FCC IC Test Report

Report No.:	FCC_IC_RF_SL20061501-JAD-006
FCC ID:	QV5MERCURY6E-M
IC:	5407A-MERCURY6EM
Test Model:	M6e-Micro
Variant Model:	M6e-M
Received Date:	08/11/2020
Test Date:	08/11/2020/-09/13/2020
Issued Date:	09/14/2020
Applicant:	JADAK, a business unit of Novanta Corporation
Address:	125 Middlesex Turnpike, Bedford, MA 01730
Manufacturer:	JADAK, a business unit of Novanta Corporation
Address:	125 Middlesex Turnpike, Bedford, MA 01730
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	775 Montague Expressway, Milpitas, CA 95035
Test Location (1):	775 Montague Expressway, Milpitas, CA 95035
FCC Registration / Designation Number:	540430
ISED# / CAB identifier:	4842D

ACCREDITED
TESTING CERT # 2742-01

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL20061501-JAD-006	Orignal Release	09/14/2020

1 Certificate of Conformity

Product:	RFID module
Brand:	JADAK, a business unit of Novanta Corporation
Test Model:	M6e-Micro, M6e-M
Sample Status:	Engineering sample
Applicant:	JADAK, a business unit of Novanta Corporation
Test Date:	08/11/2020/-09/13/2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) RSS-247 Issue 2, February 2017 ANSI C63.10: 2013 RSS-Gen Issue 5, March 2019 DA 00-705, 2000

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Gary Chou , **Date:** 09/14/2020

Gary Chou / Compliance Engineer

Approved by : Deon , **Date:** 09/14/2020

Deon Dai / Engineer Reviewer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247) / ISED RSS 247 ISSUE 2			
FCC / ISED Clause	Test Item	Result	Remarks
15.207 RSS GEN	AC Power Conducted Emission	N/A	Device is DC powered.
15.247(a)(1)(iii) RSS 247 5.1	Number of Hopping Frequency Used	PASS*	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	PASS*	Meet the requirement of limit.
15.247(a)(1) RSS 247 5.1	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS*	Meet the requirement of limit.
15.247(b) RSS 247 5.1	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d) RSS 247 (6.2)	Band Edge Measurement	PASS*	Meet the requirement of limit.
15.205 & 209 & 15.247(d) RSS 247 (6.2)	Radiated Emissions	PASS	Meet the requirement of limit.
15.203 RSS GEN	Antenna Requirement	PASS	Antenna connector is RP-TNC not a standard connector. Professional installation is required.

*Refer to Report No.:
EM2037-1 Issue 1, 11/10/2012 tested by Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
EP1632-1, 9/4/2015 Tested by Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
EO3130-1, 1/16/2015 Tested by Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

This report details the partial testing for FCC ID:QV5MERCURY6E-M and IC:5407A-MERCURY6EM) with the following modifications:

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	RFID module
Brand	JADAK, a business unit of Novanta Corporation
Test Model	M6e-Micro, M6e-M
Variant Model	M6e-M
Identification No. of EUT	262034801007
Status of EUT	Engineering sample
Power Supply Rating	5Vdc
Modulation Type	ASK
Modulation Technology	FHSS
Transfer Rate	160kHz
Operating Frequency	902.75-927.25MHz
Number of Channel	50
Output Power	Power at the output of module: 29.89 dBm Output Power at the end of the cable: 28.75 dBm.
Antenna Info	ANT 1: Antenna Type: RHCP Patch Antenna Gain: 9.5 dBiC(6.5 dbi) Typical Brand: MTI Wireless Edge Ltd. Model No: MT-242043/TRH/A/K ANT2: Antenna Type: Dipole Gain: 4 dBd (6.15 dBi) Brand: Laird Technologies Model No: S8964B
Antenna Connector	RP-TNC

There is no hardware difference between the 2 model numbers. The only difference is in the number of UHF RFID tags that the device reads. The M6e-Micro is limited to 50 tags per second, once this limit is reached no new tags are stored in the tag buffer. The M6e-M has no limitation on the number of tags that enters its tag buffer. This limitation is implemented in software. There is no change in the configuration of the RF transmitter or receiver between the 2 models.

The only changes are some components in the Tx path and the microcontroller are being replaced by new ones which have the similar specifications as the previous components they have replaced. The RF characteristics are not affected by the hardware change. See “190242_M6E-MICRO_M6E-M_Declaration” for components details.
1) Microcontroller is being replaced by a new one.
2) The input switch in the transmit path, which selects through which regional filter the RF is transmitted, is being replaced.
4) The output switch that selects if the RF needs to be transmitted through port1 or port2 is being replaced.
5) The EMI filter is being replaced.
6) The Baluns in the Tx and the Rx path are being replaced.
7) Adding Additional approved antenna: RHCP Patch Antenna, 9.5dBiC and Dipole Antenna 4dBd (see antenna specs)

3.2 Description of Test Modes

50 channels are provided to this EUT:

Mode 1(NA)

Channel	Frequency (MHz)
Low	902.75
Mid	915.25
High	927.25

Mode 2(NA 2)

Channel	Frequency (MHz)
Low	917.4
Mid	922.4
High	927.2

Mode 3(NA 3)

Channel	Frequency (MHz)
Low	917.5
Mid	920.0
High	922.5

3.3 Description of Support Units

The RFID module (which is the EUT) is soldered to the CARRIER BOARD.

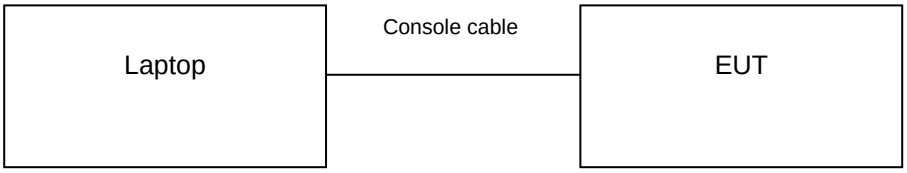
The M6E-DEVKIT provides power to the module and has Serial and USB interfaces to support both board-to-board and board-to-host connectivity.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC power supply	RIGOL	DP712	SED234155	N/A	N/A
B.	Laptop	Dell	XPS	C1MR31G5G944	N/A	N/A
C.	M6E-DEVKIT	JADAK, a business unit of Novanta Corporation	540-0061-01	N/A	N/A	N/A
D.	12 ft. cable	ThingMagic	CBL-P12	N/A	N/A	N/A

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB console cable	1	0.8	N	0	Provided by Customer

Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR FCC Part 15, Subpart C (Section 15.247)
RSS 247 Issue 2, February 2017
ANSI C63.10: 2013
RSS Gen Issue5, March 2019
DA 00-705, 2000

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
PXA Signal Analyzer KEYSIGHT	N9030B	MY55330108	07/07/2020	07/07/2021
Horn Antenna ETS-Lindgren	3117	218554	11/06/2019	11/06/2020
Biconilog Antenna Sunol	JB6	A111717	08/27/2019	11//27/2020*
Pre-Amplifier RF-Lambda	RAMP00M50GA	17032300048	06/18/2019	09/18/2020*

*Calibration extended by three months

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.The horn antenna and preamplifier (model: 3117) are used only for the measurement of emission frequency above 1GHz if tested.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna 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.

d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

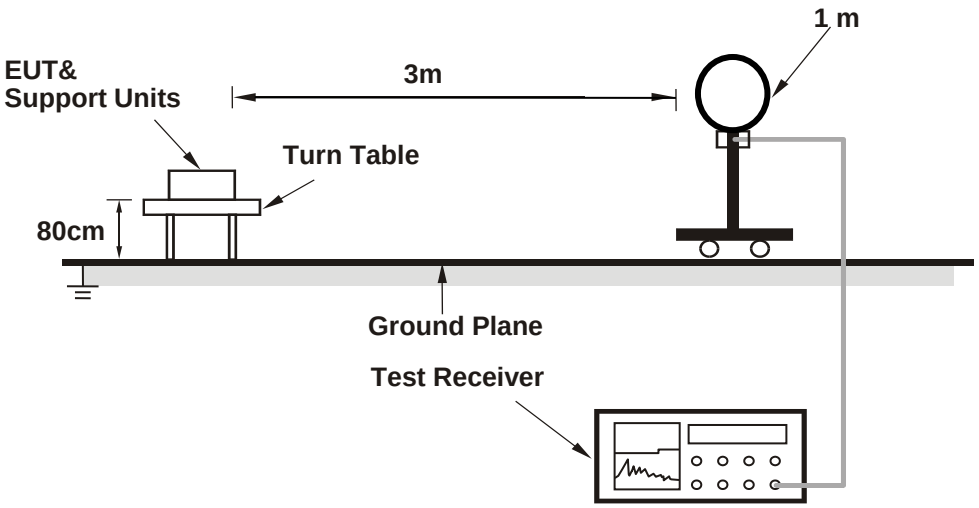
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

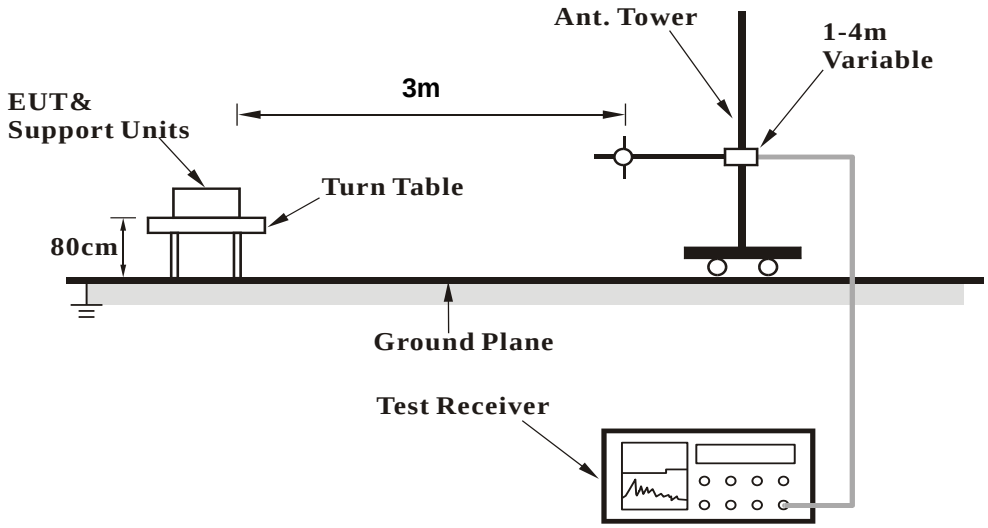
No deviation.

4.1.5 Test Setup

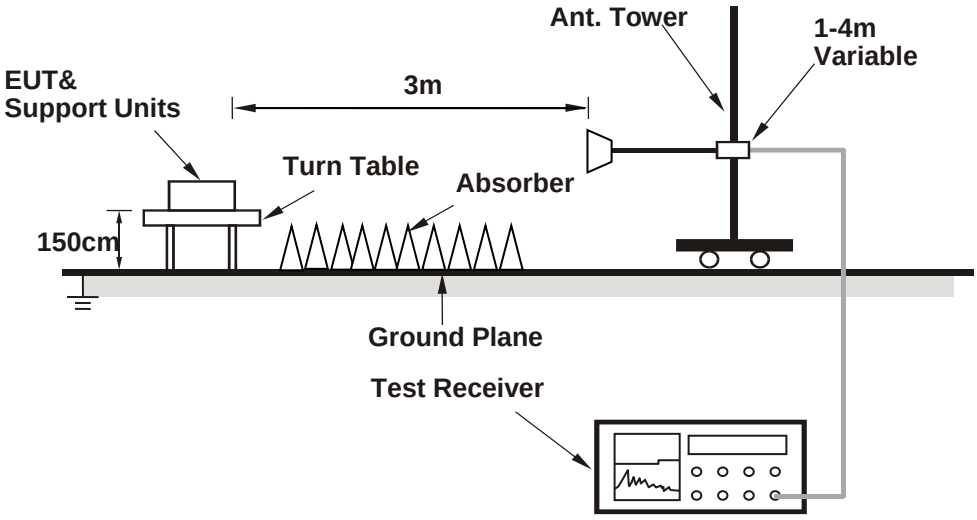
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Controlling software has been activated to set the EUT on specific status.

4.1.7 Test Results

BELOW 1GHz WORST-CASE DATA:

Mode 1

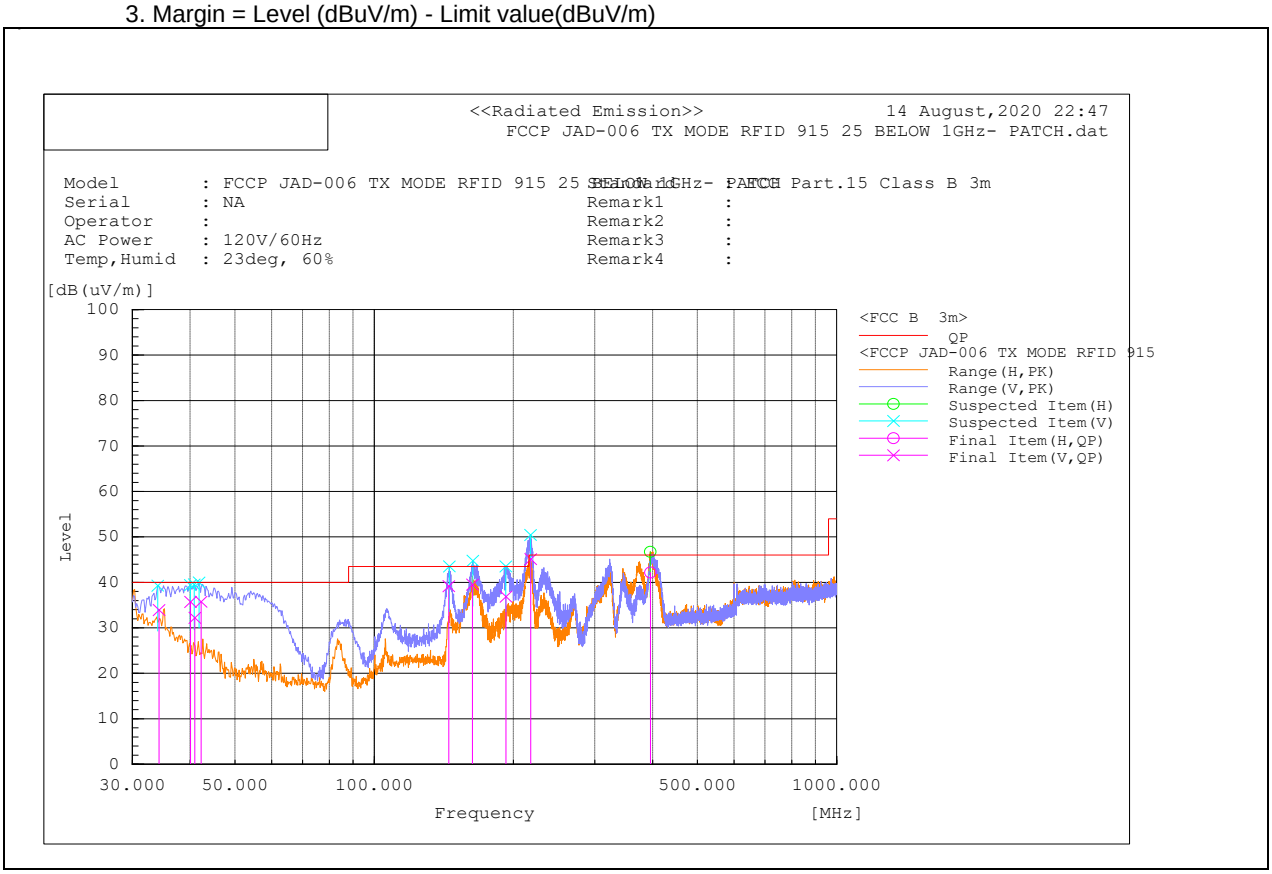
Antenna 1: RHCP Patch Antenna

CHANNEL	TX MODE 915.25 MHz	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	34.254	V	11.4	22.5	33.9	40	6.1	104	41.1	Pass
2	40.071	V	17.2	18.5	35.7	40	4.3	100	73.8	Pass
3	40.93	V	14.2	18	32.2	40	7.8	100	30.3	Pass
4	42.234	V	18.5	17.2	35.7	40	4.3	100	79.3	Pass
5	144.972	V	19.9	19.3	39.2	43.5	4.3	100	235.6	Pass
6	163.007	V	20.4	19.1	39.5	43.5	4	100	130.4	Pass
7	192.757	V	18.6	18.3	36.9	43.5	6.6	112	96.7	Pass
8	218.025	V	27.6	17.5	45.1	46	0.9	100	120.4	Pass
9	395.748	H	19.3	22.9	42.2	46	3.8	187	326.4	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



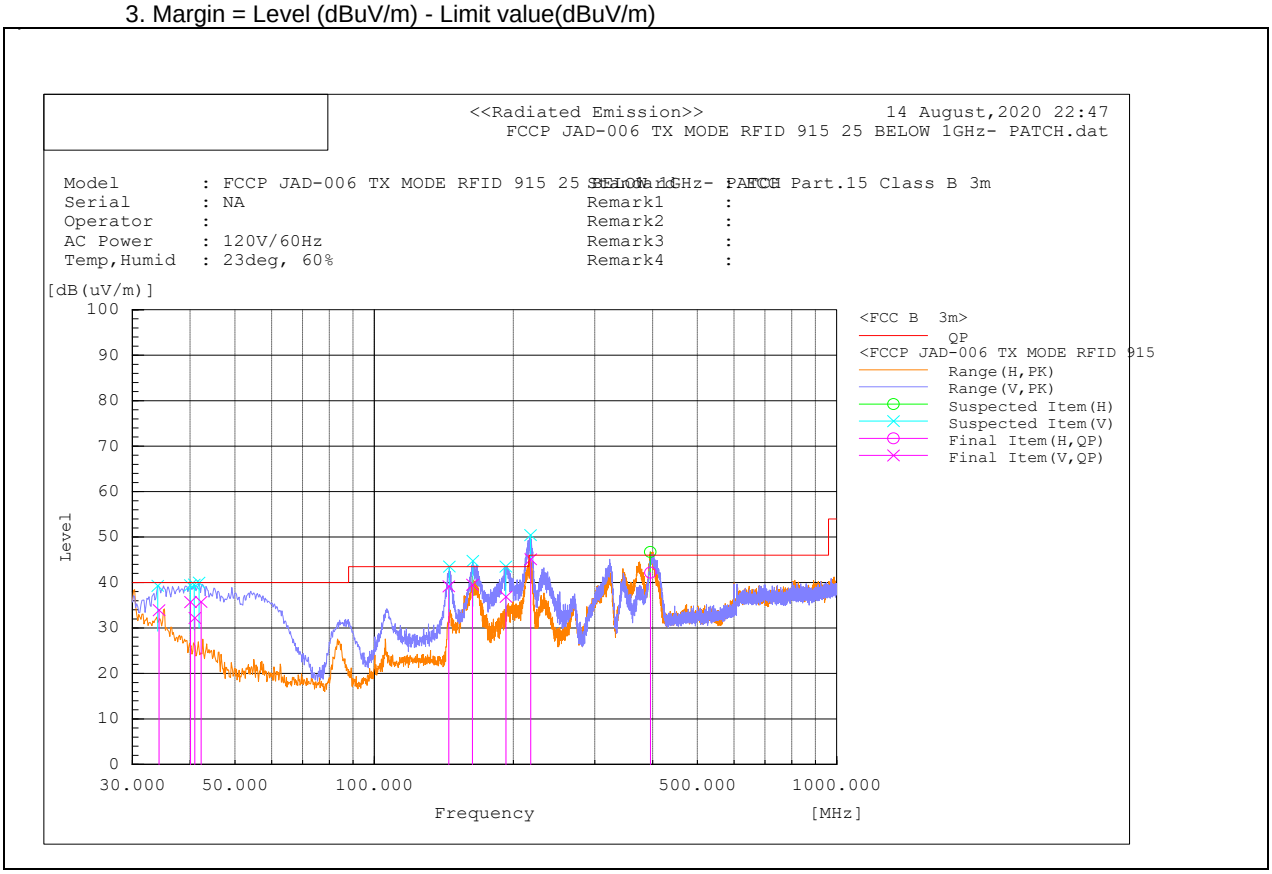
Antenna 2 (Dipole antenna)

CHANNEL	TX MODE 915.25 MHz	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	35.132	V	12.4	21.8	34.2	40	5.8	100	44	Pass
2	40.069	V	14.9	18.5	33.4	40	6.6	100	47	Pass
3	41.41	V	17.8	17.7	35.5	40	4.5	100	72.9	Pass
4	162.966	V	20.3	19.1	39.4	43.5	4.1	100	85.2	Pass
5	166.509	V	20.7	19	39.7	43.5	3.8	100	278.5	Pass
6	193.142	V	21.7	18.4	40.1	43.5	3.4	100	94	Pass
7	200.2	V	15	19.8	34.8	43.5	8.7	104	47.3	Pass
8	217.664	V	27.1	17.5	44.6	46	1.4	100	121.3	Pass
9	231.309	H	12.9	18.5	31.4	46	14.6	339	324.3	Pass
10	396.274	H	19.9	22.9	42.8	46	3.2	187	329.5	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



ABOVE 1GHz TEST DATA:

Mode 1

Antenna 1 RHCP Patch Antenna

CHANNEL	Low Channel	**DETECTOR FUNCTION**	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1804.528	V	43.9	55.8	-7.9	36	47.9	54	74	-18	-26.1	344	334	Pass
2	1804.504	H	42.5	55.7	-7.9	34.6	47.8	54	74	-19.4	-26.2	372	282	Pass
3	2075.921	V	40.5	53.7	-6.3	34.2	47.4	54	74	-19.8	-26.6	122	31.2	Pass
4	2075.338	H	40.5	58.7	-6.3	34.2	52.4	54	74	-19.8	-21.6	280	13.4	Pass
5	3608.953	V	41	54	-3.8	37.2	50.2	54	74	-16.8	-23.8	102	149.4	Pass
6	3608.961	H	40.8	53.9	-3.8	37	50.1	54	74	-17	-23.9	102	218.3	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

CHANNEL	Middle Channel	**DETECTOR FUNCTION**	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1830.503	V	43.9	55.5	-7.5	36.4	48	56	76	-19.6	-28	132	324.6	Pass
2	1830.476	H	44.1	55.7	-7.5	36.6	48.2	56	76	-19.4	-27.8	144	267	Pass
3	2745.757	V	41.5	54.2	-5.1	36.4	49.1	56	76	-19.6	-26.9	394	97.8	Pass
4	2745.754	H	42.6	55.4	-5.1	37.5	50.3	56	76	-18.5	-25.7	187	317.6	Pass
5	3659.536	V	42.2	55.3	-3.8	38.4	51.5	60	80	-21.6	-28.5	172	128.1	Pass
6	3660.448	H	42.3	55	-3.8	38.5	51.2	60	80	-21.5	-28.8	165	0	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

CHANNEL	High Channel	**DETECTOR FUNCTION**	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1854.512	V	47.5	57	-7.2	40.3	49.8	56	76	-15.7	-26.2	358	0.9	Pass
2	1854.473	H	44.1	55.7	-7.2	36.9	48.5	56	76	-19.1	-27.5	108	248	Pass
3	2781.712	V	43.6	56.1	-5.1	38.5	51	56	76	-17.5	-25	301	304.8	Pass
4	2781.743	H	43.7	55.9	-5.1	38.6	50.8	56	76	-17.4	-25.2	400	260.6	Pass
5	3709.065	V	39	52.6	-3.6	35.4	49	60	80	-24.6	-31	279	207.7	Pass
6	3708.355	H	39.1	52.6	-3.6	35.5	49	60	80	-24.5	-31	308	83.4	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

ABOVE 1GHz TEST DATA:

Mode 1

Antenna 2 (Dipole antenna)

CHANNEL	Low Channel	**DETECTOR FUNCTION**	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1804.491	V	49.4	58.2	-7.9	41.5	50.3	54	74	-12.5	-23.7	215	0	Pass
2	1804.494	H	45.8	56.3	-7.9	37.9	48.4	54	74	-16.1	-25.6	273	117.6	Pass
3	2706.717	V	39.8	53.3	-5	34.8	48.3	54	74	-19.2	-25.7	394	223.5	Pass
4	2706.764	H	42.3	53.7	-5	37.3	48.7	54	74	-16.7	-25.3	308	332.3	Pass
5	3608.036	V	40.7	54.3	-3.8	36.9	50.5	54	74	-17.1	-23.5	165	357.5	Pass
6	3607.856	H	40.7	53.9	-3.8	36.9	50.1	54	74	-17.1	-23.9	187	0	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

CHANNEL	Middle Channel	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1830.49	V	42.7	55.4	-7.5	35.2	47.9	54	74	-18.8	-26.1	100	295.1	Pass
2	1830.483	H	45.2	56.5	-7.5	37.7	49	54	74	-16.3	-25	301	113.5	Pass
3	2745.743	V	42.7	54.7	-5.1	37.6	49.6	54	74	-16.4	-24.4	365	338.3	Pass
4	2745.752	H	42.1	54.9	-5.1	37	49.8	54	74	-17	-24.2	115	301.3	Pass
5	3660.351	V	42.1	55.6	-3.8	38.3	51.8	54	74	-15.7	-22.2	287	186.6	Pass
6	3661.306	H	42.4	55.3	-3.8	38.6	51.5	54	74	-15.4	-22.5	308	358	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

CHANNEL	High Channel	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 10GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit\AV dB(uV/m)	Limit\PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	1854.508	V	44.9	55.9	-7.2	37.7	48.7	54	74	-16.3	-25.3	344	359.6	Pass
2	1854.489	H	42	55.3	-7.2	34.8	48.1	54	74	-19.2	-25.9	194	19.9	Pass
3	2781.782	V	43.5	56.1	-5.1	38.4	51	54	74	-15.6	-23	194	328.7	Pass
4	2781.763	H	42.3	55.9	-5.1	37.2	50.8	54	74	-16.8	-23.2	272	357.5	Pass
5	3708.071	V	39.4	52.4	-3.6	35.8	48.8	54	74	-18.2	-25.2	102	52.5	Pass
6	3709.081	H	39.3	52.4	-3.6	35.7	48.8	54	74	-18.3	-25.2	104	271.3	Pass

REMARKS:

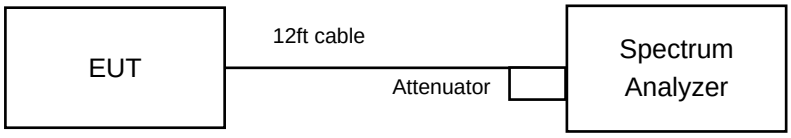
1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

4.2 Conducted Output Power Measurement

4.2.1 Limits of Conducted Output Power Measurement

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedures

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 Test Results

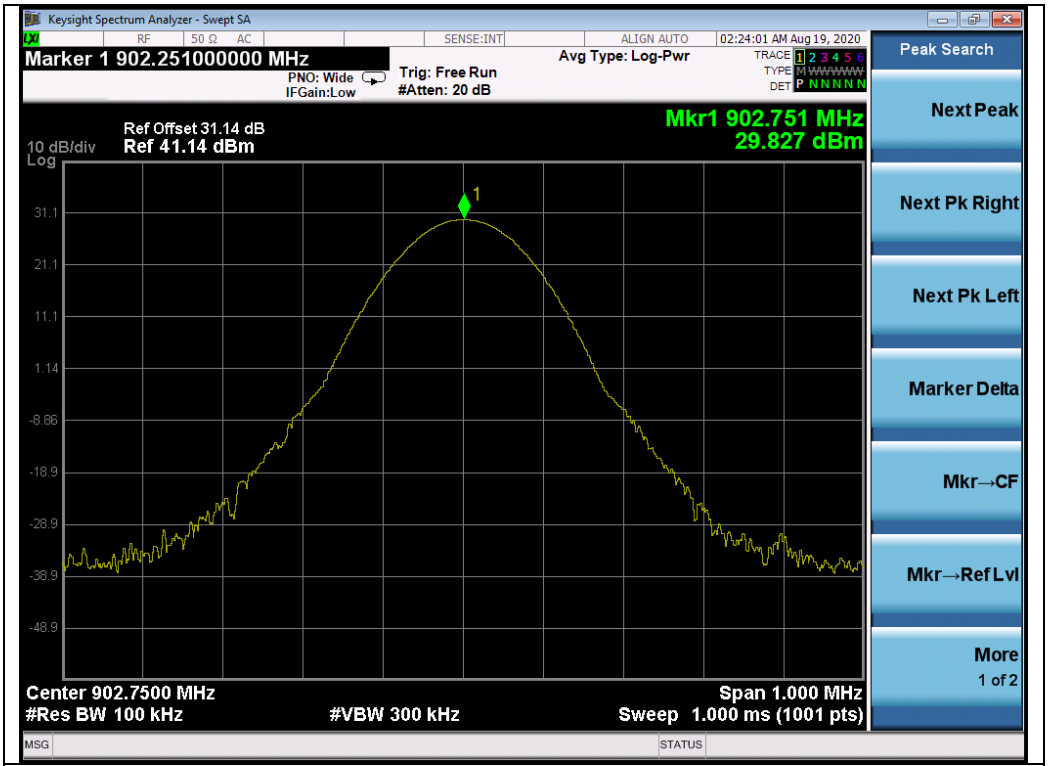
Mode 1

Port 1 :

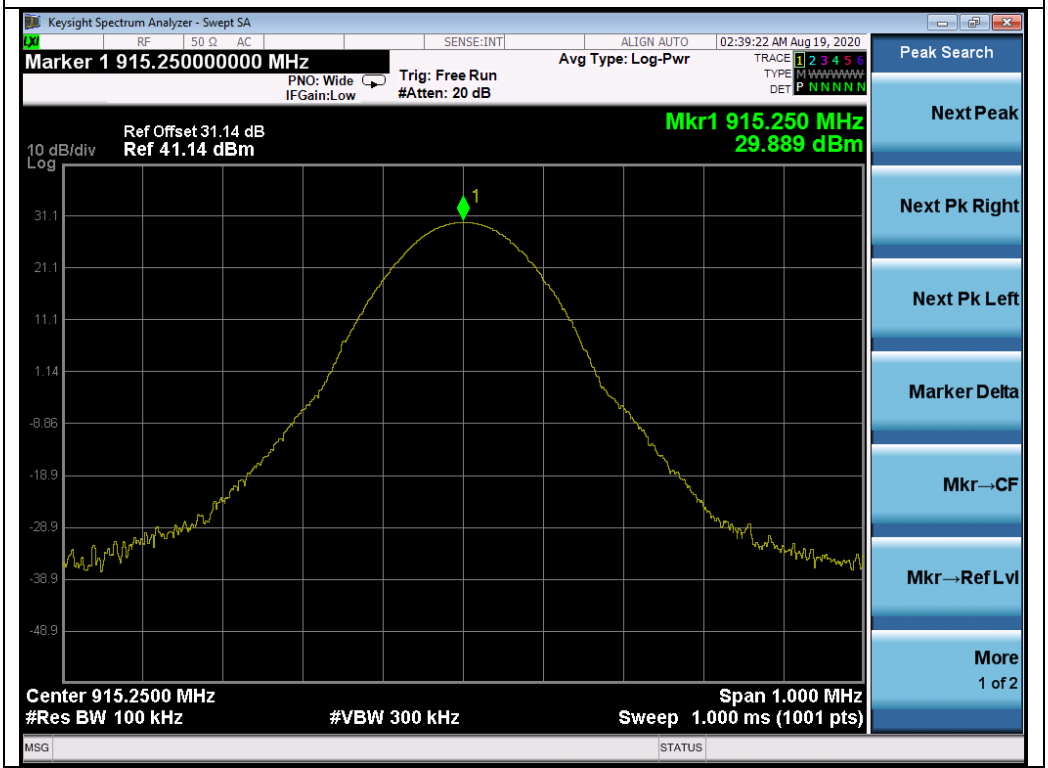
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	902.75	29.82	30	Pass
Mid	915.25	29.88	30	Pass
High	927.25	29.79	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

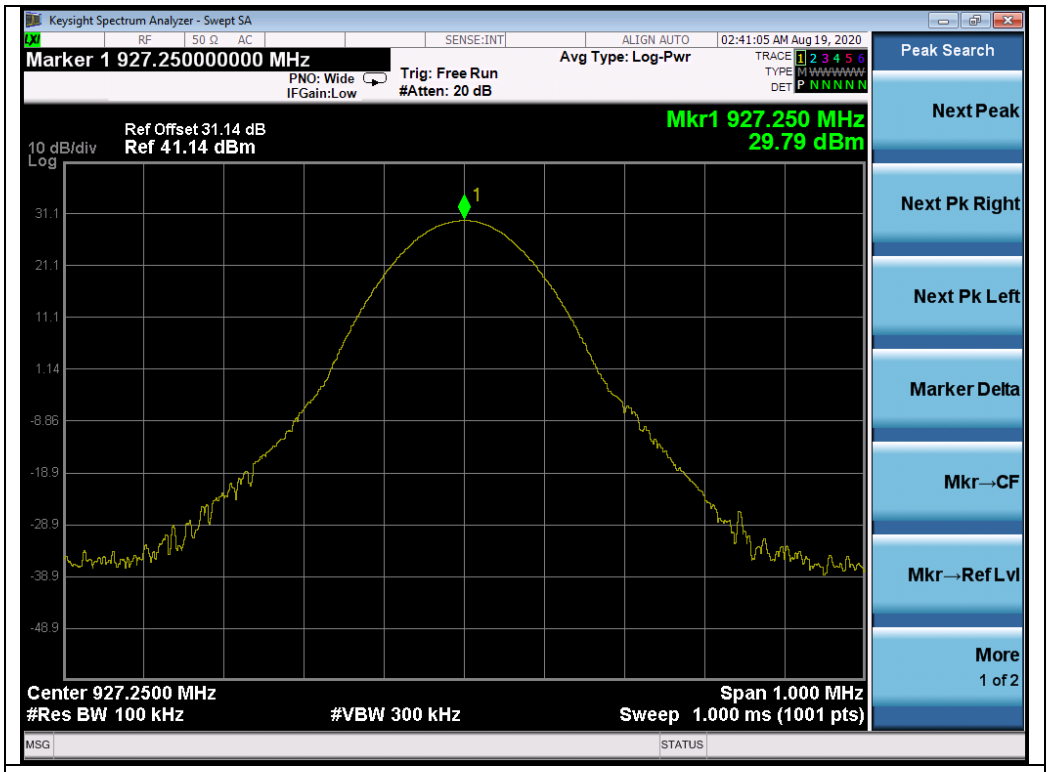
Test Plots:



Low Channel



Middle Channel



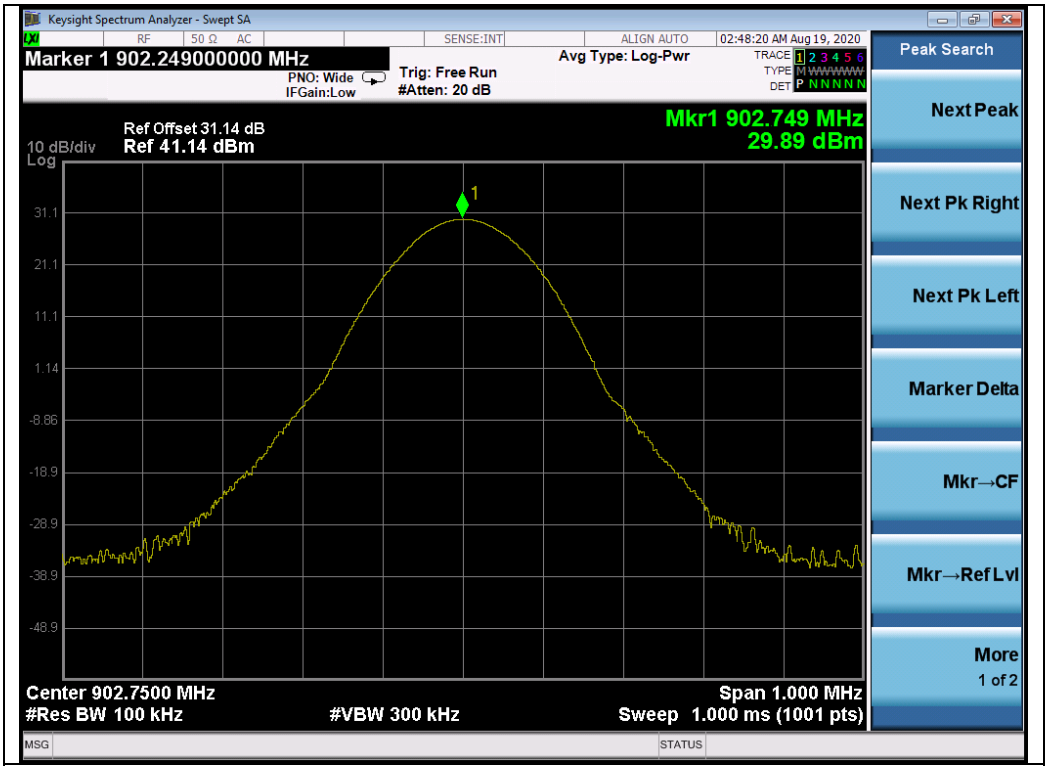
High Channel

Port 2 :

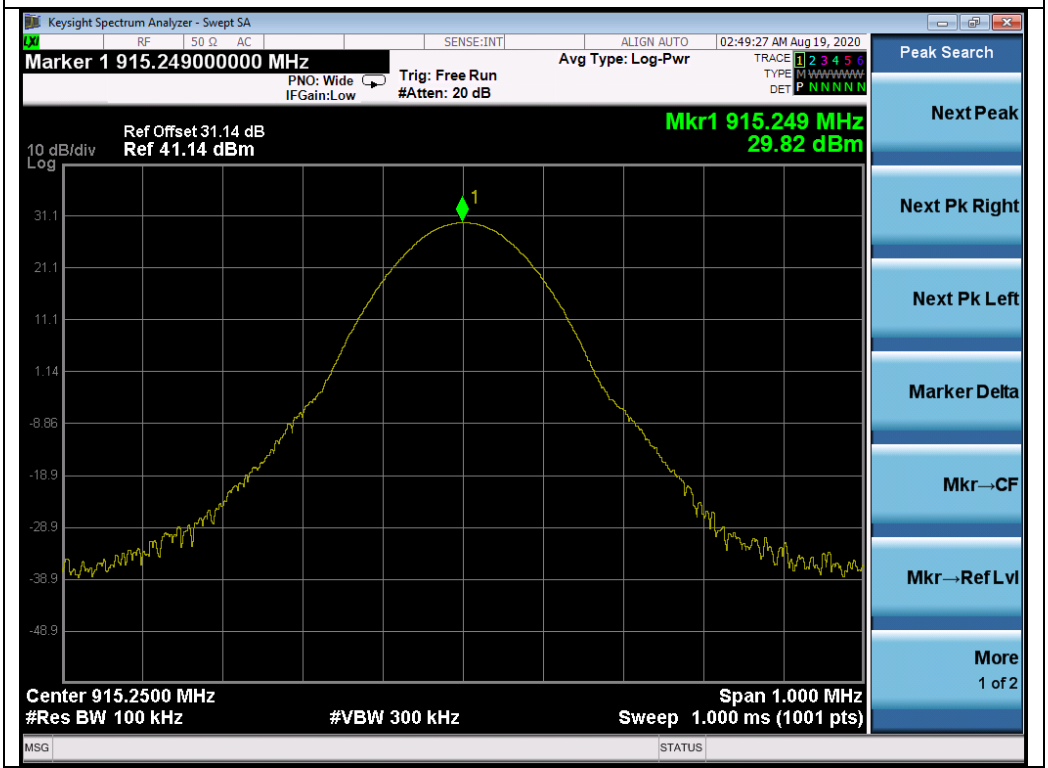
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	902.75	29.89	30	Pass
Mid	915.25	29.82	30	Pass
High	927.25	29.80	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

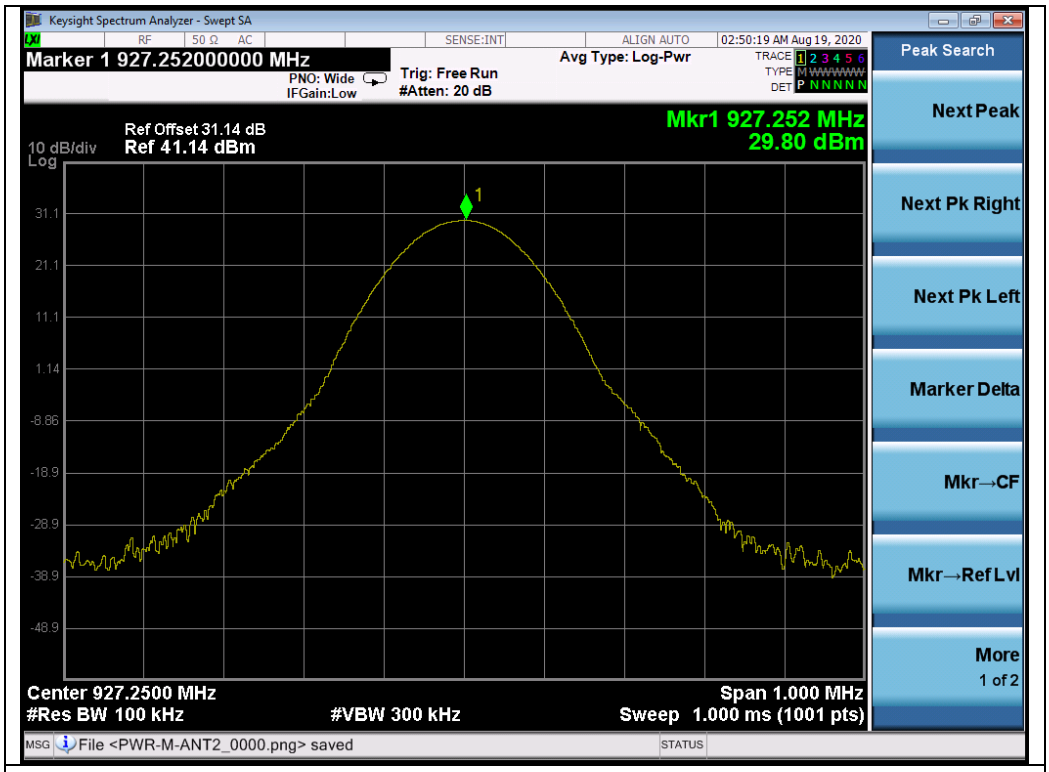
Test Plots:



Low Channel



Middle Channel



High Channel

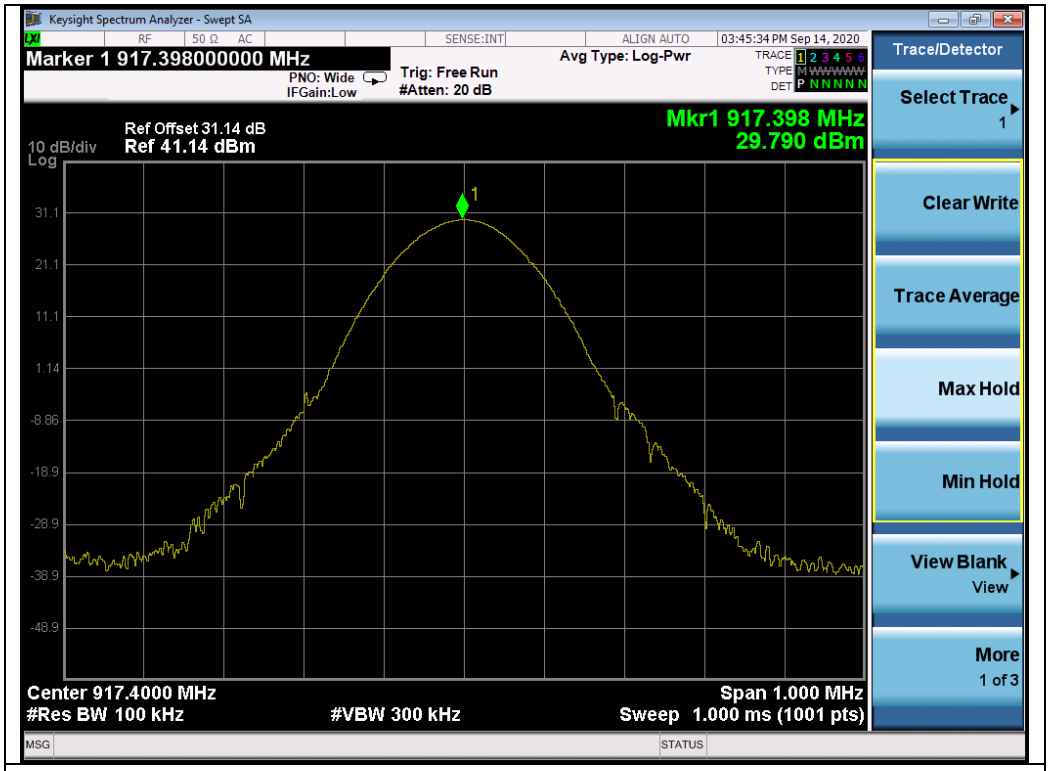
Mode 2

Port 1 :

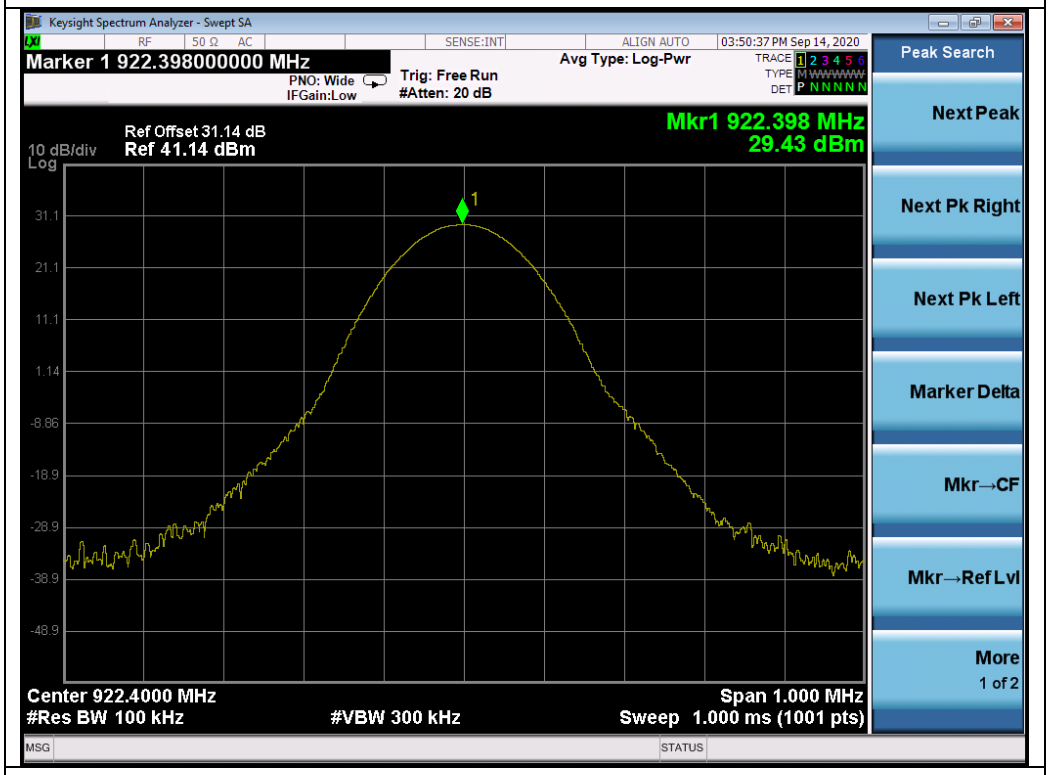
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	917.40	29.79	30	Pass
Mid	922.40	29.43	30	Pass
High	927.20	29.53	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

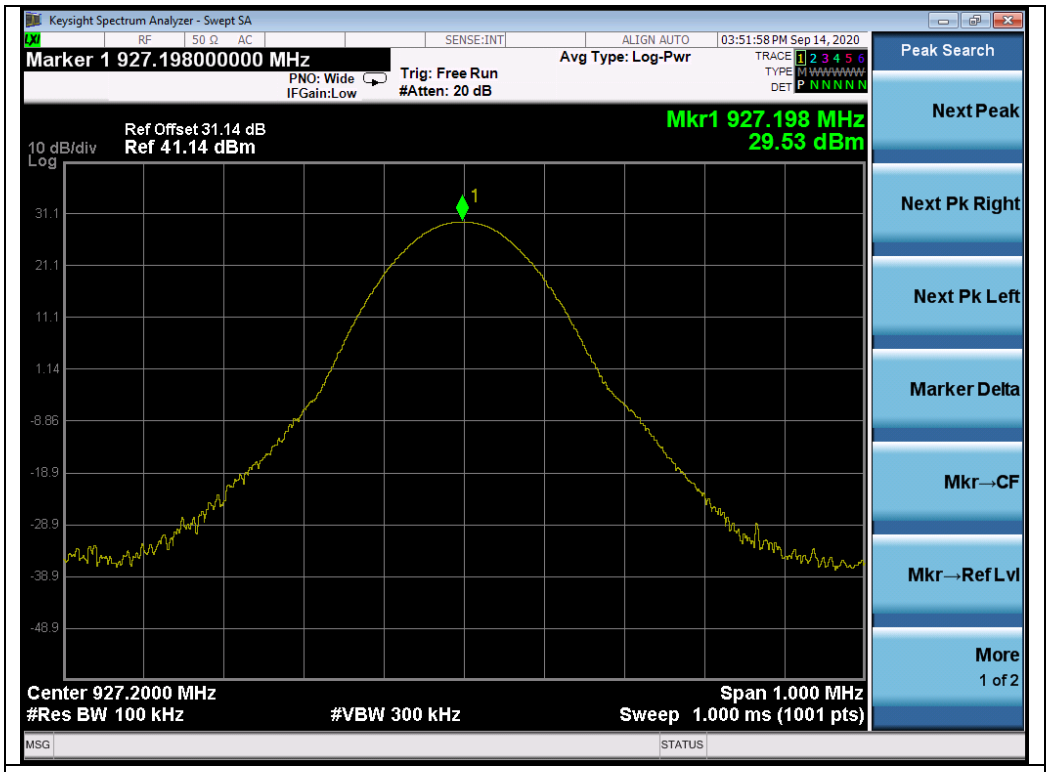
Test Plots:



Low Channel



Middle Channel



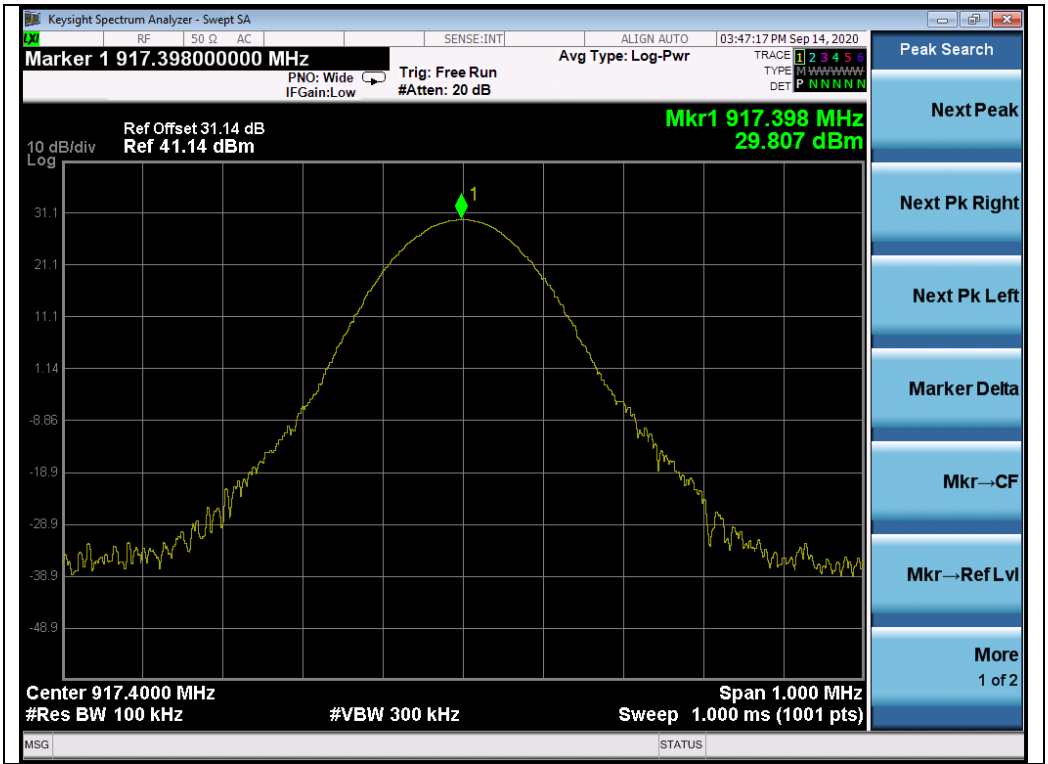
High Channel

Port 2 :

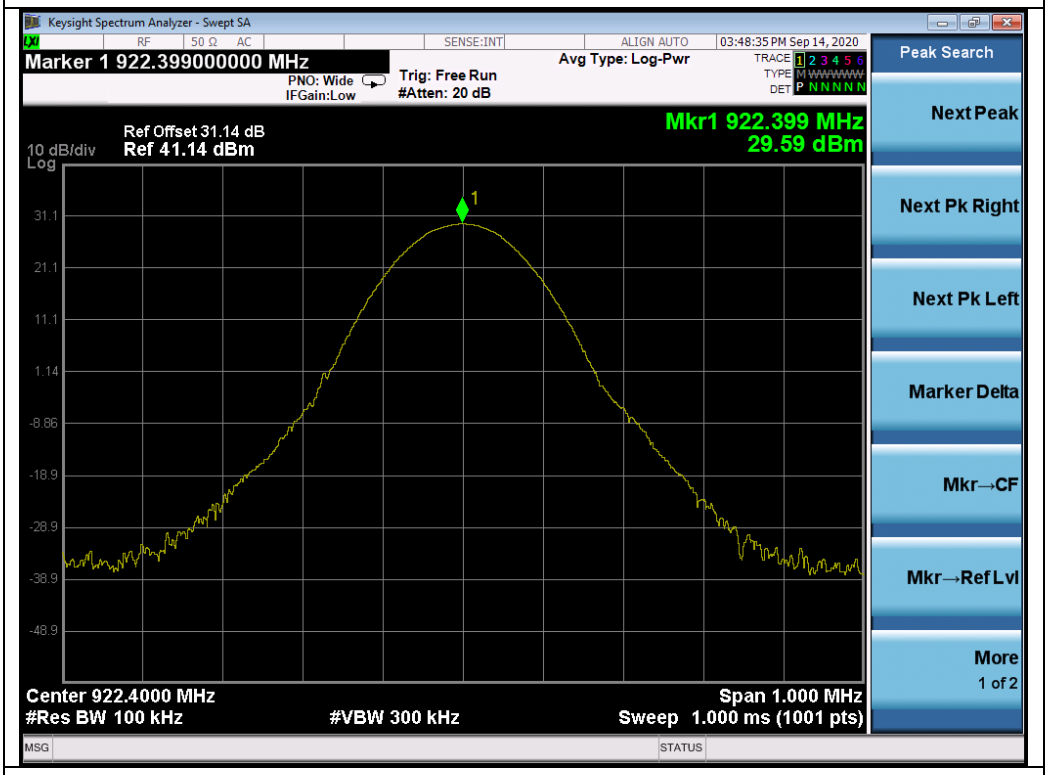
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	917.40	29.807	30	Pass
Mid	922.40	29.59	30	Pass
High	927.20	29.479	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

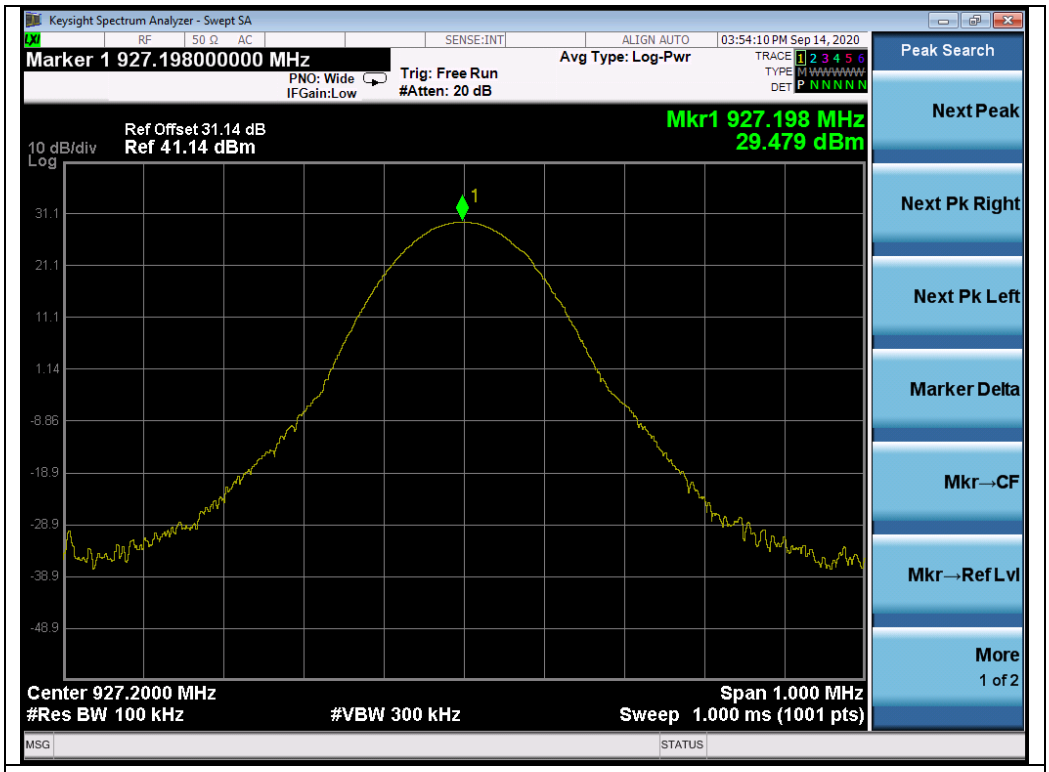
Test Plots:



Low Channel



Middle Channel



High Channel

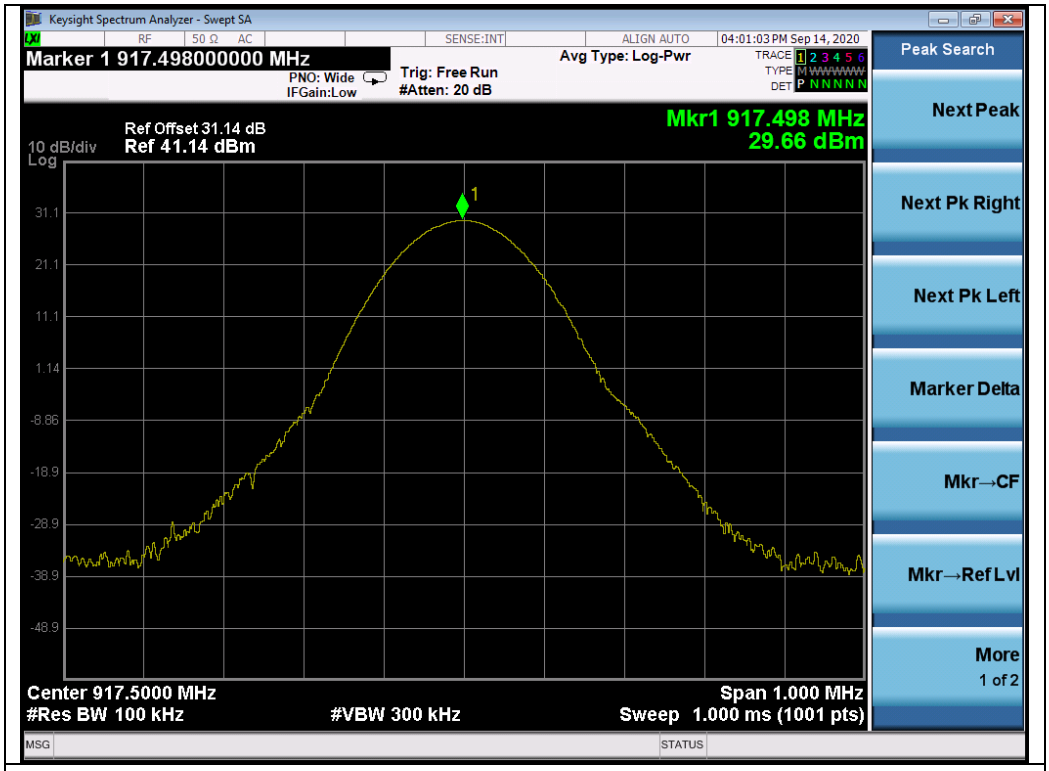
Mode 3

Port 1 :

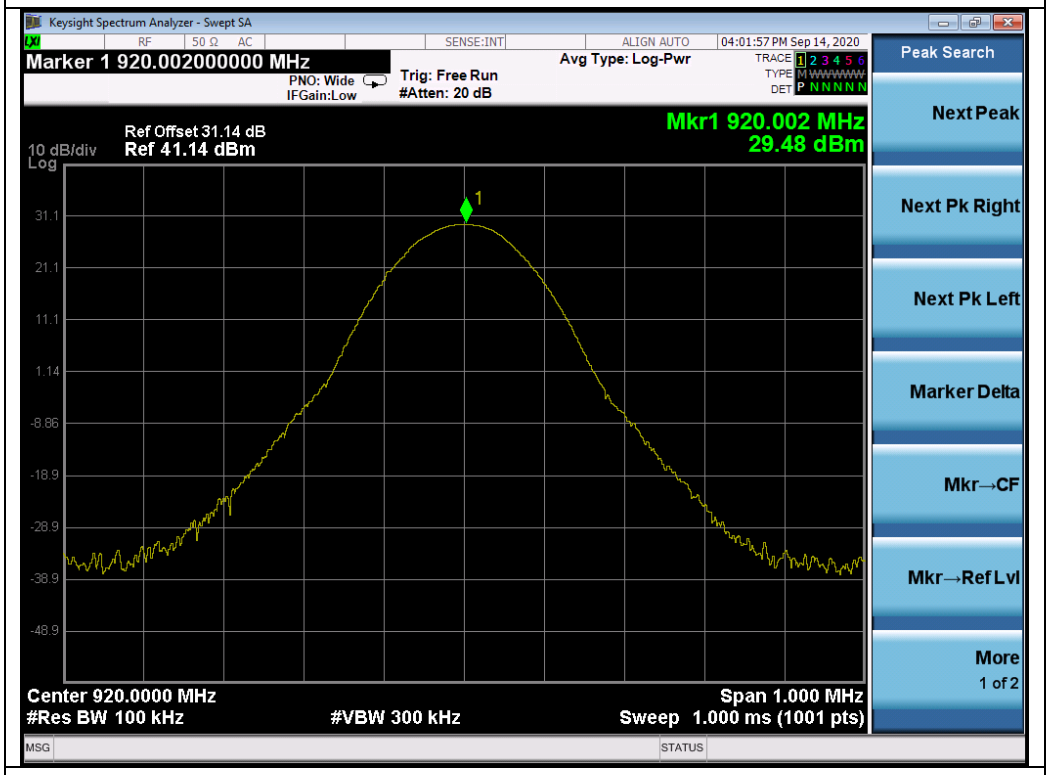
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	917.50	29.66	30	Pass
Mid	920.00	29.48	30	Pass
High	922.50	29.49	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

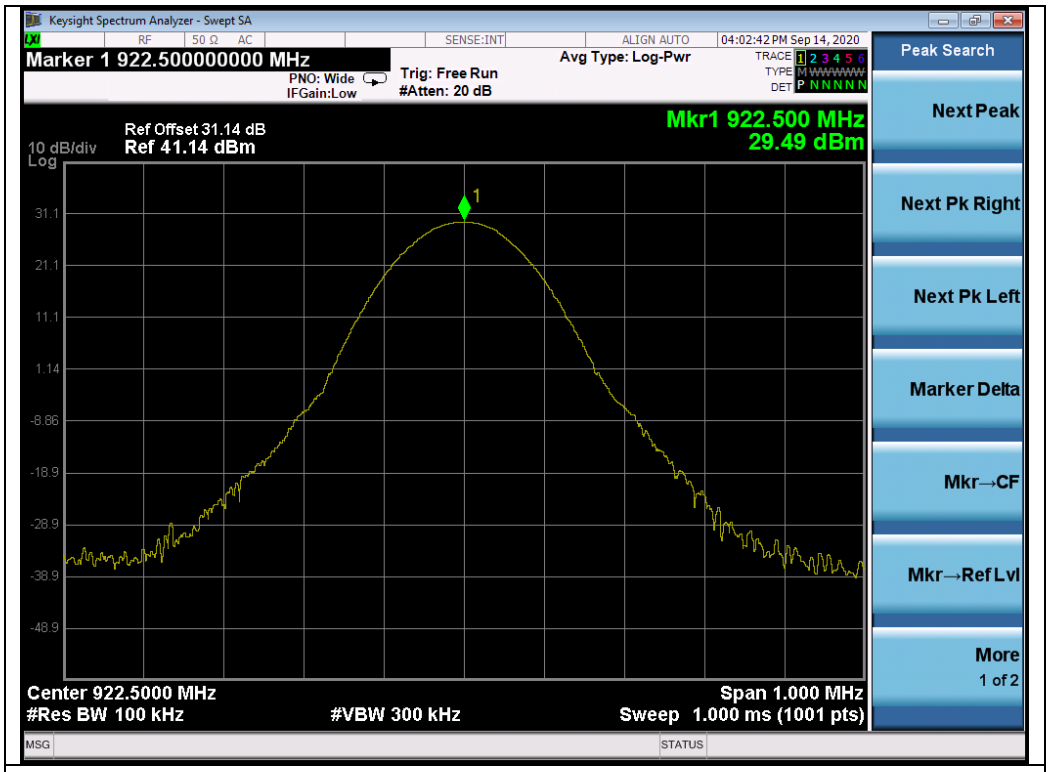
Test Plots:



Low Channel



Middle Channel



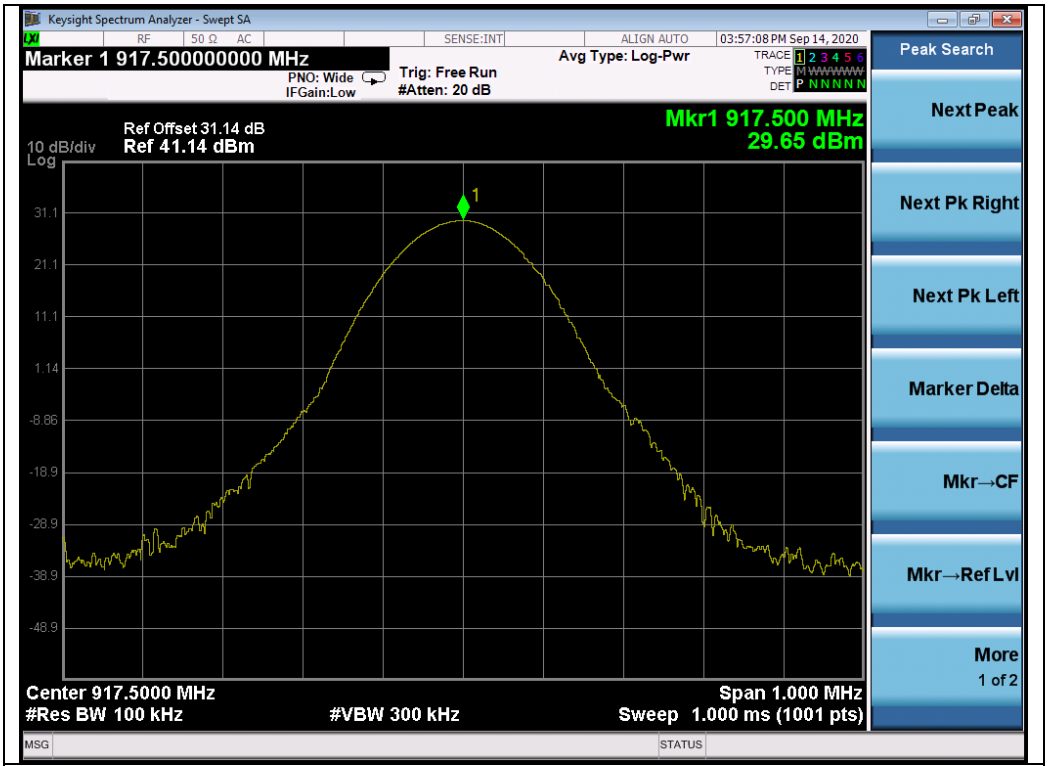
High Channel

Port 2 :

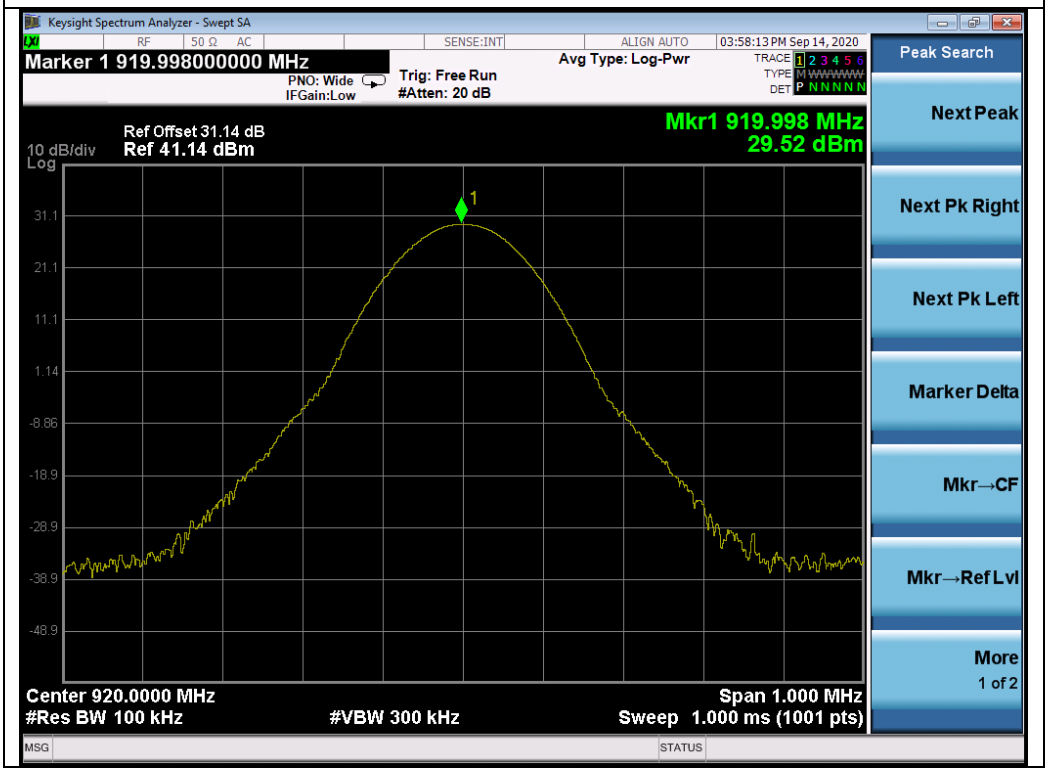
Channel	Frequency (MHz)	Conducted Power at the end of the Module (dBm)"	Limit (dBm)	Pass/Fail
Low	917.50	29.65	30	Pass
Mid	920.00	29.52	30	Pass
High	922.50	29.48	30	Pass

Note: The power result is measured at module output port, the actual power from cable is 1.14dB lower, a cable with 1.14dB loss is connected between the module and antenna.

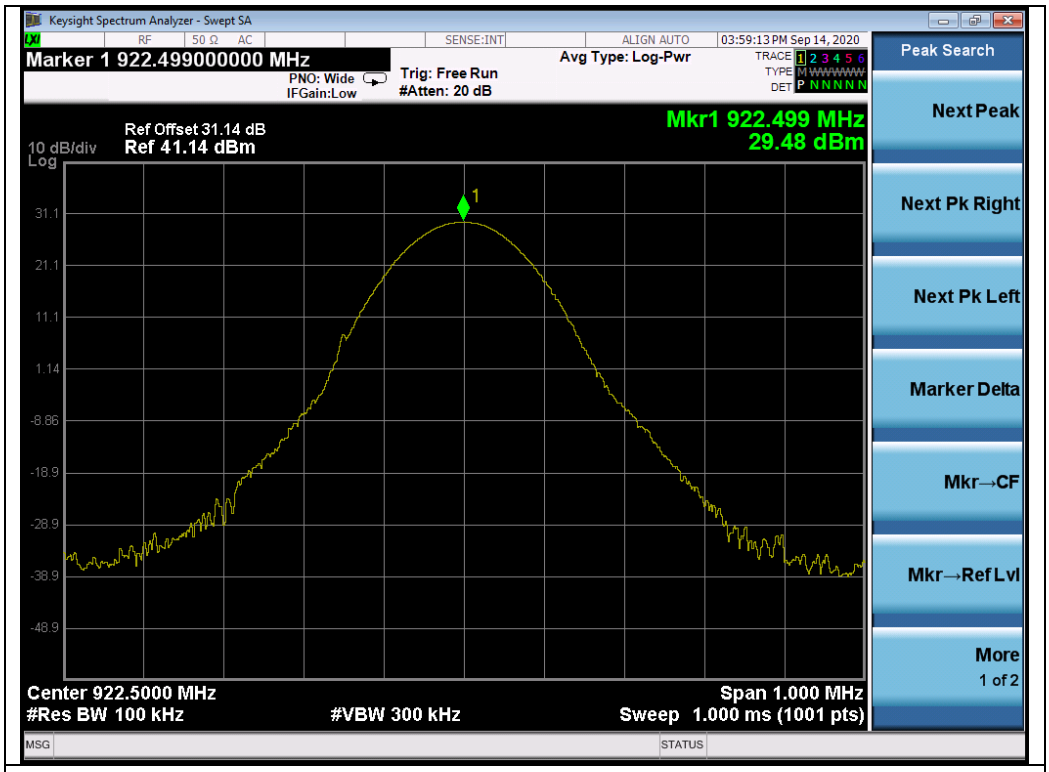
Test Plots:



Low Channel



Middle Channel



High Channel

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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