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FCC 5G mmWave REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
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Date of Issue:
June 14, 2021

Test Site/Location:
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Report No.: HCT-RF-2105-FC046-R1

FCC ID:	**A3LSMG990U**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**
Model:	SM-G990U
Additional Model:	SM-G990U1/DS, SM-G990U1
EUT Type:	Mobile Phone
Frequency Range:	27.5 GHz ~ 28.35 GHz, 37 GHz ~ 40 GHz
Modulation type:	PI/2 BPSK(DFT-s Only), QPSK, 16QAM, 64QAM
FCC Classification:	Part 30 Mobile Transmitter (5GM)
FCC Rule Part(s):	Part 30
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 842590 D01 V01r02

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

REVIEWED BY

Report prepared by : Beom Jin Cho
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2105-FC046	May 26, 2021	- First Approval Report
HCT-RF-2105-FC046-R1	June 14, 2021	- Added the Additional Model.

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1. EUT DESCRIPTION

Model	SM-G990U
Additional Model	SM-G990U1/DS, SM-G990U1
EUT Type	Mobile Phone
Power Supply	DC 3.88 V
Date(s) of Tests	April 20, 2021 ~ May 24, 2021
Band	n261: 27,500 MHz ~ 28,350 MHz(TDD) n260: 37,000 MHz ~ 40,000 MHz(TDD)
Channel Bandwidths	50 MHz/100 MHz
Carrier Specification	1CC, 2CC
Multiple transmit	SISO, SISO Dual, MIMO
Channel	Low, Mid, High
SCS	60 kHz, 120 kHz
OFDM	CP-OFDM, DFT-s-OFDM
RB size	1 RB(Offset: low, mid, high), half RB, Full RB
Modulation	PI/2 BPSK(DFT-s Only), QPSK, 16QAM, 64QAM
Antenna Specification	K patch: module 0, L patch: module 1 2 patch antennas

1.1 MAXIMUM EIRP POWER

n261 Band								
Mode	Antenna	Bandwidth (MHz)	CCs Active	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
					(W)	(dBm)		
SISO	Ant0(K patch)	50	1	27500 - 28350	0.429	26.32	45M2G7D	BPSK
SISO	Ant0(K patch)	50	1	27500 - 28350	0.429	26.32	45M5G7D	QPSK
SISO	Ant0(K patch)	50	1	27500 - 28350	0.253	24.03	45M3W7D	16QAM
SISO	Ant0(K patch)	50	1	27500 - 28350	0.181	22.57	45M3W7D	64QAM
SISO Dual	Ant0(K patch)	50	1	27500 - 28350	0.521	27.17	45M3G7D	BPSK
SISO Dual	Ant0(K patch)	50	1	27500 - 28350	0.508	27.06	45M4G7D	QPSK
SISO Dual	Ant0(K patch)	50	1	27500 - 28350	0.352	25.46	45M2W7D	16QAM
SISO Dual	Ant0(K patch)	50	1	27500 - 28350	0.207	23.15	45M4W7D	64QAM
SISO	Ant0(K patch)	50	2	27500 - 28350	0.172	22.35	94M7G7D	BPSK
SISO	Ant0(K patch)	50	2	27500 - 28350	0.169	22.27	94M4G7D	QPSK
SISO	Ant0(K patch)	50	2	27500 - 28350	0.112	20.50	94M9W7D	16QAM
SISO	Ant0(K patch)	50	2	27500 - 28350	0.071	18.49	95M0W7D	64QAM
SISO Dual	Ant0(K patch)	50	2	27500 - 28350	0.145	21.62	94M3G7D	BPSK
SISO Dual	Ant0(K patch)	50	2	27500 - 28350	0.147	21.67	94M4G7D	QPSK
SISO Dual	Ant0(K patch)	50	2	27500 - 28350	0.119	20.74	94M8W7D	16QAM
SISO Dual	Ant0(K patch)	50	2	27500 - 28350	0.076	18.82	95M0W7D	64QAM
SISO	Ant0(K patch)	100	1	27500 - 28350	0.406	26.08	90M3G7D	BPSK
SISO	Ant0(K patch)	100	1	27500 - 28350	0.421	26.24	90M9G7D	QPSK
SISO	Ant0(K patch)	100	1	27500 - 28350	0.258	24.11	90M3W7D	16QAM
SISO	Ant0(K patch)	100	1	27500 - 28350	0.187	22.73	90M6W7D	64QAM
SISO Dual	Ant0(K patch)	100	1	27500 - 28350	0.518	27.14	90M2G7D	BPSK
SISO Dual	Ant0(K patch)	100	1	27500 - 28350	0.540	27.32	90M9G7D	QPSK
SISO Dual	Ant0(K patch)	100	1	27500 - 28350	0.328	25.16	90M9W7D	16QAM
SISO Dual	Ant0(K patch)	100	1	27500 - 28350	0.213	23.28	90M9W7D	64QAM
SISO	Ant0(K patch)	100	2	27500 - 28350	0.171	22.34	190MG7D	BPSK
SISO	Ant0(K patch)	100	2	27500 - 28350	0.172	22.35	190MG7D	QPSK
SISO	Ant0(K patch)	100	2	27500 - 28350	0.122	20.88	190MW7D	16QAM
SISO	Ant0(K patch)	100	2	27500 - 28350	0.074	18.72	191MW7D	64QAM
SISO Dual	Ant0(K patch)	100	2	27500 - 28350	0.195	22.91	189MG7D	BPSK
SISO Dual	Ant0(K patch)	100	2	27500 - 28350	0.187	22.72	189MG7D	QPSK
SISO Dual	Ant0(K patch)	100	2	27500 - 28350	0.142	21.53	189MW7D	16QAM
SISO Dual	Ant0(K patch)	100	2	27500 - 28350	0.090	19.52	191MW7D	64QAM
SISO	Ant1(L patch)	50	1	27500 - 28350	0.446	26.49	45M3G7D	BPSK
SISO	Ant1(L patch)	50	1	27500 - 28350	0.439	26.42	45M7G7D	QPSK
SISO	Ant1(L patch)	50	1	27500 - 28350	0.275	24.40	45M4W7D	16QAM
SISO	Ant1(L patch)	50	1	27500 - 28350	0.180	22.56	45M6W7D	64QAM
SISO Dual	Ant1(L patch)	50	1	27500 - 28350	0.262	24.19	45M7G7D	BPSK
SISO Dual	Ant1(L patch)	50	1	27500 - 28350	0.277	24.43	45M5G7D	QPSK
SISO Dual	Ant1(L patch)	50	1	27500 - 28350	0.180	22.56	45M1W7D	16QAM
SISO Dual	Ant1(L patch)	50	1	27500 - 28350	0.117	20.67	45M6W7D	64QAM

n261 Band								
Mode	Antenna	Bandwidth (MHz)	CCs Active	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
					(W)	(dBm)		
SISO	Ant1(L patch)	50	2	27500 - 28350	0.191	22.81	90M1G7D	BPSK
SISO	Ant1(L patch)	50	2	27500 - 28350	0.189	22.76	90M6G7D	QPSK
SISO	Ant1(L patch)	50	2	27500 - 28350	0.132	21.19	90M4W7D	16QAM
SISO	Ant1(L patch)	50	2	27500 - 28350	0.083	19.21	91M1W7D	64QAM
SISO Dual	Ant1(L patch)	50	2	27500 - 28350	0.137	21.37	94M2G7D	BPSK
SISO Dual	Ant1(L patch)	50	2	27500 - 28350	0.137	21.38	94M9G7D	QPSK
SISO Dual	Ant1(L patch)	50	2	27500 - 28350	0.096	19.82	94M7W7D	16QAM
SISO Dual	Ant1(L patch)	50	2	27500 - 28350	0.057	17.53	94M0W7D	64QAM
SISO	Ant1(L patch)	100	1	27500 - 28350	0.433	26.36	94M3G7D	BPSK
SISO	Ant1(L patch)	100	1	27500 - 28350	0.432	26.35	94M5G7D	QPSK
SISO	Ant1(L patch)	100	1	27500 - 28350	0.260	24.15	94M5W7D	16QAM
SISO	Ant1(L patch)	100	1	27500 - 28350	0.171	22.34	94M8W7D	64QAM
SISO Dual	Ant1(L patch)	100	1	27500 - 28350	0.281	24.48	90M9G7D	BPSK
SISO Dual	Ant1(L patch)	100	1	27500 - 28350	0.276	24.41	91M0G7D	QPSK
SISO Dual	Ant1(L patch)	100	1	27500 - 28350	0.186	22.70	90M8W7D	16QAM
SISO Dual	Ant1(L patch)	100	1	27500 - 28350	0.121	20.84	91M5W7D	64QAM
SISO	Ant1(L patch)	100	2	27500 - 28350	0.194	22.87	190MG7D	BPSK
SISO	Ant1(L patch)	100	2	27500 - 28350	0.195	22.91	190MG7D	QPSK
SISO	Ant1(L patch)	100	2	27500 - 28350	0.134	21.28	190MW7D	16QAM
SISO	Ant1(L patch)	100	2	27500 - 28350	0.083	19.18	191MW7D	64QAM
SISO Dual	Ant1(L patch)	100	2	27500 - 28350	0.134	21.28	189MG7D	BPSK
SISO Dual	Ant1(L patch)	100	2	27500 - 28350	0.145	21.62	189MG7D	QPSK
SISO Dual	Ant1(L patch)	100	2	27500 - 28350	0.095	19.80	189MW7D	16QAM
SISO Dual	Ant1(L patch)	100	2	27500 - 28350	0.059	17.69	189MW7D	64QAM

n260 Band								
Mode	Antenna	Bandwidth (MHz)	CCs Active	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
					(W)	(dBm)		
SISO	Ant0(K patch)	50	1	37000 - 40000	0.308	24.88	46M0G7D	BPSK
SISO	Ant0(K patch)	50	1	37000 - 40000	0.294	24.69	46M2G7D	QPSK
SISO	Ant0(K patch)	50	1	37000 - 40000	0.185	22.66	46M3W7D	16QAM
SISO	Ant0(K patch)	50	1	37000 - 40000	0.131	21.18	45M2W7D	64QAM
SISO Dual	Ant0(K patch)	50	1	37000 - 40000	0.385	25.85	45M7G7D	BPSK
SISO Dual	Ant0(K patch)	50	1	37000 - 40000	0.399	26.01	46M2G7D	QPSK
SISO Dual	Ant0(K patch)	50	1	37000 - 40000	0.292	24.65	46M1W7D	16QAM
SISO Dual	Ant0(K patch)	50	1	37000 - 40000	0.148	21.69	48M1W7D	64QAM
SISO	Ant0(K patch)	50	2	37000 - 40000	0.143	21.54	94M7G7D	BPSK
SISO	Ant0(K patch)	50	2	37000 - 40000	0.149	21.73	94M8G7D	QPSK
SISO	Ant0(K patch)	50	2	37000 - 40000	0.094	19.75	95M0W7D	16QAM
SISO	Ant0(K patch)	50	2	37000 - 40000	0.057	17.55	95M7W7D	64QAM
SISO Dual	Ant0(K patch)	50	2	37000 - 40000	0.132	21.21	94M9G7D	BPSK
SISO Dual	Ant0(K patch)	50	2	37000 - 40000	0.141	21.49	95M0G7D	QPSK
SISO Dual	Ant0(K patch)	50	2	37000 - 40000	0.087	19.39	95M0W7D	16QAM
SISO Dual	Ant0(K patch)	50	2	37000 - 40000	0.052	17.14	95M9W7D	64QAM
SISO	Ant0(K patch)	100	1	37000 - 40000	0.307	24.87	92M8G7D	BPSK
SISO	Ant0(K patch)	100	1	37000 - 40000	0.323	25.09	90M1G7D	QPSK
SISO	Ant0(K patch)	100	1	37000 - 40000	0.237	23.74	89M9W7D	16QAM
SISO	Ant0(K patch)	100	1	37000 - 40000	0.125	20.97	90M0W7D	64QAM
SISO Dual	Ant0(K patch)	100	1	37000 - 40000	0.333	25.22	90M1G7D	BPSK
SISO Dual	Ant0(K patch)	100	1	37000 - 40000	0.322	25.08	90M5G7D	QPSK
SISO Dual	Ant0(K patch)	100	1	37000 - 40000	0.206	23.13	90M0W7D	16QAM
SISO Dual	Ant0(K patch)	100	1	37000 - 40000	0.126	21.02	90M3W7D	64QAM
SISO	Ant0(K patch)	100	2	37000 - 40000	0.135	21.30	191MG7D	BPSK
SISO	Ant0(K patch)	100	2	37000 - 40000	0.139	21.43	191MG7D	QPSK
SISO	Ant0(K patch)	100	2	37000 - 40000	0.094	19.71	189MW7D	16QAM
SISO	Ant0(K patch)	100	2	37000 - 40000	0.063	18.01	189MW7D	64QAM
SISO Dual	Ant0(K patch)	100	2	37000 - 40000	0.152	21.83	191MG7D	BPSK
SISO Dual	Ant0(K patch)	100	2	37000 - 40000	0.143	21.56	191MG7D	QPSK
SISO Dual	Ant0(K patch)	100	2	37000 - 40000	0.106	20.24	192MW7D	16QAM
SISO Dual	Ant0(K patch)	100	2	37000 - 40000	0.061	17.88	189MW7D	64QAM
SISO	Ant1(L patch)	50	1	37000 - 40000	0.356	25.52	46M0G7D	BPSK
SISO	Ant1(L patch)	50	1	37000 - 40000	0.344	25.36	45M9G7D	QPSK
SISO	Ant1(L patch)	50	1	37000 - 40000	0.204	23.10	46M3W7D	16QAM
SISO	Ant1(L patch)	50	1	37000 - 40000	0.125	20.96	49M6W7D	64QAM
SISO Dual	Ant1(L patch)	50	1	37000 - 40000	0.426	26.29	45M7G7D	BPSK
SISO Dual	Ant1(L patch)	50	1	37000 - 40000	0.439	26.42	45M9G7D	QPSK
SISO Dual	Ant1(L patch)	50	1	37000 - 40000	0.263	24.20	45M8W7D	16QAM
SISO Dual	Ant1(L patch)	50	1	37000 - 40000	0.168	22.26	46M4W7D	64QAM
SISO	Ant1(L patch)	50	2	37000 - 40000	0.119	20.76	95M2G7D	BPSK

n260 Band								
Mode	Antenna	Bandwidth (MHz)	CCs Active	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
					(W)	(dBm)		
SISO	Ant1(L patch)	50	2	37000 - 40000	0.116	20.66	94M8G7D	QPSK
SISO	Ant1(L patch)	50	2	37000 - 40000	0.079	18.99	94M9W7D	16QAM
SISO	Ant1(L patch)	50	2	37000 - 40000	0.059	17.72	95M6W7D	64QAM
SISO Dual	Ant1(L patch)	50	2	37000 - 40000	0.149	21.72	94M7G7D	BPSK
SISO Dual	Ant1(L patch)	50	2	37000 - 40000	0.142	21.53	95M0G7D	QPSK
SISO Dual	Ant1(L patch)	50	2	37000 - 40000	0.104	20.17	95M3W7D	16QAM
SISO Dual	Ant1(L patch)	50	2	37000 - 40000	0.065	18.12	95M2W7D	64QAM
SISO	Ant1(L patch)	100	1	37000 - 40000	0.348	25.41	92M9G7D	BPSK
SISO	Ant1(L patch)	100	1	37000 - 40000	0.372	25.70	91M0G7D	QPSK
SISO	Ant1(L patch)	100	1	37000 - 40000	0.210	23.22	90M5W7D	16QAM
SISO	Ant1(L patch)	100	1	37000 - 40000	0.138	21.41	91M0W7D	64QAM
SISO Dual	Ant1(L patch)	100	1	37000 - 40000	0.433	26.36	92M3G7D	BPSK
SISO Dual	Ant1(L patch)	100	1	37000 - 40000	0.445	26.48	93M5G7D	QPSK
SISO Dual	Ant1(L patch)	100	1	37000 - 40000	0.256	24.09	90M2W7D	16QAM
SISO Dual	Ant1(L patch)	100	1	37000 - 40000	0.168	22.26	90M7W7D	64QAM
SISO	Ant1(L patch)	100	2	37000 - 40000	0.116	20.64	191MG7D	BPSK
SISO	Ant1(L patch)	100	2	37000 - 40000	0.132	21.22	192MG7D	QPSK
SISO	Ant1(L patch)	100	2	37000 - 40000	0.077	18.84	189MW7D	16QAM
SISO	Ant1(L patch)	100	2	37000 - 40000	0.046	16.59	189MW7D	64QAM
SISO Dual	Ant1(L patch)	100	2	37000 - 40000	0.191	22.80	190MG7D	BPSK
SISO Dual	Ant1(L patch)	100	2	37000 - 40000	0.185	22.68	191MG7D	QPSK
SISO Dual	Ant1(L patch)	100	2	37000 - 40000	0.133	21.24	191MW7D	16QAM
SISO Dual	Ant1(L patch)	100	2	37000 - 40000	0.077	18.86	189MW7D	64QAM

2. FACILITIES AND ACCREDITATIONS

2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 (Version: 2014) and CISPR Publication 22.

Seoicheon-ro
■ Semi Chamber 1
□ Semi Chamber 2
□ Semi Chamber 3
■ mmWave Chamber

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. 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 fuction 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 table to bring the total table height to 1.5m for measurements above 1GHz.
Radiated spurious emission measurements from 30MHz - 18GHz were performed in a semi anechoic chamber (SAC) conforming to the site validation requirements.
Radiated power (EIRP) measurements were performed according to ANSI C63.26_2015 in a full anechoic chamber (FAC).

The test facility has been recognised by the FCC under registration number KR0032. The full scope of recognition can be viewed at https://apps.fcc.gov/oetcf/eas/reports/ViewTestFirmAccredScopes.cfm?calledFromFrame=N&RequestTimeout=500&regnum_specified=N&test_firm_id=5749.

2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

3. TEST SPECIFICATIONS

FCC Rule Parts	47 CFR FCC Part2, Part 30
Measurement standards	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01, KDB 662911 D02 v01, KDB 842590 D01 v01r02

Note:

The EUT was tested per the guidance of ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 842590 D01 v01r02

EIRP Simulation data for all Beam IDs was used to determine the worst case Beam ID for SISO operation and Beam ID pair for SISO Dual operation. These Beam ID's was used for final measurements.

All testing was performed using FTM software at continuous Tx operation(100 % duty cycle).
In case of RSE for EN-DC mode, we used 5G NR call simulator.

Each of the patch antennas is comprised of two separate antenna feeds(H/V).
L patch antenna does not radiate when K patch antenna radiates.

All modulations, RB size, CP-OFDM, DFT-s-OFDM and SCS were investigated and the worst case configuration results are reported.

In cases of SISO, SISO Dual, MIMO, CP-OFDM is supported.
In cases of SISO, SISO Dual, DFT-s-OFDM mode is supported.
Both CP-OFDM and DFT-s-OFDM were invegtiged for the Occupied Bandwidth, EIRP, Band Edge, RSE and the DFT-s-OFDM was worst case of NR Modulations in all test cases.

Per 2.1057(a)(2), spurious emissions were investigated up to 200 GHz.(up to 100 GHz for n261 band)

The radiated RF output power, band edge and all out-of-band emissions in the spurious domain are evaluated to the EIRP limits.

In case of band edge, if the band edge results does not comply the EIRP limit, the band edge results are converted to an equivalent conductive power by subtracting the known antenna gain from the EIRP measured at each frequency of interest. These emissions are compared to the 30.203 spurious emission limits as conductive power levels.

Beam IDs were selected based on which Beam ID produces the highest EIRP during EIRP simulation.

3.1. STANDARDS & TEST SUMMARY

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 30

Description	Test Limit	Reference	Results
Occupied Bandwidth	N/A	§2.1049	Compliant
Equivalent Isotropic Radiated Power	43 dBm	§30.202 §30.202	Compliant
Out-of-Band Emissions at the Band Edge	-13 dBm/MHz for all out-of-band emissions, -5 dBm/MHz from the band edge up to 10 % of the channel BW	§2.1051, §30.203	Compliant
Radiated Spurious Emissions	-13 dBm/MHz for all out-of-band emissions	§2.1051, §30.203	Compliant
Frequency Stability	Fundamental emissions stay within authorized frequency block	§2.1055	Compliant

3.2. HIGHEST E.I.R.P POSITION

Ant 0(K patch) SISO

Band	CH	Beam ID	SISO – H	Beam ID	SISO - V
n261	Low	159	H / Azi : 92 Roll : 147	20	V / Azi : 87 Roll : 192
	Mid	159	H / Azi : 73 Roll : 148	20	V / Azi : 79 Roll : 194
	High	159	H / Azi : 86 Roll : 153	20	V / Azi : 93 Roll : 184
n260	Low	162	V / Azi : 71 Roll : 207	33	H / Azi : 88 Roll : 174
	Mid	152	V / Azi : 79 Roll : 197	23	H / Azi : 89 Roll : 163
	High	161	V / Azi : 91 Roll : 183	23	H / Azi : 87 Roll : 158

Ant 0(K patch) SISO Dual, MIMO

Band	CH	Beam ID	SISO Dual - H	Beam ID	SISO Dual - V
n261	Low	31/159	H / Azi : 93 Roll : 151	31/159	V / Azi : 42 Roll : 138
	Mid	19/147	H / Azi : 88 Roll : 213	19/147	V / Azi : 63 Roll : 206
	High	31/159	H / Azi : 71 Roll : 153	31/159	V / Azi : 48 Roll : 108
n260	Low	33/161	H / Azi : 92 Roll : 177	33/161	V / Azi : 87 Roll : 161
	Mid	33/161	H / Azi : 72 Roll : 182	33/161	V / Azi : 93 Roll : 179
	High	34/162	H / Azi : 57 Roll : 214	34/162	V / Azi : 87 Roll : 208

Ant 1(L patch) SISO

Band	CH	Beam ID	SISO - H	Beam ID	SISO - V
n261	Low	154	H / Azi : 76 Roll : 3	36	V / Azi : 74 Roll : 326
	Mid	153	H / Azi : 94 Roll : 28	36	V / Azi : 58 Roll : 328
	High	162	H / Azi : 92 Roll : 13	34	V / Azi : 72 Roll : 13
n260	Low	156	V / Azi : 72 Roll : 2	27	H / Azi : 93 Roll : 34
	Mid	164	V / Azi : 77 Roll : 12	29	H / Azi : 88 Roll :342
	High	156	V / Azi : 88 Roll : 4	38	H / Azi : 92 Roll : 326

Ant 1(L patch) SISO Dual, MIMO

Band	CH	Beam ID	SISO Dual - H	Beam ID	SISO Dual - V
n261	Low	36/164	H / Azi : 86 Roll : 326	36/164	V / Azi : 93 Roll : 329
	Mid	35/163	H / Azi : 92 Roll : 341	35/163	V / Azi : 71 Roll : 349
	High	35/163	H / Azi : 88 Roll : 343	35/163	V / Azi : 78 Roll : 347
n260	Low	27/155	H / Azi : 94 Roll : 26	27/155	V / Azi : 71 Roll : 26
	Mid	36/164	H / Azi : 87 Roll : 11	36/164	V / Azi : 79 Roll : 17
	High	36/164	H / Azi : 89 Roll : 12	36/164	V / Azi : 73 Roll : 32

3.3. MAXIMUM MEASUREMENT UNCERTAINTY

The value of the measurement uncertainty for the measurement of each parameter.

Coverage factor k = 2, Confidence levels of 95 %

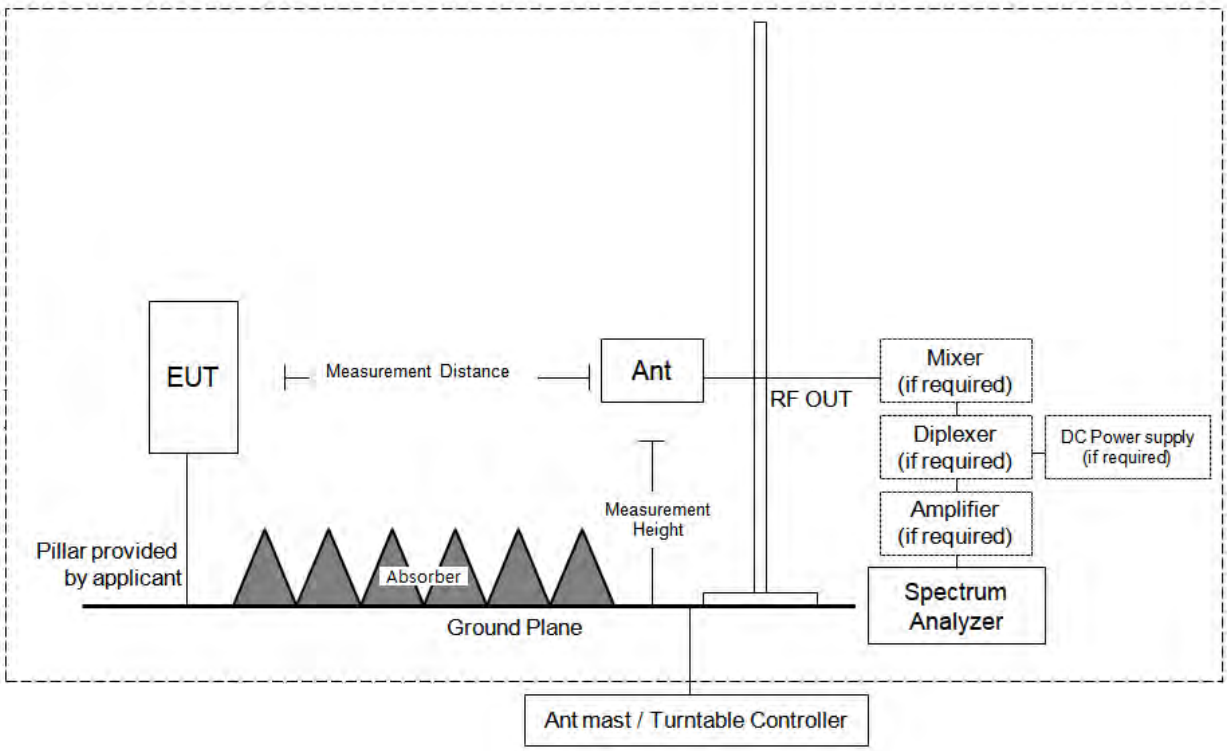
Description	Condition	Uncertainty
Occupied Bandwidth	-	± 0.31 MHz
Equivalent Isotropic Radiated Power	27.48 GHz ~ 28.37 GHz, 36.98 GHz ~ 40.02 GHz	± 5.05 dB
Band Edge		
Radiated Spurious Emissions	9 kHz ~ 30 MHz	± 3.40 dB
	30 MHz ~ 1 GHz	± 4.80 dB
	1 GHz ~ 18 GHz	± 5.70 dB
	18 GHz ~ 40 GHz	± 5.05 dB
	40 GHz ~ 200 GHz	± 4.59 dB
Frequency Stability	-	69.61 kHz

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

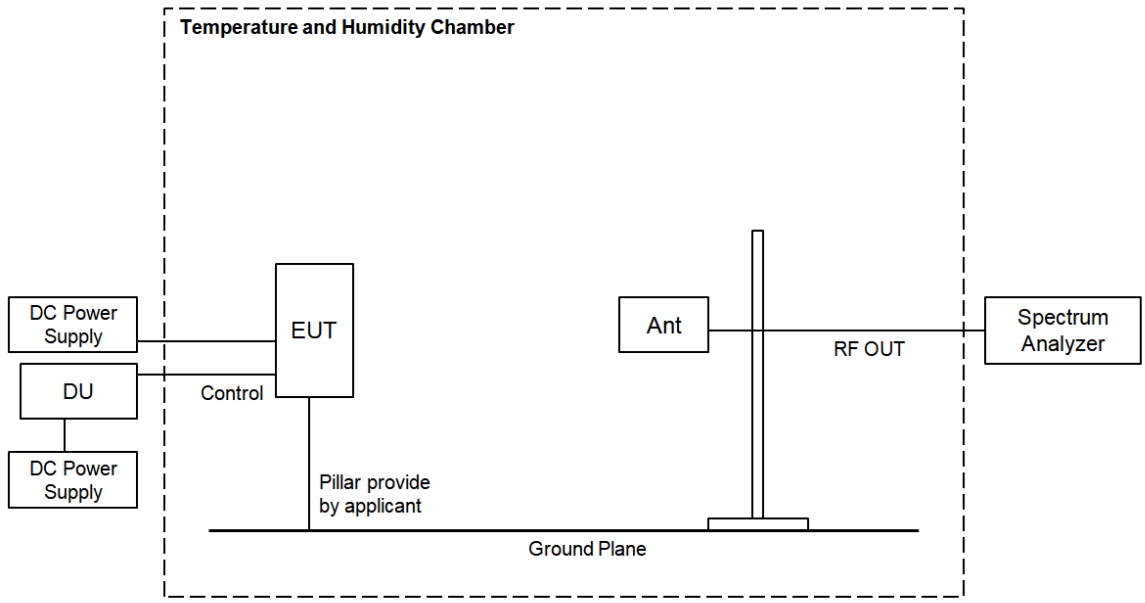
Temperature :	+15 ℃ to +35 ℃
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

3.5. TEST DIAGRAMS

Occupied Bandwidth / EIRP / Band Edge / RSE



Frequency stability



3.6. ADDITIONAL DESCRIPTIONS ABOUT TEST

- All tests is performed by radiated measurement and applied below conditions.

: Used measurement distance with far field of test such as EIRP, OBW and Band edge are as follow.

Wavelength = Speed of light / Measurement frequency = 30 / 4 000 = 0.0075

(2 X (Max measured antenna dimension) ^{2}) / Wavelength = (2 X (0.09604686)^2)/ 0.0075= ***2.46 m***

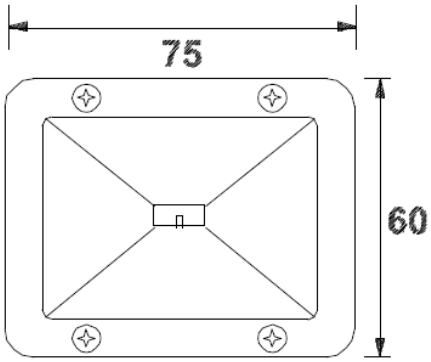
: Spurious emissions measurement distance is shown in table below(Reference : Measurement Antenna Dimension).

Frequency Rage (GHz)	Wavelength (cm)	Far Field Distance (m)	Measurement Distance(m)
18 ~ 40	0.75	2.46	3.00
40 ~ 60	0.50	1.354	3.75
60 ~90	0.33	0.856	1
90 ~ 140	0.214	0.572	1
140 ~ 200	0.15	0.332	0.5

- Unwanted radiated emissions test was performed on state of all EUT antenna path is operated with a maximum output power level.

- In case of far-field distance for fundamental, we applied the measured antenna dimension because the measured antenna is bigger than the antenna of EUT.

- Dimension of measured(BBHA 9170) antenna: 0.096046 m



- Dimension of EUT antenna : 0.020241 m

- Below 18 GHz, measurement distance is 3.00 m.

4. TEST EQUIPMENTS

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Agilent	N9030B / PXA Signal Analyzer	06/04/2020	Annual	MY55480167
Schwarzbeck	BBHA 9170 / Horn Antenna	11/29/2019	Biennial	BBHA9170541
KIKUSUI	PWR800L / DC Power Supply	07/14/2020	Annual	RE002047
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Rohde&Schwarz	FSW / Spectrum Analyzer	09/09/2020	Annual	101256
Rohde&Schwarz	FSP / Spectrum Analyzer	09/14/2020	Annual	836650/016
Schwarzbeck	Loop Antenna	05/18/2020	Biennial	1513-175
Emco	2090 / Controller	N/A	N/A	060520
Ets	Turn Table	N/A	N/A	N/A
Schwarzbeck	VULB 9168 / Hybrid Antenna	09/04/2020	Biennial	9168-0895
Schwarzbeck	BBHA 9120D / Horn Antenna	06/28/2019	Biennial	9120D-1300
OML INC.	WR-19 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M19RH-160419-2
OML INC.	WR-19 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M19RH-160419-1
OML INC.	WR-12 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M12RH-160419-1
OML INC.	WR-12 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M12RH-160419-2
OML INC.	WR-08 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M08RH-160419-2
OML INC.	WR-08 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M08RH-160419-1
OML INC.	WR-05 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M05RH-160419-1
OML INC.	WR-05 Horn Antenna / Horn Antenna	04/23/2020	Biennial	M05RH-160419-2
OML INC.	OML WR19 / Harmonic Mixer	09/09/2020	Annual	M19HWD
OML INC.	OML WR12 / Harmonic Mixer	09/09/2020	Annual	M12HWD
OML INC.	OML WR08 / Harmonic Mixer	09/09/2020	Annual	M08HWD
OML INC.	OML WR05 / Harmonic Mixer	09/09/2020	Annual	M05HWD
OML INC.	WR-19 / Source Module	09/09/2020	Annual	S19MS-A-160516-1
OML INC.	WR-12 / Source Module	09/09/2020	Annual	S12MS-A-160419-1
OML INC.	WR-08 / Source Module	09/09/2020	Annual	S08MS-A-160419-1
OML INC.	WR-05 / Source Module	09/09/2020	Annual	S05MS-A-160419-1
NANGYEUL CO., LTD.	NY-THR18750 / Temperature and Humidity Chamber	01/14/2021	Annual	NY-200912201A
Rohde & Schwarz	SMV100A / Signal Generator	07/13/2020	Annual	177633
Keysight	E7515B / UXM 5G Wireless Test Platform	01/07/2021	Annual	MY58300756

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

5. TEST RESULT

5.1. OCCUPIED BANDWIDTH

FCC Rules

Test Requirements:

§ 2.1049 Measurements required: Occupied bandwidth.

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 under the specified conditions of § 2.1049 (a) through (i) as applicable. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedures:

The measurement is performed in accordance with Section 5.4.3 and 5.4.4 of ANSI C63.26.

5.4.3 Occupied bandwidth—Relative measurement procedure

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

f) Determine the reference value by either of the following:

1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.

g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).

i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers. The spectral envelope can cross the "−X dB amplitude" at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the "−X dB amplitude."

j) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

5.4.4 Occupied bandwidth—Power bandwidth (99%) measurement procedure

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The

frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Test Results:

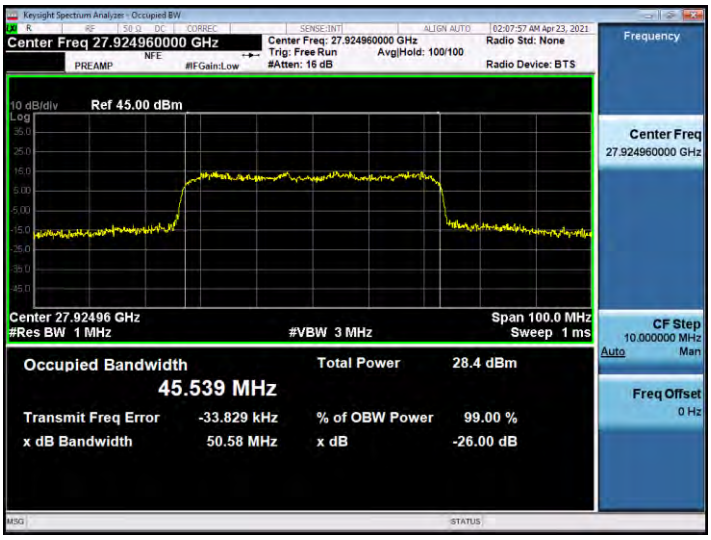
Tabular Data of Occupied Bandwidth

Band	Antenna	CCs Active	Bandwidth	Modulation	Channel	Frequency [MHz]	OBW [MHz]
n261	0(K patch)	1	50 MHz	BPSK	Low	27525	45.487
					Mid	27924.96	45.539
					High	28324.92	45.447
			100 MHz	QPSK	Low	27550.08	90.989
					Mid	27924.96	90.964
					High	28299.96	90.991
		2	50 MHz	BPSK	Low	27550	94.475
					Mid	27924.96	94.279
					High	28299.92	94.813
			100 MHz	QPSK	Low	27600.08	189.05
					Mid	27924.96	187.91
					High	28249.96	189.45
	1(L patch)	1	50 MHz	BPSK	Low	27525	45.529
					Mid	27924.96	45.648
					High	28324.92	45.570
			100 MHz	QPSK	Low	27550.08	90.962
					Mid	27924.96	90.775
					High	28299.96	90.810
		2	50 MHz	BPSK	Low	27550	94.980
					Mid	27924.96	94.708
					High	28299.92	94.691
			100 MHz	QPSK	Low	27600.08	189.13
					Mid	27924.96	189.38
					High	28249.96	189.40

Band	Antenna	CCs Active	Bandwidth	Modulation	Channel	Frequency [MHz]	OBW [MHz]
n260	0(K patch)	1	50 MHz	BPSK	Low	37025.04	46.254
					Mid	38499.96	46.097
					High	39975	46.820
			100 MHz		Low	37050	90.113
					Mid	38499.96	92.660
					High	39949.92	92.077
		2	50 MHz		Low	37050.04	95.062
					Mid	38499.96	95.226
					High	39950	95.772
			100 MHz		Low	37100	190.50
					Mid	38499.96	190.47
					High	39899.92	189.96
	1(L patch)	1	50 MHz	BPSK	Low	37025.04	45.907
					Mid	38499.96	46.165
					High	39975	49.130
			100 MHz		Low	37050	92.317
					Mid	38499.96	92.458
					High	39949.92	90.453
		2	50 MHz		Low	37050.04	94.713
					Mid	38499.96	94.930
					High	39950	95.805
			100 MHz		Low	37100	189.84
					Mid	38499.96	190.01
					High	39899.92	188.64

Plot Data of RF Occupied Bandwidth

1. Antenna 0(K patch), n261

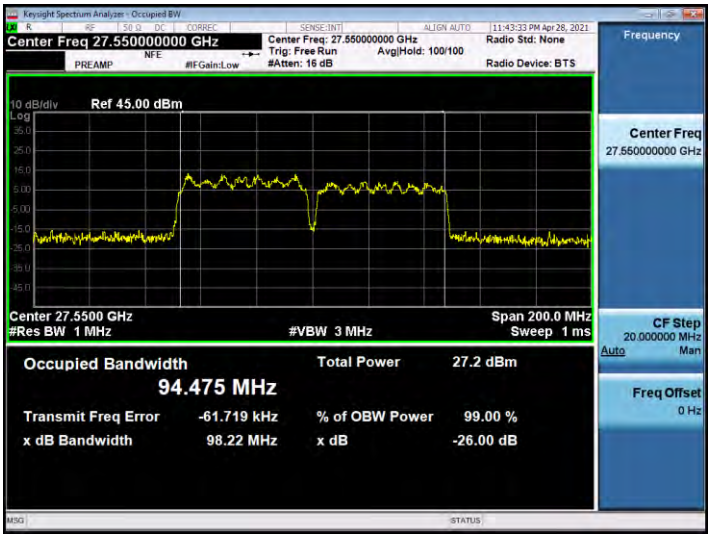
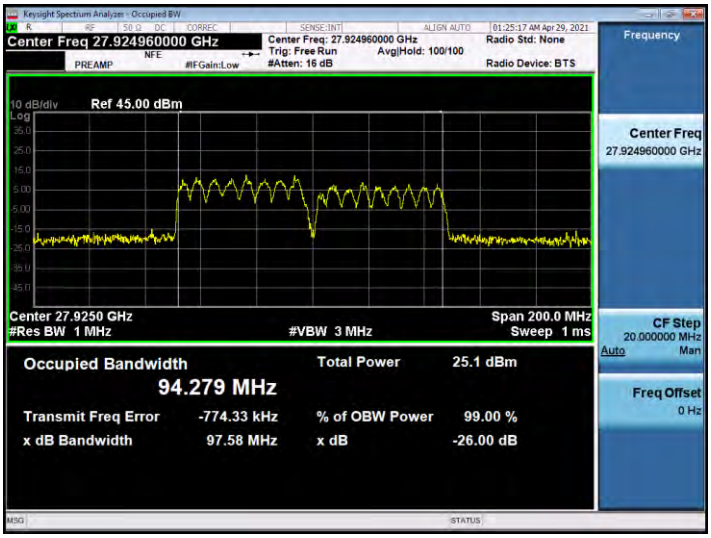
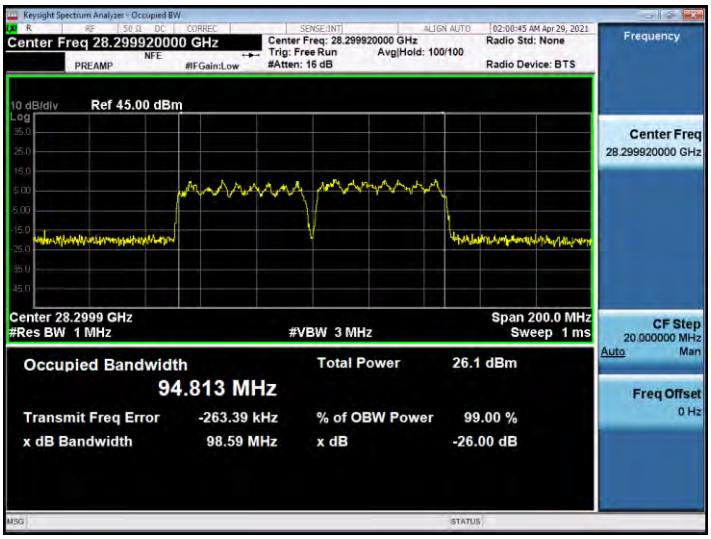
50 MHz, 1CC	
	
	

100 MHz, 1CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.550080000 GHz
Center Freq: 27.550080000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.5501 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.989 MHz
Total Power 30.5 dBm
Transmit Freq Error -1.4979 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.84 MHz
x dB -26.00 dB
Frequency
Center Freq
27.550080000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.964 MHz
Total Power 29.2 dBm
Transmit Freq Error -1.4049 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.73 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

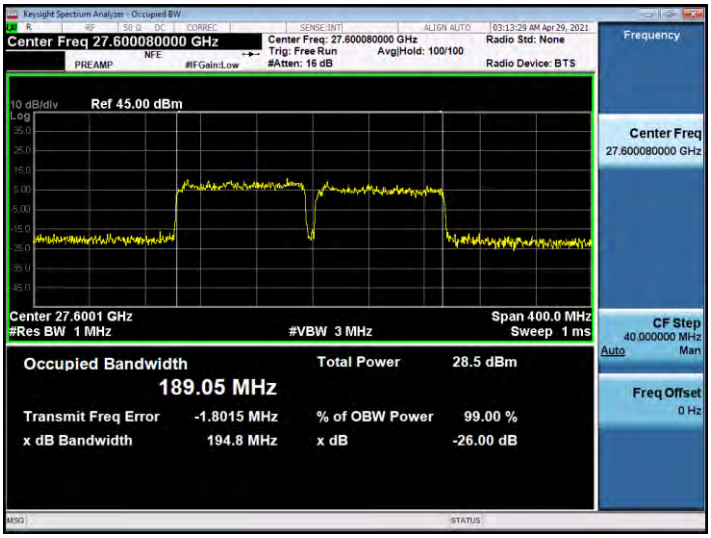
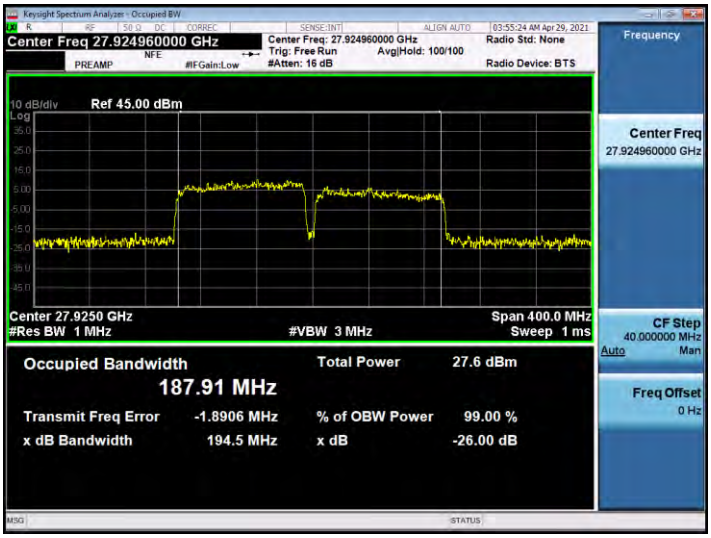
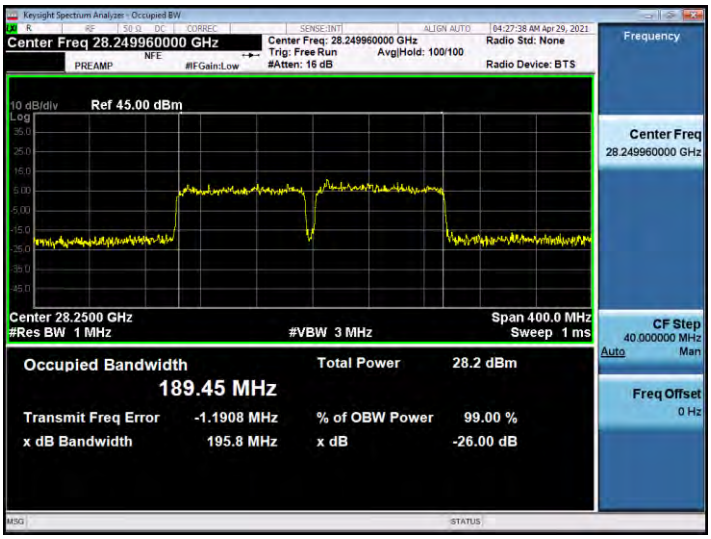
Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.299960000 GHz
Center Freq: 28.299960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.3000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.991 MHz
Total Power 29.8 dBm
Transmit Freq Error -1.5342 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.36 MHz
x dB -26.00 dB
Frequency
Center Freq
28.299960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

50 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.550000000 GHz
Center Freq: 27.550000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.5500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.475 MHz
Total Power 27.2 dBm
Transmit Freq Error -61.719 kHz
% of OBW Power 99.00 %
x dB Bandwidth 98.22 MHz
x dB -26.00 dB
Frequency
Center Freq
27.550000000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.279 MHz
Total Power 25.1 dBm
Transmit Freq Error -774.33 kHz
% of OBW Power 99.00 %
x dB Bandwidth 97.58 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.299920000 GHz
Center Freq: 28.299920000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.2999 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.813 MHz
Total Power 26.1 dBm
Transmit Freq Error -263.39 kHz
% of OBW Power 99.00 %
x dB Bandwidth 98.59 MHz
x dB -26.00 dB
Frequency
Center Freq
28.299920000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

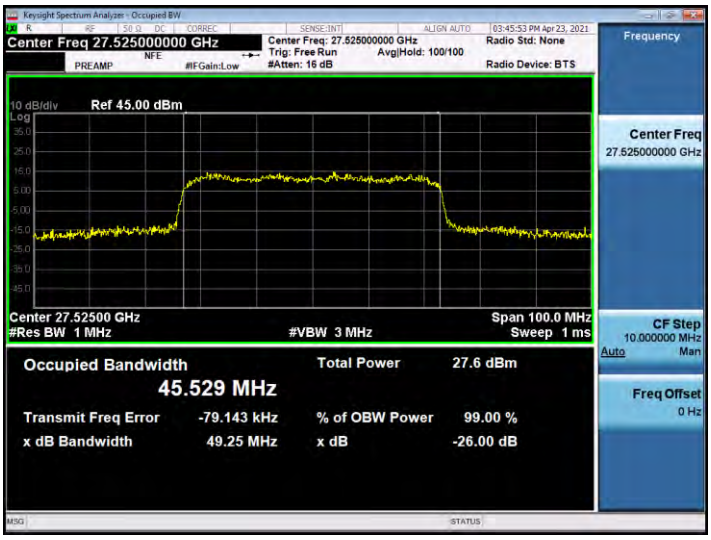
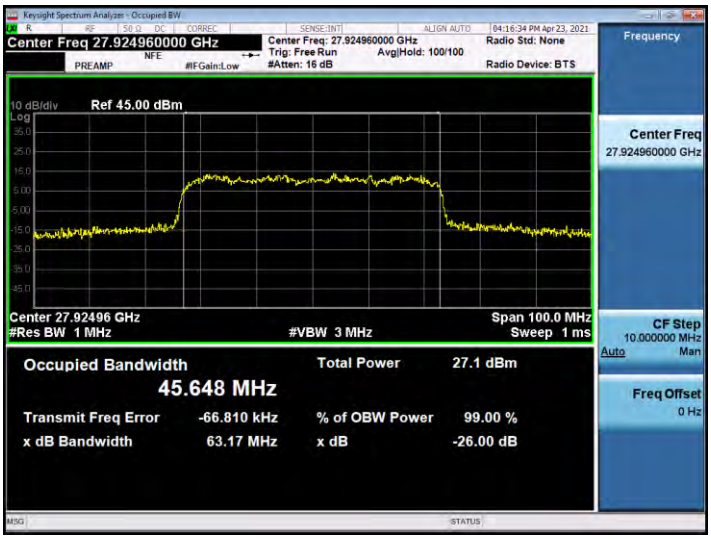
100 MHz, 2CC	
	
	

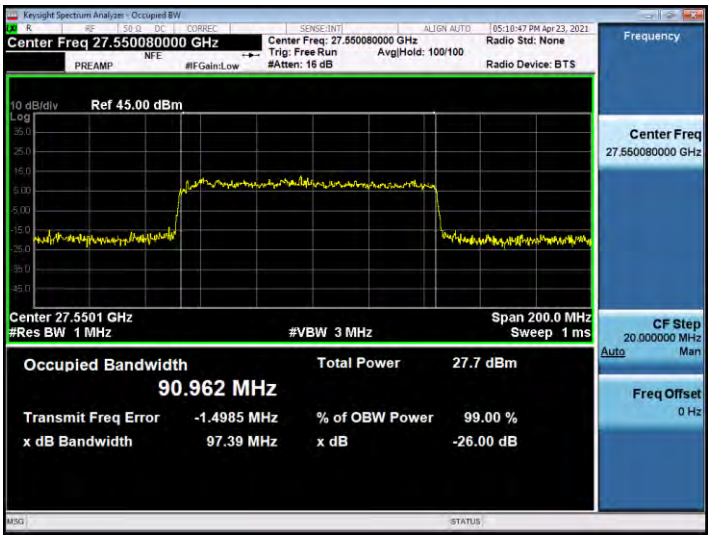
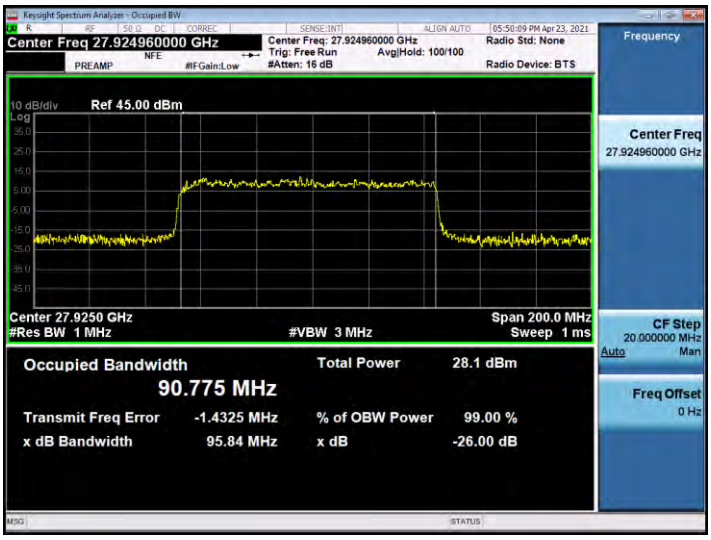
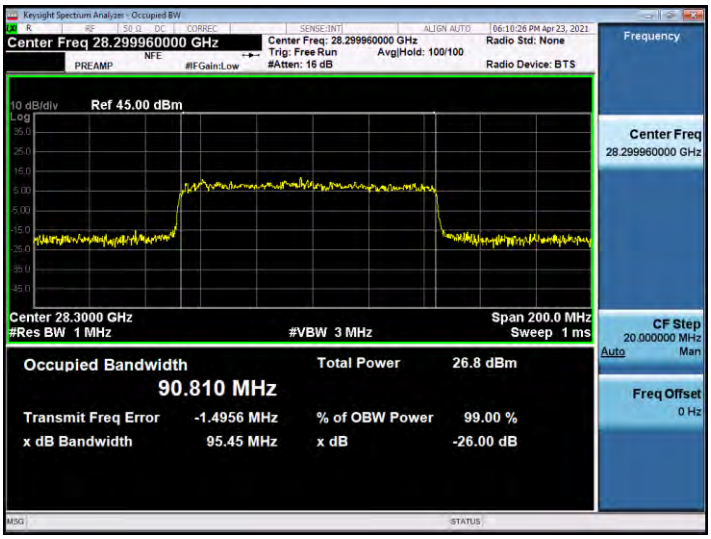
Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.600080000 GHz
Center Freq: 27.600080000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.6001 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.05 MHz
Total Power 28.5 dBm
Transmit Freq Error -1.8015 MHz
% of OBW Power 99.00 %
x dB Bandwidth 194.8 MHz
x dB -26.00 dB
Frequency
Center Freq
27.600080000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
187.91 MHz
Total Power 27.6 dBm
Transmit Freq Error -1.8906 MHz
% of OBW Power 99.00 %
x dB Bandwidth 194.5 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.249960000 GHz
Center Freq: 28.249960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.2500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.45 MHz
Total Power 28.2 dBm
Transmit Freq Error -1.1908 MHz
% of OBW Power 99.00 %
x dB Bandwidth 195.8 MHz
x dB -26.00 dB
Frequency
Center Freq
28.249960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

2. Antenna 1(L patch), n261

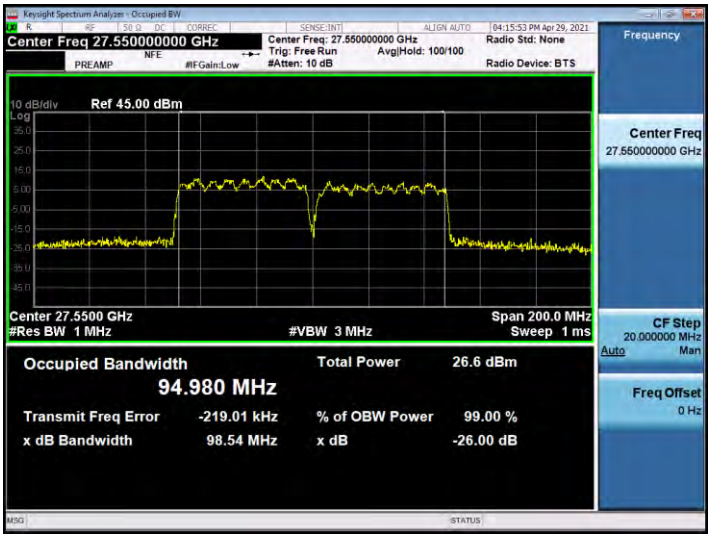
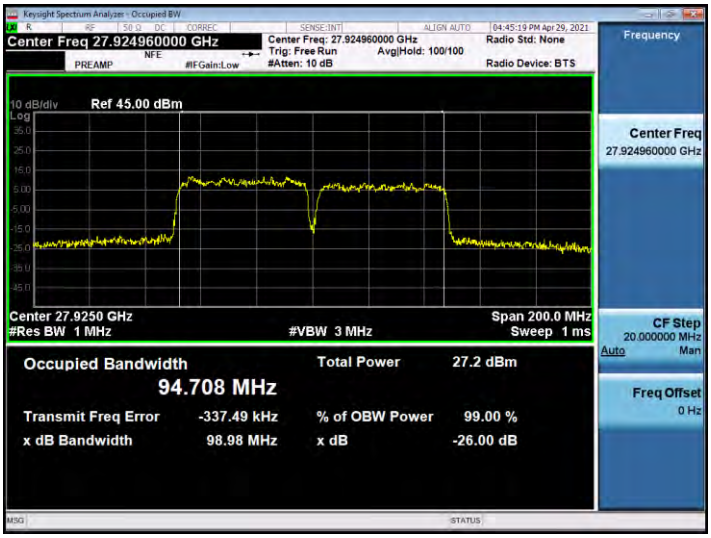
50 MHz, 1CC	
	
	

100 MHz, 1CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.550080000 GHz
Center Freq: 27.550080000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.5501 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.962 MHz
Total Power 27.7 dBm
Transmit Freq Error -1.4985 MHz
% of OBW Power 99.00 %
x dB Bandwidth 97.39 MHz
x dB -26.00 dB
Frequency
Center Freq
27.550080000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.775 MHz
Total Power 28.1 dBm
Transmit Freq Error -1.4325 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.84 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

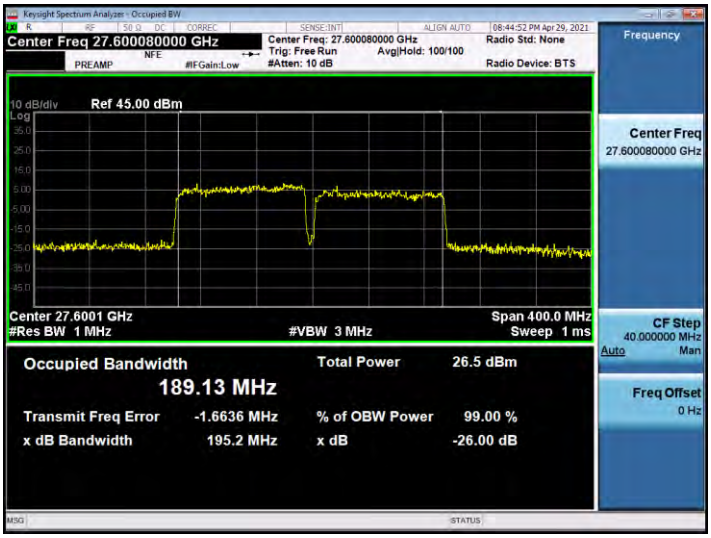
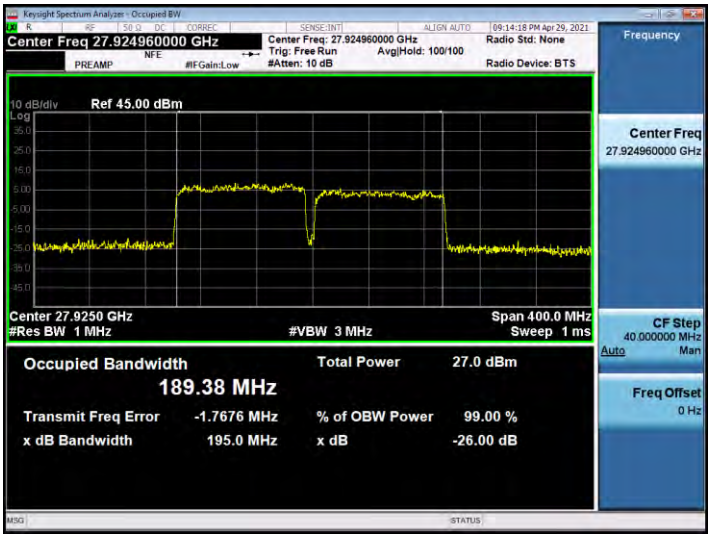
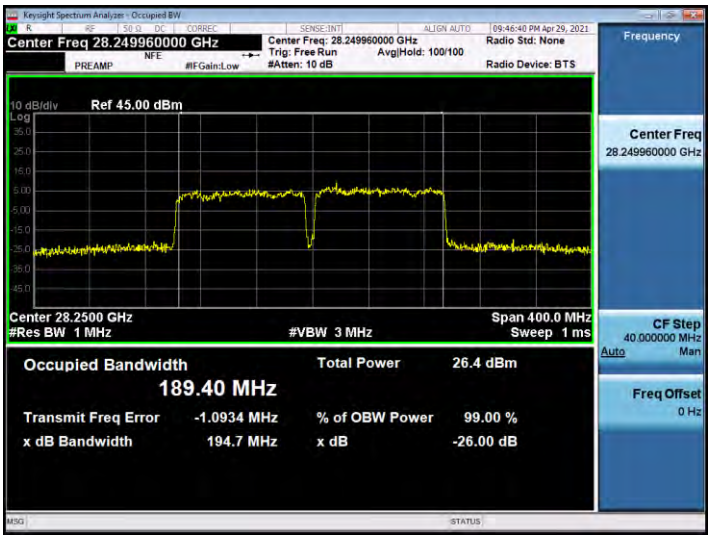
Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.299960000 GHz
Center Freq: 28.299960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.3000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.810 MHz
Total Power 26.8 dBm
Transmit Freq Error -1.4956 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.45 MHz
x dB -26.00 dB
Frequency
Center Freq
28.299960000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

50 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.550000000 GHz
Center Freq: 27.550000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.5500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.980 MHz
Total Power 26.6 dBm
Transmit Freq Error -219.01 kHz
% of OBW Power 99.00 %
x dB Bandwidth 98.54 MHz
x dB -26.00 dB
Frequency
Center Freq
27.550000000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.708 MHz
Total Power 27.2 dBm
Transmit Freq Error -337.49 kHz
% of OBW Power 99.00 %
x dB Bandwidth 98.98 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.299920000 GHz
Center Freq: 28.299920000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.2999 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.691 MHz
Total Power 27.1 dBm
Transmit Freq Error 90.742 kHz
% of OBW Power 99.00 %
x dB Bandwidth 98.98 MHz
x dB -26.00 dB
Frequency
Center Freq
28.299920000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

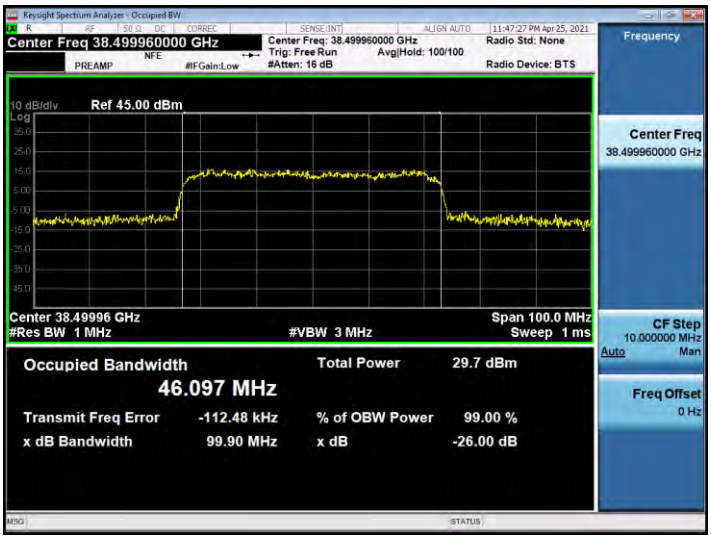
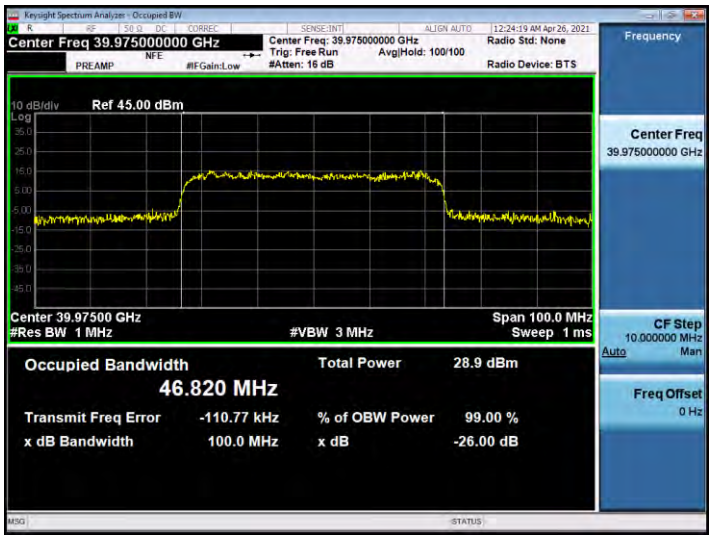
100 MHz, 2CC	
	
	

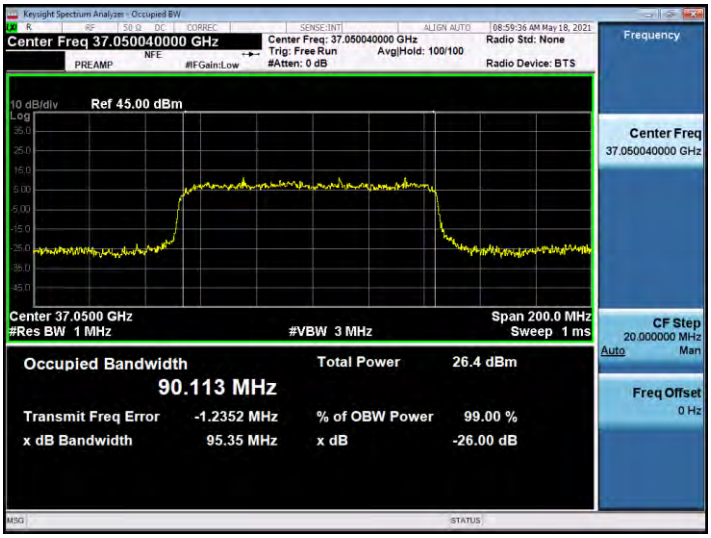
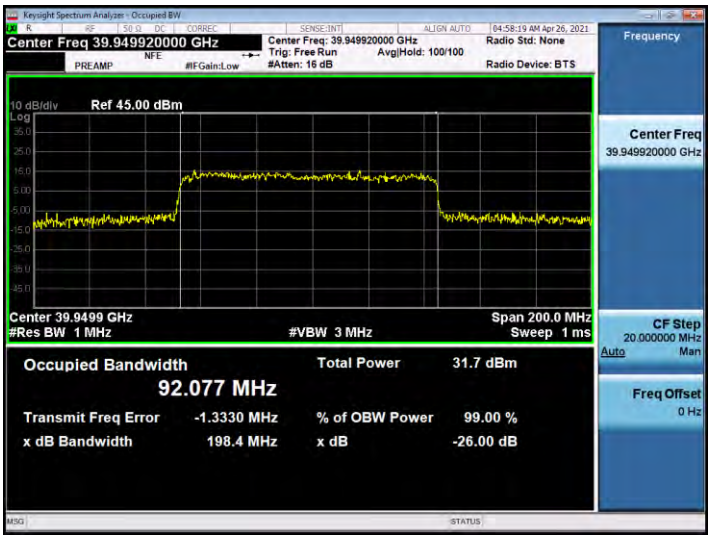
Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.600080000 GHz
Center Freq: 27.600080000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.6001 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.13 MHz
Total Power 26.5 dBm
Transmit Freq Error -1.6636 MHz
% of OBW Power 99.00 %
x dB Bandwidth 195.2 MHz
x dB -26.00 dB
Frequency
Center Freq
27.600080000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 27.924960000 GHz
Center Freq: 27.924960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 27.9250 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.38 MHz
Total Power 27.0 dBm
Transmit Freq Error -1.7676 MHz
% of OBW Power 99.00 %
x dB Bandwidth 195.0 MHz
x dB -26.00 dB
Frequency
Center Freq
27.924960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 28.249960000 GHz
Center Freq: 28.249960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 28.2500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.40 MHz
Total Power 26.4 dBm
Transmit Freq Error -1.0934 MHz
% of OBW Power 99.00 %
x dB Bandwidth 194.7 MHz
x dB -26.00 dB
Frequency
Center Freq
28.249960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

3. Antenna 0(K patch), n260

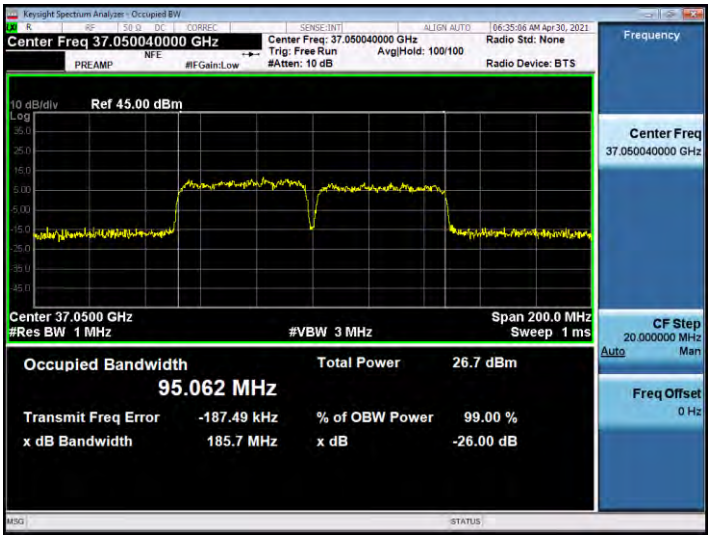
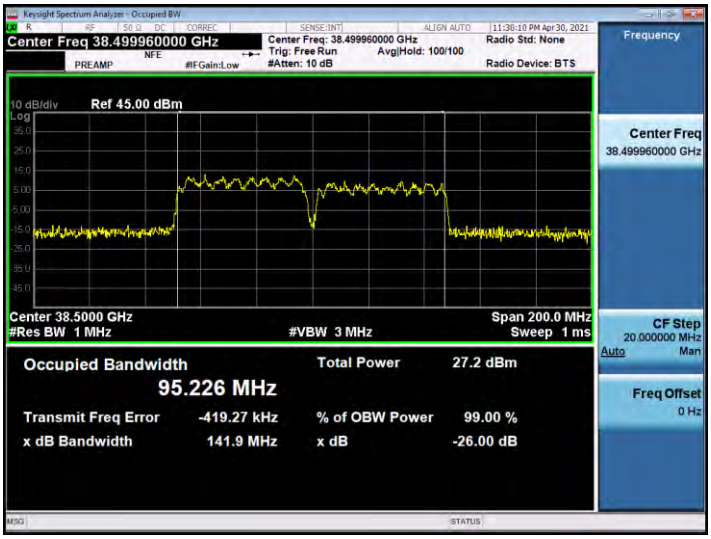
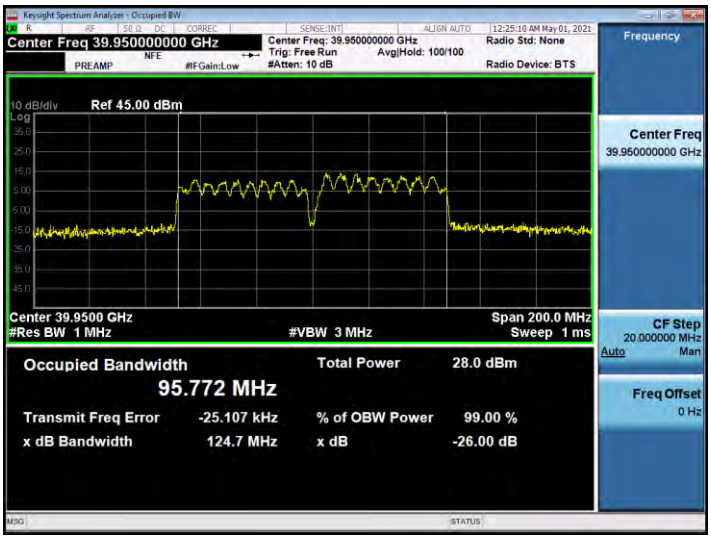
50 MHz, 1CC	
	
	

100 MHz, 1CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.050040000 GHz
Center Freq: 37.050040000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 0 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 37.0500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.113 MHz
Total Power 26.4 dBm
Transmit Freq Error -1.2352 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.35 MHz
x dB -26.00 dB
Frequency
Center Freq
37.050040000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
92.660 MHz
Total Power 29.4 dBm
Transmit Freq Error -1.6346 MHz
% of OBW Power 99.00 %
x dB Bandwidth 200.0 MHz
x dB -26.00 dB
Frequency
Center Freq
38.499960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

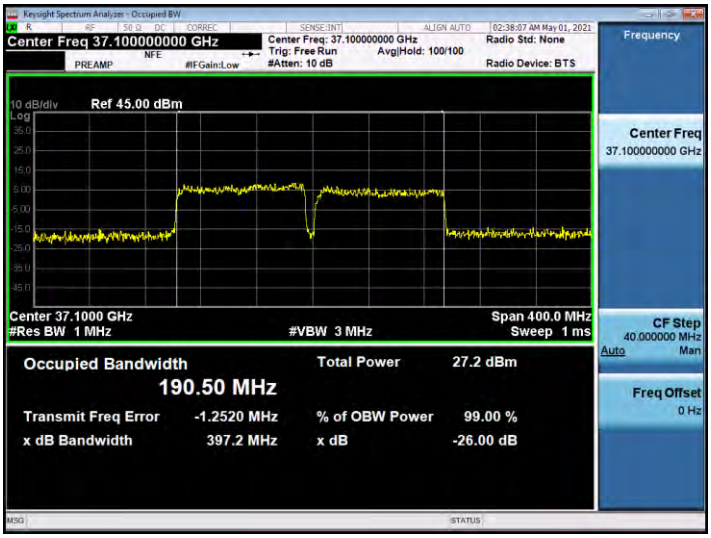
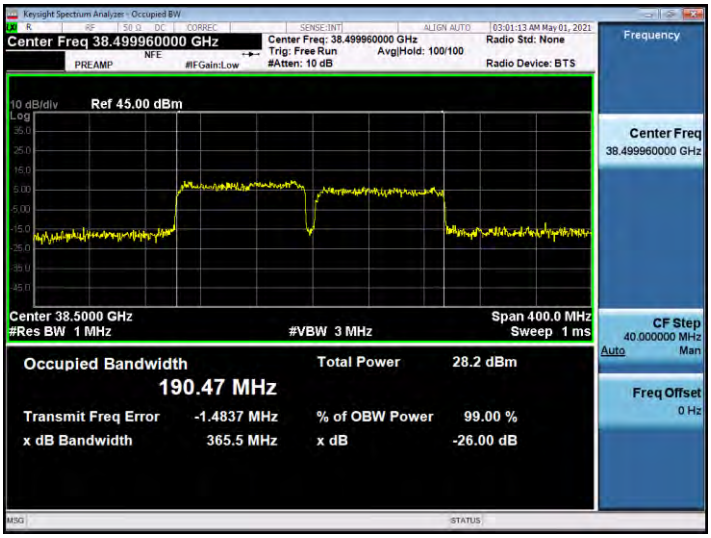
Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.949920000 GHz
Center Freq: 39.949920000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 39.9499 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
92.077 MHz
Total Power 31.7 dBm
Transmit Freq Error -1.3330 MHz
% of OBW Power 99.00 %
x dB Bandwidth 198.4 MHz
x dB -26.00 dB
Frequency
Center Freq
39.949920000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

50 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.050040000 GHz
Center Freq: 37.050040000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 37.0500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
95.062 MHz
Total Power 26.7 dBm
Transmit Freq Error -187.49 kHz
% of OBW Power 99.00 %
x dB Bandwidth 185.7 MHz
x dB -26.00 dB
Frequency
Center Freq
37.050040000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
95.226 MHz
Total Power 27.2 dBm
Transmit Freq Error -419.27 kHz
% of OBW Power 99.00 %
x dB Bandwidth 141.9 MHz
x dB -26.00 dB
Frequency
Center Freq
38.499960000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.950000000 GHz
Center Freq: 39.950000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 39.9500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
95.772 MHz
Total Power 28.0 dBm
Transmit Freq Error -25.107 kHz
% of OBW Power 99.00 %
x dB Bandwidth 124.7 MHz
x dB -26.00 dB
Frequency
Center Freq
39.950000000 GHz
CF Step
20.000000 MHz
Auto
Man
Freq Offset
0 Hz

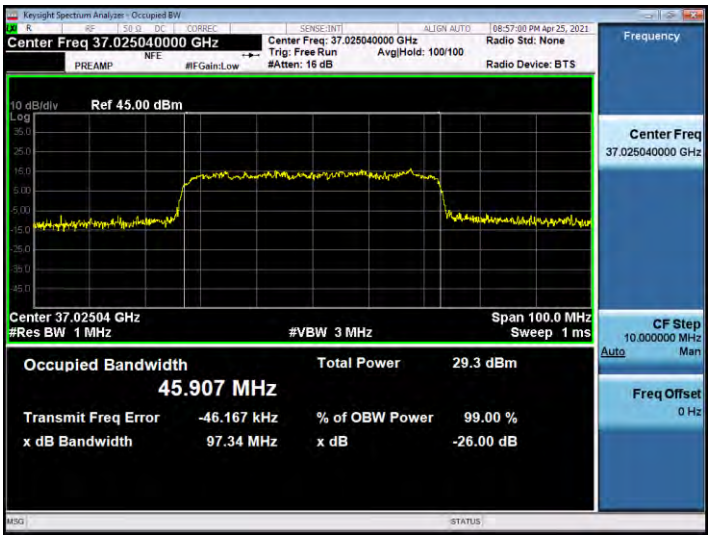
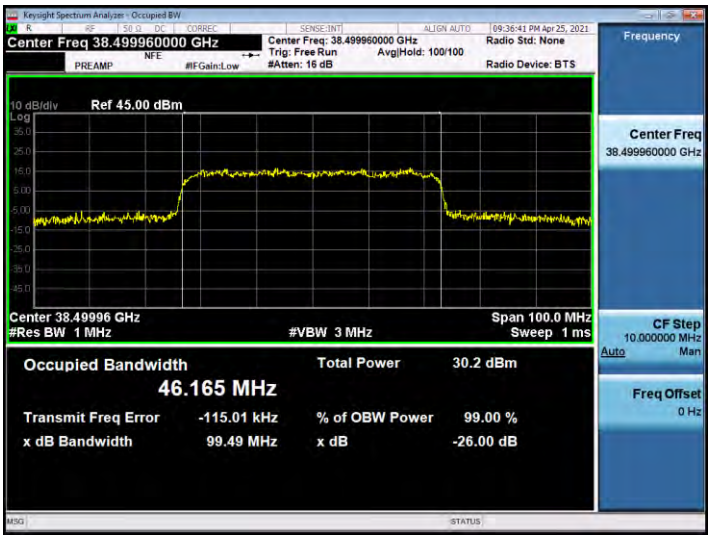
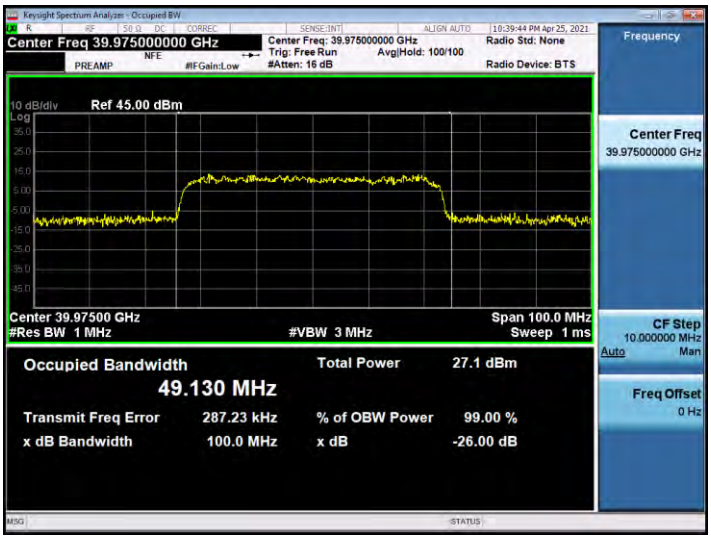
100 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.100000000 GHz
Center Freq: 37.100000000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 37.1000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
190.50 MHz
Total Power 27.2 dBm
Transmit Freq Error -1.2520 MHz
% of OBW Power 99.00 %
x dB Bandwidth 397.2 MHz
x dB -26.00 dB
Frequency
Center Freq
37.100000000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
190.47 MHz
Total Power 28.2 dBm
Transmit Freq Error -1.4837 MHz
% of OBW Power 99.00 %
x dB Bandwidth 365.5 MHz
x dB -26.00 dB
Frequency
Center Freq
38.499960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.899920000 GHz
Center Freq: 39.899920000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 39.8999 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.96 MHz
Total Power 29.8 dBm
Transmit Freq Error -880.36 kHz
% of OBW Power 99.00 %
x dB Bandwidth 393.8 MHz
x dB -26.00 dB
Frequency
Center Freq
39.899920000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

4. Antenna 1(L patch), n260

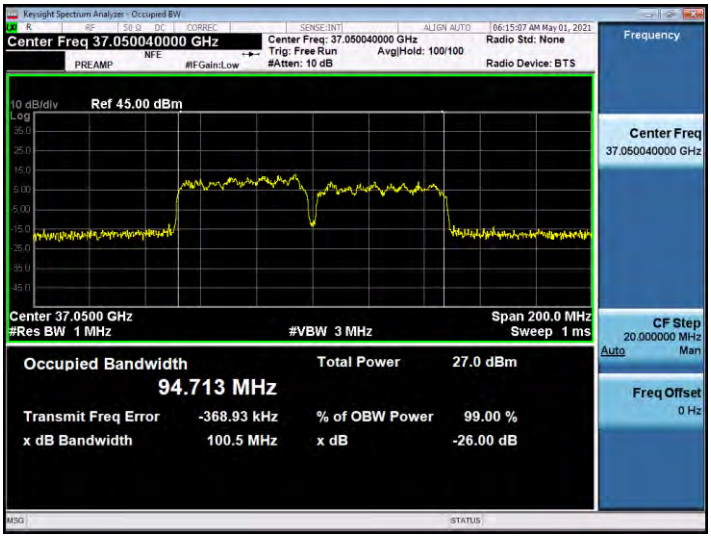
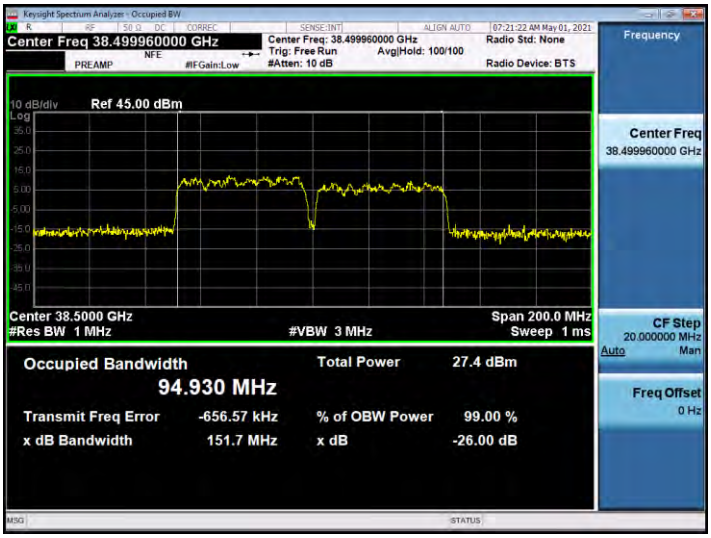
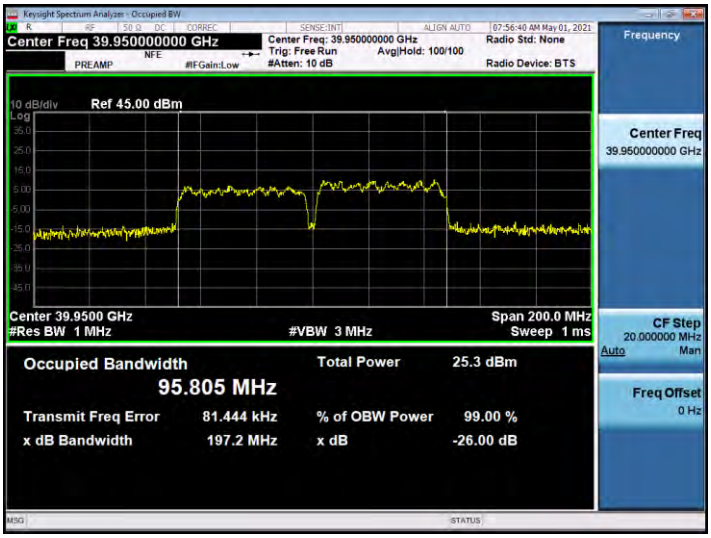
50 MHz, 1CC	
	
	

100 MHz, 1CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.050000000 GHz
Center Freq: 37.050000000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div Ref 45.00 dBm
Center 37.0500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
92.317 MHz
Total Power 28.4 dBm
Transmit Freq Error -1.3513 MHz
% of OBW Power 99.00 %
x dB Bandwidth 199.9 MHz
x dB -26.00 dB
Frequency
Center Freq
37.050000000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 16 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
92.458 MHz
Total Power 29.8 dBm
Transmit Freq Error -1.6457 MHz
% of OBW Power 99.00 %
x dB Bandwidth 200.0 MHz
x dB -26.00 dB
Frequency
Center Freq
38.499960000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

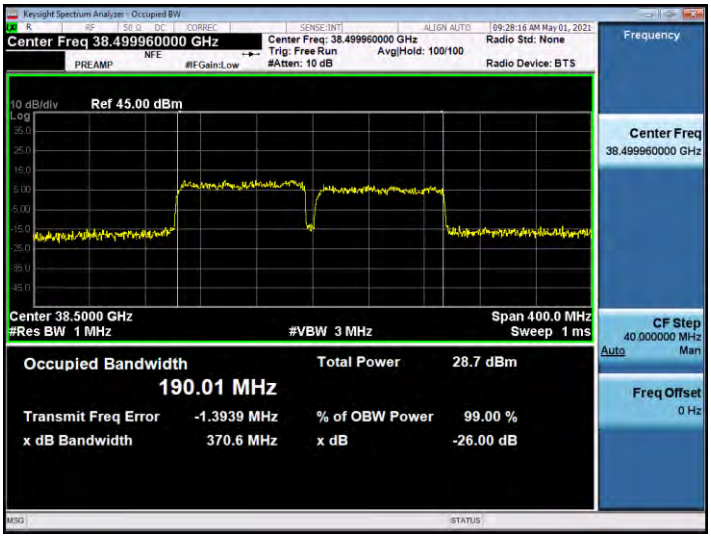
Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.949920000 GHz
Center Freq: 39.949920000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 0 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div Ref 45.00 dBm
Center 39.9499 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
90.453 MHz
Total Power 25.6 dBm
Transmit Freq Error -1.4503 MHz
% of OBW Power 99.00 %
x dB Bandwidth 95.29 MHz
x dB -26.00 dB
Frequency
Center Freq
39.949920000 GHz
CF Step
20.000000 MHz
Auto Man
Freq Offset
0 Hz

50 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.050040000 GHz
Center Freq: 37.050040000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 37.0500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.713 MHz
Total Power 27.0 dBm
Transmit Freq Error -368.93 kHz
% of OBW Power 99.00 %
x dB Bandwidth 100.5 MHz
x dB -26.00 dB
Frequency
Center Freq 37.050040000 GHz
CF Step 20.000000 MHz Auto Man
Freq Offset 0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
94.930 MHz
Total Power 27.4 dBm
Transmit Freq Error -656.57 kHz
% of OBW Power 99.00 %
x dB Bandwidth 151.7 MHz
x dB -26.00 dB
Frequency
Center Freq 38.499960000 GHz
CF Step 20.000000 MHz Auto Man
Freq Offset 0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.950000000 GHz
Center Freq: 39.950000000 GHz
Trig: Free Run Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP #IFGain:Low
10 dB/div Ref 45.00 dBm
Center 39.9500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 200.0 MHz
Sweep 1 ms
Occupied Bandwidth
95.805 MHz
Total Power 25.3 dBm
Transmit Freq Error 81.444 kHz
% of OBW Power 99.00 %
x dB Bandwidth 197.2 MHz
x dB -26.00 dB
Frequency
Center Freq 39.950000000 GHz
CF Step 20.000000 MHz Auto Man
Freq Offset 0 Hz

100 MHz, 2CC	
	
	

Keysight Spectrum Analyzer - Occupied BW
Center Freq 37.100000000 GHz
Center Freq: 37.100000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 37.1000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
189.84 MHz
Total Power 28.3 dBm
Transmit Freq Error -1.1446 MHz
% of OBW Power 99.00 %
x dB Bandwidth 330.6 MHz
x dB -26.00 dB
Frequency
Center Freq
37.100000000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 38.499960000 GHz
Center Freq: 38.499960000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 38.5000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
190.01 MHz
Total Power 28.7 dBm
Transmit Freq Error -1.3939 MHz
% of OBW Power 99.00 %
x dB Bandwidth 370.6 MHz
x dB -26.00 dB
Frequency
Center Freq
38.499960000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

Keysight Spectrum Analyzer - Occupied BW
Center Freq 39.899920000 GHz
Center Freq: 39.899920000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 0 dB
Radio Std: None
Radio Device: BTS
PREAMP
#IFGain:Low
10 dB/div
Ref 45.00 dBm
Center 39.8999 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 400.0 MHz
Sweep 1 ms
Occupied Bandwidth
188.64 MHz
Total Power 25.7 dBm
Transmit Freq Error -880.16 kHz
% of OBW Power 99.00 %
x dB Bandwidth 194.6 MHz
x dB -26.00 dB
Frequency
Center Freq
39.899920000 GHz
CF Step
40.000000 MHz
Auto Man
Freq Offset
0 Hz

5.2. EQUIVALENT ISOTROPIC RADIATED POWER

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.

FCC Rules

Test Requirements:

§ 30.202 Power limits.

(b) For mobile stations, the average power of the sum of all antenna elements is limited to a maximum EIRP of +43 dBm.

Test Procedures:

The measurement is performed in accordance with Section 5.2.4.4.2 of ANSI C63.26.

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1% to 5% of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

1) Set = auto-couple, or

2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.

f) Detector = power averaging (rms).

g) Set sweep trigger to “free run.”

h) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band or channel power measurement function with band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

j) Add 10 log (1/duty cycle) to the measured power level to compute the average power during continuous transmission.

Note:

1. The EUT was tested under rotating conditions 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. 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. 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.

Test Results:

Antenna 0(K patch), n261

SISO

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	27525	Low	H	BPSK	H	10/11	26.32
		27924.96	Mid	H	QPSK	H	10/11	25.03
		28324.92	High	H	QPSK	H	10/11	25.60
	100 MHz	27550.08	Low	H	QPSK	H	20/22	26.25
		27924.96	Mid	H	QPSK	H	20/22	25.01
		28299.96	High	H	QPSK	H	20/22	25.32
2	50 MHz	27550	Low	H	BPSK	H	32/0	22.35
		27924.96	Mid	H	BPSK	H	32/0	21.87
		28299.92	High	H	BPSK	H	32/0	22.21
	100 MHz	27600.08	Low	H	QPSK	H	64/0	22.35
		27924.96	Mid	H	QPSK	H	64/0	22.05
		28249.96	High	H	QPSK	H	64/0	21.70

SISO Dual

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	27525	Low	H+V	BPSK	H	1/11	27.17
		27924.96	Mid	H+V	BPSK	V	10/11	24.89
		28324.92	High	H+V	BPSK	H	1/11	26.40
	100 MHz	27550.08	Low	H+V	QPSK	H	1/33	27.32
		27924.96	Mid	H+V	QPSK	V	1/33	26.11
		28299.96	High	H+V	QPSK	H	1/33	26.76
2	50 MHz	27550	Low	H+V	QPSK	H	32/0	21.67
		27924.96	Mid	H+V	QPSK	V	32/0	19.65
		28299.92	High	H+V	QPSK	H	32/0	20.59
	100 MHz	27600.08	Low	H+V	BPSK	H	64/0	22.91
		27924.96	Mid	H+V	BPSK	V	20/22	22.20
		28249.96	High	H+V	BPSK	H	64/0	22.60

Antenna 1(L patch), n261

SISO

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	27525	Low	H	BPSK	H	10/11	26.49
		27924.96	Mid	H	BPSK	H	1/16	24.76
		28324.92	High	H	BPSK	H	10/11	25.68
	100 MHz	27550.08	Low	H	BPSK	H	20/22	26.36
		27924.96	Mid	H	BPSK	H	20/22	24.75
		28299.96	High	H	BPSK	H	20/22	25.27
2	50 MHz	27550	Low	H	BPSK	H	32/0	22.81
		27924.96	Mid	H	BPSK	H	32/0	21.77
		28299.92	High	H	BPSK	H	32/0	21.94
	100 MHz	27600.08	Low	H	QPSK	H	64/0	22.91
		27924.96	Mid	H	QPSK	H	64/0	21.65
		28249.96	High	H	QPSK	H	64/0	21.56

SISO Dual

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	27525	Low	H+V	QPSK	H	1/16	24.43
		27924.96	Mid	H+V	QPSK	H	10/11	24.12
		28324.92	High	H+V	QPSK	H	10/11	25.06
	100 MHz	27550.08	Low	H+V	BPSK	H	1/33	24.48
		27924.96	Mid	H+V	BPSK	H	1/33	24.53
		28299.96	High	H+V	BPSK	H	1/22	25.04
2	50 MHz	27550	Low	H+V	QPSK	H	16/16	21.38
		27924.96	Mid	H+V	QPSK	H	32/0	21.74
		28299.92	High	H+V	QPSK	H	16/16	21.73
	100 MHz	27600.08	Low	H+V	QPSK	H	32/32	21.62
		27924.96	Mid	H+V	QPSK	H	64/0	21.65
		28249.96	High	H+V	QPSK	H	64/0	21.00

Antenna 0(K patch), n260

SISO

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	37025.04	Low	V	BPSK	H	1/16	24.88
		38499.96	Mid	V	BPSK	H	10/11	26.40
		39975	High	H	BPSK	V	10/11	27.04
	100 MHz	37050	Low	H	QPSK	V	1/33	25.09
		38499.96	Mid	V	QPSK	H	20/22	25.98
		39949.92	High	H	QPSK	V	1/33	27.36
2	50 MHz	37050.04	Low	H	QPSK	V	32/0	21.73
		38499.96	Mid	H	QPSK	V	32/0	22.48
		39950	High	H	QPSK	V	32/0	23.79
	100 MHz	37100	Low	H	QPSK	V	64/0	21.43
		38499.96	Mid	V	QPSK	H	64/0	22.70
		39899.92	High	H	QPSK	V	64/0	23.42

SISO Dual

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	37025.04	Low	H+V	QPSK	H	10/11	26.01
		38499.96	Mid	H+V	QPSK	V	10/11	26.99
		39975	High	H+V	QPSK	V	1/16	28.19
	100 MHz	37050	Low	H+V	BPSK	H	1/22	25.22
		38499.96	Mid	H+V	BPSK	V	1/22	27.18
		39949.92	High	H+V	BPSK	V	20/22	28.08
2	50 MHz	37050.04	Low	H+V	QPSK	H	32/0	21.49
		38499.96	Mid	H+V	QPSK	V	32/0	21.82
		39950	High	H+V	QPSK	V	32/0	22.46
	100 MHz	37100	Low	H+V	BPSK	V	64/0	21.83
		38499.96	Mid	H+V	BPSK	H	64/0	22.50
		39899.92	High	H+V	BPSK	V	64/0	24.29

Antenna 1(L patch), n260

SISO

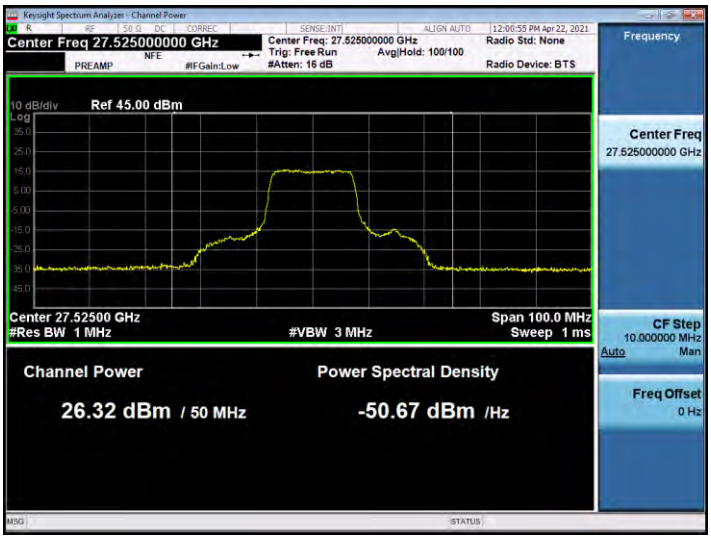
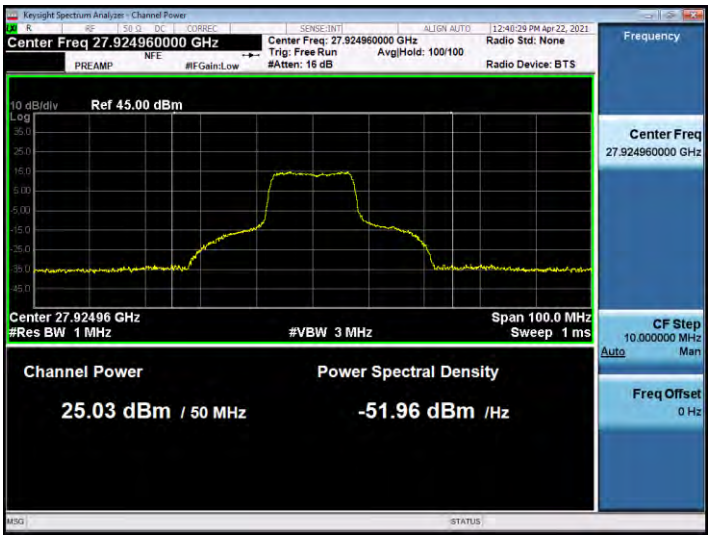
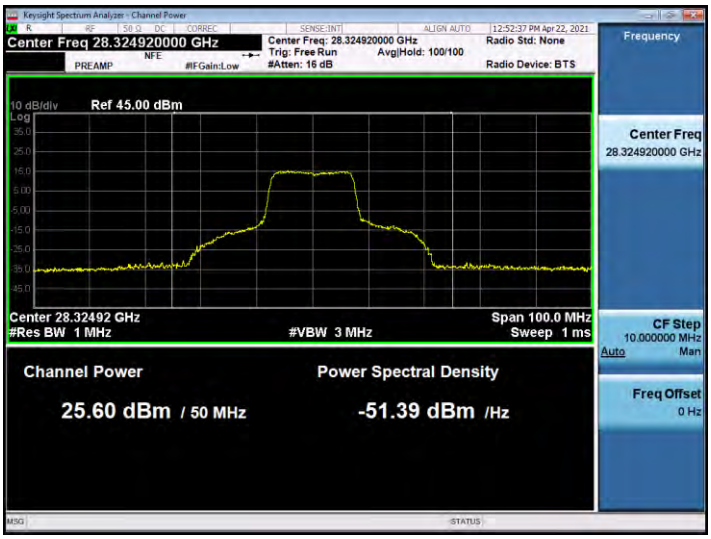
CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	37025.04	Low	H	BPSK	V	1/11	25.52
		38499.96	Mid	H	BPSK	V	1/11	25.48
		39975	High	H	QPSK	V	1/16	24.71
	100 MHz	37050	Low	H	QPSK	V	1/22	25.70
		38499.96	Mid	H	QPSK	V	1/22	26.01
		39949.92	High	H	QPSK	V	20/22	24.61
2	50 MHz	37050.04	Low	H	BPSK	V	32/0	20.76
		38499.96	Mid	H	BPSK	V	32/0	21.40
		39950	High	H	BPSK	V	32/0	21.05
	100 MHz	37100	Low	H	QPSK	V	64/0	21.22
		38499.96	Mid	H	QPSK	V	64/0	21.26
		39899.92	High	H	QPSK	V	64/0	20.78

SISO Dual

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	EIRP [dBm]
1	50 MHz	37025.04	Low	H+V	QPSK	V	1/16	26.42
		38499.96	Mid	H+V	QPSK	H	1/11	26.91
		39975	High	H+V	QPSK	H	1/11	24.03
	100 MHz	37050	Low	H+V	QPSK	V	1/22	26.48
		38499.96	Mid	H+V	QPSK	H	20/22	26.42
		39949.92	High	H+V	QPSK	V	20/22	24.32
2	50 MHz	37050.04	Low	H+V	BPSK	V	32/0	21.72
		38499.96	Mid	H+V	BPSK	H	32/0	21.90
		39950	High	H+V	BPSK	V	32/0	19.96
	100 MHz	37100	Low	H+V	BPSK	V	64/0	22.80
		38499.96	Mid	H+V	BPSK	H	64/0	23.12
		39899.92	High	H+V	BPSK	V	64/0	20.91

Plot Data of EIRP

1. Antenna 0(K patch), n261

50 MHz, 1CC SISO	
	
	

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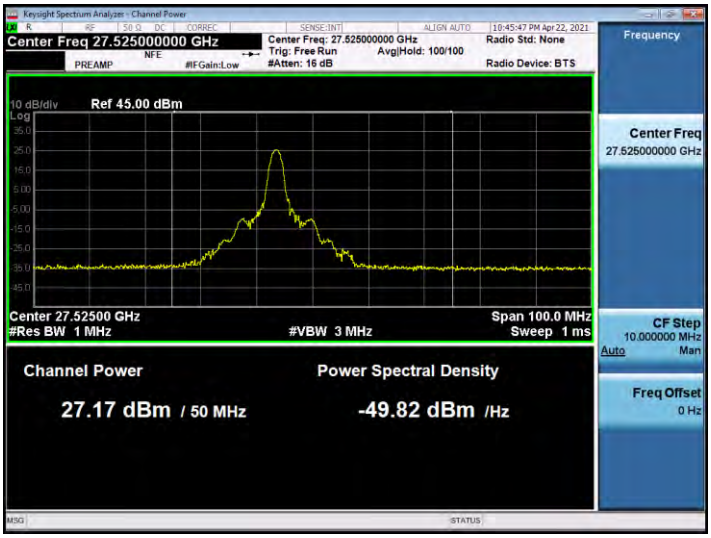	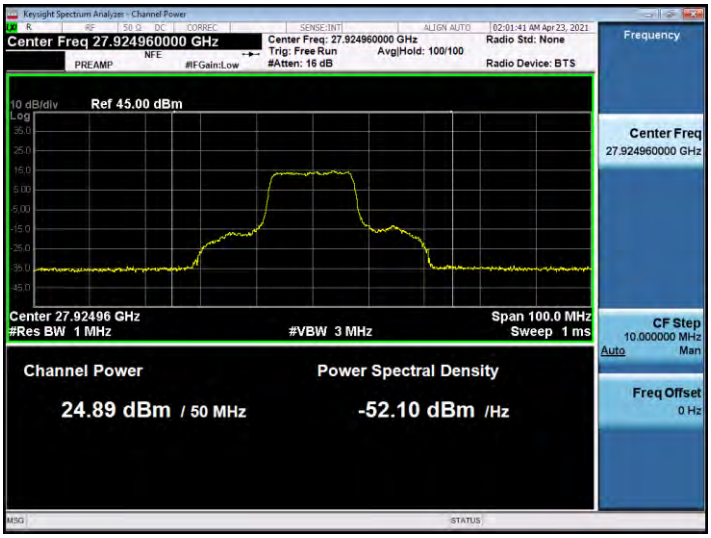
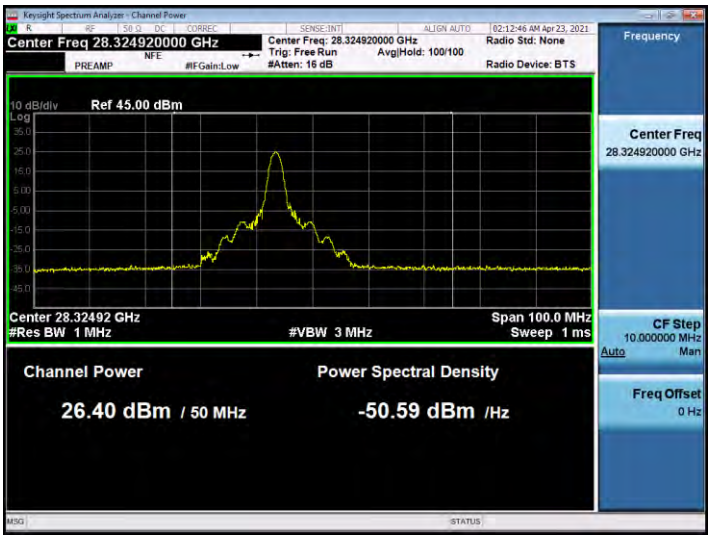	

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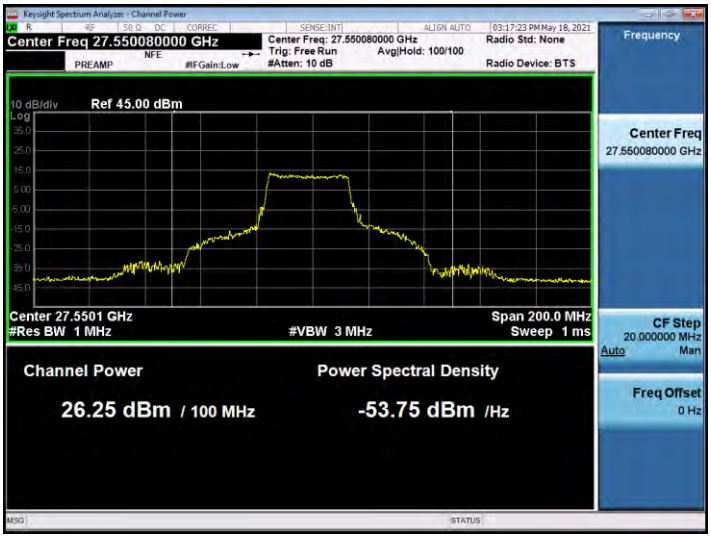
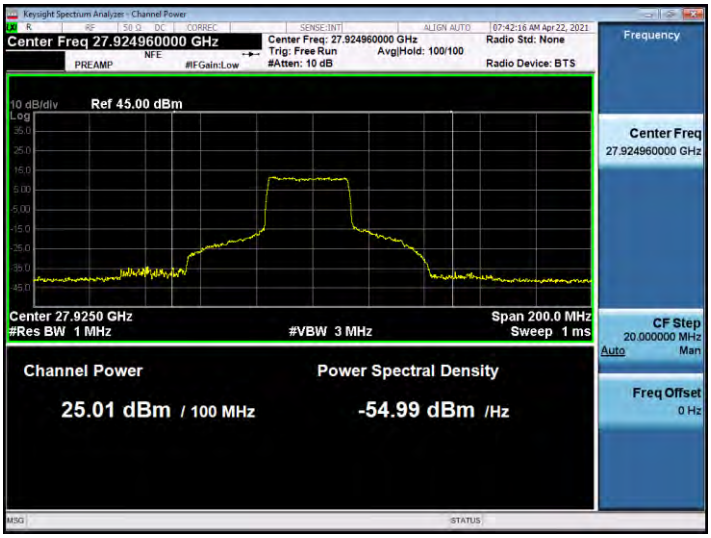
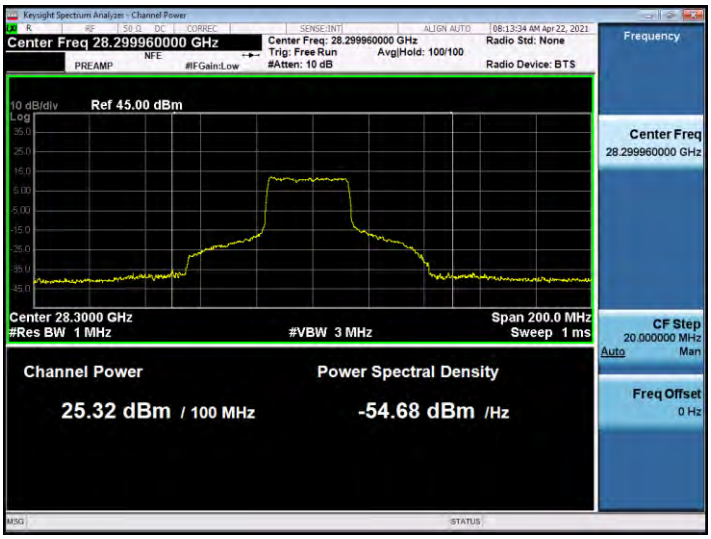
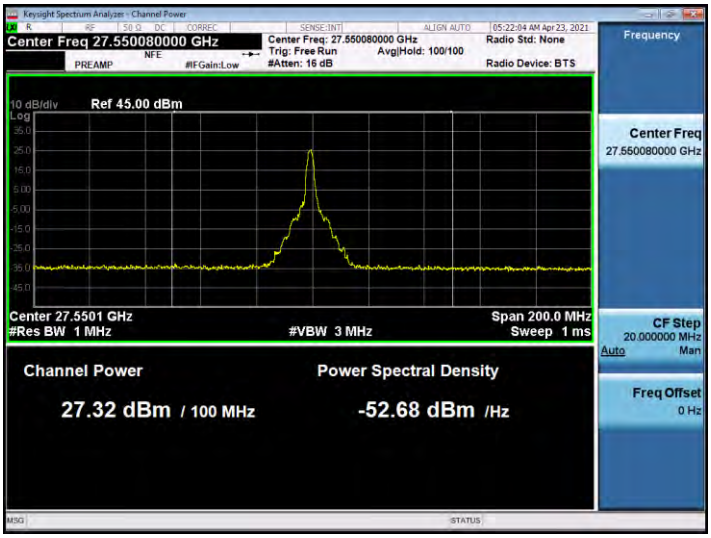
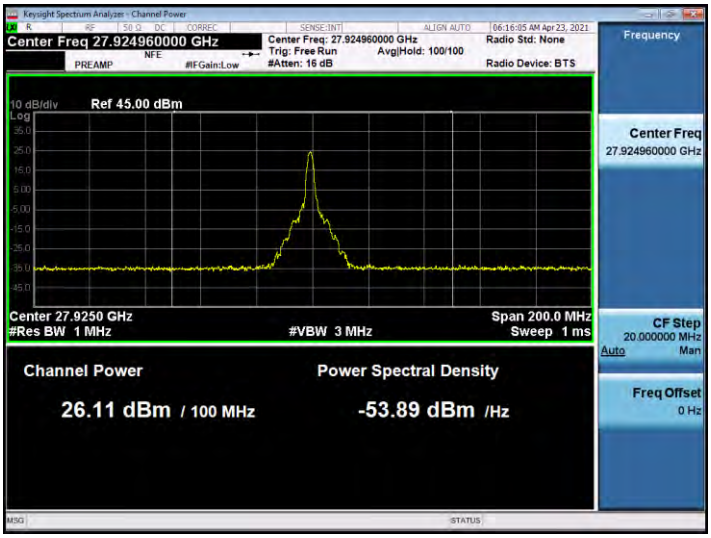
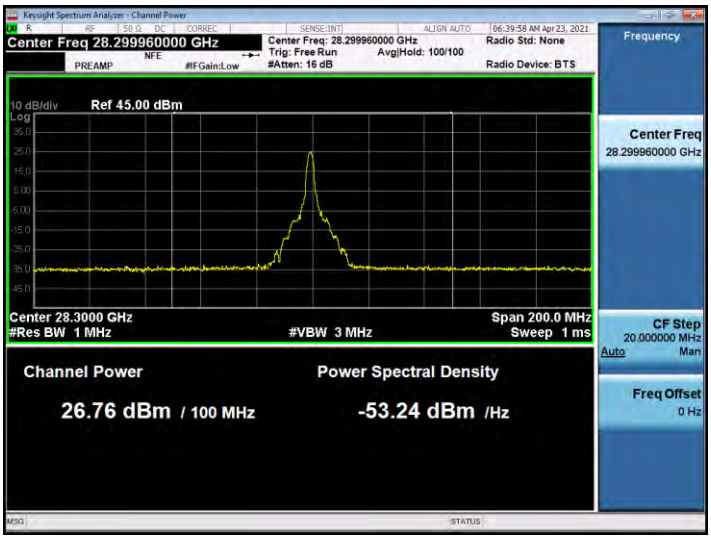
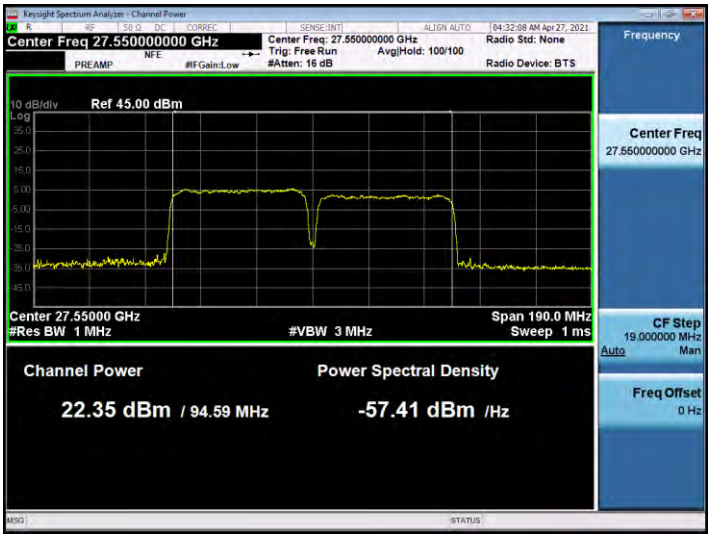
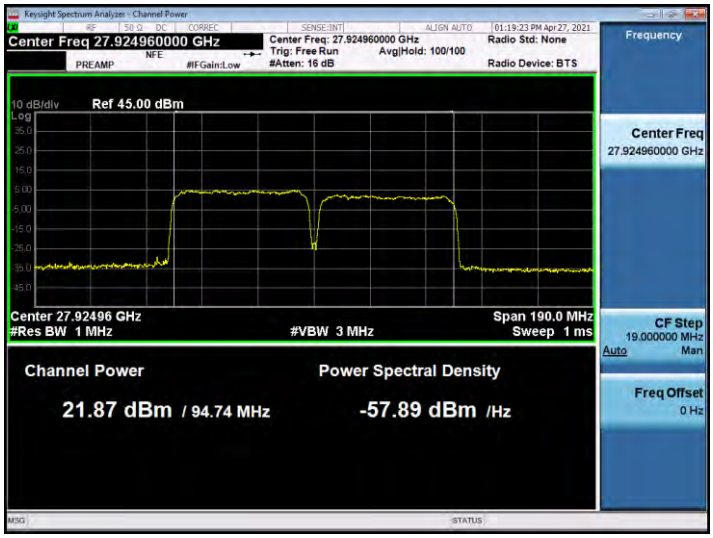
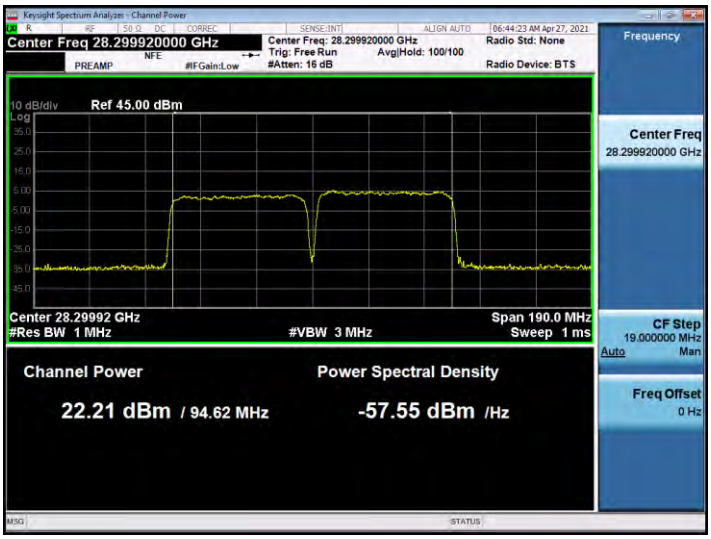
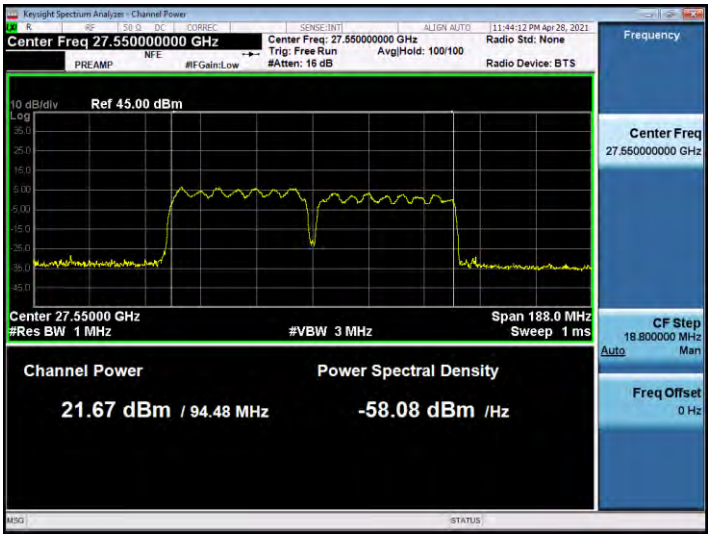
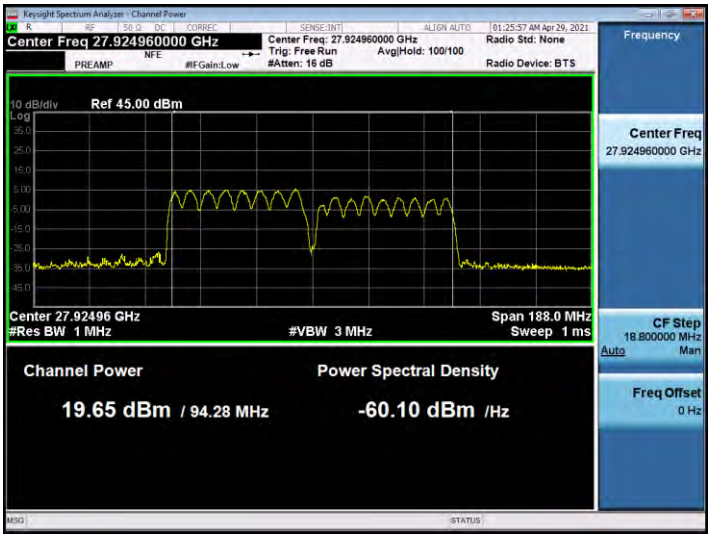
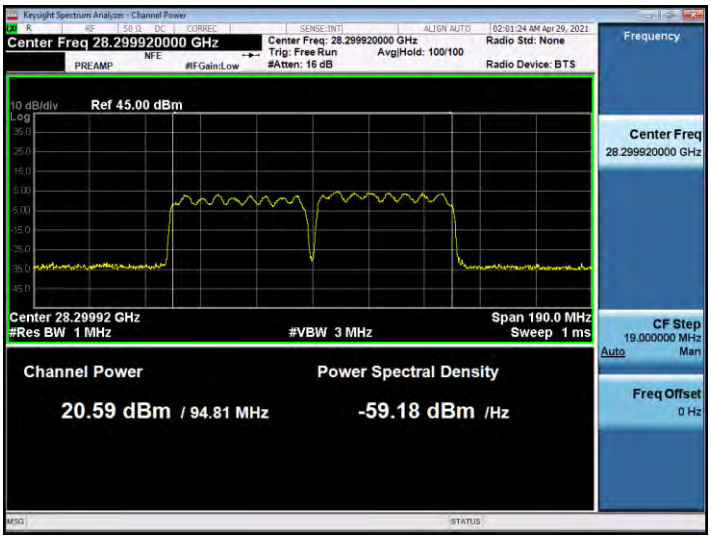
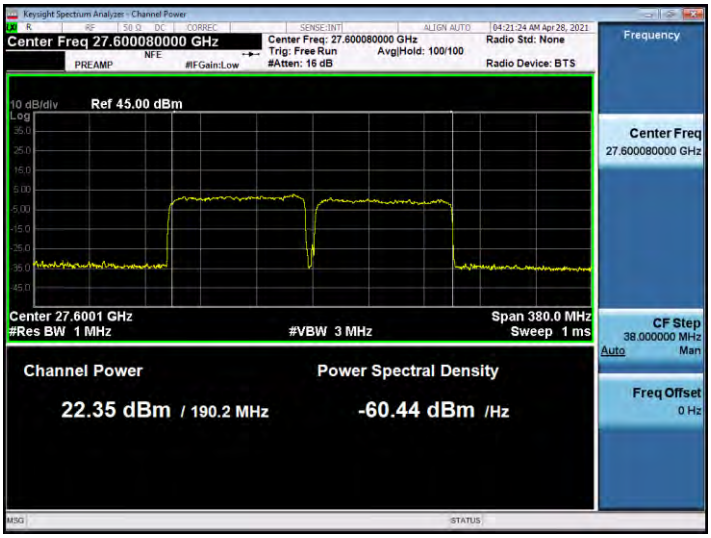
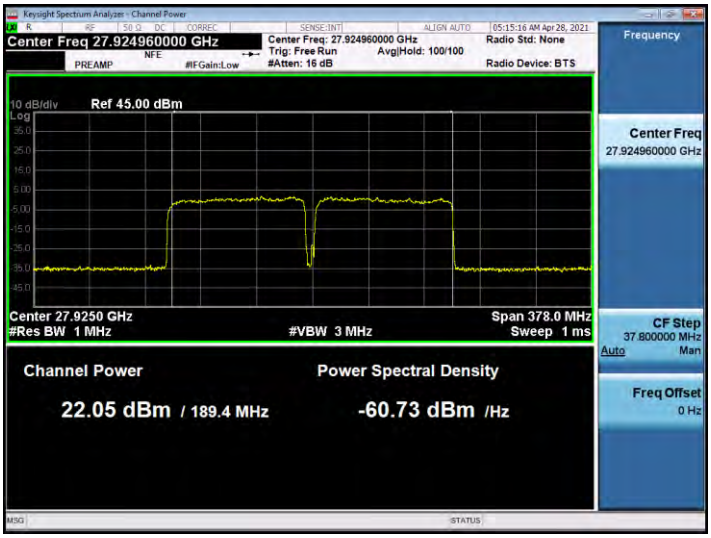
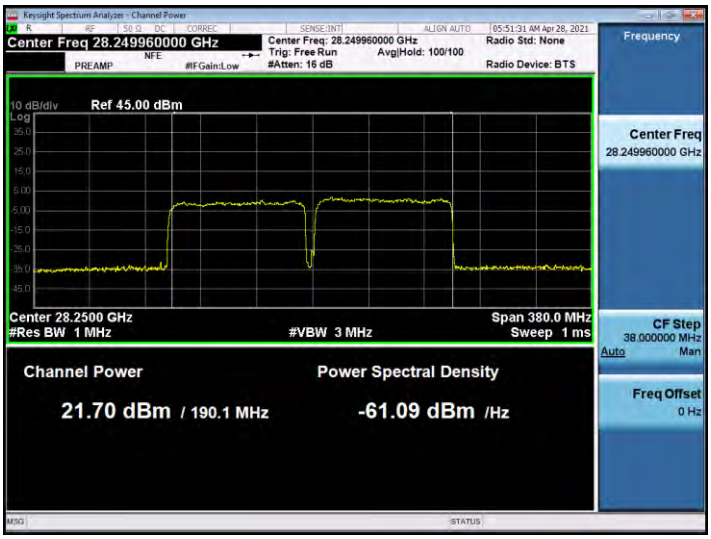
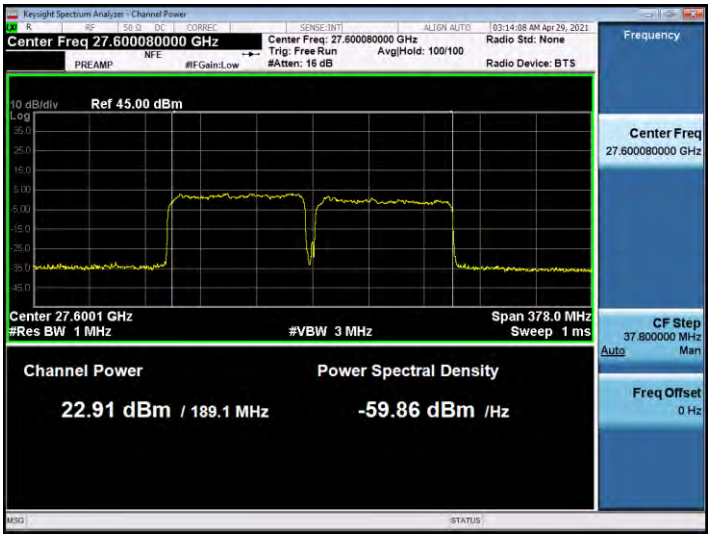
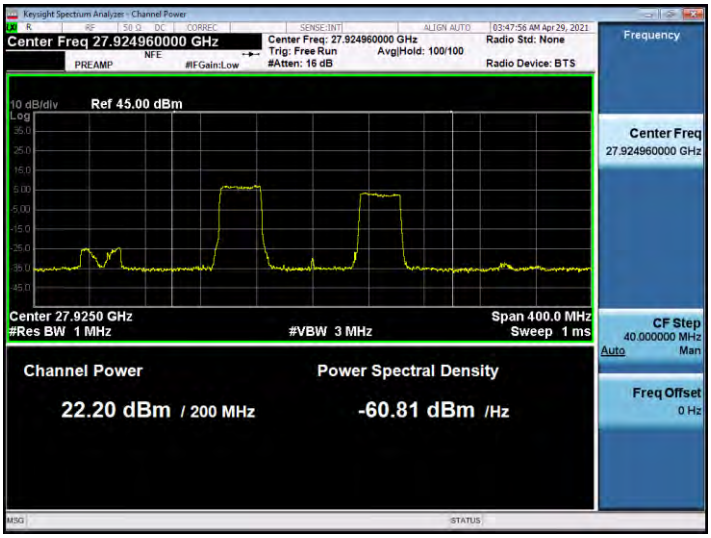
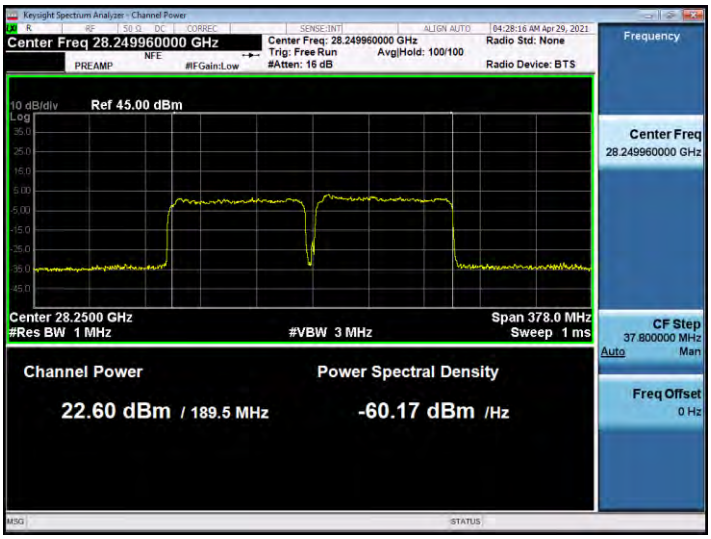
	
	

100 MHz, 1CC SISO Dual	
	
	

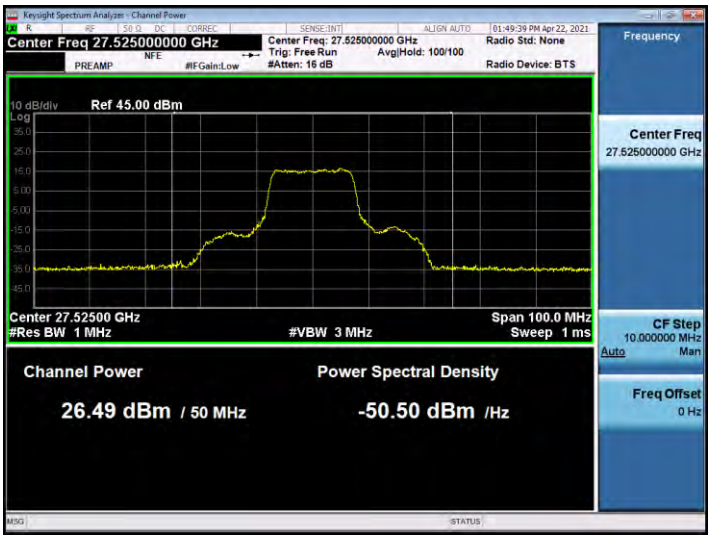
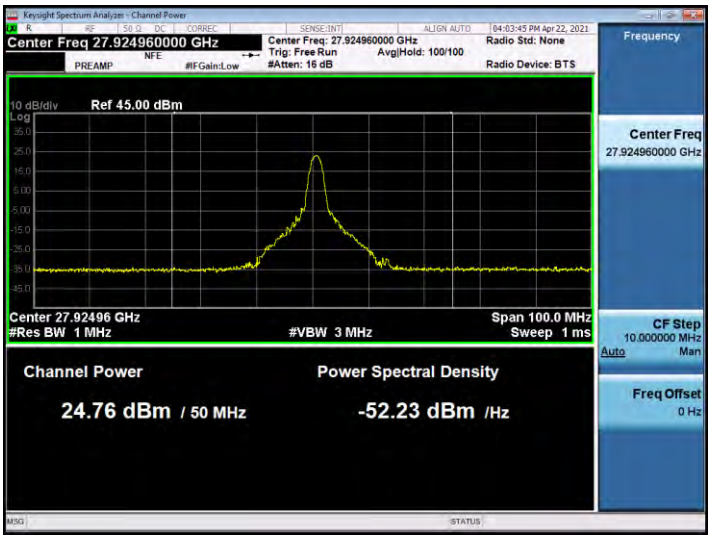
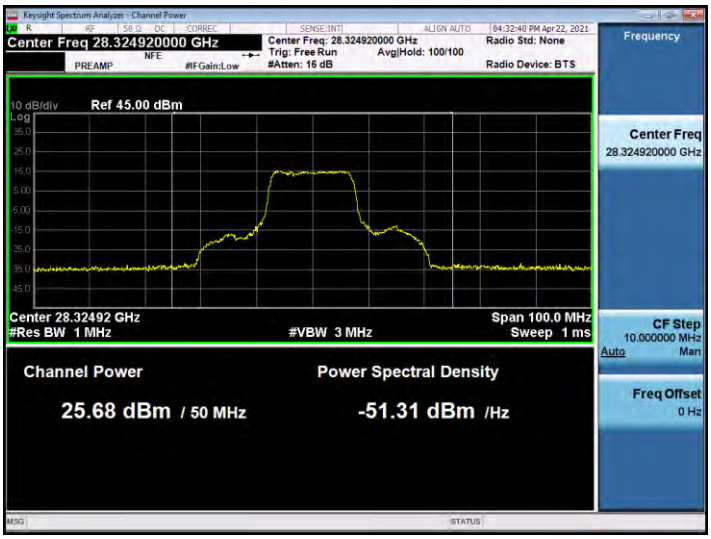
50 MHz, 2CC SISO	
	
	

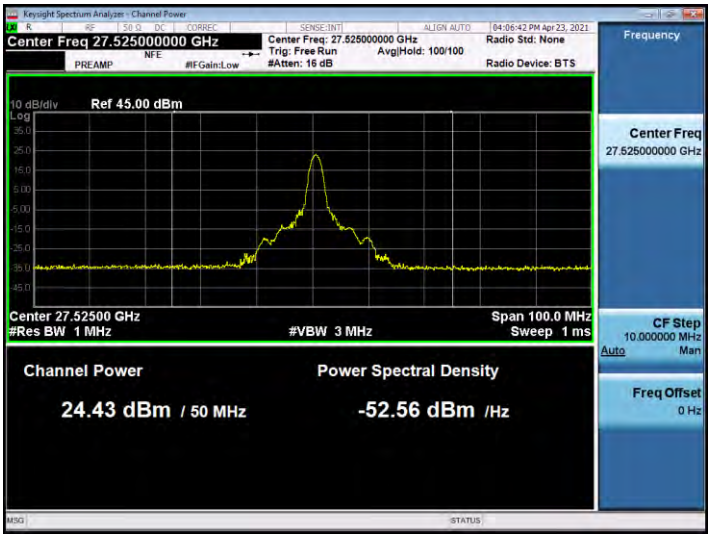
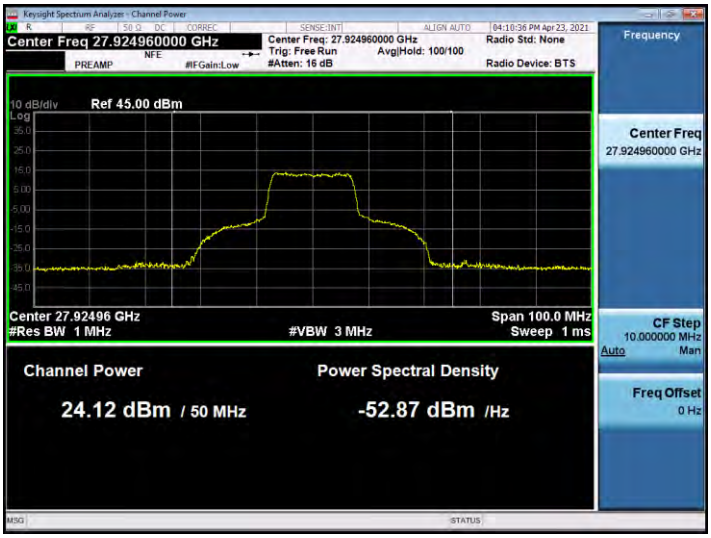
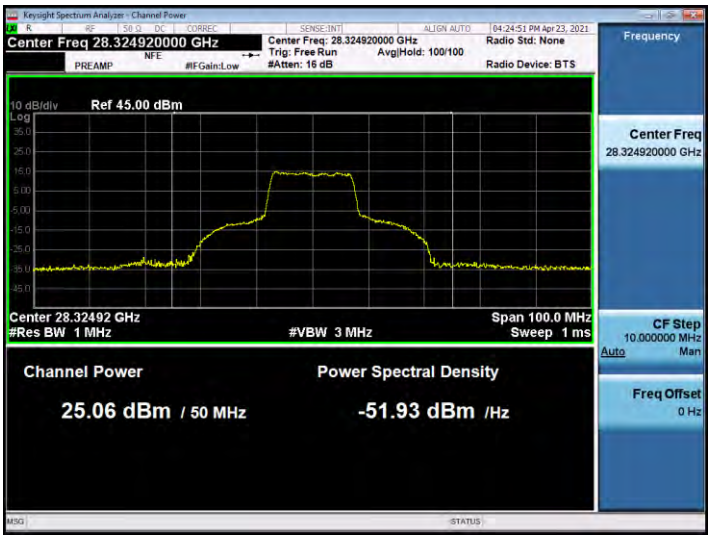
50 MHz, 2CC SISO Dual	
	
	

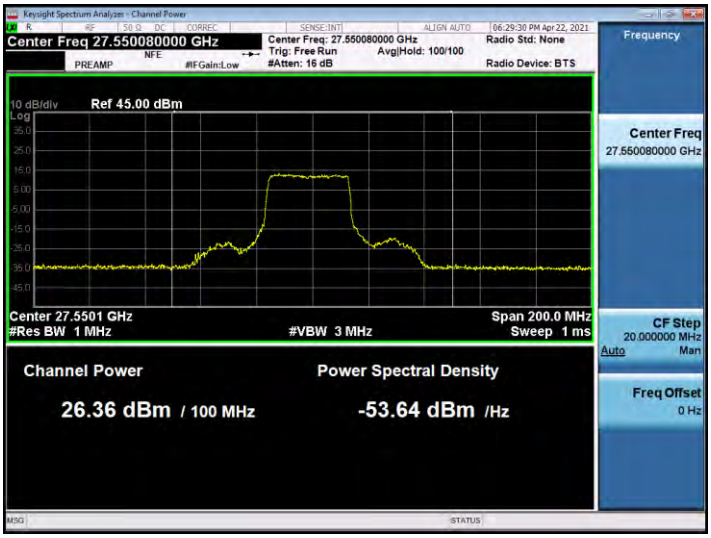
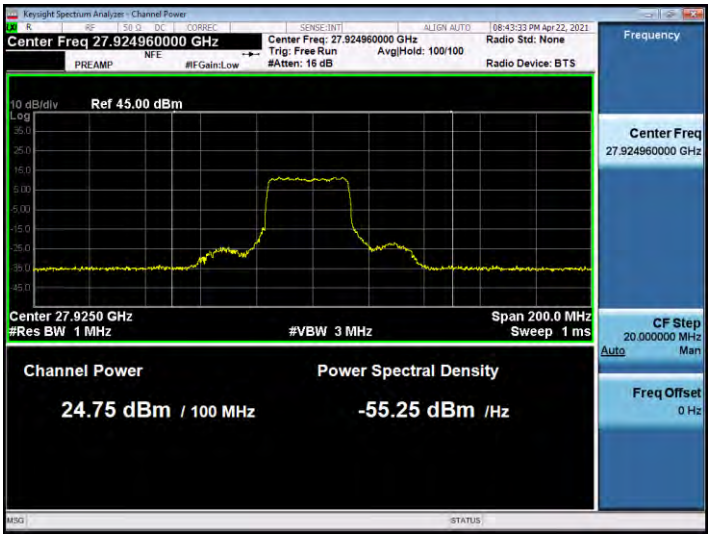
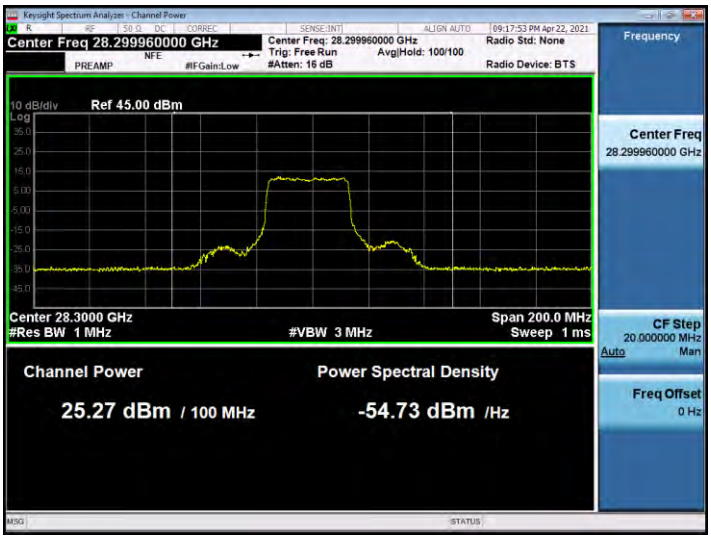
100 MHz, 2CC SISO	
	
	

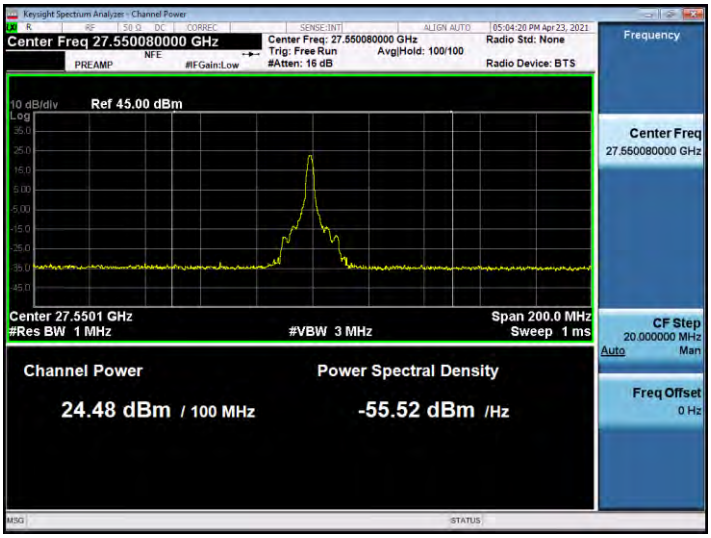
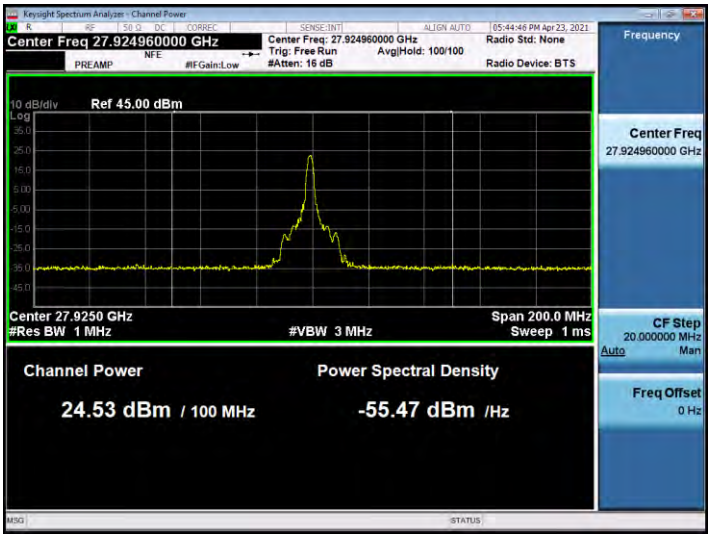
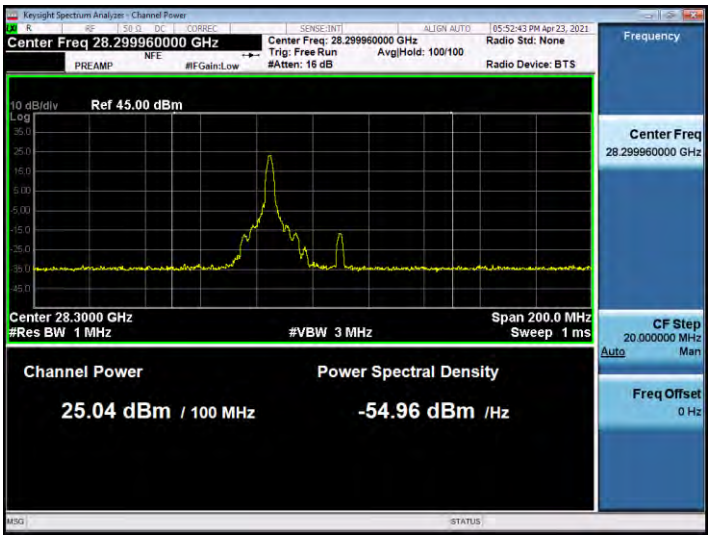
100 MHz, 2CC SISO Dual	
	
	

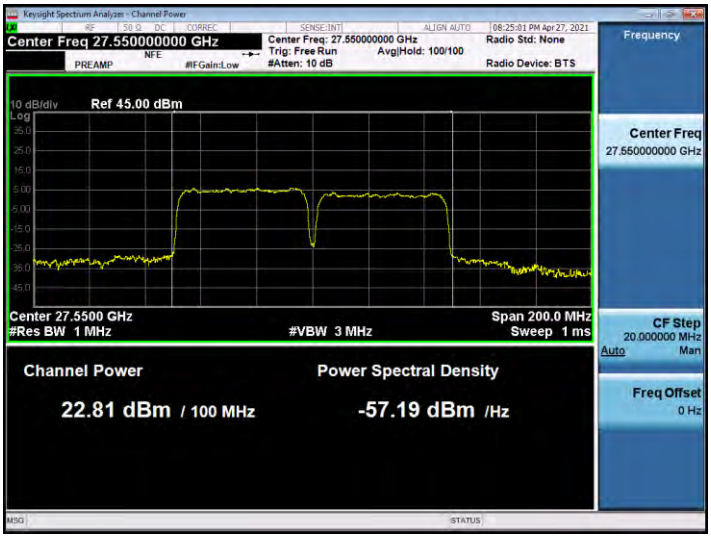
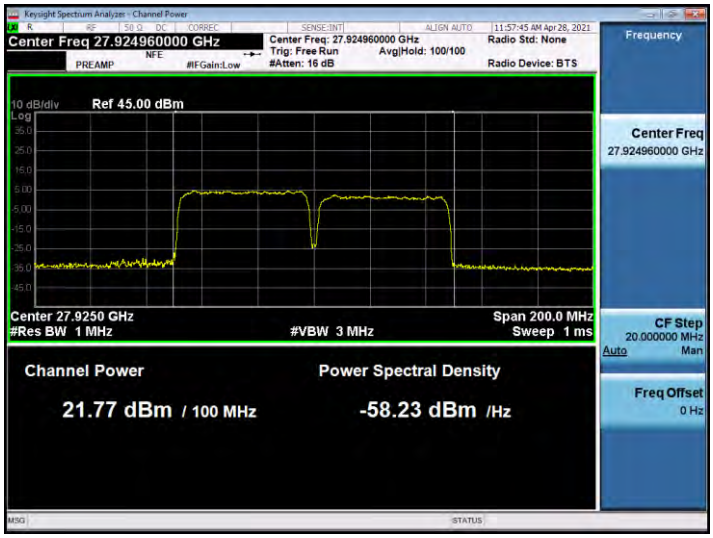
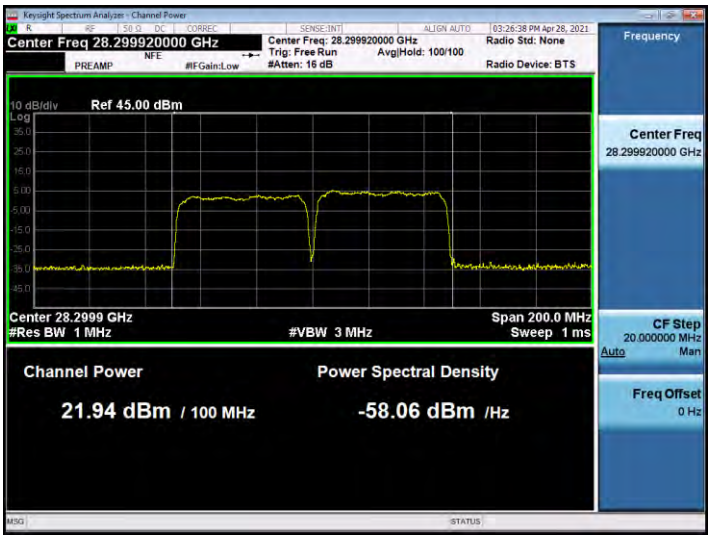
2. Antenna 1(L patch), n261

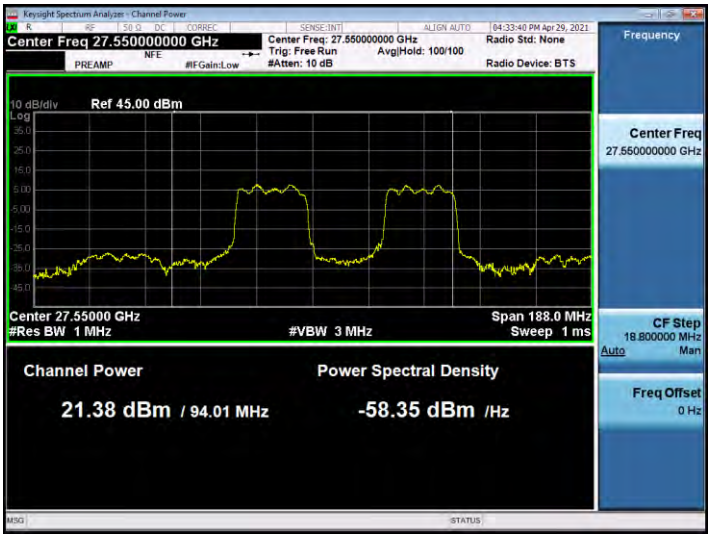
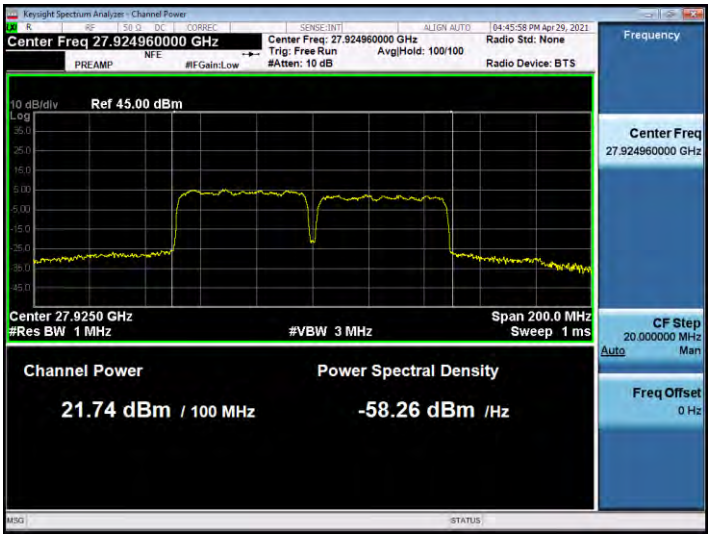
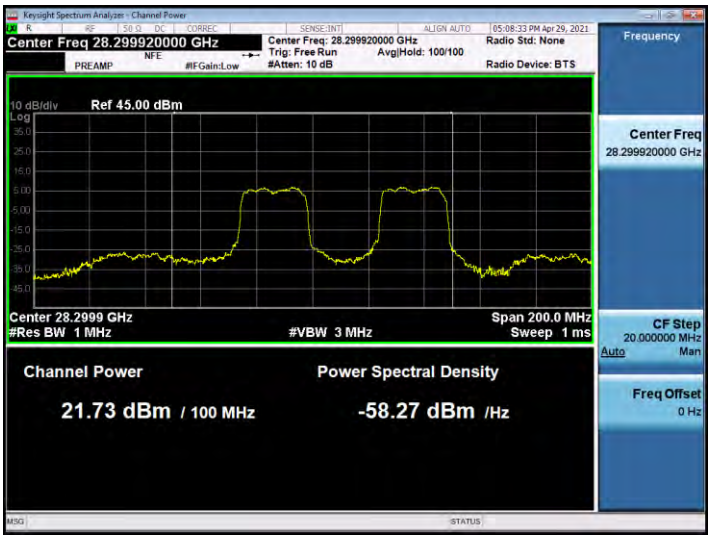
50 MHz, 1CC SISO	
	
	

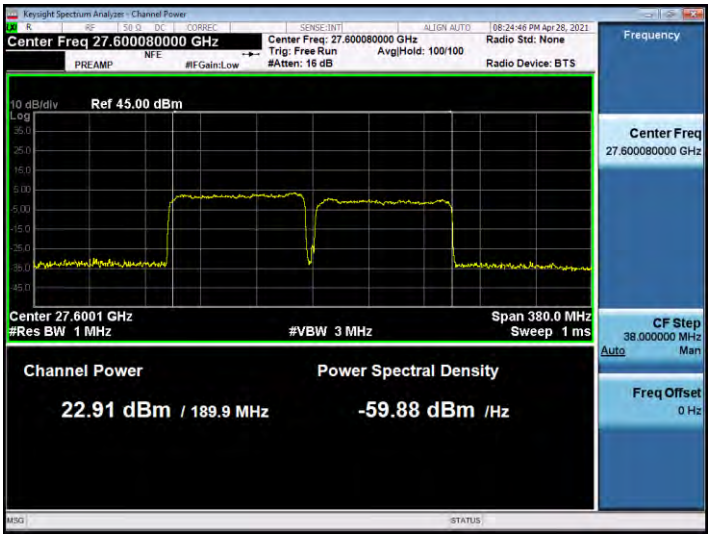
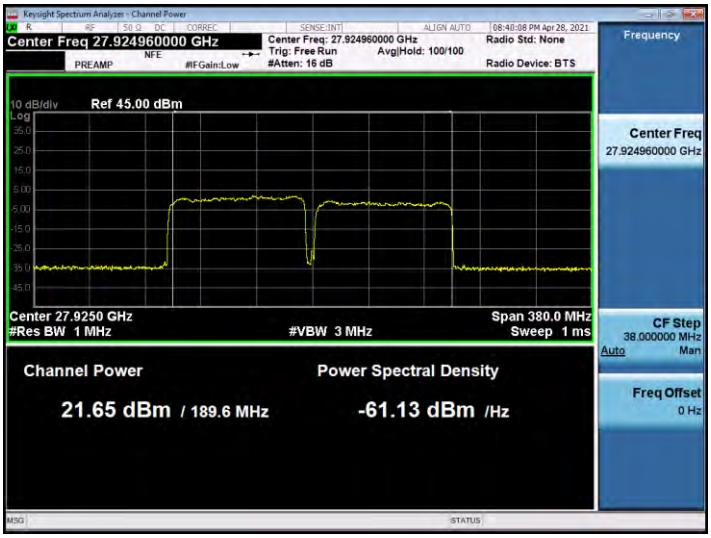
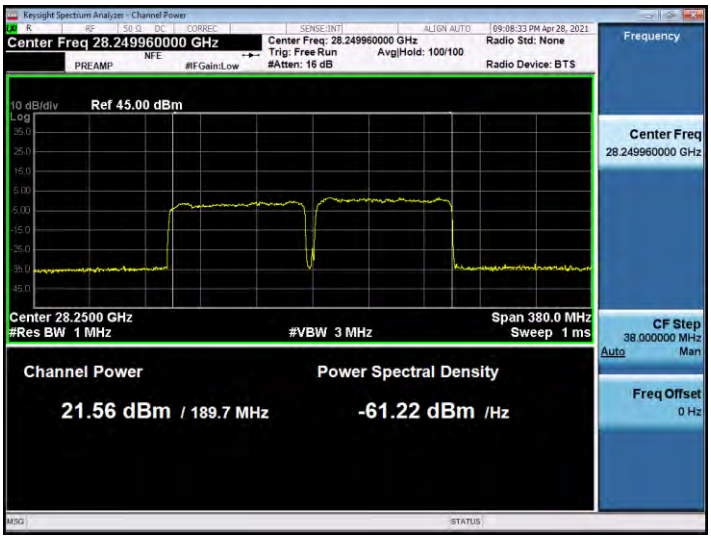
50 MHz, 1CC SISO Dual	
	
	

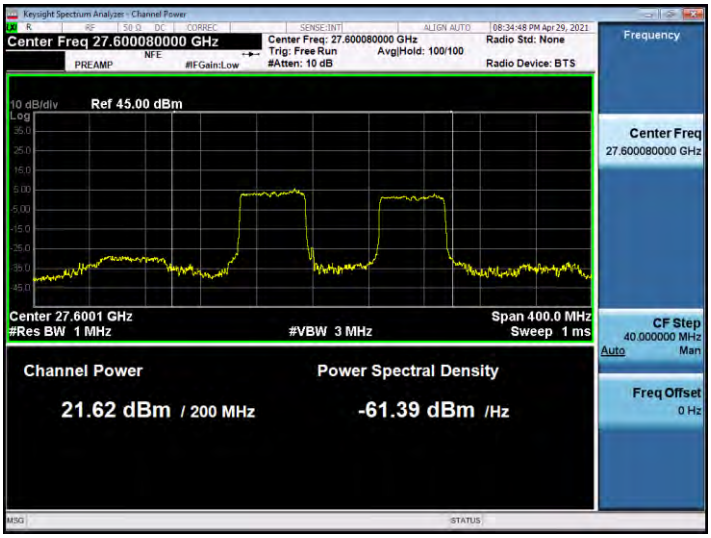
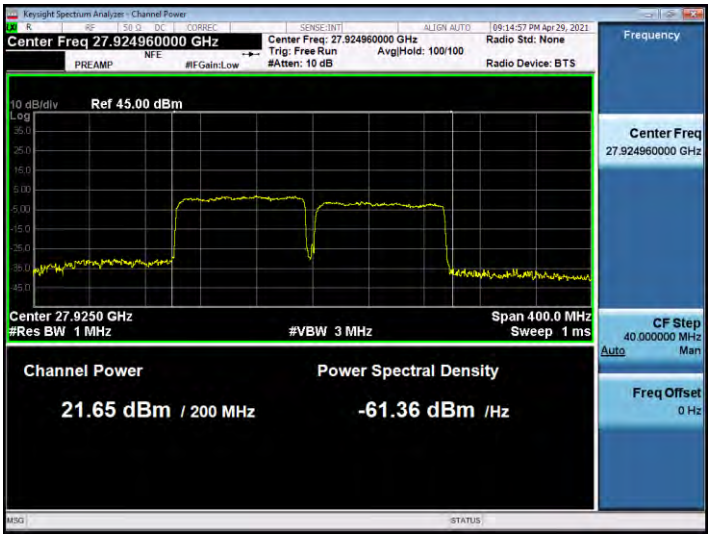
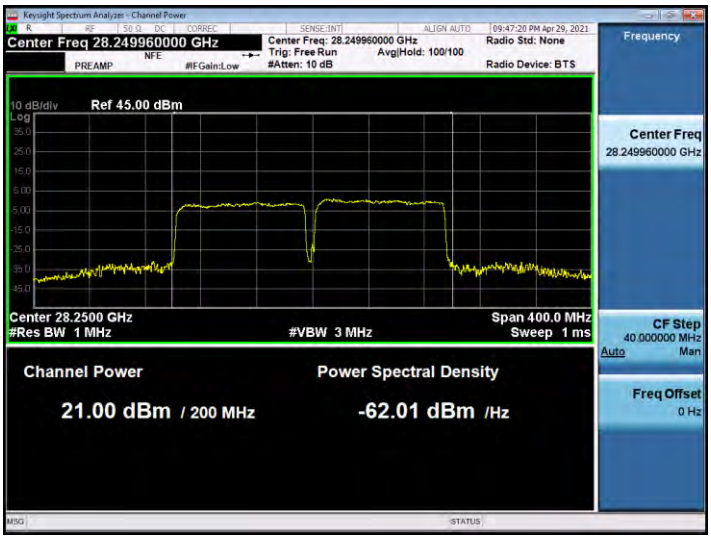
100 MHz, 1CC SISO	
	
	

100 MHz, 1CC SISO Dual	
	
	

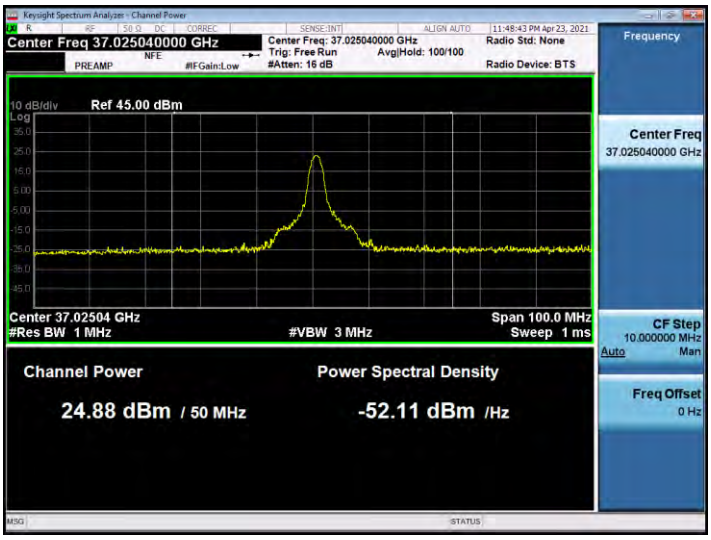
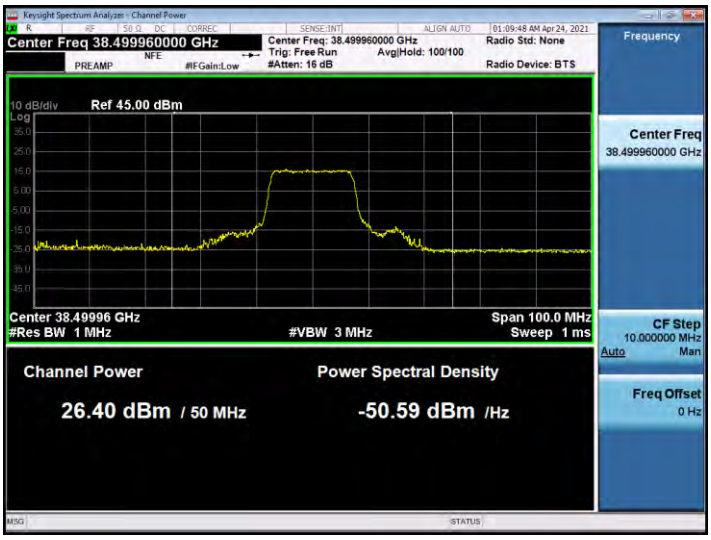
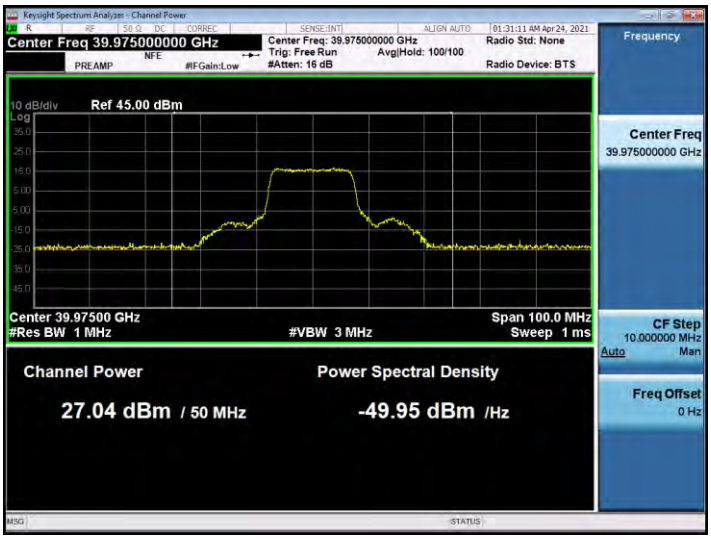
50 MHz, 2CC SISO	
	
	

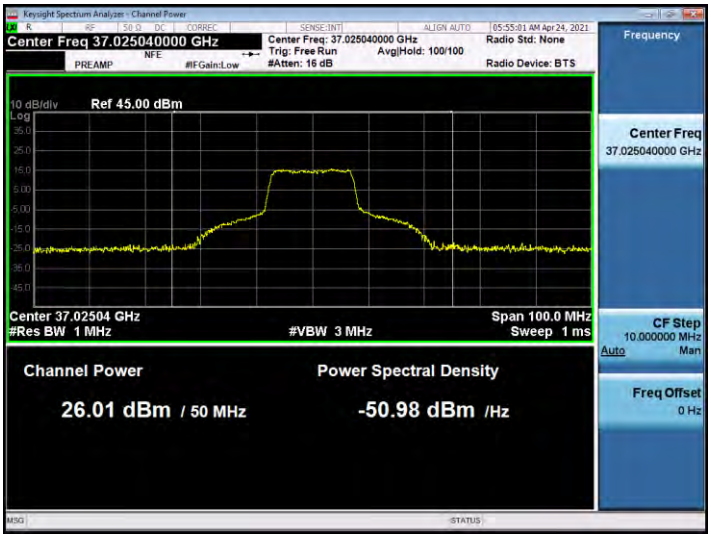
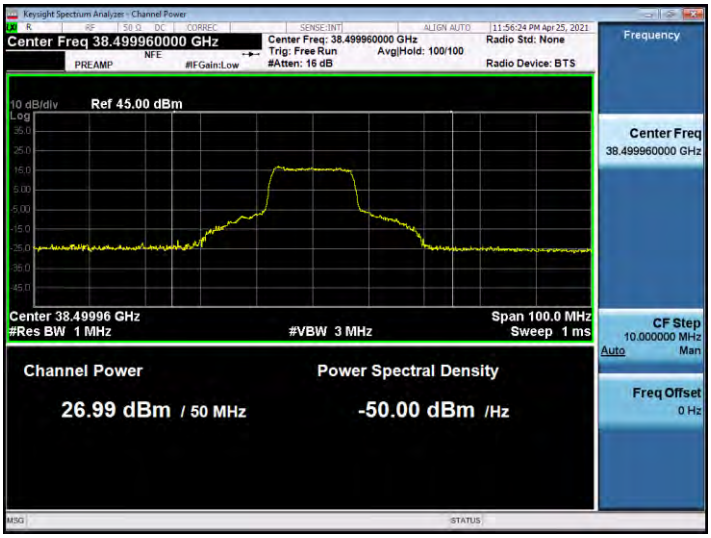
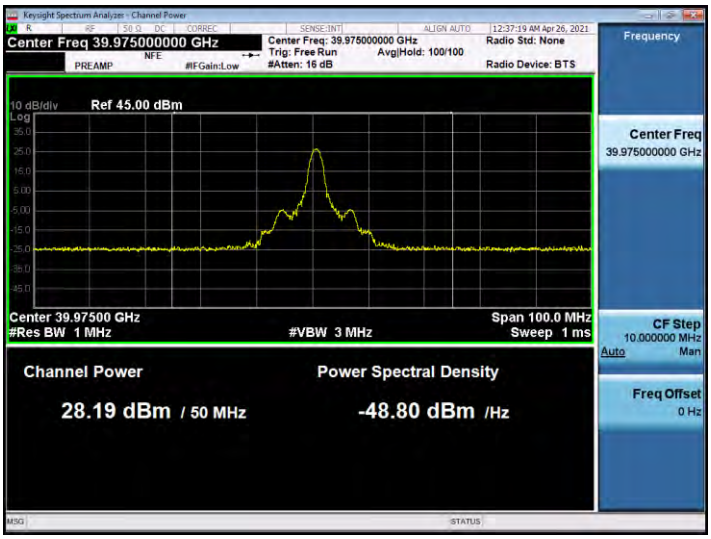
50 MHz, 2CC SISO Dual	
	
	

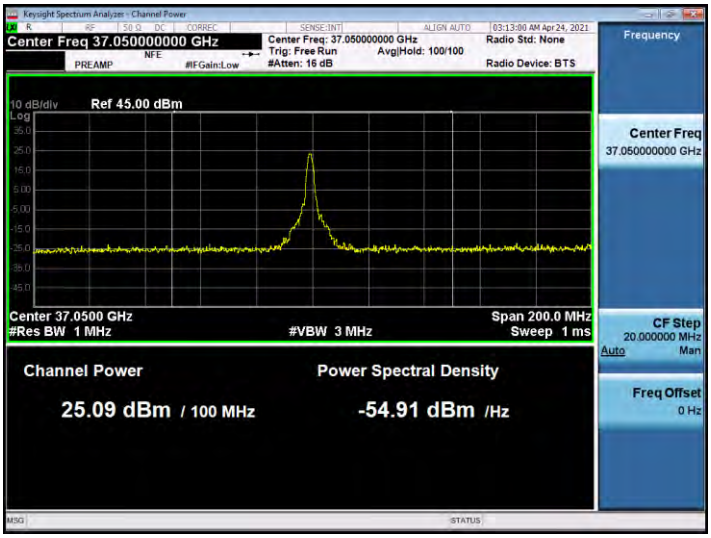
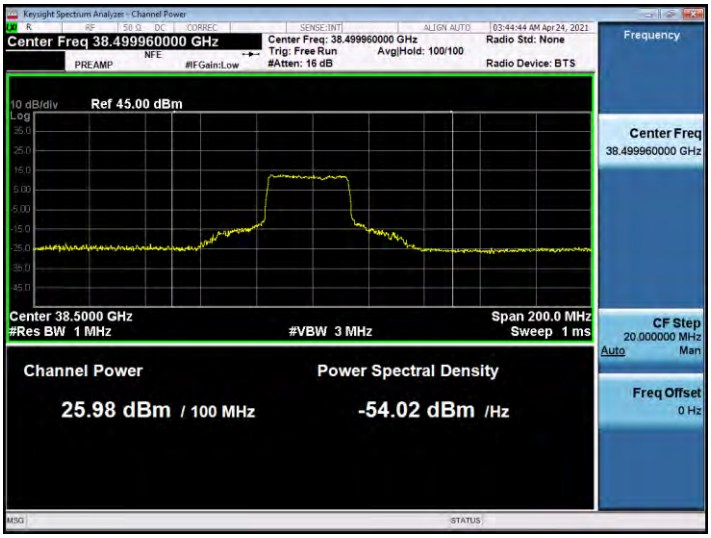
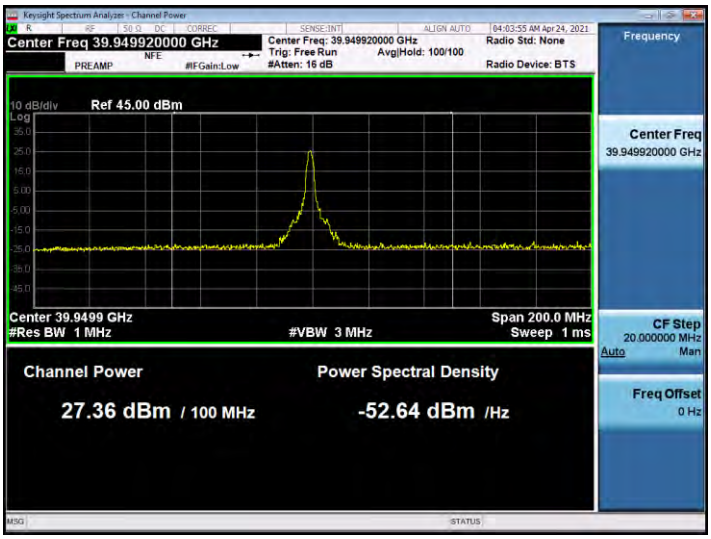
100 MHz, 2CC SISO	
	
	

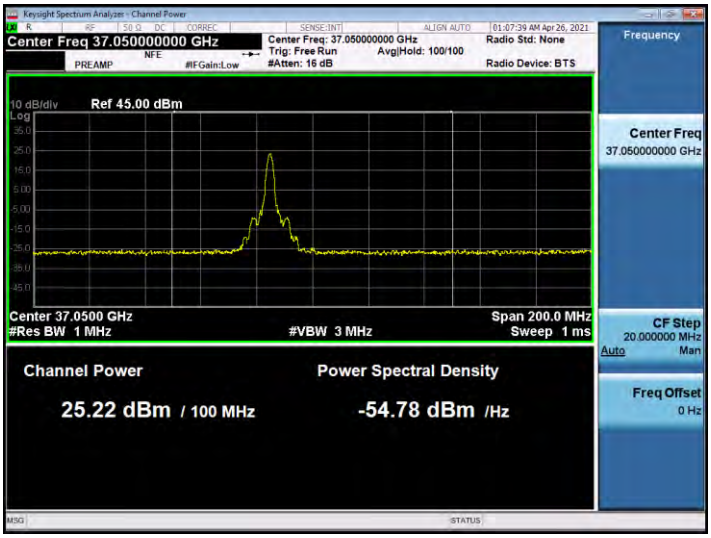
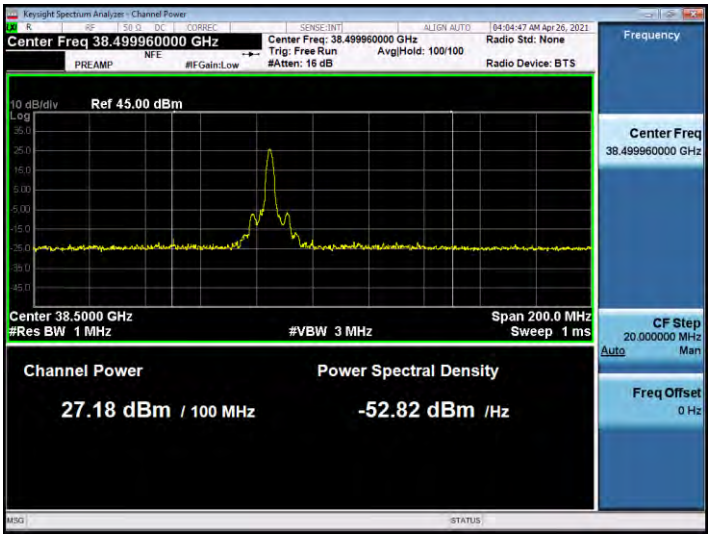
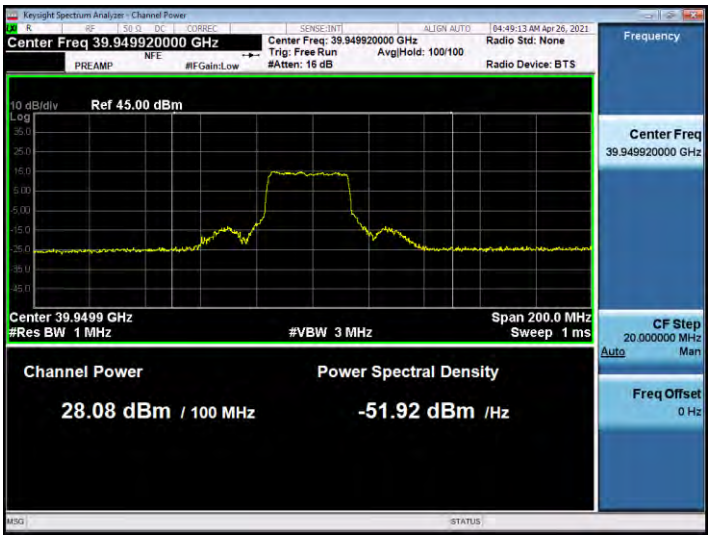
100 MHz, 2CC SISO Dual	
	
	

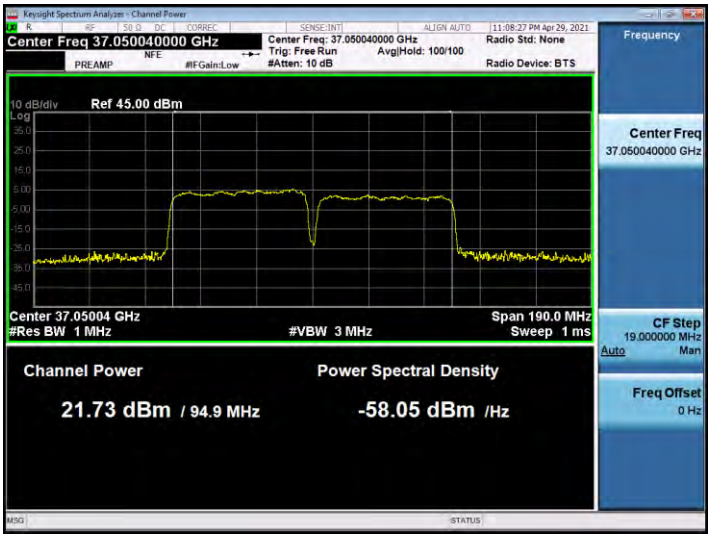
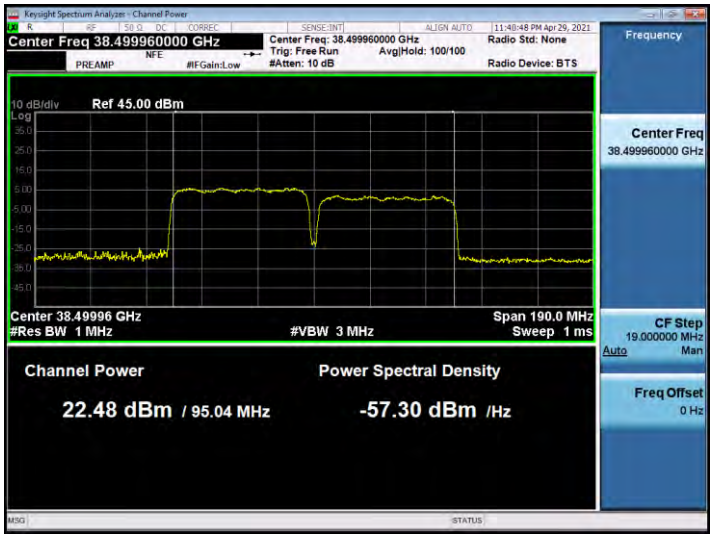
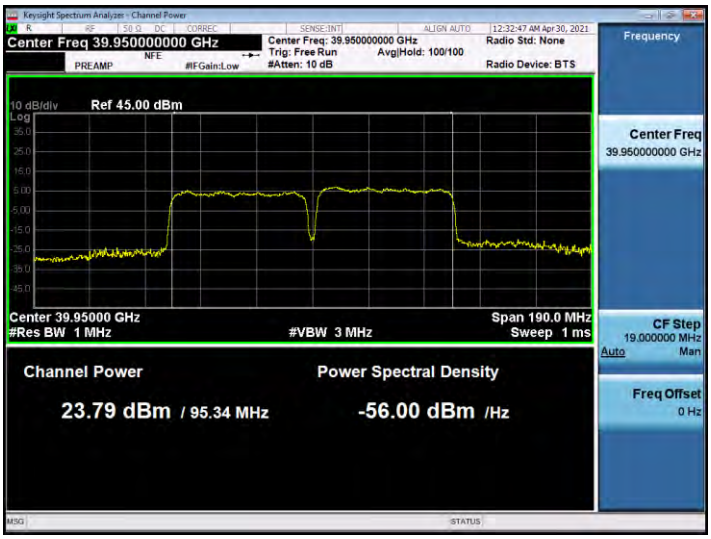
3. Antenna 0(K patch), n260

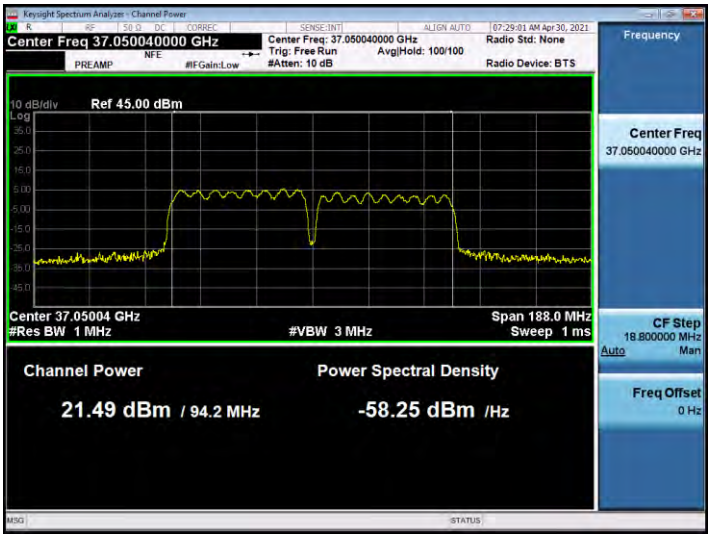
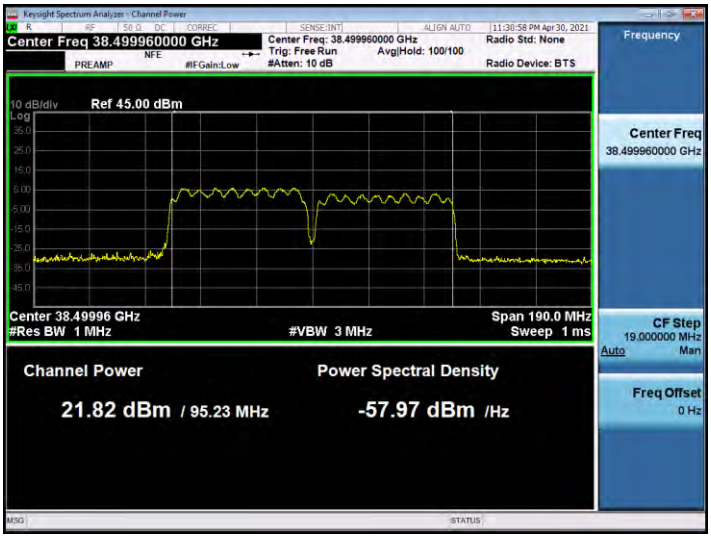
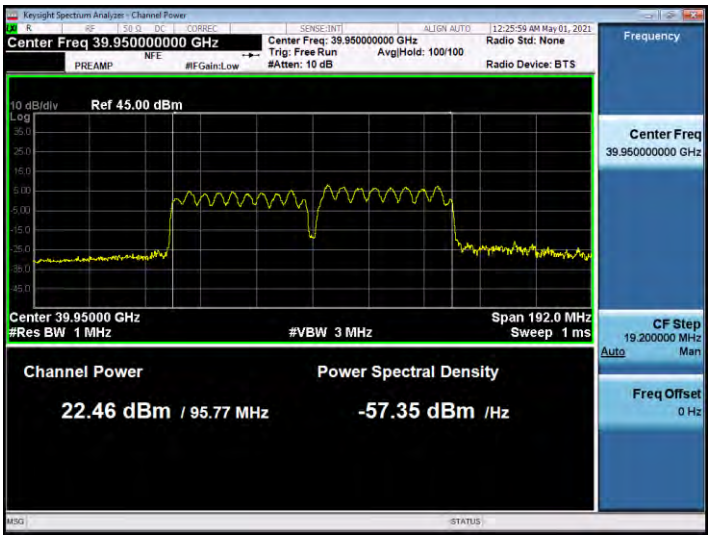
50 MHz, 1CC SISO	
	
	

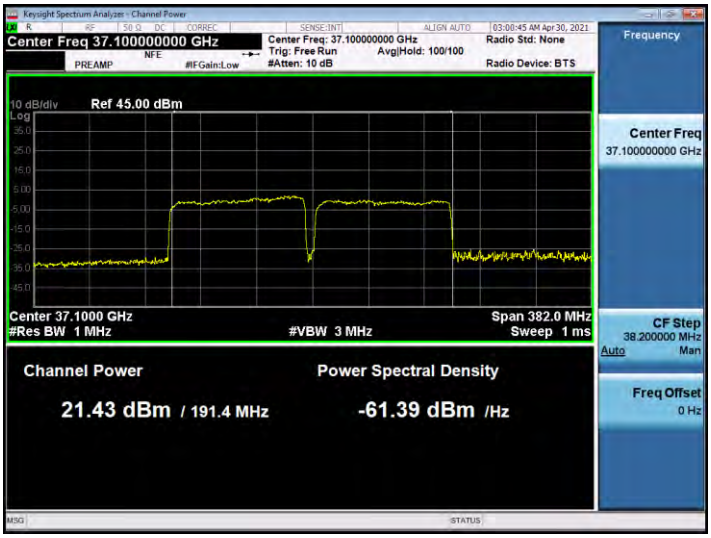
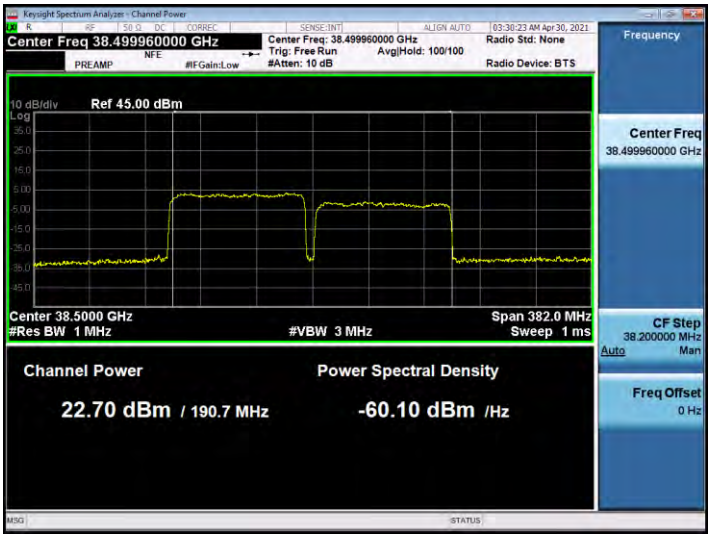
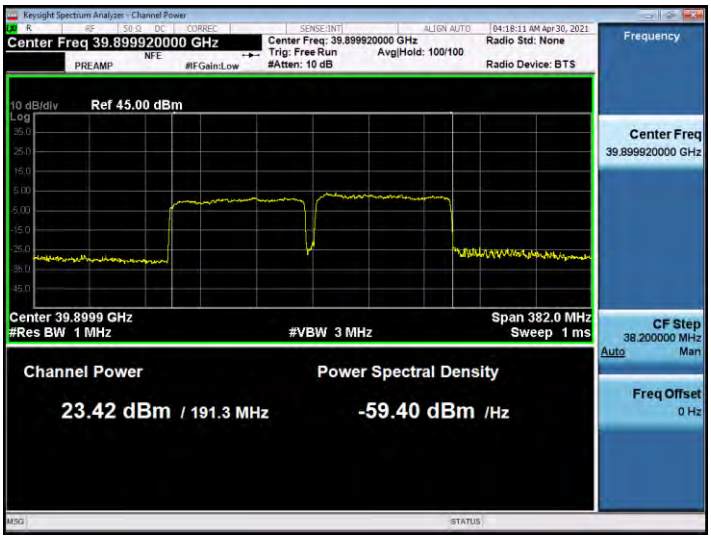
50 MHz, 1CC SISO Dual	
	
	

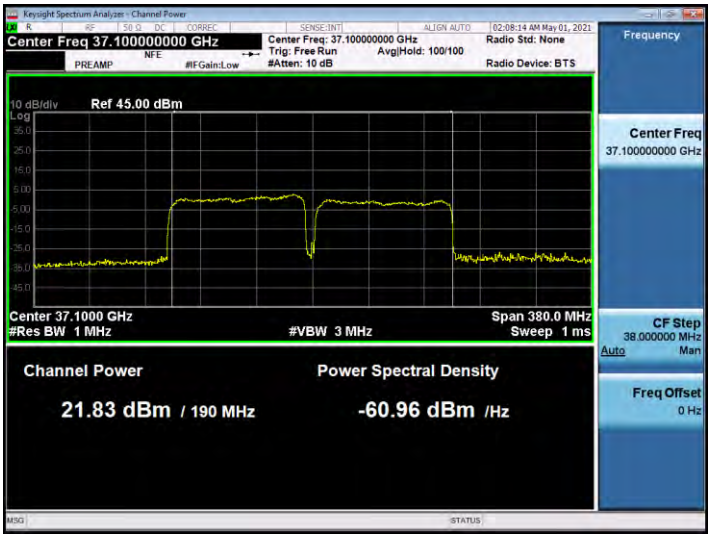
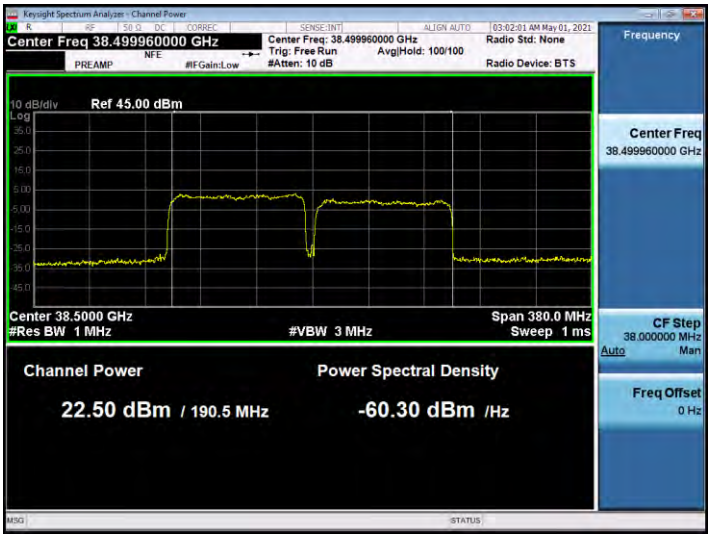
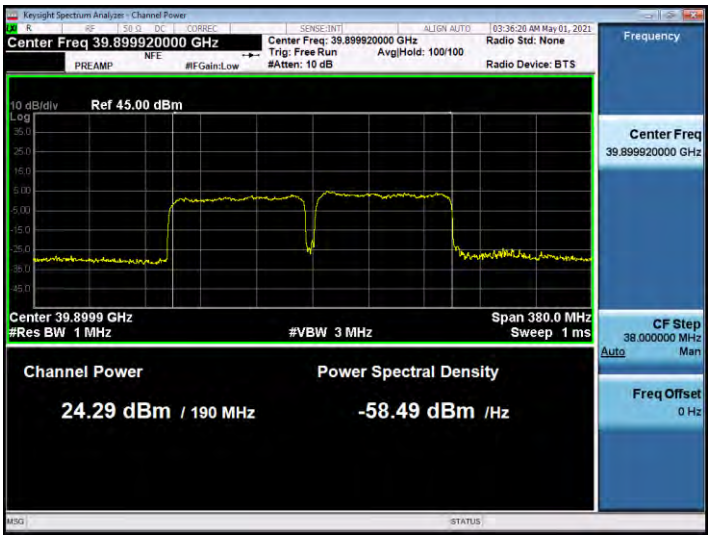
100 MHz, 1CC SISO	
	
	

100 MHz, 1CC SISO Dual	
	
	

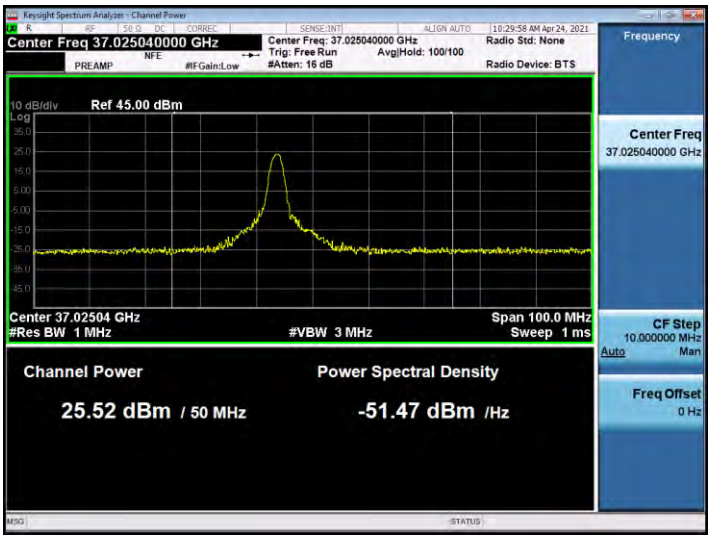
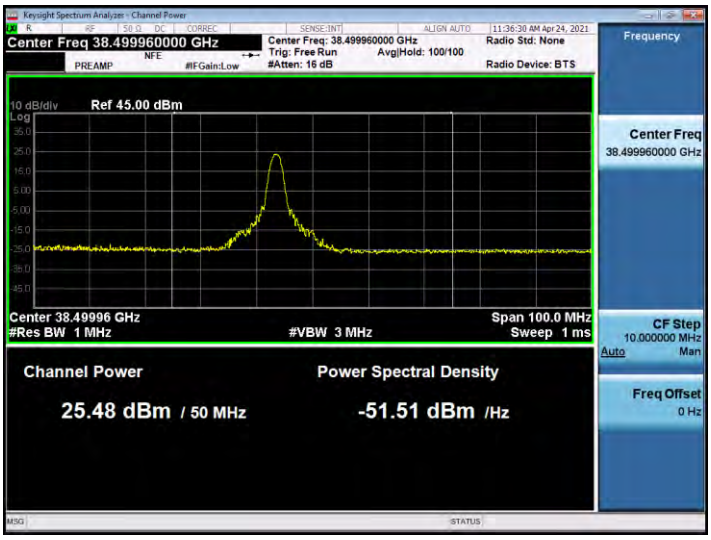
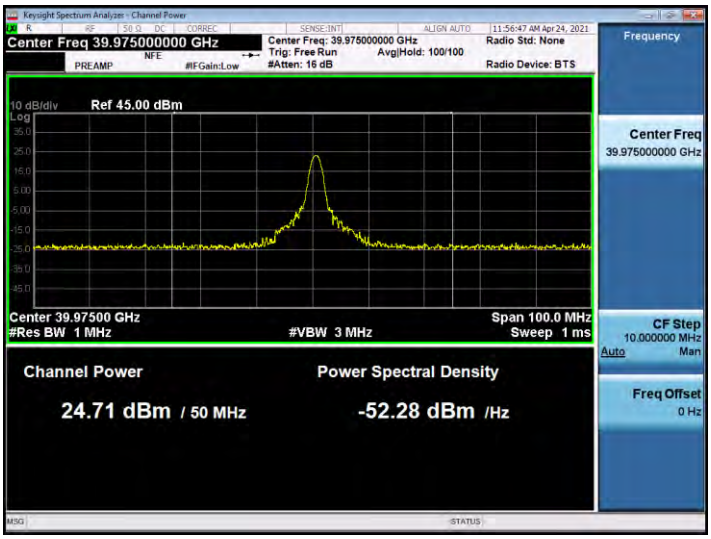
50 MHz, 2CC SISO	
	
	

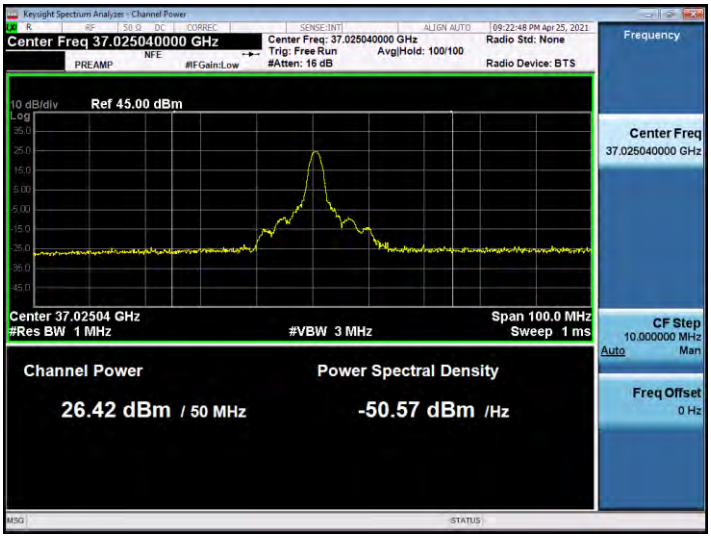
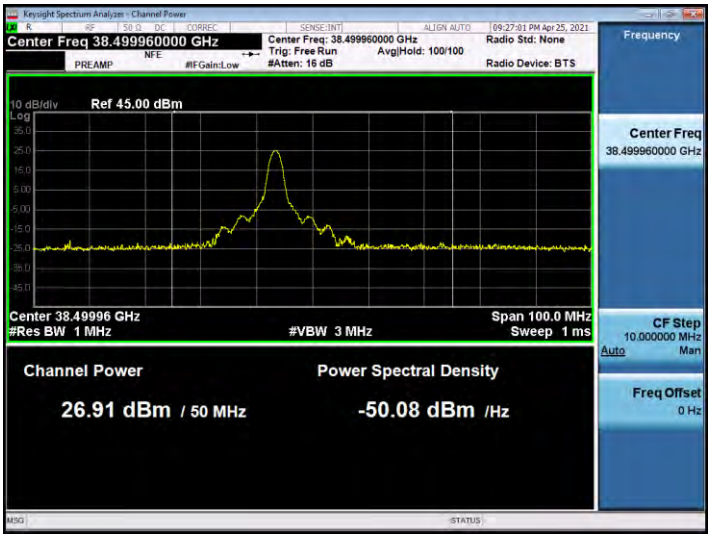
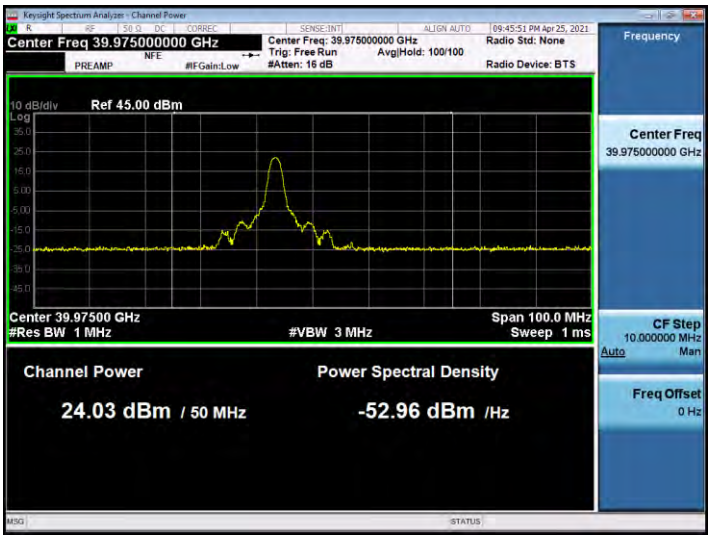
50 MHz, 2CC SISO Dual	
	
	

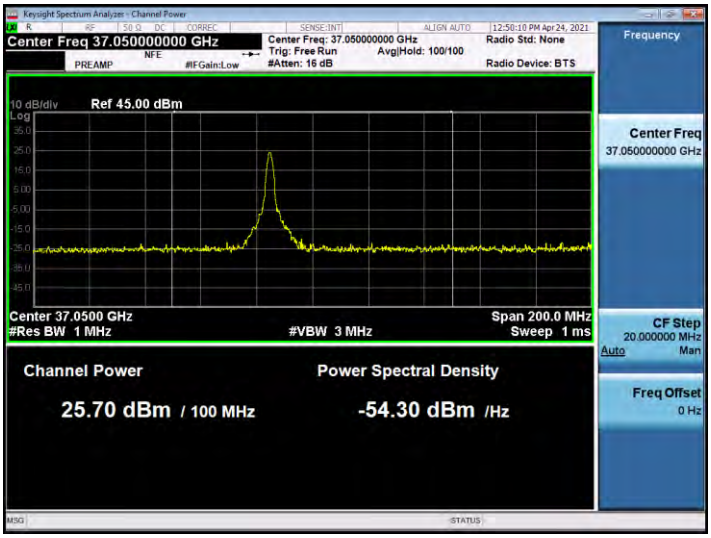
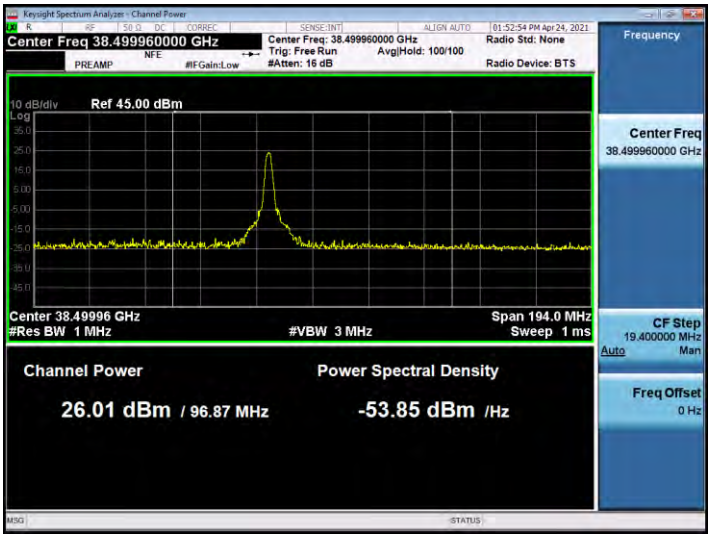
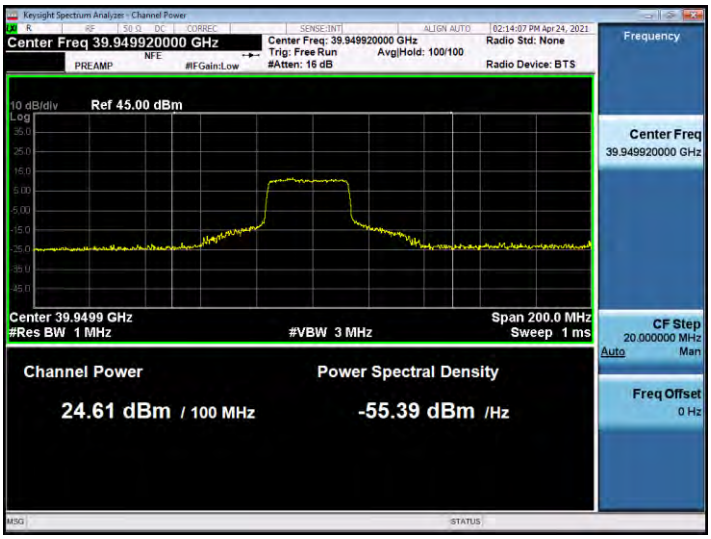
100 MHz, 2CC SISO	
	
	

100 MHz, 2CC SISO Dual	
	
	

4. Antenna 1(L patch), n260

5. 50 MHz, 1CC SISO	
	
	

50 MHz, 1CC SISO Dual	
	
	

100 MHz, 1CC SISO	
	
	

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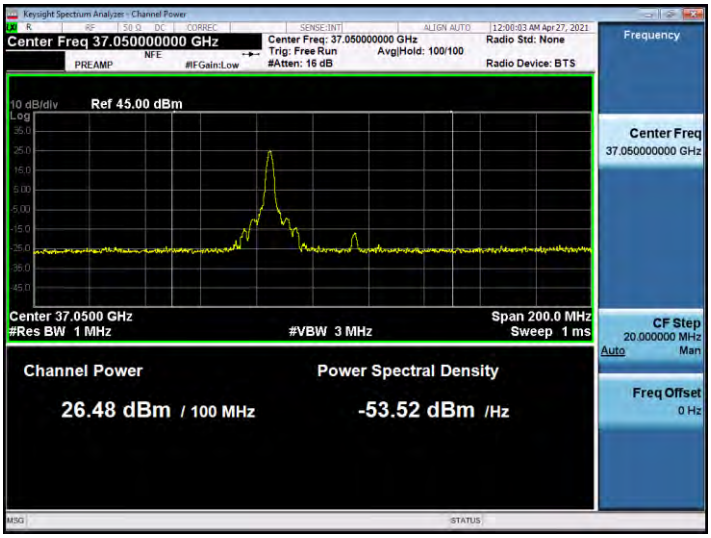	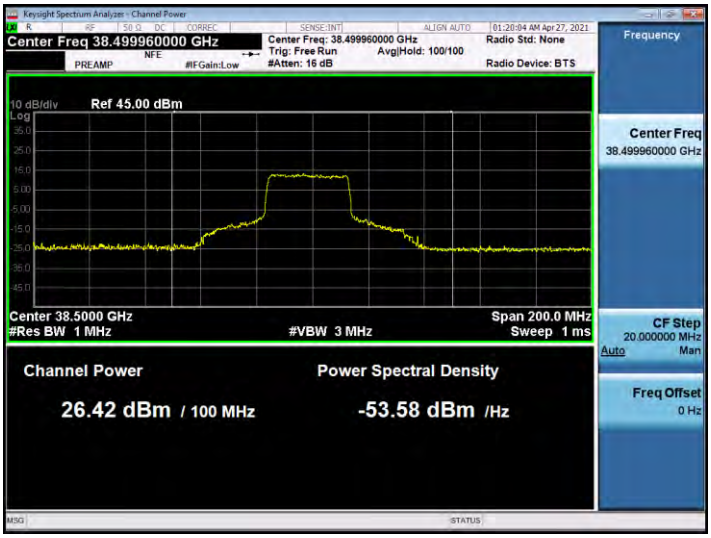
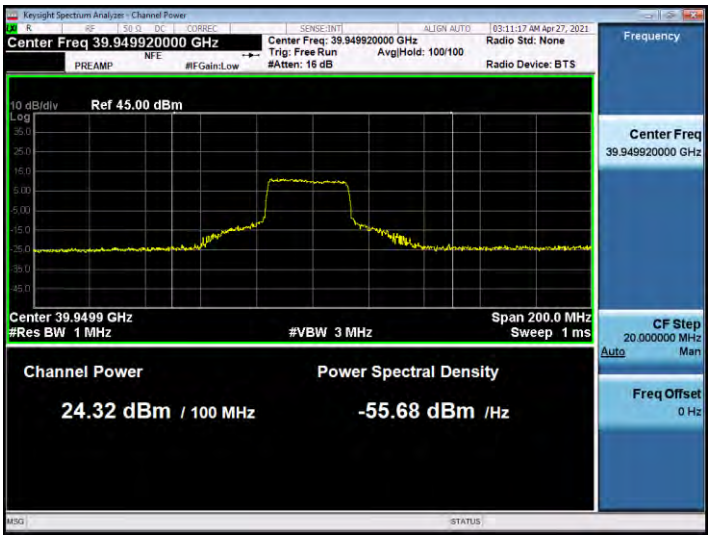	

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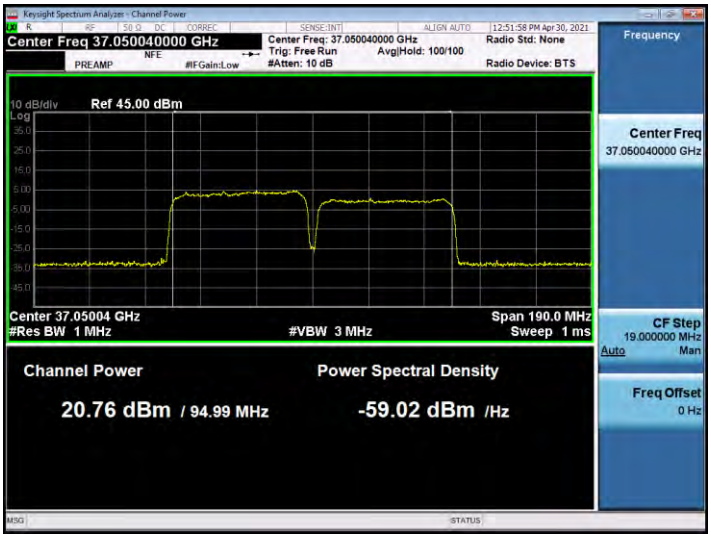
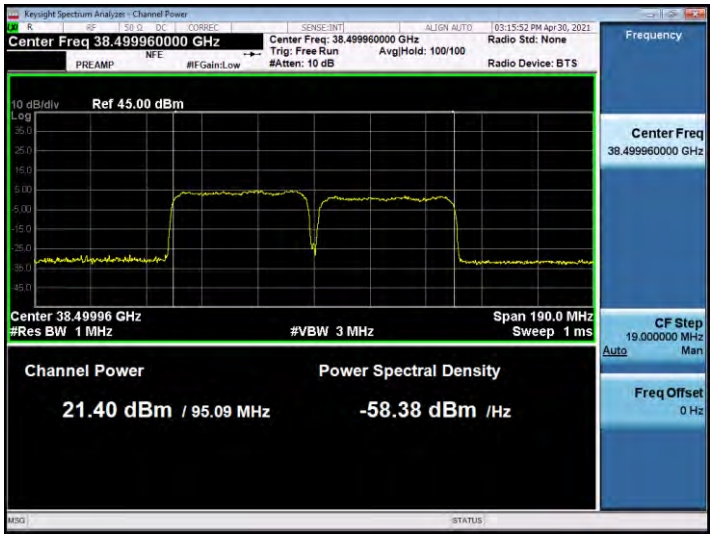
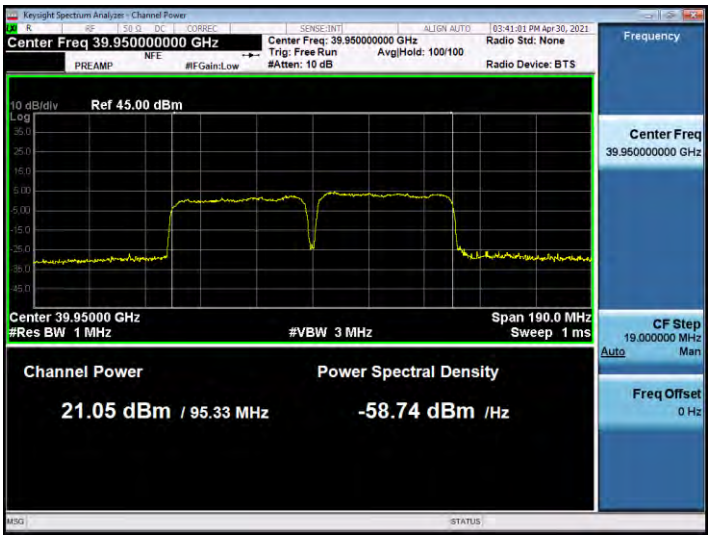
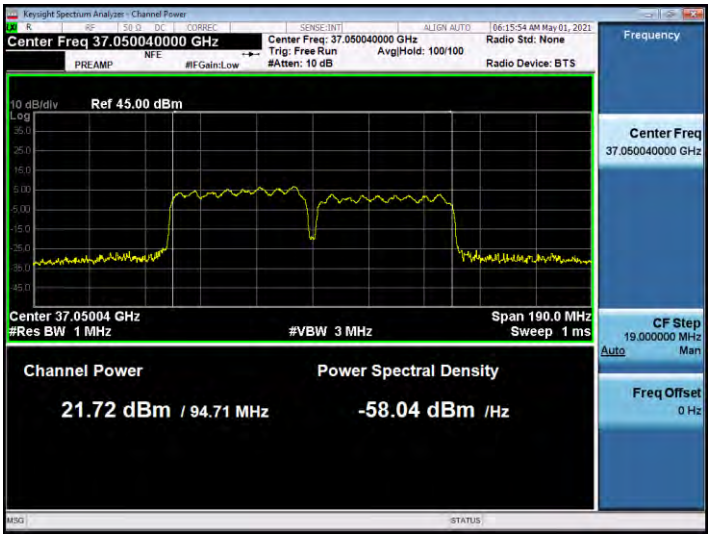
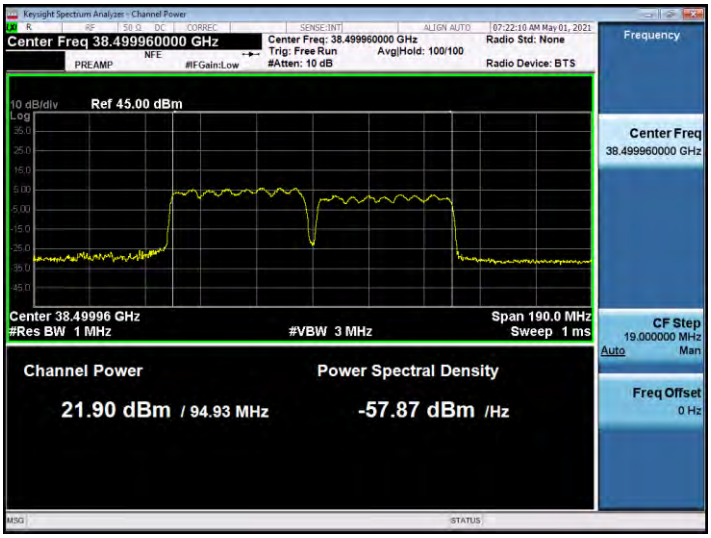
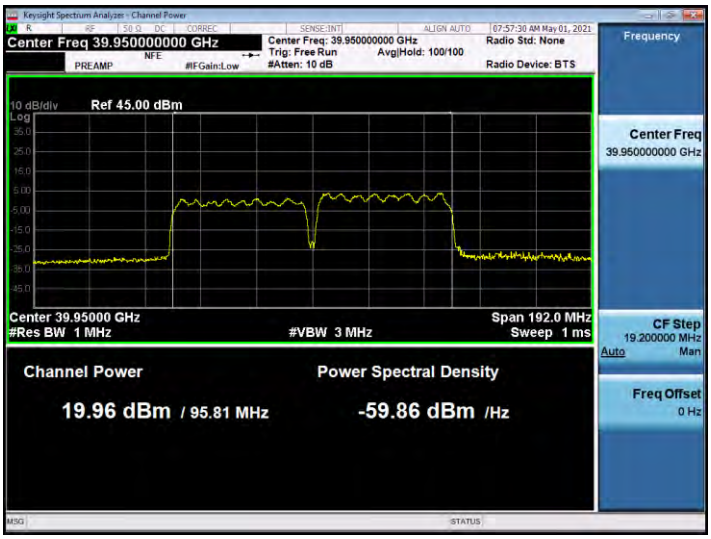
	
	

50 MHz, 2CC SISO Dual	
	
	

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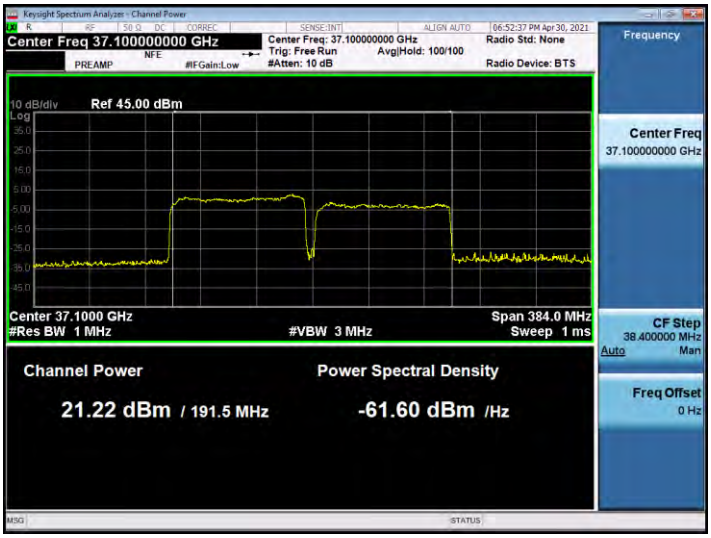
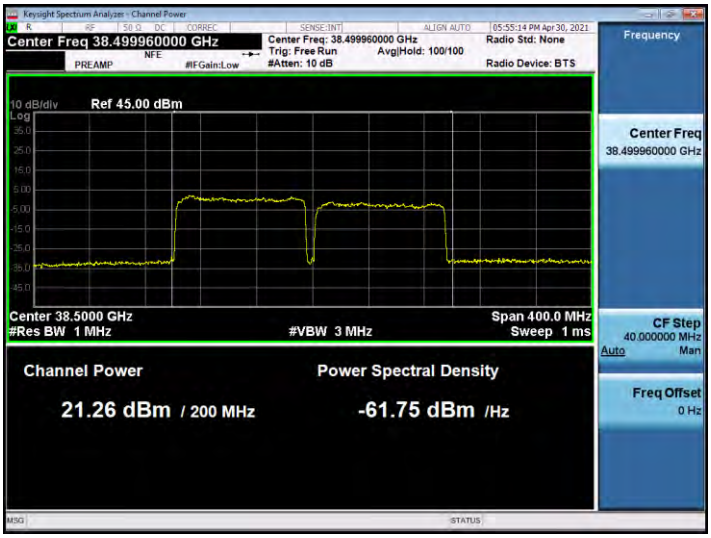
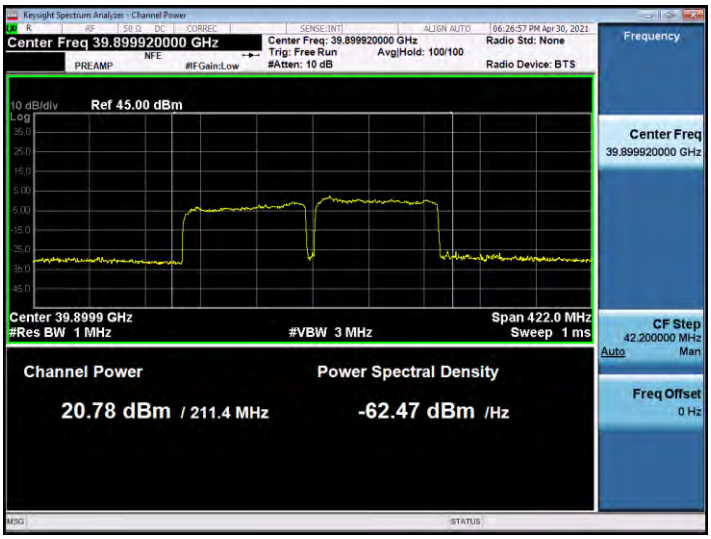
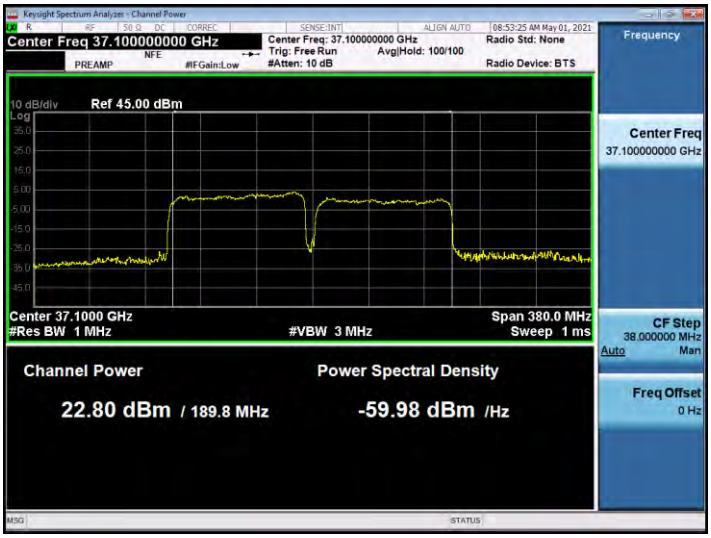
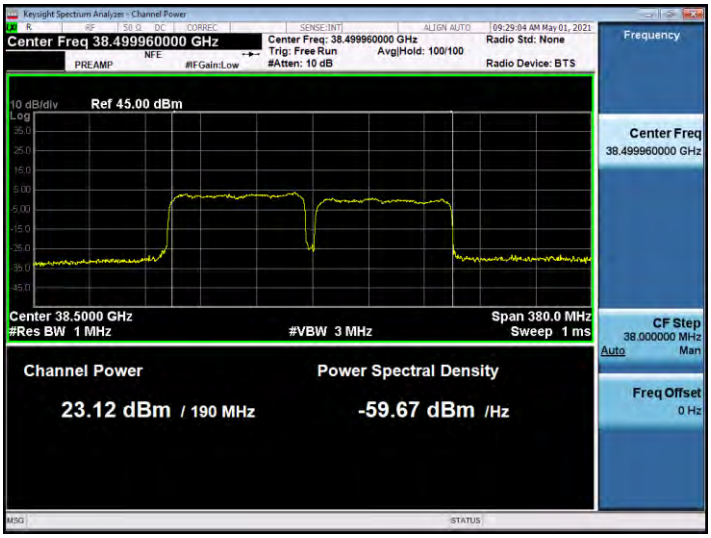
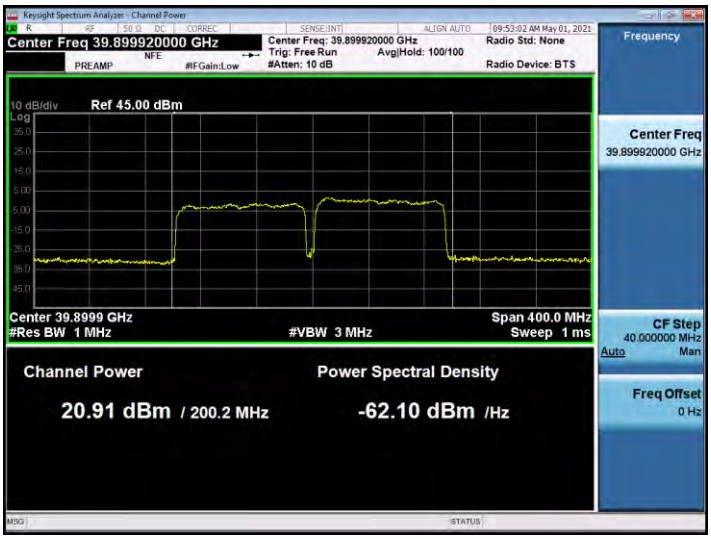
	
	

100 MHz, 2CC SISO Dual	
	
	

5.3. BAND EDGE

Test Overview

All out of band emissions are measured in a radiated setup while the EUT is operating 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 minimum permissible attenuation level of any spurious emission is -13dBm/1MHz. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

FCC Rules

Test Requirements:

§ 30.203 Emission limits.

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

(b)(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

Test Procedures:

The measurement is performed in accordance with Section 5.7.3 of ANSI C63.26.

5.7.3 Out-of-band unwanted emissions measurements

a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency.

b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out-of-band (band-edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained.

c) Set the number of points in sweep ≥ 2 × span / RBW.

d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows:

1), 2) Omitted

3) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a free running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).

4) Omitted

e) The test report shall include the plots of the measuring instrument display and the measured data.

- The TRP measurement is performed in accordance with Section 4.4.2.4 of KDB 842590 v01r02 (2021-04).

4.4.2.4 Spherical Grid Method

a) Measure the antenna dimensions, i.e., depth (d), width (w), and height (h) (see Figure A.1 in Appendix A). If the antenna dimensions are not accessible use the mechanical dimensions of the entire device.

b) Calculate the spherical and cylindrical diameters (D and Dcyl) using Equations (A.1) and (A.2) in Appendix A in KDB 842590 v01r02.

c) For the highest frequency (smallest wavelength) of the frequency band measured, calculate the reference angular steps $\Delta\theta$ref and $\Delta\theta$ref using Equations (A.3) and (A.4) in Appendix A in KDB 842590 v01r02.

d) Set the grid spatial sampling step $\Delta\theta \leq \Delta\theta$ref for the vertical angle and $\Delta\theta \leq \Delta\theta$ref for the horizontal angle.

e) For each emission frequency, measure the total EIRP (sum of two orthogonal polarizations) on the selected grid.

f) For each emission frequency, calculate the TRP using weighted angular average value using numerical integration as described in Appendix B in KDB 842590 v01r02.

g) Compare measured TRP with the applicable TRP limit to make a pass/fail decision.

Test Results:

Antenna 0(K patch), n261

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	Band Edge [dBm]
1	50 MHz	27525	Low	H+V	BPSK	H	1/0	-12.604※
		27525	Low	H+V	QPSK	H	32/0	-17.833
		28324.92	High	H+V	QPSK	H	1/31	-13.380※
		28324.92	High	H+V	QPSK	H	32/0	-18.181
	100 MHz	27550.08	Low	H+V	BPSK	H	1/0	-9.771※
		27550.08	Low	H+V	QPSK	H	64/0	-21.151
		28299.96	High	H+V	QPSK	H	1/65	-13.839※
		28299.96	High	H+V	QPSK	H	64/0	-22.794
2	50 MHz	27550	Low	H+V	BPSK	H	1/0	-17.745
		27550	Low	H+V	BPSK	H	10/11	-21.404
		28299.92	High	H+V	QPSK	H	1/31	-22.151
		28299.92	High	H+V	BPSK	H	10/11	-26.895
	100 MHz	27600.08	Low	H+V	BPSK	H	1/22	-18.097
		27600.08	Low	H+V	BPSK	H	20/22	-24.484
		28249.96	High	H+V	BPSK	H	1/43	-18.876
		28249.96	High	H+V	BPSK	H	20/22	-27.901

※ **Note :** Limit: -5 dBm

Antenna 1(L patch), n261

CCs active	BW	Frequency [MHz]	Channel	Beam Pol.	Modulation	Ant. Pol. [H/V]	RB Size/Offset	Band Edge [dBm]
1	50 MHz	27525	Low	H+V	BPSK	H	1/0	-10.947※
		27525	Low	H+V	QPSK	H	32/0	-20.245
		28324.92	High	H+V	QPSK	H	1/31	-15.419※
		28324.92	High	H+V	QPSK	H	32/0	-19.762
	100 MHz	27550.08	Low	H+V	BPSK	H	1/0	-13.020※
		27550.08	Low	H+V	QPSK	H	64/0	-24.504
		28299.96	High	H+V	BPSK	H	1/63	-16.052
		28299.96	High	H+V	BPSK	V	64/0	-28.080
2	50 MHz	27550	Low	H+V	BPSK	H	1/11	-19.599
		27550	Low	H+V	QPSK	H	10/11	-23.208
		28299.92	High	H+V	QPSK	H	1/21	-17.814
		28299.92	High	H+V	QPSK	H	10/11	-24.636
	100 MHz	27600.08	Low	H+V	BPSK	H	1/22	-17.956
		27600.08	Low	H+V	BPSK	H	20/22	-24.482
		28249.96	High	H+V	QPSK	H	1/43	-18.335
		28249.96	High	H+V	QPSK	H	20/22	-28.405

※ **Note :** Limit: -5 dBm