REPORT No.: SZ15070092W03

FCC RF TEST REPORT

APPLICANT	:	CONVERGENCE SYSTEMS LIMITED
PRODUCT NAME	:	Intelligent Integrated RFID Reader with 3G/GSM and GPS
MODEL NAME	:	CS208-3G-2
TRADE NAME	:	CSL
BRAND NAME	:	CSL
FCC ID	:	UB4CS2083G
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2015-11-17

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DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2015-11-17	First edition

TEST REPORT DECLARATION

Applicant	CONVERGENCE SYSTEMS LIMITED
Applicant Address	20/F, Chung Nam Building, No.1 Lockhart Road, Wanchai, Hong Kong
Manufacturer	DongGuan DongHongXingYe Electronics Science and Technology Limited
Manufacturer Address	1 Jianxiang Street, Hanxishui, Chashan Town, Dongguan, Guangdong, China
Product Name	Intelligent Integrated RFID Reader with 3G/GSM and GPS
Model Name	CS208-3G-2
Brand Name	CSL
HW Version	Main board (V1.9); GSM board (V4.0); RFID board (V9.0)
SW Version	12.00.006(HE910); 1.5.28(RFID); WinCE6.0(OS)
Test Standards	47 CFR Part 15 Subpart C
Test Date	2015-10-20 to 2015-11-09
Test Result	PASS

Tested by : Yuan Ling
Yuan Ling

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Zeng Dexin
Zeng Dexin

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type.....:	Intelligent Integrated RFID Reader with 3G/GSM and GPS
Serial No. .....:	(n.a, marked #1 by test site)
Hardware Version.....:	Main board (V1.9); GSM board (V4.0); RFID board (V9.0)
Software Version.....:	12.00.006(HE910); 1.5.28(RFID); WinCE6.0(OS)
Applicant.....:	CONVERGENCE SYSTEMS LIMITED 20/F, Chung Nam Building, No.1 Lockhart Road, Wanchai, Hong Kong
Manufacturer .....:	DongGuan DongHongXingYe Electronics Science and Technology Limited 1 Jianxiang Street, Hanxishui, Chashan Town Dongguan, Guangdong, China
Frequency Range.....:	The frequency range used is 902.75MHz – 927.25MHz (50 channels, at intervals of 500kHz);
Modulation Type.....:	FHSS
Data Type .....:	DSB-ASK, PR-ASK
Antenna Type.....:	Dedicated Antenna
Antenna Gain.....:	5.0dBi

NOTE:

1. The EUT is a Intelligent Integrated RFID Reader with 3G/GSM and GPS, it contains Radio Module operating at 900MHz ISM band; the frequencies allocated for the Radio Module is F(MHz)=902.25+0.5*n (1<=n<=50). The lowest, middle, highest channel numbers of the Radio Module used and tested in this report are separately 1 (902.75MHz), 26 (915.25MHz) and 50 (927.25MHz).
2. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.
3. EUT specification and Test Model:

Profile	Tari (µs)	Reader to Tag Forward Link Modulation	Pulse Width (µs)	Tag to Reader Link Frequency (kHz)	Tag to Reader Reverse Modulation
0	25.00	PR-ASK	12.50	120	Miller, M=4
1	12.50	DSB-ASK	6.25	160	Miller, M=2
2	25.00	PR-ASK	12.50	250	Miller, M=4
3	25.00	PR-ASK	12.50	300	Miller, M=4
4	6.25	DSB-ASK	3.13	400	FM0
5	25.00	PR-ASK	12.50	250	Miller, M=2

*: We just tested Profile 0, profile 2 and profile 4 for the different data mode in this report.

4. Only record the worst test case in this report.

1.2 Antenna Description

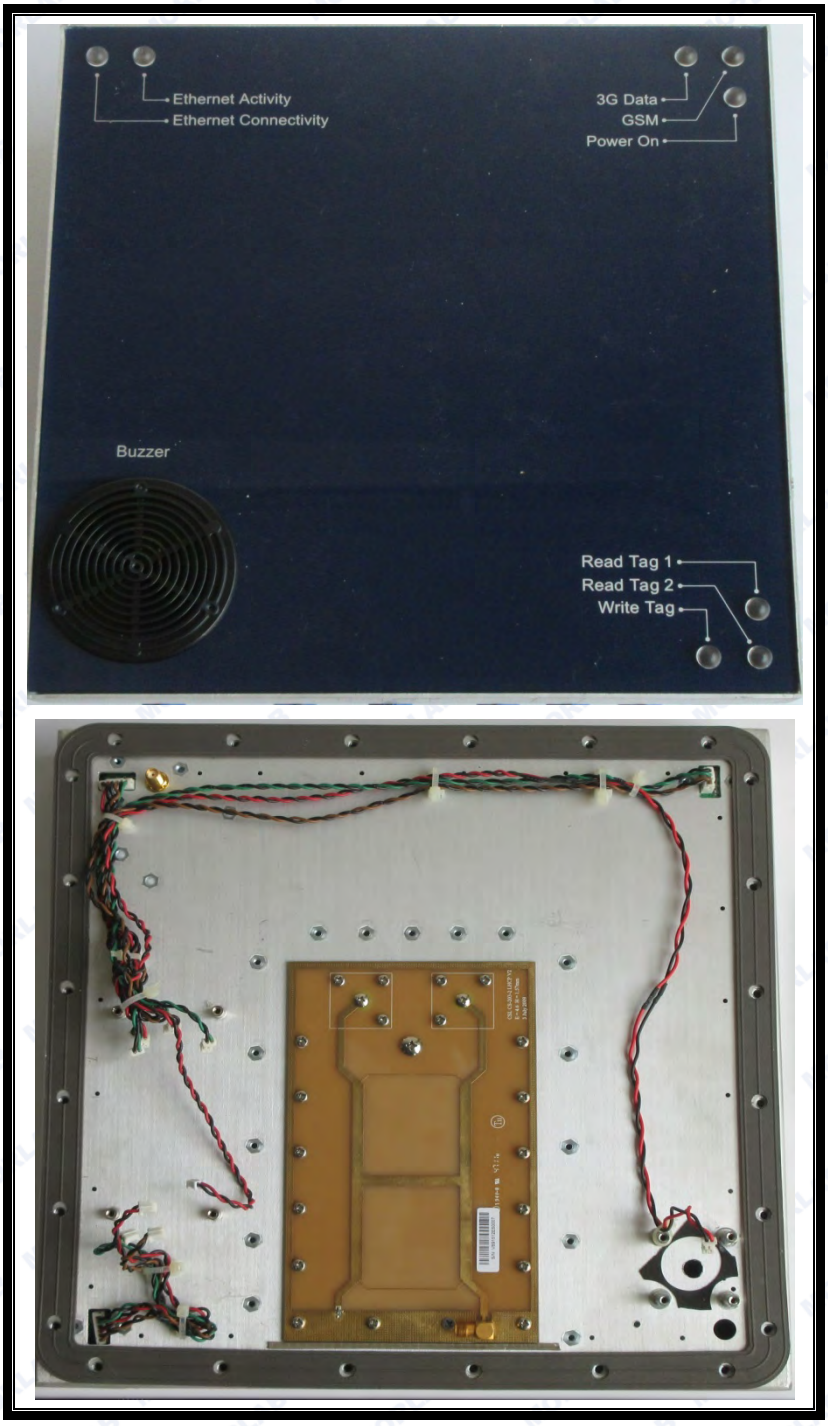
Antenna	location	Feature	Gain(dBi)	Refer Plot
Antenna 1	internal	Only for 2G&3G	2.0	Plot 1
Antenna 2	internal	Only for 2G&3G	2.0	Plot 2
Antenna 3	external	Only for 2G&3G	3.0	Plot 3
Antenna 4	external	Only for RF ID	5.0	Plot 4

Plots:

(Plot 1: Antenna 1)

(Plot 2: Antenna 2)

(Plot 3: Antenna 3)



(Plot 4: Antenna 4)

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (900 MHz ISM Band Frequency Hopping Spread Spectrum Transmitter) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-13 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	**PASS**
2	15.247(a)	Number of Hopping Frequency	**PASS**
3	15.247(b)	Peak Output Power	**PASS**
4	15.247(a)	20dB Bandwidth	**PASS**
5	15.247(a)	Carrier Frequency Separation	**PASS**
6	15.247(a)	Time of Occupancy (Dwell time)	**PASS**
7	15.247(d)	Conducted Spurious Emission and Band Edge	**PASS**
8	15.207	Conducted Emission	**PASS**
9	15.209 15.247(d)	Radiated Emission	**PASS**

NOTE:

The tests were performed according to the method of measurements prescribed in DA-00-705, ANSI C63.4-2009 and ANSI C63.10-2013.

1.4 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 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.

2.1.2 Result: Compliant

The maximum gain of antenna was defined by manufacturer. The max gain is 4.8dBi.The antenna type is SMA Antenna. For more info, please refer to the user manual.

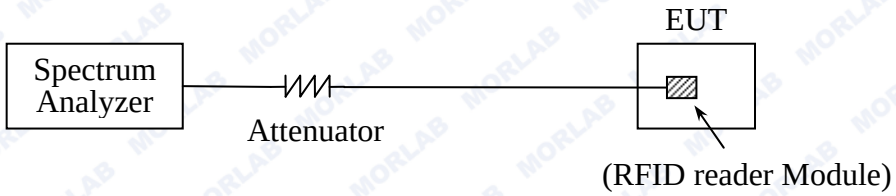
2.2 Number of Hopping Frequency

2.2.1 Requirement

According to FCC section 15.247(a)(1)(i), frequency hopping systems operating in the 902MHz to 928MHz bands shall use at least 50 hopping frequencies if the 20dB bandwidth of the hopping channel is less than 250KHz; or at least 25 hopping frequencies if the 20dB bandwidth of the hopping channel is 250KHz or greater.

2.2.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

2.2.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

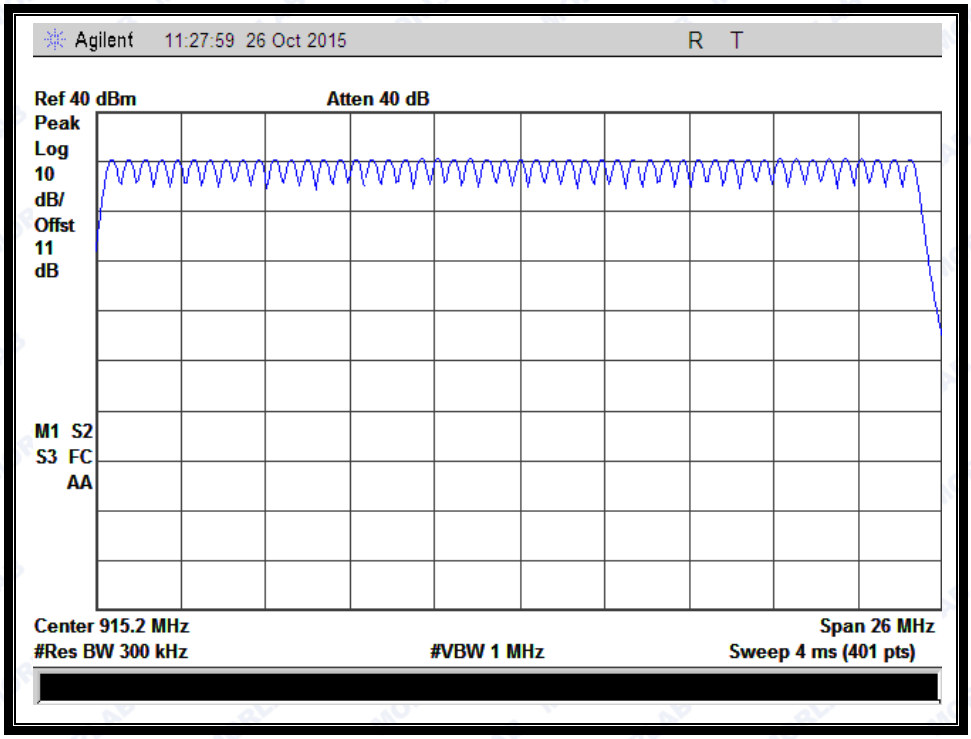
2.2.4 Test Result

The RFID Reader Module of the EUT operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

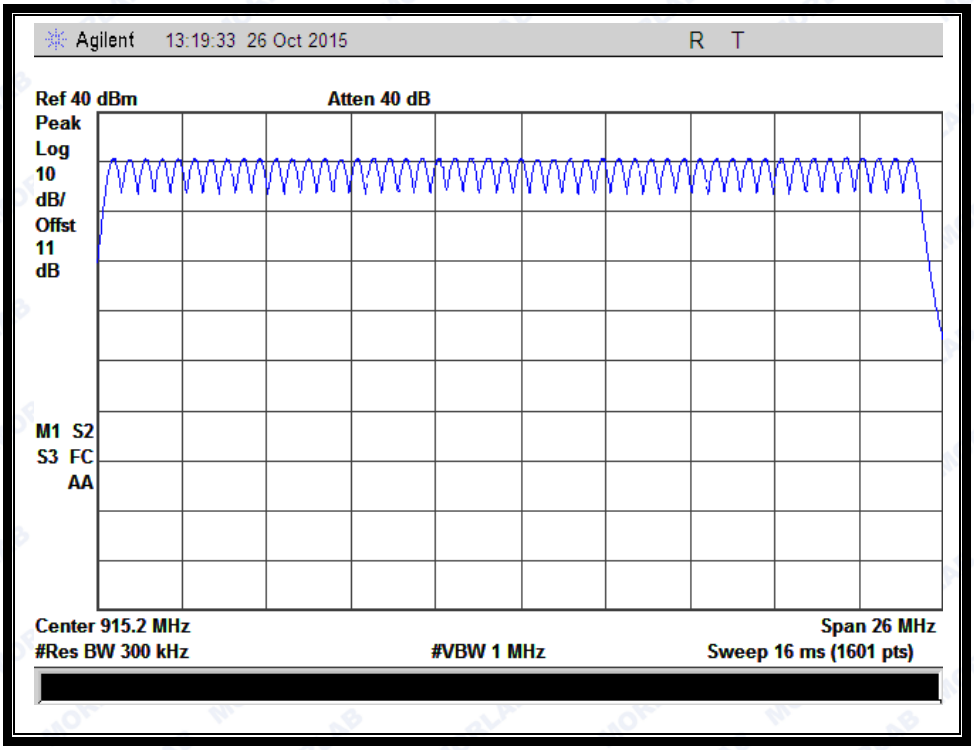
A. Test Verdict:

Profile	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
0	902 - 928	50	50	Plot A	PASS
2	902 - 928	50	50	Plot B	PASS
4	902 - 928	50	25	Plot C	PASS

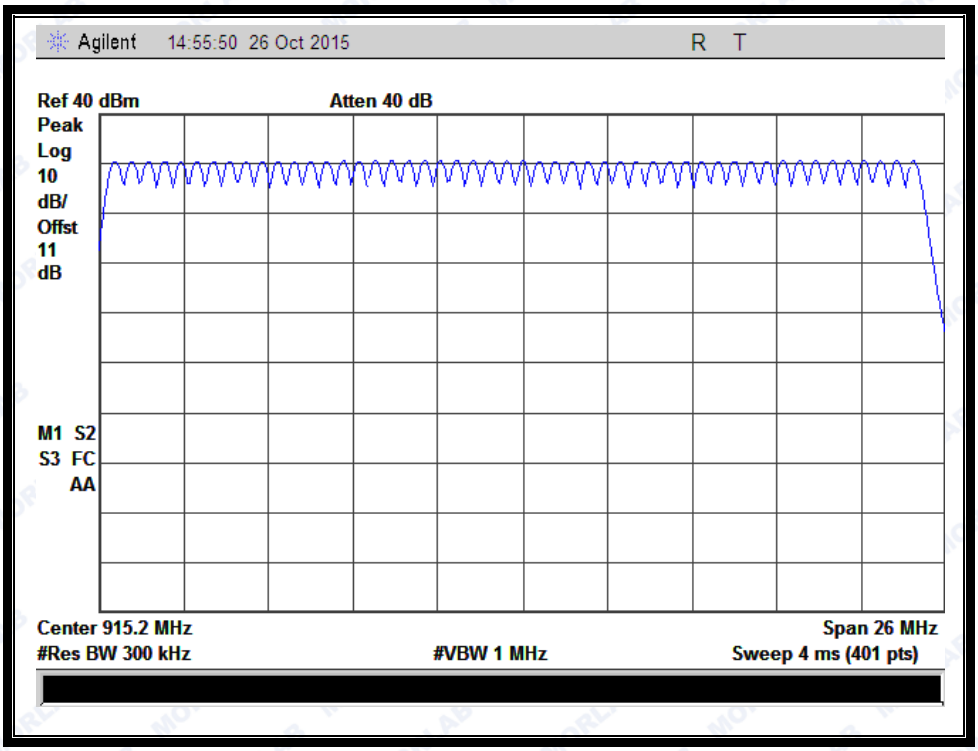
B. Test Plots:



(Plot A: Profile 0 902MHz to 928MHz)



(Plot B: Profile 2 902MHz to 928MHz)



(Plot C: Profile 4 902MHz to 928MHz)

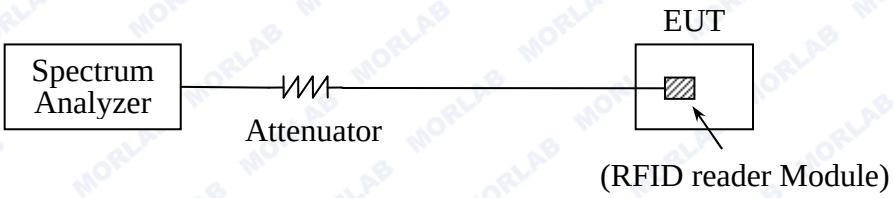
2.3 Peak Output Power

2.3.1 Requirement

According to FCC section 15.247(b)(2), for frequency hopping systems that operates in the 902MHz to 928MHz band employing at least 50 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt, and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

2.3.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

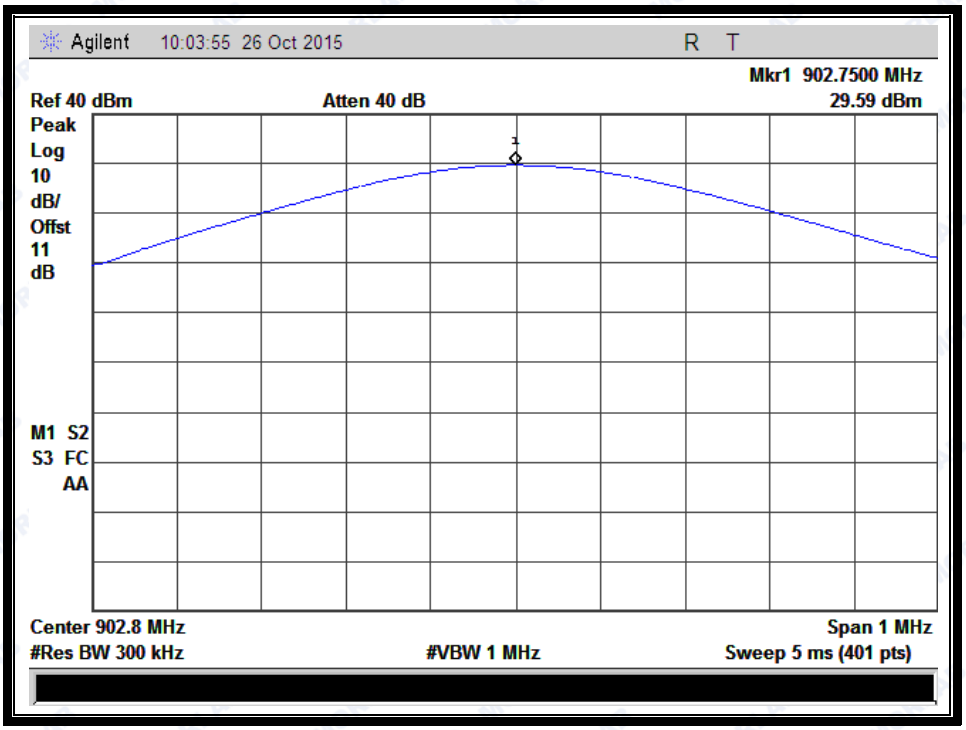
2.3.3 Test Result

The RFID Reader Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

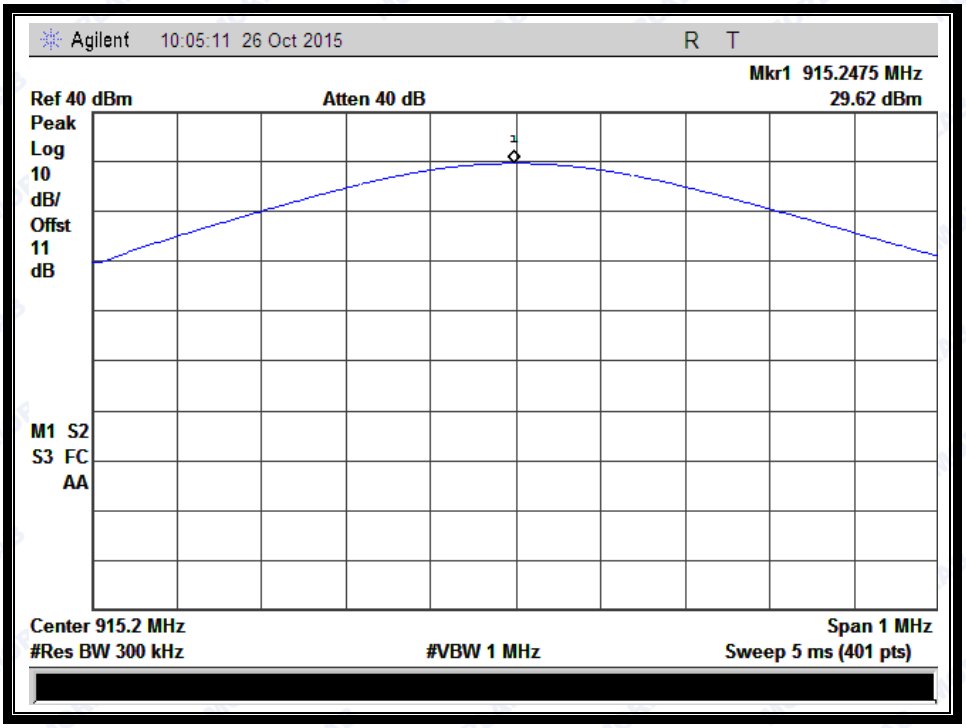
A. Test Verdict:

Profile	Channel	Frequency (MHz)	Measured Output Peak Power			Limit (W)	Verdict
			dBm	W	Refer to Plot		
0	1	902.75	29.59	0.909913	Plot A	1	PASS
	26	915.25	29.62	0.91622	Plot B		PASS
	50	927.25	29.75	0.944061	Plot C		PASS
2	1	902.75	29.57	0.905733	Plot D	1	PASS
	26	915.25	29.66	0.924698	Plot E		PASS
	50	927.25	29.8	0.954993	Plot F		PASS
4	1	902.75	29.69	0.931108	Plot G	1	PASS
	26	915.25	29.66	0.924982	Plot H		PASS
	50	927.25	29.82	0.959401	Plot I		PASS

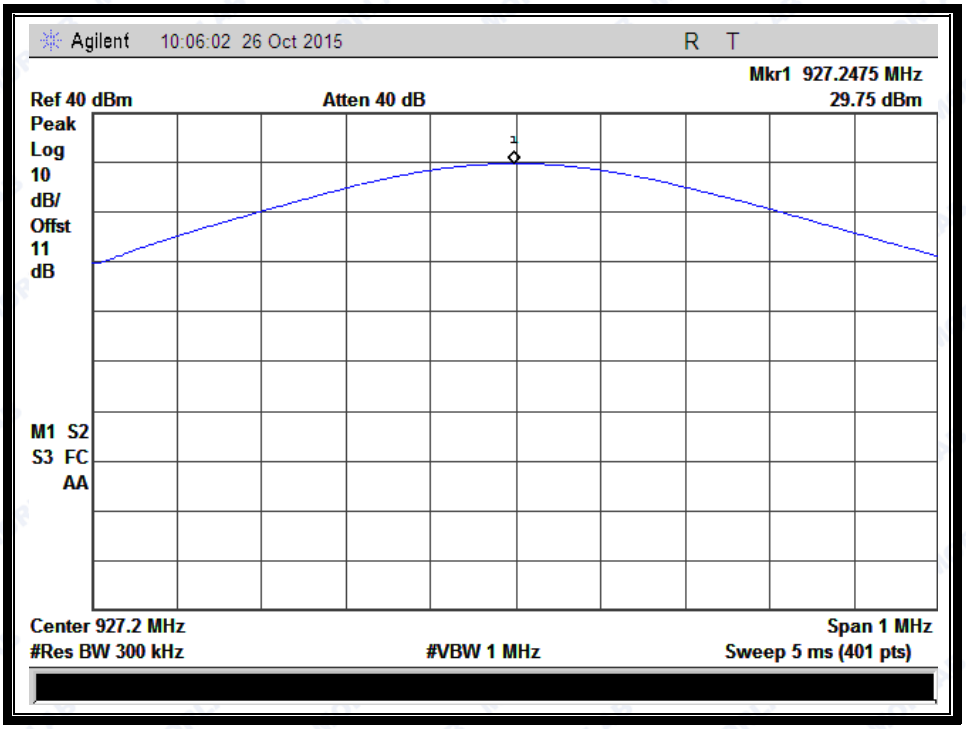
B. Test Plot:



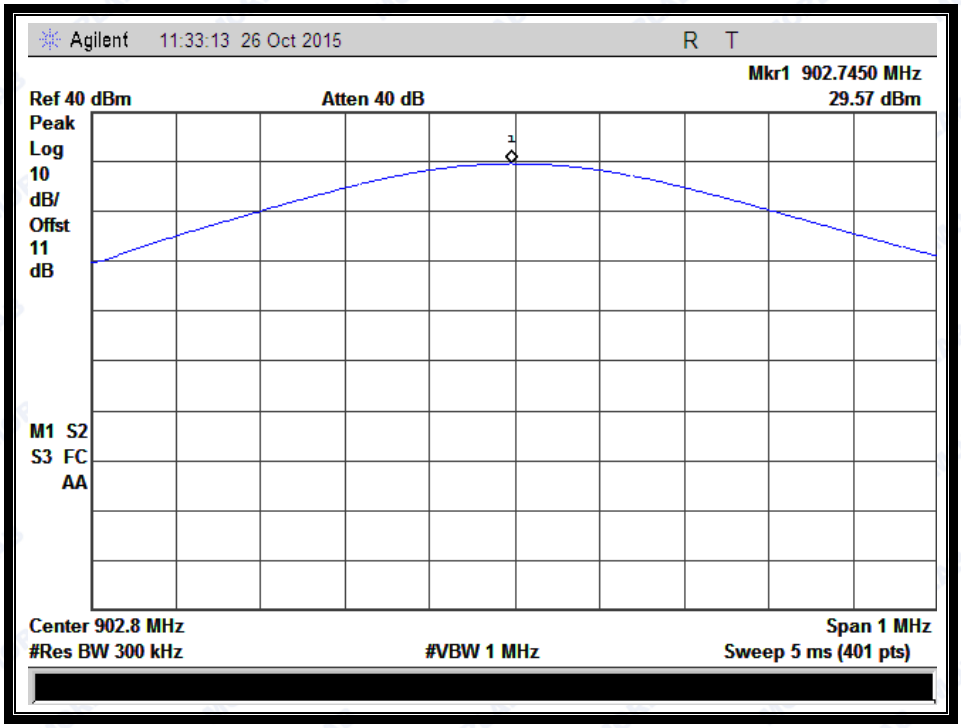
(Plot A: Profile 0 Channel = 1)



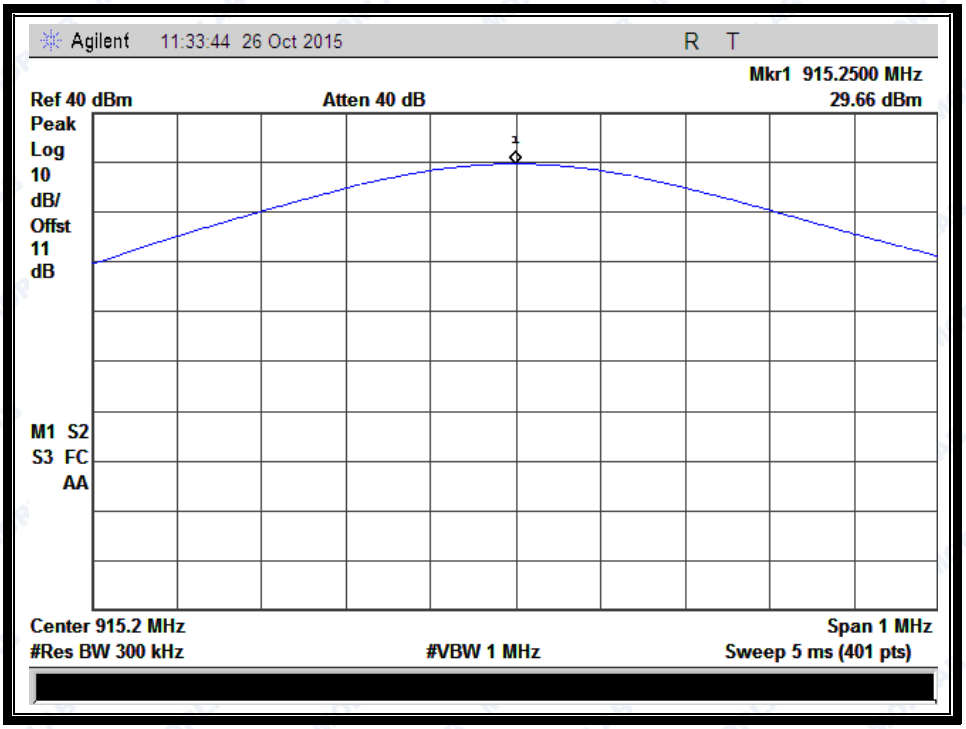
(Plot B: Profile 0 Channel = 26)



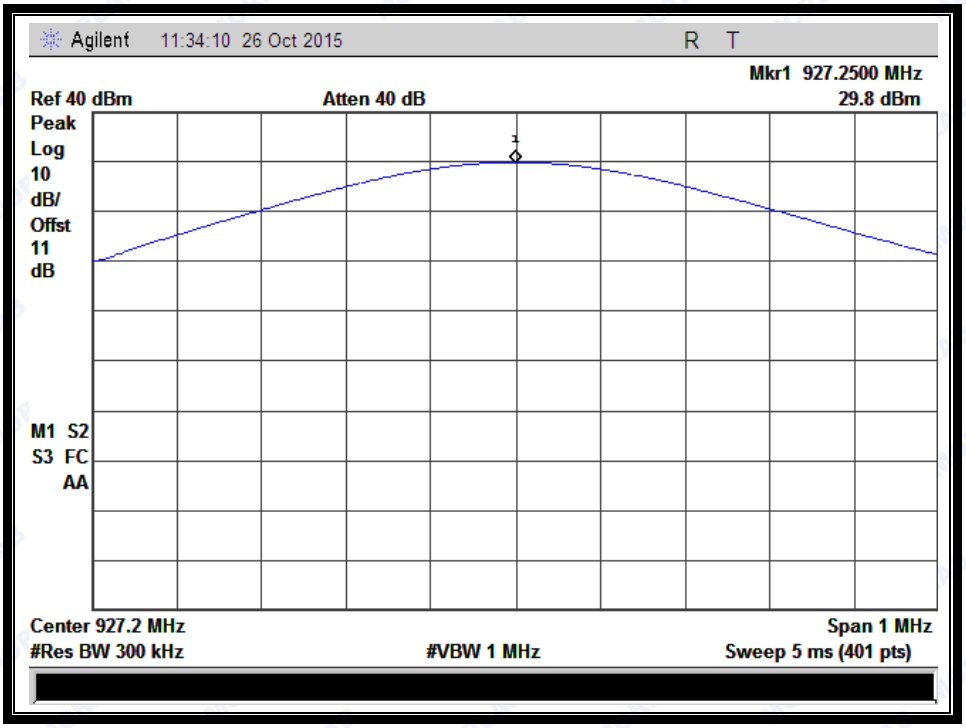
(Plot C: Profile 0 Channel = 50)



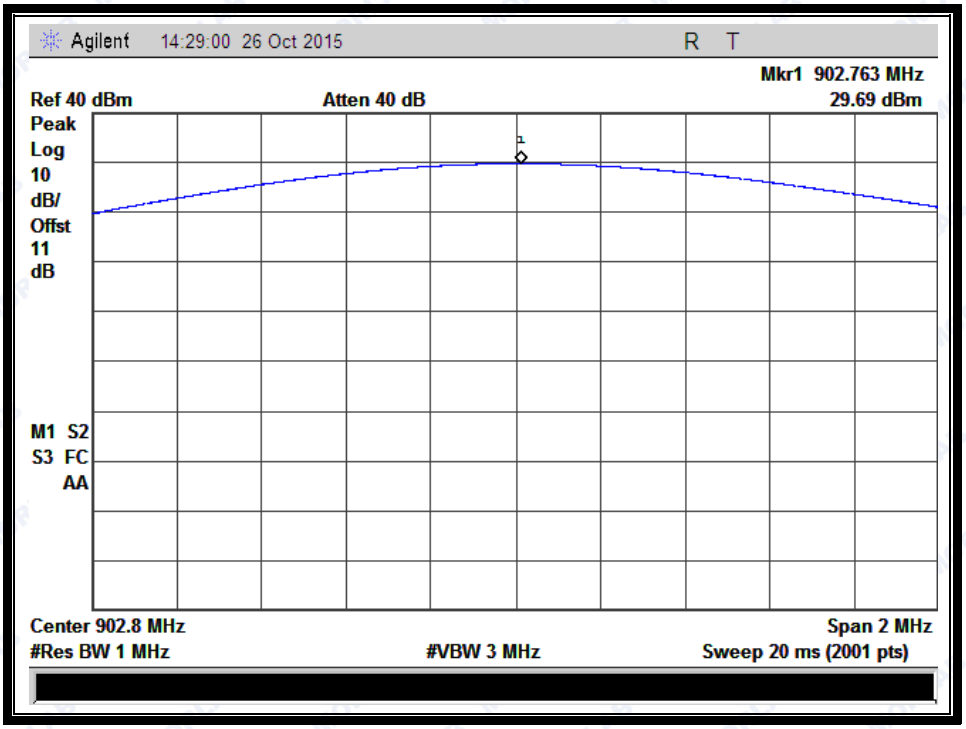
(Plot D: Profile 2 Channel = 1)



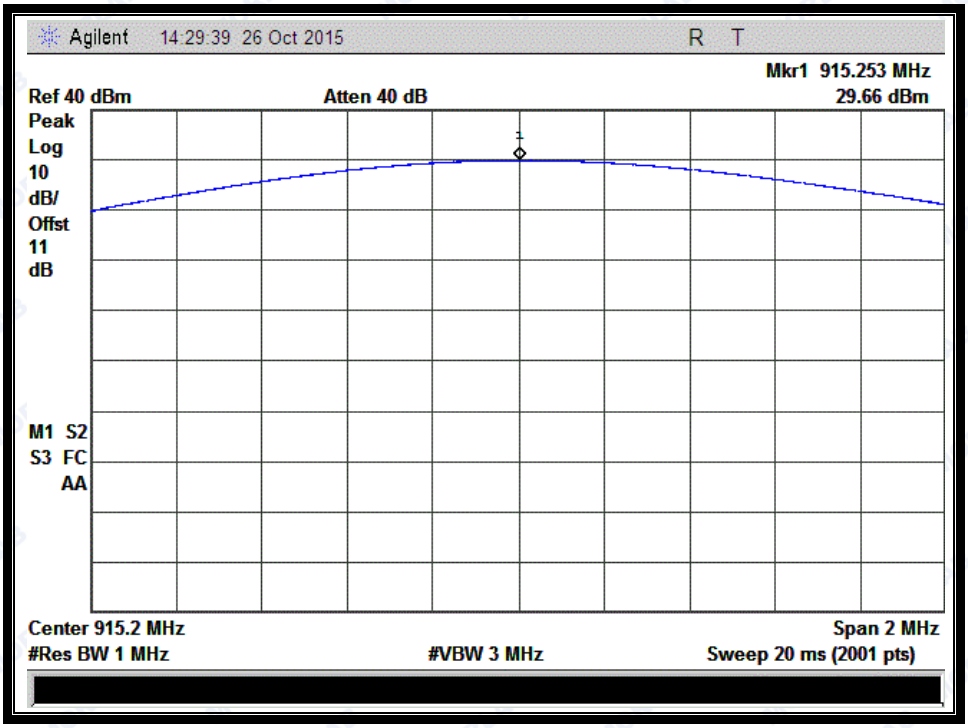
(Plot E: Profile 2 Channel = 26)



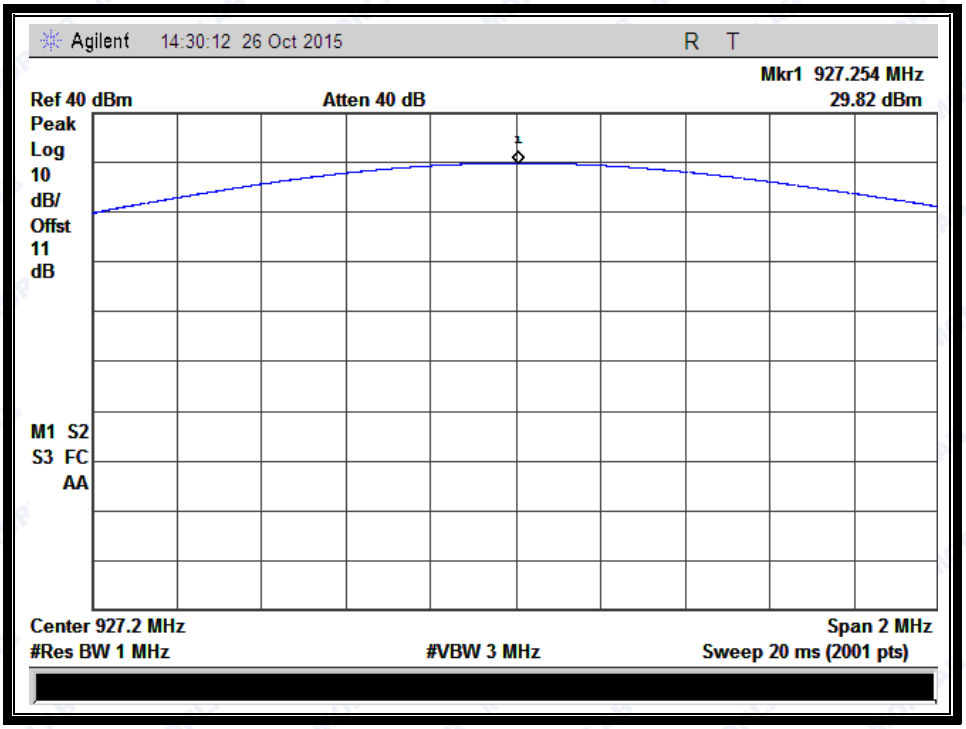
(Plot F: Profile 2 Channel = 50)



(Plot G: Profile 4 Channel = 1)



(Plot H: Profile 4 Channel = 26)



(Plot I: Profile 4 Channel = 50)

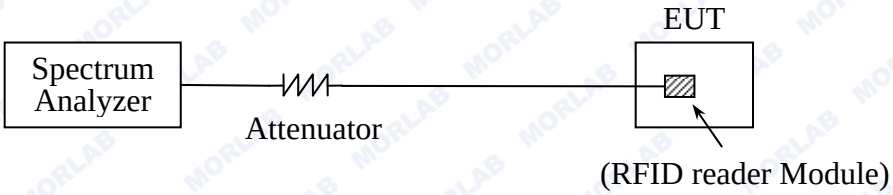
2.4 20dB Bandwidth

2.4.1 Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1% = 20dB) taking the total RF output power.

2.4.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

2.4.3 Test Procedure

Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 20 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

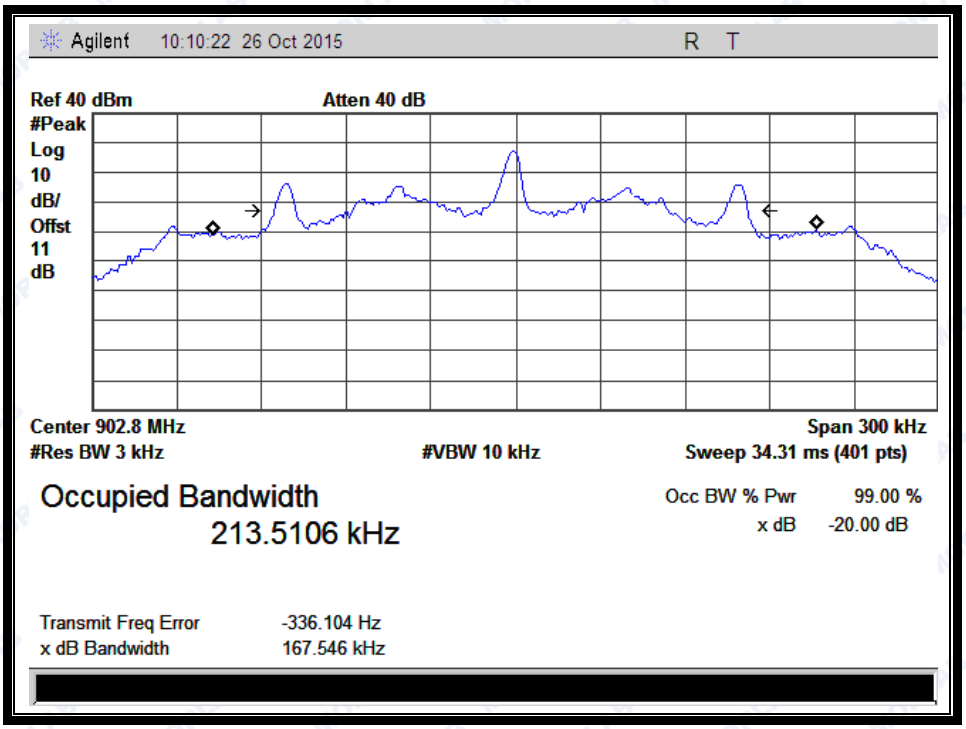
2.4.4 Test Result

The RFID Reader Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

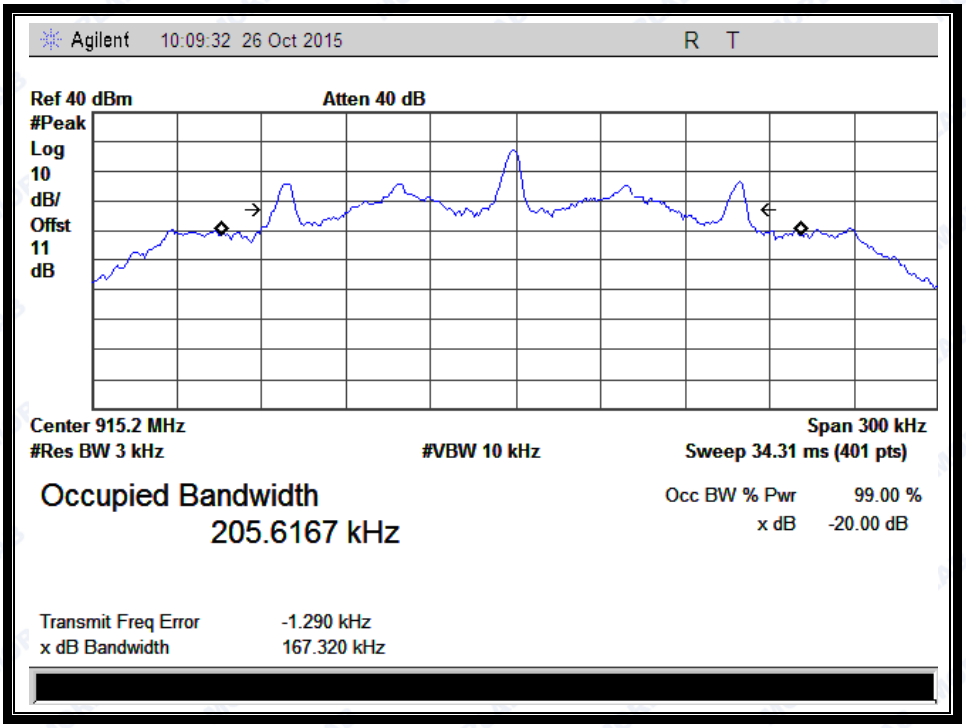
A. Test Verdict:

Profile	Channel	Frequency (MHz)	20dB Bandwidth (KHz)	Refer to Plot
0	1	902.75	167.546	Plot A
	26	915.25	167.320	Plot B
	50	927.25	168.107	Plot C
2	1	902.75	86.054	Plot D
	26	915.25	84.714	Plot E
	50	927.25	85.077	Plot F
4	1	902.75	431.789	Plot G
	26	915.25	429.849	Plot H
	50	927.25	430.172	Plot I

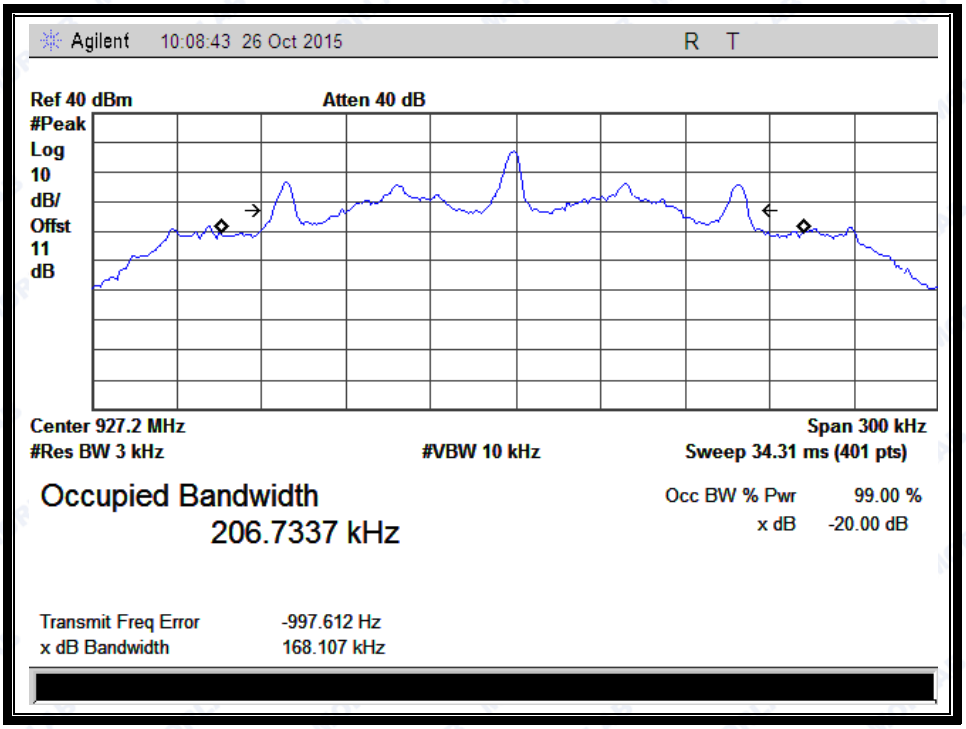
B. Test Plots:



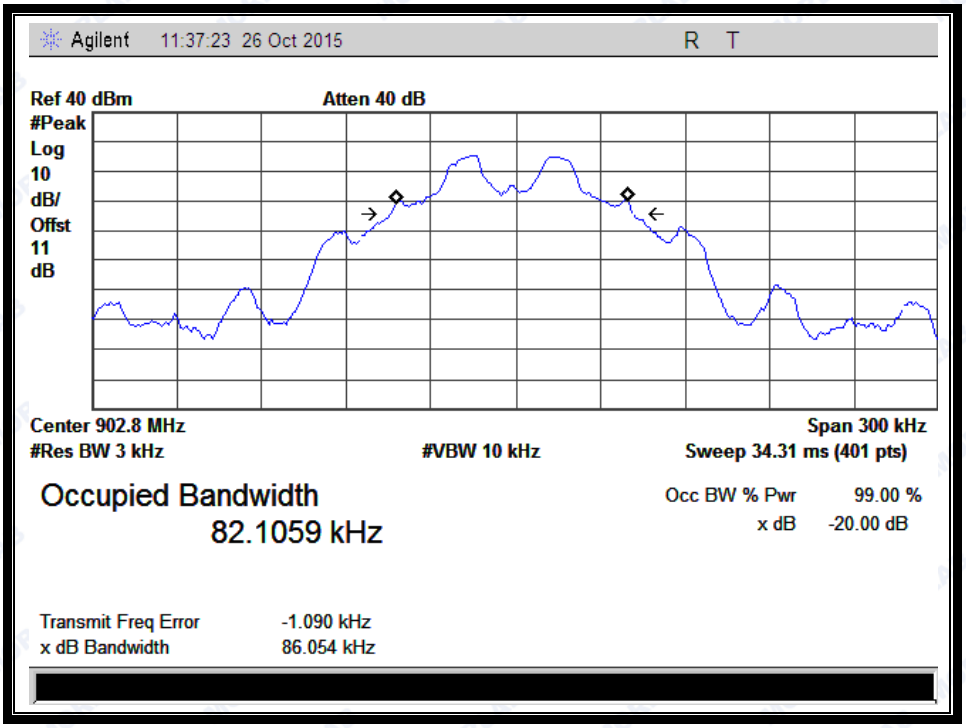
(Plot A: Profile 0 Channel = 1)



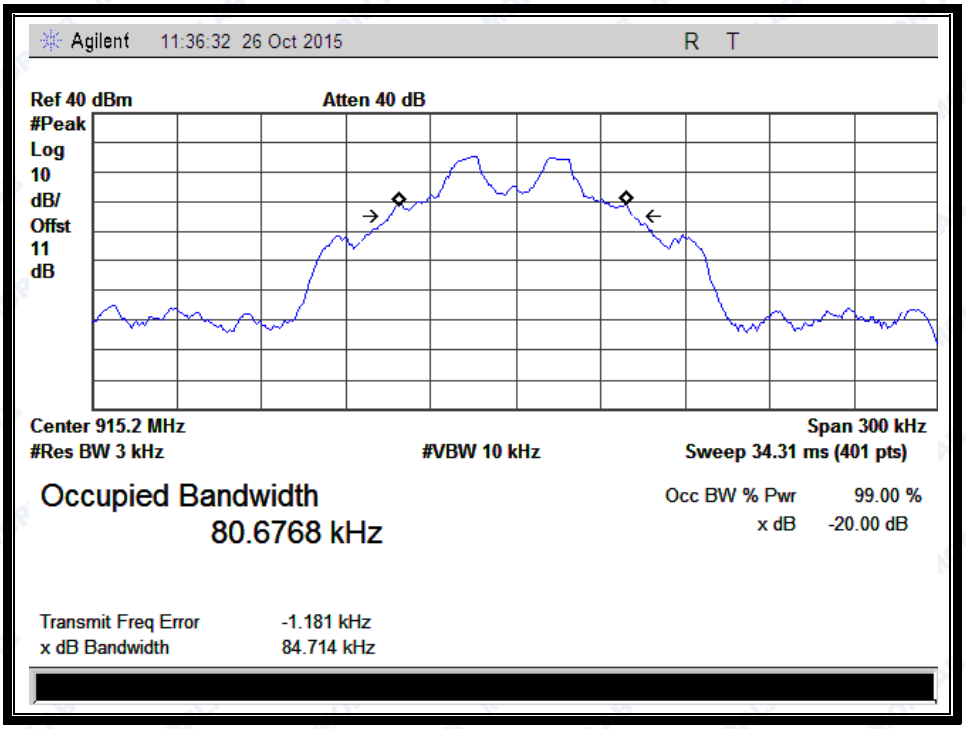
(Plot B: Profile 0 Channel = 26)



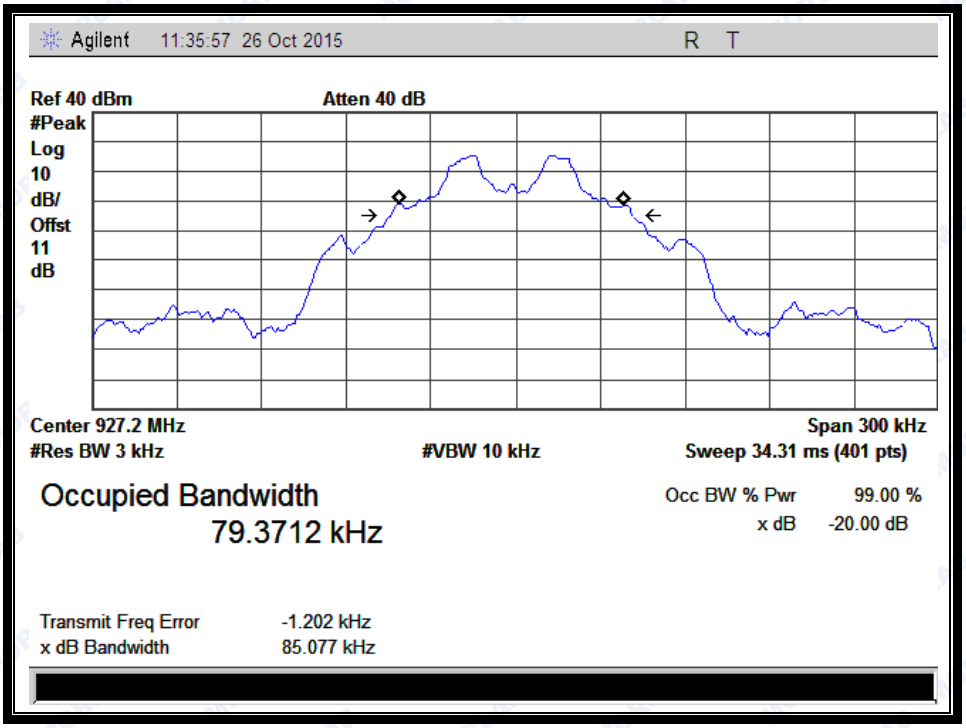
(Plot C: Profile 0 Channel = 50)



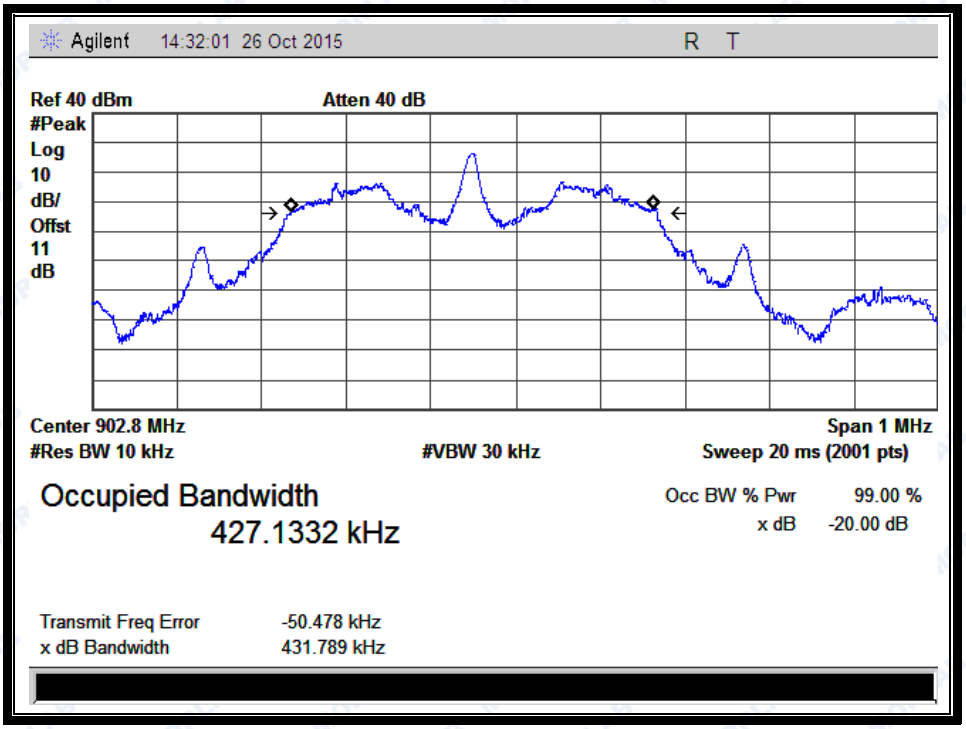
(Plot D: Profile 2 Channel = 1)



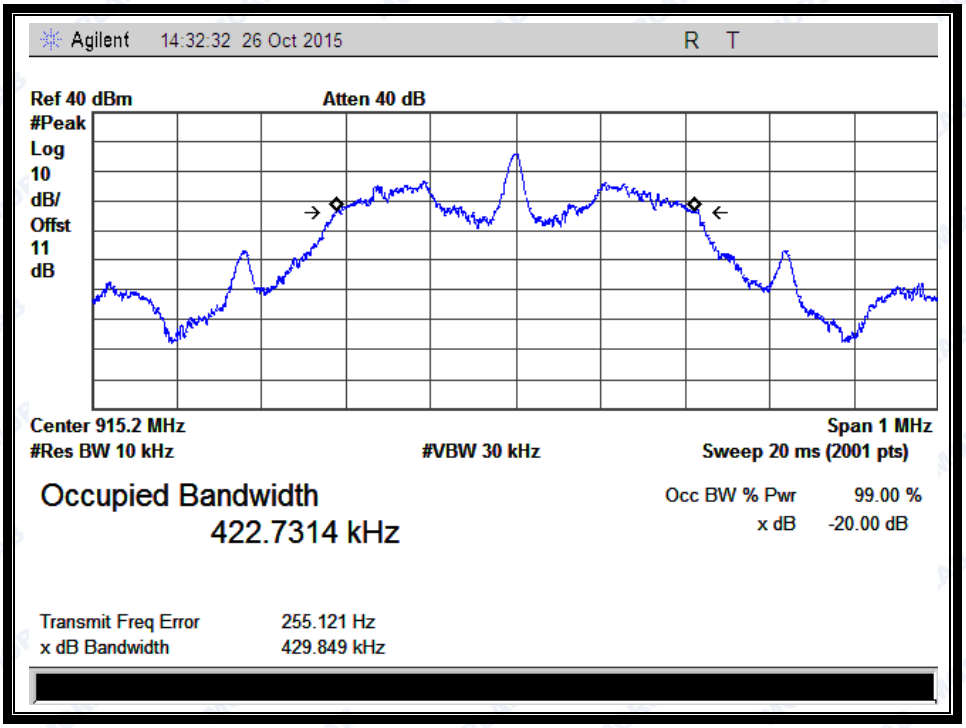
(Plot E: Profile 2 Channel = 26)



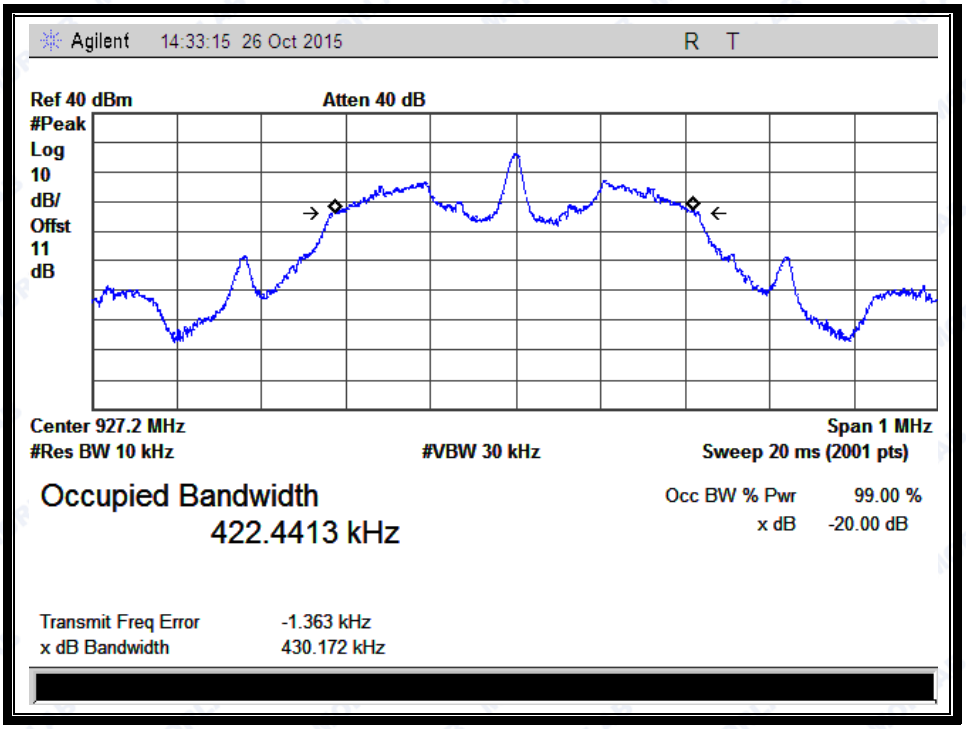
(Plot F: Profile 2 Channel = 50)



(Plot G: Profile 4 Channel = 1)



(Plot H: Profile 4 Channel = 26)



(Plot I: Profile 4 Channel = 50)

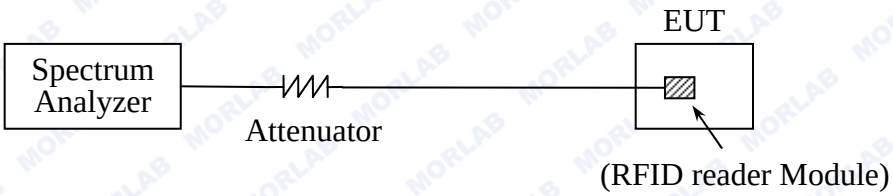
2.5 Carried Frequency Separation

2.5.1 Definition

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

2.5.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

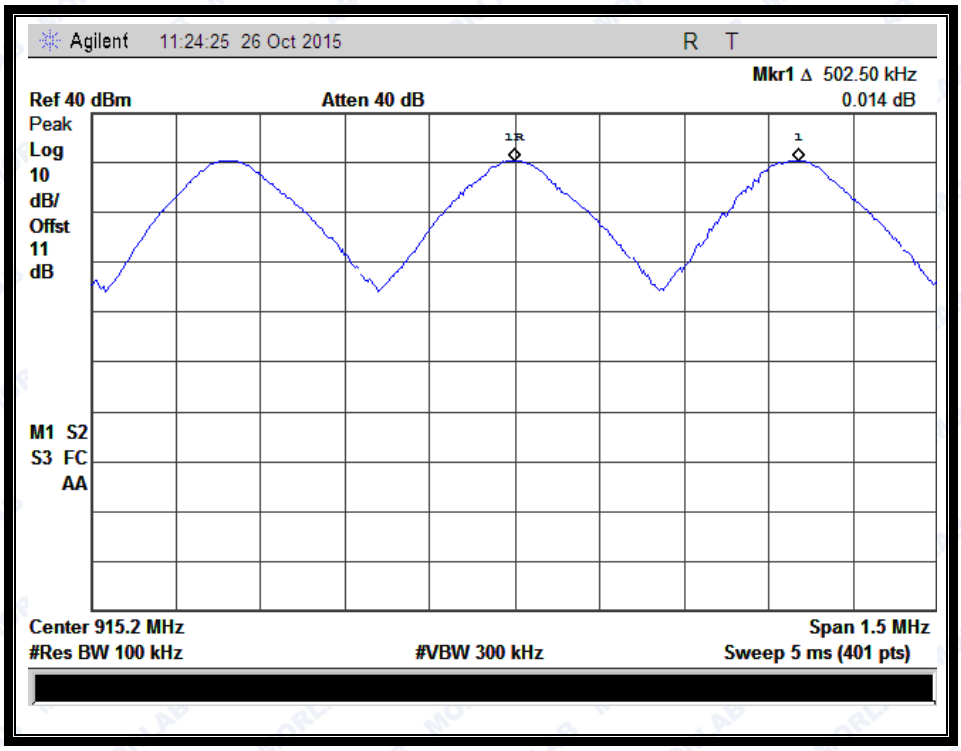
2.5.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

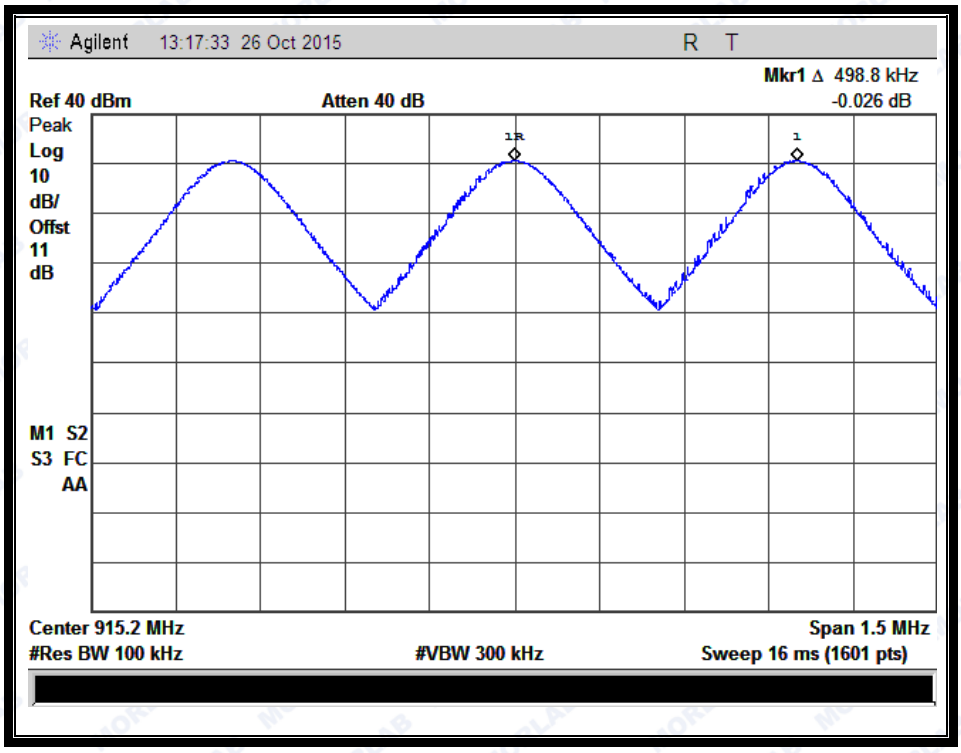
2.5.4 Test Result

The RFID Reader Module of the EUT operates at hopping-on test mode.

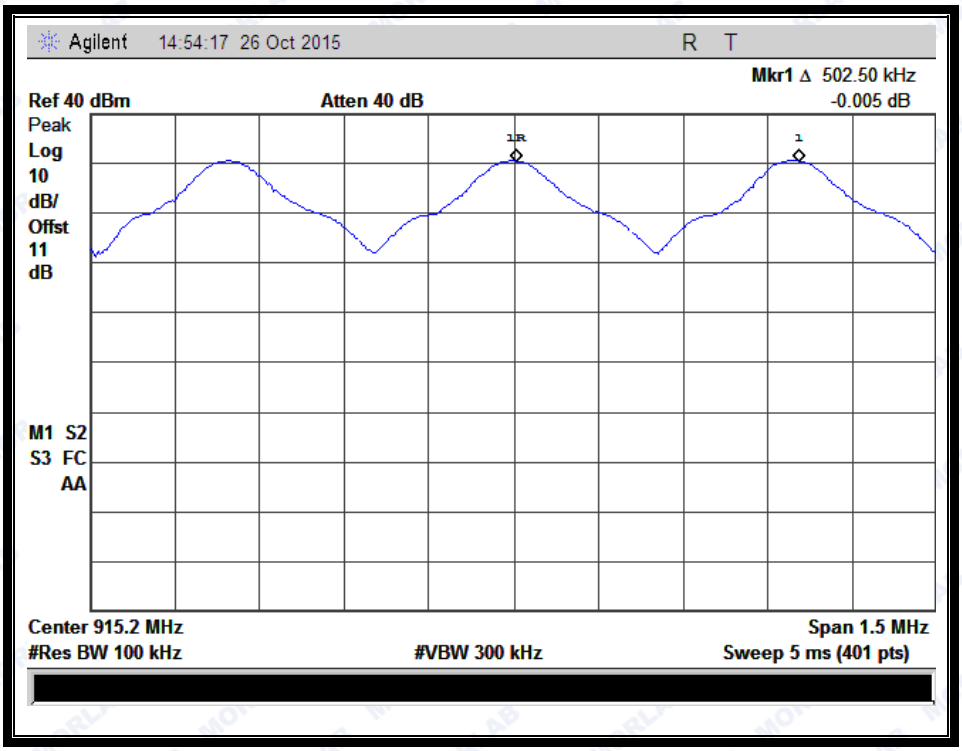
For any adjacent channels (e.g. the channel 26 and 27 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater. So, the verdict is PASSING



(Plot A: Profile 0 Carried Frequency Separation)



(Plot B: Profile 2 Carried Frequency Separation)



(Plot C: Profile 4 Carried Frequency Separation)

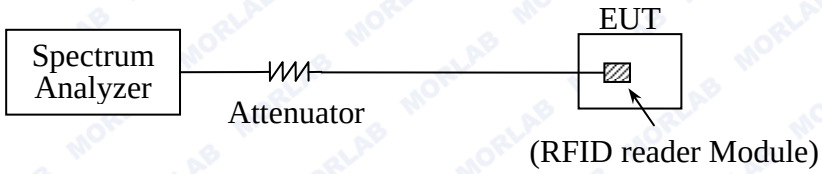
2.6 Time of Occupancy (Dwell time)

2.6.1 Requirement

According to FCC section 15.247(a)(1)(i), frequency hopping systems in the 902 - 928MHz band 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.

2.6.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

2.6.3 Test Procedure

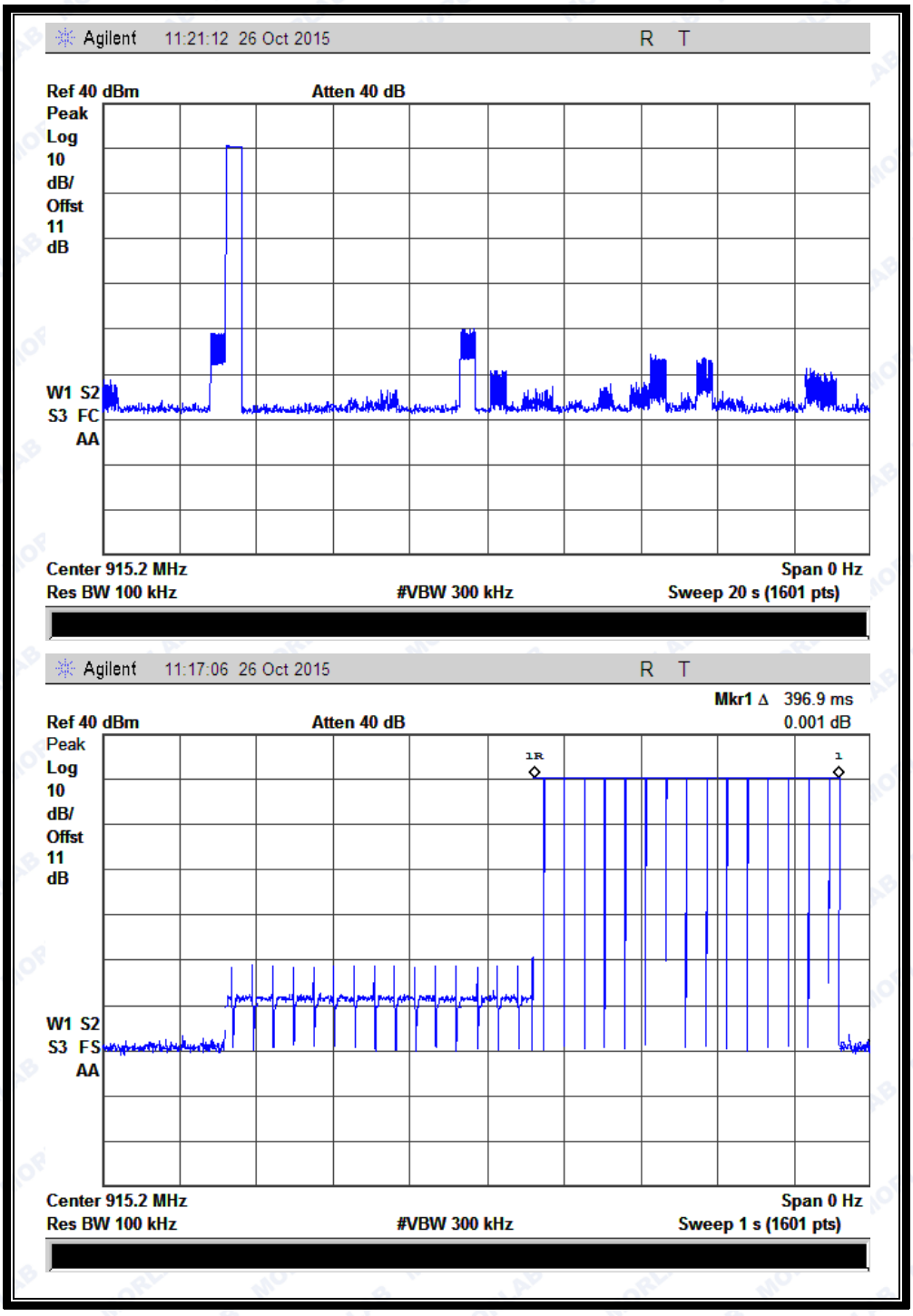
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 10/20 second scan, to enable resolution of each occurrence. The average time of occupancy in the specified 10/20 second period is equal to (# of pulses in 10/20s) * pulse width.

2.6.4 Test Result

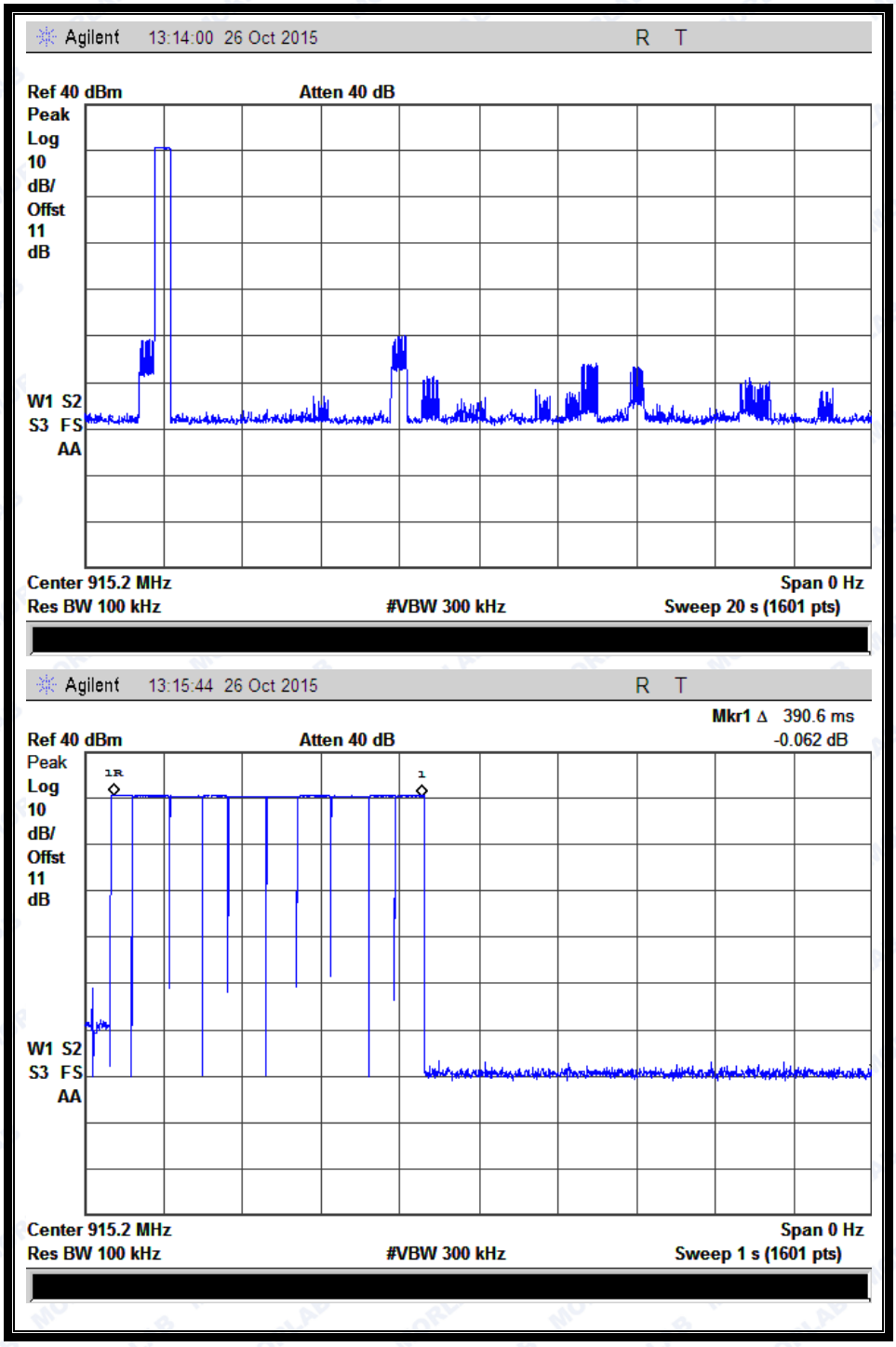
A. Test Verdict:

Profile	Pulse Width (msec)	Number of pulse in 10/20 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
0	396.9	1/20	Plot A	0.3969	0.4	PASS
2	390.6	1/20	Plot B	0.3906		PASS
4	394.4	1/10	Plot C	0.3944		PASS

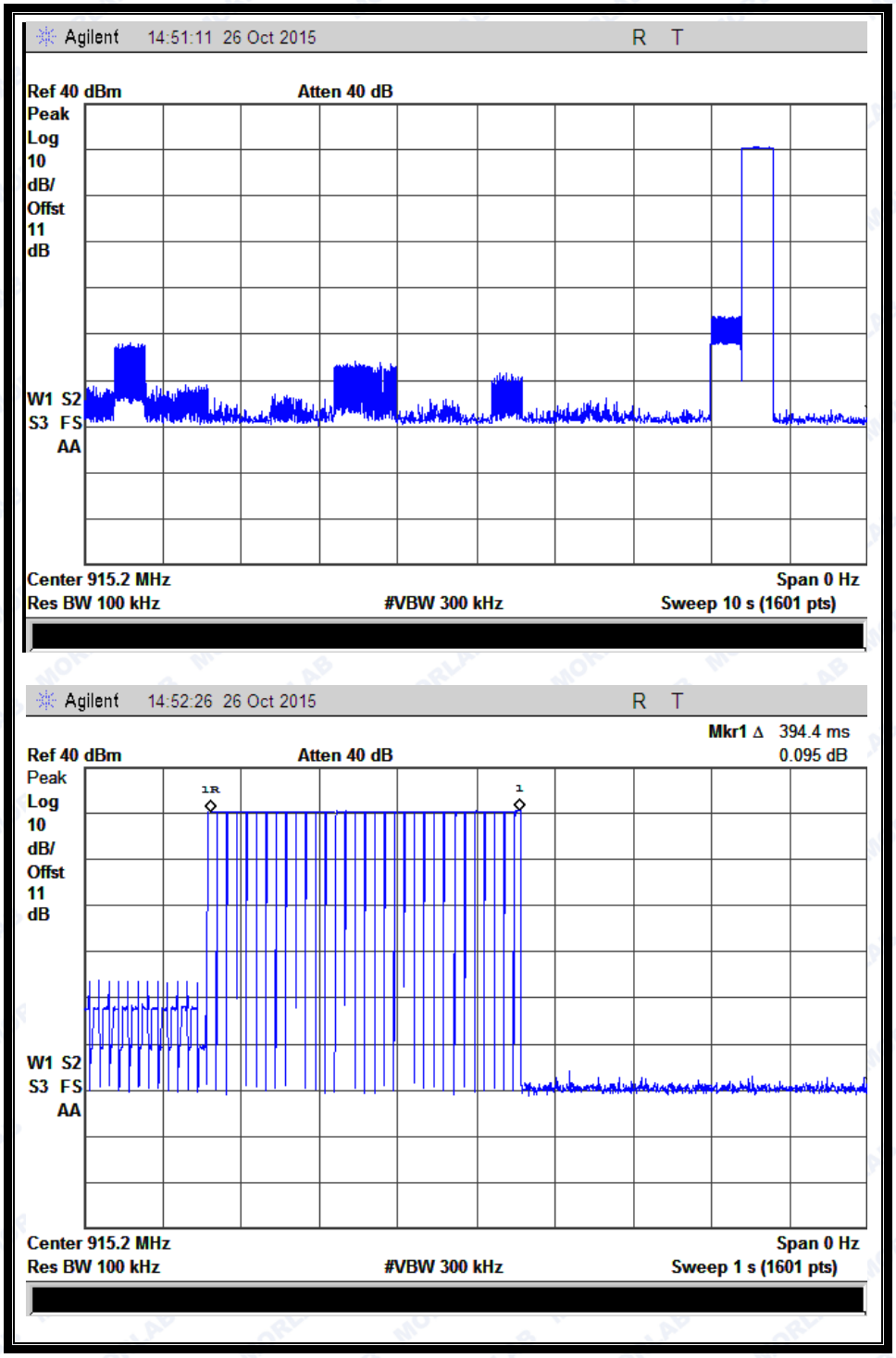
B. Test Plots:



(Plot A: Profile 0)



(Plot B: Profile 2)



(Plot C: Profile 4)

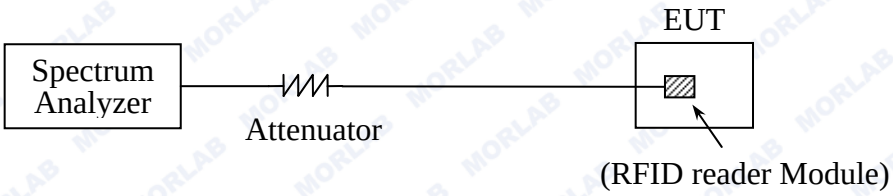
2.7 Conducted Spurious Emissions and Band Edge

2.7.1 Requirement

According to FCC §15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.7.2 Test Description

A. Test Setup:



The RFID Reader Module of the EUT, which is powered by the AC adapter, is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

B. Equipments List:

Please reference ANNEX A(1.4).

2.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.7.4 Test Result

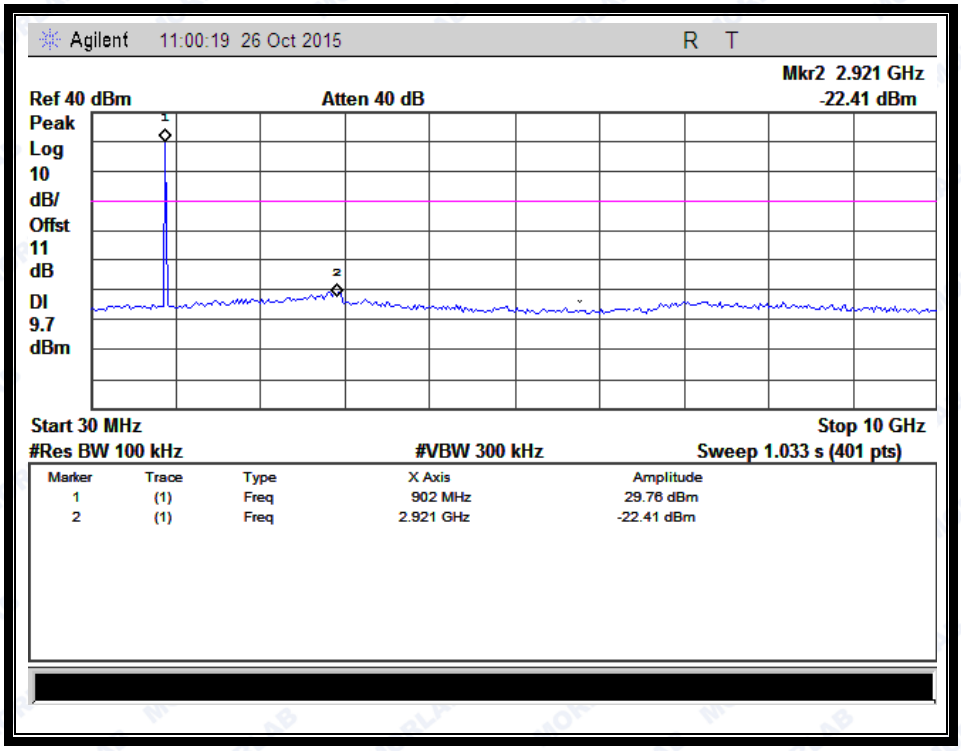
The RFID Reader Module of the EUT operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

A. Test Verdict:

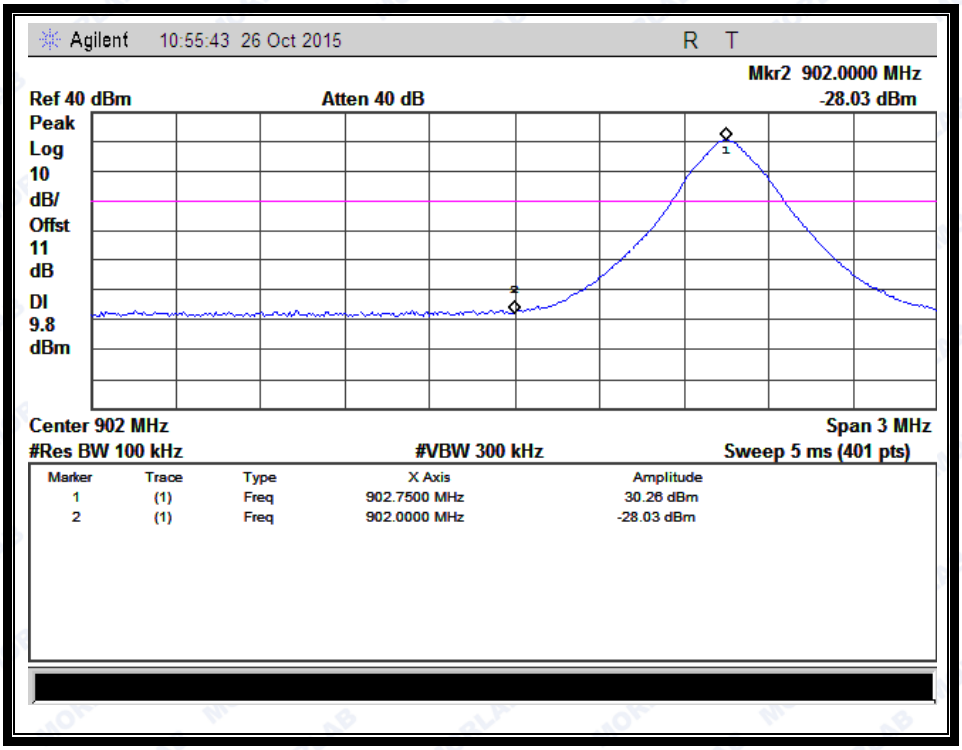
Profile	Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Plot	Limit (dBm)		Verdict
					Carrier Level	Calculated -20dBc Limit	
0	1	902.75	-22.41	Plot A	29.76	9.76	PASS
	26	915.25	-22.35	Plot B	29.58	9.58	PASS
	50	927.25	-21.27	Plot C	29.66	9.66	PASS
2	1	902.75	-22.61	Plot D	29.8	9.8	PASS
	26	915.25	-24.72	Plot E	29.18	9.18	PASS
	50	927.25	-23.53	Plot F	29.81	9.81	PASS
4	1	902.75	-22.08	Plot G	27.72	7.72	PASS
	26	915.25	-22.48	Plot H	27.54	7.54	PASS
	50	927.25	-22.27	Plot I	27.59	7.59	PASS

B. Test Plots:

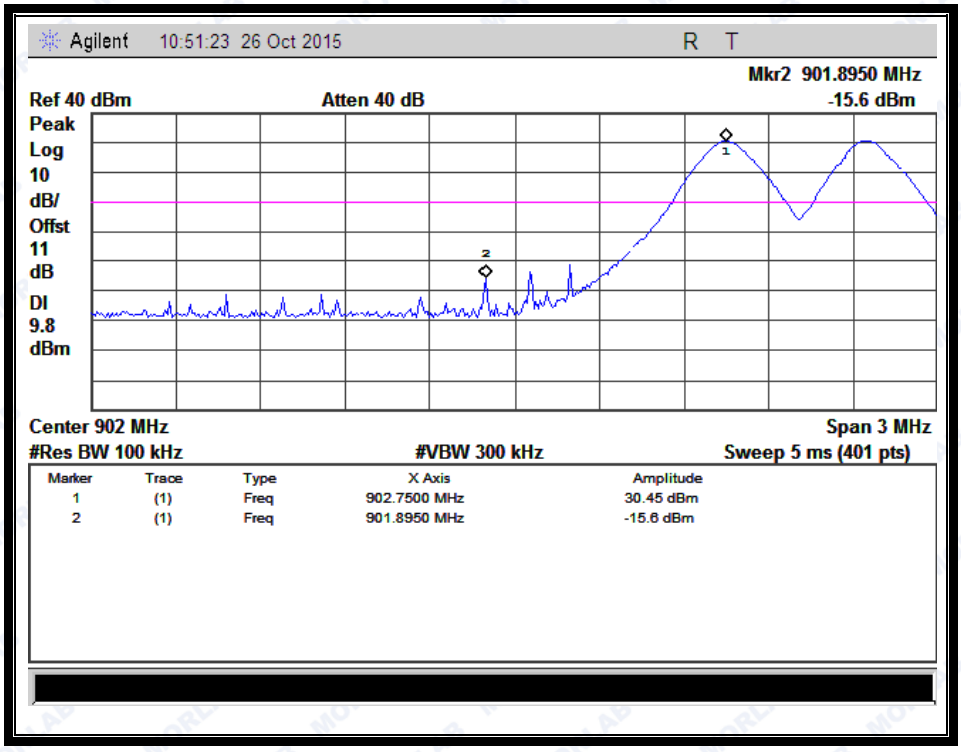
Note: the power of the Module transmitting frequency should be ignored.



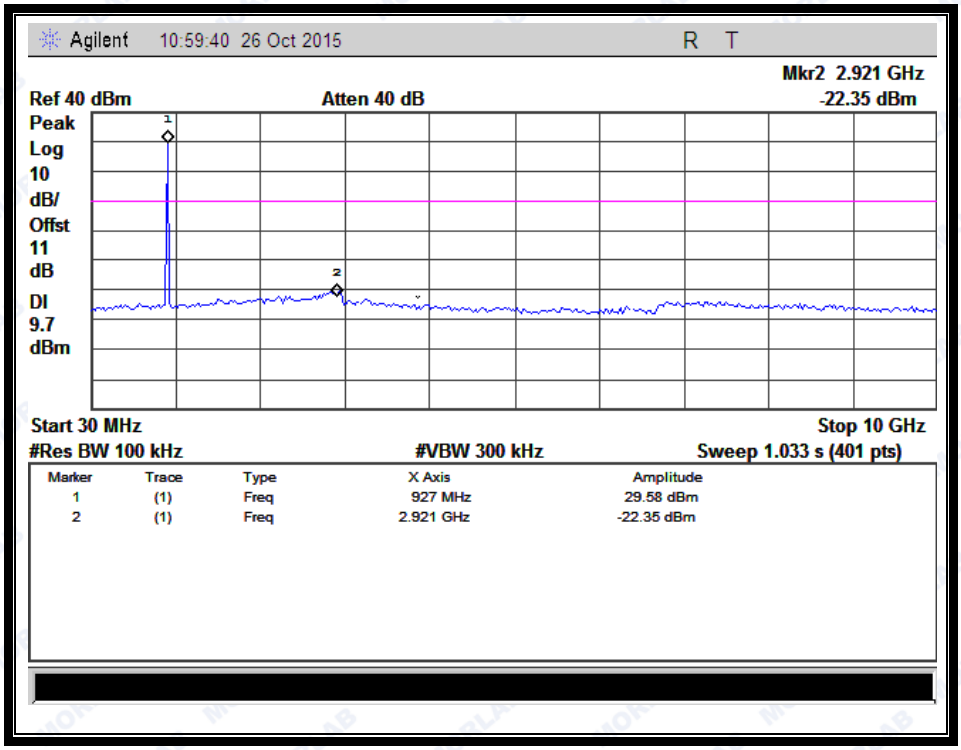
(Plot A.1: Channel = 1, 30MHz to 10GHz @ Profile 0)



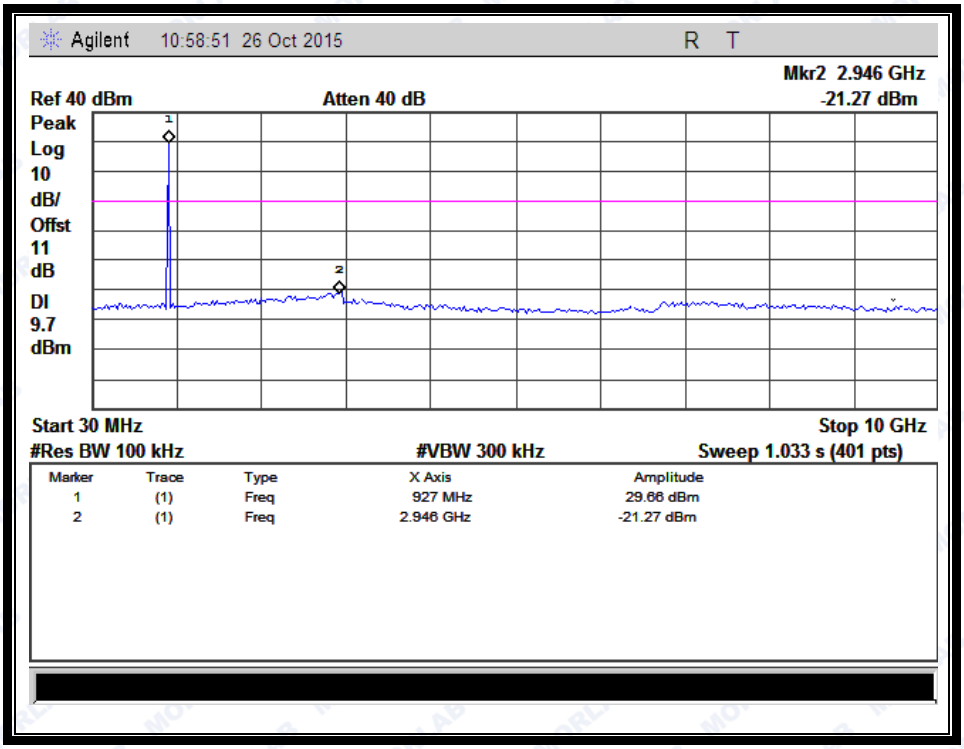
(Channel = 1, Band edge @ Profile 0)



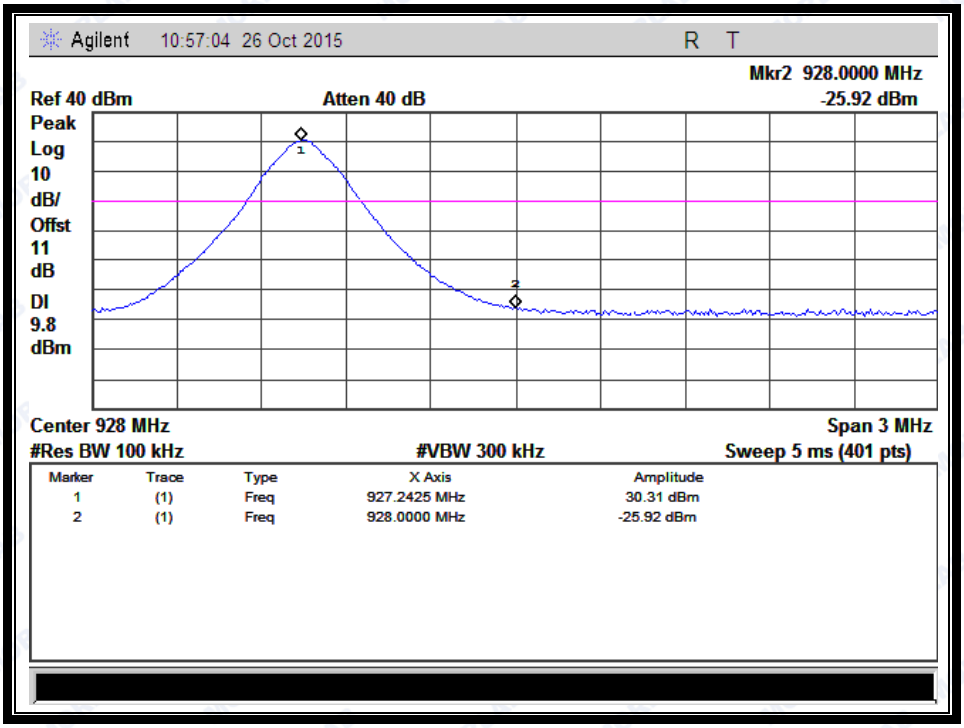
(Channel = 1, Band edge with hopping on Profile 0)



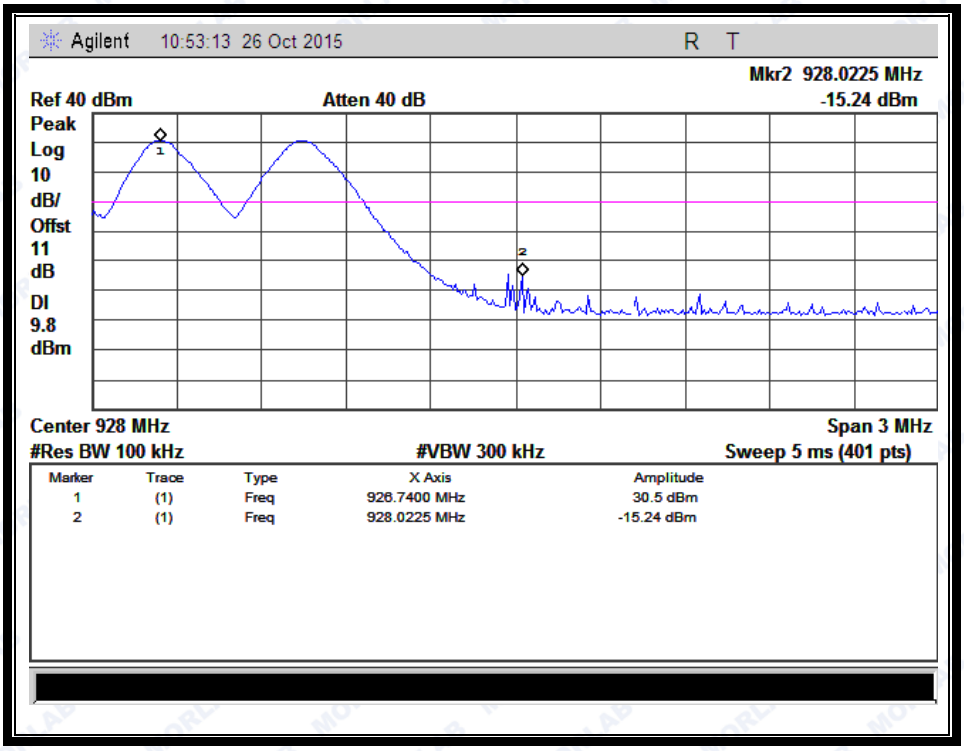
(Plot B.1: Channel = 26, 30MHz to 10GHz @ Profile 0)



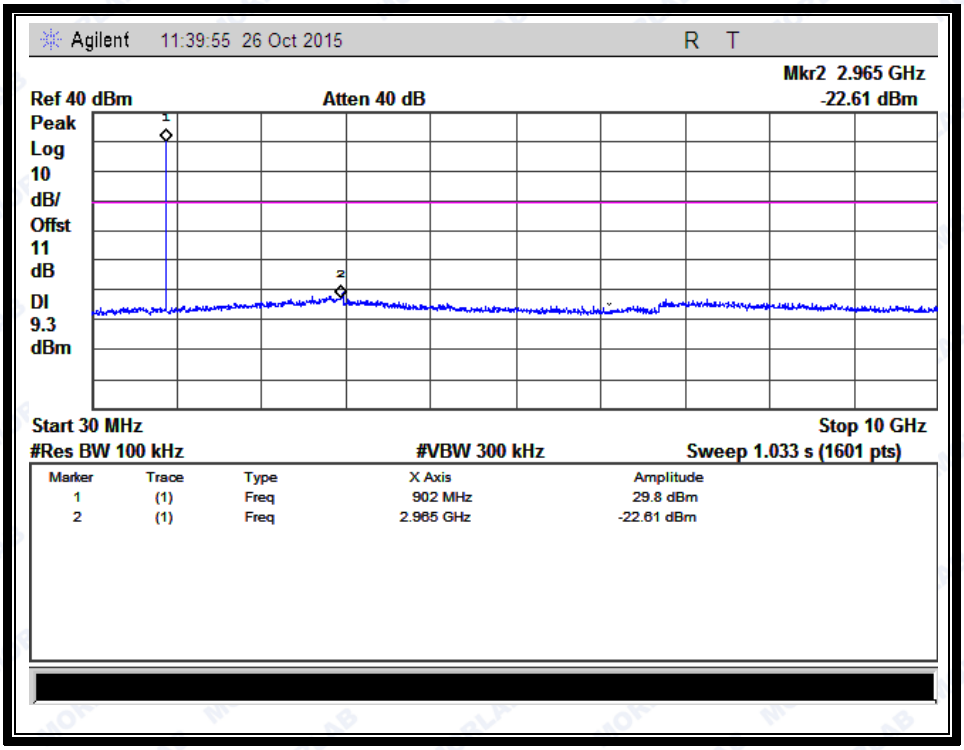
(Plot C.1: Channel = 50, 30MHz to 10GHz @ Profile 0)



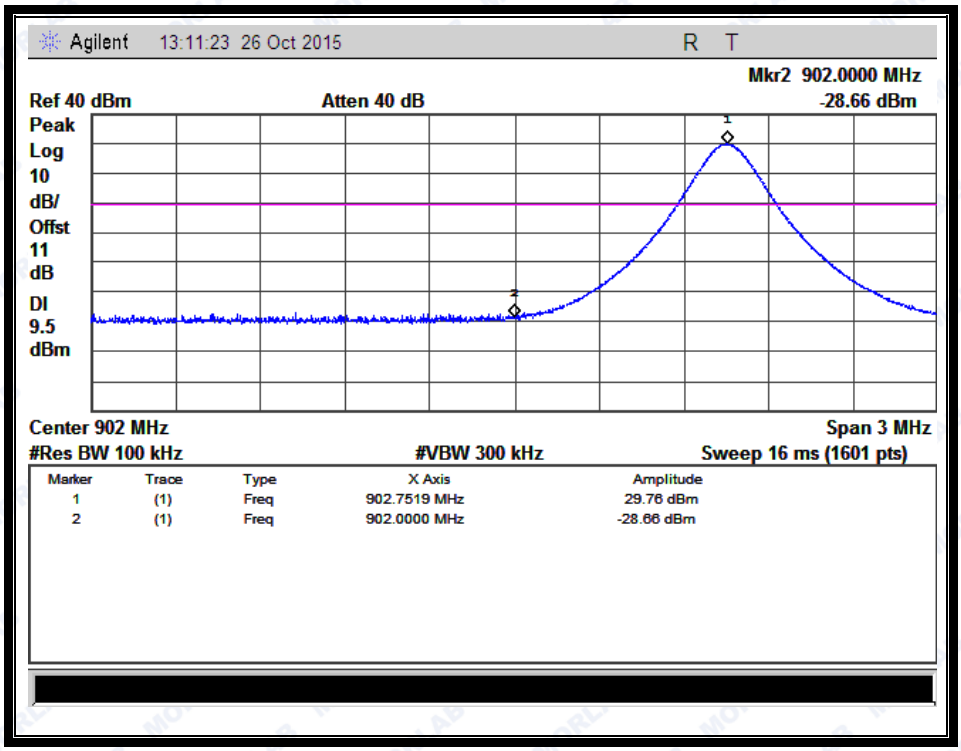
(Channel = 50, Band edge @ Profile 0)



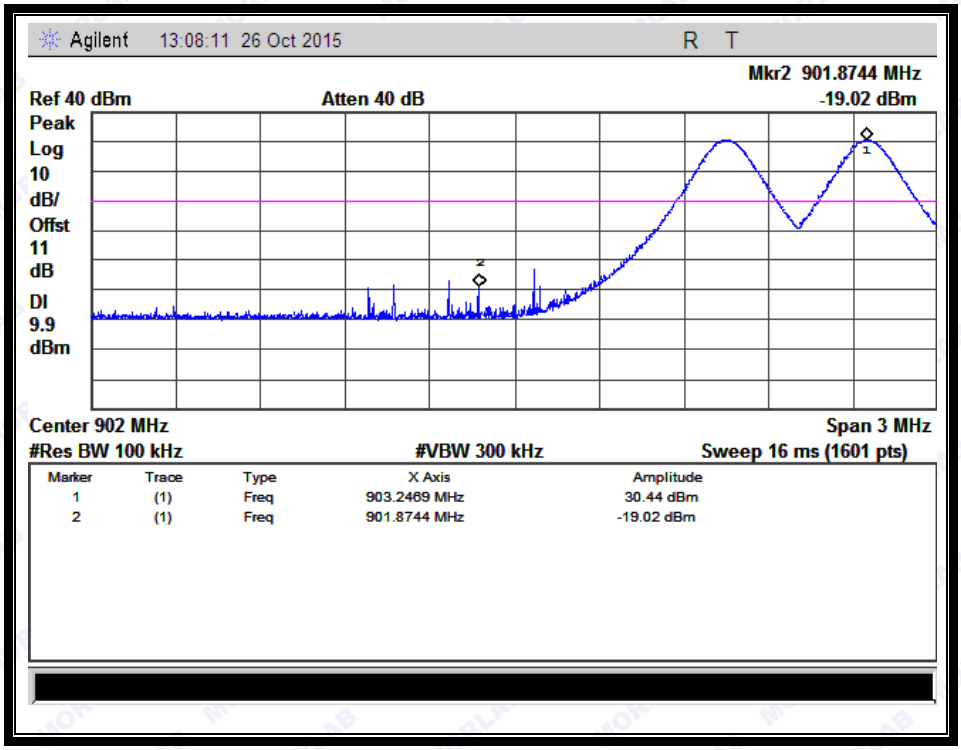
(Channel = 50, Band edge with hopping on @ Profile 0)



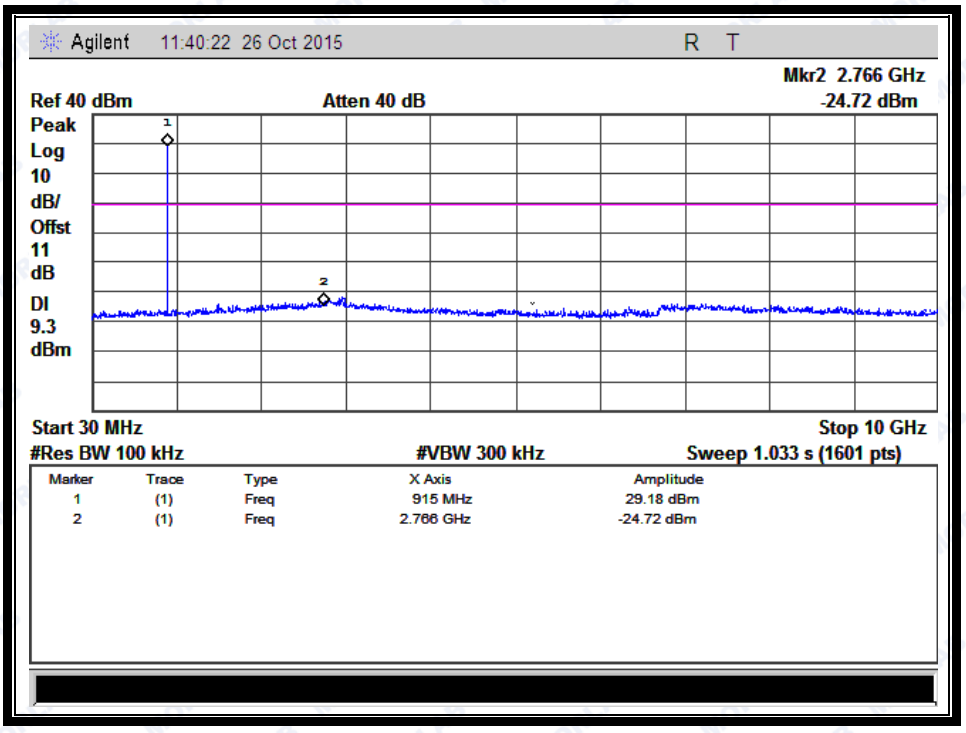
(Plot D.1: Channel = 1, 30MHz to 10GHz @ Profile 2)



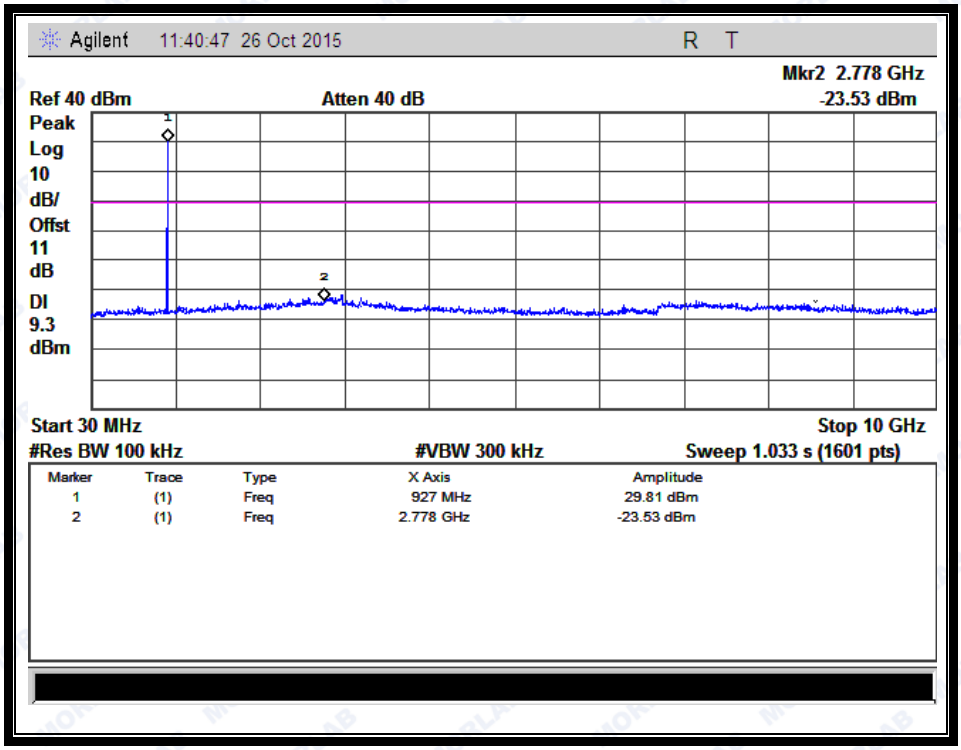
(Channel = 1, Band edge @ Profile 2)



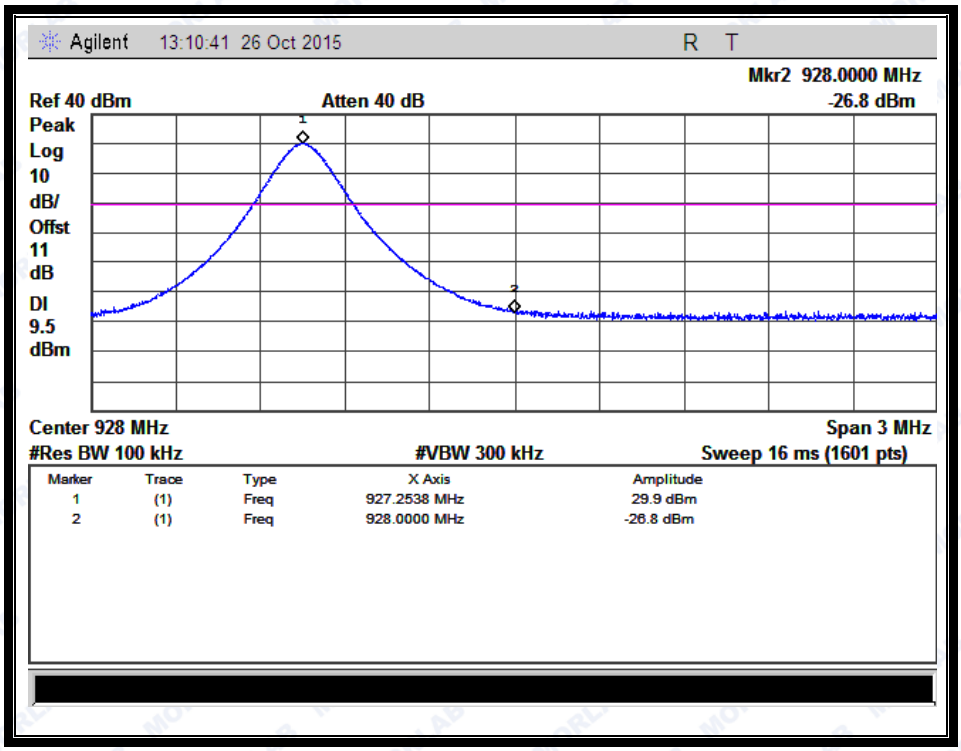
(Channel = 1, Band edge with hopping on @ Profile 2)



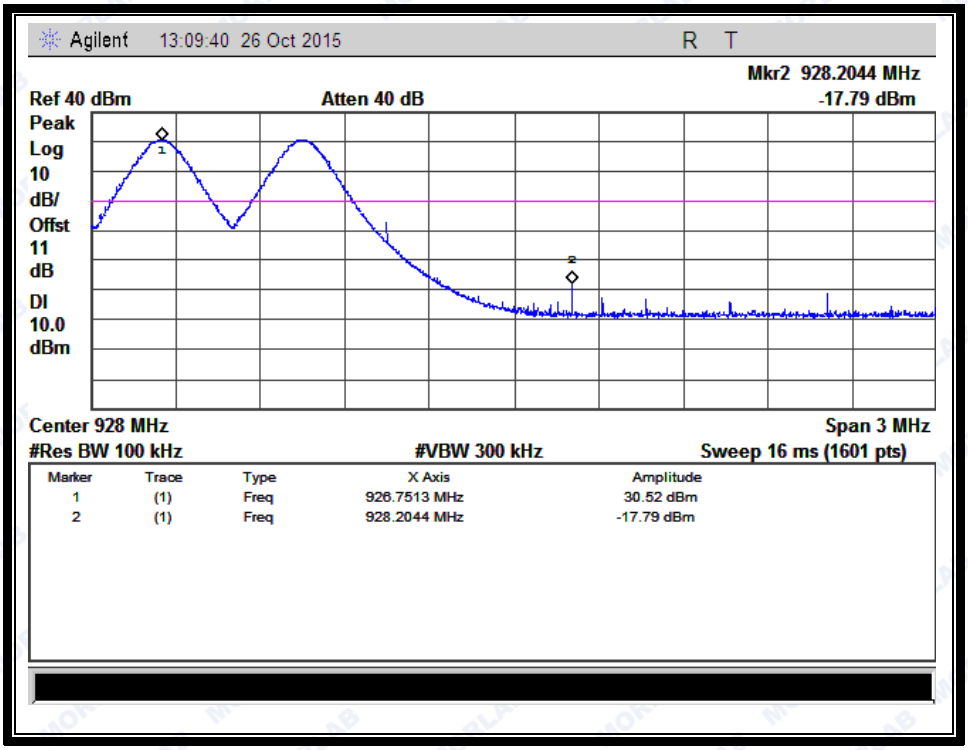
(Plot E.1: Channel = 26, 30MHz to 10GHz @ Profile 2)



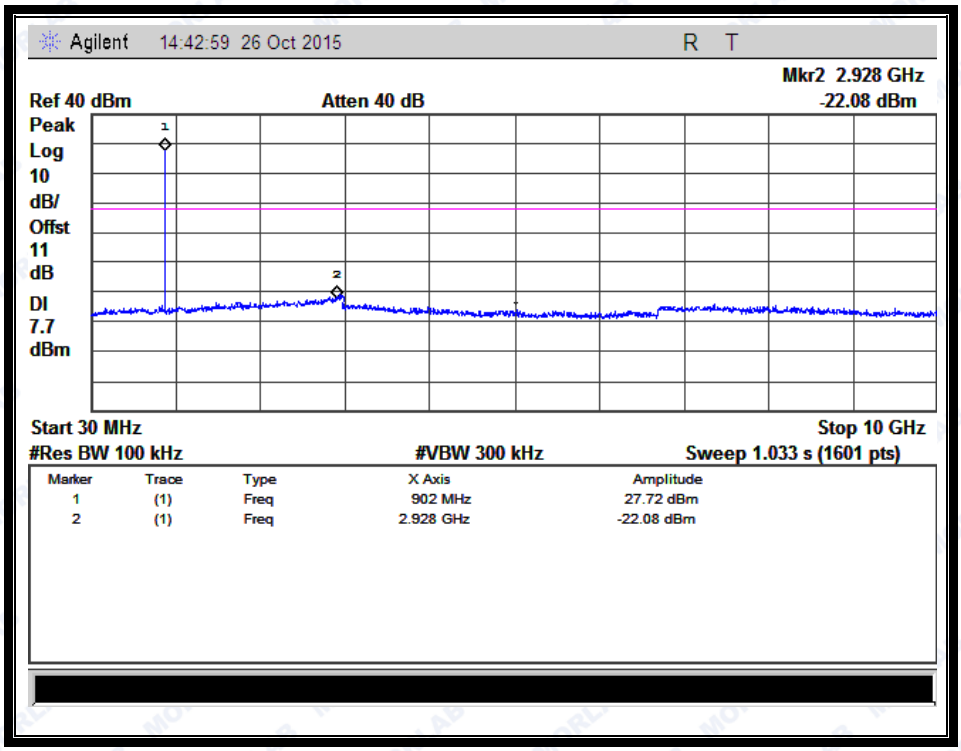
(Plot F.1: Channel = 50, 30MHz to 10GHz @ Profile 2)



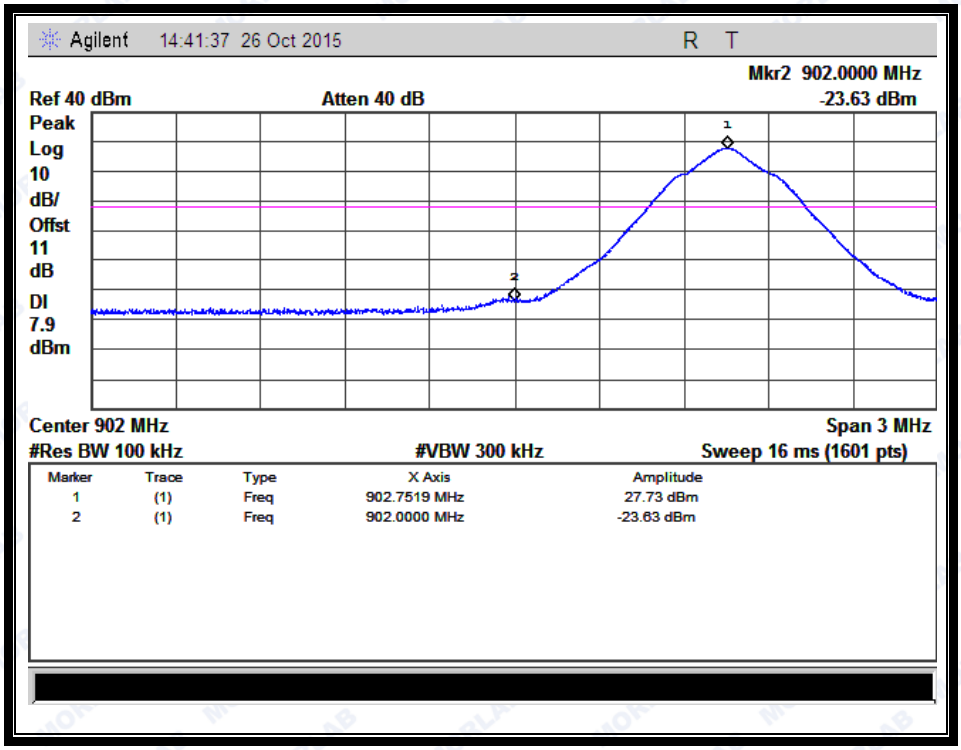
(Channel = 50, Band edge @ Profile 2)



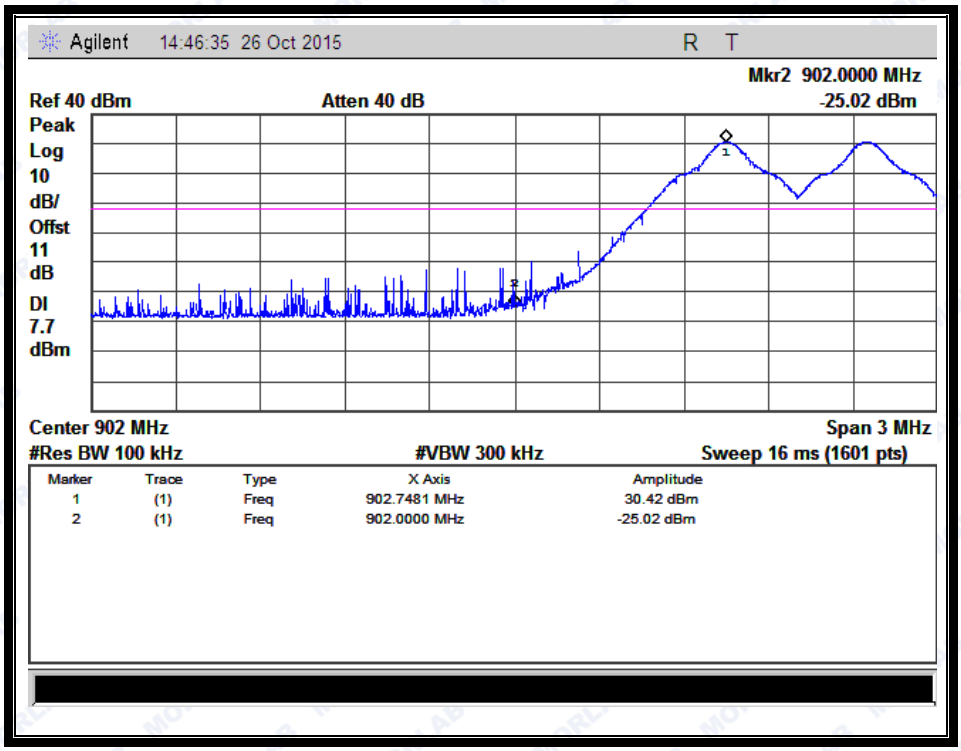
(Channel = 50, Band edge with hopping on @ Profile 2)



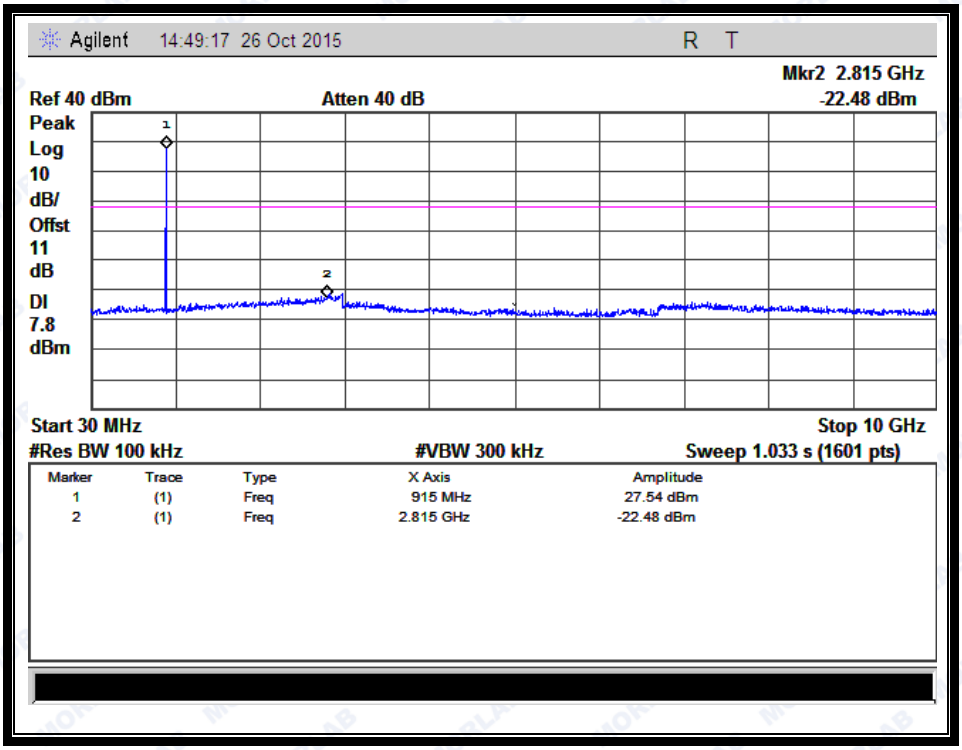
(Plot G.1: Channel = 1, 30MHz to 10GHz @ Profile 4)



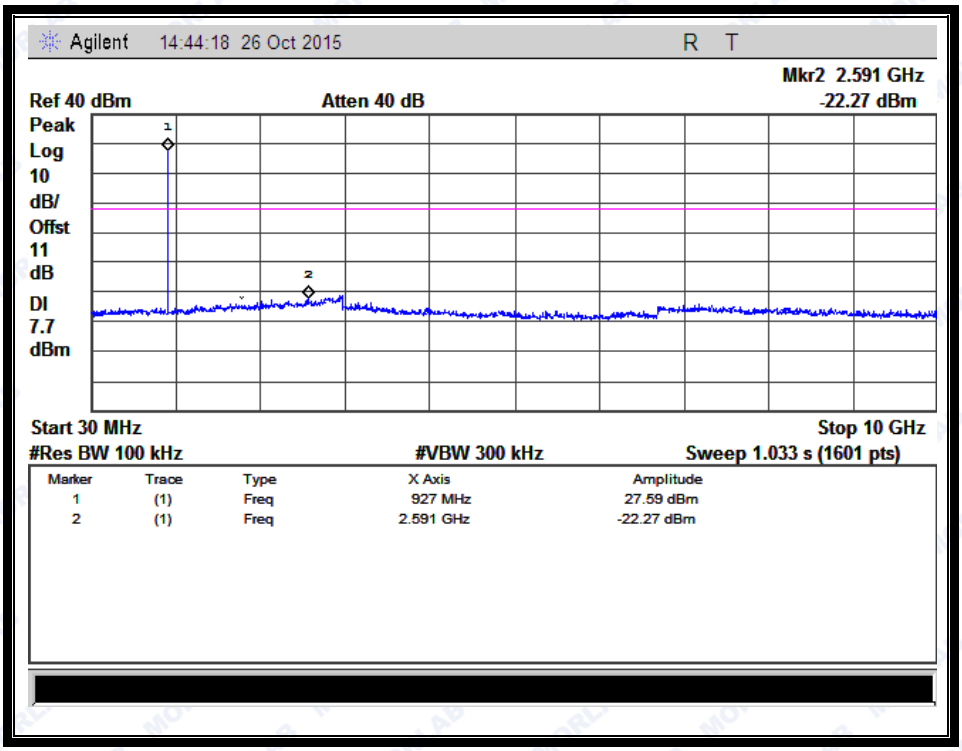
(Channel = 1, Band edge @ Profile 4)



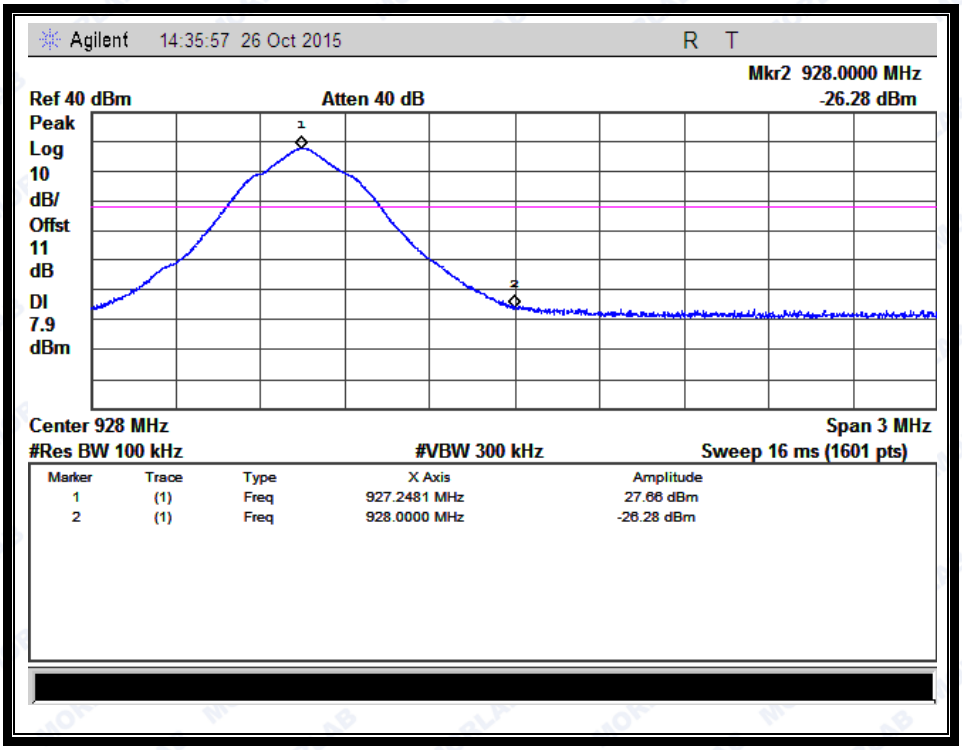
(Channel = 1, Band edge with hopping on @ Profile 4)



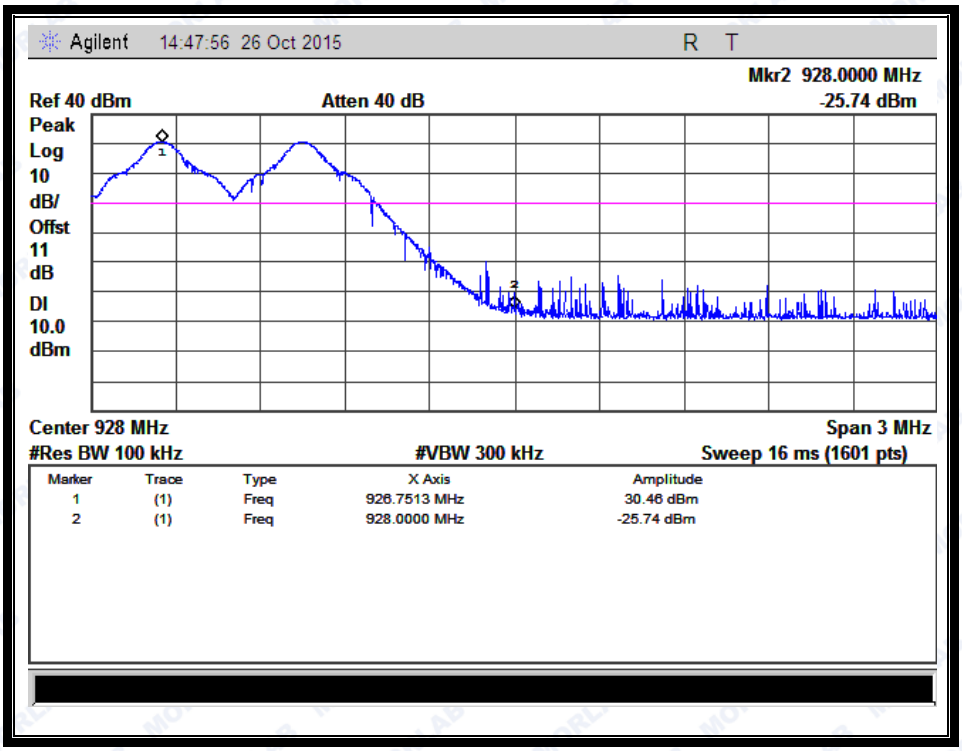
(Plot H.1: Channel = 26, 30MHz to 10GHz @ Profile 4)



(Plot I.1:Channel = 50, 30MHz to 10GHz @ Profile 4)



(Plot I.1: Channel = 50, Band edge @ Profile 4)



(Plot I.1: Channel = 50, Band edge with hopping on @ Profile 4)

2.8 Conducted Emission

2.8.1 Requirement

According to FCC section 15.207, 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

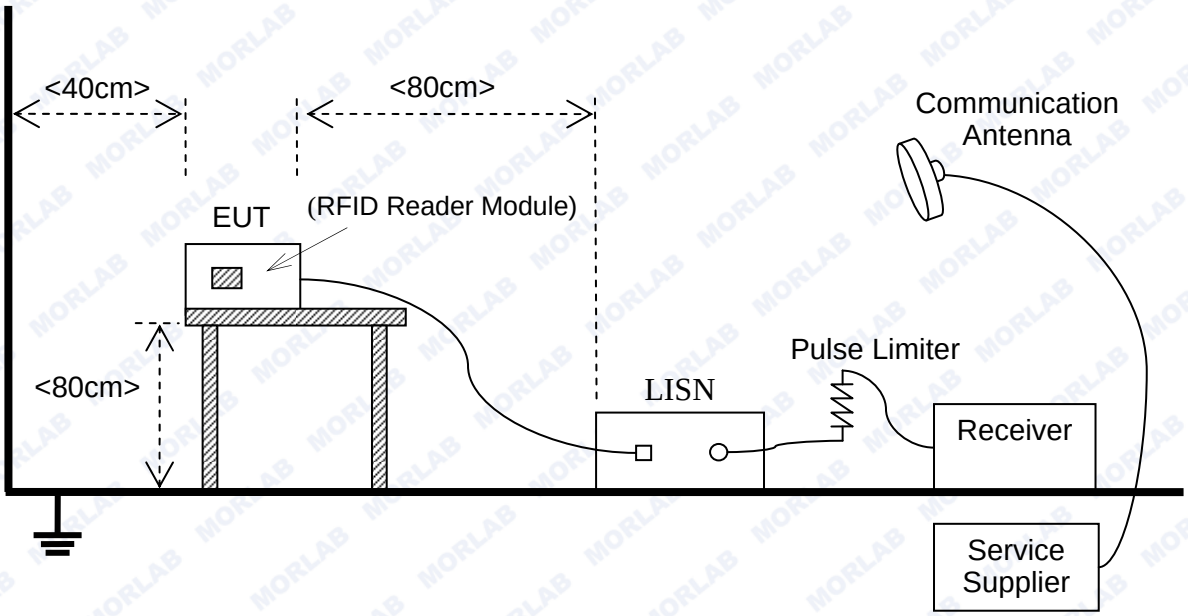
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.8.2 Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The RFID Reader is powered by the AC adapter.

B. Equipments List:

Please reference ANNEX A(1.4).

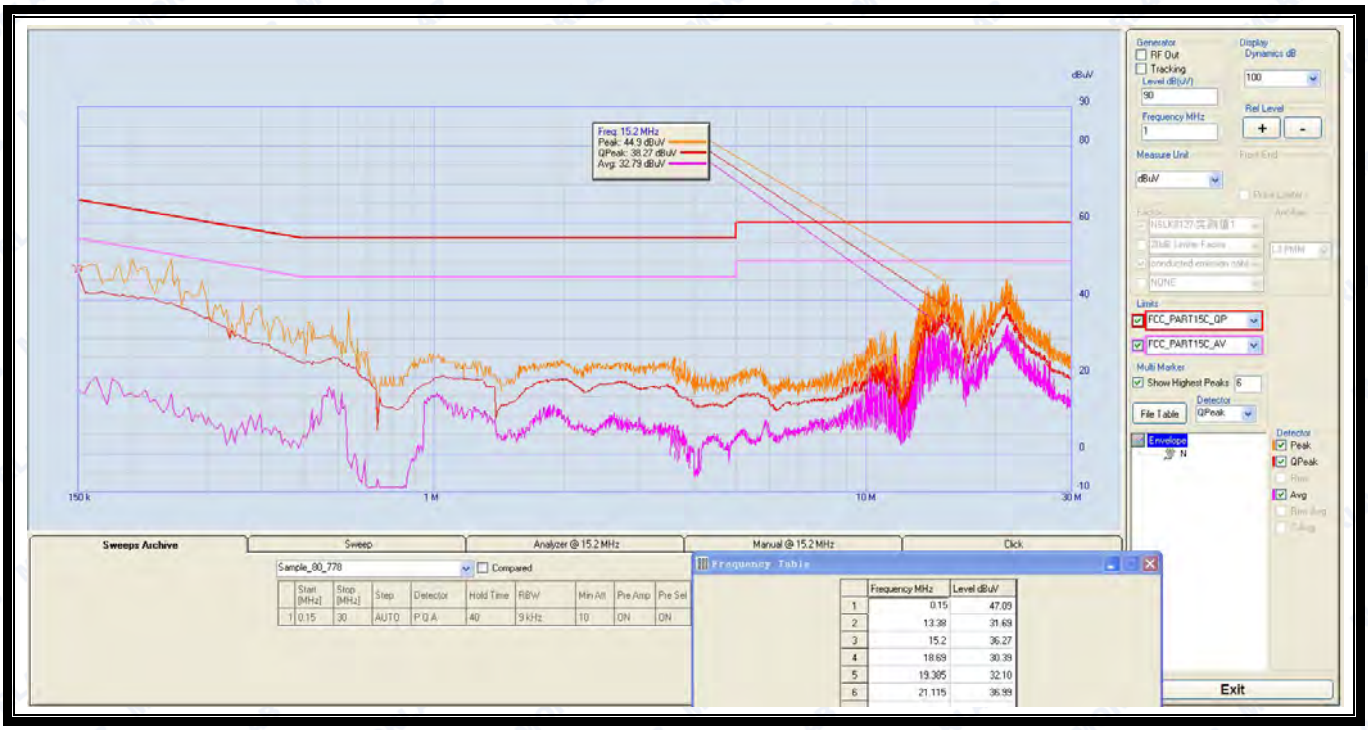
2.8.3 Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

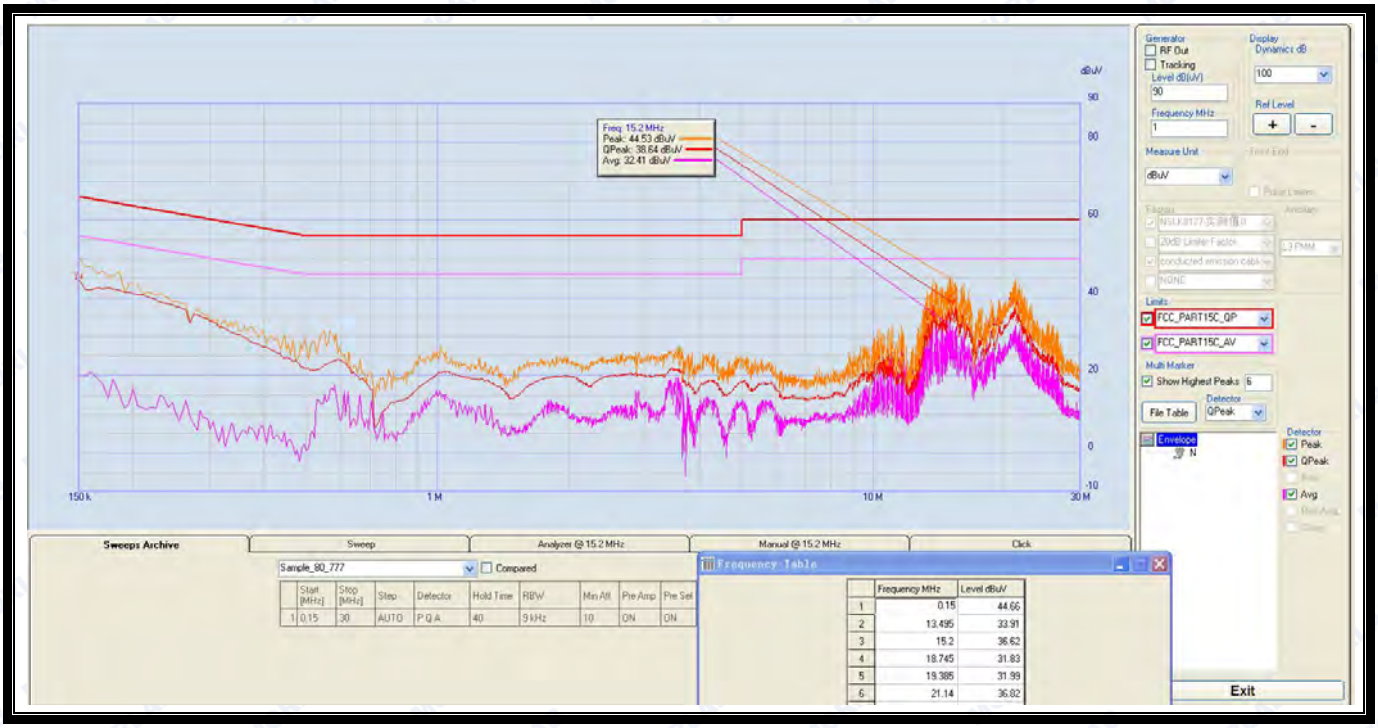
A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

2.9 Radiated Emission

2.9.1 Requirement

According to FCC section 15.247(d) and RSS-A8.5, radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

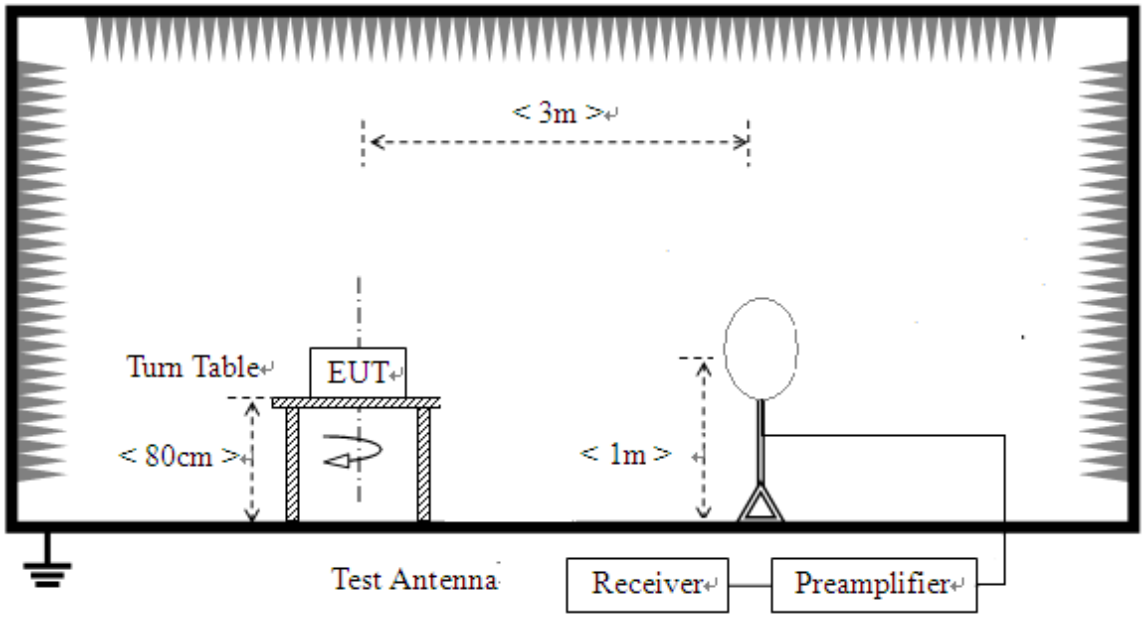
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

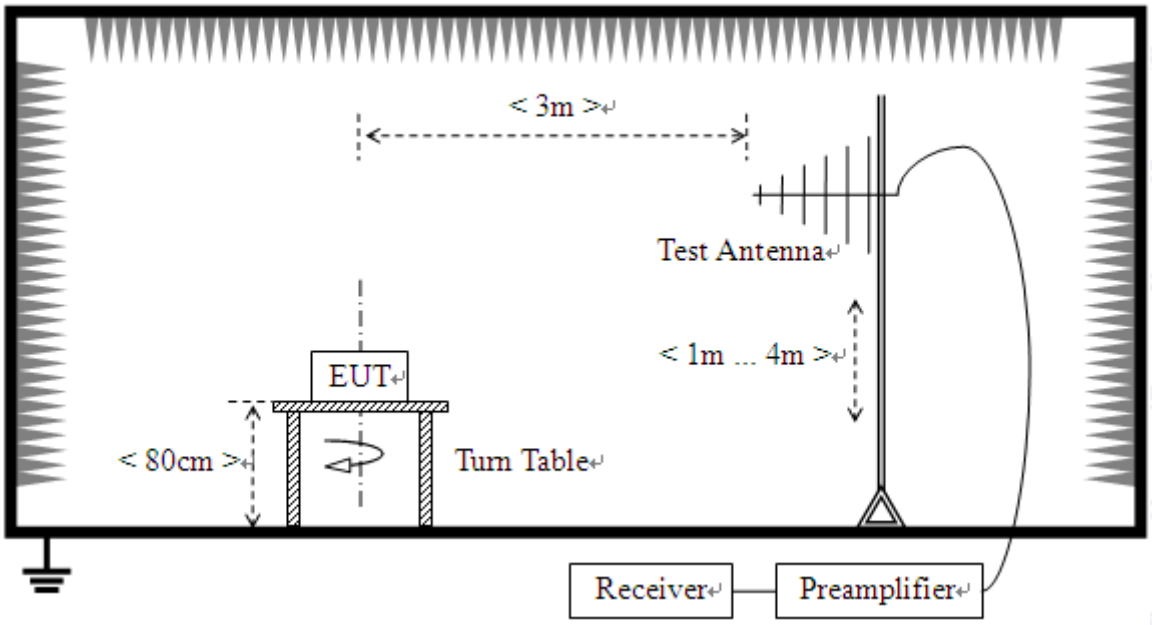
2.9.2 Test Description

A. Test Setup:

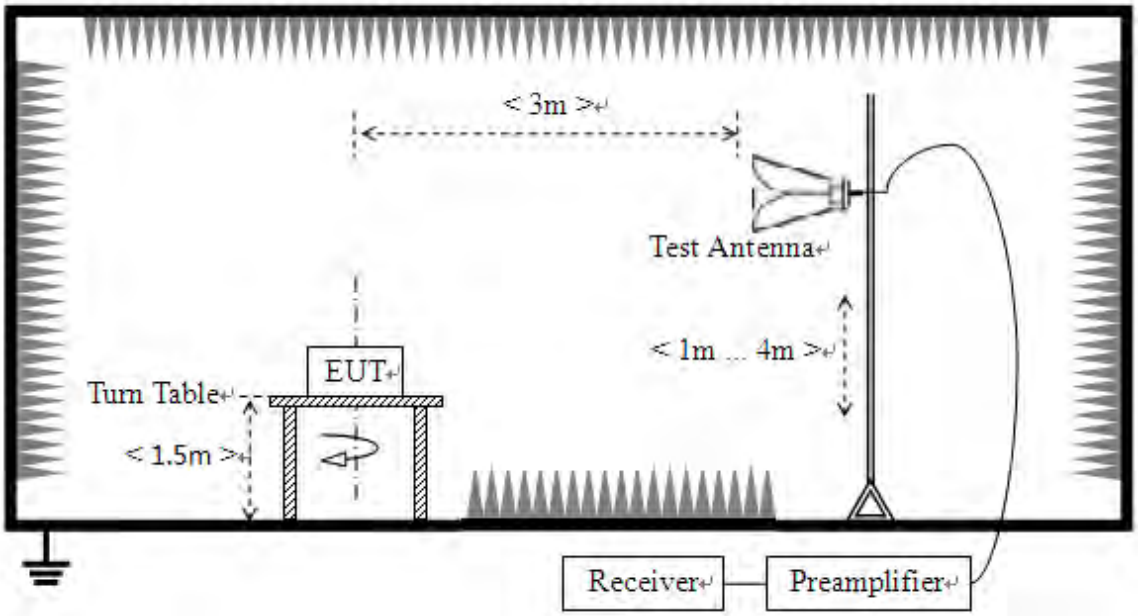
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



T he test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). For radiated emissions below or equal to 1GHz,The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The RFID Reader Module of the EUT is powered by the AC Adapter. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the RFID Reader Module of the EUT is activated by the PC via Lan port.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Please reference ANNEX A(1.4).

2.9.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.9.4 Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

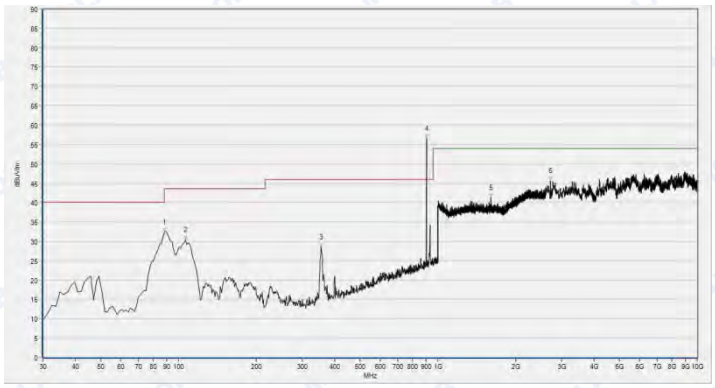
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

2.9.4.1 Profile 0 Mode:

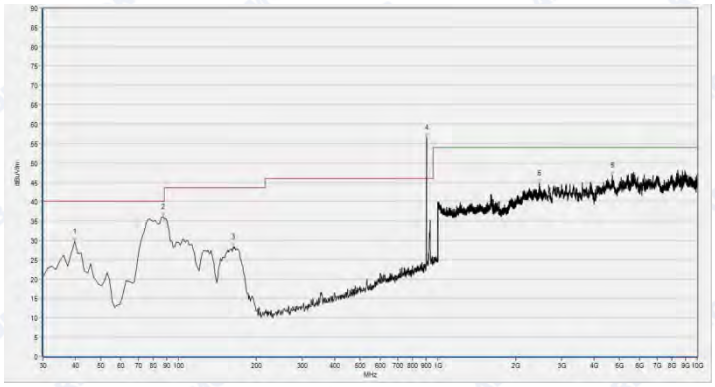
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
88.273	32.34	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
106.483	30.26	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
355.357	28.50	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
902.879	56.45	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
1600.560	41.19	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2709.984	45.59	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

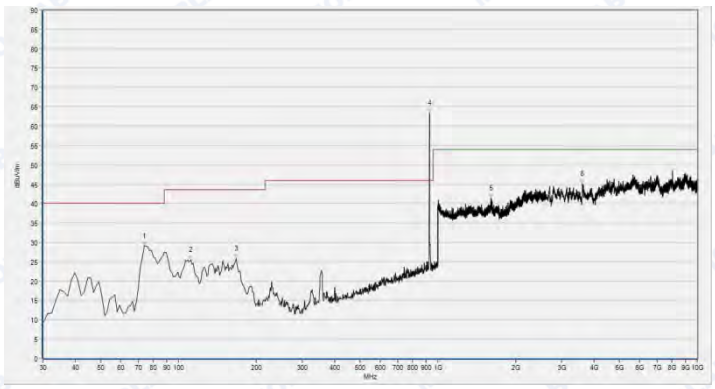
(Plot A.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 0, channel 1)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	29.61	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
87.059	36.04	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
162.328	28.31	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
902.879	56.58	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
2464.906	44.69	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4701.909	46.74	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

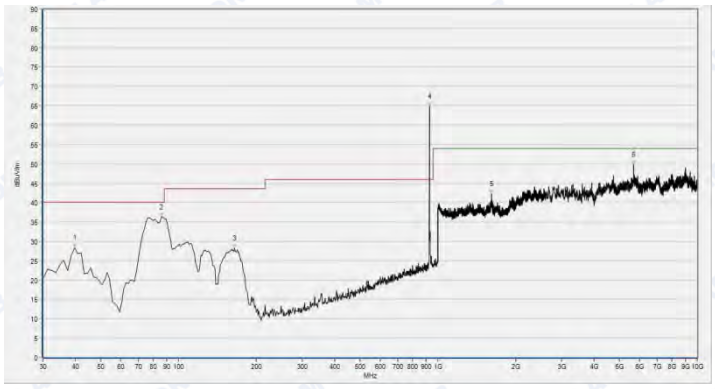
(Plot A.2: 30MHz to 10GHz, Antenna Vertical @ Profile 0, channel 1)

Plot for Channel = 26



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
73.705	28.92	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
111.339	25.42	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
167.184	25.84	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
914.253	63.42	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
1605.042	41.40	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3610.220	45.04	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

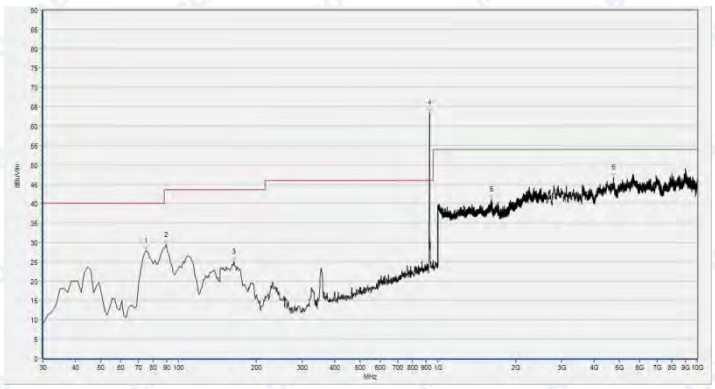
(Plot B.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 0, channel 26)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	28.35	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
85.845	36.21	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
164.756	28.21	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
914.253	64.79	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
1609.524	42.21	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5695.836	49.81	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

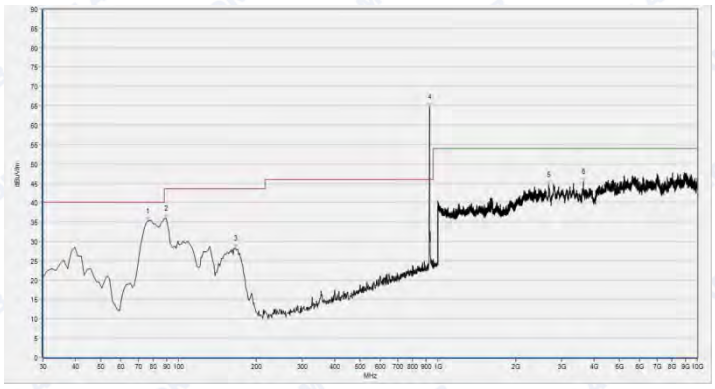
(Plot B.2: 30MHz to 10GHz, Antenna Vertical @ Profile 0, channel 26)

Plot for Channel = 50



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
74.919	27.75	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
89.487	29.40	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
163.542	24.92	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
927.159	63.56	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1611.445	41.14	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4746.718	46.76	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Plot C.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 0, channel 50)



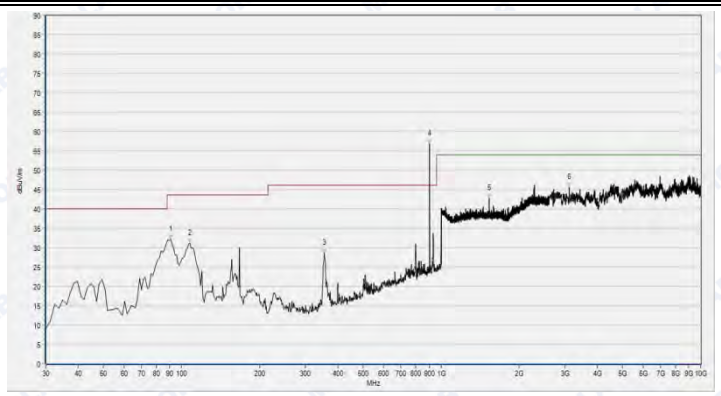
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
76.133	35.17	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
89.487	35.88	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
165.970	28.13	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
927.159	64.64	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
2677.396	44.66	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3634.661	45.48	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot C.2: 30MHz to 10GHz, Antenna Vertical @ Profile 0, channel 50)

2.9.4.2 Profile 2 Mode:

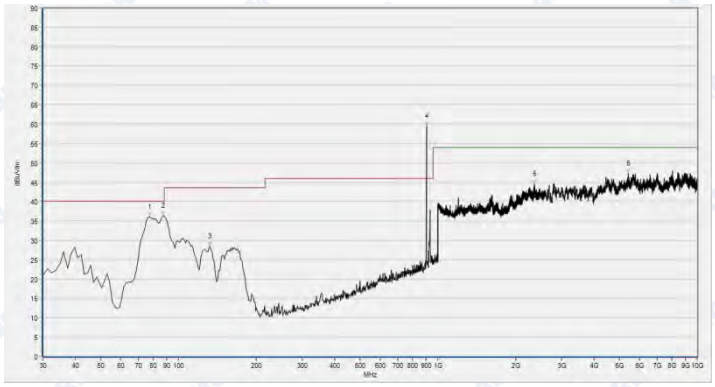
B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
90.701	32.19	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
107.697	31.15	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
355.357	28.85	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
902.879	56.81	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
1534.614	42.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3117.330	45.47	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

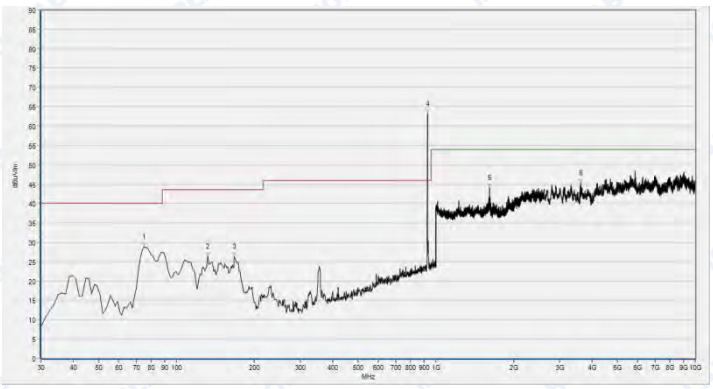
(Plot A.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 2, channel 1)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
77.347	36.05	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
87.059	36.38	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
131.977	28.47	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
902.879	59.42	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
2361.825	44.54	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5431.060	47.22	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

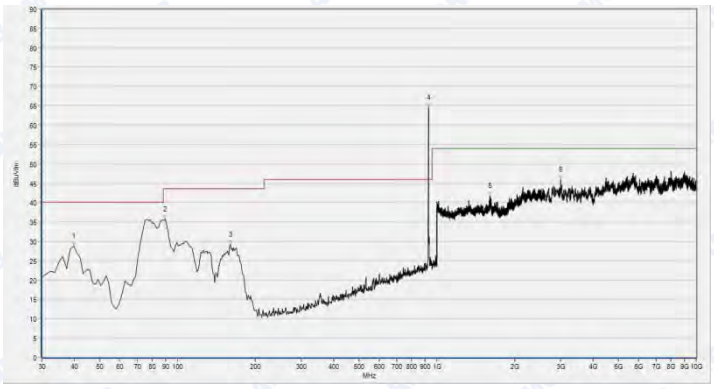
(Plot A.2: 30MHz to 10GHz, Antenna Vertical @ Profile 2, channel 1)

Plot for Channel = 26



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
74.919	28.82	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
131.977	26.34	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
167.184	26.34	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
914.253	63.24	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
1611.445	44.08	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3622.440	45.28	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

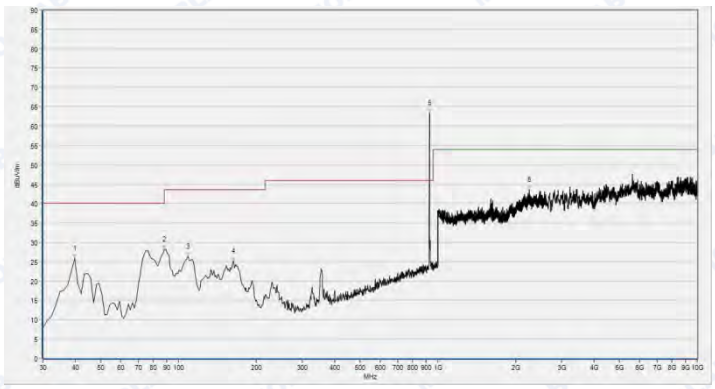
(Plot B.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 2, channel 26)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	28.82	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
89.487	35.62	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
159.900	29.18	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
914.253	64.55	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
1603.762	41.66	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3003.273	45.84	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

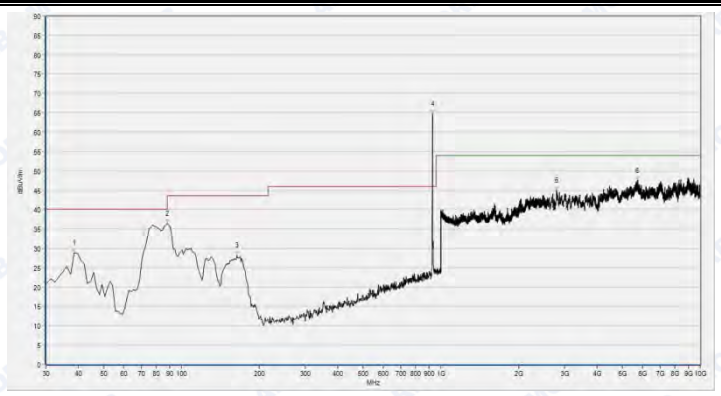
(Plot B.2: 30MHz to 10GHz, Antenna Vertical @ Profile 2, channel 26)

Plot for Channel = 50



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	25.81	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
88.273	28.22	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
108.911	26.30	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
162.328	25.11	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
927.159	63.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2251.060	43.64	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Plot C.1: 30MHz to 10GHz, Antenna Horizontal @ Profile 2, channel 50)



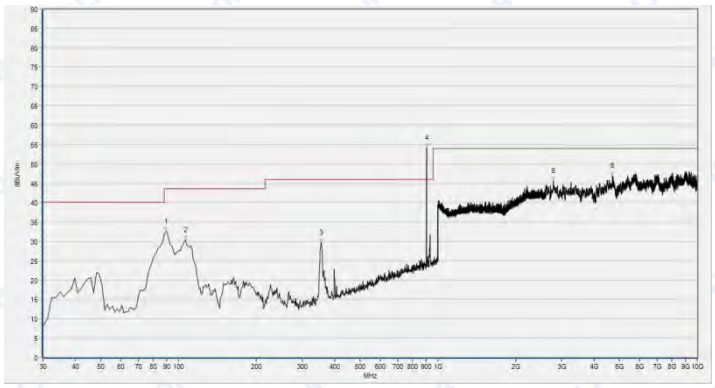
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
38.498	28.89	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
88.273	36.33	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
163.542	28.15	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
927.159	64.66	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
2795.526	44.95	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5708.056	47.37	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot C.2: 30MHz to 10GHz, Antenna Vertical @ Profile 2, channel 50)

2.9.4.3 Profile 4 Mode:

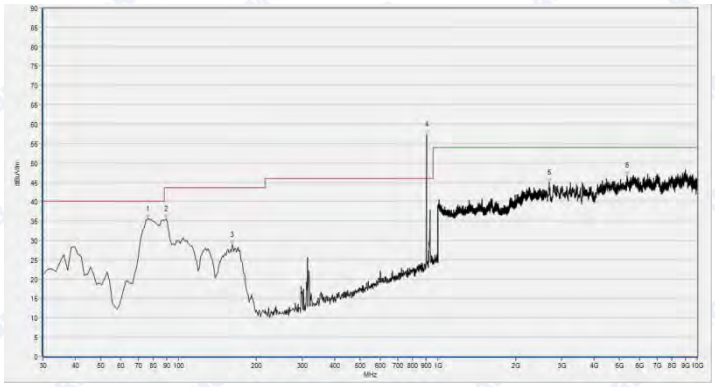
C. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
89.487	32.50	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
106.483	30.39	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
355.357	29.58	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
902.879	54.06	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
2783.306	45.59	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4718.203	46.89	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

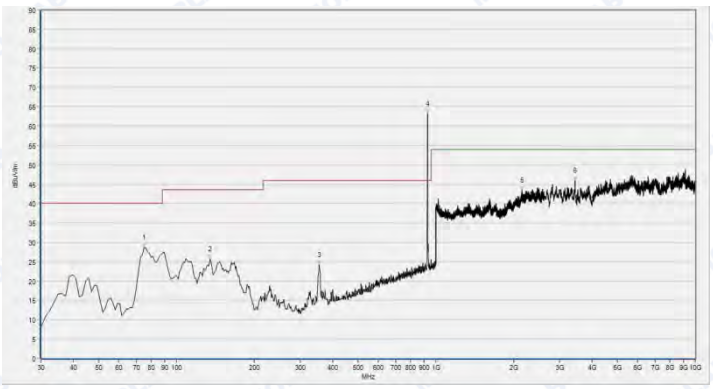
(Plot A.1: 30MHz to 10GHz, Antenna Horizontal @Profile 4, channel 1)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
76.133	35.54	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
89.487	35.47	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
161.114	28.80	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
902.879	57.34	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
2685.543	44.85	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5374.032	46.69	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

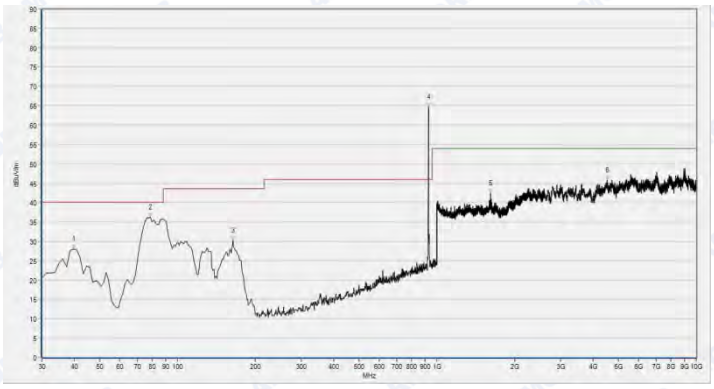
(Plot A.2: 30MHz to 10GHz, Antenna Vertical @Profile 4, channel 1)

Plot for Channel = 26



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
74.919	28.66	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
134.406	25.71	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
355.357	24.06	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
914.253	63.27	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
2144.778	43.41	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3439.134	45.95	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

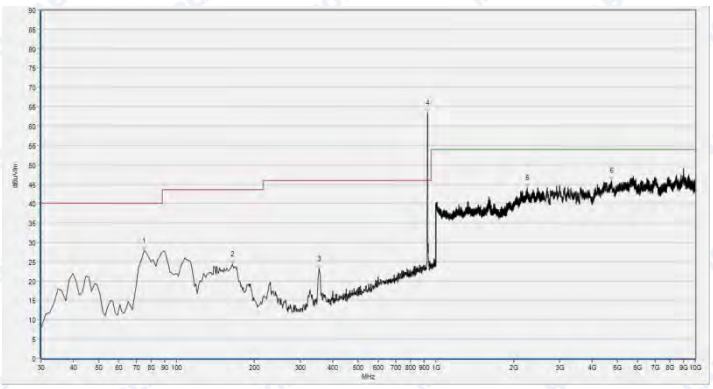
(Plot B.1: 30MHz to 10GHz, Antenna Horizontal @Profile 4, channel 26)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	28.01	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
78.561	36.15	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
163.542	30.22	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
914.253	64.62	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
1613.365	42.36	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4526.750	45.71	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

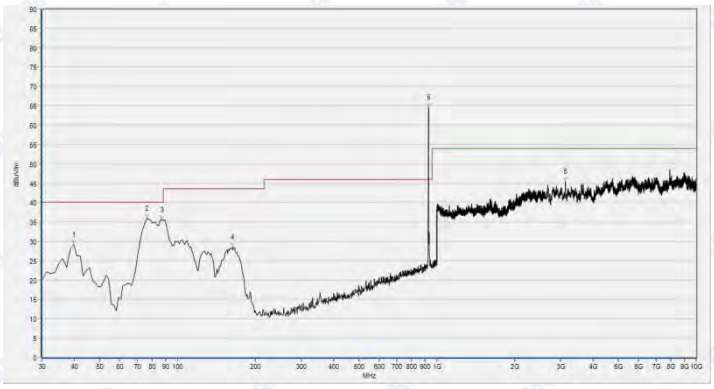
(Plot B.2: 30MHz to 10GHz, Antenna Vertical @Profile 4, channel 26)

Plot for Channel = 50



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
74.919	27.82	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
164.756	24.24	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
355.357	23.09	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
927.159	63.40	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2253.621	44.09	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4767.085	45.89	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Plot C.1: 30MHz to 10GHz, Antenna Horizontal @Profile 4, channel 50)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
39.712	29.24	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
76.133	35.90	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
87.059	35.46	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
162.328	28.52	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
927.159	64.58	N.A	N.A	N.A	46.00	N.A	Vertical	N.A
3121.404	45.37	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot C.2: 30MHz to 10GHz, Antenna Vertical @Profile 4, channel 50)

ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

1.3 Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2013, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Test Equipments Utilized

1.4.1 Conducted Test Equipments

Conducted Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Spectrum Analyzer	MY45101810	E4407B	Agilent	2014.02.26	2015.02.25
2	Power Splitter	NW521	1506A	Weinschel	2014.02.26	2015.02.25
3	Attenuator 1	(n.a.)	10dB	Resnet	2014.02.26	2015.02.25
4	Attenuator 2	(n.a.)	3dB	Resnet	2014.02.26	2015.02.25
5	USB Wideband Power Sensor	MY52280010	U2021XA	Agilent	2014.02.26	2015.02.25
6	EXA Signal Analzyer	MY51440152	N9010A	Agilent	2014.02.26	2015.02.25
7	RF cable	CB01	RF01	Morlab	N/A	N/A
8	Coaxial cable	CB02	RF02	Morlab	N/A	N/A
9	SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.4.2 Conducted Emission Test Equipments

Conducted Emission Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Receiver	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
2	LISN	812744	NSLK 8127	Schwarzbeck	2014.02.26	2015.02.25
3	Service Supplier	100448	CMU200	R&S	2014.02.26	2015.02.25
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2014.02.26	2015.02.25
5	Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A

1.4.3 Radiated Test Equipments

Radiated Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	System Simulator	100448	CMU200	R&S	2014.02.26	2015.02.25
2	Receiver	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
3	Test Antenna - Bi-Log	9163-274	9m*6m*6m	Albatross	2014.02.26	2015.02.25
4	Test Antenna - Horn	9120D-963	VULB 9163	Schwarzbeck	2014.02.26	2015.02.25
5	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2014.02.26	2015.02.25
6	Test Antenna - Loop	1519-022	HL050S7	R&S	2014.02.26	2015.02.25
7	Reject Filter	(n.a.)	BRM50702	Micro-Tronics	2014.02.26	2015.02.25
8	Coaxial cable (N male)	CB02	EMC02	Morlab	N/A	N/A
9	Coaxial cable (N male)	CB03	EMC03	Morlab	N/A	N/A

1.4.4 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2014.02.26	2015.02.25

1.4.5 Vibration Table

Vibration Table						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Vibration Table	N/A	ACT2000-S015L	CMI-COM	2014.02.26	2015.02.25

1.4.6 Anechoic Chamber

Anechoic Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6m	Albatross	2014.02.26	2015.02.25

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