ELEMENT WASHINGTON DC LLC
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.element.com

MEASUREMENT REPORT
FCC Part 30 5G mmWave

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

Date of Testing:
4/18 – 6/14/2022
Test Report Issue Date:
6/22/2022
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2204010046-01.A3L

FCC ID:	**A3LSMF936U**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-F936U
Additional Models:	SM-F936U1
EUT Type:	Portable Handset
FCC Classification:	Part 30 Mobile Transmitter (5GM)
FCC Rule Part(s):	30
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 842590 D01 v01r02

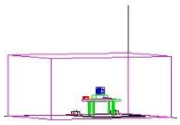
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

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.

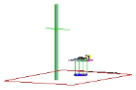
RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

TABLE OF CONTENTS



MEASUREMENT REPORT
FCC Part 30



Band	Antenna	Bandwidth [MHz]	Tx Frequency [MHz]	CCs Active	Mode	Modulation	EIRP		Emission Designator
							Max Power [W]	Max Power [dBm]	
n258 (24.25 - 24.45GHz)	J Patch	100	24250 - 24450	1	SISO	QPSK	0.560	27.48	95M2G7D
					2Tx	QPSK	1.355	31.32	95M2G7D
					2Tx	π/2 BPSK	1.363	**31.35**	91M9G7D
					2Tx	16QAM	0.765	28.84	95M2W7D
					2Tx	64QAM	0.529	27.24	95M9W7D
				2	2Tx	QPSK	0.314	24.96	197MG7D
					2Tx	π/2 BPSK	0.316	24.99	193MG7D
					2Tx	16QAM	0.239	23.79	196MW7D
					2Tx	64QAM	0.187	22.71	195MW7D
		50	24250 - 24450	1	SISO	QPSK	0.566	27.53	46M3G7D
					2Tx	QPSK	1.395	**31.44**	46M3G7D
					2Tx	π/2 BPSK	1.385	31.41	46M4G7D
					2Tx	16QAM	0.821	29.14	46M3W7D
					2Tx	64QAM	0.553	27.42	46M6W7D
				2	2Tx	QPSK	0.367	25.65	95M8G7D
					2Tx	π/2 BPSK	0.370	25.68	95M6G7D
					2Tx	16QAM	0.233	23.67	95M6W7D
					2Tx	64QAM	0.172	22.35	95M8W7D
n258 (24.25 - 24.45GHz)	K Patch	100	24250 - 24450	1	SISO	QPSK	0.673	28.28	-
					2Tx	QPSK	1.143	**30.58**	-
					2Tx	π/2 BPSK	1.138	30.56	-
					2Tx	16QAM	0.656	28.17	-
					2Tx	64QAM	0.435	26.38	-
				2	2Tx	QPSK	0.252	24.02	-
					2Tx	π/2 BPSK	0.253	24.03	-
					2Tx	16QAM	0.182	22.59	-
					2Tx	64QAM	0.164	22.15	-
		50	24250 - 24450	1	SISO	QPSK	0.693	28.41	-
					2Tx	QPSK	1.155	**30.63**	-
					2Tx	π/2 BPSK	1.147	30.60	-
					2Tx	16QAM	0.654	28.16	-
					2Tx	64QAM	0.446	26.49	-
				2	2Tx	QPSK	0.262	24.19	-
					2Tx	π/2 BPSK	0.262	24.18	-
					2Tx	16QAM	0.201	23.04	-
					2Tx	64QAM	0.163	22.13	-

EUT Overview (Band n258, 24.25-24.45GHz)

Band	Antenna	Bandwidth [MHz]	Tx Frequency [MHz]	CCs Active	Mode	Modulation	EIRP		Emission Designator
							Max Power [W]	Max Power [dBm]	
n258 (24.75 - 25.25GHz)	J Patch	100	24750 - 25250	1	SISO	QPSK	0.950	29.78	95M0G7D
					2Tx	QPSK	1.448	31.61	95M0G7D
					2Tx	π/2 BPSK	1.496	**31.75**	92M3G7D
					2Tx	16QAM	0.896	29.52	94M7W7D
					2Tx	64QAM	0.548	27.39	94M7W7D
				2	2Tx	QPSK	0.526	27.21	197MG7D
					2Tx	π/2 BPSK	0.523	27.19	193MG7D
					2Tx	16QAM	0.332	25.21	199MW7D
					2Tx	64QAM	0.227	23.56	195MW7D
		50	24750 - 25250	1	SISO	QPSK	0.998	29.99	46M2G7D
					2Tx	QPSK	1.624	**32.10**	46M2G7D
					2Tx	π/2 BPSK	1.590	32.01	46M0G7D
					2Tx	16QAM	0.933	29.70	46M0W7D
					2Tx	64QAM	0.627	27.97	46M1W7D
				2	2Tx	QPSK	0.550	27.40	96M5G7D
					2Tx	π/2 BPSK	0.554	27.43	96M3G7D
					2Tx	16QAM	0.351	25.46	96M3W7D
					2Tx	64QAM	0.236	23.73	97M1W7D
n258 (24.75 - 25.25GHz)	K Patch	100	24750 - 25250	1	SISO	QPSK	0.708	28.50	-
					2Tx	QPSK	1.316	**31.19**	-
					2Tx	π/2 BPSK	1.313	31.18	-
					2Tx	16QAM	0.760	28.81	-
					2Tx	64QAM	0.518	27.15	-
				2	2Tx	QPSK	0.280	24.48	-
					2Tx	π/2 BPSK	0.279	24.46	-
					2Tx	16QAM	0.226	23.54	-
					2Tx	64QAM	0.182	22.59	-
		50	24750 - 25250	1	SISO	QPSK	0.718	28.56	-
					2Tx	QPSK	1.385	31.41	-
					2Tx	π/2 BPSK	1.395	**31.45**	-
					2Tx	16QAM	0.829	29.19	-
					2Tx	64QAM	0.636	28.04	-
				2	2Tx	QPSK	0.306	24.85	-
					2Tx	π/2 BPSK	0.301	24.78	-
					2Tx	16QAM	0.215	23.33	-
					2Tx	64QAM	0.178	22.49	-

EUT Overview (Band n258, 24.75-25.25GHz)

Band	Antenna	Bandwidth [MHz]	Tx Frequency [MHz]	CCs Active	Mode	Modulation	EIRP		Emission Designator
							Max Power [W]	Max Power [dBm]	
n261	J Patch	100	27550 - 28300	1	SISO	QPSK	0.865	29.37	94M9G7D
					2Tx	QPSK	1.757	**32.45**	94M9G7D
					2Tx	π/2 BPSK	1.741	32.41	92M1G7D
					2Tx	16QAM	1.020	30.09	94M8W7D
					2Tx	64QAM	0.703	28.47	94M9W7D
				2	2Tx	QPSK	0.539	27.32	194MG7D
					2Tx	π/2 BPSK	0.526	27.21	192MG7D
					2Tx	16QAM	0.337	25.27	194MW7D
					2Tx	64QAM	0.262	24.18	194MW7D
		50	27525 - 28325	1	SISO	QPSK	0.836	29.22	46M2G7D
					2Tx	QPSK	1.770	**32.48**	46M2G7D
					2Tx	π/2 BPSK	1.768	32.48	46M1G7D
					2Tx	16QAM	1.016	30.07	46M0W7D
					2Tx	64QAM	0.713	28.53	45M9W7D
				2	2Tx	QPSK	0.542	27.34	95M6G7D
					2Tx	π/2 BPSK	0.543	27.35	95M8G7D
					2Tx	16QAM	0.348	25.41	95M7W7D
					2Tx	64QAM	0.247	23.92	96M0W7D
n261	K Patch	100	27550 - 28300	1	SISO	QPSK	0.454	26.57	-
					2Tx	QPSK	1.735	**32.39**	-
					2Tx	π/2 BPSK	1.731	32.38	-
					2Tx	16QAM	1.071	30.30	-
					2Tx	64QAM	0.658	28.18	-
				2	2Tx	QPSK	0.355	25.50	-
					2Tx	π/2 BPSK	0.349	25.42	-
					2Tx	16QAM	0.279	24.45	-
					2Tx	64QAM	0.250	23.98	-
		50	27525 - 28325	1	SISO	QPSK	0.529	27.23	-
					2Tx	QPSK	1.612	32.07	-
					2Tx	π/2 BPSK	1.660	**32.20**	-
					2Tx	16QAM	1.012	30.05	-
					2Tx	64QAM	0.630	27.99	-
				2	2Tx	QPSK	0.374	25.72	-
					2Tx	π/2 BPSK	0.372	25.70	-
					2Tx	16QAM	0.300	24.77	-
					2Tx	64QAM	0.224	23.49	-

EUT Overview (Band n261)

Band	Antenna	Bandwidth [MHz]	Tx Frequency [MHz]	CCs Active	Mode	Modulation	EIRP		Emission Designator
							Max Power [W]	Max Power [dBm]	
n260	J Patch	100	37050 - 39950	1	SISO	QPSK	0.536	27.29	95M8G7D
					2Tx	QPSK	1.043	30.18	95M8G7D
					2Tx	π/2 BPSK	1.091	**30.38**	92M2G7D
					2Tx	16QAM	0.615	27.89	95M7W7D
					2Tx	64QAM	0.408	26.11	96M8W7D
				2	2Tx	QPSK	0.271	24.33	195MG7D
					2Tx	π/2 BPSK	0.277	24.43	191MG7D
					2Tx	16QAM	0.195	22.90	195MW7D
					2Tx	64QAM	0.135	21.32	196MW7D
		50	37025 - 39975	1	SISO	QPSK	0.562	27.50	46M6G7D
					2Tx	QPSK	1.288	**31.10**	46M6G7D
					2Tx	π/2 BPSK	1.262	31.01	46M5G7D
					2Tx	16QAM	0.732	28.65	46M5W7D
					2Tx	64QAM	0.489	26.89	46M7W7D
				2	2Tx	QPSK	0.325	25.12	95M9G7D
					2Tx	π/2 BPSK	0.331	25.20	96M2G7D
					2Tx	16QAM	0.230	23.61	96M0W7D
					2Tx	64QAM	0.152	21.82	96M2W7D
n260	K Patch	100	37050 - 39950	1	SISO	QPSK	0.589	27.70	-
					2Tx	QPSK	0.748	**28.74**	-
					2Tx	π/2 BPSK	0.714	28.54	-
					2Tx	16QAM	0.415	26.18	-
					2Tx	64QAM	0.281	24.48	-
				2	2Tx	QPSK	0.142	21.53	-
					2Tx	π/2 BPSK	0.143	21.54	-
					2Tx	16QAM	0.110	20.43	-
					2Tx	64QAM	0.096	19.82	-
		50	37025 - 39975	1	SISO	QPSK	0.586	27.68	-
					2Tx	QPSK	0.752	**28.76**	-
					2Tx	π/2 BPSK	0.740	28.69	-
					2Tx	16QAM	0.418	26.21	-
					2Tx	64QAM	0.282	24.51	-
				2	2Tx	QPSK	0.168	22.26	-
					2Tx	π/2 BPSK	0.167	22.23	-
					2Tx	16QAM	0.115	20.62	-
					2Tx	64QAM	0.081	19.09	-

EUT Overview (Band n260)

Note: Due to similar antenna performance from the antennas after thorough investigation, the Occupied Bandwidth was only measured on one antenna for each band.

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.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

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 (2451B) test laboratory with the site description on file with ISED.

- 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 Agreement.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF936U**. The test data contained in this report pertains only to the emissions due to the EUT's 5G mmWave function.

The EUT contains two patch antennas, referred to herein as Ant1 (J-Patch) and Ant2 (K-Patch). Each of the antennas is comprised of two separate antenna feeds - one for horizontal and one for vertical polarization. Only one array antenna can be active at a time.

Antenna	Name
Ant1	J Patch
Ant2	K Patch

The EUT supports up to 2CC for UL. For each CC, the EUT supports both 50MHz bandwidth and 100MHz bandwidth. The EUT supports a subcarrier spacing (SCS) of 120kHz with two transmission schemes, CP-OFDM and DFT-s-OFDM, with pi/2-BPSK, QPSK, 16-QAM, and 64-QAM modulations. Different Beam IDs are supported, each corresponding to a different position in space for each antenna. During testing, FTM (Factory Test Mode) was used to operate the transmitter. MIMO operation was achieved by enabling two Beam IDs at the same time: one is from the list of H Beam IDs and other is from the list of V Beam IDs.

Test Device Serial No.: 1334M, 1784M, 1764M

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 and FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5,6GHz), Bluetooth (1x, EDR, LE), NFC, UWB

2.3 Test Configuration

The EUT was tested per the guidance of KDB 842590 D01 v01r02 and ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated tests.

EIRP Simulation data for all Beam IDs was used to help determine the worst case Beam ID for SISO operation and Beam ID pair for 2Tx (DFT-s-OFDM) and MIMO (CP-OFDM) operation. Several additional Beam ID's were also investigated to determine the Beam ID's producing the highest measured EIRP.

All testing was performed using FTM (Factory Test Mode) software at continuous Tx operation. When implemented out in the field, the EUT will operate with a maximum uplink configuration as allowed by the 5G network/carrier. The FTM software was also used for the EUT operation in the EN-DC mode.

While operating in the FR2 band, this device supports anchor band operation with either an LTE carrier or an NR FR1 carrier. Both were investigated during FR2 measurements.

This device supports two configurations: one is with screen open and one is with screen closed. Open, half opened and closed configurations are tested, and the worst case radiated emissions data is shown in this report.

2.4 Software and Firmware

The test was conducted with firmware version FAS0_F936UFAU0AVD5 installed on the EUT.

2.5 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 Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) and the guidance provided in KDB 842590 D01 v01r02 were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

§30.202, §30.203

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary for radiated emissions measurements in the spurious domain. 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 for measurements above 1GHz.

Radiated power (EIRP) measurements were performed in a full anechoic chamber (FAC) conforming to the site validation requirements of CISPR 16-1-4. Radiated spurious emission measurements from 30MHz - 18GHz were performed in a semi anechoic chamber (SAC) conforming to the site validation requirements of CISPR 16-1-4. A positioner was used to manipulate the EUT through several positions in space by rotating about the roll axis as shown in the figure below. The positioner was mounted on top of a turntable bringing the total EUT height to 1.5m.

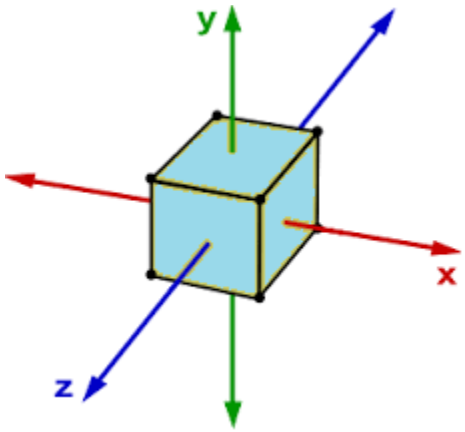


Figure 3-1. Rotation of the EUT Through Three Orthogonal Planes

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable. The measurement antenna is in the far field of the EUT per formula $2D^2/\lambda$ where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, "D" is the largest dimension of the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

Frequency Range (GHz)	Wavelength(cm)	Far Field Distance (m)	Measurement Distance (m)
18-40	0.749	0.54	1.00
40-60	0.500	1.39	1.50
60-90	0.333	0.91	1.00
90-140	0.214	0.58	1.00
140-200	0.150	0.39	1.00

Table 3-1. Far-Field Distance & Measurment Distance per Frequency Range

Radiated power levels are investigated while the receive antenna was rotated through all angles to determine the worst case polarization/positioning. It was determined that H=0 degree and V=90 degree are the worst case positions when the EUT was transmitting horizontally and vertically polarized beams, respectively.

The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration bandwidth set to the emissions’ occupied bandwidth. The EIRP is calculated from the raw power level measured with the spectrum analyzer using the formulas shown below.

Effective Isotropic Radiated Power Sample Calculation

The measured e.i.r.p is converted to E-field in V/m. Then, the distance correction is applied before converting back to calculated e.i.r.p, as explained in KDB 971168 D01.

Field Strength [dBμV/m] = Measured Value [dBm] + AFCL [dB/m] + 107

= - 32.74 dBm + (40.7dB/m + 8.78dB) + 107 = 123.74dBuV/m

= 10^(123.74/20)/1000000 = 1.54 V/m

e.i.r.p. [dBm] = 10 * log((E-Field*D_m)^2/30) + 30dB

= 10*log((1.54V/m * 1.00m)^2/30) + 30dB

= 18.98 dBm e.i.r.p.

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

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to an accredited ISO/IEC 17025 calibration facility. 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
-	ETS-001	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS
-	ETS-002	EMC Cable and Switch System	3/10/2022	Annual	3/10/2023	ETS
EMCO	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ESPEC	SH-241	Temperature Chamber	7/2/2020	Biennial	7/2/2022	92002873
ETS-Lindgren	3116C	DRG Horn Antenna	5/11/2021	Biennial	5/11/2023	218893
ETS-Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	7/21/2021	Annual	7/21/2022	MY49430494
MEGAPHASE	FAC mmWave	AP FAC mmWave 40GHz	8/18/2021	Annual	8/18/2022	20033003
Narda	180-442-KF	Wide Band Horn Antenna	9/14/2020	Biennial	9/14/2022	2172481
Narda	180-422-KF	Horn (Small)	11/5/2020	Biennial	11/5/2022	U157403-01
OML, Inc.	M05RH	WR-05 Horn Antenna, 24dBi, 140 to 220 GHz	9/24/2020	Biennial	9/24/2022	18073001
OML, Inc.	M08RH	WR-08 Horn Antenna, 24dBi, 90 to 140 GHz	10/22/2020	Biennial	10/22/2022	18073001
OML, Inc.	M12RH	WR-12 Horn Antenna, 24dBi, 60 to 90 GHz	8/12/2020	Biennial	8/12/2022	18073001
OML, Inc.	M19RH	WR-19 Horn Antenna, 24dBi, 40 to 60 GHz	8/28/2020	Biennial	8/28/2022	18073001
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/25/2021	Annual	8/25/2022	1312.8000K67
Rohde & Schwarz	FSW26	Signal Analzyer	2/2/2022	Annual	2/2/2023	101604
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and spectrum analyzer	4/14/2022	Annual	4/14/2023	103187
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	7/27/2020	Biennial	7/27/2022	A051107
UTiFlex	UTiFlex	FAC mmWave UTiFlex 40GHz	3/9/2022	Annual	3/9/2023	232062-001
UTiFlex	UTiFlex	FAC mmWave UTiFlex 40GHz	3/9/2022	Annual	3/9/2023	234142-001
Virginia Diodes, Inc.	SAX679	SAX Module (40 - 60GHz)	8/28/2020	Biennial	8/28/2022	SAX679
Virginia Diodes, Inc.	SAX680	SAX Module (60 - 90GHz)	8/14/2020	Biennial	8/14/2022	SAX680
Virginia Diodes, Inc.	SAX681	SAX Module (90 - 140GHz)	10/22/2020	Biennial	10/22/2022	SAX681
Virginia Diodes, Inc.	SAX682	SAX Module (140 - 220GHz)	9/24/2020	Biennial	9/24/2022	SAX682

Table 5-1. Test Equipment

Notes:

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.

6.0 SAMPLE CALCULATIONS

Emission Designator

π/2 BPSK/ QPSK Modulation

Emission Designator = 800MG7D

BW = 800 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 802MW7D

BW = 802 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: A3LSMF936U

FCC Classification: Part 30 Mobile Transmitter (5GM)

Mode(s): TDD

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	RADIATED	PASS	Section 7.2
2.1046, 30.202	Equivalent Isotropic Radiated Power	43dBm		PASS	Section 7.3
2.1051, 30.203	Spurious Emissions	-13dBm/MHz for all out-of-band emissions		PASS	Section 7.4
2.1051, 30.203	Out-of-Band Emissions at the Band Edge	-13dBm/MHz for all out-of-band emissions, -5dBm/MHz from the band edge up to 10% of the channel BW		PASS	Section 7.5
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.6

Table 7-1. Summary of Radiated Test Results

Notes:

1) All modes of operation and modulations were investigated. The test results shown in the following sections represent the worst case emissions.
2) This report contains references to "n258-R1" and "n258-R2". These correspond to n258 Range 1, operating from 24.25 - 24.45GHz, and n258 Range 2, operating from 24.75 - 25.25GHz, respectively, as defined in Part 30.4(a).
3) Per 2.1057(a)(2), spurious emissions were investigated up to 100GHz for n258-R1, n258-R2 and n261. For n260, spurious emissions were investigated up to 200GHz.
4) The radiated RF output power and all out-of-band emissions in the spurious domain are evaluated to the EIRP limits.
5) “CC” refers to “Component Carriers”.
6) Beam IDs were chosen based on which Beam ID produces the highest EIRP during EIRP simulation.
7) All testing was performed using FTM (Factory Test Mode) software at continuous Tx operation (100% duty cycle).
8) The CP-OFDM and DFT-s-OFDM transmission schemes were investigated fully for each test type and only the worst case data is included.

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 Procedure Used

ANSI C63.26-2015 Section 5.4.3
KDB 842590 D01 v01r02 Section 4.3

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 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 Notes

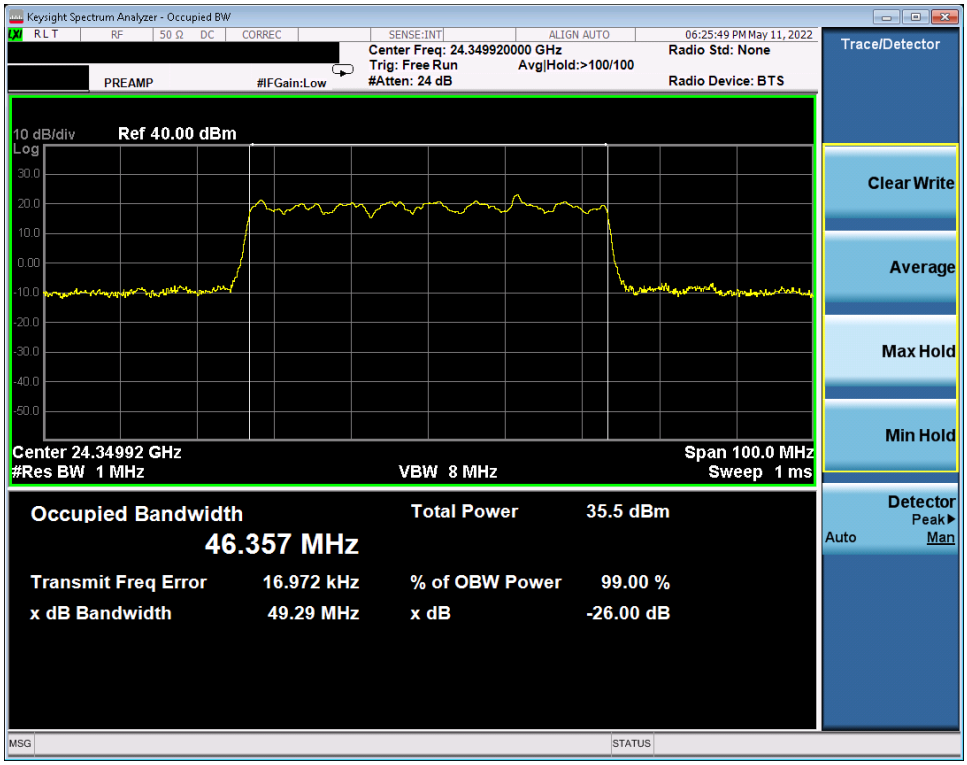
1. The EUT supports CP-OFDM and DFT-s-OFDM. OBW was measured for both waveforms and the worst case has been included in the report.
2. Due to similar antenna performance from both patch antennas, the Occupied Bandwidth was only measured on one antenna (Ant 1 − J-Patch) for each band.

Band n258-R1

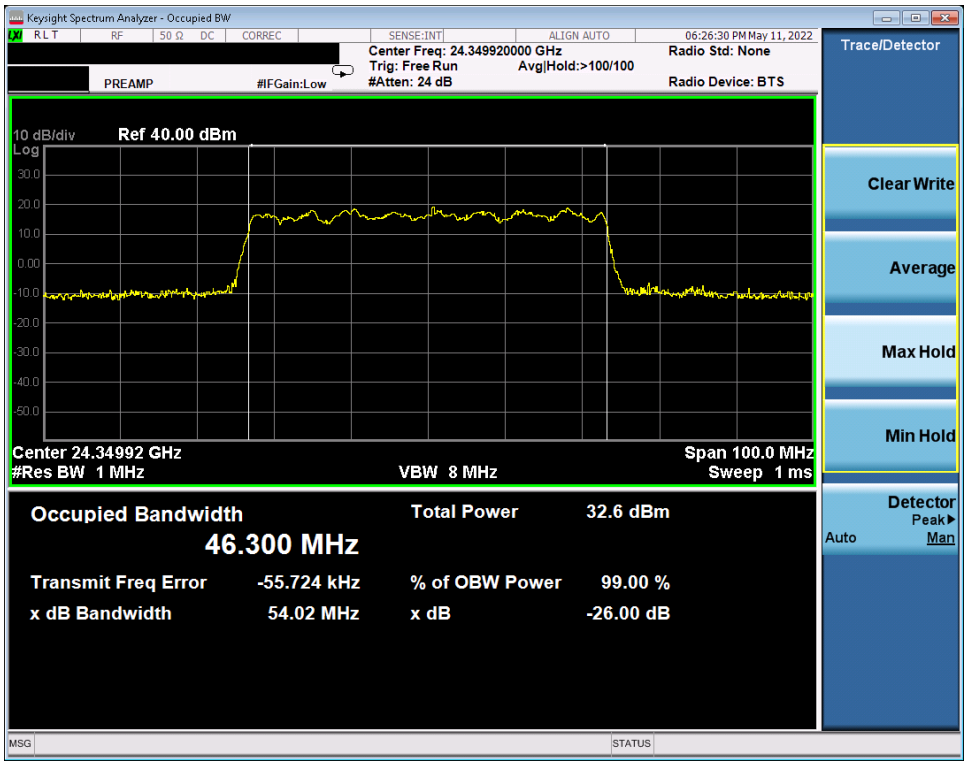
Channel	Bandwidth	CCs Active	Transmission Scheme	Modulation	OBW [MHz]
Mid	50	1	CP-OFDM	QPSK	46.29
			DFT-s-OFDM	π/2-BPSK	46.36
			CP-OFDM	16QAM	46.30
			CP-OFDM	64QAM	46.60
		2	CP-OFDM	QPSK	95.78
			DFT-s-OFDM	π/2-BPSK	95.57
			CP-OFDM	16QAM	95.64
			CP-OFDM	64QAM	95.77
	100	1	CP-OFDM	QPSK	95.16
			DFT-s-OFDM	π/2-BPSK	91.88
			CP-OFDM	16QAM	95.22
			CP-OFDM	64QAM	95.92
		2	CP-OFDM	QPSK	197.31
			DFT-s-OFDM	π/2-BPSK	193.23
			CP-OFDM	16QAM	196.23
			CP-OFDM	64QAM	194.84

Table 7-2. Summary of Occupied Bandwidths (n258-R1)

Plot 7-1. Occupied Bandwidth Plot (50MHz-1CC – QPSK – Mid Channel)



Plot 7-2. Occupied Bandwidth Plot (50MHz-1CC – pi/2-BPSK – Mid Channel)



Plot 7-3. Occupied Bandwidth Plot (50MHz-1CC – 16QAM – Mid Channel)

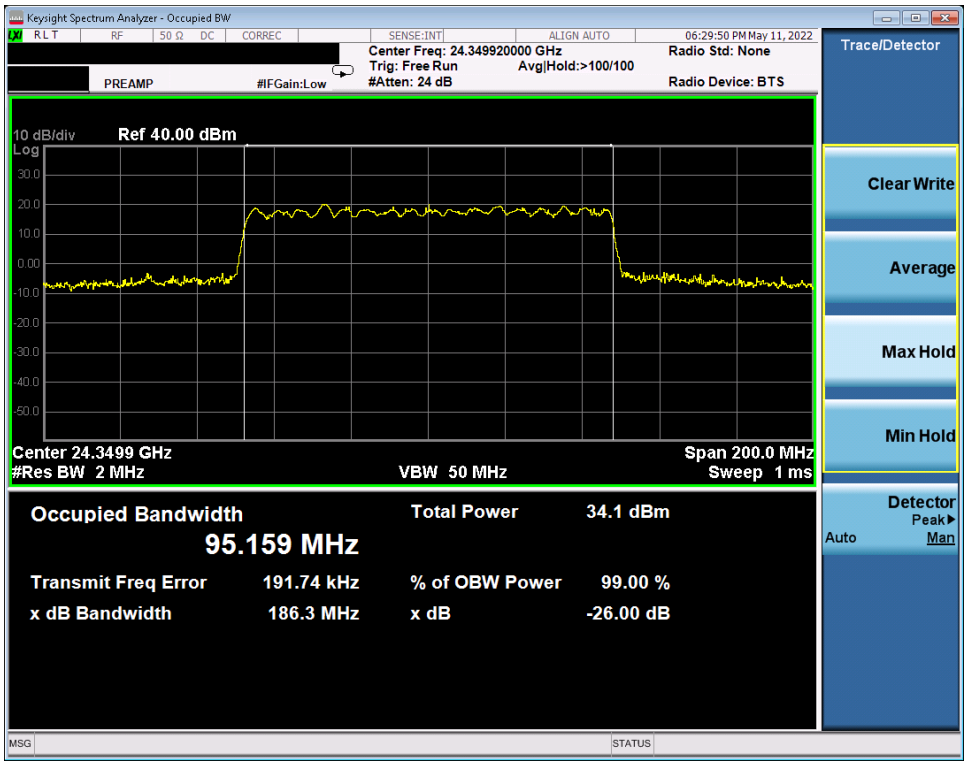
Plot 7-4. Occupied Bandwidth Plot (50MHz-1CC – 64QAM – Mid Channel)

Plot 7-5. Occupied Bandwidth Plot (50MHz-2CC – QPSK – Mid Channel)

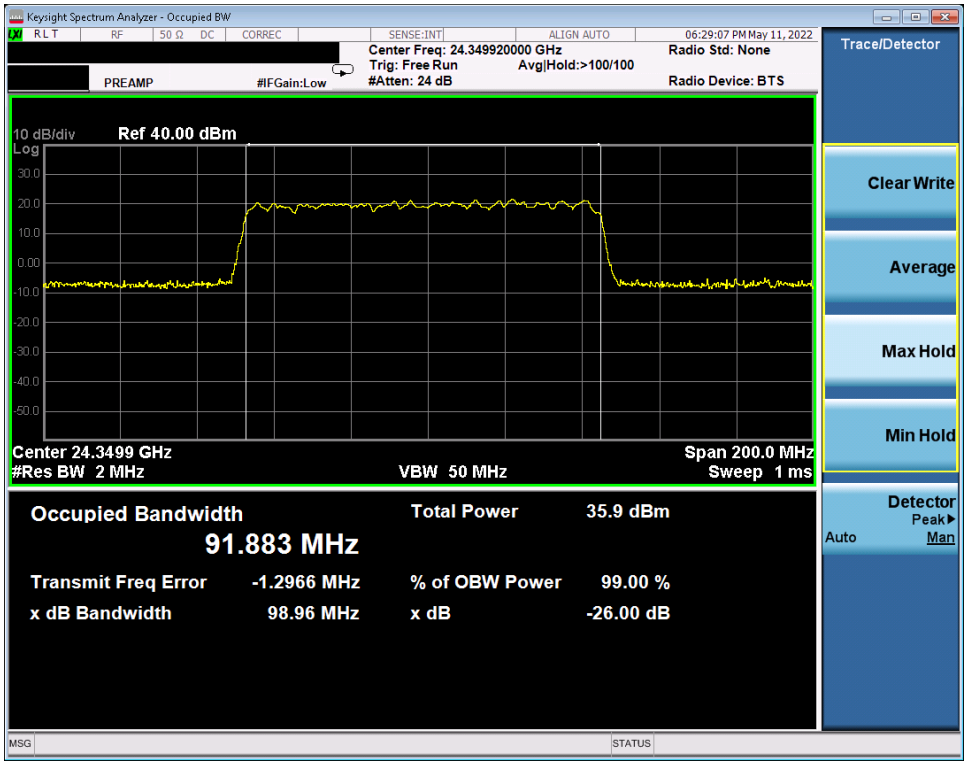
Plot 7-6. Occupied Bandwidth Plot (50MHz-2CC – pi/2-BPSK – Mid Channel)

Plot 7-7. Occupied Bandwidth Plot (50MHz-2CC – 16QAM – Mid Channel)

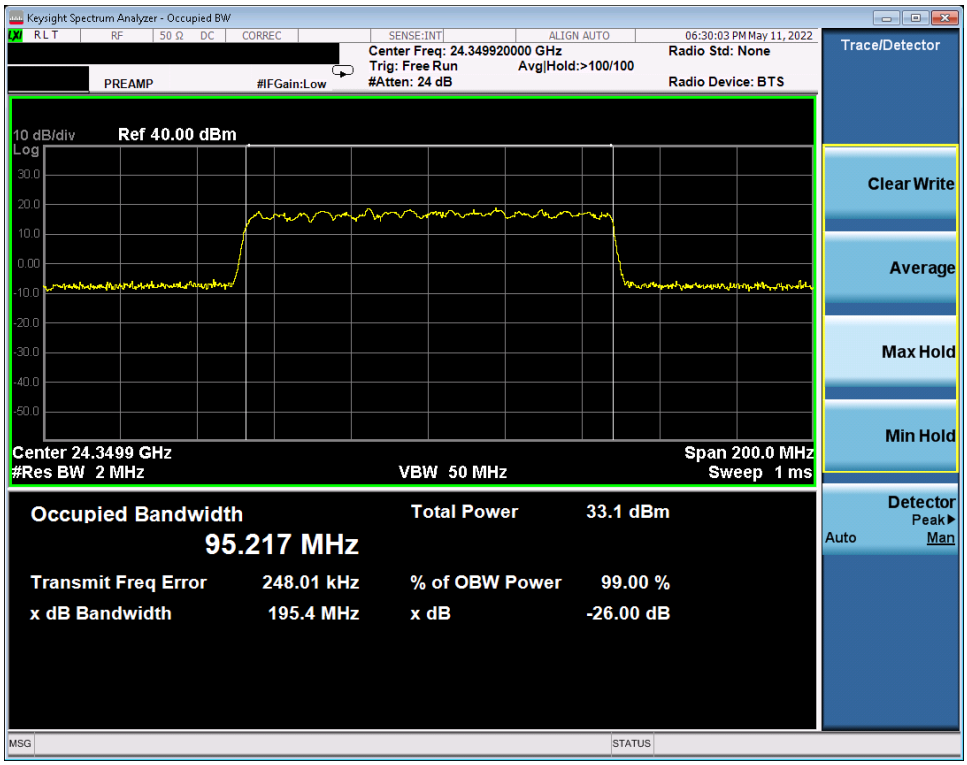
Plot 7-8. Occupied Bandwidth Plot (50MHz-2CC – 64QAM – Mid Channel)



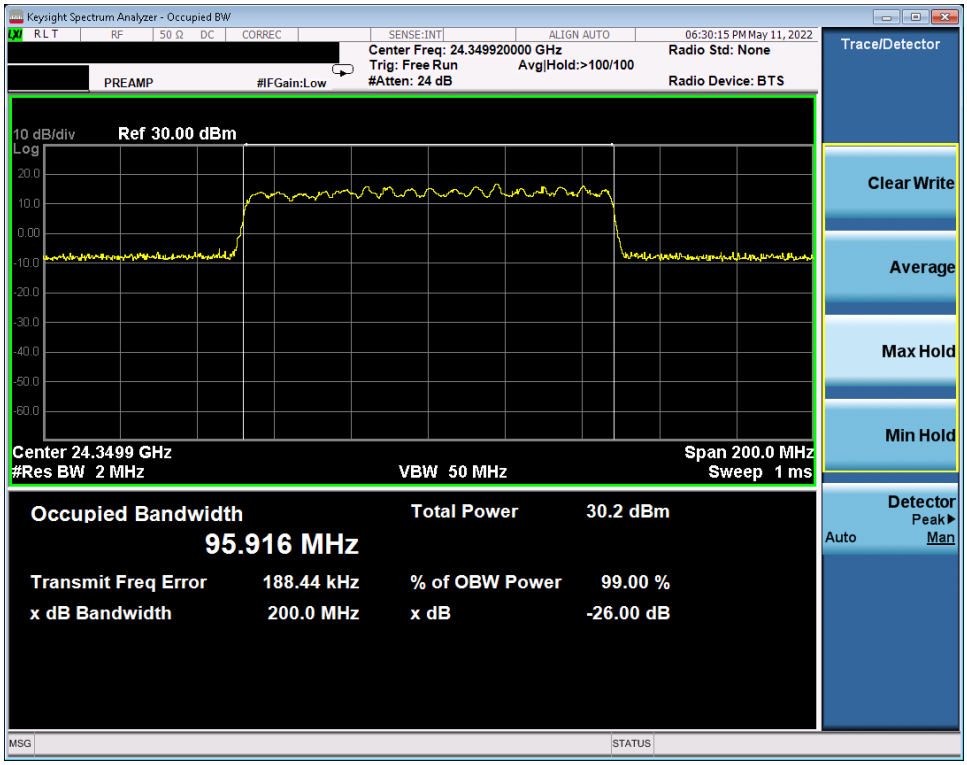
Plot 7-9. Occupied Bandwidth Plot (100MHz-1CC – QPSK – Mid Channel)



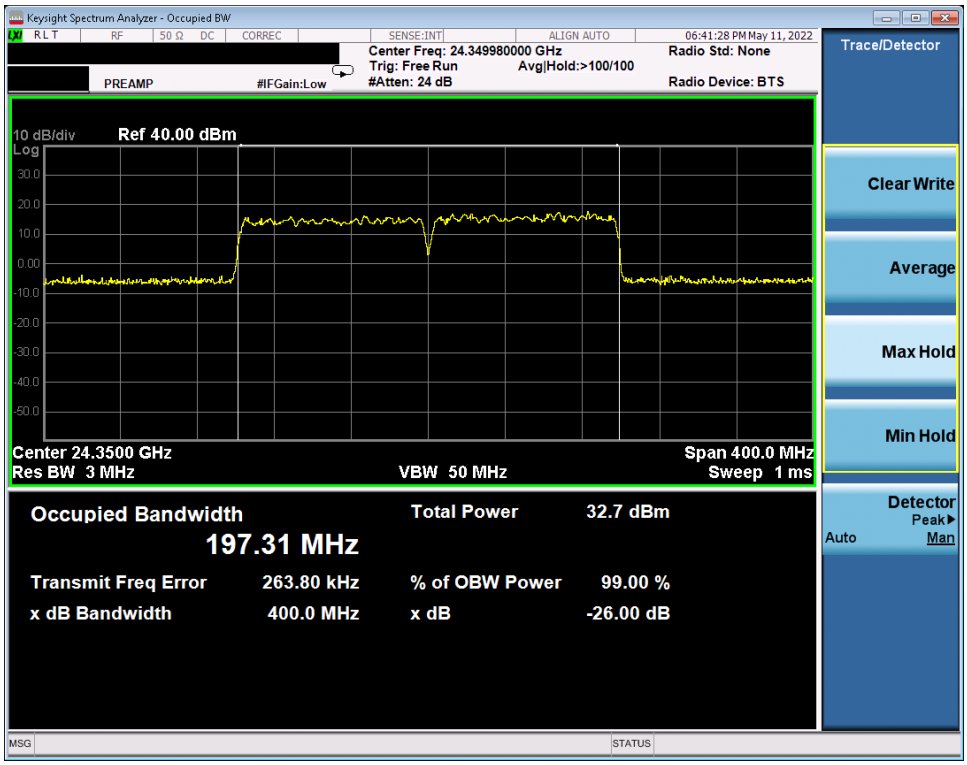
Plot 7-10. Occupied Bandwidth Plot (100MHz-1CC – pi/2-BPSK – Mid Channel)



Plot 7-11. Occupied Bandwidth Plot (100MHz-1CC – 16QAM – Mid Channel)



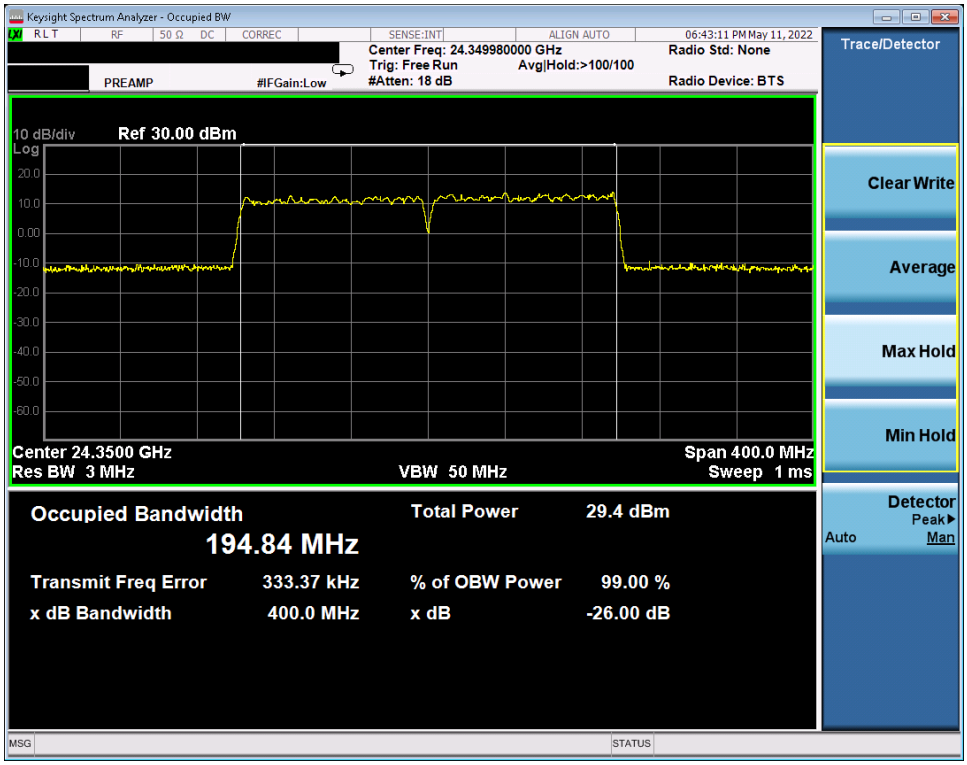
Plot 7-12. Occupied Bandwidth Plot (100MHz-1CC – 64QAM – Mid Channel)



Plot 7-13. Occupied Bandwidth Plot (100MHz-2CC – QPSK – Mid Channel)

Plot 7-14. Occupied Bandwidth Plot (100MHz-2CC – pi/2-BPSK – Mid Channel)

Plot 7-15. Occupied Bandwidth Plot (100MHz-2CC – 16QAM – Mid Channel)

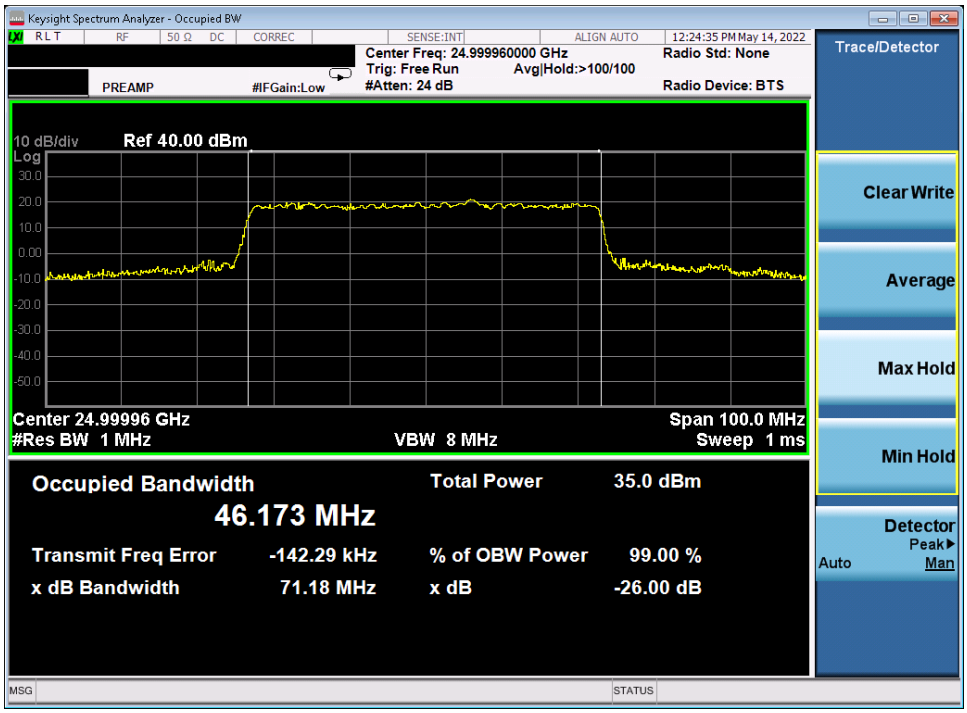


Plot 7-16. Occupied Bandwidth Plot (100MHz-2CC – 64QAM – Mid Channel)

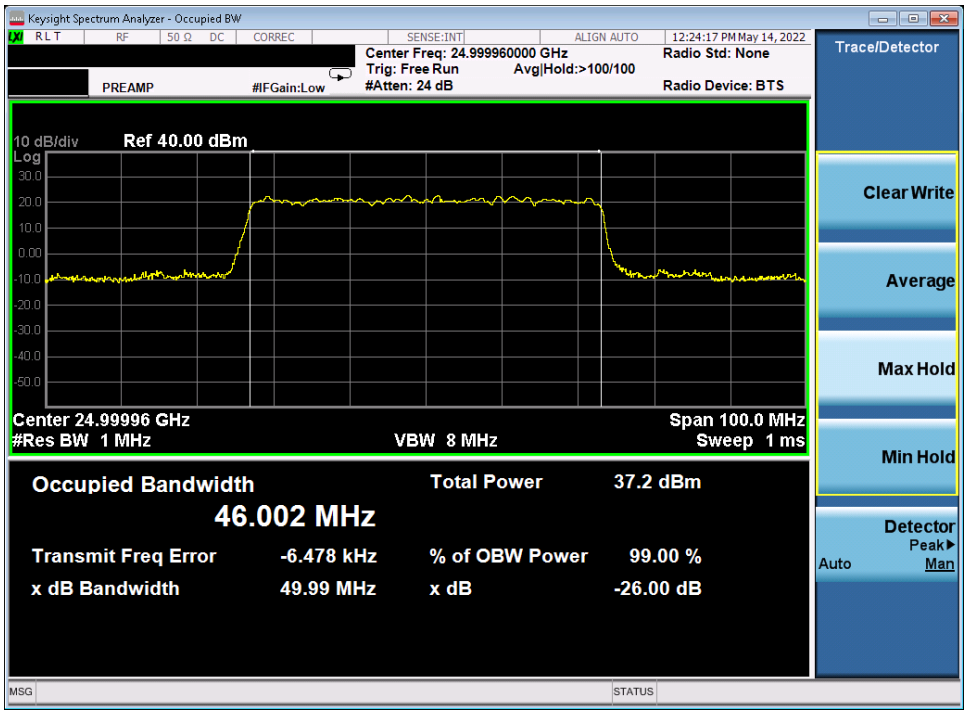
Band n258-R2

Channel	Bandwidth	CCs Active	Transmission Scheme	Modulation	OBW [MHz]
Mid	50	1	CP-OFDM	QPSK	46.17
			DFT-s-OFDM	π/2-BPSK	46.00
			CP-OFDM	16QAM	46.04
			CP-OFDM	64QAM	46.10
		2	CP-OFDM	QPSK	96.45
			DFT-s-OFDM	π/2-BPSK	96.31
			CP-OFDM	16QAM	96.26
			CP-OFDM	64QAM	97.12
	100	1	CP-OFDM	QPSK	95.04
			DFT-s-OFDM	π/2-BPSK	92.27
			CP-OFDM	16QAM	94.71
			CP-OFDM	64QAM	94.68
		2	CP-OFDM	QPSK	197.47
			DFT-s-OFDM	π/2-BPSK	192.85
			CP-OFDM	16QAM	199.21
			CP-OFDM	64QAM	194.72

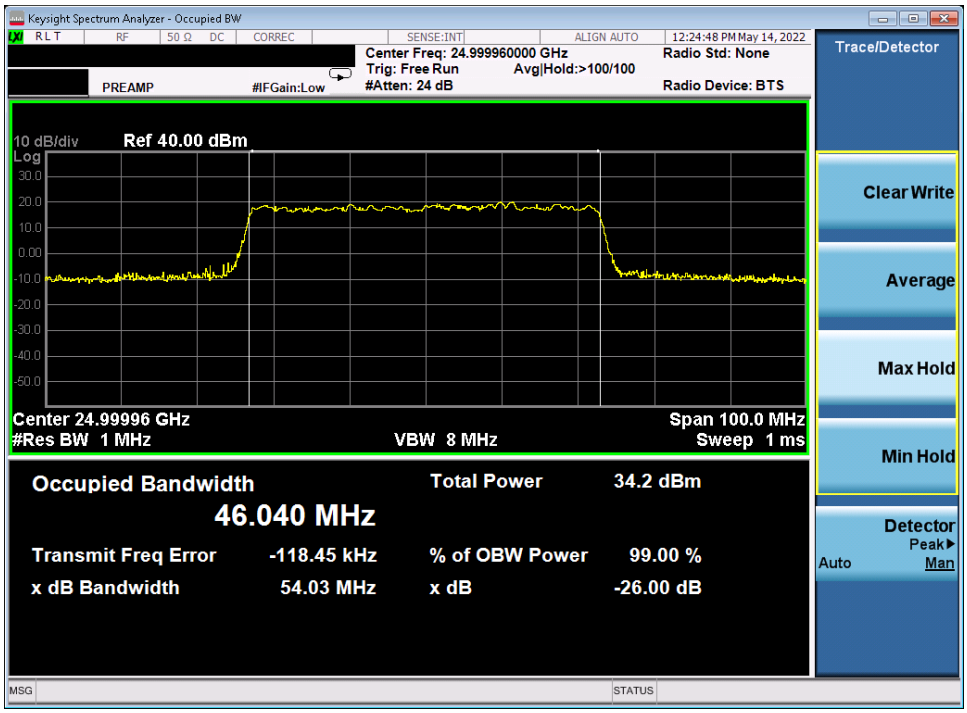
Table 7-3. Summary of Occupied Bandwidths (n258-R2)



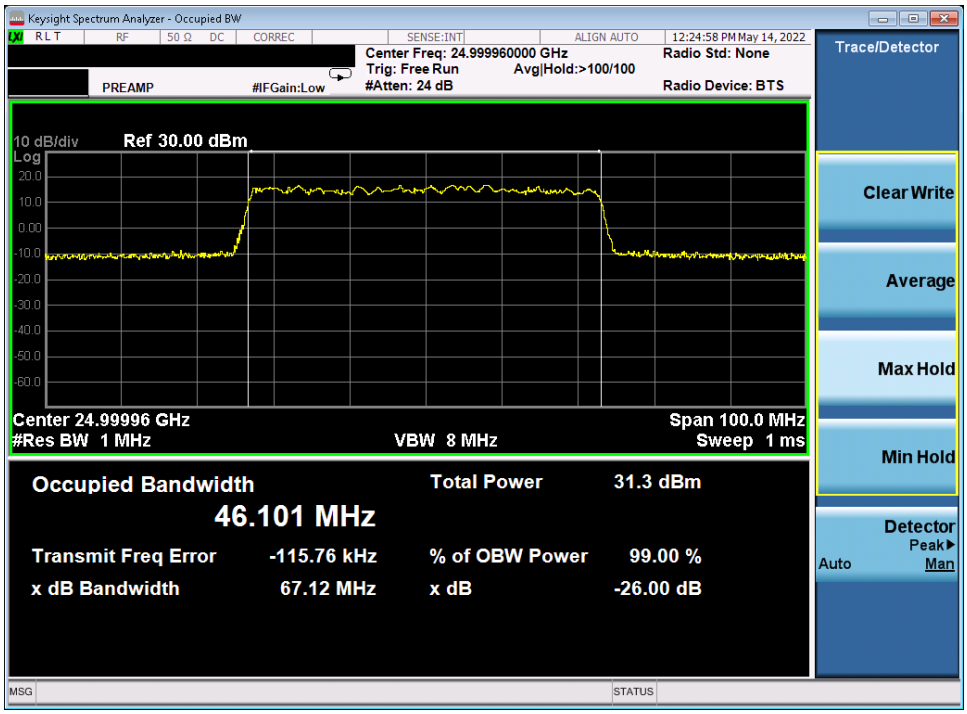
Plot 7-17. Occupied Bandwidth Plot (50MHz-1CC – QPSK – Mid Channel)



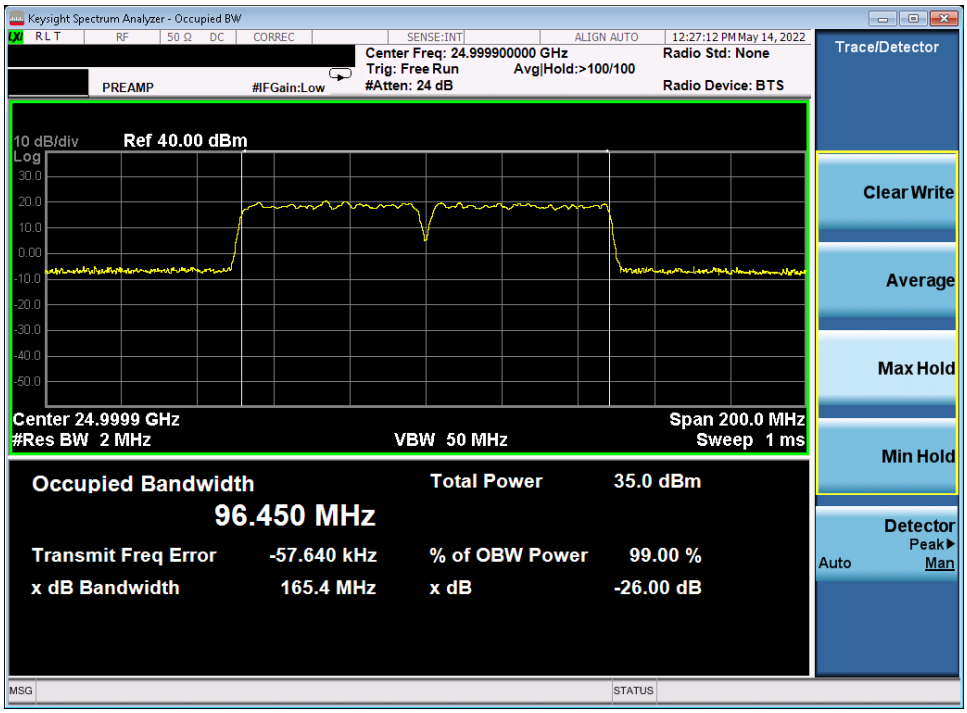
Plot 7-18. Occupied Bandwidth Plot (50MHz-1CC – pi/2-BPSK – Mid Channel)



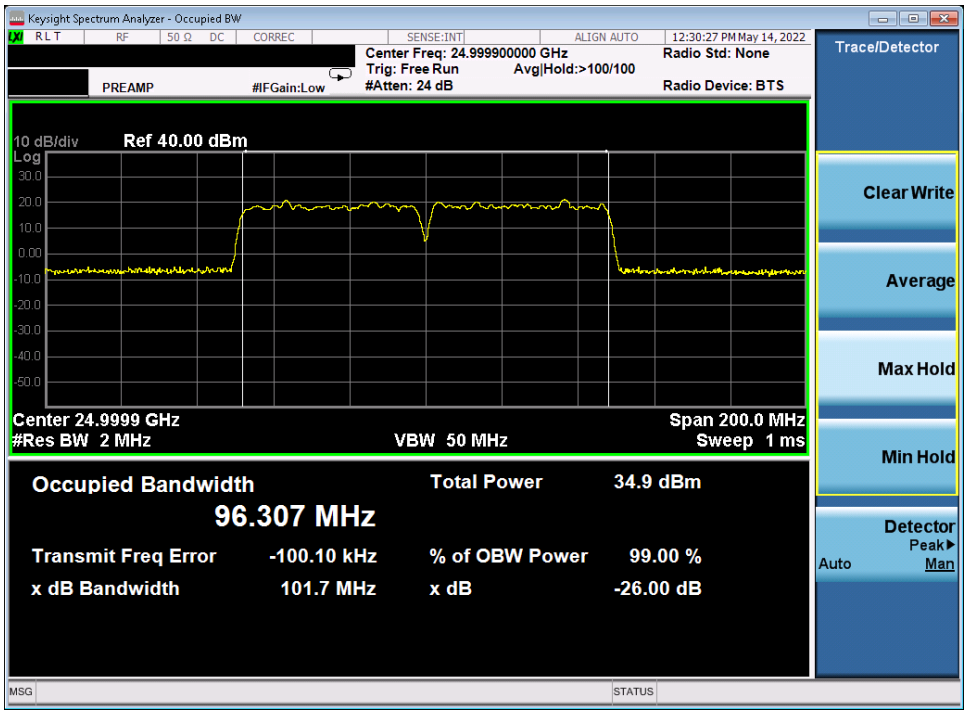
Plot 7-19. Occupied Bandwidth Plot (50MHz-1CC – 16QAM – Mid Channel)



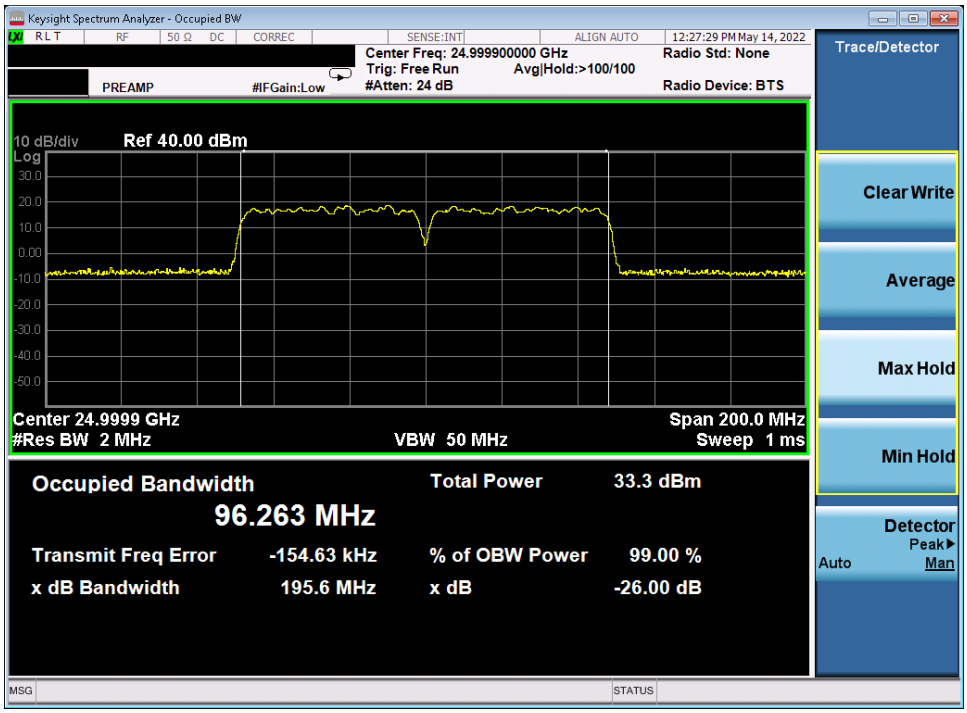
Plot 7-20. Occupied Bandwidth Plot (50MHz-1CC – 64QAM – Mid Channel)



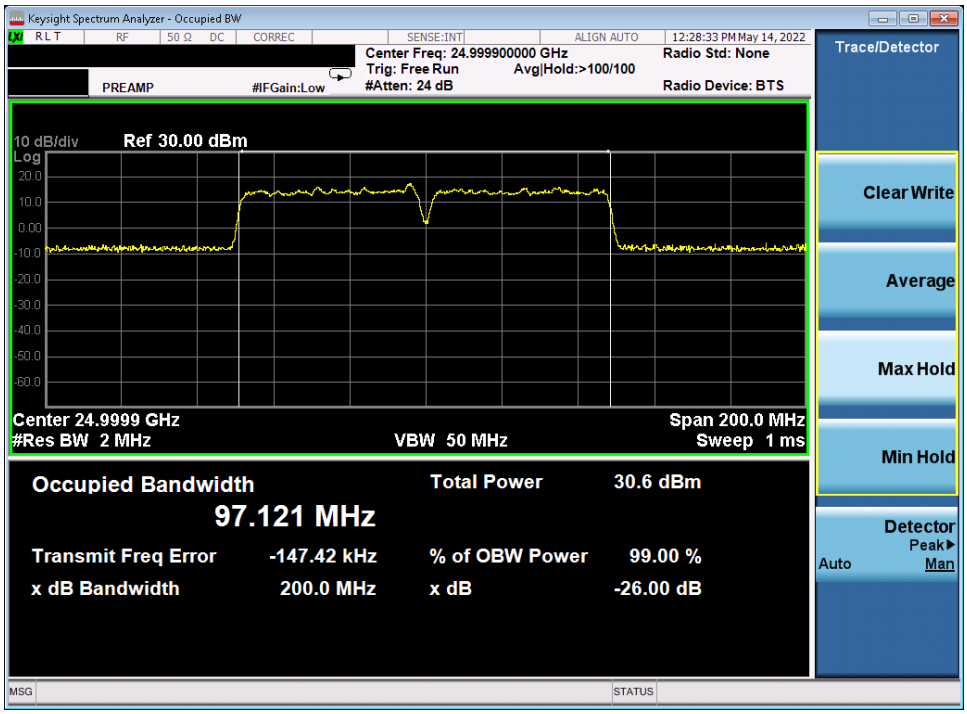
Plot 7-21. Occupied Bandwidth Plot (50MHz-2CC – QPSK – Mid Channel)



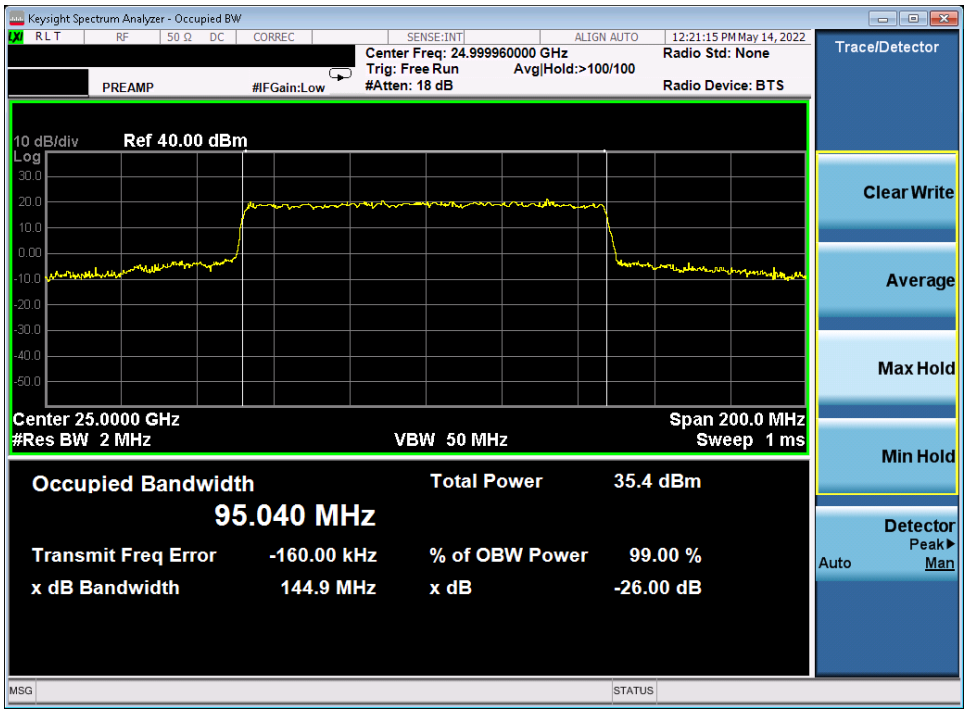
Plot 7-22. Occupied Bandwidth Plot (50MHz-2CC – pi/2-BPSK – Mid Channel)



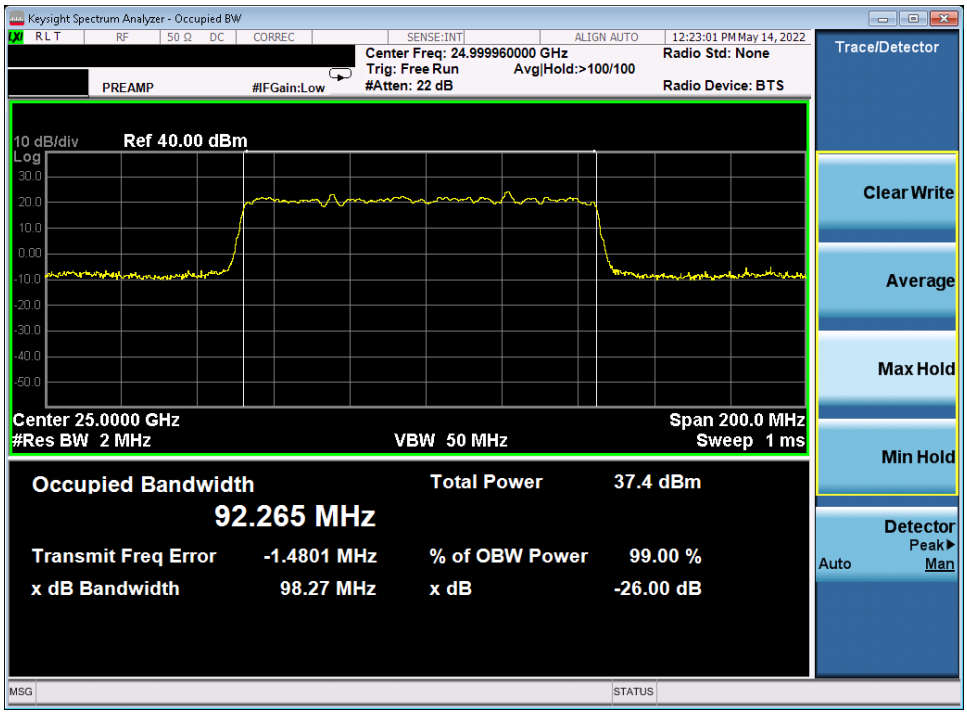
Plot 7-23. Occupied Bandwidth Plot (50MHz-2CC – 16QAM – Mid Channel)



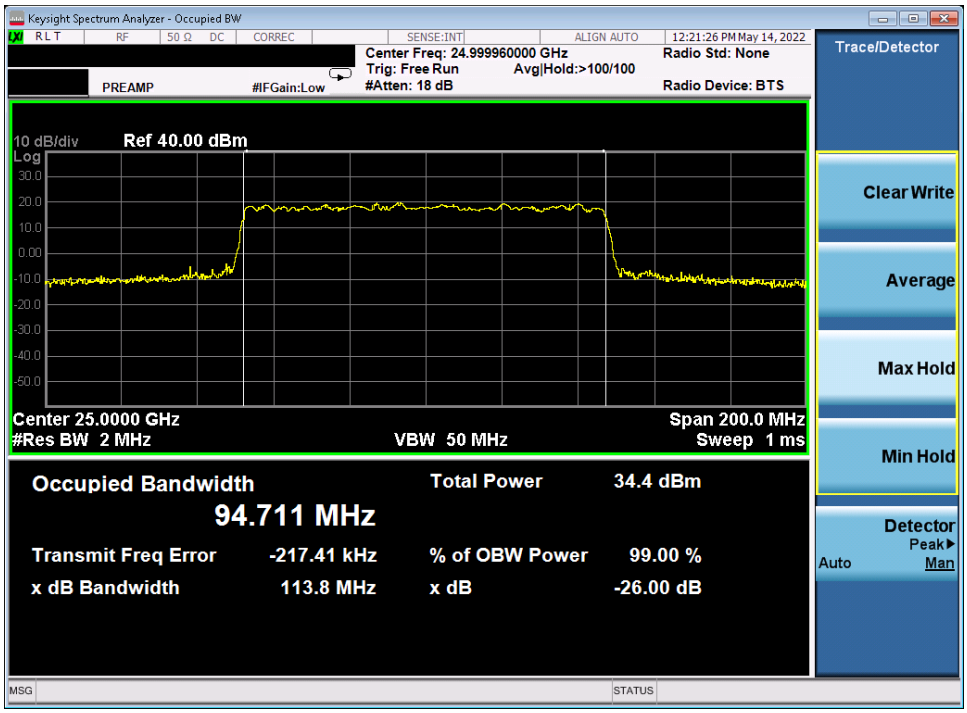
Plot 7-24. Occupied Bandwidth Plot (50MHz-2CC – 64QAM – Mid Channel)



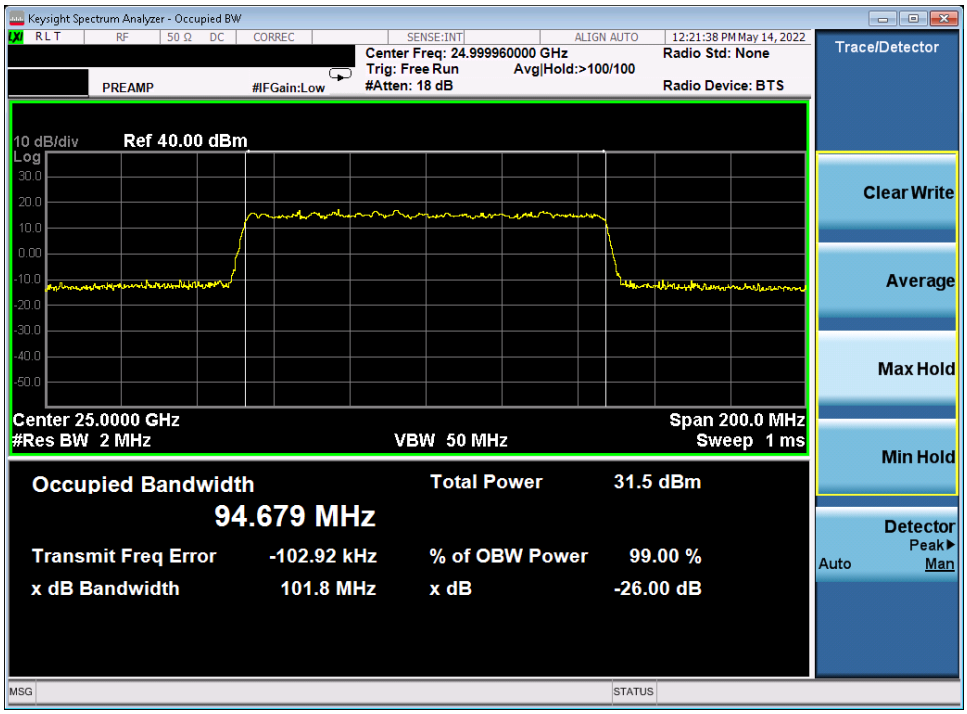
Plot 7-25. Occupied Bandwidth Plot (100MHz-1CC – QPSK – Mid Channel)



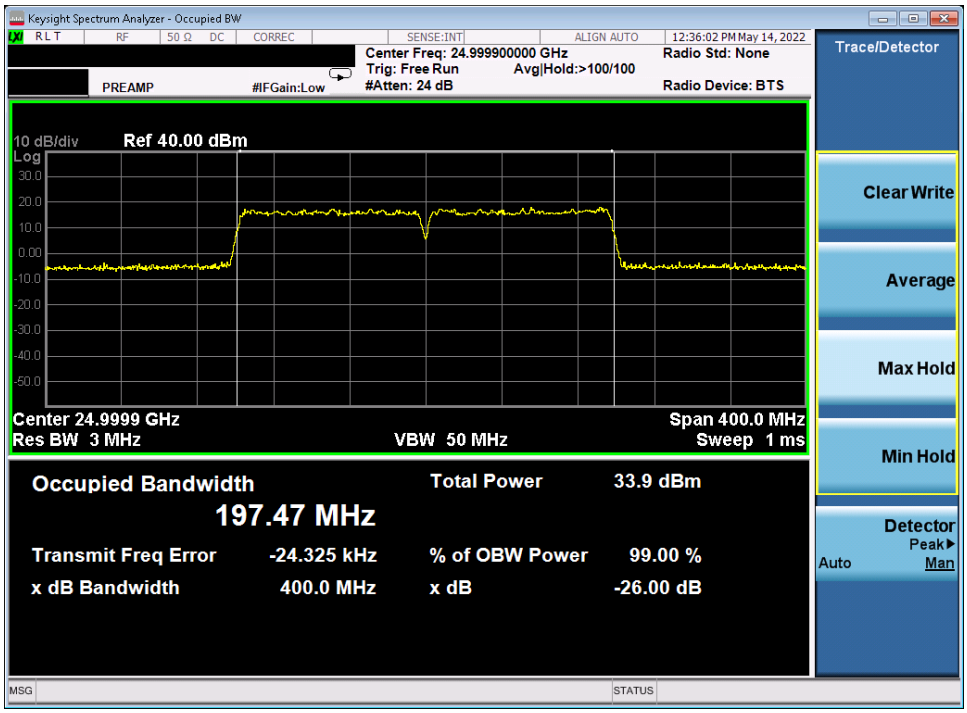
Plot 7-26. Occupied Bandwidth Plot (100MHz-1CC – pi/2-BPSK – Mid Channel)



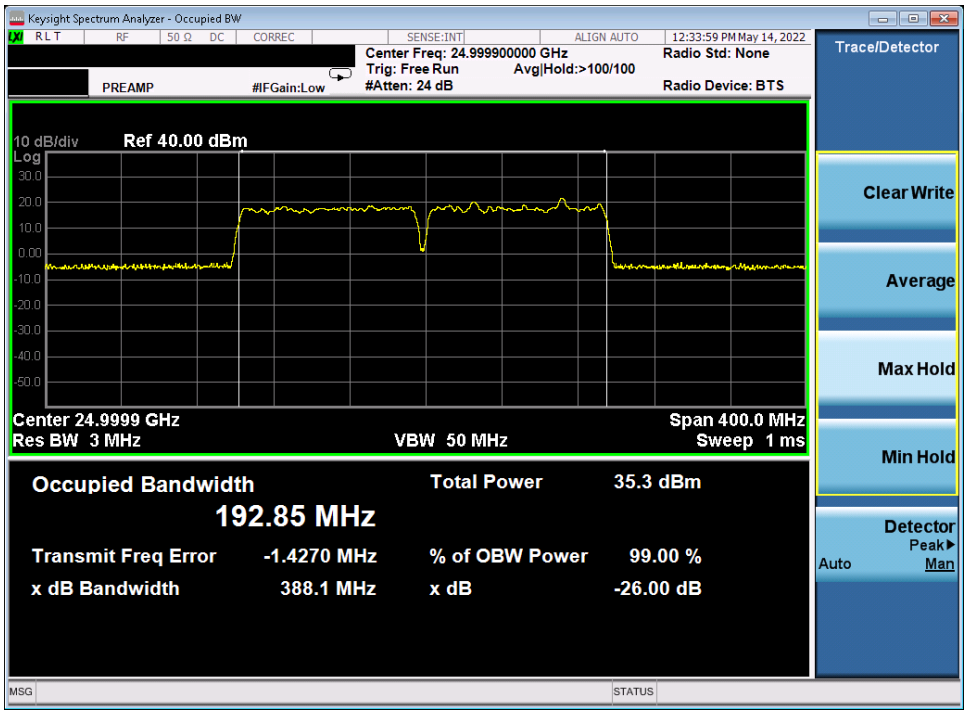
Plot 7-27. Occupied Bandwidth Plot (100MHz-1CC – 16QAM – Mid Channel)



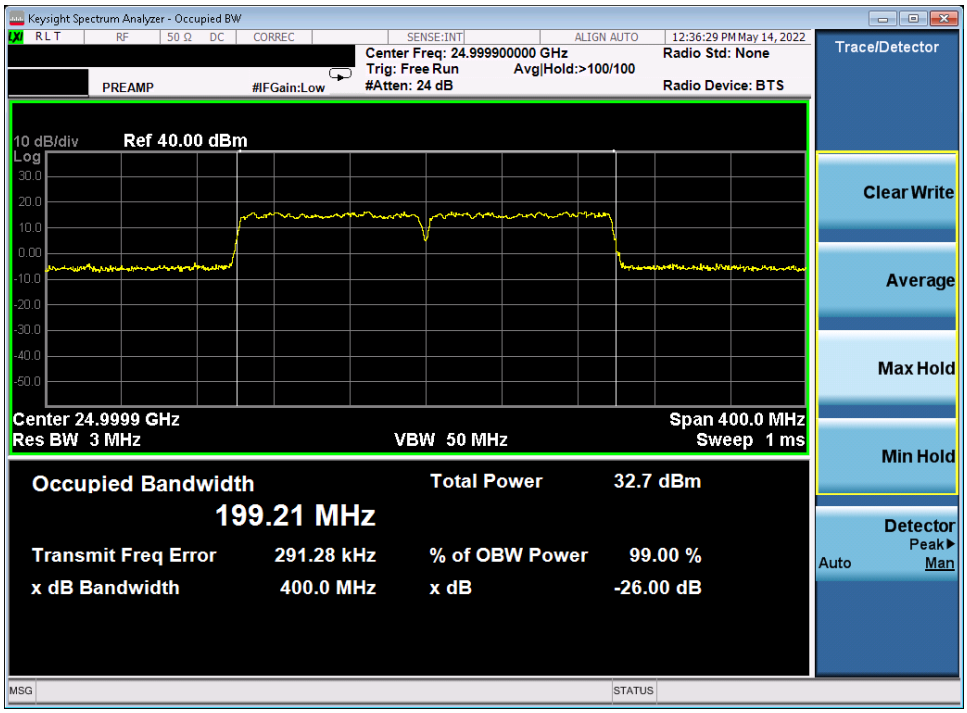
Plot 7-28. Occupied Bandwidth Plot (100MHz-1CC – 64QAM – Mid Channel)



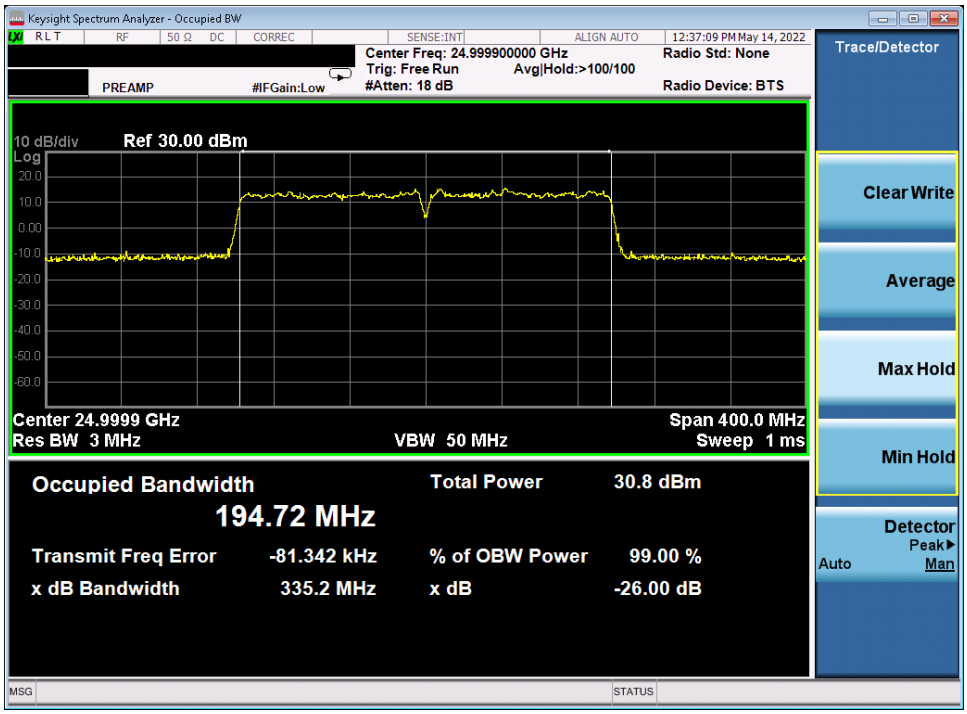
Plot 7-29. Occupied Bandwidth Plot (100MHz-2CC – QPSK – Mid Channel)



Plot 7-30. Occupied Bandwidth Plot (100MHz-2CC – pi/2-BPSK – Mid Channel)



Plot 7-31. Occupied Bandwidth Plot (100MHz-2CC – 16QAM – Mid Channel)

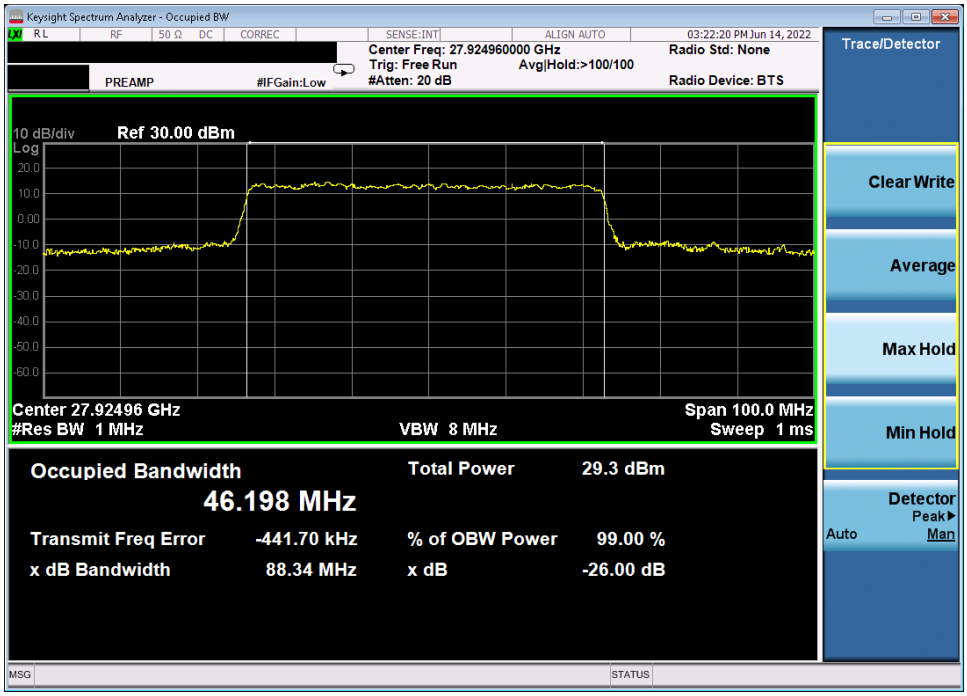


Plot 7-32. Occupied Bandwidth Plot (100MHz-2CC – 64QAM – Mid Channel)

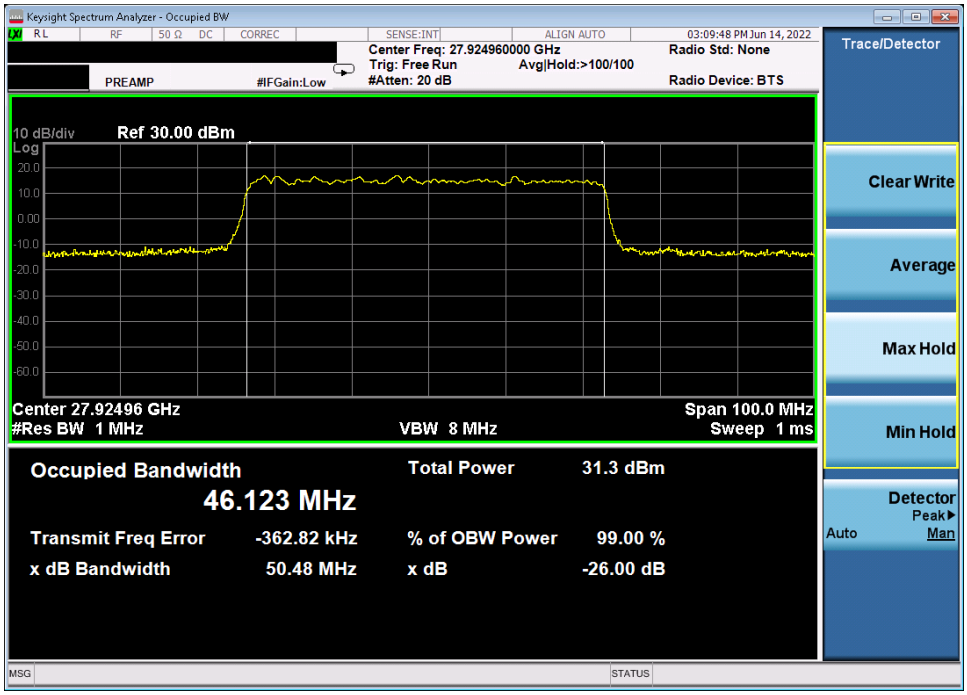
Band n261

Channel	Bandwidth	CCs Active	Transmission Scheme	Modulation	OBW [MHz]
Mid	50	1	CP-OFDM	QPSK	46.20
			DFT-s-OFDM	π/2-BPSK	46.12
			CP-OFDM	16QAM	46.00
			CP-OFDM	64QAM	45.93
		2	CP-OFDM	QPSK	95.63
			DFT-s-OFDM	π/2-BPSK	95.77
			CP-OFDM	16QAM	95.71
			CP-OFDM	64QAM	96.01
	100	1	CP-OFDM	QPSK	94.85
			DFT-s-OFDM	π/2-BPSK	92.13
			CP-OFDM	16QAM	94.81
			CP-OFDM	64QAM	94.85
		2	CP-OFDM	QPSK	194.04
			DFT-s-OFDM	π/2-BPSK	191.65
			CP-OFDM	16QAM	194.14
			CP-OFDM	64QAM	193.91

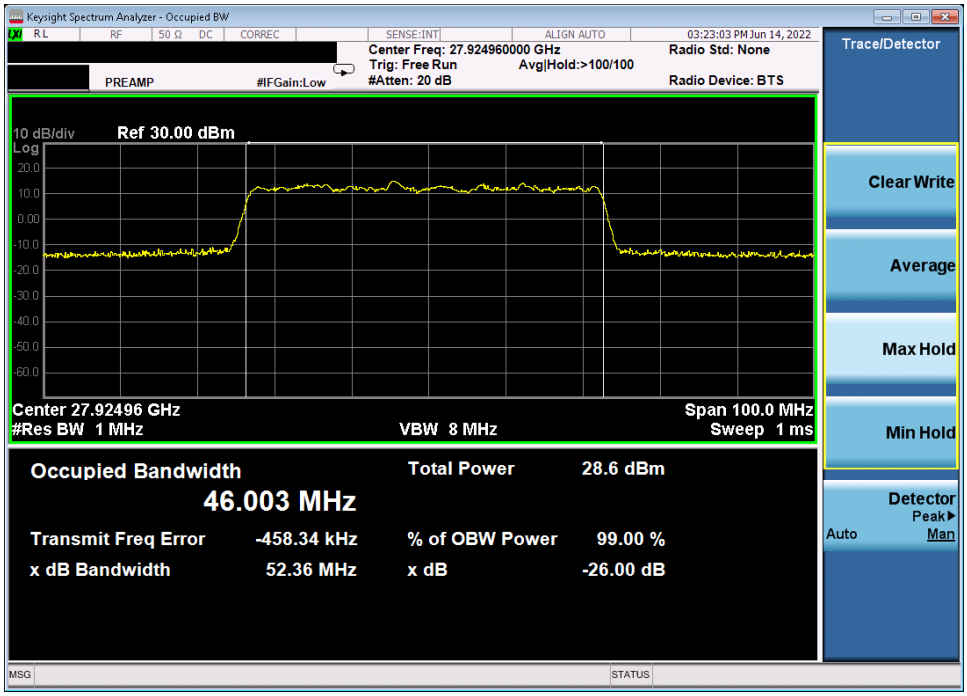
Table 7-4. Summary of Occupied Bandwidths (n261)



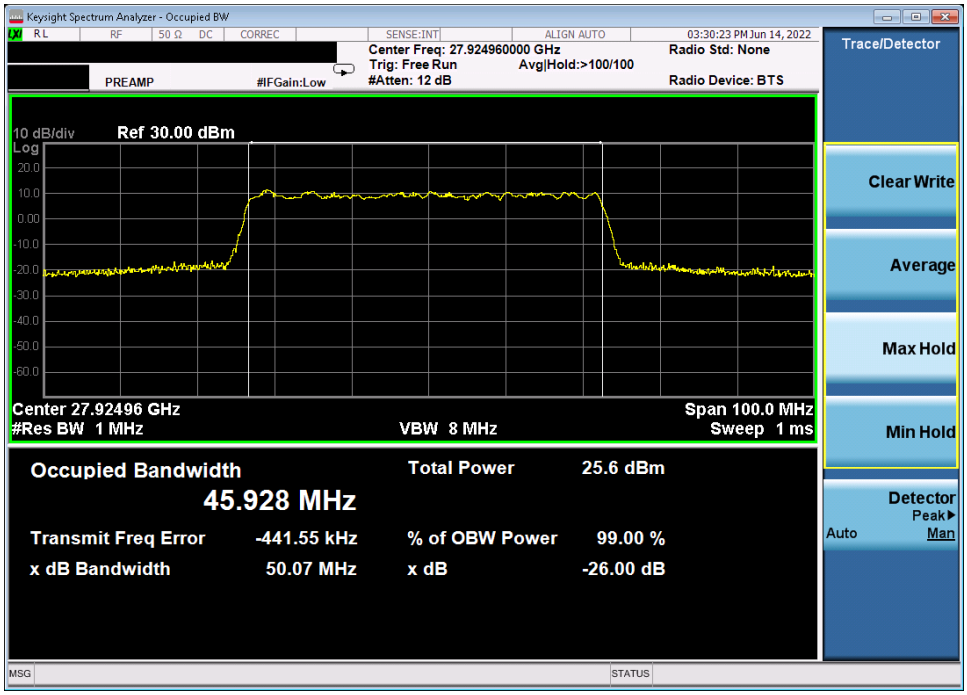
Plot 7-33. Occupied Bandwidth Plot (50MHz-1CC – QPSK – Mid Channel)



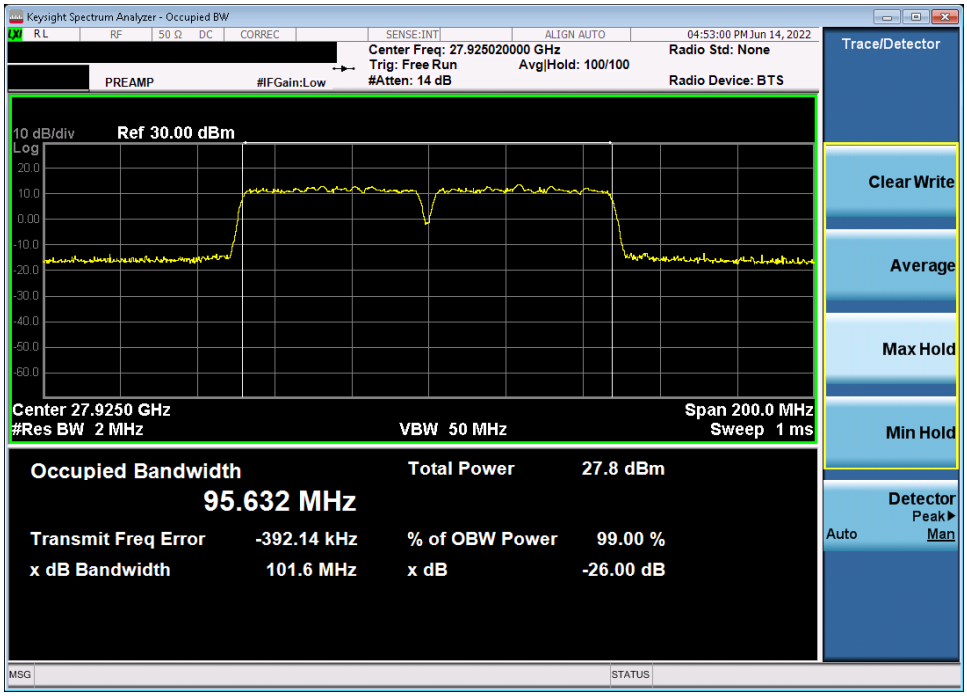
Plot 7-34. Occupied Bandwidth Plot (50MHz-1CC – pi/2-BPSK – Mid Channel)



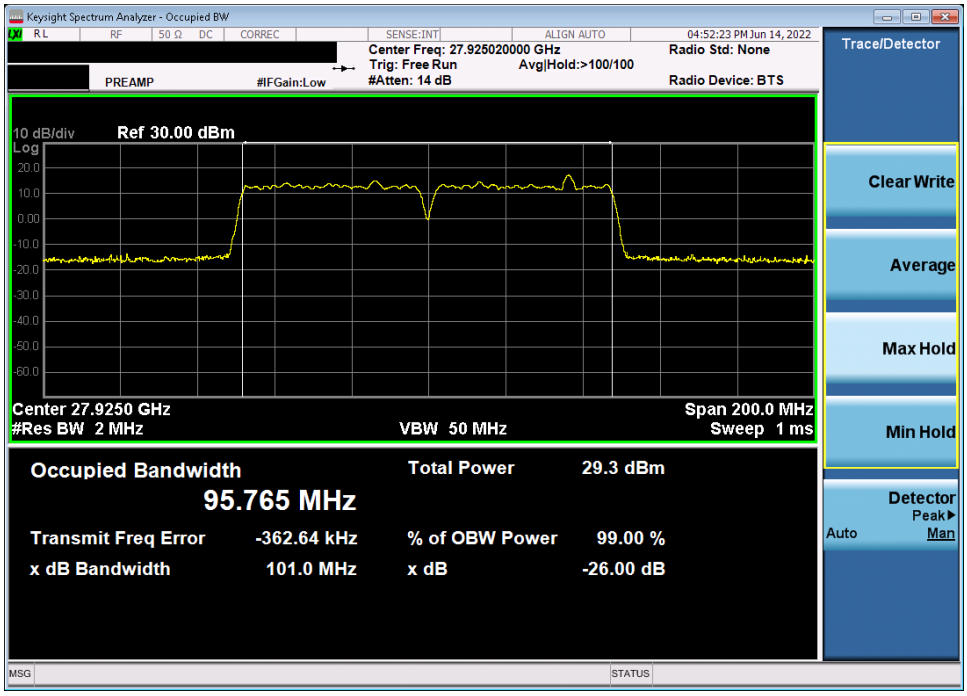
Plot 7-35. Occupied Bandwidth Plot (50MHz-1CC – 16QAM – Mid Channel)



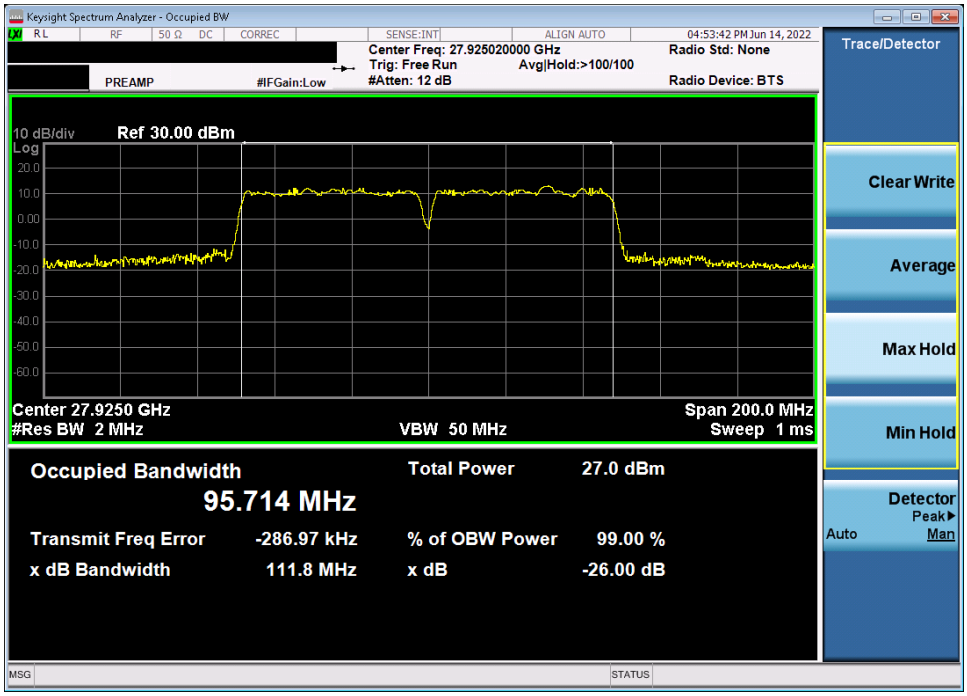
Plot 7-36. Occupied Bandwidth Plot (50MHz-1CC – 64QAM – Mid Channel)



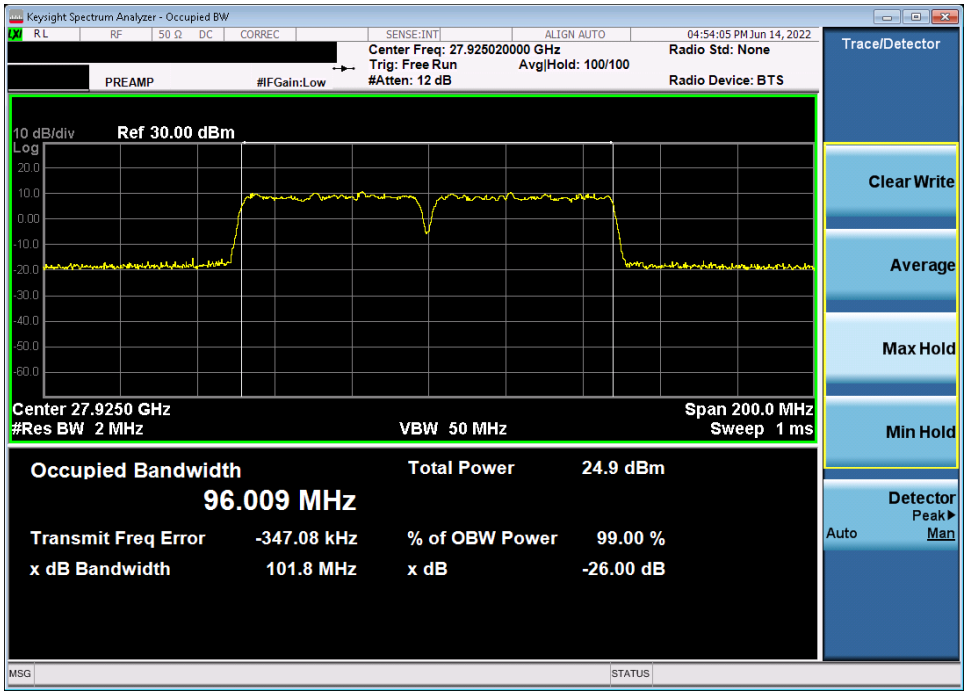
Plot 7-37. Occupied Bandwidth Plot (50MHz-2CC – QPSK – Mid Channel)



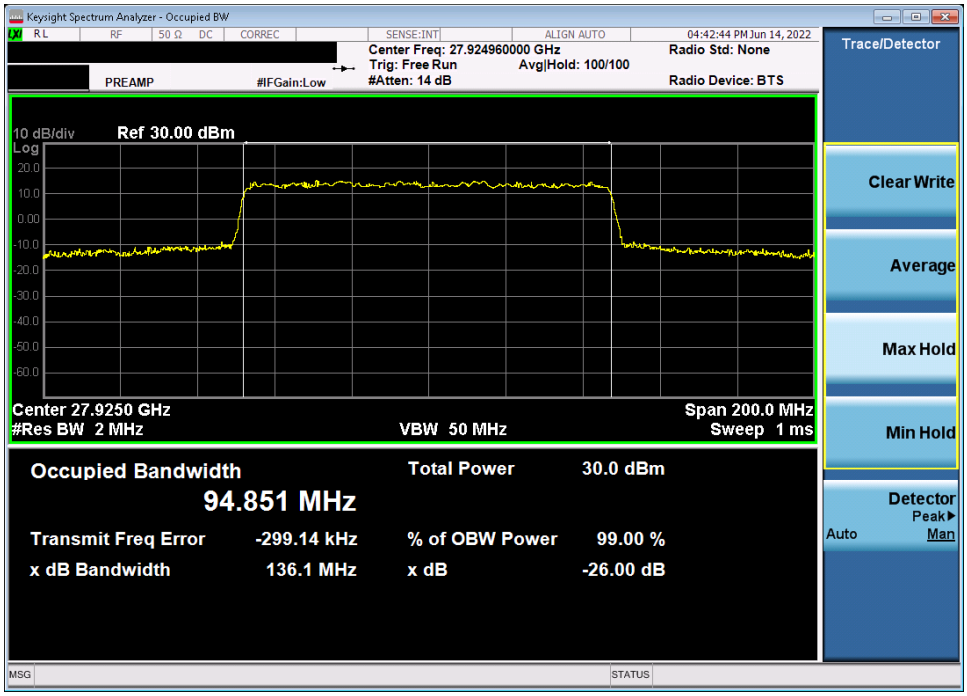
Plot 7-38. Occupied Bandwidth Plot (50MHz-2CC – pi/2-BPSK – Mid Channel)



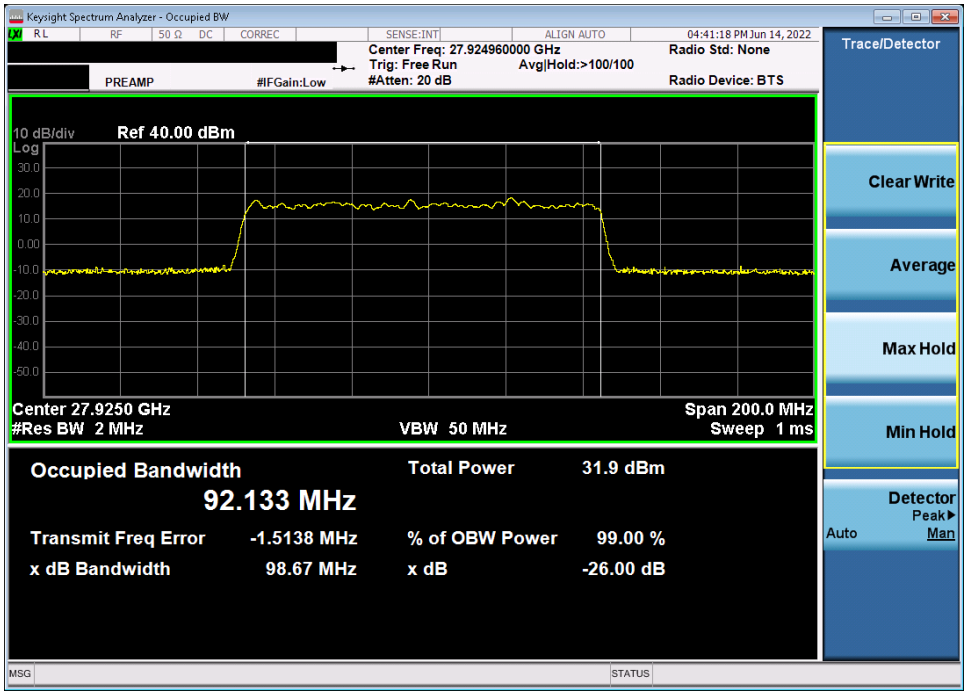
Plot 7-39. Occupied Bandwidth Plot (50MHz-2CC – 16QAM – Mid Channel)



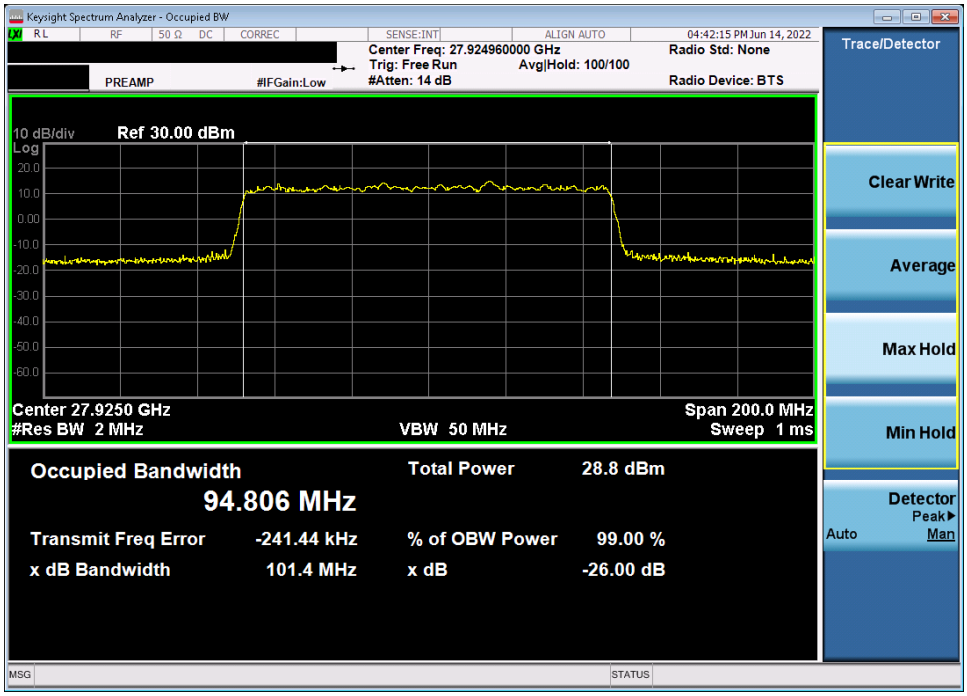
Plot 7-40. Occupied Bandwidth Plot (50MHz-2CC – 64QAM – Mid Channel)



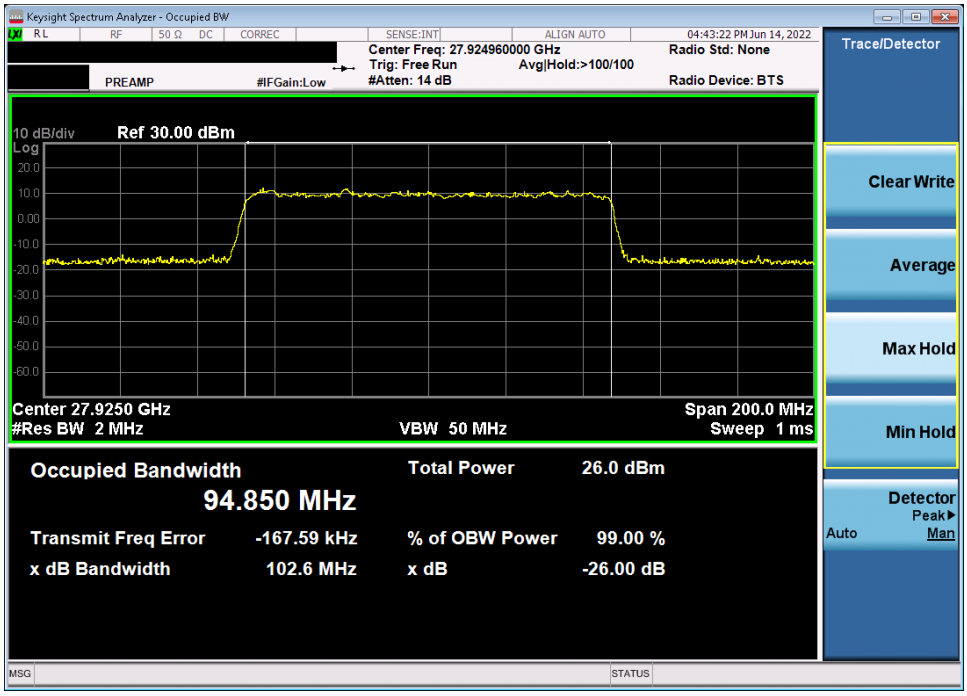
Plot 7-41. Occupied Bandwidth Plot (100MHz-1CC – QPSK – Mid Channel)



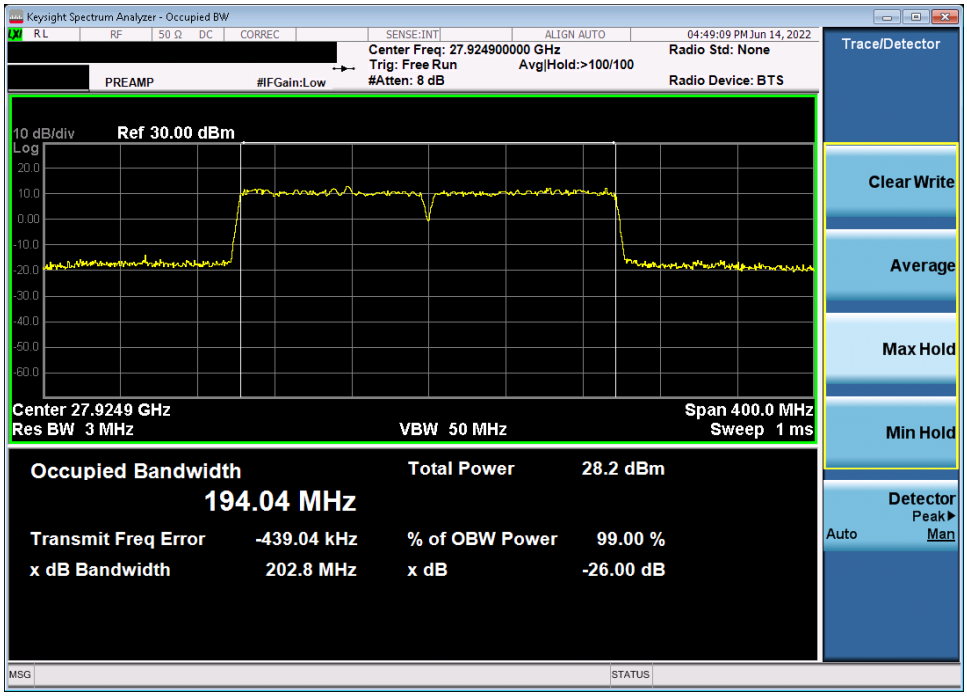
Plot 7-42. Occupied Bandwidth Plot (100MHz-1CC – pi/2-BPSK – Mid Channel)



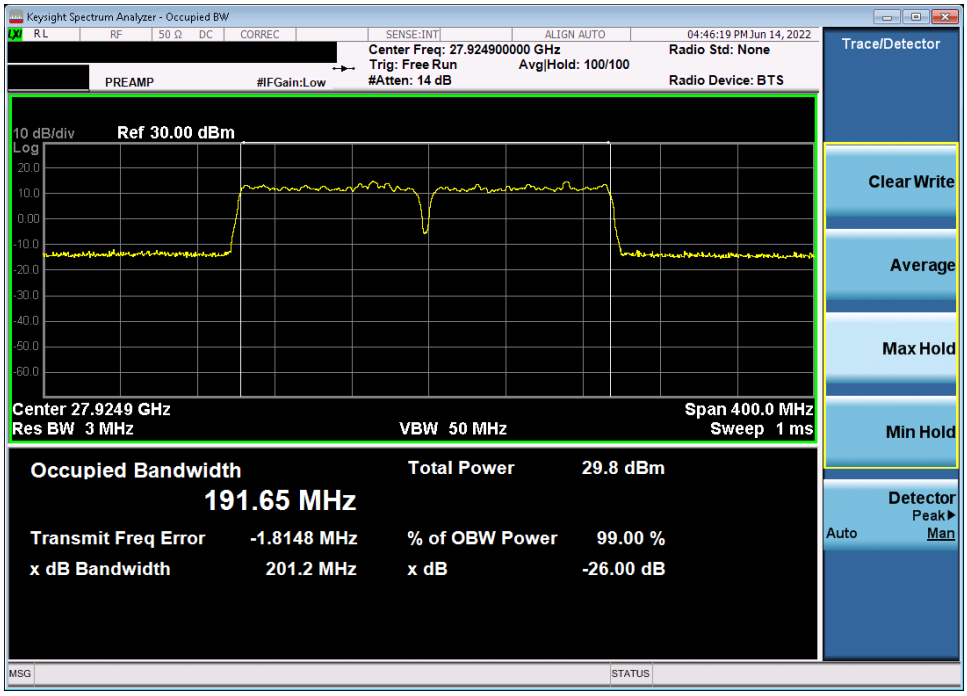
Plot 7-43. Occupied Bandwidth Plot (100MHz-1CC – 16QAM – Mid Channel)



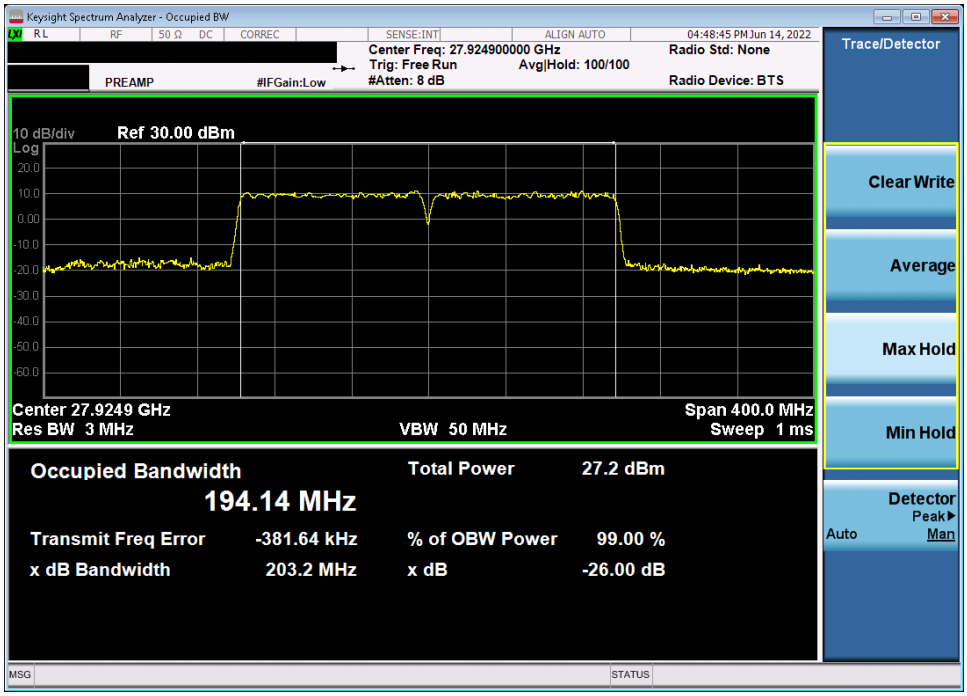
Plot 7-44. Occupied Bandwidth Plot (100MHz-1CC – 64QAM – Mid Channel)



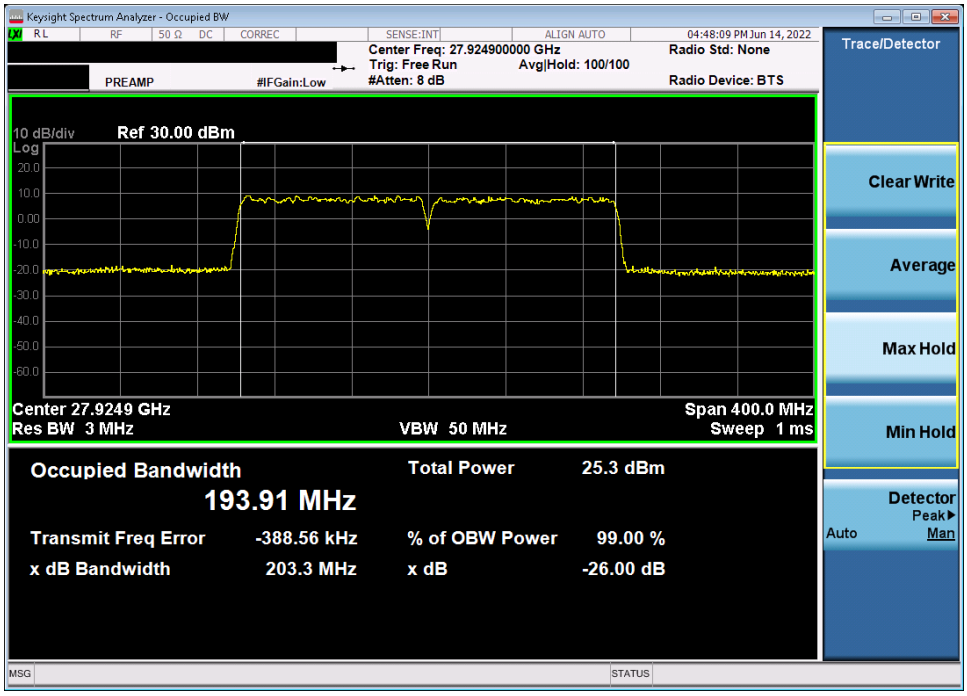
Plot 7-45. Occupied Bandwidth Plot (100MHz-2CC – QPSK – Mid Channel)



Plot 7-46. Occupied Bandwidth Plot (100MHz-2CC – pi/2-BPSK – Mid Channel)



Plot 7-47. Occupied Bandwidth Plot (100MHz-2CC – 16QAM – Mid Channel)

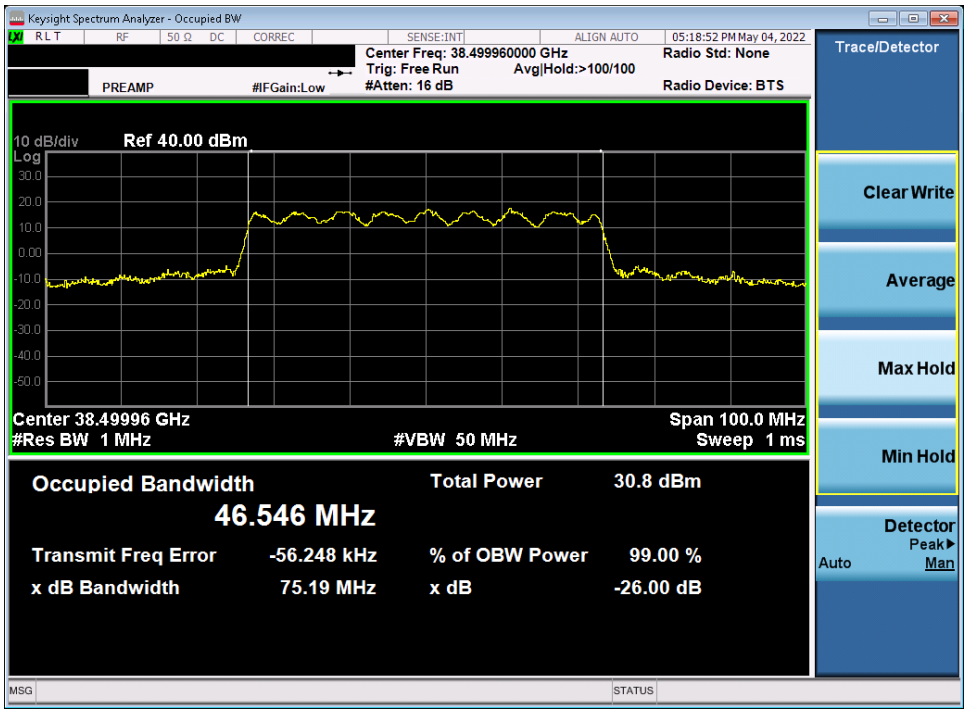


Plot 7-48. Occupied Bandwidth Plot (100MHz-2CC – 64QAM – Mid Channel)

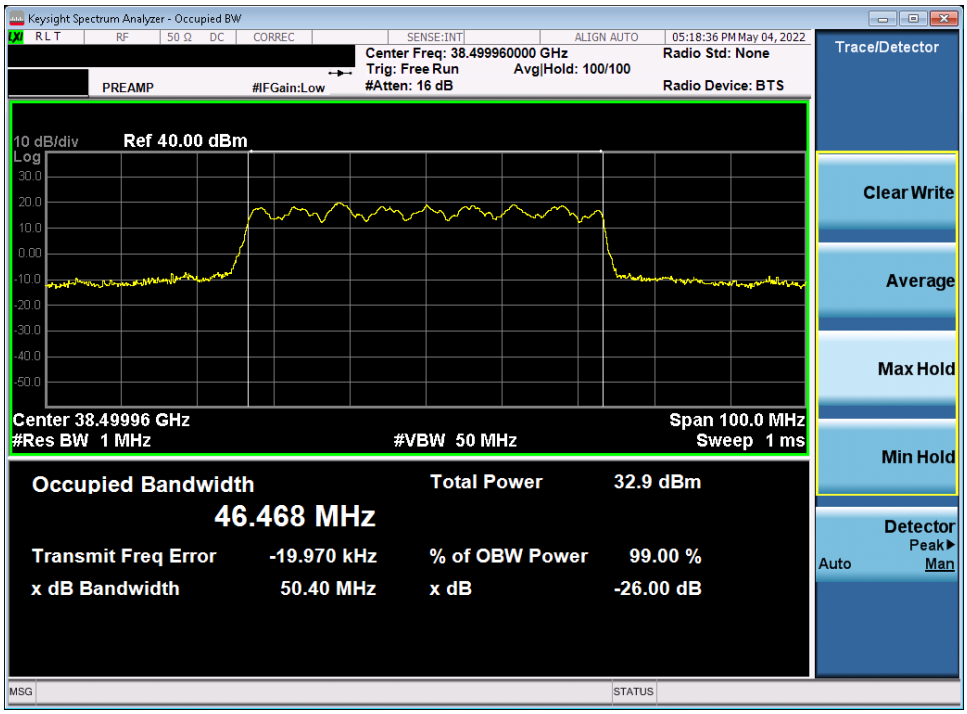
Band n260

Channel	Bandwidth	CCs Active	Transmission Scheme	Modulation	OBW [MHz]
Mid	50	1	CP-OFDM	QPSK	46.55
			DFT-s-OFDM	π/2-BPSK	46.47
			CP-OFDM	16QAM	46.51
			CP-OFDM	64QAM	46.71
		2	CP-OFDM	QPSK	95.88
			DFT-s-OFDM	π/2-BPSK	96.19
			CP-OFDM	16QAM	96.03
			CP-OFDM	64QAM	96.23
	100	1	CP-OFDM	QPSK	95.76
			DFT-s-OFDM	π/2-BPSK	92.22
			CP-OFDM	16QAM	95.72
			CP-OFDM	64QAM	96.85
		2	CP-OFDM	QPSK	195.03
			DFT-s-OFDM	π/2-BPSK	191.03
			CP-OFDM	16QAM	195.03
			CP-OFDM	64QAM	195.87

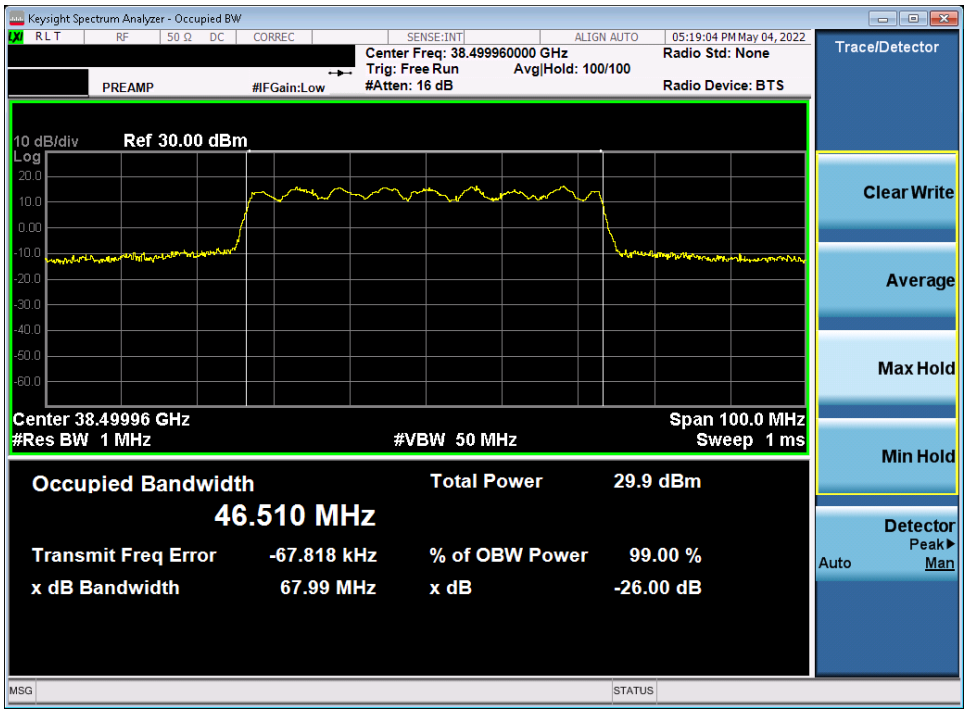
Table 7-5. Summary of Occupied Bandwidths (n260)



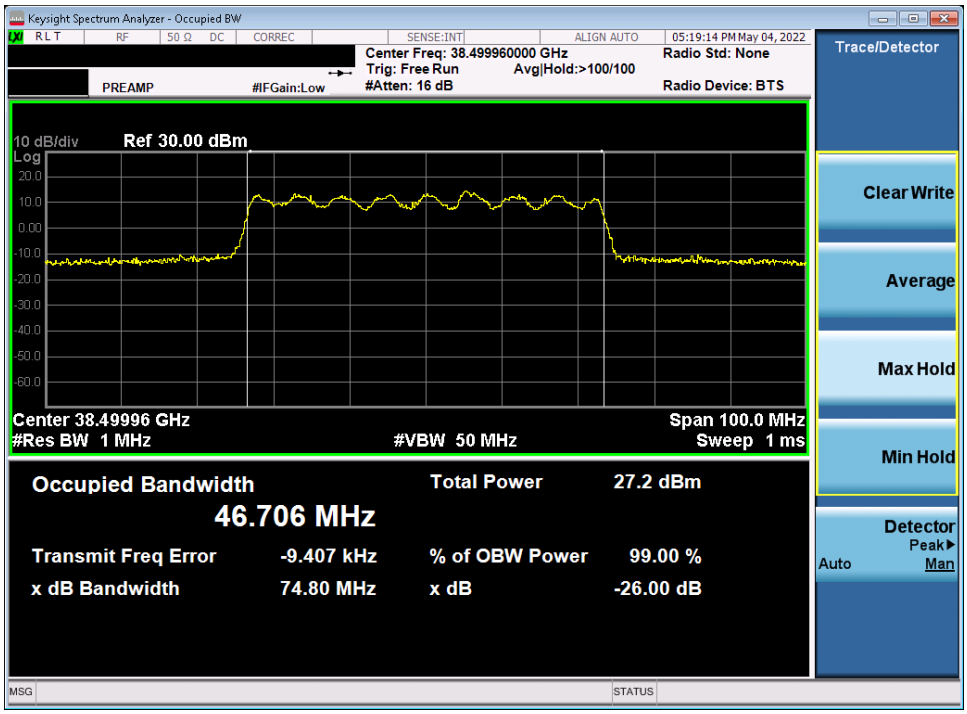
Plot 7-49. Occupied Bandwidth Plot (50MHz-1CC – QPSK – Mid Channel)



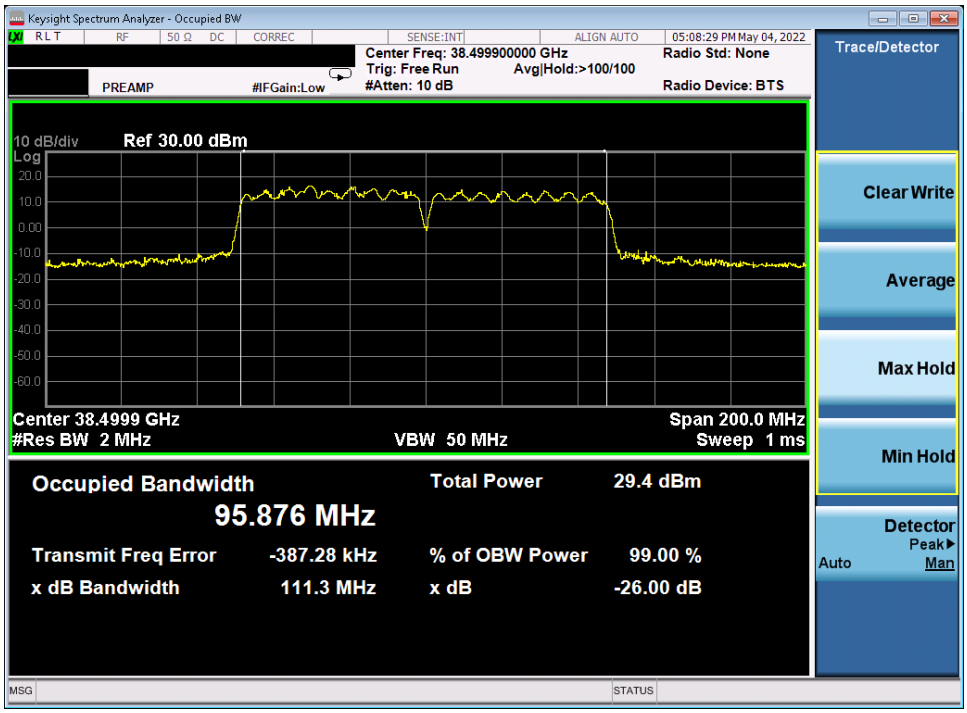
Plot 7-50. Occupied Bandwidth Plot (50MHz-1CC – pi/2-BPSK – Mid Channel)



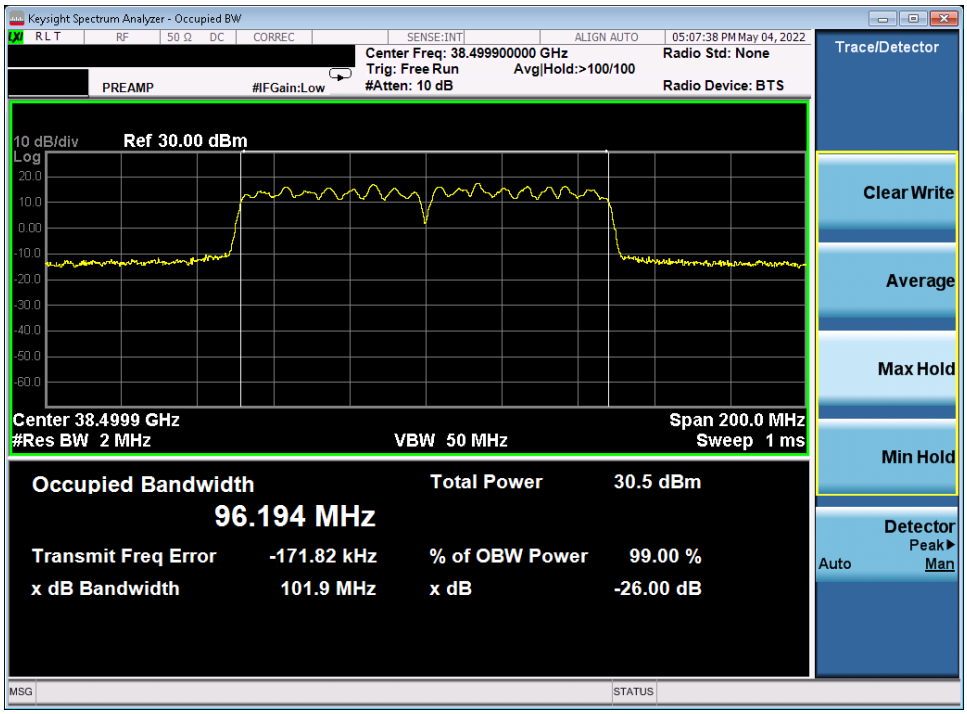
Plot 7-51. Occupied Bandwidth Plot (50MHz-1CC – 16QAM – Mid Channel)



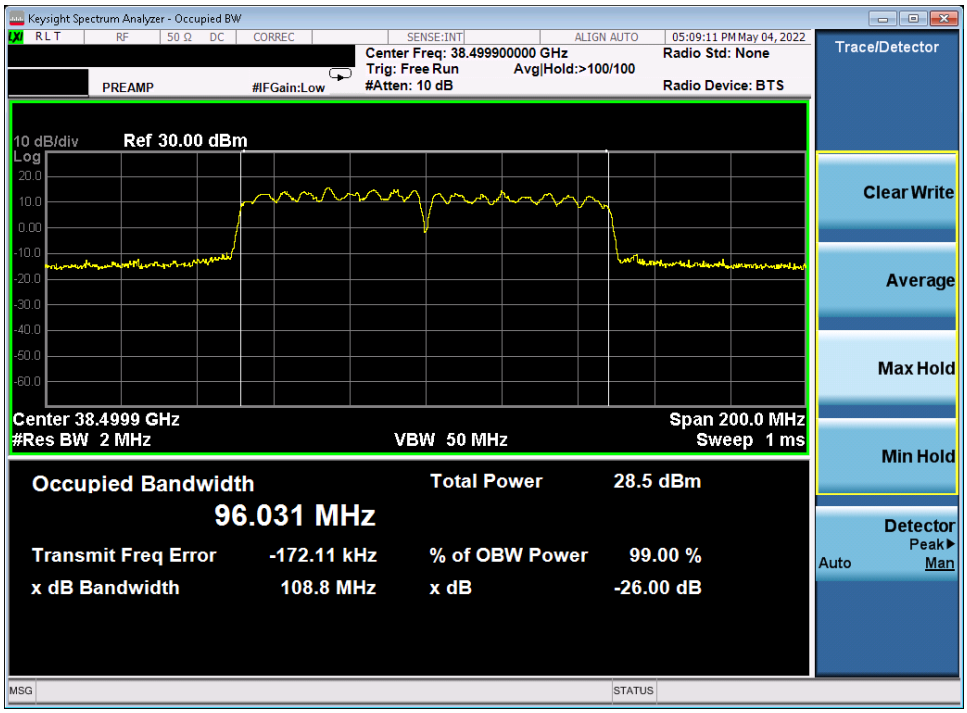
Plot 7-52. Occupied Bandwidth Plot (50MHz-1CC – 64QAM – Mid Channel)



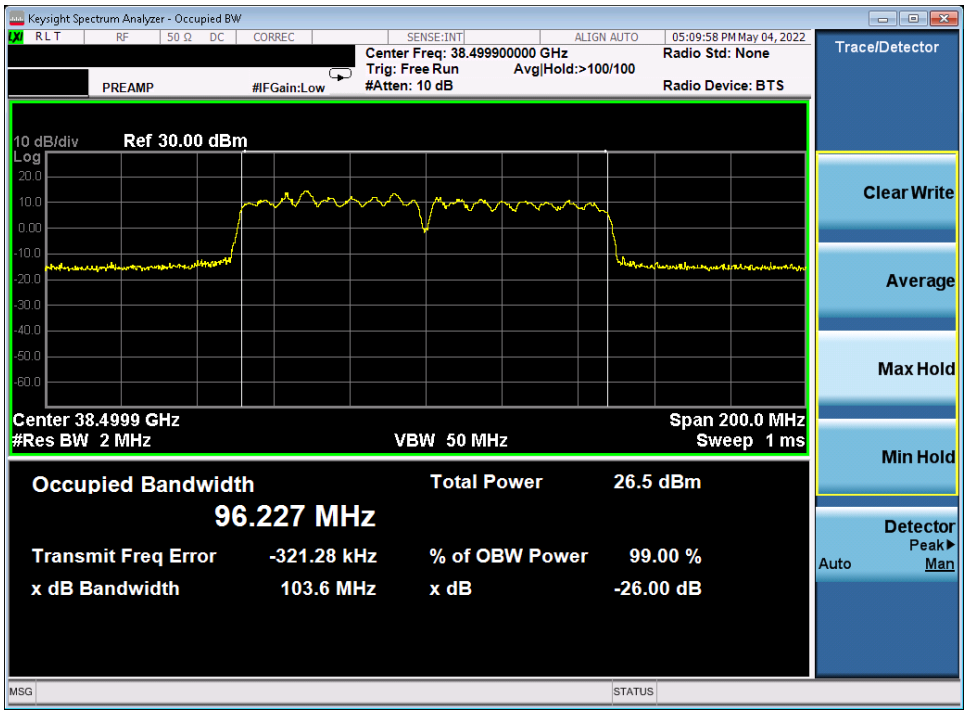
Plot 7-53. Occupied Bandwidth Plot (50MHz-2CC – QPSK – Mid Channel)



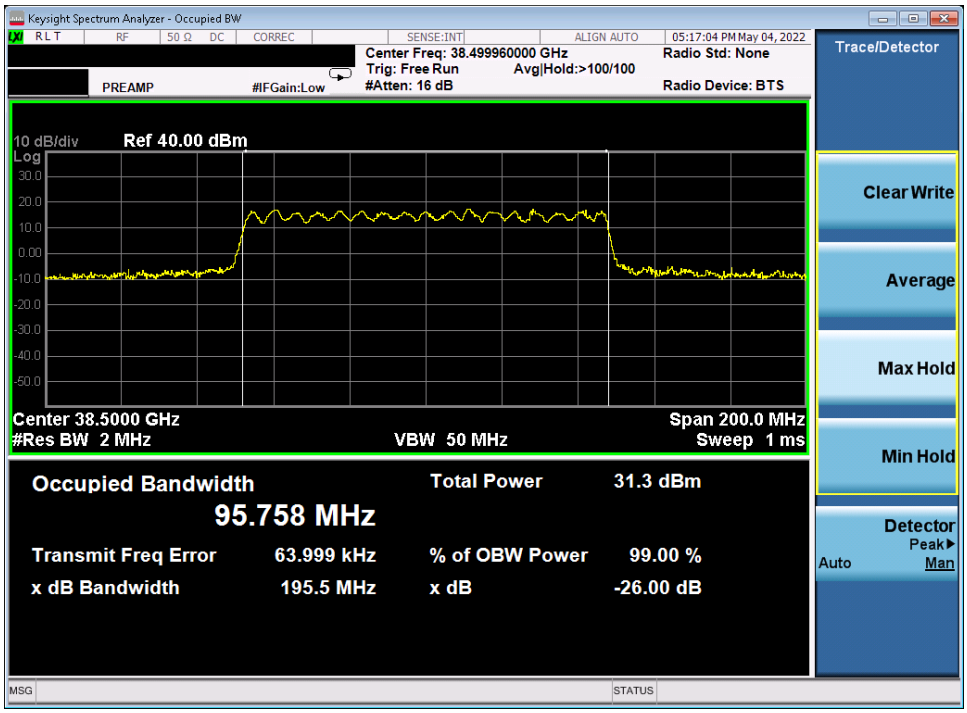
Plot 7-54. Occupied Bandwidth Plot (50MHz-2CC – pi/2-BPSK – Mid Channel)



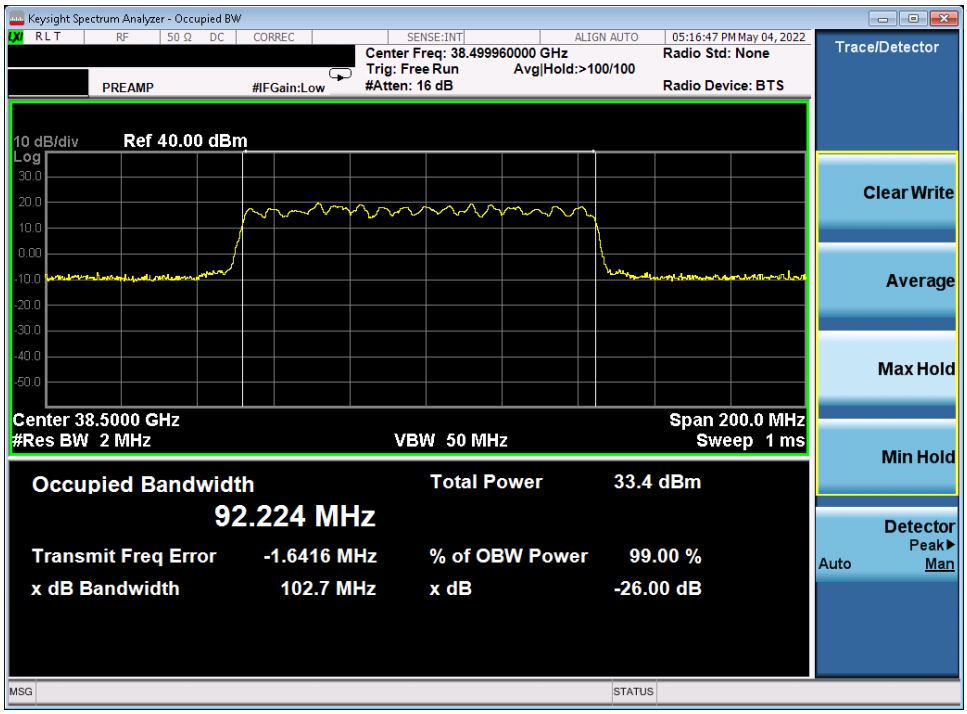
Plot 7-55. Occupied Bandwidth Plot (50MHz-2CC – 16QAM – Mid Channel)



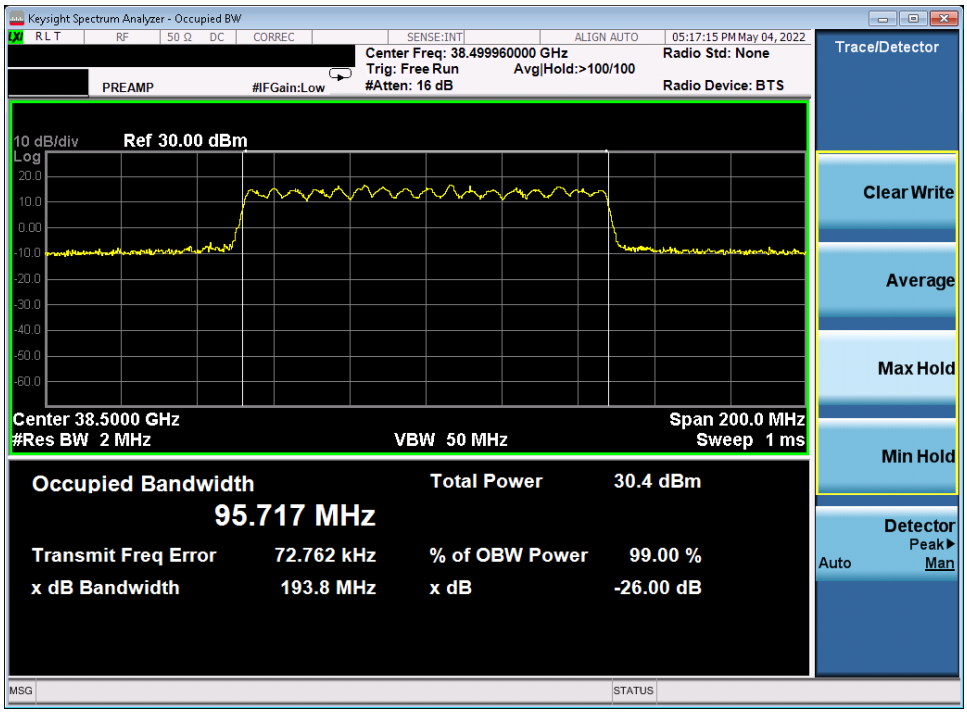
Plot 7-56. Occupied Bandwidth Plot (50MHz-2CC – 64QAM – Mid Channel)



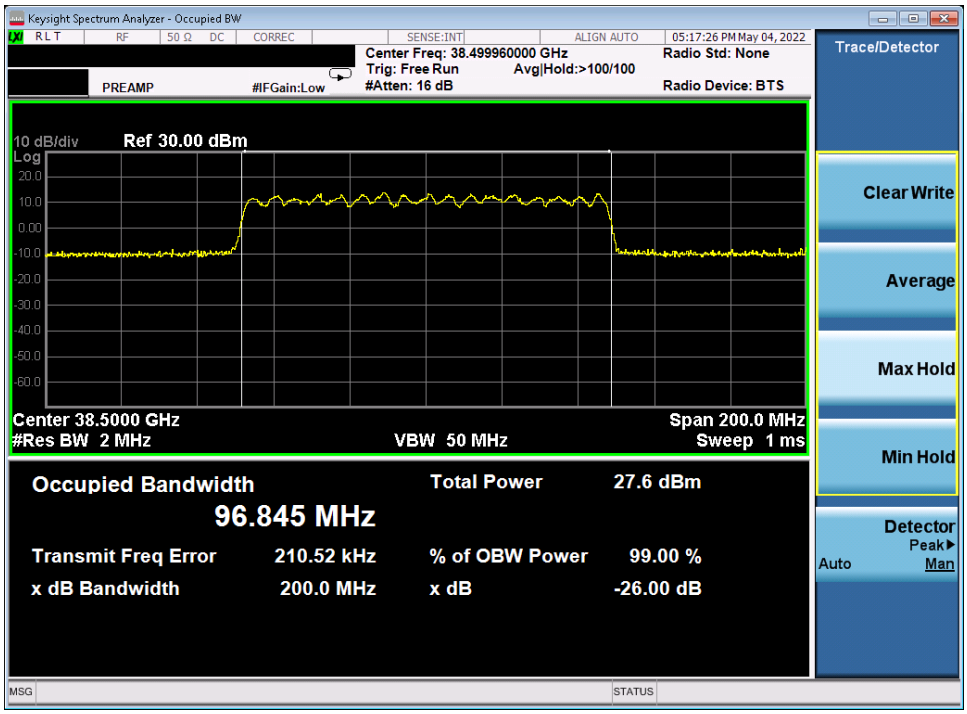
Plot 7-57. Occupied Bandwidth Plot (100MHz-1CC – QPSK – Mid Channel)



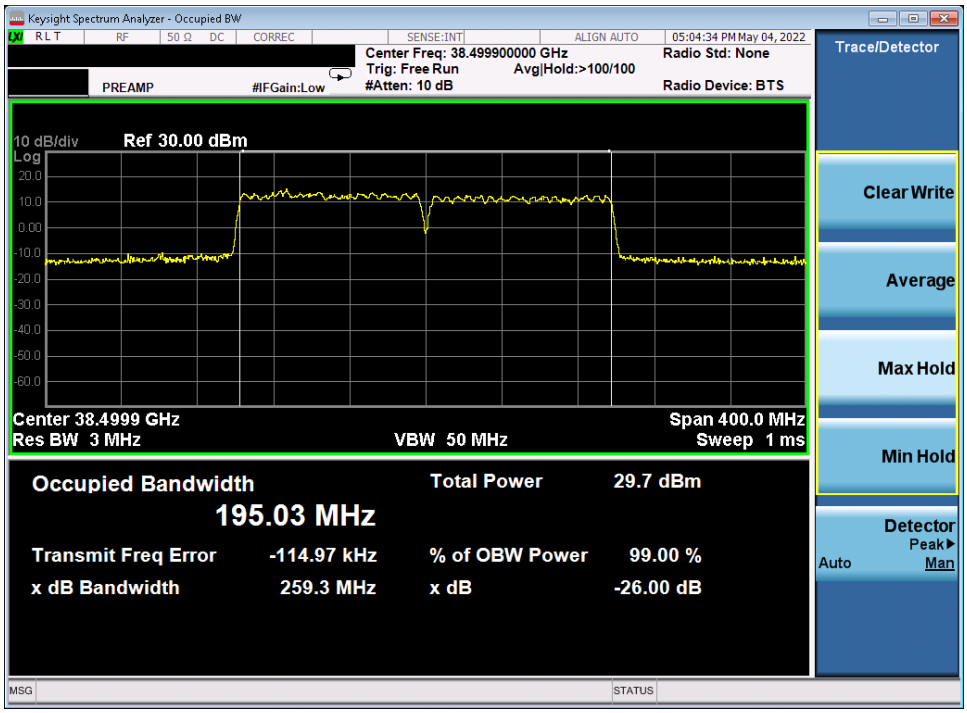
Plot 7-58. Occupied Bandwidth Plot (100MHz-1CC – pi/2-BPSK – Mid Channel)



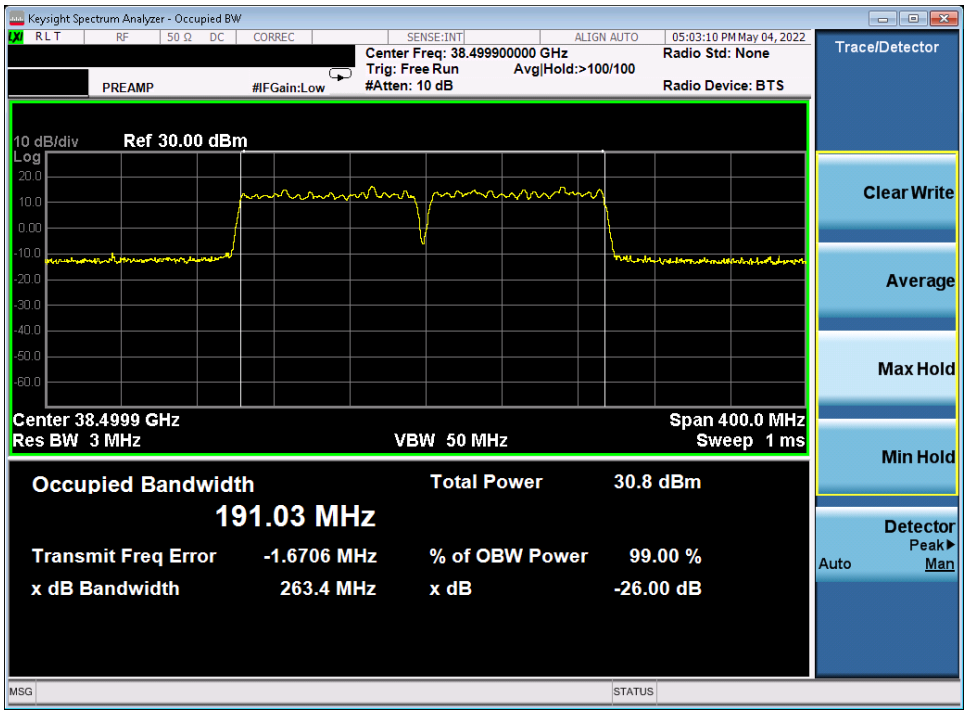
Plot 7-59. Occupied Bandwidth Plot (100MHz-1CC – 16QAM – Mid Channel)



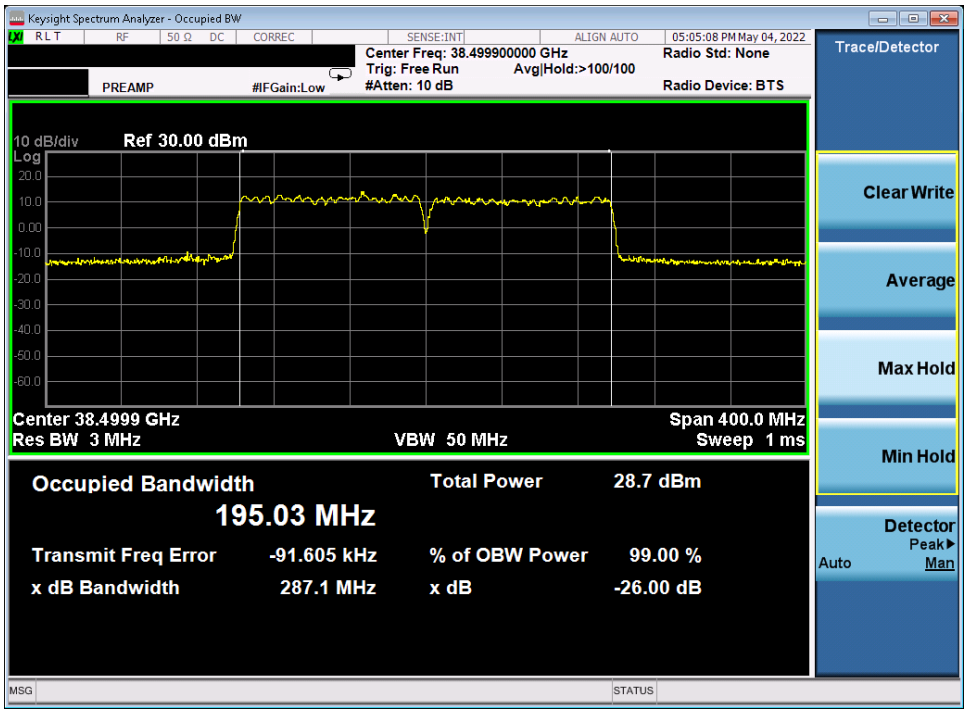
Plot 7-60. Occupied Bandwidth Plot (100MHz-1CC – 64QAM – Mid Channel)



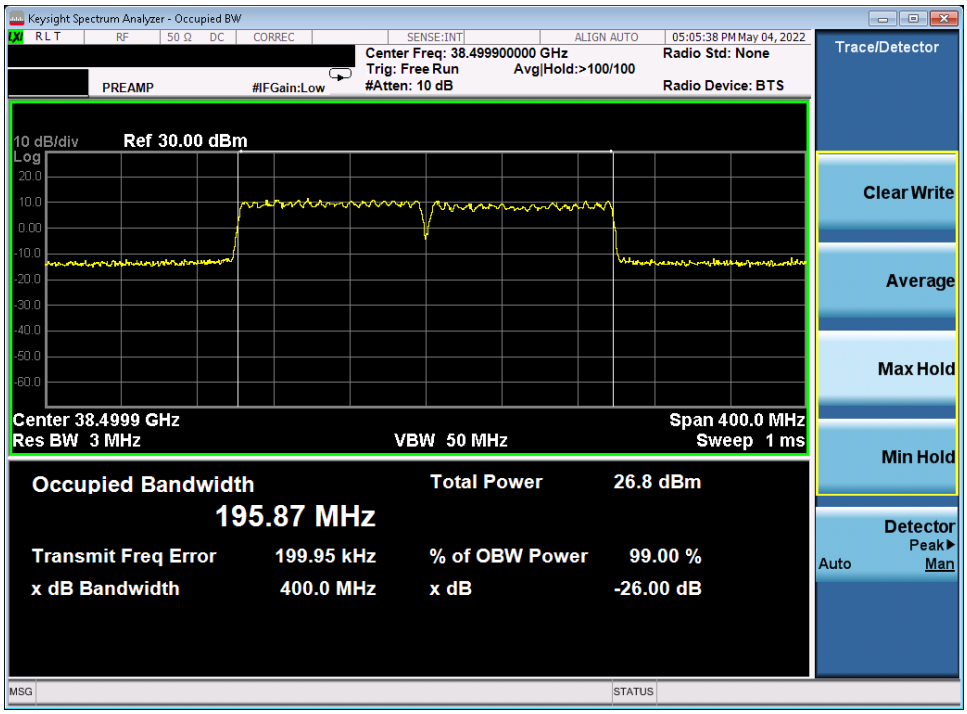
Plot 7-61. Occupied Bandwidth Plot (100MHz-2CC – QPSK – Mid Channel)



Plot 7-62. Occupied Bandwidth Plot (100MHz-2CC – pi/2-BPSK – Mid Channel)



Plot 7-63. Occupied Bandwidth Plot (100MHz-2CC – 16QAM – Mid Channel)



Plot 7-64. Occupied Bandwidth Plot (100MHz-2CC – 64QAM – Mid Channel)

7.3 Equivalent Isotropic Radiated Power

§2.1046, §30.202

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The average power of the sum of all antenna elements is limited to a maximum EIRP of +43 dBm.

Test Procedures Used

ANSI C63.26-2015 Section 5.2.4.4.1
KDB 842590 D01 v01r02 Section 4.2

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 2x to 3x the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
8. Trace mode = trace averaging (RMS) over 100 sweeps
9. The trace was allowed to stabilize

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below. Both H-Beam and V-Beam were investigated and the worst-case measurements were reported below.

2) Elements within the same antenna array are correlated to produce beamforming array gain. Antenna arrays cannot be correlated with another antenna array. During testing, only one antenna array was active.

3) EIRP measurements for all bands were taken at 1m test distance as was required for far-field conditions (see **Table 3-1**).

4) The average EIRP reported below is calculated per section 5.2.7 of ANSI C63.26-2015 which states: EIRP (dBm) = E (dBµV/m) + 20log(D) − 104.8; where D is the measurement distance (in the far field region) in m. The field strength at the antenna terminals E is calculated as: E (dBµV/m) = Spectrum Analyzer Channel Power Level (dBm) + Antenna Factor (dB/m) + Cable Loss (dB) + 107.

5) All EIRP measurements were made with the appropriate offset levels loaded into the spectrum analyzer as determined from the measurement distance, antenna factor, cable loss, and the equations in Note 4 above.

6) Radiated power levels are investigated while the receive antenna was rotated through all angles to determine the worst case polarization/positioning.

7) This device supports transmission of H-polarized and V-polarized beams from the antenna array in both CP-OFDM and DFT-s-OFDM transmission schemes. SISO and MIMO operation is also supported for some configurations. As part of the testing, all modes are investigated fully on the channel showing the highest simulated EIRP using QPSK modulation. The configuration that shows the highest measured EIRP was then used to determine the EIRP for the low and high channels and for the additional modulations.

8) Several BeamID's are investigated based on the provided simulated data to determine the worst-case BeamID.

Sample Calculation

The offset level loaded into the spectrum analyzer allows for a direct conversion of the raw channel power level measured by the analyzer into an EIRP. This offset level is frequency dependent and is calculated as follows:

Offset Level [dB] = Antenna Factor [dB/m] + Cable Loss [dB] + 20 Log(Distance [m]) + 107 - 104.8 .

For example, to measure an EIRP at a frequency of 24400MHz with an antenna factor of 40.42dB/m, a cable loss of 7.88dB, and a measurement distance of 1 meter, an offset level of:

Offset Level = 40.42dB/m + 7.88dB + 20 Log(1 meter) + 107 - 104.8 = **50.50 dB**

shall be loaded into the spectrum analyzer.

Band n258-R1 Beam ID Configurations

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	163	-
		V	26	-
	Mid	H	163	-
		V	26	-
	High	H	163	-
		V	26	-
MIMO	Low	2Tx/MIMO	154	26
	Mid	2Tx/MIMO	154	26
	High	2Tx/MIMO	154	26

Table 7-6. Ant 1 Worst Case Beam ID

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	166	-
		V	39	-
	Mid	H	166	-
		V	39	-
	High	H	166	-
		V	39	-
MIMO	Low	2Tx/MIMO	166	38
	Mid	2Tx/MIMO	166	38
	High	2Tx/MIMO	166	38

Table 7-7. Ant 2 Worst Case Beam ID

Band n258-R1

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	163	H	SISO	H	99	268	1 / 16	27.23
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	26	V	SISO	V	262	302	1 / 16	27.53
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	283	258	1 / 16	31.00
Mid	24349.92	CP-OFDM	QPSK	Folder Open	163	H	SISO	H	99	268	1 / 19	24.20
Mid	24349.92	CP-OFDM	QPSK	Folder Open	26	V	SISO	V	262	302	1 / 16	24.35
Mid	24349.92	CP-OFDM	QPSK	Folder Half	26+154	H + V	MIMO	V	283	258	1 / 16	27.92
Low	24275.04	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 19	29.34
High	24424.92	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 16	**31.44**
High	24424.92	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	V	281	261	1 / 16	30.88
High	24424.92	DFT-s-OFDM	π/2 BPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 16	31.41
High	24424.92	DFT-s-OFDM	16QAM	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 16	29.14
High	24424.92	DFT-s-OFDM	64QAM	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 16	27.42

Table 7-8. Ant 1 EIRP Data (Band n258-R1 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	24399.92	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	282	261	32 / 0	25.65
High	24399.92	DFT-s-OFDM	π/2 BPSK	Folder Half	26+154	H + V	2Tx	V	282	261	32 / 0	25.68
High	24399.92	DFT-s-OFDM	16QAM	Folder Half	26+154	H + V	2Tx	V	282	261	32 / 0	23.67
High	24399.92	DFT-s-OFDM	64QAM	Folder Half	26+154	H + V	2Tx	V	282	261	1 / 16	22.35

Table 7-9. Ant 1 EIRP Data (Band n258-R1 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	163	H	SISO	H	99	268	1 / 42	27.24
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	26	V	SISO	V	262	302	1 / 42	27.48
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	283	258	1 / 33	31.03
Mid	24349.92	CP-OFDM	QPSK	Folder Open	163	H	SISO	H	99	268	1 / 42	24.16
Mid	24349.92	CP-OFDM	QPSK	Folder Open	26	V	SISO	V	262	302	1 / 42	24.44
Mid	24349.92	CP-OFDM	QPSK	Folder Half	26+154	H + V	MIMO	V	283	258	1 / 33	27.96
Low	24300.00	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 33	30.84
High	24399.96	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 33	31.32
High	24399.96	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	V	282	259	1 / 33	30.78
High	24399.96	DFT-s-OFDM	π/2 BPSK	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 33	**31.35**
High	24399.96	DFT-s-OFDM	16QAM	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 33	28.84
High	24399.96	DFT-s-OFDM	64QAM	Folder Half	26+154	H + V	2Tx	V	281	258	1 / 33	27.24

Table 7-10. Ant 1 EIRP Data (Band n258-R1 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	24349.96	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	V	283	259	64 / 0	24.96
High	24349.96	DFT-s-OFDM	π/2 BPSK	Folder Half	26+154	H + V	2Tx	V	283	259	64 / 0	24.99
High	24349.96	DFT-s-OFDM	16QAM	Folder Half	26+154	H + V	2Tx	V	283	259	1 / 33	23.79
High	24349.96	DFT-s-OFDM	64QAM	Folder Half	26+154	H + V	2Tx	V	283	259	1 / 33	22.71

Table 7-11. Ant 1 EIRP Data (Band n258-R1 − 100MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	H	234	290	1 / 16	28.41
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	39	V	SISO	V	180	358	1 / 19	25.33
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	237	255	1 / 12	30.52
Mid	24349.92	CP-OFDM	QPSK	Folder Open	166	H	SISO	H	234	290	1 / 16	25.23
Mid	24349.92	CP-OFDM	QPSK	Folder Open	39	V	SISO	V	180	358	1 / 19	22.25
Mid	24349.92	CP-OFDM	QPSK	Folder Closed	38 + 166	H + V	MIMO	V	237	255	1 / 12	27.16
Low	24275.04	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 16	**30.63**
High	24424.92	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 16	30.48
Low	24275.04	DFT-s-OFDM	QPSK	Folder Half	38 + 166	H + V	2Tx	V	237	252	1 / 16	30.06
Low	24275.04	DFT-s-OFDM	π/2 BPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 16	30.60
Low	24275.04	DFT-s-OFDM	16QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 16	28.16
Low	24275.04	DFT-s-OFDM	64QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 16	26.49

Table 7-12. Ant 2 EIRP Data (Band n258-R1 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	24300.04	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	256	32 / 0	24.19
Low	24300.04	DFT-s-OFDM	π/2 BPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	256	32 / 0	24.18
Low	24300.04	DFT-s-OFDM	16QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	256	1 / 16	23.04
Low	24300.04	DFT-s-OFDM	64QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	256	1 / 16	22.13

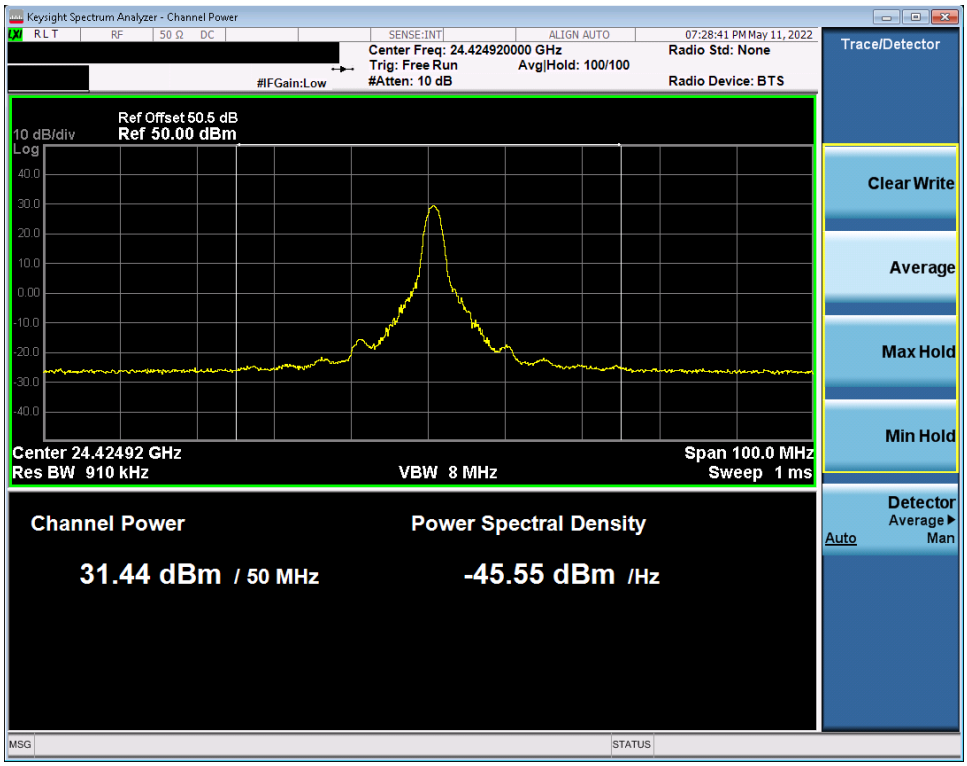
Table 7-13. Ant 2 EIRP Data (Band n258-R1 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	H	234	290	1 / 33	28.28
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Open	39	V	SISO	V	180	358	1 / 42	25.37
Mid	24349.92	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	237	255	1 / 33	30.52
Mid	24349.92	CP-OFDM	QPSK	Folder Open	166	H	SISO	H	234	290	1 / 33	25.15
Mid	24349.92	CP-OFDM	QPSK	Folder Open	39	V	SISO	V	180	358	1 / 33	22.31
Mid	24349.92	CP-OFDM	QPSK	Folder Closed	38 + 166	H + V	MIMO	V	237	255	1 / 33	27.17
Low	24300.00	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 33	**30.58**
High	24399.96	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	235	255	1 / 33	30.42
Low	24300.00	DFT-s-OFDM	QPSK	Folder Half	38 + 166	H + V	2Tx	V	237	252	1 / 23	29.94
Low	24300.00	DFT-s-OFDM	π/2 BPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 33	30.56
Low	24300.00	DFT-s-OFDM	16QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 33	28.17
Low	24300.00	DFT-s-OFDM	64QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	254	1 / 33	26.38

Table 7-14. Ant 2 EIRP Data (Band n258-R1 − 100MHz-1CC)

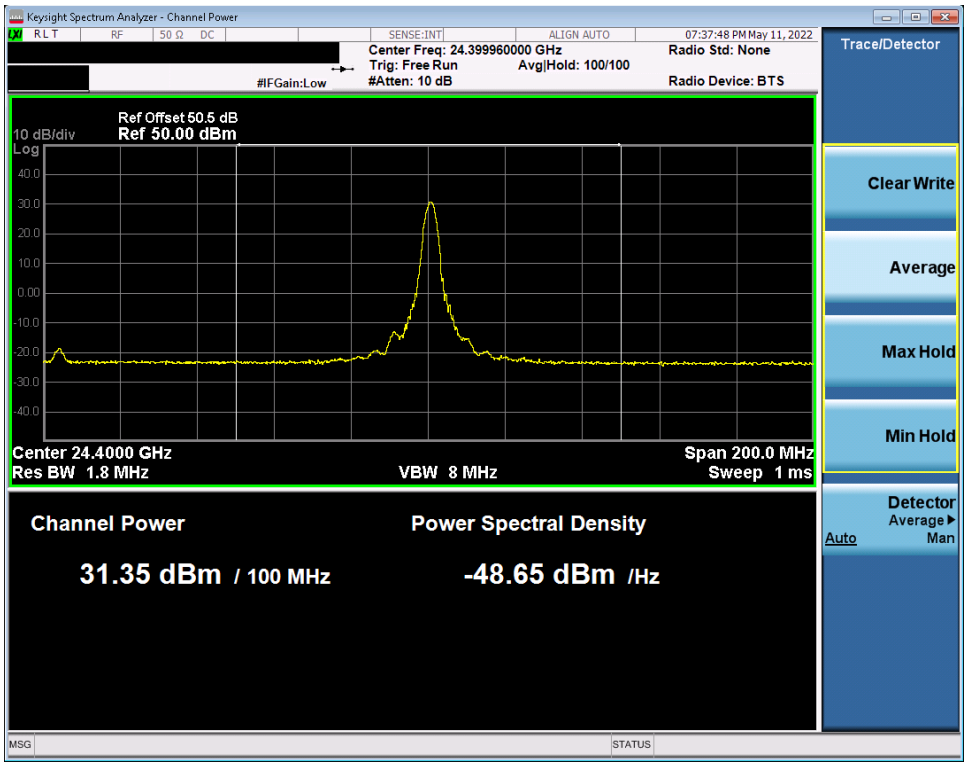
Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	24350.00	DFT-s-OFDM	QPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	256	64 / 0	24.02
Low	24350.00	DFT-s-OFDM	π/2 BPSK	Folder Closed	38 + 166	H + V	2Tx	V	238	256	64 / 0	24.03
Low	24350.00	DFT-s-OFDM	16QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	256	1 / 33	22.59
Low	24350.00	DFT-s-OFDM	64QAM	Folder Closed	38 + 166	H + V	2Tx	V	238	256	1 / 33	22.15

Table 7-15. Ant 2 EIRP Data (Band n258-R1 − 100MHz-2CC)

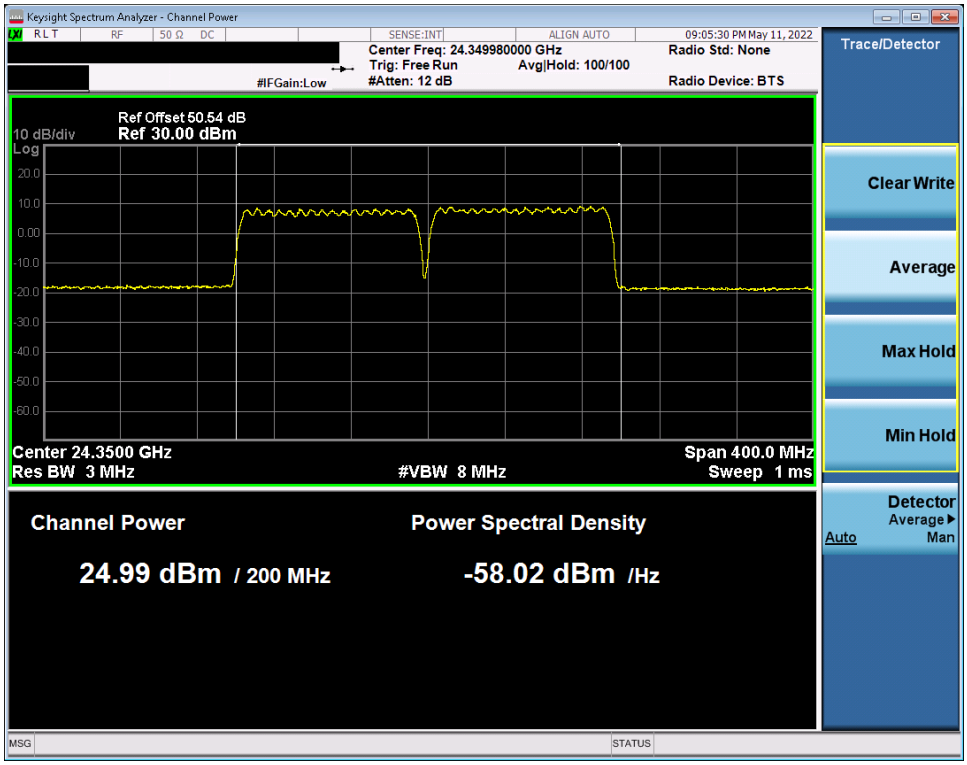


Plot 7-65. Ant 1 EIRP Plot (Band n258-R1 − 50MHz-1CC − QPSK – High Channel)

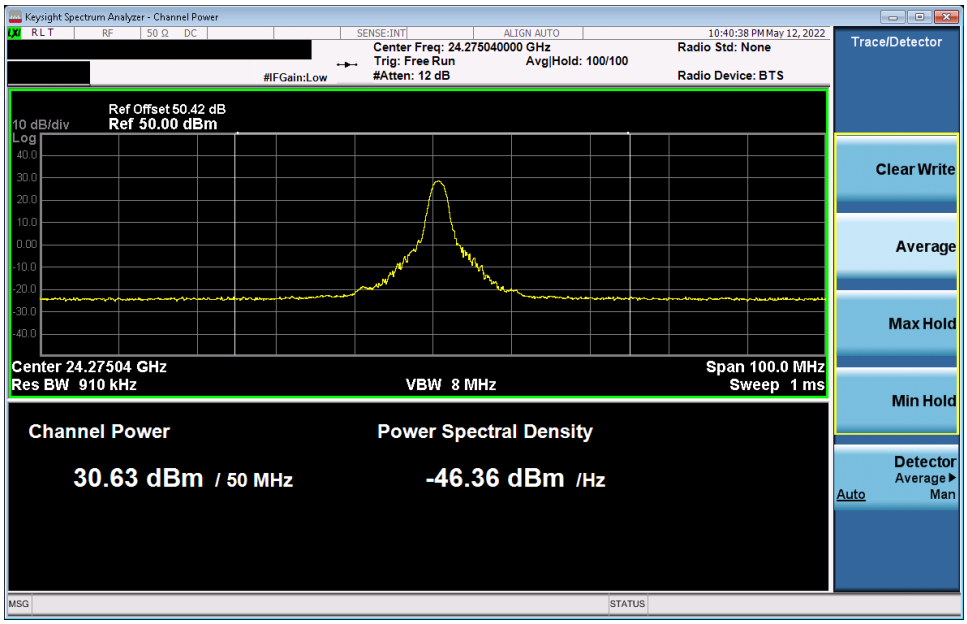
Plot 7-66. Ant 1 EIRP Plot (Band n258-R1 − 50MHz-2CC − pi/2-BPSK – High Channel)



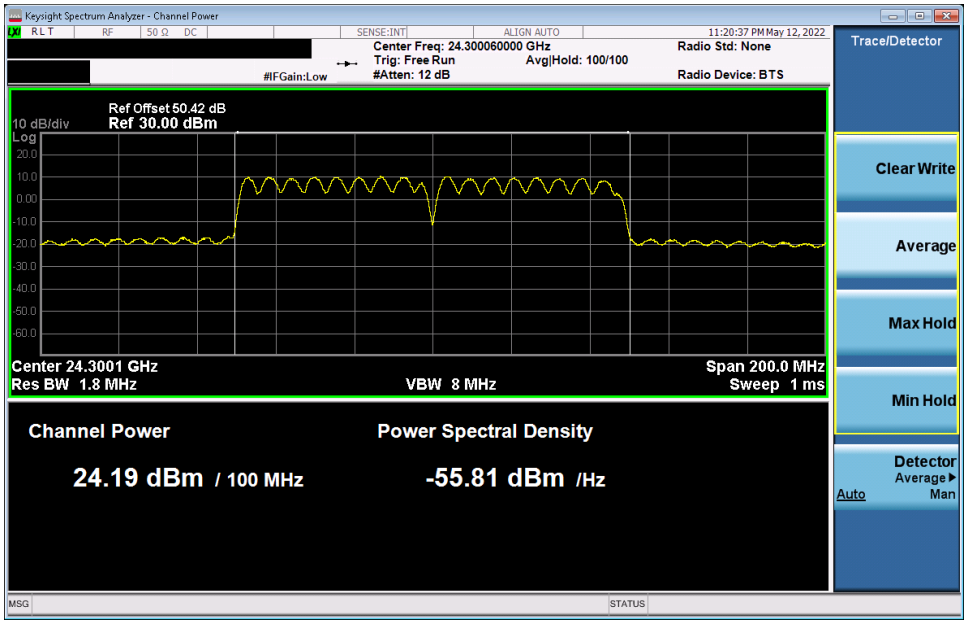
Plot 7-67. Ant 1 EIRP Plot (Band n258-R1 − 100MHz-1CC − pi/2-BPSK – High Channel)



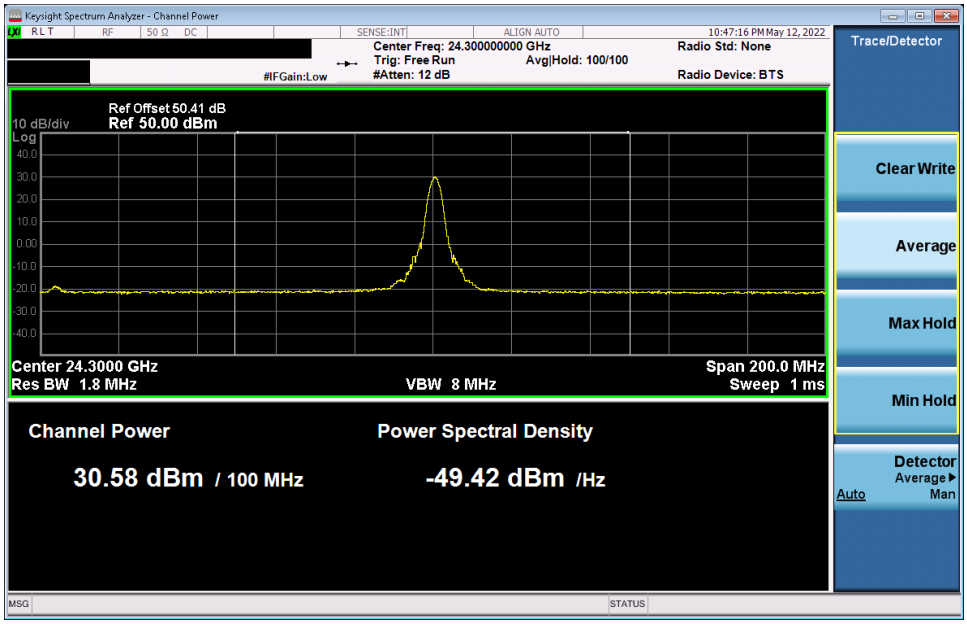
Plot 7-68. Ant 1 EIRP Plot (Band n258-R1 − 100MHz-2CC − pi/2-BPSK – High Channel)



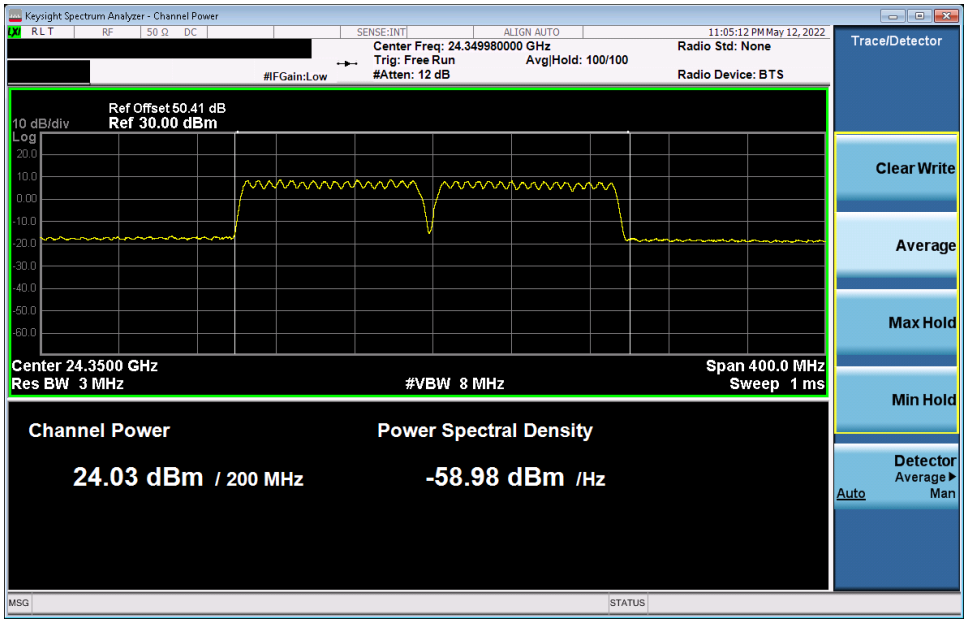
Plot 7-69. Ant 2 EIRP Plot (Band n258-R1 − 50MHz-1CC − QPSK – Low Channel)



Plot 7-70. Ant 2 EIRP Plot (Band n258-R1 − 50MHz-2CC − QPSK – Low Channel)



Plot 7-71. Ant 2 EIRP Plot (Band n258-R1 − 100MHz-1CC − QPSK – Low Channel)



Plot 7-72. Ant 2 EIRP Plot (Band n258-R1 − 100MHz-2CC − pi/2-BPSK – Low Channel)

Band n258-R2 Beam ID Configurations

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	163	-
		V	26	-
	Mid	H	163	-
		V	26	-
	High	H	163	-
		V	26	-
MIMO	Low	2Tx/MIMO	154	26
	Mid	2Tx/MIMO	154	26
	High	2Tx/MIMO	154	26

Table 7-16. Ant 1 Worst Case Beam ID

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	166	-
		V	39	-
	Mid	H	166	-
		V	39	-
	High	H	166	-
		V	39	-
MIMO	Low	2Tx/MIMO	166	38
	Mid	2Tx/MIMO	166	38
	High	2Tx/MIMO	166	38

Table 7-17. Ant 2 Worst Case Beam ID

Band n258-R2

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25224.96	DFT-s-OFDM	QPSK	Folder Closed	163	H	SISO	H	102	262	1 / 16	28.81
High	25224.96	DFT-s-OFDM	QPSK	Folder Closed	26	V	SISO	V	100	102	1 / 12	29.99
High	25200.00	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 19	**32.10**
High	25200.00	CP-OFDM	QPSK	Folder Closed	163	H	SISO	H	102	262	1 / 16	25.91
High	25224.96	CP-OFDM	QPSK	Folder Closed	26	V	SISO	V	100	102	1 / 16	26.84
High	25224.96	CP-OFDM	QPSK	Folder Closed	26+154	H + V	MIMO	H	285	257	1 / 19	28.91
Low	24775.08	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	256	1 / 16	30.43
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	256	1 / 16	31.25
High	25224.96	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	H	282	255	1 / 12	31.76
High	25224.96	DFT-s-OFDM	π/2 BPSK	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 19	32.01
High	25224.96	DFT-s-OFDM	16QAM	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 19	29.70
High	25224.96	DFT-s-OFDM	64QAM	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 19	27.97

Table 7-18. Ant 1 EIRP Data (Band n258-R2 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25199.94	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	258	32 / 0	27.40
High	25199.94	DFT-s-OFDM	π/2 BPSK	Folder Closed	26+154	H + V	2Tx	H	283	258	32 / 0	27.43
High	25199.94	DFT-s-OFDM	16QAM	Folder Closed	26+154	H + V	2Tx	H	283	258	32 / 0	25.46
High	25199.94	DFT-s-OFDM	64QAM	Folder Closed	26+154	H + V	2Tx	H	283	258	1 / 16	23.73

Table 7-19. Ant 1 EIRP Data (Band n258-R2 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25200.00	DFT-s-OFDM	QPSK	Folder Closed	163	H	SISO	H	102	262	1 / 33	28.67
High	25200.00	DFT-s-OFDM	QPSK	Folder Closed	26	V	SISO	V	100	102	1 / 23	29.78
High	25200.00	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 33	31.61
High	25200.00	CP-OFDM	QPSK	Folder Closed	163	H	SISO	H	102	262	1 / 33	25.50
High	25200.00	CP-OFDM	QPSK	Folder Closed	26	V	SISO	V	100	102	1 / 23	26.70
High	25200.00	CP-OFDM	QPSK	Folder Closed	26+154	H + V	MIMO	H	285	257	1 / 42	28.50
Low	24800.04	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	256	1 / 42	30.58
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	256	1 / 23	31.25
High	25200.00	DFT-s-OFDM	QPSK	Folder Half	26+154	H + V	2Tx	H	282	255	1 / 33	31.50
High	25200.00	DFT-s-OFDM	π/2 BPSK	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 33	**31.75**
High	25200.00	DFT-s-OFDM	16QAM	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 33	29.52
High	25200.00	DFT-s-OFDM	64QAM	Folder Closed	26+154	H + V	2Tx	H	285	257	1 / 33	27.39

Table 7-20. Ant 1 EIRP Data (Band n258-R2 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25150.02	DFT-s-OFDM	QPSK	Folder Closed	26+154	H + V	2Tx	H	283	258	64 / 0	27.21
High	25150.02	DFT-s-OFDM	π/2 BPSK	Folder Closed	26+154	H + V	2Tx	H	283	258	64 / 0	27.19
High	25150.02	DFT-s-OFDM	16QAM	Folder Closed	26+154	H + V	2Tx	H	283	258	64 / 0	25.21
High	25150.02	DFT-s-OFDM	64QAM	Folder Closed	26+154	H + V	2Tx	H	283	258	1 / 33	23.56

Table 7-21. Ant 1 EIRP Data (Band n258-R2 − 100MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	H	244	307	1 / 19	28.56
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Open	39	V	SISO	V	182.6	356	1 / 19	26.69
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	234.3	252	1 / 16	30.83
Mid	24999.96	CP-OFDM	QPSK	Folder Open	166	H	SISO	H	244	307	1 / 16	25.43
Mid	24999.96	CP-OFDM	QPSK	Folder Open	39	V	SISO	V	182.6	356	1 / 12	23.52
Mid	24999.96	CP-OFDM	QPSK	Folder Closed	38+166	H + V	MIMO	V	234.3	252	1 / 16	27.54
Low	24775.08	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 16	30.05
High	25224.96	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 16	31.41
High	25224.96	DFT-s-OFDM	QPSK	Folder Half	38+166	H + V	2Tx	V	234	255	1 / 12	31.25
High	25224.96	DFT-s-OFDM	π/2 BPSK	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 16	**31.45**
High	25224.96	DFT-s-OFDM	16QAM	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 16	29.19
High	25224.96	DFT-s-OFDM	64QAM	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 16	28.04

Table 7-22. Ant 2 EIRP Data (Band n258-R2 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25199.94	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	32 / 0	24.85
High	25199.94	DFT-s-OFDM	π/2 BPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	32 / 0	24.78
High	25199.94	DFT-s-OFDM	16QAM	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 16	23.33
High	25199.94	DFT-s-OFDM	64QAM	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 16	22.49

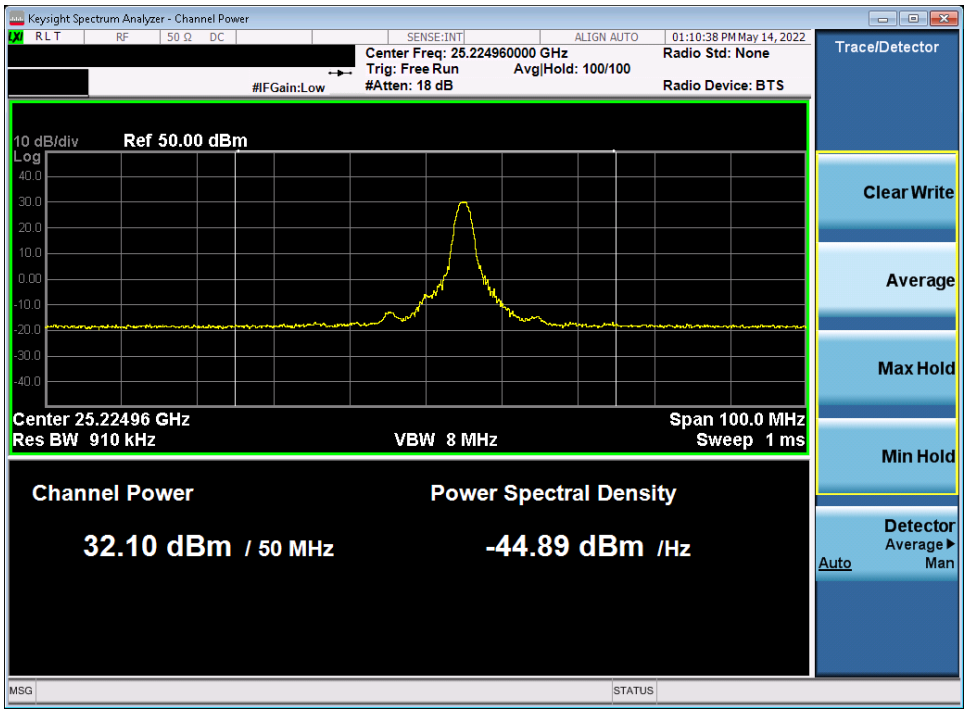
Table 7-23. Ant 2 EIRP Data (Band n258-R2 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	H	244	307	1 / 23	28.50
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Open	39	V	SISO	V	182.6	356	1 / 33	26.54
Mid	24999.96	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	234.3	252	1 / 33	30.86
Mid	24999.96	CP-OFDM	QPSK	Folder Open	166	H	SISO	H	244	307	1 / 33	25.37
Mid	24999.96	CP-OFDM	QPSK	Folder Open	39	V	SISO	V	182.6	356	1 / 33	23.57
Mid	24999.96	CP-OFDM	QPSK	Folder Closed	38+166	H + V	MIMO	V	234.3	252	1 / 33	27.59
Low	24800.04	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 33	30.07
High	25200.00	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 33	**31.19**
High	25200.00	DFT-s-OFDM	QPSK	Folder Half	38+166	H + V	2Tx	V	234	255	1 / 33	31.05
High	25200.00	DFT-s-OFDM	π/2 BPSK	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 33	31.18
High	25200.00	DFT-s-OFDM	16QAM	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 33	28.81
High	25200.00	DFT-s-OFDM	64QAM	Folder Closed	38+166	H + V	2Tx	V	236	252	1 / 33	27.15

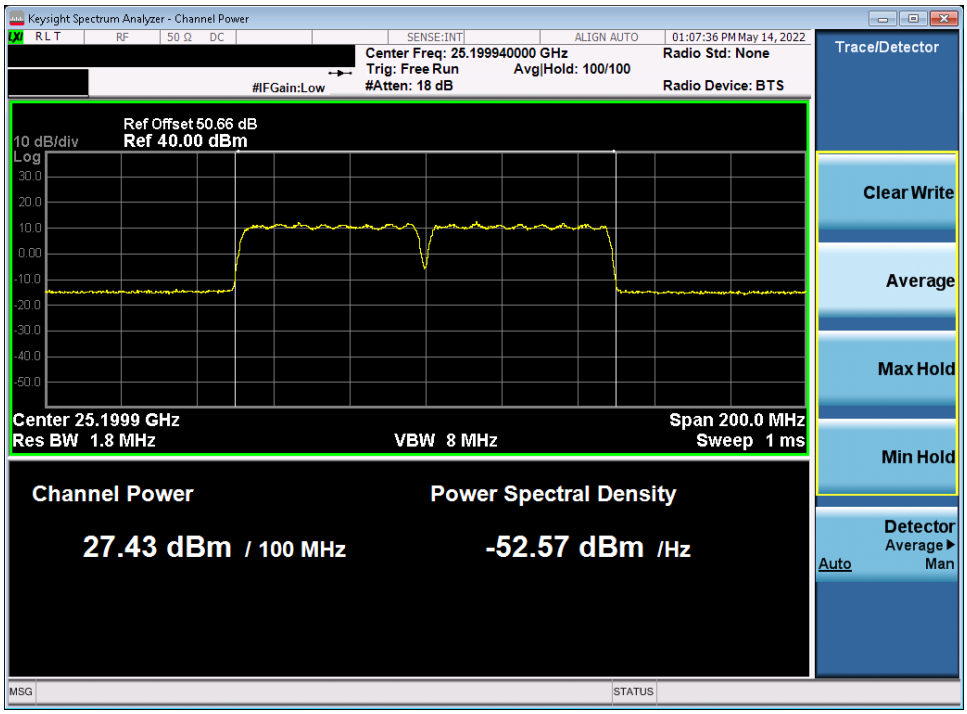
Table 7-24. Ant 2 EIRP Data (Band n258-R2 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
High	25150.02	DFT-s-OFDM	QPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	64 / 0	24.48
High	25150.02	DFT-s-OFDM	π/2 BPSK	Folder Closed	38+166	H + V	2Tx	V	236	253	64 / 0	24.46
High	25150.02	DFT-s-OFDM	16QAM	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 33	23.54
High	25150.02	DFT-s-OFDM	64QAM	Folder Closed	38+166	H + V	2Tx	V	236	253	1 / 33	22.59

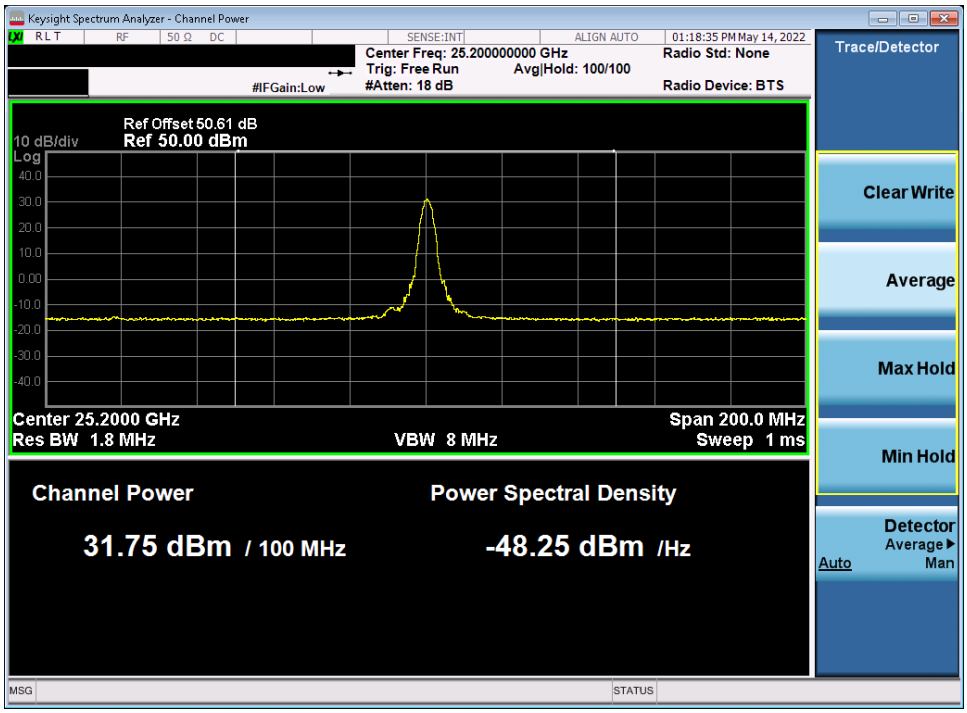
Table 7-25. Ant 2 EIRP Data (Band n258-R2 − 100MHz-2CC)



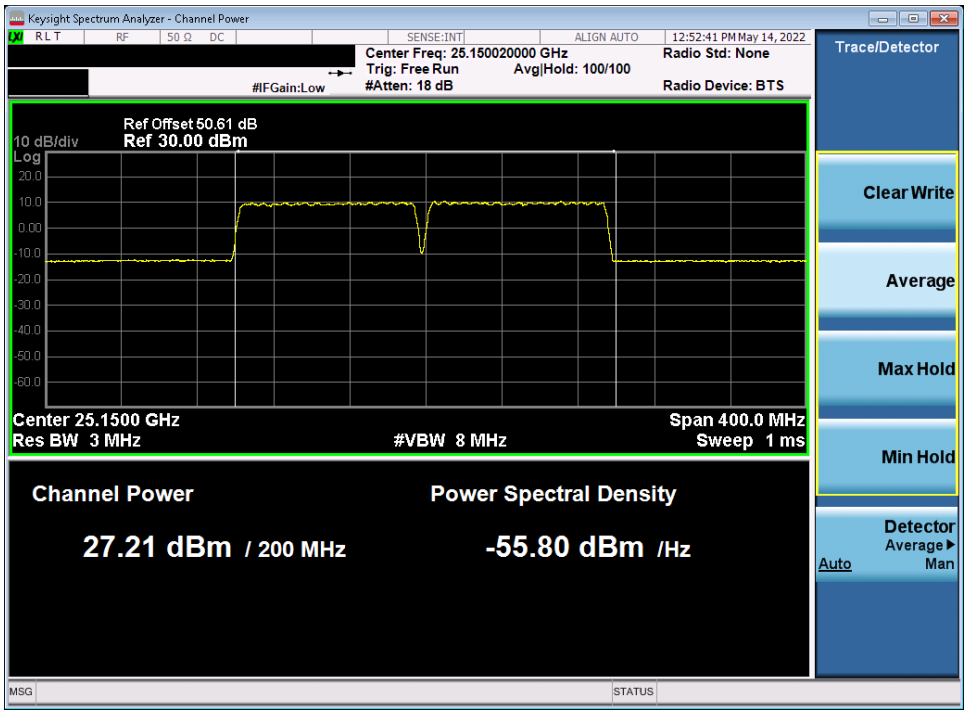
Plot 7-73. Ant 1 EIRP Plot (Band n258-R2 − 50MHz-1CC − QPSK – High Channel)



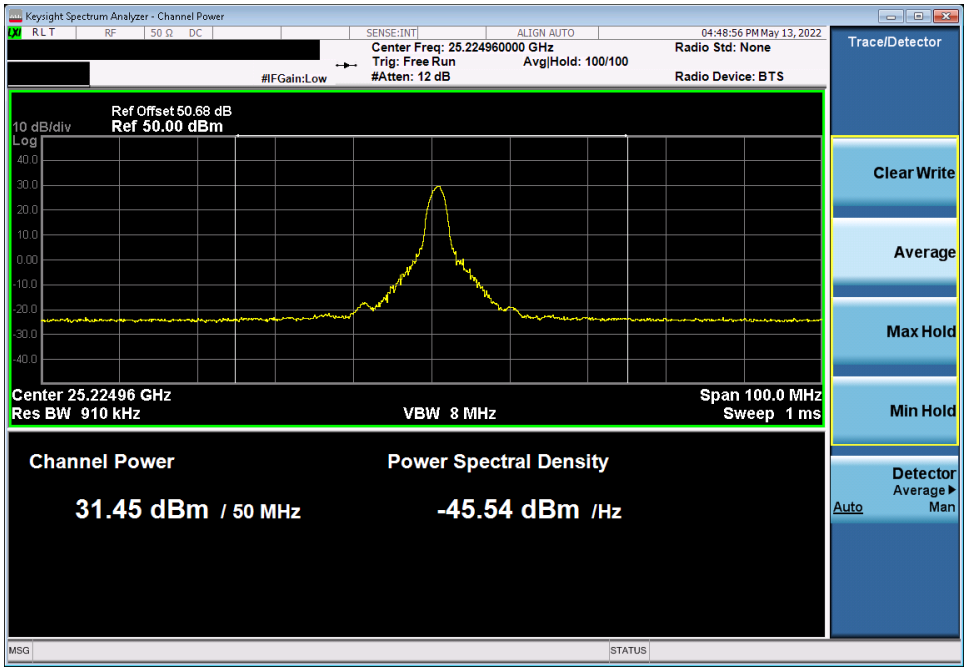
Plot 7-74. Ant 1 EIRP Plot (Band n258-R2 − 50MHz-2CC − pi/2-BPSK – High Channel)



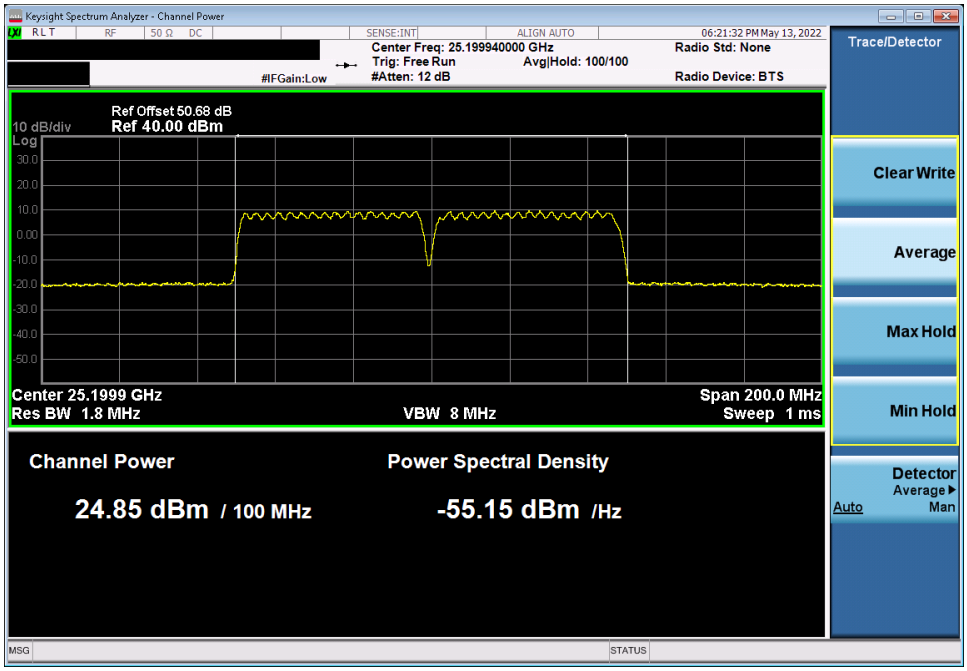
Plot 7-75. Ant 1 EIRP Plot (Band n258-R2 − 100MHz-1CC − pi/2-BPSK – High Channel)



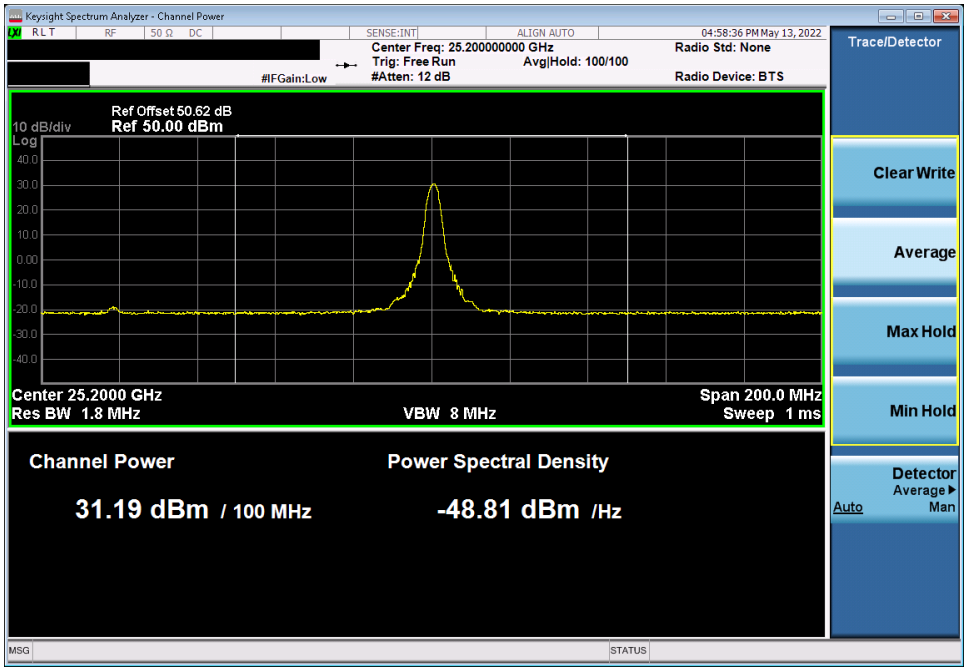
Plot 7-76. Ant 1 EIRP Plot (Band n258-R2 − 100MHz-2CC − QPSK – High Channel)



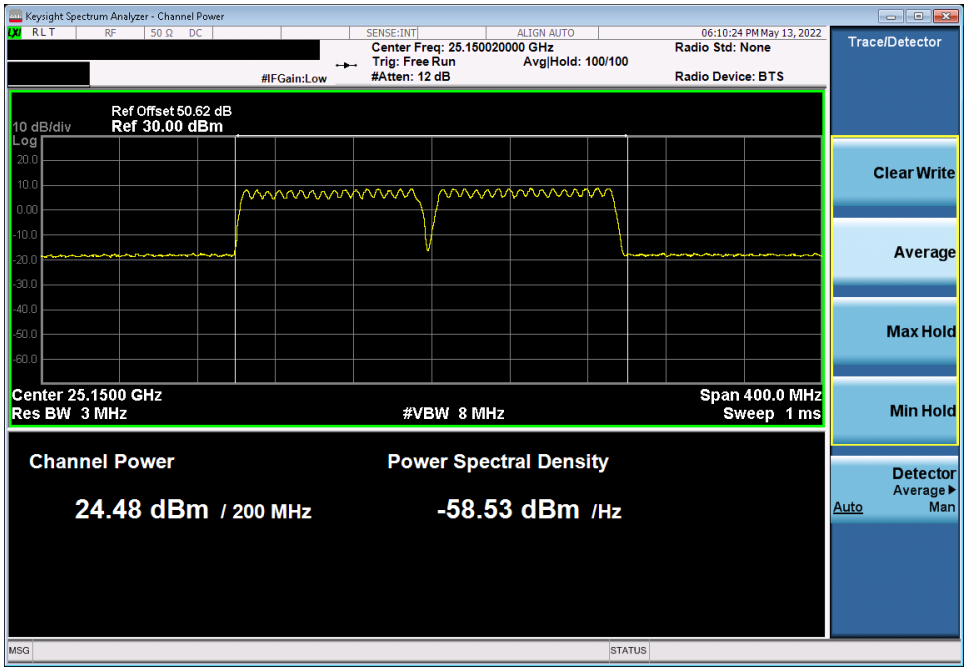
Plot 7-77. Ant 2 EIRP Plot (Band n258-R2 − 50MHz-1CC − pi/2-BPSK – High Channel)



Plot 7-78. Ant 2 EIRP Plot (Band n258-R2 − 50MHz-2CC − QPSK – High Channel)



Plot 7-79. Ant 2 EIRP Plot (Band n258-R2 − 100MHz-1CC − QPSK – High Channel)



Plot 7-80. Ant 2 EIRP Plot (Band n258-R2 − 100MHz-2CC – QPSK – High Channel)

Band n261 Beam ID Configurations

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	154	-
		V	35	-
	Mid	H	154	-
		V	35	-
	High	H	154	-
		V	35	-
MIMO	Low	2Tx/MIMO	153	25
	Mid	2Tx/MIMO	153	25
	High	2Tx/MIMO	153	25

Table 7-26. Ant 1 Worst Case Beam ID

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	168	-
		V	40	-
	Mid	H	168	-
		V	40	-
	High	H	168	-
		V	40	-
MIMO	Low	2Tx/MIMO	160	32
	Mid	2Tx/MIMO	160	32
	High	2Tx/MIMO	160	32

Table 7-27. Ant 2 Worst Case Beam ID

Band n261

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Closed	154	H	SISO	H	93.5	281	1 / 12	28.43
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	35	V	SISO	V	287	253	1 / 17	29.22
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	248	284	1 / 17	32.32
Mid	27924.96	CP-OFDM	QPSK	Folder Closed	154	H	SISO	H	93.5	281	1 / 12	25.21
Mid	27924.96	CP-OFDM	QPSK	Folder Open	35	V	SISO	V	287	253	1 / 17	26.12
Mid	27924.96	CP-OFDM	QPSK	Folder Open	25+153	H + V	MIMO	H	248	284	1 / 17	29.37
Low	27525.00	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 17	**32.48**
High	28324.92	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	248	278	1 / 12	31.70
Low	27525.00	DFT-s-OFDM	QPSK	Folder Closed	25+153	H + V	2Tx	H	247	281	1 / 17	32.28
Low	27525.00	DFT-s-OFDM	π/2 BPSK	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 17	32.48
Low	27525.00	DFT-s-OFDM	16QAM	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 17	30.07
Low	27525.00	DFT-s-OFDM	64QAM	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 17	28.53

Table 7-28. Ant 1 EIRP Data (Band n261 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	250	276	32 / 0	27.34
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	25+153	H + V	2Tx	H	250	276	32 / 0	27.35
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	25+153	H + V	2Tx	H	250	276	32 / 0	25.41
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	25+153	H + V	2Tx	H	250	276	1 / 17	23.92

Table 7-29. Ant 1 EIRP Data (Band n261 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Closed	154	H	SISO	H	91.6	282	1 / 42	28.66
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	35	V	SISO	V	289.2	263	1 / 42	29.37
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	248	284	1 / 42	32.38
Mid	27924.96	CP-OFDM	QPSK	Folder Closed	154	H	SISO	H	91.6	282	1 / 42	25.66
Mid	27924.96	CP-OFDM	QPSK	Folder Open	35	V	SISO	V	289.2	263	1 / 42	26.20
Mid	27924.96	CP-OFDM	QPSK	Folder Open	25+153	H + V	MIMO	H	248	284	1 / 42	29.33
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 42	**32.45**
High	28299.96	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	248	278	1 / 42	31.85
Low	27550.08	DFT-s-OFDM	QPSK	Folder Closed	25+153	H + V	2Tx	H	247	281	1 / 42	30.98
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 42	32.41
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 42	30.09
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	25+153	H + V	2Tx	H	249	277	1 / 42	28.47

Table 7-30. Ant 1 EIRP Data (Band n261 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	25+153	H + V	2Tx	H	250	276	64 / 0	27.32
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	25+153	H + V	2Tx	H	250	276	64 / 0	27.21
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	25+153	H + V	2Tx	H	250	276	64 / 0	25.27
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	25+153	H + V	2Tx	H	250	276	1 / 42	24.18

Table 7-31. Ant 1 EIRP Data (Band n261 − 100MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27525.00	DFT-s-OFDM	QPSK	Folder Closed	168	H	SISO	H	75.6	70	1 / 19	27.23
Low	27525.00	DFT-s-OFDM	QPSK	Folder Closed	40	V	SISO	V	73	330	1 / 16	26.33
Low	27525.00	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	32.07
Low	27525.00	CP-OFDM	QPSK	Folder Closed	168	H	SISO	H	75.6	70	1 / 19	23.85
Low	27525.00	CP-OFDM	QPSK	Folder Closed	40	V	SISO	V	73	330	1 / 16	23.60
Low	27525.00	CP-OFDM	QPSK	Folder Open	32 + 160	H + V	MIMO	V	238	243	1 / 12	28.82
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 16	31.36
High	28324.92	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	241	244	1 / 12	29.65
Low	27525.00	DFT-s-OFDM	QPSK	Folder Closed	32 + 160	H + V	2Tx	V	236	247	1 / 12	31.36
Low	27525.00	DFT-s-OFDM	π/2 BPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	**32.20**
Low	27525.00	DFT-s-OFDM	16QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	30.05
Low	27525.00	DFT-s-OFDM	64QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	27.99

Table 7-32. Ant 2 EIRP Data (Band n261 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	32 / 0	25.72
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	32 / 0	25.70
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	24.77
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 12	23.49

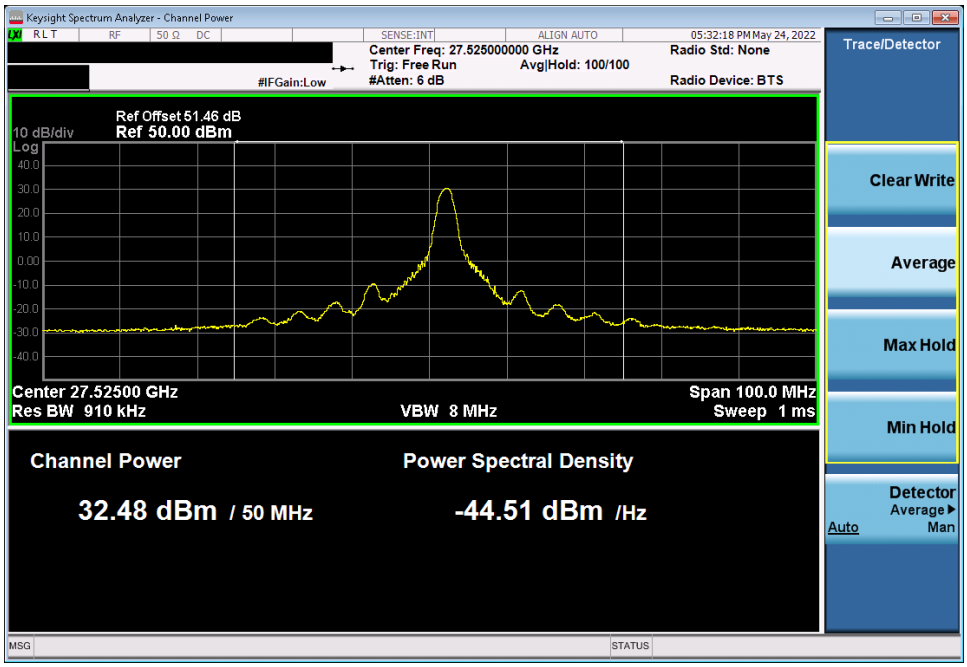
Table 7-33. Ant 2 EIRP Data (Band n261 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27550.08	DFT-s-OFDM	QPSK	Folder Closed	168	H	SISO	H	79	70	1 / 33	26.57
Low	27550.08	DFT-s-OFDM	QPSK	Folder Closed	40	V	SISO	V	73	332	1 / 33	25.99
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 23	**32.39**
Low	27550.08	CP-OFDM	QPSK	Folder Closed	168	H	SISO	H	79	70	1 / 33	23.30
Low	27550.08	CP-OFDM	QPSK	Folder Closed	40	V	SISO	V	73	332	1 / 33	22.67
Low	27550.08	CP-OFDM	QPSK	Folder Open	32 + 160	H + V	MIMO	V	238	243	1 / 23	29.15
Mid	27924.96	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 23	31.54
High	28299.96	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	241	244	1 / 23	30.41
Low	27550.08	DFT-s-OFDM	QPSK	Folder Closed	32 + 160	H + V	2Tx	V	236	247	1 / 23	30.83
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 23	32.38
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 23	30.30
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	32 + 160	H + V	2Tx	V	238	243	1 / 23	28.18

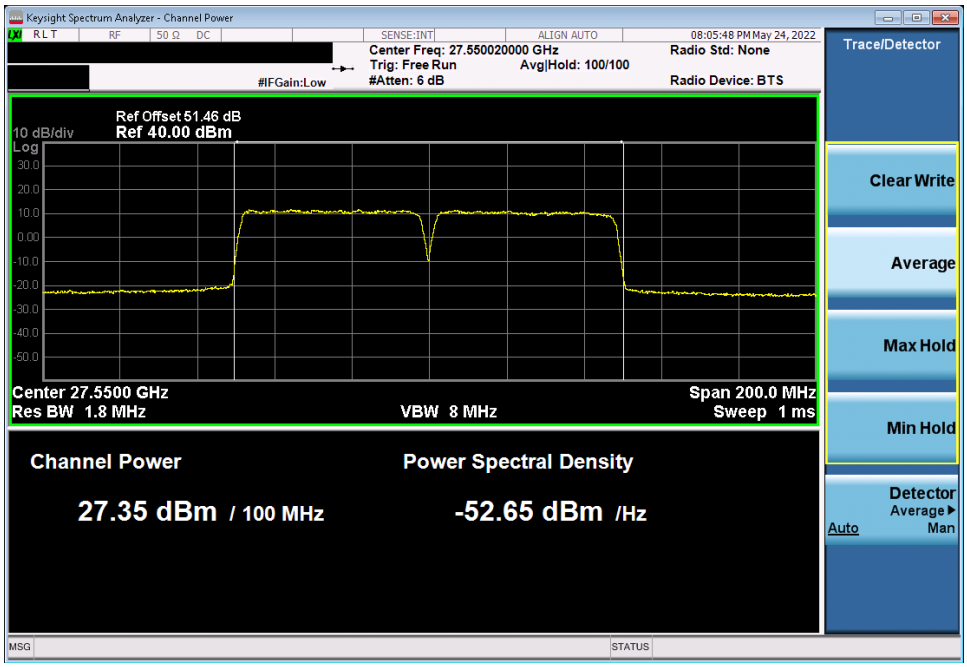
Table 7-34. Ant 2 EIRP Data (Band n261 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Low	27550.08	DFT-s-OFDM	QPSK	Folder Open	32 + 160	H + V	2Tx	V	239	244	64 / 0	25.50
Low	27550.08	DFT-s-OFDM	π/2 BPSK	Folder Open	32 + 160	H + V	2Tx	V	239	244	64 / 0	25.42
Low	27550.08	DFT-s-OFDM	16QAM	Folder Open	32 + 160	H + V	2Tx	V	239	244	1 / 23	24.45
Low	27550.08	DFT-s-OFDM	64QAM	Folder Open	32 + 160	H + V	2Tx	V	239	244	1 / 23	23.98

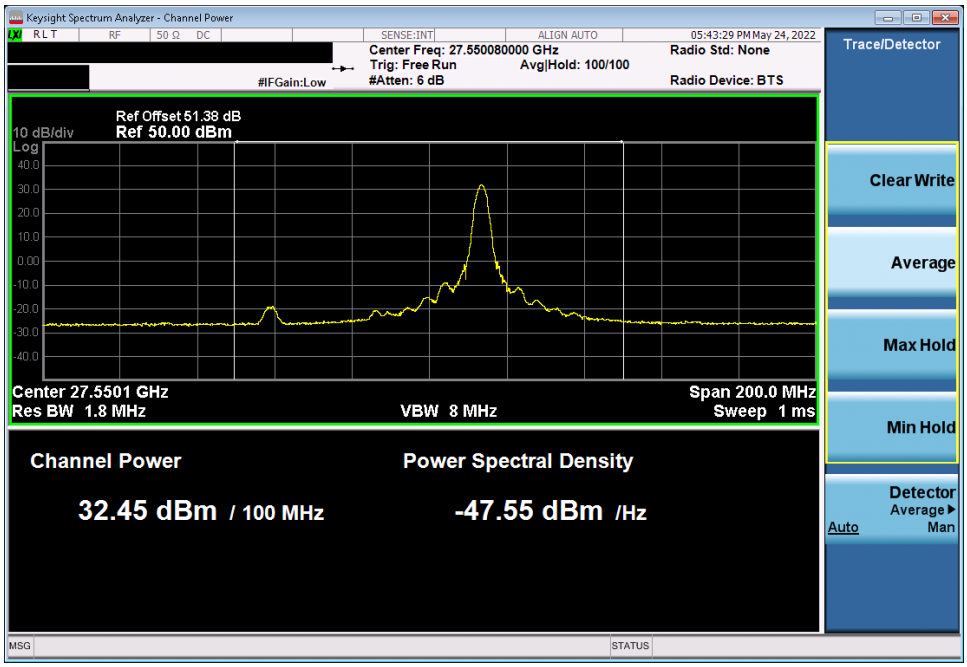
Table 7-35. Ant 2 EIRP Data (Band n261 − 100MHz-2CC)



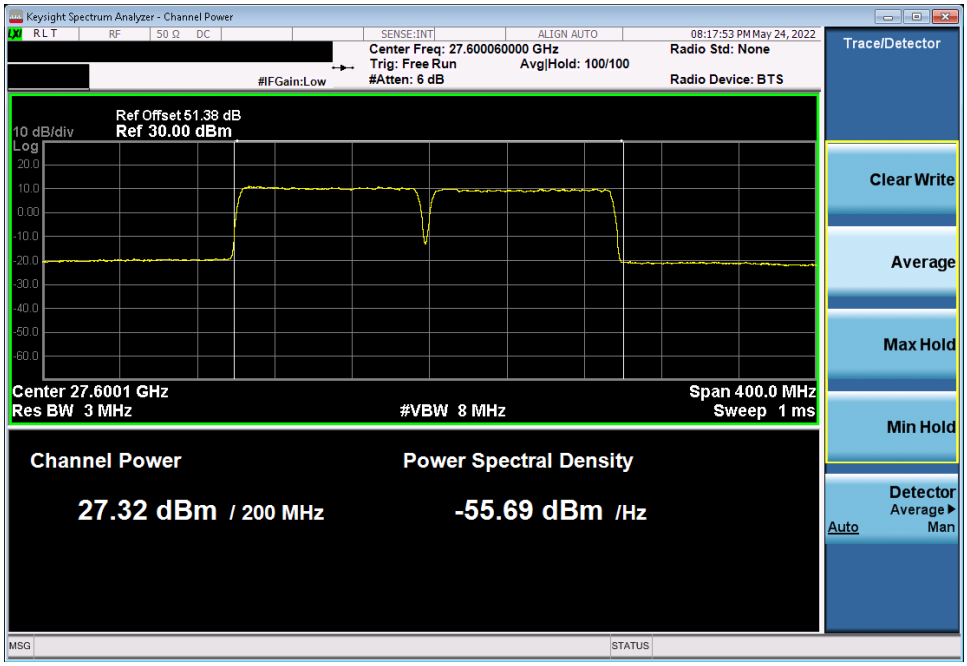
Plot 7-81. Ant 1 EIRP Plot (Band n261 − 50MHz-1CC − pi/2-BPSK – Low Channel)



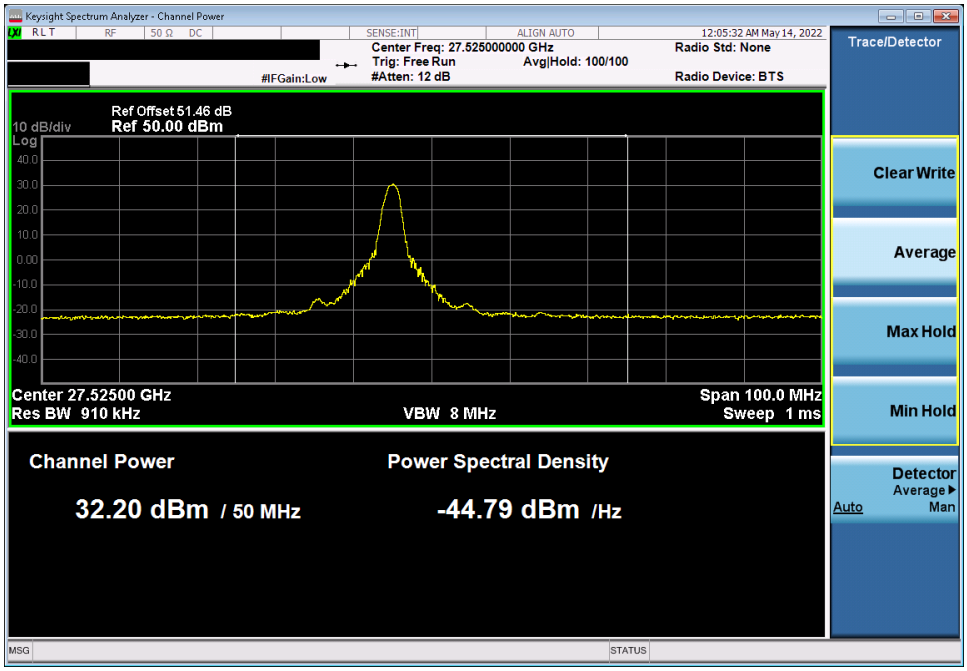
Plot 7-82. Ant 1 EIRP Plot (Band n261 − 50MHz-2CC − pi/2-BPSK – Low Channel)



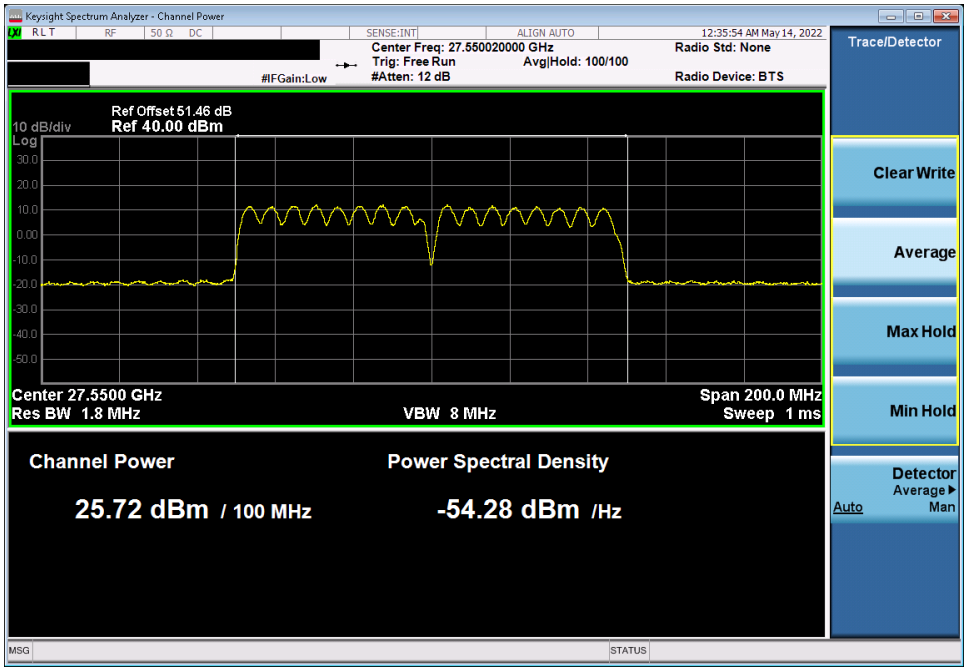
Plot 7-83. Ant 1 EIRP Plot (Band n261 − 100MHz-1CC − QPSK – Low Channel)



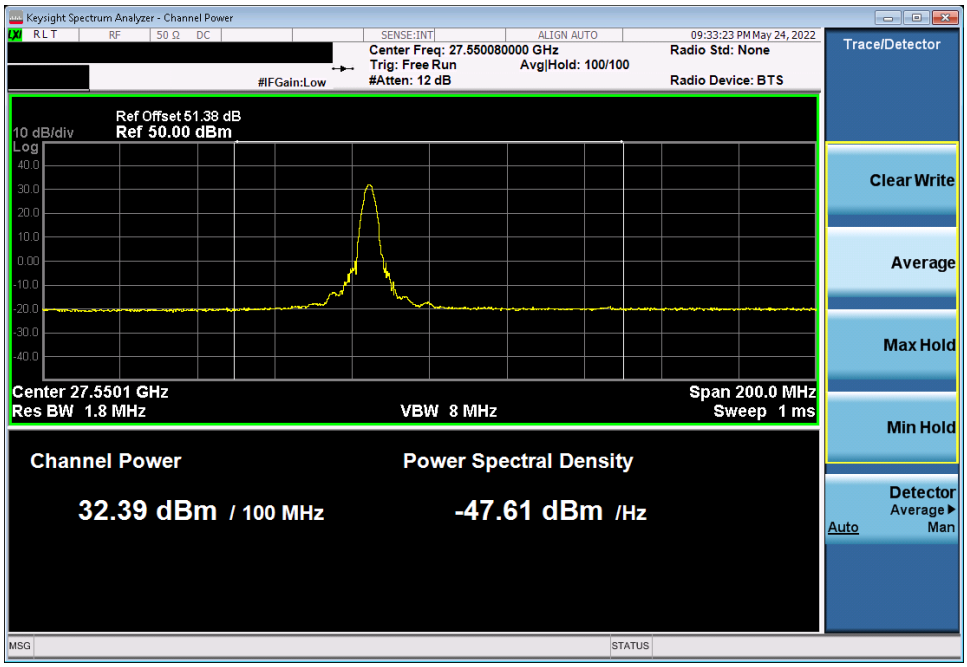
Plot 7-84. Ant 1 EIRP Plot (Band n261 − 100MHz-2CC – QPSK – Low Channel)



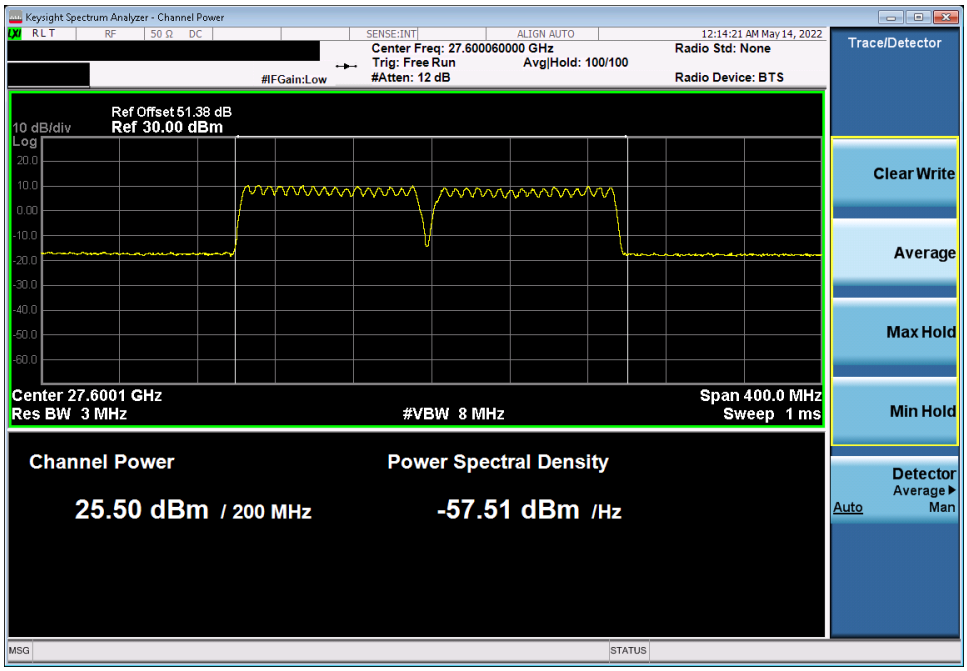
Plot 7-85. Ant 2 EIRP Plot (Band n261 − 50MHz-1CC − pi/2-BPSK – Low Channel)



Plot 7-86. Ant 2 EIRP Plot (Band n261 − 50MHz-2CC − QPSK – Low Channel)



Plot 7-87. Ant 2 EIRP Plot (Band n261 − 100MHz-1CC − pi/2-BPSK – Low Channel)



Plot 7-88. Ant 2 EIRP Plot (Band n261 − 100MHz-2CC – QPSK – Low Channel)

Band n260 Beam ID Configurations

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	153	-
		V	27	-
	Mid	H	153	-
		V	27	-
	High	H	153	-
		V	27	-
MIMO	Low	2Tx/MIMO	155	27
	Mid	2Tx/MIMO	155	27
	High	2Tx/MIMO	155	27

Table 7-36. Ant 1 Worst Case Beam ID

Mode	Channel	Beam Polarization	Beam ID	Beam ID Pair
SISO	Low	H	166	-
		V	31	-
	Mid	H	166	-
		V	31	-
	High	H	166	-
		V	31	-
MIMO	Low	2Tx/MIMO	168	40
	Mid	2Tx/MIMO	168	40
	High	2Tx/MIMO	168	40

Table 7-37. Ant 2 Worst Case Beam ID

Band n260

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	153	H	SISO	V	107.6	287	1 / 16	25.72
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27	V	SISO	H	67.6	74	1 / 16	27.50
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 19	**31.10**
Mid	38499.96	CP-OFDM	QPSK	Folder Closed	153	H	SISO	V	107.6	287	1 / 16	22.70
Mid	38499.96	CP-OFDM	QPSK	Folder Open	27	V	SISO	H	67.6	74	1 / 19	24.18
Mid	38499.96	CP-OFDM	QPSK	Folder Open	27+155	H + V	MIMO	H	63.5	80	1 / 19	27.75
Low	37025.04	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	61.5	81	1 / 12	28.41
High	39975.00	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	61.6	80	1 / 19	30.79
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	27+155	H + V	2Tx	H	297.1	259	1 / 19	30.81
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 19	31.01
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 19	28.65
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 19	26.89

Table 7-38. Ant 1 EIRP Data (Band n260 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	32 / 0	25.12
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	32 / 0	25.20
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	32 / 0	23.61
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 16	21.82

Table 7-39. Ant 1 EIRP Data (Band n260 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	153	H	SISO	H	107.6	287	1 / 33	25.62
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27	V	SISO	H	67.6	74	1 / 42	27.29
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 33	30.18
Mid	38499.96	CP-OFDM	QPSK	Folder Closed	153	H	SISO	H	107.6	287	1 / 33	22.60
Mid	38499.96	CP-OFDM	QPSK	Folder Open	27	V	SISO	H	67.6	74	1 / 42	24.20
Mid	38499.96	CP-OFDM	QPSK	Folder Open	27+155	H + V	MIMO	H	63.5	80	1 / 33	26.94
Low	37050.00	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	61	81	1 / 33	28.15
High	39949.92	DFT-s-OFDM	QPSK	Folder Open	27	H + V	2Tx	H	61	80	1 / 33	28.77
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	27+155	H + V	2Tx	H	297.1	259	1 / 33	29.95
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 33	**30.38**
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 33	27.89
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 33	26.11

Table 7-40. Ant 1 EIRP Data (Band n260 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	64 / 0	24.33
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	27+155	H + V	2Tx	H	63.5	80	64 / 0	24.43
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	64 / 0	22.90
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	27+155	H + V	2Tx	H	63.5	80	1 / 33	21.32

Table 7-41. Ant 1 EIRP Data (Band n260 − 100MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	V	162	335	1 / 12	26.30
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	31	V	SISO	H	96	21	1 / 12	27.68
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 12	**28.76**
Mid	38499.96	CP-OFDM	QPSK	Folder Open	166	H	SISO	V	162	335	1 / 12	23.14
Mid	38499.96	CP-OFDM	QPSK	Folder Closed	31	V	SISO	H	96	21	1 / 12	24.52
Mid	38499.96	CP-OFDM	QPSK	Folder Open	40 + 168	H + V	MIMO	V	111	347	1 / 12	25.64
Low	37025.04	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	114	345	1 / 12	27.69
High	39975.00	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	357	1 / 16	24.54
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	40 + 168	H + V	2Tx	V	105	351	1 / 12	27.69
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 12	28.69
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 12	26.21
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 12	24.51

Table 7-42. Ant 2 EIRP Data (Band n260 − 50MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	32 / 0	22.26
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	32 / 0	22.23
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	32 / 0	20.62
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	32 / 0	19.09

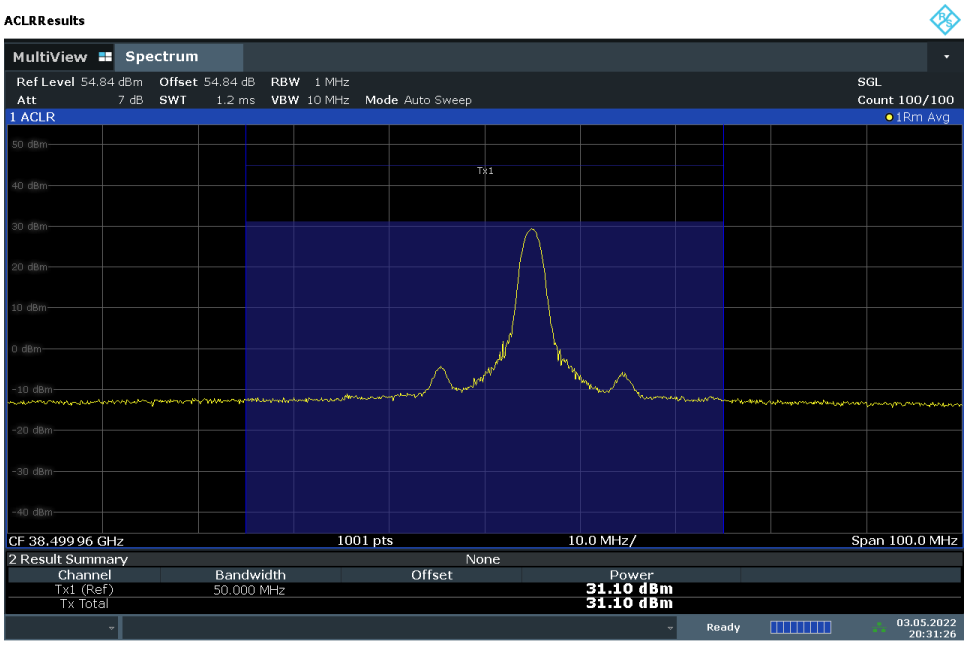
Table 7-43. Ant 2 EIRP Data (Band n260 − 50MHz-2CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	166	H	SISO	V	162	335	1 / 33	26.53
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	31	V	SISO	H	96	21	1 / 33	27.70
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	**28.74**
Mid	38499.96	CP-OFDM	QPSK	Folder Open	166	H	SISO	V	162	335	1 / 23	23.45
Mid	38499.96	CP-OFDM	QPSK	Folder Closed	31	V	SISO	H	96	21	1 / 33	24.52
Mid	38499.96	CP-OFDM	QPSK	Folder Open	40 + 168	H + V	MIMO	V	111	347	1 / 33	25.42
Low	37050.00	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	114	345	1 / 33	27.42
High	39949.92	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	357	1 / 33	24.31
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Closed	40 + 168	H + V	2Tx	V	105	351	1 / 33	27.83
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	28.54
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	26.18
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	24.48

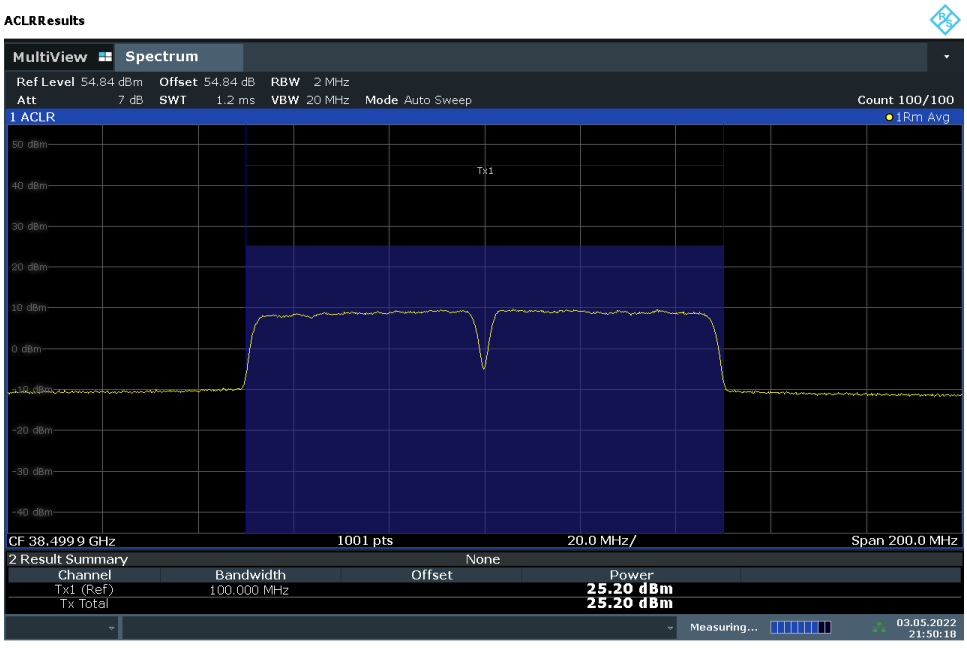
Table 7-44. Ant 2 EIRP Data (Band n260 − 100MHz-1CC)

Channel	Frequency [MHz]	Transmission Scheme	Modulation	Configuration	BeamID	Beam Pol.	Ant. Div.	Ant. Pol. [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	RB Size/Offset	EIRP [dBm]
Mid	38499.96	DFT-s-OFDM	QPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	64 / 0	21.53
Mid	38499.96	DFT-s-OFDM	π/2 BPSK	Folder Open	40 + 168	H + V	2Tx	V	111	347	64 / 0	21.54
Mid	38499.96	DFT-s-OFDM	16QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	20.43
Mid	38499.96	DFT-s-OFDM	64QAM	Folder Open	40 + 168	H + V	2Tx	V	111	347	1 / 33	19.82

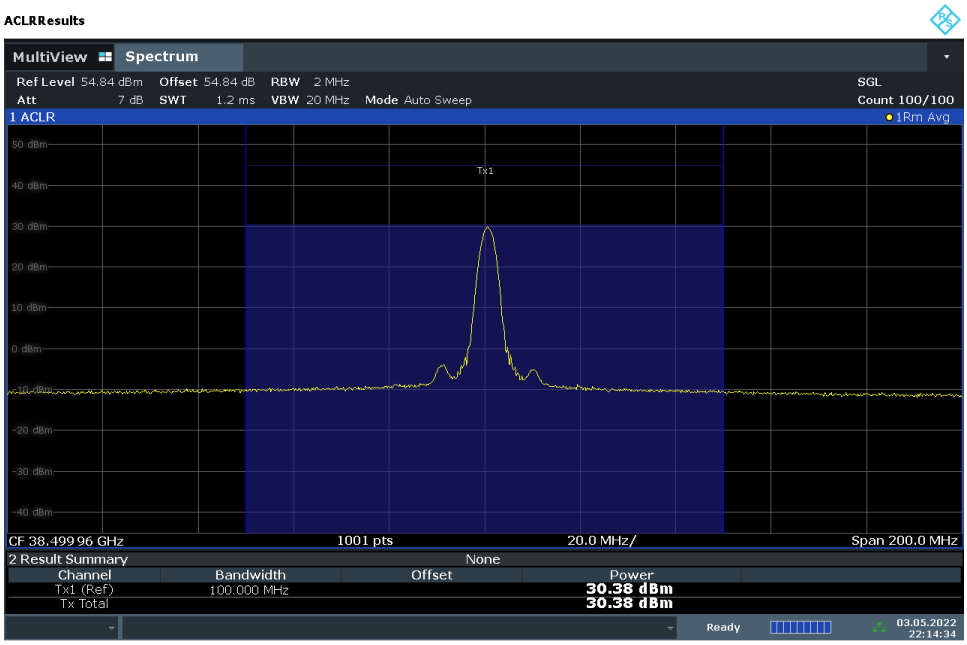
Table 7-45. Ant 2 EIRP Data (Band n260 − 100MHz-2CC)



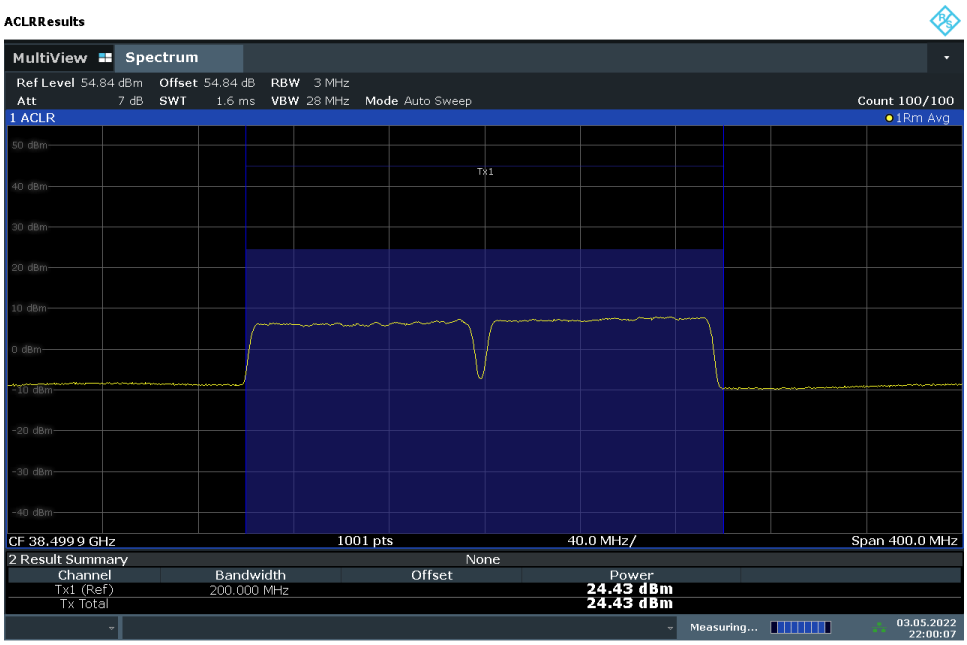
Plot 7-89. Ant 1 EIRP Plot (Band n260 − 50MHz-1CC − QPSK – Mid Channel)



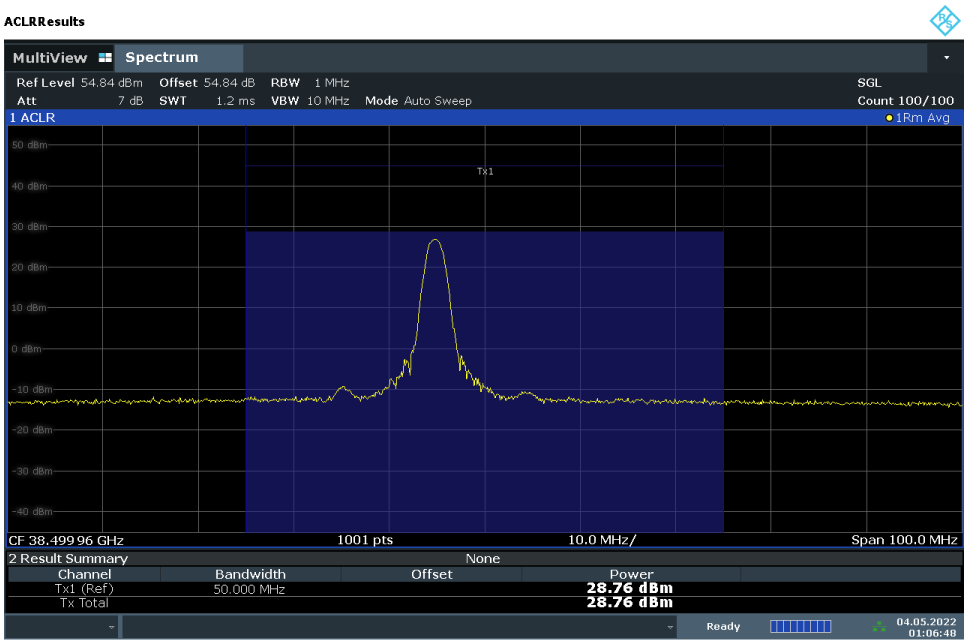
Plot 7-90. Ant 1 EIRP Plot (Band n260 − 50MHz-2CC − pi/2-BPSK – Mid Channel)



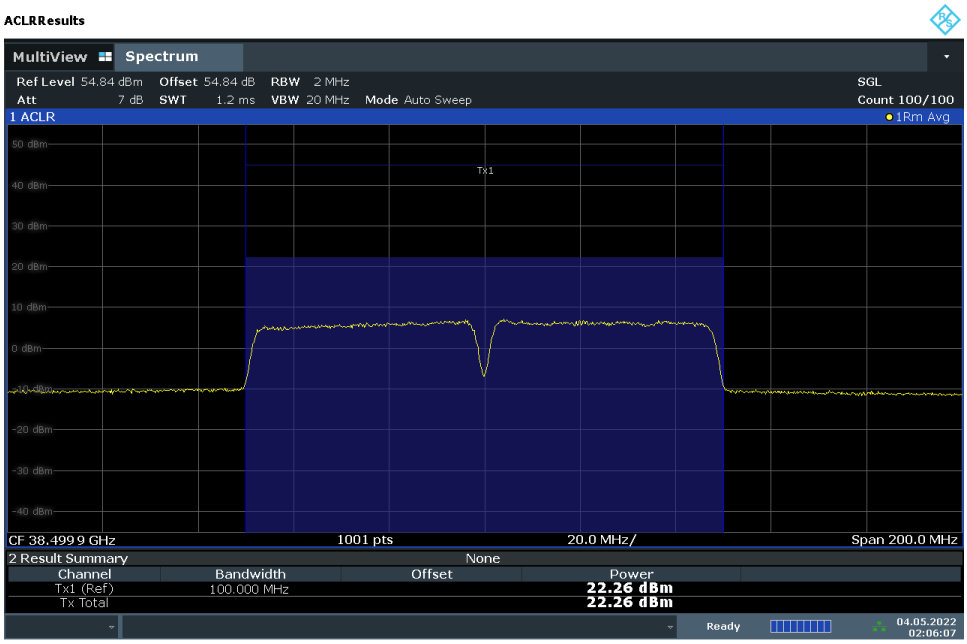
Plot 7-91. Ant 1 EIRP Plot (Band n260 − 100MHz-1CC − QPSK – Mid Channel)



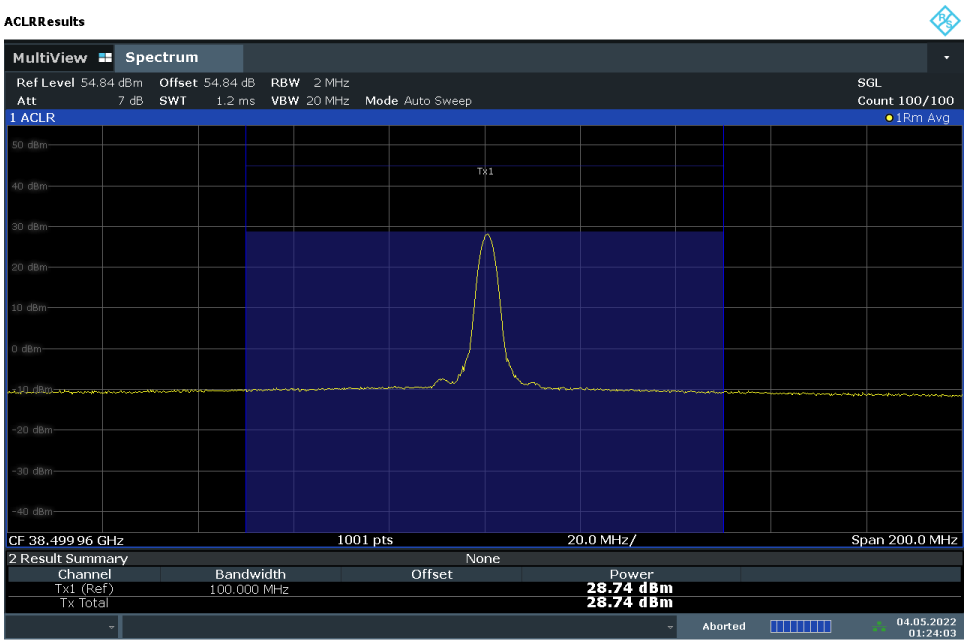
Plot 7-92. Ant 1 EIRP Plot (Band n260 − 100MHz-2CC − pi/2-BPSK – Mid Channel)



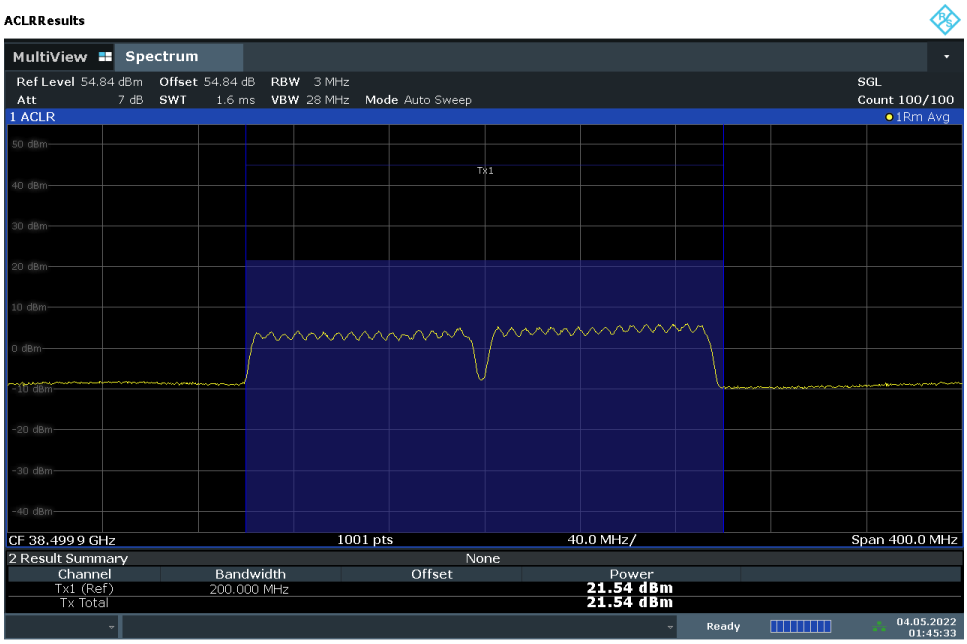
Plot 7-93. Ant 2 EIRP Plot (Band n260 − 50MHz-1CC − QPSK – Mid Channel)



Plot 7-94. Ant 2 EIRP Plot (Band n260 − 50MHz-2CC − QPSK – Mid Channel)



Plot 7-95. Ant 2 EIRP Plot (Band n260 − 100MHz-1CC − QPSK – Mid Channel)



Plot 7-96. Ant 2 EIRP Plot (Band n260 − 100MHz-2CC – pi/2-BPSK – Mid Channel)

7.4 Radiated Spurious and Harmonic Emissions

§2.1051, §30.203

Test Overview

The spectrum is scanned from 30MHz to 100GHz for n258-R1, n258-R2, and n261. For n260, the spectrum is scanned from 30MHz to 200GHz. All out of band emissions are measured in a radiated test setup while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All modulations 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 conductive power or total radiated power of any emissions outside a licensee's frequency block shall be -13dBm/1MHz.

Test Procedure Used

ANSI C63.26-2015 Section 5.7.4
KDB 842590 D01 v01r02 Section 4.4.3

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 100 GHz for n261 and 200GHz for n260. Several plots are used to show investigations in this entire span.
2. Detector = RMS
3. Trace mode = trace average
4. Sweep time = auto couple
5. Number of sweep points ≥ 2 x Span/RBW
6. The trace was allowed to stabilize
7. RBW = 1MHz, VBW = 3MHz

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) All radiated spurious emissions were measured as EIRP to compare with the §30.203 TRP limits. Emissions that were found to be non-compliant using the EIRP method were re-measured using the Spherical Grid TRP Method per KDB 842590.

3) The plots in this section were taken with the analyzer set to max hold. All final measurements shown in the tables that accompany the plots were taken with trace averaging performed over 100 sweeps while the analyzer was triggering on a specific emission of interest.

4) Elements within the same antenna array are correlated to produce beamforming array gain. Antenna arrays cannot be correlated with another antenna array. During testing, only one antenna array was active.

5) The plots from 1-200GHz show corrected average EIRP levels. The average EIRP reported below is calculated per section 5.2.7 of ANSI C63.26-2015 which states: EIRP (dBm) = E (dBµV/m) + 20log(D) − 104.8; where D is the measurement distance (in the far field region) in m. The field strength E is calculated E (dBµV/m) = Spectrum Analyzer Level (dBm) + Antenna Factor (dB/m) + Cable Loss (dB) + Harmonic Mixer Conversion Loss (dB) + 107. All appropriate Antenna Factor and Cable Loss have been applied in the spectrum analyzer for each measurement. For measurements > 40GHz, Harmonic Mixer Conversion Loss was also applied to the spectrum analyzer.

6) Emissions below 18GHz were measured at a 3 meter test distance, while emissions above 18GHz were measured at the appropriate far field distance. The far field of the mmWave signal is based on formula: R > 2D^2/wavelength, where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, D is the largest dimension of the measurement antenna.

Frequency Range (GHz)	Wavelength(cm)	Far Field Distance (m)	Measurement Distance (m)
18-40	0.749	0.54	1.00
40-60	0.500	1.39	1.50
60-90	0.333	0.91	1.00
90-140	0.214	0.58	1.00
140-200	0.150	0.39	1.00

Table 7-46. Far-Field Distance & Measurement Distance per Frequency Range

7) All emissions from 30MHz - 40GHz were measured using a spectrum analyzer with an internal preamplifier. Emissions >40GHz were measured using a harmonic mixer with the spectrum analyzer.

8) All RSE's were measured with 1CC. It was determined that adding more CC's causes the overall amplitude of just 1CC to decrease, therefore, 1CC is the worst case for the purposes of spurious emissions measurements.

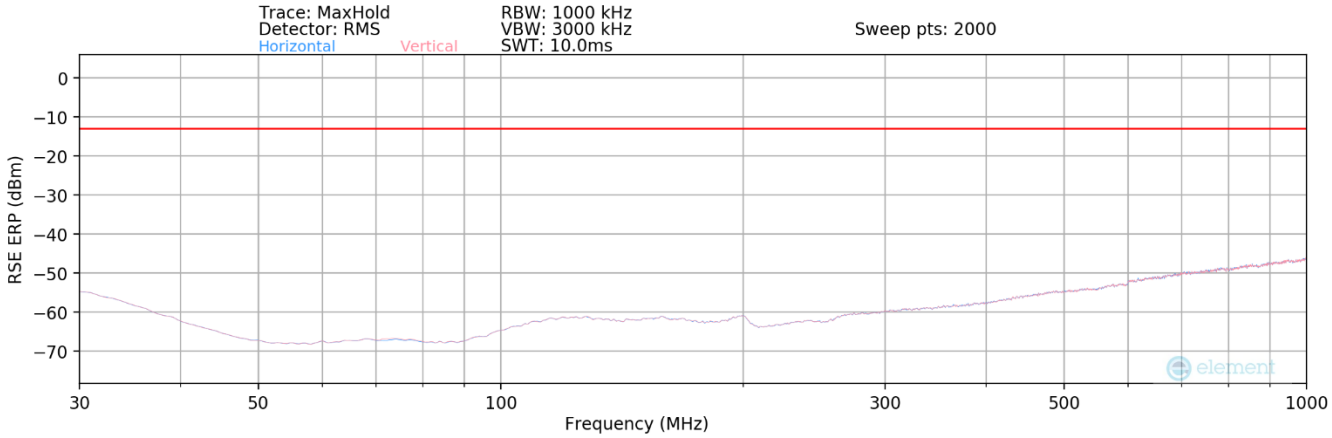
9) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

10) All RSE’s were investigated in EN-DC mode and with 802.11 chipset active. It was determined that there is no new emission introduced by EN-DC mode, or the 802.11 chipset. For EN-DC mode, n261 uses LTE B2, B5, B12, B13, B48 and B66, n260 uses LTE B2, B5, B12, B13, B14,B30, B48 and B66 and n258 uses LTE B2, B5, B12, B14, B30, and B66.

11) There was no discernible difference in the spurious emission levels when using different LTE and NR FR1 anchor bands. Thus, LTE Band 2 was used as a representative anchor band for EN-DC investigations.

Band n258-R1 – Ant 1

30MHz - 1GHz



Plot 7-97. Ant 1 - n258-R1 Radiated Spurious Plot (1CC QPSK Mid Channel 2Tx − EN-DC Anchor Band 2)

Spurious Emissions ERP Sample Calculation (n258-R1)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE ERP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

RSE ERP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8 – 2.15 (dB)

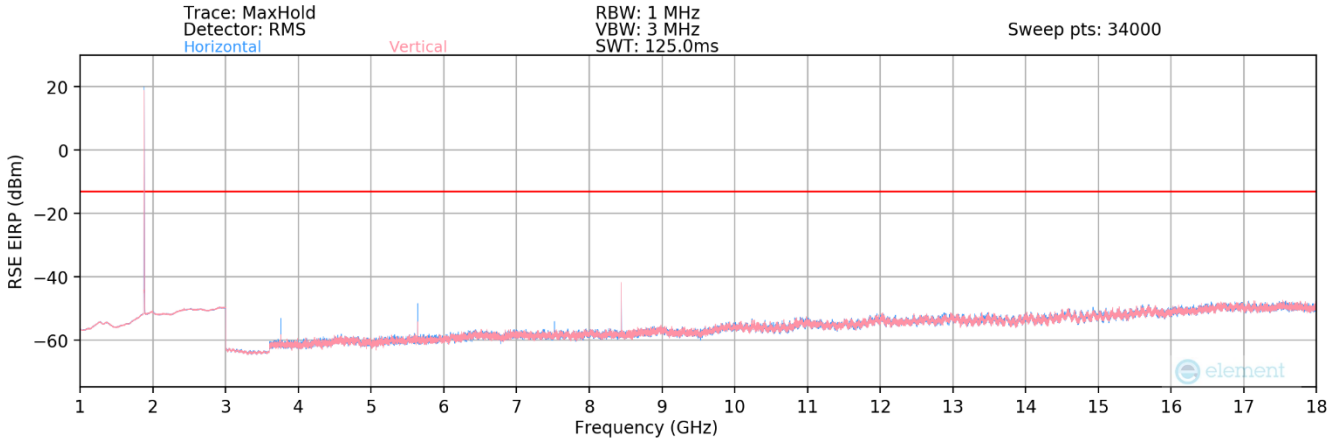
Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
629.71	Low	50	2Tx	QPSK	V	-	-	-49.72	-13.00	-36.72
698.07	Mid	50	2Tx	QPSK	V	-	-	-48.28	-13.00	-35.28
846.44	High	50	2Tx	QPSK	V	-	-	-45.99	-13.00	-32.99

Table 7-47. Ant 1 - n258-R1 Radiated Spurious Emissions Table (30MHz - 1GHz)

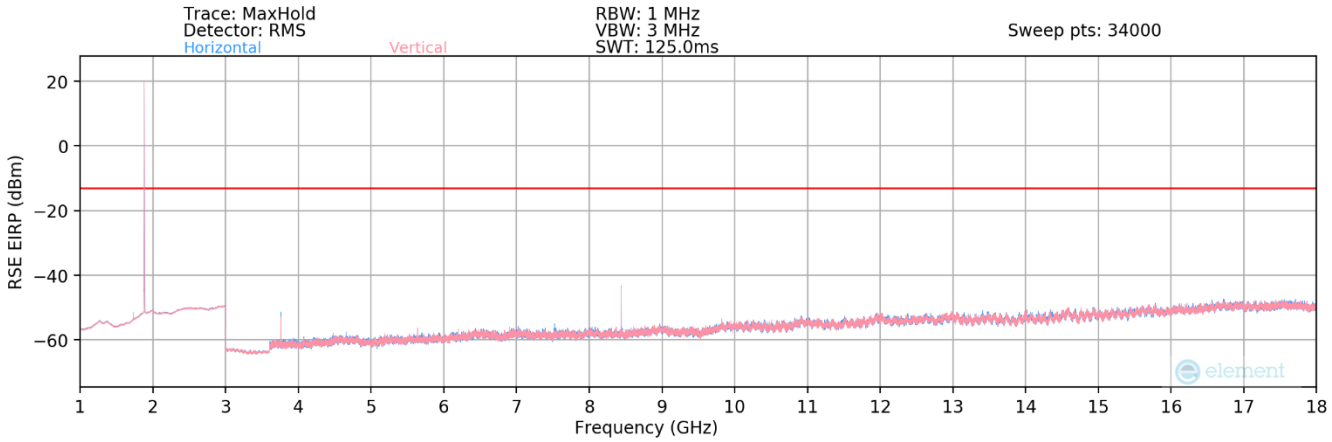
Notes

The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, and cable losses. Measurements were performed at a distance of 3 meter.

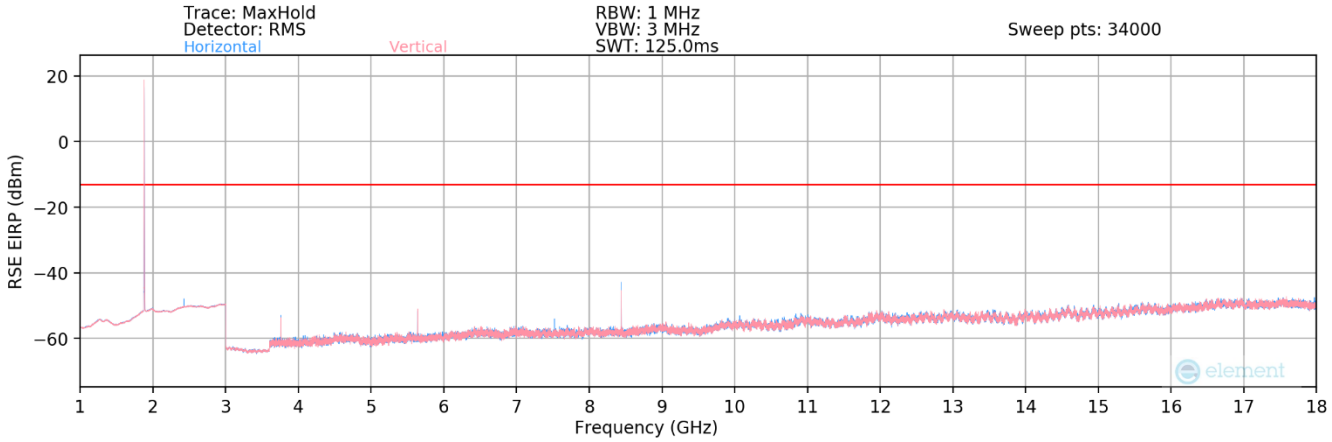
1GHz - 18GHz



Plot 7-98. Ant 1 - n258-R1 Radiated Spurious Plot (1CC QPSK Mid Channel 2Tx − EN-DC Anchor Band 2) _OPEN



Plot 7-99. Ant 1 - n258-R1 Radiated Spurious Plot (1CC QPSK Mid Channel 2Tx − EN-DC Anchor Band 2) _CLOSED



Plot 7-100. Ant 1 - n258-R1 Radiated Spurious Plot (1CC QPSK Mid Channel 2Tx − EN-DC Anchor Band 2) _HALF

Spurious Emissions EIRP Sample Calculation (n258-R1)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
8367.00	Low	50	2Tx	QPSK	V	26	175	-45.37	-13.00	-32.37
8442.00	Mid	50	2Tx	QPSK	V	27	185	-41.00	-13.00	-28.00
8517.00	High	50	2Tx	QPSK	V	27	174	-45.48	-13.00	-32.48

Table 7-48. Ant 1 - n258-R1 Radiated Spurious Emissions Table (1GHz - 18GHz)

Notes

The RSE EIRP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, and cable losses. Measurements were performed at a distance of 3 meter.