

**FCC PART 15.247
TEST REPORT**

For

SHENZHEN MARKTRACE CO., LTD.

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Nanshan District, Shenzhen, Guangdong, China

FCC ID: WKXMR6100

Report Type: Original Report	Product Type: UHF RFID Reader
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Report Number: RSZ130529004-00	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *SHENZHEN MARKTRACE CO., LTD.*'s product, model number: *MR6121E (FCC ID: WKXMR6100)* or the "EUT" in this report was a UHF RFID Reader, which was measured approximately: 28.1 cm (L) x 28.1 cm (W) x 8.5 cm (H), rated with input voltage: DC 12V adapter.

Adapter information

Model: HSAH1200400T1M2

Input: 100-240V~50/60Hz 1.2A

Output: 12VDC 4.0A

Note: The series product, model MR6121E, MR6134E MR6111E and MR6161E are electrically identical, they have the same PCB layout and schematic, the difference among them is just the model number due to marketing purpose, model MR6121E was selected for fully testing, the detailed information can be referred to the attached declaration letter that stated and guaranteed by the applicant.

** All measurement and test data in this report was gathered from production sample serial number: 1305158 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-05-29.*

Objective

This test report is prepared on behalf of *SHENZHEN MARKTRACE 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, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. 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 a testing mode which was controlled by Software.

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

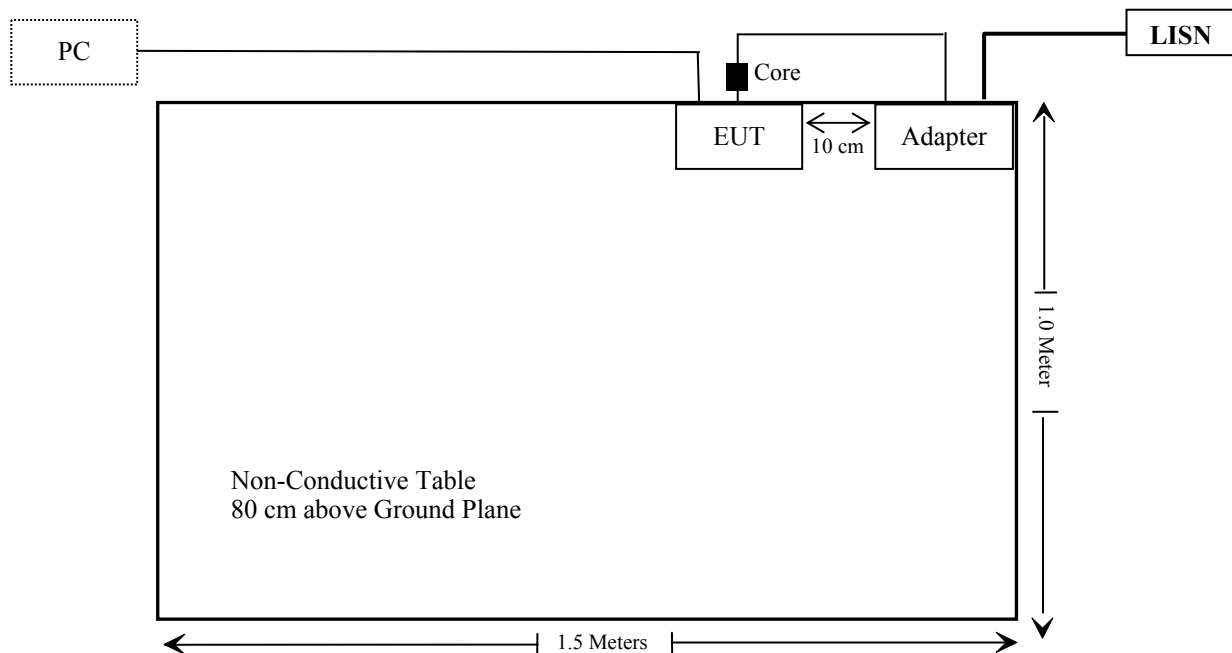
The test software “MR6100Demo” was provided by client.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	Keyboard	L100	CNORH656658907BL04TY
DELL	Mouse	MOC5UO	G1B0096D
DELL	Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
SAST	Modem	AEM-2100	0293

Block Diagram of Test Setup

For conducted emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1), §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)(i)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)(i)	Channel Separation	Compliance
§15.247(a)(1)(i)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(i)	Quantity of hopping channel	Compliance
§15.247(b)(2)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
902.5	9	7.94	24.82	303.39	20	0.479	0.602

Result: Compliance

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has a directional antenna, the gain is 9 dBi; fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

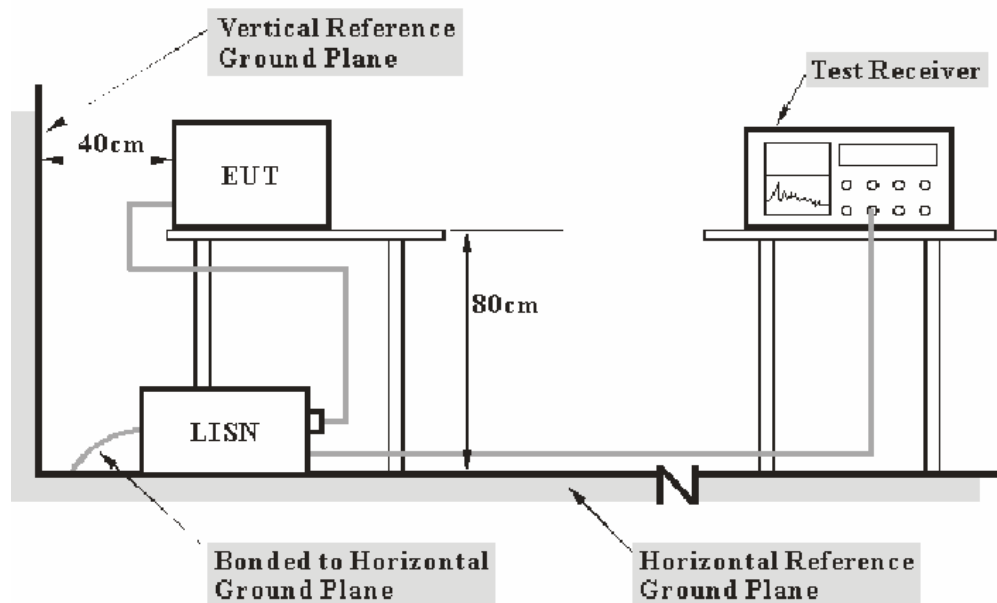
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between AMN/ISN and receiver, AMN/ISN voltage division factor, AMN/ISN 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. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	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 measurement procedure of EUT setup is according with ANSI C63.4-2009. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm

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 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	ESCI	101122	2012-08-08	2013-08-08
Rohde & Schwarz	First L.I.S.N.	ESH2-Z5	892107/021	2012-08-22	2013-08-21
COM-POWER	2 nd LISN	LI-200	12208	NCR	NCR
BACL	CE Test software	BACL-CE	V1.0	-	-

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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/ISN VDF (Voltage Division Factor) and Cable Loss. 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 7dB 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, with the worst margin reading of:

13.9 dB at 0.302000 MHz in the **Line** conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance 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

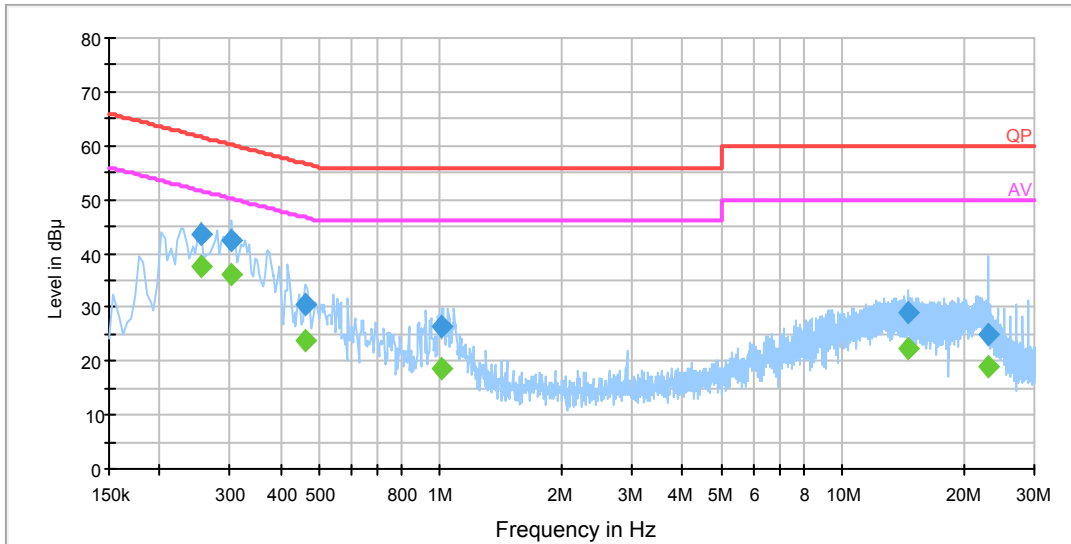
Temperature:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

The testing was performed by Rocky Kang on 2013-06-20.

EUT operation mode: Transmitting

AC 120 V, 60 Hz, Line:

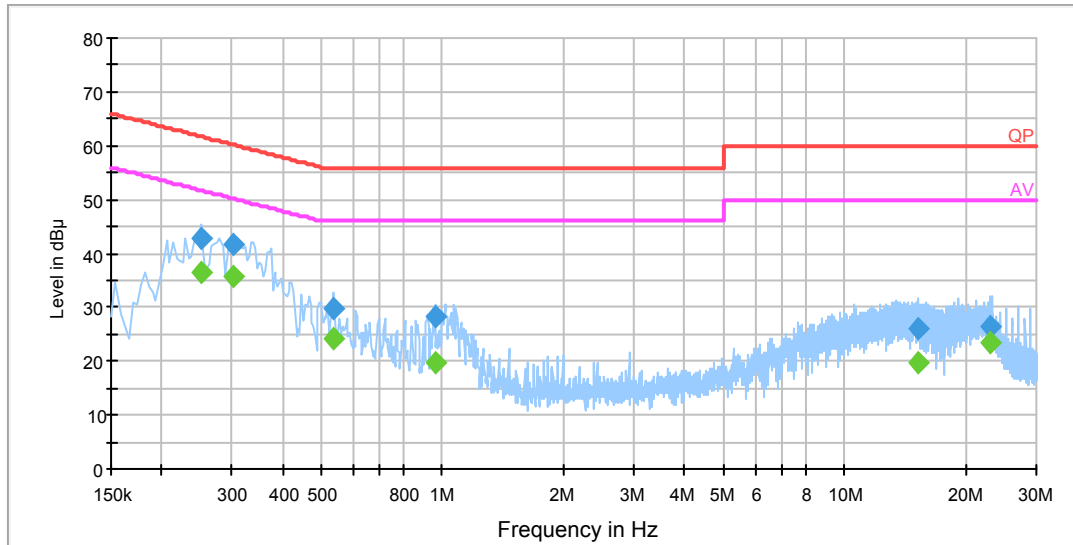
EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.302000	36.3	19.5	50.2	13.9	Ave.
0.254000	37.4	19.5	51.6	14.2	Ave.
0.302000	42.4	19.5	60.2	17.8	QP
0.254000	43.4	19.5	61.6	18.2	QP
0.462000	24.0	19.5	46.7	22.7	Ave.
0.462000	30.6	19.5	56.7	26.1	QP
1.010000	18.8	19.5	46.0	27.2	Ave.
14.562000	22.2	19.9	50.0	27.8	Ave.
1.010000	26.4	19.5	56.0	29.6	QP
23.098000	19.1	20.1	50.0	30.9	Ave.
14.562000	28.9	19.9	60.0	31.1	QP
23.098000	24.9	20.1	60.0	35.1	QP

AC 120V, 60 Hz, Neutral:

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.302000	35.8	19.5	50.2	14.4	Ave.
0.250000	36.4	19.5	51.8	15.4	Ave.
0.302000	41.9	19.5	60.2	18.3	QP
0.250000	42.9	19.5	61.8	18.9	QP
0.538000	24.0	19.5	46.0	22.0	Ave.
0.538000	29.9	19.5	56.0	26.1	QP
0.958000	19.7	19.5	46.0	26.3	Ave.
23.070000	23.6	20.3	50.0	26.4	Ave.
0.958000	28.3	19.5	56.0	27.7	QP
15.186000	19.7	20.1	50.0	30.3	Ave.
23.070000	26.6	20.3	60.0	33.4	QP
15.186000	26.0	20.1	60.0	34.0	QP

Note:

- 1) Correction Factor = LISN/ISN VDF (Voltage Division Factor) + Cable Loss
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

FCC §15.205; §15.209; §15.247(d)

Measurement Uncertainty

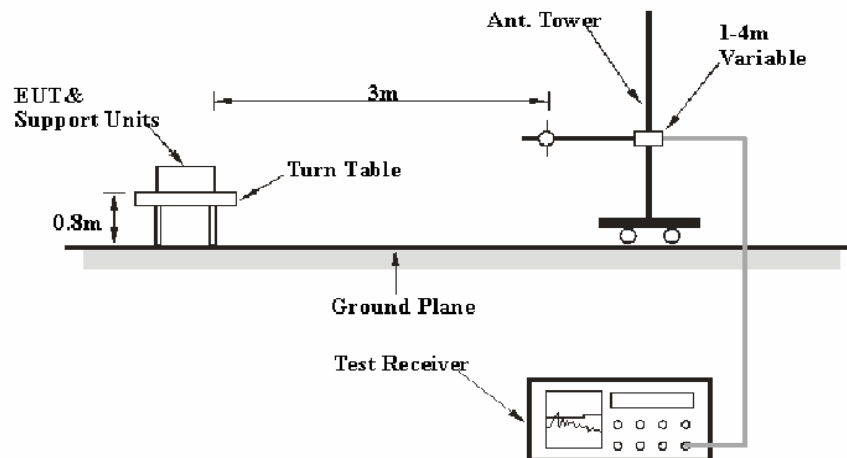
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency 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. (Shenzhen) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

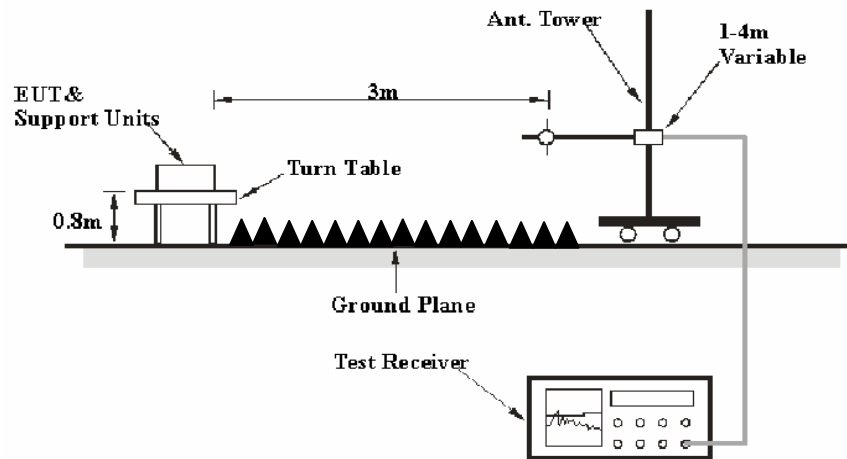
Frequency	Polarity	Measurement uncertainty
30MHz~200MHz	Horizontal	4.62 dB (k=2, 95% level of confidence)
	Vertical	4.54 dB (k=2, 95% level of confidence)
200MHz~1GHz	Horizontal	4.84 dB (k=2, 95% level of confidence)
	Vertical	5.91 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal/ Vertical	4.68 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal/ Vertical	4.92 dB (k=2, 95% level of confidence)

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209 and FCC 15.247 limits.

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

The adapter was connected to an AC 120V/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 10 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

For the radiated emissions test, the adapter was connected to the AC floor outlet.

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 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:

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Corrected Factor}$$

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 maximum 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
HP	Amplifier	8447E	1937A01046	2012-08-09	2013-08-09
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2012-11-24	2013-11-24
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
SUPER ULTRA	Amplifier	ZVA-213+	N/A	2012-11-24	2013-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that 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.

4.72 dB at 2782.5 MHz in the **Horizontal** polarization

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

The testing was performed by Rocky Kang on 2013-06-14.

EUT operation mode: Transmitting

30 MHz ~10 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBuV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (902.5 MHz)									
1805.0	43.28	Ave.	130	1.5	H	2.32	45.60	54	8.40
1805.0	41.52	Ave.	68	1.4	V	2.32	43.84	54	10.16
2707.5	34.42	Ave.	149	1.3	H	7.93	42.35	54	11.65
2707.5	33.83	Ave.	86	1.4	V	7.93	41.76	54	12.24
287.32	37.58	QP	156	1.2	V	-11.96	25.62	46	20.38
2707.5	42.18	PK	149	1.3	H	7.93	50.11	74	23.89
2707.5	41.87	PK	86	1.4	V	7.93	49.80	74	24.20
1805.0	46.77	PK	130	1.5	H	2.32	49.09	74	24.91
1805.0	45.89	PK	68	1.4	V	2.32	48.21	74	25.79
Middle Channel (915.5 MHz)									
2746.5	39.76	Ave.	2	1.2	H	7.93	47.69	54	6.31
2746.5	38.12	Ave.	156	1.5	V	7.93	46.05	54	7.95
1831.0	43.02	Ave.	124	1.5	H	1.70	44.72	54	9.28
1831.0	35.22	Ave.	84	1.2	V	1.70	36.92	54	17.08
287.32	37.49	QP	211	1.3	V	-11.96	25.53	46	20.47
2746.5	43.35	PK	2	1.2	H	7.93	51.28	74	22.72
2746.5	43.19	PK	156	1.5	V	7.93	51.12	74	22.88
1831.0	47.71	PK	124	1.5	H	1.70	49.41	74	24.59
1831.0	38.41	PK	84	1.2	V	1.70	40.11	74	33.89
High Channel (927.5 MHz)									
2782.5	40.66	Ave.	117	1.4	H	8.62	49.28	54	4.72
2782.5	38.25	Ave.	166	1.5	V	8.62	46.87	54	7.13
1855.0	41.50	Ave.	4	1.4	V	2.63	44.13	54	9.87
1855.0	39.21	Ave.	353	1.2	H	2.63	41.84	54	12.16
89.1	47.78	QP	223	1.4	H	-19.75	28.03	43.5	15.47
2782.5	43.61	PK	117	1.4	H	8.62	52.23	74	21.77
2782.5	42.73	PK	166	1.5	V	8.62	51.35	74	22.65
1855.0	46.02	PK	4	1.4	V	2.63	48.65	74	25.35
1855.0	44.89	PK	353	1.2	H	2.63	47.52	74	26.48

Note:

1. Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor
2. Corrected Amplitude = Corrected Factor + Receiver Reading
3. Margin = Limit- Corrected Amplitude

FCC §15.247(a) (1) (i)-CHANNEL SEPARATION

Applicable Standard

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace
3. Measure the channel separation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

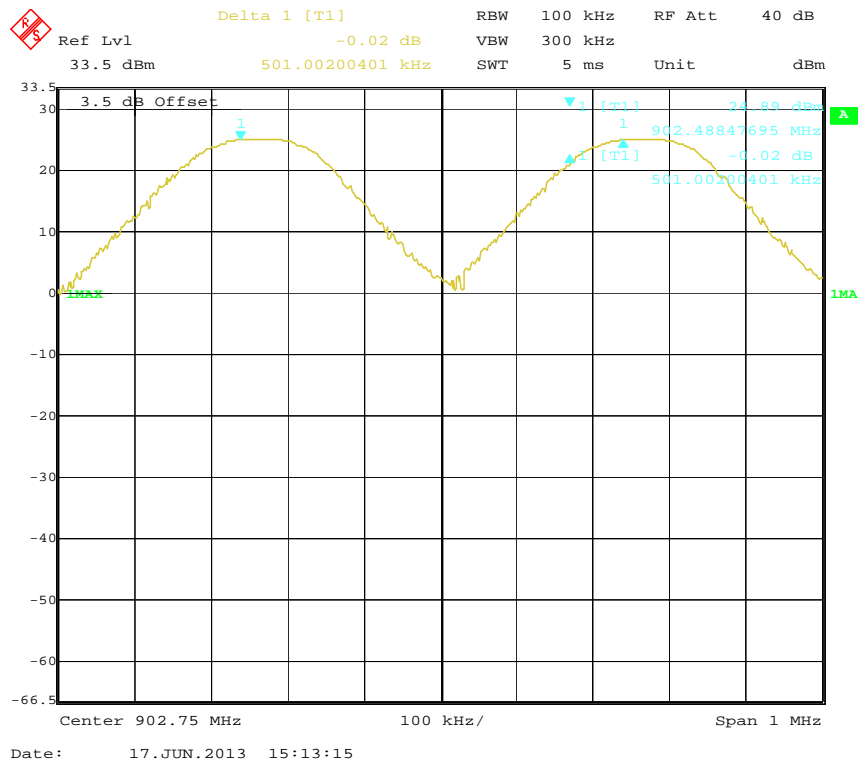
The testing was performed by Rocky Kang on 2013-06-17.

EUT operation mode: Transmitting

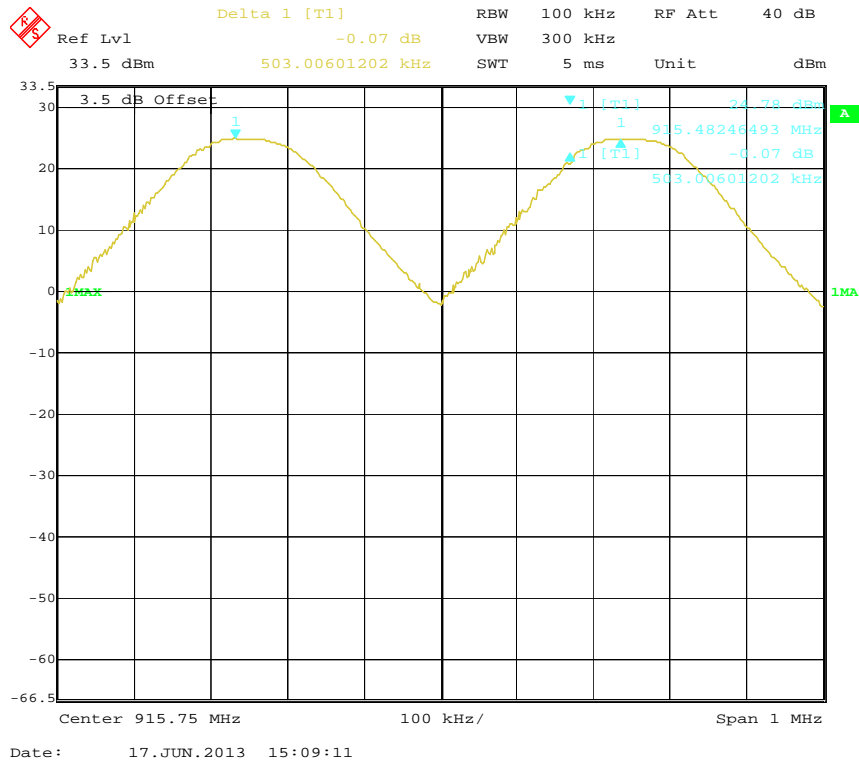
Test Result: Compliance. Please refer to following tables and plots

Channel	Frequency (MHz)	Channel Separation (MHz)	Result
Low	902.5	0.501	Pass
Adjacent	923.0		
Middle	915.5	0.503	Pass
Adjacent	916.0		
High	927.0	0.501	Pass
Adjacent	927.5		

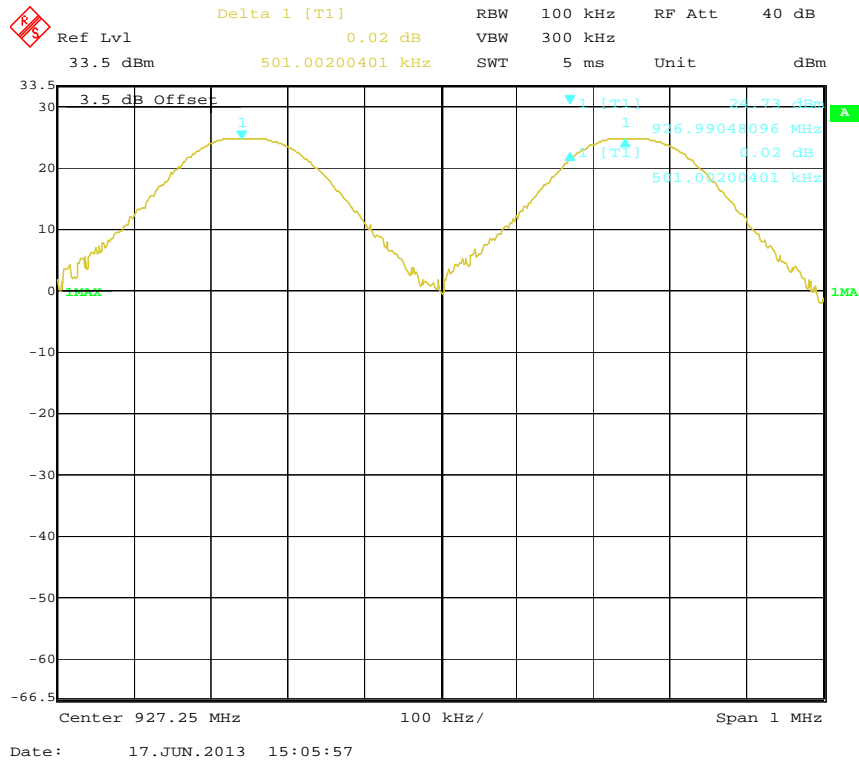
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1) (i) – 20 dB EMISSION BANDWIDTH

Applicable Standard

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 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 20 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	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

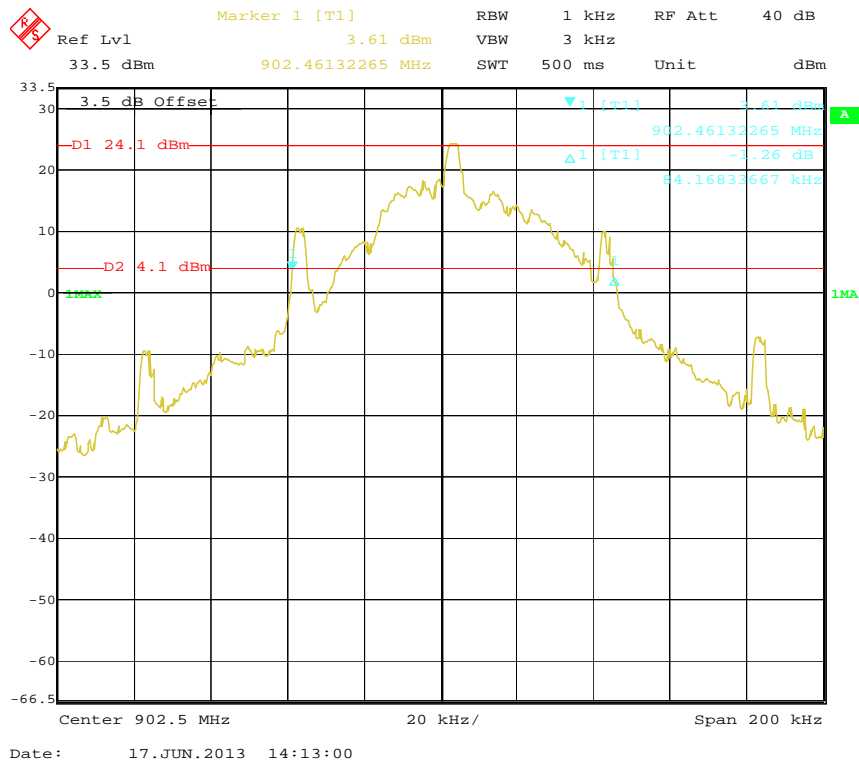
The testing was performed by Rocky Kang on 2013-06-17.

EUT operation mode: Transmitting

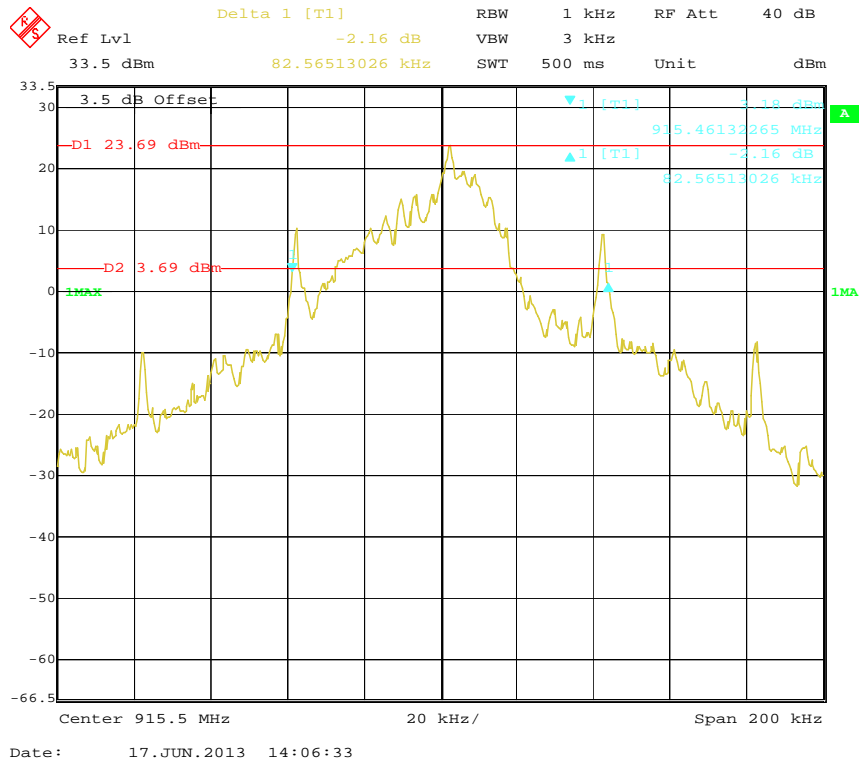
Test Result: Compliance. Please refer to following tables and plots

Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)	≤Limit (kHz)
Low	902.5	84.2	250
Middle	915.5	82.6	250
High	927.5	83.4	250

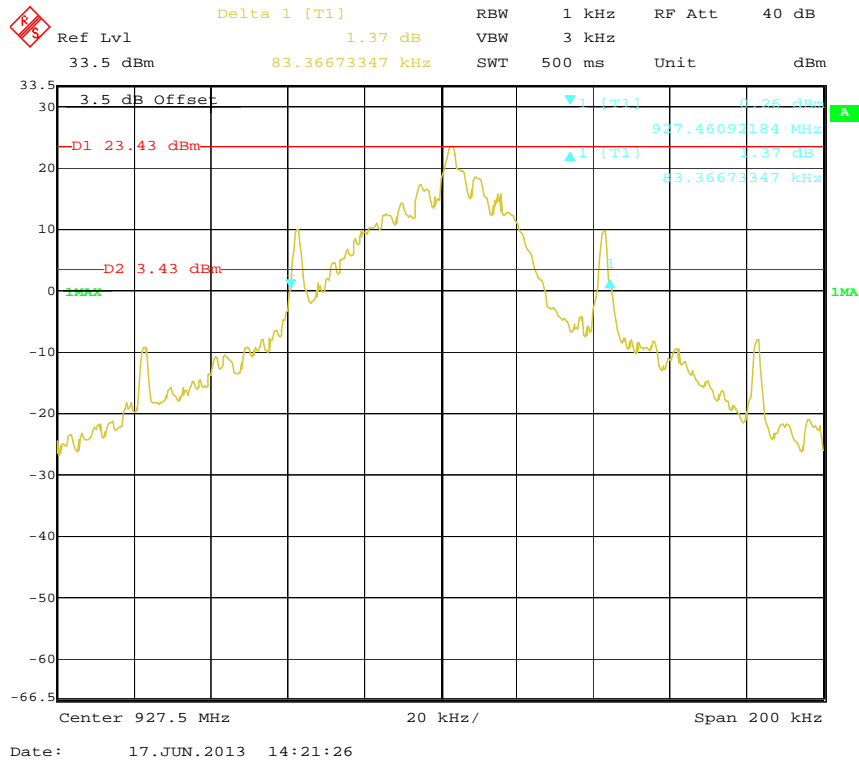
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1) (i)-QUANTITY OF HOPPING CHANNEL

Applicable Standard

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

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 hopping mode from first channel to last.
3. By using the max-hold function record the quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

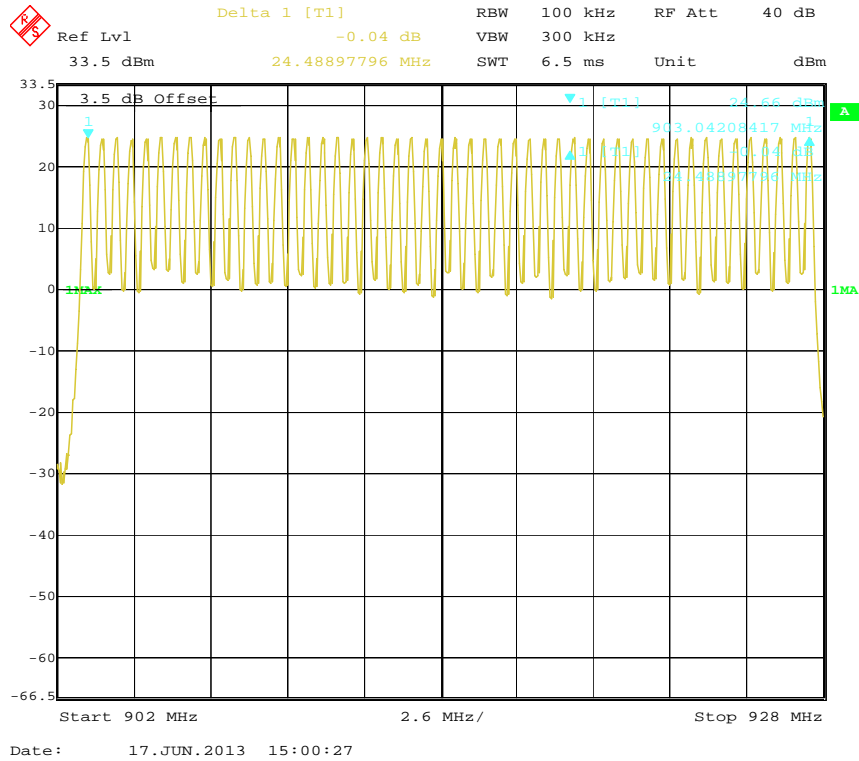
The testing was performed by Rocky Kang on 2013-06-17.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots

Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
902-928	50	≥50

Number of Hopping Channels



FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 20 (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell time = Pulse time*4/1000S

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

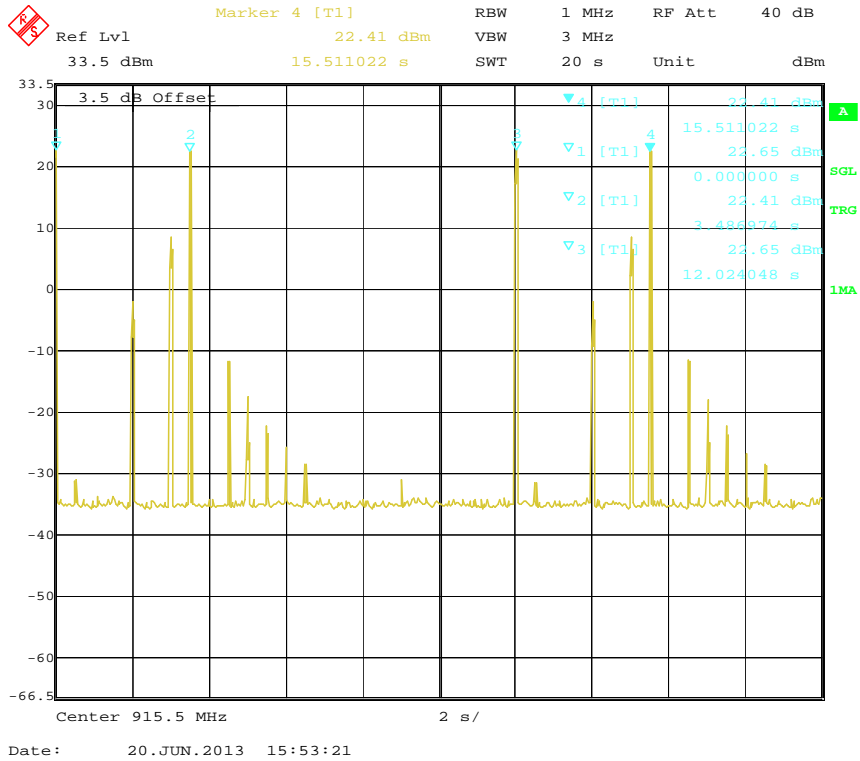
The testing was performed by Rocky Kang on 2013-06-20.

EUT operation mode: Transmitting

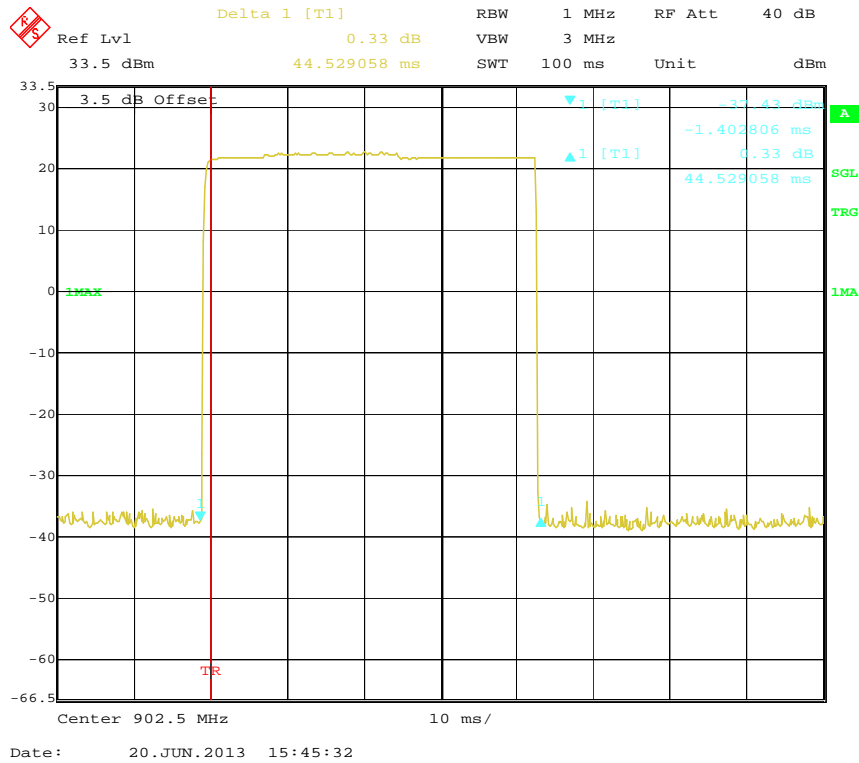
Test Result: Compliance. Please refer to following tables and plots

Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
Low	44.529	0.178	0.4	Pass
Middle	44.329	0.177	0.4	Pass
High	44.729	0.179	0.4	Pass
Note: Dwell time = Pulse time*4/1000 S				

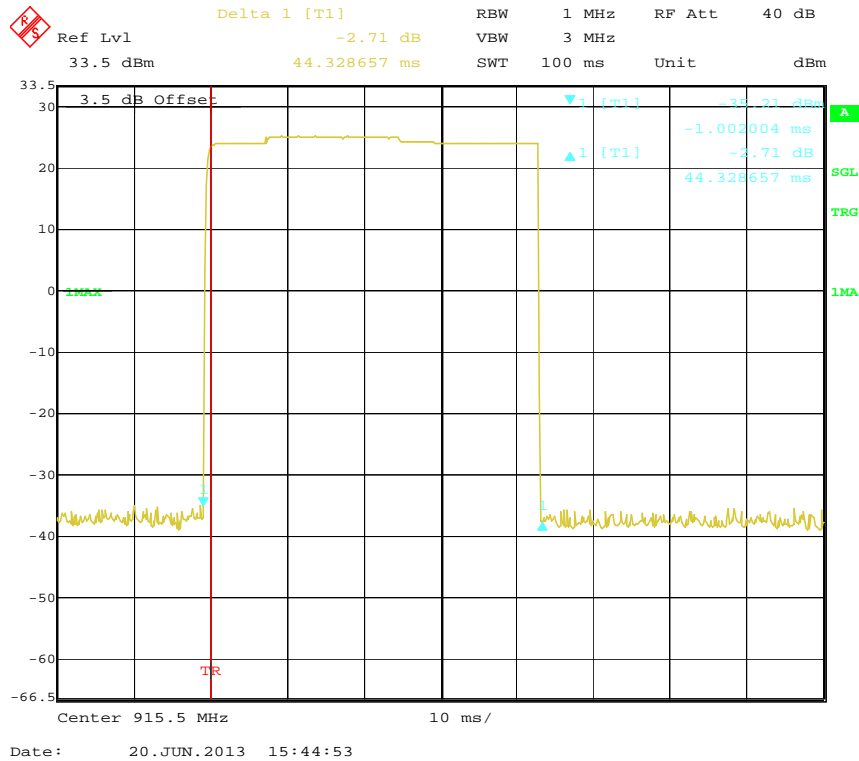
Transmission Number within 20 Seconds



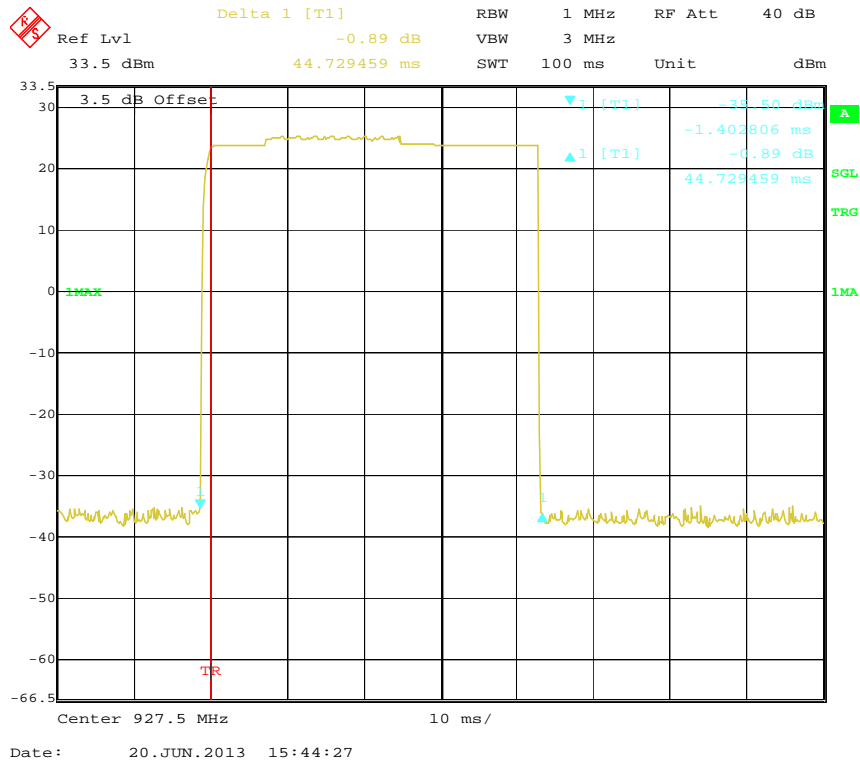
Pulse time, Low Channel



Pulse time, Middle Channel



Pulse time, High Channel



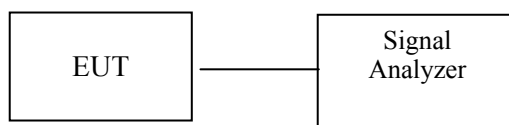
FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (2), for frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of FCC §15.247.

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 an EMI test receiver.
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	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

The testing was performed by Rocky Kang on 2013-06-17.

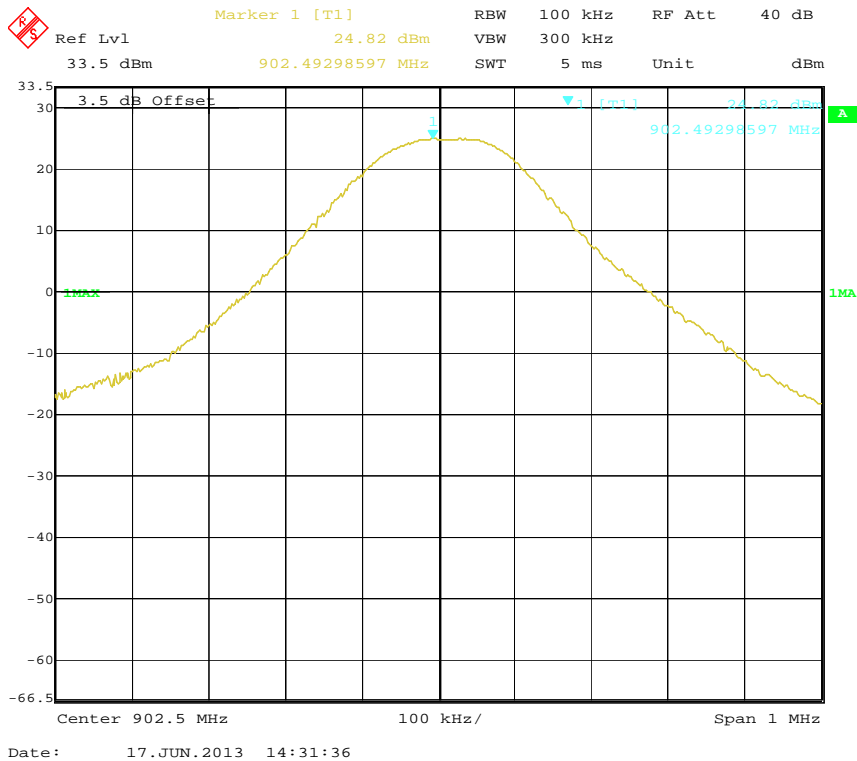
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots

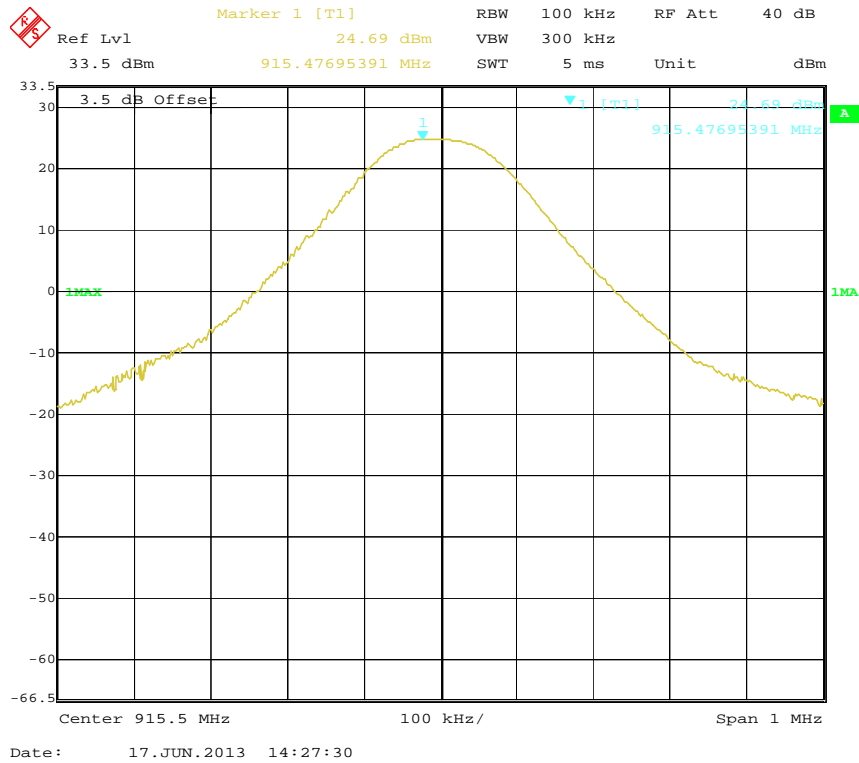
Channel	Frequency (MHz)	Conducted Output Power		Limit (dBm)
		(dBm)	(mW)	
Low	902.5	24.82	303.4	27
Middle	915.5	24.69	294.4	27
High	927.5	24.71	295.8	27

Note: limit =30dBm-(9-6) dB=27dBm, Antenna gain=9dBi

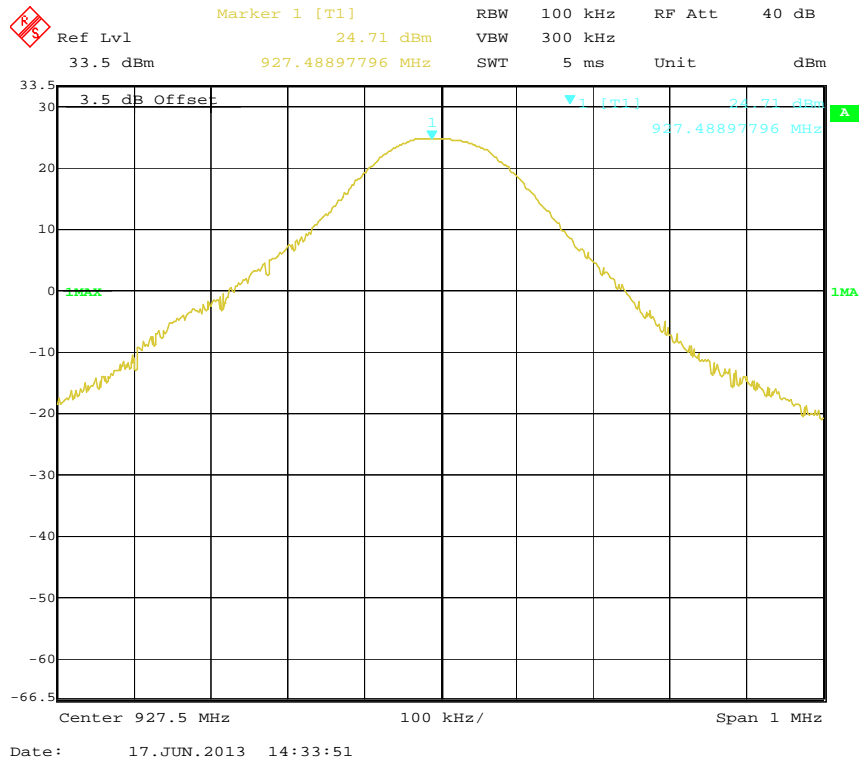
Low Channel



Middle Channel



High Chanel



FCC §15.247(d) - BAND EDGES

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

According to FCC public notice DA 00-705 released on March 30, 2000.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 300 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	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

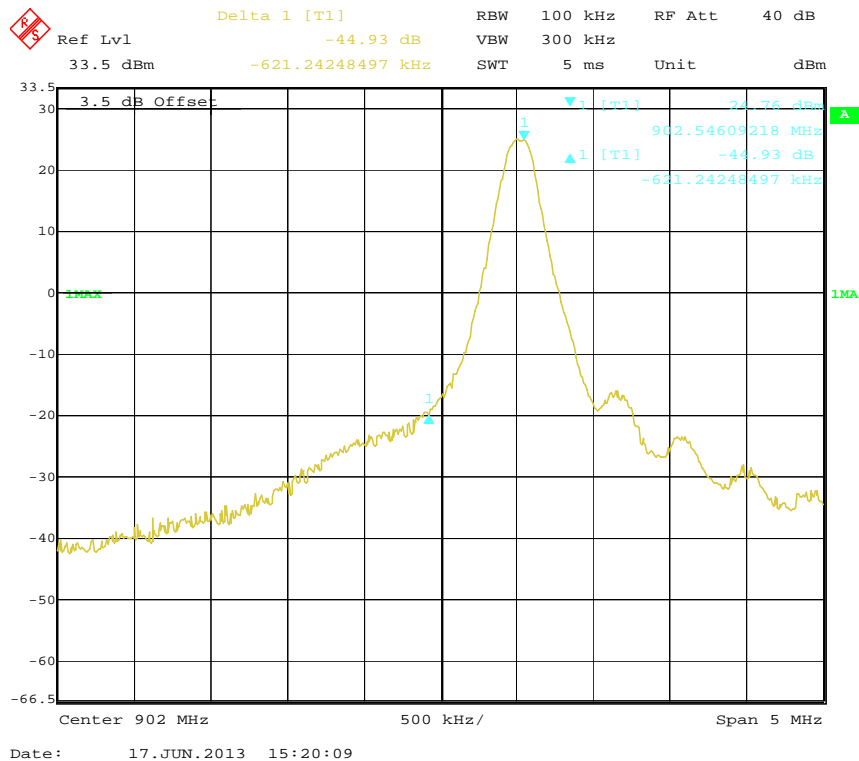
The testing was performed by Rocky Kang on 2013-06-17.

EUT operation mode: Transmitting

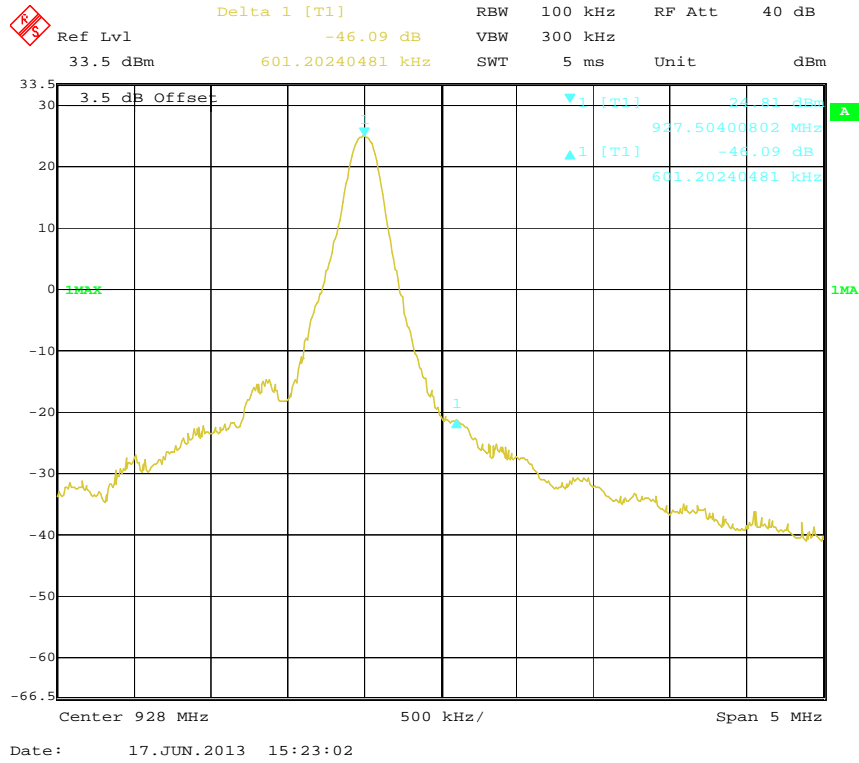
Test Result: Compliance. Please refer to following table and plots

Frequency Band	Delta Peak to band emission (dBc)	≥ Limit (dBc)	Result
Left band	44.93	20	Pass
Right band	46.09	20	Pass

Band Edge-Left Side



Band Edge-Right Side



PRODUCT SIMILARITY DECLARATION LETTER



Shenzhen Marktrace co.,Ltd.

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Tel: 0755-26546392 Fax: 0755-26553743

2013-5-29

Product Similarity Declaration

To Whom It May Concern,

We, SHENZHEN MARKTRACE CO., LTD. hereby declare that our UHF RFID Reader, Model Number: MR6134E, MR6111E ,MR6161E are electrically identical with MR6121E that was certified by BACL. They are just different in model numbers due to marketing purposes.

Please contact me if you have any question.

Qing Li
Manager

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