FCC Test Report
(Part 24 – 5G NR n25)

Report No.:	RFBCKT-WTW-P22010886-8
FCC ID:	HFSQTAD53N
Test Model:	QTAD53
Received Date:	Feb. 10, 2022
Test Date:	Feb. 27 ~ Mar. 06, 2022
Issued Date:	Mar. 30, 2022
Applicant:	Quanta Computer Inc.
Address:	NO. 188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, 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:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBCKT-WTW-P22010886-8	Original release	Mar. 30, 2022

1 Certificate of Conformity

Product:	5G Hotspot
Brand:	T-Mobile
Test Model:	QTAD53
Sample Status:	Engineering sample
Applicant:	Quanta Computer Inc.
Test Date:	Feb. 27 ~ Mar. 06, 2022
Standards:	FCC Part 24, Subpart E

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:** Mar. 30, 2022

Pettie Chen / Senior Specialist

Approved by : Jeremy Lin , **Date:** Mar. 30, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 24.232	Effective Isotropically Radiated Power	Pass	Meet the requirement of limit.
2.1046 24.232 (d)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement
2.1055 24.235	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -31.18dB at 3810.00MHz.

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	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 10, 2021	Jun. 09, 2022
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2021	Nov. 24, 2022
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 16, 2022	Feb. 15, 2023
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Oct. 28, 2021	Oct. 27, 2022
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Oct. 26, 2021	Oct. 25, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 05, 2021	Jun. 04, 2022
Preamplifier Agilent (Above 1GHz)	8449B	3008A01887	Feb. 17, 2022	Feb. 16, 2023
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 05, 2021	Jun. 04, 2022
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber GIANT FORCE	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2021	Sep. 09, 2022
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 02, 2021	Jun. 01, 2022
DC power supply Keysight	U8002A	MY56330015	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 HwaYa Chamber 9.

3 General Information

3.1 General Description of EUT

Product	5G Hotspot					
Brand	T-Mobile					
Test Model	QTAD53					
Sample Status	Engineering sample					
Power Supply Rating	5Vdc / 9Vdc / 12Vdc (Adapter) 3.85Vdc (Battery)					
Modulation Type	$\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM					
Waveform Type	CP-OFDM, DFT-s-OFDM					
Operating Frequency	n25 (Channel Bandwidth 5MHz)	1852.5MHz ~ 1912.5MHz				
	n25 (Channel Bandwidth 10MHz)	1855.0MHz ~ 1910.0MHz				
	n25 (Channel Bandwidth 15MHz)	1857.5MHz ~ 1907.5MHz				
	n25 (Channel Bandwidth 20MHz)	1860.0MHz ~ 1905.0MHz				
Max. EIRP Power		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
	n25 (Channel Bandwidth 5MHz)	281.190mW (24.49dBm)	284.446mW (24.54dBm)	264.241mW (24.22dBm)	205.589mW (23.13dBm)	119.950mW (20.79dBm)
	n25 (Channel Bandwidth 10MHz)	284.446mW (24.54dBm)	285.759mW (24.56dBm)	260.615mW (24.16dBm)	207.491mW (23.17dBm)	119.399mW (20.77dBm)
	n25 (Channel Bandwidth 15MHz)	282.488mW (24.51dBm)	287.740mW (24.59dBm)	263.633mW (24.21dBm)	206.063mW (23.14dBm)	118.577mW (20.74dBm)
	n25 (Channel Bandwidth 20MHz)	272.270mW (24.35dBm)	290.402mW (24.63dBm)	265.461mW (24.24dBm)	207.491mW (23.17dBm)	121.339mW (20.84dBm)
Emission Designator		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
	n25 (Channel Bandwidth 5MHz)	4M47G7D	4M46G7D	4M46D7W	4M46D7W	4M46D7W
	n25 (Channel Bandwidth 10MHz)	8M93G7D	8M94G7D	8M93D7W	8M94D7W	8M94D7W
	n25 (Channel Bandwidth 15MHz)	13M4G7D	13M4G7D	13M4D7W	13M4D7W	13M4D7W
	n25 (Channel Bandwidth 20MHz)	17M9G7D	17M9G7D	17M9D7W	17M9D7W	17M9D7W
Antenna Type	Refer to Note as below					
Antenna Connector	Refer to Note as below					
Accessory Device	Refer to Note as below					
Cable Supplied	Refer to Note as below					

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	TEN PAO INTERNATIONAL LTD.	S018BYU1200150	I/P: 100-240Vac, 50/60Hz, 600mA O/P: 5Vdc/9Vdc/12Vdc⎓3A/2A/1.5A
Adapter 2	Aohai Technology Co., Ltd	A138A-120150U-US2	I/P: 100-240V~50/60Hz, 0.5A O/P: 5Vdc, 2.5A/9Vdc, 2A/12Vdc, 1.5A
USB Cable 1	Electronics Taiwai Ltd.	DDEMU110079	0.95m shielded USB cable without core
USB Cable 2	IMEX INC	60-6382-520-FA	0.97m shielded USB cable without core
Battery	VEKEN	141033	3.85Vdc, 6460mAh, 24.87Wh

* After pre-tested, adapter 2 and USB cable 1 were the worst case and chosen for final test.

2. There are two sources for EUT's memory. Only the supplier is different and the rest of the specifications are the same.

Sample	Item	Brand	Model
A	Memory - Main	Nanya Technology Corporation	NM4888KSPAXAI-3E
B	Memory - Second	Jeju Semiconductor Corp.	JSFDDQ5QHAFGD-405

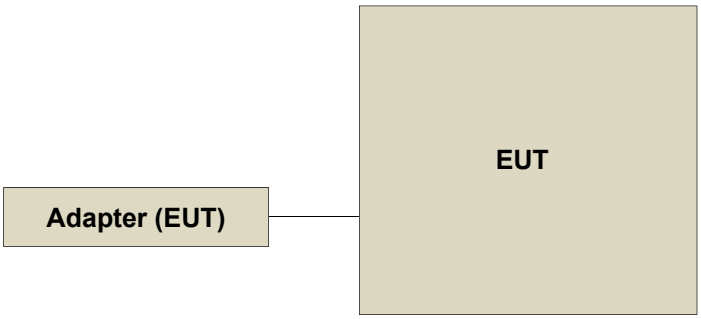
* After pre-tested, sample A was the worse and chosen for final test.

3. The following antennas were provided to the EUT.

5G FR1 Band						
Ant. No.	Type	Connector	Gain (dBi)			
			n25	n41	n66	n71
0	PIFA	MUR	1.23871	-	3.16163	0.426023
1	PIFA	IPEX	-	-	-	-
2	PIFA	IPEX	-	0.854078	-	
3	PIFA	MUR	-	-	-	-
4	PIFA	IPEX	-	-0.283214	-	-

* 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.

3.2 Configuration of System under Test



Remote site

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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	5G Wireless Test Platforms	Keysight	E7515B	MY58300759	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
n25	X-plane

n25

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	EIRP	370500 to 382500	370500 (1852.5MHz), 376500 (1882.5MHz), 382500 (1912.5MHz)	5MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset 1 RB / 13 RB Offset 1 RB / 23 RB Offset 12 RB / 0 RB Offset 12 RB / 7 RB Offset 12 RB / 13 RB Offset 25 RB / 0 RB Offset
		371000 to 382000	371000 (1855.0MHz), 376500 (1882.5MHz), 382000 (1910.0MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset 1 RB / 26 RB Offset 1 RB / 50 RB Offset 25 RB / 0 RB Offset 25 RB / 14 RB Offset 25 RB / 27 RB Offset 50 RB / 0 RB Offset
		371500 to 381500	371500 (1857.5MHz), 376500 (1882.5MHz), 381500 (1907.5MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset 1 RB / 40 RB Offset 1 RB / 77 RB Offset 36 RB / 0 RB Offset 36 RB / 22 RB Offset 36 RB / 43 RB Offset 75 RB / 0 RB Offset
		372000 to 381000	372000 (1860.0MHz), 376500 (1882.5MHz), 381000 (1905.0MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset 1 RB / 53 RB Offset 1 RB / 104 RB Offset 50RB / 0 RB Offset 50 RB / 28 RB Offset 50 RB / 56 RB Offset 100 RB / 0 RB Offset
-	Modulation characteristics	372000 to 381000	376500 (1882.5MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	100 RB / 0 RB Offset
-	Frequency Stability	370500 to 382500	370500 (1852.5MHz), 382500 (1912.5MHz)	5MHz	QPSK	25 RB / 0 RB Offset
		371000 to 382000	371000 (1855.0MHz), 382000 (1910.0MHz)	10MHz	QPSK	52 RB / 0 RB Offset
		371500 to 381500	371500 (1857.5MHz), 381500 (1907.5MHz)	15MHz	QPSK	79 RB / 0 RB Offset
		372000 to 381000	372000 (1860.0MHz), 381000 (1905.0MHz)	20MHz	QPSK	106 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Occupied Bandwidth	370500 to 382500	370500 (1852.5MHz), 376500 (1882.5MHz), 382500 (1912.5MHz)	5MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	25 RB / 0 RB Offset
		371000 to 382000	371000 (1855.0MHz), 376500 (1882.5MHz), 382000 (1910.0MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	52 RB / 0 RB Offset
		371500 to 381500	371500 (1857.5MHz), 376500 (1882.5MHz), 381500 (1907.5MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	79 RB / 0 RB Offset
		372000 to 381000	372000 (1860.0MHz), 376500 (1882.5MHz), 381000 (1905.0MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	106 RB / 0 RB Offset
-	Band Edge	370500 to 382500	370500 (1852.5MHz), 382500 (1912.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
		371000 to 382000	371000 (1855.0MHz), 382000 (1910.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 51 RB Offset 52 RB / 0 RB Offset
		371500 to 381500	371500 (1857.5MHz), 381500 (1907.5MHz)	15MHz	QPSK	1 RB / 0 RB Offset 1 RB / 78 RB Offset 79 RB / 0 RB Offset
		372000 to 381000	372000 (1860.0MHz), 381000 (1905.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset 1 RB / 105 RB Offset 106 RB / 0 RB Offset
-	Peak to Average Ratio	370500 to 382500	370500 (1852.5MHz), 376500 (1882.5MHz), 382500 (1912.5MHz)	5MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset
		371000 to 382000	371000 (1855.0MHz), 376500 (1882.5MHz), 382000 (1910.0MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset
		371500 to 381500	371500 (1857.5MHz), 376500 (1882.5MHz), 381500 (1907.5MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset
		372000 to 381000	372000 (1860.0MHz), 376500 (1882.5MHz), 381000 (1905.0MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 1 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Conducted Emission	370500 to 382500	370500 (1852.5MHz), 376500 (1882.5MHz), 382500 (1912.5MHz)	5MHz	QPSK	1 RB / 1 RB Offset
		371000 to 382000	371000 (1855.0MHz), 376500 (1882.5MHz), 382000 (1910.0MHz)	10MHz	QPSK	1 RB / 1 RB Offset
		371500 to 381500	371500 (1857.5MHz), 376500 (1882.5MHz), 381500 (1907.5MHz)	15MHz	QPSK	1 RB / 1 RB Offset
		372000 to 381000	372000 (1860.0MHz), 376500 (1882.5MHz), 381000 (1905.0MHz)	20MHz	QPSK	1 RB / 1 RB Offset
-	Radiated Emission Below 1GHz	372000 to 381000	376500 (1882.5MHz)	20MHz	QPSK	1 RB / 1 RB Offset
-	Radiated Emission Above 1GHz	370500 to 382500	370500 (1852.5MHz), 376500 (1882.5MHz), 382500 (1912.5MHz)	5MHz	QPSK	1 RB / 1 RB Offset
		372000 to 381000	372000 (1860.0MHz), 376500 (1882.5MHz), 381000 (1905.0MHz)	20MHz	QPSK	1 RB / 1 RB Offset

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 38.521-1 Section 6.5.3.1.4, choose the lowest and highest channel bandwidth for final test.
3. Only output power, modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under $\pi/2$ BPSK, QPSK, 16QAM, 64QAM and 256QAM modes, the other test items were performed under worse mode according to the maximum output power.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Modulation Characteristics	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Frequency Stability	25deg. C, 60%RH	3.85Vdc	James Yang
Occupied Bandwidth	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Band Edge	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Conducted Emission	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Radiated Emission	23deg. C, 65%RH	120Vac, 60Hz	Jones Chang

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards and References

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 24

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 as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

4.1.2 Test Procedures

Conducted Power Measurement:

The EUT was set up for the maximum power with 5GNR link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Maximum EIRP / ERP

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

$EIRP = P_{Meas} + G_T$

$ERP = P_{Meas} + G_T - 2.15$

where

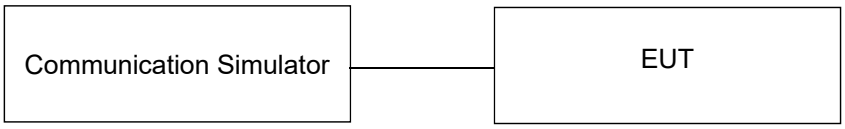
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

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)

4.1.3 Test Setup

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

NR Band 25						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		372000	376500	381000
		Frequency (MHz)		1860	1882.5	1905
20M	$\pi/2$ BPSK	1	1	23.05	23.09	23.11
20M	QPSK	1	1	23.16	23.36	23.39
		1	53	22.91	23.11	23.18
		1	104	22.88	23.08	23.15
		50	0	22.87	23.07	23.14
		50	28	22.95	23.15	23.22
		50	56	22.73	22.93	23.00
		100	0	22.93	23.13	23.20
20M	16QAM	1	1	22.73	22.93	23.00
20M	64QAM	1	1	21.66	21.86	21.93
20M	256QAM	1	1	19.33	19.53	19.60
BW	MCS Index	Channel		371500	376500	381500
		Frequency (MHz)		1857.5	1882.5	1907.5
15M	$\pi/2$ BPSK	1	1	23.03	23.21	23.27
15M	QPSK	1	1	23.12	23.31	23.35
		1	40	22.87	23.05	23.18
		1	77	22.86	22.99	23.09
		36	0	22.86	23.10	23.14
		36	22	22.87	23.03	23.11
		36	43	22.68	22.91	22.95
		75	0	22.85	23.09	23.11
15M	16QAM	1	1	22.65	22.85	22.97
15M	64QAM	1	1	21.62	21.81	21.90
15M	256QAM	1	1	19.31	19.46	19.50
BW	MCS Index	Channel		371000	376500	382000
		Frequency (MHz)		1855	1882.5	1910
10M	$\pi/2$ BPSK	1	1	23.11	23.26	23.30
10M	QPSK	1	1	23.08	23.27	23.32
		1	26	22.83	23.08	23.09
		1	50	22.82	23.02	23.06
		25	0	22.88	23.06	23.22
		25	14	22.80	22.98	23.04
		25	27	22.70	22.91	22.96
		50	0	22.89	23.07	23.16
10M	16QAM	1	1	22.64	22.85	22.92
10M	64QAM	1	1	21.56	21.80	21.93
10M	256QAM	1	1	19.23	19.53	19.52

NR Band 25						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		370500	376500	382500
		Frequency (MHz)		1852.5	1882.5	1912.5
5M	$\pi/2$ BPSK	1	1	22.97	23.25	23.23
5M	QPSK	1	1	23.03	23.27	23.30
		1	13	22.87	23.04	23.12
		1	23	22.86	22.98	23.07
		12	0	22.87	23.10	23.21
		12	7	22.82	22.97	23.12
		12	13	22.64	22.84	22.99
		25	0	22.91	23.11	23.14
5M	16QAM	1	1	22.73	22.86	22.98
5M	64QAM	1	1	21.59	21.80	21.89
5M	256QAM	1	1	19.32	19.47	19.55

EIRP Power (dBm)

NR Band 25						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		372000	376500	381000
		Frequency (MHz)		1860	1882.5	1905
20M	$\pi/2$ BPSK	1	1	24.29	24.33	24.35
20M	QPSK	1	1	24.40	24.60	24.63
		1	53	24.15	24.35	24.42
		1	104	24.12	24.32	24.39
		50	0	24.11	24.31	24.38
		50	28	24.19	24.39	24.46
		50	56	23.97	24.17	24.24
		100	0	24.17	24.37	24.44
20M	16QAM	1	1	23.97	24.17	24.24
20M	64QAM	1	1	22.90	23.10	23.17
20M	256QAM	1	1	20.57	20.77	20.84
BW	MCS Index	Channel		371500	376500	381500
		Frequency (MHz)		1857.5	1882.5	1907.5
15M	$\pi/2$ BPSK	1	1	24.27	24.45	24.51
15M	QPSK	1	1	24.36	24.55	24.59
		1	40	24.11	24.29	24.42
		1	77	24.10	24.23	24.33
		36	0	24.10	24.34	24.38
		36	22	24.11	24.27	24.35
		36	43	23.92	24.15	24.19
		75	0	24.09	24.33	24.35
15M	16QAM	1	1	23.89	24.09	24.21
15M	64QAM	1	1	22.86	23.05	23.14
15M	256QAM	1	1	20.55	20.70	20.74
BW	MCS Index	Channel		371000	376500	382000
		Frequency (MHz)		1855	1882.5	1910
10M	$\pi/2$ BPSK	1	1	24.35	24.50	24.54
10M	QPSK	1	1	24.32	24.51	24.56
		1	26	24.07	24.32	24.33
		1	50	24.06	24.26	24.30
		25	0	24.12	24.30	24.46
		25	14	24.04	24.22	24.28
		25	27	23.94	24.15	24.20
		50	0	24.13	24.31	24.40
10M	16QAM	1	1	23.88	24.09	24.16
10M	64QAM	1	1	22.80	23.04	23.17
10M	256QAM	1	1	20.47	20.77	20.76

NR Band 25						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		370500	376500	382500
		Frequency (MHz)		1852.5	1882.5	1912.5
5M	$\pi/2$ BPSK	1	1	24.21	24.49	24.47
5M	QPSK	1	1	24.27	24.51	24.54
		1	13	24.11	24.28	24.36
		1	23	24.10	24.22	24.31
		12	0	24.11	24.34	24.45
		12	7	24.06	24.21	24.36
		12	13	23.88	24.08	24.23
		25	0	24.15	24.35	24.38
5M	16QAM	1	1	23.97	24.10	24.22
5M	64QAM	1	1	22.83	23.04	23.13
5M	256QAM	1	1	20.56	20.71	20.79

4.2 Modulation Characteristics Measurement

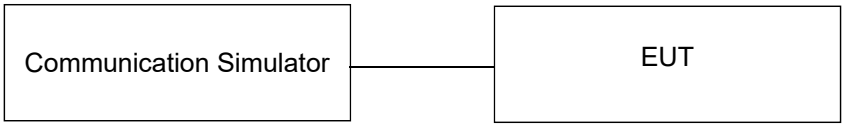
4.2.1 Limits of Modulation Characteristics

N/A

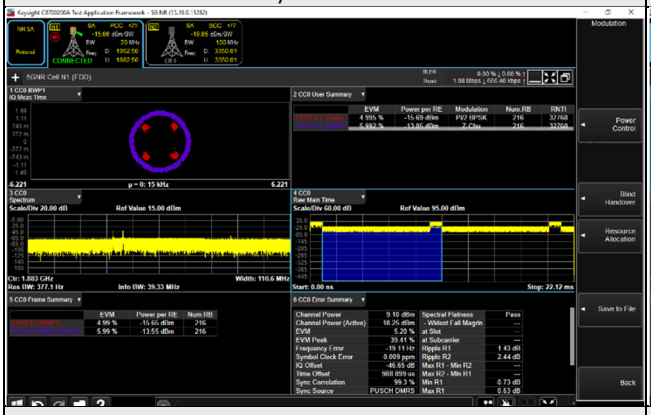
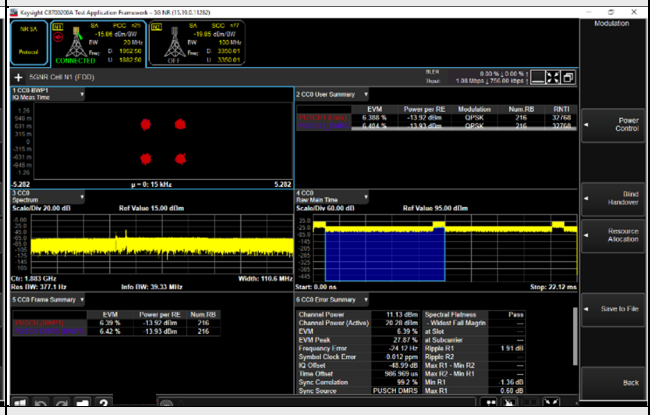
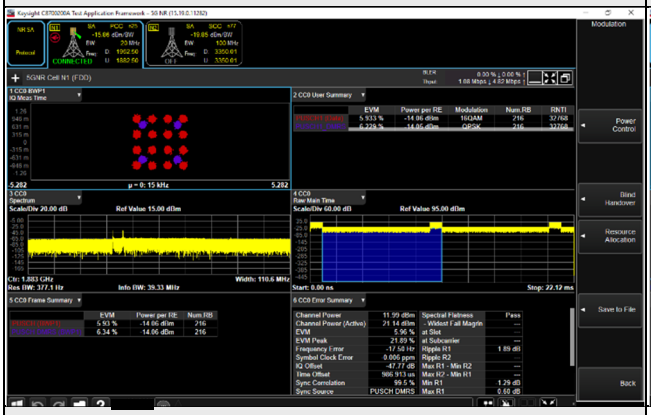
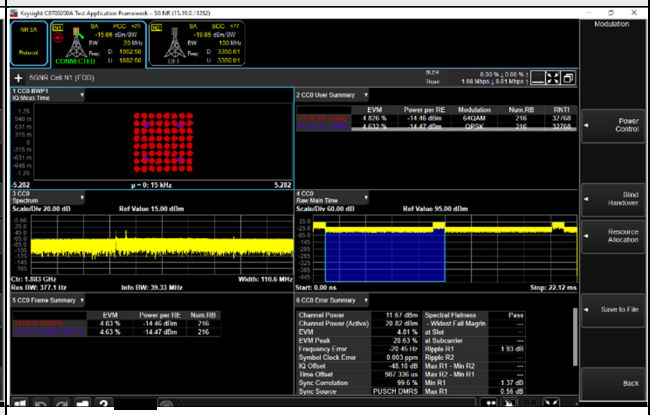
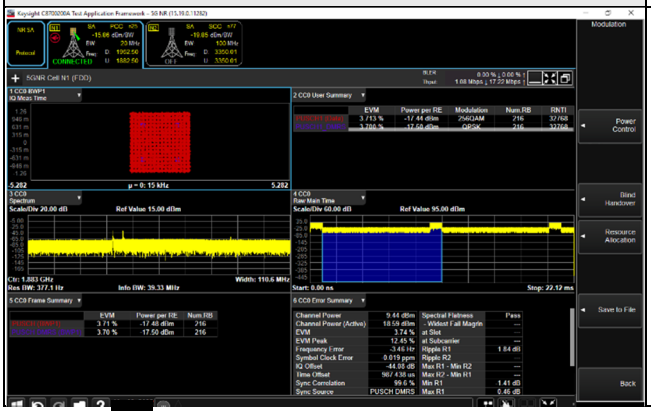
4.2.2 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector, 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

n25	
Spectrum Plot of Measurement Value	
Channel: 376000 / Frequency (MHz): 1882.5MHz	
$\pi/2$ BPSK	QPSK
	
16QAM	64QAM
	
256QAM	
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stabiliity Measurement

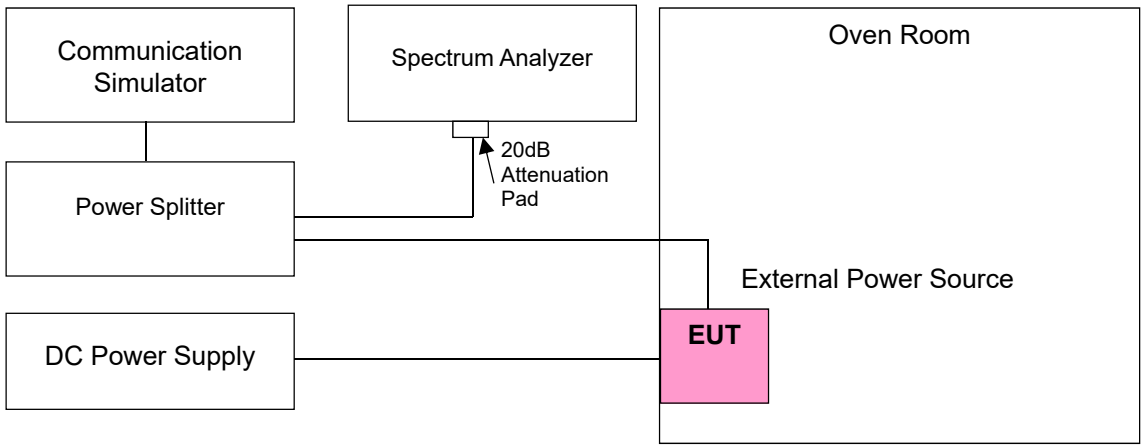
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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. EUT is connected the external power supply to control the DC input power. 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 frequency error from the communication simulator.

4.3.3 Conducted Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Vdc)	n25			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1852.500001	0.001	1912.500000	0.002
3.28	1852.499998	-0.001	1912.500000	-0.002
4.43	1852.499996	-0.002	1912.500000	0.002

Note: The applicant defined the normal working voltage is from 3.28Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (℃)	n25			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.500002	0.001	1912.500000	0.001
-20	1852.499996	-0.002	1912.500000	0.002
-10	1852.500002	0.001	1912.500000	-0.002
0	1852.500002	0.001	1912.500000	0.002
10	1852.500003	0.002	1912.500000	0.001
20	1852.500004	0.002	1912.500000	0.002
30	1852.499997	-0.002	1912.500000	0.002
40	1852.499996	-0.002	1912.500000	0.002
50	1852.499996	-0.002	1912.500000	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	n25			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1855.000004	0.002	1910.000001	0.001
3.28	1854.999997	-0.002	1909.999997	-0.002
4.43	1855.000001	0.001	1910.000001	0.001

Note: The applicant defined the normal working voltage is from 3.28Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (℃)	n25			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1855.000004	0.002	1910.000004	0.002
-20	1854.999998	-0.001	1909.999997	-0.002
-10	1855.000004	0.002	1909.999997	-0.002
0	1855.000001	0.001	1909.999998	-0.001
10	1854.999997	-0.002	1910.000004	0.002
20	1854.999998	-0.001	1910.000002	0.001
30	1855.000001	0.001	1910.000003	0.002
40	1854.999997	-0.002	1910.000001	0.001
50	1855.000004	0.002	1910.000003	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	n25			
	Channel Bandwidth 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1857.500002	0.001	1907.499996	-0.002
3.28	1857.499996	-0.002	1907.500001	0.001
4.43	1857.499996	-0.002	1907.499999	-0.001

Note: The applicant defined the normal working voltage is from 3.28Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (℃)	n25			
	Channel Bandwidth 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1857.500002	0.001	1907.499999	-0.001
-20	1857.499998	-0.001	1907.500004	0.002
-10	1857.499998	-0.001	1907.499999	-0.001
0	1857.500004	0.002	1907.500002	0.001
10	1857.499999	-0.001	1907.499998	-0.001
20	1857.500001	0.001	1907.499998	-0.001
30	1857.499996	-0.002	1907.500001	0.001
40	1857.499998	-0.001	1907.499997	-0.002
50	1857.499999	-0.001	1907.499996	-0.002

Frequency Error vs. Voltage

Voltage (Vdc)	n25			
	Channel Bandwidth 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1859.999998	-0.001	1905.000003	0.002
3.28	1860.000002	0.001	1904.999999	-0.001
4.43	1860.000003	0.002	1905.000002	0.001

Note: The applicant defined the normal working voltage is from 3.28Vdc to 4.43Vdc.

Frequency Error vs. Temperature

Temp. (℃)	n25			
	Channel Bandwidth 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1860.000002	0.001	1904.999996	-0.002
-20	1860.000001	0.001	1904.999996	-0.002
-10	1859.999999	-0.001	1904.999997	-0.002
0	1859.999999	-0.001	1905.000002	0.001
10	1859.999997	-0.002	1904.999999	-0.001
20	1860.000003	0.002	1904.999998	-0.001
30	1860.000004	0.002	1904.999999	-0.001
40	1859.999999	-0.001	1905.000003	0.002
50	1859.999998	-0.001	1905.000001	0.001

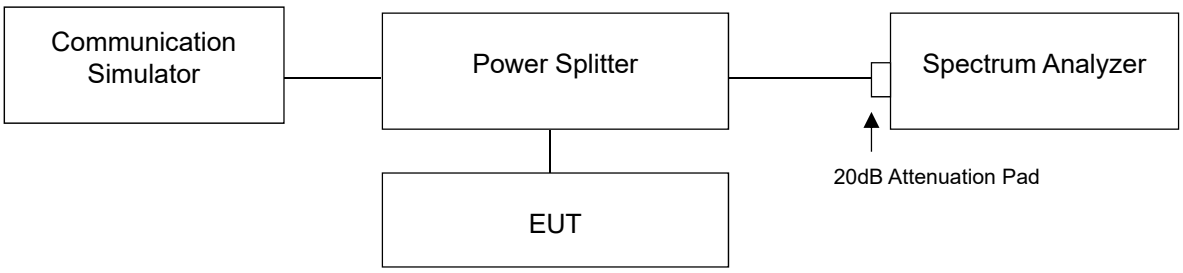
4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Measurement method, please refer to section 5.4.4 of ANSI C63.26. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

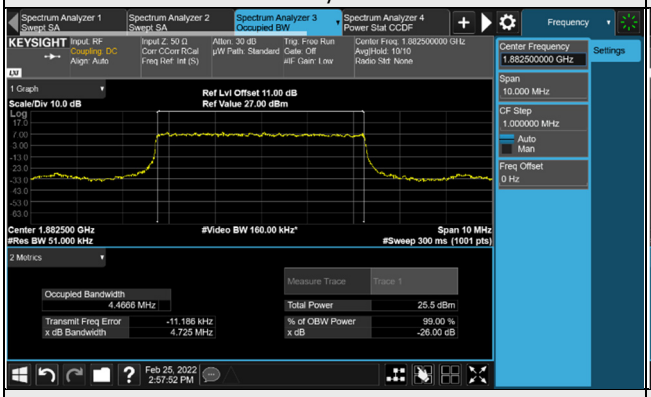
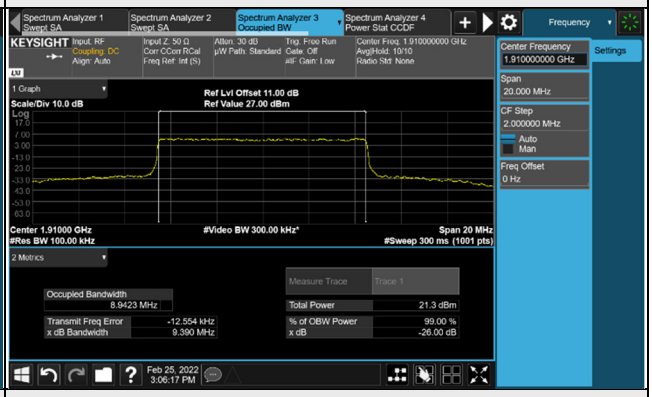
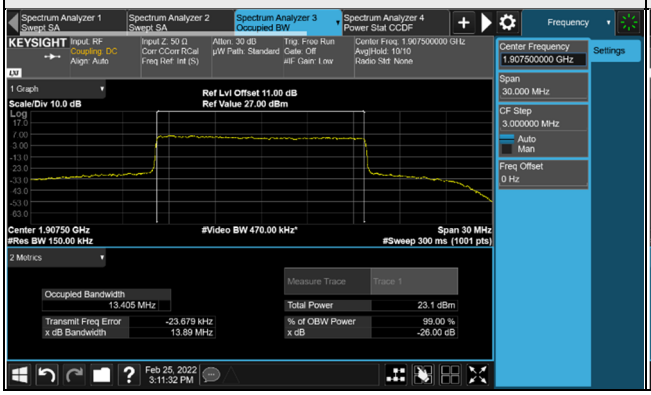
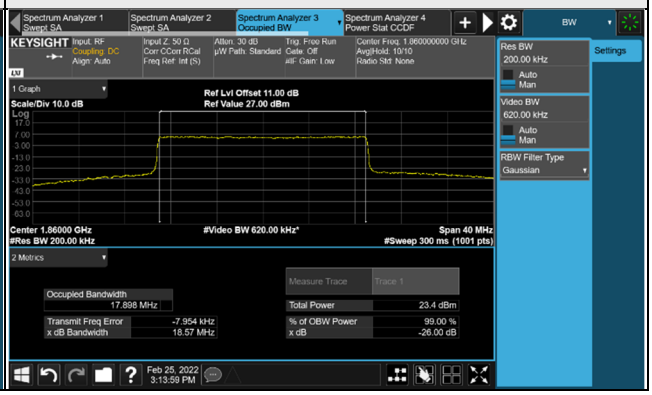
4.4.2 Test Setup



4.4.3 Test Result

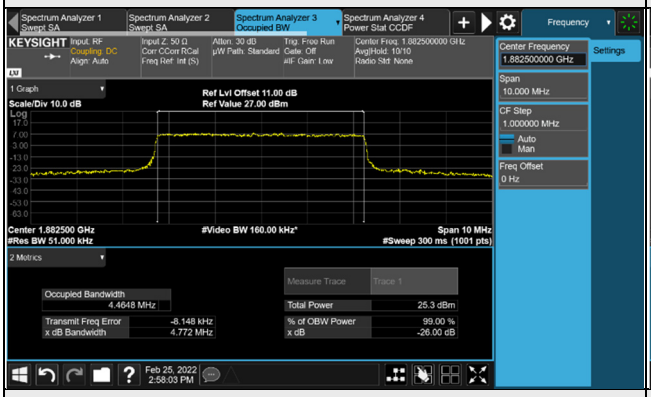
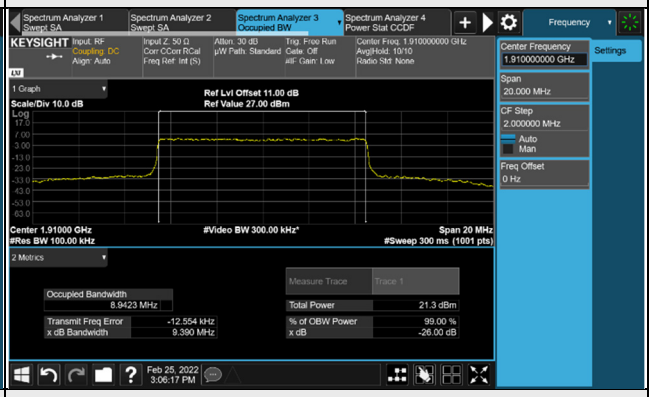
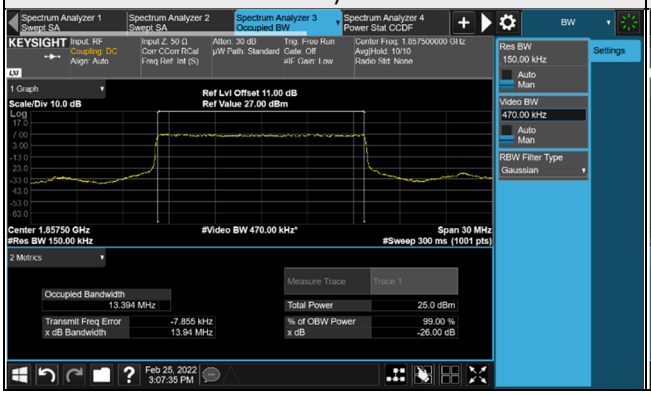
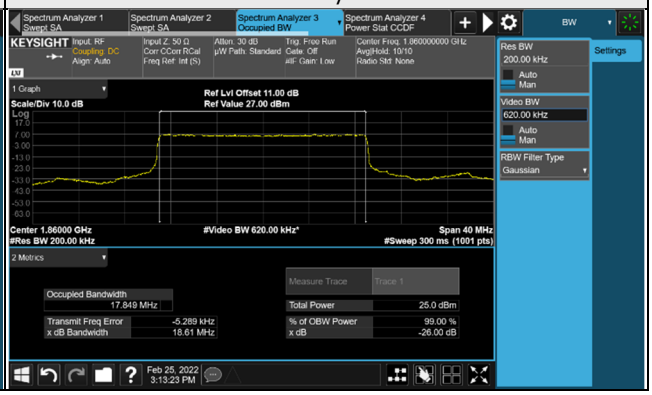
Occupied Bandwidth

n25, Channel Bandwidth: 5MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
370500	1852.5	4.46	4.46	4.46	4.46	4.46
376500	1882.5	4.47	4.46	4.46	4.46	4.46
382500	1912.5	4.46	4.46	4.46	4.46	4.46
n25, Channel Bandwidth: 10MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
371000	1855.0	8.92	8.93	8.92	8.93	8.93
376500	1882.5	8.92	8.93	8.92	8.93	8.93
382000	1910.0	8.93	8.94	8.93	8.94	8.94
n25, Channel Bandwidth: 15MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
371500	1857.5	13.39	13.38	13.39	13.40	13.40
376500	1882.5	13.39	13.38	13.39	13.39	13.39
381500	1907.5	13.40	13.39	13.40	13.41	13.40
n25, Channel Bandwidth: 20MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
372000	1860.0	17.85	17.87	17.90	17.87	17.88
376500	1882.5	17.82	17.84	17.87	17.84	17.85
381000	1905.0	17.81	17.83	17.86	17.83	17.84

Spectrum Plot of Worst Value	
5MHz / $\pi/2$ BPSK	10MHz / 256QAM
	
15MHz / 64QAM	20MHz / 16QAM
	

26dB Bandwidth

n25, Channel Bandwidth: 5MHz						
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
370500	1852.5	4.71	4.73	4.76	4.71	4.72
376500	1882.5	4.73	4.77	4.75	4.70	4.71
382500	1912.5	4.70	4.76	4.75	4.72	4.71
n25, Channel Bandwidth: 10MHz						
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
371000	1855.0	9.29	9.31	9.33	9.36	9.34
376500	1882.5	9.30	9.32	9.35	9.35	9.35
382000	1910.0	9.31	9.33	9.36	9.37	9.39
n25, Channel Bandwidth: 15MHz						
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
371500	1857.5	13.94	13.93	13.90	13.90	13.91
376500	1882.5	13.92	13.92	13.89	13.89	13.91
381500	1907.5	13.92	13.91	13.90	13.89	13.91
n25, Channel Bandwidth: 20MHz						
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
372000	1860.0	18.61	18.57	18.57	18.57	18.57
376500	1882.5	18.56	18.53	18.53	18.53	18.53
381000	1905.0	18.55	18.51	18.52	18.53	18.55

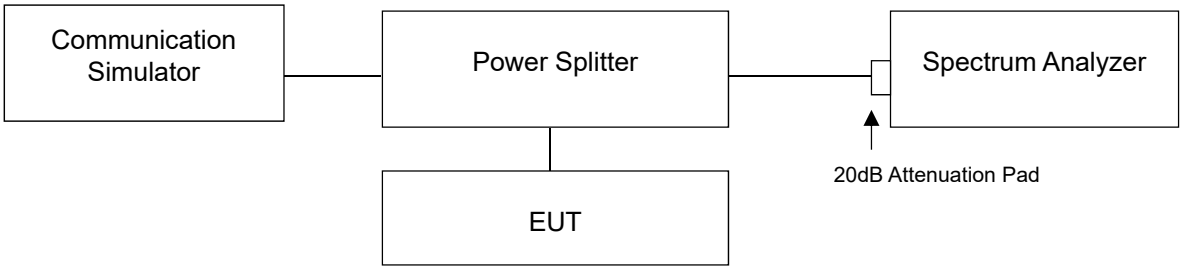
Spectrum Plot of Worst Value	
5MHz / QPSK	10MHz / 256QAM
	
15MHz / $\pi/2$ BPSK	20MHz / $\pi/2$ BPSK
	

4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

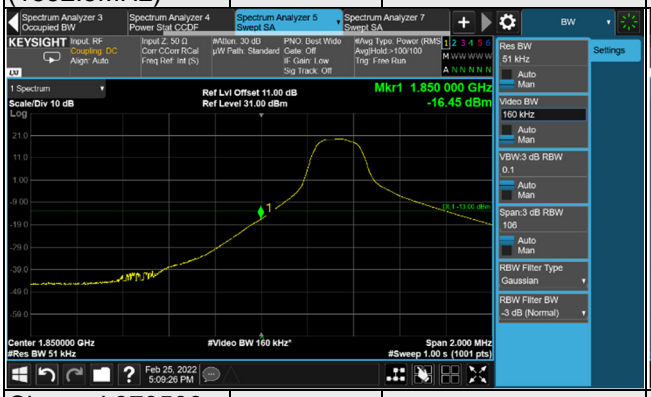
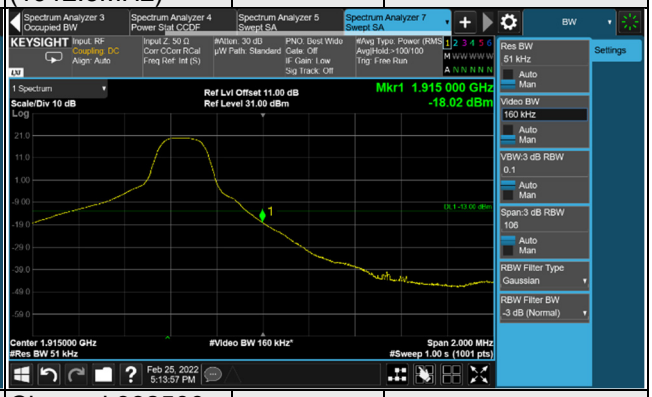
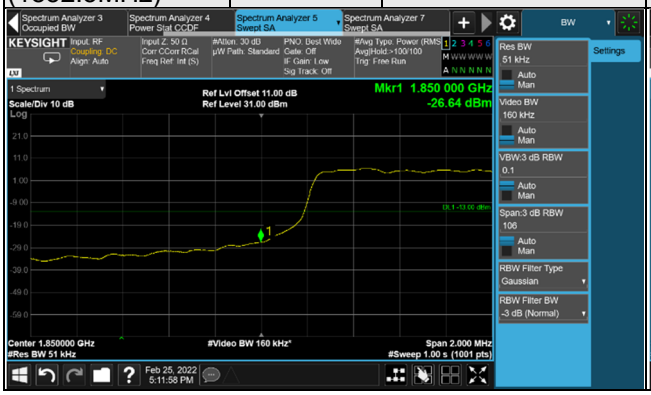
4.5.2 Test Setup

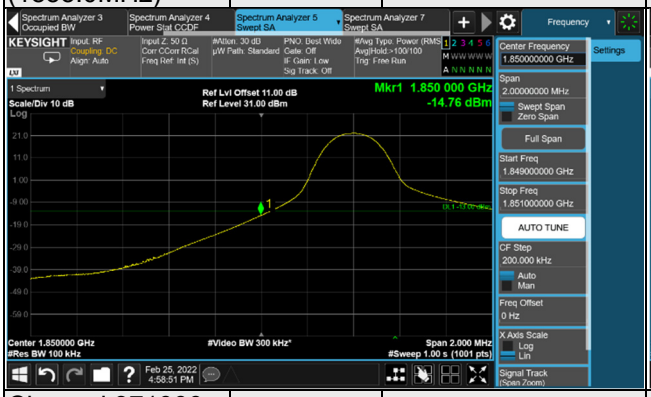
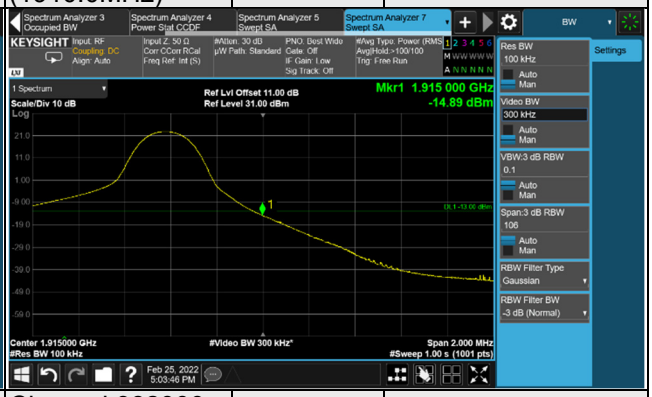
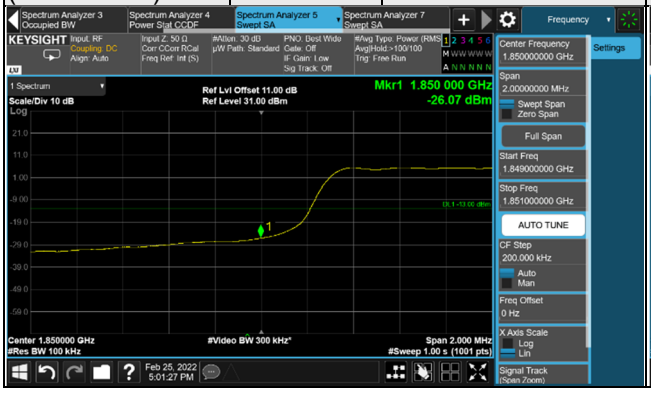


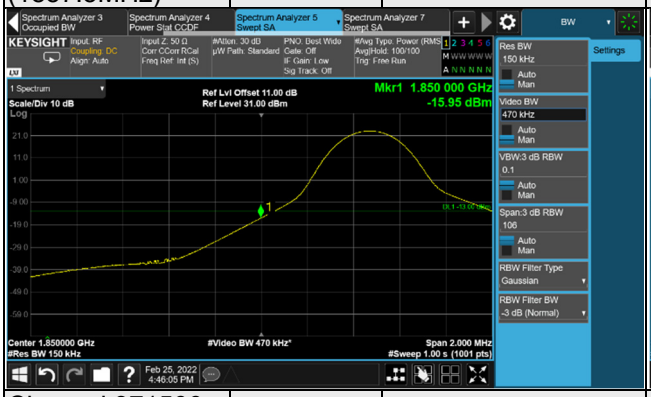
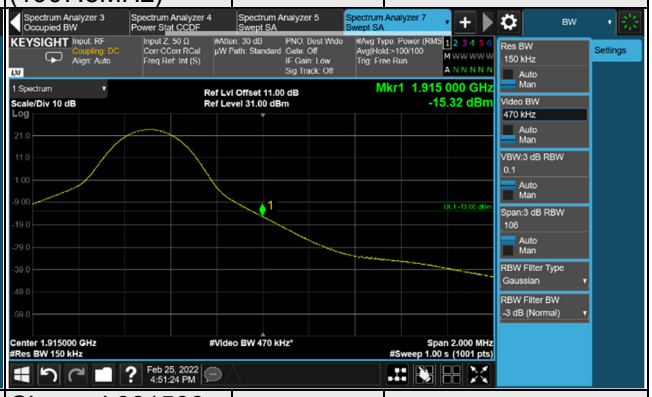
4.5.3 Test Procedures

a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (Channel Bandwidth 5MHz).
c. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (Channel Bandwidth 10MHz).
d. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 150kHz and VB of the spectrum is 470kHz (Channel Bandwidth 15MHz).
e. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 200kHz and VB of the spectrum is 620kHz (Channel Bandwidth 20MHz).
f. Record the max trace plot into the test report.

4.5.4 Test Results

n25, Channel Bandwidth 5MHz					
Channel 370500 (1852.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 382500 (1912.5MHz)	QPSK	1 RB / 24 RB Offset
					
Channel 370500 (1852.5MHz)	QPSK	25 RB / 0 RB Offset	Channel 382500 (1912.5MHz)	QPSK	25 RB / 0 RB Offset
					

n25, Channel Bandwidth 10MHz					
Channel 371000 (1855.0MHz)	QPSK	1 RB / 0 RB Offset	Channel 382000 (1910.0MHz)	QPSK	1 RB / 51 RB Offset
					
Channel 371000 (1855.0MHz)	QPSK	52 RB / 0 RB Offset	Channel 382000 (1910.0MHz)	QPSK	52 RB / 0 RB Offset
					

n25, Channel Bandwidth 15MHz					
Channel 371500 (1857.5MHz)	QPSK	1 RB / 0 RB Offset	Channel 381500 (1907.5MHz)	QPSK	1 RB / 78 RB Offset
					
Channel 371500 (1857.5MHz)	QPSK	79 RB / 0 RB Offset	Channel 381500 (1907.5MHz)	QPSK	79 RB / 0 RB Offset