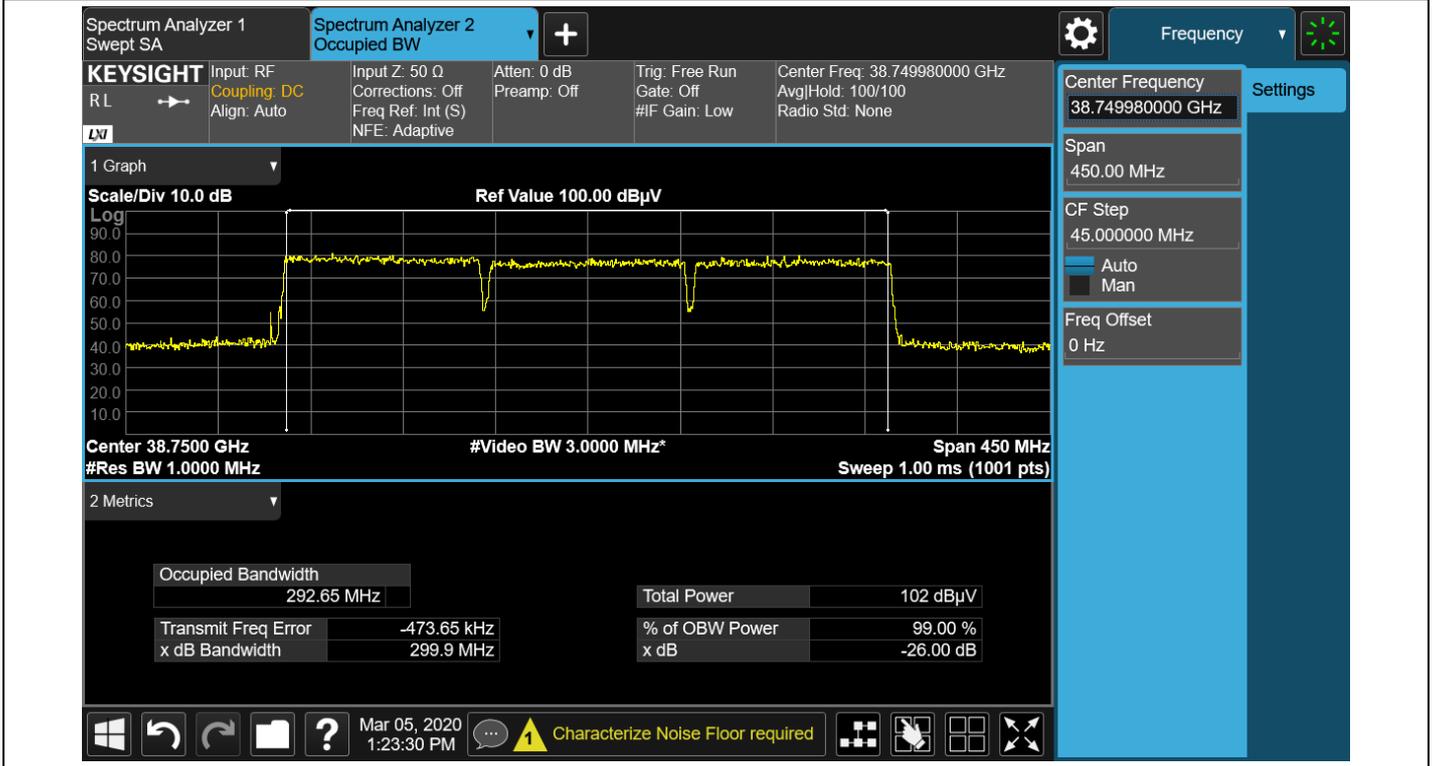
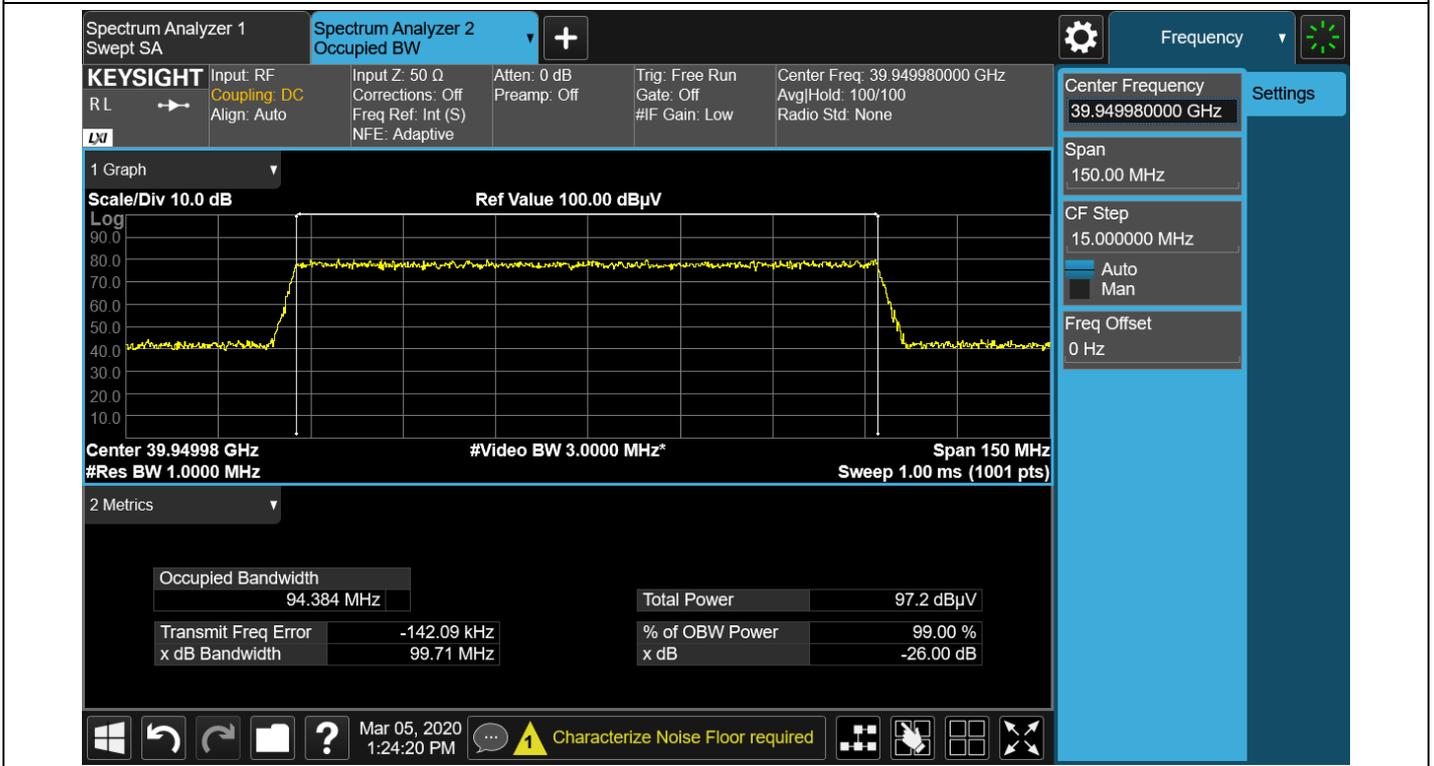


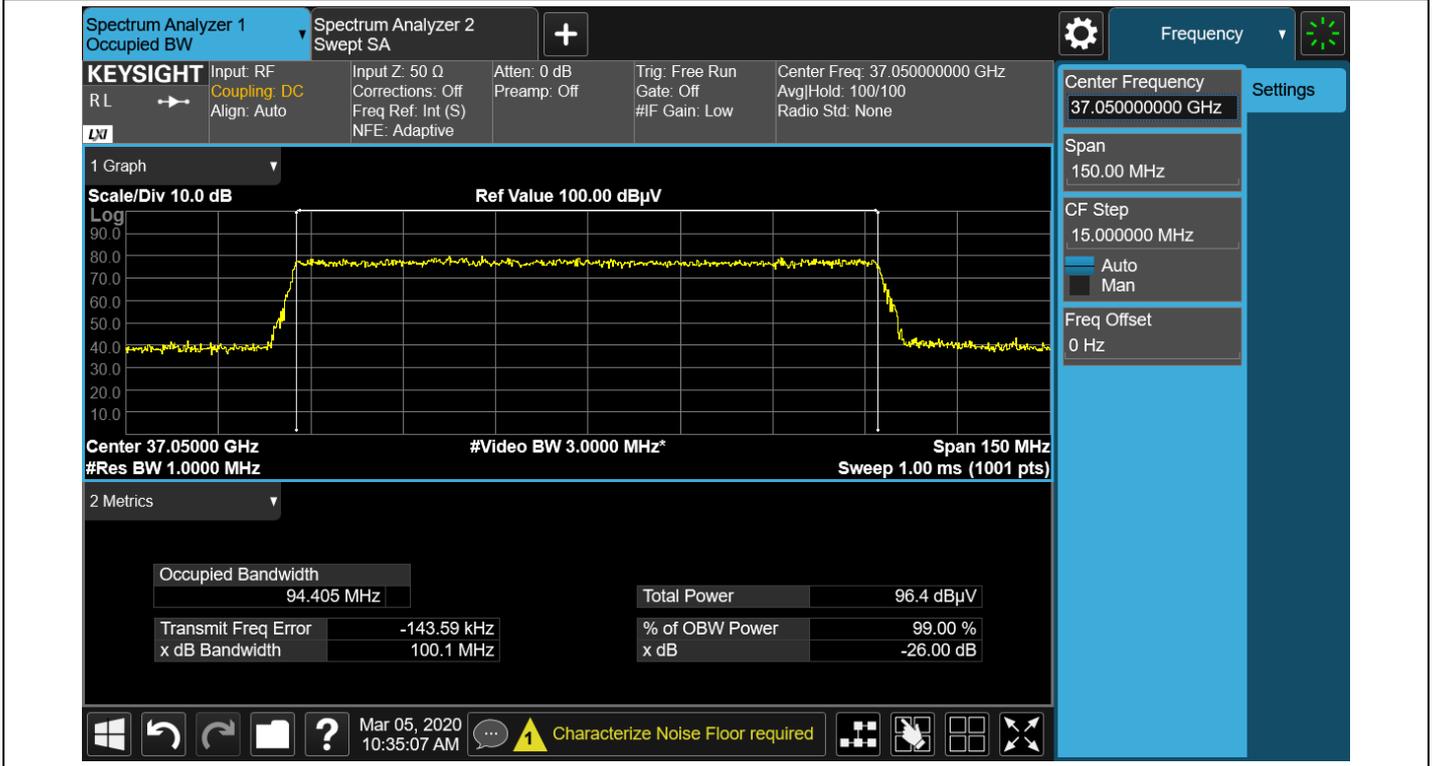
## Antenna C / cc3+1 / 64QAM / High\_1



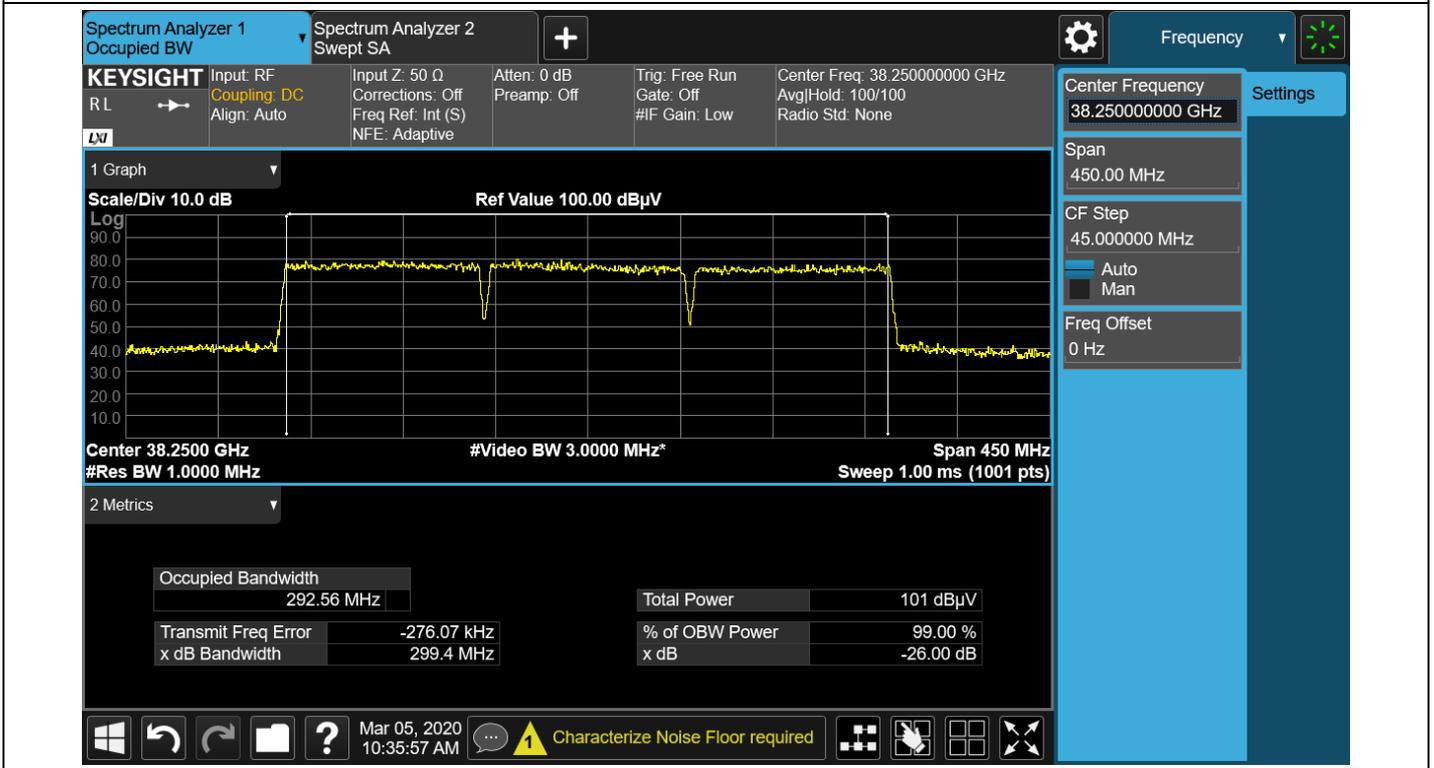
## Antenna C / cc3+1 / 64QAM / High\_2



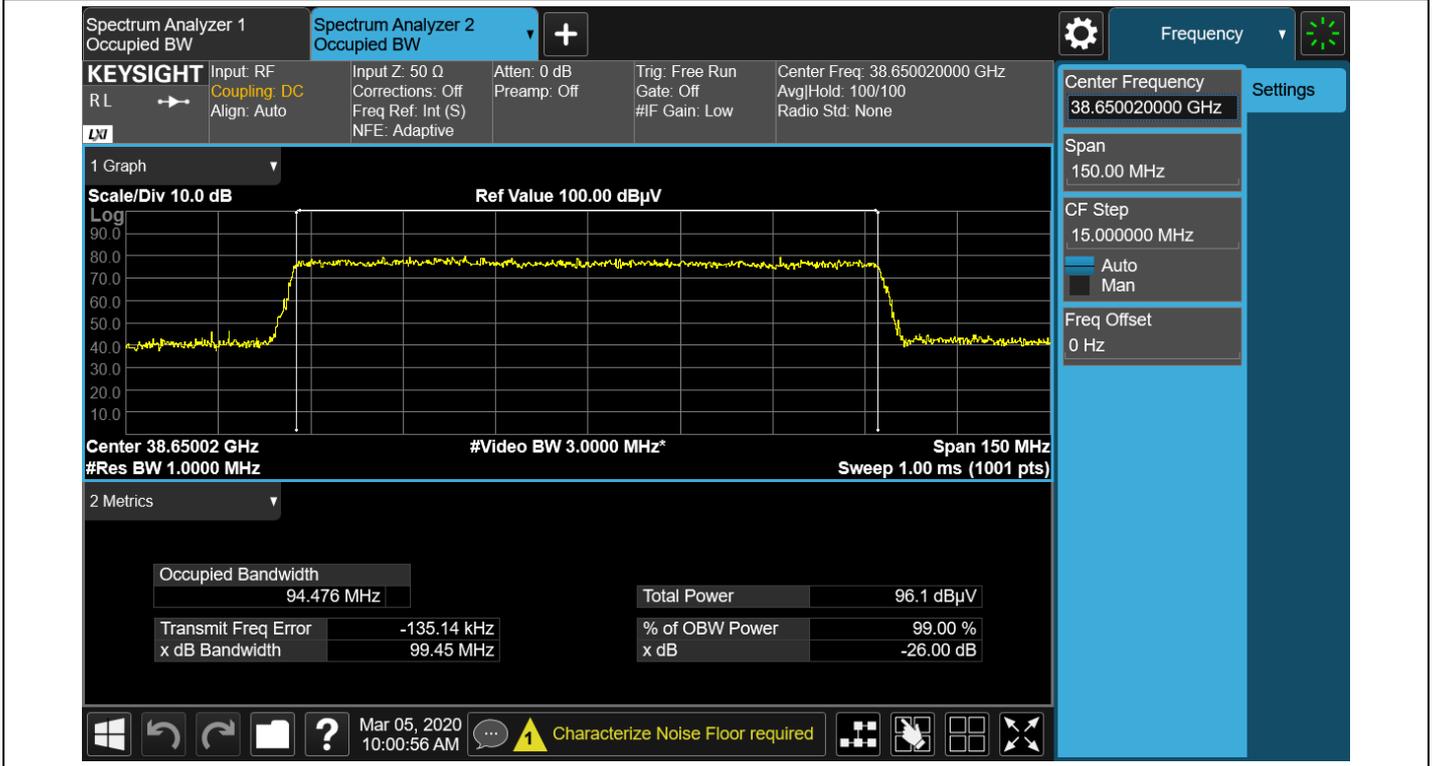
## Antenna D / cc1+3 / 64QAM / Low\_1



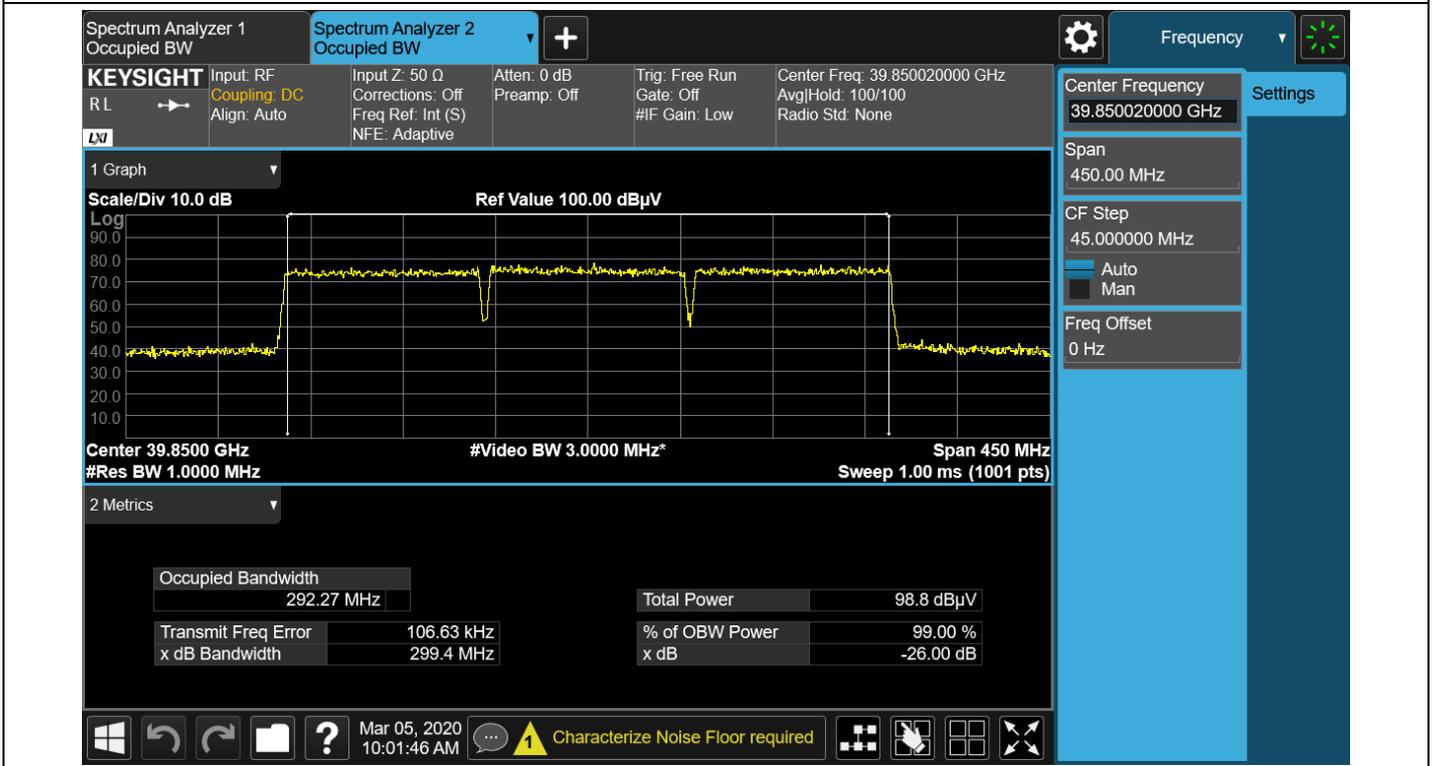
## Antenna D / cc1+3 / 64QAM / Low\_2



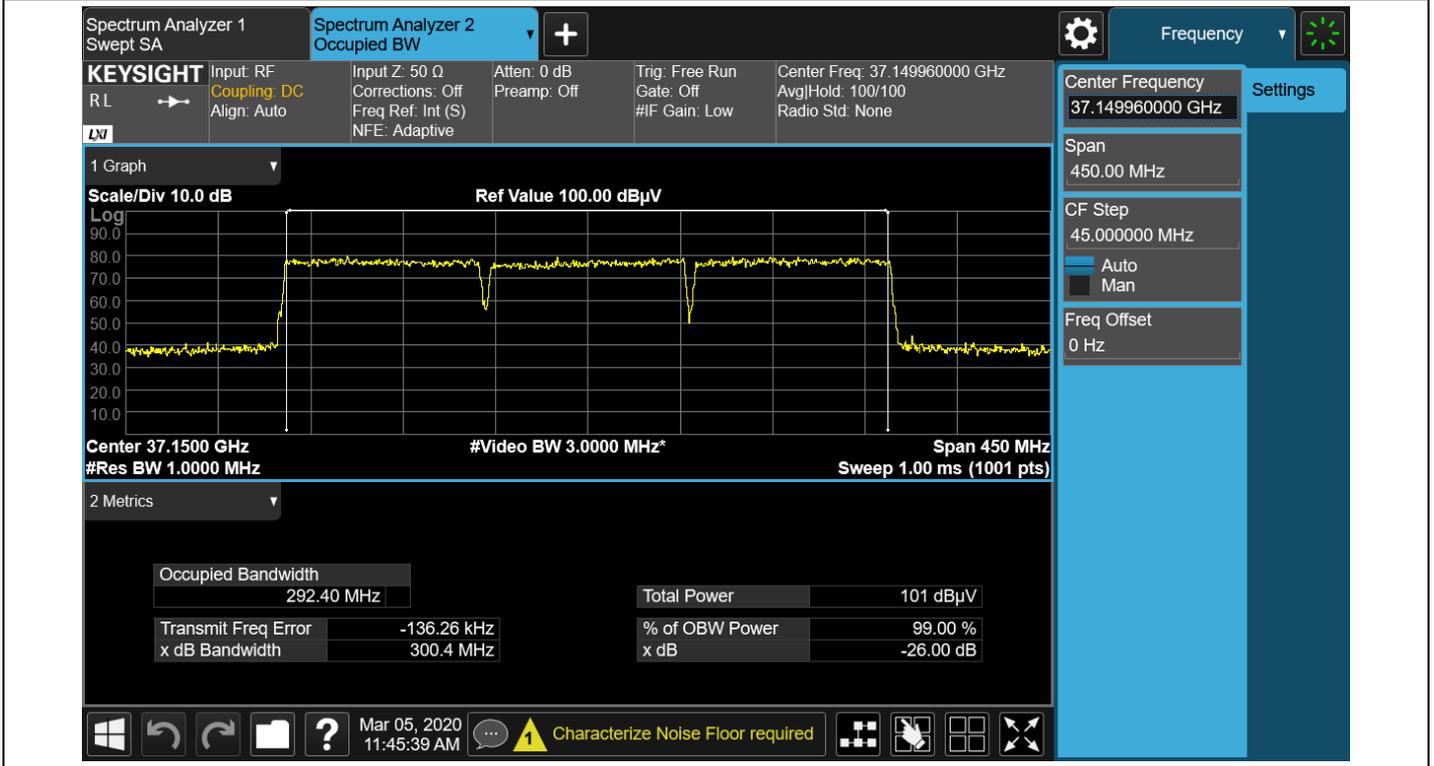
## Antenna D / cc1+3 / 64QAM / High\_1



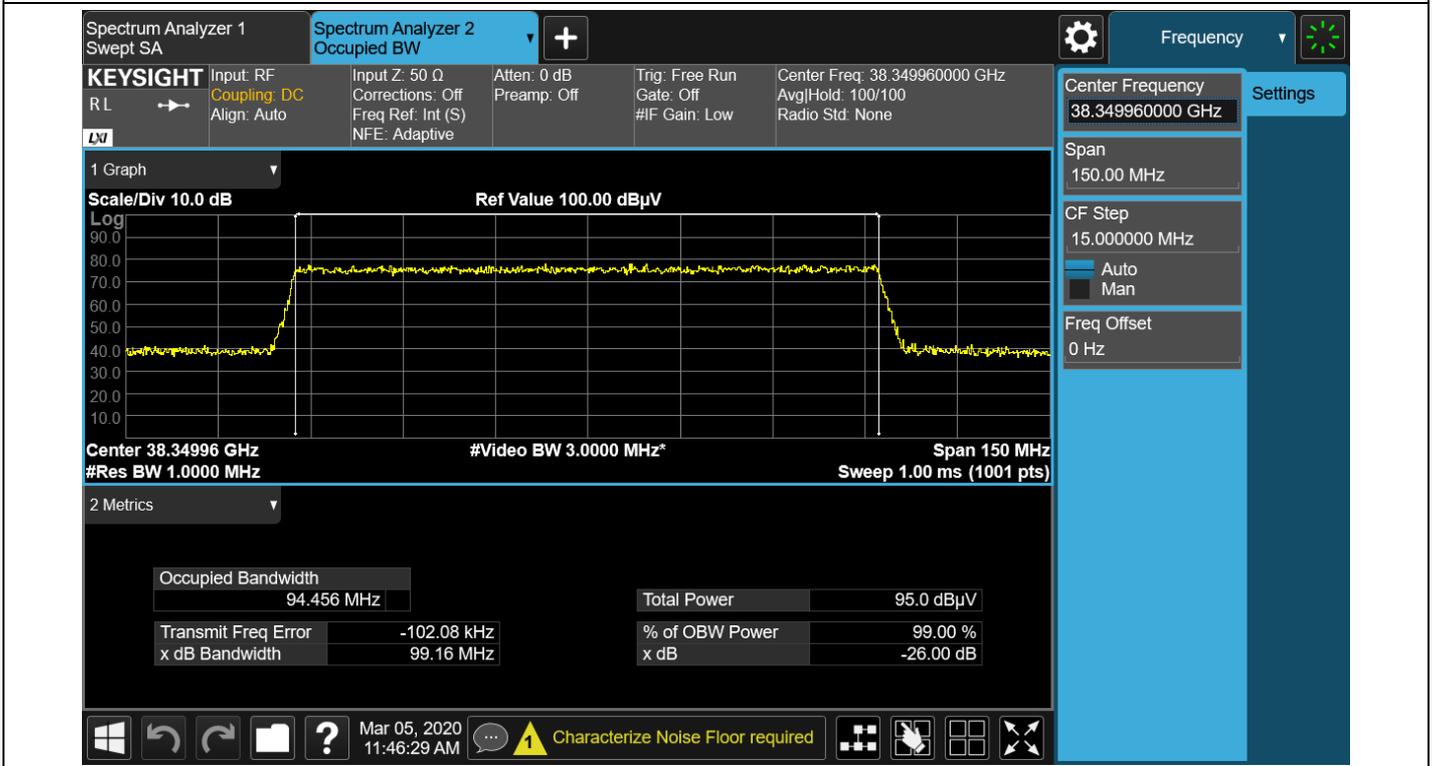
## Antenna D / cc1+3 / 64QAM / High\_2



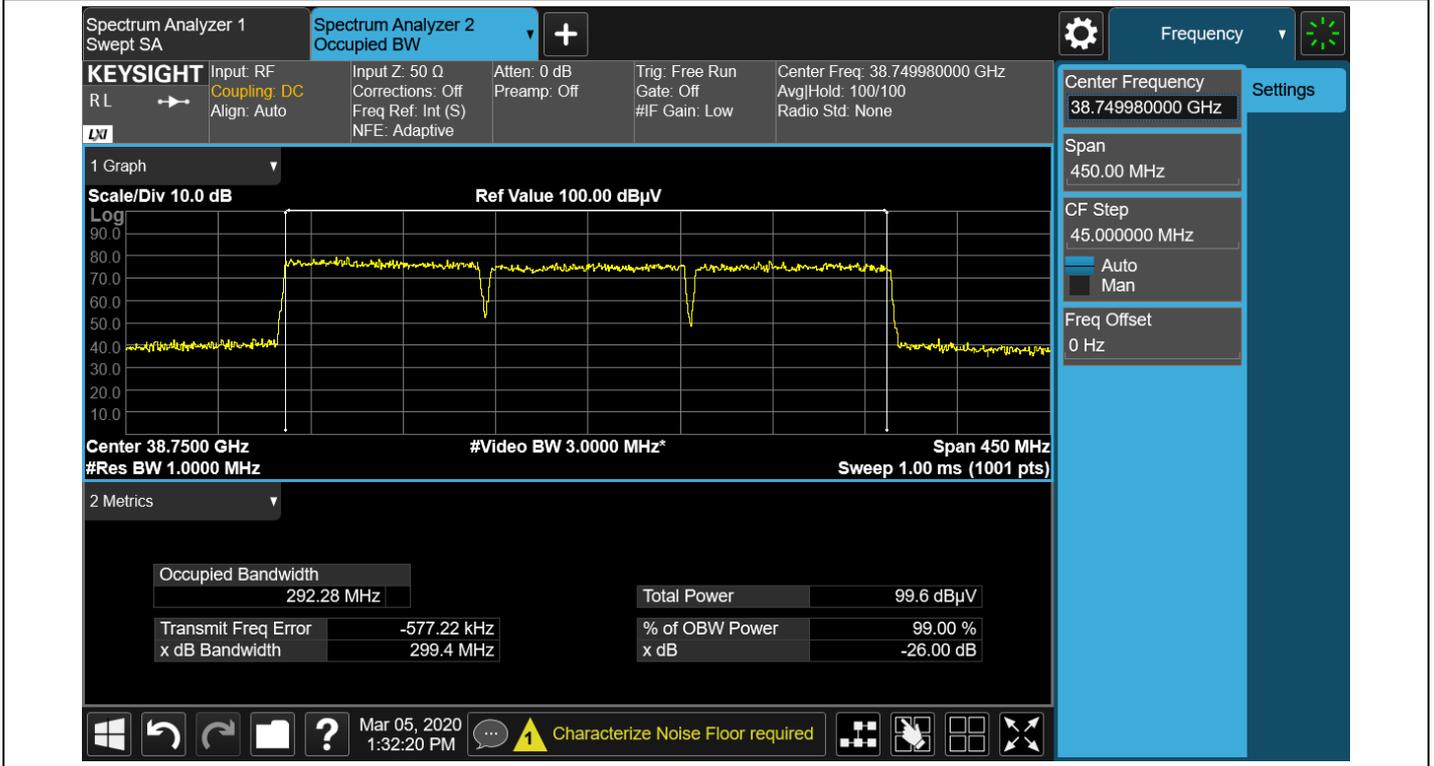
## Antenna D / cc3+1 / 64QAM / Low\_1



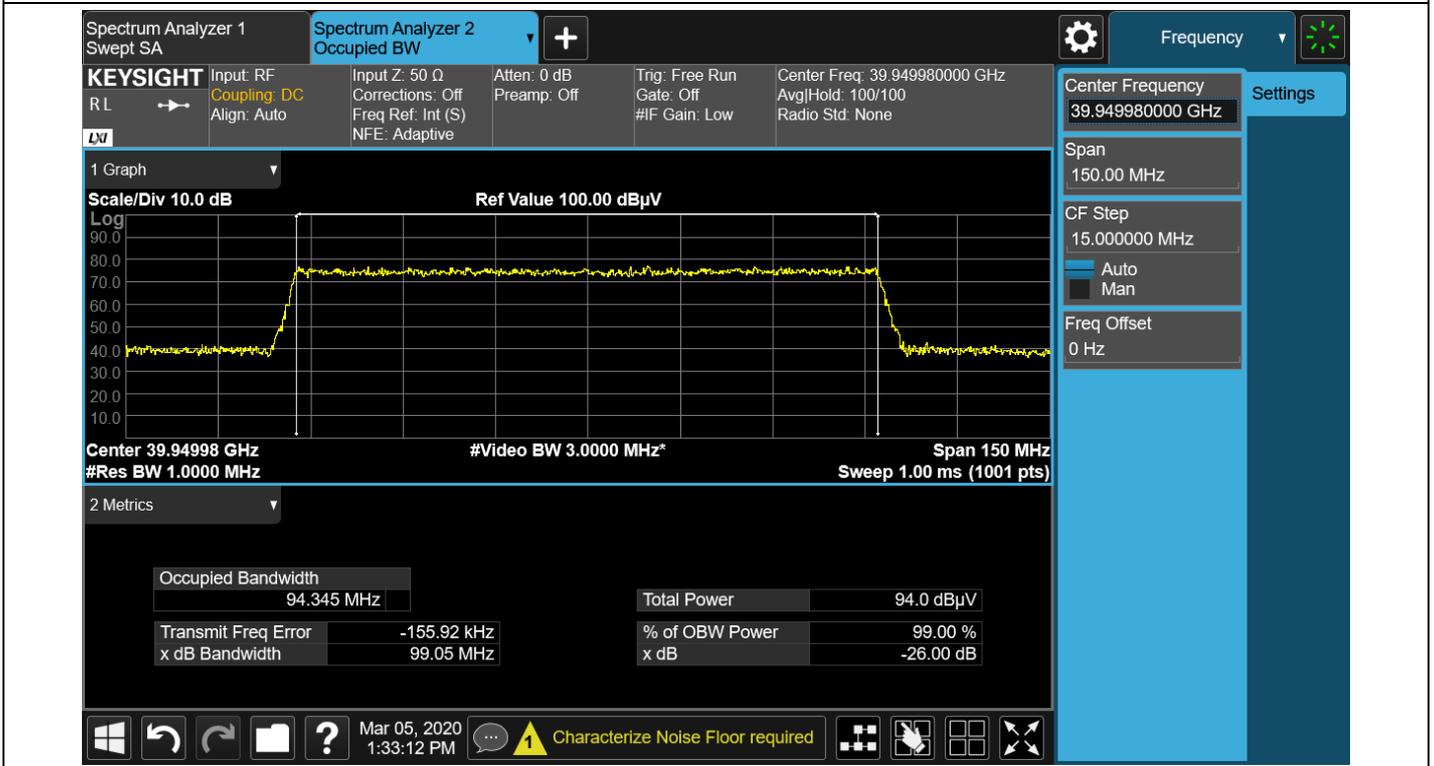
## Antenna D / cc3+1 / 64QAM / Low\_2



## Antenna D / cc3+1 / 64QAM / High\_1



## Antenna D / cc3+1 / 64QAM / High\_2



## 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) Test distance is determined to 3.75 m by far field condition; see test descriptions on page 8.
- 2) In this test, EUT is operated only measurement path is turned on and path has straight beamforming.
- 3) For 4 cc measurement, test is performed for all carriers of 100 MHz bandwidth, but recorded only maximum output level.
- 4) The angle of antenna is set as maximum radiated power conditions.
- 5) EIRP is calculated from measured value according to section 5.2.7 of ANSI C62.26-2015, and the formula is as follows.

$$\begin{aligned} EIRP (dBm) &= E (dB\mu V/m) + 20\log(3 m) - 104.77 \\ &= E (dB\mu V/m) - 95.2 \end{aligned}$$

- 6) E (dB $\mu$ V/m) value is considered AFCL and Duty cycle factor and it as follow.

$$\begin{aligned} E (dB\mu V/m) &= \text{measurement value } (dB\mu V) + AFCL (37.05 GHz) + \text{Duty cycle correction } (74 \%) \\ &= \text{measurement value } (dB\mu V) + 48.333 + 1.305 \end{aligned}$$

- 7) The output tolerance of the EUT in the specification is  $\pm 3$  dB and test result satisfies this condition.
- 8) Sample calculation:

$$\begin{aligned} & 90.36 \text{ dB}\mu\text{V (measured Value)} + 9.54(\text{distance}) - 104.77 + 48.333(\text{AFCL}) + 1.305 (\text{Duty}) \\ & = 44.80 \text{ dBm (Final EIRP)} \end{aligned}$$

**Test Results:**
**Tabular Data of EIRP Density per path**
**Contiguous**

Ant.	Ant.	CC	Channel	Frequency (GHz)	Mod.	Measured Level	Limit (dBm)	Calculated EIRP (dBm)
	Angle					(dBuV)		
A	135°	1	Low	37.05000	64QAM	90.36	75	44.80
			Middle	38.50002	64QAM	88.54		44.24
			High	39.94998	64QAM	89.14		46.73
		4	Low	37.19994	64QAM	90.43		44.87
			Middle	38.49996	64QAM	89.82		45.53
			High	39.80004	64QAM	89.91		47.41
B	45°	1	Low	37.05000	64QAM	90.54		44.98
			Middle	38.50002	64QAM	88.58		44.28
			High	39.94998	64QAM	87.11		44.69
		4	Low	37.19994	64QAM	90.64		45.08
			Middle	38.49996	64QAM	88.80		44.51
			High	39.80004	64QAM	88.14		45.72
C	135°	1	Low	37.05000	64QAM	90.71	45.15	
			Middle	38.50002	64QAM	88.42	44.12	
			High	39.94998	64QAM	89.93	47.52	
		4	Low	37.19994	64QAM	91.07	45.51	
			Middle	38.49996	64QAM	90.72	46.42	
			High	39.80004	64QAM	91.03	48.62	
D	45°	1	Low	37.05000	64QAM	90.89	45.33	
			Middle	38.50002	64QAM	88.46	44.17	
			High	39.94998	64QAM	87.45	45.04	
		4	Low	37.19994	64QAM	91.17	45.61	
			Middle	38.49996	64QAM	89.31	45.02	
			High	39.80004	64QAM	88.35	45.94	

**Tabular Data of EIRP Density for MIMO**

Ant.	CC	Ch.	Mod.	Ant A EIRP (dBm)	Ant C EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
A+C	1	Low	64QAM	44.80	45.15	75	47.99
		Middle	64QAM	44.24	44.12		47.19
		High	64QAM	46.73	47.52		50.15
	4	Low	64QAM	44.87	45.51		48.21
		Middle	64QAM	45.53	46.42		49.01
		High	64QAM	47.41	48.62		51.07

Ant.	CC	Ch.	Mod.	Ant B EIRP (dBm)	Ant D EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
B+D	1	Low	64QAM	44.98	45.33	75	48.17
		Middle	64QAM	44.28	44.17		47.24
		High	64QAM	44.69	45.04		47.88
	4	Low	64QAM	45.08	45.61		48.36
		Middle	64QAM	44.51	45.02		47.78
		High	64QAM	45.72	45.94		48.84

Ant.	CC	Ch.	Mod.	Ant A EIRP (dBm)	Ant B EIRP (dBm)	Ant C EIRP (dBm)	Ant D EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
A+B+C+D	1	Low	64QAM	44.80	44.98	45.15	45.33	75	51.09
		Middle	64QAM	44.24	44.28	44.12	44.17		50.22
		High	64QAM	46.73	44.69	47.52	45.04		52.17
	4	Low	64QAM	44.87	45.08	45.51	45.61		51.30
		Middle	64QAM	45.53	44.51	46.42	45.02		51.45
		High	64QAM	47.41	45.72	48.62	45.94		53.11

## Non-Contiguous

## 1+3

Ant.	Ant.	CC	Channel	Frequency (GHz)	Mod.	Measured Level	Limit (dBm)	Calculated EIRP (dBm)
	Angle					(dBuV)		
A	135°	1+3	Low	38.15004	64QAM	90.85	75	46.75
			High	38.65002	64QAM	90.50		48.20
B	45°	1+3	Low	38.15004	64QAM	90.13		46.03
			High	38.65002	64QAM	89.42		47.12
C	135°	1+3	Low	38.15004	64QAM	91.62		47.52
			High	38.65002	64QAM	91.36		49.06
D	45°	1+3	Low	38.15004	64QAM	90.34		46.24
			High	38.65002	64QAM	89.86		47.56

## 3+1

Ant.	Ant.	CC	Channel	Frequency (GHz)	Mod.	Measured Level	Limit (dBm)	Calculated EIRP (dBm)
	Angle					(dBuV)		
A	135°	3+1	Low	37.05000	64QAM	90.61	75	46.49
			High	38.65002	64QAM	90.83		48.53
B	45°	3+1	Low	37.24992	64QAM	90.25		46.32
			High	38.65002	64QAM	90.00		47.70
C	135°	3+1	Low	37.24992	64QAM	90.71		46.78
			High	38.65002	64QAM	91.10		48.80
D	45°	3+1	Low	37.24992	64QAM	90.28		46.35
			High	38.65002	64QAM	89.36		47.06

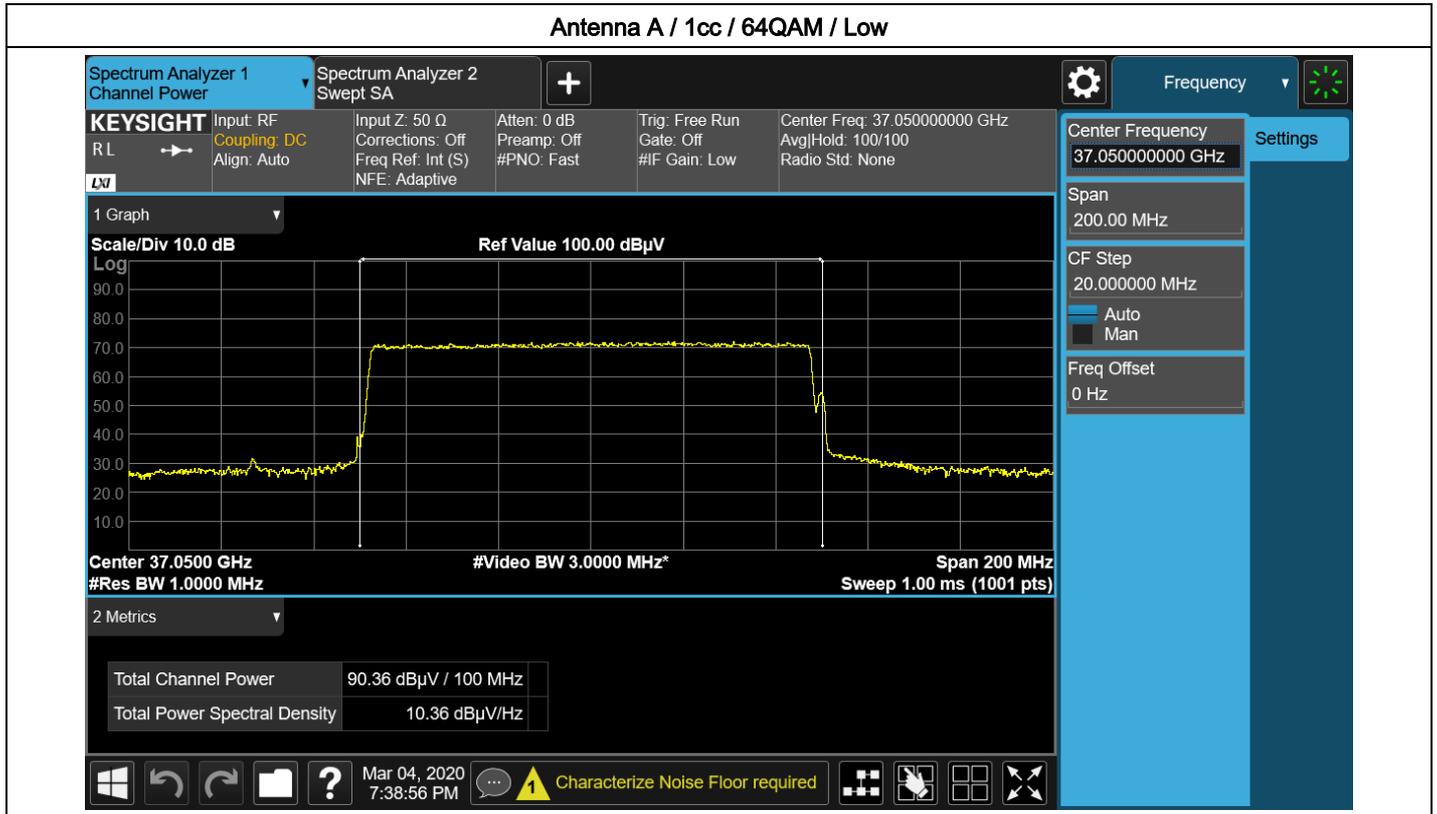
**Tabular Data of EIRP Density for MIMO**

Ant.	CC	Ch.	Mod.	Ant A EIRP (dBm)	Ant C EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
A+C	1+3	Low	64QAM	46.75	47.52	75	50.16
		High	64QAM	48.20	49.06		51.66
	3+1	Low	64QAM	46.49	46.78		49.65
		High	64QAM	48.53	48.80		51.68

Ant.	CC	Ch.	Mod.	Ant B EIRP (dBm)	Ant D EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
B+D	1+3	Low	64QAM	46.03	46.24	75	49.15
		High	64QAM	47.12	47.56		50.36
	3+1	Low	64QAM	46.32	46.35		49.34
		High	64QAM	47.70	47.06		50.40

Ant.	CC	Ch.	Mod.	Ant A EIRP (dBm)	Ant B EIRP (dBm)	Ant C EIRP (dBm)	Ant D EIRP (dBm)	Limit (dBm)	Calculated EIRP (dBm)
A+B+C+D	1+3	Low	64QAM	46.75	46.03	47.52	46.24	75	52.69
		High	64QAM	48.20	47.12	49.06	47.56		54.07
	3+1	Low	64QAM	46.49	46.32	46.78	46.35		52.51
		High	64QAM	48.53	47.70	48.80	47.06		54.10

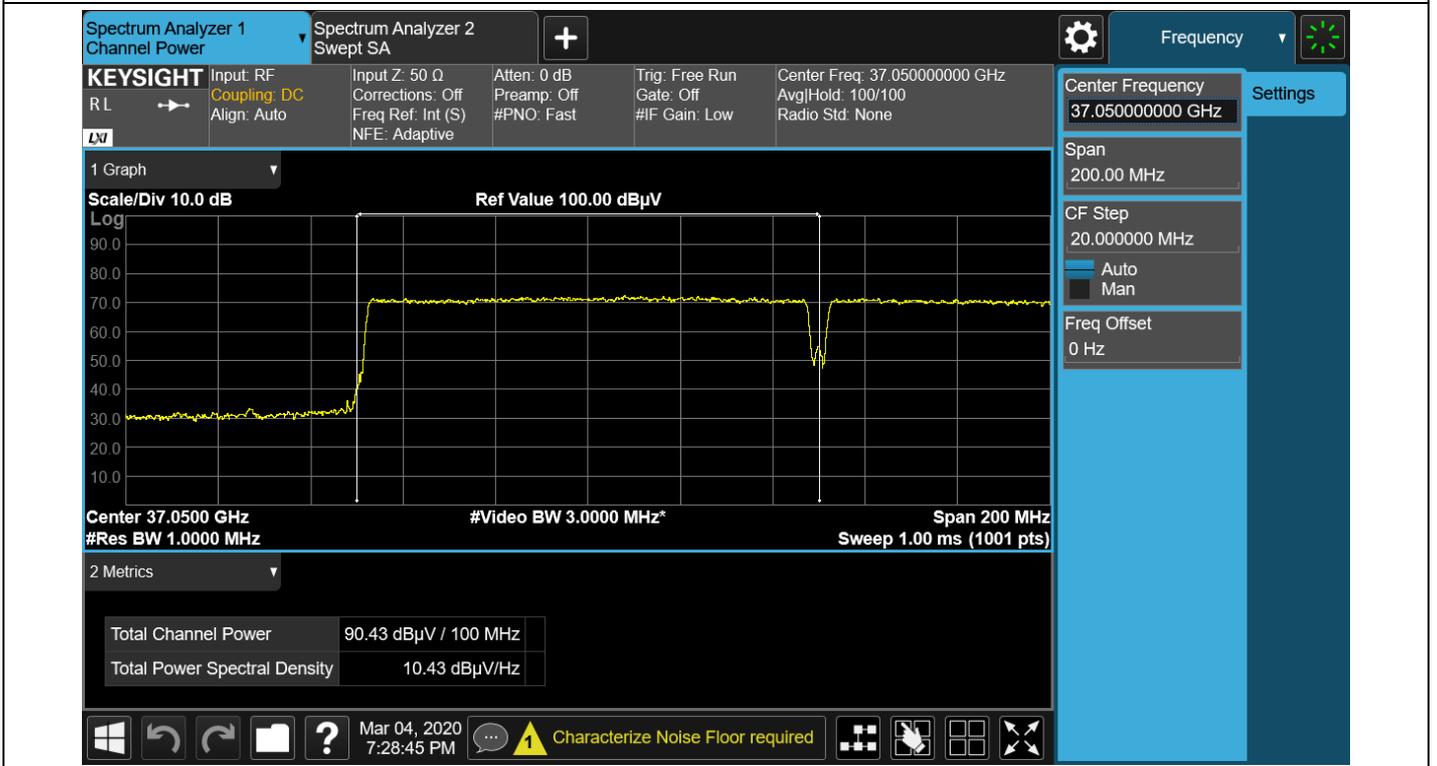
## Plot Data of EIRP Density Tabular per path



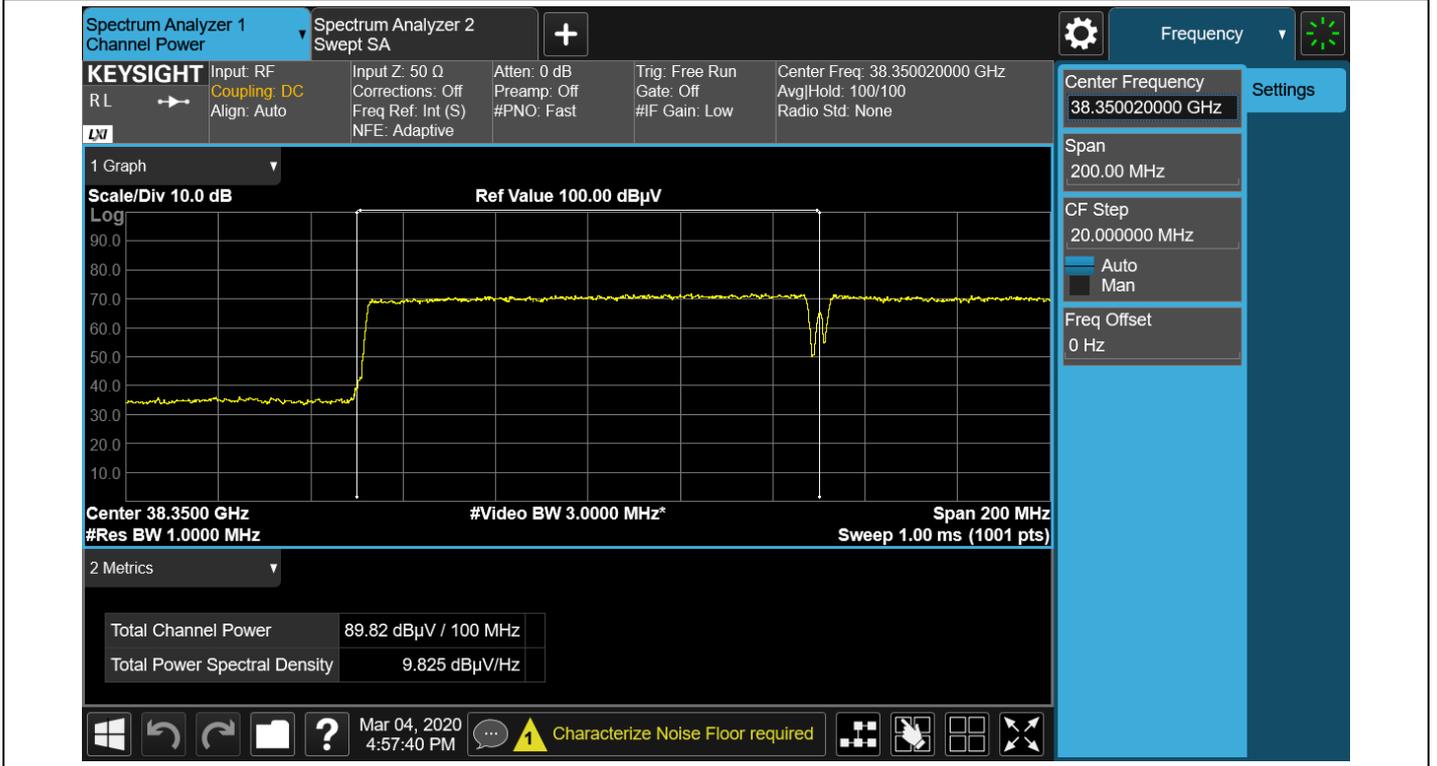
## Antenna A / 1cc / 64QAM / High



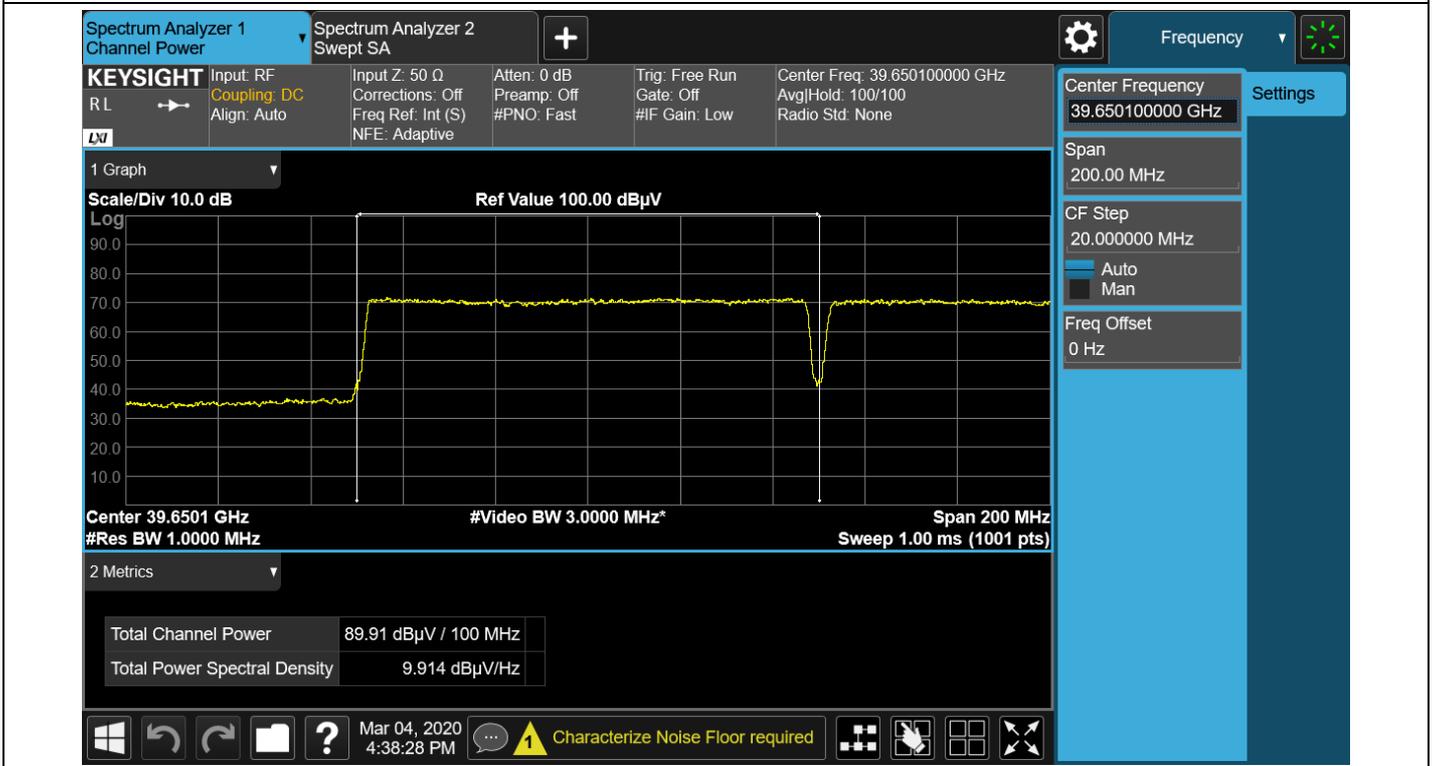
## Antenna A / 4cc / 64QAM / Low



## Antenna A / 4cc / 64QAM / Middle



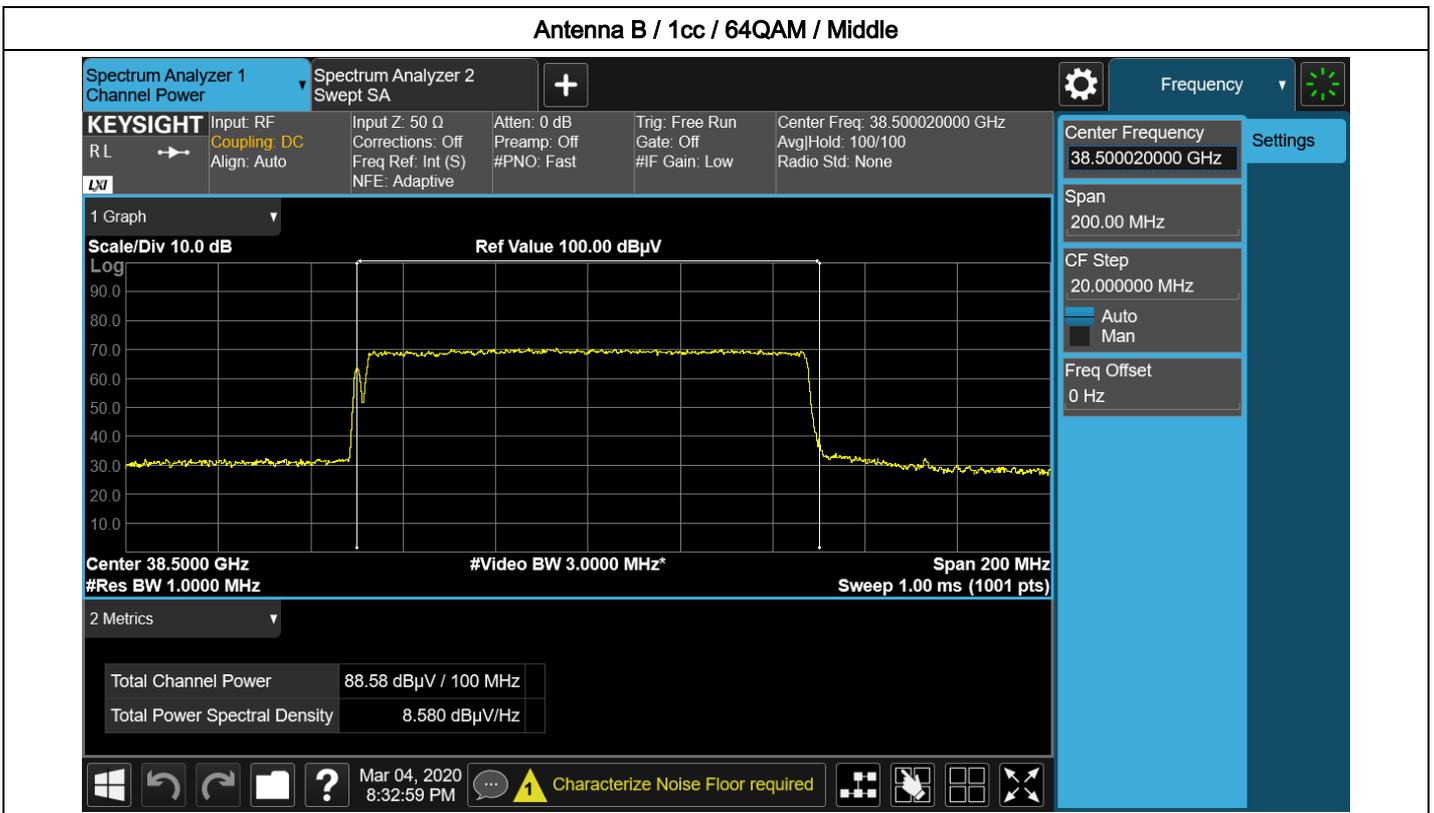
## Antenna A / 4cc / 64QAM / High



## Antenna B / 1cc / 64QAM / Low



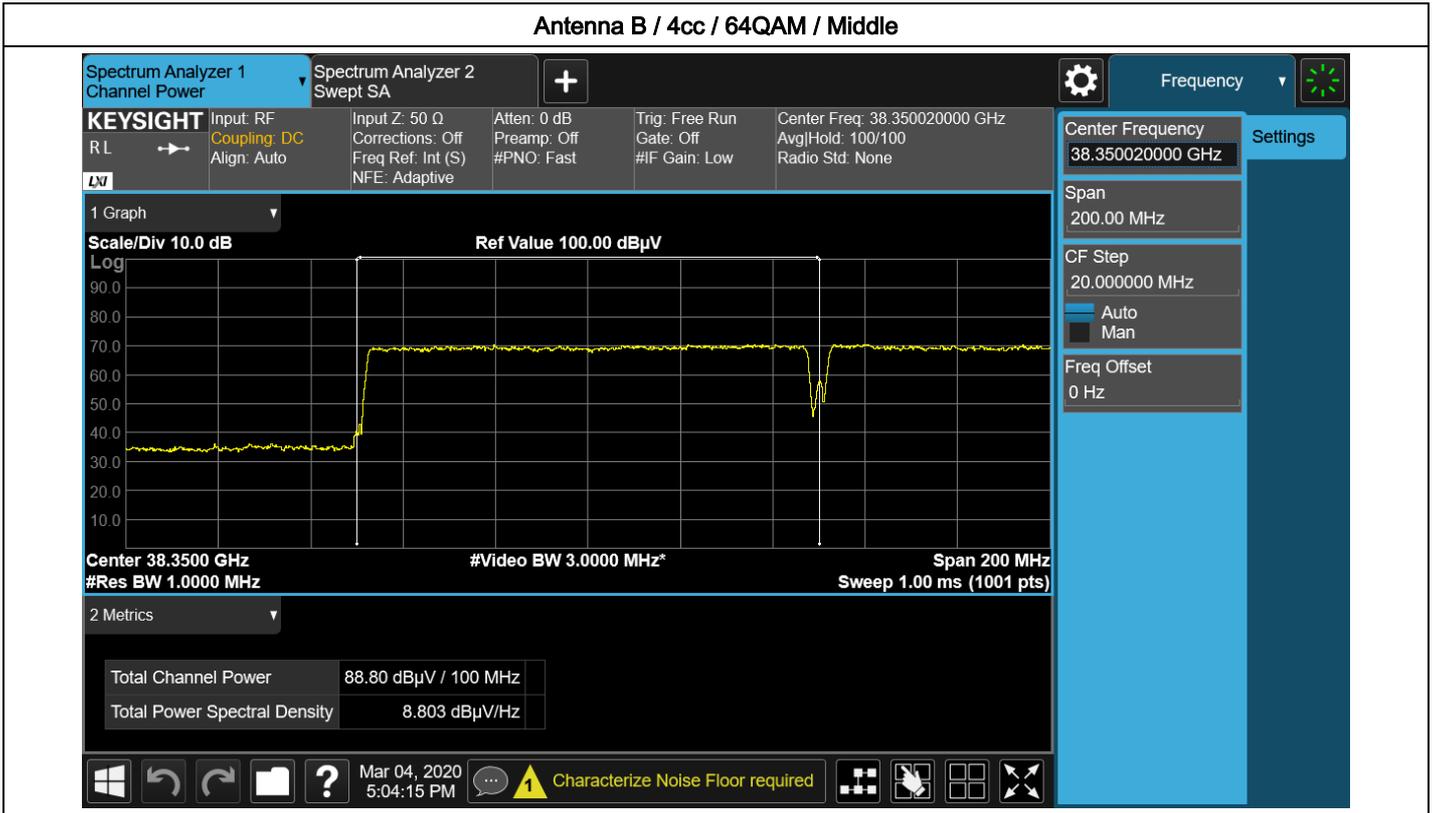
## Antenna B / 1cc / 64QAM / Middle



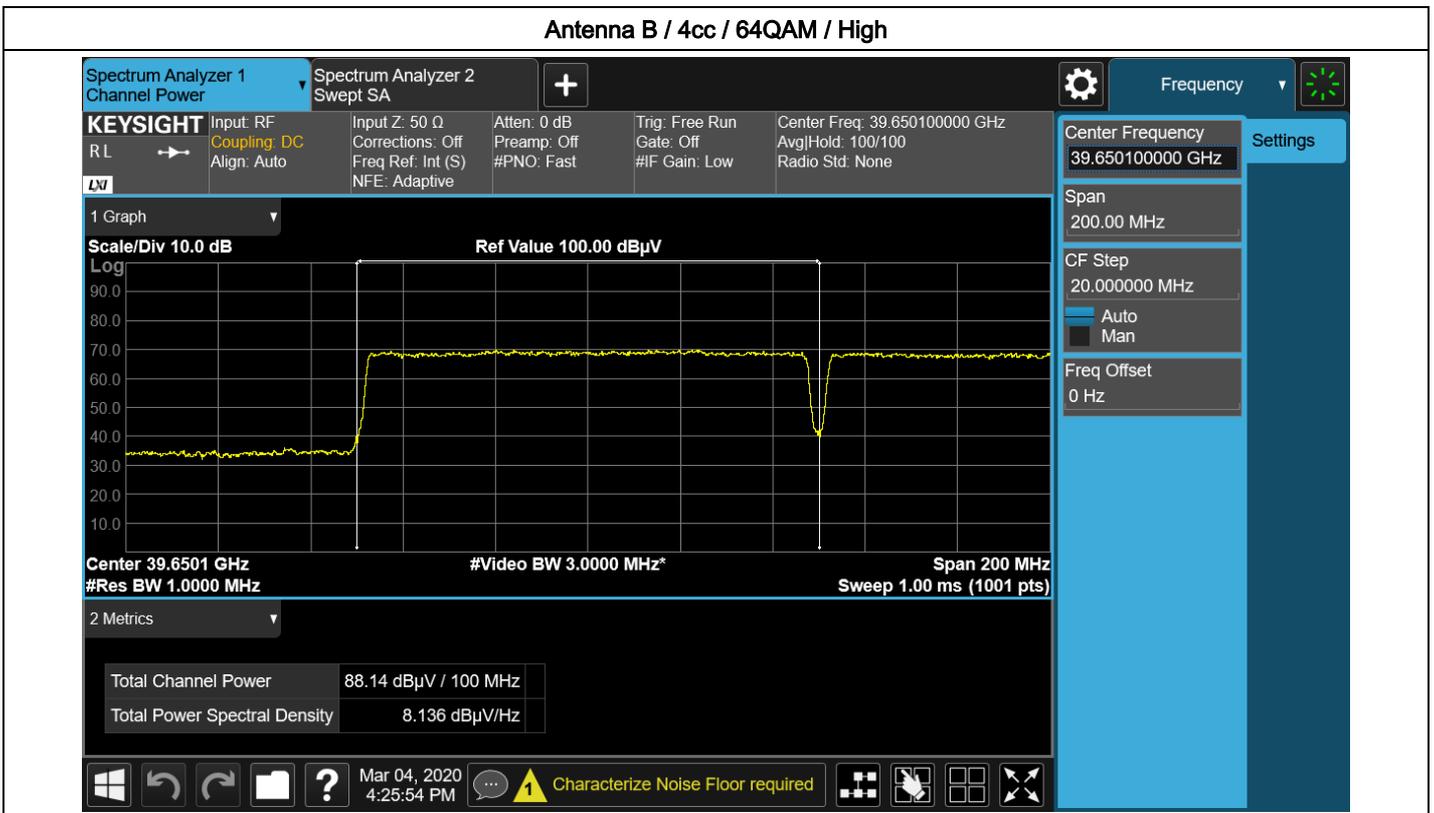
**Antenna B / 1cc / 64QAM / High**

**Antenna B / 4cc / 64QAM / Low**


## Antenna B / 4cc / 64QAM / Middle



## Antenna B / 4cc / 64QAM / High



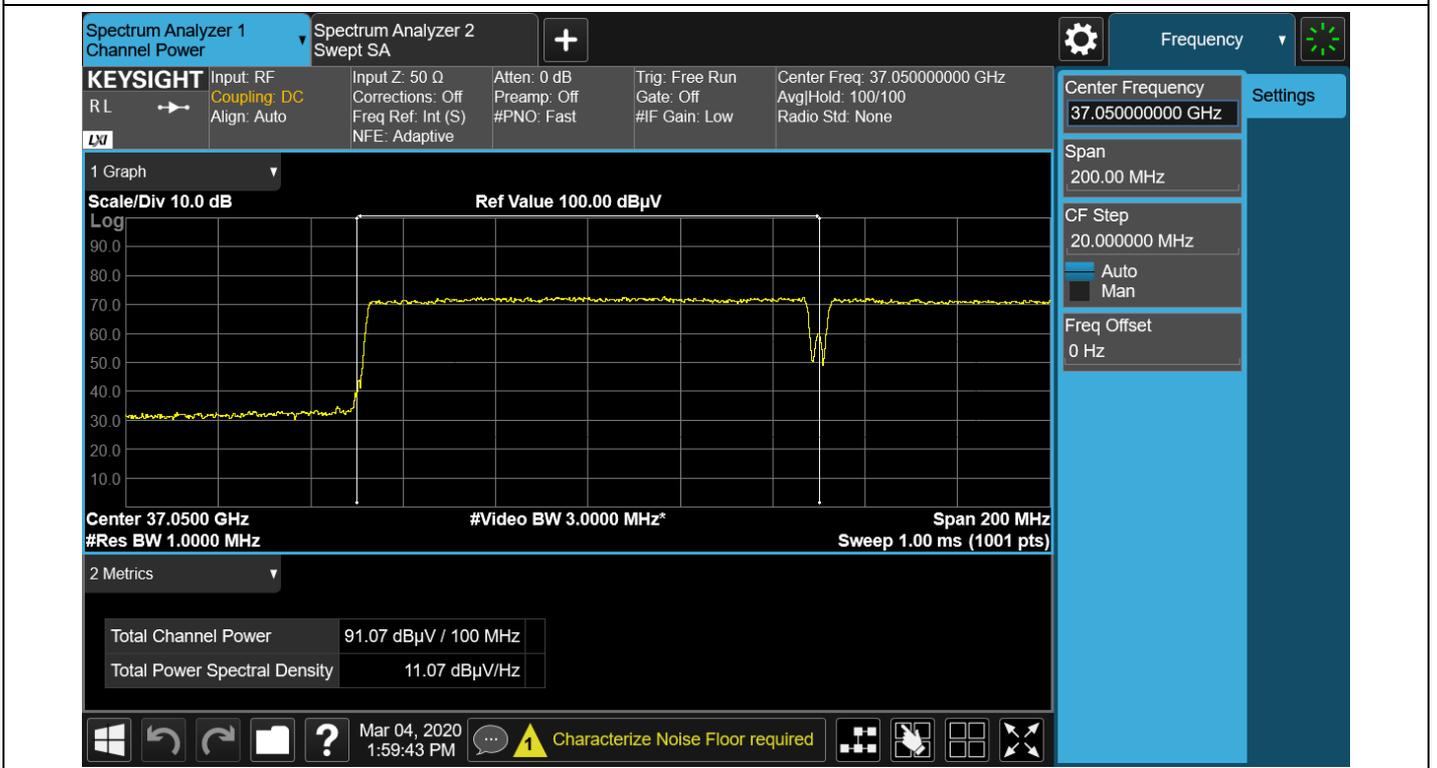
## Antenna C / 1cc / 64QAM / Low



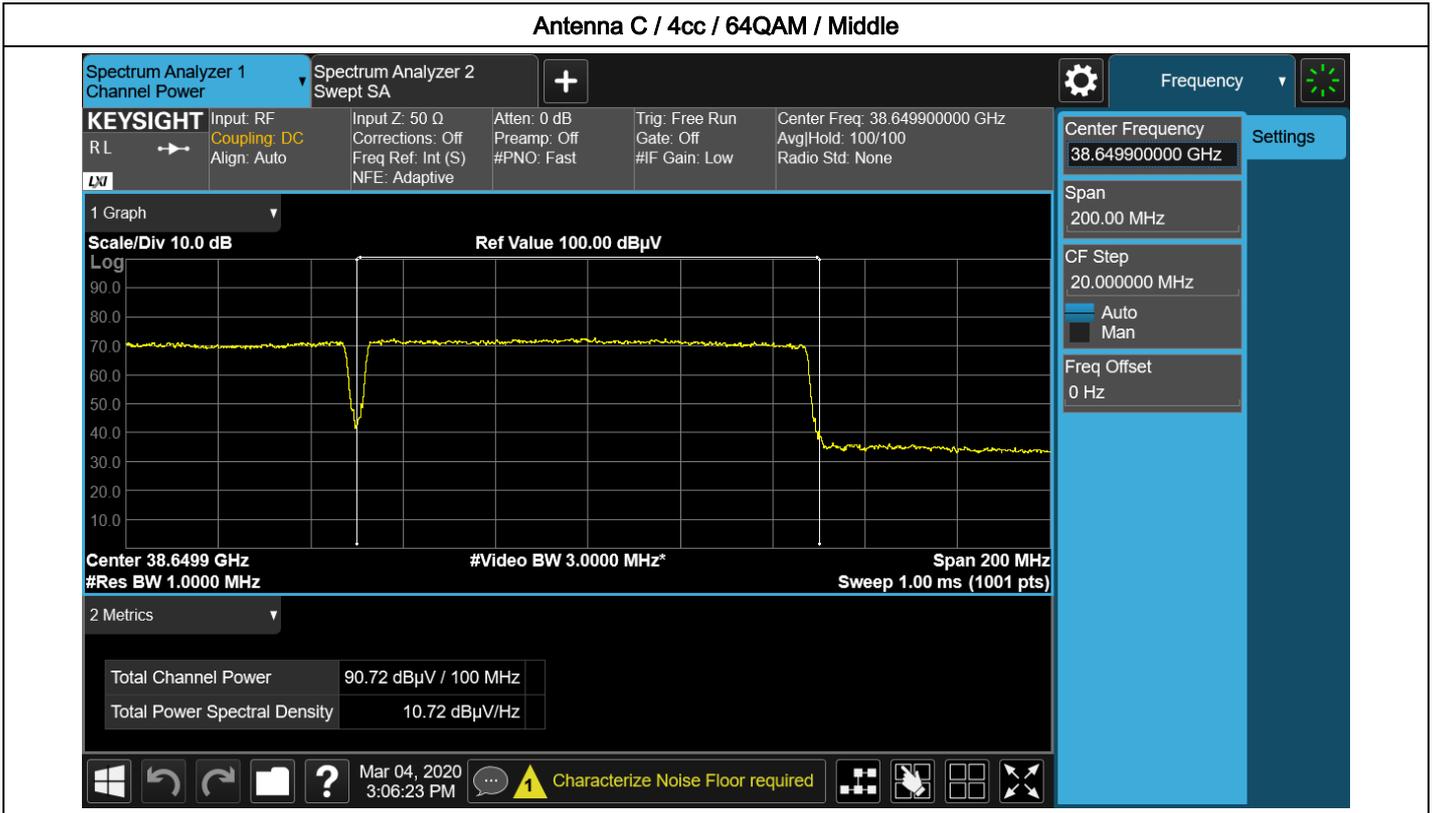
## Antenna C / 1cc / 64QAM / Middle



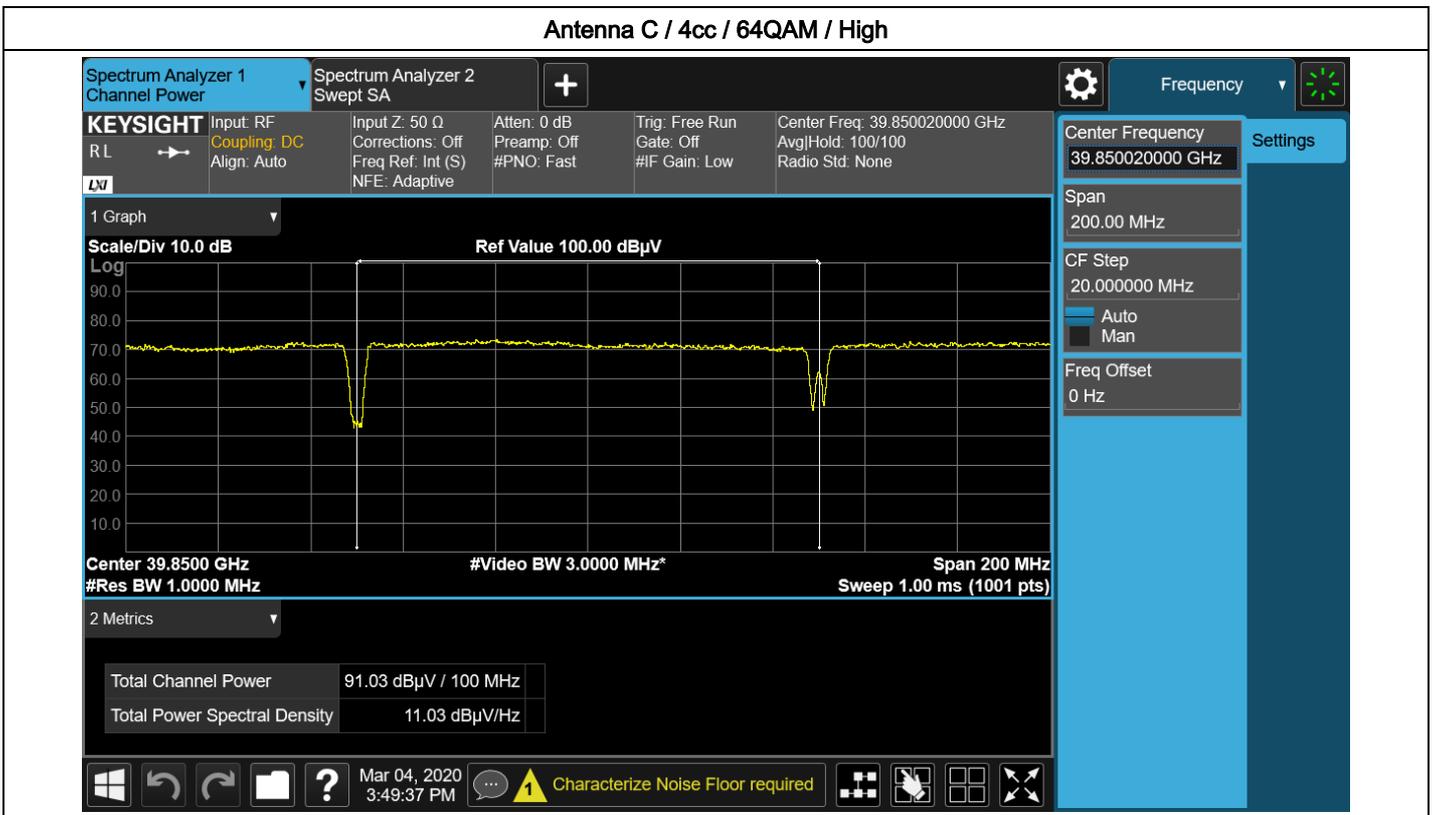
**Antenna C / 1cc / 64QAM / High**

**Antenna C / 4cc / 64QAM / Low**


## Antenna C / 4cc / 64QAM / Middle



## Antenna C / 4cc / 64QAM / High



## Antenna D / 1cc / 64QAM / Low



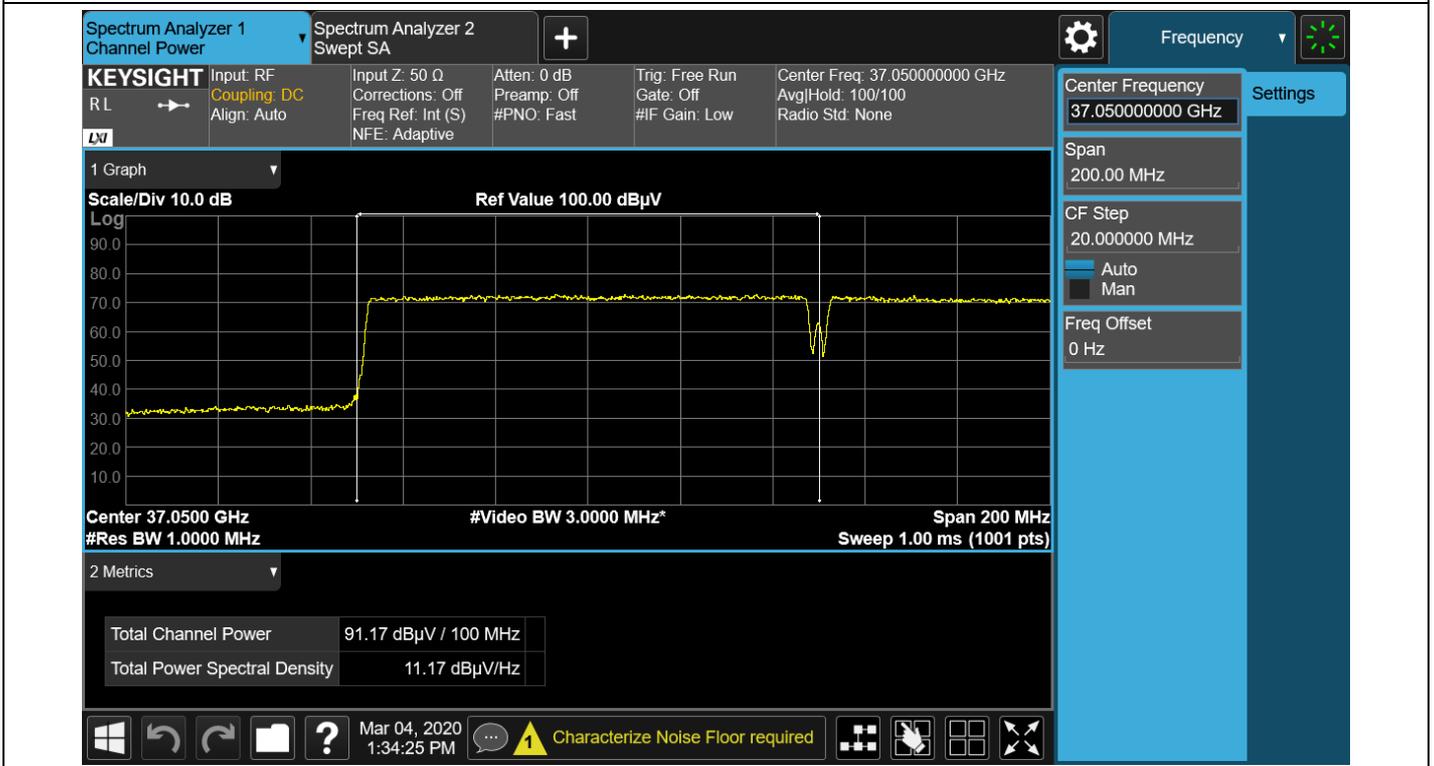
## Antenna D / 1cc / 64QAM / Middle



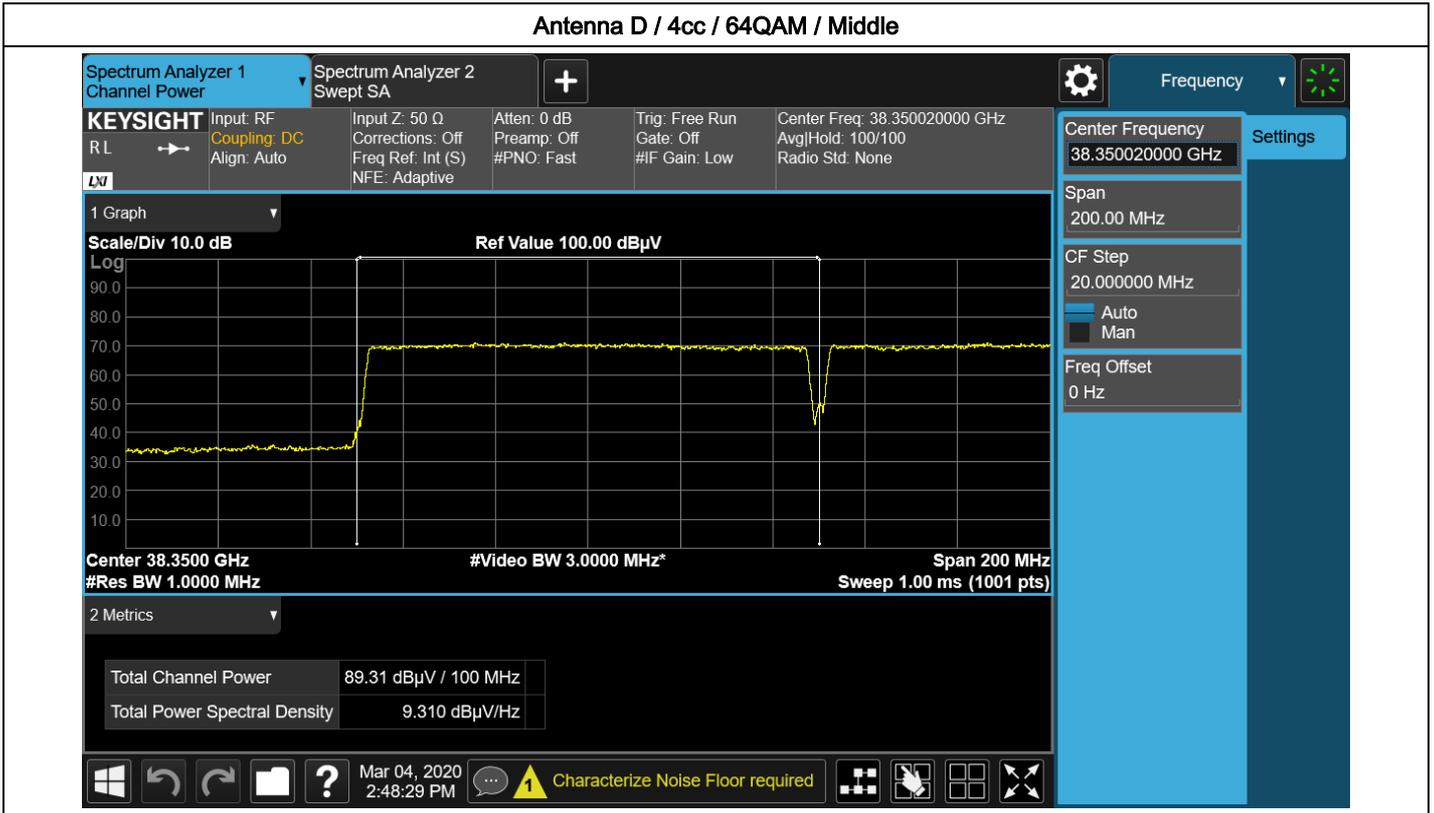
## Antenna D / 1cc / 64QAM / High



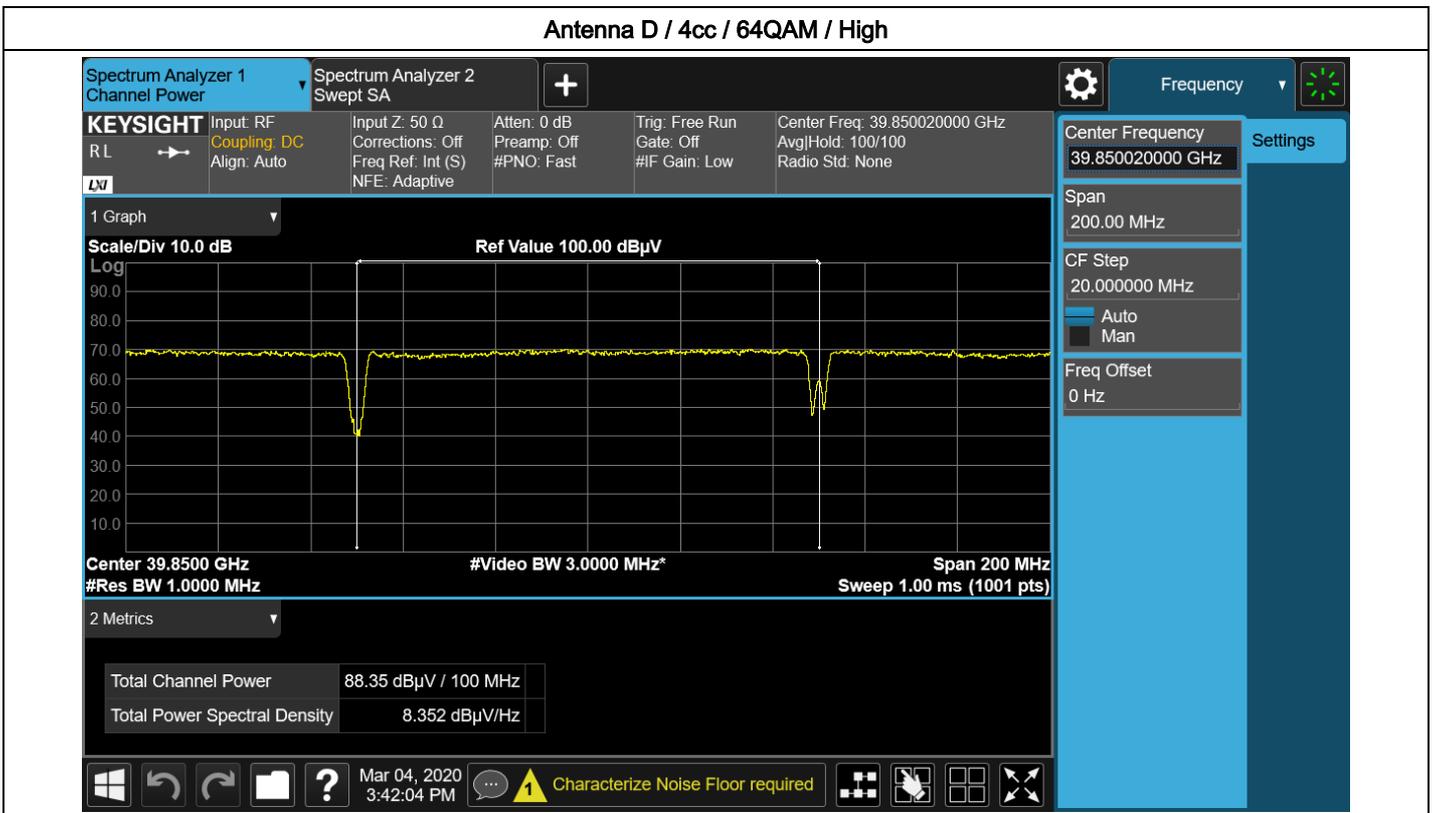
## Antenna D / 4cc / 64QAM / Low



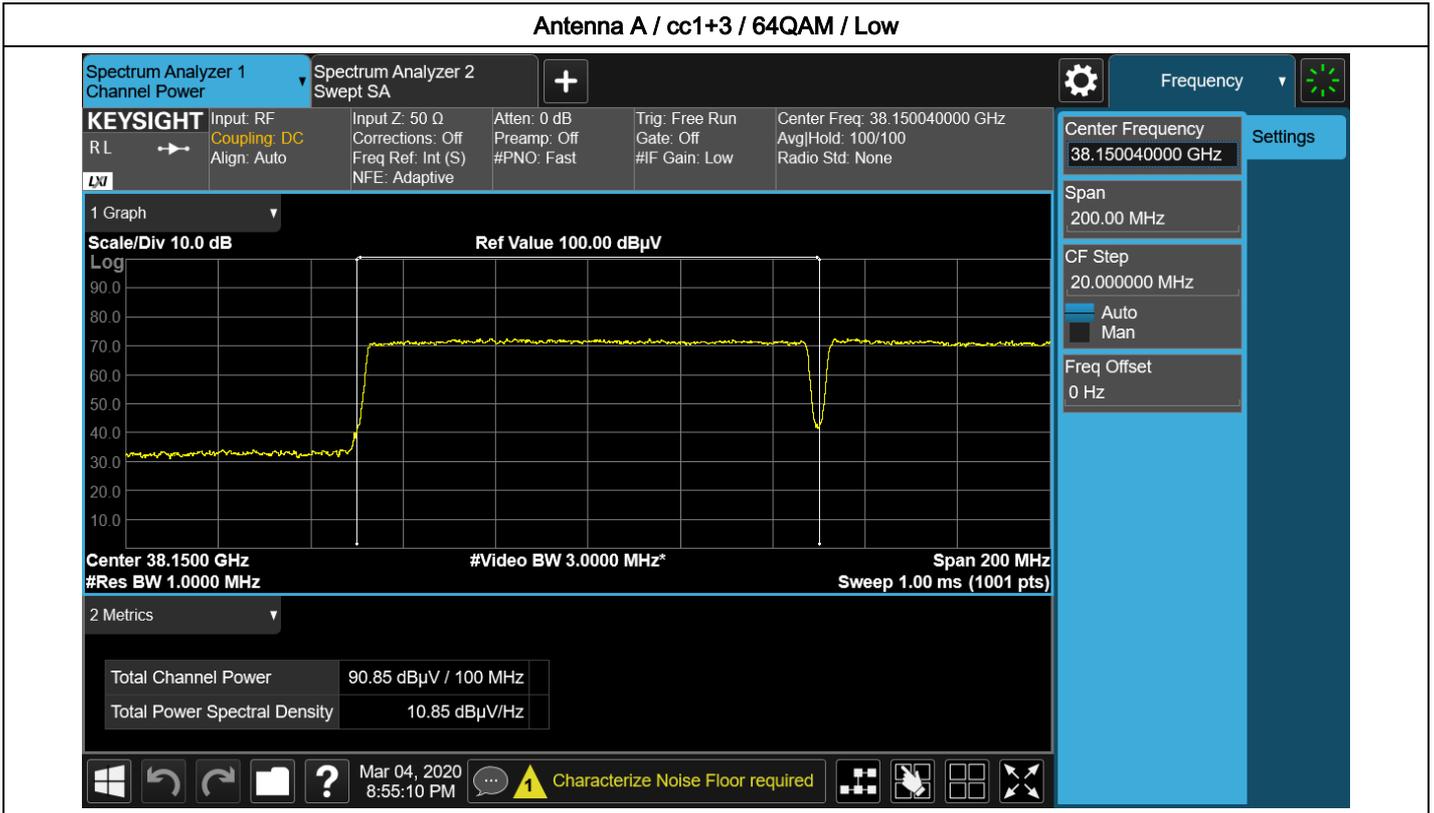
## Antenna D / 4cc / 64QAM / Middle



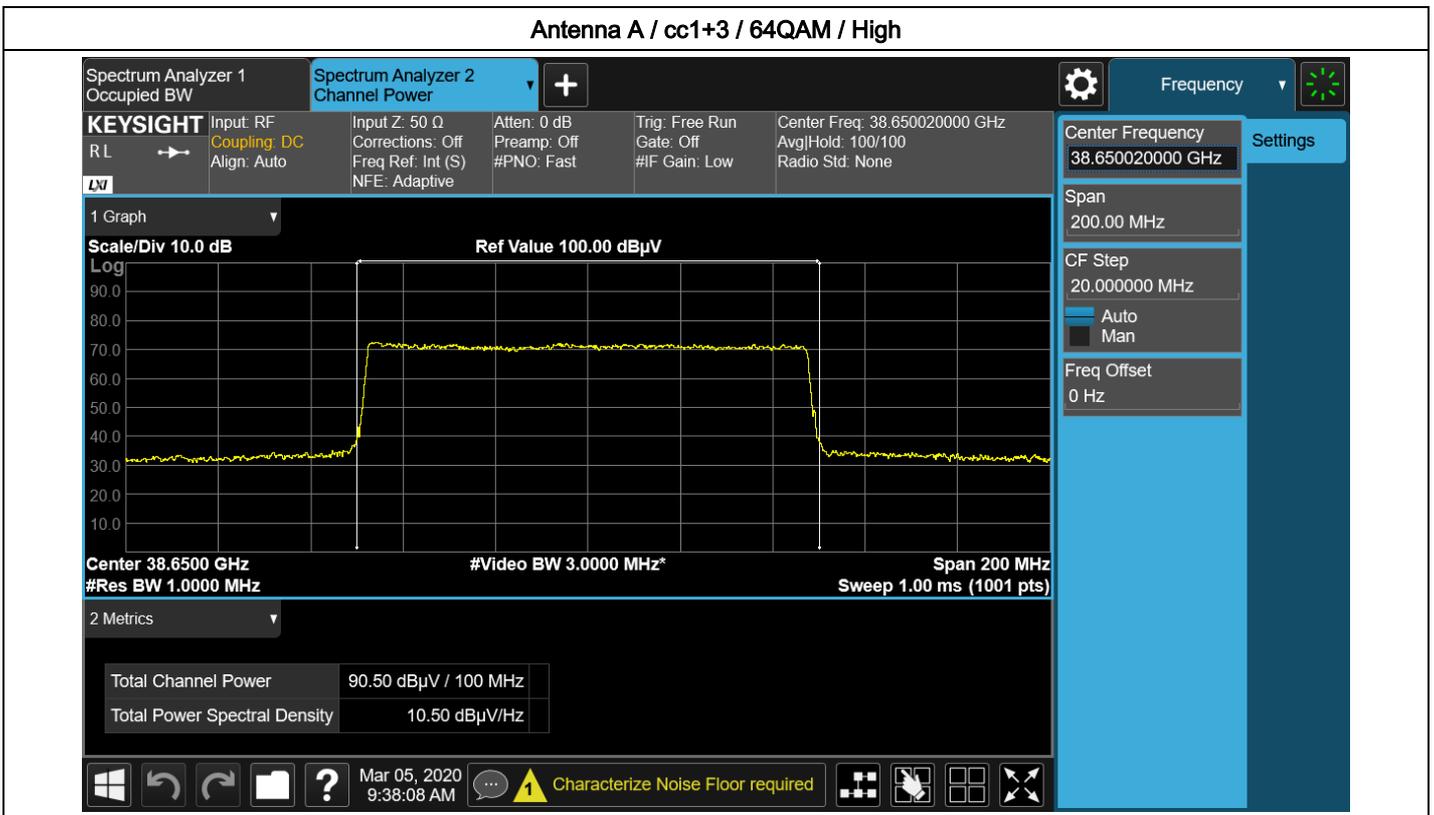
## Antenna D / 4cc / 64QAM / High



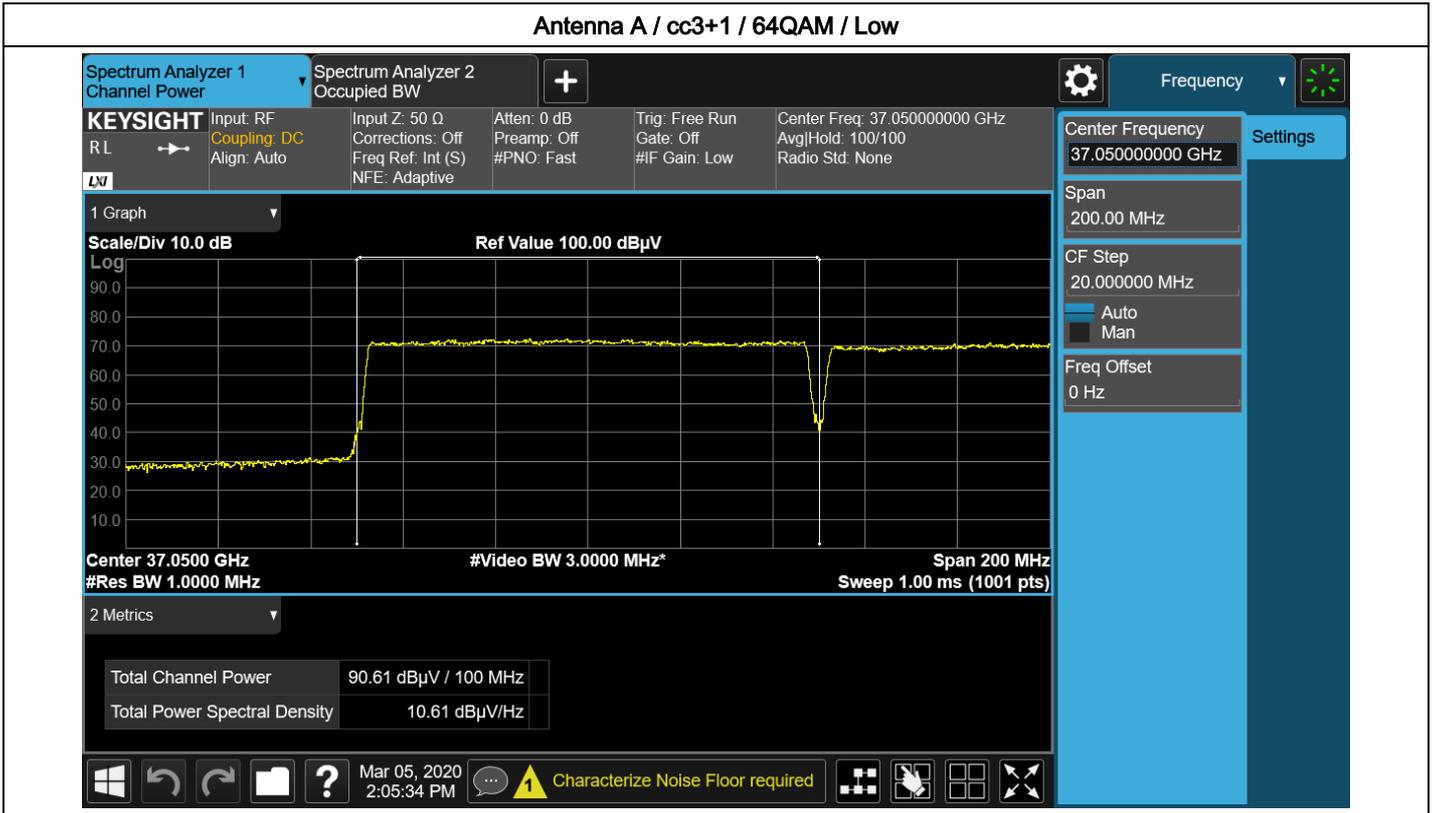
## Antenna A / cc1+3 / 64QAM / Low



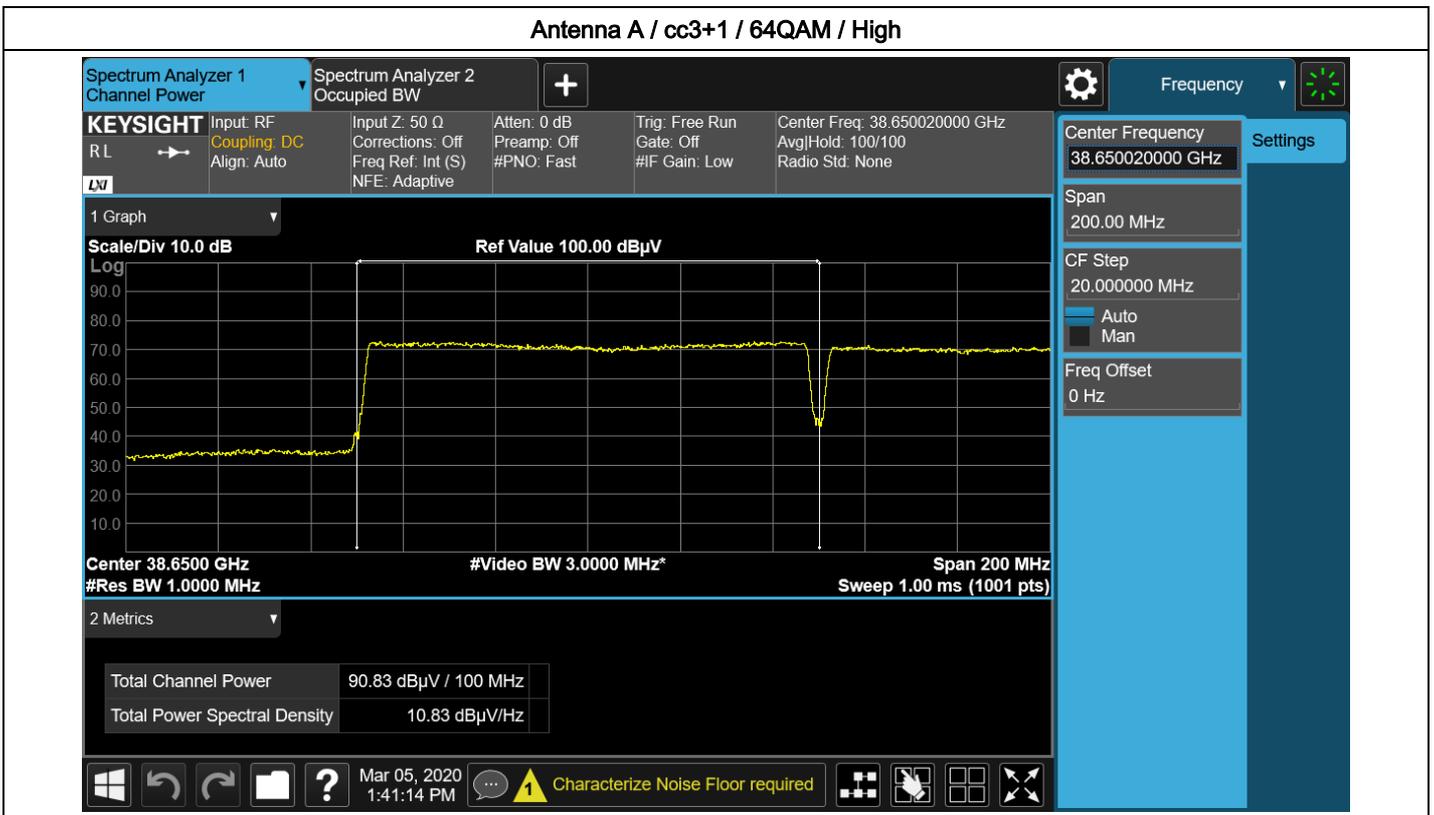
## Antenna A / cc1+3 / 64QAM / High



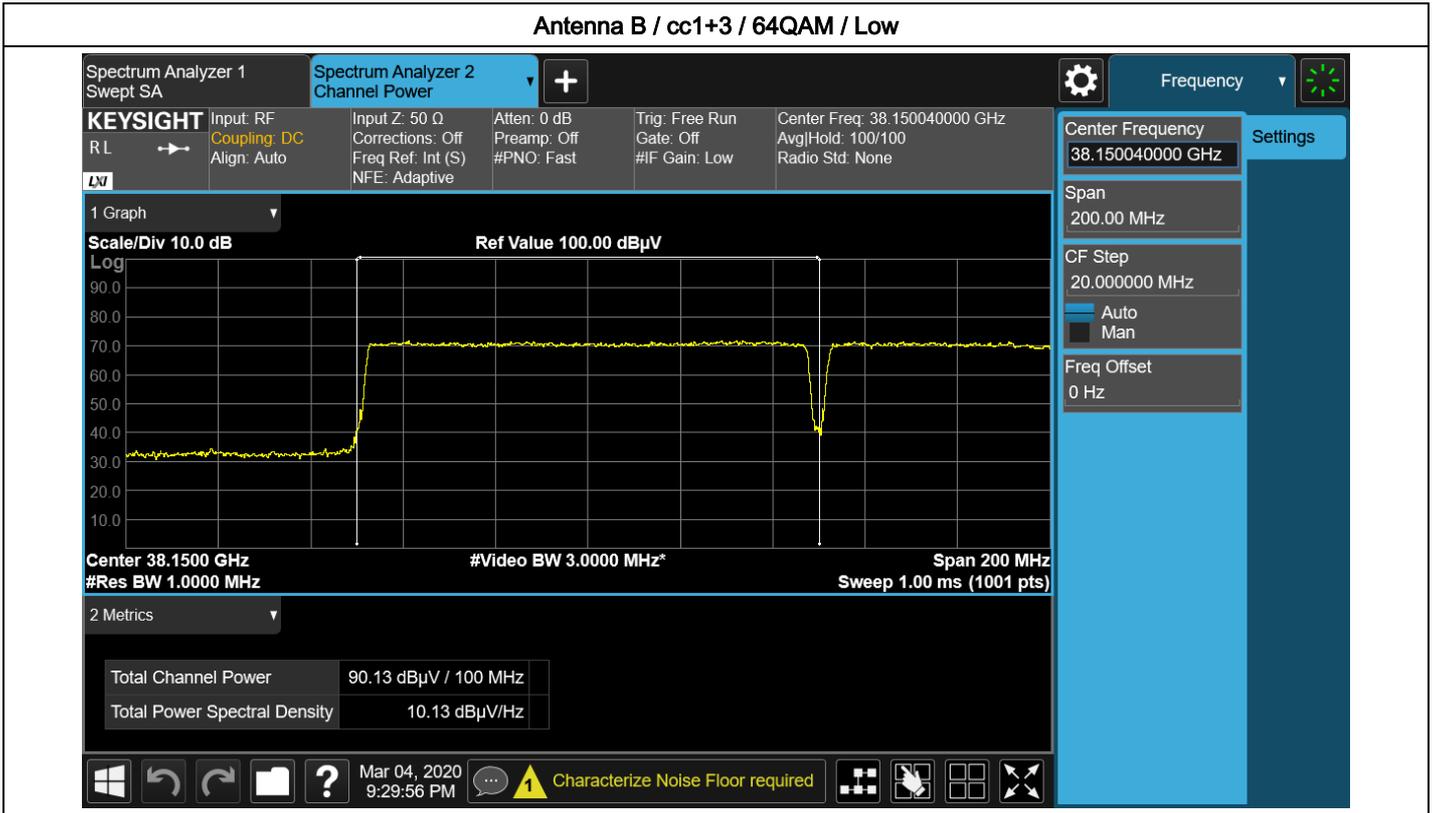
## Antenna A / cc3+1 / 64QAM / Low



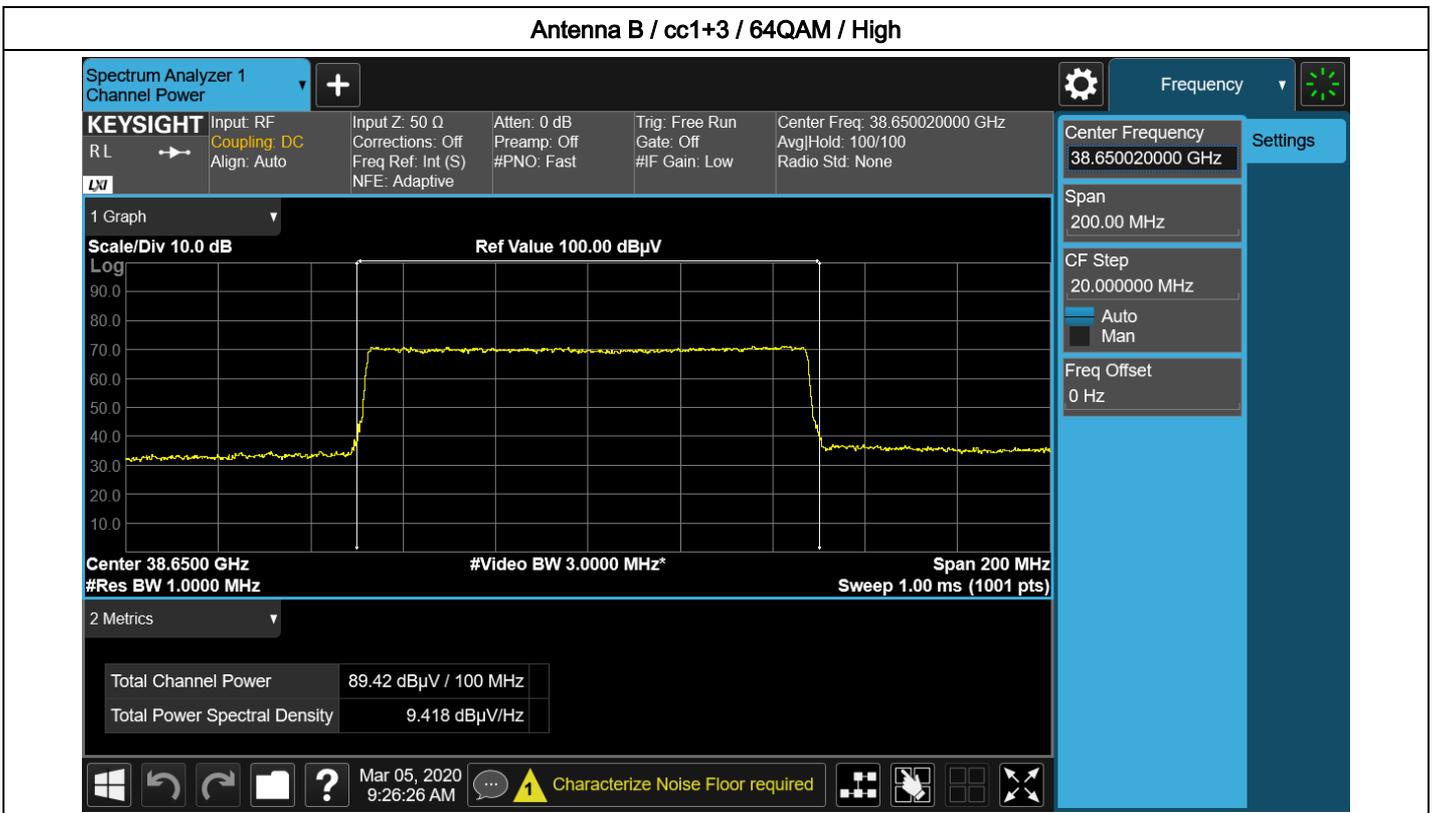
## Antenna A / cc3+1 / 64QAM / High



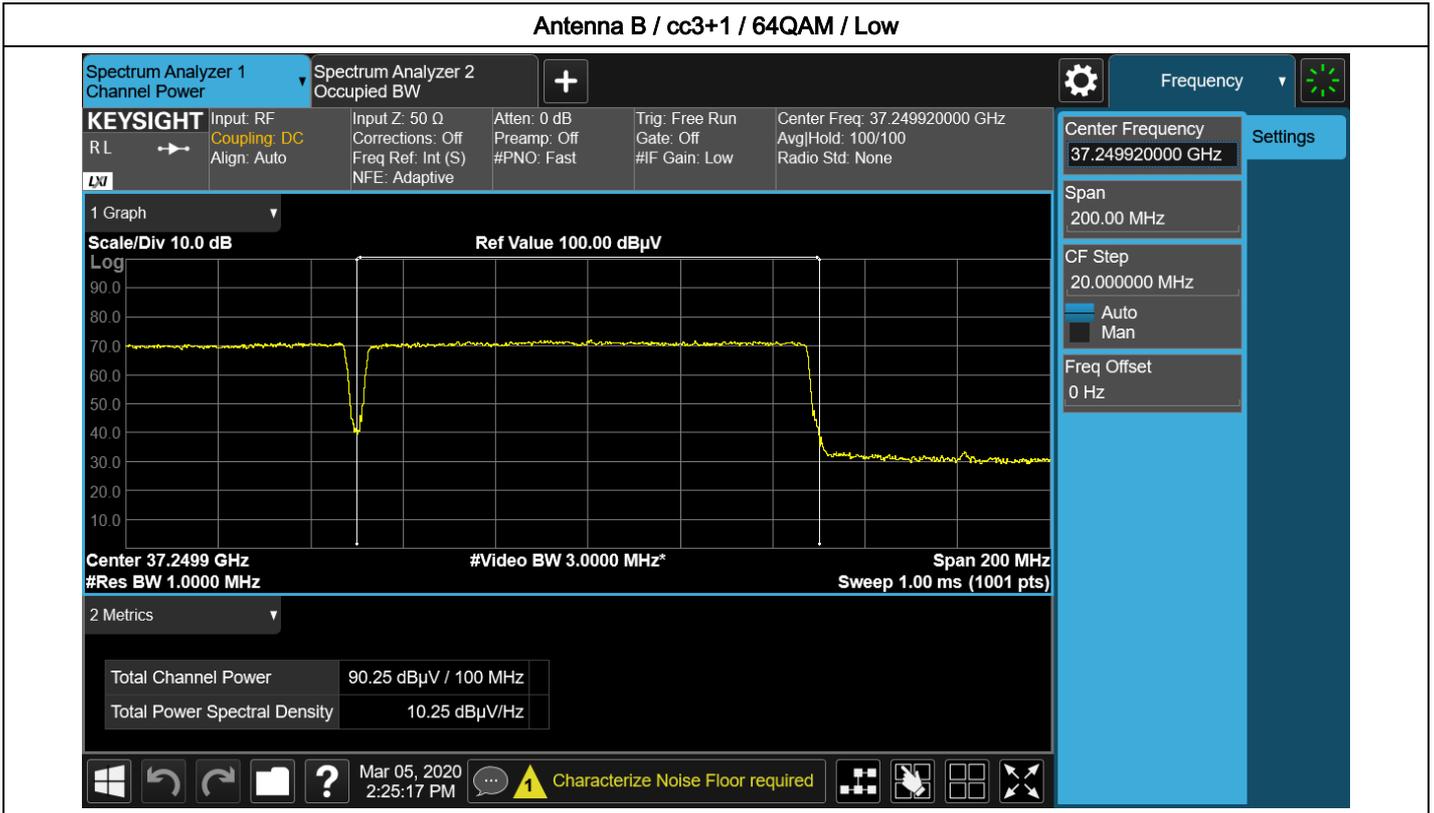
## Antenna B / cc1+3 / 64QAM / Low



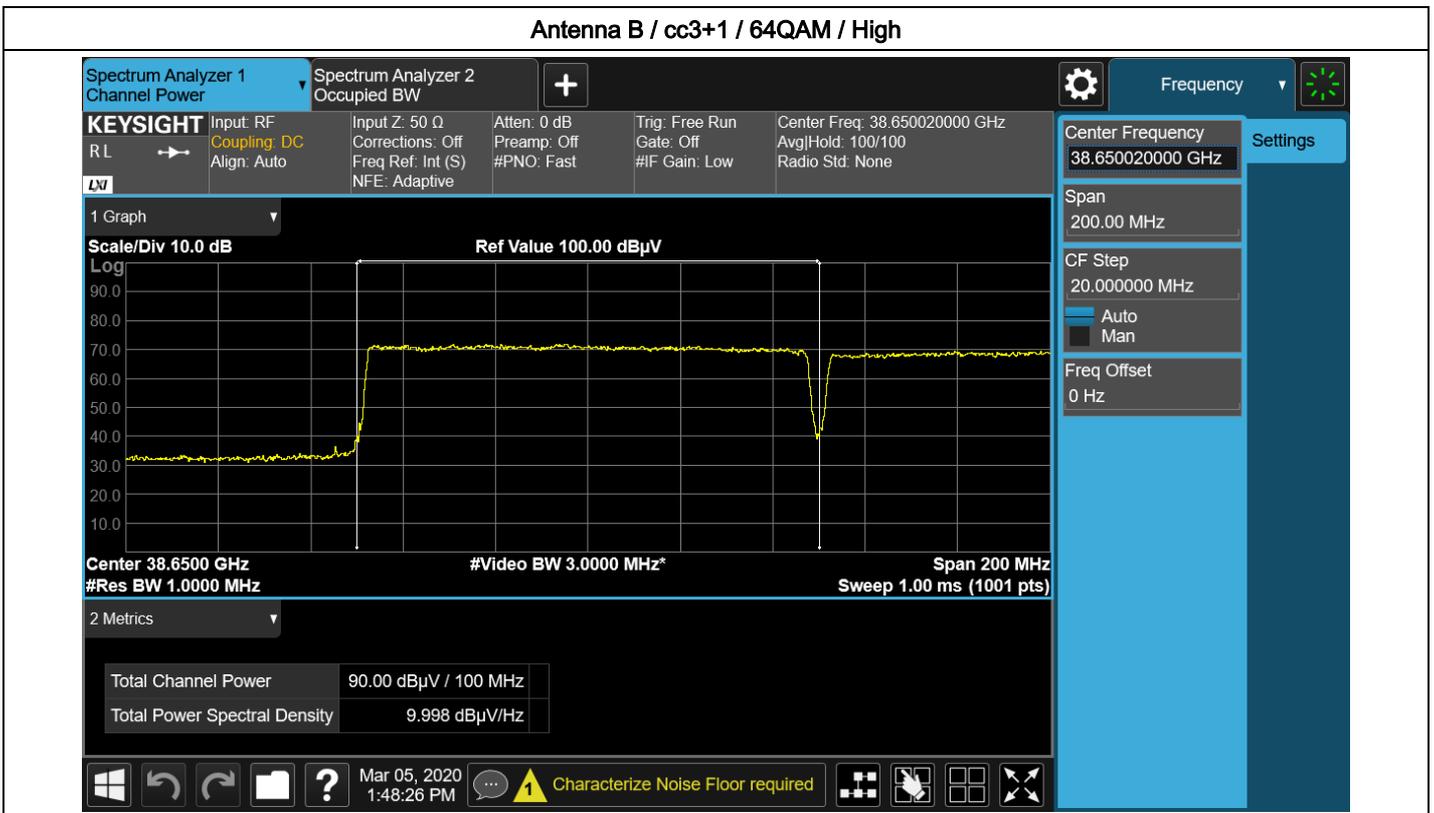
## Antenna B / cc1+3 / 64QAM / High



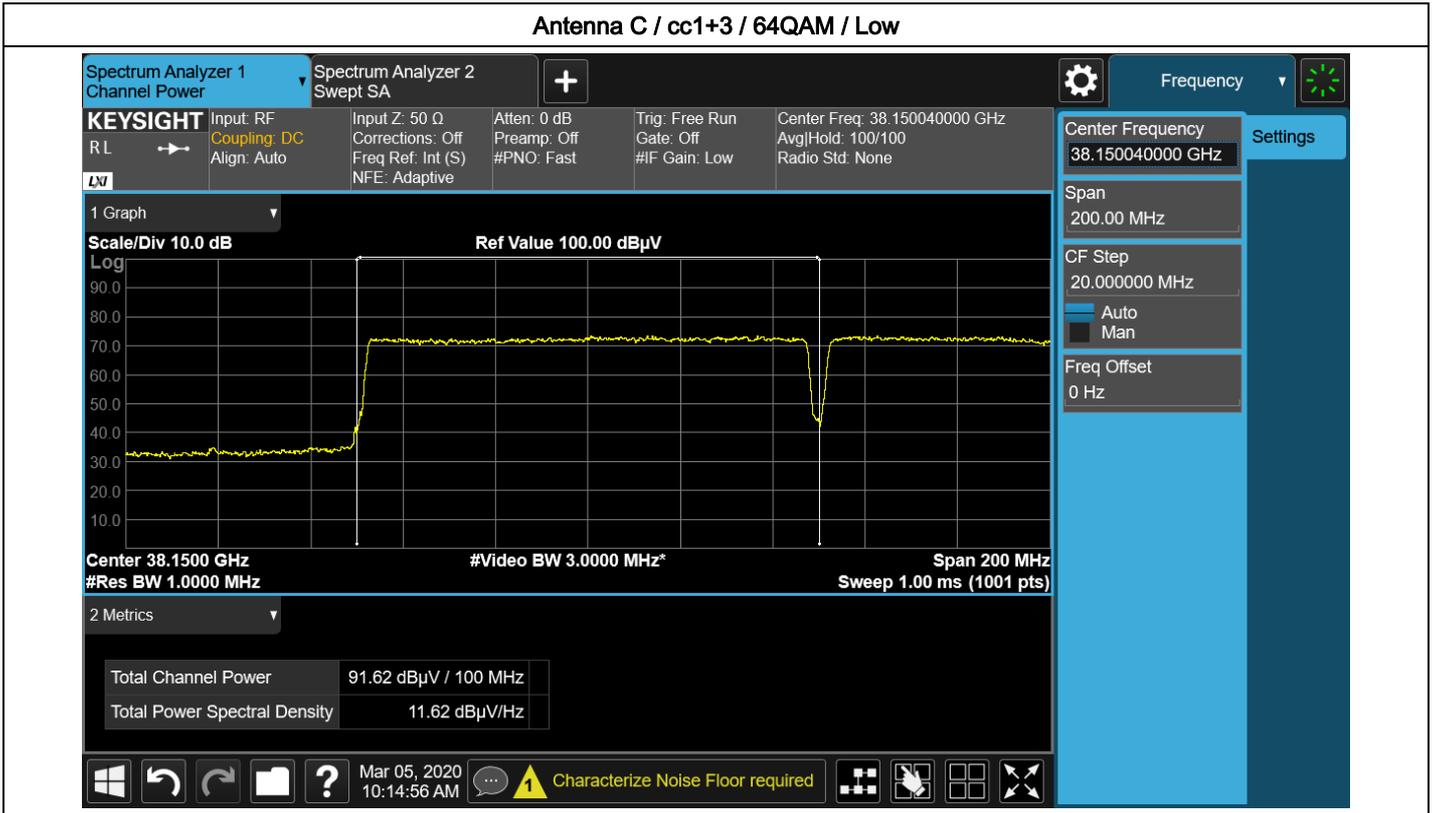
## Antenna B / cc3+1 / 64QAM / Low



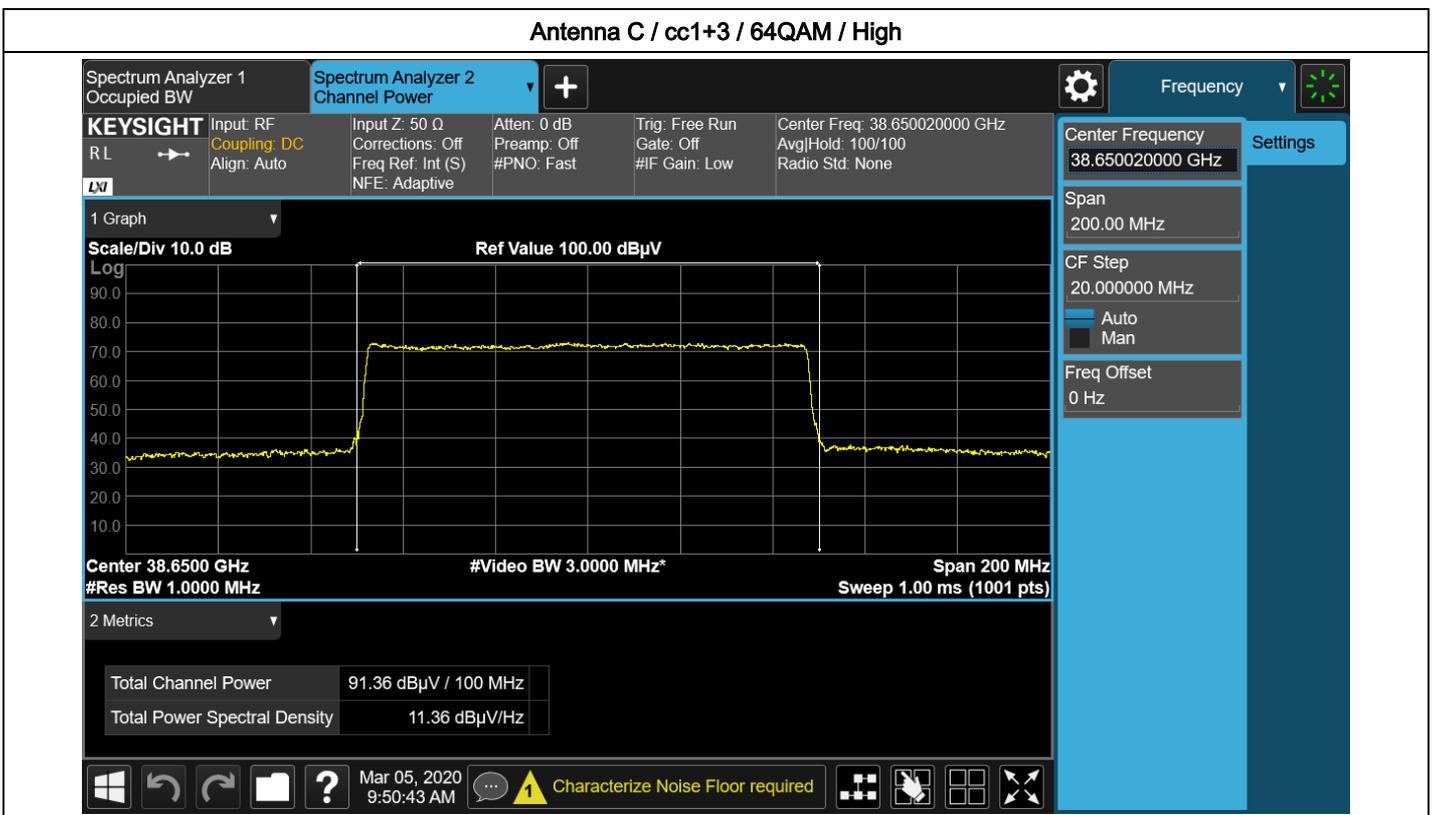
## Antenna B / cc3+1 / 64QAM / High



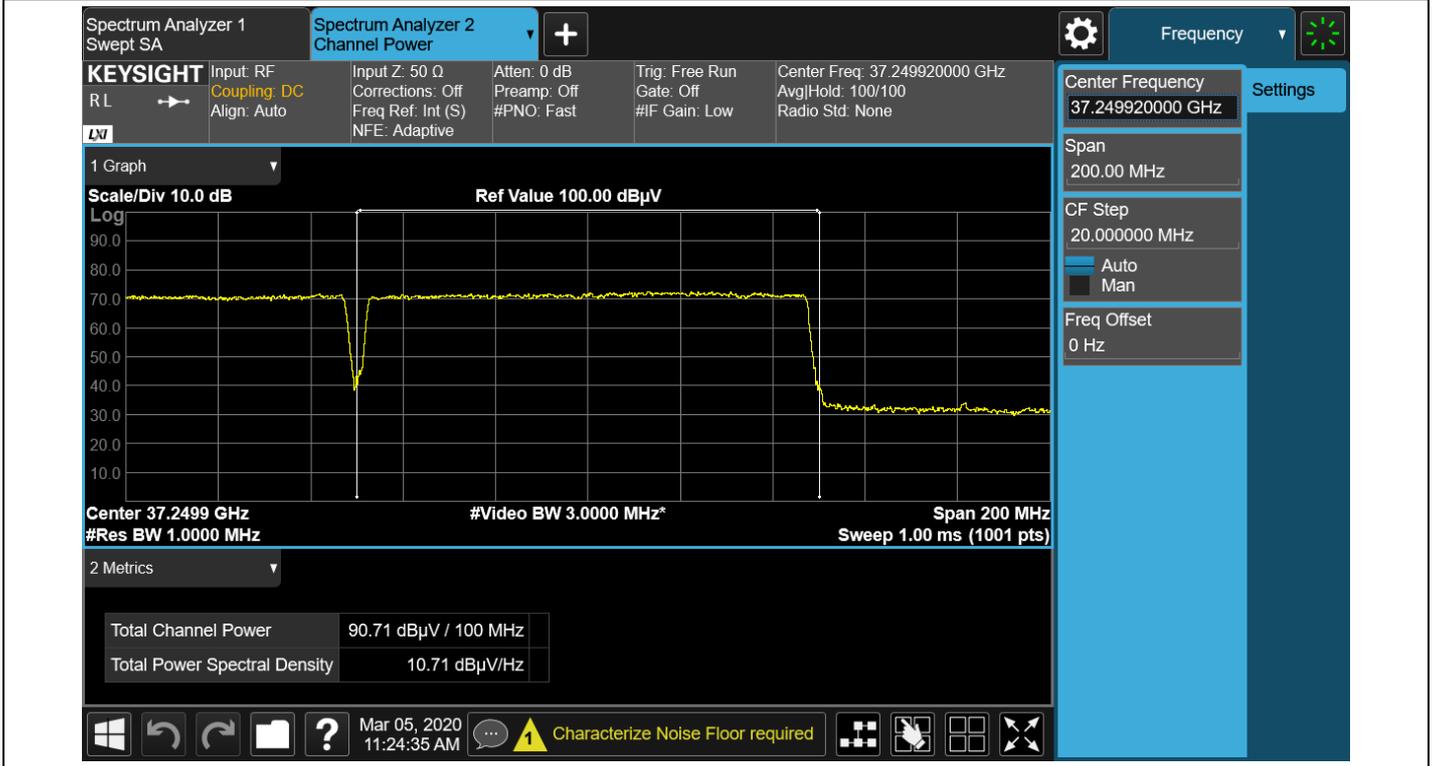
## Antenna C / cc1+3 / 64QAM / Low



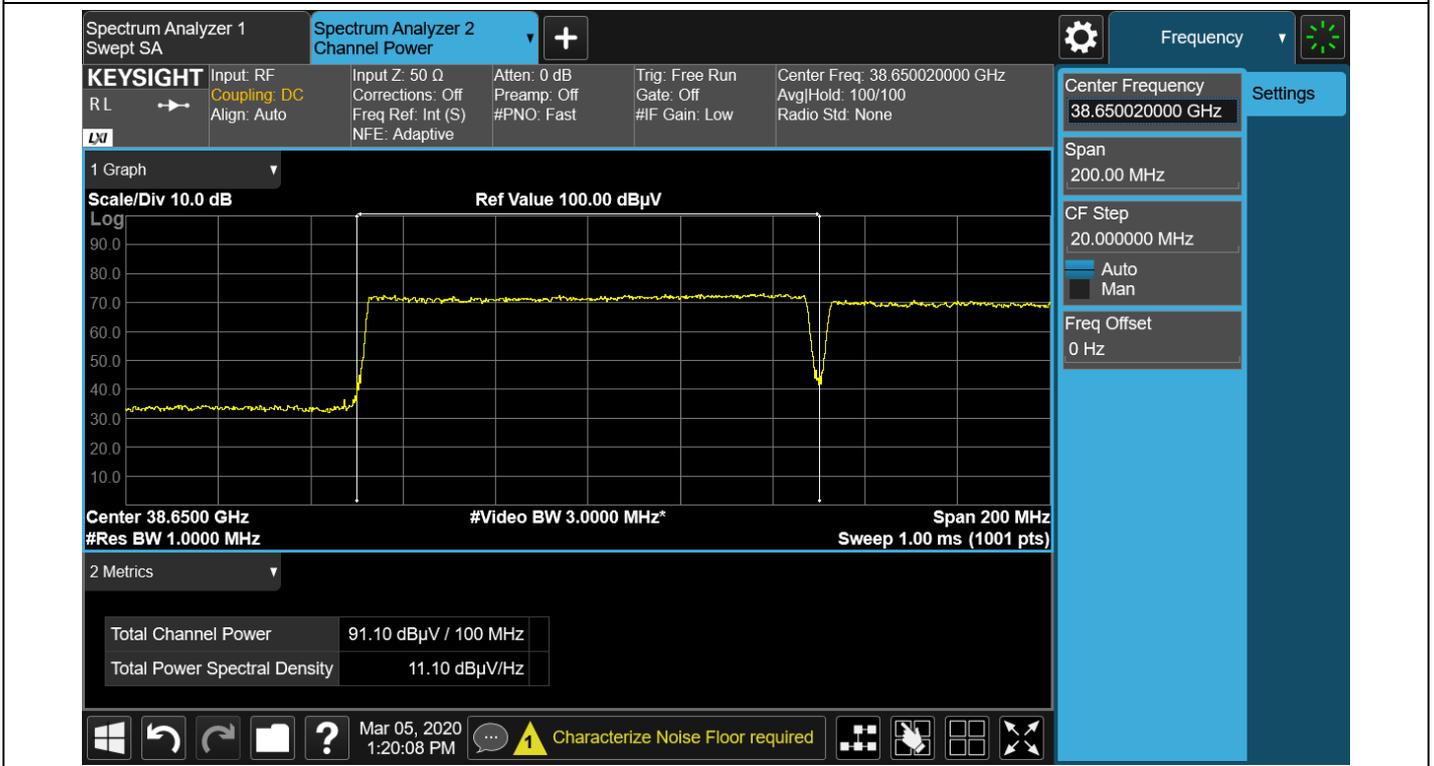
## Antenna C / cc1+3 / 64QAM / High



## Antenna C / cc3+1 / 64QAM / Low



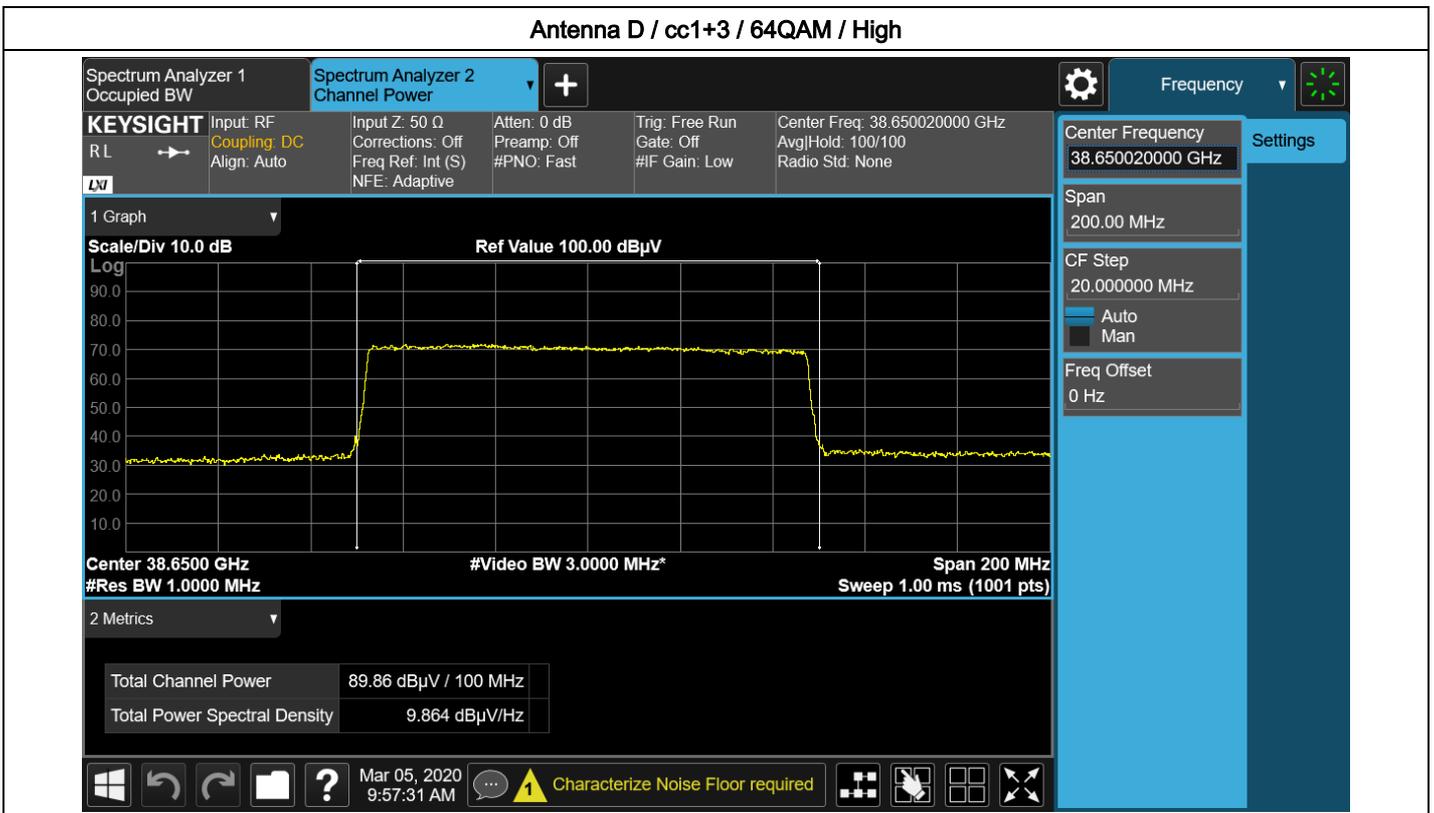
## Antenna C / cc3+1 / 64QAM / High



## Antenna D / cc1+3 / 64QAM / Low



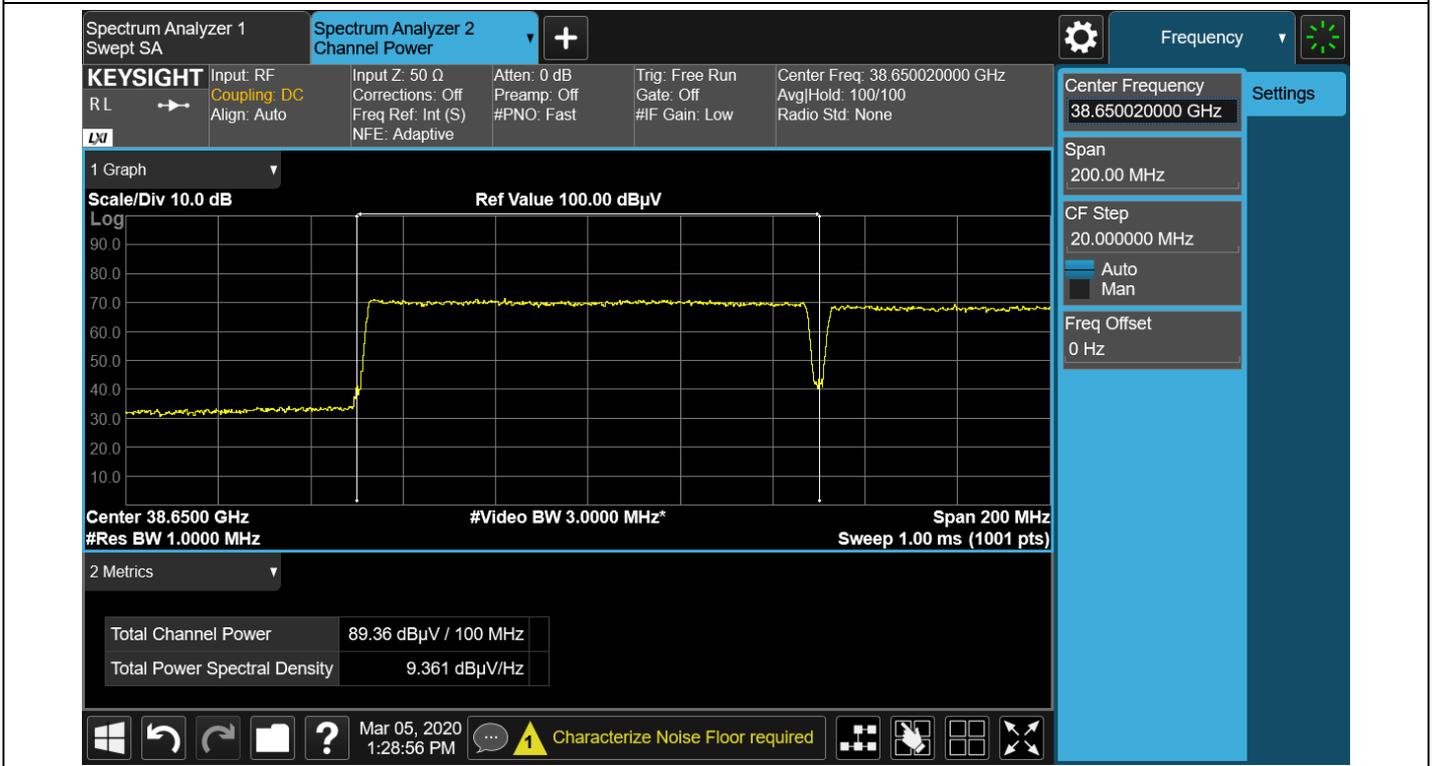
## Antenna D / cc1+3 / 64QAM / High



## Antenna D / cc3+1 / 64QAM / Low



## Antenna D / cc3+1 / 64QAM / High



### 5.3. CONDUCTED OUTPUT 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  $2 \times$  to  $3 \times$  the OBW.
- b) Set RBW = 1% to 5% of the OBW.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Set number of measurement points in sweep  $\geq 2 \times$  span / RBW.
- e) Sweep time:
  - 1) Set = auto-couple, or
  - 2) Set  $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$  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  $10 \log(1/\text{duty cycle})$  to the measured power level to compute the average power during continuous transmission.

##### Note:

- 1) Basic test conditions are same as EIRP test on page 24.

- 2) Same 400 MHz bandwidth applies for 1cc and 4 cc.
- 3) Final conducted power is calculated as follows

$$\text{Conducted Power (dBm)} = \text{EIRP (dBm)} - \text{Antenna Gain (dBi)}$$

- 4) Antenna Gain of the above formula was applied from actual measurement data of the radiation pattern document.
- 5) Sample calculation

Antenna A, 1cc, Low, 64QAM:

$$\begin{aligned} 90.67 \text{ dB}\mu\text{V (measured)} + 9.54 \text{ (distance)} - 104.77 + 48.333 \text{ (AFCL)} + 1.305 \text{ (Duty)} - 26.6872 \text{ (Ant.gain)} \\ = 18.42 \text{ dBm (Final conducted output power)} \end{aligned}$$

Total Output Power (1cc, Low, 64QAM):

Conversion dBm to mW (Antenna A, B, C, D)

$$\text{Ant A: } 10^{(18.42 \text{ dBm} / 10)} = 69.50 \text{ mW}$$

$$\text{Ant B: } 10^{(18.39 \text{ dBm} / 10)} = 69.02 \text{ mW}$$

$$\text{Ant C: } 10^{(18.61 \text{ dBm} / 10)} = 72.61 \text{ mW}$$

$$\text{Ant D: } 10^{(18.53 \text{ dBm} / 10)} = 71.29 \text{ mW}$$

Sum each antenna power

$$69.50 \text{ mW (Ant.A)} + 69.02 \text{ mW (Ant.B)} + 72.61 \text{ mW (Ant.C)} + 71.29 \text{ mW (Ant.D)} = 282.48 \text{ mW}$$

Conversion mW to dBm

$$10\text{LOG}(282.48 \text{ mW}) = 24.51 \text{ dBm}$$

**Test Results:**
**Tabular Data of Conducted Output Power**
**Contiguous**

Ant.	Ant.	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant. Gain (dBi)	Result (dBm)
	Angle								
A	135°	1	Low	37.19994	64QAM	90.67	45.11	26.6872	18.42
			Middle	38.49996	64QAM	88.97	44.68	26.9095	17.77
			High	39.80004	64QAM	89.03	46.61	27.0304	19.58
		4	Low	37.19994	64QAM	96.01	50.45	26.6872	23.76
			Middle	38.49996	64QAM	95.65	51.36	26.9095	24.45
			High	39.80004	64QAM	95.66	53.24	27.0304	26.21
B	45°	1	Low	37.19994	64QAM	90.64	45.07	26.6872	18.39
			Middle	38.49996	64QAM	88.36	44.07	26.9095	17.16
			High	39.80004	64QAM	86.75	44.34	27.0304	17.31
		4	Low	37.19994	64QAM	96.49	50.92	26.6872	24.24
			Middle	38.49996	64QAM	94.59	50.30	26.9095	23.39
			High	39.80004	64QAM	93.77	51.36	27.0304	24.33
C	135°	1	Low	37.19994	64QAM	90.86	45.30	26.6872	18.61
			Middle	38.49996	64QAM	89.41	45.11	26.9095	18.20
			High	39.80004	64QAM	89.58	47.17	27.0304	20.14
		4	Low	37.19994	64QAM	97.00	51.44	26.6872	24.75
			Middle	38.49996	64QAM	96.41	52.12	26.9095	25.21
			High	39.80004	64QAM	96.77	54.35	27.0304	27.32
D	45°	1	Low	37.19994	64QAM	90.78	45.22	26.6872	18.53
			Middle	38.49996	64QAM	88.50	44.21	26.9095	17.30
			High	39.80004	64QAM	87.31	44.90	27.0304	17.87
		4	Low	37.19994	64QAM	96.77	51.21	26.6872	24.52
			Middle	38.49996	64QAM	94.84	50.55	26.9095	23.64
			High	39.80004	64QAM	94.04	51.63	27.0304	24.60

**Tabular Data of Conducted Output Power for MIMO**

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Ant. C (dBm)	Ant. D (dBm)	Result (dBm)
A+B+C+D	1	Low	64QAM	18.42	18.39	18.61	18.53	24.51
		Middle	64QAM	17.77	17.16	18.20	17.30	23.65
		High	64QAM	19.58	17.31	20.14	17.87	24.90
	4	Low	64QAM	23.76	24.24	24.75	24.52	30.35
		Middle	64QAM	24.45	23.39	25.21	23.64	30.25
		High	64QAM	26.21	24.33	27.32	24.60	31.81

## Non-Contiguous

## 1+3

Ant.	Ant.	CC	Channel	Center Frequency (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant. Gain (dBi)	Result (dBm)
	Angle								
A	135°	1+3	Low	37.7	64QAM	96.17	52.64	26.8819	25.75
			High	39.3	64QAM	95.83	53.57	26.9575	26.61
B	45°	1+3	Low	37.7	64QAM	95.67	52.14	26.8819	25.25
			High	39.3	64QAM	94.04	51.78	26.9575	24.82
C	135°	1+3	Low	37.7	64QAM	97.24	53.71	26.8819	26.82
			High	39.3	64QAM	96.77	54.51	26.9575	27.55
D	45°	1+3	Low	37.7	64QAM	95.5	51.97	26.8819	25.08
			High	39.3	64QAM	94.11	51.85	26.9575	24.89

## 3+1

Ant.	Ant.	CC	Channel	Frequency (GHz)	Mod.	Measured Level (dBuV)	EIRP (dBm)	Ant. Gain (dBi)	Result (dBm)
	Angle								
A	135°	3+1	Low	37.7	64QAM	96.40	52.00	26.6872	25.32
			High	39.3	64QAM	96.08	54.11	26.9464	27.16
B	45°	3+1	Low	37.7	64QAM	95.65	51.25	26.6872	24.57
			High	39.3	64QAM	94.53	52.56	26.9464	25.61
C	135°	3+1	Low	37.7	64QAM	96.51	52.11	26.6872	25.43
			High	39.3	64QAM	96.08	54.11	26.9464	27.16
D	45°	3+1	Low	37.7	64QAM	95.75	51.35	26.6872	24.67
			High	39.3	64QAM	93.98	52.01	26.9464	25.06

## Tabular Data of Conducted Output Power for MIMO

Antenna	CC	Channel	Mod.	Ant. A (dBm)	Ant. B (dBm)	Ant. C (dBm)	Ant. D (dBm)	Result (dBm)
A+B+C+D	1+3	Low	64QAM	25.75	25.25	26.82	25.08	31.81
		High	64QAM	26.61	24.82	27.55	24.89	32.15
	3+1	Low	64QAM	25.32	24.57	25.43	24.67	31.03
		High	64QAM	27.16	25.61	27.16	25.06	32.37

## Plot Data of Conducted Output Power

