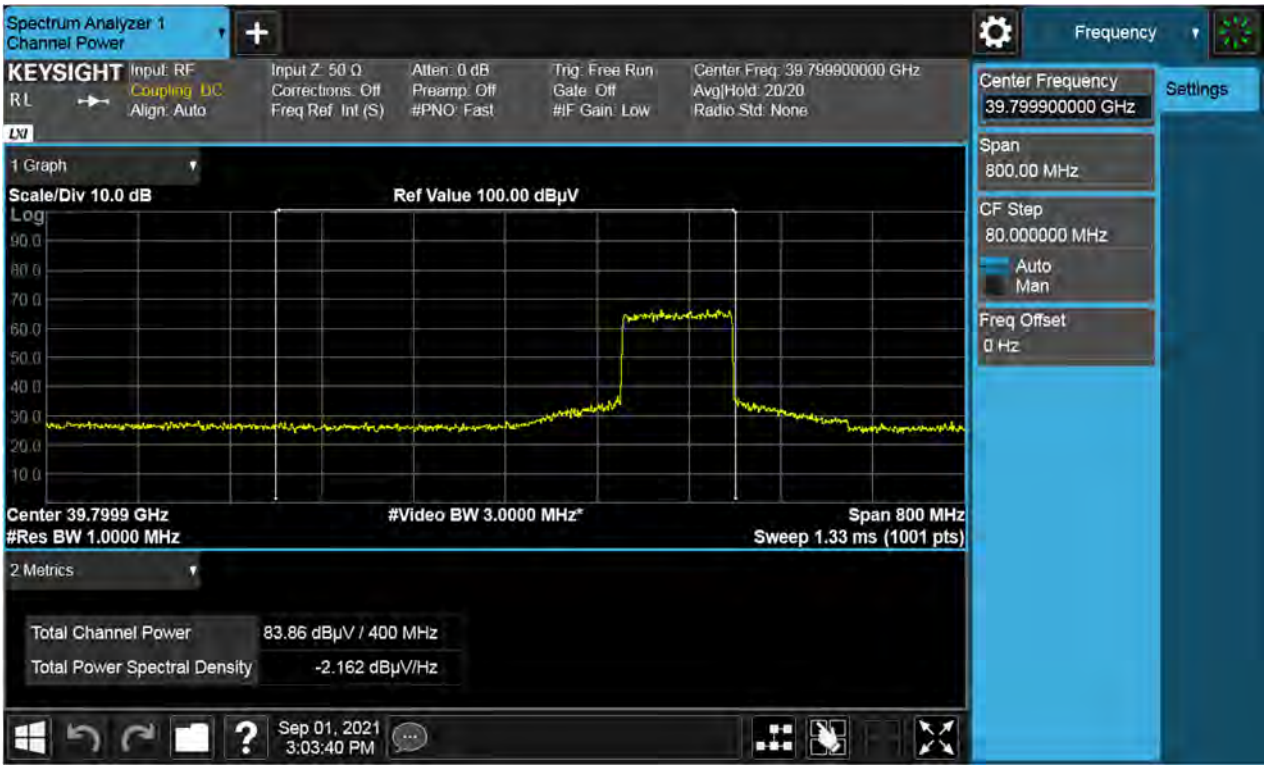
Antenna A / 1cc / 64QAM / High



Antenna A / 4cc / QPSK / Low

Antenna A / 4cc / 16QAM / Low

Antenna A / 4cc / 64QAM / Low

Antenna A / 4cc / QPSK / Middle

Antenna A / 4cc / 16QAM / Middle

Antenna A / 4cc / 64QAM / Middle

Antenna A / 4cc / QPSK / High

Antenna A / 4cc / 16QAM / High

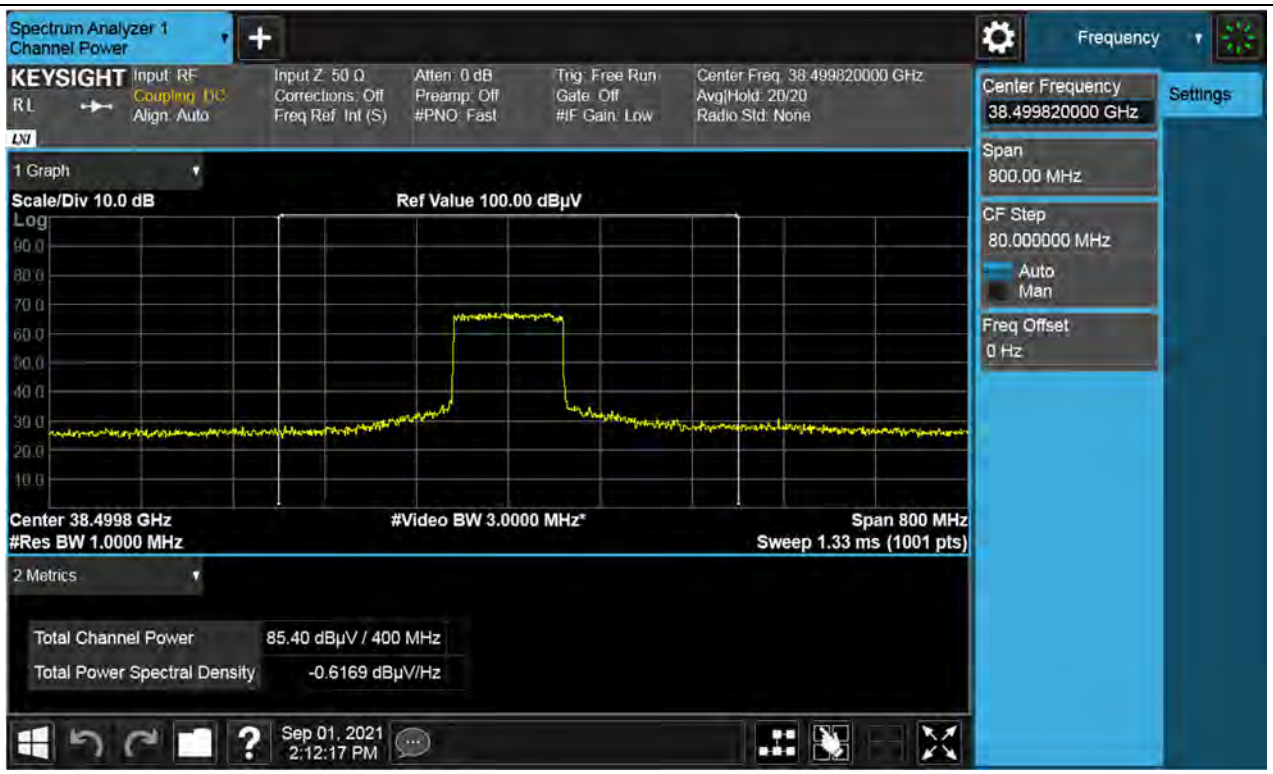
Antenna A / 4cc / 64QAM / High

Antenna B / 1cc / QPSK / Low

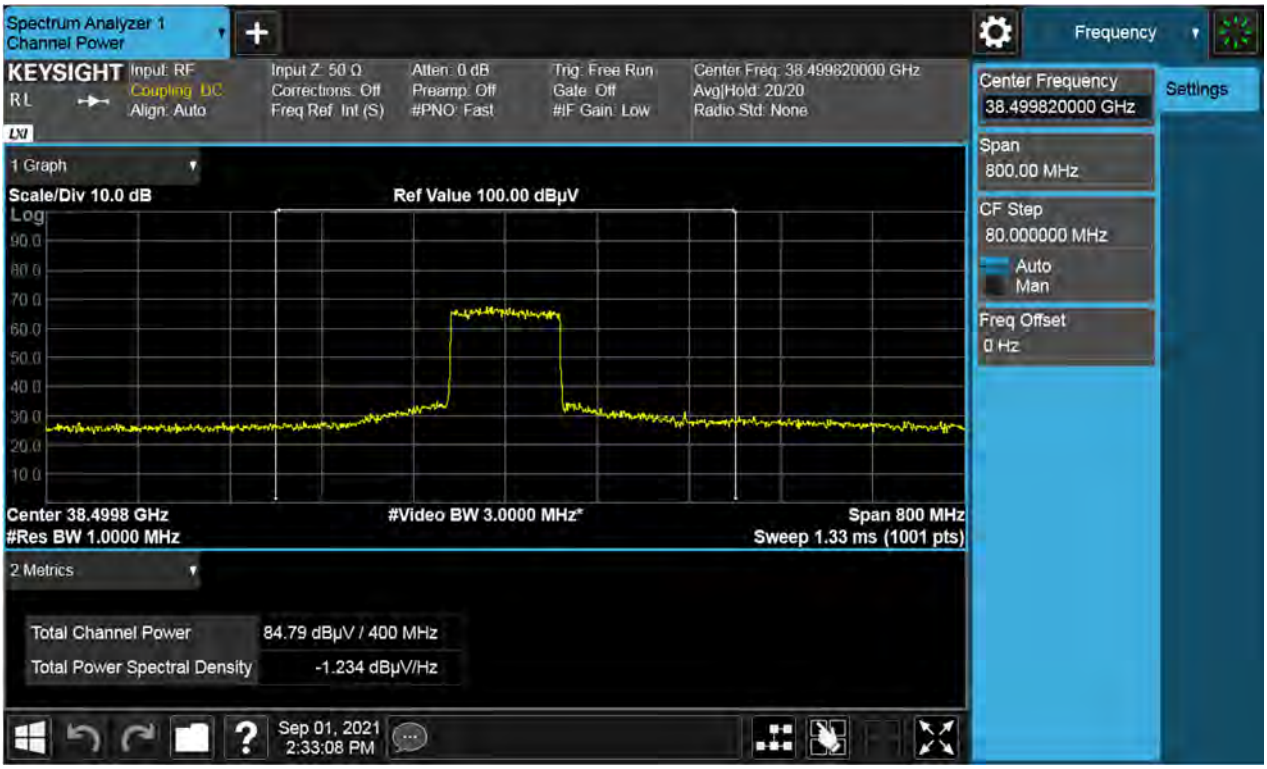
Antenna B / 1cc / 16QAM / Low

Antenna B / 1cc / 64QAM / Low

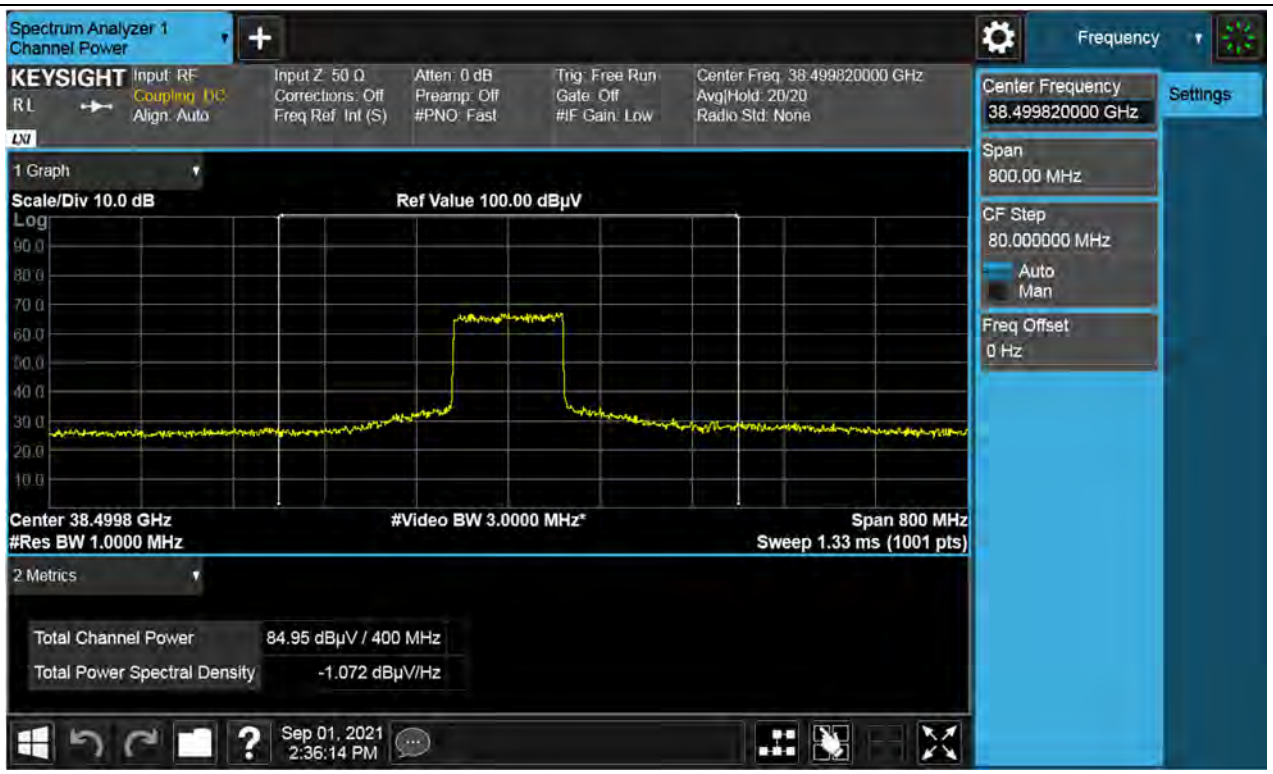
Antenna B / 1cc / QPSK / Middle



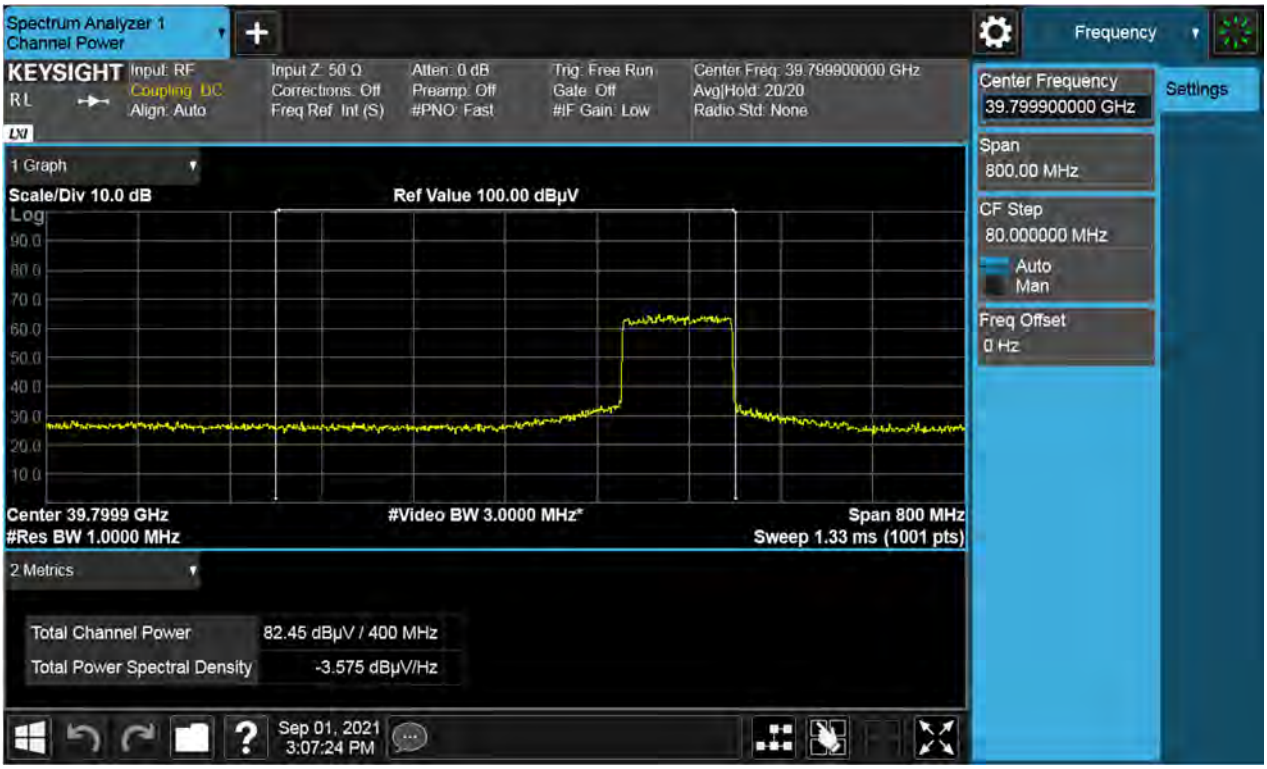
Antenna B / 1cc / 16QAM / Middle



Antenna B / 1cc / 64QAM / Middle

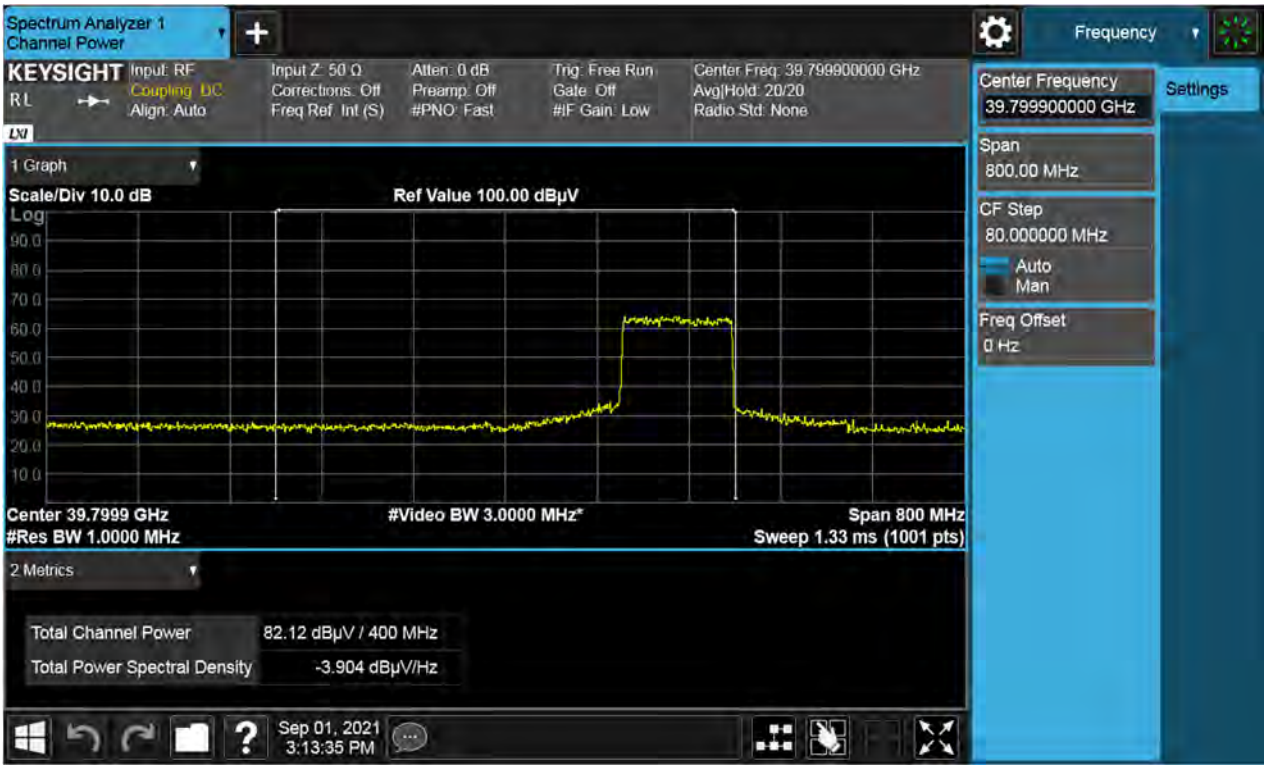


Antenna B / 1cc / QPSK / High



Antenna B / 1cc / 16QAM / High

Antenna B / 1cc / 64QAM / High



Antenna B / 4cc / QPSK / Low

Antenna B / 4cc / 16QAM / Low

Antenna B / 4cc / 64QAM / Low

Antenna B / 4cc / QPSK / Middle

Antenna B / 4cc / 16QAM / Middle

Antenna B / 4cc / 64QAM / Middle

Antenna B / 4cc / QPSK / High

Antenna B / 4cc / 16QAM / High

Antenna B / 4cc / 64QAM / High

Antenna A / 1+3 cc / QPSK / Low

Antenna A / 1+3 cc / 16QAM / Low

Antenna A / 1+3 cc / 64QAM / Low

Antenna A / 1+3 cc / QPSK / High

Antenna A / 1+3 cc / 16QAM / High

Antenna A / 1+3 cc / 64QAM / High

Antenna B / 1+3 cc / QPSK / Low

Antenna B / 1+3 cc / 16QAM / Low

Antenna B / 1+3 cc / 64QAM / Low

Antenna B / 1+3 cc / QPSK / High

Antenna B / 1+3 cc / 16QAM / High

Antenna B / 1+3 cc / 64QAM / High

Antenna A / 3+1 cc / QPSK / Low

Antenna A / 3+1 cc / 16QAM / Low

Antenna A / 3+1 cc / 64QAM / Low

Antenna A / 3+1 cc / QPSK / High

Antenna A / 3+1 cc / 16QAM / High

Antenna A / 3+1 cc / 64QAM / High

Antenna B / 3+1 cc / QPSK / Low

Antenna B / 3+1 cc / 16QAM / Low

Antenna B / 3+1 cc / 64QAM / Low

Antenna B / 3+1 cc / QPSK / High

Antenna B / 3+1 cc / 16QAM / High

Antenna B / 3+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 page 24.
2) 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 / -16.01 dBm (-13 dBm – 10*log (2))*
   *- OBW 10% from the edge: 2Tx MIMO correction: 10 log(N_{ANT}) = 10 log(2) = 3.01 dB / -8.01 dBm (-8 dBm – 10*log (2))*
3) In the band edge test of antenna A, path A, B are individually operated and measured at the maximum emission position of antenna A, and the respective measurement results are summed.
4) For measurement of antenna B repeat 2) at the maximum emission position of antenna B.
5) Band edge value is calculated as follows.

Low Band Edge = Measured Value + 20log(D) – 104.77 + AFCL + Duty
High Band Edge = Measured Value (EIRP (dBm) + 107) + 20log(D) – 104.77 + AFCL + Duty

6) Antenna Gain of the above formula was applied from actual measurement data of the radiation pattern document.
7) Sample calculation
   Maximum Antenna A, 1cc, Low, 16QAM:
   Contiguous
   Antenna A

38.932 dBμV (measured) – 6.021 (distance) – 95.2 + 50.312(AFCL) + 1.29 (Duty)
= -10.846 dBm (Antenna A Edge)

Total edge result

Conversion dBm to mW (Antenna A)

10^(-10.846 dBm /10) = 0.082300 mW

Conversion dBm to mW (Antenna B)

10^(-18.295 dBm /10) = 0.014808 mW

Conversion and sum

0.082300 mW (Ant.A) + 0.014266 mW (Ant.B) = 0.097108 mW

Conversion mW to dBm

10LOG (0.0.097108mW) = -9.989 dBm

Test Results:

Tabular Data of Band Edge

1. Contiguous

Pos.	Ant. Angle	Distance (m)	cc	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Limit (dBm)	TRP (dBm)
MAX Ant. A	45°	3	1	Low	QPSK	A	39.695*	-9.921	-8	-12.296
						B	31.394	-18.222	-16	-
					16QAM	A	38.932	-10.684	-8	-
						B	36.814	-12.802	-8	-
					64QAM	A	40.312	-9.304	-8	--
						B	35.822	-13.794	-8	-
				High	QPSK	A	43.524	-9.484	-8	-
						B	40.886	-12.122	-8	-
					16QAM	A	43.804	-9.204	-8	-
						B	37.932	-15.076	-8	-
					64QAM	A	44.103*	-8.905	-8	-12.460
						B	36.397	-16.611	-8	-
			4	Low	QPSK	A	32.413	-17.203	-8	-
						B	27.584	-21.622	-16	
					16QAM	A	32.859	-16.757	-8	-
						B	27.219	-21.771	-16	-
					64QAM	A	33.197	-16.419	-8	-
						B	27.801	-21.405	-16	-
				High	QPSK	A	38.368	-14.640	-8	-
						B	28.920	-24.088	-16	
					16QAM	A	38.349	-14.659	-8	-
						B	29.174	-23.834	-8	-
					64QAM	A	39.140	-13.868	-8	-
						B	29.274	-23.734	-8	-

Pos.	Ant. Angle	Distance (m)	cc	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Limit (dBm)	TRP (dBm)
MAX Ant. B	135°	3	1	Low	QPSK	A	32.584	-17.032	-8	-
						B	38.070	-11.546	-8	-
					16QAM	A	31.321	-18.295	-8	-
						B	38.659	-10.957	-8	-
					64QAM	A	30.419	-19.197	-16	-
						B	41.922*	-7.694	-8	-17.593
				High	QPSK	A	38.548	-14.460	-8	-
						B	44.519*	-8.489	-8	-13.458
					16QAM	A	40.482	-12.526	-8	-
						B	44.990*	-8.018	-8	-13.495
					64QAM	A	37.463	-15.545	-8	-
						B	43.934	-9.074	-8	-
			4	Low	QPSK	A	28.592	-20.331	-16	-
						B	34.709*	-15.087	-16	-18.525
					16QAM	A	28.961	-19.962	-16	-
						B	34.495*	-15.112	-16	-17.531
					64QAM	A	29.032	-19.891	-16	-
						B	33.964	-15.652	-8	-
				High	QPSK	A	29.859	-23.149	-8	-
						B	35.320	-17.688	-8	-
					16QAM	A	31.097	-21.911	-8	-
						B	36.403	-16.605	-8	-
					64QAM	A	31.070	-21.938	-8	-
						B	37.915	-15.093	-8	-

2. Non-Contiguous

1+3

Pos.	Ant. Angle	Distance (m)	cc	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Limit (dBm)
MAX Ant. A	45°	3	1+3	Low	QPSK	A	30.421	-19.195	-16
						B	26.803	-22.804	-16
					16QAM	A	30.310	-19.306	-8
						B	26.502	-23.294	-16
					64QAM	A	32.414	-17.202	-8
						B	26.650	-22.616	-16
				High	QPSK	A	38.081	-14.927	-8
						B	28.699	-24.309	-16
					16QAM	A	37.844	-15.164	-8
						B	29.656	-23.352	-16
					64QAM	A	35.466	-17.542	-8
						B	29.477	-23.531	-16
MAX Ant. B	135°			Low	QPSK	A	26.643	-23.153	-16
						B	32.574	-17.042	-8
					16QAM	A	26.707	-23.089	-8
						B	31.677	-17.939	-16
					64QAM	A	26.710	-23.086	-8
						B	31.932	-17.684	-16
				High	QPSK	A	27.465	-25.543	-16
						B	31.941	-21.067	-8
					16QAM	A	27.482	-25.526	-16
						B	31.328	-21.680	-8
					64QAM	A	27.526	-25.482	-16
						B	33.329	-19.679	-8

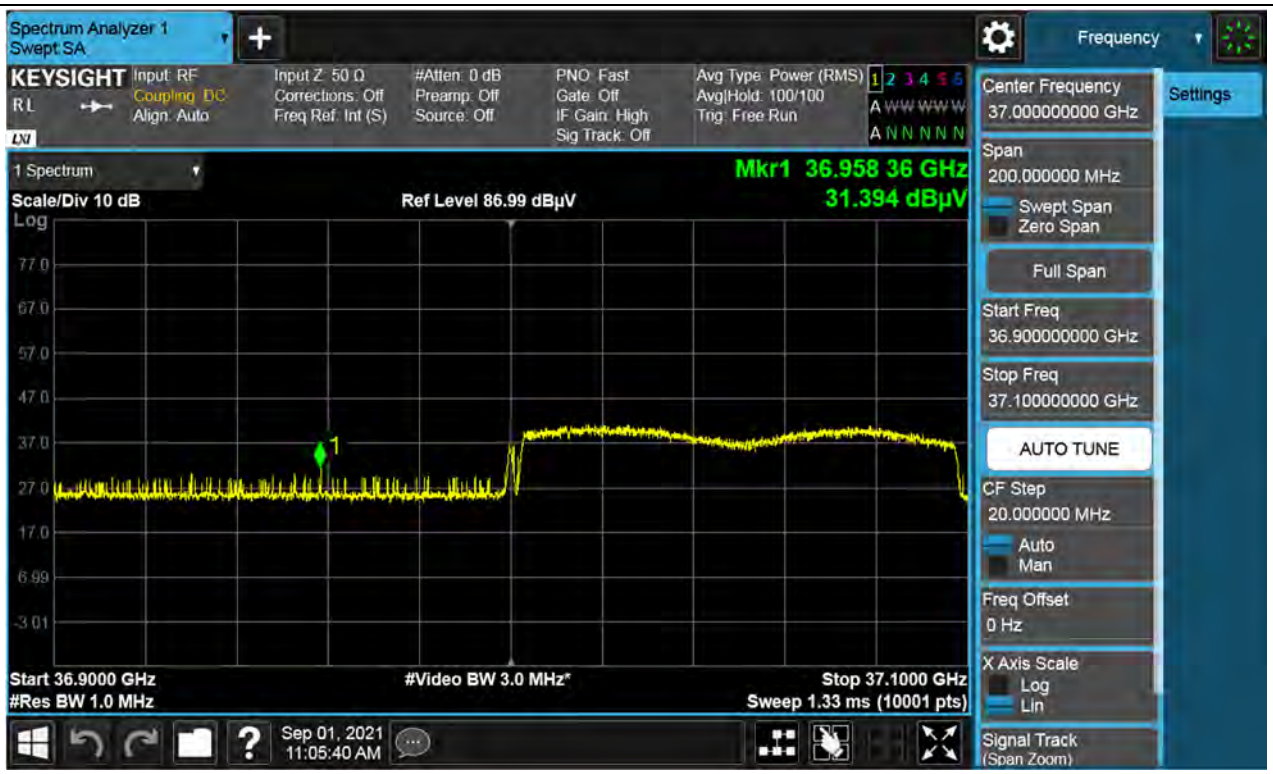
3+1

Pos.	Ant. Angle	Distance (m)	cc	Edge	Mod.	Ant	Measured Level (dBuV)	EIRP (dBm)	Limit (dBm)
MAX Ant. A	45°	3	3+1	Low	QPSK	A	30.834	-18.782	-8
						B	26.542	-22.724	-16
					16QAM	A	31.026	-18.590	-8
						B	26.652	-22.614	-16
					64QAM	A	32.809	-16.807	-8
						B	26.590	-22.676	-16
				High	QPSK	A	35.434	-17.574	-8
						B	29.076	-23.932	-16
					16QAM	A	36.802	-16.206	-8
						B	29.362	-23.646	-16
					64QAM	A	36.983	-16.025	-8
						B	28.651	-24.357	-16
MAX Ant. B	135°			Low	QPSK	A	26.635	-23.161	-16
						B	32.517	-17.099	-8
					16QAM	A	26.539	-23.257	-16
						B	32.844	-16.772	-8
					64QAM	A	26.466	-23.330	-16
						B	35.132	-14.484	-8
				High	QPSK	A	27.558	-25.450	-16
						B	32.741	-20.267	-8
					16QAM	A	27.462	-25.546	-16
						B	33.367	-19.641	-8
					64QAM	A	27.386	-25.622	-16
						B	34.064	-18.944	-8

Plot data of Band Edge

MAX Ant. A Position / 1cc / Low / QPSK / Ant. A

MAX Ant. A Position / 1cc / Low / QPSK / Ant. B

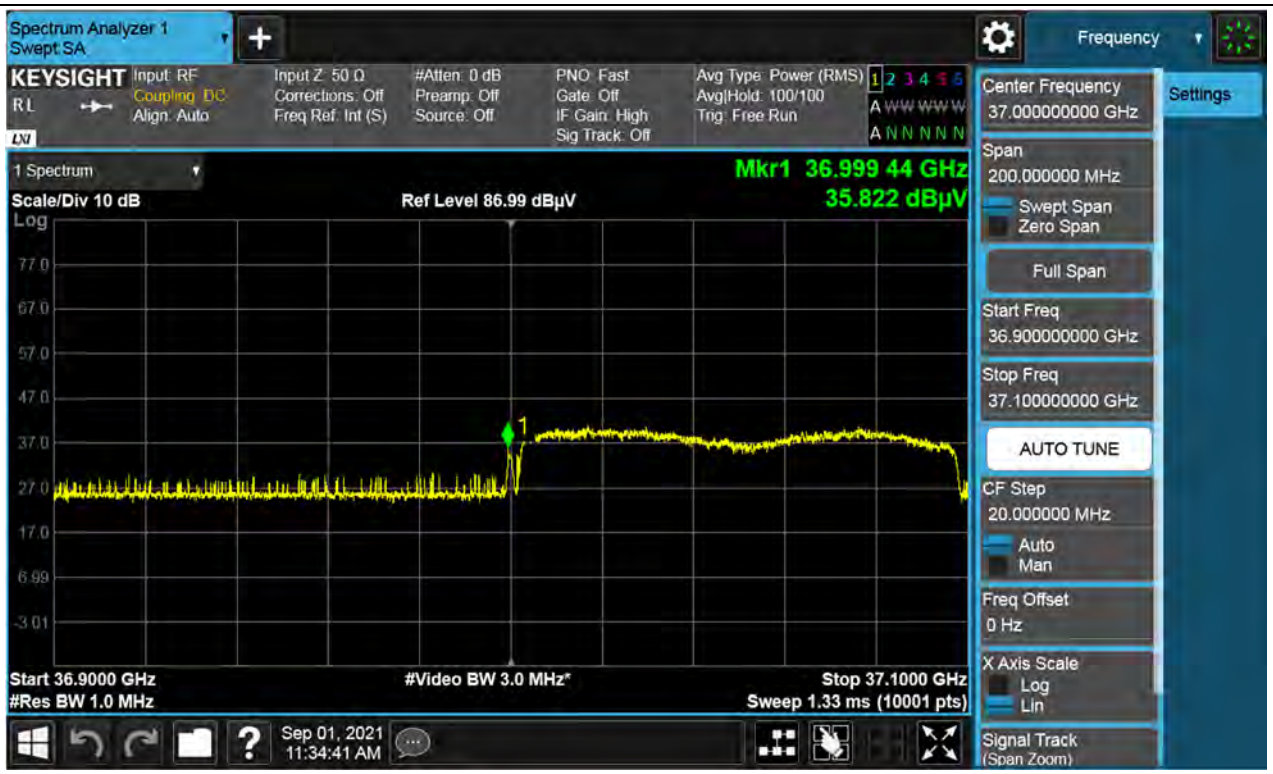


MAX Ant. A Position / 1cc / Low / 16QAM / Ant. A

MAX Ant. A Position / 1cc / Low / 16QAM / Ant. B

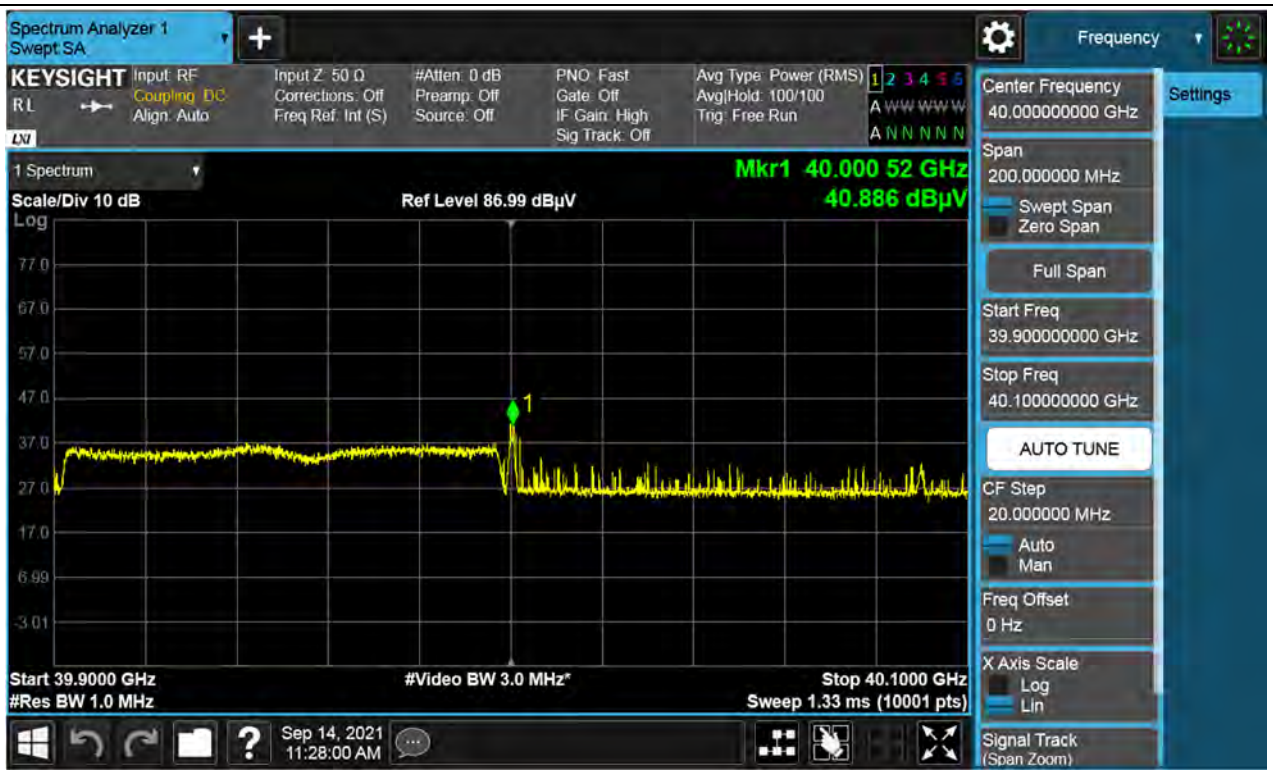
MAX Ant. A Position / 1cc / Low / 64QAM / Ant. A

MAX Ant. A Position / 1cc / Low / 64QAM / Ant. B



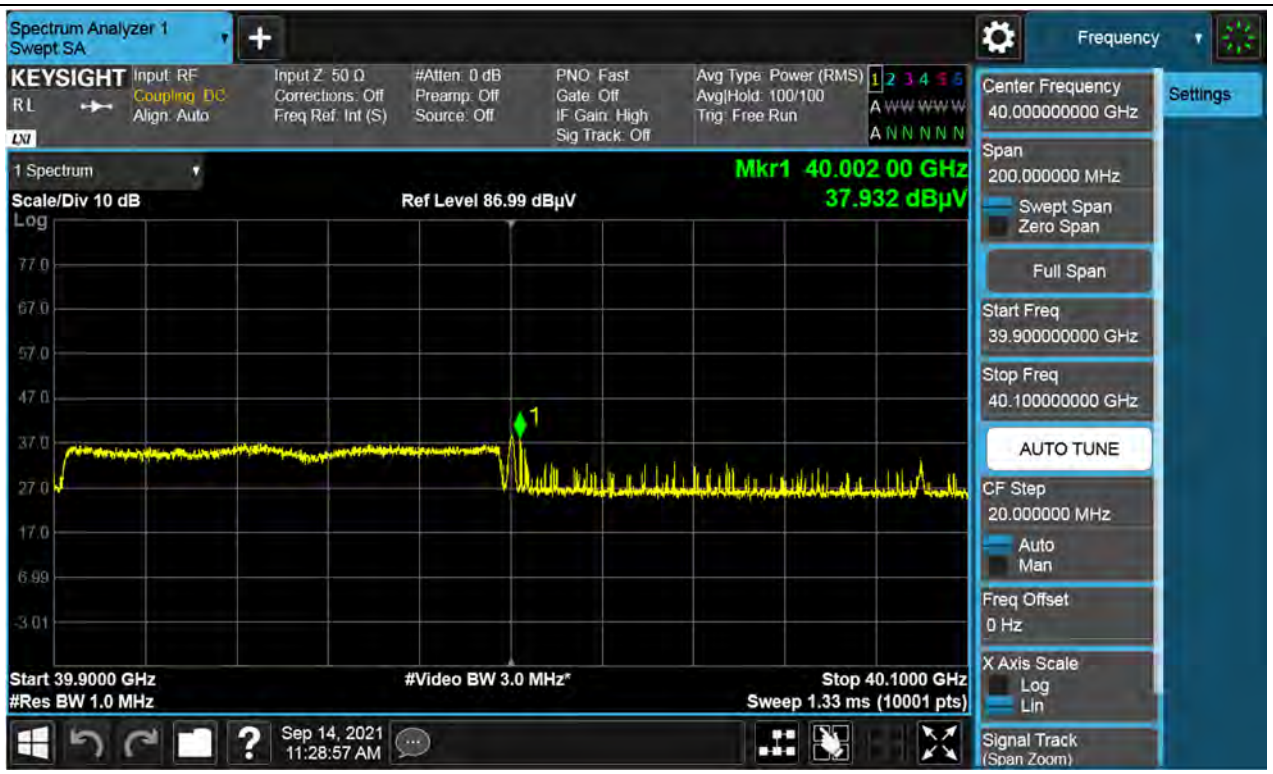
MAX Ant. A Position / 1cc / High / QPSK / Ant. A

MAX Ant. A Position / 1cc / High / QPSK / Ant. B



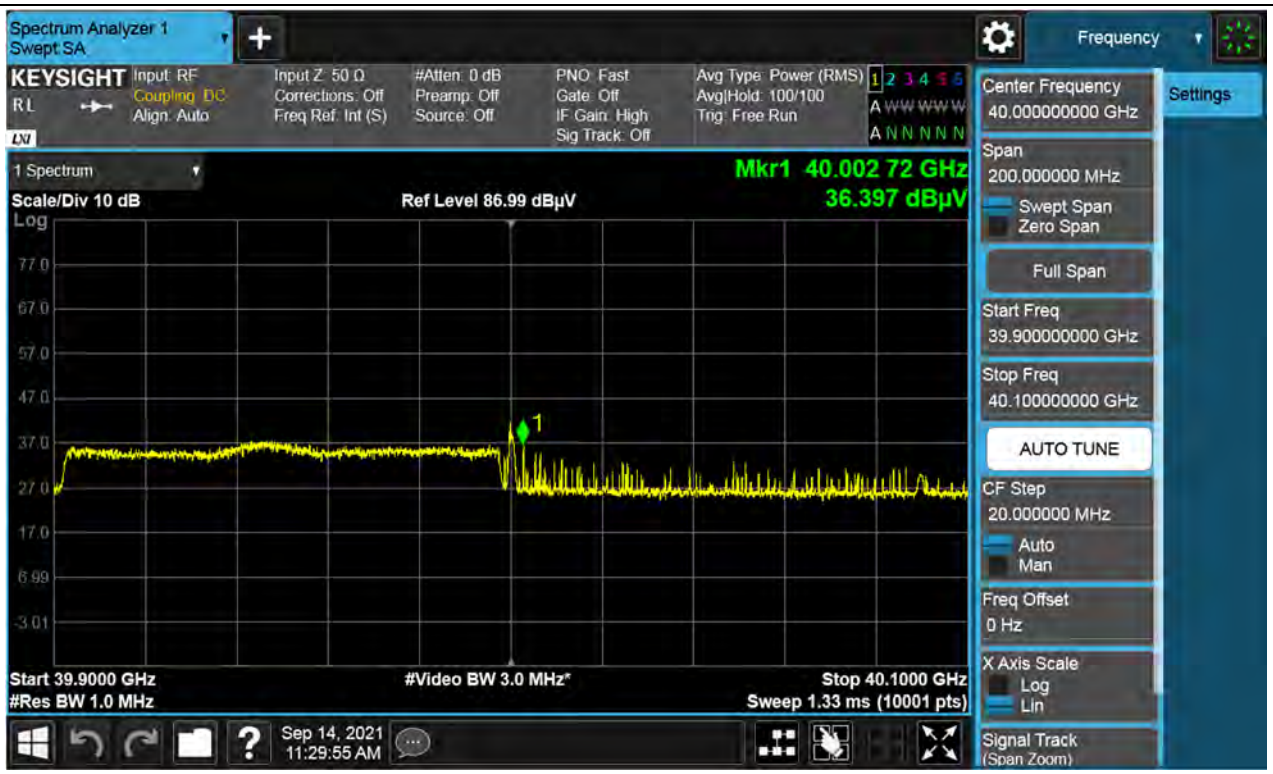
MAX Ant. A Position / 1cc / High / 16QAM / Ant. A

MAX Ant. A Position / 1cc / High / 16QAM / Ant. B

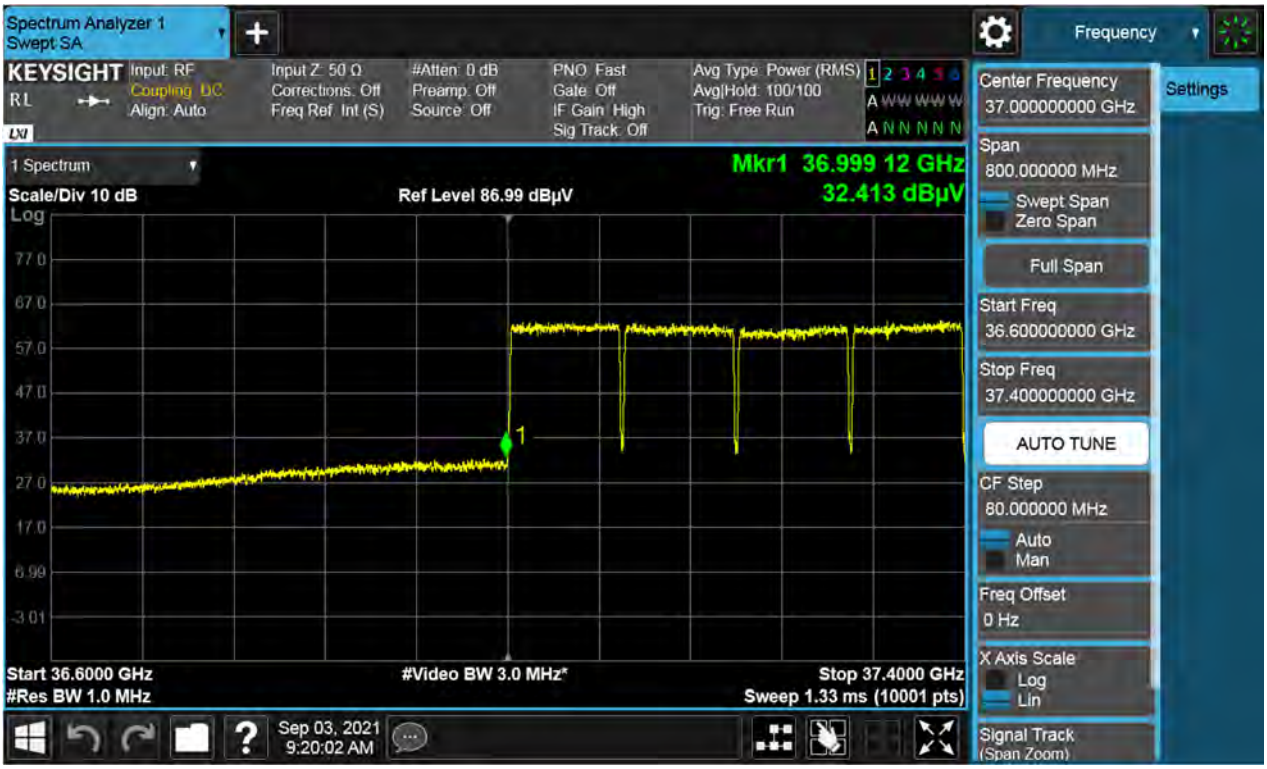


MAX Ant. A Position / 1cc / High / 64QAM / Ant. A

MAX Ant. A Position / 1cc / High / 64QAM / Ant. B

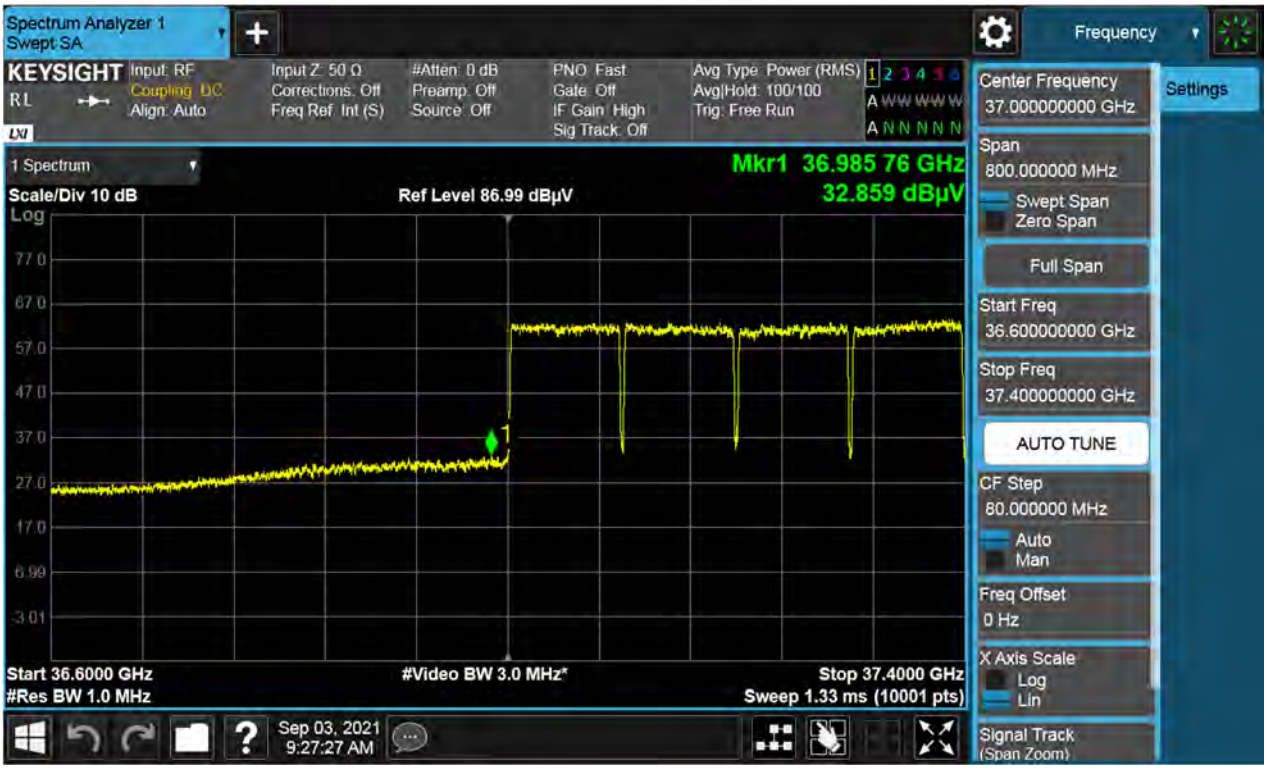


MAX Ant. A Position / 4cc / Low / QPSK / Ant. A



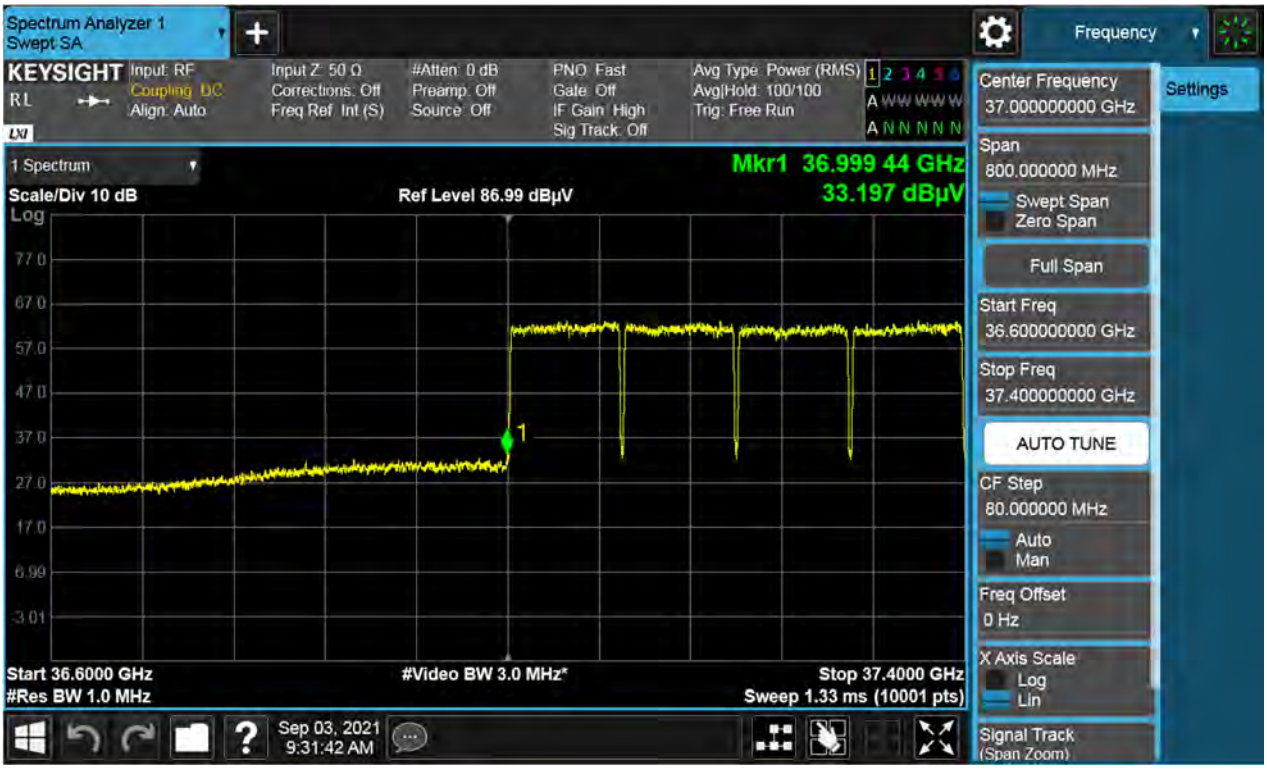
MAX Ant. A Position / 4cc / Low / QPSK / Ant. B

MAX Ant. A Position / 4cc / Low / 16QAM / Ant. A



MAX Ant. A Position / 4cc / Low / 16QAM / Ant. B

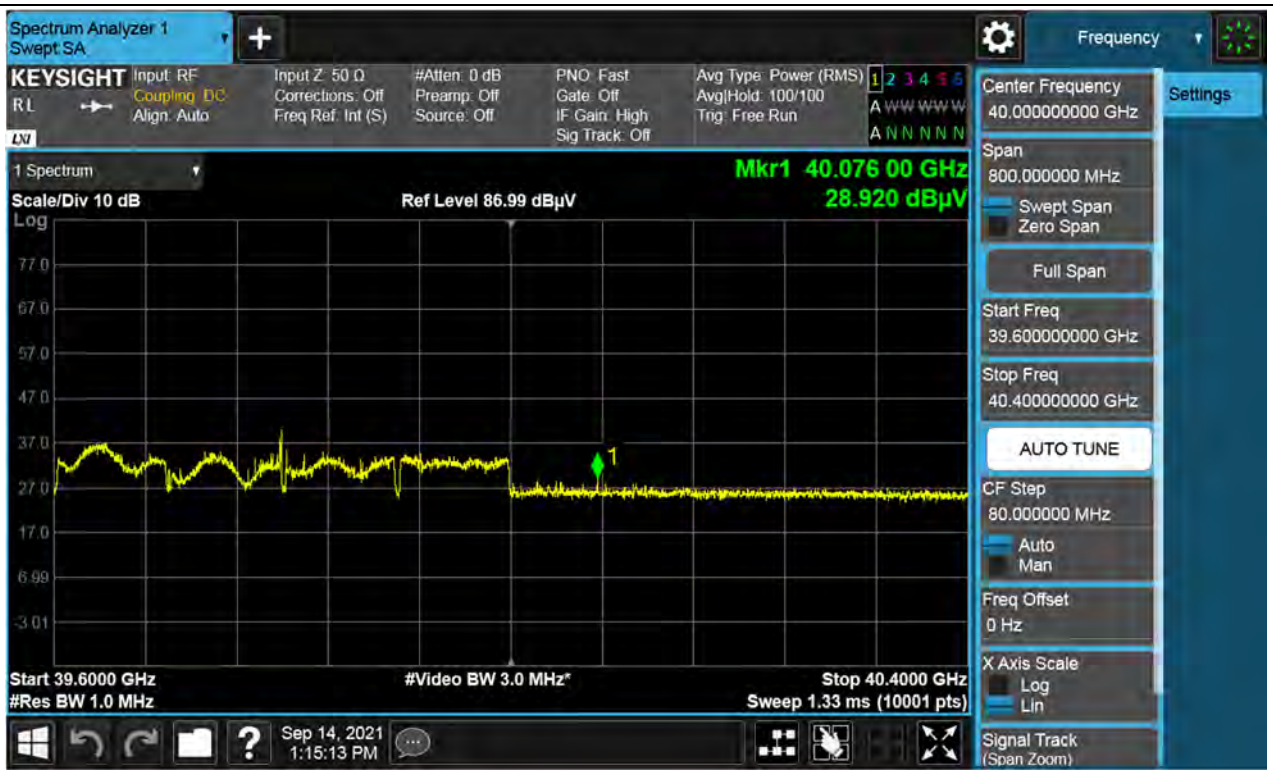
MAX Ant. A Position / 4cc / Low / 64QAM / Ant. A



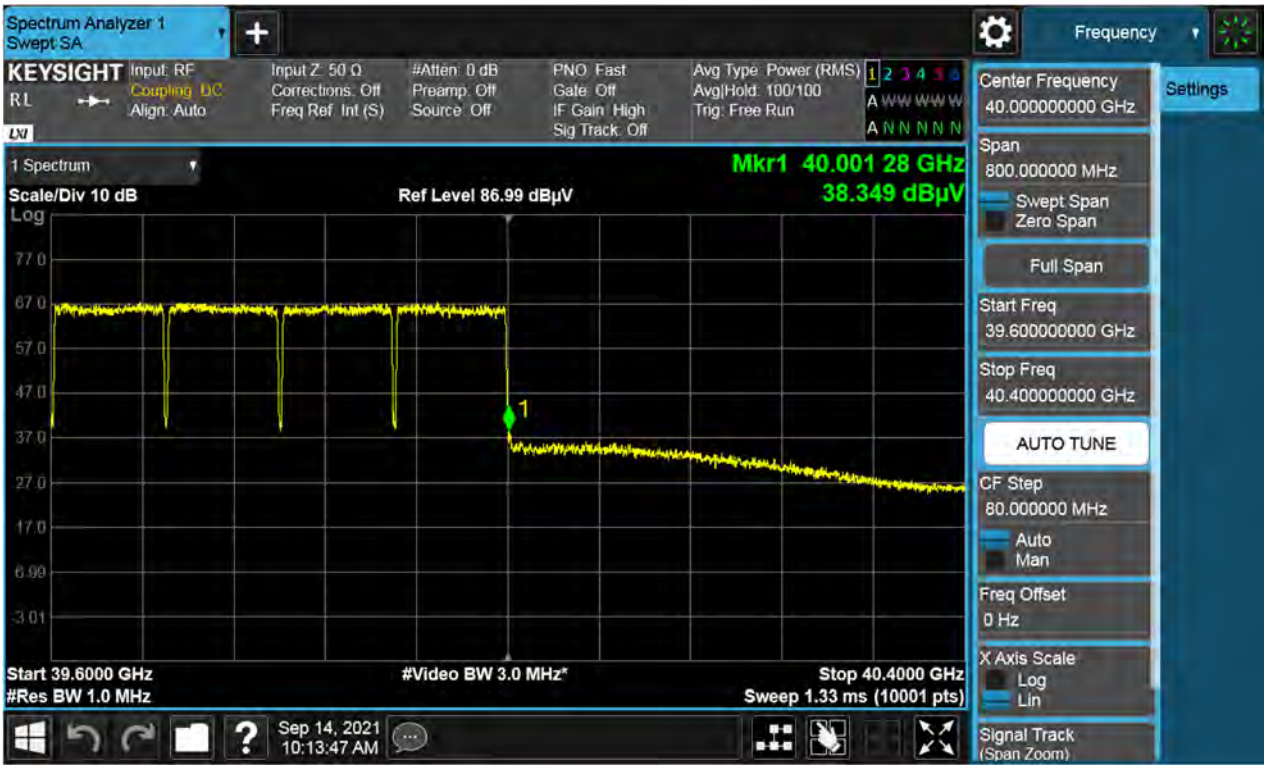
MAX Ant. A Position / 4cc / Low / 64QAM / Ant. B

MAX Ant. A Position / 4cc / High / QPSK / Ant. A

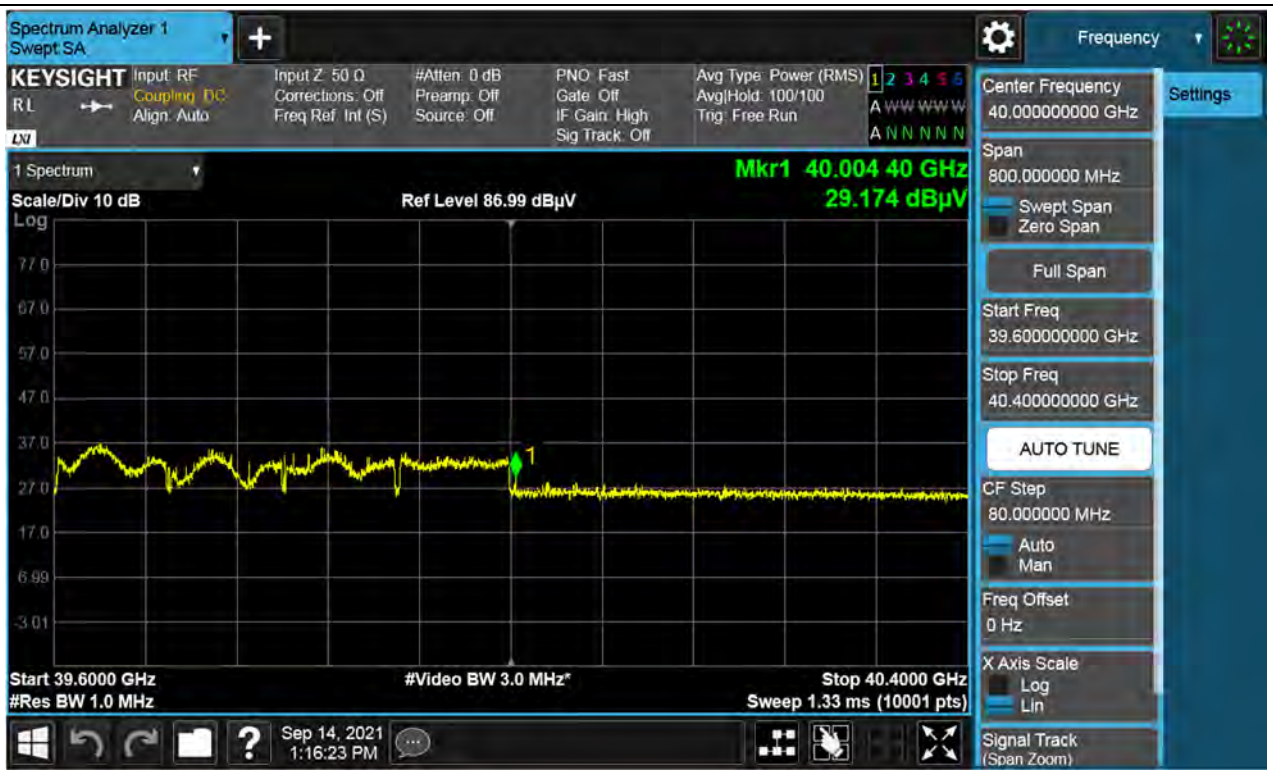
MAX Ant. A Position / 4cc / High / QPSK / Ant. B



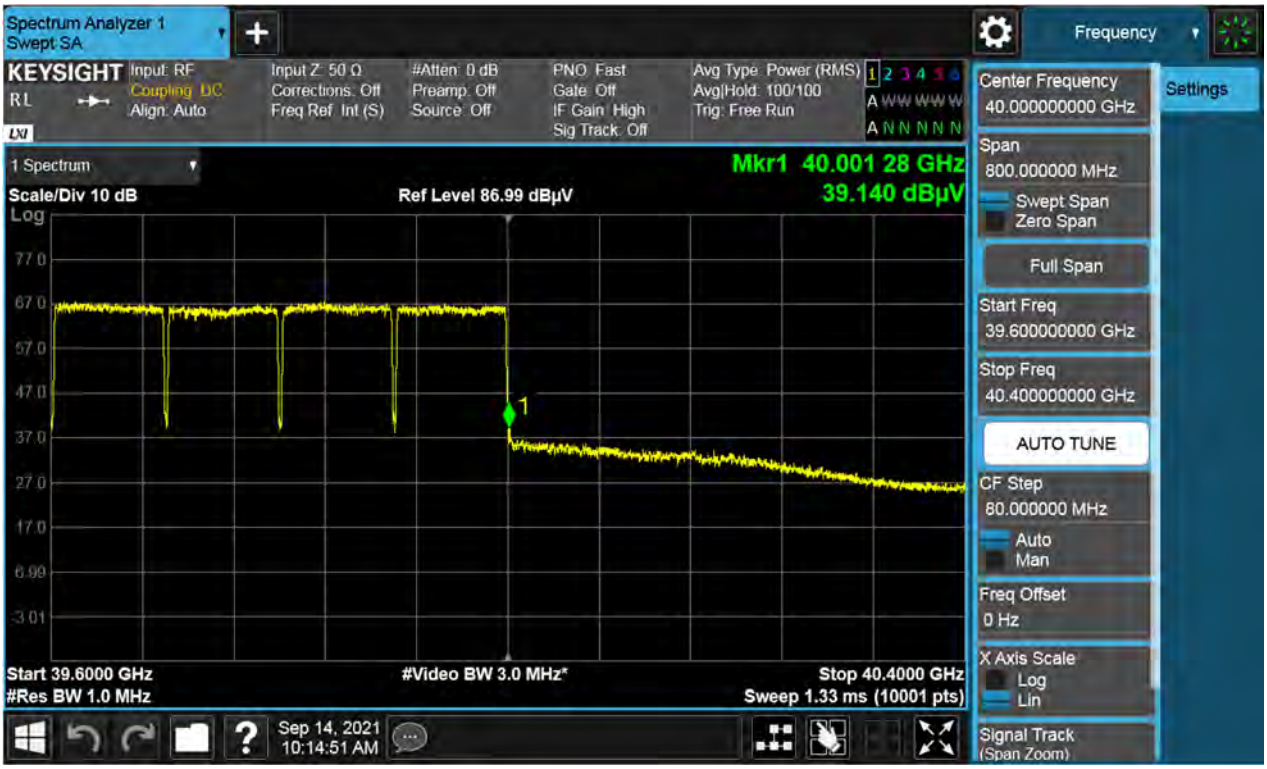
MAX Ant. A Position / 4cc / High / 16QAM / Ant. A



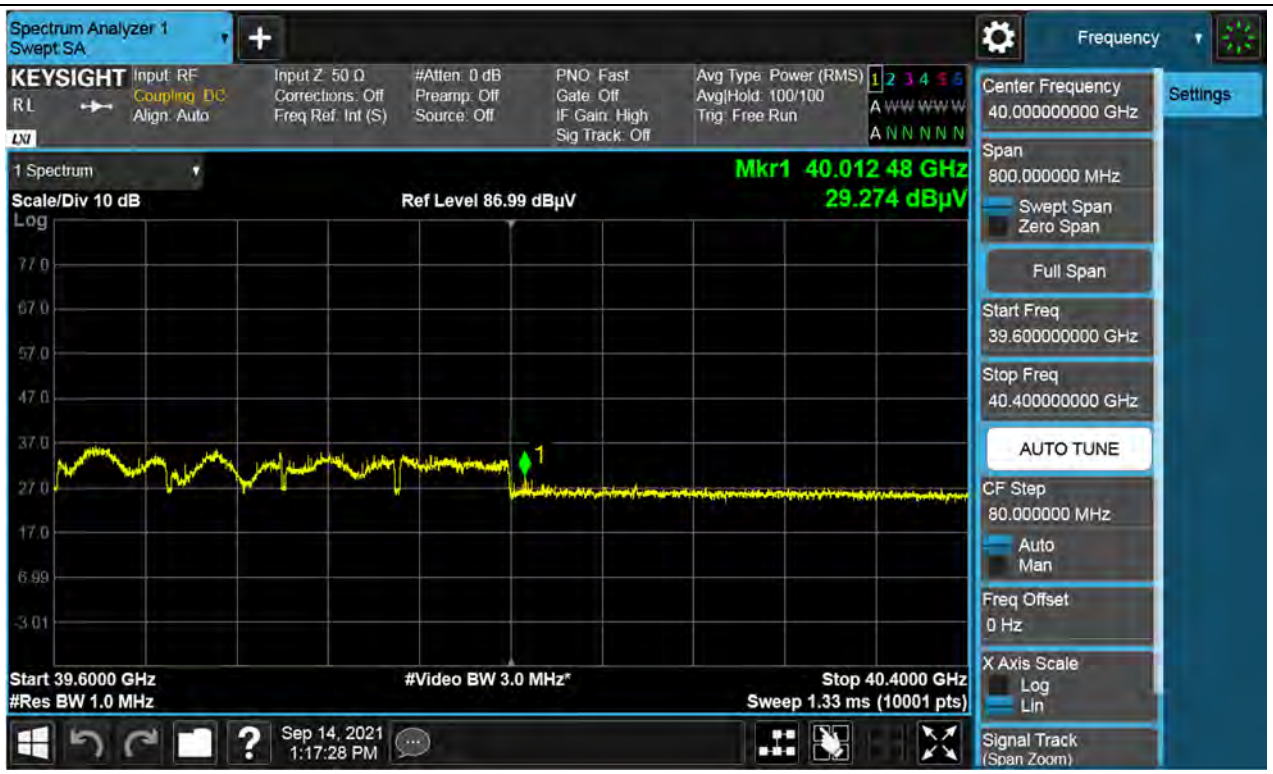
MAX Ant. A Position / 4cc / High / 16QAM / Ant. B



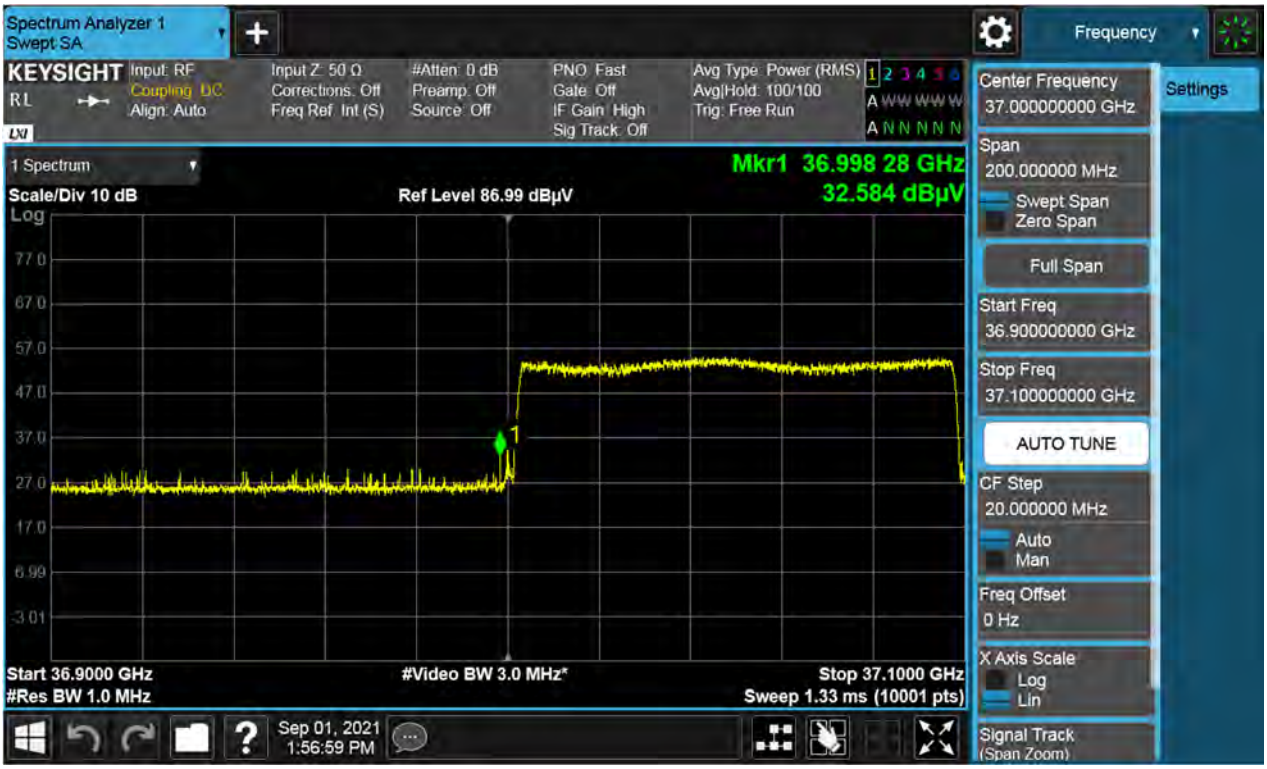
MAX Ant. A Position / 4cc / High / 64QAM / Ant. A



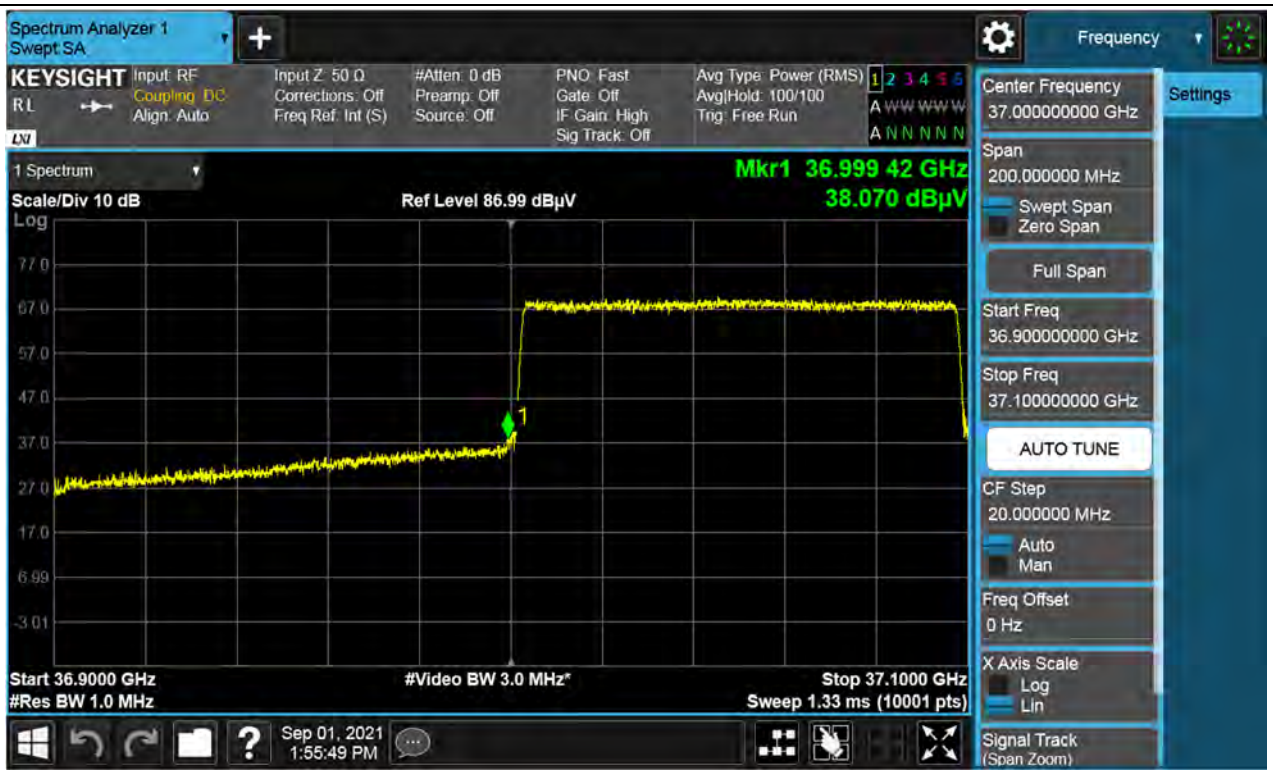
MAX Ant. A Position / 4cc / High / 64QAM / Ant. B



MAX Ant. B Position / 1cc / Low / QPSK / Ant. A

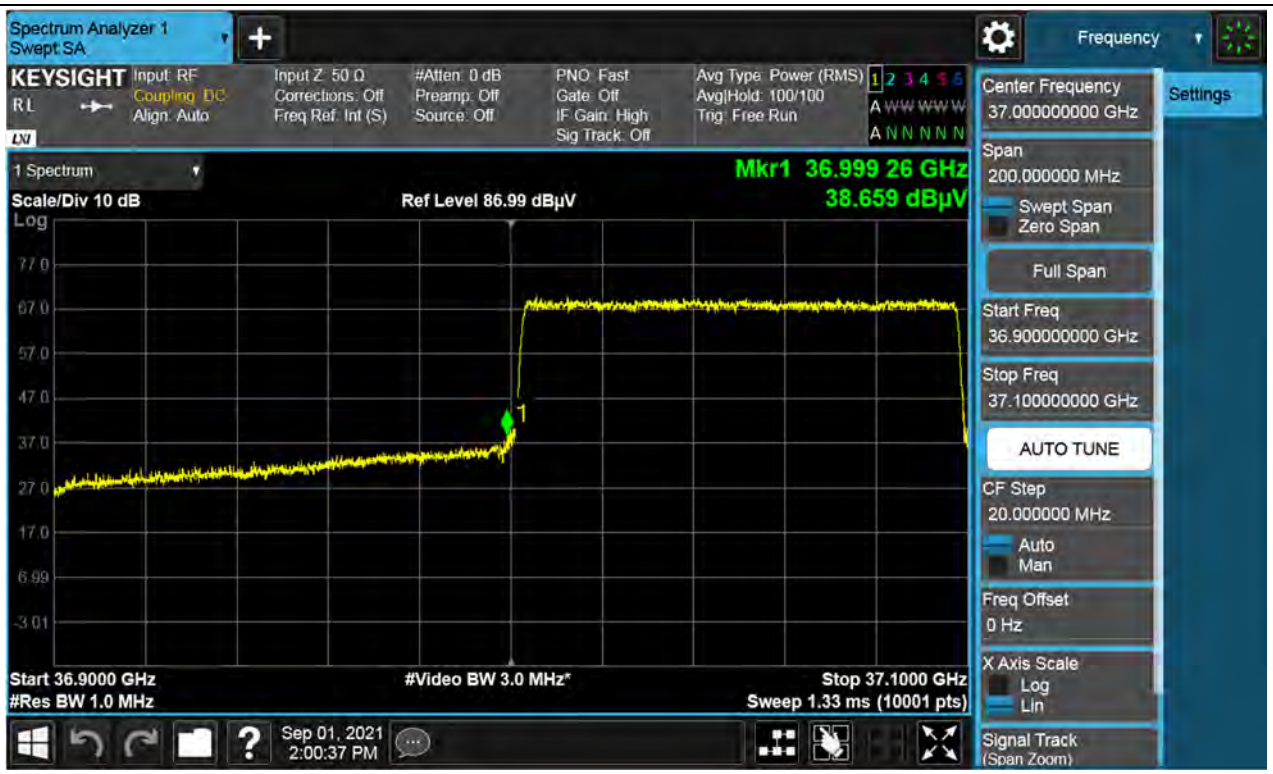


MAX Ant. B Position / 1cc / Low / QPSK / Ant. B



MAX Ant. B Position / 1cc / Low / 16QAM / Ant. A

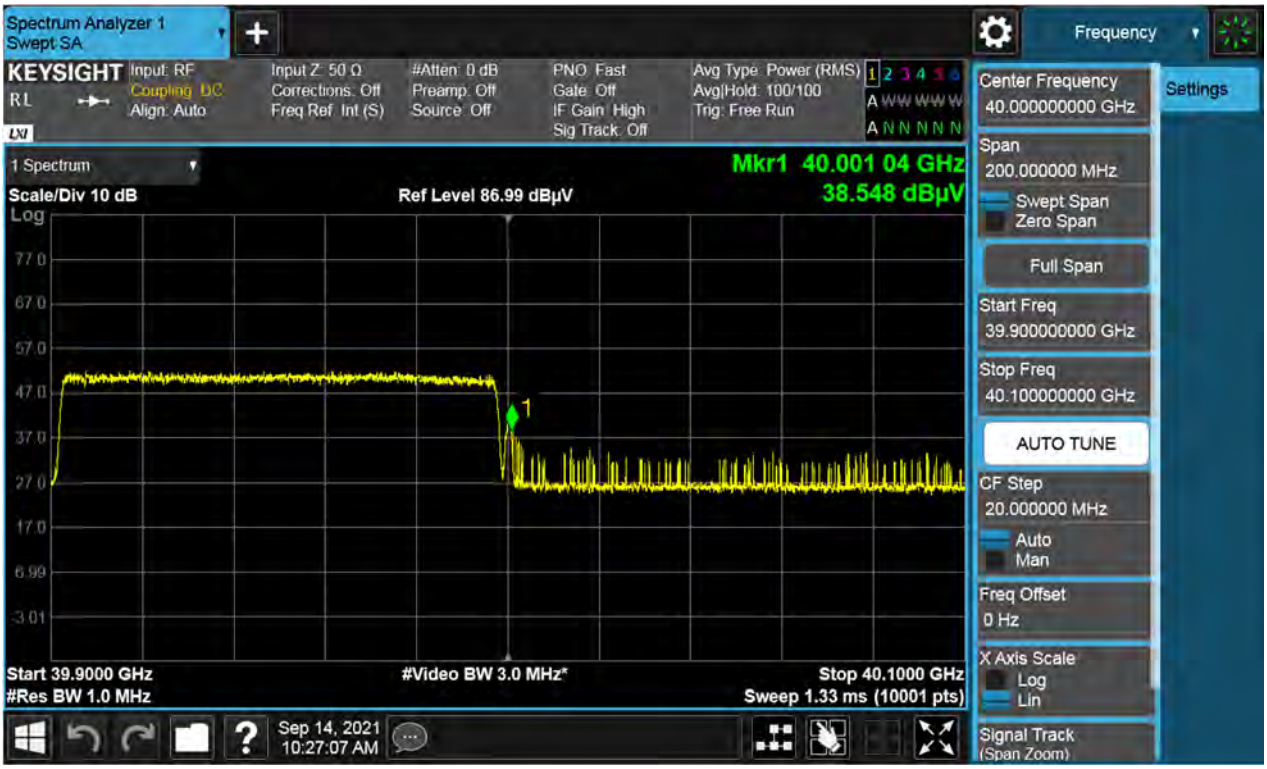
MAX Ant. B Position / 1cc / Low / 16QAM / Ant. B



MAX Ant. B Position / 1cc / Low / 64QAM / Ant. A

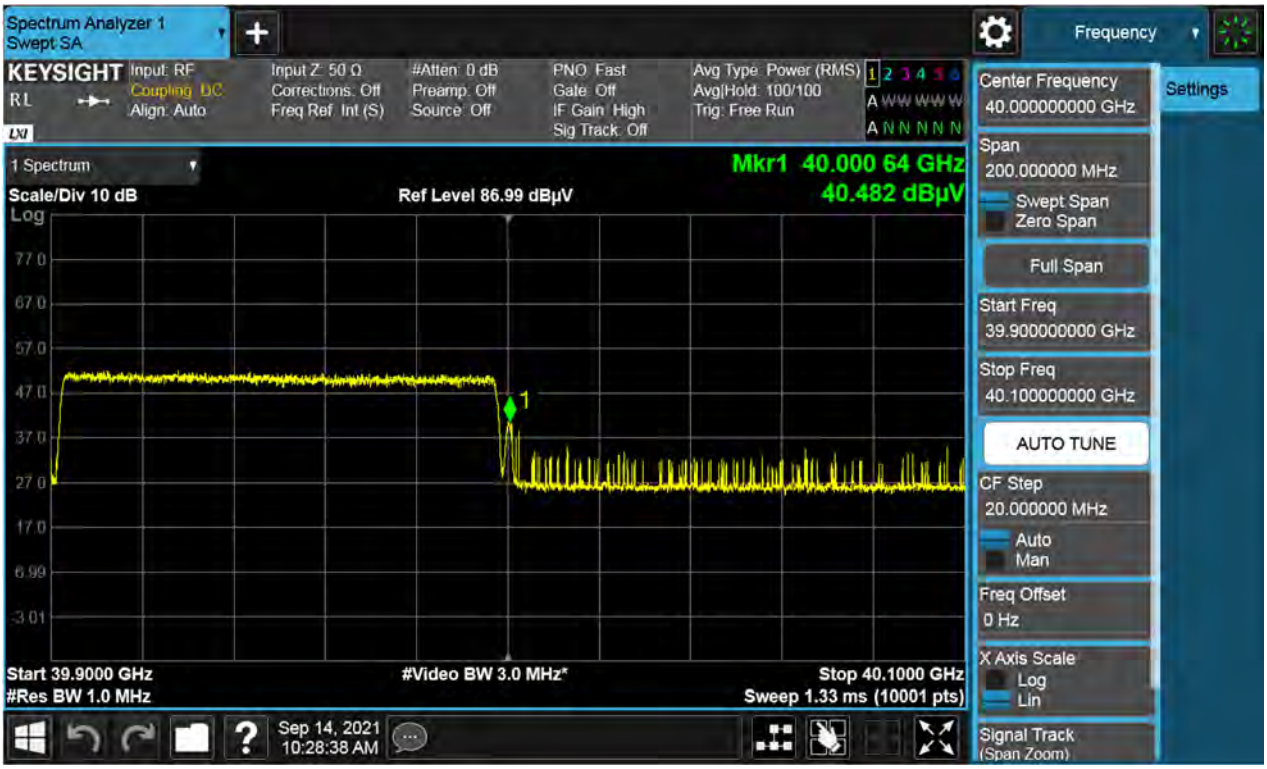
MAX Ant. B Position / 1cc / Low / 64QAM / Ant. B

MAX Ant. B Position / 1cc / High / QPSK / Ant. A

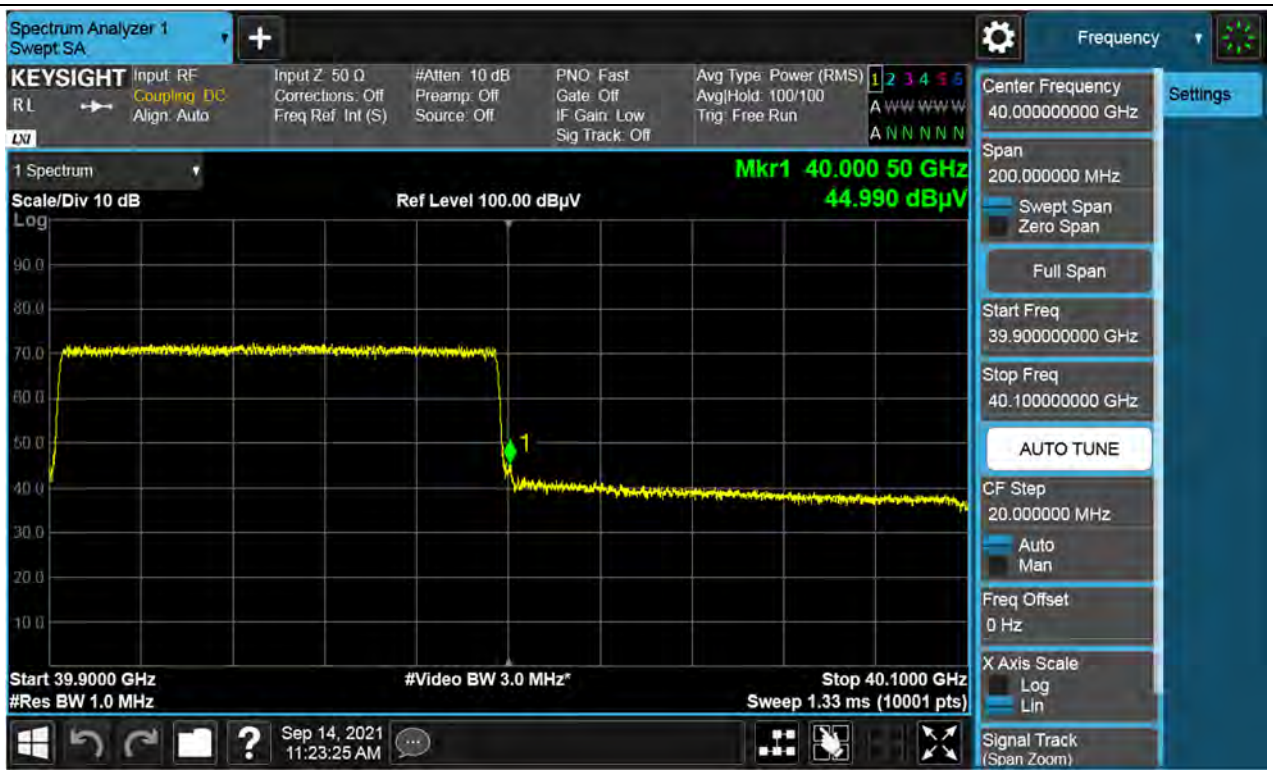


MAX Ant. B Position / 1cc / High / QPSK / Ant. B

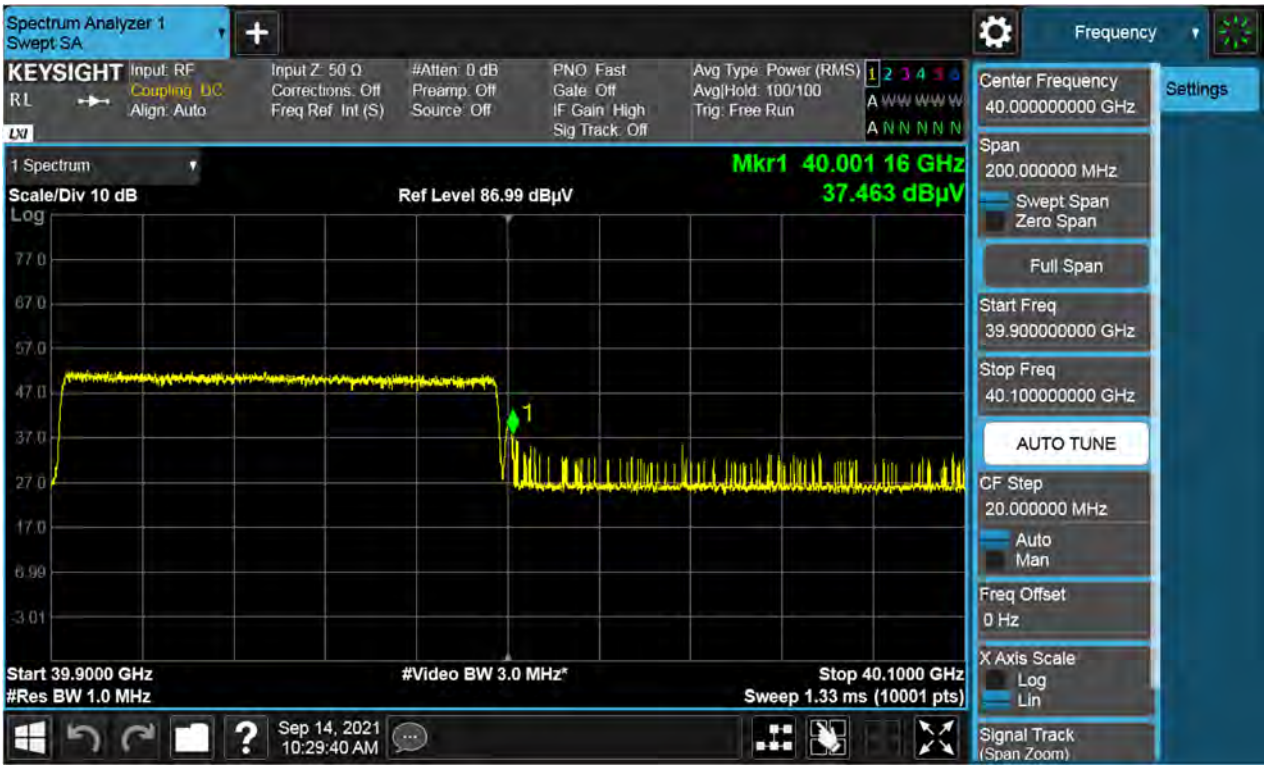
MAX Ant. B Position / 1cc / High / 16QAM / Ant. A



MAX Ant. B Position / 1cc / High / 16QAM / Ant. B



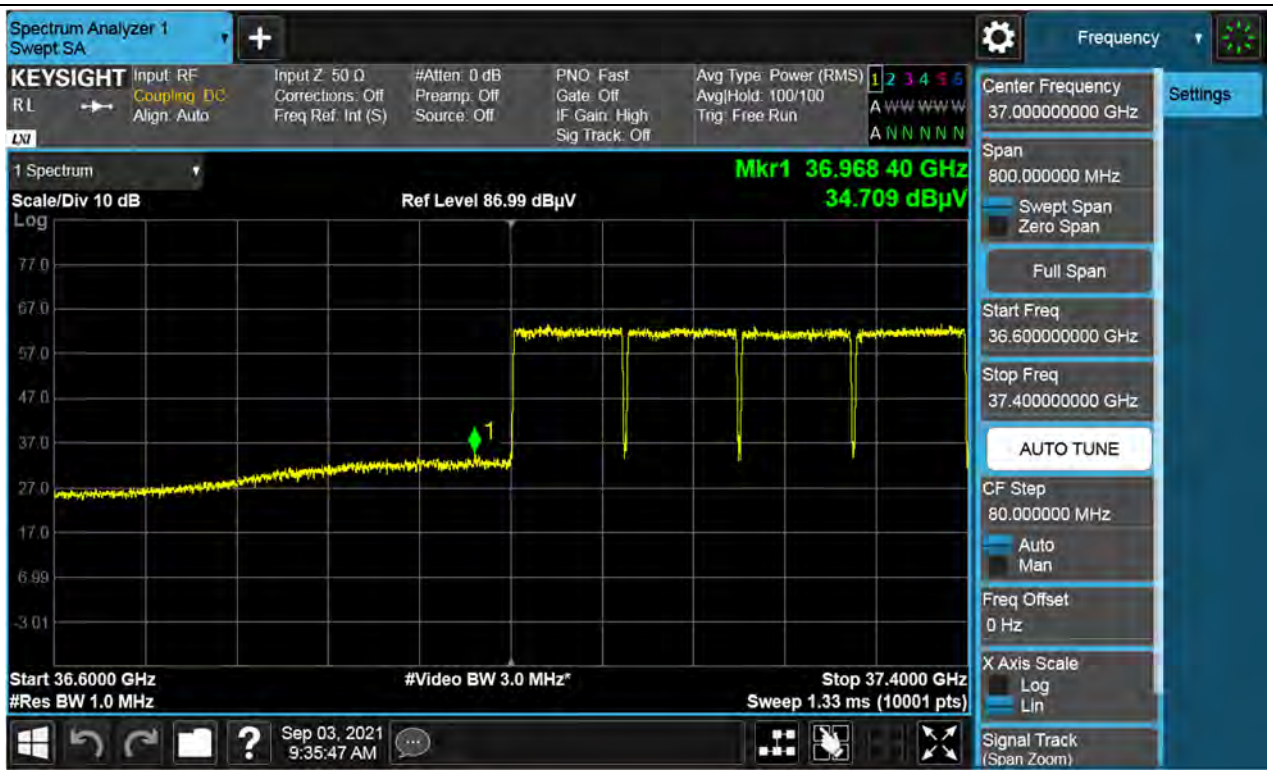
MAX Ant. B Position / 1cc / High / 64QAM / Ant. A



MAX Ant. B Position / 1cc / High / 64QAM / Ant. B

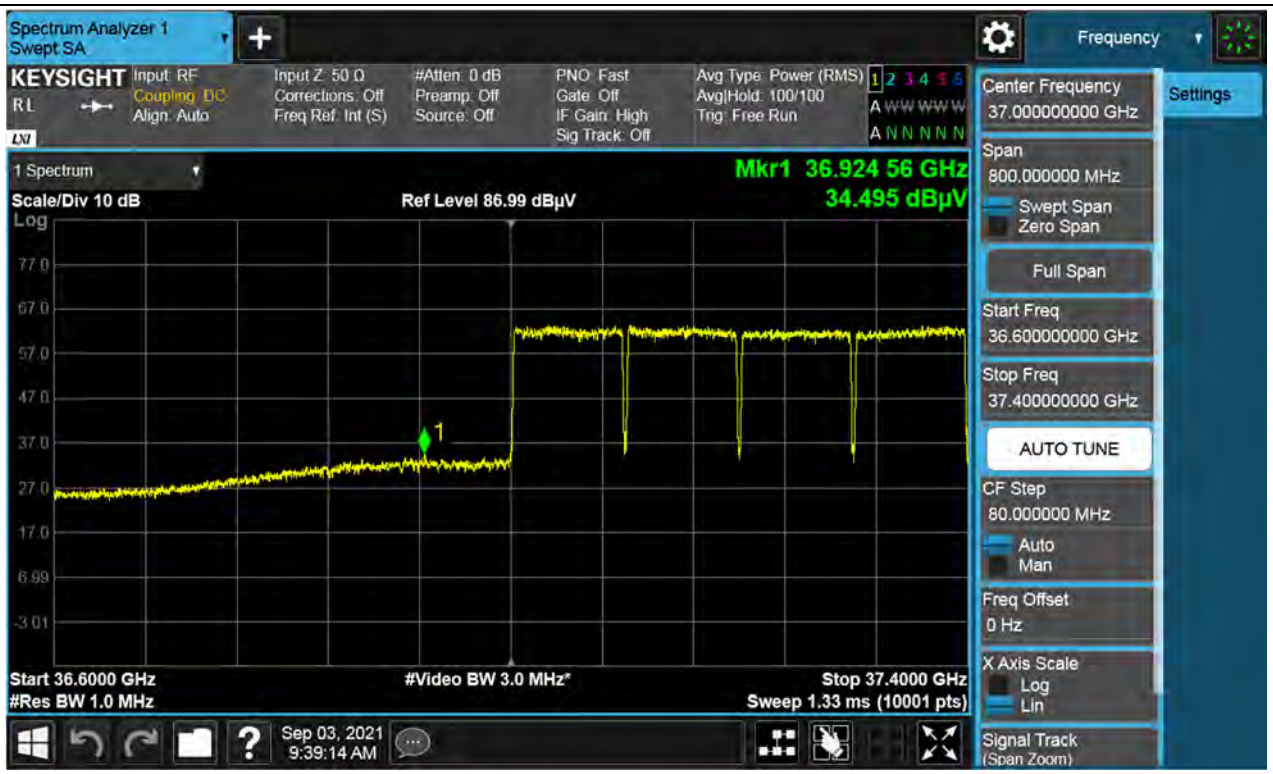
MAX Ant. B Position / 4cc / Low / QPSK / Ant. A

MAX Ant. B Position / 4cc / Low / QPSK / Ant. B



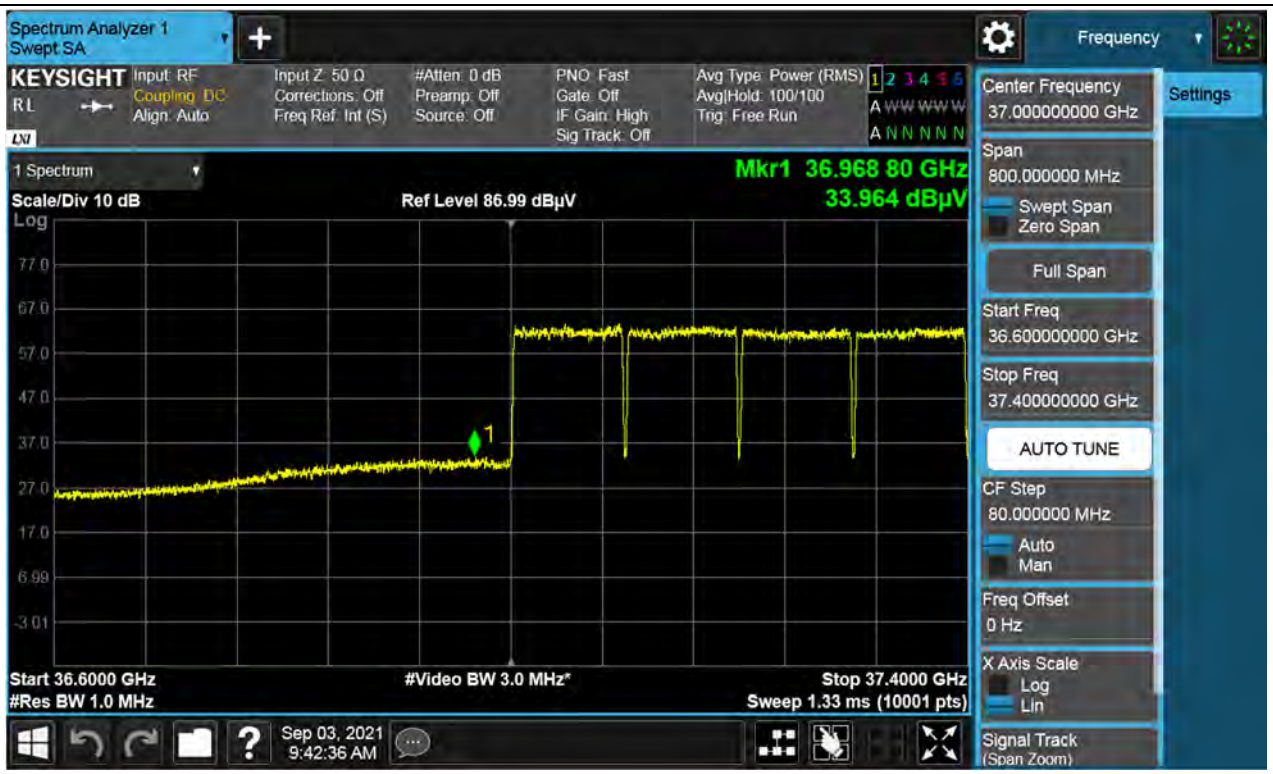
MAX Ant. B Position / 4cc / Low / 16QAM / Ant. A

MAX Ant. B Position / 4cc / Low / 16QAM / Ant. B



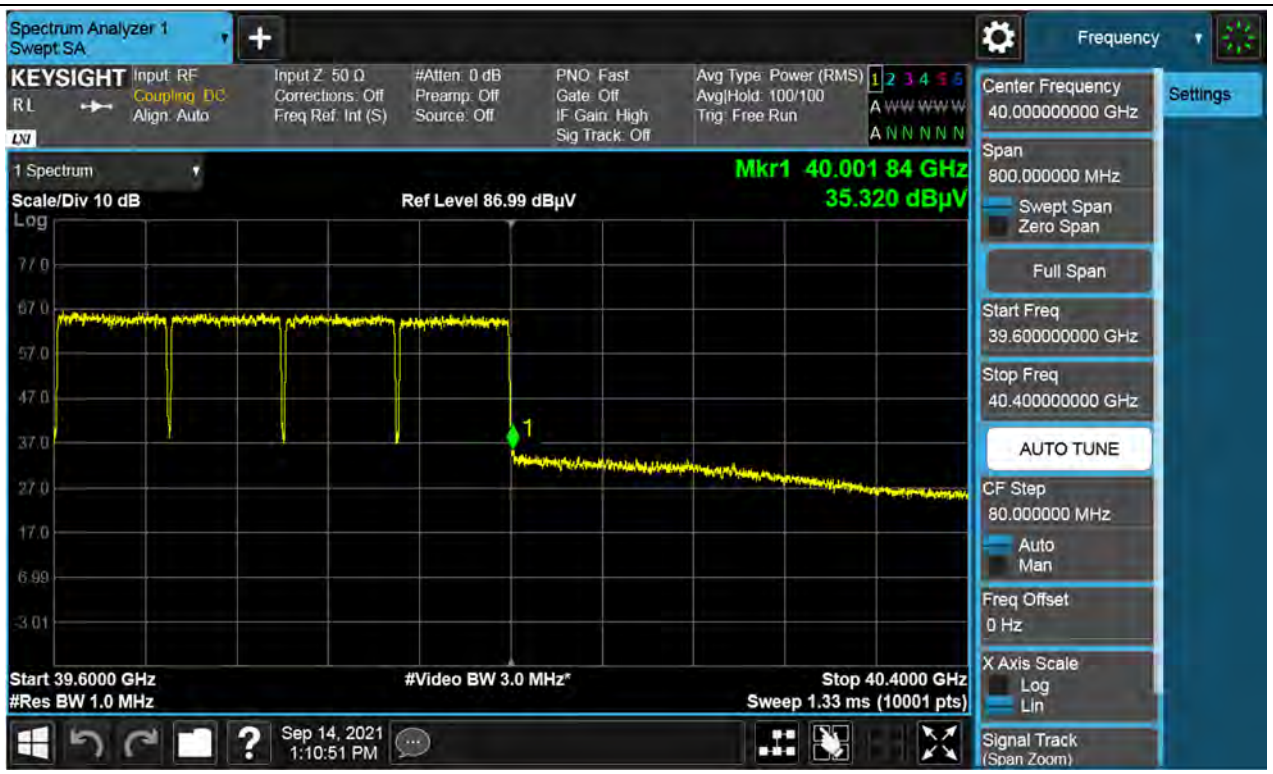
MAX Ant. B Position / 4cc / Low / 64QAM / Ant. A

MAX Ant. B Position / 4cc / Low / 64QAM / Ant. B

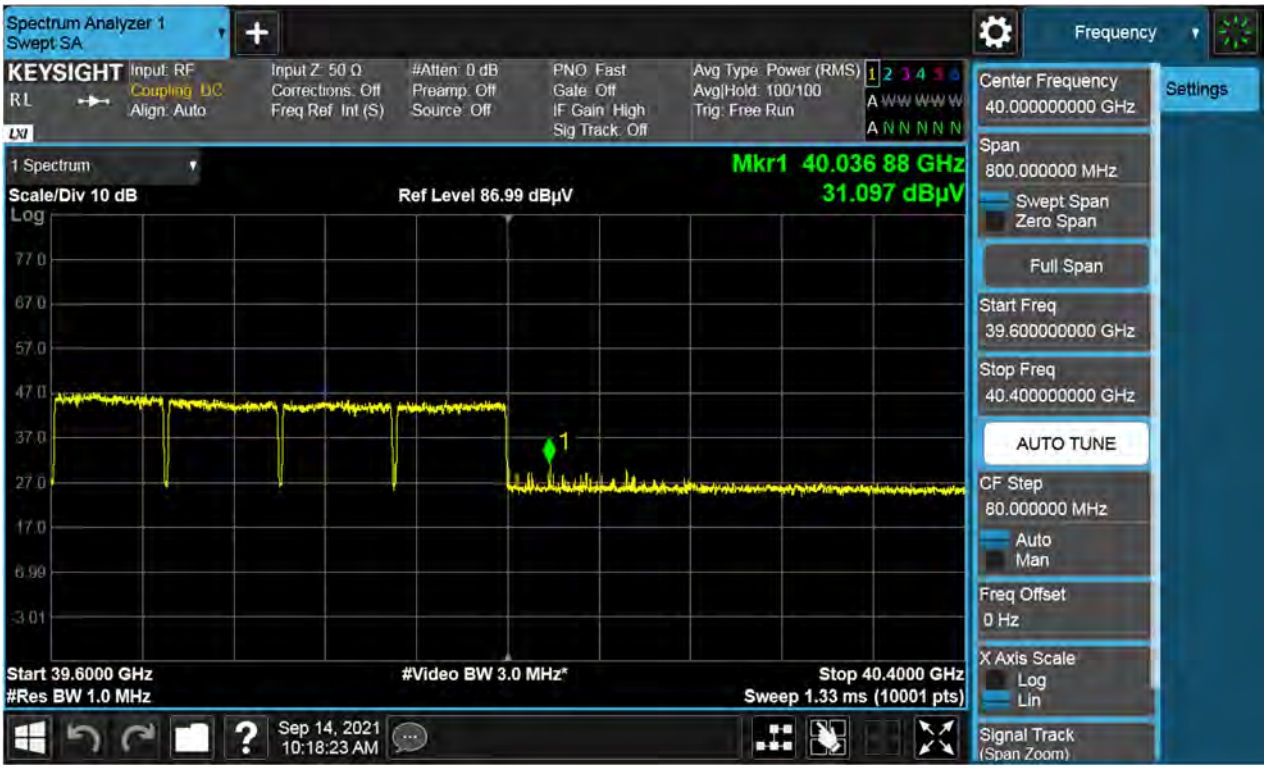


MAX Ant. B Position / 4cc / High / QPSK / Ant. A

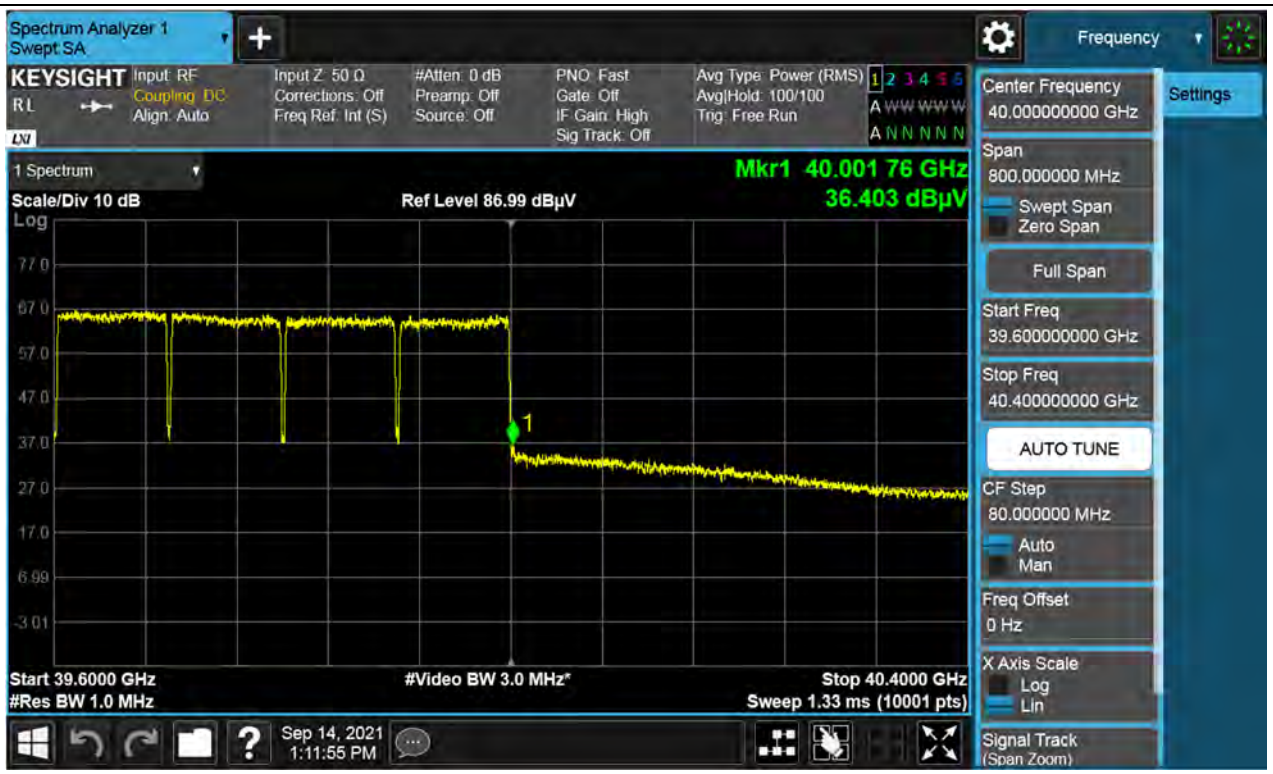
MAX Ant. B Position / 4cc / High / QPSK / Ant. B



MAX Ant. B Position / 4cc / High / 16QAM / Ant. A

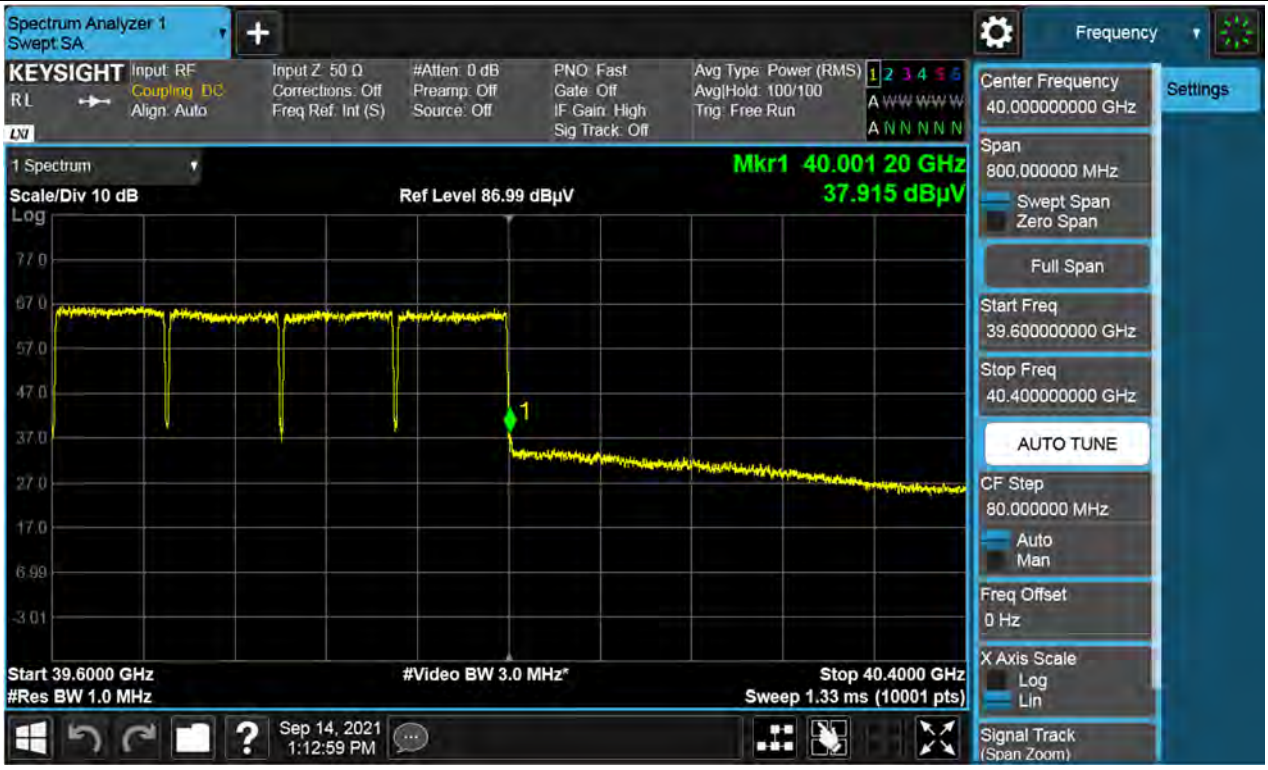


MAX Ant. B Position / 4cc / High / 16QAM / Ant. B

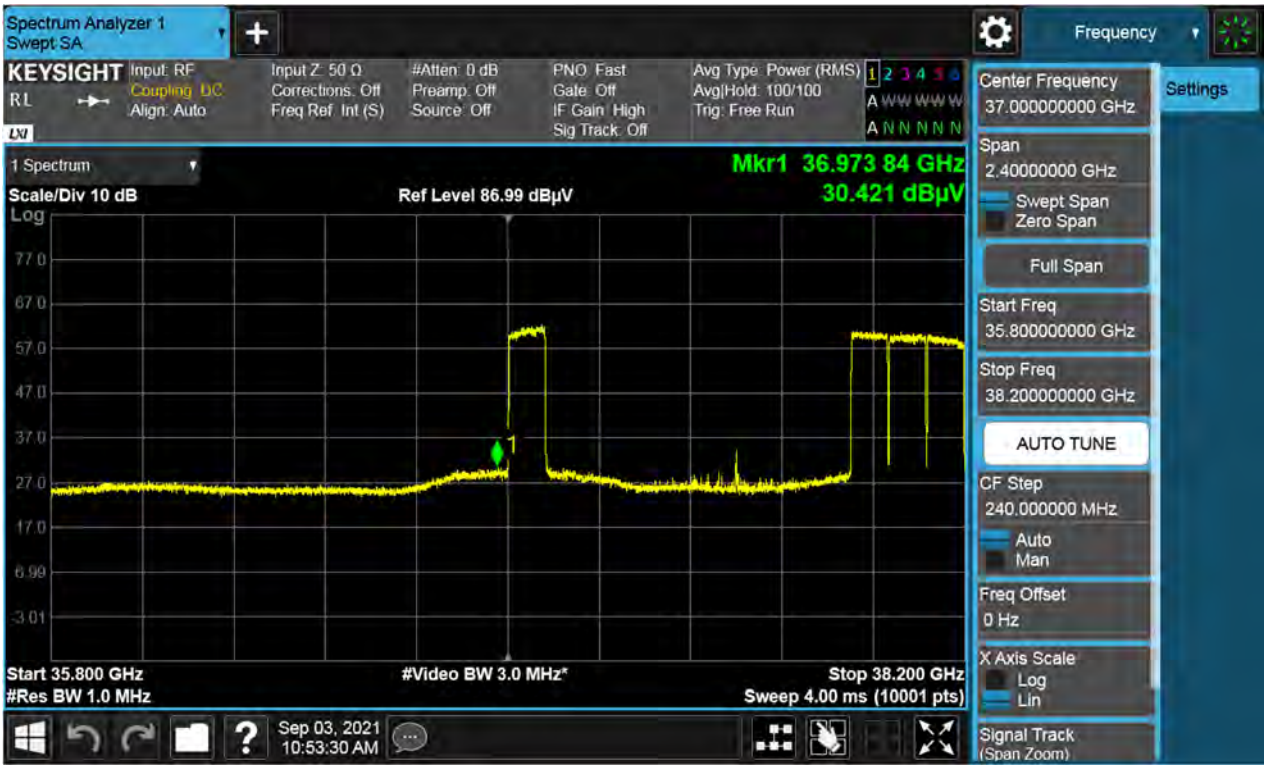


MAX Ant. B Position / 4cc / High / 64QAM / Ant. A

MAX Ant. B Position / 4cc / High / 64QAM / Ant. B

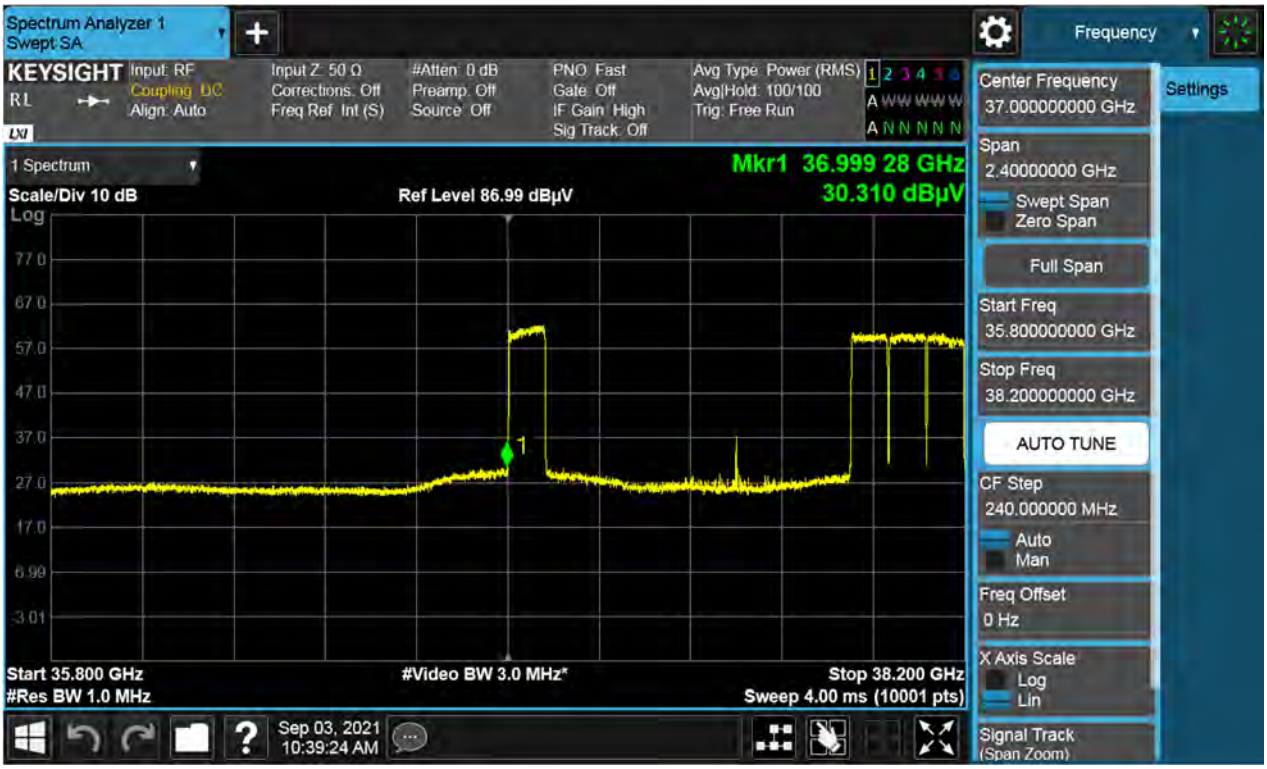


MAX Ant. A Position / 1+3cc / Low / QPSK / Ant. A

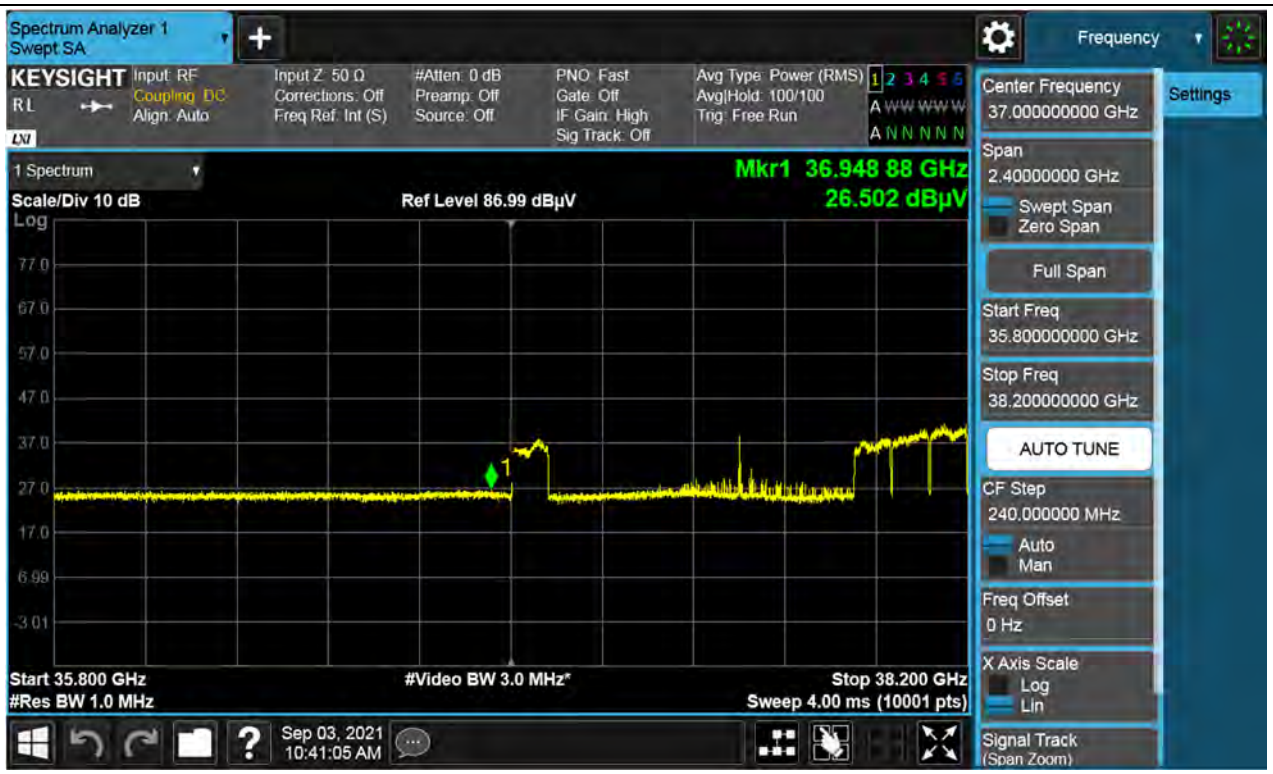


MAX Ant. A Position / 1+3cc / Low / QPSK / Ant. B

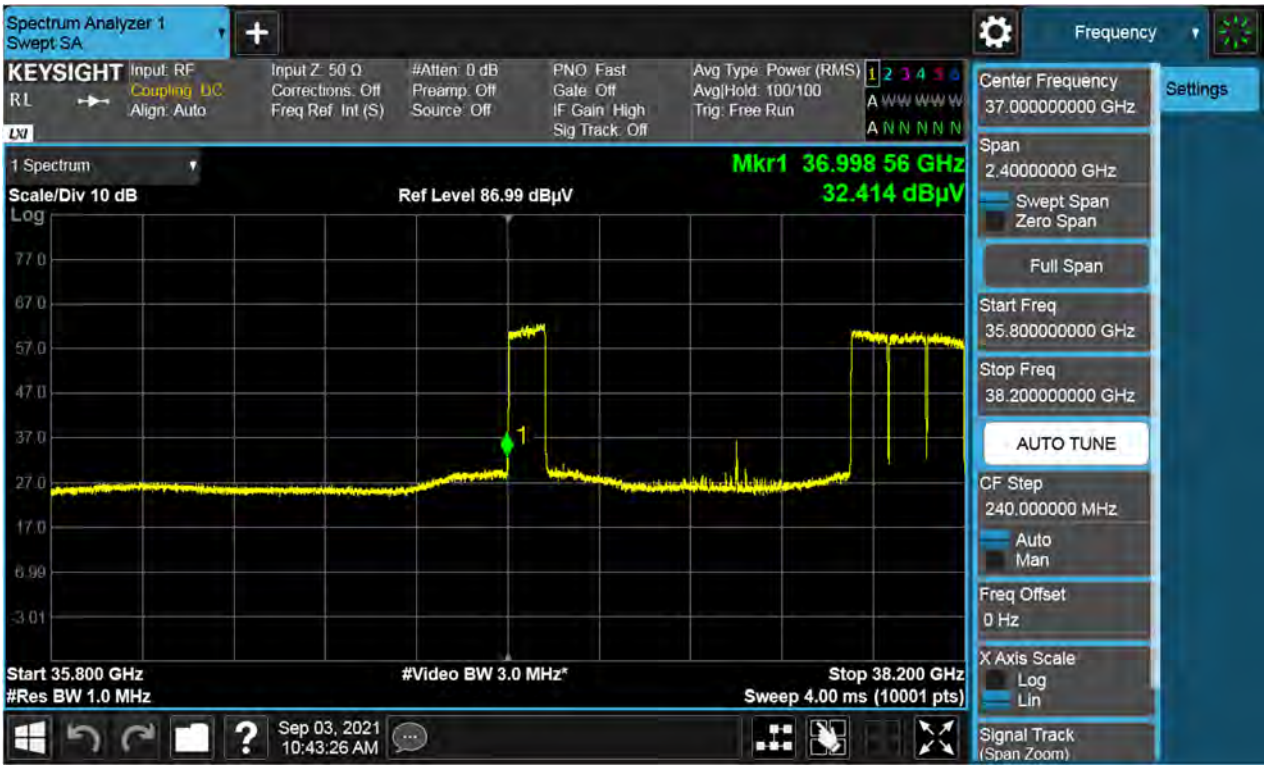
MAX Ant. A Position / 1+3cc / Low / 16QAM / Ant. A



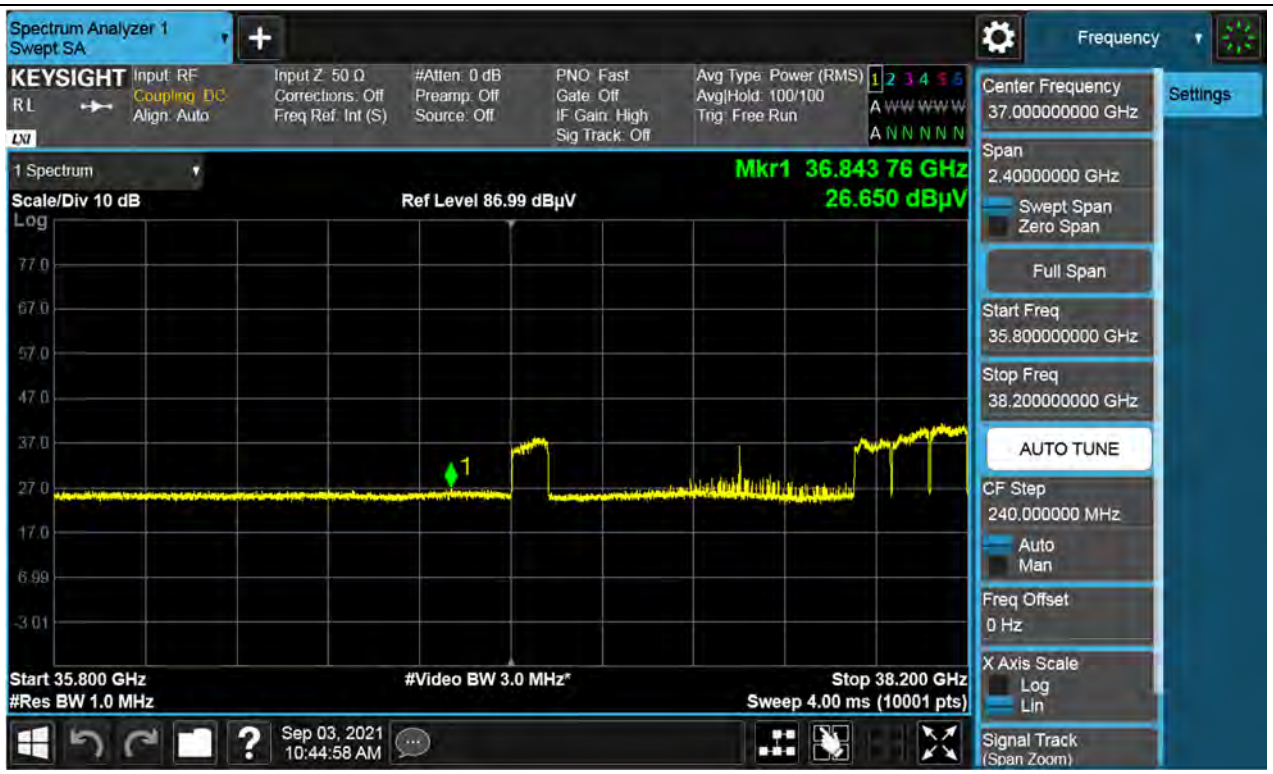
MAX Ant. A Position / 1+3cc / Low / 16QAM / Ant. B



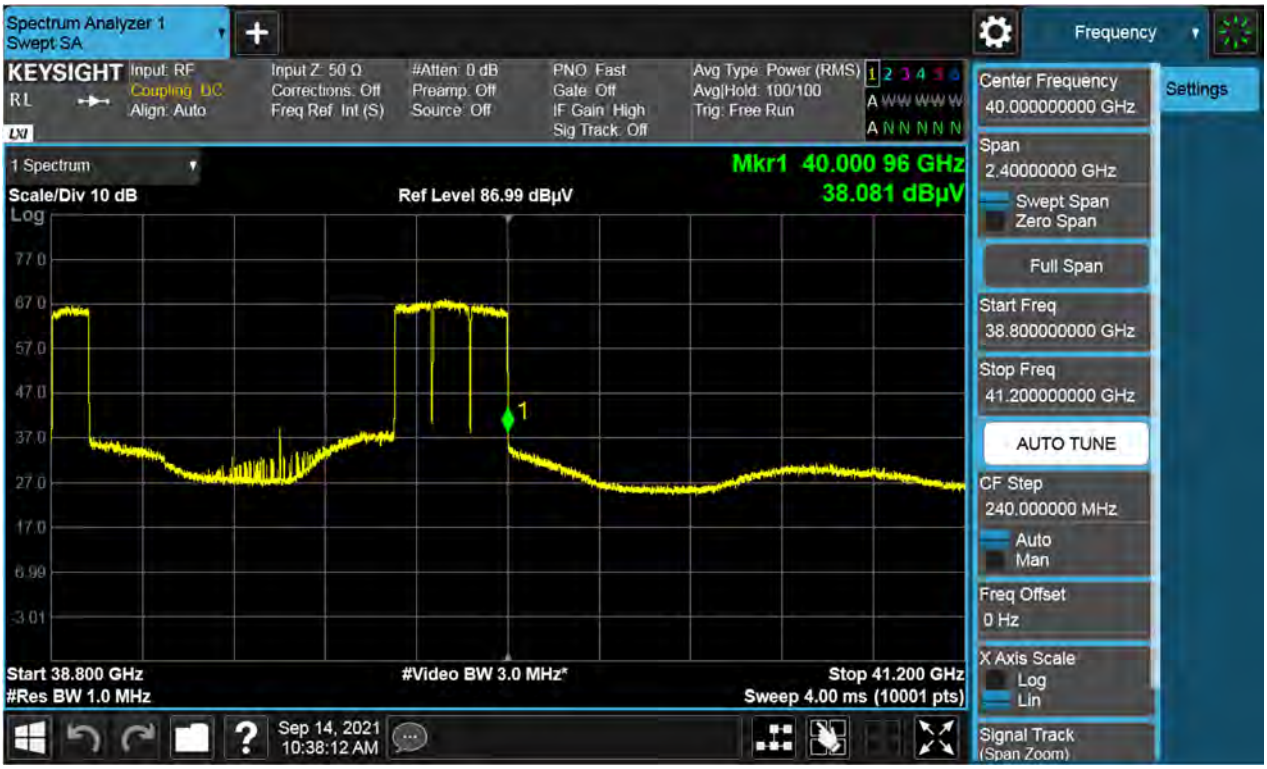
MAX Ant. A Position / 1+3cc / Low / 64QMA / Ant. A



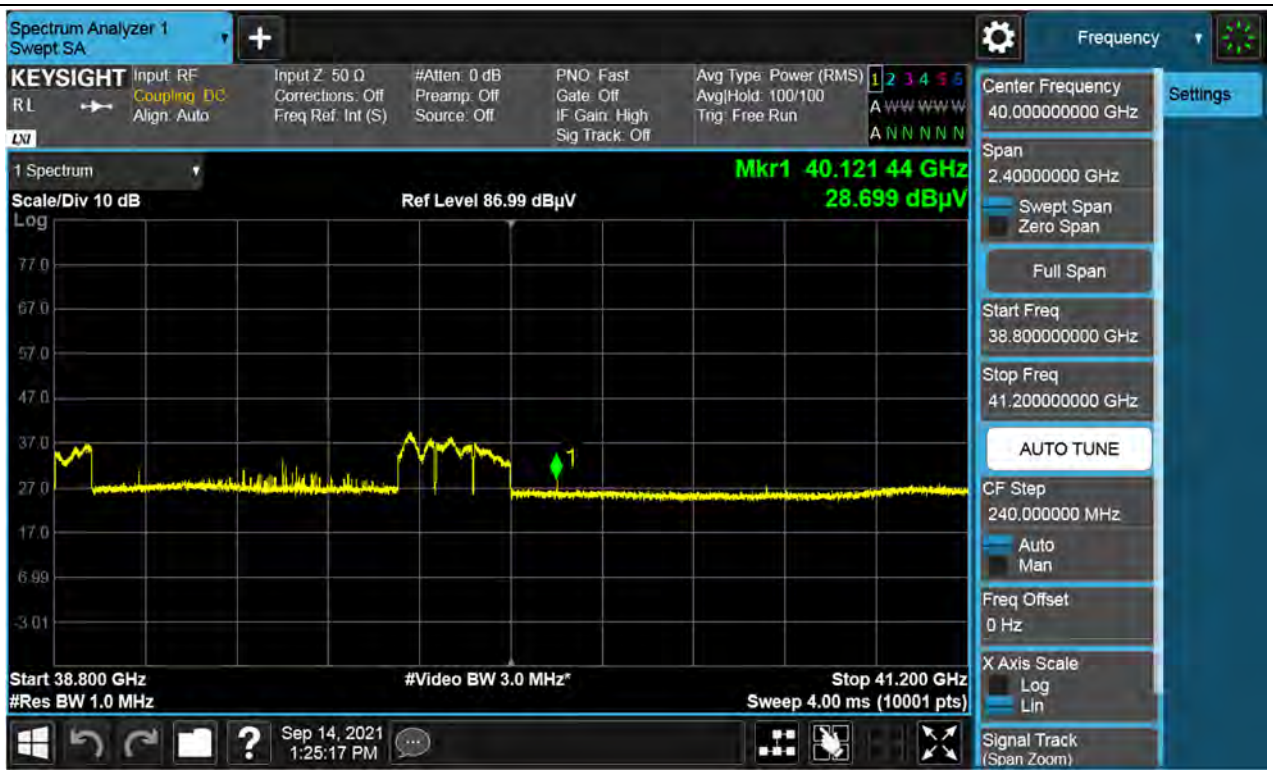
MAX Ant. A Position / 1+3cc / Low / 64QMA / Ant. B



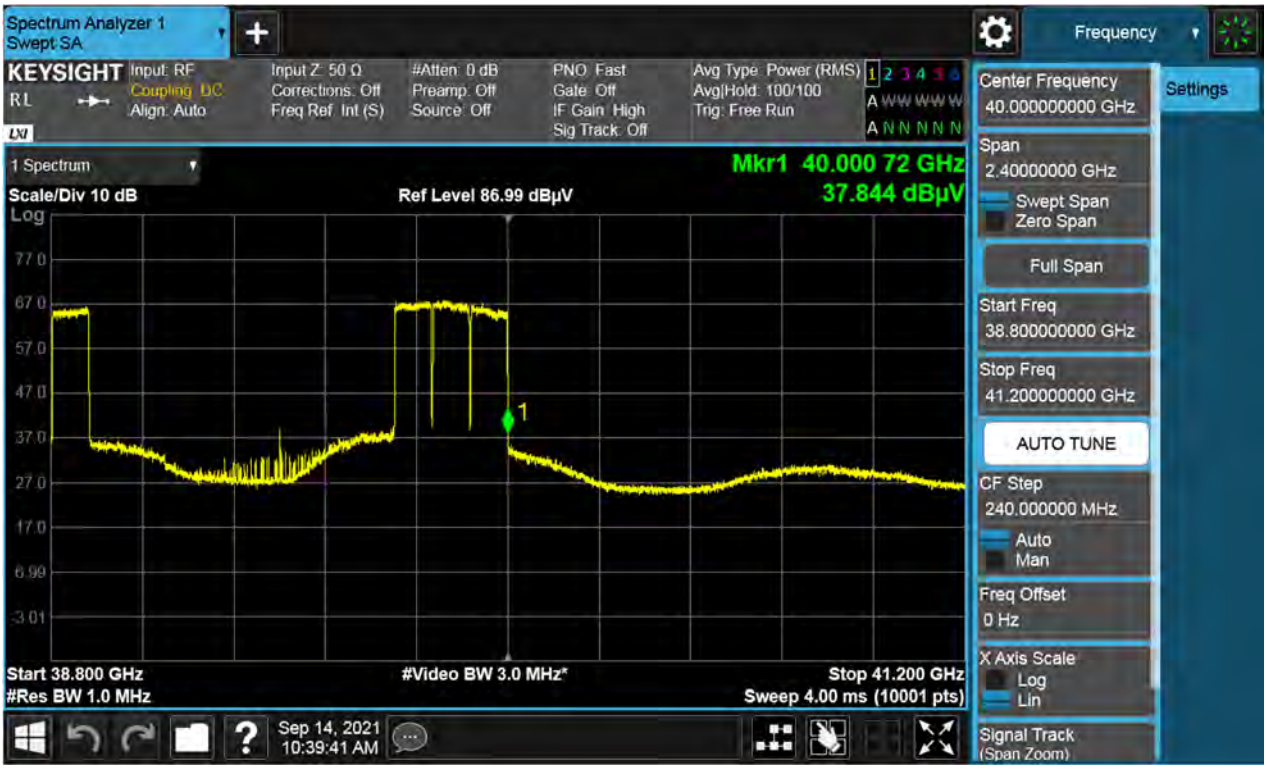
MAX Ant. A Position / 1+3cc / High / QPSK / Ant. A



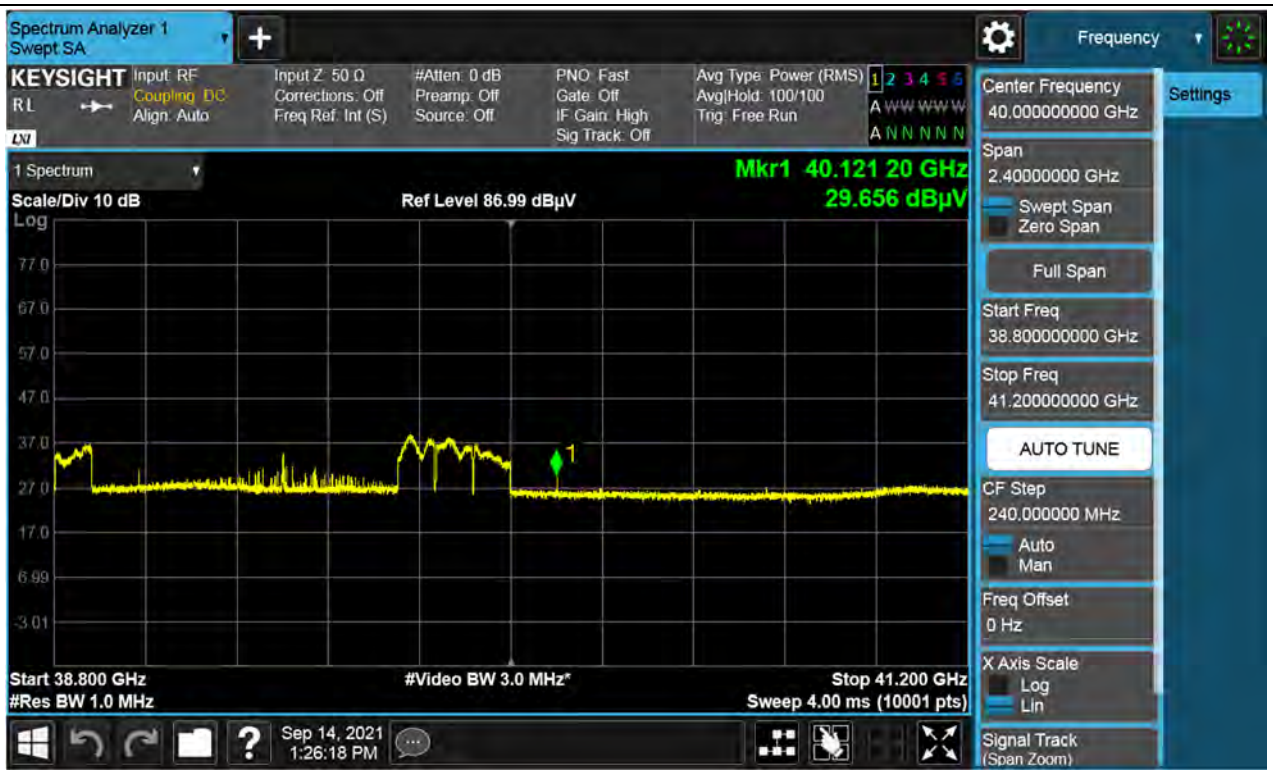
MAX Ant. A Position / 1+3cc / High / QPSK / Ant. B



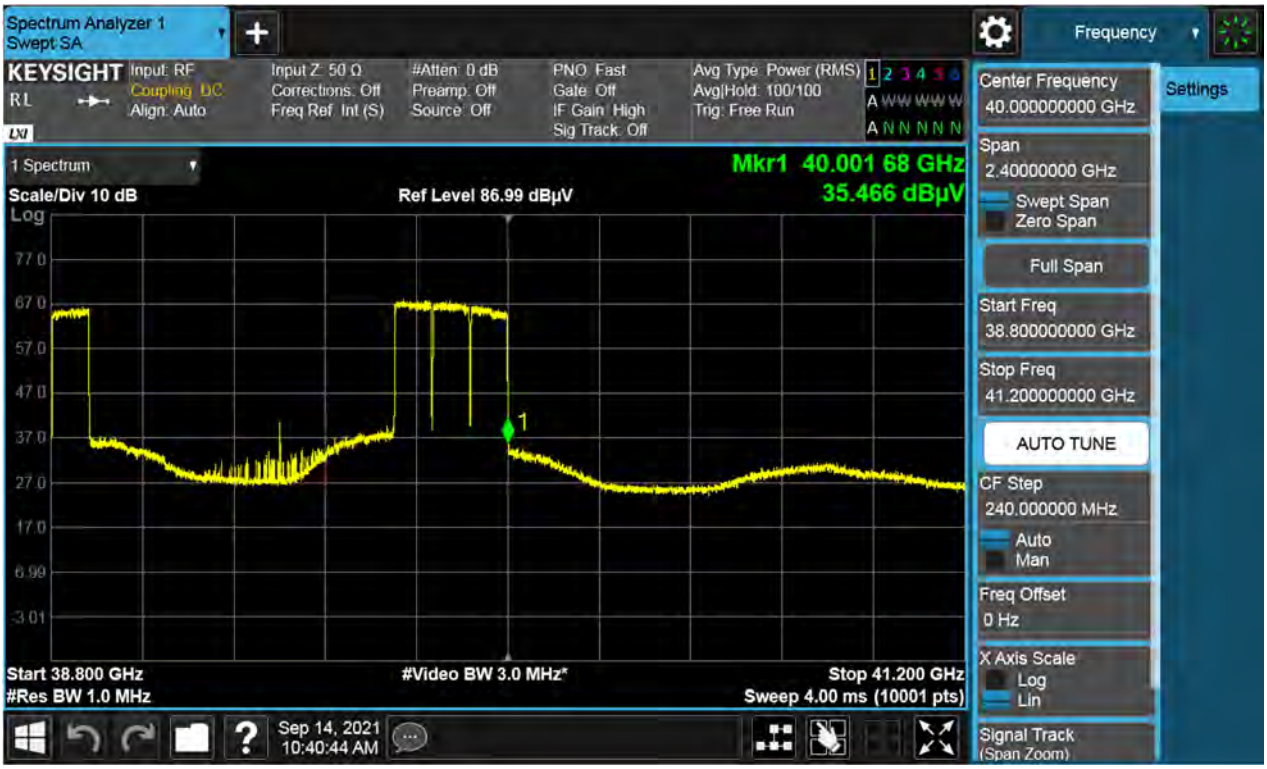
MAX Ant. A Position / 1+3cc / High / 16QAM / Ant. A



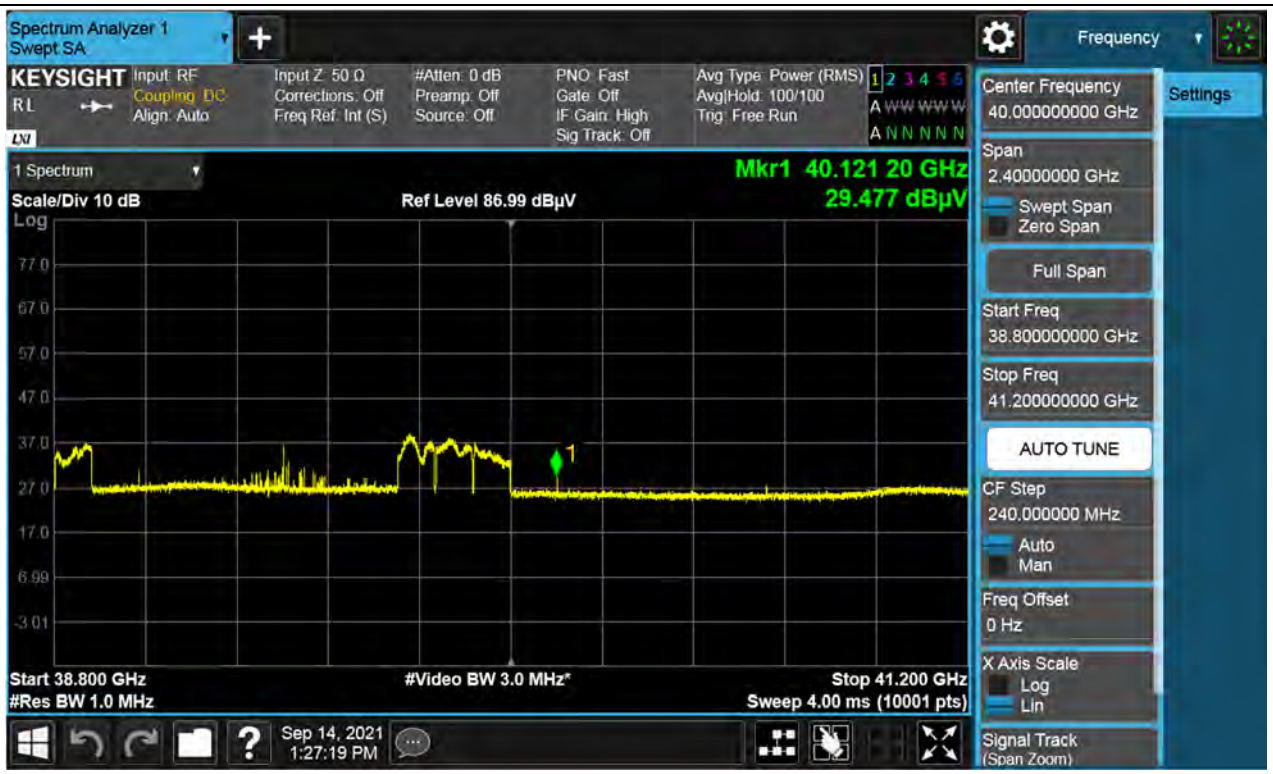
MAX Ant. A Position / 1+3cc / High / 16QAM / Ant. B



MAX Ant. A Position / 1+3cc / High / 64QAM / Ant. A

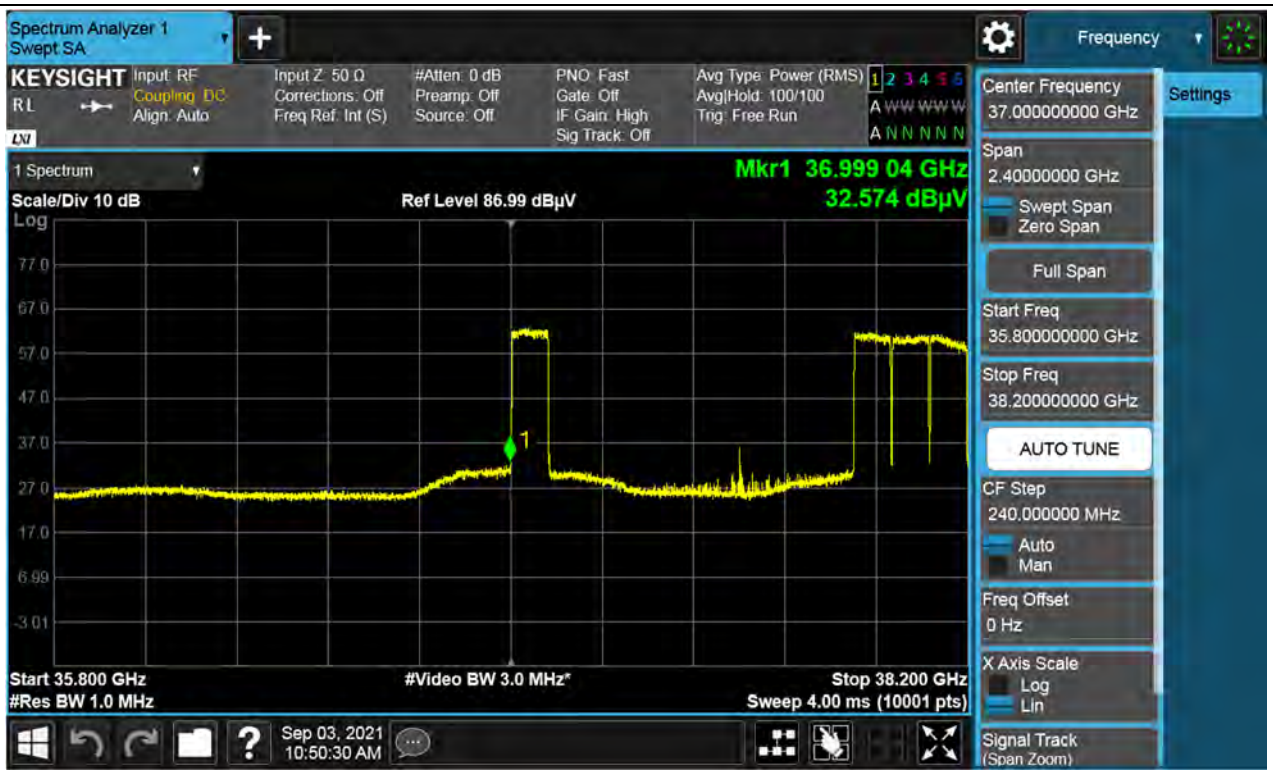


MAX Ant. A Position / 1+3cc / High / 64QAM / Ant. B



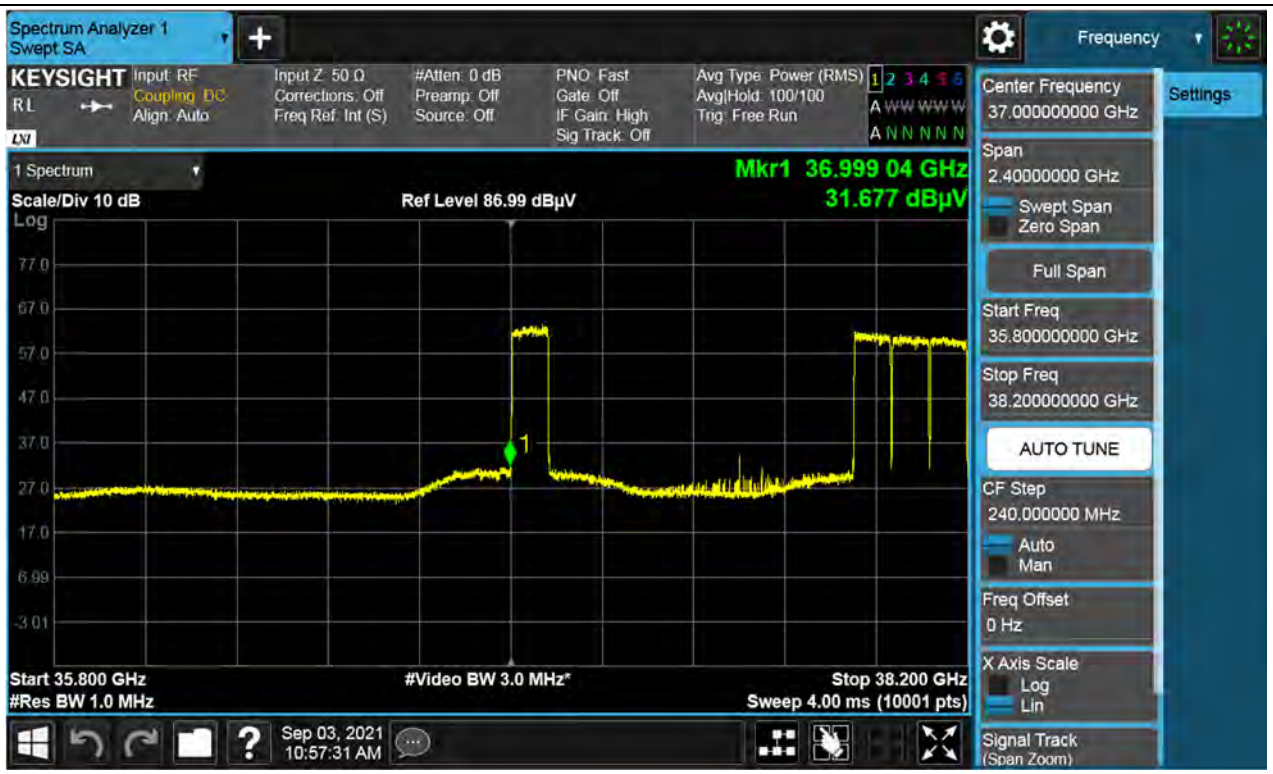
MAX Ant. B Position / 1+3cc / Low / QPSK / Ant. A

MAX Ant. B Position / 1+3cc / Low / QPSK / Ant. B



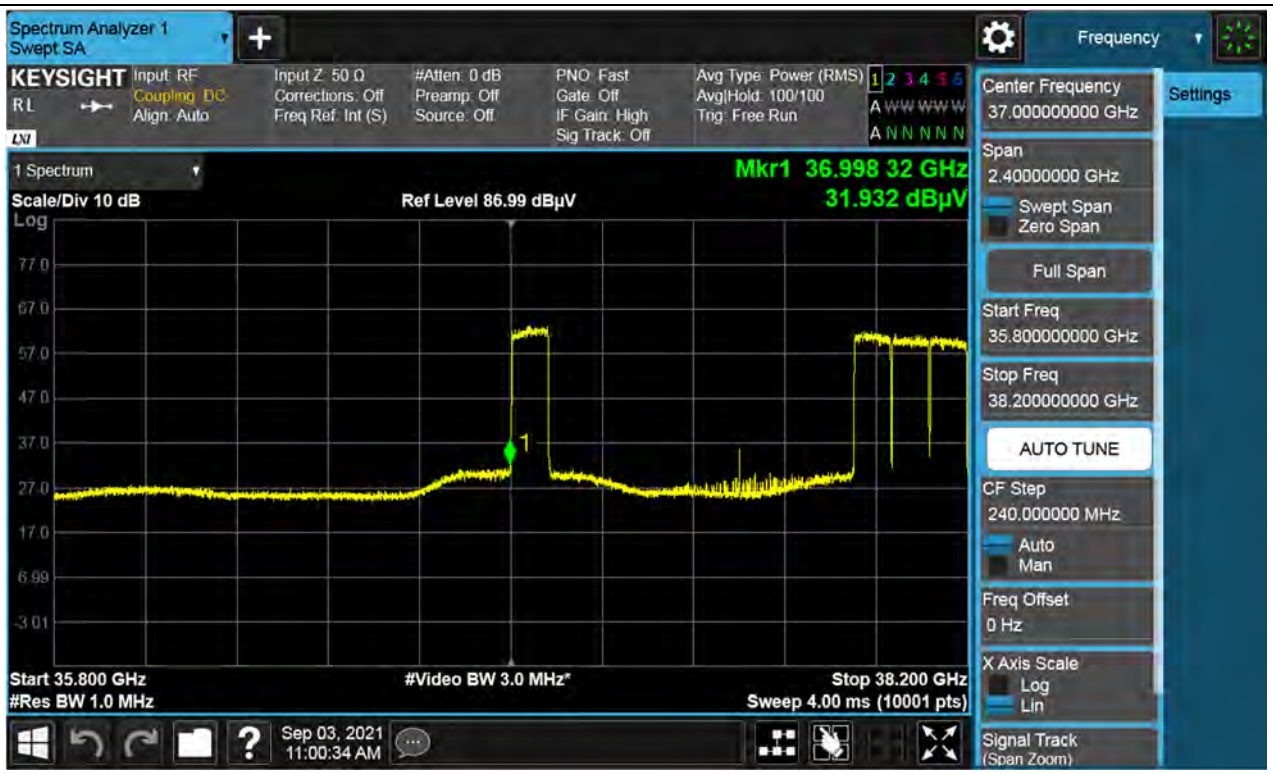
MAX Ant. B Position / 1+3cc / Low / 16QAM / Ant. A

MAX Ant. B Position / 1+3cc / Low / 16QAM / Ant. B

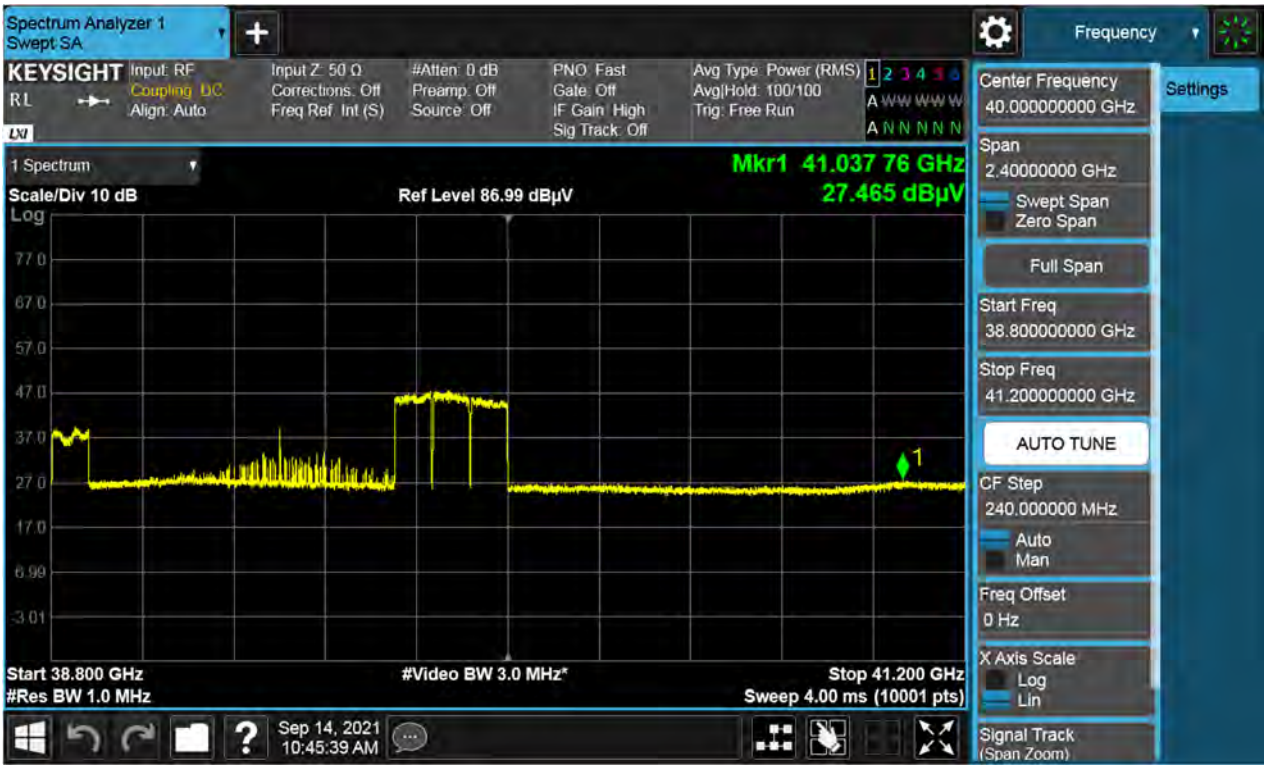


MAX Ant. B Position / 1+3cc / Low / 64QAM / Ant. A

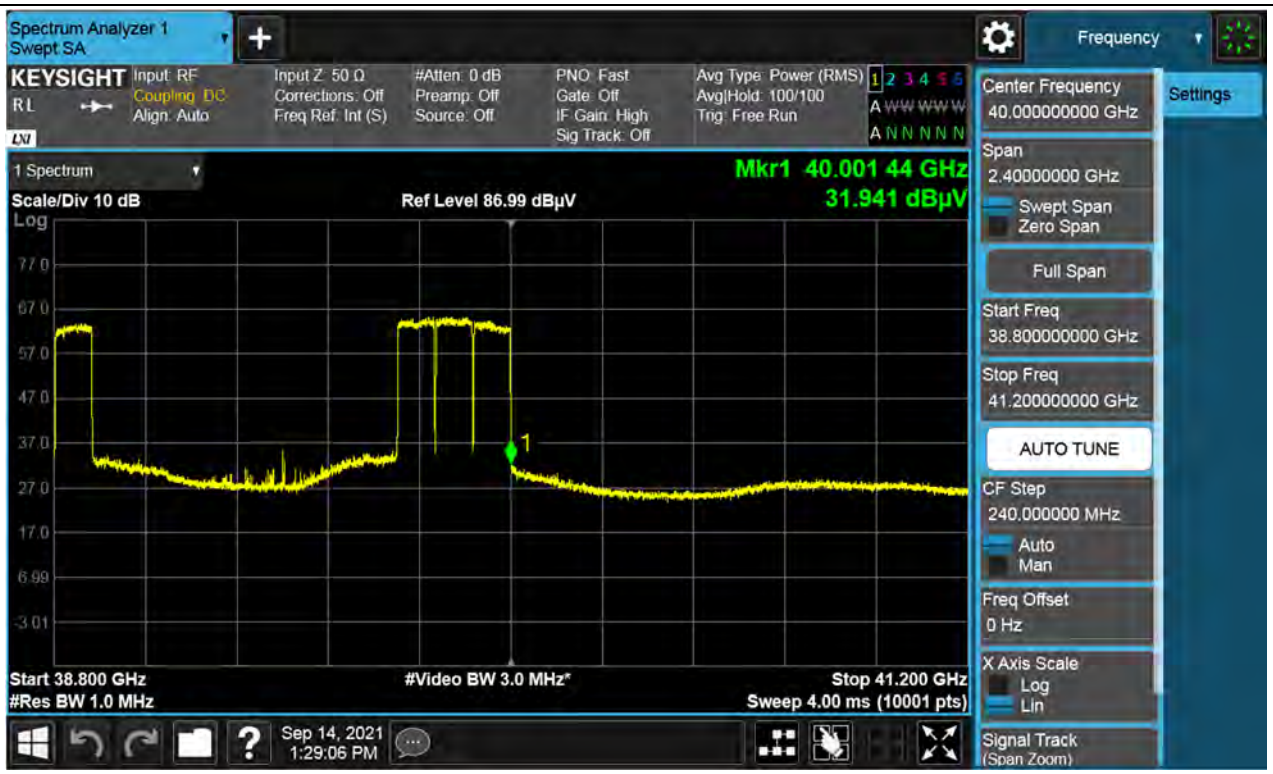
MAX Ant. B Position / 1+3cc / Low / 64QAM / Ant. B



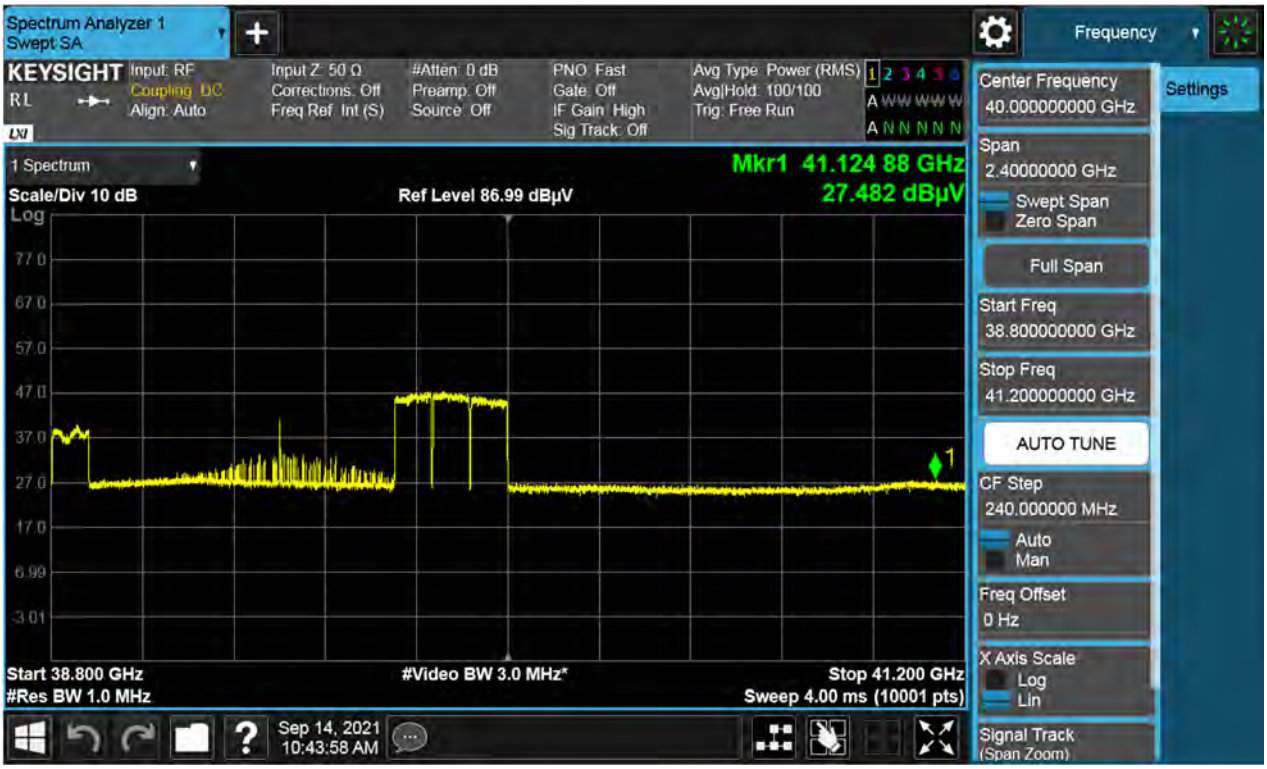
MAX Ant. B Position / 1+3cc / High / QPSK / Ant. A



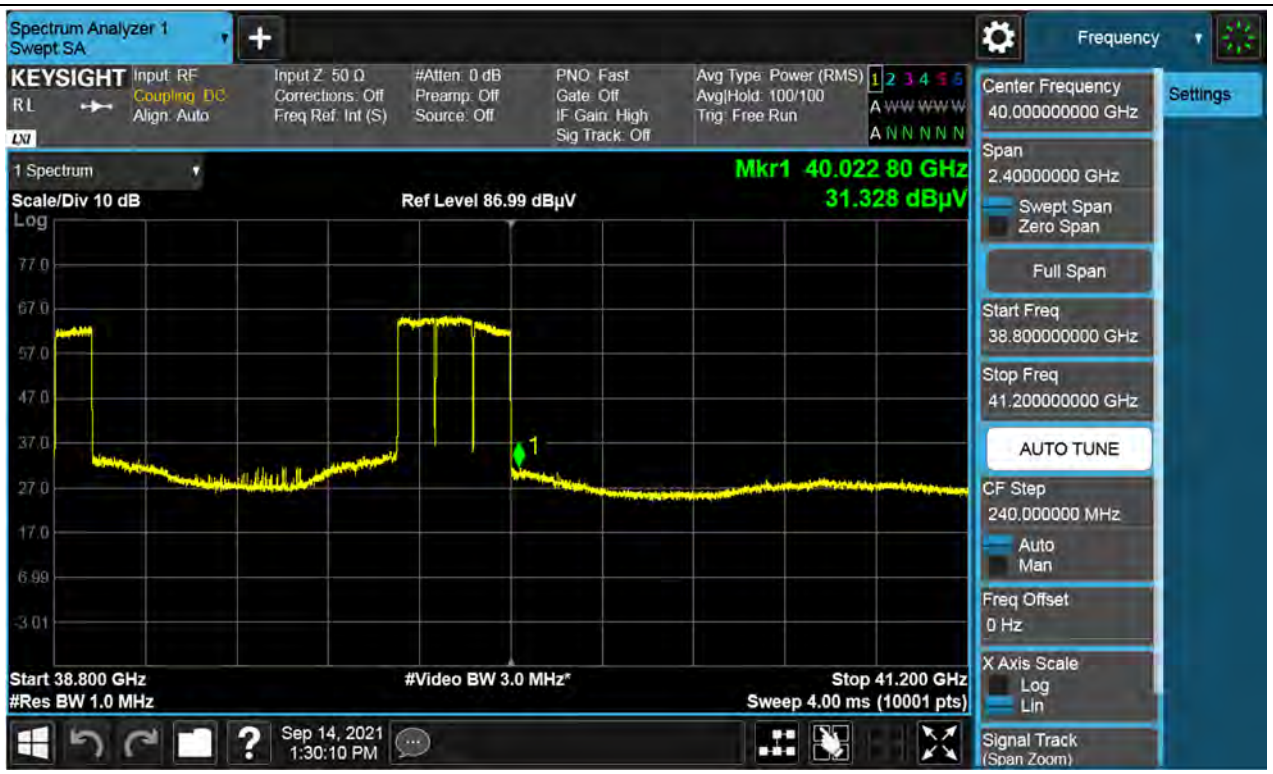
MAX Ant. B Position / 1+3cc / High / QPSK / Ant. B



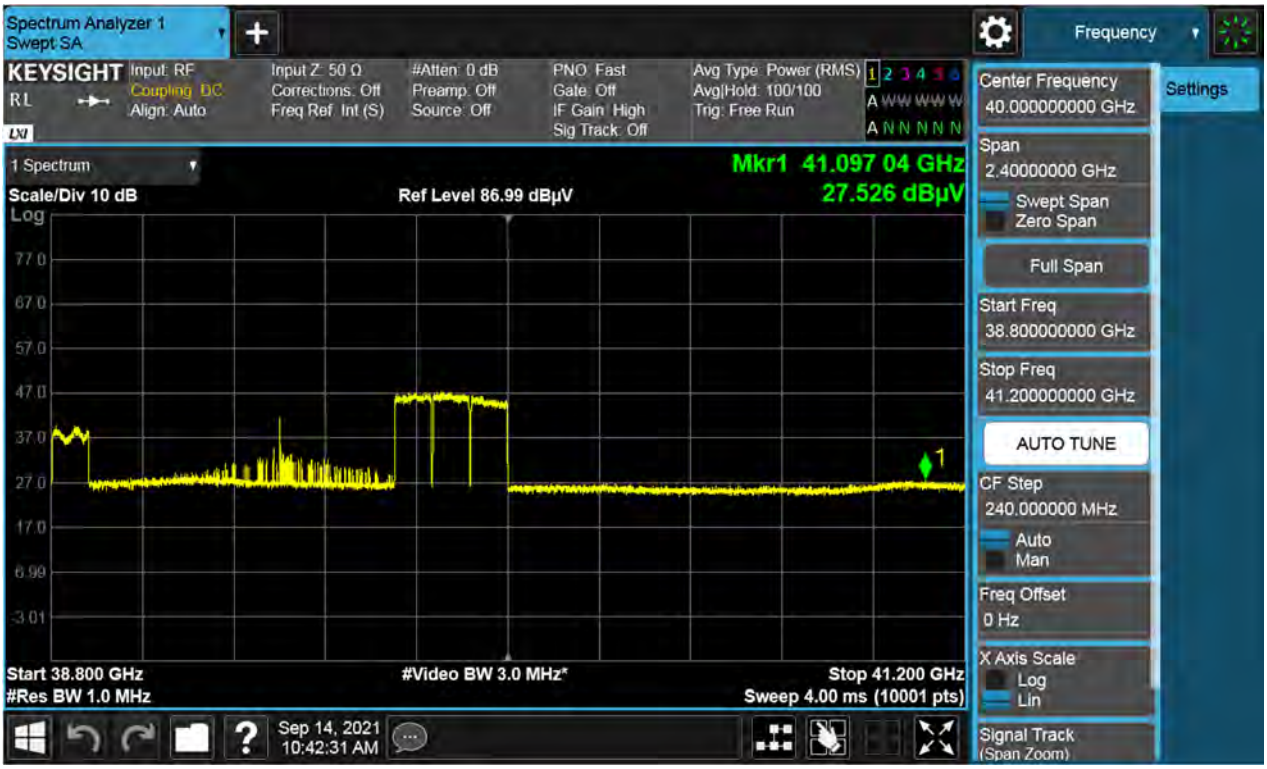
MAX Ant. B Position / 1+3cc / High / 16QAM / Ant. A



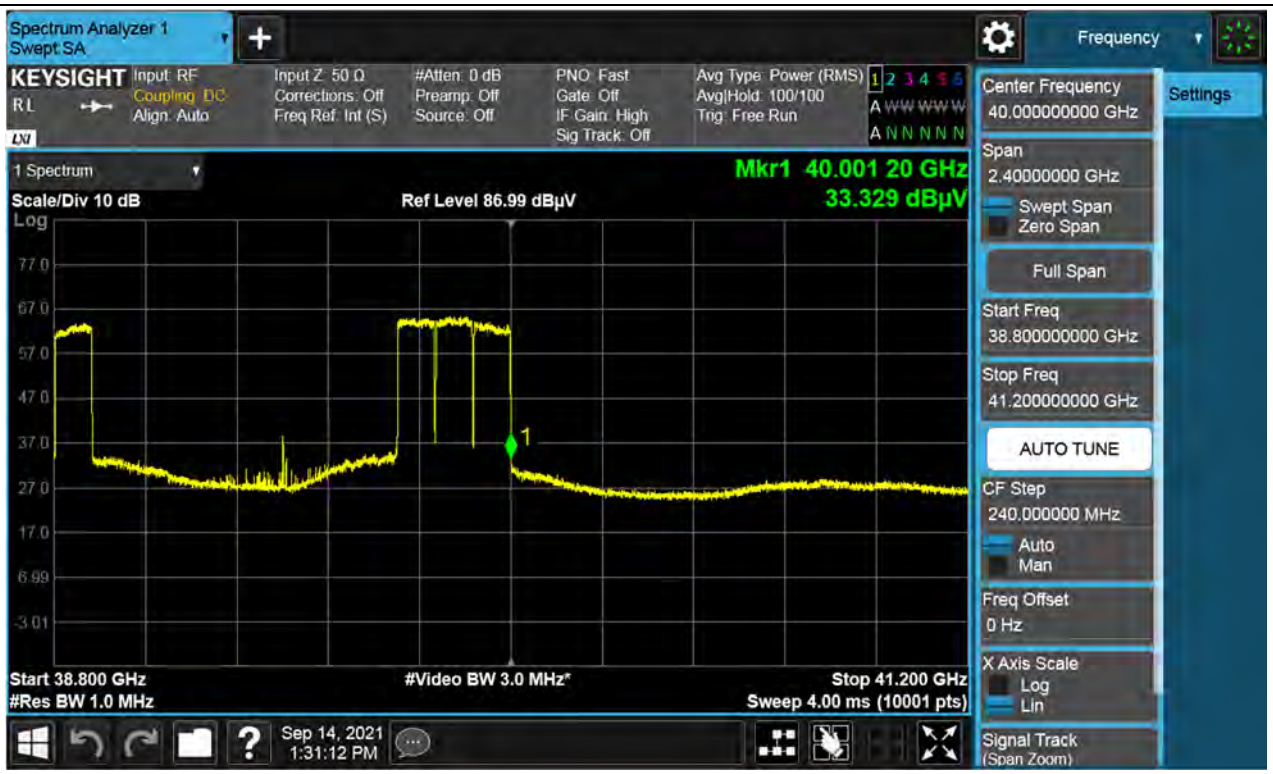
MAX Ant. B Position / 1+3cc / High / 16QAM / Ant. B



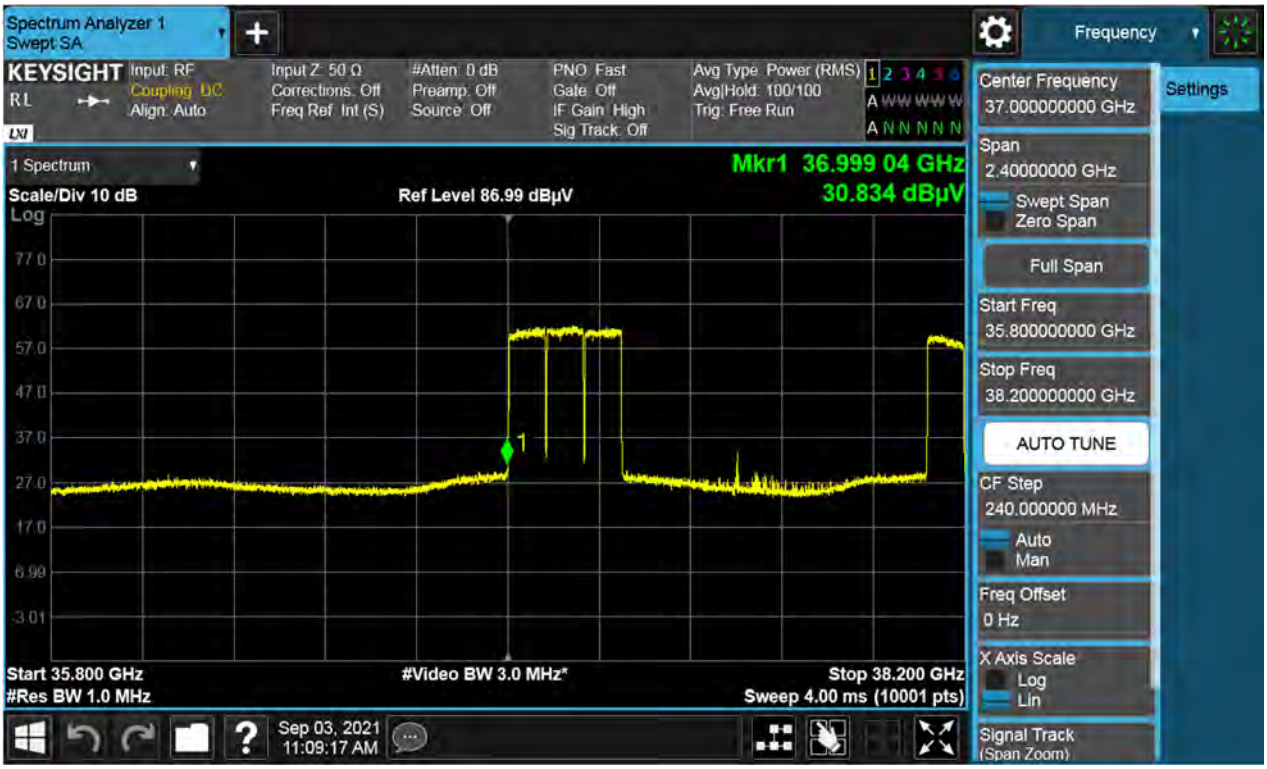
MAX Ant. B Position / 1+3cc / High / 64QAM / Ant. A



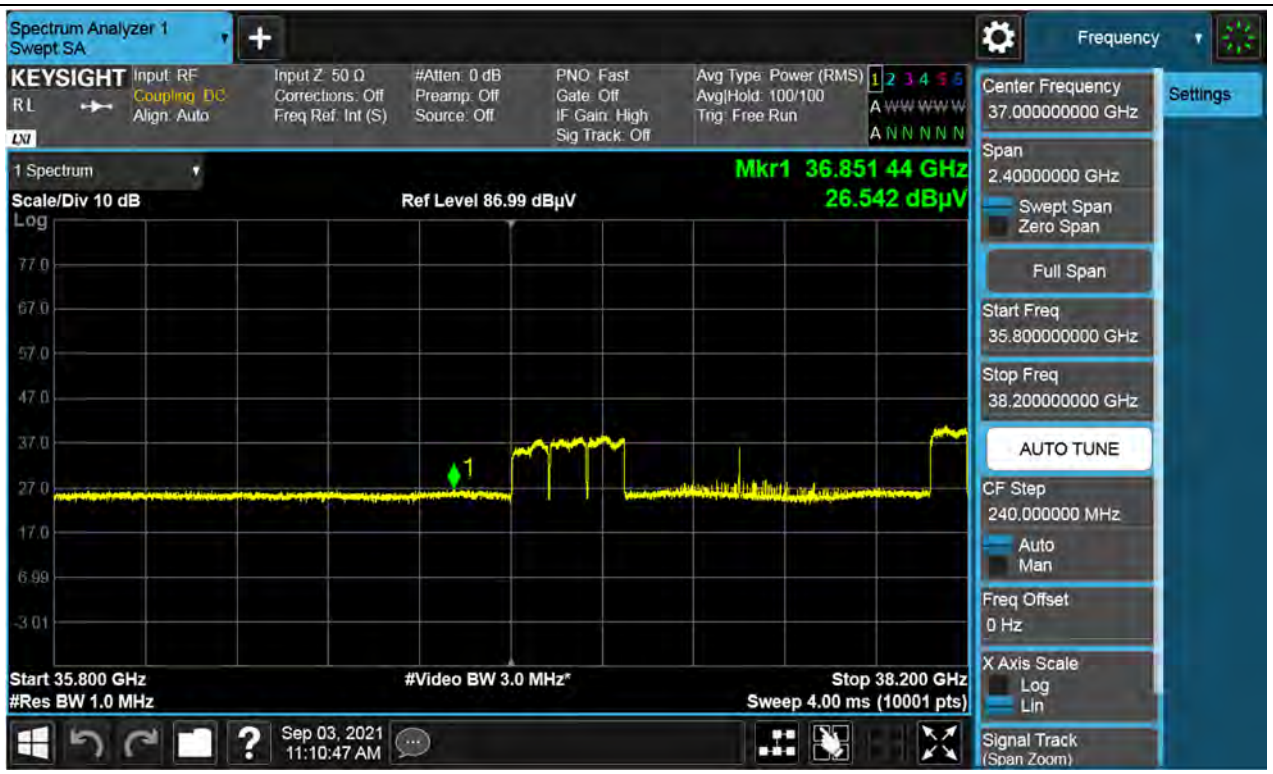
MAX Ant. B Position / 1+3cc / High / 64QAM / Ant. B



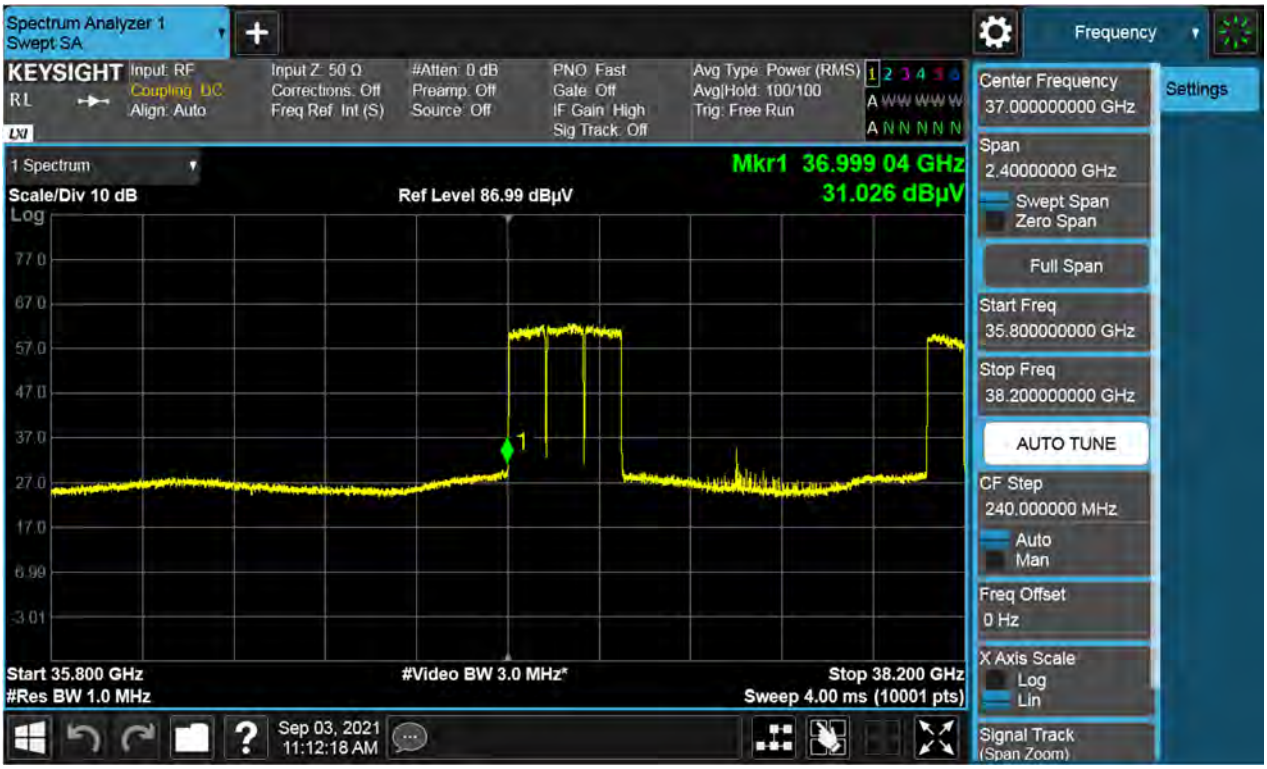
MAX Ant. A Position / 3+1cc / Low / QPSK / Ant. A



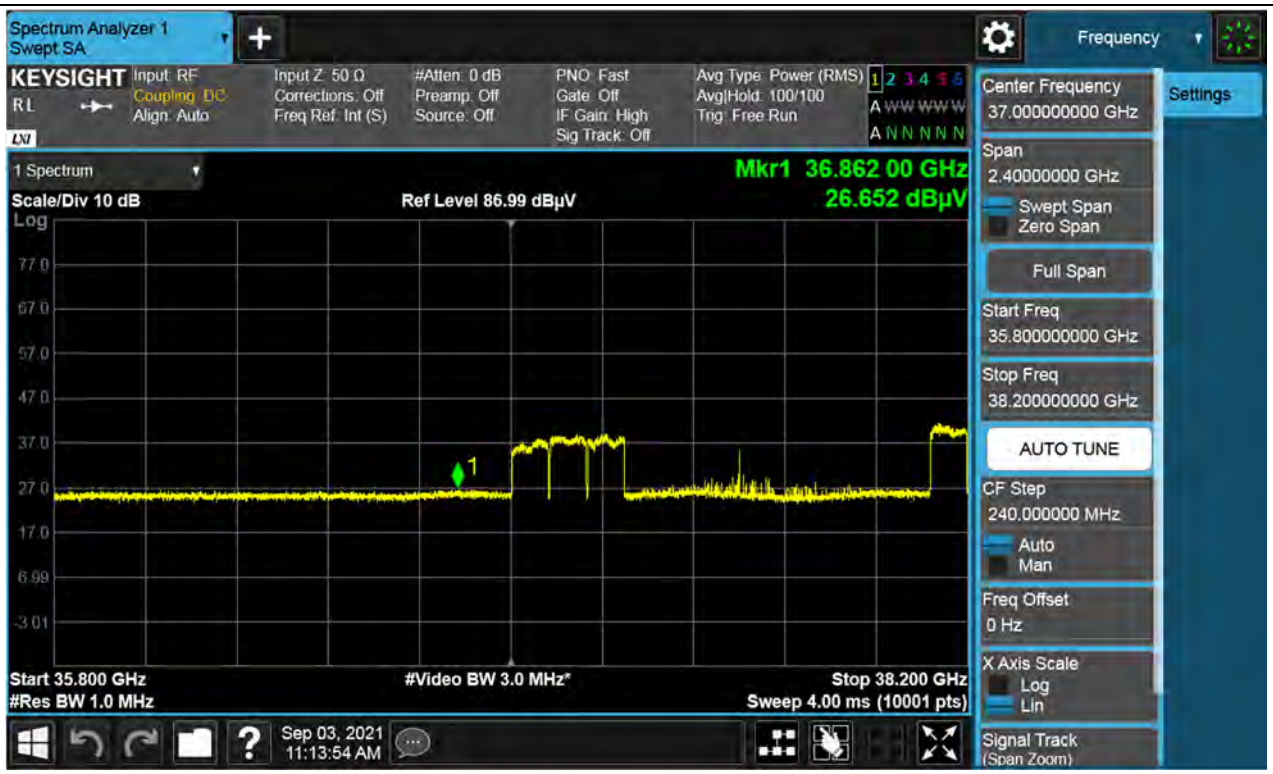
MAX Ant. A Position / 3+1cc / Low / QPSK / Ant. B



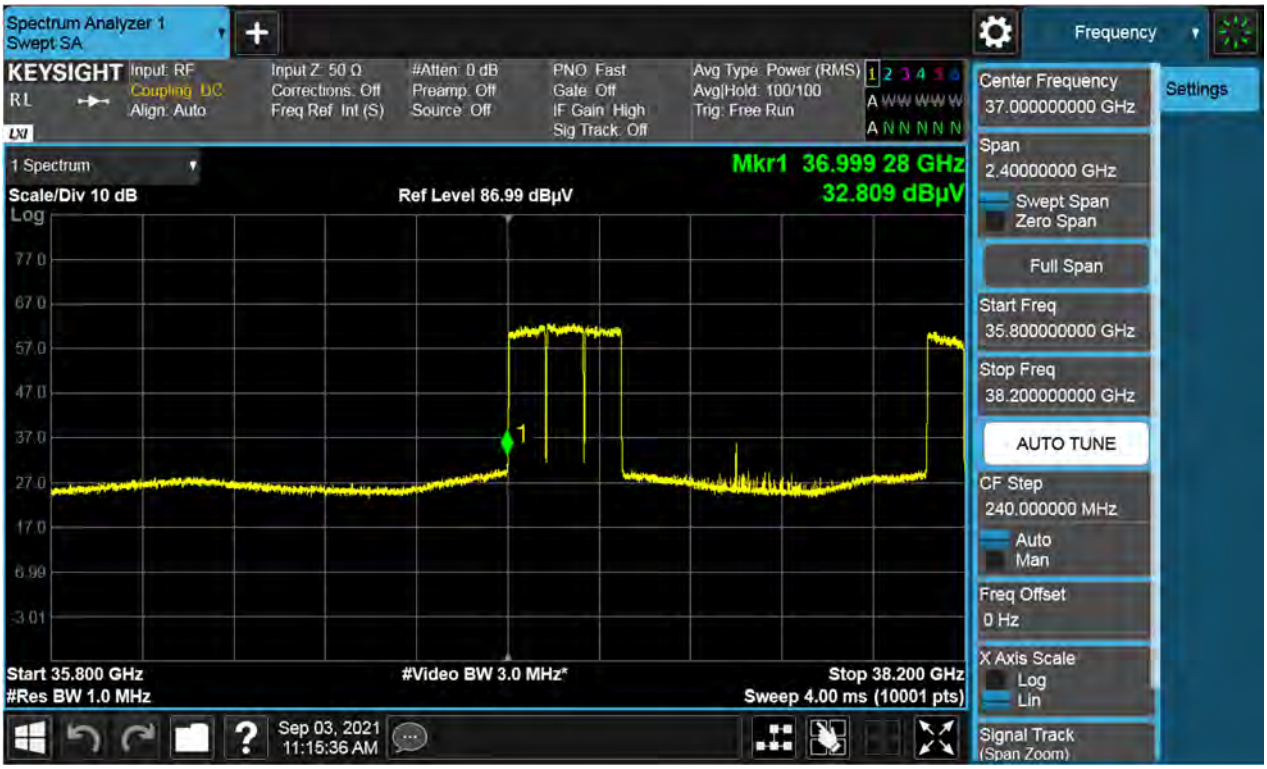
MAX Ant. A Position / 3+1cc / Low / 16QAM / Ant. A



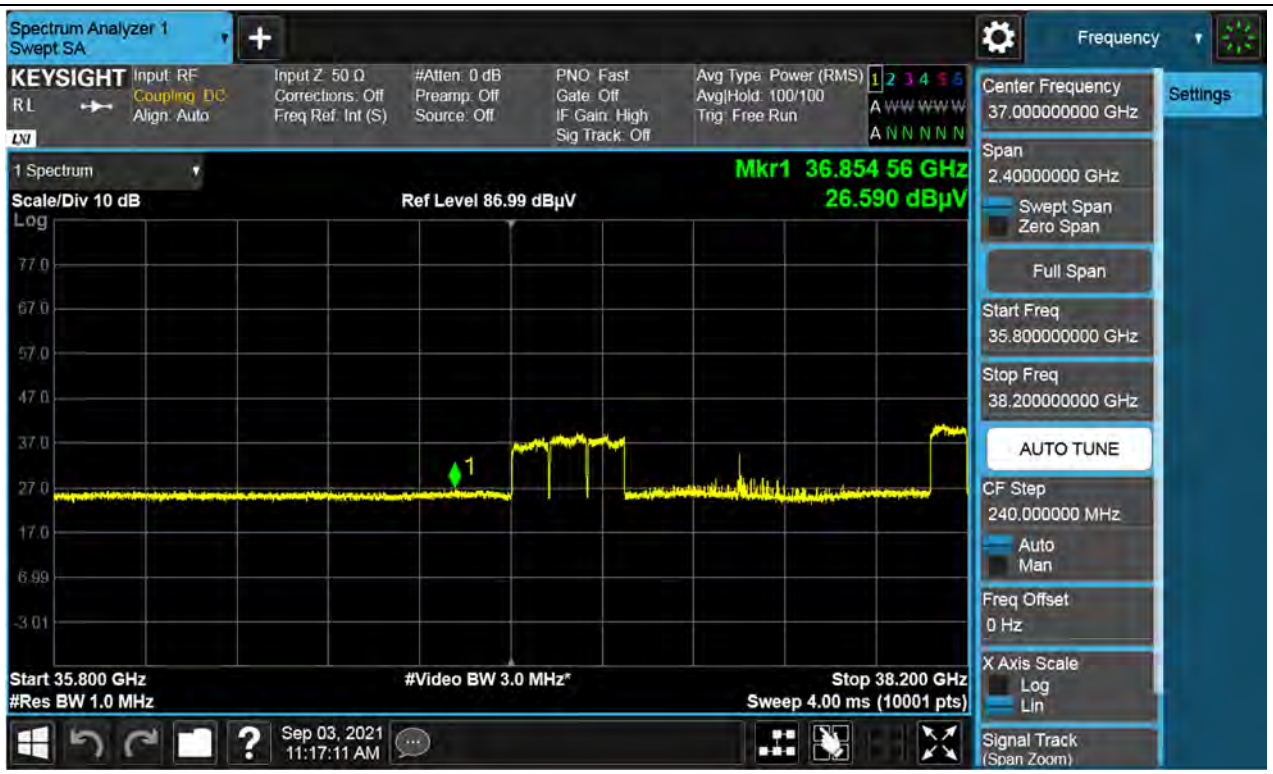
MAX Ant. A Position / 3+1cc / Low / 16QAM / Ant. B



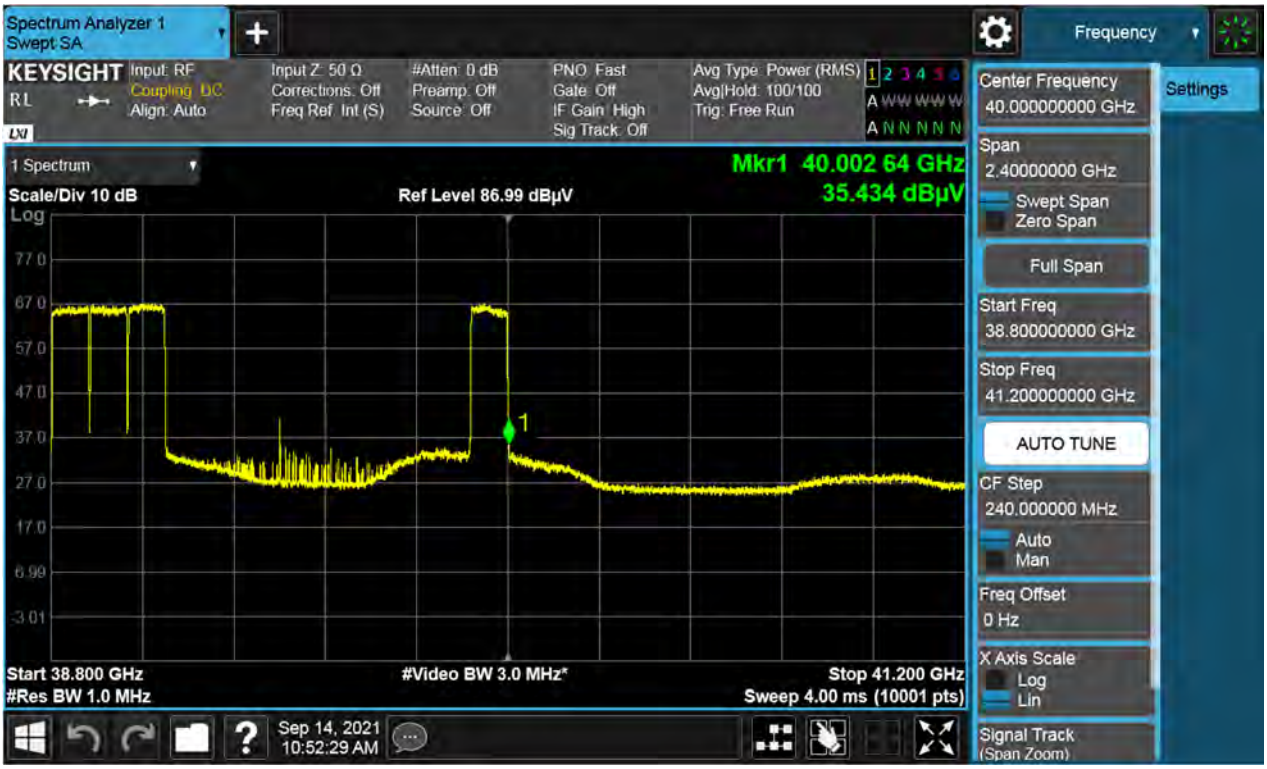
MAX Ant. A Position / 3+1cc / Low / 64QAM / Ant. A



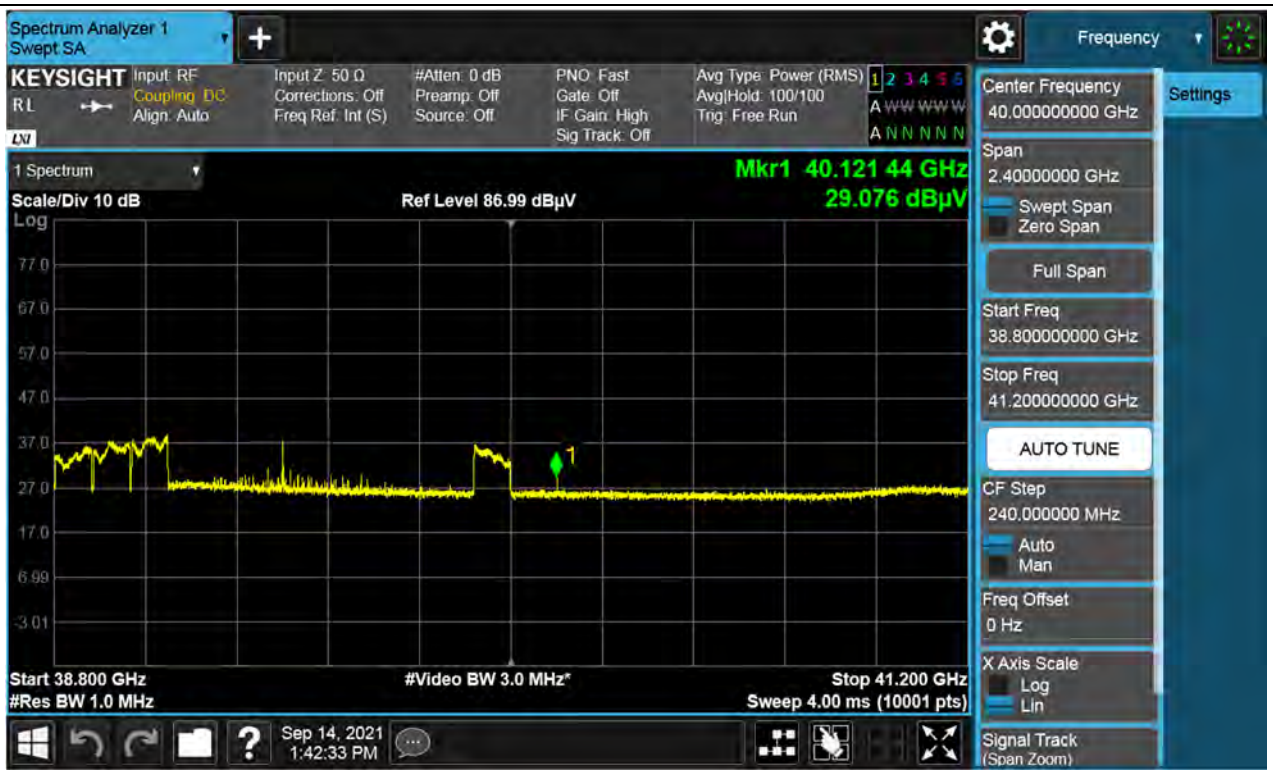
MAX Ant. A Position / 3+1cc / Low / 64QAM / Ant. B



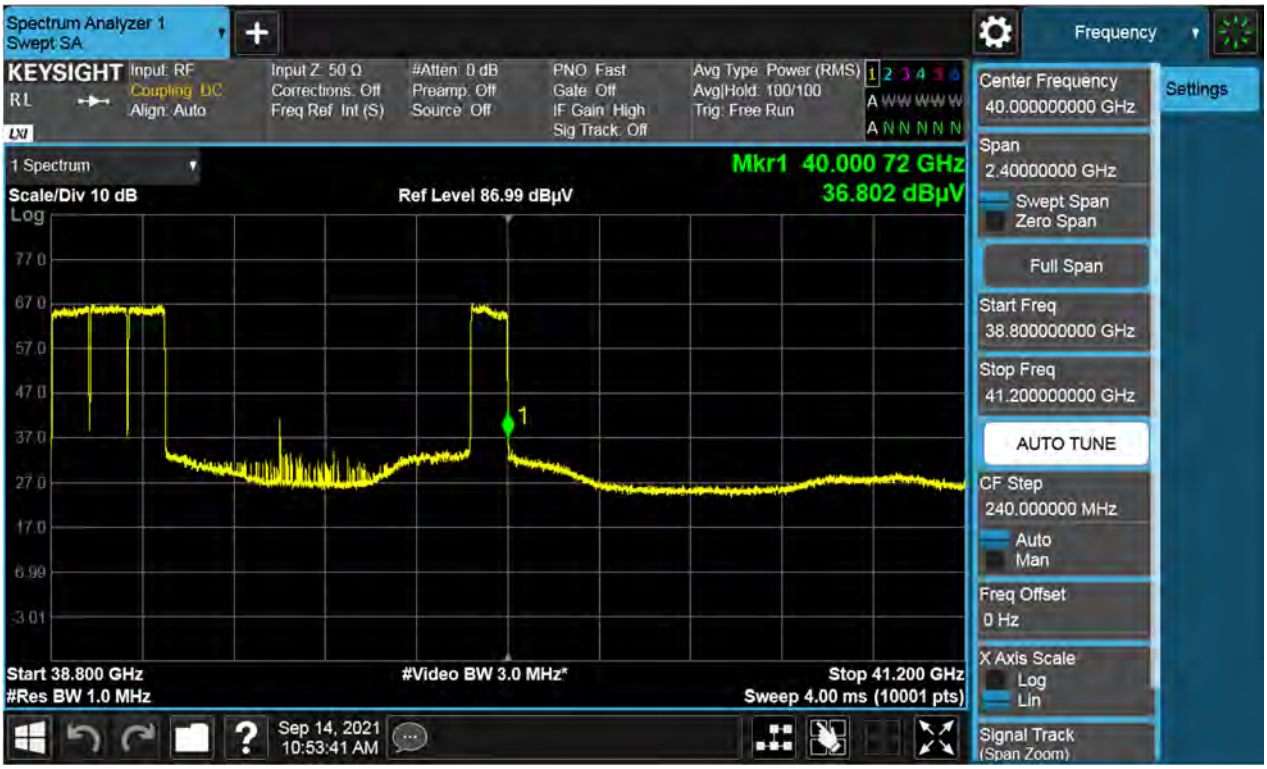
MAX Ant. A Position / 3+1cc / High / QPSK / Ant. A



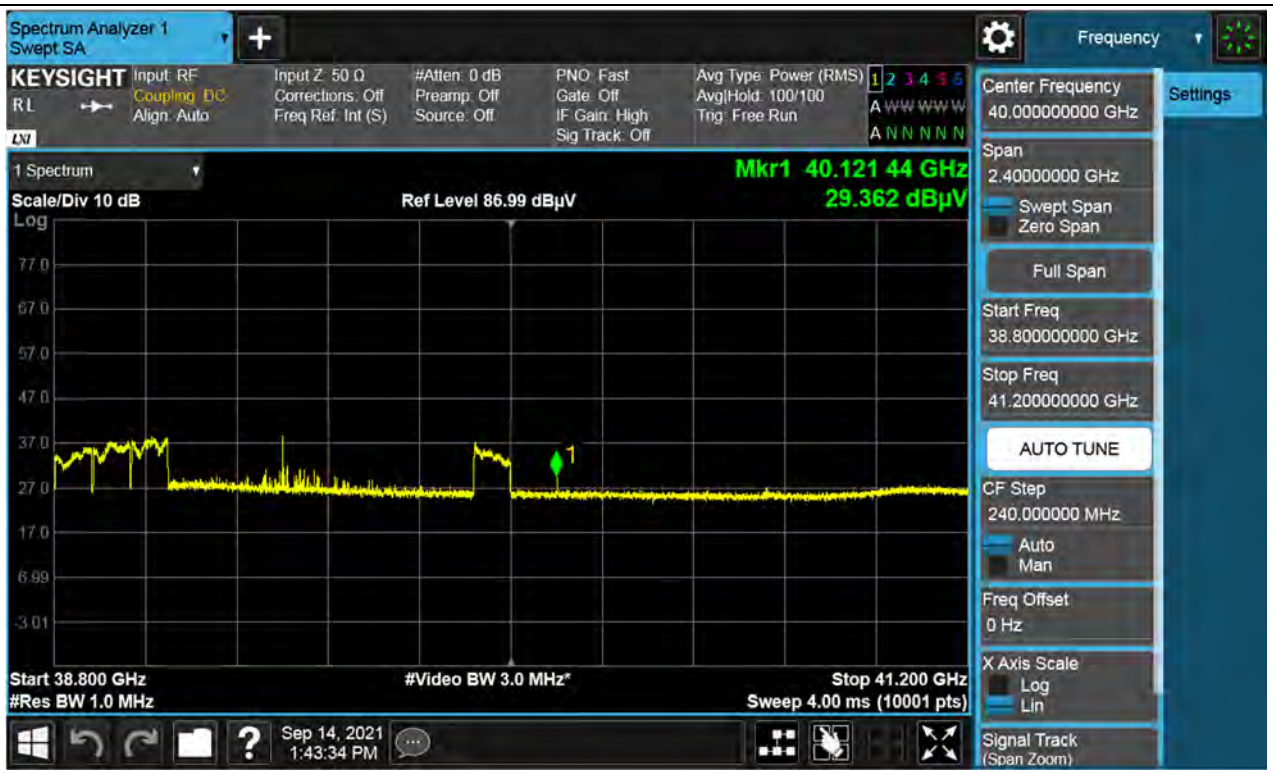
MAX Ant. A Position / 3+1cc / High / QPSK / Ant. B



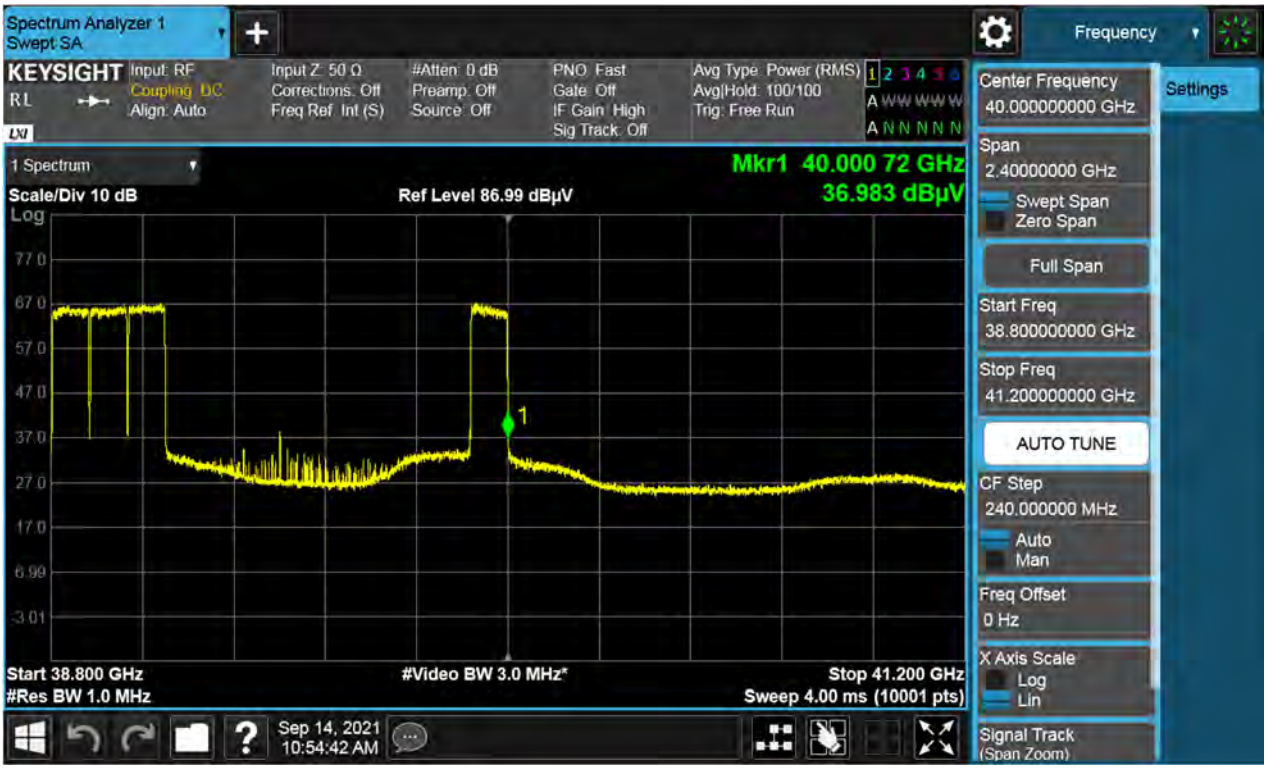
MAX Ant. A Position / 3+1cc / High / 16QAM / Ant. A



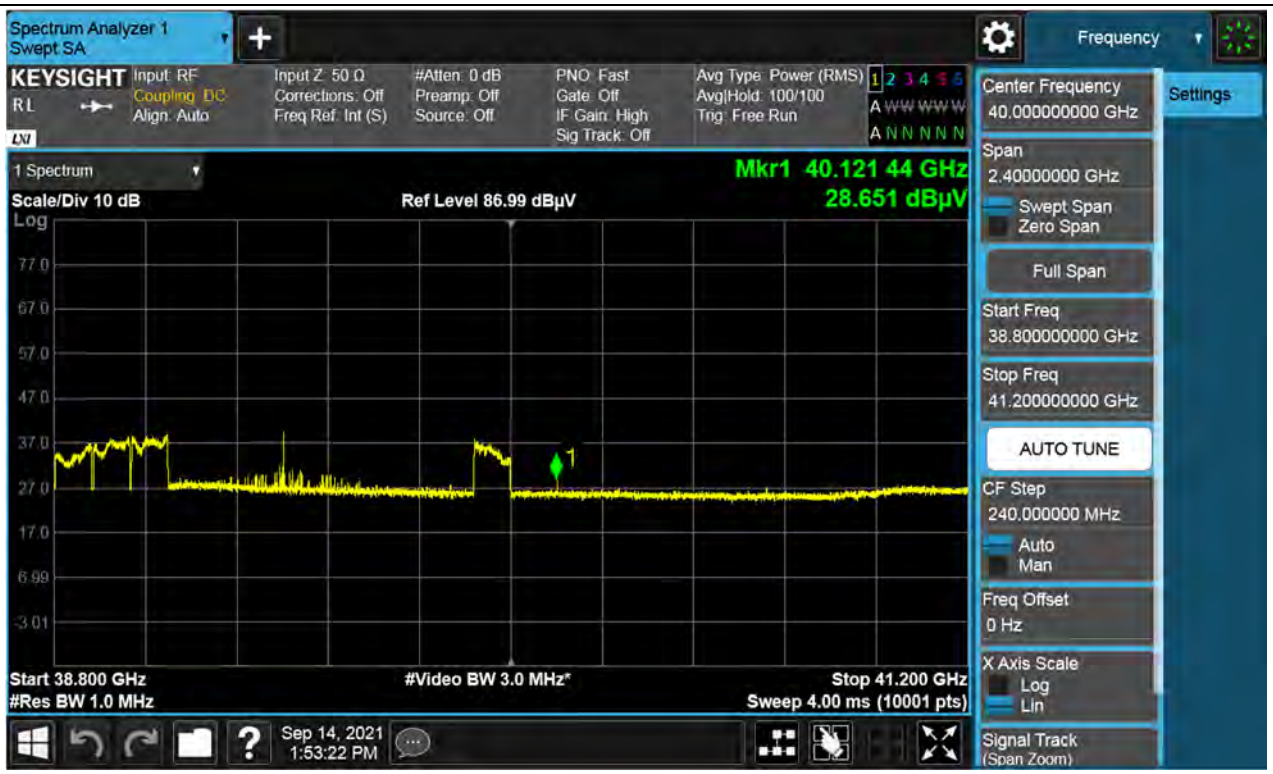
MAX Ant. A Position / 3+1cc / High / 16QAM / Ant. B



MAX Ant. A Position / 3+1cc / High / 64QAM / Ant. A

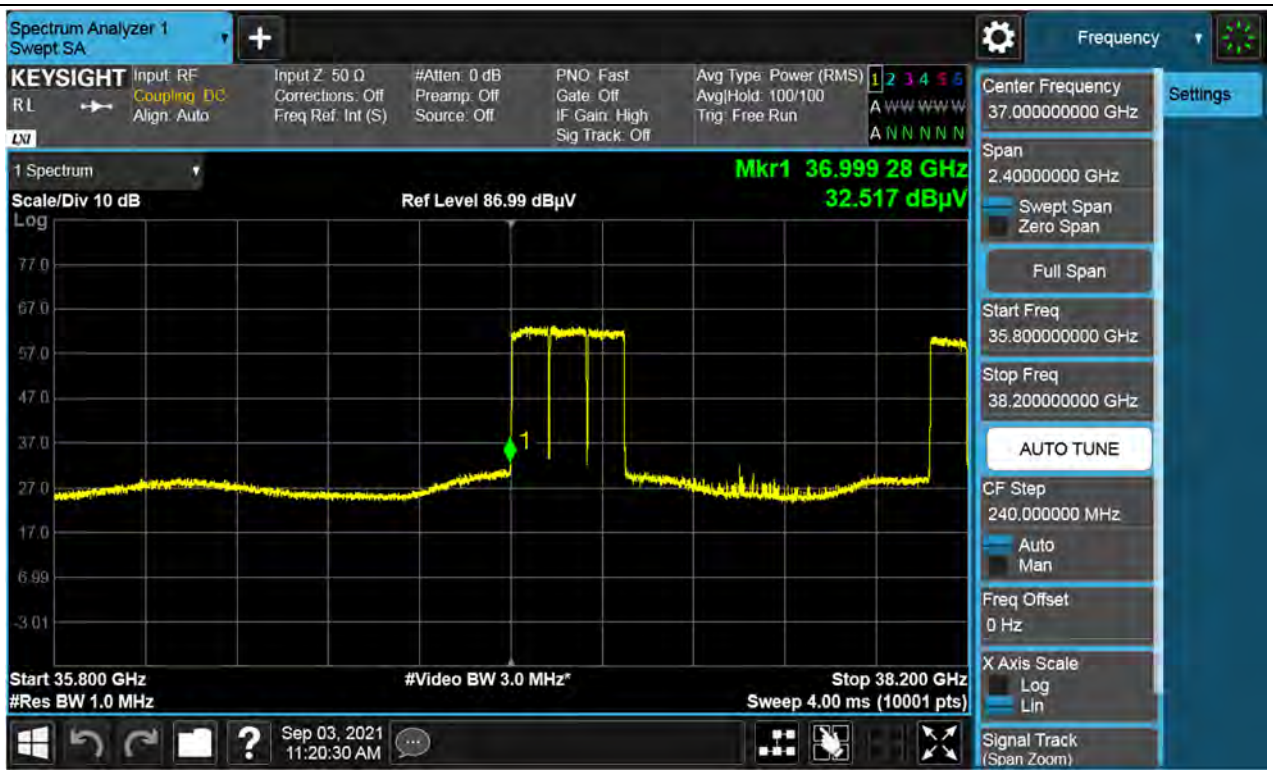


MAX Ant. A Position / 3+1cc / High / 64QAM / Ant. B

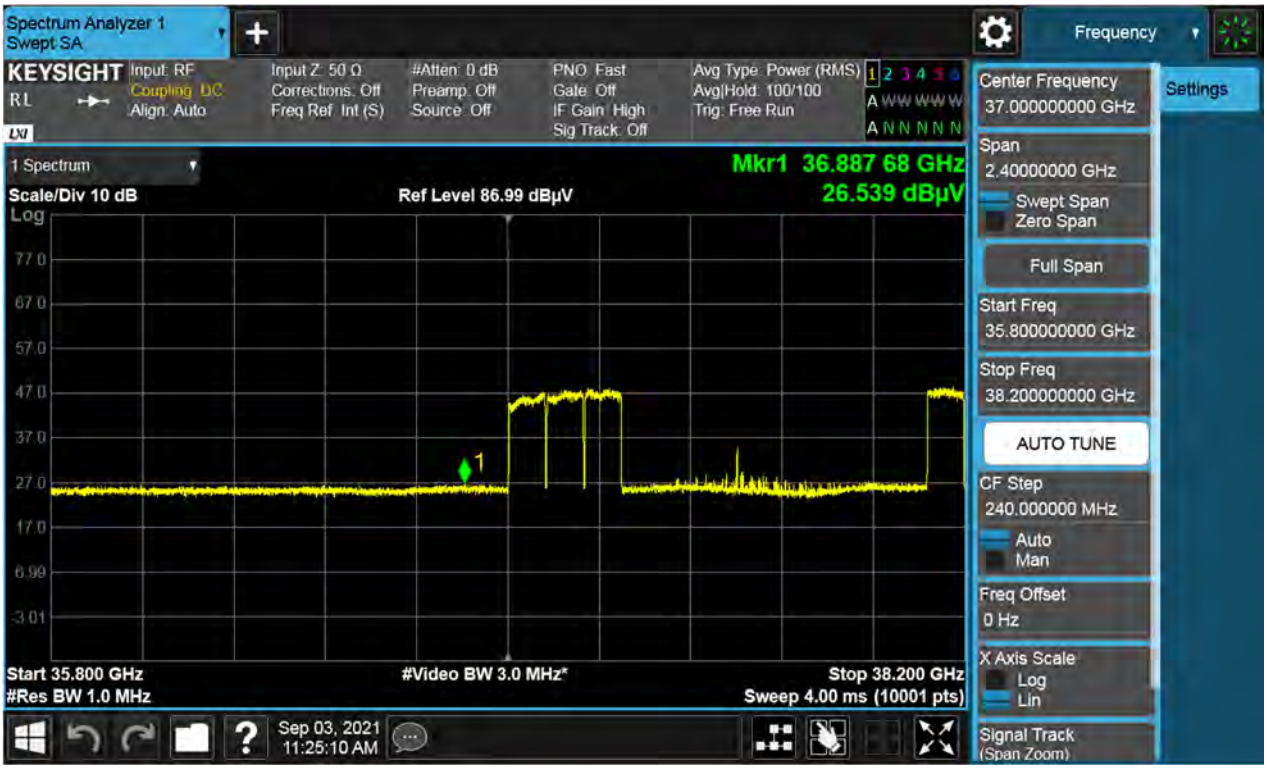


MAX Ant. B Position / 3+1cc / Low / QPSK / Ant. A

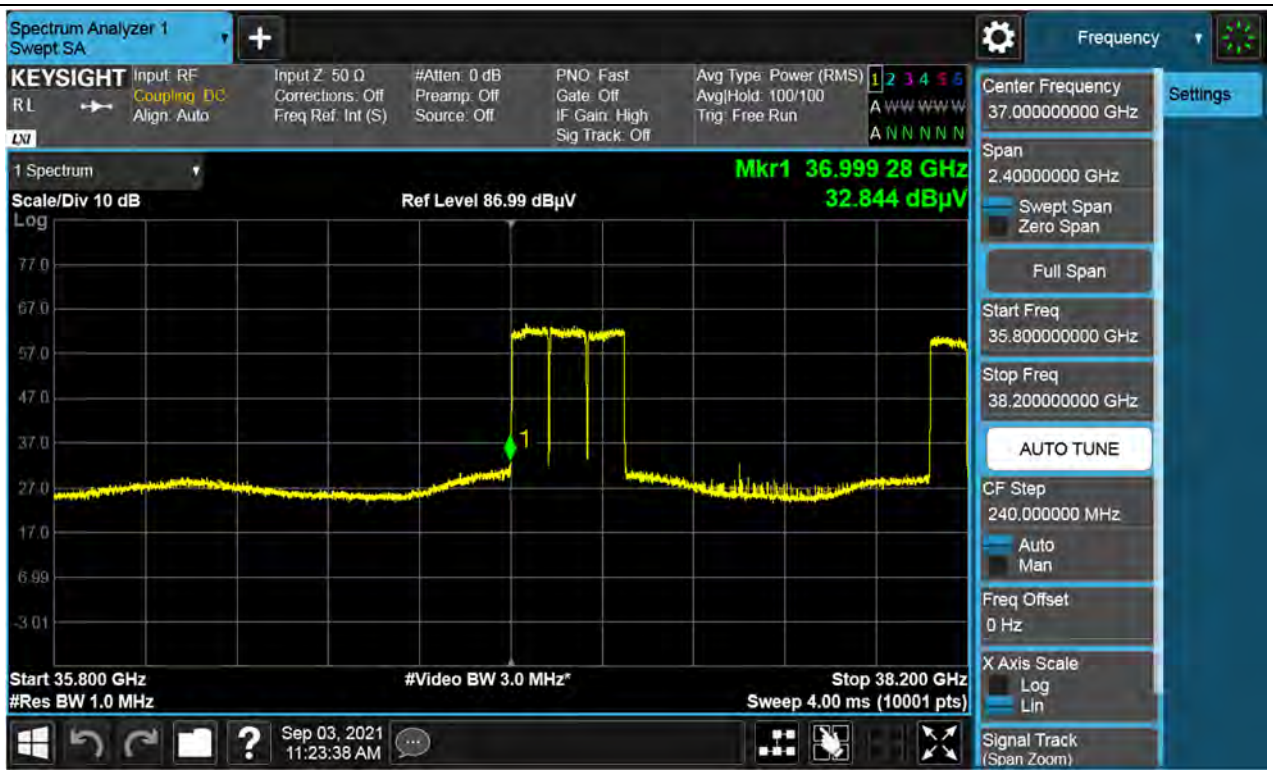
MAX Ant. B Position / 3+1cc / Low / QPSK / Ant. B



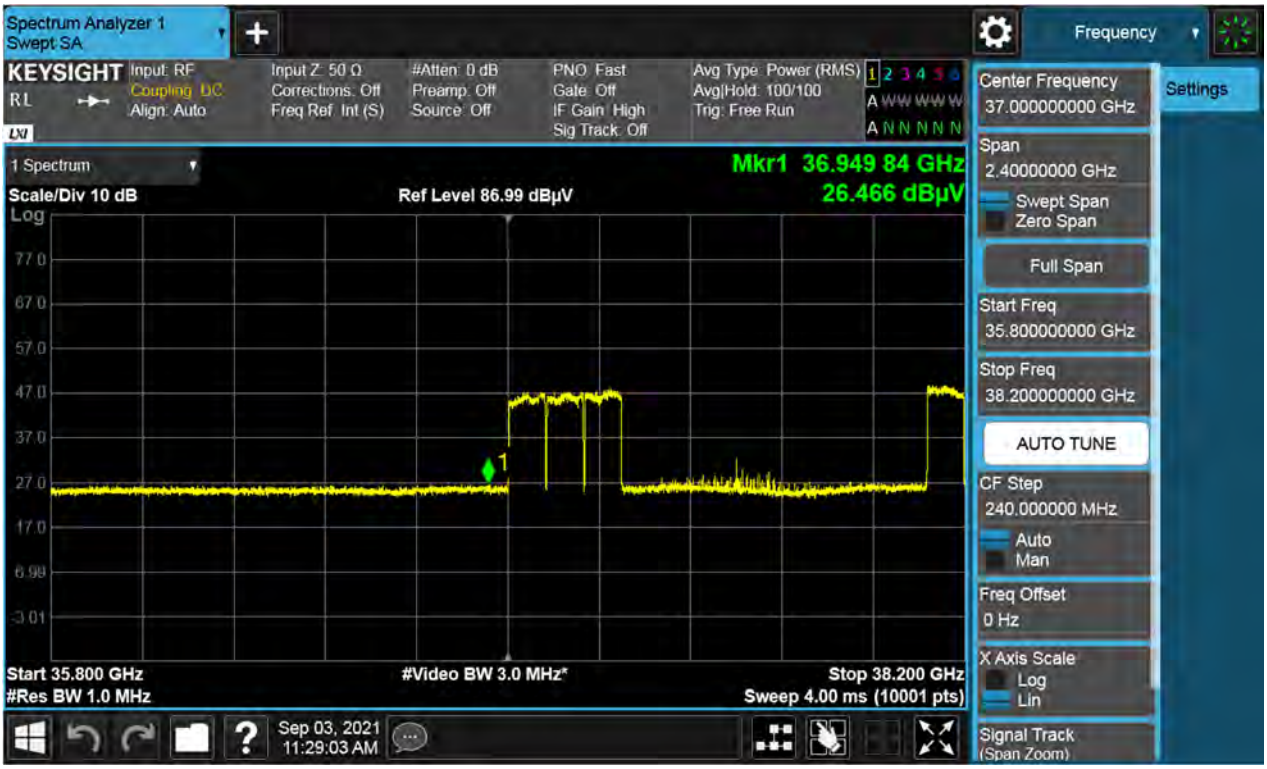
MAX Ant. B Position / 3+1cc / Low / 16QAM / Ant. A



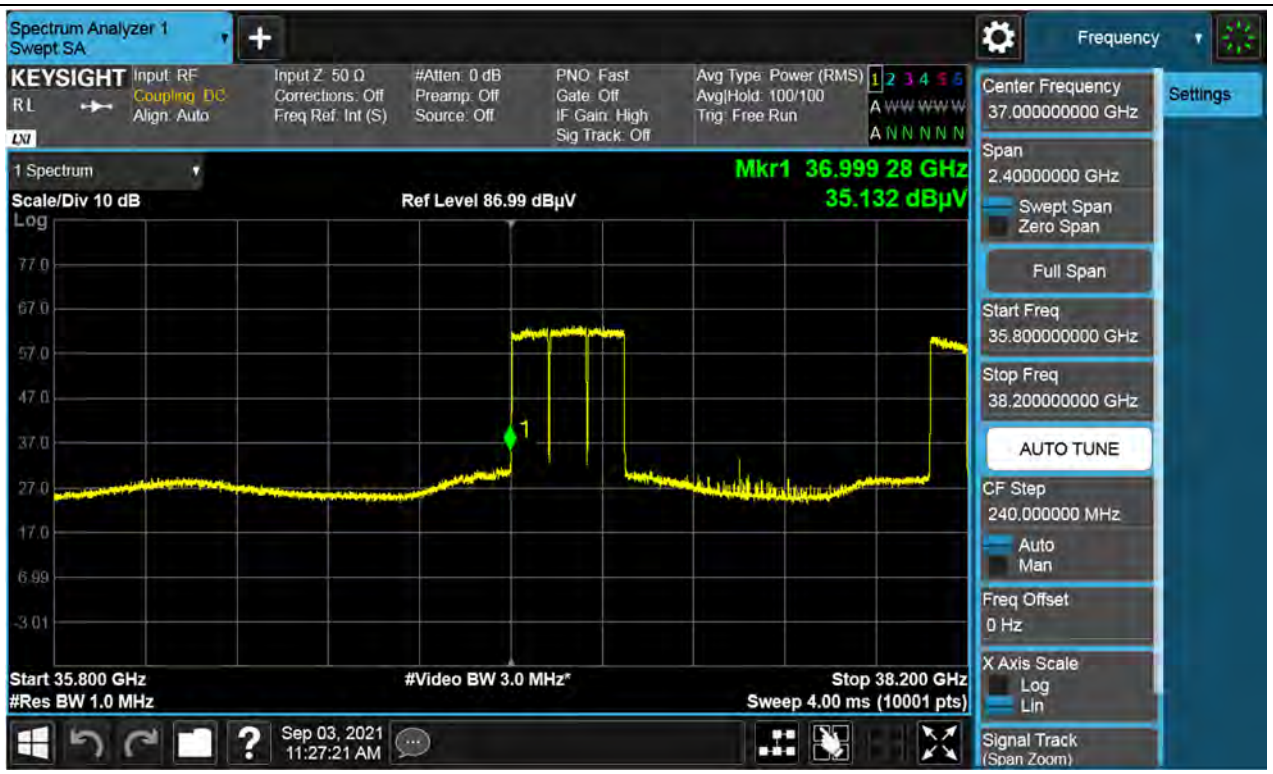
MAX Ant. B Position / 3+1cc / Low / 16QAM / Ant. B



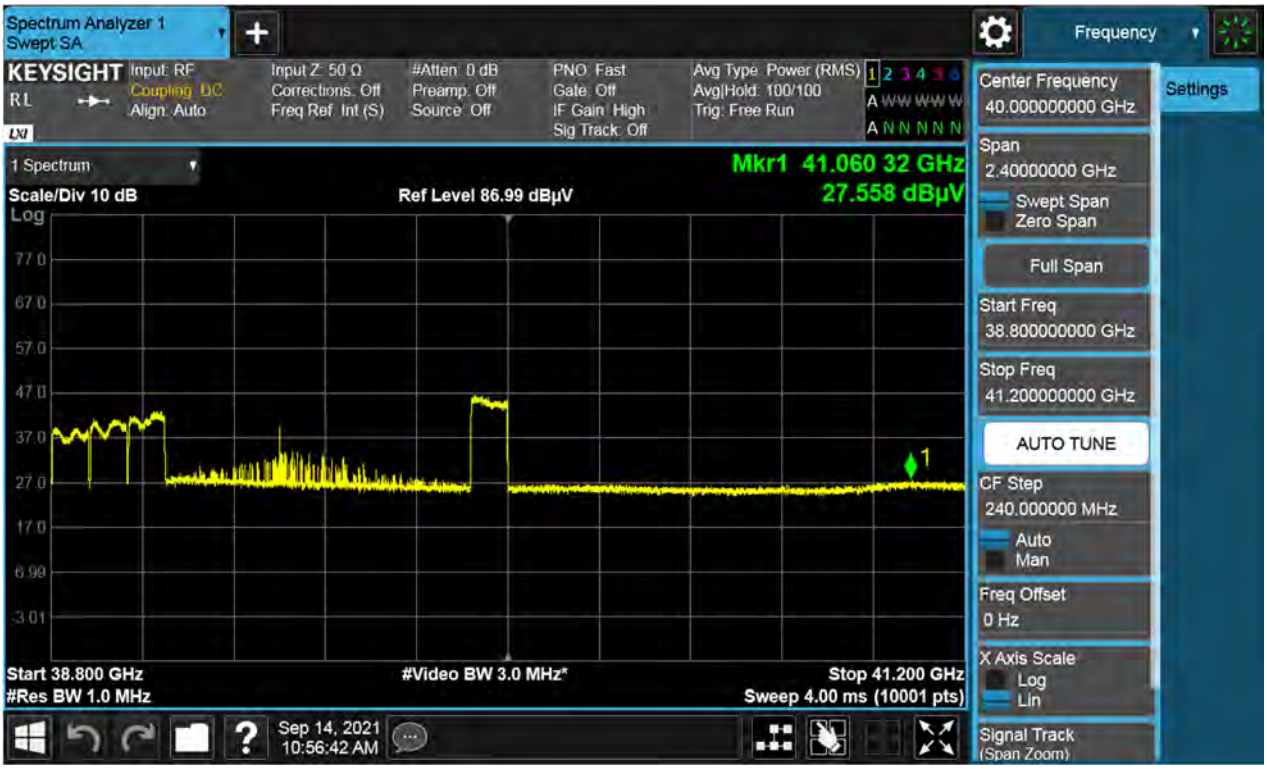
MAX Ant. B Position / 3+1cc / Low / 64QAM / Ant. A



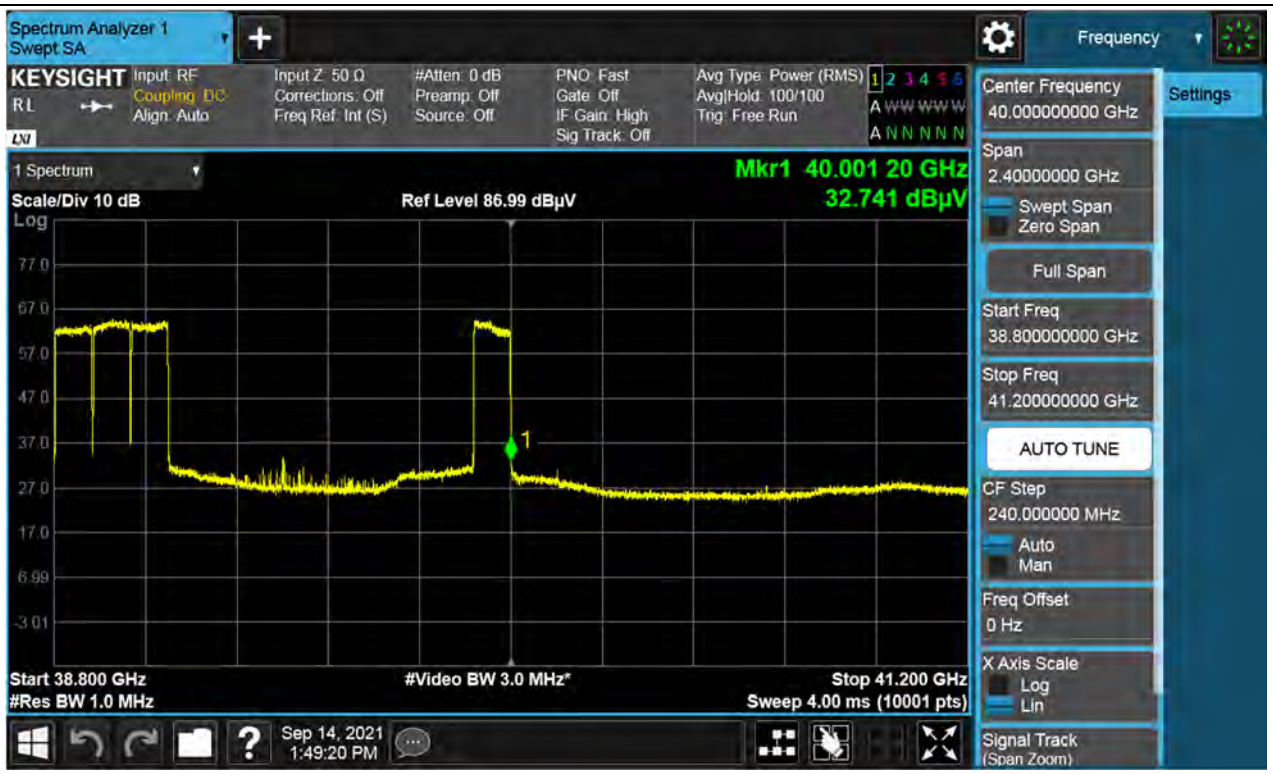
MAX Ant. B Position / 3+1cc / Low / 64QAM / Ant. B



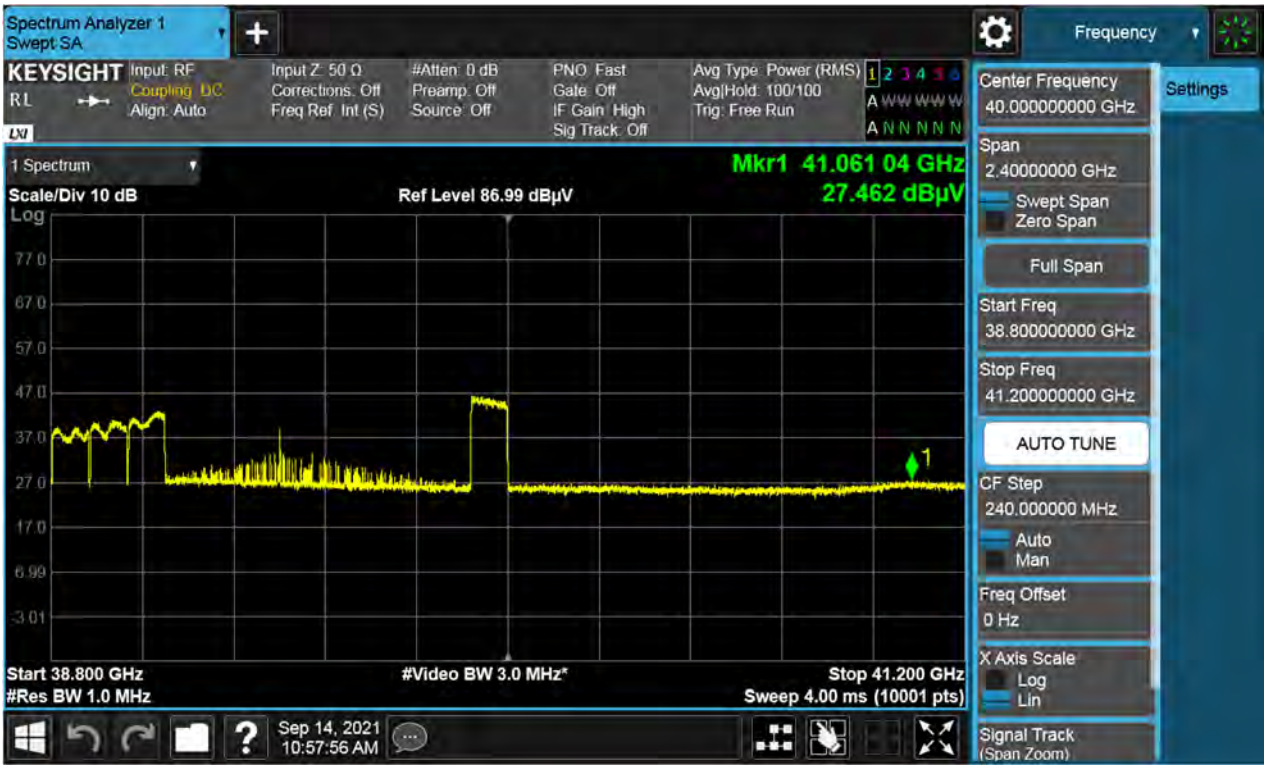
MAX Ant. B Position / 3+1cc / High / QPSK / Ant. A



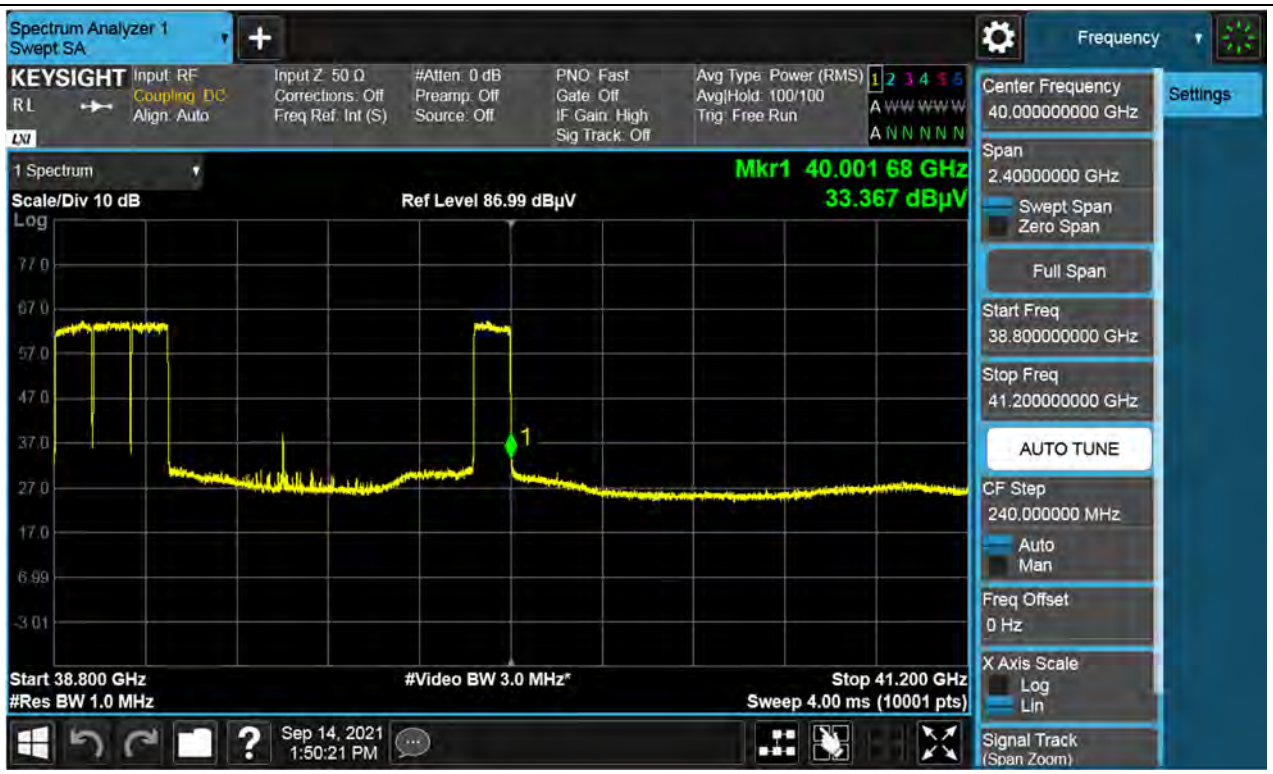
MAX Ant. B Position / 3+1cc / High / QPSK / Ant. B



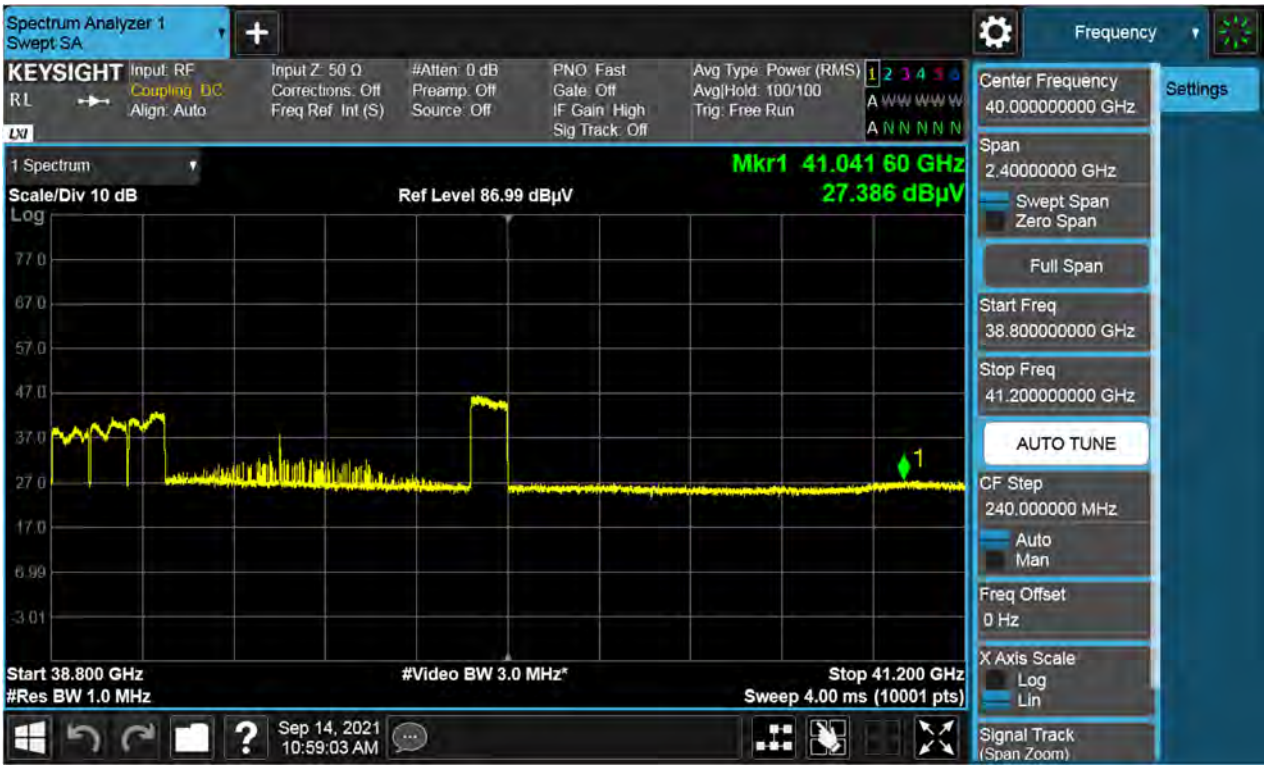
MAX Ant. B Position / 3+1cc / High / 16QAM / Ant. A



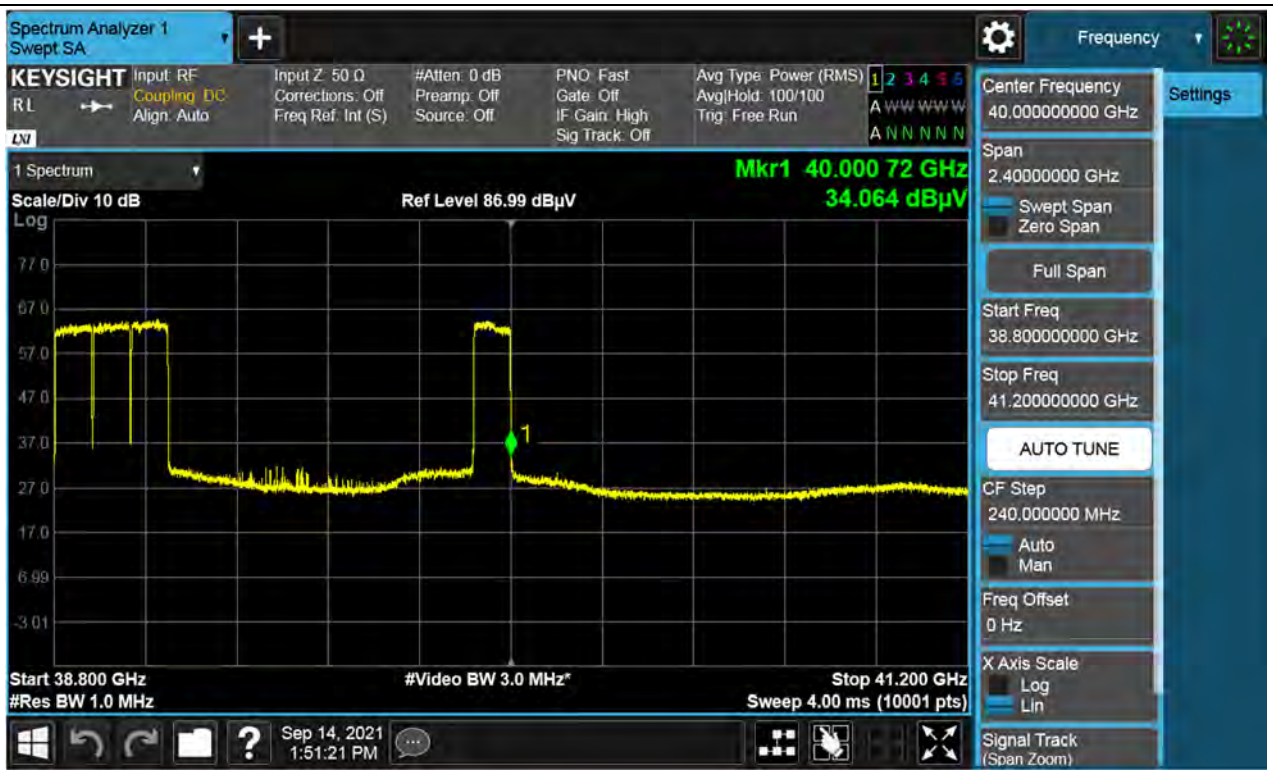
MAX Ant. B Position / 3+1cc / High / 16QAM / Ant. B



MAX Ant. B Position / 3+1cc / High / 64QAM / Ant. A



MAX Ant. B Position / 3+1cc / High / 64QAM / Ant. 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:

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 on page 8.
3) In case of 9 kHz to 30 MHz, the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4) Emissions in 35.5 GHz to 40 GHz(Low, Middle channel) or 42 GHz(High channel) band can be founded in section 5.1 through 5.4 of this report
5) We were performed the test in MIMO mode.
6) Test plot doesn't include any factors and all factors such as AFCL is calculated in tabular data.
7) In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, amplifier gain.
8) Emissions value is first converted by distance factor as follow.

Converted value (dBm) = Measured Value (dBuV) + 20 LOG(D)-104.77

9) Final spurious emissions result is calculated as follows.

Spurious Emissions = Converted Value (dBm) + AFCL

10) Refer to conducted output power test, spurious emissions test is performed about the worst case of modulation type (QPSK).
11) Sample calculations

1 GHz ~ 18 GHz

60.74 dBμV (measured) + 1.29 (Duty) + 3.44 (AFCL) – 95.2 = -29.73 dBm

18 GHz ~ 37 GHz

43.54 dBμV (measured) + 1.29 (Duty) + 48.02 (AFCL) – 95.2 = -2.35 dBm

41 GHz ~ 200 GHz (*140 GHz ~ 200 GHz has only applied distance factor because of the test distance)

15.98 dBμV (measured)) – 6..02 (distance) + 1.29 (Duty) + 57.55 (AFCL) - 95.2 = -26.40 dBm

Test Results:

Tabular Data of Radiated Spurious Emissions

1. Contiguous

1cc

Freq.	Mod	Distance (m)	Frequency (MHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
1 GHz ~ 5 GHz	QPSK	3	1030.00	55.78	-39.42	-19.14	-13	-58.56
5 GHz ~ 9 GHz			5249.00	50.31	-44.89	-6.83		-51.72
9 GHz ~ 13 GHz			10312.50	60.74	-33.17	3.44		-29.73
13 GHz ~ 17 GHz			13658.00	47.35	-47.85	6.55		-41.3
17 GHz ~ 18 GHz			17496.63	46.44	-48.76	7.54		-41.22
18 GHz ~ 37 GHz			36971.37*	35.12	-66.09	56.33		-8.48
			36981.01*	34.92	-65.89	56.33		-8.67
			36987.26*	34.92	-65.89	56.33		-8.50
40.1 GHz ~ 60 GHz			48180.96	15.47	-79.76	51.55		-28.21
60 GHz ~ 90 GHz			71262.50	15.89	-79.34	54.22		-25.12
90 GHz ~ 140 GHz			92323.04	14.71	-80.52	56.1		-24.42
140 GHz ~ 180 GHz		1.5	140047.44	15.72	-79.51	54.59		-24.92
180 GHz ~ 200 GHz			186469.01	15.98	-79.25	56.95		-26.40

4cc

Freq.	Mod	Distance (m)	Frequency (MHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
1 GHz ~ 5 GHz	QPSK	3	3750.00	55.06	-40.14	-11.03	-13	-51.17
5 GHz ~ 9 GHz			5250.00	50.45	-44.75	-6.83		-51.58
9 GHz ~ 13 GHz			10312.50	61.06	-34.14	3.44		-30.7
13 GHz ~ 17 GHz			14212.50	47.22	-47.98	7.16		-40.82
17 GHz ~ 18 GHz			17428.50	46.92	-48.28	7.31		-40.97
18 GHz ~ 37 GHz			31046.38*	43.54	-57.67	54.04		-2.35
			31046.38*	41.53	-58.41	54.04		-4.37
			31046.38*	41.89	-58.06	54.04		-4.02
40.1 GHz ~ 60 GHz			48359.07	15.47	-79.76	51.55		-28.03
60 GHz ~ 90 GHz			70625.50	16.22	-79.01	54.22		-24.61
90 GHz ~ 140 GHz			139938.00	15.29	-79.94	60.61		-19.15
140 GHz ~ 180 GHz		1.5	163353.50	14.95	-80.28	55.80		-24.48
180 GHz ~ 200 GHz			181512.00	16.05	-79.18	56.34		-22.84

Note:

1. Because of no critical emissions are detected in the test, only peak value is recorded in this report.

2. '*' This checked frequency is measured by TRP, because it is EIRP fail or Not enough Margin.

2. Non-Contiguous

1cc+3cc

Freq.	Mod	Distance (m)	Frequency (MHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
1 GHz ~ 5 GHz	QPSK	3	3750.00	54.01	-41.19	-11.03	-13	-52.22
5 GHz ~ 9 GHz			5249.50	51.13	-44.07	-6.83		-50.9
9 GHz ~ 13 GHz			10312.50	60.87	-34.33	3.44		-30.89
13 GHz ~ 17 GHz			13026.50	47.19	-48.01	5.85		-42.16
17 GHz ~ 18 GHz			17300.60	46.58	-48.62	6.62		-42
18 GHz ~ 37 GHz			30777.40*	39.15	-62.07	51.76		-10.31
			30777.40*	38.68	-60.67	51.76		-8.91
			30777.40*	38.85	-60.90	51.76		-9.14
40.1 GHz ~ 60 GHz			51088.80	15.94	-79.29	41.93		-37.36
60 GHz ~ 90 GHz			69948.00	16.30	-88.47	53.52		-34.95
90 GHz ~ 140 GHz			99456.50	14.56	-90.21	68.37		-21.84
140 GHz ~ 180 GHz		1.5	140079.00	15.19	-95.60	62.84		-35.76
180 GHz ~ 200 GHz			182162.00	15.88	-94.91	56.65		-38.29

3cc+1cc

Freq.	Mod	Distance (m)	Frequency (MHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
1 GHz ~ 5 GHz	QPSK	3	3750.00	54.45	-40.75	-9.19	-13	-49.94
5 GHz ~ 9 GHz			5248.00	50.03	-45.17	-4.20		-49.37
9 GHz ~ 13 GHz			10312.50	60.74	-34.46	6.27		-28.19
13 GHz ~ 17 GHz			14849.50	47.35	-47.85	9.62		-38.23
17 GHz ~ 18 GHz			17605.60	46.39	-48.81	10.60		-38.21
18 GHz ~ 37 GHz			30777.20*	39.40	-61.81	51.76		-10.05
			30777.20*	39.06	-61.95	51.76		-10.19
			30777.20*	38.85	-61.77	51.76		-10.01
40.1 GHz ~ 60 GHz			57556.00	15.99	-79.24	52.51		-26.73
60 GHz ~ 90 GHz			79596.00	16.42	-88.35	53.11		-35.24
90 GHz ~ 140 GHz			99496.50	15.23	-89.54	56.33		-33.21
140 GHz ~ 180 GHz		1.5	152456.50	15.01	-95.78	70.83		-24.95
180 GHz ~ 200 GHz			185844.00	15.84	-94.95	59.33		-35.62

Note:

1. Because of no critical emissions are detected in the test, only peak value is recorded in this report.

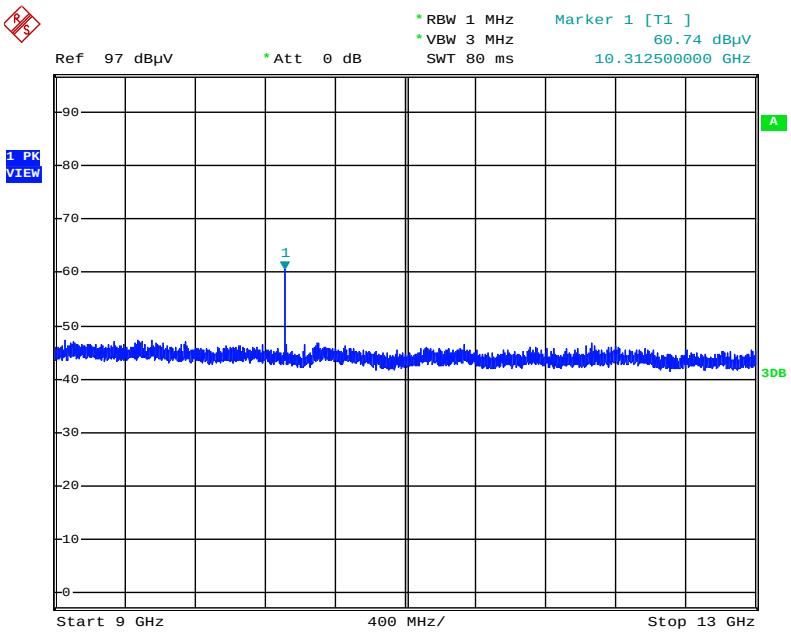
2. '*' This checked frequency is measured by TRP, because it is EIRP fail or Not enough Margin.

TRP Results.

CC / Mod	Frequency [GHz]	Result [dBm]	Limit [dBm]	Margin [dB]
1CC	36.9790	-17.048	-13	4.05
1CC	36.9810	-17.177		4.18
1CC	36.9872	-17.156		4.16
4CC	31.0464	-17.054		4.05
4CC	31.0464	-17.020		4.02
4CC	31.0464	-17.090		4.09
1CC + 3CC	30.7774	-17.362		4.36
1CC + 3CC	30.7774	-17.427		4.43
1CC + 3CC	30.7774	-17.395		4.39
3CC + 1CC	30.7772	-17.545		4.54
3CC + 1CC	30.7772	-17.523		4.52
3CC + 1CC	30.7772	-17.510		4.51

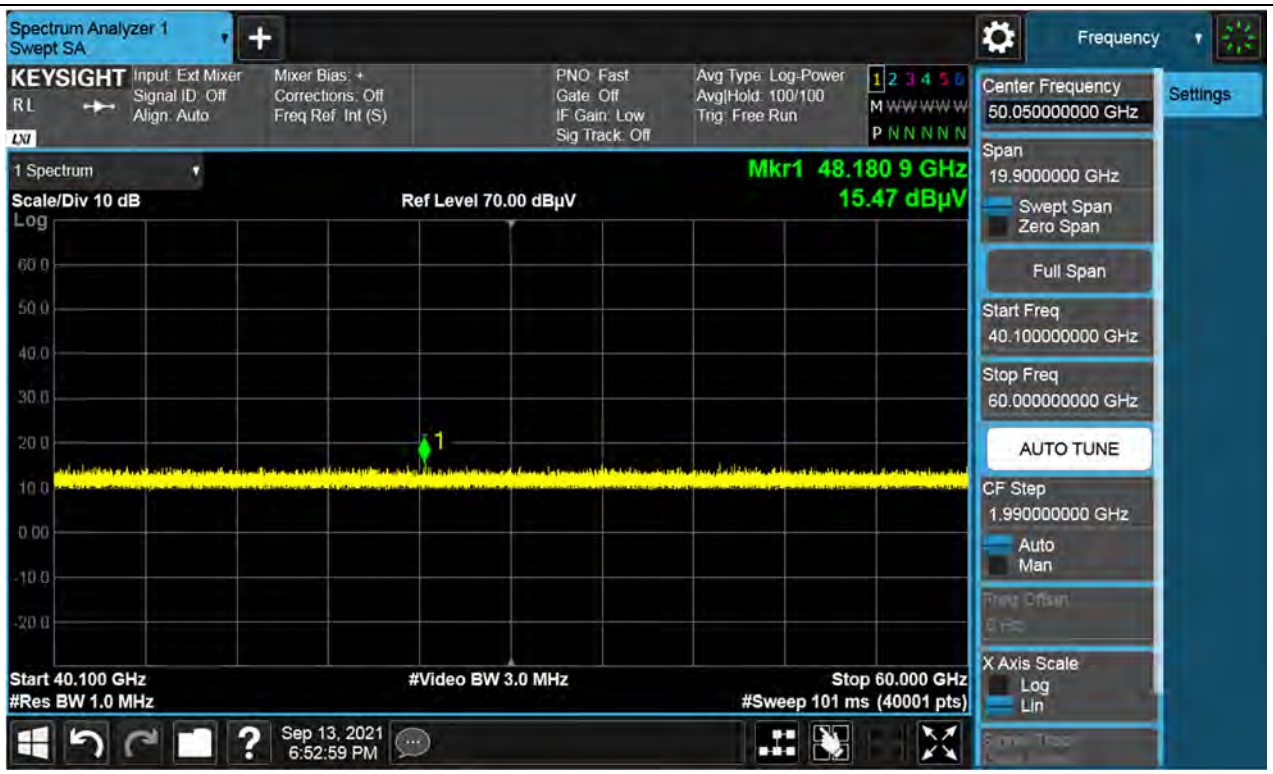
Plot data of Radiated Spurious Emissions

1 GHz ~ 18 GHz / 1cc / Middle

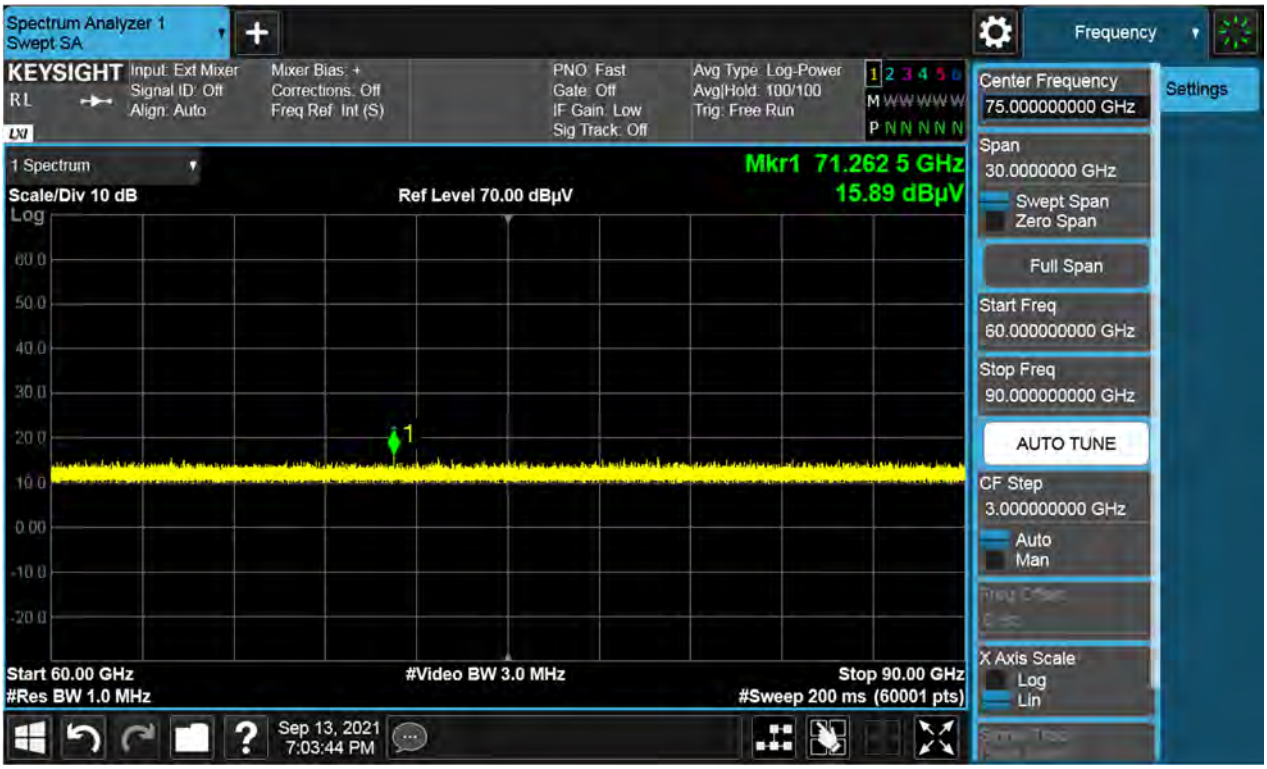


Date: 1.JAN.2003 00:53:52

40.1 GHz ~ 60 GHz / 1cc / Middle



60 GHz ~ 90 GHz / 1cc / Middle



90 GHz ~ 140 GHz / 1cc / Middle