



RSS-GEN ISSUE 4, NOVEMBER 2014  
RSS-247, ISSUE 1, MAY 2015

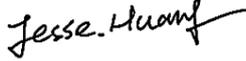
## TEST REPORT

For

### Macari Baby, Inc.

30 Martin Street Cumberland, RI 02864

**IC: 21973-401R**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Baby Monitor (Monitor Unit)
<b>Report Number:</b> RSZ160805002-08C	
<b>Report Date:</b> 2016-10-27	
<b>Reviewed By:</b> Manager	Jesse Huang 
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan) Chenghu Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>

**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.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION</b> .....	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
OBJECTIVE .....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY .....	4
MEASUREMENT UNCERTAINTY.....	4
TEST FACILITY .....	5
<b>SYSTEM TEST CONFIGURATION</b> .....	<b>6</b>
JUSTIFICATION .....	6
EUT EXERCISE SOFTWARE .....	6
SPECIAL ACCESSORIES.....	6
EQUIPMENT MODIFICATIONS .....	6
EXTERNAL I/O CABLE.....	6
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS</b> .....	<b>7</b>
<b>TEST EQUIPMENT LIST</b> .....	<b>8</b>
<b>RSS-GEN §8.3 - TRANSMITTER ANTENNA</b> .....	<b>9</b>
APPLICABLE STANDARD .....	9
ANTENNA CONNECTOR CONSTRUCTION .....	9
<b>RSS-102 § 2.5.2 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION</b>	<b>10</b>
APPLICABLE STANDARD .....	10
<b>RSS-GEN §8.8 - AC POWER LINE CONDUCTED EMISSIONS</b> .....	<b>11</b>
APPLICABLE STANDARD .....	11
EUT SETUP .....	11
EMI TEST RECEIVER SETUP.....	12
TEST PROCEDURE .....	12
TEST RESULTS SUMMARY .....	12
TEST DATA .....	12
<b>RSS-247§ 5.5 - UNWANTED EMISSIONS</b> .....	<b>15</b>
APPLICABLE STANDARD .....	15
EUT SETUP .....	15
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	16
TEST PROCEDURE .....	16
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	16
TEST RESULTS SUMMARY .....	16
TEST DATA .....	17
<b>RSS-GEN § 6.6 &amp; RSS-247 § 5.1 (2) – 99% OCCUPIED BANDWIDTH &amp; 20 DB EMISSION BANDWIDTH</b>	<b>19</b>
APPLICABLE STANDARD .....	19
TEST PROCEDURE .....	19
TEST DATA .....	19
<b>RSS-247 § 5.1 (2) - CHANNEL SEPARATION</b> .....	<b>23</b>
APPLICABLE STANDARD .....	23
TEST PROCEDURE .....	23

TEST DATA .....23

**RSS-247 § 5.1 (4) - QUANTITY OF HOPPING CHANNEL .....26**

    APPLICABLE STANDARD .....26

    TEST PROCEDURE .....26

    TEST DATA .....26

**RSS-247 § 5.1 (4) - TIME OF OCCUPANCY (DWELL TIME).....28**

    APPLICABLE STANDARD .....28

    TEST PROCEDURE .....28

    TEST DATA .....28

**RSS-247 § 5.4 (2) - PEAK OUTPUT POWER MEASUREMENT .....31**

    APPLICABLE STANDARD .....31

    TEST PROCEDURE .....31

    TEST DATA .....31

**RSS-247 § 5.5 - OUT OF BAND EMISSIONS.....32**

    APPLICABLE STANDARD .....32

    TEST PROCEDURE .....32

    TEST DATA .....32

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

The *Macari Baby, Inc.*'s product, model number: *BD04010R (IC: 21973-401R)* or the "EUT" in this report was a Baby Monitor (Monitor Unit), which was measured approximately: 11.2 cm (L) × 7.6 cm (W) × 1.3 cm (H), rated with input voltage: DC3.6V battery or DC 7.5 V from adapter.

Adapter information:

Model: P5 0750500

Input: AC100-240V~50/60Hz, 250 mA

Output: DC 7.5V, 500 mA

\*All measurement and test data in this report was gathered from production sample serial number: 1602920 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2016-08-05.

### Objective

This report is prepared on behalf of *Macari Baby, Inc.* in accordance with RSS-247, Issue 1, May 2015 of the Innovation, science and Economic Development Canada.

### Related Submittal(s)/Grant(s)

RSS-247 submissions with IC: 21973-401T and 21973-401M.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013

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

Item		Uncertainty
AC Power Lines Conducted Emissions		±3.26 dB
RF conducted test with spectrum		±0.9dB
RF Output Power with Power meter		±0.5dB
Radiated emission	30MHz~1GHz	±5.91dB
	Above 1G	±4.92dB
Occupied Bandwidth		±0.5kHz
Temperature		±1.0°C
Humidity		±6%

### **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

### Justification

The system was configured for testing in an engineering mode.

### EUT Exercise Software

N/A

### Special Accessories

No special accessory.

### Equipment Modifications

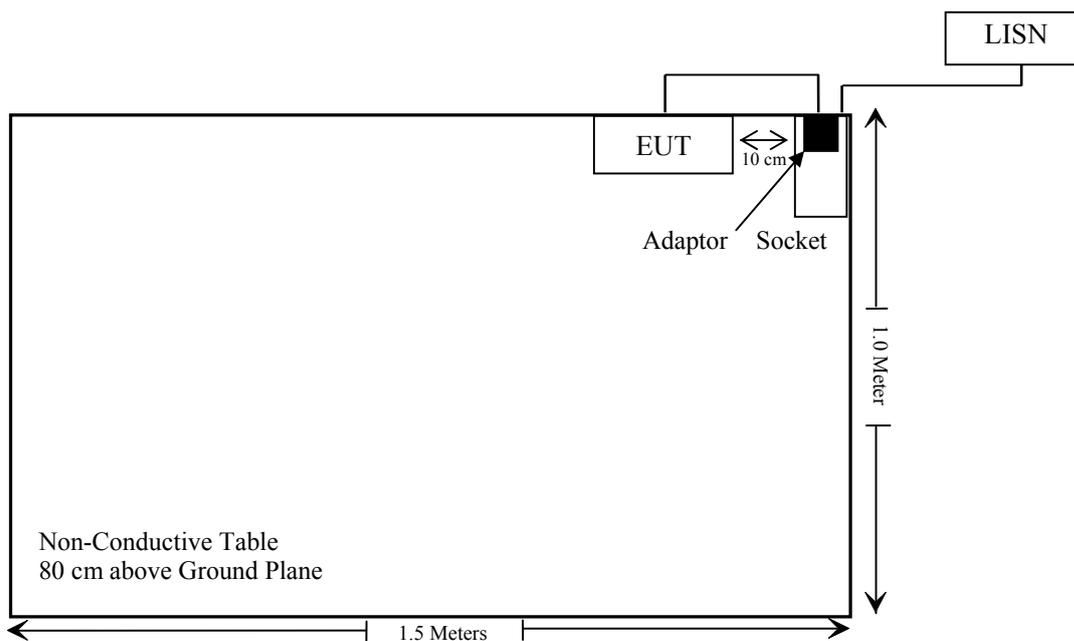
No modification was made to the EUT tested.

### External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Undetachable DC Power Cable	2.4	EUT	Adapter

### Block Diagram of Test Setup

For conducted emission



**SUMMARY OF TEST RESULTS**

<b>RSS-247/RSS-Gen Rules</b>	<b>Description of Test</b>	<b>Result</b>
RSS-Gen §8.3	Transmitter Antenna	Compliance
RSS-102 § 2.5.2	Exemption Limits for Routine Evaluation- RF Exposure Evaluation	Compliance
RSS-Gen §8.8	AC Power Line Conducted Emission	Compliance
RSS-247 § 5.5	Unwanted Emission	Compliance
RSS- Gen§6.6, RSS-247 § 5.1 (2)	99% Occupied Bandwidth & 20dB Emission Bandwidth	Compliance
RSS-247 § 5.1 (2)	Channel Separation Test	Compliance
RSS-247 § 5.1 (4)	Quantity of Hopping Channel	Compliance
RSS-247 § 5.1 (4)	Time of Occupancy (Dwell Time)	Compliance
RSS-247 § 5.4(2)	Peak output power measurement	Compliance
RSS-247 § 5.5	Out of Band Emissions	Compliance

## TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>AC Line Conducted test</b>					
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	Pulse limiter	ESH3-Z2	879940/0058	2016-06-19	2017-06-18
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2016-09-01	2017-09-01
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	NCR	NCR
<b>Radiation test</b>					
Sonoma Instrument	Amplifier	330	171377	2016-09-16	2017-09-16
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
Mini	Pre-amplifier	ZVA-183-S+	857001418	2016-09-16	2017-09-15
DUCOMMUN	Pre-amplifier	ALN-22093530-01	990147	2016-09-16	2017-09-15
EMCO	Horn Antenna	3116	9510-2384	2015-11-07	2016-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
ETS	Horn Antenna	3115	6229	2015-11-07	2016-11-06
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
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
<b>RF Conducted test</b>					
BACL	TS 8997 Cable-01	T-KS-EMC086	T-KS-EMC086	2015-12-10	2016-12-09
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
WEINSCHL	3dB Attenuator	5326	N/A	2016-06-18	2017-06-18
Rohde & Schwarz	OSP120 BASE UNIT	OSP120	101247	2016-07-04	2017-07-03
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131	2016-09-21	2017-09-21

\* **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).

---

## **RSS-GEN §8.3 - TRANSMITTER ANTENNA**

---

### **Applicable Standard**

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>9</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

### **Antenna Connector Construction**

The EUT has internal antenna arrangement which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliant.

## **RSS-102 § 2.5.2 –Exemption Limits for Routine Evaluation-RF Exposure Evaluation**

### **Applicable Standard**

According to RSS-102 § (2.5.2):

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

### **Calculated Data:**

The max tune-up conducted output power is 18.5 dBm

Time-averaged maximum e.i.r.p. of the device is  $18.5\text{dBm} + 0\text{dBi} = 18.5\text{dBm} = 0.063\text{W}$

$f = 2417$  MHz:

The limit is  $1.31 \times 10^{-2} f^{0.6834} \text{W} = 2.69\text{W}$

$0.063\text{W} < 2.69\text{W}$

**So the RF Exposure evaluation can be exempted.**

## RSS-GEN §8.8 - AC POWER LINE CONDUCTED EMISSIONS

### Applicable Standard

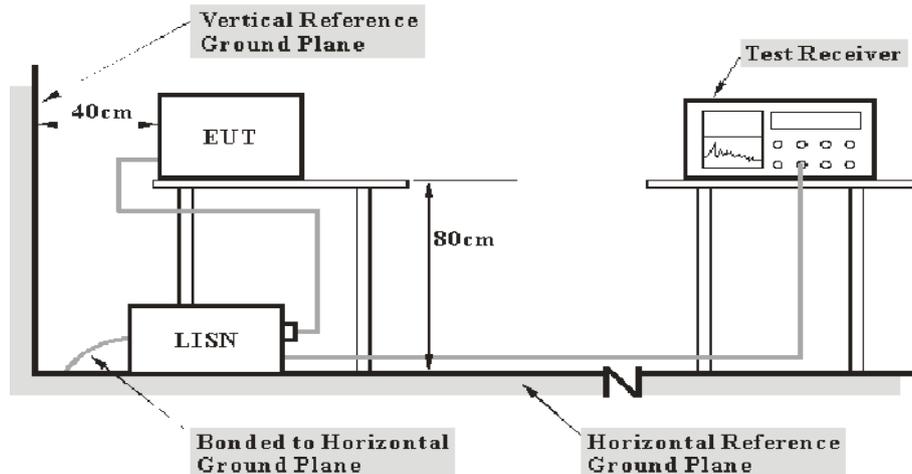
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in the below table.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in below table. The more stringent limit applies at the frequency range boundaries.

Table 2 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Note: \*Decreases with the logarithm of the frequency

### 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 RSS-247/RSS-Gen limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### 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

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

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

### Test Results Summary

According to the recorded data in following table, the EUT complied with the RSS-247/RSS-Gen. Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, 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

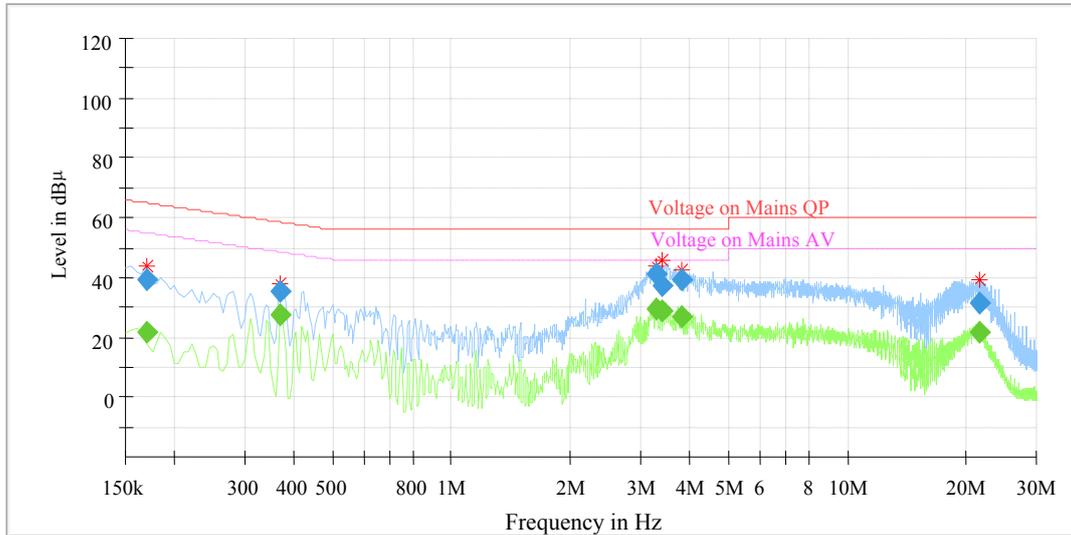
#### Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Peter Jiang on 2016-10-24.*

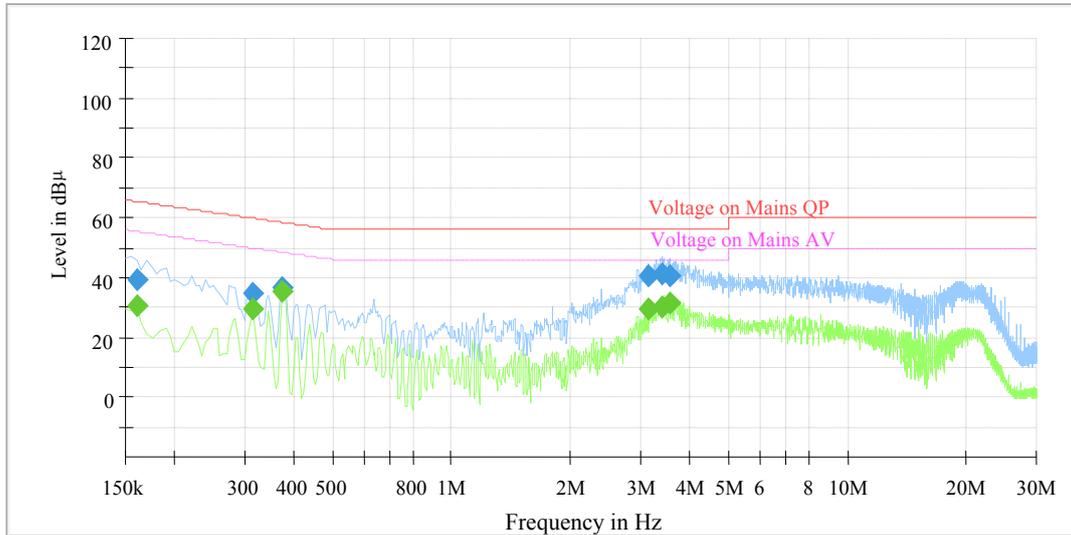
*EUT operation mode: Transmitting*

**AC 120V/60 Hz, Line:**



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.170000	---	21.90	9.000	L1	10.3	33.06	54.96	Compliance
0.170000	38.96	---	9.000	L1	10.3	26.00	64.96	Compliance
0.370000	---	27.33	9.000	L1	10.3	21.17	48.50	Compliance
0.370000	35.49	---	9.000	L1	10.3	23.01	58.50	Compliance
3.275000	---	29.56	9.000	L1	10.5	16.44	46.00	Compliance
3.275000	40.89	---	9.000	L1	10.5	15.11	56.00	Compliance
3.395000	---	28.52	9.000	L1	10.5	17.48	46.00	Compliance
3.395000	37.38	---	9.000	L1	10.5	18.62	56.00	Compliance
3.835000	---	26.59	9.000	L1	10.5	19.41	46.00	Compliance
3.835000	39.19	---	9.000	L1	10.5	16.81	56.00	Compliance
21.535000	---	21.82	9.000	L1	10.5	28.18	50.00	Compliance
21.535000	31.70	---	9.000	L1	10.5	28.30	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
0.160000	---	30.56	9.000	N	10.3	24.90	55.46	Compliance
0.160000	39.06	---	9.000	N	10.3	26.40	65.46	Compliance
0.315000	---	29.62	9.000	N	10.3	20.22	49.84	Compliance
0.315000	34.81	---	9.000	N	10.3	25.03	59.84	Compliance
0.375000	---	35.16	9.000	N	10.3	13.23	48.39	Compliance
0.375000	36.73	---	9.000	N	10.3	21.66	58.39	Compliance
3.145000	---	29.78	9.000	N	10.5	16.22	46.00	Compliance
3.145000	40.57	---	9.000	N	10.5	15.43	56.00	Compliance
3.420000	---	29.97	9.000	N	10.5	16.03	46.00	Compliance
3.420000	41.50	---	9.000	N	10.5	14.50	56.00	Compliance
3.555000	---	31.76	9.000	N	10.5	14.24	46.00	Compliance
3.555000	40.76	---	9.000	N	10.5	15.24	56.00	Compliance

**Note:**

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

## RSS-247§ 5.5 - UNWANTED EMISSIONS

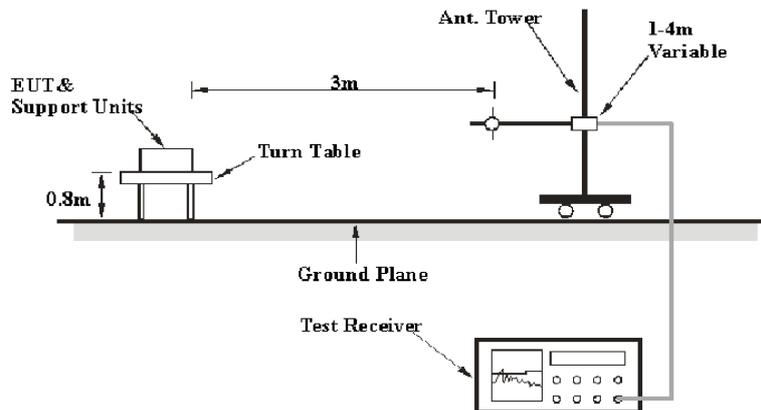
### Applicable Standard

According to RSS-247 §5.5

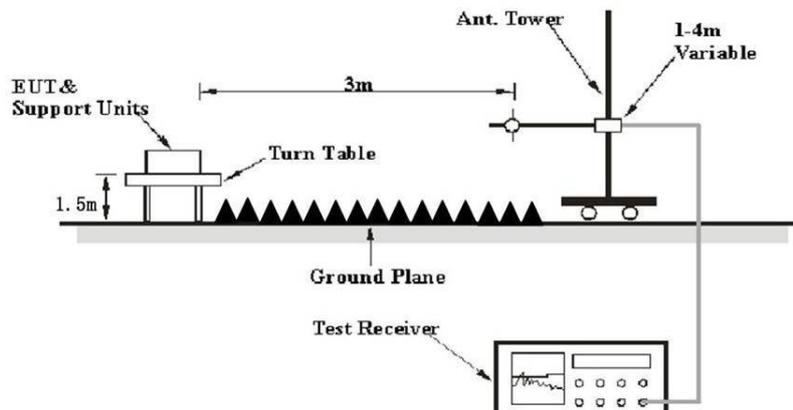
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission and out of band 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 RSS-247/RSS-Gen 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
30MHz – 1000 MHz	100 kHz	300 kHz	120kHz	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.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 or 1.5 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## 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 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 data in the following table, the EUT complied with the RSS-247/RSS-Gen,

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

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

In BAEL,  $U_{(L_m)}$  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**

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Peter Jiang on 2016-10-24.

EUT operation mode: Transmitting

30 MHz -25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB $\mu$ V/m)	RSS-247/RSS-GEN	
	Reading (dB $\mu$ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB $\mu$ V/m)	Margin (dB)
<b>Low Channel (2417 MHz)</b>									
282.84	49.87	QP	177	1.5	H	-10.92	38.95	46	7.05
2417.00	107.82	PK	337	1.3	H	-3.03	104.79	/	/
2417.00	78.61	Ave.	29	1.1	H	-3.03	75.58	/	/
2417.00	105.46	PK	237	2.2	V	-3.03	102.43	/	/
2417.00	79.21	Ave.	237	2.2	V	-3.03	76.18	/	/
2387.59	60.81	PK	287	1.2	H	-3.05	57.76	74	16.24
2387.59	31.50	Ave.	287	1.2	H	-3.05	28.45	54	25.55
2483.99	67.17	PK	272	1.1	H	-2.99	64.18	74	9.82
2483.99	32.79	Ave.	272	1.1	H	-2.99	29.80	54	24.20
2486.01	66.09	PK	221	2.1	H	-2.99	63.10	74	10.90
2486.01	32.76	Ave.	221	2.1	H	-2.99	29.77	54	24.23
4834.00	55.03	PK	354	2.0	V	7.21	62.24	74	11.76
4834.00	35.23	Ave.	354	2.0	V	7.21	42.44	54	11.56

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB $\mu$ V/m)	RSS-247/RSS-GEN	
	Reading (dB $\mu$ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB $\mu$ V/m)	Margin (dB)
<b>Middle Channel (2444.5MHz)</b>									
282.84	48.20	QP	35	1.2	H	-10.92	37.28	46	8.72
2444.50	108.37	PK	86	2.4	H	-3.02	105.35	/	/
2444.50	78.46	Ave.	86	2.4	H	-3.02	75.44	/	/
2444.50	106.15	PK	320	2.4	V	-3.02	103.13	/	/
2444.50	79.75	Ave.	320	2.4	V	-3.02	76.73	/	/
2389.67	62.06	PK	324	1.9	H	-3.05	59.01	74	14.99
2389.67	31.50	Ave.	324	1.9	H	-3.05	28.45	54	25.55
2485.88	66.10	PK	318	2.3	V	-2.99	63.11	74	10.89
2485.88	32.79	Ave.	318	2.3	V	-2.99	29.80	54	24.20
2483.76	67.45	PK	106	1.5	H	-2.99	64.46	74	9.54
2483.76	32.75	Ave.	106	1.5	H	-2.99	29.76	54	24.24
4889.00	54.77	PK	274	2.2	V	7.29	62.06	74	11.94
4889.00	35.03	Ave.	274	2.2	V	7.29	42.32	54	11.68
<b>High Channel (2468 MHz)</b>									
282.84	48.04	QP	293	1.7	H	-10.92	37.12	46	8.88
2468.00	107.75	PK	221	1.3	H	-3.00	104.75	/	/
2468.00	74.04	Ave.	221	1.3	H	-3.00	71.04	/	/
2468.00	110.37	PK	179	1.3	V	-3.00	107.37	/	/
2468.00	81.97	Ave.	179	1.3	V	-3.00	78.97	/	/
2388.87	60.36	PK	185	1.8	V	-3.05	57.31	74	16.69
2388.87	31.49	Ave.	185	1.8	V	-3.05	28.44	54	25.56
2483.66	69.04	PK	189	2.4	V	-2.99	66.05	74	7.95
2483.66	32.78	Ave.	189	2.4	V	-2.99	29.79	54	24.21
2486.04	67.03	PK	116	2.5	V	-2.99	64.04	74	9.96
2486.04	32.76	Ave.	116	2.5	V	-2.99	29.77	54	24.23
4936.00	50.89	PK	208	1.9	V	7.36	58.25	74	15.75
4936.00	33.26	Ave.	208	1.9	V	7.36	40.62	54	13.38

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB below the limit was not recorded.

## **RSS-GEN § 6.6 & RSS-247 § 5.1 (2) – 99% OCCUPIED BANDWIDTH & 20 dB EMISSION BANDWIDTH**

### **Applicable Standard**

The bandwidth of a frequency hopping channel is the -20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, whereas the long-term distribution appears evenly distributed.

### **Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Measure the frequency difference of two frequencies that were attenuated 20 dB Bandwidth from the reference level & 99% Bandwidth. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	24~26 °C
<b>Relative Humidity:</b>	50~54 %
<b>ATM Pressure:</b>	100.0~101.0 kPa

*The testing was performed by Peter Jiang from 2016-10-21 to 2016-10-26.*

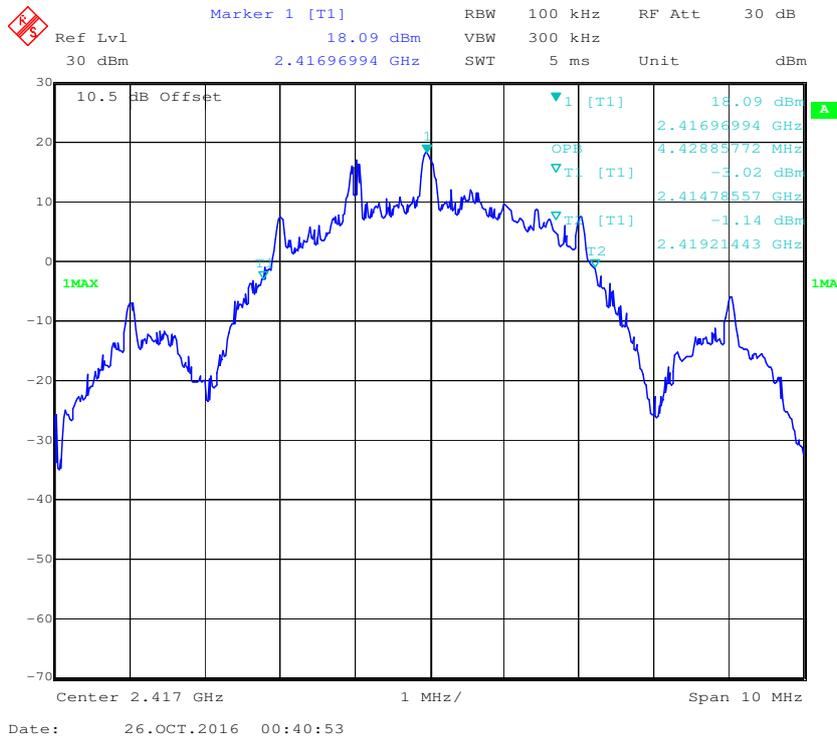
*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to following table and plots.*

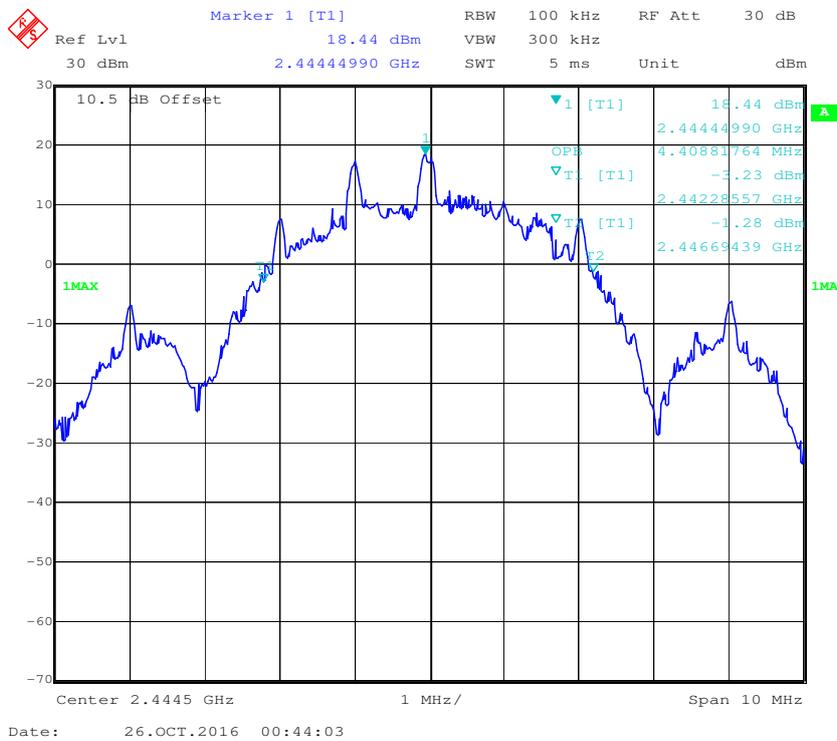
*Test Mode: Transmitting*

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>	<b>20 dB Emission Bandwidth (MHz)</b>
Low	2417.0	4.429	4.489
Middle	2444.5	4.409	4.409
High	2468.0	4.429	4.369

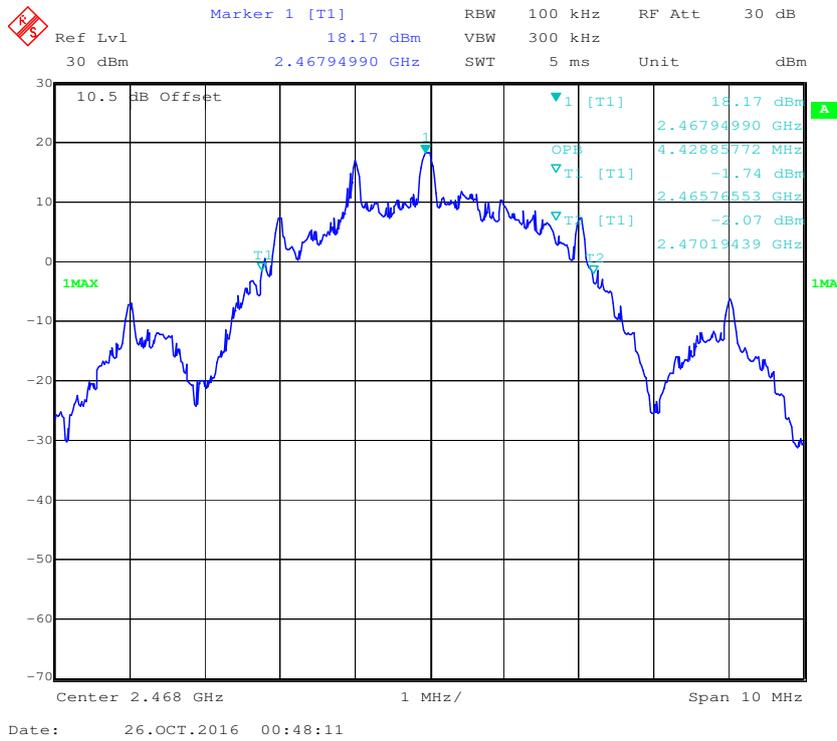
**99% Occupied Bandwidth, Low Channel**



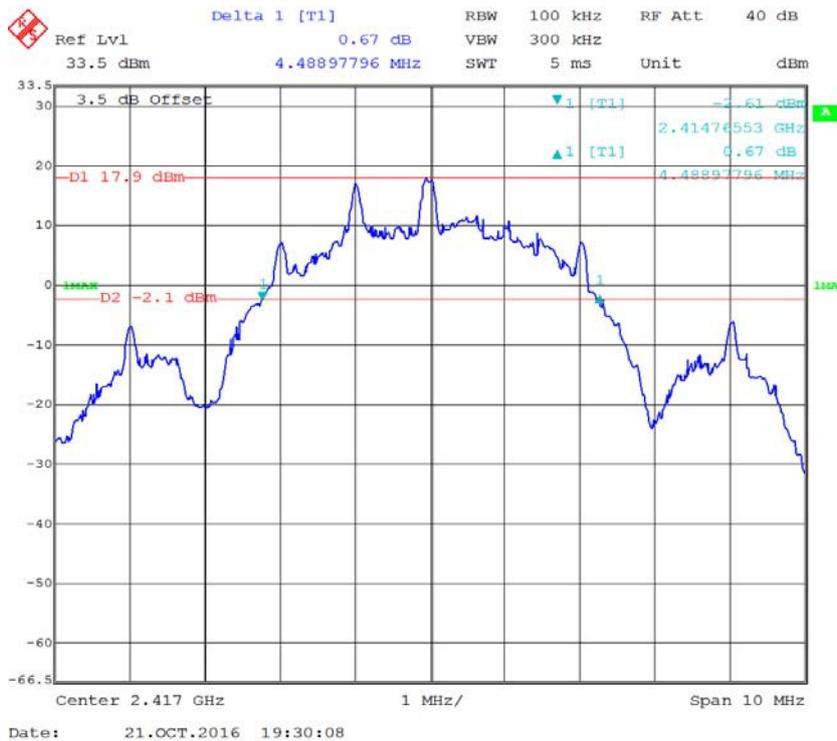
**99% Occupied Bandwidth, Middle Channel**



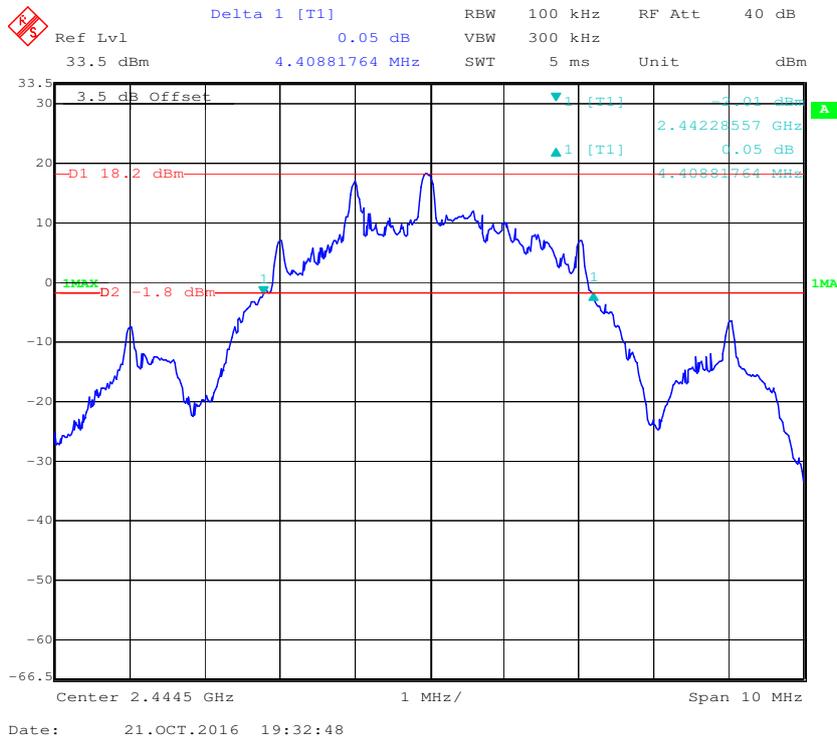
**99% Occupied Bandwidth, High Channel**



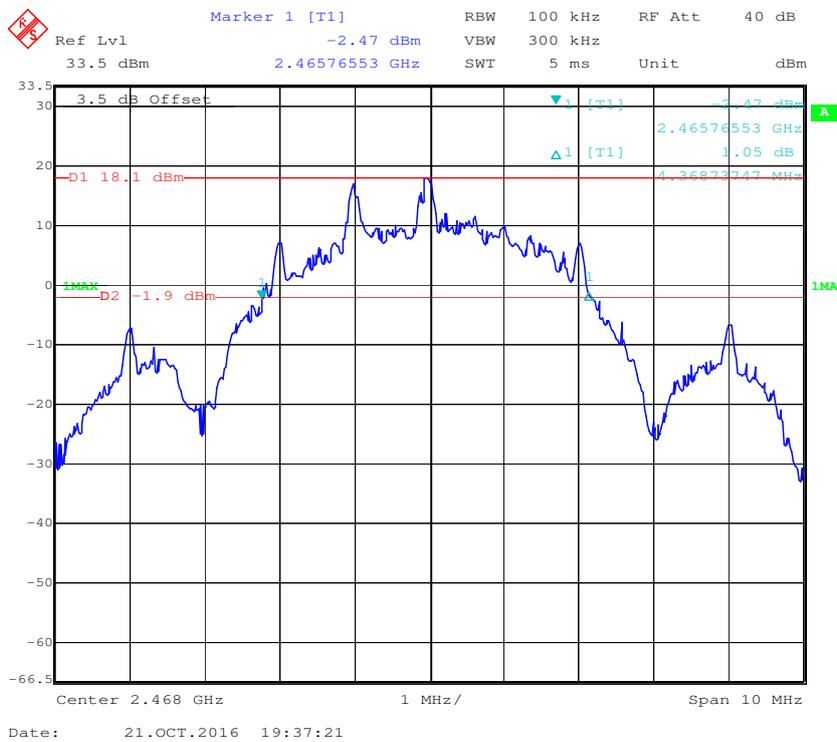
**20dB Emission Bandwidth, Low Channel**



### 20dB Emission Bandwidth, Middle Channel



### 20dB Emission Bandwidth, High Channel



## RSS-247 § 5.1 (2) - CHANNEL SEPARATION

### Applicable Standard

Frequency hopping systems (FHSs) shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the -20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### Test Procedure

1. Set the EUT in Operating mode, RBW was set at 100 kHz, VBW  $\geq$  3RBW max-hold the channel.
2. Set the adjacent channel of the EUT max-hold another trace
3. Measure the channel separation.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Peter Jiang on 2016-10-21.*

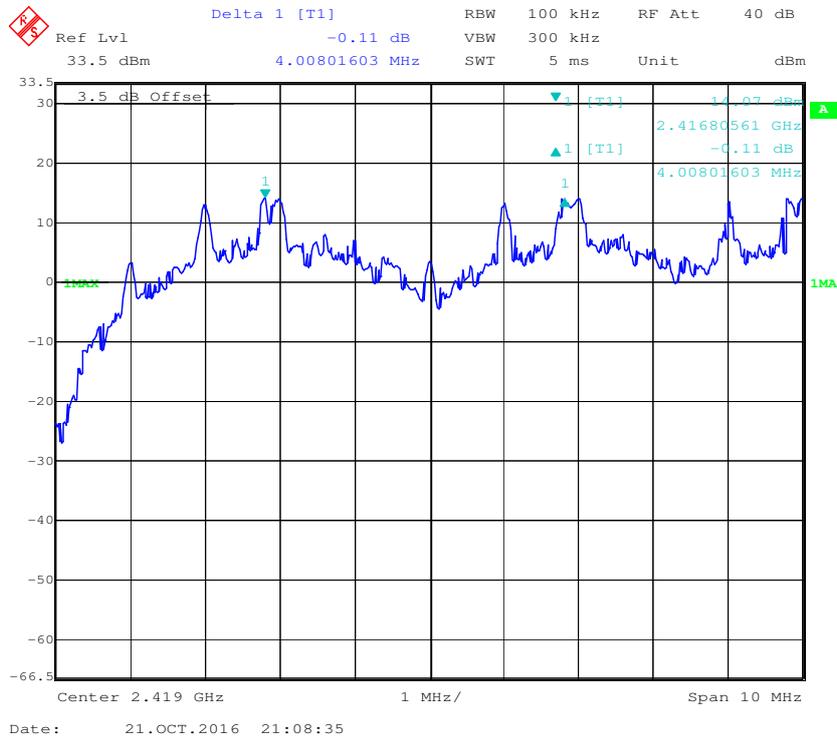
*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to following table and plots*

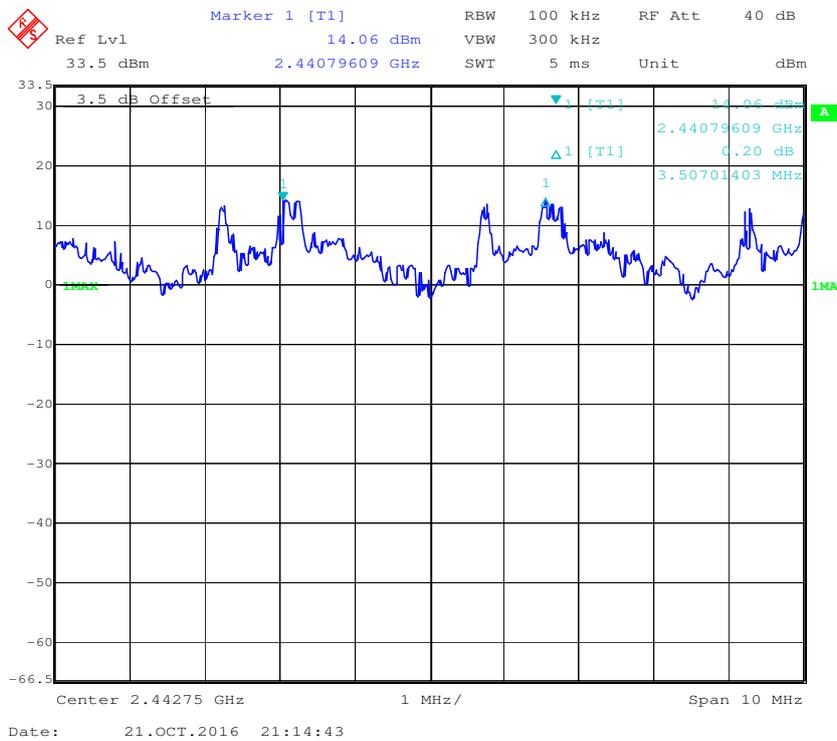
Channel	Frequency (MHz)	Channel Separation (MHz)	$\geq$ Limit (MHz)	Result
Channel 1	2417	4.008	2.993	Pass
Channel 2	2421			
Channel 8	2441	3.507	2.939	Pass
Channel 9	2444.5			
Channel 15	2465	3.006	2.913	Pass
Channel 16	2468			

Note: Limit = 20 dB bandwidth \*2/3

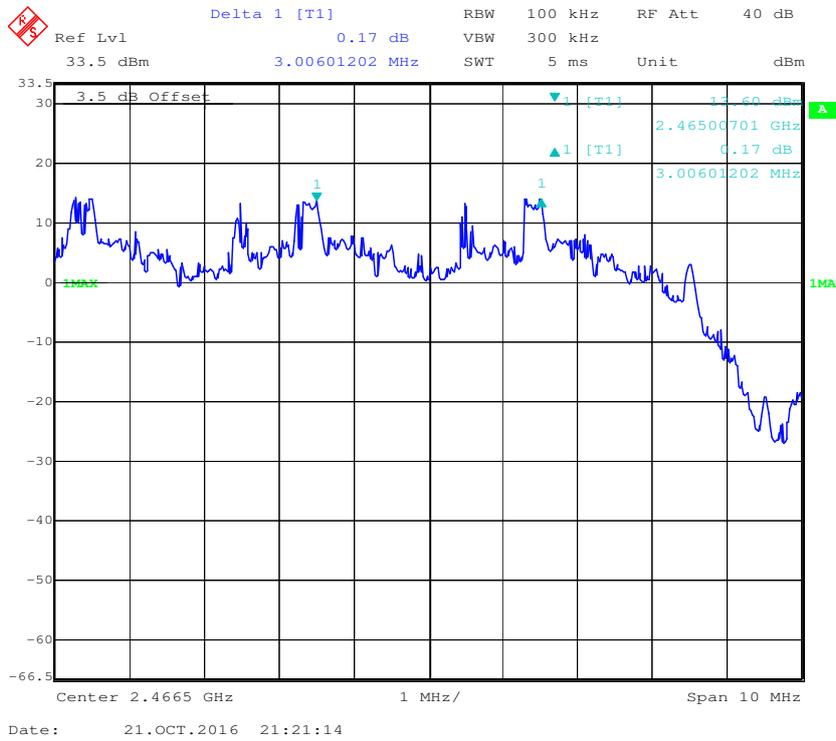
**Low Channel**



**Middle Channel**



### High Channel



## RSS-247 § 5.1 (4) - QUANTITY OF HOPPING CHANNEL

### Applicable Standard

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

### Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in transmitting mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

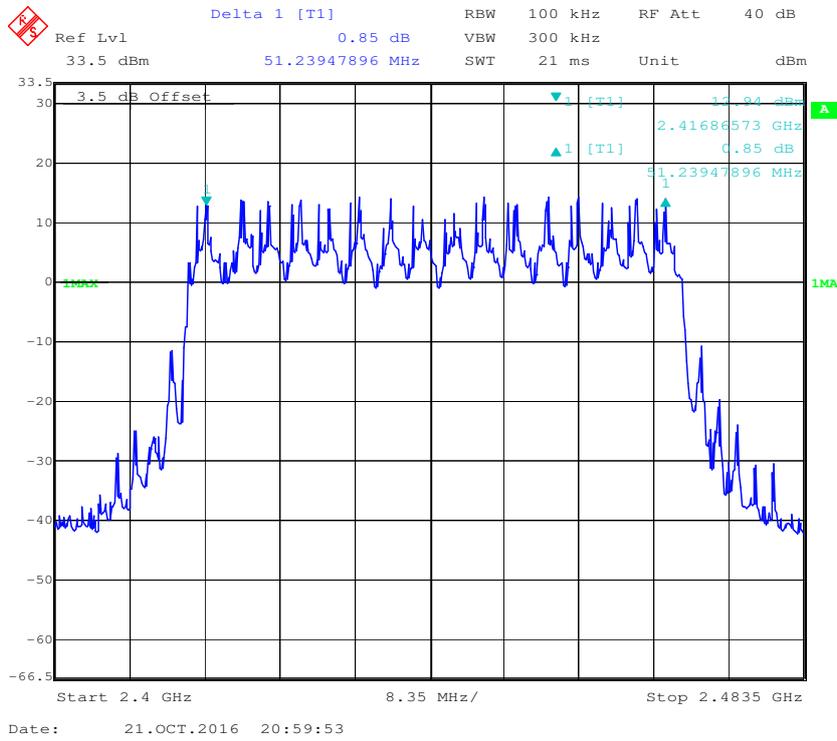
*The testing was performed by Peter Jiang on 2016-10-21*

*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to following table and plots.*

Frequency Range (MHz)	Quantity of Hopping Channel (CH)	Limit (CH)
2400-2483.5	16	≥15

### Number of Hopping Channels



## **RSS-247 § 5.1 (4) -TIME OF OCCUPANCY (DWELL TIME)**

### **Applicable Standard**

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

### **Test Procedure**

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of False was get from single sweep. In addition, the time of single Pluses was tested.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

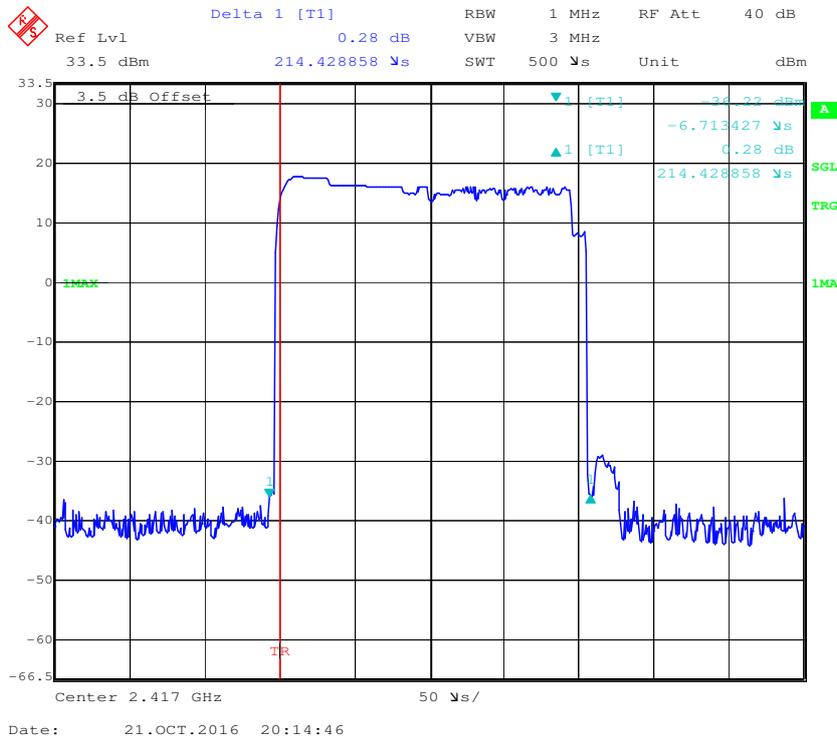
*The testing was performed by Peter Jiang on 2016-10-21*

*EUT operation mode: Transmitting*

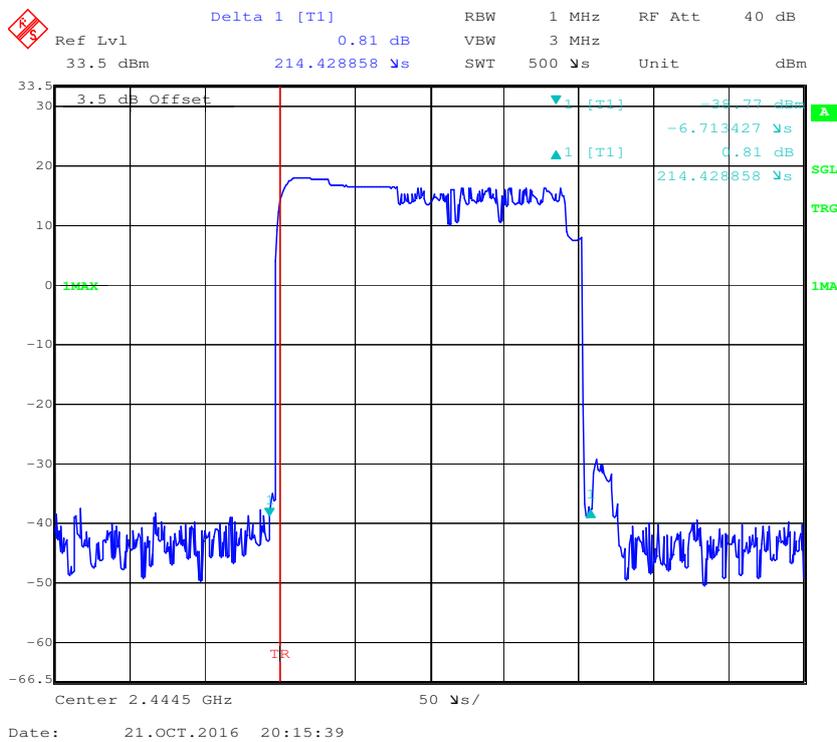
*Test Result: Compliance. Please refer to following table and plots.*

<b>Mode</b>	<b>Channel</b>	<b>Pulse Width (ms)</b>	<b>Dwell Time (s)</b>	<b>Limit (s)</b>	<b>Result</b>
GFSK	Low	0.214	0.013	0.4	Pass
	Middle	0.214	0.013	0.4	Pass
	High	0.214	0.013	0.4	Pass
Note: Dwell time = Pulse time*(150/16)*16*0.4s Hopping rate =150 times per second					

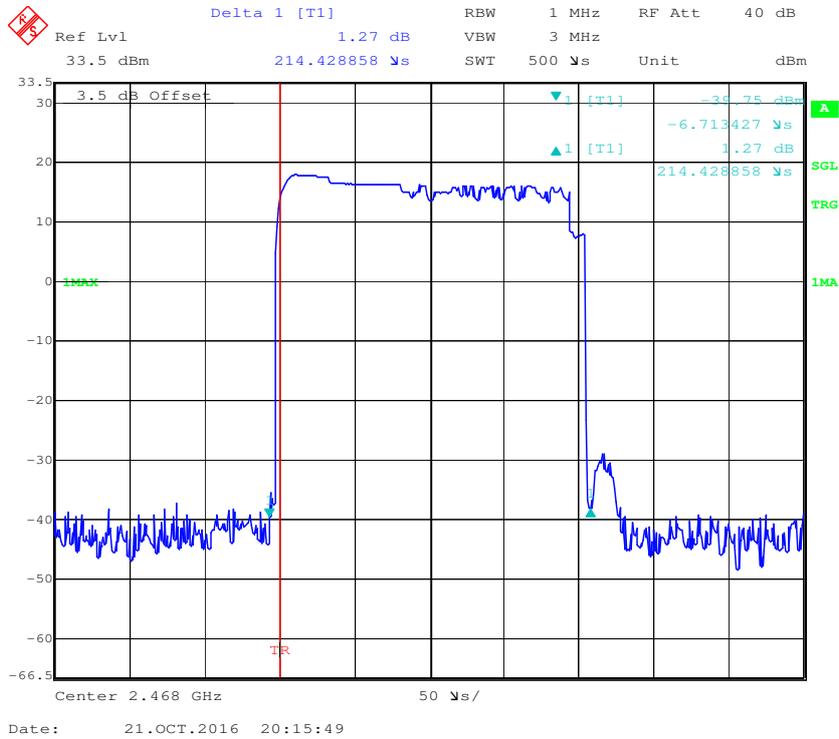
### Pulse time, Low Channel



### Pulse time, Middle Channel



**Pulse time, High Channel**



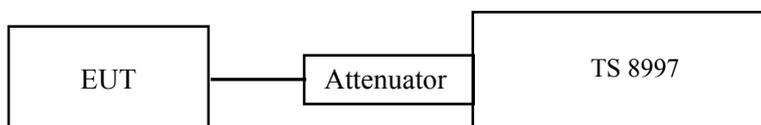
## RSS-247 § 5.4 (2) - PEAK OUTPUT POWER MEASUREMENT

### Applicable Standard

For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

### Test Procedure

1. Place the EUT on a bench and set 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 Data

#### Environmental Conditions

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Peter Jiang on 2016-10-21*

*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to following table.*

Mode	Channel	Frequency (MHz)	Peak Output Power	Limit (dBm)
			(dBm)	
GFSK	Low	2417	17.55	21
	Middle	2444.5	18.06	21
	High	2468	17.81	21

Note: The data above was tested in conducted mode.

## **RSS-247 § 5.5 - OUT OF BAND EMISSIONS**

### **Applicable Standard**

According to RSS-247 § 5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### **Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. 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.
3. Repeat above procedures until all measured frequencies were complete.

### **Test Data**

#### **Environmental Conditions**

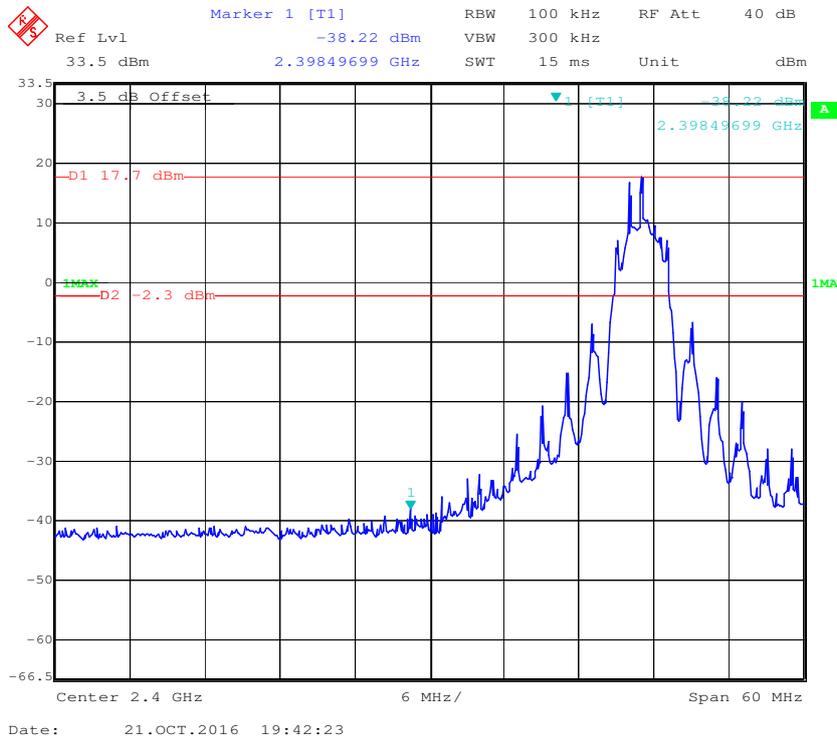
<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Peter Jiang on 2016-10-21*

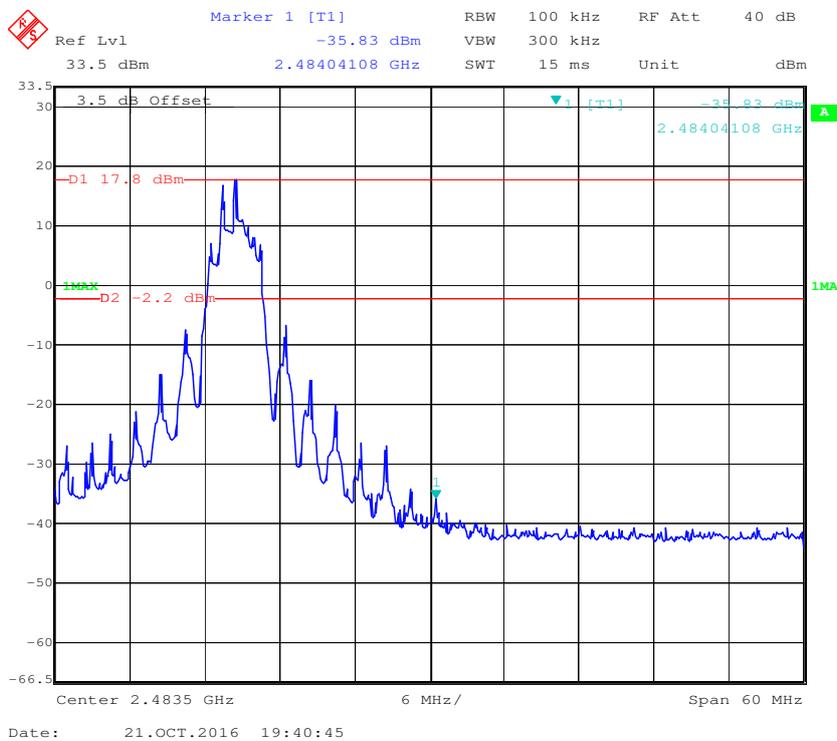
*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to following plots.*

**Band Edge: Left Side**



**Band Edge: Right Side**



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