



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.: A17011607-01
Report No.: FCCA17011607-01
FCC ID : 2AK66-EM-5200
Page: 1 of 38
Date: Apr. 21, 2017

Product Name: Wireless TENS & EMS Unit
Model No.: EM-5200
Applicant: EVERYWAY MEDICAL INSTRUMENTS CO., LTD.
3FL., NO.5, LANE155, SEC.3, BEISHEN RD., SHENKENG DIST, NEW TAIPEI CITY, TAIWAN, R.O.C.
Date of Receipt: Jan. 16, 2017
Finished date of Test: Apr. 17, 2017
Applicable Standards: 47 CFR Part 15, Subpart C
47 CFR Part 15, Subpart B
ANSI C63.10: 2013

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
(Boris Lin)

Date:

04/21/2017

Approved By :

Johnson Ho
(Johnson Ho, Director)

Date:

4/21/2017



FMNG-059_1.1 REPORT

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

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Revisions History

Report No.	Issue Date	Revisions
FCCA17011607-01	Apr. 21, 2017	Initial issue
FCCA17011607-01	May. 09, 2017	Detector updated on P.25
FCCA17011607-01	May. 09, 2017	Spurious emission limits updated on P.25 and recalculate margins.
FCCA17011607-01	May. 09, 2017	Pulse desensitization test condition noted on P.17



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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.
- AC 120V/60Hz for PC USB port, was used during the test.

1.3 EUT MODIFICATION

- No modification in SRT Lab.

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

PRODUCT	Wireless TENS & EMS Remote Controller
MODEL NO.	EM-5200
POWER SUPPLY	AC power source of PC for USB port : AC 120V/60Hz
CABLE	N/A
CARRIER FREQUENCY	433.92 MHz
NUMBER OF CHANNEL	1
RATED RF OUTPUT POWER	60.53 dBuV/m = -46.50 dBm = 22.60 μ W
MODULATION TYPE	FSK
MODE OF OPERATION	Duplex
ANTENNA TYPE	External Antenna
ANTENNA GAIN	0 dBi
OPERATING TEMPERATURE RANGE	0 ~ 40°C

NOTE: For more detailed information, please refer to the EUT's specification or user's manual provided by manufacturer.

2.3 DESCRIPTION OF EUT INTERNAL DEVICE

DEVICE	BRAND / MAKER	MODEL #	FCC ID / DOC	REMARK
Li-ion Battery	N/A	FT802518P	DOC	3.7 V / 300 mAh

2.4 EUT OPERATING CONDITION

1. Setup the EUT and all peripheral devices .
2. Turn on the power of all equipment and EUT.
3. Set the EUT under continuous transmission condition, standby and link mode.
4. The EUT was set to the highest available power level.

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2.5 DESCRIPTION OF TEST MODE

Mode			Frequency
1	Tx	Tx	433.92 MHz
2		Standby	NA
3	Rx	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:



2.6 DESCRIPTION OF SUPPORT UNIT

The EUT was configured by the requirement of ANSI C63.10:2013. 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	M32AA1	DoC	1.5m unshielded power cable
2	CRT Monitor	ASUS	VS228	DoC	1.8m unshielded power cord 1.5m shielded data cable. with one core.
3	Keyboard	ASUS	PK1100U	DoC	1.8m unshielded data cable.
4	Mouse	ASUS	MOBTUO	DoC	1.5m unshielded data cable.
5	External HD	TERASYS	F-12U	DoC	1.5m shielded data cable.
6	Printer	EPSON	STYLUS C20SX	DoC	1.5m unshielded power cord 1.2m shielded data cable.
7	Wireless TENS & EM Remote Controller	Everyway	EM-5210	2AK66_EM-5210	Tx Unit (433.92 MHz)

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

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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 C63.10: 2013

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
15.207	AC Power Conducted Emission	PASS
15.231(a)	RELEASE OR OPERATING TIME Limit: max. 5 seconds	PASS
15.231(c)	20dB bandwidth Limit: 0.25% × Center Frequency	PASS
15.231(b) 15.33(a) 15.209	FUNDAMENTAL & SPURIOUS RADIATED EMISSION	PASS

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4.1 CONDUCTED EMISSION TEST

4.1.1 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.

4.1.2 TEST EQUIPMENT

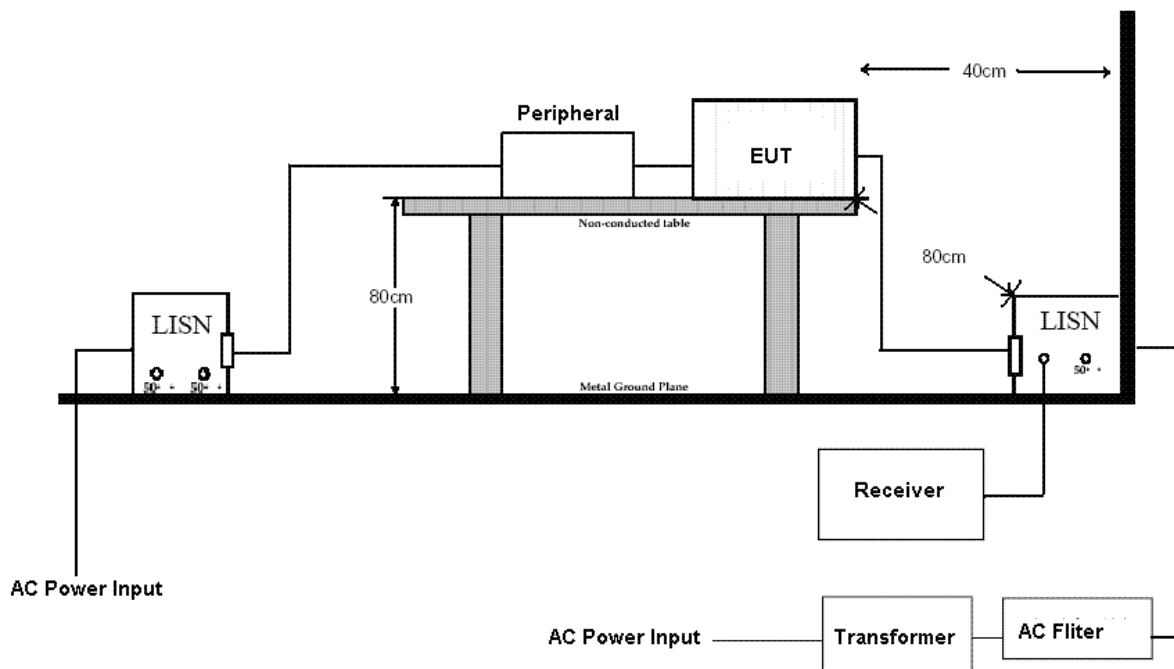
The following test equipment was used for the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	DEC. 16, 2017 ETC
EMI TEST RECEIVER	9 kHz ~ 30 MHz	ROHDE & SCHWARZ	ESHS30 / 826003/008	JAN. 22, 2018 ETC
LISN	50 μH, 50 ohm	FCC	FCC-LISN-50-25-2 / 01017	JUN. 21, 2017 ETC
LISN	50 μH, 50 ohm	SOLAR	9252-50-R-24-BNC/ 951315	OCT. 21, 2017 ETC
LISN	50 μH, 50 ohm	EMCO	3825/2/ 9204-1952	JUN. 06, 2017 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	B00-CD-204/ L1TEQU008	JUN. 24, 2017 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	B00-CD-357/ L1TEQU009	JUN. 24, 2017 ETC
COAXIAL CABLE	5 m	HUBER+SUHNER	RG214/U / #5M(L1TCAB013)	MAY. 21, 2017 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
PULSE LIMITER	9 kHz ~ 30 MHz	ROHDE & SCHWARZ	ESH3Z2/ L1TTES010	JAN. 07, 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.



4.1.3 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.

4.1.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.10:2013. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm/50μH 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.

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4.1.5 TEST RESULT

Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Tx
Receiver Detector:	Q.P. and AV.	Modulation Type:	FSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Apr. 17, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.930	0.04	28.92	26.17	28.96	26.21	56.00	46.00	-26.40	-18.97
4.292	0.12	37.60	36.67	37.72	36.79	56.00	46.00	-19.82	-10.12
4.475	0.12	38.14	37.36	38.26	37.48	56.00	46.00	-16.47	-9.25
5.016	0.14	37.18	36.43	37.32	36.57	60.00	50.00	-23.86	-12.34
8.390	0.22	34.44	31.91	34.66	32.13	60.00	50.00	-24.43	-18.78
23.181	0.57	39.22	23.60	39.79	24.17	60.00	50.00	-21.12	-24.38

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.310	0.00	36.00	32.24	36.00	32.24	60.25	50.25	-23.52	-19.10
0.330	0.00	34.82	31.70	34.82	31.70	60.16	50.16	-24.43	-17.64
3.750	0.01	30.22	27.15	30.23	27.16	56.00	46.00	-26.66	-19.48
4.570	0.02	34.92	33.03	34.94	33.05	56.00	46.00	-20.60	-13.59
14.850	0.20	31.28	22.43	31.48	22.63	60.00	50.00	-29.25	-26.73
23.181	0.33	39.62	23.07	39.95	23.40	60.00	50.00	-21.50	-25.06

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
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.



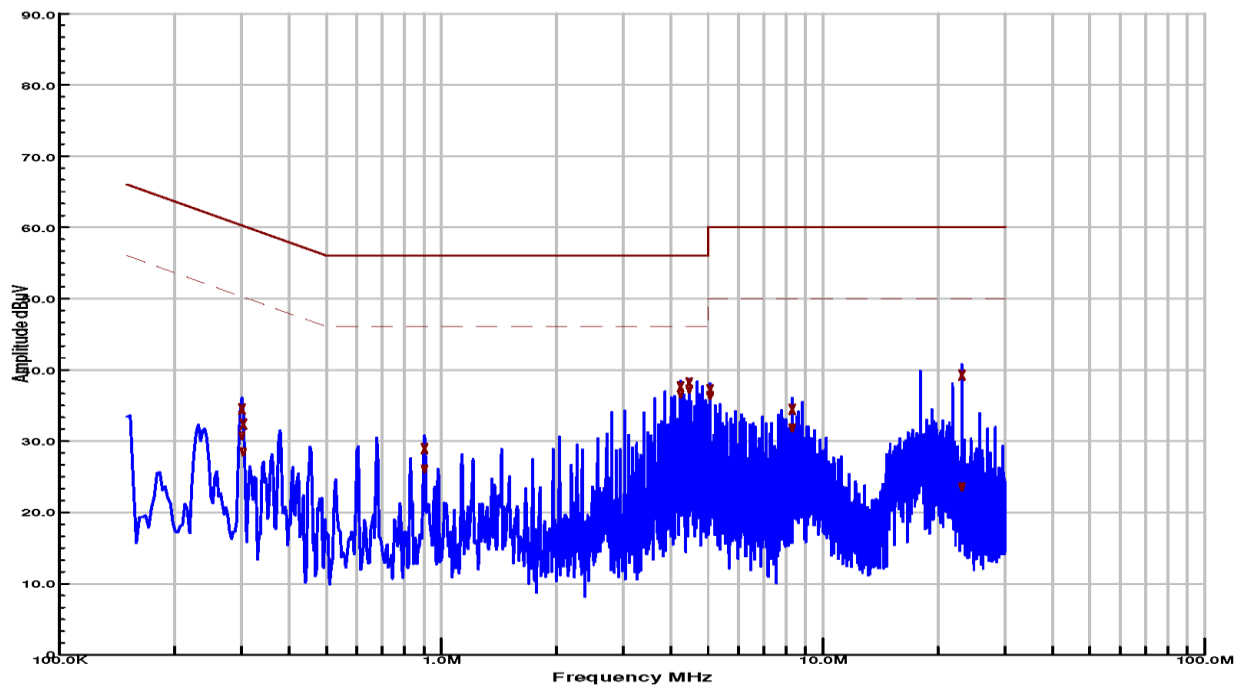
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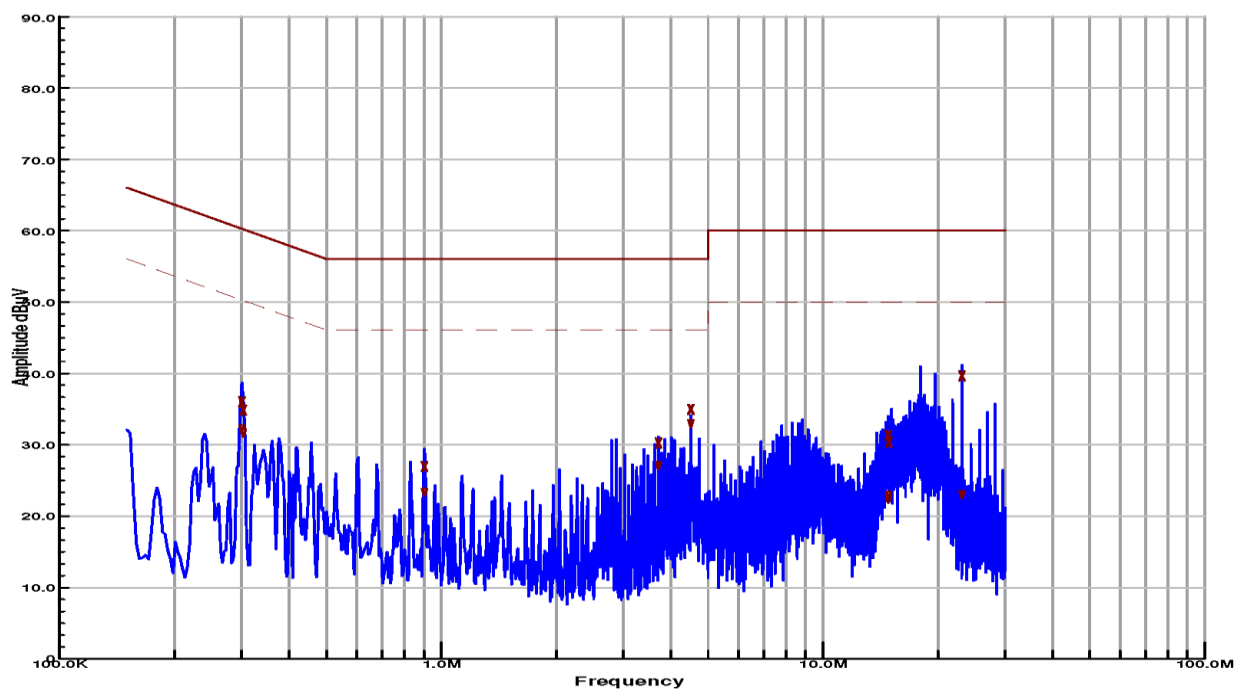
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Line



Neutral



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Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Standby
Receiver Detector:	Q.P. and AV.	Modulation Type:	FSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Apr. 17, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.930	0.04	28.52	25.73	28.56	25.77	56.00	46.00	-26.33	-21.32
4.475	0.12	37.86	36.74	37.98	36.86	56.00	46.00	-19.20	-10.41
4.746	0.13	37.90	35.24	38.03	35.37	56.00	46.00	-18.79	-11.36
5.016	0.14	36.72	35.41	36.86	35.55	60.00	50.00	-24.41	-13.54
5.356	0.14	35.18	34.14	35.32	34.28	60.00	50.00	-25.86	-14.27
19.648	0.49	35.82	27.19	36.31	27.68	60.00	50.00	-22.96	-23.23

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.310	0.00	36.24	32.26	36.24	32.26	60.25	50.25	-23.10	-18.13
0.330	0.00	35.22	31.89	35.22	31.89	60.16	50.16	-25.49	-17.72
4.021	0.01	30.52	26.13	30.53	26.14	56.00	46.00	-24.74	-20.68
4.570	0.02	35.30	33.54	35.32	33.56	56.00	46.00	-21.86	-11.34
14.620	0.19	29.88	20.23	30.07	20.42	60.00	50.00	-28.39	-30.85
19.648	0.28	35.44	27.40	35.72	27.68	60.00	50.00	-25.82	-21.23

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
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.



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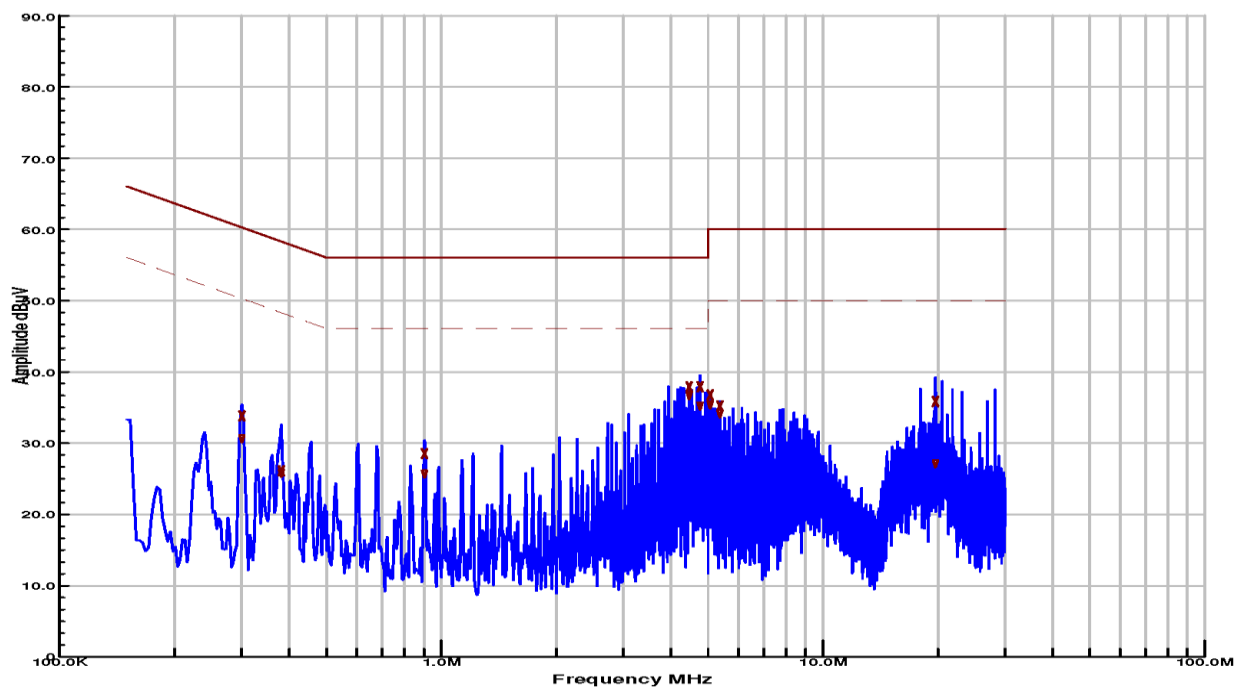
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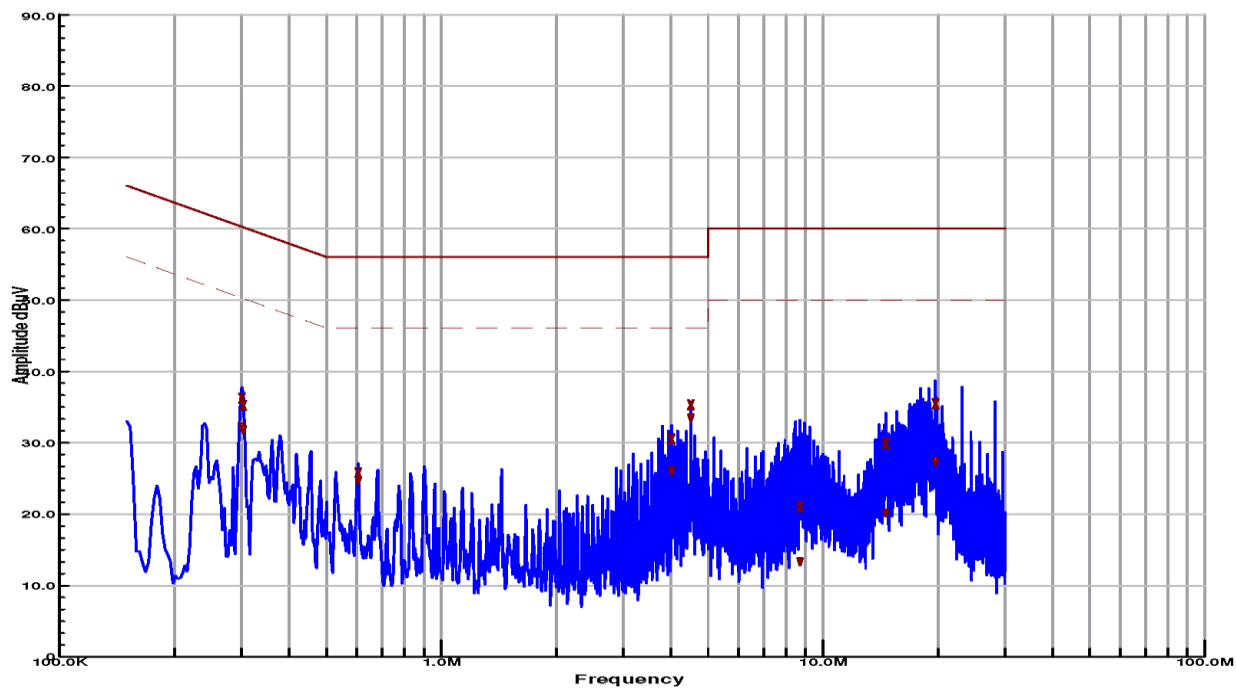
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Neutral



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Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Link
Receiver Detector:	Q.P. and AV.	Modulation Type:	FSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Apr. 17, 2017

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.310	0.04	35.28	31.42	35.32	31.46	60.25	50.25	-23.39	-19.97
4.292	0.12	37.60	36.76	37.72	36.88	56.00	46.00	-19.82	-8.21
4.475	0.12	38.62	37.20	38.74	37.32	56.00	46.00	-16.62	-9.86
5.016	0.14	37.34	36.30	37.48	36.44	60.00	50.00	-23.25	-12.65
5.356	0.14	34.24	32.48	34.38	32.62	60.00	50.00	-24.26	-16.83
17.938	0.45	38.34	25.49	38.79	25.94	60.00	50.00	-22.12	-25.60

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dB μ V)		Emission Level (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.310	0.00	37.54	33.53	37.54	33.53	60.25	50.25	-23.17	-17.27
0.330	0.00	36.14	32.68	36.14	32.68	60.16	50.16	-25.20	-16.84
4.018	0.01	33.46	30.03	33.47	30.04	56.00	46.00	-23.35	-16.69
4.743	0.02	32.60	29.07	32.62	29.09	56.00	46.00	-22.83	-15.19
14.850	0.20	31.42	22.29	31.62	22.49	60.00	50.00	-29.81	-28.15
17.938	0.25	38.54	26.27	38.79	26.52	60.00	50.00	-20.12	-22.84

NOTE :

1. Measurement uncertainty is 2.91 dB
2. Emission level = Reading value + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
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.



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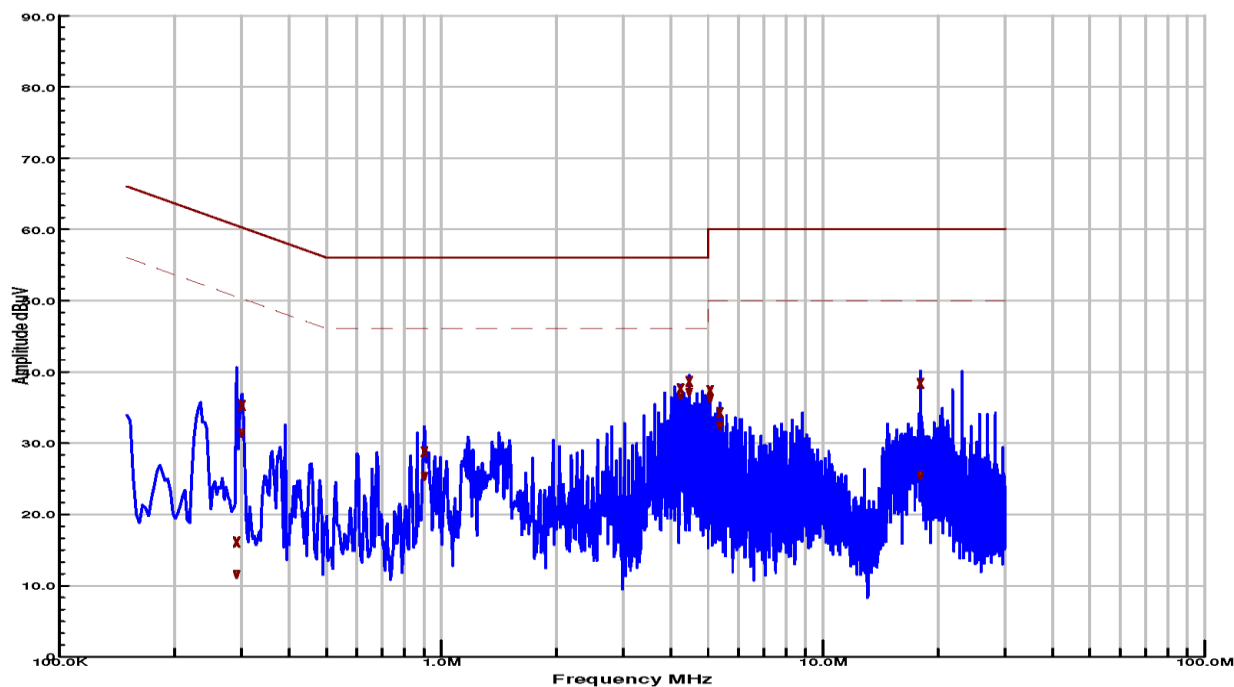
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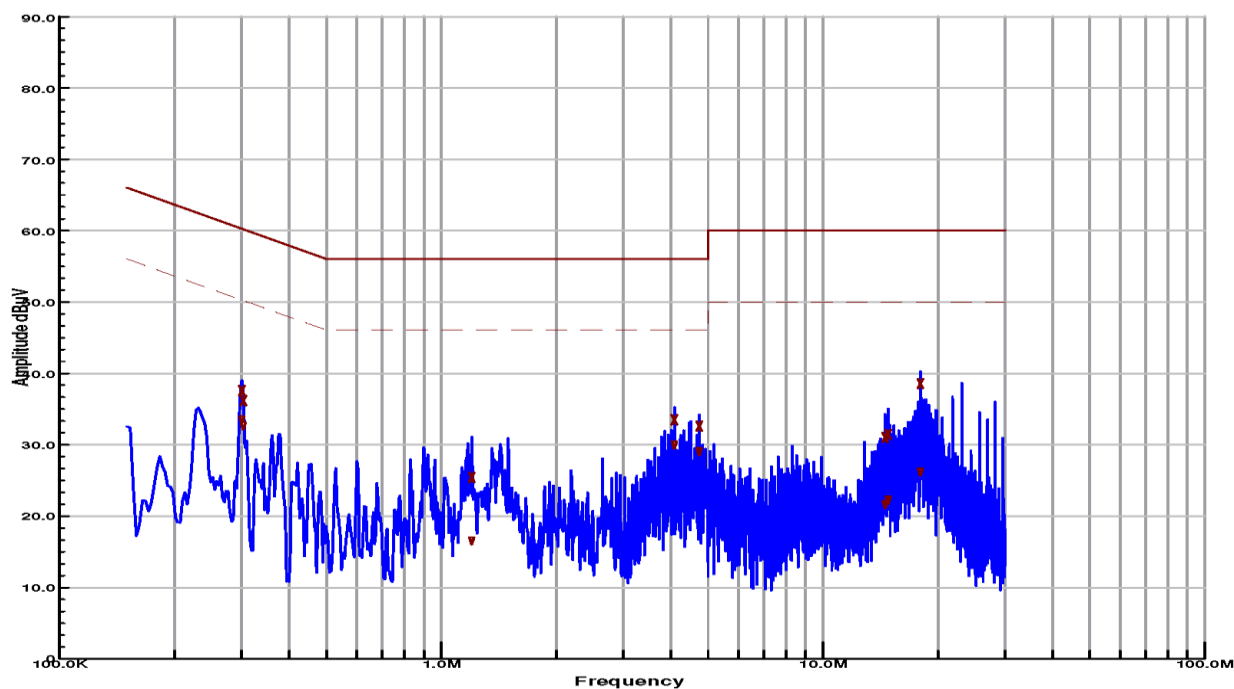
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Neutral



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4.2 20dB Bandwidth

4.2.1 LIMIT

FREQUENCY (MHz)	BANDWIDTH LIMIT(kHz)
Above 70-900	$0.25\% \times \text{Center Frequency(MHz)}$
Above 900	$0.5\% \times \text{Center Frequency(MHz)}$

NOTE: Bandwidth is determined at the points 20dB down from the modulated carrier.

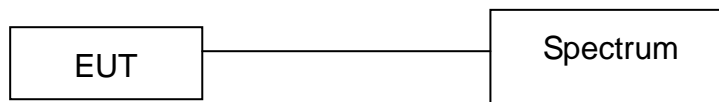
4.2.2 TEST EQUIPMENT

The following test equipment was used during the test :

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAR. 28, 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.

4.2.3 TEST SET-UP



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

4.2.4 TEST PROCEDURE

Please refer to FCC Part15C 15.231.

4.2.5 EUT OPERATING CONDITION

The EUT was operated in continually transmitting mode.

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4.2.6 TEST RESULT

Temperature: 26 °C

Humidity: 73% RH

Spectrum Detector: PK

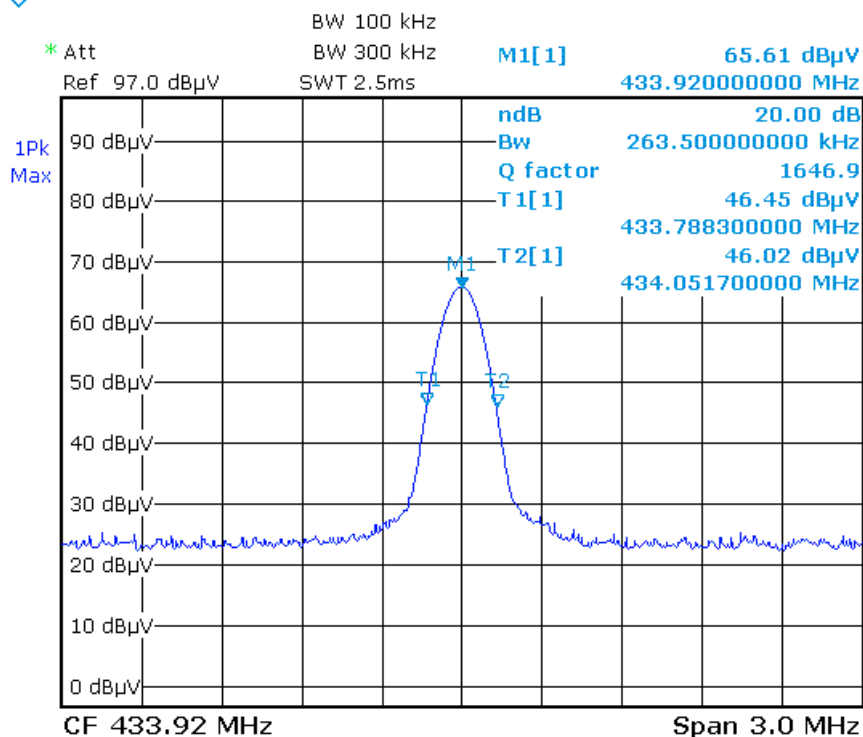
Tested by: Boris Lin

Test Result: PASS

Tested Date: Apr. 17, 2017

Channel Number	Channel Frequency (MHz)	20dB Down Bandwidth (kHz)	Maximum Limit (kHz)	Pass/Fail
1	433.92	263.5	1085	Pass

NOTE : Pulse Desensitization is not required due to RBW 100 kHz > 2 / Pulse width 1.53 sec





4.3 RELEASE OR OPERATING TIME

4.3.1 LIMIT

1. A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
2. A transmitter activated automatically shall cease transmission within 5 seconds after activation.
3. Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.
4. Intentional radiators, which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pungency of the alarm condition.

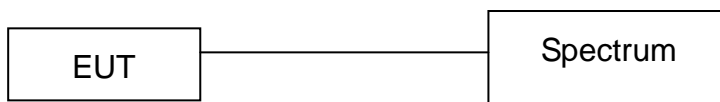
4.3.2 TEST EQUIPMENT

The following test equipment was used during the test :

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAR. 28, 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.

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4.3.4 EUT OPERATING CONDITION

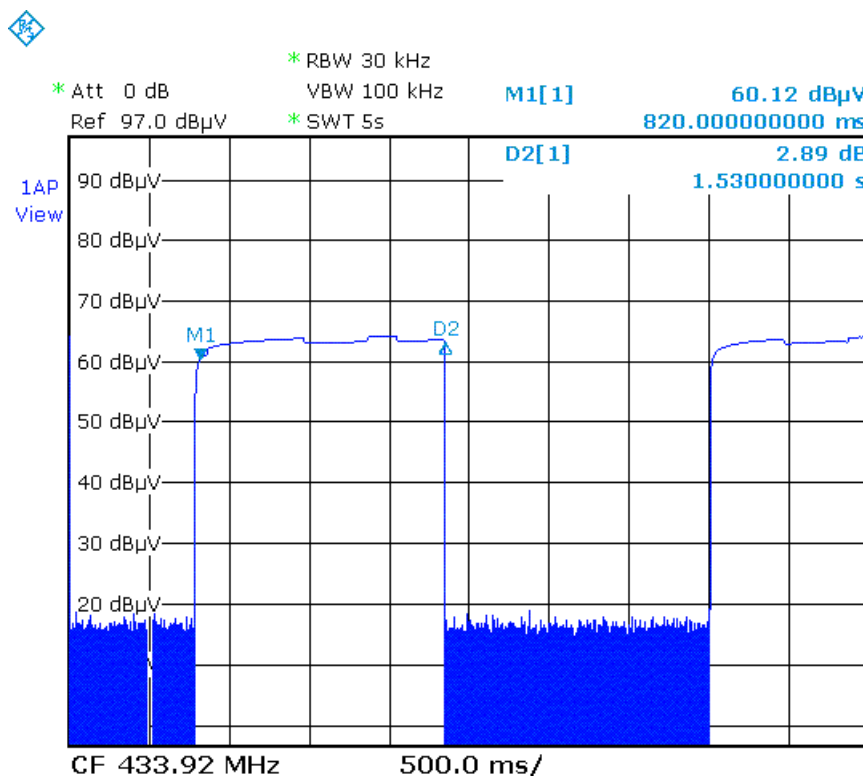
The EUT was operated in Normal Link mode.

Activation EUT's release time and measurement.

4.3.5 TEST RESULT

Temperature:	26 °C	Humidity:	73% RH
Spectrum Detector:	PK	Tested by:	Boris Lin
Test Result:	PASS	Tested Date:	Apr. 17, 2017

Total release time(s)	Limit of release time<(s)	Pass/Fail
1.53	5	Pass



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4.4 FUNDAMENTAL & SPURIOUS RADIATED EMISSION TEST**4.4.1 LIMIT**

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (dB μ V/m)
0.009 - 0.490	300	2400/F(KHz)
0.490 - 1.705	30	24000/F(KHz)
1.705 - 30	30	30
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
Above 960	3	54.0

NOTE:

- 30 dB μ V (in 30m) = 70 dB μ V (in 3m).
- 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 part15C 15.231(b) limit of fundamental and spurious emissions measurement.

FREQUENCY (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750 (NOTE 5)	125 to 375 (NOTE 7)
174-260	3750	375 (NOTE 7)
260-470	3750 to 12500 (NOTE 6)	375 to 1250
Above 470	12500	1250

NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
- In the emission tables above, the tighter limit applies at the band edges.
- Distance refers to the distance between measuring instrument, antenna, and the closest point of any part of the device or system.
- Limit = 20log(56.81818(F) - 6136.3636) ; F : Fundamental Frequency (MHz)
- Limit = 20log(41.667 x F - 7083.3333) ; F : Fundamental Frequency (MHz)
- Limit = The Limit of Fundamental Frequency - 20dB
- The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

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FCC Part 15, Section 15.35(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

4.4.2 TEST EQUIPMENT

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

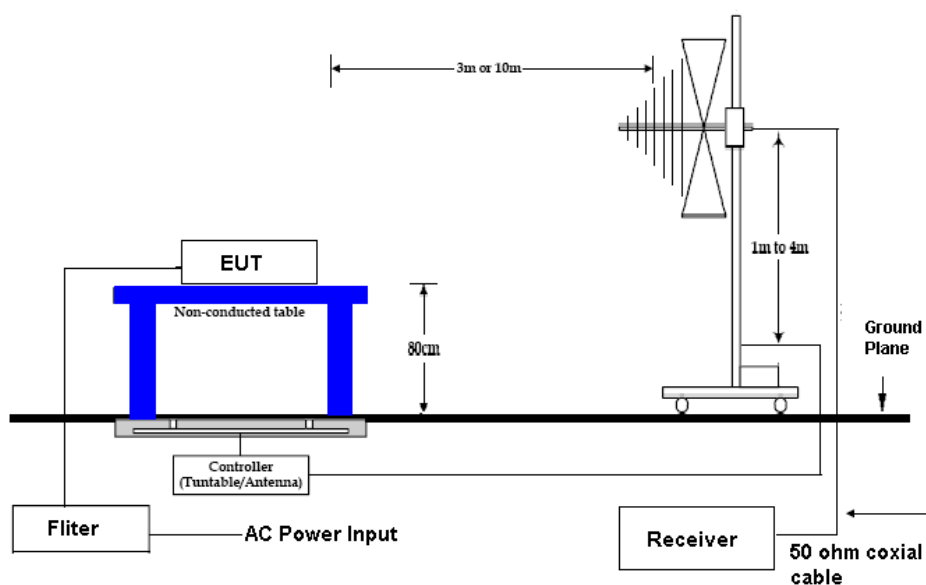
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	DEC. 16, 2017 ETC
EMI TEST RECEIVER	20 MHz ~ 1000 MHz	ROHDE & SCHWARZ	ESVS30 / 841977/003	DEC. 02, 2017 ETC
BI-LOG ANTENNA	30 MHz ~ 2 GHz	SCHAFFNER	CBL6141A / 4181	JUN. 25, 2017 ETC
HORN ANTENNA	1 GHz ~ 18 GHz	EMCO	3115/ 9602-4681	DEC. 21, 2017 ETC
OPEN AREA TEST SITE	3 – 10 M MEASUREMENT	SRT	A02 / SRT002	MAR. 09, 2018 SRT
PRE-AMPLIFIER	1 GHz ~ 26.5 GHz	AGILENT	8449B/ 3008A01995	DEC. 18, 2017 ETC
ANECHOIC CHAMBER	3 M MEASUREMENT	SRT	A01 / SRT001	MAY. 13, 2017 SRT
COAXIAL CABLE	30 M	TIMES	LMR-400 / #30M (L1TCAB014)	MAY. 30, 2017 ETC
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+SUHNER	SF102-46/2*11SK 252 /MY2611/2	MAR. 07, 2018 ETC
K-TYPE CABLE	UP TO 40 GHz, 1 m	HUBER+SUHNER	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.

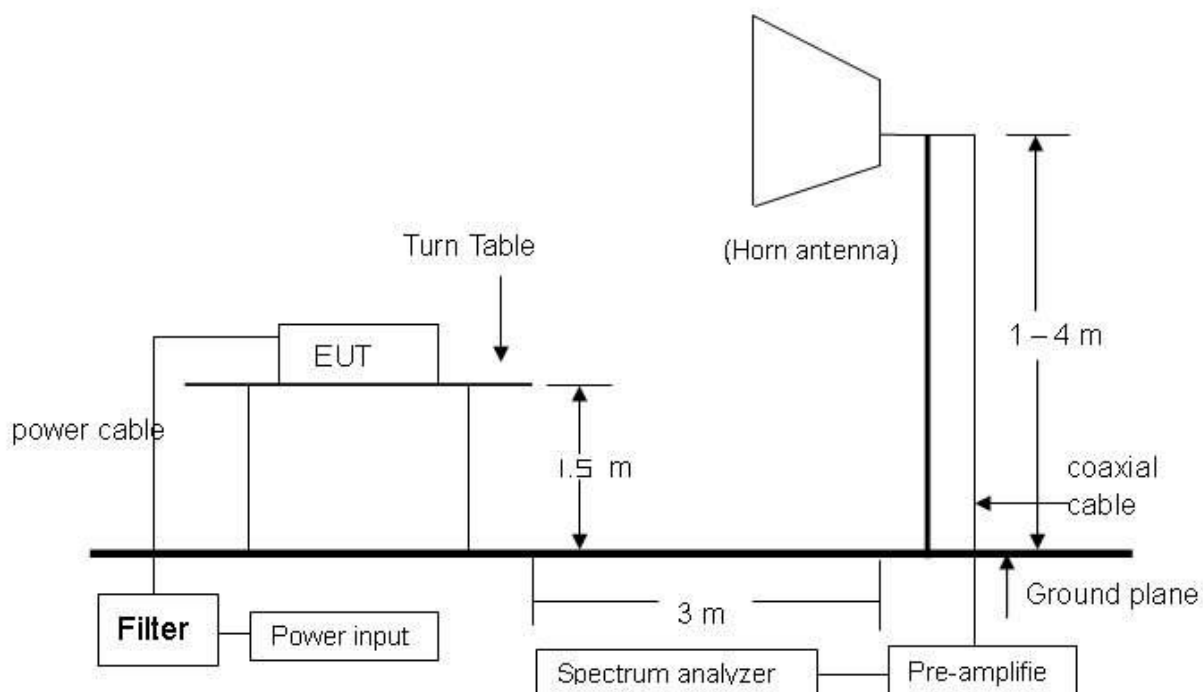


4.4.3 TEST SET-UP

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.



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4.4.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.10:2013. 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 to 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 or 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. 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.

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4.4.5 TEST RESULT

Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Tx
Receiver Detector:	Q.P.	Modulation Type:	FSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Apr. 17, 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)
72.30	1.30	8.10	12.72	22.12	40.0	-16.13	201	1.12
324.80	2.95	14.99	12.63	30.57	46.0	-16.34	234	1.91
347.31	3.08	15.72	9.48	28.28	46.0	-18.27	87	2.13
674.15	4.35	20.36	3.49	28.20	46.0	-16.08	142	2.90
842.30	5.08	22.73	3.58	31.39	46.0	-15.16	321	3.53
926.19	5.57	24.50	3.66	33.73	54.0	-21.72	276	3.65

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)
232.28	2.27	13.01	8.91	24.19	46.0	-20.18	212	3.14
630.41	4.14	19.84	7.28	31.26	46.0	-15.47	345	2.52
674.85	4.35	20.36	7.34	32.05	46.0	-12.59	125	2.70
842.60	5.08	22.73	7.52	35.33	46.0	-11.76	4	1.35
839.47	5.31	23.29	3.45	32.05	46.0	-12.69	197	1.62
926.69	5.57	24.50	3.87	33.94	54.0	-19.60	26	1.21

NOTE :

1. Measurement uncertainty is 3.85 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.

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Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Tx (Fundamental)
Receiver Detector:	Q.P.	Modulation Type:	FSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Apr. 17, 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)
433.92	3.39	17.03	39.05	59.46	80.83	-21.37	103	2.11
867.84	5.23	23.23	3.08	31.55	60.83	-29.28	211	2.32

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)
433.92	3.39	17.03	40.12	60.53	80.83	-20.30	135	3.27
867.84	5.23	23.23	4.15	32.62	60.83	-28.21	191	1.24

NOTE :

1. Measurement uncertainty is 3.85 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.



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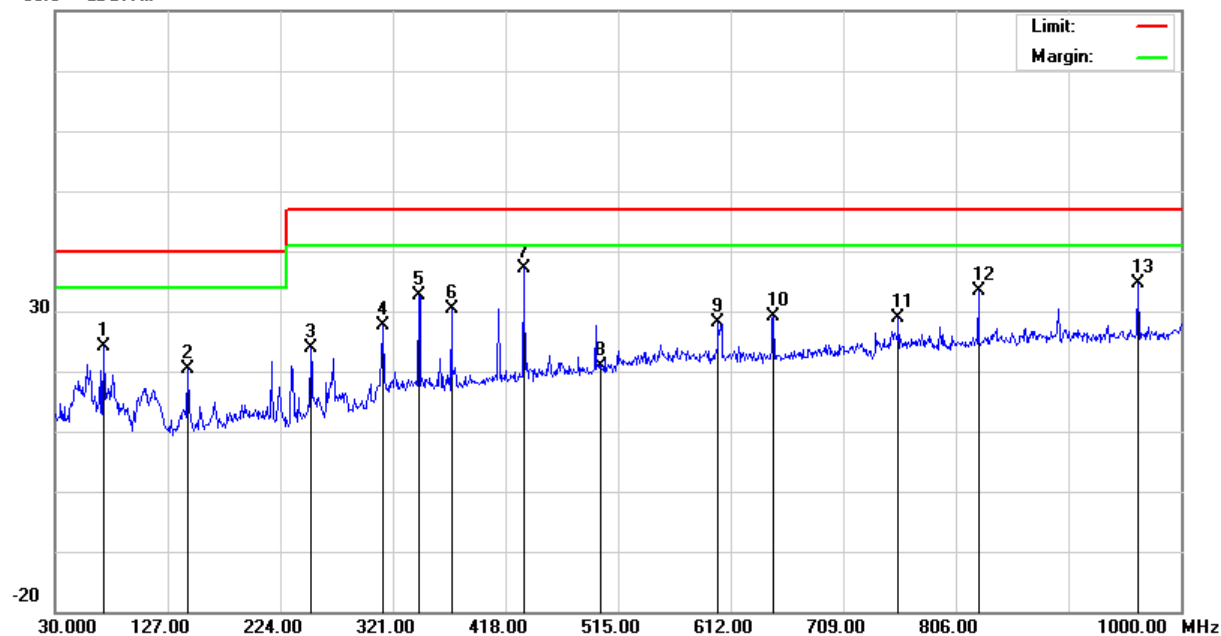
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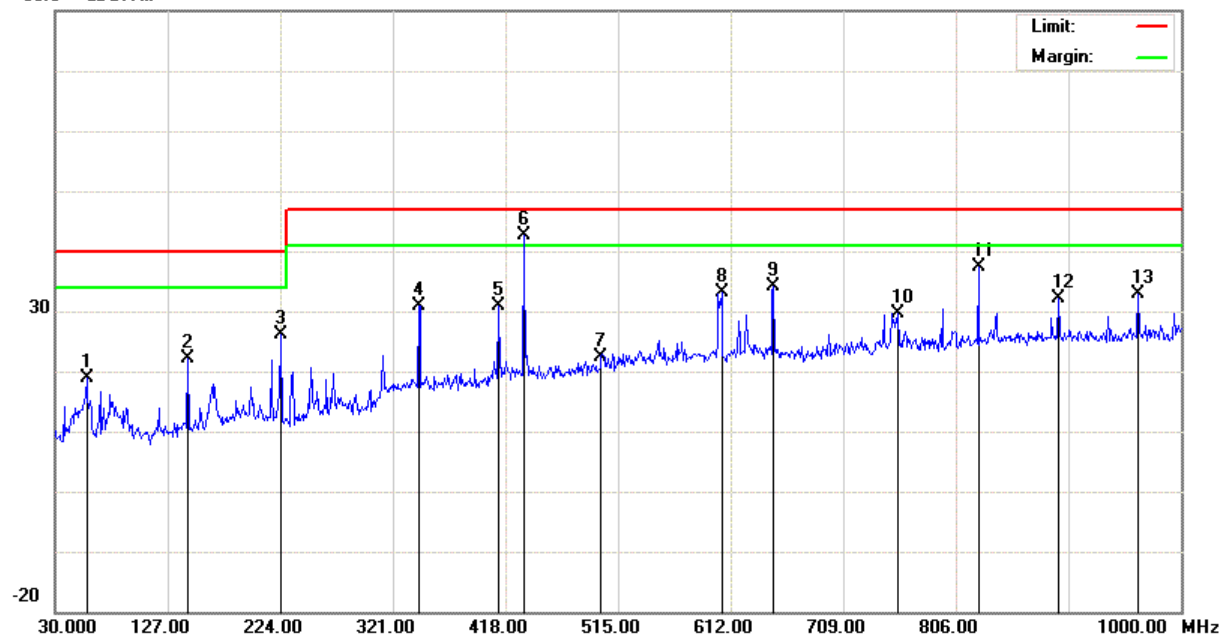
Horizontal

80.0 dBuV/m



Vertical

80.0 dBuV/m



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Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Standby
Receiver Detector:	Q.P.	Modulation Type:	FSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Apr. 17, 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)
54.13	1.18	11.70	6.37	19.25	40.0	-21.57	88	1.13
134.30	1.80	12.84	9.08	23.72	43.5	-18.87	137	1.26
419.53	3.67	18.04	5.61	27.31	46.0	-19.96	32	2.57
622.28	4.13	19.80	3.91	27.84	46.0	-17.61	215	2.89
674.63	4.35	20.36	3.35	28.06	46.0	-18.49	321	2.58
953.17	5.47	24.07	3.58	33.12	46.0	-11.13	292	3.83

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)
134.30	1.80	12.84	12.52	27.16	43.5	-17.44	152	3.41
251.74	2.22	12.65	5.77	20.64	43.5	-21.67	265	3.19
612.58	4.13	19.80	6.63	30.56	46.0	-16.32	129	2.87
674.60	4.35	20.36	7.38	32.09	46.0	-12.18	54	2.76
745.31	4.80	21.93	3.79	30.52	46.0	-16.86	96	1.51
793.28	4.94	22.20	6.33	33.47	46.0	-11.22	163	1.19

NOTE :

1. Measurement uncertainty is 3.85 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.



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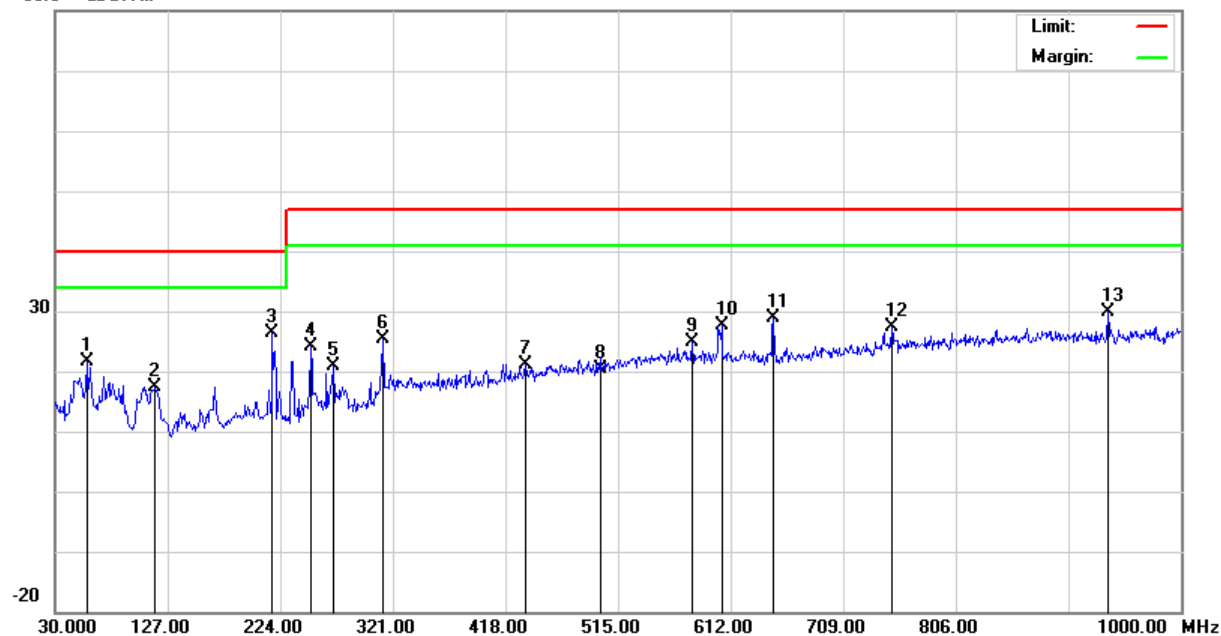
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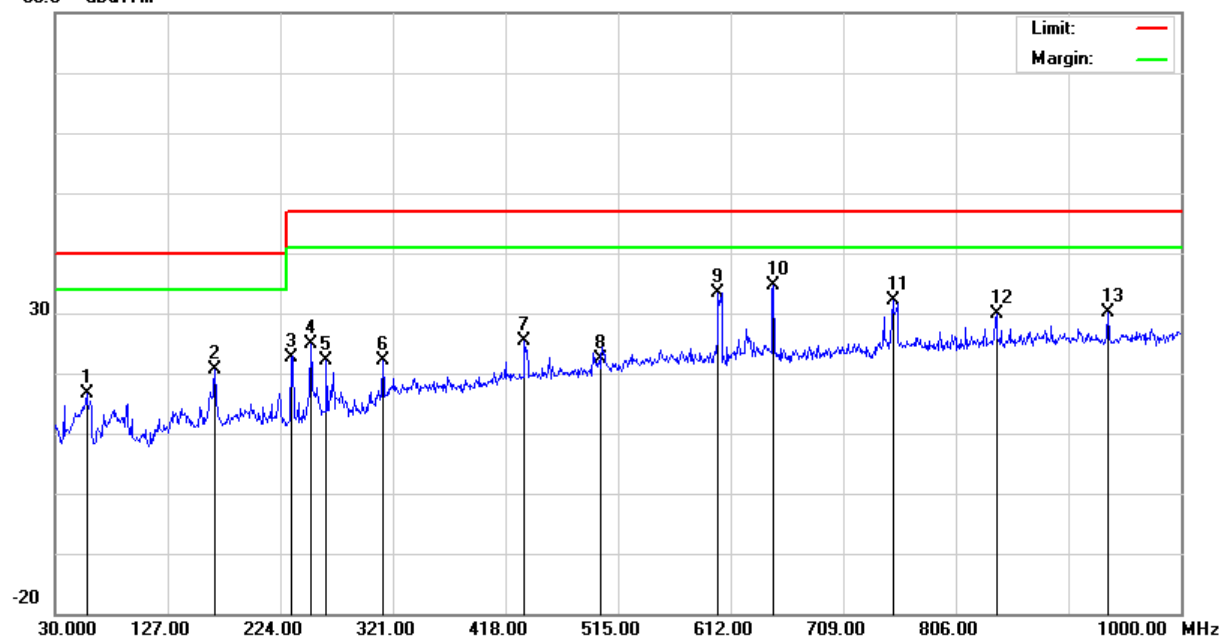
Horizontal

80.0 dBuV/m



Vertical

80.0 dBuV/m



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Temperature:	26 °C	Humidity:	73% RH
Tested By:	Boris Lin	Tested Mode:	Link
Receiver Detector:	Q.P.	Modulation Type:	FSK
Frequency Range:	30 M – 1 GHz	Tested Date:	Apr. 17, 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)
65.23	1.18	11.70	6.76	19.64	40.0	-21.66	288	1.11
261.91	2.23	12.74	9.48	24.45	46.0	-20.43	131	1.46
631.54	4.14	19.84	3.64	27.62	46.0	-19.81	91	2.32
659.71	4.35	20.36	3.52	28.23	46.0	-16.72	53	2.56
733.12	4.78	21.88	3.39	30.04	46.0	-16.63	219	3.65
948.49	5.47	24.07	3.75	33.29	46.0	-11.12	62	3.34

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)
154.01	1.94	11.60	5.16	18.70	43.5	-23.01	212	3.21
613.32	4.13	19.80	7.58	31.51	46.0	-15.93	158	2.35
675.33	4.35	20.36	7.93	32.64	46.0	-14.64	119	2.19
765.23	4.78	21.90	3.55	30.23	46.0	-14.72	273	1.66
816.35	5.14	23.00	3.38	31.52	46.0	-15.89	82	1.31
921.56	5.47	24.07	3.52	33.06	46.0	-11.41	125	1.49

NOTE :

1. Measurement uncertainty is 3.85 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.



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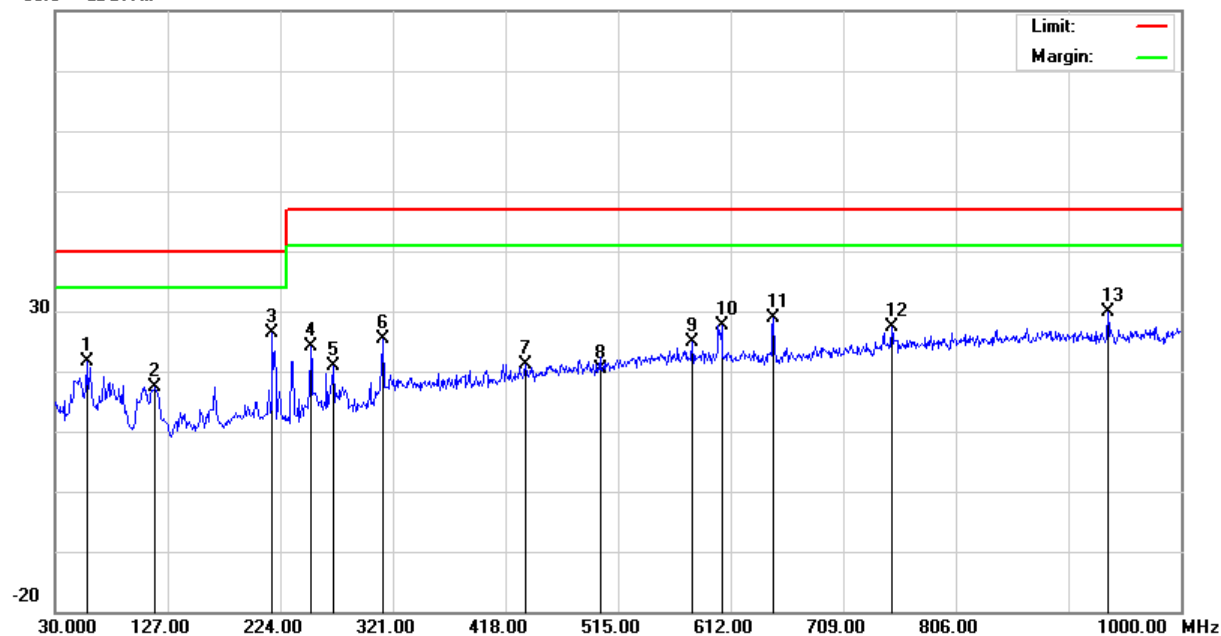
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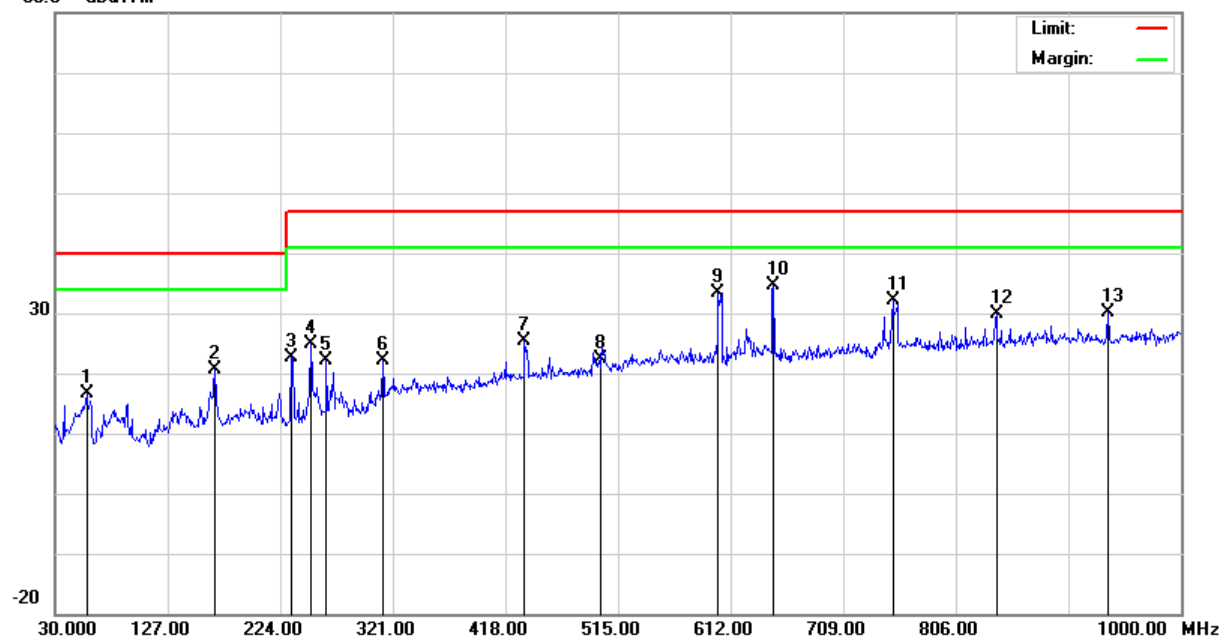
Horizontal

80.0 dBuV/m



Vertical

80.0 dBuV/m



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Temperature:	26 °C	Humidity:	73% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	FSK
Tested By:	Boris Lin	Tested Date:	Apr. 17, 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.		
2431.64	-31.11	28.41	54.69	44.23	51.98	41.52	74.00	54.00	-22.02	-12.48	130	1.42
3038.75	-30.62	30.68	46.58	36.05	46.64	36.11	74.00	54.00	-27.36	-17.89	216	1.63
3762.15	-29.52	32.23	45.83	35.26	48.54	37.97	74.00	54.00	-25.46	-16.03	157	1.87
4633.10	-28.61	33.12	47.16	36.64	51.67	41.15	74.00	54.00	-22.33	-12.85	264	2.08
5334.27	-27.31	34.47	45.97	35.48	53.13	42.64	74.00	54.00	-20.87	-11.36	305	2.31
5795.01	-27.45	34.64	46.73	36.33	53.92	43.52	74.00	54.00	-20.08	-10.48	289	2.44

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.		
2431.68	-31.11	28.41	54.46	43.92	51.75	41.21	74.00	54.00	-22.25	-12.79	128	2.08
3448.40	-29.86	31.50	47.91	37.36	49.55	39.00	74.00	54.00	-24.45	-15.00	251	1.76
4144.04	-29.13	32.80	46.24	35.71	49.91	39.38	74.00	54.00	-24.09	-14.62	109	1.55
4712.91	-28.55	33.31	46.43	35.84	51.19	40.60	74.00	54.00	-22.81	-13.40	89	1.38
5203.81	-27.71	34.28	46.38	35.78	52.96	42.36	74.00	54.00	-21.04	-11.64	224	1.25
5391.77	-27.14	34.55	46.47	35.98	53.88	43.39	74.00	54.00	-20.12	-10.61	312	1.19

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.: A17011607-01
 Report No.: FCCA17011607-01
 FCC ID : 2AK66-EM-5200
 Page: 32 of 38
 Date: Apr. 21, 2017

Temperature:	26 °C	Humidity:	73% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Tx (Fundamental)
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	FSK
Tested By:	Boris Lin	Tested Date:	Apr. 17, 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.		
1301.76	-33.10	25.08	45.78	35.21	37.76	27.19	74.00	54.00	-34.41	-24.12	122	2.13
1735.68	-32.03	26.25	45.13	34.62	39.34	28.83	74.00	54.00	-32.11	-23.75	306	2.75
2169.60	-31.43	27.67	45.37	34.76	41.62	31.01	74.00	54.00	-30.84	-20.18	204	2.95
2603.52	-30.96	29.01	45.76	35.28	43.81	33.33	74.00	54.00	-28.94	-18.56	119	2.28

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.		
1301.76	-33.10	25.08	45.09	34.57	37.07	26.55	74.00	54.00	-34.31	-25.53	163	1.85
1735.68	-32.03	26.25	44.91	34.36	39.12	28.57	74.00	54.00	-32.54	-23.31	216	1.38
2169.60	-31.43	27.67	45.75	35.19	42.00	31.44	74.00	54.00	-30.12	-20.69	85	1.72
2603.52	-30.96	29.01	45.15	34.66	43.20	32.71	74.00	54.00	-28.01	-19.95	166	1.19

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.: A17011607-01

Report No.: FCCA17011607-01

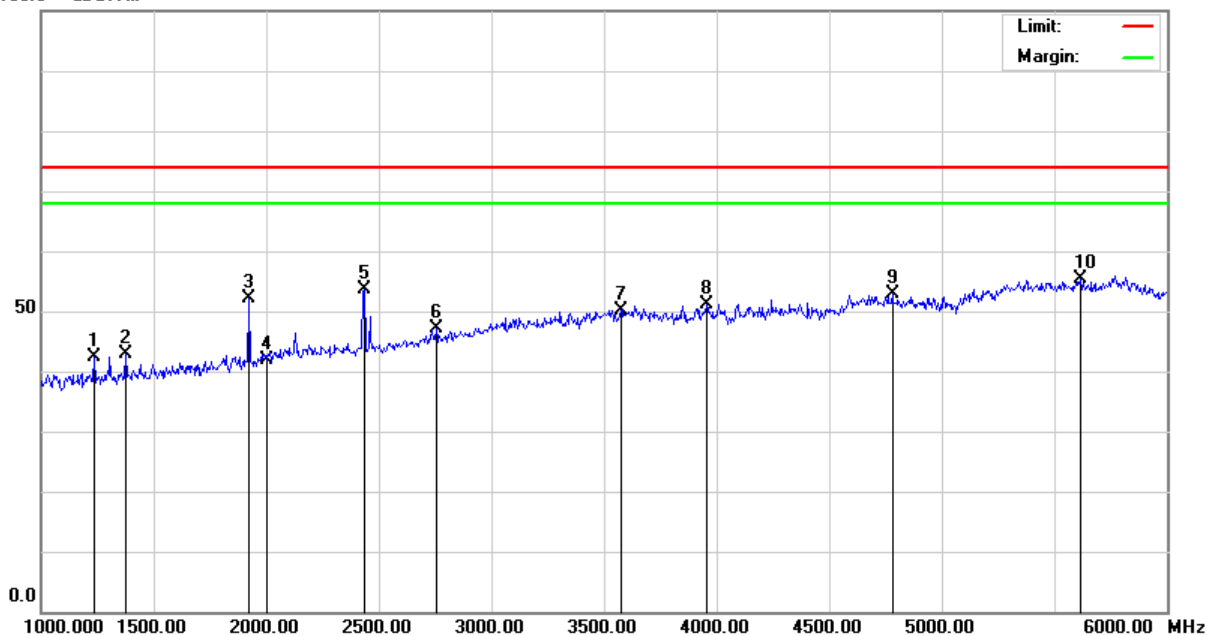
FCC ID : 2AK66-EM-5200

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Date: Apr. 21, 2017

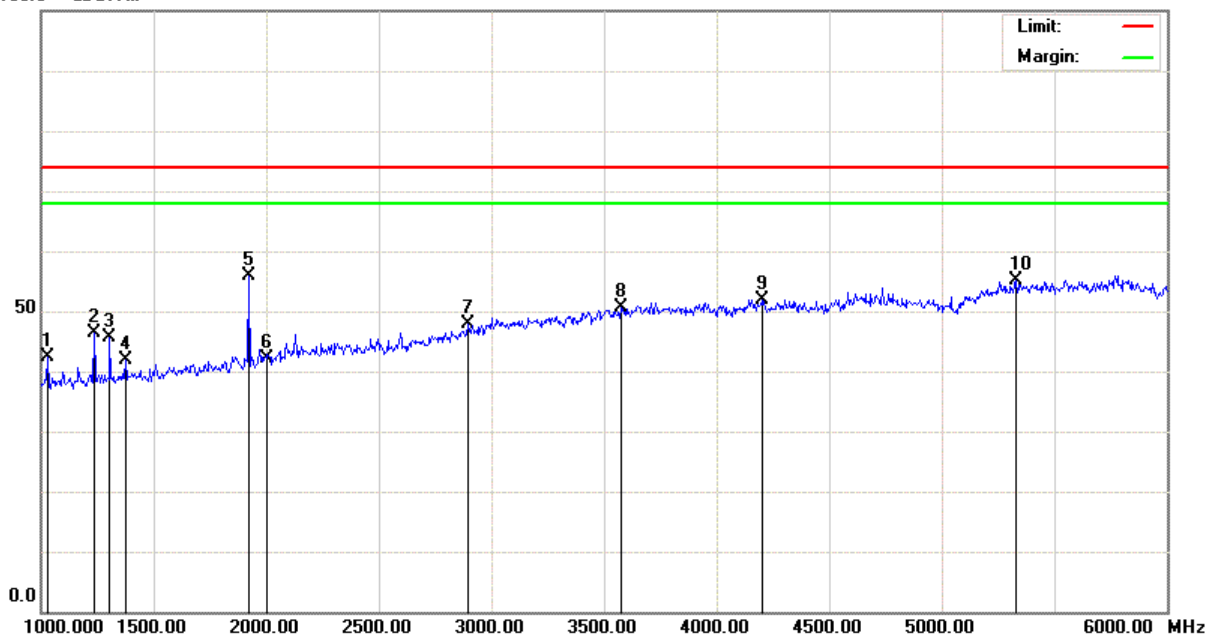
Horizontal

100.0 dBuV/m



Vertical

100.0 dBuV/m



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TEST REPORTReference No.: A17011607-01
Report No.: FCCA17011607-01
FCC ID : 2AK66-EM-5200
Page: 34 of 38
Date: Apr. 21, 2017

Temperature:	26 °C	Humidity:	73% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Standby
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	FSK
Tested By:	Boris Lin	Tested Date:	Apr. 17, 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.		
1921.49	-31.75	26.92	59.13	48.55	54.30	43.72	74.00	54.00	-19.70	-10.28	250	1.27
2433.68	-31.11	28.41	53.01	42.56	50.31	39.86	74.00	54.00	-23.69	-14.14	271	1.45
3728.16	-29.55	32.15	46.55	36.03	49.15	38.63	74.00	54.00	-24.85	-15.37	298	1.83
4052.38	-29.24	32.80	46.62	36.19	50.18	39.75	74.00	54.00	-23.82	-14.25	334	1.96
4623.86	-28.62	33.10	46.27	35.78	50.74	40.25	74.00	54.00	-23.26	-13.75	96	2.07
5319.23	-27.36	34.45	46.49	35.96	53.58	43.05	74.00	54.00	-20.42	-10.95	192	2.34

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.		
1921.45	-31.75	26.92	57.84	47.34	53.01	42.51	74.00	54.00	-20.99	-11.49	239	2.23
3649.57	-29.62	31.96	46.52	35.98	48.85	38.31	74.00	54.00	-25.15	-15.69	210	2.70
4013.07	-29.28	32.80	46.03	35.52	49.55	39.04	74.00	54.00	-24.45	-14.96	306	1.65
4442.83	-28.79	32.80	46.54	35.96	50.55	39.97	74.00	54.00	-23.45	-14.03	105	1.43
5334.26	-27.31	34.47	46.39	35.86	53.55	43.02	74.00	54.00	-20.45	-10.98	73	1.22
5749.19	-27.35	34.65	46.11	35.67	53.41	42.97	74.00	54.00	-20.59	-11.03	91	1.09

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.



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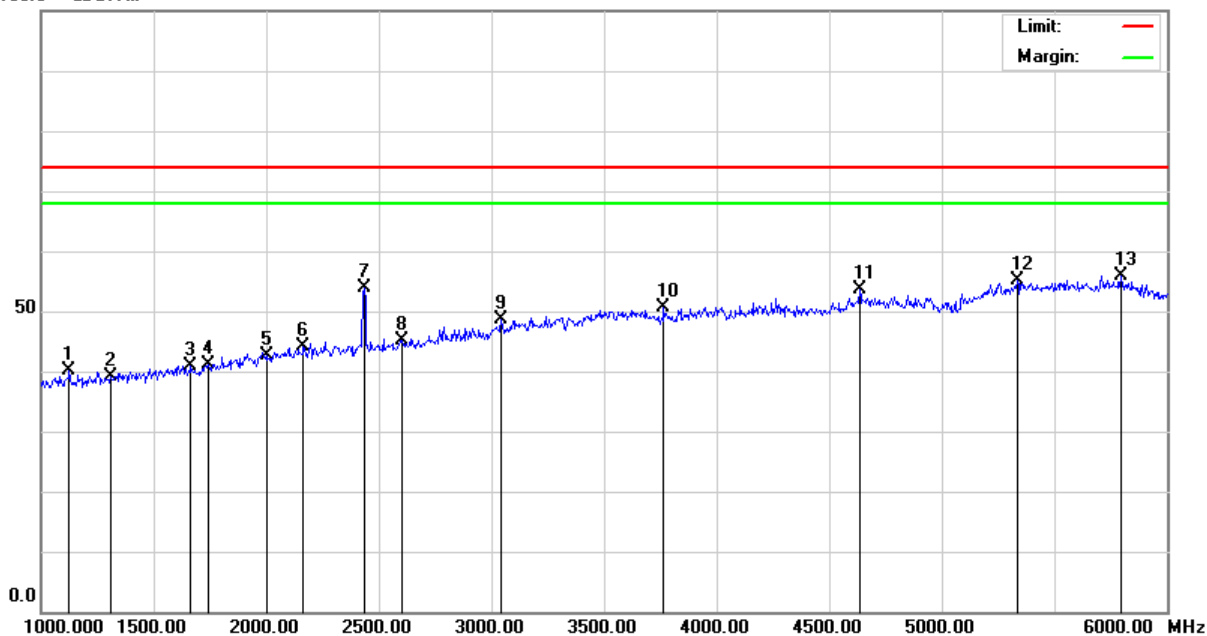
FCC ID : 2AK66-EM-5200

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Date: Apr. 21, 2017

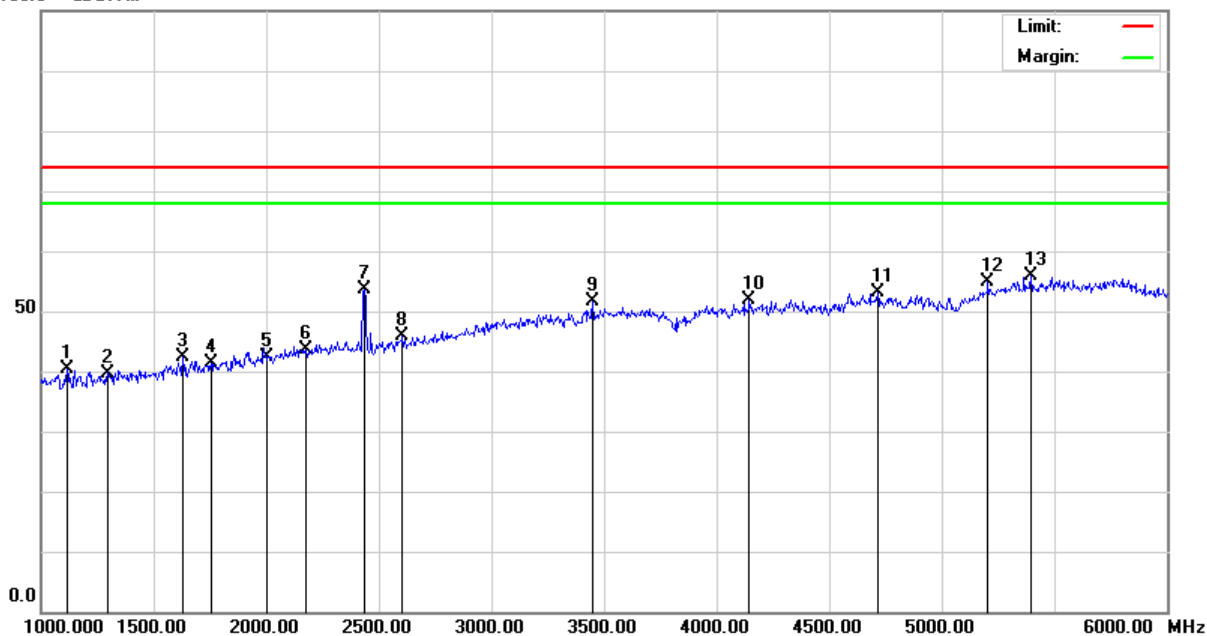
Horizontal

100.0 dBuV/m



Vertical

100.0 dBuV/m



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TEST REPORT

Reference No.: A17011607-01
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 Date: Apr. 21, 2017

Temperature:	26 °C	Humidity:	73% RH
Receiver Detector:	PK. or AV.	Tested Mode:	Link
Frequency Range:	1 GHz – 25 GHz	Modulation Type:	FSK
Tested By:	Boris Lin	Tested Date:	Apr. 17, 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.		
1921.49	-31.75	26.92	59.13	48.55	54.30	43.72	74.00	54.00	-19.70	-10.28	250	1.27
2433.68	-31.11	28.41	53.01	42.56	50.31	39.86	74.00	54.00	-23.69	-14.14	271	1.45
3728.16	-29.55	32.15	46.55	36.03	49.15	38.63	74.00	54.00	-24.85	-15.37	298	1.83
4052.38	-29.24	32.80	46.62	36.19	50.18	39.75	74.00	54.00	-23.82	-14.25	334	1.96
4623.86	-28.62	33.10	46.27	35.78	50.74	40.25	74.00	54.00	-23.26	-13.75	96	2.07
5319.23	-27.36	34.45	46.49	35.96	53.58	43.05	74.00	54.00	-20.42	-10.95	192	2.34

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.		
1921.45	-31.75	26.92	57.84	47.34	53.01	42.51	74.00	54.00	-20.99	-11.49	239	2.23
3649.57	-29.62	31.96	46.52	35.98	48.85	38.31	74.00	54.00	-25.15	-15.69	210	2.70
4013.07	-29.28	32.80	46.03	35.52	49.55	39.04	74.00	54.00	-24.45	-14.96	306	1.65
4442.83	-28.79	32.80	46.54	35.96	50.55	39.97	74.00	54.00	-23.45	-14.03	105	1.43
5334.26	-27.31	34.47	46.39	35.86	53.55	43.02	74.00	54.00	-20.45	-10.98	73	1.22
5749.19	-27.35	34.65	46.11	35.67	53.41	42.97	74.00	54.00	-20.59	-11.03	91	1.09

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.



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TEST REPORT

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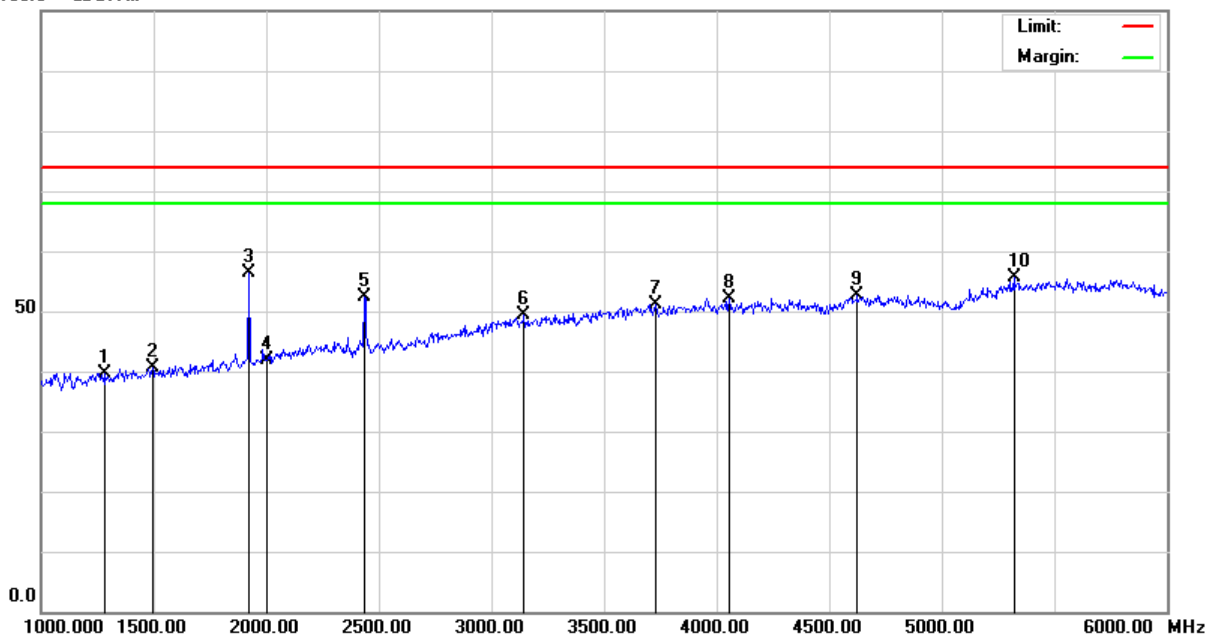
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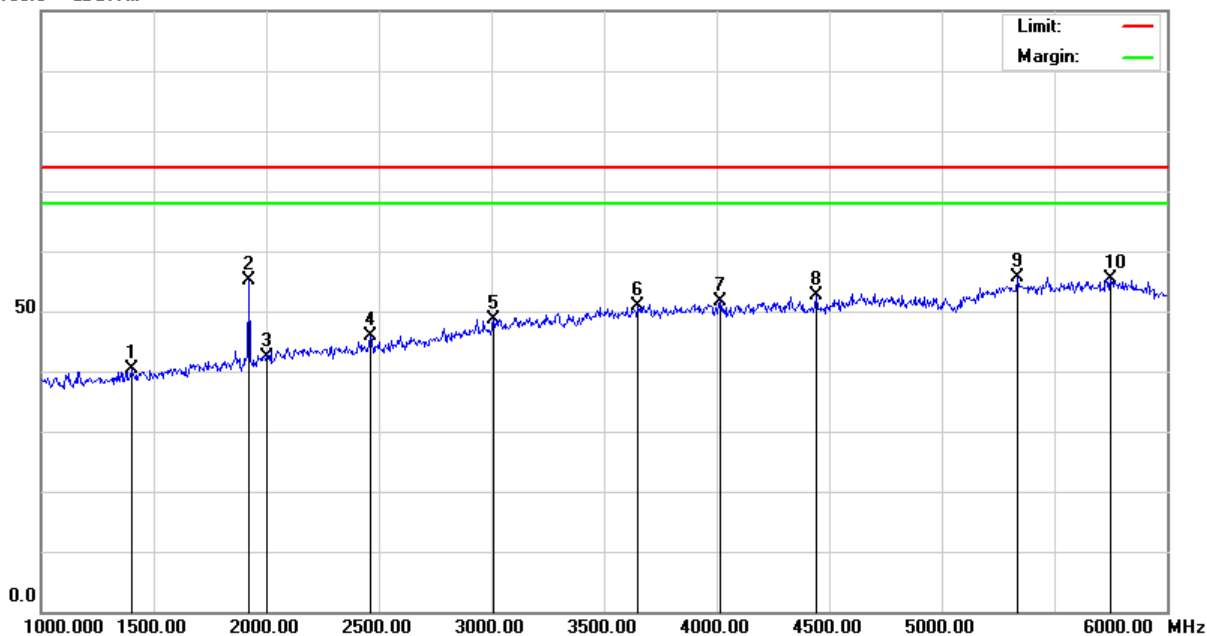
Horizontal

100.0 dBuV/m



Vertical

100.0 dBuV/m



**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.: A17011607-01
Report No.: FCCA17011607-01
FCC ID : 2AK66-EM-5200
Page: 38 of 38
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5. TERMS OF ABBREVIATION

AV.	Average detection
AZ(°)	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