

MEASUREMENT REPORT

FCC PART 90

FCC ID: 2AJYU-8EC0002

Application: SIMCom Wireless Solutions Limited

Application Type: Certification

Product: Wireless MODULE

Model No.: SIM7028

Brand Name: SIMCOM

FCC Rule Part(s): Part 90 Subpart R

Test Procedure(s): ANSI C63.26-2015

Test Date: September 07 ~ 30, 2021

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2109RSU011-U6	Rev. 01	Initial Report	11-13-2021	Valid

Note: "SIM7022" and "SIM7028" are only different models, and all the other circuits are the same. This report is based on the MRT report "2109RSU011-U2" and FCC ID "2AJYU-8EC0001" to update the model No.

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1. GENERAL INFORMATION

1.1. Applicant

SIMCom Wireless Solutions Limited
No.633 Jinzhong Road, Shanghai, China

1.2. Manufacturer

SIMCom Wireless Solutions Limited
No.633 Jinzhong Road, Shanghai, China

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 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
☐	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

1.4. Product Information

Product Name	Wireless MODULE
Model No.	SIM7028
Brand Name	SIMCOM
IMEI	863266050008153
Operating Temp.	-40 ~ 85 °C
Supply Voltage	3.0 ~ 4.3Vdc, typical 3.7Vdc
NB-IoT Specification	
Single Band	NB-IoT Band 2, 4, 5, 12, 13, 14, 17, 25, 26, 66
Modulation	BPSK, QPSK
Category	Cat NB2
Sub-carrier Spacing	3.75kHz, 15kHz
Remark:	
1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

FDD T _x Frequency Range:	Band 14: 788 ~ 798 MHz
FDD R _x Frequency Range:	Band 14: 758 ~ 768 MHz
Type of Modulation:	BPSK, QPSK

1.6. 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 CFR 47 Part 2, 90
- 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

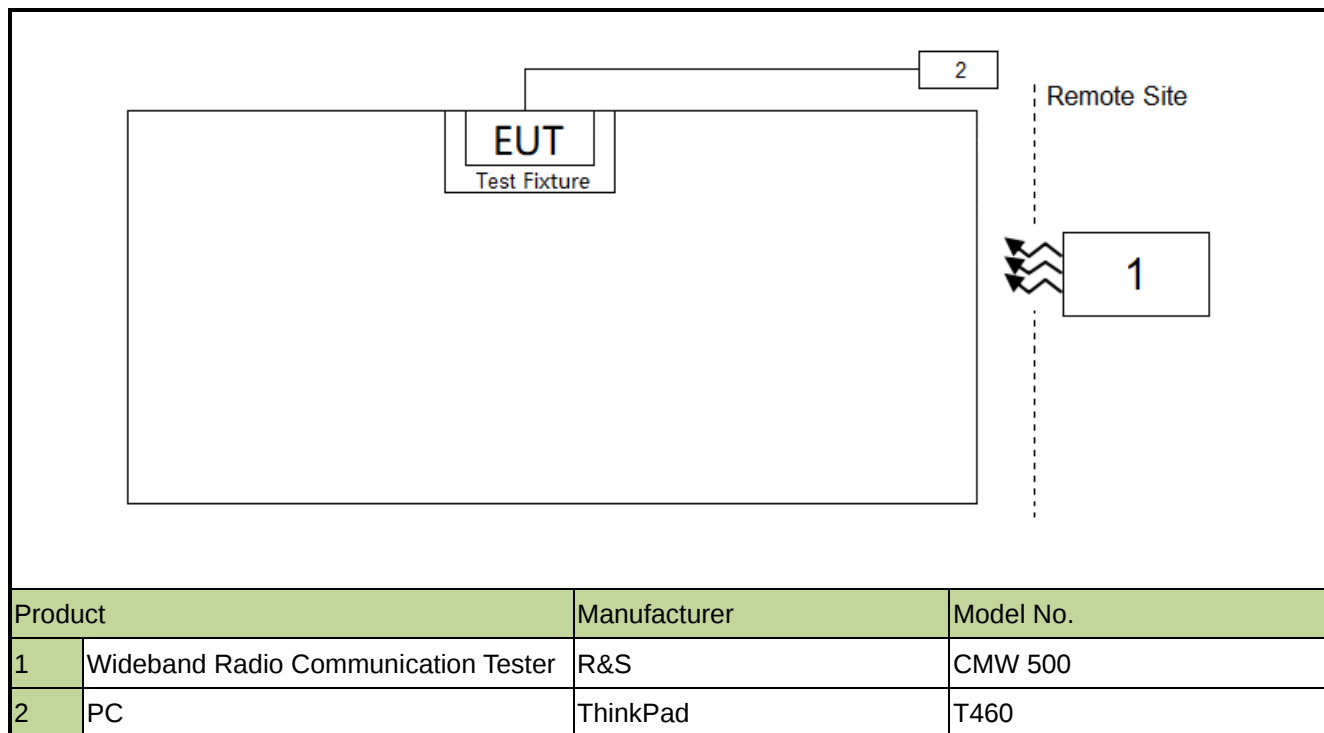
1.7. EMI Suppression Device(s)/Modifications

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

1.8. Maximum Power, Frequency Tolerance, and Emission Designator

NB-IoT Band 14		BPSK			QPSK		
BW (kHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
200	788 ~ 798	--	--	0.1507	177KG7D	0.0234	0.1535

1.9. Configuration of Tested System



1.10. Test Environment Condition

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

2. 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	2022/01/04
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2022/08/08
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/08/05
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/15
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2022/09/16
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2022/06/28
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2022/04/29

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2022/06/24
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	2022/05/24
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2021/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/12/14
Broad Band Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2021/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2022/04/29

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	2022/04/13
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2022/07/10
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2022/04/13
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	2022/05/05
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2022/03/24
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2022/03/24
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	2022/06/28

Software	Version	Function
EMI Software	V3	EMI Test Software

3. 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%

4. TEST RESULT

4.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	Conducted	Pass	Section 4.2
2.1055, 90.539(e)	Frequency Stability	< 1.25 ppm		Pass	Section 4.3
90.542(a)(6)	Equivalent Radiated Power	< 30 Watts Max ERP		Pass	Section 4.4
2.1051, 90.543(e)(2)(3)	Band Edge	Refer to section 4.5		Pass	Section 4.5
2.1051, 90.210(n)	Emission Mask	Mask B		Pass	Section 4.6
2.1051, 90.543(e)(3)	Spurious Emission	< 43 + 10log10 (P _[Watts])		Pass	Section 4.7
2.1053, 90.543(e)(3)(f)	Spurious Emissions	< 43 + 10log10 (P _[Watts])	Radiated	Pass	Section 4.8

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.
- 3) The antenna gain was provided by customer to calculate the EIRP or ERP.

4.2. Occupied Bandwidth

4.2.1. 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.

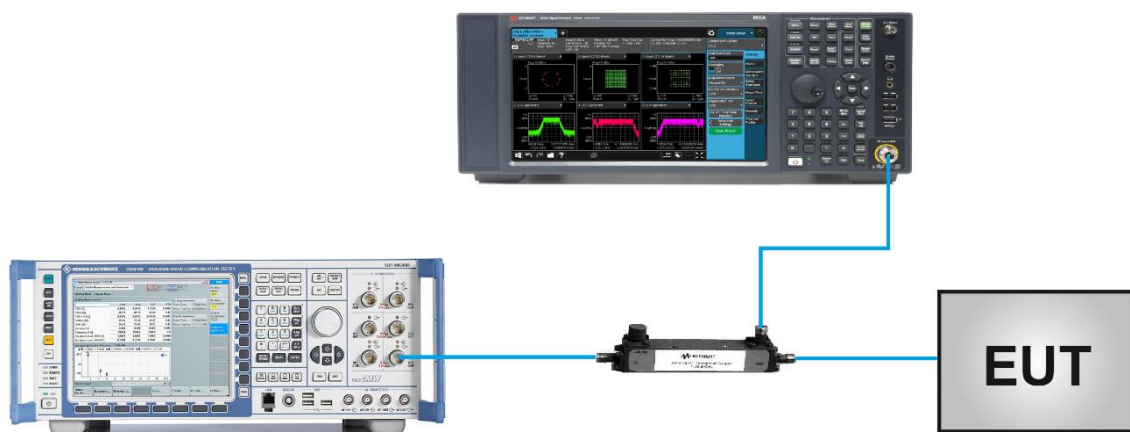
4.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.4

4.2.3. 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 $\geq 3 \times$ 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.

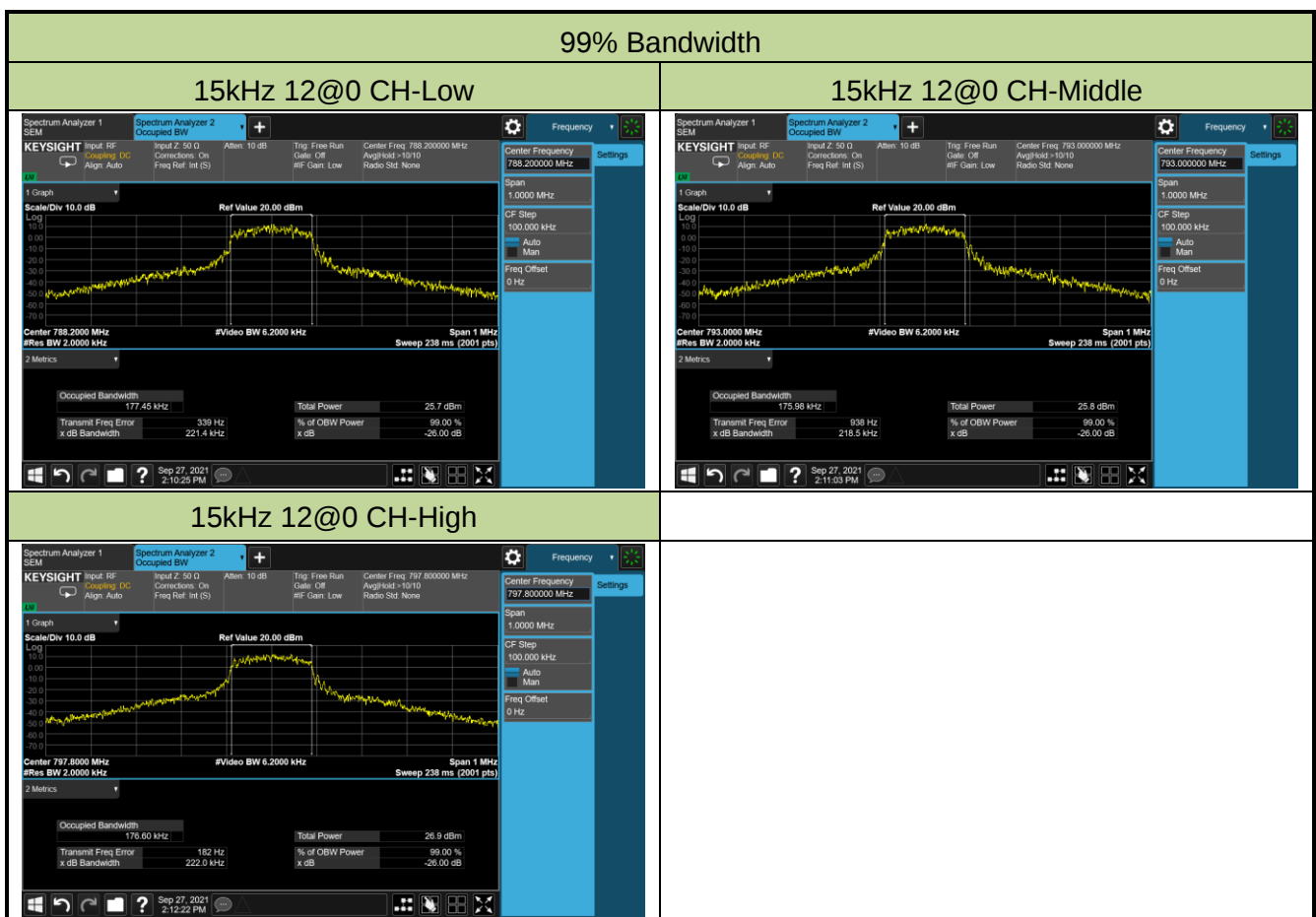
4.2.4. Test Setup



4.2.5. Test Result

Product	Wireless MODULE	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/09/27
Test Band	Band 14		

Frequency (MHz)	Modulation	Sub-carrier spacing (kHz)	N _{tones}	99% Bandwidth (kHz)
788.2	QPSK	15	12@0	177.45
793.0				175.98
797.8				176.60



4.3. Frequency Stability Measurement

4.3.1. Test Limit

The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked

4.3.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.6

4.3.3. Test Setting

Frequency Stability Under Temperature Variations:

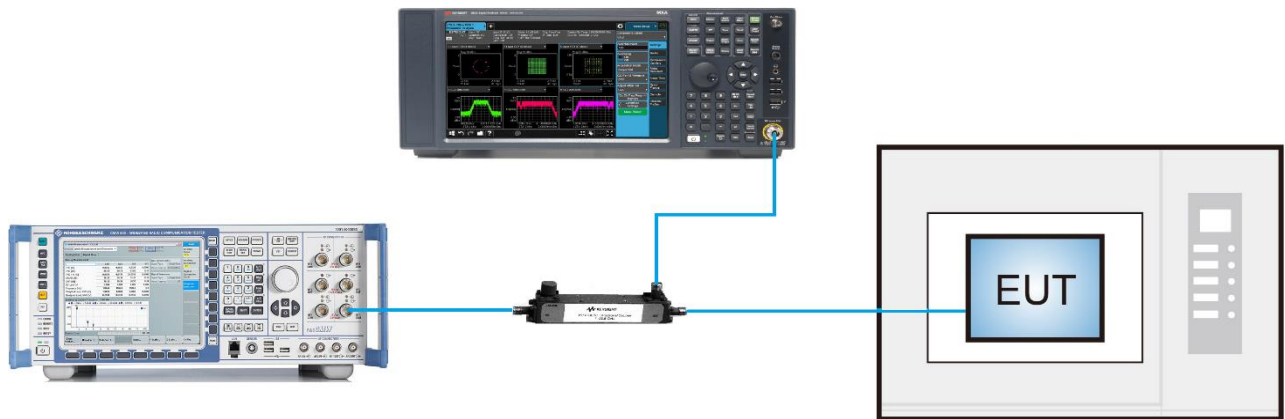
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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 ($\pm 15\%$) and endpoint, record the maximum frequency change.

4.3.4. Test Setup



4.3.5.Test Result

Product	Wireless MODULE	Test Site	WZ-TR3
Test Engineer	Caitlin Chen	Test Date	2021/09/24
Test Band	Band 14		

Power (Vdc)	Temp. (°C)	Freq. Error (Hz)	Frequency Tolerance (ppm)
3.7	- 30	1.98	0.0197
	- 20	1.54	0.0231
	- 10	1.67	-0.0097
	0	1.91	0.0234
	+ 10	1.77	-0.0085
	+ 20	2.24	0.0055
	+ 30	2.32	-0.0062
	+ 40	2.17	-0.0072
	+ 50	2.09	0.0100
4.3	+ 20	1.74	0.0084
3.0	+ 20	1.51	0.0114

4.4. Equivalent Isotropically Radiated Power Measurement

4.4.1. Test Limit

Control stations and mobile stations transmitting in the 758 ~ 768 MHz band and the 788 ~ 798 MHz band are limited to 30 watts ERP.

4.4.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.2

4.4.3. 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:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T$$

where

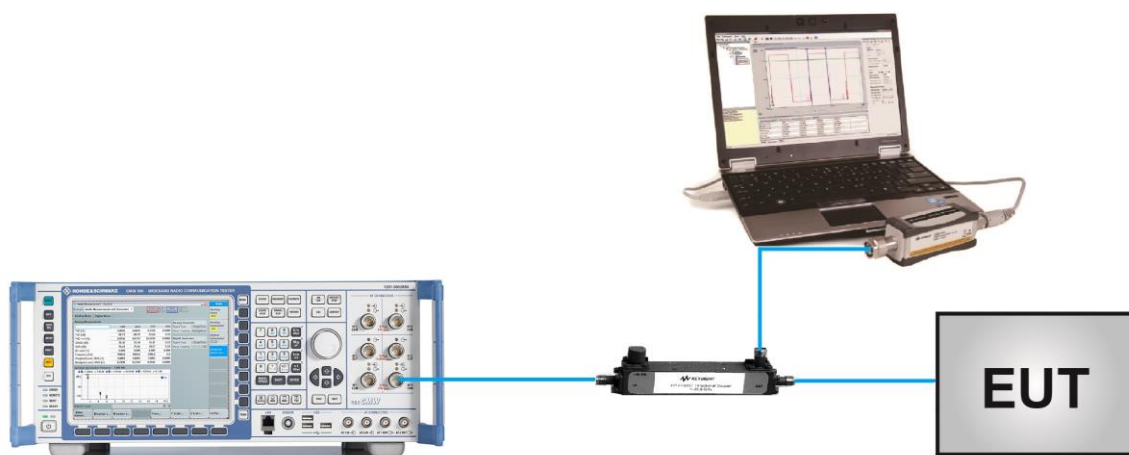
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g., dBm or dBW)

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)

$$\text{ERP} = \text{EIRP} - 2.15$$

4.4.4. Test Setup



4.4.5.Test Result

Product	Wireless MODULE	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/09/26

Frequency (MHz)	Sub-carrier spacing (kHz)	N _{tones}	Output Power (dBm)	ERP (dBm)	Limit (dBm)
BPSK					
788.2	3.75	1@0	21.66	21.74	< 44.77
793.0			21.50	21.58	< 44.77
797.8			21.69	21.77	< 44.77
788.2		1@47	21.70	21.78	< 44.77
793.0			21.56	21.64	< 44.77
797.8			21.68	21.76	< 44.77
788.2	15	1@0	21.01	21.09	< 44.77
793.0			20.92	21.00	< 44.77
797.8			21.00	21.08	< 44.77
788.2		1@11	21.02	21.10	< 44.77
793.0			20.93	21.01	< 44.77
797.8			20.96	21.04	< 44.77
QPSK					
788.2	3.75	1@0	21.76	21.84	< 44.77
793.0			21.62	21.70	< 44.77
797.8			21.76	21.84	< 44.77
788.2		1@47	21.76	21.84	< 44.77
793.0			21.61	21.69	< 44.77
797.8			21.78	21.86	< 44.77
788.2	15	1@0	21.33	21.41	< 44.77
793.0			21.26	21.34	< 44.77
797.8			21.25	21.33	< 44.77
788.2		1@11	21.34	21.42	< 44.77
793.0			21.24	21.32	< 44.77
797.8			21.26	21.34	< 44.77
788.2		12@0	19.92	20.00	< 44.77
793.0			19.95	20.03	< 44.77
797.8			20.17	20.25	< 44.77

4.5. Band Edge Measurement

4.5.1. Test Limit

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the 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, in accordance with the following:

- (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (2) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

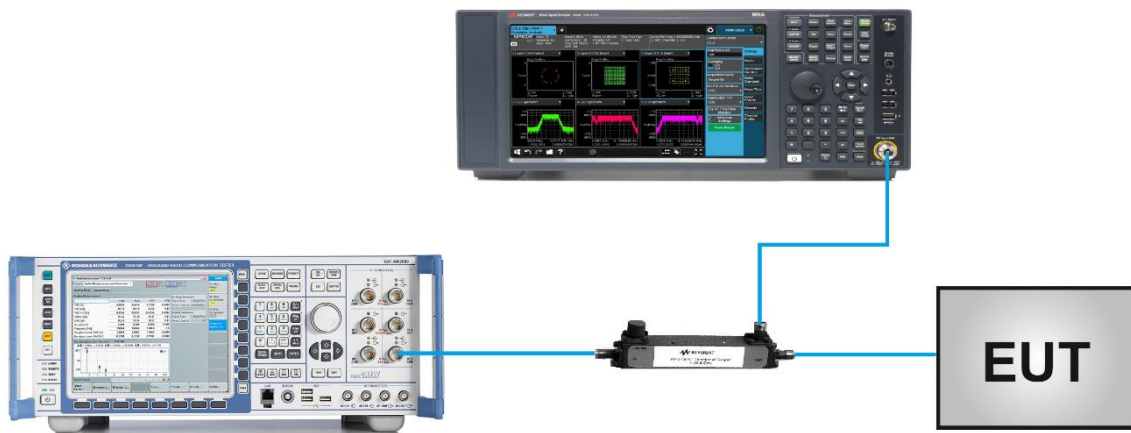
4.5.2. Test Procedure Used

ANSI C63.26-2015 - Section 5.7

4.5.3. Test Setting

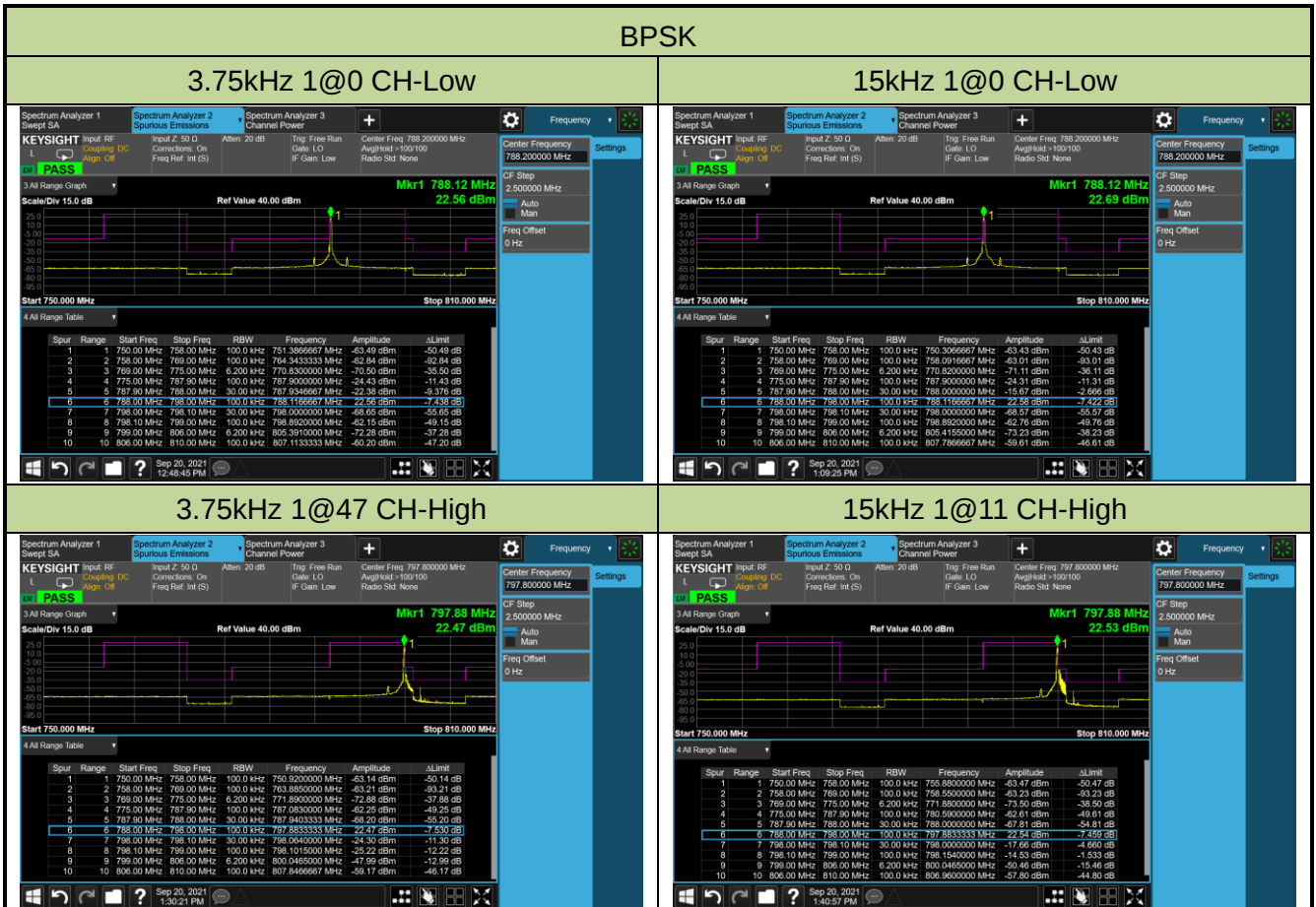
1. Set the analyzer frequency to low or high channel
2. $RBW \geq$ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, 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. $VBW \geq 3 \cdot RBW$
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.

4.5.4. Test Setup



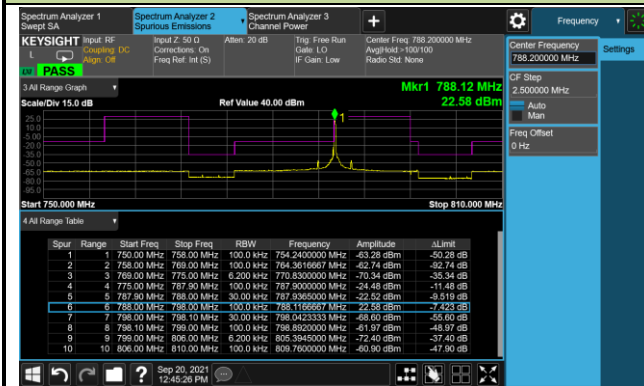
4.5.5. Test Result

Product	Wireless MODULE	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/09/20
Test Result	Pass		

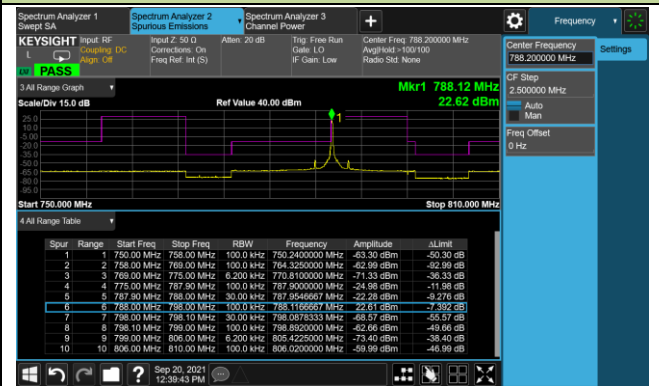


QPSK

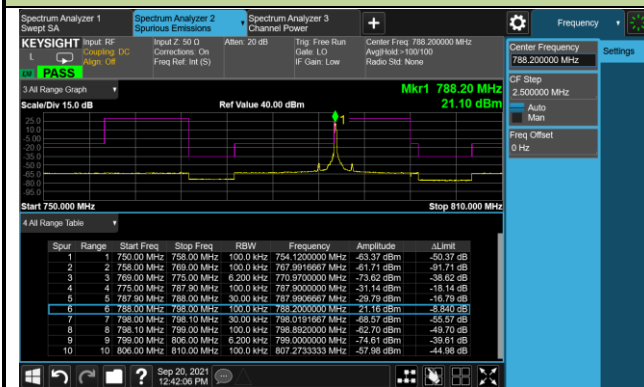
3.75kHz 1@0 CH-Low



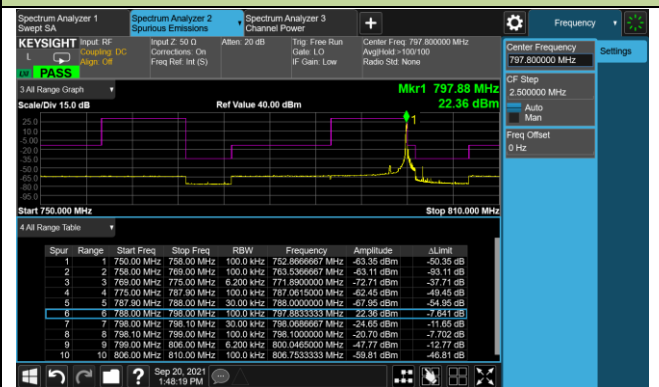
15kHz 1@0 CH-Low



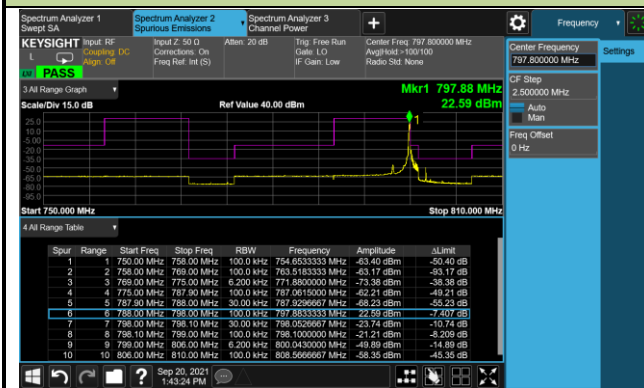
15 kHz 12@0 CH-Low



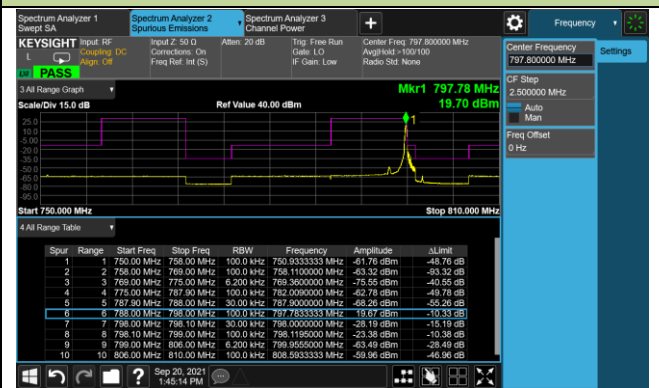
3.75kHz 1@47 CH-High



15kHz 1@11 CH-High



15kHz 12@0 CH-High



4.6. Emission Mask

4.6.1. Test Limit

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

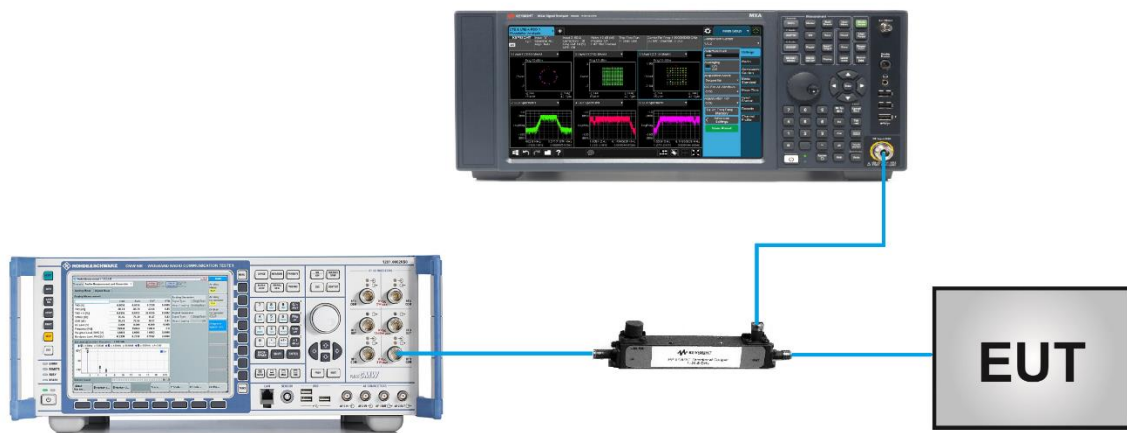
4.6.2. Test Procedure Used

ANSI C63.26-2015 - Section 5.7

4.6.3. Test Setting

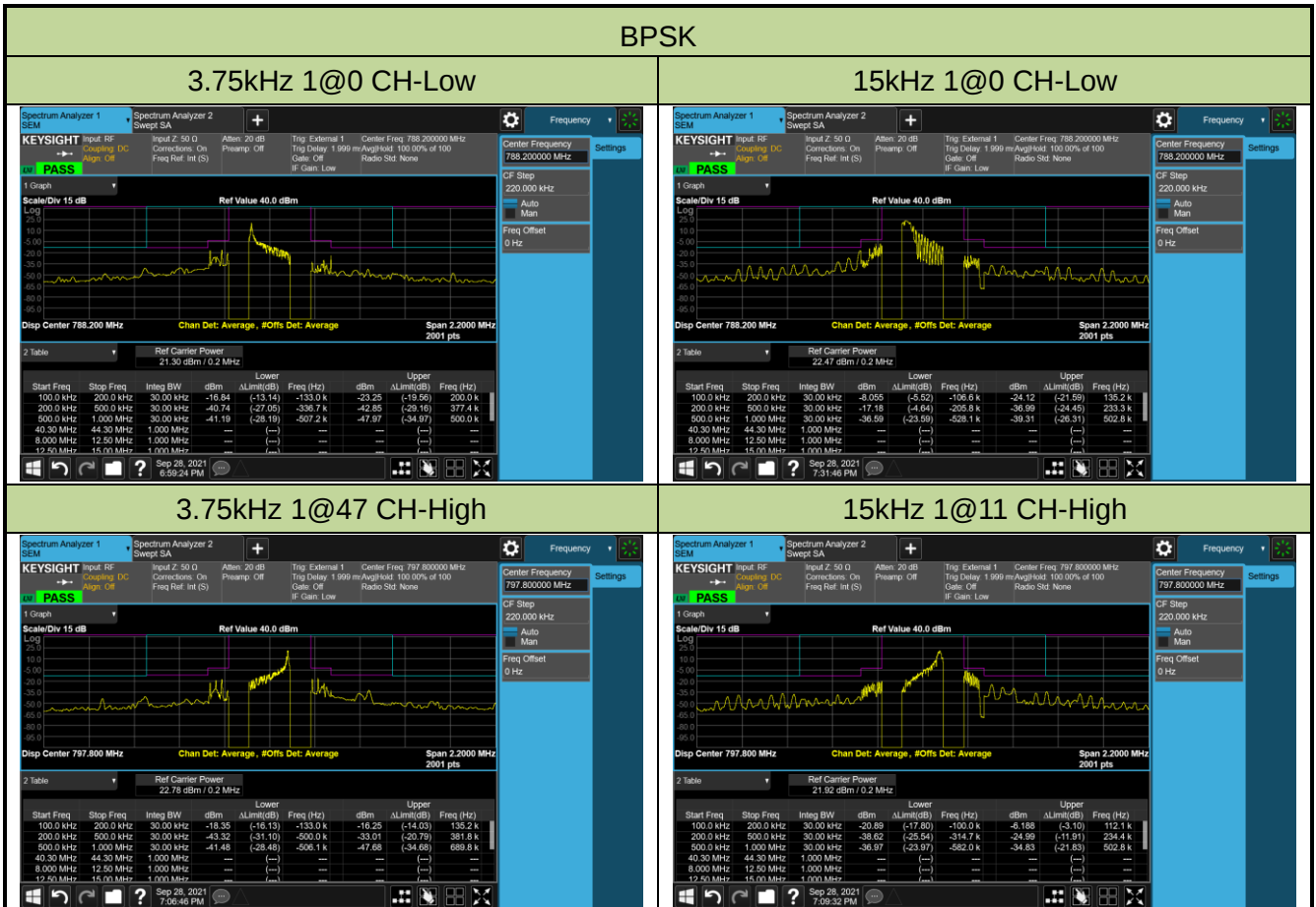
1. Set the analyzer frequency to low or high channel
2. $RBW \geq$ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, 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. $VBW \geq 3 \cdot RBW$
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.

4.6.4. Test Setup



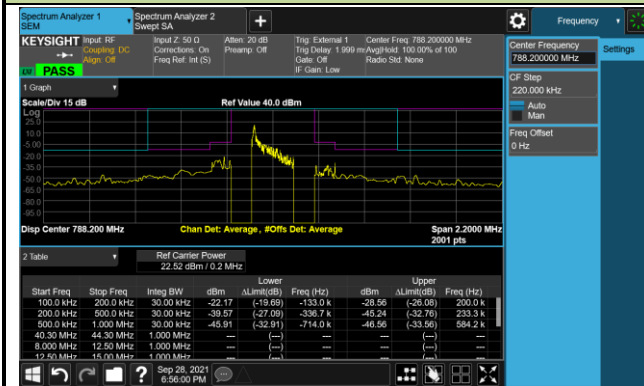
4.6.5. Test Result

Product	Wireless MODULE	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/09/28
Test Result	Pass		

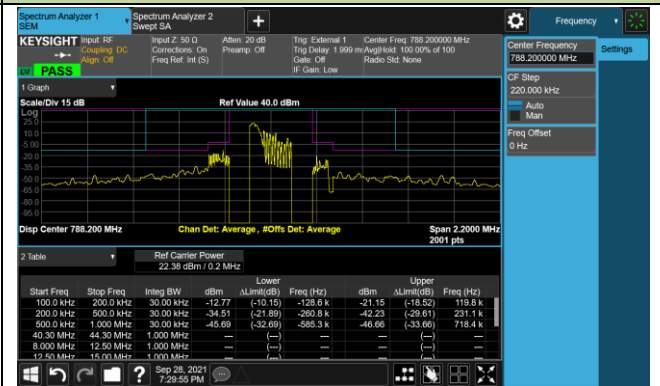


QPSK

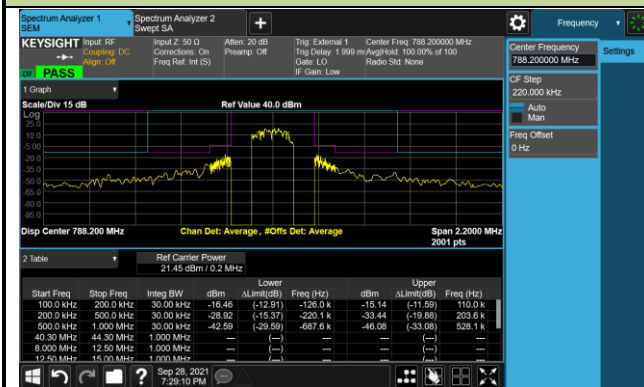
3.75kHz 1@0 CH-Low



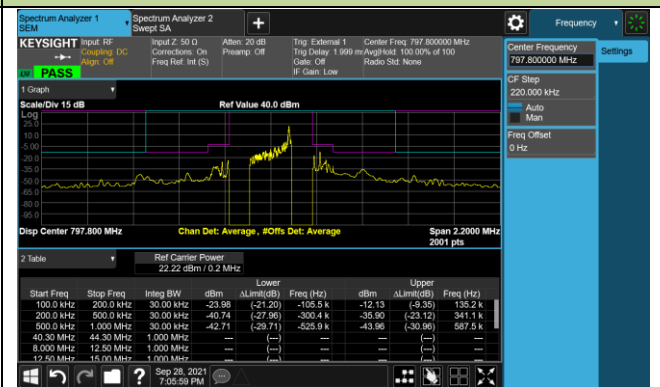
15kHz 1@0 CH-Low



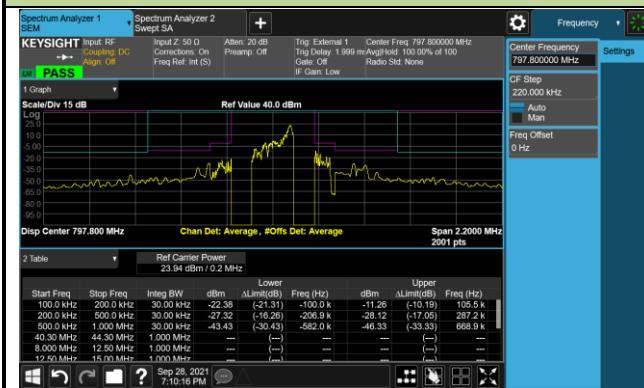
15 kHz 12@0 CH-Low



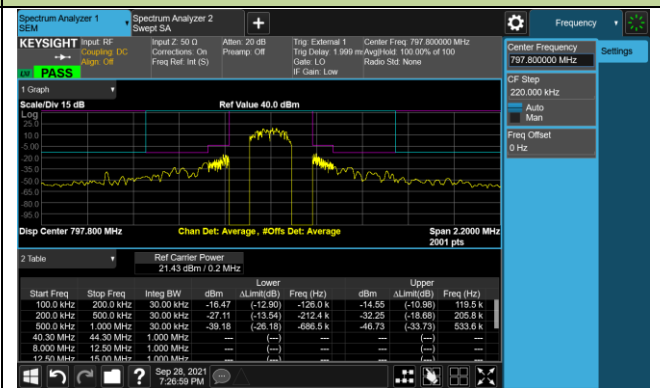
3.75kHz 1@47 CH-High



15kHz 1@11 CH-High



15kHz 12@0 CH-High



4.7. Conducted Spurious Emissions

4.7.1. Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

4.7.2. Test Procedure Used

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4.7.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW $\geq 3 \times$ 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.

4.7.4.Test Setup



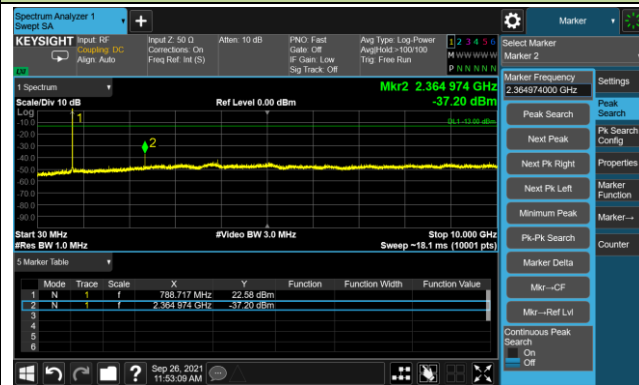
4.7.5.Test Result

Product	Wireless MODULE	Test Site	WZ-SR6
Test Engineer	Caitlin Chen	Test Date	2021/09/26

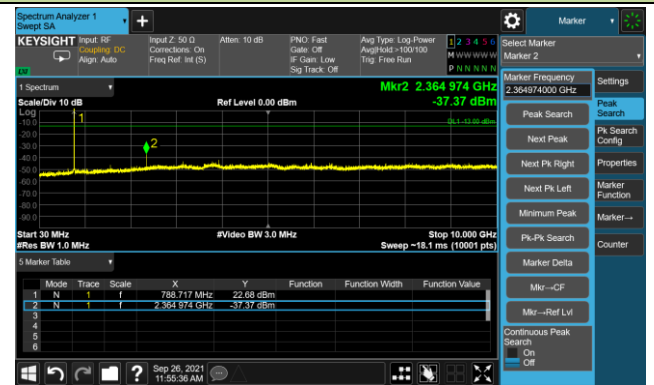
Frequency (MHz)	Sub-carrier spacing (kHz)	N _{tones}	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
BPSK						
788.2	3.75	1@0	30 ~ 10000	-37.20	≤ -13.00	Pass
788.2	15	1@0	30 ~ 10000	-37.37	≤ -13.00	Pass
793.0	3.75	1@23	30 ~ 10000	-37.63	≤ -13.00	Pass
793.0	15	1@5	30 ~ 10000	-37.73	≤ -13.00	Pass
797.8	3.75	1@47	30 ~ 10000	-38.41	≤ -13.00	Pass
797.8	15	1@11	30 ~ 10000	-38.24	≤ -13.00	Pass
QPSK						
788.2	3.75	1@0	30 ~ 10000	-35.25	≤ -13.00	Pass
788.2	15	1@0	30 ~ 10000	-36.72	≤ -13.00	Pass
788.2	15	12@0	30 ~ 10000	-37.48	≤ -13.00	Pass
793.0	3.75	1@23	30 ~ 10000	-36.03	≤ -13.00	Pass
793.0	15	1@5	30 ~ 10000	-36.80	≤ -13.00	Pass
793.0	15	12@0	30 ~ 10000	-34.59	≤ -13.00	Pass
797.8	3.75	1@47	30 ~ 10000	-38.00	≤ -13.00	Pass
797.8	15	1@11	30 ~ 10000	-37.39	≤ -13.00	Pass
797.8	15	12@0	30 ~ 10000	-35.33	≤ -13.00	Pass

788.2 MHz

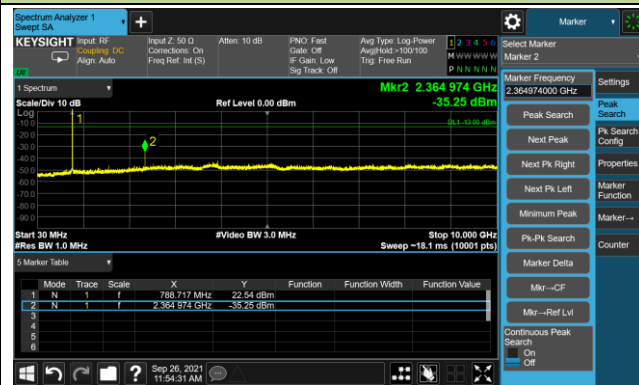
BPSK 3.75kHz 1@0



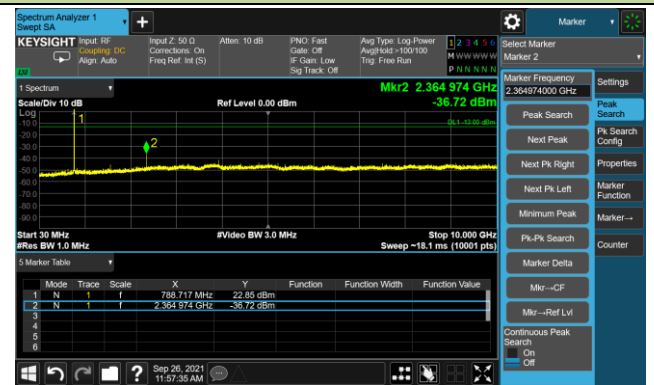
BPSK 15kHz 1@0



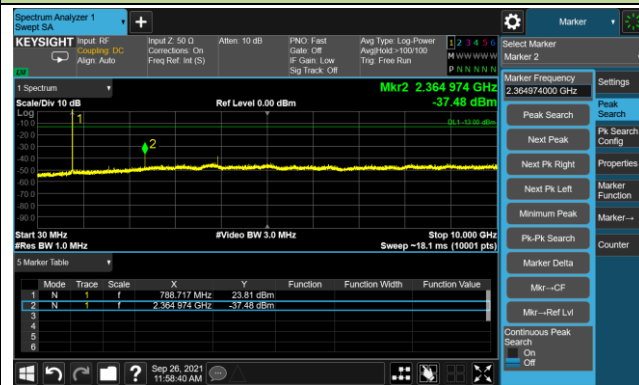
QPSK 3.75kHz 1@0



QPSK 15kHz 1@0

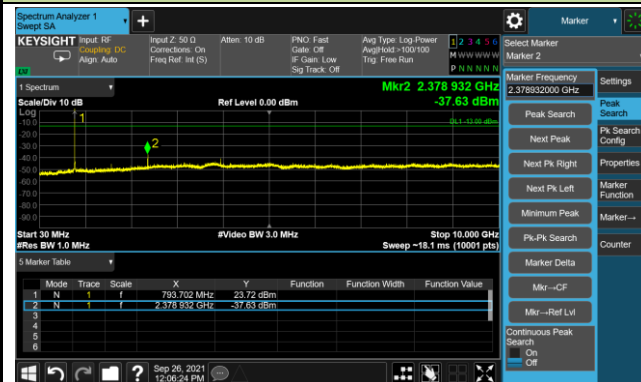


QPSK 15kHz 12@0

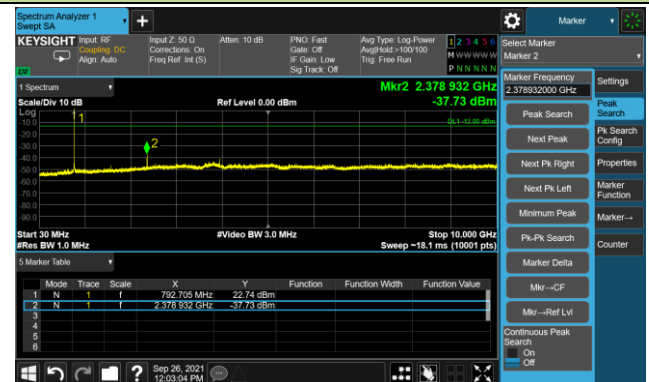


793 MHz

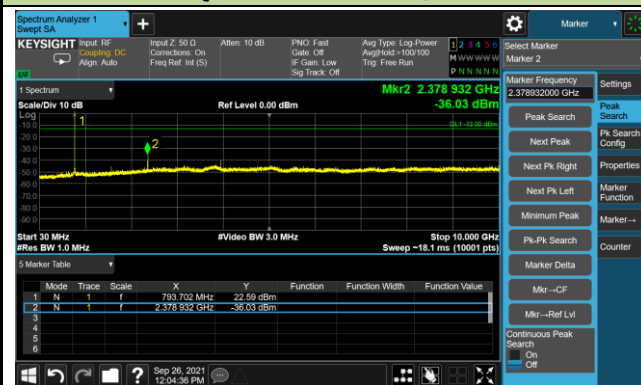
BPSK 3.75kHz 1@23



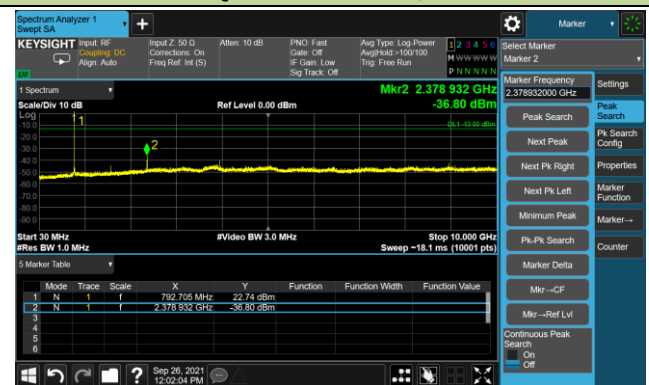
BPSK 15kHz 1@5



QPSK 3.75kHz 1@23



QPSK 15kHz 1@5

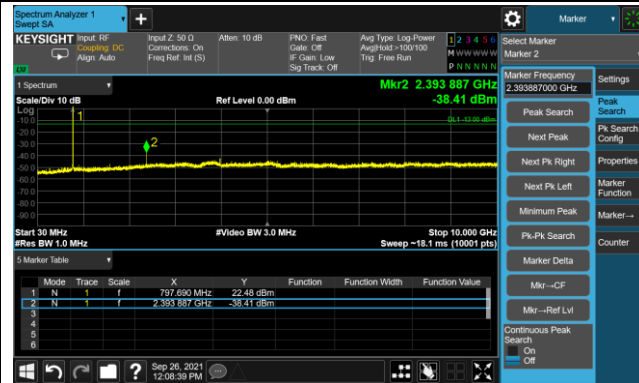


QPSK 15kHz 12@0

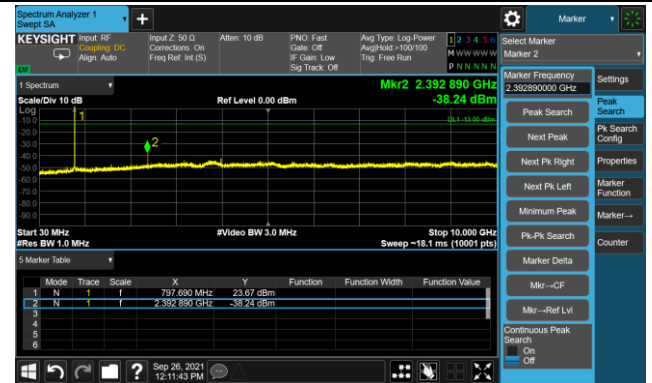


797.8 MHz

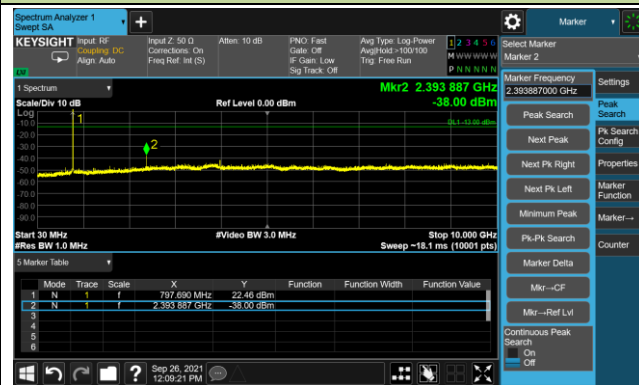
BPSK 3.75kHz 1@47



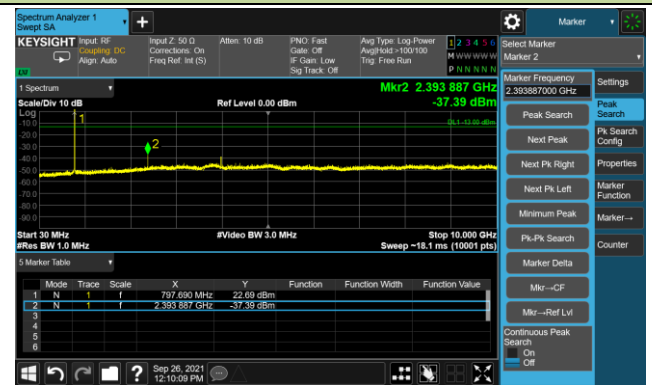
BPSK 15kHz 1@11



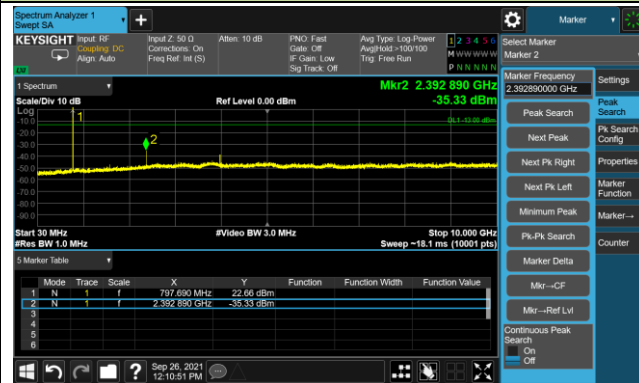
QPSK 3.75kHz 1@47



QPSK 15kHz 1@11



QPSK 15kHz 12@0



4.8. Radiated Spurious Emissions Measurements

4.8.1. Test Limit

Out of band emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (-40dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

$E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20 \log D + 104.8$; where D is the measurement distance in meters. The emission limit equal to 82.3dB μ V/m or 55.3dB μ V/m.

4.8.2. Test Procedure Used

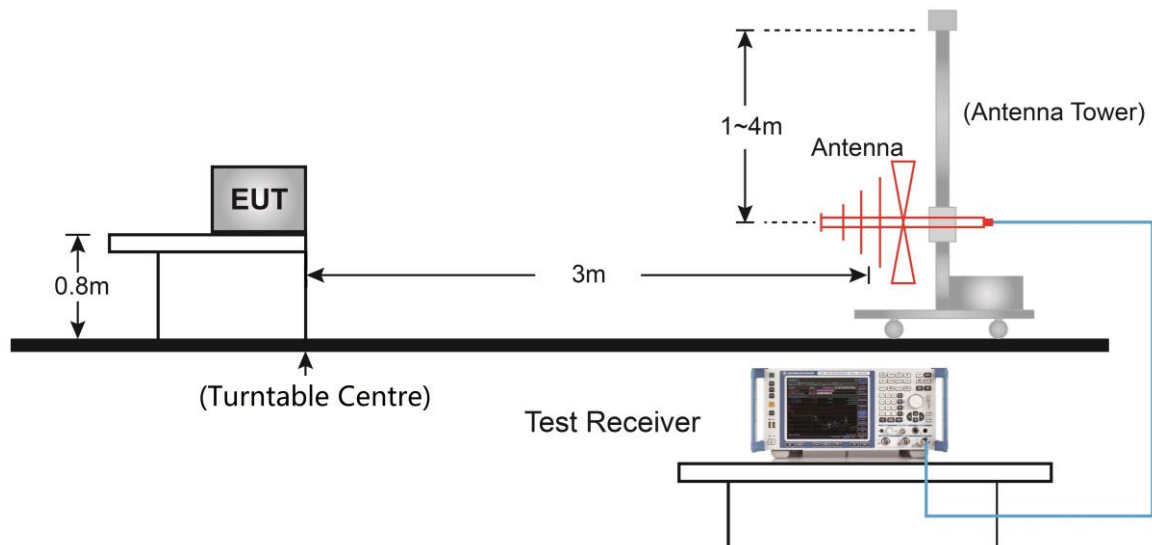
ANSI C63.26-2015 - Section 5.2.7, 5.5

4.8.3. Test Setting

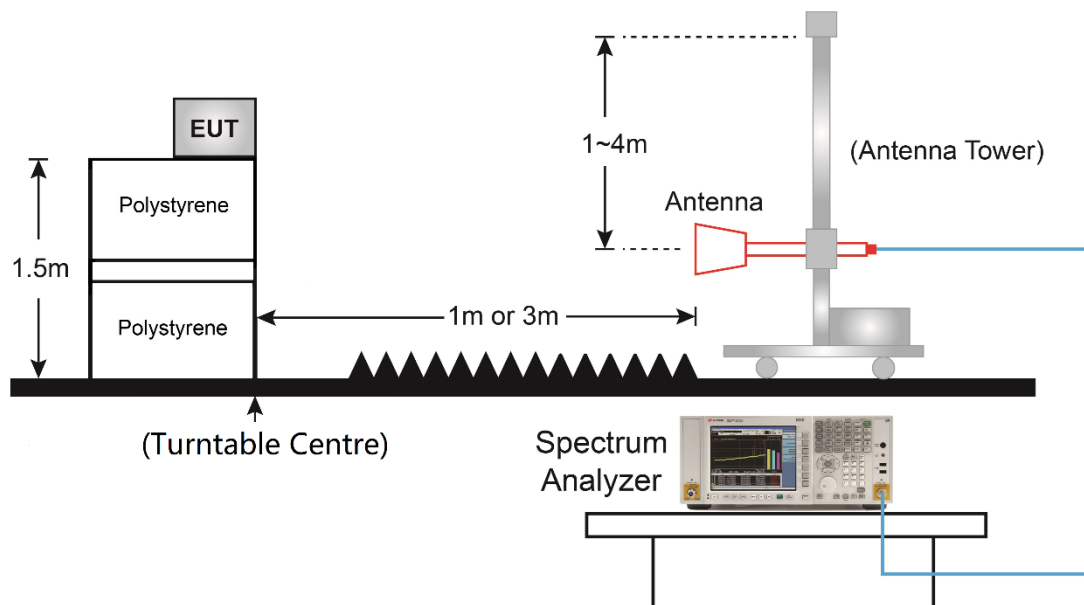
1. RBW = 100kHz or 1MHz
2. VBW $\geq 3 \times$ RBW
3. Sweep time $\geq 10 \times$ (number of points in sweep) $\times$ (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

4.8.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.8.5.Test Result

Product	Wireless MODULE	Test Site	WZ-AC2
Test Engineer	Hyde Yu	Test Date	2021/09/10
Test Configuration	NB-IoT Band 14, 3.75kHz, 1RB		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level(dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Bottom Channel							
56.7	5.0	19.9	24.9	82.3	-57.4	Peak	Horizontal
740.5	3.6	29.5	33.1	82.3	-49.2	Peak	Horizontal
38.2	14.2	18.8	33.0	82.3	-49.3	Peak	Vertical
685.7	5.9	28.7	34.6	82.3	-47.7	Peak	Vertical
1357.0	38.7	-1.9	36.8	82.3	-45.5	Peak	Horizontal
2368.5	38.9	2.5	41.4	82.3	-40.9	Peak	Horizontal
1578.0	40.1	-1.7	38.4	82.3	-43.9	Peak	Vertical
2368.5	48.4	2.5	50.9	82.3	-31.4	Peak	Vertical
Middle Channel							
56.2	3.8	20.0	23.8	82.3	-58.5	Peak	Horizontal
762.8	5.2	29.7	34.9	82.3	-47.4	Peak	Horizontal
39.2	13.9	19.1	33.0	82.3	-49.3	Peak	Vertical
768.2	5.8	29.7	35.5	82.3	-46.8	Peak	Vertical
1799.0	37.7	0.2	37.9	82.3	-44.4	Peak	Horizontal
2377.0	39.0	2.6	41.6	82.3	-40.7	Peak	Horizontal
2377.0	45.5	2.6	48.1	82.3	-34.2	Peak	Vertical
3966.5	42.1	4.4	46.5	82.3	-35.8	Peak	Vertical
Top Channel							
323.9	3.4	21.6	25.0	82.3	-57.3	Peak	Horizontal
767.7	4.2	29.7	33.9	82.3	-48.4	Peak	Horizontal
38.7	15.0	19.0	34.0	82.3	-48.3	Peak	Vertical
750.7	6.7	29.7	36.4	82.3	-45.9	Peak	Vertical
1595.0	40.7	-1.8	38.9	82.3	-43.4	Peak	Horizontal
2394.0	43.8	2.6	46.4	82.3	-35.9	Peak	Horizontal
2394.0	49.6	2.6	52.2	82.3	-30.1	Peak	Vertical
3992.0	41.2	4.3	45.5	82.3	-36.8	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

5. CONCLUSION

The data collected relate only the item(s) tested and show that unit is compliance with FCC Rules.

Appendix A - Test Setup Photograph

Refer to “2109RSU011-UT” file.

Appendix B - EUT Photograph

Refer to “2109RSU011-UE” file.