

TEST REPORT
FCC Rule Part 96

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

Date of Testing:
10/15/2021 – 03/14/2022
Test Site/Location:
PCTEST KOREA Lab. Yongin-si,
Gyeonggi-do, Korea
Test Report Serial No.:
8K21101307-R4.A3L

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

Application Type: Class II Permissive Change
Model: RT4401-48A
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 Daniel Woo
Test Engineer



Reviewed by Charles Shin
Technical Manager





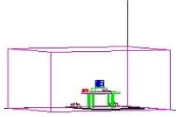
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 1 of 174	

TABLE OF CONTENTS

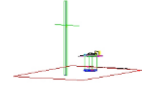
1.0	REVISION RECORD	4
2.0	INTRODUCTION	5
2.1	Scope	5
2.2	PCTEST KOREA Test Location	5
2.3	Test Facility / Accreditation	5
3.0	PRODUCT INFORMATION.....	6
3.1	Equipment Description	6
3.2	Test Configuration	7
3.3	EMI Suppression Device(s)/Modifications	8
4.0	DESCRIPTION OF TESTS	9
4.1	Measurement Procedure	9
4.2	Measurement Software	9
5.0	MEASUREMENT UNCERTAINTY	10
6.0	TEST EQUIPMENT CALIBRATION DATA	11
7.0	SAMPLE CALCULATIONS	12
8.0	TEST RESULTS	13
8.1	Summary	13
8.2	Occupied Bandwidth	14
8.3	Modulation Characteristics	25
8.4	Power Spectral Density	27
8.5	Equivalent Isotropic Radiated Power (EIRP)	59
8.6	Peak To Average Power Ratio (PAPR)	90
8.7	Channel Edge Emissions at Antenna Terminal	99
8.8	Spurious and Harmonic Emissions at Antenna Terminal	124
8.9	Radiated spurious emission	146
8.10	Frequency Stability	161
9.0	CONCLUSION.....	163
10.0	APPENDIX. A	164
10.1	Conducted Average Output Power (EIRP)	164

FCC: A3LRT4401-48A	 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 2 of 174





MEASUREMENT REPORT

FCC Rule Part 96





Mode	Total Bandwidth	Tx Frequency (MHz)	Max. PSD (dBm/1MHz)	Max. EIRP (dBm/10MHz)	Max. EIRP /Entire Bandwidth (dBm)	Max. EIRP /Entire Bandwidth (W)	Emission Designator	Modulation
n48_1C_10M	10	3550 - 3700	36.81	46.15	46.15	41.21	8M61G7D	QPSK
			36.99	46.24	46.24	42.07	8M61W7D	QAM
n48_1C_20M	20	3550 - 3700	36.55	46.14	49.06	80.54	18M3G7D	QPSK
			36.63	46.20	49.10	81.28	18M3W7D	QAM
n48_2C 10M+10M	20	3550 - 3700	36.68	46.70	49.39	86.90	18M5G7D	QPSK
			36.95	46.47	49.50	89.13	18M5W7D	QAM
n48_1C_30M	30	3550 - 3700	36.94	46.52	50.93	123.88	27M9G7D	QPSK
			36.97	46.74	51.04	127.06	27M9W7D	QAM
n48_2C 10M+20M	30	3550 - 3700	36.98	46.36	51.05	127.35	28M2G7D	QPSK
			36.98	46.48	51.13	129.72	28M3W7D	QAM
n48_1C_40M	40	3550 - 3700	36.58	46.17	52.14	163.68	37M9G7D	QPSK
			36.76	46.18	52.16	164.44	38M0W7D	QAM
n48_2C 10M+30M	40	3550 - 3700	36.97	46.31	52.16	164.44	38M1G7D	QPSK
			36.98	46.52	52.24	167.49	38M1W7D	QAM
n48_2C 20M+20M	40	3550 - 3700	36.92	46.33	52.25	167.88	38M1G7D	QPSK
			36.96	46.52	52.38	172.98	38M0W7D	QAM
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
n48_2C 20M+40M	60	3550 - 3700	36.96	46.48	54.08	255.86	57M7G7D	QPSK
			36.98	46.46	54.12	258.23	57M8W7D	QAM
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
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

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 3 of 174	

1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
8K21101307.A3L	12/15/2021	Initial Issue
8K21101307-R1.A3L	03/04/2022	Revision due to added test mode
8K21101307-R2.A3L	03/07/2022	Revision due to updated EUT Overview
8K21101307-R3.A3L	03/08/2022	Revision due to updated EIRP margin calculation
8K21101307-R4.A3L	03/14/2022	Revision due to updated EUT Overview

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 4 of 174	

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 KOREA is an ISO 17025:2005 accredited test facility under the National Institute of Standards and Technology (NIST) with Certificate number 600143-0 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for IC 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

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 5 of 174	



3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd. RRU(RT4401)**
FCC ID: A3LRT4401-48A. A class II permissive change on the original filing is being pursued to software modifications to add 5G NR radio technology without hardware modification.

This device supports the following conditional features:

EUT Type:	RRU(RT4401)		
Model Name:	RT4401-48A		
Test Device Serial No.:	S19A112801		
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 Modulation:	QPSK, 16QAM, 64QAM, 256QAM		
Supported Number of Carriers and Channel Bandwidth:	# LTE: 5, 10, 15 and 20MHz bandwidth modes for TDD LTE Band 48 with up to 4CC aggregated BWs of 5/10/15/20/25/30/35/40/45/50/55/60/65/70/75 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 and 20MHz bandwidth modes and 5G NR 10, 20, 30 and 40MHz bandwidth modes		
Maximum Conducted Output Power	Max 37 dBm/Path		
Number of Antenna ports	4		
Supported Configurations:	Single carrier, Multi carrier, Multi-RAT		
Input Voltage:	-48 VDC, 90 – 260 VAC 50/60 Hz		
Antenna Gain:	Min. 5 dBi ~ Max. 17.7 dBi		

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 6 of 174	

3.2 Test Configuration

The setup is as follows:

- a) The EUT "RT4401-48A is powered by a -48VDC power supply and the Equivalent Isotropic Radiated Power (EIRP) test case was additionally tested to 110VAC.
- b) The EUT is connected to a test laptop via an ethernet cable acting as backhaul.
- c) 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: Single carrier
- 2C: Contiguous 2 carriers in multi-carrier operation
- 3C: Contiguous 3 carriers in multi-carrier operation
- Non-Contiguous : Non-contiguous carriers in multi-carrier operation

LTE Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)						Rated Power (dBm/path)
			Lowest		Middle		Highest		
B48_2C_5M+5M	2	5+5	3552.5	3557.5	3622.5	3675.5	3692.5	3697.5	28
B48_2C_5M+5M Non-Contiguous	2	5+5	3552.5 + 3697.5						

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		3675		28
n48_1C_20M	1	20	3560		3625		3690		31
n48_2C_10M+10M	2	10+10	3555	3565	3620	3630	3685	3695	31
n48_2C_10M+10M Non-Contiguous	2	10+10	3555 + 3695						
n48_1C_30M	1	30	3565		3625		3685		32.8
n48_2C_10M+20M	2	10+20	3555	3570	3615	3630	3675	3690	32.8
n48_2C_10M+20M Non-Contiguous	2	10+20	3555 + 3690						
n48_1C_40M	1	40	3570		3625		3680		34
n48_2C_10M+30M	2	10+30	3555	3575	3610	3630	3665	3685	34
n48_2C_10M+30M Non-Contiguous	2	10+30	3555 + 3685						



FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 7 of 174	

n48_2C_20M+20M	2	20+20	3560	3580	3615	3635	3670	3690	34
n48_2C_20M+20M Non-Contiguous	2	20+20	3560 + 3690						
n48_2C_10M+40M	2	10+40	3555	3580	3605	3630	3655	3680	35
n48_2C_10M+40M Non-Contiguous	2	10+40	3555 + 3680						
n48_2C_20M+40M	2	20+40	3560	3590	3605	3635	3650	3680	36
n48_2C_20M+40M Non-Contiguous	2	20+40	3560 + 3680						
n48_2C_30M+40M	2	30+40	3565	3600	3605	3640	3645	3680	36.5
n48_2C_30M+40M Non-Contiguous	2	30+40	3565 + 3680						
n48_2C_40M+40M	2	40+40	3570	3610	3605	3645	3640	3680	37
n48_2C_40M+40M Non-Contiguous	2	40+40	3570 + 3680						

LTE + 5G NR Multi-RAT 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	3565	3620	3630	3685	3695	31			
B48_1C + n48_1C 10M+10M Non-Contiguous	2	10+10	3555 + 3695									
B48_2C + n48_1C 10M+10M+10M	3	10+10+10	3555	3565	3575	3615	3625	3635	3675	3685	3695	32.8
B48_2C + n48_1C 10M+10M+10M Non-Contiguous	3	10+10+10	3555 + 3625 + 3695									
B48_1C + n48_1C 20M+40M	2	20+40	3560	3590	3605	3635	3650	3680	36			
B48_1C + n48_1C 20M+40M Non-Contiguous	2	20+40	3560 + 3680									
B48_2C + n48_1C 20M+20M+40M	3	20+20+40	3560	3580	3610	3595	3615	3645	3630	3650	3680	37
B48_2C + n48_1C 20M+20M+40M Non-Contiguous	3	20+20+40	3560 + 3615 + 3680									

3.3 EMI Suppression Device(s)/Modifications

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

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 8 of 174	

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

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 9 of 174	

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

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 10 of 174	

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	09/02/2020	Biennial	09/01/2022	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.

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 11 of 174	

7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M61G7D

Occupied Bandwidth = 8.61 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation



Emission Designator = 8M60W7D

Occupied Bandwidth = 8.60 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 12 of 174	

8.0 TEST RESULTS

8.1 Summary



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

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.

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 13 of 174	

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 measured. All 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.

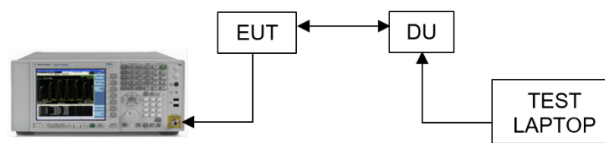




Figure 8-1. Test Instrument & Measurement Setup

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 were found while operating with 16QAM mode and only the worst case data were reported.



FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 14 of 174	

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

Table 8-2. Occupied Bandwidth Summary Data (NR_n48_1C_10M)

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

Table 8-3. Occupied Bandwidth Summary Data (NR_n48_1C_20M)



FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 15 of 174	

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	27.88	27.82	27.91	27.89
	1	27.85	27.84	27.89	27.87
	2	27.88	27.83	27.91	27.88
	3	27.87	27.84	27.88	27.85
Middle	0	27.88	27.94	27.88	27.87
	1	27.88	27.93	27.84	27.89
	2	27.91	27.93	27.93	27.89
	3	27.86	27.92	27.87	27.90
High	0	27.86	27.89	27.85	27.88
	1	27.85	27.92	27.87	27.86
	2	27.88	27.88	27.85	27.85
	3	27.81	27.90	27.82	27.87

Table 8-4. Occupied Bandwidth Summary Data (NR_n48_1C_30M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	37.81	37.81	37.95	37.84
	1	37.83	37.86	37.79	37.82
	2	37.77	37.89	37.78	37.88
	3	37.81	37.78	37.80	37.87
Middle	0	37.78	37.82	37.91	37.86
	1	37.85	37.88	37.81	37.92
	2	37.86	37.82	37.86	37.87
	3	37.86	37.78	37.80	37.88
High	0	37.89	37.80	37.80	37.76
	1	37.87	37.89	37.81	37.86
	2	37.87	37.90	37.77	37.84
	3	37.82	37.86	37.82	37.84

Table 8-5. Occupied Bandwidth Summary Data (NR_n48_1C_40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 16 of 174	

Configuration	OBW (MHz)	
	QPSK	16QAM
LTE_2C_5M+5M	9.46	9.45



Table 8-6. Occupied Bandwidth Summary Data (LTE_B48_Multi Carrier)

Configuration	OBW (MHz)	
	QPSK	16QAM
NR_2C_10M+10M	18.50	18.47
NR_2C_10M+20M	28.24	28.25
NR_2C_10M+30M	38.05	38.07
NR_2C_20M+20M	38.06	38.00
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 8-7. Occupied Bandwidth Summary Data (NR_n48_Multi Carrier)

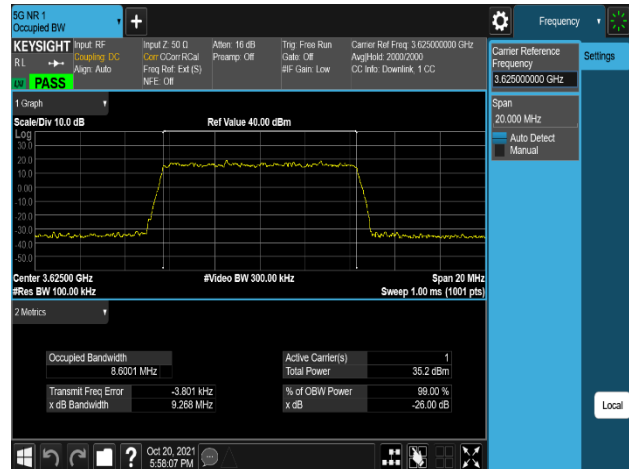
Configuration	OBW (MHz)	
	QPSK	16QAM
LTE_1C_10M + NR_1C_10M	18.68	18.67
LTE_1C_20M + NR_1C_40M	57.55	57.63
LTE_2C_10M+10M + NR_1C_10M	28.62	28.59
LTE_2C_20M+20M + NR_1C_40M	77.46	77.35

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

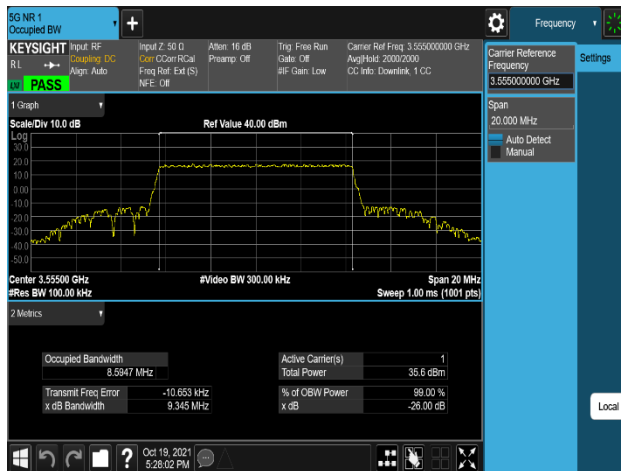
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 17 of 174	



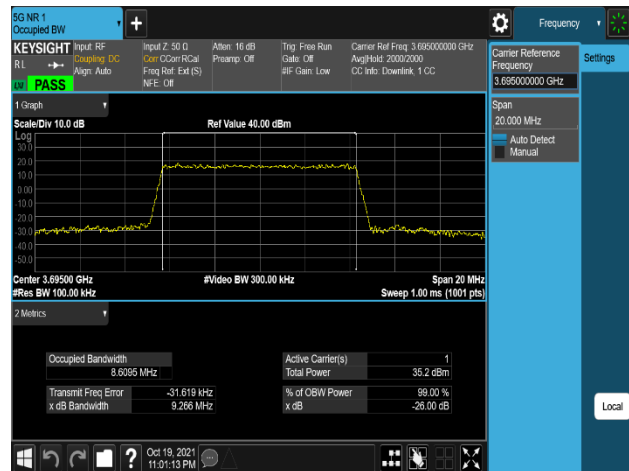
Plot 8-1. Occupied Bandwidth Plot
(NR_n48_1C_10M_QPSK - Low Channel, Port 2)



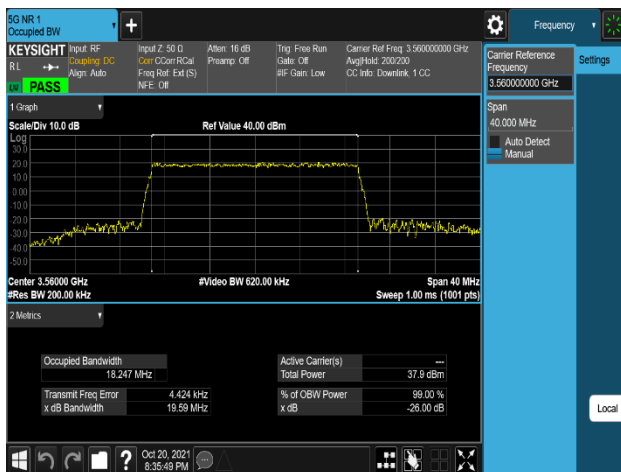
Plot 8-2. Occupied Bandwidth Plot
(NR_n48_1C_10M_16QAM - Mid Channel, Port 3)



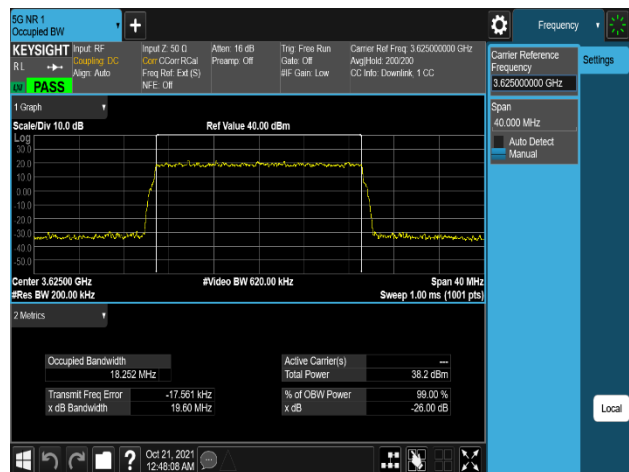
Plot 8-3. Occupied Bandwidth Plot
(NR_n48_1C_10M_64QAM - Low Channel, Port 0)



Plot 8-4. Occupied Bandwidth Plot
(NR_n48_1C_10M_256QAM - High Channel, Port 2)

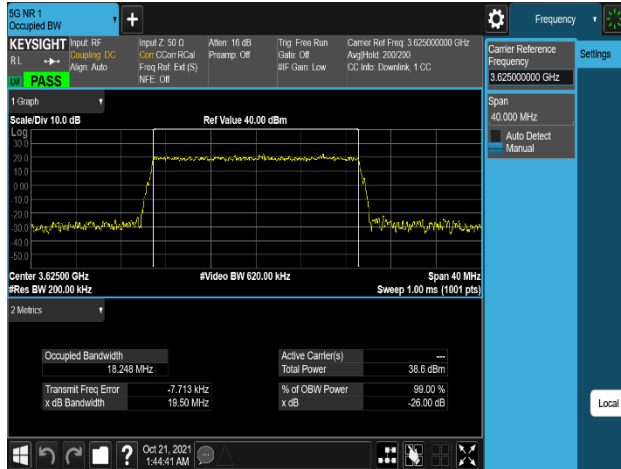


Plot 8-5. Occupied Bandwidth Plot
(NR_n48_1C_20M_QPSK - Low Channel, Port 0)

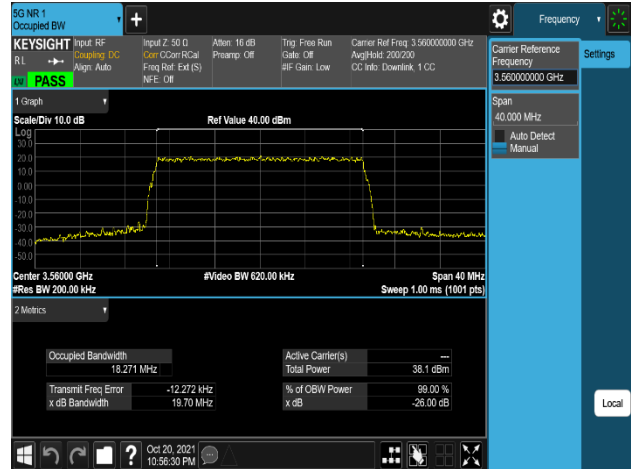


Plot 8-6. Occupied Bandwidth Plot
(NR_n48_1C_20M_16QAM - Mid Channel, Port 0)

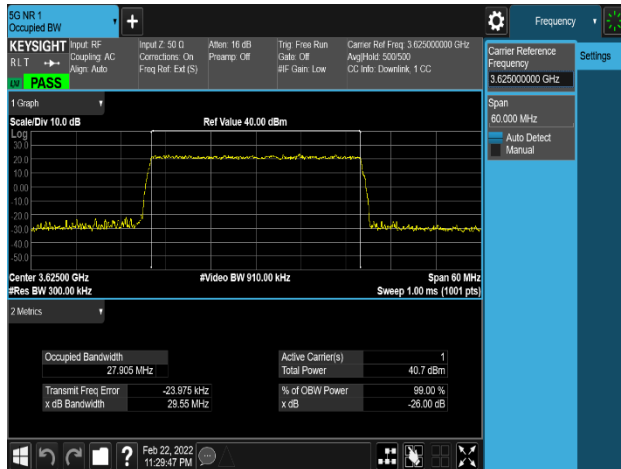
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: BK21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 18 of 174



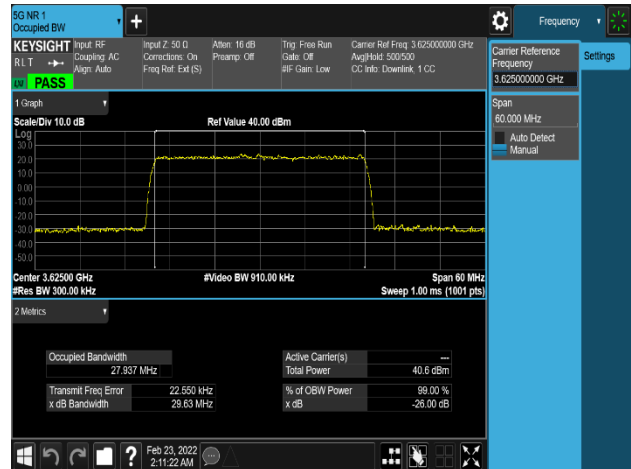
Plot 8-7. Occupied Bandwidth Plot
(NR_n48_1C_20M_64QAM - Mid Channel, Port 3)



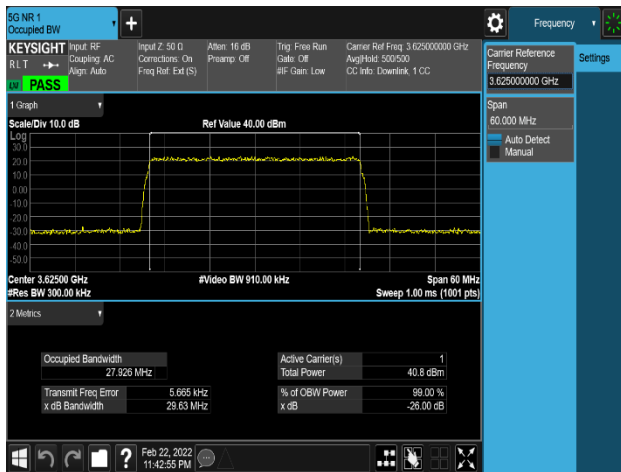
Plot 8-8. Occupied Bandwidth Plot
(NR_n48_1C_20M_256QAM - Low Channel, Port 0)



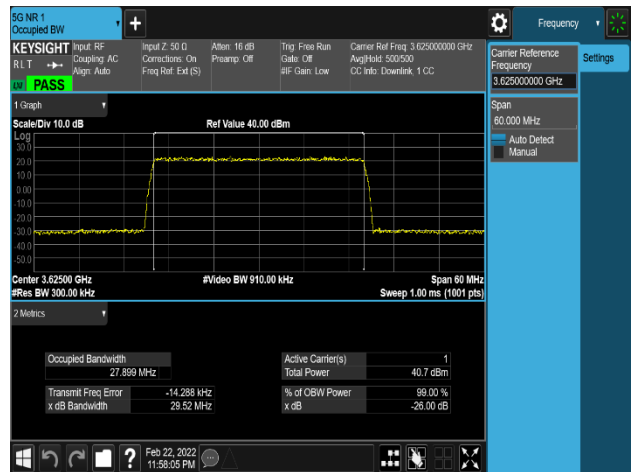
Plot 8-9. Occupied Bandwidth Plot
(NR_n48_1C_30M_QPSK - Mid Channel, Port 2)



Plot 8-10. Occupied Bandwidth Plot
(NR_n48_1C_30M_16QAM - Mid Channel, Port 0)

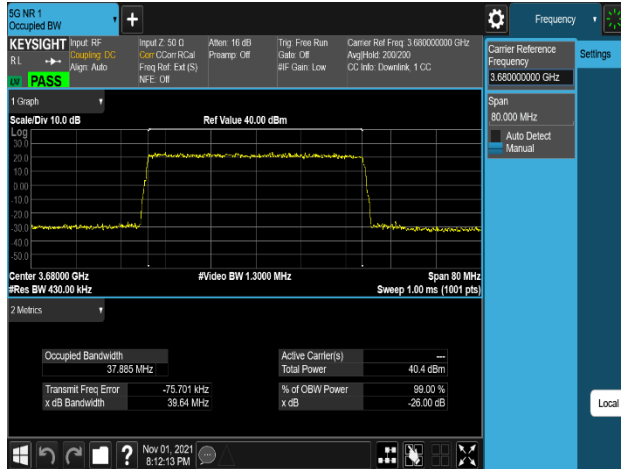


Plot 8-11. Occupied Bandwidth Plot
(NR_n48_1C_30M_64QAM - Mid Channel, Port 2)

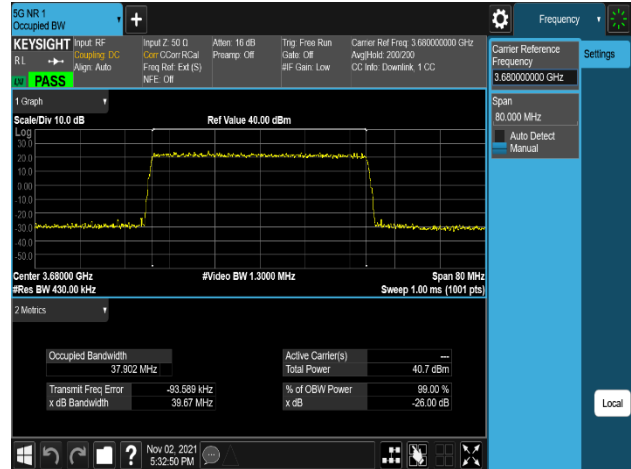


Plot 8-12. Occupied Bandwidth Plot
(NR_n48_1C_30M_256QAM - Mid Channel, Port 3)

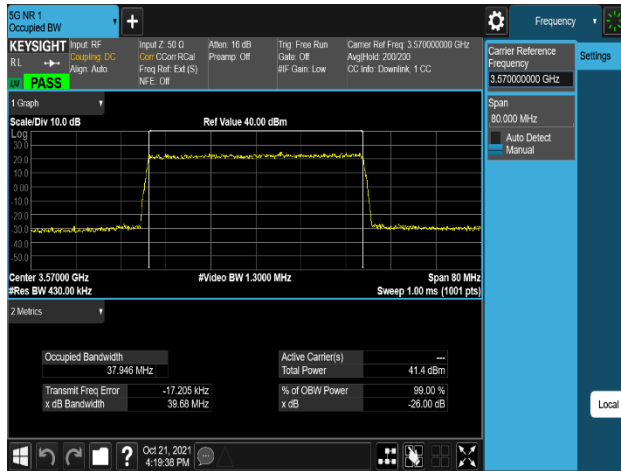
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 19 of 174



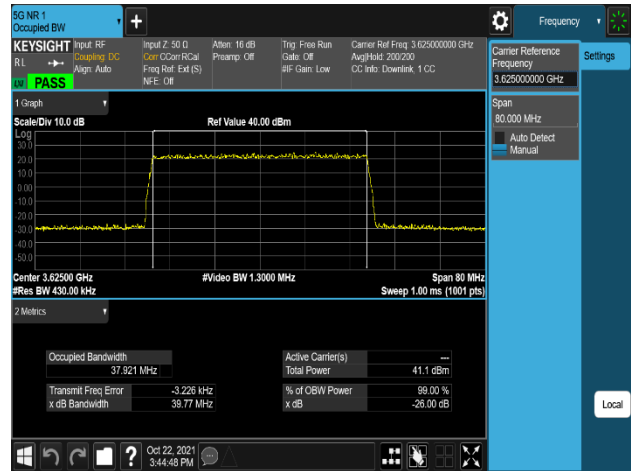
Plot 8-13. Occupied Bandwidth Plot (NR_n48_1C_40M_QPSK - High Channel, Port 0)



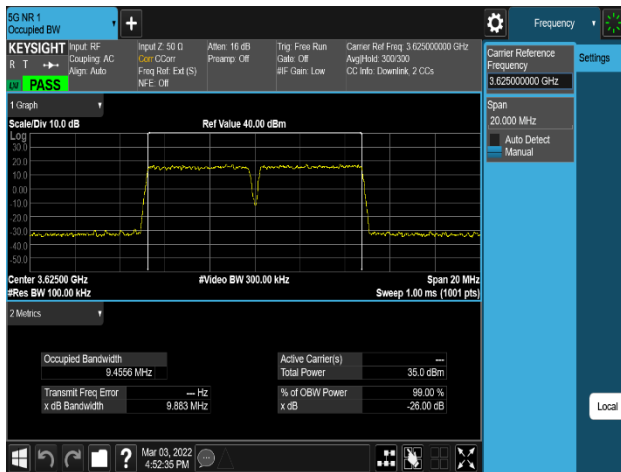
Plot 8-14. Occupied Bandwidth Plot (NR_n48_1C_40M_16QAM - High Channel, Port 2)



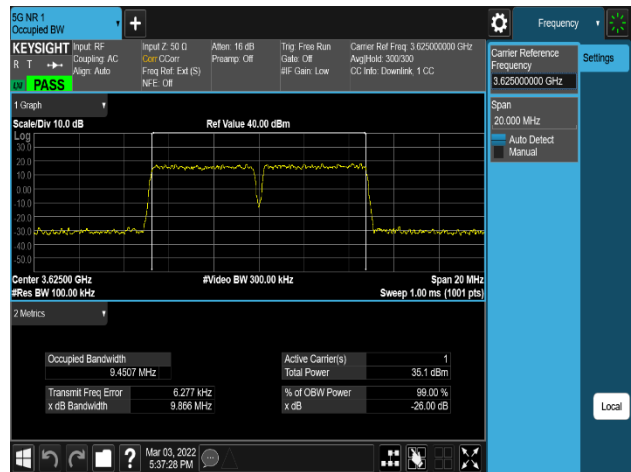
Plot 8-15. Occupied Bandwidth Plot (NR_n48_1C_40M_64QAM - Low Channel, Port 0)



Plot 8-16. Occupied Bandwidth Plot (NR_n48_1C_40M_256QAM - Mid Channel, Port 1)

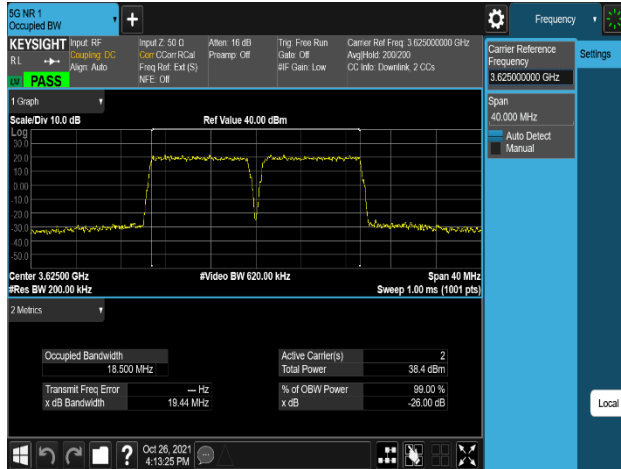


Plot 8-17. Occupied Bandwidth Plot (LTE_B48_2C_5M+5M_QPSK - Mid Channel, Port 0)

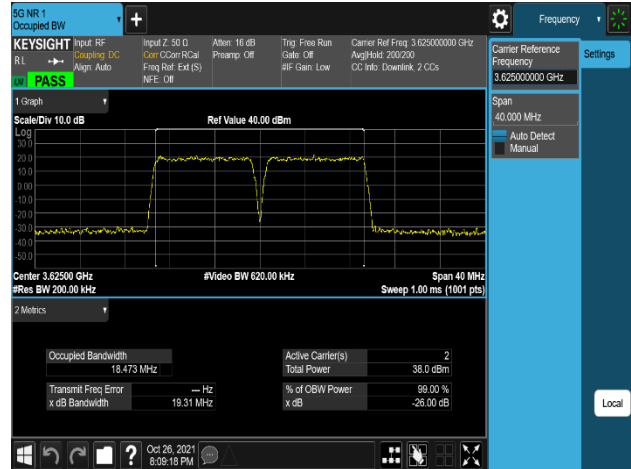


Plot 8-18. Occupied Bandwidth Plot (LTE_B48_2C_5M+5M_16QAM - Mid Channel, Port 0)

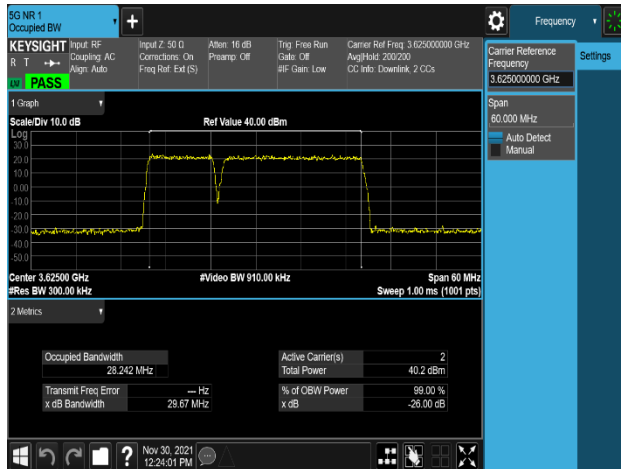
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: BK21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 20 of 174



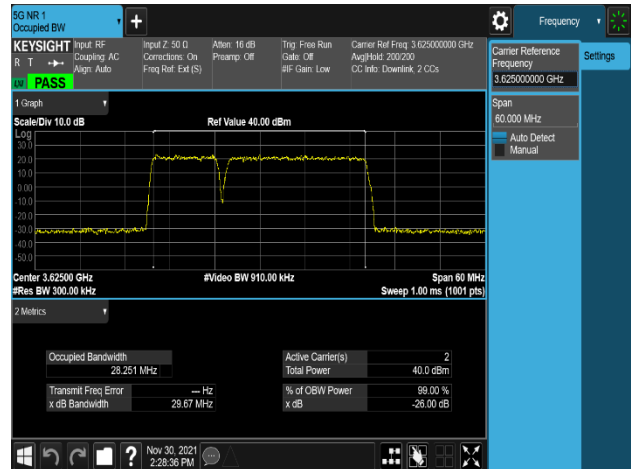
Plot 8-19. Occupied Bandwidth Plot
(NR_n48_2C_10M+10M_QPSK - Mid Channel, Port 0)



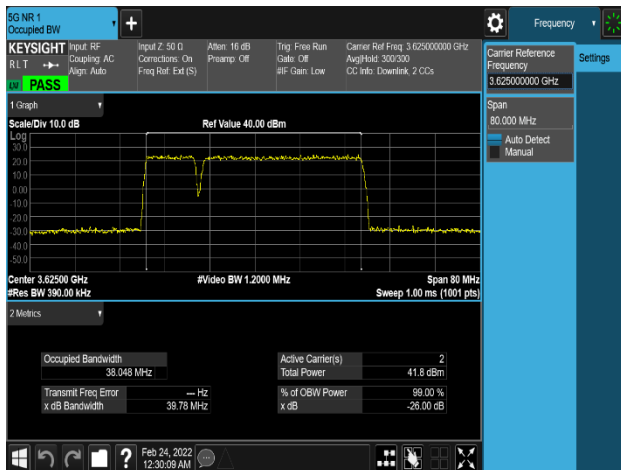
Plot 8-20. Occupied Bandwidth Plot
(NR_n48_2C_10M+10M_16QAM - Mid Channel, Port 0)



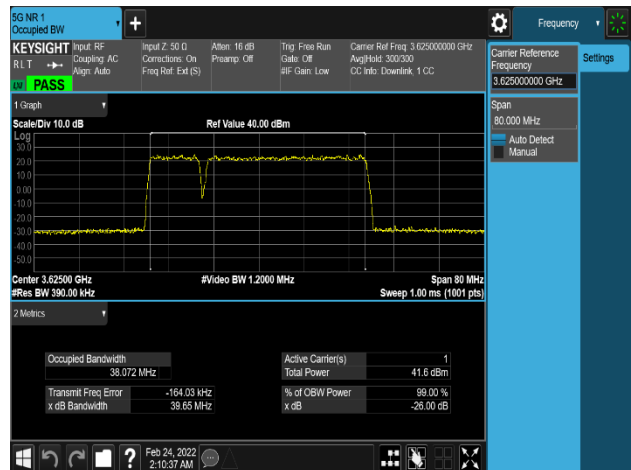
Plot 8-21. Occupied Bandwidth Plot
(NR_n48_2C_10M+20M_QPSK - Mid Channel, Port 0)



Plot 8-22. Occupied Bandwidth Plot
(NR_n48_2C_10M+20M_16QAM - Mid Channel, Port 0)

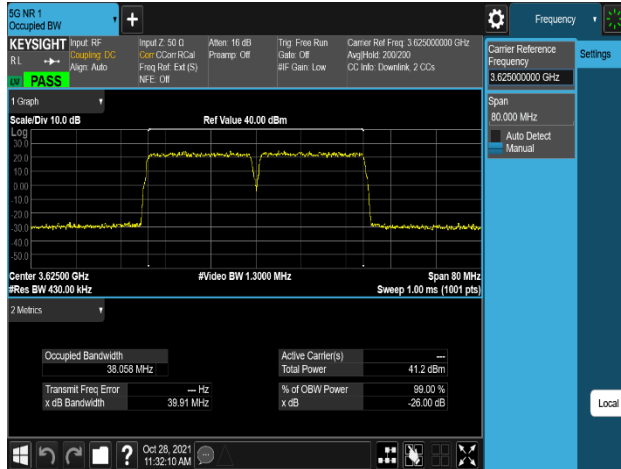


Plot 8-23. Occupied Bandwidth Plot
(NR_n48_2C_10M+30M_QPSK - Mid Channel, Port 0)

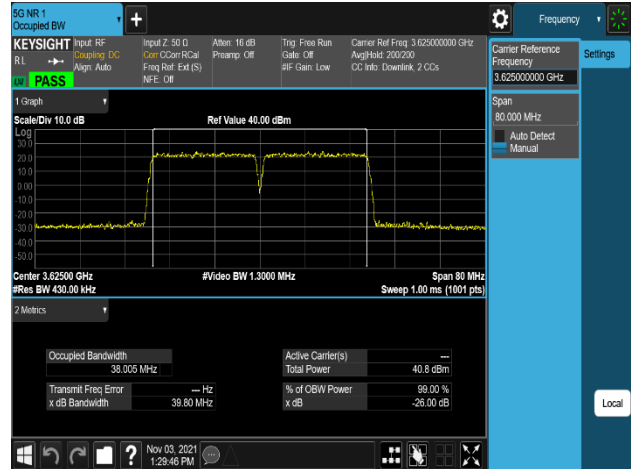


Plot 8-24. Occupied Bandwidth Plot
(NR_n48_2C_10M+30M_16QAM - Mid Channel, Port 0)

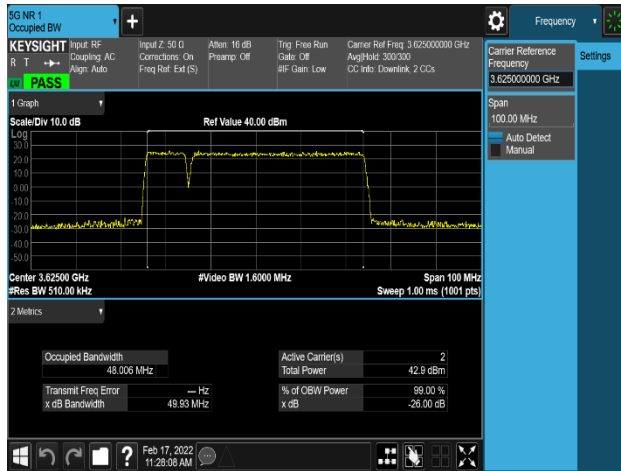
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 21 of 174



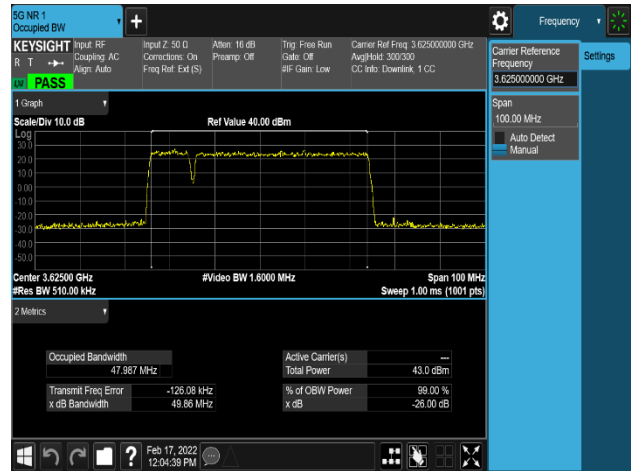
Plot 8-25. Occupied Bandwidth Plot
(NR_n48_2C_20M+20M_QPSK - Mid Channel, Port 0)



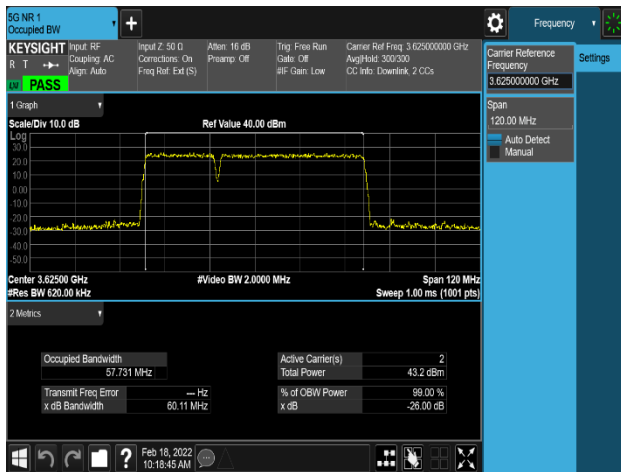
Plot 8-26. Occupied Bandwidth Plot
(NR_n48_2C_20M+20M_16QAM - Mid Channel, Port 0)



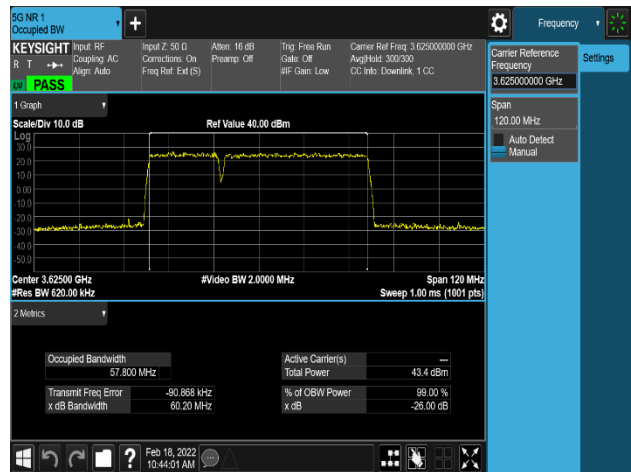
Plot 8-27. Occupied Bandwidth Plot
(NR_n48_2C_10M+40M_QPSK - Mid Channel, Port 0)



Plot 8-28. Occupied Bandwidth Plot
(NR_n48_2C_10M+40M_16QAM - Mid Channel, Port 0)

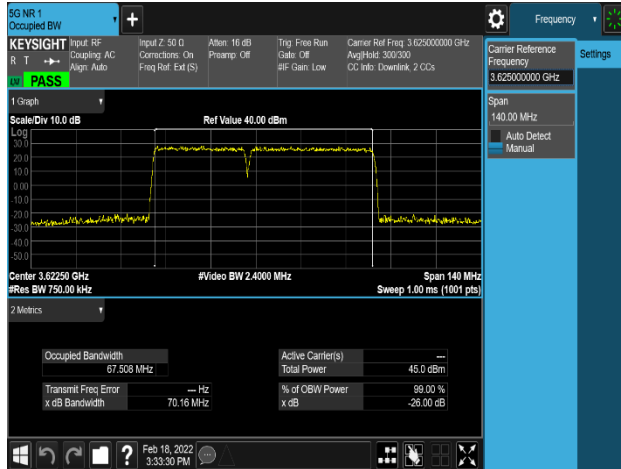


Plot 8-29. Occupied Bandwidth Plot
(NR_n48_2C_20M+40M_QPSK - Mid Channel, Port 0)

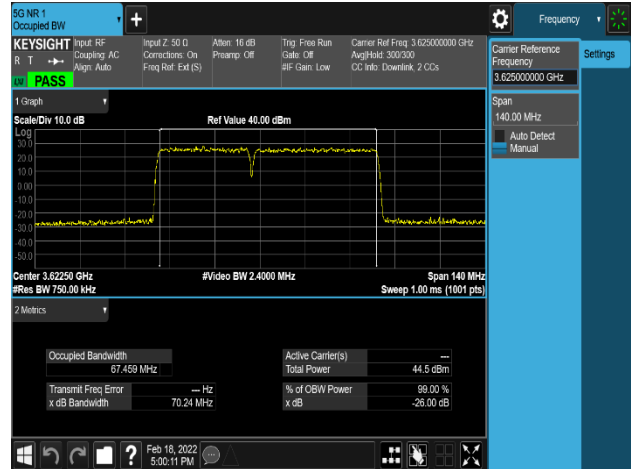


Plot 8-30. Occupied Bandwidth Plot
(NR_n48_2C_20M+40M_16QAM - Mid Channel, Port 0)

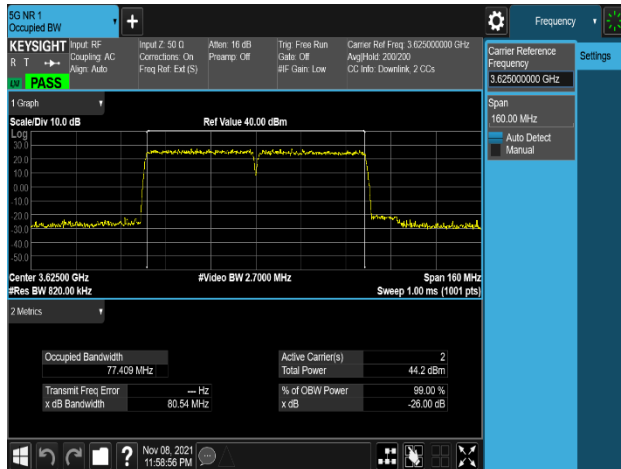
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 22 of 174



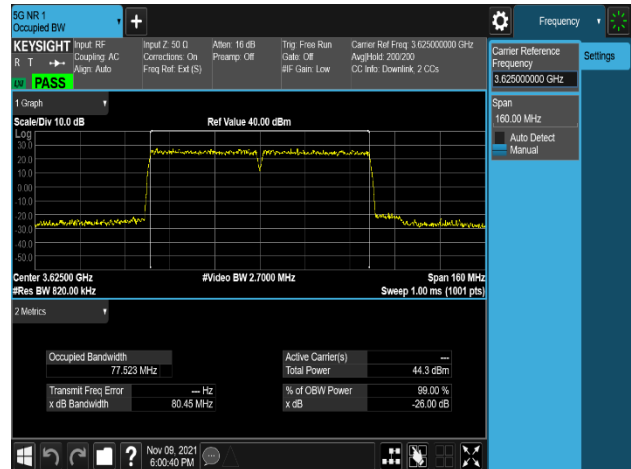
Plot 8-31. Occupied Bandwidth Plot
(NR_n48_2C_30M+40M_QPSK - Mid Channel, Port 0)



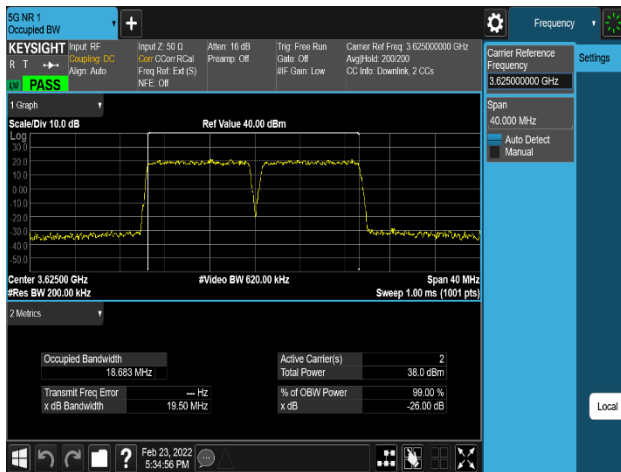
Plot 8-32. Occupied Bandwidth Plot
(NR_n48_2C_30M+40M_16QAM - Mid Channel, Port 0)



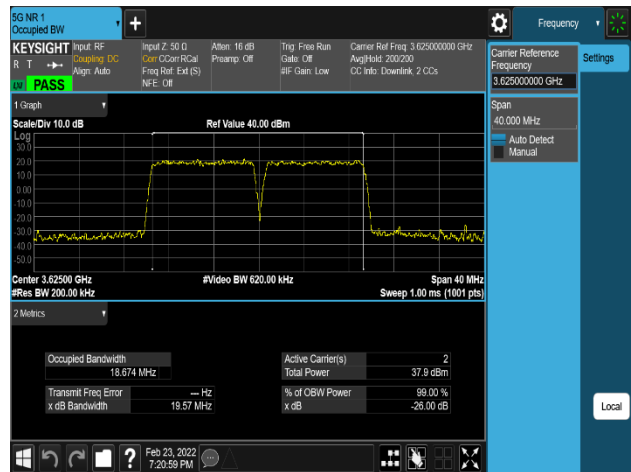
Plot 8-33. Occupied Bandwidth Plot
(NR_n48_2C_40M+40M_QPSK - Mid Channel, Port 0)



Plot 8-34. Occupied Bandwidth Plot
(NR_n48_2C_40M+40M_16QAM - Mid Channel, Port 0)

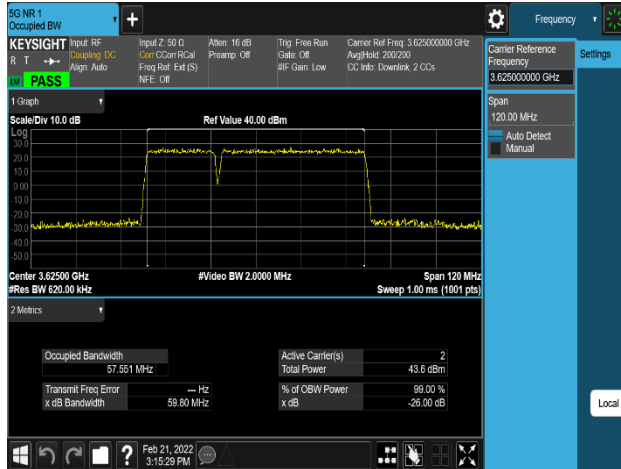


Plot 8-35. Occupied Bandwidth Plot
(LTE_1C+NR_1C_10M+10M_QPSK - Mid Channel, Port 0)

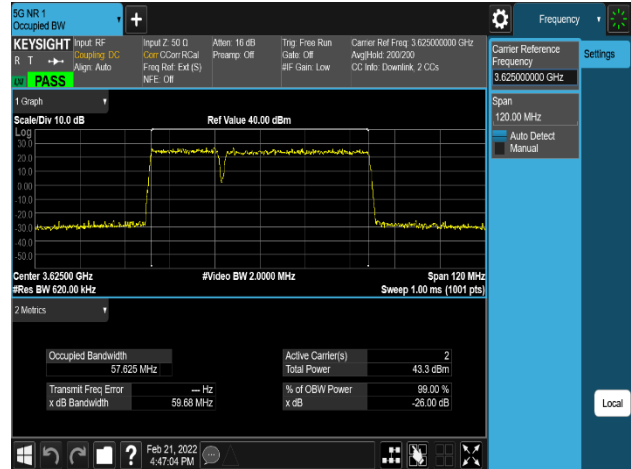


Plot 8-36. Occupied Bandwidth Plot
(LTE_1C+NR_1C_10M+10M_16QAM - Mid Channel, Port 0)

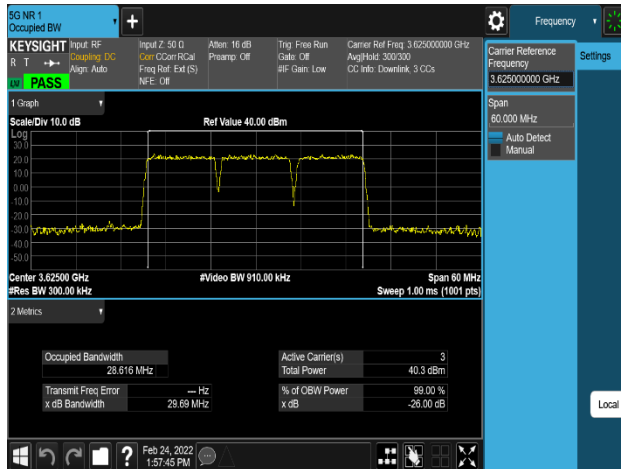
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 23 of 174



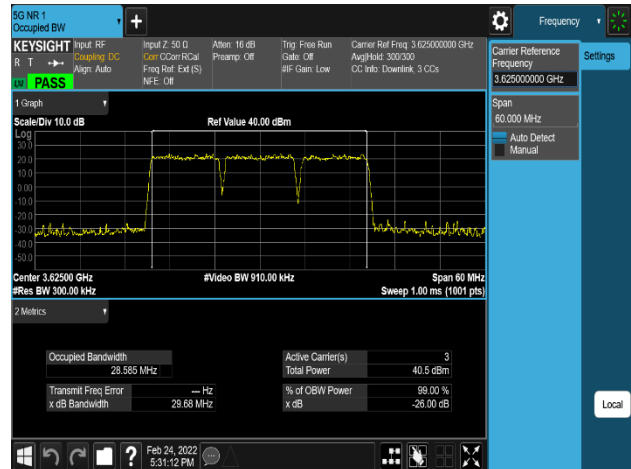
Plot 8-37. Occupied Bandwidth Plot
(LTE_1C+NR_1C_20M+40M_QPSK - Mid Channel, Port0)



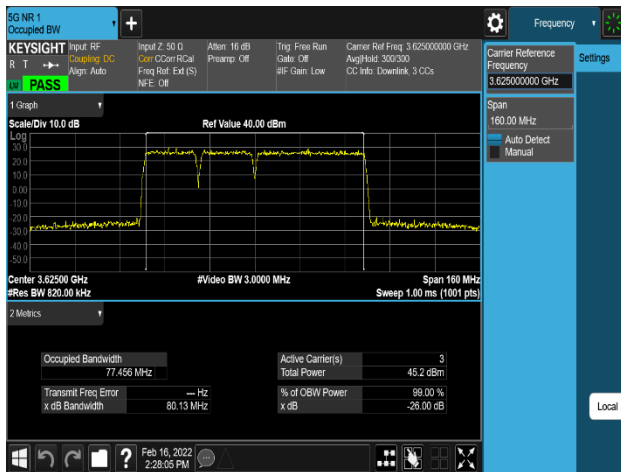
Plot 8-38. Occupied Bandwidth Plot
(LTE_1C+NR_1C_20M+40M_16QAM - Mid Channel, Port0)



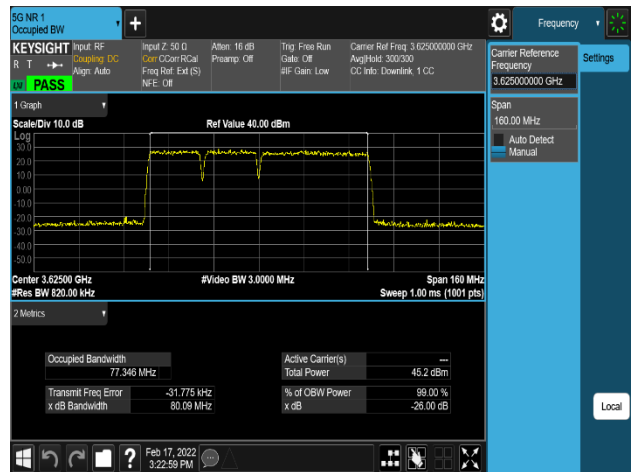
Plot 8-39. Occupied Bandwidth Plot
(LTE_2C+NR_1C_10M+10M+10M_QPSK - Mid Channel, Port0)



Plot 8-40. Occupied Bandwidth Plot
(LTE_2C+NR_1C_10M+10M+10M_16QAM - Mid Channel, Port0)



Plot 8-41. Occupied Bandwidth Plot
(LTE_2C+NR_1C_20M+20M+40M_QPSK - Mid Channel, Port0)



Plot 8-42. Occupied Bandwidth Plot
(LTE_2C+NR_1C_20M+20M+40M_16QAM - Mid Channel, Port0)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 24 of 174

8.3 Modulation Characteristics

Test Overview

Verification of a curve or equivalent data that shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Test Procedure Used

ANSI C63.26 - Section 5.3

Test Setting

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer setting was modulation analyzer mode.

Test Setup

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

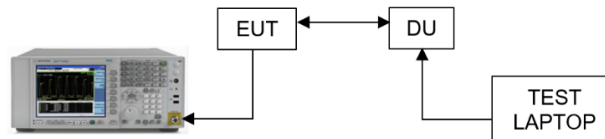




Figure 8-2. Test Instrument & Measurement Setup

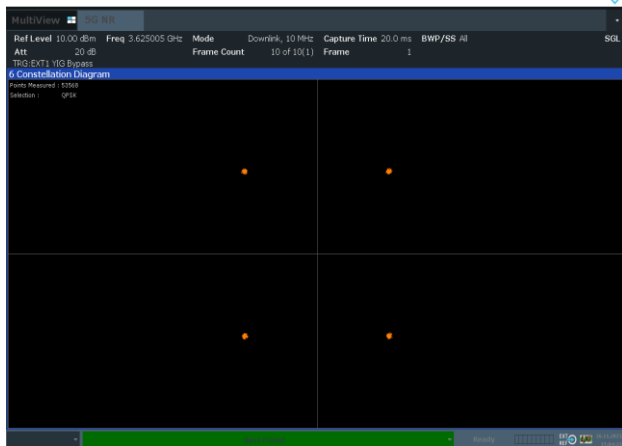
Limit

Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.

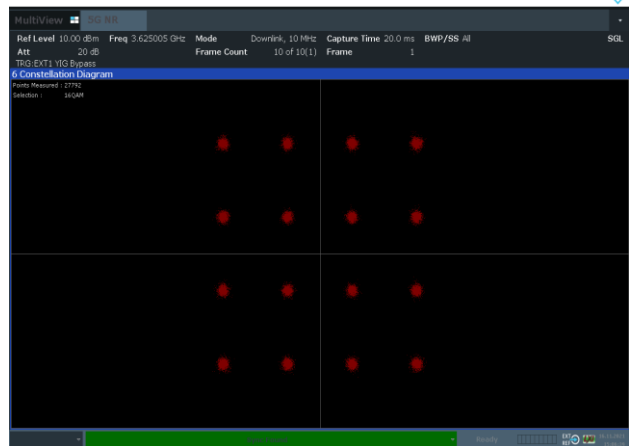
Test Notes

Systems operating used digital modulation techniques.

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 25 of 174



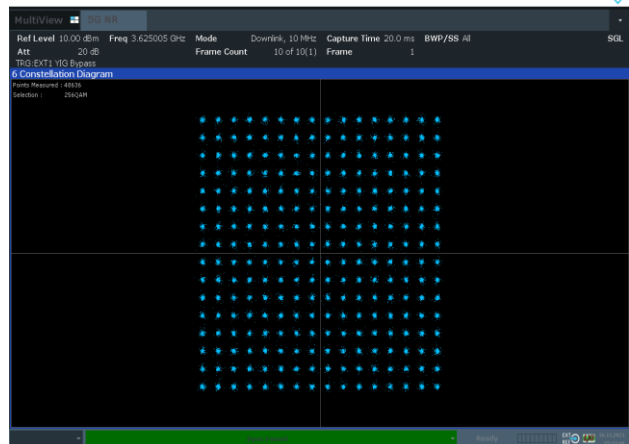
Plot 8-43. Modulation Characteristics Plot (NR_n48_1C_10M_QPSK Modulation)



Plot 8-44. Modulation Characteristics Plot (NR_n48_1C_10M_16QAM Modulation)



Plot 8-45. Modulation Characteristics Plot (NR_n48_1C_10M_64QAM Modulation)



Plot 8-46. Modulation Characteristics Plot (NR_n48_1C_10M_256QAM Modulation)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L				Test Dates: 10/15/2021 – 03/14/2022

8.4 Power Spectral Density

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedure Used

ANSI C63.26 - Section 5.2.4
ANSI C63.26 - Section 5.2.5
KDB 971168 D01 v03r01 - Section 5.3

ANSI C63.26 - Section 6.4.3.2.3
KDB 662911 D01 v02r01
- Section E)2) In-Band Power Spectral Density (PSD) Measurements
b) Measure and sum spectral maxima across the outputs.

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:

The PSD is measured following the same procedures described in 5.2.4.4 of ANSI C63.26 for measuring the total average power, but with the RBW set to the reference bandwidth specified by the applicable regulatory requirement, and by using the marker function to identify the maximum PSD instead of summing the power across the OBW. If the fundamental measurement condition cannot be realized, then one of the alternative procedures in 5.2.4.4.2 or 5.2.4.4.3 should be selected, based on whether the transmitter duty cycle is constant (variations $\leq \pm 2\%$) or non-constant (variations $> \pm 2\%$), respectively.



1. Conducted power measurements are performed using the signal analyzer's "SA mode" measurement capability for signals with continuous operation.
2. Set span to $2 \times$ to $3 \times$ the OBW.
3. Set RBW = 1 MHz (the reference bandwidth)
4. Set VBW $\geq 3 \times$ RBW.
5. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
6. Sweep time:
 - a) Set \geq auto-couple, and enable trace averaging, or
 - b) Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ and enable a single sweep (automation-compatible) measurement. The sweep time should never be faster than the auto-coupled sweep time.
7. Detector = power averaging (rms).
8. The trace was allowed to stabilize
9. Use the peak marker function to determine the maximum amplitude level. ($=P_{\text{Meas}}$)
10. The relevant equation for determining the maximum EIRP from the measured RF output power is given in

Equation as follows:

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

where

GT: gain of the transmitting antenna, in dBi (EIRP).

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 27 of 174	

Test Setup

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

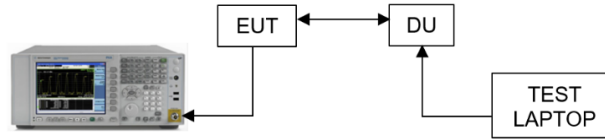


Figure 8-3. Test Instrument & Measurement Setup



Limit

Category B CBSD : 37 dBm/MHz

Test Notes

1. Consider the following factors for MIMO Power Spectral Density:
The power spectral density is measured as dBm / MHz, with the resolution bandwidth of 1 MHz PSDs are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01 - Section E) 2).
2. Periodic trigger was used with gating ON. Gate sweep time, Gate delay and gate length were set accordingly to capture ON time of the transmission.
3. PSD per port (dBm / MHz) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO conducted Power (mW). We convert this back to logarithmic scale for further PSD calculations.
4. Antenna Gains (dBi) are provided by the client.
5. The EUT have multiple antennas transmitting correlated signals with the equal antenna gains and two outputs driving a cross-polarized antennas with $N_{ANT}=2$.
Directional gain is to be computed as follows;
* Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi
6. Worst e.i.r.p Case Scenario gain antenna was selected to perform all RF testing that can get maximum power setting. And high gain antenna power setting will be reduced according to difference value of antenna gain declared by applicant.
7. Applied antenna gain as below:

Bandwidth	Antenna gain (dBi)	Directional gain (dBi)
All Bandwidth	9.0	12.0



FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 28 of 174	

8. Sample Calculation:

Let us assume the following numbers:



- a) Total MIMO Conducted Power as 302.28 mW/MHz
- b) Antenna Gain = 12.00 dBi

Factors	Value	Unit
Summed MIMO Conducted Power (linear sum)	302.28	mW/MHz
Summed MIMO Conducted Power (dBm) = $10 * \log(302.28) =$	24.80	dBm/MHz
Antenna Gain	12.00	dBi
Total MIMO EIRP	36.80	dBm/MHz
Limit	37.00	dBm/MHz
Margin = Limit - Total MIMO EIRP = 36.80 – 37.00 =	-0.20	dB

FCC: A3LRT4401-48A	 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 29 of 174



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.72	18.49	18.84	18.82
	1	18.75	18.38	18.86	18.84
	2	18.90	18.81	18.94	19.12
	3	18.77	18.57	18.90	19.09
Total MIMO Conducted Power (mW/MHz)		302.28	287.54	309.41	315.40
Total MIMO Conducted Power (dBm/MHz)		24.80	24.59	24.91	24.99
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.80	36.59	36.91	36.99
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.20	-0.41	-0.09	-0.01
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.72	19.00	18.74	18.67
	1	18.80	18.94	18.70	18.72
	2	18.80	18.93	18.57	18.73
	3	18.84	18.93	18.72	18.81
Total MIMO Conducted Power (mW/MHz)		302.61	314.01	295.55	298.74
Total MIMO Conducted Power (dBm/MHz)		24.81	24.97	24.71	24.75
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.81	36.97	36.71	36.75
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.19	-0.03	-0.29	-0.25
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.56	18.91	18.59	18.59
	1	18.61	18.71	18.69	18.76
	2	18.67	18.78	18.61	18.63
	3	18.61	18.82	18.74	18.67
Total MIMO Conducted Power (mW/MHz)		290.57	303.79	293.58	294.16
Total MIMO Conducted Power (dBm/MHz)		24.63	24.83	24.68	24.69
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.63	36.83	36.68	36.69
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.37	-0.17	-0.32	-0.31

Table 8-9. Peak Power Spectral Density Table (NR_n48_1C_10M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 30 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.26	18.47	18.39	18.43
	1	18.41	18.52	18.49	18.46
	2	18.29	18.51	18.34	18.33
	3	18.29	18.53	18.42	18.42
Total MIMO Conducted Power (mW/MHz)		271.14	283.65	277.50	277.44
Total MIMO Conducted Power (dBm/MHz)		24.33	24.53	24.43	24.43
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.33	36.53	36.43	36.43
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.67	-0.47	-0.57	-0.57
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.55	18.66	18.59	18.56
	1	18.53	18.53	18.52	18.55
	2	18.45	18.57	18.48	18.52
	3	18.59	18.61	18.63	18.64
Total MIMO Conducted Power (mW/MHz)		285.00	289.28	286.90	287.61
Total MIMO Conducted Power (dBm/MHz)		24.55	24.61	24.58	24.59
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.55	36.61	36.58	36.59
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.45	-0.39	-0.42	-0.41
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.31	18.53	18.51	18.58
	1	18.57	18.61	18.62	18.64
	2	18.38	18.61	18.68	18.56
	3	18.49	18.56	18.64	18.58
Total MIMO Conducted Power (mW/MHz)		279.32	288.27	290.56	289.11
Total MIMO Conducted Power (dBm/MHz)		24.46	24.6	24.63	24.61
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.46	36.60	36.63	36.61
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.54	-0.40	-0.37	-0.39

Table 8-10. Peak Power Spectral Density Table (NR_n48_1C_20M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 31 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.99	19.00	19.00	19.00
	1	18.96	18.88	18.97	19.00
	2	18.93	19.04	18.95	18.95
	3	18.65	18.86	18.67	18.68
Total MIMO Conducted Power (mW/MHz)		309.49	313.92	310.41	311.21
Total MIMO Conducted Power (dBm/MHz)		24.91	24.97	24.92	24.93
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.91	36.97	36.92	36.93
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.09	-0.03	-0.08	-0.07
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	19.04	18.85	18.91	18.86
	1	19.03	18.98	18.91	18.92
	2	18.83	18.82	18.85	18.87
	3	18.76	18.82	18.73	18.81
Total MIMO Conducted Power (mW/MHz)		311.64	308.22	307.02	307.93
Total MIMO Conducted Power (dBm/MHz)		24.94	24.89	24.87	24.88
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.94	36.89	36.87	36.88
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.06	-0.11	-0.13	-0.12
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.87	18.96	18.90	18.86
	1	18.95	19.04	18.98	18.85
	2	18.83	18.88	18.83	18.91
	3	18.66	18.75	18.78	18.91
Total MIMO Conducted Power (mW/MHz)		305.48	311.06	308.57	309.19
Total MIMO Conducted Power (dBm/MHz)		24.85	24.93	24.89	24.90
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.85	36.93	36.89	36.90
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.15	-0.07	-0.11	-0.10

Table 8-11. Peak Power Spectral Density Table (NR_n48_1C_30M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 32 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.57	18.33	18.52	18.70
	1	18.56	18.34	18.46	18.81
	2	18.59	18.37	18.41	18.73
	3	18.53	18.30	18.42	18.73
Total MIMO Conducted Power (mW/MHz)		287.29	272.67	279.97	299.42
Total MIMO Conducted Power (dBm/MHz)		24.58	24.36	24.47	24.76
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.58	36.36	36.47	36.76
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.42	-0.64	-0.53	-0.24
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.05	18.39	18.23	18.44
	1	18.05	18.37	18.24	18.35
	2	18.03	18.43	18.26	18.34
	3	18.01	18.54	18.26	18.32
Total MIMO Conducted Power (mW/MHz)		254.47	278.63	267.12	274.34
Total MIMO Conducted Power (dBm/MHz)		24.06	24.45	24.27	24.38
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.06	36.45	36.27	36.38
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.94	-0.55	-0.73	-0.62
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.19	18.16	18.22	18.17
	1	18.23	18.19	18.27	18.16
	2	18.33	18.46	18.38	18.39
	3	18.31	18.35	18.25	18.27
Total MIMO Conducted Power (mW/MHz)		268.22	269.84	269.19	267.23
Total MIMO Conducted Power (dBm/MHz)		24.28	24.31	24.30	24.27
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.28	36.31	36.30	36.27
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.72	-0.69	-0.70	-0.73

Table 8-12. Peak Power Spectral Density Table (NR_n48_1C_40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 33 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.25	18.59	18.36	18.39
	1	18.33	18.55	18.40	18.43
	2	18.36	18.64	18.42	18.36
	3	18.44	18.62	18.41	18.36
Total MIMO Conducted Power (mW/MHz)		273.28	289.85	276.67	275.83
Total MIMO Conducted Power (dBm/MHz)		24.37	24.62	24.42	24.41
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.37	36.62	36.42	36.41
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.63	-0.38	-0.58	-0.59
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.17	18.42	18.29	18.25
	1	18.07	18.37	18.08	18.17
	2	18.16	18.41	18.20	18.15
	3	18.12	18.31	18.24	18.22
Total MIMO Conducted Power (mW/MHz)		260.14	275.21	264.45	263.97
Total MIMO Conducted Power (dBm/MHz)		24.15	24.40	24.22	24.22
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.15	36.40	36.22	36.22
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.85	-0.60	-0.78	-0.78
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.67	18.96	18.70	18.75
	1	18.76	18.89	18.73	18.77
	2	18.76	18.95	18.72	18.65
	3	18.81	18.96	18.77	18.76
Total MIMO Conducted Power (mW/MHz)		300.08	313.38	298.50	298.67
Total MIMO Conducted Power (dBm/MHz)		24.77	24.96	24.75	24.75
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.77	36.96	36.75	36.75
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.23	-0.04	-0.25	-0.25

Table 8-13. Peak Power Spectral Density Table (LTE_B48_2C_5M+5M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 34 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.46	18.55	18.53	18.67
	1	18.54	18.69	18.58	18.73
	2	18.50	18.60	18.62	18.65
	3	18.43	18.58	18.66	18.65
Total MIMO Conducted Power (mW/MHz)		281.99	290.13	289.43	294.73
Total MIMO Conducted Power (dBm/MHz)		24.50	24.63	24.62	24.69
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.50	36.63	36.62	36.69
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.50	-0.37	-0.38	-0.31
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.68	18.61	18.81	18.86
	1	18.68	18.71	18.81	18.96
	2	18.59	18.69	18.80	18.95
	3	18.69	18.71	18.83	18.97
Total MIMO Conducted Power (mW/MHz)		293.68	295.14	304.34	312.95
Total MIMO Conducted Power (dBm/MHz)		24.68	24.70	24.83	24.95
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.68	36.70	36.83	36.95
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.32	-0.30	-0.17	-0.05
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.54	18.56	18.58	18.62
	1	18.44	18.58	18.66	18.62
	2	18.58	18.57	18.62	18.65
	3	18.47	18.63	18.55	18.65
Total MIMO Conducted Power (mW/MHz)		283.62	288.71	289.80	292.02
Total MIMO Conducted Power (dBm/MHz)		24.53	24.60	24.62	24.65
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.53	36.60	36.62	36.65
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.47	-0.40	-0.38	-0.35

Table 8-14. Peak Power Spectral Density Table (NR_n48_2C_10M+10M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 35 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.93	18.93	18.84	18.87
	1	18.94	19.02	18.85	19.05
	2	18.98	18.91	18.85	18.91
	3	18.98	18.96	19.04	18.97
Total MIMO Conducted Power (mW/MHz)		314.71	314.56	310.18	314.19
Total MIMO Conducted Power (dBm/MHz)		24.98	24.98	24.92	24.97
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.98	36.98	36.92	36.97
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.02	-0.02	-0.08	-0.03
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.70	18.94	18.71	18.71
	1	18.83	18.93	18.79	18.73
	2	18.90	18.93	18.89	18.90
	3	18.89	18.91	18.89	18.89
Total MIMO Conducted Power (mW/MHz)		305.46	312.56	304.93	303.88
Total MIMO Conducted Power (dBm/MHz)		24.85	24.95	24.84	24.83
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.85	36.95	36.84	36.83
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.15	-0.05	-0.16	-0.17
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.89	18.82	18.86	18.80
	1	18.81	18.97	18.95	18.88
	2	18.84	18.88	18.99	18.87
	3	18.94	18.97	18.99	18.97
Total MIMO Conducted Power (mW/MHz)		308.40	311.30	313.97	309.10
Total MIMO Conducted Power (dBm/MHz)		24.89	24.93	24.97	24.90
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.89	36.93	36.97	36.90
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.11	-0.07	-0.03	-0.10

Table 8-15. Peak Power Spectral Density Table (NR_n48_2C_10M+20M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 36 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	19.00	18.81	19.00	18.93
	1	18.96	18.93	18.93	18.93
	2	18.93	18.81	18.94	18.89
	3	18.90	18.80	18.97	18.91
Total MIMO Conducted Power (mW/MHz)		313.73	306.10	314.92	311.52
Total MIMO Conducted Power (dBm/MHz)		24.97	24.86	24.98	24.93
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.97	36.86	36.98	36.93
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.03	-0.14	-0.02	-0.07
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.87	18.98	18.93	18.94
	1	18.95	19.03	19.02	19.01
	2	18.82	18.86	18.87	18.91
	3	18.85	18.78	18.91	18.97
Total MIMO Conducted Power (mW/MHz)		308.49	311.44	312.96	314.50
Total MIMO Conducted Power (dBm/MHz)		24.89	24.93	24.95	24.98
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.89	36.93	36.95	36.98
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.11	-0.07	-0.05	-0.02
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.88	18.80	19.01	18.86
	1	18.93	18.90	18.99	18.92
	2	18.77	18.84	18.85	18.75
	3	18.71	18.73	18.84	18.71
Total MIMO Conducted Power (mW/MHz)		305.05	304.51	312.04	303.96
Total MIMO Conducted Power (dBm/MHz)		24.84	24.84	24.94	24.83
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.84	36.84	36.94	36.83
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.16	-0.16	-0.06	-0.17

Table 8-16. Peak Power Spectral Density Table (NR_n48_2C_10M+30M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 37 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.97	18.95	18.95	18.75
	1	18.91	18.92	18.99	18.73
	2	18.87	18.86	18.95	18.64
	3	18.86	18.96	18.86	18.71
Total MIMO Conducted Power (mW/MHz)		310.55	312.03	313.08	297.07
Total MIMO Conducted Power (dBm/MHz)		24.92	24.94	24.96	24.73
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.92	36.94	36.96	36.73
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.08	-0.06	-0.04	-0.27
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.46	18.50	18.58	18.77
	1	18.48	18.58	18.57	18.76
	2	18.40	18.52	18.62	18.80
	3	18.42	18.62	18.60	18.79
Total MIMO Conducted Power (mW/MHz)		279.41	286.95	289.29	302.25
Total MIMO Conducted Power (dBm/MHz)		24.46	24.58	24.61	24.80
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.46	36.58	36.61	36.80
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.54	-0.42	-0.39	-0.20
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.55	18.68	18.45	18.52
	1	18.62	18.78	18.56	18.60
	2	18.48	18.76	18.66	18.69
	3	18.37	18.65	18.56	18.58
Total MIMO Conducted Power (mW/MHz)		283.50	297.66	287.13	289.60
Total MIMO Conducted Power (dBm/MHz)		24.53	24.74	24.58	24.62
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.53	36.74	36.58	36.62
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.47	-0.26	-0.42	-0.38

Table 8-17. Peak Power Spectral Density Table (NR_n48_2C_20M+20M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 38 of 174	

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.91	19.02	18.92	18.90
	1	18.96	18.88	18.92	18.90
	2	18.96	18.91	18.95	18.92
	3	18.98	18.95	18.97	19.02
Total MIMO Conducted Power (mW/MHz)		314.52	313.30	313.38	313.03
Total MIMO Conducted Power (dBm/MHz)		24.98	24.96	24.96	24.96
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.98	36.96	36.96	36.96
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.02	-0.04	-0.04	-0.04
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.86	18.83	18.95	18.97
	1	19.08	18.98	19.06	18.97
	2	19.05	18.95	18.82	18.91
	3	18.81	18.90	18.77	18.93
Total MIMO Conducted Power (mW/MHz)		314.13	311.58	310.64	313.61
Total MIMO Conducted Power (dBm/MHz)		24.97	24.94	24.92	24.96
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.97	36.94	36.92	36.96
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.03	-0.06	-0.08	-0.04
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.89	18.70	18.81	18.85
	1	19.00	18.77	18.88	18.90
	2	19.04	18.80	18.91	18.97
	3	18.88	18.92	19.12	19.07
Total MIMO Conducted Power (mW/MHz)		314.23	303.45	312.94	313.94
Total MIMO Conducted Power (dBm/MHz)		24.97	24.82	24.95	24.97
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.97	36.82	36.95	36.97
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.03	-0.18	-0.05	-0.03

Table 8-18. Peak Power Spectral Density Table (NR_n48_2C_10M+40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 39 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.98	18.97	18.75	18.81
	1	18.90	18.98	18.97	18.83
	2	18.88	18.77	18.88	18.86
	3	18.92	18.73	19.04	18.91
Total MIMO Conducted Power (mW/MHz)		312.02	307.95	311.20	307.20
Total MIMO Conducted Power (dBm/MHz)		24.94	24.88	24.93	24.87
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.94	36.88	36.93	36.87
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.06	-0.12	-0.07	-0.13
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.87	18.92	18.84	18.80
	1	19.01	18.90	18.98	18.83
	2	18.72	19.00	19.04	19.08
	3	19.00	18.98	18.95	18.91
Total MIMO Conducted Power (mW/MHz)		310.55	314.02	314.28	310.97
Total MIMO Conducted Power (dBm/MHz)		24.92	24.97	24.97	24.93
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.92	36.97	36.97	36.93
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.08	-0.03	-0.03	-0.07
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.87	19.00	18.94	18.80
	1	18.81	19.06	19.07	18.79
	2	18.97	18.97	18.76	18.84
	3	19.10	18.81	18.90	18.95
Total MIMO Conducted Power (mW/MHz)		313.31	314.91	311.73	306.54
Total MIMO Conducted Power (dBm/MHz)		24.96	24.98	24.94	24.86
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.96	36.98	36.94	36.86
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.04	-0.02	-0.06	-0.14

Table 8-19. Peak Power Spectral Density Table (NR_n48_2C_20M+40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 40 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.84	18.85	19.02	18.95
	1	18.79	18.91	19.01	18.95
	2	18.88	18.81	18.93	18.98
	3	19.13	18.77	18.87	18.89
Total MIMO Conducted Power (mW/MHz)		311.57	305.87	314.70	313.54
Total MIMO Conducted Power (dBm/MHz)		24.94	24.86	24.98	24.96
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.94	36.86	36.98	36.96
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.06	-0.14	-0.02	-0.04
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.92	19.07	18.74	19.02
	1	18.83	19.02	18.85	18.90
	2	18.93	18.91	18.96	19.09
	3	18.99	18.84	18.91	18.81
Total MIMO Conducted Power (mW/MHz)		311.65	314.89	308.05	314.40
Total MIMO Conducted Power (dBm/MHz)		24.94	24.98	24.89	24.97
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.94	36.98	36.89	36.97
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.06	-0.02	-0.11	-0.03
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.98	18.99	18.86	19.08
	1	18.86	18.95	19.00	18.76
	2	18.87	18.83	18.87	18.90
	3	18.89	18.95	18.99	18.98
Total MIMO Conducted Power (mW/MHz)		310.55	312.65	312.63	312.64
Total MIMO Conducted Power (dBm/MHz)		24.92	24.95	24.95	24.95
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.92	36.95	36.95	36.95
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.08	-0.05	-0.05	-0.05

Table 8-20. Peak Power Spectral Density Table (NR_n48_2C_30M+40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 41 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.38	18.74	18.70	18.17
	1	18.44	18.77	18.53	18.22
	2	18.42	18.89	18.58	18.39
	3	18.41	18.75	18.51	18.10
Total MIMO Conducted Power (mW/MHz)		277.52	302.60	288.29	265.41
Total MIMO Conducted Power (dBm/MHz)		24.43	24.81	24.60	24.24
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.43	36.81	36.60	36.24
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.57	-0.19	-0.40	-0.76
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.61	18.52	18.77	18.75
	1	18.69	18.63	18.97	18.92
	2	18.67	18.61	18.88	18.79
	3	18.57	18.64	18.74	18.75
Total MIMO Conducted Power (mW/MHz)		292.04	289.68	306.29	303.78
Total MIMO Conducted Power (dBm/MHz)		24.65	24.62	24.86	24.83
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.65	36.62	36.86	36.83
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.35	-0.38	-0.14	-0.17
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.64	18.95	18.74	18.64
	1	18.55	18.81	18.76	18.71
	2	18.58	18.77	18.68	18.60
	3	18.56	18.70	18.64	18.59
Total MIMO Conducted Power (mW/MHz)		288.42	304.11	296.87	292.12
Total MIMO Conducted Power (dBm/MHz)		24.60	24.83	24.73	24.66
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.60	36.83	36.73	36.66
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.40	-0.17	-0.27	-0.34

Table 8-21. Peak Power Spectral Density Table (NR_n48_2C_40M+40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 42 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.76	18.67	18.66	18.76
	1	18.71	18.69	18.70	18.72
	2	18.91	18.82	18.83	18.97
	3	18.88	18.88	18.85	18.93
Total MIMO Conducted Power (mW/MHz)		304.47	300.87	300.77	306.53
Total MIMO Conducted Power (dBm/MHz)		24.84	24.78	24.78	24.86
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.84	36.78	36.78	36.86
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.16	-0.22	-0.22	-0.14
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.43	18.60	18.70	18.62
	1	18.45	18.66	18.76	18.67
	2	18.77	18.82	19.02	18.93
	3	18.72	18.99	19.07	18.98
Total MIMO Conducted Power (mW/MHz)		289.47	301.32	309.85	303.47
Total MIMO Conducted Power (dBm/MHz)		24.62	24.79	24.91	24.82
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.62	36.79	36.91	36.82
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.38	-0.21	-0.09	-0.18
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.30	18.74	18.44	18.43
	1	18.38	18.63	18.50	18.48
	2	18.87	18.82	18.96	18.91
	3	18.82	19.08	18.99	19.04
Total MIMO Conducted Power (mW/MHz)		289.61	304.90	298.68	298.16
Total MIMO Conducted Power (dBm/MHz)		24.62	24.84	24.75	24.74
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.62	36.84	36.75	36.74
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.38	-0.16	-0.25	-0.26

Table 8-22. Peak Power Spectral Density Table (LTE_B48_1C + NR_n48_1C_10M+10M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 43 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.68	18.92	18.75	18.89
	1	18.68	18.85	18.84	18.87
	2	18.85	19.01	19.07	19.02
	3	18.93	19.05	19.04	18.99
Total MIMO Conducted Power (mW/MHz)		302.52	314.70	312.60	313.39
Total MIMO Conducted Power (dBm/MHz)		24.81	24.98	24.95	24.96
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.81	36.98	36.95	36.96
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.19	-0.02	-0.05	-0.04
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.79	18.77	18.73	18.80
	1	18.86	18.85	18.82	18.86
	2	18.83	19.08	18.89	19.00
	3	18.78	18.99	18.83	18.93
Total MIMO Conducted Power (mW/MHz)		304.45	312.28	304.61	310.30
Total MIMO Conducted Power (dBm/MHz)		24.84	24.95	24.84	24.92
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.84	36.95	36.84	36.92
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.16	-0.05	-0.16	-0.08
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.71	18.89	18.70	18.82
	1	18.55	18.79	18.57	18.69
	2	18.82	19.08	18.86	18.86
	3	18.70	18.99	18.79	18.77
Total MIMO Conducted Power (mW/MHz)		296.28	313.22	298.71	302.42
Total MIMO Conducted Power (dBm/MHz)		24.72	24.96	24.75	24.81
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.72	36.96	36.75	36.81
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.28	-0.04	-0.25	-0.19

Table 8-23. Peak Power Spectral Density Table (LTE_B48_1C + NR_n48_1C_20M+40M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 44 of 174	



Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.70	18.98	18.79	18.80
	1	18.71	18.81	18.83	18.75
	2	18.90	18.92	18.98	18.85
	3	18.95	18.95	19.03	18.88
Total MIMO Conducted Power (mW/MHz)		304.58	311.54	311.03	304.73
Total MIMO Conducted Power (dBm/MHz)		24.84	24.94	24.93	24.84
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.34	36.44	36.43	36.57
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.16	-0.06	-0.07	-0.16
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.63	18.69	18.82	18.99
	1	18.62	18.62	18.93	18.73
	2	18.91	18.91	18.92	18.88
	3	18.93	18.87	18.78	18.87
Total MIMO Conducted Power (mW/MHz)		301.50	301.68	308.00	308.17
Total MIMO Conducted Power (dBm/MHz)		24.79	24.80	24.89	24.89
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.79	36.80	36.89	36.89
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.21	-0.20	-0.11	-0.11
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.42	18.56	18.75	18.79
	1	18.40	18.65	18.70	18.74
	2	18.90	18.76	19.06	18.80
	3	18.86	18.94	19.03	18.81
Total MIMO Conducted Power (mW/MHz)		293.22	298.39	309.53	302.37
Total MIMO Conducted Power (dBm/MHz)		24.67	24.75	24.91	24.81
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.67	36.75	36.91	36.81
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.33	-0.25	-0.09	-0.19

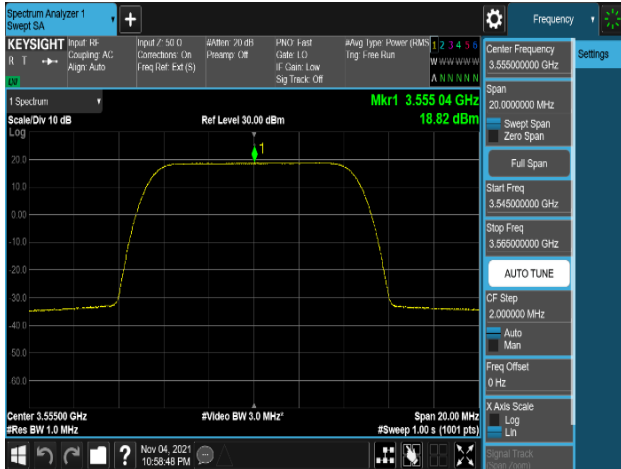
Table 8-24. Peak Power Spectral Density Table (LTE_B48_2C + NR_n48_1C_10M+10M+10M)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 45 of 174	

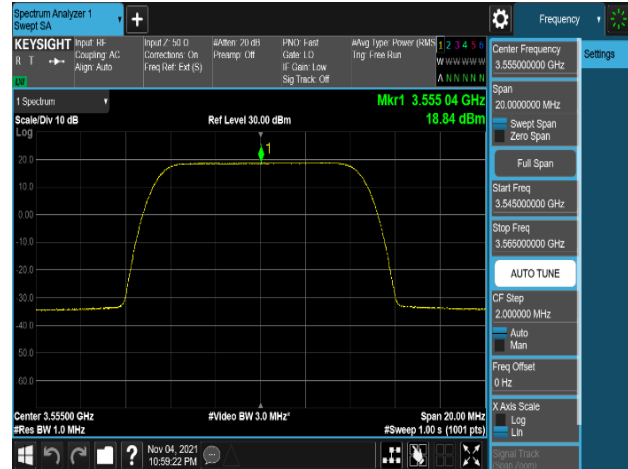
Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.73	18.86	18.78	18.82
	1	18.70	18.89	18.74	18.79
	2	18.81	18.96	18.97	18.82
	3	18.71	18.89	18.88	18.82
Total MIMO Conducted Power (mW/MHz)		299.01	310.49	306.34	304.43
Total MIMO Conducted Power (dBm/MHz)		24.76	24.92	24.86	24.83
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.76	36.92	36.86	36.83
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.24	-0.08	-0.14	-0.17
Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.42	18.79	18.58	18.66
	1	18.57	18.95	18.69	18.79
	2	18.65	18.87	19.21	19.19
	3	18.57	18.72	19.10	19.10
Total MIMO Conducted Power (mW/MHz)		286.69	305.77	310.68	313.58
Total MIMO Conducted Power (dBm/MHz)		24.57	24.85	24.92	24.96
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.57	36.85	36.92	36.96
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.43	-0.15	-0.08	-0.04
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm/MHz)	0	18.42	18.46	18.60	18.40
	1	18.50	18.50	18.64	18.51
	2	19.07	18.88	19.18	19.11
	3	18.95	18.81	19.20	19.00
Total MIMO Conducted Power (mW/MHz)		299.63	294.14	311.66	301.05
Total MIMO Conducted Power (dBm/MHz)		24.77	24.69	24.94	24.79
Ant. Gain (dBi)		12.00	12.00	12.00	12.00
e.i.r.p PSD (dBm/MHz)		36.77	36.69	36.94	36.79
e.i.r.p PSD Limit(dBm/MHz)		37.00	37.00	37.00	37.00
Margin (dB)		-0.23	-0.31	-0.06	-0.21

Table 8-25. Peak Power Spectral Density Table (LTE_B48_2C + NR_n48_1C_20M+20M+40M)

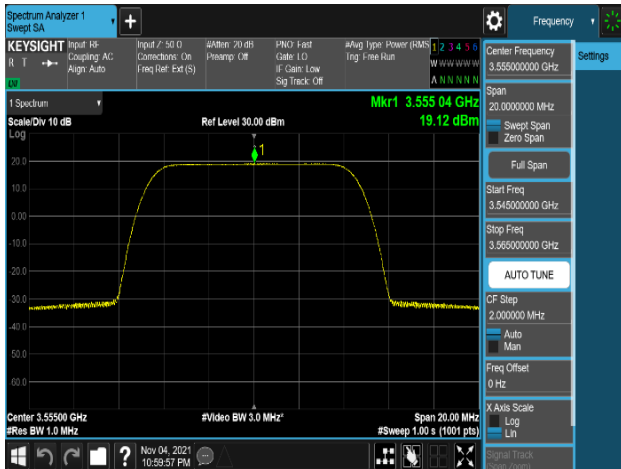
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)	Page 46 of 174	



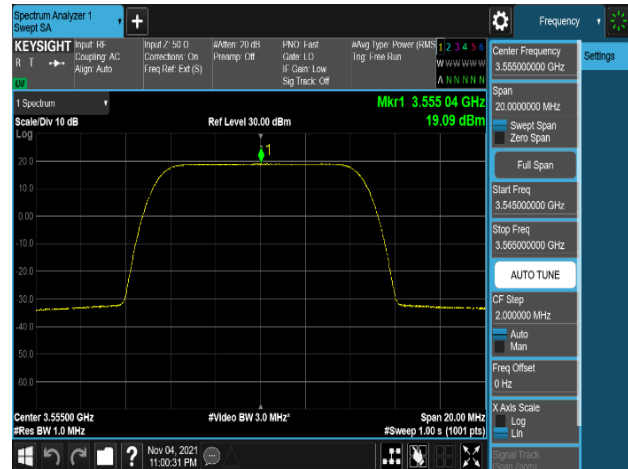
Plot 8-47. Power Spectral Density Plot
(NR_n48_1C_10M_256QAM - Low Channel, Port 0)



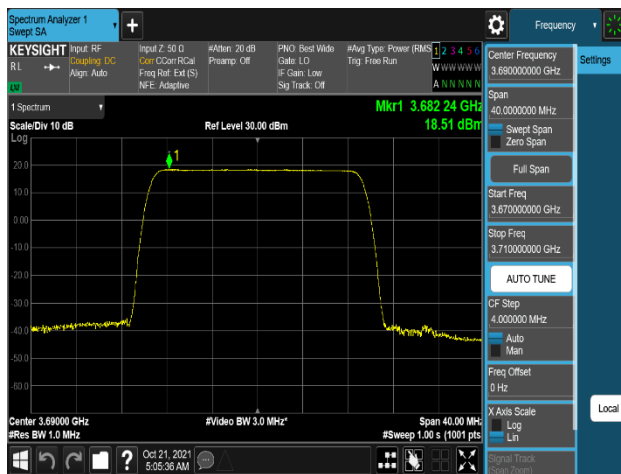
Plot 8-48. Power Spectral Density Plot
(NR_n48_1C_10M_256QAM - Low Channel, Port 1)



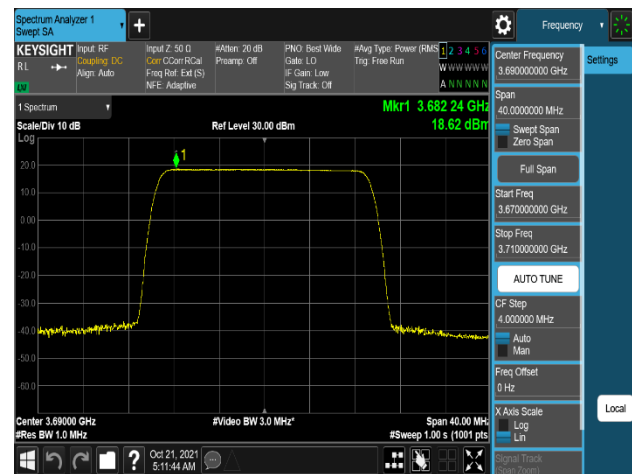
Plot 8-49. Power Spectral Density Plot
(NR_n48_1C_10M_256QAM - Low Channel, Port 2)



Plot 8-50. Power Spectral Density Plot
(NR_n48_1C_10M_256QAM - Low Channel, Port 3)

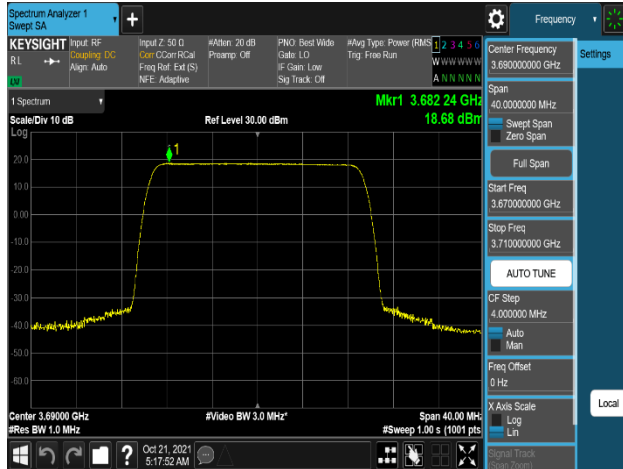


Plot 8-51. Power Spectral Density Plot
(NR_n48_1C_20M_64QAM - High Channel, Port 0)

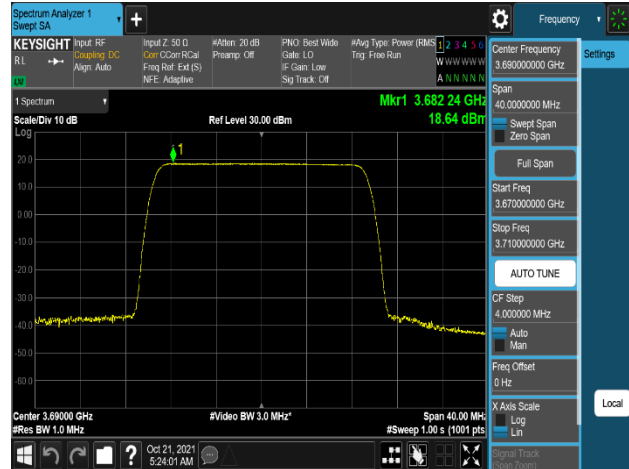


Plot 8-52. Power Spectral Density Plot
(NR_n48_1C_20M_64QAM - High Channel, Port 1)

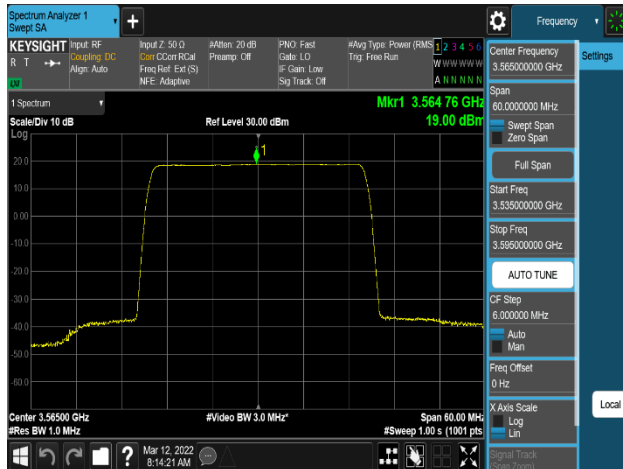
FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 47 of 174



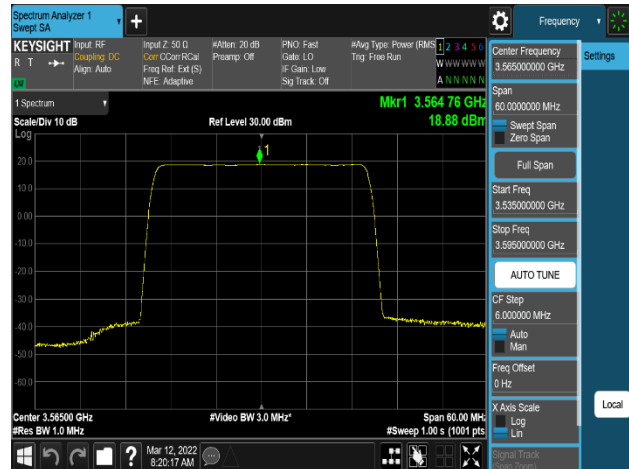
Plot 8-53. Power Spectral Density Plot
(NR_n48_1C_20M_64QAM - High Channel, Port 2)



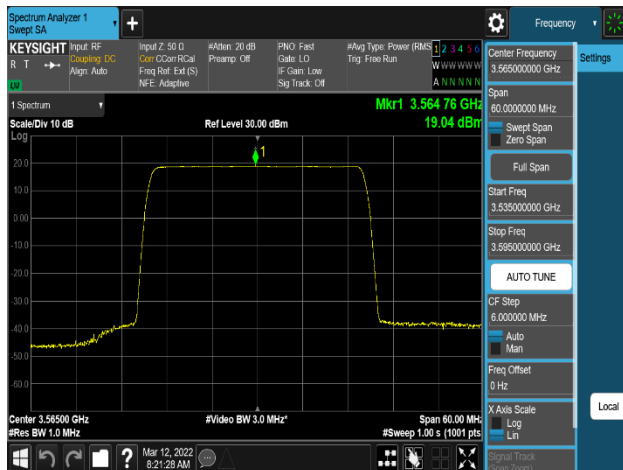
Plot 8-54. Power Spectral Density Plot
(NR_n48_1C_20M_64QAM - High Channel, Port 3)



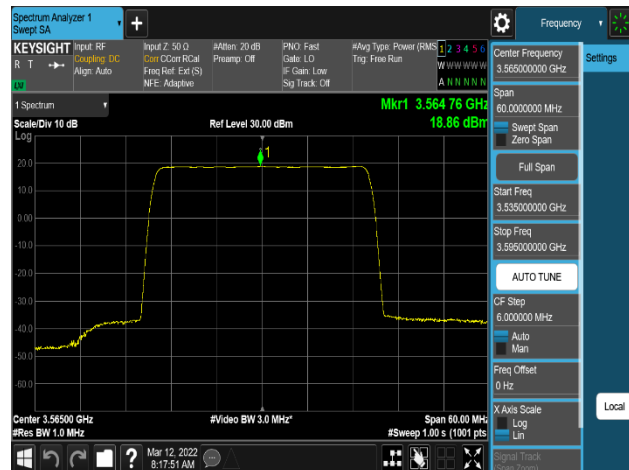
Plot 8-55. Power Spectral Density Plot
(NR_n48_1C_30M_16QAM - Low Channel, Port 0)



Plot 8-56. Power Spectral Density Plot
(NR_n48_1C_30M_16QAM - Low Channel, Port 1)



Plot 8-57. Power Spectral Density Plot
(NR_n48_1C_30M_16QAM - Low Channel, Port 2)



Plot 8-58. Power Spectral Density Plot
(NR_n48_1C_30M_16QAM - Low Channel, Port 3)

FCC: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N: 8K21101307-R4.A3L	Test Dates: 10/15/2021 – 03/14/2022	EUT Type: RRU(RT4401)		Page 48 of 174