RF MEASUREMENT REPORT

FCC ID:	2A82LSPOT-V1
Application:	Nova Labs, Inc.
Product:	Spot Mapper
Model No.:	Spot-US
Brand Name:	Helium
FCC Rule Part(s):	Part 96
Result:	Complies
Test Date:	2022-09-27 ~ 2022-11-16

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.
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
2209RSU059-U8	Rev. 01	Initial Report	2023-01-04	Invalid
2209RSU059-U8	Rev. 02	Modify the Product Name	2023-01-06	Valid

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1. General Information

1.1. Applicant

Nova Labs, Inc.

2202 South Figueroa #408, Los Angeles, California, United States

1.2. Manufacturer

Nova Labs, Inc.

2202 South Figueroa #408, Los Angeles, California, United States

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	Spot Mapper
Model No.	Spot-US
Brand Name	Helium
Test IMEI	Conducted measurement: 868692050102784 Radiated measurement: 868692050107718
E-UTRA Band	FDD Band: 2, 4, 5, 66, 71 TDD Band: 48
NR Band	TDD Band: n41, n48
Wi-Fi Specification	802.11 b/g/n/ac/ax
Bluetooth Specification	V5.1 dual mode
Lora Specification	902 ~ 928 MHz
Operating Temperature	-20 ~ 55 °C
Integrated WWAN Modular Information	
Model No.	RM505Q-AE
FCC ID	XMR2020RM505QAE
Brand Name	Quectel
Integrated BT & Wi-Fi Modular Information	
Model No.	FG50V
FCC ID	XMR202103FG50V
Brand Name	Quectel
Integrated Lora Modular Information	
Model No.	LoRa-E5-HF
FCC ID	Z4T-LORA-E5
Brand Name	Seeed
Accessories	
Rechargeable Li-ion Battery	Model No.: QDM044 Rated Voltage: 3.8V Rated Capacity: 4000mAh/15.2Wh Limited Charge Voltage: 4.35V
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

TDD T_X & R_X Frequency Range	n48: 3550 ~ 3700 MHz
Bandwidth	20, 40MHz
Modulation	UL & DL up to 256QAM
SCS	30kHz
Device Type	End User Device
Antenna Information	PIFA Antenna, 3.8dBi

1.6. EIRP and Emission Designator

Technology	Bandwidth (MHz)	Max Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP (dBm)	Emission Designator
5G NR n48	20	18.22	3.8	22.02	18M2G7D
		17.33		21.13	18M3W7D
	40	17.76		21.56	37M7G7D
		16.70		20.50	37M8W7D
Remark: The Max conducted power extracted from the SAR test report.					

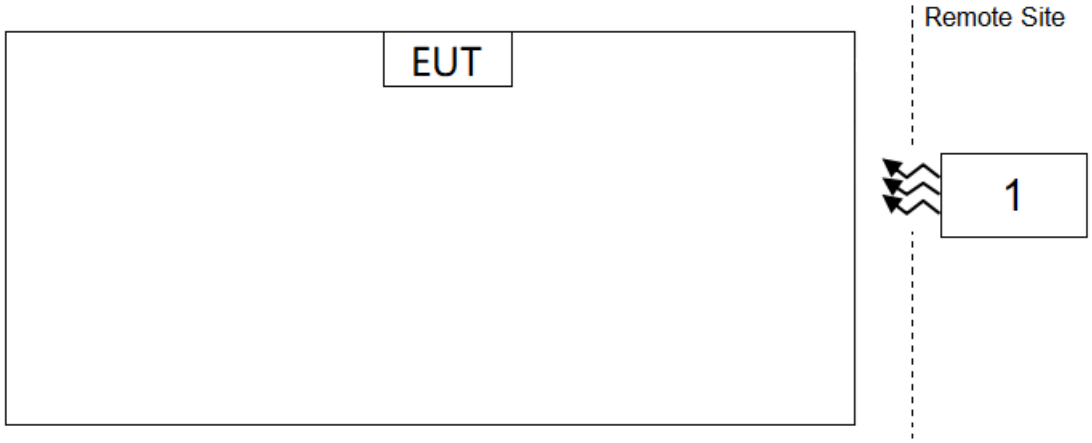
1.7. Test Methodology

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

- FCC CFR 47 Part Part 96
- 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
- WINNF-TS-0122 V1.0.2: Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)

2. Test Configuration

2.1. Test System Connection Diagram



Product		Manufacturer	Model No.
1	5G Wireless Test Platform	Keysight	E7515B

2.2. Test Environment Condition

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

3. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2023-10-08	WZ-TR3
Vibration Test System	DongLing	ES-1-150	MRTSUE06206	1 year	2023-07-07	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2023-06-06	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06362	1 year	2023-02-15	WZ-SR6
Shielding Room	HUAMING	WZ-SR6	MRTSUE06443	N/A	N/A	WZ-SR6
Signal Analyzer	Keysight	N9020B	MRTSUE06583	1 year	2023-10-08	WZ-SR6
Signal Generator	Keysight	N5173B	MRTSUE06606	1 year	2022-11-29	WZ-SR6
5G Wireless Test Platform	Keysight	E7515B	MRTSUE06942	1 year	2023-03-03	WZ
Radio Communication Analyzer	Anritsu	MT8821C	MRTSUE06960	1 year	2023-07-08	WZ
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2023-05-20	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2023-06-04	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2022-12-01	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2023-05-08	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2023-04-21	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2

Software	Version	Manufacturer	Function	Date	Location
EMI V3	V 3.0.0	QuieTek	EMI Test Software	2010.01	EMC-WZ
Controller_MF 7802	1.02	MF	RE Antenna & Turntable	2015-07-05	EMC-WZ-AC2

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.

(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.2. 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 Spurious Emissions
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
Conducted Spurious Emissions
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
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%
Frequency Stability
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 76.2Hz

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
2.1049	Occupied Bandwidth	Conducted	Pass
2.1055	Frequency Stability		Pass
96.41(b)	Equivalent Isotropic Radiated Power		Pass
2.1051 96.41(e)	Spurious Emissions; Band Edge Emissions		Pass
2.1053, 96.41(e)	Spurious Emissions	Radiated	Pass
96.47	End User Device Additional Requirements (CBSD Protocol)		Pass

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 ofthe system to connect the EUT to the analyzer at all frequencies of interest.
2) Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations the worst-case was found.
3) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Band Edge, Radiated & Conducted SpuriousEmission were presented worst case in the test report.

5.2. Occupied Bandwidth Measurement

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.

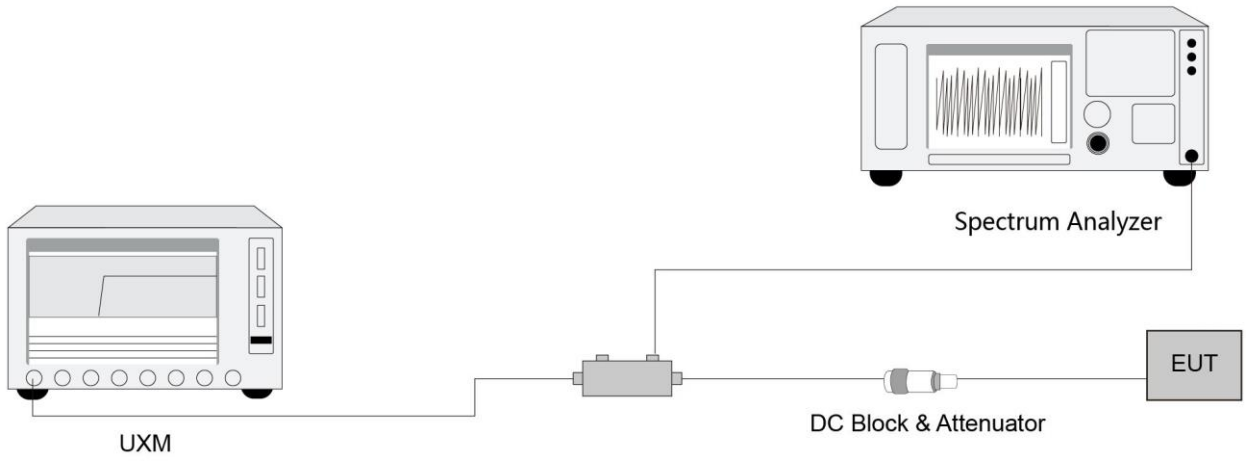
5.2.2. Test Procedure

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

Refer to Appendix A.1.

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 Procedure

ANSI C63.26-2015 - Section 5.6

5.3.3. Test Setting

Frequency Stability Under Temperature Variations:

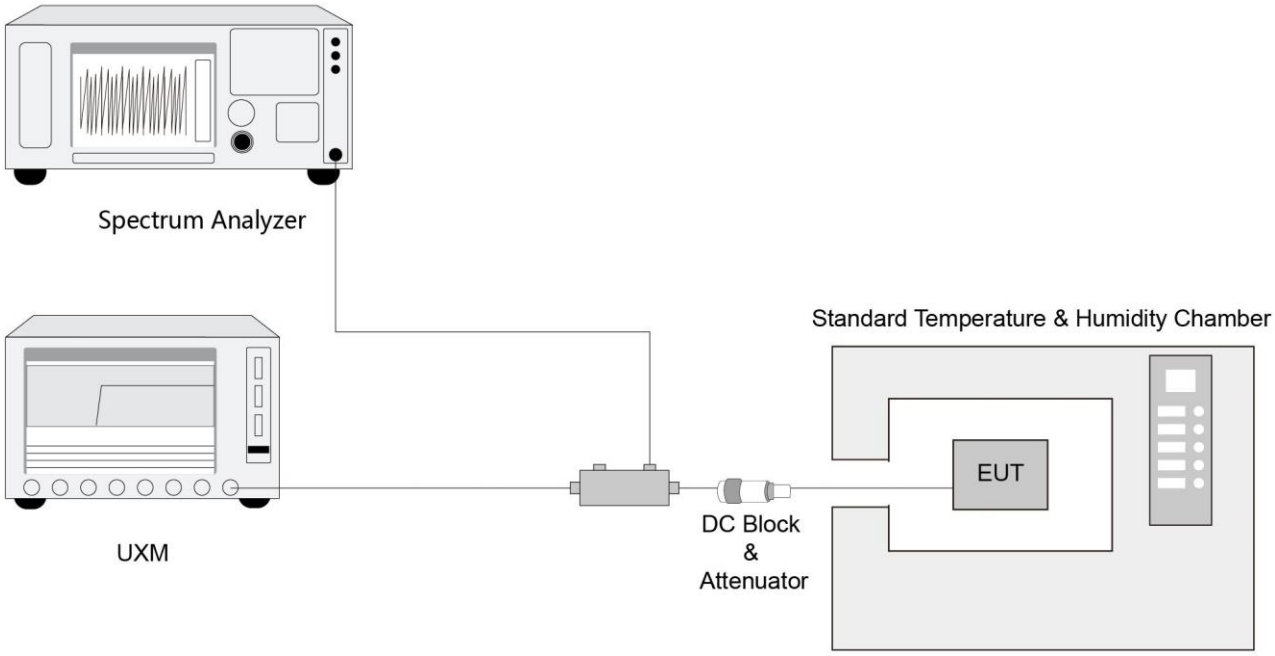
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain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

5.3.4. Test Setup



5.3.5. Test Result

Refer to Appendix A.2.

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1. Test Limit

The maximum effective isotropic radiated power (EIRP) End User Device is 23dBm/10MHz

5.4.2. Test Procedure

ANSI C63.26-2015 - Section 5.2.4.4.2 &5.2.5.5

5.4.3. Test Setting

When the fundamental condition for average power measurements cannot be realized (i.e., the EUT can not be configured to transmit at full-power on a continuous basis (i.e., duty cycle < 98%) and the instrumentation cannot be configured to measure only during active full-power transmissions), then thefollowing procedure can be used if the EUT duty cycle is constant (i.e., duty cycle variations are less thanor equal to ±2%).

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1% to 5% of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

1) Set = auto-couple, or

2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.

f) Detector = power averaging (rms).

g) Set sweep trigger to “free run.”

h) 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.

i) Using the marker function to identify the maximum PSD.

j) Add 10 log (1/duty cycle) to the measured power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25%.

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

$$\text{ERP or EIRP} = P_{Meas} + G_T \qquad (1)$$

where

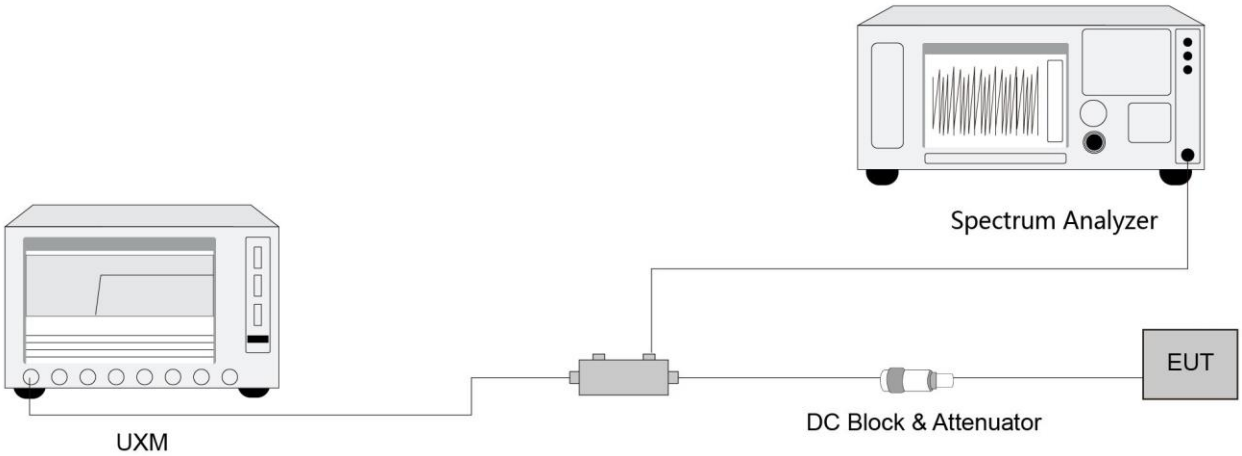
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

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)

For devices utilizing multiple antennas, see 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

5.4.4. Test Setup



5.4.5. Test Result

Refer to Appendix A.3.

5.5. Band Edge Measurement

5.5.1. Test Limit

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.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed −25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.

5.5.2. Test Procedure

ANSI C63.26-2015 - Section5.7

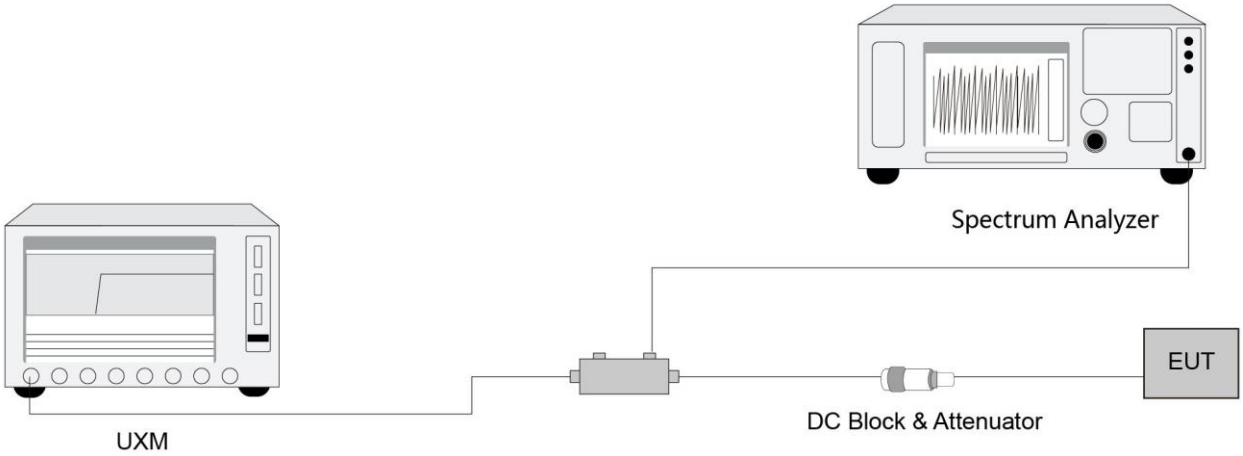
5.5.3. Test Setting

1. Set the analyzer frequency to low, middle, 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.

9. Used power integration whenusing a measurement bandwidth smaller than the specified bandwidth.

5.5.4. Test Setup



5.5.5. Test Result

Refer to Appendix A.4.

5.6. Conducted Spurious Emissions Measurement

5.6.1. 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.

The conducted power of any emissions below 3530MHz or above 3720MHz shall not exceed -40dBm/MHz.

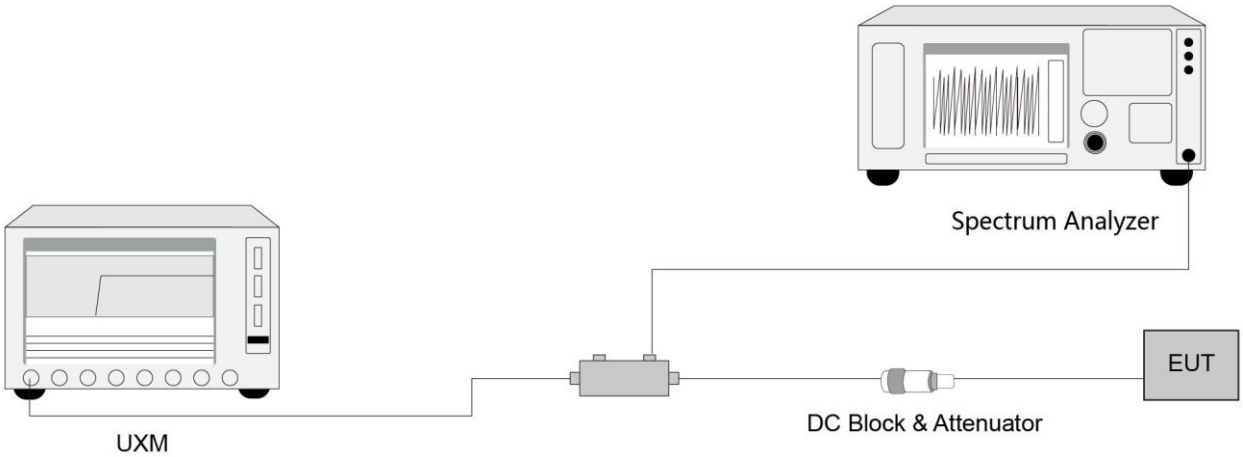
5.6.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

5.6.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
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.

5.6.4. Test Setup



5.6.5. Test Result

Refer to Appendix A.5.

5.7. Radiated Spurious Emissions Measurement

5.7.1. Test Limit

Out of band emissions: The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 55.3dBμV/m.

5.7.2. Test Procedure

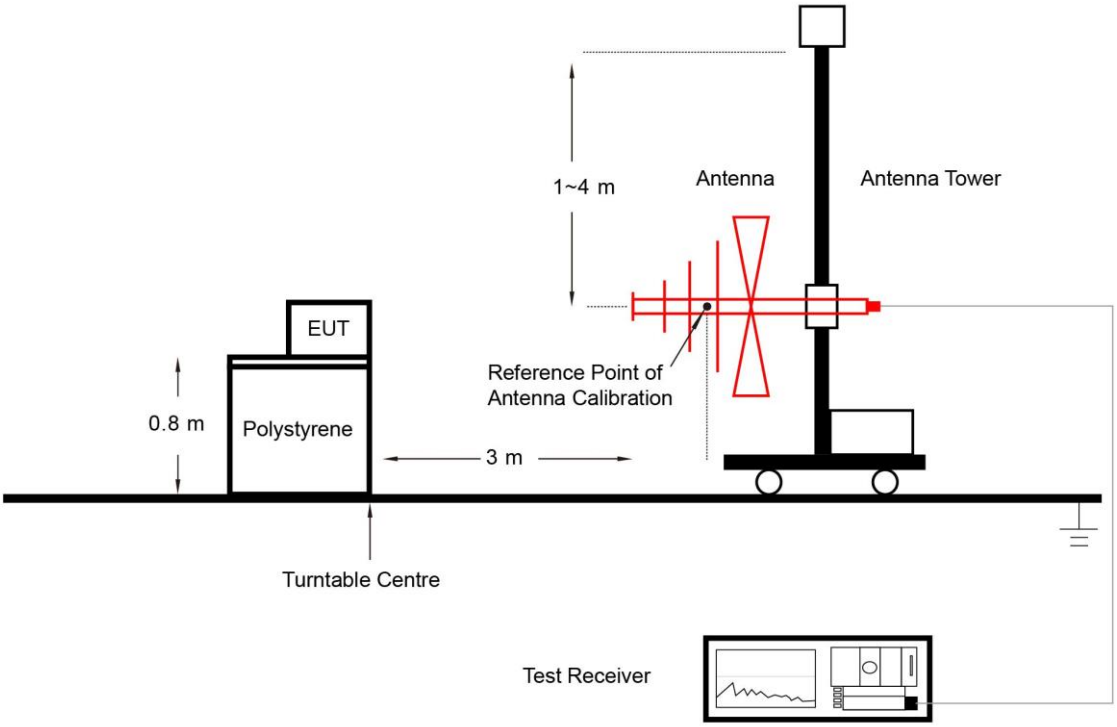
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.7.3. Test Setting

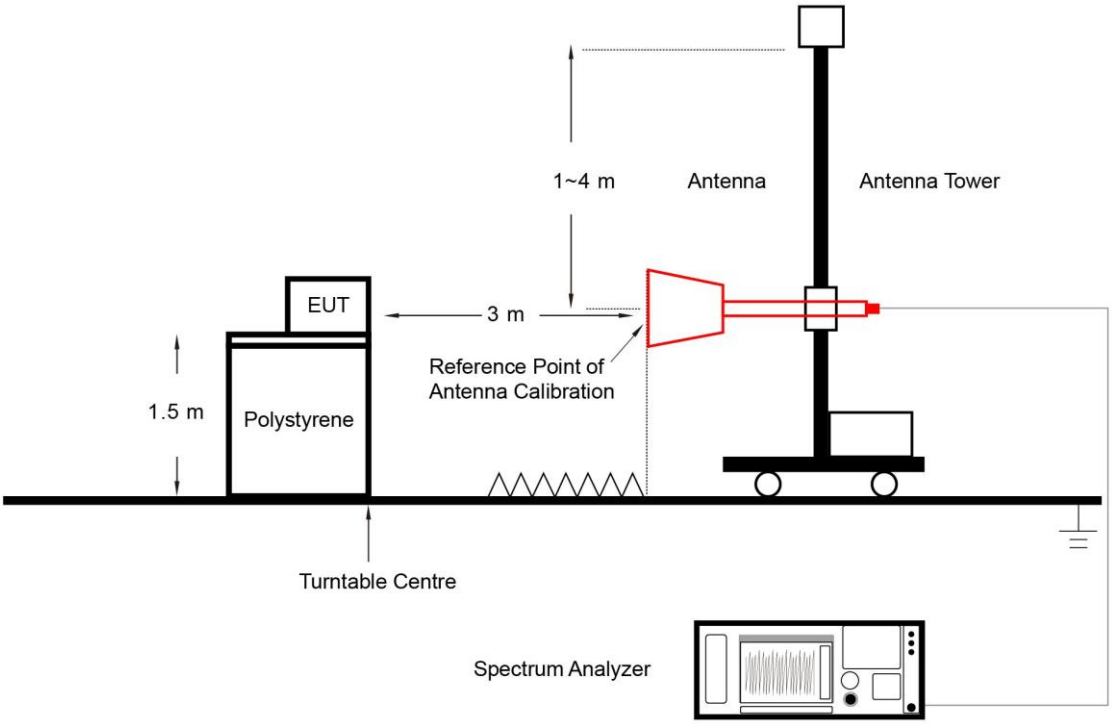
1. RBW = 1MHz
2. VBW ≥ 3*RBW
3. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.7.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.7.5. Test Result

Refer to Appendix A.6.

5.8. End User Device Additional Requirement (CBSD Protocol) Measurement

5.8.1. Test Limit

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by aCBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD

5.8.2. Test Procedure

KDB 940660 D01 v02, WINNF-TS-0122 V1.0.2

5.8.3. Test Setting

The EUT was connected via an RF cable to a certified CBSD (FCC ID: 2AD8UAZQCRH1) and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

Step 1:

a. Setup WINNF.PT.C.HBT.1 with 3570 ~ 3590MHz and power level at 24 dBm/MHz.

b. Enable Micro RRU from EPC Manage Tool.

c. Check EUT Tx frequency and power.

d. Disable Micro RRU from EPC Manage Tool and check EUT stop transmission within 10s.

Step 2:

a. Setup WINNF.PT.C.HBT.1 with 3670 ~ 3690MHz and power level at 17 dBm/MHz.

b. Enable Micro RRU from EPC Manage Tool.

c. Check EUT Tx frequency and power.

d. Disable Micro RRU from EPC Manage Tool and check EUT stop transmission within 10s.

5.8.4. Test Result

Refer to Appendix A.7.

Appendix A - Test Result

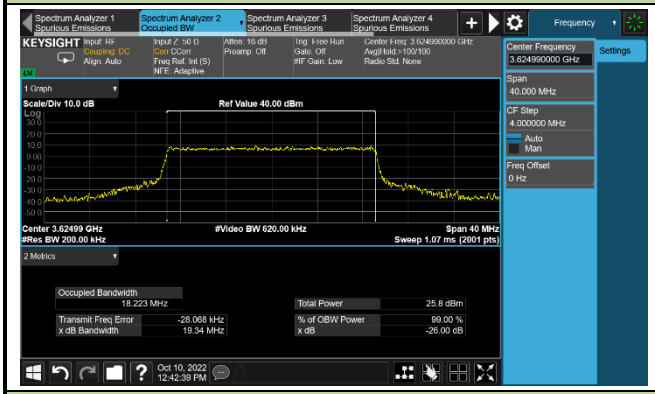
A.1 Occupied Bandwidth Test Result

Test Site	WZ-SR6	Test Engineer	Cloud Guo
Test Date	2022-10-10	Test Band	n48

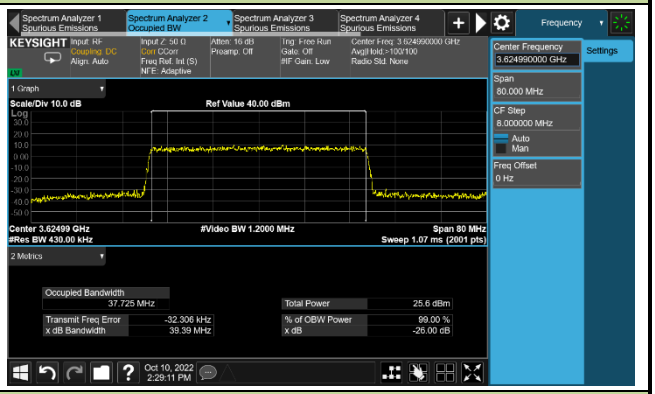
Modulation	Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK	3624.99	20	18.22
		40	37.73
16QAM	3624.99	20	18.22
		40	37.80
64QAM	3624.99	20	18.22
		40	37.74
256QAM	3624.99	20	18.25
		40	37.70

99% Bandwidth - QPSK

20MHz Channel Bandwidth

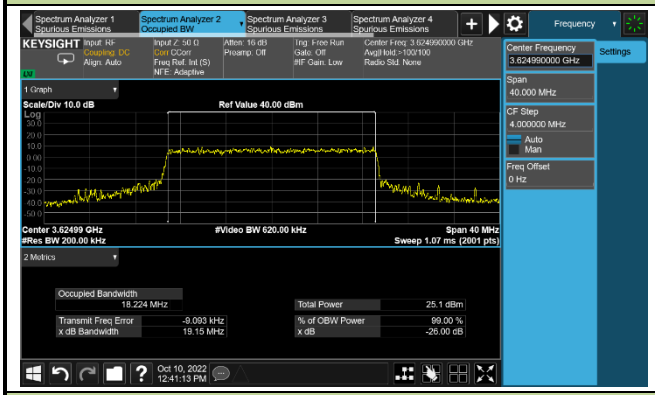


40MHz Channel Bandwidth

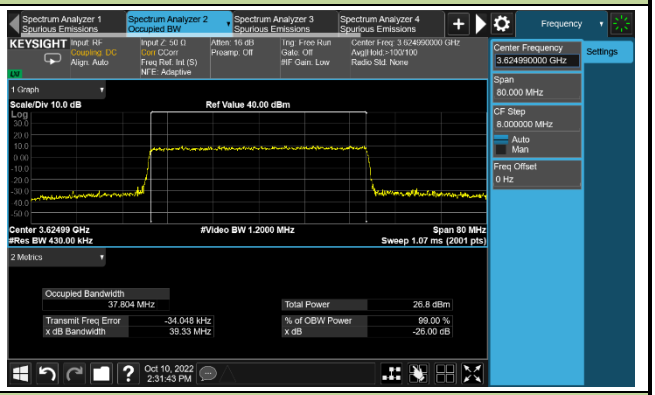


99% Bandwidth -16QAM

20MHz Channel Bandwidth

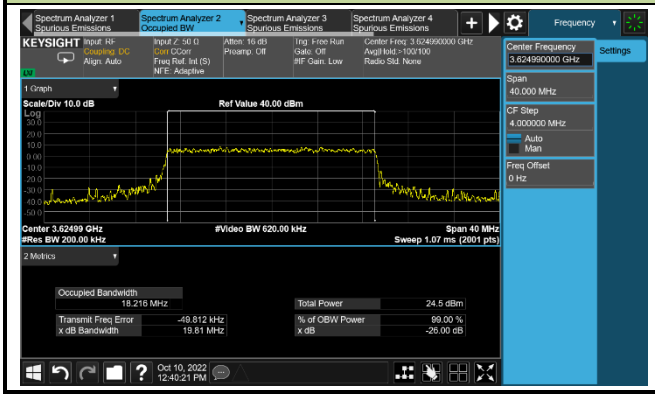


40MHz Channel Bandwidth

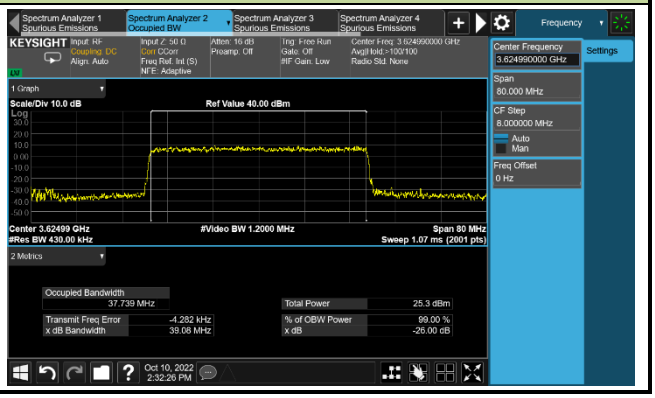


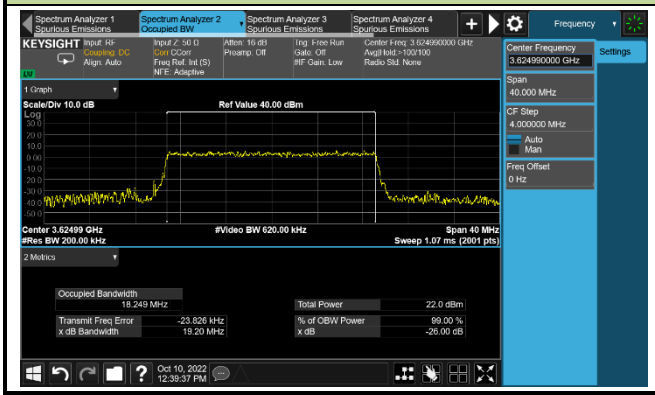
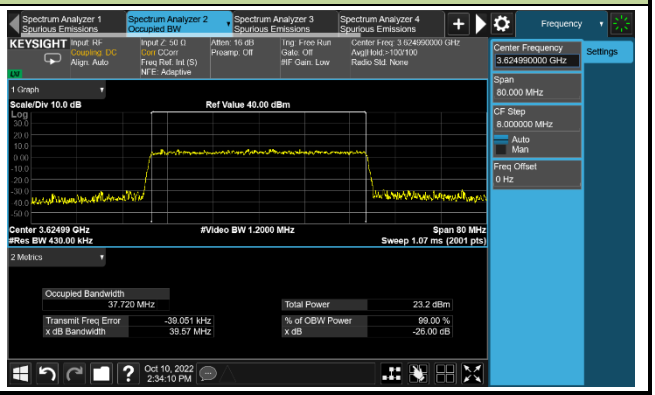
99% Bandwidth - 64QAM

20MHz Channel Bandwidth



40MHz Channel Bandwidth



99% Bandwidth - 256QAM	
20MHz Channel Bandwidth	40MHz Channel Bandwidth
	

A.2 Frequency Stability Test Result

Test Site	WZ-TR3	Test Engineer	Cloud Guo
Test Date	2022-10-21	Test Band	n48

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0058
	- 20	0.0029
	- 10	0.0019
	0	0.0014
	+ 10	0.0033
	+ 20 (Ref)	0.0000
	+ 30	0.0018
	+ 40	0.0022
	+ 50	0.0020
4.3	+ 20	0.0045
3.3	+ 20	0.0047

A.3 Equivalent Isotropically Radiated Power Test Result

Test Site	WZ-SR6	Test Engineer	Cloud Guo
Test Date	2022-11-15	Test Band	n48

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM PI/2 BPSK						
3560.01	20	25	12	18.19	21.99	<23.00
		1	1	18.33	22.13	<23.00
		1	50	18.11	21.91	<23.00
		50	0	14.70	18.50	<23.00
		1	51	17.03	20.83	<23.00
		1	0	17.88	21.68	<23.00
3624.99	20	25	12	18.48	22.28	<23.00
		1	1	17.95	21.75	<23.00
		1	50	18.89	22.69	<23.00
		50	0	15.15	18.95	<23.00
		1	51	18.12	21.92	<23.00
		1	0	17.86	21.66	<23.00
3690.00	20	25	12	18.12	21.92	<23.00
		1	1	18.32	22.12	<23.00
		1	50	17.76	21.56	<23.00
		50	0	14.94	18.74	<23.00
		1	51	17.21	21.01	<23.00
		1	0	16.89	20.69	<23.00
3570.00	40	50	25	15.89	19.69	<23.00
		1	1	18.37	22.17	<23.00
		1	104	18.41	22.21	<23.00
		100	0	12.13	15.93	<23.00
		1	105	17.49	21.29	<23.00
		1	0	16.99	20.79	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM PI/2 BPSK						
3624.99	40	50	25	15.71	19.51	<23.00
		1	1	18.43	22.23	<23.00
		1	104	18.82	22.62	<23.00
		100	0	12.31	16.11	<23.00
		1	105	18.60	22.40	<23.00
		1	0	17.24	21.04	<23.00
3679.98	40	50	25	15.84	19.64	<23.00
		1	1	18.25	22.05	<23.00
		1	104	18.50	22.30	<23.00
		100	0	12.30	16.10	<23.00
		1	105	17.56	21.36	<23.00
		1	0	17.81	21.61	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM QPSK						
3560.01	20	25	12	17.58	21.38	<23.00
		1	1	18.15	21.95	<23.00
		1	50	18.08	21.88	<23.00
		50	0	14.11	17.91	<23.00
		1	51	16.29	20.09	<23.00
		1	0	16.57	20.37	<23.00
3624.99	20	25	12	17.88	21.68	<23.00
		1	1	18.60	22.40	<23.00
		1	50	18.56	22.36	<23.00
		50	0	14.50	18.30	<23.00
		1	51	17.27	21.07	<23.00
		1	0	16.52	20.32	<23.00
3690.00	20	25	12	17.89	21.69	<23.00
		1	1	18.50	22.30	<23.00
		1	50	18.06	21.86	<23.00
		50	0	14.22	18.02	<23.00
		1	51	15.88	19.68	<23.00
		1	0	16.34	20.14	<23.00
3570.00	40	50	25	15.93	19.73	<23.00
		1	1	18.45	22.25	<23.00
		1	104	17.88	21.68	<23.00
		100	0	11.76	15.56	<23.00
		1	105	17.29	21.09	<23.00
		1	0	16.97	20.77	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM QPSK						
3624.99	40	50	25	16.03	19.83	<23.00
		1	1	18.69	22.49	<23.00
		1	104	18.38	22.18	<23.00
		100	0	11.93	15.73	<23.00
		1	105	18.08	21.88	<23.00
		1	0	17.34	21.14	<23.00
3679.98	40	50	25	16.08	19.88	<23.00
		1	1	18.63	22.43	<23.00
		1	104	17.92	21.72	<23.00
		100	0	11.59	15.39	<23.00
		1	105	16.87	20.67	<23.00
		1	0	17.48	21.28	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 16QAM						
3560.01	20	25	12	16.60	20.40	<23.00
		1	1	16.56	20.36	<23.00
		1	50	16.45	20.25	<23.00
		50	0	13.21	17.01	<23.00
		1	51	15.44	19.24	<23.00
		1	0	15.21	19.01	<23.00
3624.99	20	25	12	16.98	20.78	<23.00
		1	1	17.24	21.04	<23.00
		1	50	16.66	20.46	<23.00
		50	0	13.43	17.23	<23.00
		1	51	16.93	20.73	<23.00
		1	0	16.12	19.92	<23.00
3690.00	20	25	12	16.77	20.57	<23.00
		1	1	16.67	20.47	<23.00
		1	50	15.32	19.12	<23.00
		50	0	13.29	17.09	<23.00
		1	51	16.00	19.80	<23.00
		1	0	15.61	19.41	<23.00
3570.00	40	50	25	14.71	18.51	<23.00
		1	1	17.05	20.85	<23.00
		1	104	17.69	21.49	<23.00
		100	0	10.64	14.44	<23.00
		1	105	16.93	20.73	<23.00
		1	0	16.38	20.18	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 16QAM						
3624.99	40	50	25	14.84	18.64	<23.00
		1	1	18.13	21.93	<23.00
		1	104	17.93	21.73	<23.00
		100	0	10.75	14.55	<23.00
		1	105	17.38	21.18	<23.00
		1	0	16.74	20.54	<23.00
3679.98	40	50	25	14.74	18.54	<23.00
		1	1	17.45	21.25	<23.00
		1	104	16.03	19.83	<23.00
		100	0	11.09	14.89	<23.00
		1	105	16.37	20.17	<23.00
		1	0	15.22	19.02	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 64QAM						
3560.01	20	25	12	15.00	18.80	<23.00
		1	1	14.74	18.54	<23.00
		1	50	15.42	19.22	<23.00
		50	0	12.80	16.60	<23.00
		1	51	13.00	16.80	<23.00
		1	0	14.80	18.60	<23.00
3624.99	20	25	12	15.53	19.33	<23.00
		1	1	15.06	18.86	<23.00
		1	50	15.94	19.74	<23.00
		50	0	13.25	17.05	<23.00
		1	51	14.32	18.12	<23.00
		1	0	15.88	19.68	<23.00
3690.00	20	25	12	15.33	19.13	<23.00
		1	1	15.48	19.28	<23.00
		1	50	15.74	19.54	<23.00
		50	0	12.99	16.79	<23.00
		1	51	12.45	16.25	<23.00
		1	0	15.37	19.17	<23.00
3570.00	40	50	25	12.99	16.79	<23.00
		1	1	15.72	19.52	<23.00
		1	104	16.33	20.13	<23.00
		100	0	10.10	13.90	<23.00
		1	105	14.02	17.82	<23.00
		1	0	13.90	17.70	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 64QAM						
3624.99	40	50	25	13.05	16.85	<23.00
		1	1	16.16	19.96	<23.00
		1	104	16.66	20.46	<23.00
		100	0	10.04	13.84	<23.00
		1	105	14.77	18.57	<23.00
		1	0	14.82	18.62	<23.00
3679.98	40	50	25	13.04	16.84	<23.00
		1	1	15.01	18.81	<23.00
		1	104	15.70	19.50	<23.00
		100	0	10.63	14.43	<23.00
		1	105	15.02	18.82	<23.00
		1	0	15.52	19.32	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 256QAM						
3560.01	20	25	12	13.32	17.12	<23.00
		1	1	12.99	16.79	<23.00
		1	50	12.79	16.59	<23.00
		50	0	10.76	14.56	<23.00
		1	51	11.35	15.15	<23.00
		1	0	11.97	15.77	<23.00
3624.99	20	25	12	13.61	17.41	<23.00
		1	1	13.71	17.51	<23.00
		1	50	13.32	17.12	<23.00
		50	0	11.10	14.90	<23.00
		1	51	12.01	15.81	<23.00
		1	0	12.23	16.03	<23.00
3690.00	20	25	12	13.45	17.25	<23.00
		1	1	13.36	17.16	<23.00
		1	50	13.33	17.13	<23.00
		50	0	10.95	14.75	<23.00
		1	51	11.90	15.70	<23.00
		1	0	12.49	16.29	<23.00
3570.00	40	50	25	10.77	14.57	<23.00
		1	1	13.85	17.65	<23.00
		1	104	12.25	16.05	<23.00
		100	0	7.99	11.79	<23.00
		1	105	11.45	15.25	<23.00
		1	0	13.48	17.28	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

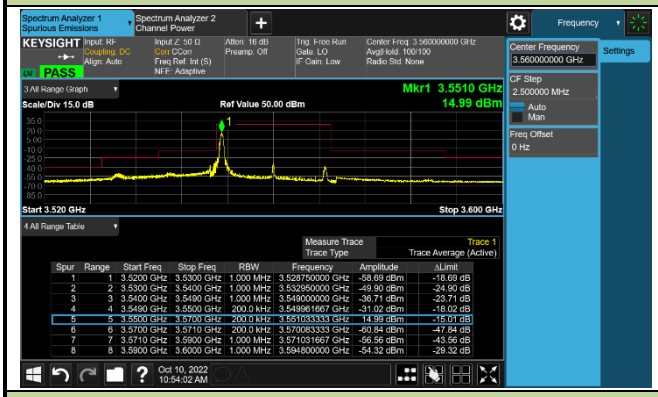
Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
DFT-s OFDM 256QAM						
3624.99	40	50	25	11.24	15.04	<23.00
		1	1	13.80	17.60	<23.00
		1	104	13.38	17.18	<23.00
		100	0	8.80	12.60	<23.00
		1	105	12.02	15.82	<23.00
		1	0	13.85	17.65	<23.00
3679.98	40	50	25	11.26	15.06	<23.00
		1	1	14.23	18.03	<23.00
		1	104	13.15	16.95	<23.00
		100	0	8.24	12.04	<23.00
		1	105	13.38	17.18	<23.00
		1	0	12.74	16.54	<23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)						

A.4 Band Edge Test Result

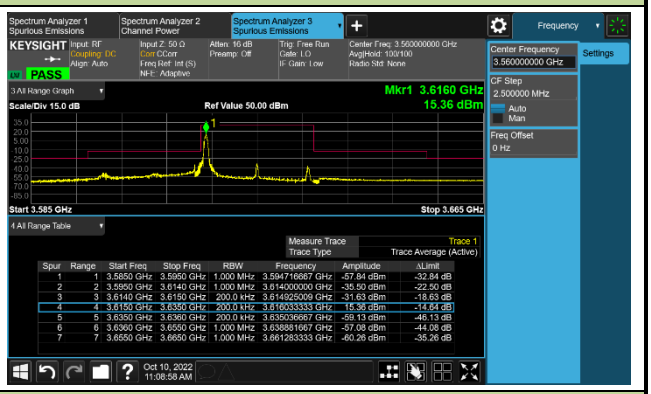
Test Site	WZ-SR6	Test Engineer	Cloud Guo
Test Date	2022-10-09 ~ 2022-10-09	Test Band	n48

20MHz Channel Bandwidth - 1RB

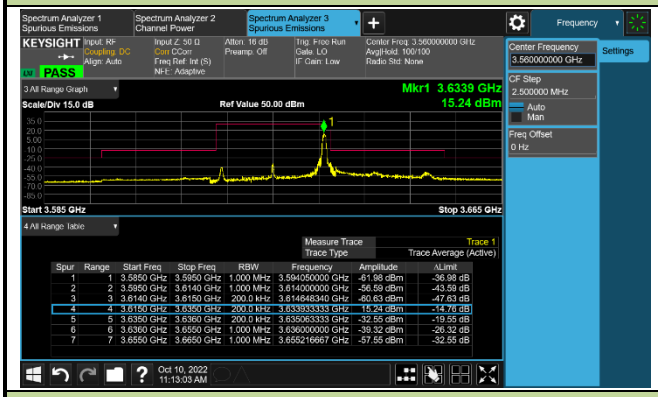
Low Channel ACP



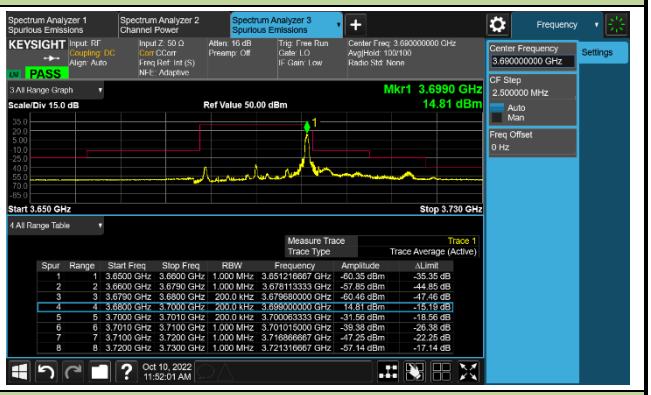
MiddleChannel ACP - Low RB Position



MiddleChannel ACP - High RB Position

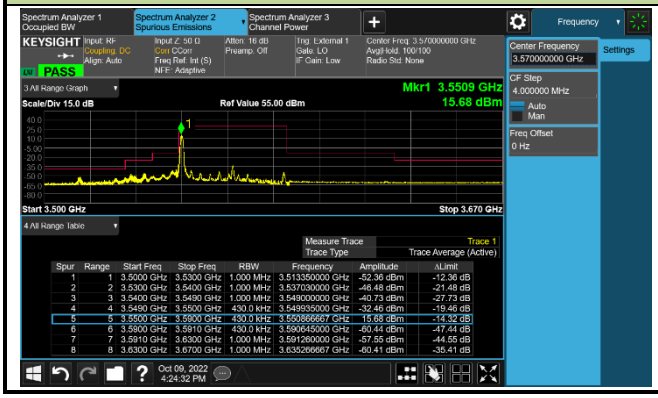


High Channel ACP

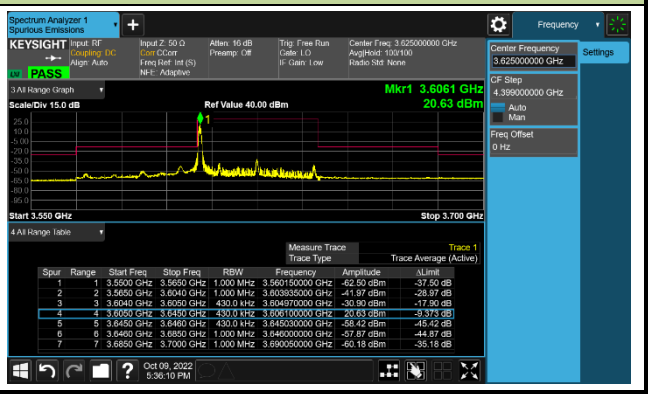


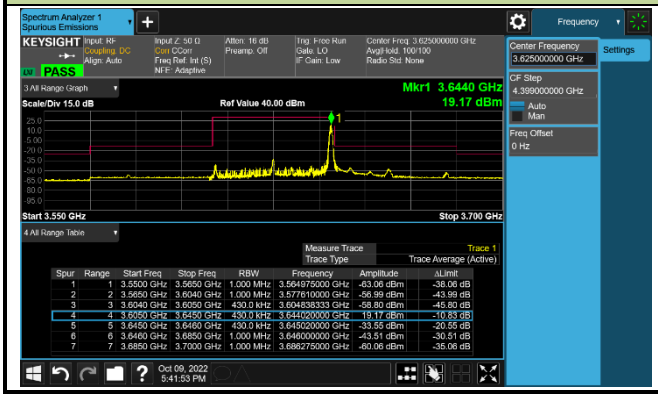
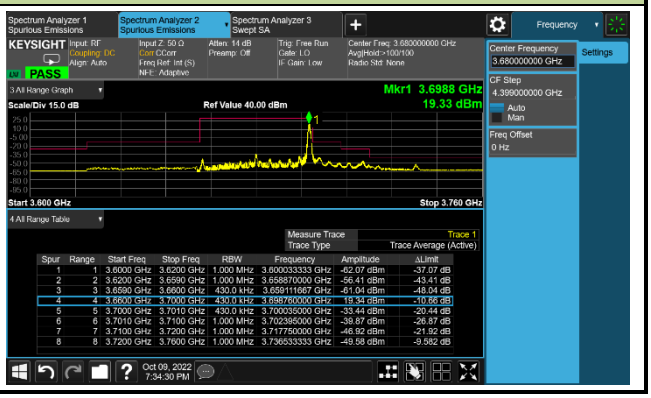
40MHz Channel Bandwidth - 1RB

Low Channel ACP



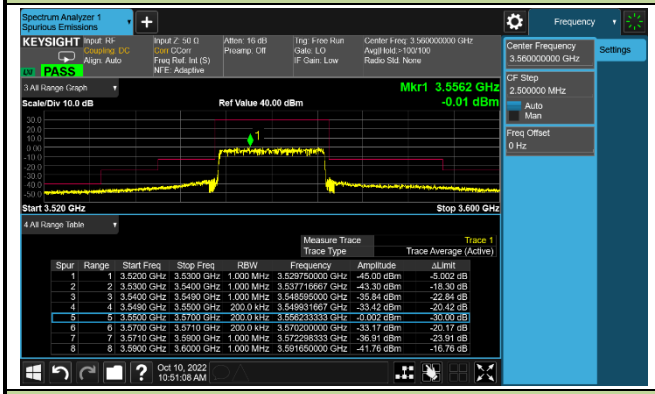
MiddleChannel ACP - Low RB Position



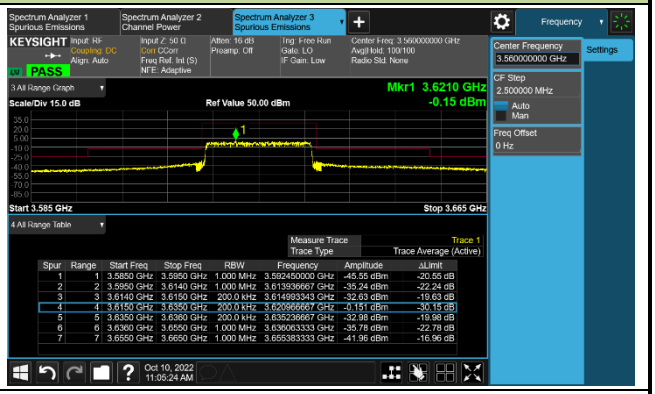
MiddleChannel ACP - High RB Position	High Channel ACP
	

20MHz Channel Bandwidth - Full RB

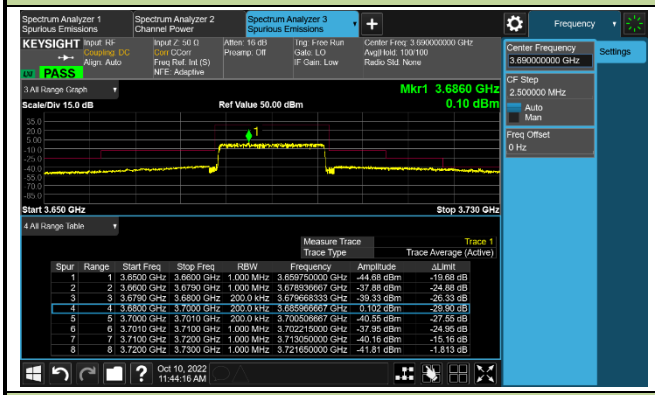
Low Channel ACP



Middle Channel ACP

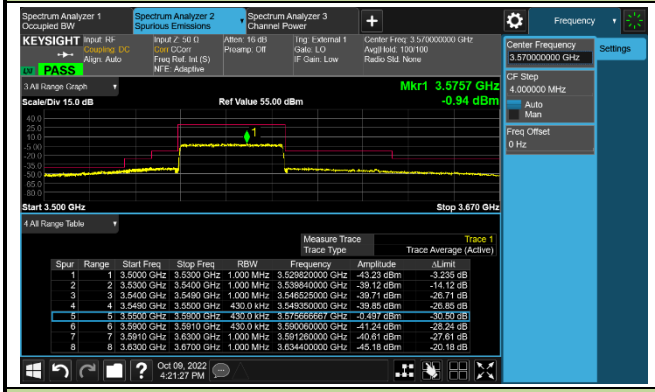


High Channel ACP

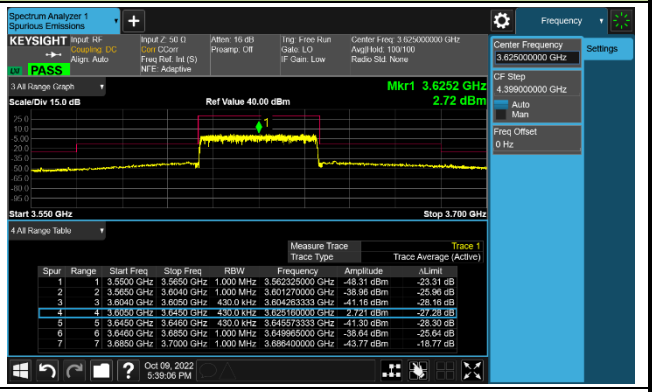


40MHz Channel Bandwidth - Full RB

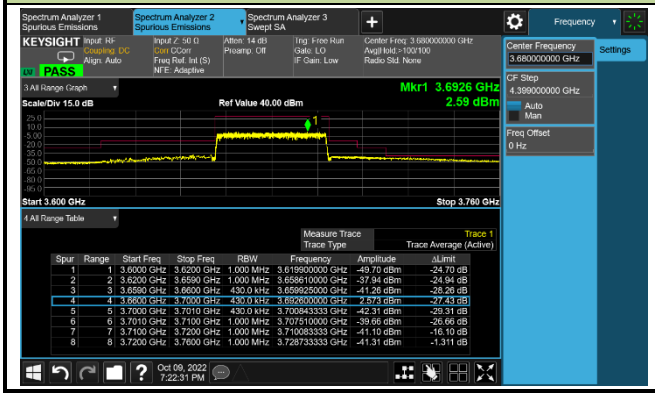
Low Channel ACP



Middle Channel ACP



High Channel ACP



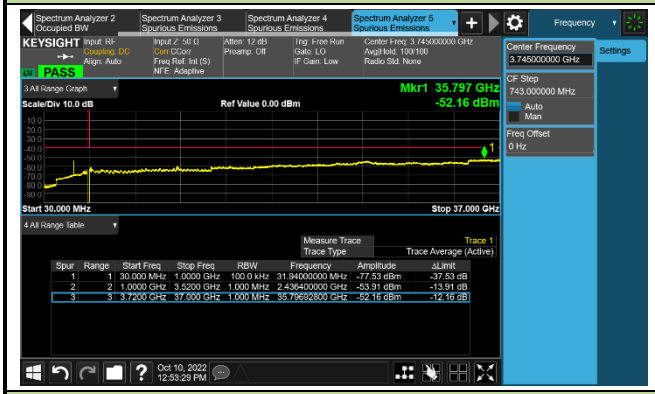
A.5 Conducted Spurious Emissions Test Result

Test Site	WZ-SR6	Test Engineer	Cloud Guo
Test Date	2022-10-10	Test Band	n48

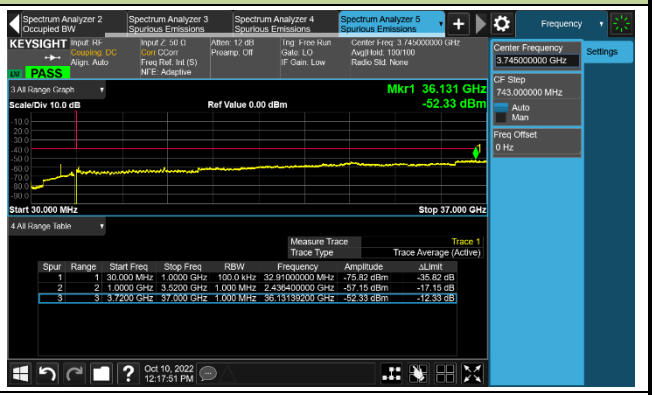
Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm/MHz)	Limit (dBm/ MHz)	Result
QPSK					
3560.01	20	30 ~ 37000	-52.10	≤ -40.00	Pass
3624.99	20	30 ~ 37000	-52.33	≤ -40.00	Pass
3690.00	20	30 ~ 37000	-52.16	≤ -40.00	Pass
3570.00	40	30 ~ 37000	-52.56	≤ -40.00	Pass
3624.99	40	30 ~ 37000	-52.43	≤ -40.00	Pass
3679.98	40	30 ~ 37000	-42.41	≤ -40.00	Pass

20MHz Channel Bandwidth

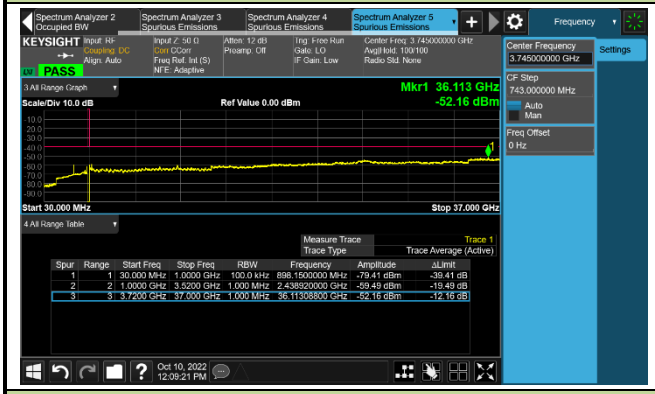
Low Channel



Middle Channel

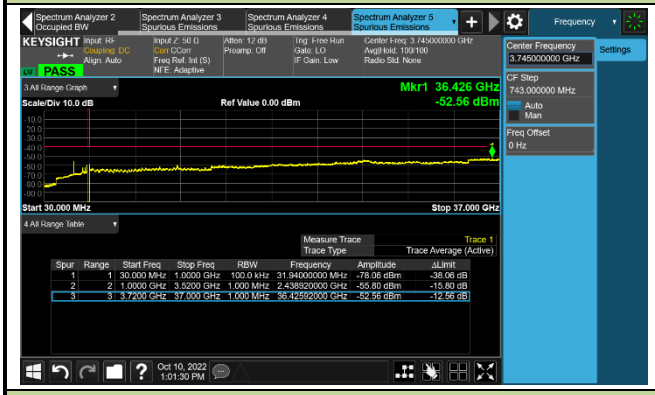


High Channel

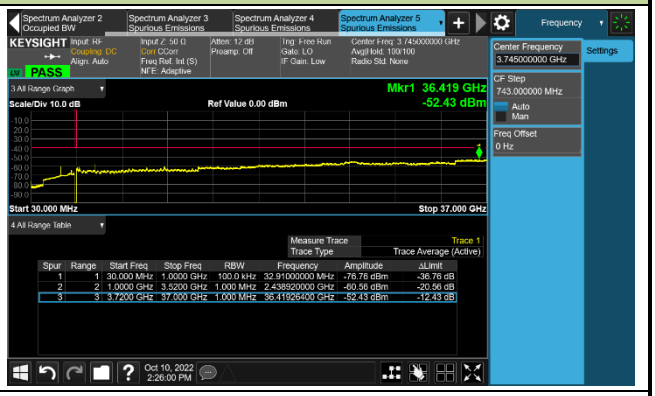


40MHz Channel Bandwidth

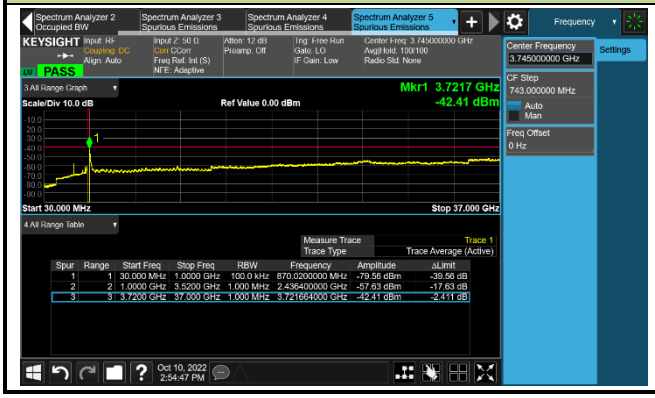
Low Channel



Middle Channel



High Channel



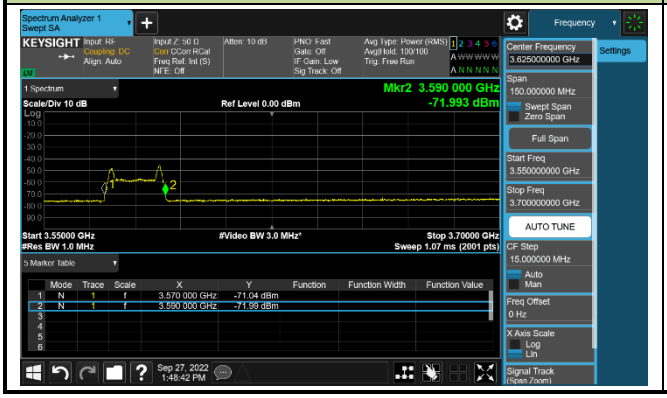
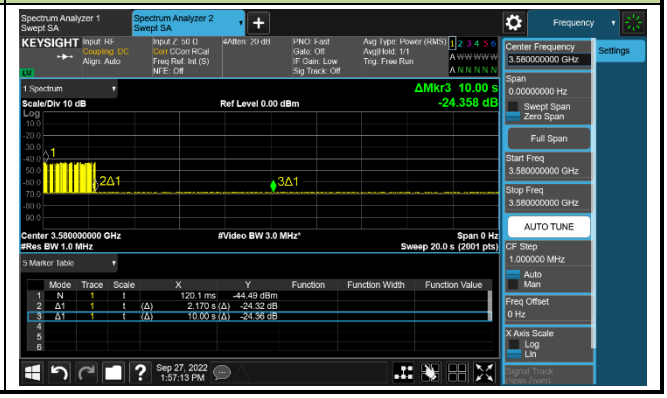
A.6 Radiated Spurious Emissions Test Result

Test Site	WZ-AC2	Test Engineer	Messiah Li
Test Date	2022-11-09 ~ 2022-11-16	Test Band	n48, 20MHz, 1RB

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Bottom Channel							
52.3	0.3	20.4	20.7	55.3	-34.6	Peak	Horizontal
92.1	1.7	17.0	18.7	55.3	-36.6	Peak	Horizontal
56.2	10.0	20.1	30.1	55.3	-25.2	Peak	Vertical
61.5	5.9	19.3	25.2	55.3	-30.1	Peak	Vertical
8097.5	32.9	12.0	44.9	55.3	-10.4	Peak	Horizontal
11115.0	31.3	17.5	48.8	55.3	-6.5	Peak	Horizontal
8803.0	32.4	13.4	45.8	55.3	-9.5	Peak	Vertical
14260.0	30.9	19.8	50.7	55.3	-4.6	Peak	Vertical
Middle Channel							
57.6	2.3	20.0	22.3	55.3	-33.0	Peak	Horizontal
99.4	0.2	18.4	18.6	55.3	-36.7	Peak	Horizontal
55.7	10.8	20.2	31.0	55.3	-24.3	Peak	Vertical
61.5	7.5	19.3	26.8	55.3	-28.5	Peak	Vertical
8820.0	32.3	13.5	45.8	55.3	-9.5	Peak	Horizontal
14192.0	31.3	20.0	51.3	55.3	-4.0	Peak	Horizontal
11200.0	31.3	17.9	49.2	55.3	-6.1	Peak	Vertical
14260.0	30.1	19.8	49.9	55.3	-5.4	Peak	Vertical
Top Channel							
55.7	1.3	20.2	21.5	55.3	-33.8	Peak	Horizontal
101.8	0.9	18.6	19.5	55.3	-35.8	Peak	Horizontal
40.2	4.9	18.8	23.7	55.3	-31.6	Peak	Vertical
55.7	10.1	20.2	30.3	55.3	-25.0	Peak	Vertical
7188.0	32.1	11.4	43.5	55.3	-11.8	Peak	Horizontal
10911.0	31.2	17.6	48.8	55.3	-6.5	Peak	Horizontal
7426.0	31.7	11.9	43.6	55.3	-11.7	Peak	Vertical
10987.5	31.0	17.3	48.3	55.3	-7.0	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).							

A.7 End User Device Additional Requirement (CBSD Protocol) Test Result

Test Site	WZ-SR6	Test Engineer	Jone Zhang
Test Date	2022-09-27	Test Band	CBSD transmit at 3580MHz (20MHz BW)

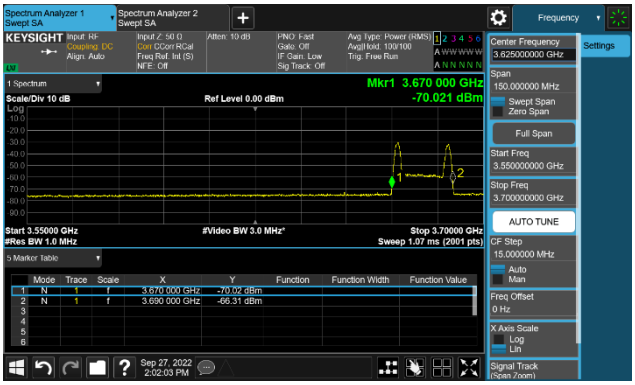
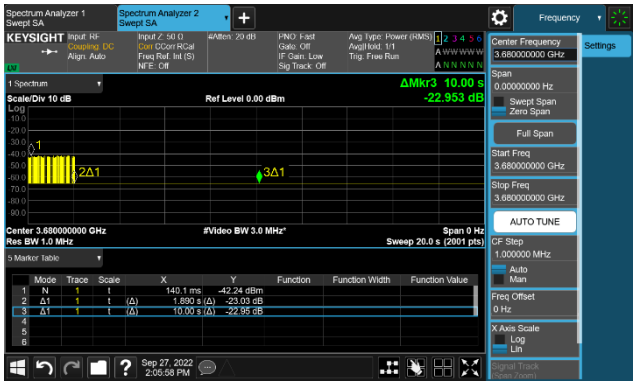
Frequency Operation	Discontinues Operations within 10s
	

Marker 1: CBSD sends instructions to discontinue NR operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

Test Site	WZ-SR6	Test Engineer	Jone Zhang
Test Date	2022-09-27	Test Band	CBSD transmit at 3680MHz (20MHz BW)

Frequency Operation	Discontinues Operations within 10s
	

Marker 1: CBSD sends instructions to discontinue NR operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

Appendix B - Test Setup Photograph

Refer to “2209RSU059-UT” file.

Appendix C - EUT Photograph

Refer to “2209RSU059-UE” file.

The End