MEASUREMENT REPORT

FCC PART 22 & 24 & 27

FCC ID:	XMR2021BC660KGL
Application:	Quectel Wireless Solutions Company Limited
Application Type:	Certification
Product:	NB-IoT Module
Model No.:	BC660K-GL
Brand Name:	Quectel
FCC Rule Part(s):	Part 2, 22 (H), 24 (E), 27
Test Procedure(s):	ANSI C63.26-2015
Test Date:	December 08, 2020 ~ January 11, 2021

Reviewed By: Sunny Sun

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
2012RSU022-U1	Rev. 01	Initial Report	01-15-2021	Invalid
2012RSU022-U1	Rev. 02	Updated with TCB's comment	01-26-2021	Valid

CONTENTS

Description Page

1. GENERAL INFORMATION

1.1. Applicant

Quectel Wireless Solutions Company Limited
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.2. Manufacturer

Quectel Wireless Solutions Company Limited
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.3. Testing Facility

☒	**Test Site - MRT Suzhou Laboratory**	
	Laboratory Location (Suzhou - Wuzhong)	
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP)	
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01	CNAS: L10551
	FCC: CN1166	ISED: CN0001
	VCCI: R-20025, G-20034, C-20020, T-20020	
☐	**Test Site - MRT Shenzhen Laboratory**	
	Laboratory Location (Shenzhen)	
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02	CNAS: L10551
	FCC: CN1284	ISED: CN0105
☐	**Test Site - MRT Taiwan Laboratory**	
	Laboratory Location (Taiwan)	
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725	
	FCC: 291082, TW3261	ISED: TW3261

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	NB-IoT Module
Model No.:	BC660K-GL
Brand Name:	Quectel
Hardware Version:	R1.0
Software Version:	BC660KGLAAR01A02
IMEI:	866207050001894; 866207050001886
Operating Temp.:	-35 ~ 75 °C
Supply Voltage:	2.2 ~ 4.3Vdc, typical 3.3Vdc
NB-IoT Specification	
Single Band:	NB-IoT Band 2, 4, 5, 12, 13, 14, 17, 25, 66, 85
Modulation:	BPSK, QPSK
Category:	Release 14 (Cat NB2)
Deployment:	Stand-alone
Sub-carrier Spacing:	3.75kHz, 15kHz

2.2. Product Specification Subjective to this Report

FDD T_X Frequency Range:	Band 2: 1850 ~ 1910 MHz; Band 4: 1710 ~ 1755 MHz Band 5: 824 ~ 849 MHz; Band 12: 699 ~ 716 MHz Band 13: 777 ~ 787 MHz; Band 17: 704 ~ 716 MHz Band 25: 1850 ~ 1915 MHz; Band 66: 1710 ~ 1780 MHz Band 85: 698 ~ 716 MHz
FDD R_X Frequency Range:	Band 2: 1930 ~ 1990 MHz; Band 4: 2110 ~ 2155 MHz Band 5: 869 ~ 894 MHz; Band 12: 729 ~ 746 MHz Band 13: 746 ~ 756 MHz; Band 17: 734 ~ 746 MHz Band 25: 1930 ~ 1995 MHz; Band 66: 2110 ~ 2180 MHz Band 85: 728 ~ 746 MHz
Type of Modulation:	BPSK, QPSK

Note 1: For other features of this EUT, test report will be issued separately.

Note 2: All product specification presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

2.3. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
NB-IoT Band 2	1850 ~ 1910	Dipole	1.59
NB-IoT Band 4	1710 ~ 1755		2.00
NB-IoT Band 5	824 ~ 849		2.53
NB-IoT Band 12	699 ~ 716		3.95
NB-IoT Band 13	777 ~ 787		4.45
NB-IoT Band 14	788 ~ 798		4.45
NB-IoT Band 17	704 ~ 716		3.95
NB-IoT Band 25	1850 ~ 1915		1.59
NB-IoT Band 66	1710 ~ 1780		2.00
NB-IoT Band 85	698 ~ 716		3.95

Note: All the information is provided by the manufacturer.

2.4. Test Methodology

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

2.5. Device Capabilities

This device contains the following capabilities:
NB-IoT (Band 2, 4, 5, 12, 13, 14, 17, 25, 66, 85)

Band 25 (1850 ~ 1915 MHz) overlaps the entire frequency range of Band 2 (1850 ~ 1910 MHz). Therefore, test data provided in this report covers Band 2 as well as Band 25.

Band 66 (1710 ~ 1780 MHz) overlaps the entire frequency range of Band 4 (1710 ~ 1755 MHz). Therefore, test data provided in this report covers Band 4 as well as Band 66.

Band 85 (698 ~ 716 MHz) overlaps the entire frequency range of Band 12 (699 ~ 716 MHz) and. Band 17 (704 ~ 716 MHz) Therefore, test data provided in this report covers Band 12 and Band 17 as well as Band 85.

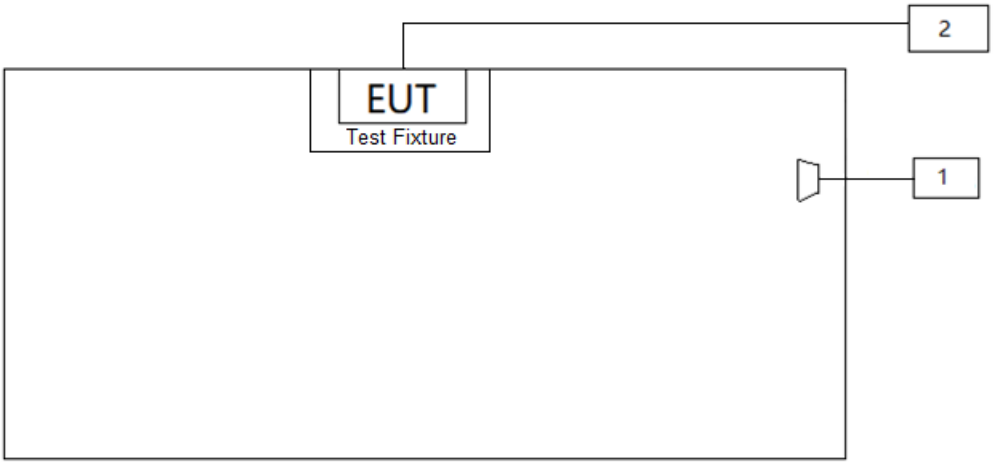
2.6. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.7. Maximum Power, Frequency Tolerance, and Emission Designator

NB-IoT Band 2/25		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	1850 ~ 1915	--	--	0.2333	177KG7D	0.0033	0.2350
NB-IoT Band 4/66		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	1710 ~ 1780	--	--	0.2333	178KG7D	0.0036	0.2328
NB-IoT Band 5		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	824 ~ 849	--	--	0.2333	178KG7D	0.0040	0.2317
NB-IoT Band 12/17/85		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	698 ~ 716	--	--	0.2360	177KG7D	0.0049	0.2312
NB-IoT Band 13		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	777 ~ 787	--	--	0.2339	177KG7D	0.0036	0.2333

2.8. Configuration of Tested System



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500
2	PC	ThinkPad	T460

2.9. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ- AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2021/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2021/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2021/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Broad Band Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2021/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Conducted Test Equipment (WZ-SR6, WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/15
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/11/18
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06080	1 year	2021/05/06
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2021/03/25
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2021/03/25
Attenuator	MVE	6dB	MRTSUE06534	1 year	2021/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2021/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 9kHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 9kHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

5. TEST RESULT

5.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	Conducted	Pass	Section 5.2
2.1055, 22.355 24.235, 27.54	Frequency Stability	< 2.5 ppm		Pass	Section 5.3
22.913(a)(5)	Equivalent Radiated Power (Band 5)	< 7 Watts Max ERP		Pass	Section 5.4
27.50(b)(9) 27.50(c)(9)	Equivalent Radiated Power (Band 13, 12/17/85)	< 30 Watts Max ERP			
24.232(c)	Equivalent Isotropic Radiated Power (Band 2/25)	< 2 Watts Max EIRP			
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4/66)	< 1 Watts Max EIRP			
24.232(d), 27.50(d)(5)	Peak to Average Ratio	< 13dB		Pass	Section 5.6
2.1051, 22.917(a) 24.238(a), 27.53(c), 27.53(g), 27.53(h)	Band Edge (Band 2/25, 4/66, 5, 13, 12/17/85)	< 43 + 10log10 (P[Watts])		Pass	Section 5.5, 5.7
2.1051, 22.917(a) 24.238(a), 27.53(c), 27.53(g), 27.53(h)	Spurious Emission (Band 2/25, 4/66, 5, 13, 12/17/85)	< 43 + 10log10 (P[Watts])			
2.1053, 22.917(a) 24.238(a), 27.53(c) (f) (g) (h)	Spurious Emissions (Band 2/25, 4/66, 5, 13, 12/17/85)	< 43 + 10log10 (P[Watts])	Radiated	Pass	Section 5.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Channel Band Edge, Radiated & Conducted Spurious Emission were presented in the test report.

5.2. Occupied Bandwidth

5.2.1.Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

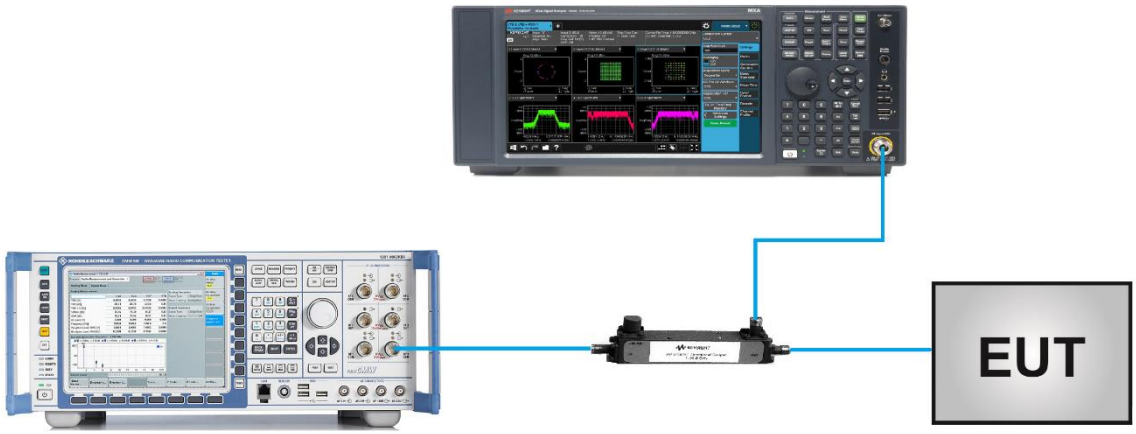
5.2.2.Test Procedure

ANSI C63.26-2015 - Section 5.4

5.2.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4.Test Setup



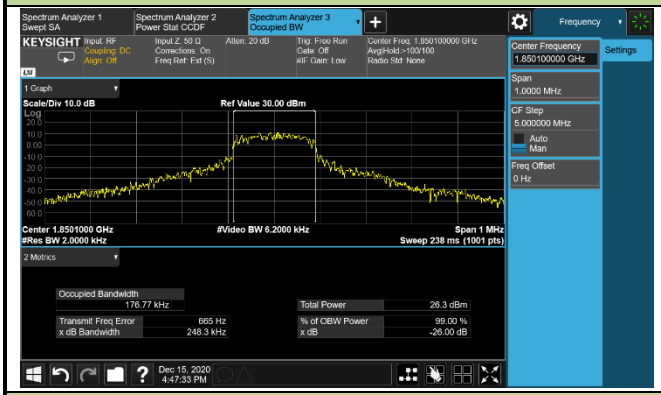
5.2.5.Test Result

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/15
Test Band	Band 2/25		

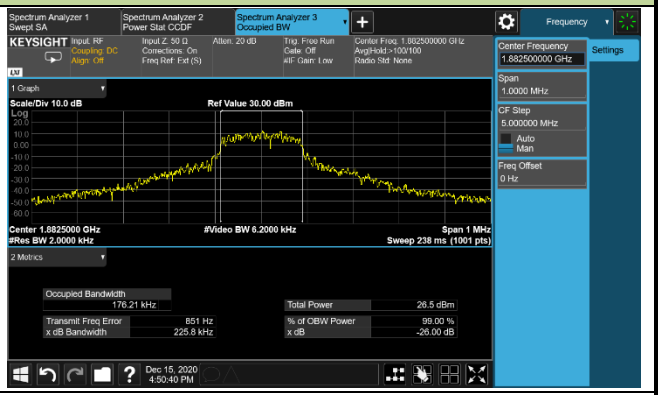
Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N_{tones}	99% Bandwidth (kHz)
26041	1850.1	QPSK	15	12@0	176.77
26365	1882.5				176.21
26689	1914.9				177.16

99% Bandwidth - QPSK

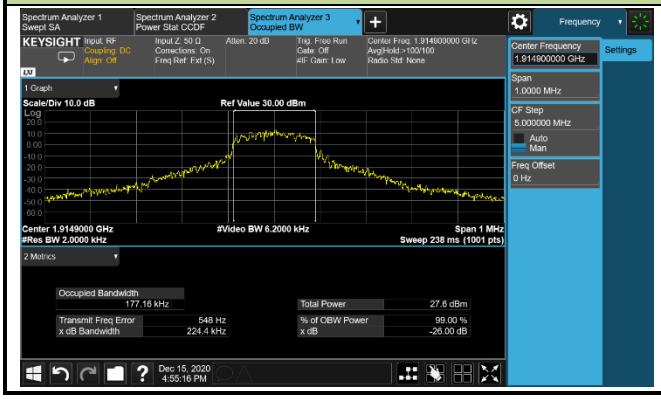
1850.1MHz



1882.5MHz



1914.9MHz

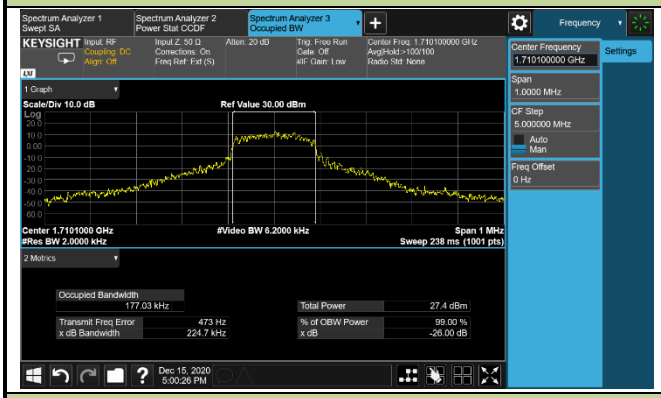


Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/15
Test Band	Band 4/66		

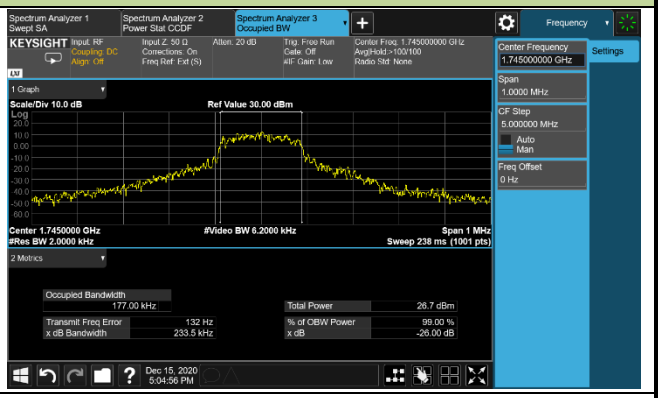
Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N_{tones}	99% Bandwidth (kHz)
131973	1710.1	QPSK	15	12@0	177.03
132322	1745.0				177.00
132671	1779.9				178.02

99% Bandwidth - QPSK

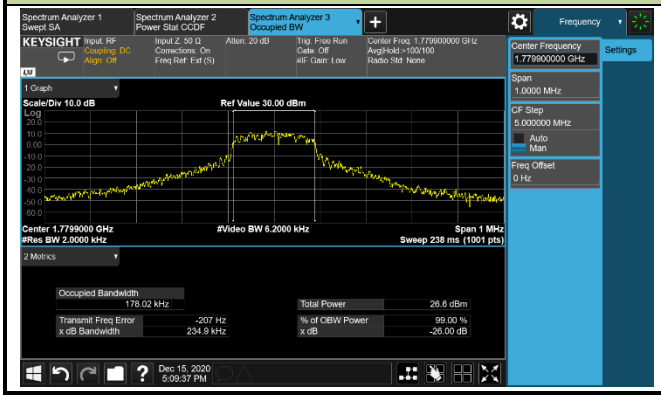
1710.1MHz



1745.0MHz



1779.9MHz

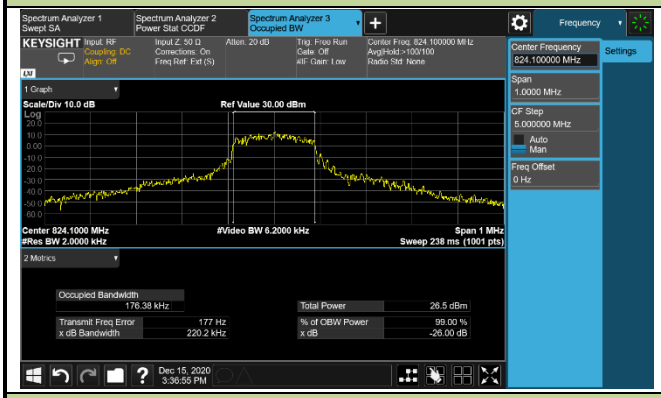


Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/15
Test Band	Band 5		

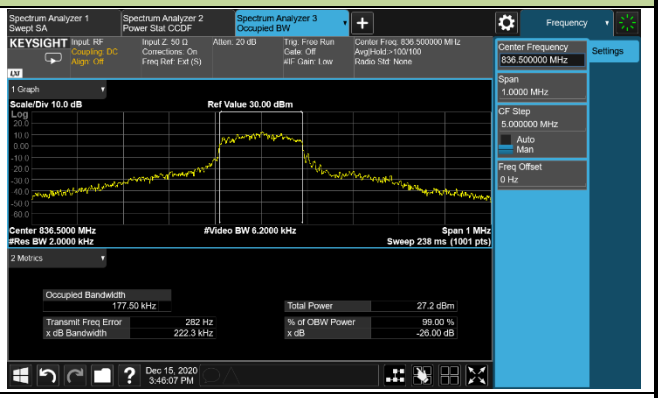
Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N_{tones}	99% Bandwidth (kHz)
20401	824.1	QPSK	15	12@0	176.38
20525	836.5				177.50
20649	848.9				177.58

99% Bandwidth - QPSK

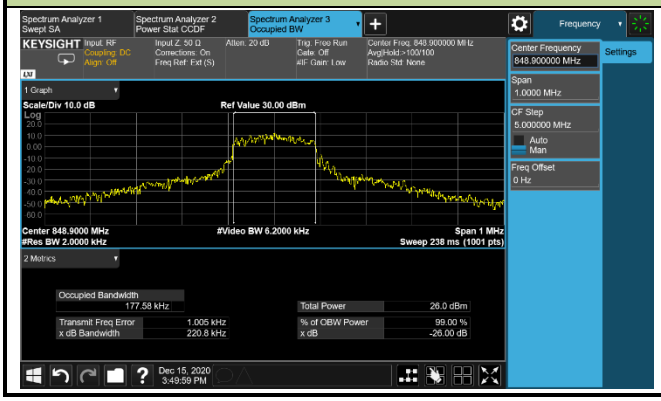
824.1MHz



836.5MHz



848.9MHz



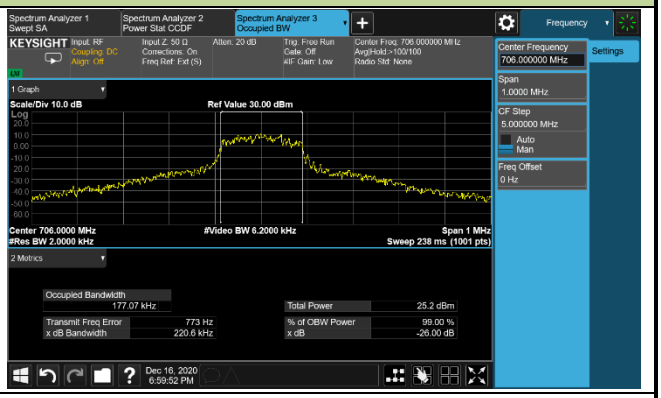
Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/15 ~ 2021/01/04
Test Band	Band 12&17/85		

Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N_{tones}	99% Bandwidth (kHz)
134004	698.2	QPSK	15	12@0	177.49
134082	706.0				177.07
134180	715.8				176.62

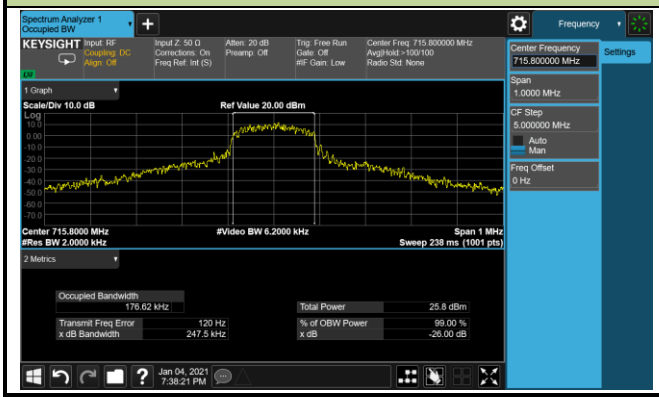
99% Bandwidth - QPSK

698.2MHz

706.0MHz



715.8MHz

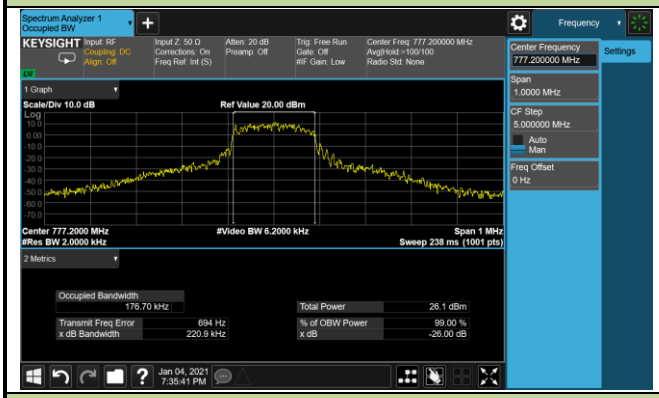


Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/15 ~ 2021/01/04
Test Band	Band 13		

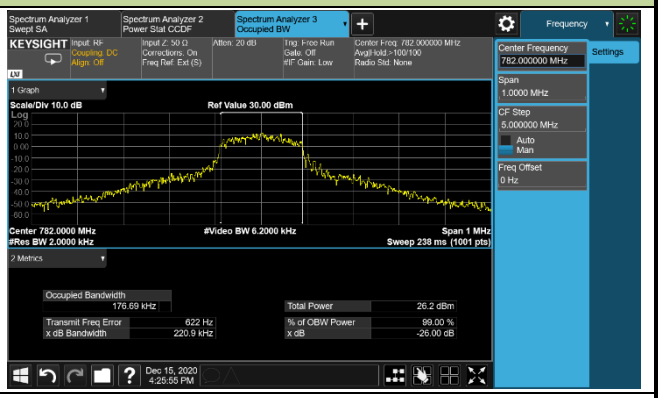
Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N_{tones}	99% Bandwidth (kHz)
23182	777.2	QPSK	15	12@0	176.70
23230	782.0				176.69
23278	786.8				176.68

99% Bandwidth - QPSK

777.2MHz



782.0MHz



786.8MHz

5.3. Frequency Stability Measurement

5.3.1.Test Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

5.3.2.Test Procedures Used

ANSI C63.26-2015 - Section 5.6

5.3.3.Test Setting

Frequency Stability Under Temperature Variations:

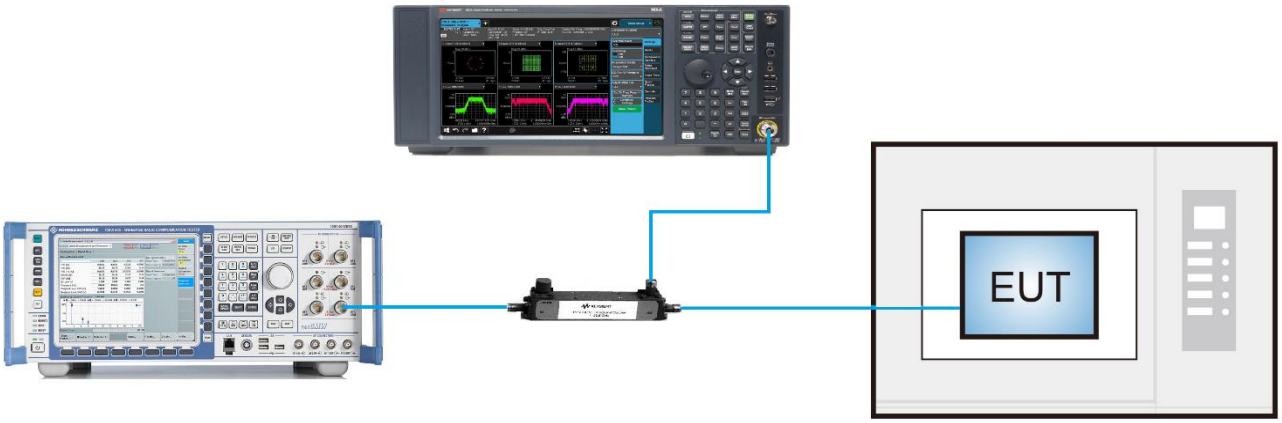
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

5.3.4.Test Setup



5.3.5.Test Result

Product	NB-IoT Module	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2020/12/17
Test Band	Band 2/25		

Power (VDC)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.3	- 30	4.35	0.00231
	- 20	4.33	0.00230
	- 10	4.07	0.00216
	0	4.25	0.00226
	+ 10	4.98	0.00265
	+ 20 (Ref)	4.30	0.00228
	+ 30	6.15	0.00327
	+ 40	3.79	0.00201
	+ 50	5.76	0.00306
4.3	+ 20	5.24	0.00278
2.2	+ 20	4.94	0.00262

Product	NB-IoT Module	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2020/12/17
Test Band	Band 4/66		

Power (VDC)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.3	- 30	5.14	0.00295
	- 20	3.53	0.00202
	- 10	4.08	0.00234
	0	4.40	0.00252
	+ 10	4.18	0.00240
	+ 20 (Ref)	3.66	0.00210
	+ 30	3.79	0.00217
	+ 40	6.23	0.00357
	+ 50	4.58	0.00262
4.3	+ 20	3.68	0.00211
2.2	+ 20	4.43	0.00254

Product	NB-IoT Module	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2020/12/17
Test Band	Band 5		

Power (VDC)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.3	- 30	2.60	0.00311
	- 20	1.69	0.00202
	- 10	2.43	0.00290
	0	1.55	0.00185
	+ 10	2.08	0.00249
	+ 20 (Ref)	1.64	0.00196
	+ 30	1.72	0.00206
	+ 40	1.97	0.00236
	+ 50	2.02	0.00241
4.3	+ 20	3.32	0.00397
2.2	+ 20	2.03	0.00243

Product	NB-IoT Module	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2020/12/18
Test Band	Band 12&17/85		

Power (VDC)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.3	- 30	3.45	0.00489
	- 20	2.82	0.00399
	- 10	3.29	0.00466
	0	2.69	0.00381
	+ 10	2.26	0.00320
	+ 20 (Ref)	2.69	0.00381
	+ 30	2.99	0.00424
	+ 40	2.61	0.00370
	+ 50	2.54	0.00360
4.3	+ 20	2.73	0.00387
2.2	+ 20	2.18	0.00309

Product	NB-IoT Module	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2020/12/18
Test Band	Band 13		

Power (VDC)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.3	- 30	2.04	0.00261
	- 20	1.78	0.00228
	- 10	2.85	0.00364
	0	2.12	0.00271
	+ 10	2.03	0.00260
	+ 20 (Ref)	1.90	0.00243
	+ 30	2.12	0.00271
	+ 40	1.99	0.00254
	+ 50	1.82	0.00233
4.3	+ 20	2.73	0.00349
2.2	+ 20	1.79	0.00229

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1.Test Limit

Band 5:

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

Band 13, 12/17/85:

Control stations and mobile stations transmitting in the 698-746 MHz, 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806MHz bands are limited to 30 watts ERP.

Band 2/25:

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Band 4/66:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

5.4.2.Test Procedures Used

ANSI C63.26-2015 - Section 5.2

5.4.3.Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

ERP or EIRP = P_{Meas} + G_T

where

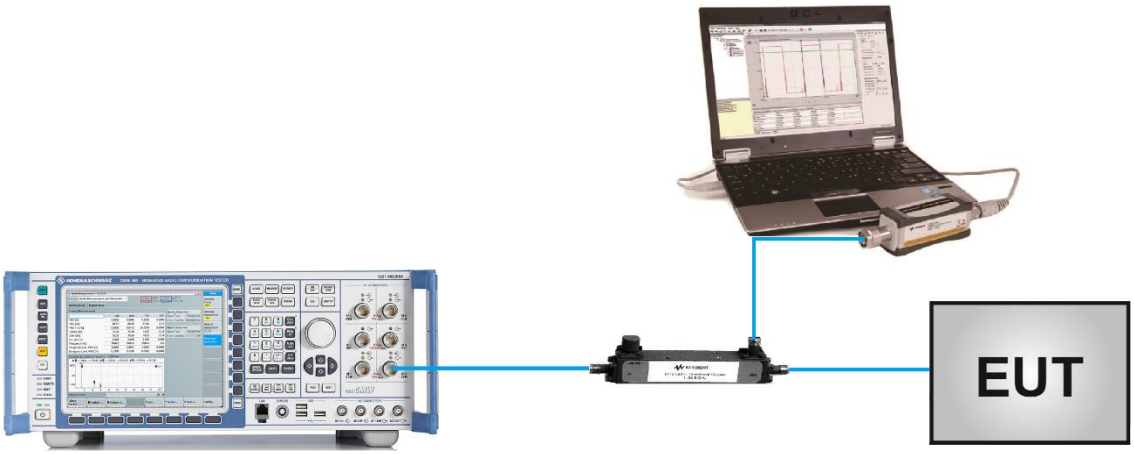
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

ERP = EIRP -2.15

5.4.4.Test Setup



5.4.5.Test Result

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/01/10
Test Band	Band 2/25		

Channel No.	Frequency (MHz)	Sub-carrier spacing (kHz)	N_{tones}	Output Power (dBm)	EIRP (dBm)	Limit (dBm)
BPSK						
26041	1850.1	3.75	1@0	23.37	24.96	< 33.01
26365	1882.5			23.41	25.00	< 33.01
26689	1914.9			23.68	25.27	< 33.01
26041	1850.1		1@47	23.59	25.38	< 33.01
26365	1882.5			23.43	25.32	< 33.01
26689	1914.9			23.53	25.12	< 33.01
26041	1850.1	15	1@0	23.67	25.26	< 33.01
26365	1882.5			23.54	25.13	< 33.01
26689	1914.9			23.66	25.25	< 33.01
26041	1850.1		1@11	23.53	25.12	< 33.01
26365	1882.5			23.50	25.09	< 33.01
26689	1914.9			23.68	25.27	< 33.01
QPSK						
26041	1850.1	3.75	1@0	23.35	24.94	< 33.01
26365	1882.5			23.43	25.02	< 33.01
26689	1914.9			23.69	25.28	< 33.01
26041	1850.1		1@47	23.38	24.97	< 33.01
26365	1882.5			23.45	25.04	< 33.01
26689	1914.9			23.56	25.15	< 33.01
26041	1850.1	15	1@0	23.55	25.14	< 33.01
26365	1882.5			23.62	25.21	< 33.01
26689	1914.9			23.54	25.33	< 33.01
26041	1850.1		1@11	23.21	24.80	< 33.01
26365	1882.5			23.56	25.15	< 33.01
26689	1914.9			23.71	25.30	< 33.01
26041	1850.1		12@0	22.14	23.73	< 33.01
26365	1882.5			22.03	23.62	< 33.01
26689	1914.9			21.90	23.49	< 33.01

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/01/10
Test Band	Band 4/66		

Channel No.	Frequency (MHz)	Sub-carrier spacing (kHz)	N_{tones}	Output Power (dBm)	EIRP (dBm)	Limit (dBm)
BPSK						
131973	1710.1	3.75	1@0	23.49	25.49	< 30.00
132322	1745.0			23.65	25.65	< 30.00
132671	1779.9			23.65	25.65	< 30.00
131973	1710.1		1@47	23.47	25.47	< 30.00
132322	1745.0			23.64	25.64	< 30.00
132671	1779.9			23.38	25.38	< 30.00
131973	1710.1	15	1@0	23.66	25.76	< 30.00
132322	1745.0			23.44	25.44	< 30.00
132671	1779.9			23.51	25.51	< 30.00
131973	1710.1		1@11	23.68	25.78	< 30.00
132322	1745.0			23.40	25.40	< 30.00
132671	1779.9			23.31	25.31	< 30.00
QPSK						
131973	1710.1	3.75	1@0	23.51	25.51	< 30.00
132322	1745.0			23.58	25.58	< 30.00
132671	1779.9			23.64	25.64	< 30.00
131973	1710.1		1@47	23.52	25.52	< 30.00
132322	1745.0			23.56	25.56	< 30.00
132671	1779.9			23.67	25.67	< 30.00
131973	1710.1	15	1@0	23.24	25.04	< 30.00
132322	1745.0			23.50	25.50	< 30.00
132671	1779.9			23.45	25.45	< 30.00
131973	1710.1		1@11	23.51	25.51	< 30.00
132322	1745.0			23.47	25.47	< 30.00
132671	1779.9			23.43	25.43	< 30.00
131973	1710.1		12@0	21.92	23.92	< 30.00
132322	1745.0			21.71	23.71	< 30.00
132671	1779.9			21.82	23.82	< 30.00

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/01/10
Test Band	Band 5		

Channel No.	Frequency (MHz)	Sub-carrier spacing (kHz)	N_{tones}	Output Power (dBm)	ERP (dBm)	Limit (dBm)
BPSK						
20401	824.1	3.75	1@0	23.26	23.64	< 38.45
20525	836.5			23.68	24.06	< 38.45
20649	848.9			23.15	23.53	< 38.45
20401	824.1		1@47	23.26	23.64	< 38.45
20525	836.5			23.36	23.14	< 38.45
20649	848.9			23.18	23.56	< 38.45
20401	824.1	15	1@0	23.44	23.82	< 38.45
20525	836.5			23.36	23.74	< 38.45
20649	848.9			23.35	23.73	< 38.45
20401	824.1		1@11	23.35	23.73	< 38.45
20525	836.5			23.37	23.75	< 38.45
20649	848.9			23.40	23.78	< 38.45
QPSK						
20401	824.1	3.75	1@0	23.26	23.64	< 38.45
20525	836.5			23.54	23.42	< 38.45
20649	848.9			22.74	23.52	< 38.45
20401	824.1		1@47	23.44	23.32	< 38.45
20525	836.5			22.75	23.13	< 38.45
20649	848.9			23.58	23.46	< 38.45
20401	824.1	15	1@0	23.41	23.59	< 38.45
20525	836.5			23.45	23.43	< 38.45
20649	848.9			23.41	23.29	< 38.45
20401	824.1		1@11	23.45	23.21	< 38.45
20525	836.5			23.37	23.35	< 38.45
20649	848.9			23.65	23.13	< 38.45
20401	824.1		12@0	22.13	22.51	< 38.45
20525	836.5			22.10	22.48	< 38.45
20649	848.9			22.08	22.46	< 38.45

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/01/10
Test Band	Band 12/17/85		

Channel No.	Frequency (MHz)	Sub-carrier spacing (kHz)	N_{tones}	Output Power (dBm)	ERP (dBm)	Limit (dBm)
BPSK						
134004	698.2	3.75	1@0	23.47	25.57	< 44.77
134082	706.0			23.45	25.55	< 44.77
134180	715.8			23.43	25.53	< 44.77
134004	698.2		1@47	23.56	25.56	< 44.77
134082	706.0			23.56	25.56	< 44.77
134180	715.8			23.67	25.47	< 44.77
134004	698.2	15	1@0	23.73	25.53	< 44.77
134082	706.0			23.66	25.46	< 44.77
134180	715.8			23.52	25.32	< 44.77
134004	698.2		1@11	23.64	25.44	< 44.77
134082	706.0			23.58	25.58	< 44.77
134180	715.8			23.57	25.57	< 44.77
QPSK						
134004	698.2	3.75	1@0	23.58	25.58	< 44.77
134082	706.0			23.61	25.61	< 44.77
134180	715.8			23.64	25.54	< 44.77
134004	698.2		1@47	23.59	25.59	< 44.77
134082	706.0			23.51	25.51	< 44.77
134180	715.8			23.21	25.01	< 44.77
134004	698.2	15	1@0	23.31	25.11	< 44.77
134082	706.0			23.20	25.00	< 44.77
134180	715.8			23.12	24.92	< 44.77
134004	698.2		1@11	23.33	25.13	< 44.77
134082	706.0			23.15	24.95	< 44.77
134180	715.8			23.08	24.88	< 44.77
134004	698.2		12@0	21.69	23.49	< 44.77
134082	706.0			21.72	23.52	< 44.77
134180	715.8			21.70	23.50	< 44.77

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/01/10
Test Band	Band 13		

Channel No.	Frequency (MHz)	Sub-carrier spacing (kHz)	N_{tones}	Output Power (dBm)	ERP (dBm)	Limit (dBm)
BPSK						
23182	777.2	3.75	1@0	23.67	25.97	< 44.77
23230	782.0			23.60	25.90	< 44.77
23278	786.8			23.61	25.91	< 44.77
23182	777.2		1@47	23.69	25.99	< 44.77
23230	782.0			23.59	25.89	< 44.77
23278	786.8			23.67	25.97	< 44.77
23182	777.2	15	1@0	23.08	25.38	< 44.77
23230	782.0			23.35	25.65	< 44.77
23278	786.8			23.36	25.66	< 44.77
23182	777.2		1@11	23.13	25.43	< 44.77
23230	782.0			23.22	25.52	< 44.77
23278	786.8			23.26	25.56	< 44.77
QPSK						
23182	777.2	3.75	1@0	23.09	25.39	< 44.77
23230	782.0			23.54	25.84	< 44.77
23278	786.8			23.68	25.98	< 44.77
23182	777.2		1@47	22.98	25.28	< 44.77
23230	782.0			23.41	25.71	< 44.77
23278	786.8			23.67	25.97	< 44.77
23182	777.2	15	1@0	23.36	25.66	< 44.77
23230	782.0			23.30	25.60	< 44.77
23278	786.8			23.40	25.70	< 44.77
23182	777.2		1@11	23.26	25.56	< 44.77
23230	782.0			23.25	25.55	< 44.77
23278	786.8			23.37	25.67	< 44.77
23182	777.2		12@0	21.70	24.00	< 44.77
23230	782.0			21.92	24.22	< 44.77
23278	786.8			21.81	24.11	< 44.77

5.5. Band Edge Measurement

5.5.1.Test Limit

22.917(a), 24.238 (a), 27.53 (g) (h)

For operations in the 824 ~ 849 MHz, 1850 ~ 1910 MHz, 1930 ~ 1990 MHz, 698 ~ 746 MHz and 1710 ~ 1755 MHz, the FCC limit is 43 + 10log10(P[$_{Watts}$]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

5.5.2.Test Procedure Used

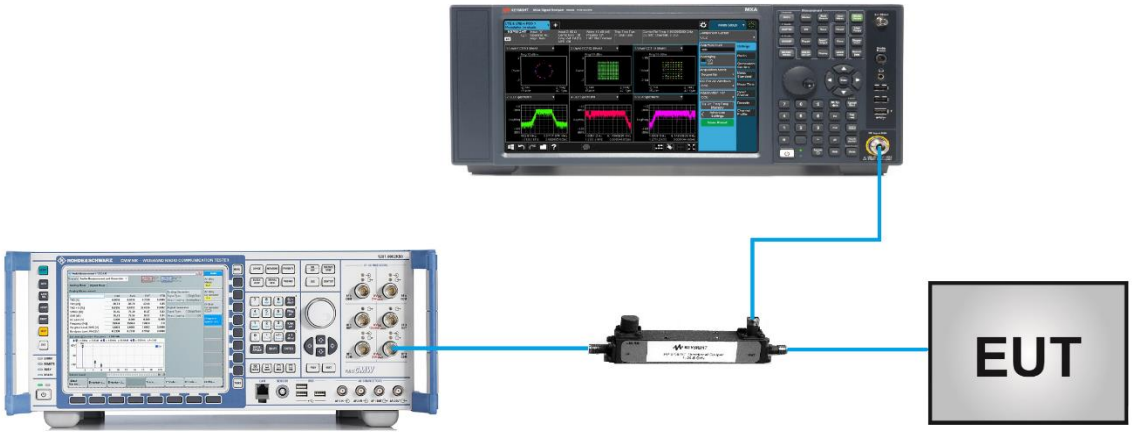
ANSI C63.26-2015 - Section 5.7

5.5.3.Test Setting

1. Set the analyzer frequency to low or high channel
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer’s band power functions.
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.

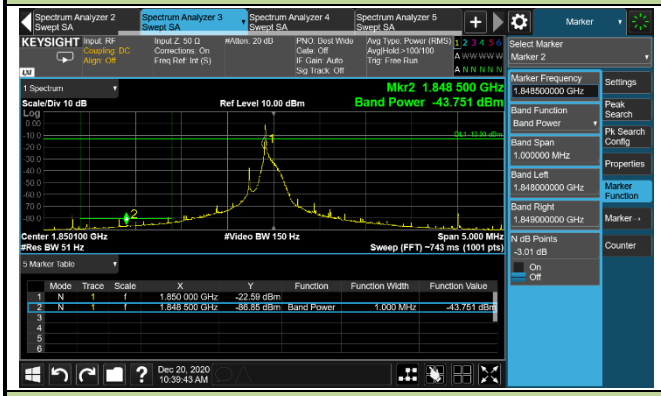
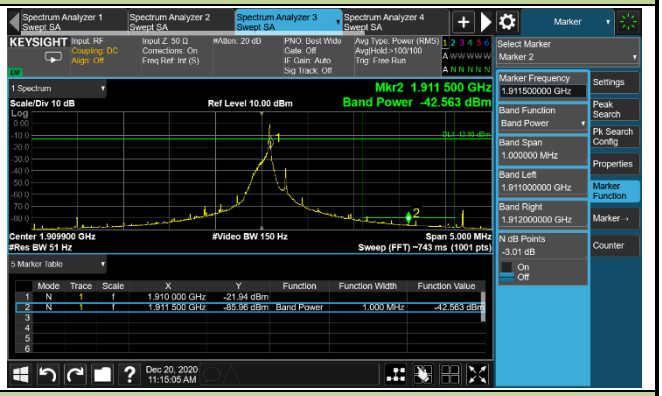
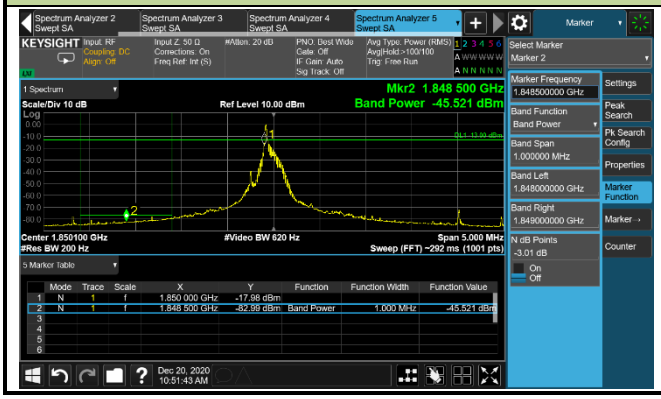
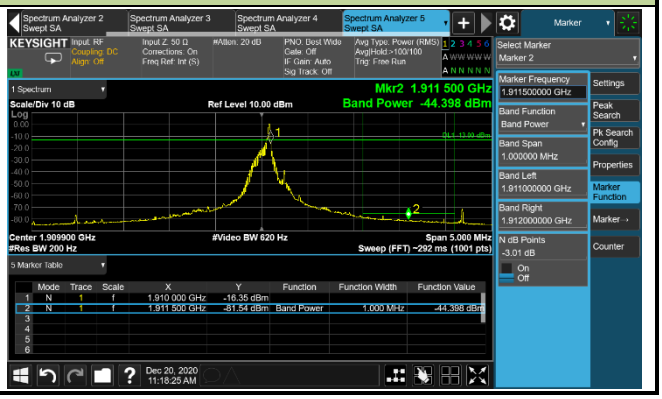
To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

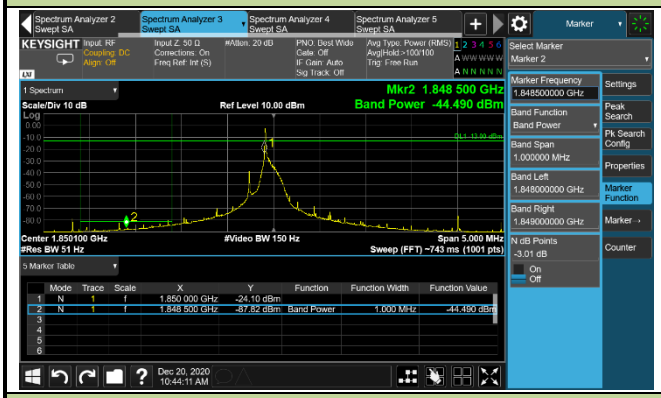
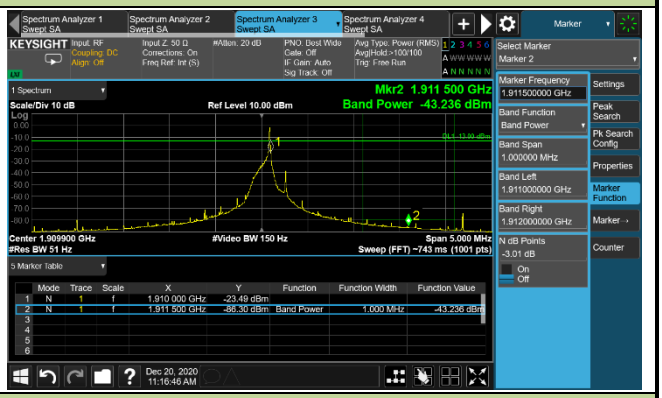
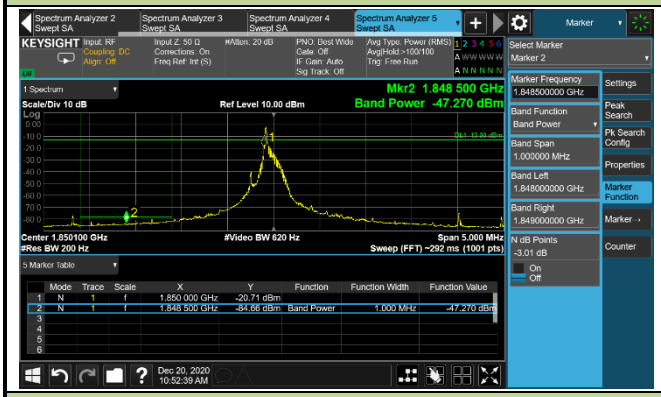
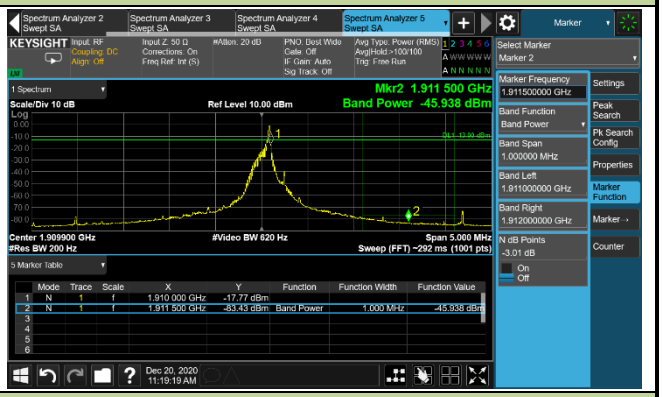
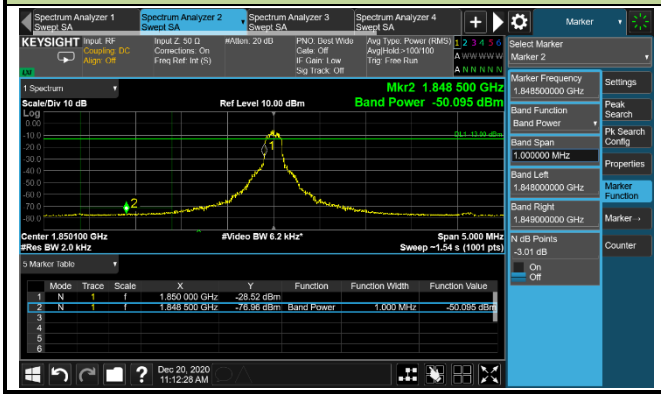
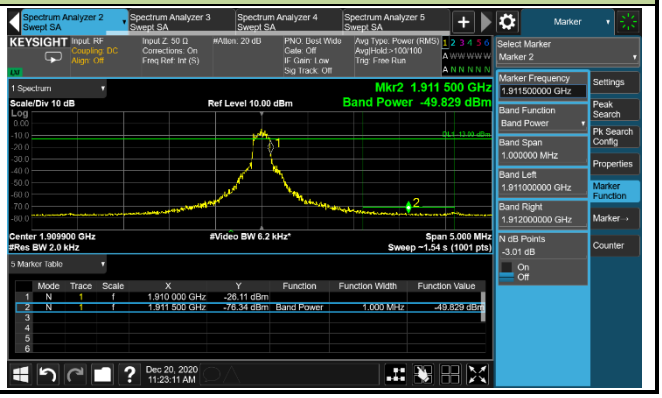
5.5.4.Test Setup



5.5.5.Test Result

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/20
Test Band	Band 2/25	Test Result	Pass

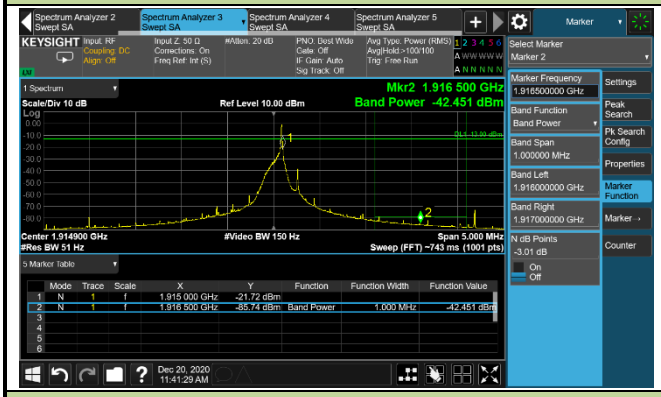
BPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	

QPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	
15 kHz 12@0 CH-Low	15kHz 12@0 CH-High
	

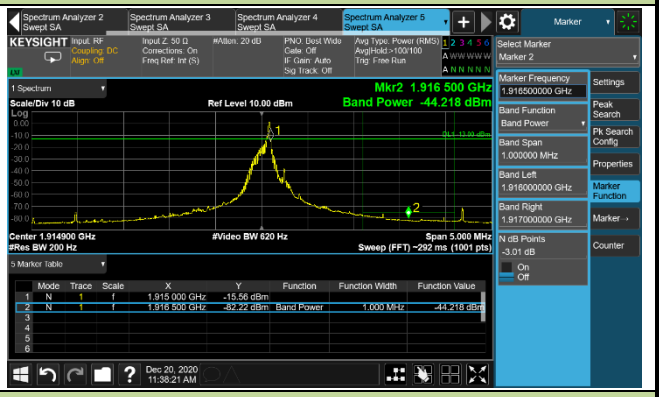
Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/20
Test Band	Band 25	Test Result	Pass

BPSK

3.75kHz 1@47 CH-High

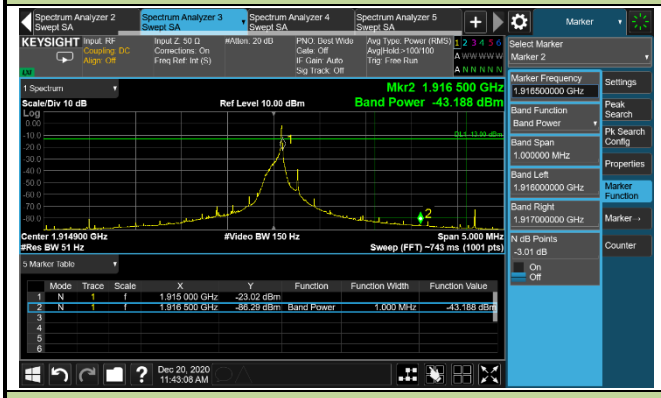


15kHz 1@11 CH-High

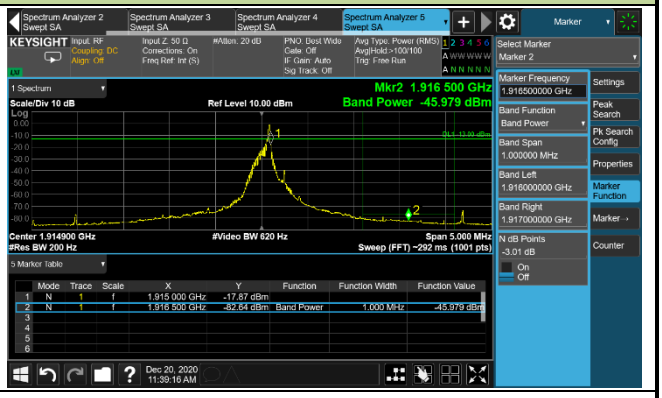


QPSK

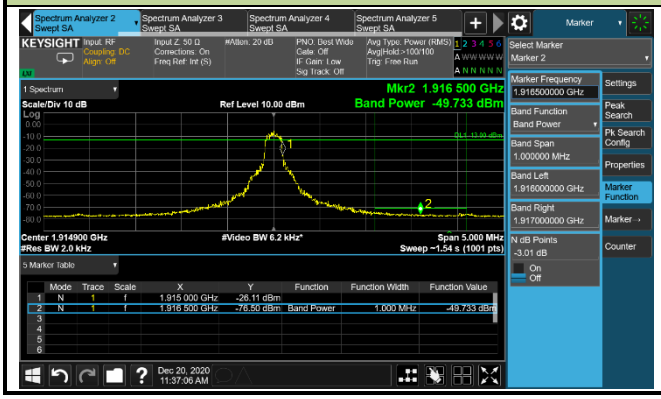
3.75kHz 1@47 CH-High



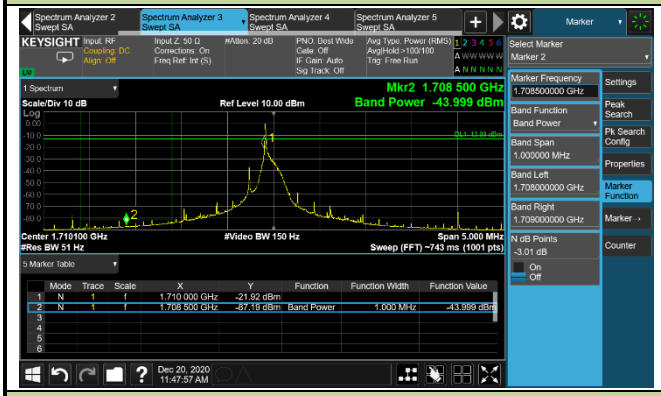
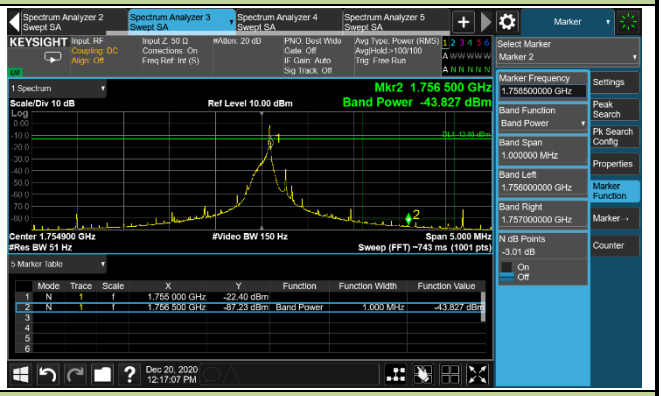
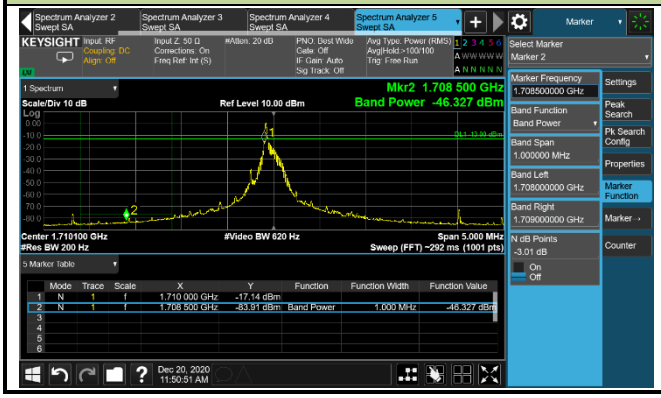
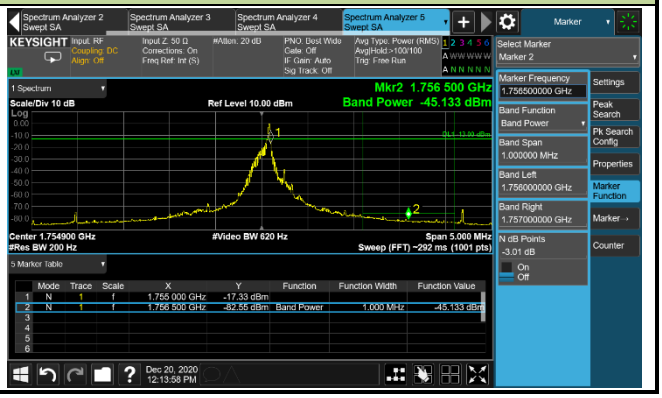
15kHz 1@11 CH-High

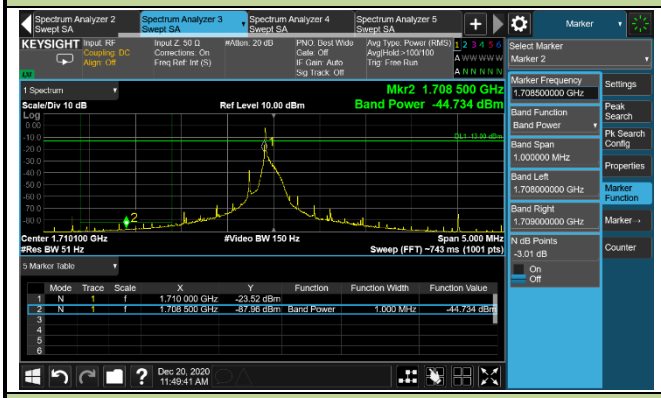
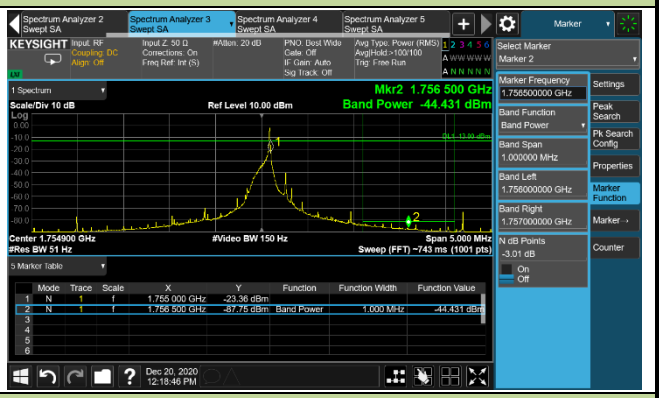
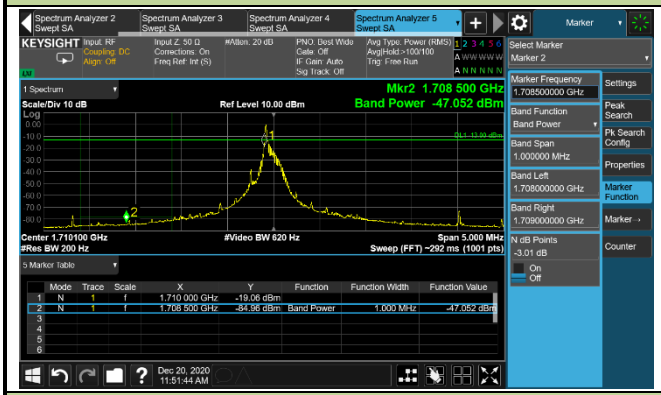
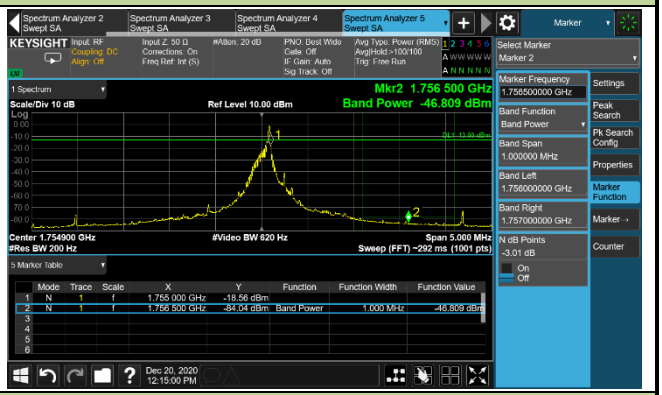
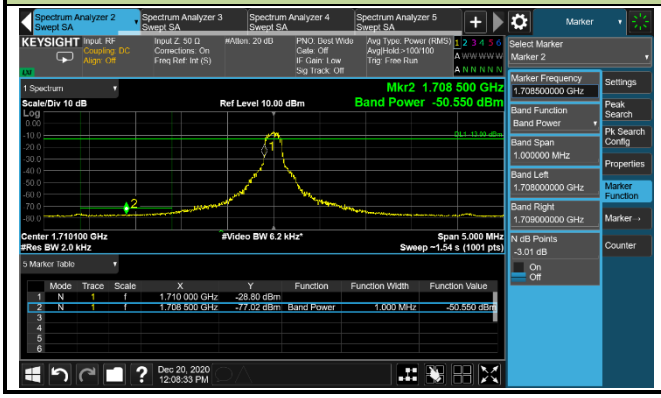
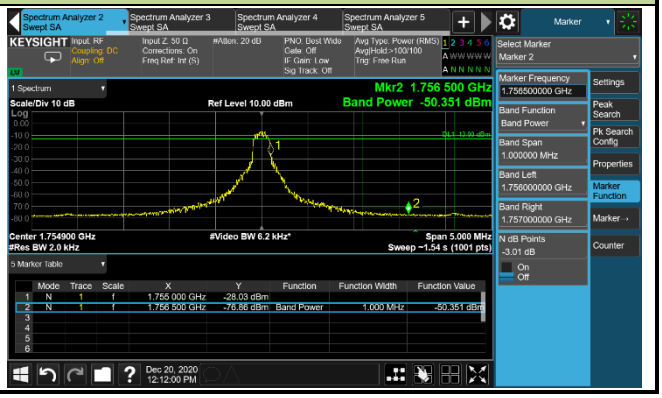


15kHz 12@0 CH-High



Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/20
Test Band	Band 4/66	Test Result	Pass

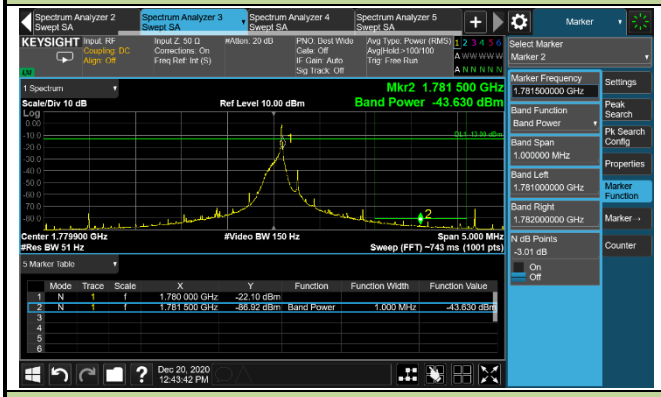
BPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	

QPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	
15 kHz 12@0 CH-Low	15kHz 12@0 CH-High
	

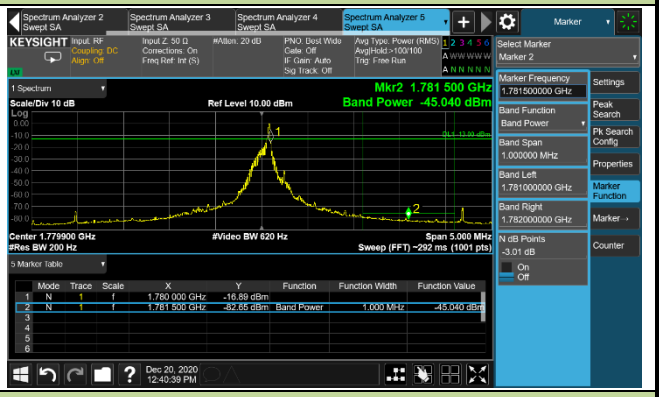
Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/20
Test Band	Band 66	Test Result	Pass

BPSK

3.75kHz 1@47 CH-High

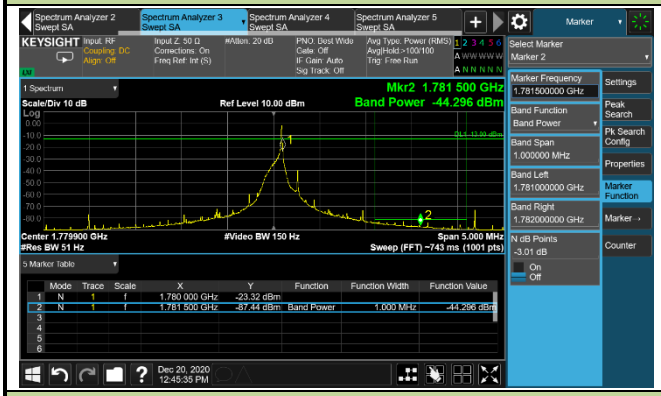


15kHz 1@11 CH-High

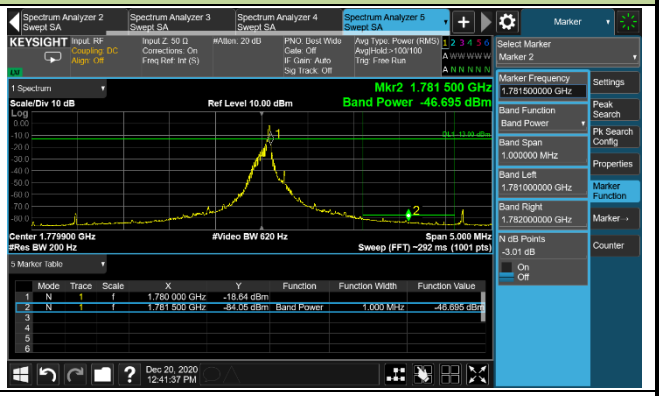


QPSK

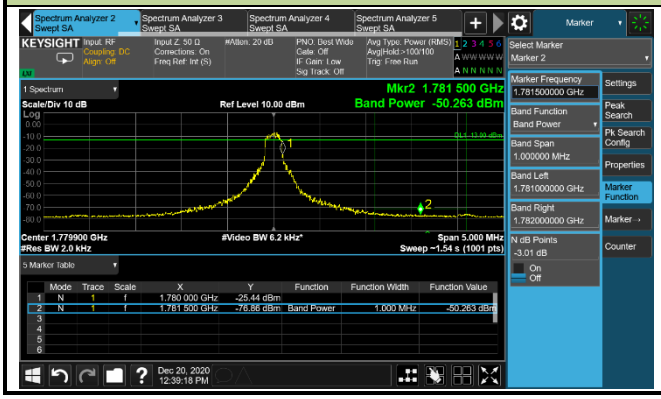
3.75kHz 1@47 CH-High



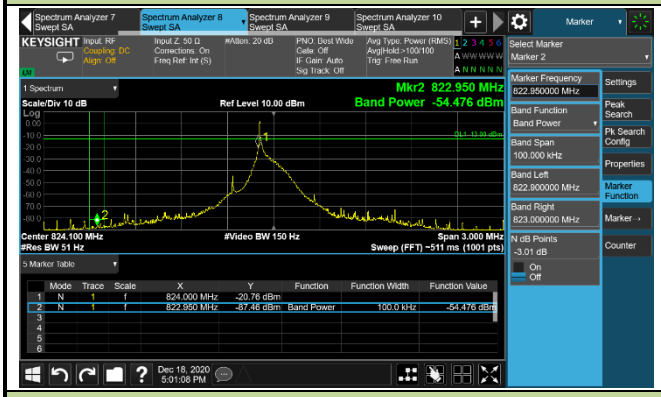
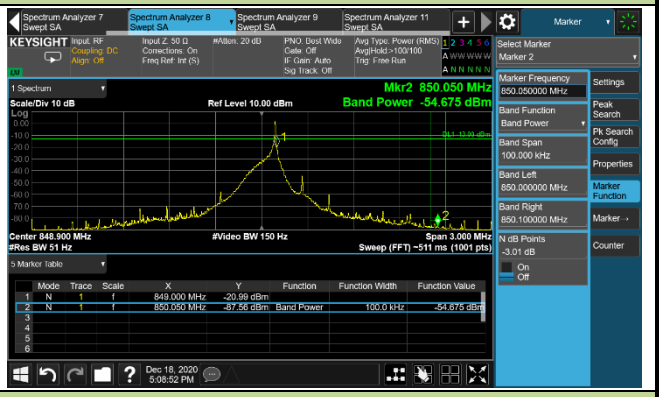
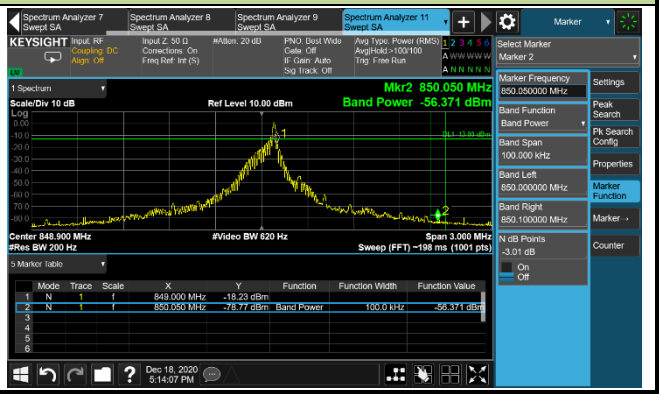
15kHz 1@11 CH-High

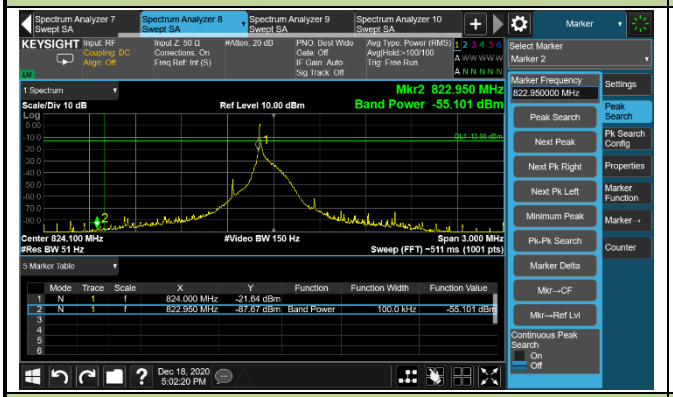
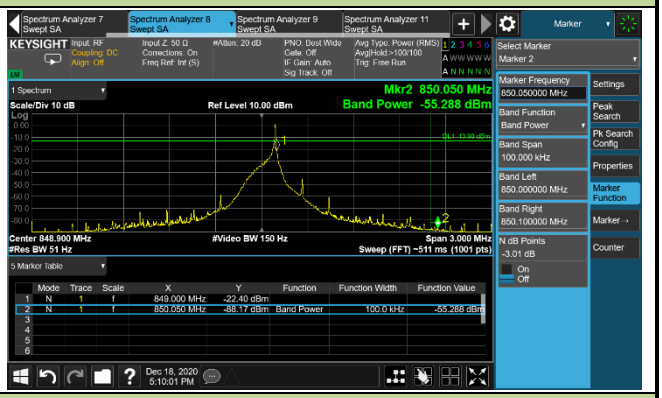
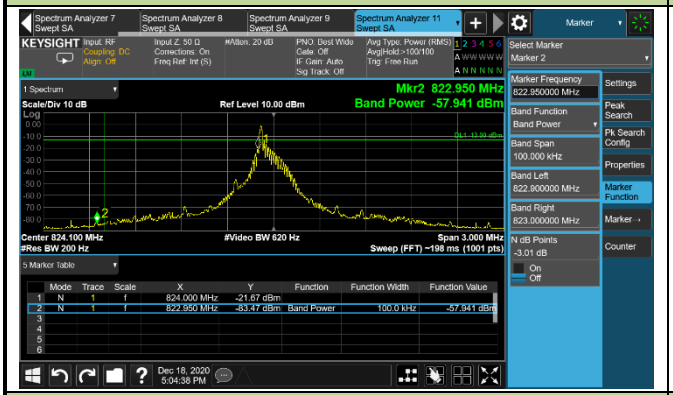
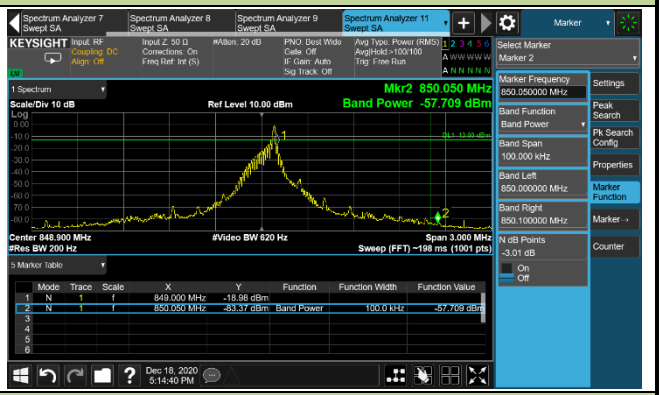
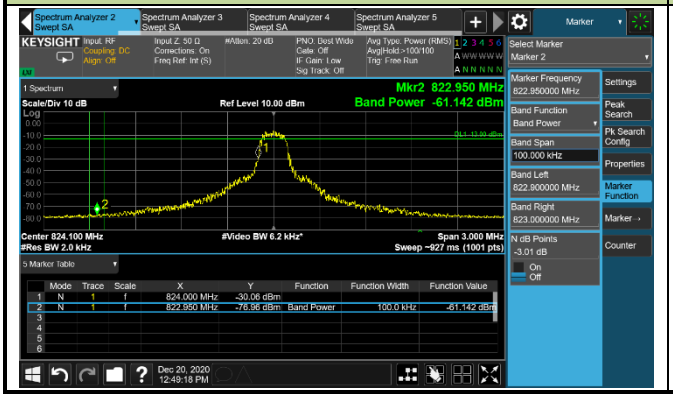
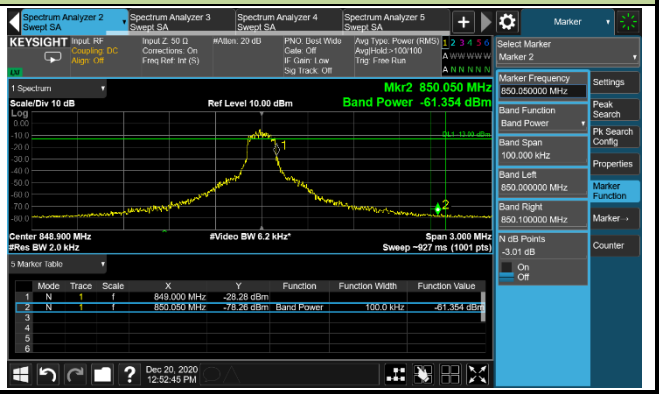


15kHz 12@0 CH-High

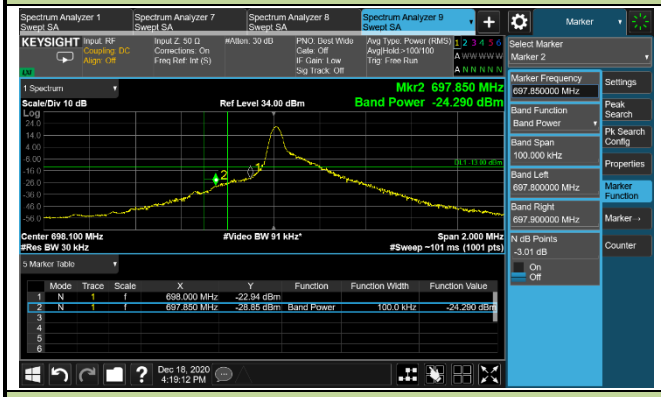
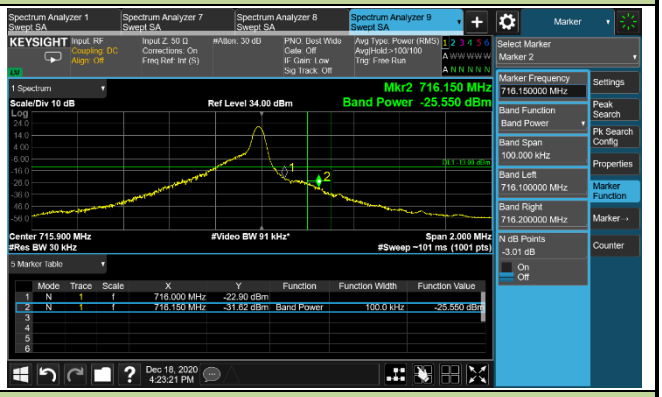
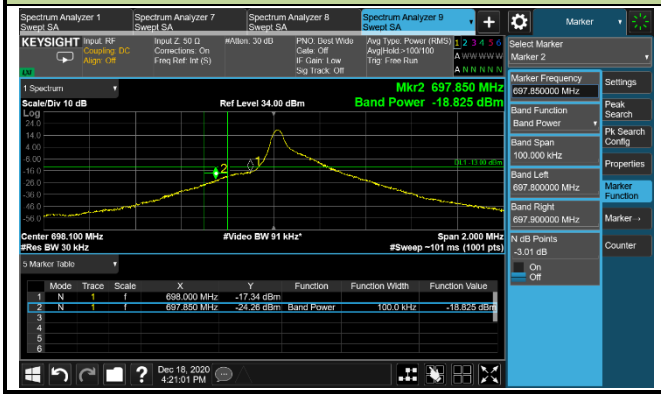
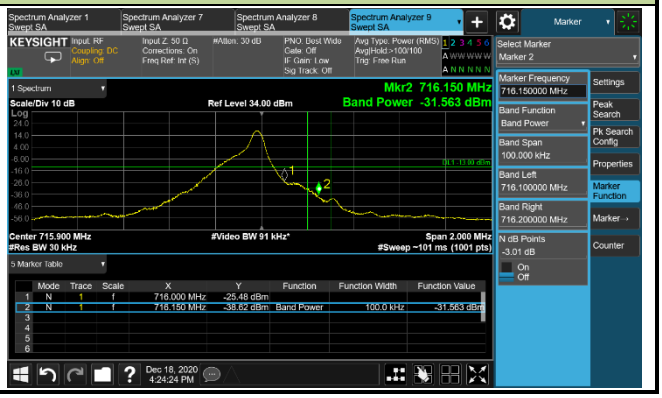


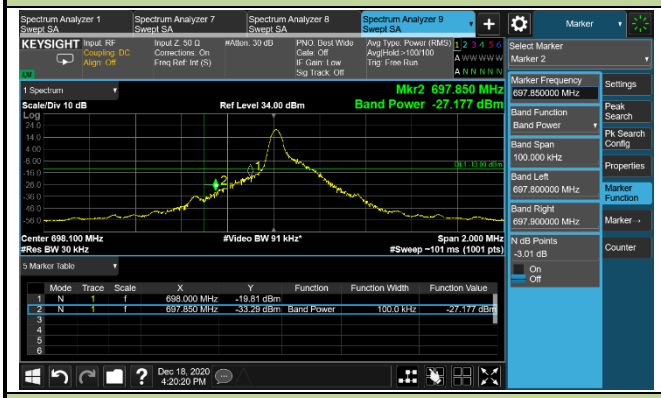
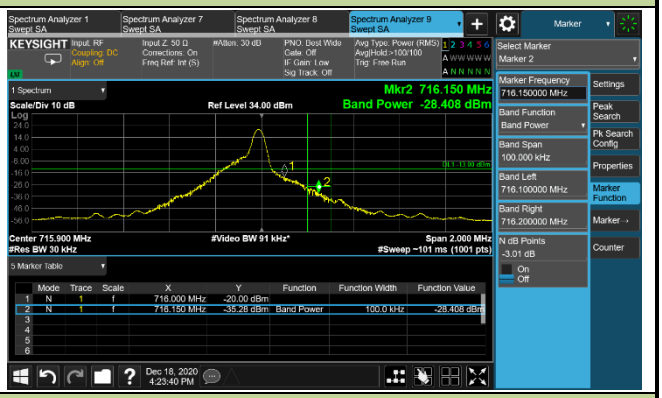
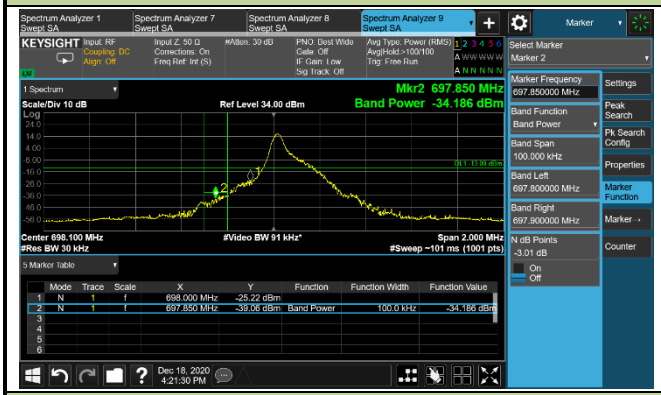
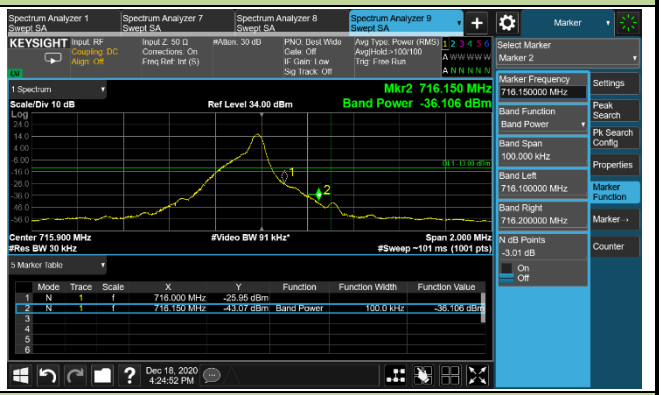
Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/18
Test Band	Band 5	Test Result	Pass

BPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	

QPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	
15 kHz 12@0 CH-Low	15kHz 12@0 CH-High
	

Product	NB-IoT Module	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2020/12/18
Test Band	Band 12&17/85	Test Result	Pass

BPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	3.75kHz 1@11 CH-High
	

QPSK	
3.75kHz 1@0 CH-Low	3.75kHz 1@47 CH-High
	
15kHz 1@0 CH-Low	15kHz 1@11 CH-High
	
15 kHz 12@0 CH-Low	15kHz 12@0 CH-High