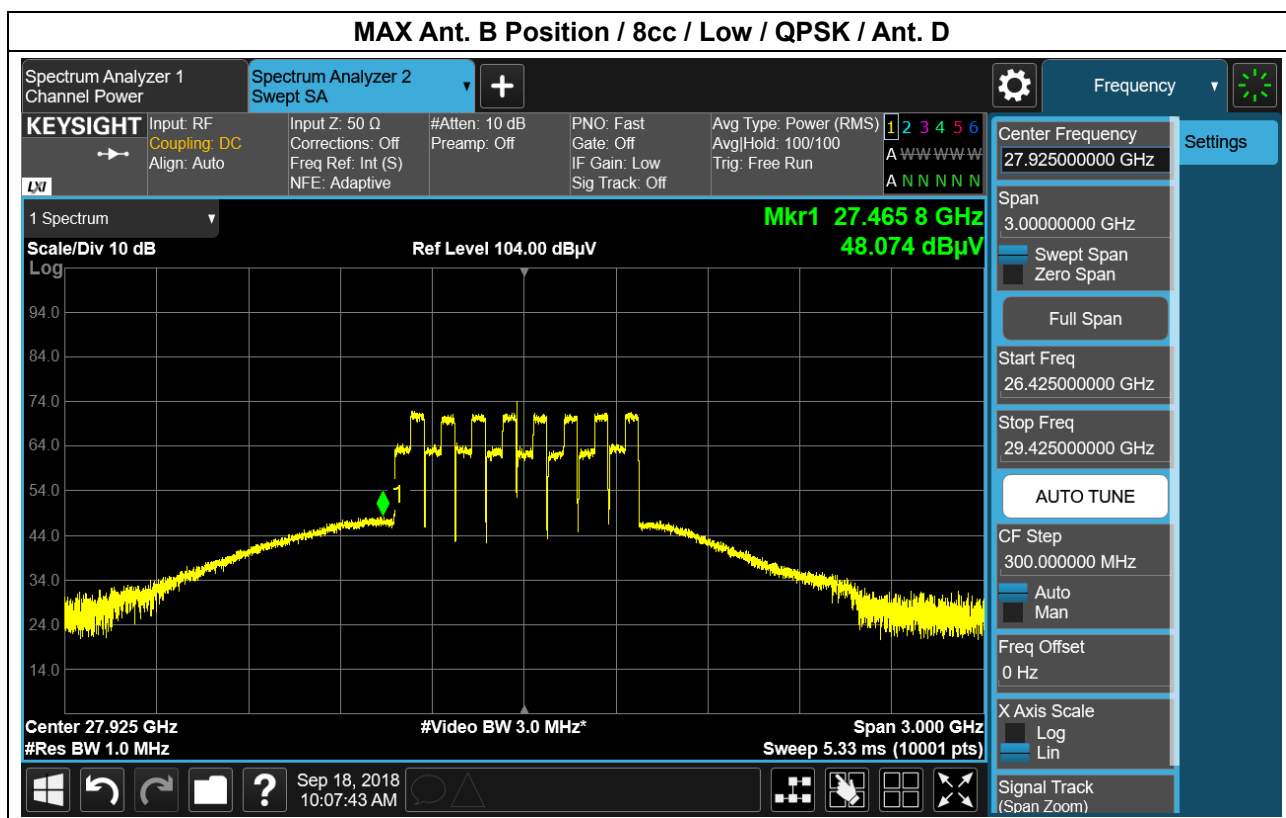
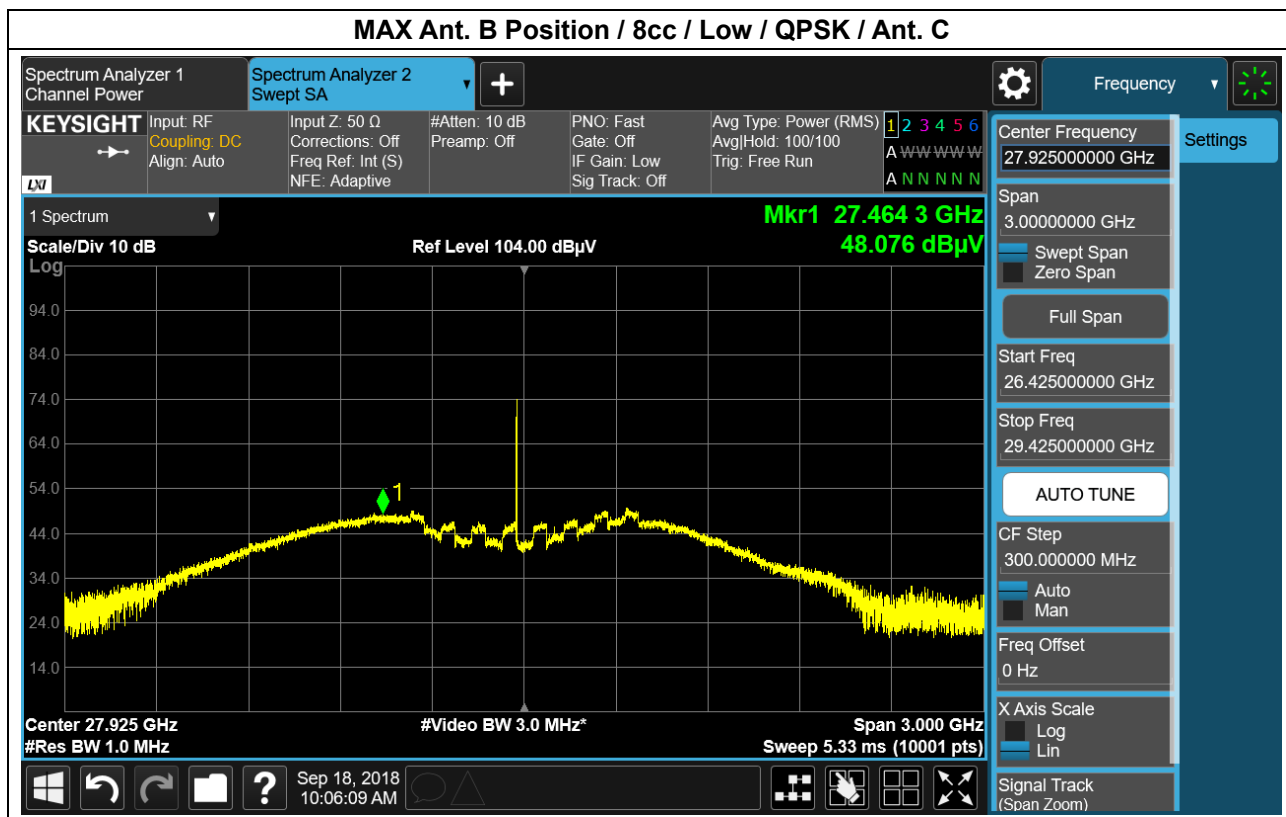
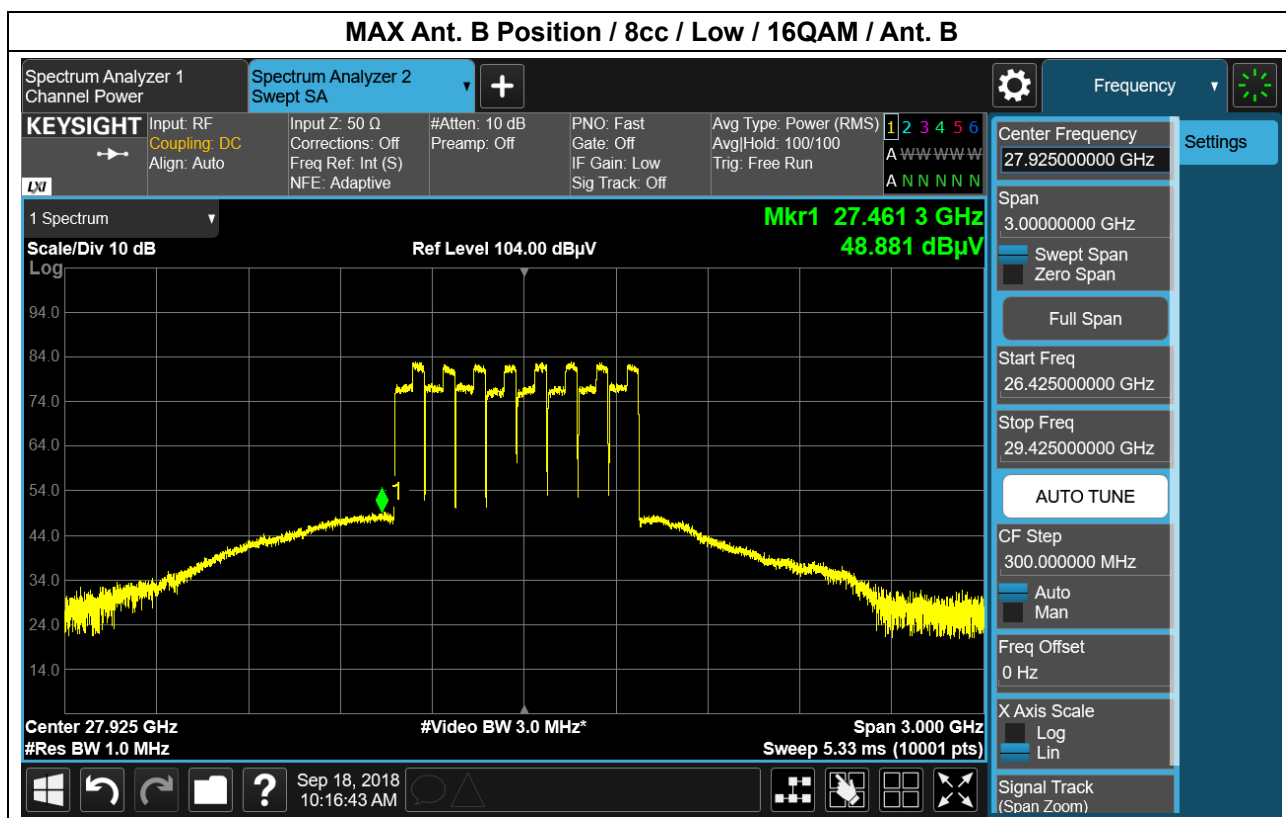
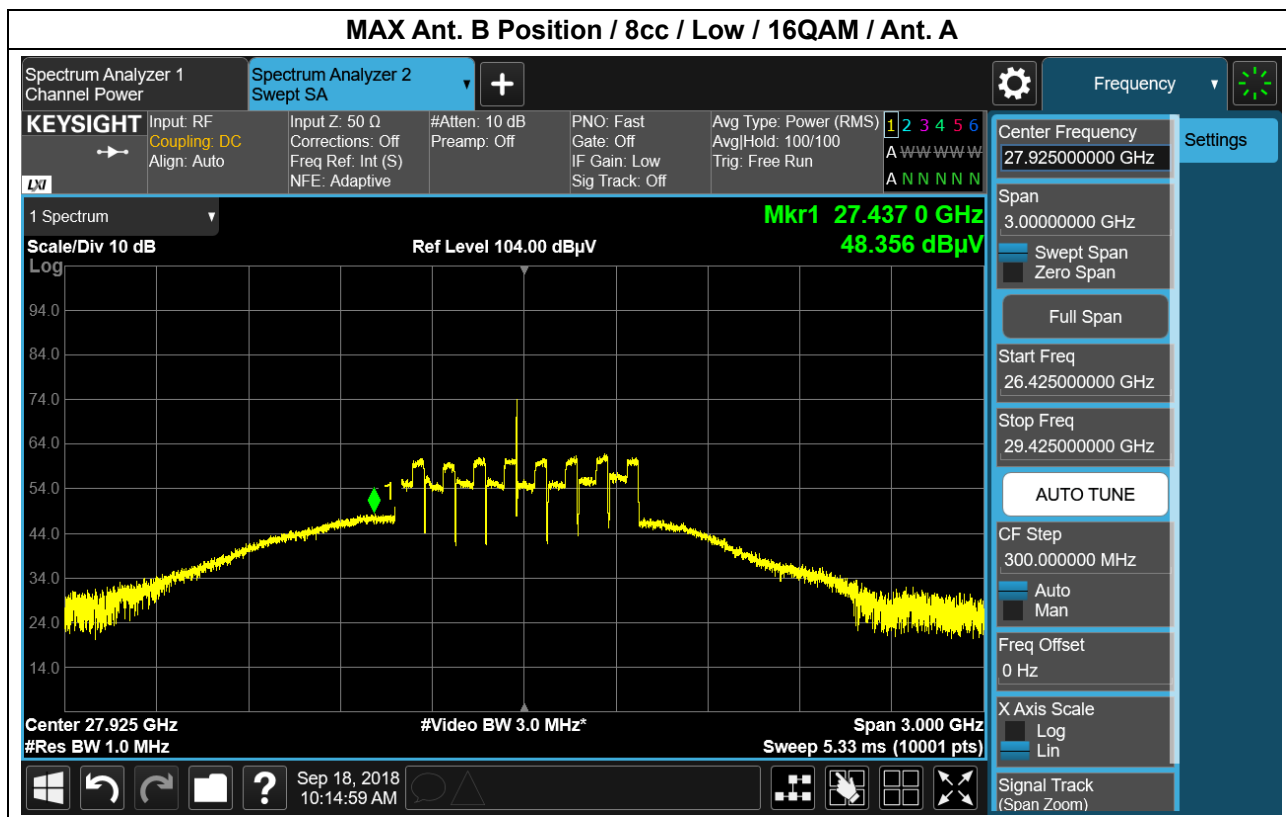
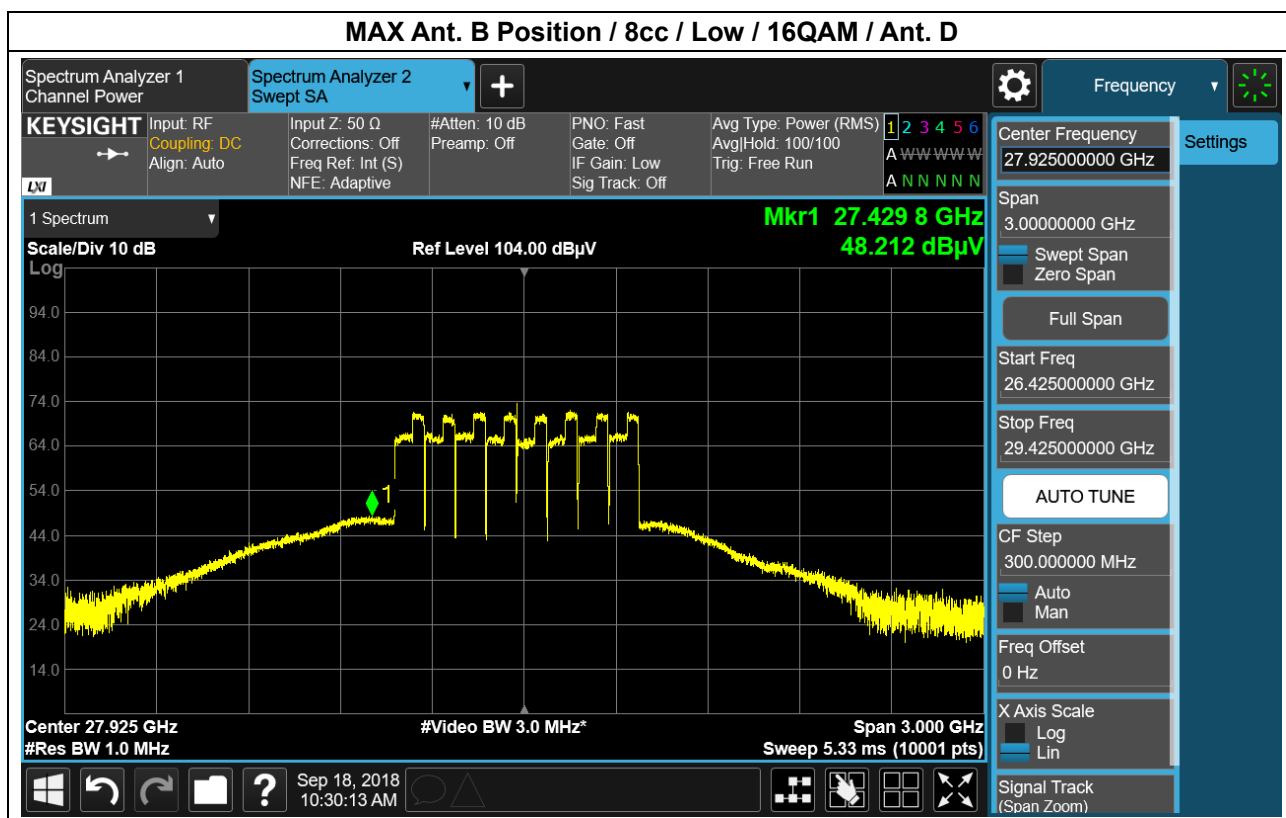
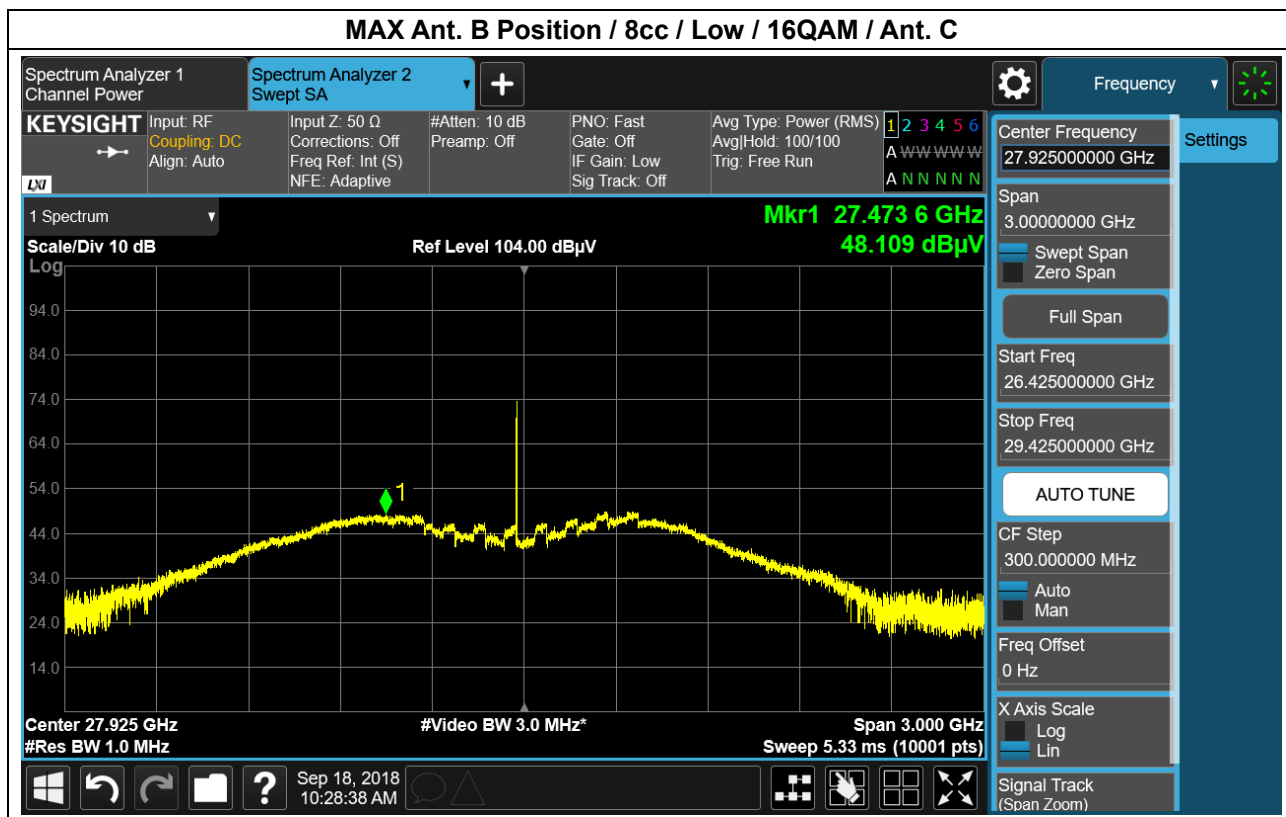
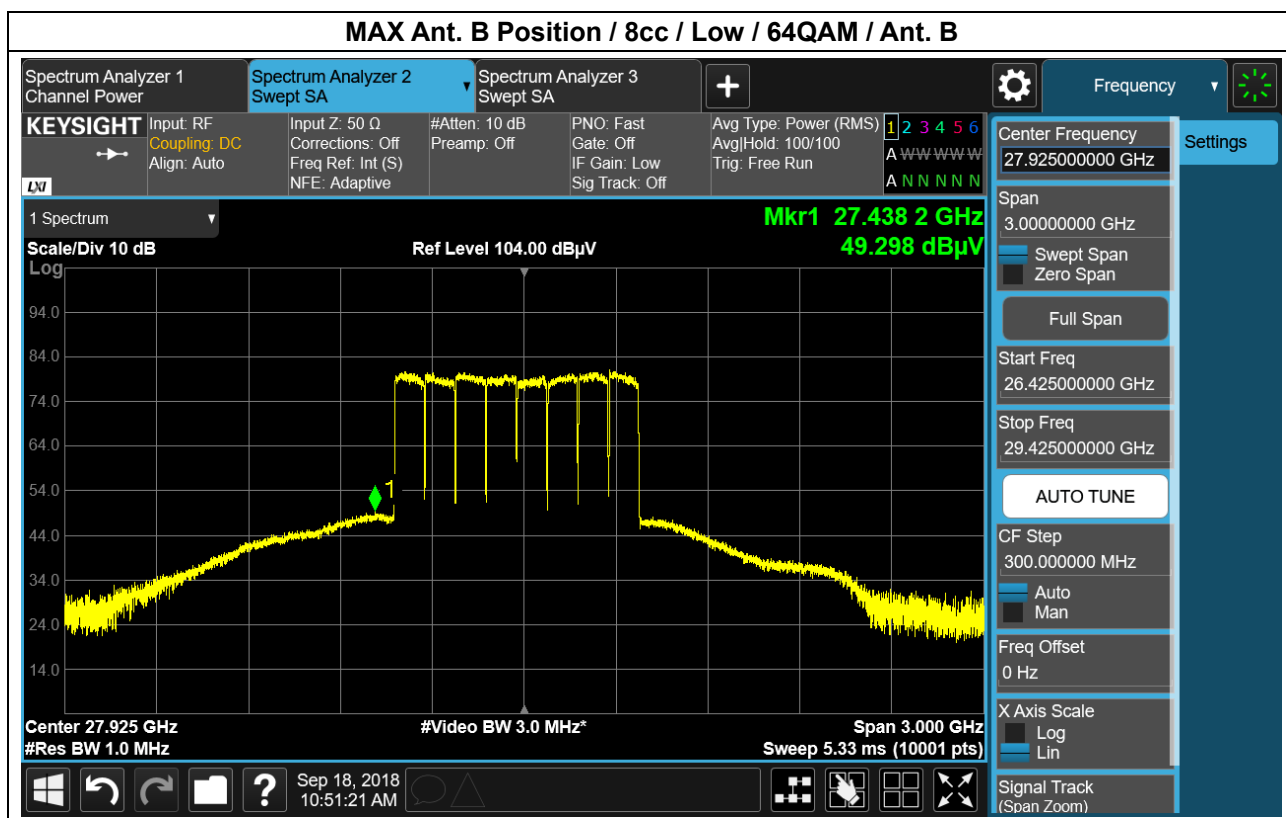
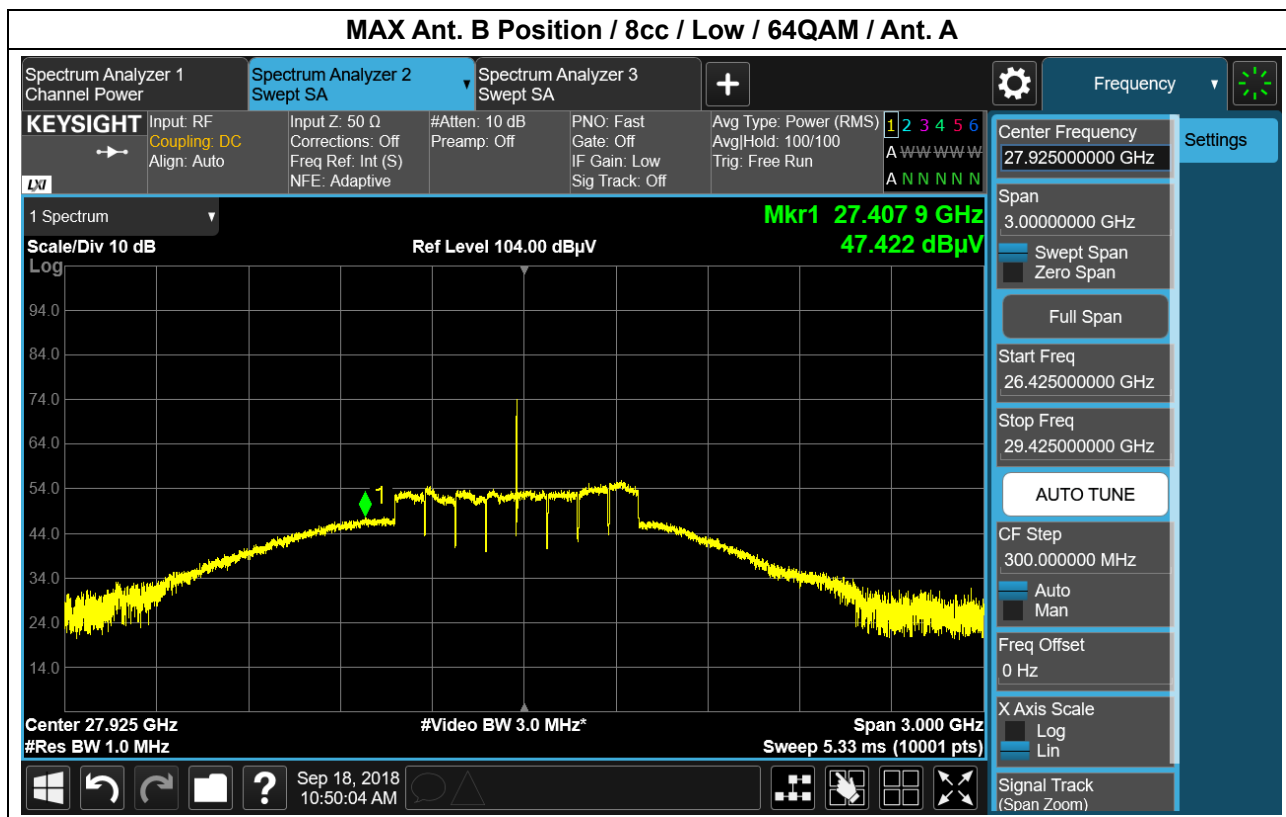
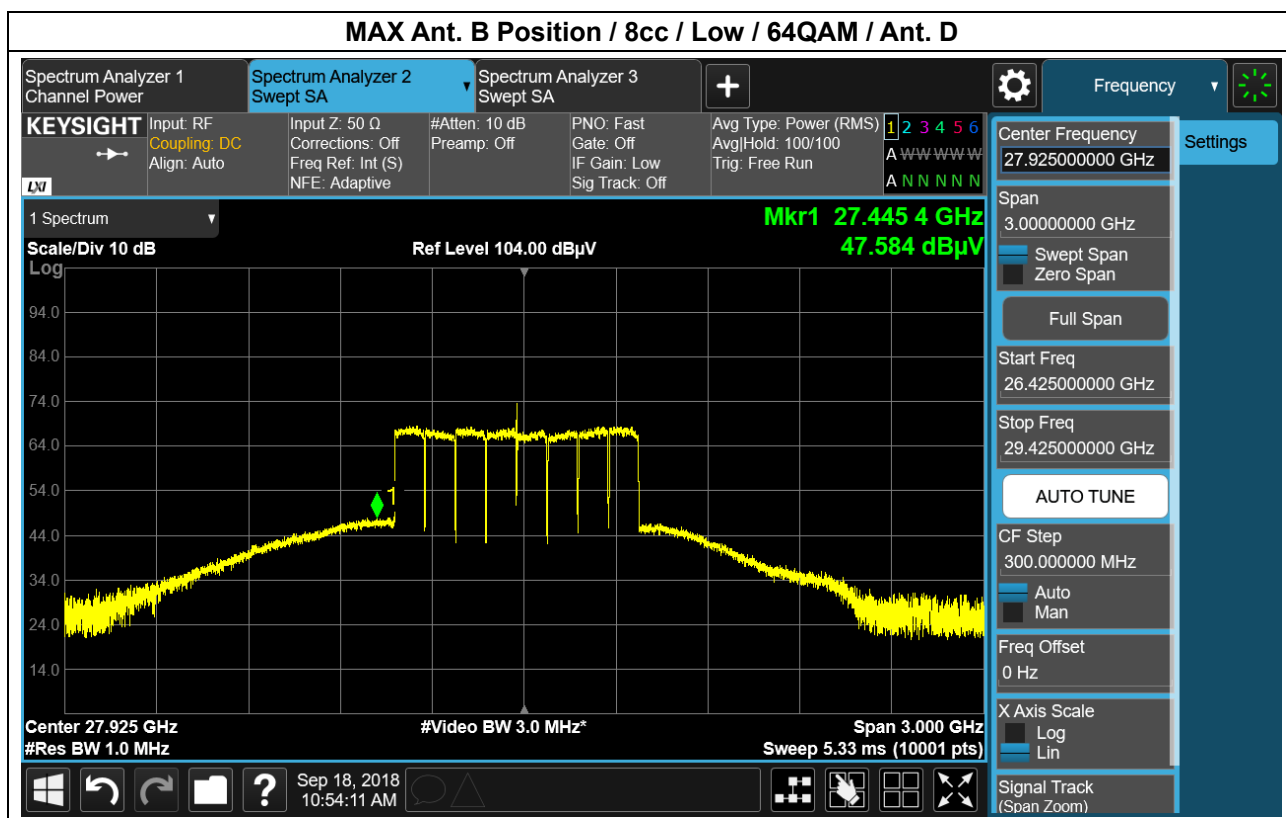
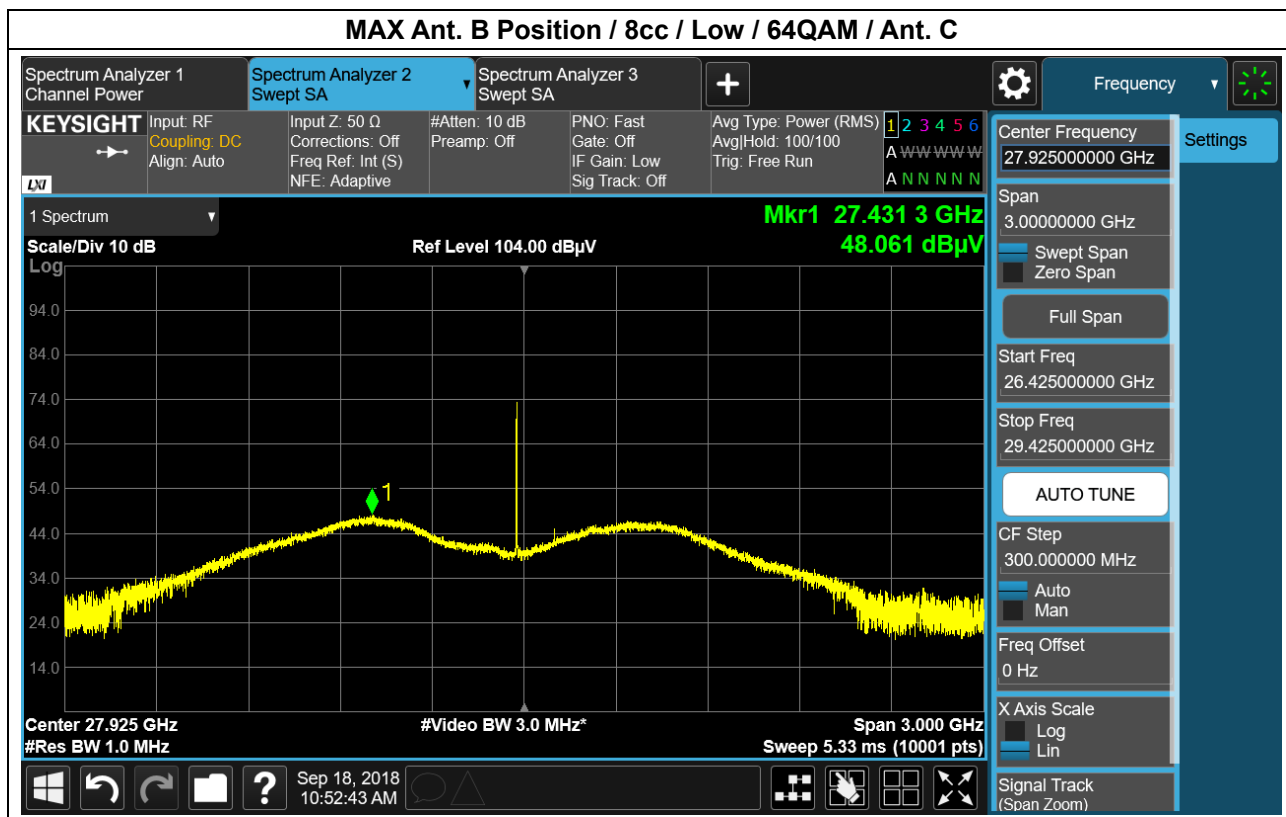


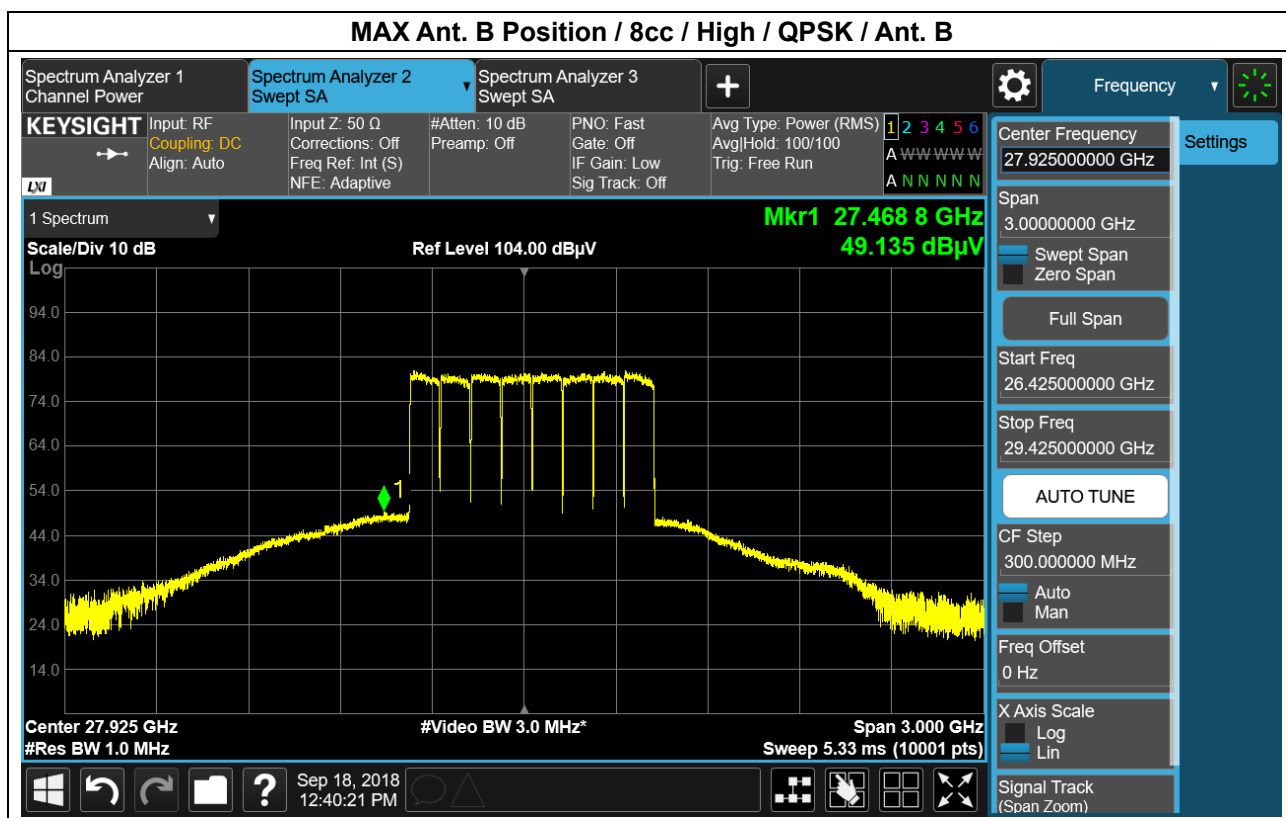
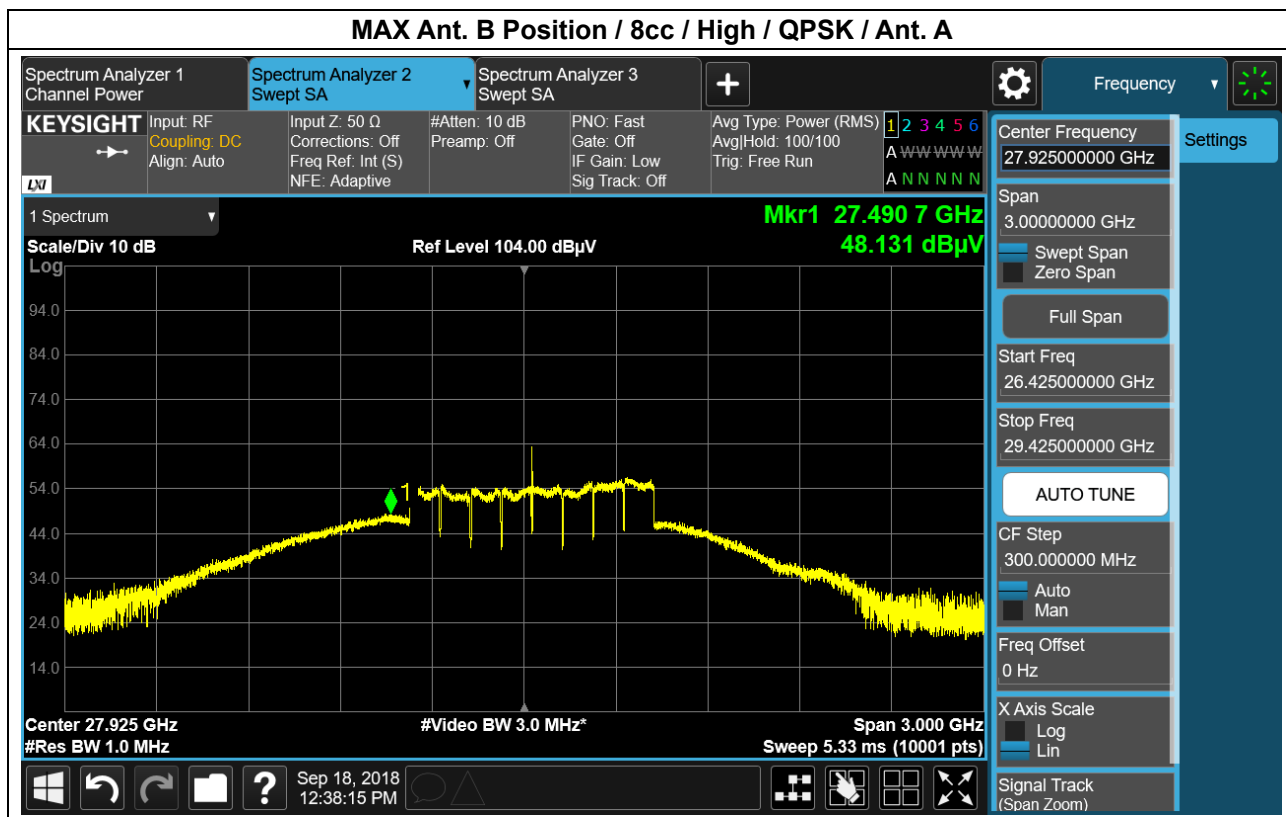


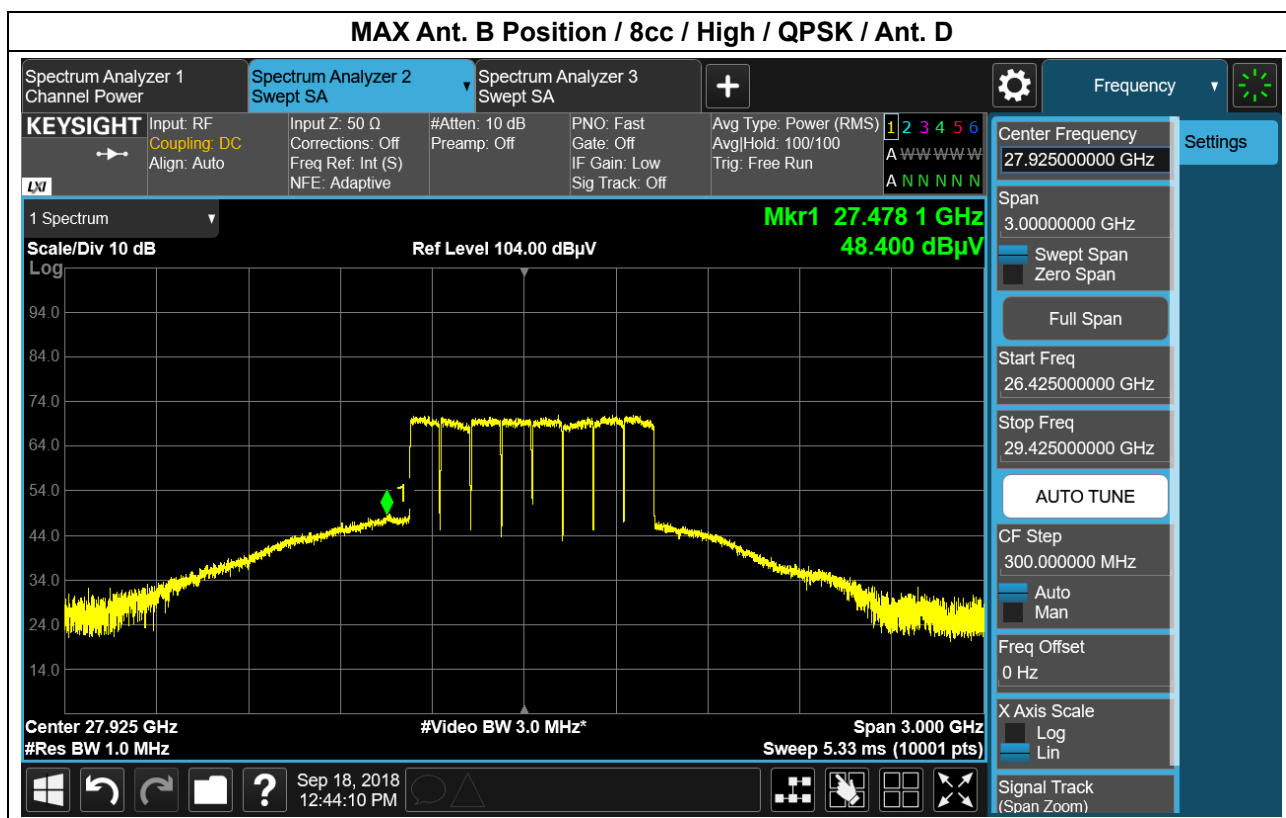
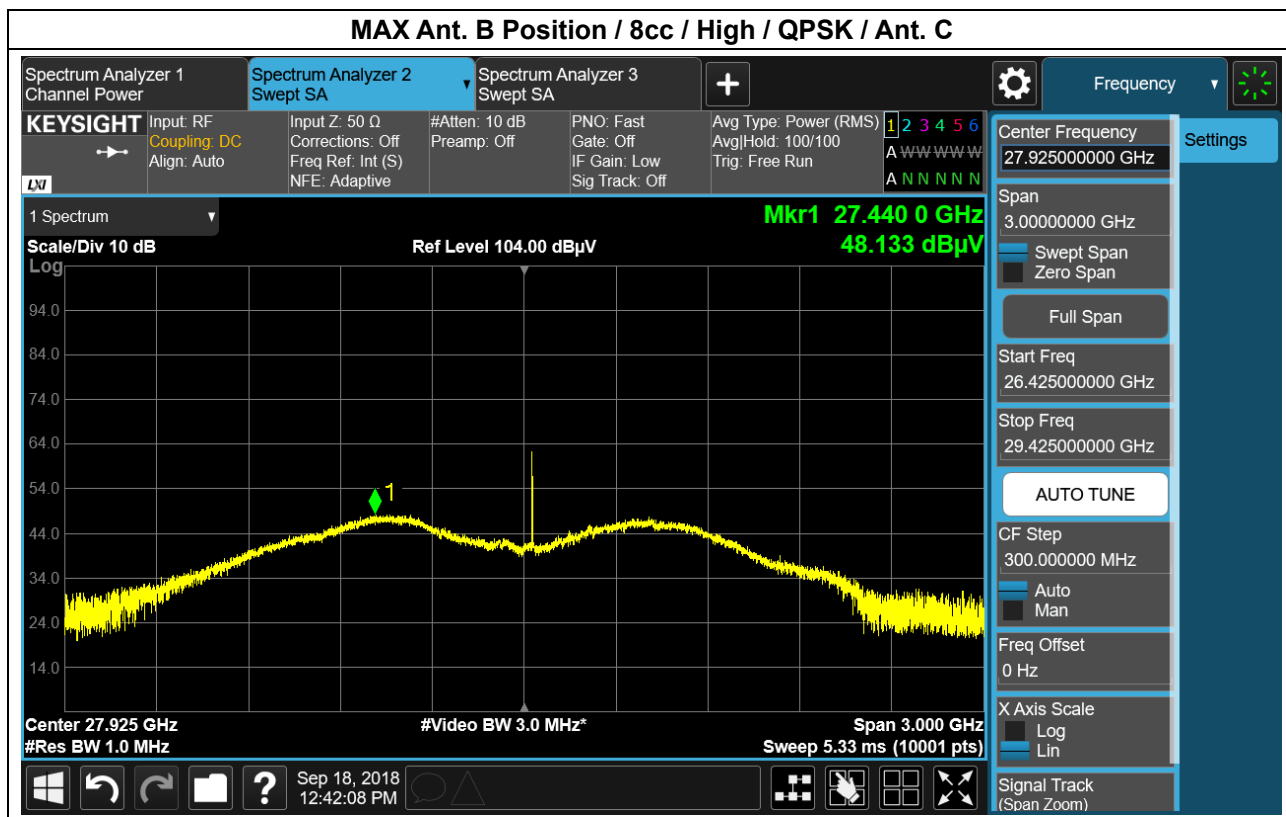


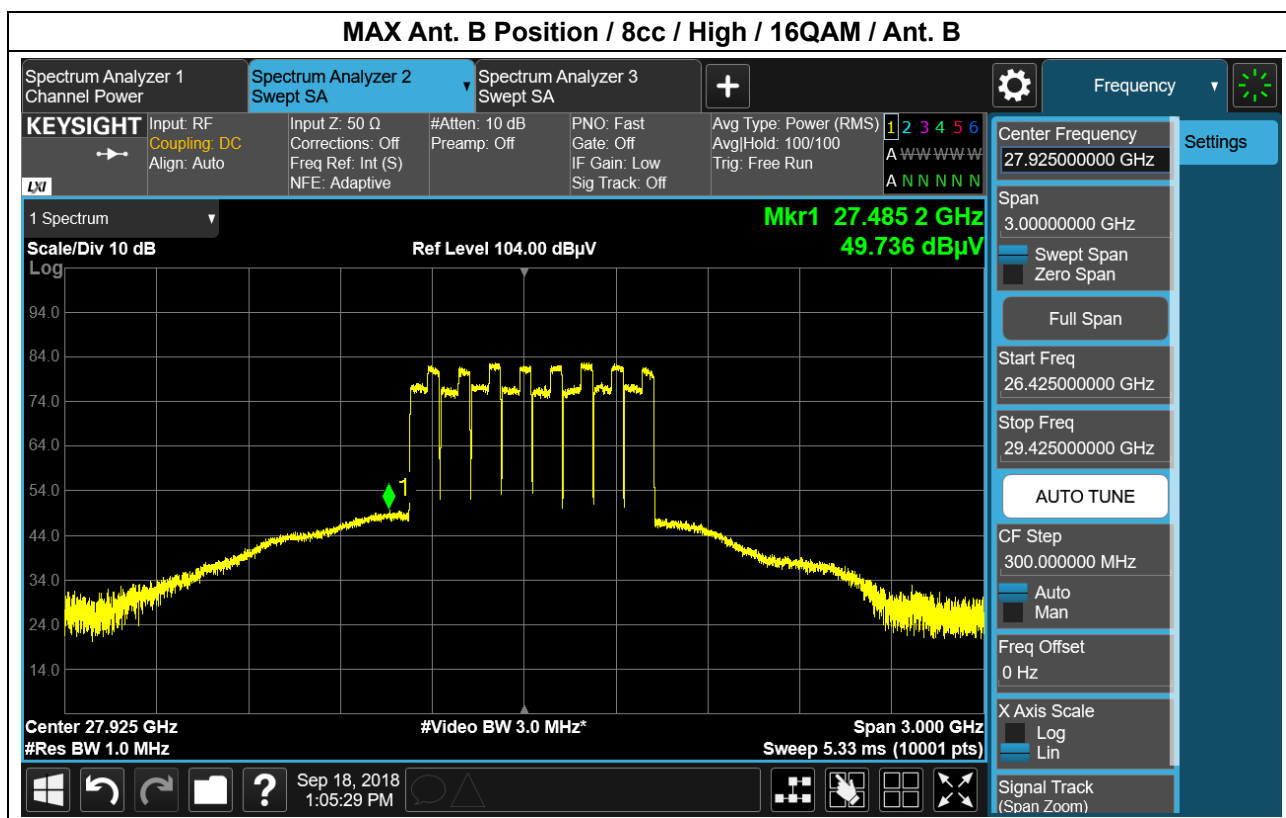
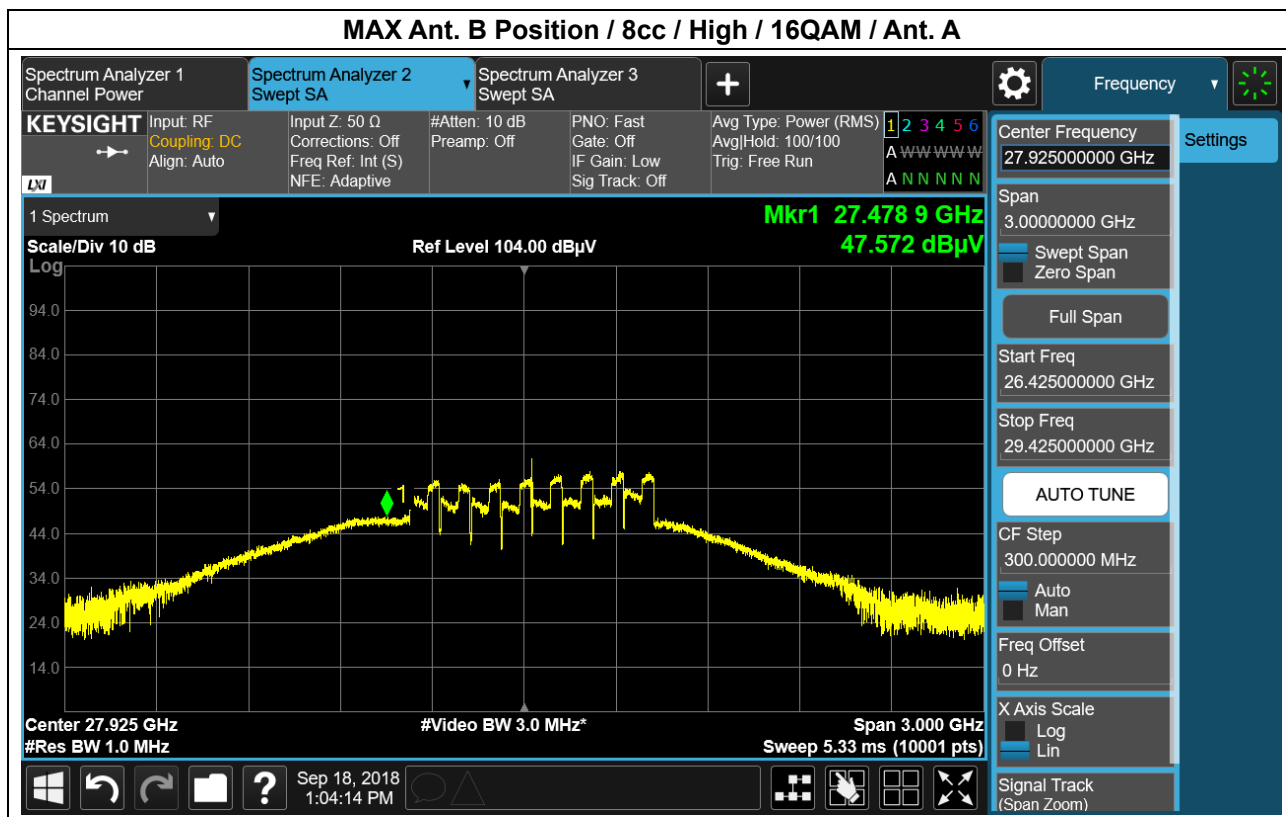


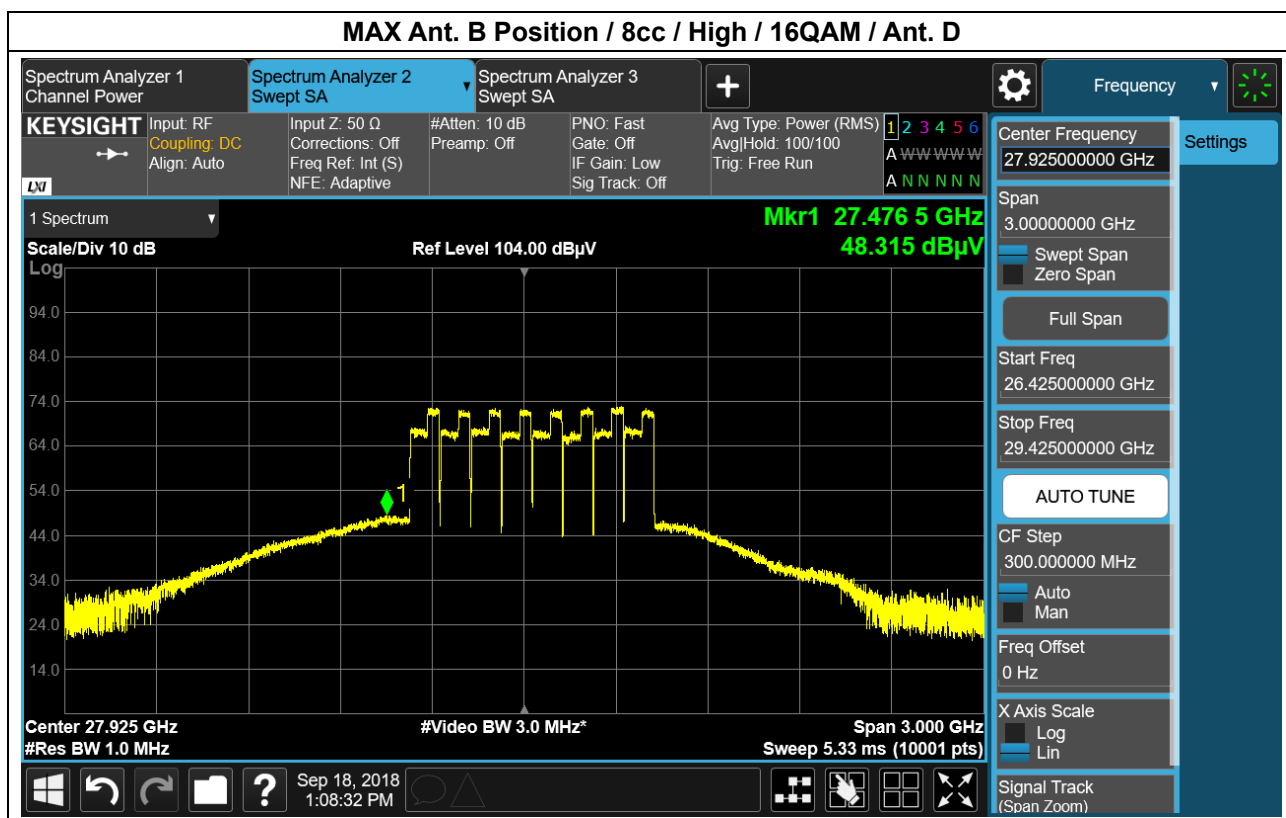
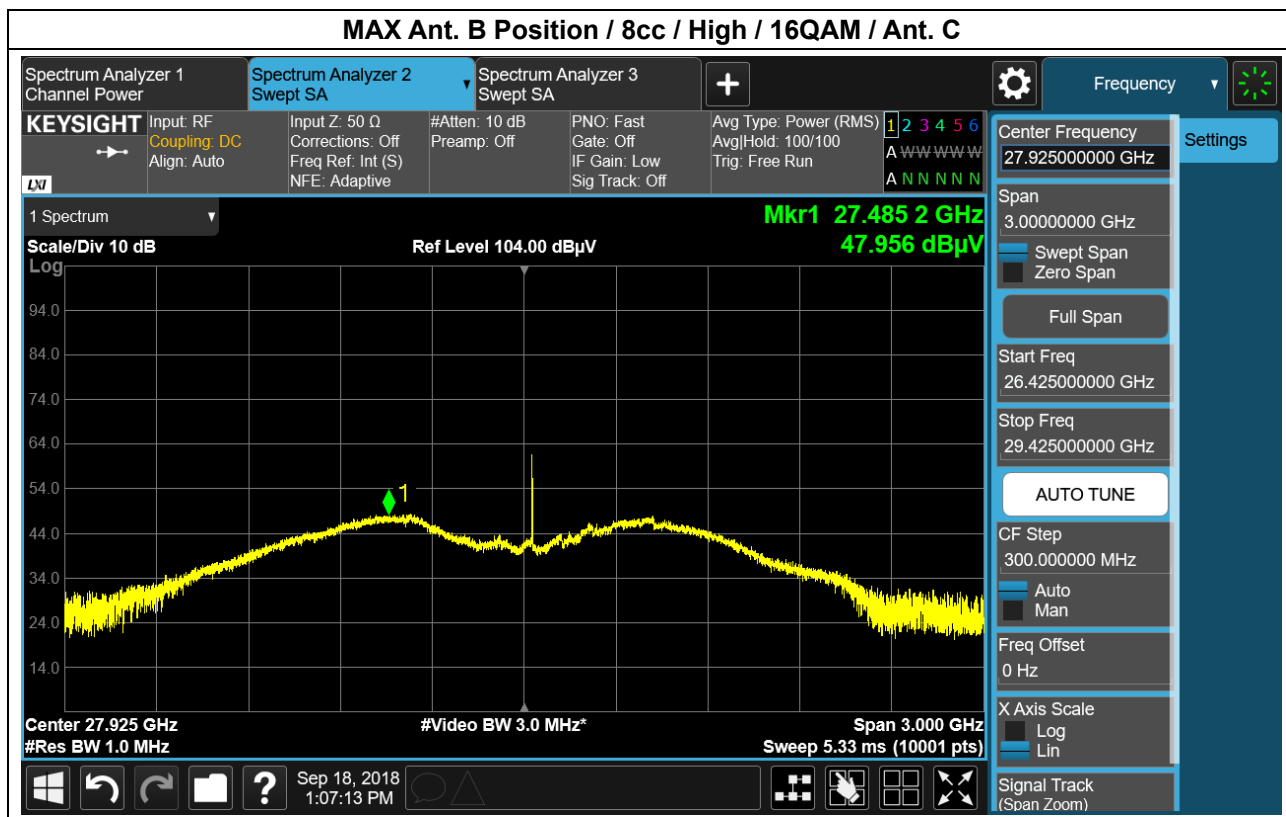


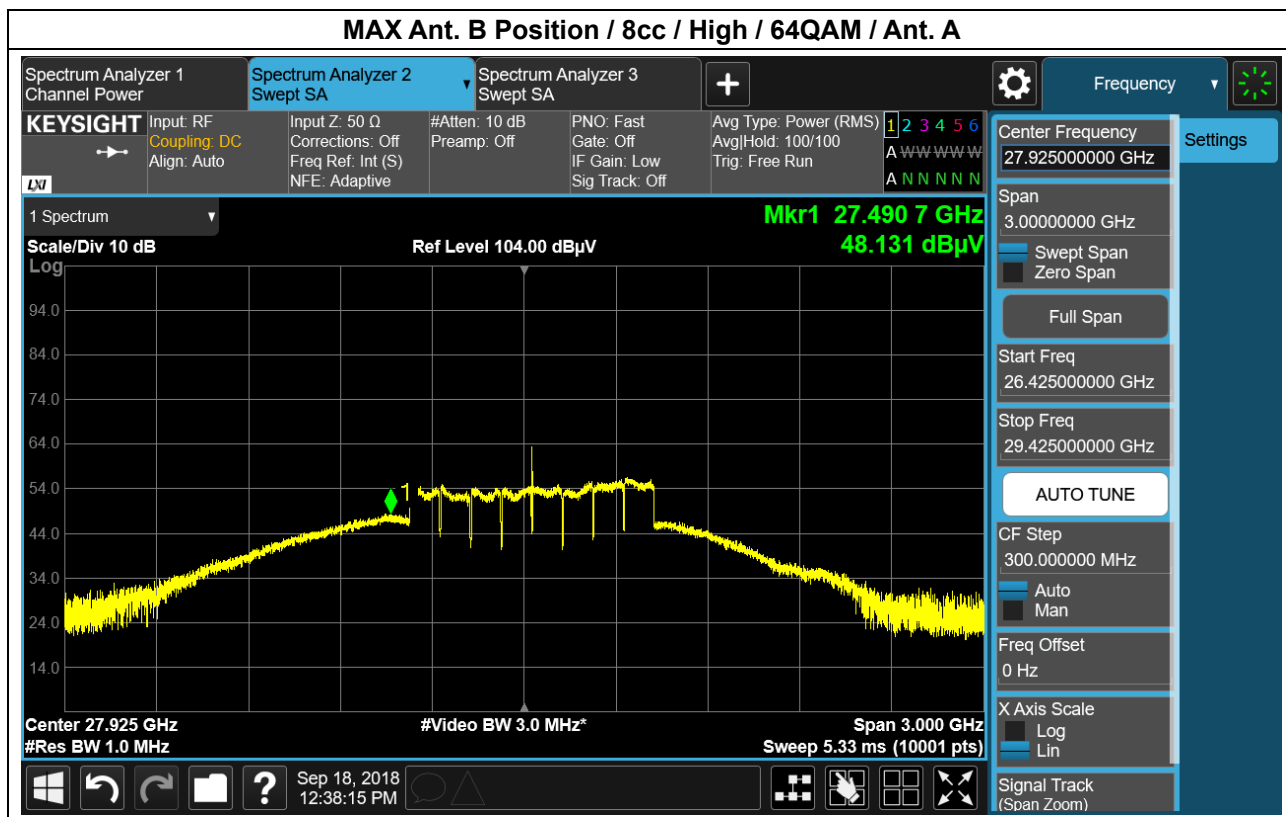


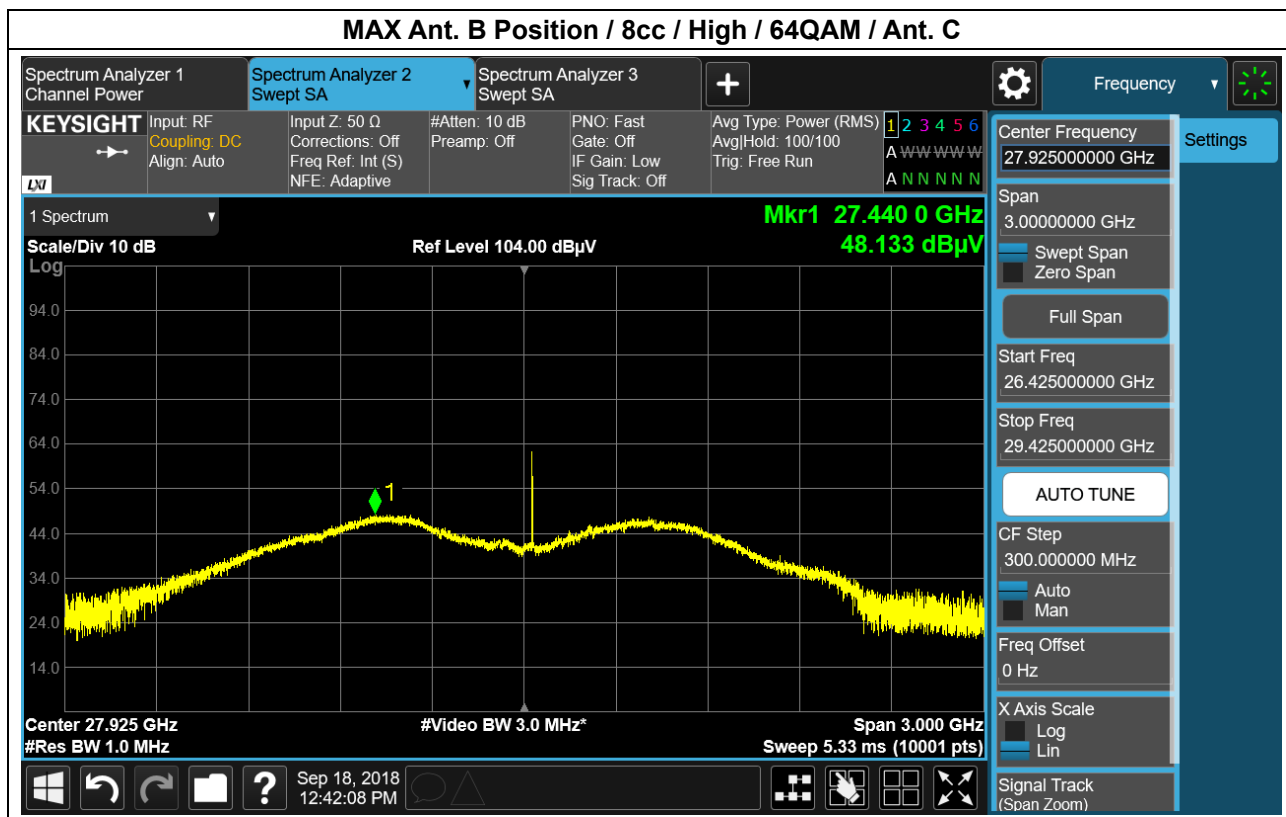












5.5. RADIATED SPURIOUS EMISSIONS

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.

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 $\geq 2 \times$ (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.

Note:

- 1) Spurious emission test is performed until the 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) Emissions in 26.5 GHz to 29.35 GHz band can be founded in section 5.1 through 5.4 of this report
- 4) Test plot doesn't include any factors and all factors such as AFCL is calculated in tabular data.
- 5) In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, amplifier gain and duty correction.
- 6) Emissions value is first converted by distance factor as follow.

$$\text{Converted value (dBm)} = \text{Measured Value (dBuV)} + 20 \text{ LOG}(D) - 104.77$$

- 7) Final spurious emissions result is calculated as follows.

$$\text{Spurious Emissions} = \text{Converted Value (dBm)} + \text{AFCL}$$

- 8) Refer to conducted output power test, spurious emissions test is performed about the worst case of modulation type (16QAM).
- 9) Sample calculations
30 MHz ~ 1 GHz (1cc, Low, H)

$$34.97 \text{ dBuV (measured)} + 9.54 \text{ (distance)} - 104.77 + 29.26(\text{AFCL}) = -31.00 \text{ dBm}$$

1 GHz ~ 18 GHz (1cc, Low, H)

$$54.54 \text{ dB}\mu\text{V (measured)} + 9.54 \text{ (distance)} - 104.77 - 7.81 \text{ (AFCL)} = -48.50 \text{ dBm}$$

18 GHz ~ 26.5 GHz (1cc, Low, H)

$$23.08 \text{ dB}\mu\text{V (measured)} + 12.67 \text{ (distance)} - 104.77 + 46.33 \text{ (AFCL)} = -22.69 \text{ dBm}$$

29.35 GHz ~ 40 GHz (1cc, Low, H)

$$61.395 \text{ dB}\mu\text{V (measured)} + 12.67 \text{ (distance)} - 104.77 - 5.33 \text{ (AFCL)} = -36.04 \text{ dBm}$$

40 GHz ~ 60 GHz (1cc, Low, H)

$$11.77 \text{ dB}\mu\text{V (measured)} + 16.19 \text{ (distance)} - 104.77 + 47.32 \text{ (AFCL)} = -29.49 \text{ dBm}$$

60 GHz ~ 90 GHz (1cc, Low, H)

$$5.29 \text{ dB}\mu\text{V (measured)} + 19.71 \text{ (distance)} - 104.77 + 59.48 \text{ (AFCL)} = -20.29 \text{ dBm}$$

90 GHz ~ 100 GHz (1cc, Low, H)

$$6.905 \text{ dB}\mu\text{V (measured)} + 20.63 \text{ (distance)} - 104.77 + 55.03 \text{ (AFCL)} = -22.20 \text{ dBm}$$

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	16 QAM	3	H	643.000	34.97	-60.26	29.26	-13	-31.00
				V	846.740	35.07	-60.16	31.76		-28.40
	M			H	819.580	35.09	-60.14	31.72		-28.42
				V	903.000	34.95	-60.28	32.33		-27.95
	H			H	804.060	34.32	-60.91	31.37		-29.54
				V	856.440	35.09	-60.14	31.77		-28.37
30 MHz ~1 GHz (8cc)	L			H	899.120	34.25	-60.98	32.33		-28.65
				V	840.920	35.16	-60.07	31.75		-28.32
	M			H	856.440	34.68	-60.55	31.77		-28.78
				V	101.780	34.22	-61.01	16.56		-44.45
	H			H	858.380	34.52	-60.71	31.77		-28.94
				V	144.460	34.80	-60.43	21.00		-39.43
1~18 GHz (1cc)	L			H	2989.000	54.54	-40.69	-7.81		-48.50
				V	1799.000	54.26	-40.97	-12.05		-53.02
	M			H	2989.000	53.71	-41.52	-7.81		-49.33
				V	1799.000	53.33	-41.90	-12.05		-53.95
	H			H	2989.000	57.78	-37.45	-7.81		-45.26
				V	1799.000	53.37	-41.86	-12.05		-53.91
1~18 GHz (8cc)	L			H	2989.000	59.03	-36.20	-7.81		-44.01
				V	2989.000	53.25	-41.98	-12.05		-54.03
	M			H	2989.000	59.29	-35.94	-7.81		-43.75
				V	1799.000	53.99	-41.24	-12.05		-53.29
	H			H	2989.000	60.18	-35.05	-7.81		-42.86
				V	1799.000	53.52	-41.71	-12.05		-53.76

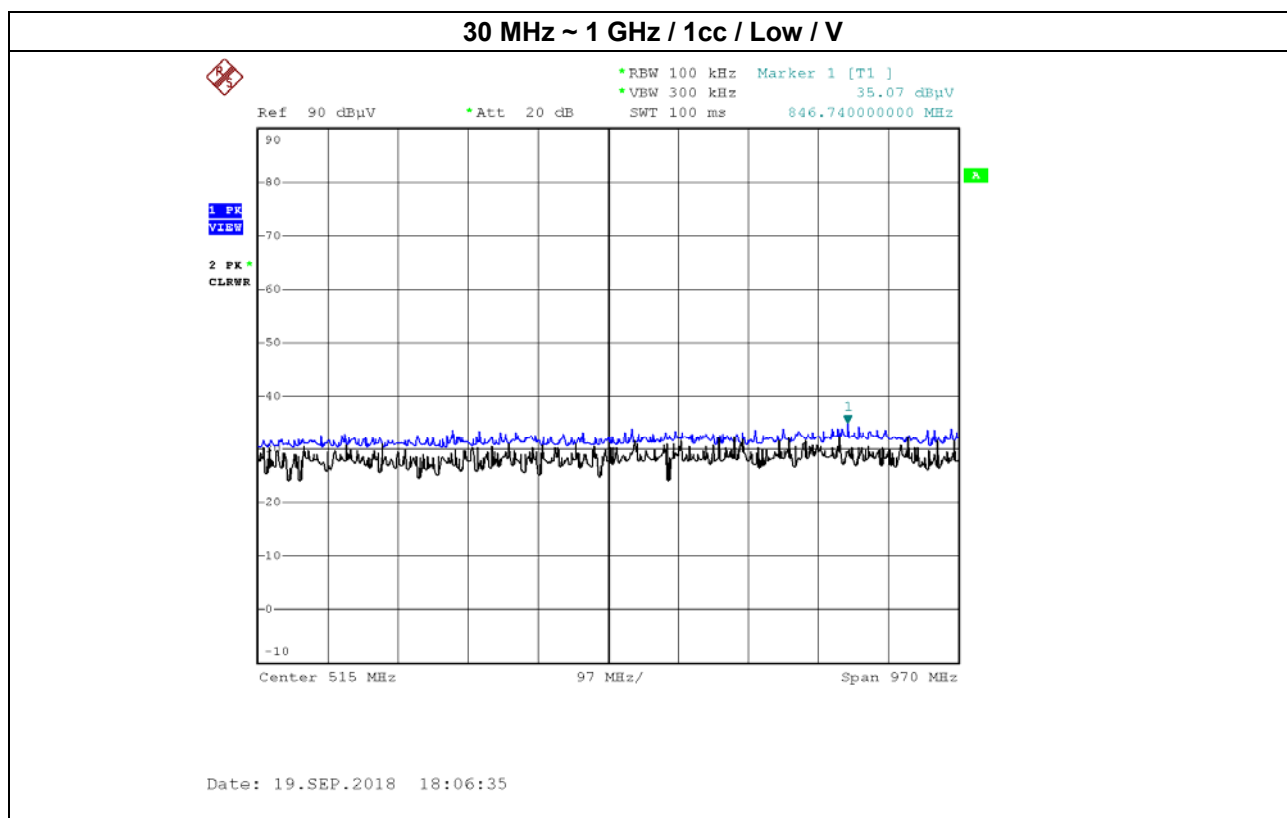
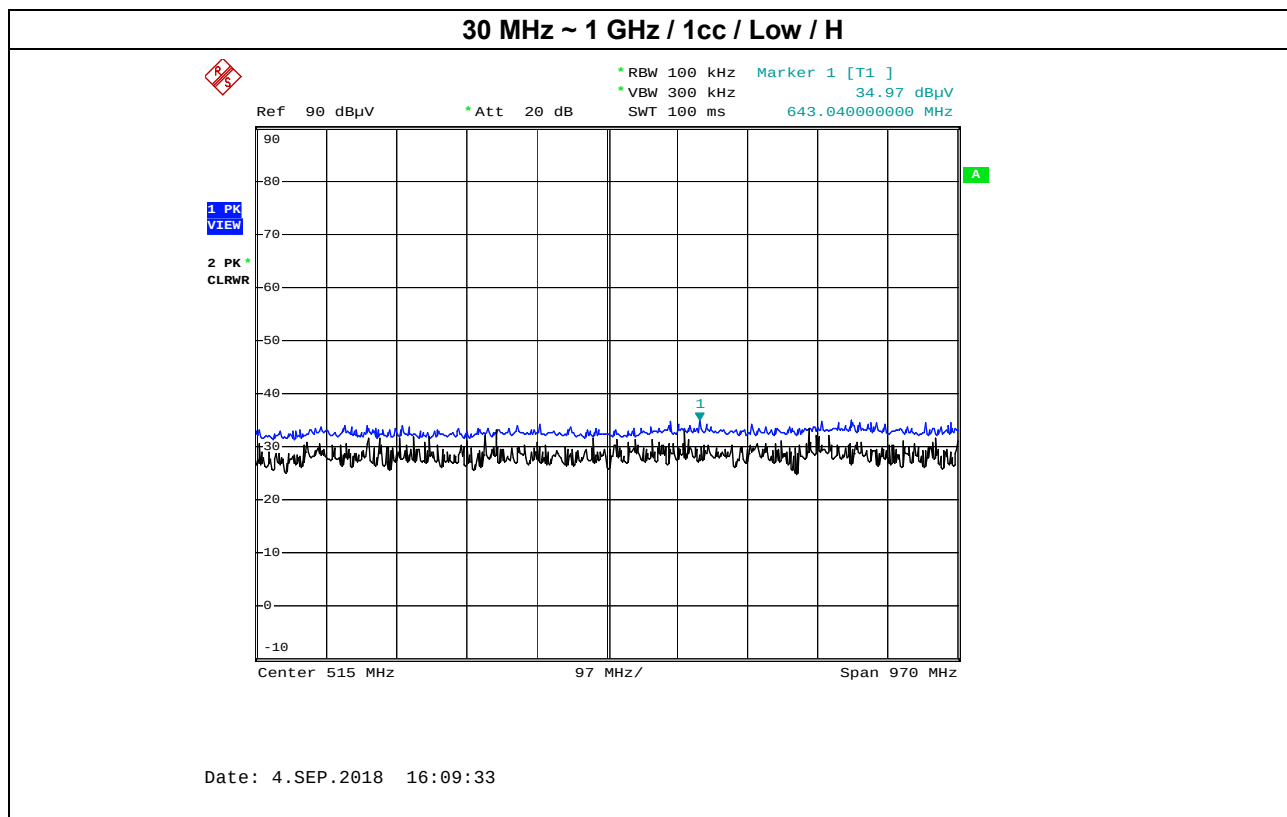
* Because of no critical emissions are detected in the test, only peak value is recorded in this report.

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	16 QAM	4.30	45	26.4983	23.080	-69.02	46.33	-13	-22.69	
				135	26.4732	23.022	-69.08	46.33		-22.75	
	M			45	26.4949	21.723	-70.38	46.33		-24.05	
				135	26.4163	22.343	-69.76	45.99		-23.77	
				H	45	22.7090	22.762	-69.34		45.42	-23.92
					135	22.7001	25.737	-66.36		45.42	-20.94
18~26.5 GHz (8cc)	L			45	22.6423	24.305	-67.80	45.18		-22.62	
				135	26.4719	21.673	-70.43	45.99		-24.44	
	M			45	22.6696	22.922	-69.18	46.09		-23.09	
				135	22.3400	26.688	-65.41	44.28		-21.13	
				H	45	26.4571	22.395	-69.71		46.33	-23.38
					135	22.6967	22.879	-69.22		45.42	-23.80
29.35 ~40 GHz (1cc)	L			45	29.4324	61.395	-30.71	-5.33		-36.04	
				135	29.4631	61.573	-30.53	-5.33		-35.86	
	M			45	29.4024	60.252	-31.85	-5.33		-37.18	
				135	29.4020	60.359	-31.74	-5.33		-37.07	
				H	45	29.5931	58.617	-33.48		-5.33	-38.81
					135	29.4793	59.180	-32.92		-5.33	-38.25
29.35 ~40 GHz (1cc)	L			45	29.3827	71.523	-20.58	-5.33		-25.91	
				135	29.4046	70.729	-21.37	-5.33		-26.70	
	M			45	29.4042	70.742	-21.36	-5.33		-26.69	
				135	29.4120	71.031	-21.07	-5.33		-26.40	
				H	45	29.3660	71.451	-20.65		-5.33	-25.98
					135	29.4213	71.531	-20.57		-5.33	-25.90
40~60 GHz (1cc)	L		6.45	45	43.8337	11.77	-76.81	47.32		-29.49	
				135	43.4237	11.71	-76.87	47.58		-29.29	
	M			45	43.2783	11.83	-76.75	47.21		-29.54	
				135	41.3551	11.76	-76.82	48.09		-28.73	
				H	45	41.2037	11.95	-76.63		48.09	-28.54
					135	43.8429	12.14	-76.44		47.35	-29.09

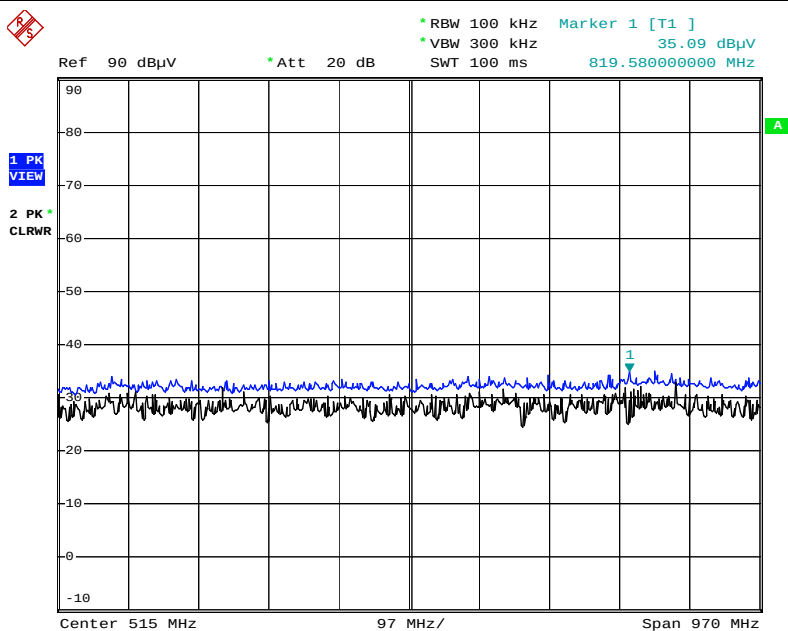
Freq.	CH	Mod.	Distance (m)	Ant. Angle	Frequency (GHz)	Measured (dBuV)	Converted (dBm)	AFCL (dB)	Limit (dBm)	Result (dBm)
40~60 GHz (8cc)	L	16 QAM	6.45	45	41.6127	11.91	-76.67	48.12	-13	-28.55
				135	43.6961	11.82	-76.76	47.61		-29.15
	M			45	43.5561	11.90	-76.68	47.58		-29.10
				135	40.9305	11.52	-77.06	50.46		-26.60
	H			45	43.7066	11.92	-76.66	47.61		-29.05
				135	43.5483	11.91	-76.67	47.58		-29.09
60~90 GHz (1cc)	L		9.68	45	64.9150	5.29	-79.76	59.48		-20.29
				135	64.9153	5.25	-79.80	59.48		-20.33
	M			45	65.1208	5.17	-79.88	59.40		-20.49
				135	64.7305	5.14	-79.91	59.45		-20.47
	H			45	64.7230	4.99	-80.06	59.45		-20.62
				135	64.9246	5.01	-80.04	59.48		-20.57
60~90 GHz (8cc)	L		10.75	45	65.1100	5.03	-80.02	59.40		-20.63
				135	64.9255	5.35	-79.70	59.48		-20.23
	M			45	68.2273	5.03	-80.02	56.56		-23.47
				135	64.9258	5.24	-79.81	59.48		-20.34
	H			45	64.9156	5.03	-80.02	59.48		-20.55
				135	65.1055	5.33	-79.72	59.48		-20.25
90~100 GHz (1cc)	L		10.75	45	92.3896	6.905	-77.24	55.03		-22.20
				135	91.2772	6.962	-77.18	54.36		-22.82
	M			45	91.1428	6.945	-77.20	54.36		-22.83
				135	90.3073	6.883	-77.26	56.95		-20.31
	H			45	91.7467	6.872	-77.27	54.99		-22.28
				135	91.7714	6.759	-77.38	54.99		-22.39
90~100 GHz (8cc)	L		10.75	45	99.8289	6.819	-77.32	59.07		-18.25
				135	99.2091	7.002	-77.14	58.71		-18.43
	M			45	90.1817	6.890	-77.25	56.95		-20.30
				135	91.3418	6.898	-77.24	54.36		-22.88
	H			45	99.7593	6.735	-77.41	59.11		-18.29
				135	90.1646	6.780	-77.36	56.95		-20.41

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

Plot data of Radiated Spurious Emissions

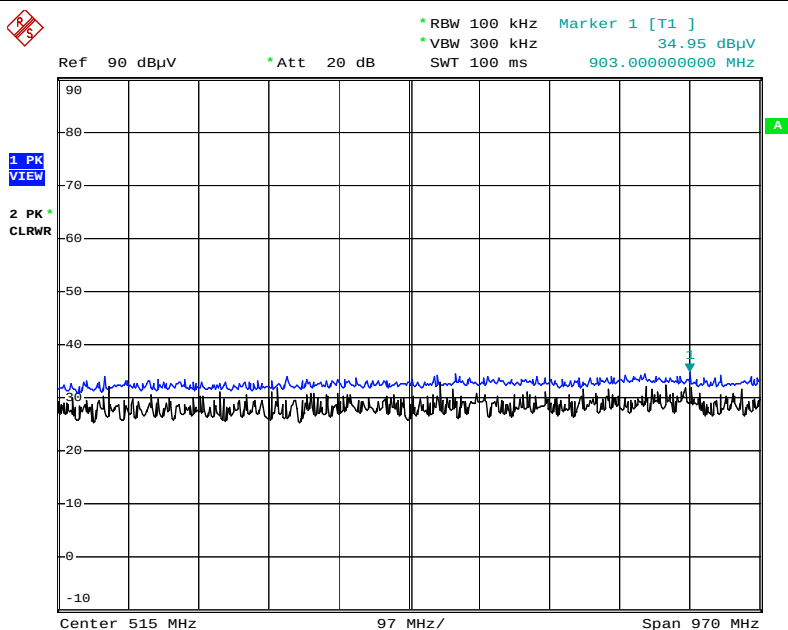


30 MHz ~ 1 GHz / 1cc / Middle / H

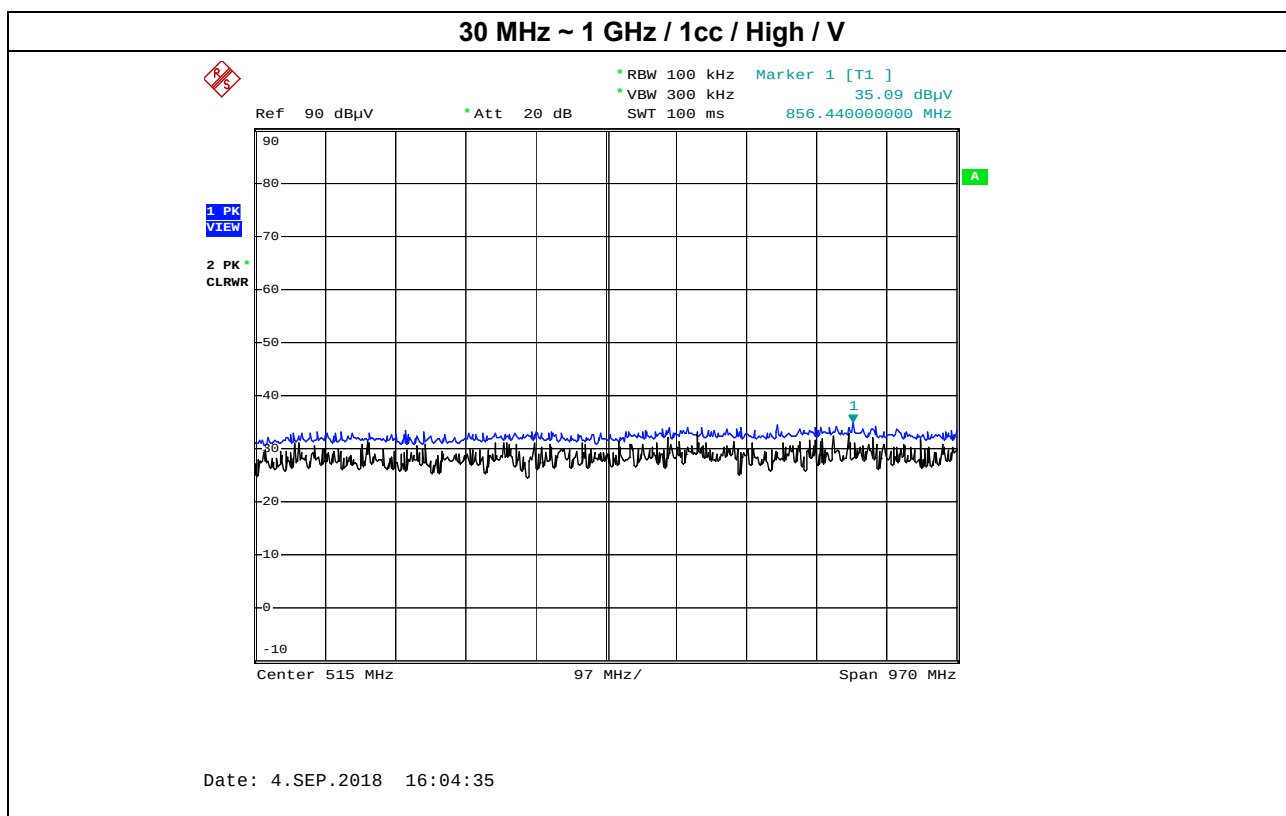
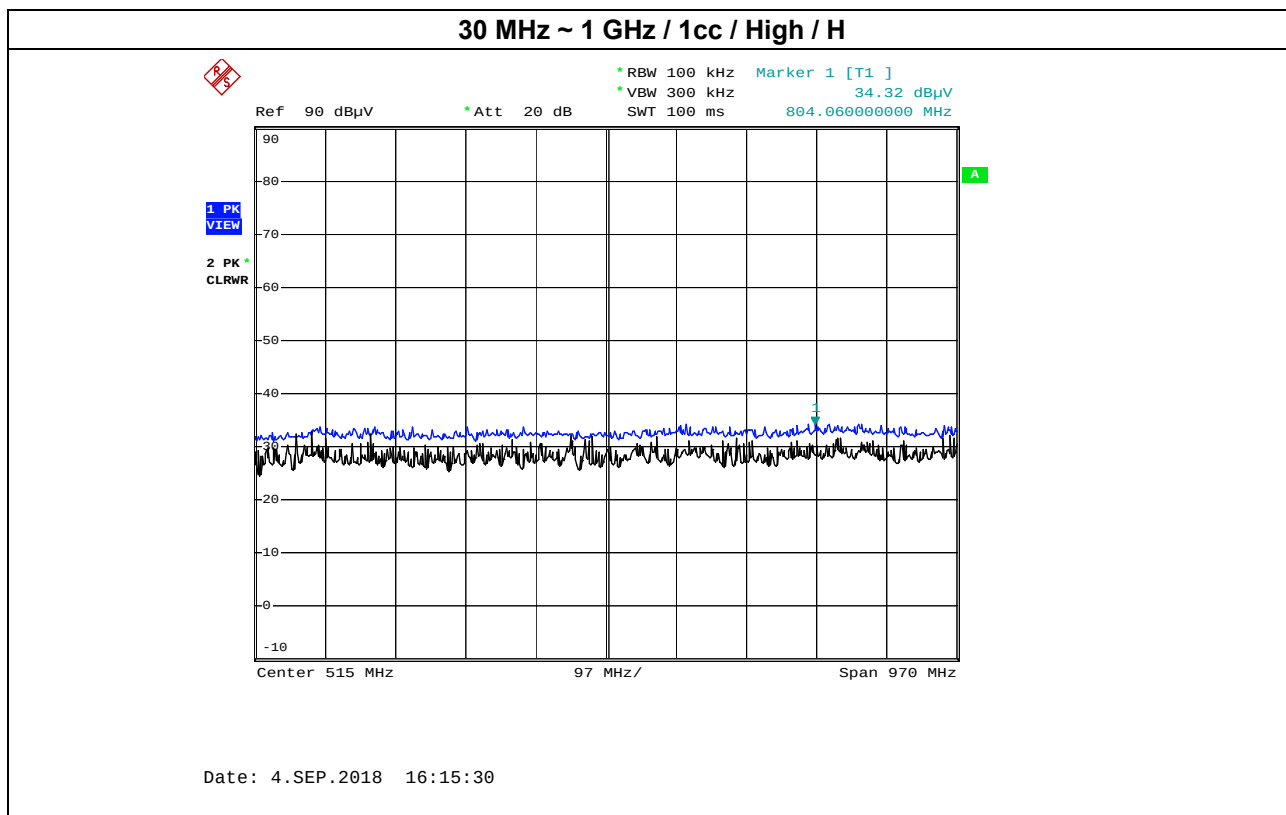


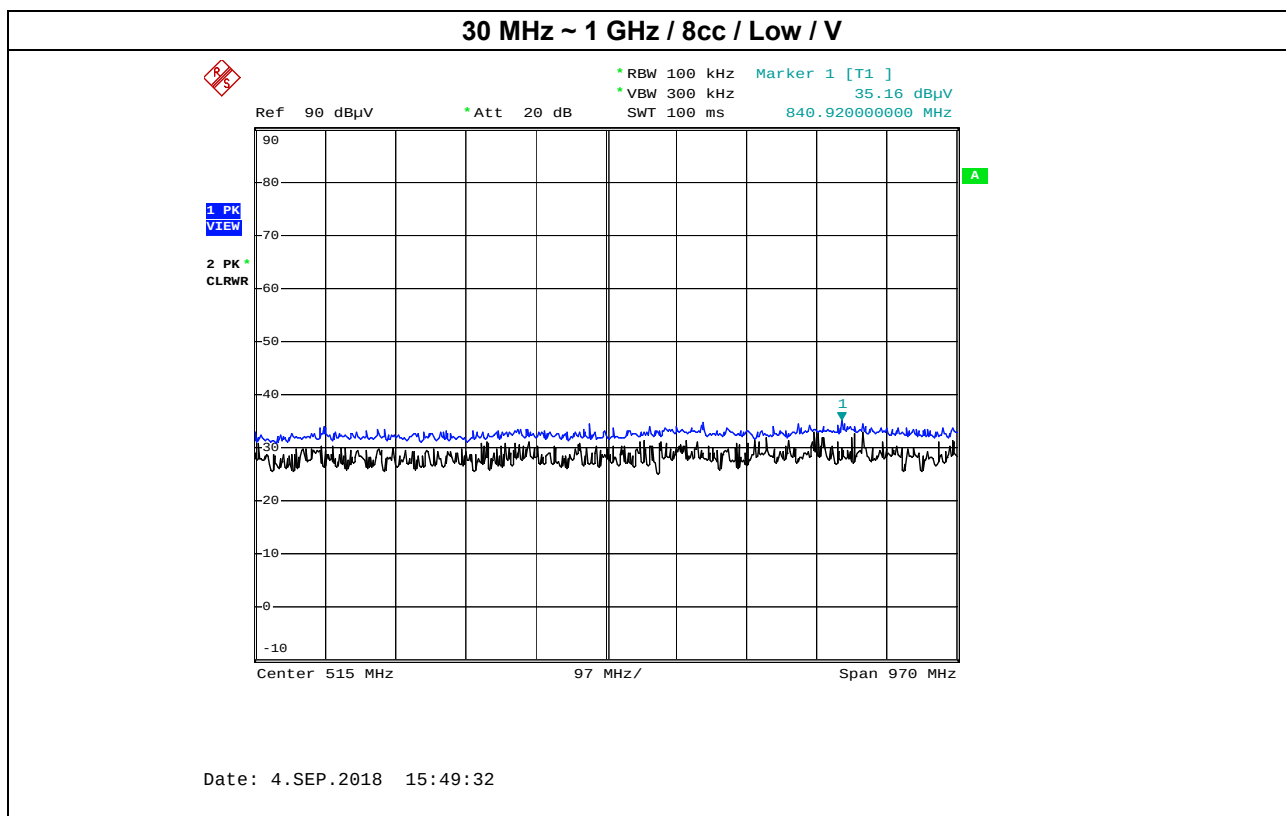
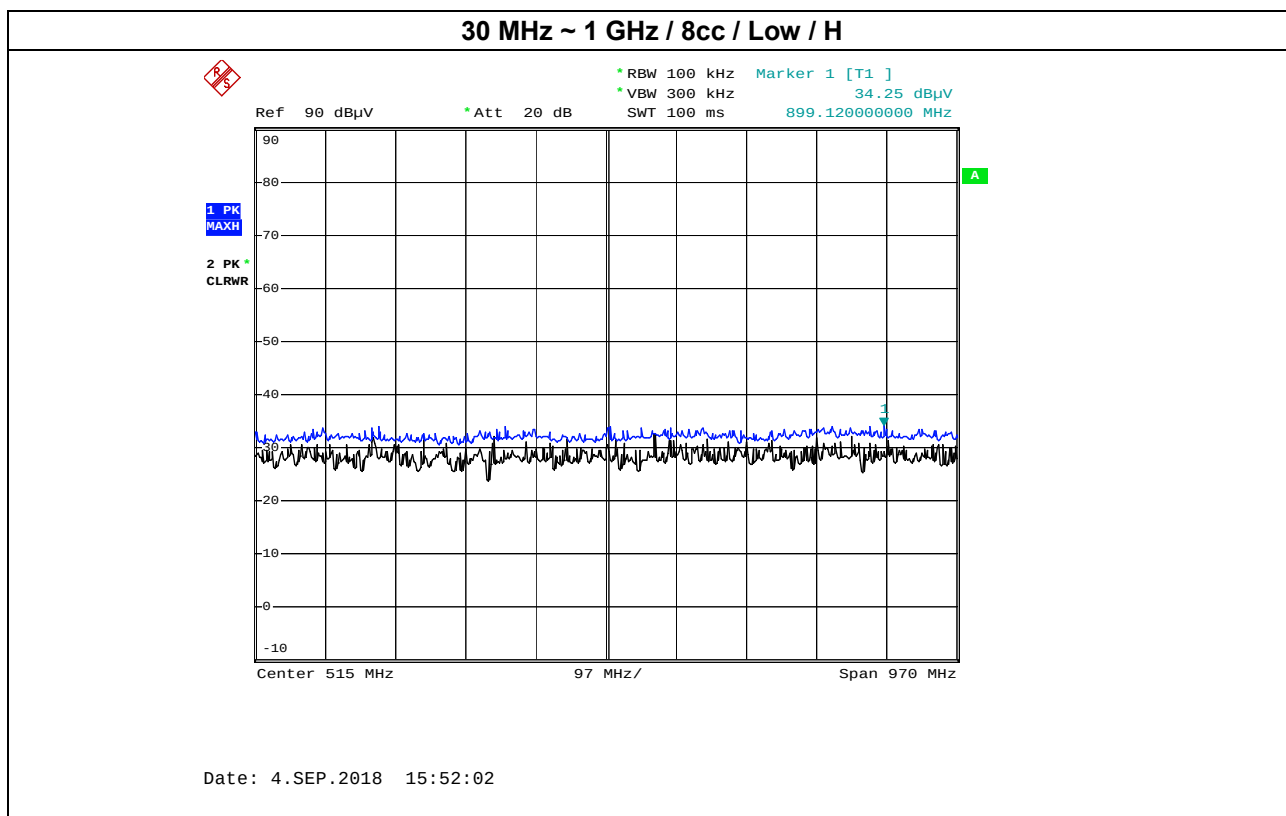
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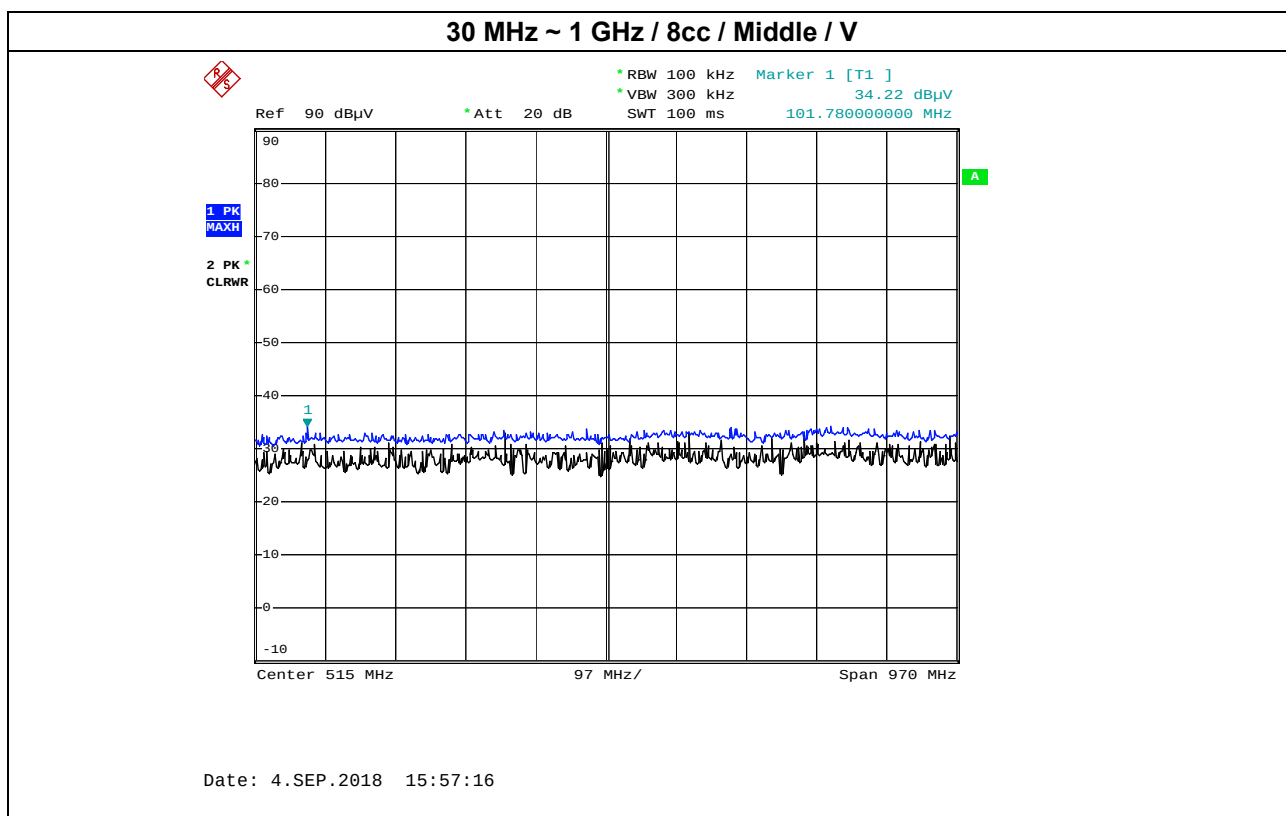
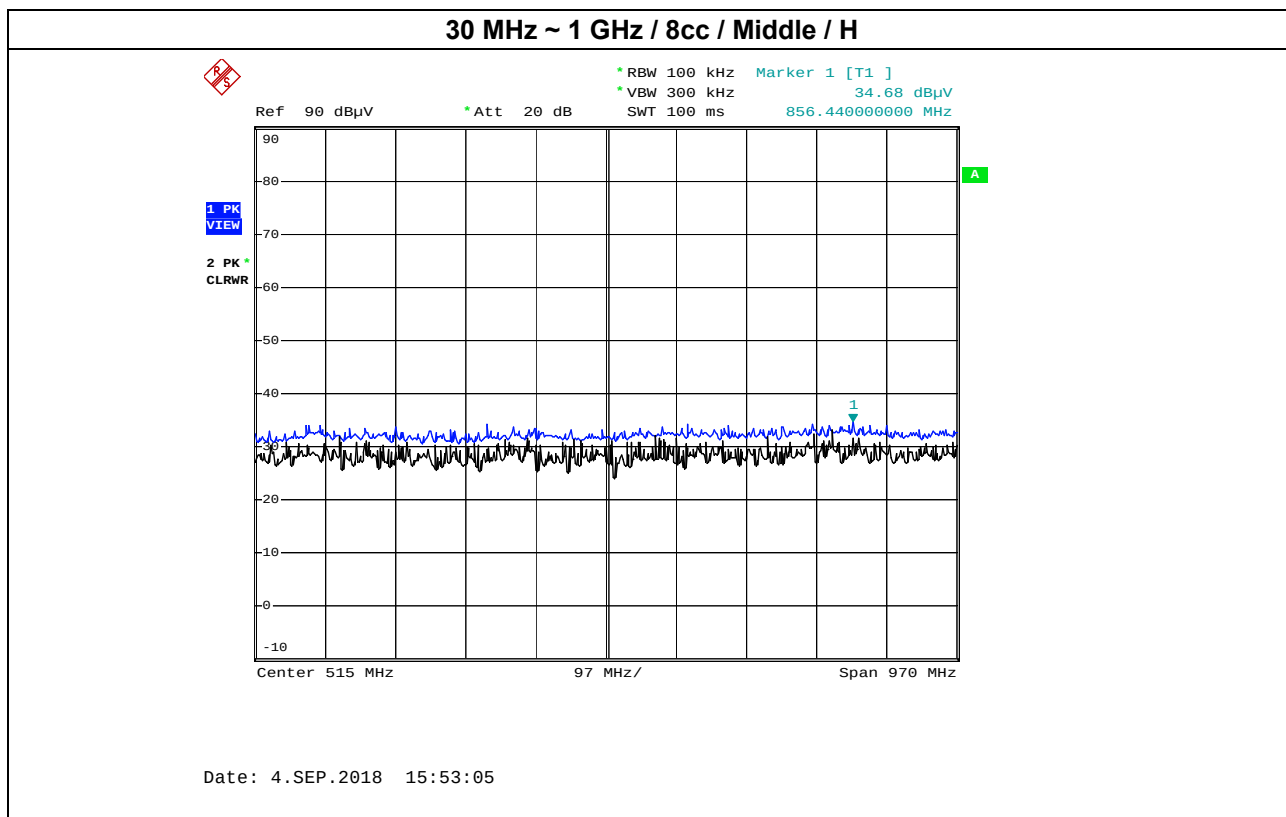
30 MHz ~ 1 GHz / 1cc / Middle / V



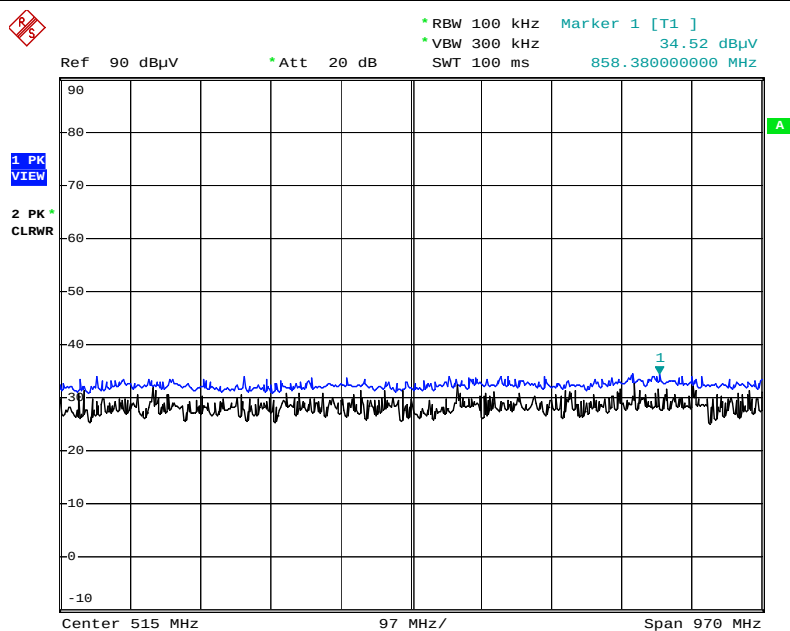
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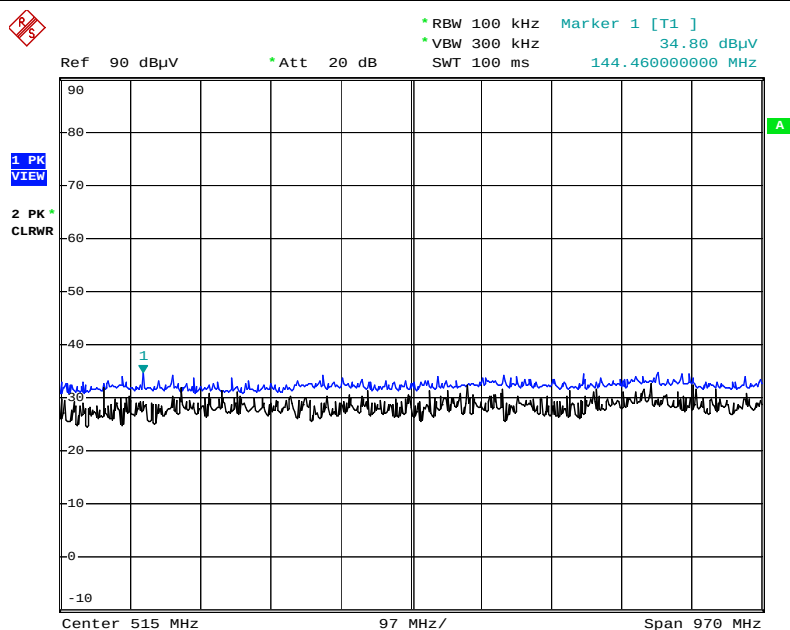


30 MHz ~ 1 GHz / 8cc / High / H

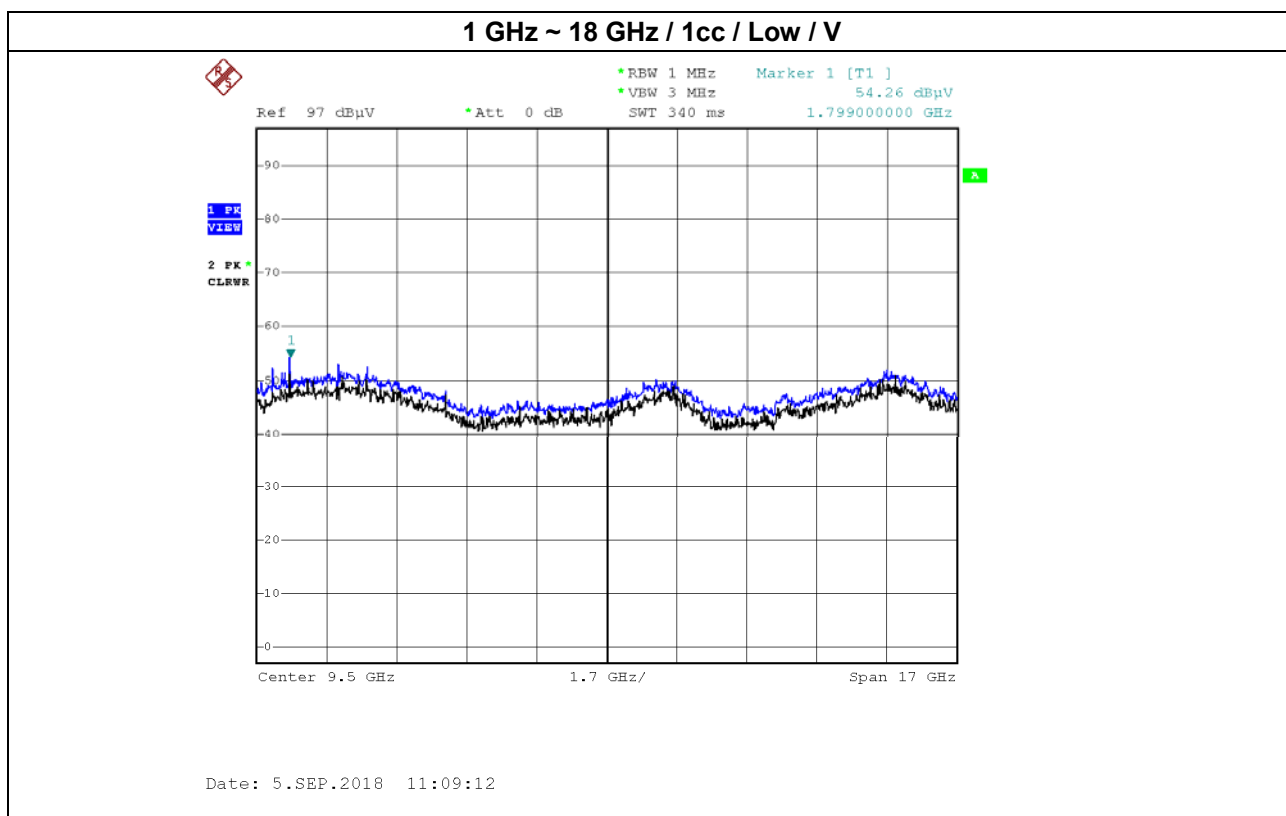
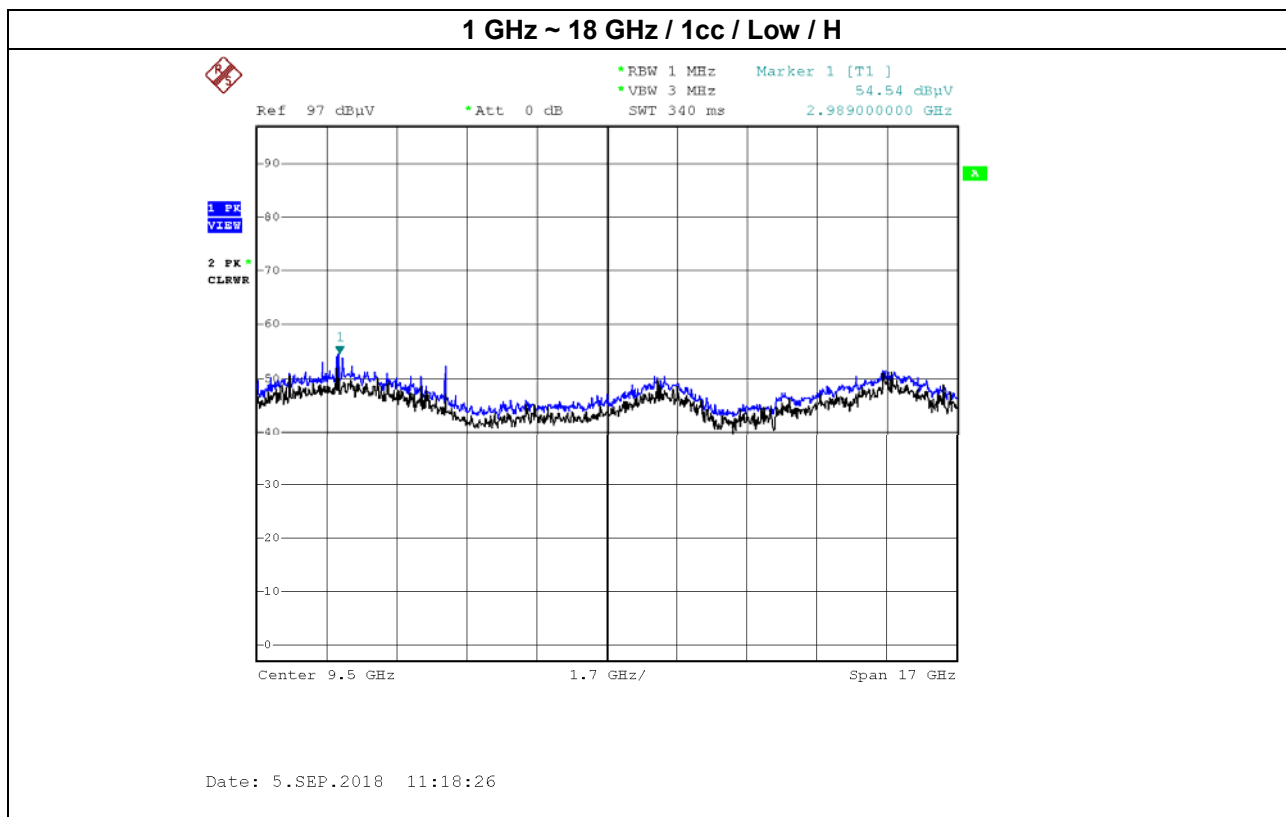


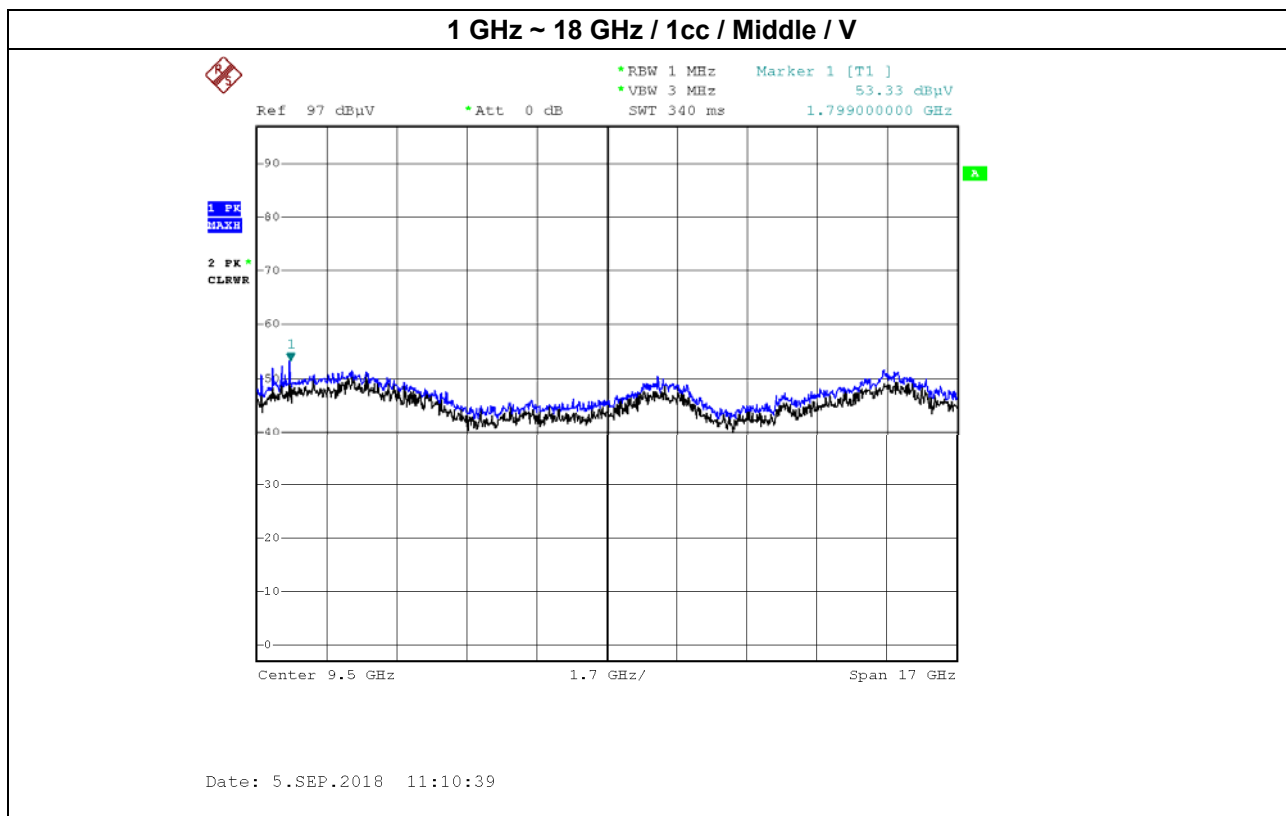
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30 MHz ~ 1 GHz / 8cc / High / V

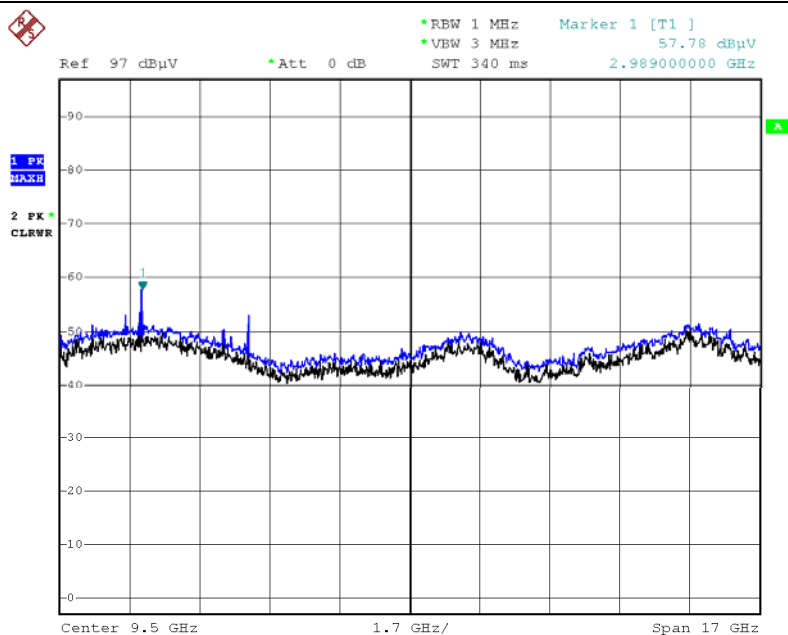


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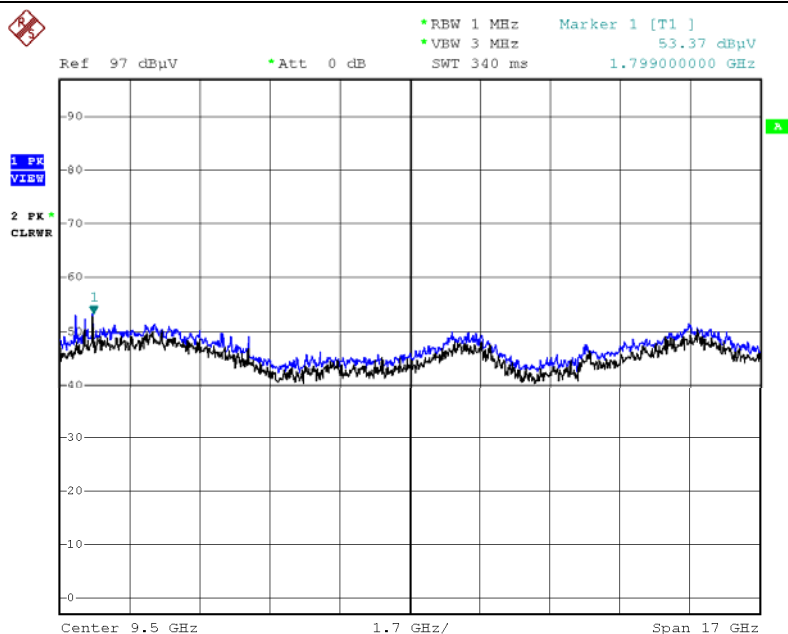


1 GHz ~ 18 GHz / 1cc / High / H



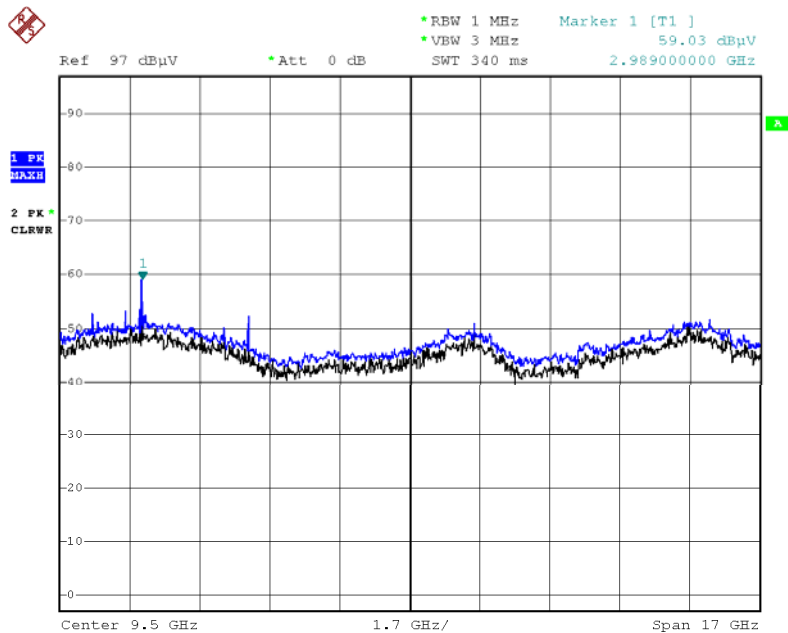
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1 GHz ~ 18 GHz / 1cc / High / V



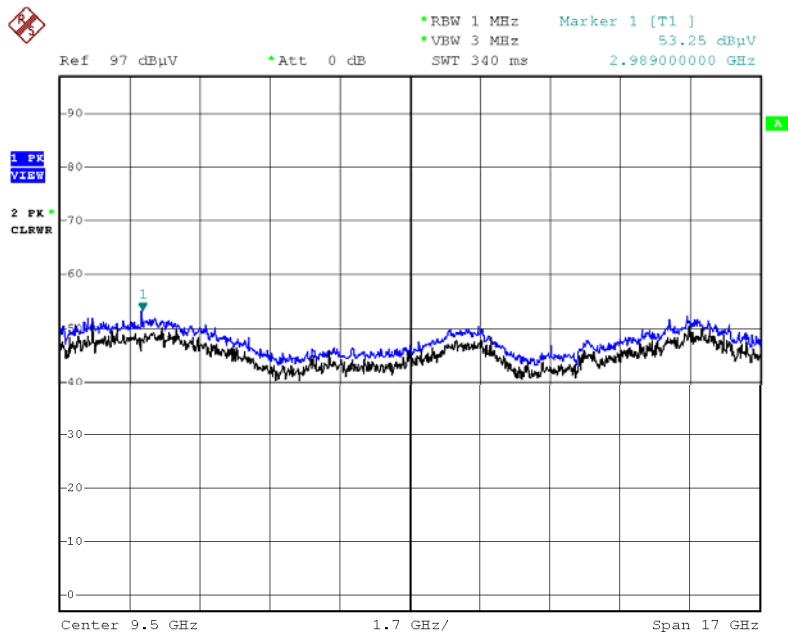
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1 GHz ~ 18 GHz / 8cc / Low / H



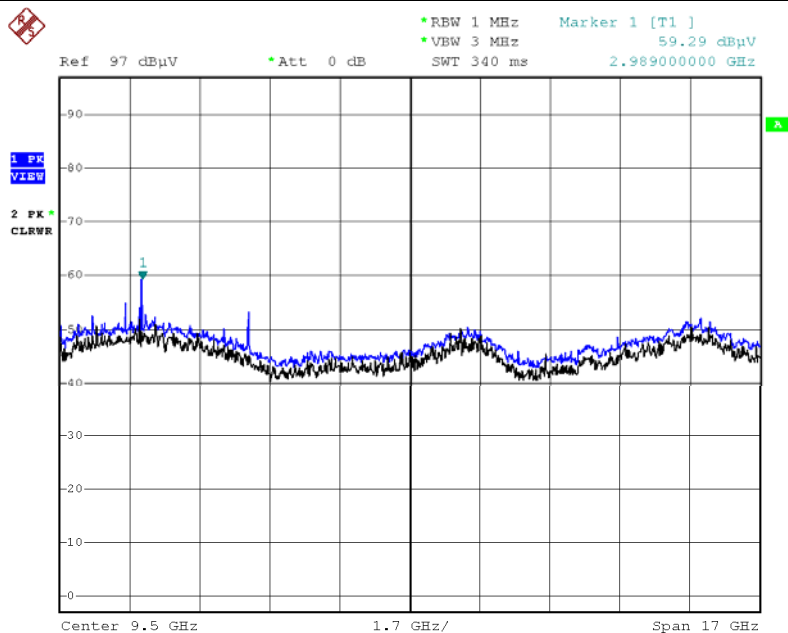
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1 GHz ~ 18 GHz / 8cc / Low / V



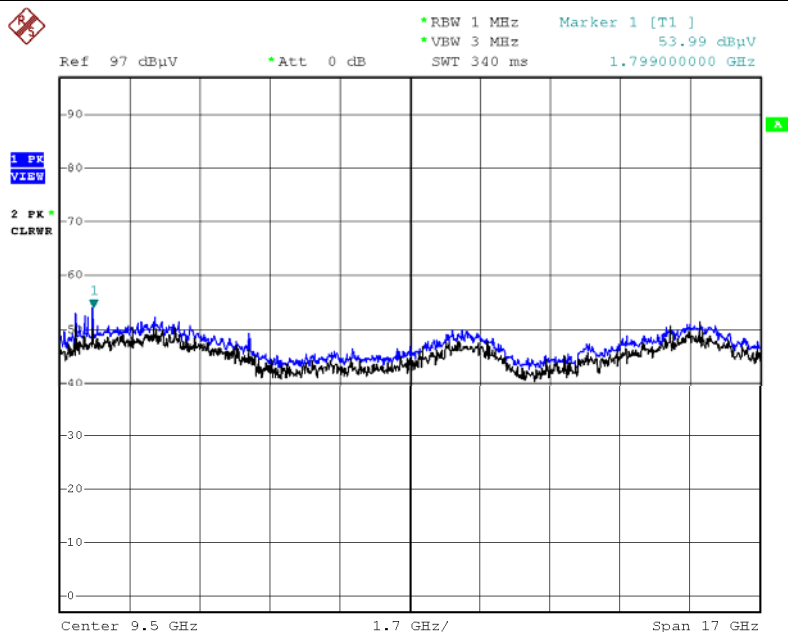
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1 GHz ~ 18 GHz / 8cc / Middle / H



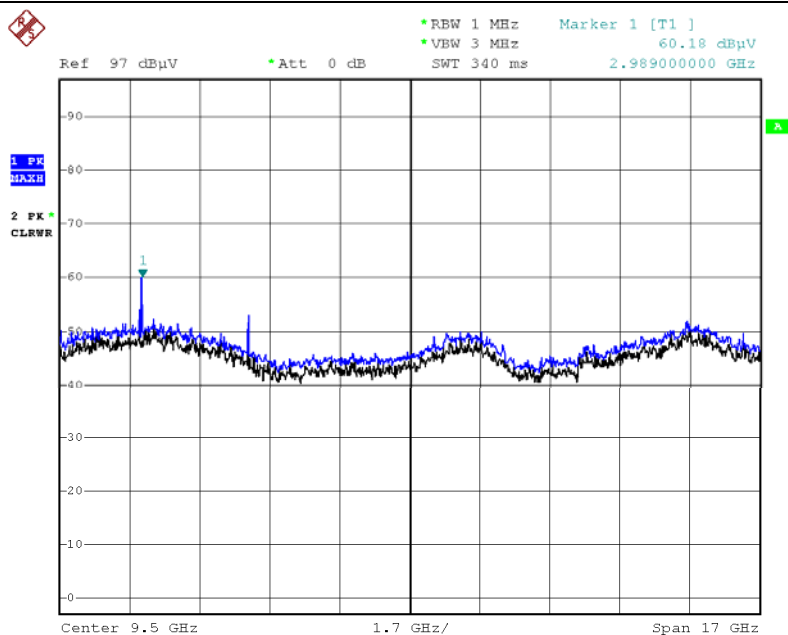
Date: 5.SEP.2018 10:41:05

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



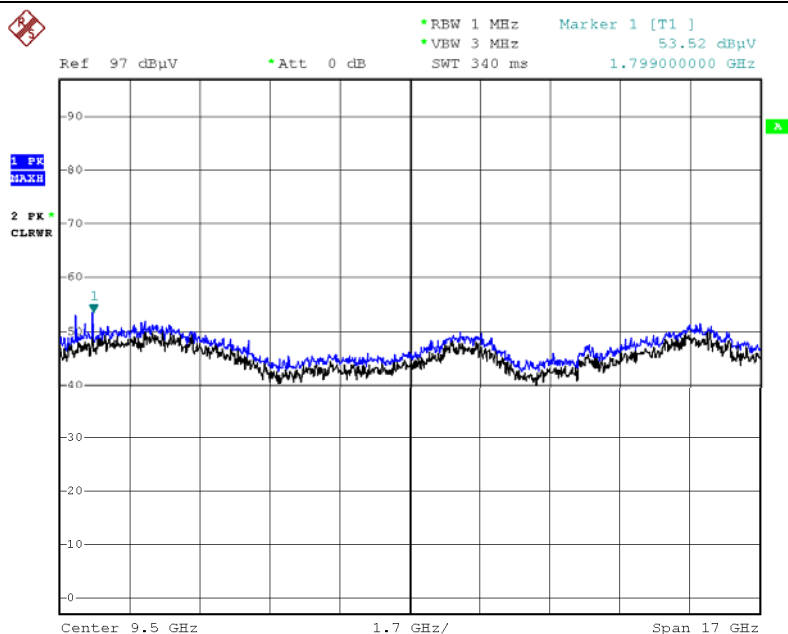
Date: 5.SEP.2018 11:04:38

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

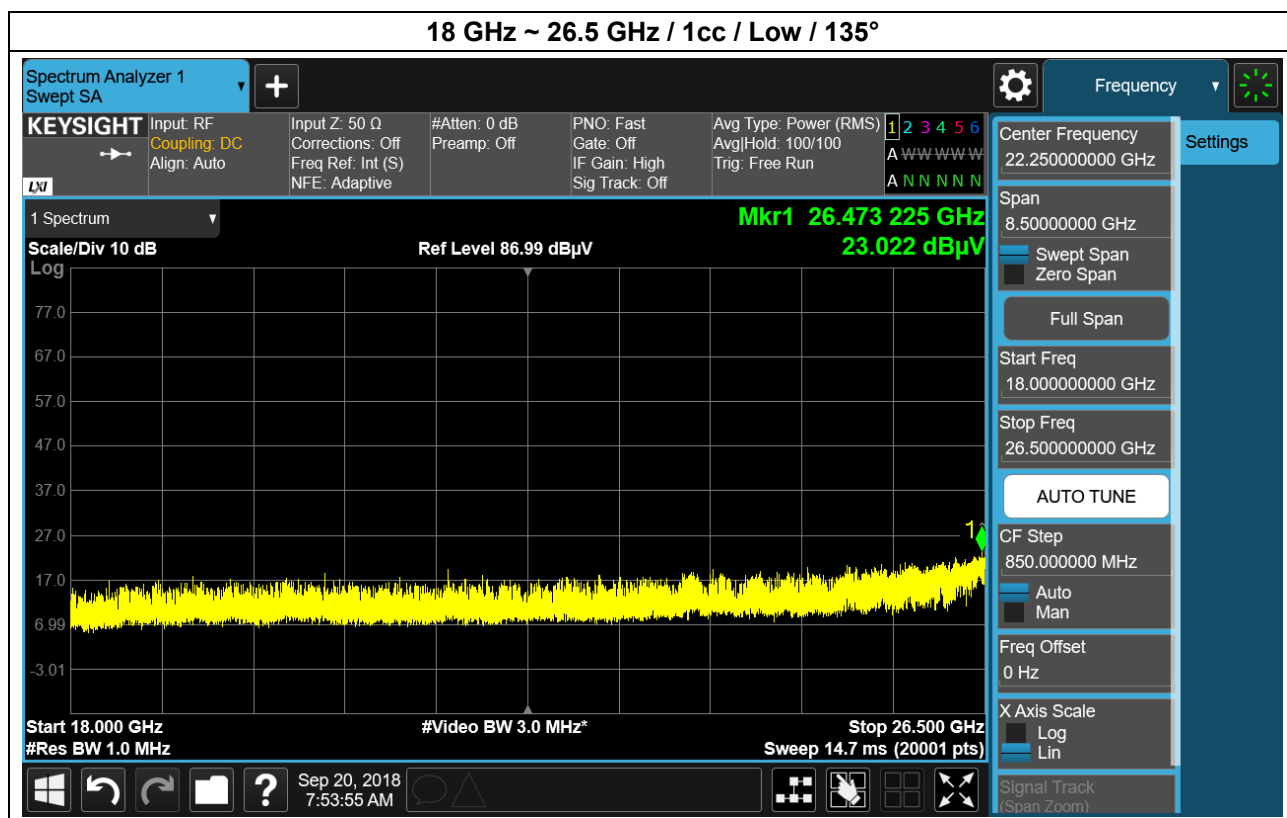
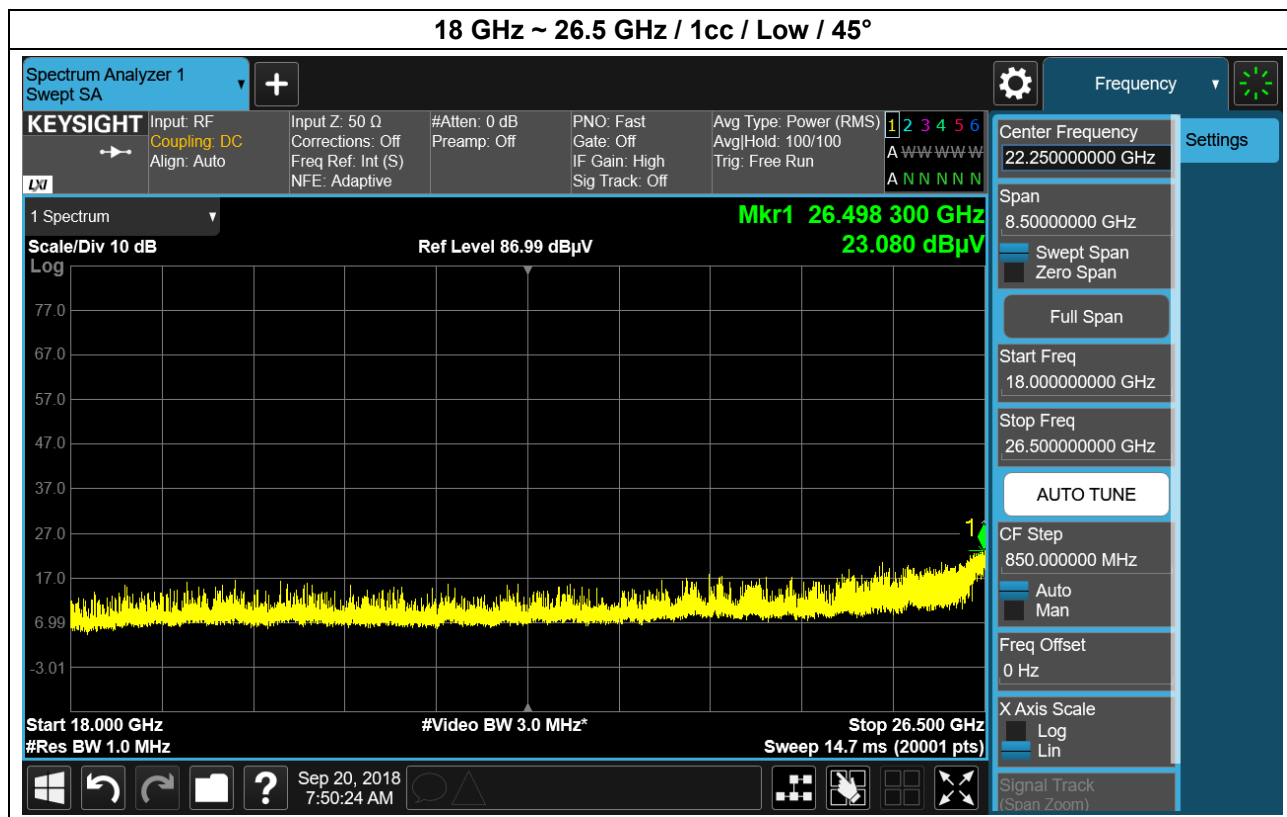


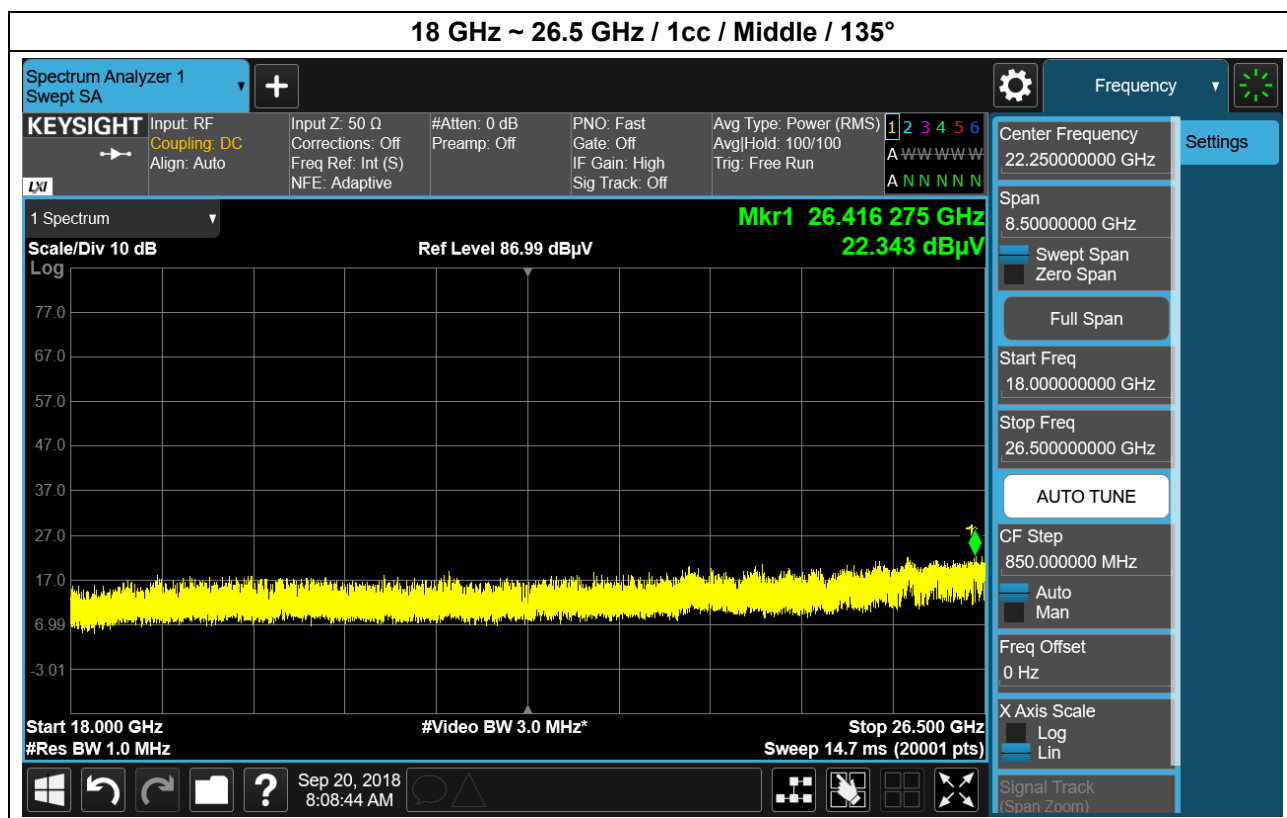
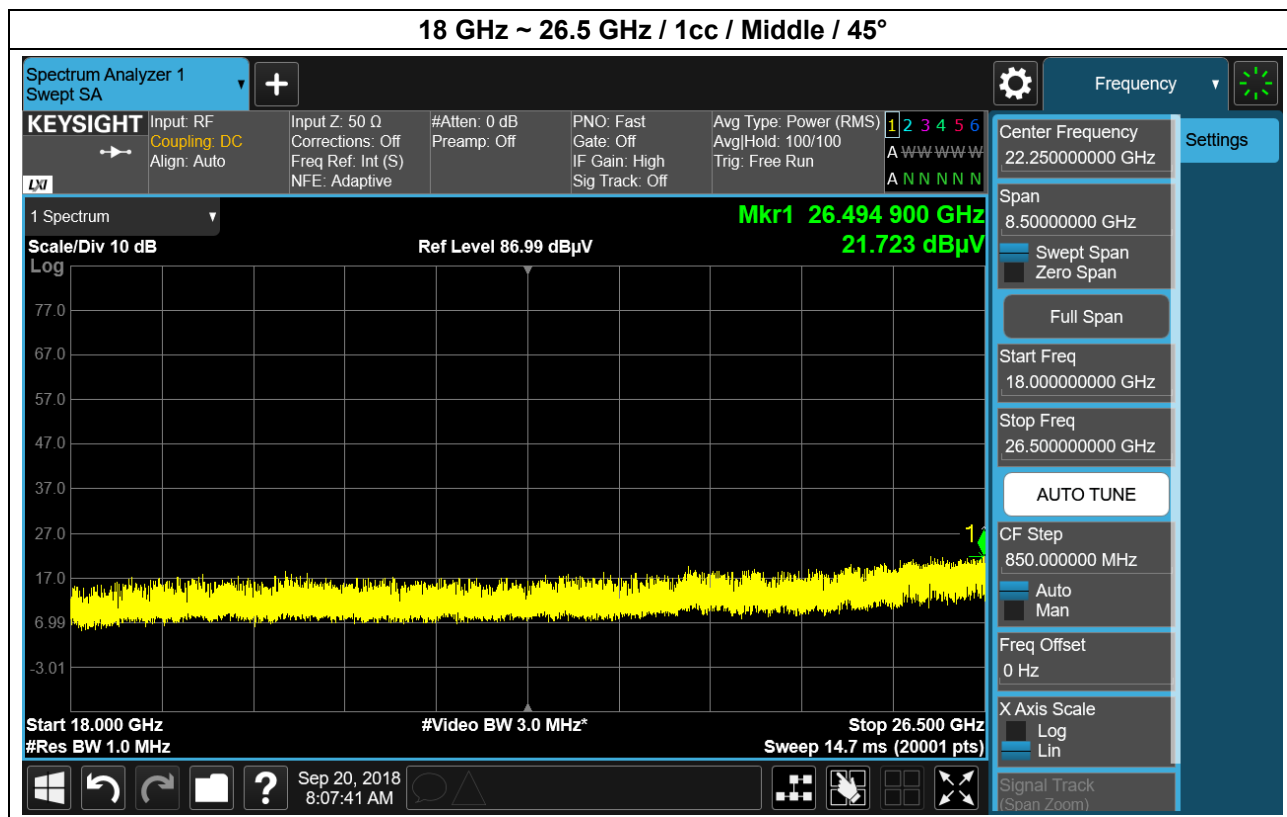
Date: 5.SEP.2018 10:52:03

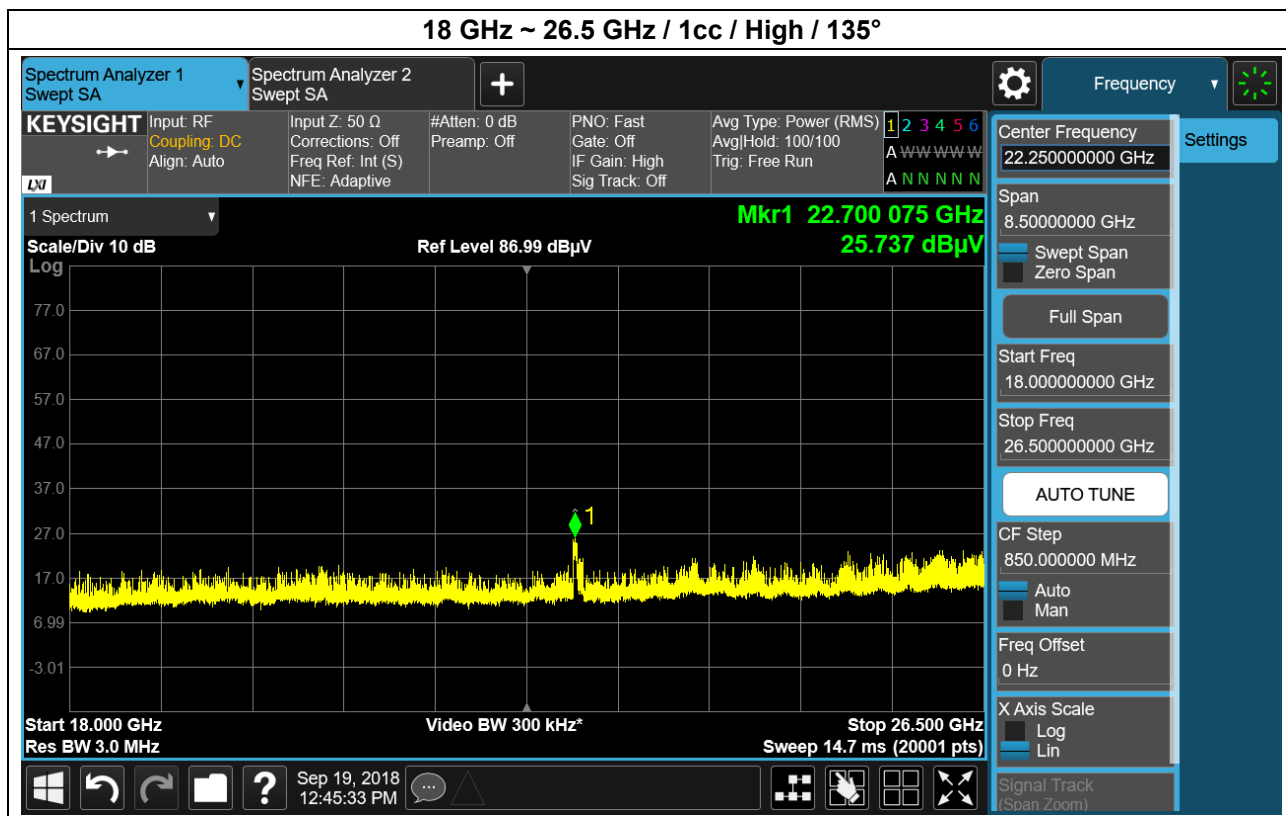
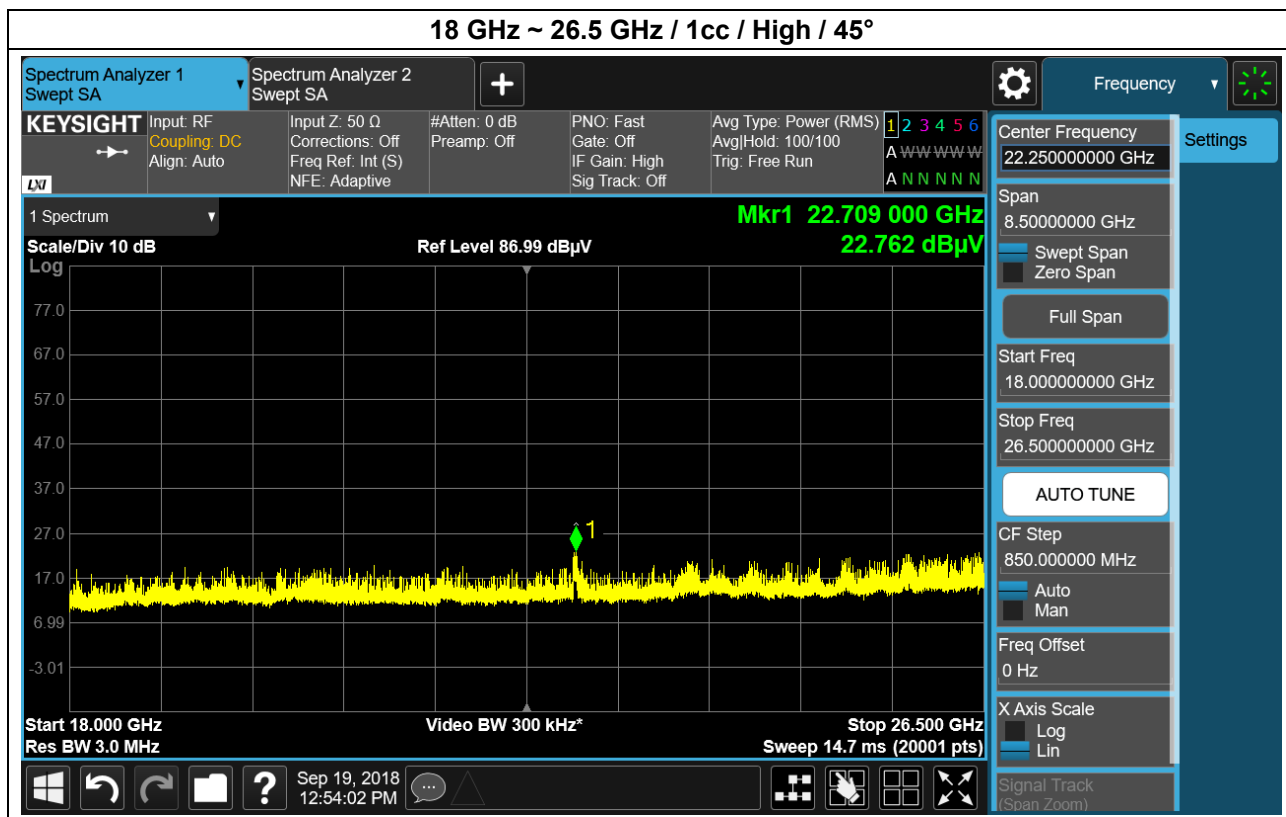
1 GHz ~ 18 GHz / 8cc / High / V

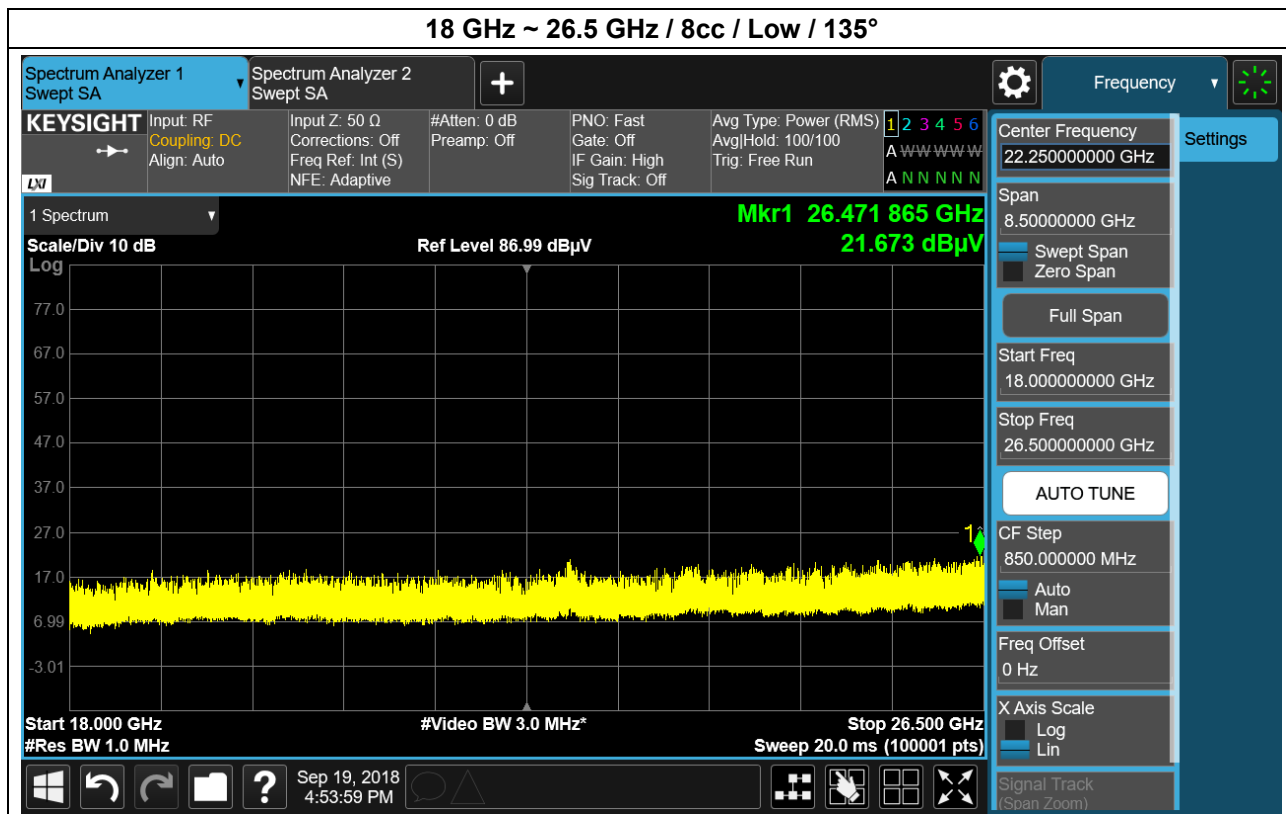
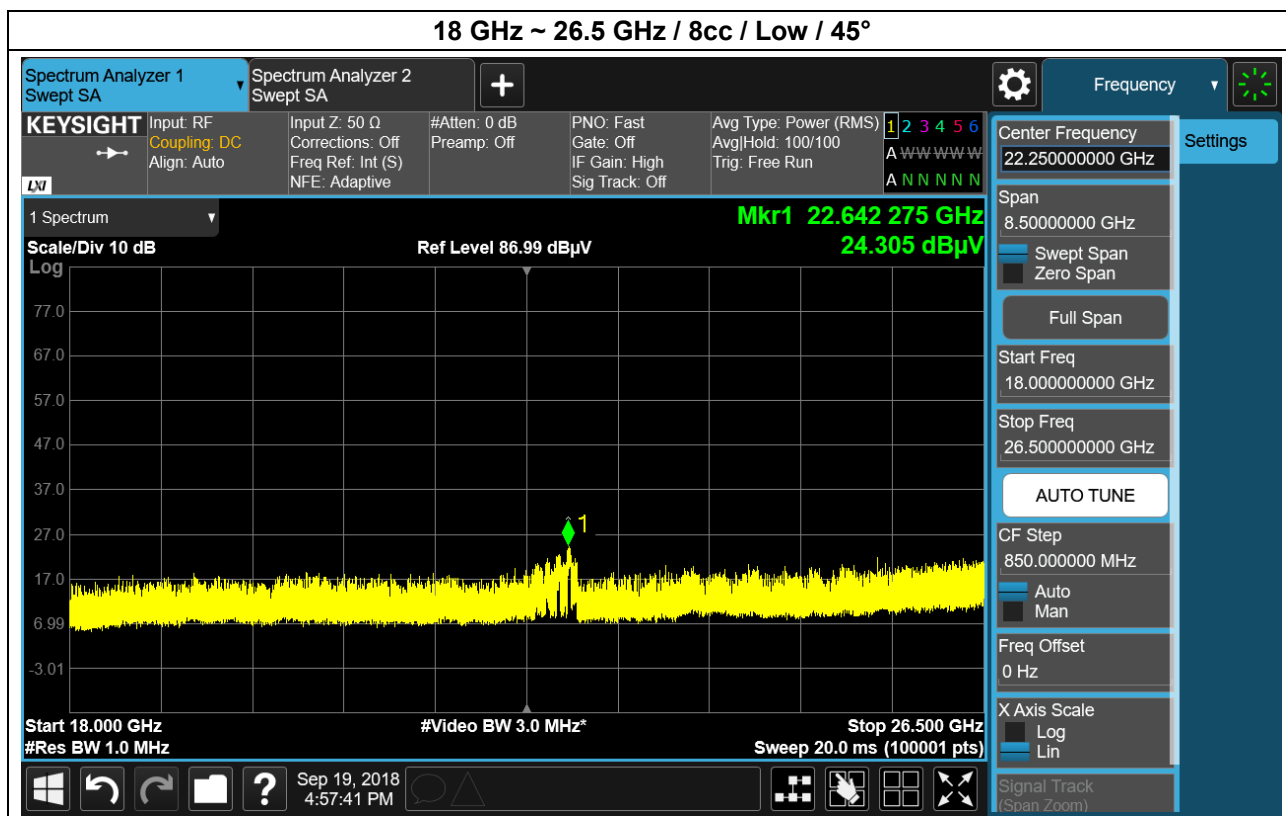


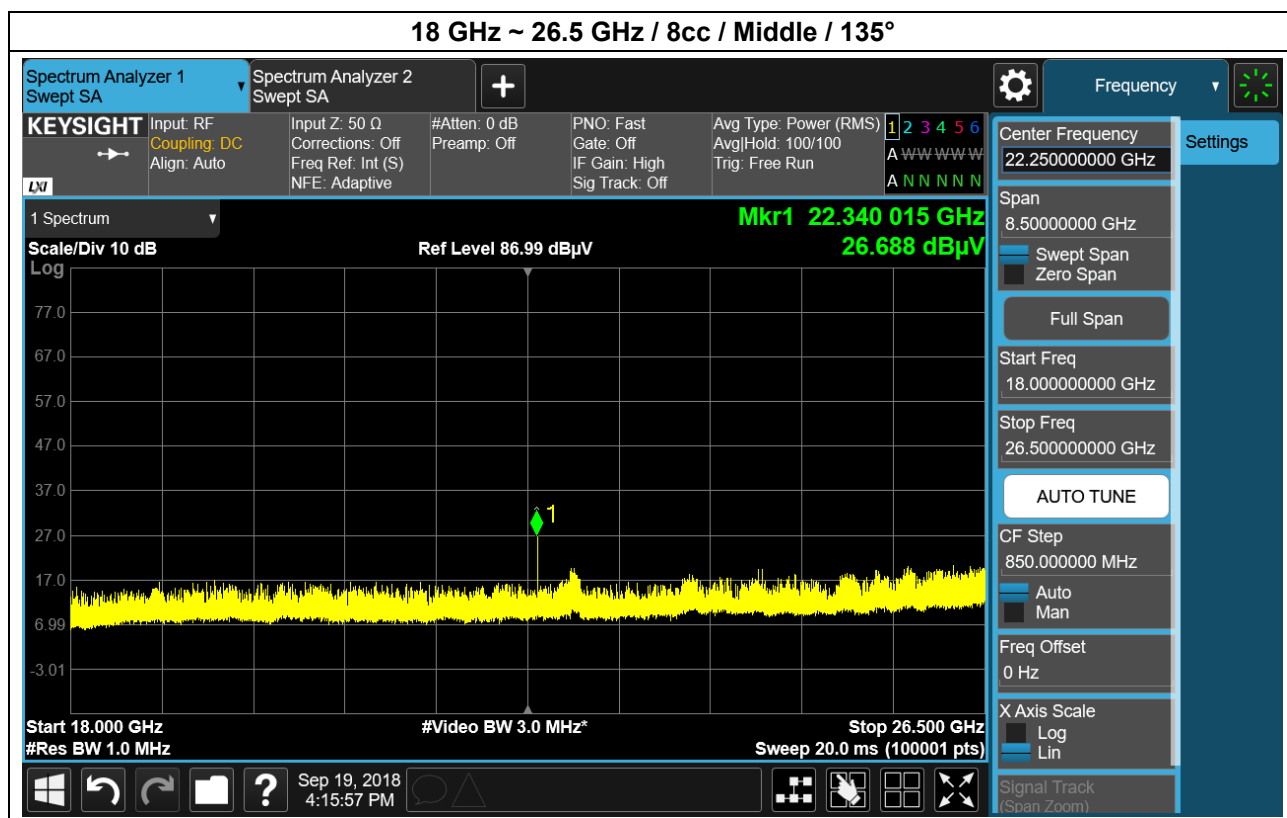
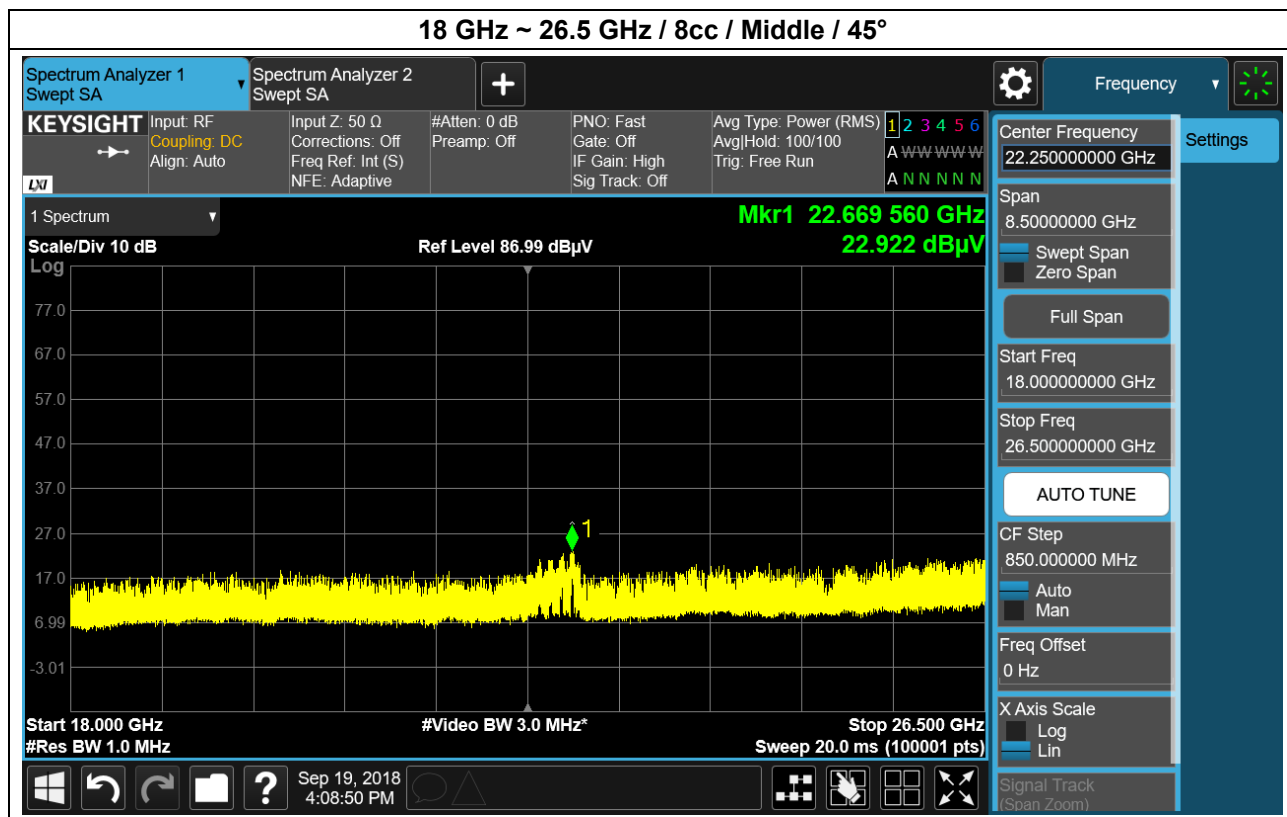
Date: 5.SEP.2018 11:06:11

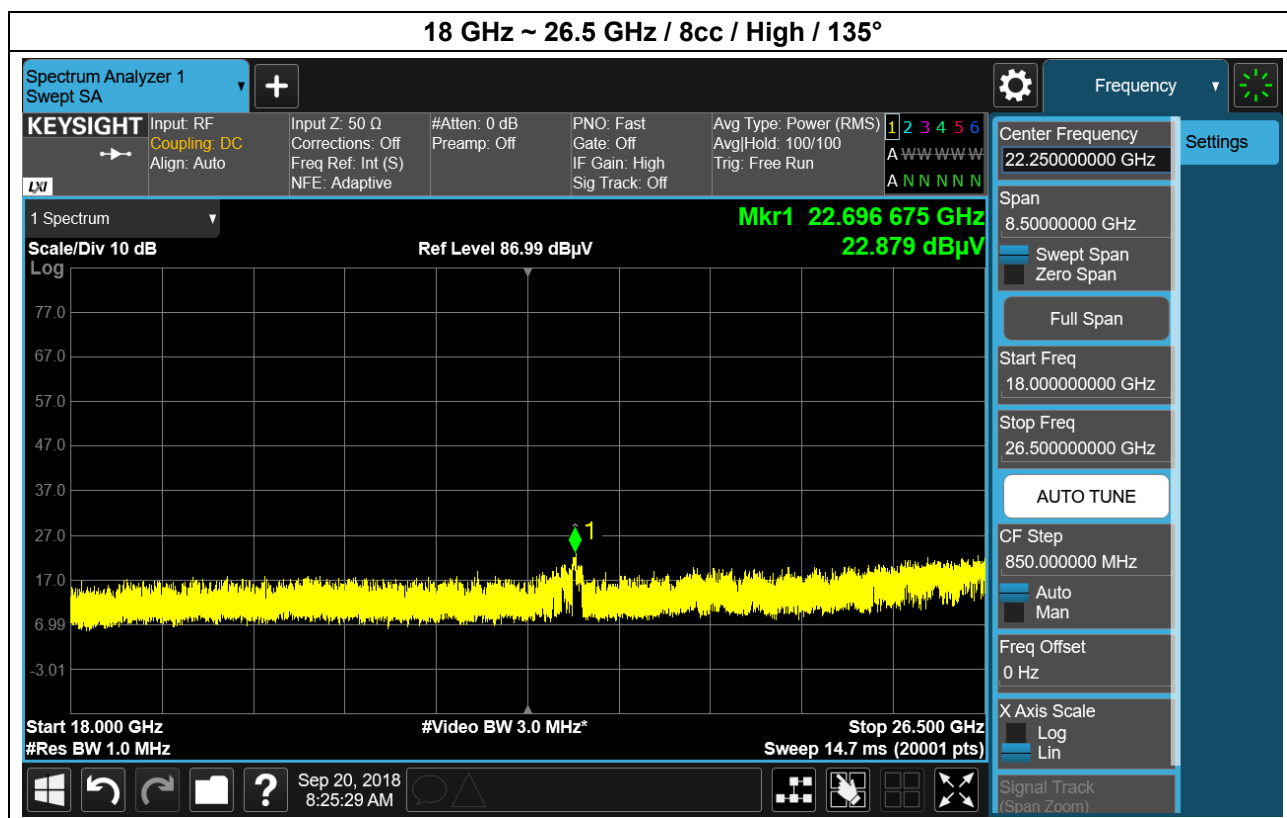
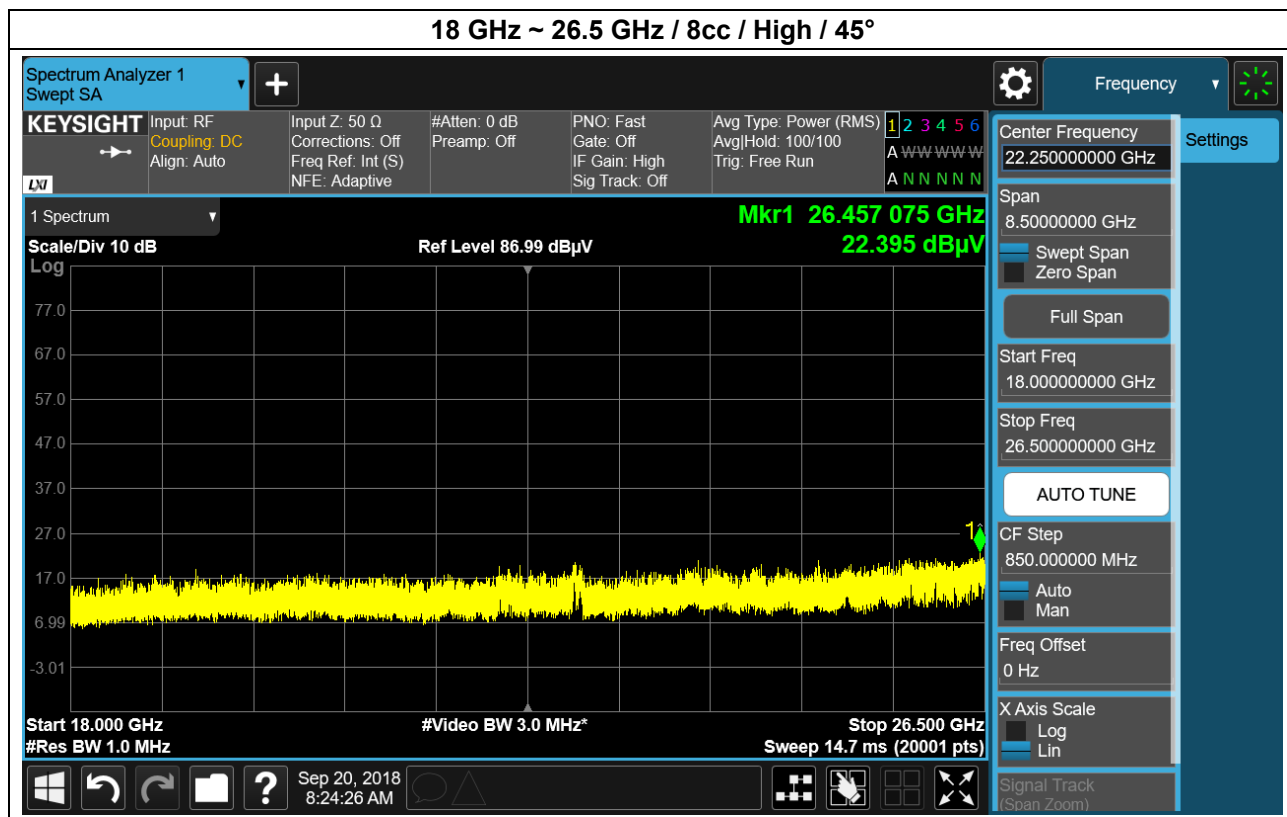


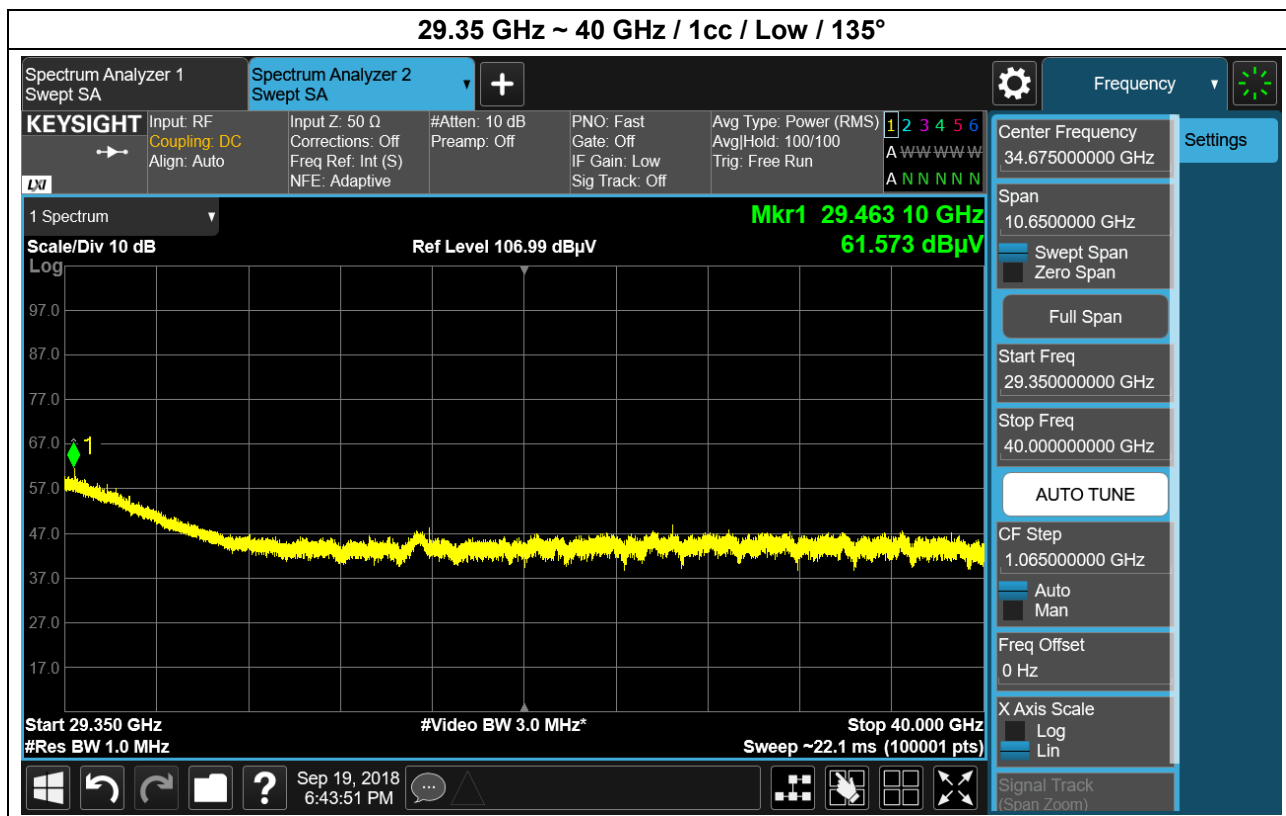
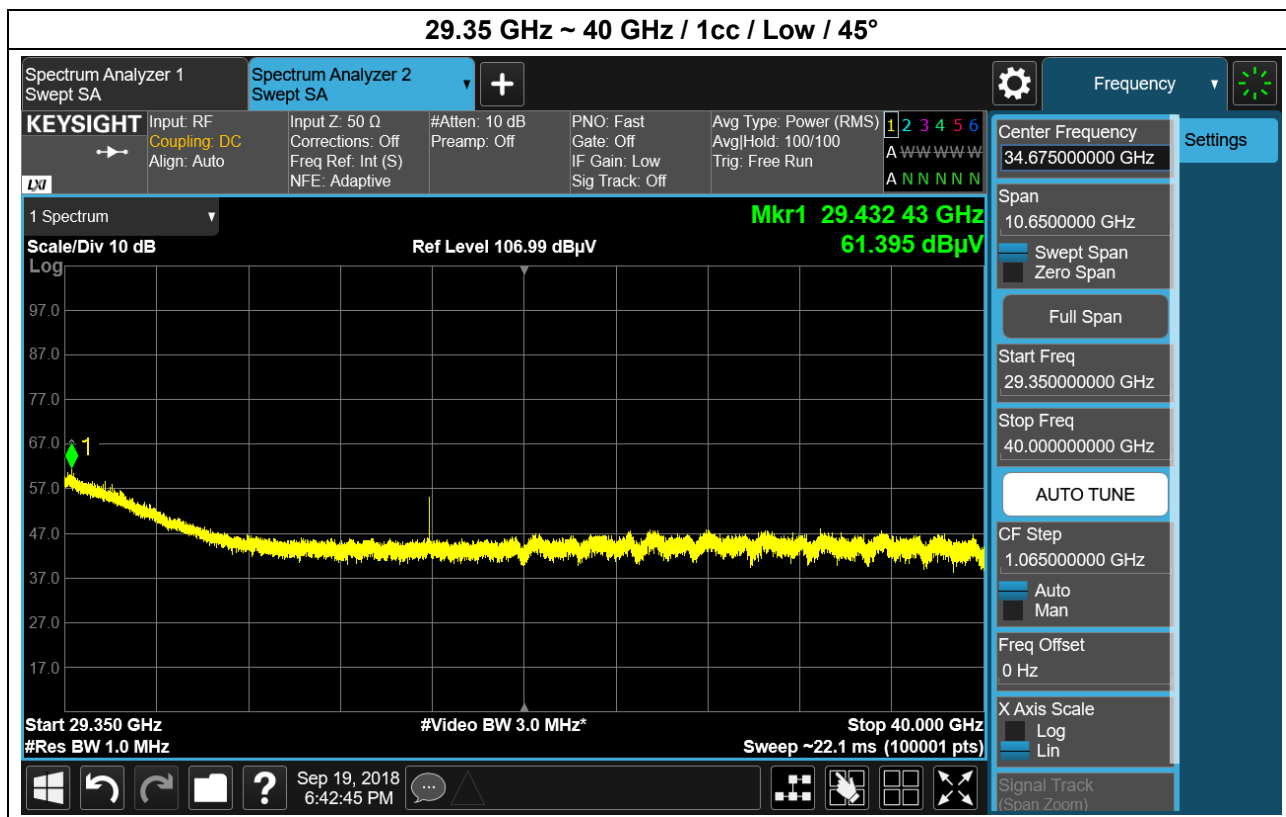


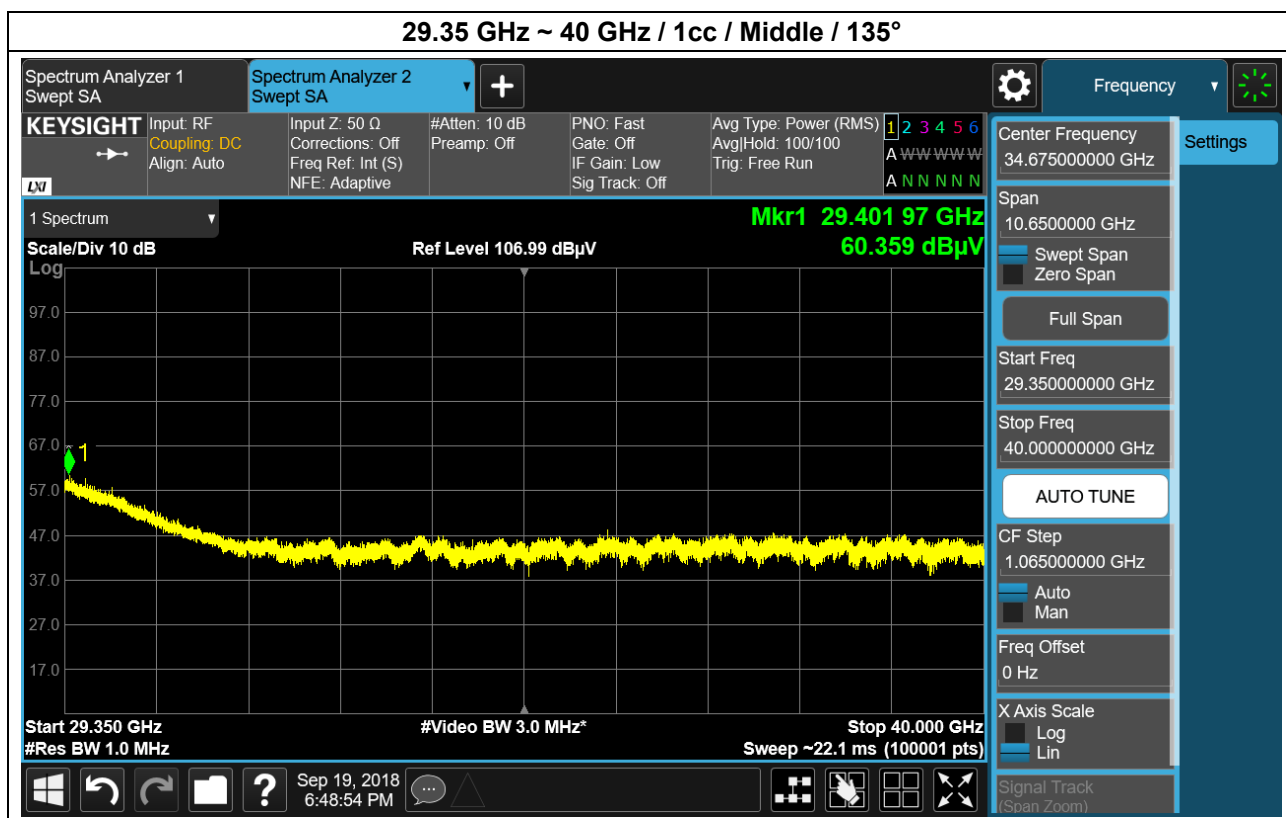
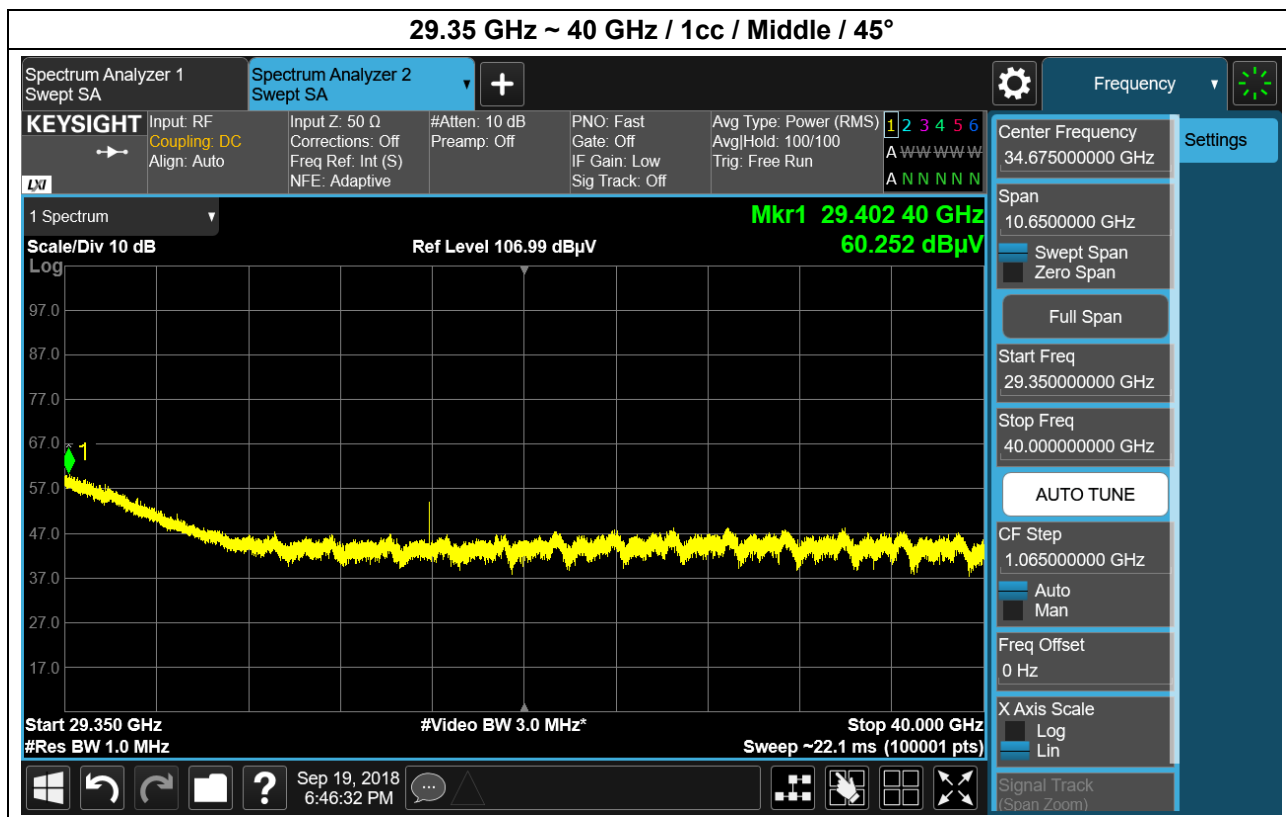


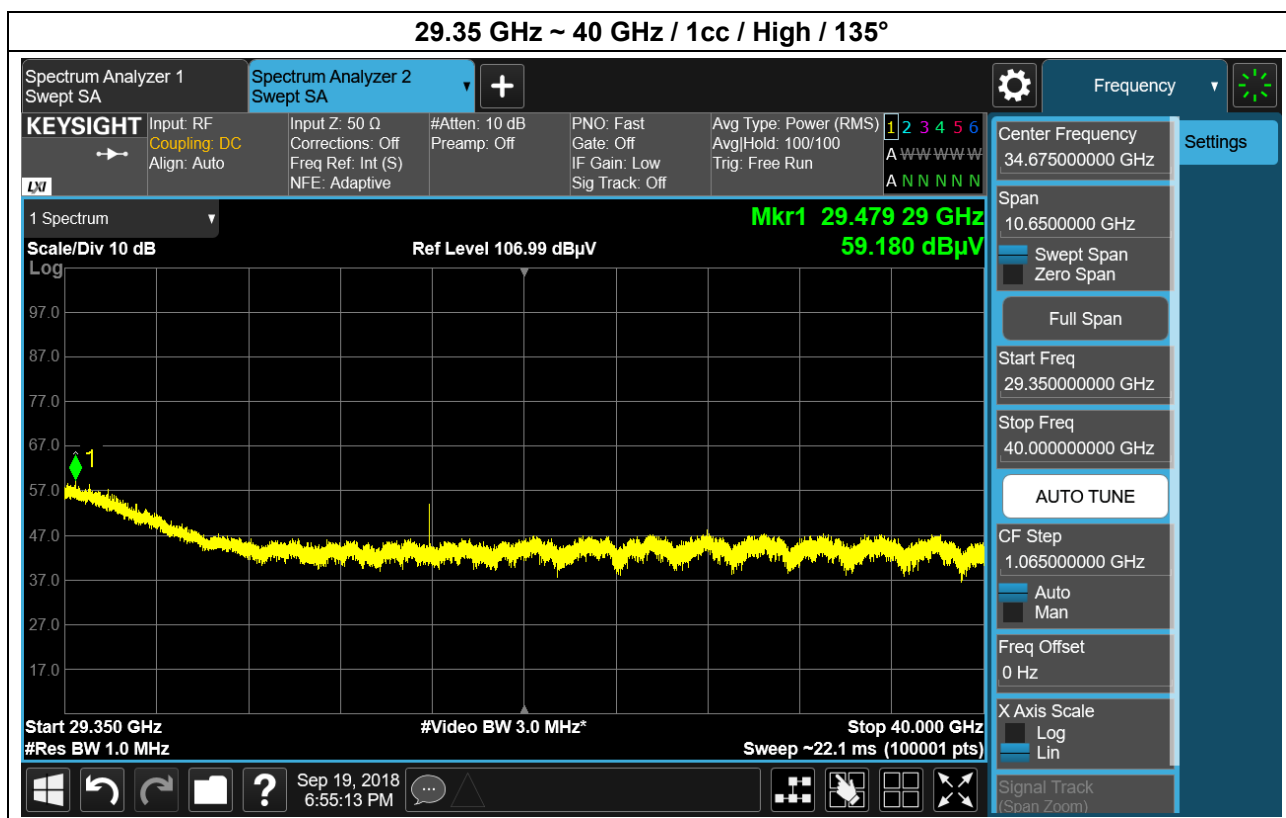
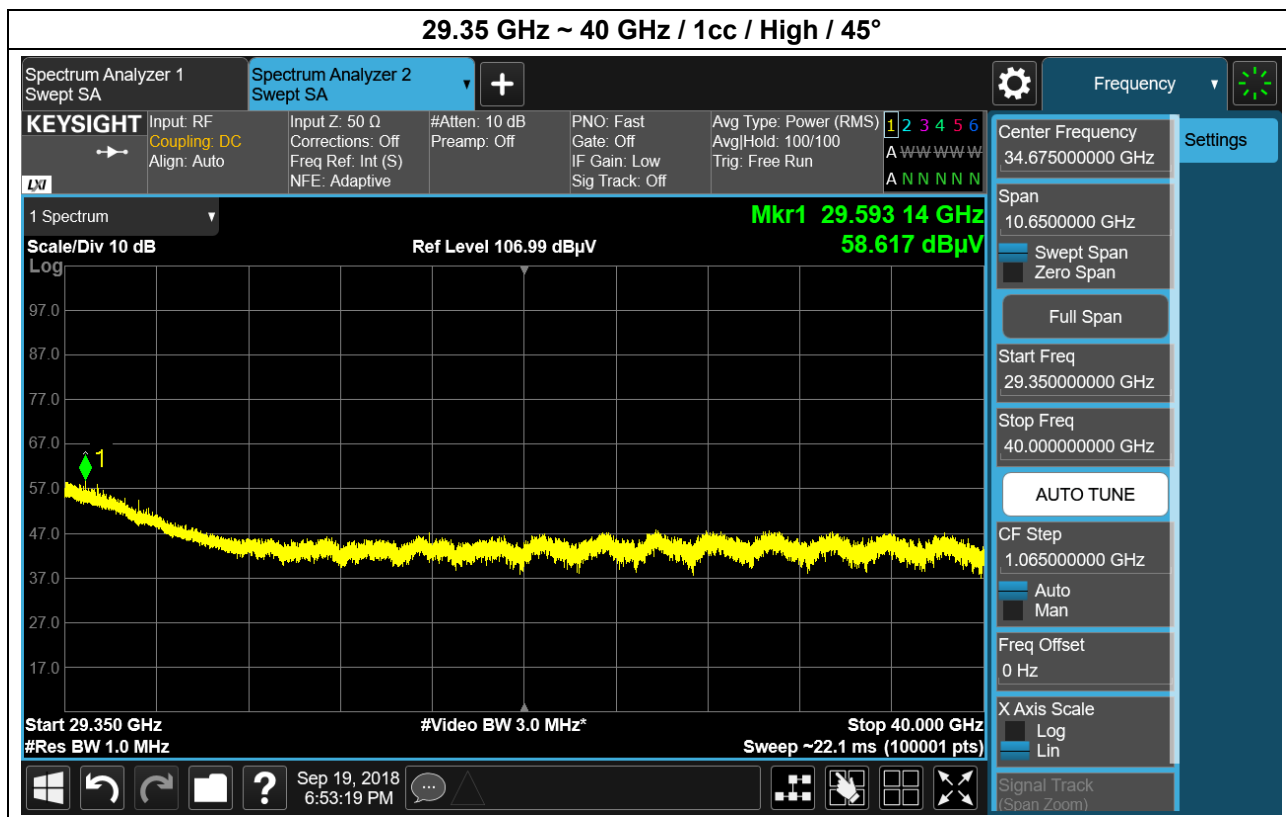


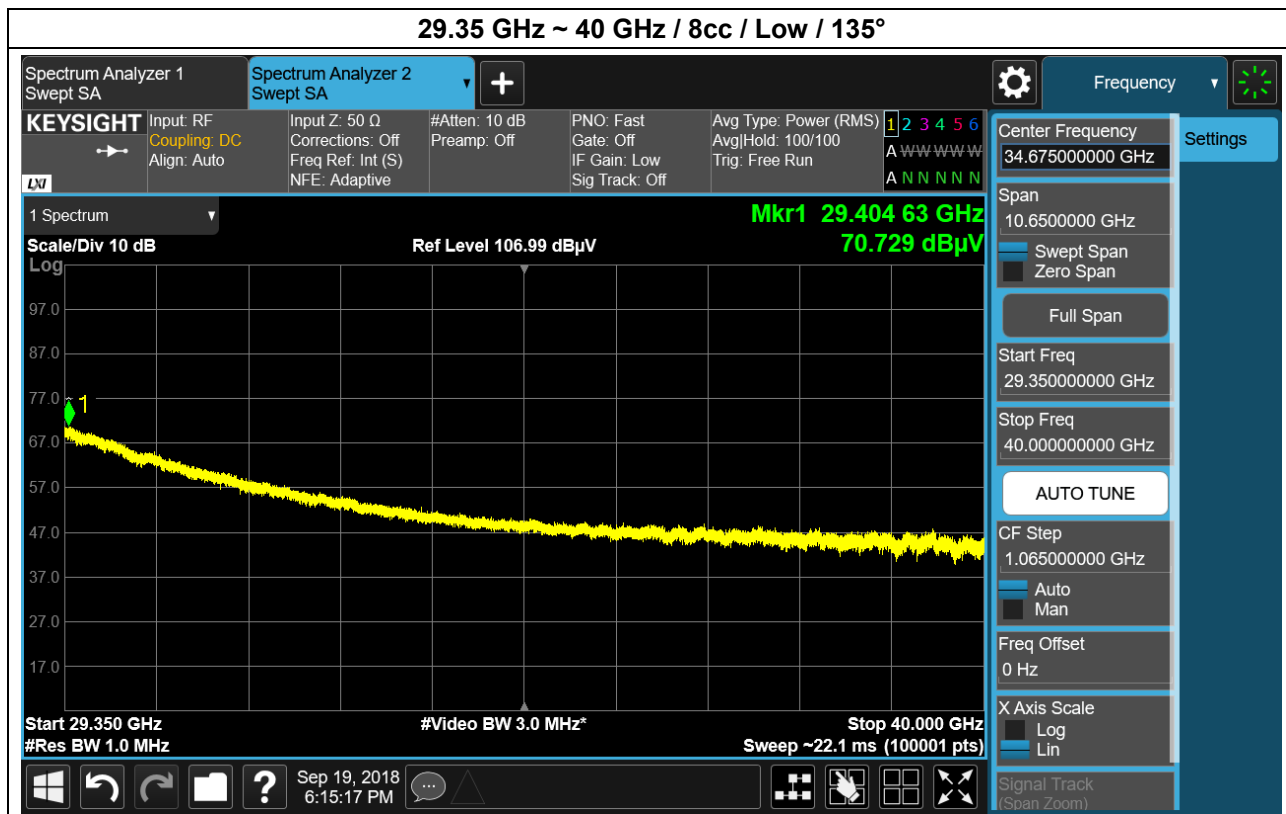
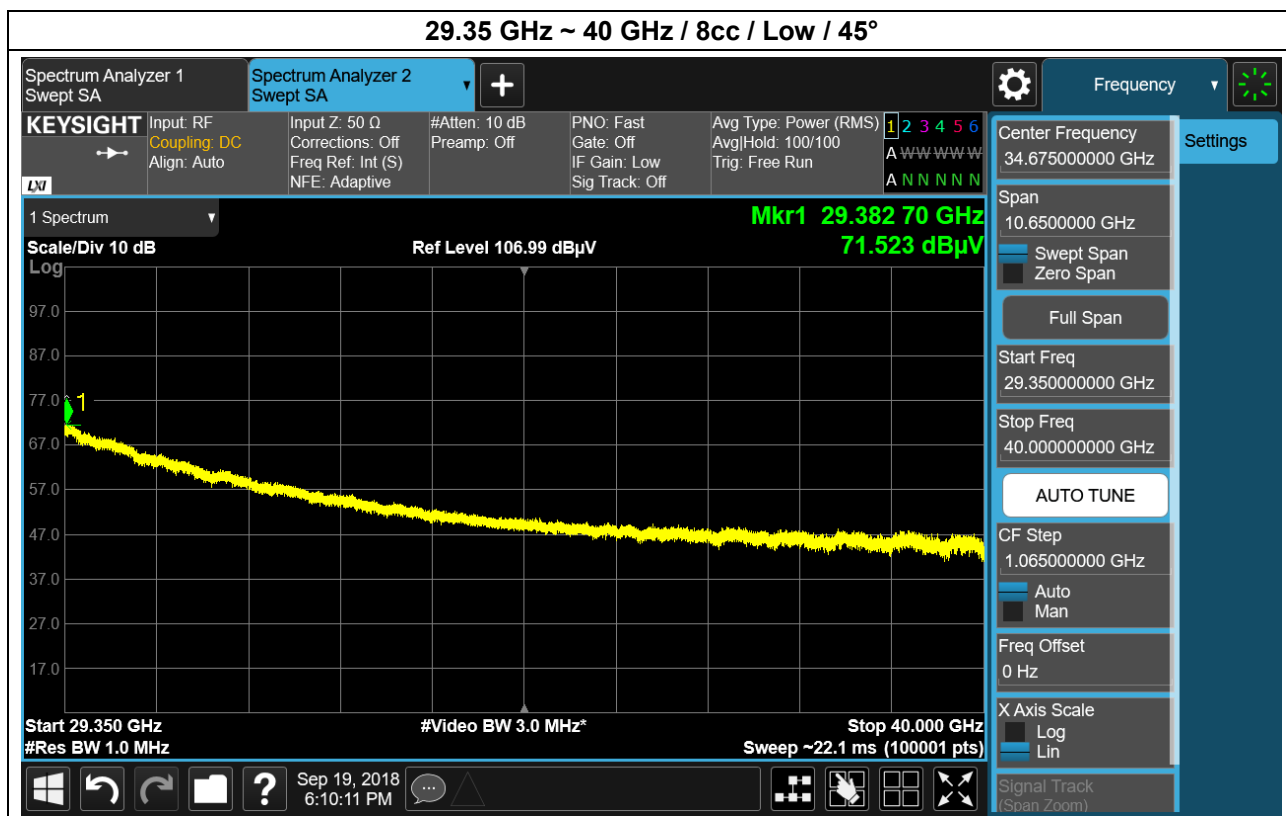


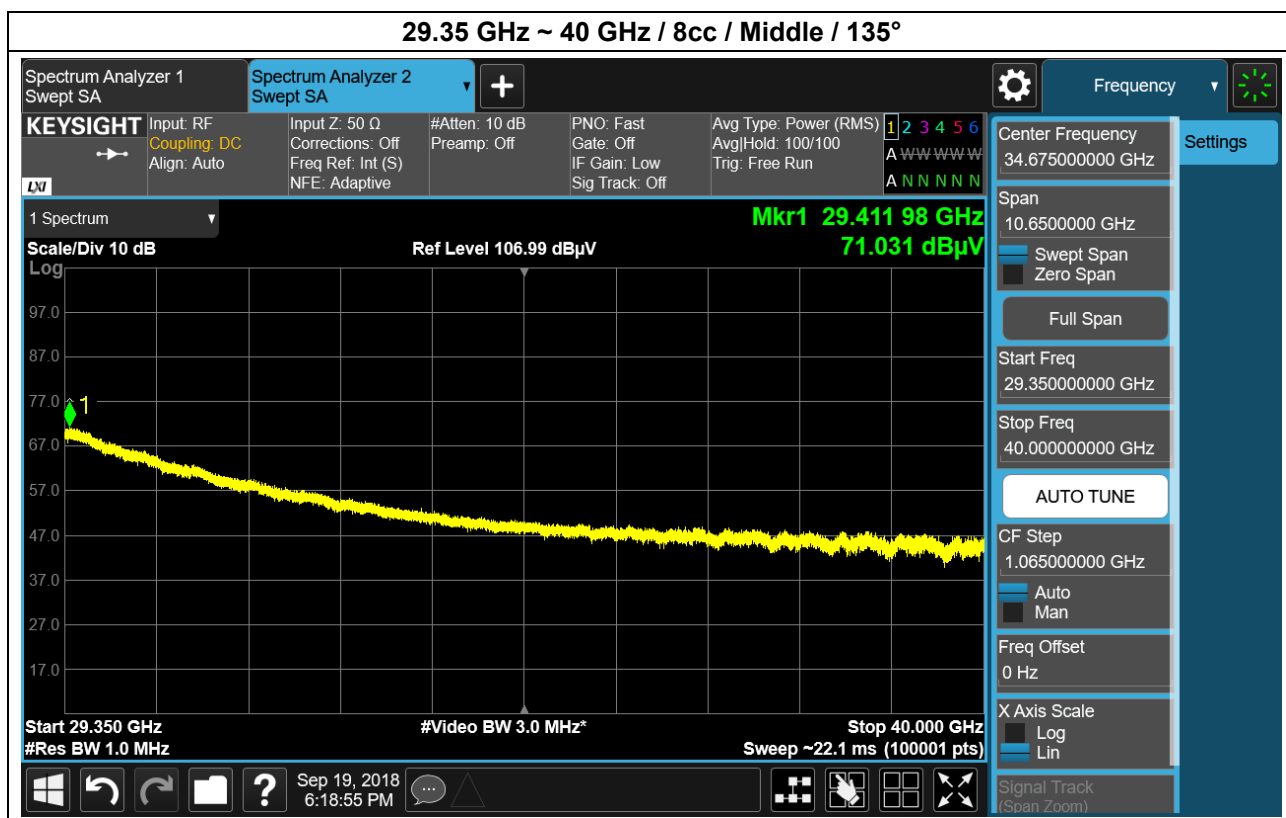
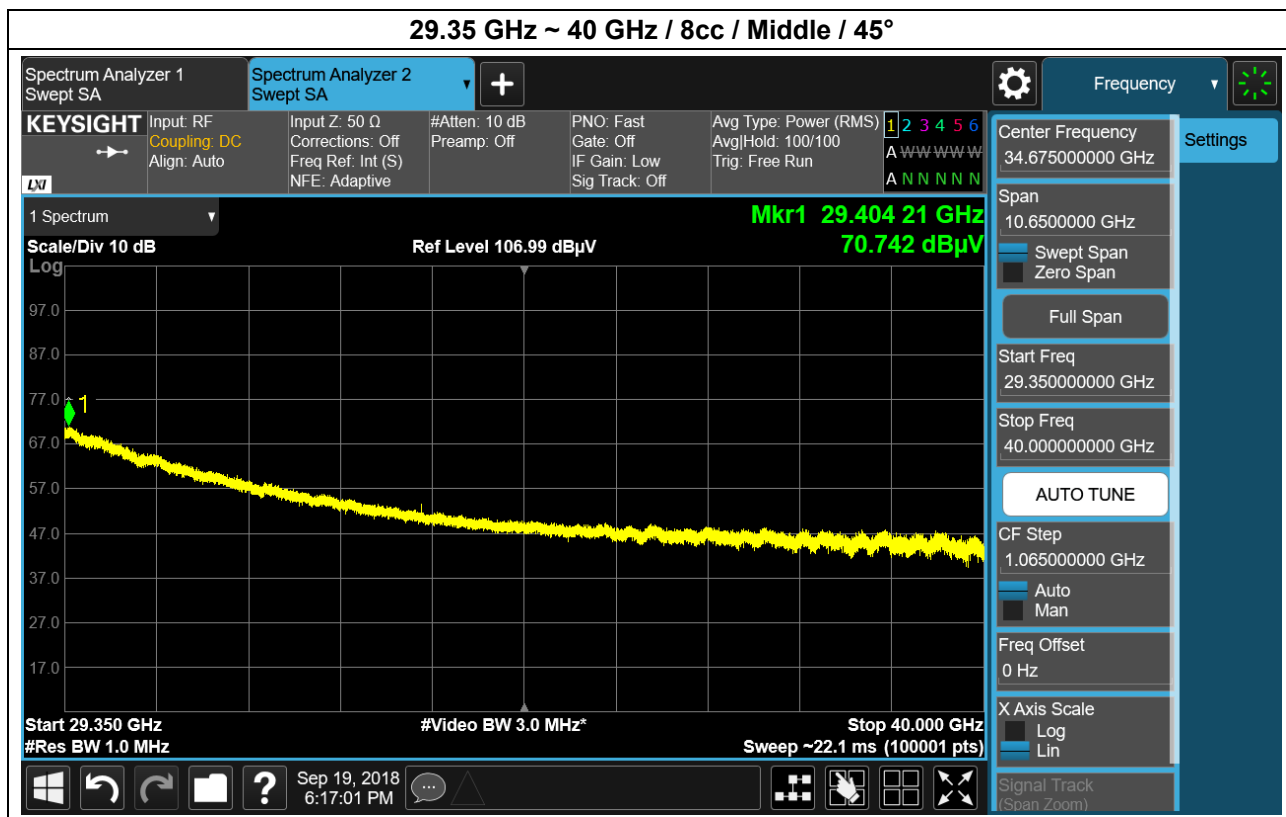


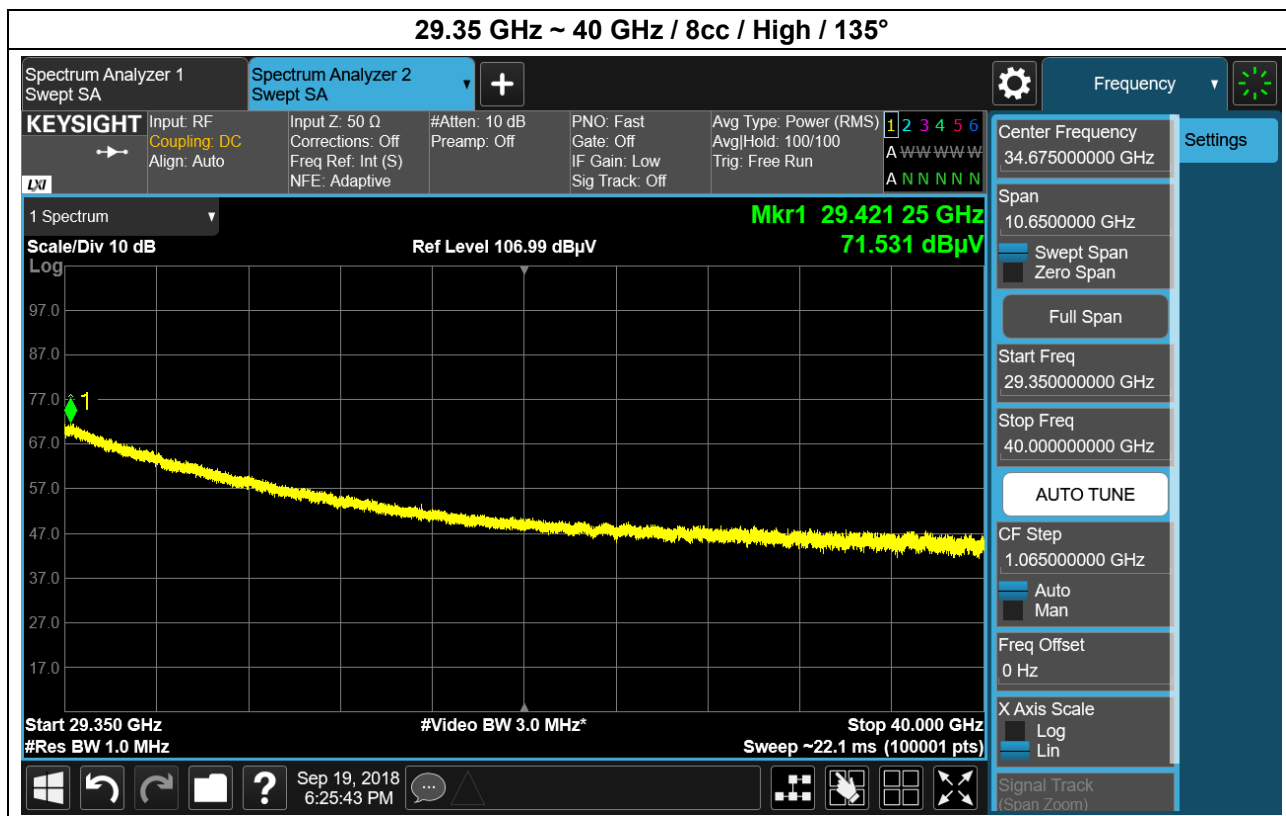
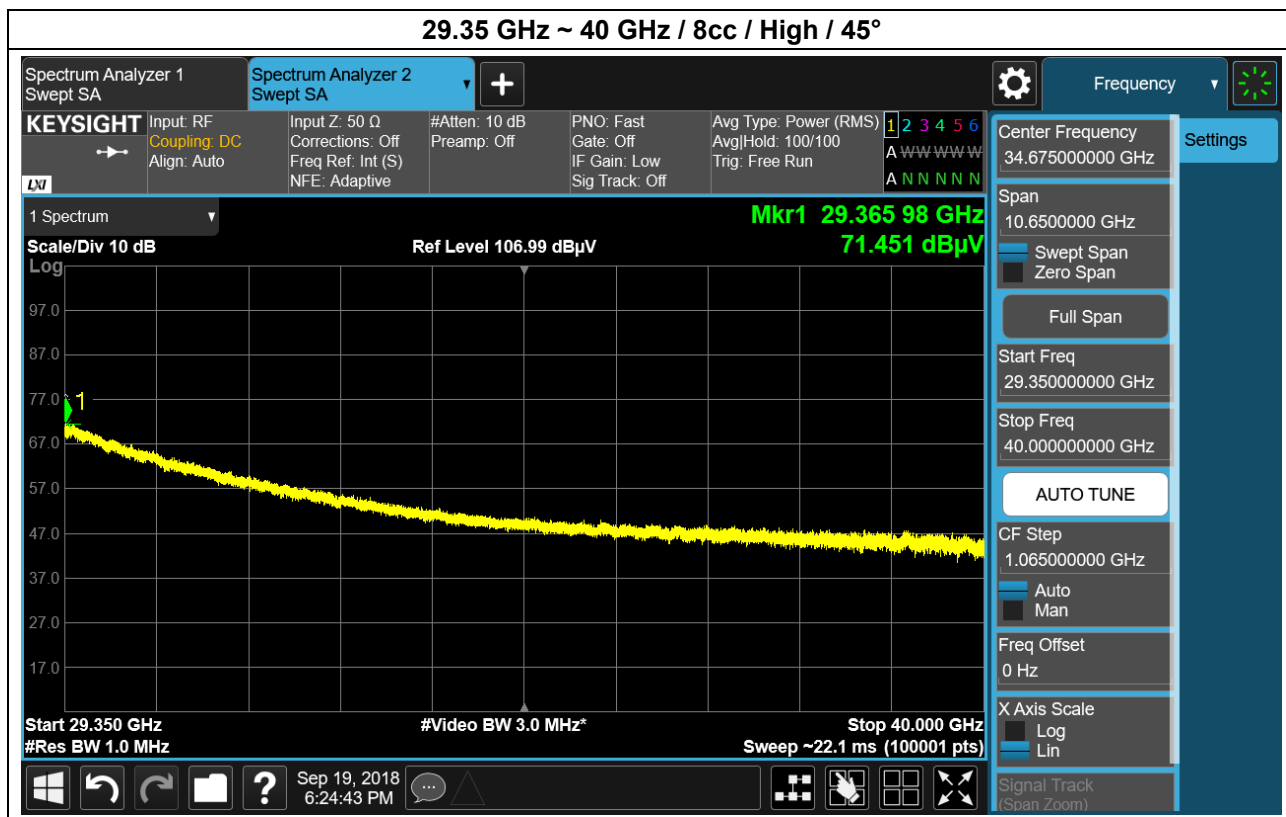




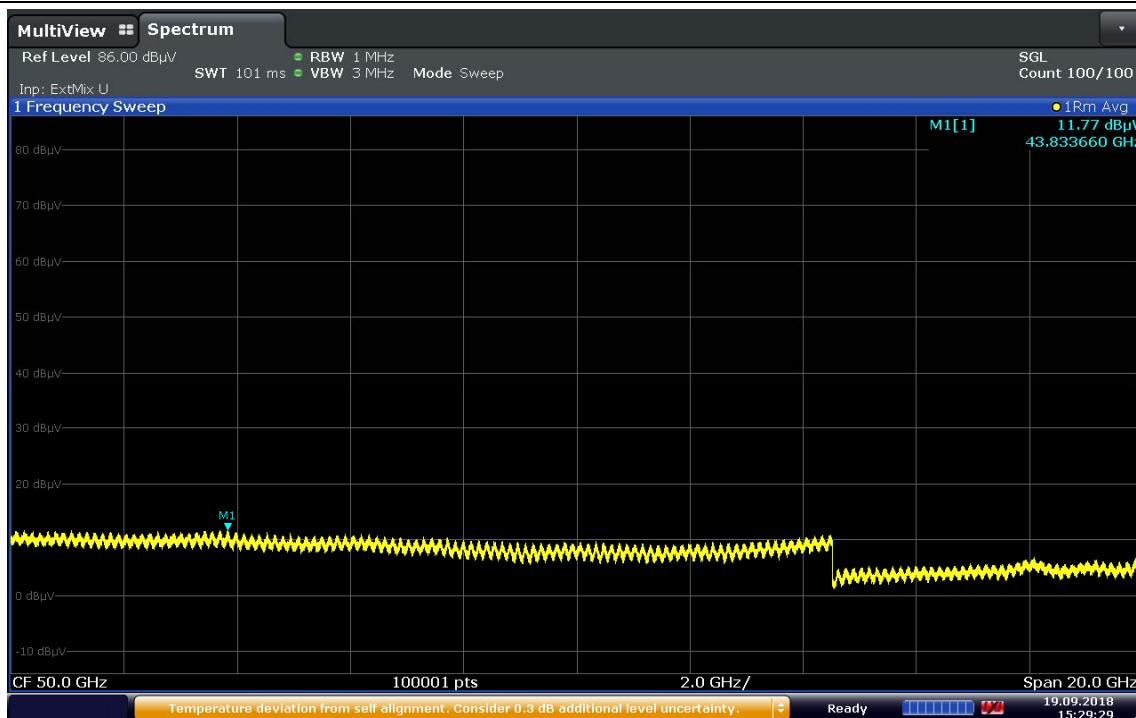






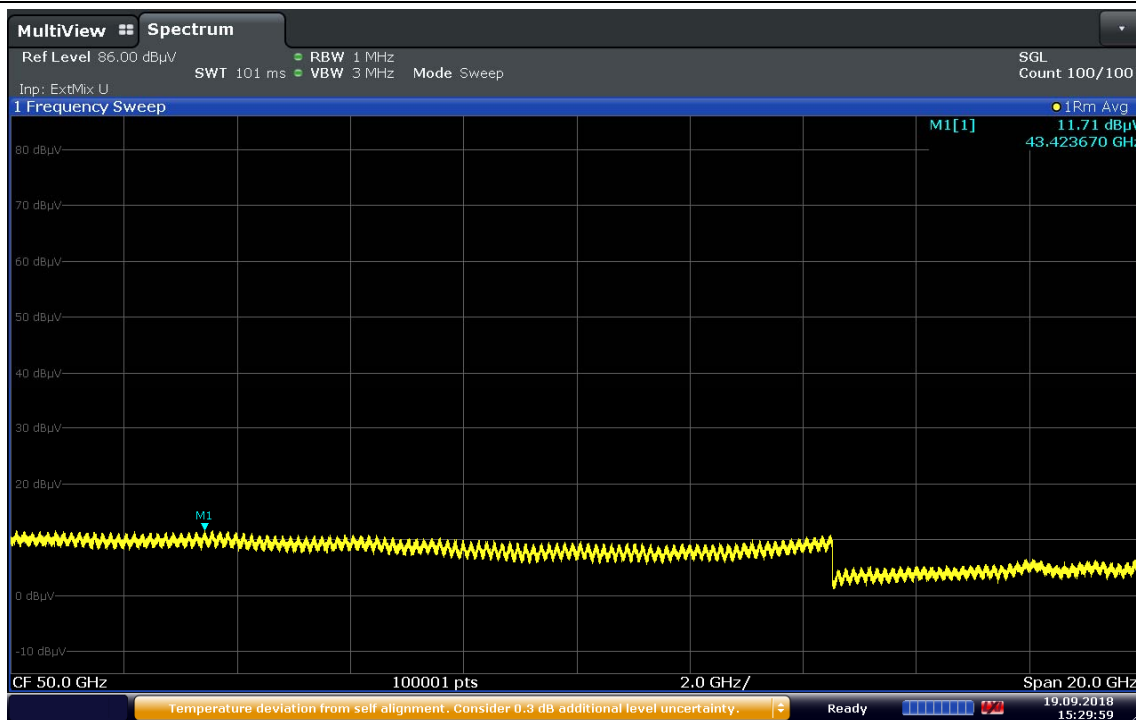


40 GHz ~ 60 GHz / 1cc / Low / 45°



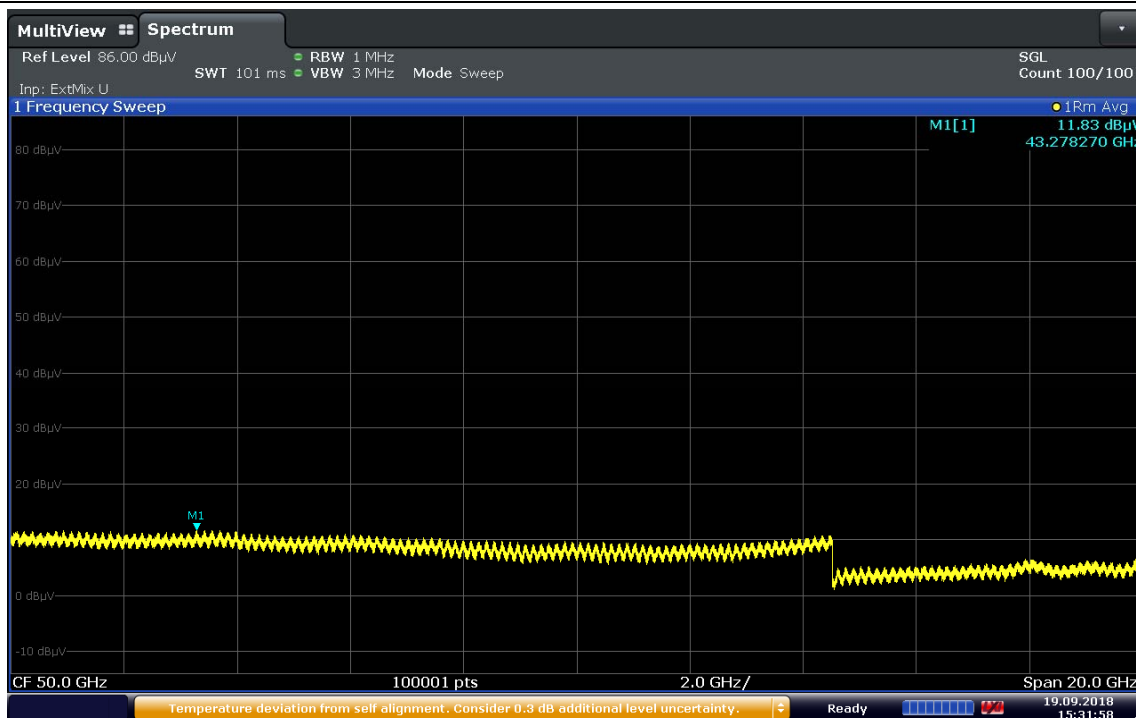
15:29:30 19.09.2018

40 GHz ~ 60 GHz / 1cc / Low / 135°



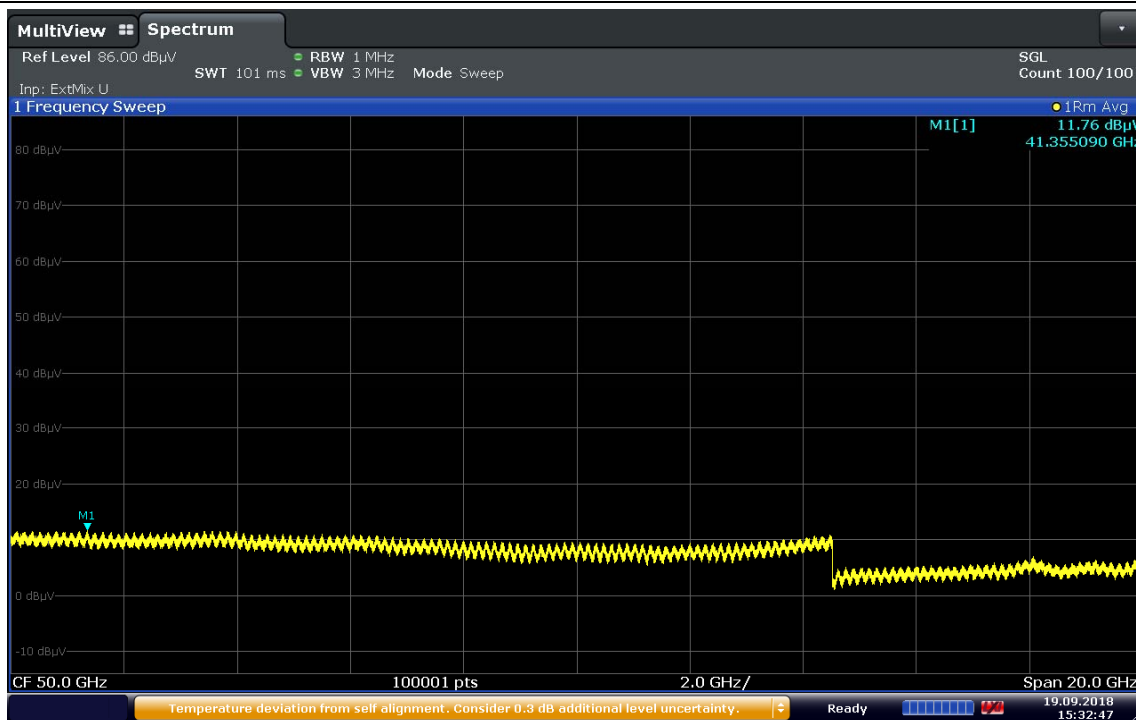
15:30:00 19.09.2018

40 GHz ~ 60 GHz / 1cc / Middle / 45°



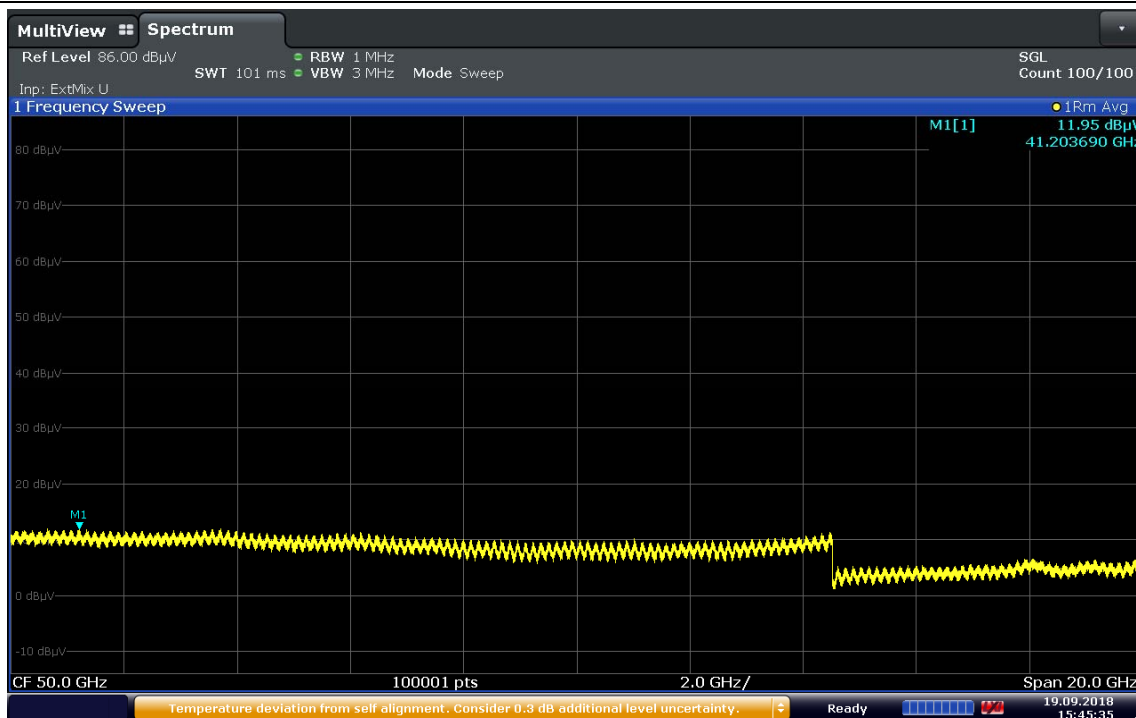
15:31:59 19.09.2018

40 GHz ~ 60 GHz / 1cc / Middle / 135°



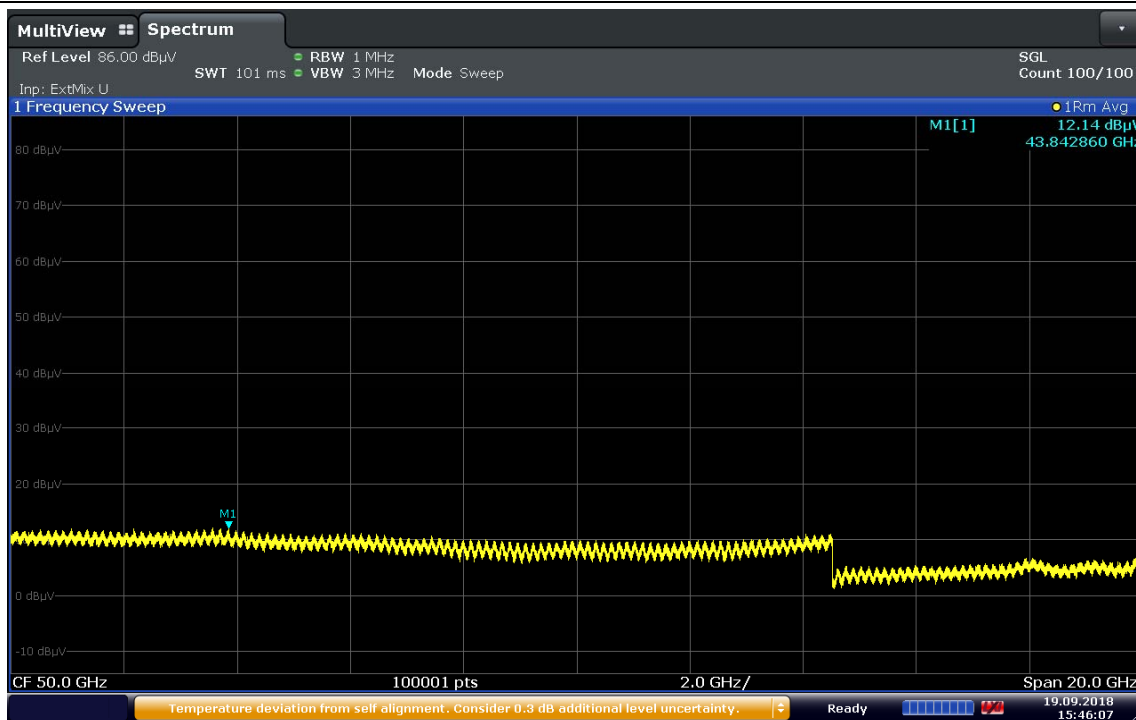
15:32:48 19.09.2018

40 GHz ~ 60 GHz / 1cc / High / 45°



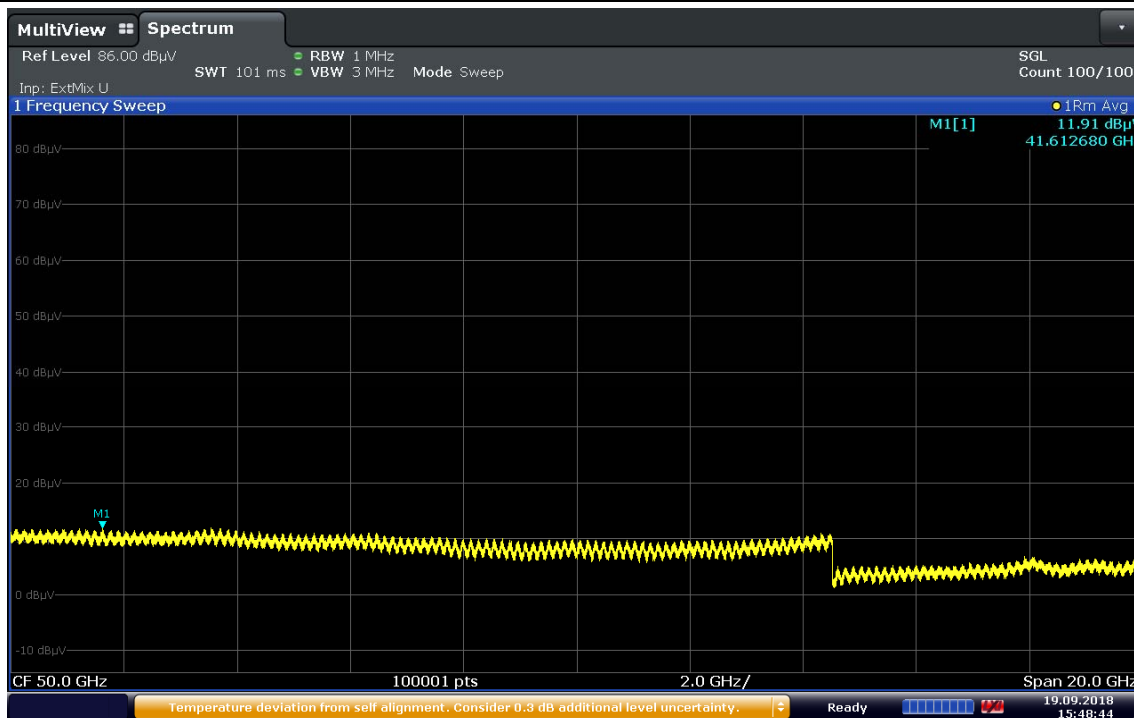
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40 GHz ~ 60 GHz / 1cc / High / 135°



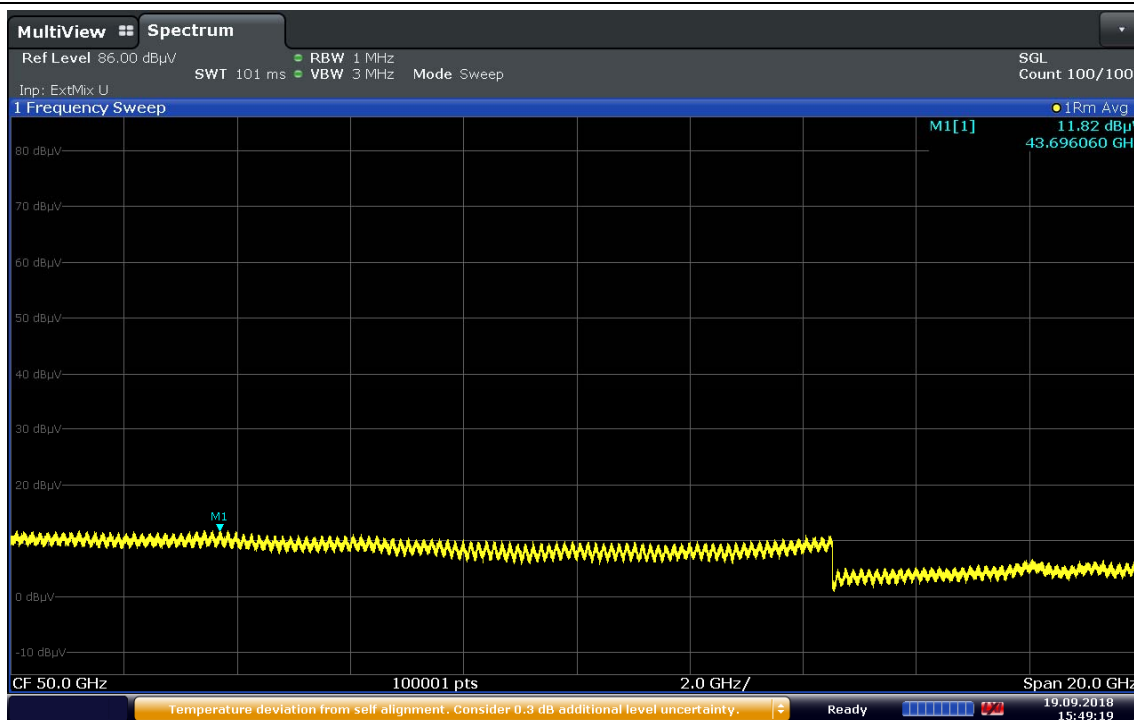
15:46:08 19.09.2018

40 GHz ~ 60 GHz / 8cc / Low / 45°



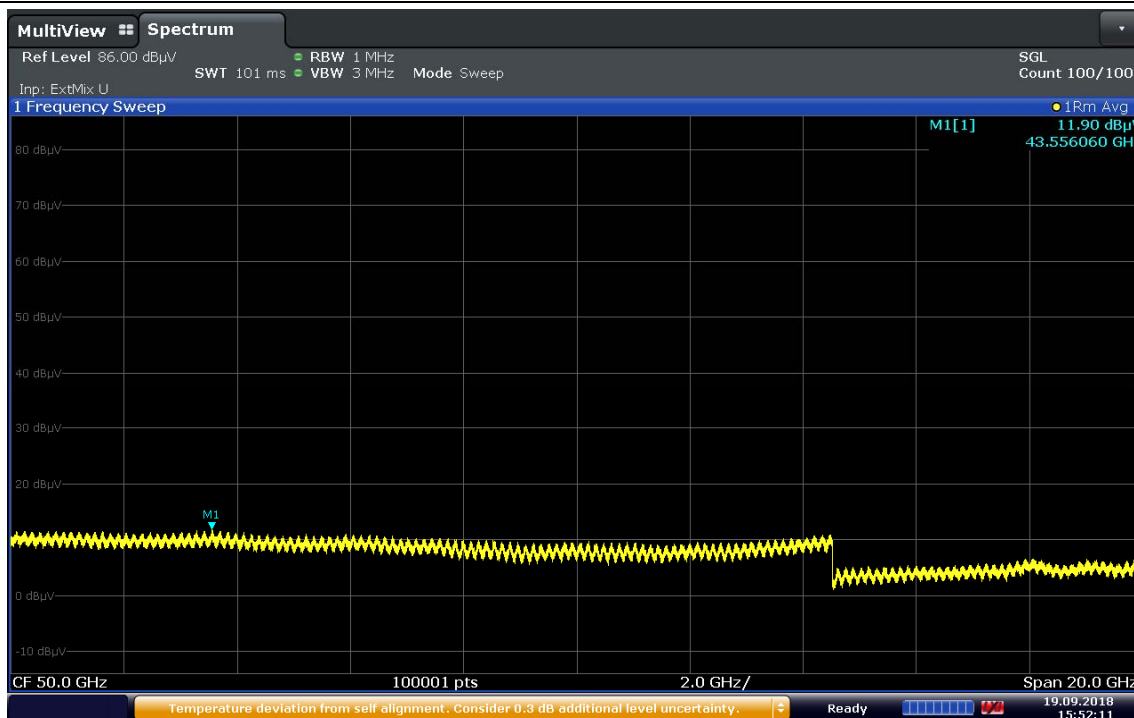
15:48:44 19.09.2018

40 GHz ~ 60 GHz / 8cc / Low / 135°



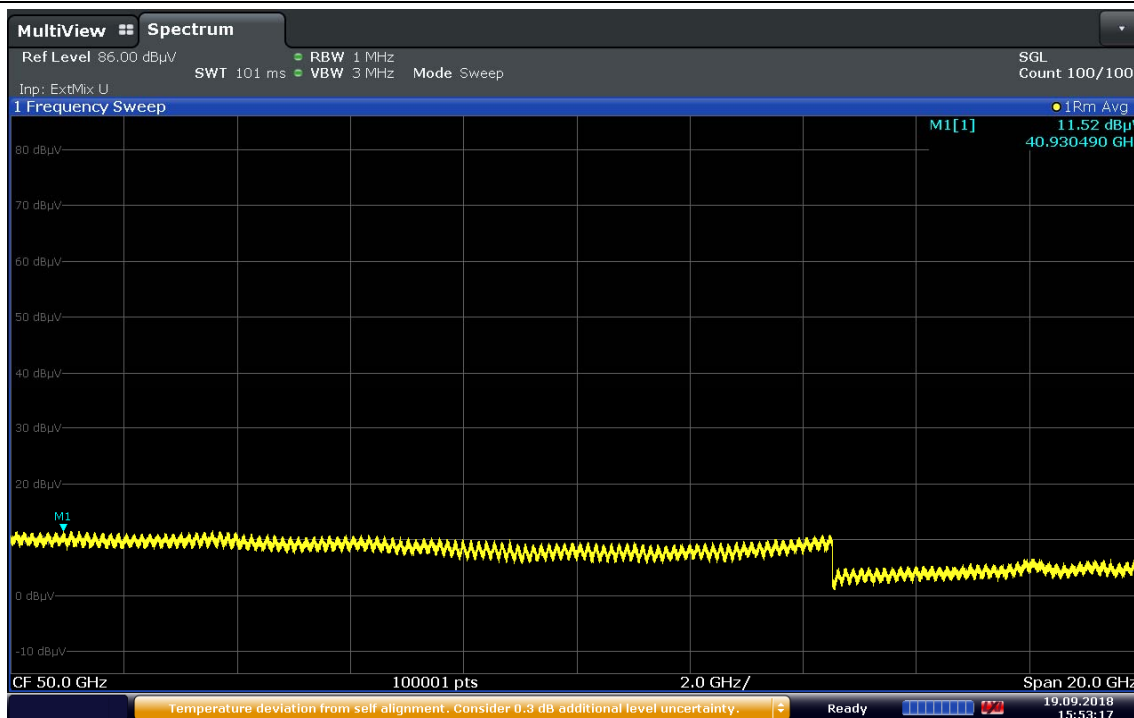
15:49:20 19.09.2018

40 GHz ~ 60 GHz / 8cc / Middle / 45°



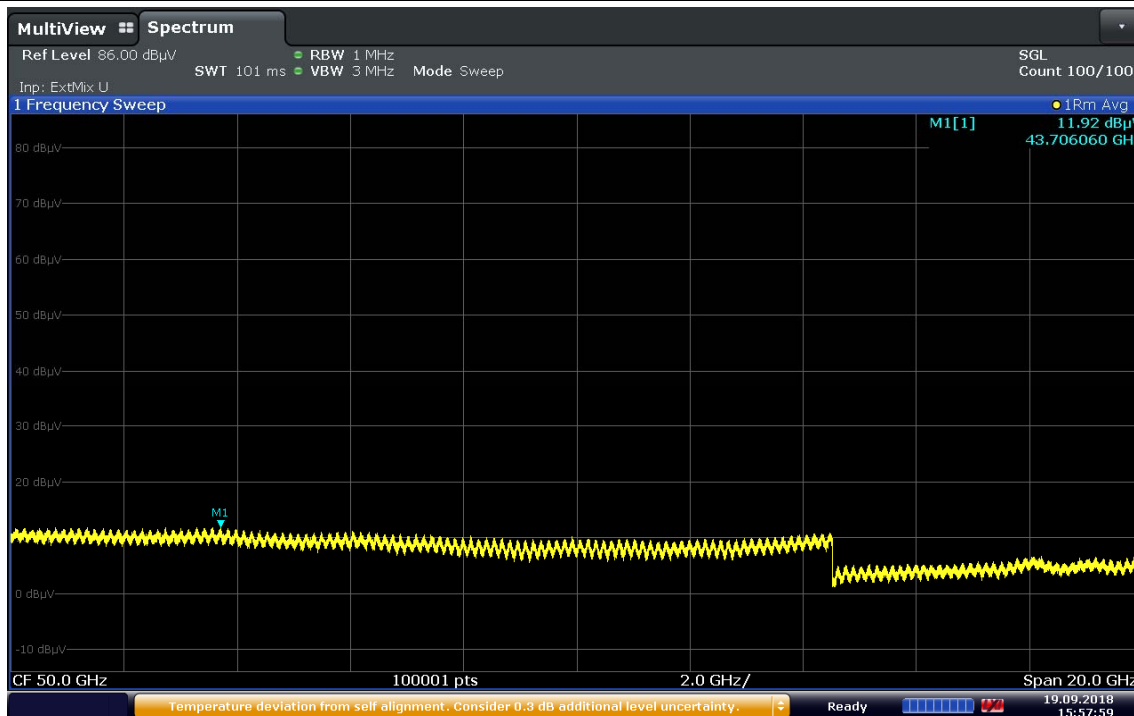
15:52:11 19.09.2018

40 GHz ~ 60 GHz / 8cc / Middle / 135°



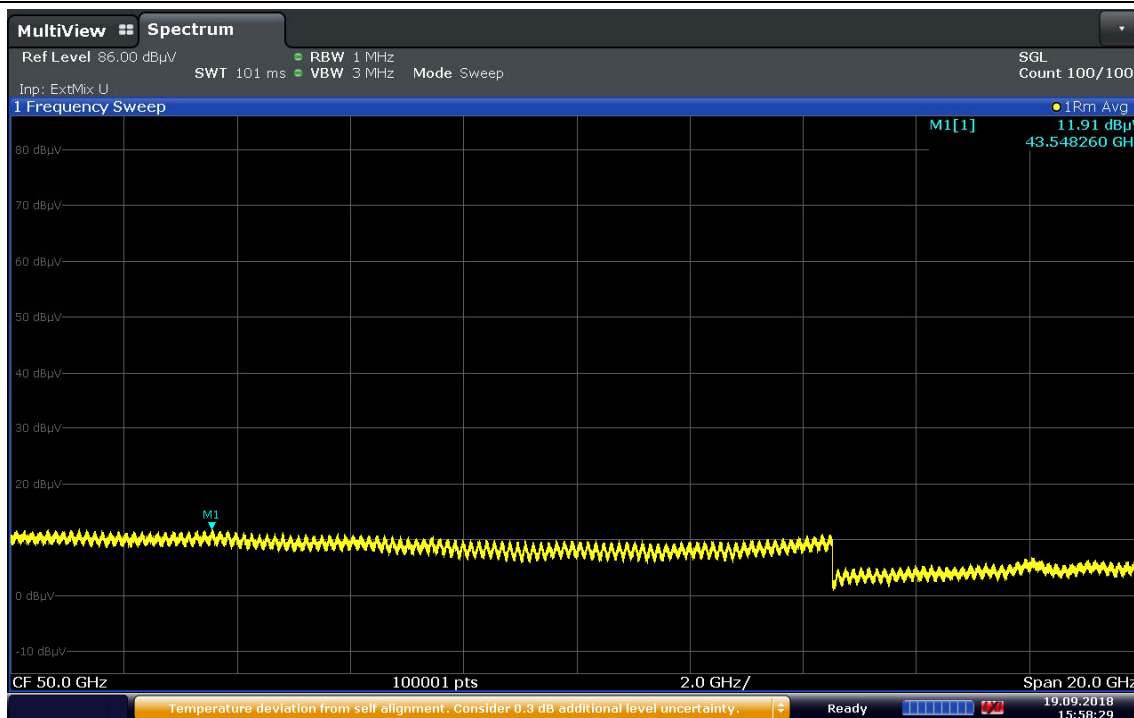
15:53:17 19.09.2018

40 GHz ~ 60 GHz / 8cc / High / 45°



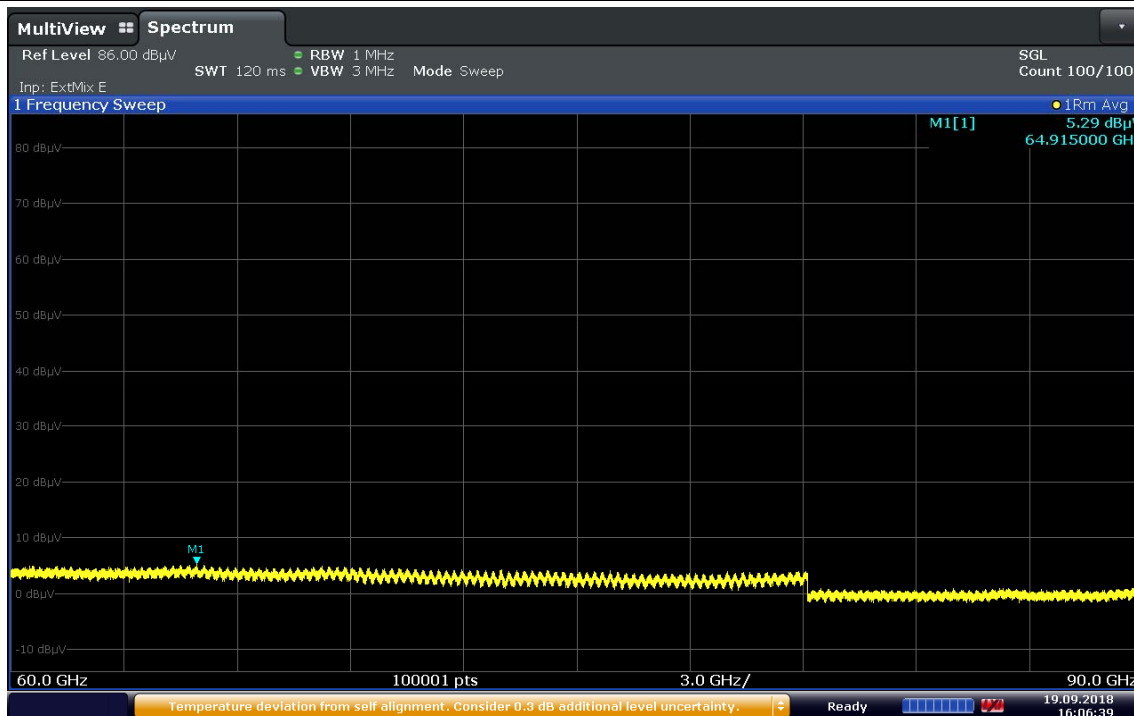
15:57:59 19.09.2018

40 GHz ~ 60 GHz / 8cc / High / 135°



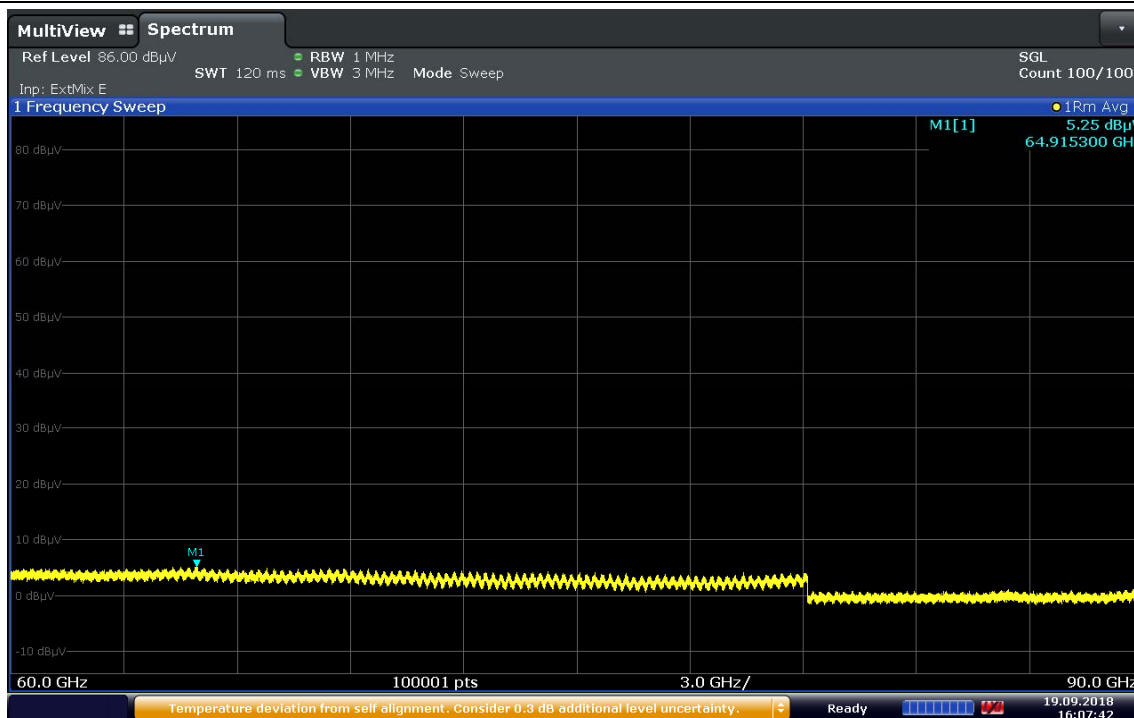
15:58:30 19.09.2018

60 GHz ~ 90 GHz / 1cc / Low / 45°



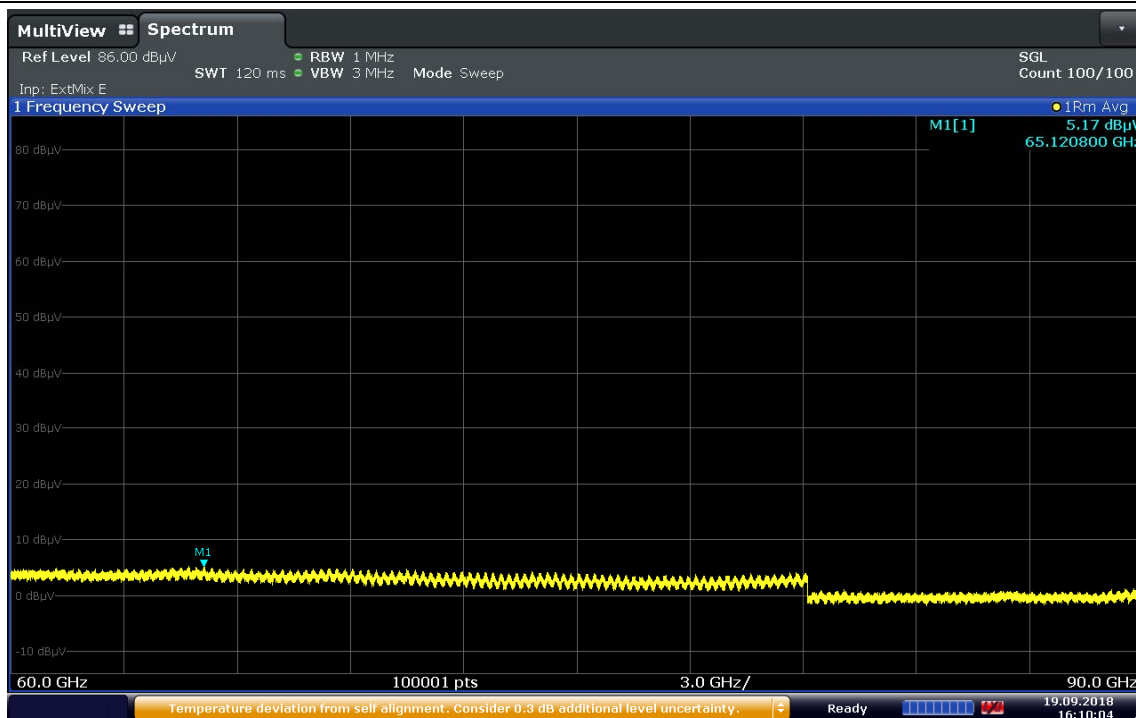
16:06:40 19.09.2018

60 GHz ~ 90 GHz / 1cc / Low / 135°



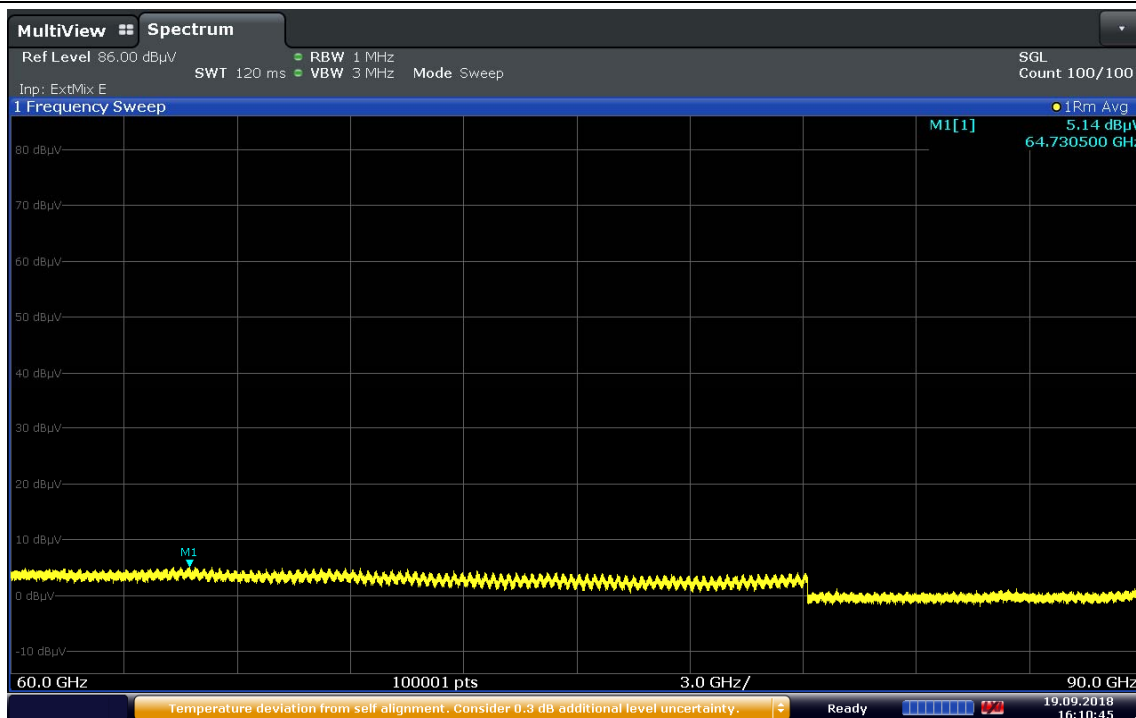
16:07:43 19.09.2018

60 GHz ~ 90 GHz / 1cc / Middle / 45°



16:10:04 19.09.2018

60 GHz ~ 90 GHz / 1cc / Middle / 135°



16:10:46 19.09.2018