

MEASUREMENT REPORT

FCC PART 27

FCC ID: 2AD8UAWHQT01

Application: Nokia Solutions and Networks, OY

Application Type: Certification

Product: AirScale Indoor Radio 4G+5G ASiR-pRRH

Model No.: AWHQT

Brand Name: Nokia

FCC Rule Part(s): Part 27

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

Test Date: November 04 ~ 17, 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.

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

Revision History

Report No.	Version	Description	Issue Date	Note
2107TW0005-U3	Rev. 01	Intial Report	12-13-2021	Valid

Note: Here is only the different antenna between FCC ID “2AD8UAWHQS01 & “2AD8UAWHQT01”, and the other circuits are the same. This report reused the conducted measurements resluts of FCC ID “2AD8UAWHQS01”.

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General Information

Applicant:	Nokia Solutions and Networks, OY
Applicant Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
Manufacturer:	Nokia Solutions and Networks, OY
Manufacturer Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
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. 153292) 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.

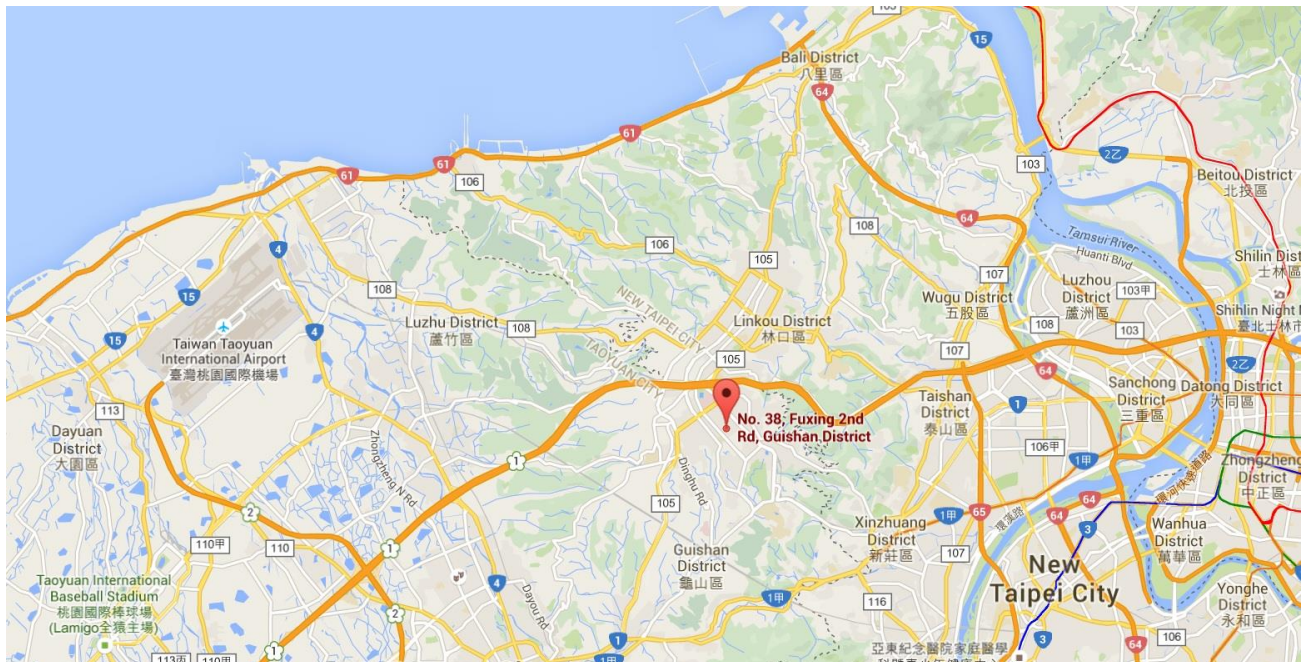
1. INTRODUCTION

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 Indoor Radio 4G+5G ASiR-pRRH
Model No.	AWHQT
Brand Name	Nokia
Test Device Serial No.	NH212200519
Operating Band (s)	5G NR: n77
Power Supply Rating:	PoE (43 ~ 57Vdc)
Emission Designator	Refer to Section 2.3
Antenna Specification	Refer to Section 2.4

2.2. Radio Specification under Test

LTE Band Specification	
Single Band	5G NR n77
T _x Frequency Range	3700 ~ 3980 MHz
R _x Frequency Range	3700 ~ 3980 MHz
Modulation	QPSK, 16QAM, 64QAM, 256QAM
Max EIRP Power	NR20 + NR100 + NR80 MHz: 34.95 dBm NR20 + NR80 + NR80 + NR20 MHz: 34.86 dBm

2.3. Emission Designator

n77 (3700~3980MHz)		QPSK			16QAM		
BW (MHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
20+100+80	3710 ~ 3940	197MG7D	-	3.1076	197MW7D	-	3.0749
20+80+80+20	3710 ~ 3970	198MG7D	-	3.0615	198MW7D	-	2.9839
n77 (3700~3980MHz)		64QAM			256QAM		
BW (MHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
20+100+80	3710 ~ 3940	197MW7D	-	3.1285	196MW7D	-	3.0816
20+80+80+20	3710 ~ 3970	198MW7D	-	2.9889	198MW7D	-	2.9997

2.4. Description of Available Antennas

Band Support	Antenna Type	Nokia Code	Antenna Gain
n77	Flat Ceiling Antenna (External)	A0012103290003 A0012103290006	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.			

2.5. Test Mode

Test Item	Channel Bandwidth	Modulation
Equivalent Isotropically Radiated Power	20+100+80 MHz 20+80+80+20 MHz	QPSK, 16QAM, 64QAM, 256QAM
Emission Bandwidth		
Conducted Spurious Emissions		QPSK
Band Edge Measurements		QPSK
Remark: 1. This report has assessed the typical multi-carrier mode (symmetry mode).		

2.6. EMI Suppression Device(s)/Modifications

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

2.7. Labeling Requirements

Per 2.1074; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase.

However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device.

2.8. 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	2022/10/03
Active 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	2022/10/12
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2022/07/13
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-UP026 4-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	2022/07/10
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	2022/11/04
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 $k = 2$.

Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): ± 2.65 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): ± 0.84 dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 3.3%

5. TEST RESULT

5.1. Summary

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1046; 27.50(j)(2)	Equivalent Isotropically Radiated Power	Refer to Section 5.2	Conducted	Pass	Section 5.2
2.1049	Emission Bandwidth	Refer to Section 5.3		Pass	Section 5.3
27.53(l)(1)	Transmitter unwanted emissions (Band Edge)	Refer to Section 5.4		Pass	Section 5.4
2.1051; 27.53(l)(1)	Out-of-frequency Band unwanted Emissions	Refer to Section 5.5		Pass	Section 5.5

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 Occupied Bandwidth and Conducted Spurious Emission were presented the worst test data of modulation & 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 27.50(j)(2) that are limited to EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

5.2.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.2.4.2 & 5.2.5.5

5.2.3. Test Setting

Average Power Measurement

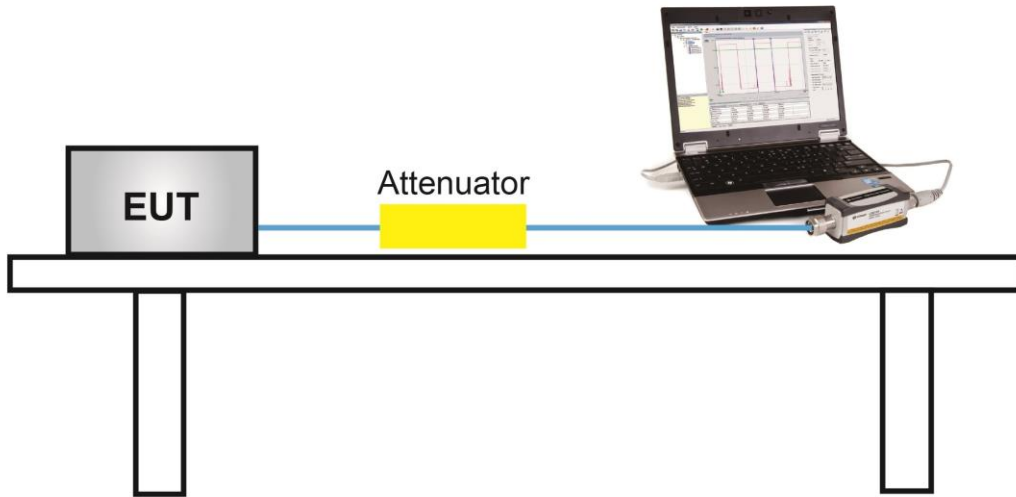
Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the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

Average Power Spectral Density Measurement

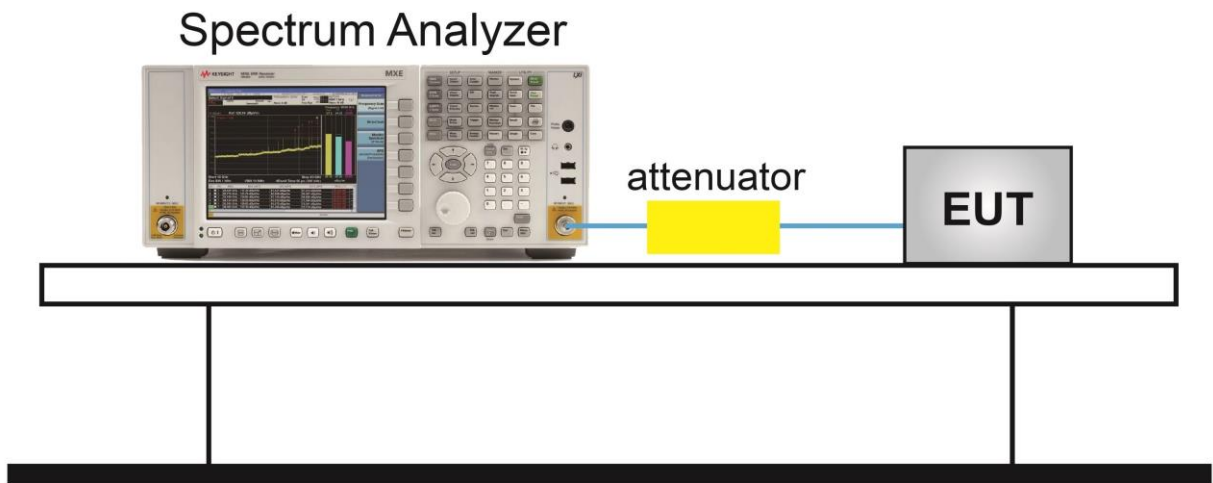
1. Span to $2 \times$ to $3 \times$ the OBW
2. RBW $\geq 1\%$ to 5% of the OBW
3. VBW $\geq 3 \times$ RBW
4. Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period)
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run"
7. If the EUT can be configured to transmit continuously, then set the trigger to free run
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.
9. The trace was allowed to stabilize
10. Compute the power by integrating the spectrum across the OBW of the signal using the Instrument's band power measurement function, with the band/channel limits set equal to the OBW band edges.
11. EIRP = Output Power Level of S.G - T_x Cable Loss + Antenna Gain of Substitution Antenna.

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	2021/11/07 ~ 2021/11/17	Test Configuration	n77 (Multi Carrier)
Test Item	EIRP Density		

Frequency (MHz)	Channel BW (MHz)	Output Power Density (dBm/MHz)				Total Power Density (dBm/MHz)	EIRP Density (dBm/MHz)	Limit (dBm /MHz)
		Ant 1	Ant 2	Ant 3	Ant 4			
QPSK								
3710.01+3769.98 +3859.98	20+100+80	6.40	6.19	6.20	5.93	12.20	17.20	< 62.15
3750+3810 +3900	20+100+80	6.59	6.41	6.58	6.83	12.63	17.63	< 62.15
3790.02+3850.02 +3939.99	20+100+80	7.43	7.06	7.07	7.18	13.21	18.21	< 62.15
3710.01+3760.02 +3840+3889.98	20+80+80+20	6.72	6.88	6.61	7.22	12.88	17.88	< 62.15
3750+3799.98 +3879.99+3930	20+80+80+20	6.59	6.80	6.05	7.16	12.69	17.69	< 62.15
3790.02+3840 +3920.01+3969.99	20+80+80+20	6.82	6.66	6.80	6.97	12.83	17.83	< 62.15
16QAM								
3710.01+3769.98 +3859.98	20+100+80	6.11	5.86	5.87	5.71	11.91	16.91	< 62.15
3750+3810 +3900	20+100+80	6.06	5.90	6.11	6.24	12.10	17.10	< 62.15
3790.02+3850.02 +3939.99	20+100+80	6.25	6.11	6.21	6.27	12.23	17.23	< 62.15
3710.01+3760.02 +3840+3889.98	20+80+80+20	6.45	6.63	6.49	7.18	12.72	17.72	< 62.15
3750+3799.98 +3879.99+3930	20+80+80+20	6.27	6.25	5.68	6.50	12.21	17.21	< 62.15
3790.02+3840 +3920.01+3969.99	20+80+80+20	6.97	6.37	6.57	6.81	12.71	17.71	< 62.15

64QAM								
3710.01+3769.98 +3859.98	20+100+80	5.60	5.38	5.35	5.21	11.41	16.41	< 62.15
3750+3810 +3900	20+100+80	5.94	5.80	6.23	6.08	12.04	17.04	< 62.15
3790.02+3850.02 +3939.99	20+100+80	6.21	5.75	5.87	5.85	11.94	16.94	< 62.15
3710.01+3760.02 +3840+3889.98	20+80+80+20	6.00	6.25	6.01	6.60	12.24	17.24	< 62.15
3750+3799.98 +3879.99+3930	20+80+80+20	5.93	5.45	5.42	6.31	11.81	16.81	< 62.15
3790.02+3840 +3920.01+3969.99	20+80+80+20	6.46	5.91	5.94	6.18	12.15	17.15	< 62.15
256QAM								
3710.01+3769.98 +3859.98	20+100+80	5.72	5.37	5.66	5.28	11.53	16.53	< 62.15
3750+3810 +3900	20+100+80	5.76	5.52	5.87	5.88	11.78	16.78	< 62.15
3790.02+3850.02 +3939.99	20+100+80	5.81	5.87	5.95	6.02	11.93	16.93	< 62.15
3710.01+3760.02 +3840+3889.98	20+80+80+20	6.21	6.51	6.27	6.97	12.52	17.52	< 62.15
3750+3799.98 +3879.99+3930	20+80+80+20	6.68	6.73	6.02	7.19	12.70	17.70	< 62.15
3790.02+3840 +3920.01+3969.99	20+80+80+20	5.85	5.92	5.58	6.01	11.86	16.86	< 62.15
Note 1: Total Power Density(dBm/MHz) = $10 \cdot \log \{ 10^{[ANT 1 \text{ Power (dBm/MHz) / 10}]} + 10^{[ANT 2 \text{ Power (dBm/MHz) / 10}]} + 10^{[ANT 3 \text{ Power (dBm/MHz) / 10}]} + 10^{[ANT 4 \text{ Power (dBm/MHz) / 10}]} \}$ (dBm/MHz). Note 2: EIRP Density (dBm/MHz) = Total Power Density (dBm/MHz) + Antenna Gain (dBi).								

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/11/07 ~ 2021/11/17	Test Configuration	n77 (Multi Carrier)
Test Item	EIRP (Reported only)		

Frequency (MHz)	Channel BW (MHz)	Output Power (dBm)				Total Power (dBm)	EIRP (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4		
QPSK							
3710.01+3769.98 +3859.98	20+100+80	23.80	24.01	23.81	23.99	29.92	34.92
3750+3810 +3900	20+100+80	23.80	23.81	23.76	24.14	29.90	34.90
3790.02+3850.02 +3939.99	20+100+80	23.82	23.79	23.60	23.98	29.82	34.82
3710.01+3760.02 +3840+3889.98	20+80+80+20	23.85	23.72	23.65	24.12	29.86	34.86
3750+3799.98 +3879.99+3930	20+80+80+20	23.97	23.73	23.37	23.82	29.75	34.75
3790.02+3840 +3920.01+3969.99	20+80+80+20	23.87	23.50	23.46	23.99	29.73	34.73
16QAM							
3710.01+3769.98 +3859.98	20+100+80	23.80	23.73	23.81	23.91	29.83	34.83
3750+3810 +3900	20+100+80	23.84	23.73	23.74	24.11	29.88	34.88
3790.02+3850.02 +3939.99	20+100+80	23.83	23.72	23.52	24.16	29.83	34.83
3710.01+3760.02 +3840+3889.98	20+80+80+20	23.64	23.46	23.63	23.90	29.68	34.68
3750+3799.98 +3879.99+3930	20+80+80+20	23.74	23.57	23.39	24.17	29.75	34.75
3790.02+3840 +3920.01+3969.99	20+80+80+20	23.66	23.56	23.30	23.99	29.66	34.66

64QAM							
3710.01+3769.98 +3859.98	20+100+80	23.82	23.92	23.77	23.98	29.89	34.89
3750+3810 +3900	20+100+80	23.95	23.83	23.77	24.17	29.95	34.95
3790.02+3850.02 +3939.99	20+100+80	23.85	23.73	23.54	24.14	29.84	34.84
3710.01+3760.02 +3840+3889.98	20+80+80+20	24.01	23.55	23.65	23.70	29.75	34.75
3750+3799.98 +3879.99+3930	20+80+80+20	23.80	23.57	23.65	23.91	29.76	34.76
3790.02+3840 +3920.01+3969.99	20+80+80+20	23.76	23.57	23.31	23.81	29.64	34.64
256QAM							
3710.01+3769.98 +3859.98	20+100+80	23.97	23.75	23.83	23.82	29.86	34.86
3750+3810 +3900	20+100+80	23.87	23.80	23.82	23.85	29.86	34.86
3790.02+3850.02 +3939.99	20+100+80	23.92	23.76	23.54	24.22	29.89	34.89
3710.01+3760.02 +3840+3889.98	20+80+80+20	23.73	23.35	23.63	23.90	29.68	34.68
3750+3799.98 +3879.99+3930	20+80+80+20	23.85	23.57	23.52	24.04	29.77	34.77
3790.02+3840 +3920.01+3969.99	20+80+80+20	23.92	23.46	23.38	23.97	29.71	34.71
Note 1: Total Power (dBm) = $10 \cdot \log \{ 10^{\text{ANT 1 Power (dBm)} / 10} + 10^{\text{ANT 2 Power (dBm)} / 10} + 10^{\text{ANT 3 Power (dBm)} / 10} + 10^{\text{ANT 4 Power (dBm)} / 10} \}$ (dBm).							
Note 2: EIRP (dBm) = Total Power (dBm) + Antenna Gain (dBi).							

5.3. Emission Bandwidth Measurement

5.3.1. Test Limit

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

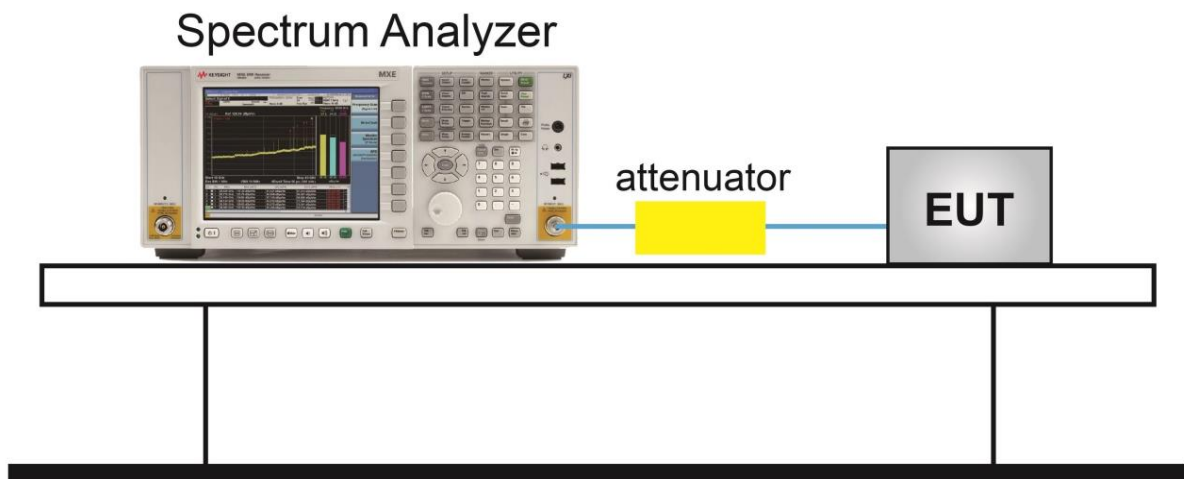
5.3.2. Test Procedure

ANSI C63.26-2015 - Section 5.4.4

5.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency;
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW;
3. VBW $\geq 3 \times$ RBW;
4. Detector = Peak;
5. Trace mode = max hold;
6. Sweep = auto couple;
7. Allow the trace to stabilize;
8. Use the 99% OBW function to record the OBW measurement result.

5.3.4. Test Setup



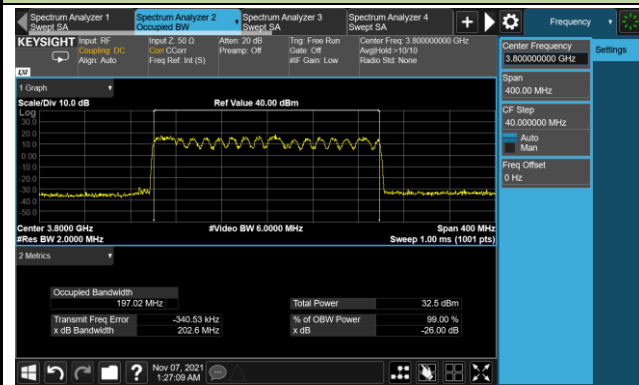
5.3.5. Test Result

Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/11/07 ~ 2021/11/17	Test Configuration	n77 (Multi Carrier)

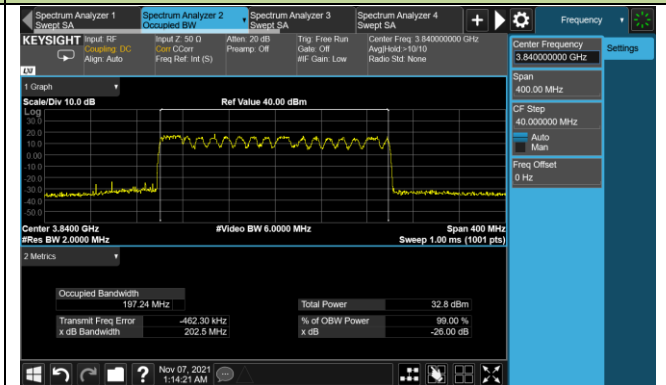
Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK		
3710.01+3769.98+3859.98	20+100+80	197.02
3750+3810+3900	20+100+80	197.24
3790.02+3850.02+3939.99	20+100+80	196.85
3710.01+3760.02+3840+3889.98	20+80+80+20	198.16
3750+3799.98+3879.99+3930	20+80+80+20	198.00
3790.02+3840+3920.01+3969.99	20+80+80+20	197.68
16QAM		
3710.01+3769.98+3859.98	20+100+80	196.71
3750+3810+3900	20+100+80	197.34
3790.02+3850.02+3939.99	20+100+80	197.08
3710.01+3760.02+3840+3889.98	20+80+80+20	197.85
3750+3799.98+3879.99+3930	20+80+80+20	198.20
3790.02+3840+3920.01+3969.99	20+80+80+20	197.94
64QAM		
3710.01+3769.98+3859.98	20+100+80	196.74
3750+3810+3900	20+100+80	196.46
3790.02+3850.02+3939.99	20+100+80	196.31
3710.01+3760.02+3840+3889.98	20+80+80+20	197.52
3750+3799.98+3879.99+3930	20+80+80+20	197.77
3790.02+3840+3920.01+3969.99	20+80+80+20	197.69
256QAM		
3710.01+3769.98+3859.98	20+100+80	196.26
3750+3810+3900	20+100+80	196.43
3790.02+3850.02+3939.99	20+100+80	196.16
3710.01+3760.02+3840+3889.98	20+80+80+20	197.58
3750+3799.98+3879.99+3930	20+80+80+20	197.81
3790.02+3840+3920.01+3969.99	20+80+80+20	197.51

20+100+80 MHz Channel Bandwidth - QPSK

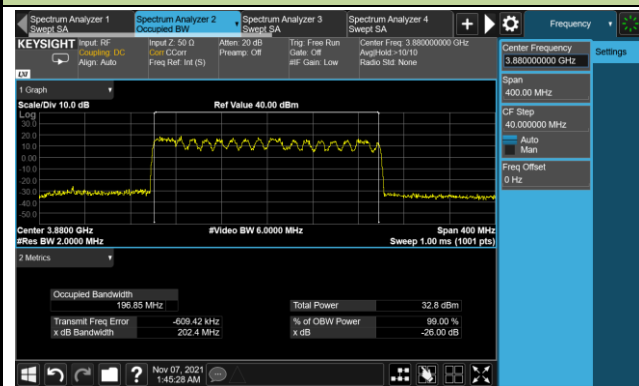
3710.01+3769.98+3859.98 MHz



3750+3810+3900 MHz

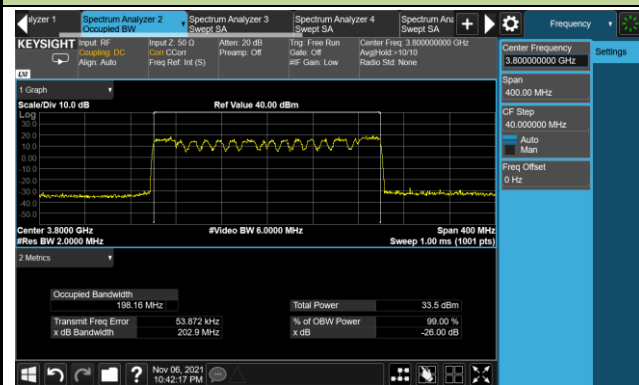


3790.02+3850.02+3939.99 MHz

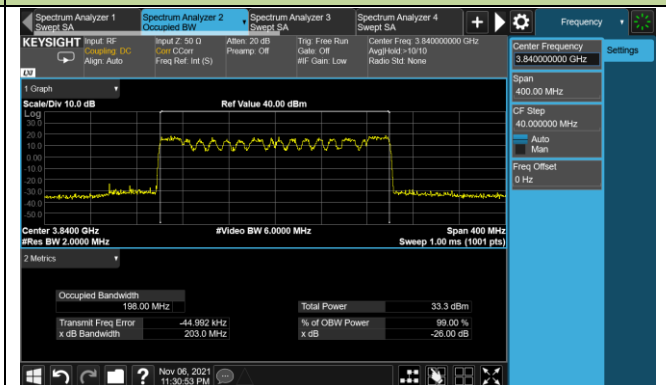


20+80+80+20 MHz Channel Bandwidth - QPSK

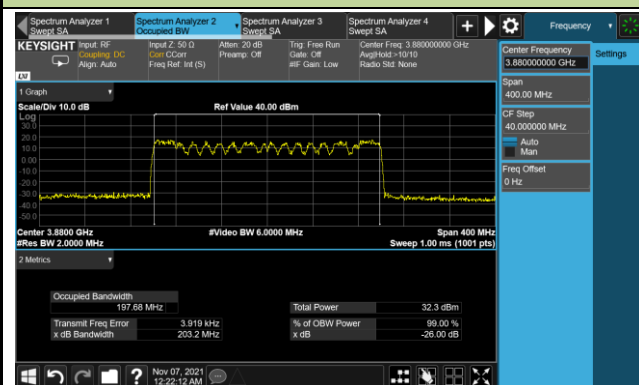
3710.01+3760.02+3840+3889.98 MHz



3750+3799.98+3879.99+3930 MHz

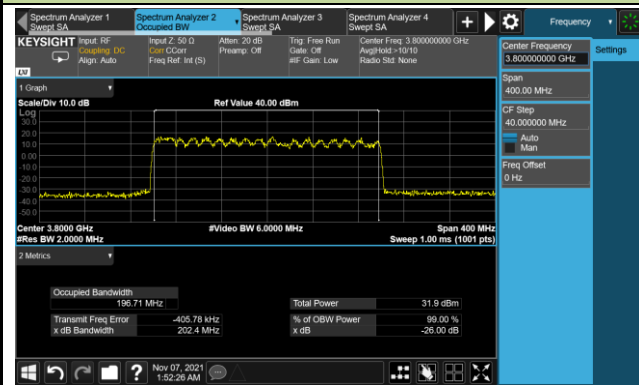


3790.02+3840+3920.01+3969.99 MHz

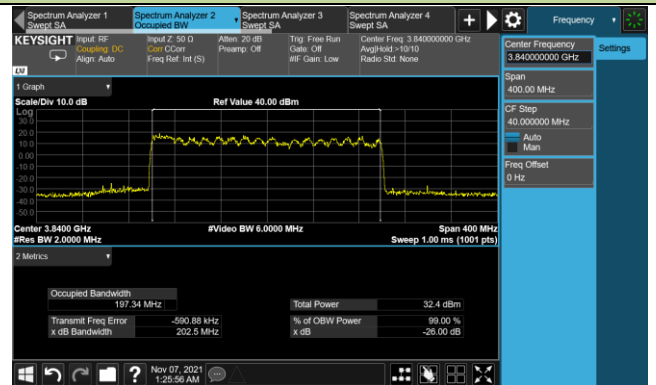


20+100+80 MHz Channel Bandwidth – 16QAM

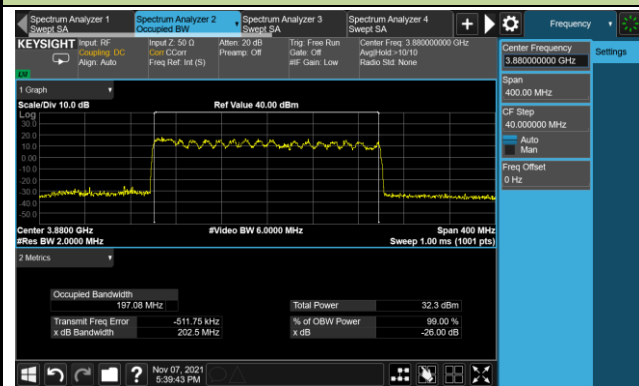
3710.01+3769.98+3859.98 MHz



3750+3810+3900 MHz

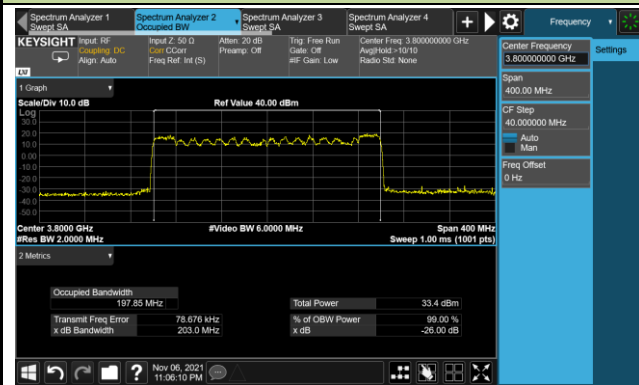


3790.02+3850.02+3939.99 MHz

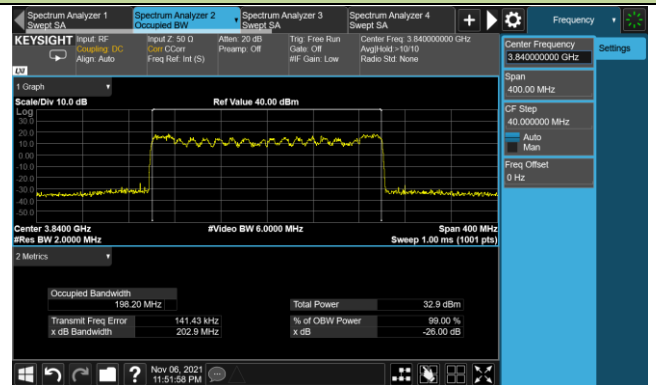


20+80+80+20 MHz Channel Bandwidth - 16QAM

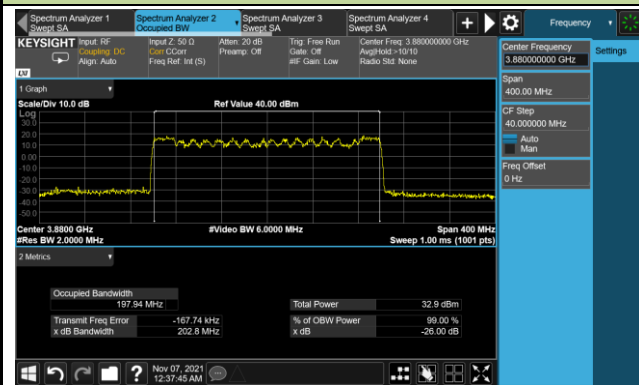
3710.01+3760.02+3840+3889.98 MHz



3750+3799.98+3879.99+3930 MHz

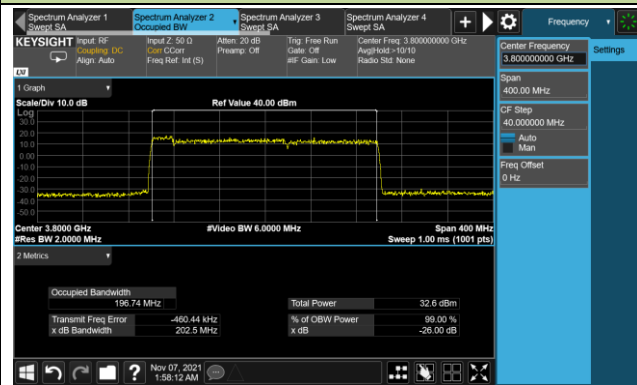


3790.02+3840+3920.01+3969.99 MHz

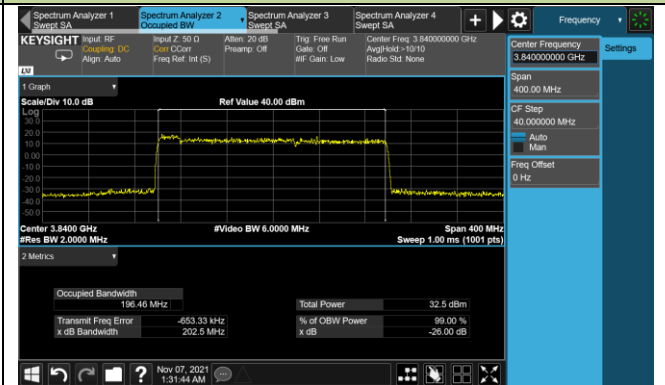


20+100+80 MHz Channel Bandwidth - 64QAM

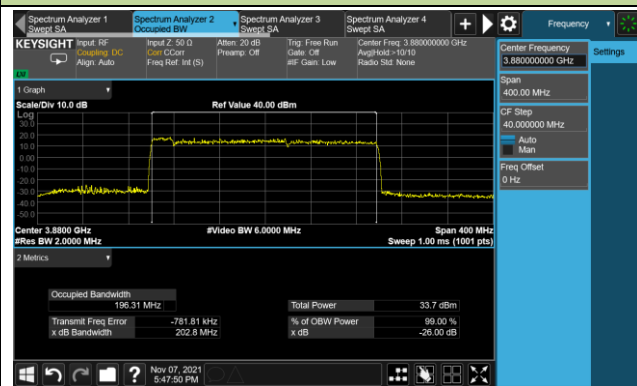
3710.01+3769.98+3859.98 MHz



3750+3810+3900 MHz

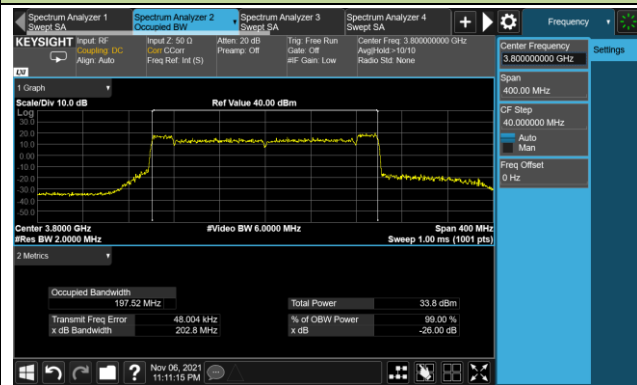


3790.02+3850.02+3939.99 MHz

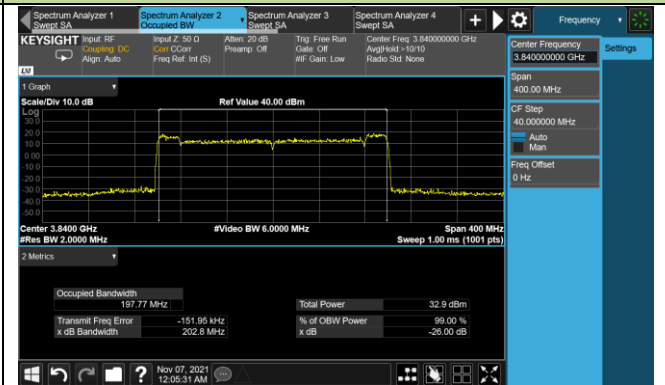


20+80+80+20 MHz Channel Bandwidth - 64QAM

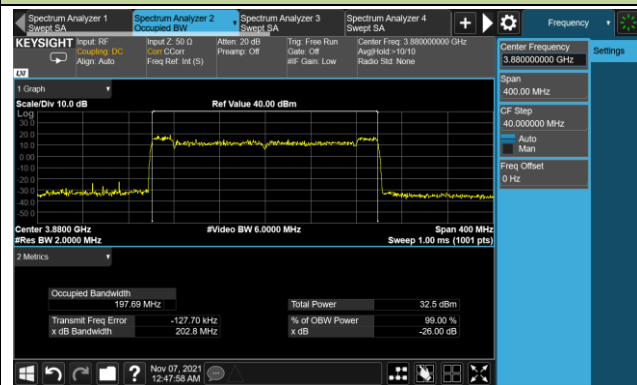
3710.01+3760.02+3840+3889.98 MHz



3750+3799.98+3879.99+3930 MHz

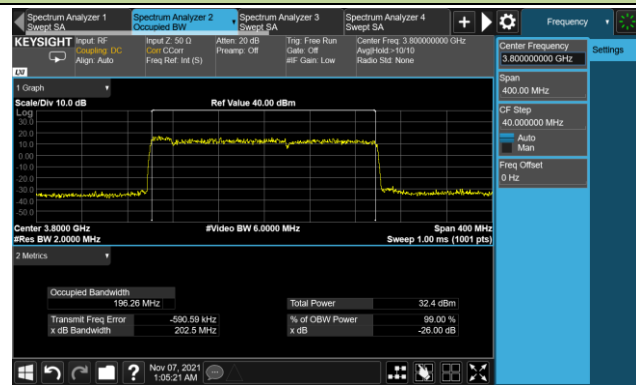


3790.02+3840+3920.01+3969.99 MHz

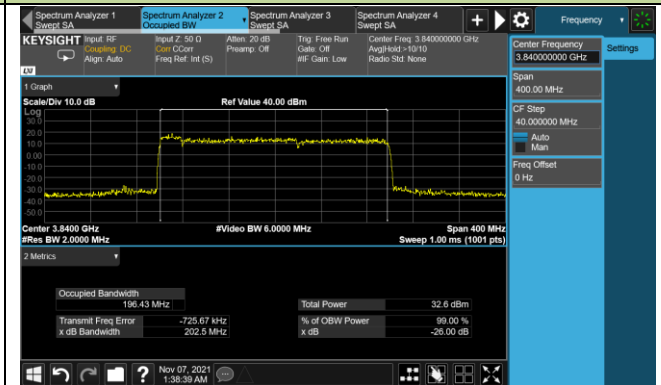


20+100+80 MHz Channel Bandwidth – 256QAM

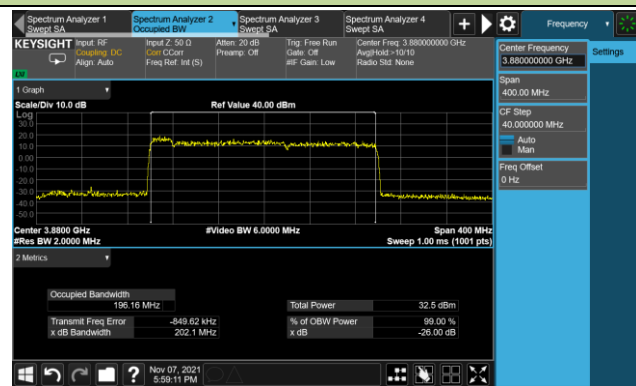
3710.01+3769.98+3859.98 MHz



3750+3810+3900 MHz

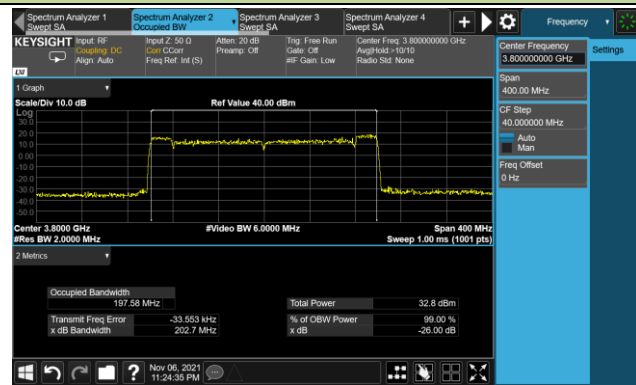


3790.02+3850.02+3939.99 MHz

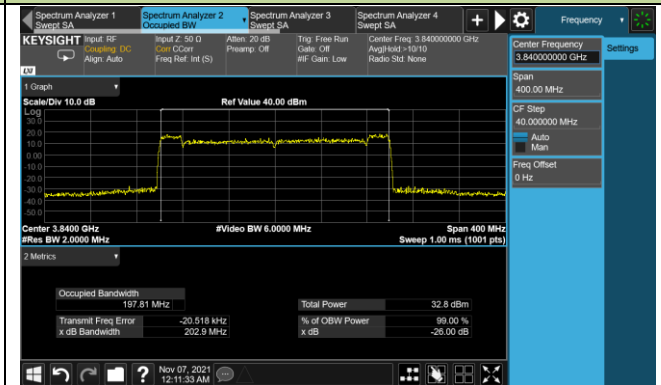


20+80+80+20 MHz Channel Bandwidth - 256QAM

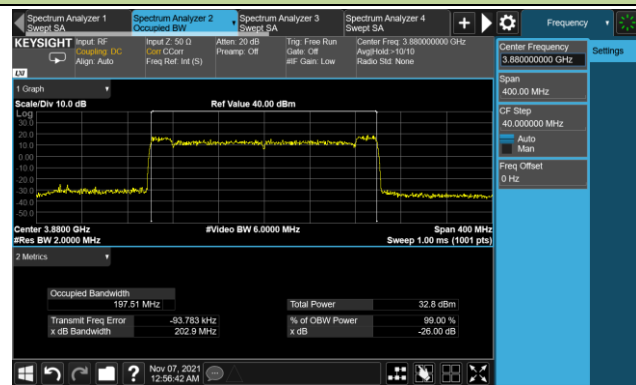
3710.01+3760.02+3840+3889.98 MHz



3750+3799.98+3879.99+3930 MHz



3790.02+3840+3920.01+3969.99 MHz



5.4. Transmitter Unwanted Emission (Band Edge) Measurement

5.4.1. 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 implement MIMO function, so the limit of spurious emissions needs to be reduced by $10 \cdot \log(\text{Numbers}_{\text{Ant}})$ according to FCC KDB 662911 D01 guidance.

The limit is adjusted to $-13 \text{ dBm} - 10 \cdot \log(4) = -19.02 \text{ dBm}$

5.4.2. Test Procedure Used

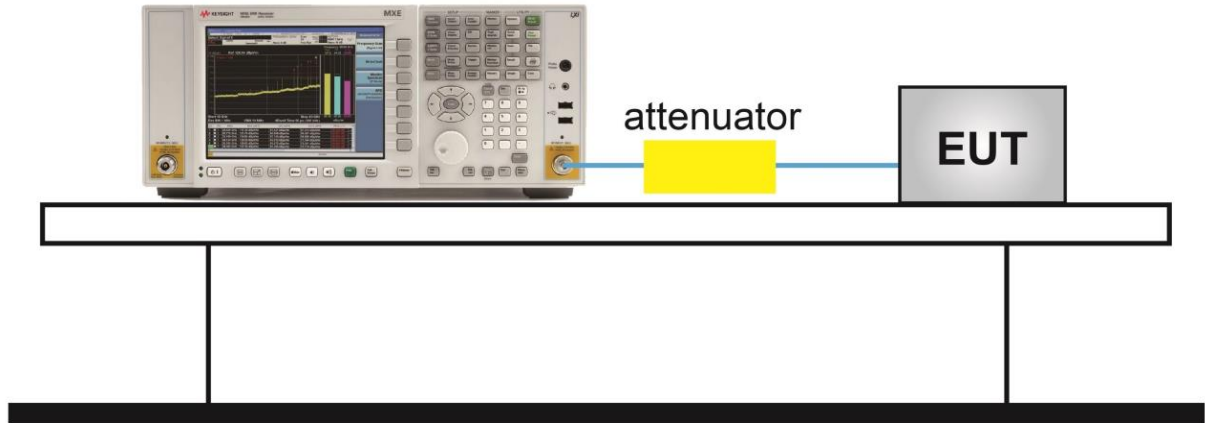
ANSI C63.26-2015 - Section 5.7

5.4.3. Test Setting

1. Set the analyzer frequency to low or high channel.
2. RBW = The nominal RBW shall be in the range of 1% of the anticipated OBW;
3. VBW $\geq 3 \cdot \text{RBW}$
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run."
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.
To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
9. Used power integration when using a measurement bandwidth smaller than the specified bandwidth.

5.4.4. Test Setup

Spectrum Analyzer

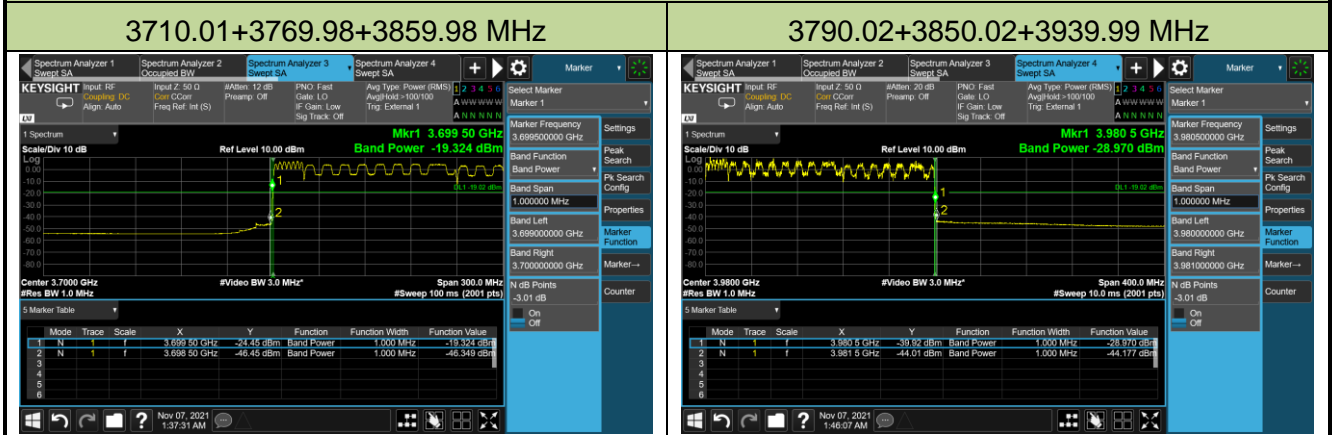


5.4.5. Test Result

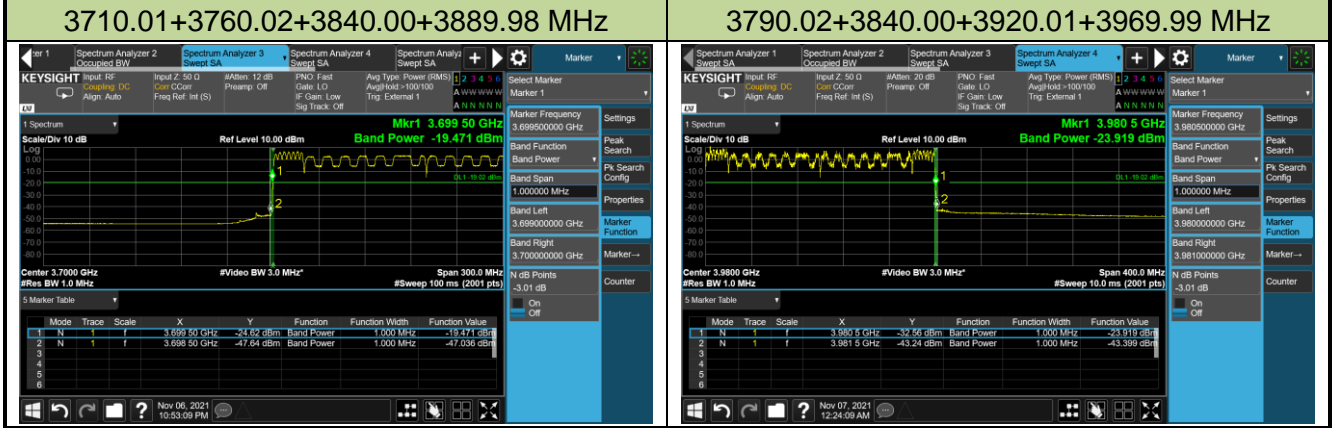
Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/11/07 ~ 2021/11/17	Test Configuration	n77 (MultiCarrier)

Unwanted Emission - Ant 1

20+100+80 MHz Channel Bandwidth



20+80+80+20 MHz Channel Bandwidth

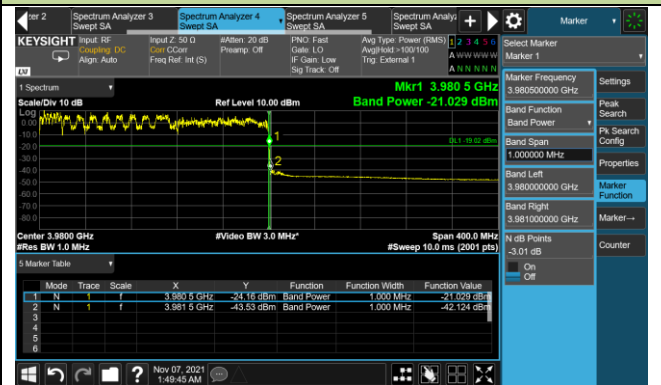
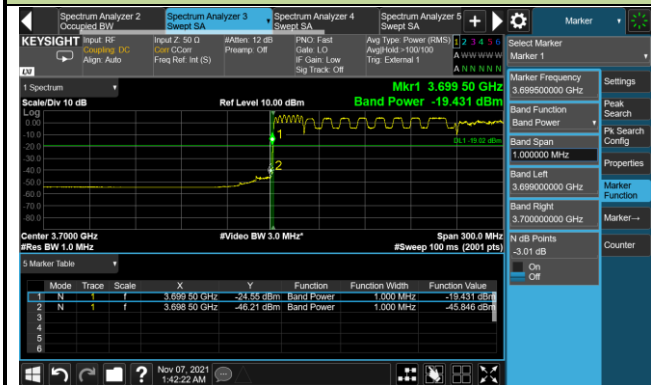


Unwanted Emission - Ant 2

20+100+80 MHz Channel Bandwidth

3710.01+3769.98+3859.98 MHz

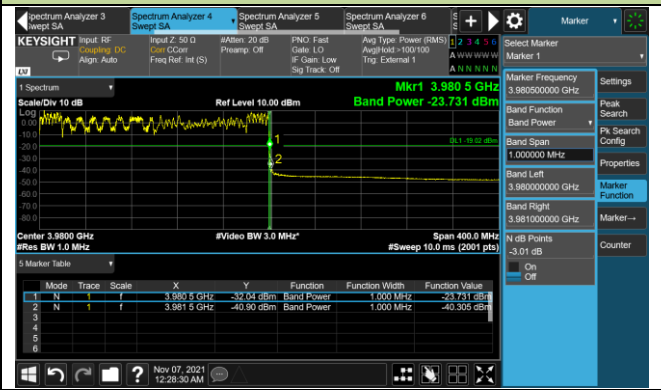
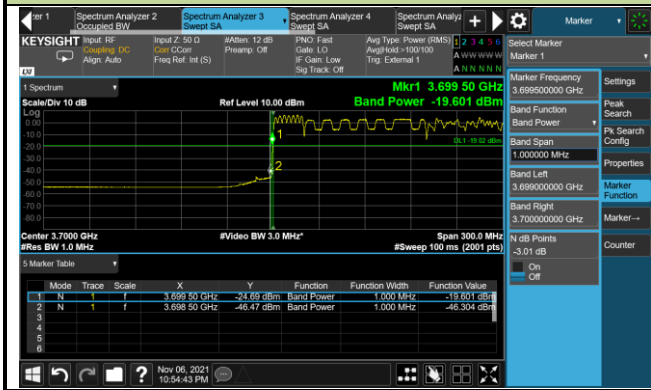
3790.02+3850.02+3939.99 MHz



20+80+80+20 MHz Channel Bandwidth

3710.01+3760.02+3840.00+3889.98 MHz

3790.02+3840.00+3920.01+3969.99 MHz

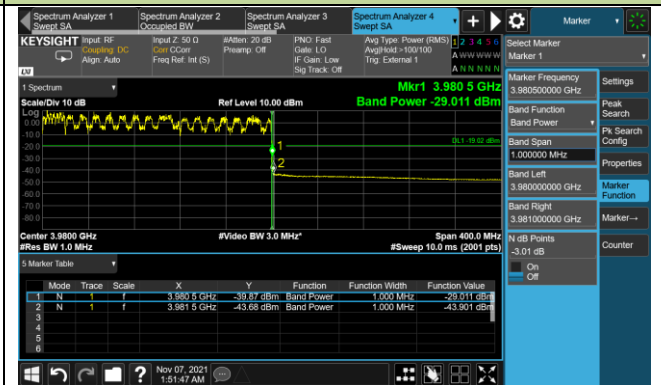
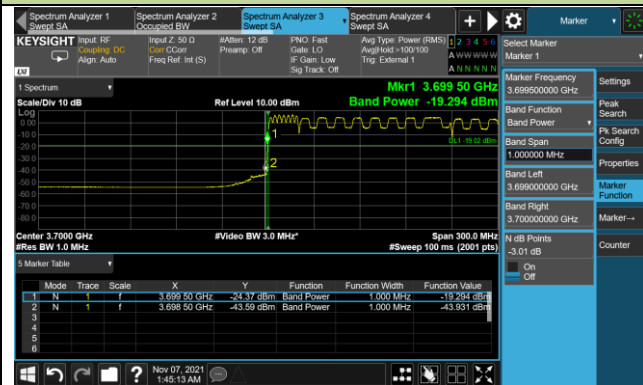


Unwanted Emission - Ant 3

20+100+80 MHz Channel Bandwidth

3710.01+3769.98+3859.98 MHz

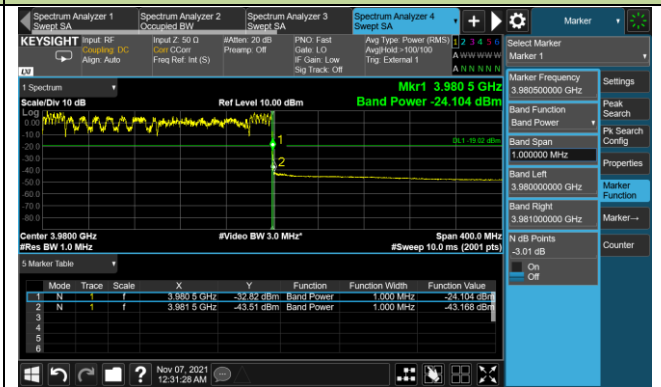
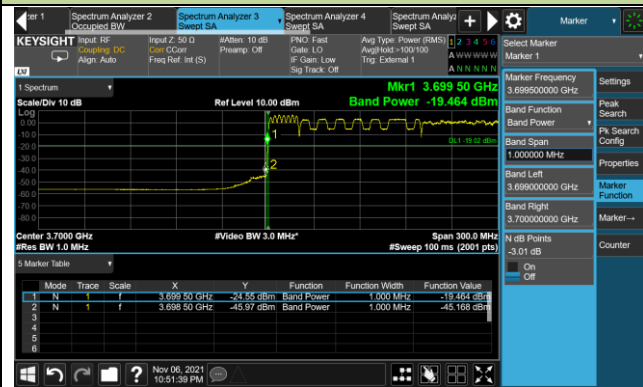
3790.02+3850.02+3939.99 MHz



20+80+80+20 MHz Channel Bandwidth

3710.01+3760.02+3840.00+3889.98 MHz

3790.02+3840.00+3920.01+3969.99 MHz

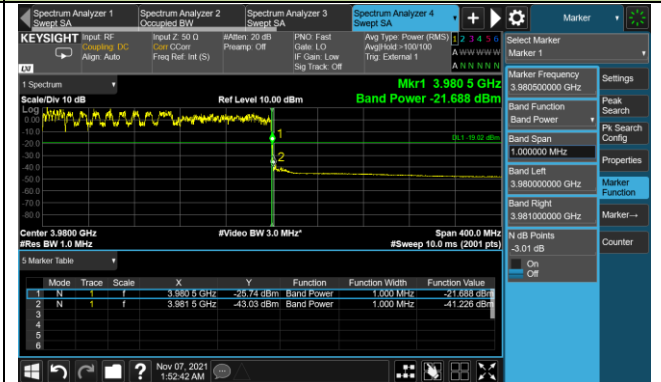
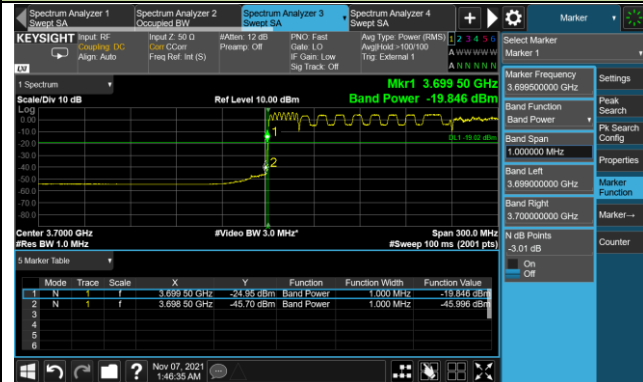


Unwanted Emission - Ant 4

20+100+80 MHz Channel Bandwidth

3710.01+3769.98+3859.98 MHz

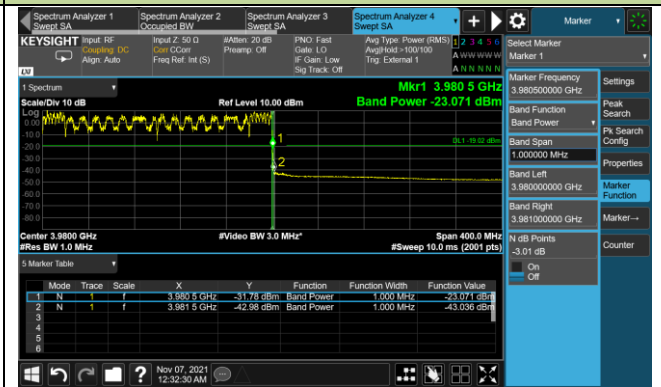
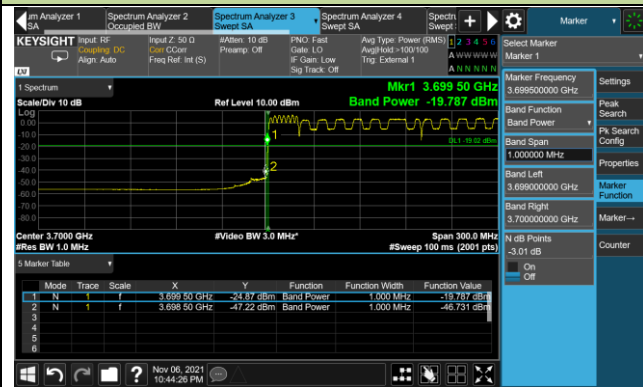
3790.02+3850.02+3939.99 MHz



20+80+80+20 MHz Channel Bandwidth

3710.01+3760.02+3840.00+3889.98 MHz

3790.02+3840.00+3920.01+3969.99 MHz



5.5. Out-of-frequency Band unwanted Emissions Measurement

5.5.1. Test Limit

After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

Note: This device can be implement MIMO function, so the limit os spurious emissions needs to be reduced $10 \cdot \log(\text{Numbers}_{\text{Ant}})$ according to FCC KDB 662911 D01 guidance.

The limit is adjusted to $-13\text{dBm} - 10 \cdot \log(4) = -19.02\text{dBm}$

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

5.5.2. Test Procedure Used

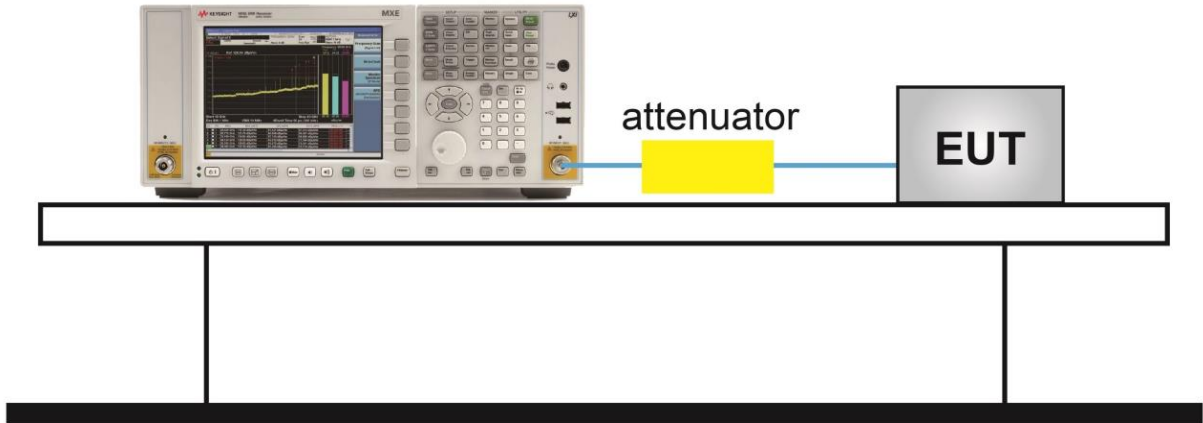
ANSI C63.26-2015 - Section 5.7 & Section 5.5

5.5.3. Test Setting

1. Set the analyzer frequency to low or high channel.
2. RBW = 1MHz
3. VBW $\geq 3 \cdot$ RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run."
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.
To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.5.4. Test Setup

Spectrum Analyzer



5.5.5. Test Result

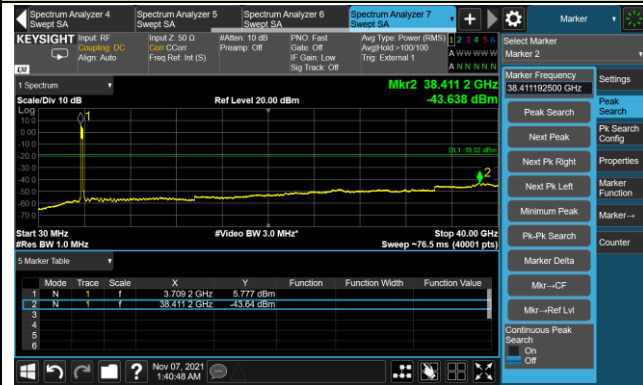
Test Engineer	Peter Xu	Test Site	SR2
Test Date	2021/11/07 ~ 2021/11/17	Test Configuration	n77 (Multi Carrier)

Frequency (MHz)	Channel BW (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
3710.01+3769.98+3859.98	20+100+80	30 ~ 40000	-43.64	≤ -19.02	Pass
3750+3810+3900	20+100+80	30 ~ 40000	-43.19	≤ -19.02	Pass
3790.02+3850.02+3939.99	20+100+80	30 ~ 40000	-43.51	≤ -19.02	Pass
3710.01+3760.02+3840+3889.98	20+80+80+20	30 ~ 40000	-42.53	≤ -19.02	Pass
3750+3799.98+3879.99+3930	20+80+80+20	30 ~ 40000	-42.81	≤ -19.02	Pass
3790.02+3840+3920.01+3969.99	20+80+80+20	30 ~ 40000	-42.39	≤ -19.02	Pass

Note: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9KHz ~ 30MHz), therefore no data appear in the report.

20+100+80 MHz Channel Bandwidth

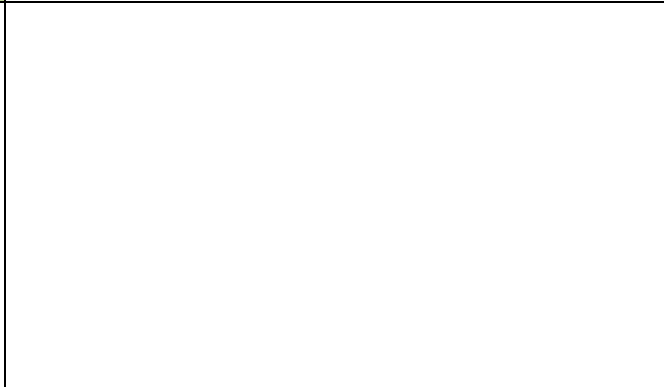
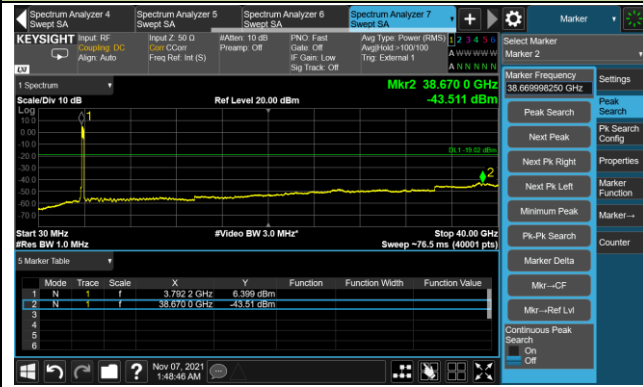
30MHz ~ 40000MHz



30MHz ~ 40000MHz

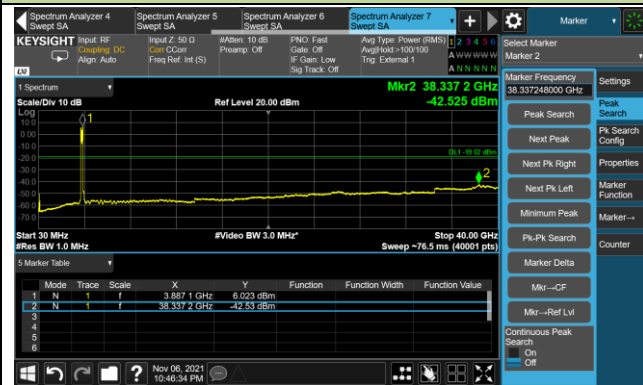


30MHz ~ 40000MHz



20+80+80+20 MHz Channel Bandwidth

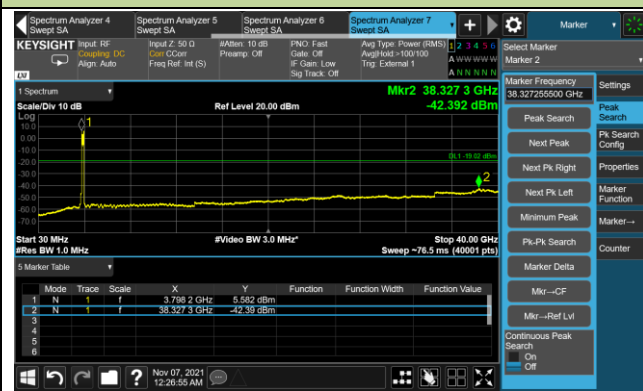
30MHz ~ 40000MHz



30MHz ~ 40000MHz



30MHz ~ 40000MHz



6. CONCLUSION

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

The End