

FCC PART 15.247

TEST REPORT

For

FrSky Electronic Co., Ltd.

No.100 Jinxi Road , Wuxi,Jiangsu, China

FCC ID: XYFX12SDP

Report Type: Original Report	Product Type: Digital Telemetry Radio System
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Report Number: RKS160226001-00C	
Report Date: 2016-08-03	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The FrSky Electronic Co., Ltd.'s product, model number: HORUS X12S (FCC ID: XYFX12SDP) (the "EUT") in this report was a Digital Telemetry Radio System, was measured approximately: 222 mm (L) x 230mm (W) x 75mm (H). rated input voltage: Supplied by Adapter DC 18V (Built-in a 9.6V/2000mAh NI-MH rechargeable battery).

Note: The series product model HORUS X12, HORUS X12D, The difference between them was explained in the attached declaration letter.

All measurement and test data in this report was gathered from production sample serial number: 20160219001

(Assigned by BACL, Kunshan). The EUT was received on 2016-02-19.

Objective

This report is prepared on behalf of FrSky Electronic 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)

FCC Part 15.249 DXX submissions with FCC ID: XYFX12SDP.

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 measureme

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu 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 December 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 for testing in an engineer mode.

EUT Exercise Software

Bluetooth

Power lever 0

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

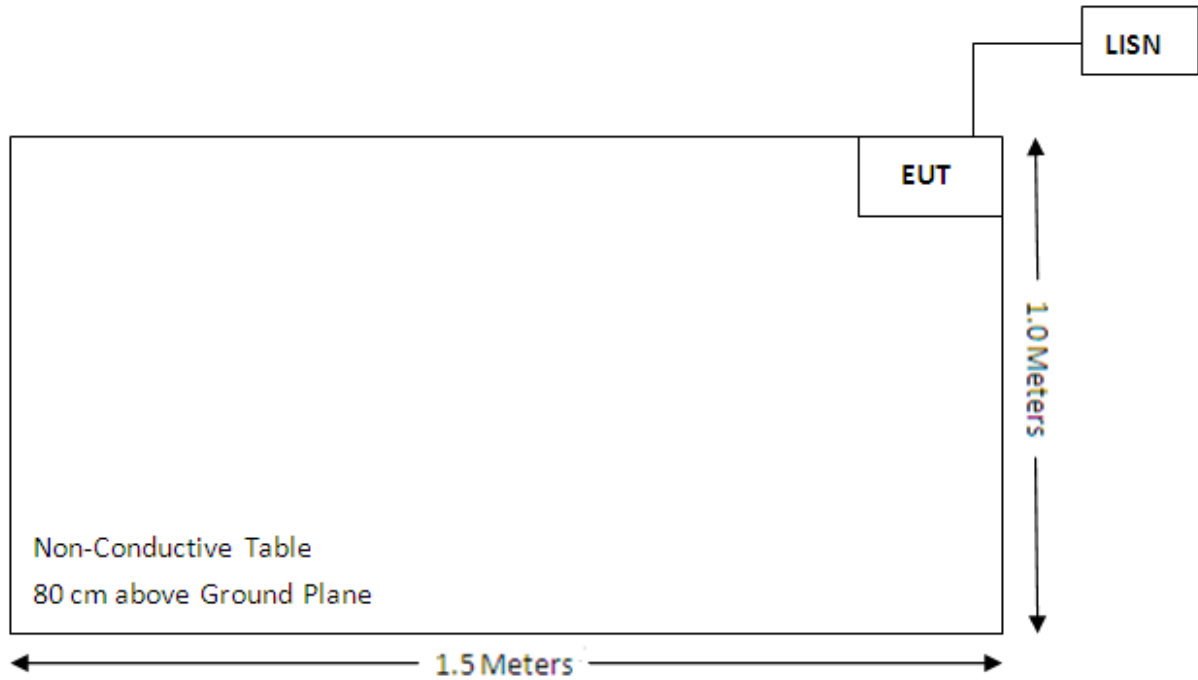
Manufacturer	Description	Model	Serial Number
YNQX	AC Adapter INPUT:100-240V~50/60Hz 0.3A OUTPUT:18V,0.5A	YNQX12T01800 50VL	N/A

External I/O Cable

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

Block Diagram of Test Setup

For conducted emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1310& §2.1093	RF Exposure	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 Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC§15.247 (i), §1.1310& §2.1093 –RF EXPOSURE**Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The maximum conducted peak output power = 3.0 dBm (2.00mW) at 2402~2480MHz
$$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$$
$$= 2.00/5 \cdot (\sqrt{2.480}) = 0.63 < 7.5$$

Note: The target power : 2 ± 1 dBm, which declared by the Manufacturer.

So the stand-alone SAR evaluation is not necessary.

FCC §15.203 - ANTENNA REQUIREMENT

Applied 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.

Antenna Connector Construction

The EUT has a PCB antenna arrangement for Bluetooth, which the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

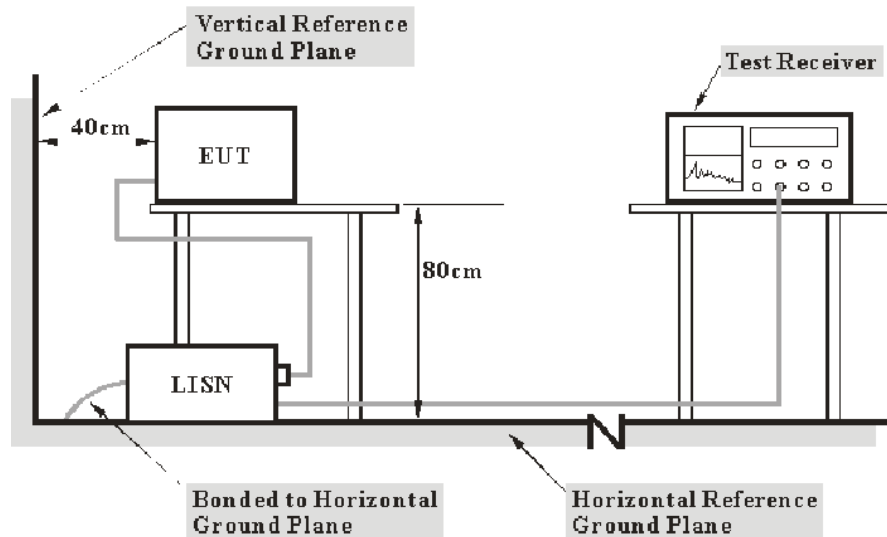
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements may be 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, the expanded 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
Rohde & Schwarz	Pulse limiter	ESH3-Z2	879940/0058	2016-06-19	2017-06-18
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:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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:

4.25 dB at 0.505000 MHz in the Line conducted mode

Refer to CISPR16-4-2 and CISPR 16-4-1, 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.

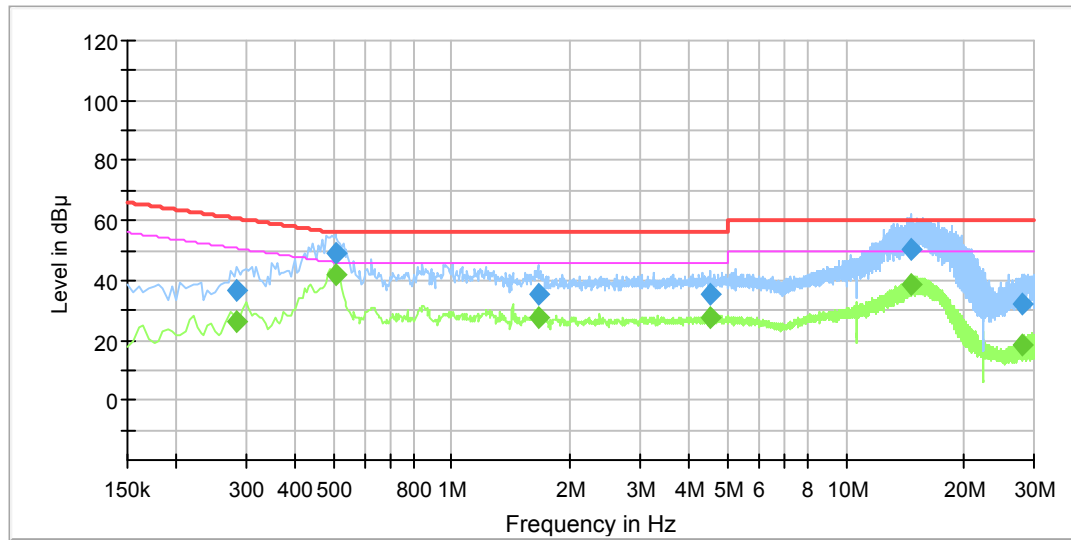
Test Data

Environmental Conditions

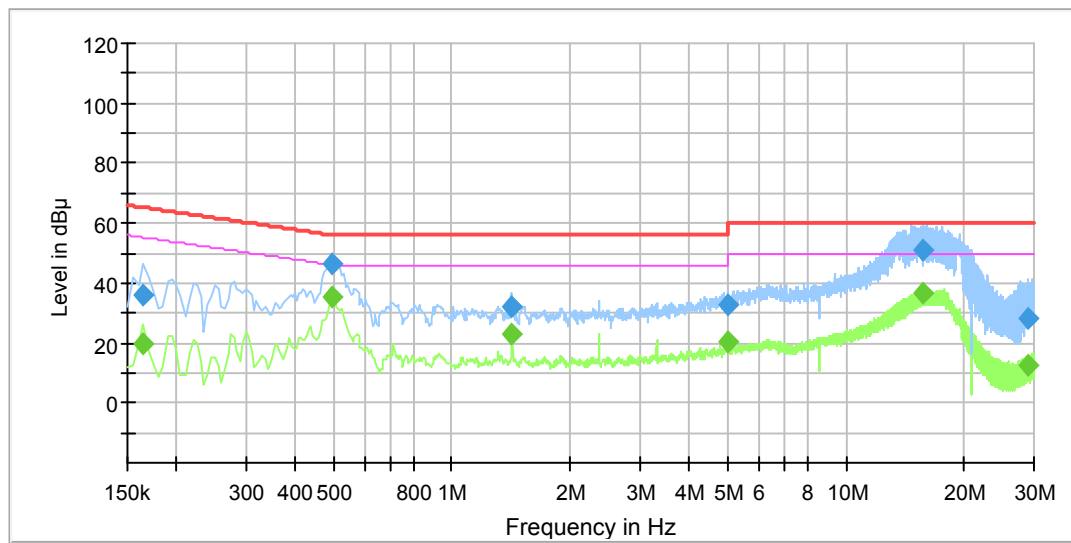
Temperature:	23 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-07-28.

EUT operation 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
0.285000	---	25.94	9.000	L1	11.0	24.73	50.67	Compliance
0.285000	36.88	---	9.000	L1	11.0	23.79	60.67	Compliance
0.505000	---	41.75	9.000	L1	11.0	4.25	46.00	Compliance
0.505000	49.29	---	9.000	L1	11.0	6.71	56.00	Compliance
1.655000	---	27.46	9.000	L1	11.2	18.54	46.00	Compliance
1.655000	35.66	---	9.000	L1	11.2	20.34	56.00	Compliance
4.525000	---	27.33	9.000	L1	11.3	18.67	46.00	Compliance
4.525000	35.55	---	9.000	L1	11.3	20.45	56.00	Compliance
14.710000	---	38.30	9.000	L1	11.3	11.70	50.00	Compliance
14.710000	50.63	---	9.000	L1	11.3	9.37	60.00	Compliance
28.070000	---	18.36	9.000	L1	11.5	31.64	50.00	Compliance
28.070000	32.35	---	9.000	L1	11.5	27.65	60.00	Compliance

AC 120V/60 Hz, Neutral

Frequency (MHz)	QuasiPeak (dBμV)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.165000	---	19.93	9.000	N	11.0	35.28	55.21	Compliance
0.165000	36.03	---	9.000	N	11.0	29.18	65.21	Compliance
0.495000	---	35.10	9.000	N	11.0	10.98	46.08	Compliance
0.495000	46.56	---	9.000	N	11.0	9.52	56.08	Compliance
1.415000	---	22.67	9.000	N	11.1	23.33	46.00	Compliance
1.415000	31.90	---	9.000	N	11.1	24.10	56.00	Compliance
5.035000	---	20.14	9.000	N	11.4	29.86	50.00	Compliance
5.035000	32.92	---	9.000	N	11.4	27.08	60.00	Compliance
15.655000	---	36.49	9.000	N	11.4	13.51	50.00	Compliance
15.655000	50.71	---	9.000	N	11.4	9.29	60.00	Compliance
28.940000	---	12.33	9.000	N	11.5	37.67	50.00	Compliance
28.940000	28.16	---	9.000	N	11.5	31.84	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

Applied Standard

FCC §15.247 (d); §15.209; §15.205;

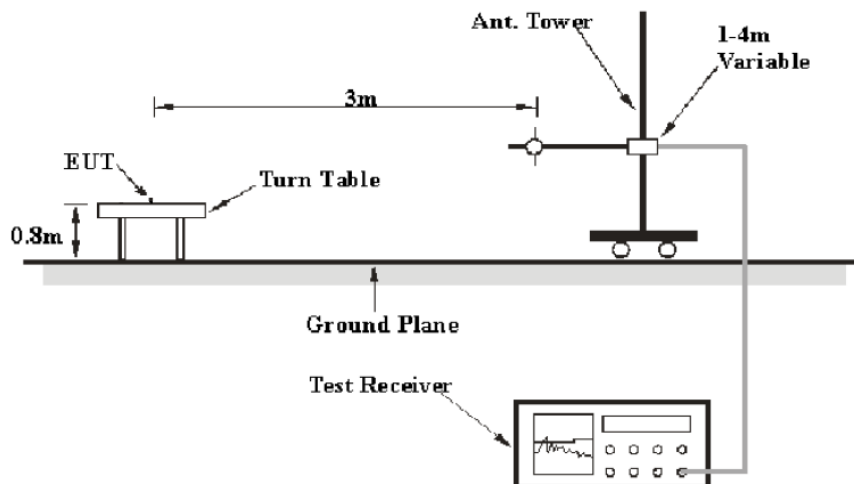
Measurement Uncertainty

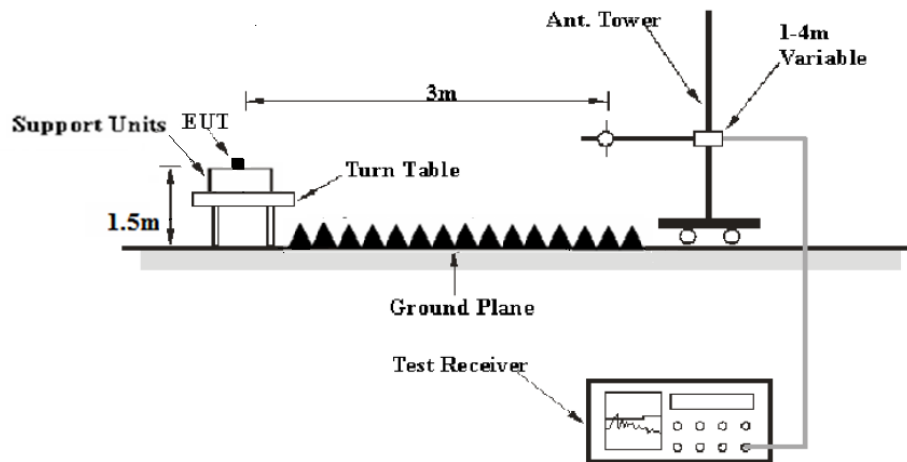
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency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

Based on CISPR 16-4-2, the expanded 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. And this uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup

Below 1GHz



Above 1GHz:

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

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

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	1 MHz	3 MHz	/	PK
	1 MHz	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-1GHz and peak and Average detection modes for frequencies above 1 GHz.

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	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, traceable to National Primary Standards and International System of Units (SI).

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, the worst margin reading as below:

2.18 dB at 360.163750MHz in the Horizontal polarization

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

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

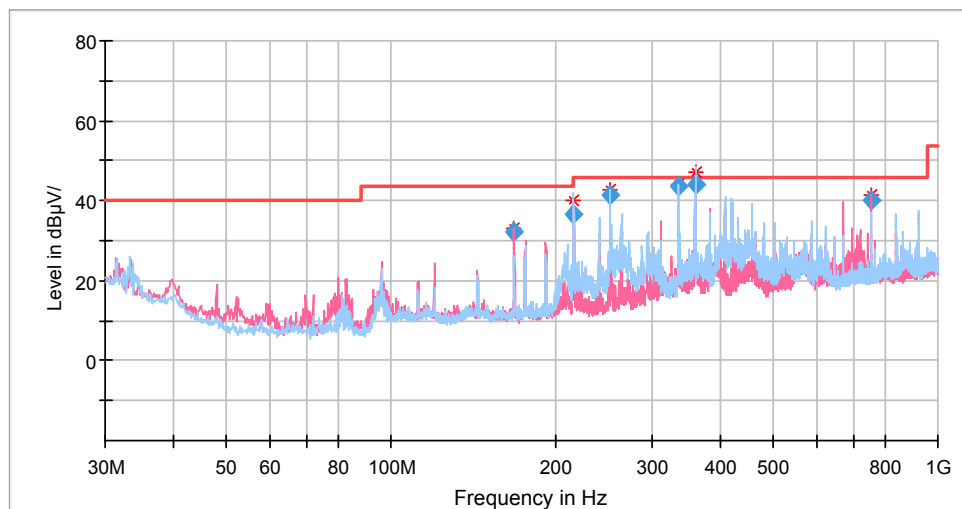
In BACL, $U_{(L_m)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data**Environmental Conditions**

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-06-27 & 2016-08-01.

EUT operation mode: Transmitting

30MHz-1GHz:

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)
167.982500	44.50	QP	195.0	101.0	V	-12.2	32.30	43.50	11.20
216.118750	48.97	QP	203.0	101.0	H	-12.5	36.47	46.00	9.53
252.008750	53.15	QP	287.0	101.0	H	-11.9	41.25	46.00	4.75
336.035000	53.32	QP	221.0	101.0	H	-9.6	43.72	46.00	2.28
360.163750	53.02	QP	203.0	101.0	H	-9.2	43.82	46.00	2.18
756.045000	42.30	QP	297.0	101.0	V	-2.1	40.20	46.00	5.80

EUT operation mode: Transmitting

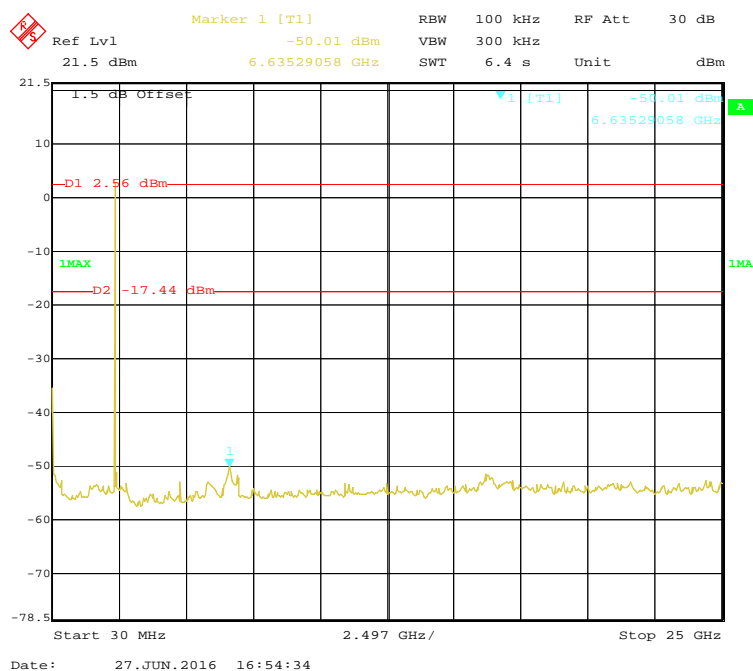
1GHz-25 GHz

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)
Low Channel (2402 MHz)									
2402	96.04	PK	208	150	V	3.0	99.04	/	/
2402	90.45	Ave	208	150	V	3.0	93.45	/	/
2402	95.67	PK	215	150	H	3.0	98.67	/	/
2402	89.63	Ave	215	150	H	3.0	92.63	/	/
2338	24.82	Ave	16	150	V	4.8	29.62	54	24.38
2338	39.54	PK	16	150	V	4.8	44.34	74	29.66
2390	23.04	Ave	26	150	V	4.9	27.94	54	26.06
2390	39.07	PK	26	150	V	4.9	43.97	74	30.03
3062	36.23	PK	203	200	V	7.0	43.23	74	30.77
3062	22.40	Ave	203	200	V	7.0	29.40	54	24.60
4804	20.05	Ave	274	150	H	13.3	33.35	54	20.65
4804	33.57	PK	274	150	H	13.3	46.87	74	27.13
7206	31.74	PK	172	150	H	19.7	51.44	74	22.56
7206	17.93	Ave	172	150	H	19.7	37.63	54	16.37
Middle Channel (2440MHz)									
2440	96.74	PK	2	150	V	2.6	99.34	/	/
2440	90.97	Ave	2	150	V	2.6	93.57	/	/
2440	95.86	PK	247	150	H	2.6	98.46	/	/
2440	90.27	Ave	247	150	H	2.6	92.87	/	/
1603	38.09	PK	148	250	V	2.9	40.99	74	33.01
1603	22.01	Ave	148	250	V	2.9	24.91	54	29.09
3062	22.74	Ave	189	150	V	7.0	29.74	54	24.26
3062	36.94	PK	189	150	V	7.0	43.94	74	30.06
4880	33.58	PK	252	150	V	13.6	47.18	74	26.82
4880	20.01	Ave	252	150	V	13.6	33.61	54	20.39
6597	36.3	PK	339	250	V	17.6	53.90	74	20.10
6597	23.38	Ave	339	250	V	17.6	40.98	54	13.02
7320	30.71	PK	229	150	H	20.8	51.51	74	22.49
7320	16.83	Ave	229	150	H	20.8	37.63	54	16.37

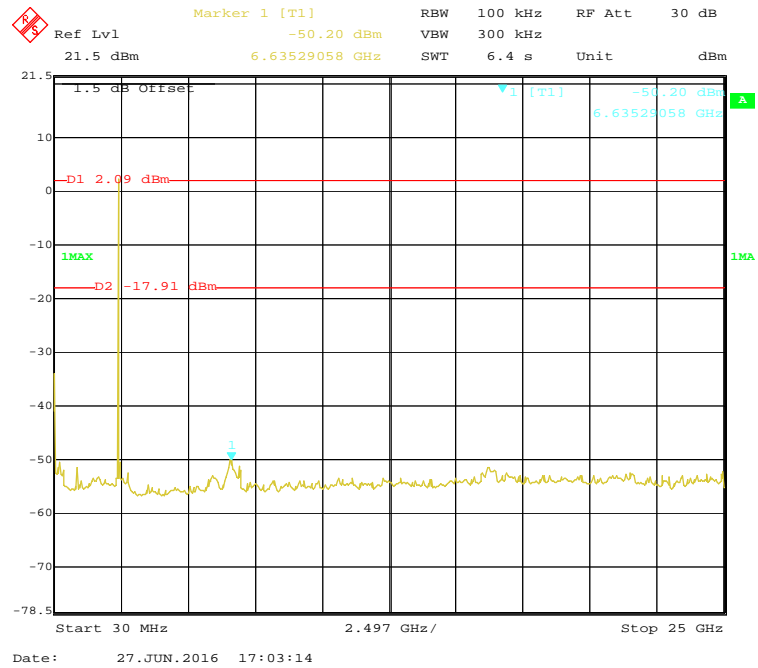
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
High Channel (2480 MHz)									
2480	92.22	PK	1	100	V	3.2	95.42	/	/
2480	86.33	Ave	1	100	V	3.2	89.53	/	/
2480	91.54	PK	31	100	H	3.2	94.74	/	/
2480	85.47	Ave	31	100	H	3.2	88.67	/	/
2483.5	28.91	Ave	124	250	V	5.0	33.91	54	20.09
2483.5	49.51	PK	124	250	V	5.0	54.51	74	19.49
2544	27.28	Ave	216	250	V	5.2	32.48	54	21.52
2544	42.22	PK	216	250	V	5.2	47.42	74	26.58
3076	22.44	Ave	118	150	V	7.0	29.44	54	24.56
3076	35.38	PK	118	150	V	7.0	42.38	74	31.62
4960	33.83	PK	300	150	V	13.9	47.73	74	26.27
4960	19.56	Ave	300	150	V	13.9	33.46	54	20.54
7440	32.10	PK	200	150	V	20.5	52.60	74	21.40
7440	19.01	Ave	200	150	V	20.5	39.51	54	14.49

Conducted Spurious Emissions at Antenna Port

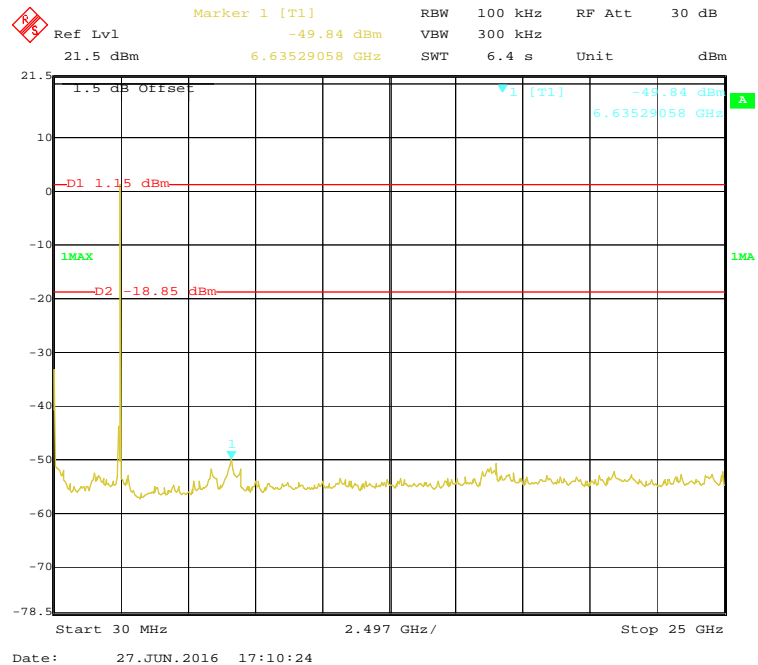
Low Channel



Middle Channel



High Channel



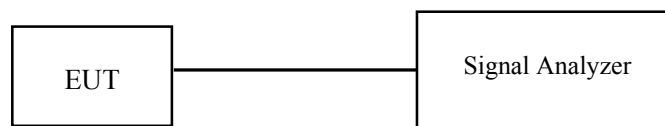
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-06-27.

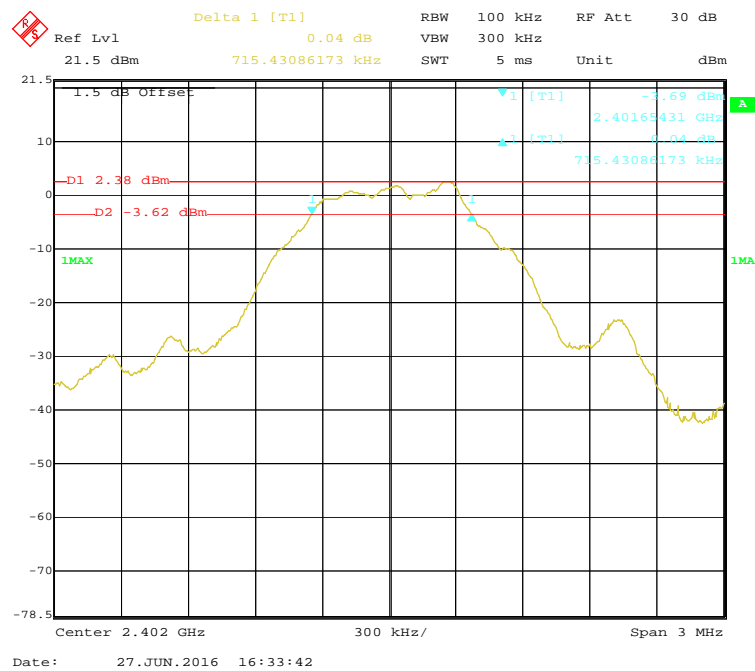
EUT operation mode: Transmitting

Test Result: Compliance

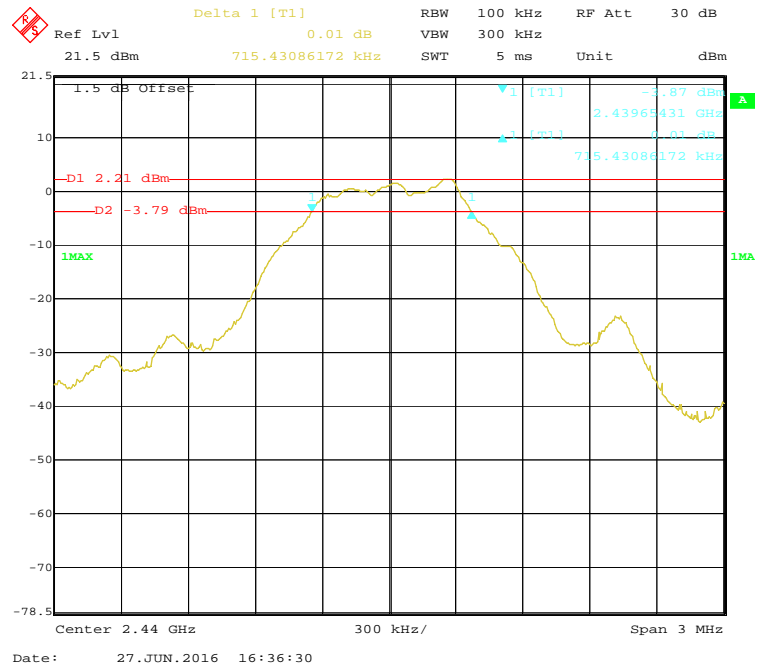
Please refer to the following tables and plots.

Channel	Channel Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
Low	2402	0.715	≥500
Middle	2440	0.715	≥500
High	2480	0.715	≥500

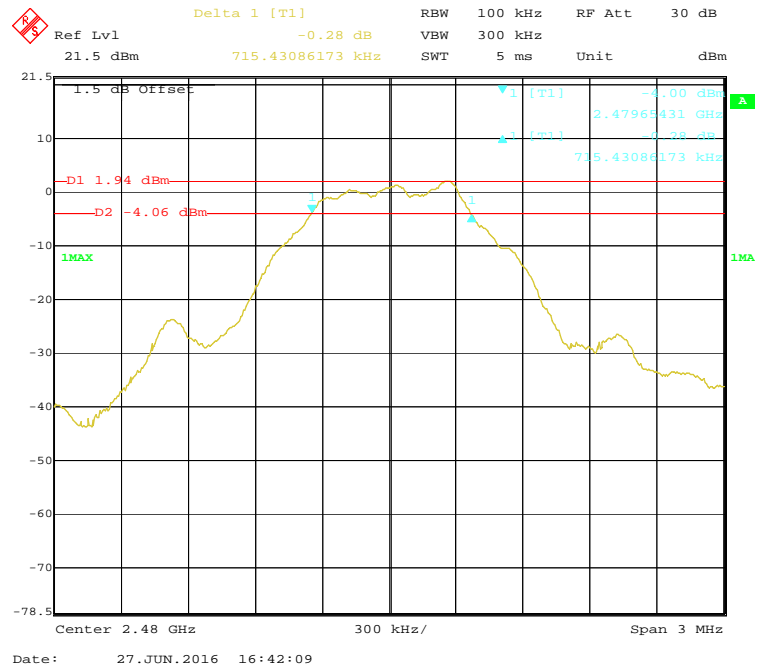
Low Channel



Middle Channel



High Channel



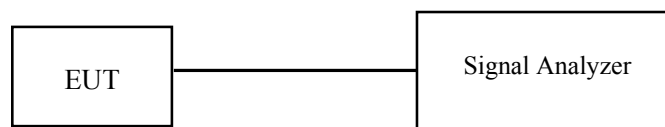
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to §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	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, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

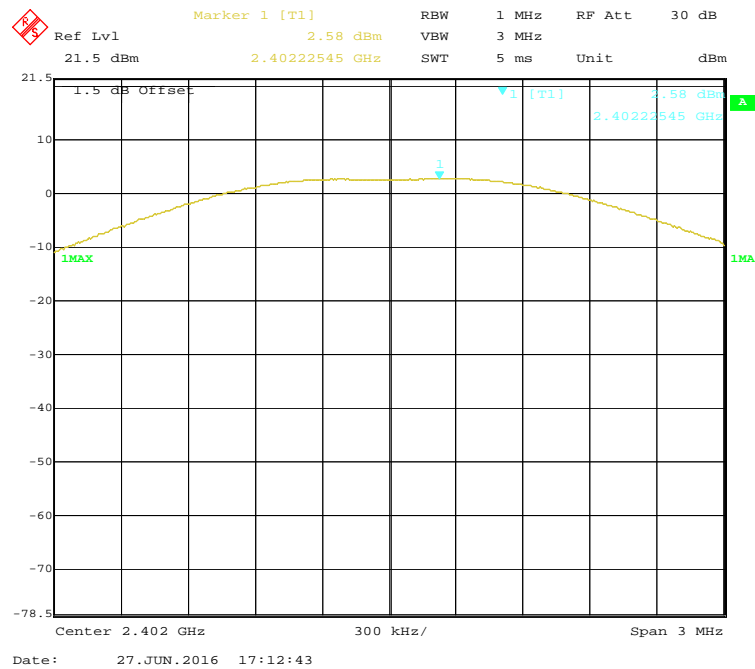
Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-06-27.

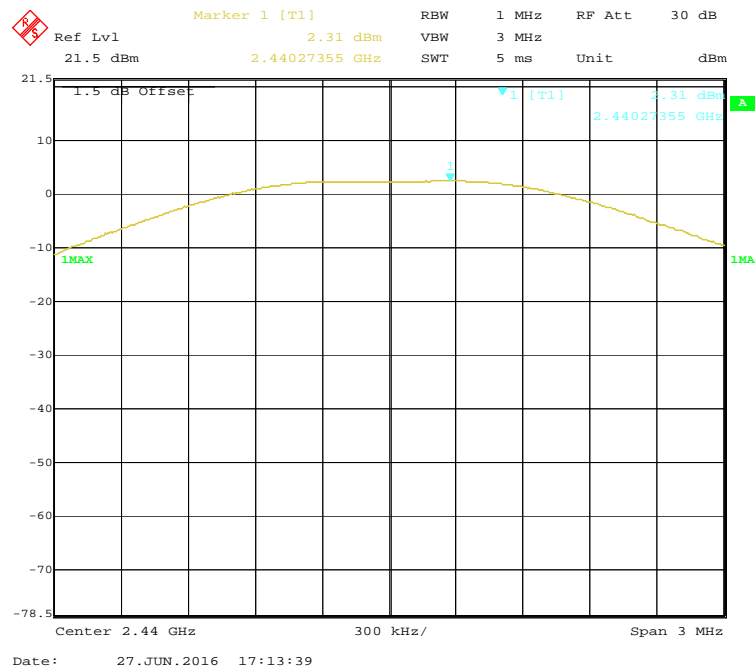
EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Peak Output Power (dBm)	Limit (dBm)	Result
Low	2402	2.58	30	Pass
Middle	2440	2.31	30	Pass
High	2480	2.02	30	Pass

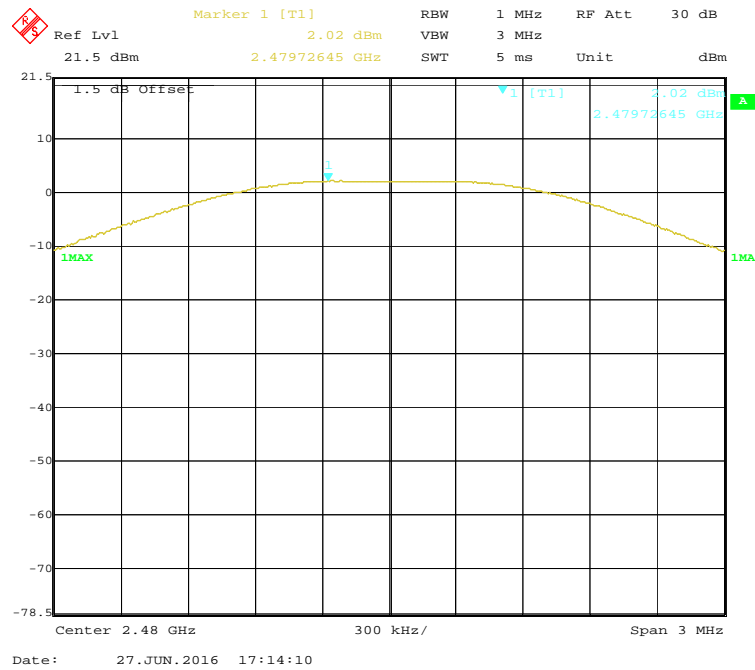
RF Output Power, Low Channel



RF Output Power, Middle Channel



RF Output Power, High Channel



FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**Applied 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, traceable to National Primary Standards and International System of Units (SI).

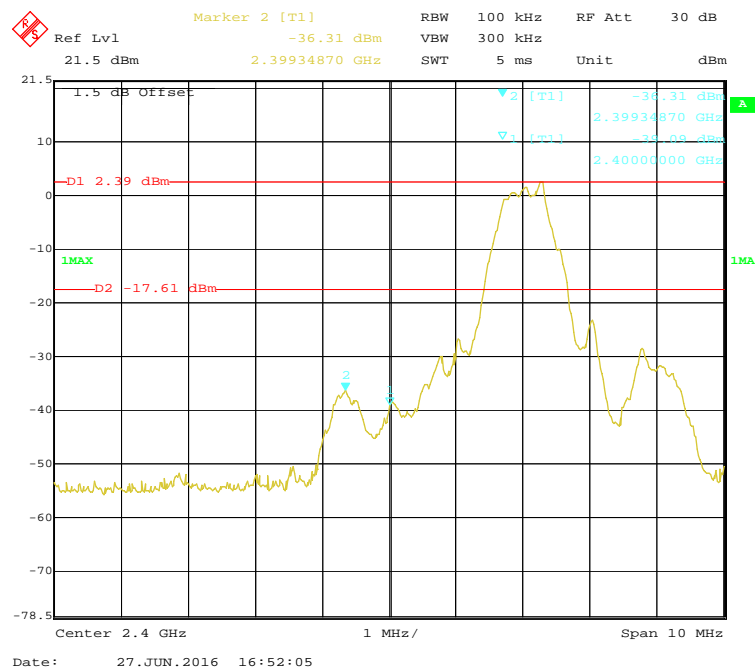
Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

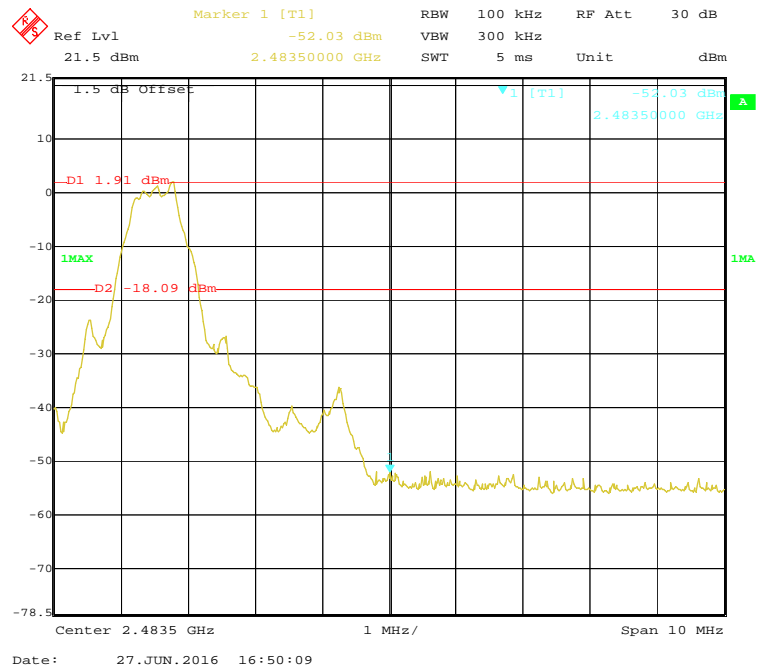
The testing was performed by Chris Wang on 2016-06-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following 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: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
3. Set the VBW $\geq 3 \times \text{RBW}$.
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, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-12-29.

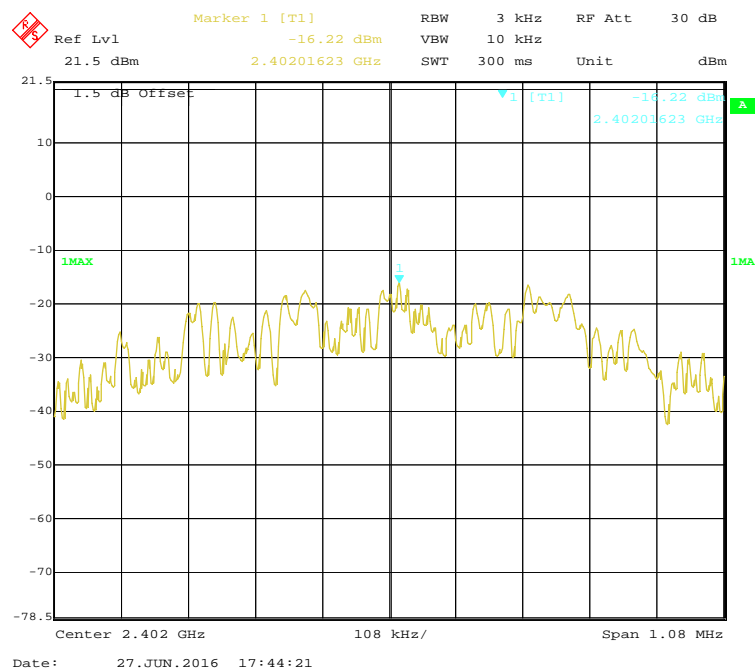
EUT operation mode: Transmitting

Test Result: Pass.

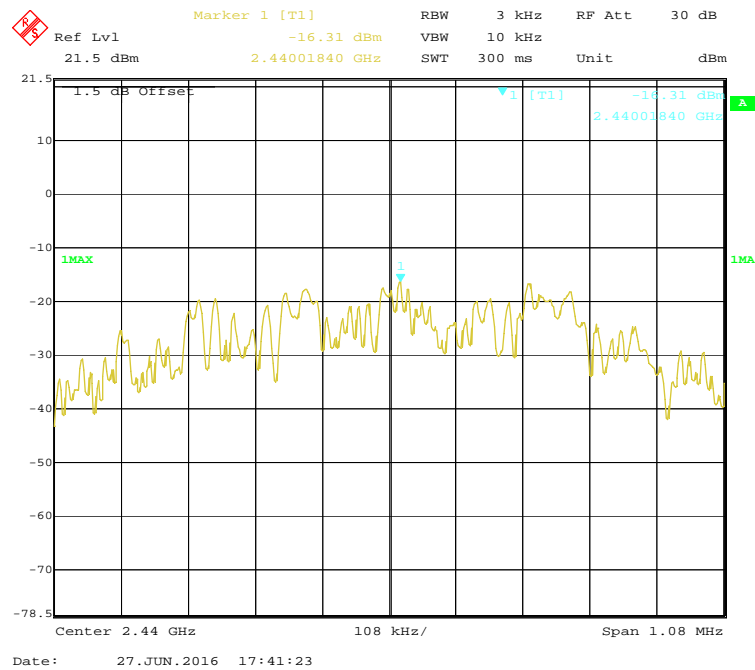
Please refer to following table and plots.

Channel	Frequency (MHz)	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.22	≤8
Middle	2440	-16.31	≤8
High	2480	-16.47	≤8

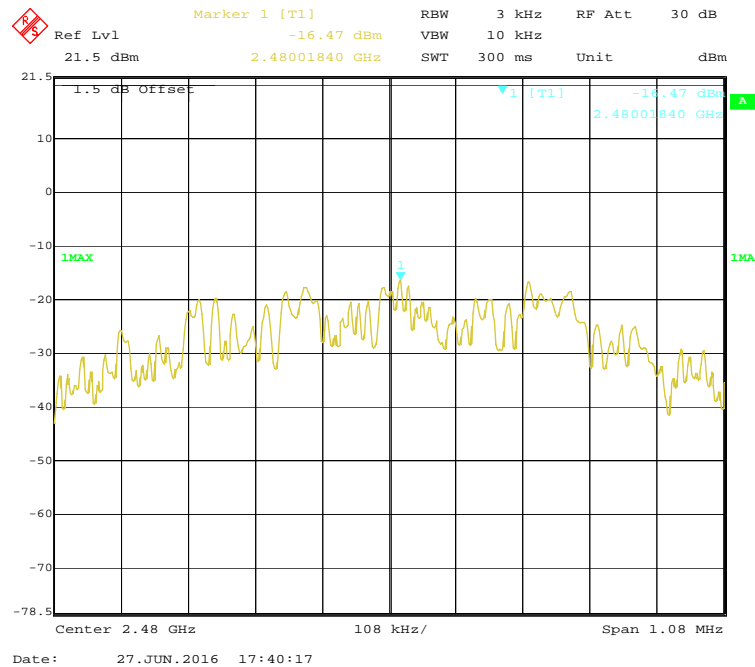
Low Channel



Middle Channel



High Channel



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