FCC PART 15.247

TEST REPORT

For

Changsha SunSky Electronic Design & Development Co., Ltd.

Room1024, Building A, Biaozhi Business Center No. 198 Xiang Fu Road, Changsha, China

FCC ID: WSVSUNVOTEKEYE1X

Report Type:	**Product Type:**
Original Report	Voting Keypad

Test Engineer:	Chris Wang
Report Number:	RKS160627001-00E
Report Date:	2016-07-28
Reviewed By:	Jesse Huang EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) Chenghu Road,Kunshan Development Zone No.248,Kunshan, Jiangsu, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Changsha SunSky Electronic Design & Development Co., Ltd.'s product, model number: E10 (FCC ID: WSVSUNVOTEKEYE1X) or the "EUT" in this report was a Voting Keypad, which was measured approximately: 110mm (L) x58mm (W)) x16mm (H), rated input voltage: DC 3.7V From lithium battery.

** All measurement and test data in this report was gathered from production sample serial number: 20160711008.*

(Assigned by BACL, Kunshan). The EUT was received on 2016-07-11.

Objective

This report is prepared on behalf of Changsha SunSky Electronic Design & Development Co., Ltd. in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related submittal

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB558074 D01 DTS Meas Guidance v03r05.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with RF radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Lake Road, Kunshan Development Zone No.248,Kunshan, Jiangsu, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured in testing mode which was provided by manufacturer.

EUT was tested with Channel 2402MHz, 2432MHz and 2464MHz.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

SunVote SDK Tool Kit 1.5.1.0

The worst condition (maximum power with 90% duty cycle) was performed under:

Power lever 15.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) & §2.1093	RF Exposure Information	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC§1.1307 (b) & §2.1093 –RF EXPOSURE INFORMAT

Applicable Standard

FCC§1.1307 (b) & §2.1093

Result:

Compliance, please refer to the SAR report : RSH160713051-20.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has a PCB antenna arrangement, which the antenna gain is -5.3dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

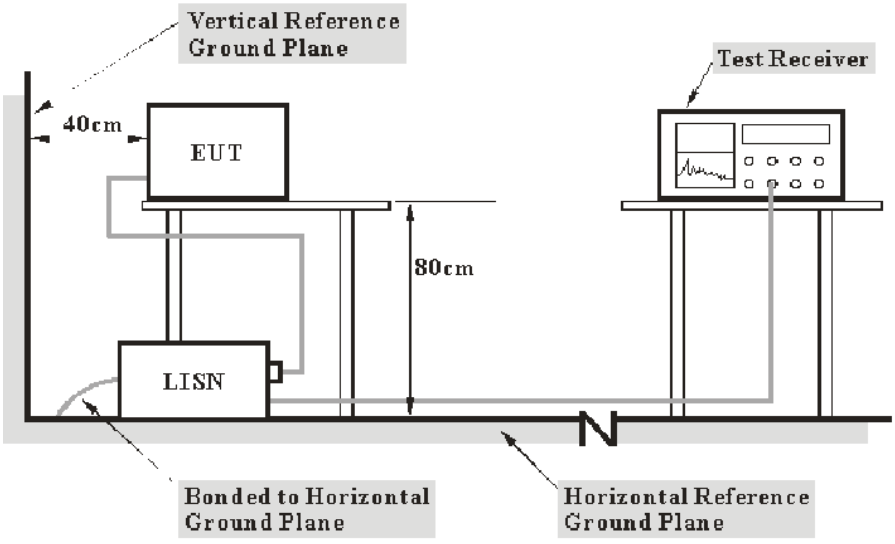
Measurement Uncertainty

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

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

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

EUT Setup



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

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

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	934115/007	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	892239/018	2016-06-23	2017-06-22
FCC	ISN	FCC-TLISN-T8-02	20376	2016-06-23	2017-06-22
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2015-10-01	2016-10-01
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	--	--

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

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

Correction Factor = LISN VDF + Cable Loss

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

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, the worst margin reading as below:

8.02dB at **0.155000 MHz** in the **Line** conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

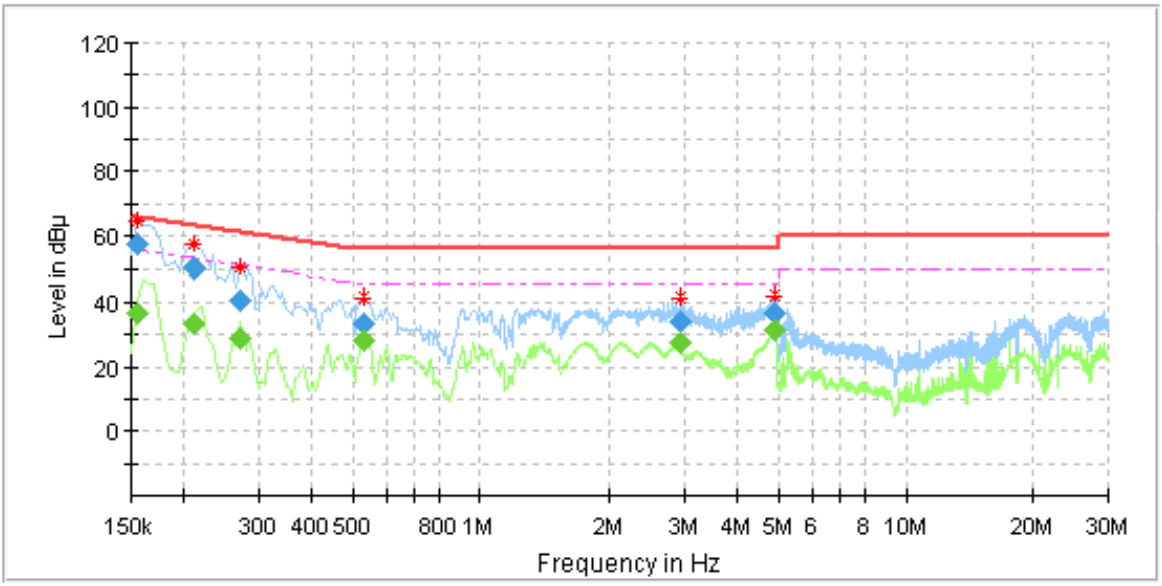
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-14.

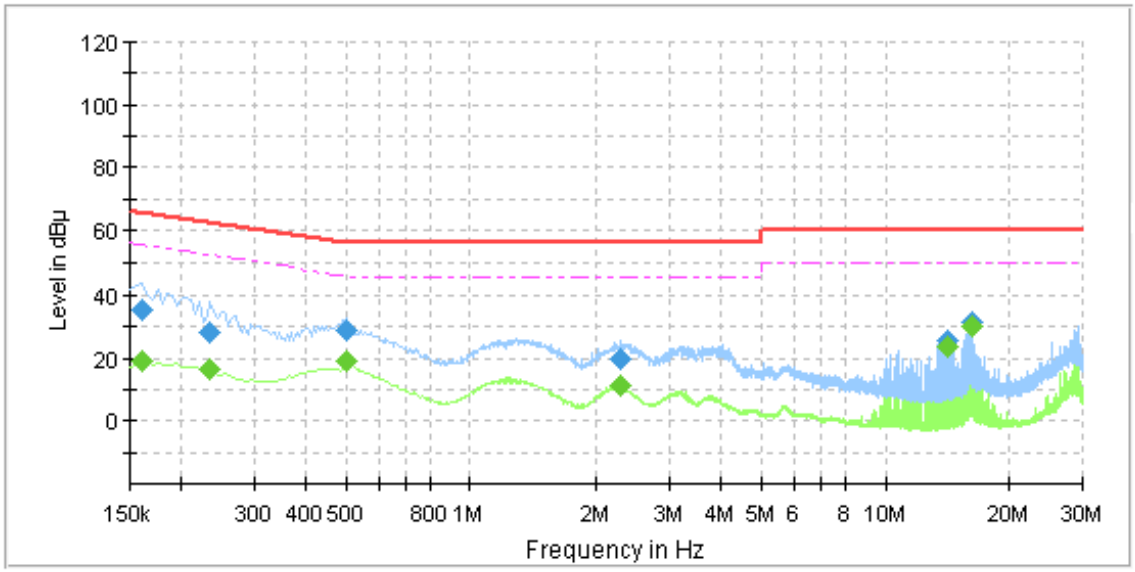
Test Mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.155000	---	36.83	9.000	L1	11.0	18.90	55.73	Compliance
0.155000	57.71	---	9.000	L1	11.0	8.02	65.73	Compliance
0.210000	---	33.21	9.000	L1	11.0	20.00	53.21	Compliance
0.210000	50.40	---	9.000	L1	11.0	12.81	63.21	Compliance
0.270000	---	29.04	9.000	L1	11.0	22.08	51.12	Compliance
0.270000	40.30	---	9.000	L1	11.0	20.82	61.12	Compliance
0.530000	---	28.08	9.000	L1	11.0	17.92	46.00	Compliance
0.530000	33.24	---	9.000	L1	11.0	22.76	56.00	Compliance
2.925000	---	27.47	9.000	L1	11.2	18.53	46.00	Compliance
2.925000	34.21	---	9.000	L1	11.2	21.79	56.00	Compliance
4.880000	---	31.29	9.000	L1	11.3	14.71	46.00	Compliance
4.880000	36.74	---	9.000	L1	11.3	19.26	56.00	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.160000	---	18.93	9.000	N	11.0	36.53	55.46	Compliance
0.160000	35.31	---	9.000	N	11.0	30.15	65.46	Compliance
0.235000	---	16.29	9.000	N	11.0	35.98	52.27	Compliance
0.235000	27.98	---	9.000	N	11.0	34.29	62.27	Compliance
0.500000	---	19.17	9.000	N	11.0	26.83	46.00	Compliance
0.500000	28.55	---	9.000	N	11.0	27.45	56.00	Compliance
2.295000	---	11.14	9.000	N	11.3	34.86	46.00	Compliance
2.295000	19.88	---	9.000	N	11.3	36.12	56.00	Compliance
14.150000	---	23.55	9.000	N	11.4	26.45	50.00	Compliance
14.150000	25.55	---	9.000	N	11.4	34.45	60.00	Compliance
16.165000	---	30.35	9.000	N	11.4	19.65	50.00	Compliance
16.165000	31.60	---	9.000	N	11.4	28.40	60.00	Compliance

Note:
1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Corrected Amplitude = Reading + Corr.
3) Margin = Limit –Corrected Amplitude

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

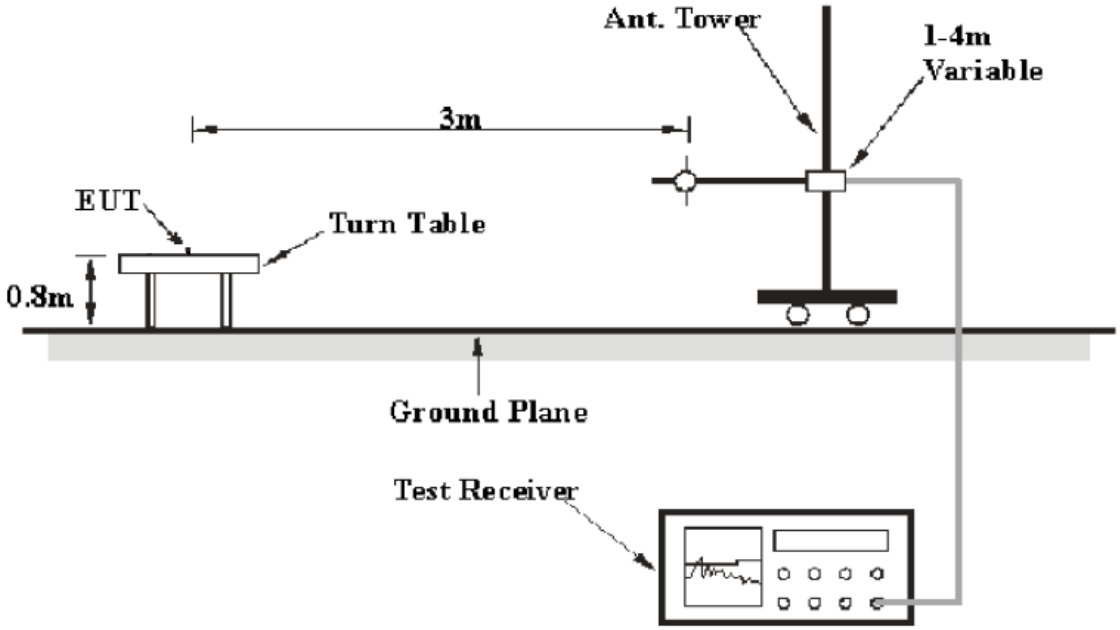
Measurement Uncertainty

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

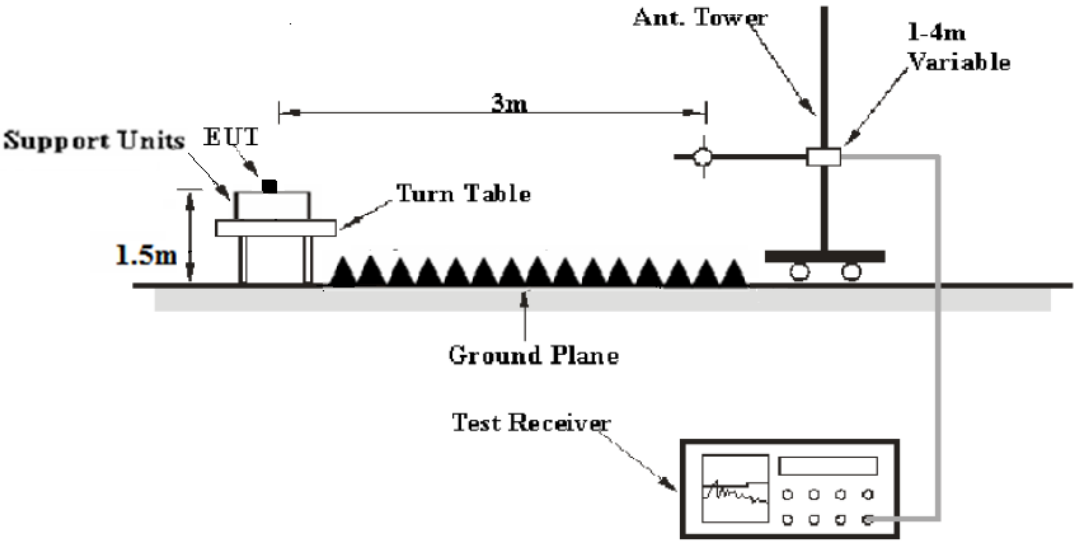
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

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

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrunent	Amplifier	330	171377	2015-09-16	2016-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2015-11-07	2016-11-06
ETS	Horn Antenna	3115	6229	2015-11-07	2016-11-06
EMCO	Horn Antenna	3116	9510-2384	2015-11-07	2016-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
Mini	Pre-amplifier	ZVA-183-S+	857001418	2015-09-16	2016-09-16
DUCOMMUN	Pre-amplifier	ALN-22093530-01	990147	2015-09-16	2016-09-16
champrotek	Chamber	Chamber A	1#	2015-09-17	2016-09-17
R&S	Auto test Software	EMC32	V 09.10.0	-	-
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

6.64 dB at **2324 MHz** in the **Horizontal** polarization

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

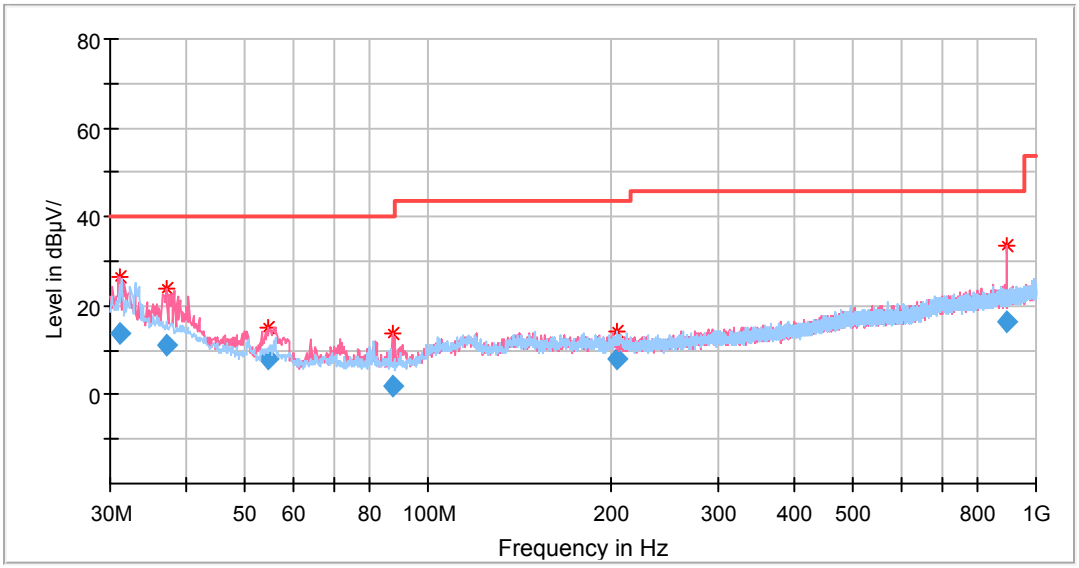
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-11.

30 MHz-1 GHz:

EUT operation mode: Transmitting



Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dB µ V/m)	Margin (dB)
31.212500	19.59	QP	304.0	200.0	V	-5.9	13.69	40.00	26.31
37.032500	20.06	QP	97.0	100.0	V	-8.8	11.26	40.00	28.74
54.613750	24.66	QP	343.0	100.0	V	-16.7	7.96	40.00	32.04
87.230000	19.01	QP	329.0	100.0	V	-17.0	2.01	40.00	37.99
203.993750	20.72	QP	338.0	100.0	H	-12.5	8.22	43.50	35.28
895.482500	17.33	QP	112.0	100.0	V	-1.0	16.33	46.00	29.67

1GHz-25 GHz

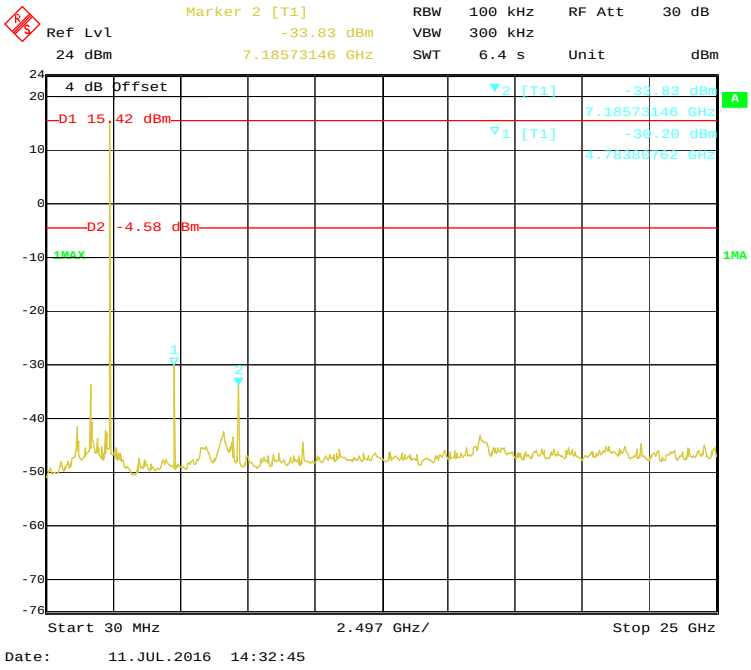
EUT operation mode: Transmitting （Scan with X, Y, Z axis, the worst case is X axis ）

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402MHz)									
2402	96.94	PK	288.0	150.0	V	4.9	101.84	/	/
2402	94.75	Ave	288.0	150.0	V	4.9	99.65	/	/
2402	96.67	PK	310.0	150.0	H	4.9	101.57	/	/
2402	94.34	Ave	310.0	150.0	H	4.9	99.24	/	/
2324	42.56	Ave	168.0	150.0	H	4.8	47.36	54	6.64
2324	54.08	PK	168.0	150.0	H	4.8	58.88	74	15.12
2390	33.87	Ave	196.0	150.0	H	4.9	38.77	54	15.23
2390	44.74	PK	196.0	150.0	H	4.9	49.64	74	24.36
1940	27.68	Ave	90.0	150.0	V	4.2	31.88	54	22.12
1940	40.70	PK	90.0	150.0	V	4.2	44.90	74	29.10
4804	31.73	PK	162.0	150.0	V	13.3	45.03	74	28.97
4804	18.56	Ave	162.0	150.0	V	13.3	31.86	54	22.14
7206	30.84	PK	101.0	200.0	V	19.7	50.54	74	23.46
7206	16.69	Ave	101.0	200.0	V	19.7	36.39	54	17.61
Frequency (MHz)	**Receiver**		**Turntable Degree**	**Rx Antenna**		**Corrected Factor (dB)**	**Corrected Amplitude (dBμV/m)**	**FCC Part 15.247/205/209**	
	Reading (dBμV)	**Detector (PK/QP/Ave.)**		**Height (cm)**	**Polar (H/V)**			**Limit (dBμV/m)**	**Margin (dB)**
Middle Channel (2432MHz)									
2432	97.53	PK	250.0	150.0	V	4.9	102.43	/	/
2432	95.42	Ave	250.0	150.0	V	4.9	100.32	/	/
2432	97.22	PK	12.0	150.0	H	4.9	102.12	/	/
2432	95.93	Ave	12.0	150.0	H	4.9	100.83	/	/
1800	41.11	PK	186.0	200.0	H	3.7	44.81	74	29.19
1800	28.23	Ave	186.0	200.0	H	3.7	31.93	54	22.07
2024	40.78	PK	175.0	150.0	H	4.4	45.18	74	28.82
2024	27.72	Ave	175.0	150.0	H	4.4	32.12	54	21.88
4864	32.98	PK	169.0	150.0	V	13.5	46.48	74	27.52
4864	18.51	Ave	169.0	150.0	V	13.5	32.01	54	21.99
6667	21.71	Ave	74.0	150.0	V	17.8	39.51	54	14.49
6667	34.86	PK	74.0	150.0	V	17.8	52.66	74	21.34
7296	39.00	PK	223.0	150.0	H	19.9	58.90	74	15.10
7296	22.77	Ave	223.0	150.0	H	19.9	42.67	54	11.33

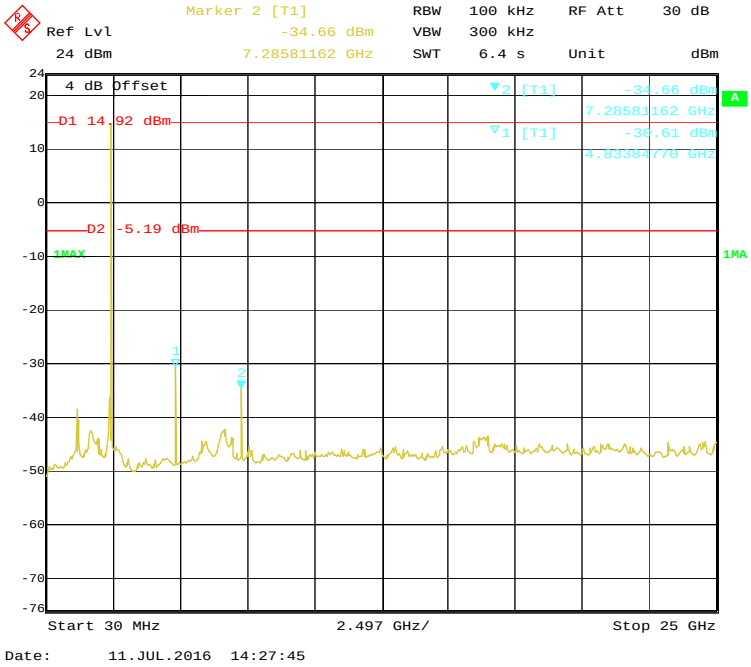
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2464MHz)									
2464	96.94	PK	132.0	150.0	V	5.0	101.94	/	/
2464	94.73	Ave	132.0	150.0	V	5.0	99.73	/	/
2464	96.87	PK	177.0	150.0	H	5.0	101.87	/	/
2464	94.77	Ave	177.0	150.0	H	5.0	99.77	/	/
2483.5	41.00	PK	167.0	150.0	H	5.0	46.00	74	28.00
2483.5	27.87	Ave	167.0	150.0	H	5.0	32.87	54	21.13
2542	51.14	PK	201.0	150.0	H	5.0	56.14	74	17.86
2542	39.41	Ave	201.0	150.0	H	5.0	44.41	54	9.59
2024	41.14	PK	191.0	150.0	H	4.4	45.54	74	28.46
2024	27.72	Ave	191.0	150.0	H	4.4	32.12	54	21.88
4928	31.49	PK	166.0	150.0	V	13.8	45.29	74	28.71
4928	18.53	Ave	166.0	150.0	V	13.8	32.33	54	21.67
7392	18.01	Ave	163.0	200.0	H	20.2	38.21	54	15.79
7392	31.49	PK	163.0	200.0	H	20.2	51.69	74	22.31

Spurious Emissions at Antenna Port:

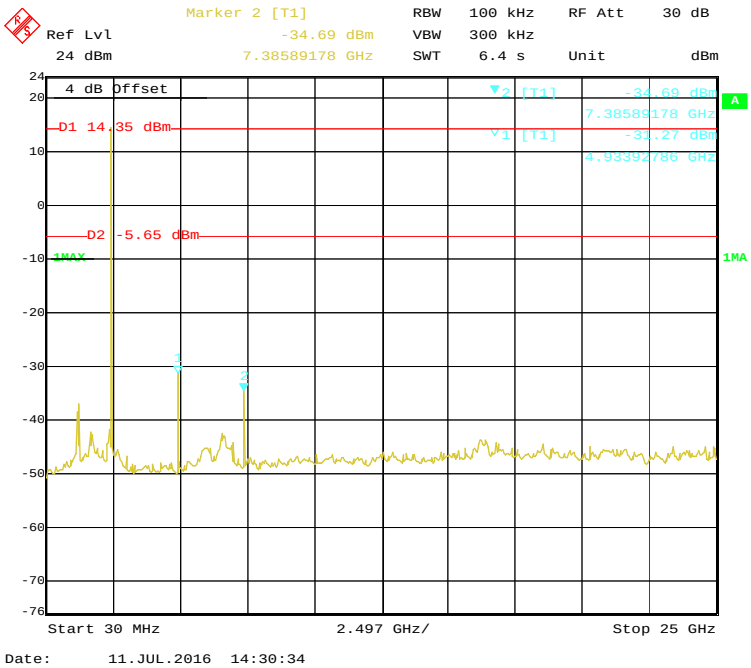
Low Channel



Middle Channel



High Channel



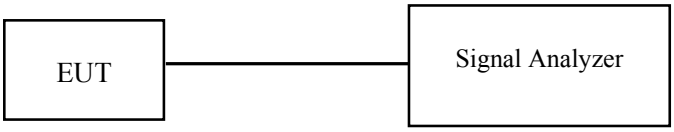
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-11.

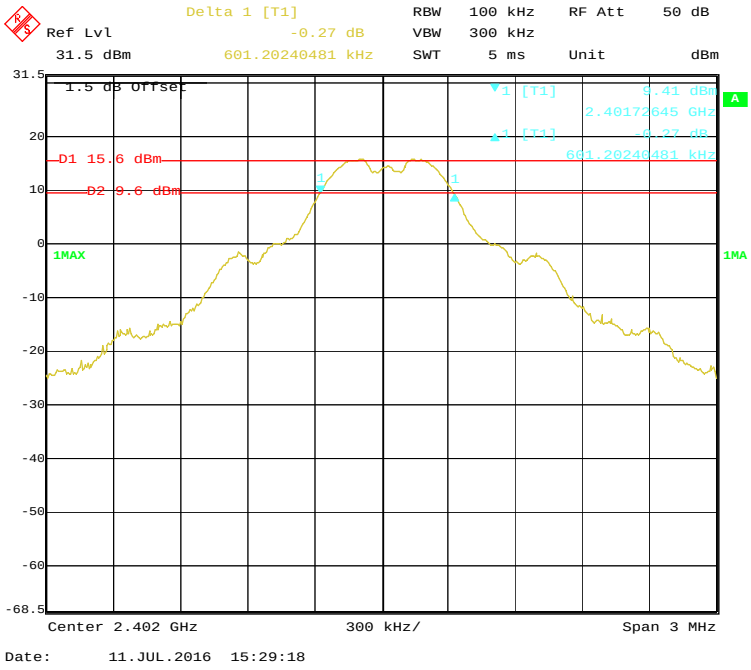
Test Result: Pass.

Please refer to the following tables and plots.

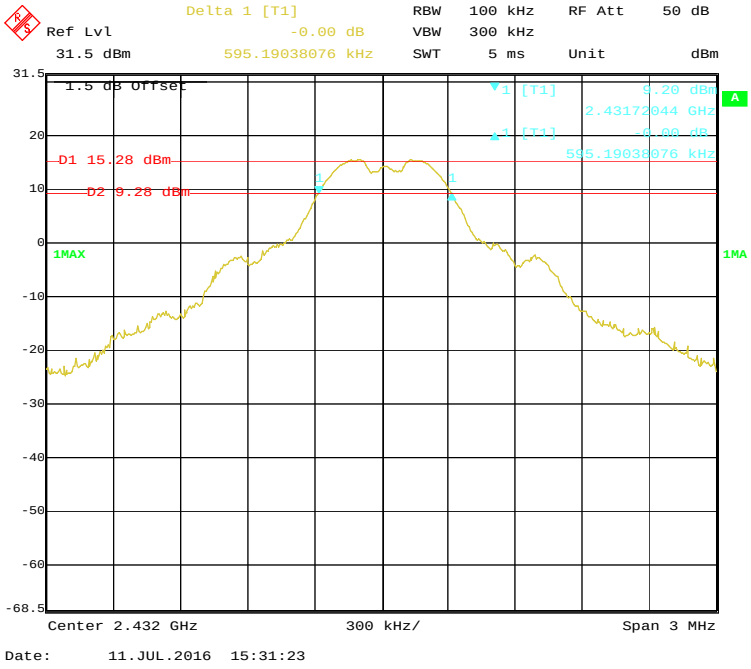
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
Low	2402	0.601	⩾500
Middle	2432	0.595	⩾500
High	2464	0.601	⩾500

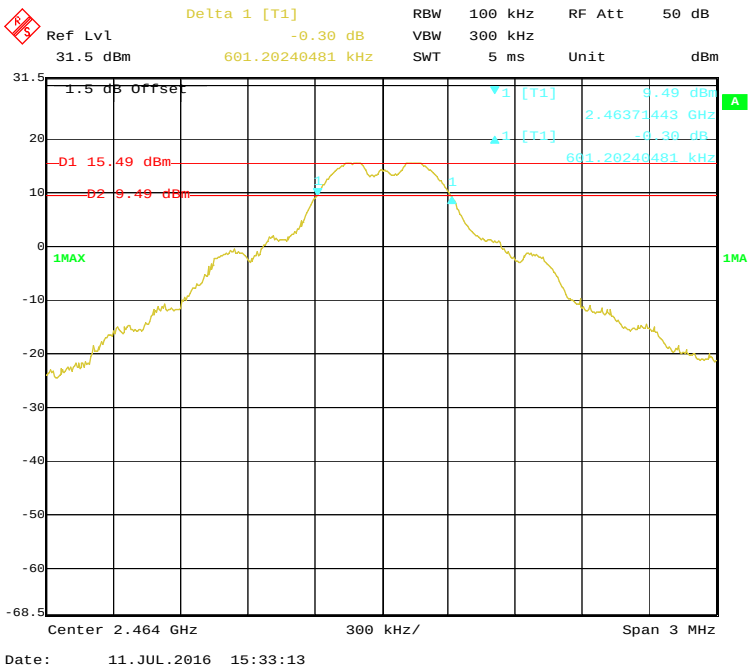
Low Channel



Middle Channel



High Channel



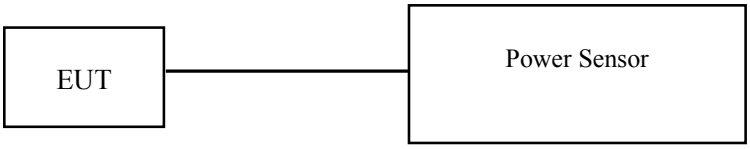
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	OSP120 BASE UNIT（WITHOUT DISPLAY）	OSP120	101247	2015-05-27	2017-05-27
Rohde & Schwarz	Power Sensor	NRP-Z91	200014	2015-08-01	2017-07-31
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-11.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)	Result
Low	2402	15.44	14.42	30	Pass
Middle	2432	15.18	14.14	30	Pass
High	2464	15.46	14.47	30	Pass

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

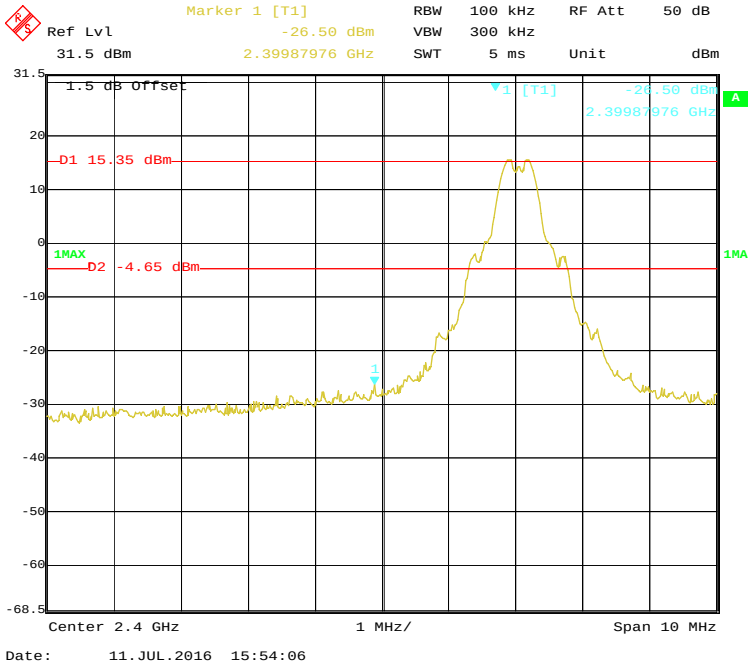
Temperature:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-11.

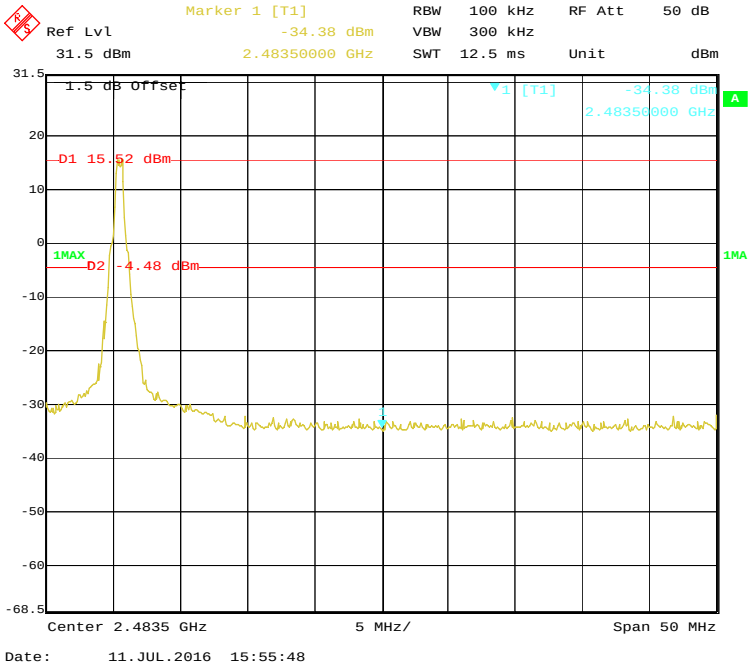
Test Result: *Compliance*

Please refer to the following table and plots.

Band Edge, Left Side



Band Edge, Right Side



FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

According to KDB558074 D01 DTS Meas Guidance v03r05 sub-clause 10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

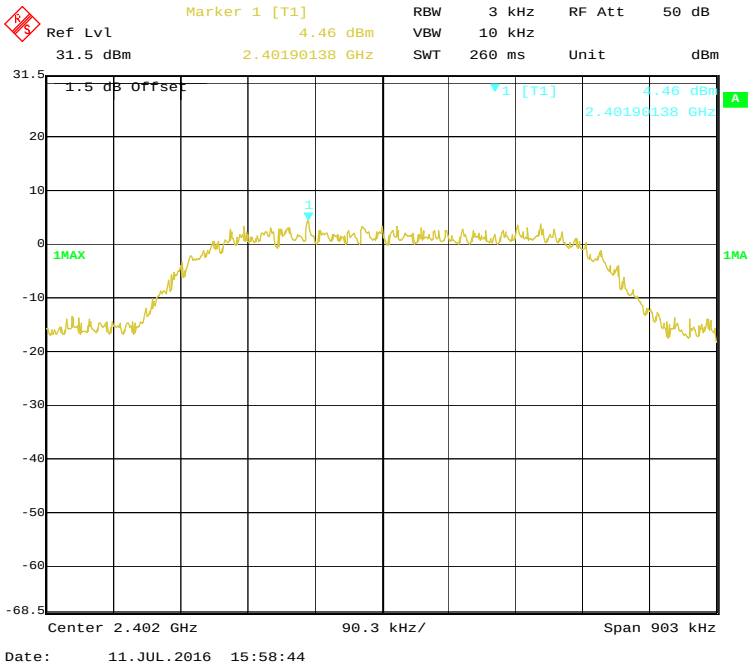
The testing was performed by Chris Wang on 2016-07-11.

EUT operation mode: Transmitting

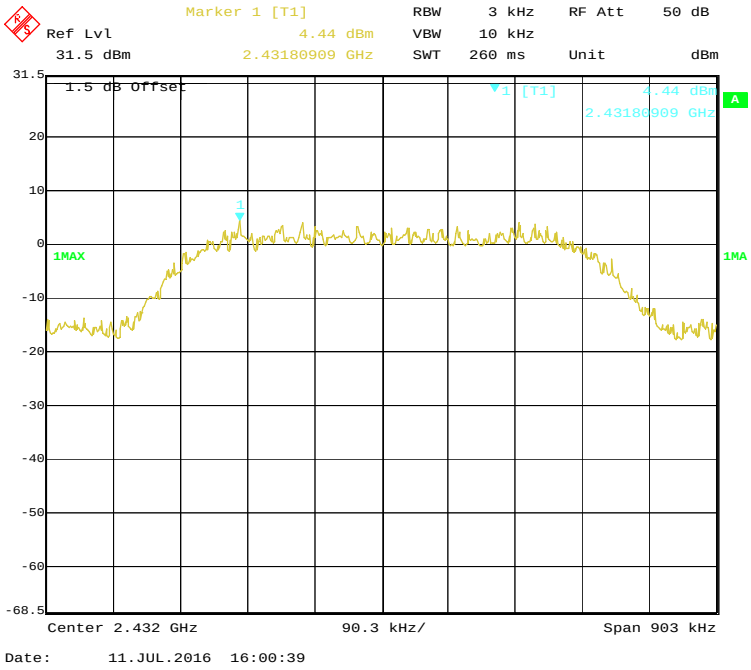
Test Result: Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	4.46	≤8
Middle	2432	4.44	≤8
High	2464	4.34	≤8

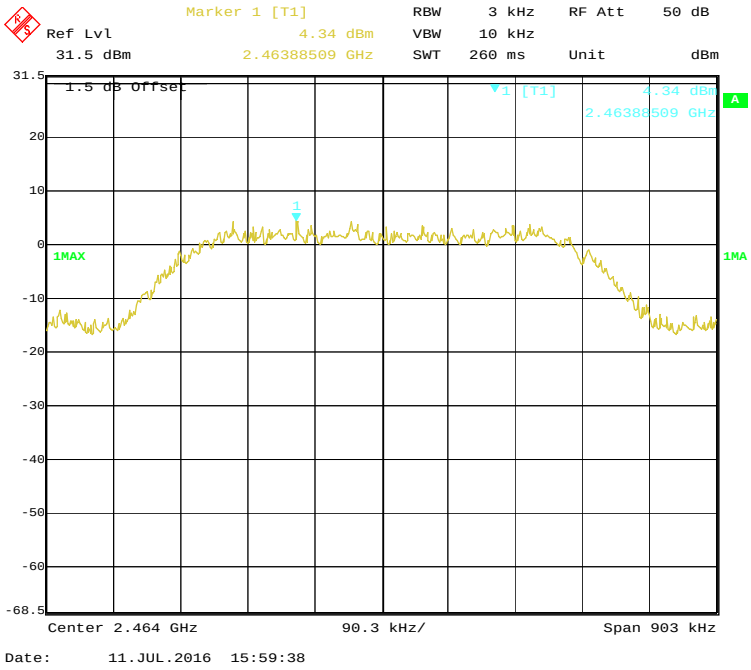
Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel



Power Spectral Density, High Channel



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