

## FCC Test Report (Part 27 – SA Mode: n77, n78)

**Report No.:** RFBGDY-WTW-P22120176

**FCC ID:** T8GSAN9000

**Test Model:** SA-N9000 OEM D1

**Received Date:** Dec. 06, 2022

**Test Date:** Jan. 04 ~ Feb. 20, 2023

**Issued Date:** Mar. 28, 2023

**Applicant:** Harman Connected Car Division

**Address:** Parking 3, 85748 Garching Germany

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, Taiwan

**FCC Registration /** 788550 / TW0003

**Designation Number:**



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### Release Control Record

Issue No.	Description	Date Issued
RFBGDY-WTW-P22120176	Original release.	Mar. 28, 2023

## 1 Certificate of Conformity

**Product:** Module

**Brand:** Harman

**Test Model:** SA-N9000 OEM D1

**Sample Status:** Standard Sample

**Applicant:** Harman Connected Car Division

**Test Date:** Jan. 04 ~ Feb. 20, 2023

**Standards:** FCC Part 27, Subpart C, O, Q

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 :** Celine Chou , **Date:** Mar. 28, 2023  
Celine Chou / Senior Specialist

**Approved by :** Jeremy Lin , **Date:** Mar. 28, 2023  
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50 (k)	Equivalent Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement
----	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53(n)	Band Edge / Out of Band Emissions Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(n)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(n)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -22.13dB at 78.50MHz.

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

### 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.44 dB
	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

## 2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 27, 2022	Apr. 26, 2023
Signal Analyzer Agilent	N9010A	MY52220207	Jan. 03, 2023	Jan. 02, 2024
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Pre-amplifier EMCI	EMC001340	980201	Sep. 23, 2022	Sep. 22, 2023
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	Jan. 15, 2022 Jan. 07, 2023	Jan. 14, 2023 Jan. 06, 2024
Preamplifier EMCI	EMC 330H	980112	Oct. 01, 2022	Sep. 30, 2023
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 21, 2022	Oct. 20, 2023
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 01, 2022	Sep. 30, 2023
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 13, 2022	Nov. 12, 2023
Preamplifier EMCI	EMC 012645	980115	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 01, 2022	Sep. 30, 2023
RF FLITER MICRO-TRONICS	BRM50716	058	Jun. 14, 2022	Jun. 13, 2023
RF FLITER MICRO-TRONICS	BRM17690	005	Jun. 14, 2022	Jun. 13, 2023
Pre-Amplifier EMCI	EMC 184045	980116	Oct. 01, 2022	Sep. 30, 2023
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 13, 2022	Nov. 12, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Jul. 09, 2022	Jul. 08, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Jul. 09, 2022	Jul. 08, 2023
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	AT93021705	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller Max-Full	MF-7802	NA	NA	NA
Boresight antenna tower fixture BV	BAF-02	7	NA	NA
UXM 5G Wireless Test Platform Keysight	E7515B	MY60102114	May 20, 2022	May 19, 2023

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 HY - 966 chamber 5.

### 3 General Information

#### 3.1 General Description of EUT

Product	Module			
Brand	Harman			
Test Model	SA-N9000 OEM D1			
Sample Status	Standard Sample			
Power Supply Rating	4.2Vdc			
Modulation Type	$\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM			
Waveform Type	CP-OFDM, DFT-s-OFDM			
Operating Frequency	Part 27O	n78 (Channel Bandwidth 10MHz)	3705.00MHz ~ 3795.00MHz	
		n78 (Channel Bandwidth 15MHz)	3707.52MHz ~ 3792.48MHz	
		n78 (Channel Bandwidth 20MHz)	3710.01MHz ~ 3789.99MHz	
		n78 (Channel Bandwidth 40MHz)	3720.00MHz ~ 3780.00MHz	
		n78 (Channel Bandwidth 50MHz)	3725.01MHz ~ 3774.99MHz	
		n78 (Channel Bandwidth 60MHz)	3730.02MHz ~ 3769.98MHz	
		n78 (Channel Bandwidth 80MHz)	3740.01MHz ~ 3759.99MHz	
		n78 (Channel Bandwidth 90MHz)	3745.02MHz ~ 3754.98MHz	
			n78 (Channel Bandwidth 100MHz)	3750.00MHz
		Part 27Q	n77 (Channel Bandwidth 10MHz)	3455.01MHz ~ 3544.98MHz
			n77 (Channel Bandwidth 15MHz)	3457.50MHz ~ 3542.49MHz
			n77 (Channel Bandwidth 20MHz)	3460.02MHz ~ 3540.00MHz
			n77 (Channel Bandwidth 40MHz)	3470.01MHz ~ 3529.98MHz
			n77 (Channel Bandwidth 50MHz)	3475.02MHz ~ 3525.00MHz
			n77 (Channel Bandwidth 60MHz)	3480.00MHz ~ 3519.99MHz
			n77 (Channel Bandwidth 80MHz)	3490.02MHz ~ 3510.00MHz
			n77 (Channel Bandwidth 90MHz)	3495.00MHz ~ 3504.99MHz
			n77 (Channel Bandwidth 100MHz)	3500.01MHz
			n78 (Channel Bandwidth 10MHz)	3455.01MHz ~ 3544.98MHz
			n78 (Channel Bandwidth 15MHz)	3457.50MHz ~ 3542.49MHz
			n78 (Channel Bandwidth 20MHz)	3460.02MHz ~ 3540.00MHz
			n78 (Channel Bandwidth 40MHz)	3470.01MHz ~ 3529.98MHz
			n78 (Channel Bandwidth 50MHz)	3475.02MHz ~ 3525.00MHz
			n78 (Channel Bandwidth 60MHz)	3480.00MHz ~ 3519.99MHz
			n78 (Channel Bandwidth 80MHz)	3490.02MHz ~ 3510.00MHz
			n78 (Channel Bandwidth 90MHz)	3495.00MHz ~ 3504.99MHz
	n78 (Channel Bandwidth 100MHz)		3500.01MHz	



Max. EIRP Power	Part 27Q		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
		n77 (Channel Bandwidth 10MHz)	358.922mW (25.55dBm)	353.997mW (25.49dBm)	309.030mW (24.90dBm)	218.776mW (23.40dBm)	86.099mW (19.35dBm)
		n77 (Channel Bandwidth 15MHz)	359.749mW (25.56dBm)	350.752mW (25.45dBm)	301.301mW (24.79dBm)	220.800mW (23.44dBm)	86.497mW (19.37dBm)
		n77 (Channel Bandwidth 20MHz)	361.410mW (25.58dBm)	355.631mW (25.51dBm)	308.319mW (24.89dBm)	217.771mW (23.38dBm)	85.901mW (19.34dBm)
		n77 (Channel Bandwidth 40MHz)	357.273mW (25.53dBm)	353.997mW (25.49dBm)	306.902mW (24.87dBm)	216.770mW (23.36dBm)	87.297mW (19.41dBm)
		n77 (Channel Bandwidth 50MHz)	358.922mW (25.55dBm)	356.451mW (25.52dBm)	305.492mW (24.85dBm)	219.786mW (23.42dBm)	86.298mW (19.36dBm)
		n77 (Channel Bandwidth 60MHz)	358.922mW (25.55dBm)	350.752mW (25.45dBm)	304.789mW (24.84dBm)	215.278mW (23.33dBm)	87.096mW (19.40dBm)
		n77 (Channel Bandwidth 80MHz)	359.749mW (25.56dBm)	353.997mW (25.49dBm)	303.389mW (24.82dBm)	221.820mW (23.46dBm)	87.498mW (19.42dBm)
		n77 (Channel Bandwidth 90MHz)	360.579mW (25.57dBm)	358.922mW (25.55dBm)	308.319mW (24.89dBm)	220.800mW (23.44dBm)	87.700mW (19.43dBm)
		n77 (Channel Bandwidth 100MHz)	363.078mW (25.60dBm)	358.096mW (25.54dBm)	309.030mW (24.90dBm)	206.538mW (23.15dBm)	86.497mW (19.37dBm)
Emission Designator	Part 27Q		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
		n77 (Channel Bandwidth 10MHz)	8M61G7D	8M60G7D	8M61D7W	8M61D7W	8M61D7W
		n77 (Channel Bandwidth 15MHz)	13M5G7D	13M6G7D	13M6D7W	13M6D7W	13M6D7W
		n77 (Channel Bandwidth 20MHz)	18M2G7D	18M3G7D	18M3D7W	18M3D7W	18M3D7W
		n77 (Channel Bandwidth 40MHz)	37M7G7D	37M9G7D	37M9D7W	37M9D7W	37M9D7W
		n77 (Channel Bandwidth 50MHz)	47M2G7D	47M5G7D	47M5D7W	47M5D7W	47M5D7W
		n77 (Channel Bandwidth 60MHz)	57M9G7D	57M9G7D	57M9D7W	57M9D7W	57M9D7W
		n77 (Channel Bandwidth 80MHz)	77M2G7D	77M5G7D	77M5D7W	77M5D7W	77M5D7W
		n77 (Channel Bandwidth 90MHz)	86M9G7D	87M5G7D	87M5D7W	87M5D7W	87M5D7W
n77 (Channel Bandwidth 100MHz)	96M9G7D	97M3G7D	97M3D7W	97M4D7W	97M3D7W		
Antenna Type	Refer to note						
Antenna Connector	Refer to note						
Accessory Device	NA						
Cable Supplied	NA						

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RF200514C16A-2) are adding n77 (3450-3550MHz) and n78 (3450-3550MHz and 3700-3800MHz) bands.
2. The antenna information is listed as below.

Operating frequency band	Antenna	Gain (dBi)	Connector Type
Band 2	5G/4G Terminal Mount Monopole Antenna	2.92	SMA
Band 5		1.01	
Band 7		2.20	
Band 12		-1.17	
Band 25		2.97	
Band 38		2.18	
Band 41		2.20	
Band 66		3.44	
Band 71		1.72	
Band 77, 78		2.61	

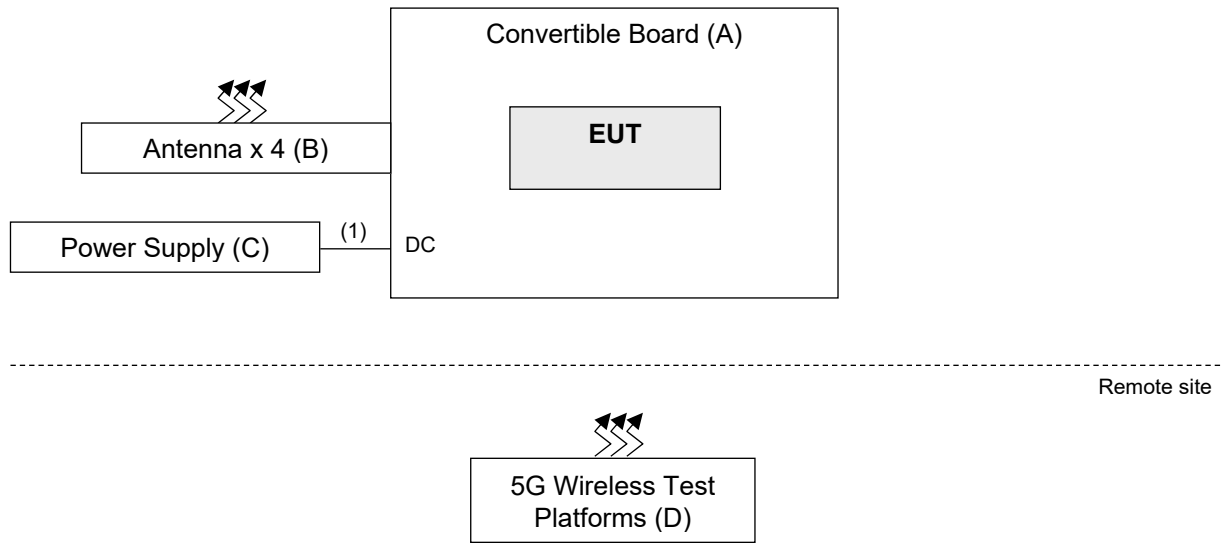
- \* The EUT only support 1TX function.
- \* PRX antenna is primary RX & TX 2G, 3G 4G function and diversity RX 5G function.  
DRX antenna is primary RX & TX 5G function and diversity RX 2G, 3G 4G function.  
The rest of the antennas are non-functional.
- \* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3. The EUT supports the following ENDC configuration.

	FCC 5G FR1			ENDC
	Band	SCS	Bandwidth (MHz)	
5G NR	n5	15kHz	5/10/15/20	Band 2/66
	n41	30kHz	10/15/20/40/50/60/80/90/100	Band 26
	n66	15kHz	5/10/15/20/40	Band 5/12
	n71	15kHz	5/10/15/20	Band 2/66
	n77, n78	30kHz	10/15/20/40/50/60/80/90/100	Band 2/5/7/38/41/66

4. 5G NR n78 has the same RF characteristic and power setting as 5G NR n77.
5. 5G NR n78 (3450-3550MHz) overlaps the entire frequency range of 5G NR n77 (3450-3550MHz). Therefore, test data provided in this report covers 5G NR n78 as well as 5G NR n77.
6. 5G NR n78 (3700-3800MHz) overlaps the entire frequency range of 5G NR n77 (3700-3980MHz). Therefore, test data provided in original test report (Report No.: RF200514C16A-2) covers 5G NR n78 as well as 5G NR n77.

### 3.2 Configuration of System under Test



#### 3.2.1 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Convertible Board	NA	NA	NA	NA	Provided by client
B.	Antenna x 4	TAOGLAS	TG.55.8113	NA	NA	Provided by client
C.	DC Power supply	TECPEL	GPS-3030DD	GEO855739	NA	-
D.	5G Wireless Test Platforms	Keysight	E7515B	MY60102114	NA	-

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1	N	0	-

### 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 on Z-plane for antenna. Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	EIRP	630334 to 636332	630334 (3455.01MHz), 633334 (3500.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		630500 to 636166	630500 (3457.50MHz), 633334 (3500.01MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		630668 to 636000	630668 (3460.02MHz), 633334 (3500.01MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		631334 to 635332	631334 (3470.01MHz), 633334 (3500.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		631668 to 635000	631668 (3475.02MHz), 633334 (3500.01MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		632000 to 634666	632000 (3480.00MHz), 633334 (3500.01MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		632668 to 634000	632668 (3490.02MHz), 633334 (3500.01MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		633000 to 633666	633000 (3495.00MHz), 633334 (3500.01MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 Half Full
-	Modulation Characteristics	633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Frequency Stability	630334 to 636332	630334 (3455.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK	Full
		630500 to 636166	630500 (3457.50MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK	Full
		630668 to 636000	630668 (3460.02MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK	Full
		631334 to 635332	631334 (3470.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK	Full
		631668 to 635000	631668 (3475.02MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK	Full
		632000 to 634666	632000 (3480.00MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK	Full
		632668 to 634000	632668 (3490.02MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK	Full
		633000 to 633666	633000 (3495.00MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK	Full
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK	Full
-	Emission Bandwidth	630334 to 636332	630334 (3455.01MHz), 633334 (3500.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		630500 to 636166	630500 (3457.50MHz), 633334 (3500.01MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		630668 to 636000	630668 (3460.02MHz), 633334 (3500.01MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		631334 to 635332	631334 (3470.01MHz), 633334 (3500.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		631668 to 635000	631668 (3475.02MHz), 633334 (3500.01MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		632000 to 634666	632000 (3480.00MHz), 633334 (3500.01MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		632668 to 634000	632668 (3490.02MHz), 633334 (3500.01MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		633000 to 633666	633000 (3495.00MHz), 633334 (3500.01MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	Full

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
--	Band Edge	630334 to 636332	630334 (3455.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK	1 Half Full
		630500 to 636166	630500 (3457.50MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK	1 Half Full
		630668 to 636000	630668 (3460.02MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK	1 Half Full
		631334 to 635332	631334 (3470.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK	1 Half Full
		631668 to 635000	631668 (3475.02MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK	1 Half Full
		632000 to 634666	632000 (3480.00MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK	1 Half Full
		632668 to 634000	632668 (3490.02MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK	1 Half Full
		633000 to 633666	633000 (3495.00MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK	1 Half Full
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK	1 Half Full

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Peak to Average Ratio	630334 to 636332	630334 (3455.01MHz), 633334 (3500.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		630500 to 636166	630500 (3457.50MHz), 633334 (3500.01MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		630668 to 636000	630668 (3460.02MHz), 633334 (3500.01MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		631334 to 635332	631334 (3470.01MHz), 633334 (3500.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		631668 to 635000	631668 (3475.02MHz), 633334 (3500.01MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		632000 to 634666	632000 (3480.00MHz), 633334 (3500.01MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		632668 to 634000	632668 (3490.02MHz), 633334 (3500.01MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		633000 to 633666	633000 (3495.00MHz), 633334 (3500.01MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1
-	Conducted Emission	630334 to 636332	630334 (3455.01MHz), 633334 (3500.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK	1
		630500 to 636166	630500 (3457.50MHz), 633334 (3500.01MHz), 636166 (3542.49MHz)	15MHz	$\pi/2$ BPSK	1
		630668 to 636000	630668 (3460.02MHz), 633334 (3500.01MHz), 636000 (3540.00MHz)	20MHz	$\pi/2$ BPSK	1
		631334 to 635332	631334 (3470.01MHz), 633334 (3500.01MHz), 635332 (3529.98MHz)	40MHz	$\pi/2$ BPSK	1
		631668 to 635000	631668 (3475.02MHz), 633334 (3500.01MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK	1
		632000 to 634666	632000 (3480.00MHz), 633334 (3500.01MHz), 634666 (3519.99MHz)	60MHz	$\pi/2$ BPSK	1
		632668 to 634000	632668 (3490.02MHz), 633334 (3500.01MHz), 634000 (3510.00MHz)	80MHz	$\pi/2$ BPSK	1
		633000 to 633666	633000 (3495.00MHz), 633334 (3500.01MHz), 633666 (3504.99MHz)	90MHz	$\pi/2$ BPSK	1
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK	1

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission Below 1GHz	630334 to 636332	636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK	1
-	Radiated Emission Above 1GHz	630334 to 636332	630334 (3455.01MHz), 633334 (3500.01MHz), 636332 (3544.98MHz)	10MHz	$\pi/2$ BPSK	1
		631668 to 635000	631668 (3475.02MHz), 633334 (3500.01MHz), 635000 (3525.00MHz)	50MHz	$\pi/2$ BPSK	1
		633334	633334 (3500.01MHz)	100MHz	$\pi/2$ BPSK	1

**Note:**

1. 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 worst mode according to the maximum output power.
2. For radiated emission above 1GHz, according to 3GPP 38.521-1 Section 6.5.3.1.4, choose the lowest, mid and highest channel bandwidth for final test.
3. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25deg. C, 60%RH	4.2Vdc	James Yang
Modulation Characteristics	25deg. C, 60%RH	4.2Vdc	James Yang
Frequency Stability	25deg. C, 60%RH	4.2Vdc	James Yang
Occupied Bandwidth	25deg. C, 60%RH	4.2Vdc	James Yang
Band Edge	25deg. C, 60%RH	4.2Vdc	James Yang
Peak To Average Ratio	25deg. C, 60%RH	4.2Vdc	James Yang
Conducted Emission	25deg. C, 60%RH	4.2Vdc	James Yang
Radiated Emission	22deg. C, 70%RH 24deg. C, 78%RH	120Vac, 60Hz (System)	Thomas Cheng Vincent Chen



### **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 and References:

#### **Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

**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 devices transmitting in the 3450-3550 MHz band are limited to 1Watt (30 dBm) EIRP. Mobile devices operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

#### 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 (Built-in power meter). 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:

$$\text{EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

$$\text{ERP} = P_{\text{Meas}} + G_{\text{T}} - 2.15$$

where

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

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

$G_{\text{T}}$  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 77 (SCS 30kHz)				
BW	MCS Index	RB Size	RB Offset	Mid
		Channel		633334
		Frequency (MHz)		3500.01
100M	pi/2 BPSK	1	1	22.99
		1	137	22.95
		1	271	22.05
		135	0	22.31
		135	69	22.86
		135	138	22.37
		270	0	22.30
	QPSK	1	1	22.93
		1	137	22.83
		1	271	21.55
		135	0	21.77
		135	69	22.90
		135	138	21.88
		270	0	21.76
	16QAM	1	1	22.09
		1	137	22.29
		1	271	21.01
		135	0	20.85
		135	69	21.93
		135	138	20.86
		270	0	20.78
	64QAM	1	1	20.54
		1	137	20.41
		1	271	20.11
		135	0	20.35
		135	69	20.44
		135	138	20.38
		270	0	20.26
256QAM	1	1	16.76	
	1	137	16.53	
	1	271	16.15	
	135	0	16.23	
	135	69	16.34	
	135	138	16.29	
	270	0	16.28	

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		633000	633334	633666
		Frequency (MHz)		3495	3500.01	3504.99
90M	pi/2 BPSK	1	1	22.90	22.96	22.93
		1	123	22.86	22.94	22.89
		1	243	22.68	22.69	22.77
		120	0	22.40	22.35	22.28
		120	63	22.88	22.94	22.94
		120	125	22.45	22.44	22.38
		243	0	22.26	22.32	22.42
	QPSK	1	1	22.88	22.85	22.82
		1	123	22.81	22.83	22.79
		1	243	22.71	22.72	22.67
		120	0	21.89	21.88	21.76
		120	63	22.94	22.93	22.91
		120	125	21.91	21.95	21.88
		243	0	21.84	21.89	21.93
	16QAM	1	1	22.28	22.25	22.16
		1	123	22.07	22.17	21.93
		1	243	21.89	21.71	21.92
		120	0	20.90	20.87	20.78
		120	63	21.87	21.94	21.99
		120	125	20.92	20.94	20.90
		243	0	20.78	20.83	20.94
	64QAM	1	1	20.76	20.83	20.62
		1	123	20.56	20.65	20.57
		1	243	20.40	20.47	20.31
		120	0	20.32	20.40	20.29
		120	63	20.41	20.48	20.47
		120	125	20.46	20.48	20.39
		243	0	20.26	20.33	20.45
	256QAM	1	1	16.73	16.82	16.78
		1	123	16.56	16.42	16.60
1		243	16.38	16.36	16.53	
120		0	16.36	16.27	16.20	
120		63	16.37	16.40	16.51	
120		125	16.35	16.37	16.38	
243		0	16.35	16.28	16.41	

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		632668	633334	634000
		Frequency (MHz)		3490.02	3500.01	3510
80M	pi/2 BPSK	1	1	22.86	22.85	22.95
		1	109	22.88	22.94	22.84
		1	215	22.58	22.68	22.69
		108	0	22.38	22.27	22.25
		108	55	22.84	22.85	22.87
		108	109	22.40	22.38	22.39
		216	0	22.21	22.34	22.43
	QPSK	1	1	22.80	22.75	22.74
		1	109	22.82	22.79	22.72
		1	215	22.68	22.64	22.68
		108	0	21.81	21.81	21.75
		108	55	22.83	22.85	22.88
		108	109	21.93	21.90	21.77
		216	0	21.86	21.89	21.83
	16QAM	1	1	22.17	22.21	22.08
		1	109	22.07	22.12	21.85
		1	215	21.87	21.71	21.82
		108	0	20.86	20.86	20.80
		108	55	21.85	21.85	21.94
		108	109	20.91	20.88	20.80
		216	0	20.78	20.83	20.96
	64QAM	1	1	20.73	20.85	20.55
		1	109	20.49	20.55	20.49
		1	215	20.42	20.49	20.33
		108	0	20.29	20.29	20.30
		108	55	20.40	20.41	20.43
		108	109	20.46	20.42	20.41
		216	0	20.24	20.35	20.45
	256QAM	1	1	16.69	16.81	16.68
		1	109	16.53	16.32	16.53
		1	215	16.36	16.37	16.52
		108	0	16.28	16.29	16.19
		108	55	16.28	16.29	16.50
		108	109	16.37	16.36	16.38
		216	0	16.36	16.23	16.40

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		632000	633334	634666
		Frequency (MHz)		3480	3500.01	3519.99
60M	pi/2 BPSK	1	1	22.81	22.94	22.91
		1	81	22.84	22.92	22.83
		1	160	22.61	22.65	22.73
		81	0	22.30	22.26	22.27
		81	41	22.81	22.88	22.85
		81	81	22.40	22.38	22.33
		162	0	22.25	22.23	22.36
	QPSK	1	1	22.81	22.78	22.81
		1	81	22.76	22.81	22.68
		1	160	22.61	22.69	22.56
		81	0	21.91	21.78	21.65
		81	41	22.84	22.82	22.80
		81	81	21.93	21.84	21.78
		162	0	21.82	21.87	21.93
	16QAM	1	1	22.23	22.22	22.17
		1	81	22.00	22.19	21.82
		1	160	21.83	21.69	21.83
		81	0	20.84	20.76	20.72
		81	41	21.87	21.94	21.89
		81	81	20.88	20.90	20.86
		162	0	20.79	20.74	20.93
	64QAM	1	1	20.69	20.72	20.52
		1	81	20.52	20.62	20.48
		1	160	20.30	20.42	20.32
		81	0	20.24	20.39	20.20
		81	41	20.31	20.38	20.38
		81	81	20.38	20.48	20.34
		162	0	20.20	20.23	20.47
	256QAM	1	1	16.73	16.76	16.79
		1	81	16.46	16.37	16.62
		1	160	16.33	16.37	16.42
		81	0	16.35	16.25	16.17
		81	41	16.38	16.40	16.44
		81	81	16.27	16.33	16.39
		162	0	16.27	16.27	16.30

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		631668	633334	635000
		Frequency (MHz)		3475.02	3500.01	3525
50M	pi/2 BPSK	1	1	22.82	22.90	22.84
		1	67	22.80	22.83	22.78
		1	131	22.57	22.66	22.78
		64	0	22.34	22.28	22.27
		64	35	22.89	22.92	22.94
		64	69	22.43	22.41	22.32
		128	0	22.24	22.34	22.38
	QPSK	1	1	22.84	22.86	22.75
		1	67	22.72	22.73	22.80
		1	131	22.66	22.62	22.56
		64	0	21.88	21.85	21.77
		64	35	22.83	22.89	22.91
		64	69	21.93	21.94	21.88
		128	0	21.81	21.81	21.92
	16QAM	1	1	22.24	22.14	22.16
		1	67	22.09	22.19	21.84
		1	131	21.86	21.63	21.87
		64	0	20.87	20.81	20.77
		64	35	21.81	21.90	21.97
		64	69	20.88	20.96	20.82
		128	0	20.69	20.81	20.94
	64QAM	1	1	20.72	20.81	20.56
		1	67	20.55	20.56	20.53
		1	131	20.41	20.44	20.24
		64	0	20.26	20.40	20.31
		64	35	20.31	20.46	20.49
		64	69	20.41	20.49	20.29
		128	0	20.26	20.27	20.44
	256QAM	1	1	16.71	16.75	16.67
		1	67	16.53	16.41	16.59
1		131	16.28	16.32	16.50	
64		0	16.27	16.17	16.20	
64		35	16.26	16.32	16.51	
64		69	16.26	16.39	16.33	
128		0	16.35	16.18	16.40	

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		631334	633334	635332
		Frequency (MHz)		3470.01	3500.01	3529.98
40M	pi/2 BPSK	1	1	22.91	22.92	22.89
		1	53	22.80	22.87	22.84
		1	104	22.67	22.63	22.75
		50	0	22.41	22.30	22.25
		50	28	22.85	22.87	22.92
		50	56	22.41	22.42	22.37
		100	0	22.19	22.34	22.37
	QPSK	1	1	22.79	22.82	22.81
		1	53	22.83	22.79	22.71
		1	104	22.70	22.74	22.58
		50	0	21.81	21.88	21.71
		50	28	22.84	22.86	22.88
		50	56	21.92	21.87	21.88
		100	0	21.83	21.83	21.90
	16QAM	1	1	22.21	22.26	22.11
		1	53	21.98	22.06	21.82
		1	104	21.91	21.66	21.88
		50	0	20.79	20.76	20.76
		50	28	21.84	21.84	21.88
		50	56	20.89	20.92	20.88
		100	0	20.76	20.72	20.96
	64QAM	1	1	20.67	20.75	20.63
		1	53	20.49	20.60	20.55
		1	104	20.37	20.39	20.21
		50	0	20.25	20.40	20.26
		50	28	20.41	20.49	20.37
		50	56	20.43	20.50	20.36
		100	0	20.27	20.28	20.34
	256QAM	1	1	16.73	16.77	16.80
		1	53	16.47	16.43	16.61
1		104	16.28	16.34	16.50	
50		0	16.26	16.26	16.19	
50		28	16.29	16.39	16.41	
50		56	16.35	16.36	16.30	
100		0	16.25	16.20	16.43	



NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630668	633334	636000
		Frequency (MHz)		3460.02	3500.01	3540
20M	pi/2 BPSK	1	1	22.89	22.97	22.90
		1	26	22.86	22.88	22.90
		1	49	22.66	22.66	22.78
		25	0	22.31	22.28	22.26
		25	13	22.90	22.96	22.87
		25	26	22.47	22.37	22.34
		50	0	22.20	22.22	22.34
	QPSK	1	1	22.90	22.78	22.72
		1	26	22.77	22.74	22.75
		1	49	22.66	22.72	22.58
		25	0	21.80	21.78	21.68
		25	13	22.84	22.89	22.89
		25	26	21.80	21.90	21.79
		50	0	21.86	21.85	21.83
	16QAM	1	1	22.28	22.19	22.09
		1	26	22.08	22.08	21.92
		1	49	21.78	21.62	21.83
		25	0	20.85	20.80	20.73
		25	13	21.89	21.84	21.99
		25	26	20.87	20.92	20.80
		50	0	20.69	20.84	20.94
	64QAM	1	1	20.68	20.77	20.56
		1	26	20.55	20.54	20.56
		1	49	20.34	20.46	20.30
		25	0	20.25	20.34	20.22
		25	13	20.43	20.43	20.46
		25	26	20.41	20.46	20.33
		50	0	20.26	20.34	20.43
	256QAM	1	1	16.70	16.73	16.73
		1	26	16.56	16.33	16.52
1		49	16.34	16.33	16.53	
25		0	16.34	16.26	16.18	
25		13	16.38	16.37	16.48	
25		26	16.28	16.38	16.27	
50		0	16.32	16.30	16.42	

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630500	633334	636166
		Frequency (MHz)		3457.5	3500.01	3542.49
15M	pi/2 BPSK	1	1	22.84	22.93	22.88
		1	19	22.88	22.95	22.83
		1	36	22.68	22.61	22.76
		18	0	22.35	22.25	22.20
		18	10	22.78	22.86	22.88
		18	20	22.46	22.46	22.35
		36	0	22.27	22.30	22.40
	QPSK	1	1	22.82	22.83	22.78
		1	19	22.74	22.79	22.70
		1	36	22.64	22.65	22.60
		18	0	21.78	21.88	21.72
		18	10	22.83	22.83	22.84
		18	20	21.88	21.91	21.82
		36	0	21.82	21.84	21.85
	16QAM	1	1	22.17	22.18	22.12
		1	19	21.99	22.13	21.85
		1	36	21.91	21.71	21.81
		18	0	20.85	20.80	20.68
		18	10	21.80	21.85	21.97
		18	20	20.92	20.93	20.87
		36	0	20.71	20.72	20.84
	64QAM	1	1	20.69	20.83	20.60
		1	19	20.50	20.62	20.53
		1	36	20.41	20.45	20.25
		18	0	20.25	20.30	20.20
		18	10	20.41	20.37	20.36
		18	20	20.47	20.50	20.41
		36	0	20.15	20.30	20.38
	256QAM	1	1	16.69	16.76	16.67
		1	19	16.58	16.31	16.59
1		36	16.28	16.29	16.43	
18		0	16.25	16.24	16.12	
18		10	16.35	16.33	16.44	
18		20	16.37	16.29	16.27	
36		0	16.24	16.23	16.39	

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630334	633334	636332
		Frequency (MHz)		3455.01	3500.01	3544.98
10M	pi/2 BPSK	1	1	22.83	22.89	22.94
		1	11	22.77	22.91	22.90
		1	22	22.60	22.63	22.79
		12	0	22.41	22.25	22.21
		12	6	22.79	22.88	22.84
		12	12	22.47	22.34	22.35
		24	0	22.28	22.29	22.43
	QPSK	1	1	22.81	22.83	22.74
		1	11	22.76	22.84	22.77
		1	22	22.62	22.72	22.68
		12	0	21.83	21.77	21.76
		12	6	22.88	22.88	22.80
		12	12	21.93	21.93	21.88
		24	0	21.75	21.81	21.83
	16QAM	1	1	22.29	22.24	22.05
		1	11	21.99	22.18	21.84
		1	22	21.91	21.61	21.88
		12	0	20.81	20.85	20.80
		12	6	21.79	21.83	21.91
		12	12	20.87	20.90	20.84
		24	0	20.75	20.74	20.89
	64QAM	1	1	20.74	20.79	20.59
		1	11	20.45	20.57	20.47
		1	22	20.40	20.40	20.28
		12	0	20.26	20.31	20.27
		12	6	20.30	20.44	20.39
		12	12	20.41	20.44	20.29
		24	0	20.17	20.34	20.43
	256QAM	1	1	16.72	16.74	16.67
		1	11	16.57	16.42	16.57
1		22	16.30	16.29	16.44	
12		0	16.33	16.29	16.13	
12		6	16.28	16.39	16.50	
12		12	16.31	16.30	16.40	
24		0	16.26	16.24	16.37	

**EIRP Power (dBm)**

NR Band 77 (SCS 30kHz)				
BW	MCS Index	RB Size	RB Offset	Mid
		Channel		633334
		Frequency (MHz)		3500.01
100M	pi/2 BPSK	1	1	25.60
		1	137	25.56
		1	271	24.66
		135	0	24.92
		135	69	25.47
		135	138	24.98
		270	0	24.91
	QPSK	1	1	25.54
		1	137	25.44
		1	271	24.16
		135	0	24.38
		135	69	25.51
		135	138	24.49
		270	0	24.37
	16QAM	1	1	24.70
		1	137	24.90
		1	271	23.62
		135	0	23.46
		135	69	24.54
		135	138	23.47
		270	0	23.39
	64QAM	1	1	23.15
		1	137	23.02
		1	271	22.72
		135	0	22.96
		135	69	23.05
		135	138	22.99
		270	0	22.87
	256QAM	1	1	19.37
		1	137	19.14
		1	271	18.76
		135	0	18.84
135		69	18.95	
135		138	18.90	
270		0	18.89	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		633000	633334	633666
		Frequency (MHz)		3495	3500.01	3504.99
90M	pi/2 BPSK	1	1	25.51	25.57	25.54
		1	123	25.47	25.55	25.50
		1	243	25.29	25.30	25.38
		120	0	25.01	24.96	24.89
		120	63	25.49	25.55	25.55
		120	125	25.06	25.05	24.99
		243	0	24.87	24.93	25.03
	QPSK	1	1	25.49	25.46	25.43
		1	123	25.42	25.44	25.40
		1	243	25.32	25.33	25.28
		120	0	24.50	24.49	24.37
		120	63	25.55	25.54	25.52
		120	125	24.52	24.56	24.49
		243	0	24.45	24.50	24.54
	16QAM	1	1	24.89	24.86	24.77
		1	123	24.68	24.78	24.54
		1	243	24.50	24.32	24.53
		120	0	23.51	23.48	23.39
		120	63	24.48	24.55	24.60
		120	125	23.53	23.55	23.51
		243	0	23.39	23.44	23.55
	64QAM	1	1	23.37	23.44	23.23
		1	123	23.17	23.26	23.18
		1	243	23.01	23.08	22.92
		120	0	22.93	23.01	22.90
		120	63	23.02	23.09	23.08
		120	125	23.07	23.09	23.00
		243	0	22.87	22.94	23.06
	256QAM	1	1	19.34	19.43	19.39
		1	123	19.17	19.03	19.21
1		243	18.99	18.97	19.14	
120		0	18.97	18.88	18.81	
120		63	18.98	19.01	19.12	
120		125	18.96	18.98	18.99	
243		0	18.96	18.89	19.02	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		632668	633334	634000
		Frequency (MHz)		3490.02	3500.01	3510
80M	pi/2 BPSK	1	1	25.47	25.46	25.56
		1	109	25.49	25.55	25.45
		1	215	25.19	25.29	25.30
		108	0	24.99	24.88	24.86
		108	55	25.45	25.46	25.48
		108	109	25.01	24.99	25.00
		216	0	24.82	24.95	25.04
	QPSK	1	1	25.41	25.36	25.35
		1	109	25.43	25.40	25.33
		1	215	25.29	25.25	25.29
		108	0	24.42	24.42	24.36
		108	55	25.44	25.46	25.49
		108	109	24.54	24.51	24.38
		216	0	24.47	24.50	24.44
	16QAM	1	1	24.78	24.82	24.69
		1	109	24.68	24.73	24.46
		1	215	24.48	24.32	24.43
		108	0	23.47	23.47	23.41
		108	55	24.46	24.46	24.55
		108	109	23.52	23.49	23.41
		216	0	23.39	23.44	23.57
	64QAM	1	1	23.34	23.46	23.16
		1	109	23.10	23.16	23.10
		1	215	23.03	23.10	22.94
		108	0	22.90	22.90	22.91
		108	55	23.01	23.02	23.04
		108	109	23.07	23.03	23.02
		216	0	22.85	22.96	23.06
	256QAM	1	1	19.30	19.42	19.29
		1	109	19.14	18.93	19.14
1		215	18.97	18.98	19.13	
108		0	18.89	18.90	18.80	
108		55	18.89	18.90	19.11	
108		109	18.98	18.97	18.99	
216		0	18.97	18.84	19.01	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		632000	633334	634666
		Frequency (MHz)		3480	3500.01	3519.99
60M	pi/2 BPSK	1	1	25.42	25.55	25.52
		1	81	25.45	25.53	25.44
		1	160	25.22	25.26	25.34
		81	0	24.91	24.87	24.88
		81	41	25.42	25.49	25.46
		81	81	25.01	24.99	24.94
		162	0	24.86	24.84	24.97
	QPSK	1	1	25.42	25.39	25.42
		1	81	25.37	25.42	25.29
		1	160	25.22	25.30	25.17
		81	0	24.52	24.39	24.26
		81	41	25.45	25.43	25.41
		81	81	24.54	24.45	24.39
		162	0	24.43	24.48	24.54
	16QAM	1	1	24.84	24.83	24.78
		1	81	24.61	24.80	24.43
		1	160	24.44	24.30	24.44
		81	0	23.45	23.37	23.33
		81	41	24.48	24.55	24.50
		81	81	23.49	23.51	23.47
		162	0	23.40	23.35	23.54
	64QAM	1	1	23.30	23.33	23.13
		1	81	23.13	23.23	23.09
		1	160	22.91	23.03	22.93
		81	0	22.85	23.00	22.81
		81	41	22.92	22.99	22.99
		81	81	22.99	23.09	22.95
		162	0	22.81	22.84	23.08
	256QAM	1	1	19.34	19.37	19.40
		1	81	19.07	18.98	19.23
1		160	18.94	18.98	19.03	
81		0	18.96	18.86	18.78	
81		41	18.99	19.01	19.05	
81		81	18.88	18.94	19.00	
162		0	18.88	18.88	18.91	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		631668	633334	635000
		Frequency (MHz)		3475.02	3500.01	3525
50M	pi/2 BPSK	1	1	25.43	25.51	25.45
		1	67	25.41	25.44	25.39
		1	131	25.18	25.27	25.39
		64	0	24.95	24.89	24.88
		64	35	25.50	25.53	25.55
		64	69	25.04	25.02	24.93
		128	0	24.85	24.95	24.99
	QPSK	1	1	25.45	25.47	25.36
		1	67	25.33	25.34	25.41
		1	131	25.27	25.23	25.17
		64	0	24.49	24.46	24.38
		64	35	25.44	25.50	25.52
		64	69	24.54	24.55	24.49
		128	0	24.42	24.42	24.53
	16QAM	1	1	24.85	24.75	24.77
		1	67	24.70	24.80	24.45
		1	131	24.47	24.24	24.48
		64	0	23.48	23.42	23.38
		64	35	24.42	24.51	24.58
		64	69	23.49	23.57	23.43
		128	0	23.30	23.42	23.55
	64QAM	1	1	23.33	23.42	23.17
		1	67	23.16	23.17	23.14
		1	131	23.02	23.05	22.85
		64	0	22.87	23.01	22.92
		64	35	22.92	23.07	23.10
		64	69	23.02	23.10	22.90
		128	0	22.87	22.88	23.05
	256QAM	1	1	19.32	19.36	19.28
		1	67	19.14	19.02	19.20
		1	131	18.89	18.93	19.11
		64	0	18.88	18.78	18.81
		64	35	18.87	18.93	19.12
		64	69	18.87	19.00	18.94
		128	0	18.96	18.79	19.01

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)



NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		631334	633334	635332
		Frequency (MHz)		3470.01	3500.01	3529.98
40M	pi/2 BPSK	1	1	25.52	25.53	25.50
		1	53	25.41	25.48	25.45
		1	104	25.28	25.24	25.36
		50	0	25.02	24.91	24.86
		50	28	25.46	25.48	25.53
		50	56	25.02	25.03	24.98
		100	0	24.80	24.95	24.98
	QPSK	1	1	25.40	25.43	25.42
		1	53	25.44	25.40	25.32
		1	104	25.31	25.35	25.19
		50	0	24.42	24.49	24.32
		50	28	25.45	25.47	25.49
		50	56	24.53	24.48	24.49
		100	0	24.44	24.44	24.51
	16QAM	1	1	24.82	24.87	24.72
		1	53	24.59	24.67	24.43
		1	104	24.52	24.27	24.49
		50	0	23.40	23.37	23.37
		50	28	24.45	24.45	24.49
		50	56	23.50	23.53	23.49
		100	0	23.37	23.33	23.57
	64QAM	1	1	23.28	23.36	23.24
		1	53	23.10	23.21	23.16
		1	104	22.98	23.00	22.82
		50	0	22.86	23.01	22.87
		50	28	23.02	23.10	22.98
		50	56	23.04	23.11	22.97
		100	0	22.88	22.89	22.95
	256QAM	1	1	19.34	19.38	19.41
		1	53	19.08	19.04	19.22
		1	104	18.89	18.95	19.11
		50	0	18.87	18.87	18.80
		50	28	18.90	19.00	19.02
		50	56	18.96	18.97	18.91
		100	0	18.86	18.81	19.04

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630668	633334	636000
		Frequency (MHz)		3460.02	3500.01	3540
20M	pi/2 BPSK	1	1	25.50	25.58	25.51
		1	26	25.47	25.49	25.51
		1	49	25.27	25.27	25.39
		25	0	24.92	24.89	24.87
		25	13	25.51	25.57	25.48
		25	26	25.08	24.98	24.95
		50	0	24.81	24.83	24.95
	QPSK	1	1	25.51	25.39	25.33
		1	26	25.38	25.35	25.36
		1	49	25.27	25.33	25.19
		25	0	24.41	24.39	24.29
		25	13	25.45	25.50	25.50
		25	26	24.41	24.51	24.40
		50	0	24.47	24.46	24.44
	16QAM	1	1	24.89	24.80	24.70
		1	26	24.69	24.69	24.53
		1	49	24.39	24.23	24.44
		25	0	23.46	23.41	23.34
		25	13	24.50	24.45	24.60
		25	26	23.48	23.53	23.41
		50	0	23.30	23.45	23.55
	64QAM	1	1	23.29	23.38	23.17
		1	26	23.16	23.15	23.17
		1	49	22.95	23.07	22.91
		25	0	22.86	22.95	22.83
		25	13	23.04	23.04	23.07
		25	26	23.02	23.07	22.94
		50	0	22.87	22.95	23.04
	256QAM	1	1	19.31	19.34	19.34
		1	26	19.17	18.94	19.13
1		49	18.95	18.94	19.14	
25		0	18.95	18.87	18.79	
25		13	18.99	18.98	19.09	
25		26	18.89	18.99	18.88	
50		0	18.93	18.91	19.03	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630500	633334	636166
		Frequency (MHz)		3457.5	3500.01	3542.49
15M	pi/2 BPSK	1	1	25.45	25.54	25.49
		1	19	25.49	25.56	25.44
		1	36	25.29	25.22	25.37
		18	0	24.96	24.86	24.81
		18	10	25.39	25.47	25.49
		18	20	25.07	25.07	24.96
		36	0	24.88	24.91	25.01
	QPSK	1	1	25.43	25.44	25.39
		1	19	25.35	25.40	25.31
		1	36	25.25	25.26	25.21
		18	0	24.39	24.49	24.33
		18	10	25.44	25.44	25.45
		18	20	24.49	24.52	24.43
		36	0	24.43	24.45	24.46
	16QAM	1	1	24.78	24.79	24.73
		1	19	24.60	24.74	24.46
		1	36	24.52	24.32	24.42
		18	0	23.46	23.41	23.29
		18	10	24.41	24.46	24.58
		18	20	23.53	23.54	23.48
		36	0	23.32	23.33	23.45
	64QAM	1	1	23.30	23.44	23.21
		1	19	23.11	23.23	23.14
		1	36	23.02	23.06	22.86
		18	0	22.86	22.91	22.81
		18	10	23.02	22.98	22.97
		18	20	23.08	23.11	23.02
		36	0	22.76	22.91	22.99
	256QAM	1	1	19.30	19.37	19.28
		1	19	19.19	18.92	19.20
1		36	18.89	18.90	19.04	
18		0	18.86	18.85	18.73	
18		10	18.96	18.94	19.05	
18		20	18.98	18.90	18.88	
36		0	18.85	18.84	19.00	

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

NR Band 77 (SCS 30kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		630334	633334	636332
		Frequency (MHz)		3455.01	3500.01	3544.98
10M	pi/2 BPSK	1	1	25.44	25.50	25.55
		1	11	25.38	25.52	25.51
		1	22	25.21	25.24	25.40
		12	0	25.02	24.86	24.82
		12	6	25.40	25.49	25.45
		12	12	25.08	24.95	24.96
		24	0	24.89	24.90	25.04
	QPSK	1	1	25.42	25.44	25.35
		1	11	25.37	25.45	25.38
		1	22	25.23	25.33	25.29
		12	0	24.44	24.38	24.37
		12	6	25.49	25.49	25.41
		12	12	24.54	24.54	24.49
		24	0	24.36	24.42	24.44
	16QAM	1	1	24.90	24.85	24.66
		1	11	24.60	24.79	24.45
		1	22	24.52	24.22	24.49
		12	0	23.42	23.46	23.41
		12	6	24.40	24.44	24.52
		12	12	23.48	23.51	23.45
		24	0	23.36	23.35	23.50
	64QAM	1	1	23.35	23.40	23.20
		1	11	23.06	23.18	23.08
		1	22	23.01	23.01	22.89
		12	0	22.87	22.92	22.88
		12	6	22.91	23.05	23.00
		12	12	23.02	23.05	22.90
		24	0	22.78	22.95	23.04
	256QAM	1	1	19.33	19.35	19.28
		1	11	19.18	19.03	19.18
		1	22	18.91	18.90	19.05
		12	0	18.94	18.90	18.74
		12	6	18.89	19.00	19.11
		12	12	18.92	18.91	19.01
		24	0	18.87	18.85	18.98

\*EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

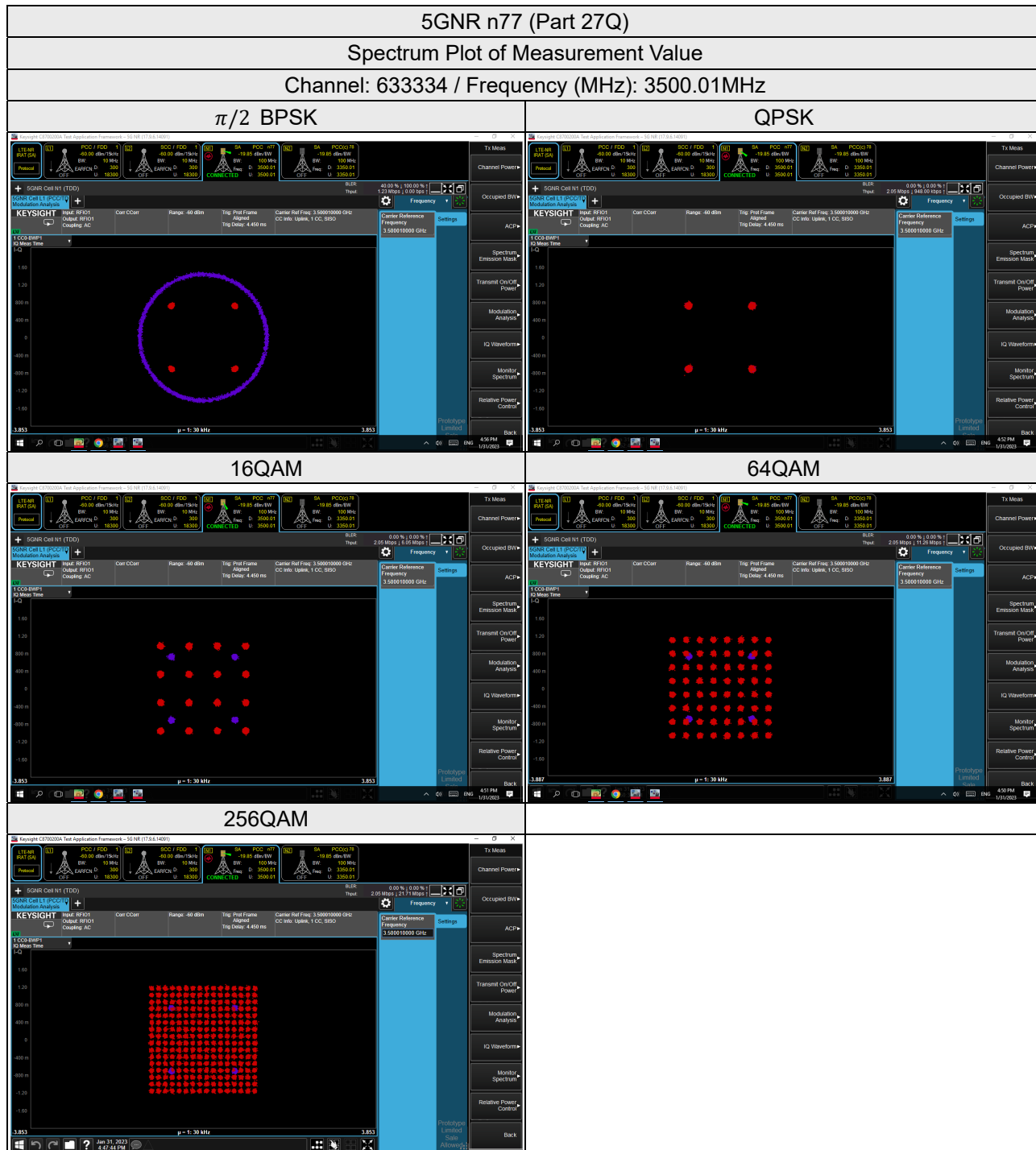
### 4.2.2 Test Procedure

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



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT  $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

#### 4.3.2 Test Procedure

- 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.
- 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.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  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.

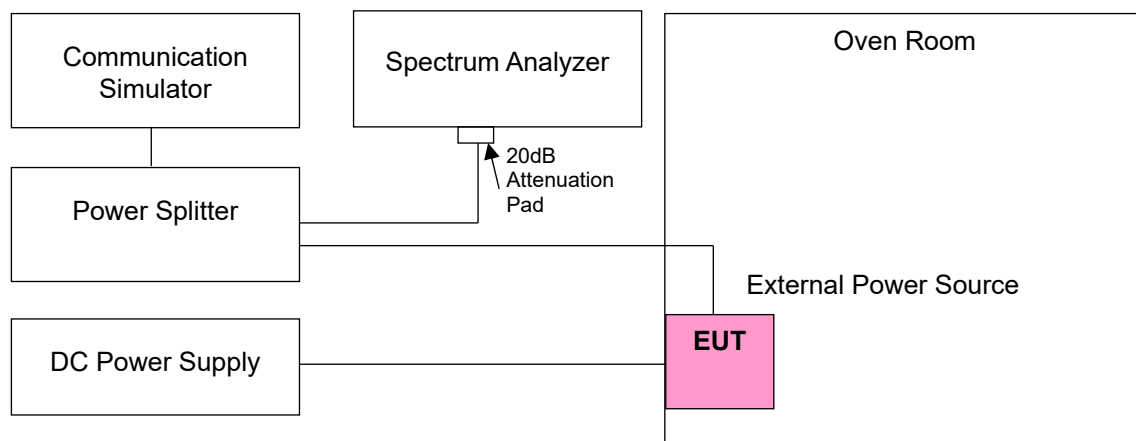
Note: The frequency error was recorded frequency error from the communication simulator.

#### 4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
UXM 5G Wireless Test Platform Keysight	E7515B	MY60102114	May 20, 2022	May 19, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 27, 2022	Dec. 26, 2023
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2022	Jun. 22, 2023
DC Power Supply Topward	6306A	727263	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.

#### 4.3.4 Test Setup



#### 4.3.5 Test Results

##### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3455.009996	-0.0012	3544.979999	-0.0003
4.2	3455.009998	-0.0006	3544.979997	-0.0008
4.4	3455.009999	-0.0003	3544.980002	0.0006

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

##### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3455.009997	-0.0009	3544.980002	0.0006
-20	3455.010001	0.0003	3544.980001	0.0003
-10	3455.010003	0.0009	3544.979998	-0.0006
0	3455.010002	0.0006	3544.980001	0.0003
10	3455.010004	0.0012	3544.979999	-0.0003
20	3455.009997	-0.0009	3544.980004	0.0011
30	3455.010003	0.0009	3544.980001	0.0003
40	3455.009998	-0.0006	3544.979997	-0.0008
50	3455.010001	0.0003	3544.979997	-0.0008



Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3457.500003	0.0009	3542.489996	-0.0011
4.2	3457.500001	0.0003	3542.489997	-0.0008
4.4	3457.500001	0.0003	3542.489997	-0.0008

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3457.500003	0.0009	3542.490001	0.0003
-20	3457.500004	0.0012	3542.489996	-0.0011
-10	3457.500001	0.0003	3542.490001	0.0003
0	3457.500002	0.0006	3542.489998	-0.0006
10	3457.499999	-0.0003	3542.490002	0.0006
20	3457.500004	0.0012	3542.489999	-0.0003
30	3457.499996	-0.0012	3542.489998	-0.0006
40	3457.499998	-0.0006	3542.489997	-0.0008
50	3457.499997	-0.0009	3542.489999	-0.0003

### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3460.019997	-0.0009	3540.000002	0.0006
4.2	3460.020002	0.0006	3540.000003	0.0008
4.4	3460.019996	-0.0012	3539.999996	-0.0011

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3460.020002	0.0006	3539.999997	-0.0008
-20	3460.019997	-0.0009	3539.999997	-0.0008
-10	3460.020002	0.0006	3539.999999	-0.0003
0	3460.020003	0.0009	3539.999999	-0.0003
10	3460.019998	-0.0006	3540.000003	0.0008
20	3460.019997	-0.0009	3539.999996	-0.0011
30	3460.020003	0.0009	3540.000002	0.0006
40	3460.019997	-0.0009	3539.999999	-0.0003
50	3460.019997	-0.0009	3540.000001	0.0003

### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 40 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3470.010001	0.0003	3529.979996	-0.0011
4.2	3470.009996	-0.0012	3529.980004	0.0011
4.4	3470.010001	0.0003	3529.980003	0.0008

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 40 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3470.009998	-0.0006	3529.979999	-0.0003
-20	3470.010002	0.0006	3529.979997	-0.0008
-10	3470.009999	-0.0003	3529.979998	-0.0006
0	3470.009999	-0.0003	3529.980003	0.0008
10	3470.009997	-0.0009	3529.980001	0.0003
20	3470.010003	0.0009	3529.979999	-0.0003
30	3470.010004	0.0012	3529.980002	0.0006
40	3470.009997	-0.0009	3529.979999	-0.0003
50	3470.010004	0.0012	3529.980001	0.0003

### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 50 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3475.019996	-0.0012	3524.999997	-0.0009
4.2	3475.020001	0.0003	3524.999996	-0.0011
4.4	3475.020002	0.0006	3525.000002	0.0006

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 50 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3475.020001	0.0003	3524.999998	-0.0006
-20	3475.019997	-0.0009	3524.999998	-0.0006
-10	3475.019998	-0.0006	3525.000004	0.0011
0	3475.019998	-0.0006	3525.000002	0.0006
10	3475.020004	0.0012	3525.000004	0.0011
20	3475.019996	-0.0012	3525.000004	0.0011
30	3475.020003	0.0009	3525.000002	0.0006
40	3475.019997	-0.0009	3524.999998	-0.0006
50	3475.020004	0.0012	3525.000004	0.0011

Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 60 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3479.999998	-0.0006	3519.990004	0.0011
4.2	3480.000002	0.0006	3519.990002	0.0006
4.4	3479.999996	-0.0011	3519.989997	-0.0009

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 60 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3480.000003	0.0009	3519.990001	0.0003
-20	3480.000003	0.0009	3519.989998	-0.0006
-10	3480.000001	0.0003	3519.989997	-0.0009
0	3479.999996	-0.0011	3519.990001	0.0003
10	3480.000004	0.0011	3519.990002	0.0006
20	3480.000004	0.0011	3519.990003	0.0009
30	3480.000003	0.0009	3519.990002	0.0006
40	3479.999996	-0.0011	3519.990001	0.0003
50	3479.999999	-0.0003	3519.990002	0.0006

### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 80 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3490.020003	0.0009	3509.999996	-0.0011
4.2	3490.019998	-0.0006	3509.999999	-0.0003
4.4	3490.020001	0.0003	3510.000003	0.0009

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 80 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3490.020001	0.0003	3509.999998	-0.0006
-20	3490.019998	-0.0006	3509.999997	-0.0009
-10	3490.019999	-0.0003	3509.999998	-0.0006
0	3490.019998	-0.0006	3509.999998	-0.0006
10	3490.020002	0.0006	3509.999996	-0.0011
20	3490.019998	-0.0006	3509.999997	-0.0009
30	3490.019999	-0.0003	3510.000004	0.0011
40	3490.019998	-0.0006	3510.000004	0.0011
50	3490.019996	-0.0011	3510.000001	0.0003

### Frequency Error vs. Voltage

Voltage (Vdc)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 90 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	3495.000001	0.0003	3504.989998	-0.0006
4.2	3495.000004	0.0011	3504.989996	-0.0011
4.4	3495.000004	0.0011	3504.989999	-0.0003

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	5GNR n77 (Part 27Q)			
	Channel Bandwidth 90 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3494.999996	-0.0011	3504.990002	0.0006
-20	3494.999997	-0.0009	3504.989996	-0.0011
-10	3494.999999	-0.0003	3504.989999	-0.0003
0	3494.999998	-0.0006	3504.989997	-0.0009
10	3494.999998	-0.0006	3504.990002	0.0006
20	3495.000004	0.0011	3504.989997	-0.0009
30	3495.000001	0.0003	3504.989998	-0.0006
40	3494.999998	-0.0006	3504.990003	0.0009
50	3495.000004	0.0011	3504.990004	0.0011

**Frequency Error vs. Voltage**

Voltage (Vdc)	5GNR n77 (Part 27Q)	
	Channel Bandwidth 100 MHz	
	Frequency (MHz)	Frequency Error (ppm)
4.0	3500.010002	0.0006
4.2	3500.009996	-0.0011
4.4	3500.009999	-0.0003

Note: The applicant defined the normal working voltage is from 4.00Vdc to 4.40Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	5GNR n77 (Part 27Q)	
	Channel Bandwidth 100 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-30	3500.010003	0.0009
-20	3500.009998	-0.0006
-10	3500.009999	-0.0003
0	3500.009999	-0.0003
10	3500.009996	-0.0011
20	3500.010003	0.0009
30	3500.010001	0.0003
40	3500.009997	-0.0009
50	3500.009997	-0.0009



## 4.4 Emission Bandwidth Measurement

### 4.4.1 Limits of Emission Bandwidth Measurement

According to FCC 2.1049, 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 % of the total mean power radiated by a given emission.

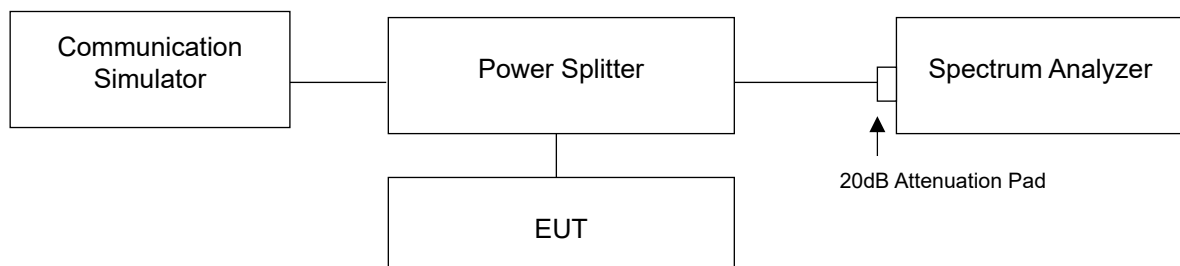
### 4.4.2 Test Procedure

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

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d) 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 36 dB below the reference level.
- e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- f) Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- g) Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- i) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

### 4.4.3 Test Setup



#### 4.4.4 Test Result

##### Occupied Bandwidth

5GNR n77 (Part 27Q), Channel Bandwidth 10MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630334	3455.01	8.58	8.60	8.61	8.61	8.61
633334	3500.01	8.61	8.60	8.61	8.61	8.58
636332	3544.98	8.57	8.60	8.60	8.60	8.61
5GNR n77 (Part 27Q), Channel Bandwidth 15MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630500	3457.50	13.51	13.59	13.58	13.62	13.62
633334	3500.01	13.52	13.59	13.59	13.59	13.62
636166	3542.49	13.52	13.52	13.52	13.58	13.61
5GNR n77 (Part 27Q), Channel Bandwidth 20MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630668	3460.02	18.11	18.25	18.25	18.25	18.25
633334	3500.01	18.19	18.25	18.25	18.26	18.25
636000	3540.00	18.11	18.25	18.25	18.25	18.25
5GNR n77 (Part 27Q), Channel Bandwidth 40MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631334	3470.01	37.65	37.93	37.94	37.84	37.84
633334	3500.01	37.62	37.94	37.94	37.92	37.92
635332	3529.98	37.65	37.93	37.94	37.84	37.92
5GNR n77 (Part 27Q) Channel Bandwidth 50MHz						
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631668	3475.02	47.24	47.46	47.45	47.45	47.46
633334	3500.01	47.21	47.46	47.45	47.45	47.47
635000	3525.00	47.21	47.46	47.45	47.45	47.47

5GNR n77 (Part 27Q) Channel Bandwidth 60MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632000	3480.00	57.71	57.85	57.84	57.85	57.72
633334	3500.01	57.86	57.85	57.86	57.71	57.85
634666	3519.99	57.72	57.86	57.85	57.88	57.86

5GNR n77 (Part 27Q), Channel Bandwidth 80MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632668	3490.02	77.21	77.47	77.49	77.46	77.47
633334	3500.01	77.18	77.48	77.45	77.50	77.47
634000	3510.00	77.16	77.48	77.49	77.48	77.48

5GNR n77 (Part 27Q), Channel Bandwidth 90MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633000	3495.00	86.92	87.30	87.30	87.48	87.50
633334	3500.01	86.89	87.48	87.29	87.30	87.27
633666	3504.99	86.89	87.49	87.49	87.49	87.49

5GNR n77 (Part 27Q), Channel Bandwidth 100MHz

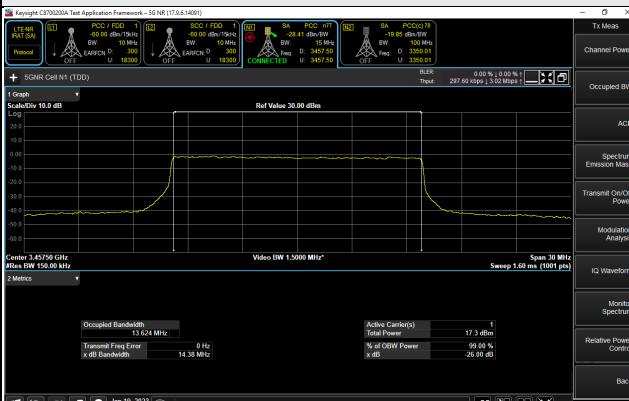
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633334	3500.01	96.88	97.33	97.31	97.35	97.30

### Spectrum Plot of Worst Value

#### 10MHz / 256QAM



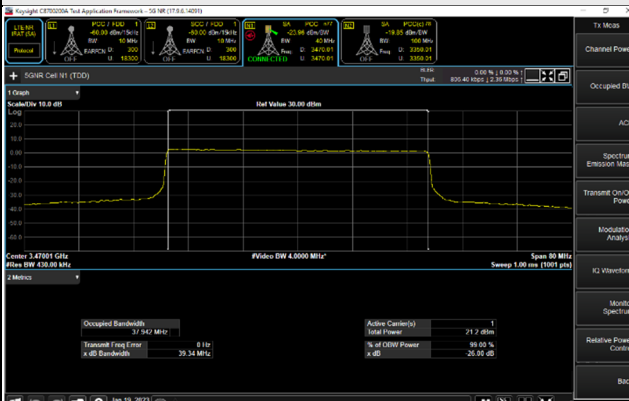
#### 15MHz / 256QAM



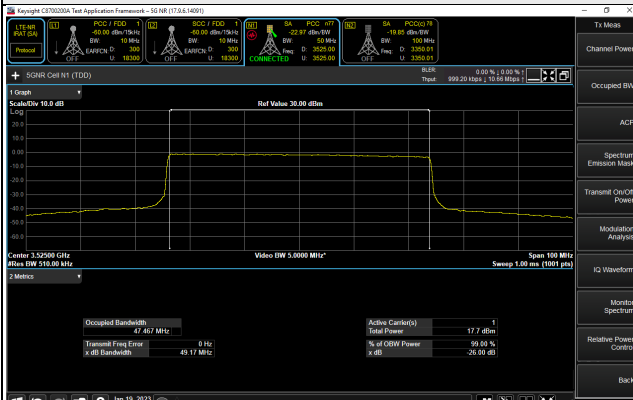
#### 20MHz / 64QAM



#### 40MHz / 16QAM



#### 50MHz / 256QAM



#### 60MHz / 64QAM



#### 80MHz / 64QAM

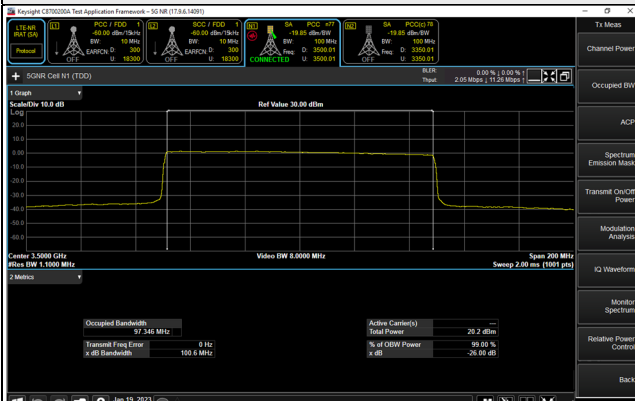


#### 90MHz / 256QAM



## Spectrum Plot of Worst Value

### 100MHz / 64QAM



26dB Bandwidth

5GNR n77 (Part 27Q), Channel Bandwidth 10MHz						
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630334	3455.01	9.27	9.37	9.41	9.34	9.36
633334	3500.01	9.43	9.40	9.28	9.54	9.30
636332	3544.98	9.27	9.15	9.38	9.29	9.41
5GNR n77 (Part 27Q), Channel Bandwidth 15MHz						
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630500	3457.50	13.50	14.37	14.20	14.45	14.38
633334	3500.01	13.67	14.33	14.32	14.36	14.32
636166	3542.49	13.66	13.72	13.61	14.33	14.35
5GNR n77 (Part 27Q), Channel Bandwidth 20MHz						
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630668	3460.02	18.69	19.08	19.05	19.21	19.02
633334	3500.01	18.72	19.16	19.14	19.09	19.15
636000	3540.00	18.60	19.06	19.06	19.06	18.98
5GNR n77 (Part 27Q), Channel Bandwidth 40MHz						
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631334	3470.01	37.09	39.30	39.34	39.30	39.25
633334	3500.01	37.07	39.33	39.29	39.26	39.30
635332	3529.98	37.09	39.25	39.32	39.26	39.34
5GNR n77 (Part 27Q) Channel Bandwidth 50MHz						
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631668	3475.02	47.39	49.21	49.16	49.17	49.18
633334	3500.01	47.36	49.15	49.16	49.19	49.17
635000	3525.00	47.39	49.16	49.17	49.19	49.17

5GNR n77 (Part 27Q) Channel Bandwidth 60MHz

Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632000	3480.00	59.84	59.87	59.87	59.83	59.83
633334	3500.01	59.82	59.85	59.85	59.85	59.81
634666	3519.99	59.82	59.87	59.87	59.91	59.85

5GNR n77 (Part 27Q), Channel Bandwidth 80MHz

Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632668	3490.02	79.77	80.10	80.12	80.10	80.07
633334	3500.01	79.75	80.08	80.08	80.11	80.10
634000	3510.00	79.73	80.11	80.06	80.08	80.09

5GNR n77 (Part 27Q), Channel Bandwidth 90MHz

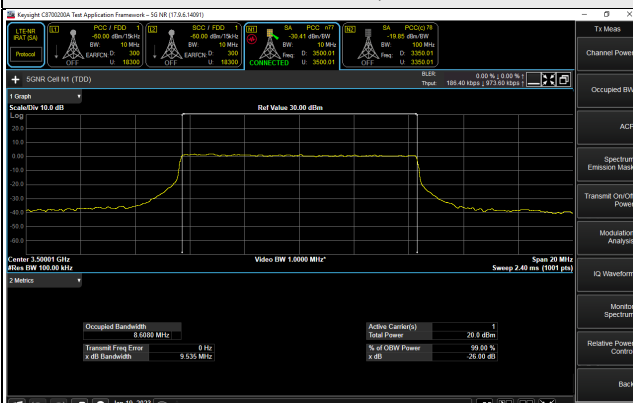
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633000	3495.00	89.71	90.37	90.35	90.36	90.39
633334	3500.01	89.70	90.38	90.35	90.39	90.32
633666	3504.99	89.67	90.43	90.38	90.37	90.35

5GNR n77 (Part 27Q), Channel Bandwidth 100MHz

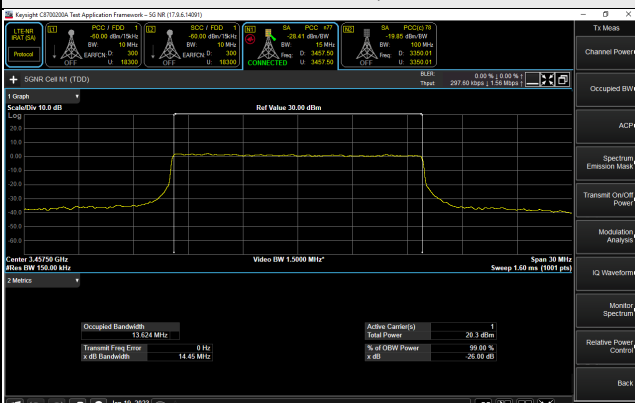
Channel	Frequency (MHz)	26dB Bandwidth (MHz)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633334	3500.01	99.58	100.60	100.60	100.60	100.50

### Spectrum Plot of Worst Value

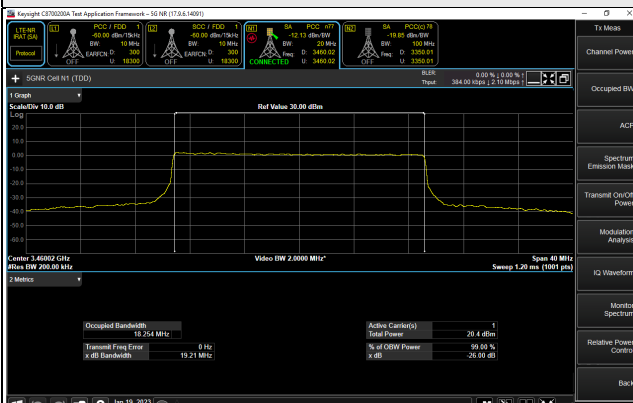
#### 10MHz / 64QAM



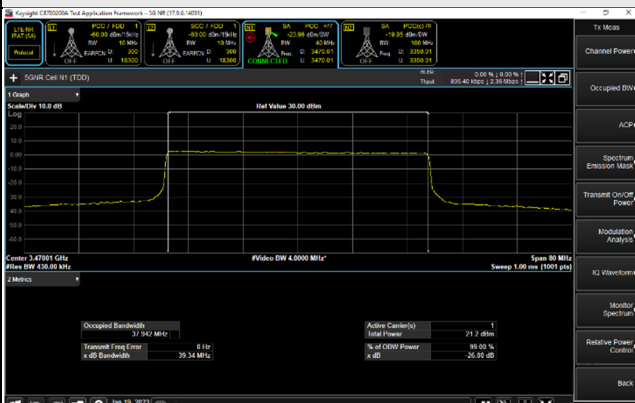
#### 15MHz / 64QAM



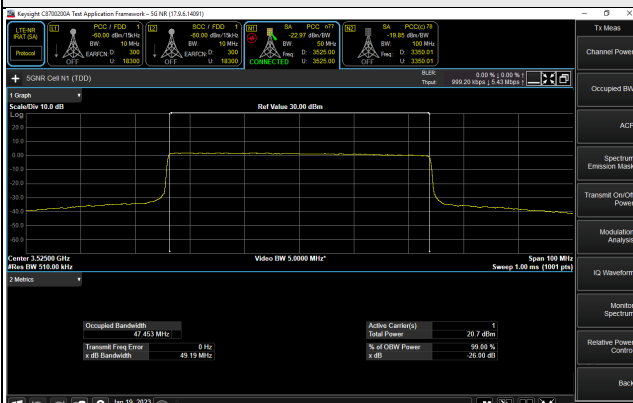
#### 20MHz / 64QAM



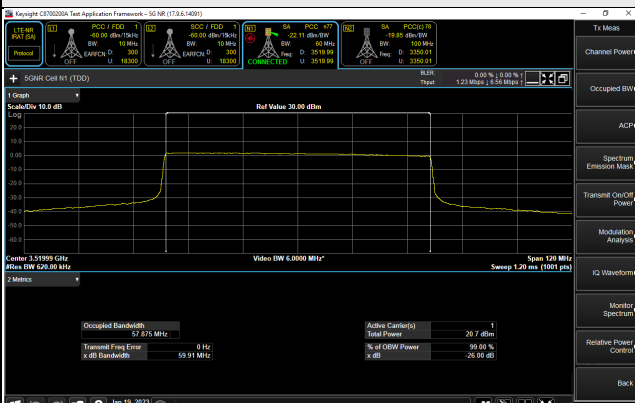
#### 40MHz / 16QAM



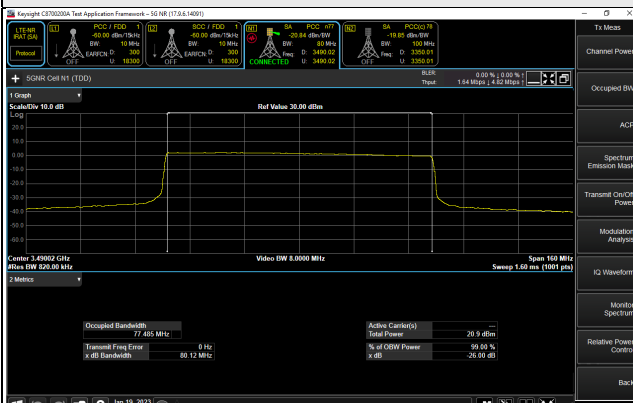
#### 50MHz / 64QAM



#### 60MHz / 64QAM



#### 80MHz / 16QAM



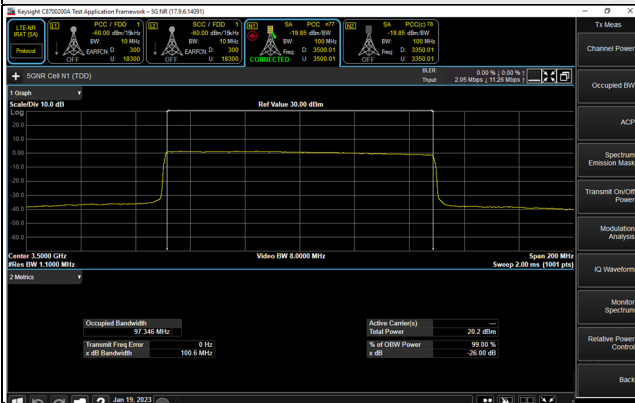
#### 90MHz / QPSK





## Spectrum Plot of Worst Value

100MHz / 64QAM

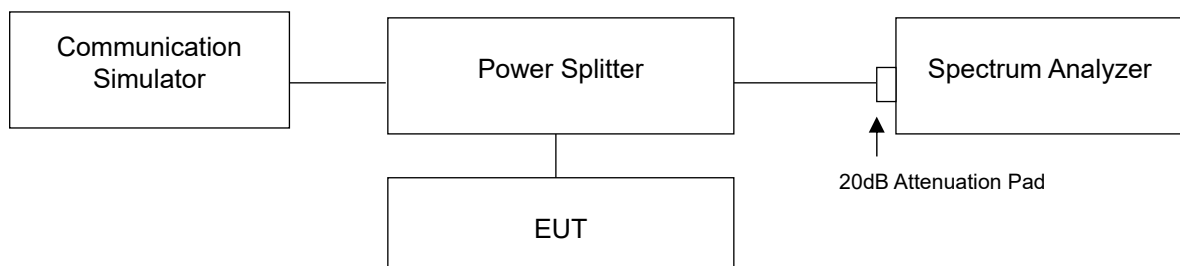


## 4.5 Channel Edge / Out-of-Band Emissions Measurement

### 4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement

According to FCC 27.53(n), for operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz.

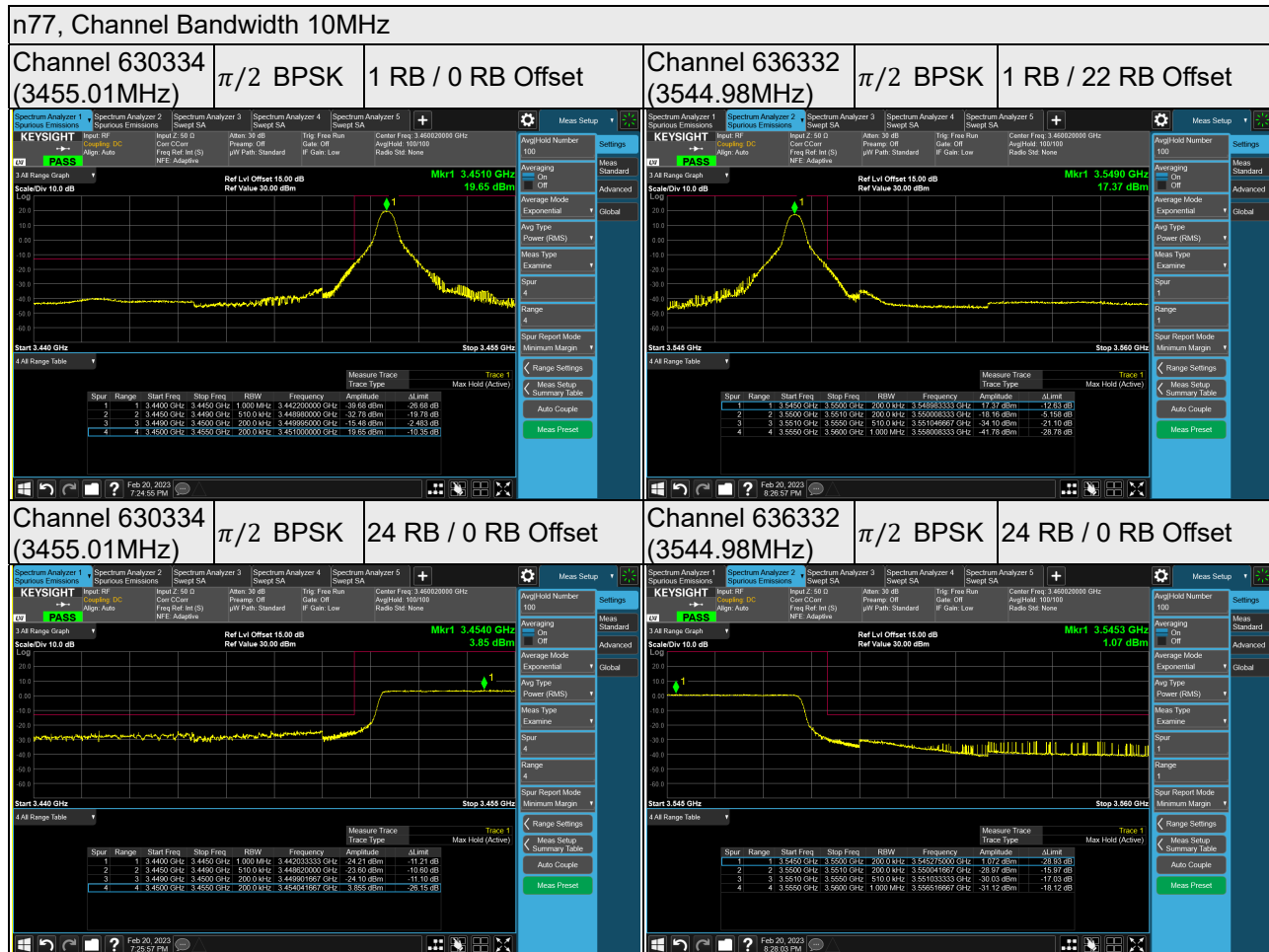
### 4.5.2 Test Setup



### 4.5.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. Band edge measurements were done at 2 channels: low and high operational frequency range.
- Measurement refer to ANSI C63.26 section 5.7.2 and FCC Part 27 section 27.53.
- Record the max trace plot into the test report.

### 4.5.4 Test Results



### n77, Channel Bandwidth 15MHz

Channel 630500  
(3457.50MHz)

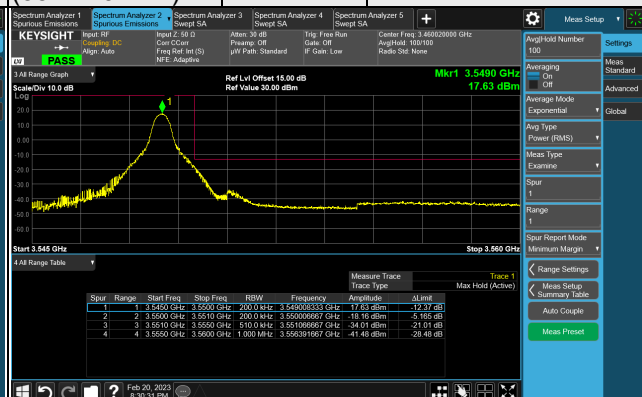
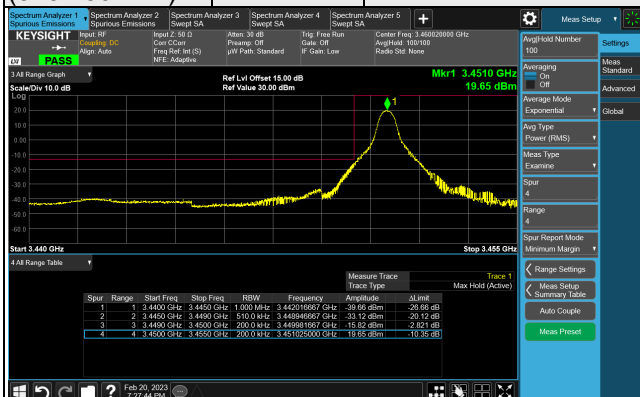
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 636166  
(3542.49MHz)

$\pi/2$  BPSK

1 RB / 36 RB Offset



Channel 630500  
(3457.50MHz)

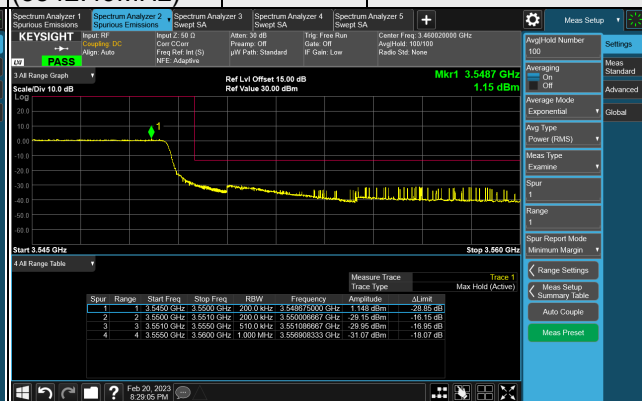
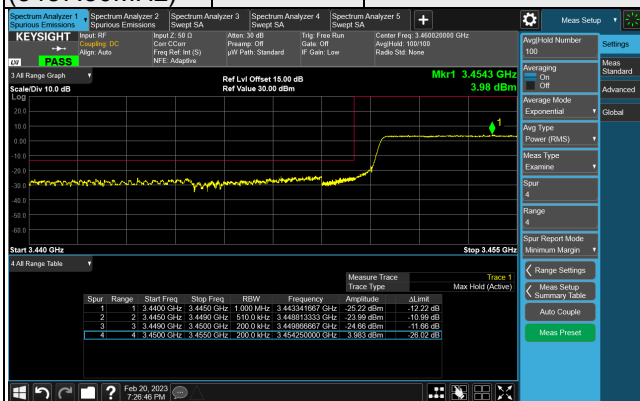
$\pi/2$  BPSK

36 RB / 0 RB Offset

Channel 636166  
(3542.49MHz)

$\pi/2$  BPSK

36 RB / 0 RB Offset



### n77, Channel Bandwidth 20MHz

Channel 630668  
(3460.02MHz)

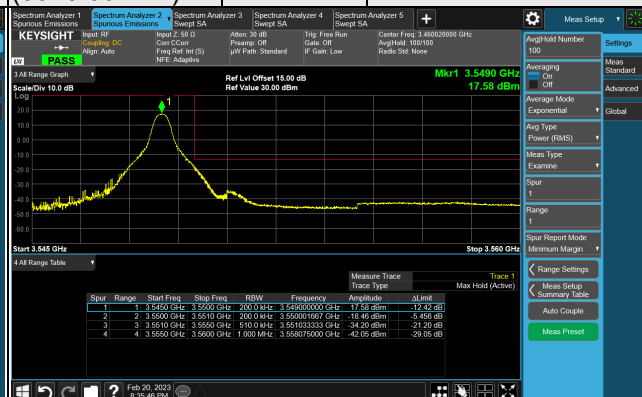
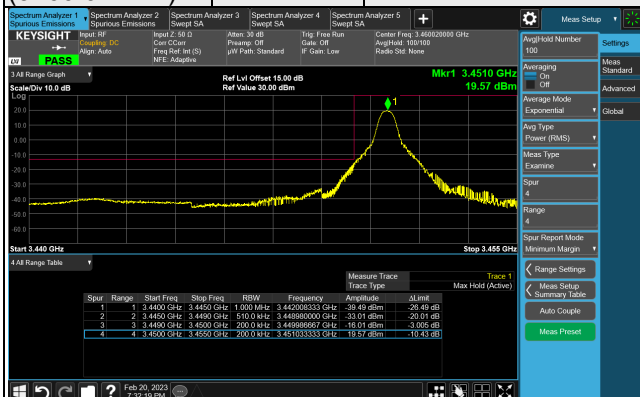
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 636000  
(3540.00MHz)

$\pi/2$  BPSK

1 RB / 49 RB Offset



Channel 630668  
(3460.02MHz)

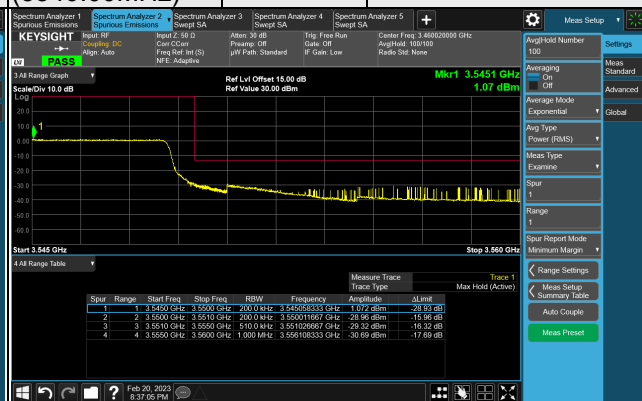
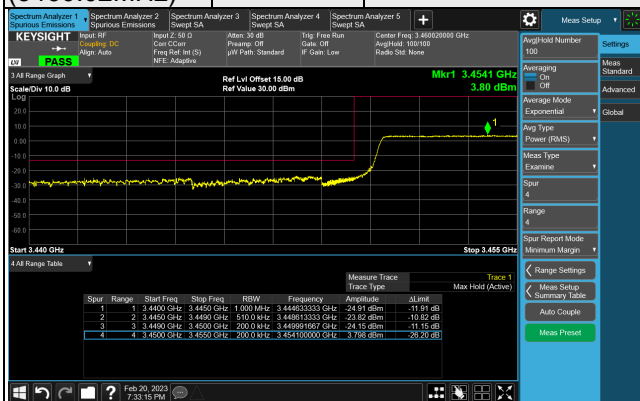
$\pi/2$  BPSK

50 RB / 0 RB Offset

Channel 636000  
(3540.00MHz)

$\pi/2$  BPSK

50 RB / 0 RB Offset



### n77, Channel Bandwidth 40MHz

Channel 631334  
(3470.01MHz)

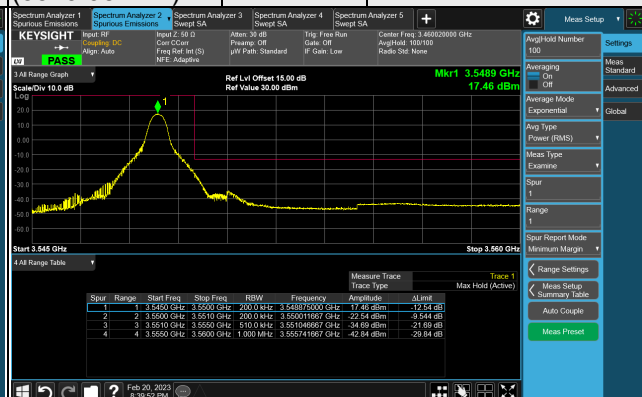
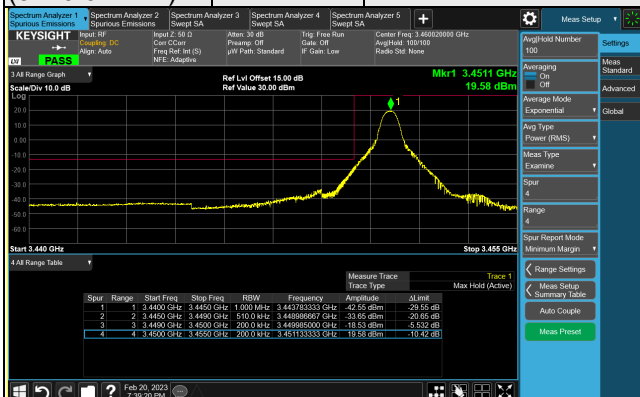
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 635332  
(3529.98MHz)

$\pi/2$  BPSK

1 RB / 104 RB Offset



Channel 631334  
(3470.01MHz)

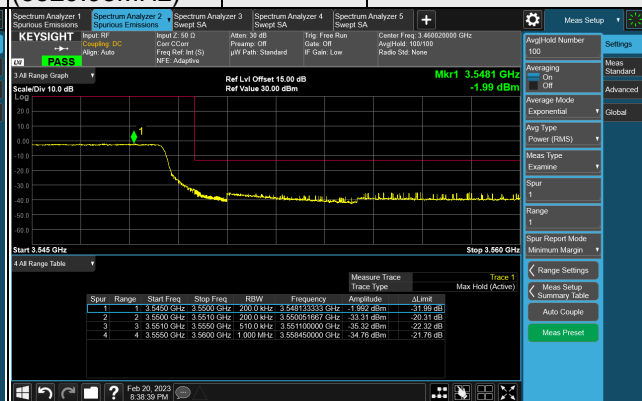
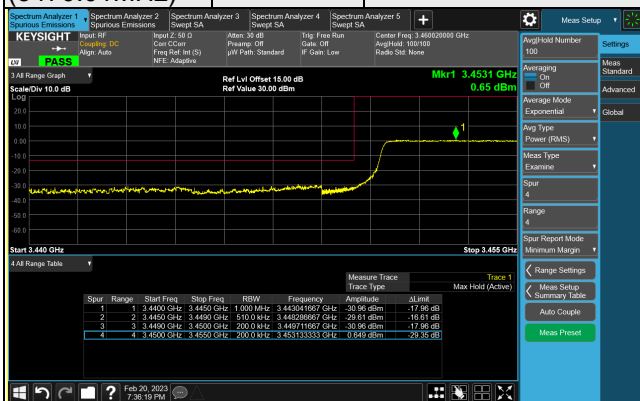
$\pi/2$  BPSK

100 RB / 0 RB Offset

Channel 635332  
(3529.98MHz)

$\pi/2$  BPSK

100 RB / 0 RB Offset



### n77, Channel Bandwidth 50MHz

Channel 631668  
(3475.02MHz)

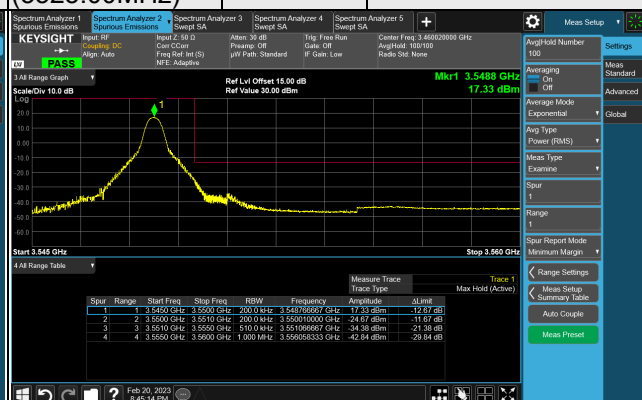
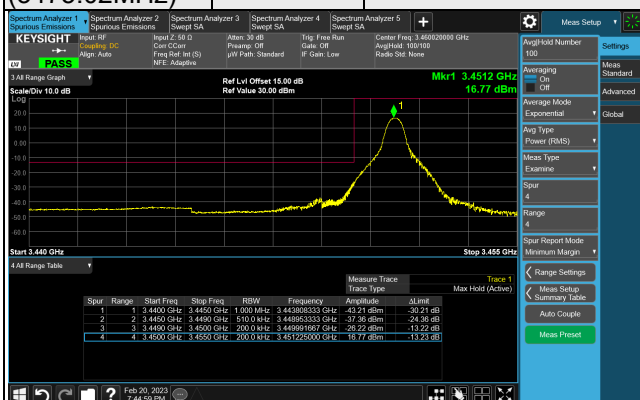
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 635000  
(3525.00MHz)

$\pi/2$  BPSK

1 RB / 131 RB Offset



Channel 631668  
(3475.02MHz)

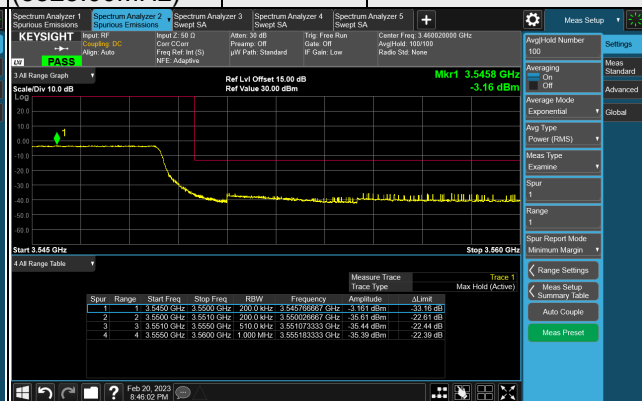
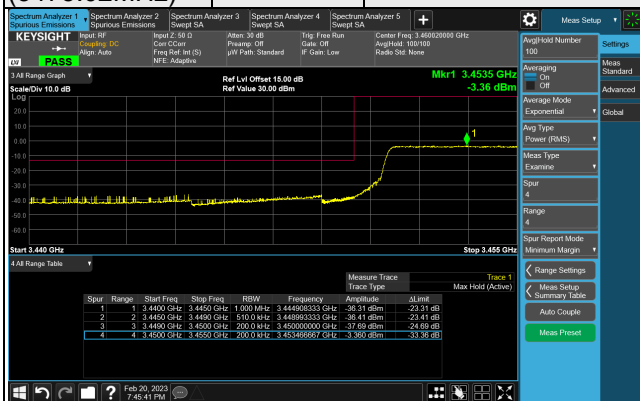
$\pi/2$  BPSK

128 RB / 0 RB Offset

Channel 635000  
(3525.00MHz)

$\pi/2$  BPSK

128 RB / 0 RB Offset



### n77, Channel Bandwidth 60MHz

Channel 632000  
(3480.00MHz)

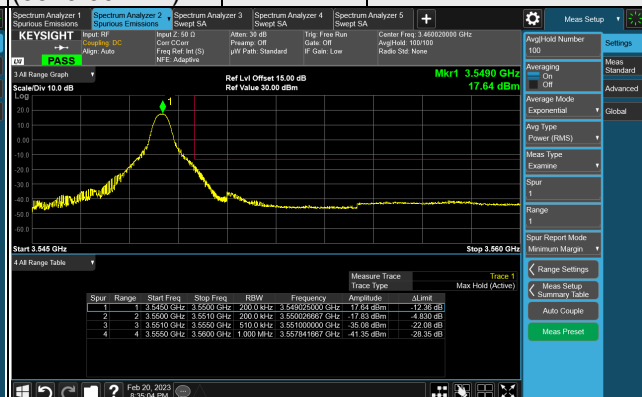
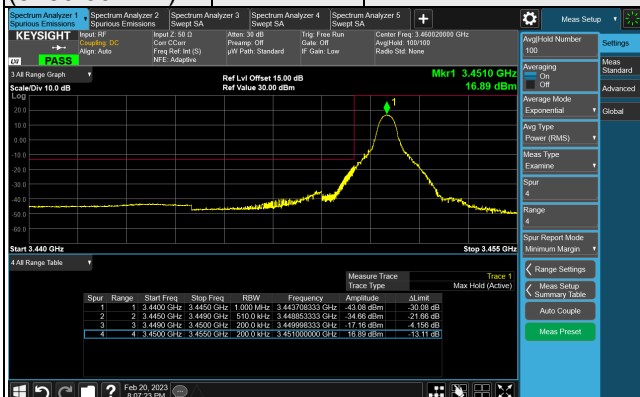
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 634666  
(3519.99MHz)

$\pi/2$  BPSK

1 RB / 160 RB Offset



Channel 632000  
(3480.00MHz)

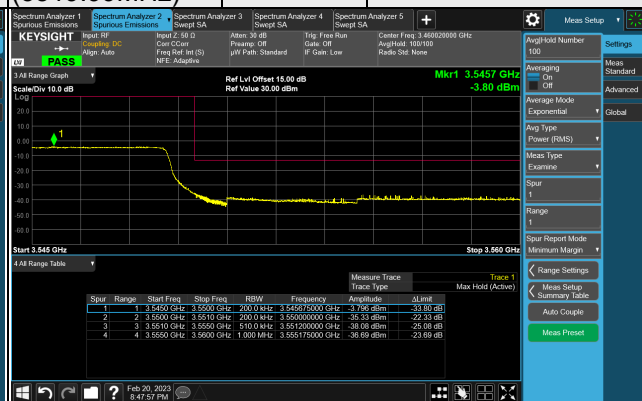
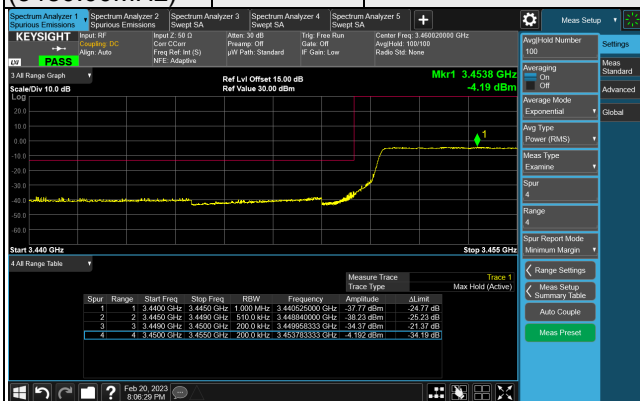
$\pi/2$  BPSK

162 RB / 0 RB Offset

Channel 634666  
(3519.99MHz)

$\pi/2$  BPSK

162 RB / 0 RB Offset





### n77, Channel Bandwidth 80MHz

Channel 632668  
(3490.02MHz)

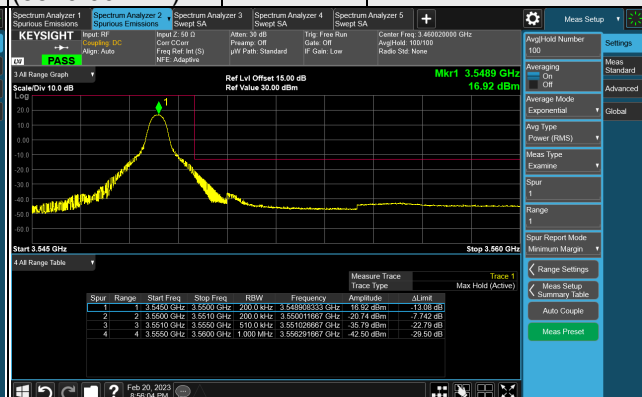
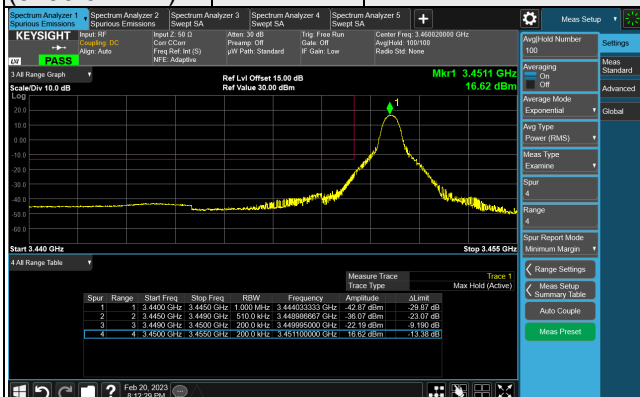
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 634000  
(3510.00MHz)

$\pi/2$  BPSK

1 RB / 215 RB Offset



Channel 632668  
(3490.02MHz)

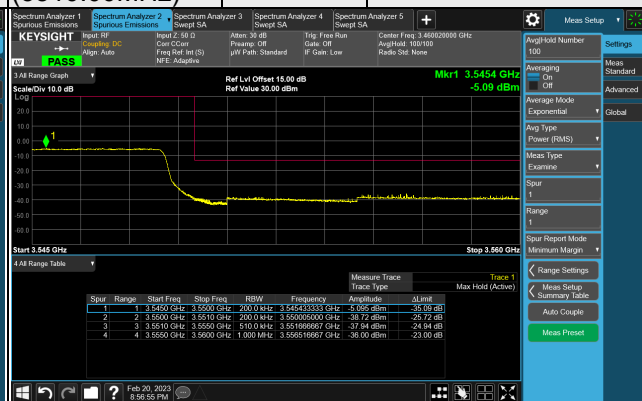
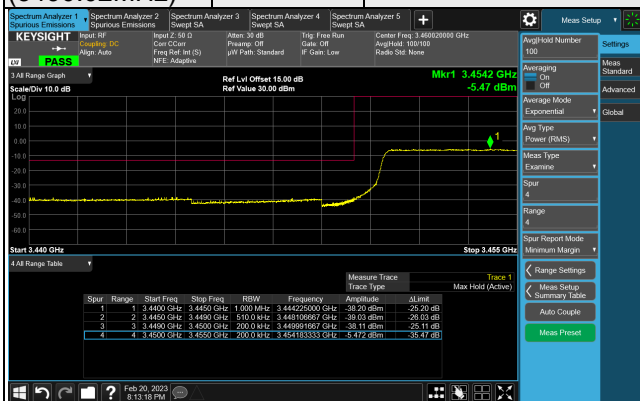
$\pi/2$  BPSK

216 RB / 0 RB Offset

Channel 634000  
(3510.00MHz)

$\pi/2$  BPSK

216 RB / 0 RB Offset



n77, Channel Bandwidth 90MHz

Channel 633000  
(3495.00MHz)

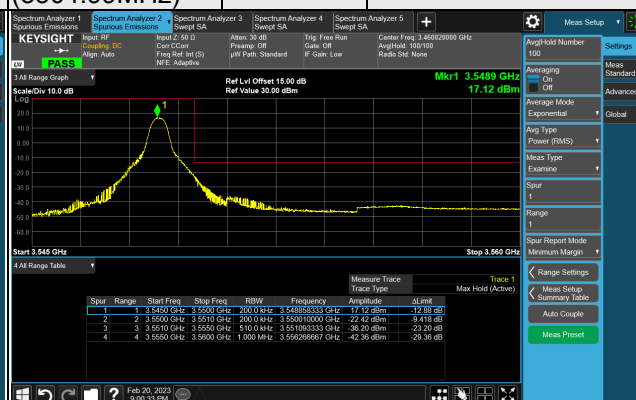
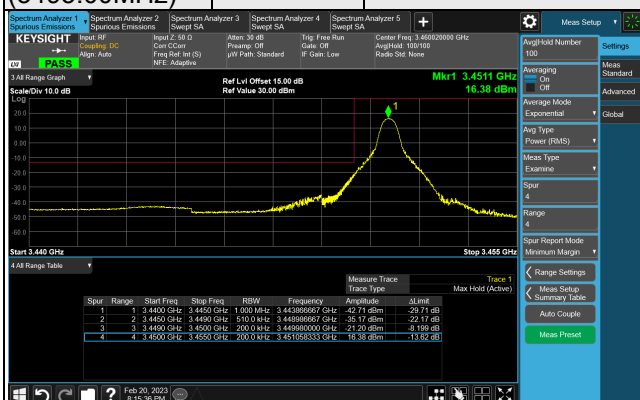
$\pi/2$  BPSK

1 RB / 0 RB Offset

Channel 633666  
(3504.99MHz)

$\pi/2$  BPSK

1 RB / 243 RB Offset



Channel 633000  
(3495.00MHz)

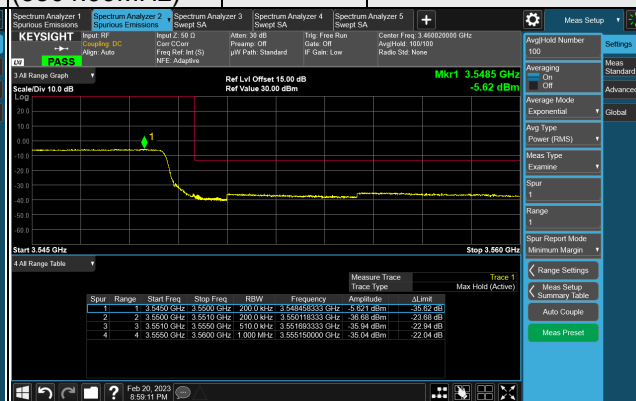
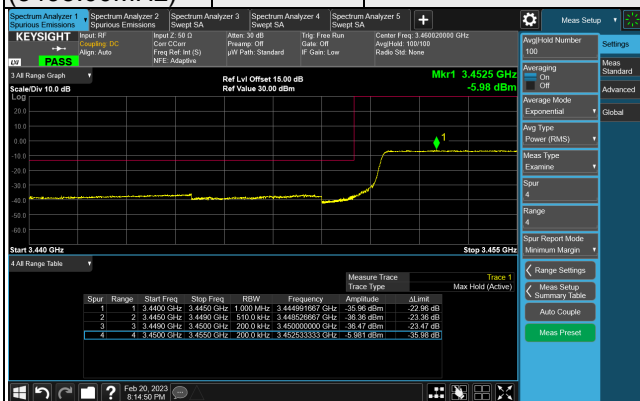
$\pi/2$  BPSK

243 RB / 0 RB Offset

Channel 633666  
(3504.99MHz)

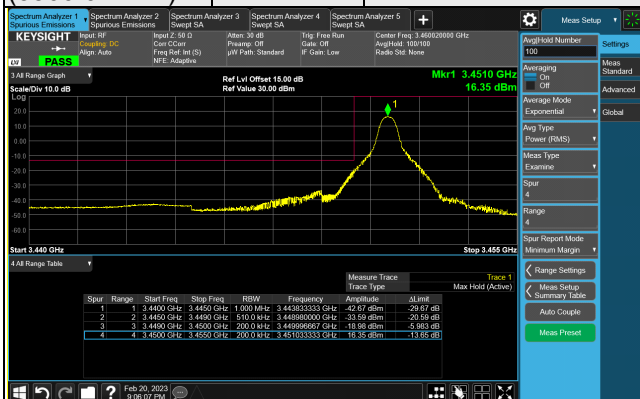
$\pi/2$  BPSK

243 RB / 0 RB Offset

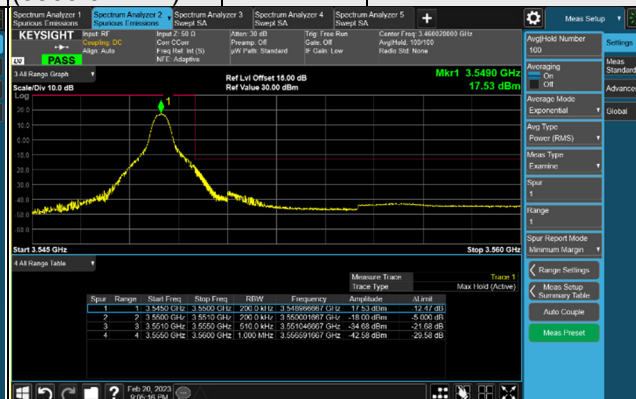


n77, Channel Bandwidth 100MHz

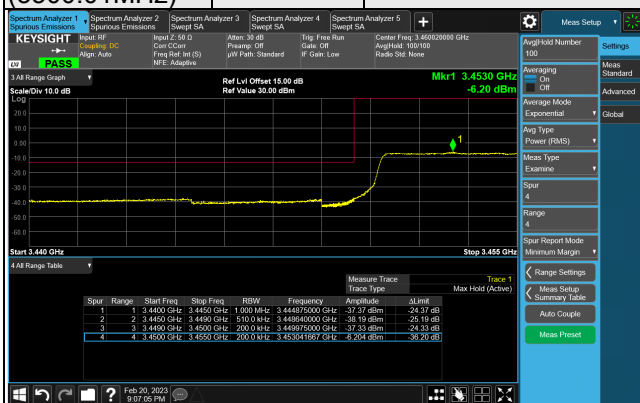
Channel 633334 (3500.01MHz)  $\pi/2$  BPSK 1 RB / 0 RB Offset



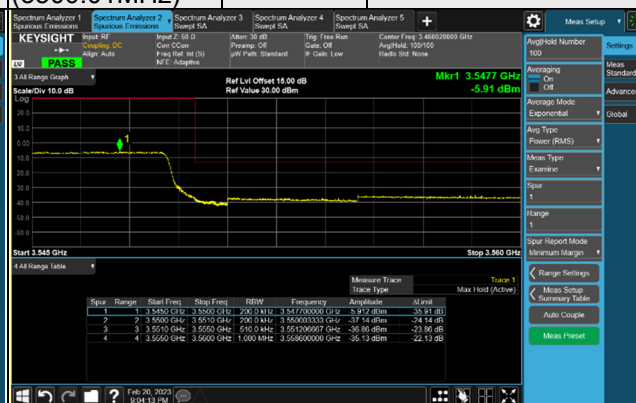
Channel 633334 (3500.01MHz)  $\pi/2$  BPSK 1 RB / 271 RB Offset



Channel 633334 (3500.01MHz)  $\pi/2$  BPSK 270 RB / 0 RB Offset



Channel 633334 (3500.01MHz)  $\pi/2$  BPSK 270 RB / 0 RB Offset

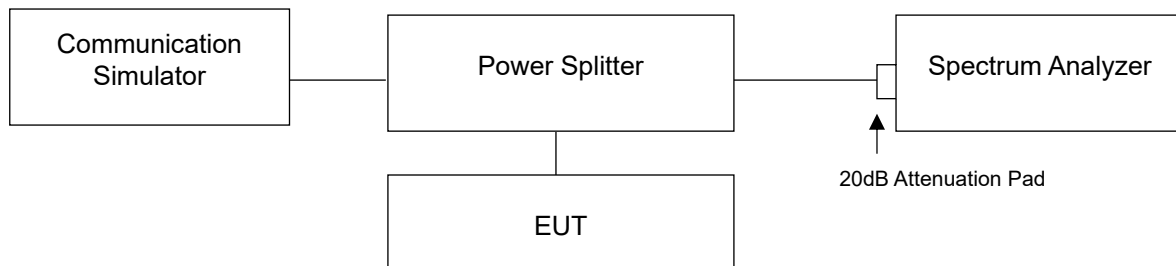


## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

### 4.6.2 Test Setup



### 4.6.3 Test Procedures

- Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

#### 4.6.4 Test Results

5GNR n77 (Part 27Q), Channel Bandwidth 10MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630334	3455.01	4.94	8.50	8.69	8.44	8.61
633334	3500.01	4.91	8.64	8.59	8.68	8.42
636332	3544.98	4.91	8.54	8.75	8.60	8.48
5GNR n77 (Part 27Q), Channel Bandwidth 15MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630500	3457.50	4.89	8.62	8.70	8.67	8.60
633334	3500.01	4.89	8.66	8.54	8.83	8.77
636166	3542.49	4.86	8.62	8.51	8.55	8.66
5GNR n77 (Part 27Q), Channel Bandwidth 20MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
630668	3460.02	4.90	8.50	8.61	8.72	8.74
633334	3500.01	4.89	8.66	8.61	8.77	8.88
636000	3540.00	4.93	8.62	8.61	8.67	8.76
5GNR n77 (Part 27Q), Channel Bandwidth 40MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631334	3470.01	4.91	8.50	8.56	8.58	8.65
633334	3500.01	4.93	8.51	8.59	8.60	8.68
635332	3529.98	4.91	8.50	8.56	8.57	8.69
5GNR n77 (Part 27Q) Channel Bandwidth 50MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
631668	3475.02	5.06	8.60	8.64	8.50	8.63
633334	3500.01	5.08	8.58	8.65	8.52	8.64
635000	3525.00	5.05	8.56	8.61	8.51	8.64

5GNR n77 (Part 27Q) Channel Bandwidth 60MHz

Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632000	3480.00	4.71	8.56	8.63	8.63	8.60
633334	3500.01	4.76	8.59	8.71	8.71	8.73
634666	3519.99	4.72	8.59	8.60	8.53	8.70

5GNR n77 (Part 27Q), Channel Bandwidth 80MHz

Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
632668	3490.02	5.33	8.64	8.55	8.66	8.70
633334	3500.01	5.32	8.56	8.61	8.63	8.72
634000	3510.00	5.32	8.63	8.52	8.54	8.69

5GNR n77 (Part 27Q), Channel Bandwidth 90MHz

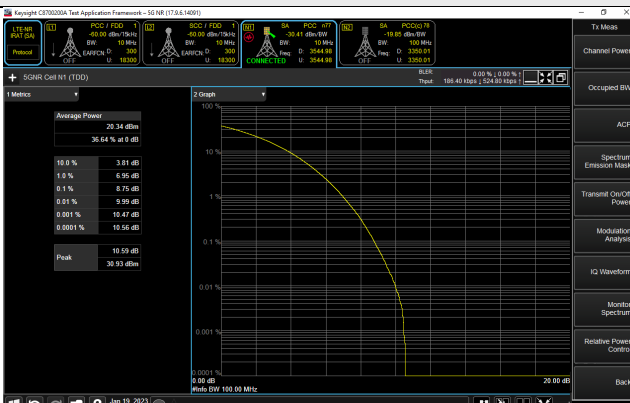
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633000	3495.00	4.80	8.56	8.56	8.57	8.75
633334	3500.01	4.77	8.60	8.63	8.65	8.63
633666	3504.99	4.76	8.53	8.50	8.59	8.77

5GNR n77 (Part 27Q), Channel Bandwidth 100MHz

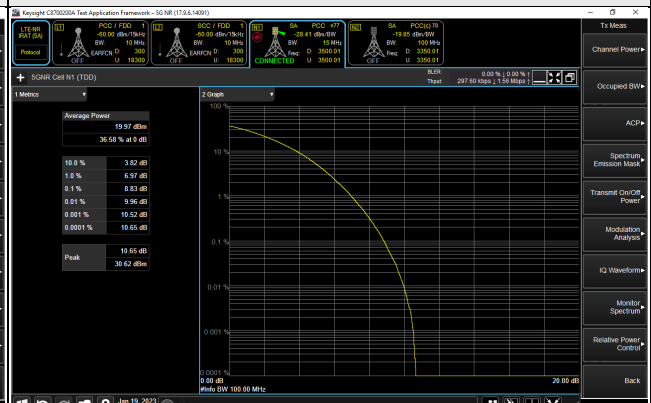
Channel	Frequency (MHz)	Peak To Average Ratio (dB)				
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
633334	3500.01	5.33	8.58	8.57	8.56	8.69

### Spectrum Plot of Worst Value

#### 10MHz / 16QAM



#### 15MHz / 64QAM



#### 20MHz / 256QAM



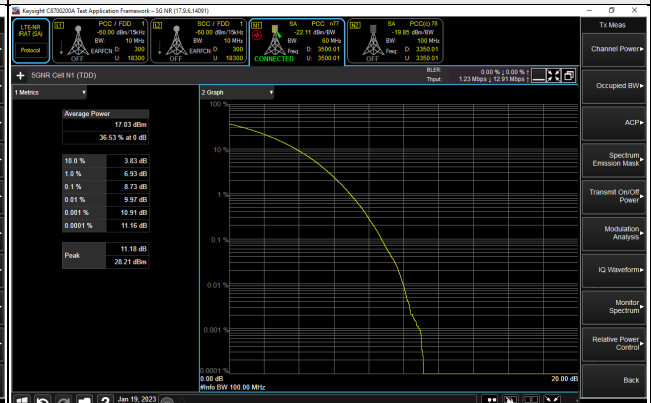
#### 40MHz / 256QAM



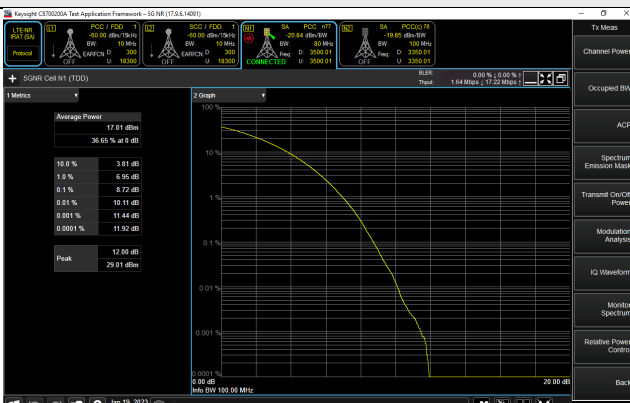
#### 50MHz / 16QAM



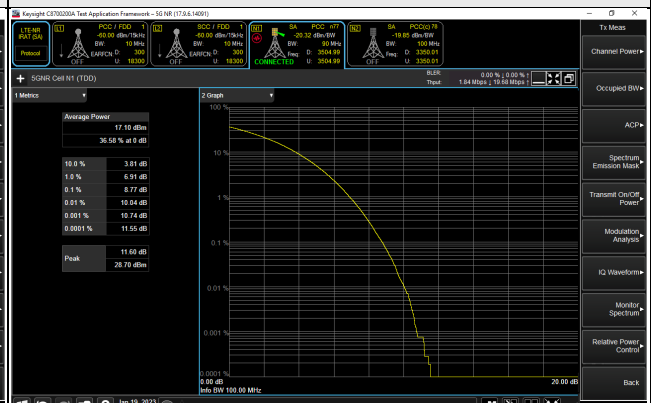
#### 60MHz / 256QAM



#### 80MHz / 256QAM

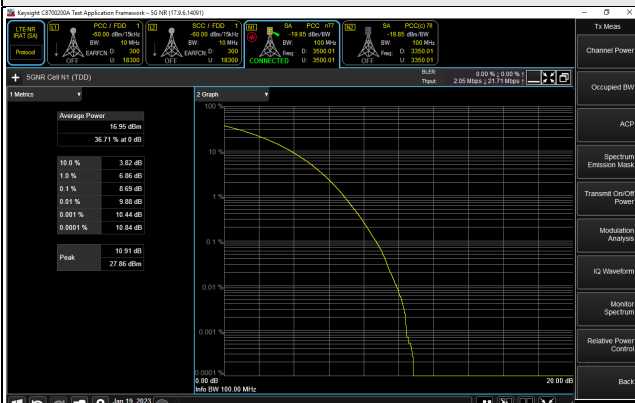


#### 90MHz / 256QAM



## Spectrum Plot of Worst Value

100MHz / 256QAM



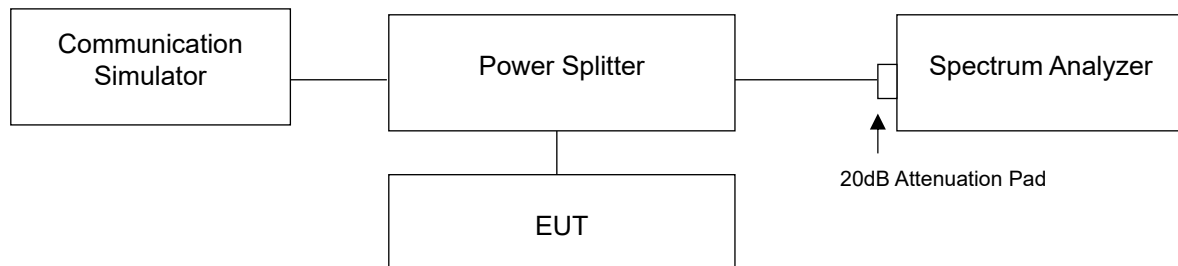


## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

According to FCC 27.53(n), for operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

### 4.7.2 Test Setup



### 4.7.3 Test Procedure

- All measurements were done at low, middle and high channels operational frequency range.
- Measuring frequency range is from 9kHz to 40GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.