MEASUREMENT REPORT

FCC PART 24 Subpart E

FCC ID:	VBNAHFB-01
Application:	Nokia Solutions and Networks
Application Type:	Certification
Product:	AirScale Base Station RRH 1.9GHz
Model No.:	AHFB
Brand Name:	Nokia
FCC Rule Part(s):	Part 24 Subpart E
Test Procedure(s):	ANSI C63.26-2015
Test Date:	June 22 ~ July 09, 2021

Reviewed By: Paddy Chen

Approved By: Chenz Ker

Testing Laboratory
3261

The test results relate only to the samples tested.

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

Revision History

Report No.	Version	Description	Issue Date	Note
2106TW0003-U1	Rev. 01	Initial Report	07-16-2021	Valid

Note: This report is prepared for FCC Class II permissive supplement to FCC ID: VBNAHFB-01, added 5G NR bandwidth and related data.

CONTENTS

Description Page

General Information

Applicant:	Nokia Solutions and Networks
Applicant Address:	3201 Olympus Blvd, Dallas, Texas, 75039
Manufacturer:	Nokia Solutions and Networks
Manufacturer Address:	3201 Olympus Blvd, Dallas, Texas, 75039
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- **MRT facility is a FCC registered (Reg. No. TW3261) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.**
- **MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.**

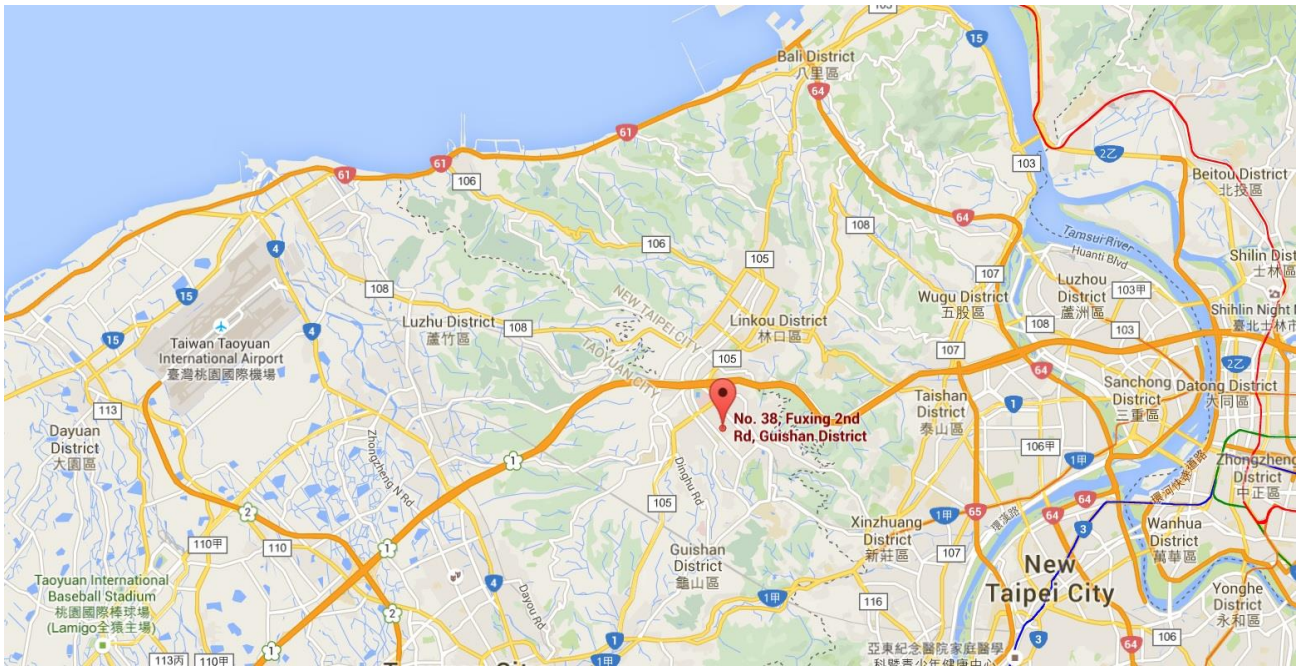
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	AirScale Base Station RRH 1.9GHz
Model No.	AHFB
Brand Name	Nokia
Test Device Serial No.	AH202500116
Operating Band (s)	5G NR n25
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM
Frequency Range	$T_{X:}$ 1930 ~ 1995MHz; $R_{X:}$ 1850 ~ 1915MHz
Max EIRP	5MHz: 55.58dBm; 10MHz: 55.60dBm; 15MHz: 55.57dBm
Emission Designator:	Refer to Section 2.2
Antenna Specification:	Refer to Section 2.3

2.2. Emission Designator

Bandwidth (MHz)	Modulation	Emission Designator	Bandwidth (MHz)	Modulation	Emission Designator
5	QPSK	4M49G7D	10	QPSK	9M14G7D
	16QAM	4M49W7D		16QAM	9M21W7D
	64QAM	4M47W7D		64QAM	9M28W7D
	256QAM	4M47W7D		256QAM	9M26W7D
15	QPSK	14M1G7D	--		
	16QAM	14M1W7D			
	64QAM	14M1W7D			
	256QAM	14M1W7D			

2.3. Description of Available Antennas

Band Support	Antenna Type	Model	Antenna Gain
n25	Directional Antenna	AAFA	12.5dBi

Remark:

1. The transmit signals are completely uncorrelated with each other, directional gain = G_{ANT} dBi, G_{ANT} is the antenna gain in dBi;
2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

2.4. Test Mode and Channel Detail

Test Item	Channel Bandwidth	Modulation
Equivalent Isotropically Radiated Power	5 MHz, 10 MHz, 15 MHz	QPSK, 16QAM, 64QAM, 256QAM
Emission Bandwidth		
Conducted Spurious Emissions	5 MHz, 10 MHz,15 MHz	QPSK
Band Edge Measurements		
Peak to Average Ratio	15MHz	
Frequency Stability		
Radiated Spurious Emissions	5 MHz	

2.5. EMI Suppression Device(s)/Modifications

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

2.6. Test Environment Condition

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

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emissions Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2021/10/05
Acitve Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2022/05/06
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2022/04/21
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2022/04/28
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2022/04/21
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2022/04/26
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2022/03/23
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2022/03/24
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2021/10/14
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2021/07/14
Antenna Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2022/06/15
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2022/05/26
Cable	Rosnol	K1K50-UP0264-K1K50-4M	MRTTWE00012	1 year	2022/06/20

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2022/04/23
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2022/03/25
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2022/10/01
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2022/03/23
DC Power Supply	GWINSTEK	SPS-606	MRTTWA00034	Check by TRUE RMS MULTIMETER	
TRUE RMS MULTIMETER	FLUKE	117	MRTTWA00022	1 year	2022/05/05
Temperature & Humidity Chamber	TEN BILLION	TTH-B3UP	MRTTWA00036	1 year	2021/11/06
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2022/03/08

Software	Version	Function
EMI Software	V3	EMI Test Software

4. MEASUREMENT UNCERTAINTY

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

Conducted Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.65dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 30MHz: 3.92dB 30MHz ~ 1GHz: 4.25dB 1GHz ~ 18GHz: 4.40dB

5. TEST RESULT

5.1. Summary

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1046; 24.232(a) (2)	Equivalent Isotropically Radiated Power	EIRP < 1640 watts/MHz	Conducted	Pass	Section 5.2
2.1055; 24.235	Frequency Stability	Refer to Section 5.3	Conducted	Pass	Section 5.3
2.1049	Emission Bandwidth	Refer to Section 5.4		Pass	Section 5.4
24.238(b)	Band Edge Measurements	< -13dBm/1% BW		Pass	Section 5.5
2.1046; 24.232	Peak to Average Ratio	< 13dB		Pass	Section 5.6
2.1051; 24.238(a)	Conducted Spurious Emissions	< -13dBm/MHz		Pass	Section 5.7
2.1053; 24.238(a)	Radiated Spurious Emissions	< -13dBm/MHz	Radiated	Pass	Section 5.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) The Channel Band-edge, Radiated Spurious Emission were presented the worst test data of modultation & antenna port in the test report.

5.2. Equivalent Isotropically Radiated Power Measurement

5.2.1.Test Limit

The Radiated Equivalent Isotropically Power shall be according to the specific rule Part 24.232(a)(2) that are limited to EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

5.2.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.2.4.2 & 5.2.7

5.2.3.Test Setting

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

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

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

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)

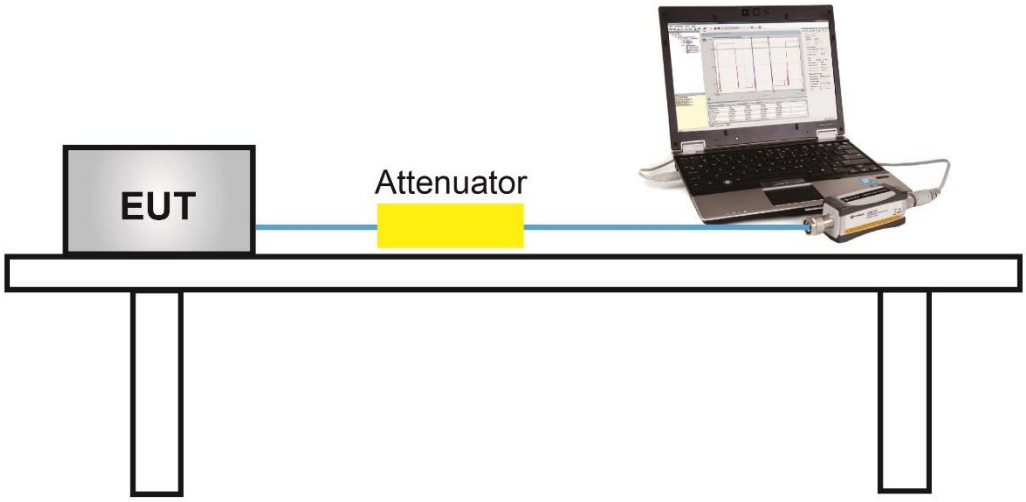
P_{Meas} measured transmitter output power or PSD, in dBm or dBW

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

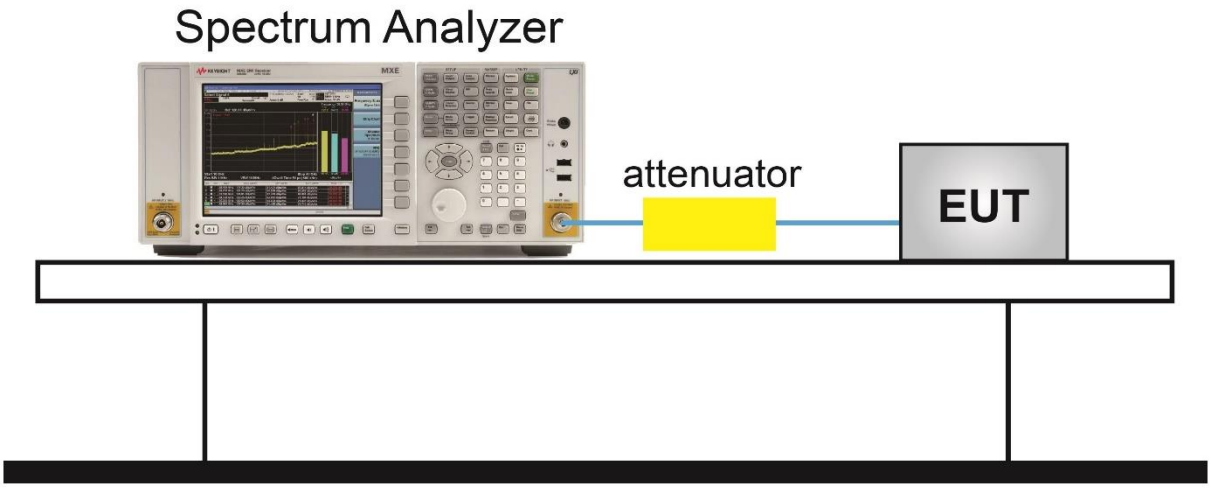
For devices utilizing multiple antennas, see 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

5.2.4.Test Setup

Conducted Output Power



Conducted Power Density



5.2.5.Test Result

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=5MHz
Test Item	EIRP Density		

Frequency (MHz)	Output Power Density (dBm/MHz)				Total Power Density (dBm/MHz)	EIRP Density (dBm/MHz)	Limit (dBm /MHz)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1932.5	31.26	31.32	30.98	31.27	37.23	49.73	< 62.15	Pass
1962.5	31.24	31.20	30.97	31.21	37.18	49.68	< 62.15	Pass
1992.5	31.51	31.46	31.16	31.46	37.42	49.92	< 62.15	Pass
16QAM								
1932.5	30.63	30.62	30.59	30.81	36.68	49.18	< 62.15	Pass
1962.5	30.90	31.11	30.92	31.20	37.05	49.55	< 62.15	Pass
1992.5	30.88	30.86	30.77	30.55	36.79	49.29	< 62.15	Pass
64QAM								
1932.5	30.21	30.43	30.17	30.44	36.33	48.83	< 62.15	Pass
1962.5	30.41	30.60	30.44	30.74	36.57	49.07	< 62.15	Pass
1992.5	30.50	30.41	30.42	30.52	36.48	48.98	< 62.15	Pass
256QAM								
1932.5	30.19	30.44	30.13	30.41	36.32	48.82	< 62.15	Pass
1962.5	30.37	30.60	30.41	30.69	36.54	49.04	< 62.15	Pass
1992.5	30.46	30.17	30.52	30.46	36.43	48.93	< 62.15	Pass

Note 1: Note: Total Power Density (dBm/MHz) = 10*log*{$10^{\wedge[\text{ ANT 1 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ ANT 2 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ ANT 3 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ ANT 4 Power (dBm/MHz) / 10}]}$} (dBm/MHz).

Note 2: EIRP Density (dBm/MHz) = Total Power Density (dBm/MHz) + Directional Gain (dBi).

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=10MHz
Test Item	EIRP Density		

Frequency (MHz)	Output Power Density (dBm/MHz)				Total Power Density (dBm/MHz)	EIRP Density (dBm/MHz)	Limit (dBm /MHz)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1935.0	29.92	29.75	29.85	29.61	35.80	48.30	< 62.15	Pass
1962.5	29.91	29.83	29.83	29.59	35.81	48.31	< 62.15	Pass
1990.0	29.57	29.34	29.34	29.48	35.45	47.95	< 62.15	Pass
16QAM								
1935.0	28.53	28.43	28.17	28.49	34.43	46.93	< 62.15	Pass
1962.5	28.67	28.60	28.65	28.49	34.62	47.12	< 62.15	Pass
1990.0	29.01	28.81	28.86	28.92	34.92	47.42	< 62.15	Pass
64QAM								
1935.0	27.65	27.53	27.59	27.26	33.53	46.03	< 62.15	Pass
1962.5	27.65	27.54	27.72	27.52	33.63	46.13	< 62.15	Pass
1990.0	28.11	27.90	28.00	28.08	34.04	46.54	< 62.15	Pass
256QAM								
1935.0	27.52	27.54	27.64	27.46	33.56	46.06	< 62.15	Pass
1962.5	27.76	27.57	27.47	27.63	33.63	46.13	< 62.15	Pass
1990.0	27.99	27.77	27.69	27.91	33.86	46.36	< 62.15	Pass

Note 1: Note: Total Power Density (dBm/MHz) = 10*log*{10^[ANT 1 Power (dBm/MHz) / 10] + 10^[ANT 2 Power (dBm/MHz) / 10] + 10^[ANT 3 Power (dBm/MHz) / 10] + 10^[ANT 4 Power (dBm/MHz) / 10]} (dBm/MHz).

Note 2: EIRP Density (dBm/MHz) = Total Power Density (dBm/MHz) + Directional Gain (dBi).

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=15MHz
Test Item	EIRP Density		

Frequency (MHz)	Output Power Density (dBm/MHz)				Total Power Density (dBm/MHz)	EIRP Density (dBm/MHz)	Limit (dBm /MHz)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1937.5	27.57	27.38	27.47	27.50	33.50	46.00	< 62.15	Pass
1962.5	27.57	27.37	27.60	27.44	33.52	46.02	< 62.15	Pass
1987.5	27.86	26.57	27.74	27.84	33.56	46.06	< 62.15	Pass
16QAM								
1937.5	27.60	27.42	27.39	27.36	33.46	45.96	< 62.15	Pass
1962.5	27.53	27.42	27.60	27.61	33.56	46.06	< 62.15	Pass
1987.5	27.59	26.61	27.37	27.86	33.40	45.90	< 62.15	Pass
64QAM								
1937.5	25.74	25.45	25.57	25.73	31.64	44.14	< 62.15	Pass
1962.5	25.71	25.56	25.85	25.84	31.76	44.26	< 62.15	Pass
1987.5	26.10	25.81	25.62	26.14	31.94	44.44	< 62.15	Pass
256QAM								
1937.5	25.75	25.62	25.55	25.78	31.70	44.20	< 62.15	Pass
1962.5	25.82	25.52	25.71	25.89	31.76	44.26	< 62.15	Pass
1987.5	26.13	25.84	25.88	26.07	32.00	44.50	< 62.15	Pass

Note 1: Note: Total Power Density (dBm/MHz) = 10*log*{$10^{\wedge[\text{ANT 1 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ANT 2 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ANT 3 Power (dBm/MHz) / 10}]}$ + $10^{\wedge[\text{ANT 4 Power (dBm/MHz) / 10}]}$} (dBm/MHz).

Note 2: EIRP Density (dBm/MHz) = Total Power Density (dBm/MHz) + Directional Gain (dBi).

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=5MHz
Test Item	EIRP		

Frequency (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1932.5	36.78	36.62	36.62	36.59	42.67	55.17	< 62.15	Pass
1962.5	36.88	36.79	36.88	36.95	42.90	55.40	< 62.15	Pass
1992.5	36.66	36.61	36.65	36.64	42.66	55.16	< 62.15	Pass
16QAM								
1932.5	36.82	36.58	36.65	36.54	42.67	55.17	< 62.15	Pass
1962.5	36.92	36.84	36.95	36.94	42.93	55.43	< 62.15	Pass
1992.5	36.66	36.65	36.63	36.70	42.68	55.18	< 62.15	Pass
64QAM								
1932.5	36.93	36.77	36.76	36.72	42.82	55.32	< 62.15	Pass
1962.5	37.10	37.01	37.10	37.03	43.08	55.58	< 62.15	Pass
1992.5	36.79	36.68	36.75	36.87	42.79	55.29	< 62.15	Pass
256QAM								
1932.5	36.87	36.72	36.67	36.73	42.77	55.27	< 62.15	Pass
1962.5	36.99	36.94	36.98	36.94	42.98	55.48	< 62.15	Pass
1992.5	36.73	36.61	36.66	36.78	42.72	55.22	< 62.15	Pass

Note 1: Note: Total Power (dBm) = 10*log*{$10^{\wedge[\text{ANT 1 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 2 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 3 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 4 Power (dBm) / 10}]}$} (dBm).

Note 2: EIRP (dBm) = Total Power (dBm) + Directional Gain (dBi).

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=10MHz
Test Item	EIRP		

Frequency (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1935.0	37.02	36.82	36.95	36.89	42.94	55.44	< 62.15	Pass
1962.5	36.99	36.93	36.99	36.97	42.99	55.49	< 62.15	Pass
1990.0	36.88	36.81	36.87	36.95	42.90	55.40	< 62.15	Pass
16QAM								
1935.0	36.92	36.75	36.89	36.78	42.86	55.36	< 62.15	Pass
1962.5	36.99	36.89	36.97	36.91	42.96	55.46	< 62.15	Pass
1990.0	36.84	36.85	36.88	36.96	42.90	55.40	< 62.15	Pass
64QAM								
1935.0	37.10	36.91	36.99	37.01	43.02	55.52	< 62.15	Pass
1962.5	37.08	37.02	37.08	37.12	43.10	55.60	< 62.15	Pass
1990.0	37.03	36.95	37.02	37.04	43.03	55.53	< 62.15	Pass
256QAM								
1935.0	37.01	36.86	36.94	36.91	42.95	55.45	< 62.15	Pass
1962.5	37.02	36.95	37.00	37.03	43.02	55.52	< 62.15	Pass
1990.0	36.91	36.93	36.95	36.97	42.96	55.46	< 62.15	Pass

Note 1: Note: Total Power (dBm) = 10*log*{$10^{[\text{ANT 1 Power (dBm) / 10}]}$ + $10^{[\text{ANT 2 Power (dBm) / 10}]}$ + $10^{[\text{ANT 3 Power (dBm) / 10}]}$ + $10^{[\text{ANT 4 Power (dBm) / 10}]}$} (dBm).

Note 2: EIRP (dBm) = Total Power (dBm) + Directional Gain (dBi).

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/25	Test Configuration	BW=15MHz
Test Item	EIRP		

Frequency (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
	Ant 0	Ant 1	Ant 2	Ant 3				
QPSK								
1937.5	37.06	36.95	36.96	37.02	43.02	55.52	< 62.15	Pass
1962.5	37.03	36.94	37.04	37.01	43.03	55.53	< 62.15	Pass
1987.5	37.01	37.02	37.05	37.03	43.05	55.55	< 62.15	Pass
16QAM								
1937.5	37.06	36.94	36.94	36.92	42.99	55.49	< 62.15	Pass
1962.5	36.93	36.95	37.01	36.95	42.98	55.48	< 62.15	Pass
1987.5	37.06	37.03	36.99	37.03	43.05	55.55	< 62.15	Pass
64QAM								
1937.5	37.04	37.02	36.94	36.94	43.01	55.51	< 62.15	Pass
1962.5	37.03	36.99	37.06	37.02	43.05	55.55	< 62.15	Pass
1987.5	37.02	37.01	37.06	37.05	43.06	55.56	< 62.15	Pass
256QAM								
1937.5	37.05	37.02	36.98	37.04	43.04	55.54	< 62.15	Pass
1962.5	37.09	37.01	37.03	37.05	43.07	55.57	< 62.15	Pass
1987.5	37.03	37.04	37.06	37.03	43.06	55.56	< 62.15	Pass

Note 1: Note: Total Power (dBm) = 10*log*{$10^{\wedge[\text{ANT 1 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 2 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 3 Power (dBm) / 10}]}$ + $10^{\wedge[\text{ANT 4 Power (dBm) / 10}]}$} (dBm).

Note 2: EIRP (dBm) = Total Power (dBm) + Directional Gain (dBi).

5.3. Frequency Stability Measurement

5.3.1.Test Limit

N/A

5.3.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.6

5.3.3.Test Setting

Frequency Stability Under Temperature Variations:

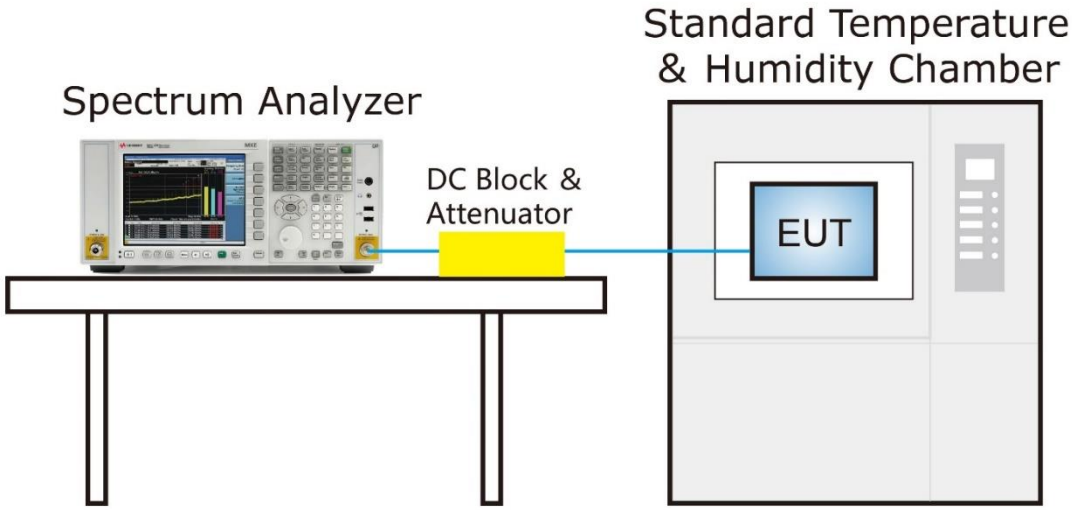
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain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

Frequency Stability Under Voltage Variations:

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

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint (If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15%is applied to the uppermost voltage), recordthe maximum frequency change.

5.3.4.Test Setup



5.3.5.Test Result

Test Engineer	Peter Xu	Test Site	SR3
Test Date	2021/06/27	Test Configuration	BW=15MHz, Middle Channel

Voltage (DC)	Temp (°C)	Frequency Tolerance (ppm)
48V	- 30	-0.052
	- 20	-0.046
	- 10	-0.049
	0	-0.054
	+ 10	-0.050
	+ 20	-0.058
	+ 30	-0.052
	+ 40	-0.051
	+ 50	-0.046
40.5V	+ 20	-0.053
57.0V	+ 20	-0.054

5.4. Emission Bandwidth Measurement

5.4.1.Test Limit

The 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 26 dB below the transmitter power.

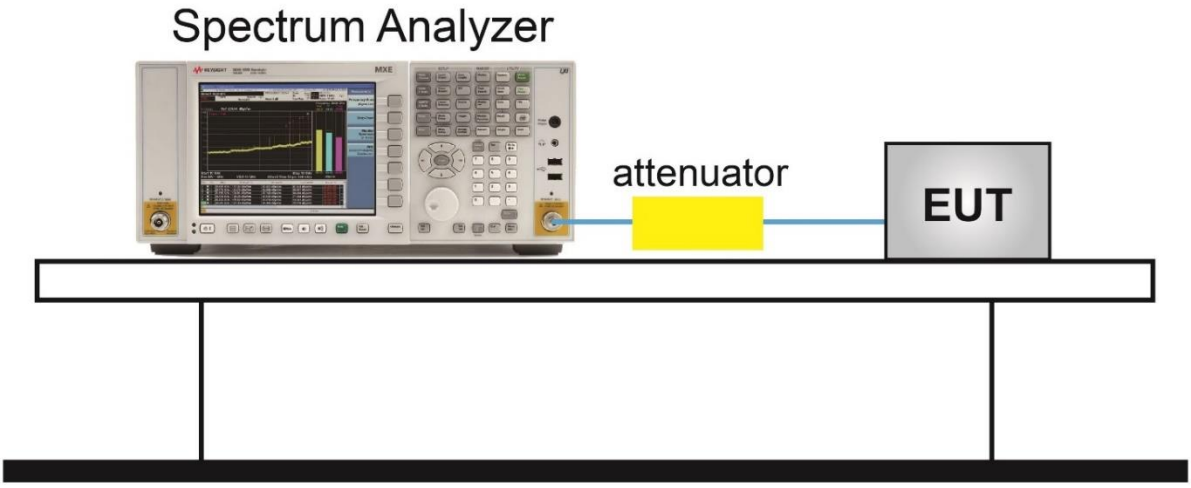
5.4.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.4.3 & 5.4.4

5.4.3.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. The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “−X dB” requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 26 dB below the reference level

5.4.4.Test Setup



5.4.5.Test Result

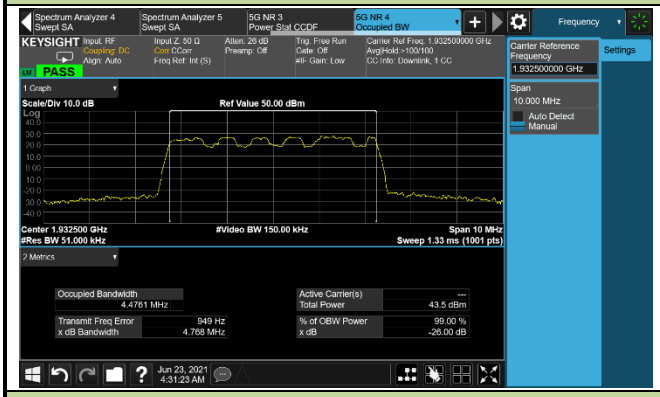
Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/23 ~ 2021/06/24		

Frequency (MHz)	Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK			
1932.5	5	4.77	4.48
1962.5	5	4.81	4.49
1992.5	5	4.78	4.48
1935.0	10	9.69	9.14
1962.5	10	9.68	9.13
1990.0	10	9.69	9.11
1937.5	15	14.70	14.13
1962.5	15	14.72	14.14
1987.5	15	14.70	14.14
16QAM			
1932.5	5	4.79	4.49
1962.5	5	4.78	4.49
1992.5	5	4.76	4.47
1935.0	10	9.68	9.21
1962.5	10	9.68	9.21
1990.0	10	9.70	9.21
1937.5	15	14.71	14.13
1962.5	15	14.69	14.13
.431987.5	15	14.71	14.13

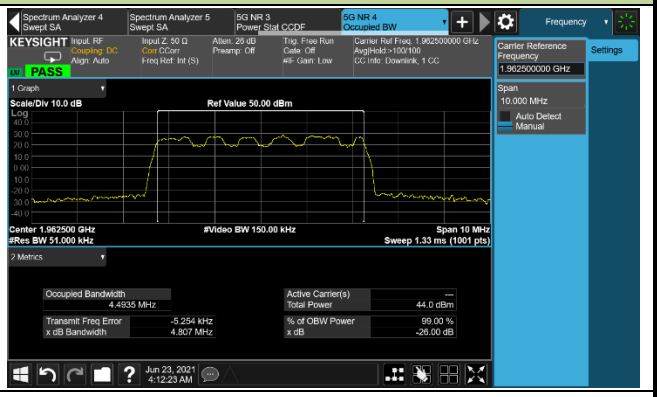
Frequency (MHz)	Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
64QAM			
1932.5	5	4.76	4.47
1962.5	5	4.76	4.47
1992.5	5	4.77	4.47
1935.0	10	9.73	9.28
1962.5	10	9.73	9.28
1990.0	10	9.73	9.28
1937.5	15	14.72	14.11
1962.5	15	14.73	14.12
1987.5	15	14.69	14.10
256QAM			
1932.5	5	4.78	4.46
1962.5	5	4.77	4.47
1992.5	5	4.77	4.46
1935.0	10	9.72	9.26
1962.5	10	9.75	9.26
1990.0	10	9.71	9.26
1937.5	15	14.67	14.07
1962.5	15	14.68	14.08
1987.5	15	14.69	14.06

5MHz Channel Bandwidth - QPSK

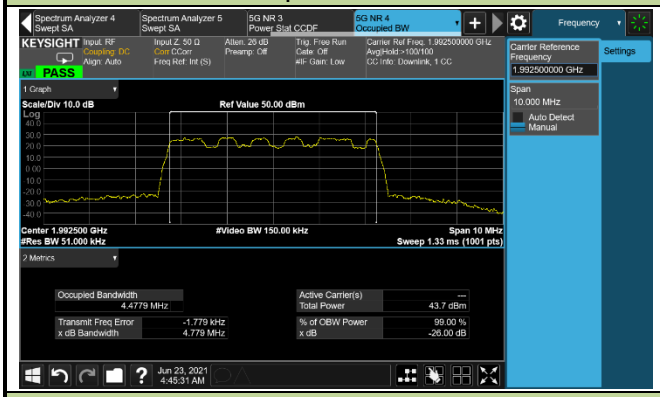
Bottom Channel



Middle Channel

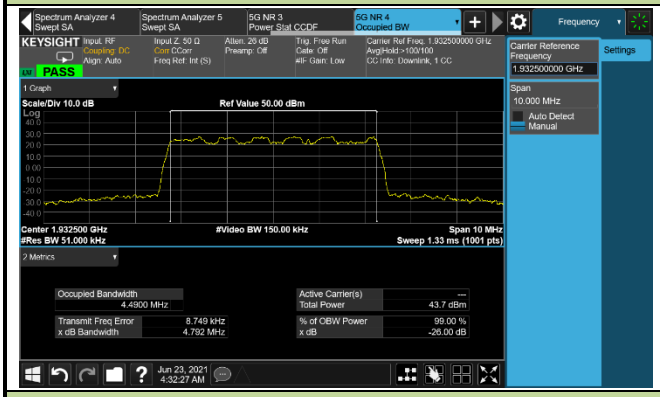


Top Channel

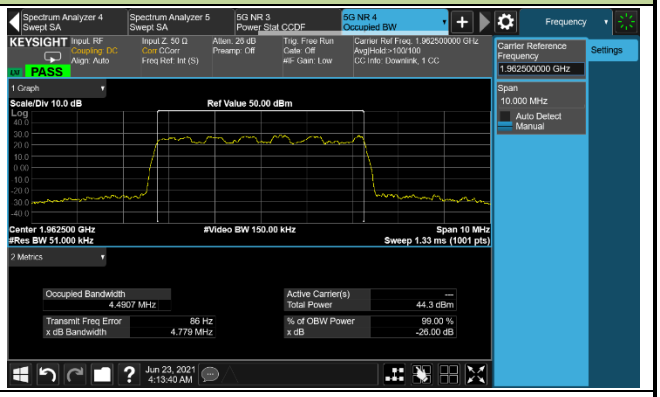


5MHz Channel Bandwidth - 16QAM

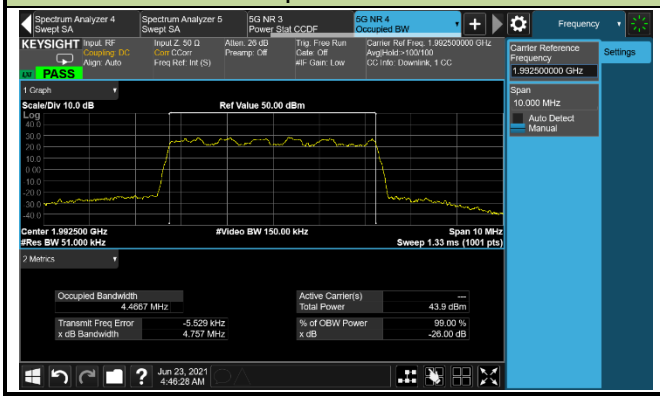
Bottom Channel



Middle Channel

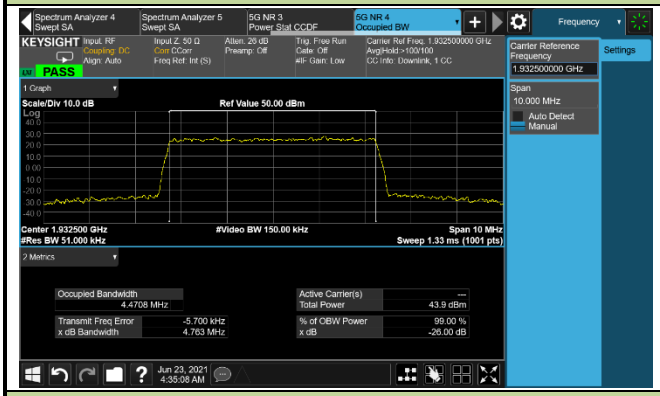


Top Channel

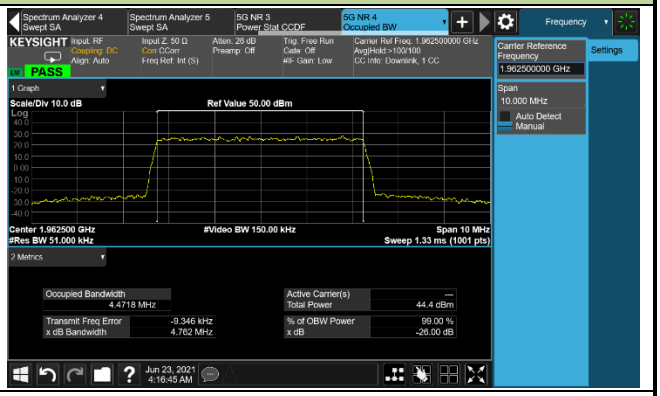


5MHz Channel Bandwidth - 64QAM

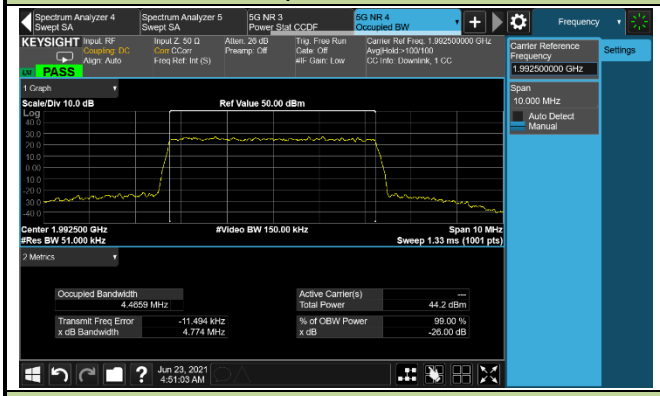
Bottom Channel



Middle Channel

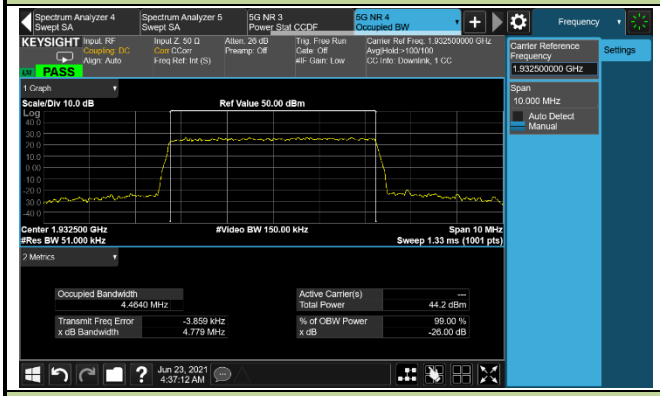


Top Channel

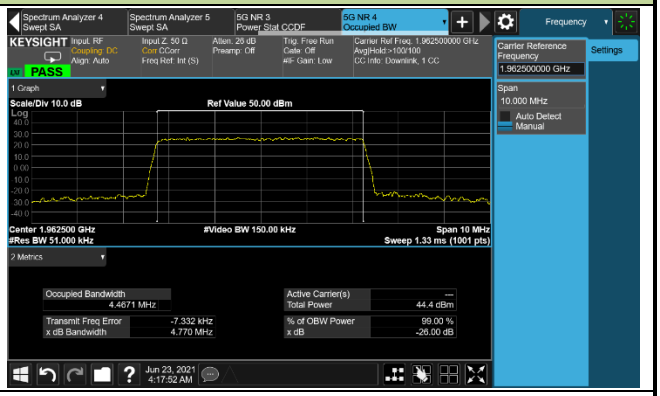


5MHz Channel Bandwidth - 256QAM

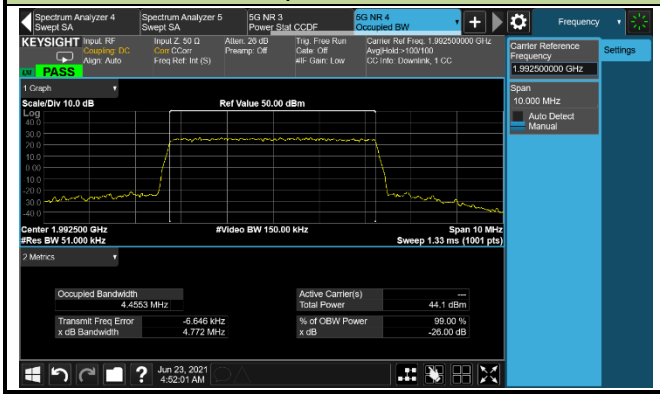
Bottom Channel



Middle Channel

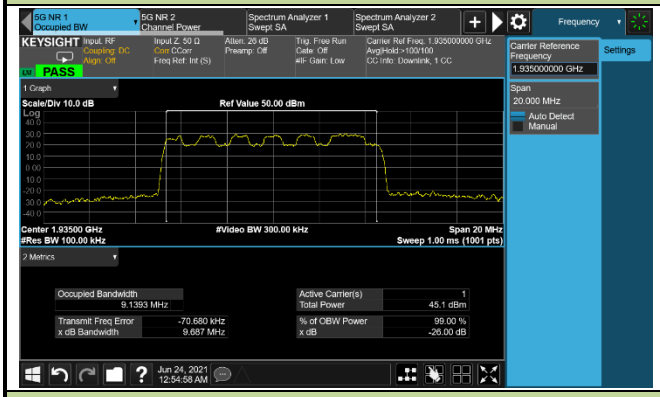


Top Channel

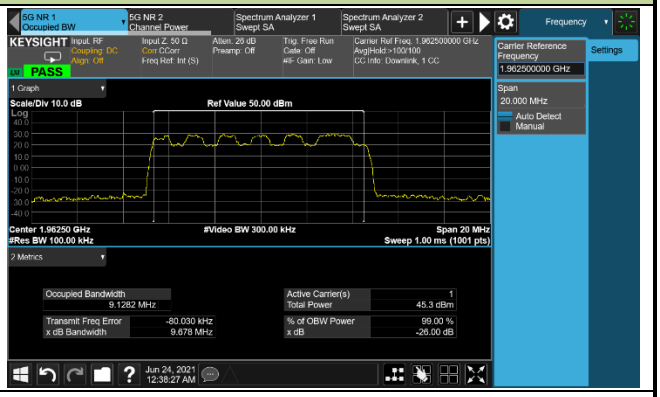


10MHz Channel Bandwidth - QPSK

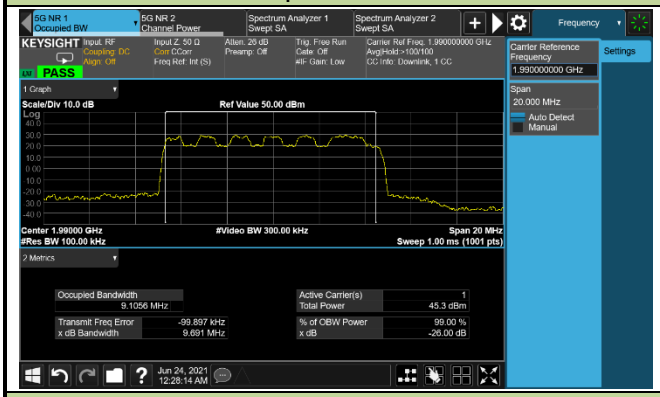
Bottom Channel



Middle Channel

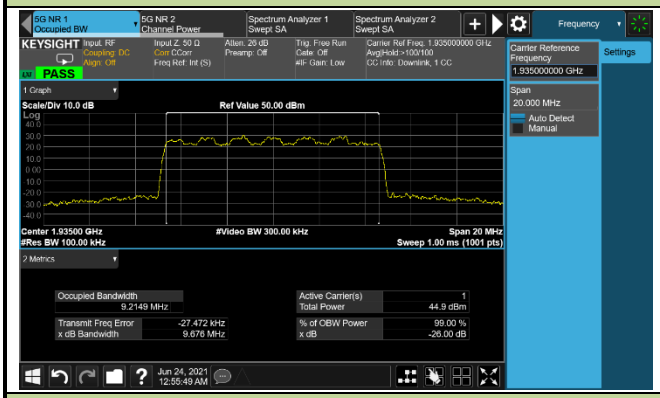


Top Channel

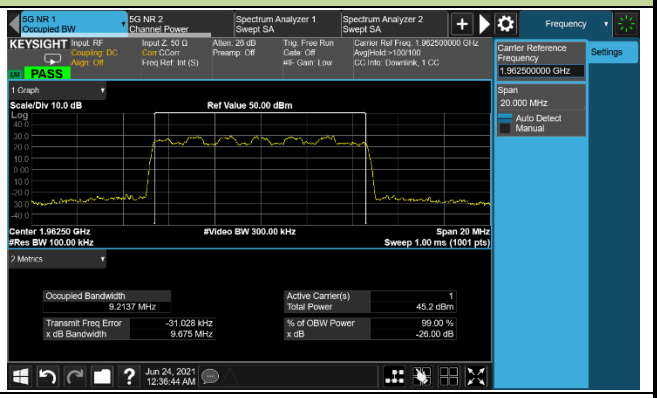


10MHz Channel Bandwidth - 16QAM

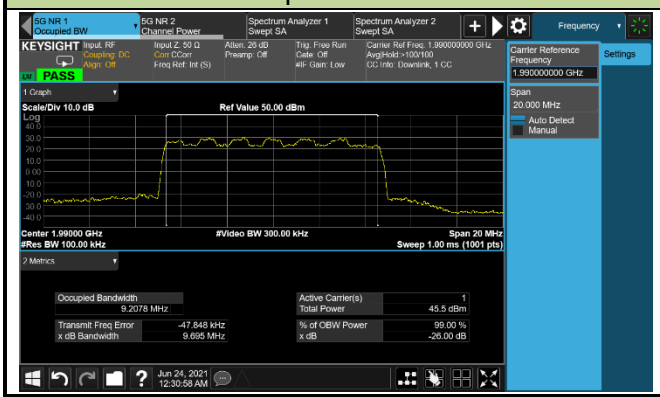
Bottom Channel



Middle Channel

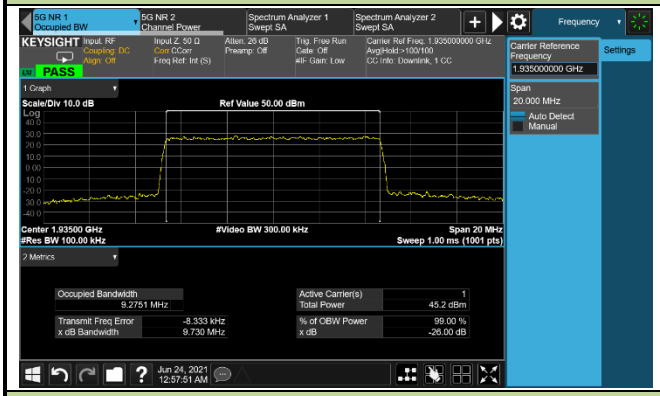


Top Channel

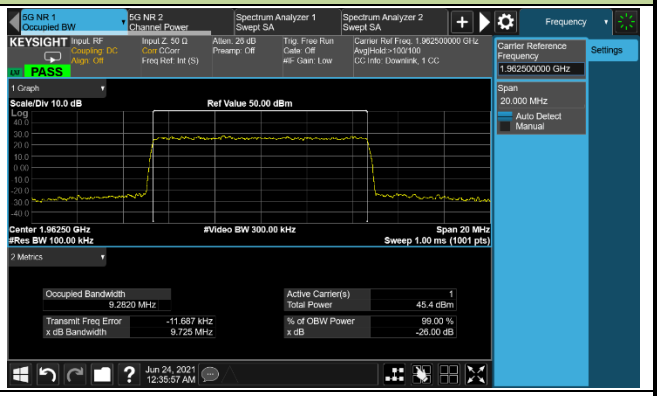


10MHz Channel Bandwidth - 64QAM

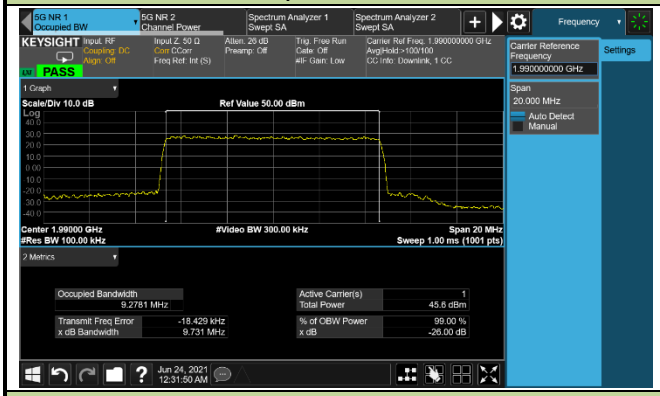
Bottom Channel



Middle Channel

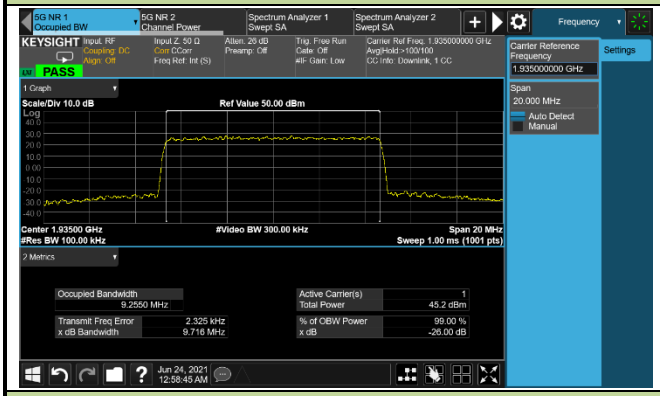


Top Channel

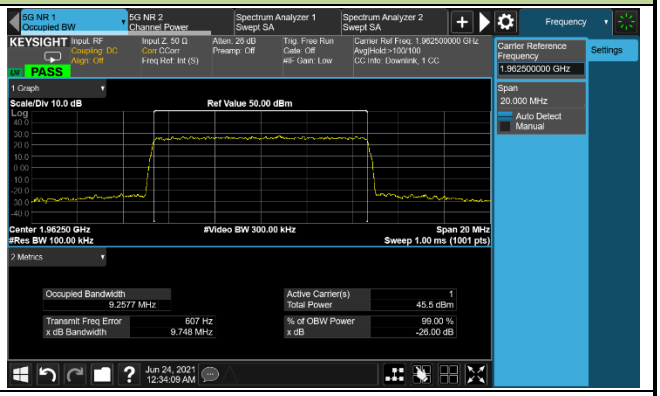


10MHz Channel Bandwidth - 256QAM

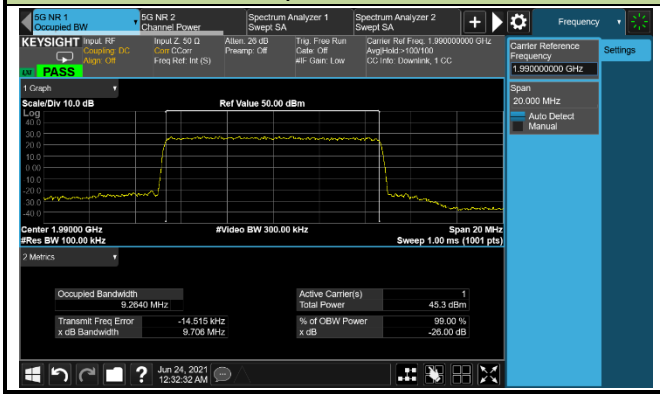
Bottom Channel



Middle Channel

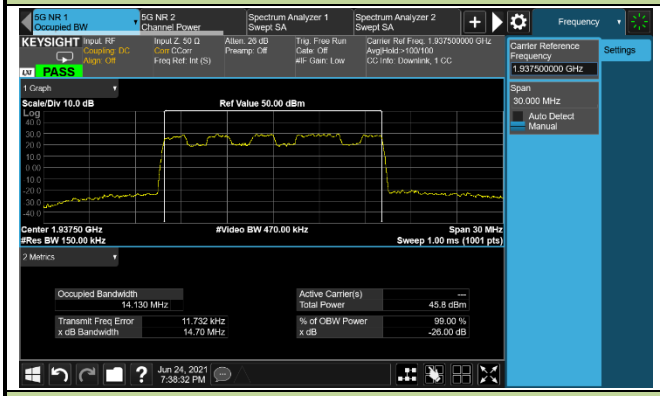


Top Channel

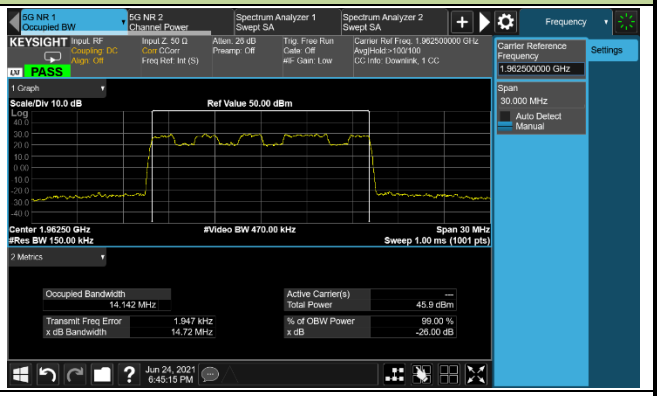


15MHz Channel Bandwidth - QPSK

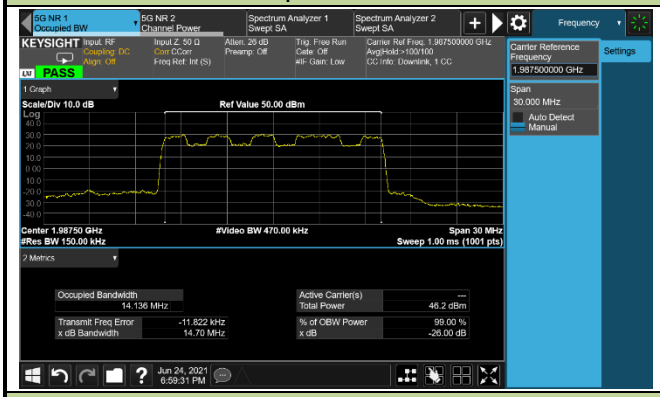
Bottom Channel



Middle Channel

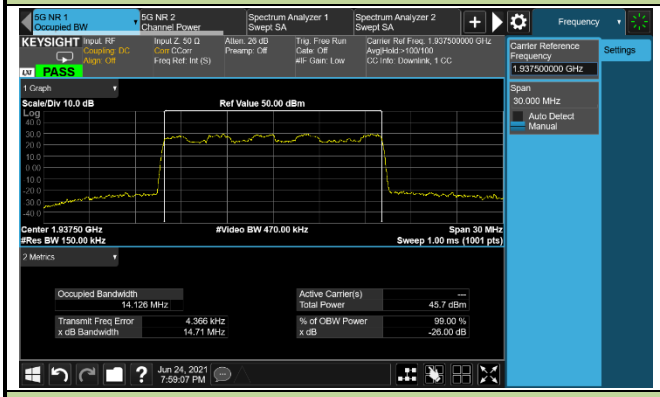


Top Channel

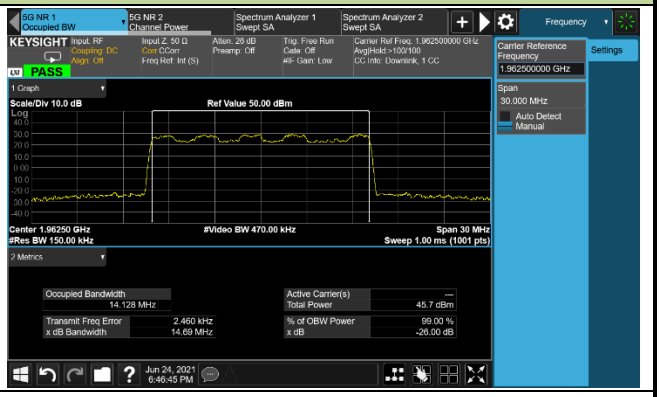


15MHz Channel Bandwidth - 16QAM

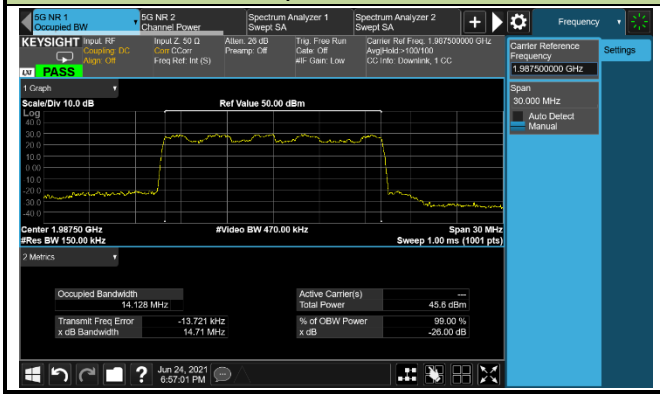
Bottom Channel



Middle Channel

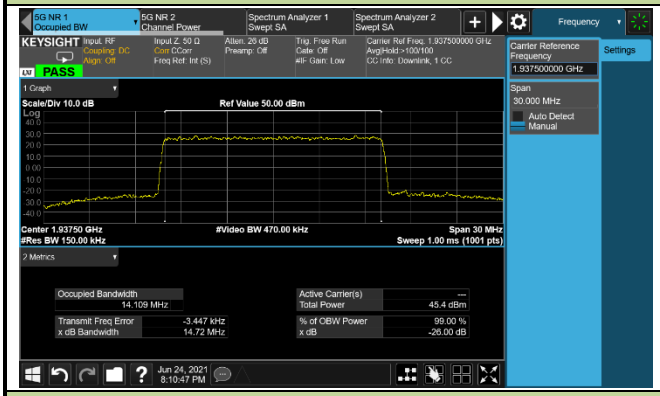


Top Channel

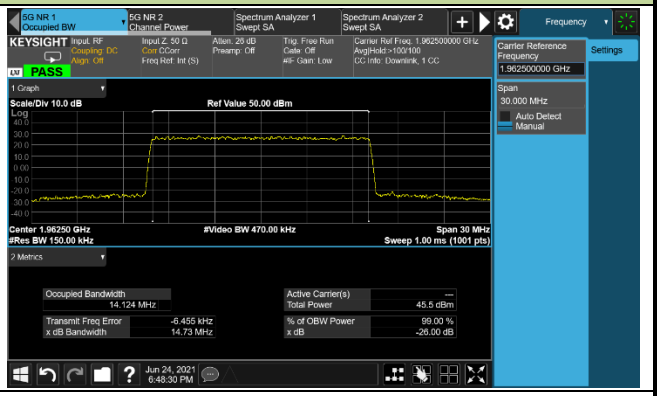


15MHz Channel Bandwidth - 64QAM

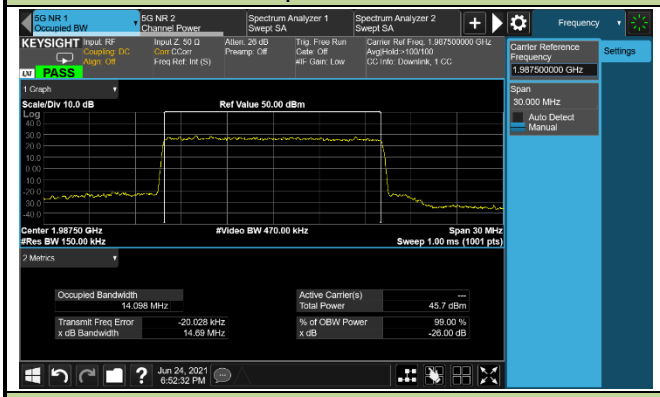
Bottom Channel



Middle Channel

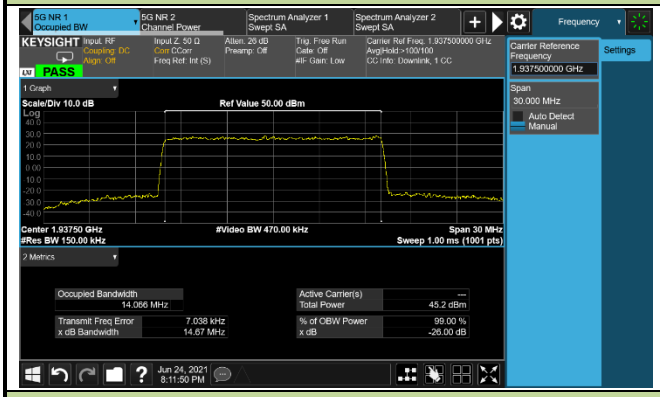


Top Channel

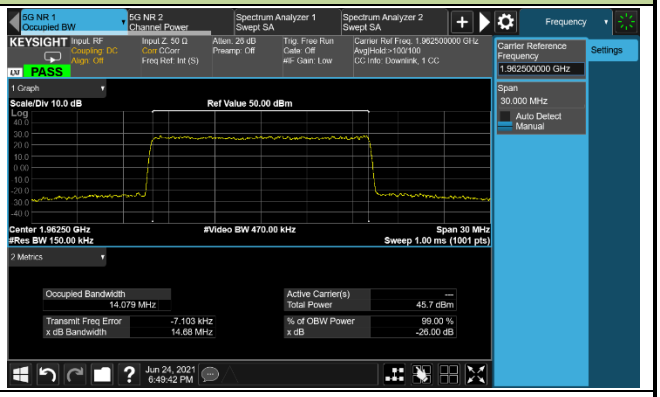


15MHz Channel Bandwidth - 256QAM

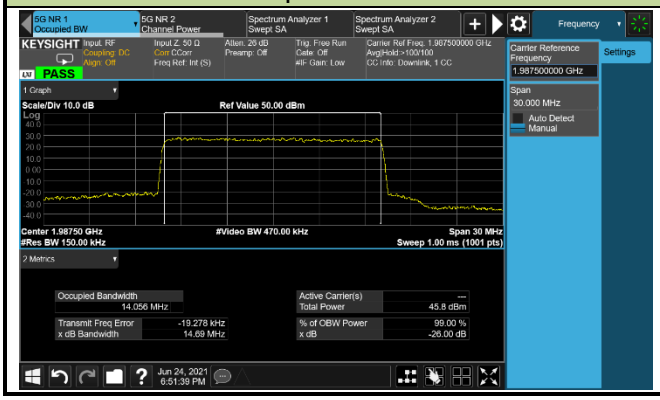
Bottom Channel



Middle Channel



Top Channel



5.5. Band Edge Measurement

5.5.1.Test Limit

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

This device can be impelement MIMO function, so the limit of spurious emissions needs to be reduced by 10*log($Numbers_{Ant}$) according to FCC KDB 662911 D01 guidance.

The limit is adjusted to -13 dBm - 10*log (4) = -19.02dBm

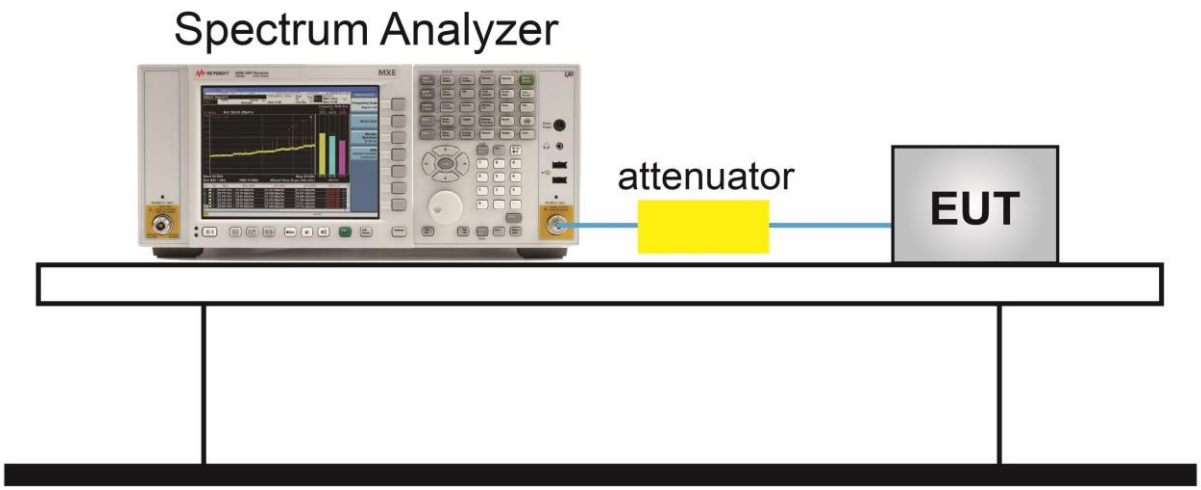
5.5.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.7.1

5.5.3.Test Setting

1. Set the analyzer frequency to Bottom or Top channel.
1. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
2. VBW ≥ 3*RBW
3. Sweep time = auto
4. Detector = power averaging (rms)
5. Set sweep trigger to “free run”
6. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.5.4.Test Setup



5.5.5.Test Result

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/06/23 ~ 2021/06/24		

Frequency (MHz)	Channel BW (MHz)	Max Band Edge (dBm/MHz)				Limit (dBm/MHz)	Result
		Ant 0	Ant 1	Ant 2	Ant 3		
1932.5	5	-26.35	-25.73	-25.58	-25.04	≤ -19.02	Pass
1992.5	5	-27.26	-26.10	-26.51	-25.61	≤ -19.02	Pass
1935.0	10	-27.03	-26.88	-26.01	-26.15	≤ -19.02	Pass
1990.0	10	-28.09	-26.30	-25.62	-25.24	≤ -19.02	Pass
1937.5	15	-27.53	-27.37	-27.02	-27.24	≤ -19.02	Pass
1987.5	15	-27.71	-26.74	-26.92	-26.45	≤ -19.02	Pass

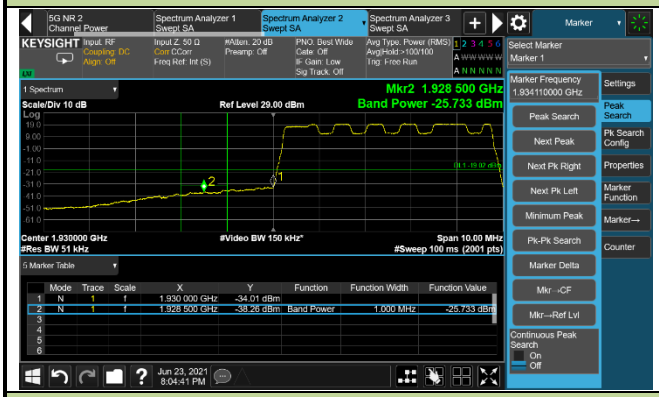
5MHz Channel Bandwidth - Ant 0

Bottom Channel

Top Channel

5MHz Channel Bandwidth - Ant 1

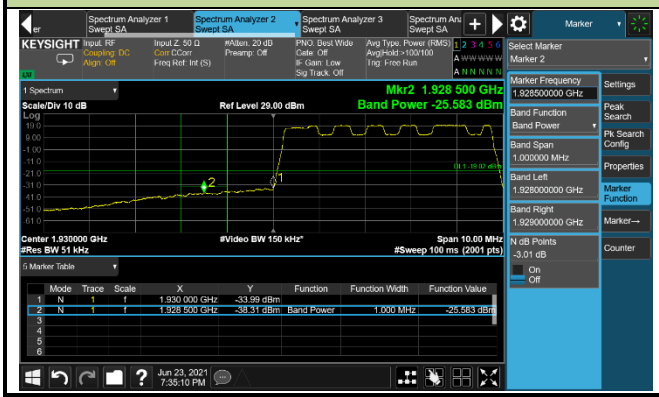
Bottom Channel



Top Channel

5MHz Channel Bandwidth - Ant 2

Bottom Channel



Top Channel