FCC Test Report (Part 27)

Report No.:	RFBEOO-WTW-P21020573B
FCC ID:	MADG2021-49-01B
Test Model:	G2021-49-01B
Received Date:	Sep. 13, 2021
Test Date:	Sep. 14 ~ Nov. 12, 2021
Issued Date:	Nov. 15, 2021
Applicant:	Microelectronics Technology Inc.
Address:	No. 1, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number (1):	788550 / TW0003
Test Location (2):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number (2):	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RFBEOO-WTW-P21020573B	Original release.	Nov. 15, 2021

1 Certificate of Conformity

Product:	Dual Mid Band RU
Brand:	MTI
Test Model:	G2021-49-01B
Sample Status:	Engineering sample
Applicant:	Microelectronics Technology Inc.
Test Date:	Sep. 14 ~ Nov. 12, 2021
Standards:	FCC Part 27, Subpart L FCC Part 2

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

Prepared by : Pettie Chen , **Date:** Nov. 15, 2021

Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Nov. 15, 2021

Bruce Chen / Senior Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27, Subpart L & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(d)(2)	Equivalent Isotropically radiated power	PASS	Meet the requirement of limit.
2.1047	Modulation characteristics	PASS	Meet the requirement
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	PASS	Meet the requirement of limit.
2.1049 27.53	Occupied Bandwidth	PASS	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	PASS	Meet the requirement of limit.
27.50(d)(5)	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -49.16dB at 6292.50MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Test Site and Instruments

For radiated spurious emissions test:

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Keysight	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
Pre-Amplifier EMCI	EMC001340	980142	May 24, 2021	May 23, 2022
Loop Antenna Electro-Metrics	EM-6879	264	Mar. 05, 2021	Mar. 04, 2022
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	Oct. 20, 2020	Oct. 19, 2021
			Oct. 19, 2021	Oct. 18, 2022
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 05, 2020	Nov. 04, 2021
			Oct. 26, 2021	Oct. 25, 2022
RF Cable	8D	966-3-1	Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-2	Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-3	Mar. 16, 2021	Mar. 15, 2022
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 24, 2020	Sep. 23, 2021
			Sep. 23, 2021	Sep. 22, 2022
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC104-SM-SM-1500	180504	Apr. 26, 2021	Apr. 25, 2022
RF Cable	EMC104-SM-SM-2000	180601	Jun. 08, 2021	Jun. 07, 2022
RF Cable	EMC104-SM-SM-6000	210201	May 13, 2021	May 12, 2022
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 10, 2021	Mar. 09, 2022
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Hsinchu 966 Chamber No. 3.

For other test:

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer Keysight	N9030B	MY60070562	Jan. 06, 2021	Jan. 05, 2022
Fixed Attenuator Woken	00800N1G03H-30	01	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Nov. 24, 2020	Nov. 23, 2021
True RMS Clamp Meter FLUKE	325	31130711WS	Jun. 02, 2021	Jun. 01, 2022
DC power supply Chroma	62024P-80-60	62024PA00674	NA	NA
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

3 General Information

3.1 General Description of EUT

Product	Dual Mid Band RU						
Brand	MTI						
Test Model	G2021-49-01B						
Status of EUT	Engineering sample						
Power Supply Rating	-40.5Vdc to -58.5Vdc						
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM						
Modulation Technology	5G NR FDD						
Operating Frequency	Band n66	Channel Bandwidth: 5MHz		ANT0 ANT1 ANT2 ANT3	2112.5MHz ~ 2197.5MHz		
	Band n70	Channel Bandwidth: 5MHz		ANT0 ANT1 ANT2 ANT3	1997.5MHz ~ 2017.5MHz		
Max. EIRP Power	Band n66	ANT0 ANT1 ANT2 ANT3	Channel Bandwidth: 5MHz	1470.01 W/MHz (16QAM)			
Emission Designator				QPSK	16QAM	64QAM	256QAM
	Band n66	Channel Bandwidth: 5MHz	ANT0	4M47G7D	4M47D7W	4M46D7W	4M45D7W
			ANT1	4M47G7D	4M47D7W	4M46D7W	4M45D7W
			ANT2	4M47G7D	4M47D7W	4M46D7W	4M45D7W
			ANT3	4M47G7D	4M47D7W	4M46D7W	4M45D7W
	One Carrier: Band n66 5MHz(60W)_Ch 439500 (2197.5MHz)+ Band n70 5MHz(20W)_Ch 399500 (1997.5MHz)		ANT0	8M94G7D	8M94D7W	8M92D7W	8M90D7W
			ANT1	8M94G7D	8M94D7W	8M92D7W	8M90D7W
			ANT2	8M94G7D	8M94D7W	8M92D7W	8M90D7W
			ANT3	8M94G7D	8M94D7W	8M92D7W	8M90D7W
Antenna Type	Directional Cross-Polarized Sector antenna with Band n66 Gain = 15 dBi Band n70 Gain = 17 dBi						
Antenna Connector	4x4.3-10 Female						
Accessory Device	NA						
Data Cable Supplied	NA						

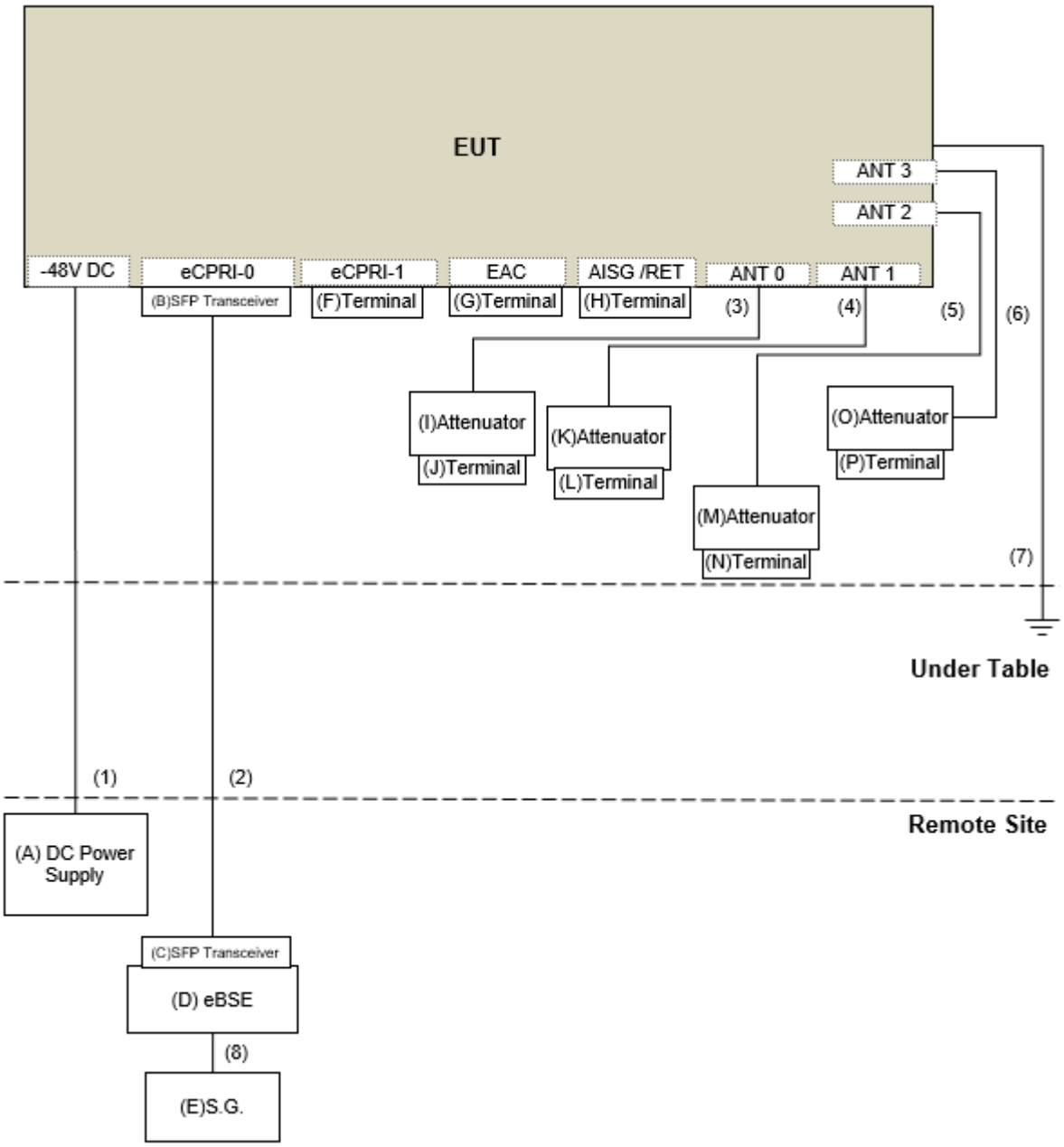
Note:

1. The EUT incorporates a MIMO function.

Band n66			
Channel Bandwidth	Modulation	TX & RX configuration	
5MHz	QPSK, 16QAM, 64QAM, 256QAM	4TX	4RX
Band n70			
Channel Bandwidth	Modulation	TX & RX configuration	
5MHz	QPSK, 16QAM, 64QAM, 256QAM	4TX	4RX

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
3. The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
4. Based on the maximum RF power (conducted & EIRP) listed in this report, considerations pertaining to the maximum allowed EIRP (conducted power level), signal type and antenna gain should be considered for each installation.

3.2 Configuration of System under Test



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	DC Power Supply	NA	NA	NA	NA	Supplied by client
B	SFP Transceiver	NA	NA	NA	NA	Supplied by client
C	SFP Transceiver	NA	NA	NA	NA	Supplied by client
D	eBSE (Note 2)	NA	NA	NA	NA	Supplied by client
E	S.G	Agilent	E4438C	NA	NA	Provided by Lab
F	Terminal	NA	NA	NA	NA	Supplied by client
G	Terminal	NA	NA	NA	NA	Supplied by client
H	Terminal	NA	NA	NA	NA	Supplied by client
I	Attenuator	NA	NA	NA	NA	Supplied by client
J	Terminal	NA	NA	NA	NA	Supplied by client
K	Attenuator	NA	NA	NA	NA	Supplied by client
L	Terminal	NA	NA	NA	NA	Supplied by client
M	Attenuator	NA	NA	NA	NA	Supplied by client
N	Terminal	NA	NA	NA	NA	Supplied by client
O	Attenuator	NA	NA	NA	NA	Supplied by client
P	Terminal	NA	NA	NA	NA	Supplied by client

NOTE:

1. All power cords of the above support units are non-shielded (1.8 m).
2. eBSE: Based Station Emulator which is to transmit/receive the waveform

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	DC Power Cable	1	10	Yes	0	Supplied by client
2	Coaxial Cable	1	10	Yes	0	Supplied by client
3	RF Cable	1	1.5	Yes	0	Supplied by client
4	RF Cable	1	1.5	Yes	0	Supplied by client
5	RF Cable	1	1.5	Yes	0	Supplied by client
6	RF Cable	1	1.5	Yes	0	Supplied by client
7	GND Cable	1	3	No	0	Provided by Lab
8	RF Cable	1	3	No	0	Supplied by client

3.3 Test Mode Applicability and Tested Channel Detail

Band n66 5MHz (60W):

Following channel(s) was (were) selected for the final test as listed below:

Test Item	Available Frequency (MHz)	Tested Channel	Channel Bandwidth	Modulation
Output Power	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	QPSK, 16QAM, 64QAM, 256QAM
Modulation Characteristics	2112.5 to 2197.5	Ch 431000 (2155.0MHz)	5MHz Single Carrier	QPSK, 16QAM, 64QAM, 256QAM
Frequency Stability	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	16QAM
Emission Bandwidth	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	QPSK, 16QAM, 64QAM, 256QAM
Channel Edge	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	16QAM
Peak To Average Ratio	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	QPSK, 16QAM, 64QAM, 256QAM
Conducted Emission	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	16QAM
Radiated Emission Below 1GHz	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	16QAM
Radiated Emission Above 1GHz	2112.5 to 2197.5	Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)	5MHz Single Carrier	16QAM

NOTE:

1. All supported modulation types were evaluated. The Worst case of 16QAM was selected. Therefore, the Frequency Stability, Conducted Emission and Radiated Emission were performed under 16QAM mode only.

Band n66 5MHz (60W) + Band n70 5MHz (20W):

Following test modes were selected for the final test:

Test Item	Test Mode
EIRP	One Carrier: Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)
Occupied Bandwidth	One Carrier: Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)
Conducted Emission	One Carrier: Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)
Radiated Emission	One Carrier: Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)

Test Condition:

Test Item	Environmental Conditions	Input Power (System)	Tested By
Output Power	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Modulation characteristics	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Frequency Stability	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Emission Bandwidth	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Band Edge	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Conducted Emission	25deg. C, 63%RH	120Vac, 60Hz	James Yang
Radiated Emission	25deg. C, 75%RH	120Vac, 60Hz	Ryan Du

Note: Above input power with the AC/DC PSU used during testing.

3.4 General Description of Applied Standards

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 27, Subpart L

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

According to FCC 27.50(d)(2)that the power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

4.1.2 Test Procedures

EIRP / ERP Measurement:

Conducted Power Measurement:

a. A spectrum analyzer was used on the output port of the EUT and recorded output power from the spectrum analyzer.
b. The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

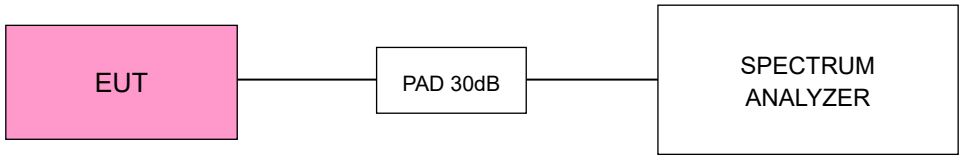
   EIRP = PMeas + GT
   ERP = PMeas + GT- 2.15

   Where ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, e.g., dBm or dBW)

   PMeas: measured transmitter output power or PSD, in dBm or dBW
   GT: gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

CONDUCTED POWER MEASUREMENT:



4.1.4 Test Results

Band n66 5MHz (60W)
Single Carrier

Ch 422500 (2112.5MHz), Ch 431000 (2155.0MHz), Ch 439500 (2197.5MHz)

5MHz

Channel Number	Freq. (MHz)	QPSK									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm/MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant.0	Ant.1	Ant.2	Ant.3	Total					
422500	2112.5	40.33	40.40	40.26	40.22	46.32	15	61.32	1356.64	1640.00	PASS
431000	2155	40.25	40.37	40.30	40.24	46.31	15	61.31	1352.35	1640.00	PASS
439500	2197.5	40.26	40.39	40.32	40.26	46.33	15	61.33	1357.82	1640.00	PASS

5MHz

Channel Number	Freq. (MHz)	16QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm/MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant.0	Ant.1	Ant.2	Ant.3	Total					
422500	2112.5	40.65	40.69	40.62	40.65	46.67	15	61.67	1469.83	1640.00	PASS
431000	2155	40.68	40.62	40.68	40.63	46.67	15	61.67	1470.01	1640.00	PASS
439500	2197.5	40.60	40.63	40.61	40.65	46.64	15	61.64	1459.87	1640.00	PASS

5MHz

Channel Number	Freq. (MHz)	64QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm/MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant.0	Ant.1	Ant.2	Ant.3	Total					
422500	2112.5	40.22	40.28	40.22	40.18	46.25	15	61.25	1332.22	1640.00	PASS
431000	2155	40.23	40.29	40.25	40.20	46.26	15	61.26	1337.59	1640.00	PASS
439500	2197.5	40.24	40.29	40.25	40.25	46.28	15	61.28	1342.19	1640.00	PASS

5MHz

Channel Number	Freq. (MHz)	256QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm/MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant.0	Ant.1	Ant.2	Ant.3	Total					
422500	2112.5	40.18	40.25	40.23	40.16	46.23	15	61.23	1326.10	1640.00	PASS
431000	2155	40.25	40.23	40.21	40.18	46.24	15	61.24	1329.90	1640.00	PASS
439500	2197.5	40.22	40.23	40.19	40.18	46.23	15	61.23	1326.07	1640.00	PASS

CA One Carrier

Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)

Channel Number	Freq. (MHz)	QPSK									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm /MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant. TX 0	Ant. TX 1	Ant. TX 2	Ant. TX 3	Total					
n66 439500	2197.5	40.26	40.39	40.32	40.26	46.33	15	61.33	1357.82	1640.00	PASS
n70 399500	1997.5	37.44	37.39	37.35	37.38	43.41	17	60.41	1099.25	1640.00	PASS

Channel Number	Freq. (MHz)	16QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm /MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant. TX 0	Ant. TX 1	Ant. TX 2	Ant. TX 3	Total					
n66 439500	2197.5	40.60	40.63	40.61	40.65	46.64	15	61.64	1459.87	1640.00	PASS
n70 399500	1997.5	37.22	37.30	37.23	37.16	43.25	17	60.25	1058.86	1640.00	PASS

Channel Number	Freq. (MHz)	64QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm /MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant. TX 0	Ant. TX 1	Ant. TX 2	Ant. TX 3	Total					
n66 439500	2197.5	40.24	40.29	40.25	40.25	46.28	15	61.28	1342.19	1640.00	PASS
n70 399500	1997.5	36.63	36.68	36.61	36.62	42.66	17	59.66	923.78	1640.00	PASS

Channel Number	Freq. (MHz)	256QAM									PASS /FAIL
		Conducted Average Power (dBm/MHz)					Gain	EIRP (dBm /MHz)	EIRP (W/MHz)	Limit (W/MHz)	
		Ant. TX 0	Ant. TX 1	Ant. TX 2	Ant. TX 3	Total					
n66 439500	2197.5	40.22	40.23	40.19	40.18	46.23	15	61.23	1326.07	1640.00	PASS
n70 399500	1997.5	36.44	36.28	36.35	36.21	42.34	17	59.34	859.30	1640.00	PASS

4.2 Modulation characteristics Measurement

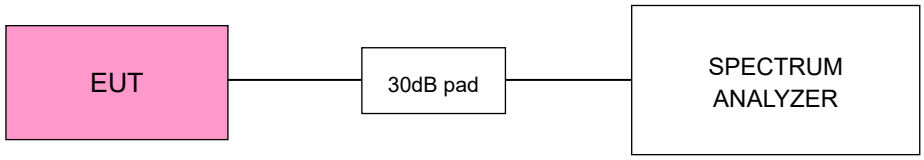
4.2.1 Limits of Modulation characteristics

N/A

4.2.2 Test Procedure

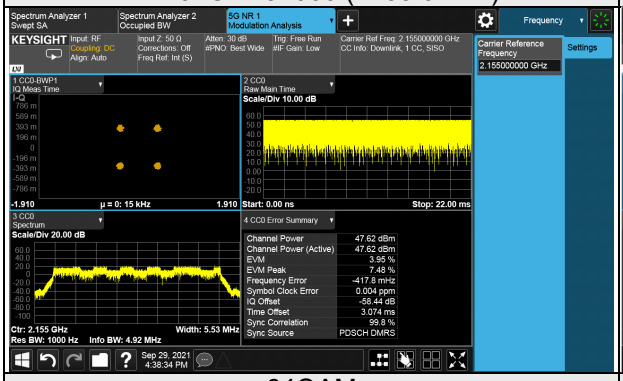
Connect the EUT to spectrum analyzer. The frequency band is set as EUT supported modulation and channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.3 Test Setup



4.2.4 Test Results

Band n66 5MHz (60W)

Spectrum Plot of Measurement Value	
5MHz	
QPSK	16QAM
Ant. 0: Ch 431000 (2155.0MHz)	Ant. 0: Ch 431000 (2155.0MHz)
	
64QAM	256QAM
Ant. 0: Ch 431000 (2155.0MHz)	Ant. 0: Ch 431000 (2155.0MHz)
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that" The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT -40℃ ~ 55℃.

4.3.2 Test Procedure

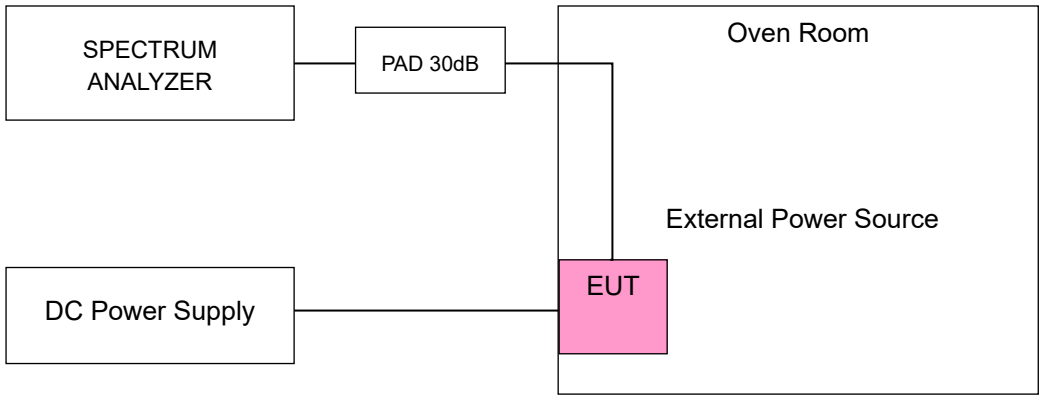
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

b. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded from the spectrum analyzer.

4.3.3 Test Setup



4.3.4 Test Results

Band n66 5MHz (60W)

SC Mode- Ant. TX 0

FREQUENCY ERROR vs. VOLTAGE					PASS/ FAIL
Voltage (Volts)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-48	2112.500017	0.008	2197.500027	0.012	PASS
-40.5	2112.500028	0.013	2197.500041	0.019	PASS
-58.5	2112.500048	0.023	2197.500041	0.019	PASS

FREQUENCY ERROR vs. Temperature					PASS/ FAIL
Temp. (℃)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-40	2112.500011	0.005	2197.500025	0.011	PASS
-30	2112.500026	0.012	2197.500022	0.010	PASS
-20	2112.500039	0.018	2197.500027	0.012	PASS
-10	2112.500024	0.011	2197.500024	0.011	PASS
0	2112.500048	0.023	2197.500019	0.009	PASS
10	2112.500015	0.007	2197.500049	0.022	PASS
20	2112.499957	-0.020	2197.499974	-0.012	PASS
30	2112.499979	-0.010	2197.499983	-0.008	PASS
40	2112.499972	-0.013	2197.499980	-0.009	PASS
50	2112.499951	-0.023	2197.499956	-0.020	PASS
55	2112.499972	-0.013	2197.499977	-0.010	PASS

SC Mode- Ant. TX 1

FREQUENCY ERROR vs. VOLTAGE					PASS/ FAIL
Voltage (Volts)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-48	2112.500013	0.006	2197.500029	0.013	PASS
-40.5	2112.500019	0.009	2197.500049	0.022	PASS
-58.5	2112.500023	0.011	2197.500034	0.015	PASS

FREQUENCY ERROR vs. Temperature					PASS/ FAIL
Temp. (℃)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-40	2112.500014	0.007	2197.500026	0.012	PASS
-30	2112.500031	0.015	2197.500032	0.015	PASS
-20	2112.500022	0.010	2197.500036	0.016	PASS
-10	2112.500026	0.012	2197.500020	0.009	PASS
0	2112.500010	0.005	2197.500034	0.015	PASS
10	2112.500024	0.011	2197.500018	0.008	PASS
20	2112.499961	-0.018	2197.499976	-0.011	PASS
30	2112.499955	-0.021	2197.499978	-0.010	PASS
40	2112.499972	-0.013	2197.499950	-0.023	PASS
50	2112.499973	-0.013	2197.499989	-0.005	PASS
55	2112.499965	-0.017	2197.499971	-0.013	PASS

SC Mode- Ant. TX 2

FREQUENCY ERROR vs. VOLTAGE					PASS/ FAIL
Voltage (Volts)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-48	2112.500037	0.018	2197.500025	0.011	PASS
-40.5	2112.500041	0.019	2197.500048	0.022	PASS
-58.5	2112.500027	0.013	2197.500039	0.018	PASS

FREQUENCY ERROR vs. Temperature					PASS/ FAIL
Temp. (℃)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-40	2112.500024	0.011	2197.500028	0.013	PASS
-30	2112.500033	0.016	2197.500020	0.009	PASS
-20	2112.500042	0.020	2197.500042	0.019	PASS
-10	2112.500041	0.019	2197.500028	0.013	PASS
0	2112.500042	0.020	2197.500050	0.023	PASS
10	2112.500014	0.007	2197.500028	0.013	PASS
20	2112.499950	-0.024	2197.499954	-0.021	PASS
30	2112.499972	-0.013	2197.499961	-0.018	PASS
40	2112.499984	-0.008	2197.499978	-0.010	PASS
50	2112.499989	-0.005	2197.499982	-0.008	PASS
55	2112.499977	-0.011	2197.499976	-0.011	PASS

SC Mode- Ant. TX 3

FREQUENCY ERROR vs. VOLTAGE					PASS/ FAIL
Voltage (Volts)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-48	2112.500033	0.016	2197.500042	0.019	PASS
-40.5	2112.500032	0.015	2197.500014	0.006	PASS
-58.5	2112.500029	0.014	2197.500017	0.008	PASS

FREQUENCY ERROR vs. Temperature					PASS/ FAIL
Temp. (℃)	Test result (MHz)				
	5MHz				
	2112.5MHz		2197.5MHz		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-40	2112.500040	0.019	2197.500022	0.010	PASS
-30	2112.500025	0.012	2197.500021	0.010	PASS
-20	2112.500037	0.018	2197.500028	0.013	PASS
-10	2112.500036	0.017	2197.500013	0.006	PASS
0	2112.500016	0.008	2197.500039	0.018	PASS
10	2112.500016	0.008	2197.500012	0.005	PASS
20	2112.499968	-0.015	2197.499958	-0.019	PASS
30	2112.499950	-0.024	2197.499950	-0.023	PASS
40	2112.499978	-0.010	2197.499966	-0.015	PASS
50	2112.499982	-0.009	2197.499968	-0.015	PASS
55	2112.499987	-0.006	2197.499970	-0.014	PASS

4.4 Emission Bandwidth Measurement

4.4.1 Limits of Emission Bandwidth Measurement

The frequency shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

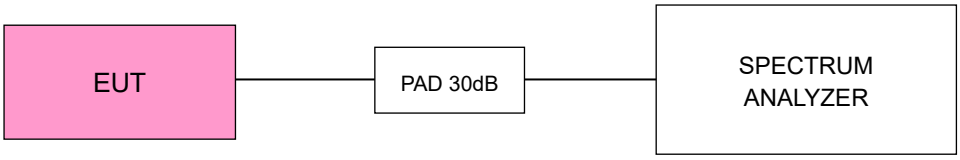
4.4.2 Test Procedure

-26dBc Bandwidth
That emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

Occupied Bandwidth
All measurements were done at low, middle and high operational frequency range. EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 51kHz and VBW = 160kHz (Channel Bandwidth: 5MHz). The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.4.3 Test Setup



4.4.4 Test Results (-26dBc Bandwidth)

Band n66 5MHz (60W)
Single Carrier

5MHz

Channel Number	Freq. (MHz)	-26dB Bandwidth (MHz)															
		Ant. TX0				Ant. TX1				Ant. TX2				Ant. TX3			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
422500	2112.5	4.65	4.65	4.67	4.66	4.65	4.65	4.66	4.66	4.64	4.65	4.66	4.66	4.65	4.65	4.66	4.66
431000	2155	4.66	4.65	4.66	4.65	4.65	4.65	4.66	4.64	4.65	4.64	4.66	4.64	4.66	4.64	4.66	4.64
439500	2197.5	4.65	4.65	4.67	4.65	4.65	4.65	4.67	4.65	4.65	4.65	4.67	4.65	4.65	4.65	4.67	4.65

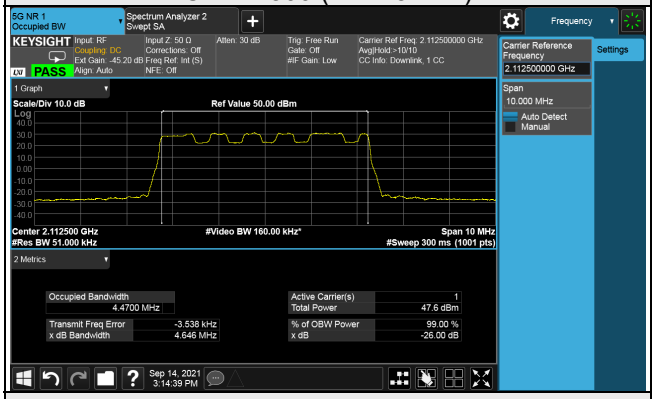
Ant. TX 0

Spectrum Plot of Worst Value

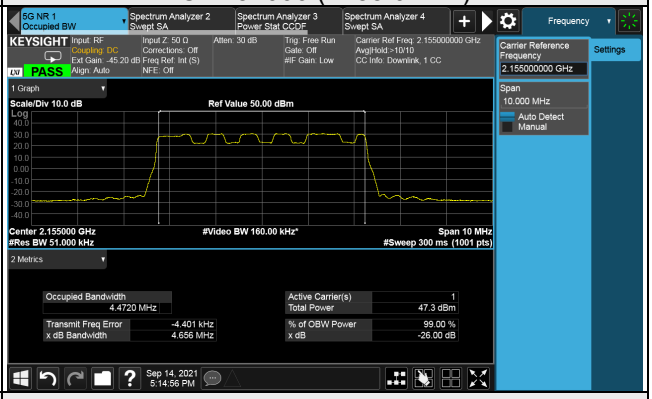
-26dBc Bandwidth

QPSK

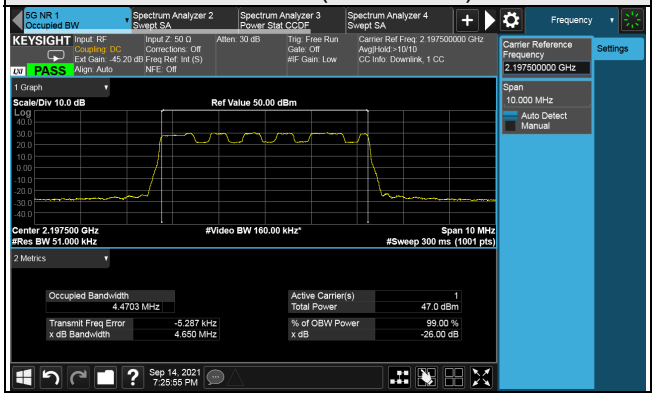
Ch 422500 (2112.5MHz)

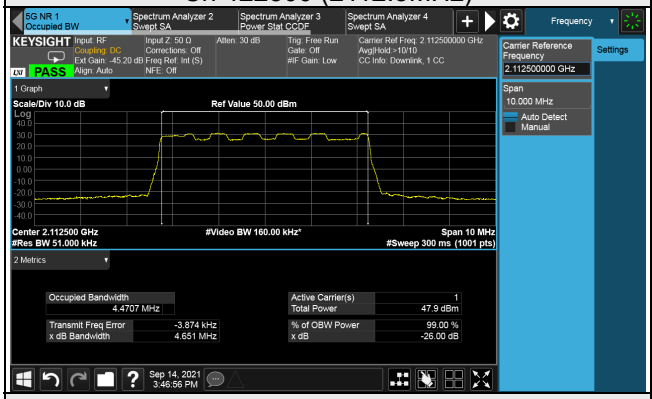
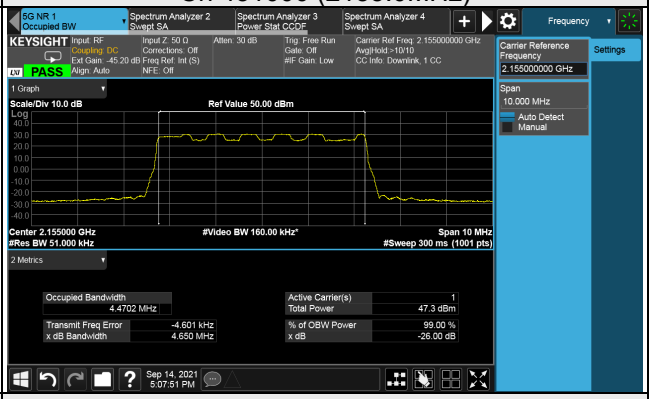
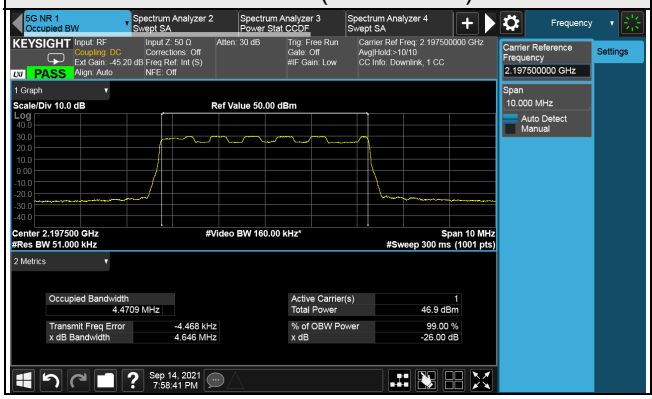


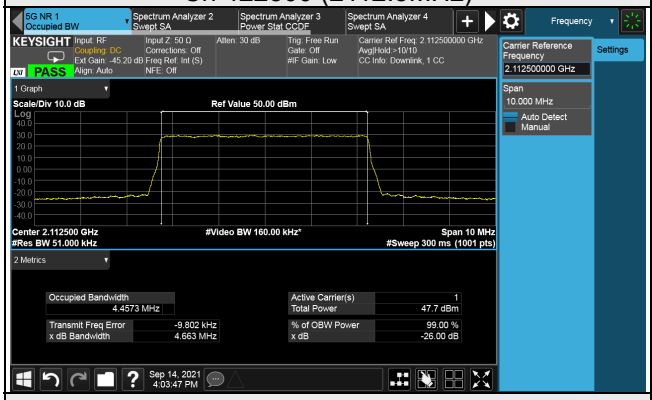
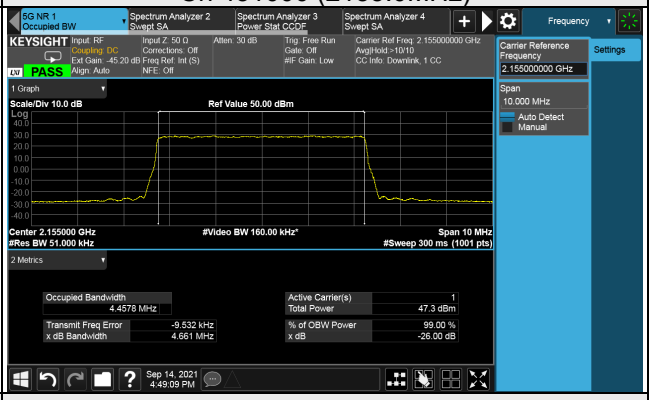
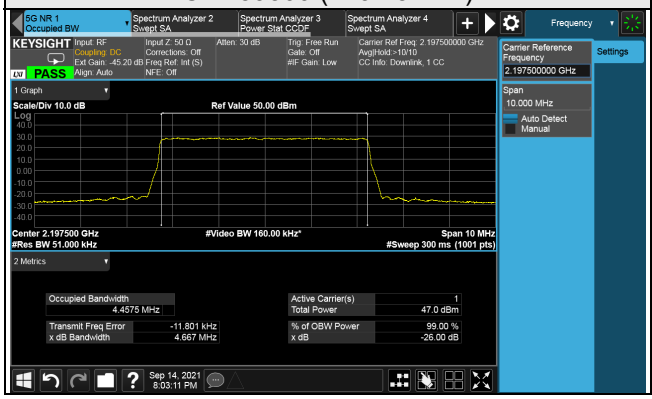
Ch 431000 (2155.0MHz)

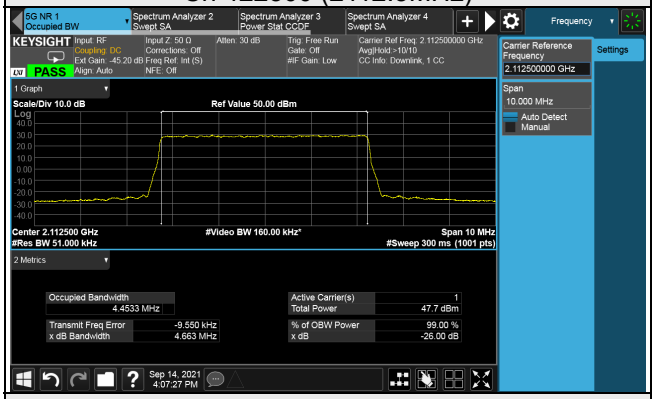
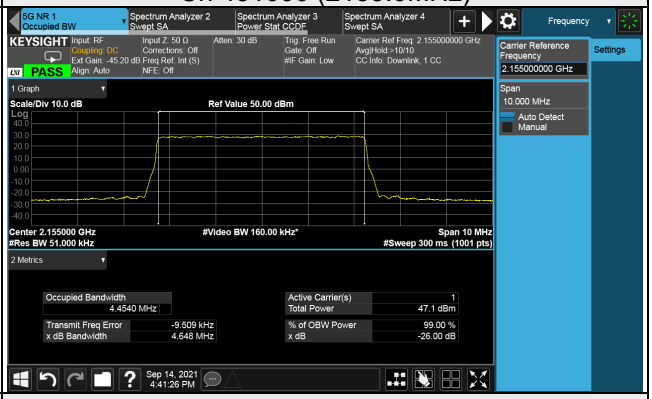
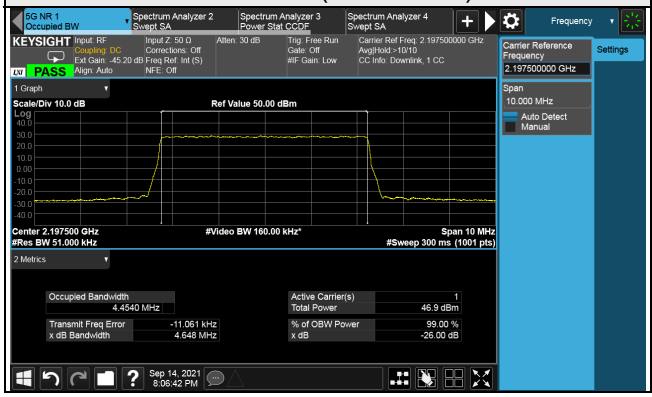


Ch 439500 (2197.5MHz)

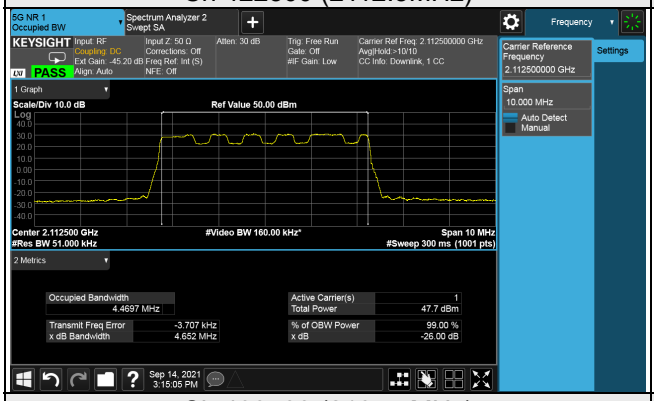
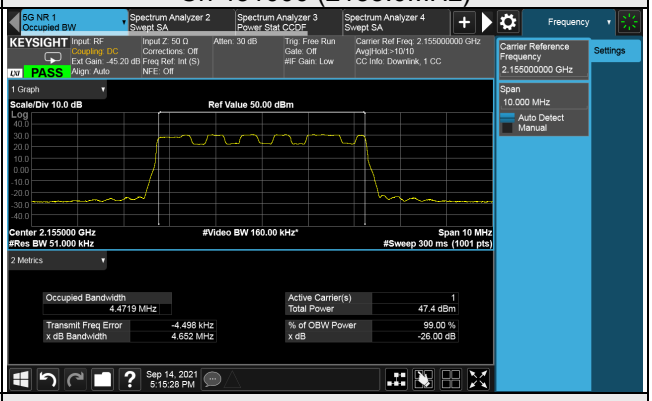
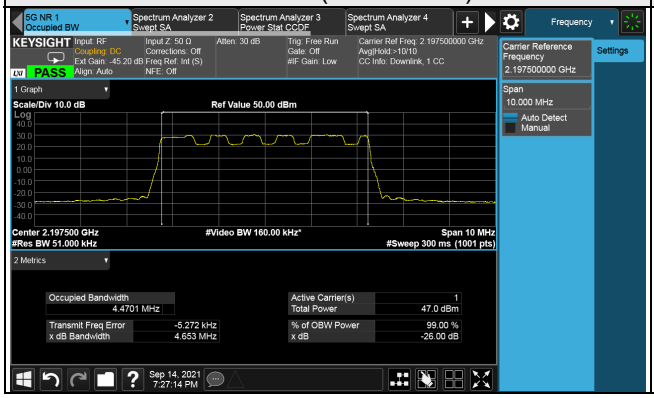


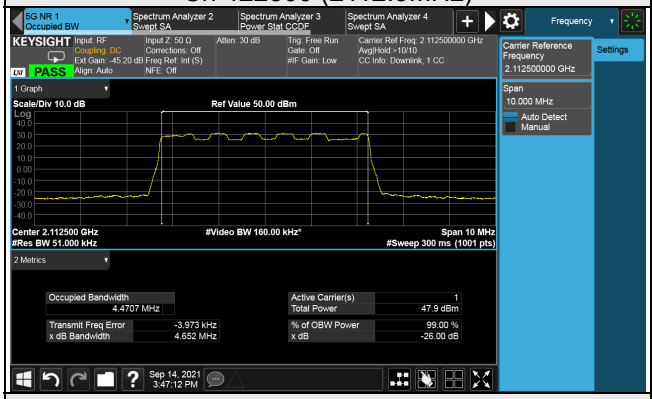
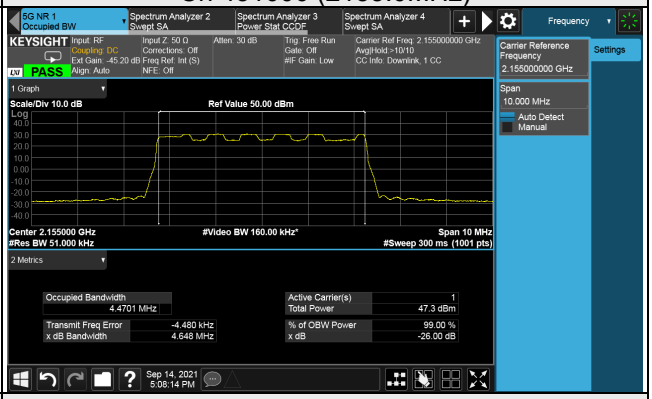
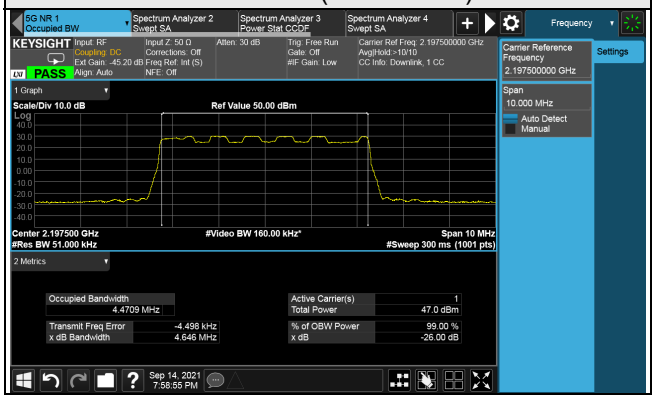
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

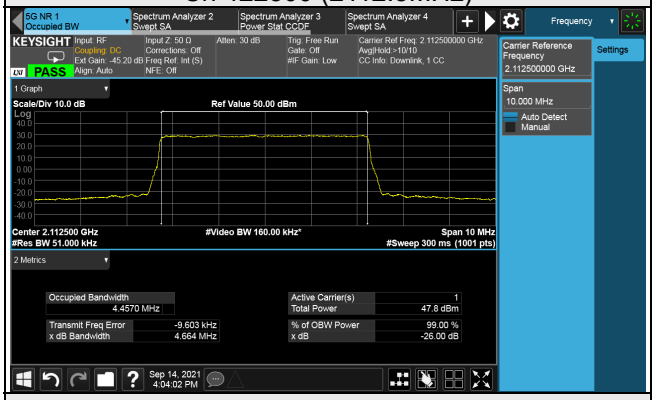
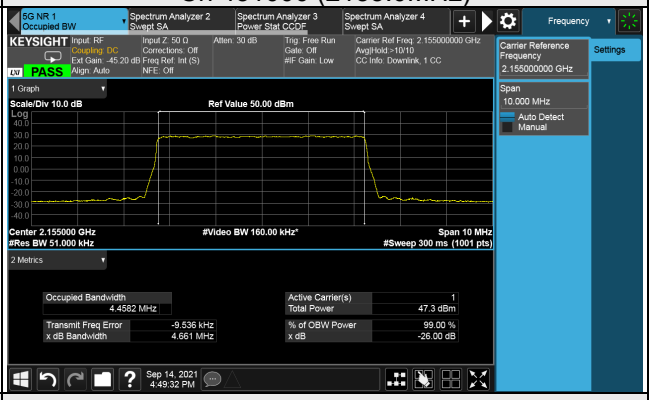
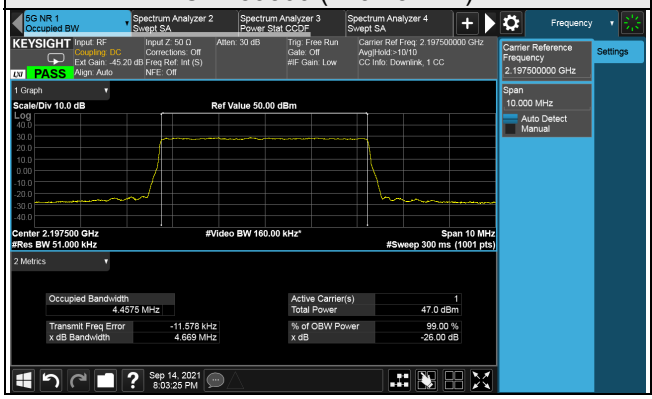
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

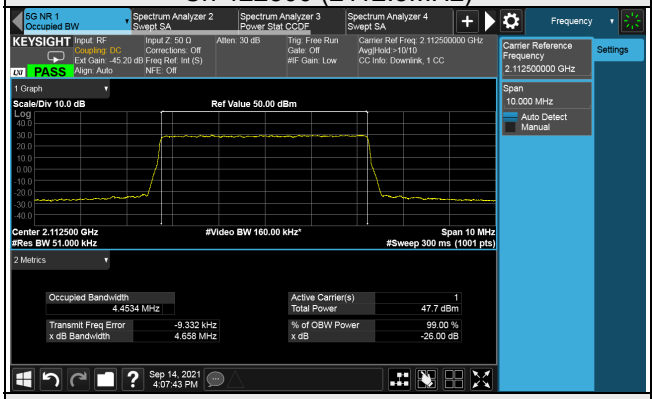
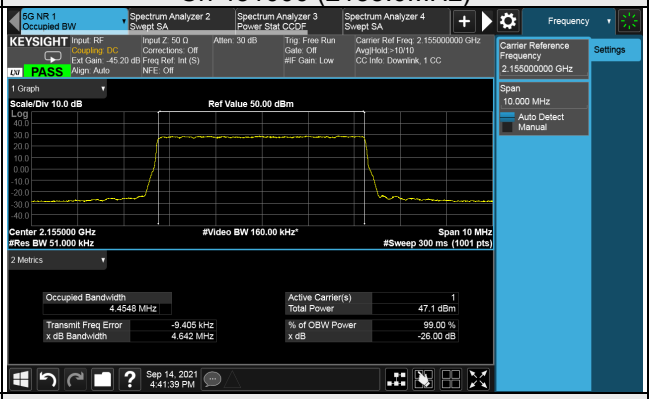
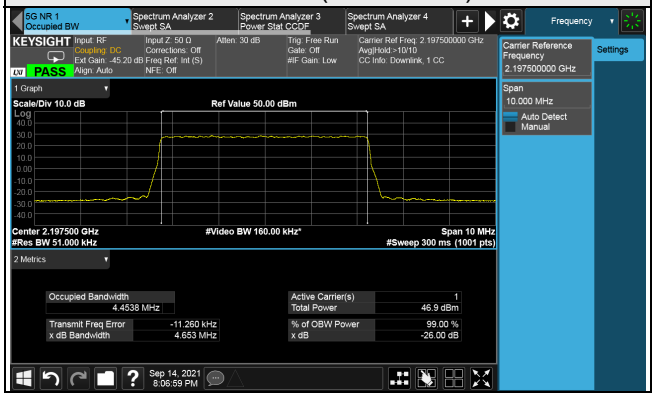
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 1

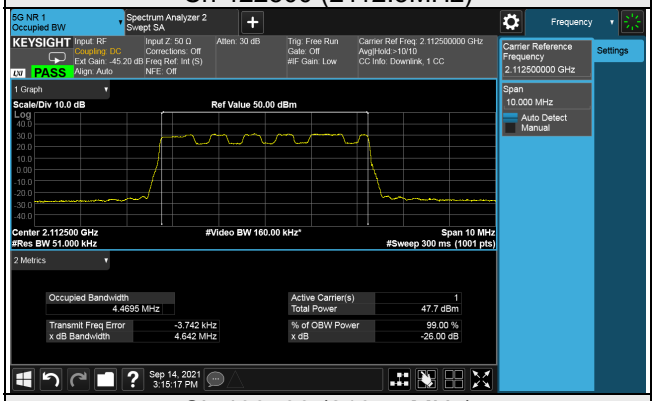
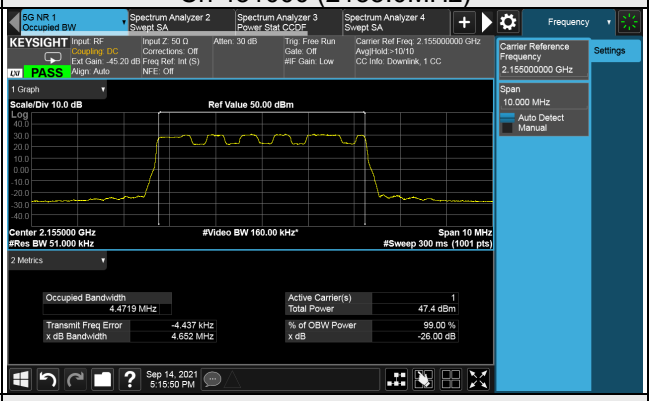
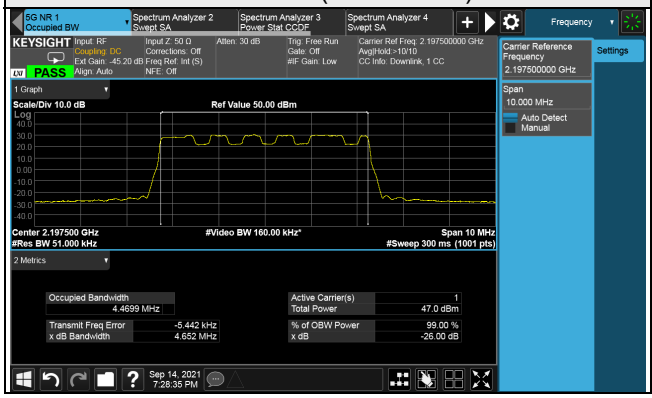
Spectrum Plot of Worst Value	
-26dBc Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

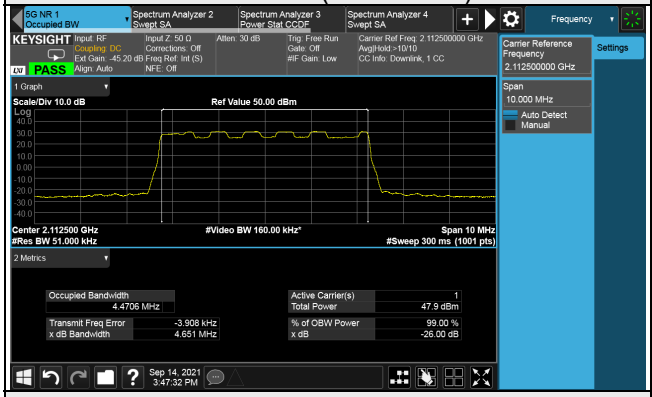
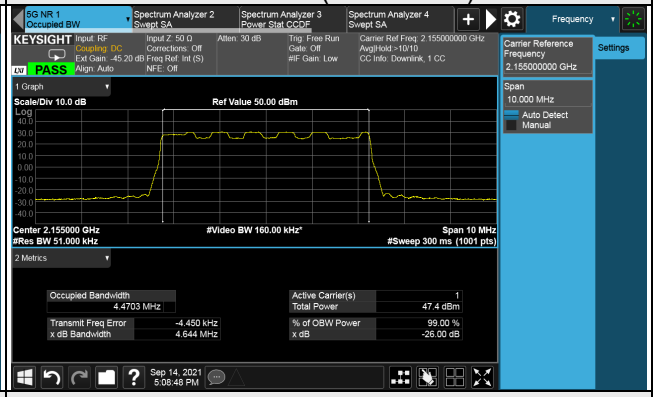
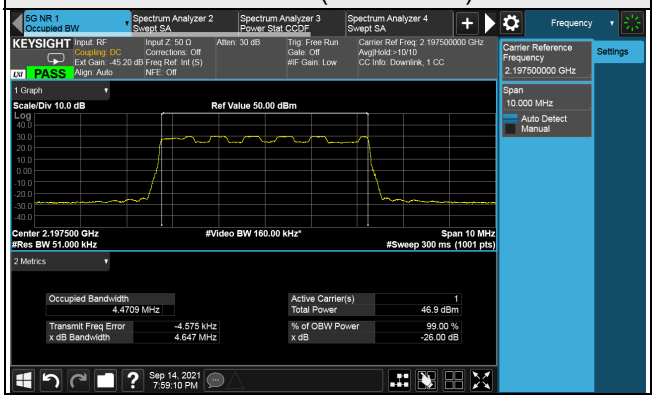
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

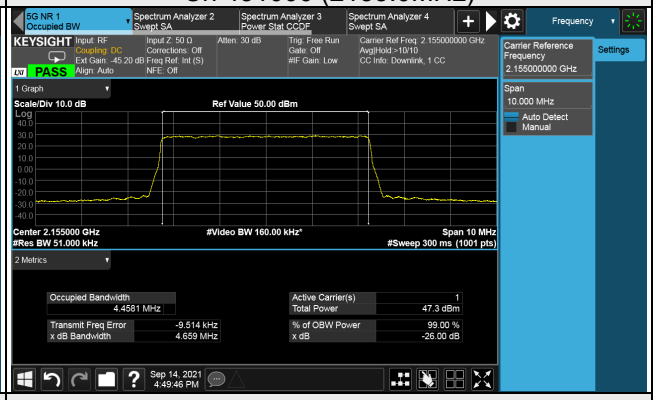
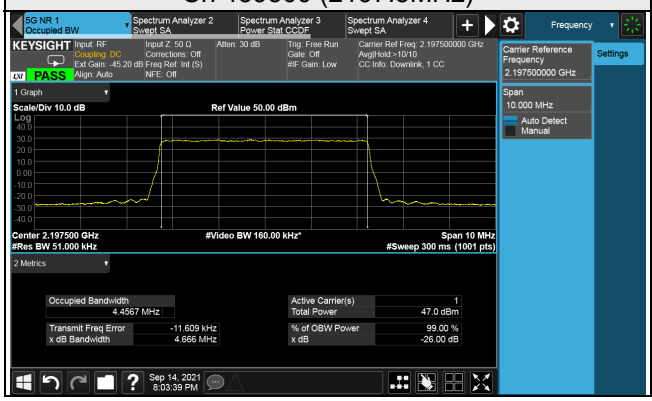
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

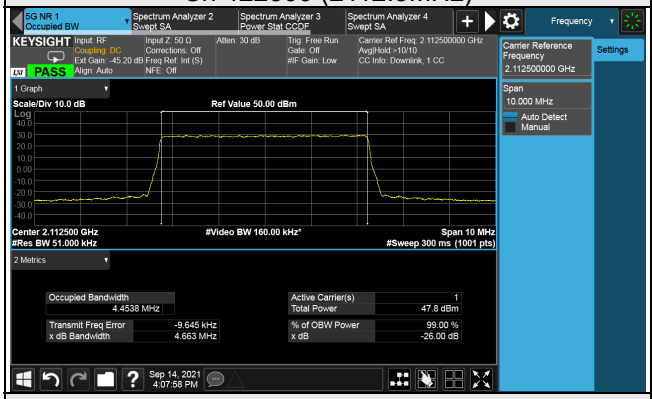
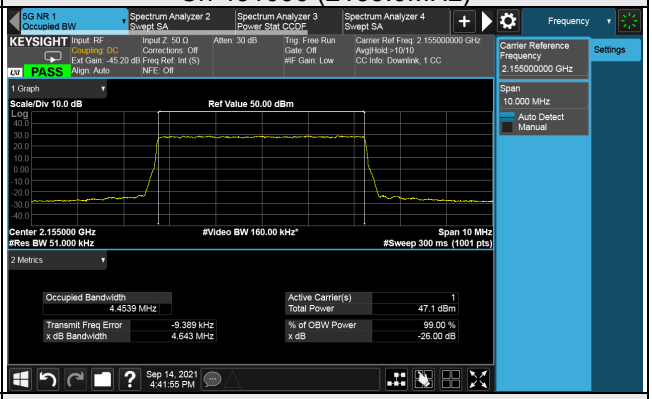
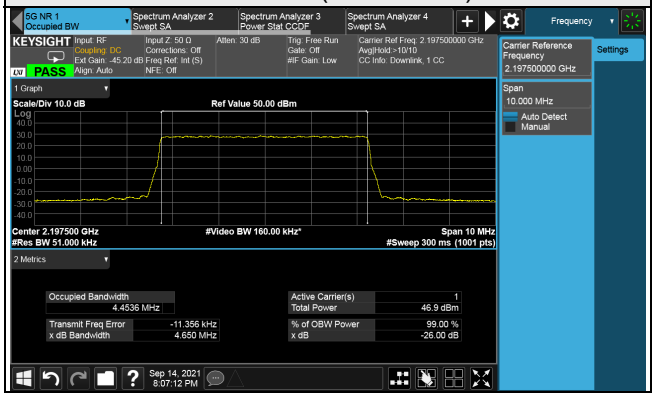
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 2

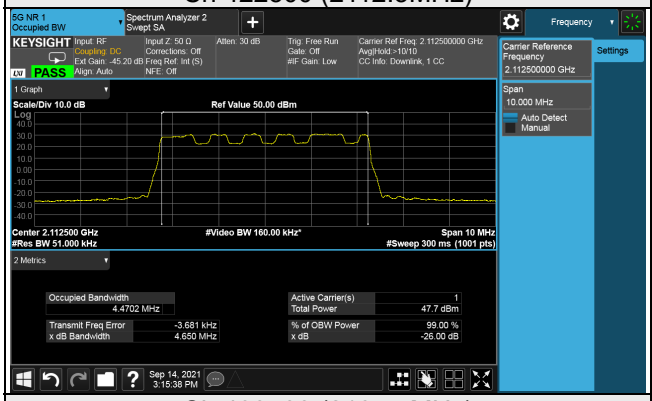
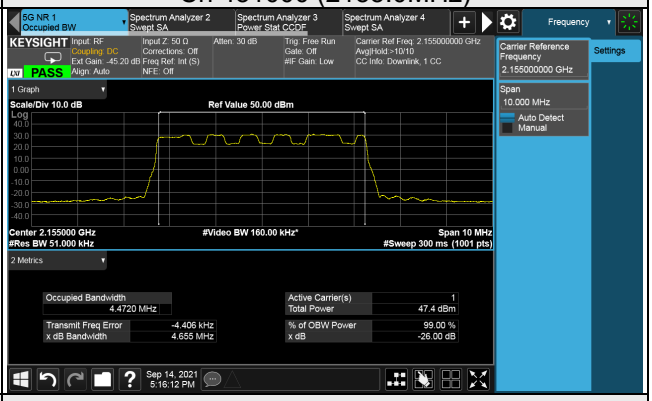
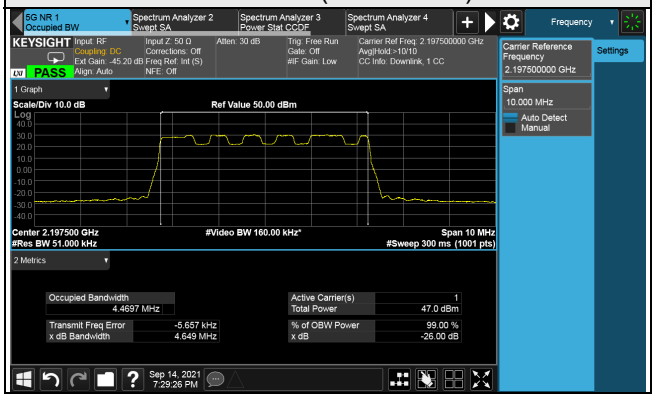
Spectrum Plot of Worst Value	
-26dBc Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

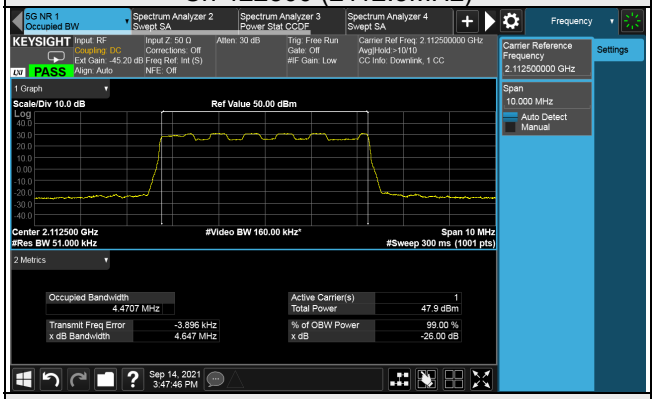
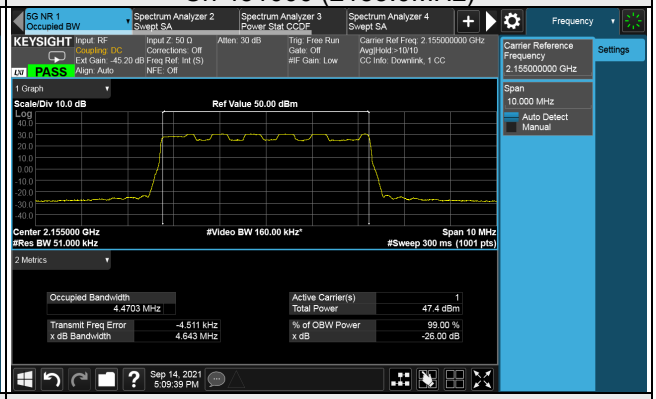
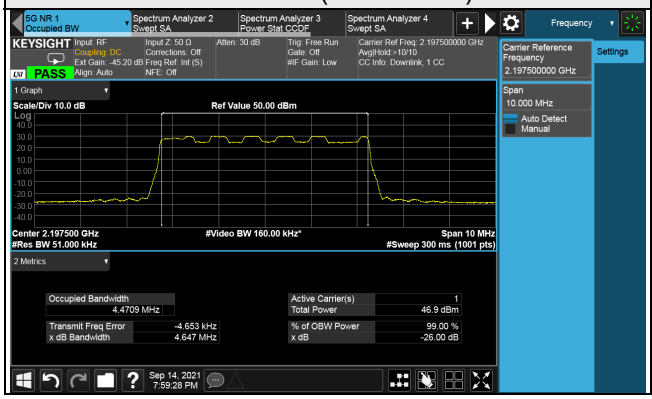
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

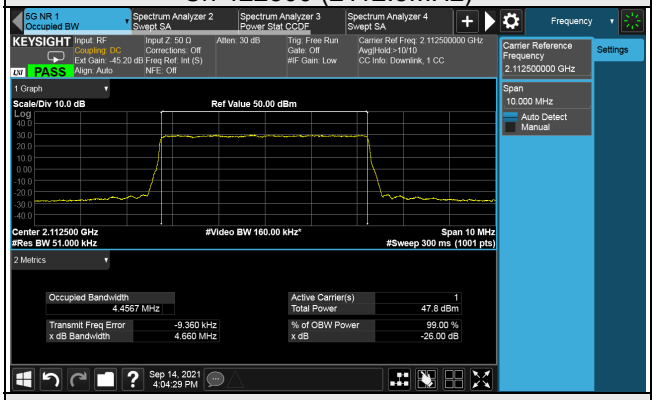
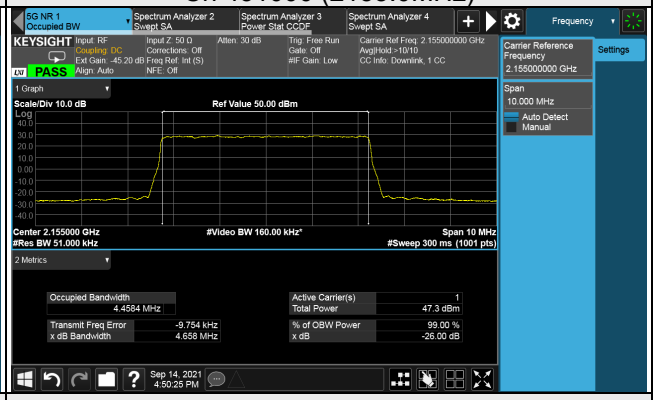
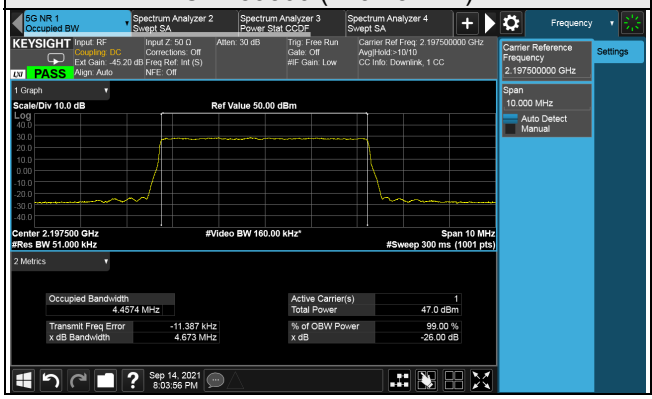
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

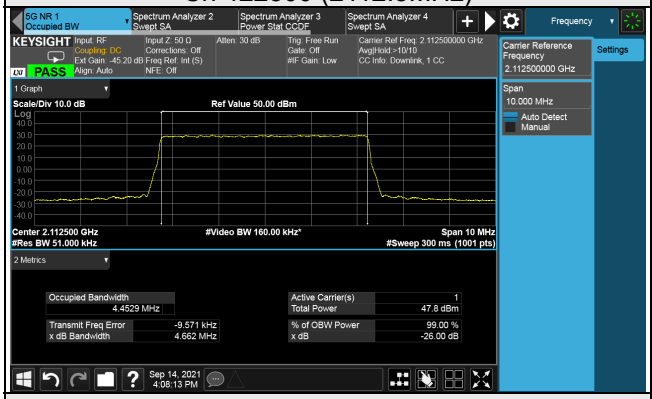
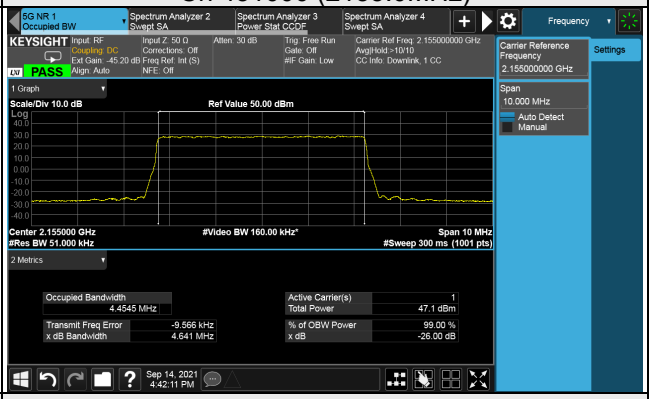
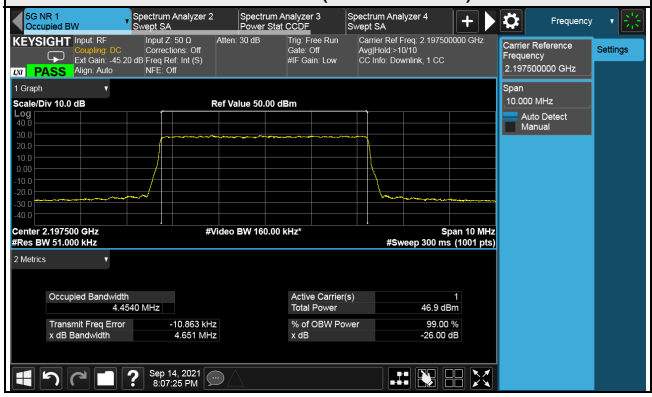
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 3

Spectrum Plot of Worst Value	
-26dBc Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

4.4.5 Test Results (Occupied Bandwidth)

Band n66 5MHz (60W)
Single Carrier

5MHz

Channel Number	Freq. (MHz)	OCP 99 Bandwidth (MHz)															
		Ant. TX0				Ant. TX1				Ant. TX2				Ant. TX3			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
422500	2112.5	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45
431000	2155	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45
439500	2197.5	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45

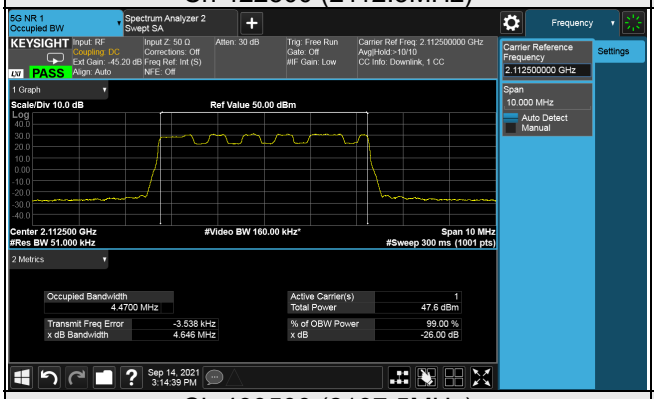
Ant. TX 0

Spectrum Plot of Worst Value

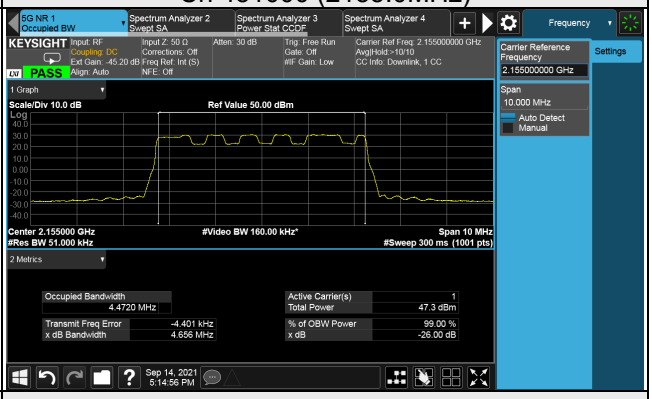
OCP 99 Bandwidth

QPSK

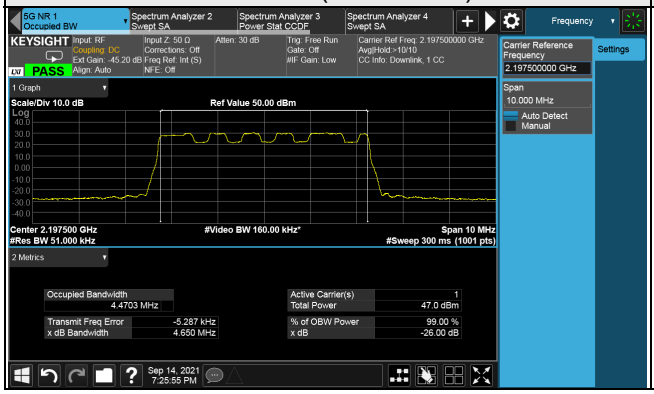
Ch 422500 (2112.5MHz)

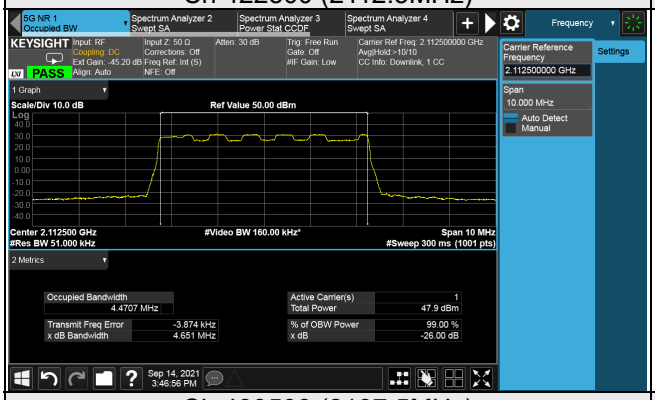
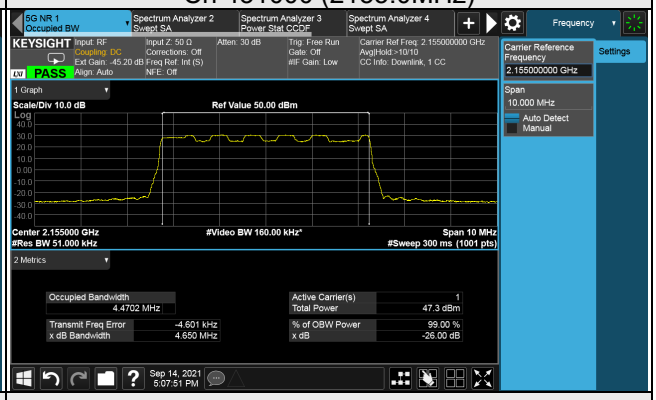
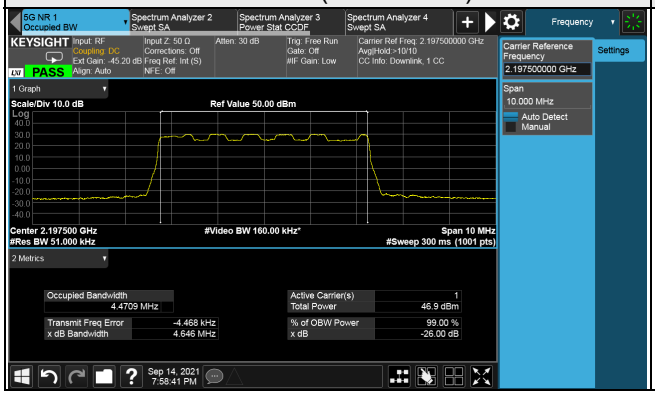


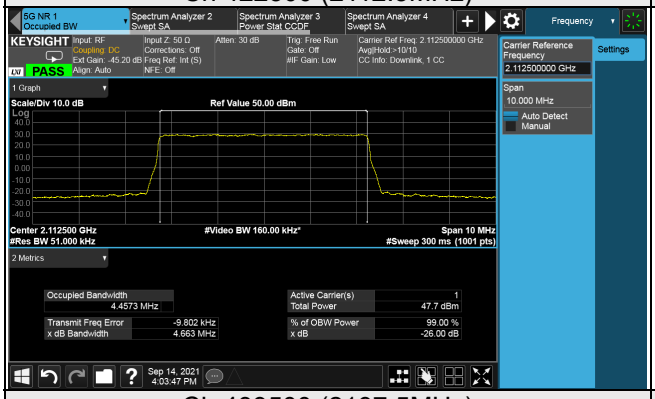
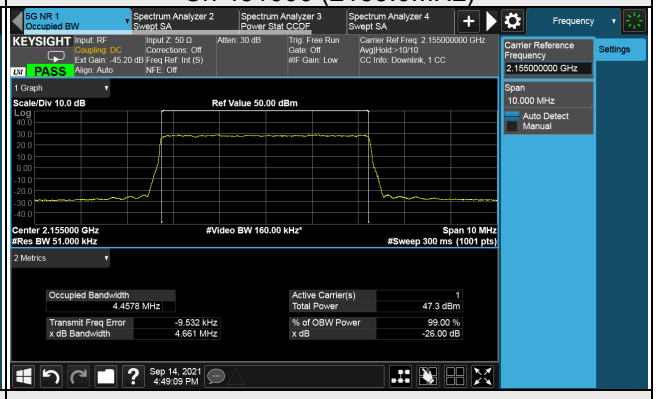
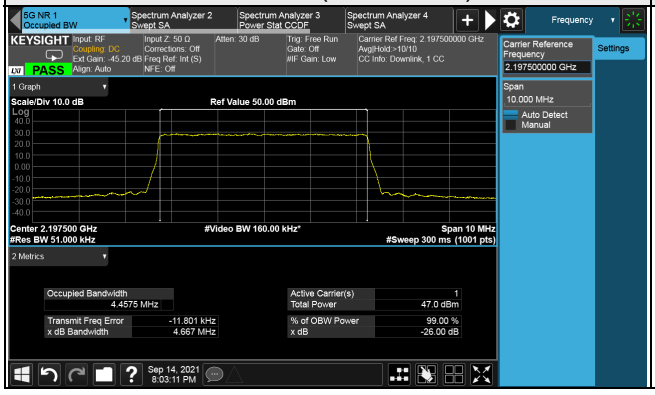
Ch 431000 (2155.0MHz)

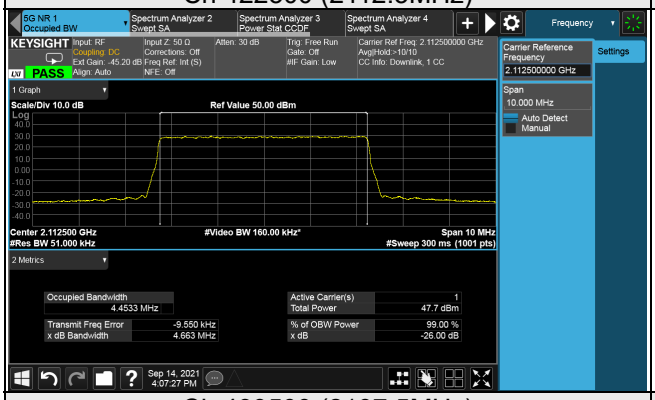
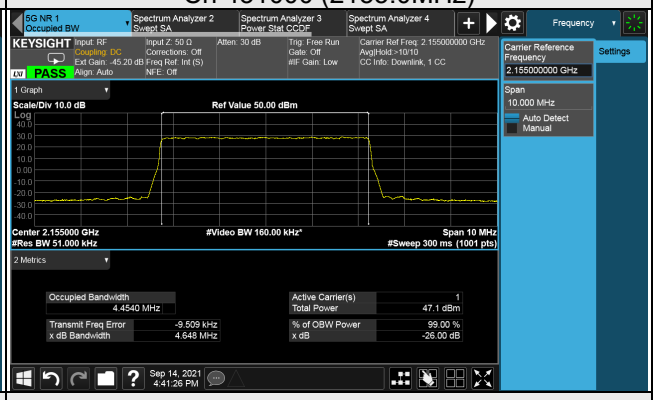
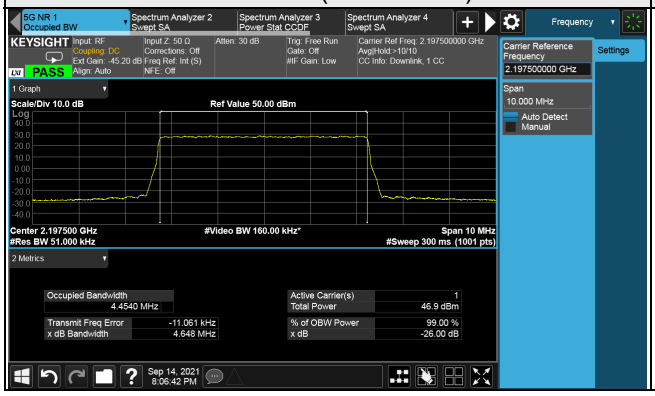


Ch 439500 (2197.5MHz)

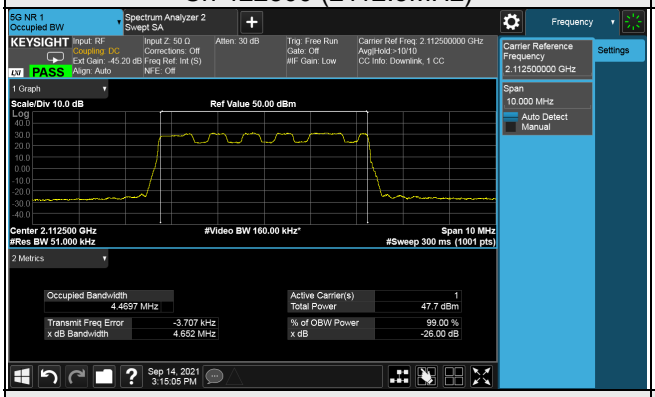
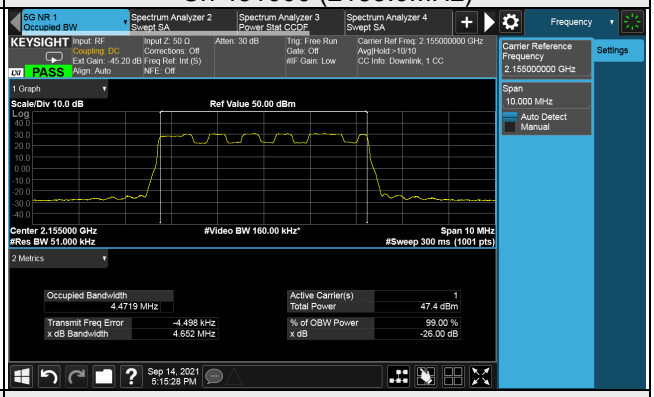
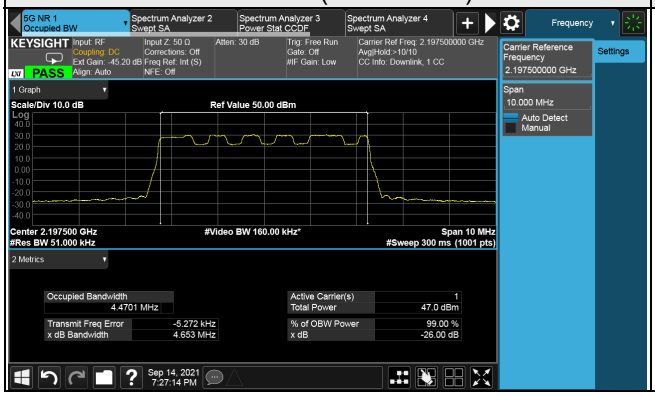


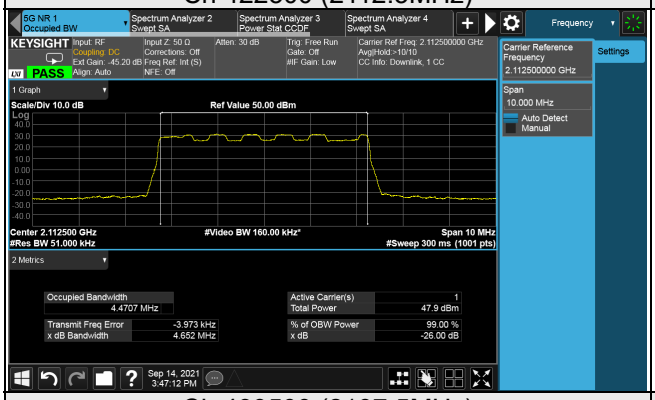
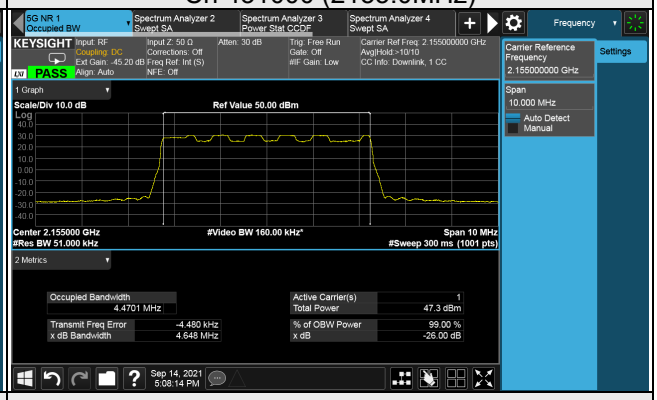
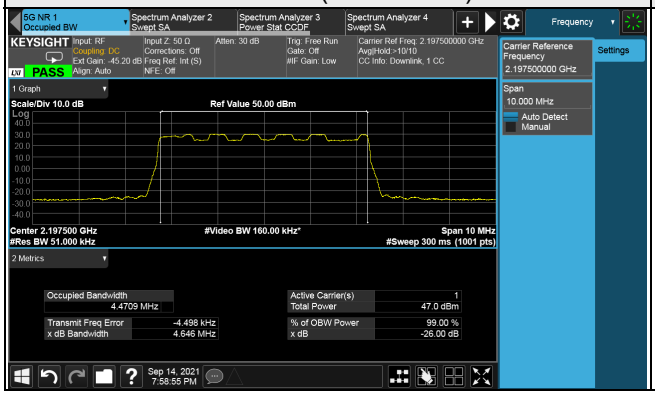
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

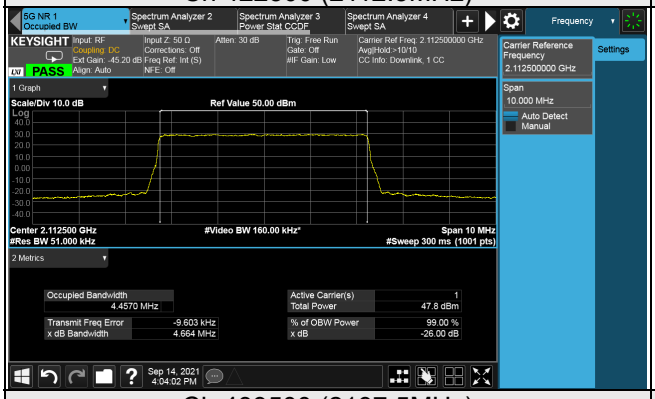
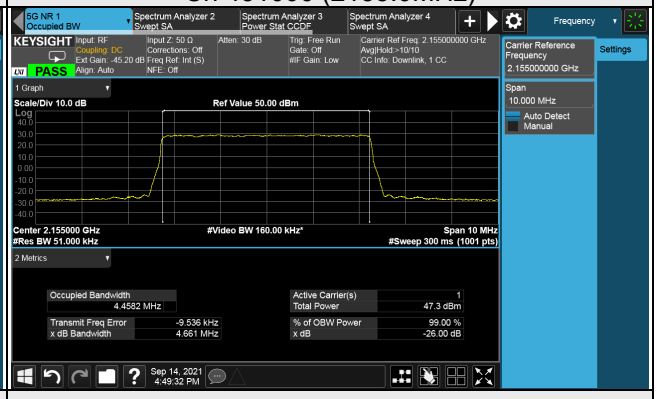
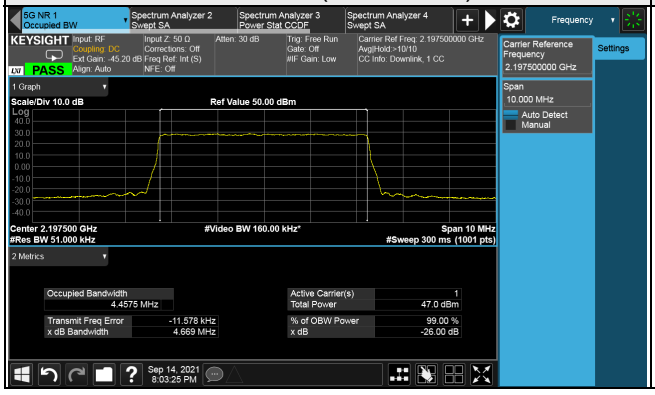
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

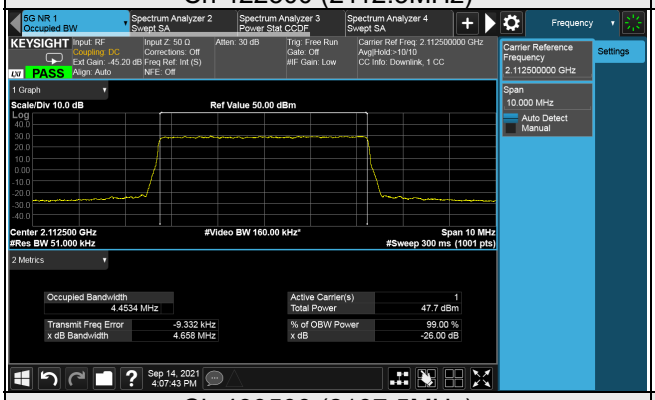
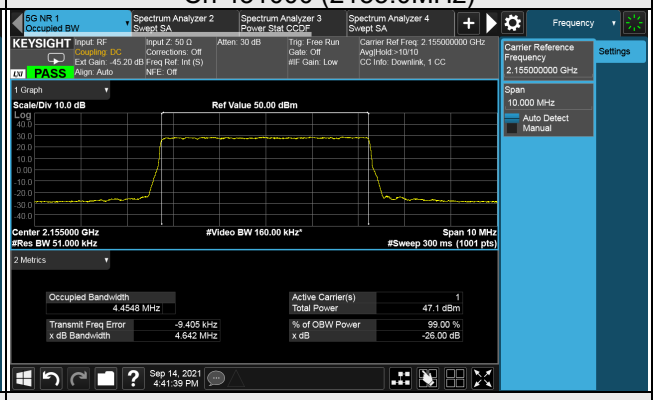
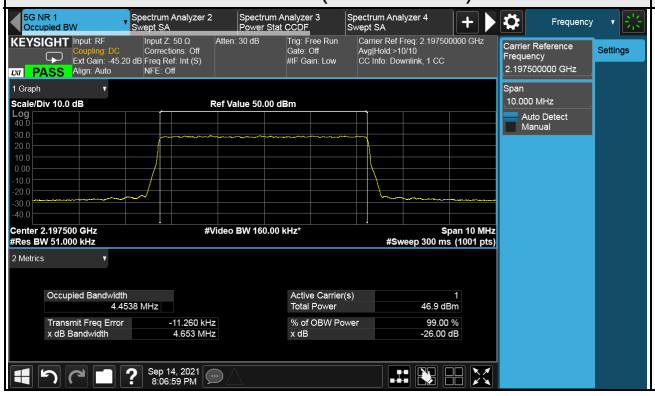
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 1

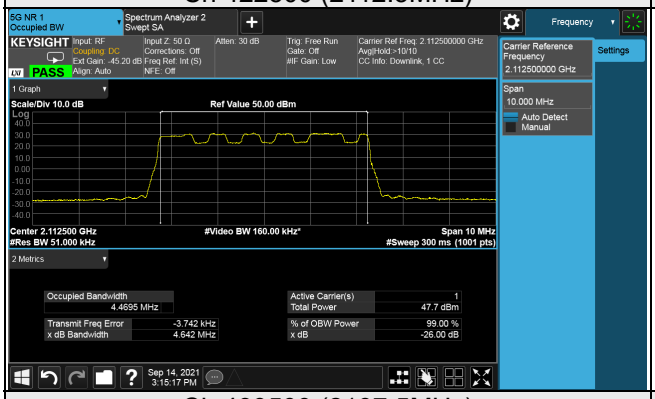
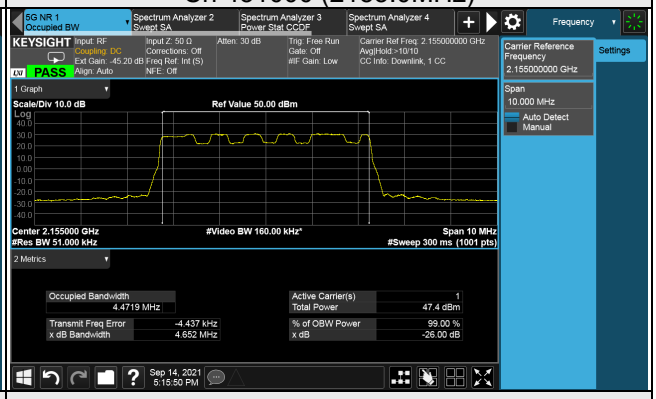
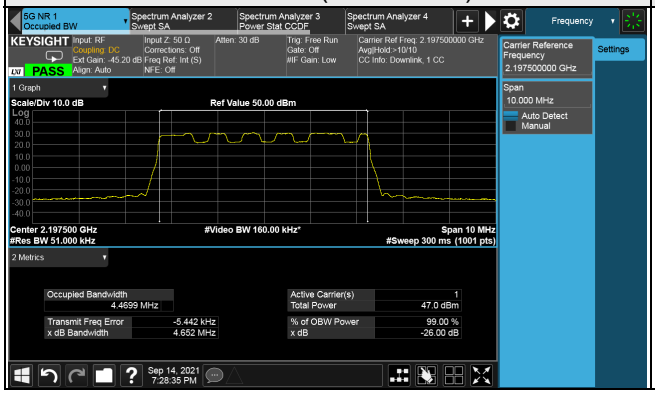
Spectrum Plot of Worst Value	
OCP 99 Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

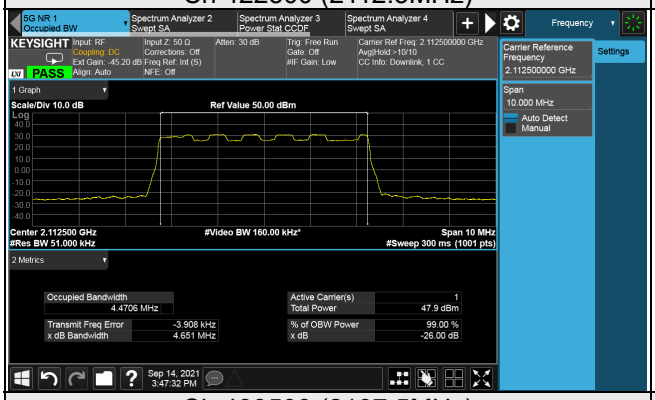
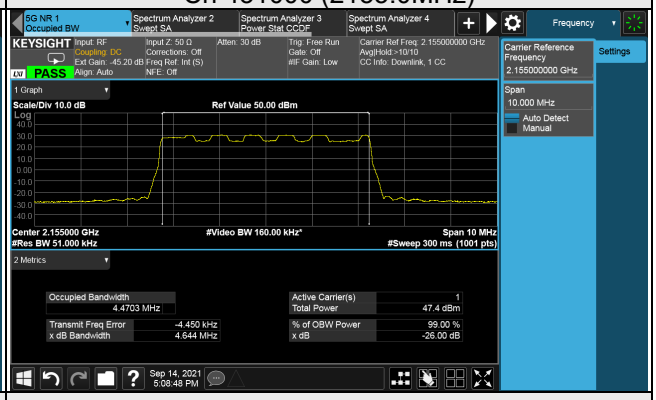
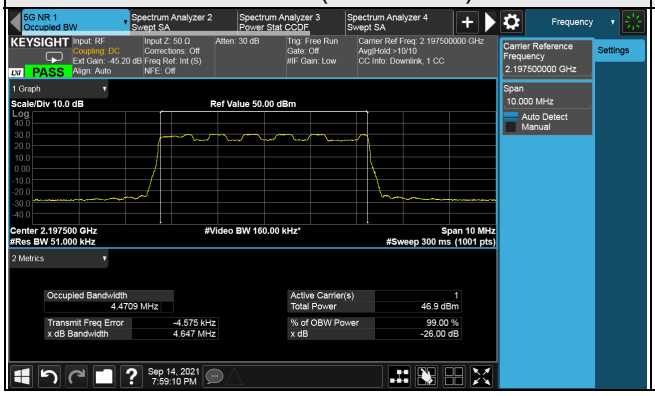
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

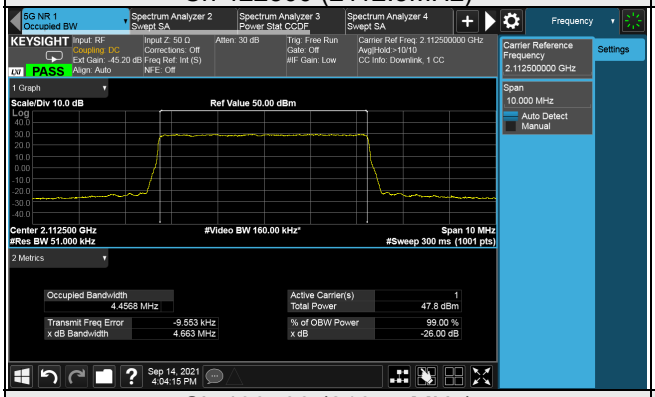
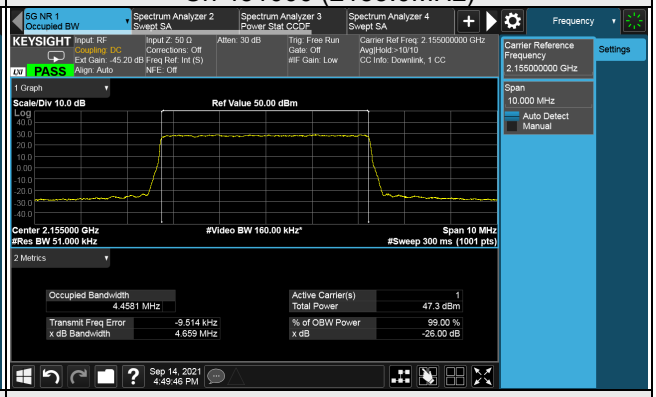
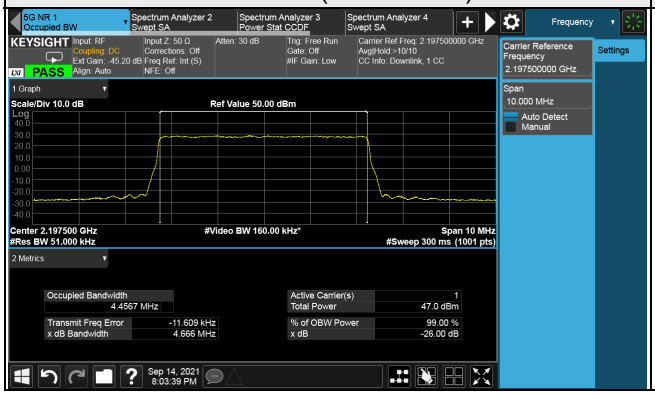
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

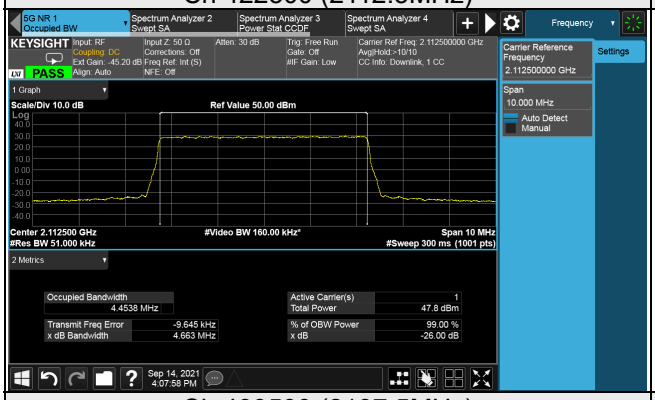
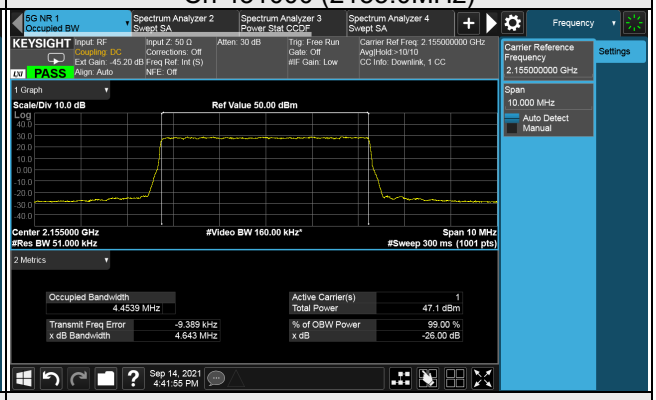
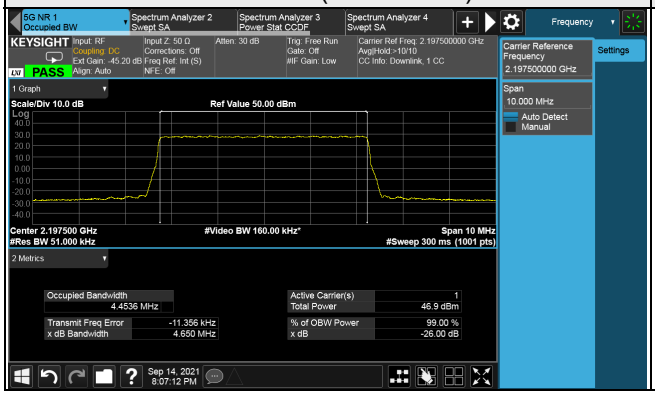
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 2

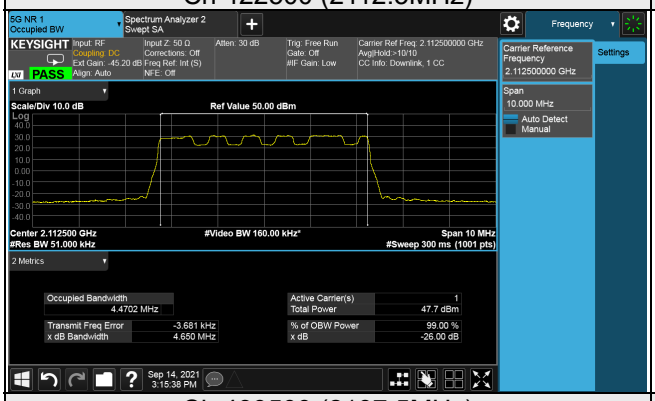
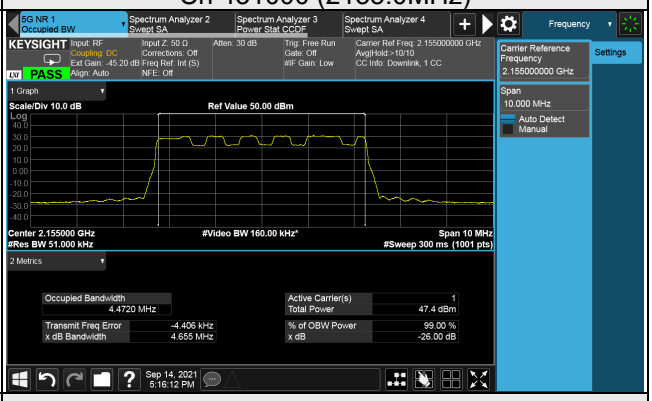
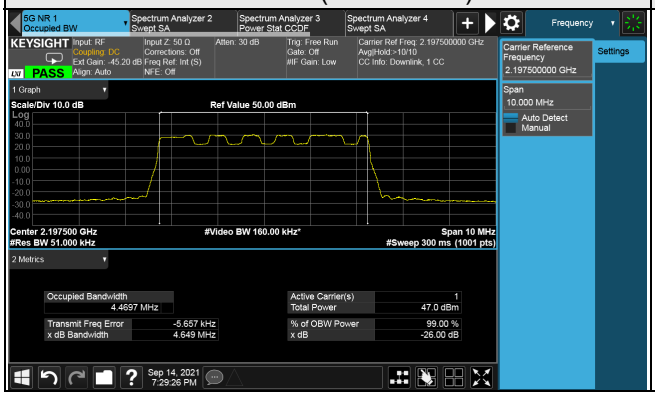
Spectrum Plot of Worst Value	
OCP 99 Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

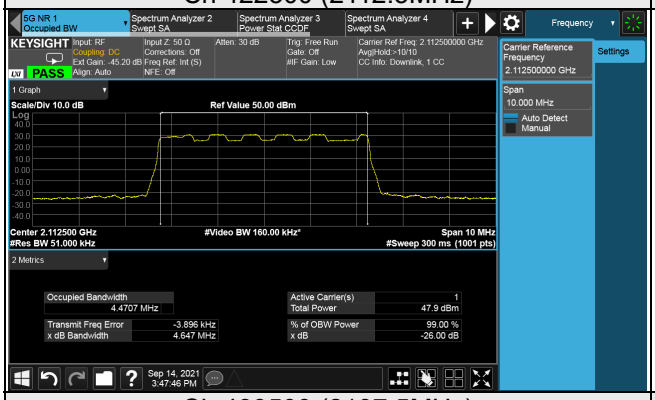
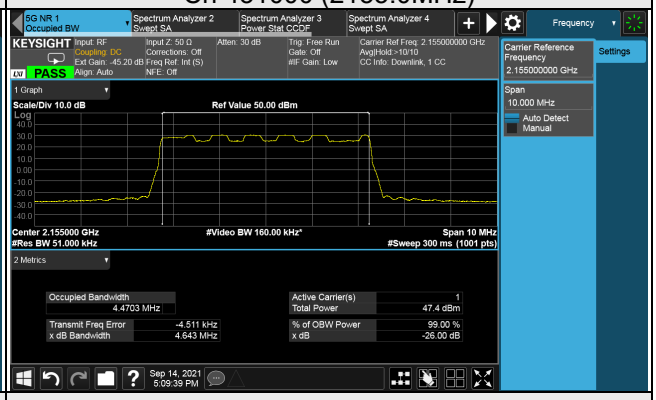
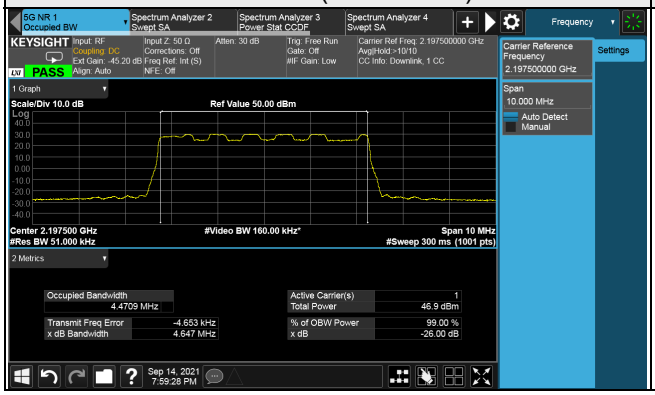
16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

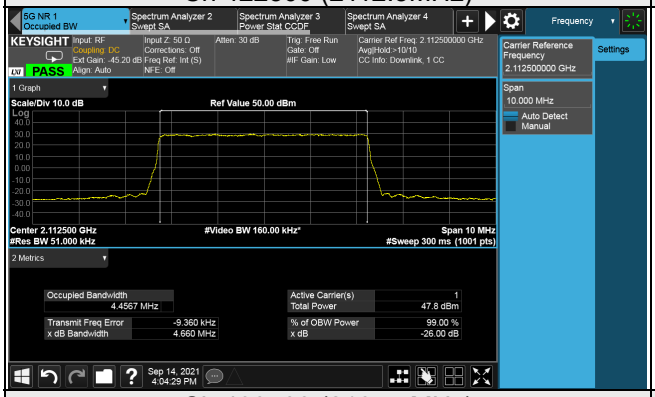
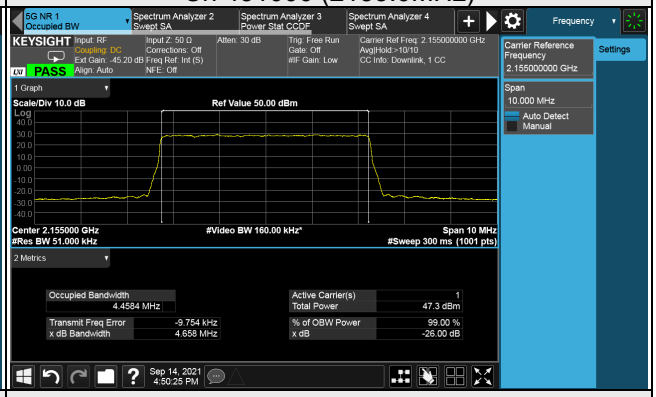
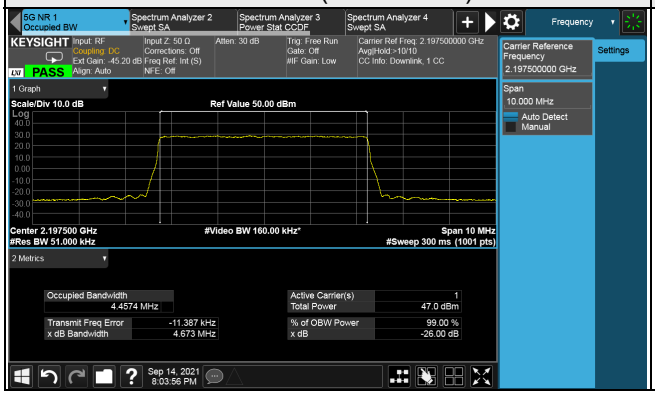
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

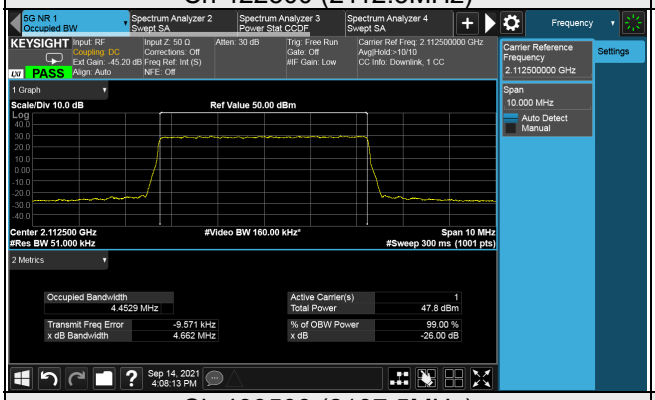
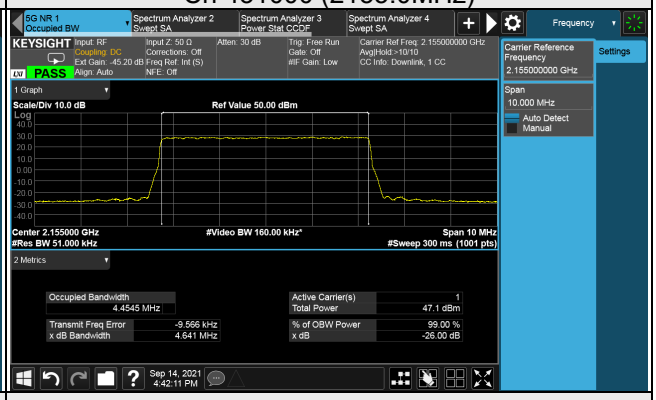
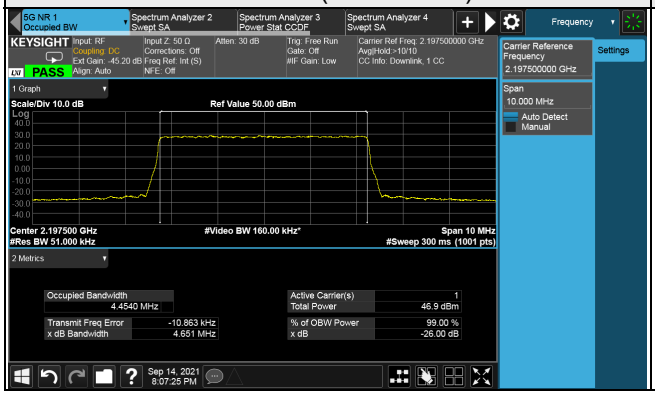
256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

Ant. TX 3

Spectrum Plot of Worst Value	
OCP 99 Bandwidth	
QPSK	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

16QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

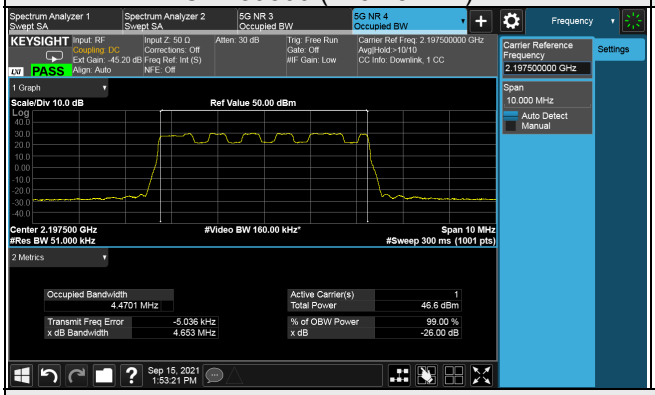
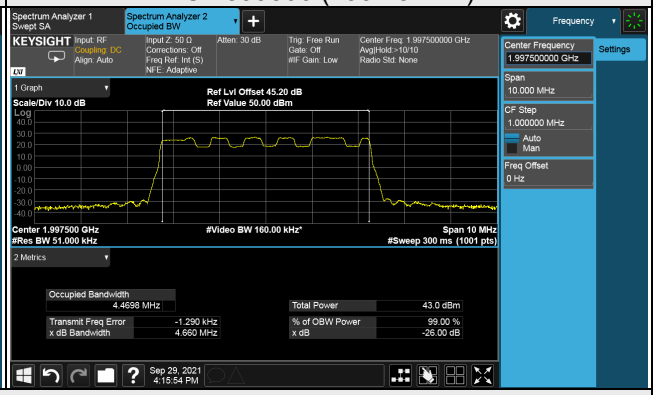
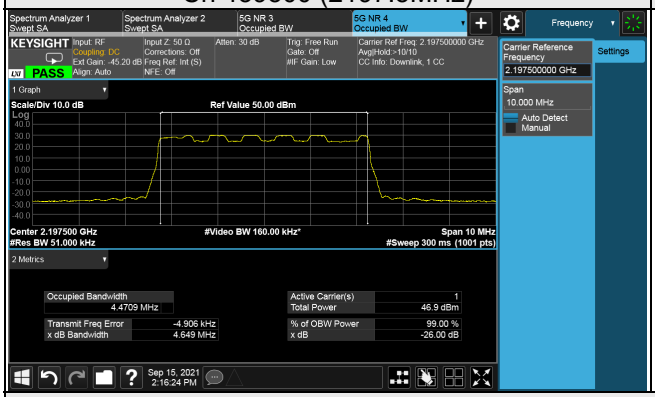
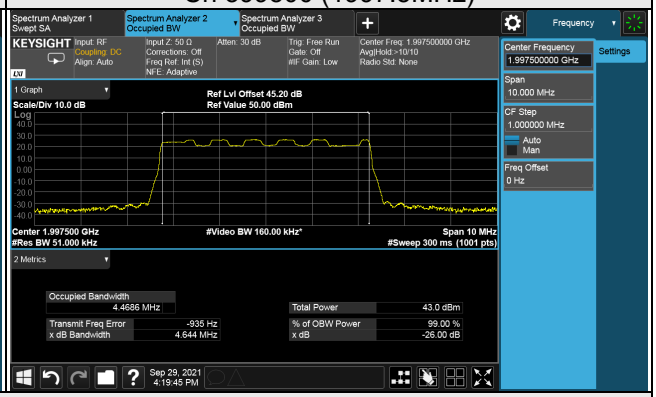
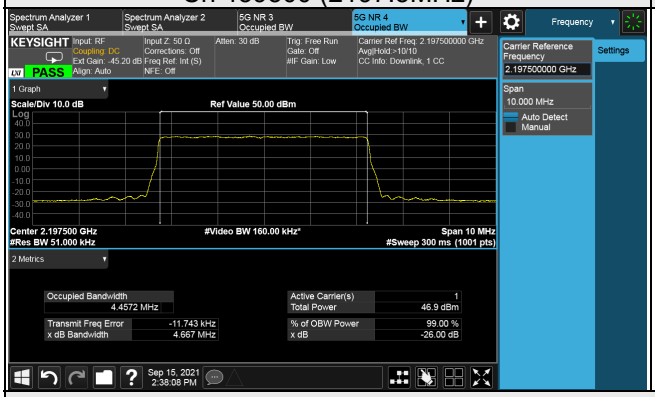
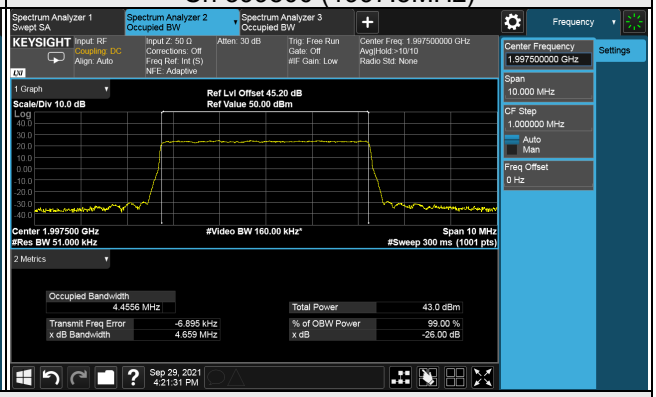
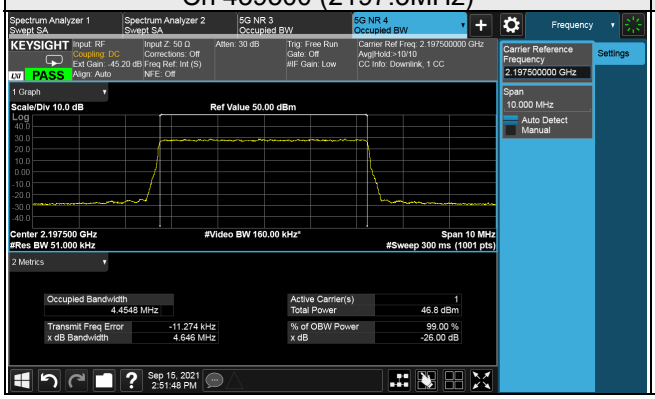
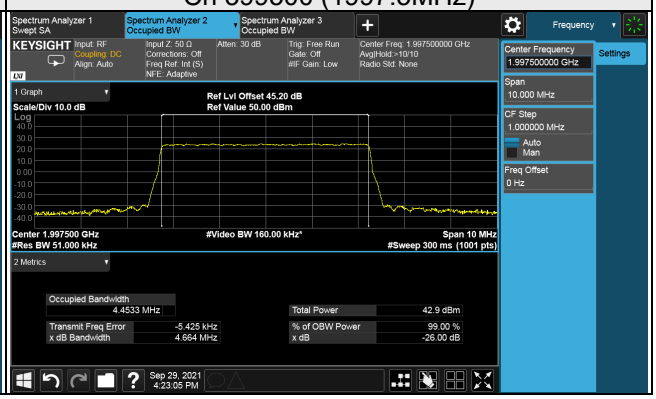
64QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

256QAM	
Ch 422500 (2112.5MHz)	Ch 431000 (2155.0MHz)
	
Ch 439500 (2197.5MHz)	
	

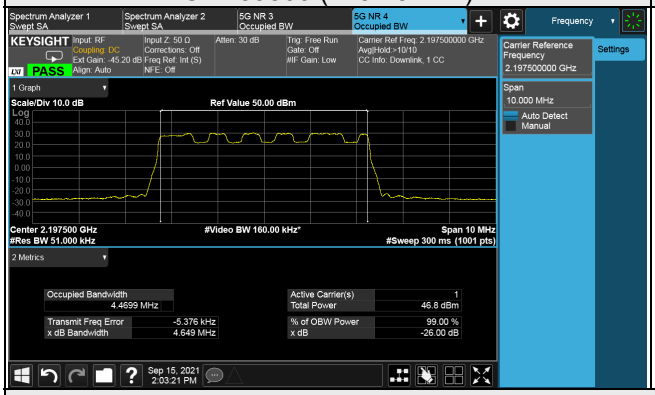
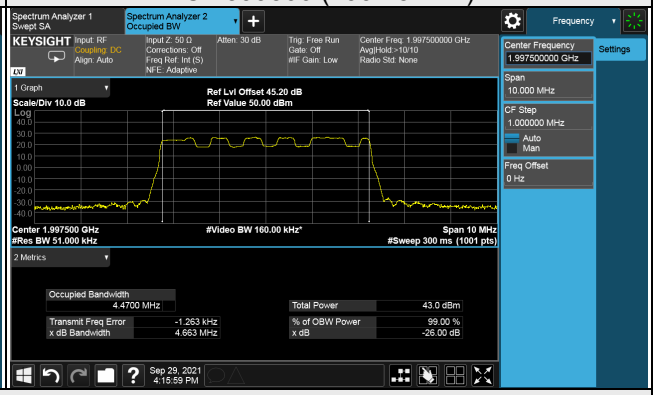
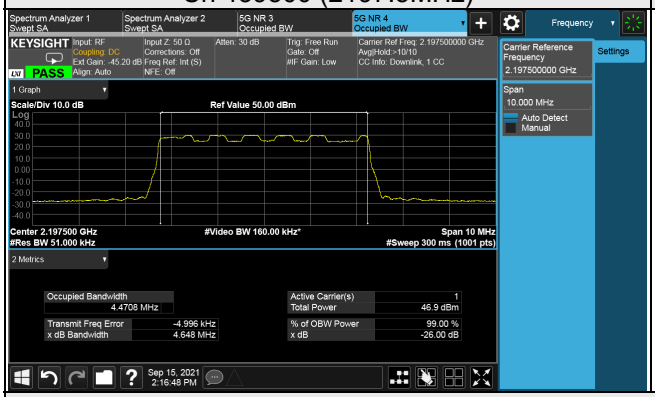
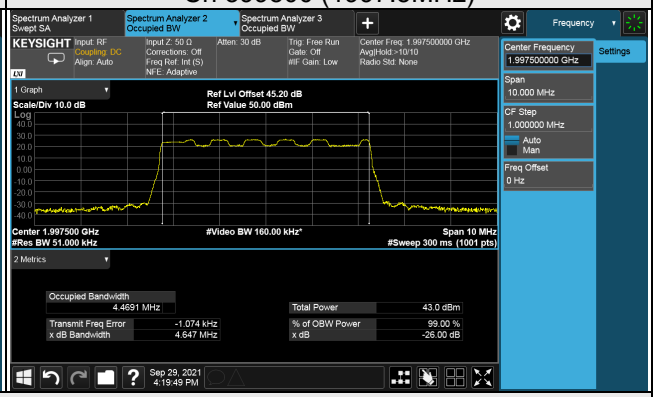
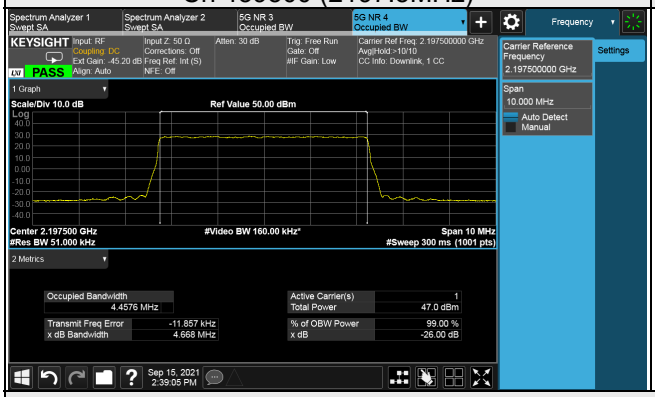
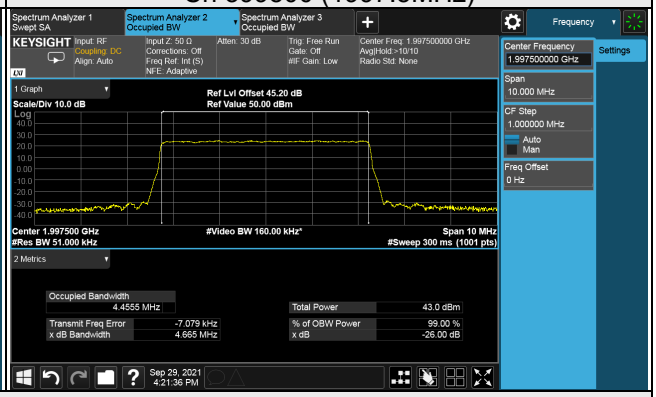
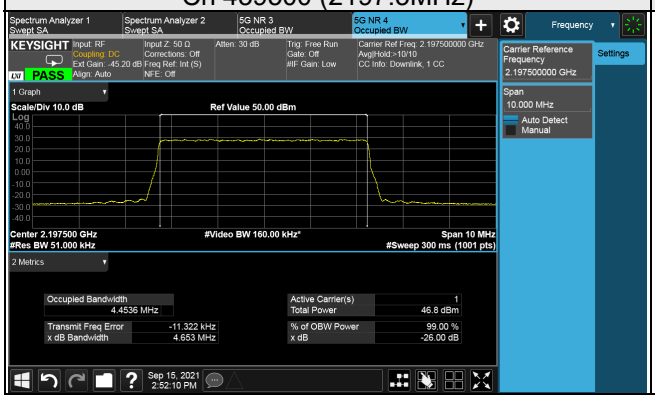
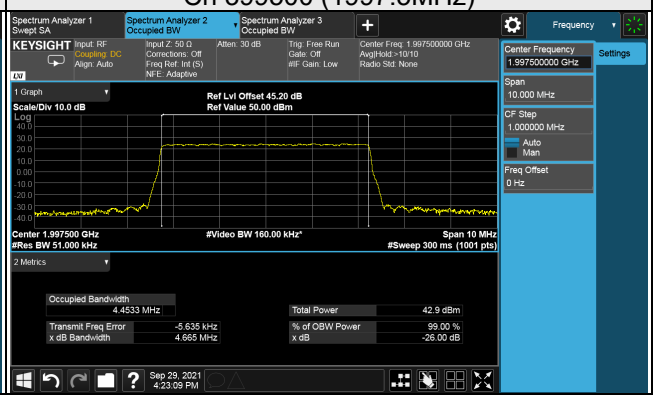
Band n66 5MHz (60W)_Ch 439500 (2197.5MHz)+ Band n70 5MHz (20W)_Ch 399500 (1997.5MHz)

Channel Number	Freq. (MHz)	OCP 99 Bandwidth (MHz)															
		Ant. TX0				Ant. TX1				Ant. TX2				Ant. TX3			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
n66 439500	2197.5	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45
n70 399500	1997.5	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45	4.47	4.47	4.46	4.45
Total		8.94	8.94	8.92	8.90	8.94	8.94	8.92	8.90	8.94	8.94	8.92	8.90	8.94	8.94	8.92	8.90

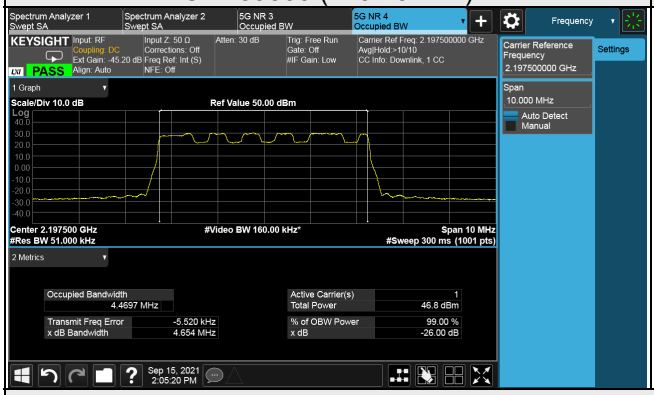
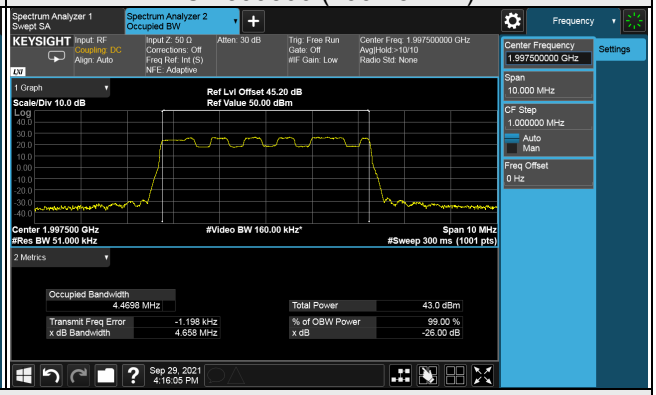
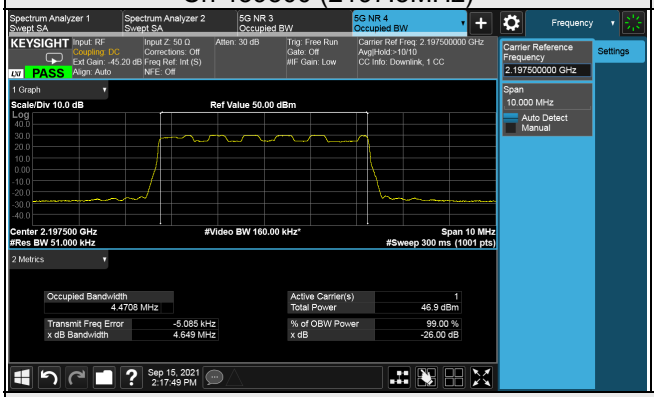
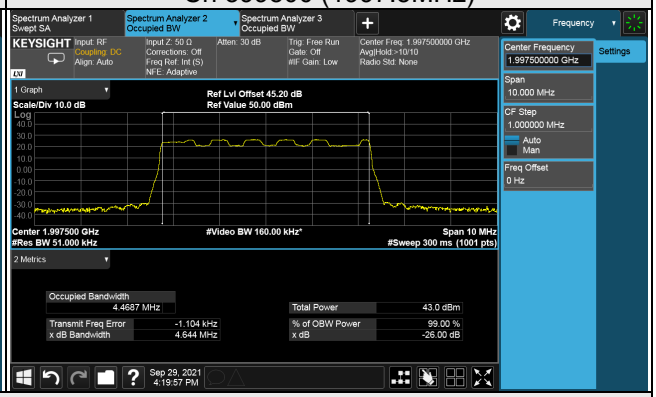
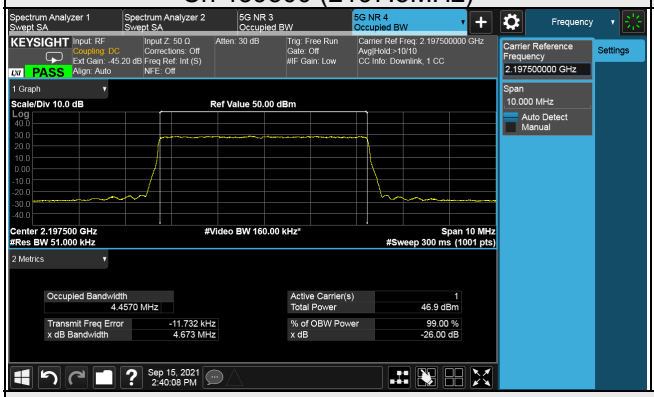
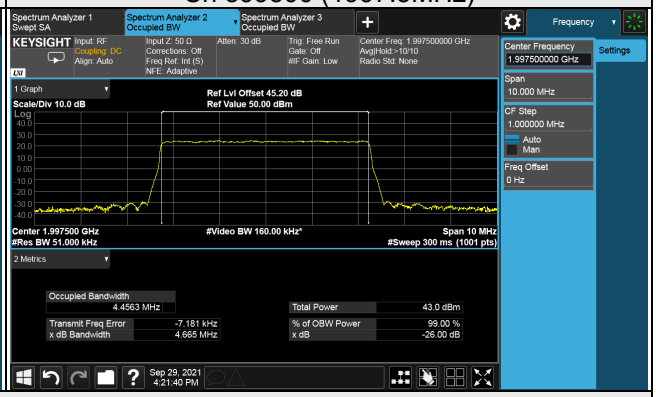
Ant. TX 0

Spectrum Plot of Worst Value	
QPSK	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
16QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
64QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
256QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	

Ant. TX 1

Spectrum Plot of Worst Value	
QPSK	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
16QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
64QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
256QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	

Ant. TX 2

Spectrum Plot of Worst Value	
QPSK	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
16QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
64QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)
	
256QAM	
Ch 439500 (2197.5MHz)	Ch 399500 (1997.5MHz)