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TEST REPORT

FCC Test for AT1K08d-A00

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2210-FC004

DATE OF ISSUE
October 14, 2022

Tested by
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October 14, 2022

Additional Model
-

Applicant	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Product Name	AU(AT1K08d)
Model Name	AT1K08d-A00
FCC ID	A3LAT1K08D-A00
Date of Test	August 16, 2022 ~ October 14, 2022
Test Standard Used	CFR 47 Part 2, Part 30

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	October 14, 2022	Initial Release

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.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

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1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	Samsung Electronics Co., Ltd.
Company Address	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

1.2. PRODUCT INFORMATION

EUT Type	AU(AT1K08d)
EUT Serial Number	DKN2208004
Equipment Class	5GB-Part 30 Fixed Transmitter
Power Supply	100~240V AC

Output Power

Mode		OBW [MHz]	EIRP [dBm/CC/path]	Total [dBm)
28 GHz	1CC	50	54.0	57.0
	2CC	100	57.0	60.0
	1CC	100	57.0	60.0
	2CC	150	58.8	61.8
	3CC	200	60.0	63.0
	2CC	200	60.0	63.0
	3CC	250	61.0	64.0
	4CC	300	61.8	64.8
	3CC	300	61.8	64.8
	4CC	350	62.5	65.5
	5CC	400	63.0	66.0
	5CC~8CC	450 ~ 800	63.0	66.0
39 GHz	1CC	100	57.0	60.0
	2CC	200	60.0	63.0
	3CC	300	61.8	64.8
	4CC ~ 16CC	400 ~ 1600	63.0	66.0
29 GHz + 39 GHz	Max. 8CC + Max. 8CC	Max. 1600	Max. 69.0	

*For detail carrier configuration, refer to the ODP documents.

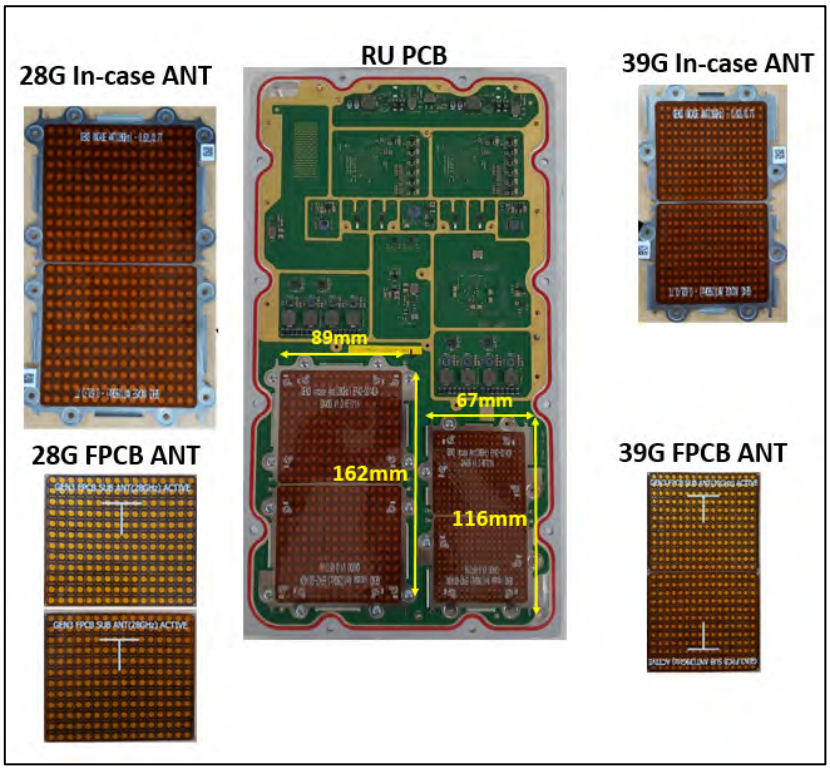
Frequency Range	27 500 MHz ~ 28 350 MHz 37 600 MHz ~ 39 300 MHz

Emission Designator	Mode	QPSK (G7D)	QPSK Max EIRP Density [W/100 MHz]	QAM (W7D)	QAM Max EIRP Density [W/100 MHz]
	28 GHz 1CC 50 MHz Contiguous	46M1G7D	234.96	46M1W7D	237.14
	28 GHz 1CC 100 MHz Contiguous	94M5G7D	547.02	94M4W7D	528.45
	28 GHz 8CC Contiguous	788MG7D	300.61	789MW7D	314.77
	28 GHz 1CC+ 7CC Non-Contiguous	783MG7D	281.19	784MW7D	356.45
	28 GHz 7CC+ 1CC Non-Contiguous	783MG7D	293.76	783MW7D	328.85
	38 GHz 1CC Contiguous	94M5G7D	835.60	94M4W7D	826.04
	38 GHz16CC Contiguous	1G58G7D	224.91	1G58W7D	234.42
	38 GHz 1CC+ 15CC Non-Contiguous	1G58G7D	242.10	1G58W7D	245.47
	38 GHz 15CC+ 1CC Non-Contiguous	1G57G7D	235.50	1G58W7D	243.78
Channel Bandwidths	28 GHz up to 8CC: 1CC(50 MHz, 100 MHz) ~ 8CC(100 MHz * 8) 39 GHz up to 16CC: 1CC(100 MHz) ~ 16CC(100 MHz * 16) 28 GHz + 39 GHz up to 16CC: 16CC(28 GHz 8CC + 39 GHz 8CC)				
Modulation Type	5G NR: QPSK, 16QAM, 64QAM, 256QAM				

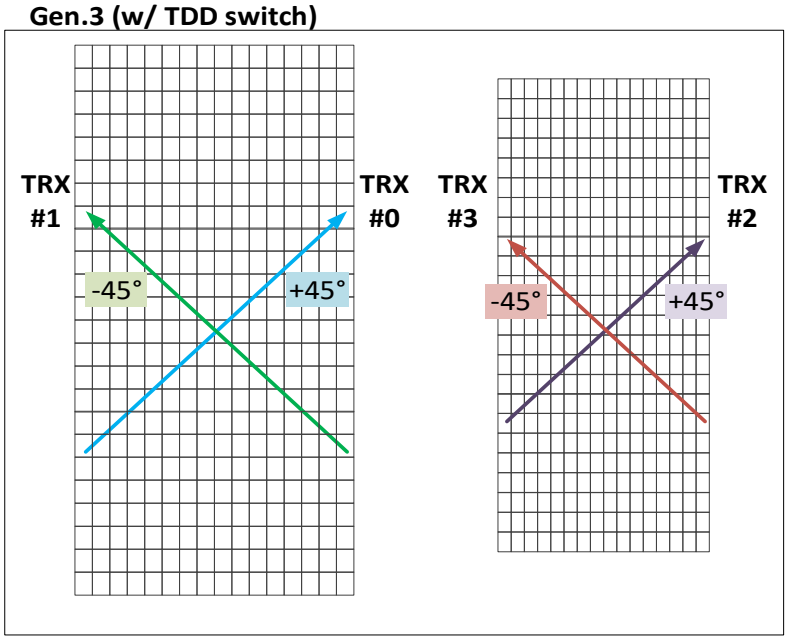
Antenna Specification

Maximum Gain: 30.57 dBi (28 GHz) / 30.05 dBi (39 GHz)

Size:



Array:



1.3. TEST INFORMATION

FCC Rule Parts	CFR 47 Part 2, Part 30
Measurement standards	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01, KDB 842590 D01 v01r02
Place of Test	HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

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. Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

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

3.1. STANDARDS

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

Description	Reference	Results
Occupied Bandwidth	§ 2.1049	Compliant
EIRP Density	§ 30.202	Compliant
Equivalent Isotropic Radiated Power	§ 2.1046	Compliant
Band Edge	§ 2.1051, § 30.203	Compliant
Radiated Spurious Emissions	§ 2.1051, § 30.203	Compliant
Frequency Stability	§ 2.1055	Compliant

3.2. 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.

28 GHz	*Wavelength[m] = Speed of light[m/s] / Measurement frequency[Hz] = (3 x 10^8) / (28.35 x 10^9)= 0.01058* *(2 X (EUT Antenna dimension)^2) / Wavelength = (2 X (0.18484)^2)/ 0.01058 = 6.46* ***m***
39 GHz	*Wavelength[m] = Speed of light[m/s] / Measurement frequency[Hz] = (3 x 10^8) / (39.3 x 10^9)= 0.00763* *(2 X (EUT Antenna dimension)^2) / Wavelength = (2 X (0.13396)^2)/ 0.00763 = 4.70* ***m***

So, measurement distance is 6.6 m.

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

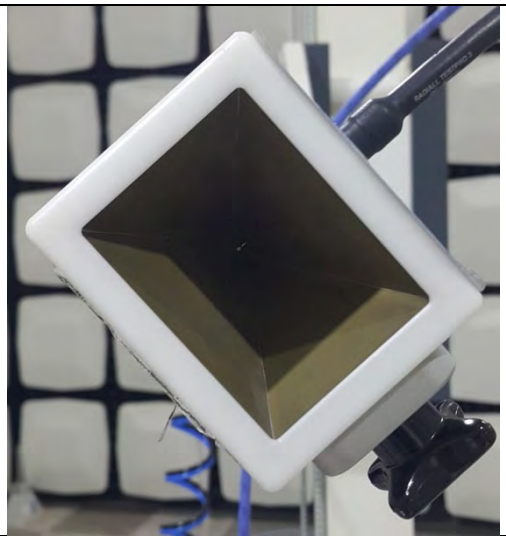
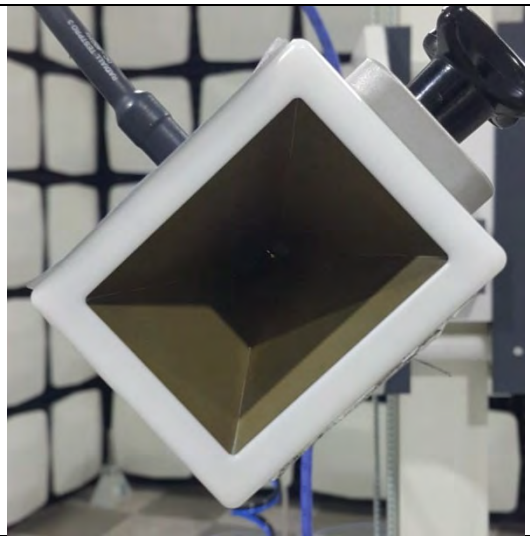
[28 GHz]

Frequency Rage (GHz)	Wavelength (cm)	Far Field Distance (m)	Measurement Distance(m)
18 ~ 27.5	1.09	1.691	3.50
28.35 ~ 40	0.75	2.460	3.50
40 ~ 60	0.50	1.354	1.50
60 ~90	0.33	0.856	1.50
90 ~ 140	0.21	0.572	1.50
140 ~ 200	0.15	0.332	1.50

[39 GHz]

Frequency Rage (GHz)	Wavelength (cm)	Far Field Distance (m)	Measurement Distance(m)
18 ~ 37.6	0.80	2.312	3.50
39.3 ~ 40	0.75	2.460	3.50
40 ~ 60	0.50	1.354	1.50
60 ~90	0.33	0.856	1.50
90 ~ 140	0.21	0.572	1.50
140 ~ 200	0.15	0.332	1.50

: Radiated test is performed on various angle of antenna and following location is worst test case.

45°	135°
	

- CC means component carriers and EUT support 1CC ~ 8CC (28 GHz), 1CC ~ 16CC (39GHz).

: 28 GHz up to 8CC: 1CC(50 MHz, 100 MHz) ~ 8CC(100 MHz * 8)

39 GHz up to 16CC: 1CC(100 MHz) ~ 16CC(100 MHz * 16)

28 GHz + 39 GHz up to 16CC: 16CC(28 GHz 8CC + 39 GHz 8CC)

- Inter-Band Carrier aggregation of 28GHz and 39 GHz was tested in 8CC (28GHz) + 8CC (39 GHz) for RSE and band edge test as worst case mode.

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

- Test was performed the carrier case having maximum output power and maximum PSD(It means the worst case.).

- After pre-testing in all modes from 1CC to 8CC (28 GHz) / 1CC to 16CC (39 GHz),
1CC and 8CC (28 GHz) / 1CC and 16CC (39 GHz)modes has founded out as worst mode.
And in non-contiguous operation, 8CC(28 GHz) / 16CC(39 GHz) is the mode which has highest total power and 1CC + 7CC, 7CC + 1CC (28 GHz) / 1CC + 15CC, 15CC + 1CC (39 GHz) mode as non-contiguous mode is the worst case in both RSE and Bandedge test.

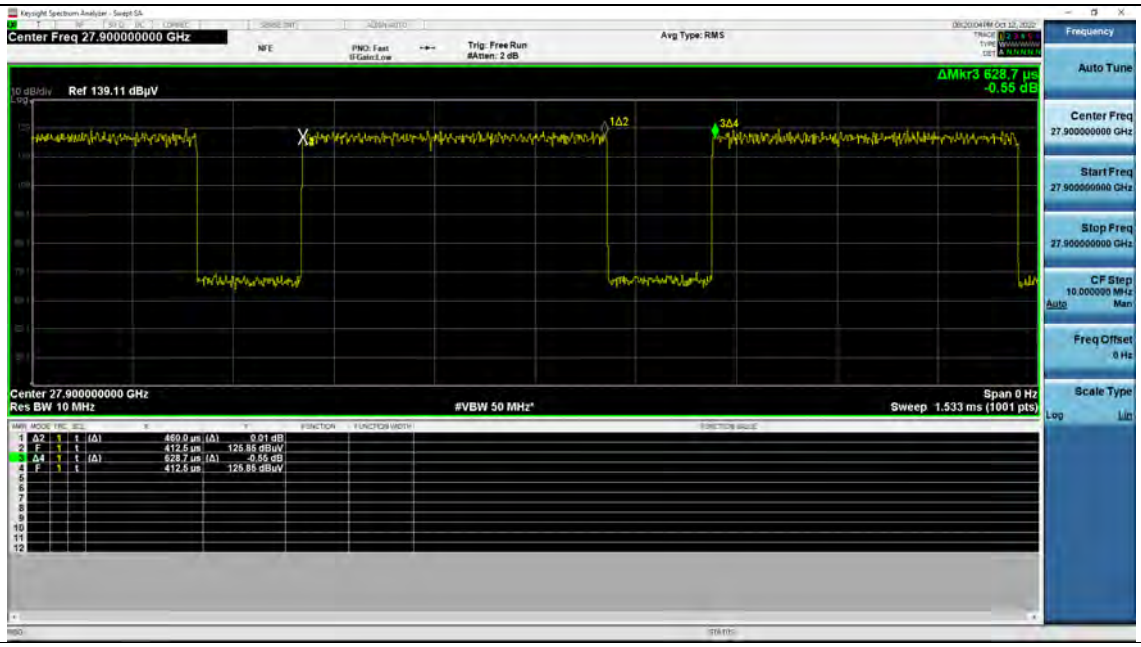
- Unwanted radiated emissions test was performed on state of all EUT antenna path is operated with a maximum output power level.

- Transmitter output signals are correlated.

- All modulations(QPSK, 16QAM, 64QAM, 256QAM) were investigated and the worst case configuration results are reported.

- Because of the EUT using TDD technology, it cannot be configured to transmit continuously and measurement instrument cannot be configured to measure only during active transmissions. So we perform the measurement using duty cycle method.

Measurement Result of AT1K08d-A00 Transmit On/Off Timing, QPSK

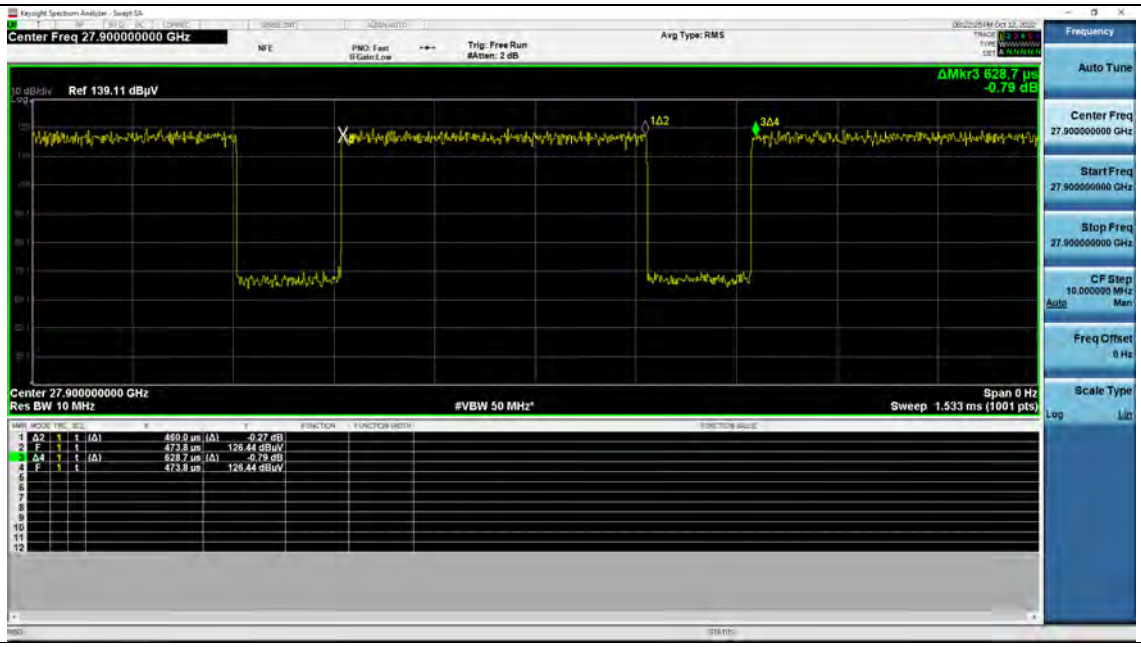


: The EUT duty cycle is calculated according to ANSI C63.26 - 5.2.4.3.4.

Duty Cycle = On-time / Transmitter period = 0.4600 ms / 0.6287 ms = 0.7317

Duty Correction = 10 log (1/duty cycle) = 10 log (1/0.7317) = 1.3569 dB

Measurement Result of AT1K08d-A00 Transmit On/Off Timing, 16QAM

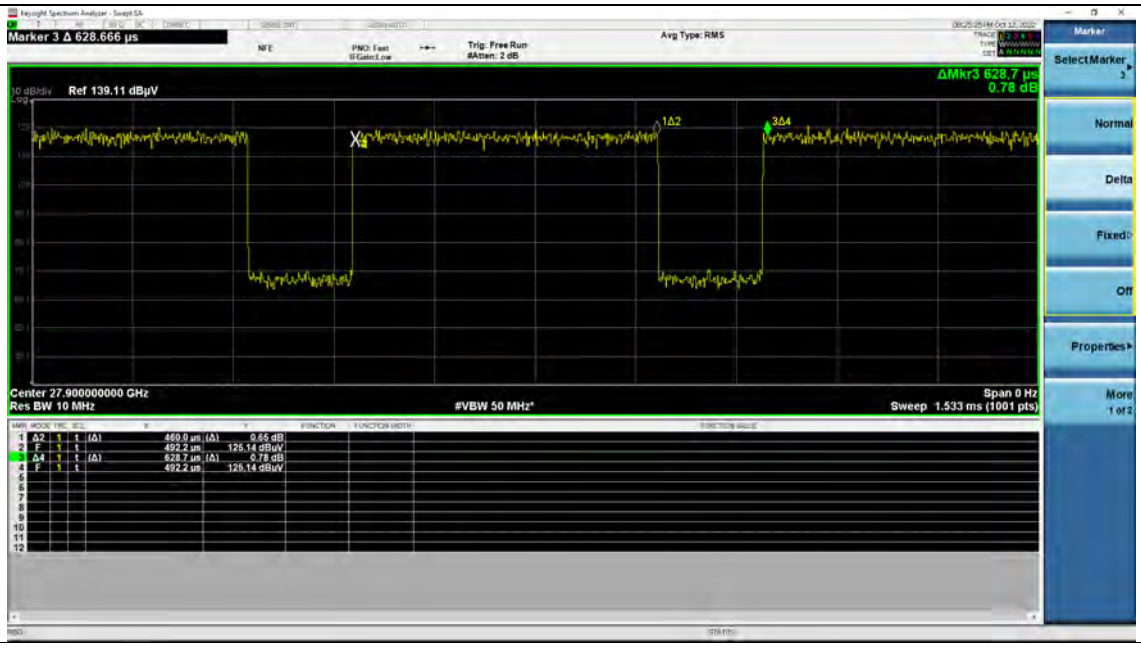


: The EUT duty cycle is calculated according to ANSI C63.26 - 5.2.4.3.4.

Duty Cycle = On-time / Transmitter period = 0.4600 ms / 0.6287 ms = 0.7317

Duty Correction = 10 log (1/duty cycle) = 10 log (1/0.7317) = 1.3569 dB

Measurement Result of AT1K08d-A00 Transmit On/Off Timing, 64QAM

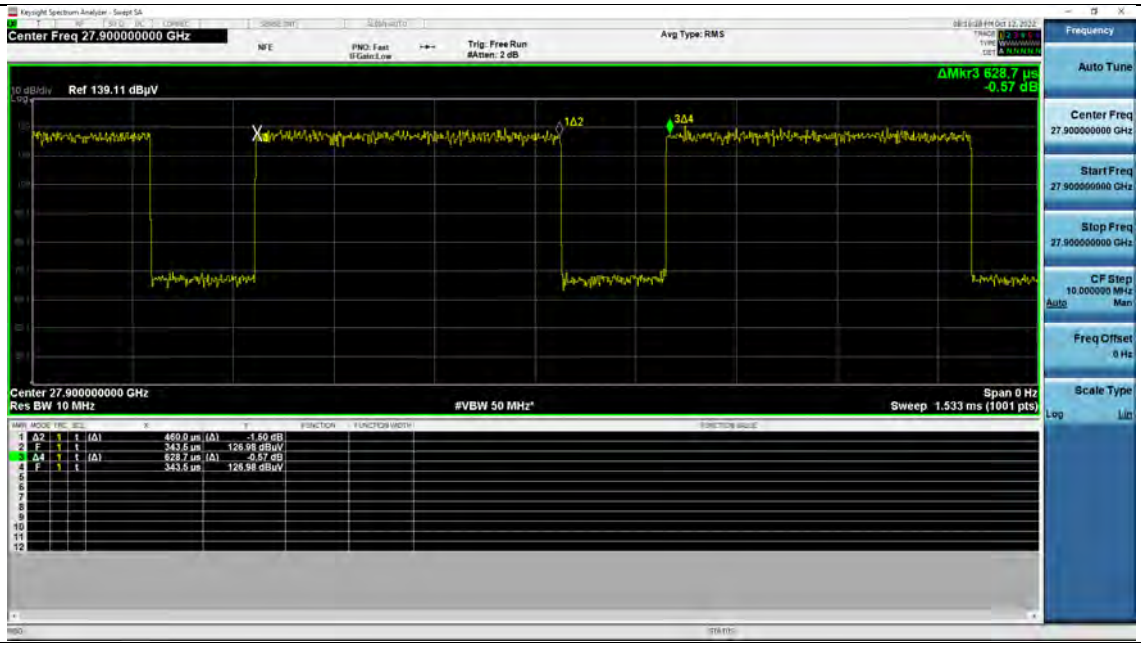


: The EUT duty cycle is calculated according to ANSI C63.26 - 5.2.4.3.4.

Duty Cycle = On-time / Transmitter period = 0.4600 ms / 0.6287 ms = 0.7317

Duty Correction = 10 log (1/duty cycle) = 10 log (1/0.7317) = 1.3569 dB

Measurement Result of AT1K08d-A00 Transmit On/Off Timing, 256QAM



: The EUT duty cycle is calculated according to ANSI C63.26 - 5.2.4.3.4.

Duty Cycle = On-time / Transmitter period = 0.4600 ms / 0.6287 ms = 0.7317

Duty Correction = 10 log (1/duty cycle) = 10 log (1/0.7317) = 1.3569 dB

3.3. MAXIMUM MEASUREMENTUNCERTAINTY

Description	Frequency	Uncertainty
Radiated Disturbance	9 kHz ~ 30 MHz	± 4.40 dB
	30 MHz ~ 1 GHz	± 5.74 dB
	1 GHz ~ 18 GHz	± 5.51 dB
	18 GHz ~ 40 GHz	± 5.92 dB
	Above 40 GHz	± 5.48 dB

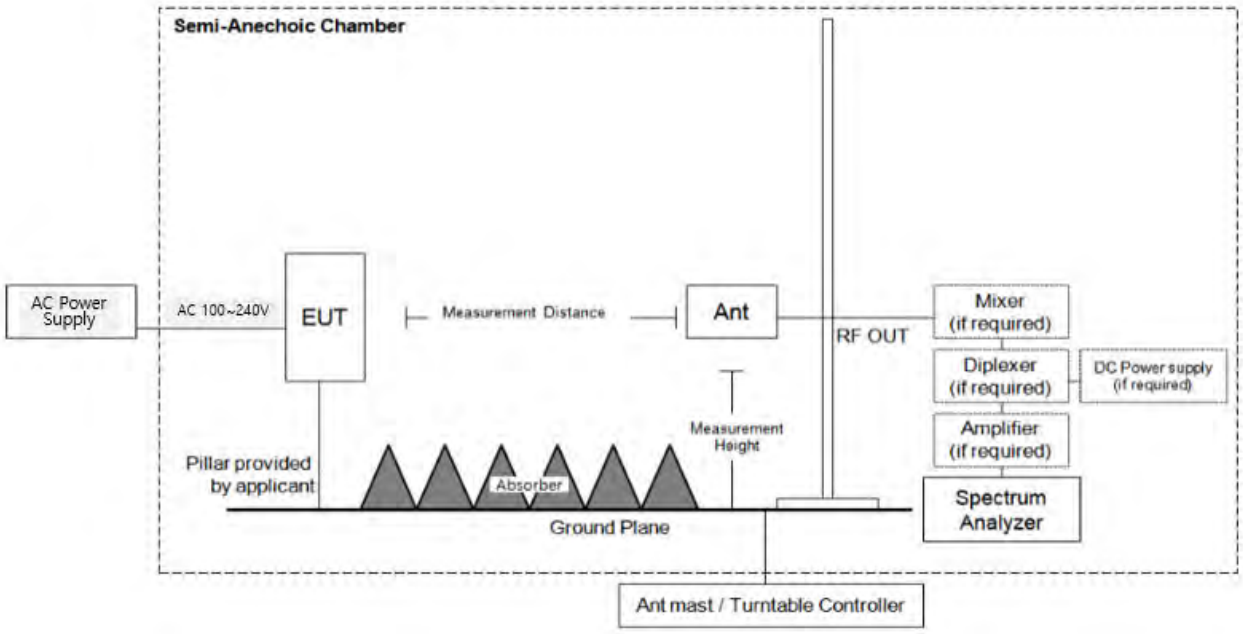
Coverage factor k = 2, Confidence levels of 95 %

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

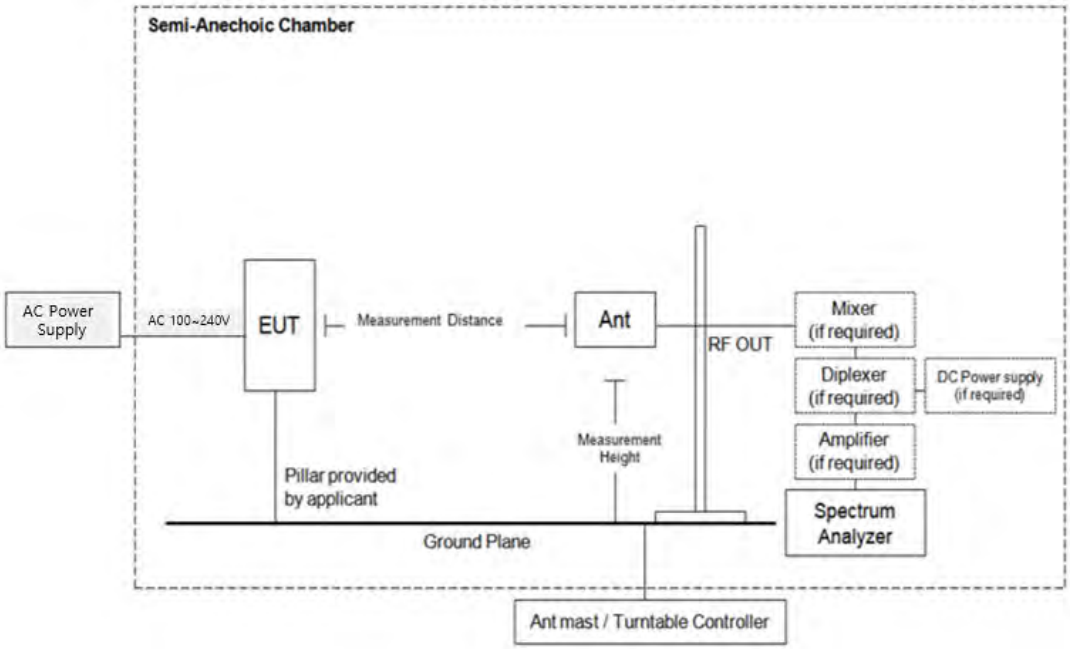
Temperature :	+15 °C to +35 °C
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

3.5. TEST DIAGRAMS

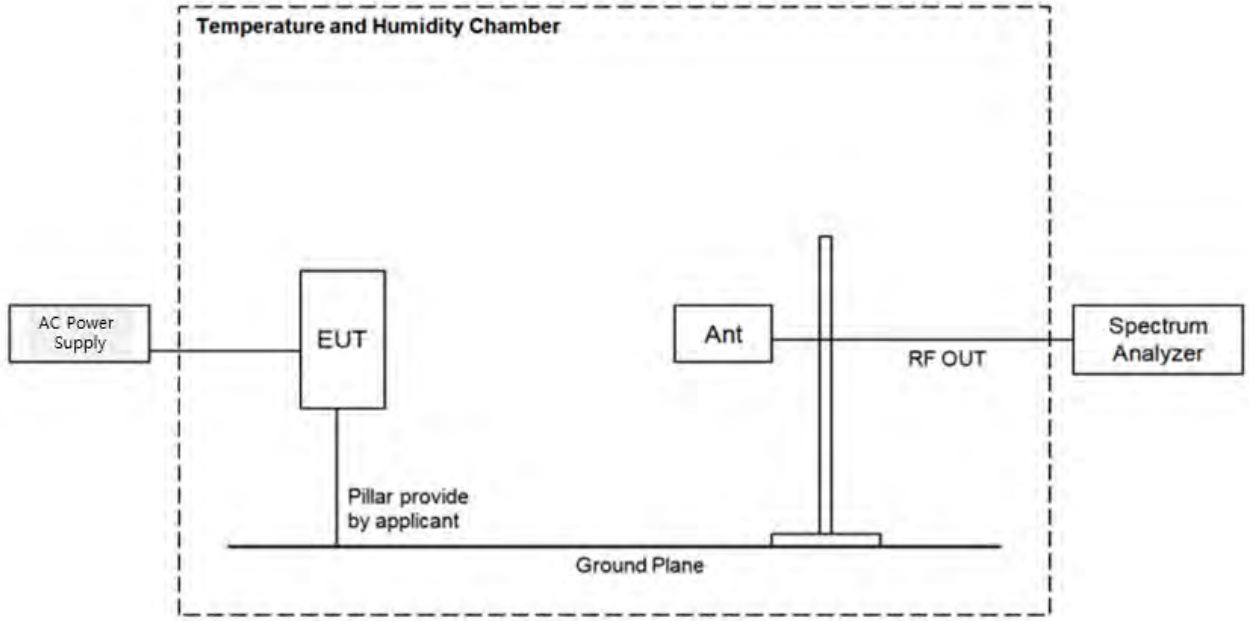
Occupied Bandwidth / EIRP / Band Edge / Radiated Spurious Emissions in 1 GHz to 40 GHz



Radiated Spurious Emissions in other bands



Frequency stability



4. TEST EQUIPMENTS

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
PXA Signal Analyzer	N9030A	Keysight	MY55410714	02/14/2023	Annual
PXA Signal Analyzer	N9030B	Keysight	MY60070602	10/22/2022	Annual
AC Power Supply	PCR2000MA	KIKUSUI	ZL002530	01/03/2023	Annual
DC Power Supply	PWR800L	KIKUSUI	RK000880	07/27/2023	Annual
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	2090	Emco	060520	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	Loop Antenna	Rohde & Schwarz	1513-175	05/18/2023	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	00895	07/14/2023	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1300	01/18/2024	Biennial
Horn Antenna	BBHA 9170	Schwarzbeck	BBHA9170541	11/16/2023	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	18042301	04/23/2024	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	18042302	04/23/2024	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	18042301	04/23/2024	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	18042302	04/23/2024	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	18050101	04/23/2024	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	18050102	04/23/2024	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	18050101	04/23/2024	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	18050102	04/23/2024	Biennial
Harmonic Mixer	WR-5	VDI	SAX774	03/17/2023	Annual
Harmonic Mixer	WR-8	VDI	SAX779	03/17/2023	Annual
Harmonic Mixer	WR-12	VDI	SAX773	03/17/2023	Annual
Harmonic Mixer	WR-19	VDI	SAX771	03/16/2023	Annual
Source Module	WR-19	OML INC.	S19MS-A-160516-1	09/02/2023	Annual
Source Module	WR-12	OML INC.	S12MS-A-160419-1	09/02/2023	Annual
Source Module	WR-08	OML INC.	S08MS-A-160419-1	09/02/2023	Annual
Source Module	WR-05	OML INC.	S05MS-A-160419-1	09/02/2023	Annual
Temperature and Humidity Chamber	NY-THR18750	NANGYEUL CO., LTD.	NY-2009012201A	01/14/2023	Annual

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.

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

1. Contiguous

28 GHz 1CC 50 MHz

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured OBW (MHz)
A	45°	1	Low	27.525	QPSK	45.843
					16QAM	46.038
					64QAM	46.025
					256QAM	45.758
			Middle	27.925	QPSK	45.890
					16QAM	46.068
					64QAM	46.033
					256QAM	45.076
			High	28.325	QPSK	45.920
					16QAM	45.865
					64QAM	45.900
					256QAM	45.884
B	135°	1	Low	27.525	QPSK	45.933
					16QAM	45.925
					64QAM	46.078
					256QAM	45.986
			Middle	27.925	QPSK	46.014
					16QAM	46.078
					64QAM	46.082
					256QAM	45.918
			High	28.325	QPSK	46.062
					16QAM	45.882
					64QAM	45.938
					256QAM	45.910

28 GHz 1CC 100 MHz, 8CC

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)
A	45°	1	Low	QPSK	27.55	94.363
				16QAM		94.189
				64QAM		94.247
				256QAM		94.383
		8		QPSK	27.90	786.57
				16QAM		788.10
				64QAM		786.83
				256QAM		788.31
B	135°	1		QPSK	27.55	94.219
				16QAM		94.314
				64QAM		94.409
				256QAM		94.384
		8		QPSK	27.90	787.39
				16QAM		785.83
				64QAM		787.34
				256QAM		787.97
A	45°	1	Middle	QPSK	27.925	94.423
				16QAM		94.355
				64QAM		94.242
				256QAM		94.213
		8		QPSK	27.925	787.10
				16QAM		788.34
				64QAM		786.81
				256QAM		786.84
B	135°	1		QPSK	27.925	94.446
				16QAM		94.211
				64QAM		94.362
				256QAM		94.271
		8		QPSK	27.925	787.78
				16QAM		787.54
				64QAM		787.37
				256QAM		787.09

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)
A	45°	1	High	QPSK	28.30	94.299
				16QAM		94.264
				64QAM		94.011
				256QAM		94.300
		8		QPSK	27.95	787.06
				16QAM		788.03
				64QAM		787.82
				256QAM		787.45
B	135°	1		QPSK	28.30	94.163
				16QAM		94.160
				64QAM		94.137
				256QAM		94.355
		8		QPSK	27.95	787.45
				16QAM		787.89
				64QAM		788.75
				256QAM		788.63

39 GHz 1CC, 16CC

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)
A	45°	1	Low	QPSK	37.65	94.246
				16QAM		94.211
				64QAM		94.122
				256QAM		94.207
		16		QPSK	38.40	1 580.2
				16QAM		1 582.2
				64QAM		1 580.9
				256QAM		1 581.5
B	135°	1		QPSK	37.65	94.167
				16QAM		94.194
				64QAM		94.264
				256QAM		94.295
		16		QPSK	38.40	1 579.9
				16QAM		1 579.3
				64QAM		1 582.5
				256QAM		1 582.7
A	45°	1	Middle	QPSK	38.45	94.256
				16QAM		94.240
				64QAM		94.293
				256QAM		94.343
		16		QPSK	38.45	1 579.8
				16QAM		1 583.8
				64QAM		1 581.8
				256QAM		1 581.4
B	135°	1		QPSK	38.45	94.338
				16QAM		94.139
				64QAM		94.165
				256QAM		94.318
		16		QPSK	38.45	1 581.1
				16QAM		1 581.3
				64QAM		1 582.7
				256QAM		1 580.4

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)
A	45°	1	High	QPSK	39.25	94.241
				16QAM		94.430
				64QAM		94.393
				256QAM		94.091
		16		QPSK	38.50	1 578.7
				16QAM		1 582.0
				64QAM		1 579.9
				256QAM		1 579.0
B	135°	1		QPSK	39.25	94.532
				16QAM		94.392
				64QAM		94.348
				256QAM		94.383
		16		QPSK	38.50	1 582.2
				16QAM		1 580.0
				64QAM		1 580.9
				256QAM		1 581.2

2. Non-Contiguous

28 GHz 1+7 CC_Low

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)_Left	Measured OBW (MHz)_Right	SUM OBW (MHz)
A	135°	1+7	Low	QPSK	27.55	94.345	687.94	782.29
				16QAM		94.218	688.87	783.09
				64QAM		94.460	688.63	783.09
				256QAM		94.443	688.76	783.20
B	45°	1+7		QPSK	28.00	94.415	688.55	782.97
				16QAM		94.423	688.52	782.94
				64QAM		94.433	688.44	782.88
				256QAM		94.206	689.41	783.62

28 GHz 7+1 CC_Low

Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)_Left	Measured OBW (MHz)_Right	SUM OBW (MHz)
A	135°	7+1	Low	QPSK	27.85	94.239	688.10	782.34
				16QAM		94.258	687.55	781.81
				64QAM		94.092	688.02	782.11
				256QAM		94.156	687.18	781.34
B	45°	7+1		QPSK	28.30	94.213	688.53	782.75
				16QAM		94.332	688.32	782.65
				64QAM		94.361	687.74	782.10
				256QAM		94.341	688.54	782.88

39 GHz 1+15 CC_Low

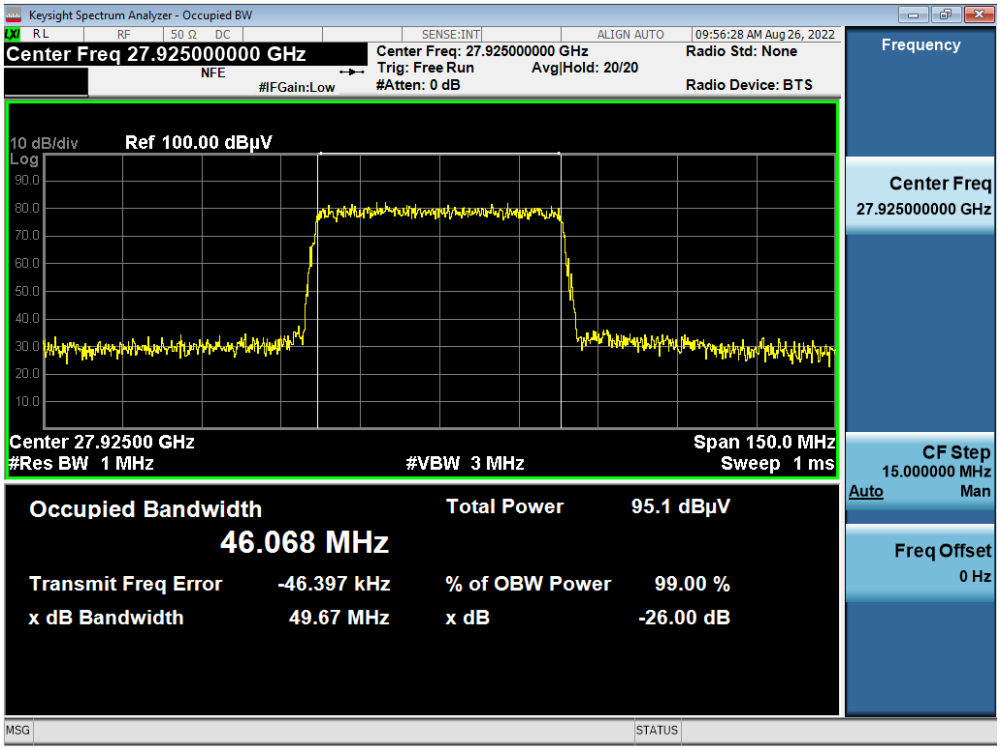
Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)_Left	Measured OBW (MHz)_Right	SUM OBW (MHz)
A	135°	1+15	Low	QPSK	37.65	94.342	1 482.1	1 576.4
				16QAM		94.245	1 484.1	1 578.3
				64QAM		94.281	1 483.1	1 577.4
				256QAM		94.216	1 482.5	1 576.7
B	45°	1+15		QPSK	38.55	94.254	1 482.5	1 576.8
				16QAM		94.277	1 482.6	1 576.9
				64QAM		94.366	1 483.1	1 577.4
				256QAM		94.176	1 482.0	1 576.1

39 GHz 15+1 CC_Low

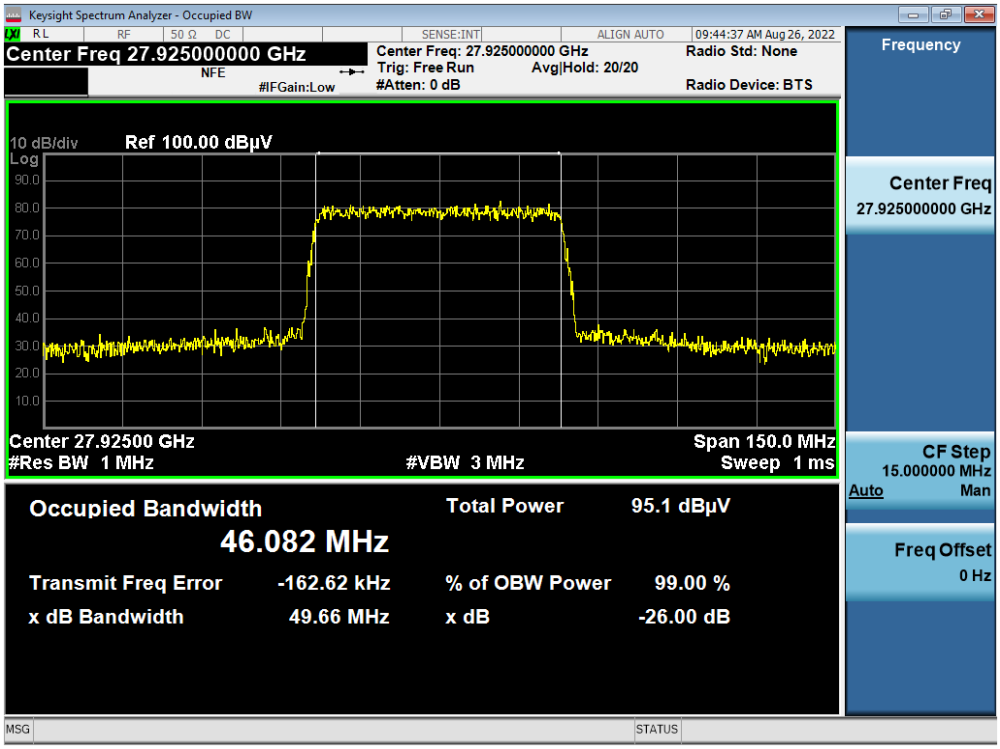
Ant.	Ant. Angle	CC	Channel	Mod.	Freq. (GHz)	Measured OBW (MHz)_Left	Measured OBW (MHz)_Right	SUM OBW (MHz)
A	135°	15+1	Low	QPSK	38.35	1 478.5	94.387	1 572.9
				16QAM		1 480.3	94.215	1 574.5
				64QAM		1 481.0	94.386	1 575.4
				256QAM		1 479.9	94.421	1 574.3
B	45°	15+1		QPSK	39.25	1 479.2	94.240	1 573.5
				16QAM		1 480.1	94.395	1 574.4
				64QAM		1 479.2	94.286	1 573.5
				256QAM		1 481.6	94.372	1 576.0

Plot Data of RF Occupied Bandwidth

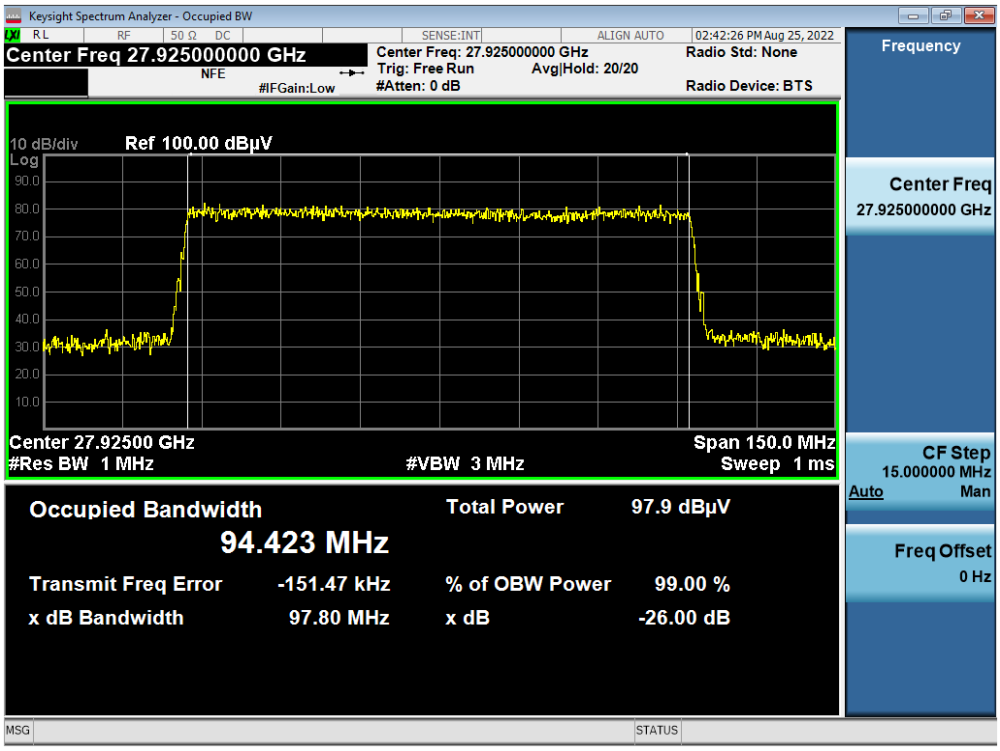
Antenna A / 28 GHz 1CC 50 MHz / 16QAM / Middle



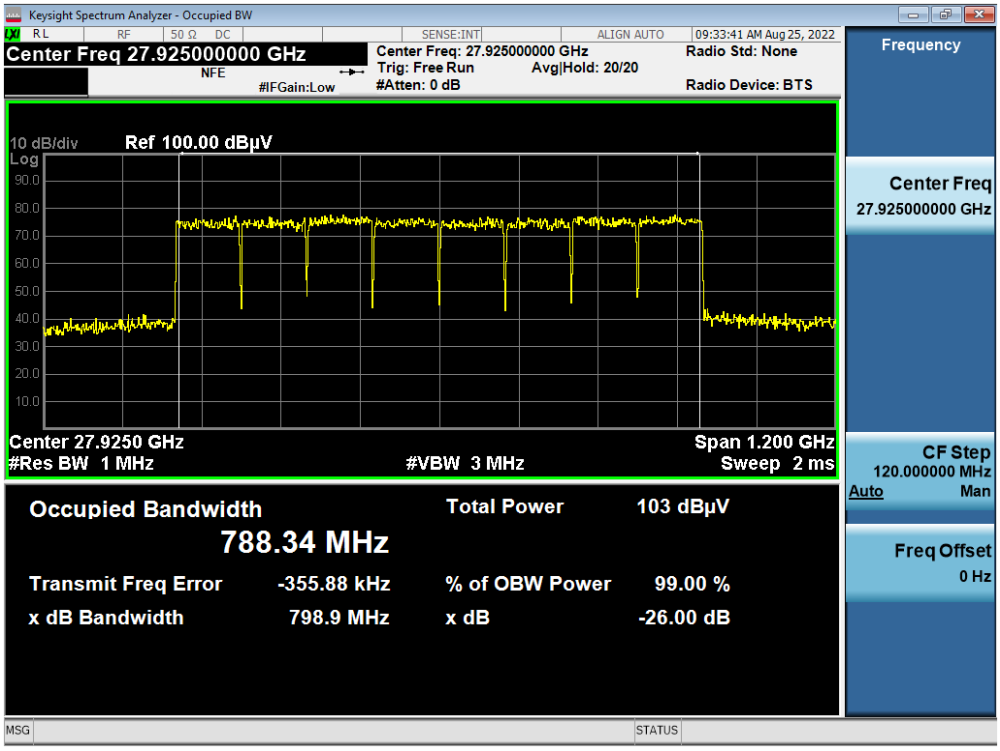
Antenna B / 28 GHz 1CC 50 MHz / 64QAM / Middle



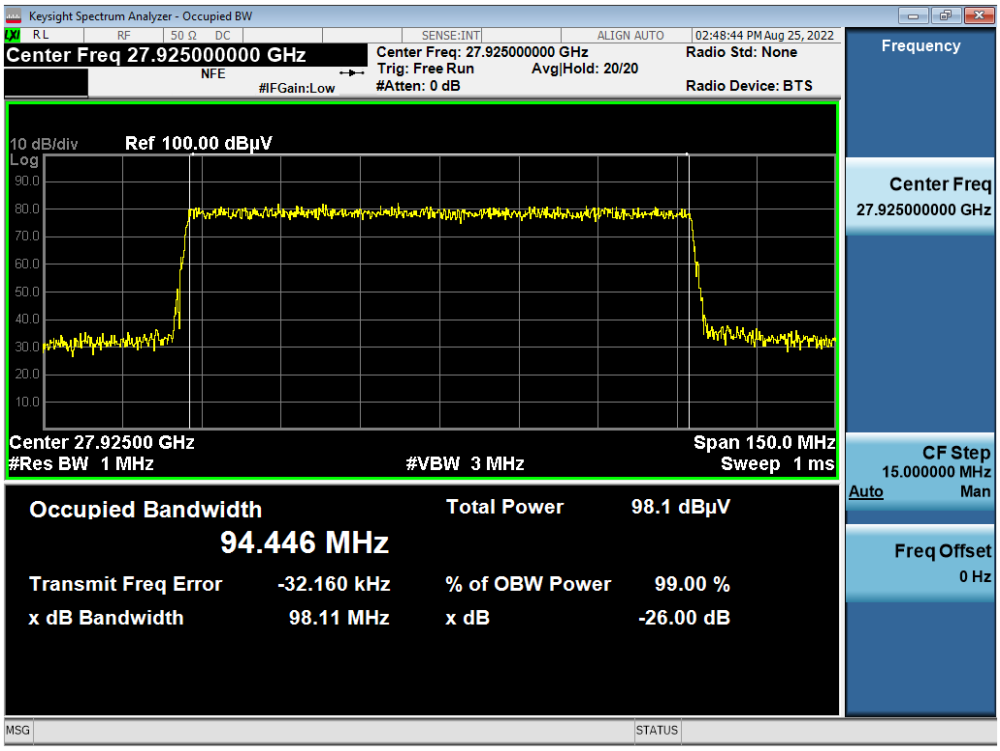
Antenna A / 28 GHz 1CC 100 MHz / QPSK / Middle



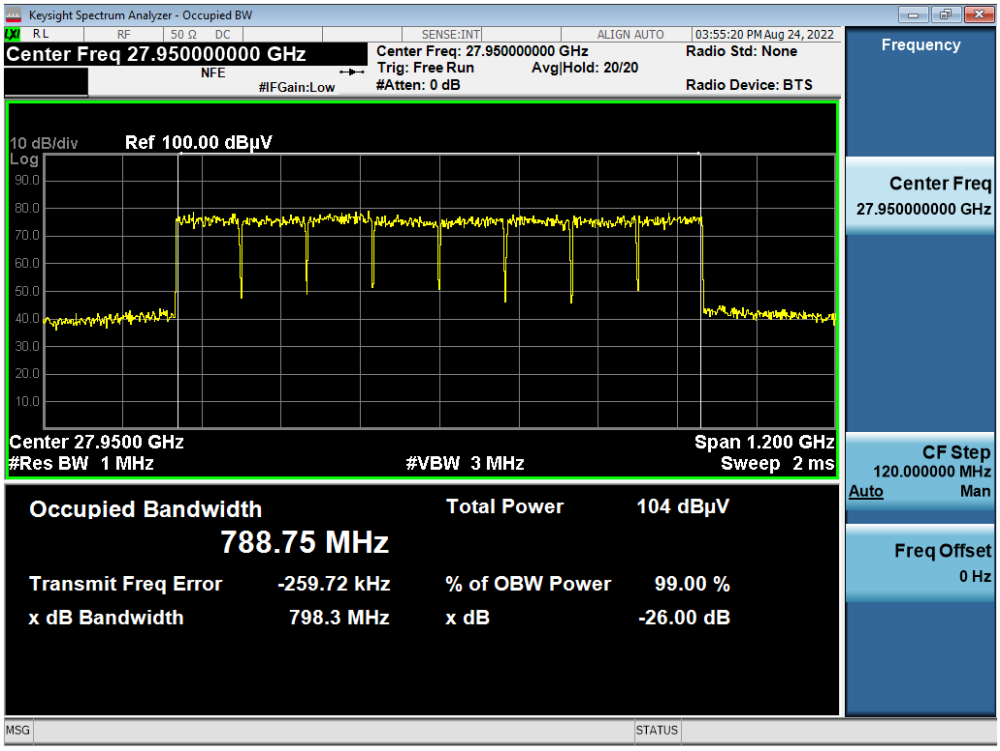
Antenna A / 28 GHz 8CC 100 MHz / 16QAM / Middle



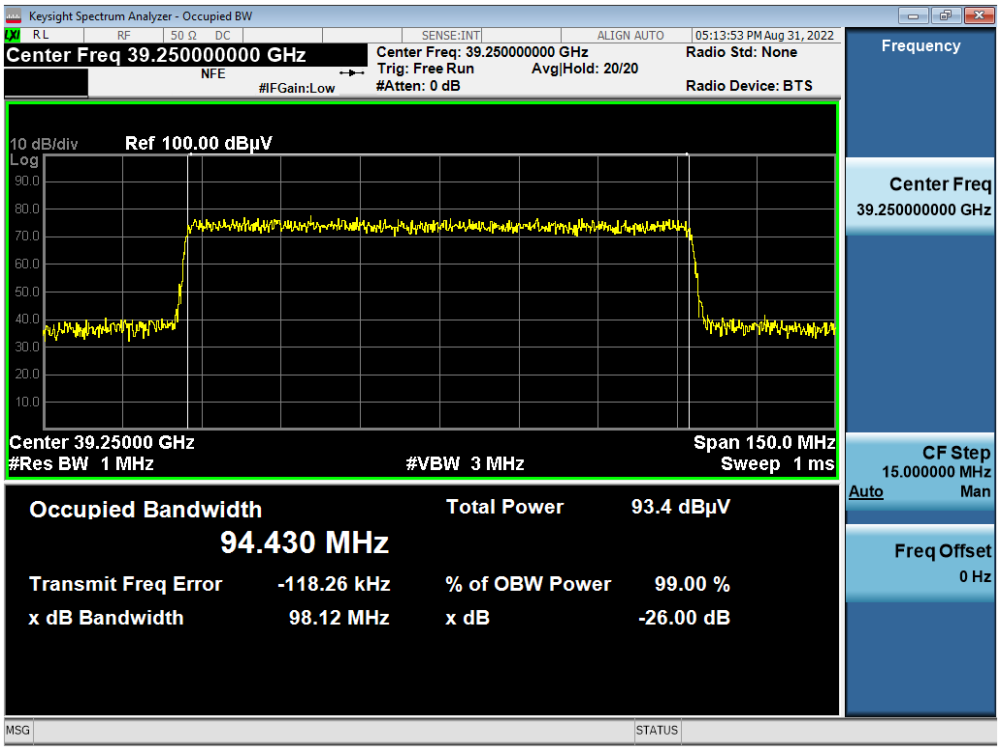
Antenna B / 28 GHz 1CC 100 MHz / QPSK / Middle



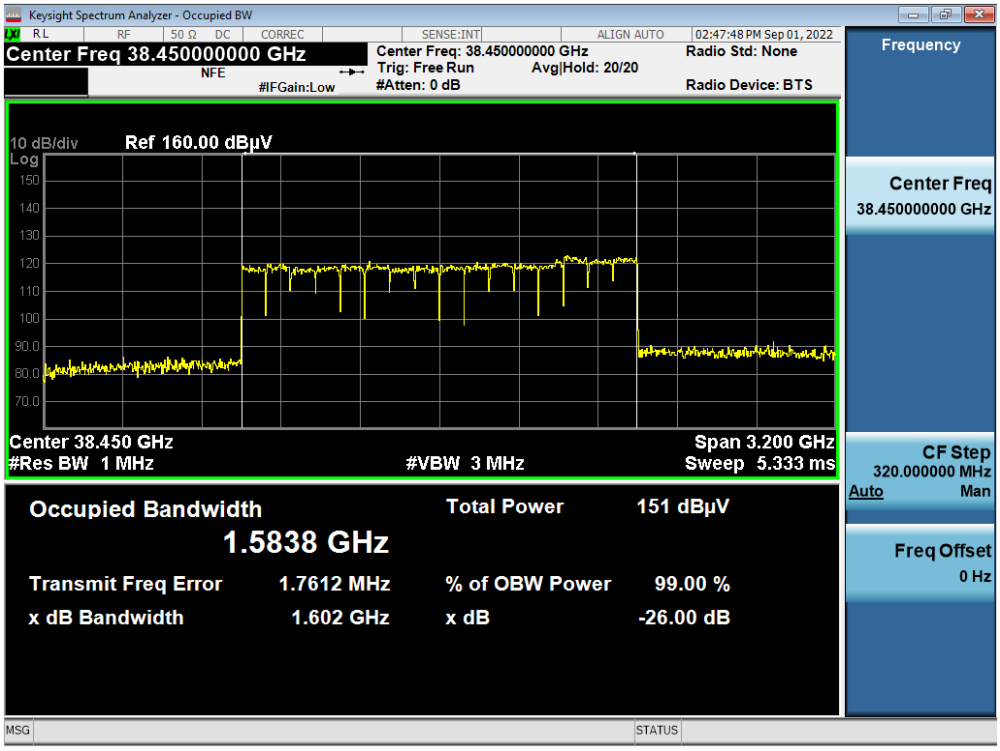
Antenna B / 28 GHz 8CC 100 MHz / 64QAM / High



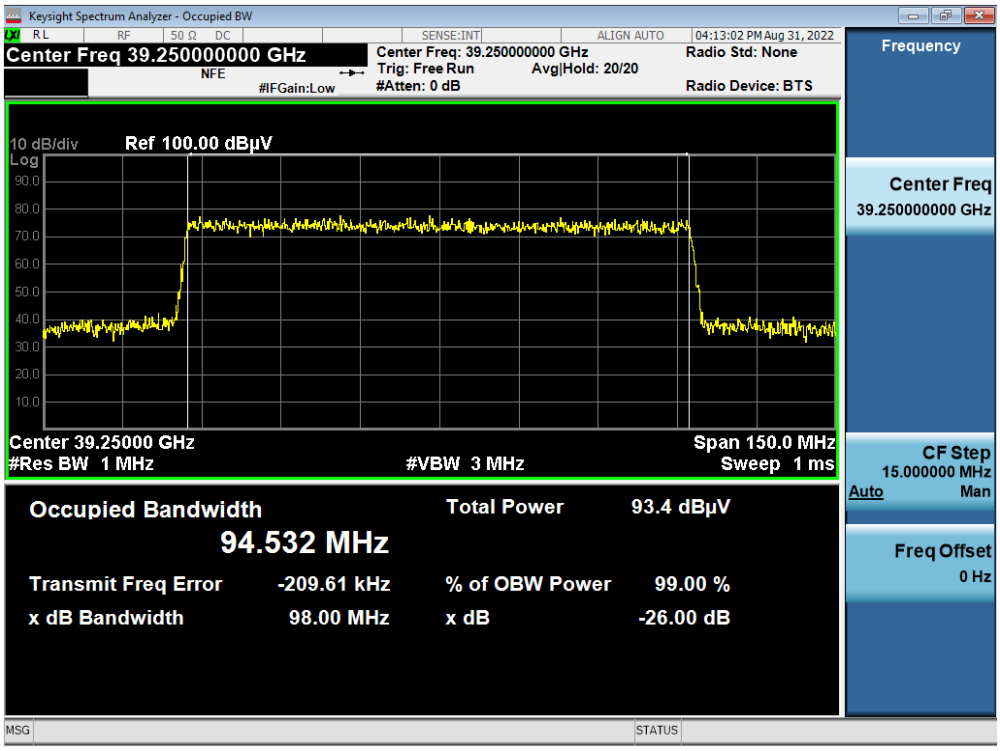
Antenna A / 39 GHz 1CC / 16QAM / High



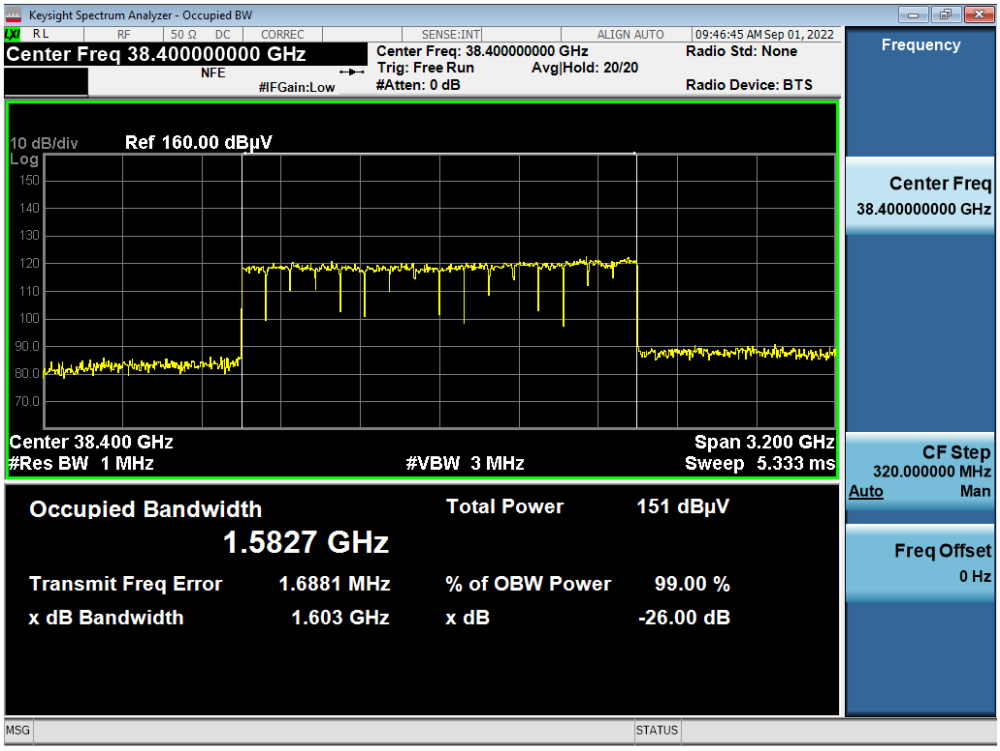
Antenna A / 39 GHz 16CC / 16QAM / Middle



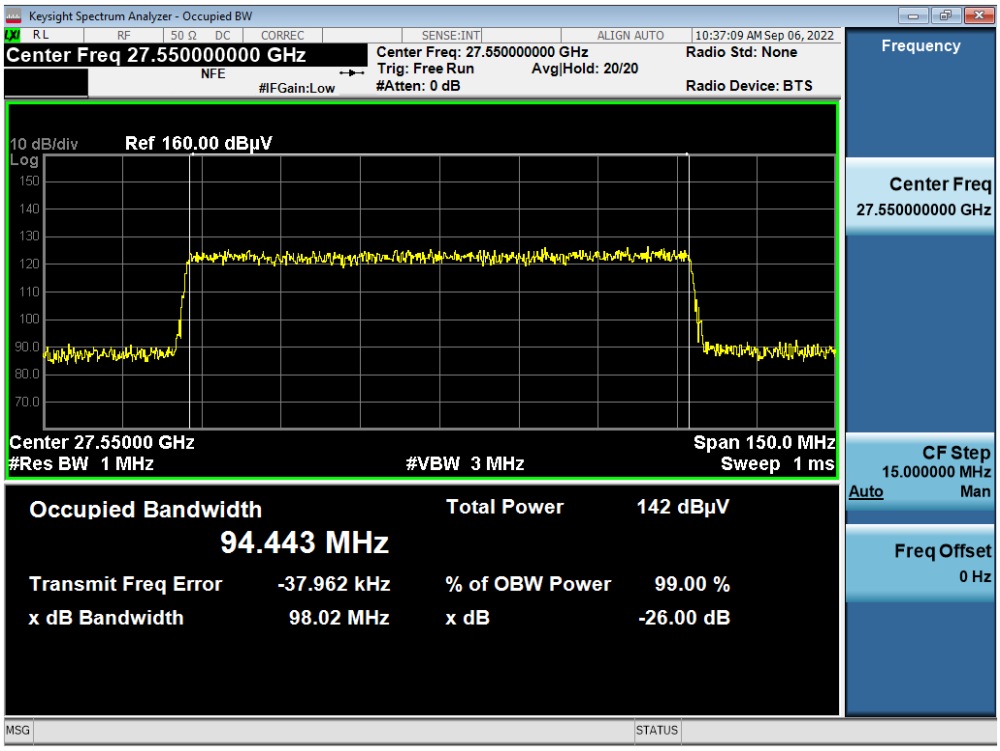
Antenna B / 39 GHz 1CC / QPSK / High



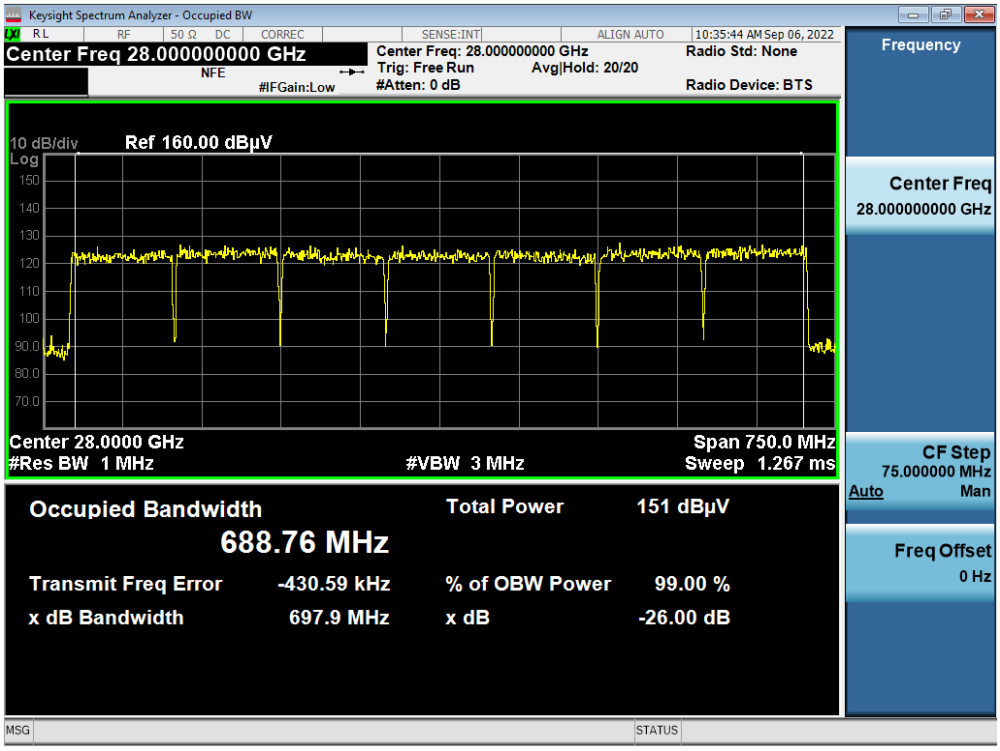
Antenna B / 39 GHz 16CC / 256QAM / Low



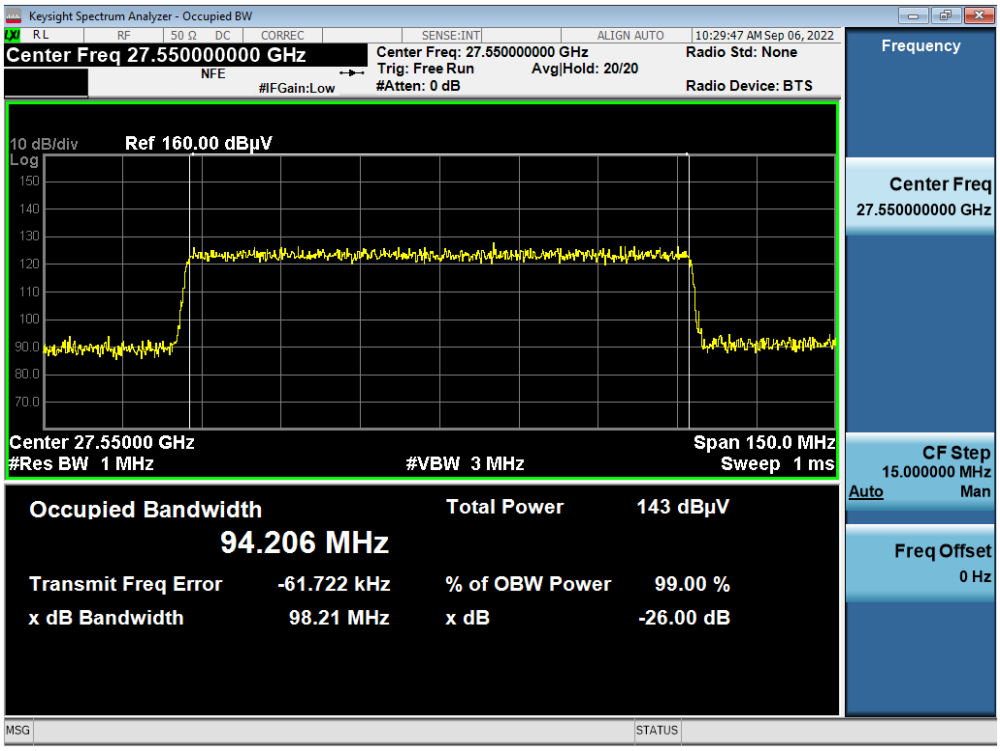
Antenna A / 28 GHz 1+7 CC / 256QAM / Low_Left



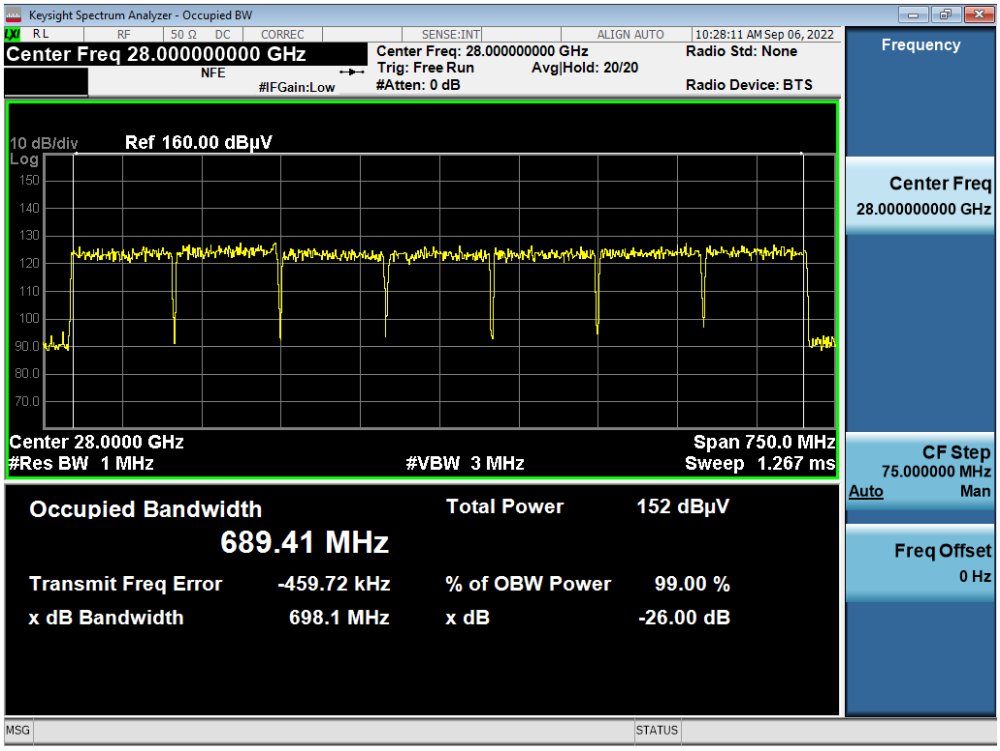
Antenna A / 28 GHz 1+7 CC / 256QAM / Low_Right



Antenna B / 28 GHz 1+7 CC / 256QAM / Low_Left

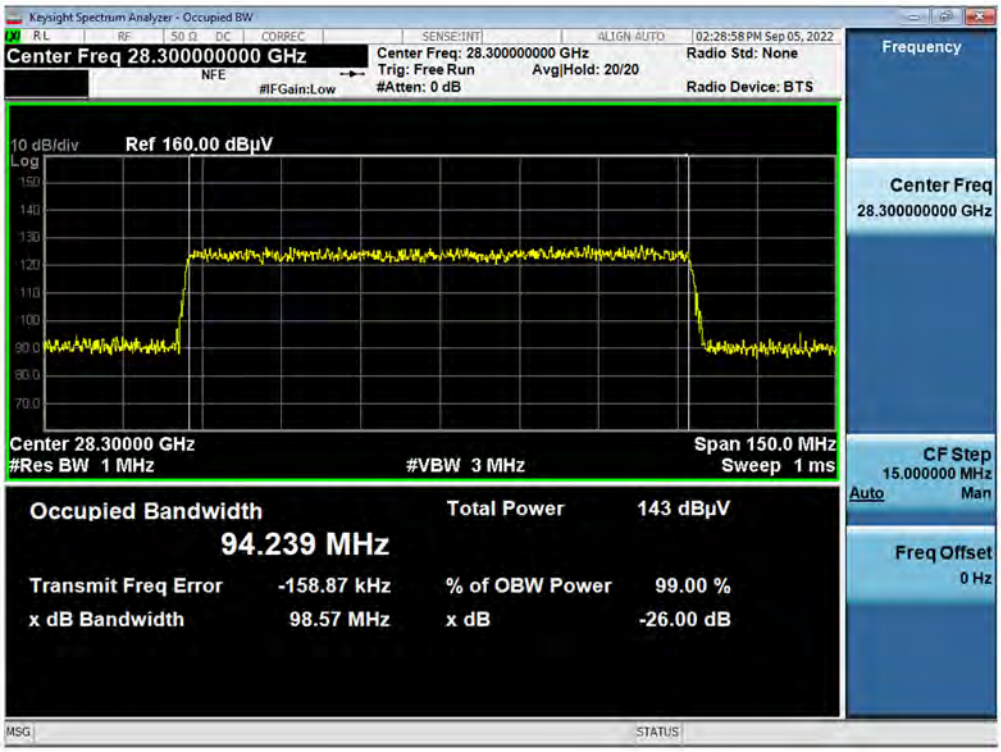


Antenna B / 28 GHz 1+7 CC / 256QAM / Low_Right

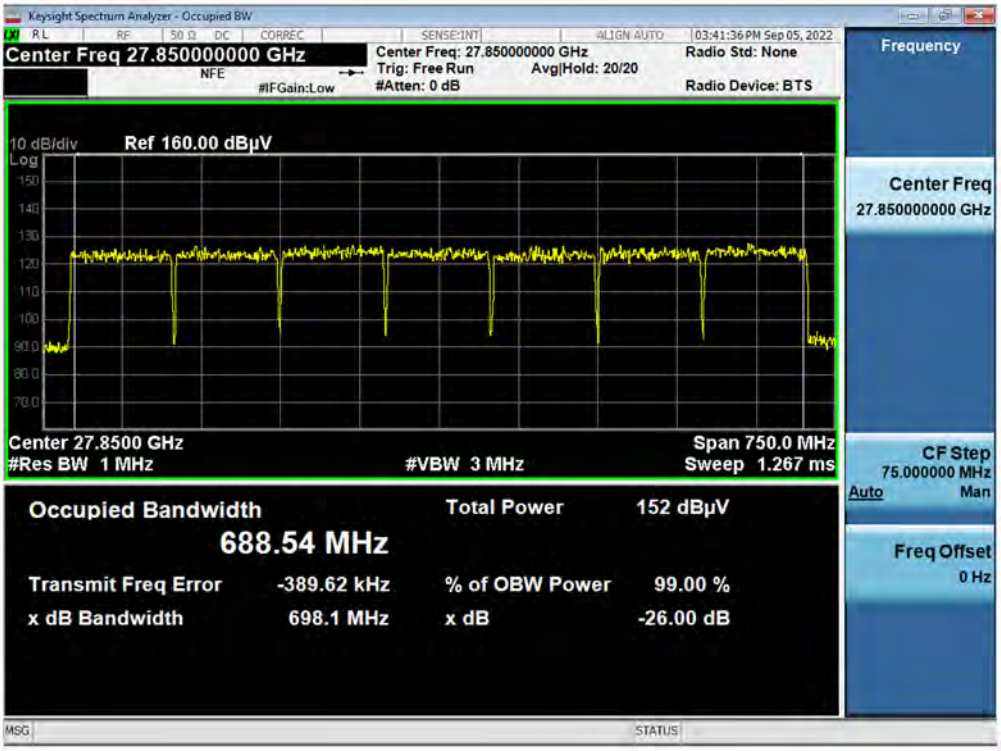


Antenna A / 28 GHz 7+1 CC / QPSK / Low_Left

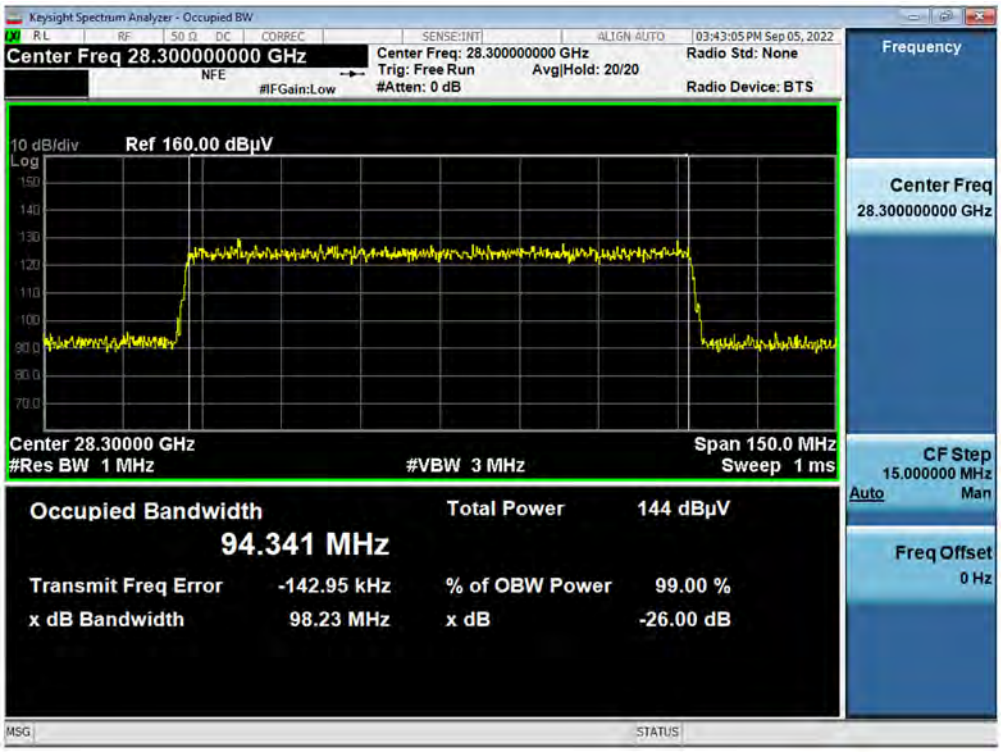
Antenna A / 28 GHz 7+1 CC / QPSK / Low_Right



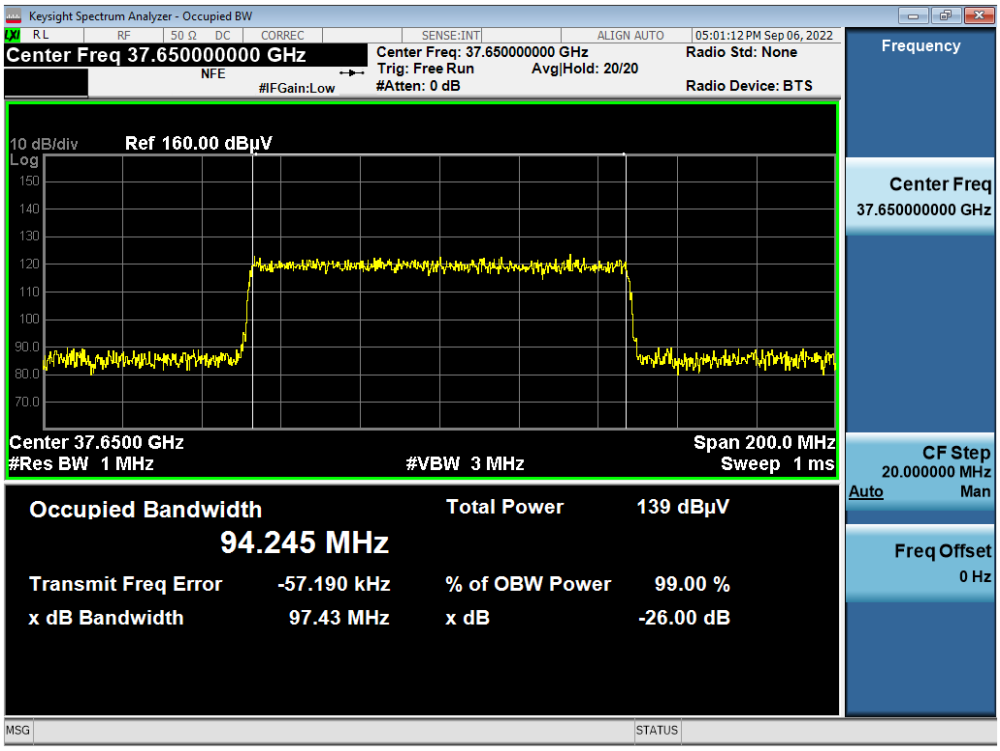
Antenna B / 28 GHz 7+1 CC / 256QAM / Low_Left



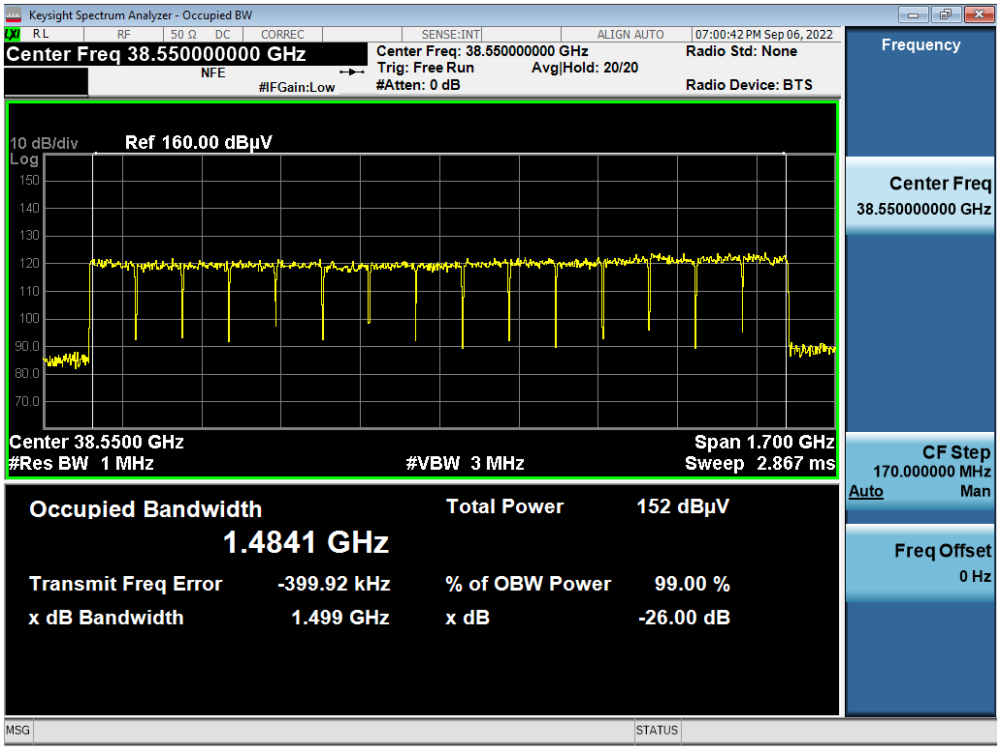
Antenna B / 28 GHz 7+1 CC / 256QAM / Low_Right



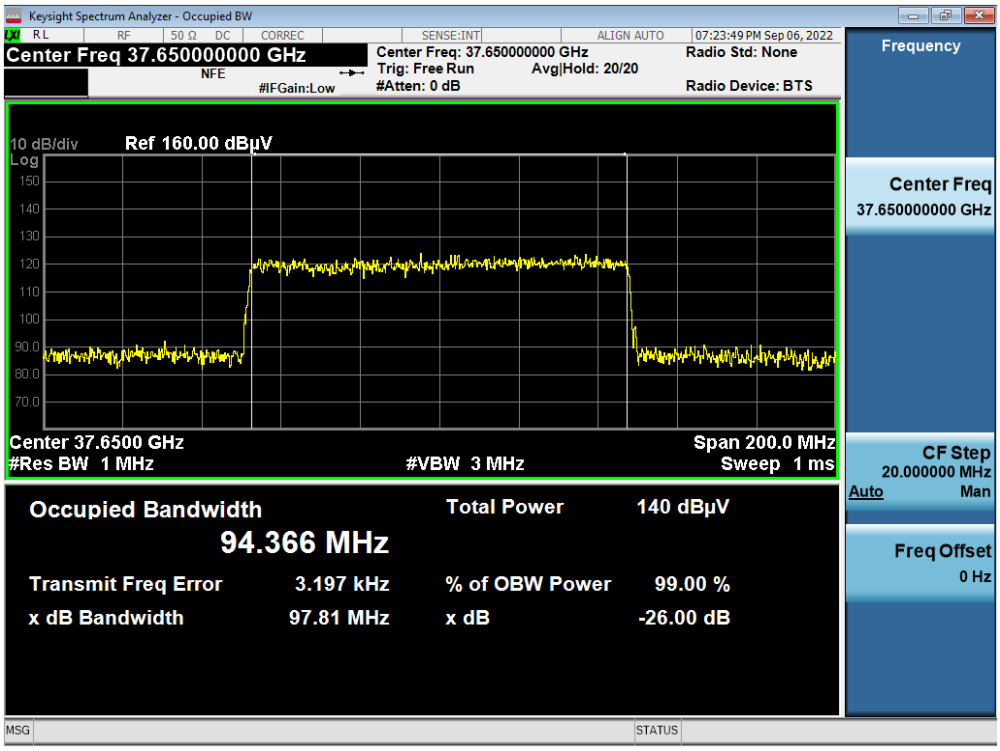
Antenna A / 39 GHz 1+15 CC / 16QAM / Low_Left



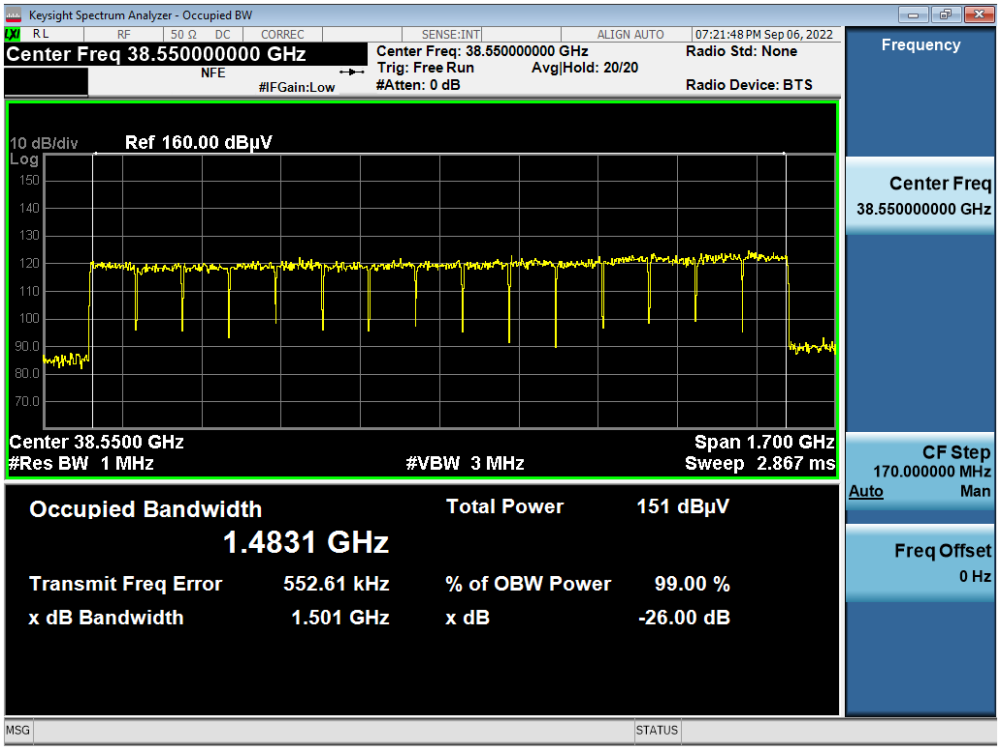
Antenna A / 39 GHz 1+15 CC / 16QAM / Low_Right



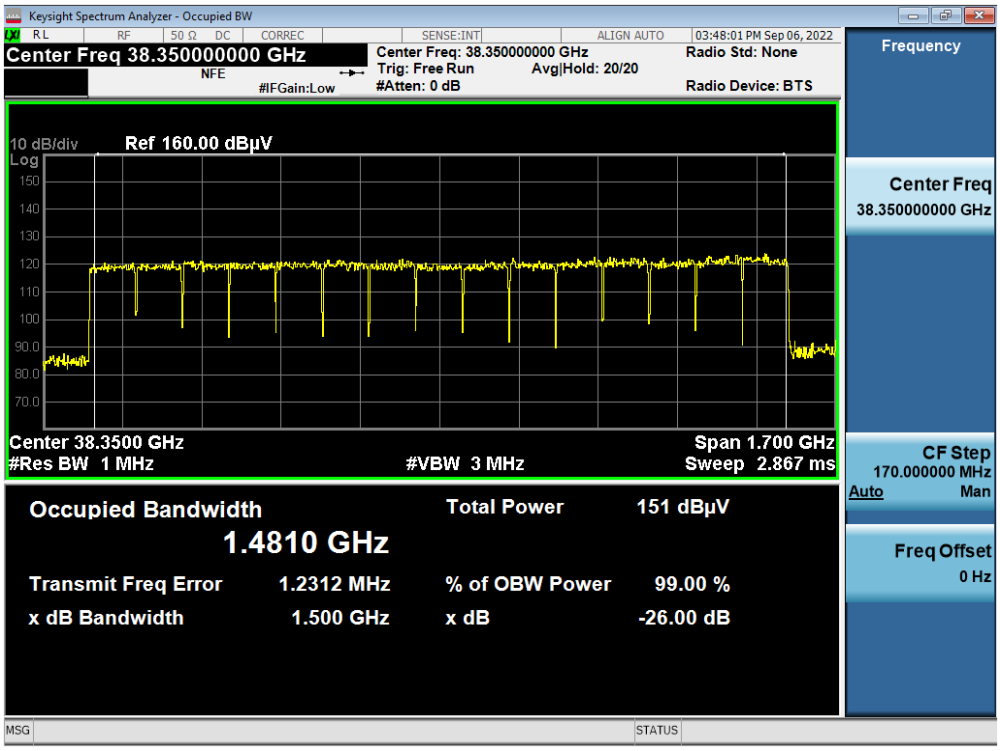
Antenna B / 39 GHz 1+15 CC / 64QAM / Low_Left



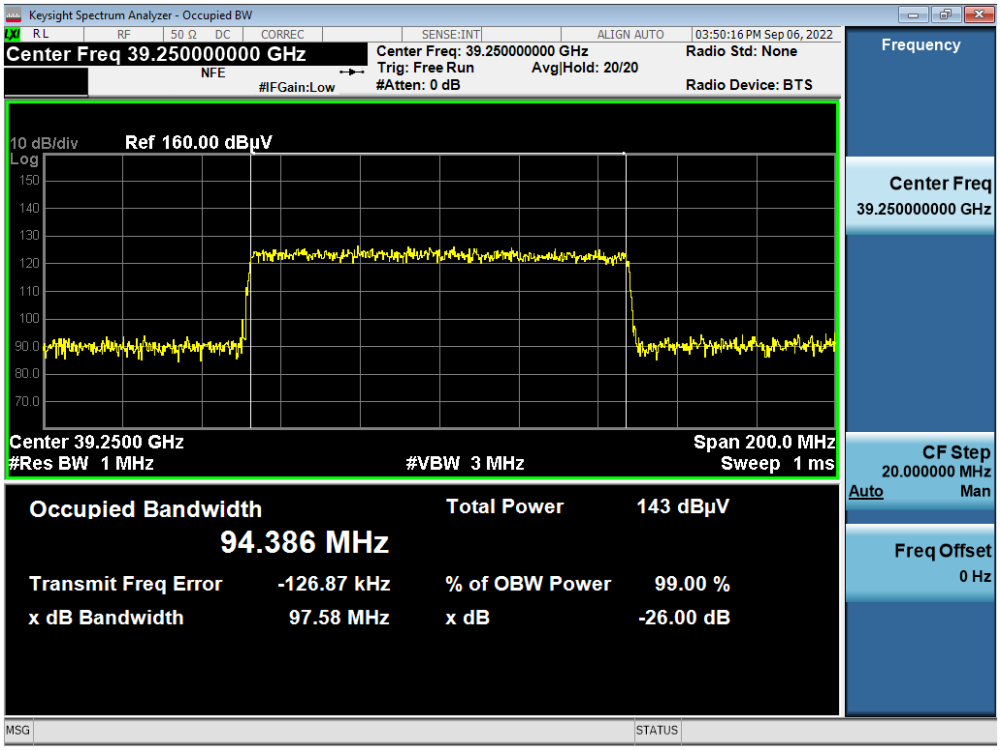
Antenna B / 39 GHz 1+15 CC / 64QAM / Low_Right



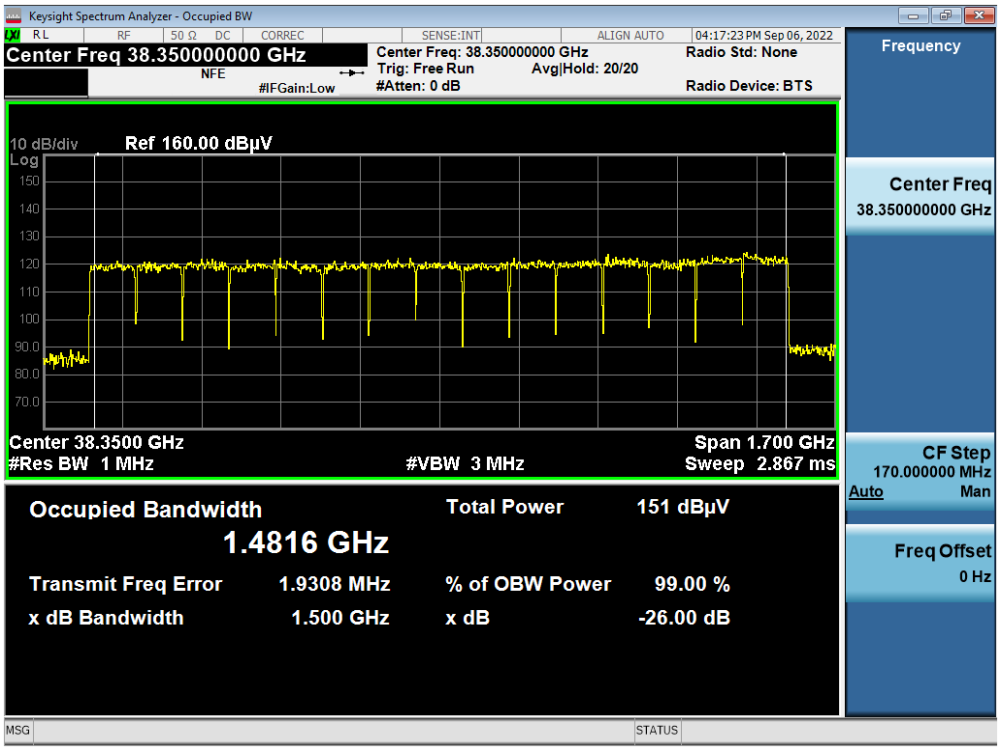
Antenna A / 39 GHz 15+1 CC / 64QAM / Low_Left



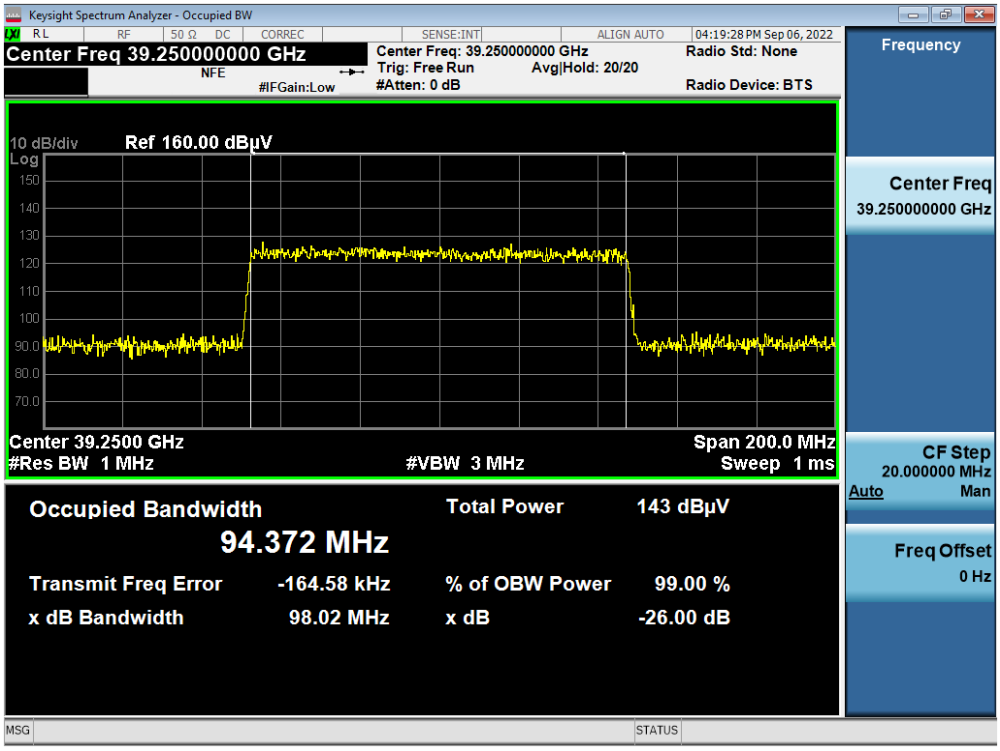
Antenna A / 39 GHz 15+1 CC / 64QAM / Low_Right



Antenna B / 39 GHz 15+1 CC / 256QAM / Low_Left



Antenna B / 39 GHz 15+1 CC / 256QAM / Low_Right



5.2. EIRP DENSITY

FCC Rules

Test Requirements:

§ 30.202 Power limits.

(a) For fixed and base stations operating in connection with mobile systems, the average power of the sum of all antenna elements is limited to an equivalent isotopically radiated power (EIRP) density of +75dBm/100 MHz. For channel bandwidths less than 100 megahertz the EIRP must be reduced proportionally and linearly based on the bandwidth relative to 100 megahertz.

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. In this test, EUT is operated only measurement path is turned on and path has straight beamforming.
2. For 8CC and 16CC measurement, test is performed for all carriers of 100 MHz bandwidth, but recorded only maximum output level.
3. The angle of antenna is set as maximum radiated power conditions.
4. The output tolerance of the EUT in the specification is ±3 dB and test result satisfies this condition.
5. Measurement distance is applied far field condition in section 3.2.
6. EIRP is calculated from measured value according to section 5.2.7 of ANSI C63.26-2015, and the formula is as follows.

$$EIRP\ (dBm) = E\ (dB\mu V/m) + 20\log(6.6\ m) - 104.77$$
$$= E\ (dB\mu V/m) - 88.38$$

7. E (dBμV/m) value is considered AFCL and Duty cycle factor and it as follow.

   Sample calculation:

$$E\ (dB\mu V/m) = measurement\ value\ (dB\mu V) + AFCL\ (27.525\ GHz) + Duty\ cycle\ correction\ (73\ \%)$$
$$= measurement\ value\ (dB\mu V) + 47.39 + 1.3569$$

8. Final EIRP value as follow.

   Sample calculation:

$$89.21\ dB\mu V\ (measured\ Value) + 16.39(Distance\ Factor) - 104.77 + 47.39\ (AFCL) + 1.3569\ (Duty)$$
$$= 49.58\ dBm\ (Final\ EIRP)$$

9. All modes of operation and modulations were investigated. The test results included in this sections are worst case emission in each emission designator W7D, G7D.

Test Results:

1. Contiguous

28 GHz 1CC 50 MHz

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	1	Low	27.525	QPSK	89.21	75	49.58
					16QAM	89.16		49.52
					64QAM	89.25		49.62
					256QAM	89.23		49.60
			Middle	27.925	QPSK	90.05		50.54
					16QAM	89.98		50.47
					64QAM	89.77		50.26
					256QAM	90.53		51.02
			High	28.325	QPSK	89.79		50.36
					16QAM	89.63		50.20
					64QAM	89.83		50.40
					256QAM	89.93		50.51
B	45°	1	Low	27.525	QPSK	89.59		49.96
					16QAM	89.66		50.03
					64QAM	89.64		50.00
					256QAM	89.71		50.08
			Middle	27.925	QPSK	90.38		50.86
					16QAM	90.10		50.59
					64QAM	90.06		50.55
					256QAM	89.96		50.45
			High	28.325	QPSK	90.02		50.59
					16QAM	89.95		50.52
					64QAM	90.08		50.66
					256QAM	90.09		50.67

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	1	Low	QPSK	49.58	49.96	75	52.78
			16QAM	49.52	50.03		52.79
			64QAM	49.62	50.00		52.82
			256QAM	49.60	50.08		52.86
		Middle	QPSK	50.54	50.86		53.71
			16QAM	50.47	50.59		53.54
			64QAM	50.26	50.55		53.42
			256QAM	51.02	50.45		53.75
		High	QPSK	50.36	50.59		53.49
			16QAM	50.20	50.52		53.37
			64QAM	50.40	50.66		53.54
			256QAM	50.51	50.67		53.60

28 GHz 1CC 100 MHz, 8CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	1	Low	27.55	QPSK	93.56	75	53.95
					16QAM	92.87		53.26
					64QAM	92.75		53.13
					256QAM	92.69		53.08
			Middle	27.93	QPSK	92.61		53.10
					16QAM	92.70		53.18
					64QAM	92.96		53.44
					256QAM	92.87		53.36
			High	28.30	QPSK	93.75		54.45
					16QAM	93.54		54.25
					64QAM	93.36		54.07
					256QAM	93.47		54.18
		8	Low	27.90	QPSK	90.57		51.07
					16QAM	90.84		51.34
					64QAM	90.97		51.46
					256QAM	91.12		51.61
			Middle	27.93	QPSK	90.94		51.43
					16QAM	90.67		51.16
					64QAM	90.74		51.23
					256QAM	91.00		51.49
			High	27.95	QPSK	90.87		51.37
					16QAM	91.08		51.59
					64QAM	91.18		51.68
					256QAM	91.13		51.64

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
B	45°	1	Low	27.55	QPSK	92.98	75	53.37
					16QAM	92.99		53.38
					64QAM	92.91		53.29
					256QAM	92.84		53.23
			Middle	27.93	QPSK	92.92		53.41
					16QAM	92.90		53.38
					64QAM	93.03		53.51
					256QAM	92.90		53.39
			High	28.30	QPSK	93.58		54.29
					16QAM	93.47		54.18
					64QAM	93.62		54.33
					256QAM	93.57		54.28
		8	Low	27.90	QPSK	91.50		51.99
					16QAM	91.43		51.93
					64QAM	91.19		51.69
					256QAM	91.43		51.93
			Middle	27.93	QPSK	91.36		51.84
					16QAM	91.03		51.52
					64QAM	91.22		51.71
					256QAM	91.41		51.90
			High	27.95	QPSK	91.62		52.13
					16QAM	91.48		51.98
					64QAM	91.73		52.24
					256QAM	91.05		51.56

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	1	Low	QPSK	53.95	53.37	75	56.68
			16QAM	53.26	53.38		56.33
			64QAM	53.13	53.29		56.22
			256QAM	53.08	53.23		56.17
		Middle	QPSK	53.1	53.41		56.27
			16QAM	53.18	53.38		56.29
			64QAM	53.44	53.51		56.49
			256QAM	53.36	53.39		56.39
		High	QPSK	54.45	54.29		57.38
			16QAM	54.25	54.18		57.23
			64QAM	54.07	54.33		57.21
			256QAM	54.18	54.28		57.24
	8	Low	QPSK	51.07	51.99		54.56
			16QAM	51.34	51.93		54.66
			64QAM	51.46	51.69		54.59
			256QAM	51.61	51.93		54.78
		Middle	QPSK	51.43	51.84		54.65
			16QAM	51.16	51.52		54.35
			64QAM	51.23	51.71		54.49
			256QAM	51.49	51.9		54.71
		High	QPSK	51.37	52.13		54.78
			16QAM	51.59	51.98		54.80
			64QAM	51.68	52.24		54.98
			256QAM	51.57	51.48		54.54

39 GHz 1CC, 16CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	1	Low	37.65	QPSK	87.45	75	52.62
					16QAM	87.42		52.59
					64QAM	87.44		52.60
					256QAM	87.49		52.66
			Middle	38.45	QPSK	87.20		53.38
					16QAM	87.44		53.62
					64QAM	87.23		53.41
					256QAM	87.18		53.36
			High	39.25	QPSK	88.34		56.21
					16QAM	88.45		56.32
					64QAM	88.24		56.11
					256QAM	87.95		55.81
		16	Low	38.00	QPSK	136.84		49.82
					16QAM	136.56		49.54
					64QAM	136.87		49.85
					256QAM	137.24		50.22
			Middle	38.45	QPSK	137.34		50.32
					16QAM	137.70		50.68
					64QAM	137.62		50.60
					256QAM	137.43		50.41
			High	38.90	QPSK	137.30		50.27
					16QAM	137.30		50.28
					64QAM	137.55		50.53
					256QAM	136.94		49.92

*39 GHz 16CC measured value include AFCL factors.

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
B	45°	1	Low	37.65	QPSK	87.84	75	53.01
					16QAM	88.37		53.54
					64QAM	88.22		53.39
					256QAM	88.36		53.53
			Middle	38.45	QPSK	87.34		53.51
					16QAM	87.32		53.50
					64QAM	87.42		53.60
					256QAM	87.54		53.72
			High	39.25	QPSK	88.34		56.21
					16QAM	88.11		55.98
					64QAM	88.33		56.20
					256QAM	88.33		56.20
		16	Low	38.00	QPSK	137.20		50.18
					16QAM	137.03		50.01
					64QAM	136.84		49.82
					256QAM	137.03		50.01
			Middle	38.45	QPSK	137.72		50.70
					16QAM	137.73		50.70
					64QAM	137.62		50.60
					256QAM	137.52		50.50
			High	38.90	QPSK	137.42		50.40
					16QAM	137.37		50.34
					64QAM	137.54		50.51
					256QAM	137.42		50.40

*39 GHz 16CC measured value include AFCL factors.

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	1	Low	QPSK	52.62	53.01	75	55.83
			16QAM	52.59	53.54		56.10
			64QAM	52.6	53.39		56.02
			256QAM	52.66	53.53		56.13
		Middle	QPSK	53.38	53.51		56.46
			16QAM	53.62	53.5		56.57
			64QAM	53.41	53.6		56.52
			256QAM	53.36	53.72		56.55
		High	QPSK	56.21	56.21		59.22
			16QAM	56.32	55.98		59.16
			64QAM	56.11	56.2		59.17
			256QAM	55.81	56.2		59.02
	16	Low	QPSK	49.82	50.18		53.01
			16QAM	49.54	50.01		52.79
			64QAM	49.85	49.82		52.85
			256QAM	50.22	50.01		53.13
		Middle	QPSK	50.32	50.7		53.52
			16QAM	50.68	50.7		53.70
			64QAM	50.6	50.6		53.61
			256QAM	50.41	50.5		53.47
		High	QPSK	50.27	50.4		53.35
			16QAM	50.28	50.34		53.32
			64QAM	50.53	50.51		53.53
			256QAM	49.85	50.33		53.11

2. Non-Contiguous

28 GHz 1+7 CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	1+7	Low	27.55	QPSK	137.16	75	50.13
					16QAM	137.07		50.05
					64QAM	137.04		50.01
					256QAM	137.21		50.19
			High	28.00	QPSK	138.35		51.33
					16QAM	138.62		51.60
					64QAM	138.60		51.58
					256QAM	138.44		51.42
B	45°		Low	27.55	QPSK	137.84		50.82
					16QAM	137.62		50.60
					64QAM	137.92		50.89
					256QAM	138.11		51.09
			High	28.00	QPSK	138.65		51.63
					16QAM	138.83		51.81
					64QAM	140.30		53.28
					256QAM	139.31		52.29

*Measured value include AFCL factors.

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	1+7	Low	QPSK	50.13	50.82	75	53.50
			16QAM	50.05	50.6		53.34
			64QAM	50.01	50.89		53.48
			256QAM	50.19	51.09		53.67
		High	QPSK	51.33	51.63		54.49
			16QAM	51.60	51.81		54.72
			64QAM	51.58	53.28		55.52
			256QAM	51.42	52.29		54.89

28 GHz 7+1 CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	7+1	Low	27.85	QPSK	138.41	75	51.39
					16QAM	139.33		52.31
					64QAM	138.55		51.53
					256QAM	138.69		51.67
			High	28.30	QPSK	138.45		51.43
					16QAM	138.29		51.26
					64QAM	138.45		51.43
					256QAM	138.60		51.58
B	45°		Low	27.85	QPSK	138.96		51.94
					16QAM	139.02		52.00
					64QAM	139.26		52.24
					256QAM	139.10		52.08
			High	28.30	QPSK	138.80		51.77
					16QAM	138.93		51.91
					64QAM	138.70		51.67
					256QAM	138.88		51.85

*Measured value include AFCL factors.

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	7+1	Low	QPSK	51.39	51.94	75	54.68
			16QAM	52.31	52.00		55.17
			64QAM	51.53	52.24		54.91
			256QAM	51.67	52.08		54.89
		High	QPSK	51.43	51.77		54.61
			16QAM	51.26	51.91		54.61
			64QAM	51.43	51.67		54.56
			256QAM	51.58	51.85		54.73

39 GHz 1+15 CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	1+15	Low	37.65	QPSK	134.51	75	47.49
					16QAM	133.91		46.89
					64QAM	134.43		47.41
					256QAM	134.20		47.18
			High	38.55	QPSK	137.46		50.44
					16QAM	137.69		50.67
					64QAM	137.63		50.61
					256QAM	137.75		50.73
B	45°		Low	37.65	QPSK	134.71		47.69
					16QAM	134.57		47.55
					64QAM	134.29		47.27
					256QAM	135.09		48.07
			High	38.55	QPSK	138.20		51.18
					16QAM	138.06		51.03
					64QAM	138.07		51.05
					256QAM	138.07		51.05

*Measured value include AFCL factors.

Tabular Data of SUM EIRP Density

Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	1+15	Low	QPSK	47.49	47.69	75	50.60
			16QAM	46.89	47.55		50.24
			64QAM	47.41	47.27		50.35
			256QAM	47.18	48.07		50.66
		High	QPSK	50.44	51.18		53.84
			16QAM	50.67	51.03		53.86
			64QAM	50.61	51.05		53.85
			256QAM	50.73	51.05		53.90

39 GHz 15+1 CC

Tabular Data of EIRP Density per path

Ant.	Ant. Angle	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A	135°	15+1	Low	38.35	QPSK	137.09	75	50.06
					16QAM	136.40		49.38
					64QAM	137.54		50.52
					256QAM	137.43		50.40
			High	39.25	QPSK	137.43		50.41
					16QAM	137.91		50.89
					64QAM	137.73		50.71
					256QAM	137.12		50.1
B	45°		Low	38.35	QPSK	137.05		50.03
					16QAM	137.21		50.18
					64QAM	137.17		50.14
					256QAM	137.25		50.23
			High	39.25	QPSK	138.01		50.99
					16QAM	137.85		50.83
					64QAM	137.79		50.76
					256QAM	137.95		50.93

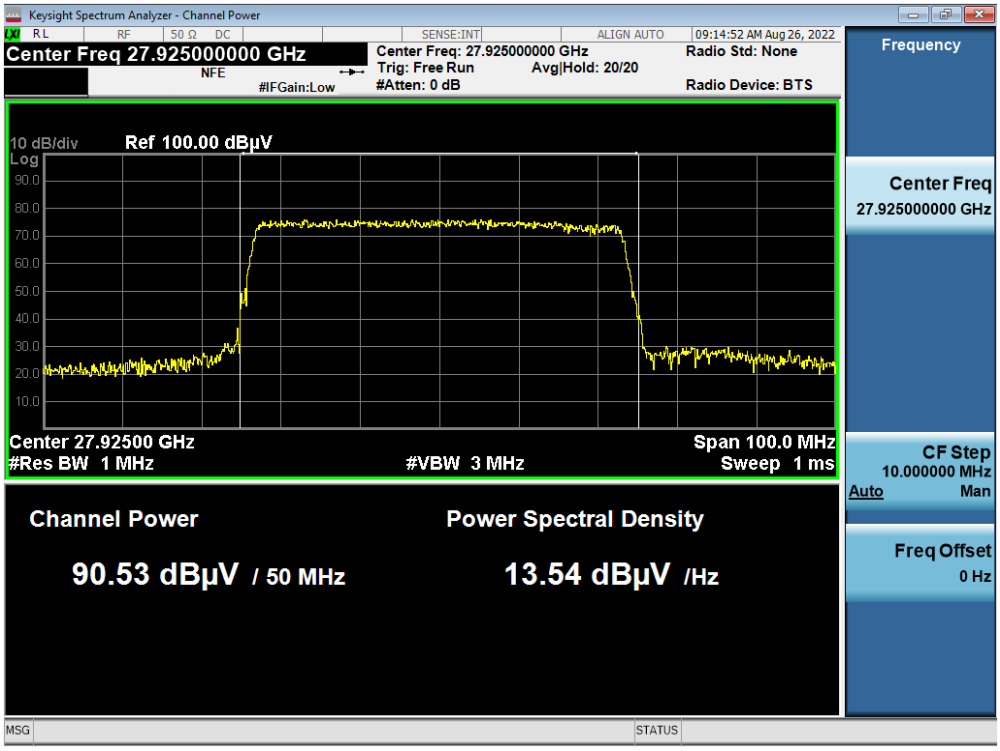
*Measured value include AFCL factors.

Tabular Data of SUM EIRP Density

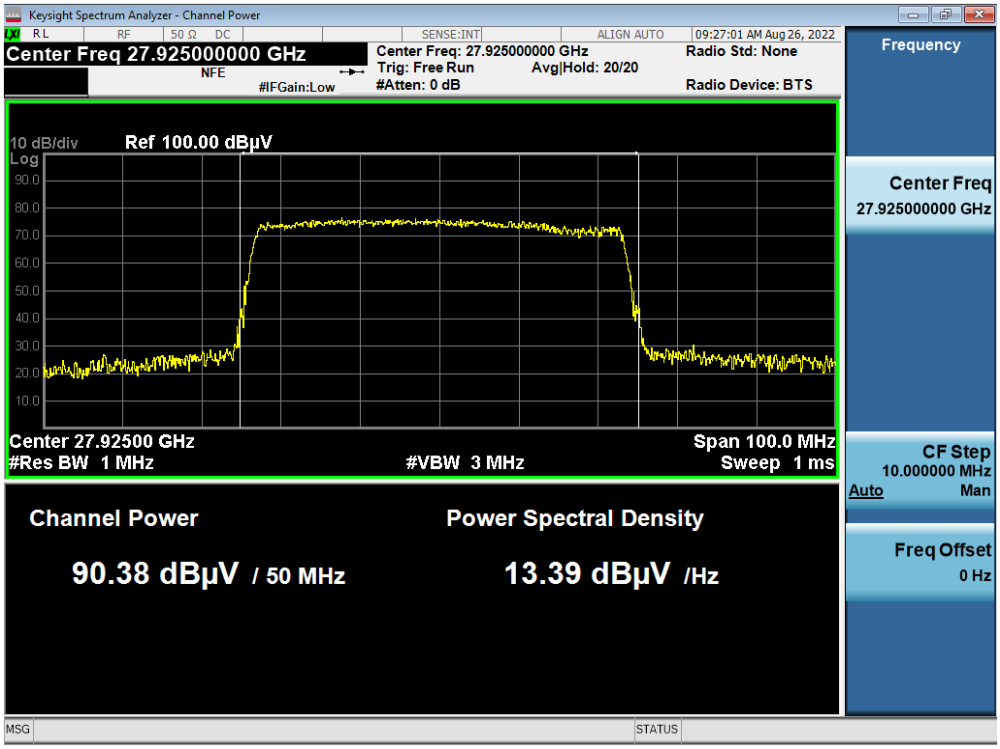
Ant.	CC	Channel	Modulation	Ant A EIRP (dBm/100 MHz)	Ant B EIRP (dBm/100 MHz)	Limit (dBm/100 MHz)	Calculated EIRP (dBm/100 MHz)
A+B	15+1	Low	QPSK	50.06	50.03	75	53.06
			16QAM	49.38	50.18		52.81
			64QAM	50.52	50.14		53.34
			256QAM	50.4	50.23		53.33
		High	QPSK	50.41	50.99		53.72
			16QAM	50.89	50.83		53.87
			64QAM	50.71	50.76		53.75
			256QAM	50.1	50.93		53.55

Plot Data of EIRP Density Tabular per path

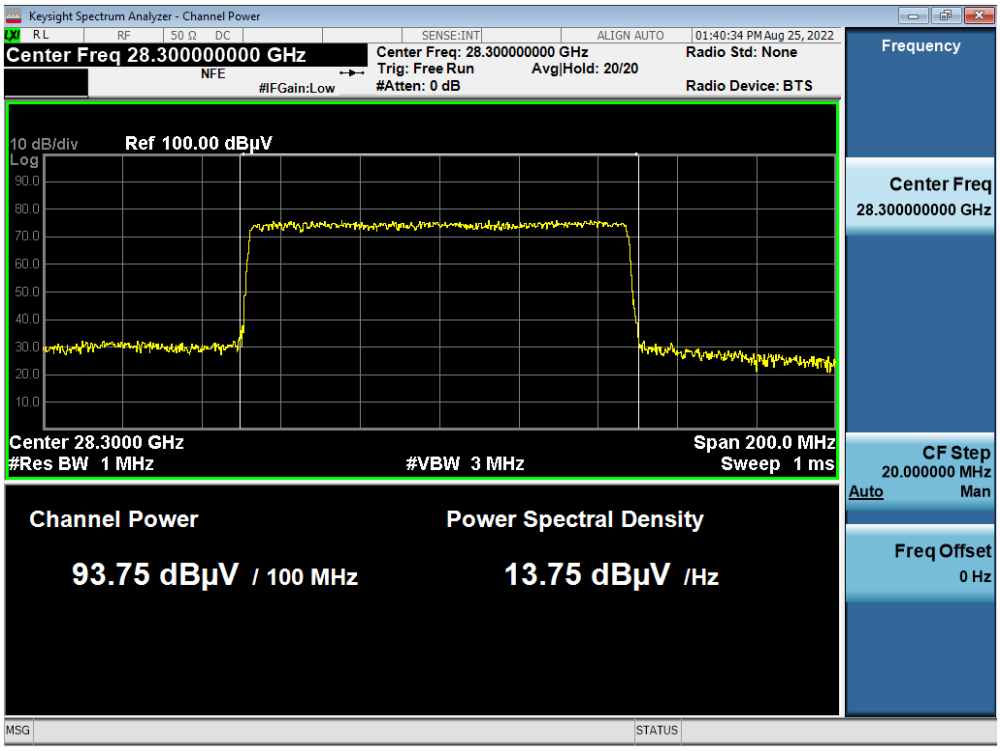
Antenna A / 28 GHz 1CC 50 MHz / 256QAM / Middle



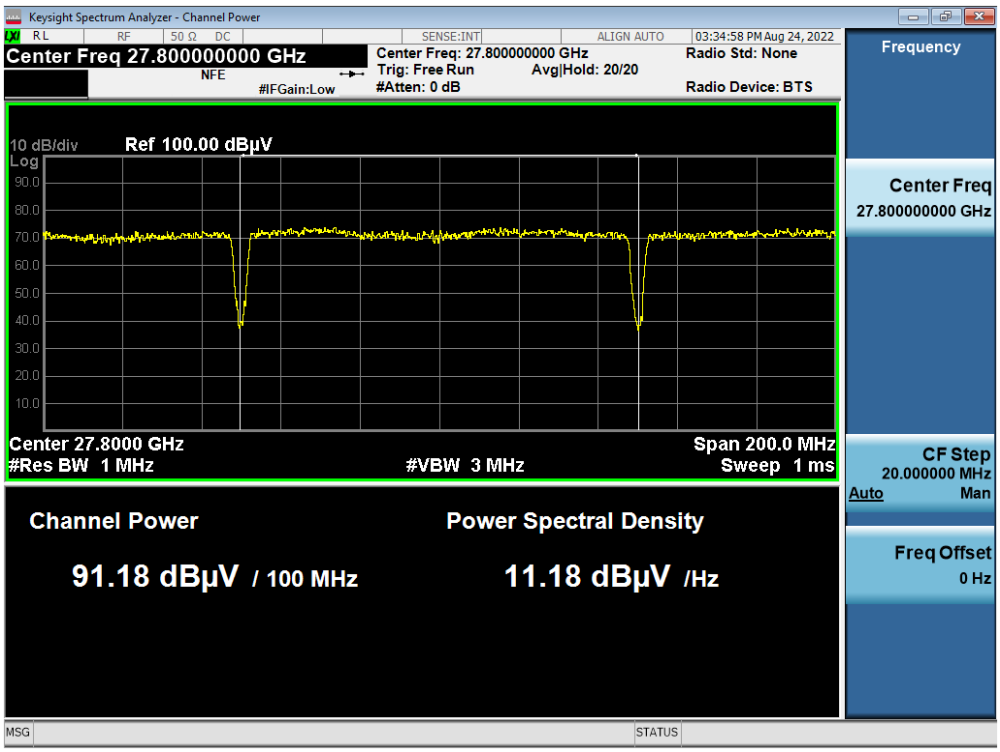
Antenna B / 28 GHz 1CC 50 MHz / QPSK / Middle



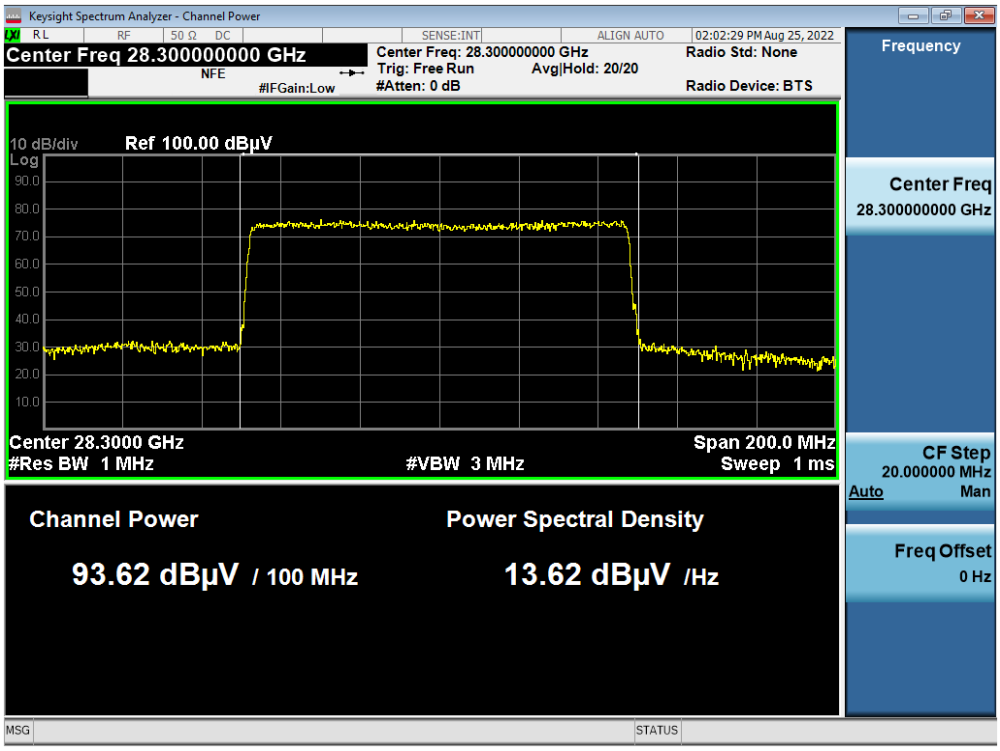
Antenna A / 28 GHz 1CC 100 MHz / QPSK / High



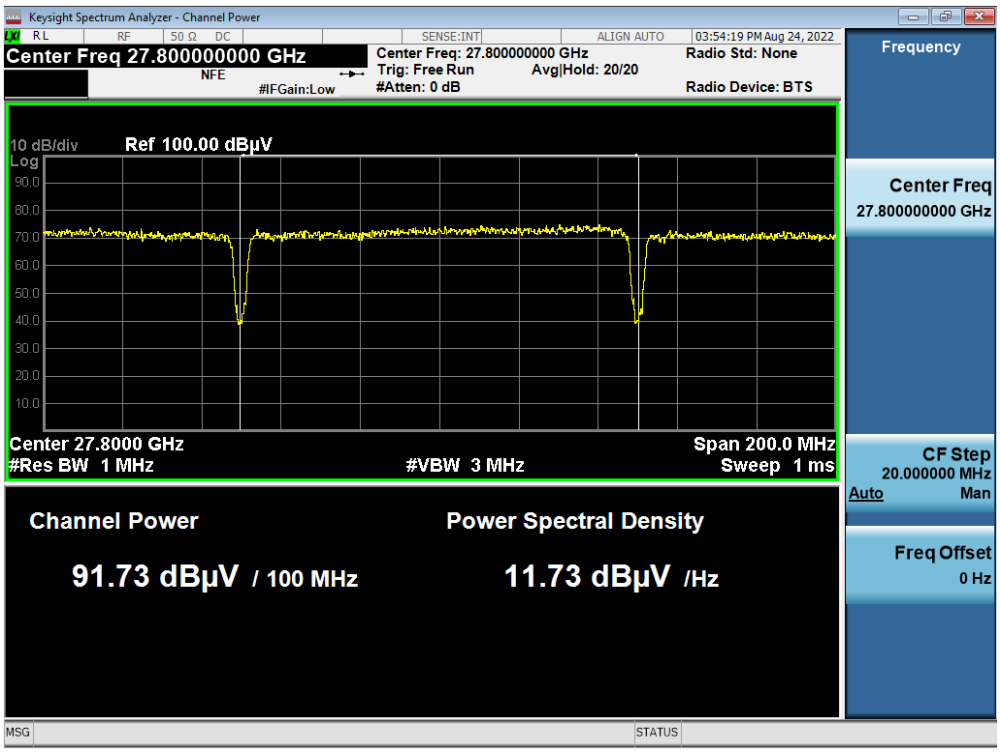
Antenna A / 28 GHz 8CC 100 MHz / 64QAM / High



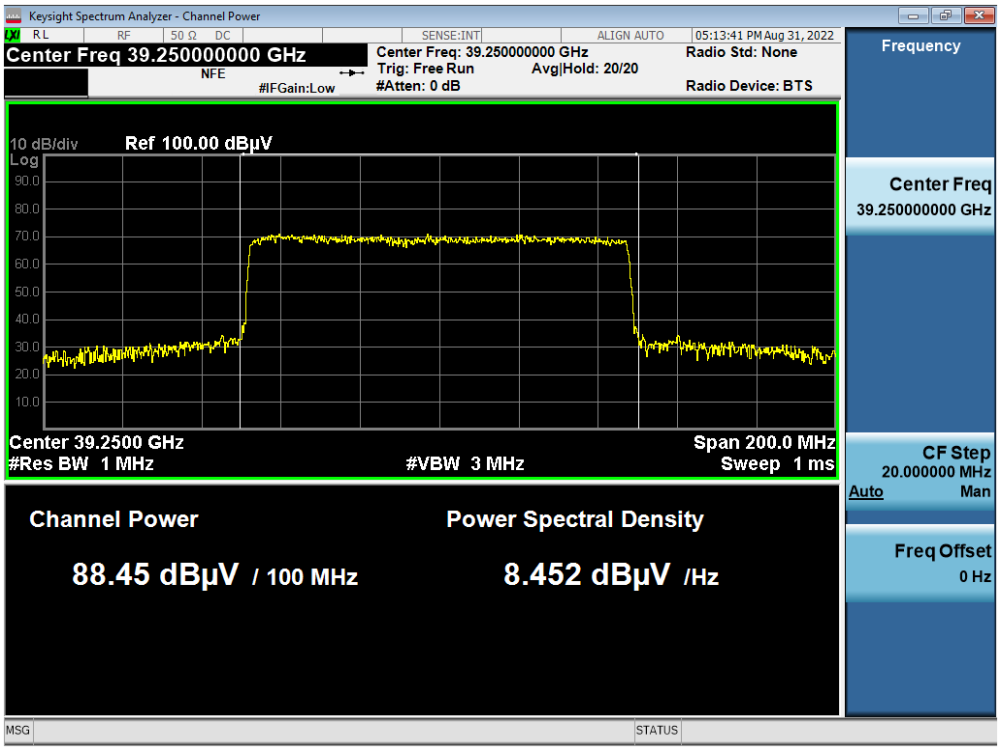
Antenna B / 28 GHz 1CC 100 MHz / 64QAM / High



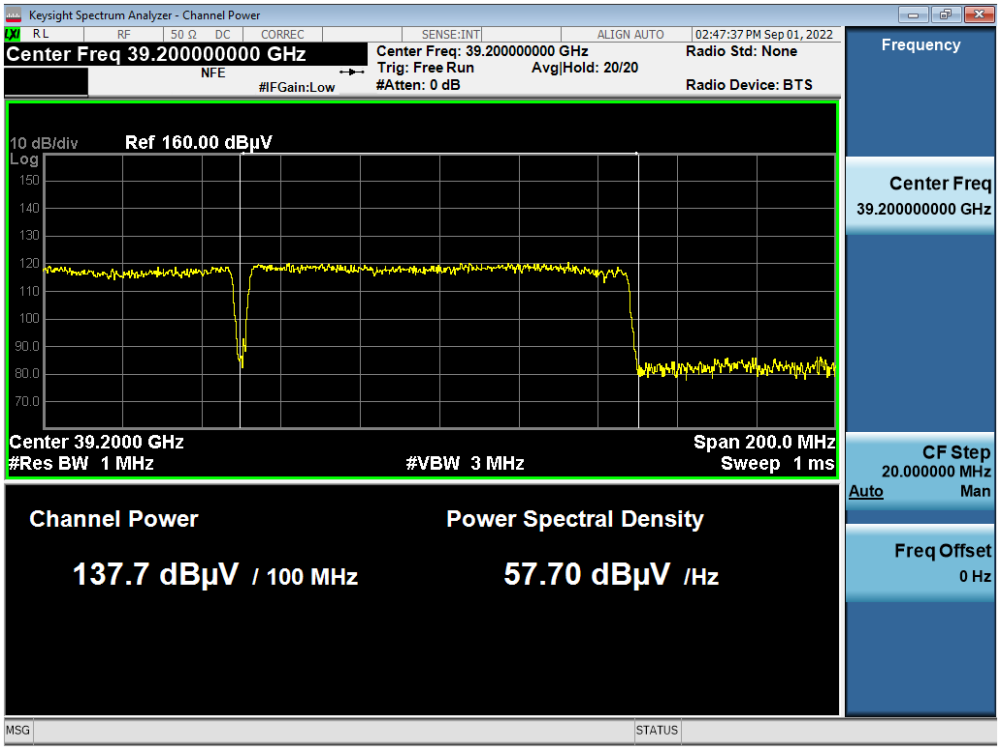
Antenna B / 28 GHz 8CC 100 MHz / 64QAM / High



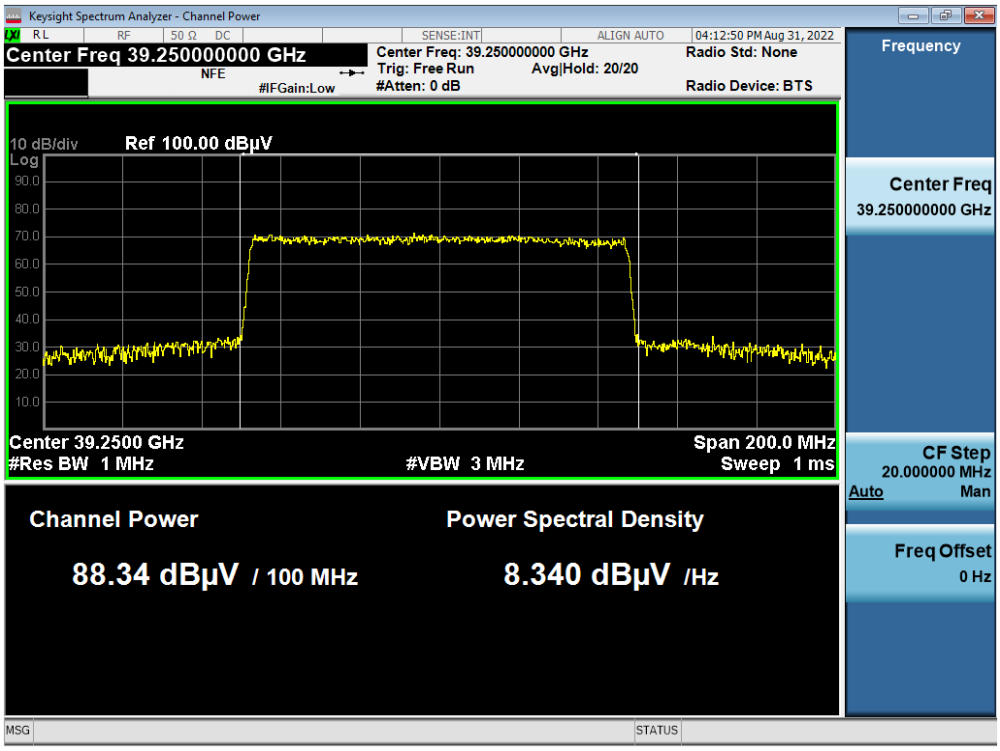
Antenna A / 39 GHz 1CC / 16QAM / High



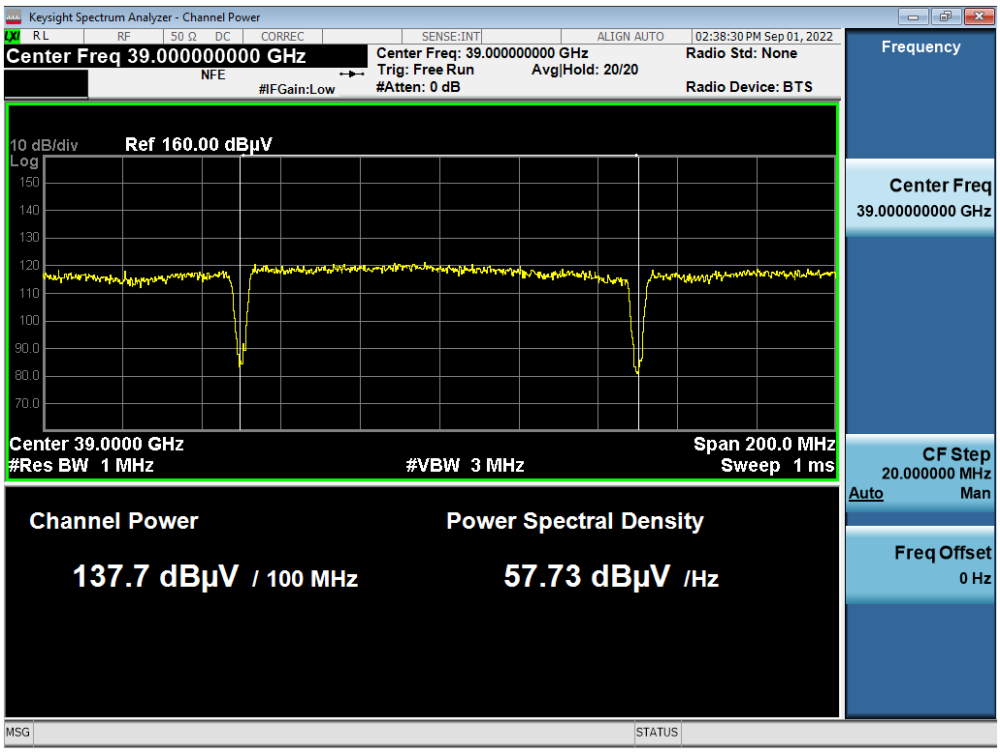
Antenna A / 39 GHz 16CC / 16QAM / Middle



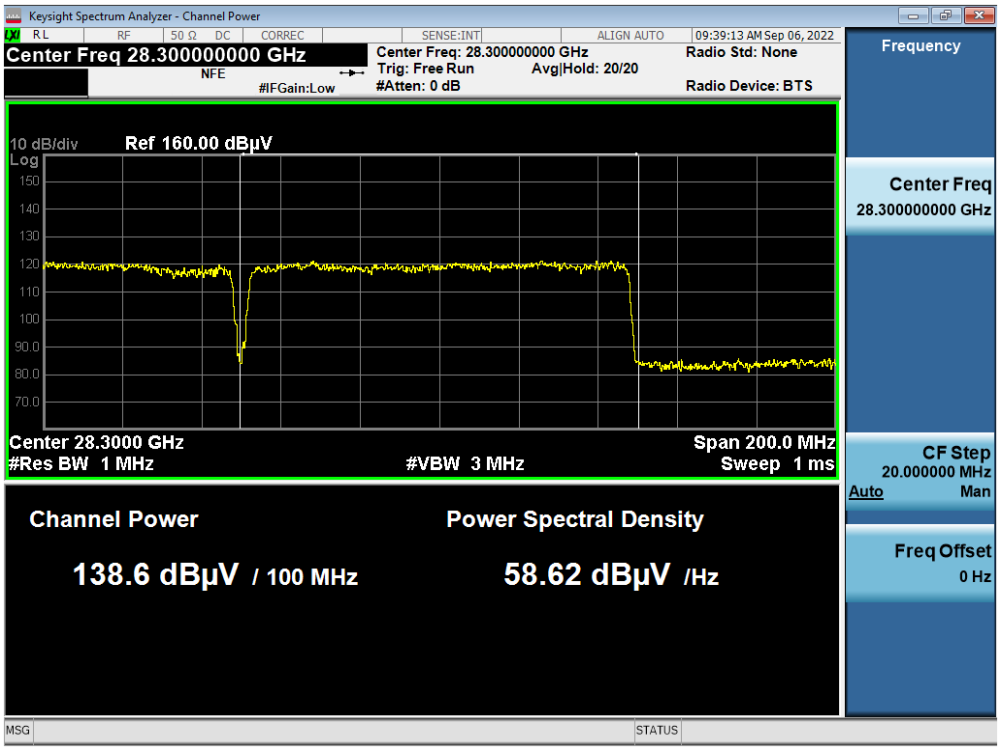
Antenna B / 39 GHz 1CC / QPSK / High



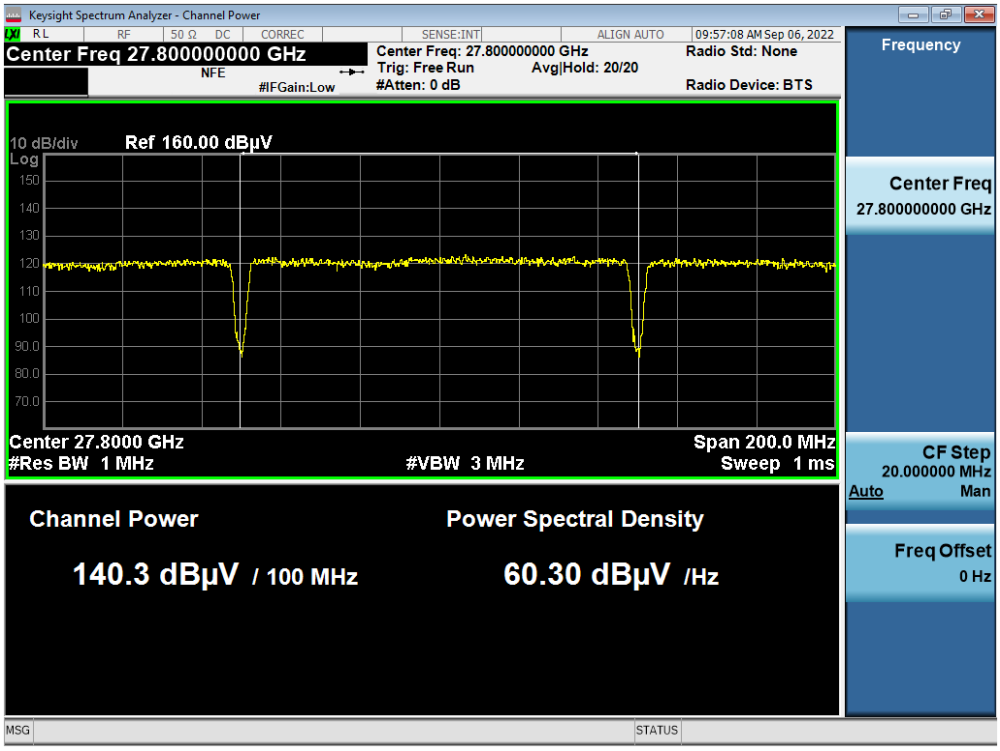
Antenna B / 39 GHz 16CC / 16QAM / Middle



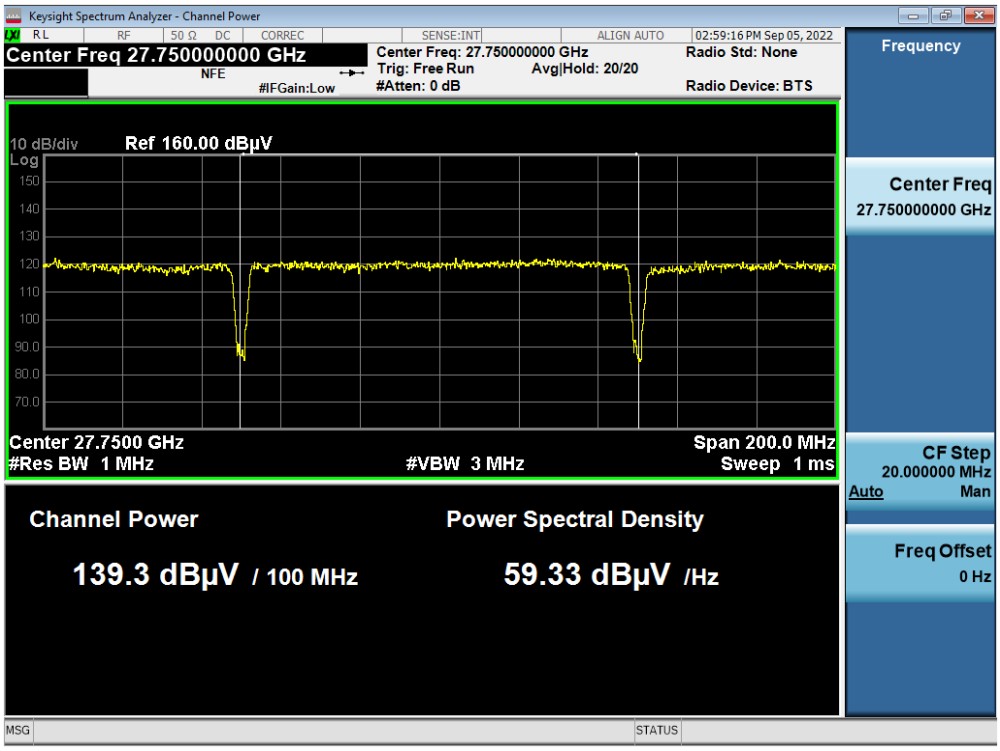
Antenna A / 28 GHz 1+7 CC / 16QAM / High



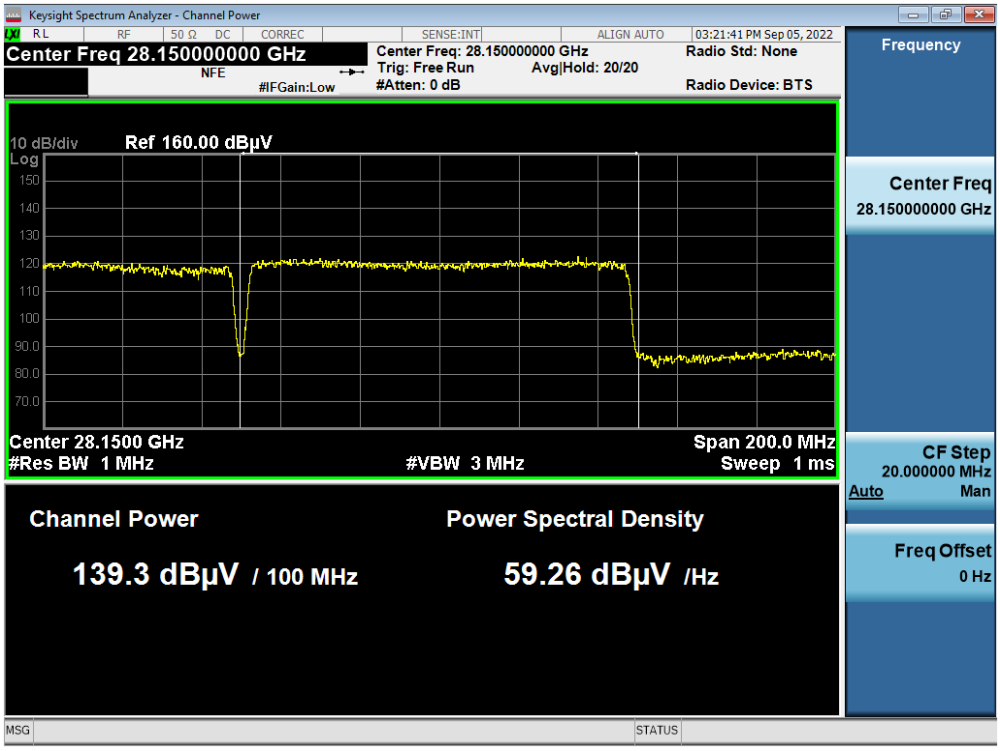
Antenna B / 28 GHz 1+7 CC / 64QAM / High



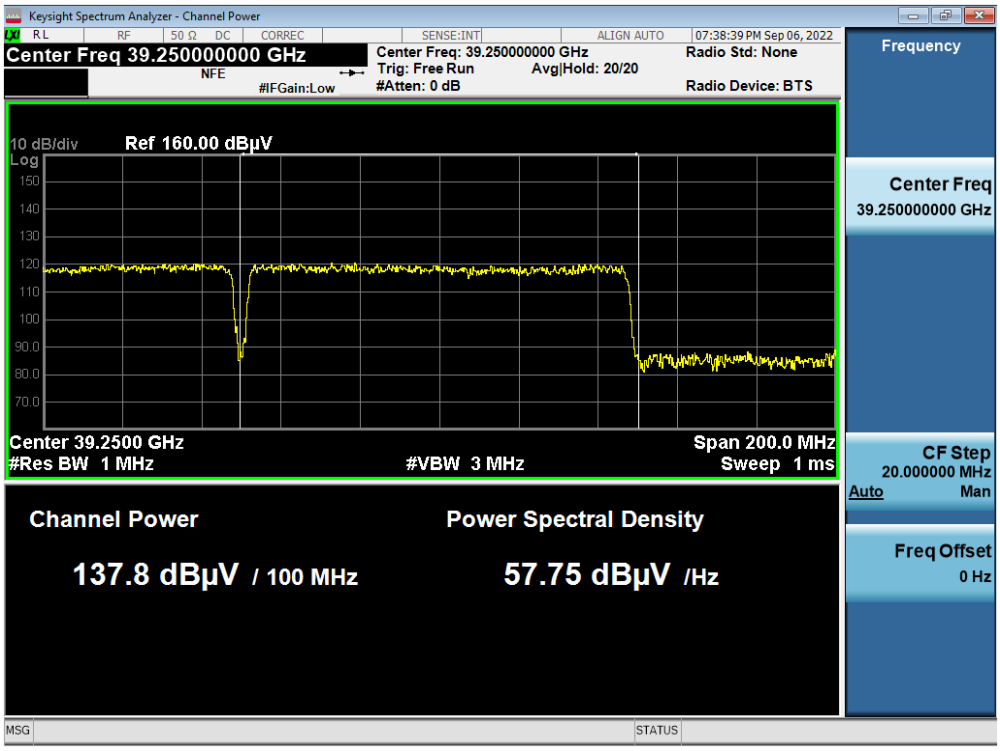
Antenna A / 28 GHz 7+1 CC / 16QAM / Low



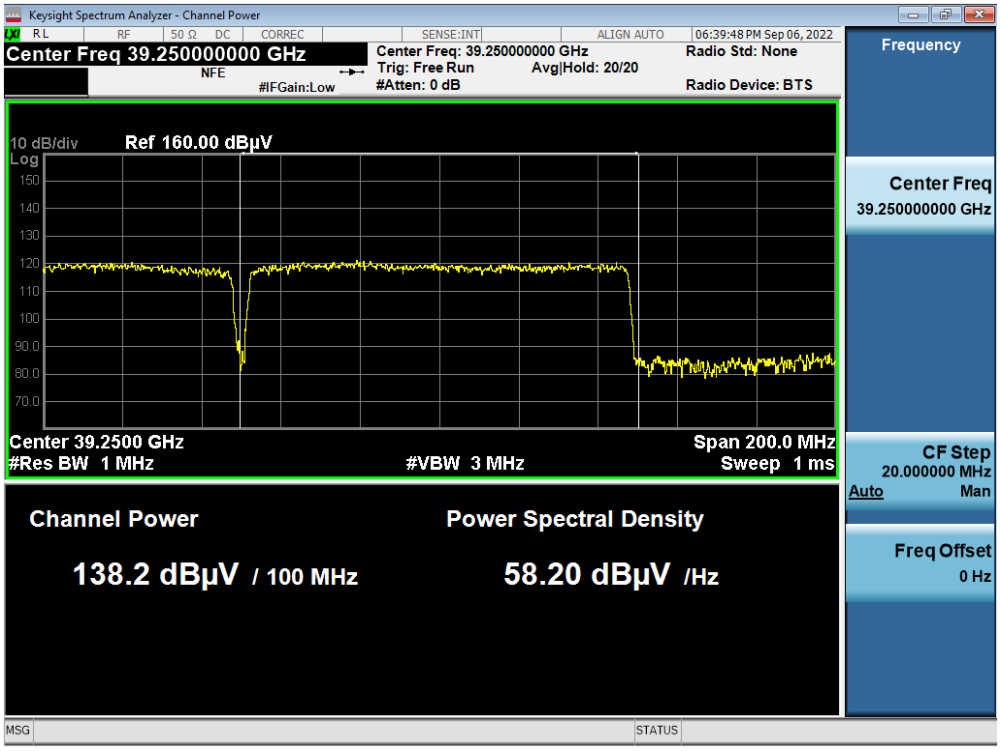
Antenna B / 28 GHz 7+1 CC / 64QAM / Low



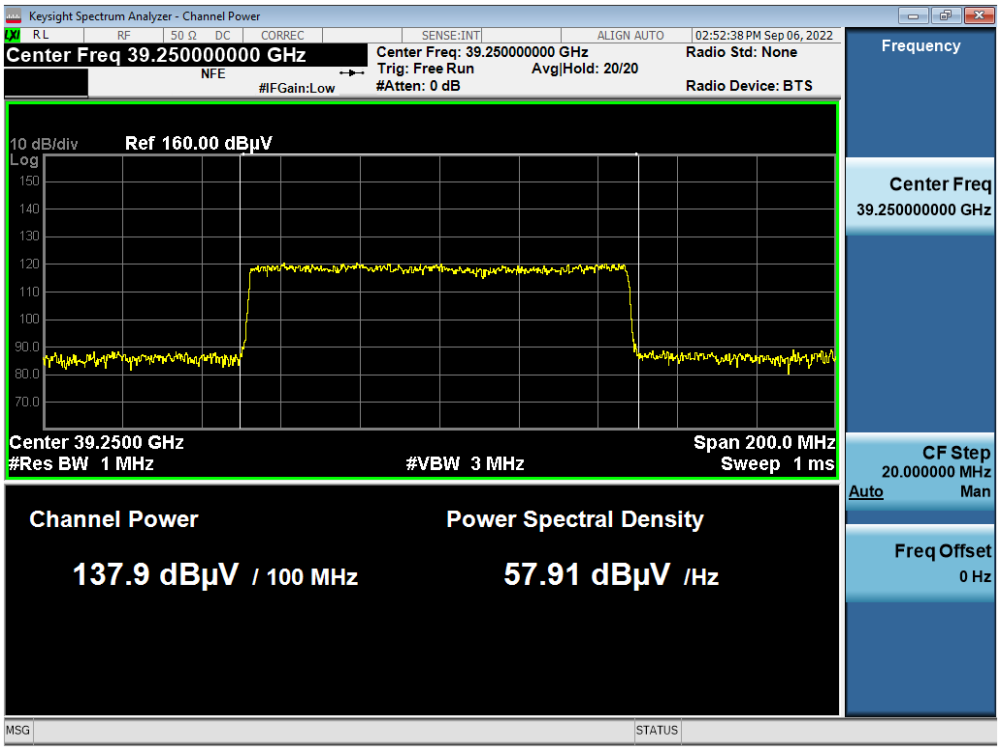
Antenna A / 39 GHz 1+15 CC / 256QAM / High



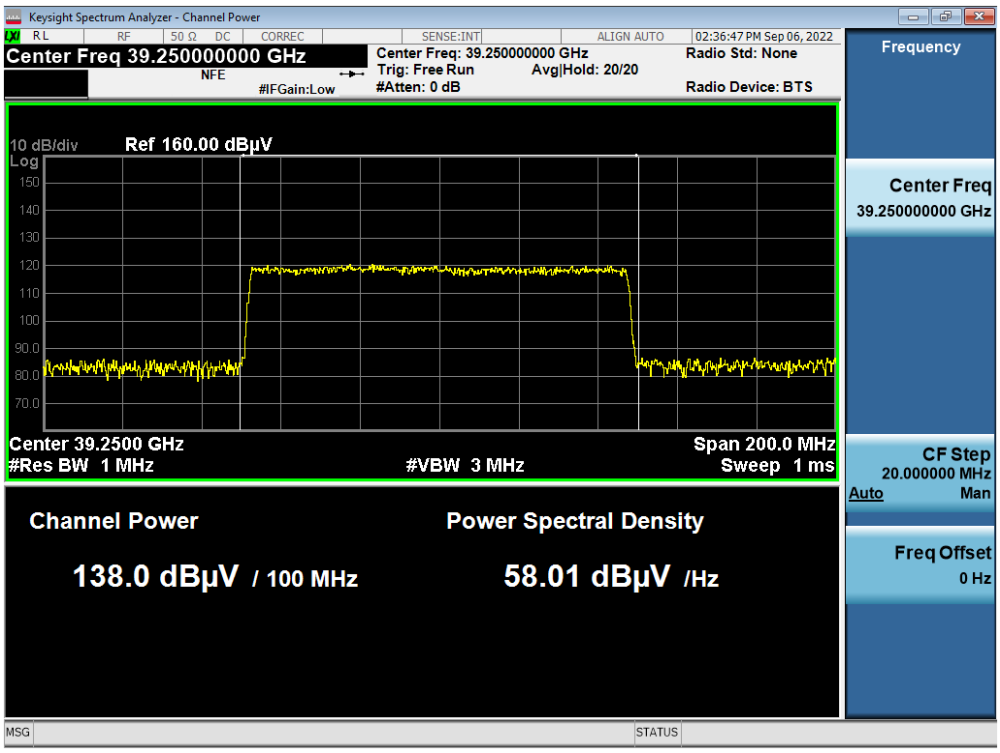
Antenna B / 39 GHz 1+15 CC / QPSK / High



Antenna A / 39 GHz 15+1 CC / 16QAM / High



Antenna B / 39 GHz 15+1 CC / QPSK / High



5.3. EQUIVALENT ISOTROPIC RADIATED POWER

FCC Rules

Test Requirements:

§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

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. Basic test conditions are same as EIRP density test on section 5.2.
2. Final conducted power is calculated as follows

Conducted Power (dBm) = EIRP (dBm) – Antenna Gain (dBi)

3. Antenna Gain of the above formula was applied from actual measurement data of the radiation pattern document.
4. Sample calculations:

Antenna A, 50M, 1CC, Low, QPSK:

Contiguous

137.22 dBμV (measured) + 16.39 (distance) + 1.3569 (Duty) – 104.77(Conversion) – 30.35 (Ant Gain)

= 19.85 dBm (Final conducted output power)

Antenna B, 1CC, Low, QPSK:

Contiguous

138.24 dBμV (measured) + 16.39 (distance) + 1.3569 (Duty) – 104.77(Conversion) – 30.35 (Ant Gain)

= 20.86 dBm (Final conducted output power)

Total Output Power (100M, 1CC, Low, QPSK):

Conversion dBm to mW (Antenna A)

10^(23.31 dBm /10) = 214.289 mW

Conversion dBm to mW (Antenna B)

10^(23.82 dBm /10) = 240.990 mW

Sum each antenna power

214.289 (Ant.A) + 240.990 (Ant.B) = 455.279 mW

Conversion mW to dBm

*10 * log (455.279 mW) = 26.58 dBm*

Test Results:

1. Contiguous

28 GHz 1CC 50 MHz

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	1	Low	27.525	QPSK	137.22	50.20	30.35	19.85
					16QAM	137.20	50.18		19.83
					64QAM	137.37	50.35		20.00
					256QAM	138.05	51.03		20.68
			Middle	27.925	QPSK	138.07	51.05	30.45	20.60
					16QAM	138.01	50.99		20.54
					64QAM	137.97	50.95		20.50
					256QAM	138.05	51.03		20.58
			High	28.325	QPSK	138.18	51.15	30.57	20.58
					16QAM	138.00	50.98		20.41
					64QAM	138.17	51.15		20.58
					256QAM	138.01	50.99		20.42
B	45°	1	Low	27.525	QPSK	138.24	51.21	30.35	20.86
					16QAM	138.12	51.09		20.74
					64QAM	138.30	51.28		20.93
					256QAM	137.85	50.83		20.48
			Middle	27.925	QPSK	138.64	51.62	30.45	21.17
					16QAM	138.64	51.61		21.16
					64QAM	138.50	51.47		21.02
					256QAM	138.39	51.37		20.92
			High	28.325	QPSK	138.63	51.60	30.57	21.03
					16QAM	138.57	51.55		20.98
					64QAM	138.23	51.21		20.64
					256QAM	138.41	51.38		20.81

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1	Low	QPSK	19.85	20.86	23.39
			16QAM	19.83	20.74	23.32
			64QAM	20.00	20.93	23.50
			256QAM	20.68	20.48	23.59
		Middle	QPSK	20.60	21.17	23.90
			16QAM	20.54	21.16	23.87
			64QAM	20.50	21.02	23.78
			256QAM	20.58	20.92	23.76
		High	QPSK	20.58	21.03	23.82
			16QAM	20.41	20.98	23.71
			64QAM	20.58	20.64	23.62
			256QAM	20.42	20.81	23.63

28 GHz 1CC 100 MHz, 8CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	1	Low	27.550	QPSK	140.71	53.69	30.38	23.31
					16QAM	140.62	53.60		23.22
					64QAM	140.31	53.28		22.90
					256QAM	140.63	53.61		23.23
			Middle	27.925	QPSK	141.05	54.02	30.45	23.57
					16QAM	141.37	54.34		23.89
					64QAM	141.35	54.33		23.88
					256QAM	141.19	54.17		23.72
			High	28.300	QPSK	141.51	54.48	30.57	23.91
					16QAM	141.73	54.70		24.13
					64QAM	141.71	54.69		24.12
					256QAM	141.94	54.92		24.35
		8	Low	27.900	QPSK	147.27	60.25	30.45	29.80
					16QAM	147.30	60.28		29.83
					64QAM	147.37	60.35		29.90
					256QAM	147.26	60.24		29.79
			Middle	27.925	QPSK	147.29	60.27	30.45	29.82
					16QAM	147.36	60.34		29.89
					64QAM	147.28	60.26		29.81
					256QAM	147.34	60.32		29.87
			High	27.950	QPSK	147.28	60.26	30.50	29.76
					16QAM	147.22	60.20		29.70
					64QAM	147.21	60.19		29.69
					256QAM	147.23	60.21		29.71

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
B	45°	1	Low	27.550	QPSK	141.22	54.20	30.38	23.82
					16QAM	141.37	54.34		23.96
					64QAM	140.40	53.37		22.99
					256QAM	141.18	54.15		23.77
			Middle	27.925	QPSK	141.76	54.74	30.45	24.29
					16QAM	141.54	54.52		24.07
					64QAM	141.66	54.64		24.19
					256QAM	140.97	53.95		23.50
			High	28.300	QPSK	141.85	54.82	30.57	24.25
					16QAM	141.87	54.85		24.28
					64QAM	141.89	54.87		24.30
					256QAM	141.76	54.74		24.17
		8	Low	27.900	QPSK	147.70	60.68	30.45	30.23
					16QAM	147.77	60.75		30.30
					64QAM	147.82	60.80		30.35
					256QAM	147.77	60.75		30.30
			Middle	27.925	QPSK	147.85	60.83	30.45	30.38
					16QAM	147.80	60.78		30.33
					64QAM	147.80	60.78		30.33
					256QAM	147.82	60.80		30.35
			High	27.950	QPSK	147.77	60.75	30.50	30.25
					16QAM	147.78	60.75		30.25
					64QAM	147.78	60.76		30.26
					256QAM	147.78	60.76		30.26

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1	Low	QPSK	23.31	23.82	26.58
			16QAM	23.22	23.96	26.62
			64QAM	22.90	22.99	25.96
			256QAM	23.23	23.77	26.52
		Middle	QPSK	23.57	24.29	26.96
			16QAM	23.89	24.07	26.99
			64QAM	23.88	24.19	27.05
			256QAM	23.72	23.50	26.62
		High	QPSK	23.91	24.25	27.09
			16QAM	24.13	24.28	27.22
			64QAM	24.12	24.30	27.22
			256QAM	24.35	24.17	27.27
	8	Low	QPSK	29.80	30.23	33.03
			16QAM	29.83	30.30	33.08
			64QAM	29.90	30.35	33.14
			256QAM	29.79	30.30	33.06
		Middle	QPSK	29.82	30.38	33.12
			16QAM	29.89	30.33	33.13
			64QAM	29.81	30.33	33.09
			256QAM	29.87	30.35	33.13
		High	QPSK	29.76	30.25	33.02
			16QAM	29.70	30.25	32.99
			64QAM	29.69	30.26	32.99
			256QAM	29.71	30.26	33.00

39 GHz 1CC, 16CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	1	Low	37.650	QPSK	140.76	53.73	29.75	23.98
					16QAM	140.39	53.37		23.62
					64QAM	140.84	53.82		24.07
					256QAM	140.73	53.71		23.96
			Middle	38.450	QPSK	142.21	55.19	29.87	25.32
					16QAM	142.27	55.25		25.38
					64QAM	142.44	55.41		25.54
					256QAM	142.26	55.23		25.36
			High	39.250	QPSK	143.56	56.54	30.05	26.49
					16QAM	143.73	56.70		26.65
					64QAM	143.67	56.64		26.59
					256QAM	143.56	56.53		26.48
		16	Low	38.400	QPSK	148.92	61.90	29.85	32.05
					16QAM	148.53	61.50		31.65
					64QAM	148.50	61.48		31.63
					256QAM	148.98	61.96		32.11
			Middle	38.450	QPSK	148.83	61.81	29.87	31.94
					16QAM	148.80	61.78		31.91
					64QAM	148.83	61.80		31.93
					256QAM	148.82	61.80		31.93
			High	38.500	QPSK	148.78	61.75	29.87	31.88
					16QAM	148.77	61.75		31.88
					64QAM	148.77	61.75		31.88
					256QAM	148.75	61.73		31.86

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
B	45°	1	Low	37.650	QPSK	141.32	54.30	29.75	24.55
					16QAM	141.58	54.55		24.80
					64QAM	141.40	54.38		24.63
					256QAM	141.41	54.39		24.64
			Middle	38.450	QPSK	142.82	55.79	29.87	25.92
					16QAM	142.59	55.57		25.70
					64QAM	142.85	55.83		25.96
					256QAM	142.66	55.63		25.76
			High	39.250	QPSK	144.35	57.33	30.05	27.28
					16QAM	144.38	57.36		27.31
					64QAM	144.44	57.42		27.37
					256QAM	144.27	57.25		27.20
		16	Low	38.400	QPSK	149.05	62.03	29.85	32.18
					16QAM	149.08	62.06		32.21
					64QAM	149.02	62.00		32.15
					256QAM	149.03	62.01		32.16
			Middle	38.450	QPSK	148.94	61.92	29.87	32.05
					16QAM	148.93	61.91		32.04
					64QAM	149.00	61.98		32.11
					256QAM	148.92	61.90		32.03
			High	38.500	QPSK	149.00	61.98	29.87	32.11
					16QAM	148.92	61.90		32.03
					64QAM	148.87	61.85		31.98
					256QAM	148.97	61.94		32.07

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1	Low	QPSK	23.98	24.55	27.28
			16QAM	23.62	24.80	27.26
			64QAM	24.07	24.63	27.37
			256QAM	23.96	24.64	27.32
		Middle	QPSK	25.32	25.92	28.64
			16QAM	25.38	25.70	28.55
			64QAM	25.54	25.96	28.77
			256QAM	25.36	25.76	28.57
		High	QPSK	26.49	27.28	29.91
			16QAM	26.65	27.31	30.00
			64QAM	26.59	27.37	30.01
			256QAM	26.48	27.20	29.87
	16	Low	QPSK	32.05	32.18	35.13
			16QAM	31.65	32.21	34.95
			64QAM	31.63	32.15	34.91
			256QAM	32.11	32.16	35.15
		Middle	QPSK	31.94	32.05	35.01
			16QAM	31.91	32.04	34.99
			64QAM	31.93	32.11	35.03
			256QAM	31.93	32.03	34.99
		High	QPSK	31.88	32.11	35.01
			16QAM	31.88	32.03	34.97
			64QAM	31.88	31.98	34.94
			256QAM	31.86	32.07	34.98

2. Non-Contiguous

28 GHz 1+7 CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	1+7	Low	27.550	QPSK	137.74	50.72	30.38	20.34
					16QAM	138.14	51.11		20.73
					64QAM	137.91	50.89		20.51
					256QAM	137.91	50.89		20.51
			High	28.000	QPSK	146.65	59.63	30.50	29.13
					16QAM	146.64	59.62		29.12
					64QAM	146.68	59.66		29.16
					256QAM	146.67	59.65		29.15
B	45°		Low	27.550	QPSK	138.42	51.40	30.38	21.02
					16QAM	138.54	51.52		21.14
					64QAM	138.53	51.50		21.12
					256QAM	138.60	51.58		21.20
			High	28.000	QPSK	147.17	60.15	30.50	29.65
					16QAM	147.18	60.16		29.66
					64QAM	147.27	60.24		29.74
					256QAM	147.14	60.12		29.62

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1+7	Low	QPSK	20.34	21.02	23.70
			16QAM	20.73	21.14	23.95
			64QAM	20.51	21.12	23.84
			256QAM	20.51	21.2	23.88
		High	QPSK	29.13	29.65	32.41
			16QAM	29.12	29.66	32.41
			64QAM	29.16	29.74	32.47
			256QAM	29.15	29.62	32.40

28 GHz 7+1 CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	7+1	Low	27.850	QPSK	146.80	59.77	30.45	29.32
					16QAM	146.84	59.82		29.37
					64QAM	146.80	59.78		29.33
					256QAM	146.84	59.81		29.36
			High	28.300	QPSK	138.74	51.72	30.57	21.15
					16QAM	138.62	51.59		21.02
					64QAM	138.71	51.69		21.12
					256QAM	138.55	51.53		20.96
B	45°		Low	27.850	QPSK	147.33	60.31	30.45	29.86
					16QAM	147.37	60.34		29.89
					64QAM	147.32	60.30		29.85
					256QAM	147.35	60.32		29.87
			High	28.300	QPSK	138.81	51.79	30.57	21.22
					16QAM	138.94	51.92		21.35
					64QAM	138.85	51.83		21.26
					256QAM	139.09	52.07		21.50

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	7+1	Low	QPSK	29.32	29.86	32.61
			16QAM	29.37	29.89	32.65
			64QAM	29.33	29.85	32.61
			256QAM	29.36	29.87	32.63
		High	QPSK	21.15	21.22	24.20
			16QAM	21.02	21.35	24.20
			64QAM	21.12	21.26	24.20
			256QAM	20.96	21.5	24.25

39 GHz 1+15 CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	1+15	Low	37.650	QPSK	134.50	47.48	29.75	17.73
					16QAM	135.04	48.01		18.26
					64QAM	135.26	48.24		18.49
					256QAM	134.73	47.71		17.96
			High	38.550	QPSK	148.79	61.77	29.90	31.87
					16QAM	148.74	61.71		31.81
					64QAM	148.75	61.73		31.83
					256QAM	148.63	61.61		31.71
B	45°		Low	37.650	QPSK	134.77	47.74	29.75	17.99
					16QAM	135.20	48.18		18.43
					64QAM	134.88	47.86		18.11
					256QAM	134.92	47.90		18.15
			High	38.550	QPSK	148.82	61.80	29.90	31.90
					16QAM	148.81	61.79		31.89
					64QAM	148.77	61.75		31.85
					256QAM	148.71	61.69		31.79

Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1+15	Low	QPSK	17.73	17.99	20.87
			16QAM	18.26	18.43	21.36
			64QAM	18.49	18.11	21.31
			256QAM	17.96	18.15	21.07
		High	QPSK	31.87	31.90	34.90
			16QAM	31.81	31.89	34.86
			64QAM	31.83	31.85	34.85
			256QAM	31.71	31.79	34.76

39 GHz 15+1 CC

Tabular Data of RF Output Power

Ant.	Ant. Angle	CC	Channel	Freq. (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Conducted (dBm)
A	135°	15+1	Low	38.350	QPSK	148.25	61.22	29.85	31.37
					16QAM	148.27	61.25		31.40
					64QAM	148.20	61.17		31.32
					256QAM	148.27	61.25		31.40
			High	39.250	QPSK	137.70	50.68	30.05	20.63
					16QAM	137.78	50.76		20.71
					64QAM	137.80	50.78		20.73
					256QAM	137.67	50.65		20.60
B	45°		Low	38.350	QPSK	148.99	61.97	29.85	32.12
					16QAM	148.98	61.96		32.11
					64QAM	149.02	62.00		32.15
					256QAM	148.89	61.87		32.02
			High	39.250	QPSK	138.31	51.29	30.05	21.24
					16QAM	138.17	51.15		21.10
					64QAM	138.36	51.34		21.29
					256QAM	138.18	51.15		21.10

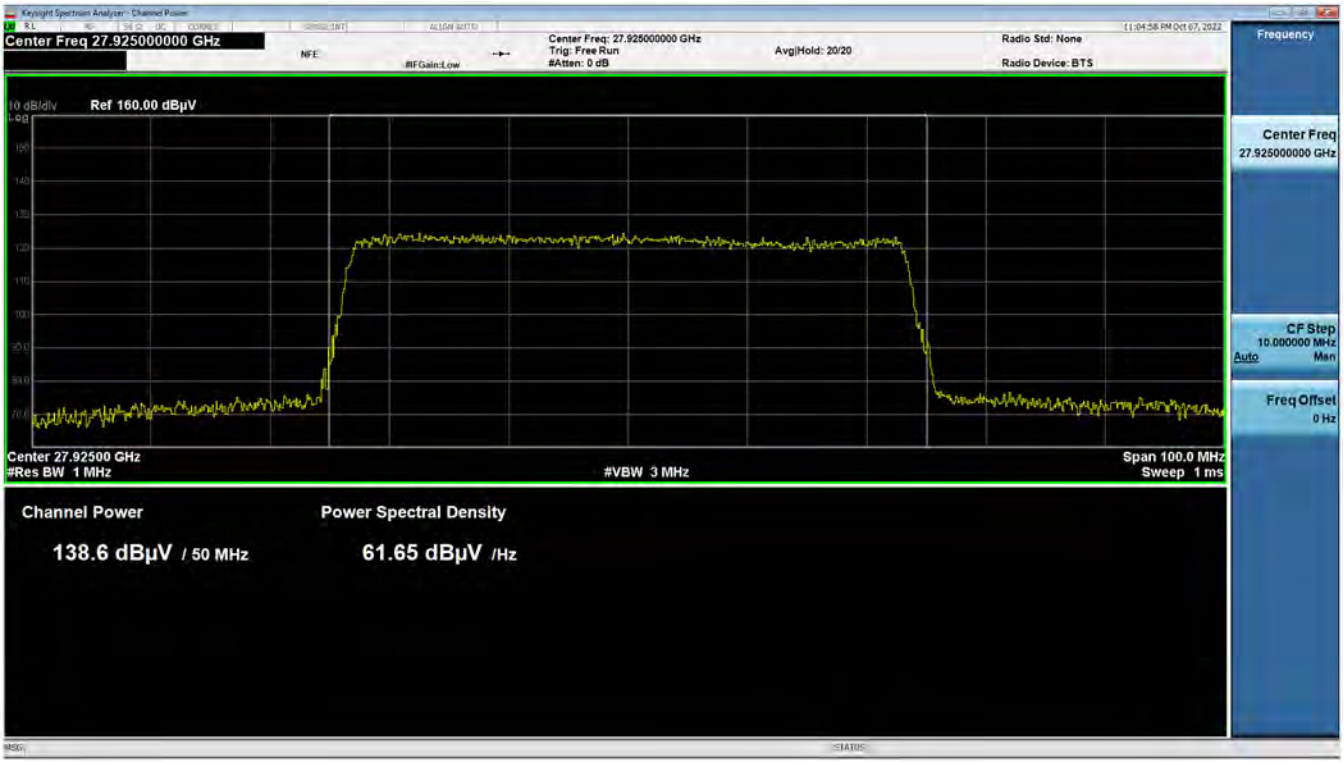
Tabular Data of SUM Output Power

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Result (dBm)
A+B	1+15	Low	QPSK	31.37	32.12	34.77
			16QAM	31.40	32.11	34.78
			64QAM	31.32	32.15	34.77
			256QAM	31.40	32.02	34.73
		High	QPSK	20.63	21.24	23.96
			16QAM	20.71	21.10	23.92
			64QAM	20.73	21.29	24.03
			256QAM	20.60	21.10	23.87

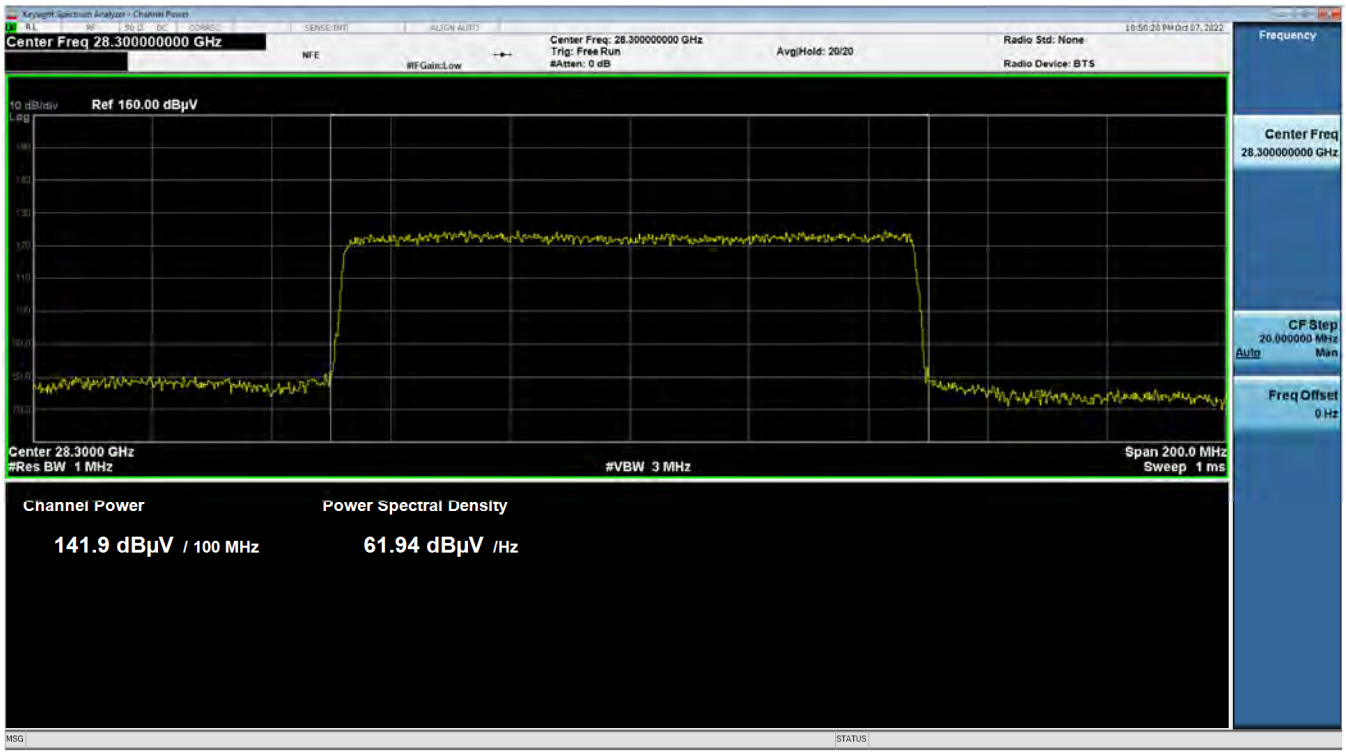
Plot Data of Equivalent Isotropic Radiated Power

Antenna A / 28 GHz 1CC 50 MHz / 64QAM / High

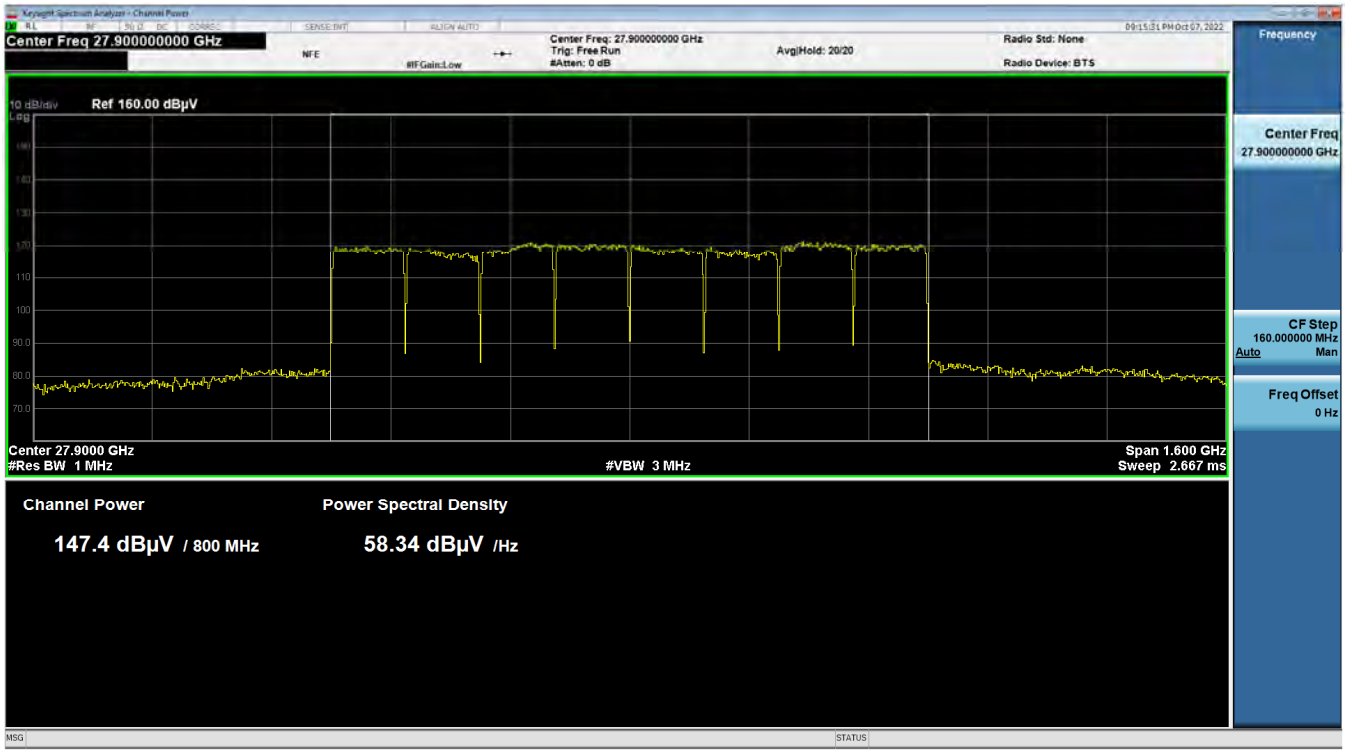
Antenna B / 28 GHz 1CC 50 MHz / QPSK / Middle



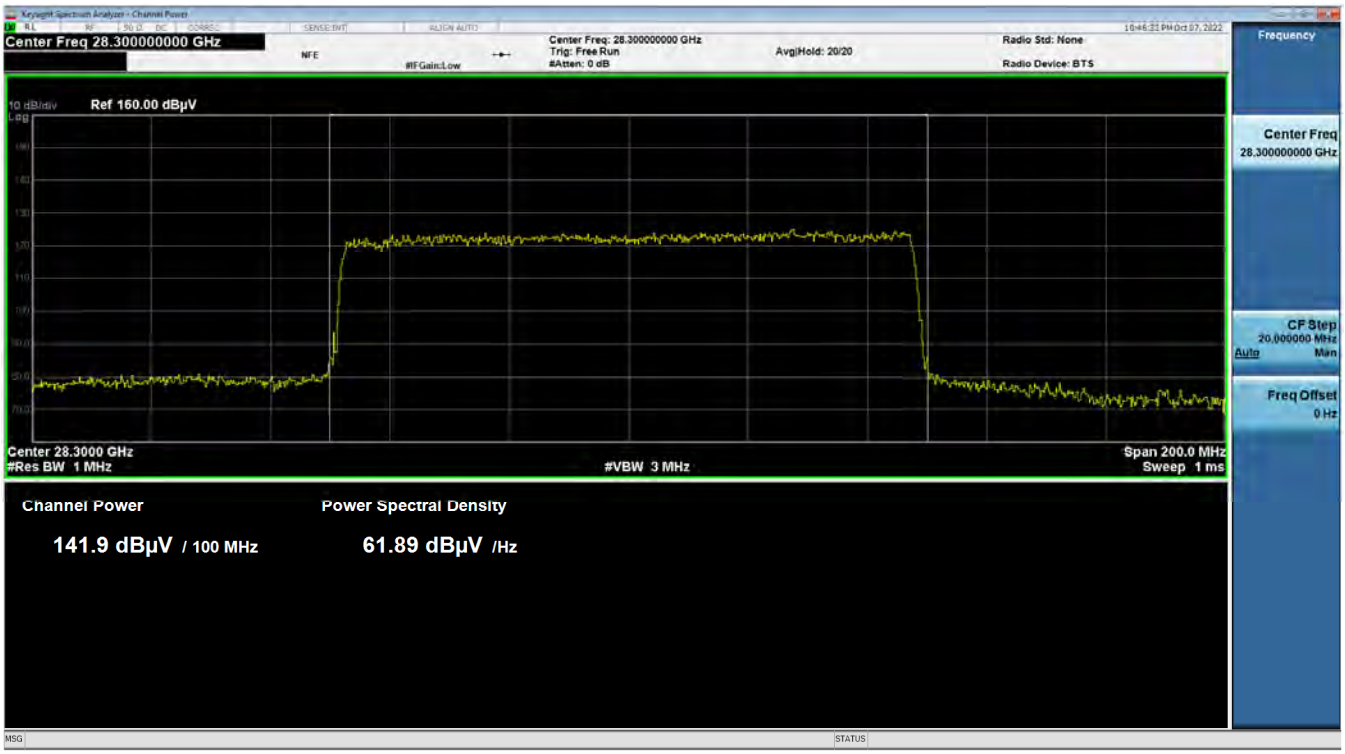
Antenna A / 28 GHz 1CC 100 MHz / 256QAM / High



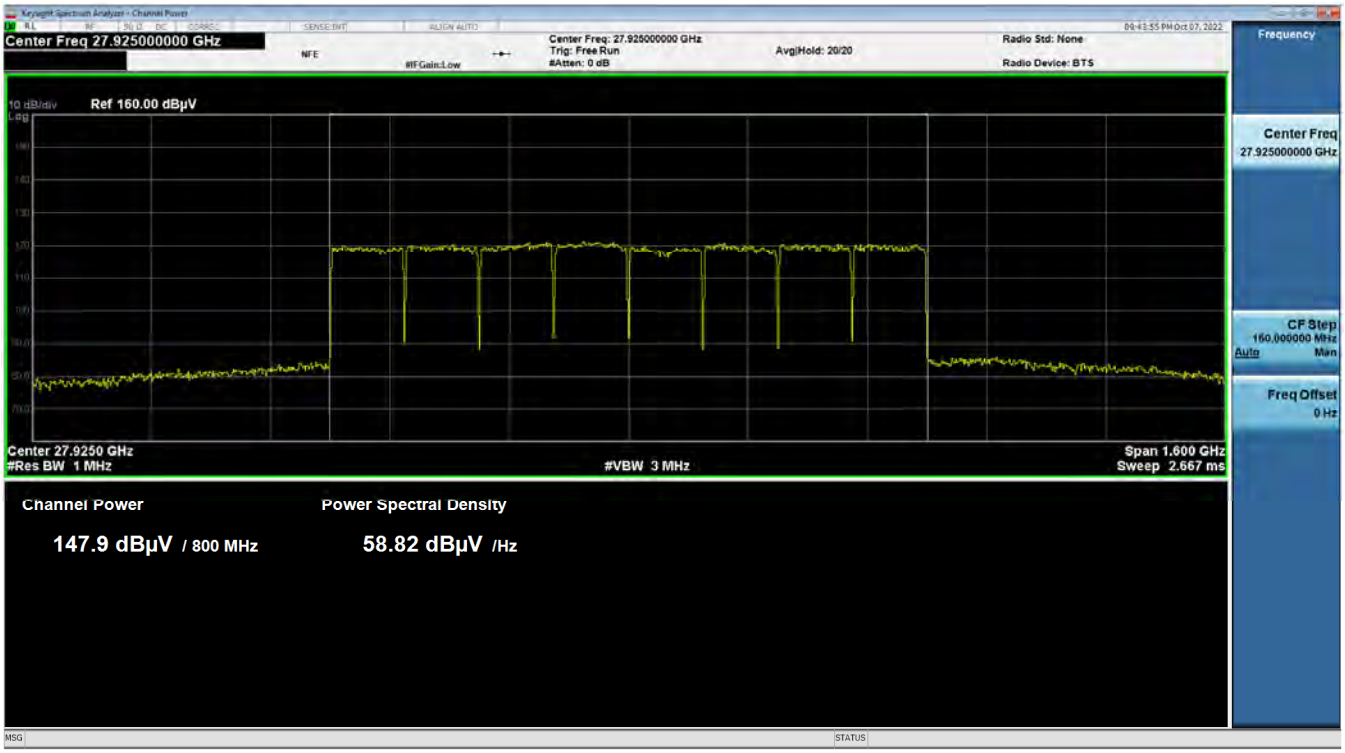
Antenna A / 28 GHz 8CC 100 MHz / 64QAM / Low



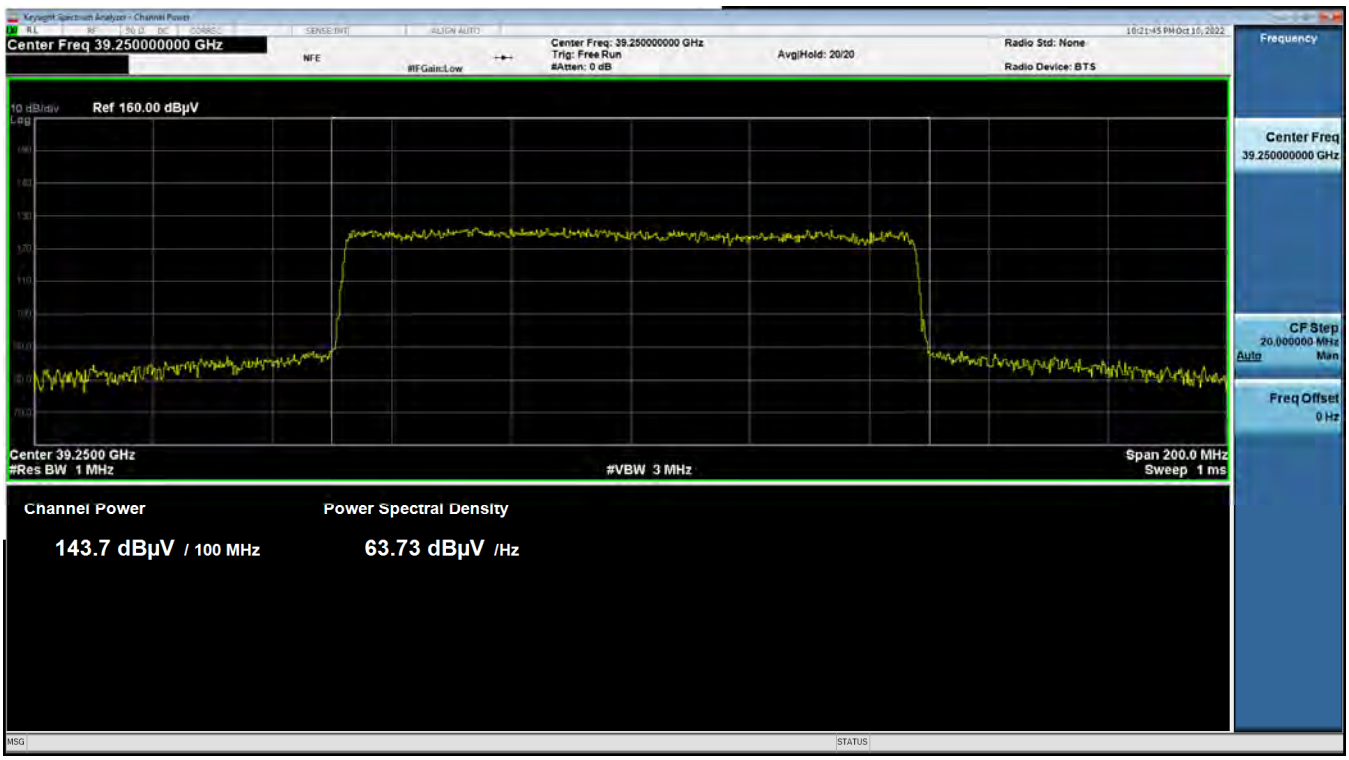
Antenna B / 28 GHz 1CC 100 MHz / 64QAM / High



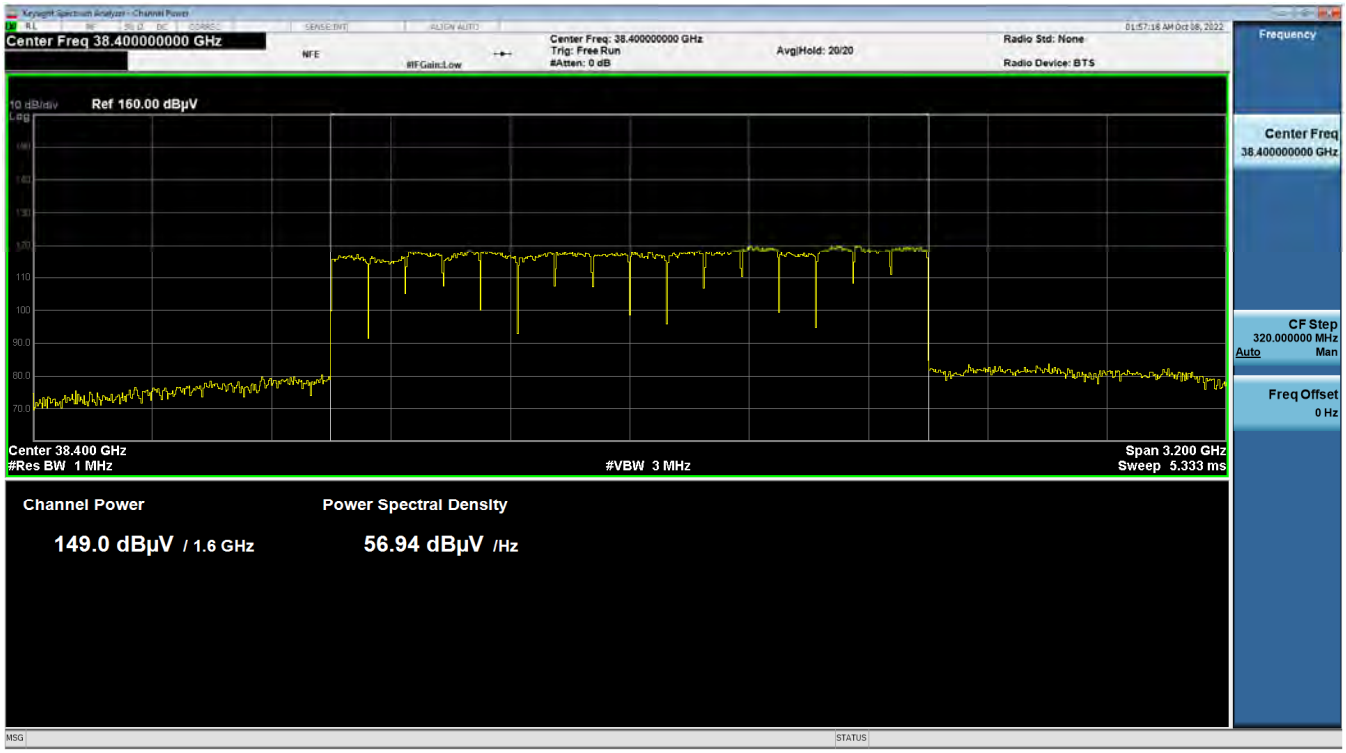
Antenna B / 28 GHz 8CC 100 MHz / QPSK / Middle



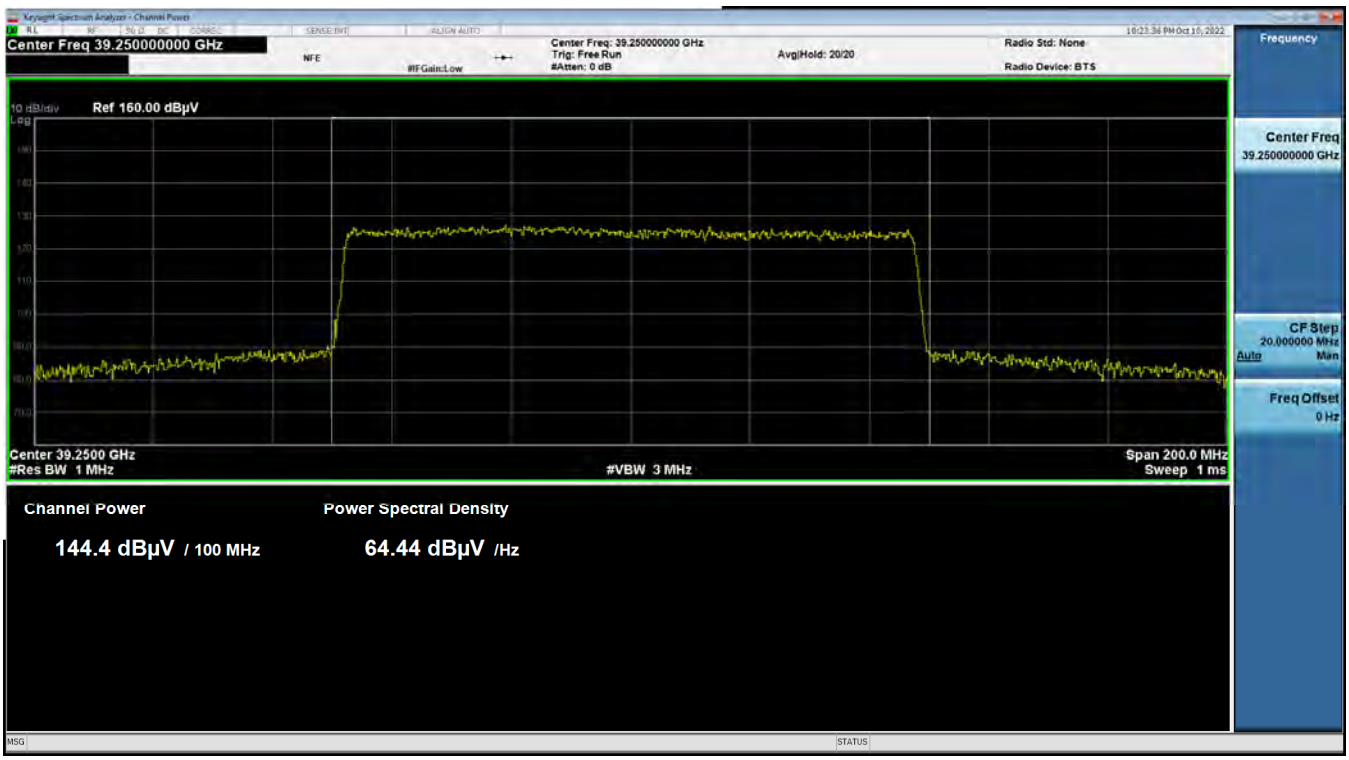
Antenna A / 39 GHz 1CC / 16QAM / High



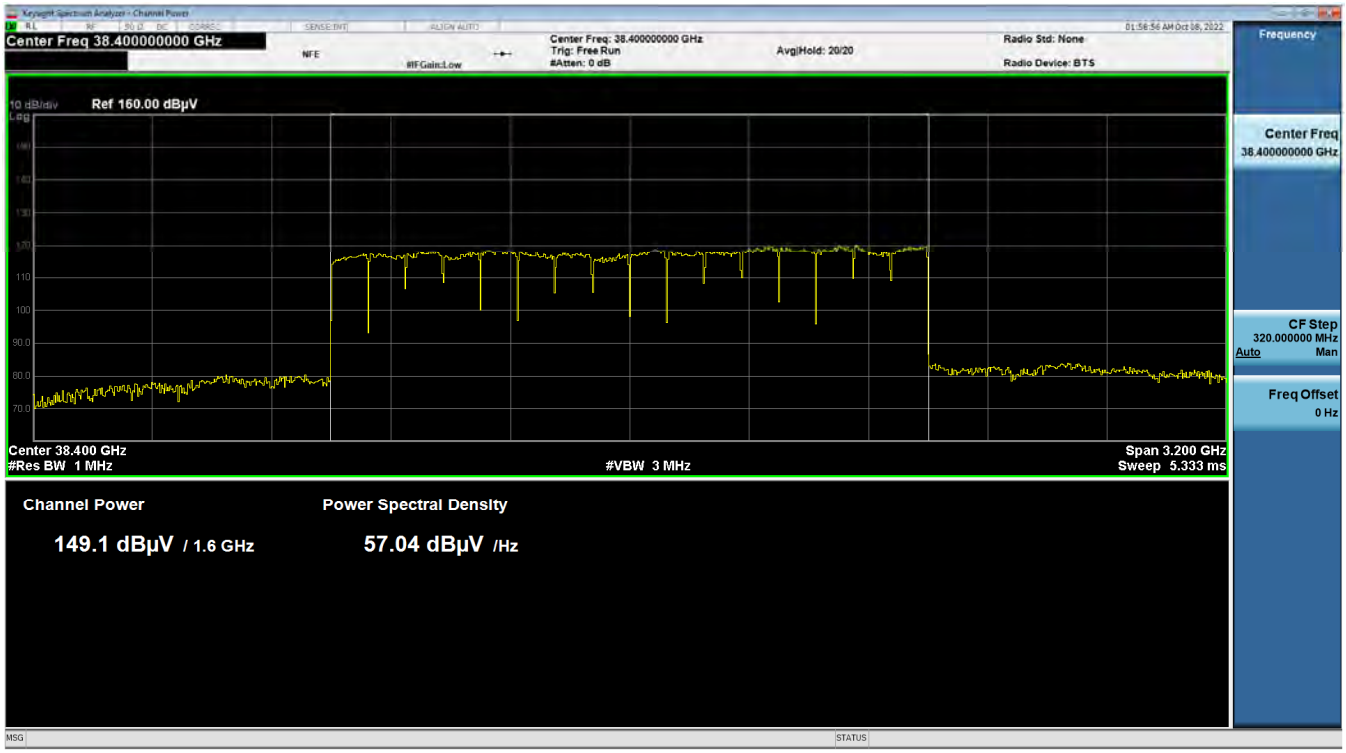
Antenna A / 39 GHz 16CC / 256QAM / Low



Antenna B / 39 GHz 1CC / 64QAM / High

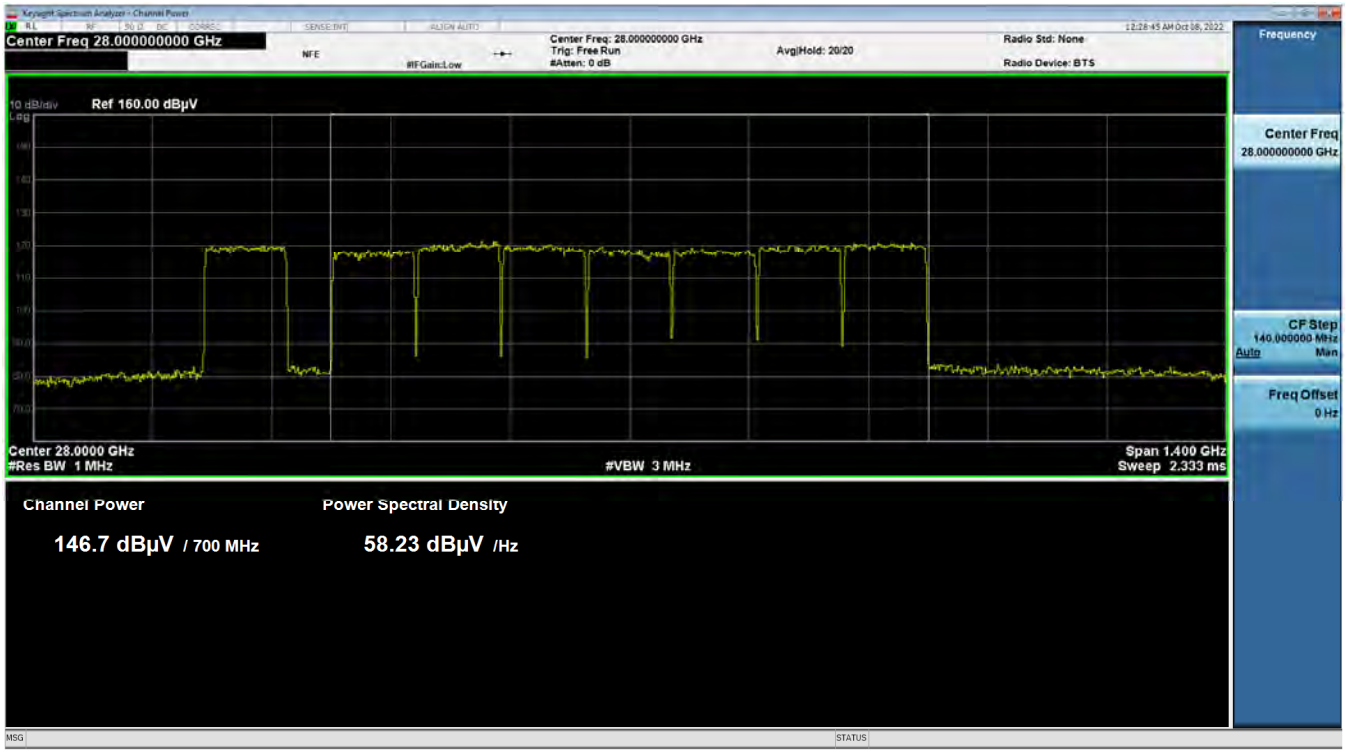


Antenna B / 39 GHz 16CC / 16QAM / Low

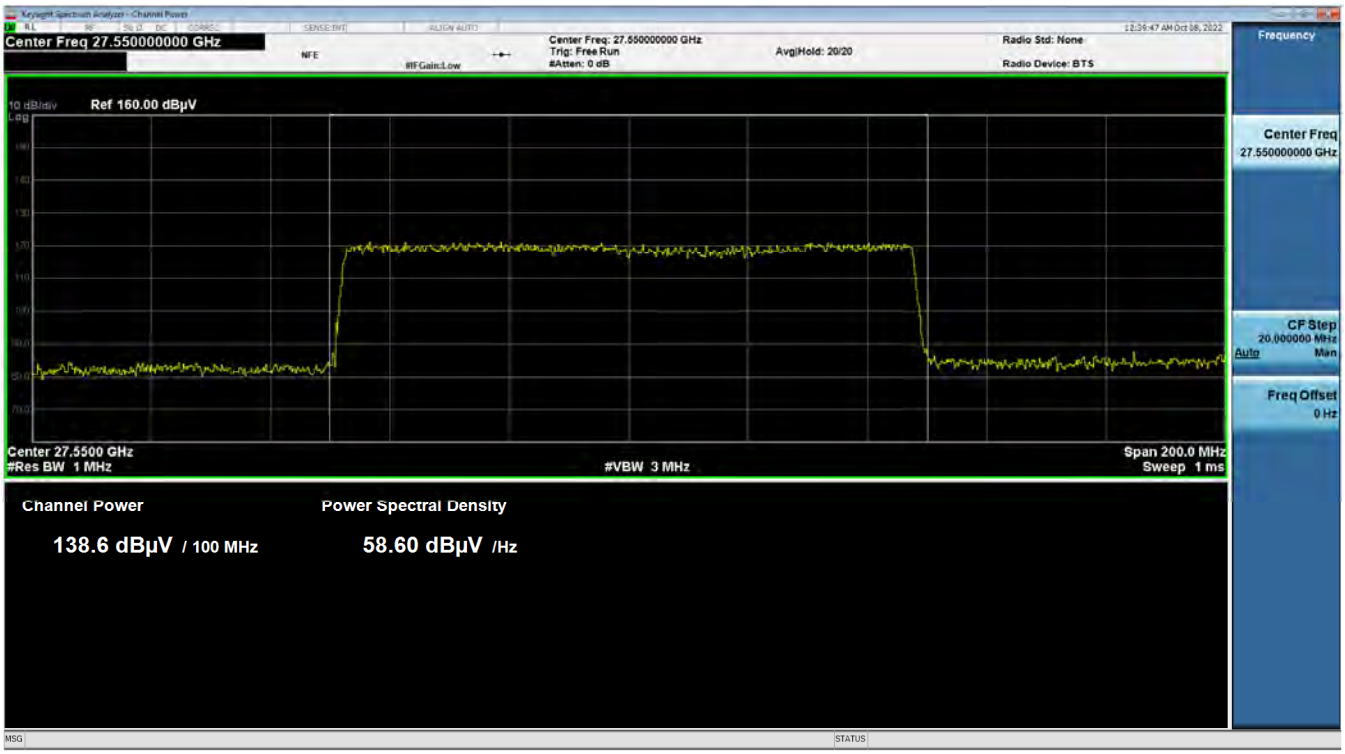


Antenna A / 28 GHz 1+7 CC / 16QAM / Low

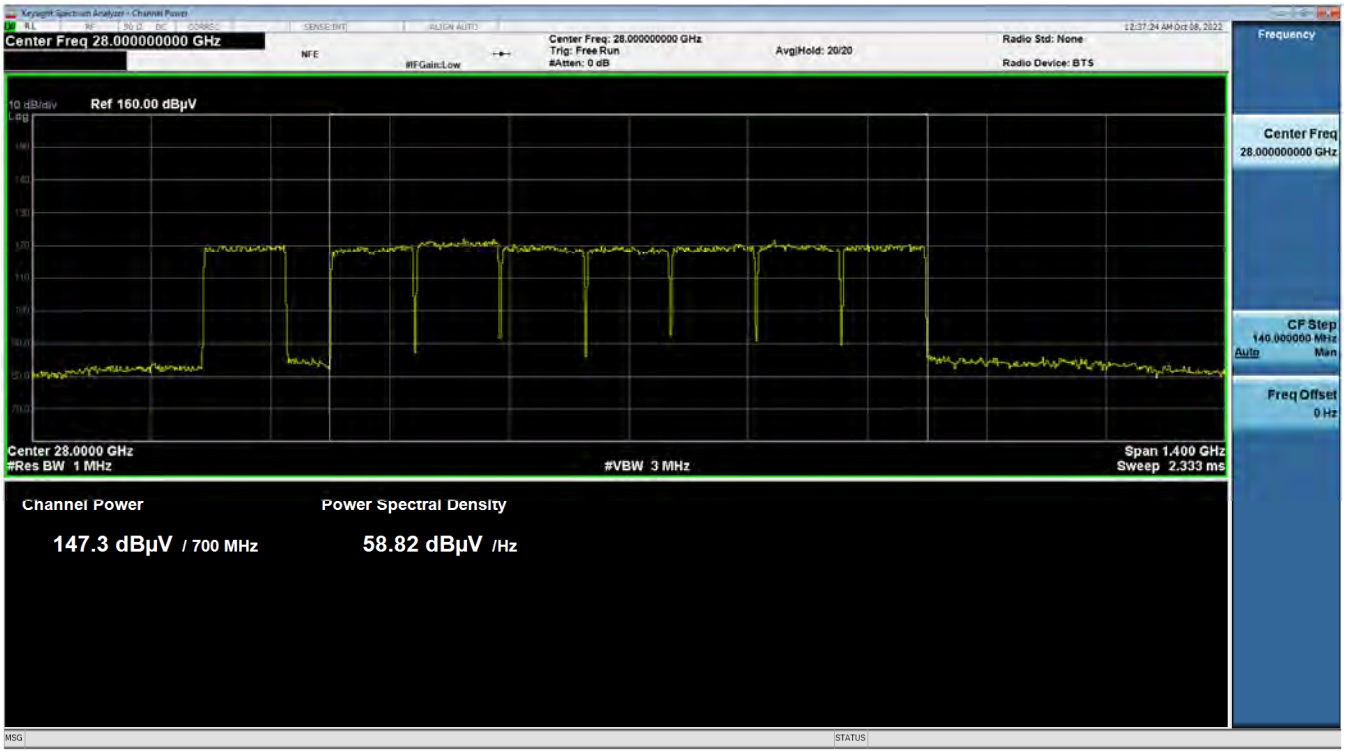
Antenna A / 28 GHz 1+7 CC / 64QAM / High



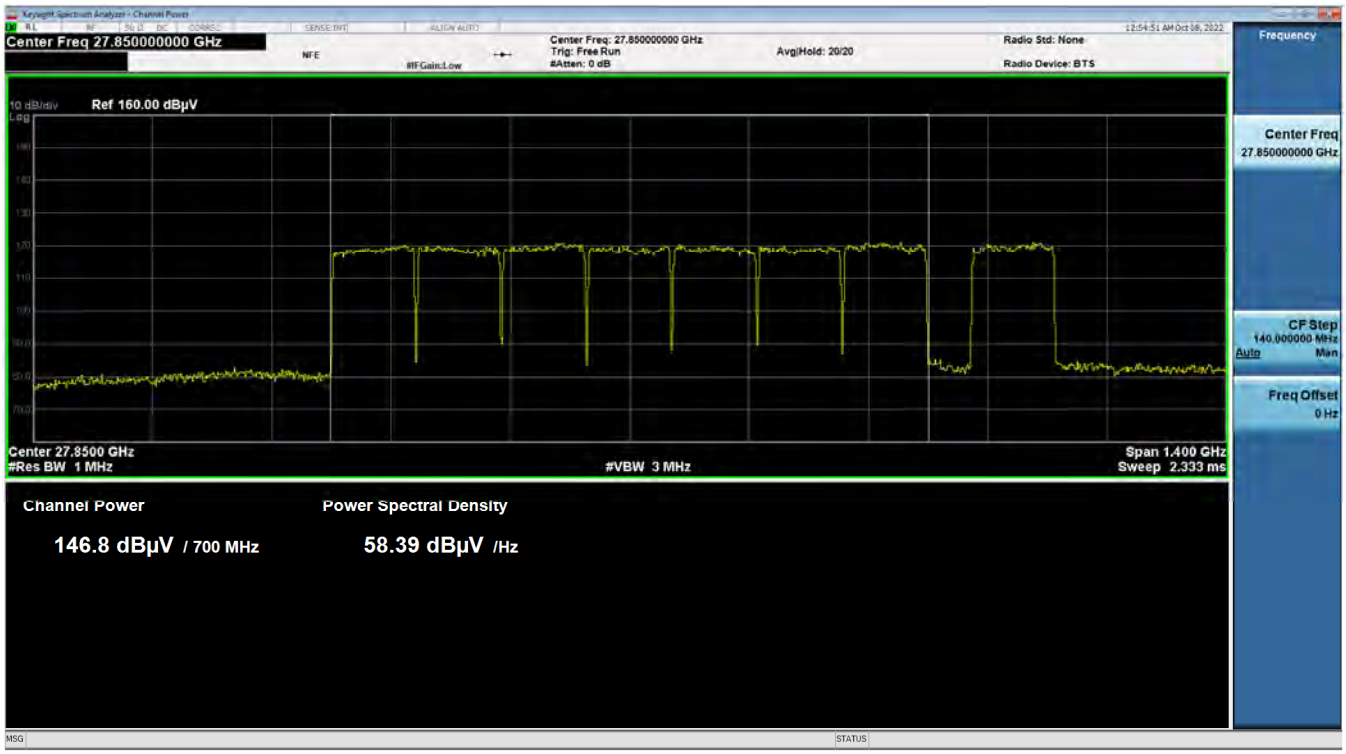
Antenna B / 28 GHz 1+7 CC / 256QAM / Low



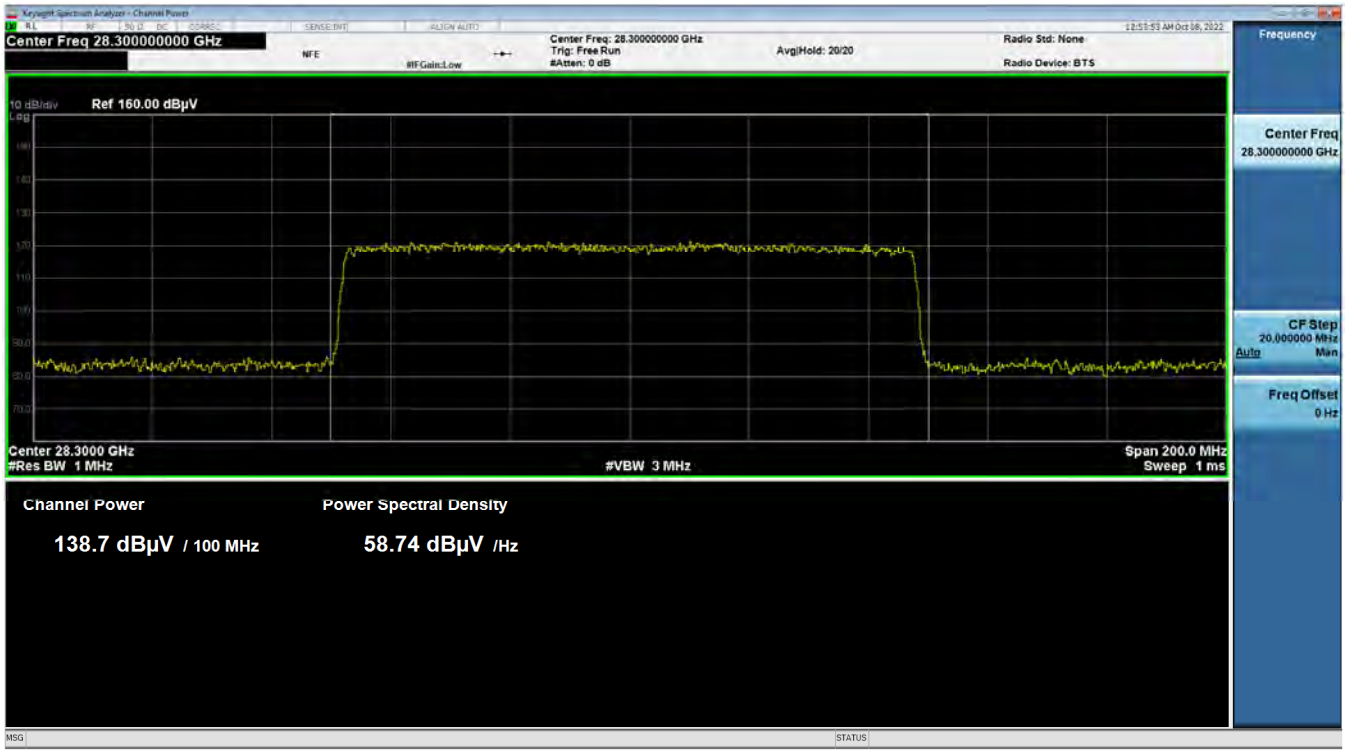
Antenna B / 28 GHz 1+7 CC / 64QAM / High



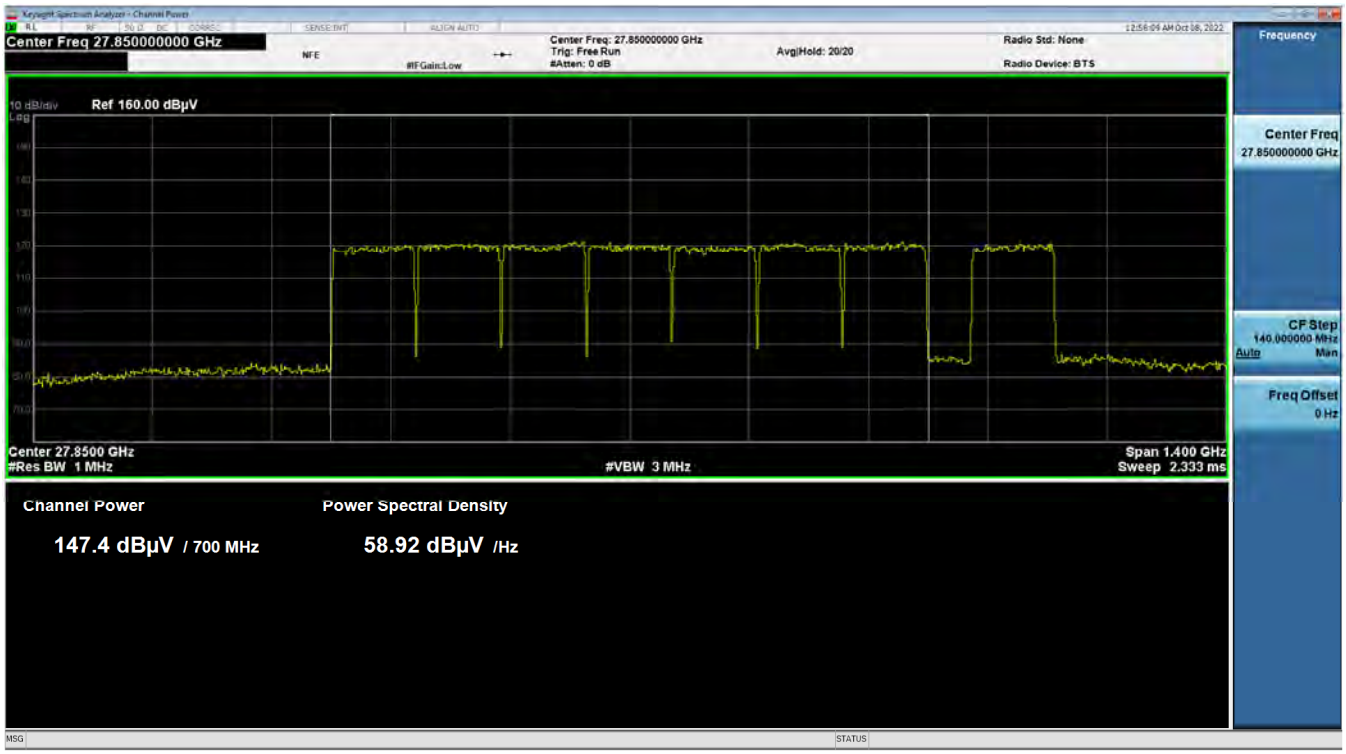
Antenna A / 28 GHz 7+1 CC / 16QAM / Low



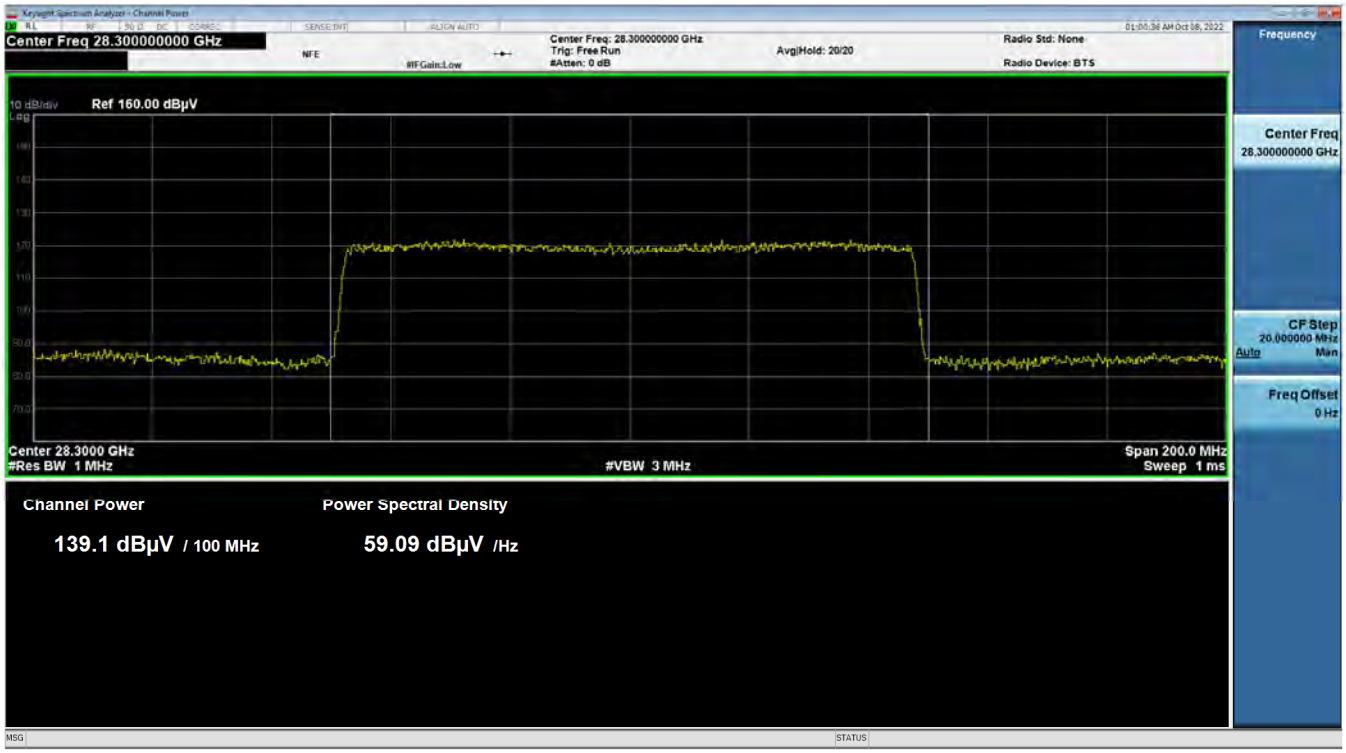
Antenna A / 28 GHz 7+1 CC / QPSK / High



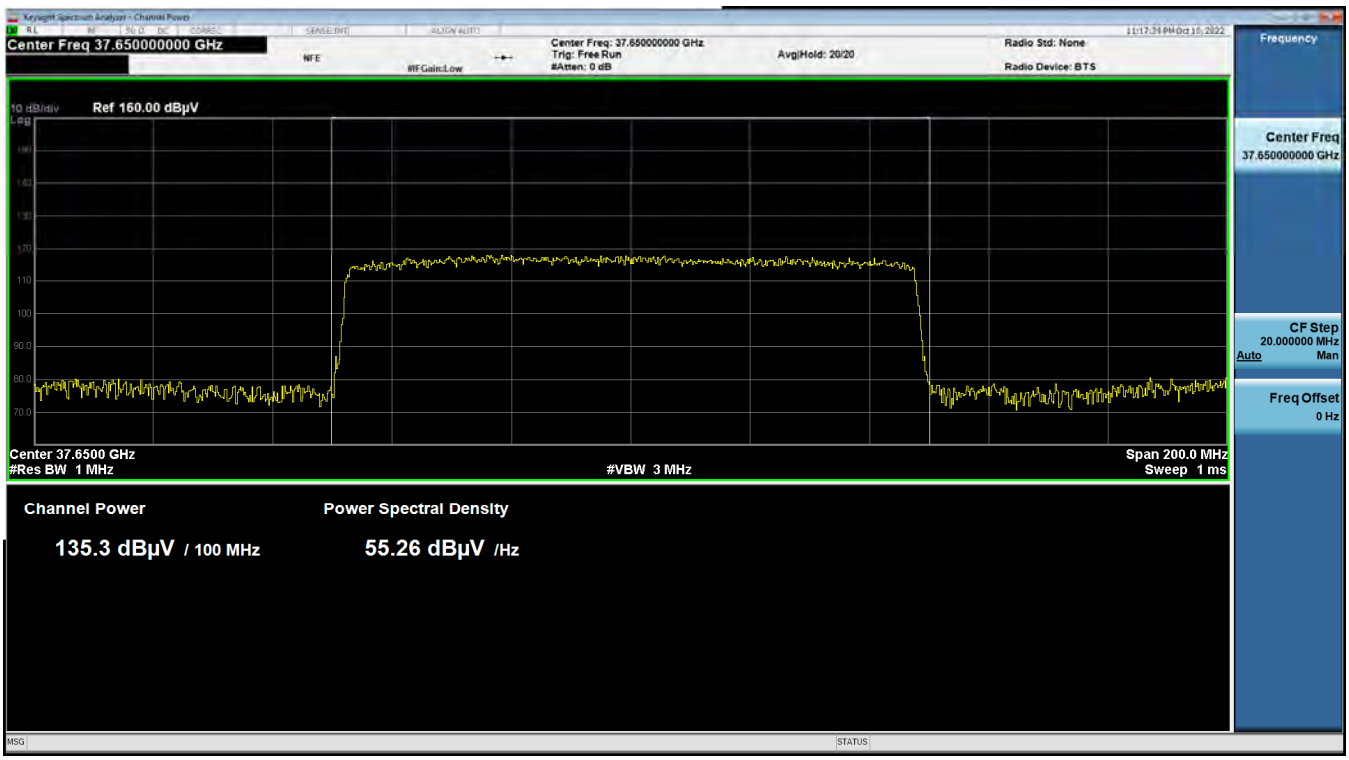
Antenna B / 28 GHz 7+1 CC / 16QAM / Low



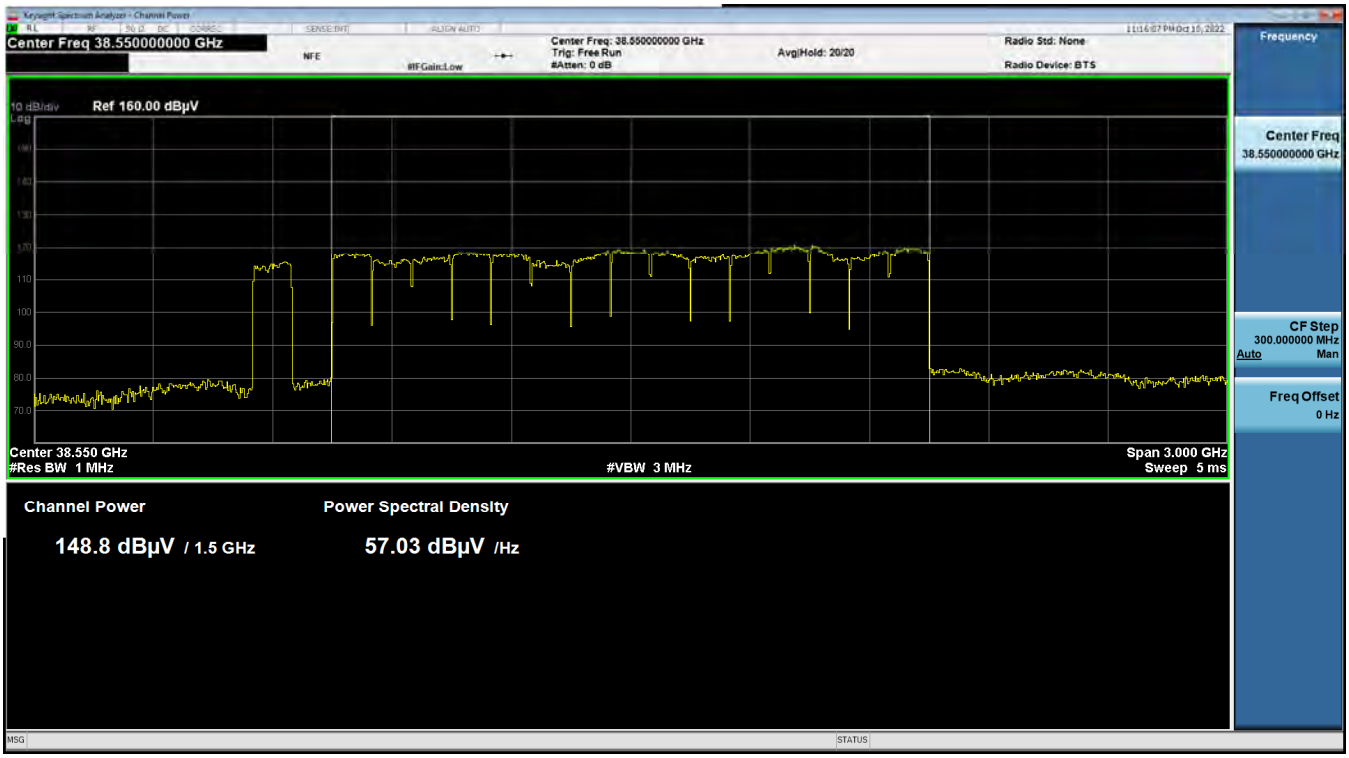
Antenna B / 28 GHz 7+1 CC / 256QAM / High



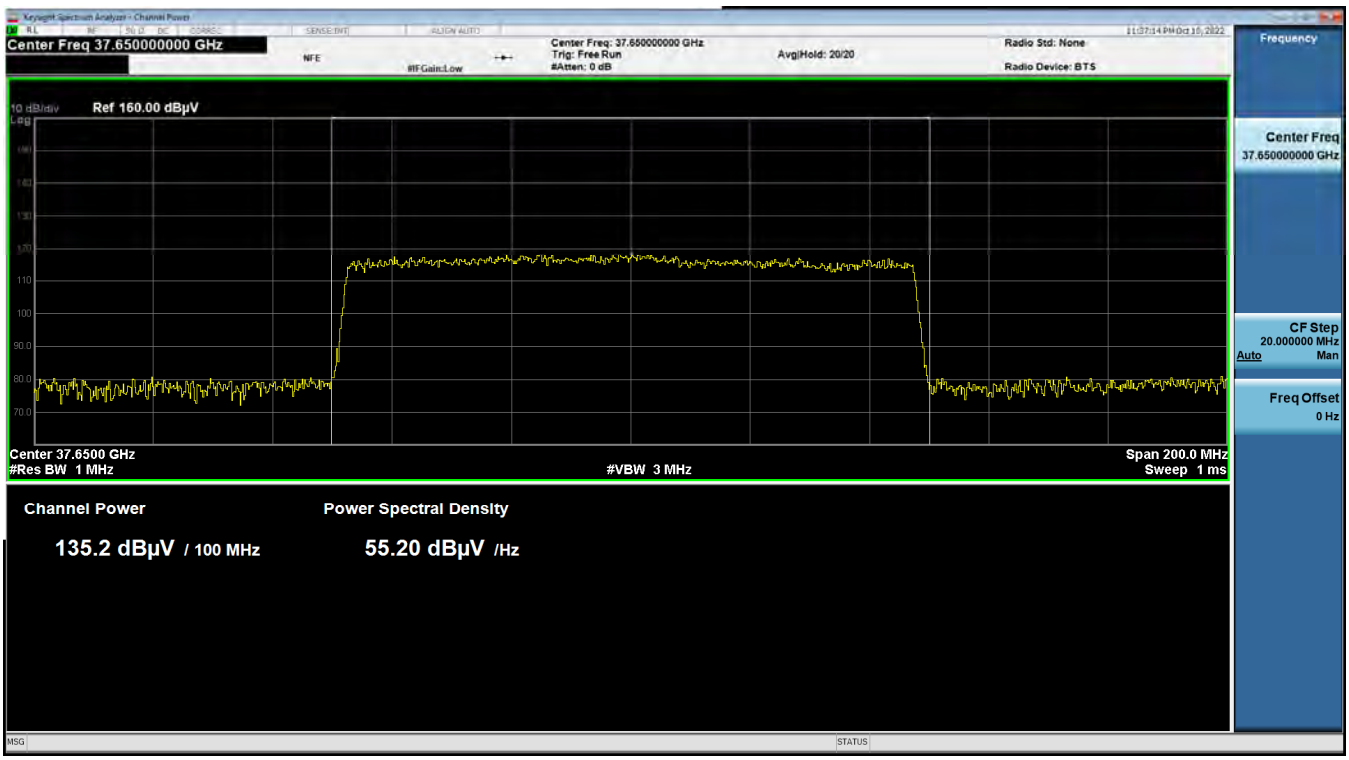
Antenna A / 39 GHz 1+15 CC / 64QAM / Low



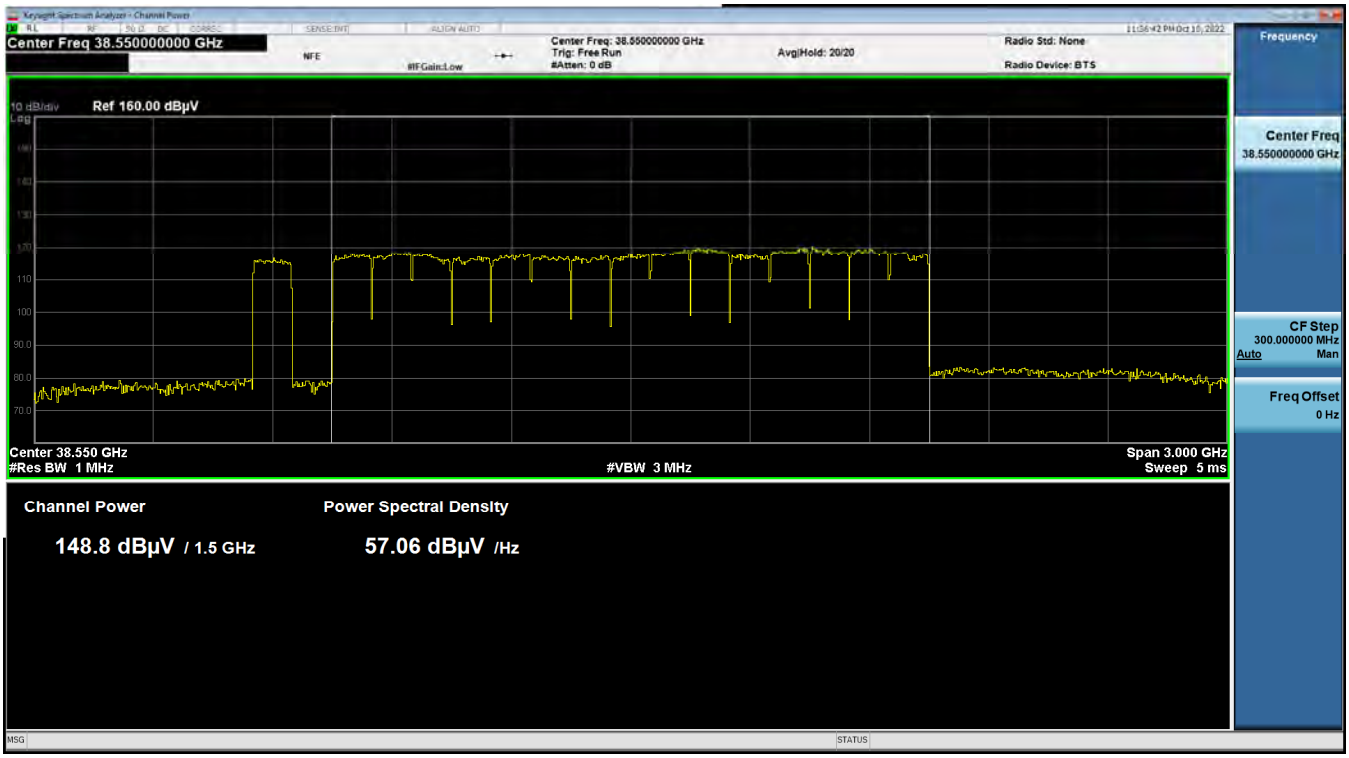
Antenna A / 39 GHz 1+15 CC / QPSK / High



Antenna B / 39 GHz 1+15 CC / 16QAM / Low

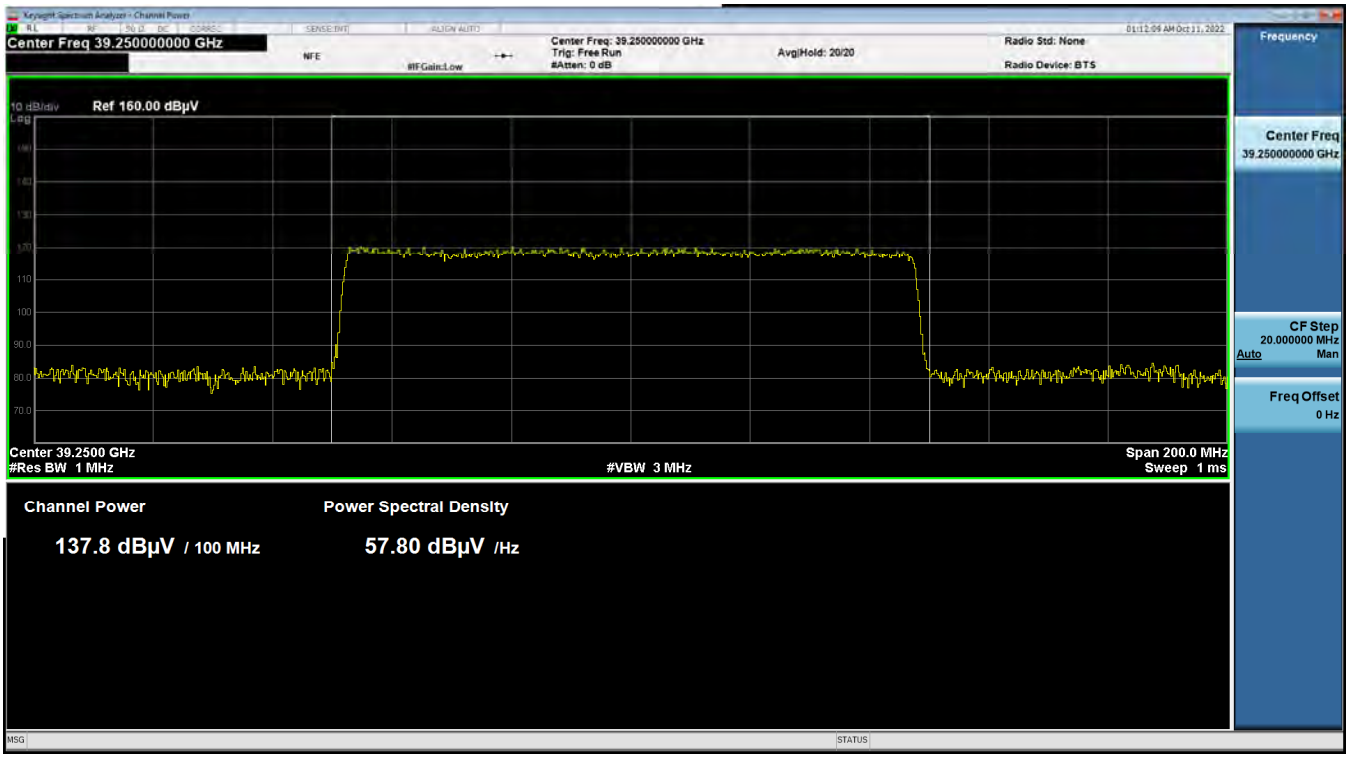


Antenna B / 39 GHz 1+15 CC / QPSK / High

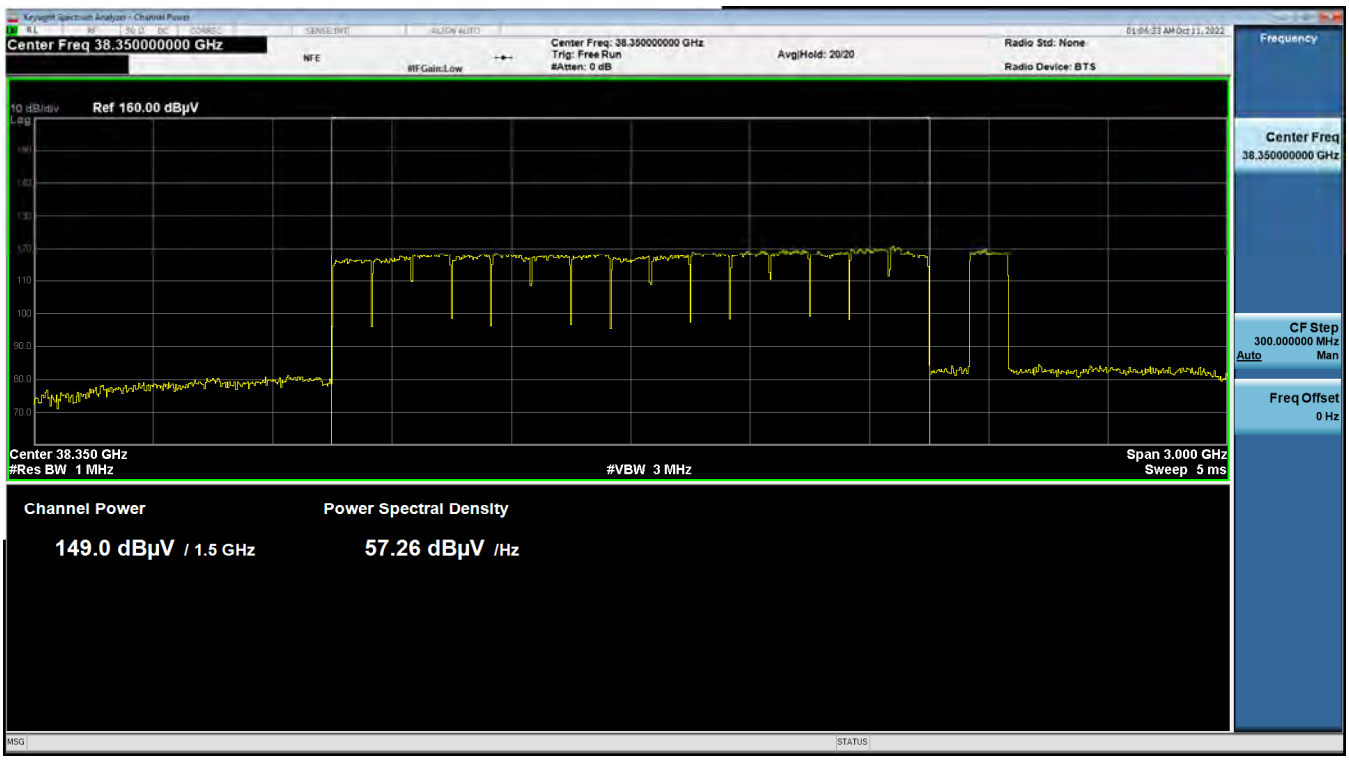


Antenna A / 39 GHz 15+1 CC / 16QAM / Low

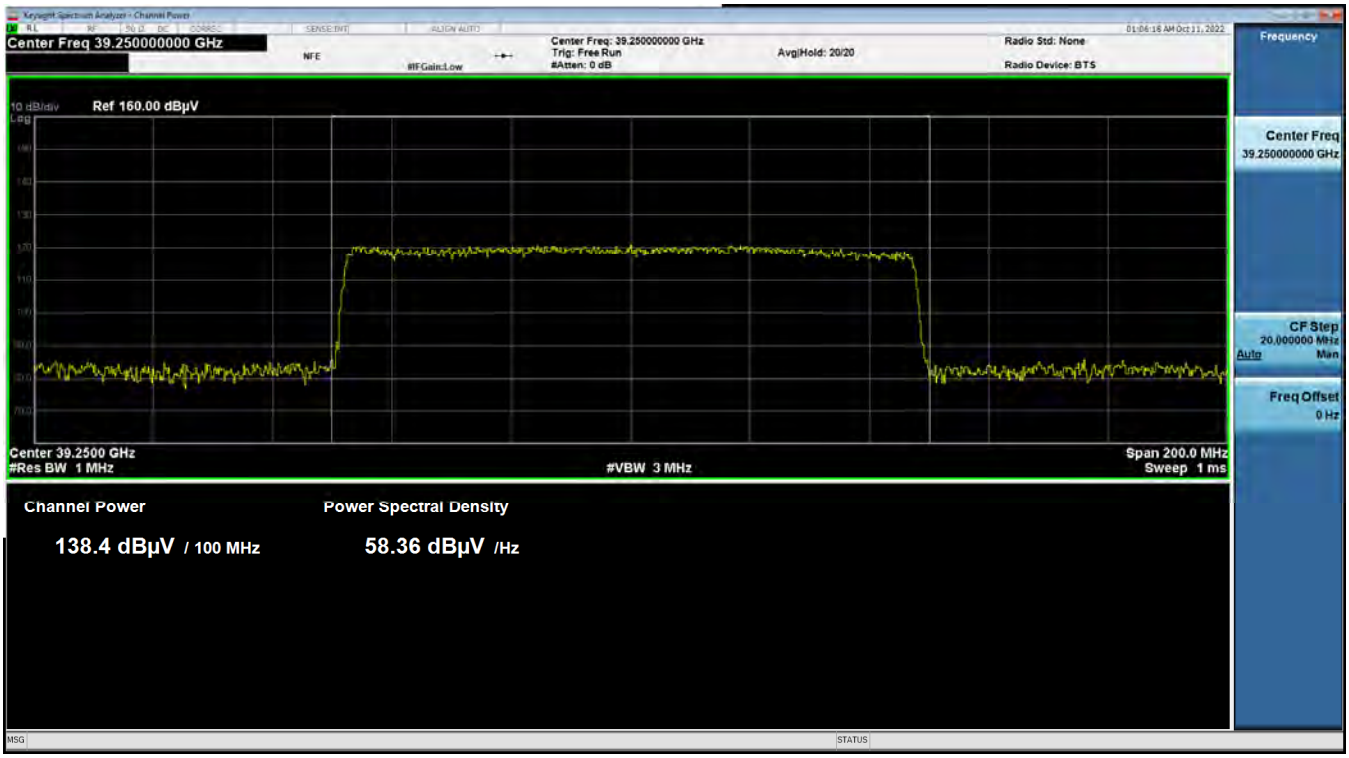
Antenna A / 39 GHz 15+1 CC / 64QAM / High



Antenna B / 39 GHz 15+1 CC / 64QAM / Low



Antenna B / 39 GHz 15+1 CC / 64QAM / High



5.4. BAND EDGE

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 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.

f) See Annex I for example emission mask plots.

Note:

1. Basic test conditions are same as EIRP test on section 5.2.
2. In the band edge test of path A and B are individually operated and measured at the maximum emission position of path A. For measurement of path B repeat at the maximum emission position of path B.
3. Due to MIMO operations, a correction has been added to the limit according to KDB 662911 D01 v02r01.
   - *OBW 10% from the edge: 2Tx MIMO correction: 10 log(N_{ANT}) = 10 log(2) = 3.01 dB*

     *-5 dBm – 10*log (2) = -8.01 dBm*
4. Band edge value is calculated as follows.

   *Band Edge Result = Measured Value + 20 * log(D) – 104.77 + AFCL + Duty – EUT Antenna Gain**

   * Antenna Gain of the above formula was applied from actual measurement data of the radiation pattern document.

5. Sample calculation:

   41.98 dBμV (measured) + 16.39 (distance) + 1.3569 (Duty) – 104.77 (Conversion) - 30.35 (Ant Gain)

   = -28.00 dBm (Band Edge Result)

Test Results:
1. Contiguous

28 GHz 1CC 50 MHz
Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	6.6	1	Low	QPSK	Lower A	41.98	2.35	30.35	-28.00	-8
						Lower B	24.79	-14.84	30.35	-45.19	-8
						Upper A	24.78	-14.65	30.585	-45.24	-8
						Upper B	18.97	-20.45	30.585	-51.04	-8
					16QAM	Lower A	42.85	3.22	30.35	-27.13	-8
						Lower B	25.66	-13.98	30.35	-44.33	-8
						Upper A	24.57	-14.85	30.585	-45.44	-8
						Upper B	21.26	-18.16	30.585	-48.75	-8
					64QAM	Lower A	42.49	2.85	30.35	-27.50	-8
						Lower B	27.19	-12.44	30.35	-42.79	-8
						Upper A	25.00	-14.43	30.585	-45.02	-8
						Upper B	19.80	-19.62	30.585	-50.21	-8
					256QAM	Lower A	22.27	-17.36	30.35	-47.71	-8
						Lower B	21.86	-17.77	30.35	-48.12	-8
						Upper A	23.66	-15.76	30.585	-46.35	-8
						Upper B	19.23	-20.19	30.585	-50.78	-8
				Middle	QPSK	Lower A	21.92	-17.71	30.35	-48.06	-8
						Lower B	20.60	-19.03	30.35	-49.38	-8
						Upper A	21.33	-18.09	30.585	-48.68	-8
						Upper B	19.12	-20.31	30.585	-50.90	-8
					16QAM	Lower A	22.82	-16.81	30.35	-47.16	-8
						Lower B	20.65	-18.99	30.35	-49.34	-8
						Upper A	22.86	-16.57	30.585	-47.16	-8
						Upper B	21.58	-17.84	30.585	-48.43	-8
					64QAM	Lower A	22.68	-16.95	30.35	-47.30	-8
						Lower B	20.12	-19.51	30.35	-49.86	-8
						Upper A	20.58	-18.85	30.585	-49.44	-8
						Upper B	20.95	-18.47	30.585	-49.06	-8
					256QAM	Lower A	22.27	-17.36	30.35	-47.71	-8
						Lower B	21.86	-17.77	30.35	-48.12	-8
						Upper A	23.66	-15.76	30.585	-46.35	-8
						Upper B	19.23	-20.19	30.585	-50.78	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	6.6	1	High	QPSK	Lower A	22.43	-17.20	30.35	-47.55	-8
						Lower B	20.30	-19.33	30.35	-49.68	-8
						Upper A	44.02	4.60	30.585	-25.99	-8
						Upper B	25.16	-14.26	30.585	-44.85	-8
					16QAM	Lower A	22.57	-17.07	30.35	-47.42	-8
						Lower B	20.89	-18.74	30.35	-49.09	-8
						Upper A	42.40	2.98	30.585	-27.61	-8
						Upper B	25.73	-13.69	30.585	-44.28	-8
					64QAM	Lower A	21.75	-17.88	30.35	-48.23	-8
						Lower B	20.35	-19.28	30.35	-49.63	-8
						Upper A	41.75	2.33	30.585	-28.26	-8
						Upper B	25.37	-14.05	30.585	-44.64	-8
					256QAM	Lower A	22.14	-17.49	30.35	-47.84	-8
						Lower B	21.30	-18.33	30.35	-48.68	-8
						Upper A	44.64	5.22	30.585	-25.37	-8
						Upper B	25.87	-13.56	30.585	-44.15	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	6.6	1	Low	QPSK	Lower A	28.19	-11.44	30.35	-41.79	-8
						Lower B	44.74	5.10	30.35	-25.25	-8
						Upper A	20.64	-18.78	30.585	-49.37	-8
						Upper B	25.25	-14.17	30.585	-44.76	-8
					16QAM	Lower A	25.19	-14.44	30.35	-44.79	-8
						Lower B	43.02	3.38	30.35	-26.97	-8
						Upper A	19.49	-19.93	30.585	-50.52	-8
						Upper B	25.50	-13.93	30.585	-44.52	-8
					64QAM	Lower A	25.30	-14.34	30.35	-44.69	-8
						Lower B	42.83	3.20	30.35	-27.15	-8
						Upper A	18.71	-20.71	30.585	-51.30	-8
						Upper B	26.36	-13.06	30.585	-43.65	-8
					256QAM	Lower A	22.09	-17.55	30.35	-47.90	-8
						Lower B	23.89	-15.74	30.35	-46.09	-8
						Upper A	18.87	-20.55	30.585	-51.14	-8
						Upper B	22.63	-16.79	30.585	-47.38	-8
				Middle	QPSK	Lower A	20.61	-19.02	30.35	-49.37	-8
						Lower B	21.70	-17.93	30.35	-48.28	-8
						Upper A	19.99	-19.43	30.585	-50.02	-8
						Upper B	21.45	-17.97	30.585	-48.56	-8
					16QAM	Lower A	22.83	-16.81	30.35	-47.16	-8
						Lower B	23.36	-16.27	30.35	-46.62	-8
						Upper A	19.52	-19.91	30.585	-50.50	-8
						Upper B	22.20	-17.23	30.585	-47.82	-8
					64QAM	Lower A	22.42	-17.21	30.35	-47.56	-8
						Lower B	23.32	-16.32	30.35	-46.67	-8
						Upper A	20.66	-18.76	30.585	-49.35	-8
						Upper B	22.10	-17.33	30.585	-47.92	-8
					256QAM	Lower A	22.09	-17.55	30.35	-47.90	-8
						Lower B	23.89	-15.74	30.35	-46.09	-8
						Upper A	18.87	-20.55	30.585	-51.14	-8
						Upper B	22.63	-16.79	30.585	-47.38	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	6.6	1	High	QPSK	Lower A	20.03	-19.60	30.35	-49.95	-8
						Lower B	21.52	-18.11	30.35	-48.46	-8
						Upper A	26.04	-13.38	30.585	-43.97	-8
						Upper B	43.54	4.12	30.585	-26.47	-8
					16QAM	Lower A	21.51	-18.12	30.35	-48.47	-8
						Lower B	22.85	-16.78	30.35	-47.13	-8
						Upper A	24.82	-14.60	30.585	-45.19	-8
						Upper B	43.91	4.49	30.585	-26.10	-8
					64QAM	Lower A	22.12	-17.51	30.35	-47.86	-8
						Lower B	23.71	-15.93	30.35	-46.28	-8
						Upper A	27.39	-12.04	30.585	-42.63	-8
						Upper B	42.11	2.69	30.585	-27.90	-8
					256QAM	Lower A	21.96	-17.68	30.35	-48.03	-8
						Lower B	22.89	-16.75	30.35	-47.10	-8
						Upper A	26.15	-13.27	30.585	-43.86	-8
						Upper B	43.20	3.78	30.585	-26.81	-8

28 GHz 1CC 100 MHz, 8CC
Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	1	Low	QPSK	Lower A	32.69	-6.93	30.35	-37.28	-8
						Lower B	23.77	-15.84	30.35	-46.19	-8
						Upper A	23.44	-15.86	30.585	-46.45	-8
						Upper B	18.98	-20.32	30.585	-50.91	-8
					16QAM	Lower A	31.81	-7.80	30.35	-38.15	-8
						Lower B	23.16	-16.45	30.35	-46.80	-8
						Upper A	24.22	-15.07	30.585	-45.66	-8
						Upper B	20.22	-19.07	30.585	-49.66	-8
					64QAM	Lower A	32.99	-6.63	30.35	-36.98	-8
						Lower B	22.38	-17.23	30.35	-47.58	-8
						Upper A	23.85	-15.45	30.585	-46.04	-8
						Upper B	21.58	-17.71	30.585	-48.30	-8
					256QAM	Lower A	32.43	-7.18	30.35	-37.53	-8
						Lower B	23.29	-16.32	30.35	-46.67	-8
						Upper A	24.53	-14.77	30.585	-45.36	-8
						Upper B	19.50	-19.79	30.585	-50.38	-8
				Middle	QPSK	Lower A	23.48	-16.13	30.35	-46.48	-8
						Lower B	22.10	-17.51	30.35	-47.86	-8
						Upper A	22.47	-16.82	30.585	-47.41	-8
						Upper B	20.21	-19.08	30.585	-49.67	-8
					16QAM	Lower A	22.93	-16.68	30.35	-47.03	-8
						Lower B	21.18	-18.43	30.35	-48.78	-8
						Upper A	22.71	-16.59	30.585	-47.18	-8
						Upper B	20.32	-18.97	30.585	-49.56	-8
					64QAM	Lower A	22.17	-17.45	30.35	-47.80	-8
						Lower B	23.11	-16.50	30.35	-46.85	-8
						Upper A	22.17	-17.12	30.585	-47.71	-8
						Upper B	19.68	-19.61	30.585	-50.20	-8
					256QAM	Lower A	22.40	-17.21	30.35	-47.56	-8
						Lower B	20.59	-19.02	30.35	-49.37	-8
						Upper A	22.34	-16.95	30.585	-47.54	-8
						Upper B	19.59	-19.71	30.585	-50.30	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	1	High	QPSK	Lower A	22.44	-17.17	30.35	-47.52	-8
						Lower B	22.23	-17.38	30.35	-47.73	-8
						Upper A	33.03	-6.26	30.585	-36.85	-8
						Upper B	22.34	-16.95	30.585	-47.54	-8
					16QAM	Lower A	23.06	-16.56	30.35	-46.91	-8
						Lower B	21.94	-17.68	30.35	-48.03	-8
						Upper A	32.08	-7.21	30.585	-37.80	-8
						Upper B	21.68	-17.61	30.585	-48.20	-8
					64QAM	Lower A	22.84	-16.78	30.35	-47.13	-8
						Lower B	21.79	-17.82	30.35	-48.17	-8
						Upper A	33.46	-5.84	30.585	-36.43	-8
						Upper B	21.58	-17.72	30.585	-48.31	-8
					256QAM	Lower A	23.62	-15.99	30.35	-46.34	-8
						Lower B	20.98	-18.63	30.35	-48.98	-8
						Upper A	32.90	-6.39	30.585	-36.98	-8
						Upper B	21.75	-17.54	30.585	-48.13	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	8	Low	QPSK	Lower A	35.17	-4.44	30.35	-34.79	-8
						Lower B	23.42	-16.19	30.35	-46.54	-8
						Upper A	37.27	-2.03	30.585	-32.62	-8
						Upper B	23.07	-16.22	30.585	-46.81	-8
					16QAM	Lower A	35.97	-3.64	30.35	-33.99	-8
						Lower B	24.07	-15.55	30.35	-45.90	-8
						Upper A	36.66	-2.63	30.585	-33.22	-8
						Upper B	23.65	-15.64	30.585	-46.23	-8
					64QAM	Lower A	36.00	-3.62	30.35	-33.97	-8
						Lower B	24.23	-15.38	30.35	-45.73	-8
						Upper A	36.99	-2.30	30.585	-32.89	-8
						Upper B	22.99	-16.31	30.585	-46.90	-8
					256QAM	Lower A	35.65	-3.96	30.35	-34.31	-8
						Lower B	25.55	-14.06	30.35	-44.41	-8
						Upper A	37.12	-2.18	30.585	-32.77	-8
						Upper B	23.98	-15.31	30.585	-45.90	-8
				Middle	QPSK	Lower A	35.79	-3.83	30.35	-34.18	-8
						Lower B	24.44	-15.17	30.35	-45.52	-8
						Upper A	38.01	-1.28	30.585	-31.87	-8
						Upper B	22.95	-16.34	30.585	-46.93	-8
					16QAM	Lower A	34.63	-4.98	30.35	-35.33	-8
						Lower B	23.90	-15.71	30.35	-46.06	-8
						Upper A	37.00	-2.29	30.585	-32.88	-8
						Upper B	22.75	-16.55	30.585	-47.14	-8
					64QAM	Lower A	34.39	-5.22	30.35	-35.57	-8
						Lower B	22.62	-16.99	30.35	-47.34	-8
						Upper A	36.75	-2.54	30.585	-33.13	-8
						Upper B	22.70	-16.60	30.585	-47.19	-8
					256QAM	Lower A	35.59	-4.02	30.35	-34.37	-8
						Lower B	24.72	-14.89	30.35	-45.24	-8
						Upper A	37.78	-1.51	30.585	-32.10	-8
						Upper B	23.96	-15.33	30.585	-45.92	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	8	High	QPSK	Lower A	35.63	-3.99	30.35	-34.34	-8
						Lower B	24.05	-15.56	30.35	-45.91	-8
						Upper A	37.38	-1.91	30.585	-32.50	-8
						Upper B	23.64	-15.65	30.585	-46.24	-8
					16QAM	Lower A	34.97	-4.64	30.35	-34.99	-8
						Lower B	23.97	-15.64	30.35	-45.99	-8
						Upper A	37.94	-1.35	30.585	-31.94	-8
						Upper B	23.22	-16.08	30.585	-46.67	-8
					64QAM	Lower A	35.21	-4.40	30.35	-34.75	-8
						Lower B	24.10	-15.52	30.35	-45.87	-8
						Upper A	38.21	-1.08	30.585	-31.67	-8
						Upper B	24.14	-15.16	30.585	-45.75	-8
					256QAM	Lower A	35.30	-4.31	30.35	-34.66	-8
						Lower B	24.64	-14.97	30.35	-45.32	-8
						Upper A	37.88	-1.41	30.585	-32.00	-8
						Upper B	23.15	-16.14	30.585	-46.73	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	1	Low	QPSK	Lower A	22.94	-16.68	30.35	-47.03	-8
						Lower B	35.13	-4.48	30.35	-34.83	-8
						Upper A	20.21	-19.08	30.585	-49.67	-8
						Upper B	24.01	-15.29	30.585	-45.88	-8
					16QAM	Lower A	23.85	-15.76	30.35	-46.11	-8
						Lower B	34.50	-5.11	30.35	-35.46	-8
						Upper A	20.56	-18.73	30.585	-49.32	-8
						Upper B	25.43	-13.87	30.585	-44.46	-8
					64QAM	Lower A	22.86	-16.75	30.35	-47.10	-8
						Lower B	34.13	-5.49	30.35	-35.84	-8
						Upper A	19.88	-19.41	30.585	-50.00	-8
						Upper B	24.53	-14.76	30.585	-45.35	-8
					256QAM	Lower A	23.05	-16.57	30.35	-46.92	-8
						Lower B	34.19	-5.43	30.35	-35.78	-8
						Upper A	19.74	-19.56	30.585	-50.15	-8
						Upper B	24.72	-14.57	30.585	-45.16	-8
				Middle	QPSK	Lower A	21.74	-17.87	30.35	-48.22	-8
						Lower B	22.31	-17.31	30.35	-47.66	-8
						Upper A	20.49	-18.81	30.585	-49.40	-8
						Upper B	22.80	-16.50	30.585	-47.09	-8
					16QAM	Lower A	22.59	-17.03	30.35	-47.38	-8
						Lower B	22.83	-16.78	30.35	-47.13	-8
						Upper A	20.81	-18.48	30.585	-49.07	-8
						Upper B	23.19	-16.10	30.585	-46.69	-8
					64QAM	Lower A	20.49	-19.12	30.35	-49.47	-8
						Lower B	23.73	-15.88	30.35	-46.23	-8
						Upper A	20.75	-18.55	30.585	-49.14	-8
						Upper B	22.20	-17.09	30.585	-47.68	-8
					256QAM	Lower A	20.40	-19.21	30.35	-49.56	-8
						Lower B	22.85	-16.76	30.35	-47.11	-8
						Upper A	19.79	-19.50	30.585	-50.09	-8
						Upper B	22.71	-16.59	30.585	-47.18	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	1	High	QPSK	Lower A	21.93	-17.68	30.35	-48.03	-8
						Lower B	23.15	-16.46	30.35	-46.81	-8
						Upper A	22.40	-16.90	30.585	-47.49	-8
						Upper B	33.00	-6.29	30.585	-36.88	-8
					16QAM	Lower A	21.74	-17.87	30.35	-48.22	-8
						Lower B	23.25	-16.36	30.35	-46.71	-8
						Upper A	22.13	-17.16	30.585	-47.75	-8
						Upper B	33.81	-5.49	30.585	-36.08	-8
					64QAM	Lower A	20.47	-19.14	30.35	-49.49	-8
						Lower B	23.35	-16.26	30.35	-46.61	-8
						Upper A	22.51	-16.78	30.585	-47.37	-8
						Upper B	33.81	-5.49	30.585	-36.08	-8
					256QAM	Lower A	21.88	-17.74	30.35	-48.09	-8
						Lower B	24.04	-15.58	30.35	-45.93	-8
						Upper A	22.06	-17.23	30.585	-47.82	-8
						Upper B	35.05	-4.24	30.585	-34.83	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	8	Low	QPSK	Lower A	24.82	-14.79	30.35	-45.14	-8
						Lower B	37.17	-2.44	30.35	-32.79	-8
						Upper A	23.25	-16.04	30.585	-46.63	-8
						Upper B	38.63	-0.66	30.585	-31.25	-8
					16QAM	Lower A	24.55	-15.06	30.35	-45.41	-8
						Lower B	37.73	-1.88	30.35	-32.23	-8
						Upper A	23.40	-15.89	30.585	-46.48	-8
						Upper B	38.83	-0.47	30.585	-31.06	-8
					64QAM	Lower A	25.28	-14.33	30.35	-44.68	-8
						Lower B	37.69	-1.93	30.35	-32.28	-8
						Upper A	22.87	-16.42	30.585	-47.01	-8
						Upper B	38.70	-0.60	30.585	-31.19	-8
					256QAM	Lower A	24.62	-15.00	30.35	-45.35	-8
						Lower B	37.42	-2.19	30.35	-32.54	-8
						Upper A	24.17	-15.13	30.585	-45.72	-8
						Upper B	38.80	-0.49	30.585	-31.08	-8
				Middle	QPSK	Lower A	24.36	-15.26	30.35	-45.61	-8
						Lower B	37.26	-2.35	30.35	-32.70	-8
						Upper A	23.20	-16.09	30.585	-46.68	-8
						Upper B	39.93	0.64	30.585	-29.95	-8
					16QAM	Lower A	23.73	-15.88	30.35	-46.23	-8
						Lower B	35.80	-3.81	30.35	-34.16	-8
						Upper A	23.22	-16.07	30.585	-46.66	-8
						Upper B	38.05	-1.24	30.585	-31.83	-8
					64QAM	Lower A	23.95	-15.66	30.35	-46.01	-8
						Lower B	36.08	-3.53	30.35	-33.88	-8
						Upper A	22.81	-16.48	30.585	-47.07	-8
						Upper B	38.45	-0.84	30.585	-31.43	-8
					256QAM	Lower A	25.26	-14.36	30.35	-44.71	-8
						Lower B	37.55	-2.06	30.35	-32.41	-8
						Upper A	24.28	-15.01	30.585	-45.60	-8
						Upper B	39.34	0.05	30.585	-30.54	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	8	High	QPSK	Lower A	24.23	-15.38	30.35	-45.73	-8
						Lower B	37.09	-2.53	30.35	-32.88	-8
						Upper A	23.70	-15.59	30.585	-46.18	-8
						Upper B	39.26	-0.04	30.585	-30.63	-8
					16QAM	Lower A	24.02	-15.60	30.35	-45.95	-8
						Lower B	36.72	-2.89	30.35	-33.24	-8
						Upper A	24.16	-15.13	30.585	-45.72	-8
						Upper B	39.21	-0.08	30.585	-30.67	-8
					64QAM	Lower A	24.47	-15.15	30.35	-45.50	-8
						Lower B	37.40	-2.21	30.35	-32.56	-8
						Upper A	24.36	-14.94	30.585	-45.53	-8
						Upper B	39.05	-0.24	30.585	-30.83	-8
					256QAM	Lower A	24.35	-15.26	30.35	-45.61	-8
						Lower B	36.59	-3.02	30.35	-33.37	-8
						Upper A	23.89	-15.41	30.585	-46.00	-8
						Upper B	39.05	-0.24	30.585	-30.83	-8

39 GHz 1CC, 16CC
Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	1	Low	QPSK	Lower A	29.63	-5.20	29.72	-34.92	-8
						Lower B	26.77	-8.06	29.72	-37.78	-8
						Upper A	25.56	-6.57	30.05	-36.62	-8
						Upper B	27.02	-5.12	30.05	-35.17	-8
					16QAM	Lower A	30.08	-4.76	29.72	-34.48	-8
						Lower B	27.28	-7.56	29.72	-37.28	-8
						Upper A	26.40	-5.74	30.05	-35.79	-8
						Upper B	26.84	-5.30	30.05	-35.35	-8
					64QAM	Lower A	29.65	-5.18	29.72	-34.90	-8
						Lower B	27.65	-7.19	29.72	-36.91	-8
						Upper A	26.65	-5.49	30.05	-35.54	-8
						Upper B	26.46	-5.67	30.05	-35.72	-8
					256QAM	Lower A	30.13	-4.71	29.72	-34.43	-8
						Lower B	26.85	-7.98	29.72	-37.70	-8
						Upper A	27.37	-4.76	30.05	-34.81	-8
						Upper B	26.08	-6.05	30.05	-36.10	-8
				Middle	QPSK	Lower A	25.46	-9.38	29.72	-39.10	-8
						Lower B	26.22	-8.62	29.72	-38.34	-8
						Upper A	27.66	-4.47	30.05	-34.52	-8
						Upper B	26.92	-5.21	30.05	-35.26	-8
					16QAM	Lower A	27.63	-7.20	29.72	-36.92	-8
						Lower B	26.78	-8.05	29.72	-37.77	-8
						Upper A	26.87	-5.26	30.05	-35.31	-8
						Upper B	27.60	-4.53	30.05	-34.58	-8
					64QAM	Lower A	26.91	-7.92	29.72	-37.64	-8
						Lower B	27.54	-7.29	29.72	-37.01	-8
						Upper A	26.38	-5.75	30.05	-35.80	-8
						Upper B	26.81	-5.33	30.05	-35.38	-8
					256QAM	Lower A	26.14	-8.69	29.72	-38.41	-8
						Lower B	28.09	-6.74	29.72	-36.46	-8
						Upper A	27.53	-4.60	30.05	-34.65	-8
						Upper B	27.36	-4.77	30.05	-34.82	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	1	High	QPSK	Lower A	27.02	-7.82	29.72	-37.54	-8
						Lower B	26.22	-8.61	29.72	-38.33	-8
						Upper A	35.47	3.33	30.05	-26.72	-8
						Upper B	28.15	-3.98	30.05	-34.03	-8
					16QAM	Lower A	26.99	-7.84	29.72	-37.56	-8
						Lower B	25.01	-9.83	29.72	-39.55	-8
						Upper A	33.92	1.79	30.05	-28.26	-8
						Upper B	28.94	-3.19	30.05	-33.24	-8
					64QAM	Lower A	26.58	-8.25	29.72	-37.97	-8
						Lower B	26.49	-8.34	29.72	-38.06	-8
						Upper A	33.24	1.10	30.05	-28.95	-8
						Upper B	27.99	-4.14	30.05	-34.19	-8
					256QAM	Lower A	26.87	-7.96	29.72	-37.68	-8
						Lower B	27.02	-7.82	29.72	-37.54	-8
						Upper A	33.84	1.70	30.05	-28.35	-8
						Upper B	27.61	-4.53	30.05	-34.58	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	16	Low	QPSK	Lower A	82.90	-4.13	29.72	-33.85	-8
						Lower B	79.28	-7.74	29.72	-37.46	-8
						Upper A	87.47	0.44	30.05	-29.61	-8
						Upper B	83.11	-3.91	30.05	-33.96	-8
					16QAM	Lower A	81.58	-5.44	29.72	-35.16	-8
						Lower B	78.87	-8.15	29.72	-37.87	-8
						Upper A	86.22	-0.80	30.05	-30.85	-8
						Upper B	82.84	-4.18	30.05	-34.23	-8
					64QAM	Lower A	82.00	-5.02	29.72	-34.74	-8
						Lower B	79.25	-7.77	29.72	-37.49	-8
						Upper A	85.58	-1.44	30.05	-31.49	-8
						Upper B	82.68	-4.34	30.05	-34.39	-8
					256QAM	Lower A	81.05	-5.97	29.72	-35.69	-8
						Lower B	79.00	-8.03	29.72	-37.75	-8
						Upper A	86.02	-1.01	30.05	-31.06	-8
						Upper B	82.29	-4.73	30.05	-34.78	-8
				Middle	QPSK	Lower A	81.00	-6.02	29.72	-35.74	-8
						Lower B	79.73	-7.29	29.72	-37.01	-8
						Upper A	85.57	-1.45	30.05	-31.50	-8
						Upper B	83.05	-3.97	30.05	-34.02	-8
					16QAM	Lower A	81.61	-5.41	29.72	-35.13	-8
						Lower B	79.96	-7.06	29.72	-36.78	-8
						Upper A	86.47	-0.55	30.05	-30.60	-8
						Upper B	83.24	-3.79	30.05	-33.84	-8
					64QAM	Lower A	81.68	-5.35	29.72	-35.07	-8
						Lower B	79.23	-7.79	29.72	-37.51	-8
						Upper A	86.35	-0.67	30.05	-30.72	-8
						Upper B	82.65	-4.37	30.05	-34.42	-8
					256QAM	Lower A	81.51	-5.51	29.72	-35.23	-8
						Lower B	79.79	-7.24	29.72	-36.96	-8
						Upper A	87.22	0.20	30.05	-29.85	-8
						Upper B	83.28	-3.74	30.05	-33.79	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3.01	16	High	QPSK	Lower A	81.94	-5.08	29.72	-34.80	-8
						Lower B	78.67	-8.36	29.72	-38.08	-8
						Upper A	86.35	-0.68	30.05	-30.73	-8
						Upper B	82.77	-4.25	30.05	-34.30	-8
					16QAM	Lower A	82.14	-4.88	29.72	-34.60	-8
						Lower B	80.08	-6.94	29.72	-36.66	-8
						Upper A	86.84	-0.18	30.05	-30.23	-8
						Upper B	83.28	-3.74	30.05	-33.79	-8
					64QAM	Lower A	81.85	-5.17	29.72	-34.89	-8
						Lower B	78.80	-8.23	29.72	-37.95	-8
						Upper A	86.78	-0.24	30.05	-30.29	-8
						Upper B	83.31	-3.71	30.05	-33.76	-8
					256QAM	Lower A	81.92	-5.11	29.72	-34.83	-8
						Lower B	79.02	-8.00	29.72	-37.72	-8
						Upper A	86.13	-0.89	30.05	-30.94	-8
						Upper B	83.39	-3.64	30.05	-33.69	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	1	Low	QPSK	Lower A	26.76	-8.07	29.72	-37.79	-8
						Lower B	30.72	-4.11	29.72	-33.83	-8
						Upper A	28.18	-3.95	30.05	-34.00	-8
						Upper B	25.86	-6.28	30.05	-36.33	-8
					16QAM	Lower A	28.03	-6.80	29.72	-36.52	-8
						Lower B	31.43	-3.40	29.72	-33.12	-8
						Upper A	26.35	-5.78	30.05	-35.83	-8
						Upper B	25.43	-6.71	30.05	-36.76	-8
					64QAM	Lower A	26.95	-7.88	29.72	-37.60	-8
						Lower B	31.20	-3.63	29.72	-33.35	-8
						Upper A	26.61	-5.52	30.05	-35.57	-8
						Upper B	25.64	-6.49	30.05	-36.54	-8
					256QAM	Lower A	27.56	-7.27	29.72	-36.99	-8
						Lower B	30.82	-4.01	29.72	-33.73	-8
						Upper A	25.36	-6.77	30.05	-36.82	-8
						Upper B	26.38	-5.75	30.05	-35.80	-8
				Middle	QPSK	Lower A	25.74	-9.09	29.72	-38.81	-8
						Lower B	25.05	-9.78	29.72	-39.50	-8
						Upper A	28.15	-3.98	30.05	-34.03	-8
						Upper B	27.38	-4.75	30.05	-34.80	-8
					16QAM	Lower A	24.76	-10.08	29.72	-39.80	-8
						Lower B	26.07	-8.76	29.72	-38.48	-8
						Upper A	26.98	-5.15	30.05	-35.20	-8
						Upper B	28.92	-3.21	30.05	-33.26	-8
					64QAM	Lower A	25.30	-9.53	29.72	-39.25	-8
						Lower B	27.34	-7.49	29.72	-37.21	-8
						Upper A	27.38	-4.75	30.05	-34.80	-8
						Upper B	27.12	-5.01	30.05	-35.06	-8
					256QAM	Lower A	26.85	-7.98	29.72	-37.70	-8
						Lower B	26.39	-8.44	29.72	-38.16	-8
						Upper A	27.48	-4.66	30.05	-34.71	-8
						Upper B	27.69	-4.44	30.05	-34.49	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	1	High	QPSK	Lower A	26.19	-8.64	29.72	-38.36	-8
						Lower B	26.43	-8.40	29.72	-38.12	-8
						Upper A	27.84	-4.29	30.05	-34.34	-8
						Upper B	34.46	2.32	30.05	-27.73	-8
					16QAM	Lower A	26.19	-8.65	29.72	-38.37	-8
						Lower B	27.09	-7.74	29.72	-37.46	-8
						Upper A	27.73	-4.40	30.05	-34.45	-8
						Upper B	34.12	1.98	30.05	-28.07	-8
					64QAM	Lower A	26.45	-8.38	29.72	-38.10	-8
						Lower B	26.59	-8.24	29.72	-37.96	-8
						Upper A	27.62	-4.51	30.05	-34.56	-8
						Upper B	34.21	2.08	30.05	-27.97	-8
					256QAM	Lower A	25.86	-8.97	29.72	-38.69	-8
						Lower B	26.79	-8.05	29.72	-37.77	-8
						Upper A	28.06	-4.07	30.05	-34.12	-8
						Upper B	34.14	2.01	30.05	-28.04	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	16	Low	QPSK	Lower A	79.59	-7.44	29.72	-37.16	-8
						Lower B	82.13	-4.89	29.72	-34.61	-8
						Upper A	83.91	-3.11	30.05	-33.16	-8
						Upper B	86.20	-0.82	30.05	-30.87	-8
					16QAM	Lower A	79.55	-7.48	29.72	-37.20	-8
						Lower B	82.56	-4.46	29.72	-34.18	-8
						Upper A	82.43	-4.59	30.05	-34.64	-8
						Upper B	86.74	-0.28	30.05	-30.33	-8
					64QAM	Lower A	80.06	-6.96	29.72	-36.68	-8
						Lower B	82.92	-4.11	29.72	-33.83	-8
						Upper A	82.80	-4.22	30.05	-34.27	-8
						Upper B	87.07	0.05	30.05	-30.00	-8
					256QAM	Lower A	79.17	-7.85	29.72	-37.57	-8
						Lower B	82.04	-4.98	29.72	-34.70	-8
						Upper A	82.32	-4.71	30.05	-34.76	-8
						Upper B	85.95	-1.08	30.05	-31.13	-8
				Middle	QPSK	Lower A	80.37	-6.65	29.72	-36.37	-8
						Lower B	82.58	-4.45	29.72	-34.17	-8
						Upper A	83.09	-3.93	30.05	-33.98	-8
						Upper B	87.09	0.06	30.05	-29.99	-8
					16QAM	Lower A	79.14	-7.88	29.72	-37.60	-8
						Lower B	83.19	-3.83	29.72	-33.55	-8
						Upper A	82.62	-4.40	30.05	-34.45	-8
						Upper B	87.13	0.11	30.05	-29.94	-8
					64QAM	Lower A	80.20	-6.82	29.72	-36.54	-8
						Lower B	82.14	-4.88	29.72	-34.60	-8
						Upper A	82.60	-4.42	30.05	-34.47	-8
						Upper B	86.10	-0.92	30.05	-30.97	-8
					256QAM	Lower A	78.86	-8.16	29.72	-37.88	-8
						Lower B	83.09	-3.93	29.72	-33.65	-8
						Upper A	83.01	-4.01	30.05	-34.06	-8
						Upper B	87.28	0.26	30.05	-29.79	-8

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. B	135°	3.01	16	High	QPSK	Lower A	79.11	-7.91	29.72	-37.63	-8
						Lower B	82.33	-4.70	29.72	-34.42	-8
						Upper A	82.28	-4.74	30.05	-34.79	-8
						Upper B	87.26	0.24	30.05	-29.81	-8
					16QAM	Lower A	79.95	-7.07	29.72	-36.79	-8
						Lower B	81.76	-5.26	29.72	-34.98	-8
						Upper A	83.14	-3.89	30.05	-33.94	-8
						Upper B	86.76	-0.27	30.05	-30.32	-8
					64QAM	Lower A	79.09	-7.93	29.72	-37.65	-8
						Lower B	82.14	-4.88	29.72	-34.60	-8
						Upper A	82.98	-4.04	30.05	-34.09	-8
						Upper B	86.32	-0.70	30.05	-30.75	-8
					256QAM	Lower A	78.44	-8.59	29.72	-38.31	-8
						Lower B	81.47	-5.55	29.72	-35.27	-8
						Upper A	82.64	-4.38	30.05	-34.43	-8
						Upper B	86.92	-0.11	30.05	-30.16	-8

2. Non-Contiguous

28 GHz 1+7 CC

Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3	1+7	Low	QPSK	A	83.28	-3.75	30.35	-34.10	-8
						B	71.07	-15.95	30.35	-46.30	-8
					16QAM	A	82.47	-4.55	30.35	-34.90	-8
						B	71.97	-15.06	30.35	-45.41	-8
					64QAM	A	83.25	-3.78	30.35	-34.13	-8
						B	71.30	-15.72	30.35	-46.07	-8
					256QAM	A	84.59	-2.43	30.35	-32.78	-8
						B	71.48	-15.54	30.35	-45.89	-8
				High	QPSK	A	85.19	-1.84	30.57	-32.41	-8
						B	71.05	-15.97	30.57	-46.54	-8
					16QAM	A	85.21	-1.81	30.57	-32.38	-8
						B	71.11	-15.91	30.57	-46.48	-8
					64QAM	A	86.12	-0.91	30.57	-31.48	-8
						B	71.35	-15.67	30.57	-46.24	-8
					256QAM	A	85.57	-1.45	30.57	-32.02	-8
						B	71.34	-15.68	30.57	-46.25	-8
MAX Ant. B	135°			Low	QPSK	A	71.78	-15.24	30.35	-45.59	-8
						B	84.08	-2.94	30.35	-33.29	-8
					16QAM	A	72.08	-14.94	30.35	-45.29	-8
						B	84.54	-2.49	30.35	-32.84	-8
					64QAM	A	72.10	-14.93	30.35	-45.28	-8
						B	85.37	-1.65	30.35	-32.00	-8
					256QAM	A	72.54	-14.48	30.35	-44.83	-8
						B	85.47	-1.55	30.35	-31.90	-8
				High	QPSK	A	71.03	-16.00	30.57	-46.57	-8
						B	86.57	-0.45	30.57	-31.02	-8
					16QAM	A	71.22	-15.80	30.57	-46.37	-8
						B	87.36	0.33	30.57	-30.24	-8
					64QAM	A	71.50	-15.52	30.57	-46.09	-8
						B	88.14	1.12	30.57	-29.45	-8
					256QAM	A	70.84	-16.19	30.57	-46.76	-8
						B	87.84	0.82	30.57	-29.75	-8

28 GHz 7+1 CC

Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3	7+1	Low	QPSK	A	83.42	-3.61	30.35	-33.96	-8
						B	71.15	-15.87	30.35	-46.22	-8
					16QAM	A	83.64	-3.39	30.35	-33.74	-8
						B	72.58	-14.44	30.35	-44.79	-8
					64QAM	A	83.80	-3.22	30.35	-33.57	-8
						B	72.55	-14.47	30.35	-44.82	-8
					256QAM	A	83.75	-3.27	30.35	-33.62	-8
						B	71.92	-15.10	30.35	-45.45	-8
				High	QPSK	A	86.39	-0.64	30.57	-31.21	-8
						B	71.42	-15.61	30.57	-46.18	-8
					16QAM	A	85.53	-1.50	30.57	-32.07	-8
						B	71.35	-15.68	30.57	-46.25	-8
					64QAM	A	86.10	-0.93	30.57	-31.50	-8
						B	71.52	-15.51	30.57	-46.08	-8
					256QAM	A	85.86	-1.17	30.57	-31.74	-8
						B	71.49	-15.53	30.57	-46.10	-8
MAX Ant. B	135°			Low	QPSK	A	71.97	-15.06	30.35	-45.41	-8
						B	85.09	-1.93	30.35	-32.28	-8
					16QAM	A	71.21	-15.81	30.35	-46.16	-8
						B	85.25	-1.77	30.35	-32.12	-8
					64QAM	A	70.99	-16.04	30.35	-46.39	-8
						B	84.88	-2.15	30.35	-32.50	-8
					256QAM	A	70.57	-16.45	30.35	-46.80	-8
						B	85.32	-1.70	30.35	-32.05	-8
				High	QPSK	A	70.98	-16.04	30.57	-46.61	-8
						B	87.65	0.63	30.57	-29.94	-8
					16QAM	A	70.23	-16.79	30.57	-47.36	-8
						B	87.42	0.40	30.57	-30.17	-8
					64QAM	A	70.90	-16.12	30.57	-46.69	-8
						B	86.98	-0.05	30.57	-30.62	-8
					256QAM	A	71.37	-15.65	30.57	-46.22	-8
						B	87.50	0.48	30.57	-30.09	-8

39 GHz 1+15 CC

Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3	1+15	Low	QPSK	A	81.54	-5.49	29.72	-35.21	-8
						B	79.58	-7.44	29.72	-37.16	-8
					16QAM	A	82.09	-4.94	29.72	-34.66	-8
						B	79.59	-7.43	29.72	-37.15	-8
					64QAM	A	82.22	-4.81	29.72	-34.53	-8
						B	80.00	-7.02	29.72	-36.74	-8
					256QAM	A	82.31	-4.71	29.72	-34.43	-8
						B	79.65	-7.37	29.72	-37.09	-8
				High	QPSK	A	86.79	-0.23	30.05	-30.28	-8
						B	84.63	-2.39	30.05	-32.44	-8
					16QAM	A	87.33	0.31	30.05	-29.74	-8
						B	83.57	-3.45	30.05	-33.50	-8
					64QAM	A	86.26	-0.76	30.05	-30.81	-8
						B	82.81	-4.21	30.05	-34.26	-8
					256QAM	A	86.70	-0.32	30.05	-30.37	-8
						B	83.39	-3.63	30.05	-33.68	-8
MAX Ant. B	135°			Low	QPSK	A	79.49	-7.53	29.72	-37.25	-8
						B	82.99	-4.03	29.72	-33.75	-8
					16QAM	A	79.72	-7.31	29.72	-37.03	-8
						B	83.03	-3.99	29.72	-33.71	-8
					64QAM	A	78.53	-8.49	29.72	-38.21	-8
						B	82.45	-4.58	29.72	-34.30	-8
					256QAM	A	79.29	-7.73	29.72	-37.45	-8
						B	82.96	-4.07	29.72	-33.79	-8
				High	QPSK	A	82.90	-4.12	30.05	-34.17	-8
						B	87.80	0.78	30.05	-29.27	-8
					16QAM	A	83.39	-3.63	30.05	-33.68	-8
						B	87.18	0.16	30.05	-29.89	-8
					64QAM	A	82.88	-4.14	30.05	-34.19	-8
						B	87.38	0.36	30.05	-29.69	-8
					256QAM	A	82.64	-4.38	30.05	-34.43	-8
						B	87.11	0.09	30.05	-29.96	-8

39 GHz 15+1 CC

Tabular Data of Band Edge

Pos.	Ant. Angle	Distance (m)	CC	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	3	15+1	Low	QPSK	A	81.92	-5.11	29.72	-34.83	-8
						B	79.61	-7.41	29.72	-37.13	-8
					16QAM	A	81.84	-5.19	29.72	-34.91	-8
						B	79.04	-7.99	29.72	-37.71	-8
					64QAM	A	82.45	-4.57	29.72	-34.29	-8
						B	79.74	-7.28	29.72	-37.00	-8
					256QAM	A	82.68	-4.34	29.72	-34.06	-8
						B	79.69	-7.33	29.72	-37.05	-8
				High	QPSK	A	86.65	-0.38	30.05	-30.43	-8
						B	83.06	-3.96	30.05	-34.01	-8
					16QAM	A	88.59	1.57	30.05	-28.48	-8
						B	82.96	-4.07	30.05	-34.12	-8
					64QAM	A	86.96	-0.06	30.05	-30.11	-8
						B	83.28	-3.74	30.05	-33.79	-8
					256QAM	A	86.48	-0.54	30.05	-30.59	-8
						B	83.30	-3.72	30.05	-33.77	-8
MAX Ant. B	135°			Low	QPSK	A	79.34	-7.68	29.72	-37.40	-8
						B	82.81	-4.22	29.72	-33.94	-8
					16QAM	A	79.96	-7.07	29.72	-36.79	-8
						B	82.78	-4.24	29.72	-33.96	-8
					64QAM	A	79.21	-7.81	29.72	-37.53	-8
						B	82.26	-4.76	29.72	-34.48	-8
					256QAM	A	79.58	-7.44	29.72	-37.16	-8
						B	82.59	-4.44	29.72	-34.16	-8
				High	QPSK	A	83.03	-3.99	30.05	-34.04	-8
						B	87.16	0.13	30.05	-29.92	-8
					16QAM	A	83.15	-3.87	30.05	-33.92	-8
						B	86.71	-0.32	30.05	-30.37	-8
					64QAM	A	82.82	-4.20	30.05	-34.25	-8
						B	86.45	-0.58	30.05	-30.63	-8
					256QAM	A	82.79	-4.24	30.05	-34.29	-8
						B	87.19	0.17	30.05	-29.88	-8

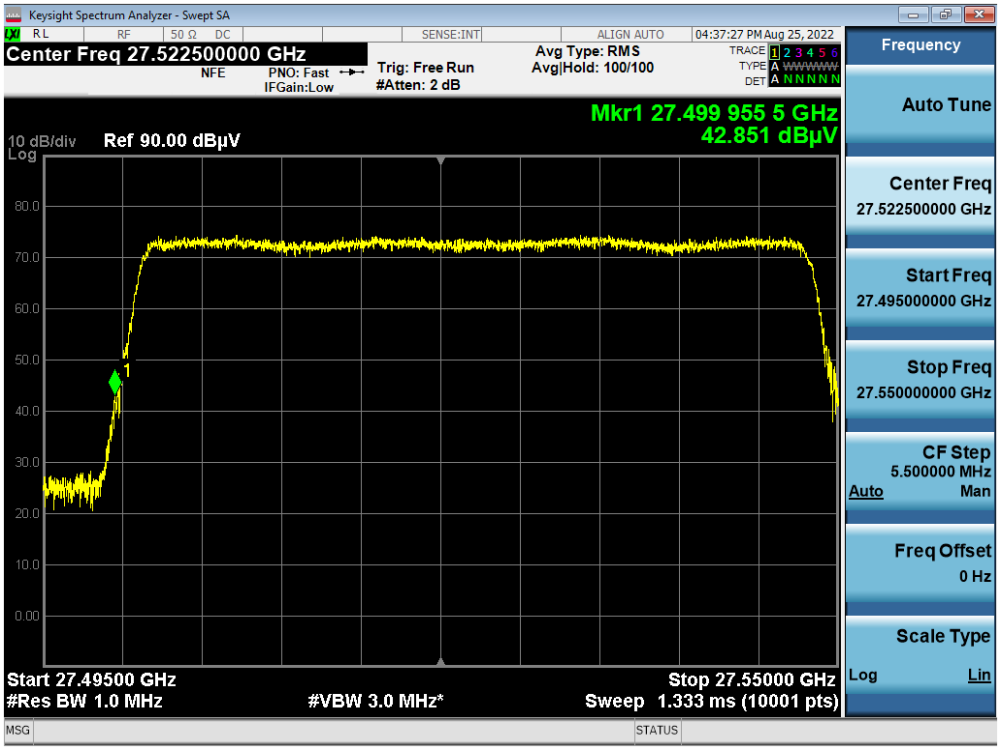
InterBand

Tabular Data of Band Edge

Pos.	Ant. Angle	Edge	Mod.	Ant	28 GHz Measured Level (dBuV)	28 GHz EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	39 GHz Measured Level (dBuV)	39 GHz EIRP (dBm)	Ant Gain (dBi)	Result (dBm)	Limit (dBm)
MAX Ant. A	45°	Low	QPSK	Lower A	39.42	-0.56	30.35	-30.91	31.56	-3.75	29.72	-33.47	-8
				Lower B	25.77	-13.88	30.35	-44.23	27.90	-6.93	29.72	-36.65	-8
				Upper A	40.23	0.94	30.585	-29.65	33.59	1.14	30.05	-28.91	-8
				Upper B	28.19	-13.87	30.585	-44.46	28.47	-3.66	30.05	-33.71	-8
			16QAM	Lower A	38.65	-0.97	30.35	-31.32	31.36	-3.47	29.72	-33.19	-8
				Lower B	24.80	-14.63	30.35	-44.98	28.32	-6.51	29.72	-36.23	-8
				Upper A	39.74	0.44	30.585	-30.15	32.91	0.77	30.05	-29.28	-8
				Upper B	24.35	-14.94	30.585	-45.53	28.65	-3.48	30.05	-33.53	-8
			64QAM	Lower A	38.94	-0.67	30.35	-31.02	31.20	-3.63	29.72	-33.35	-8
				Lower B	27.33	-12.28	30.35	-42.63	27.33	-7.50	29.72	-37.22	-8
				Upper A	40.09	0.80	30.585	-29.79	33.80	1.66	30.05	-28.39	-8
				Upper B	27.78	-11.52	30.585	-42.11	28.75	-3.39	30.05	-33.44	-8
			256QAM	Lower A	38.99	-0.63	30.35	-30.98	31.52	-3.32	29.72	-33.04	-8
				Lower B	25.50	-14.12	30.35	-44.47	27.84	-6.99	29.72	-36.71	-8
				Upper A	40.34	1.05	30.585	-29.54	32.73	0.65	30.05	-29.40	-8
				Upper B	24.87	-14.42	30.585	-45.01	28.86	-3.28	30.05	-33.33	-8
MAX Ant. B	135°	Low	QPSK	Lower A	25.54	-14.07	30.35	-44.42	28.14	-6.69	29.72	-36.41	-8
				Lower B	40.51	0.89	30.35	-29.46	32.89	-1.94	29.72	-31.66	-8
				Upper A	24.86	-14.43	30.585	-45.02	28.32	-3.81	30.05	-33.86	-8
				Upper B	41.79	2.50	30.585	-28.09	41.79	9.66	30.05	-20.39	-8
			16QAM	Lower A	25.52	-14.09	30.35	-44.44	27.61	-7.22	29.72	-36.94	-8
				Lower B	40.01	0.39	30.35	-29.96	33.19	-1.64	29.72	-31.36	-8
				Upper A	24.13	-15.16	30.585	-45.75	28.55	-3.58	30.05	-33.63	-8
				Upper B	42.08	2.79	30.585	-27.80	34.29	2.16	30.05	-27.89	-8
			64QAM	Lower A	28.29	-11.32	30.35	-41.67	27.99	-6.85	29.72	-36.57	-8
				Lower B	41.14	1.53	30.35	-28.82	33.54	-1.29	29.72	-31.01	-8
				Upper A	27.89	-11.40	30.585	-41.99	28.48	-3.65	30.05	-33.70	-8
				Upper B	42.29	3.00	30.585	-27.59	35.57	3.43	30.05	-26.62	-8
			256QAM	Lower A	24.75	-14.86	30.35	-45.21	28.44	-6.40	29.72	-36.12	-8
				Lower B	40.22	0.61	30.35	-29.74	33.67	-1.16	29.72	-30.88	-8
				Upper A	23.76	-15.53	30.585	-46.12	28.16	-3.97	30.05	-34.02	-8
				Upper B	41.64	2.34	30.585	-28.25	35.37	3.23	30.05	-26.82	-8

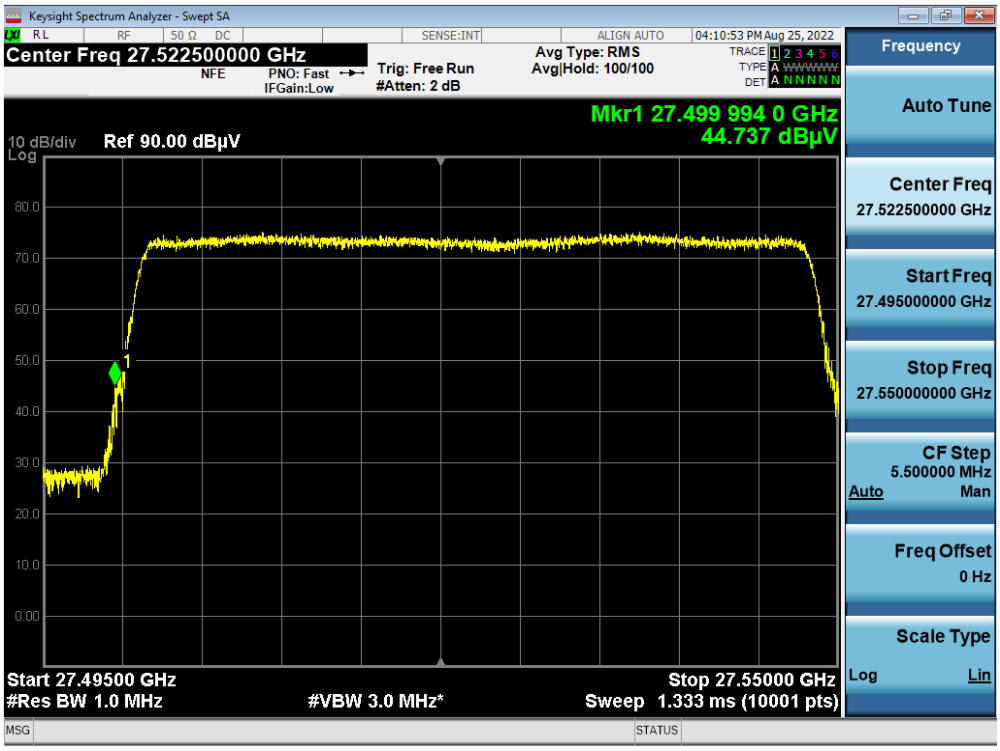
Plot data of Band Edge

Antenna A / 28 GHz 1CC 50 MHz / 16QAM / Low / Lower A

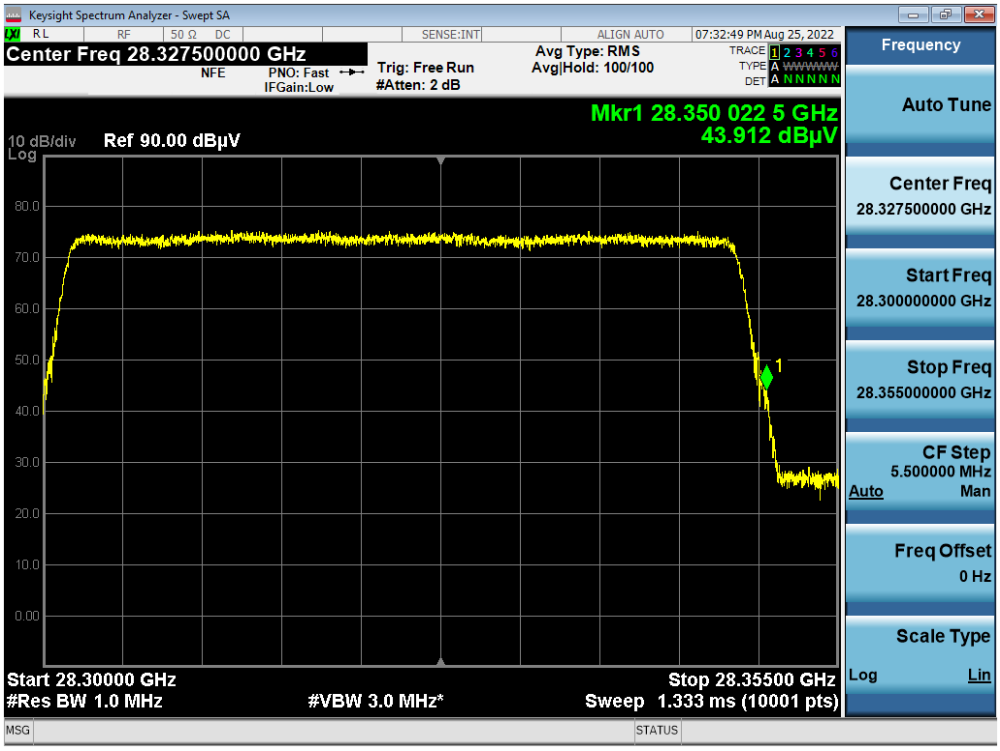


Antenna A / 28 GHz 1CC 50 MHz / 256QAM / High / Upper A

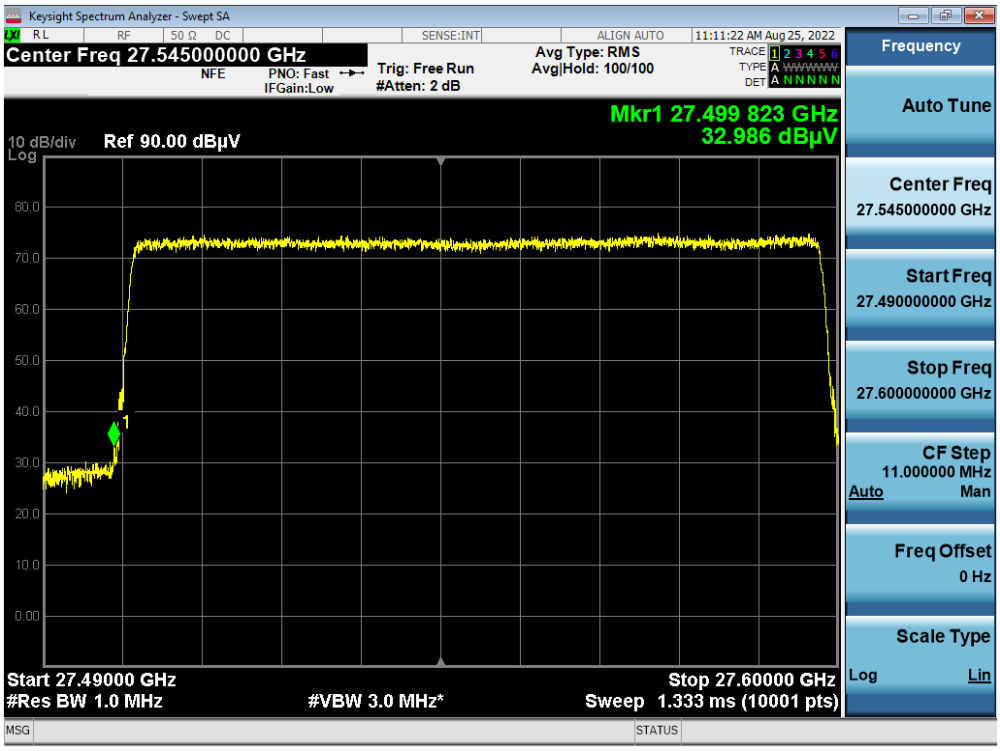
Antenna B / 28 GHz 1CC 50 MHz / QPSK / Low / Lower B



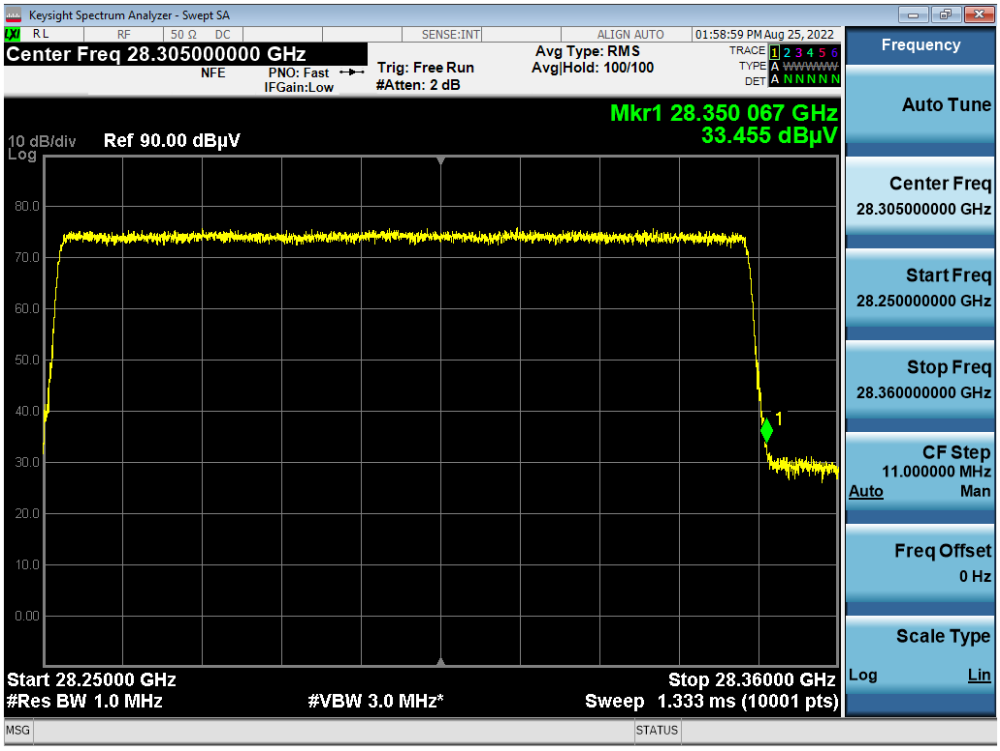
Antenna B / 28 GHz 1CC 50 MHz / 16QAM / High / Upper B



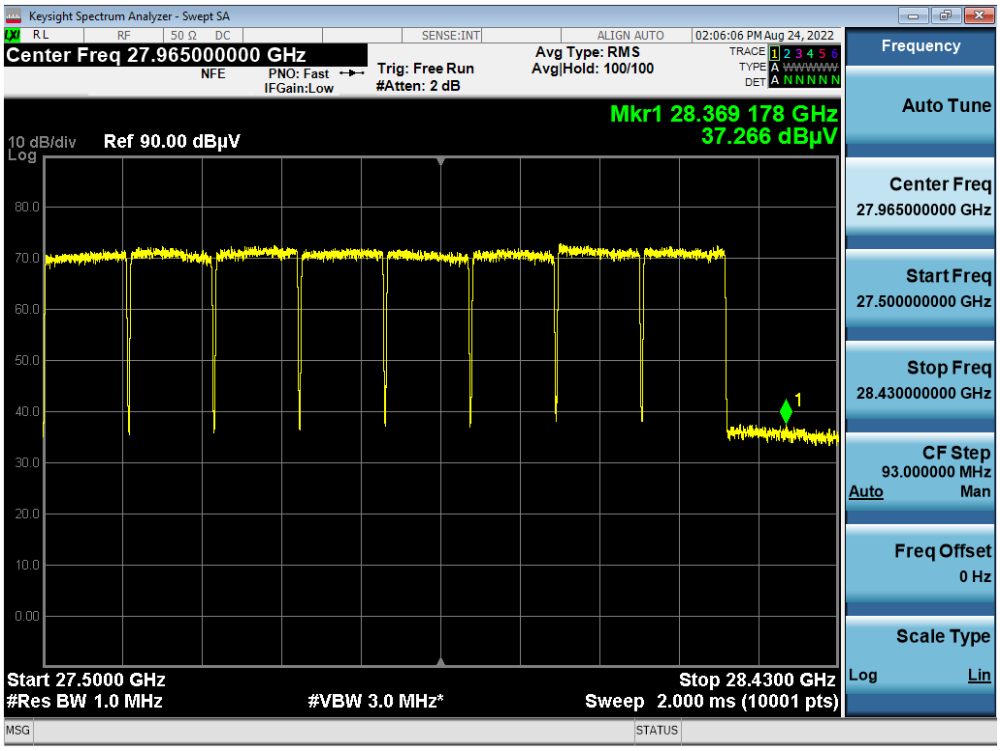
Antenna A / 28 GHz 1CC 100 MHz / 64QAM / Low / Lower A



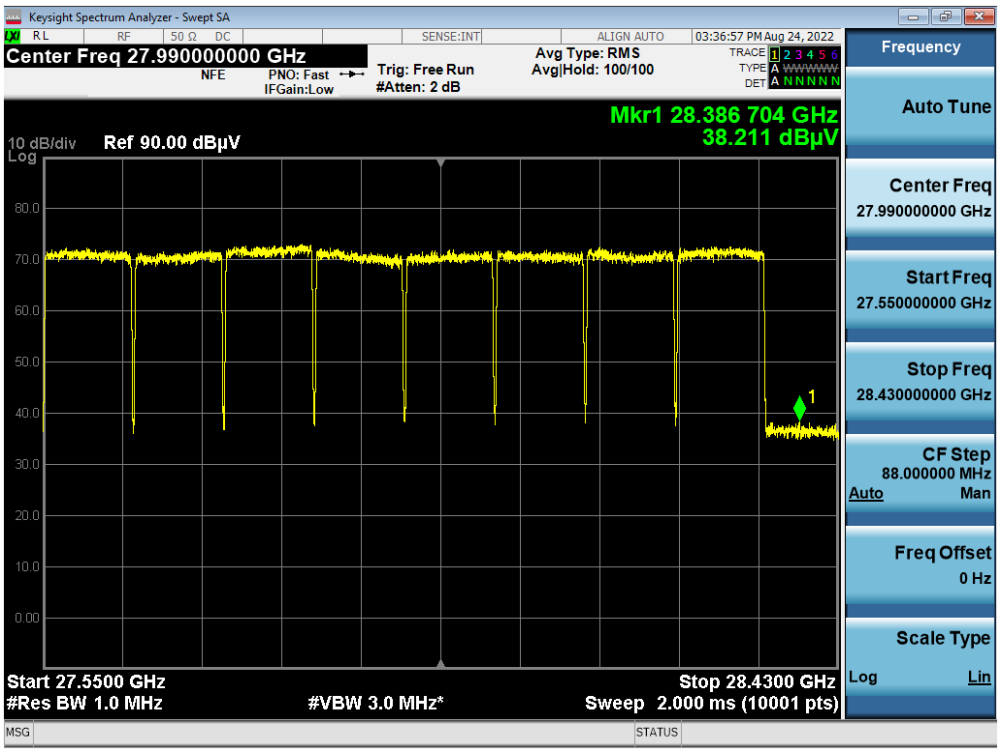
Antenna A / 28 GHz 1CC 100 MHz / 64QAM / High / Upper A



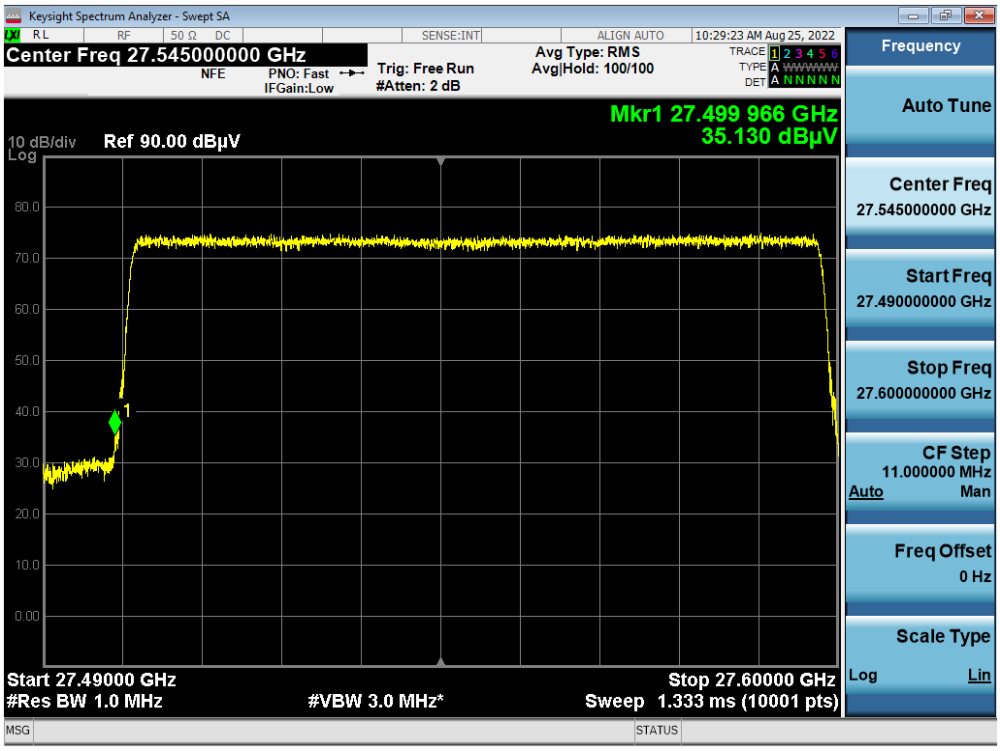
Antenna A / 28 GHz 8CC 100 MHz / QPSK / Low / Upper A



Antenna A / 28 GHz 8CC 100 MHz / 64QAM / High / Upper A

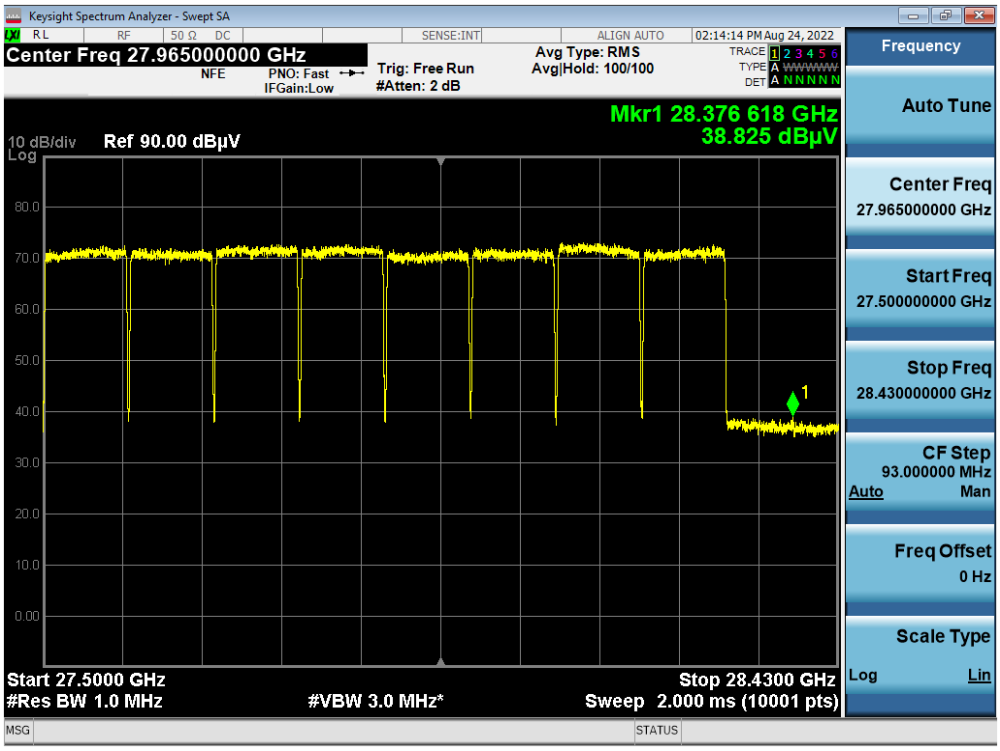


Antenna B / 28 GHz 1CC 100 MHz / QPSK / Low / Lower B

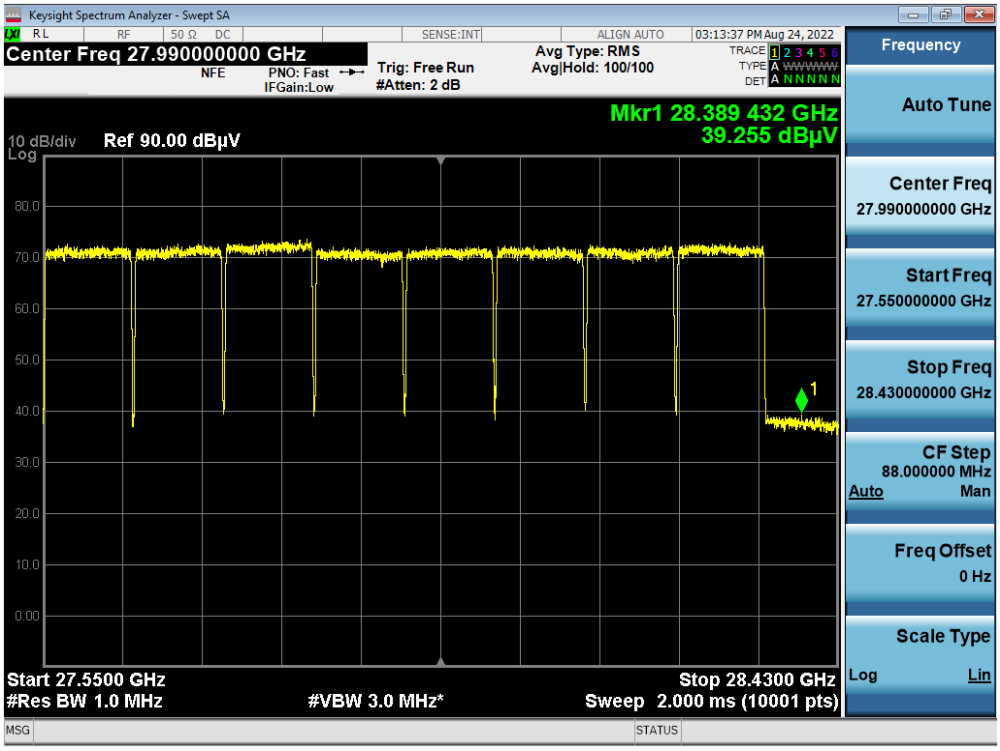


Antenna B / 28 GHz 1CC 100 MHz / 256QAM / High / Upper B

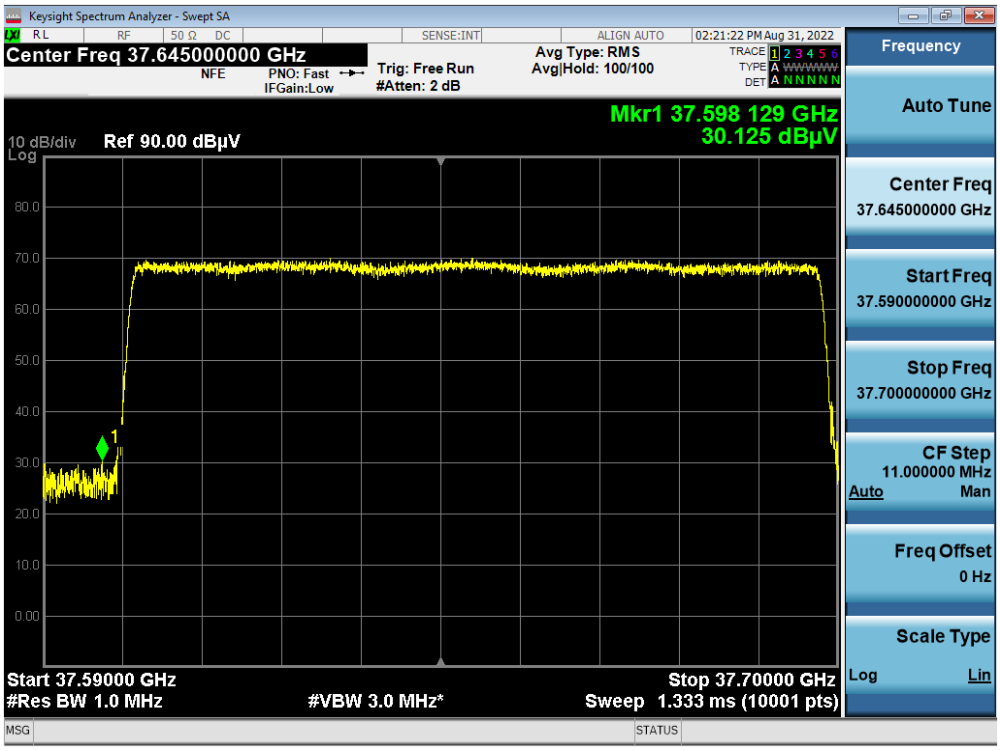
Antenna B / 28 GHz 8CC 100 MHz / 16QAM / Low / Upper B



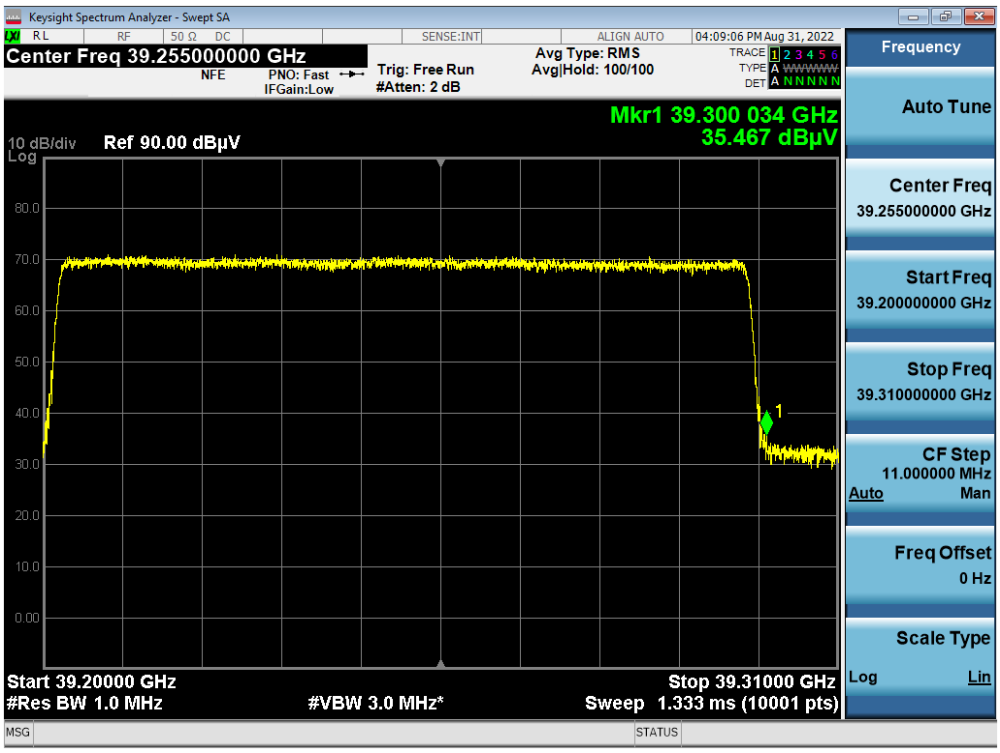
Antenna B / 28 GHz 8CC 100 MHz / QPSK / High / Upper B



Antenna A / 39 GHz 1CC / 256QAM / Low / Lower A

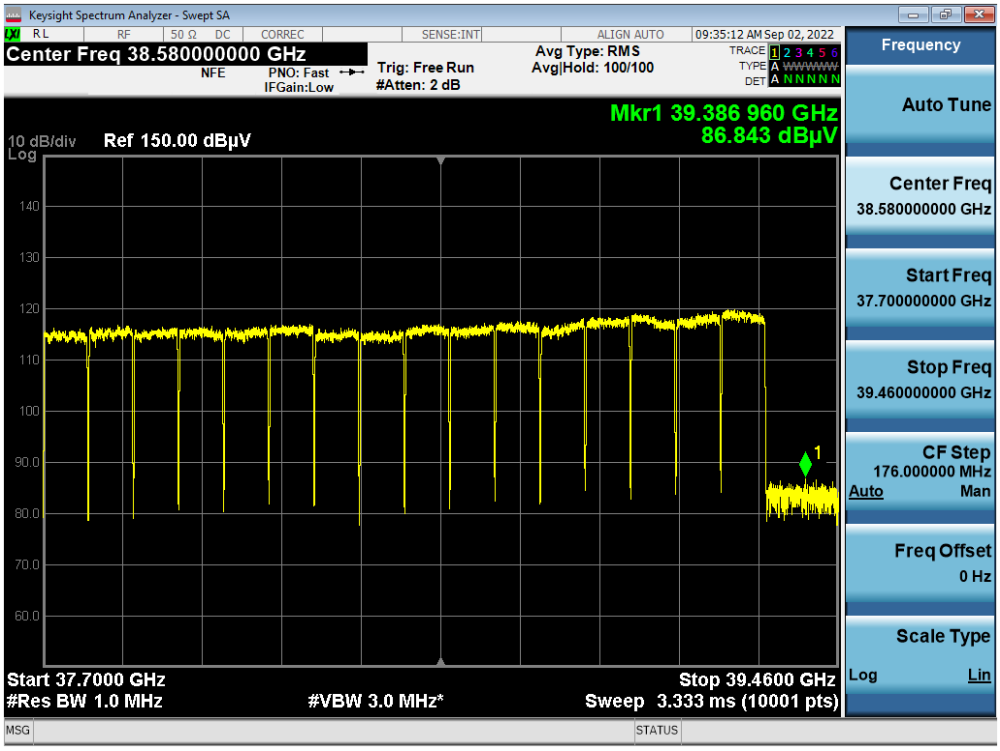


Antenna A / 39 GHz 1CC / QPSK / High / Upper A

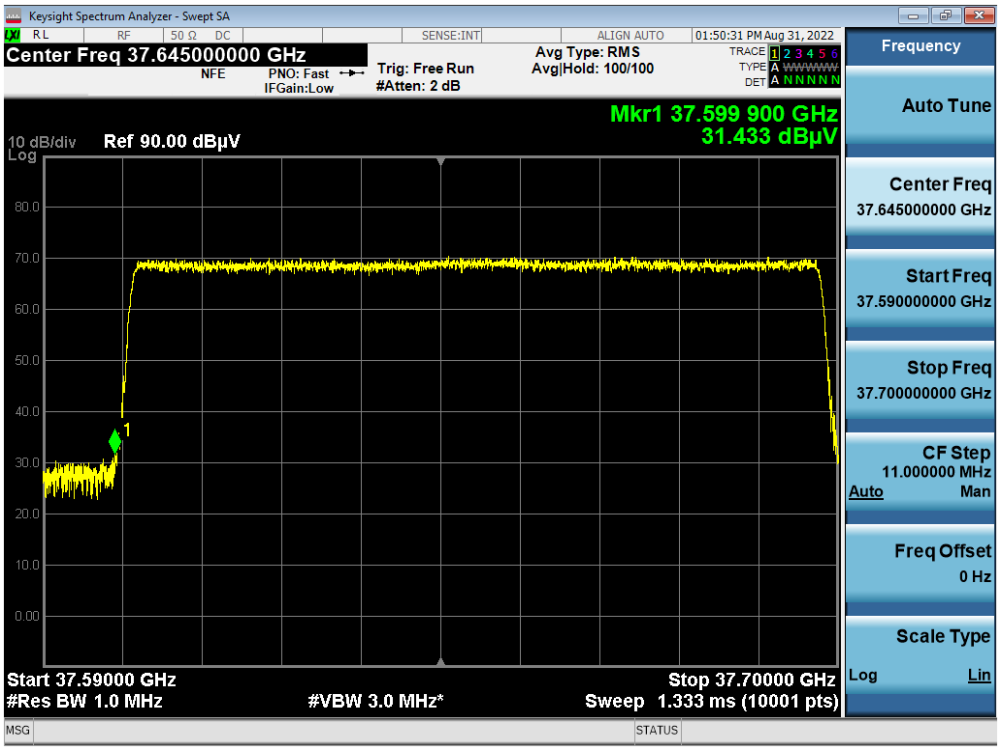


Antenna A / 39 GHz 16CC / QPSK / Low / Upper A

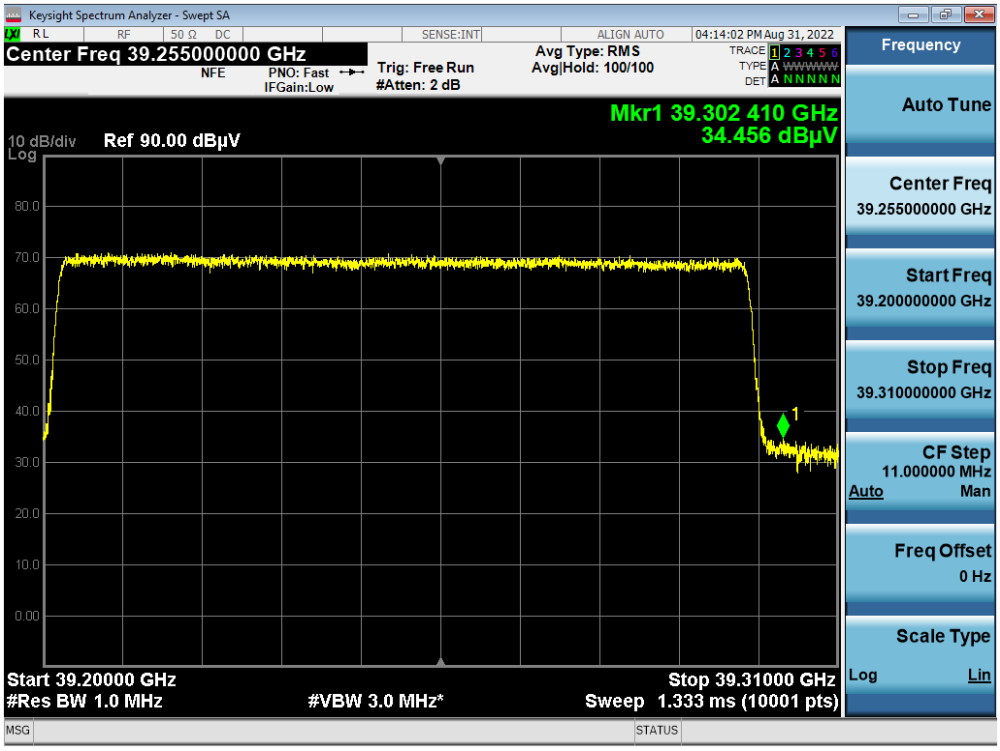
Antenna A / 39 GHz 16CC / 16QAM / High / Upper A



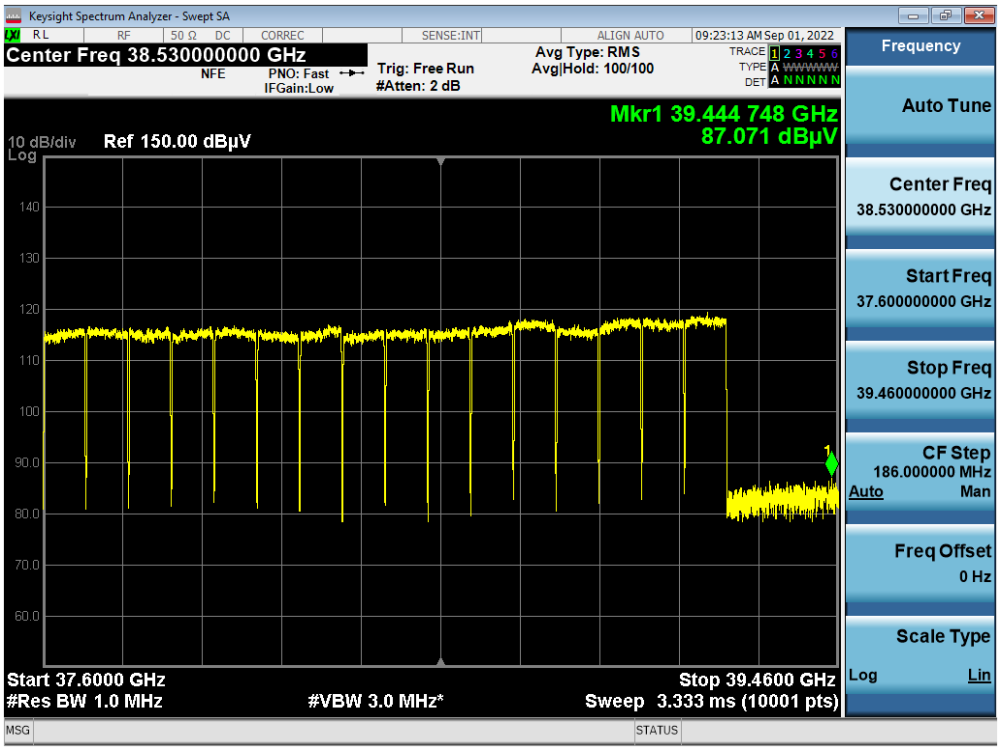
Antenna B / 39 GHz 1CC / 16QAM / Low / Lower B



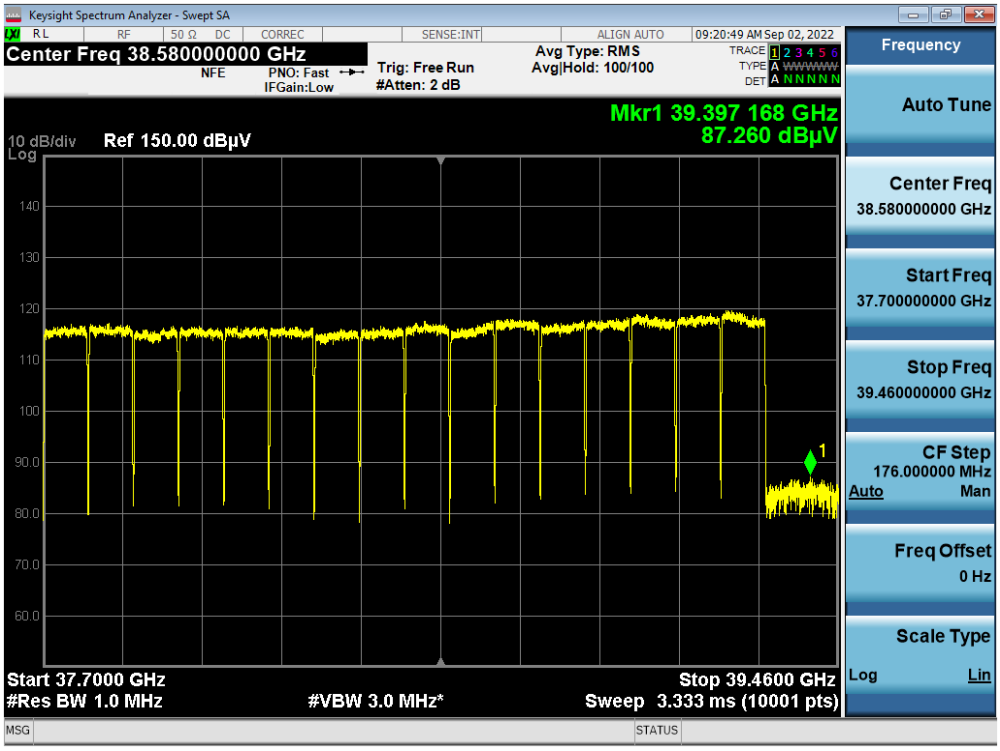
Antenna B / 39 GHz 1CC / QPSK / High / Upper B



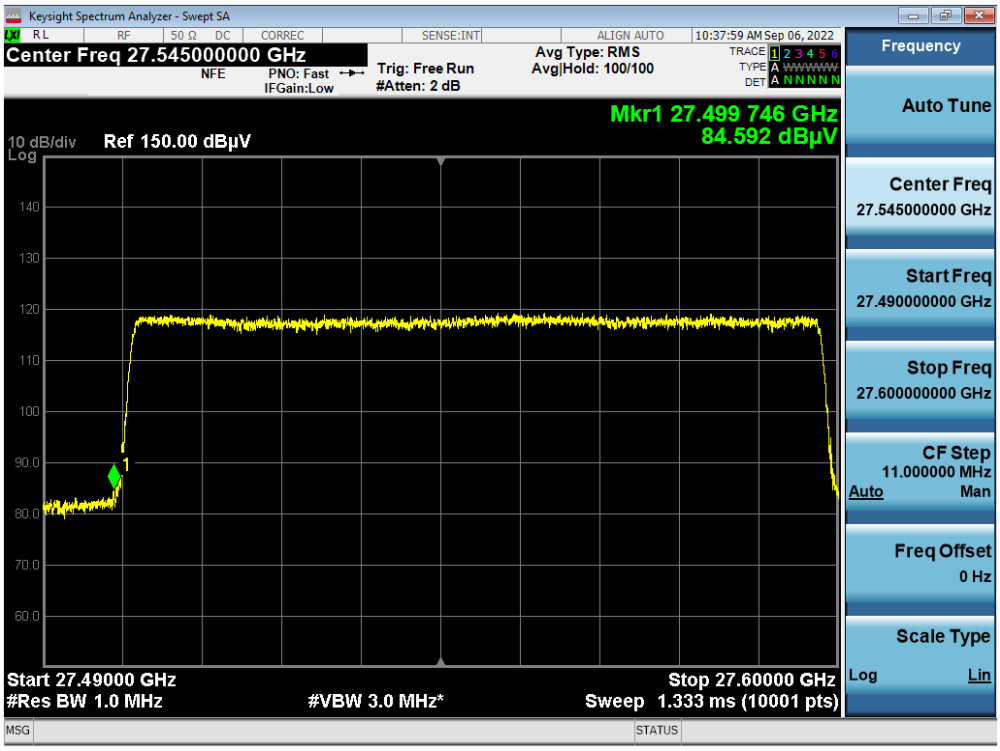
Antenna B / 39 GHz 16CC / 64QAM / Low / Upper B



Antenna B / 39 GHz 16CC / QPSK / High / Upper B

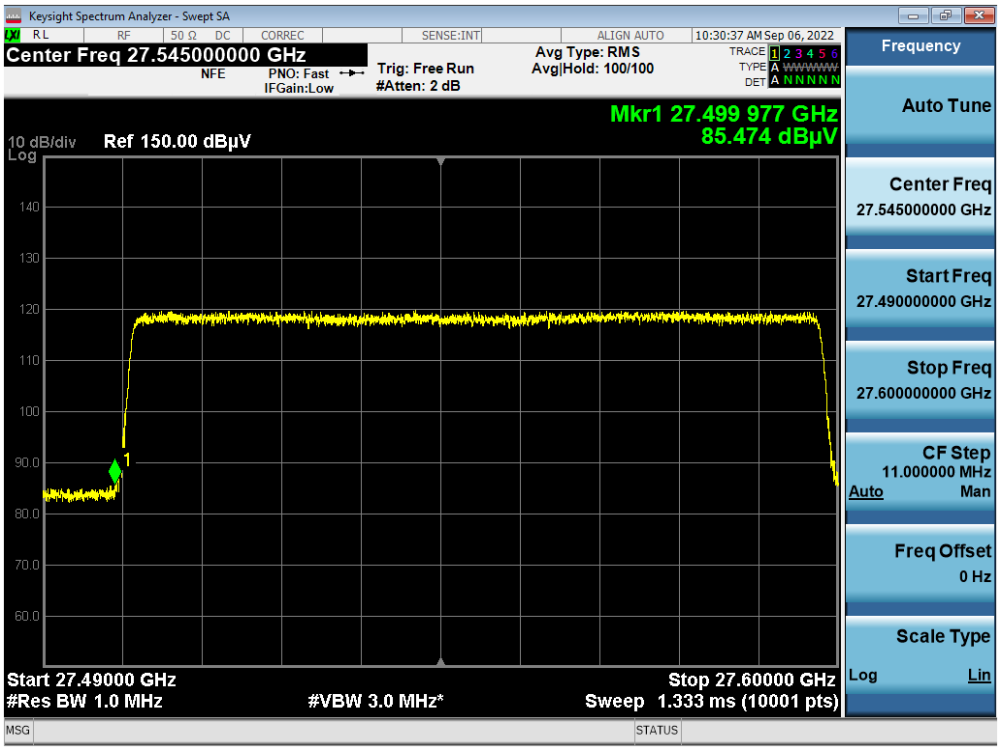


Antenna A / 28 GHz 1+7 CC / 256QAM / Low / A



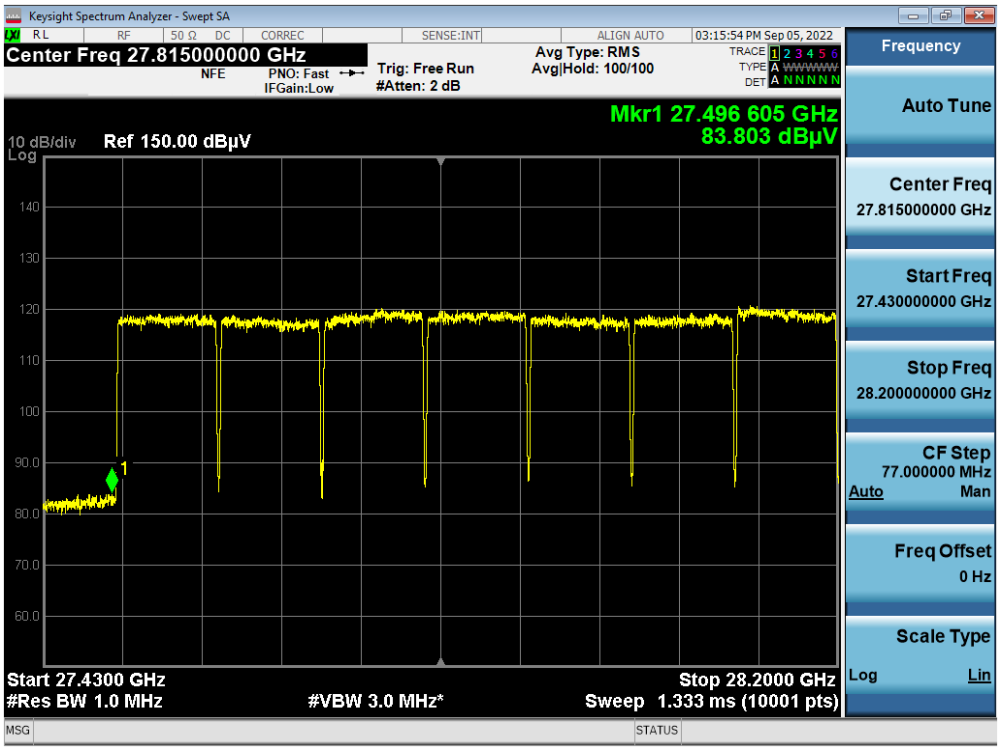
Antenna A / 28 GHz 1+7 CC / 64QAM / High / A

Antenna B / 28 GHz 1+7 CC / 256QAM / Low / B

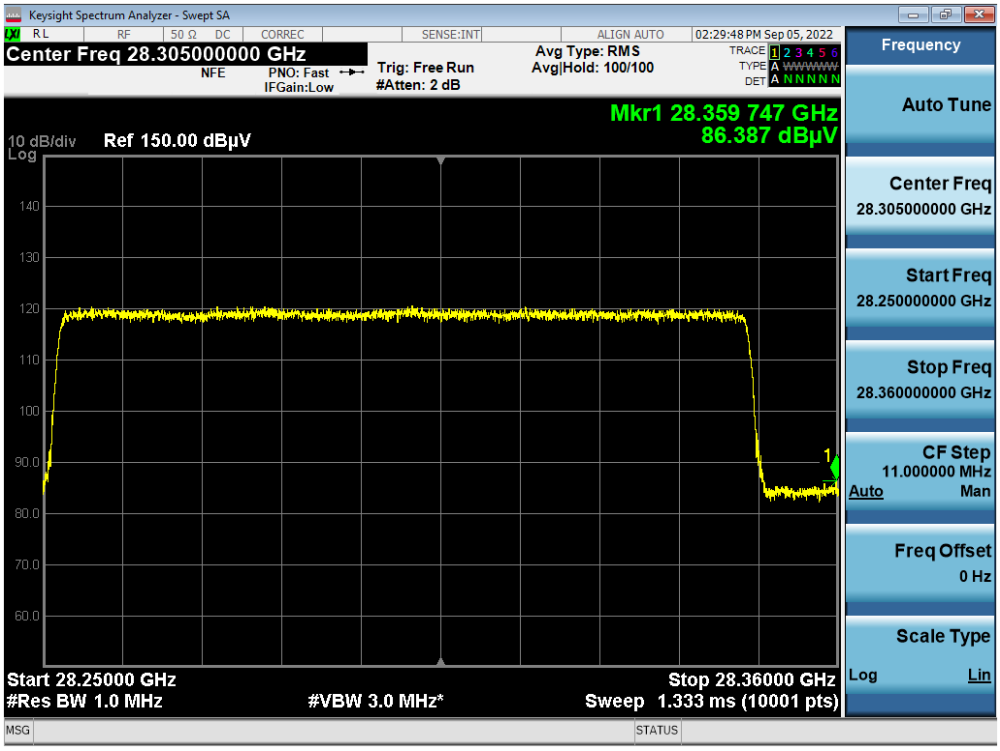


Antenna B / 28 GHz 1+7 CC / 64QAM / High / B

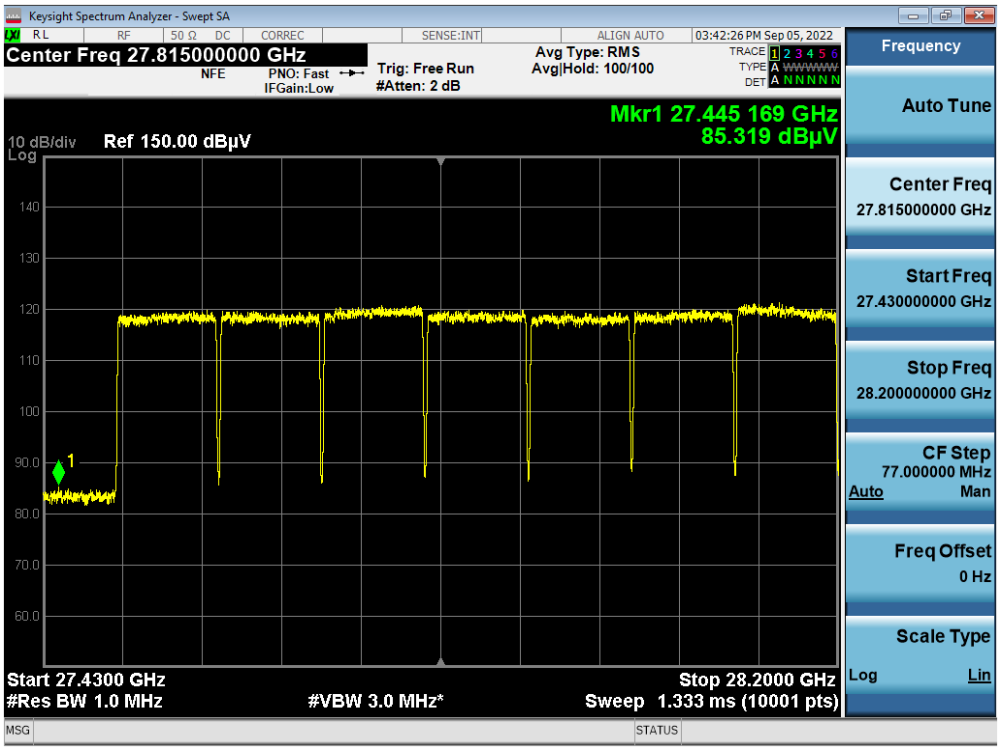
Antenna A / 28 GHz 7+1 CC / 64QAM / Low / A



Antenna A / 28 GHz 7+1 CC / QPSK / High / A

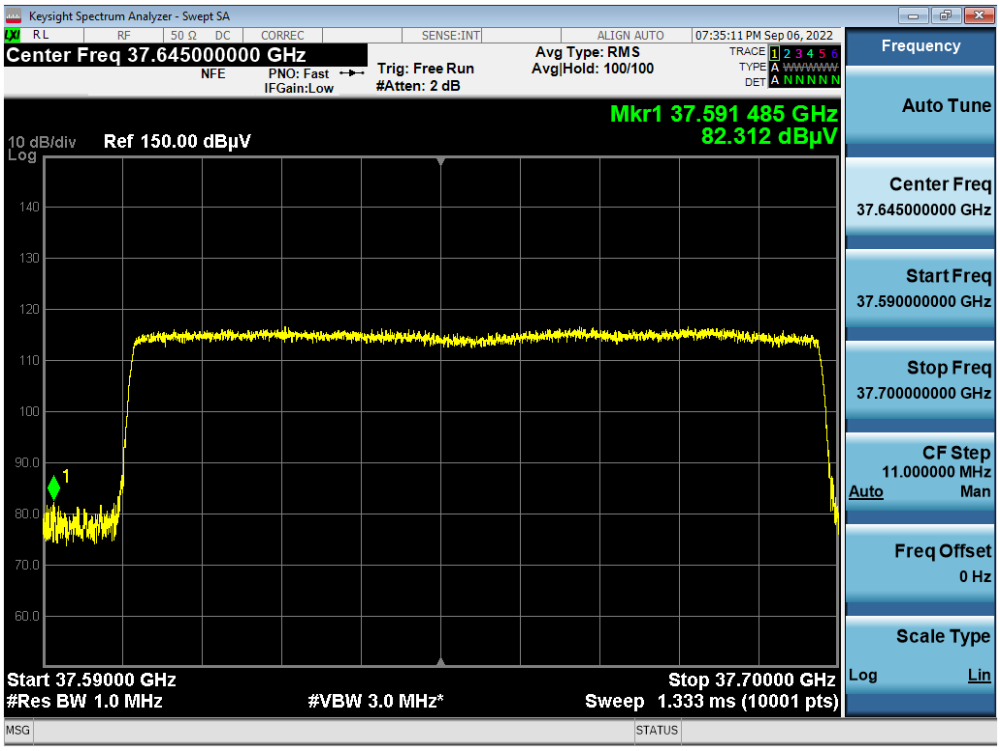


Antenna B / 28 GHz 7+1 CC / 256QAM / Low / B

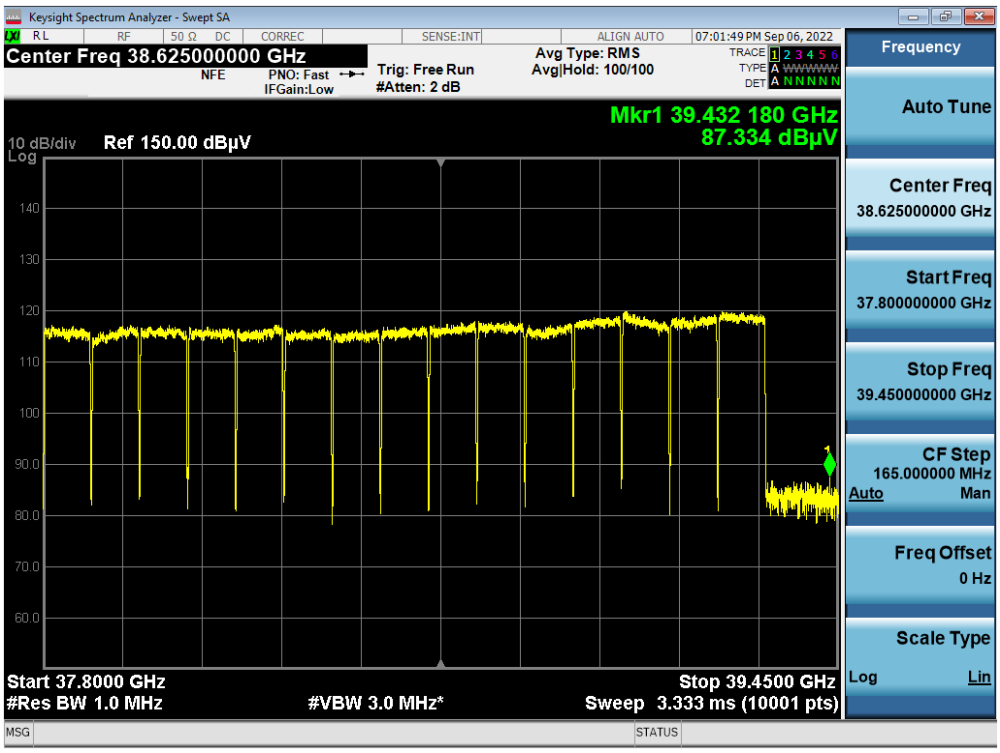


Antenna B / 28 GHz 7+1 CC / QPSK / High / B

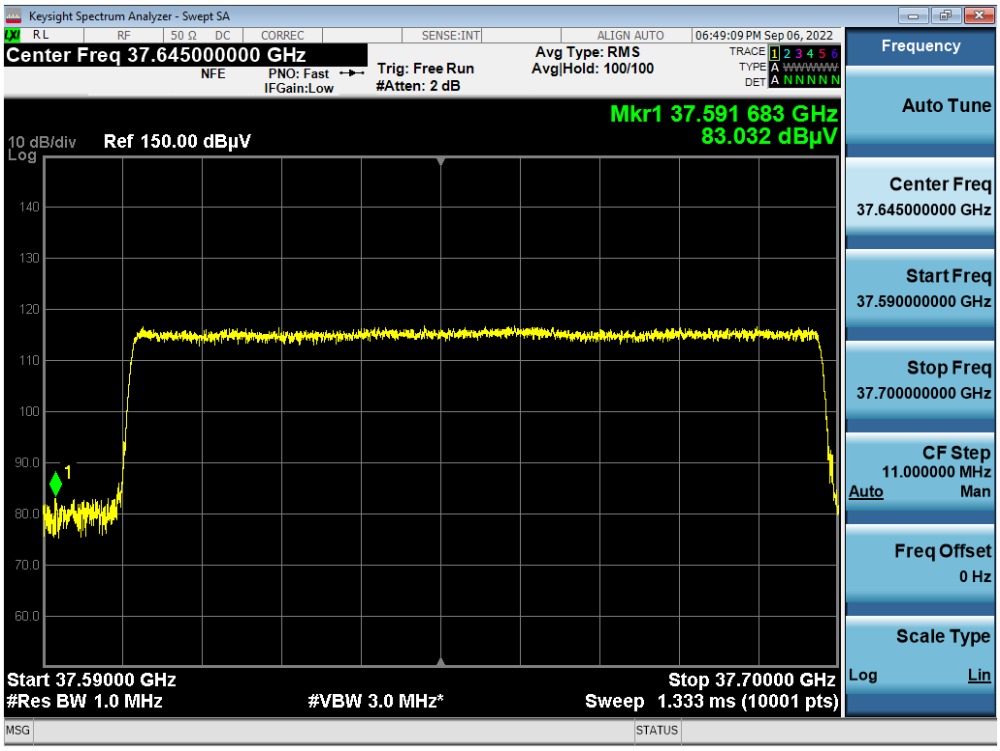
Antenna A / 39 GHz 1+15 CC / 256QAM / Low / A



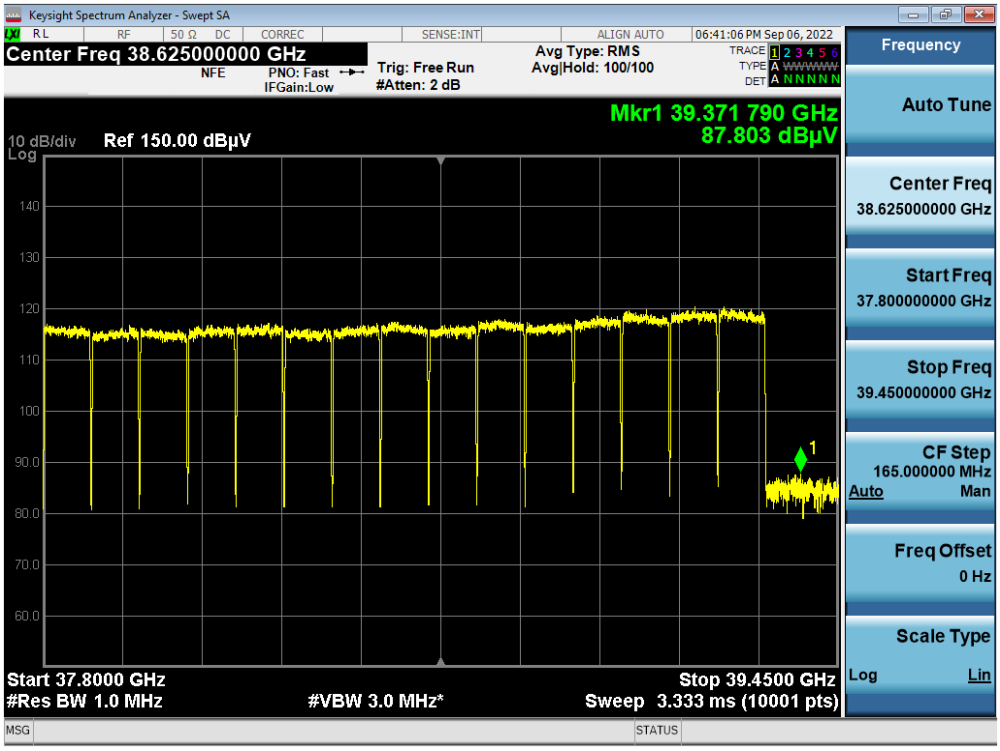
Antenna A / 39 GHz 1+15 CC / 16QAM / High / A



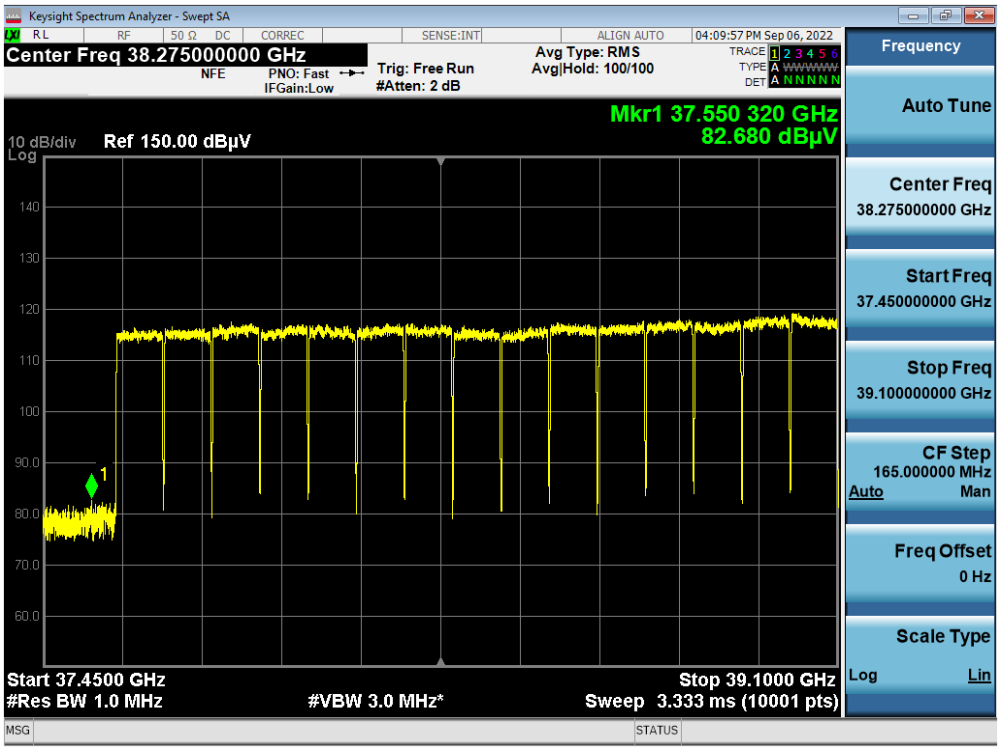
Antenna B / 39 GHz 1+15 CC / 16QAM / Low / B



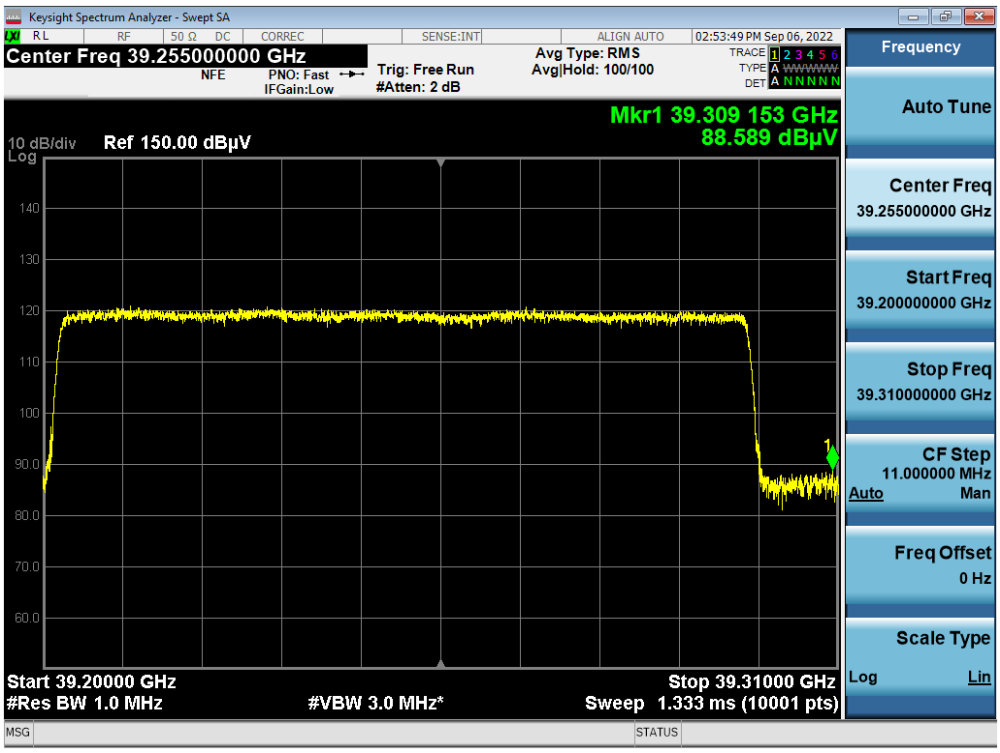
Antenna B / 39 GHz 1+15 CC / QPSK / High / B



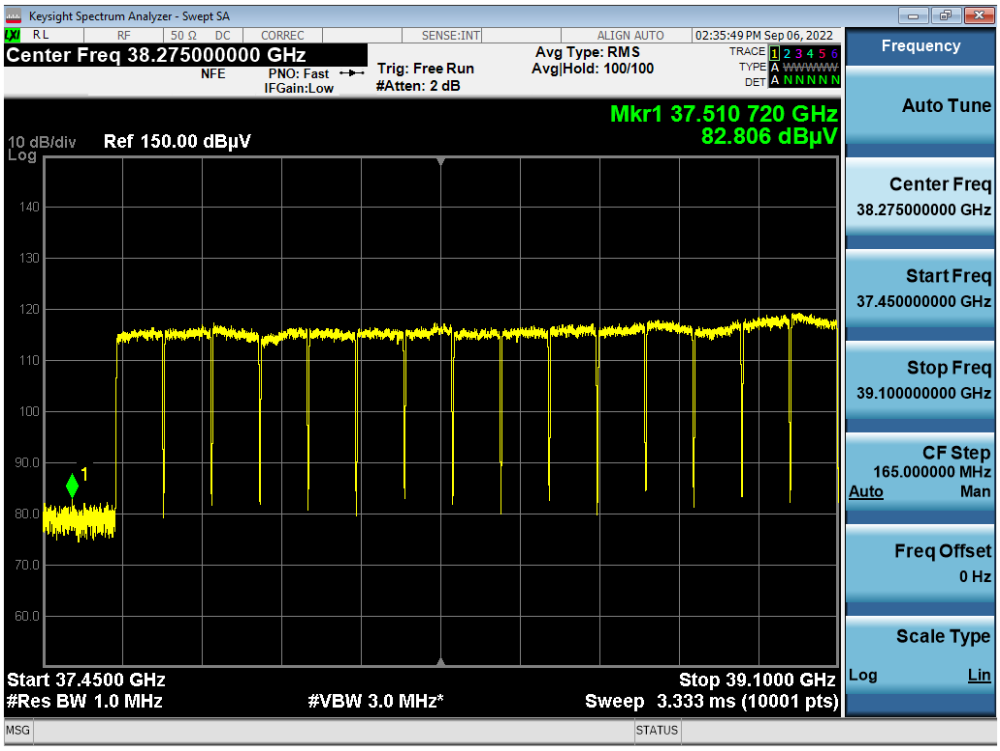
Antenna A / 39 GHz 15+1 CC / 256QAM / Low / A



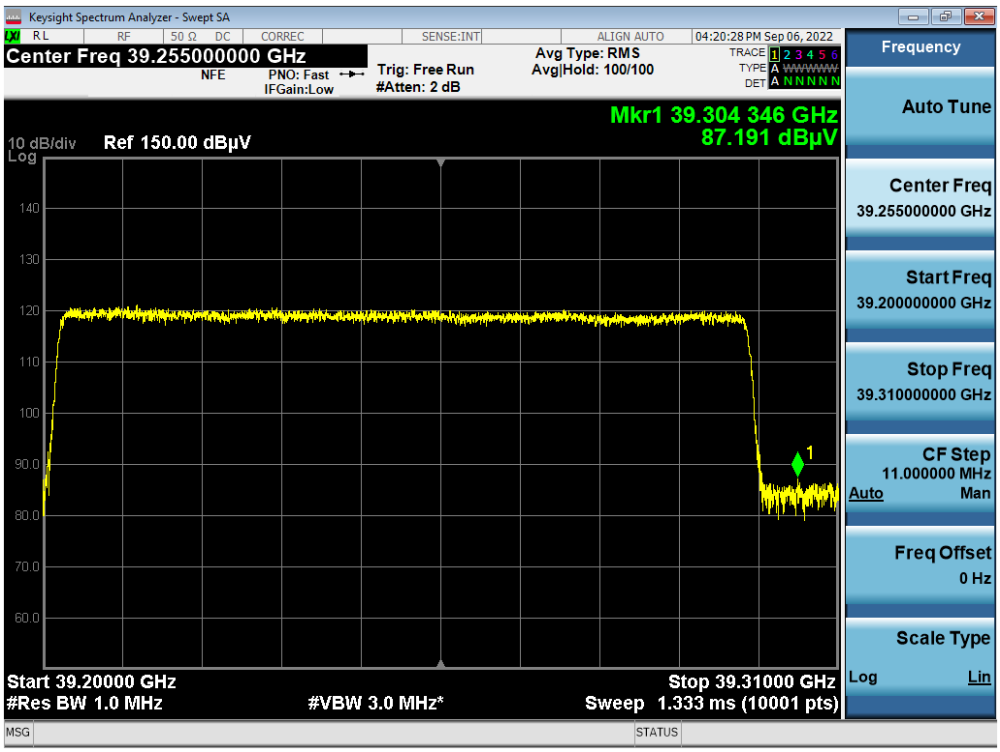
Antenna A / 39 GHz 15+1 CC / 16QAM / High / A



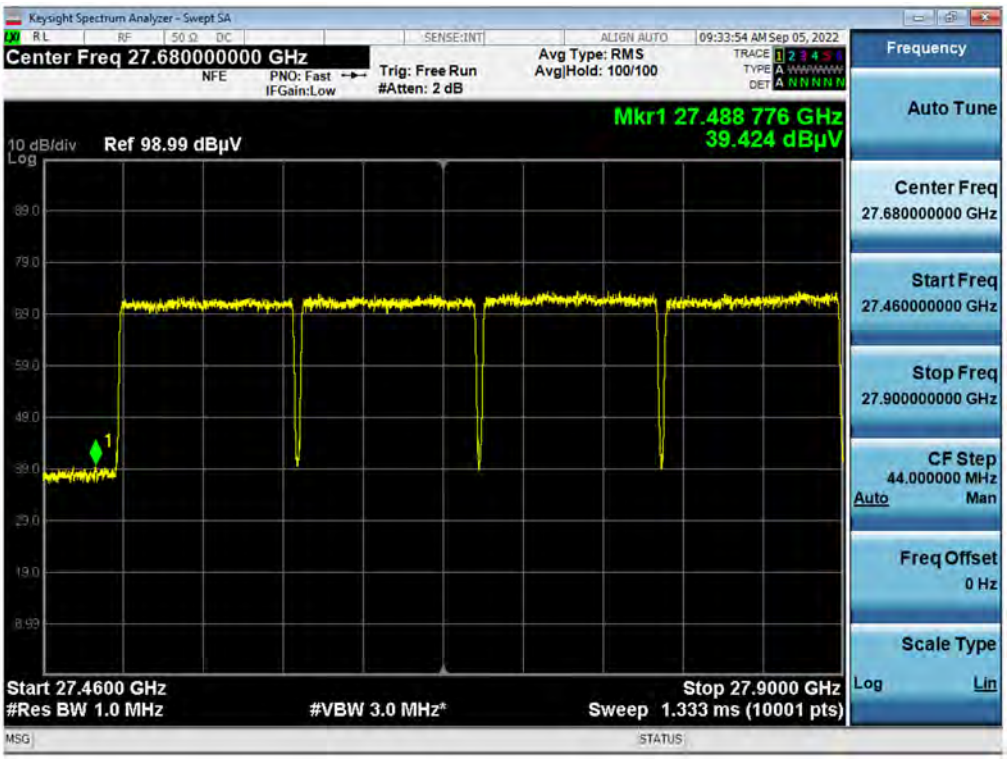
Antenna B / 39 GHz 15+1 CC / QPSK / Low / B



Antenna B / 39 GHz 15+1 CC / 256QAM / High / B



Antenna A / InterBand / 28 GHz / QPSK / Lower A

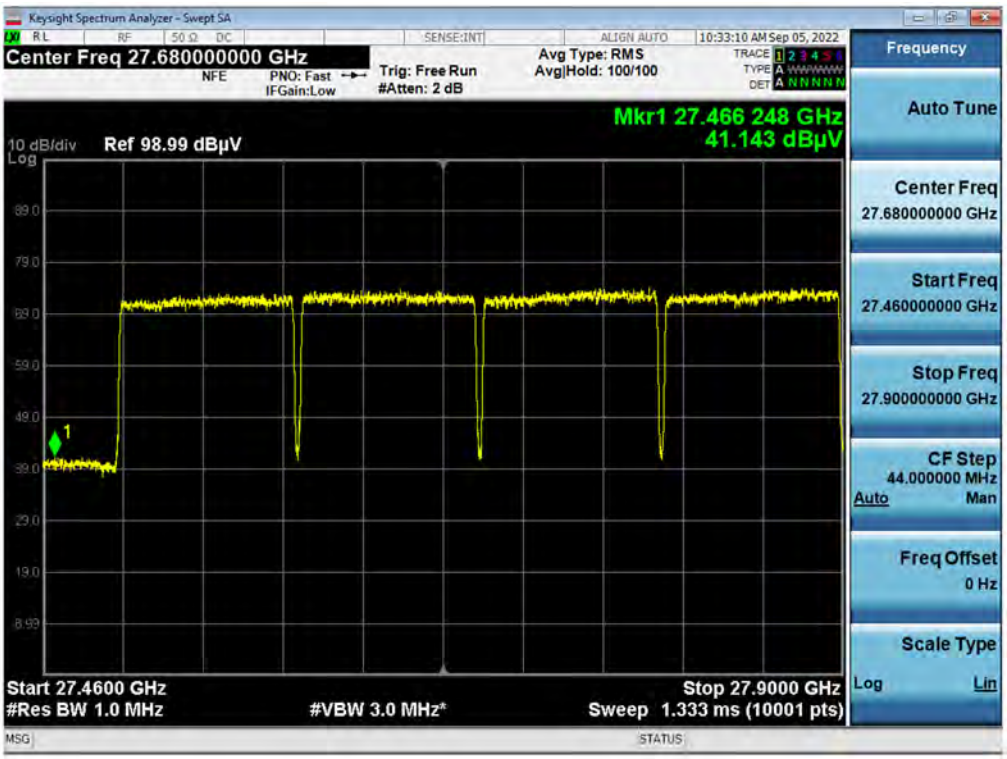


Antenna A / InterBand / 28 GHz / 256QAM / Upper A

Antenna A / InterBand / 39 GHz / 256QAM / Lower A

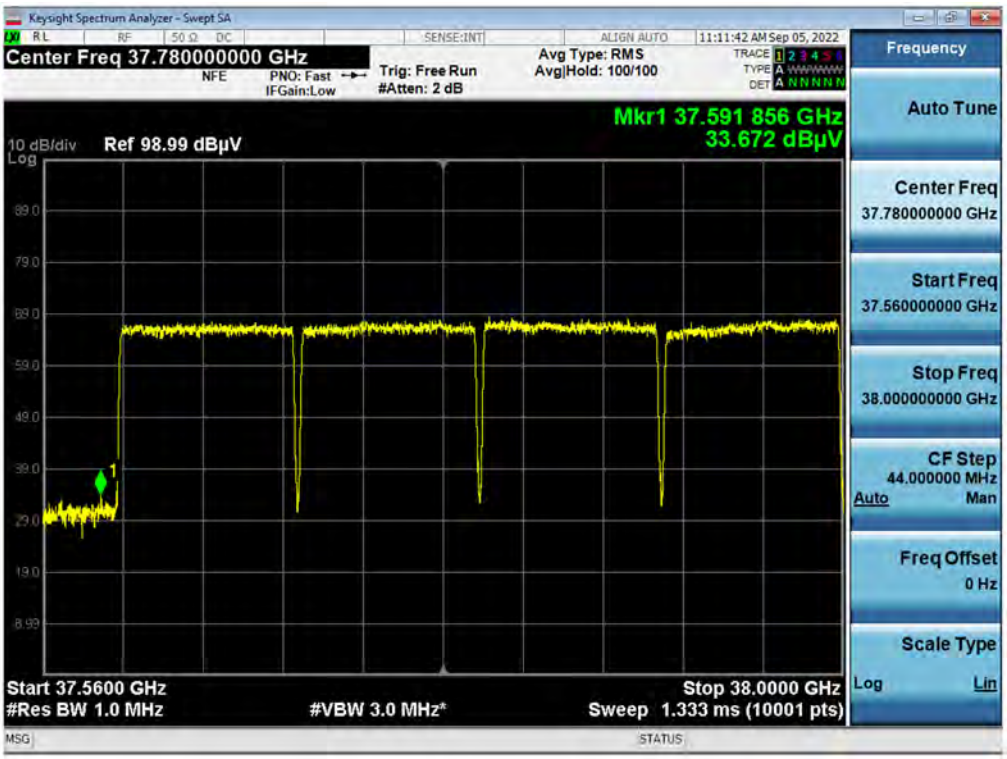
Antenna A / InterBand / 39 GHz / 64QAM / Upper A

Antenna B / InterBand / 28 GHz / 64QAM / Lower B



Antenna B / InterBand / 28 GHz / 64QAM / Upper B

Antenna B / InterBand / 39 GHz / 256QAM / Lower B



Antenna B / InterBand / 39 GHz / QPSK / Upper B

5.5. RADIATED SPURIOUS EMISSIONS

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 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.

EIRP Test Procedures:

The measurement is performed in accordance with Section 5.7.4 of ANSI C63.26.

5.7.4 Spurious unwanted emission measurements

a) Set the spectrum analyzer start frequency to the lowest frequency generated by the EUT, without going below 9 kHz, and the stop frequency to the lower frequency covered by the measurements previously performed in 5.7.3. As an alternative, the stop frequency can be set to the value specified in 5.1.1, depending on the EUT operating range, if the resulting plot can clearly demonstrate compliance for all frequencies not addressed by the out-of-band emissions measurements performed as per 5.7.3.

b) When using an average power (rms) detector, ensure that the number of points in the sweep ≥ 2 × (span / RBW). This may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the spectrum analyzer capabilities. This requirement does not apply to peak-detected power measurements. When average power is specified by the applicable regulation, a peak-detector can be utilized for preliminary measurements to accommodate wider frequency spans. Any emissions found in the preliminary measurement to exceed the applicable limit(s) shall be further examined using a power averaging (rms) detector with the minimum number of measurement points as defined above.

c) The sweep time should be set to auto-couple for performing peak-detector measurements. For measurements that use a power averaging (rms) detector, the sweep time shall be set as described for out-of-band emissions measurements in item

d) of 5.7.3.

d) Identify and measure the highest spurious emission levels in each frequency range. It is not necessary to re-measure the out-of-band emissions as a part of this test. Record the frequencies and amplitudes corresponding to the measured emissions and capture the data plots.

e) Repeat step b) through step d) for the upper spurious emission frequency range if not already captured by a wide span measurement performed as per the alternative provided in step a). The upper frequency for this measurement is defined in 5.1.1 as a function of the EUT operating range.

f) Compare the results with the corresponding limit in the applicable regulation.

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

TRP Test Procedures:

The measurement is performed in accordance with Section 4.4.3.3.2 of KDB 842590 v01r02 (2021-04).

a) Align the EUT with a chosen xy-plane and the xz-plane of the antenna measurement coordinate system.
NOTE 1: For harmonics and spurious emission frequencies which are beamforming as identified in exploratory scan, it may be required to align the orthogonal cuts to include the peak based on exploratory scans.

b) Measure the EUT dimensions, i.e., depth (d), width (w), and height (h); see Figure A.1 in Appendix A.

c) Calculate the spherical and cylindrical diameters (D and Dcyl) using Equations (A.1) and (A.2) (see Appendix A).

d) For the highest frequency (smallest wavelength) of the frequency band measured, calculate the reference angular steps $\Delta\theta$ref and $\Delta\phi$ref using Equations (A.3) and (A.4).

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

f) For each emission frequency, measure the EIRP (as a sum of two orthogonal polarizations) at each spatial sampling step on the selected grid.

g) For each emission frequency, calculate the average EIRP for both the cuts separately, and then take the average of these two average values.

h) Add 2 dB as a correction factor to the averaged value computed in step g).

i) If the TRP limit is exceeded, a third orthogonal cut in the yz-plane and using the $\Delta\theta$ angular step, can be added. Now, calculate the average values in all three cuts separately, and then take the average value of these three average values.

j) Add 1.5 dB as a correction factor to the averaged value computed in step i).

k) Evaluate the pass/fail decision by comparing TRP from step h) or step j) against the applicable TRP limit.
NOTE 2: The 2 dB correction factor for two cut and 1.5 dB correction factor for three cuts is derived from [4].

Note:

1. Spurious emission test is performed up to 200 GHz frequency according to section 5.1.1 of ANSI C63.26 -2015.
2. Measurement distance is applied far field condition in section 3.2.
3. We were performed the test in MIMO mode.
4. Due to MIMO operations, a correction has been added to the limit according to KDB 662911 D01 v02r01.
   - *Beyond OBW 10%: 2Tx MIMO correction: 10 log(N_{ANT}) = 10 log(2) = 3.01 dB*

     *-13 dBm – 10*log (2) = -16.01 dBm*
5. In case of 9 kHz to 18 GHz and 40 GHz to 200 GHz, the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured so we are attached only the worst case plots.
6. Because of no critical emissions are detected in the test, only peak value is recorded in this report.
7. Test plot(18 GHz ~ 40 GHz) include AFCL factors and results are calculated in tabular data.
8. In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, amplifier gain..
9. Emissions value is first converted by distance factor as follow. *(*Measured Value include AFCL factors.)*

   Converted value (dBm) = Measured Value (dBuV) + 20 * log(D) - 104.77*
10. Final spurious emissions result is calculated as follows.

    Spurious Emissions = Converted Value (dBm) + Duty Cycle correction
11. Spurious emissions test is performed about the worst case of modulation type.
12. Sample calculations:

    18 GHz ~ Low Edge

    90.598 dBμV (measured) + 10.88 (distance) – 104.77 (Conversion) + 1.3569 (Duty) = -1.93 dBm/MHz

    High Edge ~ 40 GHz

    82.161 dBμV (measured) + 10.88 (distance) – 104.77 (Conversion) + 1.3569 (Duty) = -10.37 dBm/MHz

Test Results:

1. Contiguous

28 GHz 1CC 50 MHz

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Channel	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	1	3.5	Low	16QAM	26 682.703	90.598	-1.93	-13	-17.05
			Middle	64QAM	26 915.330	78.119	-14.41	-13	-24.75
			High	16QAM	26 915.330	78.403	-14.13	-13	-24.91
High Edge ~ 40 GHz	1	3.5	Low	256QAM	28 389.547	82.161	-10.37	-13	-22.29
			Middle	16QAM	39 970.111	79.960	-12.57	-13	-23.00
			High	16QAM	39 033.853	84.948	-7.58	-13	-20.51

Note: All results in the above tabular are measured by TRP, because result value is fail or insufficient margin.

28 GHz 1CC 100 MHz, 8CC

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Channel	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	1	3.5	Low	64QAM	26 627.834	89.473	-3.059	-13	-17.58
			Middle	16QAM	26 914.906	77.762	-14.770	-13	-25.27
			High	16QAM	26 914.906	77.937	-14.595	-13	-25.21
	8	3.5	Low	QPSK	27 396.450	87.747	-4.785	-13	-18.74
			Middle	256QAM	27 321.090	88.924	-3.608	-13	-18.09
			High	64QAM	27 411.522	90.021	-2.511	-13	-17.16
High Edge ~ 40 GHz	1	3.5	Low	256QAM	28 389.876	83.011	-9.521	-13	-22.45
			Middle	16QAM	28 389.876	80.753	-11.779	-13	-22.80
			High	256QAM	28 360.000	85.151	-7.381	-13	-20.92
	8	3.5	Low	QPSK	28 442.341	90.206	-2.326	-13	-17.80
			Middle	256QAM	28 443.884	90.935	-1.597	-13	-17.17
			High	256QAM	28 440.027	92.781	0.249	-13	-15.14

Note: All results in the above tabular are measured by TRP, because result value is fail or insufficient margin.

39 GHz 1CC, 16CC

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Channel	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	1	3.5	Low	256QAM	37 589.347	85.834	-6.768	-13	-21.18
			Middle	16QAM	37 414.996	78.236	-14.366	-13	-25.13
			High	QPSK	37 414.996	79.255	-13.347	-13	-24.76
	16	3.5	Low	256QAM	37 419.102	87.240	-5.362	-13	-19.64
			Middle	64QAM	37 415.214	86.825	-5.777	-13	-20.09
			High	256QAM	37 439.514	86.975	-5.627	-13	-20.22
High Edge ~ 40 GHz	1	3.5	Low	16QAM	39 872.350	82.793	-9.809	-13	-23.59
			Middle	QPSK	39 872.350	82.341	-10.261	-13	-23.85
			High	64QAM	39 312.760	92.993	0.391	-13	-15.06
	16	3.5	Low	QPSK	39 563.140	89.561	-3.041	-13	-18.22
			Middle	64QAM	39 539.920	90.291	-2.311	-13	-17.53
			High	16QAM	39 480.520	89.268	-3.334	-13	-18.15

Note: All results in the above tabular are measured by TRP, because result value is fail or insufficient margin.

2. Non-Contiguous

28 GHz

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	7+1	3.5	16QAM	27 380.021	88.957	-3.645	-13	-19.33
	1+7	3.5	256QAM	27 439.229	91.103	-1.499	-13	-16.53
High Edge ~ 40 GHz	7+1	3.5	256QAM	28 413.156	91.568	-1.034	-13	-16.26
	1+7	3.5	256QAM	28 452.038	92.563	-0.039	-13	-15.69

Note: All results in the above tabular are measured by TRP, because result value is fail.

39 GHz

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	15+1	3.5	64QAM	37 446.110	86.950	-5.652	-13	-20.07
	1+15	3.5	256QAM	37 555.718	86.929	-5.673	-13	-20.16
High Edge ~ 40 GHz	15+1	3.5	64QAM	39 557.020	89.645	-2.957	-13	-18.49
	1+15	3.5	256QAM	39 505.550	90.715	-1.887	-13	-16.79

Note: All results in the above tabular are measured by TRP, because result value is fail.

3. InterBand

28 GHz

Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	8+8	3.5	16QAM	27 446.283	89.475	-3.127	-13	-19.32
28 GHz High Edge ~ 39 GHz Low Edge	8+8	3.5	256QAM	28 408.340	91.622	-0.980	-13	-15.90
High Edge ~ 40 GHz	8+8	3.5	16QAM	39 368.160	92.565	-0.037	-13	-15.07

Note: All results in the above tabular are measured by TRP, because result value is fail.

39 GHz

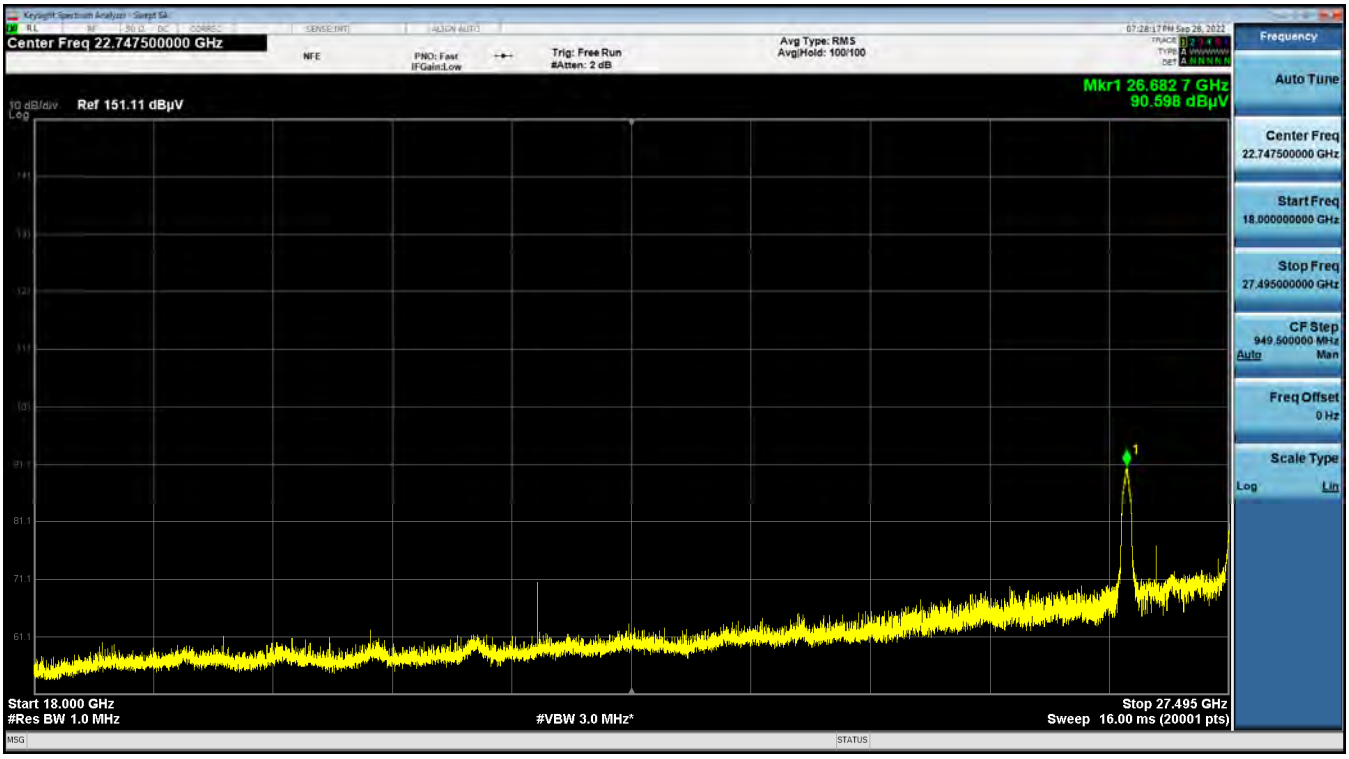
Tabular Data of Radiated Spurious Emissions

Freq.	Carrier	Distance (m)	Modulation	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	8+8	3.5	64QAM	27 453.378	90.100	-2.502	-13	-17.53
28 GHz High Edge ~ 39 GHz Low Edge	8+8	3.5	QPSK	28 390.000	91.440	-1.162	-13	-16.64
High Edge ~ 40 GHz	8+8	3.5	64QAM	39 342.640	91.068	-1.534	-13	-16.56

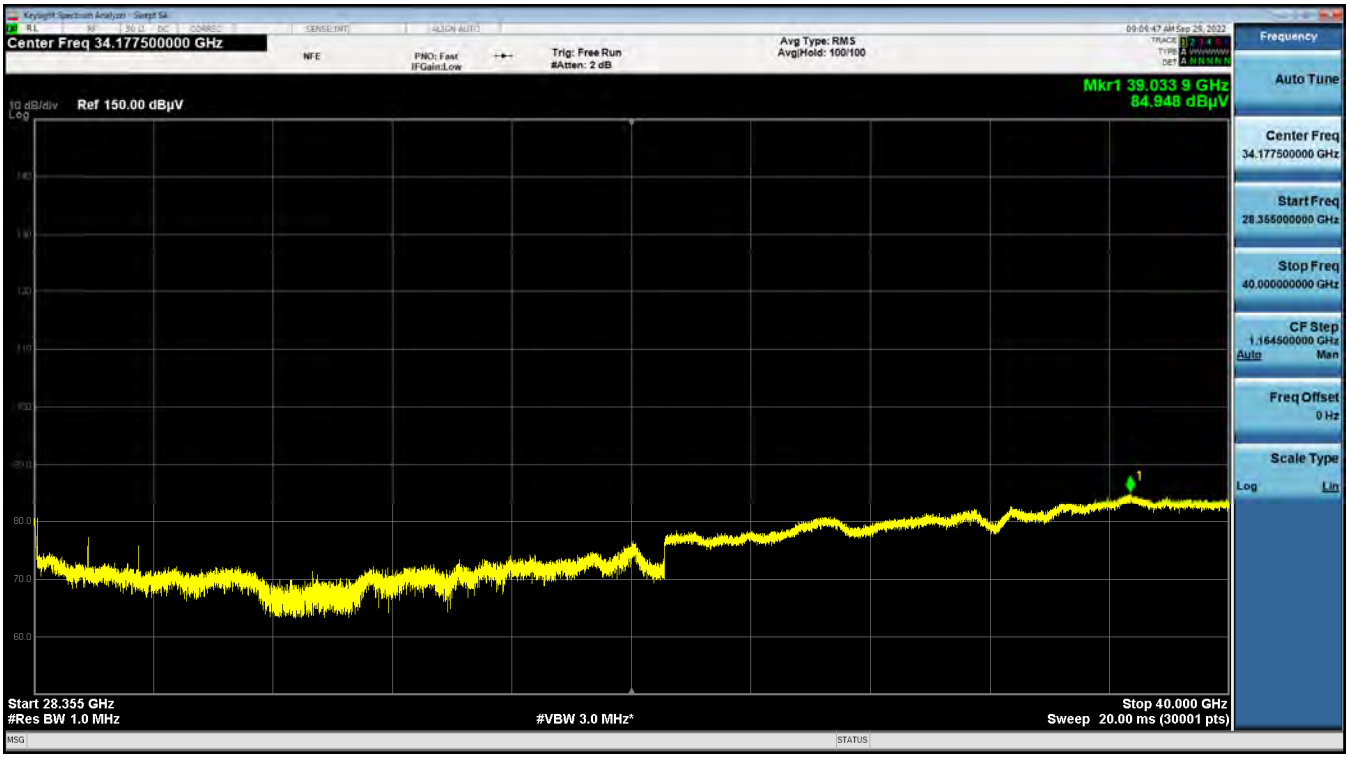
Note: All results in the above tabular are measured by TRP, because result value is fail.

Plot data of Radiated Spurious Emissions

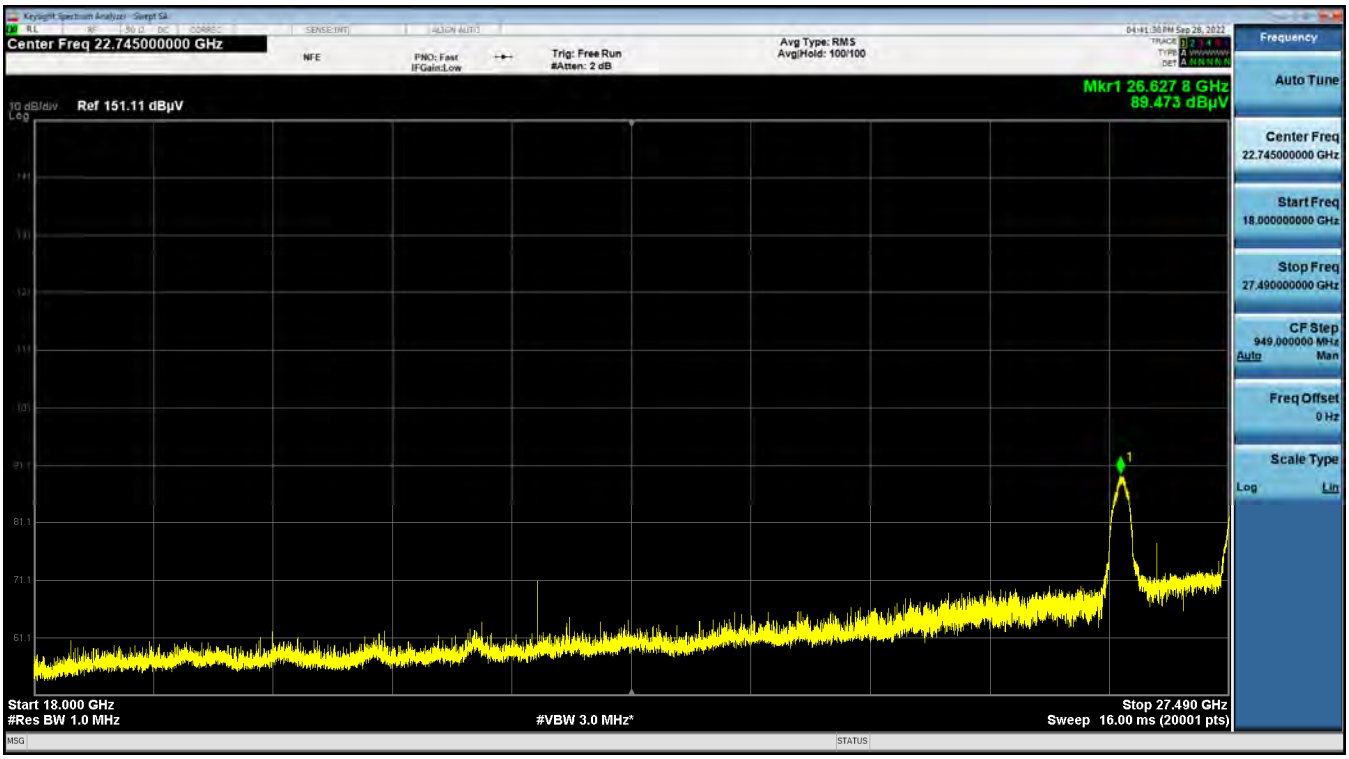
18 GHz ~ Low Edge / 28 GHz 1CC 50 MHz / Low / 16QAM



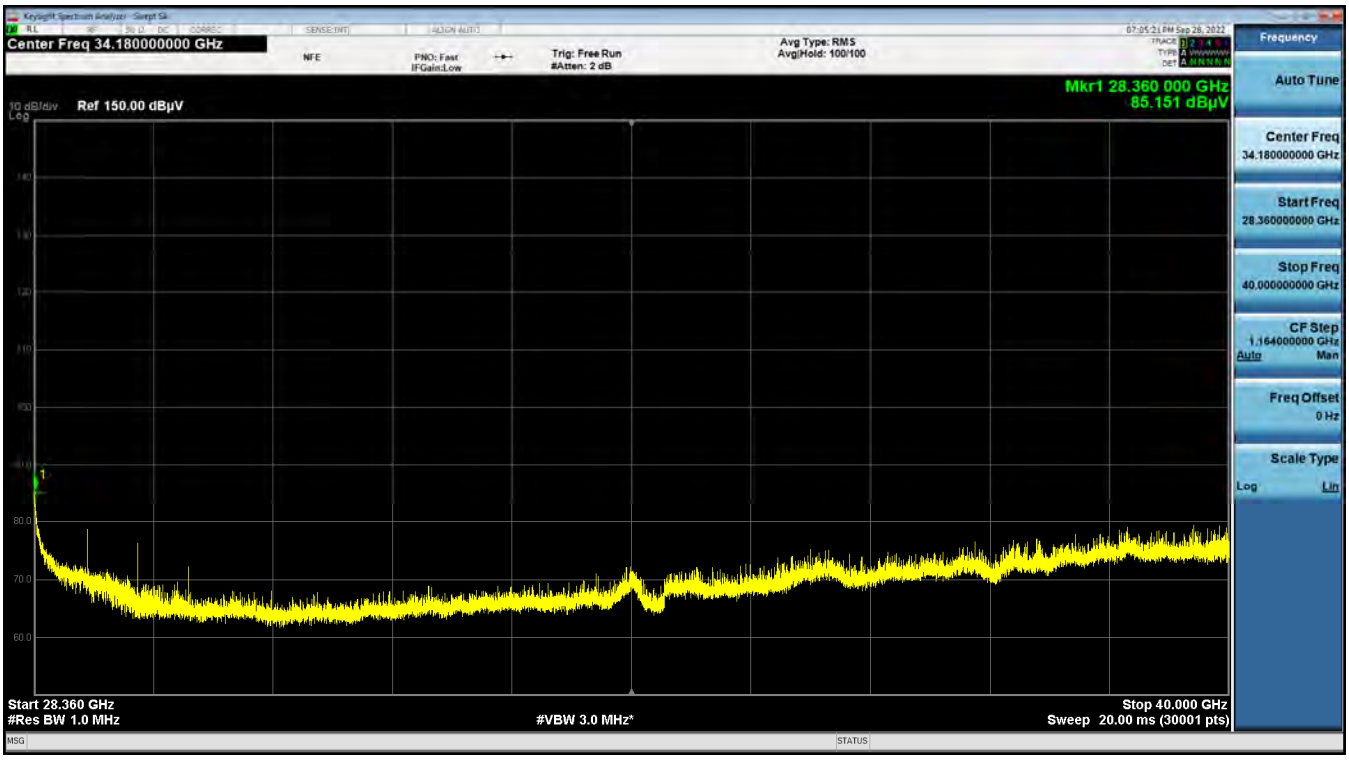
High Edge ~ 40 GHz / 28 GHz 1CC 50 MHz / High / 16QAM



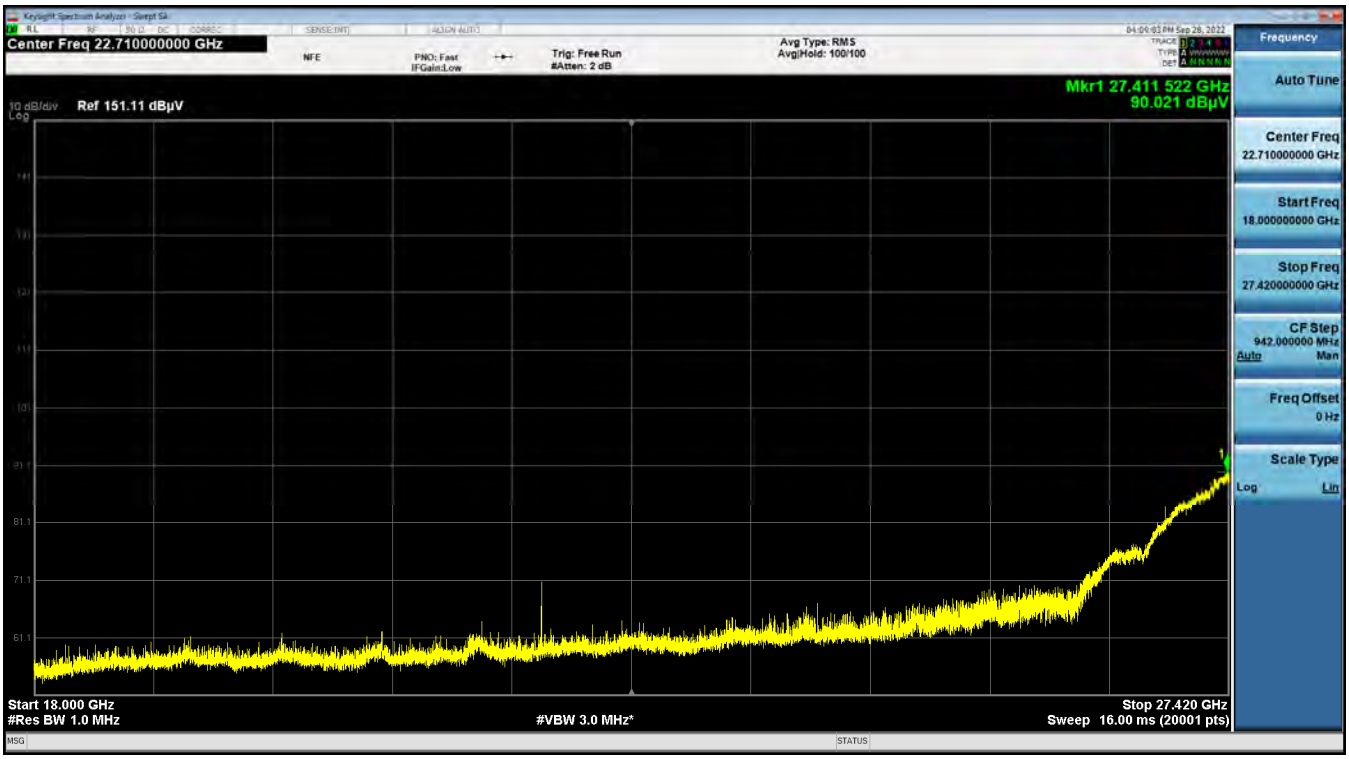
18 GHz ~ Low Edge / 28 GHz 1CC 100 MHz / Low / 64QAM



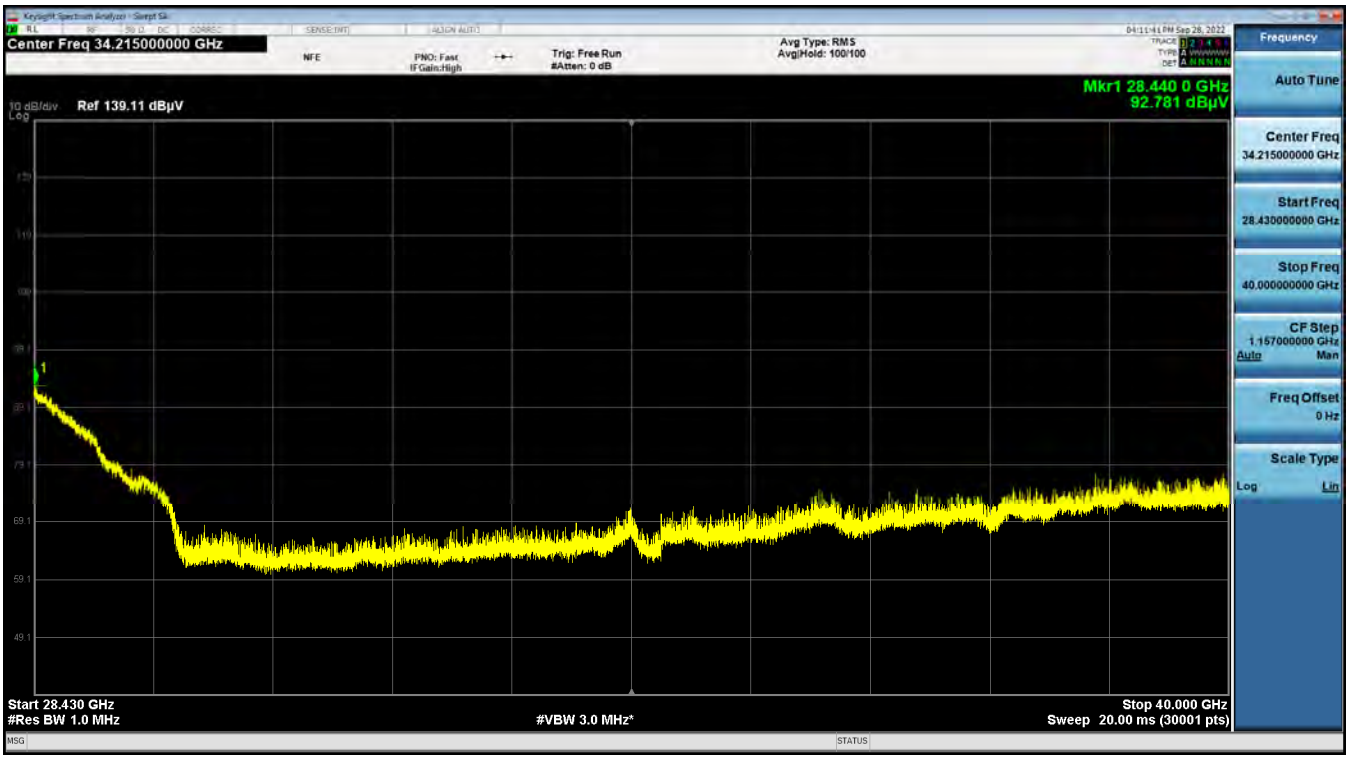
High Edge ~ 40 GHz / 28 GHz 1CC 100 MHz / High / 256QAM



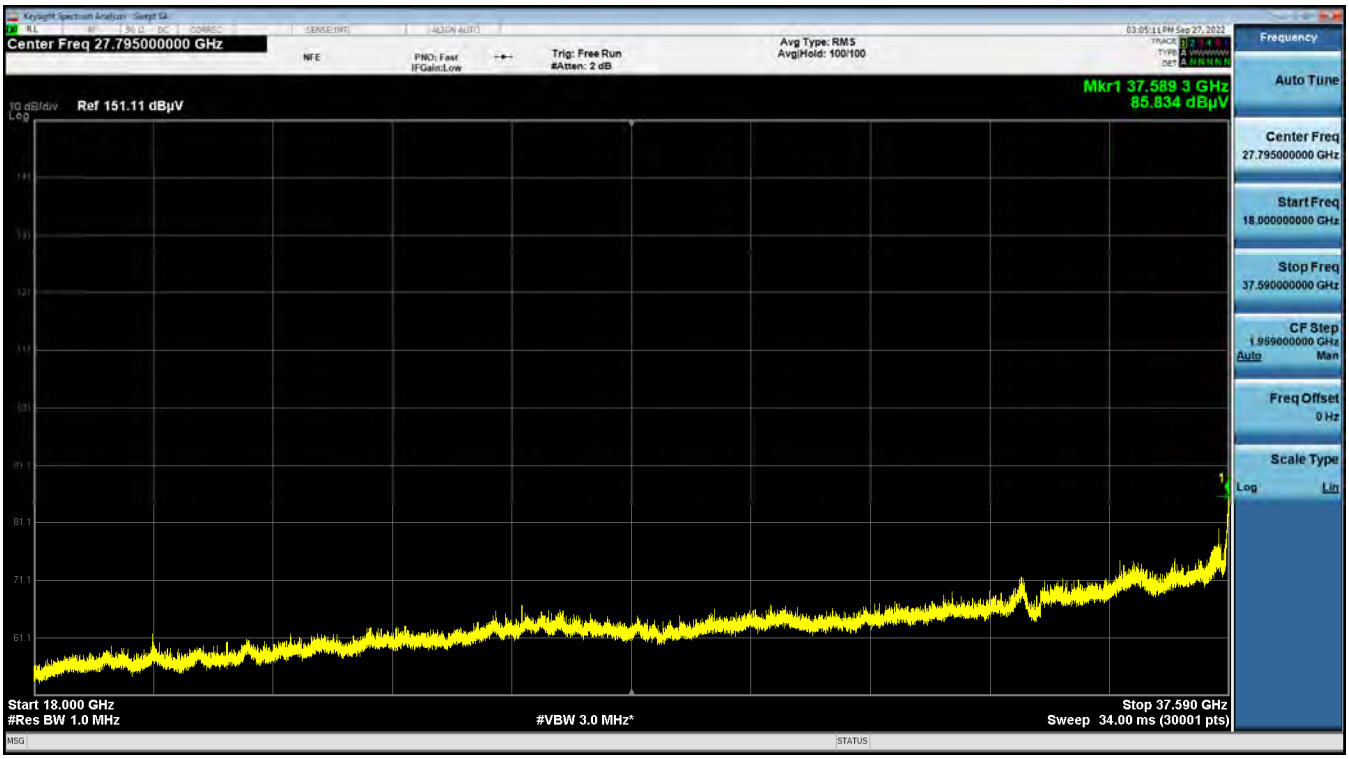
18 GHz ~ Low Edge / 28 GHz 8CC / High / 64QAM



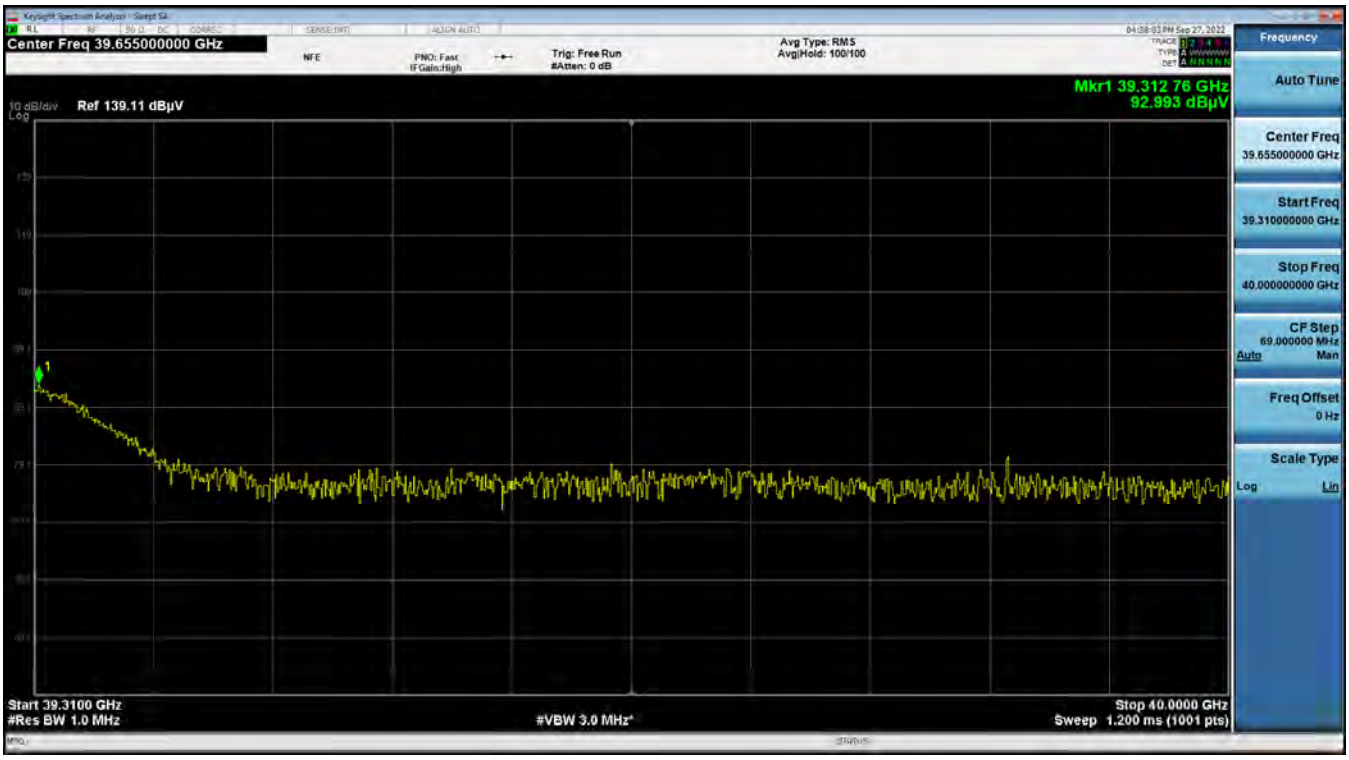
High Edge ~ 40 GHz / 28 GHz 8CC / High / 256QAM



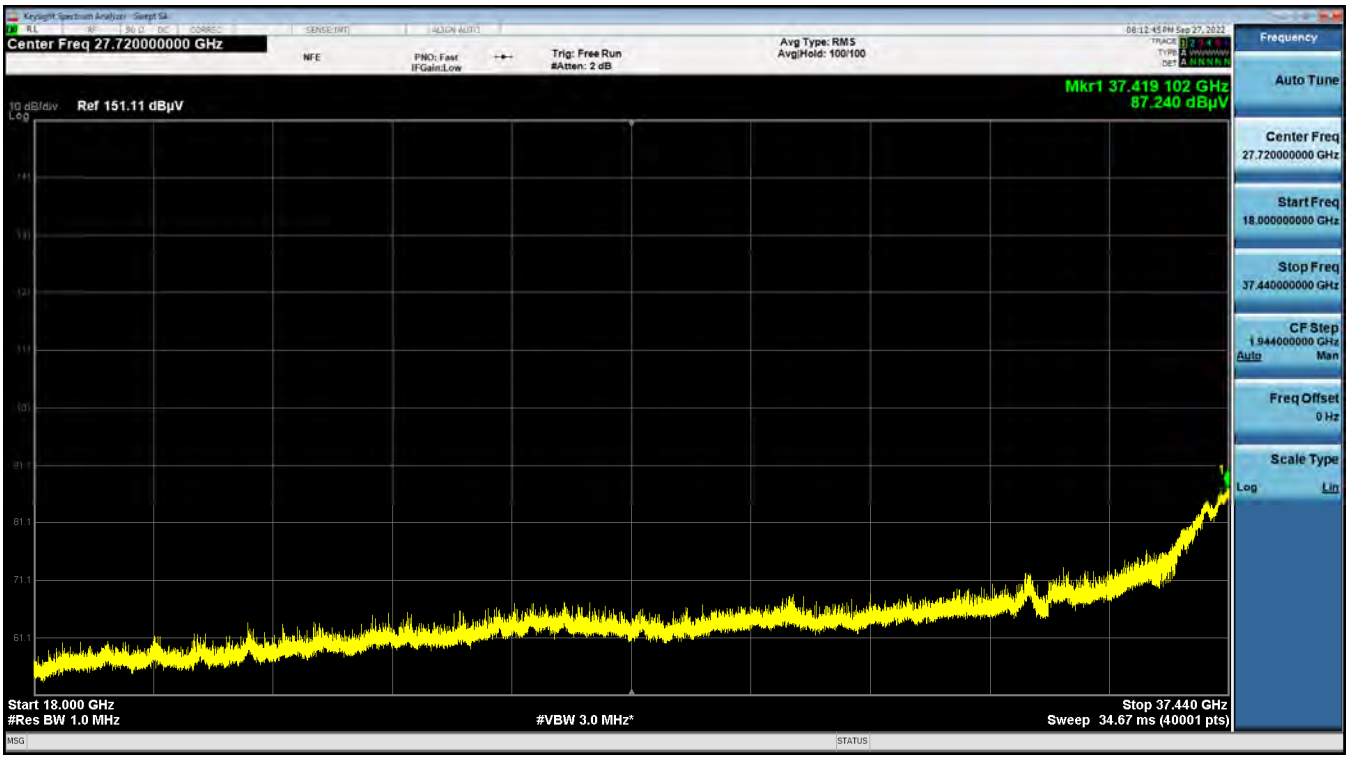
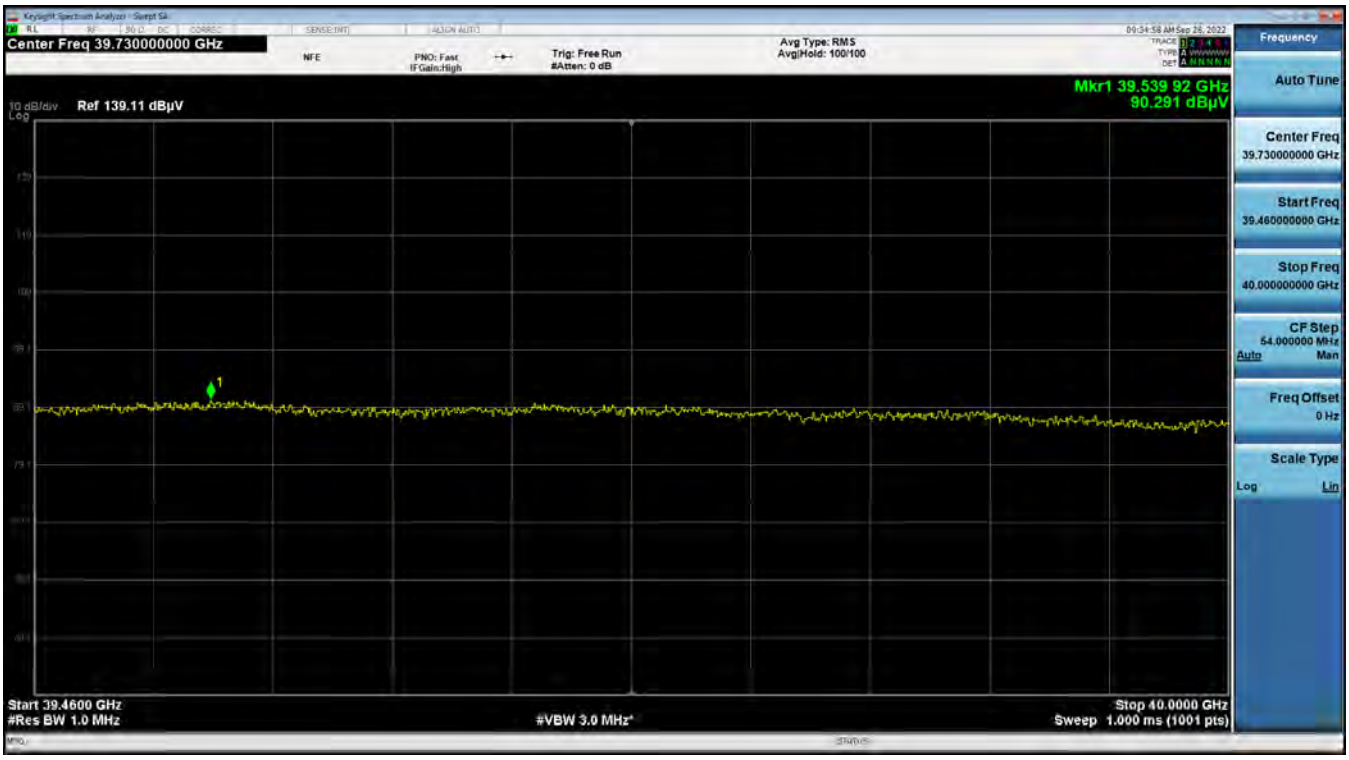
18 GHz ~ Low Edge / 39 GHz 1CC / Low / 256QAM



High Edge ~ 40 GHz / 39 GHz 1CC / High / 64QAM



18 GHz ~ Low Edge / 39 GHz 16CC / Low / 256QAM



High Edge ~ 40 GHz / 39 GHz 16CC / Middle / 64QAM