

TEST REPORT FCC Rule Part 96

Applicant Name:
 Samsung Electronics Co., Ltd.
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 Yeongtong-gu, Suwon-si
 Gyeonggi-do, 16677, Korea

Date of Testing:
 10/20/2021 – 04/05/2022
Test Site/Location:
 PCTEST KOREA Lab. Yongin-si,
 Gyeonggi-do, Korea
Test Report Serial No.:
 8K21101306-R4.A3L

FCC ID: A3LRT4401-48A1
APPLICANT: Samsung Electronics Co., Ltd.

Application Type: Certification
Model: RT4401-48A1
EUT Type: RRU(RT4401)
FCC Classification: Citizens Band Category B Devices (CBD)
FCC Rule Part(s): 96
Test Procedure(s): ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01,
 KDB 940660 D01 v02, KDB 662911 D01 v02r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Prepared by Ian Kim
 Test Engineer



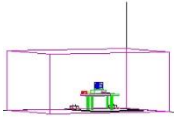
Reviewed by Charles Shin
 Technical Manager

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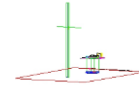
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Mode	Total Bandwidth (MHz)	Tx Frequency (MHz)	Max. PSD (dBm/1MHz)	Max. EIRP (dBm/10MHz)	Max. EIRP /Entire Band width (dBm)	Max. EIRP /Entire Band width (W)	Emission Designator	Modulation
LTE Band 48 1C 10M	10	3550 - 3700	36.92	46.30	46.30	42.66	8M98G7D	QPSK
			36.93	46.55	46.55	45.19	8M98W7D	QAM
LTE Band 48 1C 15M	15	3550 - 3700	36.92	46.79	48.34	68.23	13M5G7D	QPSK
			36.92	46.98	48.25	66.83	13M5W7D	QAM
LTE Band 48 1C 20M	20	3550 - 3700	36.93	46.49	49.16	82.41	17M9G7D	QPSK
			36.95	46.87	49.70	93.33	17M9W7D	QAM
LTE Band 48 2C 10M+10M	20	3550 - 3700	36.90	46.75	49.45	88.10	18M9G7D	QPSK
			36.95	46.83	49.86	96.83	18M9W7D	QAM
LTE Band 48 2C 10M+15M	25	3550 - 3700	36.51	46.44	50.24	105.68	23M6G7D	QPSK
			36.82	46.38	50.23	105.44	23M6W7D	QAM
LTE Band 48 2C 15M+15M	30	3550 - 3700	36.63	46.36	51.08	128.23	28M4G7D	QPSK
			36.76	46.49	51.06	127.64	28M4W7D	QAM
LTE Band 48 3C 10M+10M+15M	35	3550 - 3700	36.62	46.43	51.69	147.57	33M5G7D	QPSK
			36.92	46.42	51.61	144.88	33M5W7D	QAM
LTE Band 48 2C 20M+20M	40	3550 - 3700	36.85	46.89	52.55	179.89	37M7G7D	QPSK
			36.95	46.89	52.83	191.87	37M7W7D	QAM
LTE Band 48 4C 10M+10M+10M+10M	40	3550 - 3700	36.69	46.14	52.24	167.49	38M7G7D	QPSK
			36.93	46.54	52.29	169.43	38M7W7D	QAM
LTE Band 48 3C 10M+15M+20M	45	3550 - 3700	36.72	46.38	52.86	193.20	43M2G7D	QPSK
			36.95	46.40	52.81	190.99	43M2W7D	QAM
LTE Band 48 3C 10M+20M+20M	50	3550 - 3700	36.50	46.72	53.25	211.35	48M2G7D	QPSK
			36.85	46.78	53.30	213.80	48M2W7D	QAM
LTE Band 48 3C 15M+20M+20M	55	3550 - 3700	36.64	46.34	53.50	223.87	52M8G7D	QPSK
			36.82	46.25	53.66	232.27	52M8W7D	QAM
LTE Band 48 3C 20M+20M+20M	60	3550 - 3700	36.61	46.86	53.95	248.31	57M6G7D	QPSK
			36.92	46.82	54.07	255.27	57M6W7D	QAM
LTE Band 48 4C 10M+15M+20M+20M	65	3550 - 3700	36.94	46.35	54.39	274.79	63M0G7D	QPSK
			36.94	46.50	54.42	276.69	63M0W7D	QAM
LTE Band 48 4C 10M+20M+20M+20M	70	3550 - 3700	36.59	46.40	54.72	296.48	68M1G7D	QPSK
			36.83	46.49	54.71	295.80	68M0W7D	QAM
LTE Band 48 4C 15M+20M+20M+20M	75	3550 - 3700	36.85	46.39	55.04	319.15	72M5G7D	QPSK
			36.97	46.47	54.98	314.77	72M7W7D	QAM
LTE Band 48 4C 20M+20M+20M+20M	80	3550 - 3700	36.89	46.50	55.29	338.06	77M4G7D	QPSK
			36.96	46.56	55.33	341.19	77M3W7D	QAM

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Mode	Total Bandwidth (MHz)	Tx Frequency (MHz)	Max. PSD (dBm/1MHz)	Max. EIRP (dBm/10MHz)	Max. EIRP /Entire Band width (dBm)	Max. EIRP /Entire Band width (W)	Emission Designator	Modulation
5G NR n48 1C 10M	10	3550 - 3700	36.85	46.27	46.27	42.36	8M61G7D	QPSK
			36.90	46.39	46.39	43.55	8M61W7D	QAM
5G NR n48 1C 20M	20	3550 - 3700	36.55	46.59	49.27	84.53	18M3G7D	QPSK
			36.70	46.47	49.24	83.95	18M3W7D	QAM
5G NR n48 2C 10M+10M	20	3550 - 3700	36.90	46.51	49.23	83.75	18M5G7D	QPSK
			36.98	46.70	49.26	84.33	18M5W7D	QAM
5G NR n48 1C 30M	30	3550 - 3700	36.87	46.70	51.03	126.77	27M9G7D	QPSK
			36.91	46.44	51.07	127.94	28M0W7D	QAM
5G NR n48 2C 10M+20M	30	3550 - 3700	36.92	46.69	50.98	125.31	28M3G7D	QPSK
			36.96	46.78	50.87	122.18	28M3W7D	QAM
5G NR n48 1C 40M	40	3550 - 3700	36.79	46.15	52.49	177.42	37M9G7D	QPSK
			36.96	46.31	52.56	180.30	38M0W7D	QAM
5G NR n48 2C 10M+30M	40	3550 - 3700	36.97	46.33	52.16	164.44	38M1G7D	QPSK
			36.98	46.52	52.24	167.49	38M1W7D	QAM
5G NR n48 2C 10M+40M	50	3550 - 3700	36.98	46.46	53.13	205.59	48M0G7D	QPSK
			36.97	46.89	53.06	202.30	48M0W7D	QAM
5G NR n48 2C 20M+40M	60	3550 - 3700	36.96	46.48	54.08	255.86	57M7G7D	QPSK
			36.98	46.72	54.12	258.23	57M8W7D	QAM
5G NR n48 2C 30M+40M	70	3550 - 3700	36.94	46.84	54.68	293.76	67M5G7D	QPSK
			36.98	46.82	54.66	292.42	67M5W7D	QAM
5G NR n48 2C 40M+40M	80	3550 - 3700	36.65	46.34	55.20	331.13	77M4G7D	QPSK
			36.86	46.44	55.27	336.51	77M5W7D	QAM

EUT Overview

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1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
8K21101306.A3L	12/09/2021	Initial Issue
8K21101306-R1.A3L	12/13/2021	Revision due to revised result table typo
8K21101306-R2.A3L	04/05/2022	Revision due to added test mode
8K21101306-R3.A3L	04/07/2022	Revision due to updated limit
8K21101306-R4.A3L	04/11/2022	Revision due to revised result table typo

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2.0 INTRODUCTION

2.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

2.2 PCTEST KOREA Test Location

These measurement tests were conducted at the PCTEST KOREA CO., LTD. facility located at (#1407) 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do 16954, Korea.

2.3 Test Facility / Accreditation

Measurements were performed at PCTEST KOREA Lab located in Yongin-si, Gyeonggi, Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST KOREA facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.
 - Designation Number / CABID: KR0169
 - Test Firm Registration Number of FCC: 417945
 - Test Firm Registration Number of IC: 26168

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3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd. RRU(RT4401)**
FCC ID: A3LRT4401-48A1. Per FCC Part 96, this device is evaluated under Citizens Band Category B Devices (CBD).

This device supports the following conditional features:

EUT Type:	RRU(RT4401)		
Model Name:	RT4401-48A1		
Test Device Serial No.:	S614C24805		
Device Capabilities:	LTE, 5G NR		
Operating Band:	Band	Tx (Downlink)	Rx (Uplink)
	5G NR n48:	3550 MHz to 3700 MHz	3550 MHz to 3700 MHz
	LTE B48:	3550 MHz to 3700 MHz	3550 MHz to 3700 MHz
Supported Number of Carriers:	Max. 4 carrier		
Supported Modulation:	QPSK, 16QAM, 64QAM, 256QAM		
Supported Number of Carriers and Channel Bandwidth:	# LTE: 10, 15 and 20MHz bandwidth modes for TDD LTE Band 48 with up to 4CC aggregated BWs of 20/25/30/35/40/45/50/55/60/65/70/75 and 80MHz. # NR: 10, 20, 30 and 40MHz bandwidth modes for 5G NR Band n48 with up to 2CC aggregated BWs of 20/30/40/50/60/70 and 80MHz # Multi-RAT: 2CC (1xLTE + 1x5G NR) and 3CC (2xLTE + 1x5G NR) LTE 10, 15, 20MHz bandwidth modes and 5G NR 10, 20, 30, 40MHz bandwidth modes		
Maximum Output Power	Max 37 dBm/Path		
Number of Antenna ports	4		
Supported Configurations:	Single carrier, Multi carrier, Multi-RAT		
Input Voltage:	-48 VDC (-38 to -57 VDC), 90 – 260 VAC 50/60 Hz (clip-on AC-DC converter)		
Antenna Gain:	Min. 5 dBi ~ Max. 17.7 dBi		

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3.2 Test Configuration

The setup is as follows:

- The EUT "RT4401-48A1" is powered by a -48VDC power supply and the Equivalent Isotropic Radiated Power (EIRP) test case was additionally tested to 110VAC.
- The EUT is connected to a test laptop via an ethernet cable acting as backhaul.
- An RF cable connects the signal analyzer and the EUT Ports for respective measurement.

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the antenna port conducted emissions tests.

The following information is about configurations of carrier frequency and output power per port declared by the manufacturer.

* Abbreviations:

- 1C: 1 carrier
- 2C: Contiguous 2 carriers in multi-carrier operation
- 3C: Contiguous 3 carriers in multi-carrier operation
- 4C: Contiguous 4 carriers in multi-carrier operation
- Non-Contiguous : Non-contiguous carriers in multi-carrier operation

Single RAT: LTE Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (dBm/path)
			Lowest	Middle	Highest	
B48_1C_10M	1	10	3555	3625	3695	30
B48_1C_15M	1	15	3557.5	3625	3692.5	31.8
B48_1C_20M	1	20	3560	3625	3690	33
B48_2C_10M+10M	2	10+10	3555 3565	3620 3630	3685 3695	32
B48_2C_10M+10M Non-Contiguous	2	10+10	3555 + 3695			
B48_2C_10M+15M	2	10+15	3555 3567.5	3617.5 3630	3680 3692.5	33
B48_2C_10M+15M Non-Contiguous	2	10+15	3555 + 3692.5			
B48_2C_15M+15M	2	15+15	3557.5 3572.5	3617.5 3632.5	3677.5 3692.5	33.8
B48_2C_15M+15M Non-Contiguous	2	15+15	3557.5 + 3692.5			
B48_3C 10M+10M+15M	3	10+10+15	3555 3565 3577.5	3612.5 3622.5 3635	3670 3680 3692.5	34.5
B48_3C 10M+10M+15M Non-Contiguous	3	10+10+15	3555 + 3622.5 + 3692.5			
B48_2C_20M+20M	2	20+20	3560 3580	3615 3635	3670 3690	35.0
B48_2C_20M+20M Non-Contiguous	2	20+20	3560 + 3690			
B48_4C 10M+10M+10M+10M	4	10+10 +10+10	3555 3565 3575 3585	3610 3620 3630 3640	3665 3675 3685 3695	34
B48_4C 10M+10M+10M+10M Non-Contiguous	4	10+10 +10+10	3555 + 3600 + 3650 + 3695			

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B48_3C 10M+15M+20M	3	10+15+20	3555	3607.5	3660	35.5
			3567.5	3620	3672.5	
			3585	3637.5	3690	
B48_3C 10M+15M+20M Non-Contiguous	3	10+15+20	3555 + 3620 + 3690			
B48_3C 10M+20M+20M	3	10+20+20	3555	3605	3655	36
			3570	3620	3670	
			3590	3640	3690	
B48_3C 10M+20M+20M Non-Contiguous	3	10+20+20	3555 + 3620 + 3690			
B48_3C 15M+20M+20M	3	15+20+20	3557.5	3605	3652.5	36.4
			3575	3622.5	3670	
			3595	3642.5	3690	
B48_3C 15M+20M+20M Non-Contiguous	3	15+20+20	3557.5 + 3622.5 + 3670			
B48_3C 20M+20M+20M	3	20+20+20	3560	3605	3650	36.8
			3580	3625	3670	
			3600	3645	3690	
B48_3C 20M+20M+20M Non-Contiguous	3	20+20+20	3560 + 3625 + 3690			
B48_4C 10M+15M+20M+20M	4	10+15 +20+20	3555	3597.5	3640	36.1
			3567.5	3610	3652.5	
			3585	3627.5	3670	
			3605	3647.5	3690	
B48_4C 10M+15M+20M+20M Non-Contiguous	4	10+15 +20+20	3555 + 3610 + 3647.5 + 3690			
B48_4C 10M+20M+20M+20M	4	10+20 +20+20	3555	3595	3635	36.4
			3570	3610	3650	
			3590	3630	3670	
			3610	3650	3690	
B48_4C 10M+20M+20M+20M Non-Contiguous	4	10+20 +20+20	3555 + 3610 + 3650 + 3690			
B48_4C 15M+20M+20M+20M	4	15+20 +20+20	3557.5	3595	3632.5	36.8
			3575	3612.5	3650	
			3595	3632.5	3670	
			3615	3652.5	3690	
B48_4C 15M+20M+20M+20M Non-Contiguous	4	15+20 +20+20	3557.5 + 3612.5 + 3652.5 + 3690			
B48_4C 20M+20M+20M+20M	4	20+20 +20+20	3560	3595	3630	37
			3580	3615	3650	
			3600	3635	3670	
			3620	3655	3690	
B48_4C 20M+20M+20M+20M Non-Contiguous	4	20+20 +20+20	3560 + 3605 + 3645 + 3690			

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Single RAT: 5G NR Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (dBm/path)
			Lowest	Middle	Highest	
n48_1C_10M	1	10	3555	3625	3695	30
n48_1C_20M	1	20	3560	3625	3690	33
n48_2C_10M+10M	2	10+10	3555	3620	3685	32
			3565	3630	3695	
n48_2C_10M+10M_ Non-Contiguous	2	10+10	3555 + 3695			33.8
n48_1C_30M	1	30	3565	3625	3685	
n48_2C_10M+20M	2	10+20	3555	3615	3675	33.8
			3570	3630	3690	
n48_2C_10M+20M_ Non-Contiguous	2	10+20	3555 + 3690			35
n48_1C_40M	1	40	3570	3625	3680	
n48_2C_10M+30M	2	10+30	3555	3610	3665	34
			3575	3630	3685	
n48_2C_10M+30M_ Non-Contiguous	2	10+30	3555 + 3685			35
n48_2C_10M+40M	2	10+40	3555	3605	3655	
			3580	3630	3680	
n48_2C_10M+40M_ Non-Contiguous	2	10+40	3555 + 3680			35.8
n48_2C_20M+40M	2	20+40	3560	3605	3650	
			3590	3635	3680	
n48_2C_20M+40M_ Non-Contiguous	2	20+40	3560 + 3680			36.5
n48_2C_30M+40M	2	30+40	3565	3605	3645	
			3600	3640	3680	
n48_2C_30M+40M_ Non-Contiguous	2	30+40	3565 + 3680			37
n48_2C_40M+40M	2	40+40	3570	3605	3640	
			3610	3645	3680	
n48_2C_40M+40M_ Non-Contiguous	2	40+40	3570 + 3680			

Multi-RAT: LTE + 5G NR Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (dBm/path)
			Lowest	Middle	Highest	
B48_1C + n48_1C 10M+10M	2	10+10	3555	3620	3685	32
			3565	3630	3695	
B48_1C + n48_1C 10M+10M Non-Contiguous	2	10+10	3555 + 3695			33.8
B48_2C + n48_1C 10M+10M+10M	3	10+10+10	3555	3615	3675	
			3565	3625	3685	
			3575	3635	3695	
B48_2C + n48_1C 10M+10M+10M Non-Contiguous	3	10+10+10	3555 + 3625 + 3695			35.8
B48_1C + n48_1C 20M+40M	2	20+40	3560	3605	3650	
			3590	3635	3680	
B48_1C + n48_1C 20M+40M Non-Contiguous	2	20+40	3560 + 3680			37
B48_2C + n48_1C 20M+20M+40M	3	20+20+40	3560	3595	3630	
			3580	3615	3650	
			3610	3645	3680	
B48_2C + n48_1C 20M+20M+40M Non-Contiguous	3	20+20+40	3560 + 3615 + 3680			

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3.3 EMI Suppression Device(s)/Modifications

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

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4.0 DESCRIPTION OF TESTS

4.1 Measurement Procedure

The measurement procedures described in the document titled “American National Standard for Compliance Testing of Transmitter Used in Licensed Radio Service” (ANSI C63.26-2015) and the guidance provided in KDB 971168 D01 v03r01, and KDB 662911 D01 v02r01 and KDB 940660 D01 were used in the measurement of the EUT.

Occupied Bandwidth:

KDB 971168 D01 v03r01 – Section 4.3
ANSI C63.26-2015 – Section 5.4.4

Modulation Characteristics:

ANSI C63.26 - Section 5.3

Conducted Power Measurement and EIRP and PSD

KDB 971168 D01 v03r01 – Section 5.3
KDB 971168 D01 v03r01 – Section 5.4
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.5
ANSI C63.26-2015 – Section 5.2.4

Peak-to-Average Power Ratio:

KDB 971168 D01 v03r01 – Section 5.7
ANSI C63.26-2015 – Section 5.2.3.4

Channel Edge Emissions at Antenna Terminal

KDB 971168 D01 v03r01 – Section 6
KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements
a) Absolute Emission Limits
iii) Measure and add $10 \log(N_{ANT})$ dB

ANSI C63.26-2015 – Section 5.7

Spurious and Harmonic Emissions at Antenna Terminal

KDB 971168 D01 v03r01 – Section 6
KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements
a) Absolute Emission Limits
iii) Measure and add $10 \log(N_{ANT})$ dB

ANSI C63.26-2015 – Section 5.7

Radiated unwanted emission

KDB 971168 D01 v03r01 – Section 7
ANSI C63.26-2015 – Section 5.8

Frequency Stability / Temperature Variation

KDB 971168 D01 v03r01 – Section 9
ANSI C63.26-2015 – Section 5.6

4.2 Measurement Software

Test item	Name	Version
Conducted Measurement	Node B automation	1.0

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacture	Model	Description	Cal Date	Cal interval	Cal Due	Serial Number
KEYSIGHT	N9030B	PXA Signal Analyzer	05/11/2021	Annual	05/10/2022	MY57142018
KEYSIGHT	N9020B	MXA Signal Analyzer	10/22/2021	Annual	10/21/2022	MY55470135
KIKISUI	PWR1201ML	DC POWER SUPPLY	05/25/2021	Annual	05/24/2022	ZL000972
Rohde & Schwarz	FSW43	Signal & Spectrum Analyzer	09/15/2021	Annual	09/14/2022	101250
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	01/19/2022	Annual	01/18/2023	102151
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	07/13/2021	Biennial	07/12/2023	9162-217
Sunol sciences	DRH-118	Horn Antenna	01/12/2021	Biennial	01/11/2023	A060215
Schwarzbeck	BBHA 9170	Horn Antenna	01/27/2022	Biennial	01/26/2024	1037
Centric RF	C411-20	Attenuator	01/19/2022	Annual	01/18/2023	0002
Centric RF	C411-20	Attenuator	01/19/2022	Annual	01/18/2023	0003
Centric RF	C411-20	Attenuator	01/19/2022	Annual	01/18/2023	0004
Centric RF	C411-20	Attenuator	05/24/2021	Annual	05/23/2022	0001
RF One	RFHB1810SC10	Attenuator	01/18/2022	Annual	01/17/2023	RFHB0003
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0288
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0289
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0290
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0291

Table 6-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. All testing was performed before the calibration due date.

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7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 18M3G7D

Occupied Bandwidth = 18.27 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 18M3W7D

Occupied Bandwidth = 18.26 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

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8.0 TEST RESULTS

8.1 Summary

Company Name: SAMSUNG Electronics Co., Ltd.
 FCC ID: A3LRT4401-48A1
 Type of Radio Equipment: Citizens Band Category B Devices (CBD)
 Mode(s): LTE, 5G NR

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 8.2
2.1046 96.41(a)	Modulation Characteristics	Digital modulation		PASS	Section 8.3
2.1046 96.41(b)	Power Spectral Density (PSD)	37 dBm/MHz (PSD)		PASS	Section 8.4
2.1046 96.41(b)	Equivalent Isotropic Radiated Power (EIRP)	47 dBm/10MHz (EIRP)		PASS	Section 8.5
96.41(g)	Peak-Average Ratio	≤ 13 dB		PASS	Section 8.6
2.1051 96.41(e)	Out of Band Emissions	Within 0 MHz to 10 MHz above and below the assigned channel ≤ -13 dBm/MHz Greater than 10 MHz above and below the assigned channel ≤ -25 dBm/MHz Any emission below 3530 MHz and above 3720 MHz ≤ -40 dBm/MHz		PASS	Section 8.7
2.1055 96.41(e)	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 8.9
2.1051 96.41(e)	Radiated unwanted emission	< -40dBm/MHz	Radiated	PASS	Section 8.8

Table 8-1. Summary of Test Results

Notes:

- All modes of operation and data rates were investigated.
The test results shown in the following sections represent the worst case emissions.
- The analyzer plots were all taken with a correction table loaded into the analyzer.
- All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

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8.2 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be. All measured modes of operation were investigated, and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26 - Section 5.4.4
KDB 971168 D01 v03r01 - Section 4.3

Test Setting

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

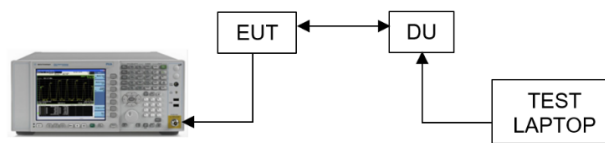


Figure 8-1. Test Instrument & Measurement Setup

Limit

The occupied bandwidth shall not exceed the equipment's channel bandwidth, which is declared by the manufacturer.

Test Notes

For multi carriers configuration, the QAM modulation worst case was found while operating with 16QAM mode and only the worst-case data were reported.

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	8.97	8.95	8.97	8.94
	1	8.96	8.95	8.97	8.95
	2	8.95	8.96	8.96	8.95
	3	8.95	8.96	8.96	8.95
Middle	0	8.92	8.94	8.98	8.96
	1	8.95	8.94	8.95	8.95
	2	8.95	8.94	8.97	8.95
	3	8.94	8.94	8.97	8.95
High	0	8.98	8.94	8.95	8.96
	1	8.95	8.94	8.94	8.96
	2	8.94	8.94	8.95	8.94
	3	8.94	8.95	8.94	8.92

Table 8-2. Occupied Bandwidth Summary Data (LTE_B48_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	13.45	13.45	13.46	13.43
	1	13.48	13.44	13.46	13.45
	2	13.46	13.44	13.46	13.43
	3	13.46	13.46	13.45	13.44
Middle	0	13.44	13.45	13.41	13.42
	1	13.46	13.45	13.45	13.41
	2	13.45	13.42	13.43	13.44
	3	13.46	13.45	13.44	13.44
High	0	13.40	13.41	13.43	13.43
	1	13.42	13.44	13.40	13.39
	2	13.42	13.44	13.41	13.42
	3	13.43	13.41	13.43	13.40

Table 8-3. Occupied Bandwidth Summary Data (LTE_B48_1C_15M)

FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	17.88	17.88	17.88	17.88
	1	17.89	17.91	17.91	17.91
	2	17.90	17.93	17.91	17.86
	3	17.87	17.89	17.87	17.88
Middle	0	17.87	17.90	17.85	17.90
	1	17.90	17.87	17.87	17.85
	2	17.88	17.88	17.88	17.87
	3	17.86	17.82	17.87	17.88
High	0	17.93	17.88	17.88	17.90
	1	17.87	17.88	17.90	17.87
	2	17.89	17.84	17.90	17.82
	3	17.86	17.92	17.84	17.88

Table 8-4. Occupied Bandwidth Summary Data (LTE_B48_1C_20M)

Channel	Configuration	OBW (MHz)	
		QPSK	16QAM
Middle	LTE_2C_10M+10M	18.85	18.86
	LTE_2C_10M+15M	23.58	23.57
	LTE_2C_15M+15M	28.37	28.39
	LTE_2C_20M+20M	37.71	37.72
	LTE_3C_10M+10M+15M	33.53	33.49
	LTE_3C_10M+15M+20M	43.17	43.17
	LTE_3C_10M+20M+20M	48.18	48.17
	LTE_3C_15M+20M+20M	52.82	52.83
	LTE_3C_20M+20M+20M	57.55	57.55
	LTE_4C_10M+10M+10M+10M	38.73	38.73
	LTE_4C_10M+15M+20M+20M	62.96	62.98
	LTE_4C_10M+20M+20M+20M	68.09	67.96
	LTE_4C_15M+20M+20M+20M	72.52	72.71
	LTE_4C_20M+20M+20M+20M	77.38	77.34

Table 8-5. Occupied Bandwidth Summary Data (LTE_B48_Multi Carrier)

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	8.59	8.61	8.58	8.60
	1	8.60	8.61	8.58	8.61
	2	8.58	8.58	8.58	8.58
	3	8.58	8.58	8.58	8.59
Middle	0	8.58	8.59	8.58	8.58
	1	8.58	8.59	8.57	8.59
	2	8.60	8.59	8.60	8.58
	3	8.61	8.60	8.58	8.59
High	0	8.58	8.58	8.60	8.60
	1	8.60	8.59	8.58	8.60
	2	8.60	8.58	8.59	8.59
	3	8.58	8.60	8.58	8.58

Table 8-6. Occupied Bandwidth Summary Data (NR_n48_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	18.25	18.23	18.20	18.26
	1	18.24	18.26	18.24	18.24
	2	18.23	18.26	18.23	18.27
	3	18.22	18.23	18.21	18.27
Middle	0	18.26	18.21	18.25	18.27
	1	18.24	18.25	18.23	18.26
	2	18.21	18.22	18.27	18.24
	3	18.27	18.20	18.28	18.26
High	0	18.25	18.24	18.26	18.29
	1	18.22	18.22	18.22	18.22
	2	18.25	18.21	18.25	18.27
	3	18.25	18.22	18.26	18.23

Table 8-7. Occupied Bandwidth Summary Data (NR_n48_1C_20M)

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	27.87	27.85	27.90	27.90
	1	27.88	27.84	27.88	27.89
	2	27.88	27.81	27.89	27.86
	3	27.88	27.83	27.87	27.88
Middle	0	27.86	27.96	27.90	27.88
	1	27.86	27.90	27.84	27.87
	2	27.86	27.94	27.84	27.88
	3	27.85	27.96	27.85	27.91
High	0	27.83	27.88	27.86	27.87
	1	27.86	27.85	27.87	27.84
	2	27.89	27.84	27.86	27.79
	3	27.85	27.91	27.87	27.84

Table 8-8. Occupied Bandwidth Summary Data (NR_n48_1C_30M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	37.91	37.84	37.84	37.86
	1	37.80	37.82	37.87	37.82
	2	37.82	37.82	37.82	37.83
	3	37.83	37.84	37.80	37.81
Middle	0	37.88	37.82	37.84	37.85
	1	37.84	37.79	37.86	37.87
	2	37.84	37.87	37.78	37.95
	3	37.86	37.85	37.98	37.87
High	0	37.82	37.86	37.91	37.81
	1	37.91	37.89	37.79	37.93
	2	37.84	37.83	37.82	37.90
	3	37.91	37.81	37.86	37.86

Table 8-9. Occupied Bandwidth Summary Data (NR_n48_1C_40M)

FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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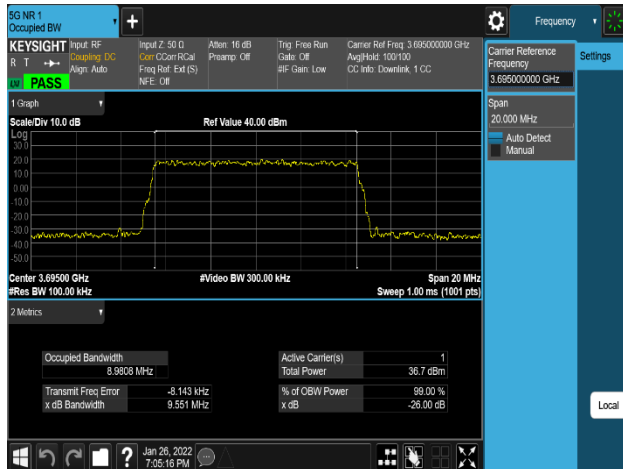
Channel	Configuration	OBW (MHz)	
		QPSK	16QAM
Middle	NR_2C_10M+10M	18.52	18.47
	NR_2C_10M+20M	28.30	28.29
	NR_2C_10M+30M	38.05	38.07
	NR_2C_10M+40M	48.01	47.99
	NR_2C_20M+40M	57.73	57.80
	NR_2C_30M+40M	67.51	67.46
	NR_2C_40M+40M	77.41	77.52

Table 8-10. Occupied Bandwidth Summary Data (NR_n48_Multi Carrier)

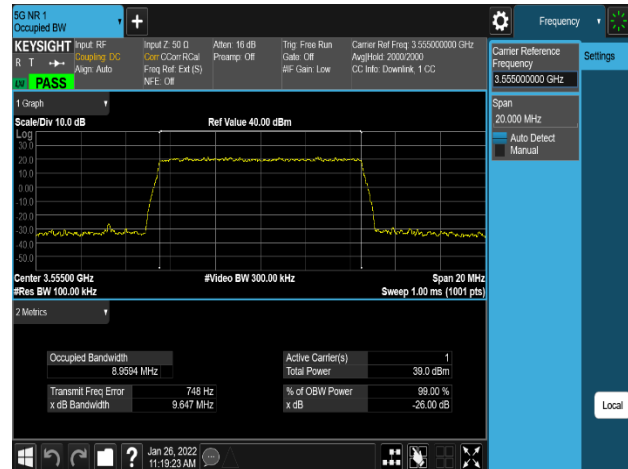
Channel	Configuration	OBW (MHz)	
		QPSK	16QAM
Middle	LTE_1C_10M + NR_1C_10M	18.66	18.71
	LTE_1C_20M + NR_1C_40M	57.55	57.63
	LTE_2C_10M+10M + NR_1C_10M	28.58	28.66
	LTE_2C_20M+20M + NR_1C_40M	77.46	77.35

Table 8-11. Occupied Bandwidth Summary Data (LTE_B48 + NR_n48_Multi-RAT)

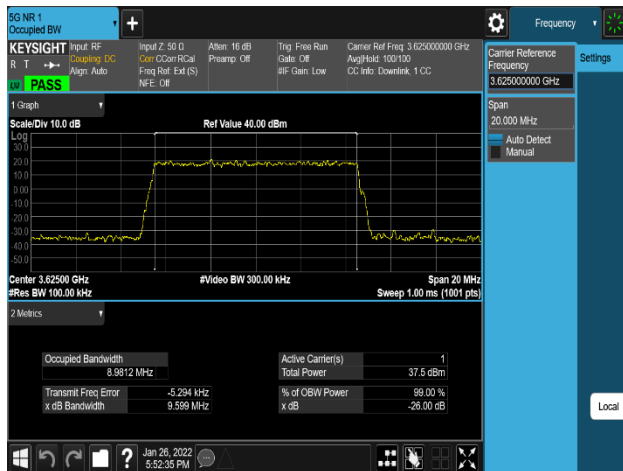
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 8-1. Occupied Bandwidth Plot
(LTE_B48_1C_10M_QPSK - High Channel, Port 0)



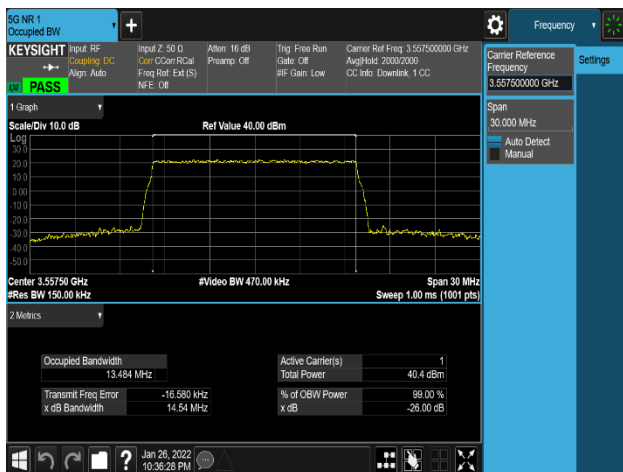
Plot 8-2. Occupied Bandwidth Plot
(LTE_B48_1C_10M_16QAM - Low Channel, Port 3)



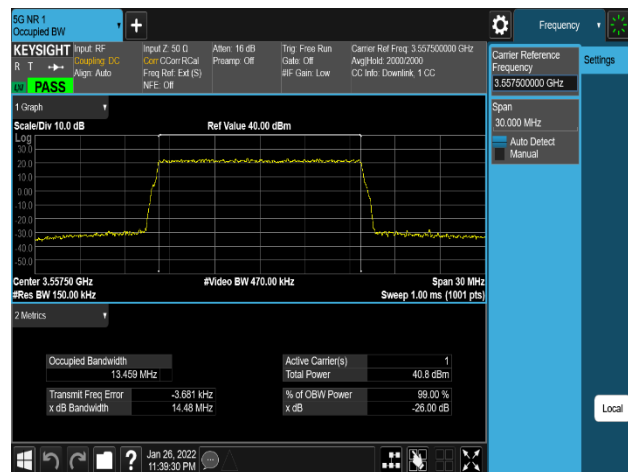
Plot 8-3. Occupied Bandwidth Plot
(LTE_B48_1C_10M_64QAM - Mid Channel, Port 0)



Plot 8-2. Occupied Bandwidth Plot
(LTE_B48_C_10M_256QAM - Mid Channel, Port 0)

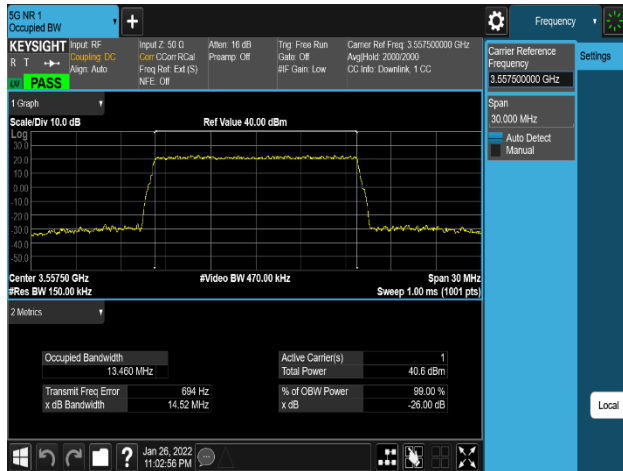


Plot 8-5. Occupied Bandwidth Plot
(LTE_B48_1C_15M_QPSK - Low Channel, Port 1)

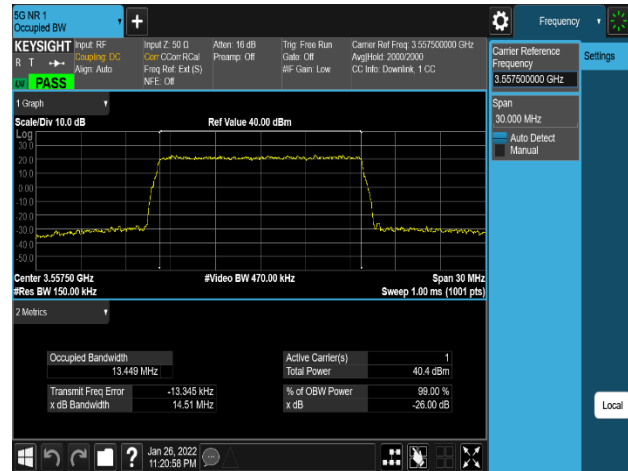


Plot 8-6. Occupied Bandwidth Plot
(LTE_B48_1C_15M_16QAM - Low Channel, Port 3)

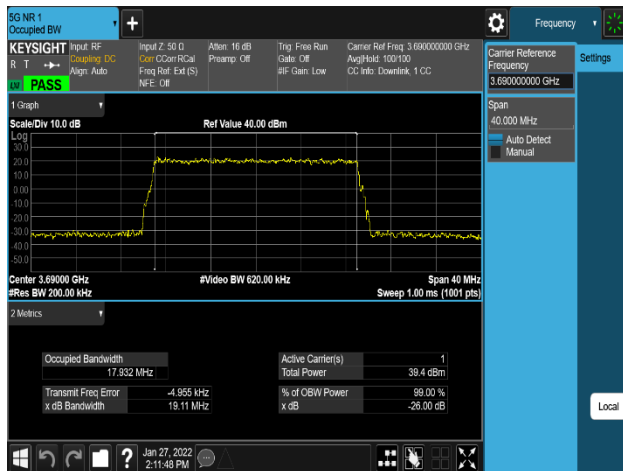
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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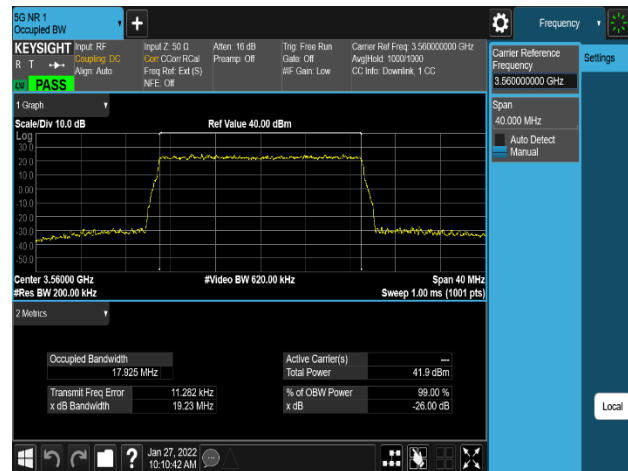
Plot 8-7. Occupied Bandwidth Plot
(LTE_B48_1C_15M_64QAM - Low Channel, Port 0)



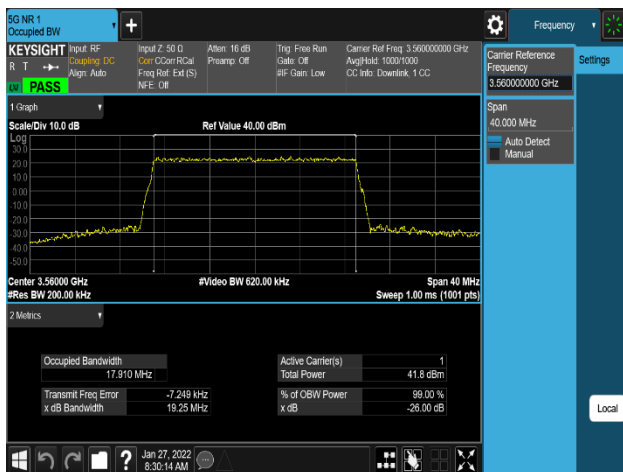
Plot 8-8. Occupied Bandwidth Plot
(LTE_B48_1C_15M_256QAM - Low Channel, Port 1)



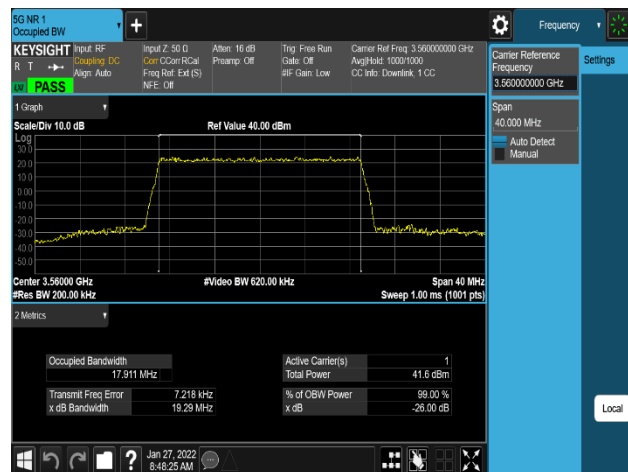
Plot 8-9. Occupied Bandwidth Plot
(LTE_B48_1C_20M_QPSK - High Channel, Port 0)



Plot 8-10. Occupied Bandwidth Plot
(LTE_B48_1C_20M_16QAM - Low Channel, Port 2)

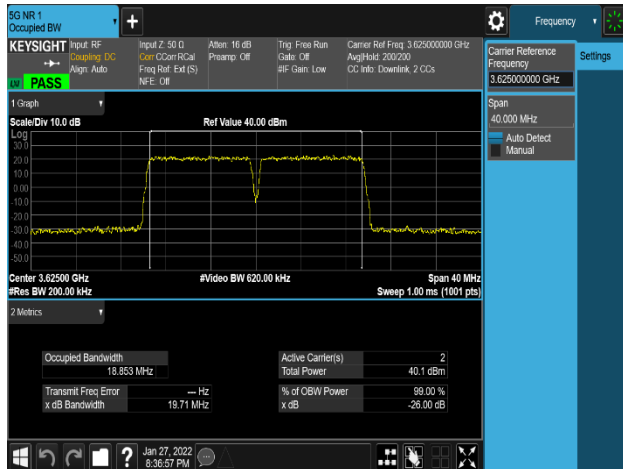


Plot 8-11. Occupied Bandwidth Plot
(LTE_B48_1C_20M_64QAM - Low Channel, Port 1)

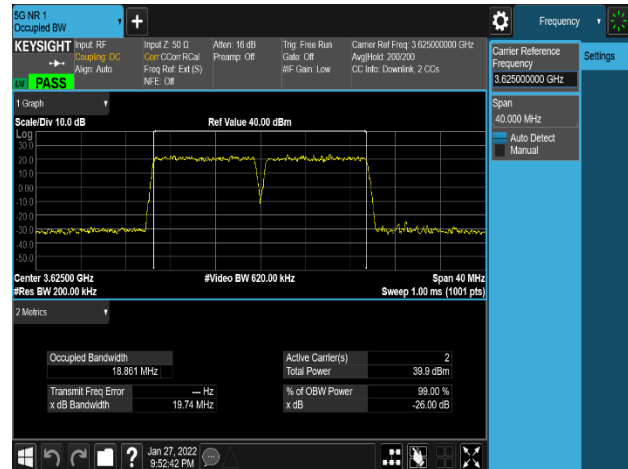


Plot 8-12. Occupied Bandwidth Plot
(LTE_B48_1C_20M_256QAM - Low Channel, Port 1)

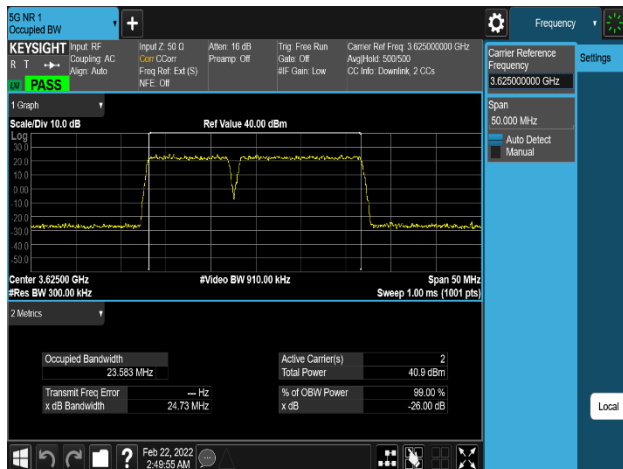
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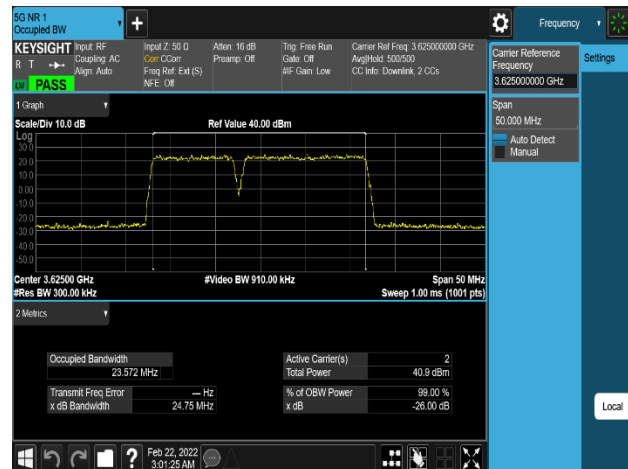
Plot 8-33. Occupied Bandwidth Plot
(LTE_B48_2C_10M+10M_QPSK-Mid Channel, Port 0)



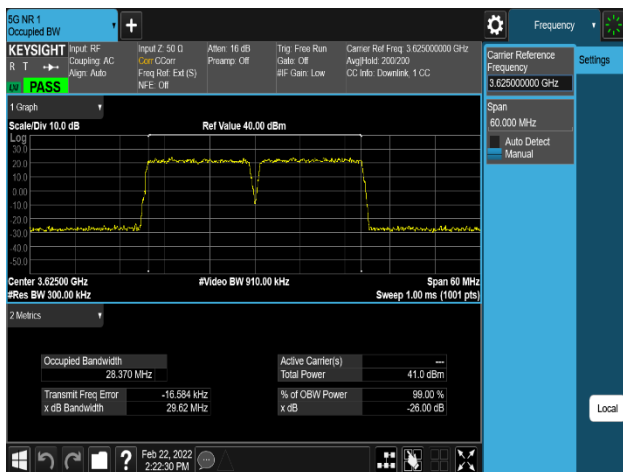
Plot 8-14. Occupied Bandwidth Plot
(LTE_B48_2C_10M+10M_16QAM-Mid Channel, Port 0)



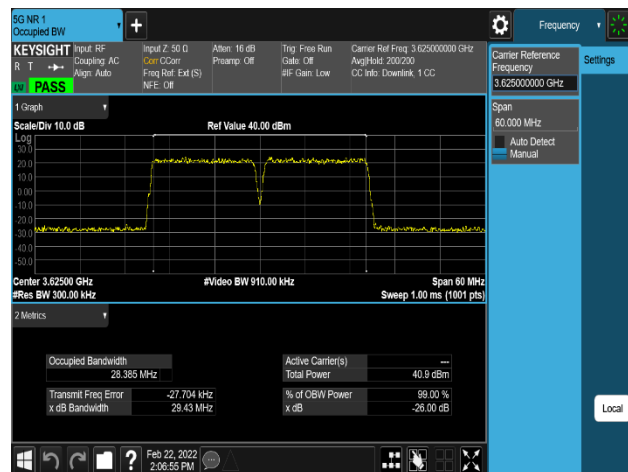
Plot 8-45. Occupied Bandwidth Plot
(LTE_B48_2C_10M+15M_QPSK-Mid Channel, Port 0)



Plot 8-16. Occupied Bandwidth Plot
(LTE_B48_2C_10M+15M_16QAM-Mid Channel, Port 0)

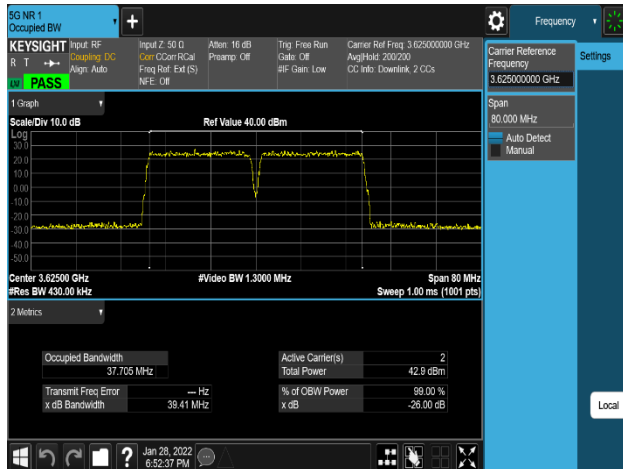


Plot 8-17. Occupied Bandwidth Plot
(LTE_B48_2C_15M+15M_QPSK-Mid Channel, Port 0)

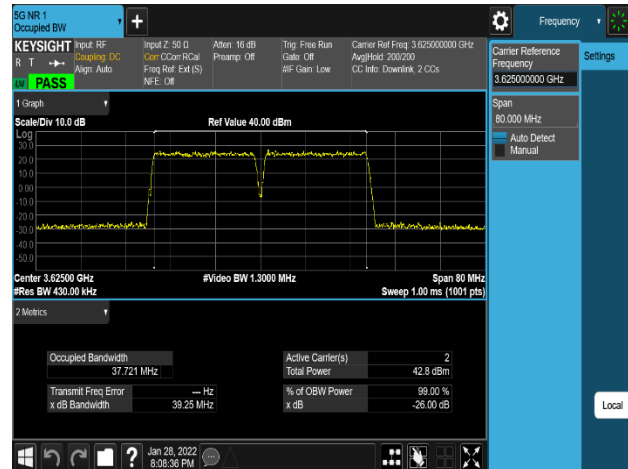


Plot 8-18. Occupied Bandwidth Plot
(LTE_B48_2C_15M+15M_16QAM-Mid Channel, Port 0)

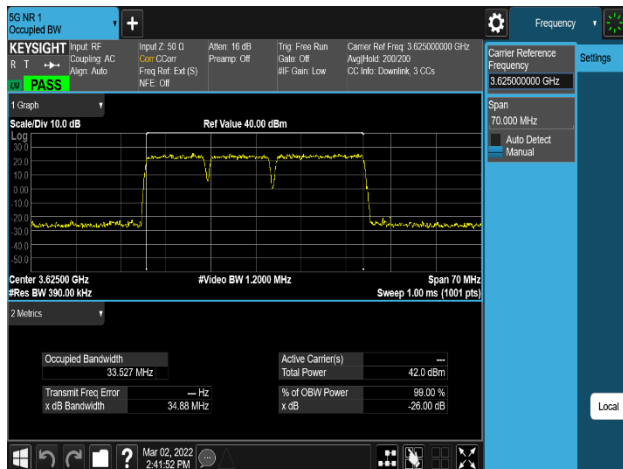
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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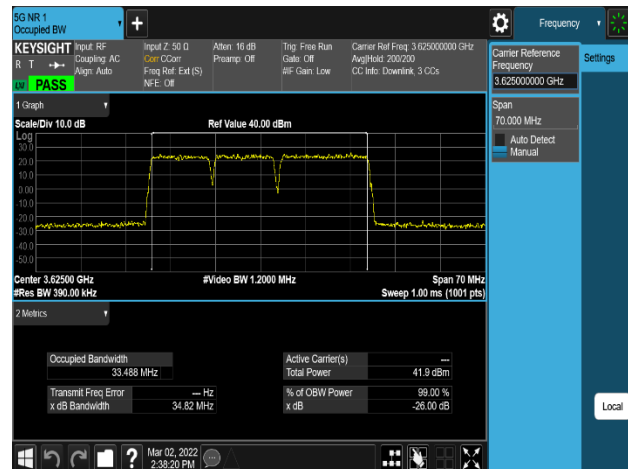
Plot 8-19. Occupied Bandwidth Plot
(LTE_B48_2C_20M+20M_QPSK-Mid Channel, Port 0)



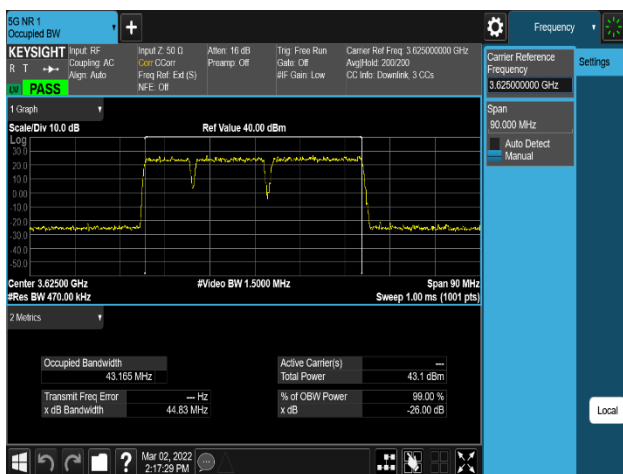
Plot 8-50. Occupied Bandwidth Plot
(LTE_B48_2C_20M+20M_16QAM-Mid Channel, Port 0)



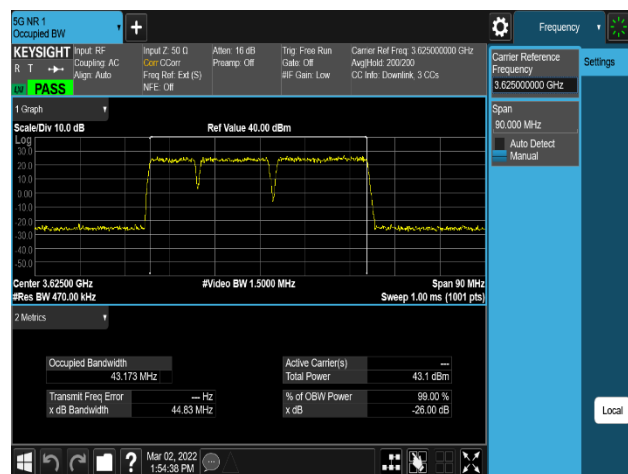
Plot 8-26. Occupied Bandwidth Plot
(LTE_B48_3C_10M+10M+15M_QPSK-Mid Channel, Port 0)



Plot 8-72. Occupied Bandwidth Plot
(LTE_B48_3C_10M+10M+15M_16QAM-Mid Channel, Port 0)

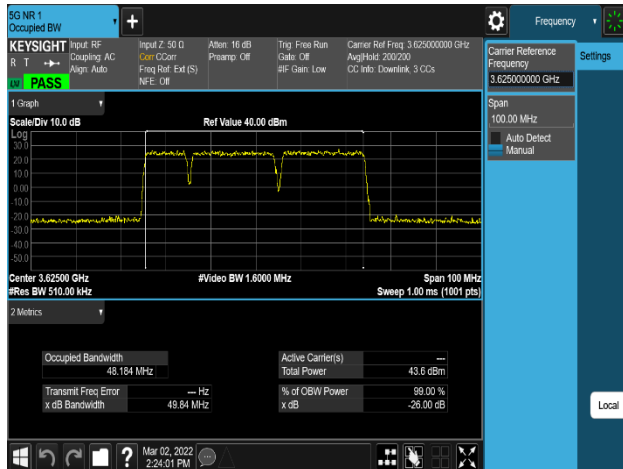


Plot 8-23. Occupied Bandwidth Plot
(LTE_B48_3C_10M+15M+20M_QPSK-Mid Channel, Port 0)

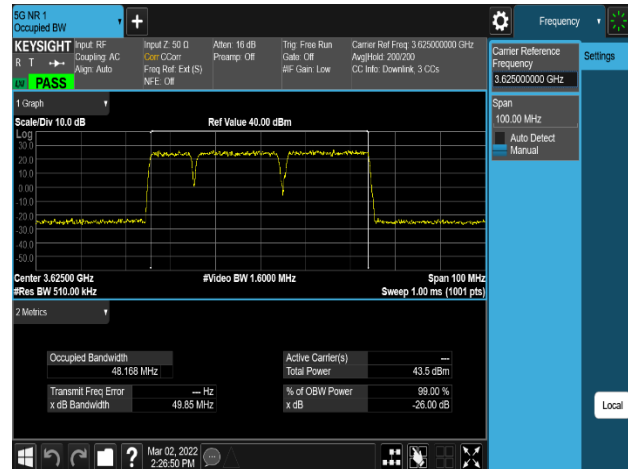


Plot 8-24. Occupied Bandwidth Plot
(LTE_B48_3C_10M+15M+20M_16QAM-Mid Channel, Port 0)

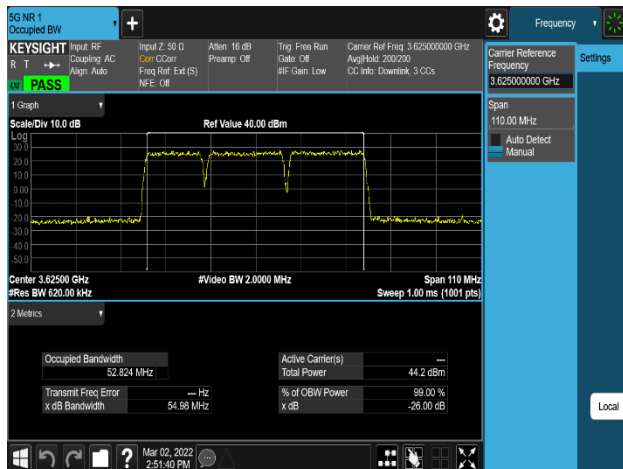
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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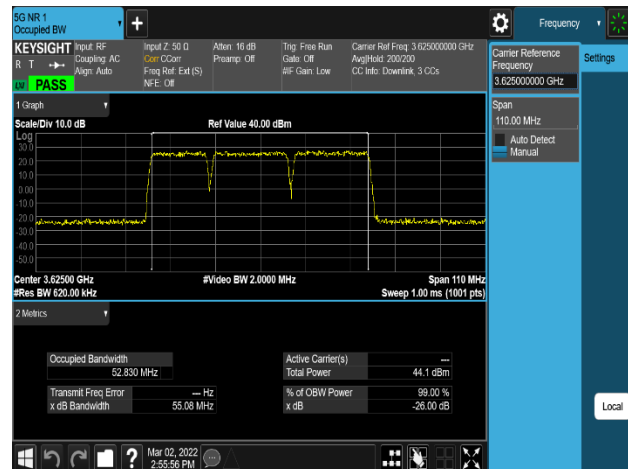
Plot 8-25. Occupied Bandwidth Plot
(LTE_B48_3C_10M+20M+20M_QPSK-Mid Channel, Port 0)



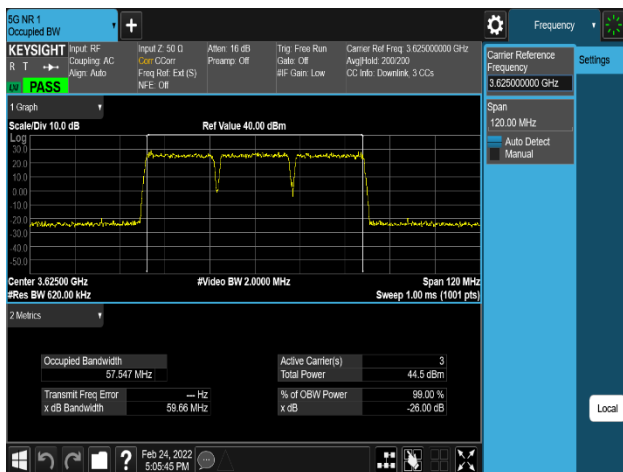
Plot 8-86. Occupied Bandwidth Plot
(LTE_B48_3C_10M+20M+20M_16QAM-Mid Channel, Port 0)



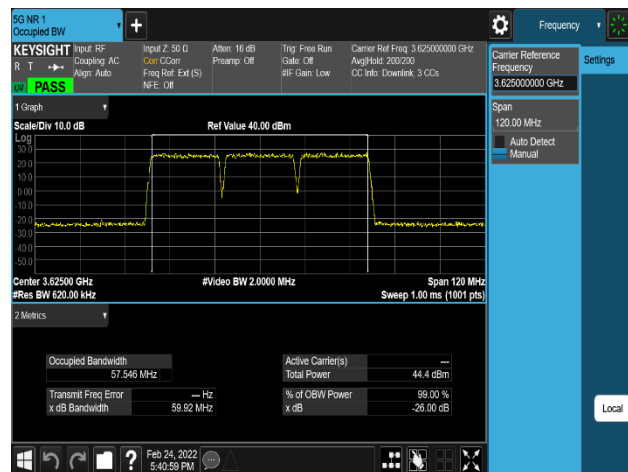
Plot 8-27. Occupied Bandwidth Plot
(LTE_B48_3C_15M+20M+20M_QPSK-Mid Channel, Port 0)



Plot 8-28. Occupied Bandwidth Plot
(LTE_B48_3C_15M+20M+20M_16QAM-Mid Channel, Port 0)

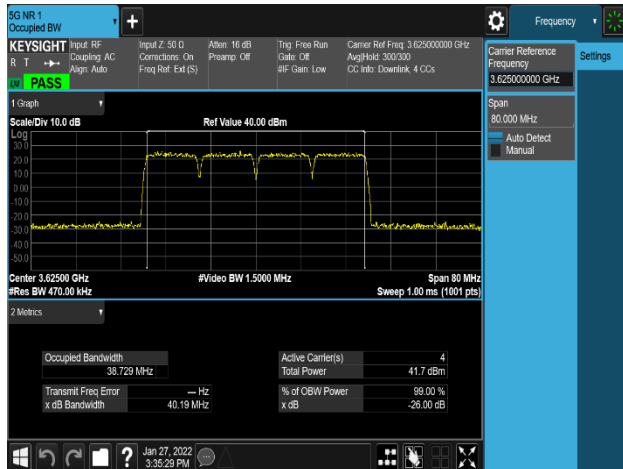


Plot 8-29. Occupied Bandwidth Plot
(LTE_B48_3C_20M+20M+20M_QPSK-Mid Channel, Port 0)

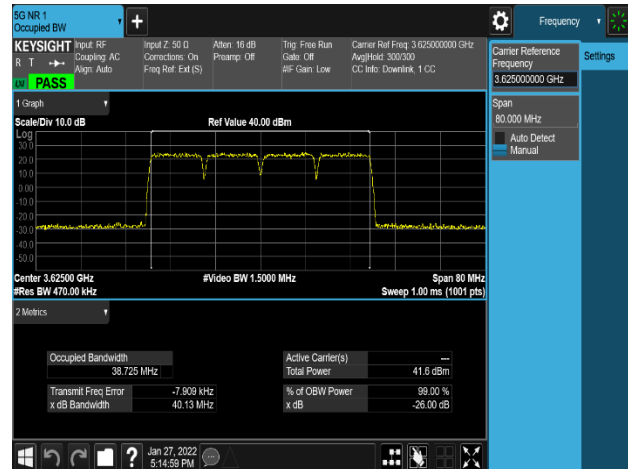


Plot 8-30. Occupied Bandwidth Plot
(LTE_B48_3C_20M+20M+20M_16QAM-Mid Channel, Port 0)

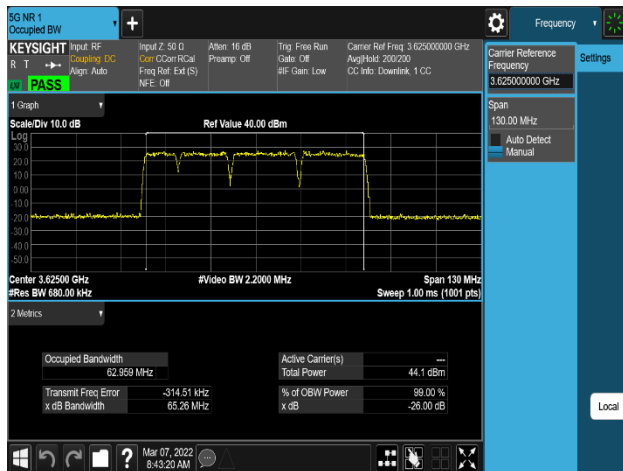
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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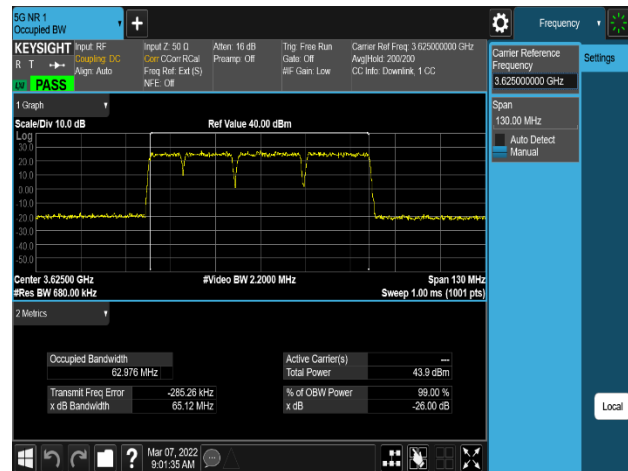
Plot 8-31. Occupied Bandwidth Plot
(LTE_B48_4C_10M+10M+10M+10M_QPSK-Mid Channel, Port 0)



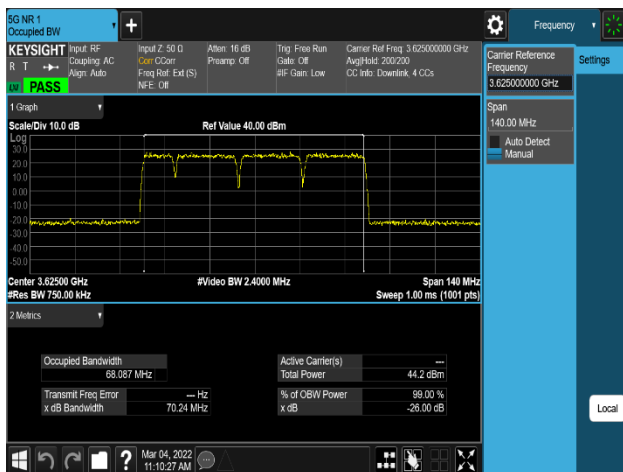
Plot 8-39. Occupied Bandwidth Plot
(LTE_B48_4C_10M+10M+10M+10M_16QAM-Mid Channel, Port 0)



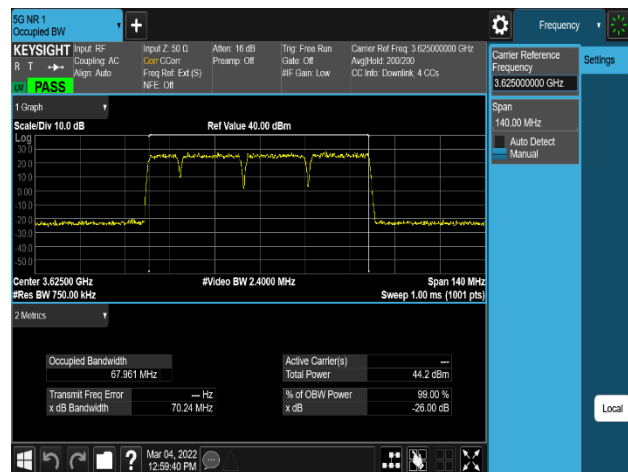
Plot 8-33. Occupied Bandwidth Plot
(LTE_B48_4C_10M+15M+20M+20M_QPSK-Mid Channel, Port 0)



Plot 8-34. Occupied Bandwidth Plot
(LTE_B48_4C_10M+15M+20M+20M_16QAM-Mid Channel, Port 0)

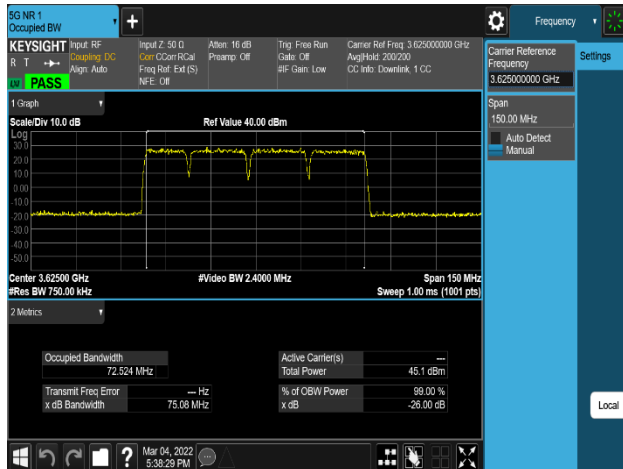


Plot 8-35. Occupied Bandwidth Plot
(LTE_B48_4C_10M+20M+20M+20M_QPSK-Mid Channel, Port 0)

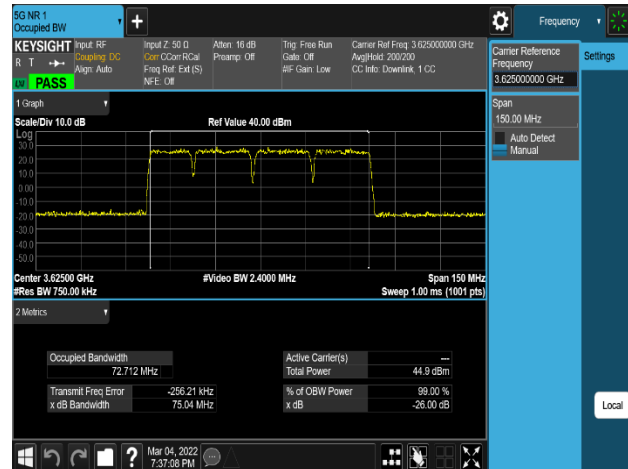


Plot 8-36. Occupied Bandwidth Plot
(LTE_B48_4C_10M+20M+20M+20M_16QAM-Mid Channel, Port 0)

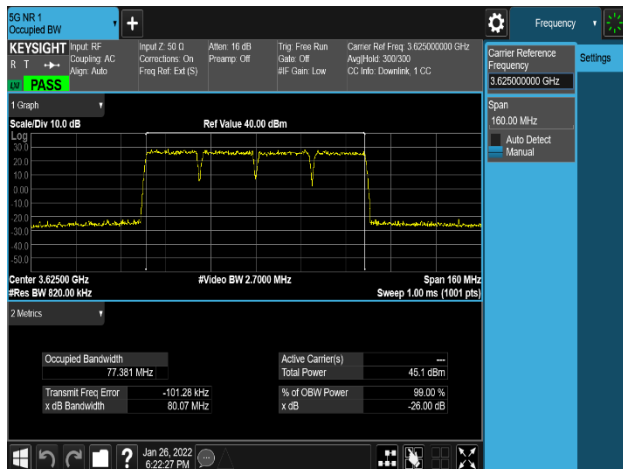
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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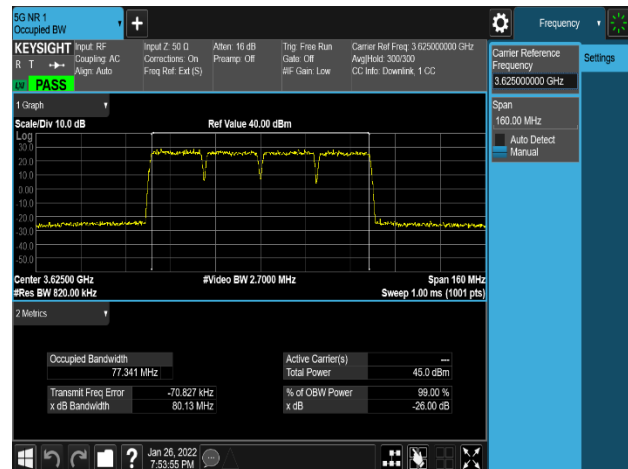
Plot 8-37. Occupied Bandwidth Plot
(LTE_B48_4C_15M+20M+20M+20M_QPSK-Mid Channel, Port 0)



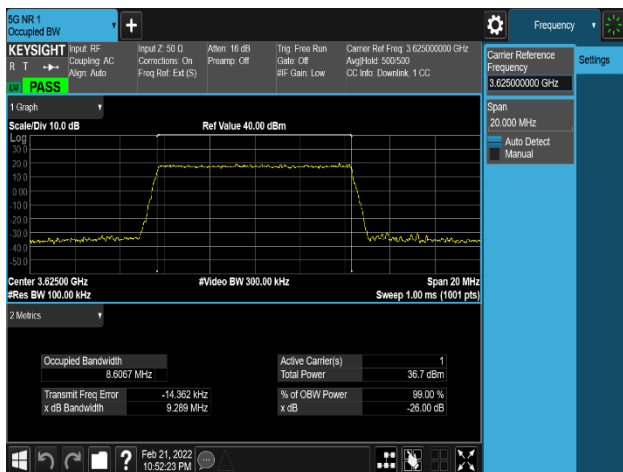
Plot 8-38. Occupied Bandwidth Plot
(LTE_B48_4C_15M+20M+20M+20M_16QAM-Mid Channel, Port 0)



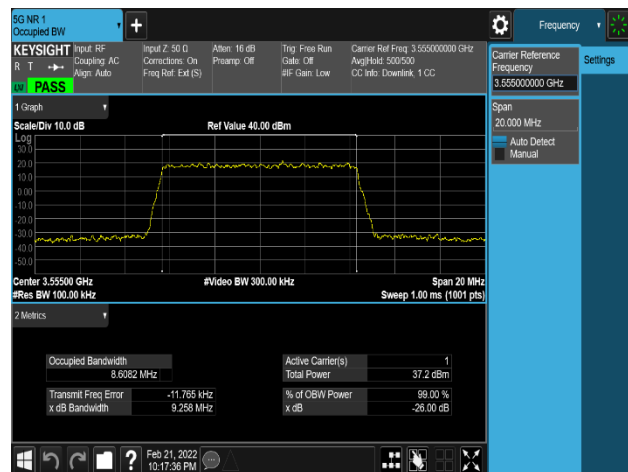
Plot 8-39. Occupied Bandwidth Plot
(LTE_B48_4C_20M+20M+20M+20M_QPSK-Mid Channel, Port 0)



Plot 8-40. Occupied Bandwidth Plot
(LTE_B48_4C_20M+20M+20M+20M_16QAM-Mid Channel, Port 0)

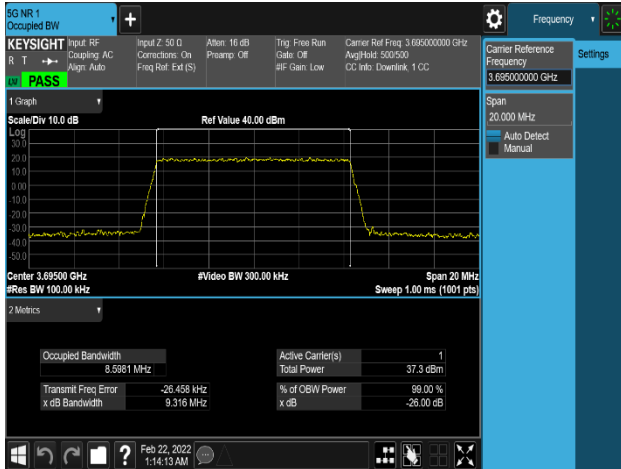


Plot 8-41. Occupied Bandwidth Plot
(NR_n48_1C_10M_QPSK - Mid Channel, Port 3)

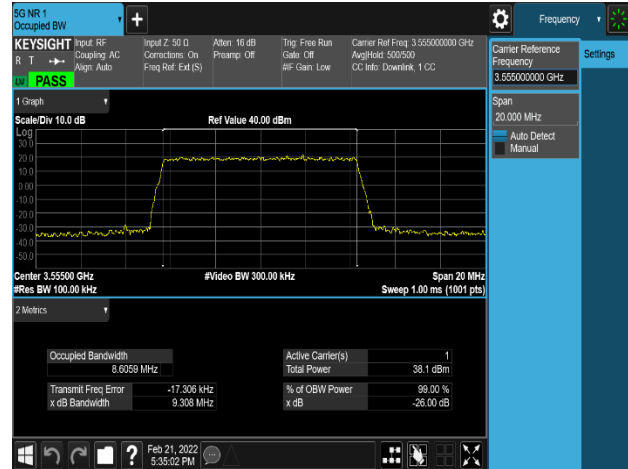


Plot 8-102. Occupied Bandwidth Plot
(NR_n48_1C_10M_16QAM - Low Channel, Port 1)

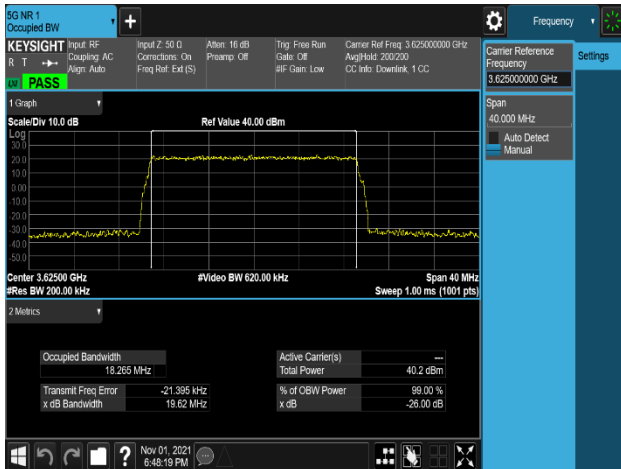
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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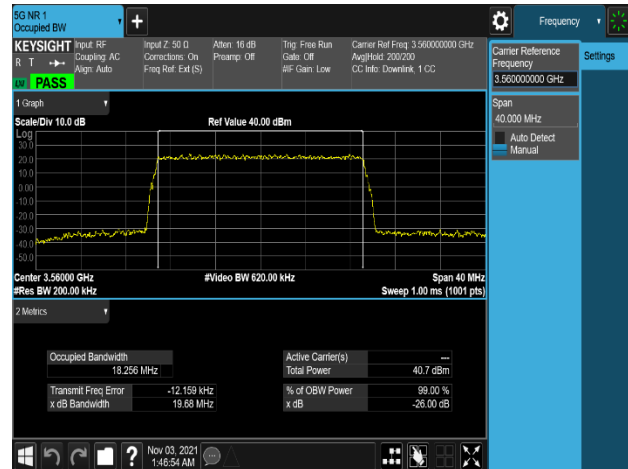
Plot 8-43. Occupied Bandwidth Plot
(NR_n48_1C_10M_64QAM - High Channel, Port 0)



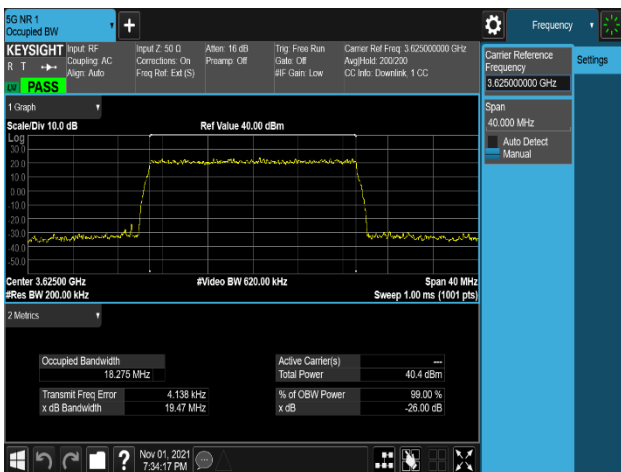
Plot 8-114. Occupied Bandwidth Plot
(NR_n48_1C_10M_256QAM - Low Channel, Port 1)



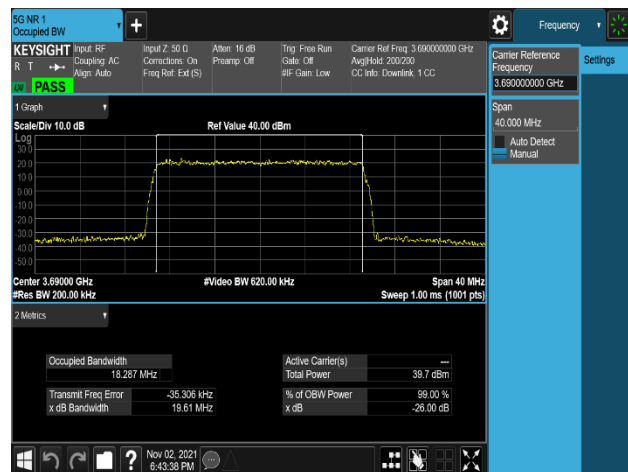
Plot 8-45. Occupied Bandwidth Plot
(NR_n48_1C_20M_QPSK - Mid Channel, Port 3)



Plot 8-126. Occupied Bandwidth Plot
(NR_n48_1C_20M_16QAM - Low Channel, Port 1)

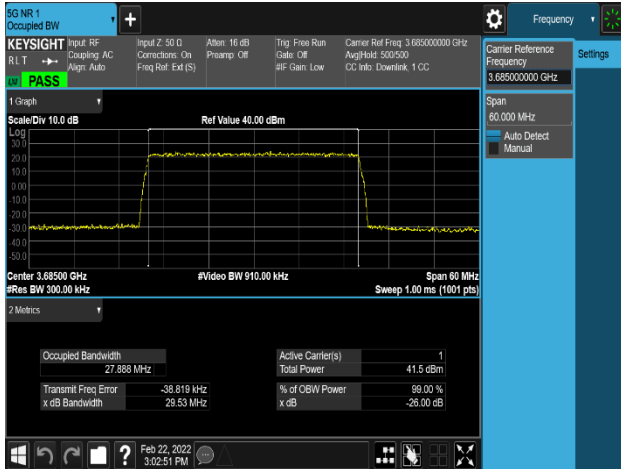


Plot 8-47. Occupied Bandwidth Plot
(NR_n48_1C_20M_64QAM - Mid Channel, Port 3)

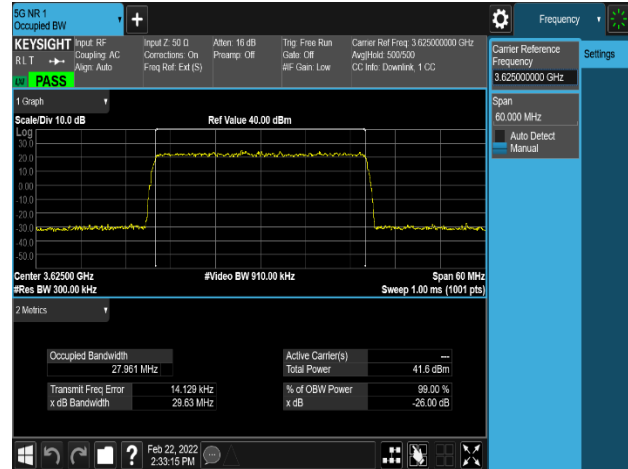


Plot 8-48. Occupied Bandwidth Plot
(NR_n48_1C_20M_256QAM - High Channel, Port 0)

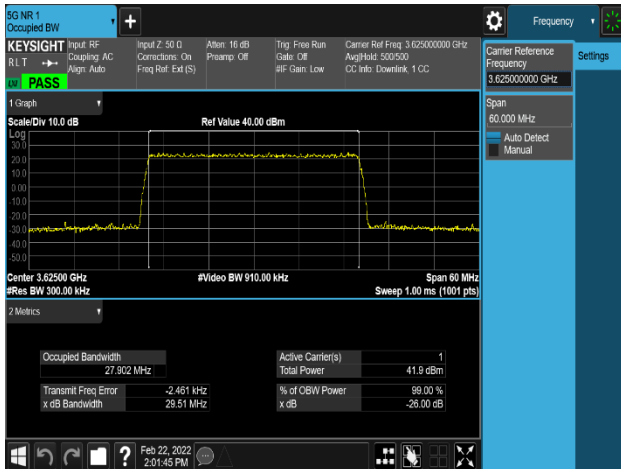
FCC: A3LRT4401-48A1		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Technical Manager
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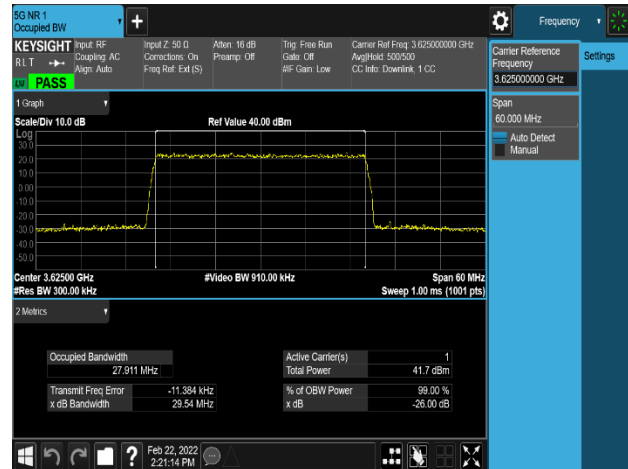
Plot 8-49. Occupied Bandwidth Plot (NR_n48_1C_30M_QPSK - High Channel, Port 2)



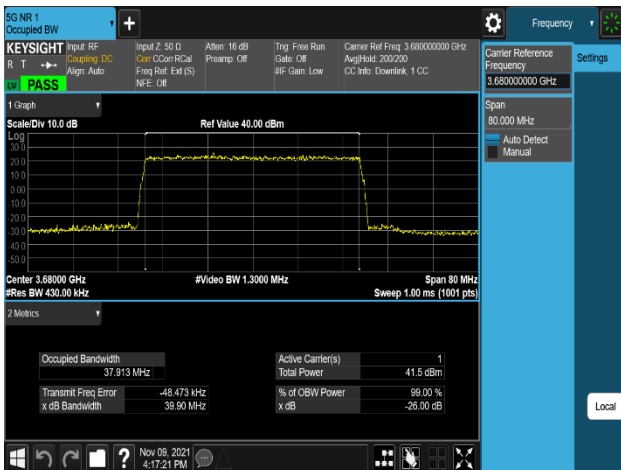
Plot 8-50. Occupied Bandwidth Plot (NR_n48_1C_30M_16QAM - Mid Channel, Port 0)



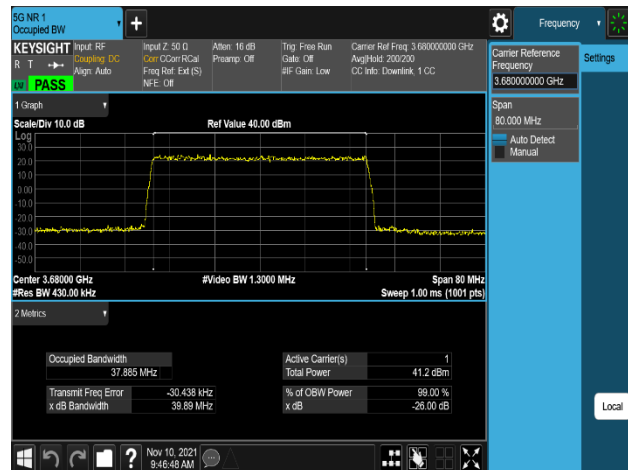
Plot 8-51. Occupied Bandwidth Plot (NR_n48_1C_30M_64QAM - Mid Channel, Port 0)



Plot 8-52. Occupied Bandwidth Plot (NR_n48_1C_30M_256QAM - Mid Channel, Port 3)

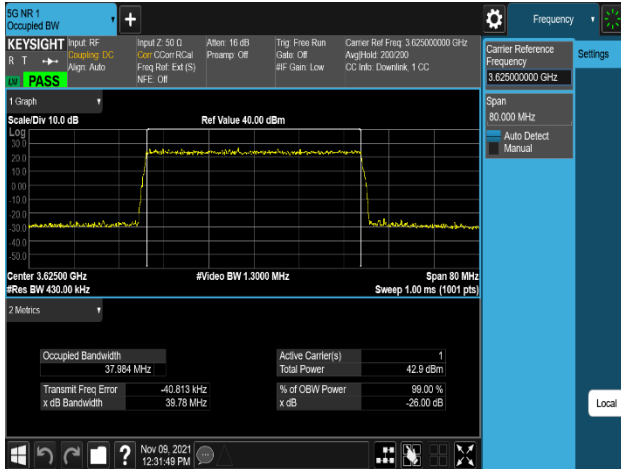


Plot 8-53. Occupied Bandwidth Plot (NR_n48_1C_40M_QPSK - High Channel, Port 1)

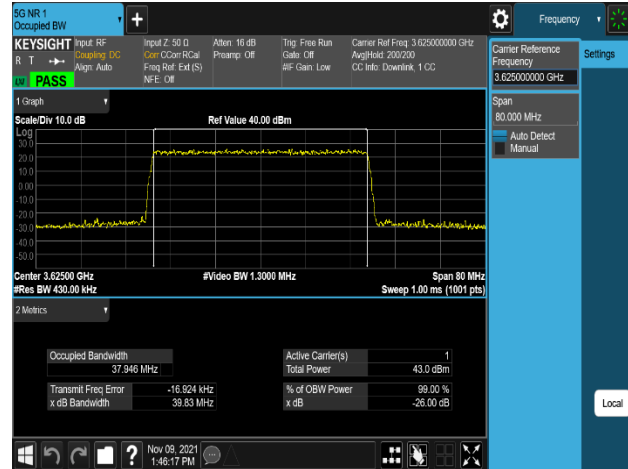


Plot 8-54. Occupied Bandwidth Plot (NR_n48_1C_40M_16QAM - High Channel, Port 1)

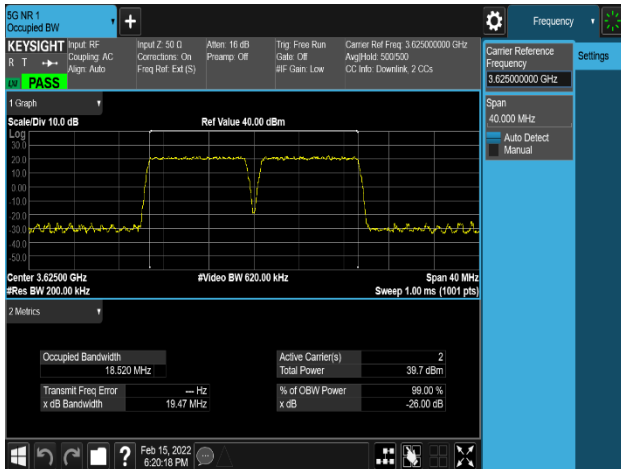
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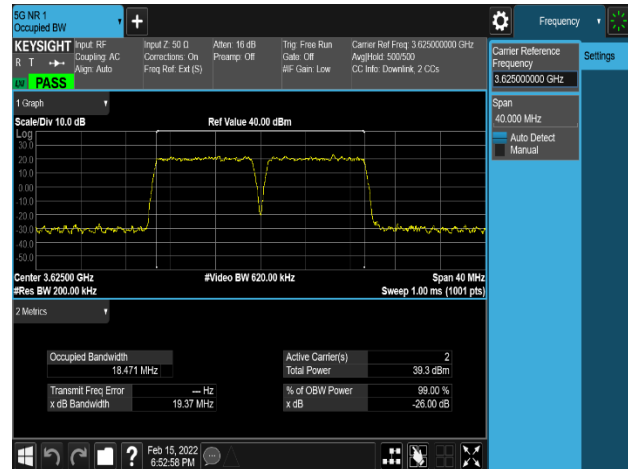
Plot 8-55. Occupied Bandwidth Plot
(NR_n48_1C_40M_64QAM - Mid Channel, Port 3)



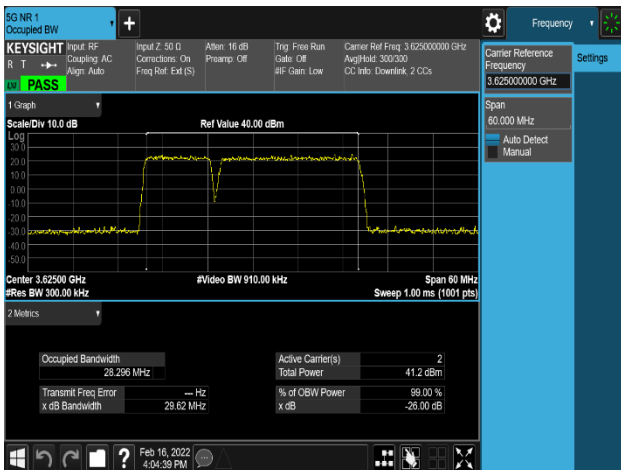
Plot 8-56. Occupied Bandwidth Plot
(NR_n48_1C_40M_256QAM - Mid Channel, Port 2)



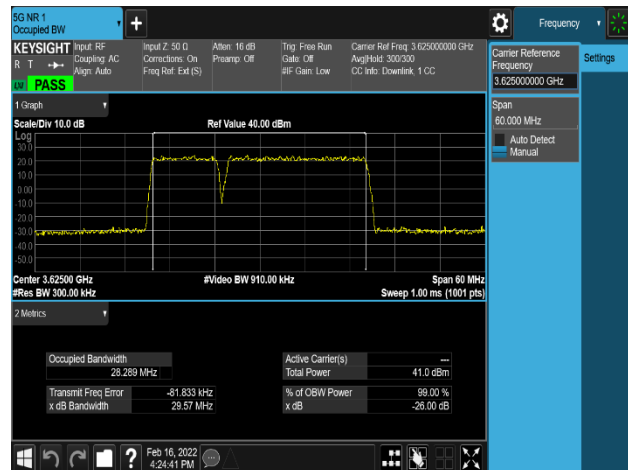
Plot 8-57. Occupied Bandwidth Plot
(NR_n48_2C_10M+10M_QPSK - Mid Channel, Port 0)



Plot 8-58. Occupied Bandwidth Plot
(NR_n48_2C_10M+10M_16QAM - Mid Channel, Port 0)

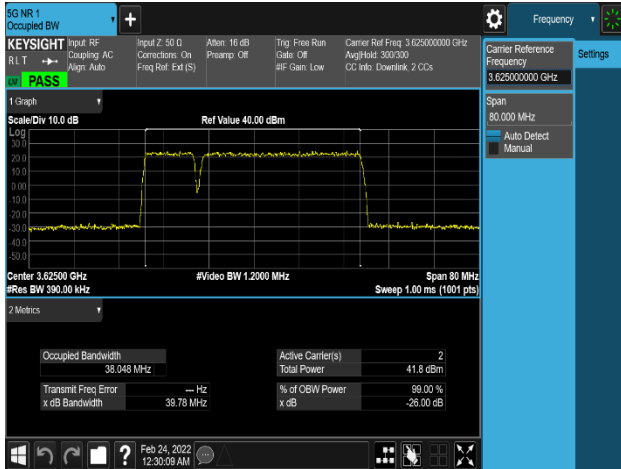


Plot 8-59. Occupied Bandwidth Plot
(NR_n48_2C_10M+20M_QPSK - Mid Channel, Port 0)

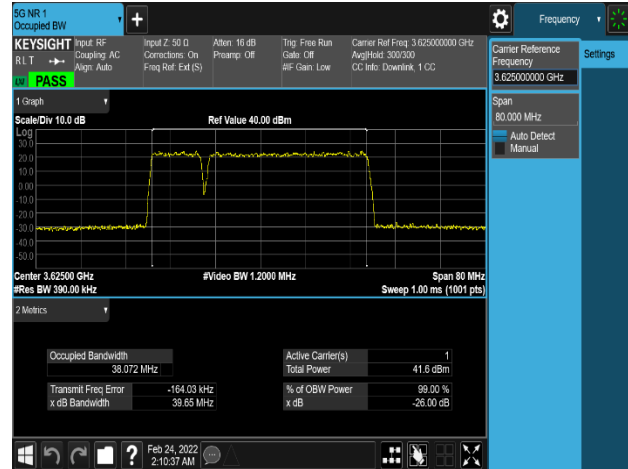


Plot 8-60. Occupied Bandwidth Plot
(NR_n48_2C_10M+20M_16QAM - Mid Channel, Port 0)

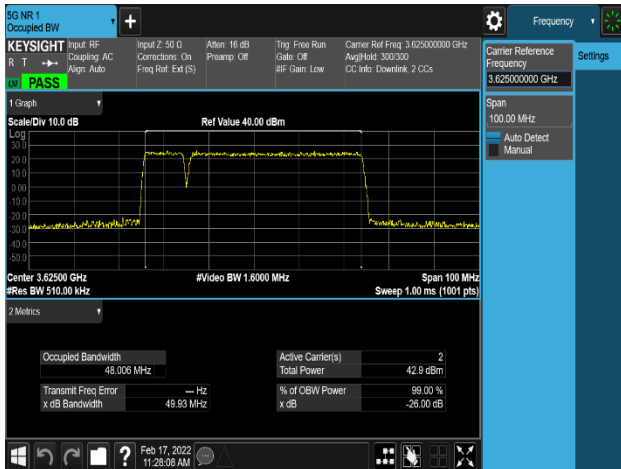
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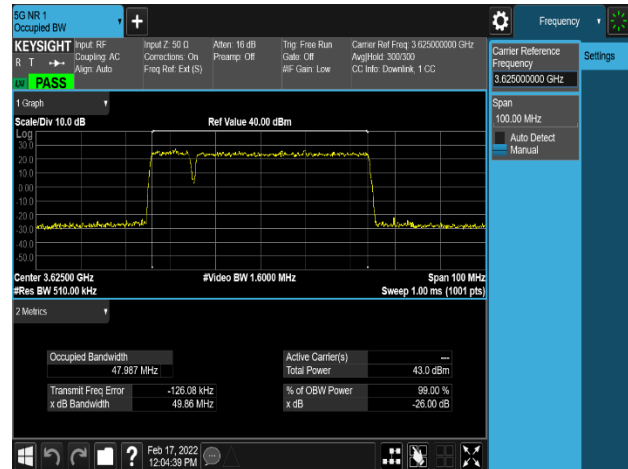
Plot 8-61. Occupied Bandwidth Plot
(NR_n48_2C_10M+30M_QPSK - Mid Channel, Port 0)



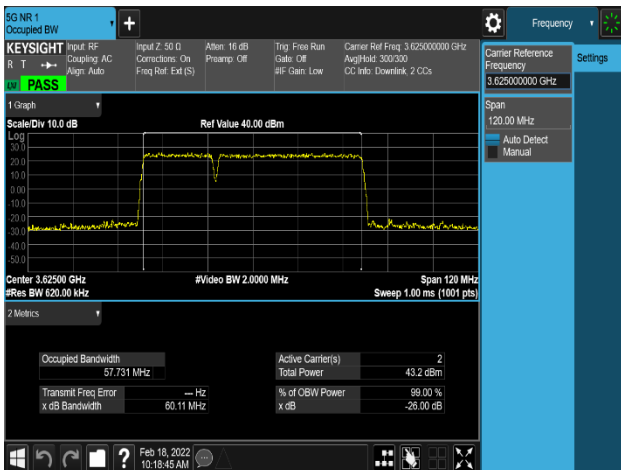
Plot 8-62. Occupied Bandwidth Plot
(NR_n48_2C_10M+30M_16QAM - Mid Channel, Port 0)



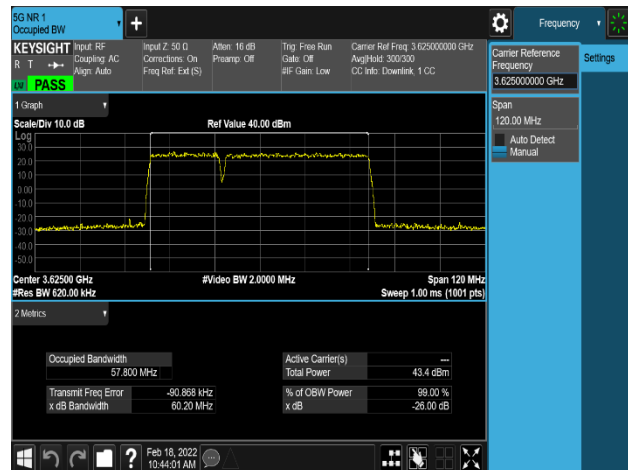
Plot 8-63. Occupied Bandwidth Plot
(NR_n48_2C_10M+40M_QPSK - Mid Channel, Port 0)



Plot 8-64. Occupied Bandwidth Plot
(NR_n48_2C_10M+40M_16QAM - Mid Channel, Port 0)



Plot 8-65. Occupied Bandwidth Plot
(NR_n48_2C_20M+40M_QPSK - Mid Channel, Port 0)



Plot 8-66. Occupied Bandwidth Plot
(NR_n48_2C_20M+40M_16QAM - Mid Channel, Port 0)

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