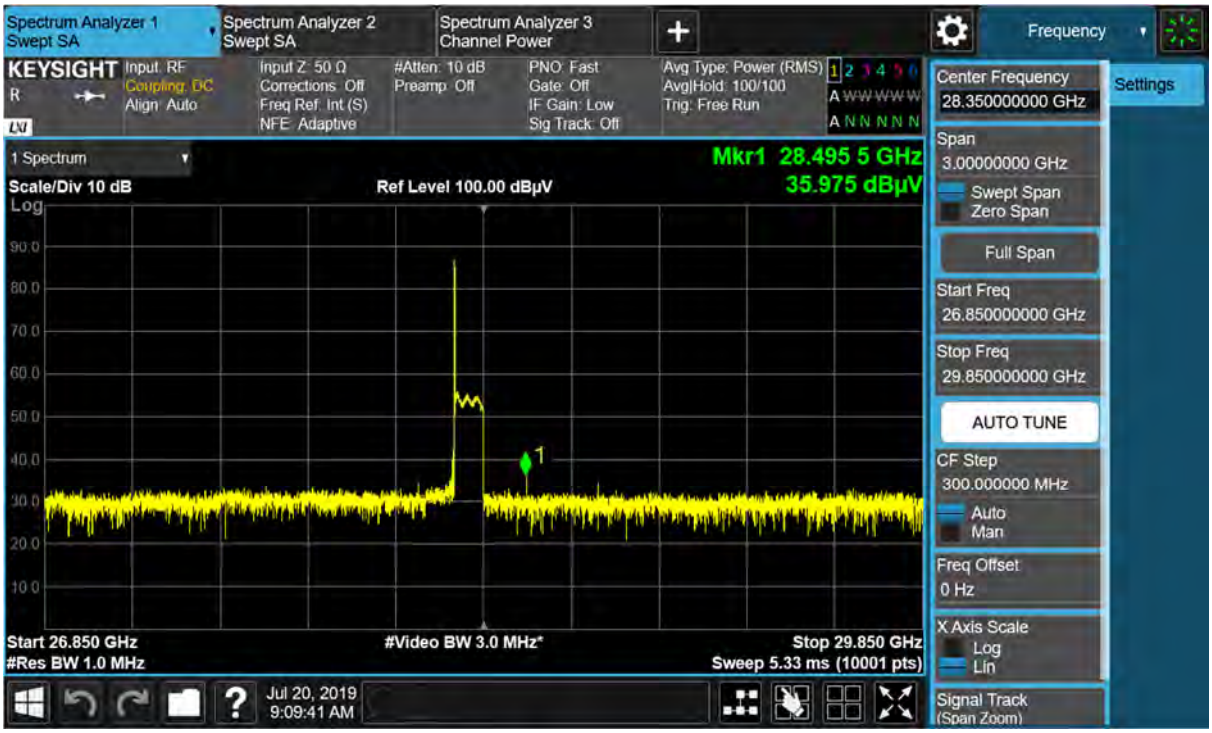
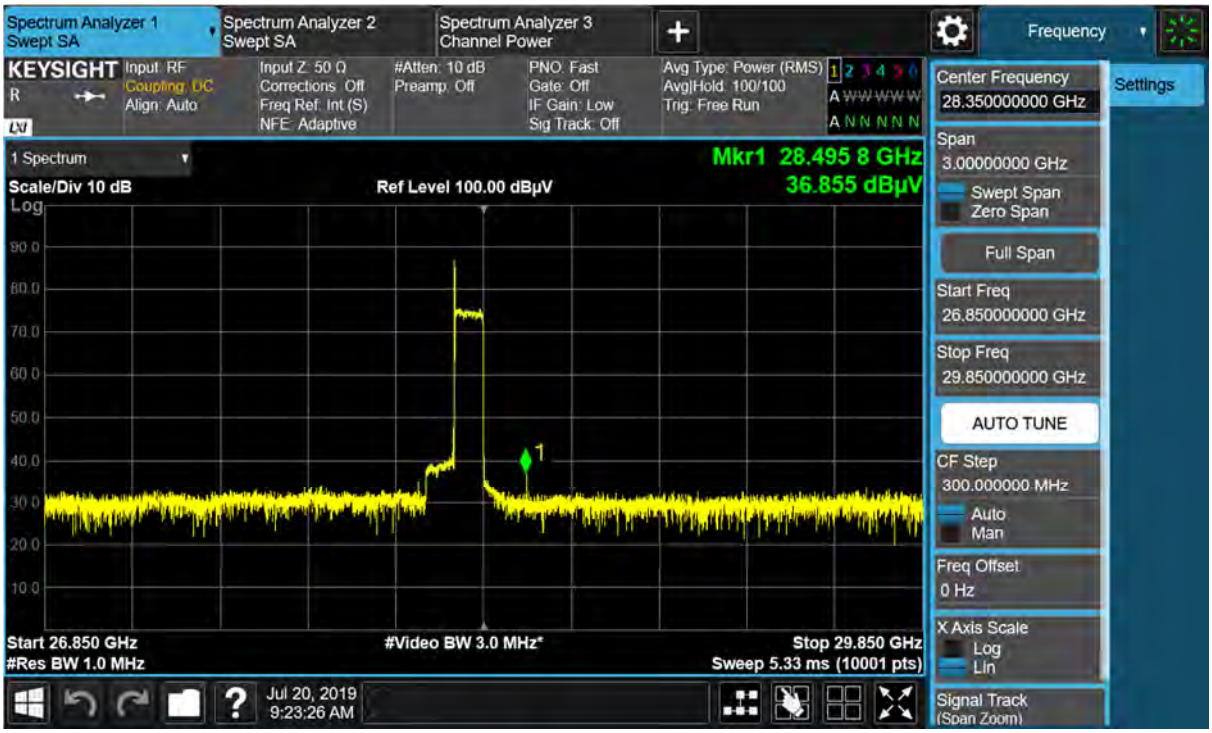
MAX Ant. D Position / 1cc / High / 16QAM / Ant. C


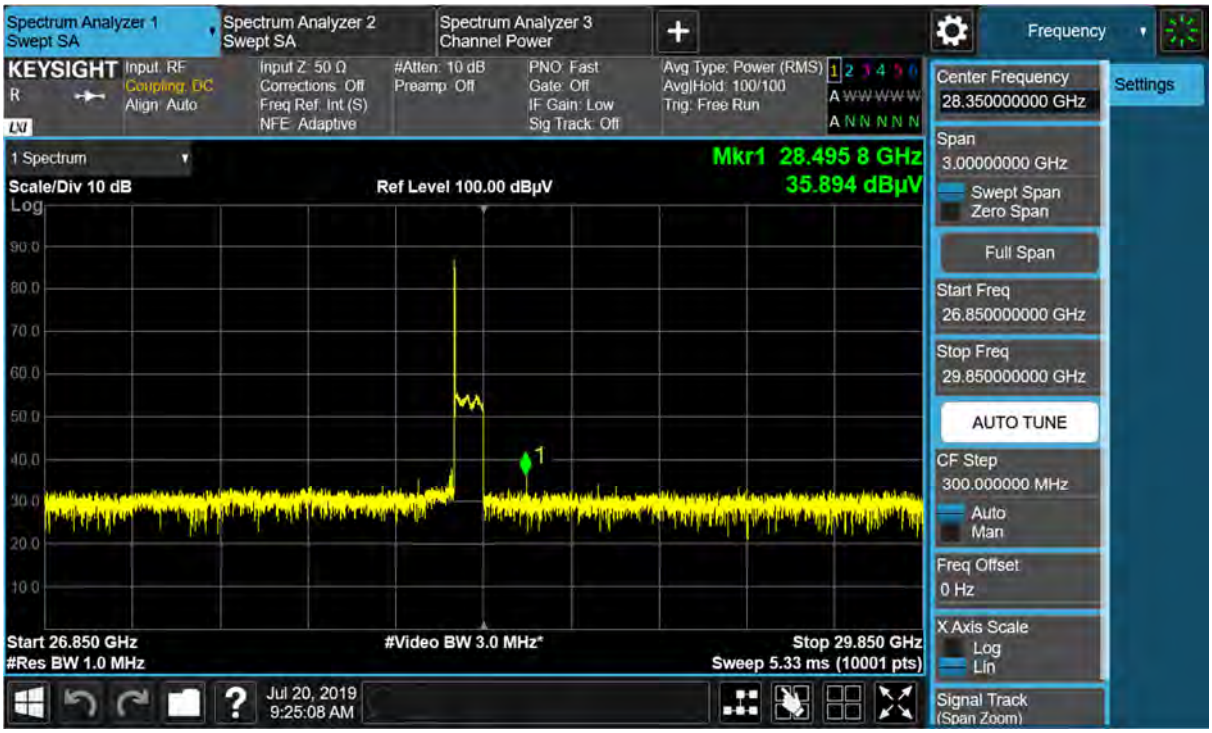
MAX Ant. D Position / 1cc / High / 16QAM / Ant. D


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

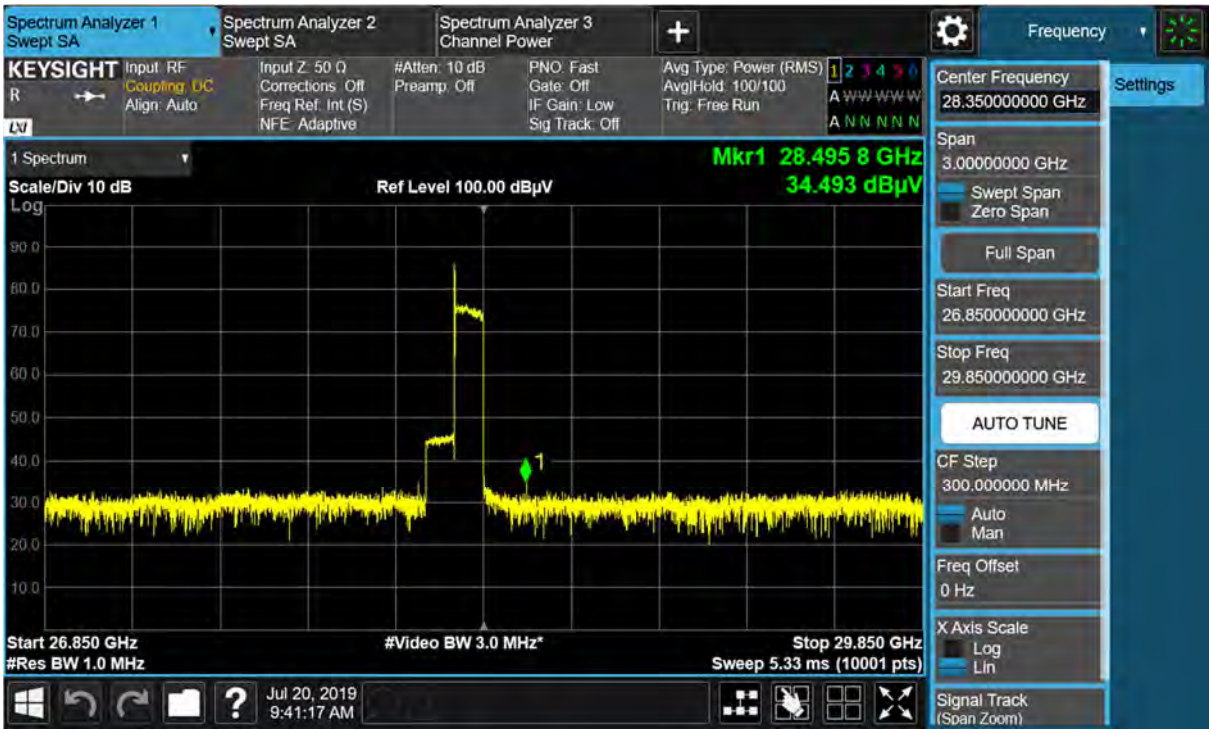
MAX Ant. D Position / 1cc / High / 64QAM / Ant. B



MAX Ant. D Position / 1cc / High / 64QAM / Ant. C

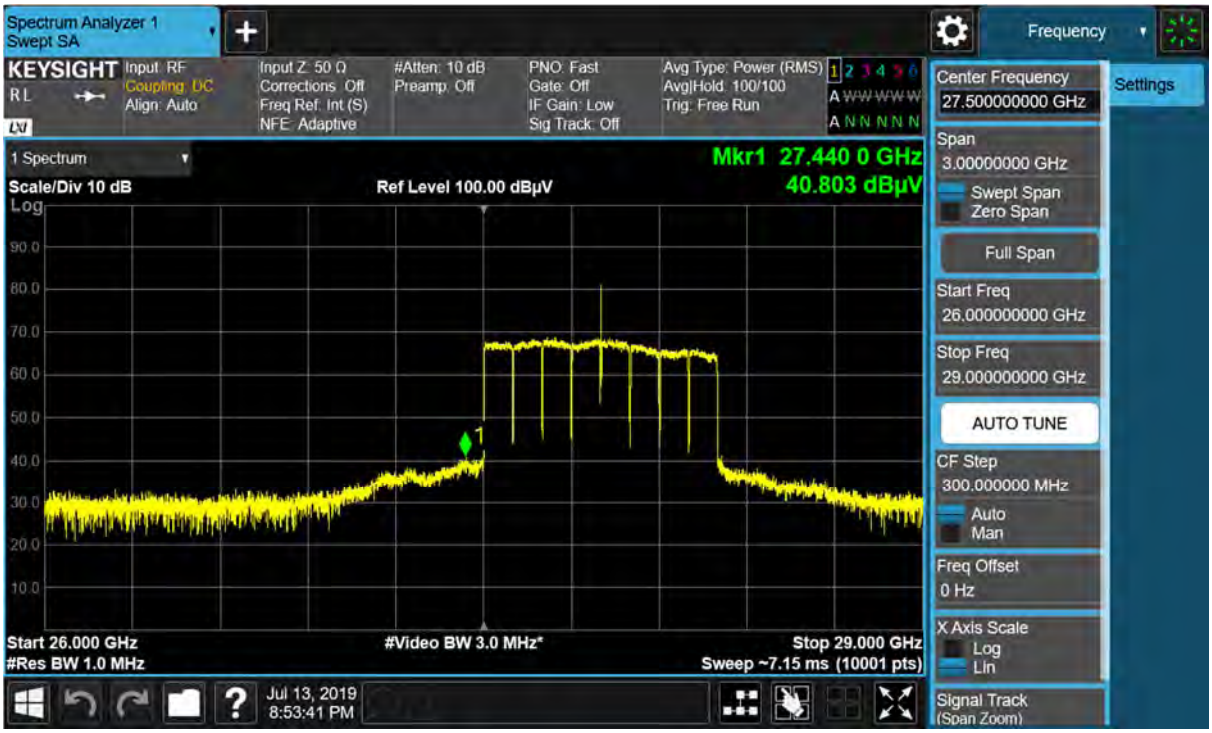


MAX Ant. D Position / 1cc / High / 64QAM / Ant. D



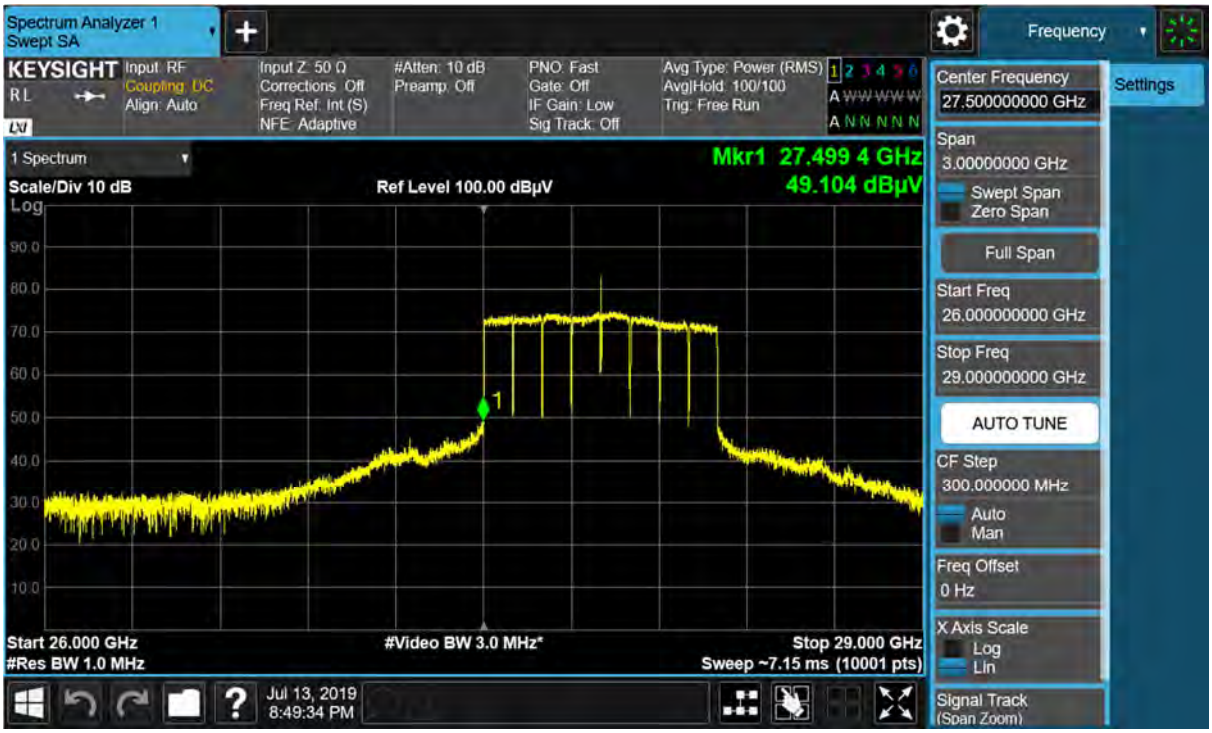
MAX Ant. D Position / 8cc / Low / QPSK / Ant. A

MAX Ant. D Position / 8cc / Low / QPSK / Ant. B



MAX Ant. D Position / 8cc / Low / QPSK / Ant. C

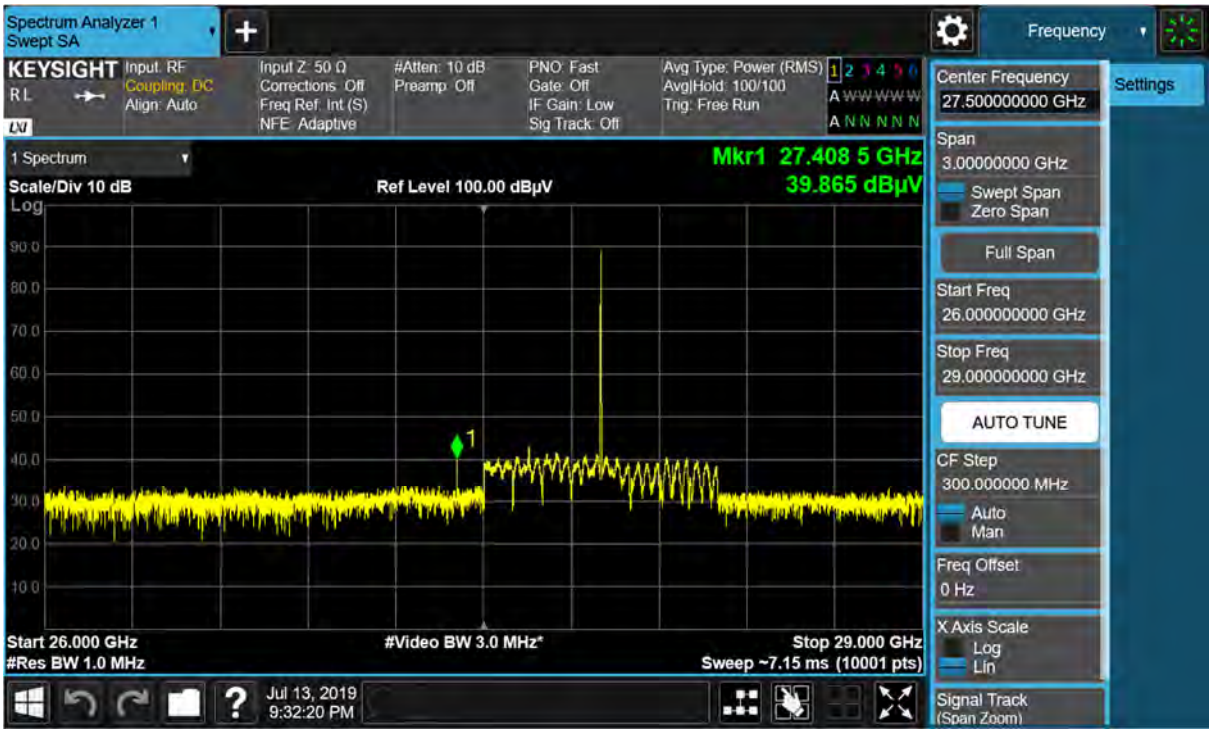
MAX Ant. D Position / 8cc / Low / QPSK / Ant. D



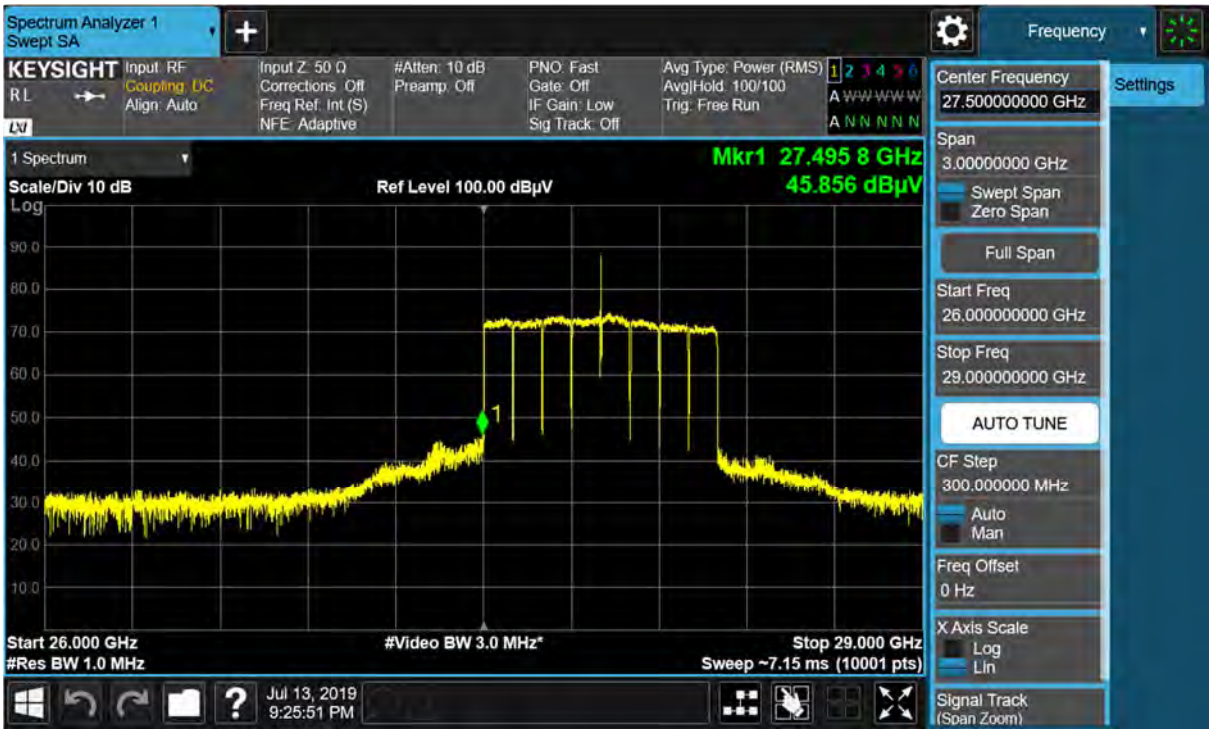
MAX Ant. D Position / 8cc / Low / 16QAM / Ant. A

MAX Ant. D Position / 8cc / Low / 16QAM / Ant. B

MAX Ant. D Position / 8cc / Low / 16QAM / Ant. C

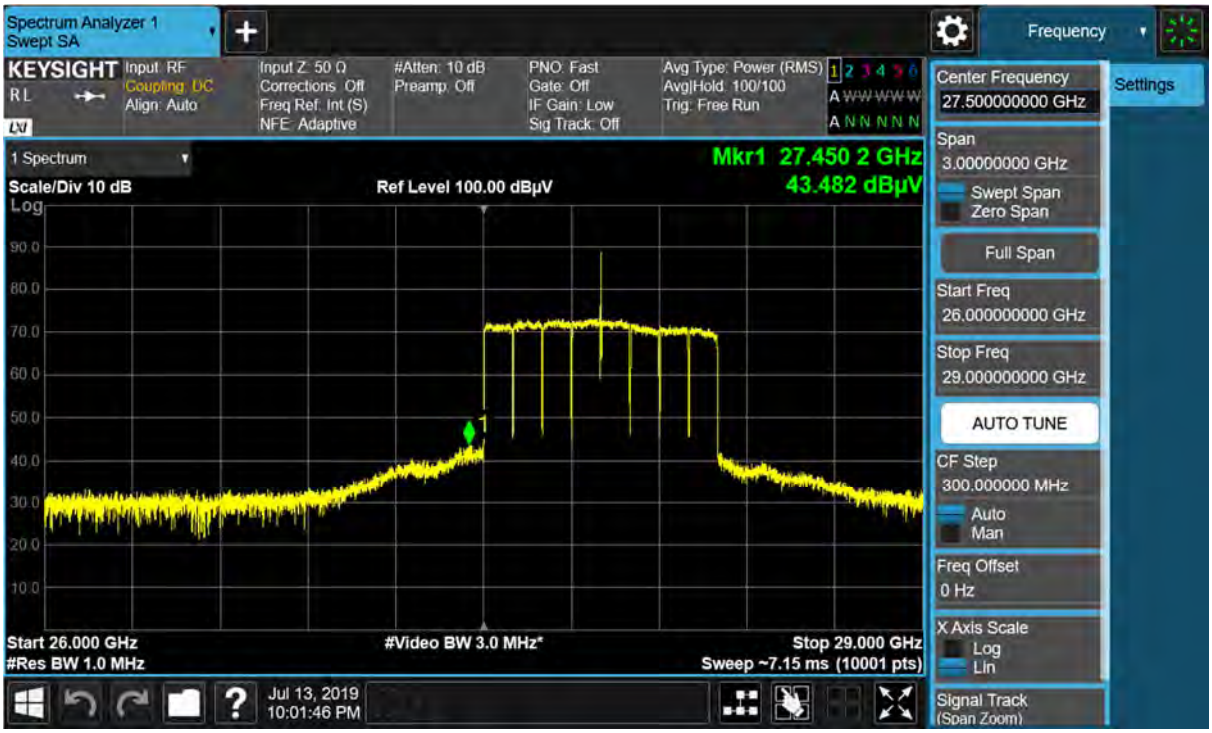


MAX Ant. D Position / 8cc / Low / 16QAM / Ant. D



MAX Ant. D Position / 8cc / Low / 64QAM / Ant. A

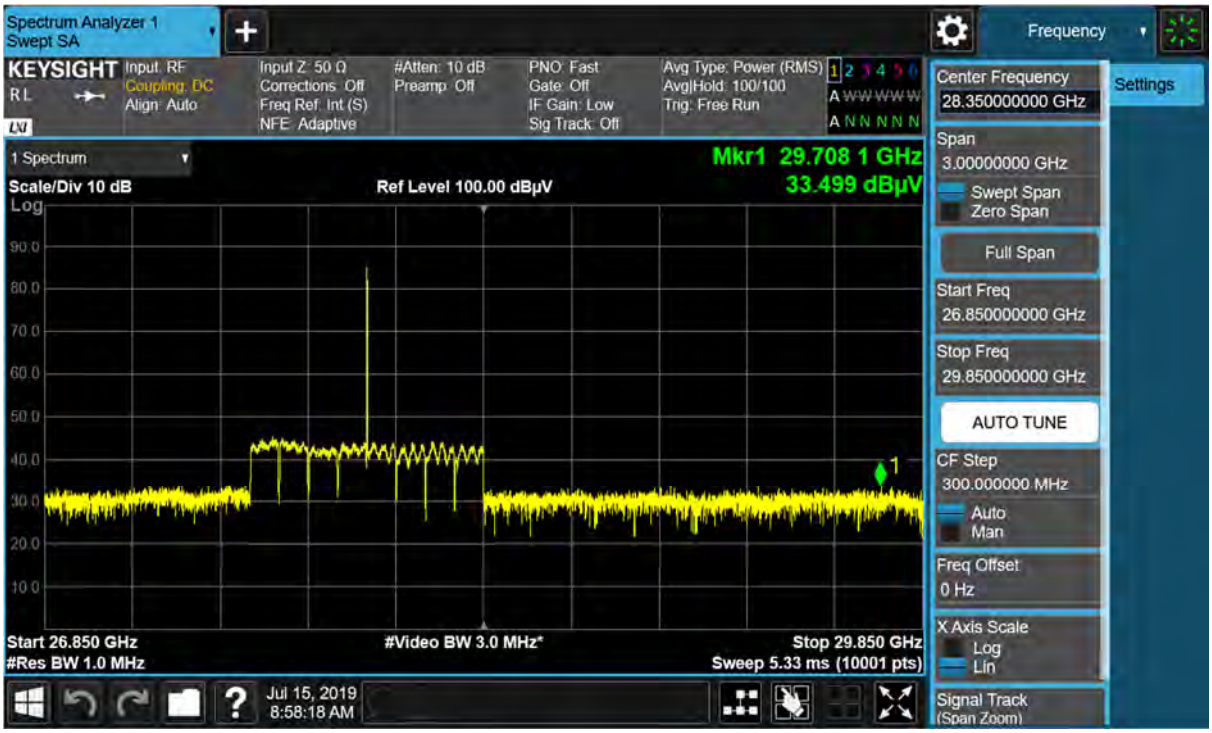
MAX Ant. D Position / 8cc / Low / 64QAM / Ant. B



MAX Ant. D Position / 8cc / Low / 64QAM / Ant. C

MAX Ant. D Position / 8cc / Low / 64QAM / Ant. D

MAX Ant. D Position / 8cc / High / QPSK / Ant. A



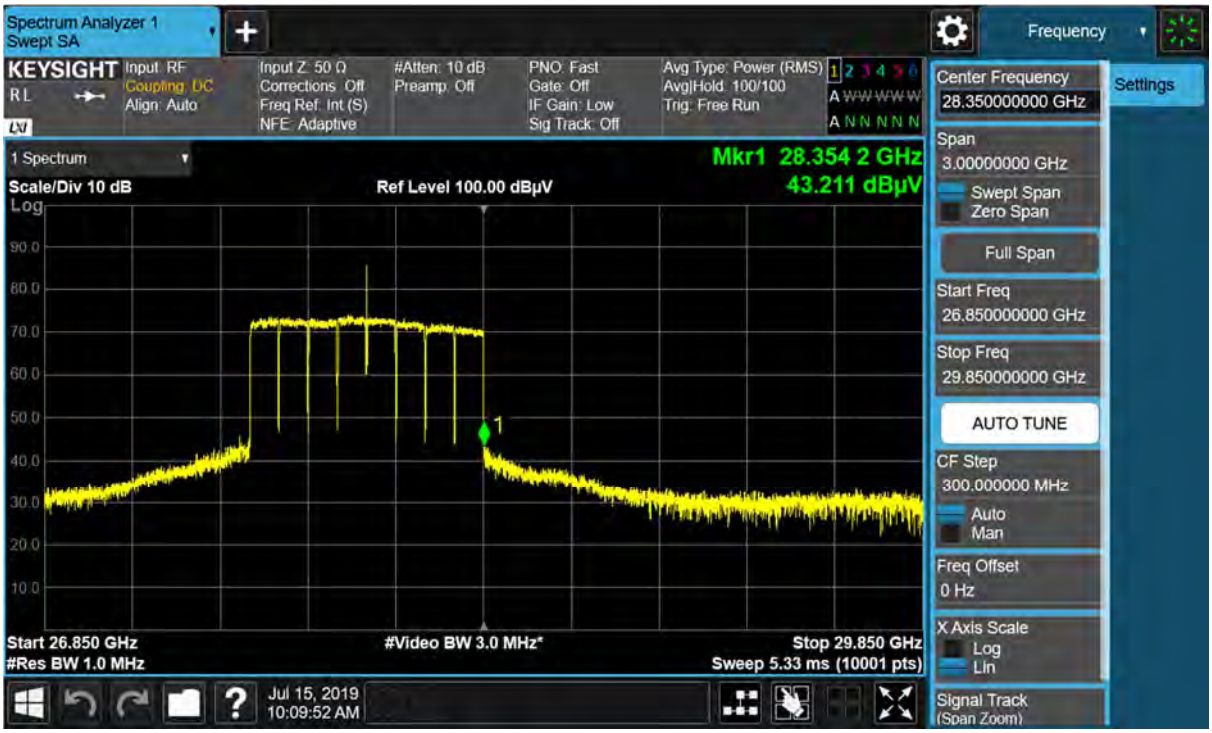
MAX Ant. D Position / 8cc / High / QPSK / Ant. B

MAX Ant. D Position / 8cc / High / QPSK / Ant. C

MAX Ant. D Position / 8cc / High / QPSK / Ant. D

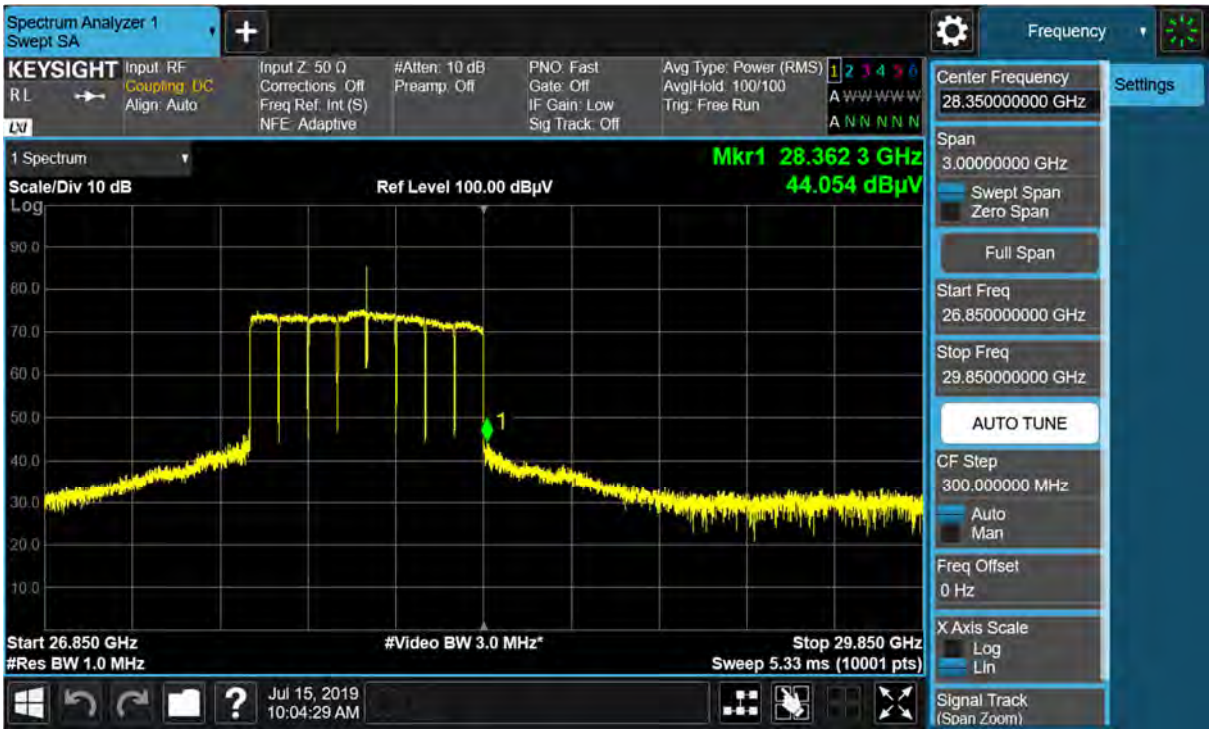
MAX Ant. D Position / 8cc / High / 16QAM / Ant. A

MAX Ant. D Position / 8cc / High / 16QAM / Ant. B

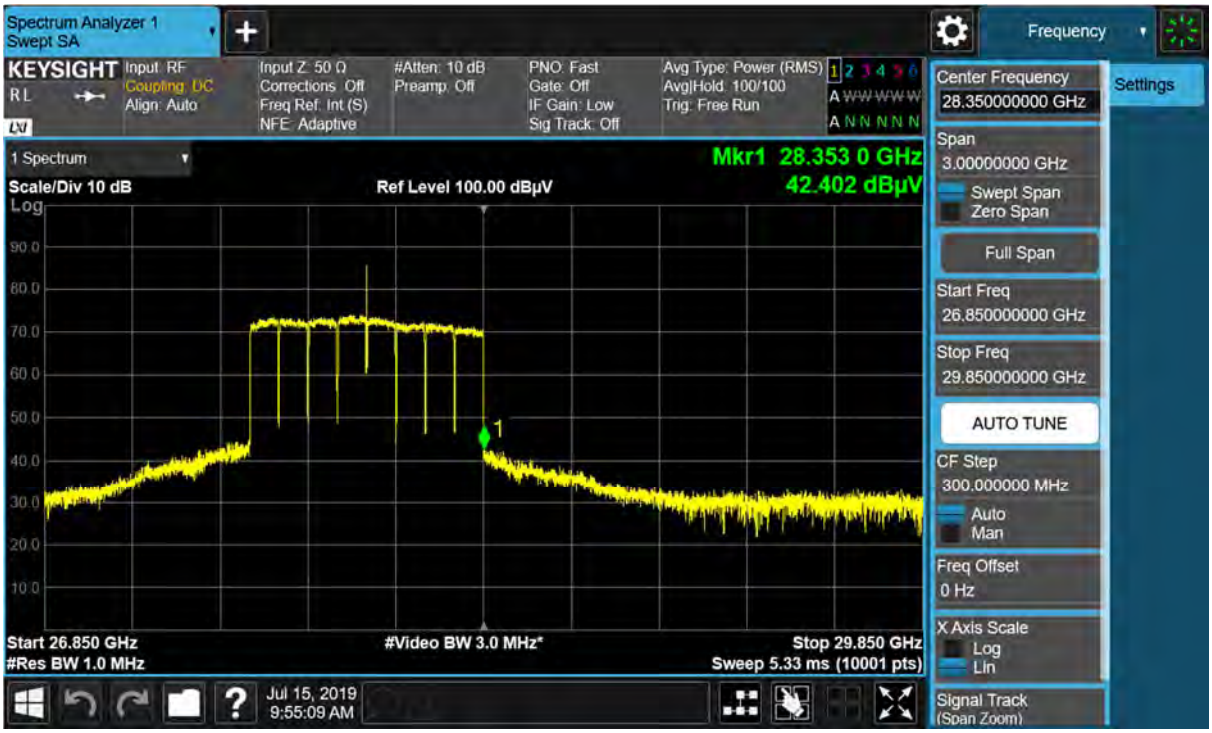


MAX Ant. D Position / 8cc / High / 16QAM / Ant. C

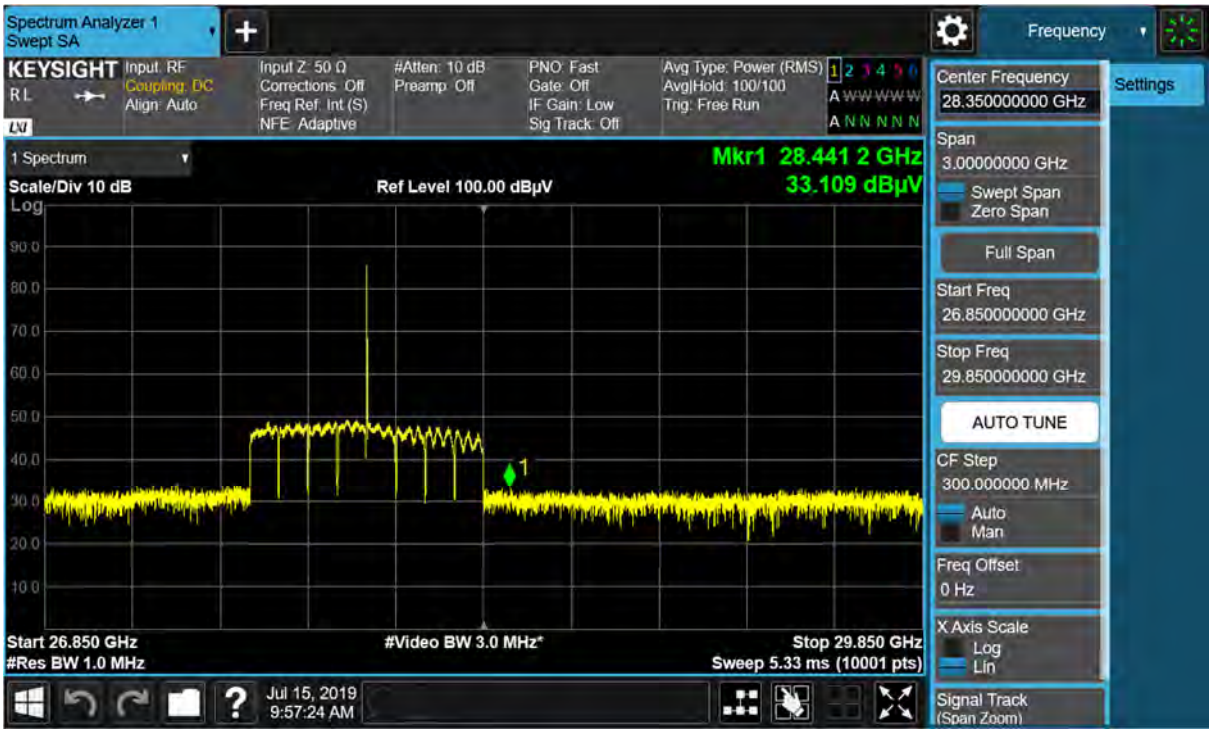
MAX Ant. D Position / 8cc / High / 16QAM / Ant. D



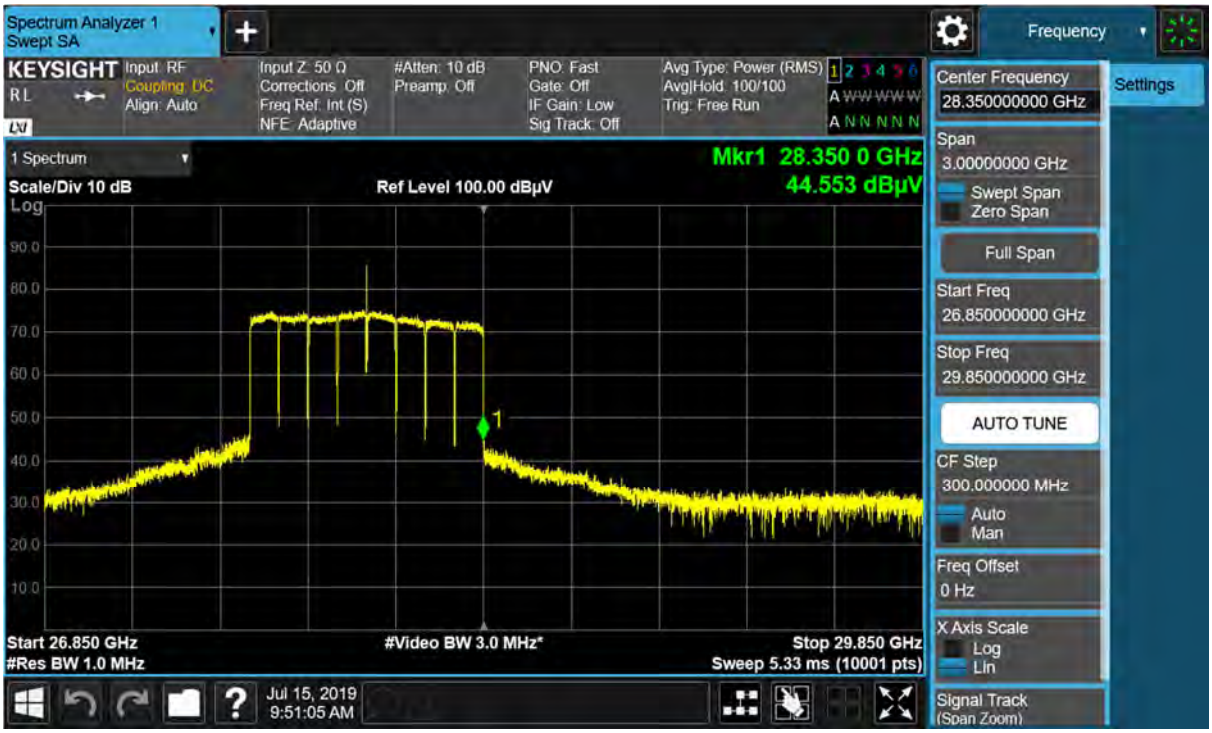
MAX Ant. D Position / 8cc / High / 64QAM / Ant. A


MAX Ant. D Position / 8cc / High / 64QAM / Ant. B


MAX Ant. D Position / 8cc / High / 64QAM / Ant. C



MAX Ant. D Position / 8cc / High / 64QAM / Ant. D



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 v01 (2019-04).

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 100 GHz frequency according to section 5.1.1 of ANSI C63.26 -2015.
2) Measurement distance is 3 m at frequency below 18 GHz and other frequencies 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 26.5 GHz to 29.35 GHz band can be founded in section 5.1 through 5.4 of this report
5) Test plot doesn't include any factors and all factors such as AFCL is calculated in tabular data.
6) In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, amplifier gain and duty correction.
7) Emissions value is first converted by distance factor as follow.

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

8) Final spurious emissions result is calculated as follows.

Spurious Emissions = Converted Value (dBm) + AFCL

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

30 MHz ~ 1 GHz

9.82 dBμV (measured) + 11.48 (distance) - 104.77 + 16.01(AFCL) = -67.46dBm

1 GHz ~ 18 GHz

19.158 dBμV (measured) + 11.48 (distance) - 104.77 + 43.92 (AFCL) = -30.21 dBm

18 GHz ~ 26.5 GHz

24.995 dBμV (measured) + 11.48 (distance) - 104.77 + 45.82 (AFCL) = -22.48 dBm

29.35 GHz ~ 40 GHz

25.000 dBμV (measured) + 11.48 (distance) - 104.77 + 48.10 (AFCL) = -20.19 dBm

40 GHz ~ 60 GHz

9.65 dBµV (measured) + 11.48 (distance) - 104.77 + 47.70 (AFCL) = -35.94 dBm

60 GHz ~ 90 GHz

6.99 dBµV (measured) + 11.48 (distance) - 104.77 + 60.06 (AFCL) = -26.24 dBm

90 GHz ~ 100 GHz

7.581 dBµV (measured) + 11.48 (distance) - 104.77 + 57.85 (AFCL) = -27.86 dBm

Test Results:

Tabular Data of Radiated Spurious Emissions

Freq.	CH	Mod	Distance (m)	Ant. Pol.	Frequency (MHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
30 MHz ~1 GHz (1cc)	L	QPSK	3.75	H	38.366	9.82	-83.47	16.01	-13	-67.46
				V	38.366	9.71	-83.58	16.01		-67.57
	M			H	38.366	10.43	-82.86	16.01		-66.85
				V	38.366	10.12	-83.17	16.01		-67.16
	H			H	38.366	10.07	-83.22	16.01		-67.21
				V	38.366	10.35	-82.94	16.01		-66.93
30 MHz ~1 GHz (8cc)	L			H	38.366	10.22	-83.07	16.01		-67.06
				V	143.975	10.2	-83.09	14.85		-68.24
	M			H	38.366	10.66	-82.63	16.01		-66.62
				V	38.366	10.09	-83.20	16.01		-67.19
	H			H	38.366	9.99	-83.30	16.01		-67.29
				V	38.366	9.78	-83.51	16.01		-67.50
1~18 GHz (1cc)	L			H	16243	19.158	-74.13	43.92		-30.21
				V	14180	18.801	-74.49	46.21		-28.28
	M			H	14567	18.541	-74.75	47.01		-27.74
				V	17980	18.488	-74.80	52.53		-22.28
	H			H	17293	18.701	-74.59	46.79		-27.80
				V	17686	18.592	-74.70	49.38		-25.32
1~18 GHz (8cc)	L			H	17120	18.636	-74.65	46.06		-28.60
				V	15186	18.977	-74.31	45.45		-28.87
	M			H	13699	18.75	-74.54	45.39		-29.15
				V	14666	19.273	-74.02	46.66		-27.36
	H			H	14580	18.709	-74.58	46.53		-28.06
				V	14361	18.931	-74.36	46.40		-27.96

Note:

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

Freq.	CH	Mod.	Distance (m)	Ant. Angle	Frequency (GHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
18~26.5 GHz (1cc)	L	QPSK	3.75	45	25.985	24.995	-68.29	45.82	-13	-22.48
				135	25.872	25.186	-68.10	45.82		-22.29
	M			45	25.986	24.169	-69.12	45.82		-23.31
				135	25.828	24.56	-68.73	45.82		-22.91
	H			45	25.991	23.834	-69.46	45.82		-23.64
				135	25.994	24.572	-68.72	45.82		-22.90
18~26.5 GHz (8cc)	L			45	*25.934	30.6	-62.69	45.82		-16.87
				135	*25.934	35.63	-57.66	45.82		-11.84
	M			45	*25.959	35.72	-57.57	45.82		-11.75
				135	*25.959	35.63	-57.66	45.82		-11.84
	H			45	26.494	26.676	-66.61	46.00		-20.62
				135	*25.984	36.97	-56.32	45.82		-10.50
29.35 ~40 GHz (1cc)	L			45	*33.120	40.050	-53.24	48.10		-5.14
				135	*33.120	43.59	-49.70	48.10		-1.60
	M			45	*33.450	35.41	-57.88	48.10		-9.78
				135	*33.450	40.82	-52.47	48.10		-4.37
	H			45	*33.900	31.44	-61.85	48.41		-13.44
				135	*33.900	34.640	-58.65	48.41		-10.24
29.35 ~40 GHz (8cc)	L			45	*33.480	38.380	-54.91	48.10		-6.81
				135	*33.480	39.36	-53.93	48.10		-5.83
	M			45	*33.510	39.36	-53.93	48.10		-5.83
				135	*33.510	39.27	-54.02	48.10		-5.92
	H			45	*33.540	34.02	-59.27	48.10		-11.17
				135	*33.540	37.86	-55.43	48.10		-7.33
40~60 GHz (1cc)	L		3.75	45	43.567	9.65	-83.64	47.70		-35.94
				135	43.424	9.48	-83.81	47.70		-36.11
	M			45	43.292	9.60	-83.69	47.70		-35.99
				135	43.279	9.44	-83.85	47.70		-36.15
	H			45	43.427	9.37	-83.92	47.70		-36.22
				135	43.422	9.59	-83.70	47.70		-36.00

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

TRP Results.

CC / CH / Mod	Frequency [GHz]	Result [dBm]	Limit [dBm]	Margin [dB]
8CC / L / QPSK	25.934	-19.39	-13	6.39
8CC / M / QPSK	25.959	-19.33	-13	6.33
8CC / H / QPSK	25.984	-19.28	-13	6.28
1CC / L / QPSK	33.120	-15.31	-13	2.31
1CC / M / QPSK	33.450	-16.36	-13	3.36
1CC / H / QPSK	33.900	-17.16	-13	4.16
8CC / L / QPSK	33.480	-16.10	-13	3.10
8CC / M / QPSK	33.510	-16.27	-13	3.27
8CC / H / QPSK	33.540	-16.60	-13	3.60

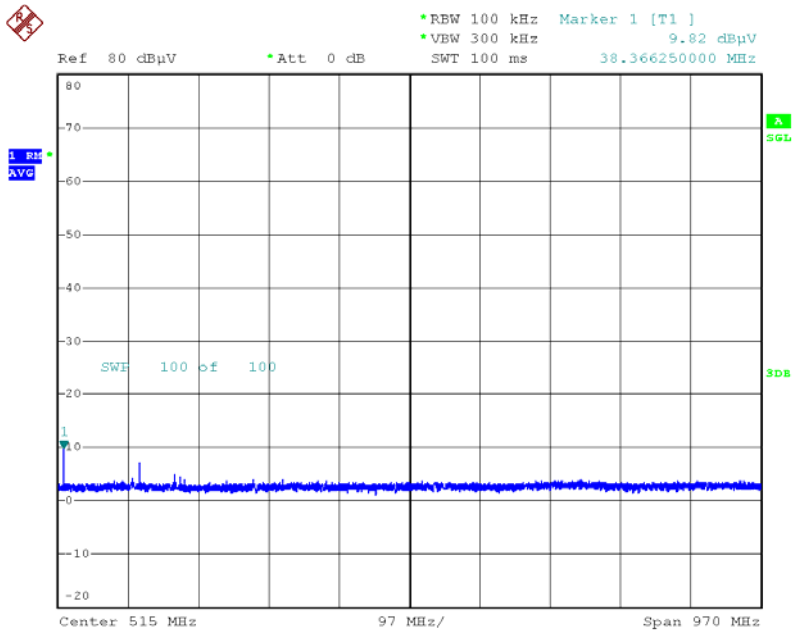
Freq.	CH	Mod.	Distance (m)	Ant. Angle	Frequency (GHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
40~60 GHz (8cc)	L	QPSK	3.75	45	43.154	11.64	-81.65	47.30	-13	-34.35
				135	43.837	11.71	-81.58	47.96		-33.62
	M			45	43.566	11.72	-81.57	47.70		-33.87
				135	43.841	11.65	-81.64	47.96		-33.68
	H			45	41.492	11.60	-81.69	47.61		-34.08
				135	43.983	11.71	-81.58	47.99		-33.59
60~90 GHz (1cc)	L		3.75	45	64.726	6.99	-86.30	60.06		-26.24
				135	64.703	6.94	-86.35	60.06		-26.29
	M			45	64.726	6.92	-86.37	60.06		-26.31
				135	64.938	7.11	-86.18	59.84		-26.34
	H			45	68.456	7.01	-86.28	54.07		-32.21
				135	64.501	7.02	-86.27	60.06		-26.21
60~90 GHz (8cc)	L			45	64.279	7.08	-86.21	61.18		-25.03
				135	64.504	6.99	-86.30	60.06		-26.24
	M			45	64.109	6.97	-86.32	61.18		-25.14
				135	64.509	7.02	-86.27	60.06		-26.21
	H			45	64.721	6.91	-86.38	60.06		-26.32
				135	64.925	7.08	-86.21	60.04		-26.17
90~100 GHz (1cc)	L		3.75	45	98.393	7.581	-85.71	57.85		-27.86
				135	98.768	7.623	-85.67	57.85		-27.82
	M			45	99.597	7.591	-85.70	53.18		-32.52
				135	99.531	7.571	-85.72	52.99		-32.73
	H			45	98.807	7.578	-85.71	57.85		-27.86
				135	99.517	7.798	-85.49	52.99		-32.50
90~100 GHz (8cc)	L			45	99.511	7.672	-85.62	52.99		-32.63
				135	99.940	7.421	-85.87	53.03		-32.84
	M			45	99.566	7.696	-85.59	52.99		-32.60
				135	99.525	7.620	-85.67	52.99		-32.68
	H			45	98.775	7.643	-85.65	57.85		-27.80
				135	99.237	7.516	-85.77	52.99		-32.78

Note:

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

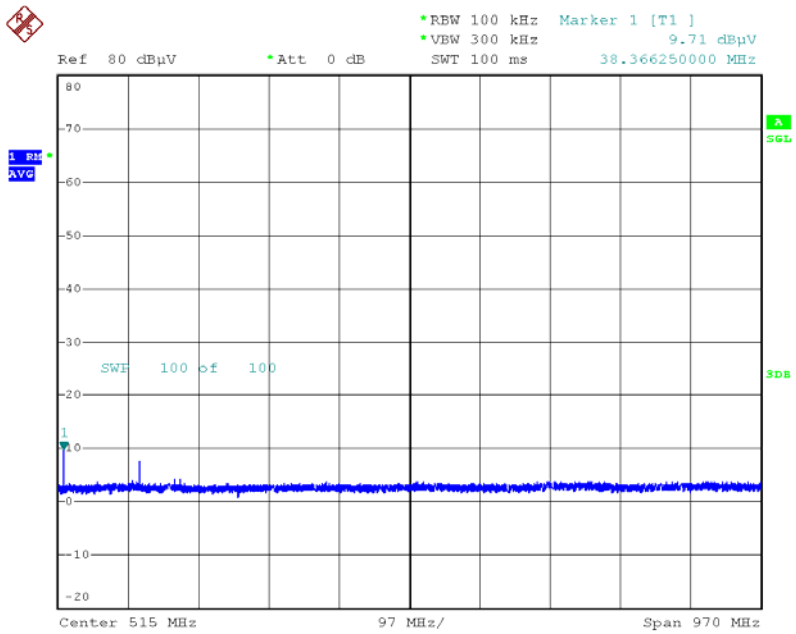
Plot data of Radiated Spurious Emissions

30 MHz ~ 1 GHz / 1cc / Low / H



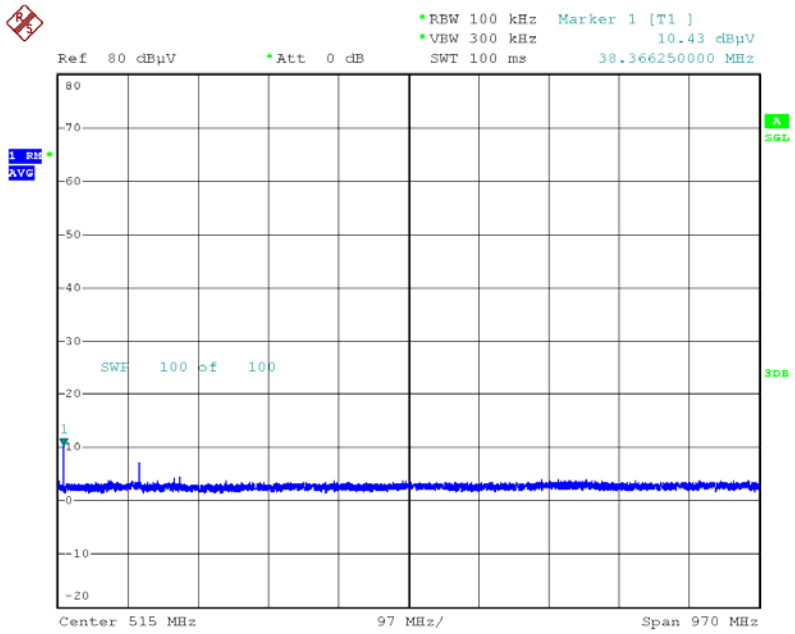
Date: 1.JAN.2003 00:23:34

30 MHz ~ 1 GHz / 1cc / Low / V



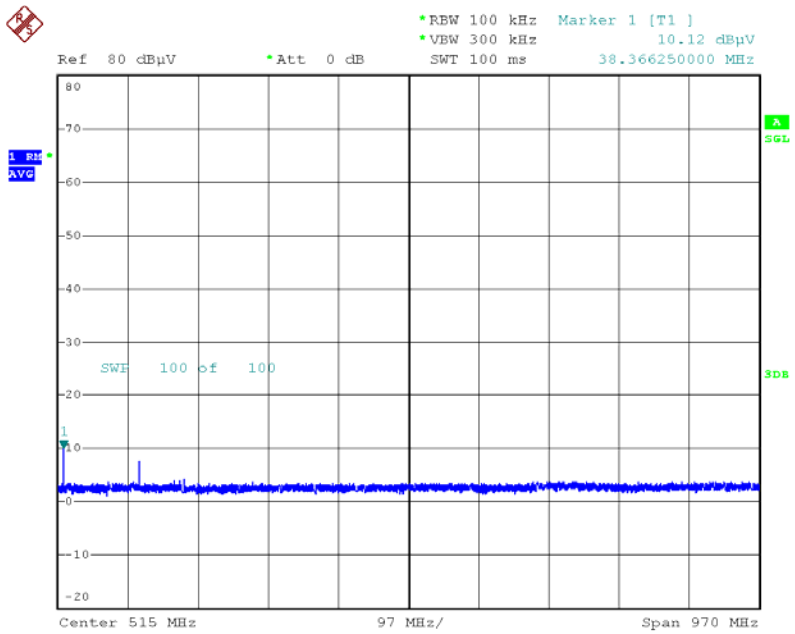
Date: 1.JAN.2003 00:24:48

30 MHz ~ 1 GHz / 1cc / Middle / H



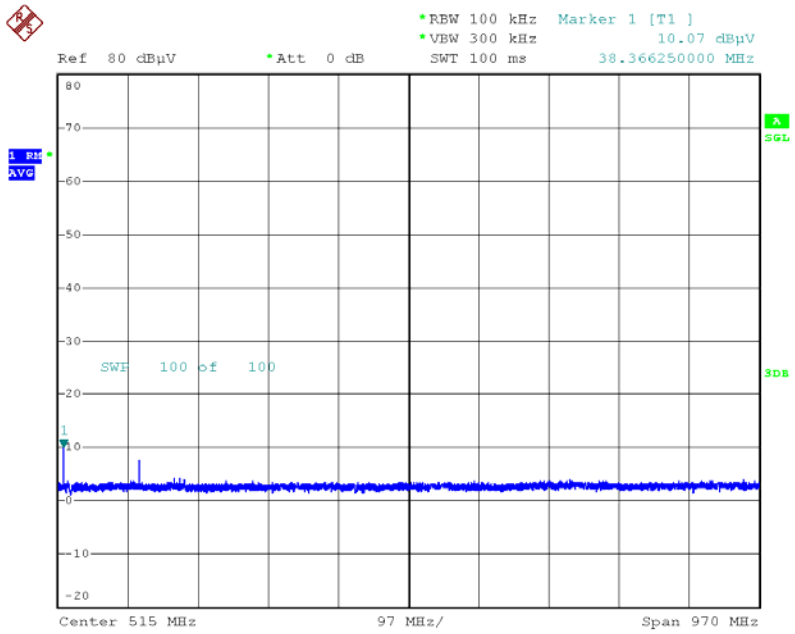
Date: 1.JAN.2003 00:25:26

30 MHz ~ 1 GHz / 1cc / Middle / V



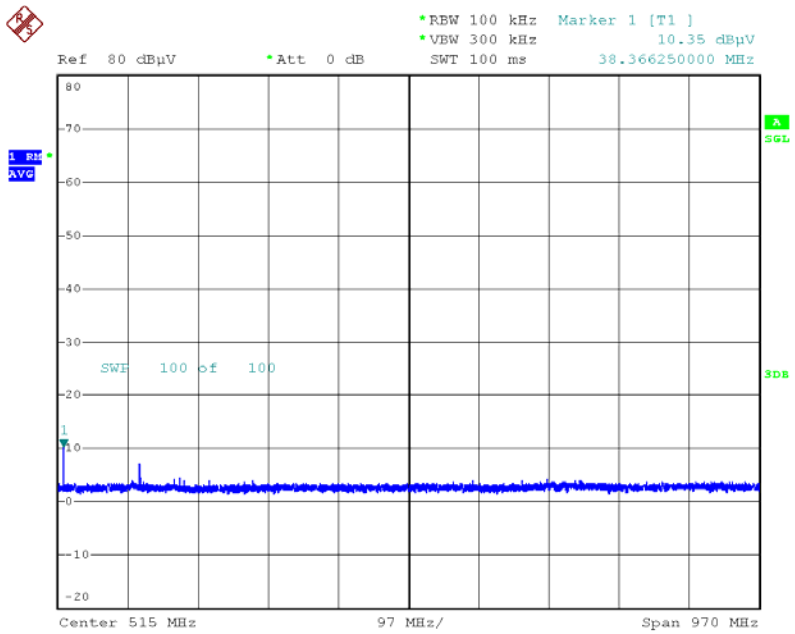
Date: 1.JAN.2003 00:26:12

30 MHz ~ 1 GHz / 1cc / High / H



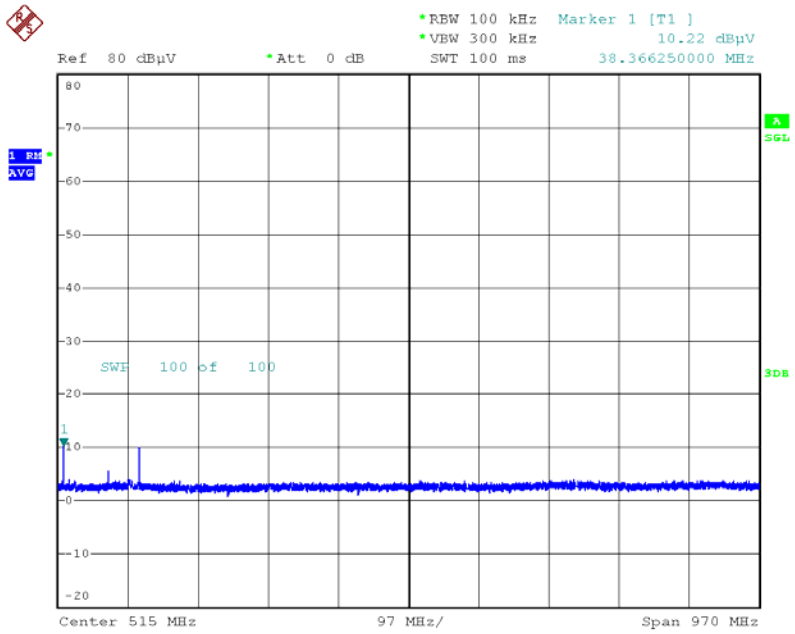
Date: 1.JAN.2003 00:26:59

30 MHz ~ 1 GHz / 1cc / High / V



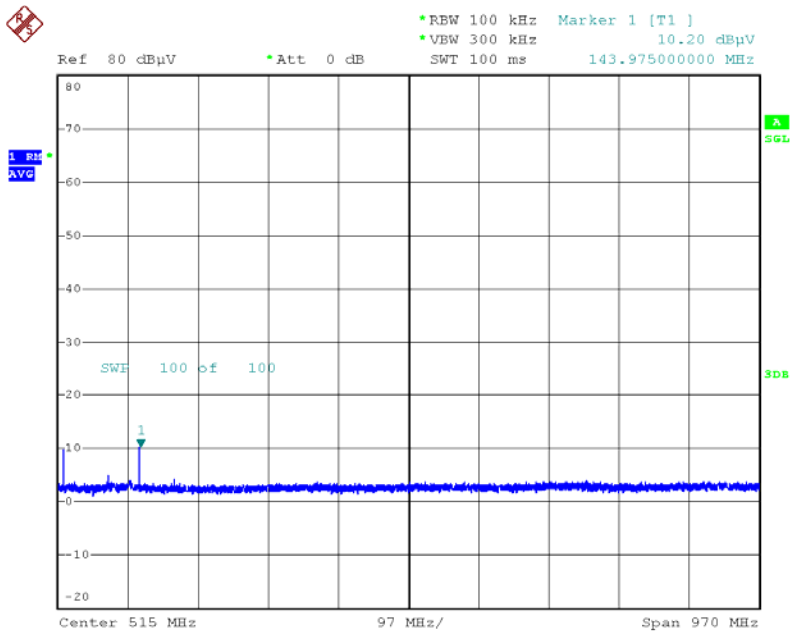
Date: 1.JAN.2003 00:27:38

30 MHz ~ 1 GHz / 8cc / Low / H



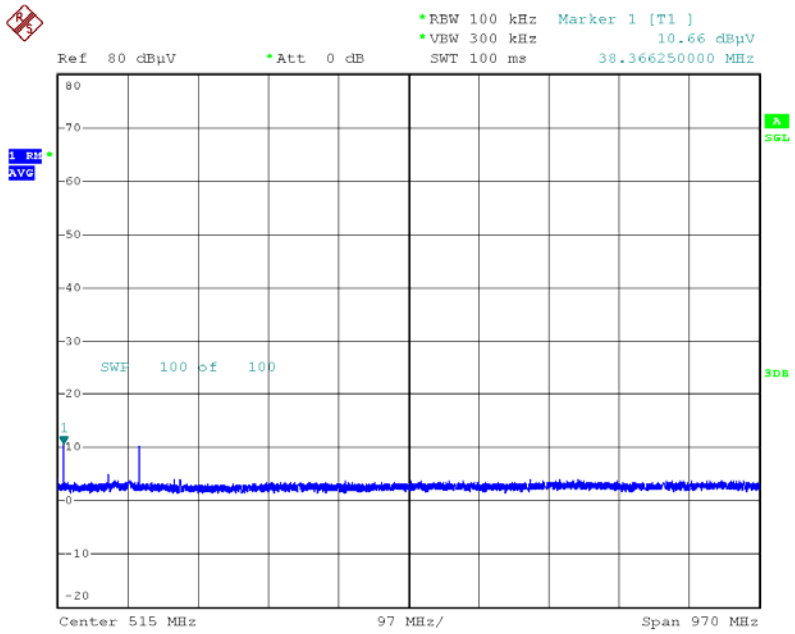
Date: 1.JAN.2003 01:36:20

30 MHz ~ 1 GHz / 8cc / Low / V

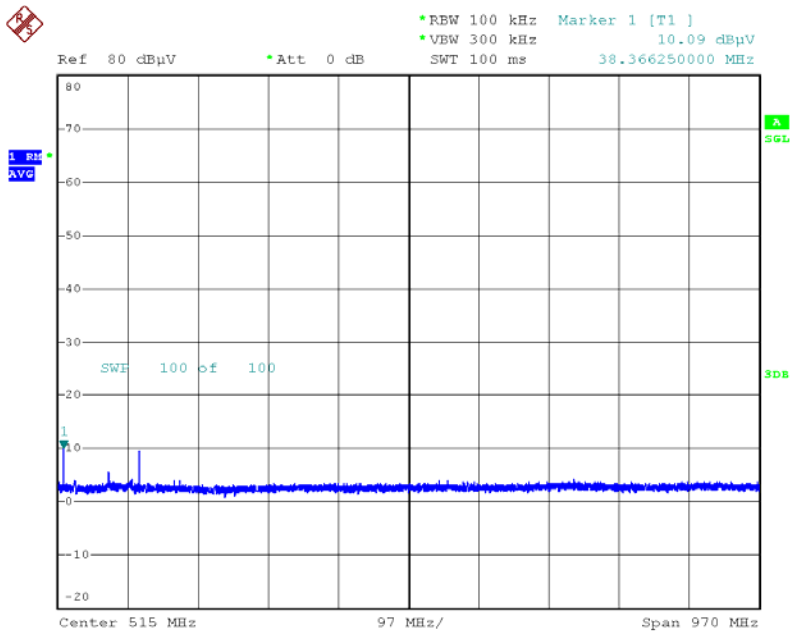


Date: 1.JAN.2003 01:37:06

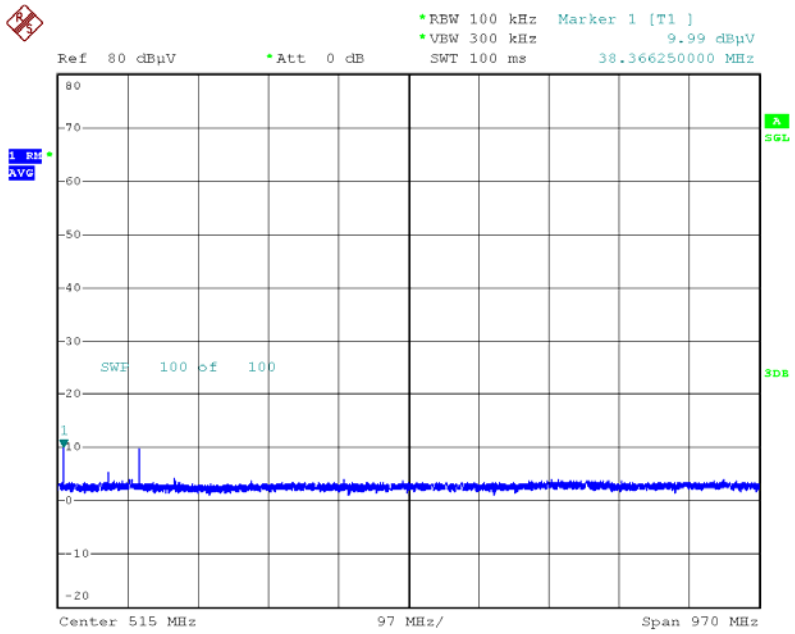
30 MHz ~ 1 GHz / 8cc / Middle / H



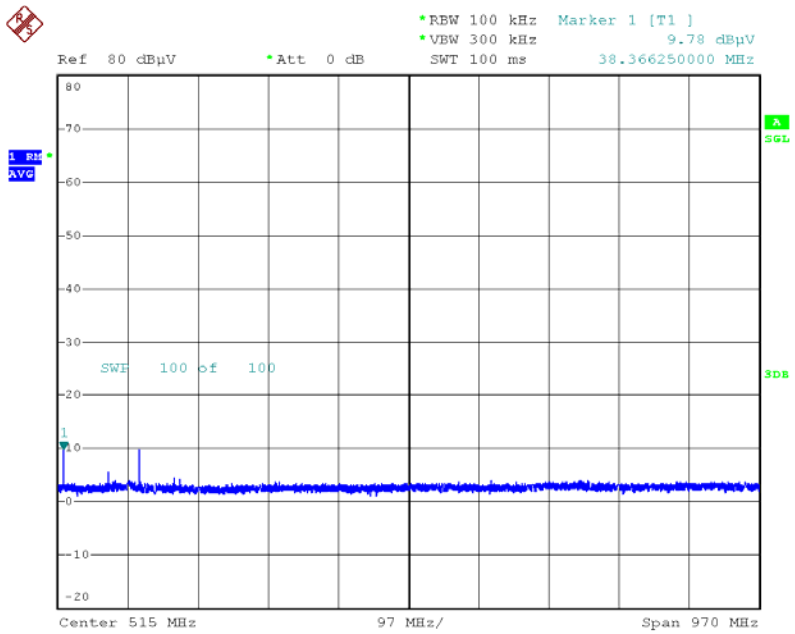
30 MHz ~ 1 GHz / 8cc / Middle / V



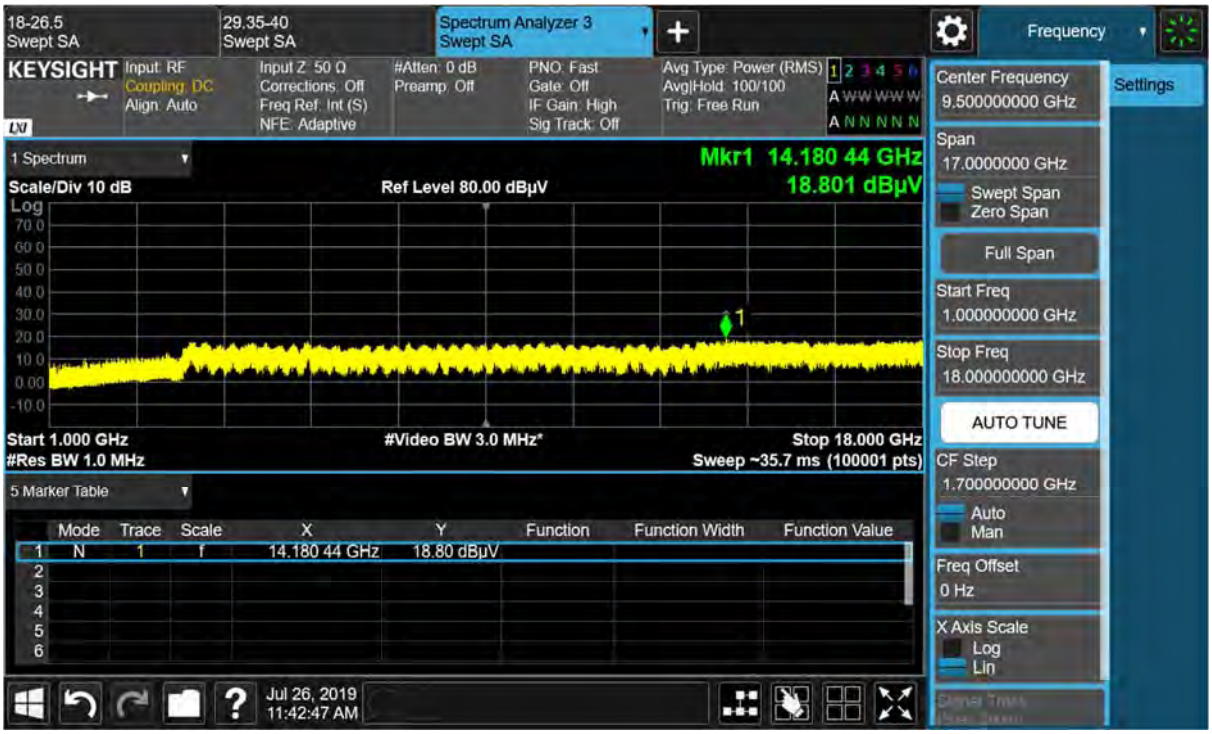
30 MHz ~ 1 GHz / 8cc / High / H



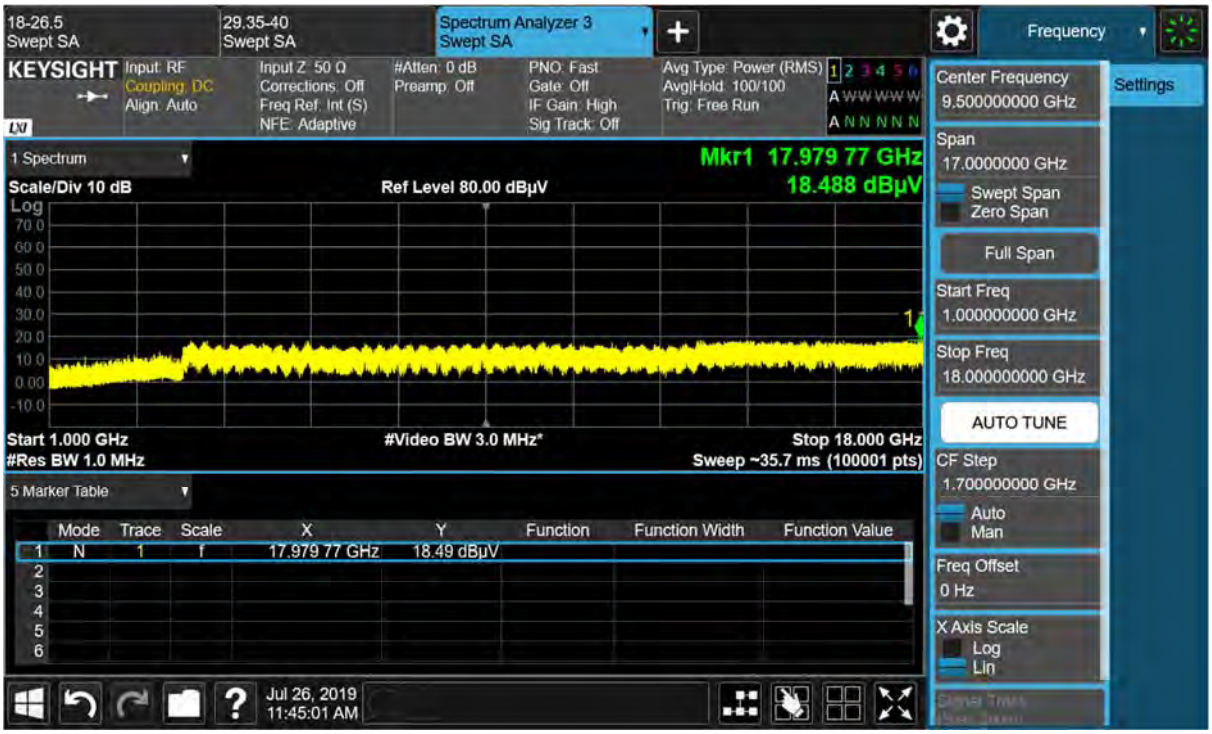
30 MHz ~ 1 GHz / 8cc / High / V

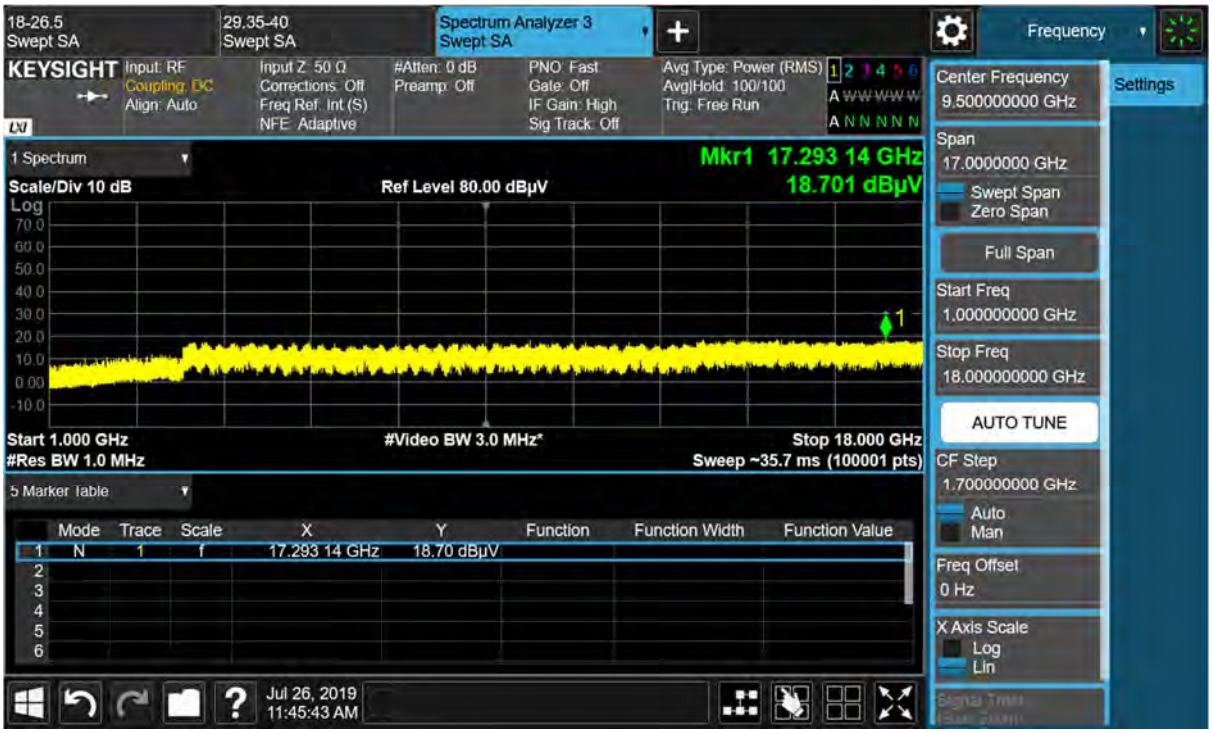


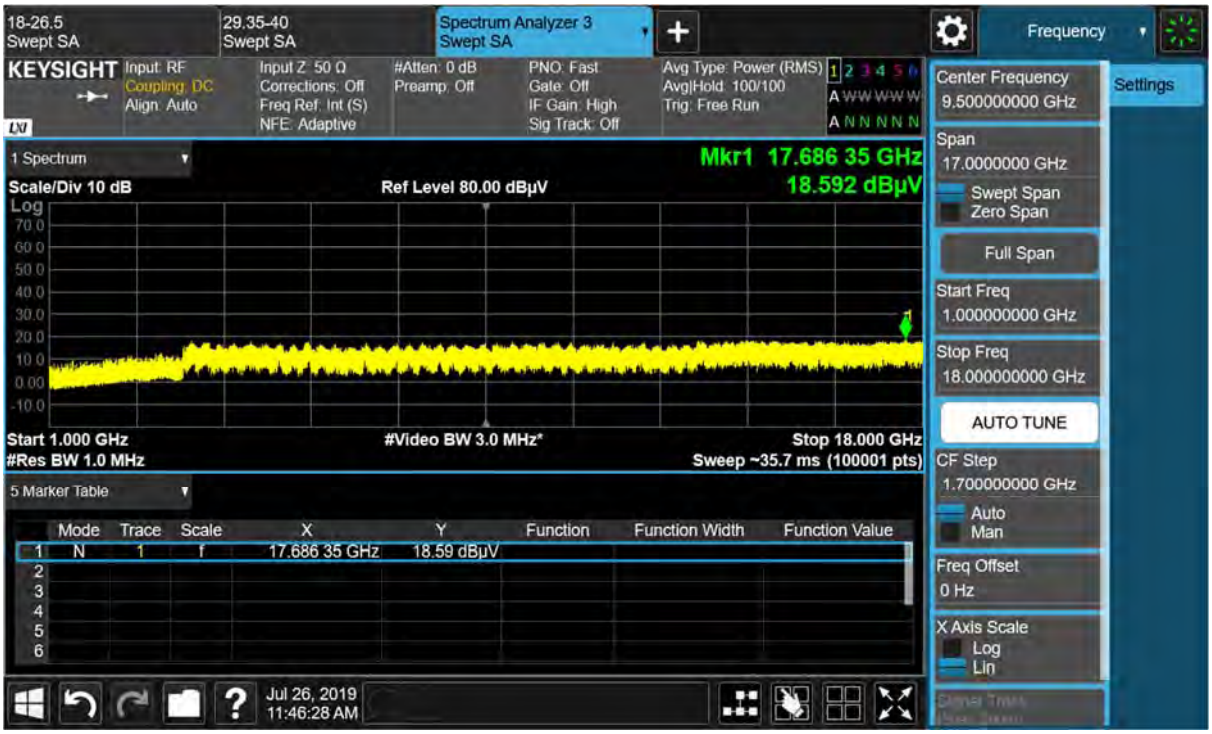
1 GHz ~ 18 GHz / 1cc / Low / H

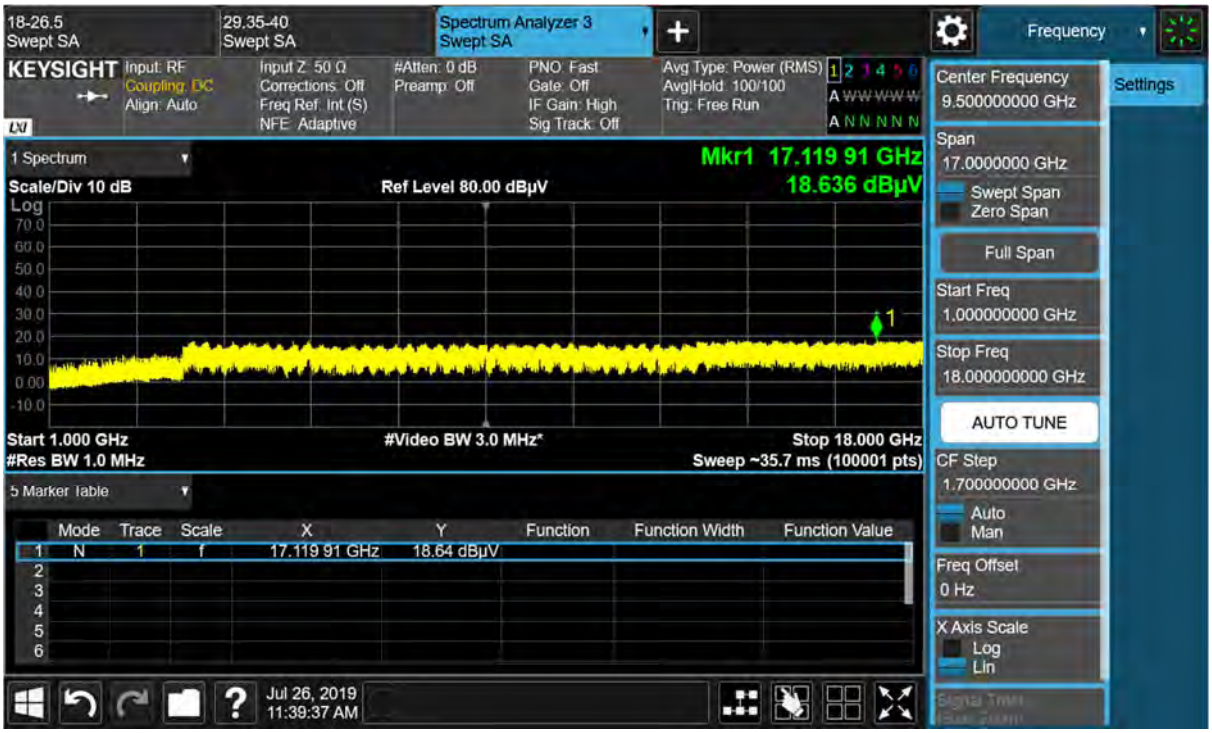

1 GHz ~ 18 GHz / 1cc / Low / V


1 GHz ~ 18 GHz / 1cc / Middle / H


1 GHz ~ 18 GHz / 1cc / Middle / V


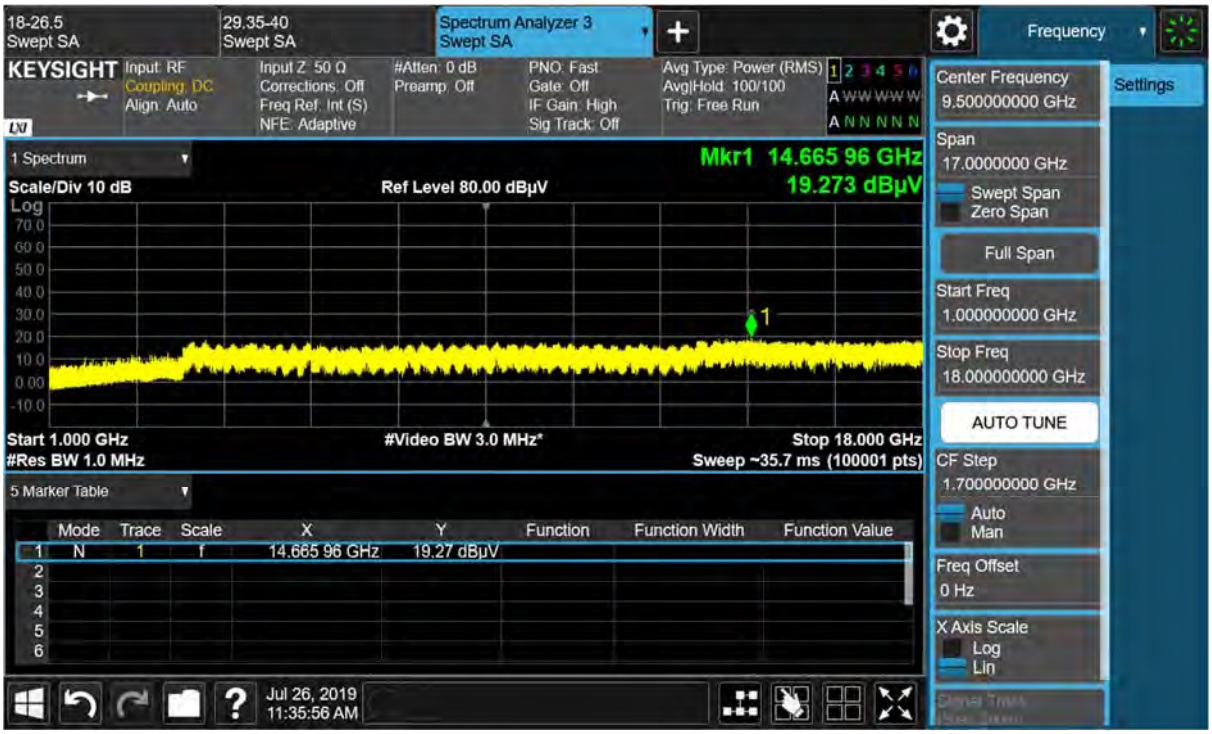
1 GHz ~ 18 GHz / 1cc / High / H


1 GHz ~ 18 GHz / 1cc / High / V


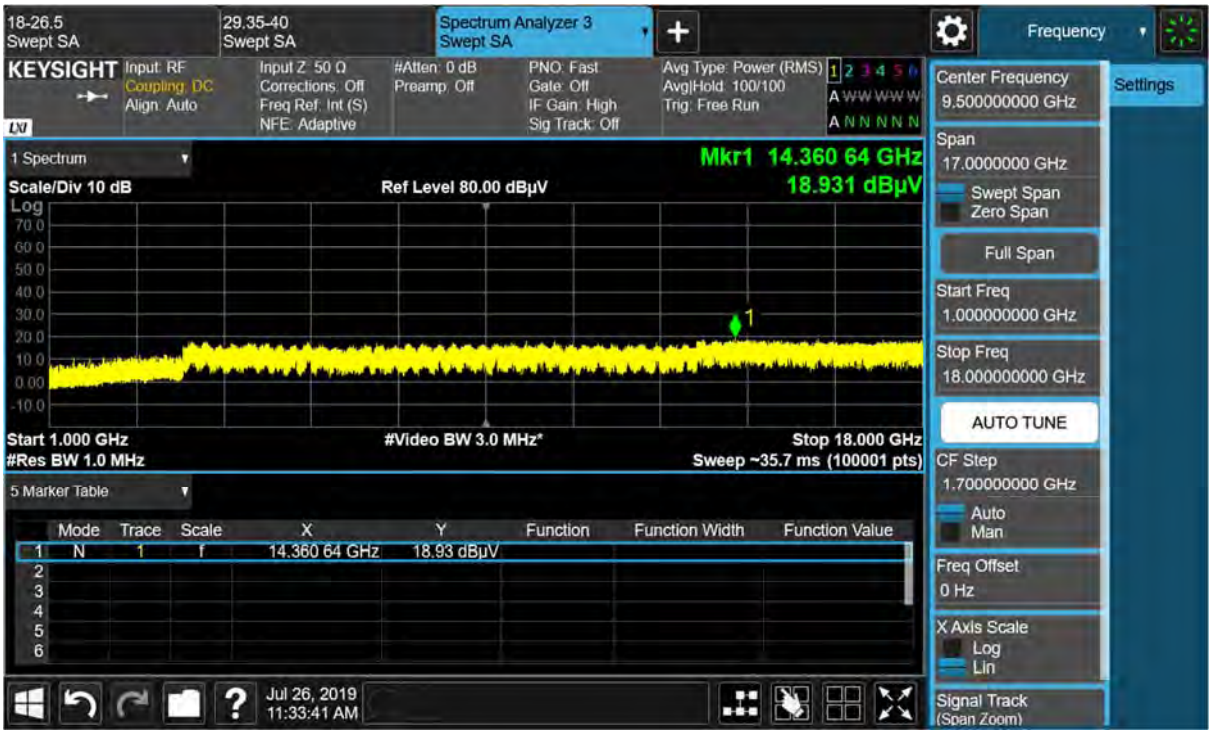
1 GHz ~ 18 GHz / 8cc / Low / H


1 GHz ~ 18 GHz / 8cc / Low / V

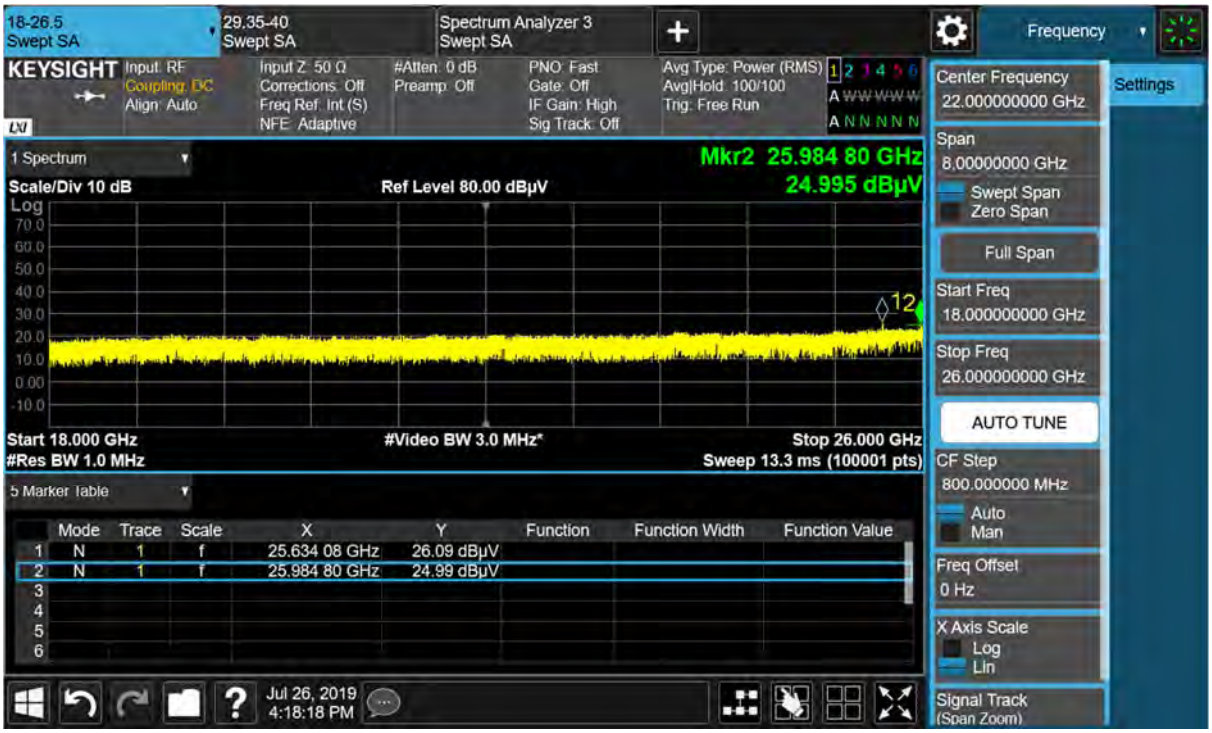

1 GHz ~ 18 GHz / 8cc / Middle / H


1 GHz ~ 18 GHz / 8cc / Middle / V


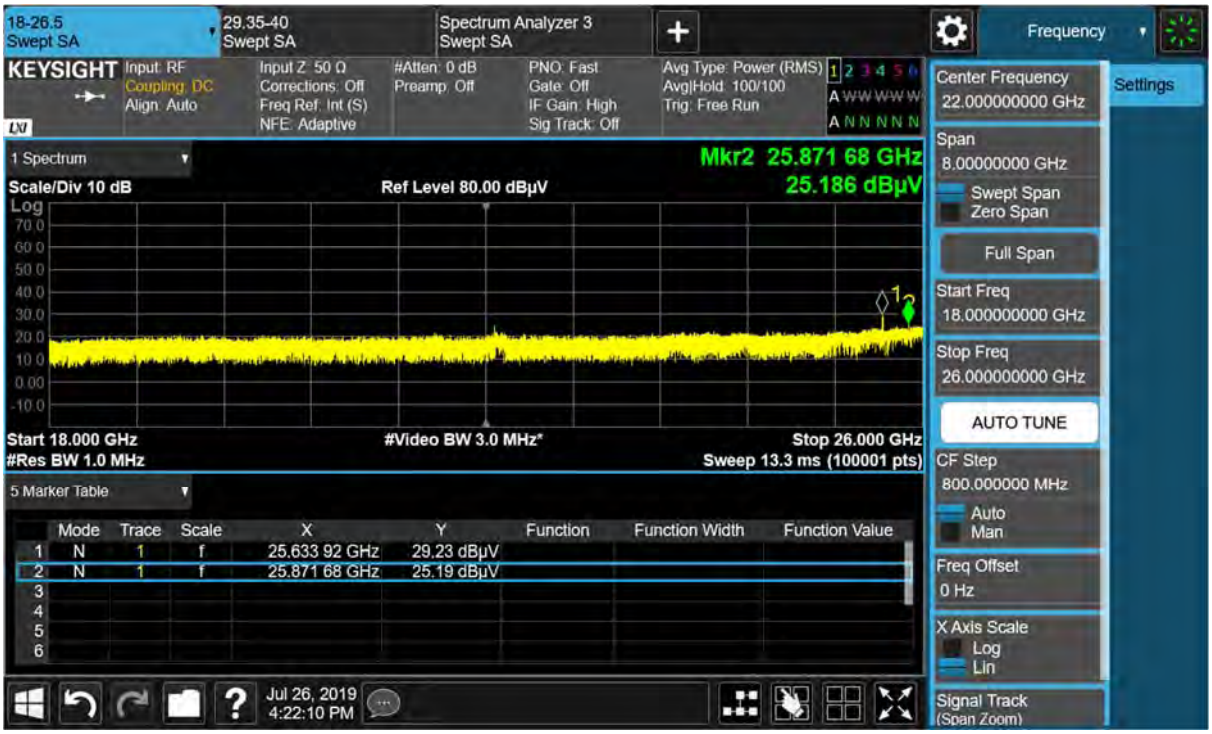
1 GHz ~ 18 GHz / 8cc / High / H


1 GHz ~ 18 GHz / 8cc / High / V


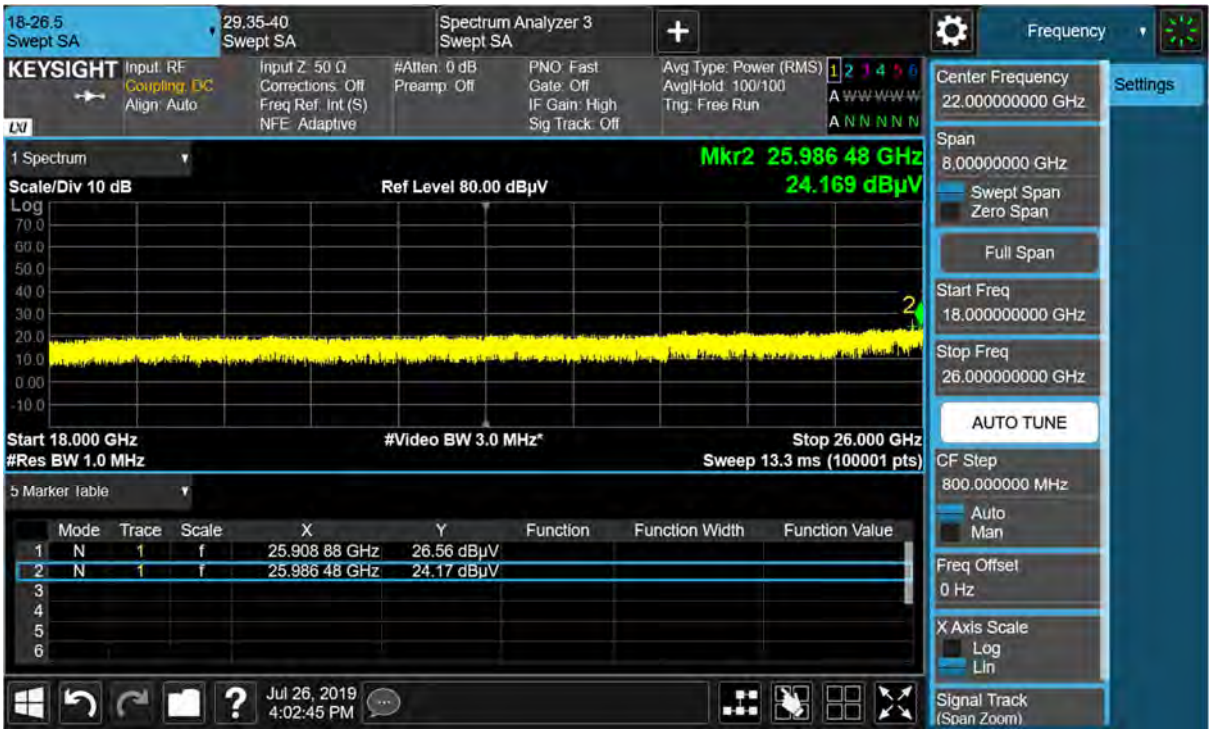
18 GHz ~ 26.5 GHz / 1cc / Low / 45°



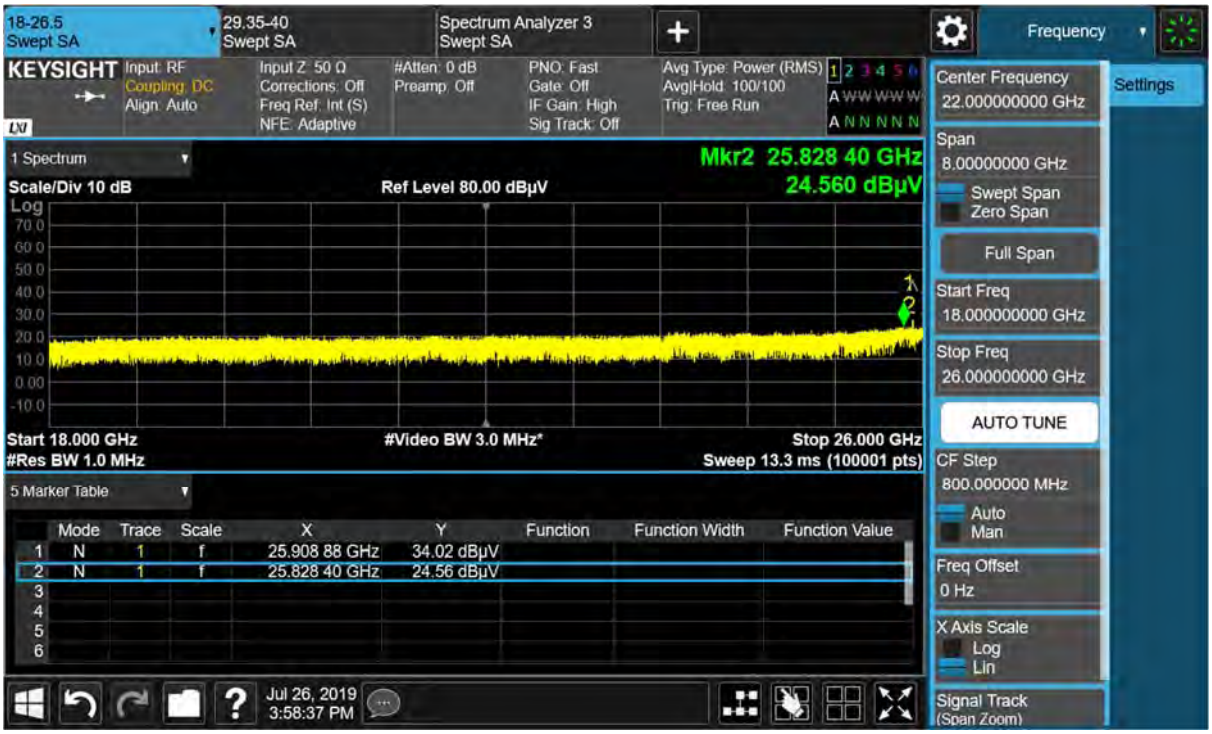
18 GHz ~ 26.5 GHz / 1cc / Low / 135°

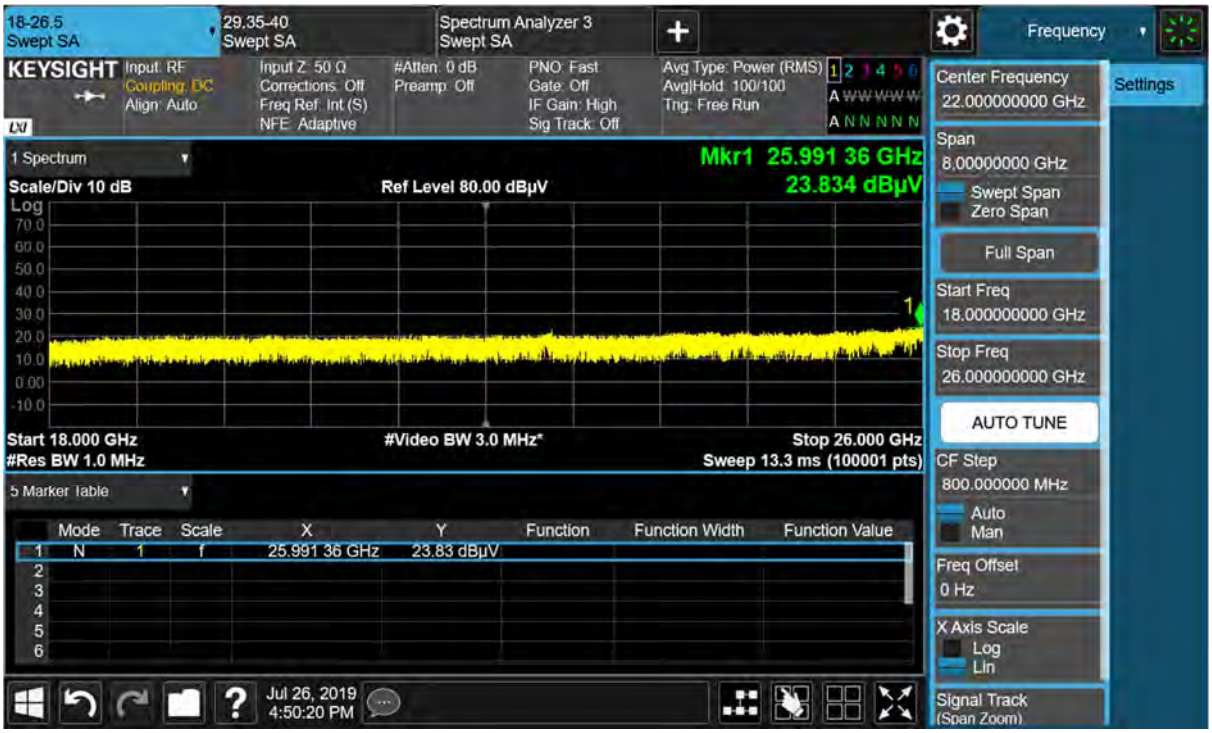


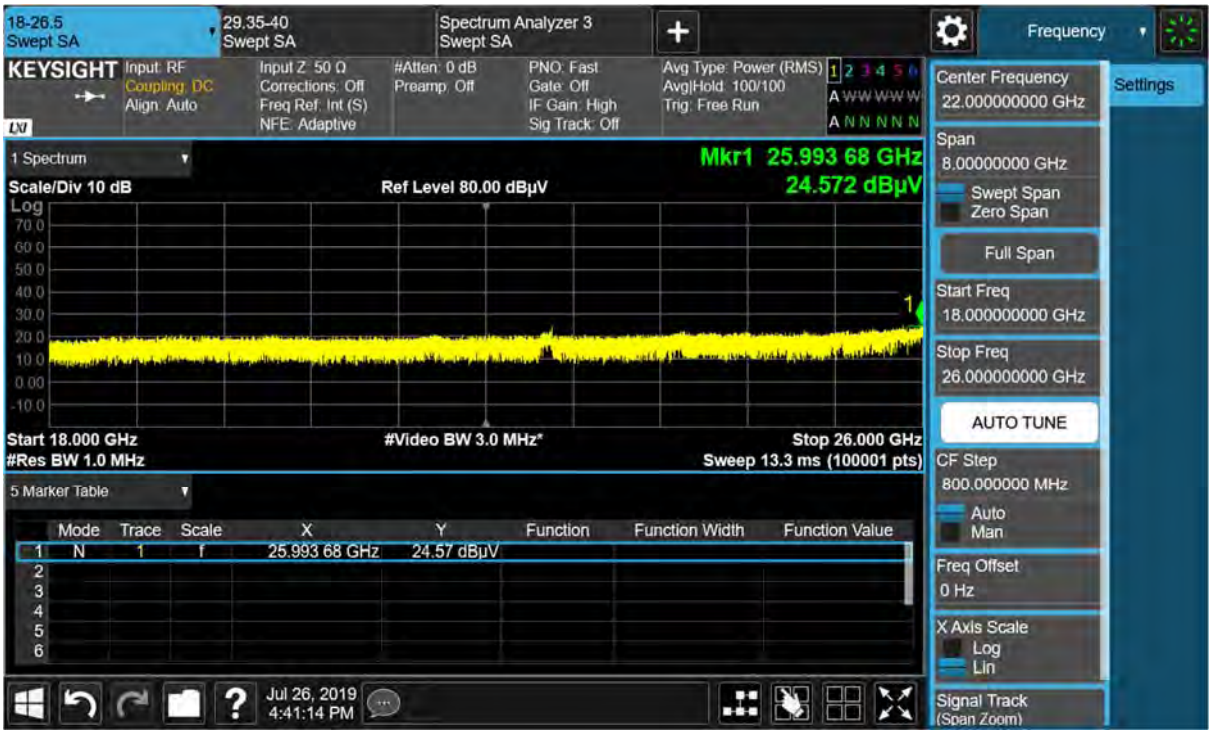
18 GHz ~ 26.5 GHz / 1cc / Middle / 45°

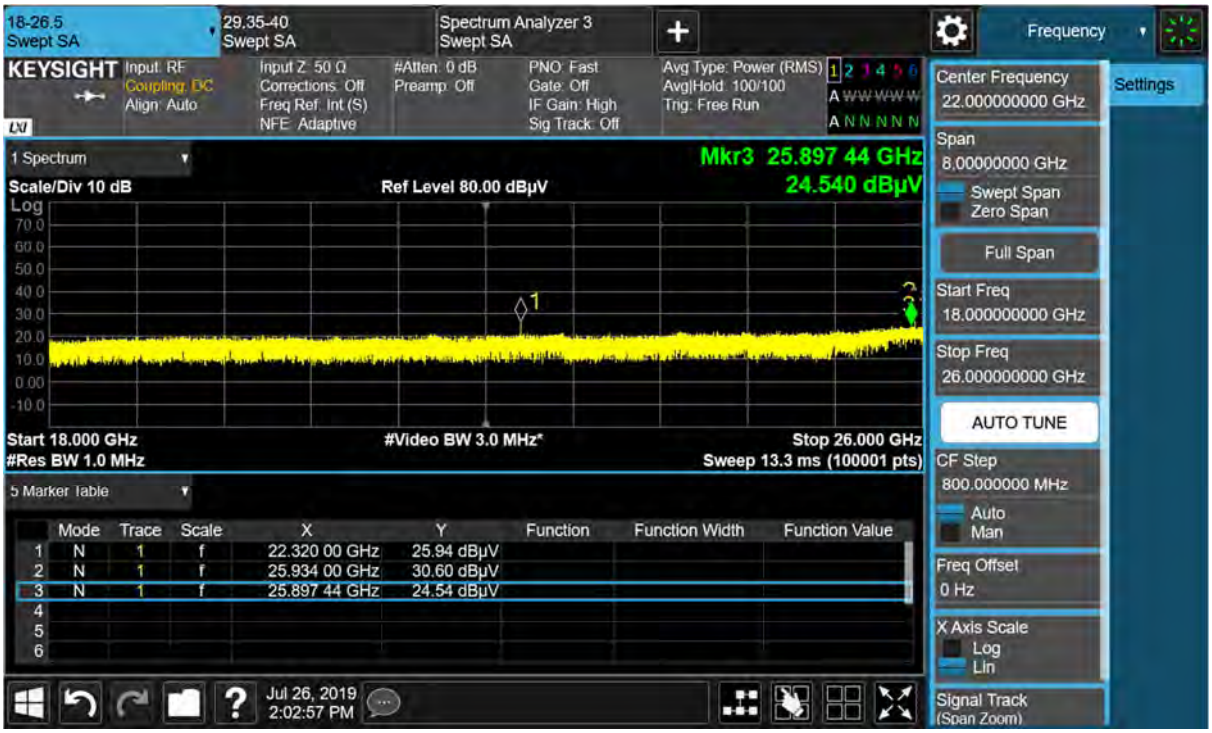


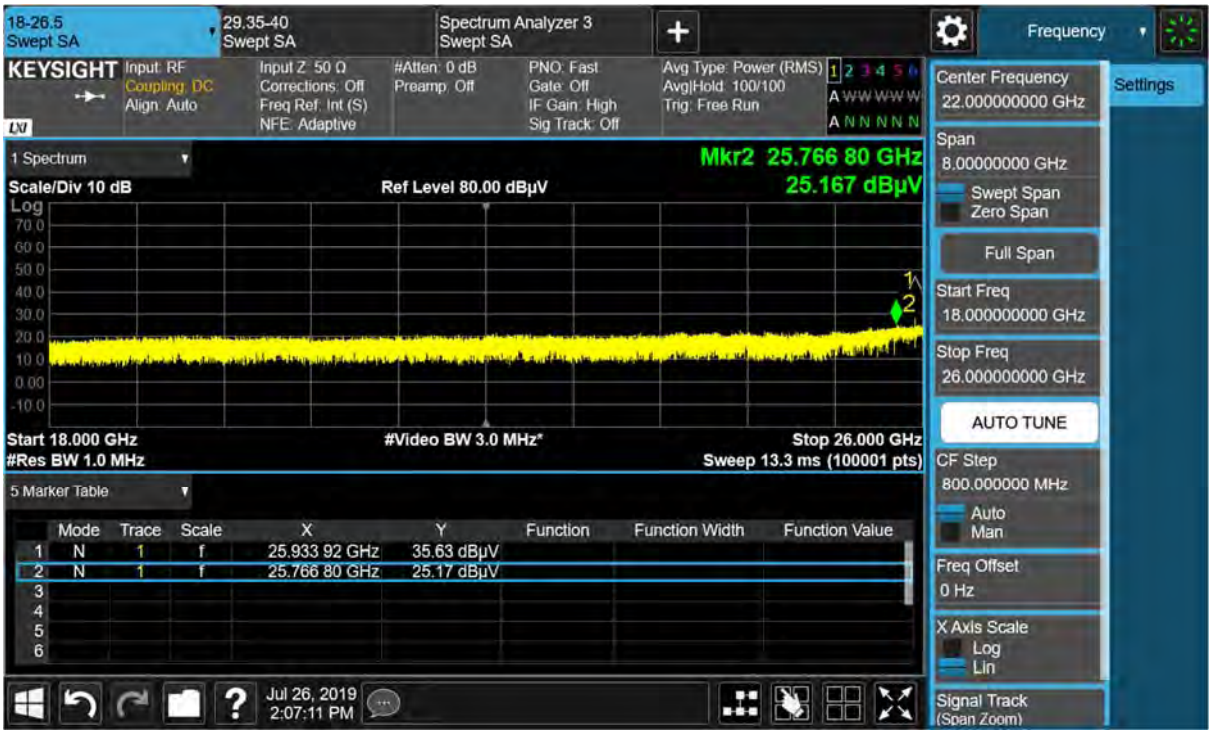
18 GHz ~ 26.5 GHz / 1cc / Middle / 135°

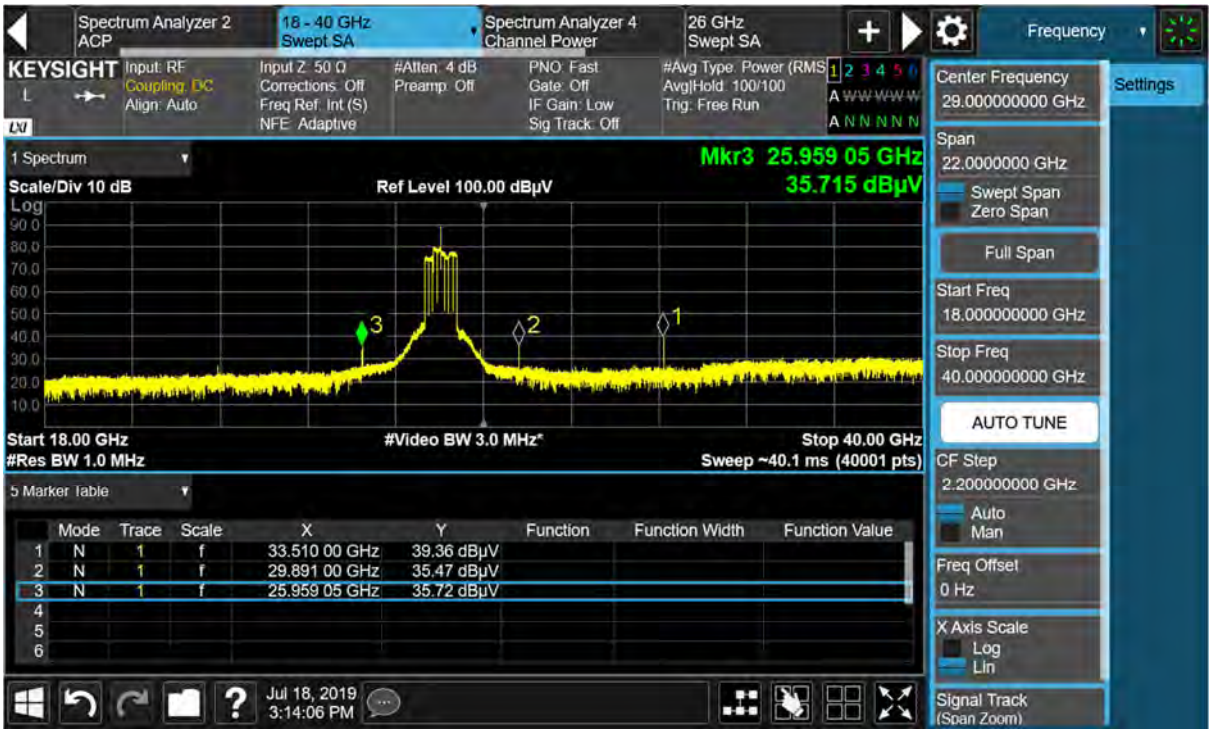


18 GHz ~ 26.5 GHz / 1cc / High / 45°


18 GHz ~ 26.5 GHz / 1cc / High / 135°


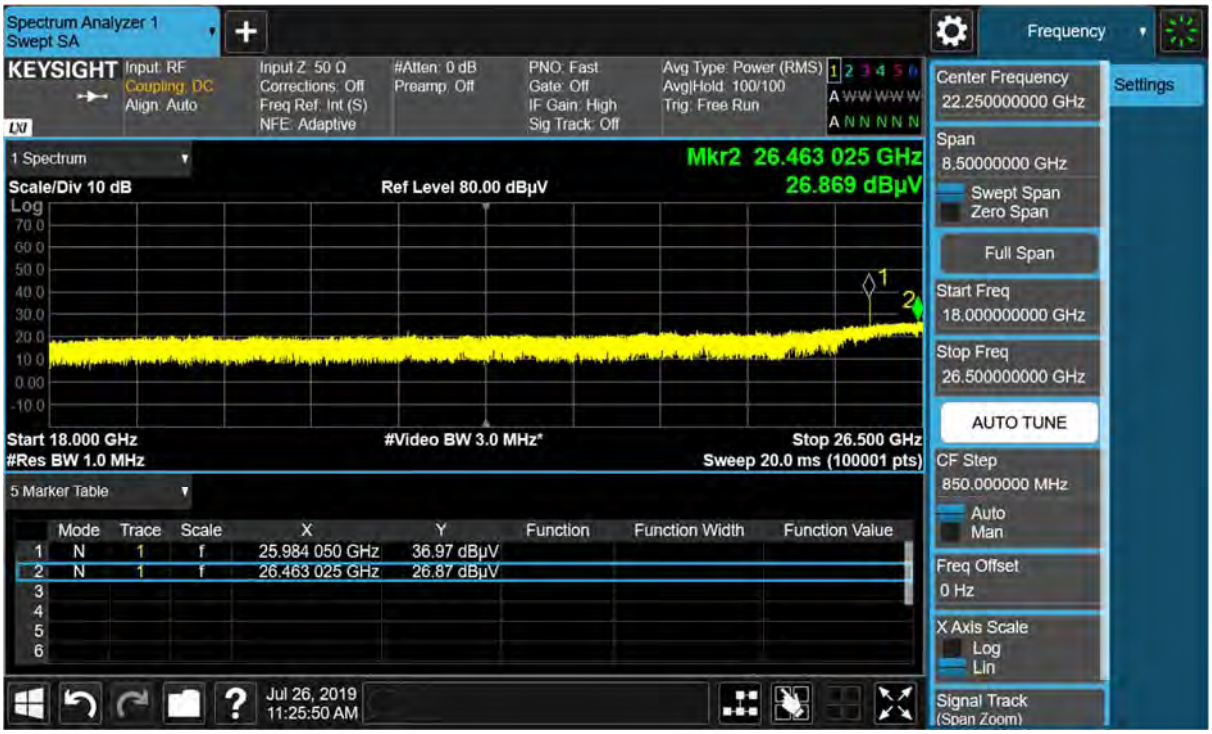
18 GHz ~ 26.5 GHz / 8cc / Low / 45°


18 GHz ~ 26.5 GHz / 8cc / Low / 135°


18 GHz ~ 26.5 GHz / 8cc / Middle / 45°


18 GHz ~ 26.5 GHz / 8cc / High / 45°

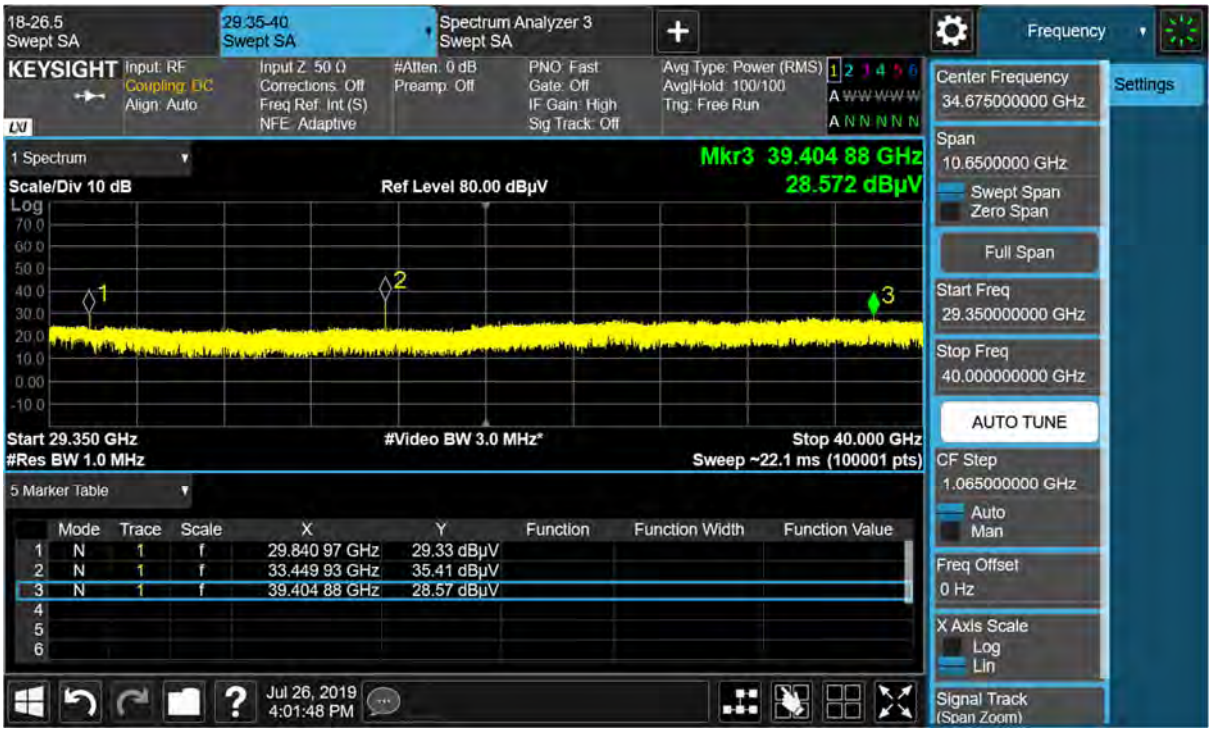
18 GHz ~ 26.5 GHz / 8cc / High / 135°



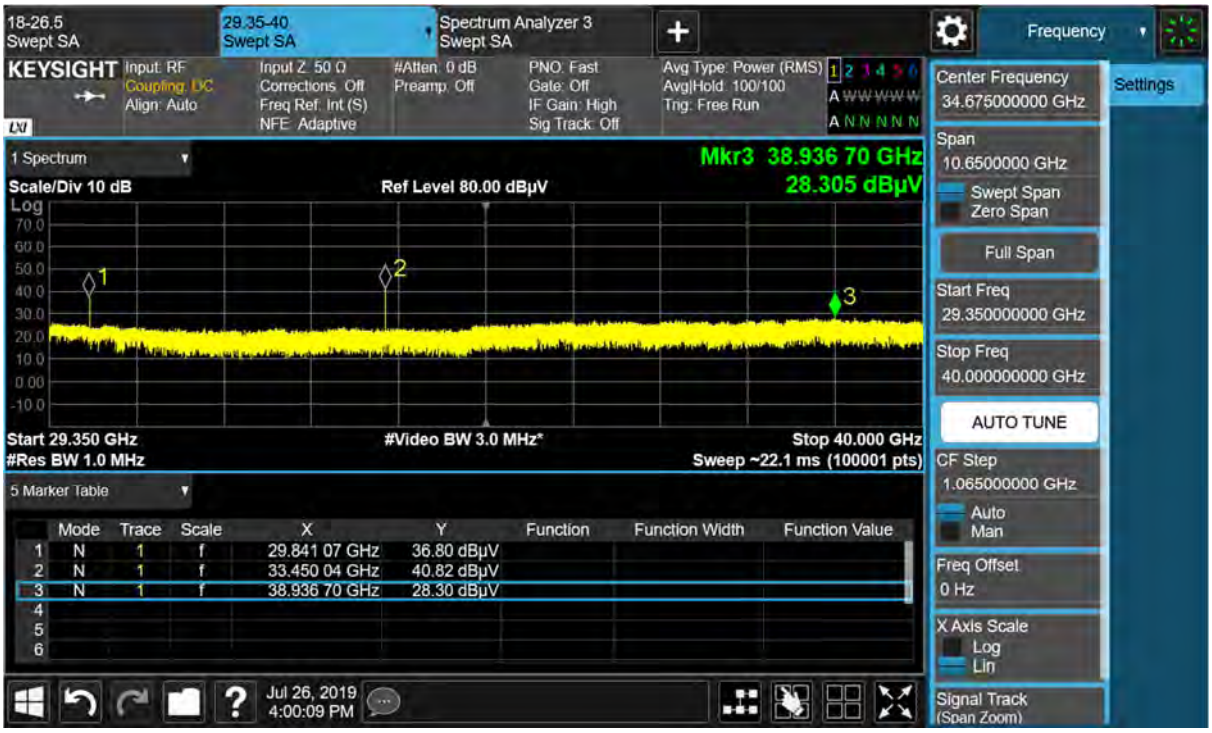
29.35 GHz ~ 40 GHz / 1cc / Low / 45°

29.35 GHz ~ 40 GHz / 1cc / Low / 135°

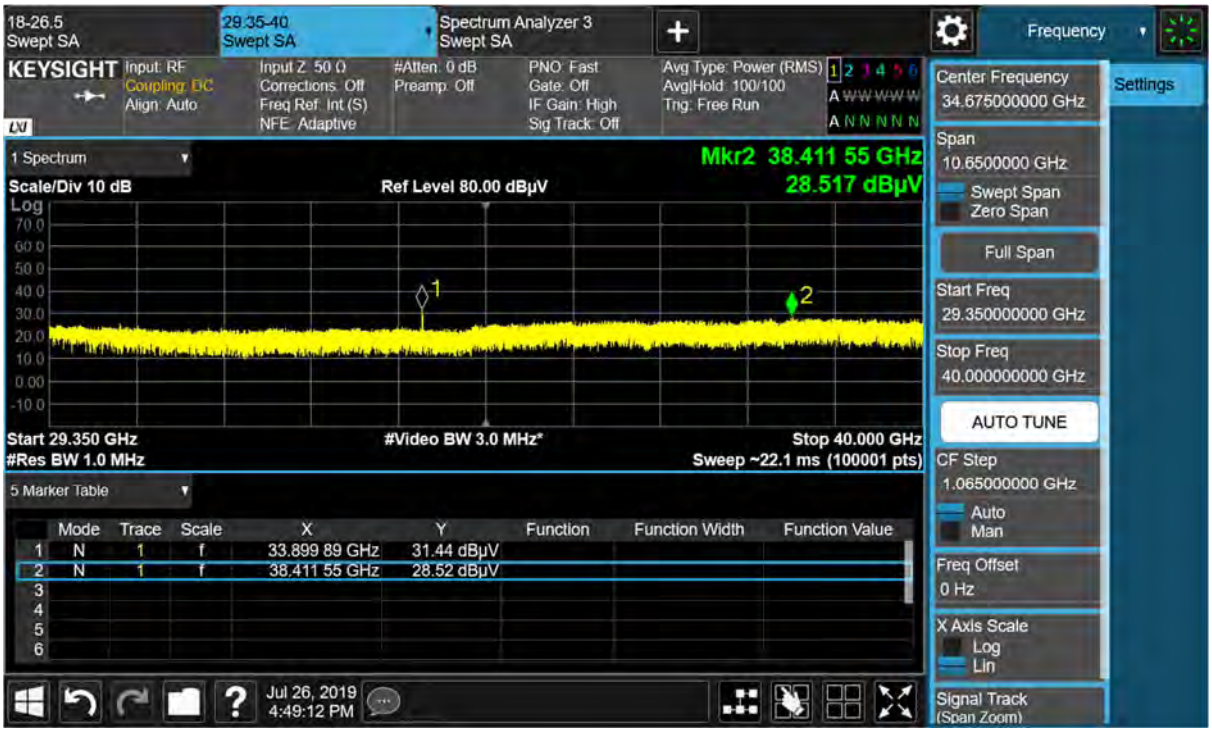
29.35 GHz ~ 40 GHz / 1cc / Middle / 45°



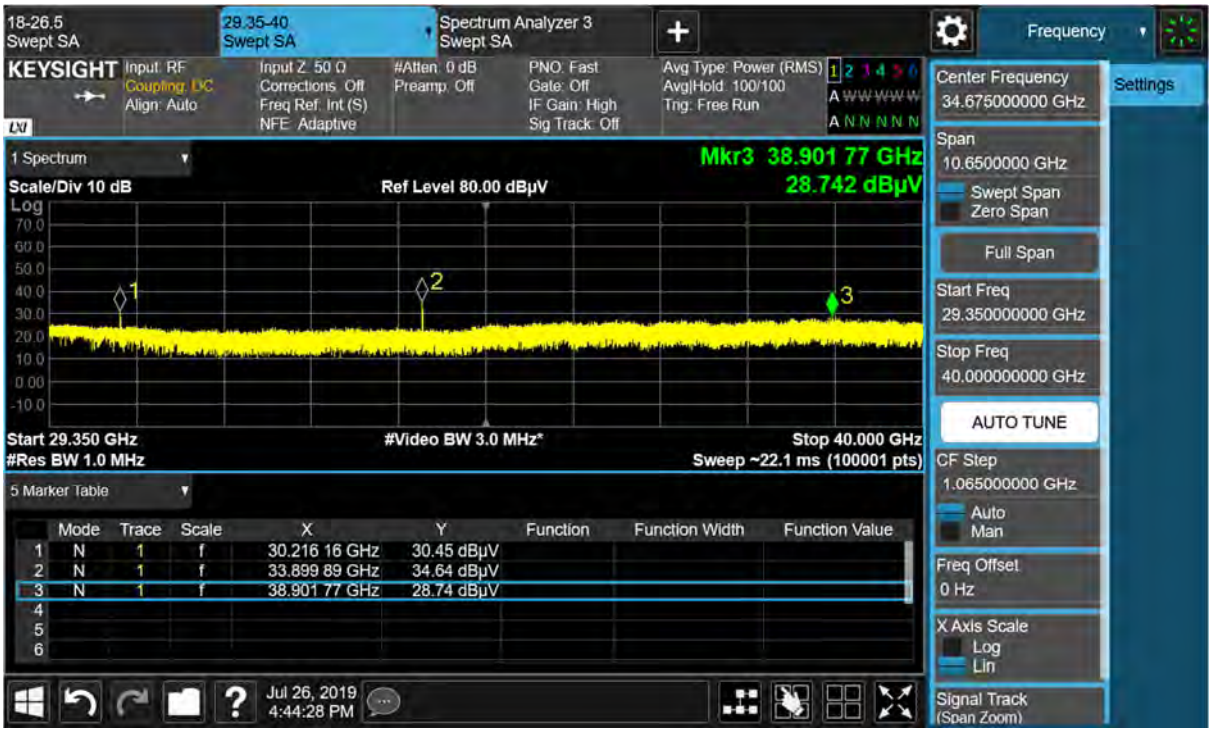
29.35 GHz ~ 40 GHz / 1cc / Middle / 135°



29.35 GHz ~ 40 GHz / 1cc / High / 45°

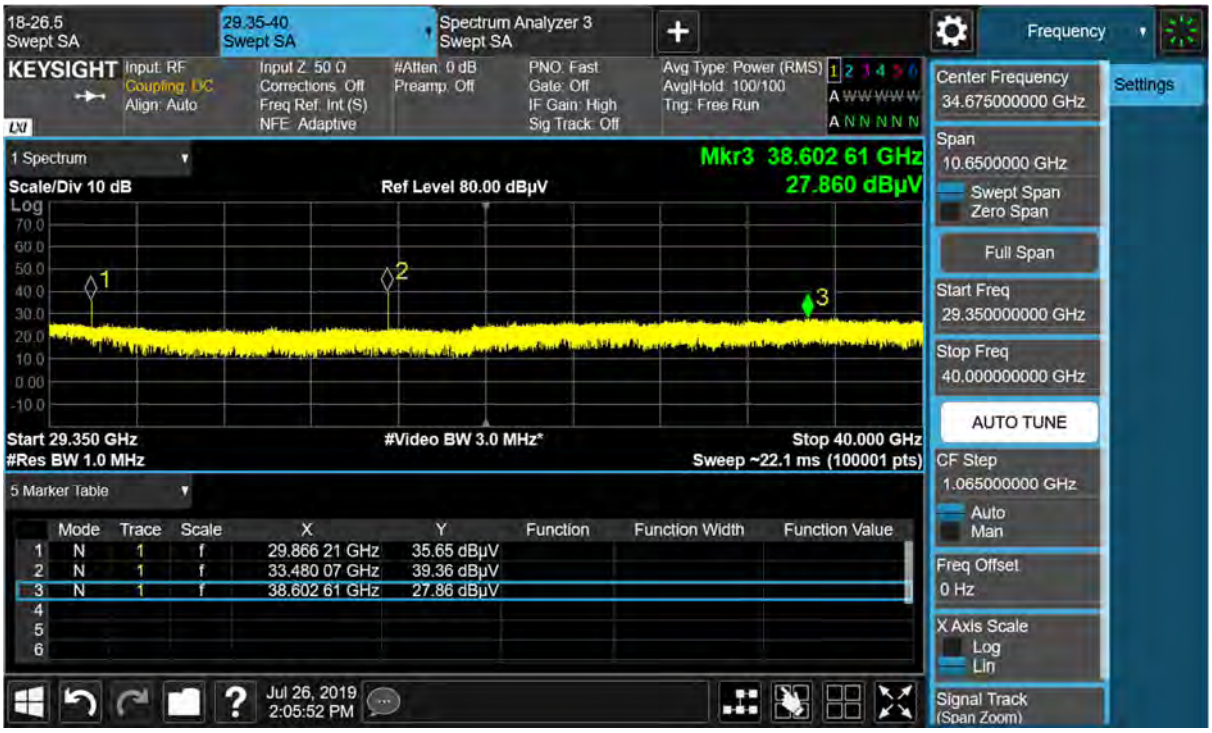


29.35 GHz ~ 40 GHz / 1cc / High / 135°



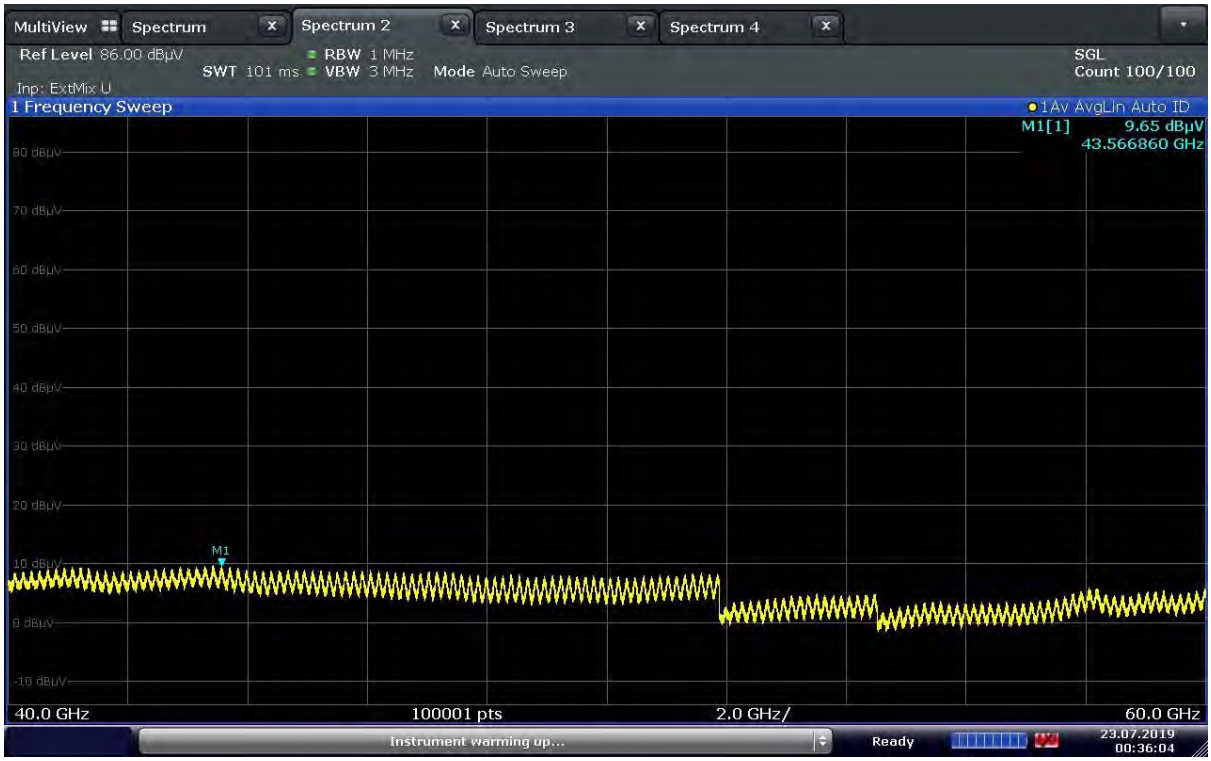
29.35 GHz ~ 40 GHz / 8cc / Low / 45°

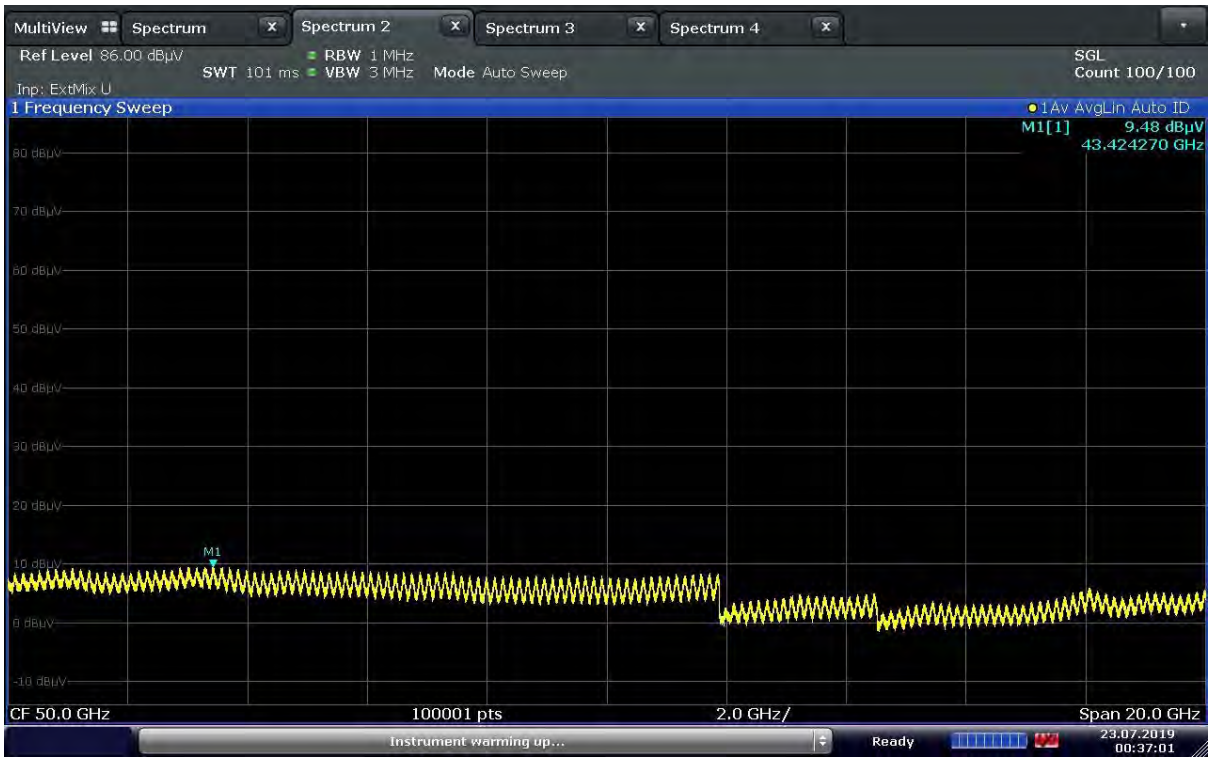
29.35 GHz ~ 40 GHz / 8cc / Low / 135°

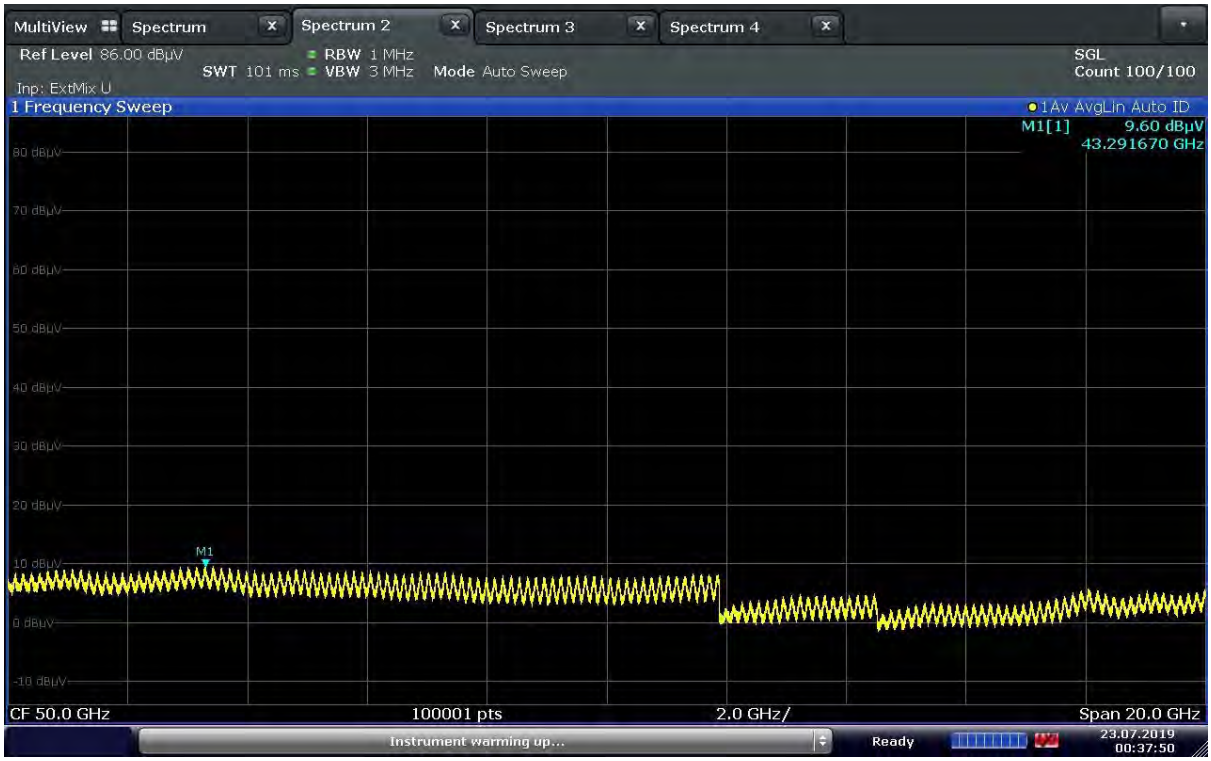


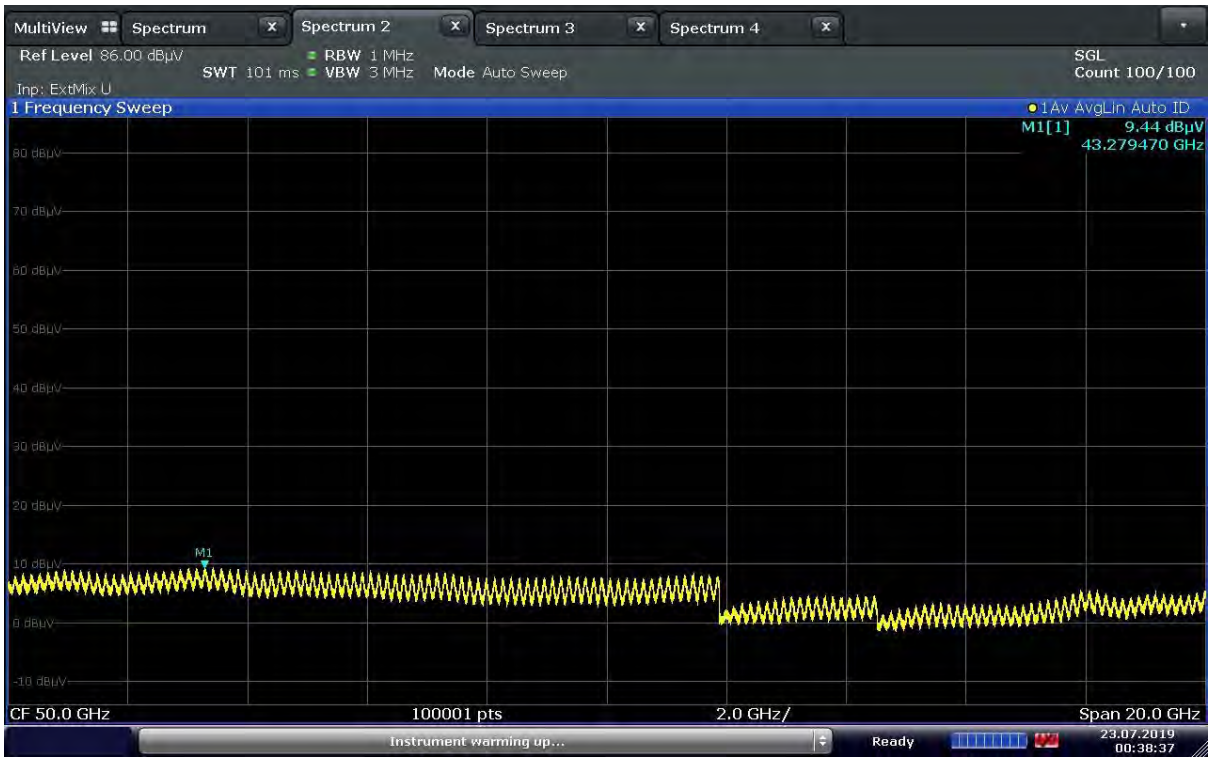
29.35 GHz ~ 40 GHz / 8cc / High / 45°

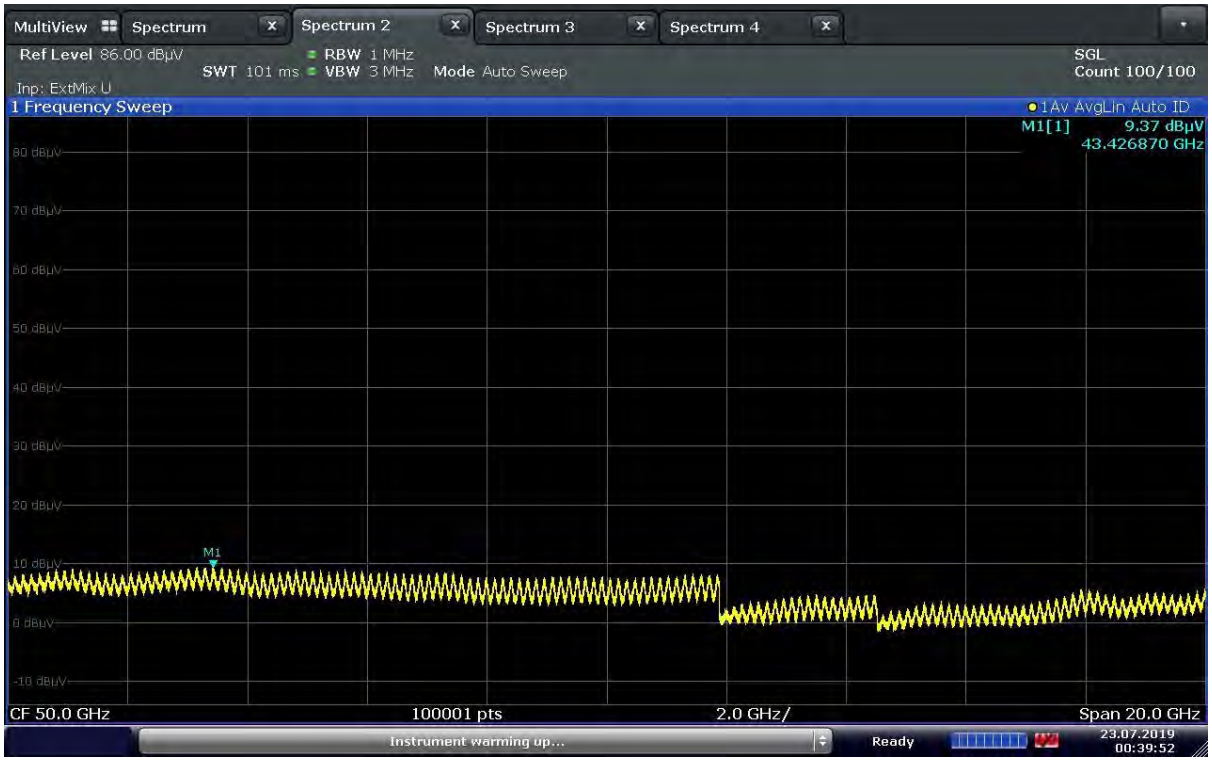
29.35 GHz ~ 40 GHz / 8cc / High / 135°

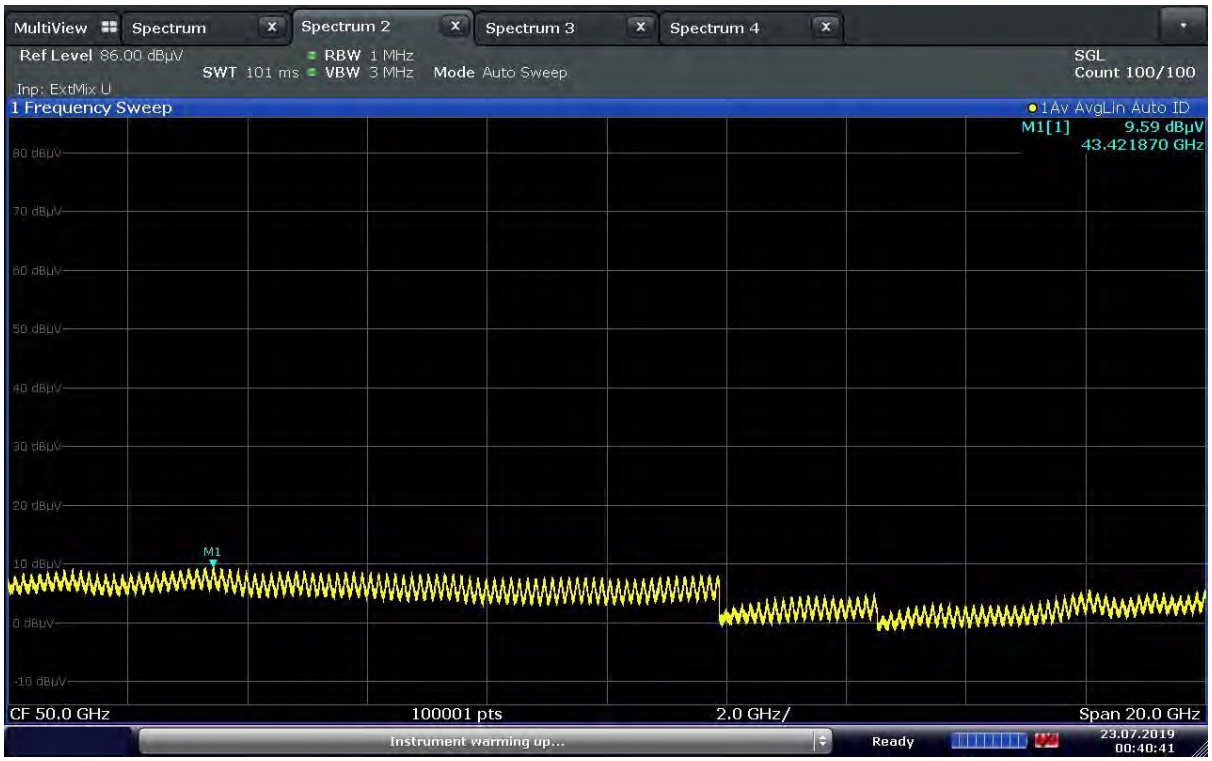
40 GHz ~ 60 GHz / 1cc / Low / 45°


40 GHz ~ 60 GHz / 1cc / Low / 135°


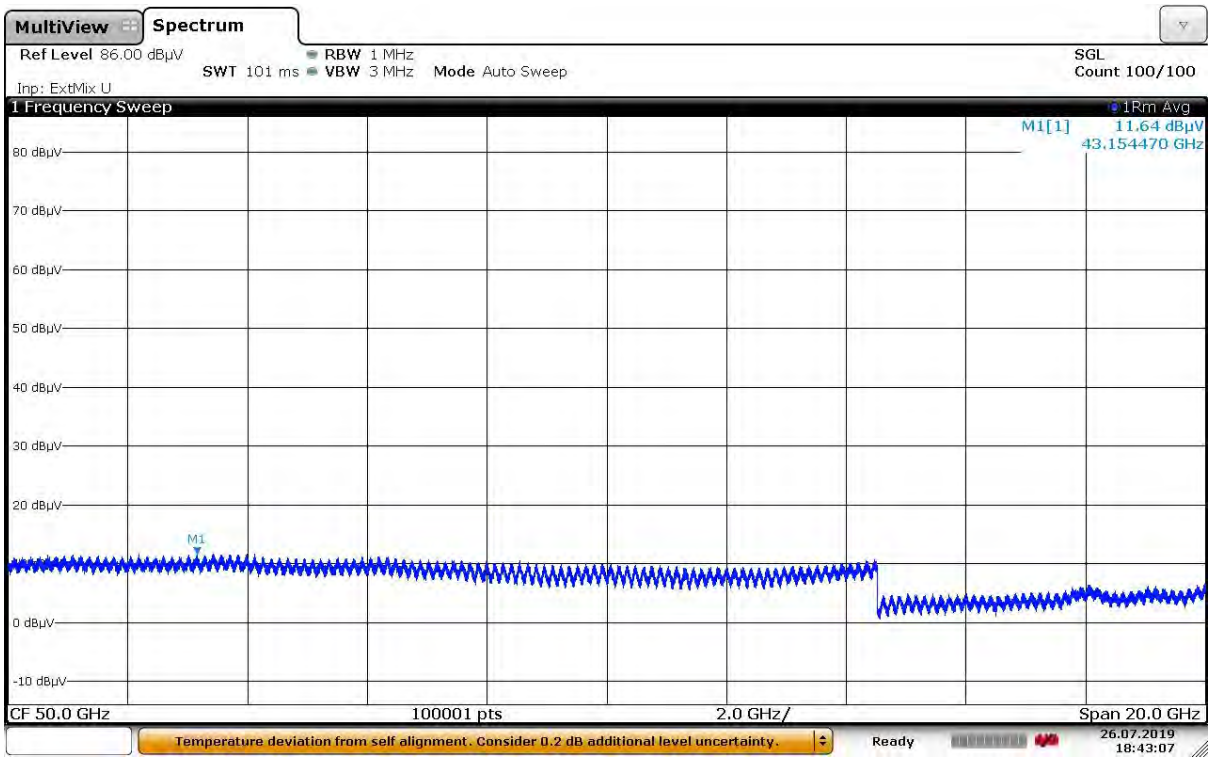
40 GHz ~ 60 GHz / 1cc / Middle / 45°


40 GHz ~ 60 GHz / 1cc / Middle / 135°


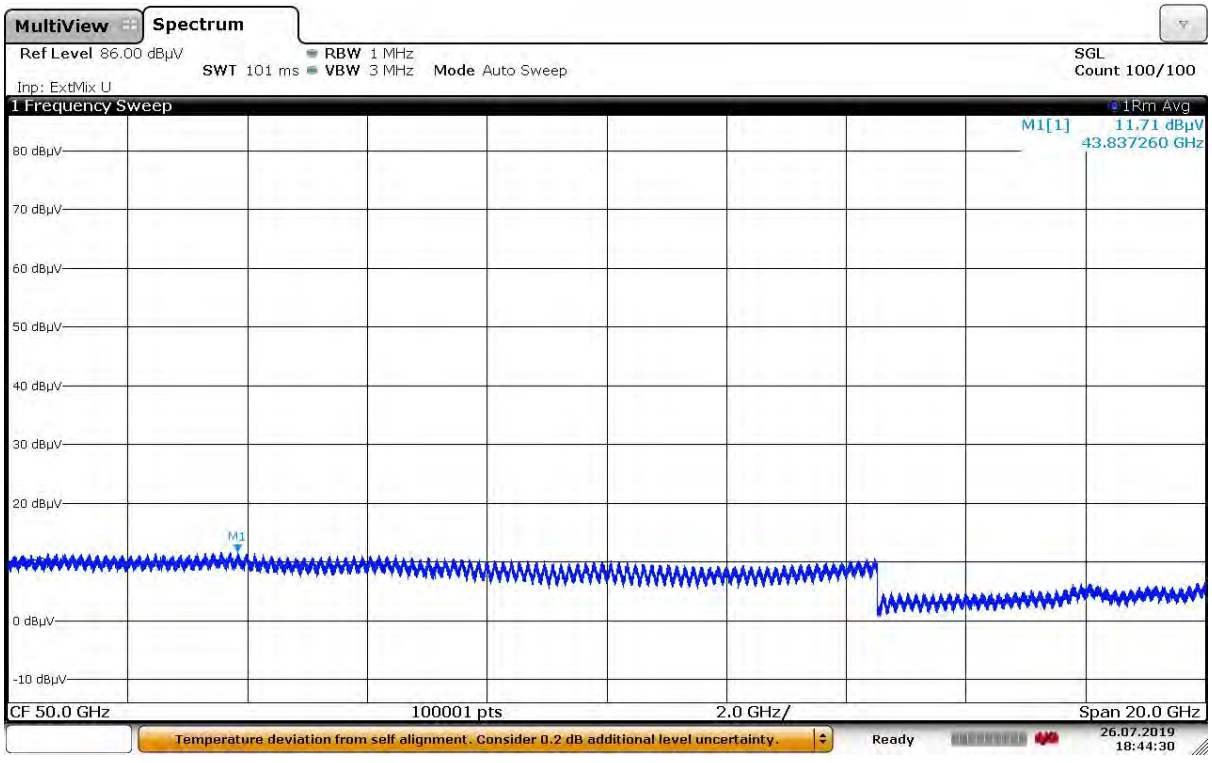
40 GHz ~ 60 GHz / 1cc / High / 45°


40 GHz ~ 60 GHz / 1cc / High / 135°


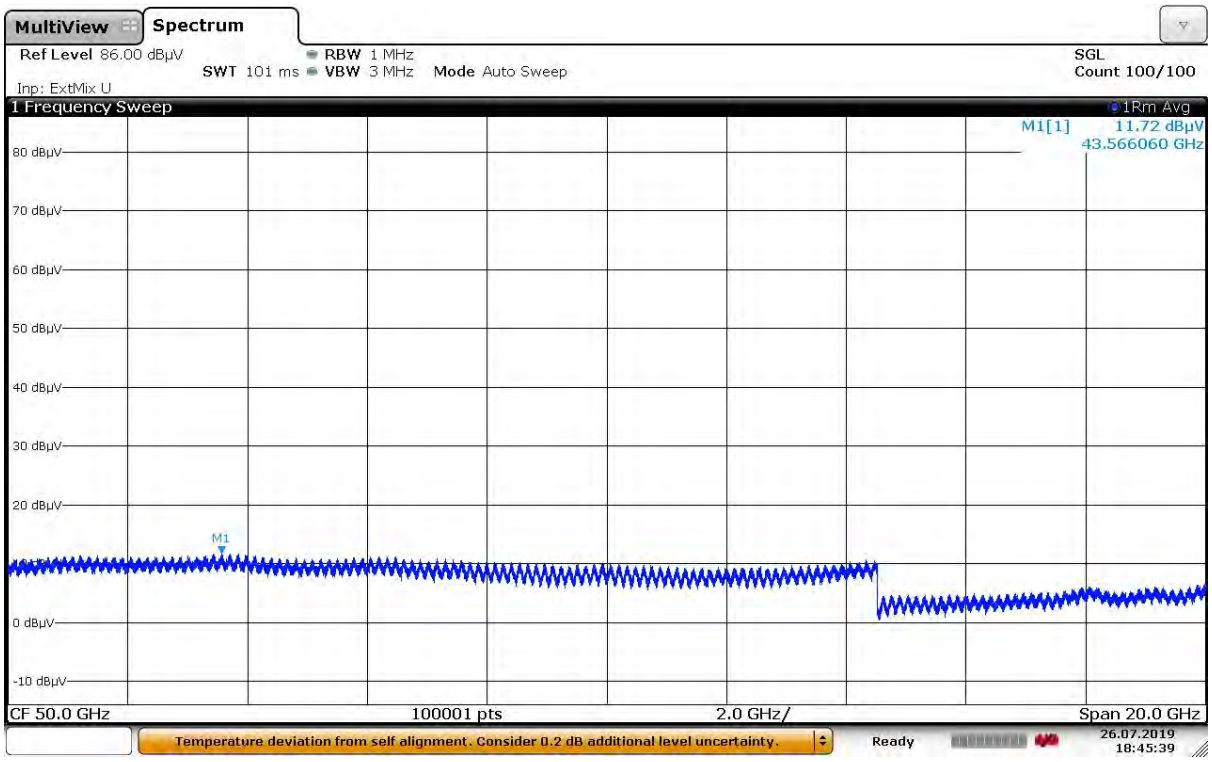
40 GHz ~ 60 GHz / 8cc / Low / 45°



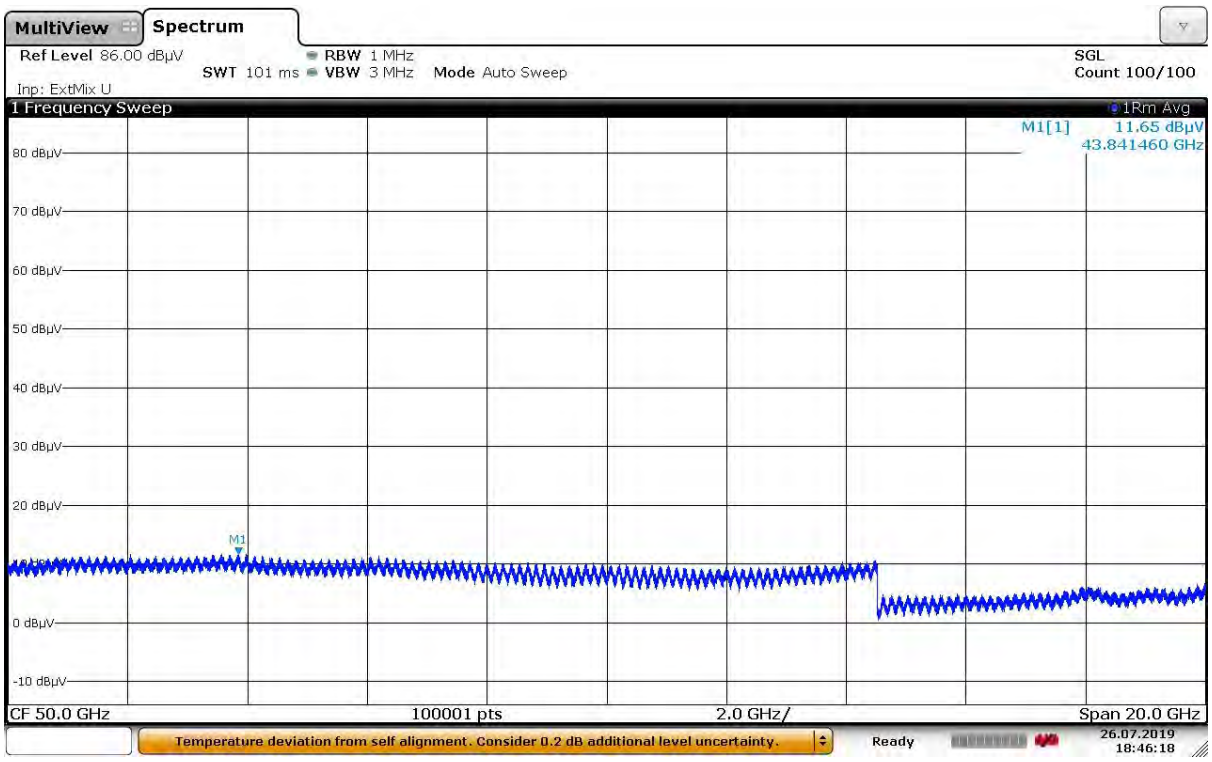
40 GHz ~ 60 GHz / 8cc / Low / 135°



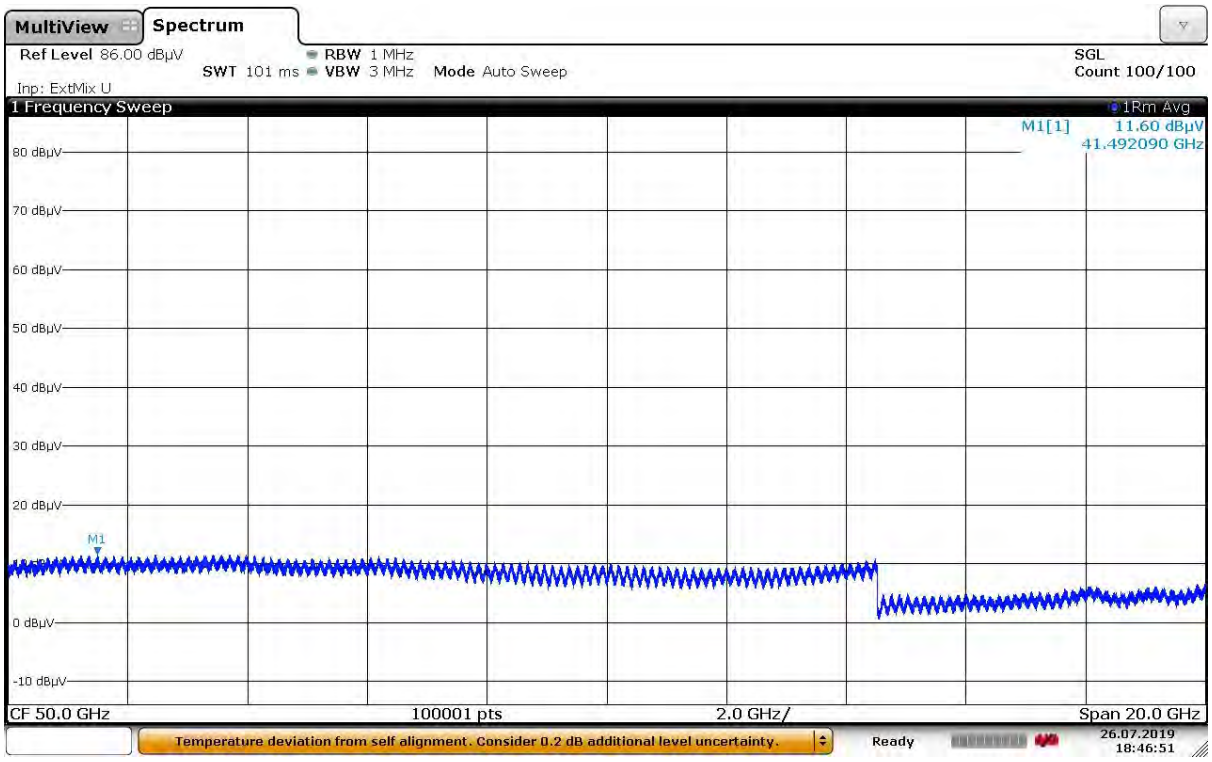
40 GHz ~ 60 GHz / 8cc / Middle / 45°



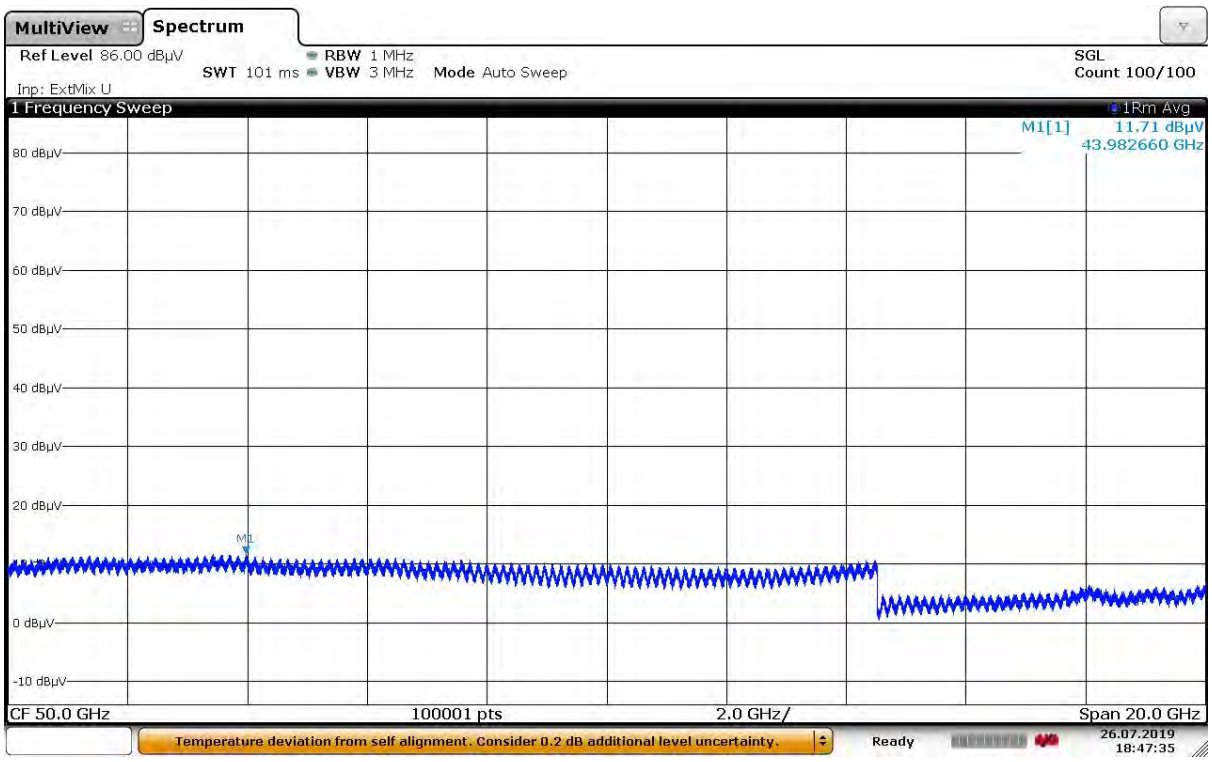
40 GHz ~ 60 GHz / 8cc / Middle / 135°



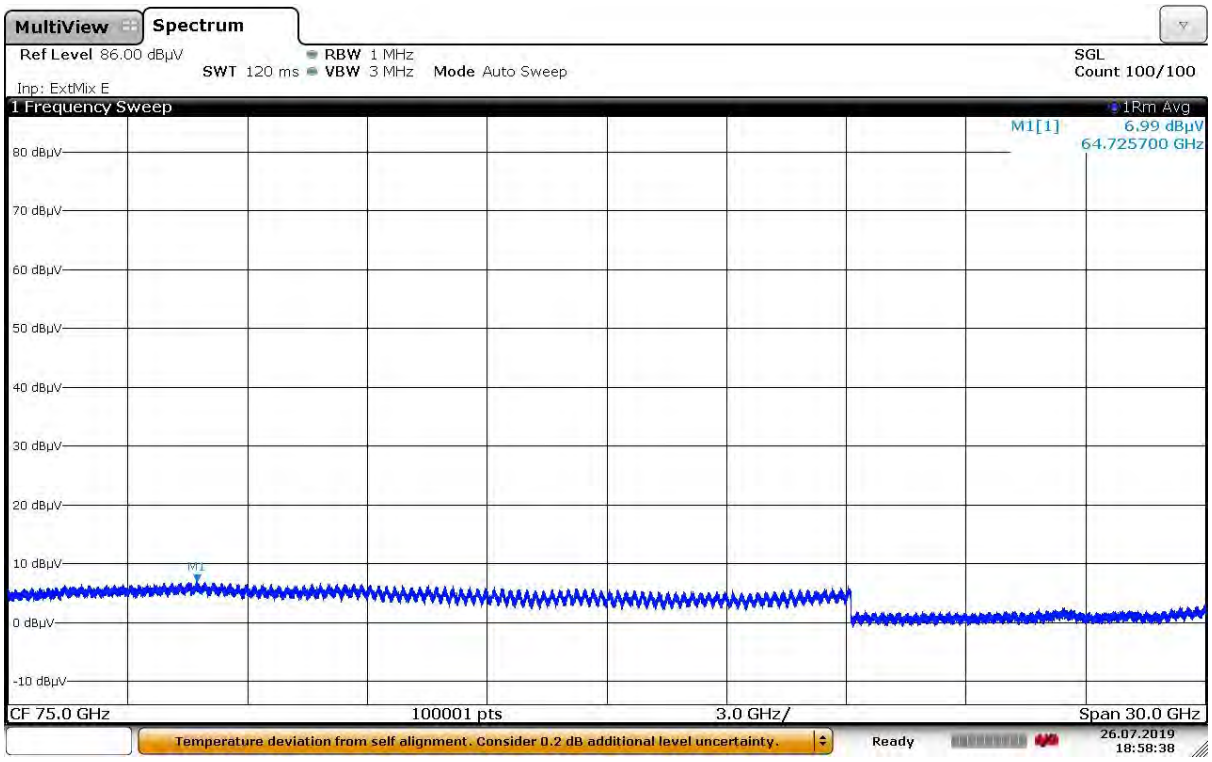
40 GHz ~ 60 GHz / 8cc / High / 45°



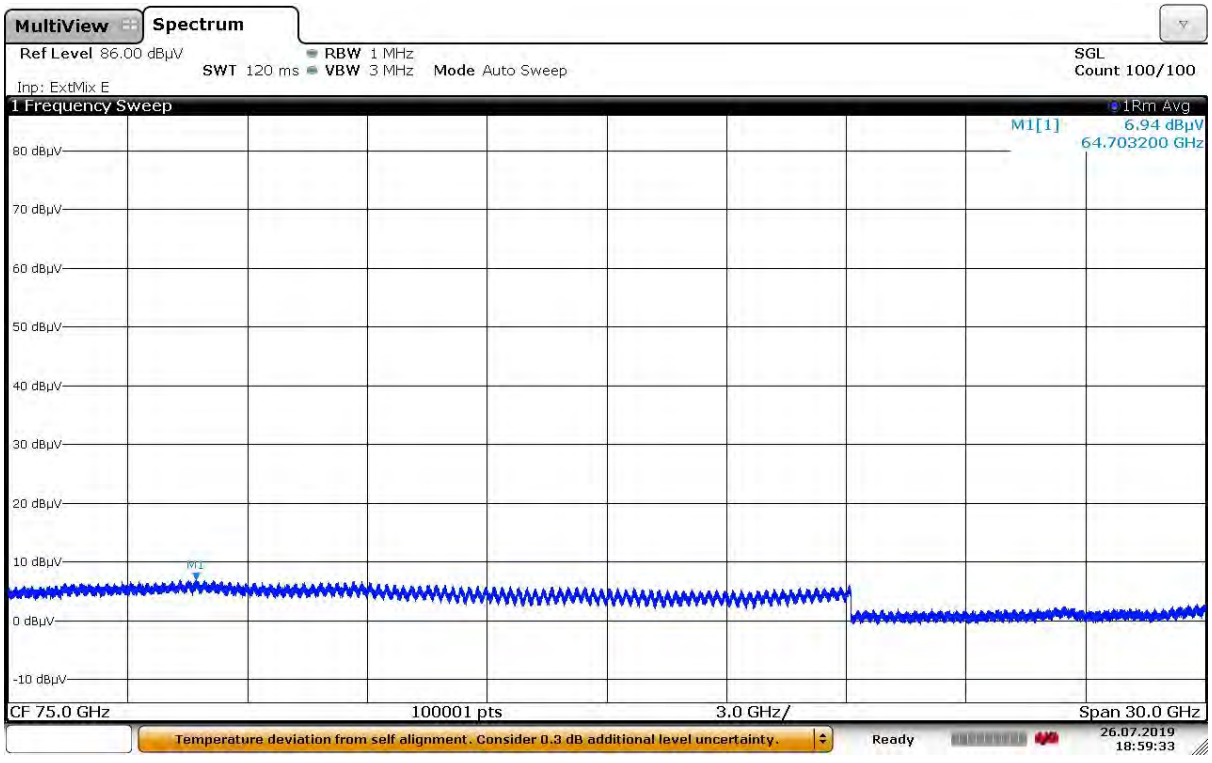
40 GHz ~ 60 GHz / 8cc / High / 135°



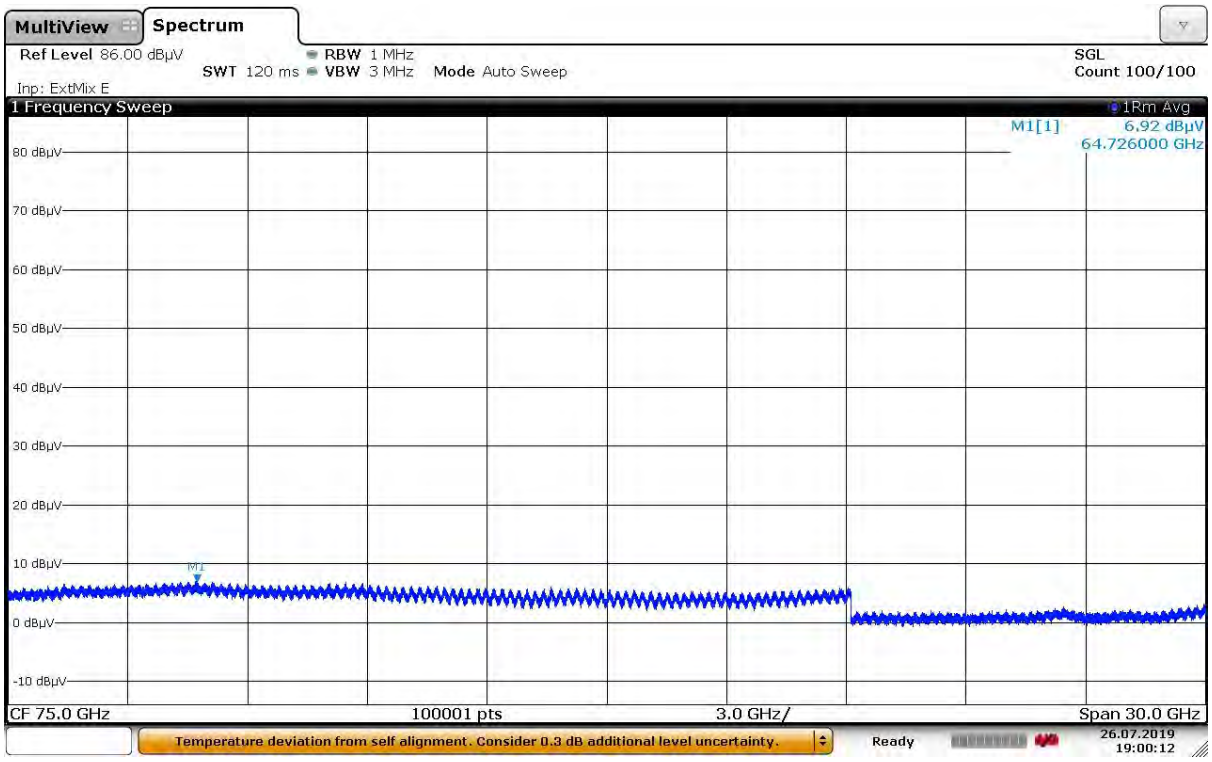
60 GHz ~ 90 GHz / 1cc / Low / 45°



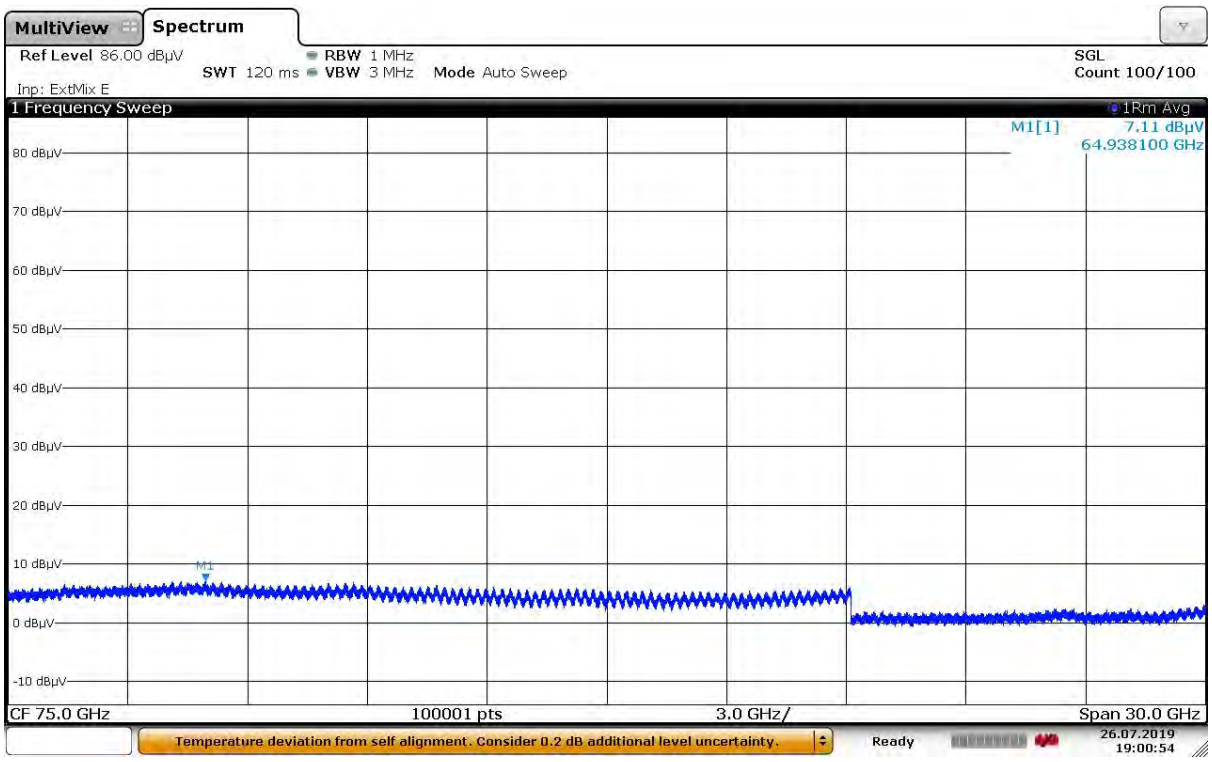
60 GHz ~ 90 GHz / 1cc / Low / 135°



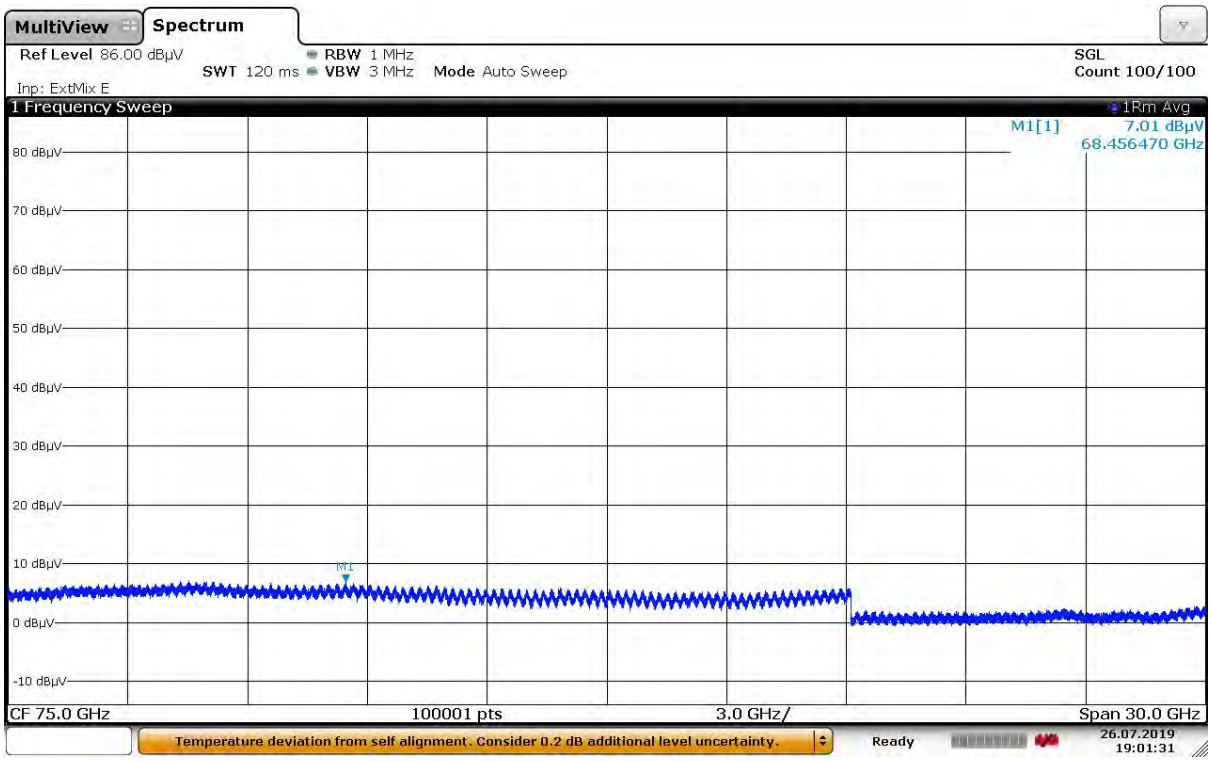
60 GHz ~ 90 GHz / 1cc / Middle / 45°



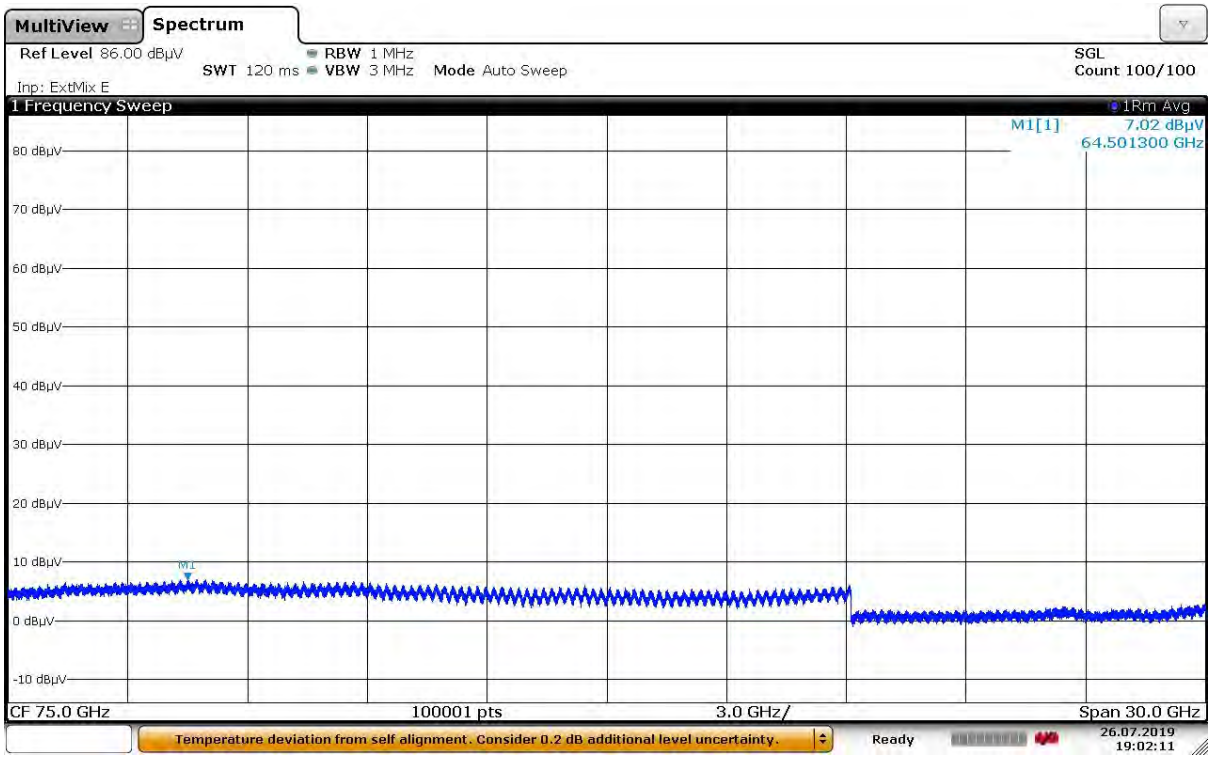
60 GHz ~ 90 GHz / 1cc / Middle / 135°



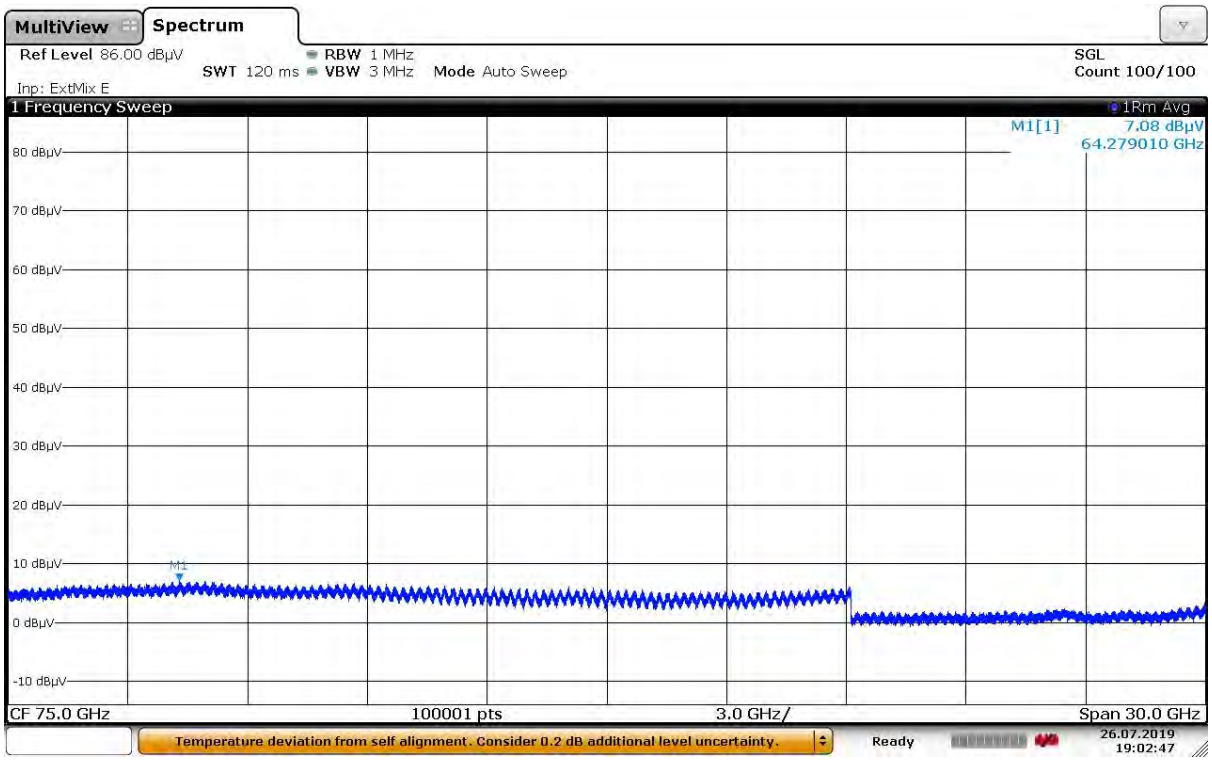
60 GHz ~ 90 GHz / 1cc / High / 45°



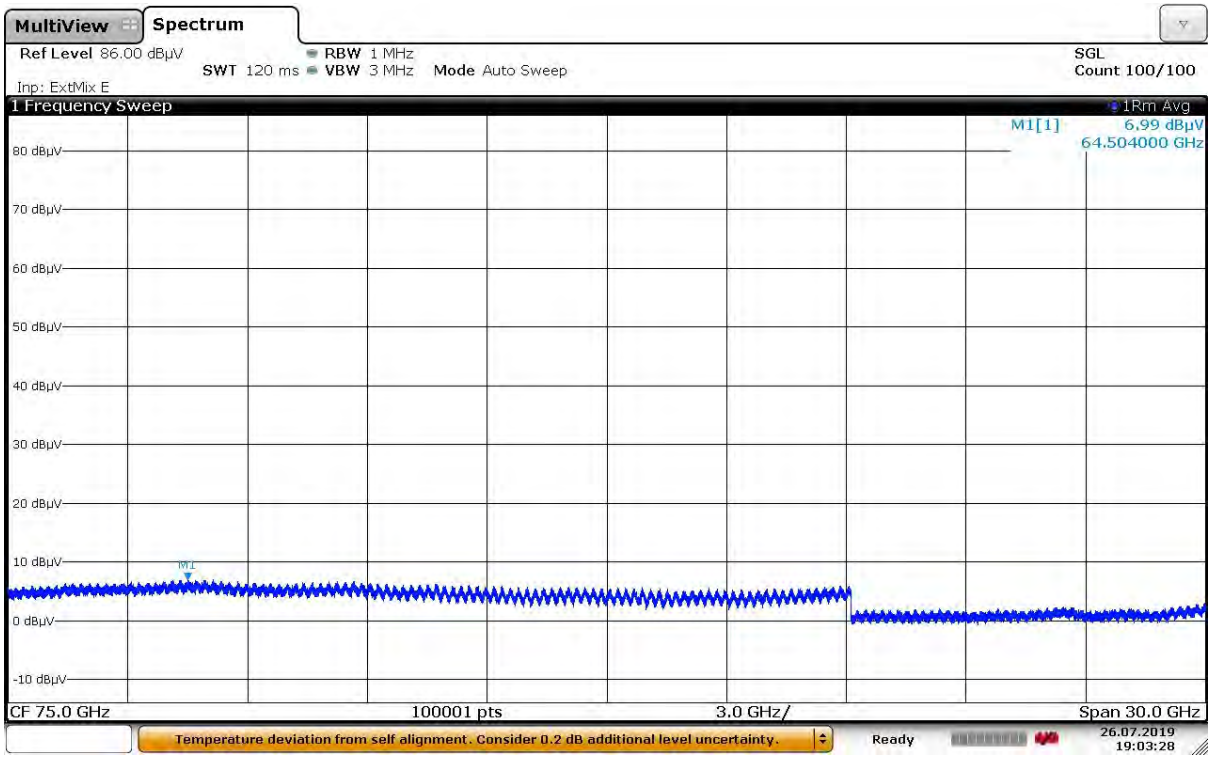
60 GHz ~ 90 GHz / 1cc / High / 135°



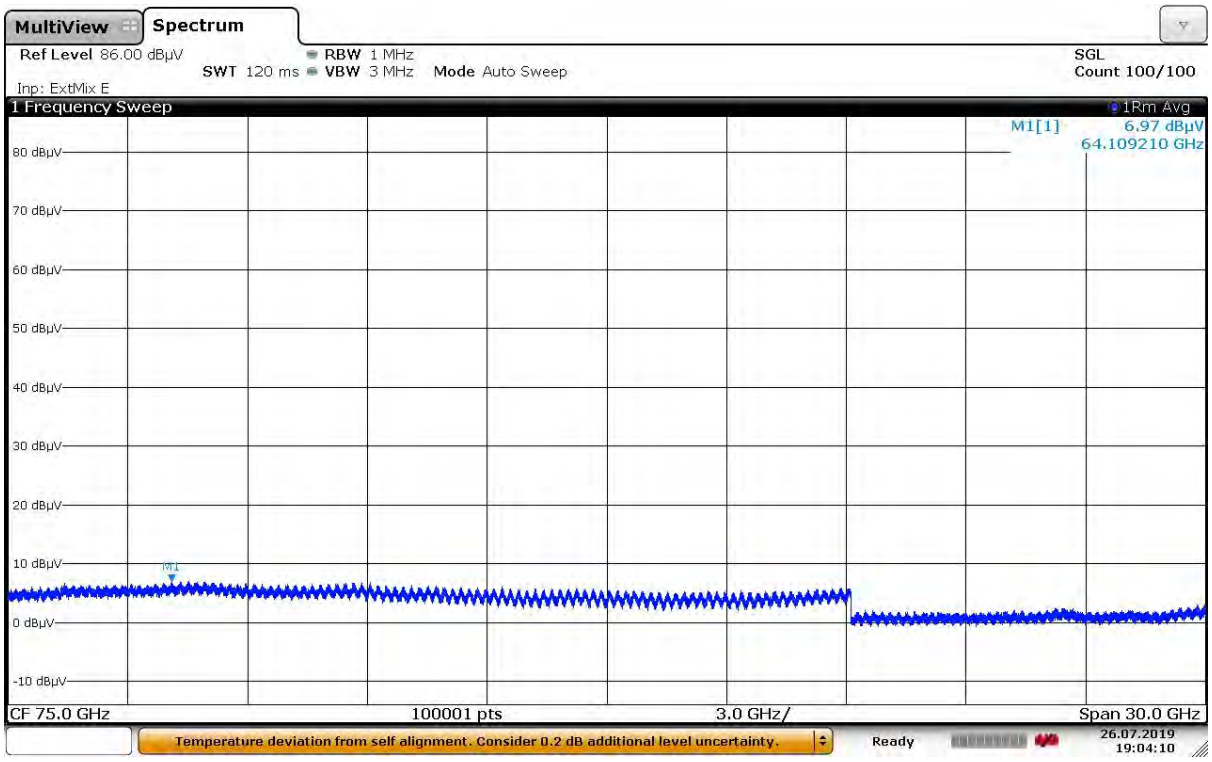
60 GHz ~ 90 GHz / 8cc / Low / 45°



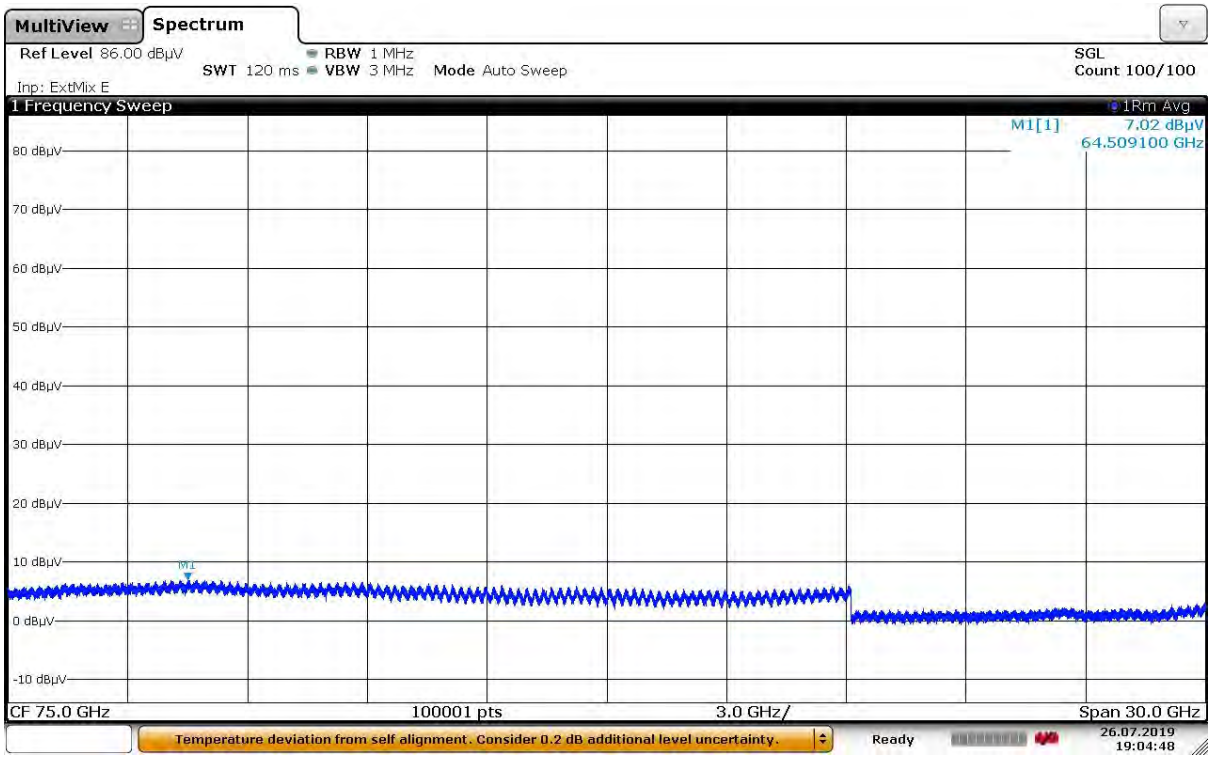
60 GHz ~ 90 GHz / 8cc / Low / 135°



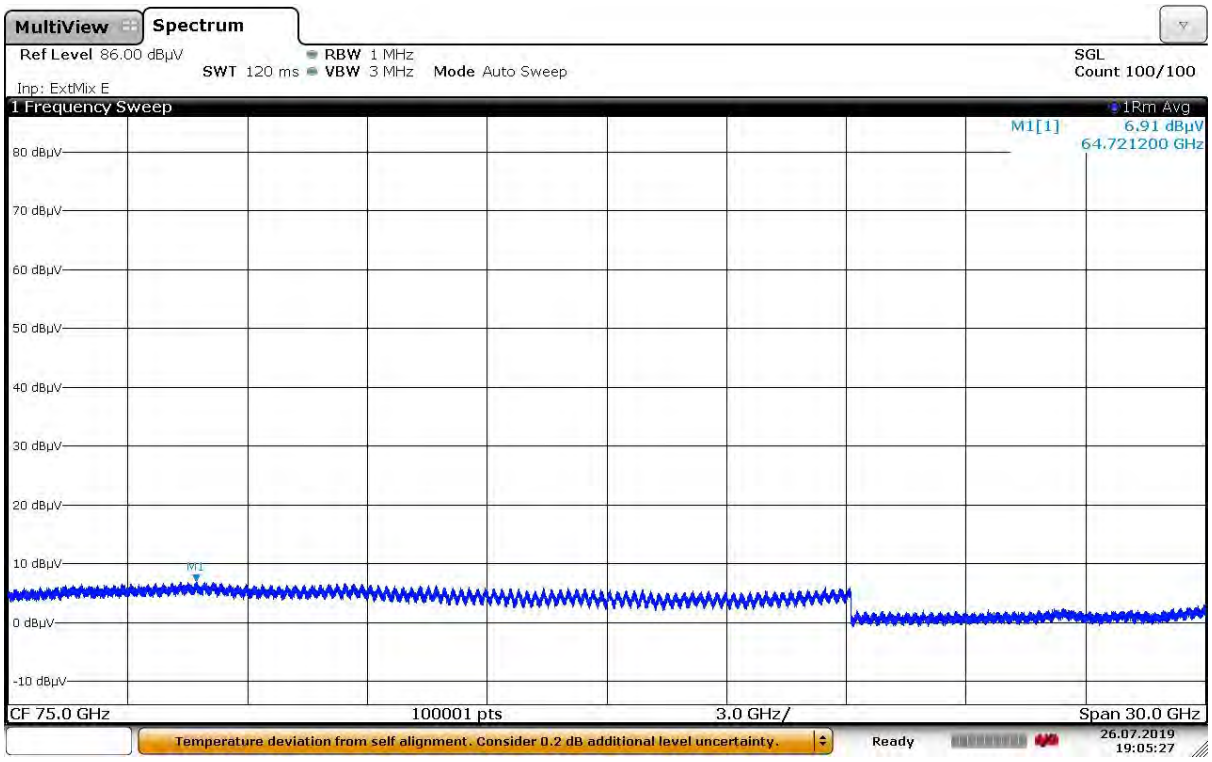
60 GHz ~ 90 GHz / 8cc / Middle / 45°



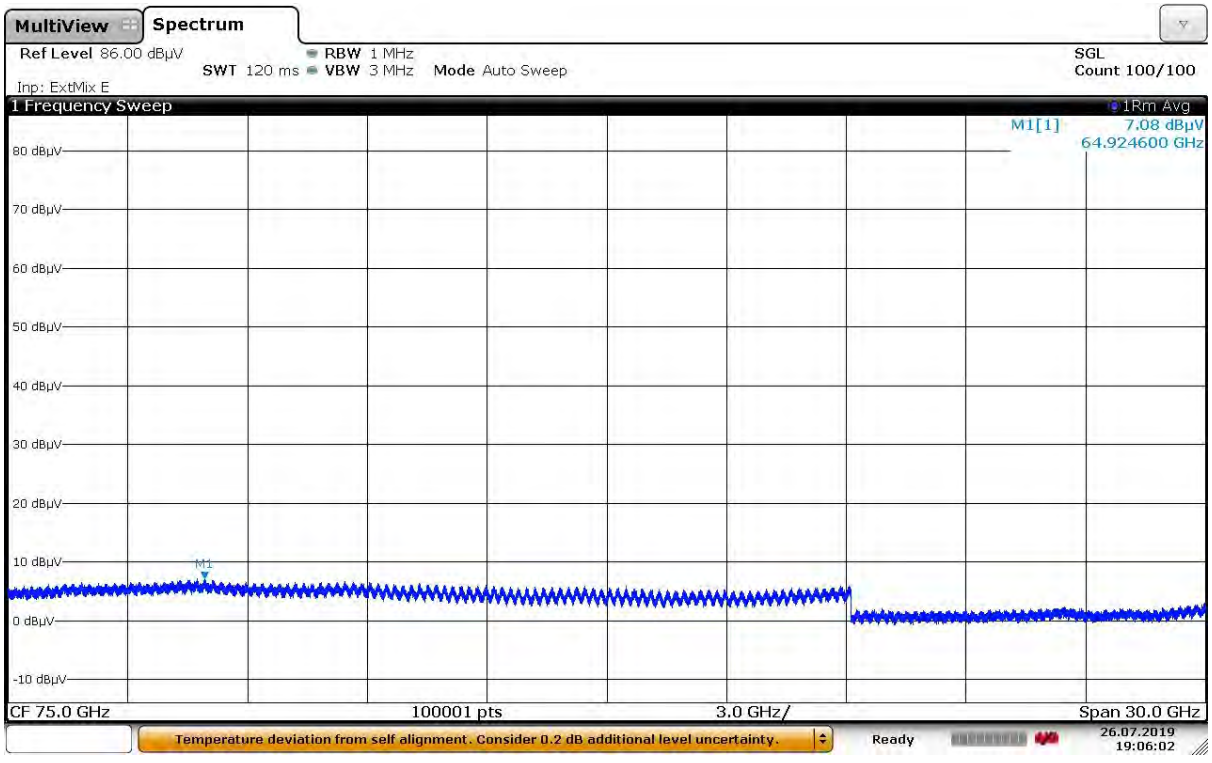
60 GHz ~ 90 GHz / 8cc / Middle / 135°



60 GHz ~ 90 GHz / 8cc / High / 45°



60 GHz ~ 90 GHz / 8cc / High / 135°



90 GHz ~ 100 GHz / 1cc / Low / 45°

90 GHz ~ 100 GHz / 1cc / Low / 135°

90 GHz ~ 100 GHz / 1cc / Middle / 45°

90 GHz ~ 100 GHz / 1cc / Middle / 135°

90 GHz ~ 100 GHz / 1cc / High / 45°


90 GHz ~ 100 GHz / 1cc / High / 135°


90 GHz ~ 100 GHz / 8cc / Low / 45°


90 GHz ~ 100 GHz / 8cc / Low / 135°


90 GHz ~ 100 GHz / 8cc / Middle / 45°


90 GHz ~ 100 GHz / 8cc / Middle / 135°


90 GHz ~ 100 GHz / 8cc / High / 45°


90 GHz ~ 100 GHz / 8cc / High / 135°


5.6. FREQUENCY STABILTY

FCC Rules

Test Requirements:

§ 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

Test Procedures:

The measurement is performed in accordance with Section 5.6.4 and 5.6.5 of ANSI C63.26.

5.6.4 Frequency stability over variations in temperature

a) Supply the EUT with a nominal 60 Hz ac voltage, dc voltage, or install a new or fully charged battery in the EUT.

b) If possible a dummy load should be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible.

c) Turn on the EUT, and tune it to the center frequency of the operating band.

d) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible, make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away).

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

e) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.

f) Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

g) Set the temperature control on the chamber to the highest temperature specified in the regulatory requirements for the type of device, and allow the oscillator heater and the chamber temperature to stabilize. Unless otherwise instructed by the regulatory authority, this temperature should be 50 °C.

h) While maintaining a constant temperature inside the environmental chamber, turn on the EUT and allow sufficient time for the EUT temperature to stabilize.

i) Measure the frequency.

j) Switch off the EUT, but do not switch off the oscillator heater.

k) Lower the chamber temperature to the next level that is required by the standard and allow the temperature inside the chamber to stabilize. Unless otherwise instructed by the regulators, this temperature step should be 10 °C.

l) Repeat step h) through step k) down to the lowest specified temperature. Unless otherwise instructed by the regulators, this temperature should be −30 °C. When the frequency stability limit is stated as being sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods shall be added or subtracted from the values of f_L and f_H and the resulting frequencies must remain within the band.

m) Omitted

5.6.5 Frequency stability when varying supply voltage

a) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away)

b) Supply the EUT with nominal ac or dc voltage. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

c) Turn on the EUT, and couple its output to a frequency counter or other frequency-measuring instrument.

d) Tune the EUT to the center frequency of the operating band. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

e) Measure the frequency.

f) Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.

g) For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

h) Repeat the frequency measurement.

NOTE—For band-edge compliance, it can be required to make these measurements at the low and high channel of the operating band.

Note:

1) The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each path, so we are attached only the worst case data.
2) Test signal is CW signal for frequency stability.

Test Results:

Reference: Voltage = 100 ~ 240 VAC at 20°C, Frequency = 27 925.0 MHz

Voltage (%)	Temp.(°C)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	27925.02405	0	0
	-30	27925.0239	-146.7000002	-0.005253353
	-20	27925.0239	-154.5999985	-0.005536254
	-10	27925.02385	-204.1999978	-0.007312439
	0	27925.02386	-188.1999997	-0.006739476
	10	27925.02385	-196.2999995	-0.007029538
	30	27925.02382	-234.6000001	-0.008401068
	40	27925.02382	-228.6999988	-0.008189788
	50	27925.0238	-253.8000008	-0.009088624
115%	20	27925.02405	208.1000021	-0.000164727
85%	20	27925.02402	-0.299998646	-0.001131602

6. Annex A_Test Equipment CERTIFIED DOCUMENTS

Please refer to test equipment certified documents.

7. Annex B_EUT AND TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1907-FC011-P