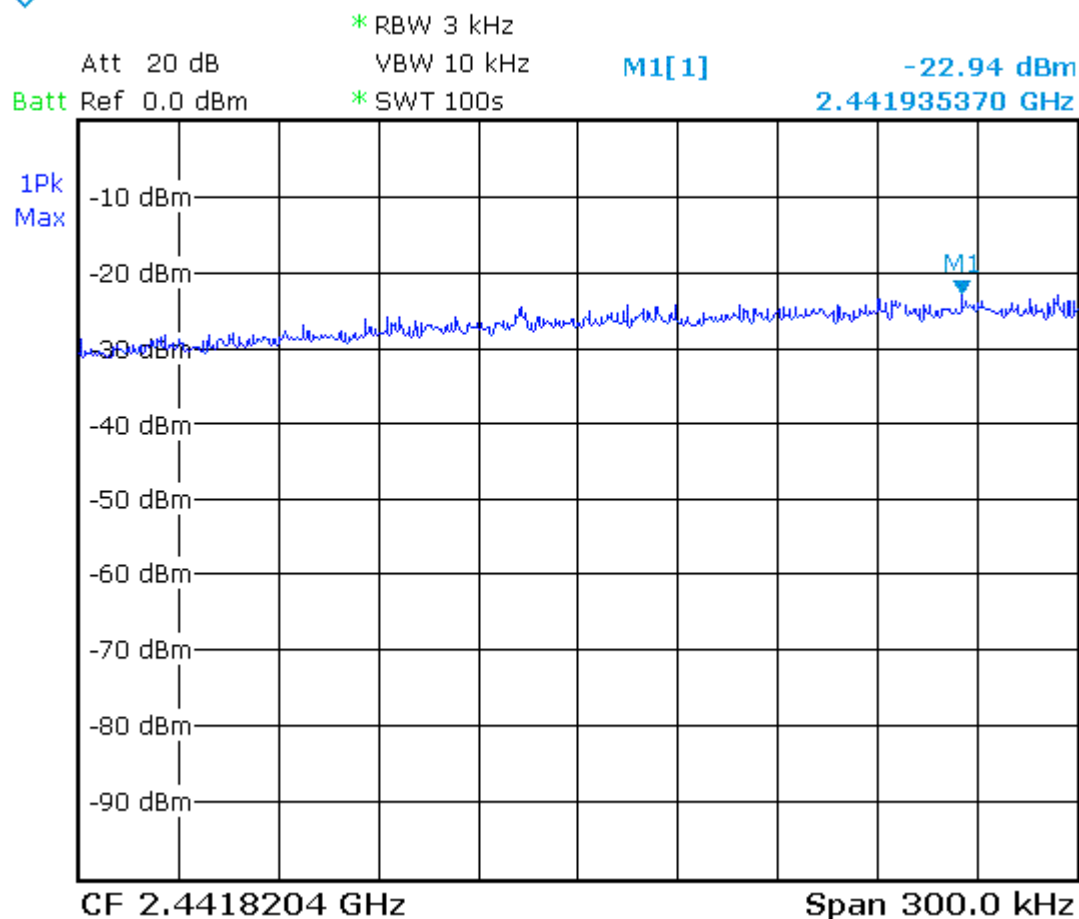
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 51 of 54
Date: Jul. 31, 2017

CH20 :





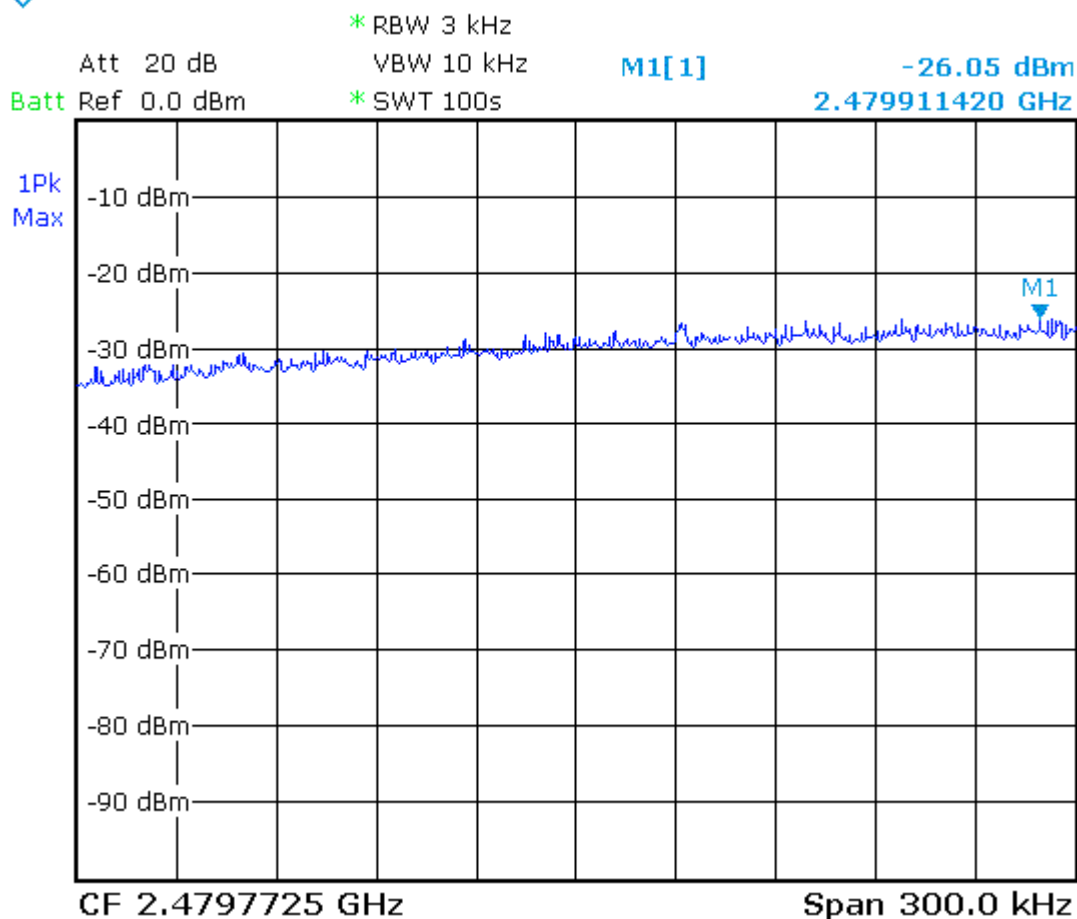
Spectrum Research & Testing Lab., Inc.

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 52 of 54
Date: Jul. 31, 2017

CH39 :





**Spectrum Research &
Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong
Rd., Ling 8, Shan-Tong Li,
Chung-Li Dist., Taoyuan City
320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 53 of 54
Date: Jul. 31, 2017

5. Antenna application

5.1 Antenna requirement

The EUT's antenna is met the requirement of FCC Part 15C section 15.203 and 15.204.

FCC part15C section15.247 requirement:

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Result

The EUT used a chip antenna. Gain of antenna is 0.50 dBi that meets the requirement.

**Spectrum Research & Testing Lab., Inc.**

No.167, Ln. 780, Shan-Tong Rd., Ling 8, Shan-Tong Li, Chung-Li Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEST REPORT

Reference No.: A16051805
Report No.: FCCA16051805
FCC ID : 2AIUHTP001
Page: 54 of 54
Date: Jul. 31, 2017

6. TERMS OF ABBREVIATION

AV.	Average detection
AZ(o)	Turn table azimuth
Correct.	Correction
EL(m)	Antenna height (meter)
EUT	Equipment Under Test
Horiz.	Horizontal direction
LISN	Line Impedance Stabilization Network
NSA	Normalized Site Attenuation
Q.P.	Quasi-peak detection
SRT Lab	Spectrum Research & Testing Laboratory, Inc.
Vert.	Vertical direction