TEST REPORT

DT&C Co., Ltd. 42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel : 031-321-2664, Fax : 031-321-1664	Report No : DRTFCC1607-0090(1) Pages:(1) / (43) page	Dt&C

1. Customer

   • Name : SEGI LIMITED

   • Address : UNIT S, 3-F, HARIBEST INDUSTRIAL BUILDING, 45-47, AU PUI WAN STREET, SHATIN, NT HONGKONG China

2. Use of Report : FCC & IC Original Grant

3. Product Name (FCCID, IC): Keyless Entry System (VA5JA1000-2WSS, 7087A-2WA1000SS)

4. Date of Test : 2016-06-21 ~ 2016-06-24

5. Test Method Used : FCC Part 15 Subpart C 247
   RSS-247 Issue 1 (2015-05), RSS-GEN Issue 4 (2014-11)

6. Testing Environment : See appended test report

7. Test Result : ☒ Pass ☐ Fail

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Name : Jaejin Lee (Signature)	Technical Manager Name : Geunki Son (Signature)

2016 . 07 . 18 .

DT&C Co., Ltd.

* If this test report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1607-0090	Jul. 07, 2016	Initial issue
DRTFCC1607-0090(1)	Jul. 18, 2016	Add the test results, equipment list and measurement uncertainty

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1.General Information

1.1 Testing Laboratory

DT&C Co., Ltd.			
Standard		**Site number**	**Address**
FCC	☒	**165783**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**804488**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**596748**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**678747**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
IC	☒	**5740A-3**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**5740A-2**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
www.dtnc.net			
Telephone	:	+ 82-31-321-2664	
FAX	:	+ 82-31-321-1664	

1.2 Details of Applicant

Applicant	:	SEGI LIMITED
Address	:	UNIT S, 3-F, HARIBEST INDUSTRIAL BUILDING, 45-47, AU PUI WAN STREET, SHATIN, NT HONGKONG China
Contact person	:	Youngil Chang

1.3 Description of EUT

Product	Keyless Entry System
Model Name	ANT-2WSS
Serial Number	Identical prototype
Product SW version	1.0
Product HW version	1.0
Radio SW version	1.0
Radio HW version	1.0
Test SW HW version	NA
RF Power Setting in TEST SW	NA
Power Supply	DC 12 V
Frequency Range	910.92 ~ 919.08 MHz
Modulation Technique	FSK
Number of Channels	25(Channel Spacing 340kHz)
Antenna Type	Helical Antenna
Antenna Gain	Max. PK 1.63 dBi

1.4 Declaration by the manufacturer

- N/A

1.5 Test conditions

Ambient Condition	
▪ Temperature	+22 ℃ ~ +23 ℃
▪ Relative Humidity	40 % ~ 45 %

1.6 Measurement Uncertainty

Test items	Measurement uncertainty
Peak Output power	0.91 dB (The confidence level is about 95 %, k = 2)
Average Output power	0.71 dB (The confidence level is about 95 %, k = 2)
Conducted spurious emission	1.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

1.7 Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent Technologies	N9020A	16/01/06	17/01/06	MY46471096
MXA Signal Analyzer	Agilent Technologies	N9020A	15/09/09	16/09/09	MY46471248
DC Power Supply	SM techno	SDP30-5D	15/09/23	16/09/23	305DMG305
Multimeter	FLUKE	17B	16/04/21	17/04/21	26030065WS
Vector Signal Generator	R&S	SMBV100A	16/01/05	17/01/05	255571
Signal Generator	Rohde Schwarz	SMR20	16/04/24	17/04/24	101251
2W 3dB Attenuator	SMAJK	SMAJK-2-3	15/10/19	16/10/19	3
Thermohygrometer	BODYCOM	BJ5478	16/02/25	17/02/25	1209
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
TRILOG Broadband Test-Antenna(30MHz-1GHz)	Schwarzbeck	VULB 9160	14/07/31	16/07/31	9160-3362
HORN ANT	ETS	3117	16/05/03	18/05/03	140394
Low Noise Pre Amplifier	tsj	MLA-010K01-B01-27	16/03/10	17/03/10	1844539
Amplifier (30dB)	Agilent	8449B	15/11/06	16/11/06	3008A02108
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	15/09/23	16/09/23	7
Tunable Notch Filter	Wainwright	WRCT800/960	15/11/06	16/11/06	32
EMI TEST RECEIVER	R&S	ESU	15/07/14	16/07/14	100469
CABLE	DTNC	CABLE	NA	NA	C-016-2
CABLE	DTNC	CABLE	NA	NA	C-016-3
CABLE	DTNC	CABLE	NA	NA	C-016-4
CABLE	DTNC	CABLE	NA	NA	RF2-104
CABLE	DTNC	CABLE	NA	NA	RF2-102
CABLE	DTNC	CABLE	NA	NA	RF2-17

1.8 Summary of Test Results

FCC Part RSS Std.	Parameter	Limit (Using in 2400~ 2483.5 MHz)	Test Condition	Status Note 1
15.247(a) RSS-247(5.1)	Carrier Frequency Separation	>= 25 kHz or >= Two thirds of the 20 dB BW, whichever is greater.	Conducted	C
	Number of Hopping Frequencies	>= 25 hops		C
	20 dB Bandwidth	< 500 kHz		C
	Dwell Time	=< 0.4 seconds		C
15.247(b) RSS-247(5.4)	Transmitter Output Power	**For FCC** =< 1 Watt , if CHs >= 50 =< 0.25 W, if CHs >= 25, < 50 **For IC** if CHs >= 50 =< 1 Watt For Conducted Power =< 4 Watt For e.i.r.p, if CHs >= 25, < 50 =< 0.25 W For Conducted Power. =< 1 Watt For e.i.r.p		C
15.247(d) RSS-247(5.5)	Conducted Spurious Emissions	The radiated emission to any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density.		C
RSS Gen(6.6)	Occupied Bandwidth (99 %)	N/A		C
15.247(d) 15.205 & 209 RSS-247(5.5) RSS-Gen (8.9 & 8.10)	Radiated Spurious Emissions	FCC 15.209 Limits RSS-Gen 8.9	Radiated	C Note2
15.207 RSS-Gen(8.8)	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	NA Note4
15.203 RSS-Gen(8.3)	Antenna Requirements	FCC 15.203	-	C

Note 1 : **C** = Comply **NC** = Not Comply **NT** = Not Tested **NA** = Not Applicable

Note 2 : This test item was performed in each axis and the worst case data was reported.

Note 3 : The sample was tested according to the following specifications :

- ANSI C63.10-2013

Note 4: This device is installed in a car. Therefore the power source is a battery of car.

1.9 Conclusion of worst-case and operation mode

The field strength of spurious emission was measured in three orthogonal EUT positions(X-axis, Y-axis and Z-axis).

Tested frequency information,

- Hopping Function: Enable

	TX Frequency (MHz)	RX Frequency (MHz)
Hopping Band	910.92 ~ 919.08 MHz	910.92 ~ 919.08 MHz

- Hopping Function: Disable

Channel	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	910.92	910.92
Middle Channel	915.00	915.00
Highest Channel	919.08	919.08

2. Maximum Peak Output Power Measurement

2.1 Test Setup

Refer to the APPENDIX I.

2.2 Limit

▣ FCC Requirements

The maximum peak output power of the intentional radiator shall not exceed the following :

1. §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 this section.

▣ IC Requirements

1. RSS-247(5.4)(1), For FHSs operating in the band 902-928 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 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

2.3 Test Procedure

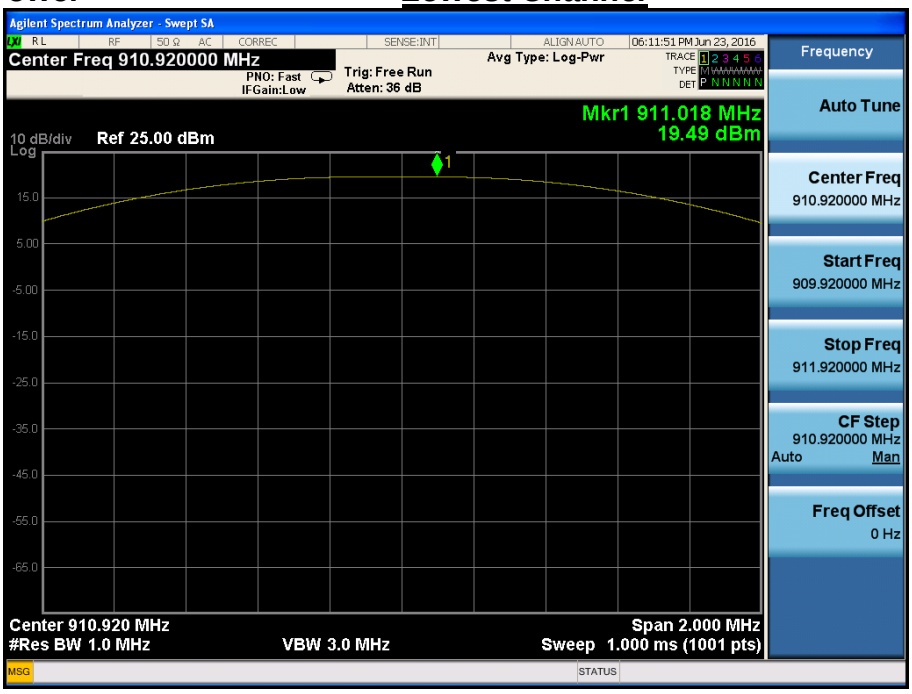
1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using ;
   Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 20 dB BW
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

2.4 Test Results

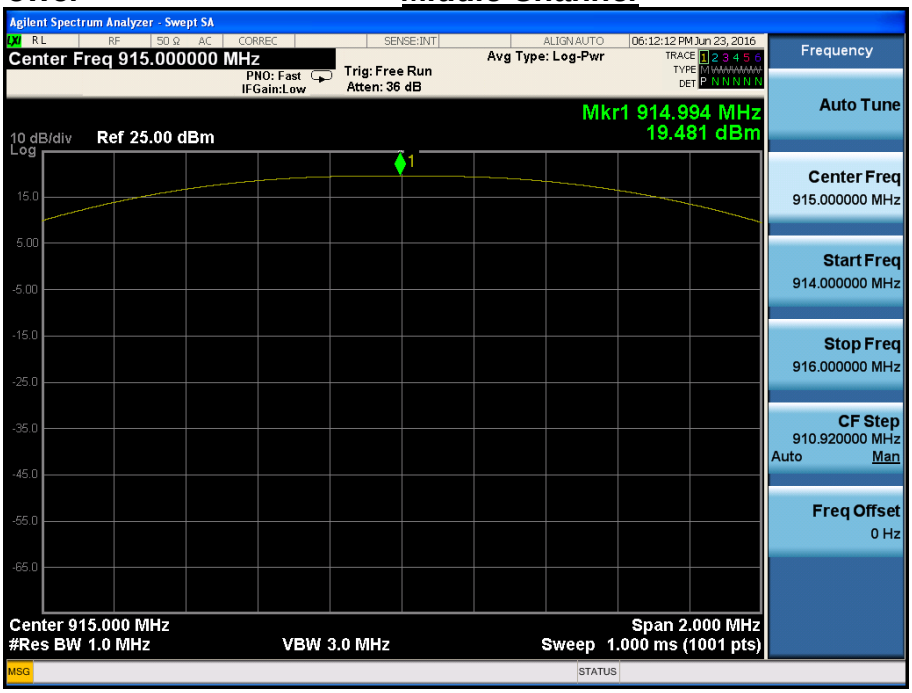
Tested Channel	Peak Output Power	
	dBm	mW
Lowest	**19.490**	**88.920**
Middle	19.481	88.736
Highest	19.469	88.491

Note 1: See next pages for actual measured spectrum plots.

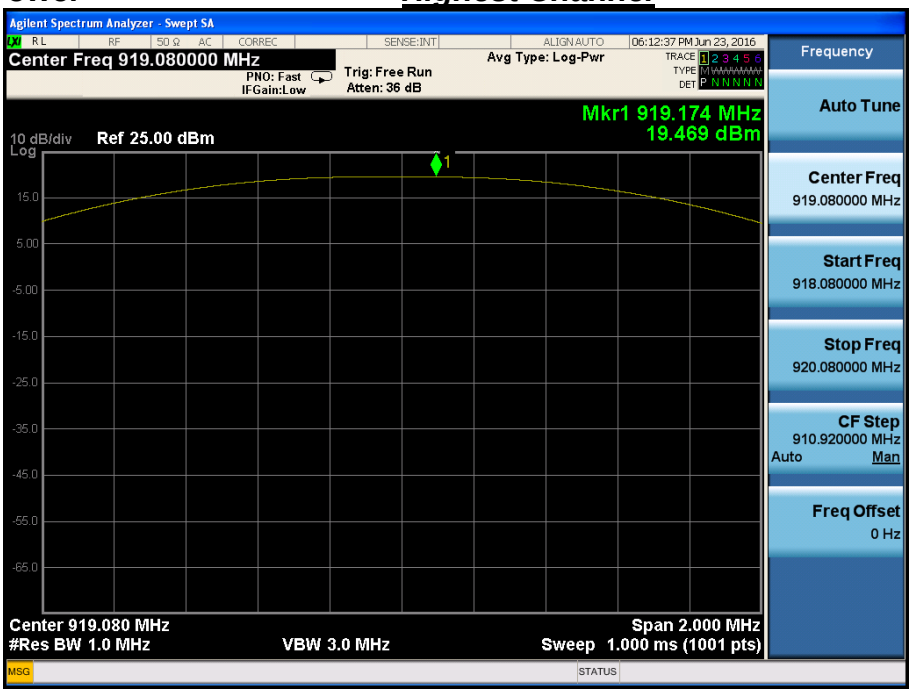
Peak Output Power *Lowest Channel*



Peak Output Power *Middle Channel*



Peak Output Power ***Highest Channel***



3. 20dBc BW

3.1 Test Setup

Refer to the APPENDIX I.

3.2 Limit

Limit: 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.

3.3 Test Procedure

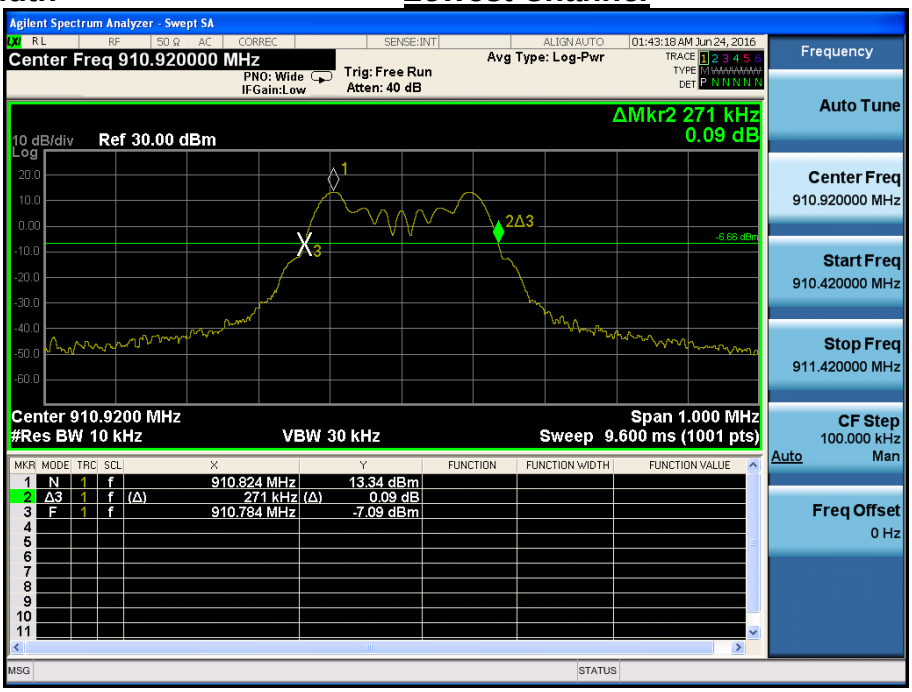
1. The 20 dB bandwidth were measured with a spectrum analyzer connected to RF antenna Connector (conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using below setting: RBW shall be in the range of 1% to 5% of the 20 dB bandwidth and VBW ≥ 3 × RBW, Span = between two times and five times the 20 dB bandwidth.

3.4 Test Results

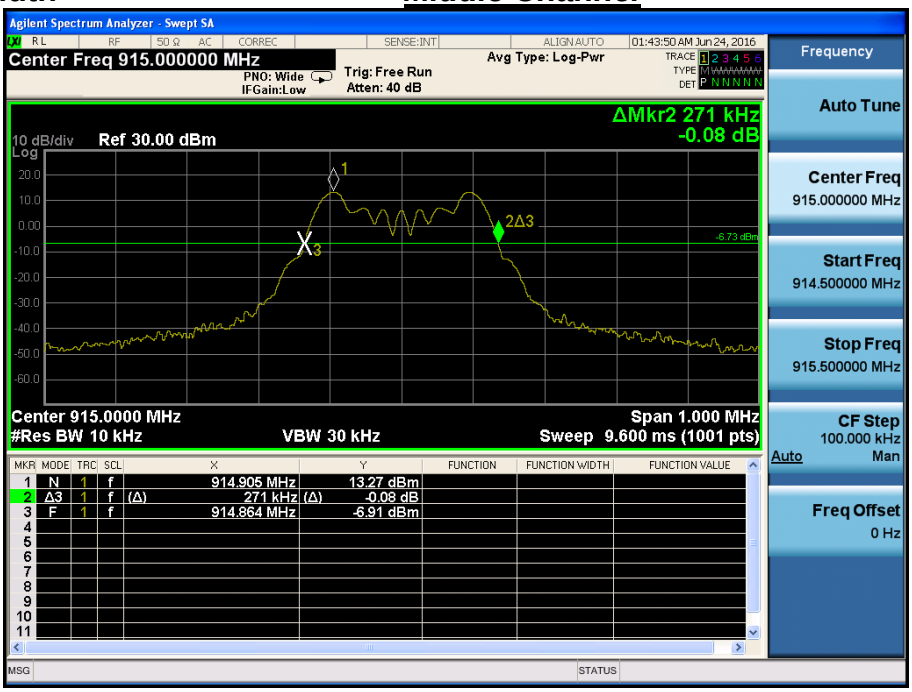
Frequency (MHz)	Tested Channel	20dBc BW (kHz)
910.92	**Lowest**	271.00
915.00	**Middle**	271.00
919.08	**Highest**	273.00

Note 1: See next pages for actual measured spectrum plots.

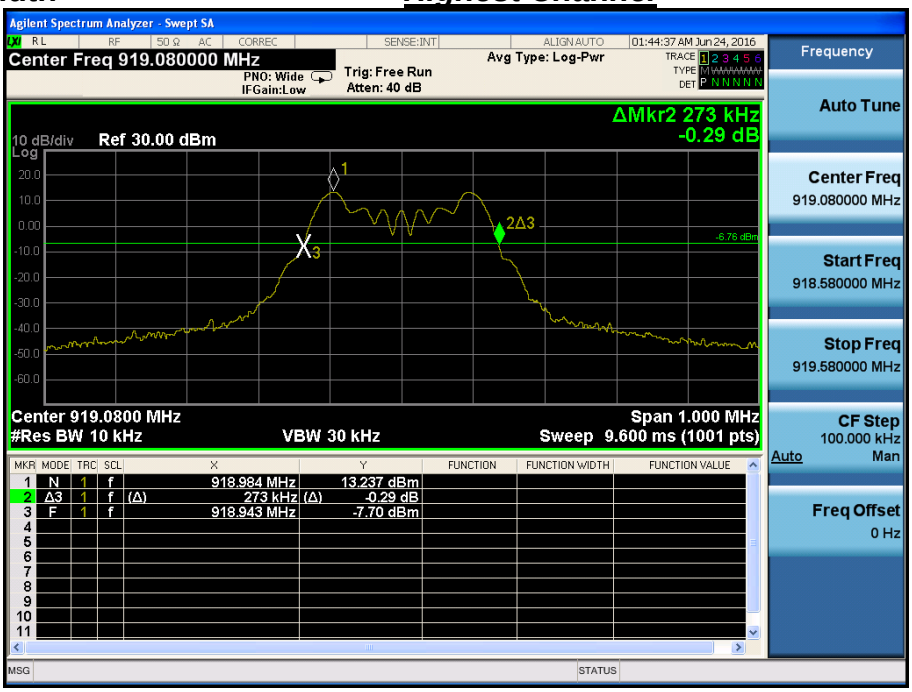
20dBc Bandwidth ***Lowest Channel***



20dBc Bandwidth ***Middle Channel***



20dBc Bandwidth ***Highest Channel***



4. Carrier Frequency Separation

4.1 Test Setup

Refer to the APPENDIX I.

4.2 Limit

Limit : ≥ 25 kHz or ≥ Two-Thirds of the 20 dB BW whichever is greater.

4.3 Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

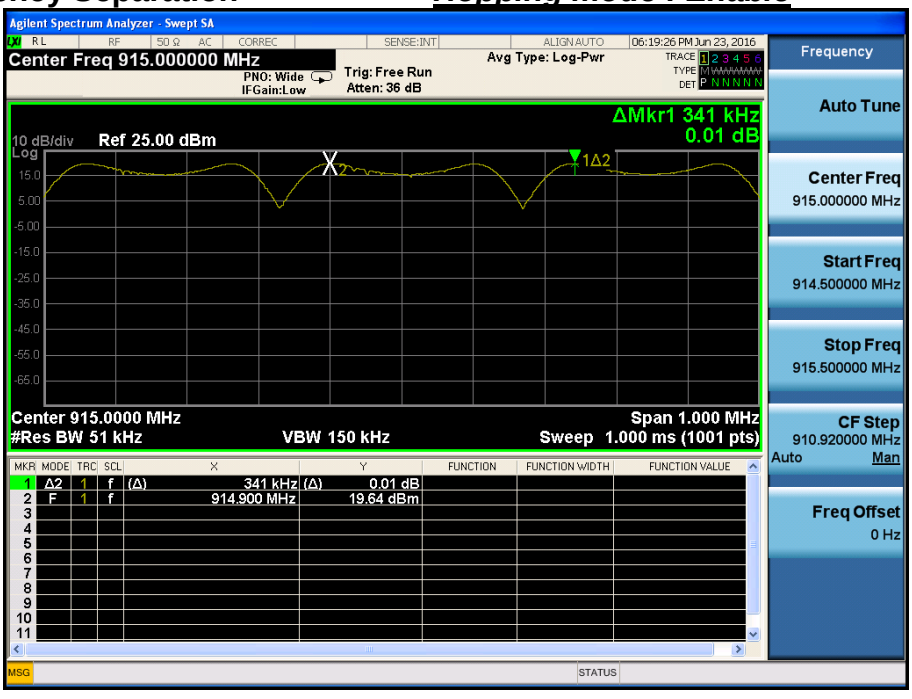
The spectrum analyzer is set to :

Span = wide enough to capture the peaks of two adjacent channels
RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW ≥ RBW Sweep = auto
Detector function = peak Trace = max hold

4.4 Test Results:

Hopping Mode	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (kHz)
Enable	914.900	915.241	341

Carrier Frequency Separation ***Hopping mode : Enable***



5. Number of Hopping Frequencies

5.1 Test Setup

Refer to the APPENDIX I.

5.2 Limit

Limit: >= 25 hops

5.3 Procedure

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, two frequency ranges for FH mode within the 902 ~ 928 MHz were examined.

The spectrum analyzer is set to :

Span for FH mode = 10 MHz Start Frequency = 915.0 MHz, Stop Frequency = 920.0 MHz

RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

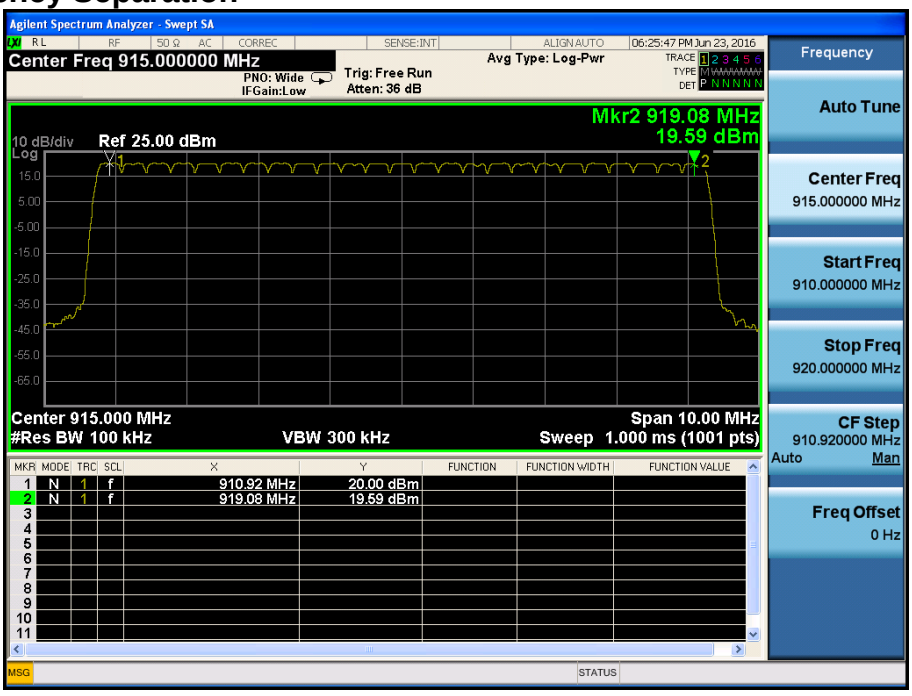
VBW ≥ RBW Sweep = auto

Detector function = peak Trace = max hold

5.4 Test Results:

Hopping mode	Test Result (Total Hops)
Enable	25

Carrier Frequency Separation ***Hopping mode : Enable***



6. Time of Occupancy (Dwell Time)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

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.

6.3 Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

Center frequency = 915 MHz Span = zero

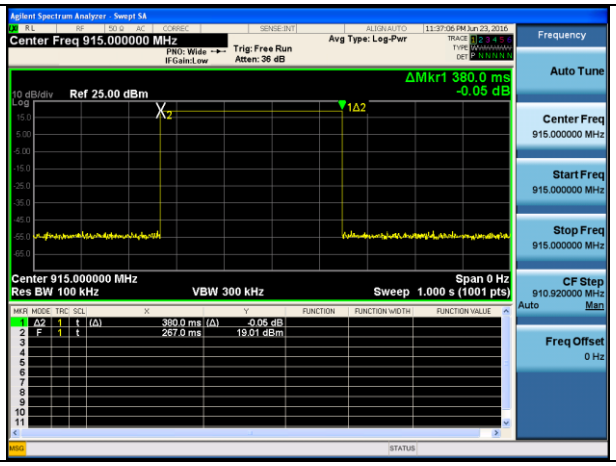
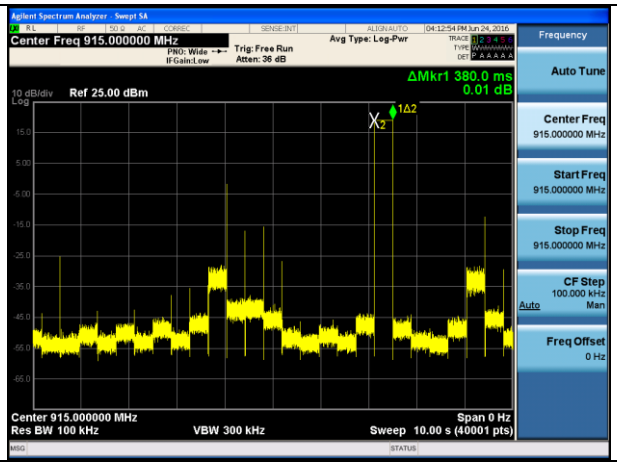
RBW = 100 kHz (RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel)

VBW ≥ RBW Detector function = peak

Trace = max hold

6.4 Test Results

Channel Frequency (MHz)	Length (ms)	Number	Dwell Time (ms)
915.25	380	1	380

Length	Period
	

7. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

According to §15.247(d), 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 section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		
			3600 ~ 4400		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

7.3 Test Procedures

7.3.1 Test Procedures for Radiated Spurious Emissions

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
   The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 or 3 meter away from the interference-receiving antenna.
3. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
4. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.

NOTE 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.

NOTE 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz for Average detection (AV) at frequency above 1 GHz.

7.3.2 Test Procedures for Conducted Spurious Emissions

1. The transmitter output was connected to the spectrum analyzer.
2. The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
3. The conducted spurious emission was tested each ranges were set as below.

Frequency range : 9 kHz ~ 30 MHz
RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

Frequency range : 30 MHz ~ 10 GHz
RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

7.4 Test Results

7.4.1 Radiated Emission

Note 1: Attached plot of worst data(A channel of the least margin), refer to the APPENDIX II.

9kHz ~ 10GHz Data

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*910.84	H	Z	PK	92.30	28.16	N/A	120.46	N/A	N/A
404.85	H	X	QP	36.20	-10.94	N/A	25.26	46.00	20.74
2732.85	H	X	PK	49.78	4.07	N/A	53.85	74.00	20.15
2732.80	H	X	AV	44.99	4.07	N/A	49.06	54.00	4.94
3643.30	V	Z	PK	49.73	5.87	N/A	55.60	74.00	18.40
3643.74	V	Z	AV	43.11	5.87	N/A	48.98	54.00	5.02
**6377.15	H	Z	PK	57.76	11.16	N/A	68.92	100.46	31.54
7286.32	H	Z	PK	47.03	11.68	N/A	58.71	74.00	15.29
7287.80	H	Z	AV	37.54	11.68	N/A	49.22	54.00	4.78
8198.31	H	Z	PK	47.26	11.97	N/A	59.23	74.00	14.77
8197.50	H	Z	AV	38.01	11.97	N/A	49.98	54.00	4.02
9109.96	H	Z	PK	46.51	12.13	N/A	58.64	74.00	15.36
9109.80	H	Z	AV	35.05	12.13	N/A	47.18	54.00	6.82

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. The limit is applied as below,
   Restricted band = FCC Part 15.209
   Non-restricted band = Fundamental level(120.46dBuV/m – 20dB) = 100.46dBuV/m
   *= Fundamental
   **= Non-restricted band
4. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*914.90	H	Z	PK	91.97	28.20	N/A	120.17	N/A	N/A
403.34	H	X	QP	36.40	-10.94	N/A	25.46	46.00	20.54
2744.81	H	X	PK	49.34	4.12	N/A	53.46	74.00	20.54
2745.05	H	X	AV	44.25	4.12	N/A	48.37	54.00	5.63
3660.19	V	Z	PK	48.86	5.89	N/A	54.75	74.00	19.25
3660.01	V	Z	AV	42.58	5.89	N/A	48.47	54.00	5.53
**6405.38	H	Z	PK	57.87	11.21	N/A	69.08	100.17	31.09
7320.30	H	Z	PK	47.19	11.68	N/A	58.87	74.00	15.13
7320.56	H	Z	AV	37.47	11.68	N/A	49.15	54.00	4.85
8234.20	H	Z	PK	47.60	11.97	N/A	59.57	74.00	14.43
8234.12	H	Z	AV	38.46	11.97	N/A	50.43	54.00	3.57
9150.69	H	Z	PK	46.42	12.18	N/A	58.60	74.00	15.40
9150.84	H	Z	AV	35.51	12.18	N/A	47.69	54.00	6.31

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. The limit is applied as below,
   Restricted band = FCC Part 15.209
   Non-restricted band = Fundamental level(120.17dBuV/m – 20dB) = 100.17dBuV/m
   *= Fundamental
   **= Non-restricted band
4. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor

▪ Highest Channel

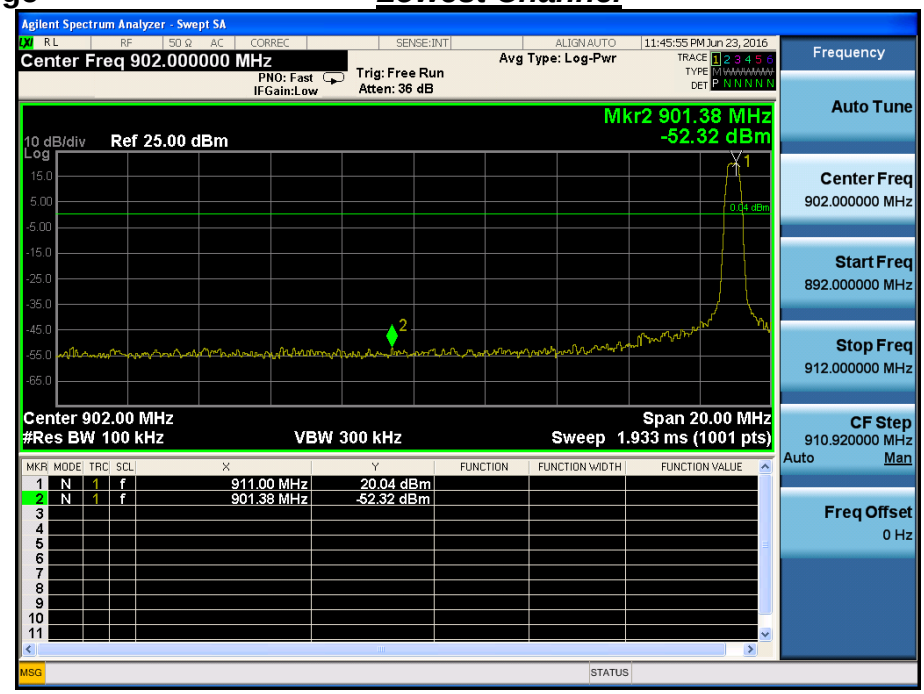
Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*919.00	H	Z	PK	91.49	28.23	N/A	119.72	N/A	N/A
405.70	H	X	QP	36.30	-10.94	N/A	25.36	46.00	20.64
2756.78	H	X	PK	49.53	4.17	N/A	53.70	74.00	20.30
2757.26	H	X	AV	44.24	4.17	N/A	48.41	54.00	5.59
3676.71	V	Z	PK	49.48	5.90	N/A	55.38	74.00	18.62
3673.37	V	Z	AV	43.07	5.90	N/A	48.97	54.00	5.03
**6432.91	H	Z	PK	59.17	11.26	N/A	70.43	99.72	29.29
7351.83	H	Z	PK	48.51	11.68	N/A	60.19	74.00	13.81
7353.26	H	Z	AV	39.33	11.68	N/A	51.01	54.00	2.99
8271.97	H	Z	PK	47.90	11.97	N/A	59.87	74.00	14.13
8271.03	H	Z	AV	39.16	11.97	N/A	51.13	54.00	2.87
9189.60	H	Z	PK	45.47	12.24	N/A	57.71	74.00	16.29
9189.73	H	Z	AV	35.14	12.24	N/A	47.38	54.00	6.62

Note.

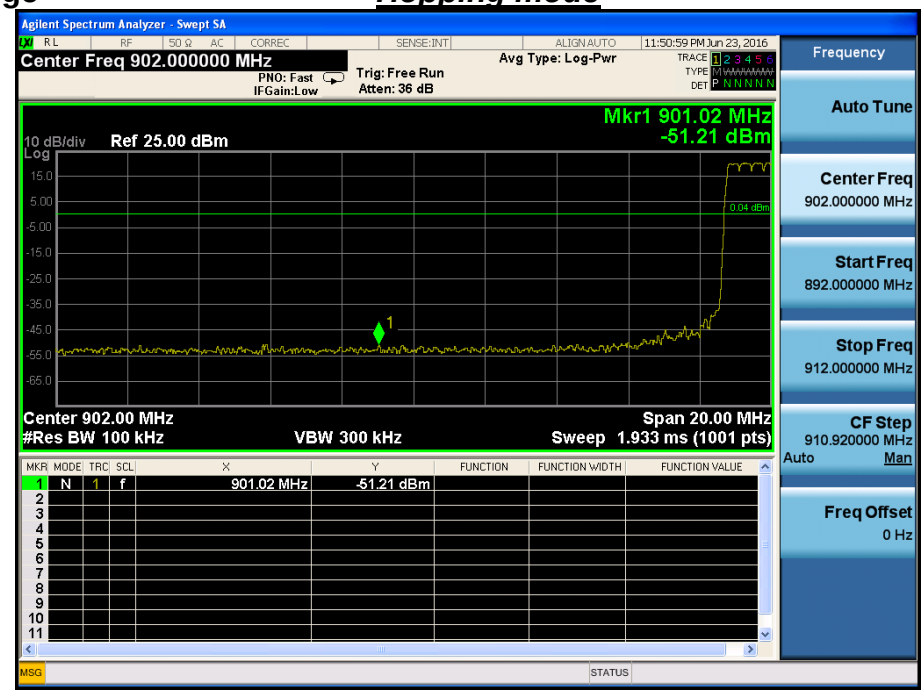
1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. The limit is applied as below,
   Restricted band = FCC Part 15.209
   Non-restricted band = Fundamental level(119.72dBuV/m – 20dB) = 99.72dBuV/m
   *= Fundamental
   **= Non-restricted band
4. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor

7.4.2 Conducted Spurious Emissions

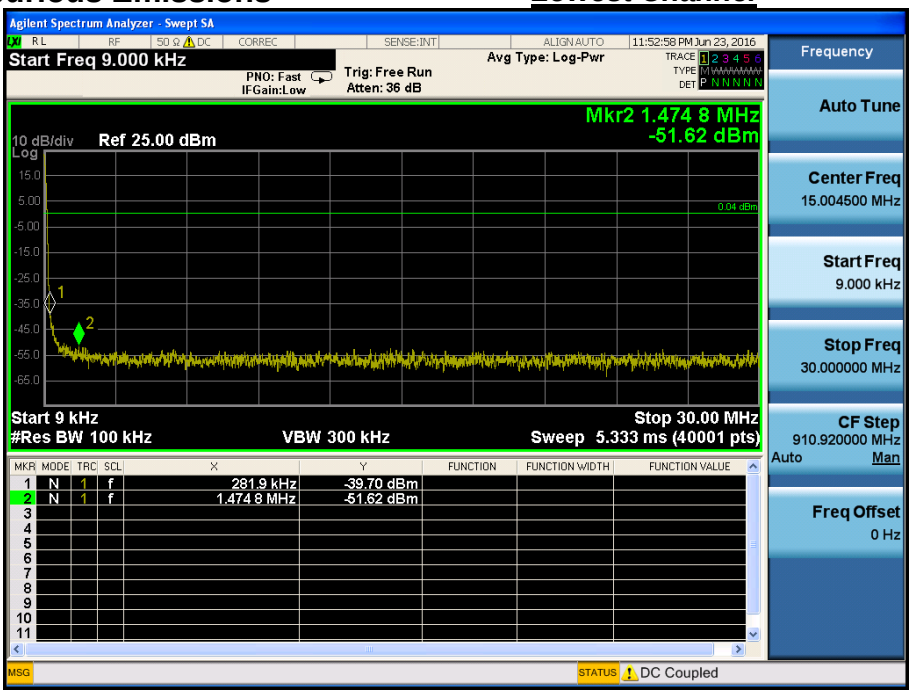
Low Band-edge ***Lowest Channel***

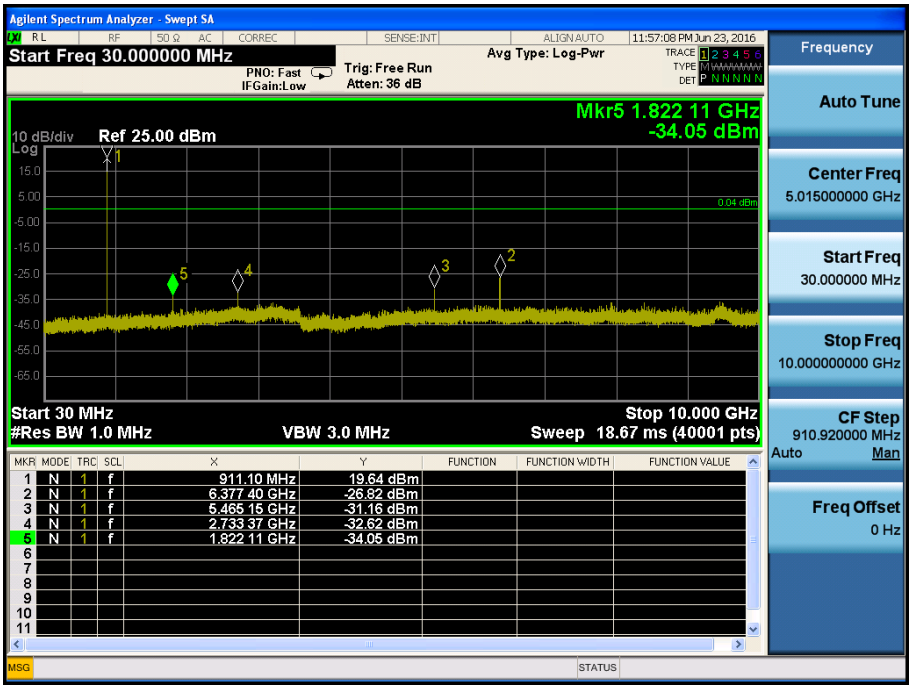


Low Band-edge ***Hopping mode***



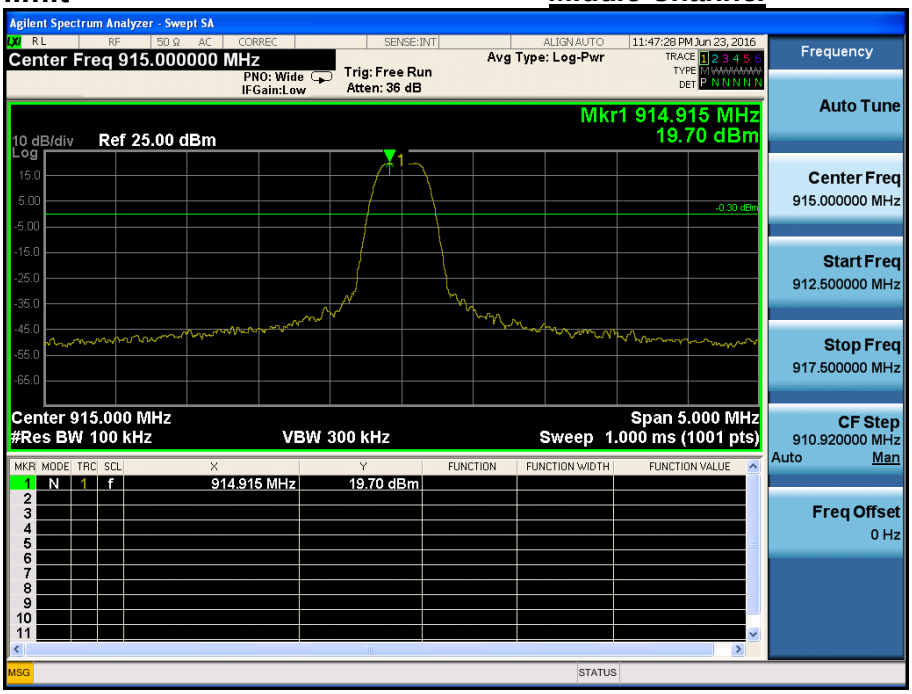
Conducted Spurious Emissions ***Lowest Channel***



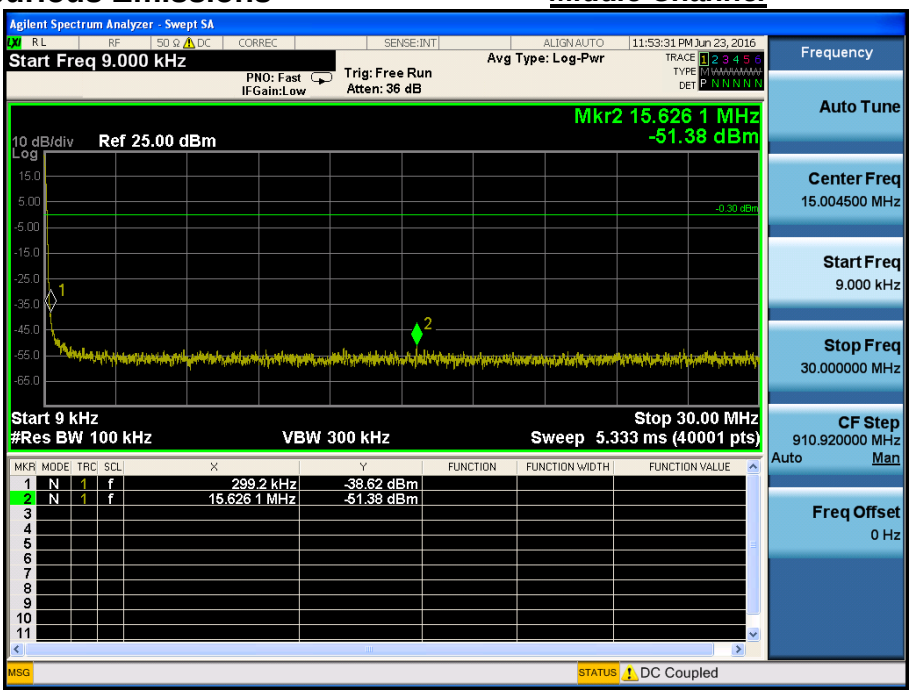


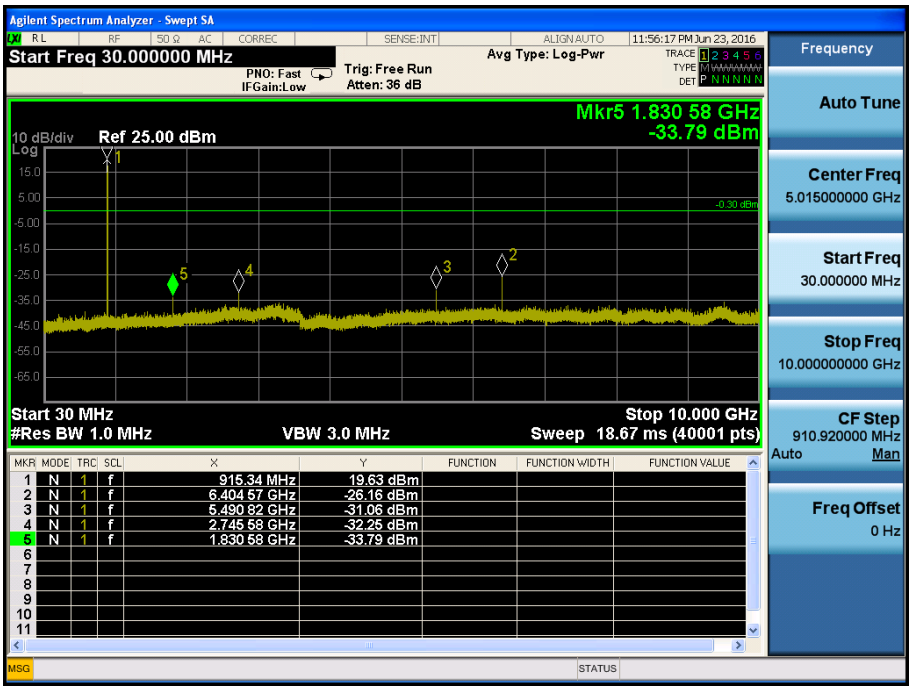
Reference for limit

Middle Channel

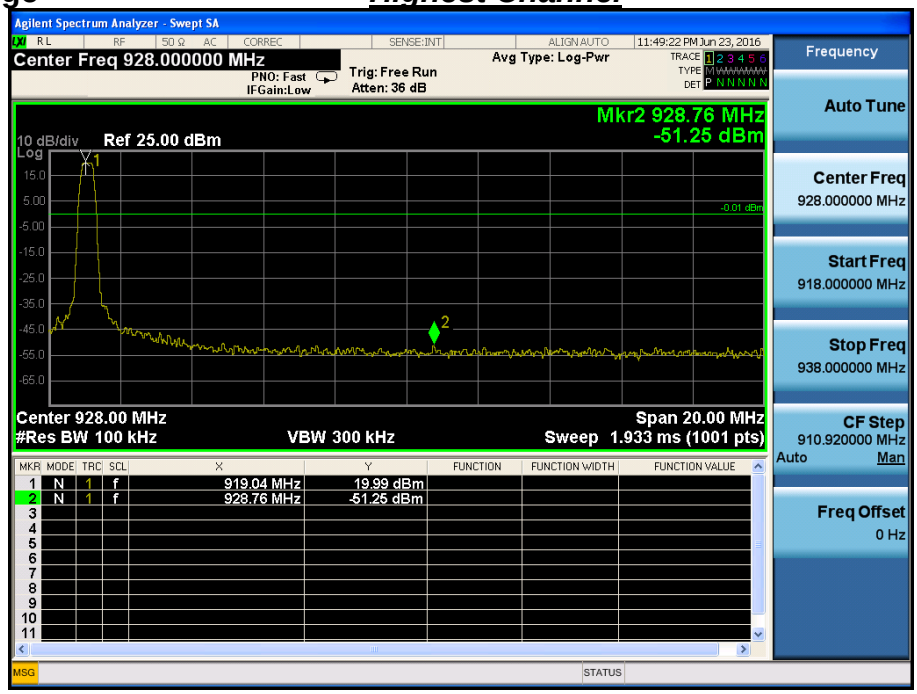


Conducted Spurious Emissions ***Middle Channel***

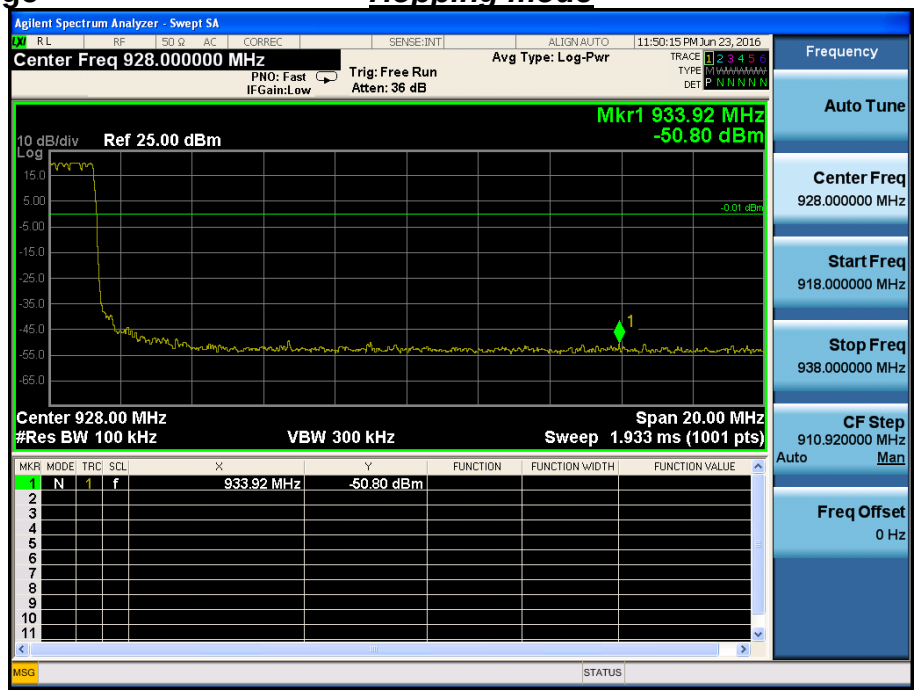




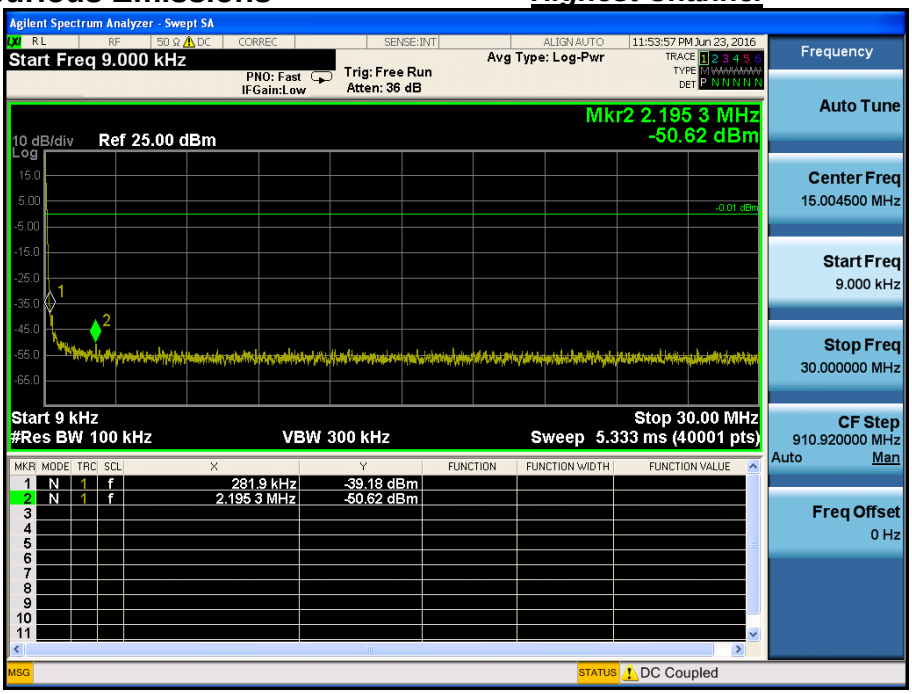
High Band-edge ***Highest Channel***

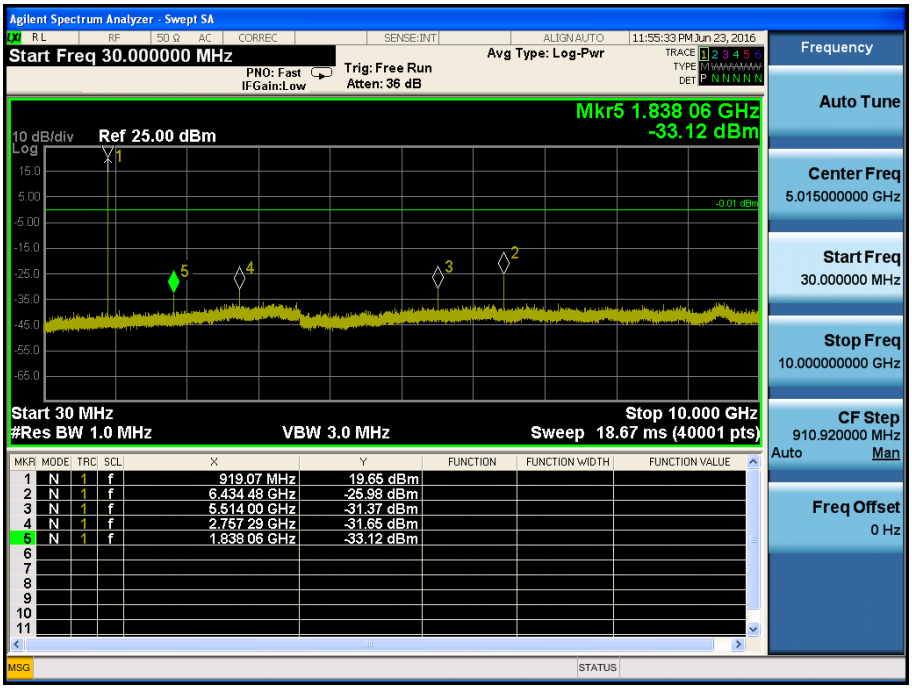


High Band-edge ***Hopping mode***



Conducted Spurious Emissions ***Highest Channel***





8. Transmitter AC Power Line Conducted Emission

8.1 Test Setup

Not Applicable

8.2 Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

8.3 Test Procedures

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4. Test Results

Not Applicable

9. Antenna Requirement

9.1 Procedure

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

9.2 Conclusion

: **Comply**

The antenna is permanently attached.(Refer to Internal Photo file.)

Minimum Standard:

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.

10. Occupied Bandwidth (99 %)

10.1 Test Setup

Refer to the APPENDIX I.

10.2 Limit

Limit : Not Applicable

10.3 Test Procedure

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 × RBW.

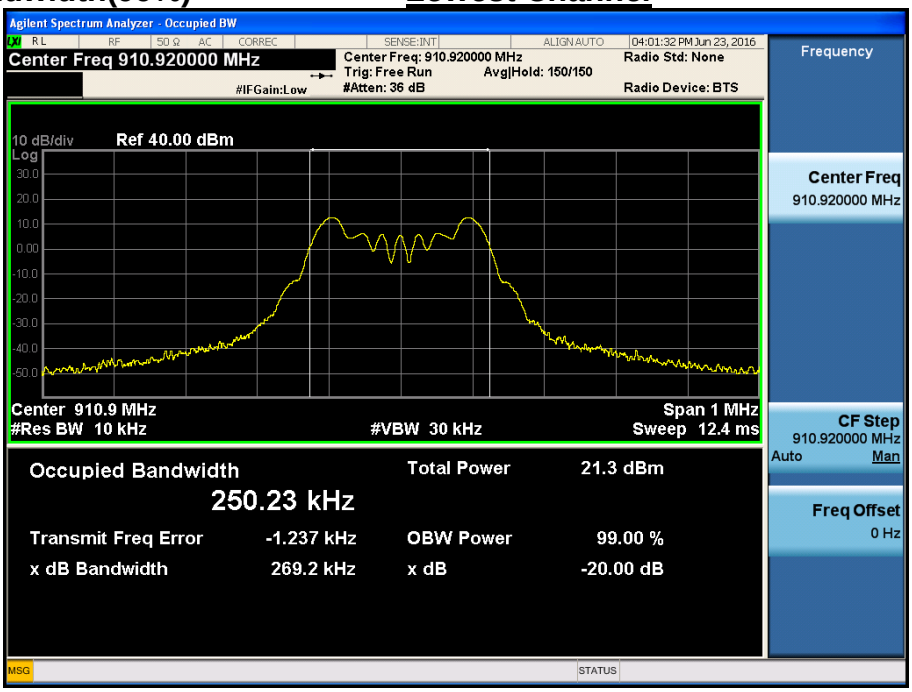
Spectrum analyzer plots are included on the following pages.

10.4 Test Results

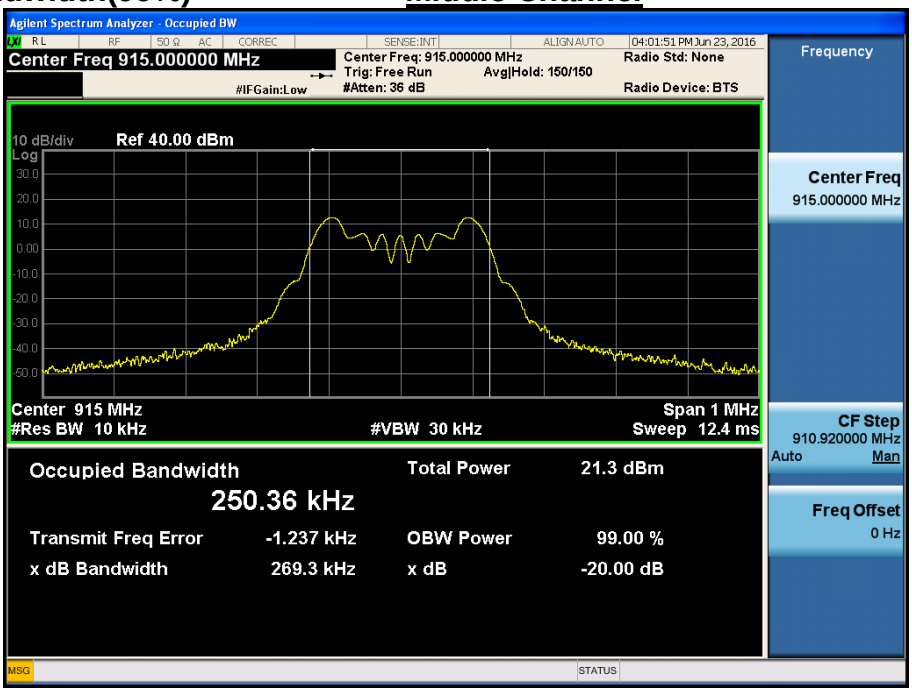
Frequency (MHz)	Tested Channel	Occupied BW (99%) (kHz)
910.92	**Lowest**	250.23
915.00	**Middle**	250.36
919.08	**Highest**	250.59

Note 1: See next pages for actual measured spectrum plots.

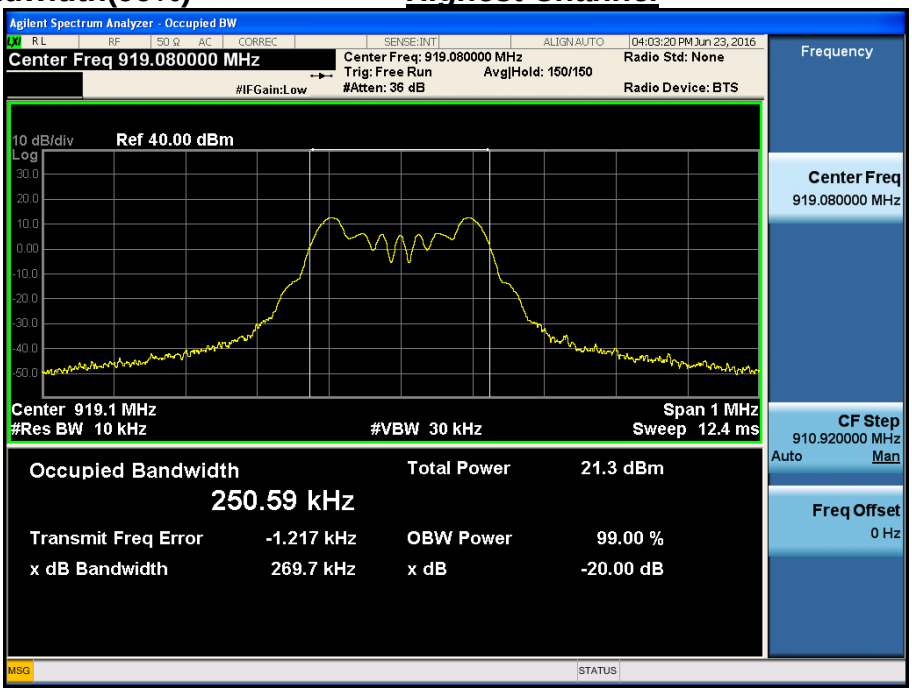
Occupied Bandwidth(99%) ***Lowest Channel***



Occupied Bandwidth(99%) ***Middle Channel***



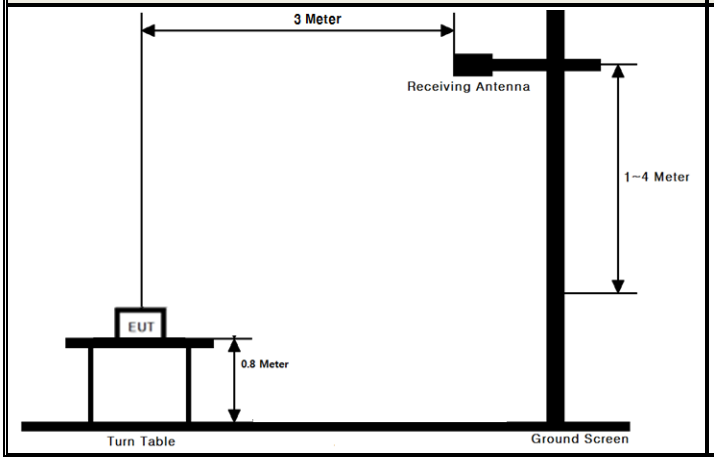
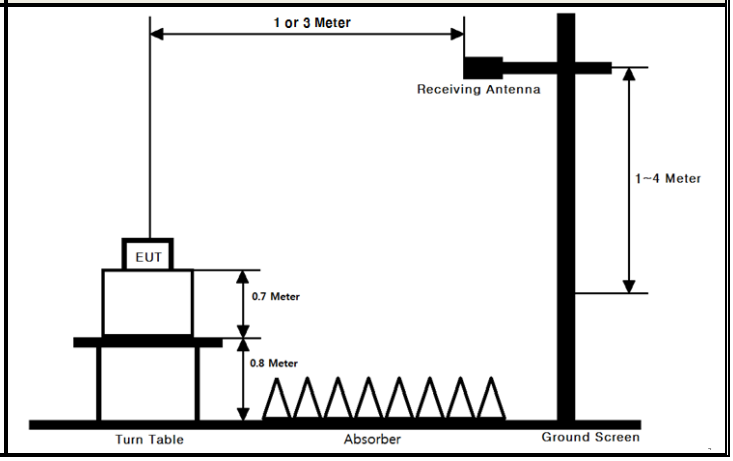
Occupied Bandwidth(99%) ***Highest Channel***



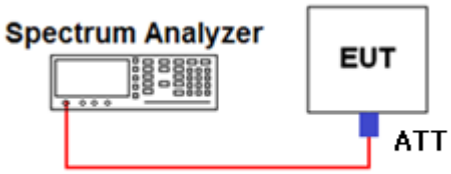
APPENDIX I

Test set up diagrams

- **Radiated Measurement**

Below 1GHz	Above 1GHz
	

- **Conducted Measurement**



Path loss information

Frequency (MHz)	Path Loss (dB)	Frequency (MHz)	Path Loss (dB)
30	3.84	1000	4.16
500	4.01	5000	4.65
910.92 & 915.00 & 919.08	4.12	10000	5.12
-	-	-	-

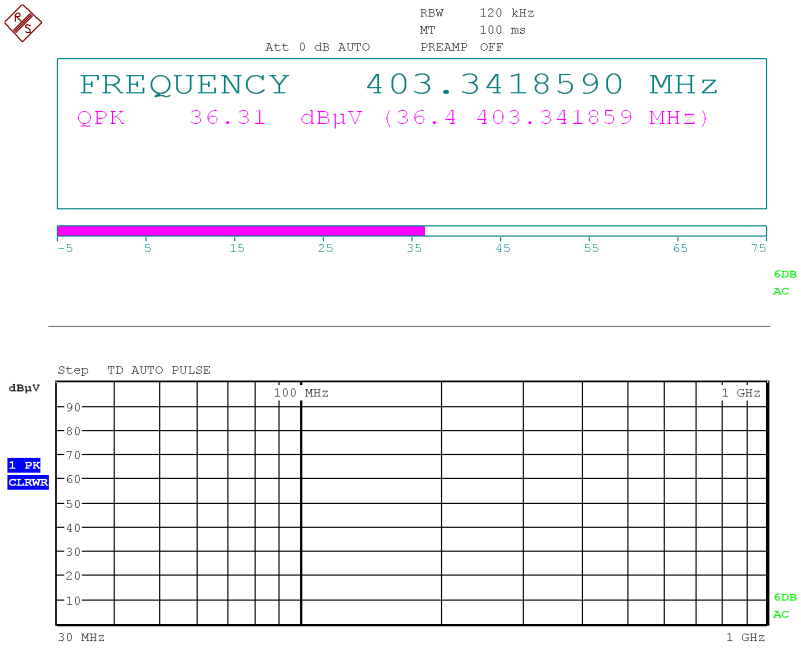
Note 1 : The path loss from EUT to Spectrum analyzer were measured and used for test.

Path loss (S/A's Correction factor) = Cable A + Attenuator

APPENDIX II

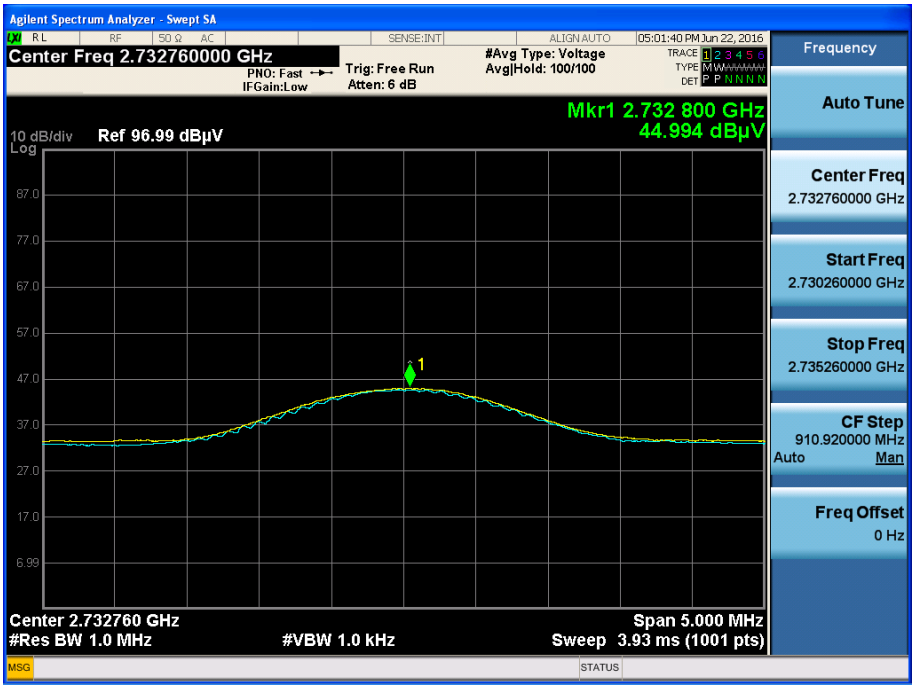
Unwanted Emissions (Radiated) Test Plot(Reading value)

Middle & X & Hor **Detector Mode : QP**

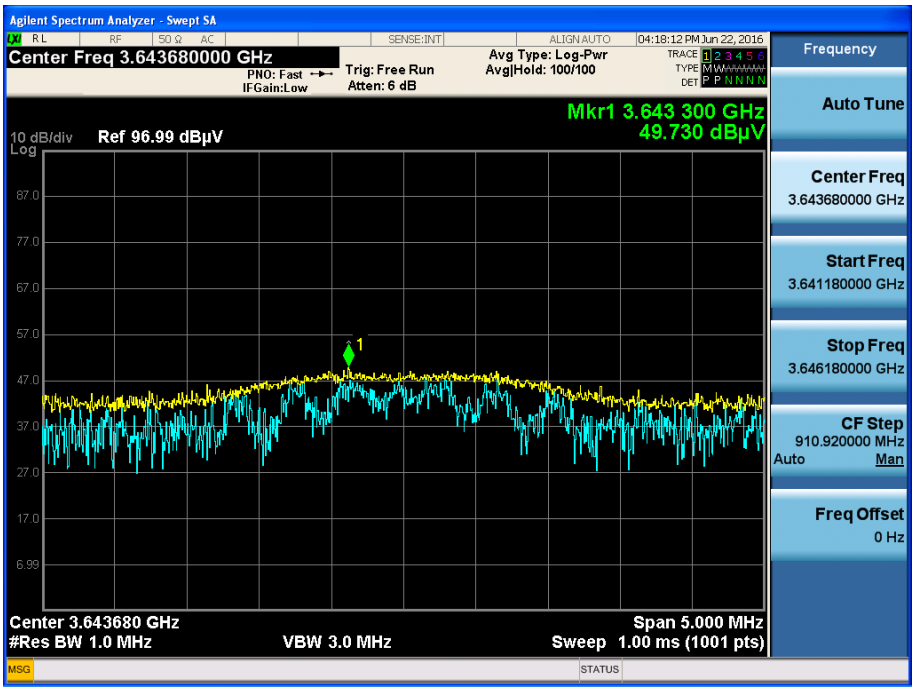


Lowest & X & Hor **Detector Mode : PK**

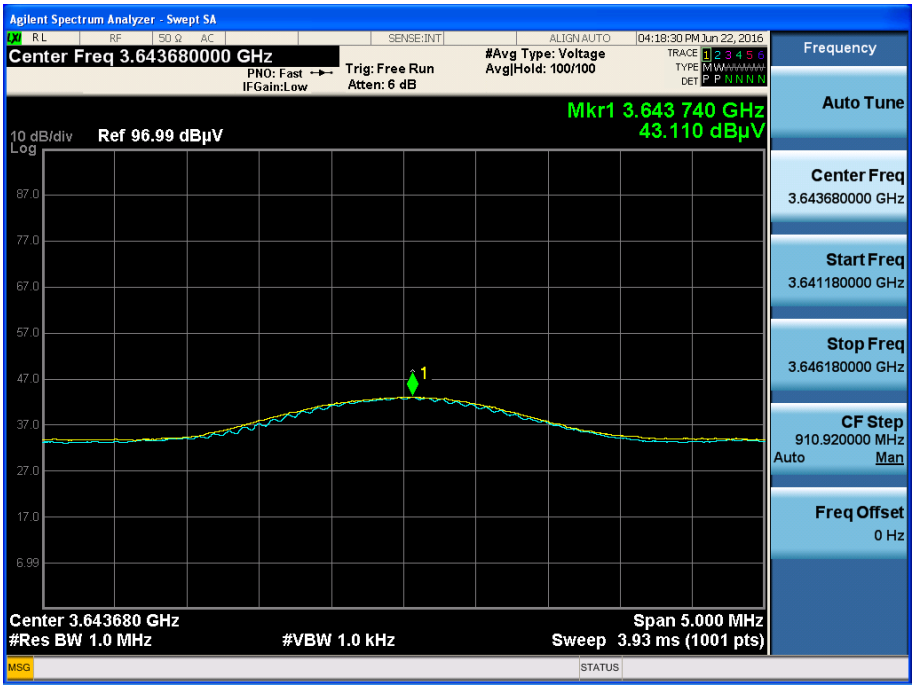
Lowest & X & Hor **Detector Mode : AV**



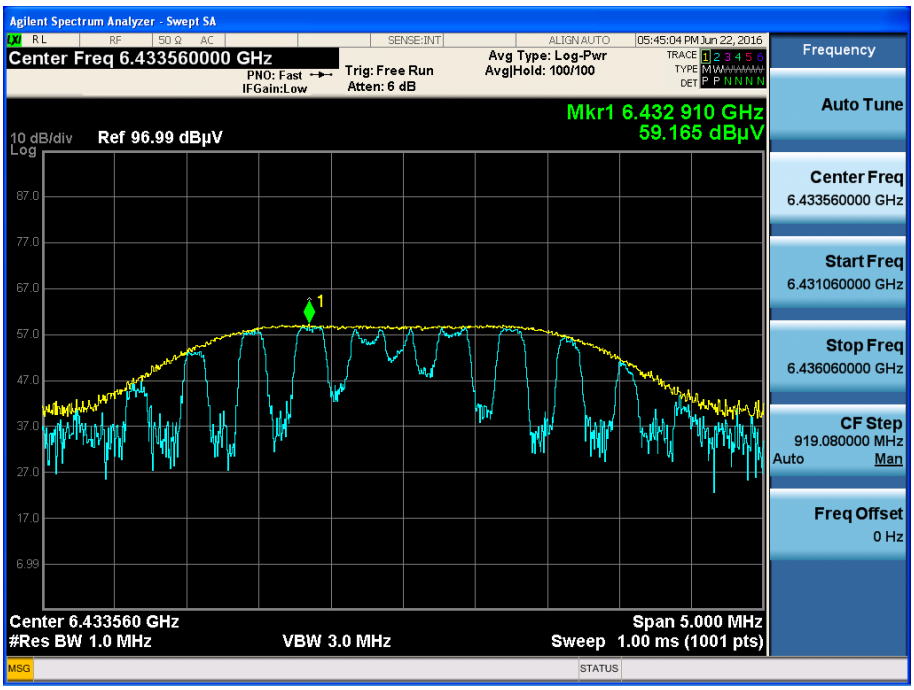
Lowest & Z & Ver **Detector Mode : PK**



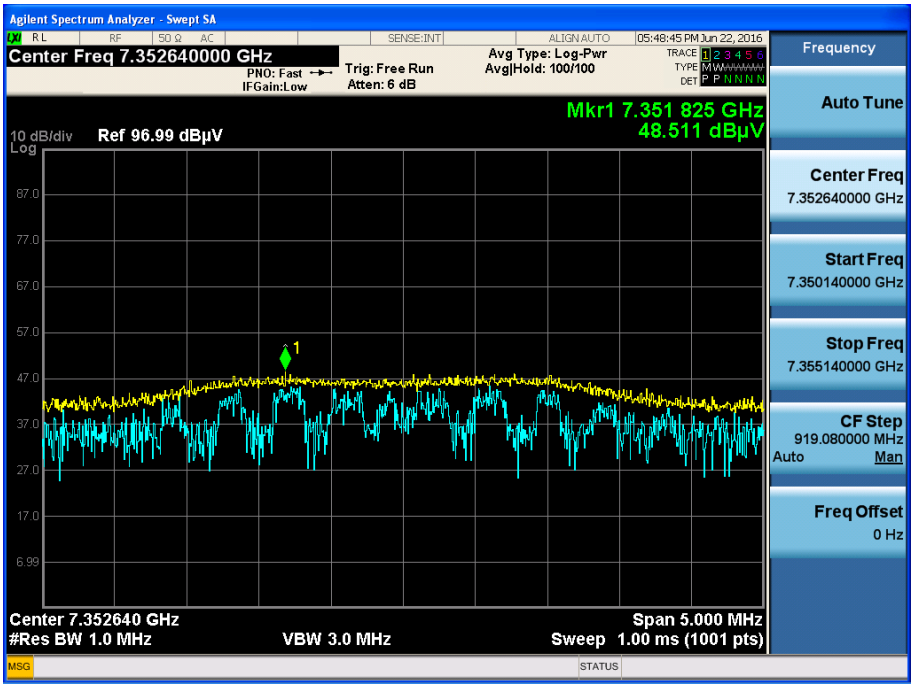
Lowest & Z & Ver **Detector Mode : AV**



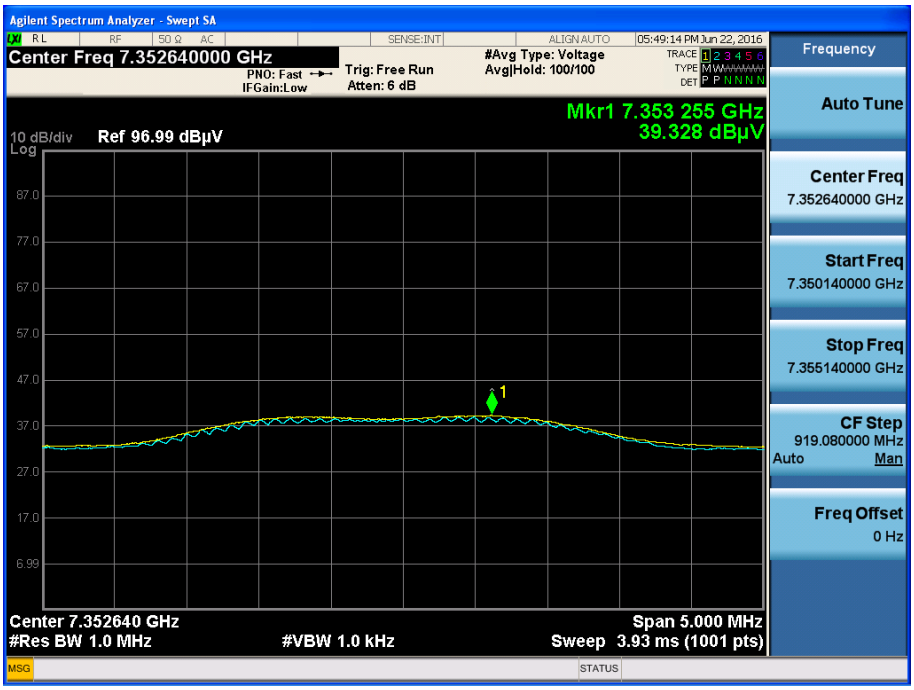
Highest & Z & Hor **Detector Mode : PK**



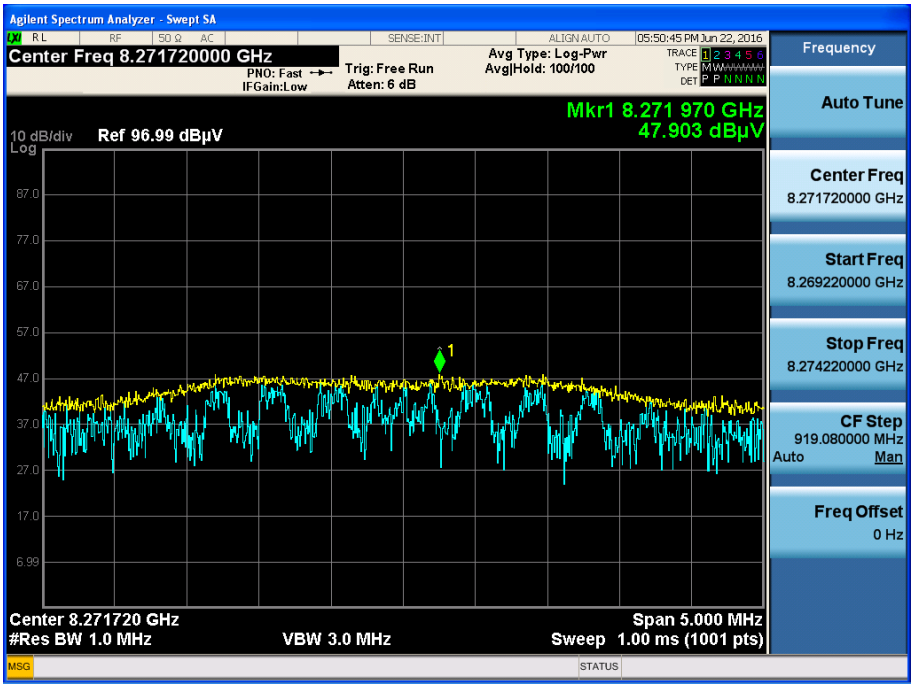
Highest & Z & Hor **Detector Mode : PK**



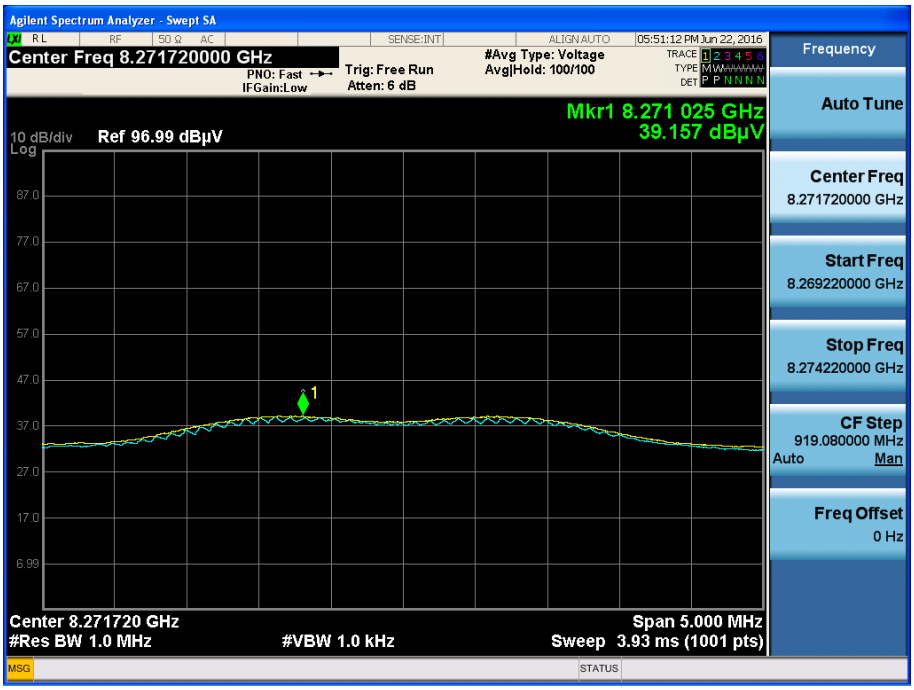
Highest & Z & Hor **Detector Mode : AV**



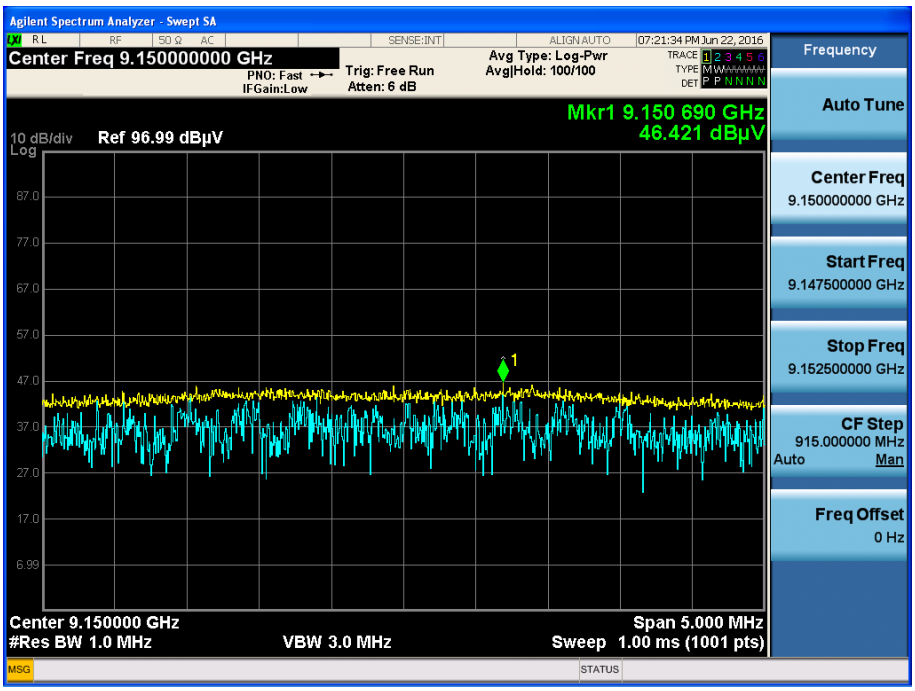
Highest & Z & Hor **Detector Mode : PK**



Highest & Z & Hor **Detector Mode : AV**



Middle & Z & Hor **Detector Mode : PK**



Middle & Z & Hor **Detector Mode : AV**