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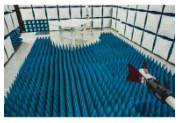

MEASUREMENT REPORT
LTE

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

Date of Testing:
07/19/2021 – 08/18/2021
Test Site/Location:
PCTEST KOREA Lab. Yongin-si, Gyeonggi-do, Korea
Test Report Serial No.:
8K21071202-R2.A3L

FCC ID:	**A3LRF4437D-25C**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	RF4437d-25C
EUT Type:	RRU(RF4437d)
FCC Classification:	PCS Licensed Transmitter
FCC Rule Part(s):	24 & 27
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01

This revised Test Report (S/N: 8K21071202-R2.A3L) supersedes and replaces the previously issued test report (S/N: 8K21071202-R1.A3L) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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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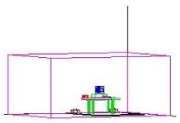
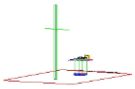


MEASUREMENT REPORT
FCC Part 24E & 27



Total Bandwidth (MHz)	Band	FCC Rule Part	Tx Frequency (MHz)	Total Power		Emission Designator	Modulation
				MaxPower (W)	MaxPower (dBm)		
5	LTE Band 2	24E	1930.0 – 1990.0	41.21	46.15	4M48G7D	QPSK
				35.48	45.50	4M47W7D	16QAM
				35.81	45.54	4M48W7D	64QAM
				35.56	45.51	4M48W7D	256QAM
10	LTE Band 2	24E	1930.0 – 1990.0	35.16	45.46	8M97G7D	QPSK
				35.56	45.51	8M97W7D	16QAM
				35.32	45.48	8M98W7D	64QAM
				35.81	45.54	8M96W7D	256QAM
10 (5+5)	LTE Band 2	24E	1930.0 – 1990.0	36.06	45.59	9M44G7D	QPSK
				36.73	45.65	9M43W7D	16QAM
				37.15	45.70	9M45W7D	64QAM
				36.31	45.60	9M45W7D	256QAM
15	LTE Band 2	24E	1930.0 – 1990.0	37.41	45.73	13M4G7D	QPSK
				36.98	45.68	13M4W7D	16QAM
				37.15	45.70	13M4W7D	64QAM
				37.24	45.71	13M4W7D	256QAM
15 (5+5+5)	LTE Band 2	24E	1930.0 – 1990.0	36.39	45.61	14M4G7D	QPSK
				35.89	45.55	14M4W7D	16QAM
				36.06	45.57	14M4W7D	64QAM
				36.06	45.57	14M4W7D	256QAM
20	LTE Band 2	24E	1930.0 – 1990.0	34.75	45.41	17M9G7D	QPSK
				34.99	45.44	17M9W7D	16QAM
				35.56	45.51	17M9W7D	64QAM
				35.89	45.55	17M9W7D	256QAM
25 (5+20)	LTE Band 2	24E	1930.0 – 1990.0	35.08	45.45	23M7G7D	QPSK
				35.32	45.48	23M7W7D	16QAM
				35.24	45.47	23M7W7D	64QAM
				34.99	45.44	23M7W7D	256QAM
30 (10+20)	LTE Band 2	24E	1930.0 – 1990.0	36.22	45.59	28M3G7D	QPSK
				35.40	45.49	28M3W7D	16QAM
				35.48	45.50	28M3W7D	64QAM
				35.40	45.49	28M3W7D	256QAM
30 (5+5+20)	LTE Band 2	24E	1930.0 – 1990.0	34.99	45.44	28M6G7D	QPSK
				35.24	45.47	28M5W7D	16QAM
				35.24	45.47	28M6W7D	64QAM
				35.32	45.48	28M6W7D	256QAM
5	LTE Band 66	27	2110.0 – 2180.0	47.53	46.77	4M48G7D	QPSK
				47.64	46.78	4M48W7D	16QAM
				47.53	46.77	4M49W7D	64QAM
				47.32	46.75	4M48W7D	256QAM
10	LTE Band 66	27	2110.0 – 2180.0	47.42	46.76	8M97G7D	QPSK
				47.75	46.79	8M98W7D	16QAM
				48.75	46.88	8M99W7D	64QAM
				48.75	46.88	8M97W7D	256QAM
10 (5+5)	LTE Band 66	27	2110.0 – 2180.0	45.92	46.62	9M44G7D	QPSK
				45.92	46.62	9M43W7D	16QAM
				46.03	46.63	9M45W7D	64QAM
				45.92	46.62	9M46W7D	256QAM
15	LTE Band 66	27	2110.0 – 2180.0	47.53	46.77	13M4G7D	QPSK
				48.42	46.85	13M4W7D	16QAM
				47.75	46.79	13M5W7D	64QAM
				48.19	46.83	13M5W7D	256QAM

15 (5+5+5)	LTE Band 66	27	2110.0 – 2180.0	45.50	46.58	14M4G7D	QPSK
				45.60	46.59	14M4W7D	16QAM
				45.71	46.60	14M4W7D	64QAM
				45.39	46.57	14M4W7D	256QAM
20	LTE Band 66	27	2110.0 – 2180.0	46.77	46.70	17M9G7D	QPSK
				47.21	46.74	17M9W7D	16QAM
				46.77	46.70	17M9W7D	64QAM
				47.21	46.74	17M9W7D	256QAM
20 (5+5+5+5)	LTE Band 66	27	2110.0 – 2180.0	47.75	46.79	19M4G7D	QPSK
				47.64	46.78	19M4W7D	16QAM
				48.08	46.82	19M4W7D	64QAM
				47.75	46.79	19M4W7D	256QAM
25 (5+20)	LTE Band 66	27	2110.0 – 2180.0	45.29	46.56	23M7G7D	QPSK
				44.98	46.53	23M7W7D	16QAM
				45.39	46.57	23M7W7D	64QAM
				44.98	46.53	23M7W7D	256QAM
30 (5+5+20)	LTE Band 66	27	2110.0 – 2180.0	45.39	46.57	28M6G7D	QPSK
				45.39	46.57	28M6W7D	16QAM
				45.50	46.58	28M6W7D	64QAM
				45.50	46.58	28M7W7D	256QAM
35 (5+5+5+20)	LTE Band 66	27	2110.0 – 2180.0	46.77	46.70	33M5G7D	QPSK
				46.77	46.70	33M5W7D	16QAM
				46.34	46.66	33M5W7D	64QAM
				46.45	46.67	33M6W7D	256QAM
40 (20+20)	LTE Band 66	27	2110.0 – 2180.0	45.08	46.54	37M9G7D	QPSK
				45.29	46.56	38M0W7D	16QAM
				45.71	46.60	37M9W7D	64QAM
				45.29	46.56	37M9W7D	256QAM
40 (5+15+20)	LTE Band 66	27	2110.0 – 2180.0	45.50	46.58	38M5G7D	QPSK
				45.39	46.57	38M5W7D	16QAM
				45.19	46.55	38M5W7D	64QAM
				44.98	46.53	38M5W7D	256QAM
40 (5+5+10+20)	LTE Band 66	27	2110.0 – 2180.0	44.98	46.53	38M6G7D	QPSK
				46.03	46.63	38M7W7D	16QAM
				45.50	46.58	38M6W7D	64QAM
				45.19	46.55	38M6W7D	256QAM

EUT Overview

Notes:

Total Power shown in the table above are the full conducted average output power that will appear on the Grant of Authorization.

1.0 INTRODUCTION

1.1 Scope

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

1.2 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.

1.3 Test Facility / Accreditations

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung RRU(RF4437d) FCC ID: A3LRRF4437D-25C**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that perate under the provisions of Part 24 and 27.

This device supports the following conditional features:

EUT Type:	RRU(RF4437d)		
Model Name:	RF4437d-25C		
Test Device Serial No.:	S617628270		
Device Capabilities:	FD-LTE		
Operating Band/Frequency Range:	Band	Tx (Downlink)	Rx (Uplink)
	B2:	1930 MHz to 1990 MHz	1850 MHz to 1910 MHz
	B66:	2110 MHz to 2180 MHz	1710 MHz to 1780 MHz
Supported Number of Carriers:	Max. 3 carriers in band 2 Max. 4 carrier in band 66		
Supported Modulation:	LTE: QPSK(E-TM 1.1), 16QAM(E-TM 3.2), 64QAM(E-TM 3.1), 256QAM(E-TM 3.1a)		
Supported Channel Bandwidth:	5MHz, 10MHz, 15MHz, and 20MHz		
Number of Antenna ports	4		
Supported Configurations:	Single carrier, Multi-carrier, Multi-band operation		
Input Voltage:	-48 VDC		
Antenna:	☐ Internal antenna ■ External antenna		
Antenna Peak Gain:	Max. 12.5 dBi (11.5 dBi ± 1dB)		

2.2 Test Configuration

The setup is as follows:

a) The EUT ("RRU(RF4437d)") and a Data Unit (DU) are each powered by -48V DC power supply.
b) The DU is connected to a test laptop via an ethernet cable acting as backhaul.
c) DU connects to the EUT through a fiber optic cable.
d) An RF cable connects the signal analyzer and the EUT Ports for respective measurement.

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests..

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

Configuration	Operation	Channel	Carrier Configuration							
			1st Carrier		2nd Carrier		3rd Carrier		4th Carrier	
			Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)
B2_5M_1C	Single	Lowest	1932.5	5	N/A					
		Middle	1960.0							
		Highest	1987.5							
B2_10M_1C	Single	Lowest	1935.0	10						
		Middle	1960.0							
		Highest	1985.0							
B2_15M_1C	Single	Lowest	1937.5	15						
		Middle	1960.0							
		Highest	1982.5							
B2_20M_1C	Single	Lowest	1940.0	20						
		Middle	1960.0							
		Highest	1980.0							
B2_5M+5M_2C	Contiguous	Lowest	1932.5	5	1937.5	5	N/A			
		Middle	1957.5	5	1962.5	5				
		Highest	1982.5	5	1987.5	5				
	Non-contiguous		1932.5	5	1987.5	5				
B2_5M+20M _2C	Contiguous	Lowest	1932.5	5	1945.0	20				
		Middle	1950.0	5	1962.5	20				
		Highest	1967.5	5	1980.0	20				
	Non-contiguous		1932.5	5	1980.0	20				
B2_10M+20M _2C	Contiguous	Lowest	1935.0	10	1950.0	20				
		Middle	1950.0	10	1965.0	20				
		Highest	1965.0	10	1980.0	20				
	Non-contiguous		1935.0	10	1980.0	20				
B2_5M+5M+5M _3C	Contiguous	Lowest	1932.5	5	1937.5	5	1942.5	5	N/A	
		Middle	1955.0	5	1960.0	5	1965.0	5		
		Highest	1977.5	5	1982.5	5	1987.5	5		
	Non-contiguous		1932.5	5	1960.0	5	1987.5	5		
B2_5M+5M +20M_3C	Contiguous	Lowest	1932.5	5	1937.5	5	1950.0	20		
		Middle	1947.5	5	1952.5	5	1965.0	20		
		Highest	1962.5	5	1967.5	5	1980.0	20		
	Non-contiguous		1932.5	5	1960.0	5	1980.0	20		

Configuration	Operation	Channel	Carrier Configuration							
			1st Carrier		2nd Carrier		3rd Carrier		4th Carrier	
			Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)
B66_5M_1C	Single	Lowest	2112.5	5	N/A					
		Middle	2145.0							
		Highest	2177.5							
B66_10M_1C	Single	Lowest	2115.0	10						
		Middle	2145.0							
		Highest	2175.0							
B66_15M_1C	Single	Lowest	2117.5	15						
		Middle	2145.0							
		Highest	2172.5							
B66_20M_1C	Single	Lowest	2120.0	20						
		Middle	2145.0							
		Highest	2170.0							
B66_5M+5M _2C	Contiguous	Lowest	2112.5	5	2117.5	5	N/A			
		Middle	2142.5	5	2147.5	5				
		Highest	2172.5	5	2177.5	5				
	Non-contiguous		2112.5	5	2177.5	5				
B66_5M+20M _2C	Contiguous	Lowest	2112.5	5	2125.0	20				
		Middle	2135.0	5	2147.5	20				
		Highest	2157.5	5	2170.0	20				
	Non-contiguous		2112.5	5	2170.0	20				
B66_20M+20M _2C	Contiguous	Lowest	2120.0	20	2140.0	20				
		Middle	2135.0	20	2155.0	20				
		Highest	2150.0	20	2170.0	20				
	Non-contiguous		2120.0	20	2170.0	20				
B66_5M+5M +5M_3C	Contiguous	Lowest	2112.5	5	2117.5	5	2122.5	5	N/A	
		Middle	2140.0	5	2145.0	5	2150.0	5		
		Highest	2167.5	5	2172.5	5	2177.5	5		
	Non-contiguous		2112.5	5	2145.0	5	2177.5	5		
B66_5M+5M +20M_3C	Contiguous	Lowest	2112.5	5	2117.5	5	2130.0	20		
		Middle	2132.5	5	2137.5	5	2150.0	20		
		Highest	2152.5	5	2157.5	5	2170.0	20		
	Non-contiguous		2112.5	5	2145.0	5	2170.0	20		
B66_5M+15M +20M_3C	Contiguous	Lowest	2112.5	5	2122.5	15	2140.0	20		
		Middle	2127.5	5	2137.5	15	2155.0	20		
		Highest	2142.5	5	2152.5	15	2170.0	20		
	Non-contiguous		2112.5	5	2145.0	15	2170.0	20		
B66_5M+5M +5M+5M_4C	Contiguous	Lowest	2112.5	5	2117.5	5	2122.5	5	2127.5	5
		Middle	2137.5	5	2142.5	5	2147.5	5	2152.5	5
		Highest	2162.5	5	2167.5	5	2172.5	5	2177.5	5
	Non-contiguous		2112.5	5	2137.5	5	2152.5	5	2177.5	5
B66_5M+5M +5M+20M_4C	Contiguous	Lowest	2112.5	5	2117.5	5	2122.5	5	2135.0	20
		Middle	2130.0	5	2135.0	5	2140.0	5	2152.5	20
		Highest	2147.5	5	2152.5	5	2157.5	5	2170.0	20
	Non-contiguous		2112.5	5	2130.0	5	2145.0	5	2170.0	20
B66_5M+5M +10M+20M_4C	Contiguous	Lowest	2112.5	5	2117.5	5	2125.0	10	2140.0	20
		Middle	2127.5	5	2132.5	5	2140.0	10	2155.0	20
		Highest	2142.5	5	2147.5	5	2155.0	10	2170.0	20
	Non-contiguous		2112.5	5	2127.5	5	2145.0	10	2170.0	20

Configuration	Operation	Channel	Carrier Configuration							
			1st Carrier		2nd Carrier		3rd Carrier		4th Carrier	
			Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)	Fre.(MHz)	BW(MHz)
Multi Band_ B2_5M_1C_Low+ B66_5M_1C_High	Contiguous	B2_ Lowest	1932.5	5	N/A					
		B66_ Highest	2177.5	5						
Multi Band_ B2_5M_1C_High+ B66_5M_1C_Low	Contiguous	B2_ Highest	1987.5	5						
		B66_ Lowest	2112.5	5						
Multi Band_B2_5M+5M +5M_3C_Low + B66_5M+5M+5M_ 3C_High	Contiguous	B2_ Lowest	1932.5	5	1937.5	5	1942.5	5	N/A	
		B66_ Highest	2167.5	5	2172.5	5	2177.5	5		
Multi Band_B2_5M+5M +5M_3C_High + B66_5M+5M+5M_ 3C_Low	Contiguous	B2_ Highest	1977.5	5	1982.5	5	1987.5	5		
		B66_ Lowest	2112.5	5	2117.5	5	2122.5	5		
Multi Band_B2_5M+5M +5M_3C - Non-contiguous + B66_5M+5M+5M+ 5M_3C - Non-contiguous	B2_Non-contiguous		1932.5	5	1960.0	5	1987.5	5		
	B66_Non-contiguous		2112.5	5	2145.0	5	2177.5	5		

2.3 EMI Suppression Device(s)/Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 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 842590 D01 v01r01 were used in the measurement of the EUT.

Conducted Average Output Power:

KDB 971168 D01 v03r01 – Section 5
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4.4.1

Equivalent Isotropically Radiated Power (Power Spectral Density):

KDB 971168 D01 v03r01 – Section 5
KDB 662911 D01 v02r01 – Section E)2) In-Band Power Spectral Density (PSD) Measurements
b) Measure and sum spectral maxima across the outputs
ANSI C63.26-2015 – Section 5.2.4.5

Band 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

Peak-to-Average Power Ratio:

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

Occupied Bandwidth:

KDB 971168 D01 v03r01 – Section 4.2
ANSI C63.26-2015 – Section 5.4.3

Radiated unwanted emission

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

Frequency stability

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

3.2 Measurement Software

Test item	Name	Version
Conducted Measurement, Radiated Measurement	Node B automation	1.0

4.0 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 (±dB)
Conducted Bench Top Measurements	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements 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	11/13/2020	Annual	11/12/2021	MY55470135
Rohde & Schwarz	FSW	Signal & Spectrum Analyzer	09/17/2020	Annual	09/16/2021	101250
KIKISUI	PWR1201ML	DC POWER SUPPLY	05/25/2021	Annual	05/24/2022	ZL000972
SUKSAN TECHNOLOGY	SE-CT-10	Temperature Chamber	09/17/2020	Annual	09/16/2021	191021
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	02/19/2021	Annual	02/18/2022	102131
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
Reachline	250W18N-40FF	Attenuator	03/17/2021	Annual	03/16/2022	PK0291
Reachline	250W18N-40FF	Attenuator	03/17/2021	Annual	03/16/2022	PK0292
Reachline	250W18N-40FF	Attenuator	03/17/2021	Annual	03/16/2022	PK0294
Reachline	250W18N-40FF	Attenuator	03/17/2021	Annual	03/16/2022	PK0295
RF One	RFH1840NA250-D	Attenuator	07/07/2021	Annual	07/06/2022	PG0502
RF One	RFH1820NA250-D	Attenuator	07/07/2021	Annual	07/06/2022	PG0504
RF One	RFH1820NA250-D	Attenuator	07/07/2021	Annual	03/16/2022	PG0503
Weinschel	290-40-33	Attenuator	07/06/2021	Annual	07/05/2022	CL4563
Weinschel	290-40-33	Attenuator	07/06/2021	Annual	07/05/2022	CL4564

Table 5-1. 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. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 4M48G7D

Occupied Bandwidth = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 4M47W7D

Occupied Bandwidth = 4.47 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

7.0 TEST RESULTS

7.1 Summary

Company Name: SAMSUNG Electronics Co., Ltd.

FCC ID: A3LRF4437D-25C

FCC Classification: PCS Licensed Transmitter

Mode(s): LTE

FCC Part Section(s)	Test Description	Test Condition	Test Result	Reference
§ 2.1049	Occupied Bandwidth	CONDUCTED	PASS	Section 7.2
§ 2.1046	Conducted Average Output Power		PASS	Section 7.3
§ 2.1046, § 24.232, § 27.50(d)	Equivalent Isotropically Radiated Power (Power Spectral Density		PASS	Section 7.4
§ 2.1046, § 24.232, § 27.50(d)	Peak-to-average power ratio		PASS	Section 7.5
§ 2.1051, § 24.238, § 27.53(h)	Band Edge Emissions at Antenna Terminal		PASS	Section 7.6
§ 2.1051, § 24.238, § 27.53(h)	Spurious and Harmonic Emissions at Antenna Terminal		PASS	Section 7.7
§ 2.1055	Frequency stability		PASS	Section 7.9
§ 2.1051, § 24.238, § 27.53(h)	Radiated unwanted emission	RADIATED	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The correction table was used to account for the losses of the cables and attenuators used to test the EUT at all frequencies of interest.
3) The analyzer plots were all taken with a correction table loaded into the analyzer.
4) 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.
5) This unit was tested while powered by a 48V DC power source.

7.2 Occupied Bandwidth

§ 2.1049

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 Procedures Used

KDB 971168 D01 v03r01 – Section 4.2, Section 4.3

ANSI C63.26-2015 – Section 5.4.3, Section 5.4.4

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 were as follows:

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB 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 ≥ 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.

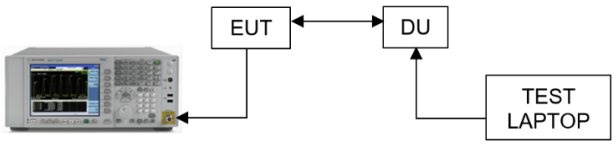


Figure 7-1. Test Instrument & Measurement Setup

Limit

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

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**4.47**	**4.47**	**4.48**	4.47
	1	4.47	4.47	4.48	**4.48**
	2	4.47	4.47	4.48	4.48
	3	4.47	4.47	4.48	4.47
Middle	0	**4.48**	**4.47**	**4.48**	**4.48**
	1	4.47	4.47	4.48	4.48
	2	4.47	4.47	4.48	4.47
	3	4.48	4.47	4.48	4.48
High	0	**4.48**	**4.47**	**4.48**	**4.48**
	1	4.47	4.47	4.48	4.48
	2	4.47	4.47	4.48	4.48
	3	4.47	4.47	4.48	4.48

Table 7-2. Occupied Bandwidth Summary Data (B2_5M_1C)

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

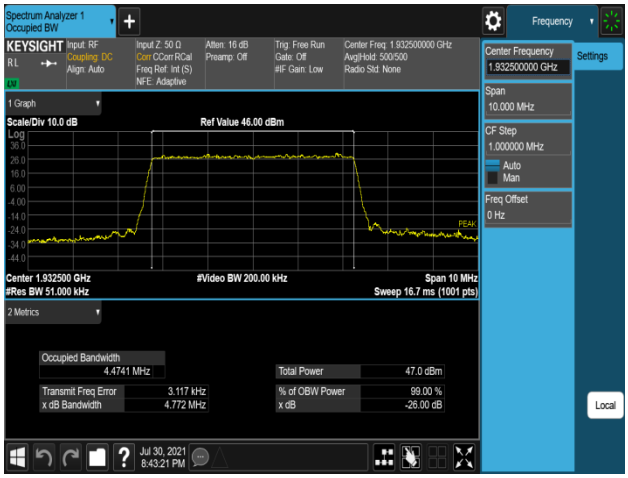
Table 7-3. Occupied Bandwidth Summary Data (B2_10M_1C)

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

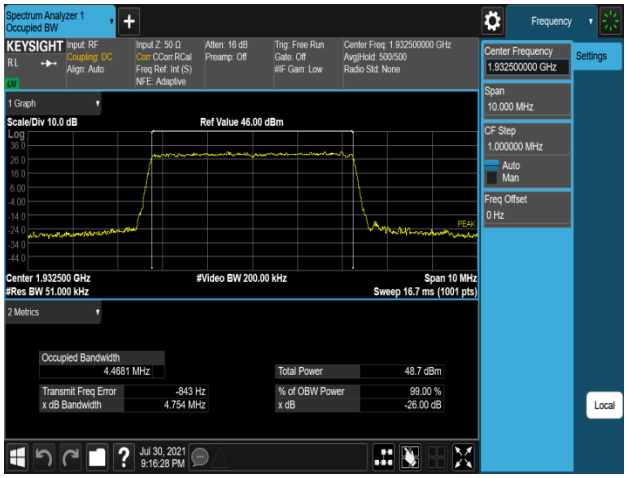
Table 7-4. Occupied Bandwidth Summary Data (B2_15M_1C)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**17.89**	17.87	17.87	**17.88**
	1	17.86	**17.89**	17.88	17.87
	2	17.87	17.88	**17.89**	17.88
	3	17.88	17.86	17.89	17.88
Middle	0	17.89	17.88	**17.90**	17.87
	1	17.87	**17.92**	17.87	**17.90**
	2	**17.90**	17.83	17.87	17.90
	3	17.87	17.85	17.87	17.85
High	0	17.88	**17.91**	17.88	17.87
	1	**17.90**	17.90	**17.90**	17.87
	2	17.88	17.89	17.88	**17.91**
	3	17.86	17.92	17.87	17.91

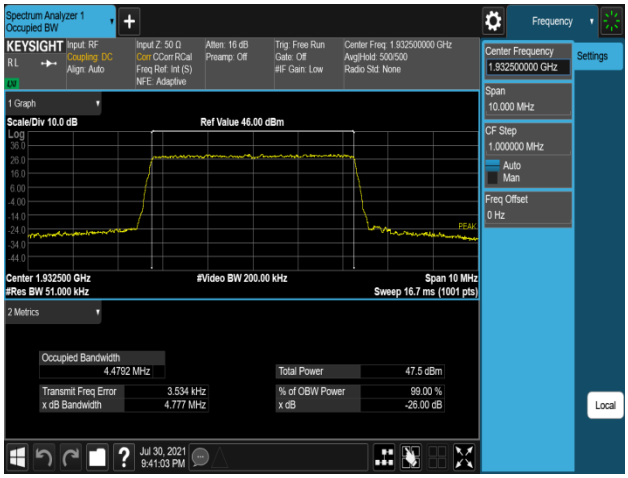
Table 7-5. Occupied Bandwidth Summary Data (B2_20M_1C)



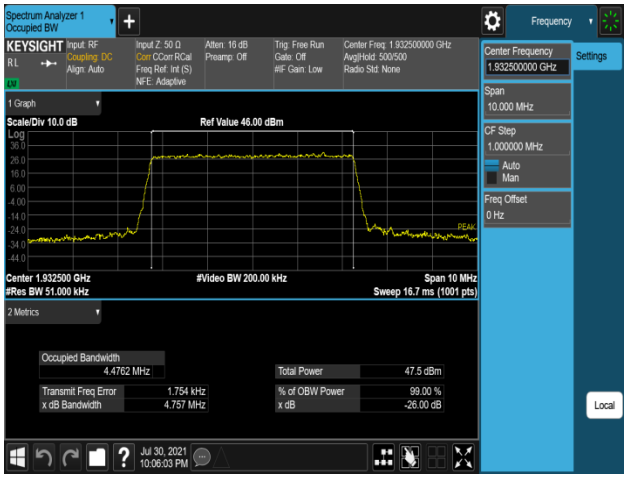
Plot 7-1. Occupied Bandwidth Plot
(B2_5M_1C_QPSK - Low Channel, Port 0)



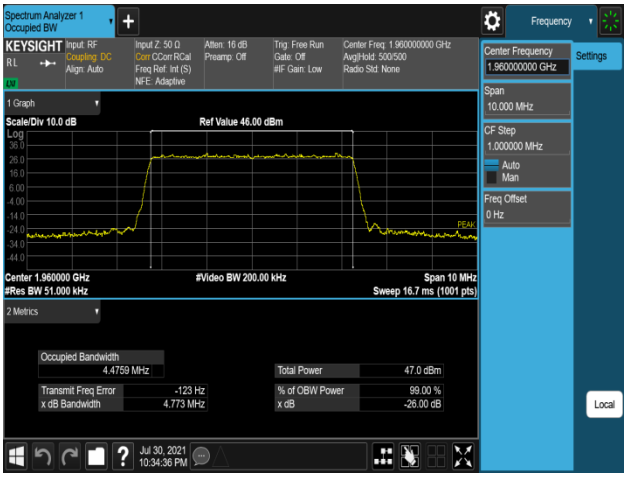
Plot 7-2. Occupied Bandwidth Plot
(B2_5M_1C_16QAM - Low Channel, Port 0)



Plot 7-3. Occupied Bandwidth Plot
(B2_5M_1C_64QAM - Low Channel, Port 0)

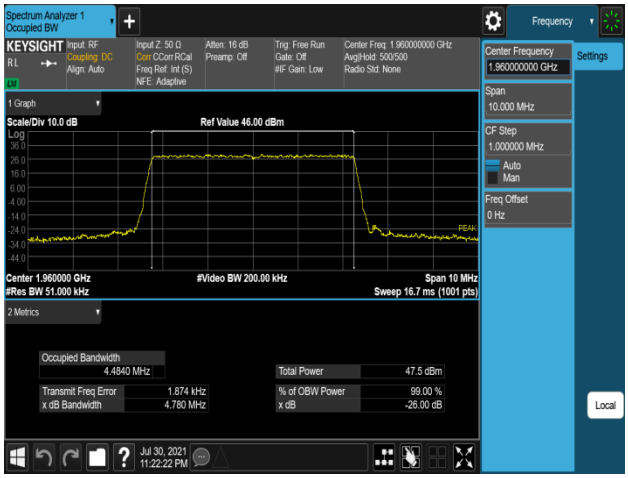


Plot 7-4. Occupied Bandwidth Plot
(B2_5M_1C_256QAM - Low Channel, Port 1)



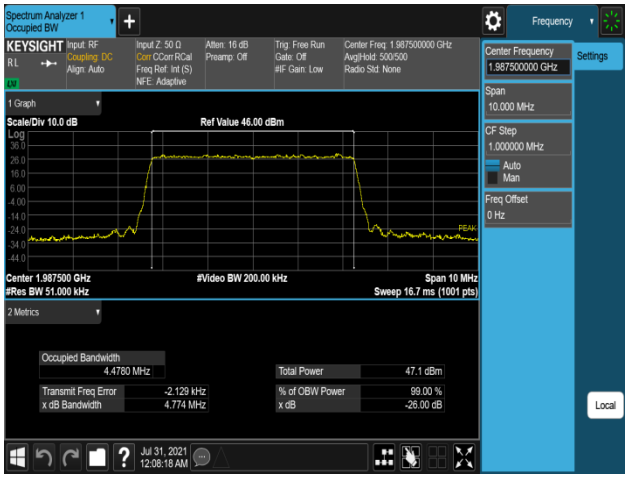
Plot 7-5. Occupied Bandwidth Plot
(B2_5M_1C_QPSK - Mid Channel, Port 0)

Plot 7-6. Occupied Bandwidth Plot
(B2_5M_1C_16QAM – Mid Channel, Port 0)

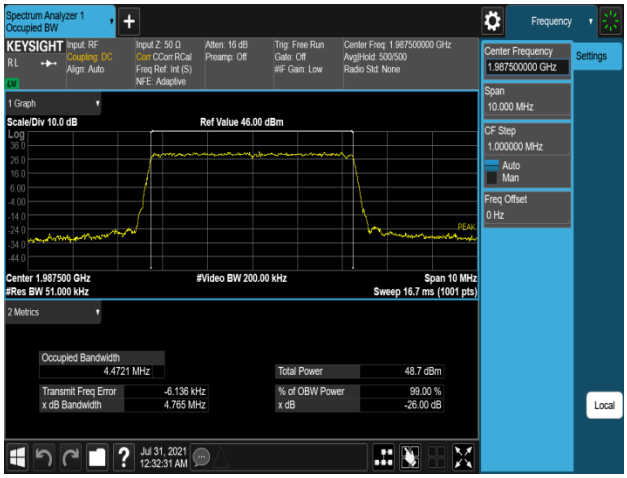


Plot 7-7. Occupied Bandwidth Plot
(B2_5M_1C_64QAM - Mid Channel, Port 0)

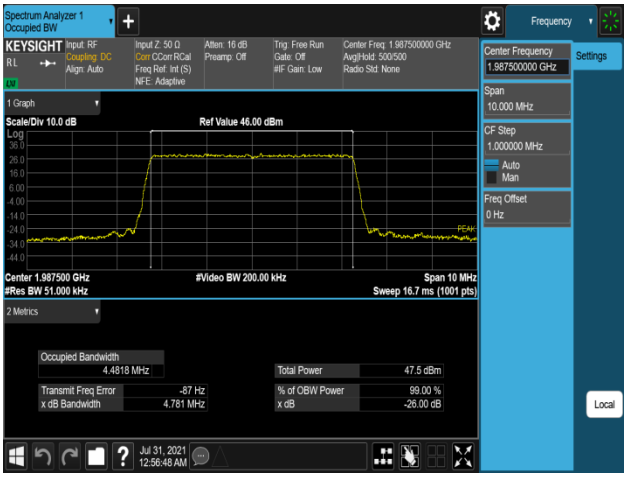
Plot 7-8. Occupied Bandwidth Plot
(B2_5M_1C_256QAM – Mid Channel, Port 0)



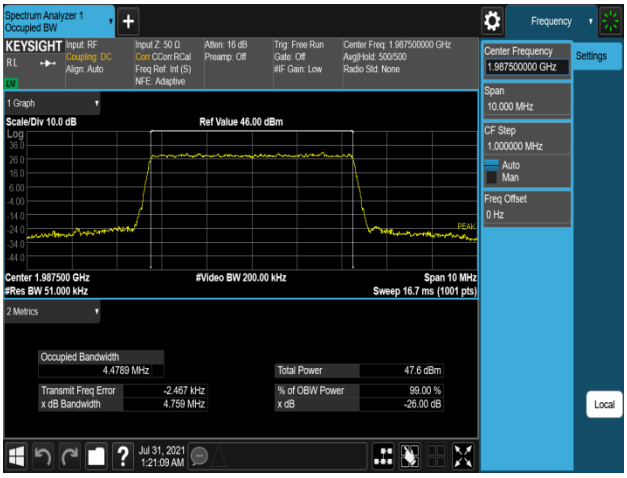
Plot 7-9. Occupied Bandwidth Plot
(B2_5M_1C_QPSK - Low Channel, Port 2)



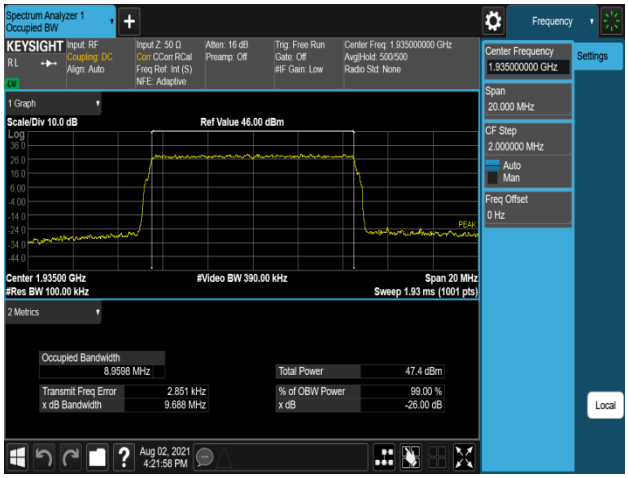
Plot 7-10. Occupied Bandwidth Plot
(B2_5M_1C_16QAM - Low Channel, Port 2)



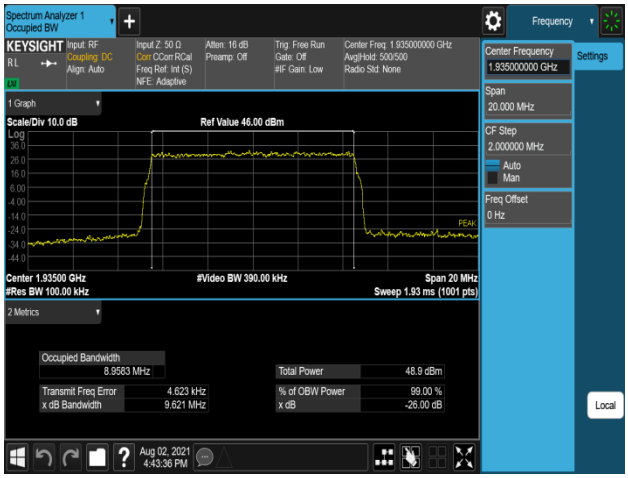
Plot 7-11. Occupied Bandwidth Plot
(B2_5M_1C_64QAM - Low Channel, Port 2)



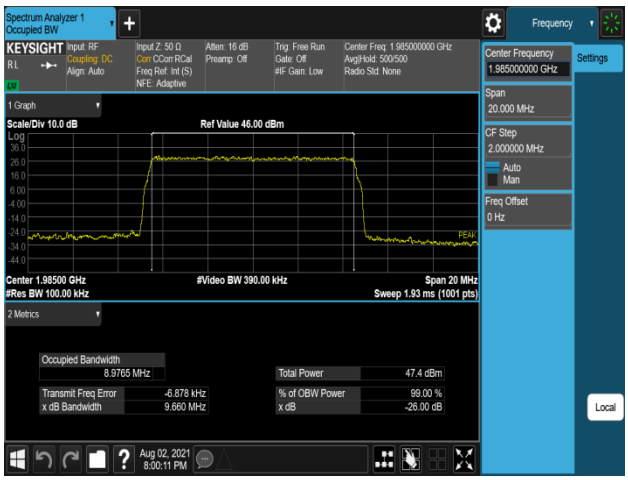
Plot 7-12. Occupied Bandwidth Plot
(B2_5M_1C_256QAM - Low Channel, Port 2)



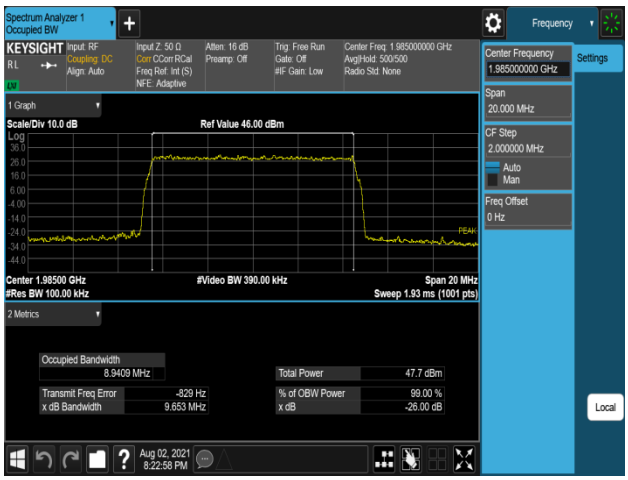
Plot 7-13. Occupied Bandwidth Plot
(B2_10M_1C_QPSK - Low Channel, Port 2)



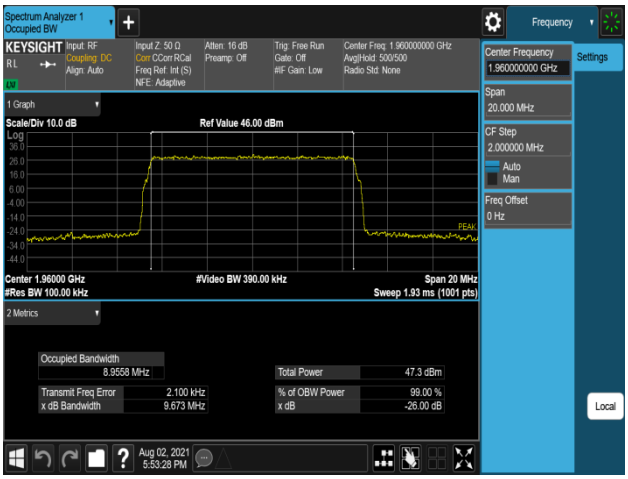
Plot 7-14. Occupied Bandwidth Plot
(B2_10M_1C_16QAM - Low Channel, Port 1)



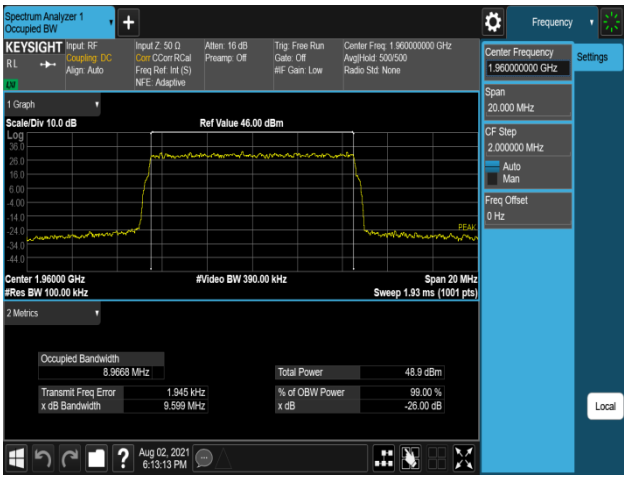
Plot 7-15. Occupied Bandwidth Plot
(B2_10M_1C_64QAM - Low Channel, Port 0)



Plot 7-16. Occupied Bandwidth Plot
(B2_10M_1C_256QAM - Low Channel, Port 0)

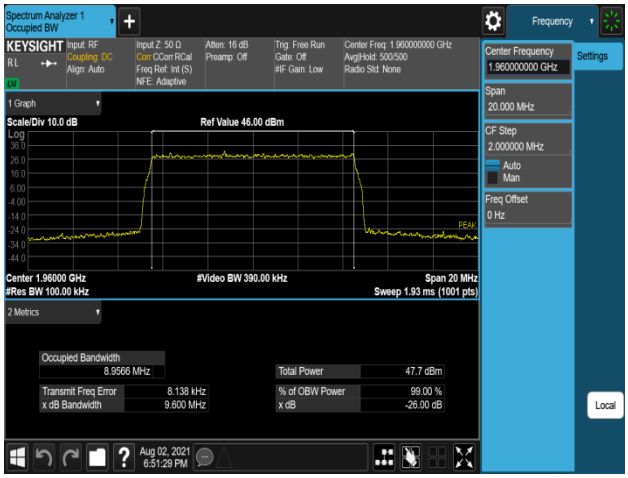


Plot 7-17. Occupied Bandwidth Plot
(B2_10M_1C_QPSK - Mid Channel, Port 1)

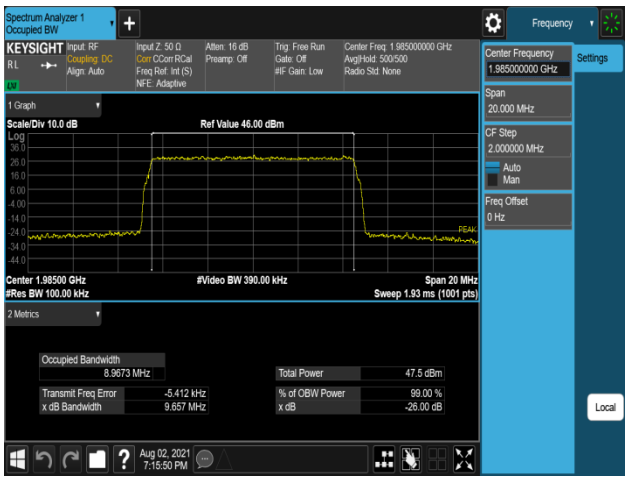


Plot 7-18. Occupied Bandwidth Plot
(B2_10M_1C_16QAM – Mid Channel, Port 2)

Plot 7-19. Occupied Bandwidth Plot
(B2_10M_1C_64QAM - Mid Channel, Port 0)

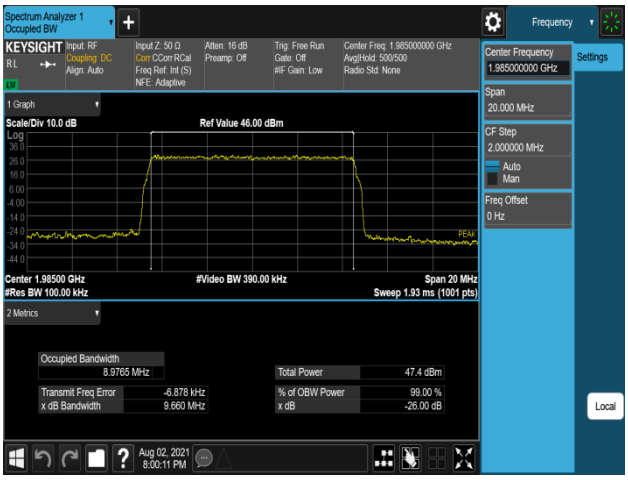


Plot 7-20. Occupied Bandwidth Plot
(B2_10M_1C_256QAM – Mid Channel, Port 0)

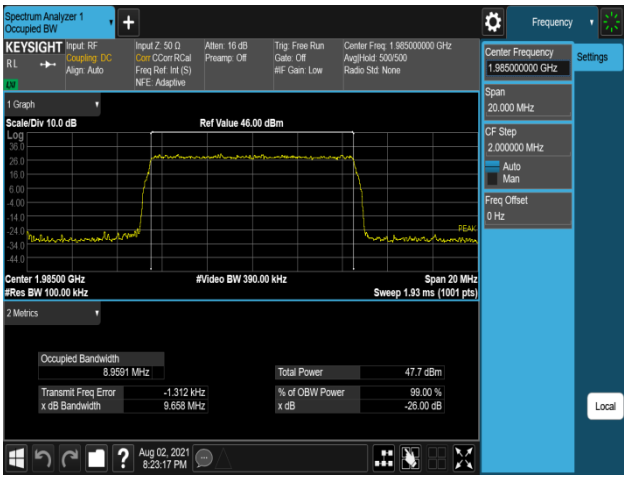


Plot 7-21. Occupied Bandwidth Plot
(B2_10M_1C_QPSK - High Channel, Port 3)

Plot 7-22. Occupied Bandwidth Plot
(B2_10M_1C_16QAM – High Channel, Port 1)

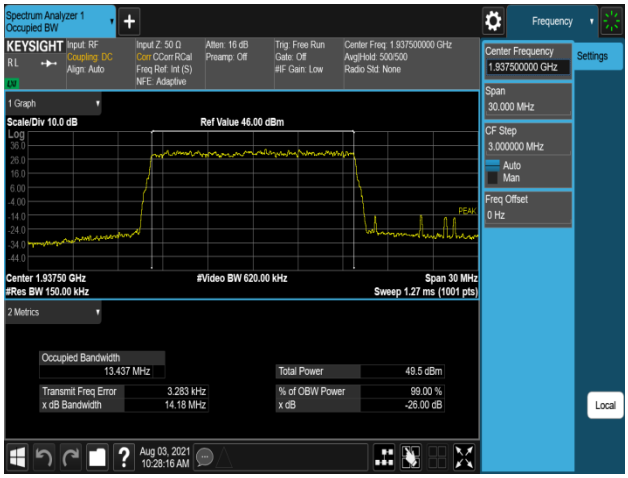


Plot 7-23. Occupied Bandwidth Plot
(B2_10M_1C_64QAM - High Channel, Port 0)

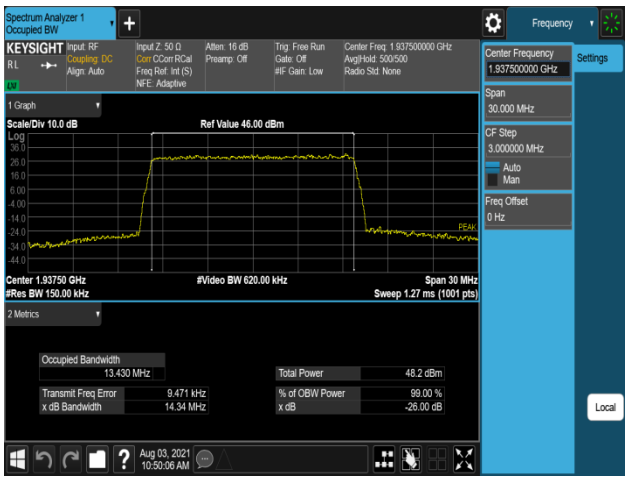


Plot 7-24. Occupied Bandwidth Plot
(B2_10M_1C_256QAM – High Channel, Port 1)

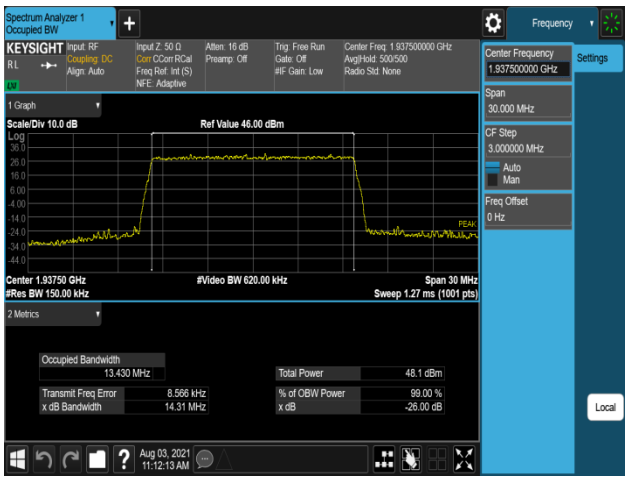
Plot 7-25. Occupied Bandwidth Plot
(B2_15M_1C_QPSK - Low Channel, Port 1)



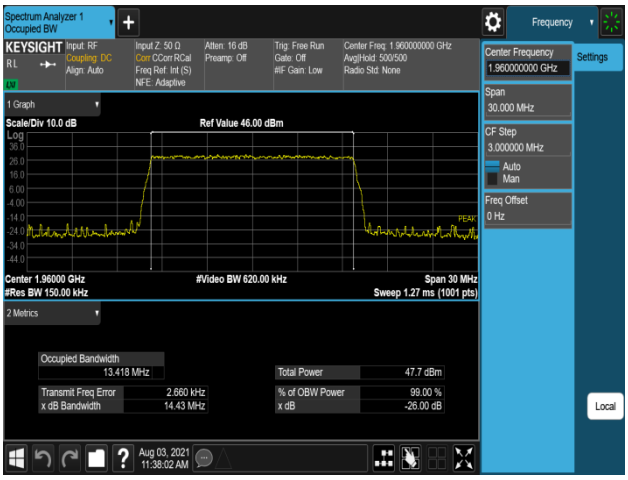
Plot 7-26. Occupied Bandwidth Plot
(B2_15M_1C_16QAM - Low Channel, Port 1)



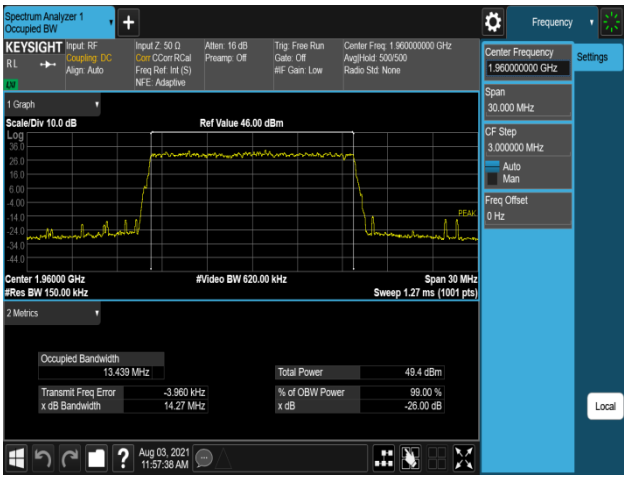
Plot 7-27. Occupied Bandwidth Plot
(B2_15M_1C_64QAM - Low Channel, Port 1)



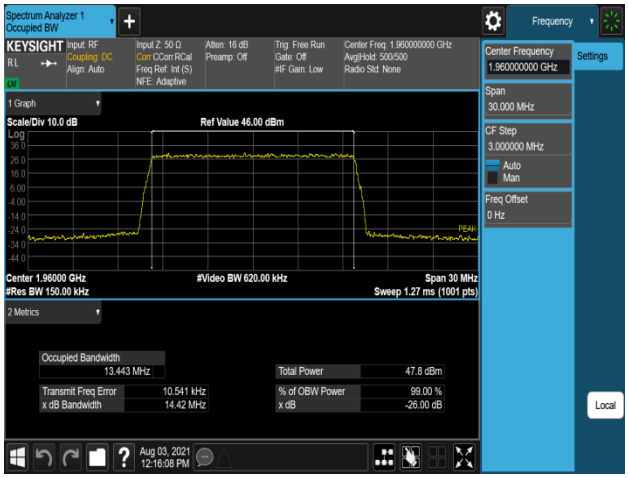
Plot 7-28. Occupied Bandwidth Plot
(B2_15M_1C_256QAM - Low Channel, Port 2)



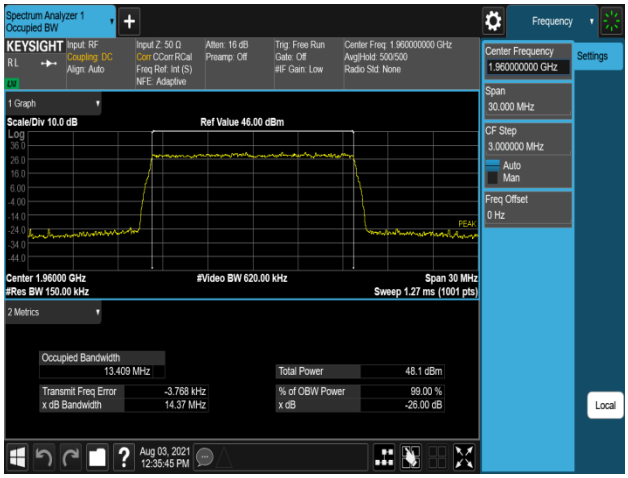
Plot 7-29. Occupied Bandwidth Plot
(B2_15M_1C_QPSK - Mid Channel, Port 2)



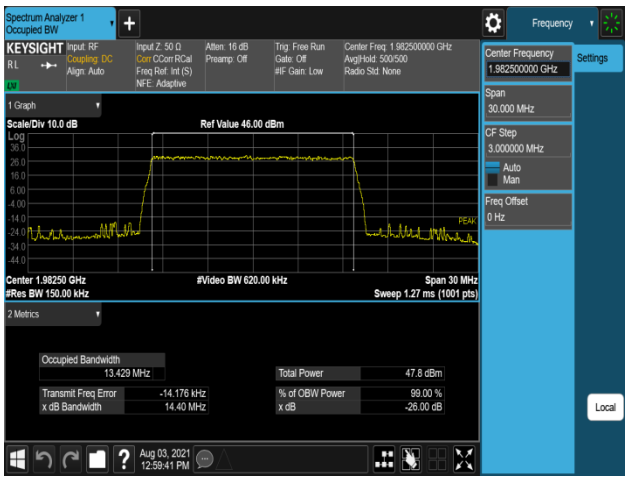
Plot 7-30. Occupied Bandwidth Plot
(B2_15M_1C_16QAM – Mid Channel, Port 3)



Plot 7-31. Occupied Bandwidth Plot
(B2_15M_1C_64QAM - Mid Channel, Port 0)

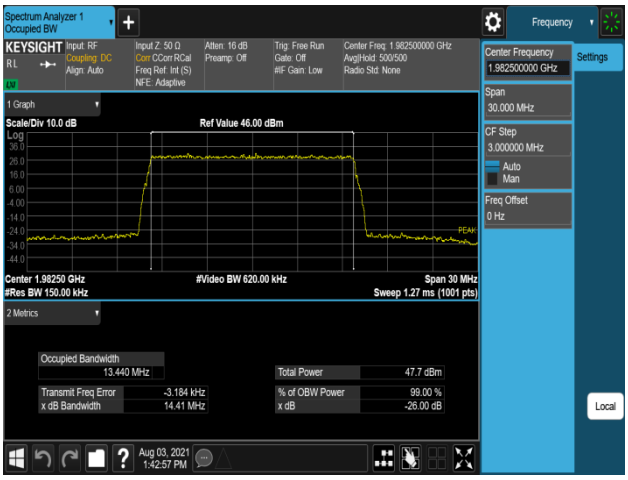


Plot 7-32. Occupied Bandwidth Plot
(B2_15M_1C_256QAM – Mid Channel, Port 1)

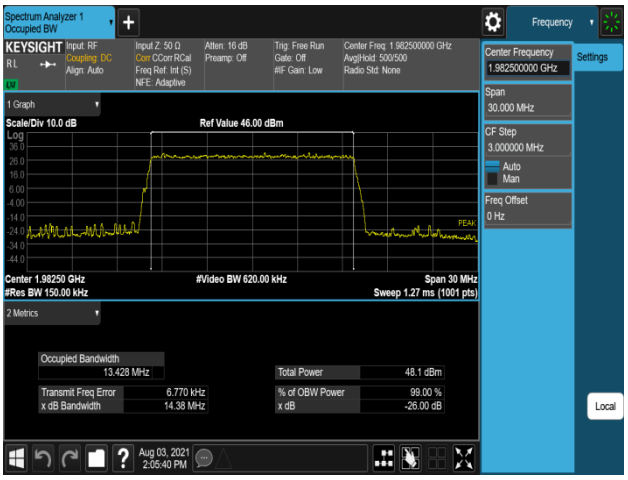


Plot 7-33. Occupied Bandwidth Plot
(B2_15M_1C_QPSK - High Channel, Port 3)

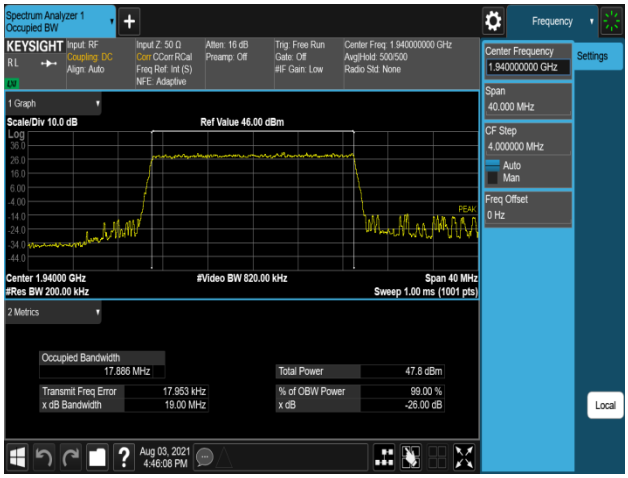
Plot 7-34. Occupied Bandwidth Plot
(B2_15M_1C_16QAM – High Channel, Port 3)



Plot 7-35. Occupied Bandwidth Plot
(B2_15M_1C_64QAM - High Channel, Port 0)

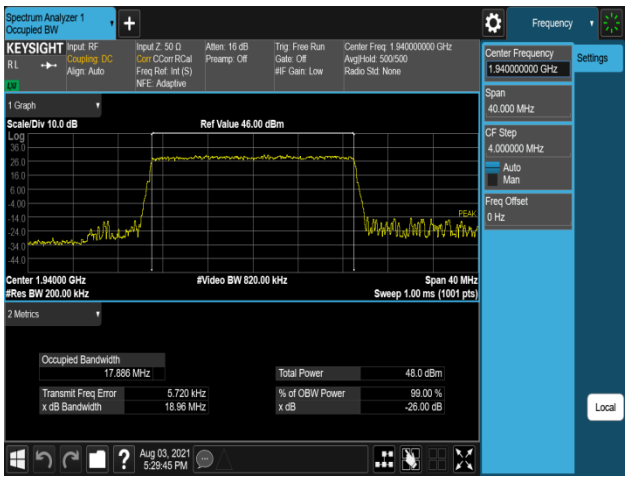


Plot 7-36. Occupied Bandwidth Plot
(B2_15M_1C_256QAM – High Channel, Port 2)



Plot 7-37. Occupied Bandwidth Plot
(B2_20M_1C_QPSK - Low Channel, Port 0)

Plot 7-38. Occupied Bandwidth Plot
(B2_20M_1C_16QAM - Low Channel, Port 1)

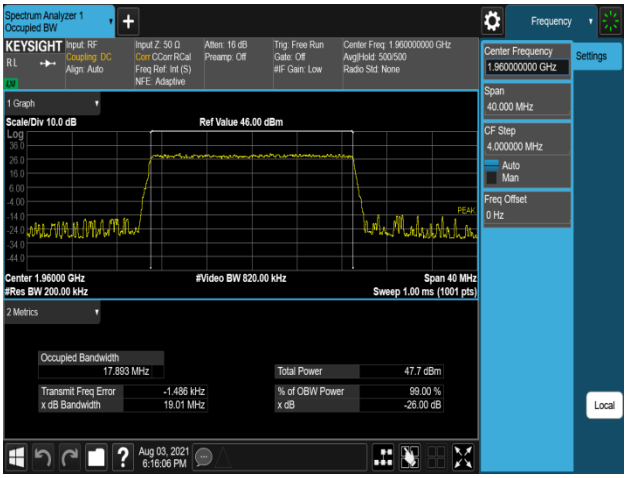


Plot 7-39. Occupied Bandwidth Plot
(B2_20M_1C_64QAM - Low Channel, Port 2)

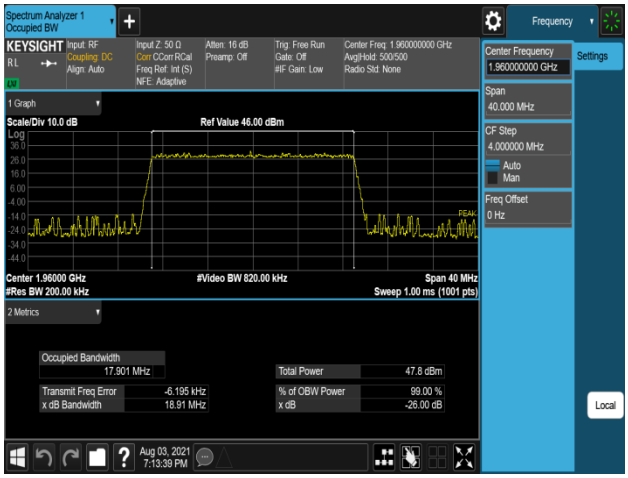
Plot 7-40. Occupied Bandwidth Plot
(B2_20M_1C_256QAM - Low Channel, Port 0)

Plot 7-41. Occupied Bandwidth Plot
(B2_20M_1C_QPSK - Mid Channel, Port 2)

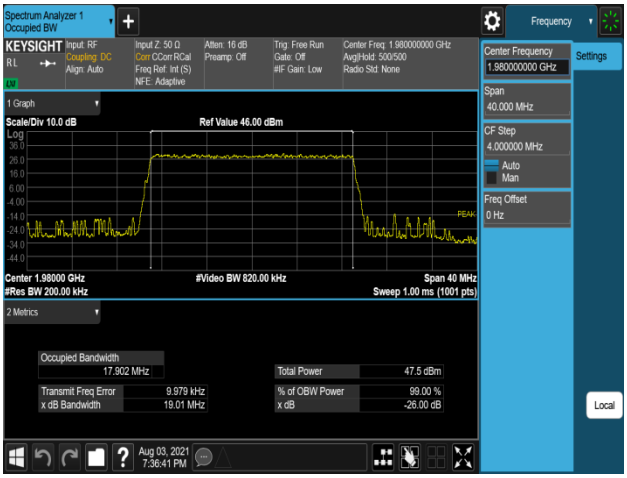
Plot 7-42. Occupied Bandwidth Plot
(B2_20M_1C_16QAM – Mid Channel, Port 1)



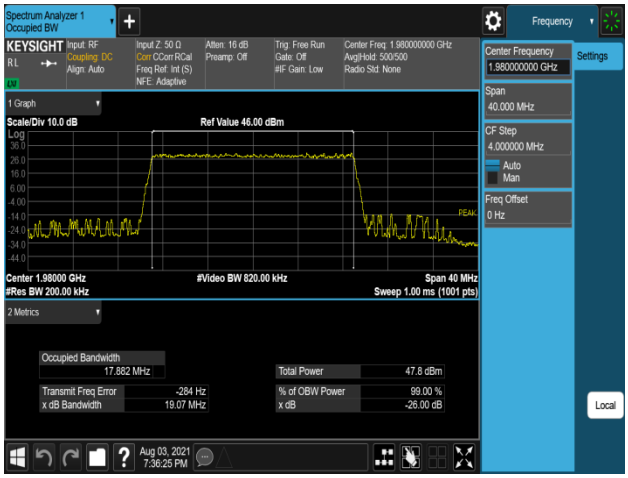
Plot 7-43. Occupied Bandwidth Plot
(B2_20M_1C_64QAM - Mid Channel, Port 0)



Plot 7-44. Occupied Bandwidth Plot
(B2_20M_1C_256QAM – Mid Channel, Port 1)

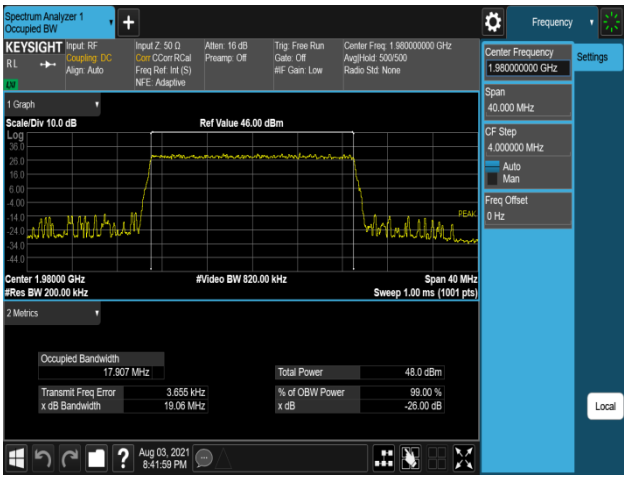


Plot 7-45. Occupied Bandwidth Plot
(B2_20M_1C_QPSK - High Channel, Port 1)



Plot 7-46. Occupied Bandwidth Plot
(B2_20M_1C_16QAM - High Channel, Port 0)

Plot 7-47. Occupied Bandwidth Plot
(B2_20M_1C_64QAM - High Channel, Port 1)



Plot 7-48. Occupied Bandwidth Plot
(B2_20M_1C_256QAM – High Channel, Port 2)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**9.43**	9.42	9.42	9.43
	1	9.43	9.41	9.43	**9.45**
	2	9.43	9.42	**9.44**	9.44
	3	9.42	**9.43**	9.44	9.45
Middle	0	**9.44**	9.41	9.44	**9.45**
	1	9.43	9.42	**9.45**	9.45
	2	9.42	**9.43**	9.42	9.43
	3	9.43	9.41	9.43	9.44
High	0	9.42	9.42	**9.44**	**9.45**
	1	9.42	**9.43**	9.43	9.45
	2	**9.43**	9.43	9.42	9.42
	3	9.43	9.42	9.44	9.44

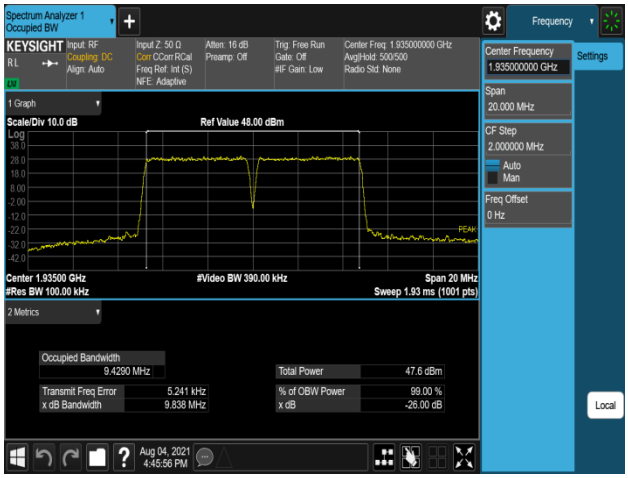
Table 7-6. Occupied Bandwidth Summary Data (B2_5M+5M_2C)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	23.67	23.69	23.65	**23.70**
	1	23.66	23.66	23.65	23.68
	2	**23.69**	**23.71**	**23.69**	23.64
	3	23.63	23.69	23.67	23.67
Middle	0	**23.68**	23.64	**23.68**	23.64
	1	23.66	**23.67**	23.67	23.66
	2	23.62	23.63	23.64	23.65
	3	23.64	23.65	23.66	**23.69**
High	0	23.61	23.60	23.63	23.66
	1	23.65	23.63	**23.70**	23.66
	2	**23.69**	23.65	23.67	23.66
	3	23.65	**23.69**	23.70	**23.69**

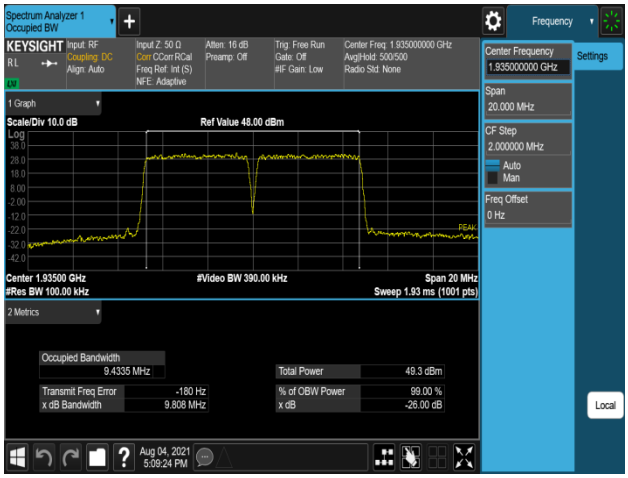
Table 7-7. Occupied Bandwidth Summary Data (B2_5M+20M_2C)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	28.30	**28.34**	28.27	28.25
	1	28.28	28.30	28.28	28.27
	2	**28.31**	28.31	**28.30**	28.26
	3	28.26	28.24	28.29	**28.29**
Middle	0	28.28	28.30	28.30	**28.32**
	1	**28.33**	28.28	28.28	28.26
	2	28.26	28.26	**28.31**	28.29
	3	28.26	**28.33**	28.28	28.32
High	0	28.28	28.21	28.30	28.27
	1	**28.29**	**28.33**	28.27	28.26
	2	28.27	28.32	28.31	**28.31**
	3	28.29	28.25	**28.32**	28.30

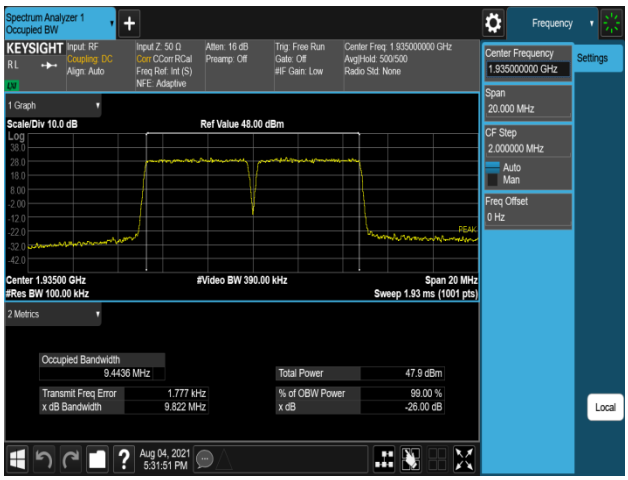
Table 7-8. Occupied Bandwidth Summary Data (B2_10M+20M_2C)



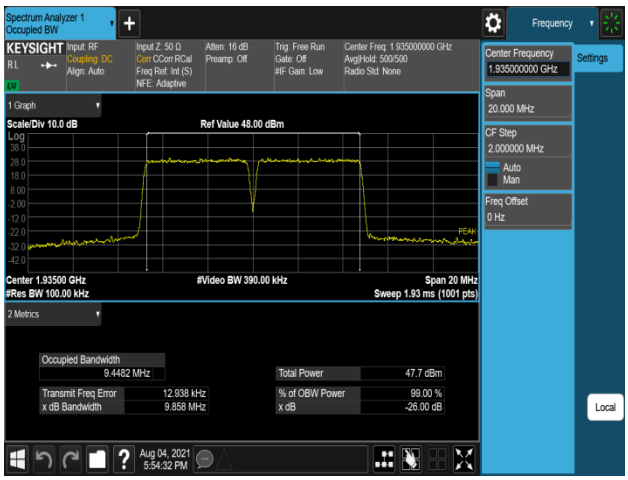
Plot 7-49. Occupied Bandwidth Plot
(B2_5M+5M_2C_QPSK - Low Channel, Port 0)



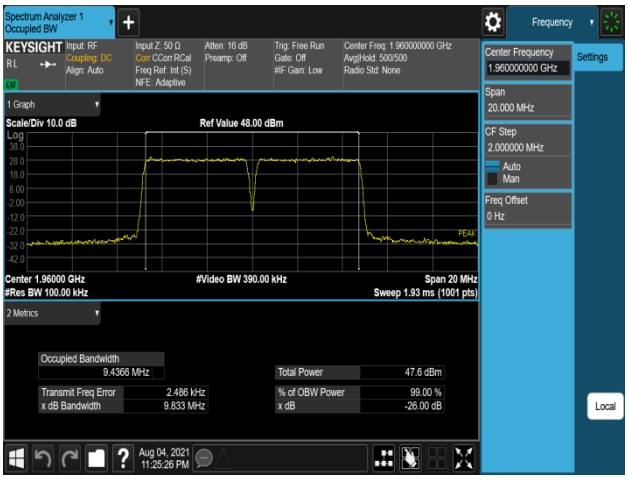
Plot 7-50. Occupied Bandwidth Plot
(B2_5M+5M_2C_16QAM - Low Channel, Port 3)



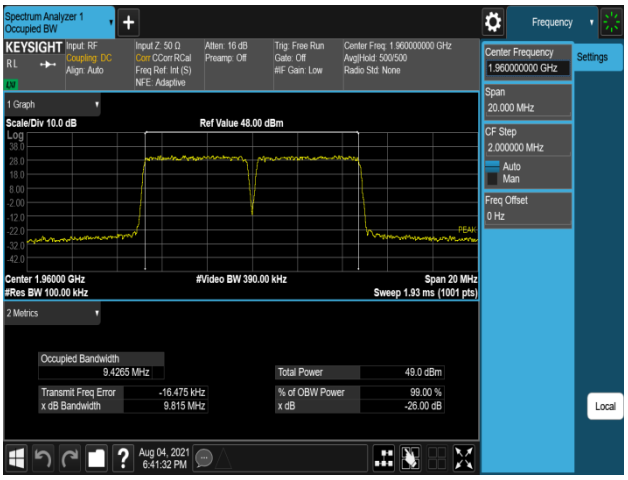
Plot 7-51. Occupied Bandwidth Plot
(B2_5M+5M_2C_64QAM - Low Channel, Port 2)



Plot 7-52. Occupied Bandwidth Plot
(B2_5M+5M_2C_256QAM - Low Channel, Port 1)



Plot 7-53. Occupied Bandwidth Plot
(B2_5M+5M_2C_QPSK - Mid Channel, Port 0)



Plot 7-54. Occupied Bandwidth Plot
(B2_5M+5M_2C_16QAM – Mid Channel, Port 2)

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