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PART 24 MEASUREMENT REPORT

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

Date of Testing:
9/2/2025 - 11/14/2025
Test Report Issue Date:
11/18/2025
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2508250079-07.A3L

FCC ID:	**A3LSMS948B**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S948B/DS
Additional Model(s):	SM-S948B
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	24
Test Procedure(s):	ANSI C63.26-2015, KDB 648474 D03 v01r04

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.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

TEST REPORT REVISION HISTORY

Rev. No.	Report S/N	Description	Issue Date
-	1M2508250079-07.A3L	Initial Release	11/18/2025

TABLE OF CONTENTS

PART 24 MEASUREMENT REPORT

Antenna 1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	0.884	29.46	243KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.335	25.25	244KG7W
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.276	24.40	4M17F9W
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.295	24.70	18M1G7D
		16QAM	1860 - 1905	0.243	23.86	18M1W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.312	24.95	13M6G7D
		16QAM	1857.5 - 1907.5	0.248	23.95	13M6W7D
	10 MHz	QPSK	1855 - 1910	0.296	24.71	9M06G7D
		16QAM	1855 - 1910	0.247	23.92	9M03W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.305	24.84	4M55G7D
		16QAM	1852.5 - 1912.5	0.261	24.16	4M54W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.300	24.77	2M75G7D
		16QAM	1851.5 - 1913.5	0.260	24.14	2M73W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.299	24.76	1M11G7D
		16QAM	1850.7 - 1914.3	0.251	23.99	1M12W7D
NR Band n25/2	40 MHz	π/2 BPSK	1870 - 1895	0.250	23.99	39M2G7D
		QPSK	1870 - 1895	0.252	24.01	38M8G7D
		16QAM	1870 - 1895	0.194	22.89	38M7W7D
	30 MHz	π/2 BPSK	1865 - 1900	0.266	24.25	28M7G7D
		QPSK	1865 - 1900	0.259	24.14	28M7G7D
		16QAM	1865 - 1900	0.201	23.03	28M7W7D
	25 MHz	π/2 BPSK	1862.5 - 1902.5	0.266	24.25	23M1G7D
		QPSK	1862.5 - 1902.5	0.259	24.13	23M9G7D
		16QAM	1862.5 - 1902.5	0.209	23.19	23M9W7D
	20 MHz	π/2 BPSK	1860 - 1905	0.260	24.15	18M0G7D
		QPSK	1860 - 1905	0.250	23.97	19M0G7D
		16QAM	1860 - 1905	0.210	23.23	19M1W7D
	15 MHz	π/2 BPSK	1857.5 - 1907.5	0.265	24.23	13M5G7D
		QPSK	1857.5 - 1907.5	0.259	24.13	14M2G7D
		16QAM	1857.5 - 1907.5	0.211	23.24	14M2W7D
	10 MHz	π/2 BPSK	1855 - 1910	0.262	24.18	8M99G7D
		QPSK	1855 - 1910	0.247	23.93	9M36G7D
		16QAM	1855 - 1910	0.206	23.13	9M35W7D
	5 MHz	π/2 BPSK	1852.5 - 1912.5	0.260	24.15	4M54G7D
		QPSK	1852.5 - 1912.5	0.263	24.20	4M54G7D
		16QAM	1852.5 - 1912.5	0.207	23.16	4M52W7D

Antenna 2						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.178	22.52	18M1G7D
		16QAM	1860 - 1905	0.143	21.55	18M1W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.187	22.72	13M6G7D
		16QAM	1857.5 - 1907.5	0.150	21.77	13M6W7D
	10 MHz	QPSK	1855 - 1910	0.175	22.43	9M06G7D
		16QAM	1855 - 1910	0.148	21.69	9M05W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.179	22.53	4M57G7D
		16QAM	1852.5 - 1912.5	0.158	21.98	4M56W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.178	22.50	2M73G7D
		16QAM	1851.5 - 1913.5	0.146	21.65	2M74W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.172	22.35	1M11G7D
		16QAM	1850.7 - 1914.3	0.146	21.66	1M13W7D
NR Band n25/2	40 MHz	π/2 BPSK	1870 - 1895	0.135	21.32	38M8G7D
		QPSK	1870 - 1895	0.141	21.49	38M8G7D
		16QAM	1870 - 1895	0.109	20.39	38M8W7D
	30 MHz	π/2 BPSK	1865 - 1900	0.135	21.30	28M8G7D
		QPSK	1865 - 1900	0.142	21.52	28M8G7D
		16QAM	1865 - 1900	0.110	20.42	28M8W7D
	25 MHz	π/2 BPSK	1862.5 - 1902.5	0.134	21.28	23M1G7D
		QPSK	1862.5 - 1902.5	0.143	21.55	24M0G7D
		16QAM	1862.5 - 1902.5	0.107	20.29	23M9W7D
	20 MHz	π/2 BPSK	1860 - 1905	0.133	21.25	18M0G7D
		QPSK	1860 - 1905	0.138	21.39	19M0G7D
		16QAM	1860 - 1905	0.104	20.17	19M1W7D
	15 MHz	π/2 BPSK	1857.5 - 1907.5	0.135	21.29	13M5G7D
		QPSK	1857.5 - 1907.5	0.141	21.50	14M2G7D
		16QAM	1857.5 - 1907.5	0.108	20.35	14M2W7D
	10 MHz	π/2 BPSK	1855 - 1910	0.134	21.27	9M00G7D
		QPSK	1855 - 1910	0.140	21.46	9M37G7D
		16QAM	1855 - 1910	0.107	20.29	9M36W7D
	5 MHz	π/2 BPSK	1852.5 - 1912.5	0.134	21.26	4M54G7D
		QPSK	1852.5 - 1912.5	0.139	21.43	4M53G7D
		16QAM	1852.5 - 1912.5	0.107	20.28	4M51W7D

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 Element Test Location

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4:2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered test laboratory with the site description on file with ISED (Wireless Test Lab number 2451B) and FCC (Designation Number US1113).

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS948B**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 24.

The authorization for this device utilize data referencing from FCC ID: A3LSMS948U as permitted per KDB 484596 D01 v03. Data referencing data test results are included in Appendix A of this report.

Test Device Serial No.: 0516M, 0502M, 0789M, 0532M, 0533M, 0843M, 0545M, 0490M, 0523M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ac/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

2.3 Test Configuration

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

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: EP-2400 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

Band	Ant1	Ant2
GSM/GPRS	Ant A	-
WCDMA	Ant A	-
LTE Band 25/2	Ant A	Ant F
NR Band n25/2	Ant A	Ant F

2.4 Duty Cycle Information

For all 5G NR and LTE operations in FDD mode, the EUT duty cycle was set to 100%.

For LTE TDD operation, a call box was used to force maximum transmission for each band. For LTE TDD bands, the maximum duty cycle is 63.3% for PC3 and 43.3% for PC2.

2.5 Software and Firmware

Testing was performed on device(s) using software/firmware version S948USQU0AYIB installed on the EUT.

2.6 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 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26:2015) were used in the measurement of the EUT.

Deviation from Measurement Procedure……..None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4:2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26:2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – cable loss $_{[dB]}$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26:2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4:2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26:2015.

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	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

Table 4-1. Measurement Uncertainty Budget

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.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP1-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP1-002
-	AP2-001	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-001
-	AP2-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-002
-	ETS-001	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-002
-	LTx1	Licensed Transmitter Cable Set	2/25/2025	Annual	2/25/2026	LTx1
-	LTx2	Licensed Transmitter Cable Set	2/25/2025	Annual	2/25/2026	LTx2
-	LTx3	Licensed Transmitter Cable Set	2/25/2025	Annual	2/25/2026	LTx3
Agilent	N9038A	MXE EMI Receiver	9/16/2024	Annual	11/22/2025	MY51210133
Anritsu	MT8000A	Radio Communication Test Station	6/4/2025	Annual	6/4/2026	6261914237
Anritsu	MT8000A	Radio Communication Test Station	3/11/2025	Annual	3/11/2026	6272337439
Anritsu	MT8821C	Radio Communication Analyze	9/15/2025	Annual	9/15/2026	6201381794
Anritsu	MT8821C	Radio Communication Analyze	3/14/2025	Annual	3/14/2026	6262044715
EMCO	3115	Horn Antenna (1-18GHz)	9/6/2024	Biennial	9/6/2026	9704-5182
Espec	ESX-2CA	Environmental Chamber	11/20/2024	Biennial	11/20/2026	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	6/4/2025	Biennial	6/4/2027	125518
ETS-Lindgren	3116C	DRG Horn Antenna	4/22/2025	Biennial	4/22/2027	218893
Keysight Technologies	N9020A	MXA Signal Analyzer (NM)	6/4/2025	Annual	6/4/2026	MY54500644
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	9/15/2025	Annual	9/15/2026	MY49430494
Keysight Technologies	N9030A	PXA Signal Analyzer (OM - EMC)	6/16/2025	Annual	6/16/2026	MY55410501
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	9/15/2025	Annual	9/15/2026	MY49430494
Keysight Technologies	N9038A	MXE EMI Receiver	9/16/2024	Annual	11/22/2025	MY51210133
Keysight Technologies	N9020A	MXA Signal Analyzer	5/7/2025	Annual	5/7/2026	US46470561
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	6/6/2025	Annual	6/6/2026	MY52350166
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	5/12/2025	Annual	5/12/2026	103200
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	11/25/2024	Annual	11/25/2025	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/25/2025	Annual	3/25/2026	101716
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/18/2025	Annual	6/18/2026	140148
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Sunol Sciences	DRH-118	Horn (Small)	2/13/2024	Biennial	2/13/2026	A042511

Table 5-1. Test Equipment Calibration Table

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.

Component	Serial Number
Sucoflex 106A Cable	501992
MegaPhase Cable N29-N1N1-324	20335606 001
Rohde & Schwarz SF Unit	102133
MiniCircuits Cable CBL-2FT-SMSM+	77745
MegaPhase Cable 10511-1	15034701 001
MiniCircuits Switch RC 2SPDT-A18	11703270 041
Sucoflex 104 Cable	320259/4
Sucoflex 104 Cable	321999/4
Sucoflex 104 Cable	321995/4

Table 5-2. AP1 EMC Cable and Switch System Components

Component	Serial Number
Flex Cable	P2A-0001
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
Chamber Passthrough	CP4/X12
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Micro-Coax Utiflex Cable UFB142A-0-0629-5GU200 MFR 6463	232069-001
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181

Table 5-3. AP2-001 EMC Cable and Switch System Components

Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	19046401 001
Megaphase (CAGE 1GVT4) Flex Cable 10511-1	15044701-006
Micro-Coax Utiflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-002
Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-004
Micro-Coax Utiflex Cable UFB142A-0-0629-5GU200 MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181
Micro-Coax Utilfex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
· Micro-Coax Utilfex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335

Table 5-4. AP2-002 EMC Cable and Switch System Components

Component	Serial Number
Pasternack Cable RG214/U	111815
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001

Table 5-5. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	20502201 001
Rohde & Schwarz SF Unit	102134
Minicircuits Cable CBL=0.5M-NMNM+	15440

Table 5-6. ETS-002 EMC Cable and Switch System Components

Component	Serial Number
Keysight Directional Coupler, Model: 87300C	55300398
Mini Circuits 6dB Attenuator, BW S6 2W263+	2105
MegaPhase Cable, Model: TM26-S1S1-30	20233001 004

Table 5-7. LTx1 Licensed Transmitter Cable Set

Component	Serial Number
Keysight Directional Coupler, Model: 87300C	55300391
Mini Circuits 6dB Attenuator, Model: BW S6 2W263+	1845
MegaPhase Cable, Model: TM26-S1S1-30	20233001 006

Table 5-8. LTx2 Licensed Transmitter Cable Set

Component	Serial Number
Keysight Directional Coupler, Model: 87300C	55300390
Pasternack 10dB Attenuator, Model: PE7005-10	N/A
MegaPhase Cable, Model: TM26-S1S1-36	18160103 002

Table 5-9. LTx3 Licensed Transmitter Cable Set

6.0 SAMPLE EMISSION DESIGNATORS

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W
EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W
WCDMA BW = 4.16 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D
LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D
LTE BW = 8.45 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: A3LSMS948B

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): GSM/GPRS/EDGE/WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference	Data Referencing
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2	GSM/GPRS/WCDMA: Yes LTE/NR: No
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3	GSM/GPRS/WCDMA: Yes LTE/NR: No
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.4, 7.5	GSM/GPRS/WCDMA: Yes LTE/NR: No
	Peak-to-Average Ratio	24.232(d)	≤ 13 dB	PASS	Section 7.6	GSM/GPRS/WCDMA: Yes LTE/NR: No
	Frequency Stability	2.1055, 24.235	Fundamental emissions stay within authorized frequency block **Carrier frequency shall not depart from the reference frequency in	PASS	Section 7.9	Yes
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	< 2 Watts max. EIRP	PASS	Section 7.7	Yes
	Radiated Spurious Emissions	2.1053, 24.238(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power **Spurious emissions from receivers shall not exceed the limits detailed in	PASS	Section 7.8	Yes

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

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 analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) 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, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v2.3.0.
5) Data was referenced from model SM-S948U for the certification of SM-S948B/DS. See Section 9.0 for spotcheck results

7.2 Conducted Output Power Data

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26:2015 – Section 5.2

Test Settings

1. Detector = RMS
2. Trace mode = trace average for continuous emissions, max hold for pulse emissions
3. Sweep time = auto couple
4. The trace was allowed to stabilize
5. Please see test notes below for RBW and VBW settings

Test Setup

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

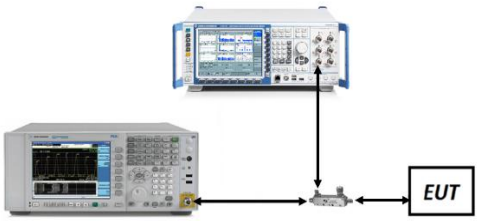


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

2. All other conducted power measurements are contained in the RF exposure report for this filing.

3. Conducted power was found to reduce for the higher order QAM modulations when compared to 16QAM. Due to this trend, only the worst-case QAM (16QAM) powers are included in this section.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	26140	1860.0	1 / 50	23.64
		26365	1882.5	1 / 50	23.62
		26590	1905.0	1 / 0	23.64
	16-QAM	26140	1860.0	1 / 99	22.74
		26365	1882.5	1 / 99	23.08
		26590	1905.0	1 / 0	22.86
15 MHz	QPSK	26115	1857.5	1 / 74	23.69
		26365	1882.5	1 / 74	23.68
		26615	1907.5	1 / 0	23.66
	16-QAM	26115	1857.5	1 / 74	22.95
		26365	1882.5	1 / 0	22.91
		26615	1907.5	1 / 0	22.83
10 MHz	QPSK	26090	1855.0	1 / 25	23.51
		26365	1882.5	1 / 0	23.66
		26640	1910.0	1 / 0	23.56
	16-QAM	26090	1855.0	1 / 25	22.91
		26365	1882.5	1 / 25	22.83
		26640	1910.0	1 / 49	22.63
5 MHz	QPSK	26065	1852.5	1 / 24	23.62
		26365	1882.5	1 / 12	23.64
		26665	1912.5	1 / 12	23.59
	16-QAM	26065	1852.5	1 / 12	22.82
		26365	1882.5	1 / 24	22.98
		26665	1912.5	1 / 12	22.95
3 MHz	QPSK	26055	1851.5	1 / 7	23.83
		26365	1882.5	1 / 7	23.72
		26675	1913.5	1 / 0	23.67
	16-QAM	26055	1851.5	1 / 14	22.99
		26365	1882.5	1 / 14	22.98
		26675	1913.5	1 / 7	22.95
1.4 MHz	QPSK	26047	1850.7	1 / 0	23.58
		26365	1882.5	1 / 0	23.67
		26683	1914.3	1 / 0	23.63
	16-QAM	26047	1850.7	1 / 5	22.91
		26365	1882.5	1 / 0	22.93
		26683	1914.3	1 / 5	22.93

Table 7-2. LTE Conducted Power Results – LTE Band 25/2 – Ant2

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	374000	1870.0	1 / 1	23.46
		376500	1882.5	1 / 1	23.64
		379000	1895.0	1 / 1	23.40
	QPSK	374000	1870.0	1 / 1	23.23
		376500	1882.5	1 / 1	23.42
		379000	1895.0	1 / 1	23.26
	16-QAM	374000	1870.0	1 / 1	22.47
		376500	1882.5	1 / 1	22.39
		379000	1895.0	1 / 1	22.31
35 MHz	QPSK	379500	1897.5	1 / 1	23.84
	16-QAM	374500	1867.5	1 / 158	23.89
		376500	1882.5	1 / 80	23.86
		379500	1897.5	1 / 1	23.80
30 MHz	π/2 BPSK	372000	1865.0	1 / 1	23.48
		376500	1882.5	1 / 158	23.63
		381000	1900.0	1 / 80	23.32
	QPSK	372000	1865.0	1 / 1	23.45
		376500	1882.5	1 / 158	23.44
		381000	1900.0	1 / 80	23.10
	16-QAM	372000	1865.0	1 / 1	22.52
		376500	1882.5	1 / 158	22.13
		381000	1900.0	1 / 80	22.00
25 MHz	π/2 BPSK	372000	1862.5	1 / 1	23.67
		376500	1882.5	1 / 66	23.51
		381000	1902.5	1 / 66	23.52
	QPSK	372000	1862.5	1 / 1	23.63
		376500	1882.5	1 / 66	23.49
		381000	1902.5	1 / 66	23.43
	16-QAM	372000	1862.5	1 / 1	22.61
		376500	1882.5	1 / 66	22.44
		381000	1902.5	1 / 66	22.46
20 MHz	π/2 BPSK	372000	1860.0	1 / 53	23.55
		376500	1882.5	1 / 1	23.45
		381000	1905.0	1 / 53	23.65
	QPSK	372000	1860.0	1 / 53	23.51
		376500	1882.5	1 / 1	23.33
		381000	1905.0	1 / 53	23.59
	16-QAM	372000	1860.0	1 / 53	22.41
		376500	1882.5	1 / 1	22.38
		381000	1905.0	1 / 53	22.41
15 MHz	π/2 BPSK	371500	1857.5	1 / 39	23.61
		376500	1882.5	1 / 1	23.54
		381500	1907.5	1 / 1	23.26
	QPSK	371500	1857.5	1 / 39	23.44
		376500	1882.5	1 / 1	23.48
		381500	1907.5	1 / 1	23.07
	16-QAM	371500	1857.5	1 / 39	22.38
		376500	1882.5	1 / 1	22.41
		381500	1907.5	1 / 1	22.29
10 MHz	π/2 BPSK	371000	1855.0	1 / 1	23.77
		376500	1882.5	1 / 26	23.37
		382000	1910.0	1 / 1	23.59
	QPSK	371000	1855.0	1 / 1	23.50
		376500	1882.5	1 / 26	23.42
		382000	1910.0	1 / 1	23.35
	16-QAM	371000	1855.0	1 / 1	22.52
		376500	1882.5	1 / 26	22.38
		382000	1910.0	1 / 1	22.41
5 MHz	π/2 BPSK	370500	1852.5	1 / 1	23.47
		376500	1882.5	1 / 12	23.35
		382500	1912.5	1 / 12	23.47
	QPSK	370500	1852.5	1 / 1	23.38
		376500	1882.5	1 / 12	23.32
		382500	1912.5	1 / 12	23.39
	16-QAM	370500	1852.5	1 / 1	22.50
		376500	1882.5	1 / 12	22.19
		382500	1912.5	1 / 12	22.46

Table 7-3. LTE Conducted Power Results – NR Band n25/2 – Ant2

7.3 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 C63.26:2015 – Section 5.4.4

Test Settings

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.

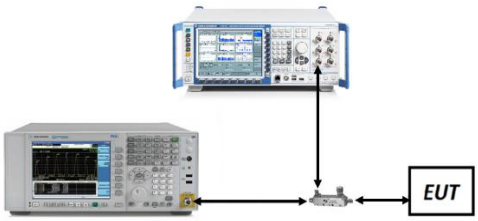


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

Mode	Bandwidth	Modulation	OBW [MHz]
GSM-PCS	N/A	GMSK	0.243
GSM-PCS EDGE		8-PSK	0.244
WCDMA-PCS		Spread Spectrum	4.175
LTE-B25-2	20MHz	QPSK	18.04
		16QAM	18.06
	15MHz	QPSK	13.55
		16QAM	13.54
	10MHz	QPSK	9.03
		16QAM	9.05
	5MHz	QPSK	4.53
		16QAM	4.52
	3MHz	QPSK	2.72
		16QAM	2.73
	1.4MHz	QPSK	1.10
		16QAM	1.11

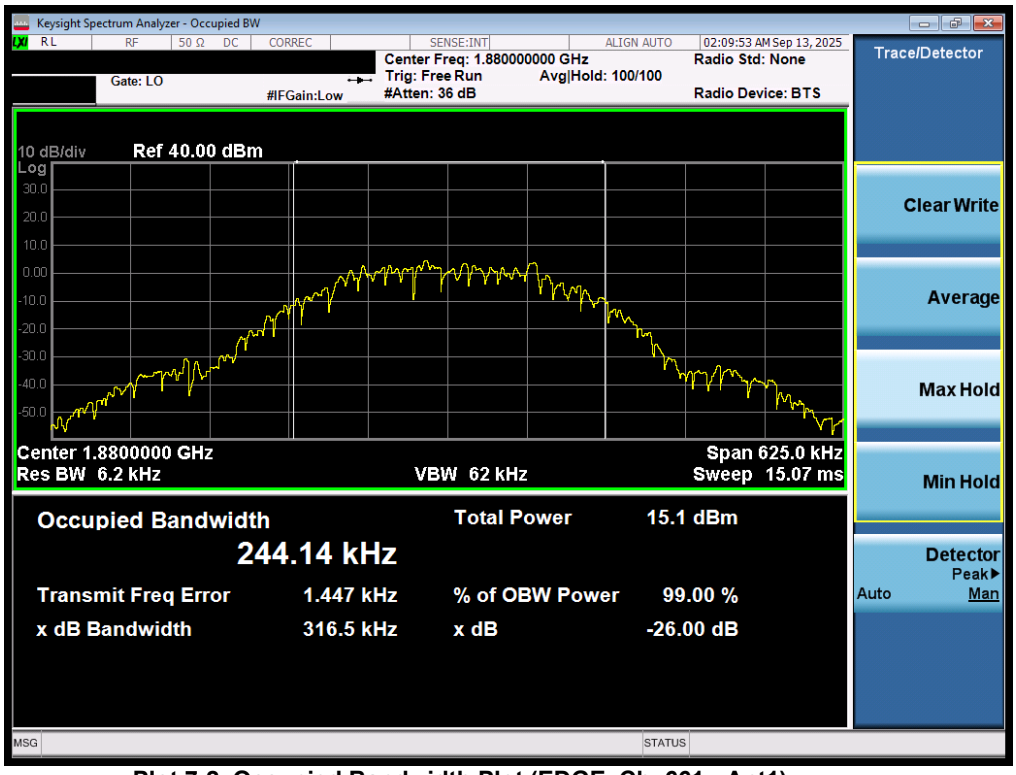
Table 7-4. Occupied Bandwidth Results – Ant1

Mode	Bandwidth	Modulation	OBW [MHz]
NR-n25-2	40MHz	BPSK	38.70
		QPSK	38.78
		16QAM	38.69
	30MHz	BPSK	28.77
		QPSK	28.70
		16QAM	28.74
	25MHz	BPSK	23.05
		QPSK	23.87
		16QAM	23.87
	20MHz	BPSK	18.00
		QPSK	18.96
		16QAM	19.02
	15MHz	BPSK	13.50
		QPSK	14.17
		16QAM	14.19
	10MHz	BPSK	8.99
		QPSK	9.34
		16QAM	9.36
	5MHz	BPSK	4.55
		QPSK	4.53
		16QAM	4.54

Table 7-5. Occupied Bandwidth Results – Ant1

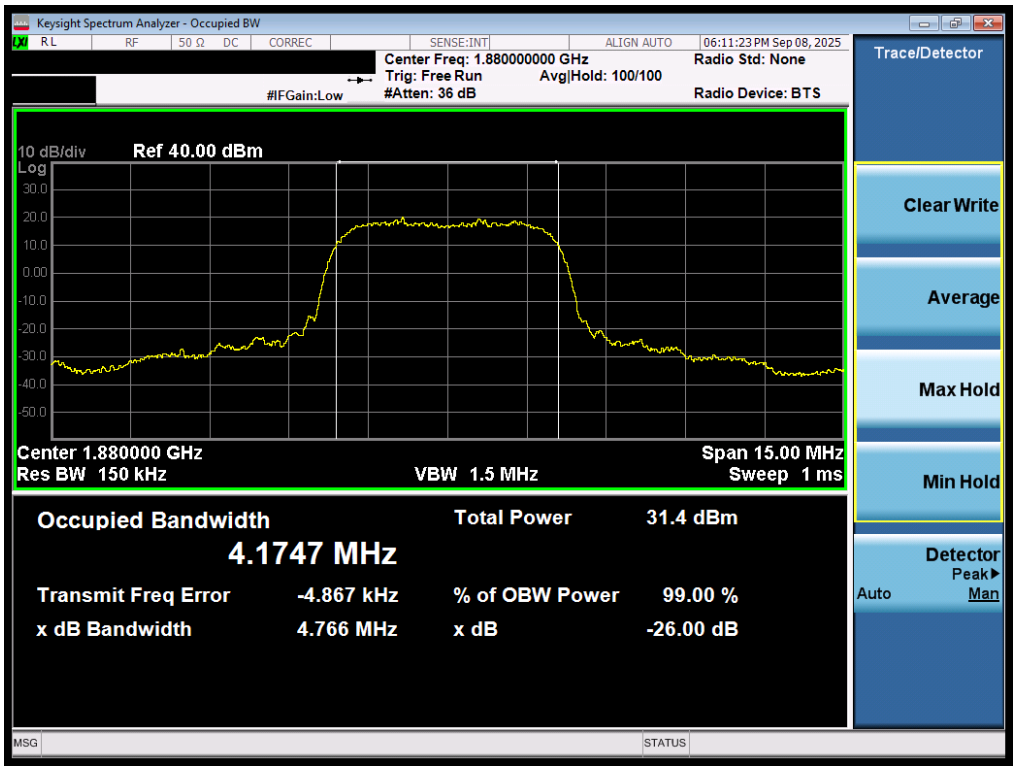
GSM/GPRS PCS – Ant1

Plot 7-1. Occupied Bandwidth Plot (GPRS, Ch. 661 - Ant1)



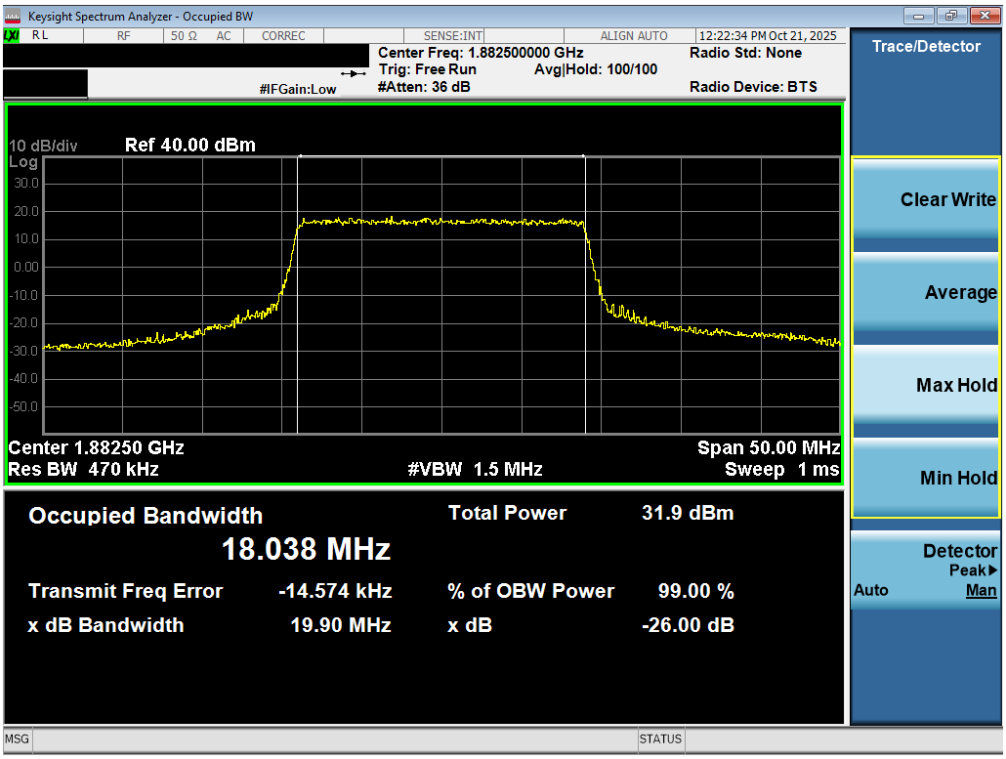
Plot 7-2. Occupied Bandwidth Plot (EDGE, Ch. 661 - Ant1)

WCDMA PCS – Ant1

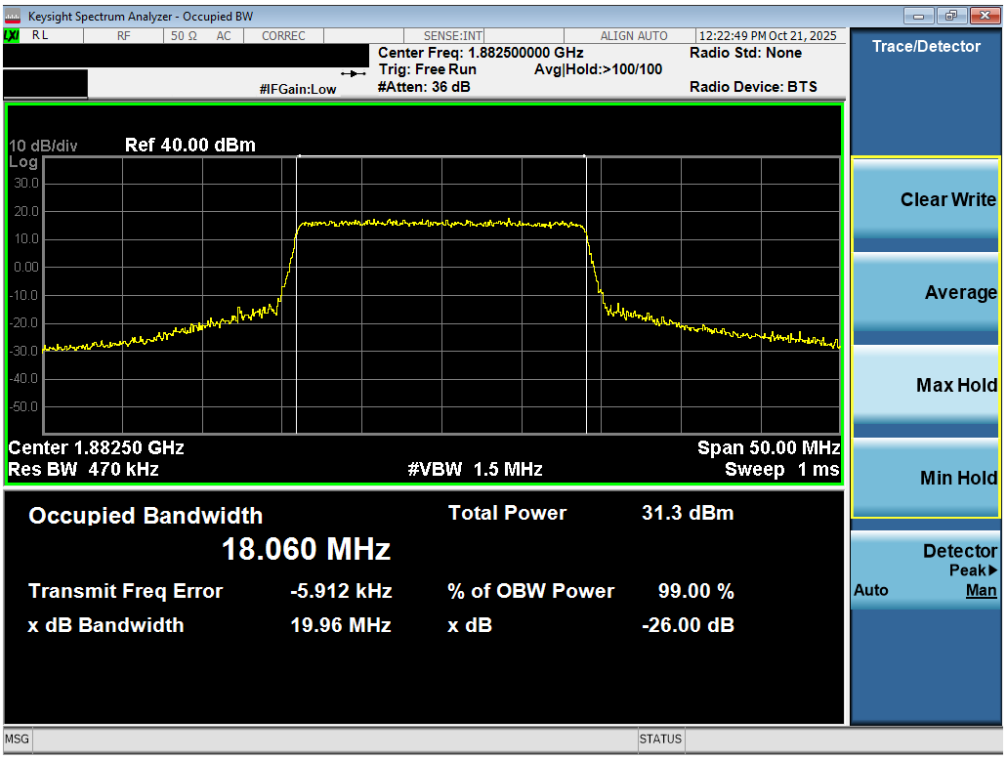


Plot 7-3. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant1)

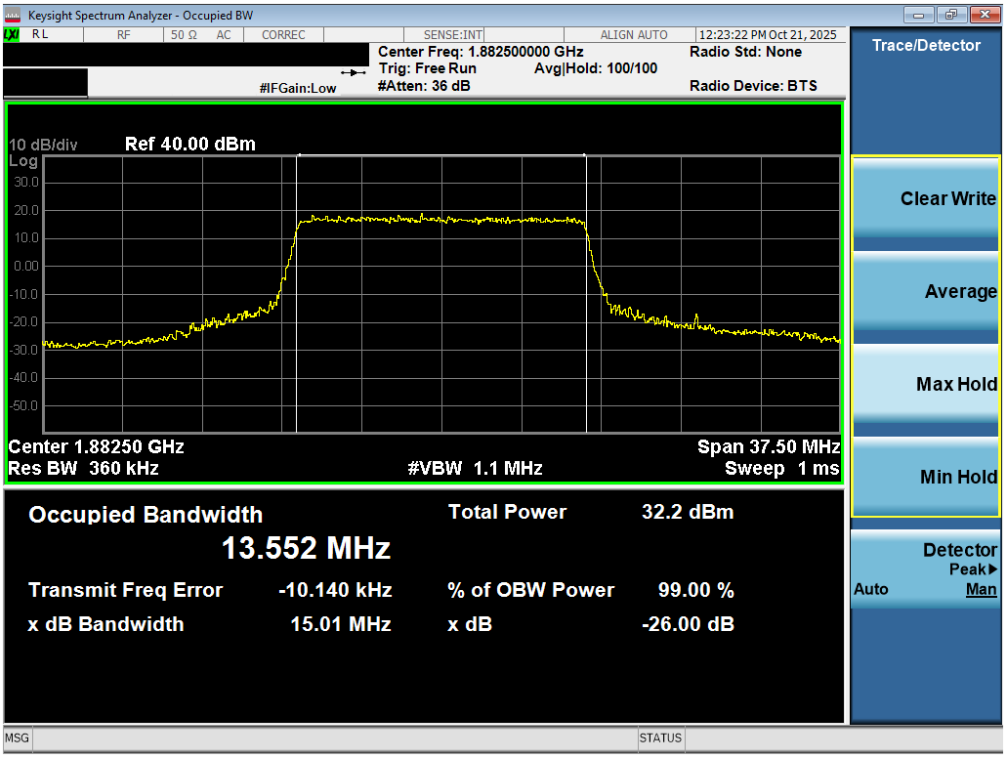
LTE Band 25/2 – Ant1



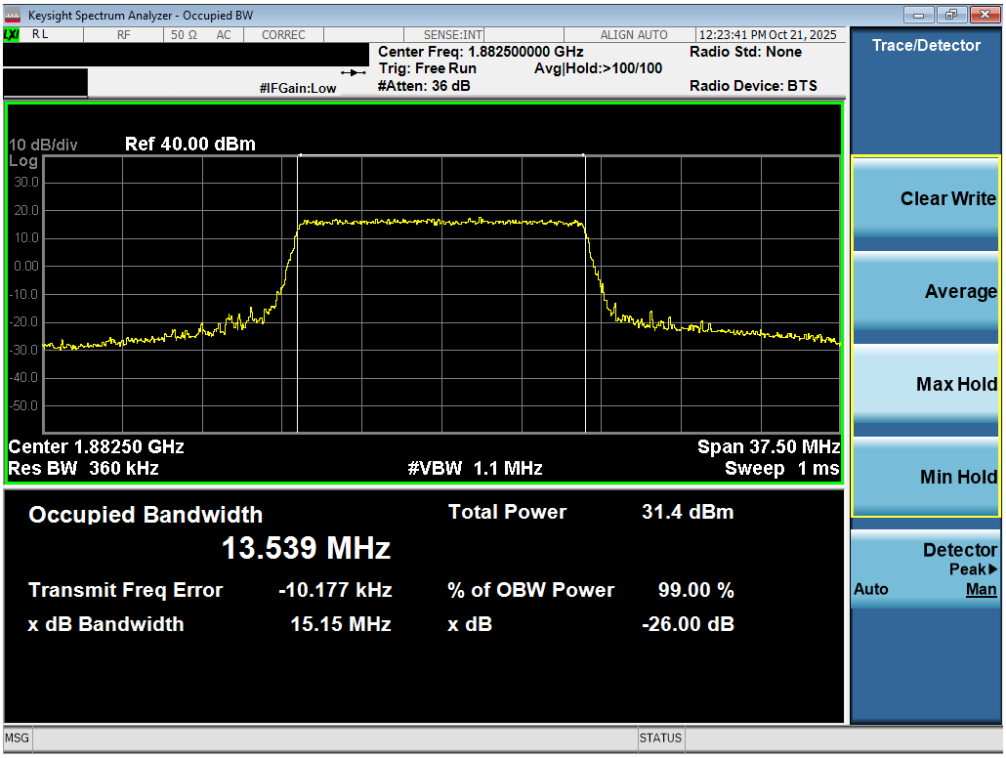
Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant1)



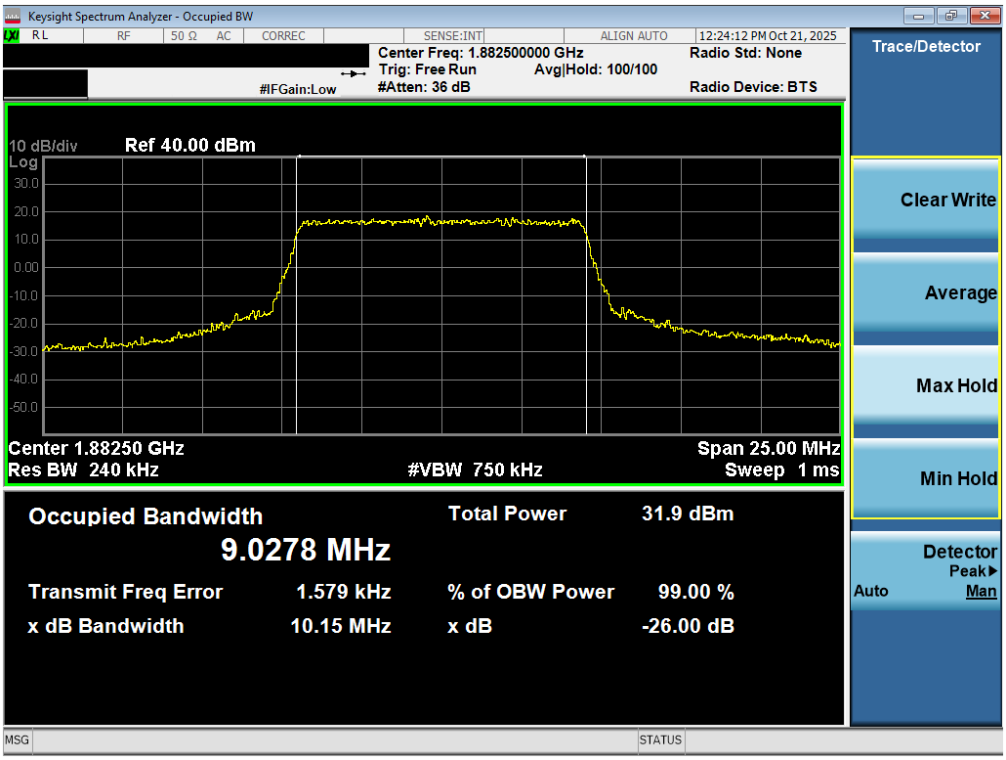
Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant1)



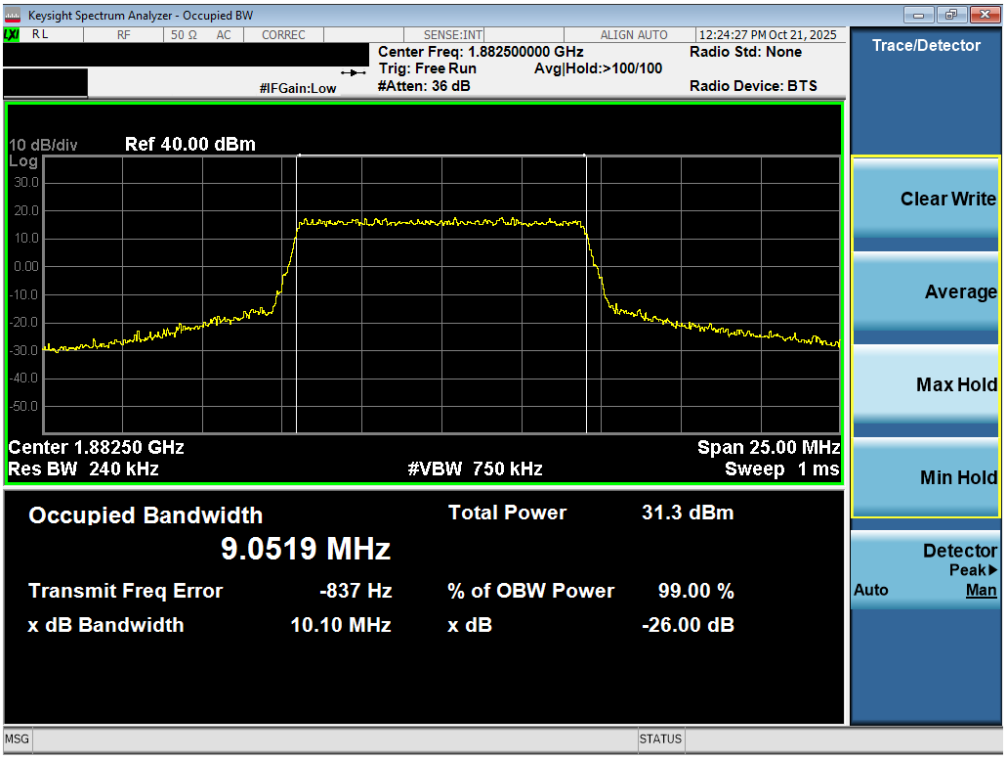
Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB - Ant1)



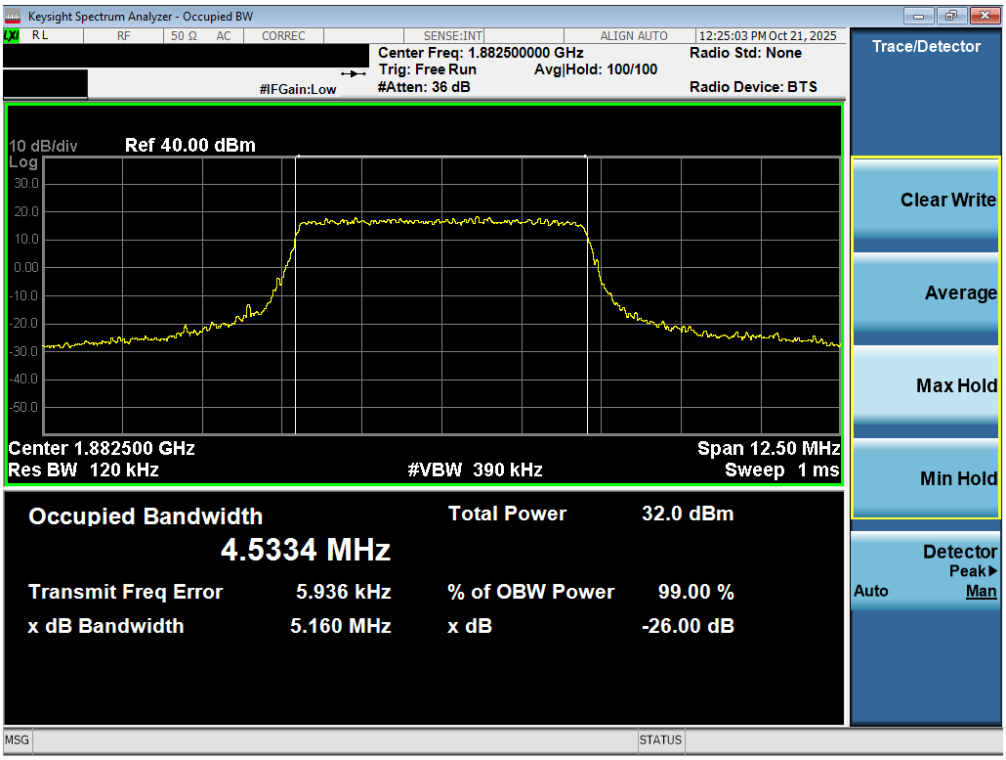
Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB - Ant1)



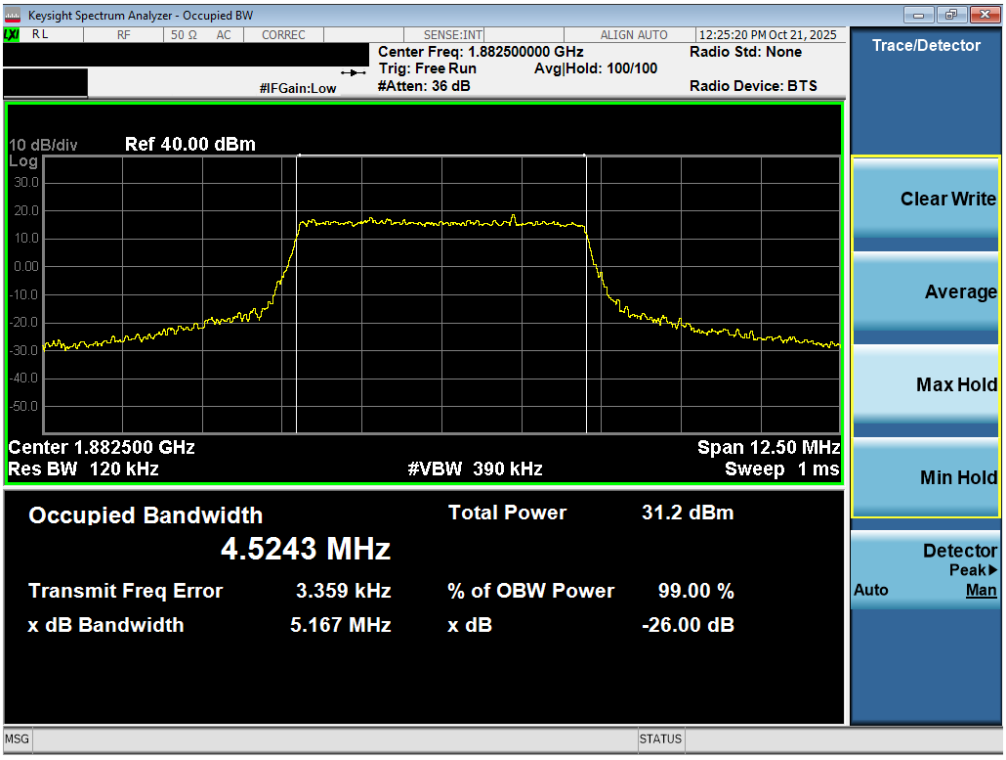
Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB - Ant1)



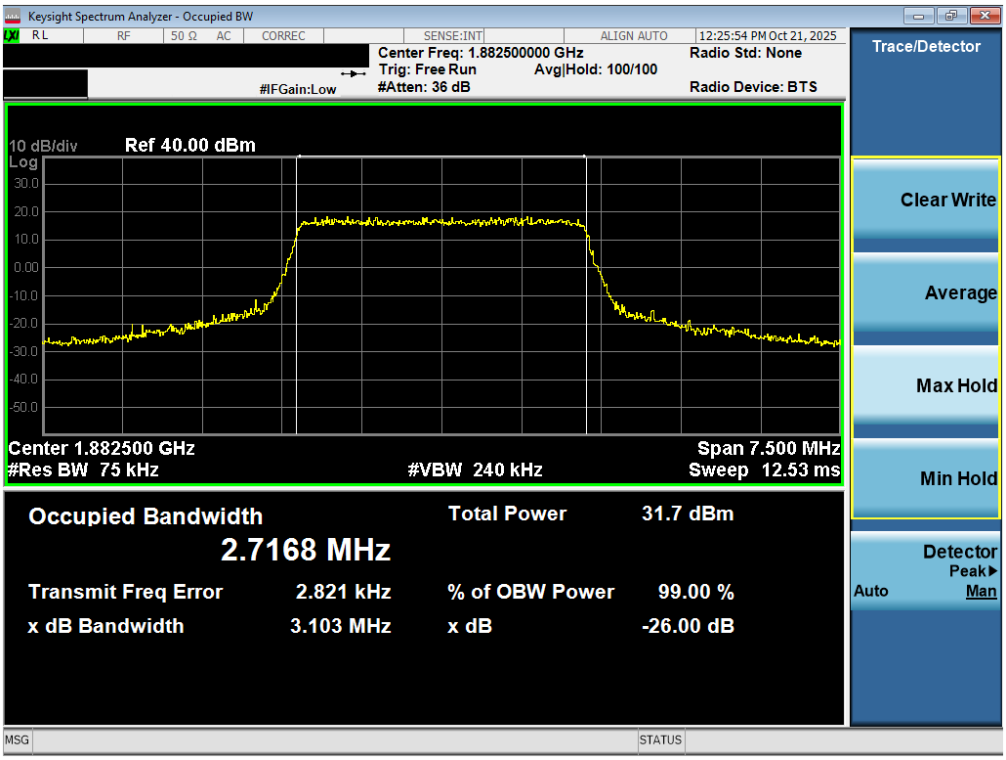
Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB - Ant1)



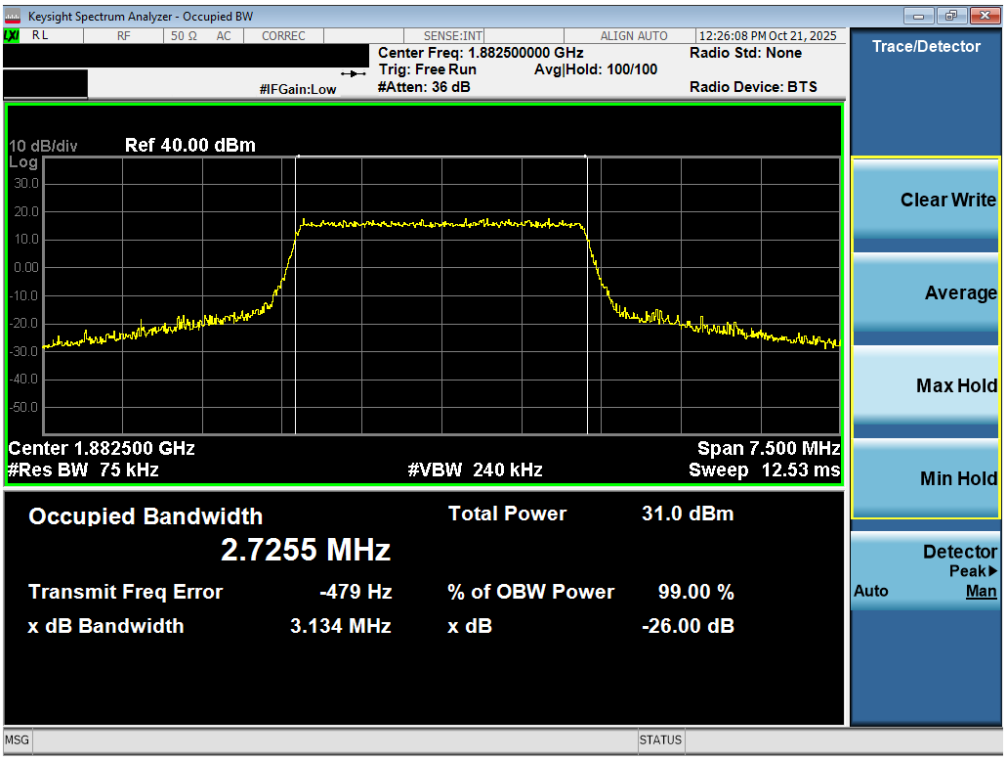
Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB - Ant1)



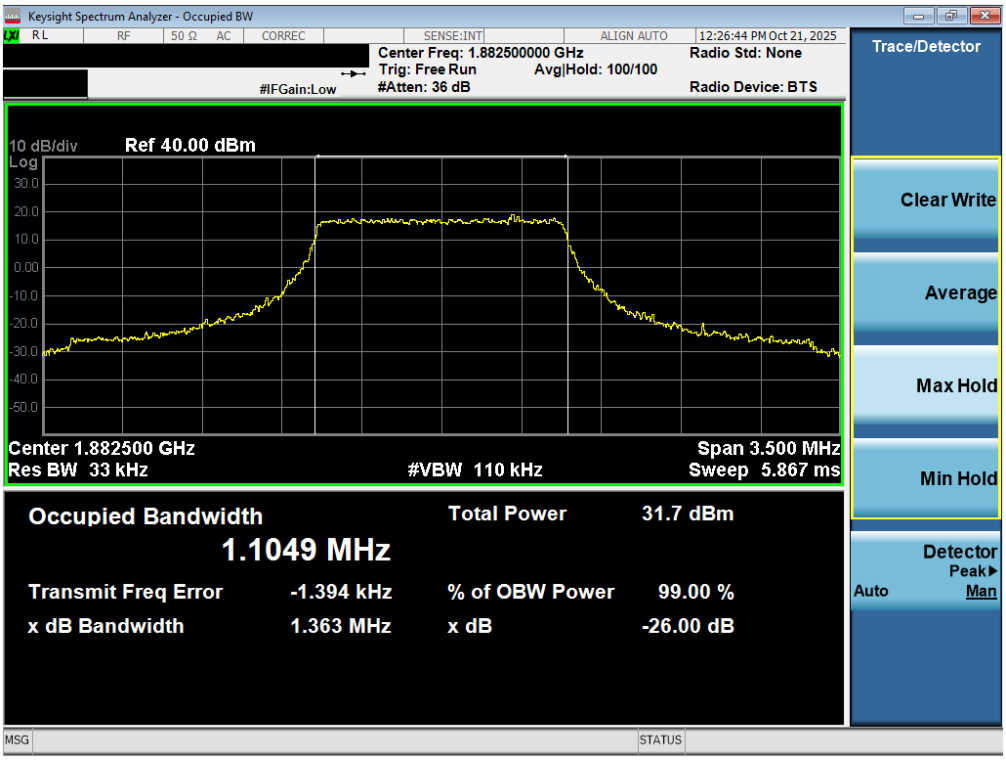
Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB - Ant1)



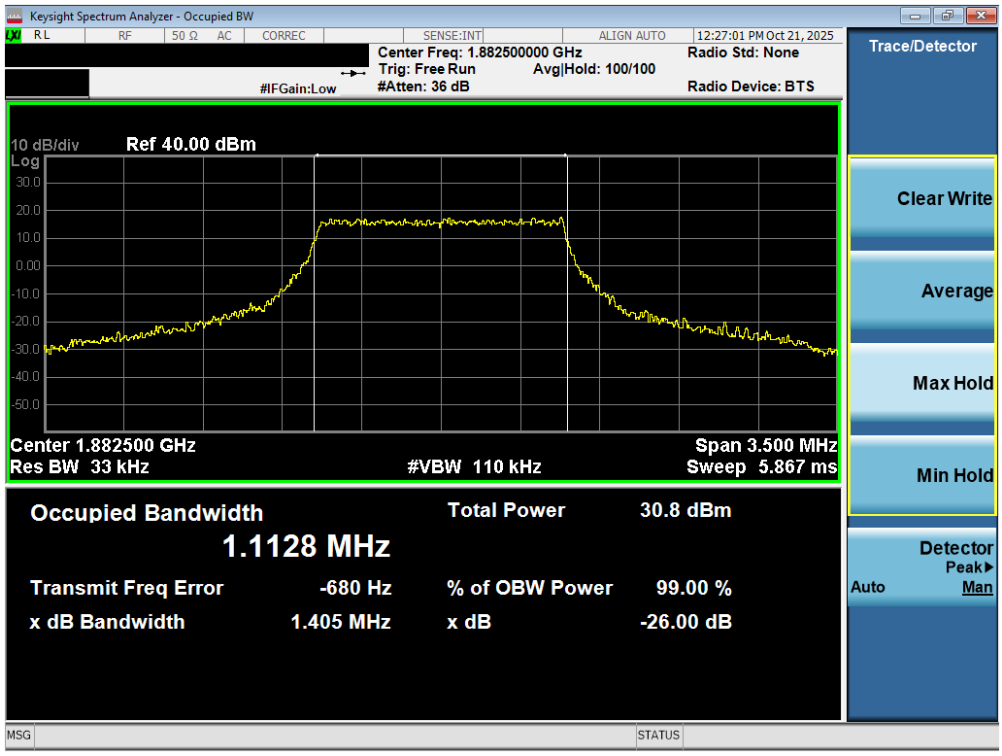
Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB - Ant1)



Plot 7-13. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB - Ant1)

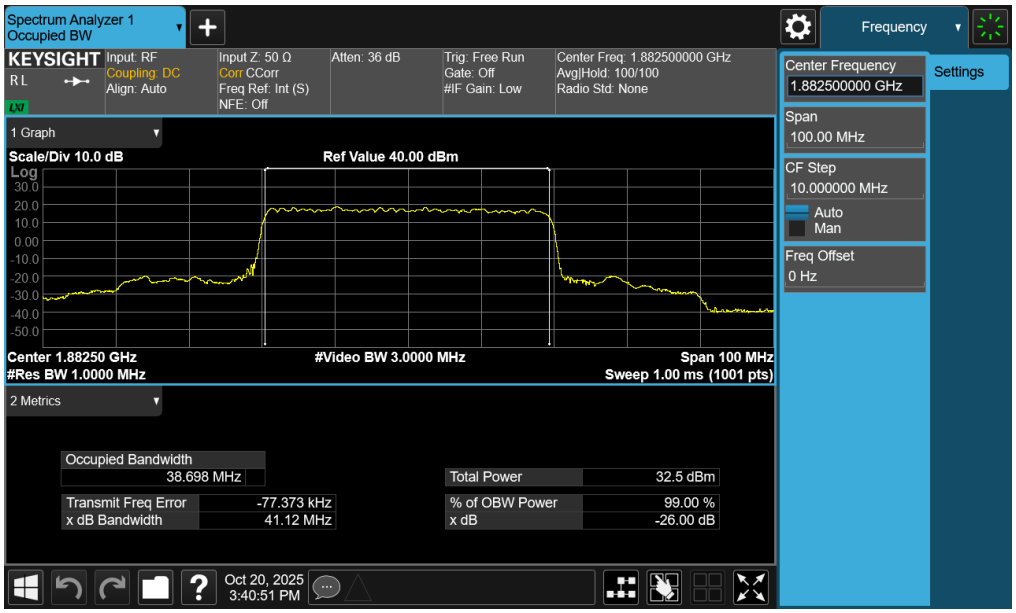


Plot 7-14. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB - Ant1)



Plot 7-15. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB - Ant1)

NR Band n25/2 – Ant1



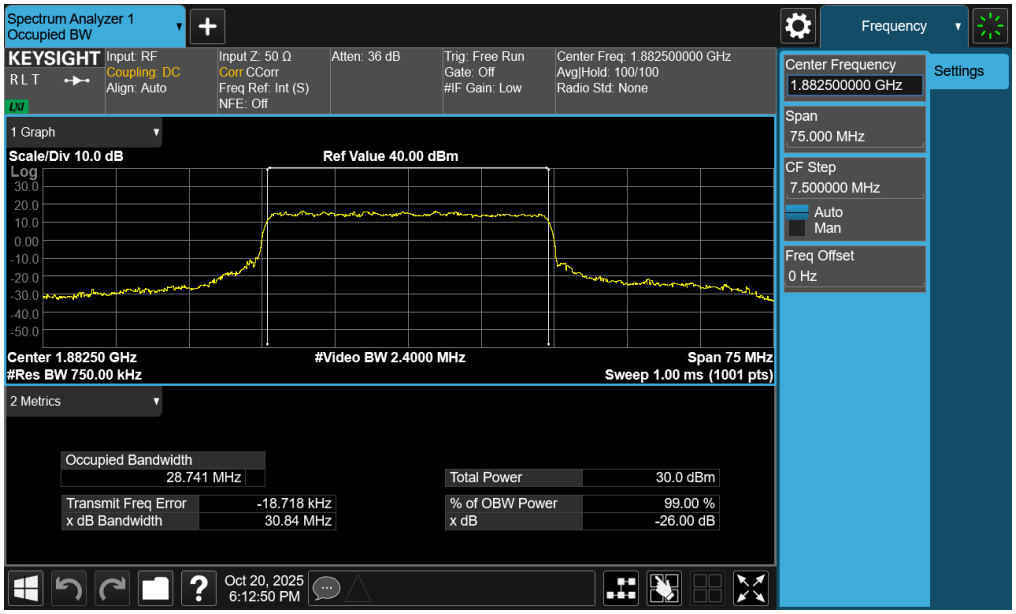
Plot 7-16. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)

Plot 7-17. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM QPSK - Full RB - ANT1)

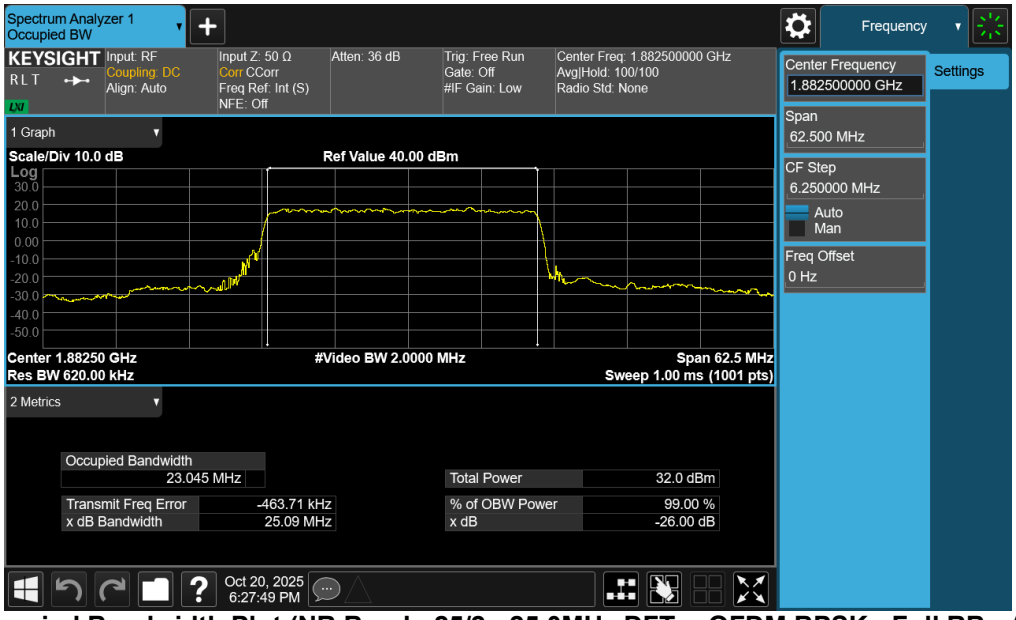
Plot 7-18. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM 16QAM - Full RB - ANT1)

Plot 7-19. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)

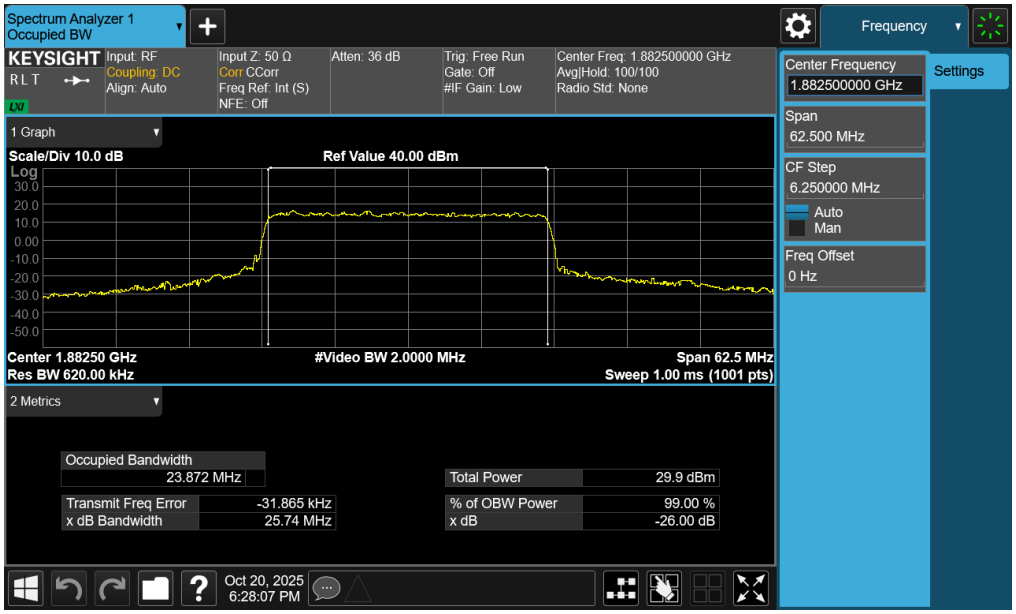
Plot 7-20. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM QPSK - Full RB - ANT1)



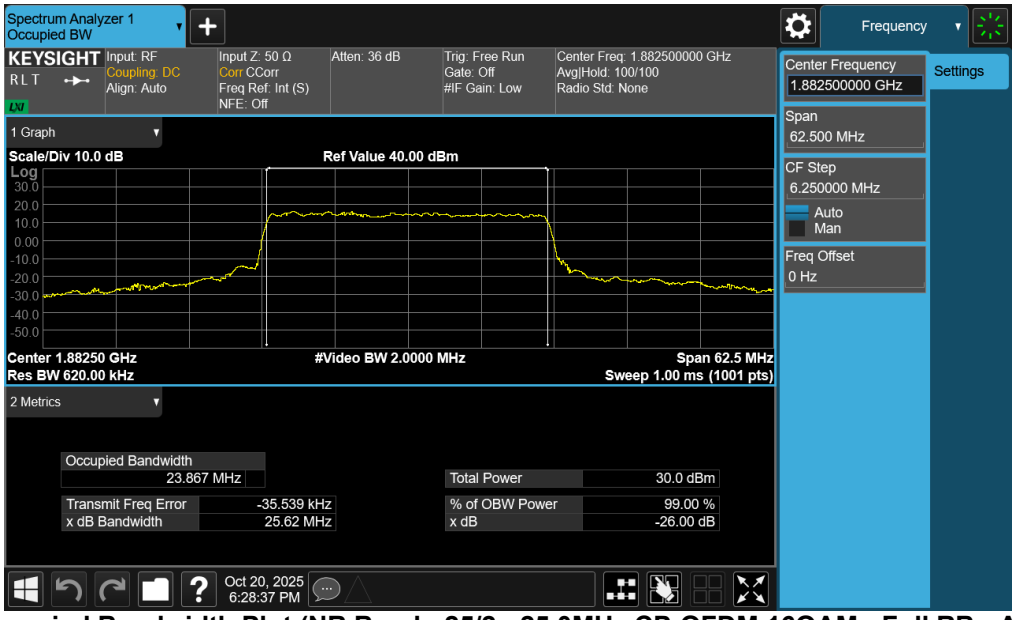
Plot 7-21. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM 16QAM - Full RB - ANT1)



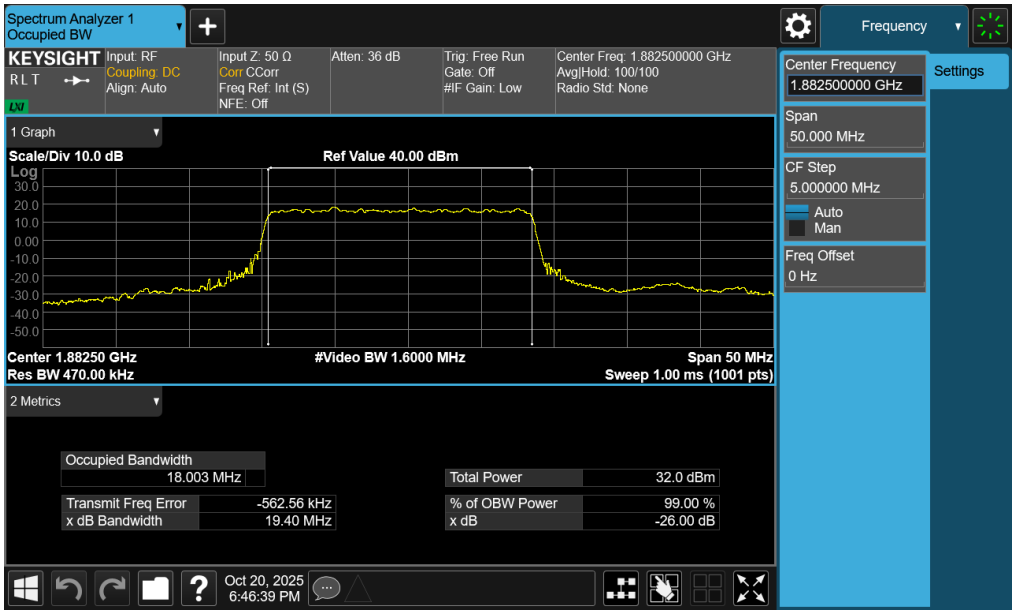
Plot 7-22. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)



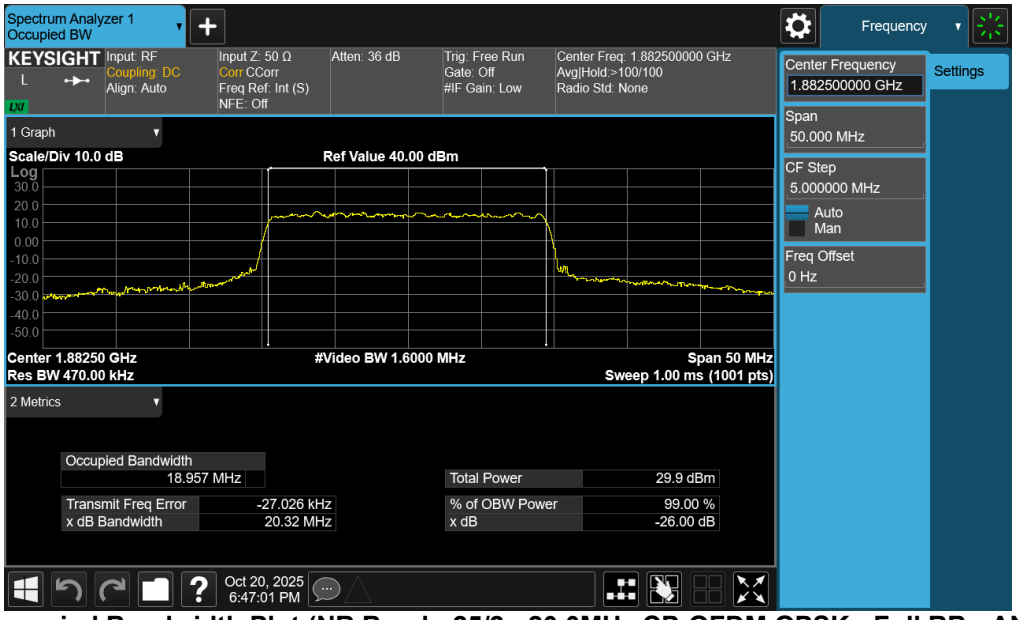
Plot 7-23. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM QPSK - Full RB - ANT1)



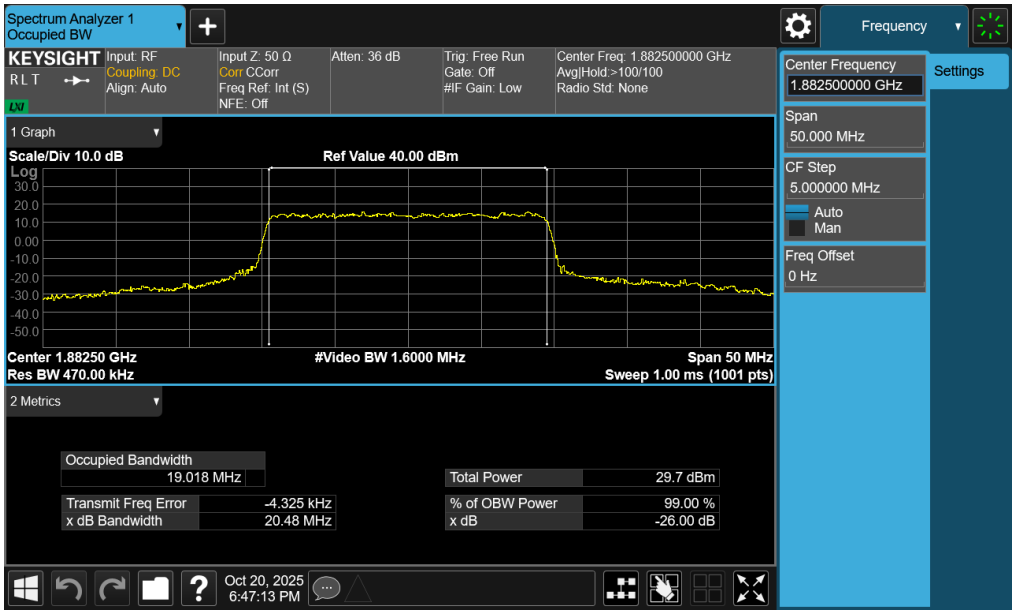
Plot 7-24. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM 16QAM - Full RB - ANT1)



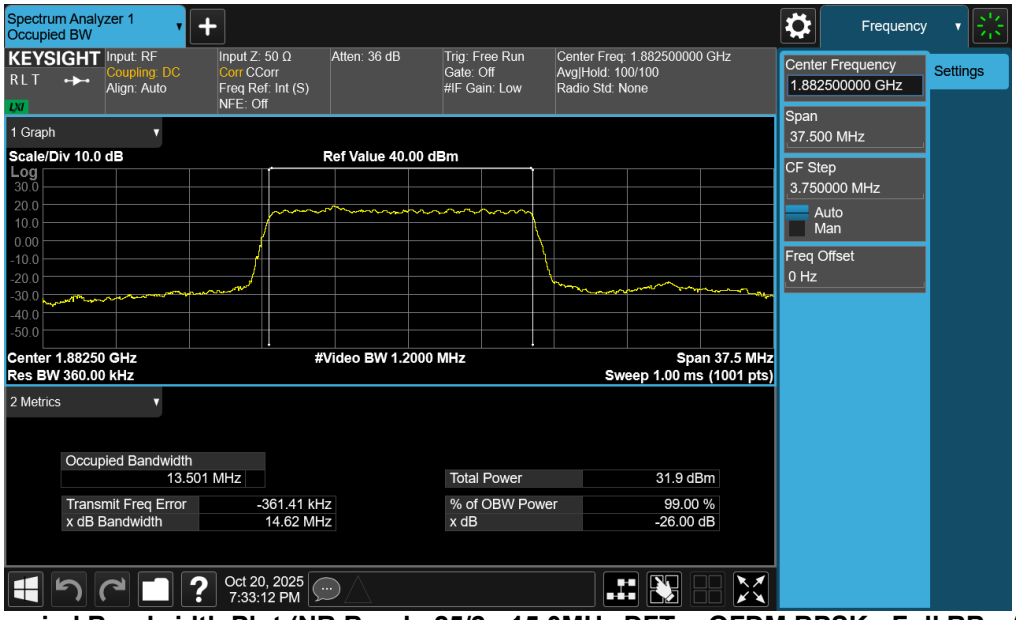
Plot 7-25. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)



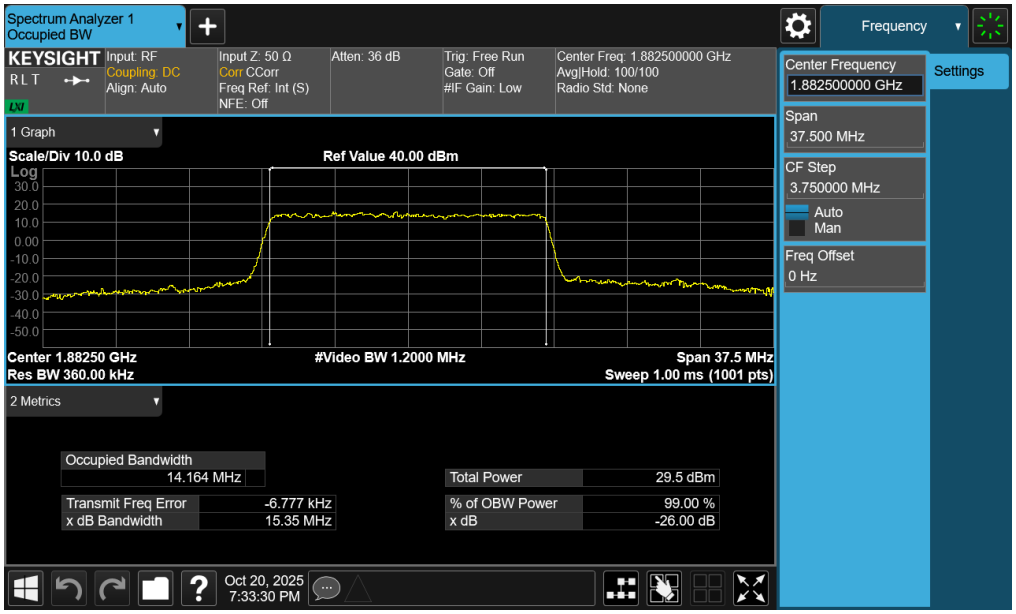
Plot 7-26. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB - ANT1)



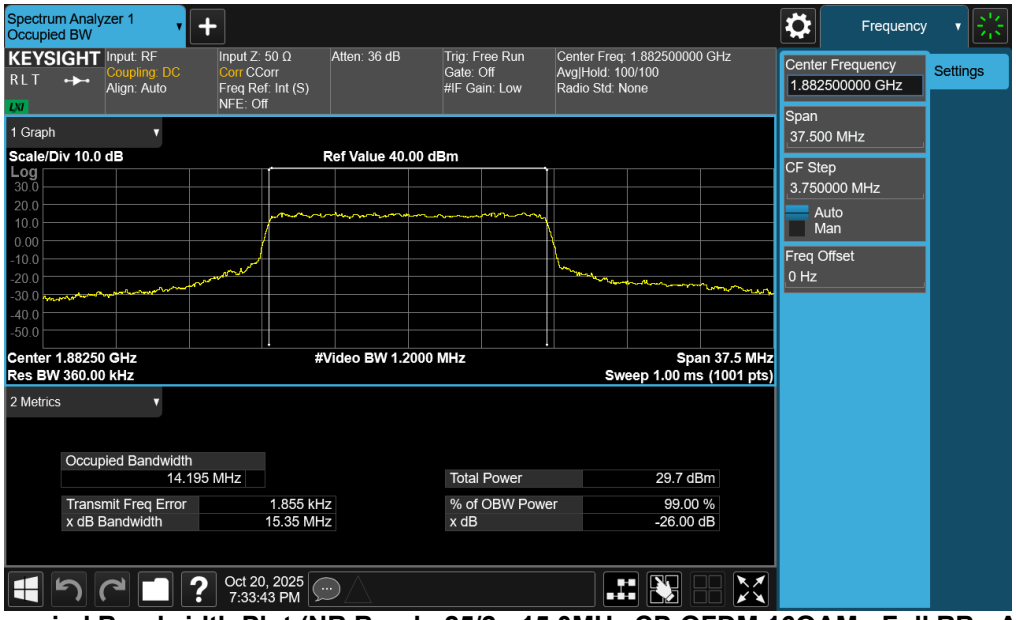
Plot 7-27. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT1)



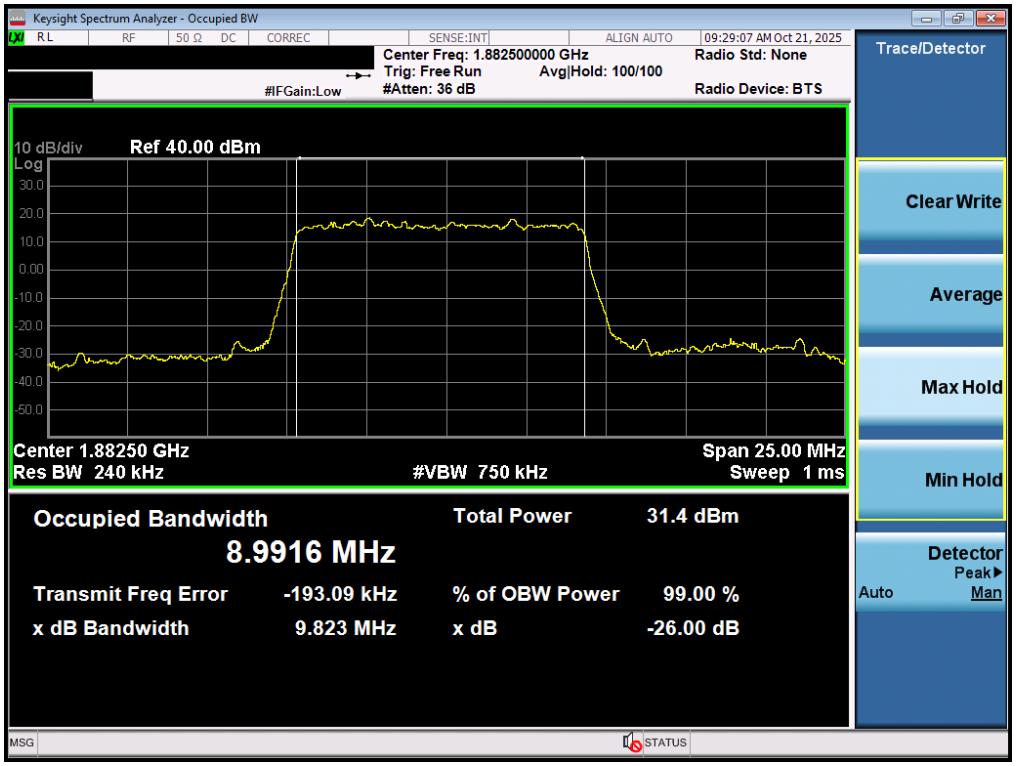
Plot 7-28. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)



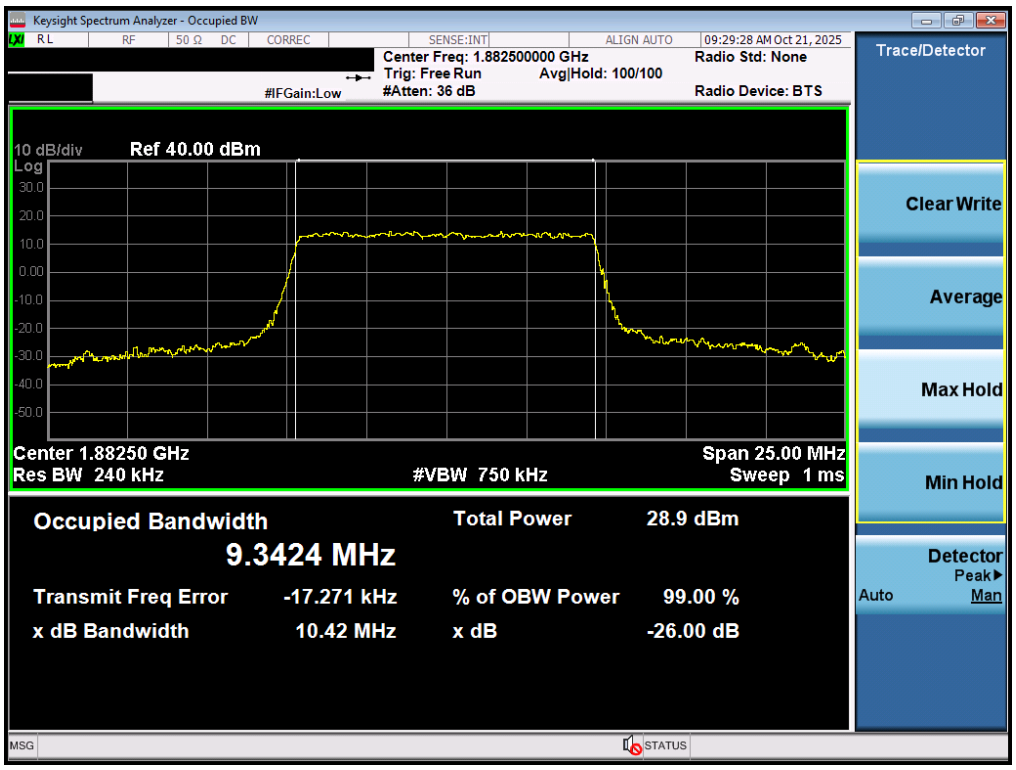
Plot 7-29. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT1)



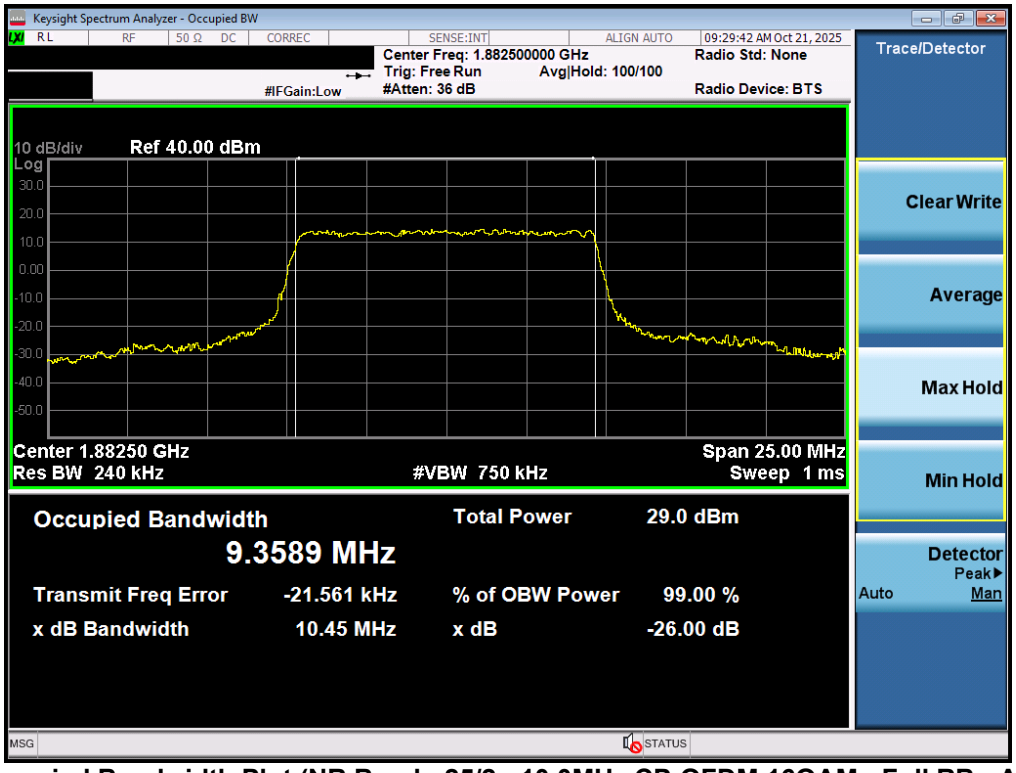
Plot 7-30. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT1)



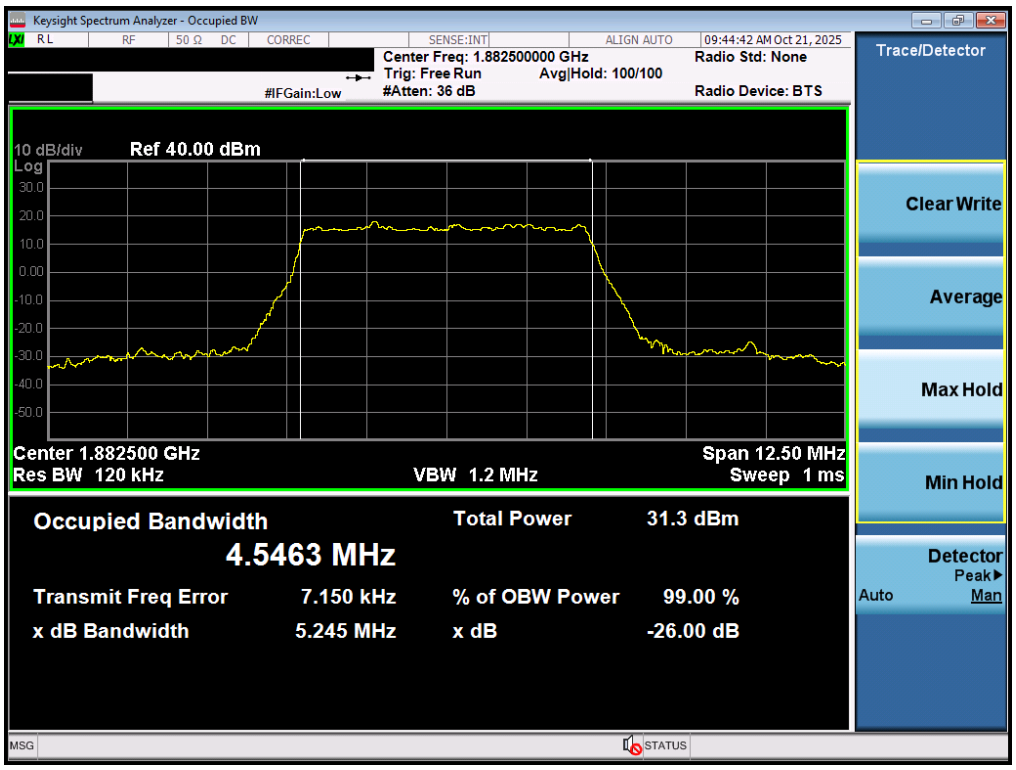
Plot 7-31. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)



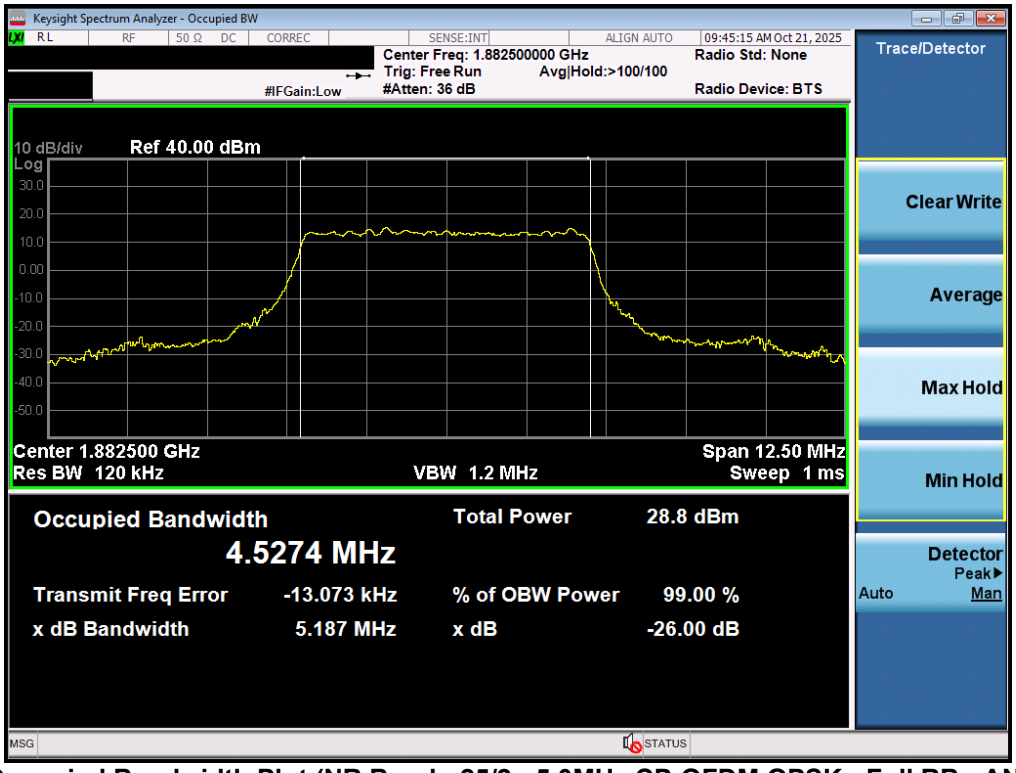
Plot 7-32. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB - ANT1)



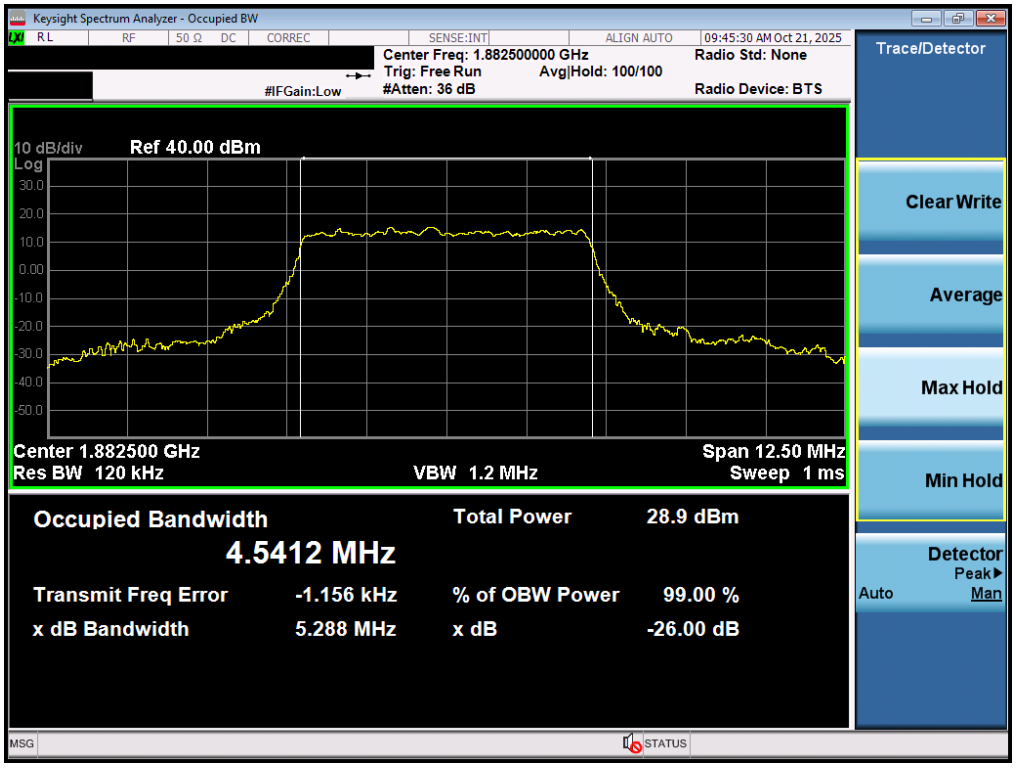
Plot 7-33. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT1)



Plot 7-34. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)



Plot 7-35. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT1)



Plot 7-36. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT1)

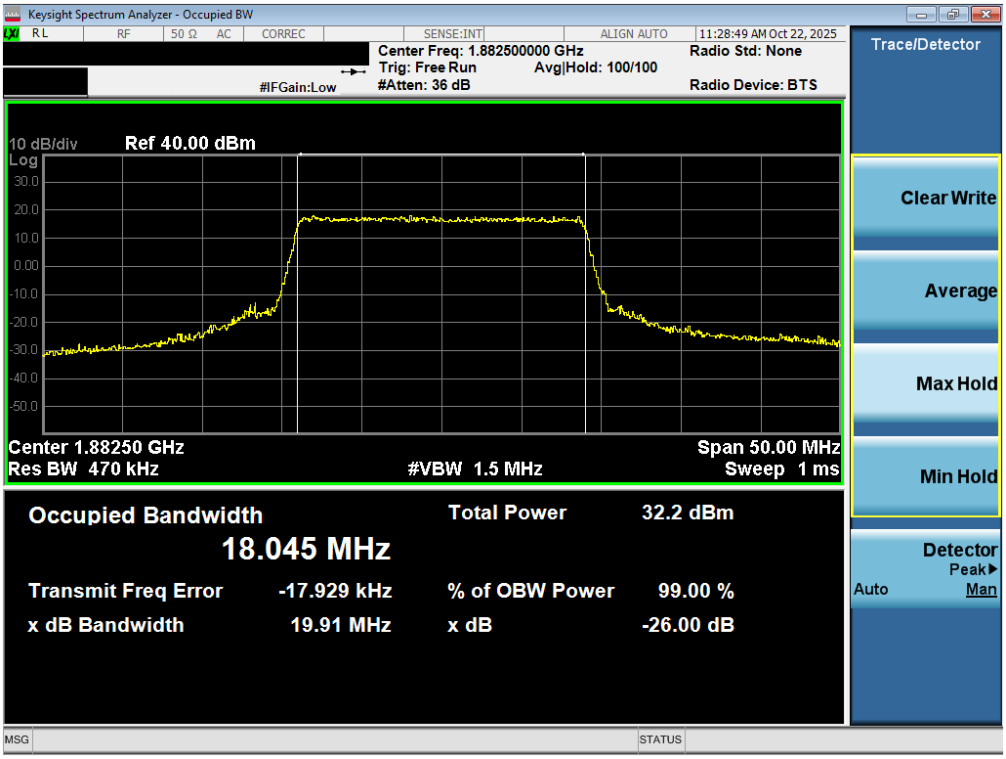
Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B25-2	20MHz	QPSK	18.05
		16QAM	18.04
	15MHz	QPSK	13.54
		16QAM	13.55
	10MHz	QPSK	9.02
		16QAM	9.03
	5MHz	QPSK	4.53
		16QAM	4.54
	3MHz	QPSK	2.72
		16QAM	2.72
	1.4MHz	QPSK	1.11
		16QAM	1.11

Table 7-6. Occupied Bandwidth Results – Ant2

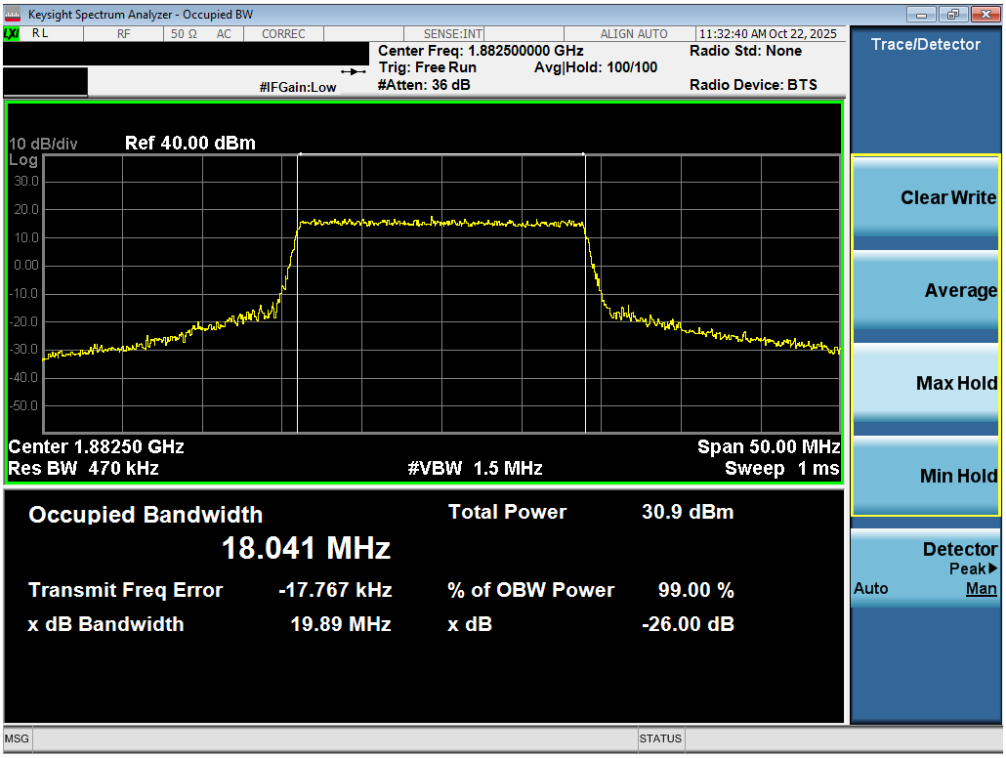
Mode	Bandwidth	Modulation	OBW [MHz]
NR-n25-2	40MHz	BPSK	38.71
		QPSK	38.76
		16QAM	38.68
	30MHz	BPSK	28.79
		QPSK	28.74
		16QAM	28.76
	25MHz	BPSK	23.06
		QPSK	23.88
		16QAM	23.87
	20MHz	BPSK	18.00
		QPSK	18.96
		16QAM	19.03
	15MHz	BPSK	13.49
		QPSK	14.18
		16QAM	14.20
	10MHz	BPSK	8.99
		QPSK	9.34
		16QAM	9.36
	5MHz	BPSK	#N/A
		QPSK	#N/A
		16QAM	#N/A

Table 7-7. Occupied Bandwidth Results – Ant2

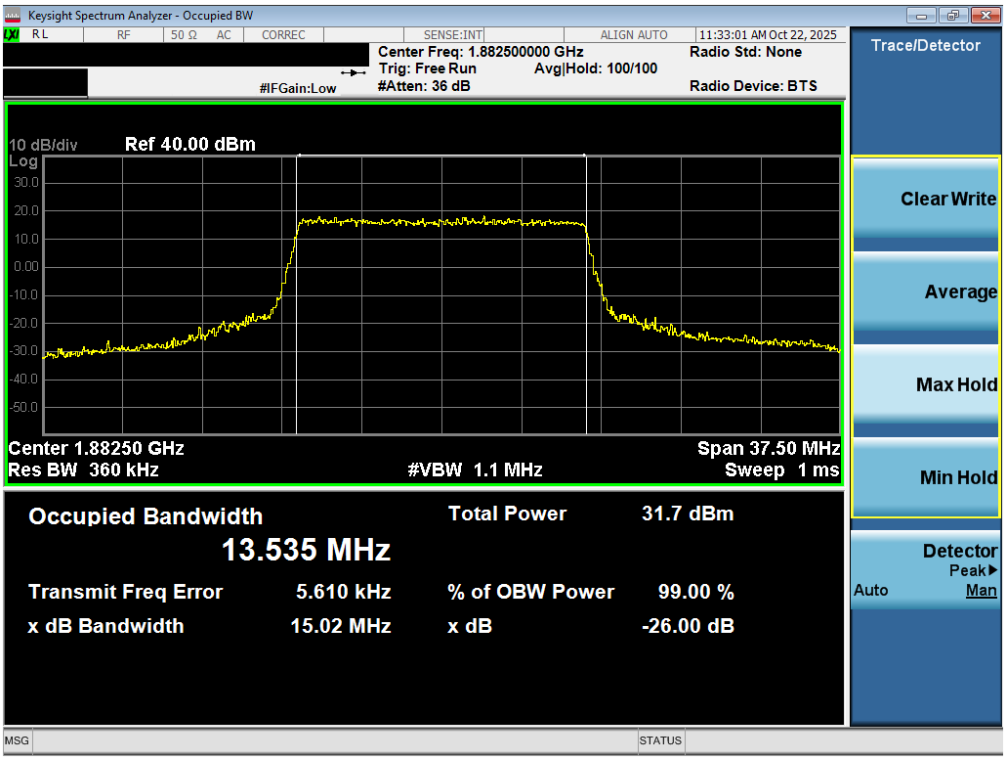
LTE Band 25/2 – Ant2



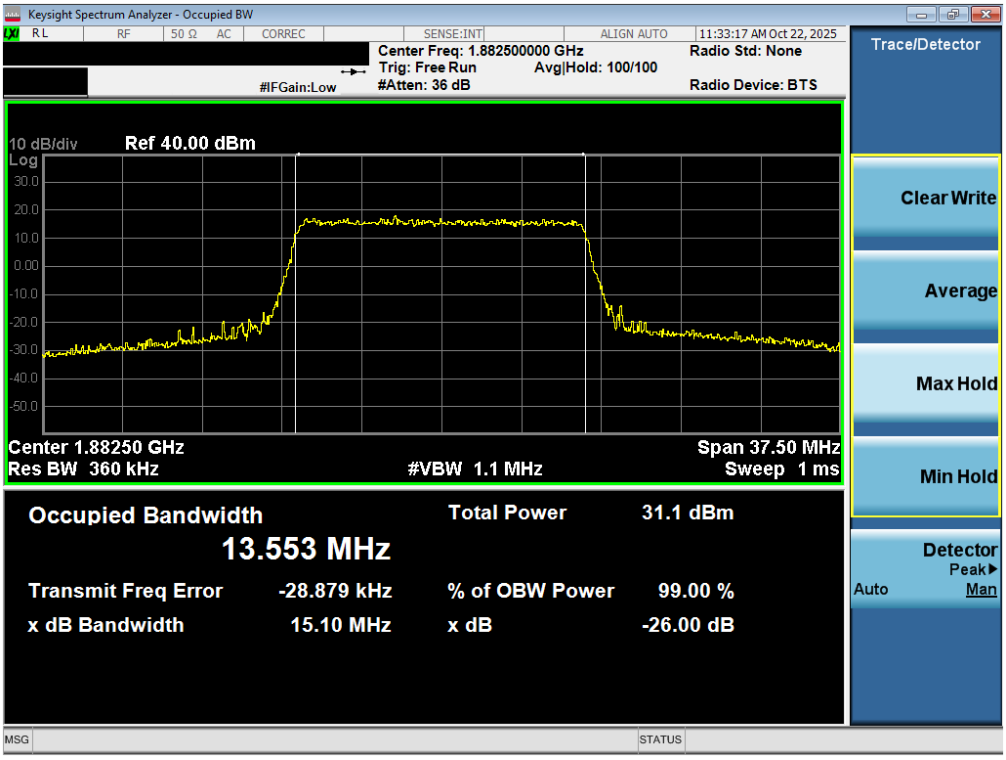
Plot 7-37. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant2)



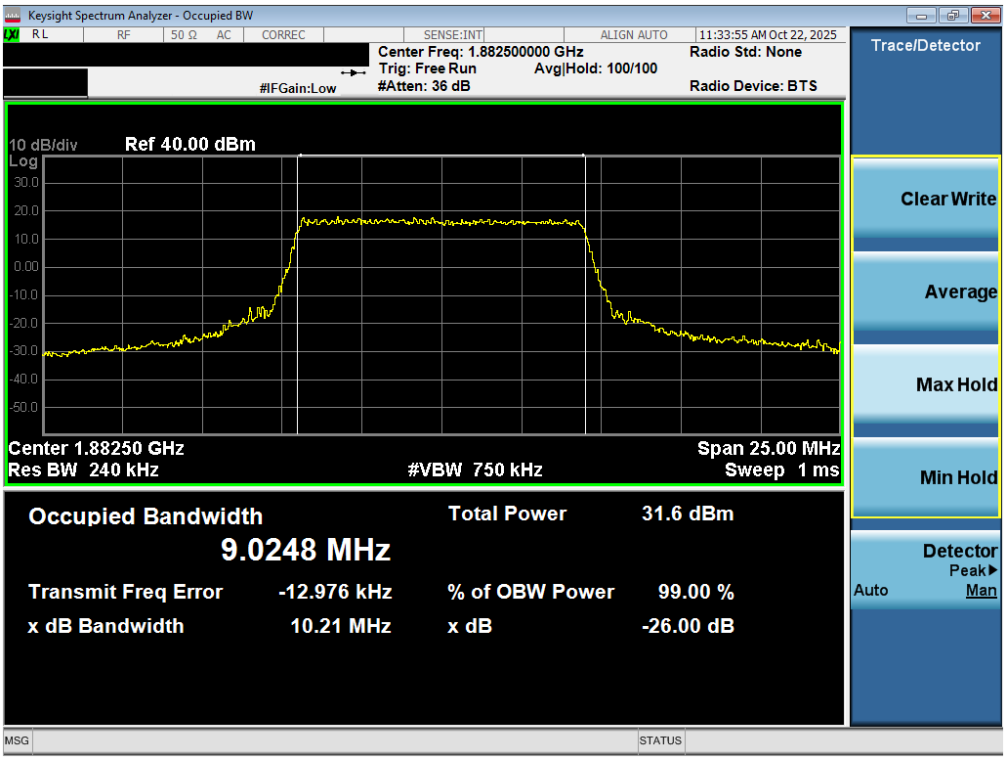
Plot 7-38. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant2)



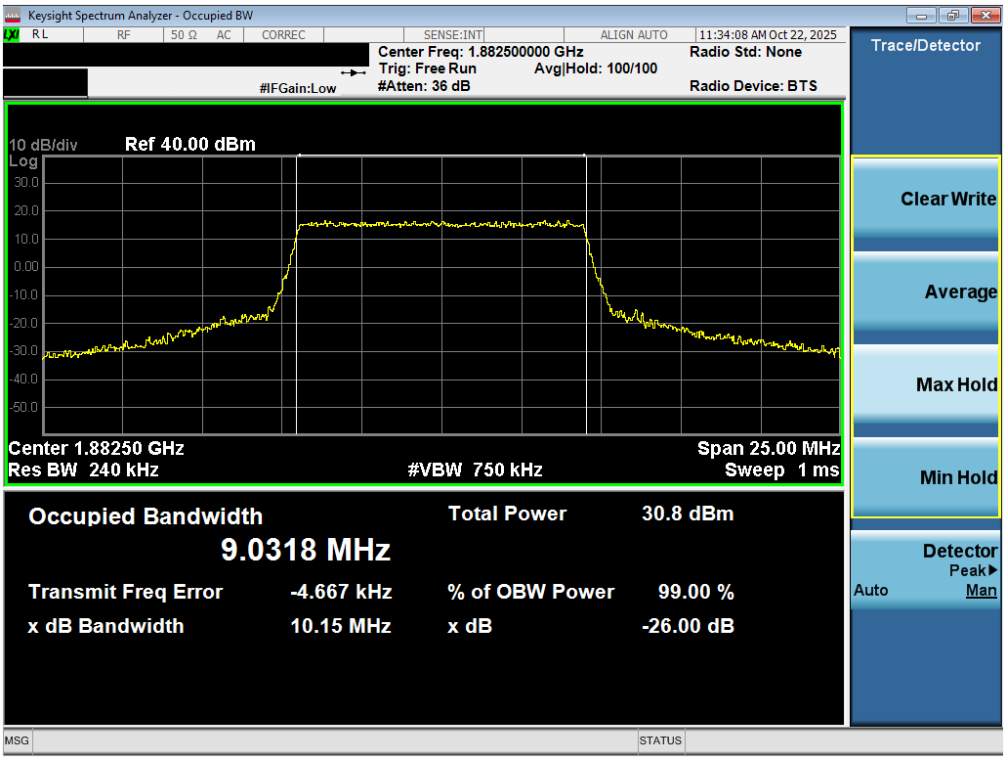
Plot 7-39. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB - Ant2)



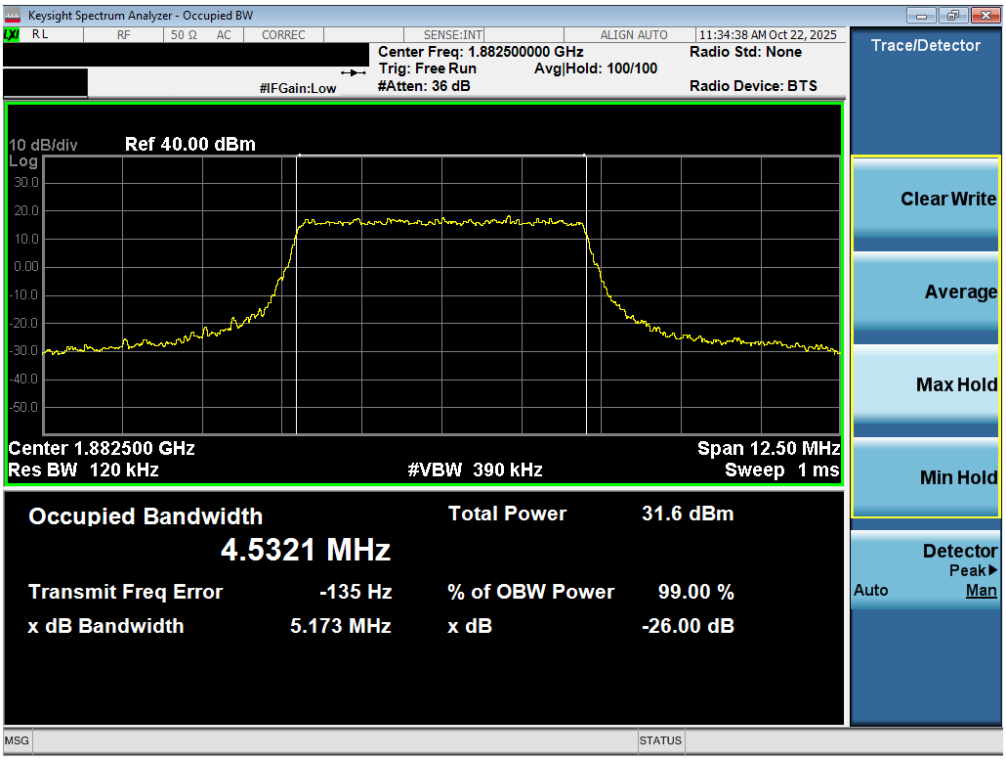
Plot 7-40. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB - Ant2)



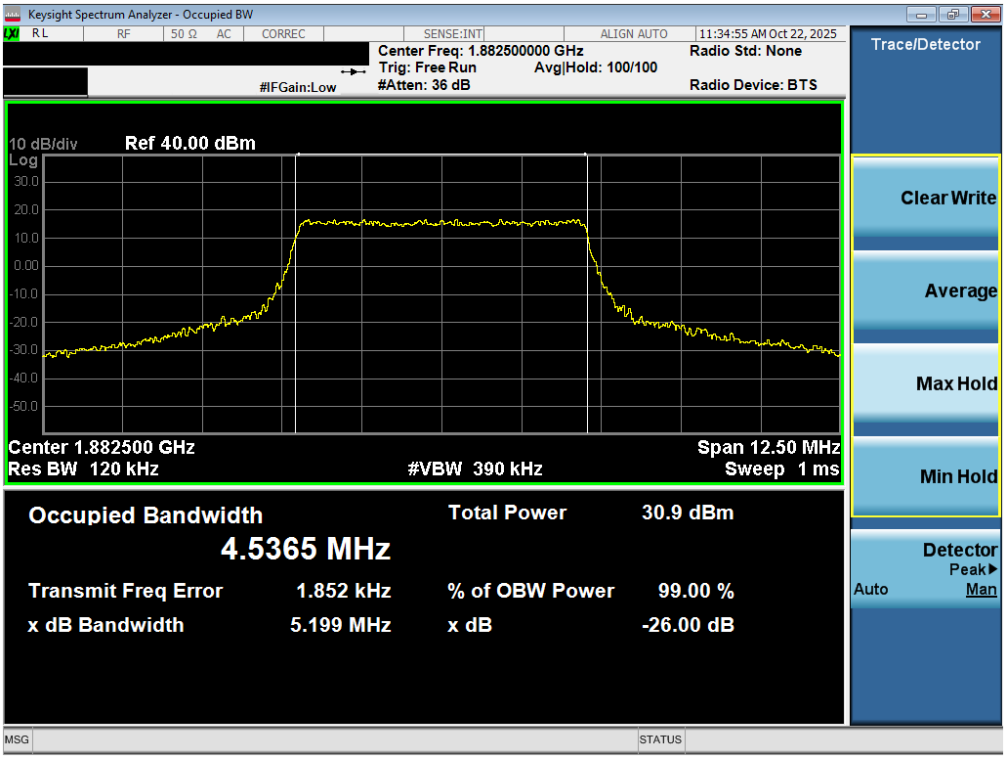
Plot 7-41. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB - Ant2)



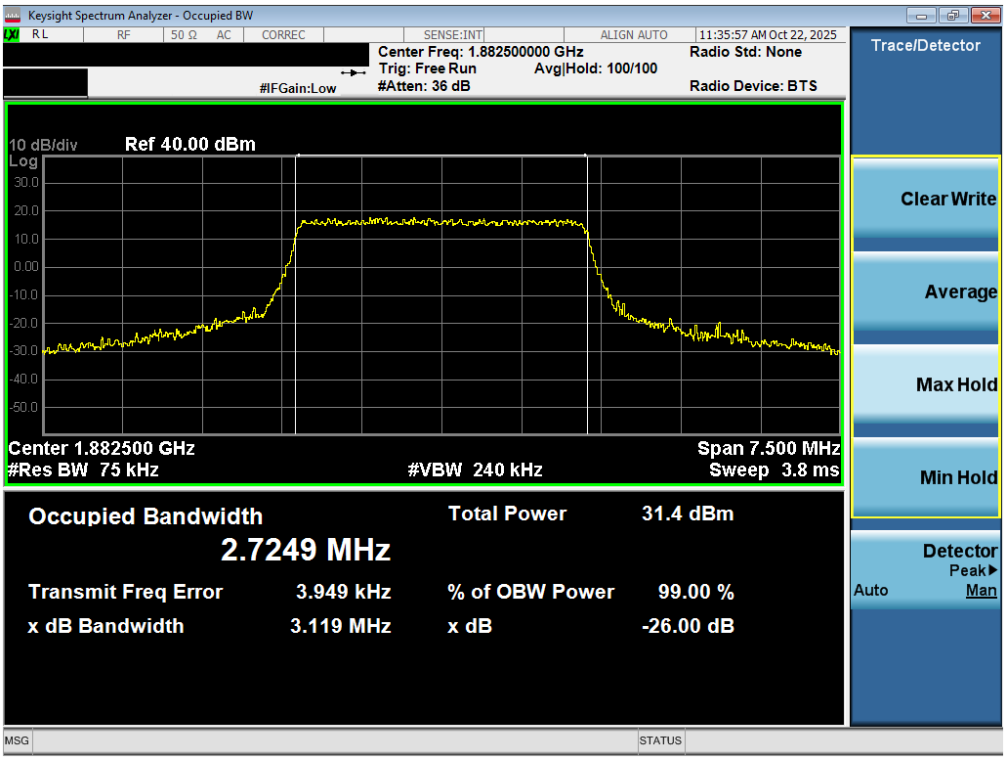
Plot 7-42. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB - Ant2)



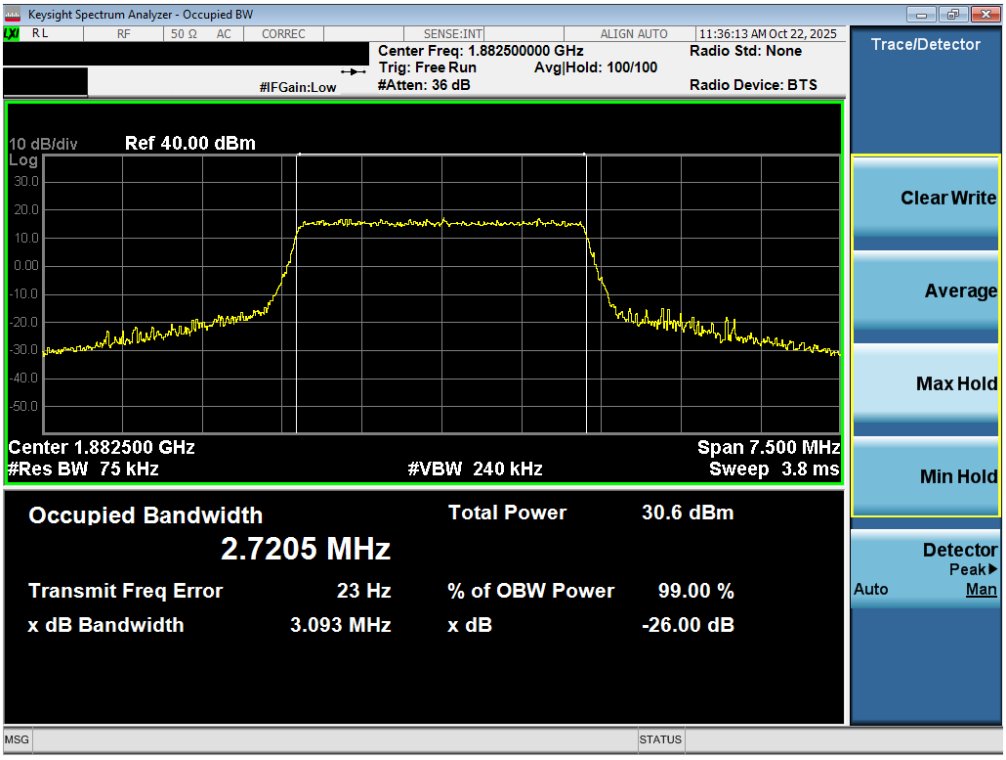
Plot 7-43. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB - Ant2)



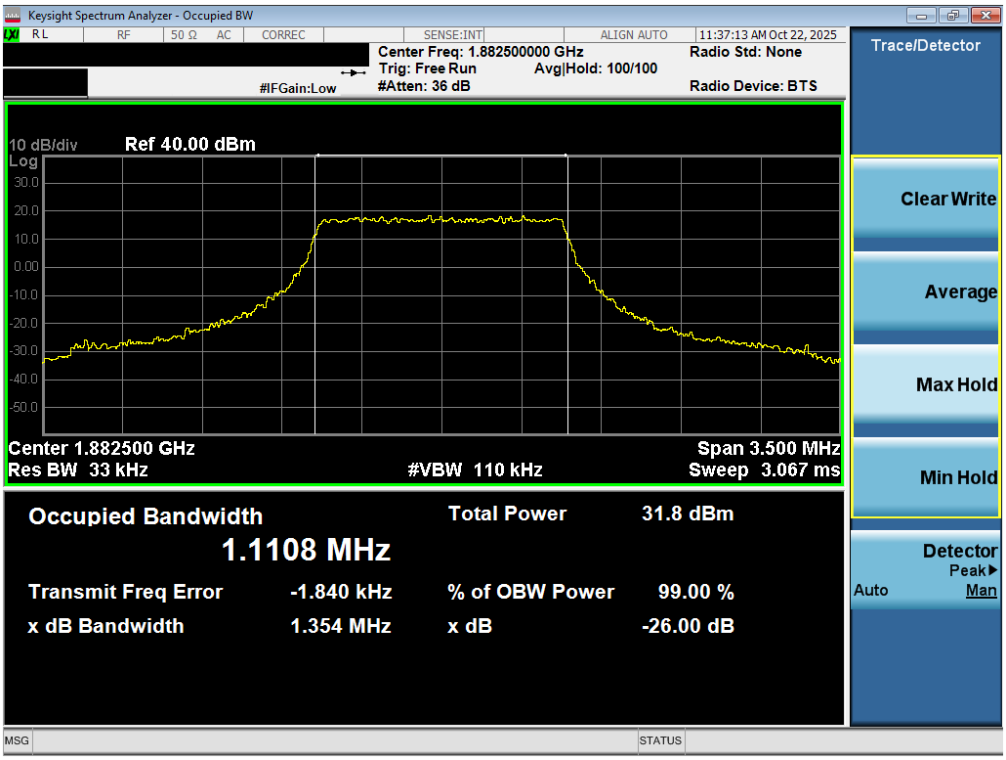
Plot 7-44. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB - Ant2)



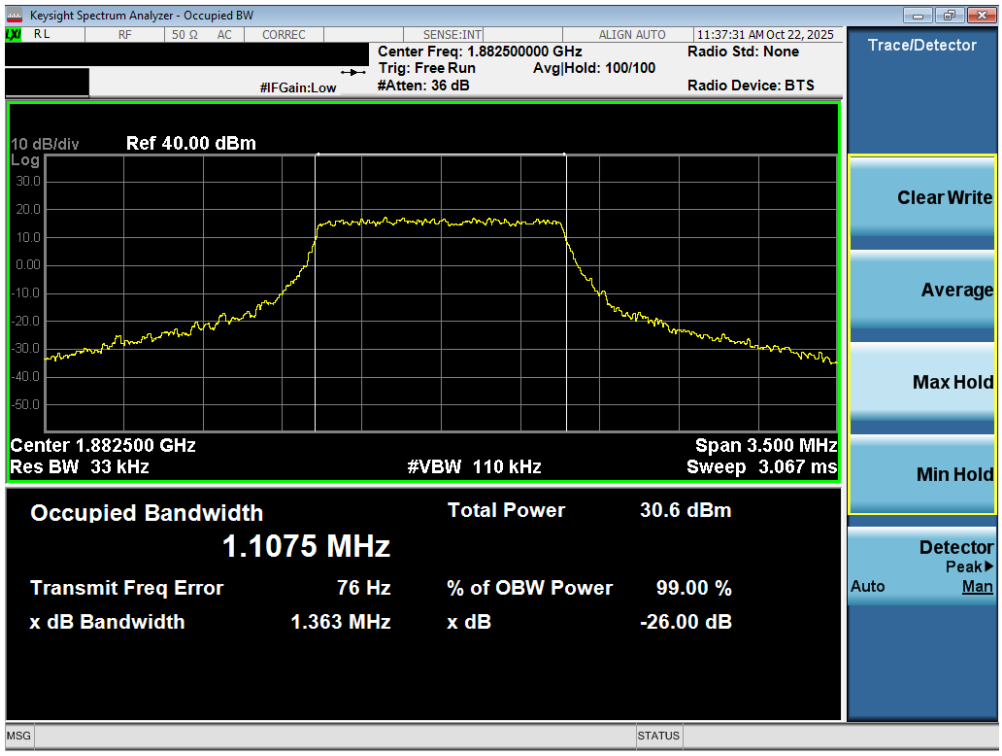
Plot 7-45. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB - Ant2)



Plot 7-46. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB - Ant2)

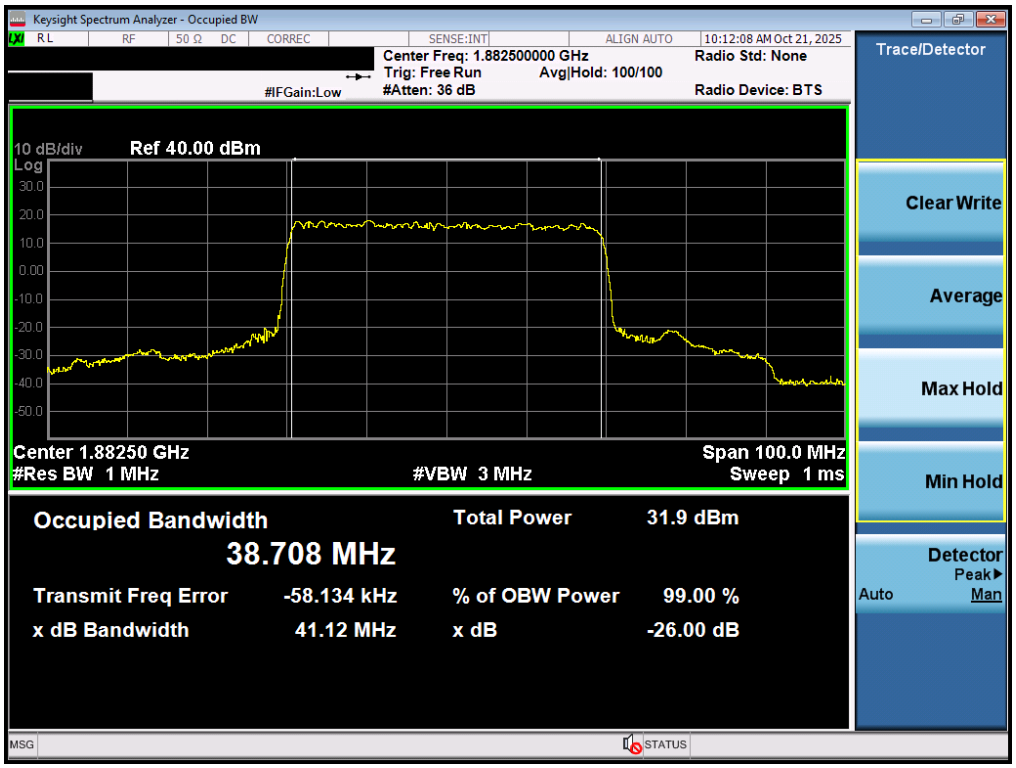


Plot 7-47. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB - Ant2)

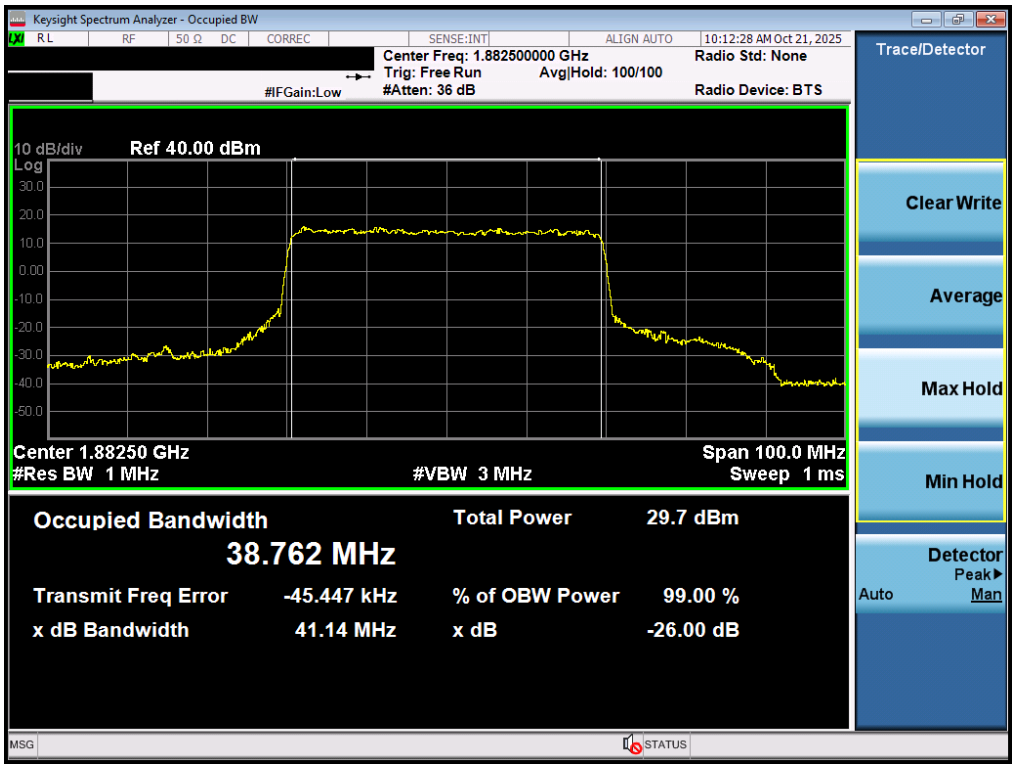


Plot 7-48. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB - Ant2)

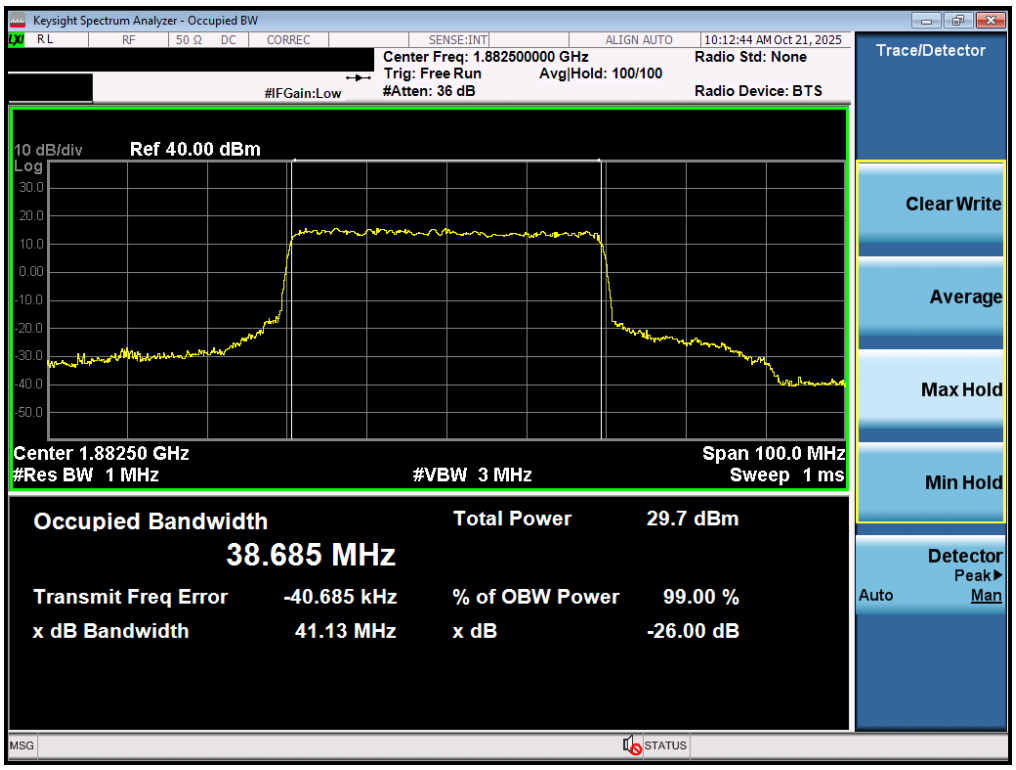
NR Band n25/2 – Ant2



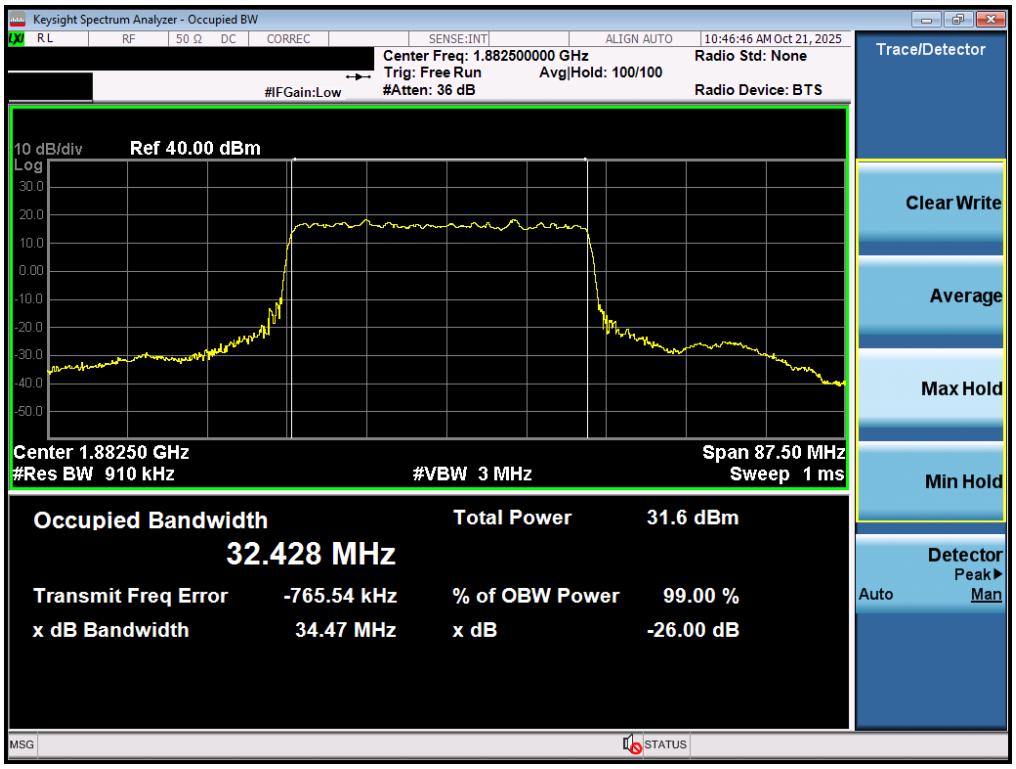
Plot 7-49. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



Plot 7-50. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM QPSK - Full RB - ANT2)

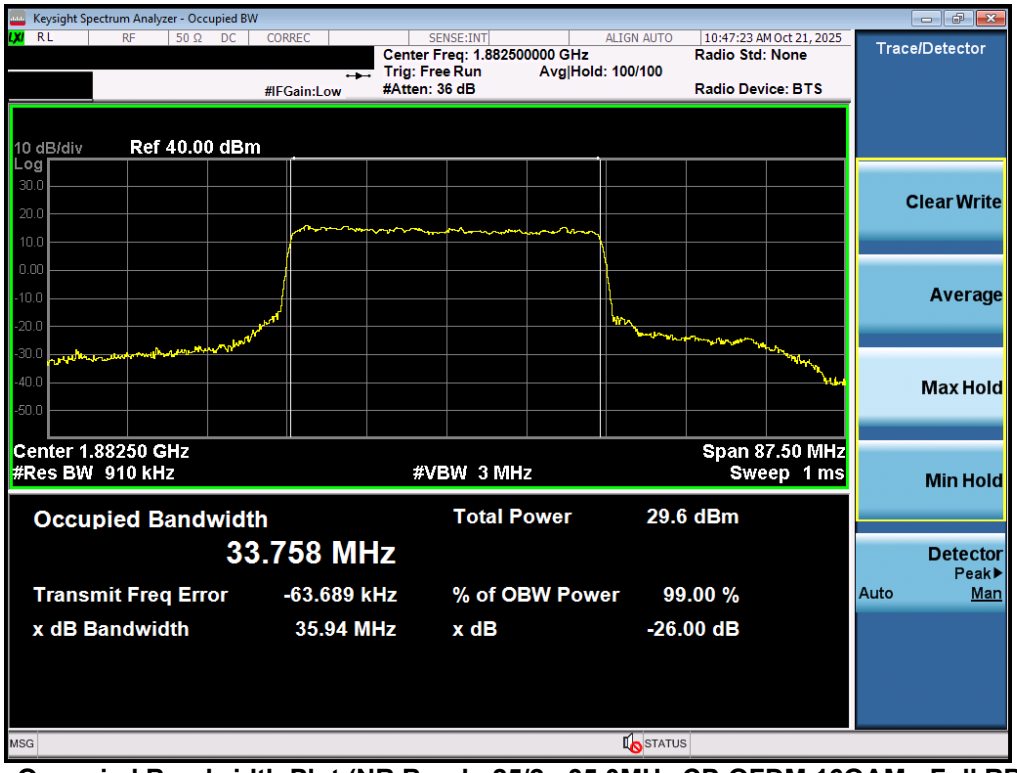


Plot 7-51. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM 16QAM - Full RB - ANT2)

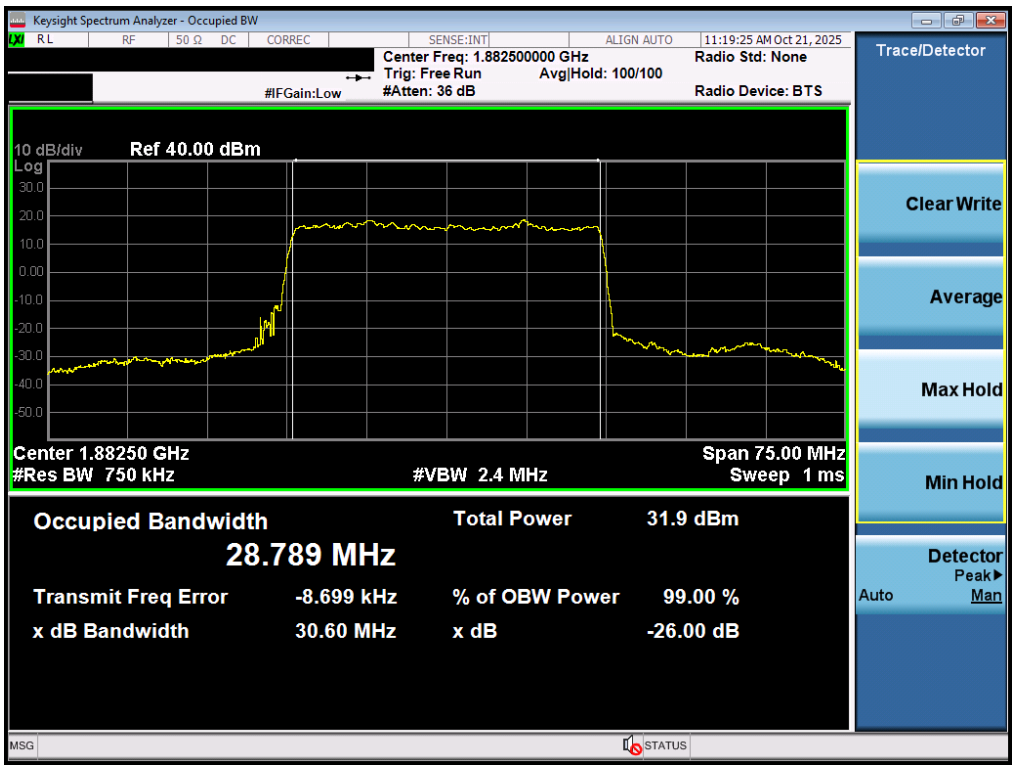


Plot 7-52. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)

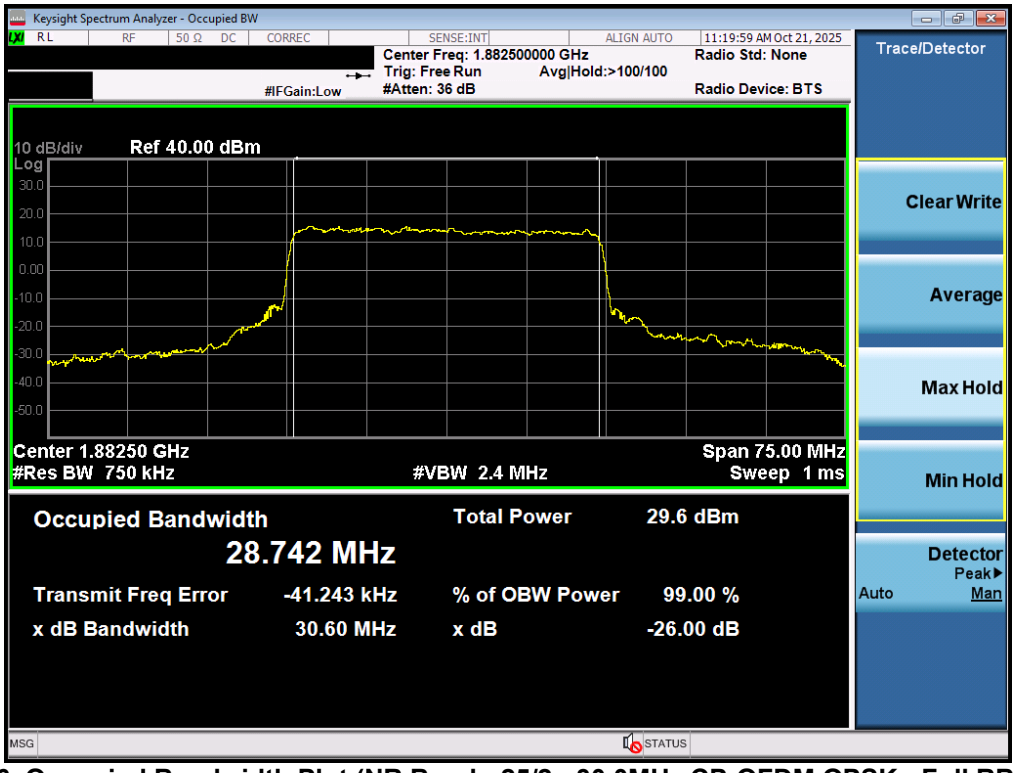
Plot 7-53. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM QPSK - Full RB - ANT2)



Plot 7-54. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM 16QAM - Full RB - ANT2)

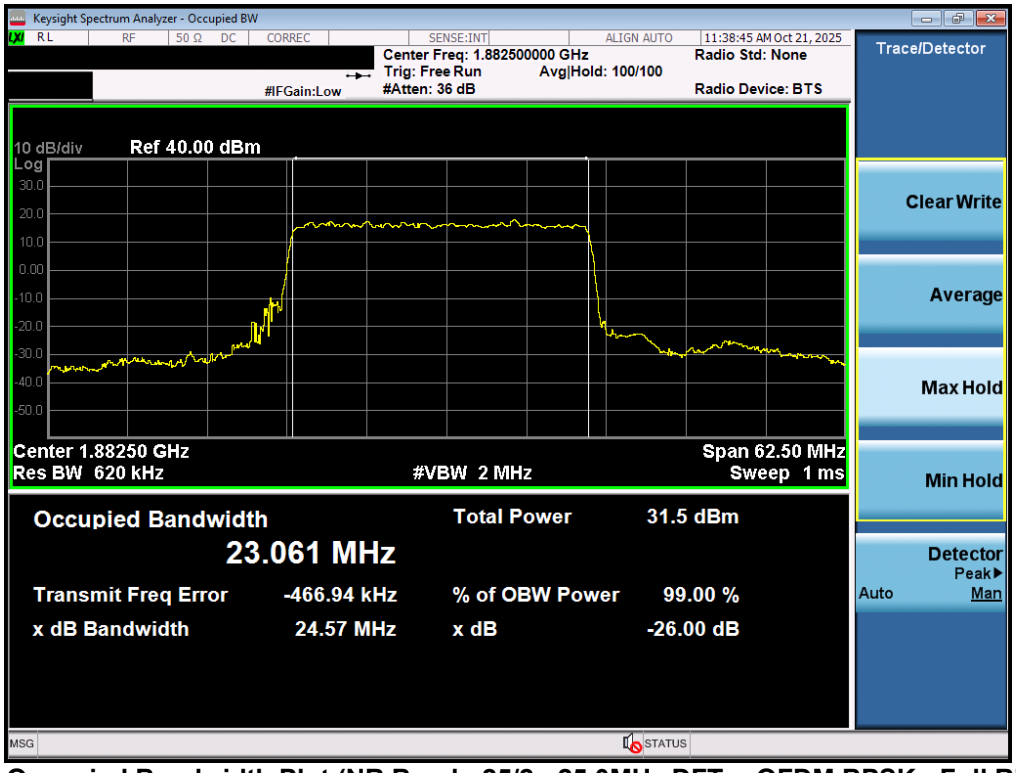


Plot 7-55. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



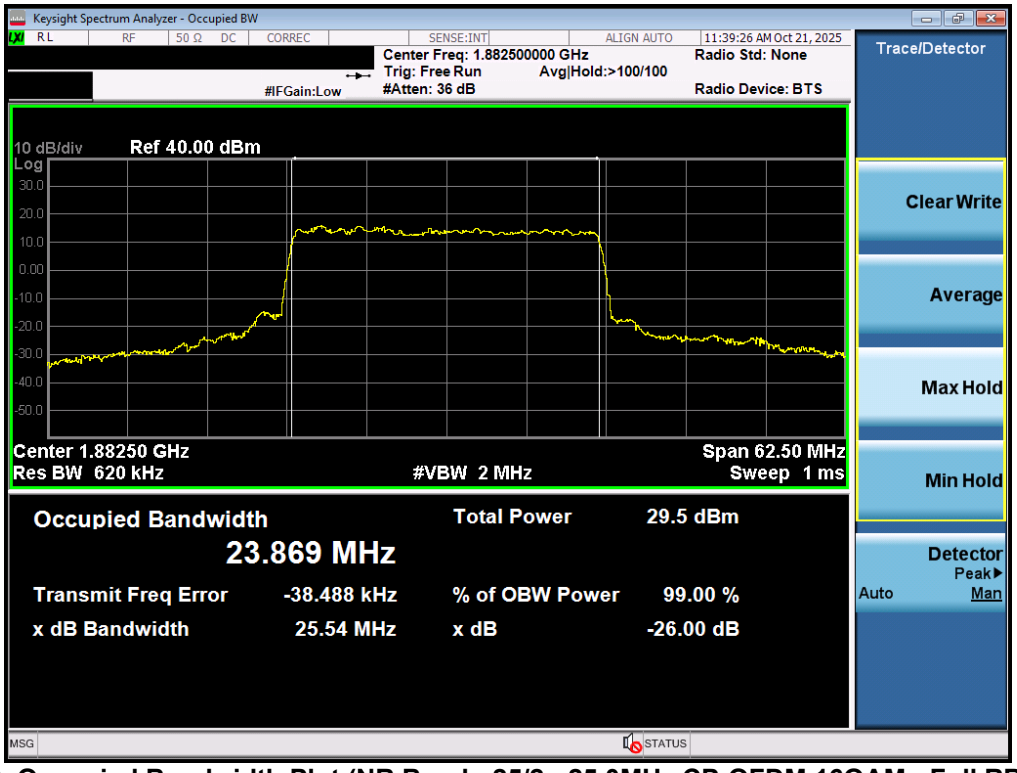
Plot 7-56. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM QPSK - Full RB - ANT2)

Plot 7-57. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM 16QAM - Full RB - ANT2)

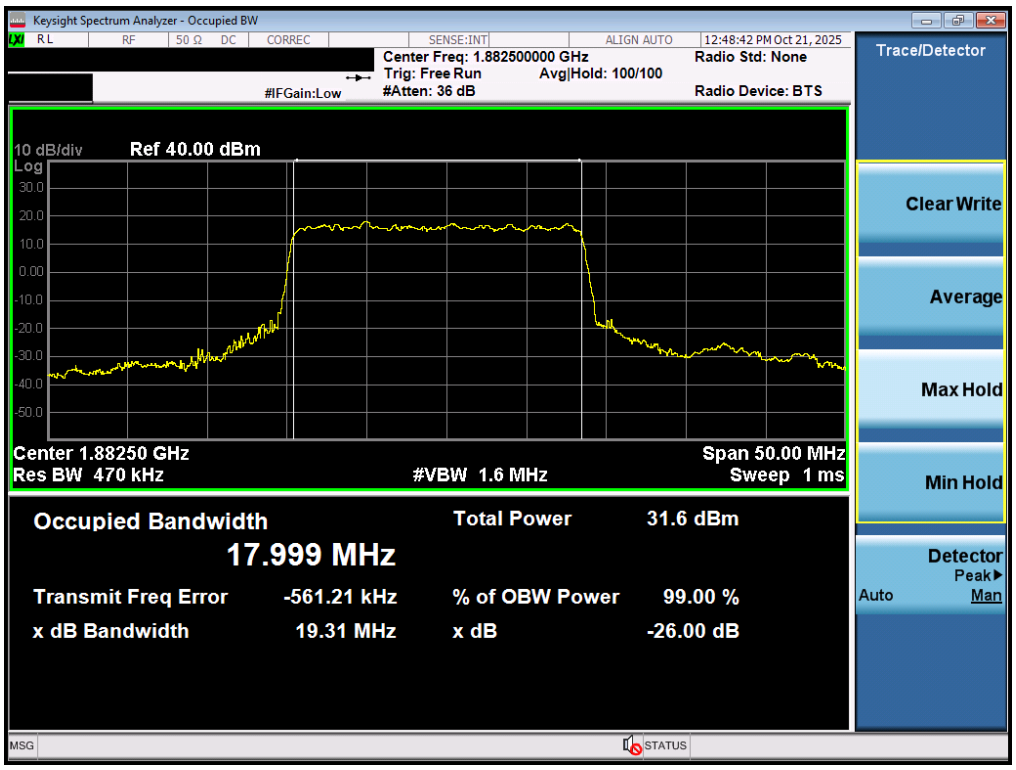


Plot 7-58. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)

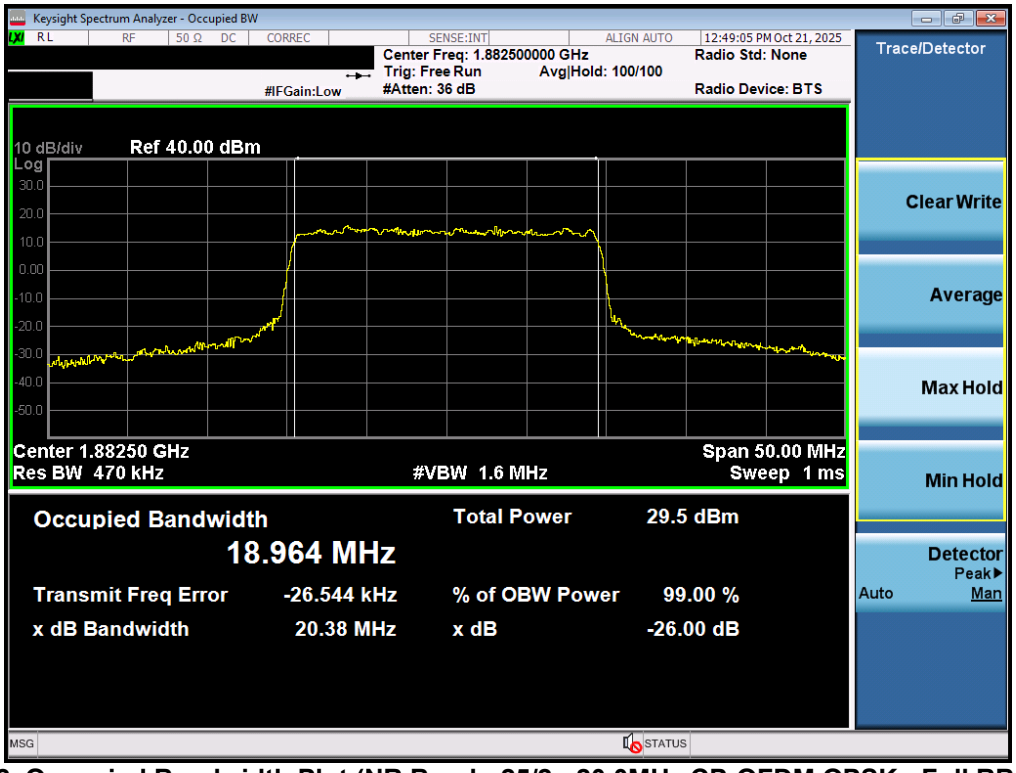
Plot 7-59. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM QPSK - Full RB - ANT2)



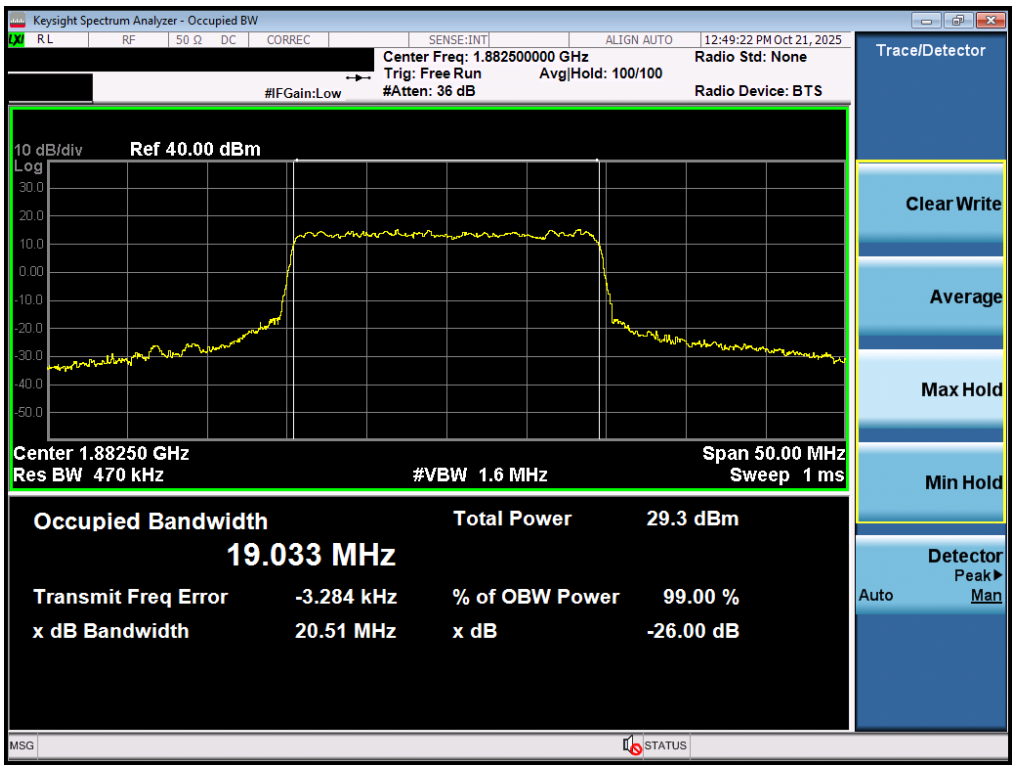
Plot 7-60. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM 16QAM - Full RB - ANT2)



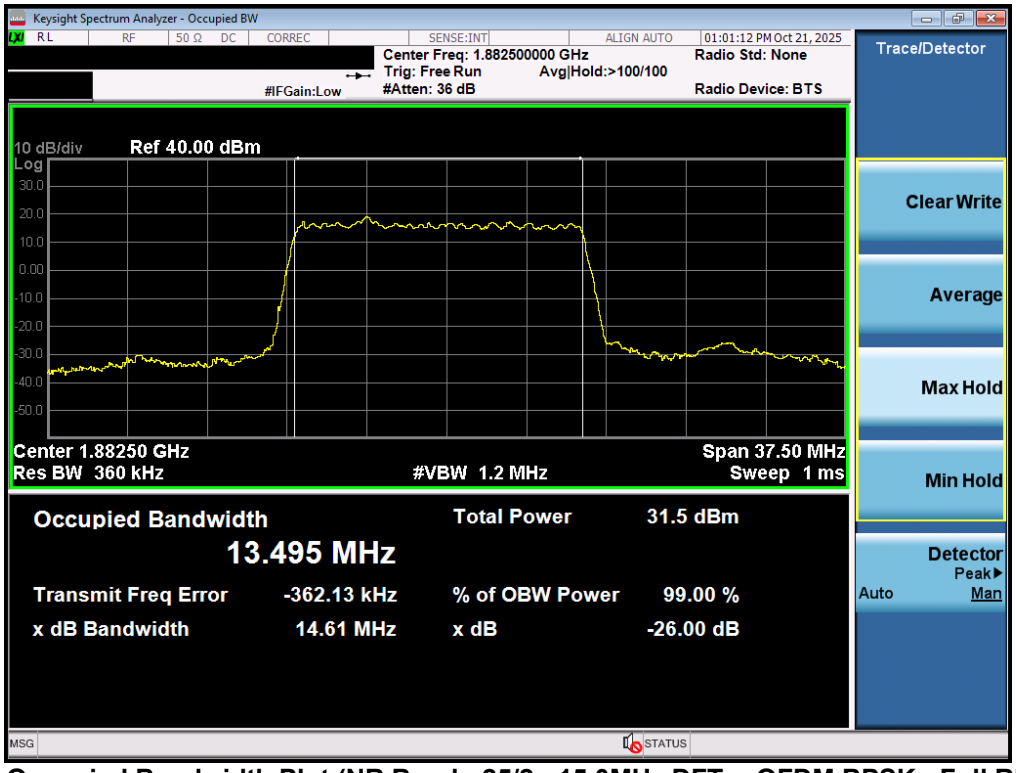
Plot 7-61. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



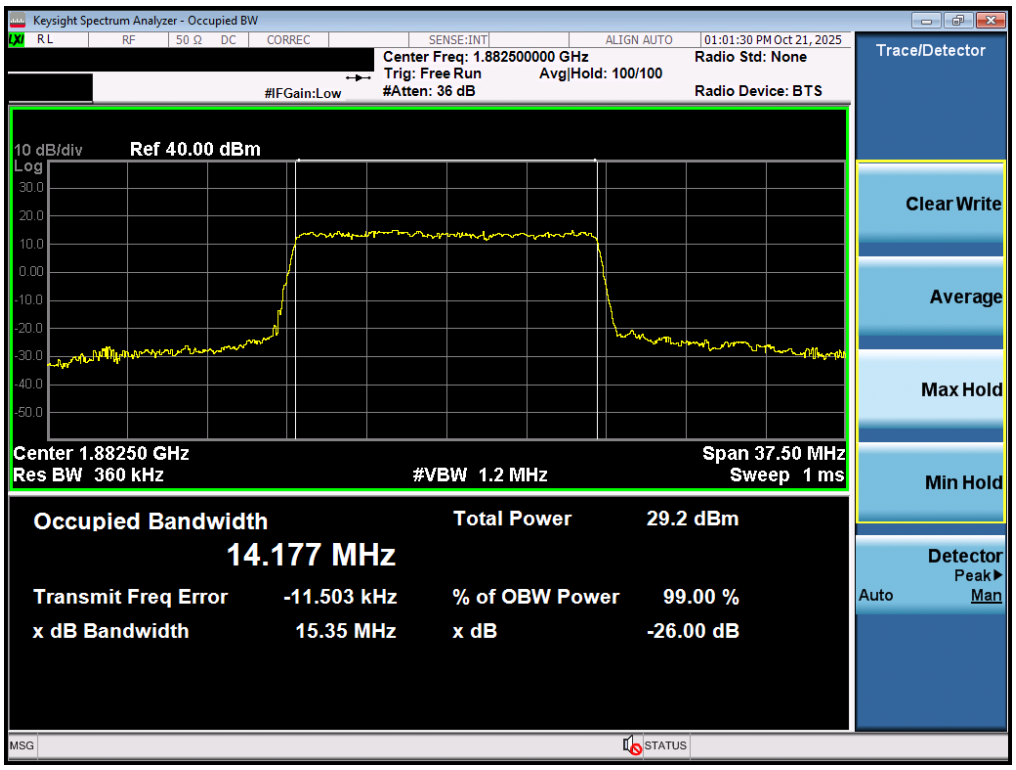
Plot 7-62. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB - ANT2)



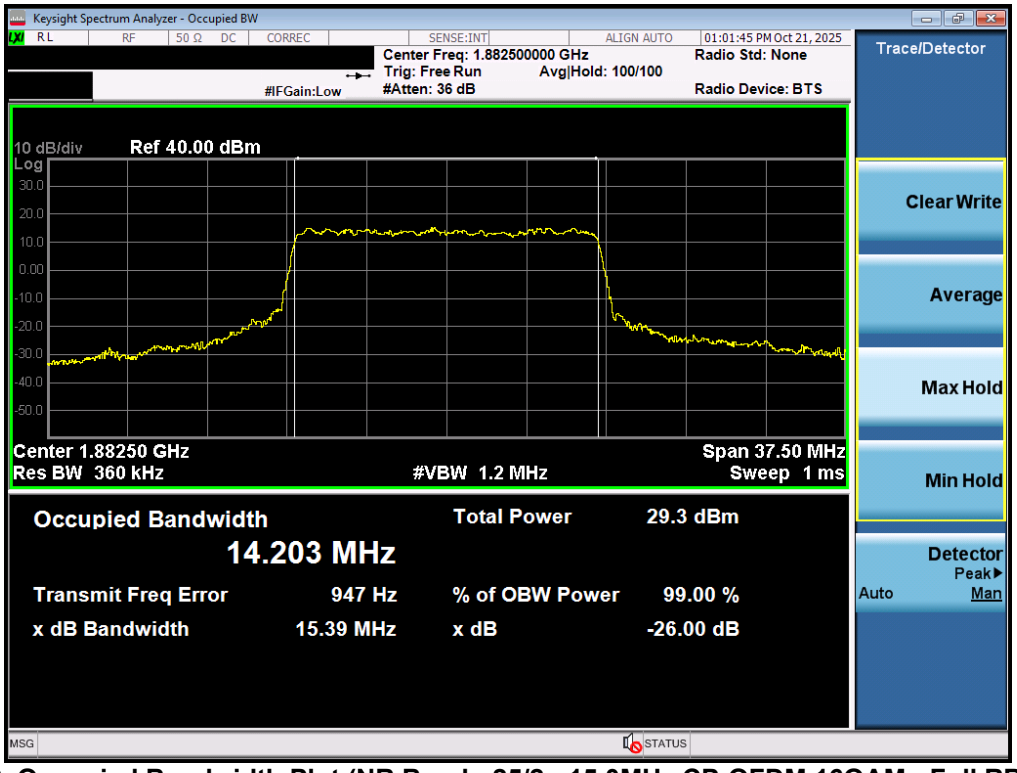
Plot 7-63. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT2)



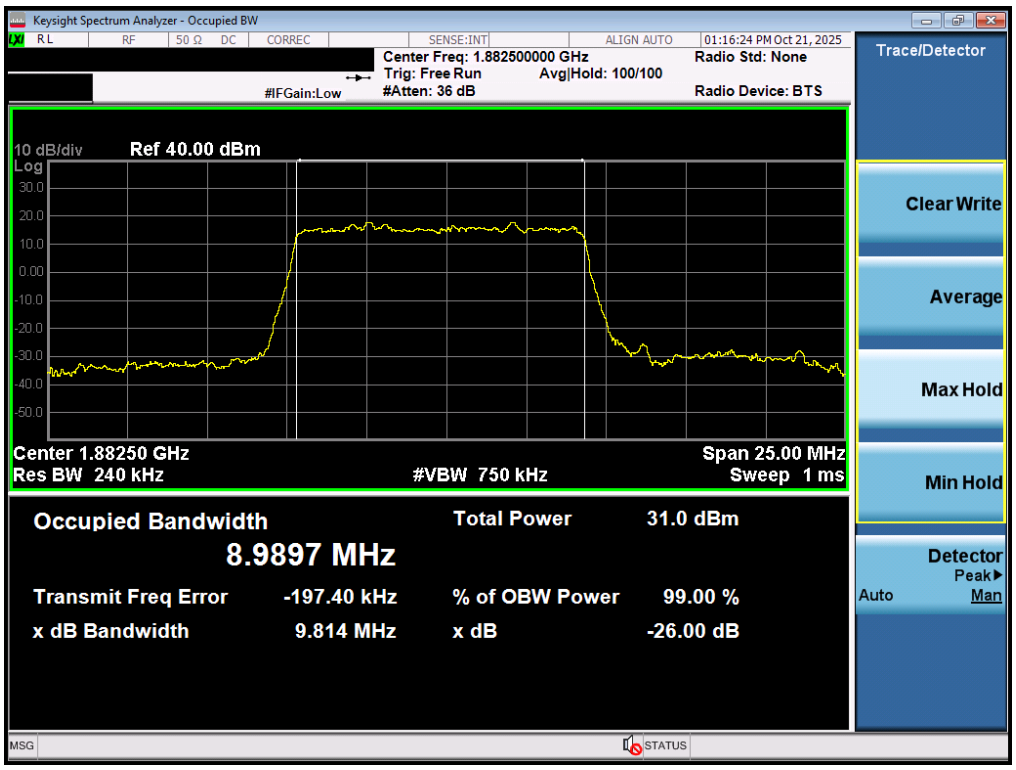
Plot 7-64. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



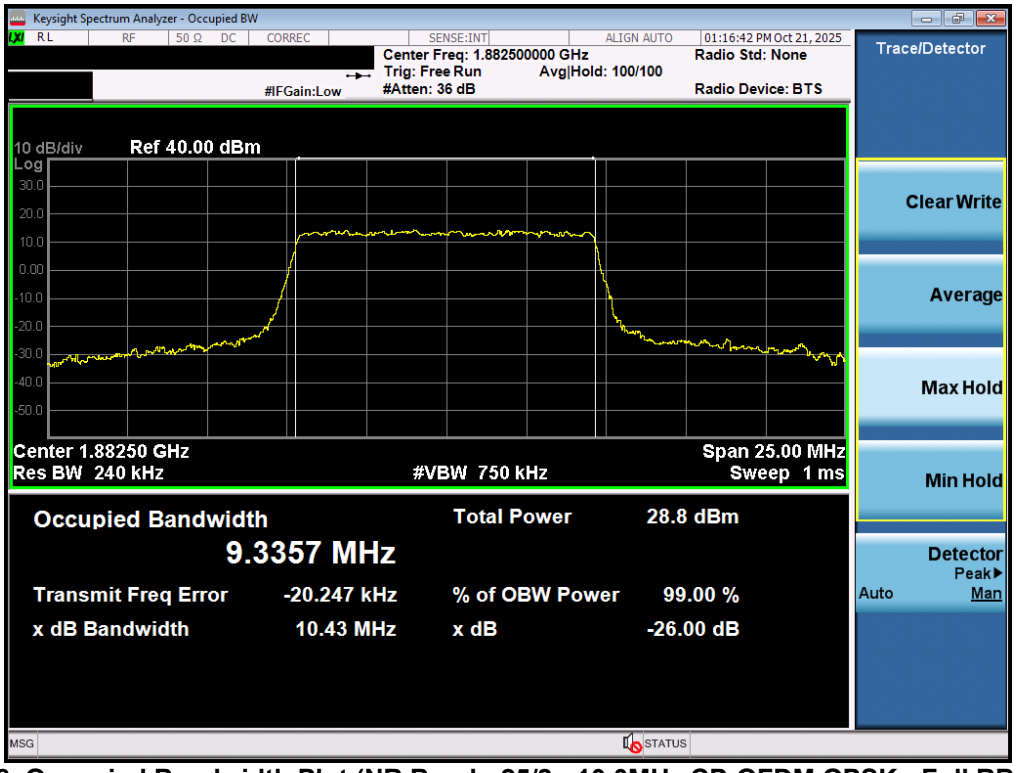
Plot 7-65. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT2)



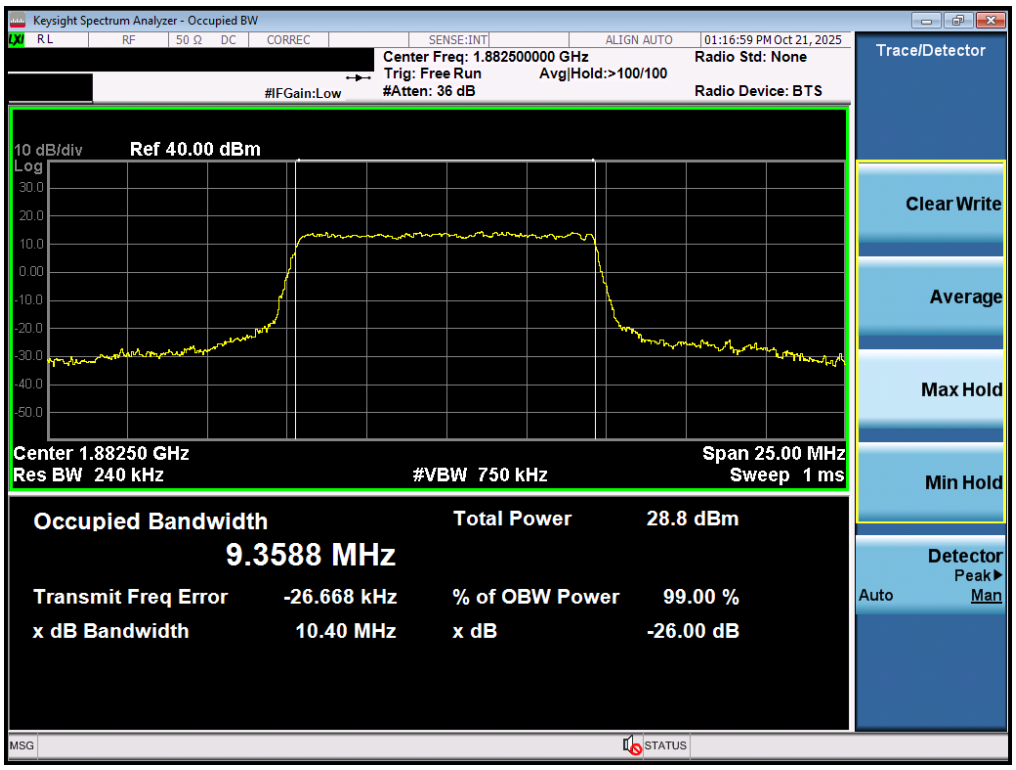
Plot 7-66. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT2)



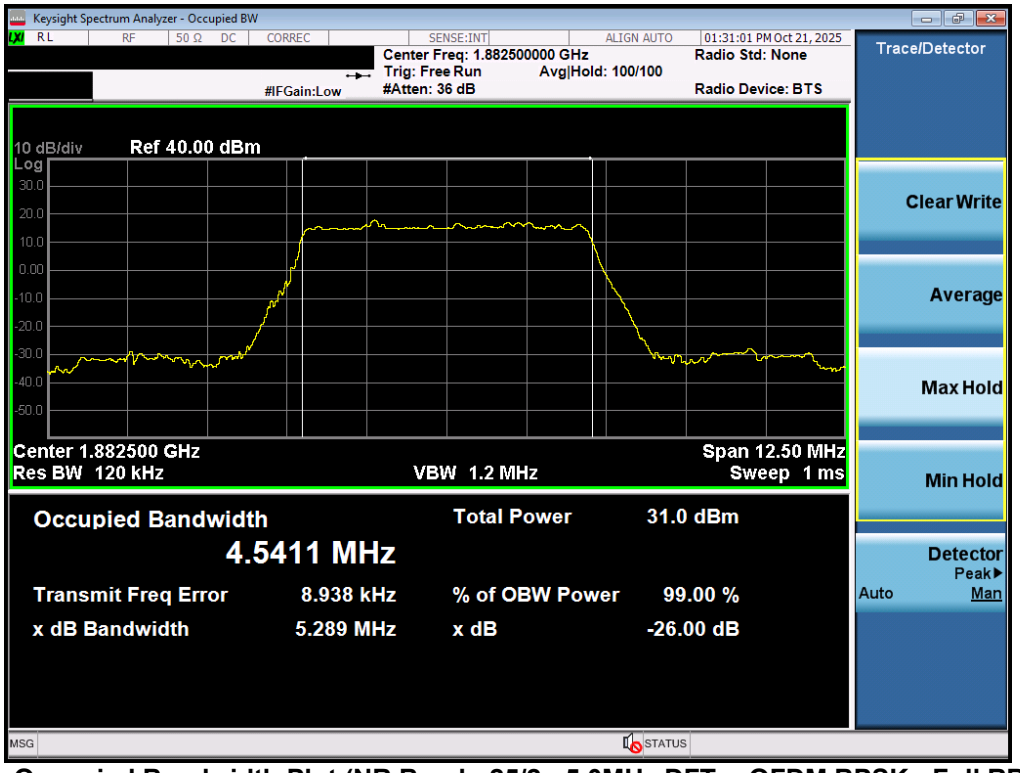
Plot 7-67. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



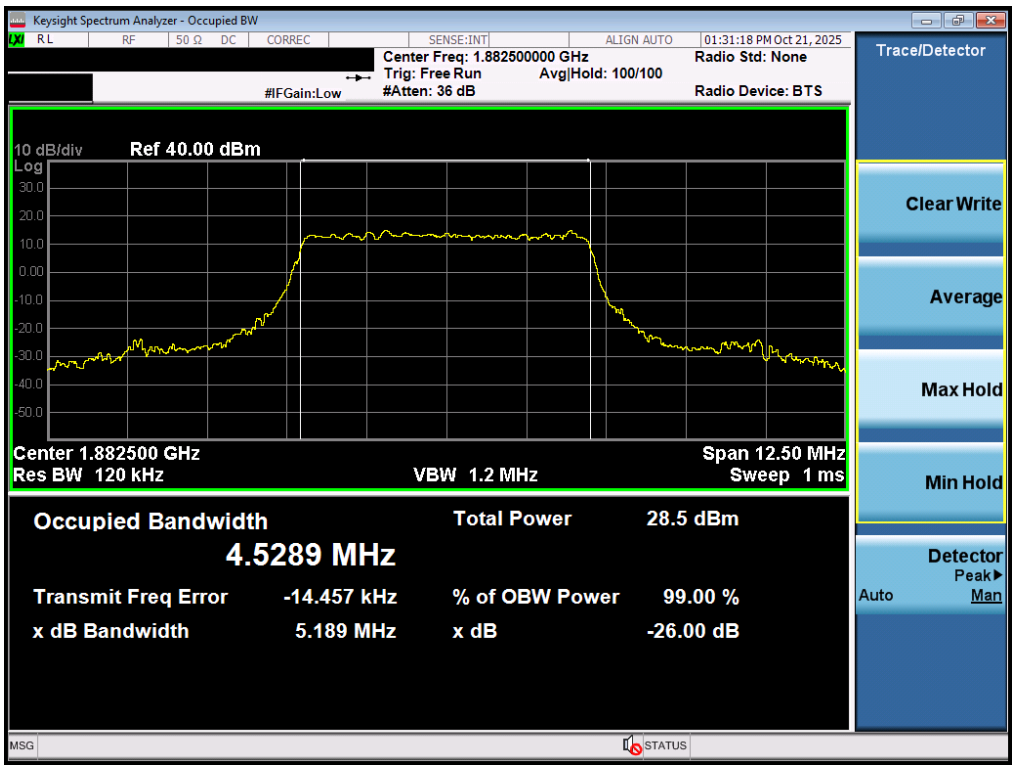
Plot 7-68. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB - ANT2)



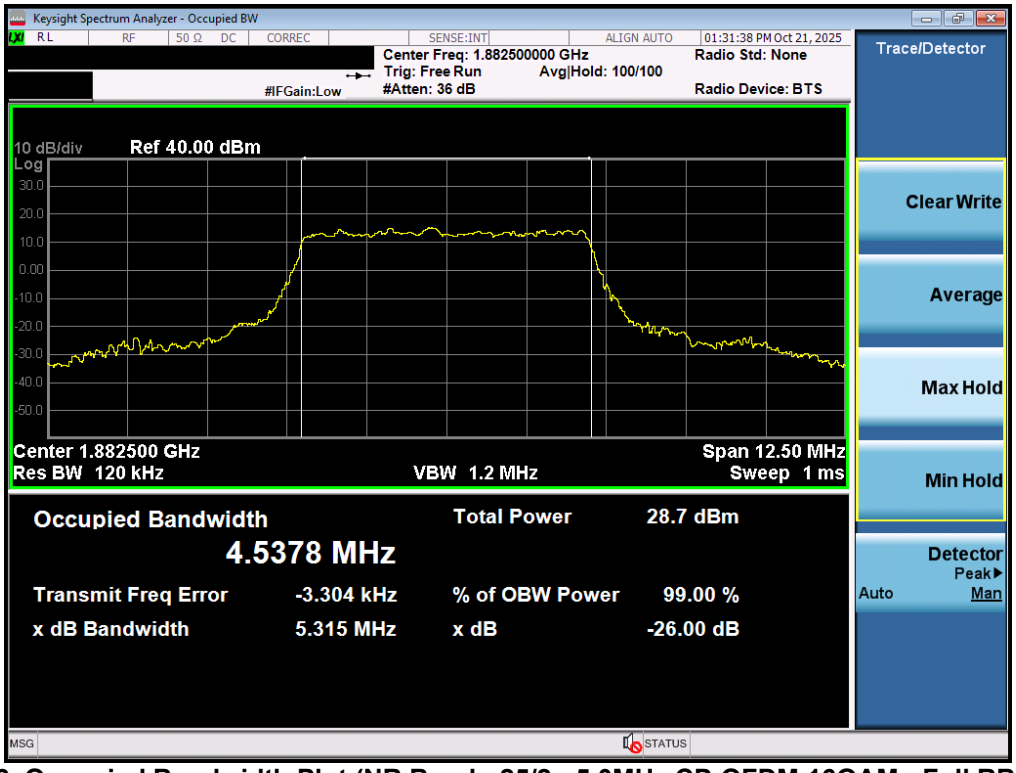
Plot 7-69. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT2)



Plot 7-70. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)



Plot 7-71. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT2)



Plot 7-72. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT2)

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26:2015 – Section 5.7.4

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

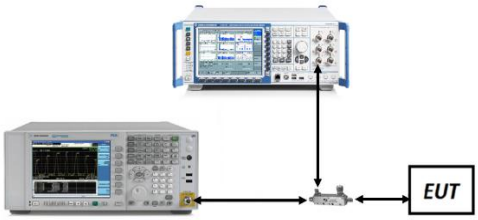


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

1. Per Part 24 and RSS-133, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

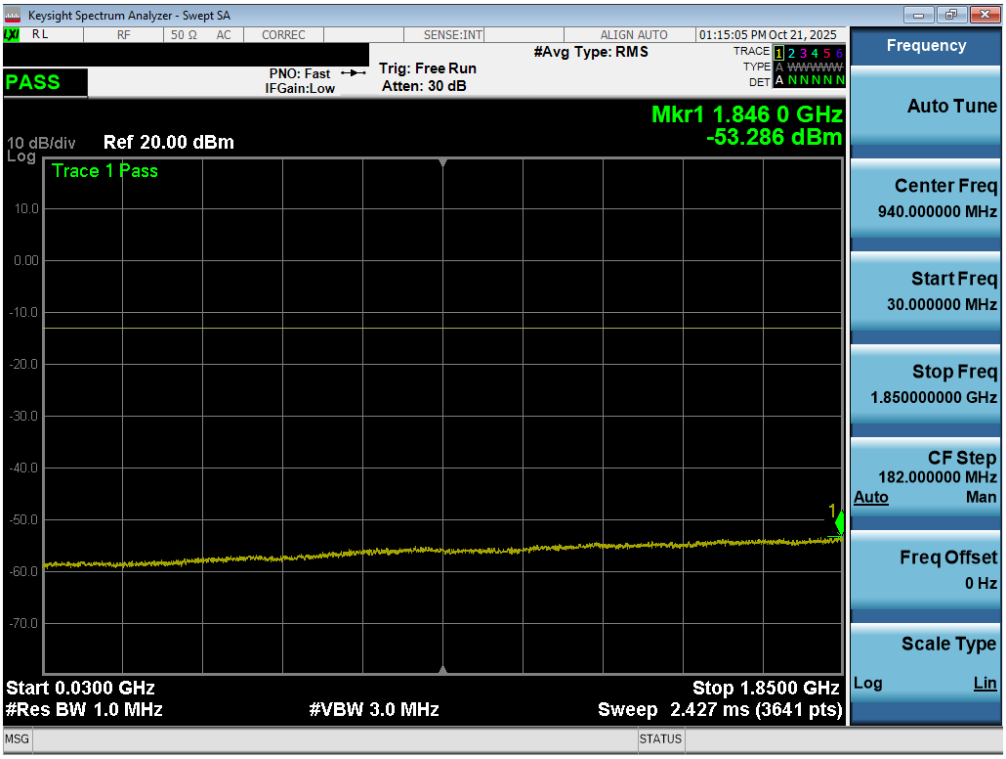
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-PCS	250kHz	Low	30.0 - 1845.0	-49.40	-13	-36.40
		Low	1910.0 - 10000.0	-42.86	-13	-29.86
		Low	10000.0 - 20000.0	-57.85	-13	-44.85
		Mid	30.0 - 1850.0	-50.03	-13	-37.03
		Mid	1910.0 - 10000.0	-42.55	-13	-29.55
		Mid	10000.0 - 20000.0	-58.23	-13	-45.23
		High	30.0 - 1850.0	-50.01	-13	-37.01
		High	1915.0 - 10000.0	-42.89	-13	-29.89
		High	10000.0 - 20000.0	-58.21	-13	-45.21
WCDMA-PCS	5MHz	Low	30.0 - 1845.0	-35.32	-13	-22.32
		Low	1910.0 - 10000.0	-47.44	-13	-34.44
		Low	10000.0 - 20000.0	-63.43	-13	-50.43
		Mid	30.0 - 1850.0	-54.26	-13	-41.26
		Mid	1910.0 - 10000.0	-47.75	-13	-34.75
		Mid	10000.0 - 20000.0	-63.73	-13	-50.73
		High	30.0 - 1850.0	-54.62	-13	-41.62
		High	1915.0 - 10000.0	-38.41	-13	-25.41
		High	10000.0 - 20000.0	-63.98	-13	-50.98
LTE-B25-2	20MHz	Low	30.0 - 1849.0	-52.20	-13	-39.20
		Low	1915.0 - 10000.0	-49.99	-13	-36.99
		Low	10000.0 - 20000.0	-61.93	-13	-48.93
		Mid	30.0 - 1850.0	-53.29	-13	-40.29
		Mid	1915.0 - 10000.0	-49.70	-13	-36.70
		Mid	10000.0 - 20000.0	-61.73	-13	-48.73
		High	30.0 - 1850.0	-53.56	-13	-40.56
		High	1916.0 - 10000.0	-49.96	-13	-36.96
		High	10000.0 - 20000.0	-61.94	-13	-48.94

Table 7-8. Conducted Emission Test Results – LTE - Ant1

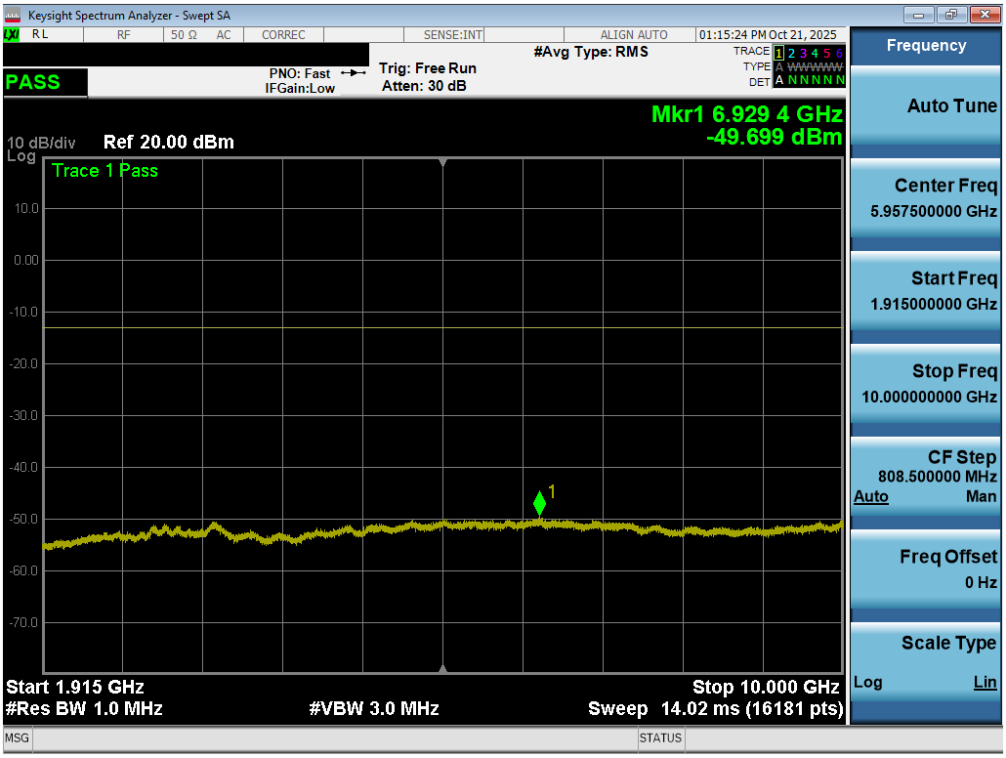
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n25-2	40MHz	Low	30.0 - 1849.0	-52.87	-13	-39.87
		Low	1915.0 - 10000.0	-51.04	-13	-38.04
		Low	10000.0 - 20000.0	-65.31	-13	-52.31
		Mid	30.0 - 1850.0	-53.62	-13	-40.62
		Mid	1915.0 - 10000.0	-51.25	-13	-38.25
		Mid	10000.0 - 20000.0	-65.45	-13	-52.45
		High	30.0 - 1850.0	-53.89	-13	-40.89
		High	1916.0 - 10000.0	-50.99	-13	-37.99
		High	10000.0 - 20000.0	-65.34	-13	-52.34

Table 7-9. Conducted Emission Test Results – NR - Ant1

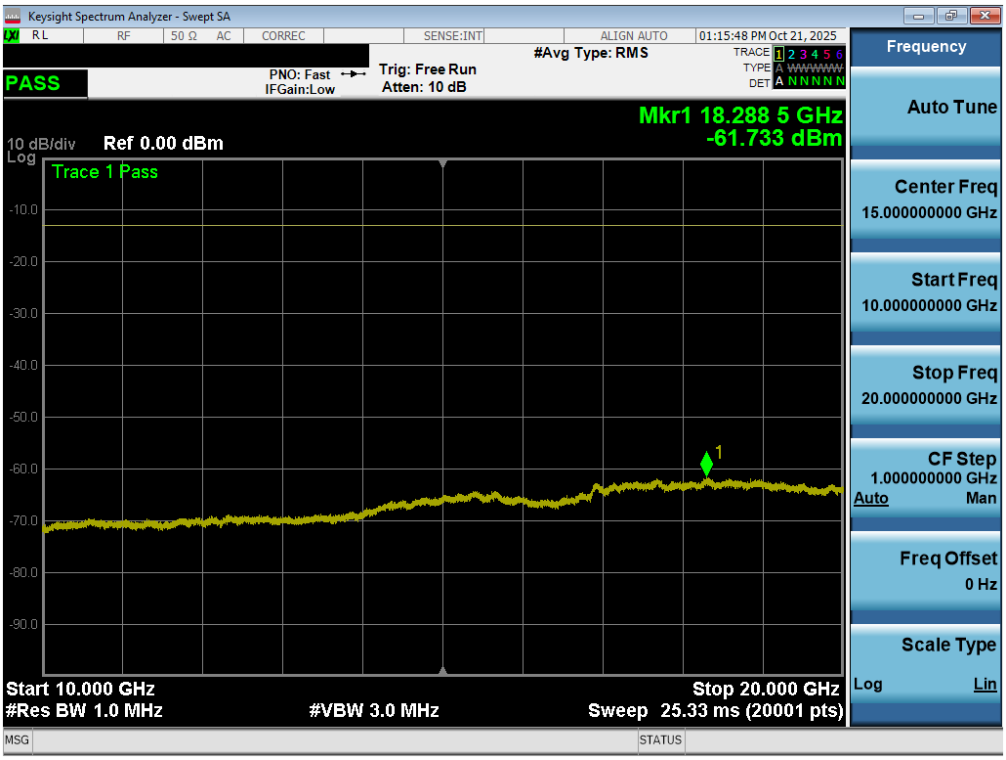
LTE Band 25/2 – Ant1



Plot 7-73. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel - Ant1)

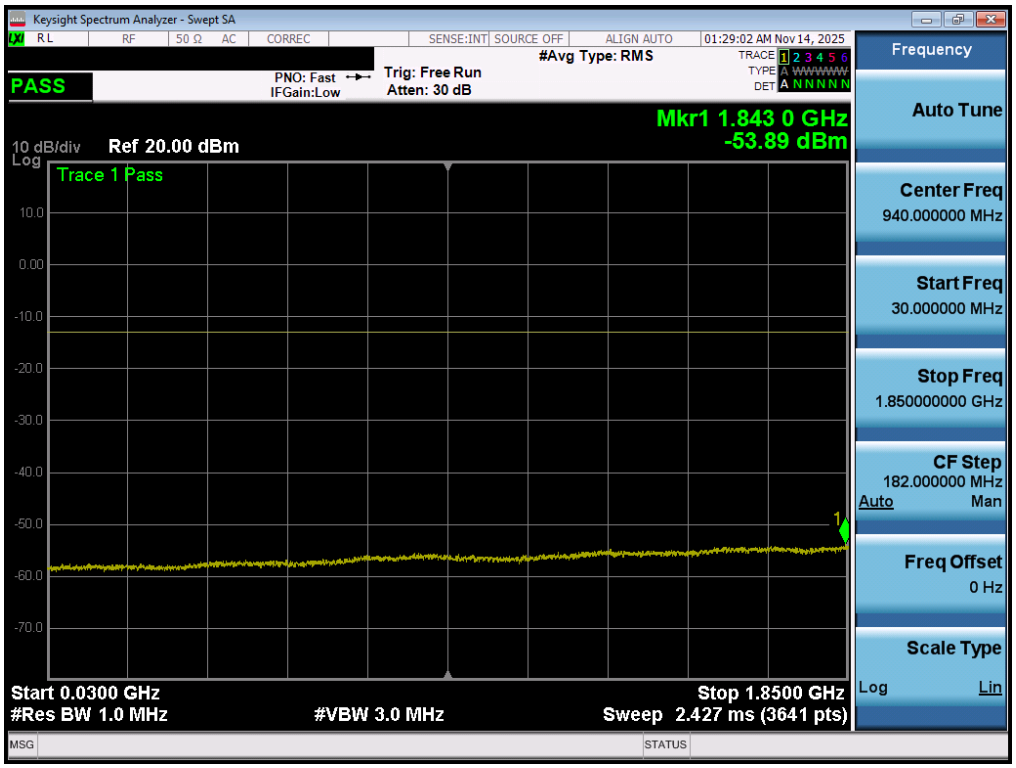


Plot 7-74. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel - Ant1)



Plot 7-75. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel - Ant1)

NR Band n25/2 – Ant1



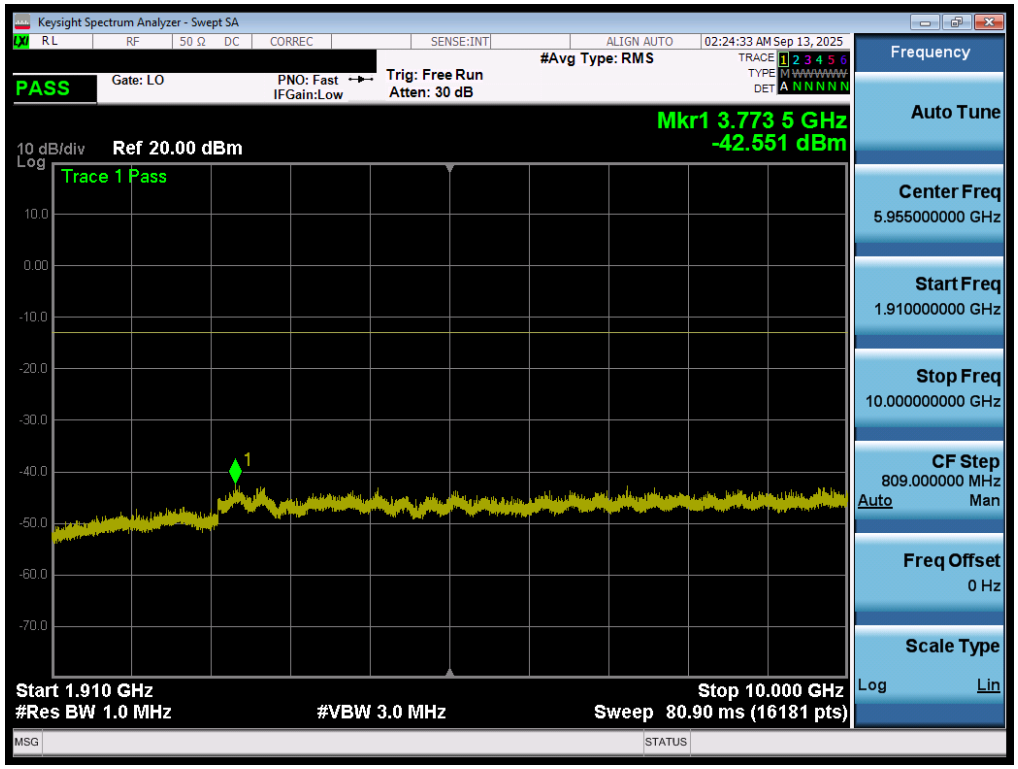
Plot 7-76. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - High Channel - Ant1)

Plot 7-77. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - High Channel - Ant1)

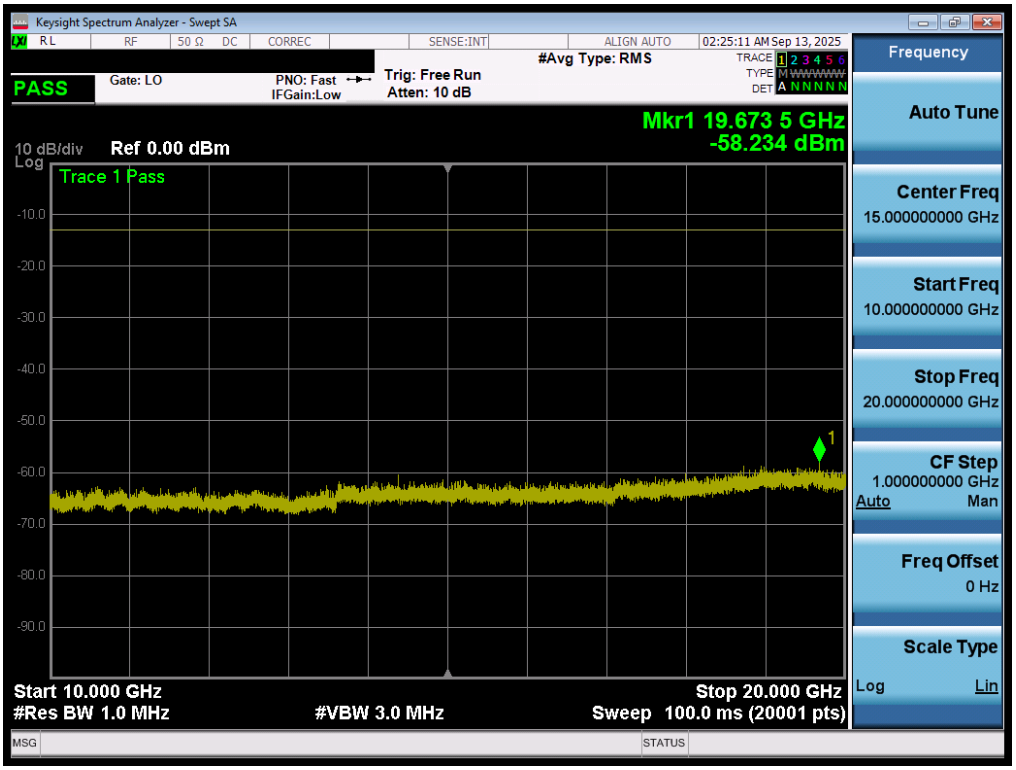
Plot 7-78. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - High Channel - Ant1)

GSM/GPRS PCS – Ant1

Plot 7-79. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)

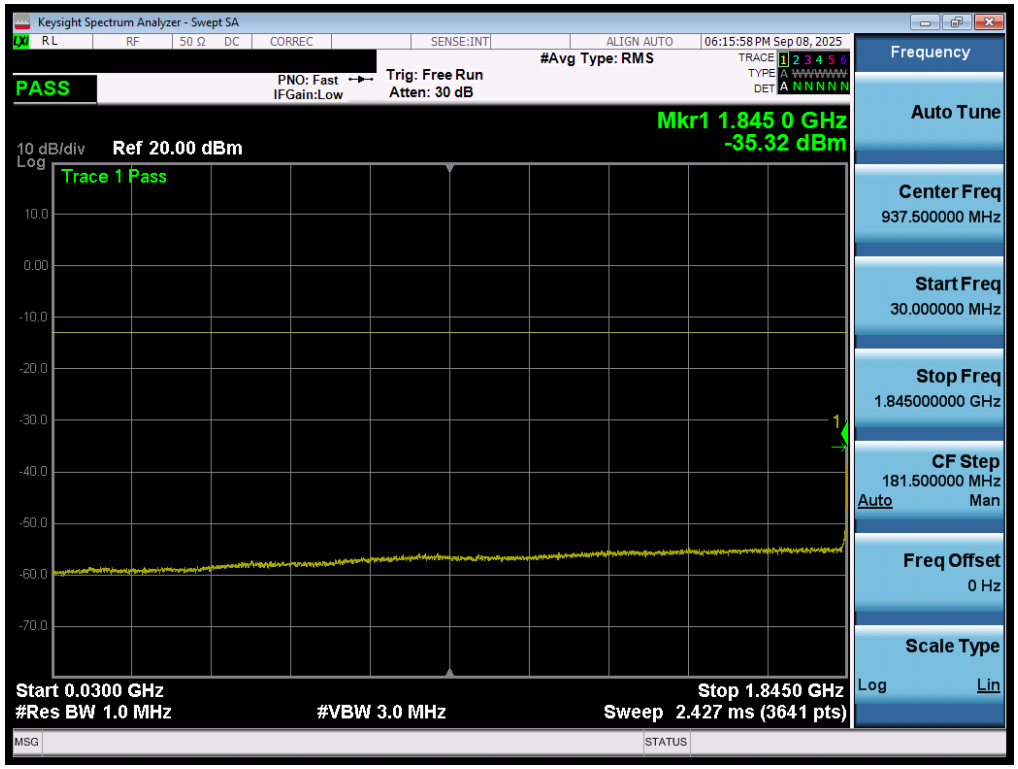


Plot 7-80. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)

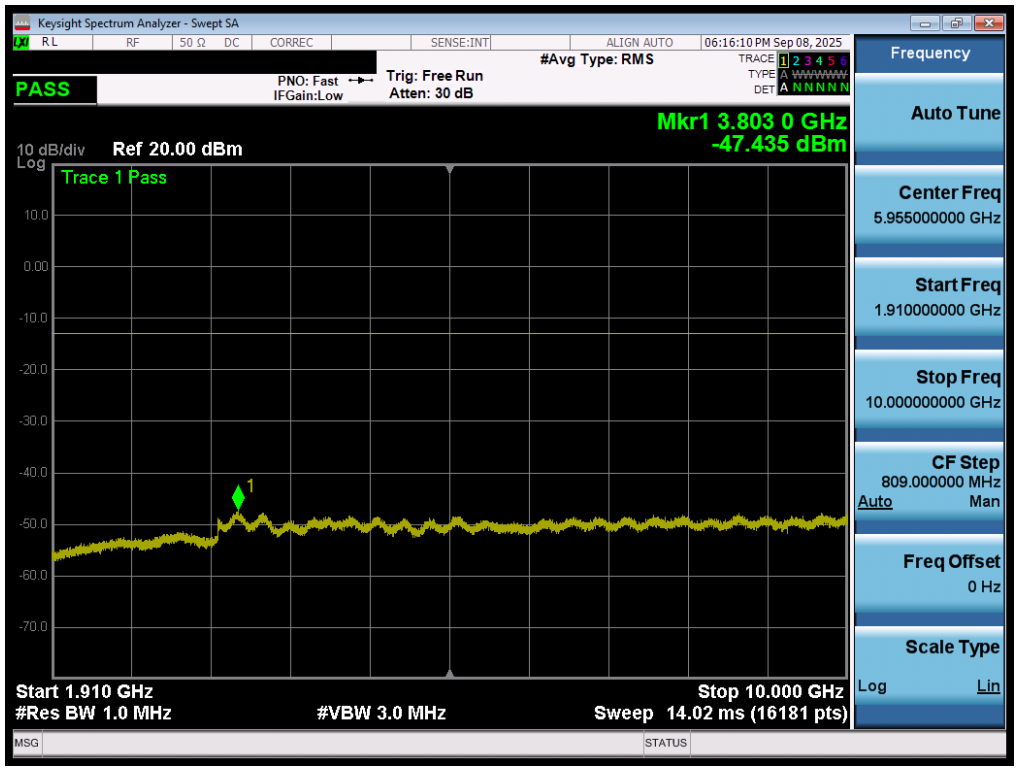


Plot 7-81. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)

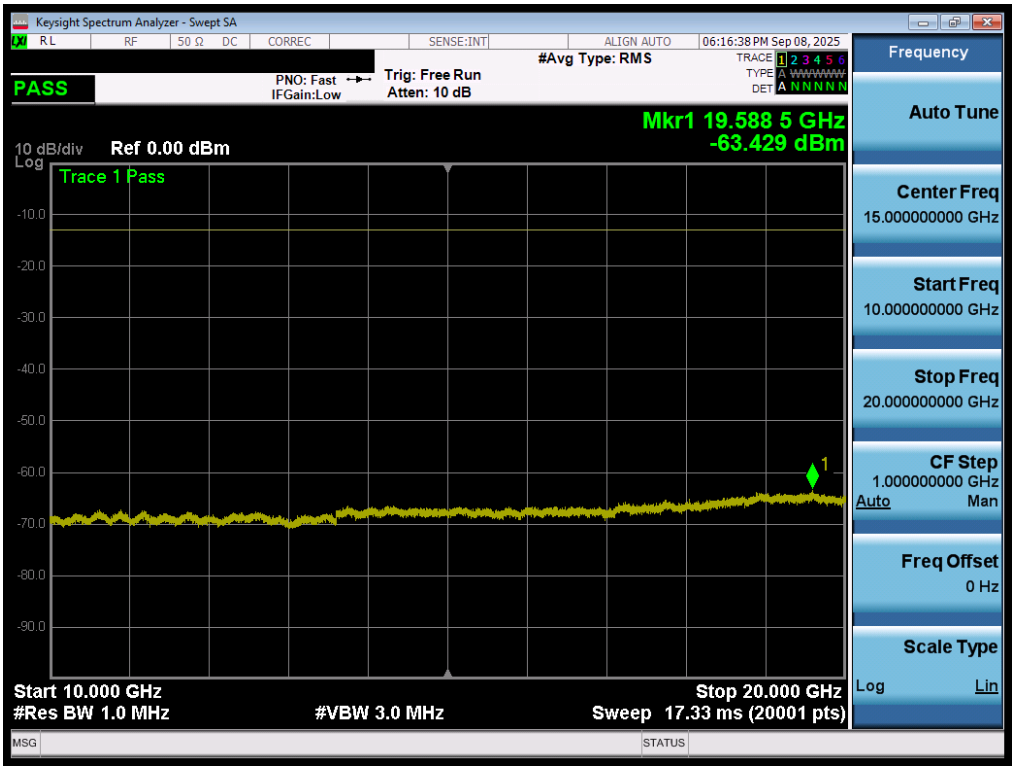
WCDMA PCS – Ant1



Plot 7-82. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)



Plot 7-83. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)



Plot 7-84. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)

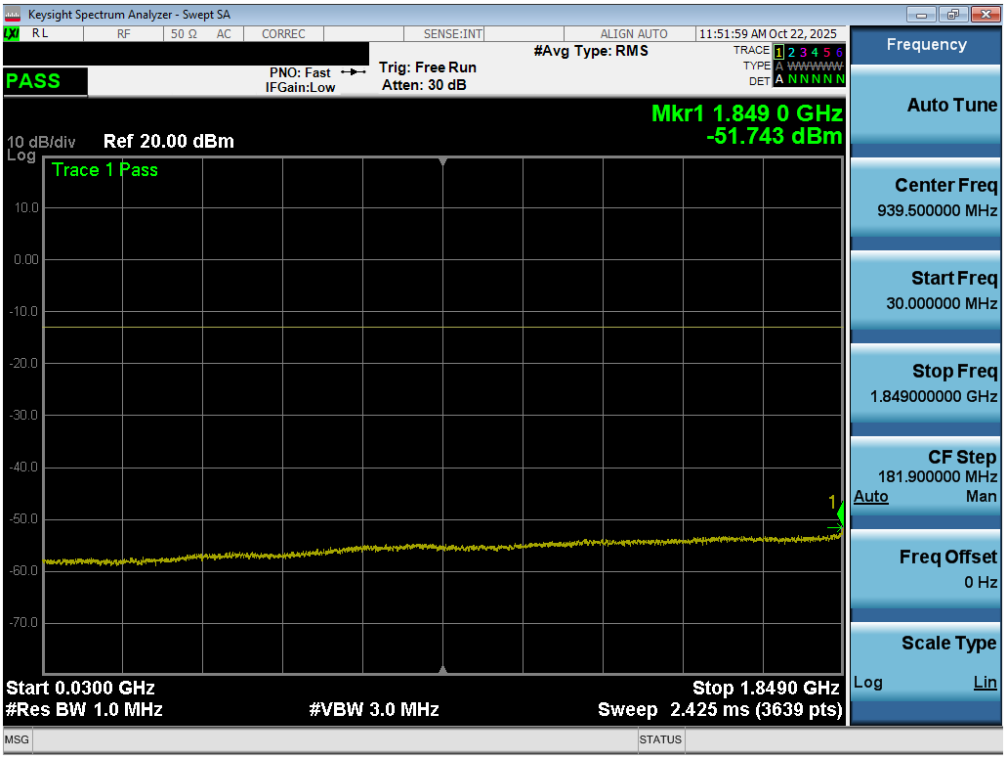
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE-B25-2	20MHz	Low	30.0 - 1849.0	-51.74	-13	-38.74
		Low	1915.0 - 10000.0	-48.59	-13	-35.59
		Low	10000.0 - 20000.0	-62.00	-13	-49.00
		Mid	30.0 - 1850.0	-52.80	-13	-39.80
		Mid	1915.0 - 10000.0	-48.85	-13	-35.85
		Mid	10000.0 - 20000.0	-62.03	-13	-49.03
		High	30.0 - 1850.0	-53.01	-13	-40.01
		High	1916.0 - 10000.0	-48.66	-13	-35.66
		High	10000.0 - 20000.0	-62.05	-13	-49.05

Table 7-10. Conducted Emission Test Results – LTE – Ant2

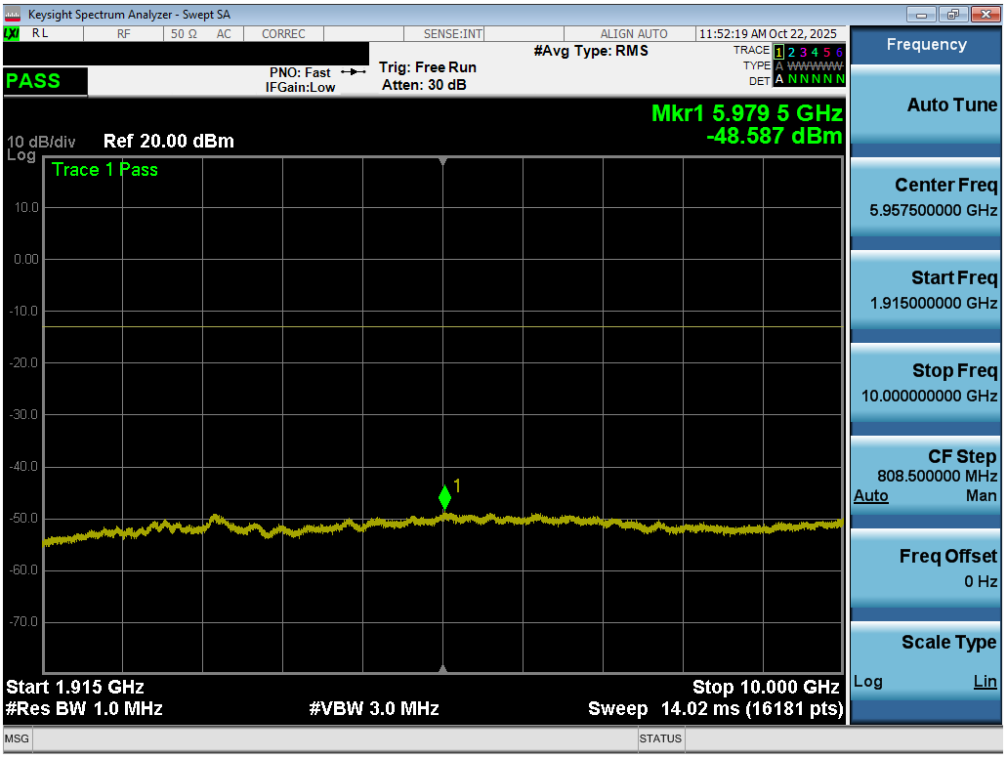
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n25-2	40MHz	Low	30.0 - 1849.0	-52.77	-13	-39.77
		Low	1915.0 - 10000.0	-46.26	-13	-33.26
		Low	10000.0 - 20000.0	-61.52	-13	-48.52
		Mid	30.0 - 1850.0	-53.51	-13	-40.51
		Mid	1915.0 - 10000.0	-46.51	-13	-33.51
		Mid	10000.0 - 20000.0	-61.53	-13	-48.53
		High	30.0 - 1850.0	-53.61	-13	-40.61
		High	1916.0 - 10000.0	-46.59	-13	-33.59
		High	10000.0 - 20000.0	-61.45	-13	-48.45

Table 7-11. Conducted Emission Test Results – NR – Ant2

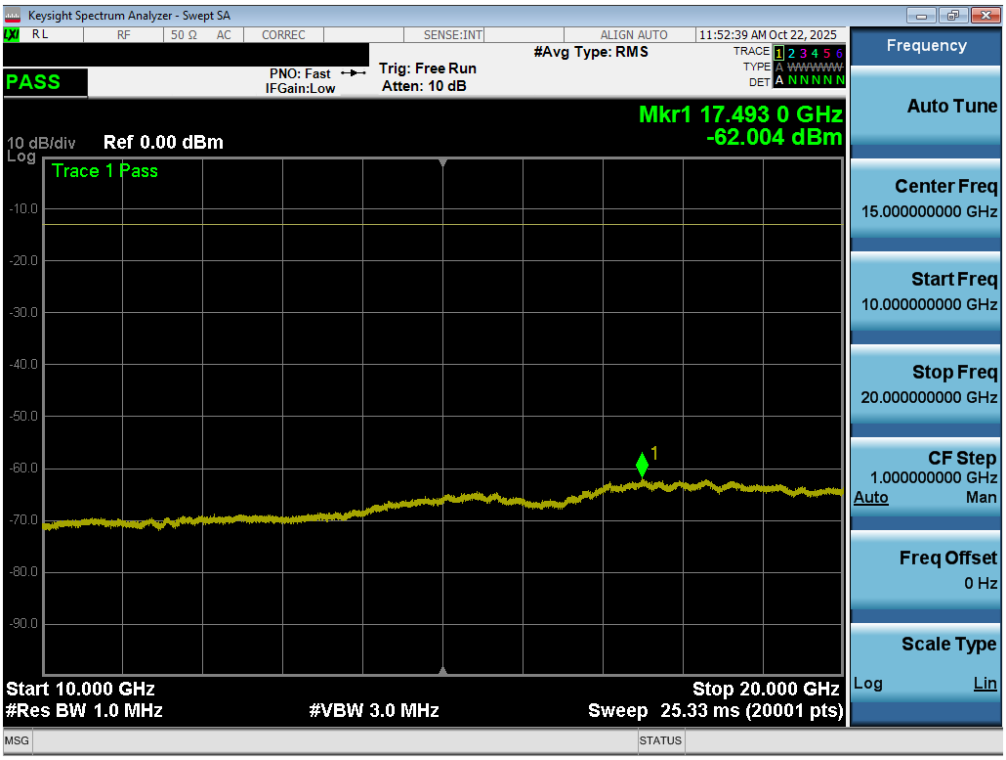
LTE Band 25/2 – Ant2



Plot 7-85. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel - Ant2)

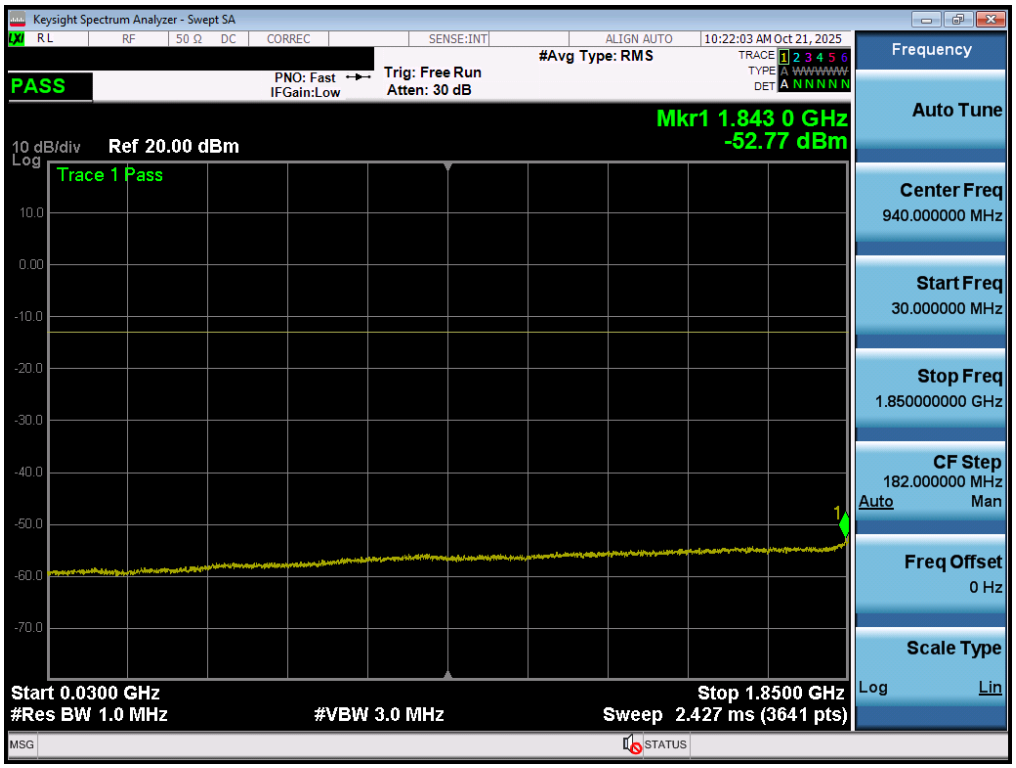


Plot 7-86. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel - Ant2)

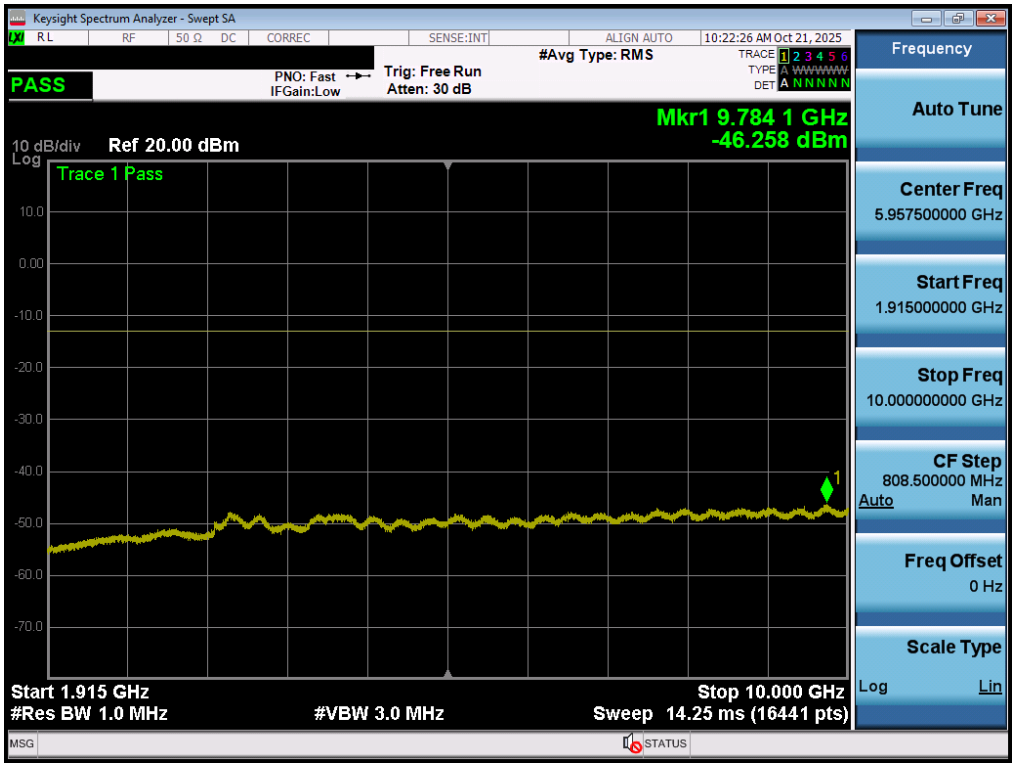


Plot 7-87. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel - Ant2)

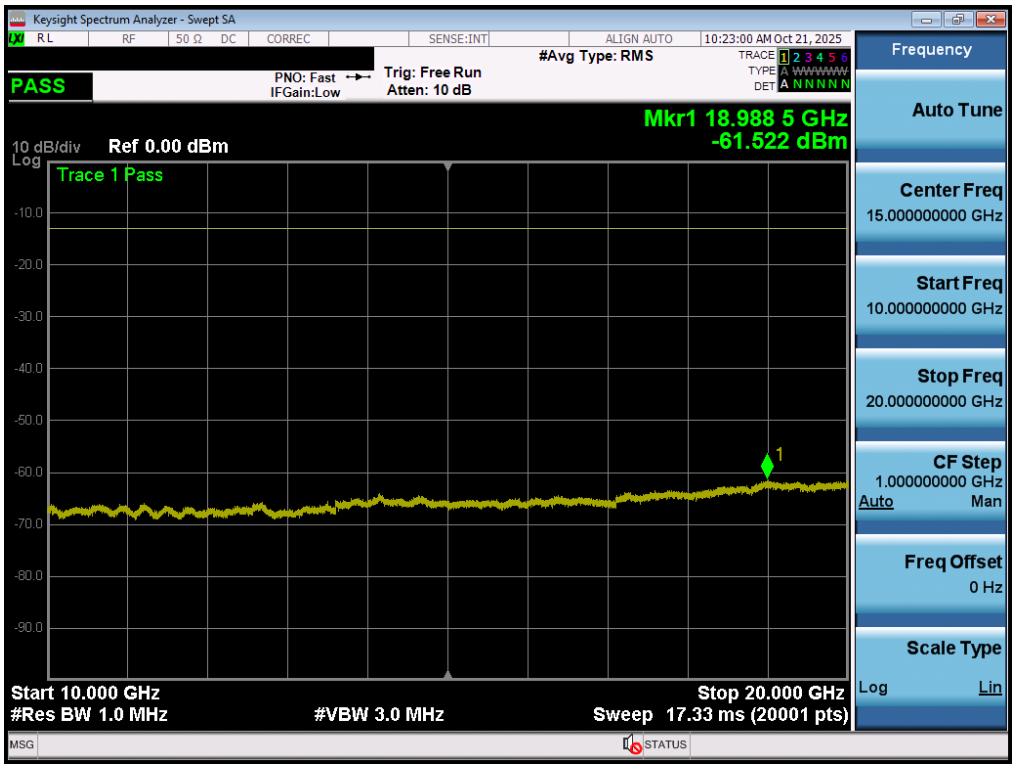
NR Band n25/2 – Ant2



Plot 7-88. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - Low Channel - Ant2)



Plot 7-89. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - Low Channel - Ant2)



Plot 7-90. Conducted Spurious Plot (NR Band n25/2 - 40.0MHz - 1RB - Low Channel - Ant2)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26:2015 – Section 5.7.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

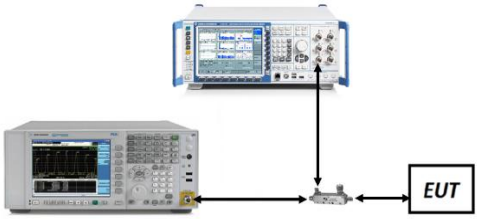


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

1. Per 24.238(b) and RSS-133(6.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

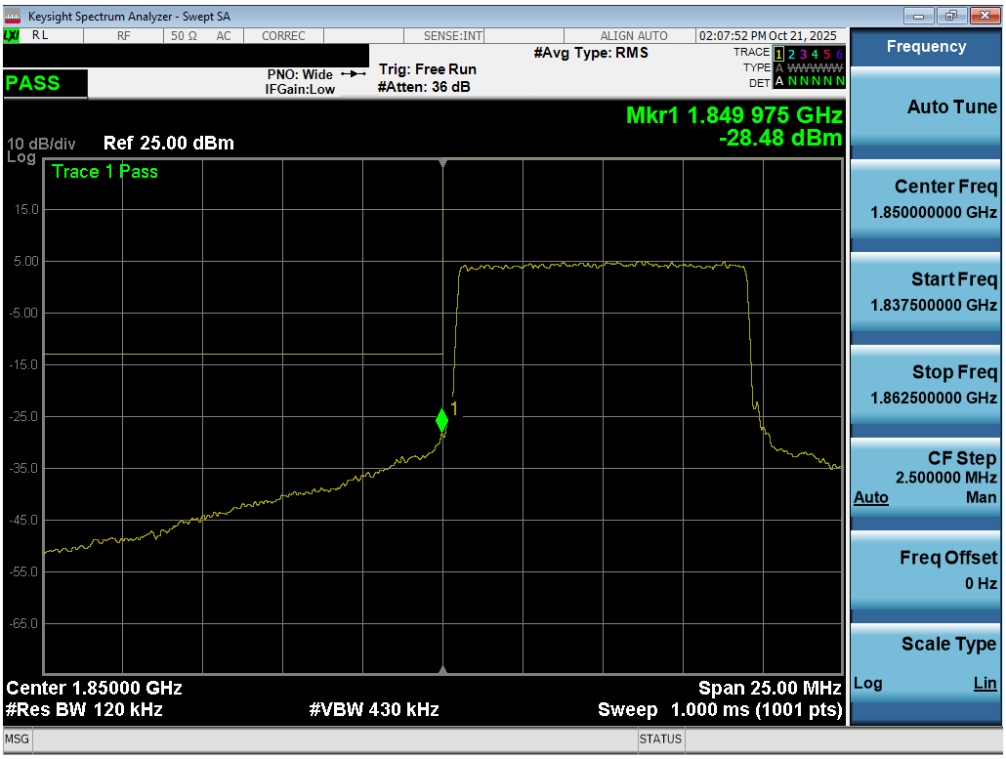
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-PCS	250kHz	Low	Band Edge	-18.45	-13	-5.45
		Low	Extended	-45.12	-13	-32.12
		High	Band Edge	-18.45	-13	-5.45
		High	Extended	-44.77	-13	-31.77
WCDMA-PCS	5MHz	Low	Band Edge	-23.41	-13	-10.41
		Low	Extended	-16.25	-13	-3.25
		High	Band Edge	-23.28	-13	-10.28
		High	Extended	-17.20	-13	-4.20
LTE-B25-2	20MHz	Low	Band Edge	-31.09	-13	-18.09
		Low	Extended	-26.55	-13	-13.55
		High [B2]	Band Edge	-30.02	-13	-17.02
		High [B25]	Band Edge	-31.10	-13	-18.10
		High [B2]	Extended	-26.04	-13	-13.04
		High [B25]	Extended	-25.95	-13	-12.95
	15MHz	Low	Band Edge	-30.53	-13	-17.53
		Low	Extended	-26.40	-13	-13.40
		High [B2]	Band Edge	-30.08	-13	-17.08
		High [B25]	Band Edge	-24.03	-13	-11.03
		High [B2]	Extended	-24.26	-13	-11.26
		High [B25]	Extended	-24.81	-13	-11.81
	10MHz	Low	Band Edge	-28.48	-13	-15.48
		Low	Extended	-22.59	-13	-9.59
		High [B2]	Band Edge	-26.56	-13	-13.56
		High [B25]	Band Edge	-29.28	-13	-16.28
		High [B2]	Extended	-20.85	-13	-7.85
		High [B25]	Extended	-22.33	-13	-9.33
	5MHz	Low	Band Edge	-25.68	-13	-12.68
		Low	Extended	-24.75	-13	-11.75
		High [B2]	Band Edge	-26.35	-13	-13.35
		High [B25]	Band Edge	-27.31	-13	-14.31
		High [B2]	Extended	-23.40	-13	-10.40
		High [B25]	Extended	-24.14	-13	-11.14
	3MHz	Low	Band Edge	-25.10	-13	-12.10
		Low	Extended	-24.26	-13	-11.26
		High [B2]	Band Edge	-24.11	-13	-11.11
		High [B25]	Band Edge	-24.90	-13	-11.90
		High [B2]	Extended	-23.35	-13	-10.35
		High [B25]	Extended	-23.25	-13	-10.25
	1.4MHz	Low	Band Edge	-25.84	-13	-12.84
		Low	Extended	-31.10	-13	-18.10
		High [B2]	Band Edge	-26.05	-13	-13.05
		High [B25]	Band Edge	-25.75	-13	-12.75
		High [B2]	Extended	-29.68	-13	-16.68
		High [B25]	Extended	-29.66	-13	-16.66

Table 7-12. Conducted Band Edge Results – Ant1

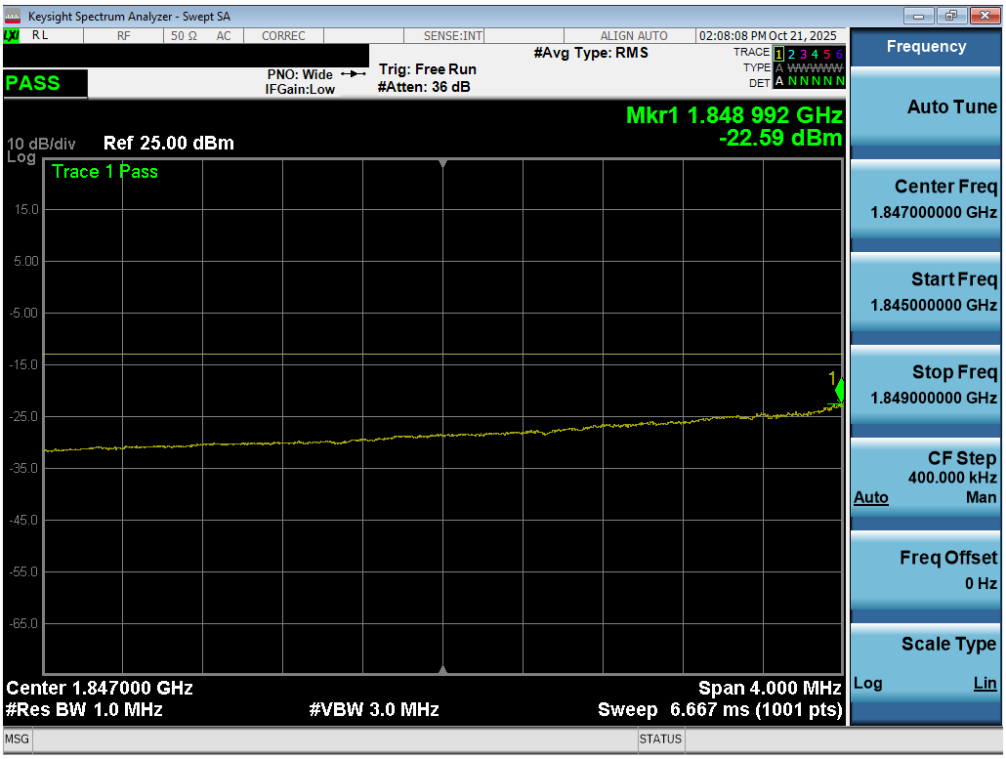
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n25-2	40MHz	Low	Band Edge	-26.48	-13	-13.48
		Low	Extended	-26.84	-13	-13.84
		High [n2]	Band Edge	-26.94	-13	-13.94
		High [n25]	Band Edge	-26.85	-13	-13.85
		High [n2]	Extended	-28.96	-13	-15.96
		High [n25]	Extended	-27.21	-13	-14.21
	30MHz	Low	Band Edge	-30.39	-13	-17.39
		Low	Extended	-29.14	-13	-16.14
		High [n2]	Band Edge	-31.41	-13	-18.41
		High [n25]	Band Edge	-32.91	-13	-19.91
		High [n2]	Extended	-27.67	-13	-14.67
		High [n25]	Extended	-29.67	-13	-16.67
	25MHz	Low	Band Edge	-31.20	-13	-18.20
		Low	Extended	-27.85	-13	-14.85
		High [n2]	Band Edge	-32.29	-13	-19.29
		High [n25]	Band Edge	-34.21	-13	-21.21
		High [n2]	Extended	-28.33	-13	-15.33
		High [n25]	Extended	-30.15	-13	-17.15
	20MHz	Low	Band Edge	-30.17	-13	-17.17
		Low	Extended	-25.67	-13	-12.67
		High [n2]	Band Edge	-27.22	-13	-14.22
		High [n25]	Band Edge	-30.65	-13	-17.65
		High [n2]	Extended	-26.31	-13	-13.31
		High [n25]	Extended	-26.34	-13	-13.34
	15MHz	Low	Band Edge	-28.60	-13	-15.60
		Low	Extended	-22.43	-13	-9.43
		High [n2]	Band Edge	-25.94	-13	-12.94
		High [n25]	Band Edge	-28.41	-13	-15.41
		High [n2]	Extended	-22.79	-13	-9.79
		High [n25]	Extended	-23.34	-13	-10.34
	10MHz	Low	Band Edge	-28.08	-13	-15.08
		Low	Extended	-18.64	-13	-5.64
		High [n2]	Band Edge	-27.48	-13	-14.47
		High [n25]	Band Edge	-28.35	-13	-15.35
		High [n2]	Extended	-18.93	-13	-5.93
		High [n25]	Extended	-19.61	-13	-6.61
	5MHz	Low	Band Edge	-25.73	-13	-12.73
		Low	Extended	-26.90	-13	-13.90
		High [n2]	Band Edge	-23.17	-13	-10.17
		High [n25]	Band Edge	-23.51	-13	-10.51
		High [n2]	Extended	-14.13	-13	-1.13
		High [n25]	Extended	-27.39	-13	-14.39

Table 7-13. Conducted Band Edge Results – Ant1

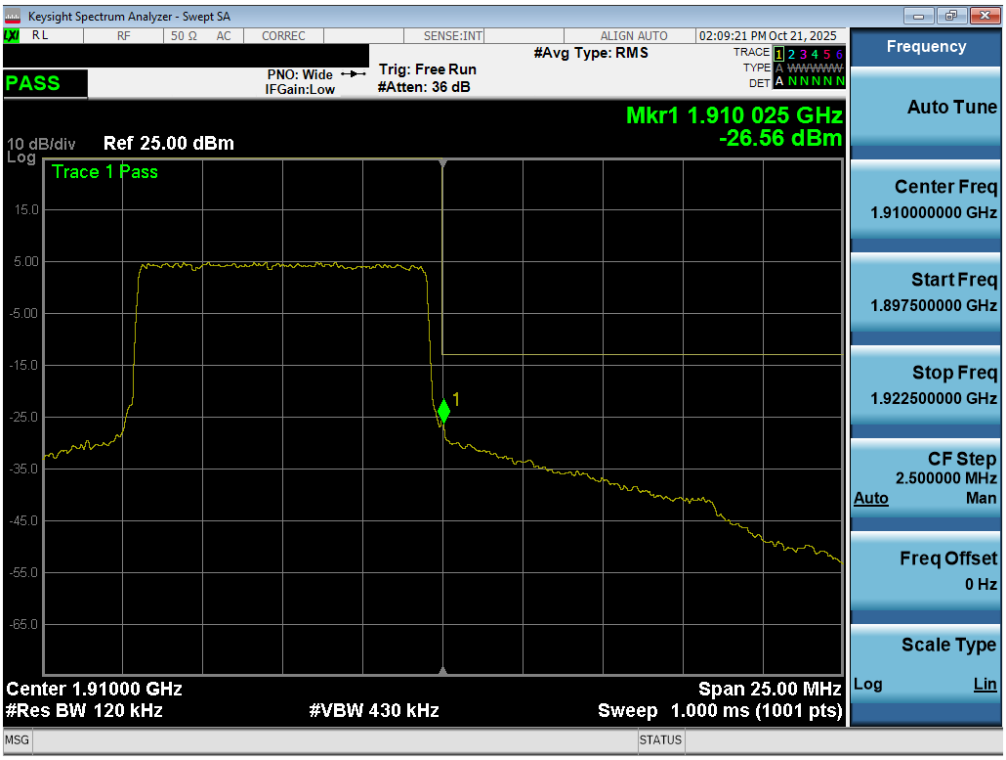
LTE Band 25/2 – Ant1



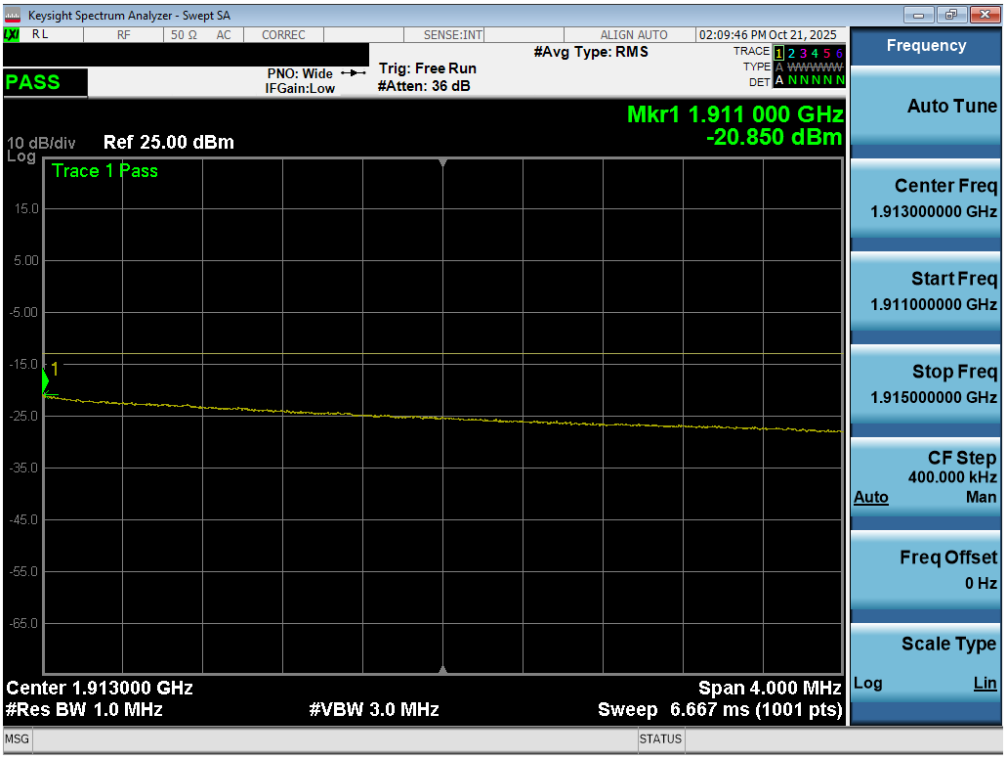
Plot 7-91. Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK – Full RB - Ant1)



Plot 7-92. Extended Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK – Full RB - Ant1)

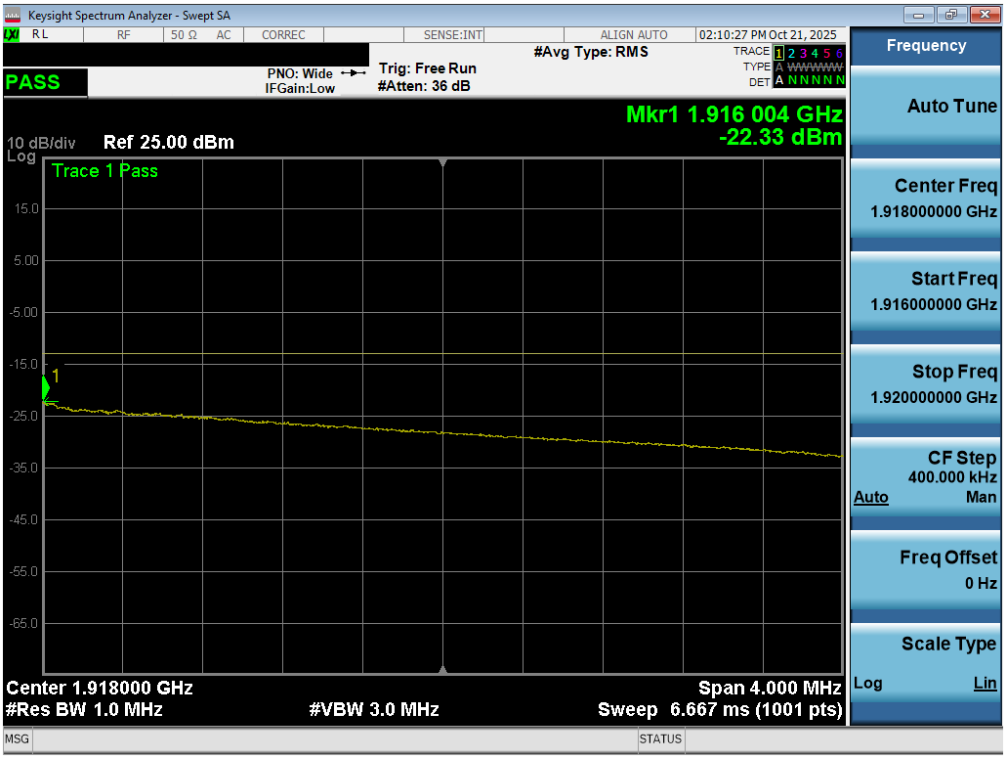


Plot 7-93. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)



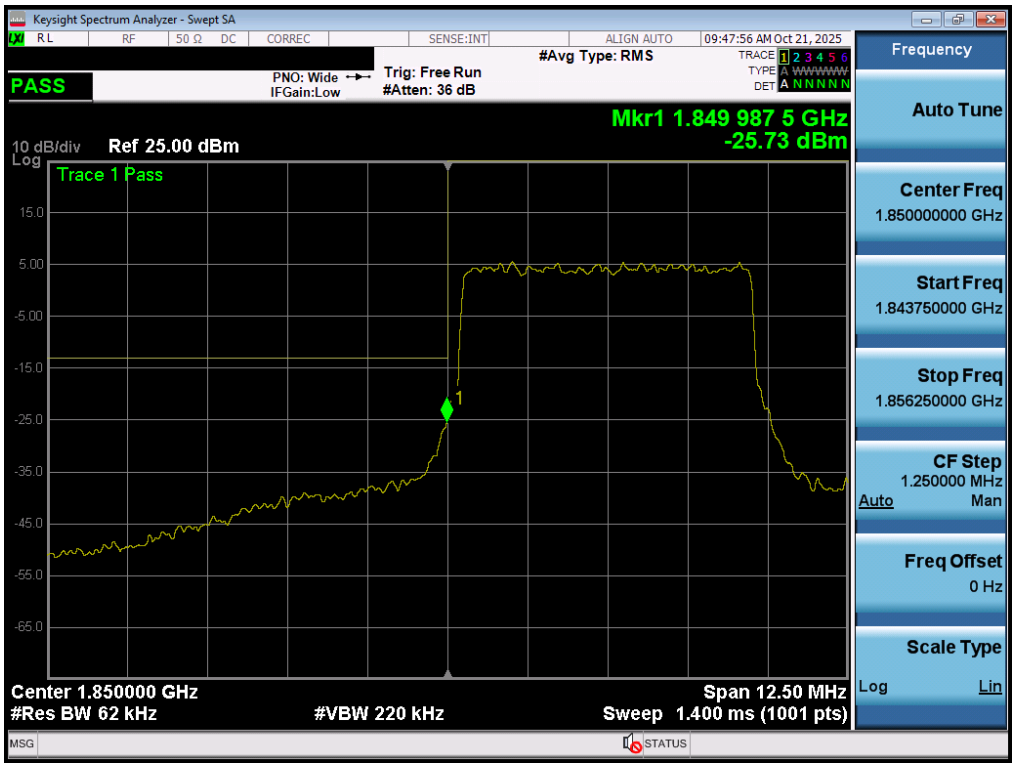
Plot 7-94. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)

Plot 7-95. Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK – Full RB - Ant1)

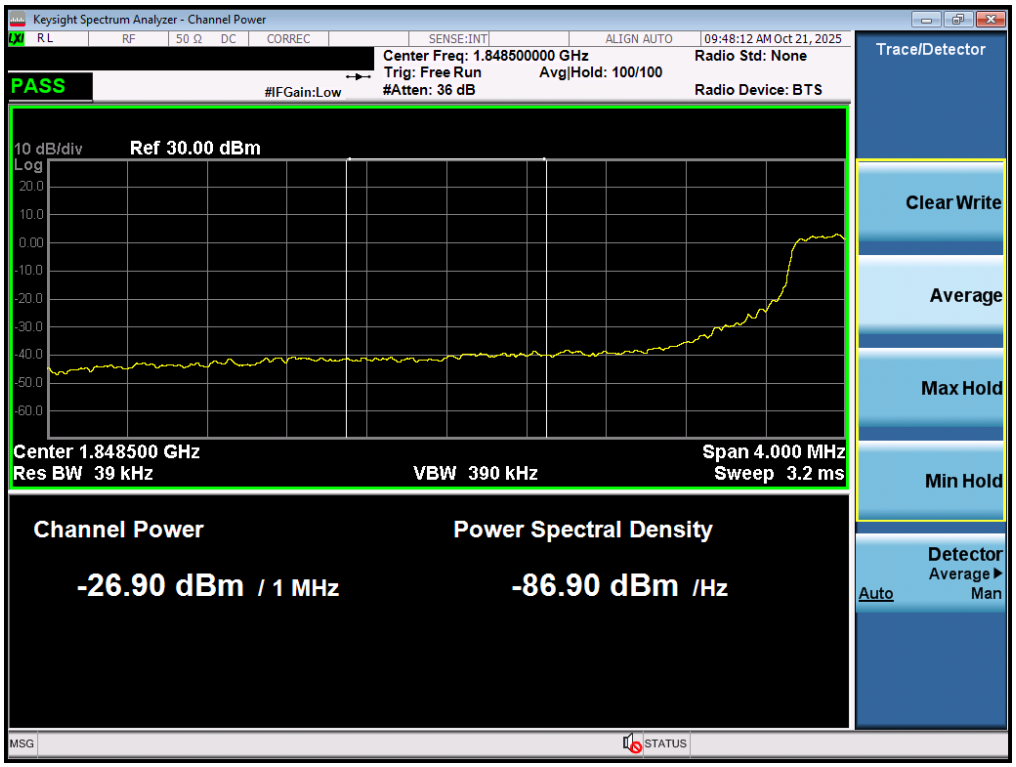


Plot 7-96. Extended Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK – Full RB - Ant1)

NR Band n25/2 – Ant1

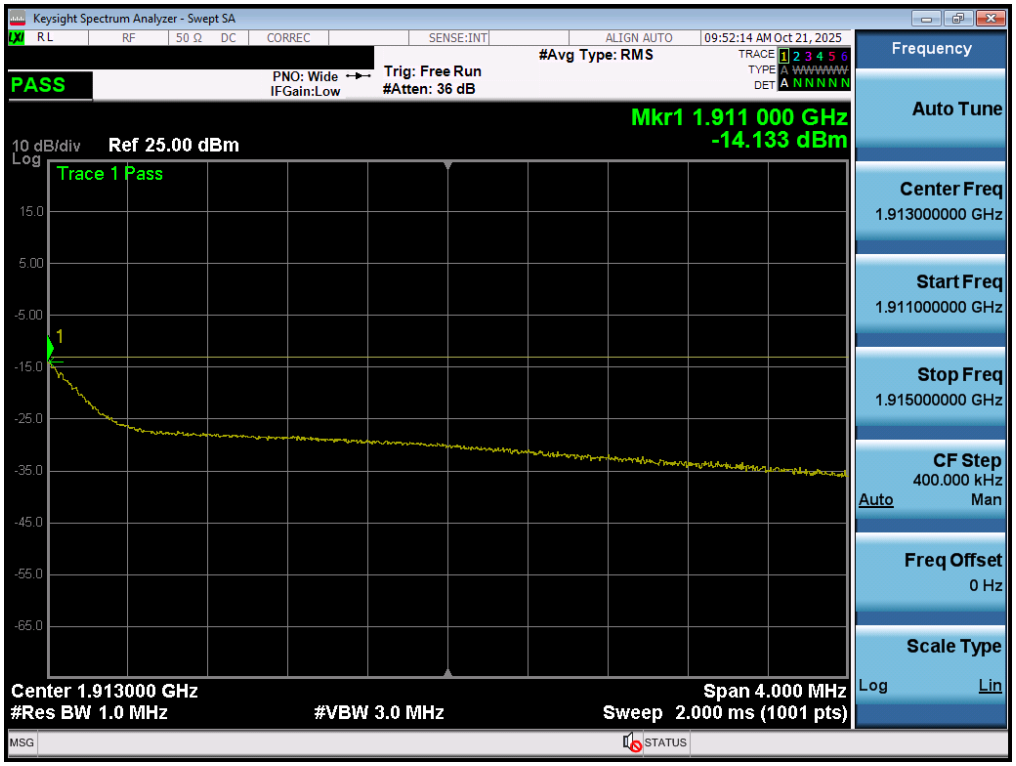


Plot 7-97. Lower Band Edge Plot (NR Band n25/2 - 5MHz QPSK – Full RB - Ant1)



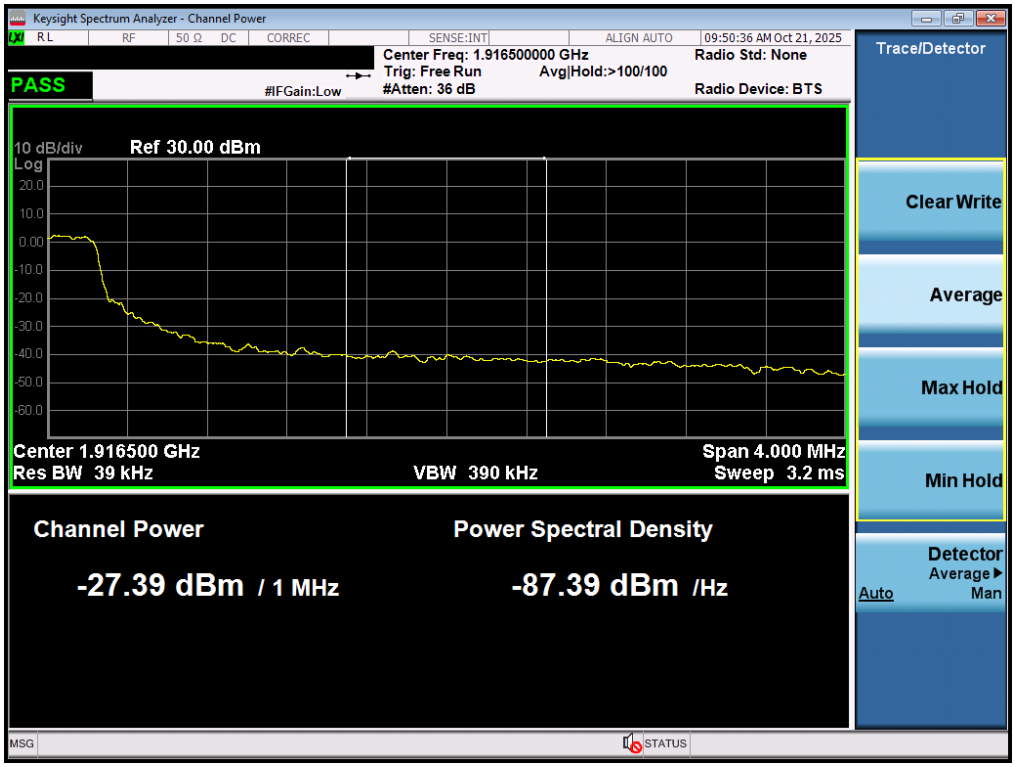
Plot 7-98. Extended Lower Band Edge Plot (NR Band n25/2 - 5MHz QPSK – Full RB - Ant1)

Plot 7-99. Upper Band Edge Plot (NR Band n2 - 5MHz QPSK – Full RB - Ant1)



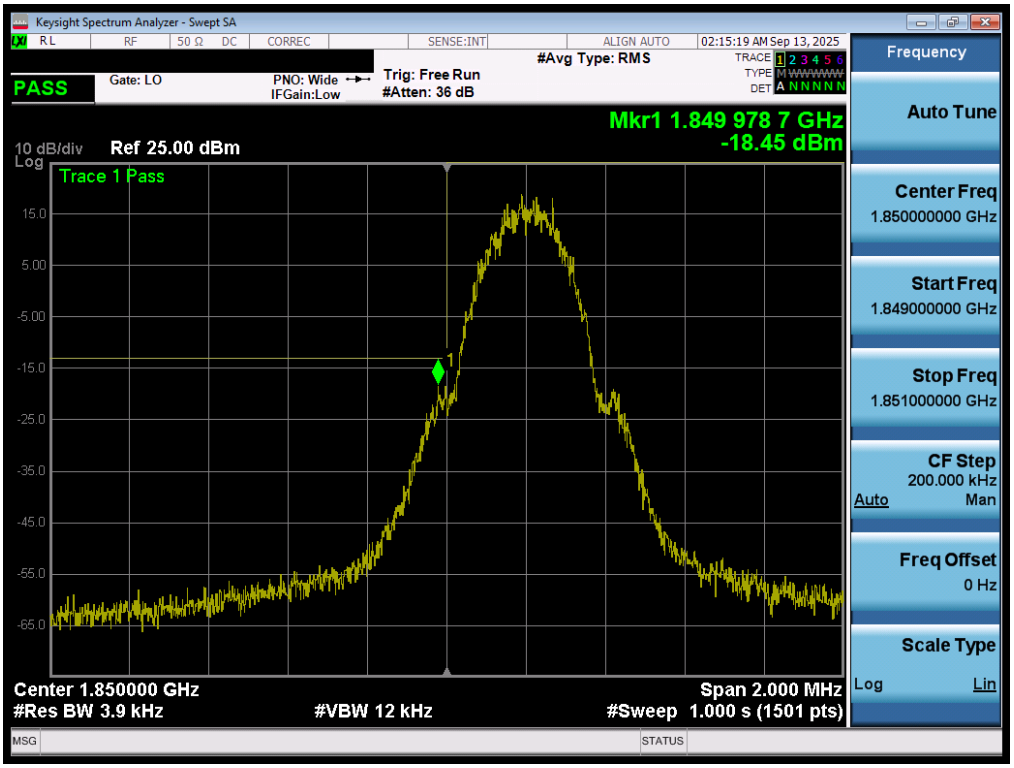
Plot 7-100. Extended Upper Band Edge Plot (NR Band n2 - 5MHz QPSK – Full RB - Ant1)

Plot 7-101. Upper Band Edge Plot (NR Band n25 - 5MHz QPSK – Full RB - Ant1)

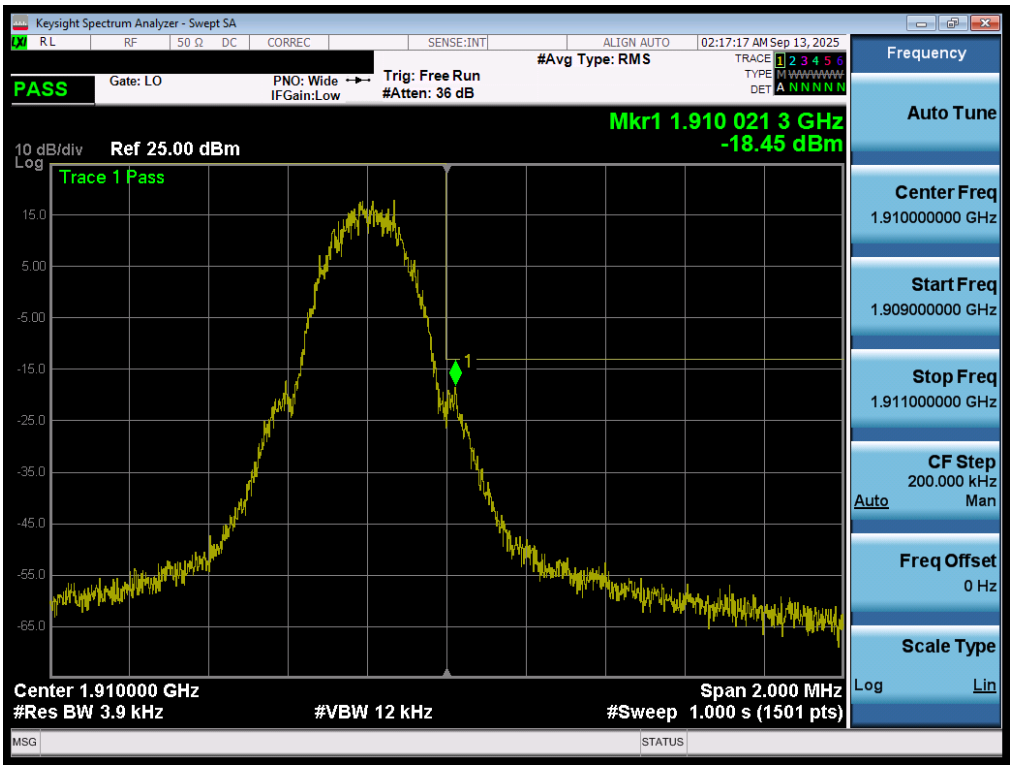


Plot 7-102. Extended Upper Band Edge Plot (NR Band n25 - 5MHz QPSK – Full RB - Ant1)

GSM/GPRS PCS – Ant1



Plot 7-103. Lower Band Edge Plot (GPRS PCS – Ch. 512 - Ant1)



Plot 7-104. Upper Band Edge Plot (GPRS PCS – Ch. 810 - Ant1)

WCDMA PCS – Ant1

Plot 7-105. Lower Band Edge Plot (WCDMA PCS – Ch. 9262 - Ant1)

Plot 7-106. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9262 - Ant1)