

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : W167R-D050
AGR No. : A166A-080
Applicant : BLUEBIRD INC.
Address : (Dogok-dong, SEI Tower13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Manufacturer : BLUEBIRD INC.
Address : (Dogok-dong, SEI Tower13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Type of Equipment : Handheld Mobile Computer
FCC ID. : SS4RFR900
Model Name : RFR900
Serial number : N/A
Total page of Report : 46 pages (including this page)
Date of Incoming : June 02, 2016
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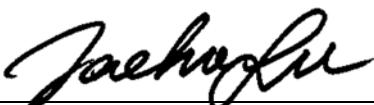
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Jae-Ho, Lee / Chief Engineer
ONETECH Corp.

Approved by:



Sung-ik, Han/ Managing Director
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W167R-D050	July 12, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : BLUEBIRD INC.
ADDRESS : (Dogok-dong, SEI Tower13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
CONTACT PERSON : Jae-ho, Lee / Assistant Manager
TELEPHONE NO : +82-70-7730-8210
FCC ID : SS4RFR900
MODEL NAME : RFR900
SERIAL NUMBER : N/A
DATE : July 12, 2016

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
KIND OF EQUIPMENT	Handheld Mobile Computer
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m, Semi Anechoic Chamber

- The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (1)	Carrier Frequency Separation	Met the Limit / PASS
15.247 (a) (1) (i)	Minimum Number of Hopping Channels	Met the Limit / PASS
15.247 (a) (1) (i)	Average Time of Occupancy	Met the Limit / PASS
15.247 (b) (2)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.209	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

- . Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

- . Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The BLUEBIRD INC., Model RFR900 (referred to as the EUT in this report) is a Handheld Mobile Computer. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Handheld Mobile Computer				
OPERATING FREQUENCY	Bluetooth	2 402 MHz ~ 2 480 MHz			
	RFID	902.75 MHz ~ 927.25 MHz			
RF OUTPUT POWER	Bluetooth	1 Mbps	1.40 dBm		
		2 Mbps	2.98 dBm		
		3 Mbps	3.02 dBm		
	RFID	29.37 dBm (0.865 W)			
NUMBER OF CHANNEL	Bluetooth	79 Channels			
	RFID	50 Channels			
MODULATION TYPE	Bluetooth	GFSK for 1 Mbps, $\pi/4$ -DQPSK for 2 Mbps, 8DPSK for 3 Mbps			
	RFID	ASK			
ANTENNA TYPE	PCB Antenna				
ANTENNA GAIN	Bluetooth	4.535 dBi			
	RFID	3.72 dBi			
LIST OF EACH OSC. OR CRYSTAL. FREQ.(FREQ.>=1 MHz)	12 MHz				
RATED SUPPLY VOLTAGE	DC 3.635 V				

3.2 Alternative type(s)/model(s); also covered by this test report.

- None

4. EUT MODIFICATIONS

- None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	
Switch Board	FPCB-RFR900-BATTERY- REV0.2	N/A	
RFID Module	IDRO900MI	N/A	
RFID Antenna	SANGSHIN 6015_V2.0	N/A	
Connect Board	EF400	N/A	
Battery	BAT-RFR900	GSP	

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
RFR900	BLUEBIRD INC.	Handheld Mobile Computer	Adapter
ETA-U90KWK	RF Tech (Tianjin) Electronics Co., Ltd.	Adapter	EUT
EF400	BLUEBIRD INC.	PDA	10pin connector

5.3 Mode of operation during the test

- EUT does not transmitting mode during charging
- Charge mode : The USB connector and 10pin connector on the EUT was connected to the adapter and PDA, then the EUT was operated with charging continuously during the testing.
- For the testing, software of PDA used to control the EUT for staying in continuous transmitting mode is programmed.
- For final testing, EUT was set at Low Channel (917.1 MHz), Middle Channel (921.9 MHz), and High Channel (926.9 MHz).

5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in a charging mode and transmitting mode. The EUT was connected to adapter and PDA. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI 63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m semi anechoic chamber. The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

According to the rule, FCC Part 15C Section 15.203 the transmitter antenna shall be integral with the device, or the antenna coupling be so designed that no antenna other than that furnished by the party responsible for compliance shall be used.

Antenna Construction:

The transmitter antenna of the EUT is a PCB Antenna, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Charging Mode	-
Charging Mode & Transmitting Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Charging Mode	-
Charging Mode & Transmitting Mode	X

7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °C

Relative humidity : 56 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



7.3 Test equipment used

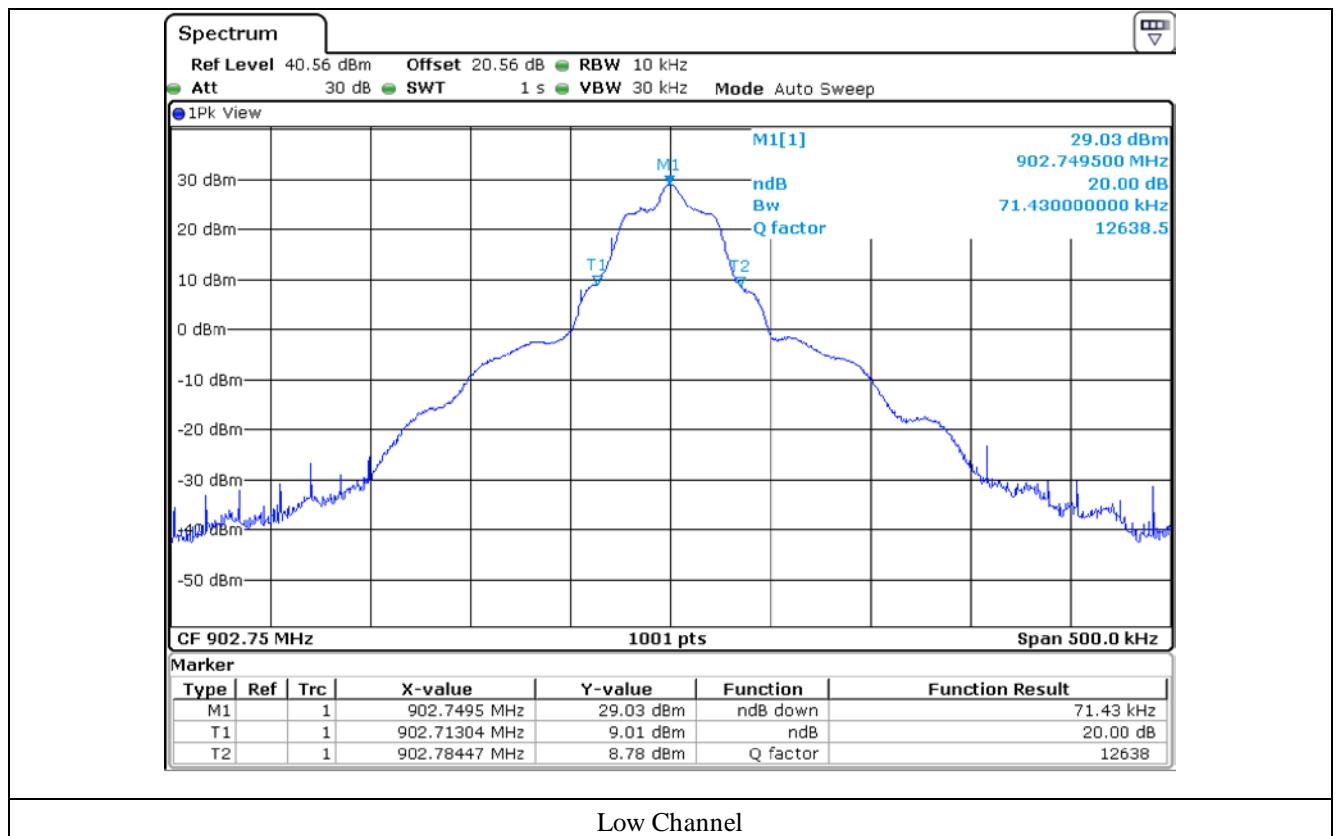
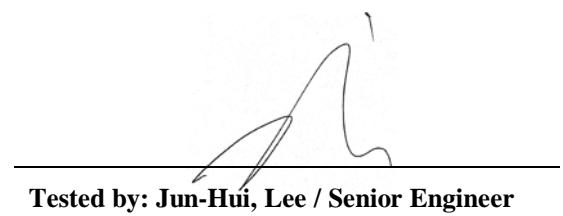
Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)

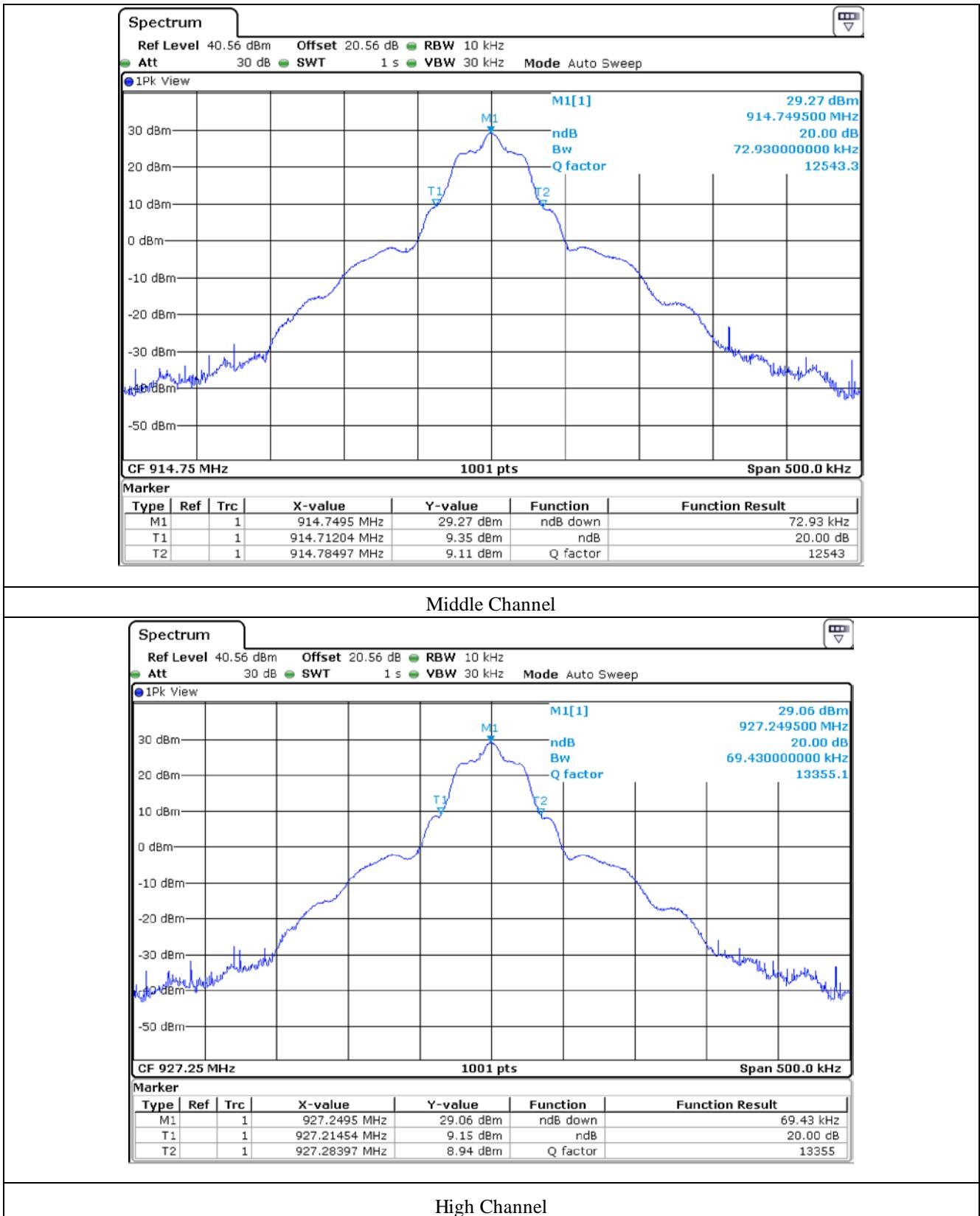
All test equipment used is calibrated on a regular basis.

7.4 Test data

- Test Date : June 13, 2016

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)	Limits(kHz)
Low	902.75	71.43	250
Middle	914.75	72.93	
High	927.25	69.43	





8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature : 23 °C

Relative humidity : 56 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 10 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)

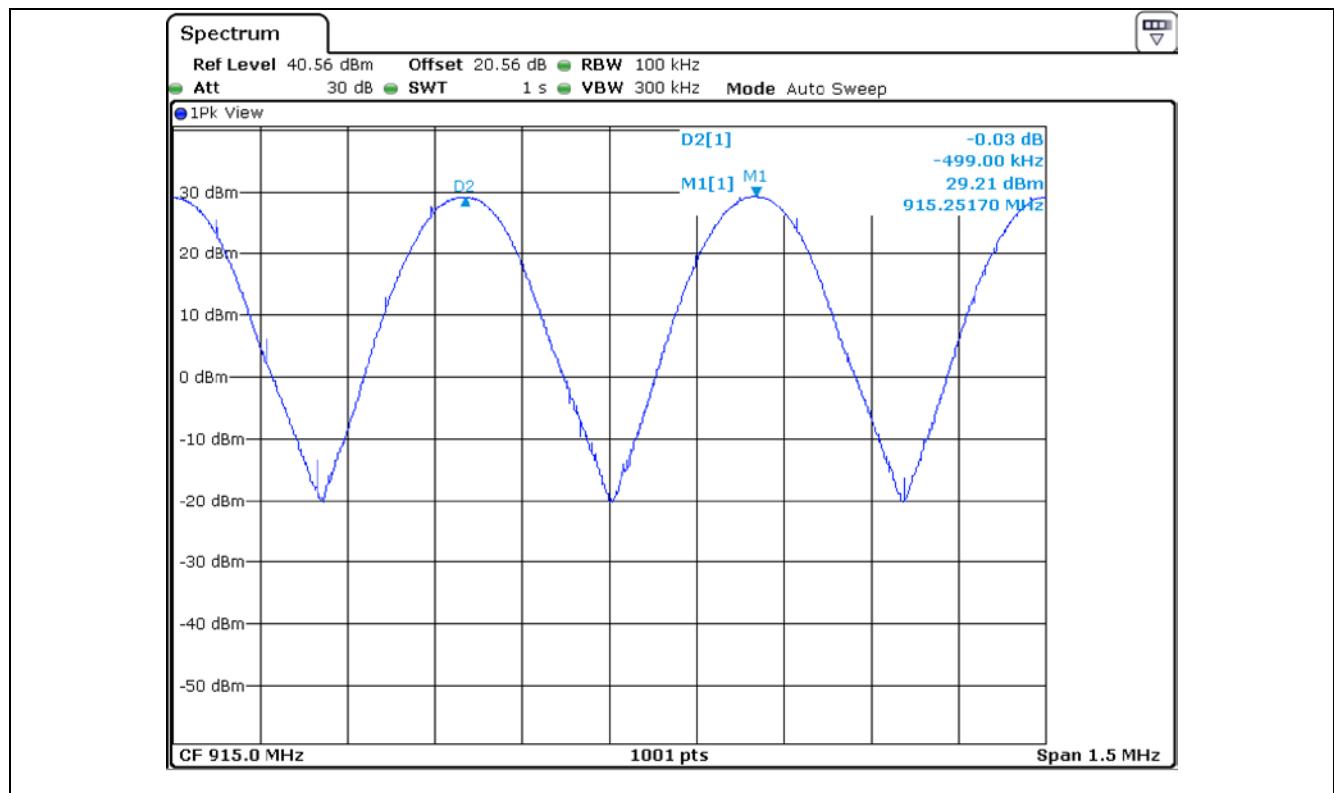
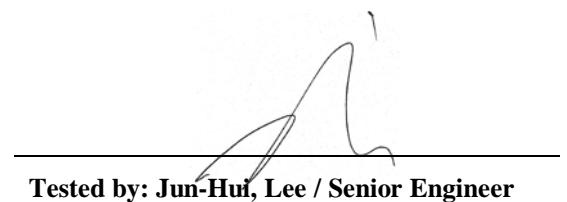
All test equipment used is calibrated on a regular basis.

8.4 Test data

- Test Date : June 13, 2016

- Test Result : Pass

Frequency (MHz)	Measured Value (kHz)	LIMIT
915.25	499.00	Minimum of 25 kHz or the 20 dB Bandwidth



9. NUMBER OF HOPPING CHANNELS

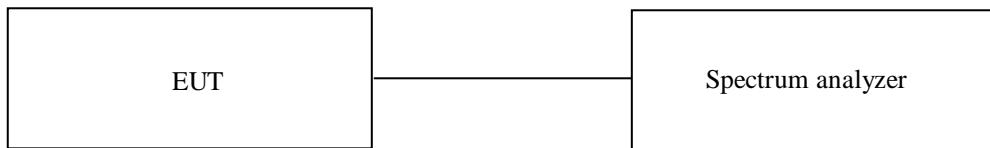
9.1 Operating environment

Temperature : 23 °C

Relative humidity : 56 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



9.3 Test equipment used

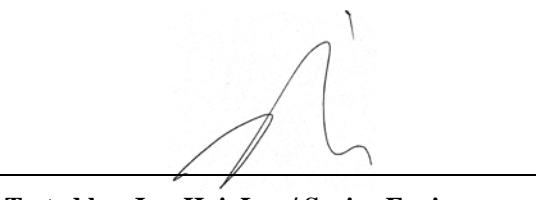
Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

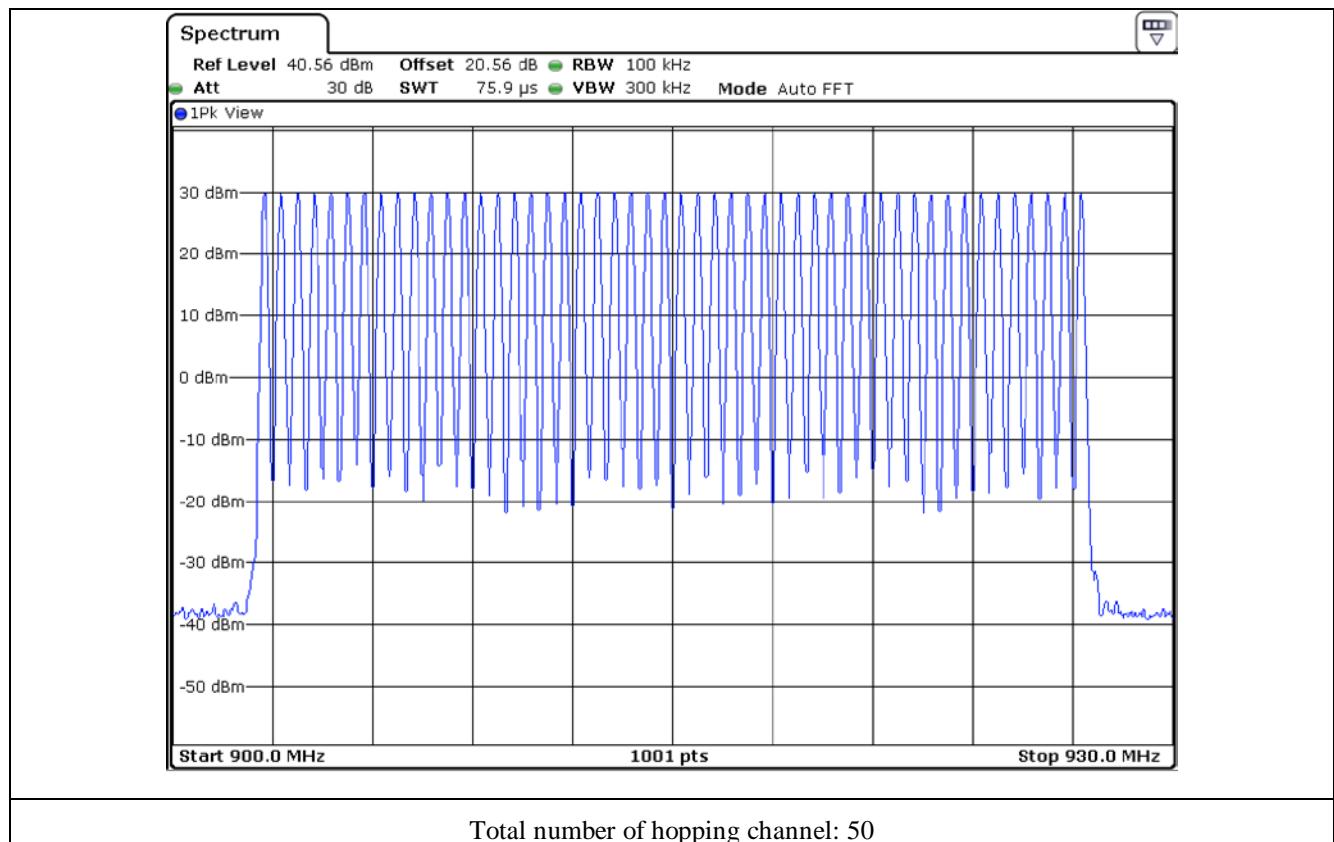
9.4 Test data

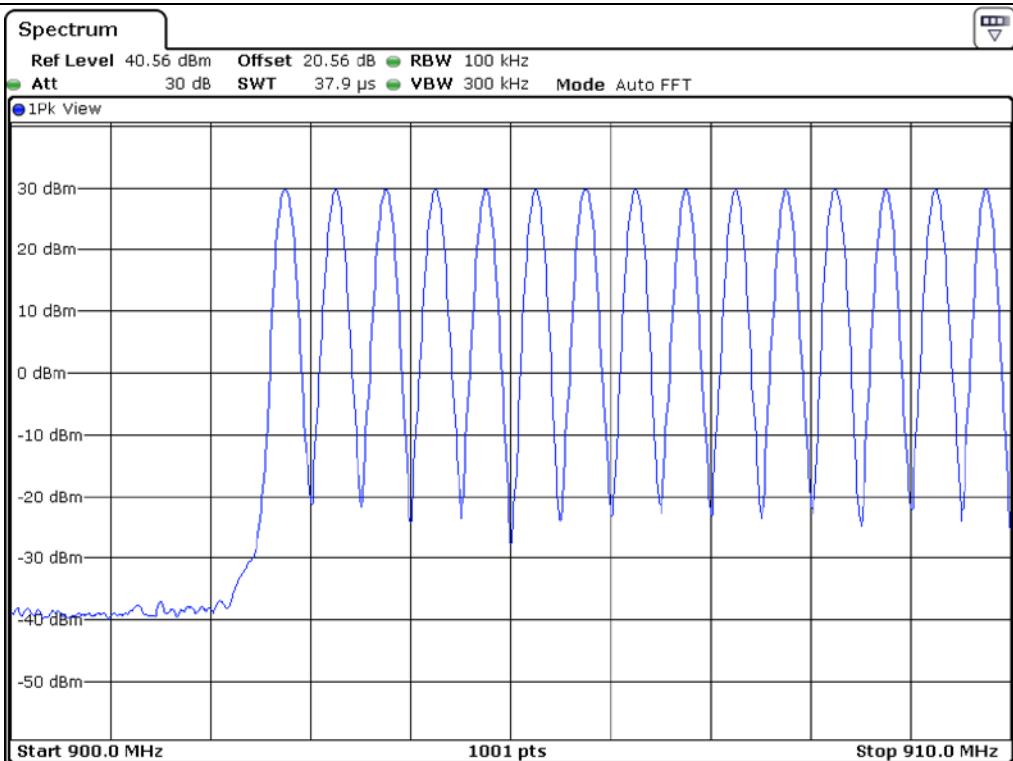
- Test Date : June 13, 2016
- Test Result : Pass

Frequency Range (MHz)	Measured value (Number)	20 dB Bandwidth (kHz)	Limit
902.75 ~ 927.25	50	< 250	≥ 50

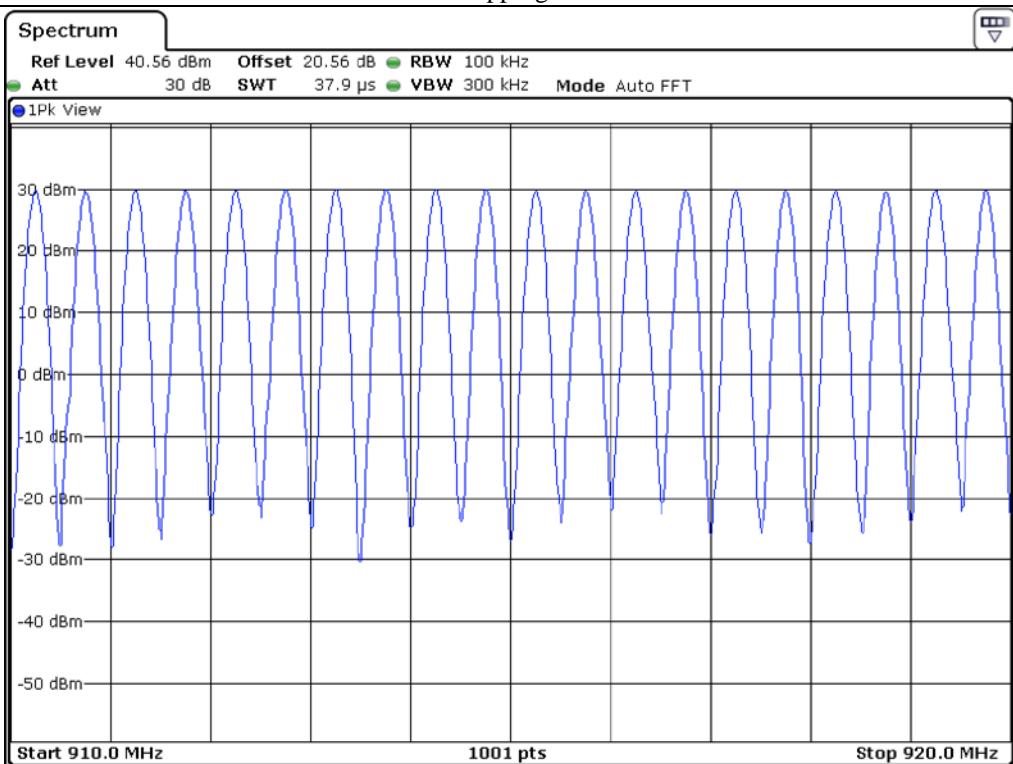


Tested by: Jun-Hui, Lee / Senior Engineer

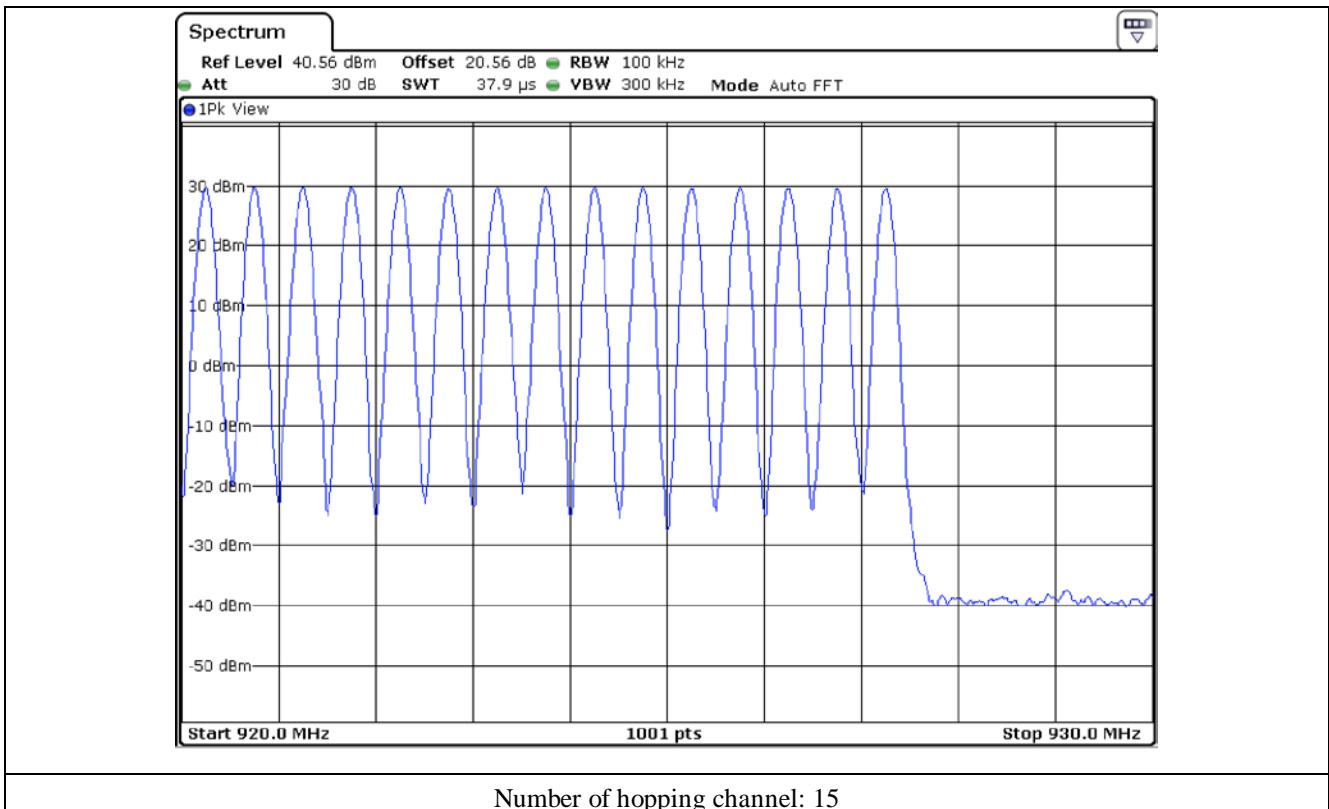




Number of hopping channel: 15



Number of hopping channel: 20



10. TIME OF OCCUPANCY

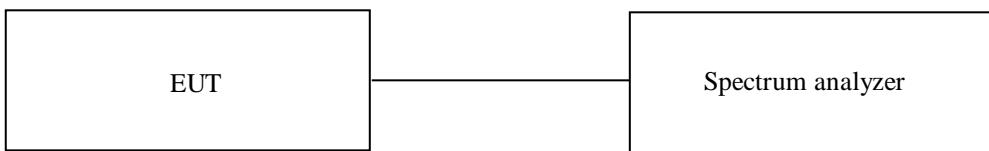
10.1 Operating environment

Temperature : 23 °C

Relative humidity : 56 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)

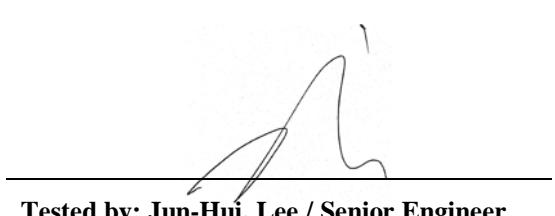
All test equipment used is calibrated on a regular basis.

10.4 Test data

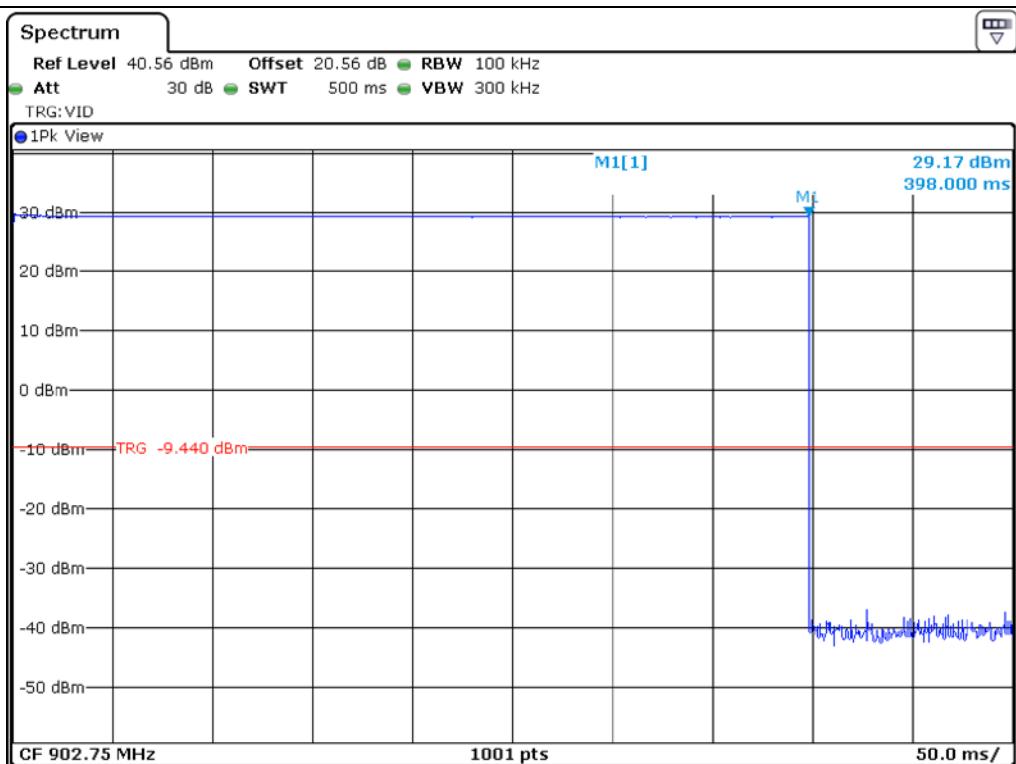
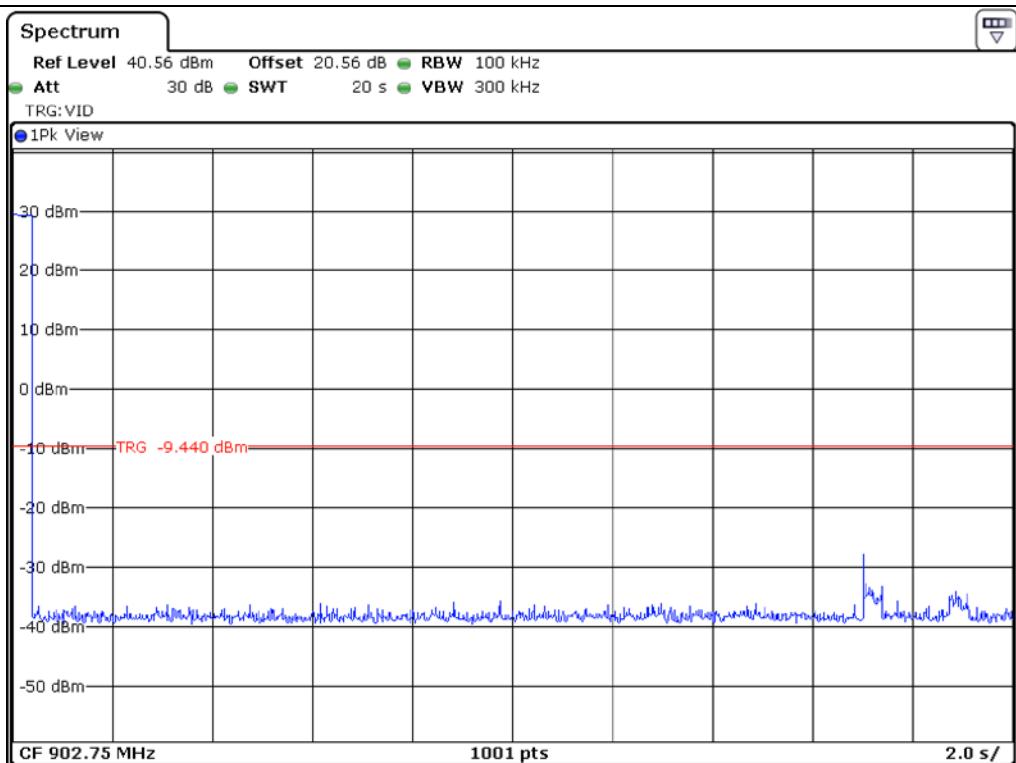
-. Test Date : June 13, 2016

Frequency Range (MHz)	20 dB Bandwidth (kHz)	Pulse Time (ms)	Number of Transmission (20 s period)	Dwell Time (ms)	Limit (ms)
902.75 ~ 927.25	< 250	398.00	1.0	398.00	< 400

Note: Dwell Time (s) = Pulse Time * Number of Transmissions during a 20 second period.



Tested by: Jun-Hui, Lee / Senior Engineer

**Pulse Time**

Number of Transmissions during a 20 second period

11. MAXIMUM PEAK OUTPUT POWER

11.1 Operating environment

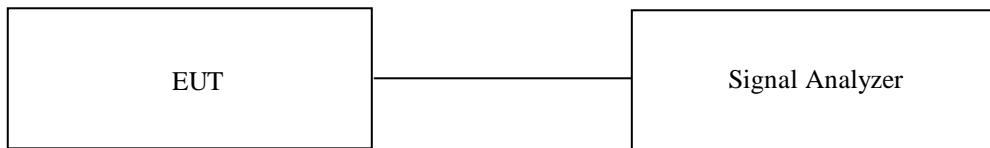
Temperature : 23 °C

Relative humidity : 56 % R.H

11.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT.

The EUT was operating in transmit mode at the appropriate center frequency.



11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

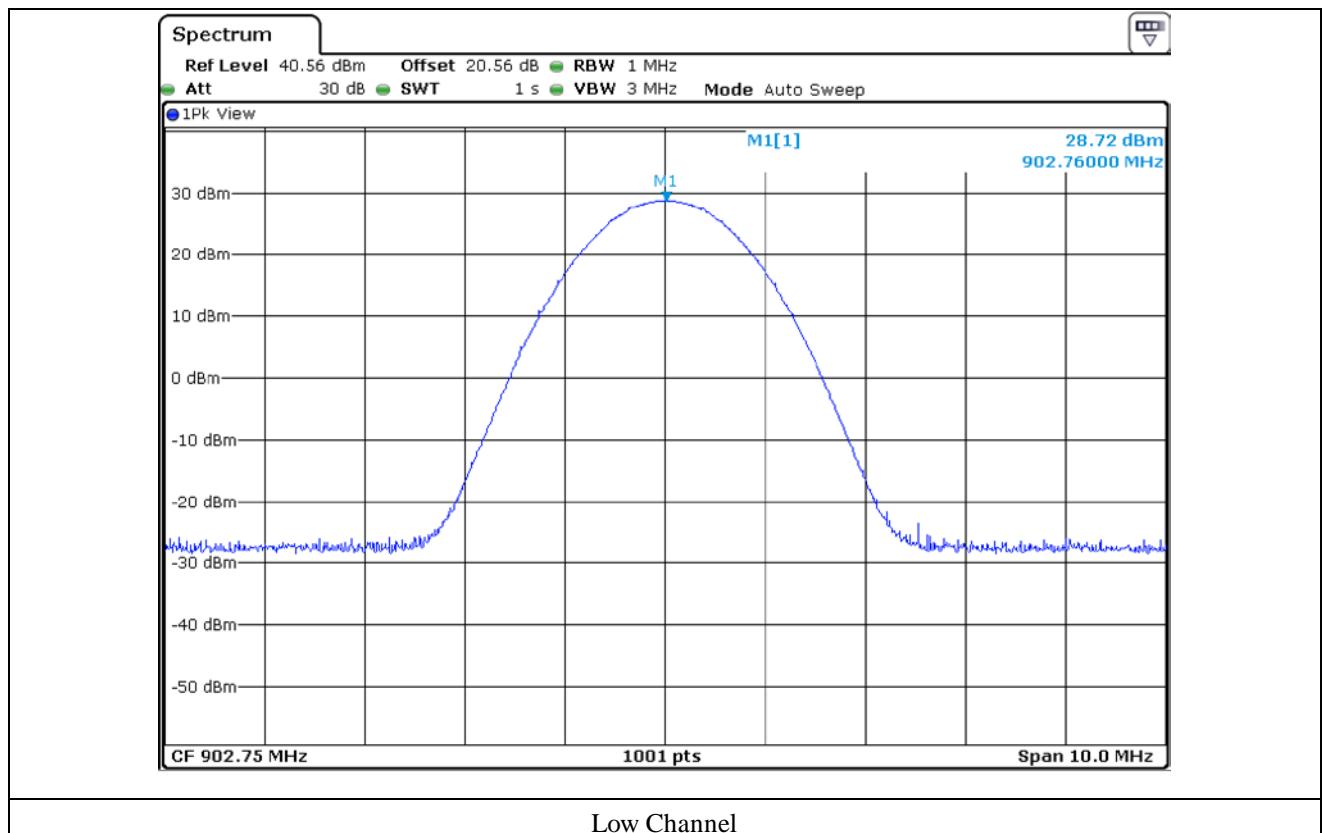
11.4 Test data

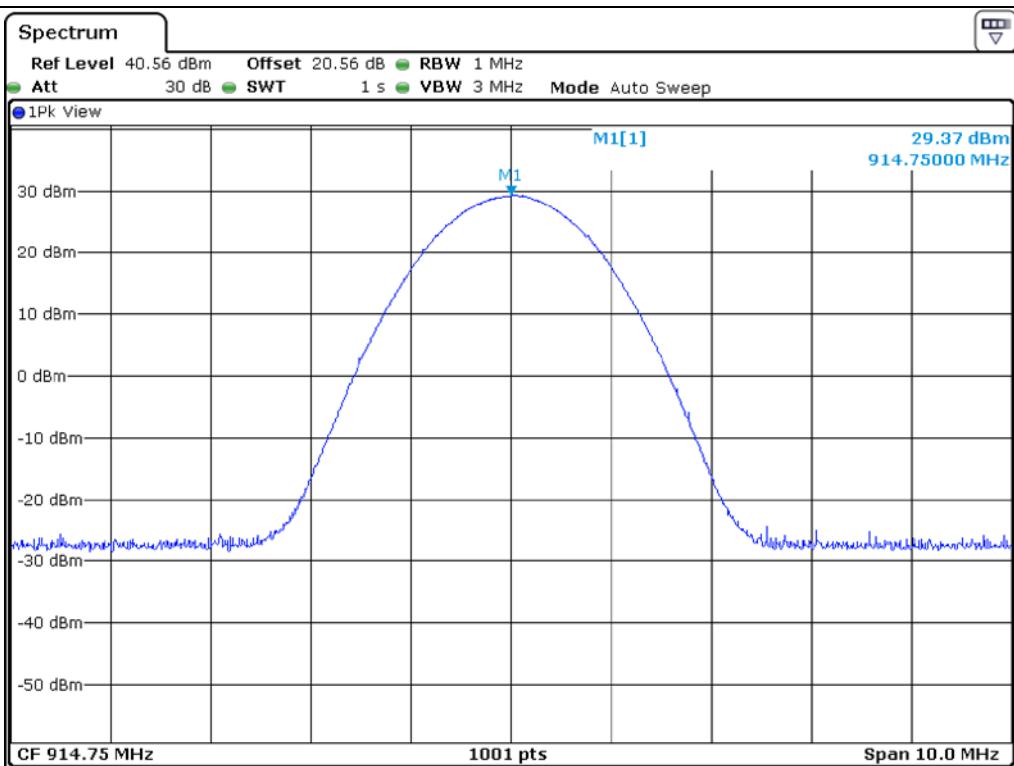
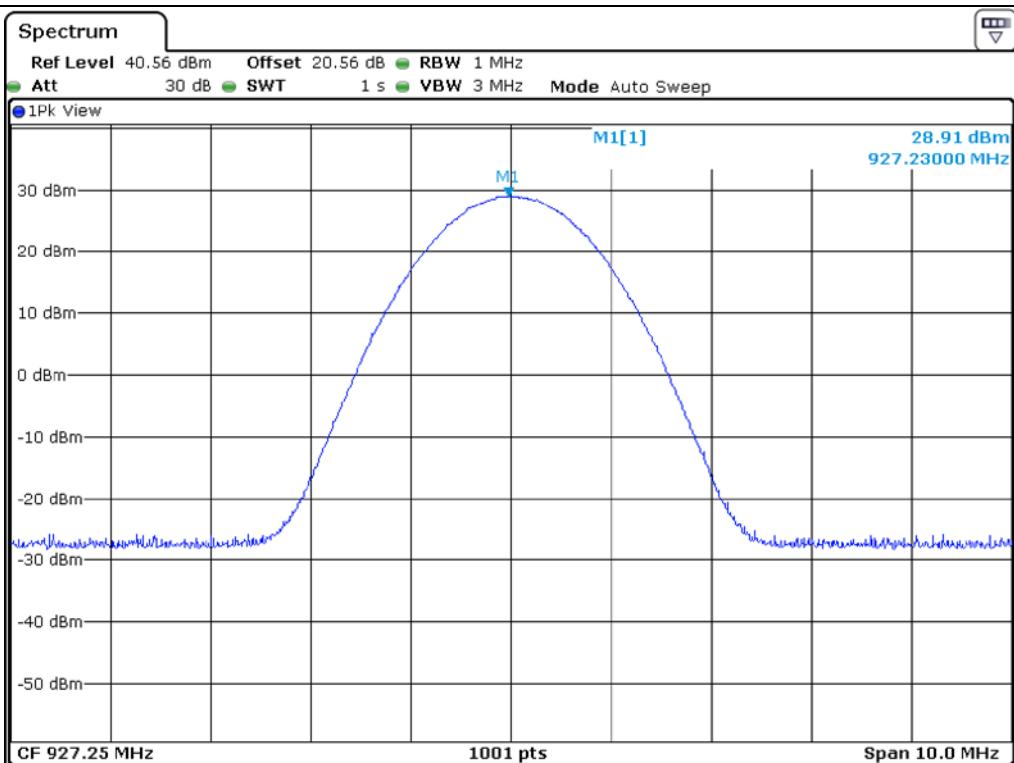
- Test Date : June 13, 2016

- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	MEASURED VLAUE (W)	LIMITS (dBm)	LIMITS (W)
Low	902.75	28.72	0.745	30.00	1.0
Middle	914.75	29.37	0.865	30.00	1.0
High	927.25	28.91	0.778	30.00	1.0

1
Tested by: Jun-Hui, Lee / Senior Engineer



**Middle Channel****High Channel**

12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature : 23 °C

Relative humidity : 56 % R.H

12.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



12.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber.3 m, The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.

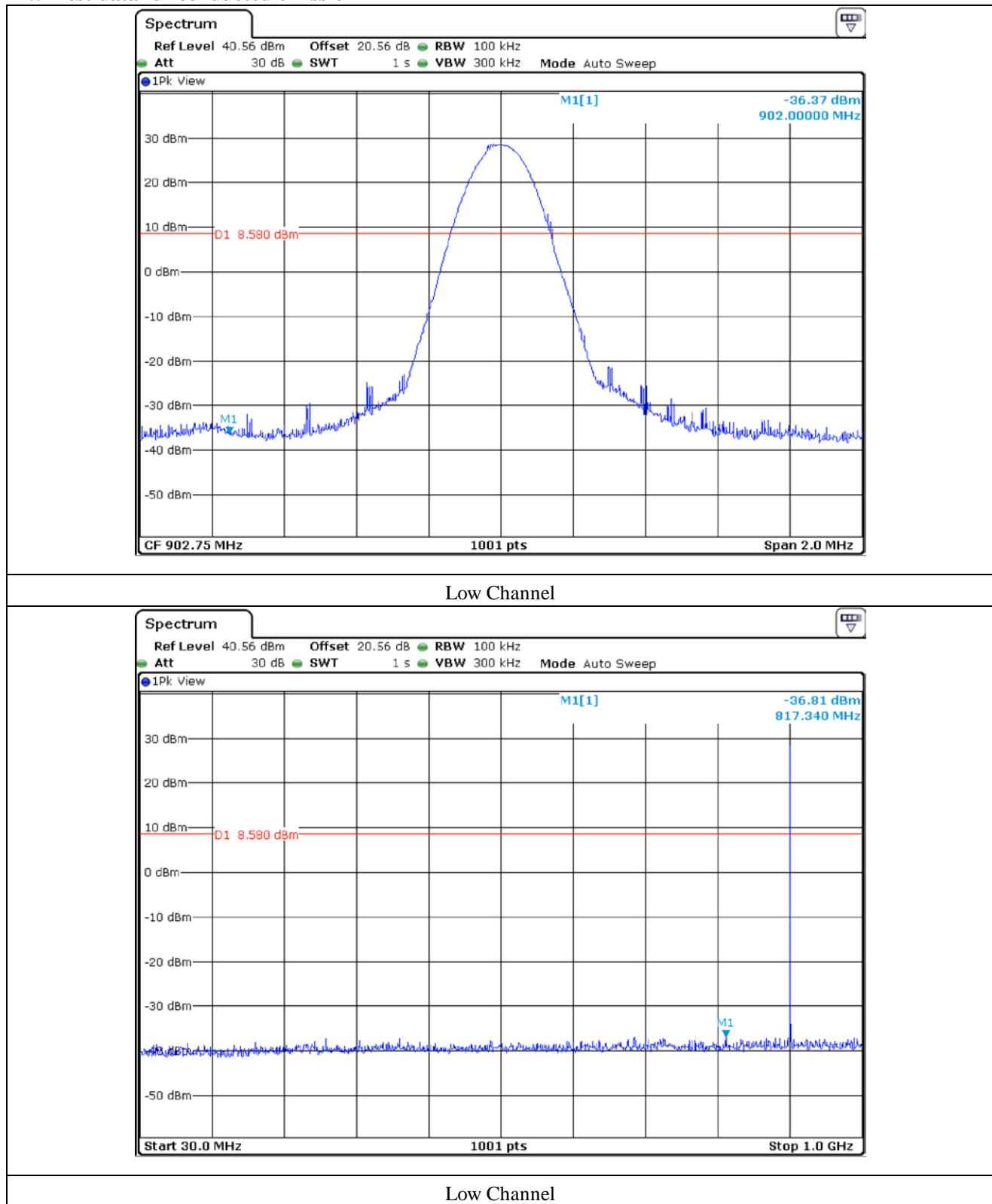
The frequency spectrum from 30 MHz to 10 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 ms in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

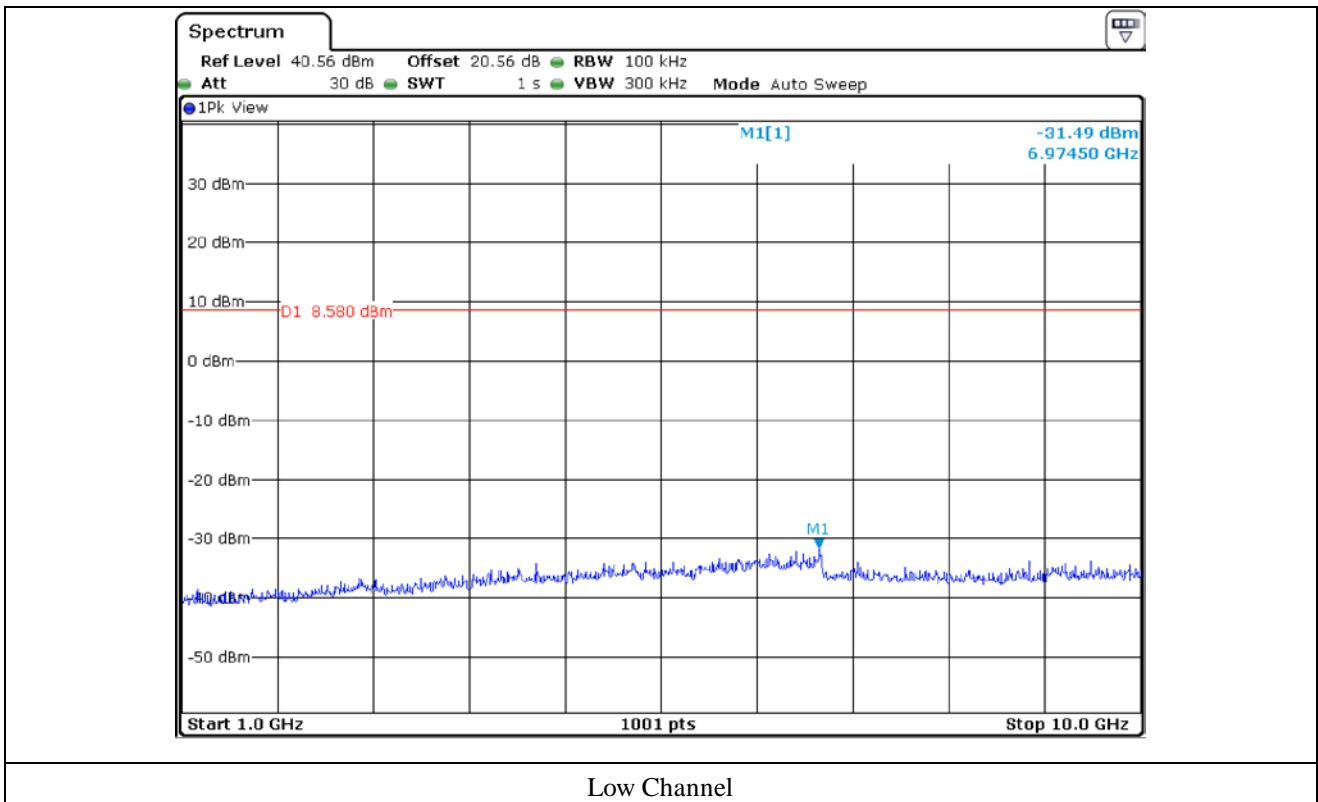
12.4 Test equipment used

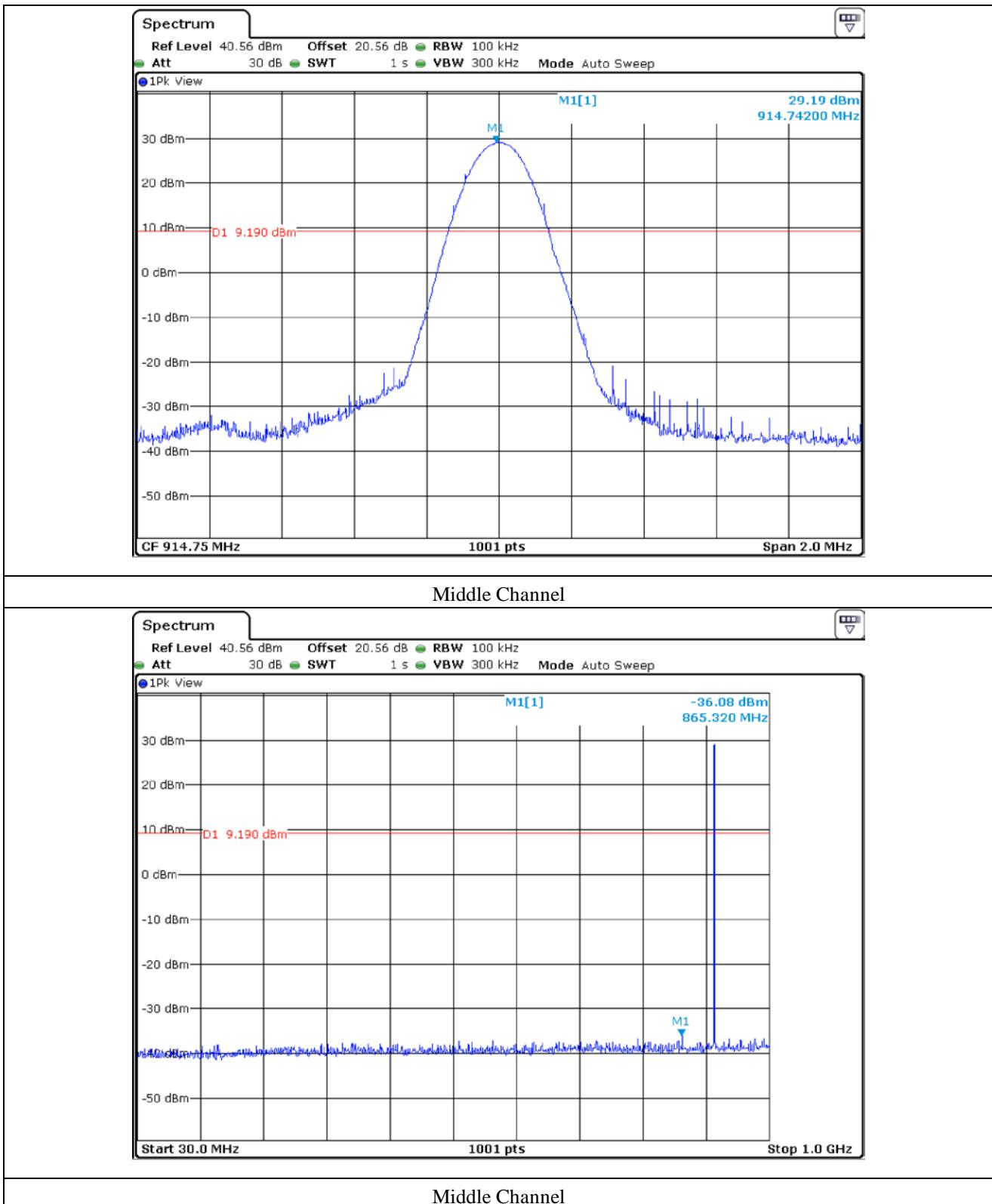
Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ - ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Nov. 02, 2015 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 06, 2016 (1Y)
□ - 8564E	HP	Spectrum Analyzer	3650A00756	Apr. 11, 2016 (1Y)
□ - FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Oct. 07, 2015 (1Y)
■ - 310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 05, 2016 (1Y)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jun. 15, 2016 (1Y)
■ - SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	102209	May. 31, 2016 (1Y)
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - HD100	HD GmbH	Position Controller	N/A	N/A
■ - DS420S	HD GmbH	Turn Table	N/A	N/A
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	879 285/26	Dec. 09, 2014 (2Y)
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May. 20, 2016 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 31, 2015 (2Y)
■ - 83051A	Agilent	Microwave System Preamplifier	3950M00201	Apr. 15, 2016 (1Y)

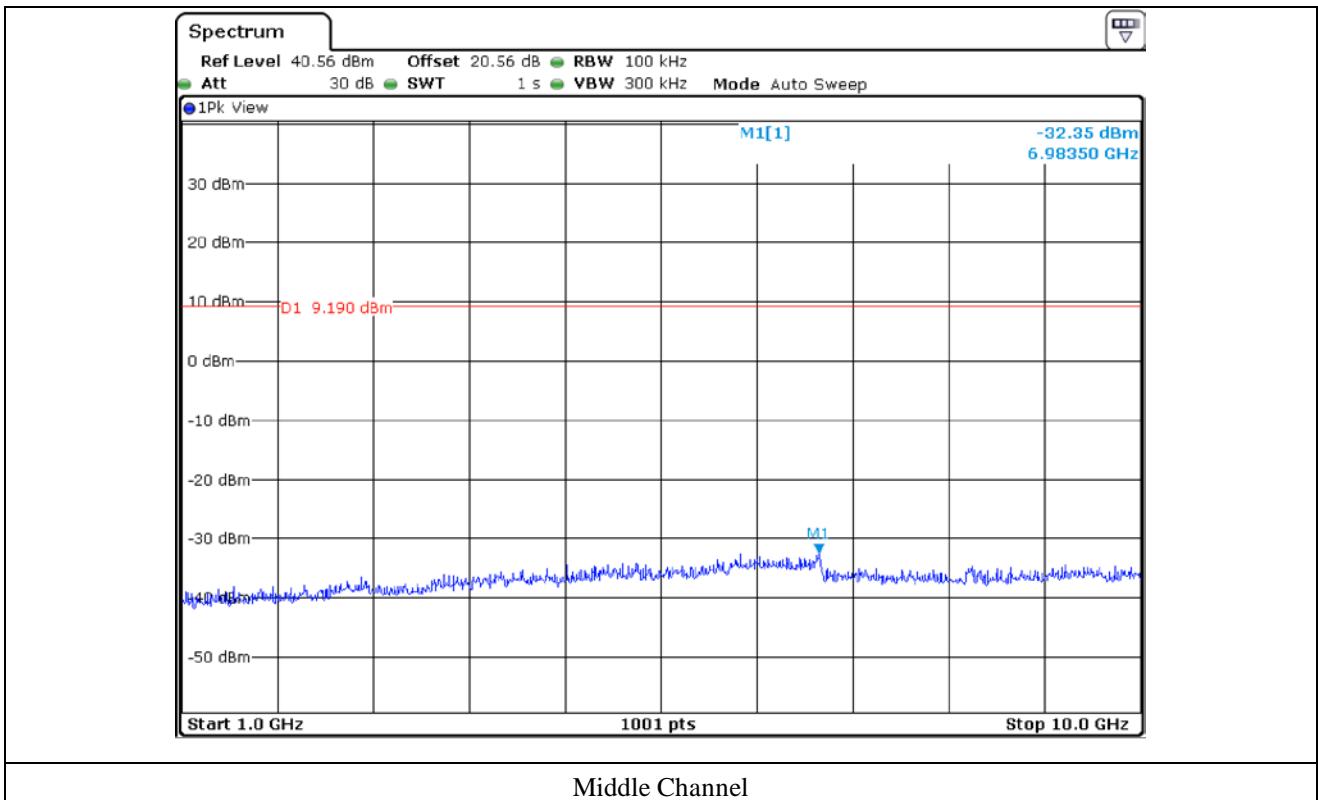
All test equipment used is calibrated on a regular basis.

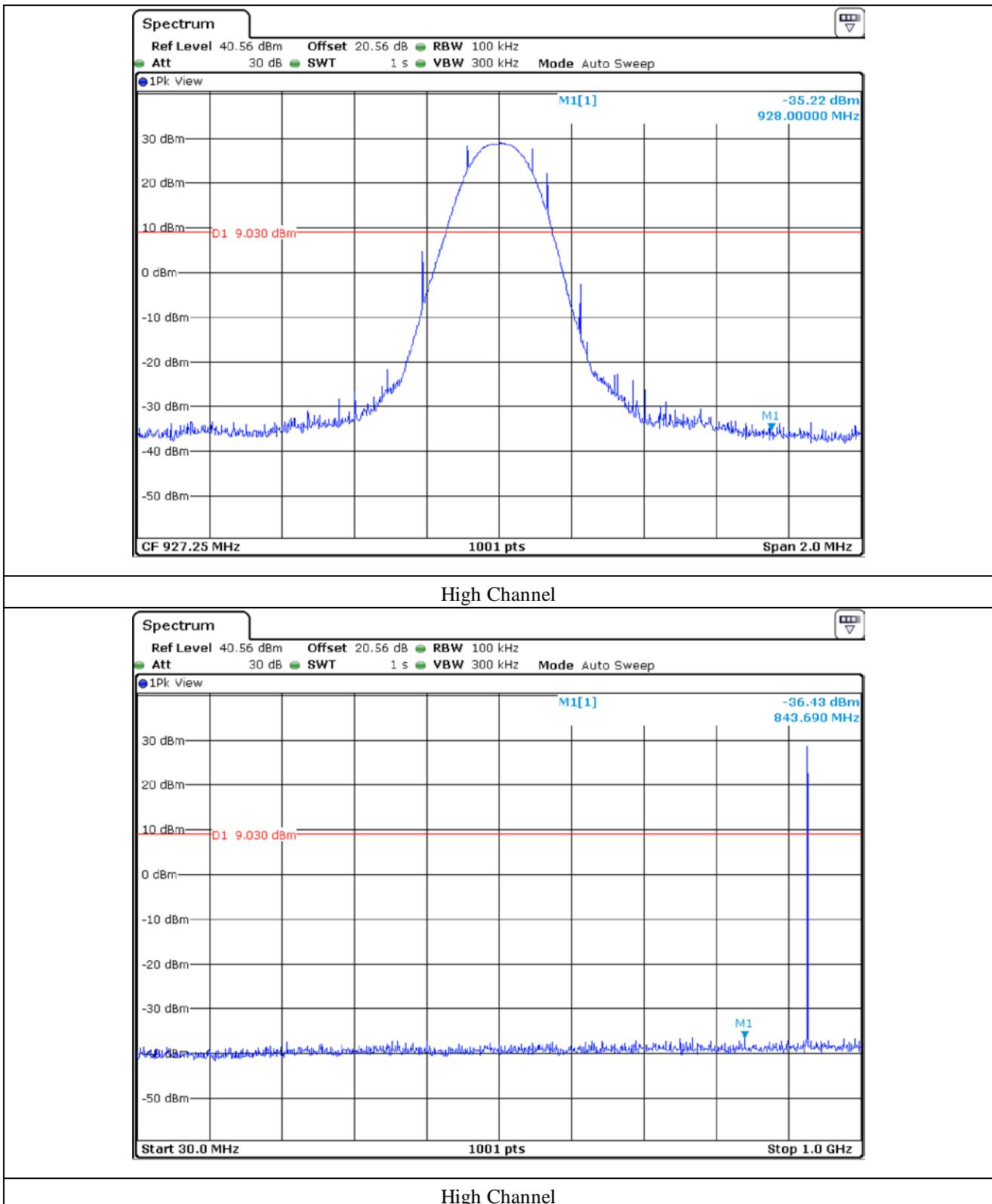
12.5 Test data for conducted emission

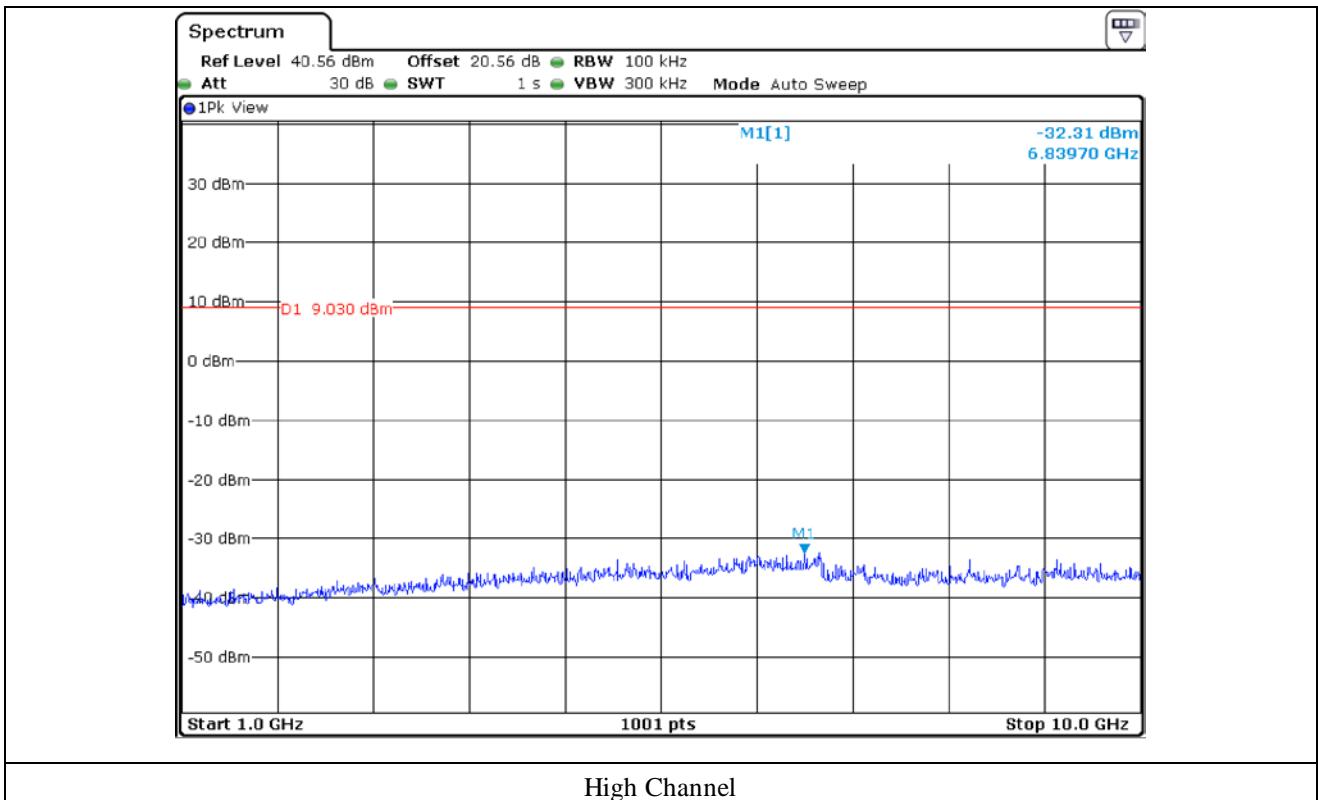












12.6 Test data for radiated emission at Transmitting Mode

12.6.1 Radiated Emission which fall in the Band Edge

- Test Date : July 10, 2016
- Resolution bandwidth : 100 kHz
- Video bandwidth : 300 kHz
- Measurement distance : 3 m
- Operating Condition : Highest Output Power Transmitting Mode
- Result : PASSED

Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Test Data for Low Channel									
928.05	41.27	Peak	H	21.90	12.30	32.30	43.17	53.98	-10.81
928.05	40.13	Peak	V				42.03	53.98	-11.95
Test Data for High Channel									
901.97	42.02	Peak	H	21.90	12.30	32.30	43.92	53.98	-10.06
901.95	42.34	Peak	V				44.24	53.98	-9.74

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

Tested by: Jun-Hui, Lee / Senior Engineer

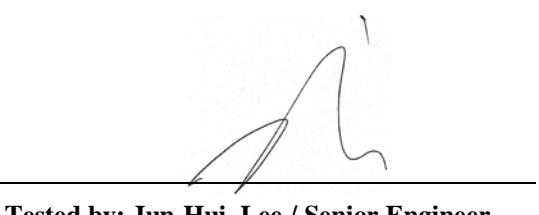
12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

- Test Date : July 10, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 10 GHz
- Measurement distance : 3 m
- Operating Condition : Highest Output Power Transmitting Mode
- Result : PASSED

Frequency (GHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Test Data for Low Channel									
1 805.50	60.18	Peak	H	25.30	11.10	42.50	54.08	74.00	-19.92
	45.11	Average	H				39.01	54.00	-14.99
	59.75	Peak	V				53.65	74.00	-20.35
	44.70	Average	V				38.60	54.00	-15.40
Test Data for Middle Channel									
1 829.50	61.03	Peak	H	25.30	11.20	42.50	55.03	74.00	-18.97
	45.87	Average	H				39.87	54.00	-14.13
	59.96	Peak	V				53.96	74.00	-20.04
	44.82	Average	V				38.82	54.00	-15.18
Test Data for High Channel									
1 854.50	60.21	Peak	H	25.30	11.30	42.50	54.31	74.00	-19.69
	45.06	Average	H				39.16	54.00	-14.84
	59.89	Peak	V				53.99	74.00	-20.01
	44.74	Average	V				38.84	54.00	-15.16

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band



Tested by: Jun-Hui, Lee / Senior Engineer

12.6.3 Spurious Radiated Emission

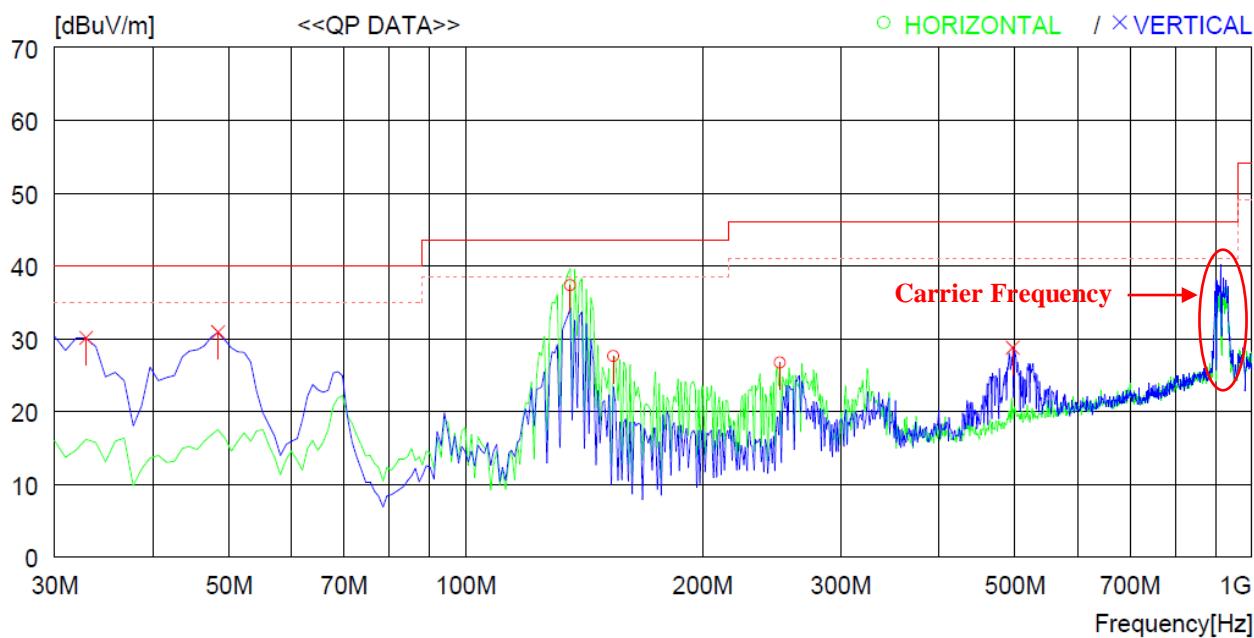
12.6.3.1 Test Data for 30 MHz ~ 1 000 MHz

Humidity Level : 50 % R.H. Temperature: 22 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247
 Result : PASSED

EUT : Handheld Mobile Computer Date: July 10, 2016

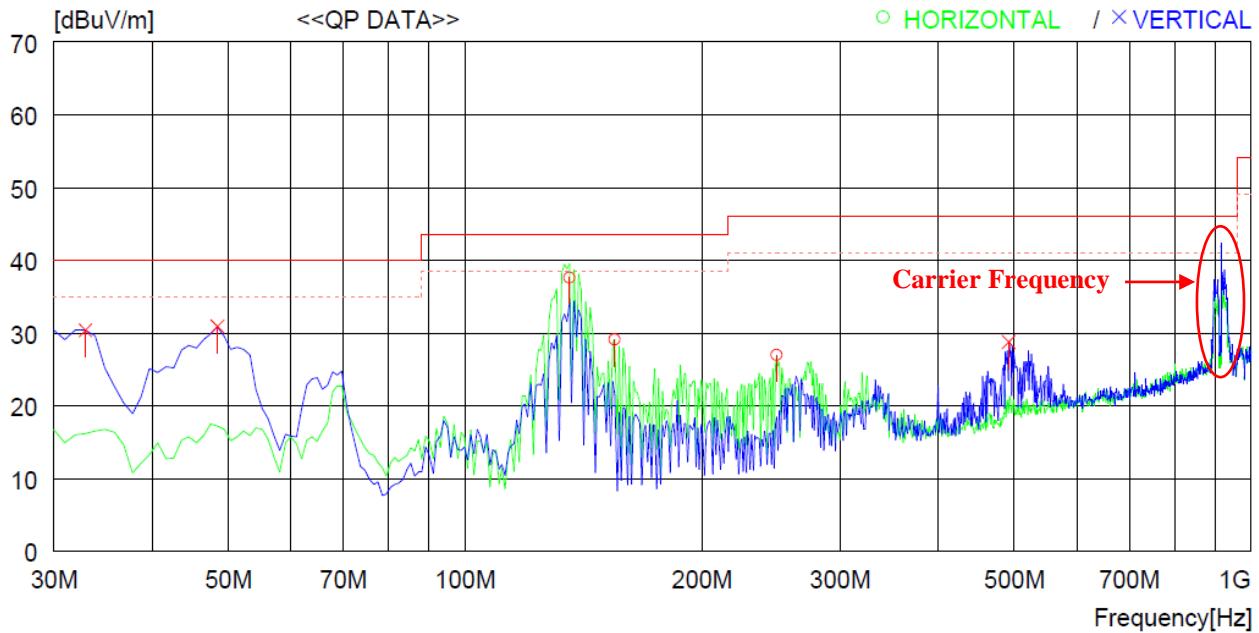
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Operating condition : Low Channel



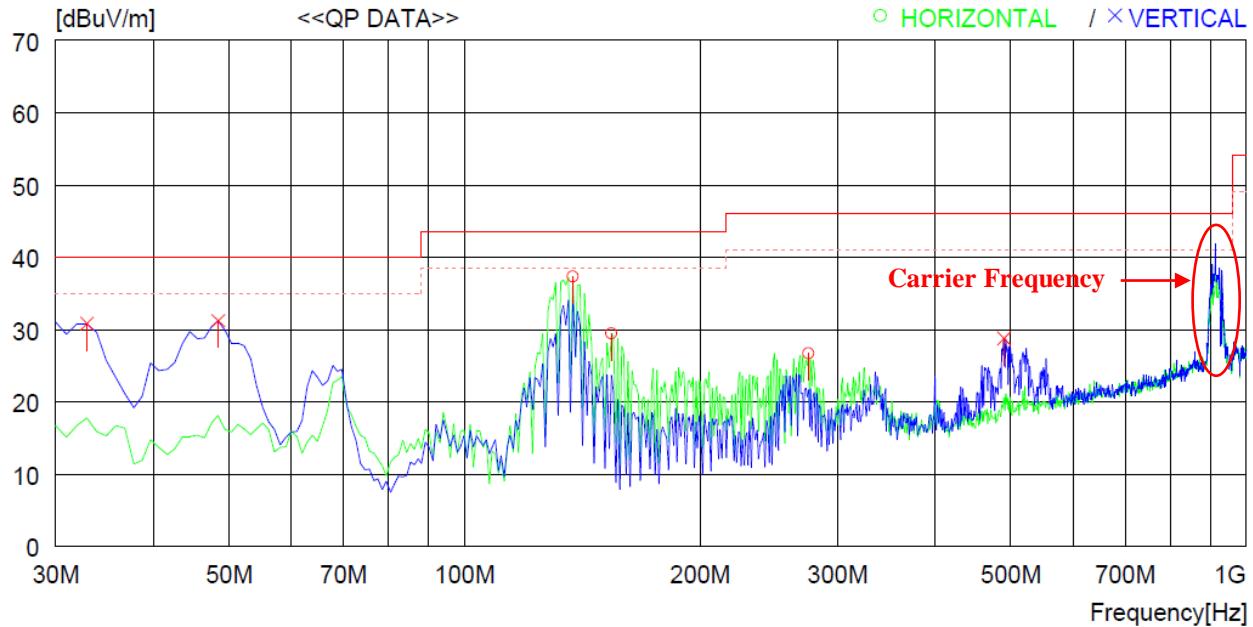
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE	
									[cm]	[DEG]
----- Horizontal -----										
1	135.730	58.9	8.4	3.1	33.1	37.3	43.5	6.2	200	0
2	154.160	49.1	8.3	3.3	33.1	27.6	43.5	15.9	200	77
3	251.160	43.4	12.2	4.1	33.0	26.7	46.0	19.3	100	359
----- Vertical -----										
4	32.910	49.5	11.9	1.7	33.0	30.1	40.0	9.9	100	355
5	48.430	48.1	13.8	2.0	33.0	30.9	40.0	9.1	100	146
6	496.571	38.1	17.1	6.8	33.2	28.8	46.0	17.2	100	141

Operating condition : Middle Channel



No.	FREQ [MHz]	READING QP	ANT FACTOR	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [cm]	ANTENNA TABLE	
									[dBuV]	[DEG]
----- Horizontal -----										
1	135.730	59.2	8.4	3.1	33.1	37.6	43.5	5.9	200	359
2	155.130	50.6	8.3	3.3	33.1	29.1	43.5	14.4	200	257
3	249.220	43.7	12.2	4.1	33.0	27.0	46.0	19.0	100	0
----- Vertical -----										
4	32.910	49.8	11.9	1.7	33.0	30.4	40.0	9.6	100	355
5	48.430	48.1	13.8	2.0	33.0	30.9	40.0	9.1	100	359
6	491.721	38.5	17.0	6.5	33.2	28.8	46.0	17.2	100	126

Operating condition : High Channel



No.	FREQ [MHz]	READING QP	ANT FACTOR	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE	
									[dBuV]	[cm] [DEG]
----- Horizontal -----										
1	137.670	59.1	8.2	3.1	33.1	37.3	43.5	6.2	200	254
2	154.160	50.9	8.3	3.3	33.1	29.4	43.5	14.1	200	95
3	275.410	42.6	12.8	4.3	33.0	26.7	46.0	19.3	100	114
----- Vertical -----										
4	32.910	50.2	11.9	1.7	33.0	30.8	40.0	9.2	100	150
5	48.430	48.4	13.8	2.0	33.0	31.2	40.0	8.8	100	0
6	489.781	38.6	17.0	6.4	33.2	28.8	46.0	17.2	100	134

Tested by: Jun-Hui, Lee / Senior Engineer

12.6.3.2 Test Data for Below 30 MHz

- Test Date : July 10, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating Condition : Highest Output Power Transmitting Mode
- Result : PASSED

Frequency (MHz)	Reading (dB μ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Any emissions were not observed from the EUT.								



Tested by: Jun-Hui Lee / Senior Engineer

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 23 °C
Relative humidity : 56 % R.H

13.2 Test set-up

The radiated emissions measurements were on the 3 m, semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 1 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Measurement uncertainty

Radiated emission electric field intensity, 0.15 MHz ~ 30 MHz : ± 2.61 dB

Radiated emission electric field intensity, 30 MHz ~ 300 MHz : ± 4.43 dB

Radiated emission electric field intensity, 300 MHz ~ 1 000 MHz : ± 3.80 dB

Radiated emission electric field intensity, 1 000 MHz ~ 3 000 MHz: ± 4.40 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

13.4 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May. 31, 2016 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 06, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2016 (1Y)
■ - SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	102209	May. 31, 2016 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Apr. 15, 2016 (2Y)
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	879 285/26	Dec. 09, 2014(2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 31, 2015 (2Y)

All test equipment used is calibrated on a regular basis.

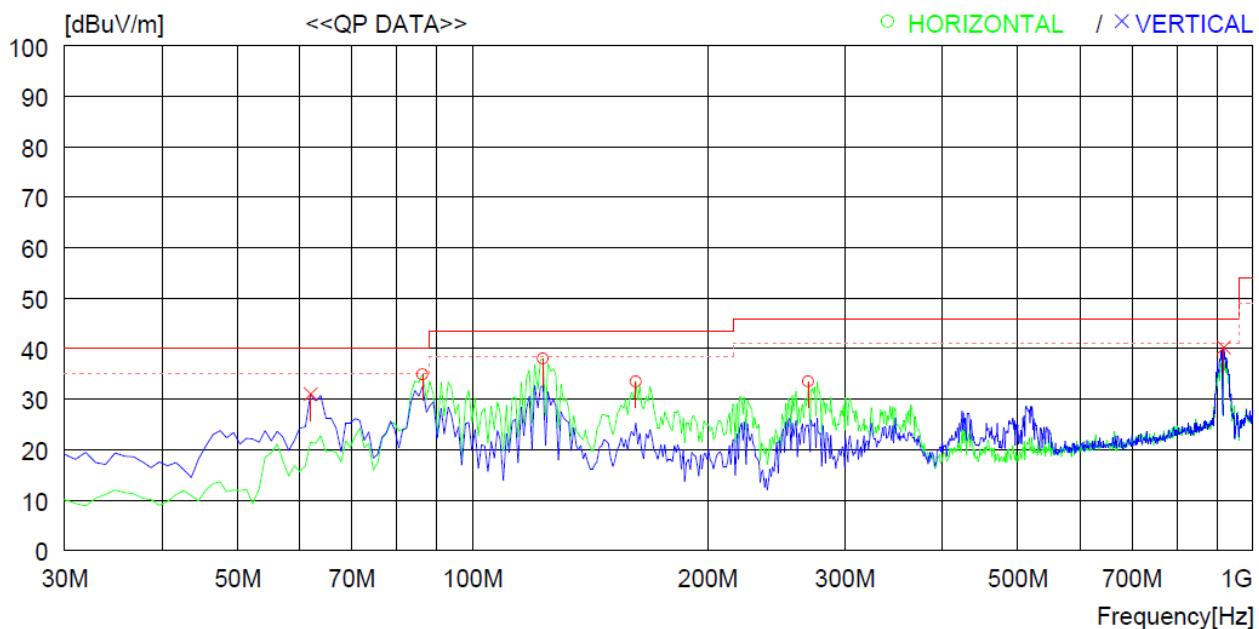
13.5 Test data for Charging Mode

13.5.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 56 % R.H. Temperature: 23 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247
 Result : PASSED

EUT : Handheld Mobile Computer Date: June 24, 2016

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[deg]
----- Horizontal -----										
1	86.260	56.4	9.1	2.5	33.1	34.9	40.0	5.1	200	66
2	123.120	57.9	9.8	3.4	33.1	38.0	43.5	5.5	200	0
3	161.920	54.6	8.5	3.4	33.0	33.5	43.5	10.0	200	262
4	269.590	49.6	12.6	4.3	33.0	33.5	46.0	12.5	100	359
----- Vertical -----										
5	62.010	49.2	12.6	2.2	33.0	31.0	40.0	9.0	100	8
6	917.538	42.2	22.0	8.5	32.5	40.2	46.0	5.8	100	8

Tested by: Jun-Hui, Lee / Senior Engineer

13.5.2 Test data for Below 30 MHz

- Test Date : June 24, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating Condition : Charging Mode
- Result : PASSED

Frequency (MHz)	Reading (dB μ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Any emissions were not observed from the EUT.								

13.5.3 Test data for above 1 GHz

- Test Date : June 24, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating Condition : Charging Mode
- Result : PASSED

Frequency (MHz)	Reading (dB μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Any emissions were not observed from the EUT.									



Tested by: Jun-Hui Lee / Senior Engineer

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C

Relative humidity : 53 % R.H

14.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a $50 \Omega / 50 \mu\text{H} + 5 \Omega$ Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

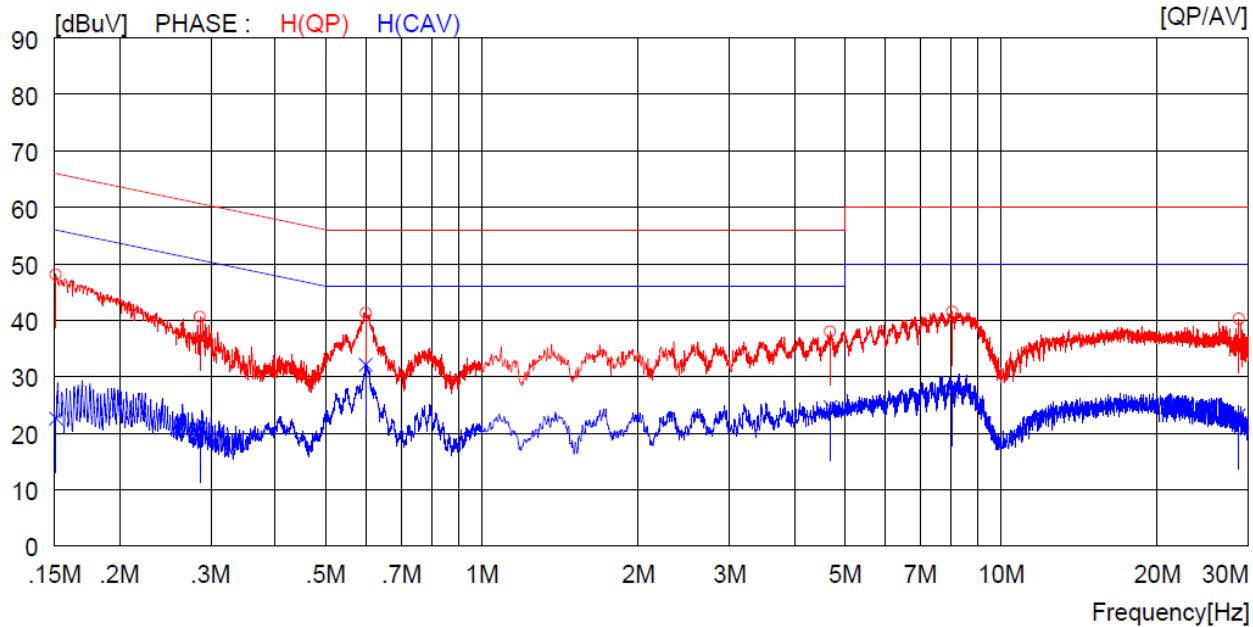
14.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESPI	Rohde & Schwarz	EMI Test Receiver	101278	Nov. 02, 2015 (1Y)
□ - ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Apr. 05, 2016 (1Y)
□ NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 06, 2016 (1Y)
■ - NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 05, 2016 (1Y)
□ - 3825/2	EMCO	AMN	9109-1869	Apr. 06, 2016 (1Y)
■ -- 3825/2	EMCO	AMN	9109-1867	Apr. 06, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

14.4 Test data for Charging Mode

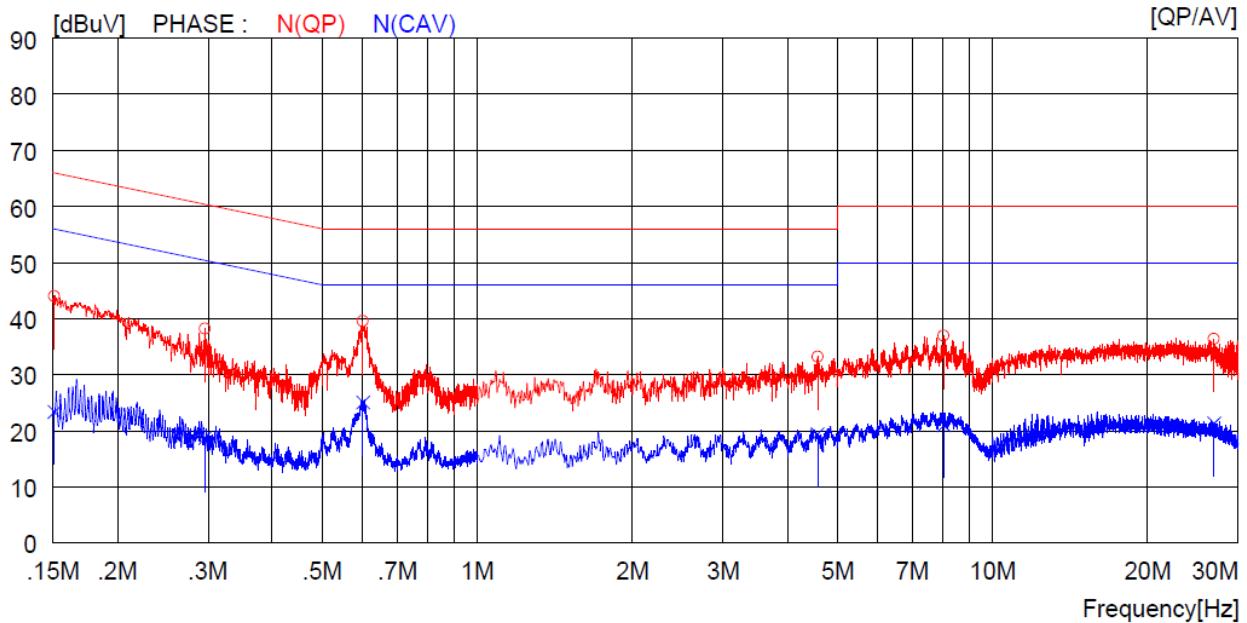
- Test Date : July 09, 2016
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING QP [dBuV]	C.FACTOR	RESULT			LIMIT QP [dBuV]	MARGIN	PHASE
				QP [dB]	AV [dBuV]	QP [dBuV]			
1	0.15100	38.0	---	10.1	48.1	---	65.9	---	H(QP)
2	0.28600	30.5	---	10.1	40.6	---	60.6	---	H(QP)
3	0.59700	31.2	---	10.1	41.3	---	56.0	---	H(QP)
4	4.69200	27.8	---	10.2	38.0	---	56.0	---	H(QP)
5	8.05500	31.3	---	10.2	41.5	---	60.0	---	H(QP)
6	28.71000	29.5	---	10.7	40.2	---	60.0	---	H(QP)
7	0.15100	12.5	10.1	---	22.6	---	55.9	---	H(CAV)
8	0.28600	10.7	10.1	---	20.8	---	50.6	---	H(CAV)
9	0.59700	22.0	10.1	---	32.1	---	46.0	---	H(CAV)
10	4.69200	14.4	10.2	---	24.6	---	46.0	---	H(CAV)
11	8.05500	17.1	10.2	---	27.3	---	50.0	---	H(CAV)
12	28.71000	12.4	10.7	---	23.1	---	50.0	---	H(CAV)

- Tested Line

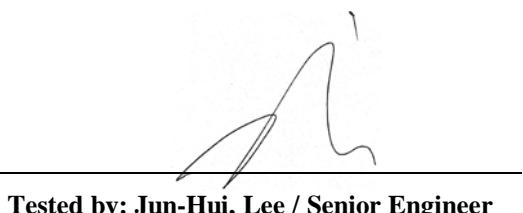
: NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]	QP [dB]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15100	33.9	---	10.1	44.0	---	65.9	---	21.9	---	---	N(QP)
2	0.29600	28.1	---	10.1	38.2	---	60.4	---	22.2	---	---	N(QP)
3	0.60000	29.4	---	10.1	39.5	---	56.0	---	16.5	---	---	N(QP)
4	4.57600	23.0	---	10.2	33.2	---	56.0	---	22.8	---	---	N(QP)
5	8.05000	26.8	---	10.2	37.0	---	60.0	---	23.0	---	---	N(QP)
6	26.92000	25.8	---	10.6	36.4	---	60.0	---	23.6	---	---	N(QP)
7	0.15100	---	13.3	10.1	---	23.4	---	55.9	---	32.5	---	N(CAV)
8	0.29600	---	8.6	10.1	---	18.7	---	50.4	---	31.7	---	N(CAV)
9	0.60000	---	15.0	10.1	---	25.1	---	46.0	---	20.9	---	N(CAV)
10	4.57600	---	9.2	10.2	---	19.4	---	46.0	---	26.6	---	N(CAV)
11	8.05000	---	10.8	10.2	---	21.0	---	50.0	---	29.0	---	N(CAV)
12	26.92000	---	10.7	10.6	---	21.3	---	50.0	---	28.7	---	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.



Tested by: Jun-Hui, Lee / Senior Engineer