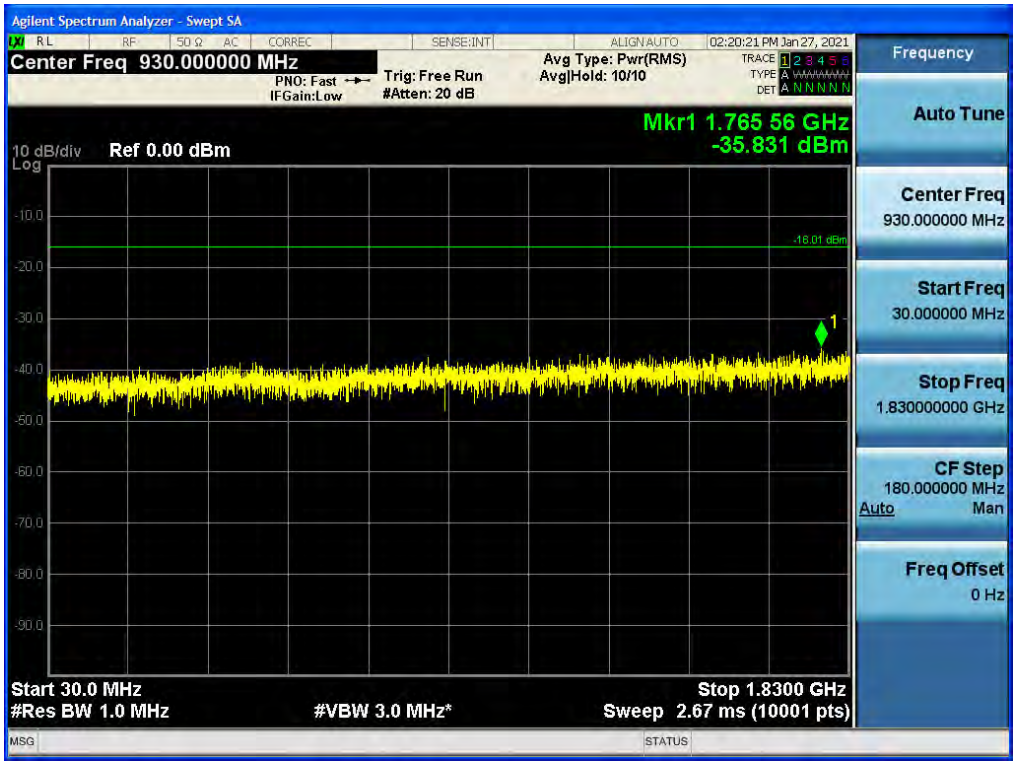
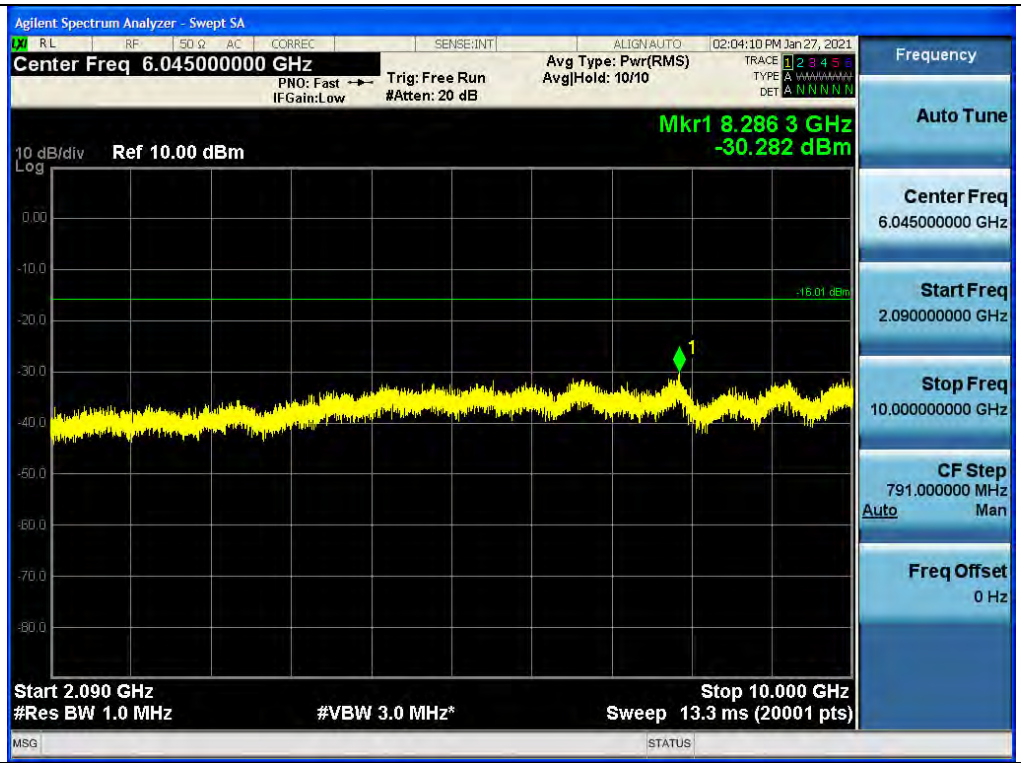
Antenna 1 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / High



Antenna 0 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / Low

Antenna 0 / High Edge ~ High Edge+100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 16QAM / High

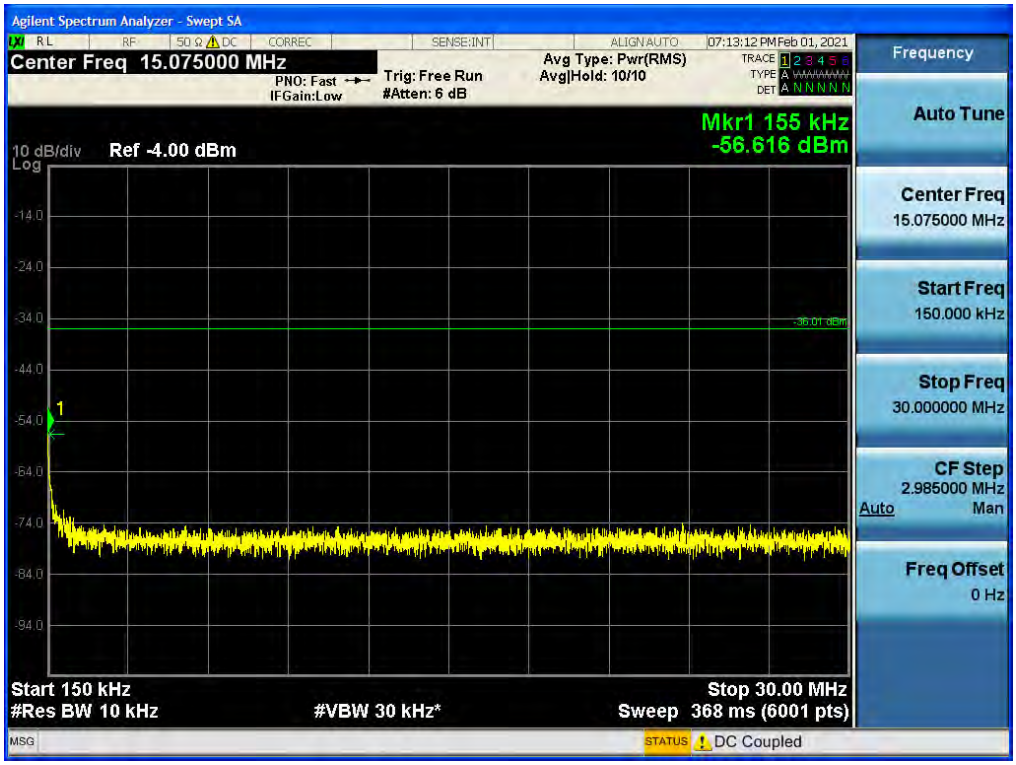
Antenna 1 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 256QAM / Low



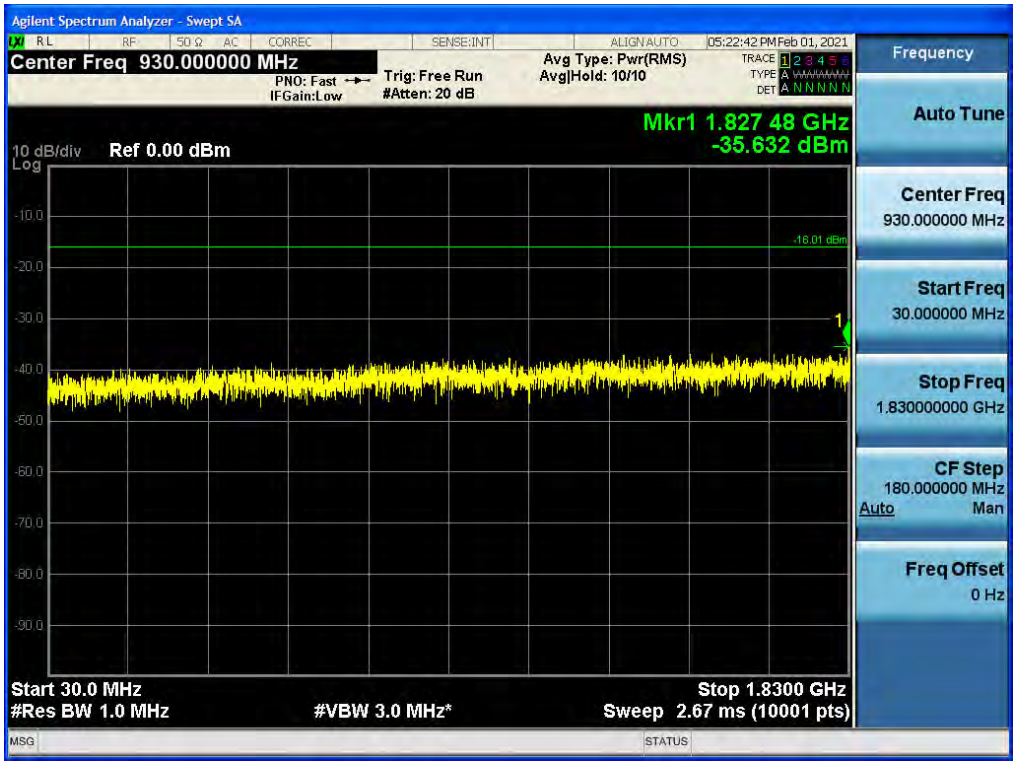
Antenna 0 / 10 GHz ~ 26.5 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / High

Antenna 1 / 9 kHz ~ 150 kHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / 256QAM / High

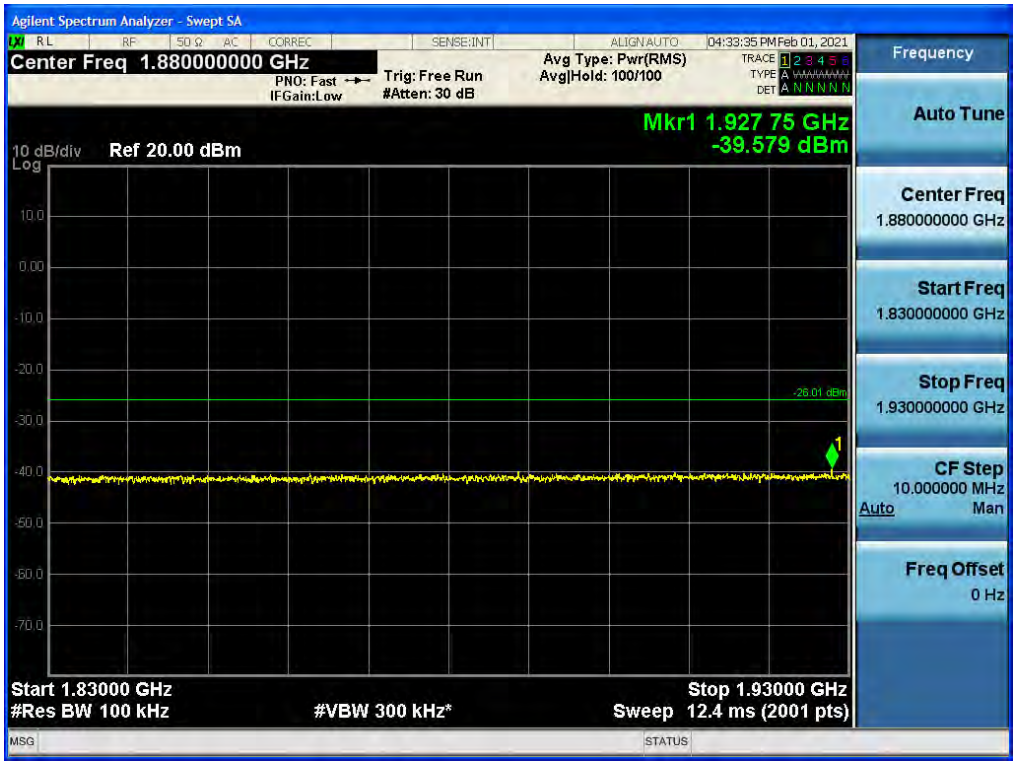
Antenna 1 / 150 kHz ~ 30 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / 256QAM / Middle



Antenna 1 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / 16QAM / Low

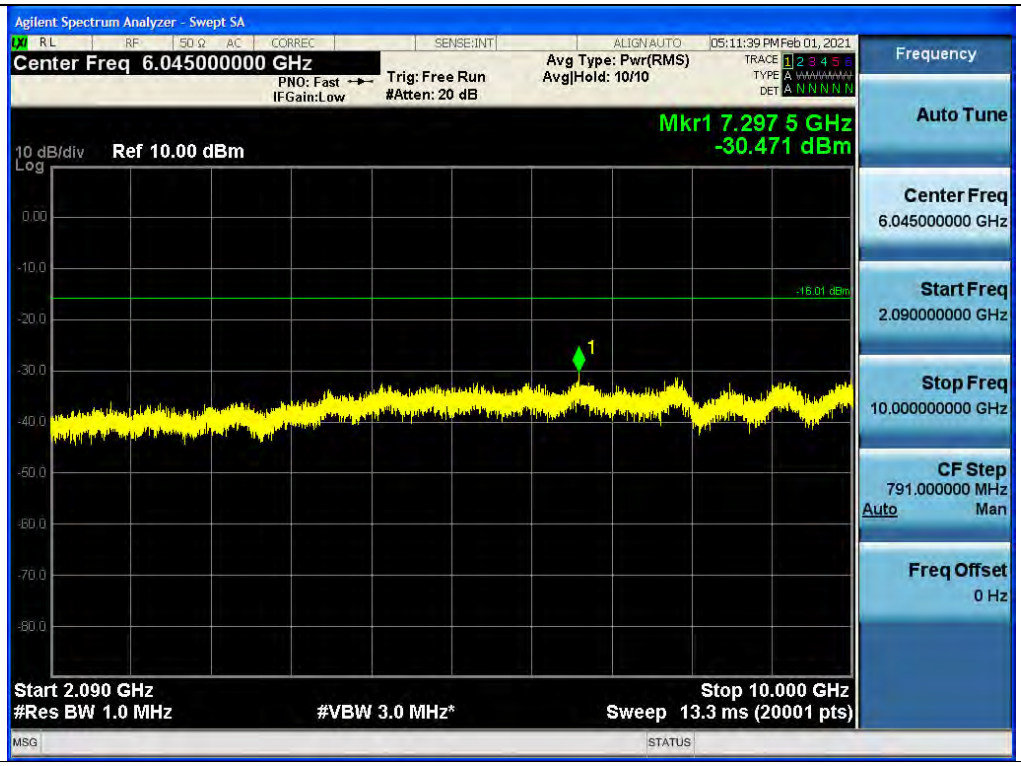


Antenna 0 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / QPSK / High



Antenna 1 / High Edge ~ High Edge+100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / 256QAM / High

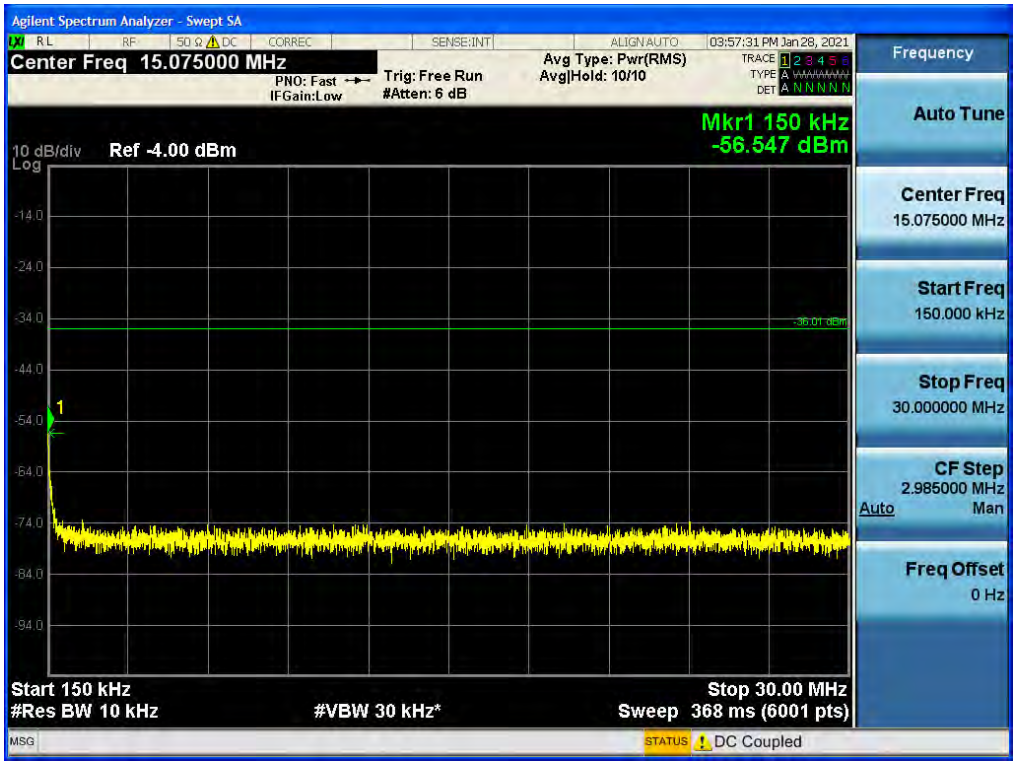
Antenna 1 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / QPSK / Low



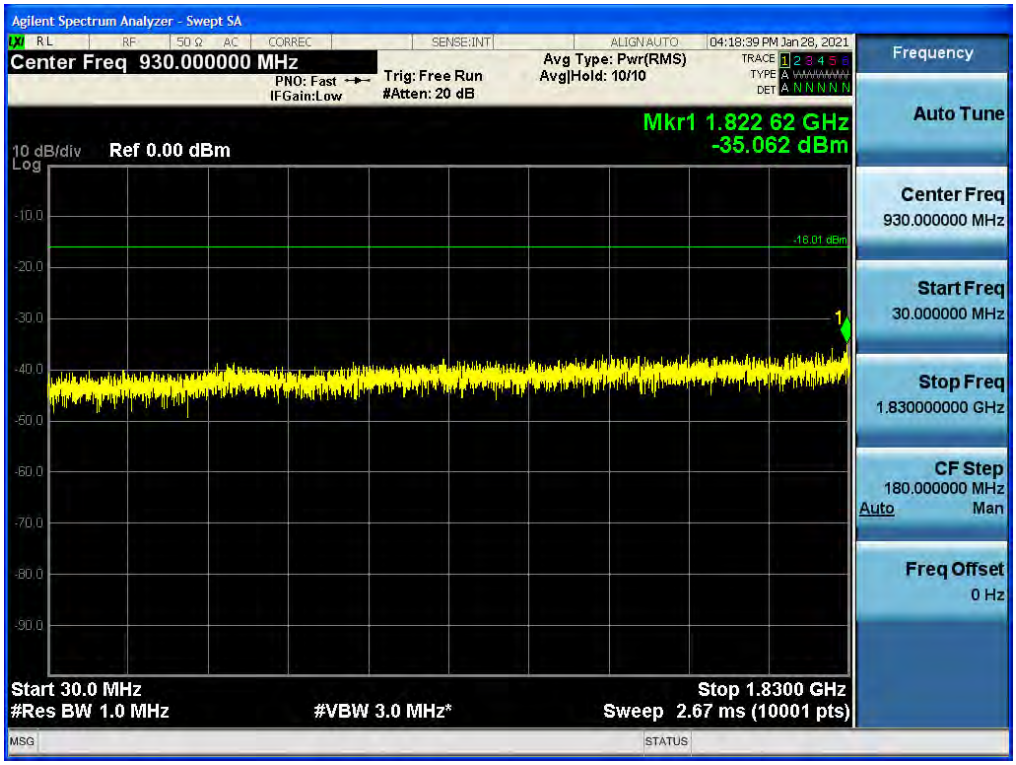
Antenna 1 / 10 GHz ~ 26.5 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Contiguous / 256QAM / Low

Antenna 1 / 9 kHz ~ 150 kHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 16QAM / Middle

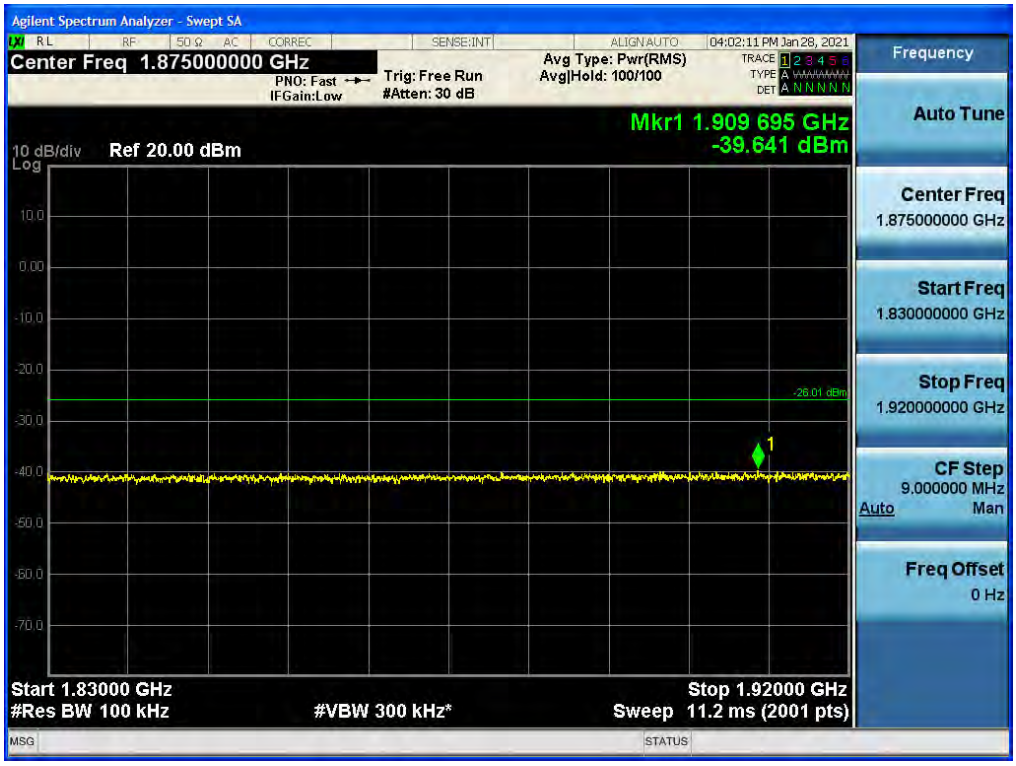
Antenna 1 / 150 kHz ~ 30 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 16QAM / Low



Antenna 1 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / Middle

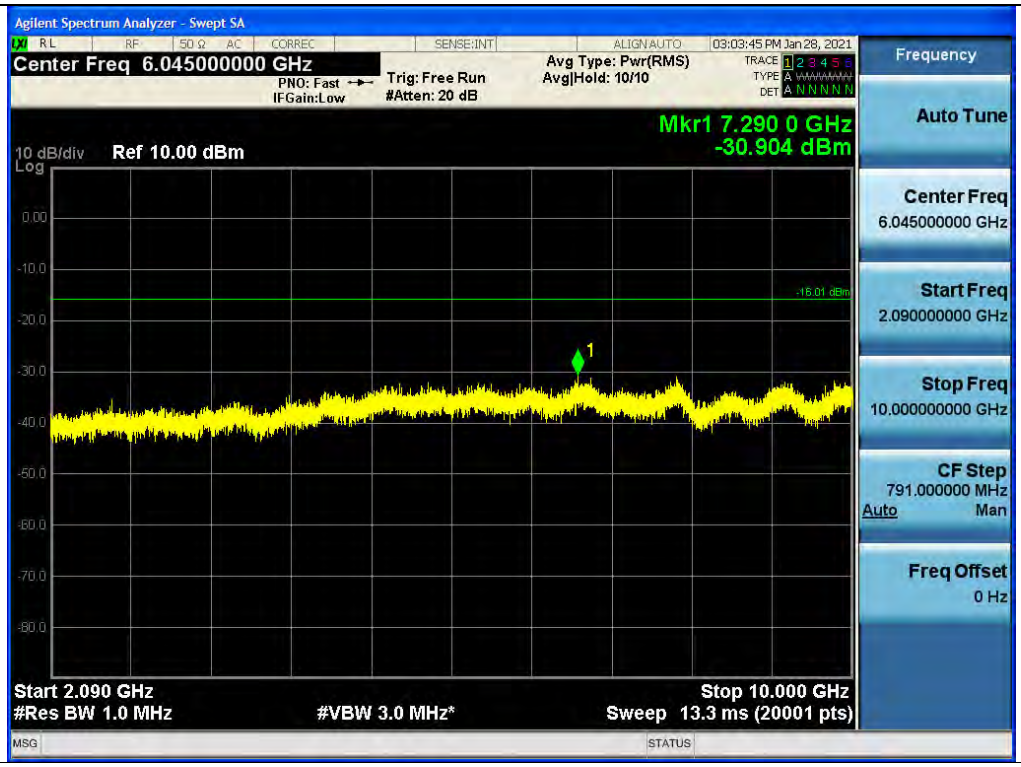


Antenna 1 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / Low



Antenna 0 / High Edge ~ High Edge+100 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / QPSK / High

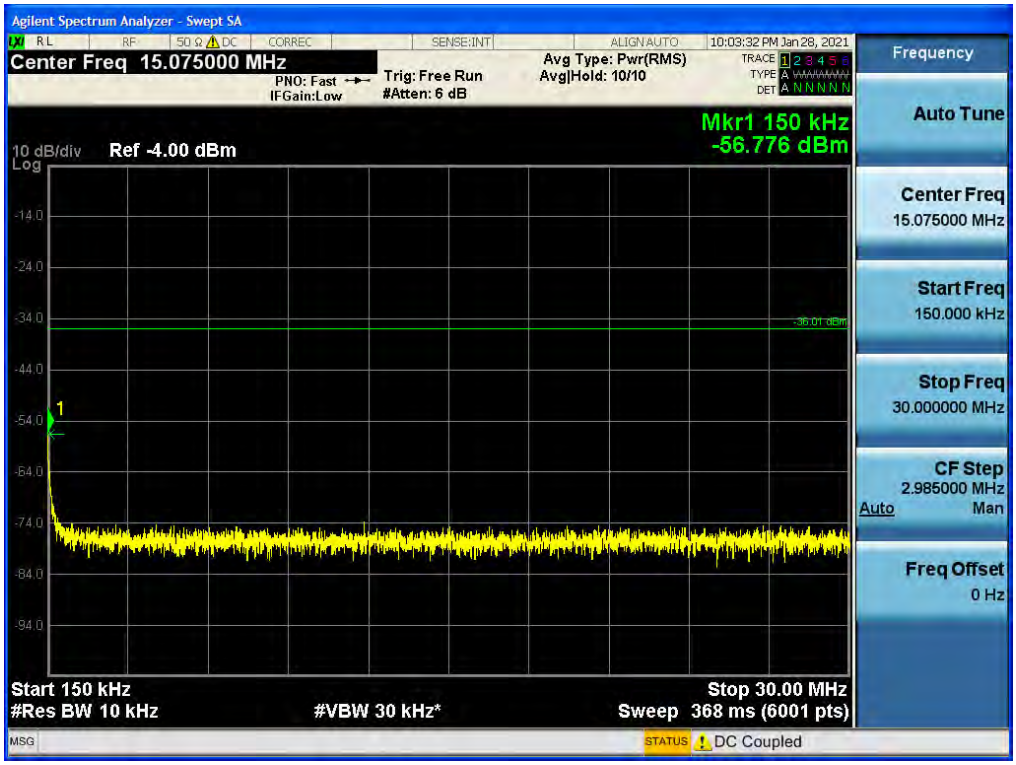
Antenna 0 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / QPSK / Low



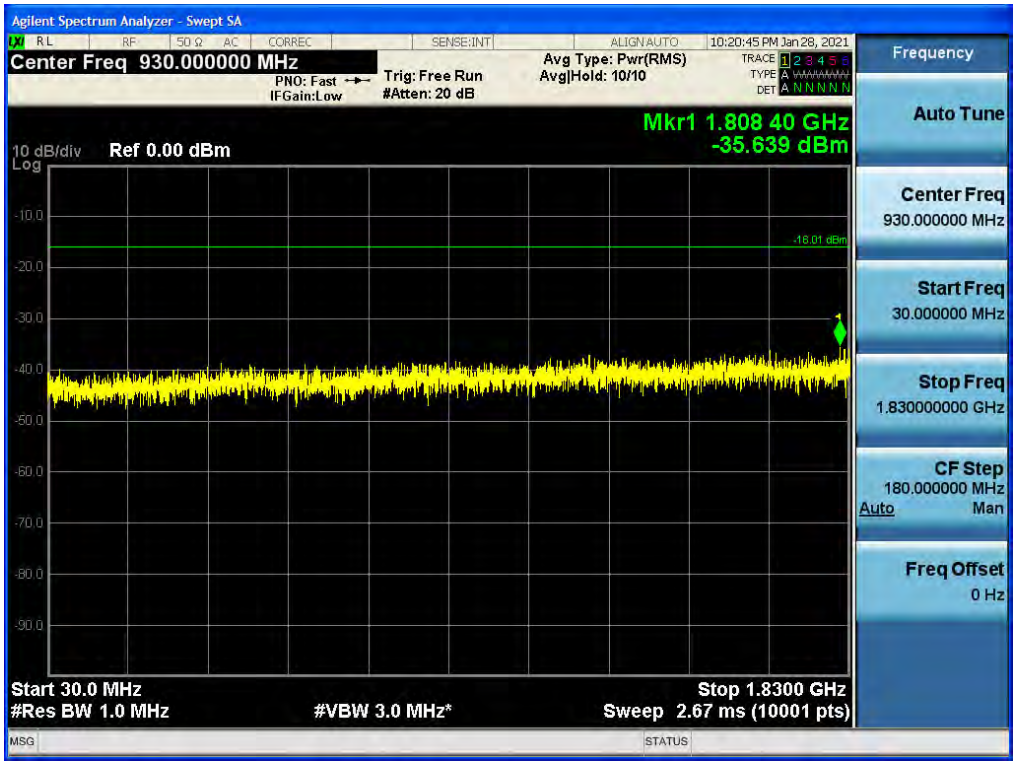
Antenna 1 / 10 GHz ~ 26.5 GHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Contiguous / 64QAM / Middle

Antenna 0 / 9 kHz ~ 150 kHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 16QAM

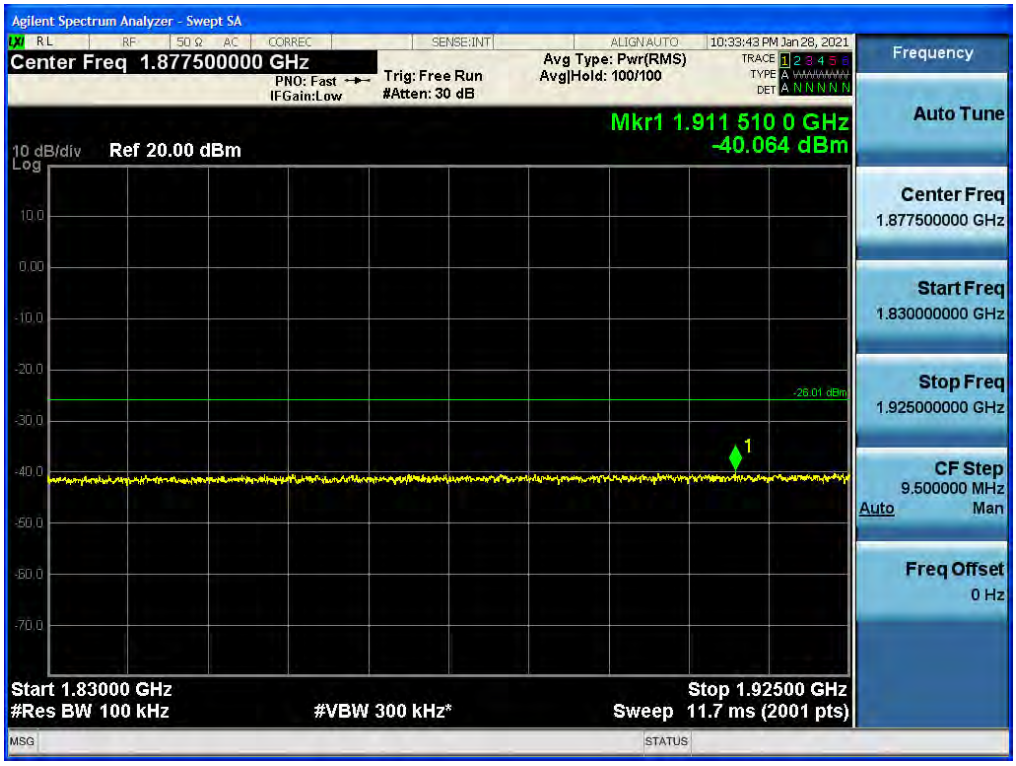
Antenna 0 / 150 kHz ~ 30 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 16QAM



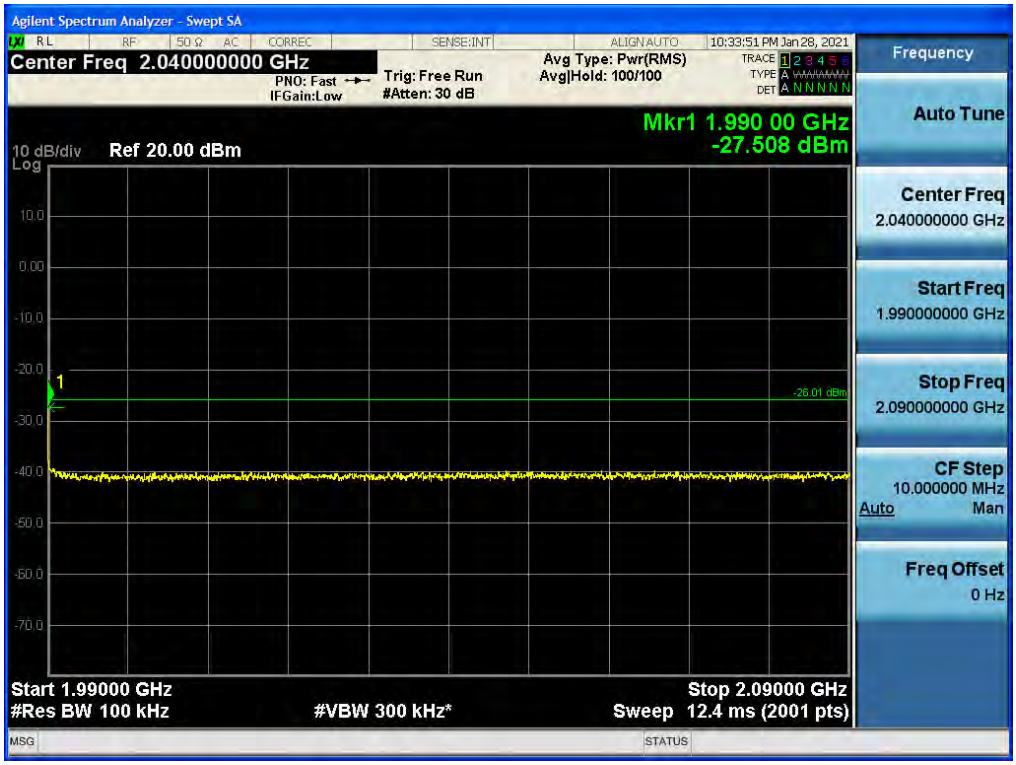
Antenna 1 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 256QAM



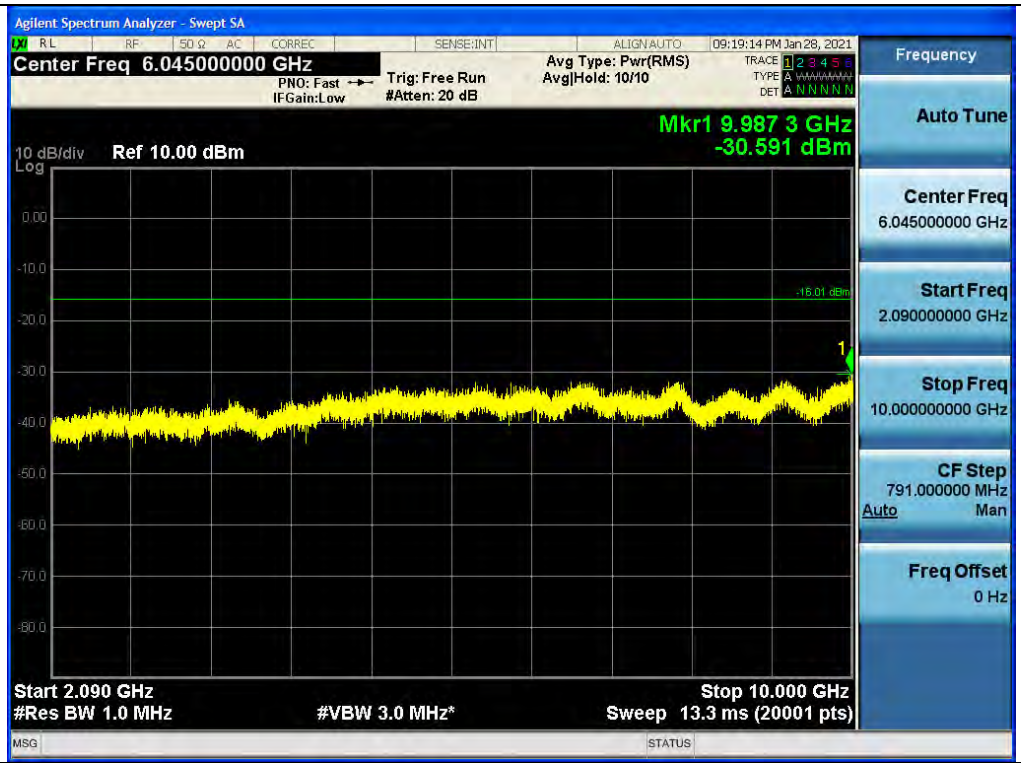
Antenna 1 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 16QAM



Antenna 1 / High Edge ~ High Edge+100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 16QAM



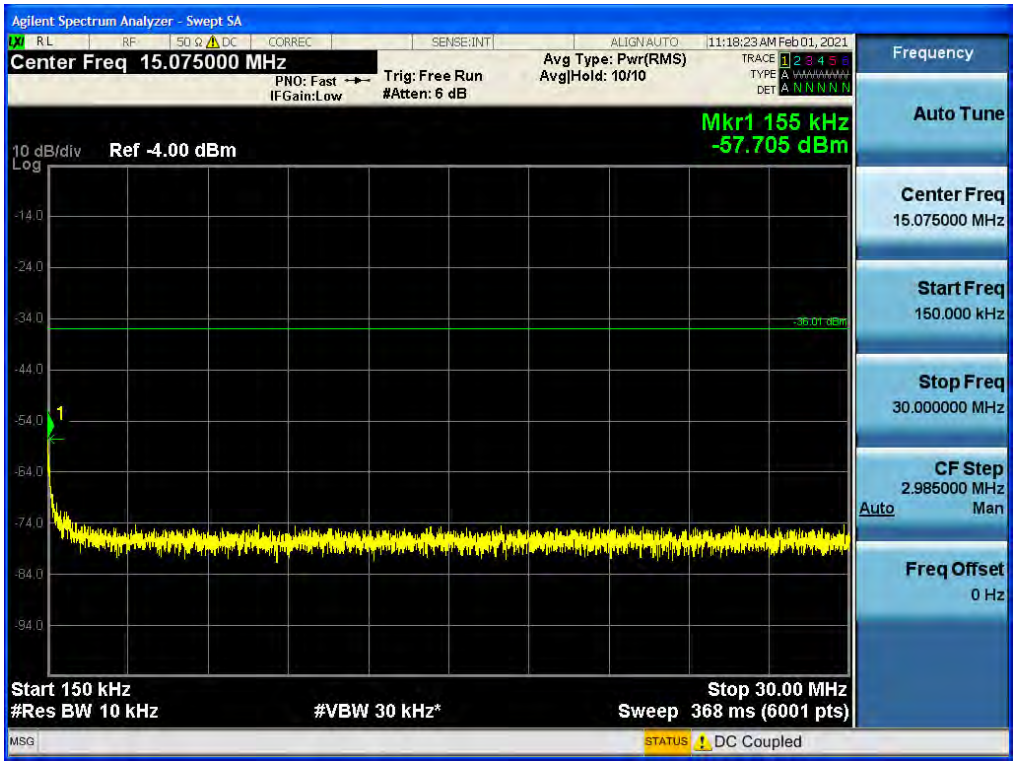
Antenna 0 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 256QAM



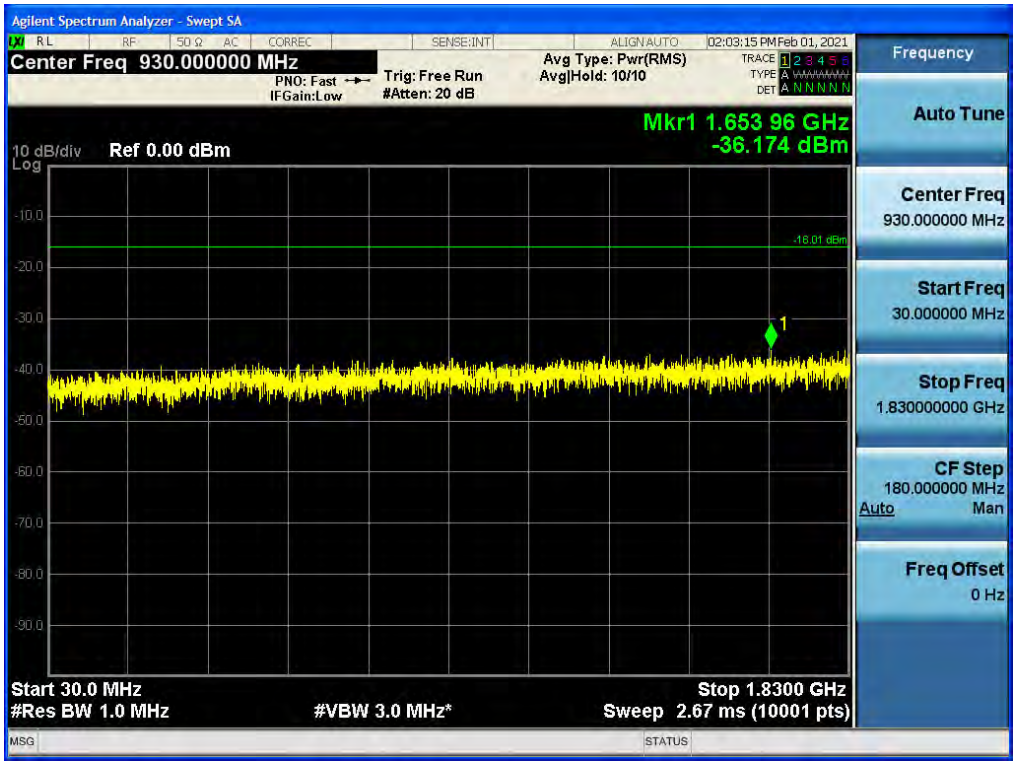
Antenna 0 / 10 GHz ~ 26.5 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz / Non-Contiguous / 64QAM

Antenna 0 / 9 kHz ~ 150 kHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

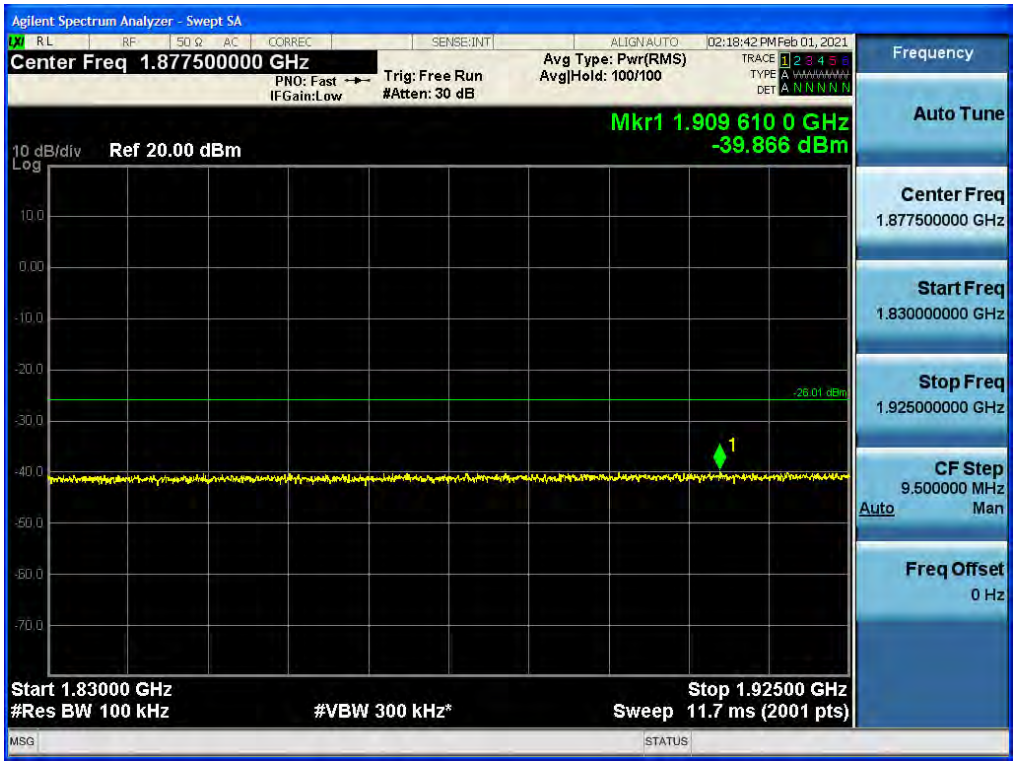
Antenna 0 / 150 kHz ~ 30 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 64QAM



Antenna 1 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 64QAM

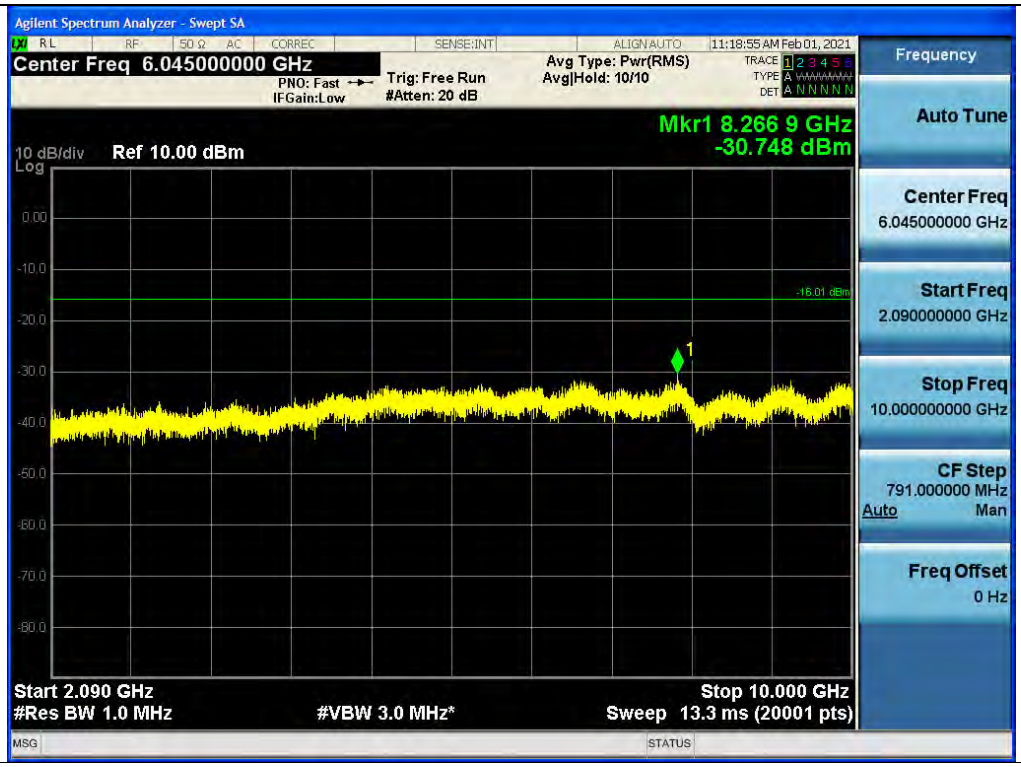


Antenna 1 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM



Antenna 0 / High Edge ~ High Edge+100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 256QAM

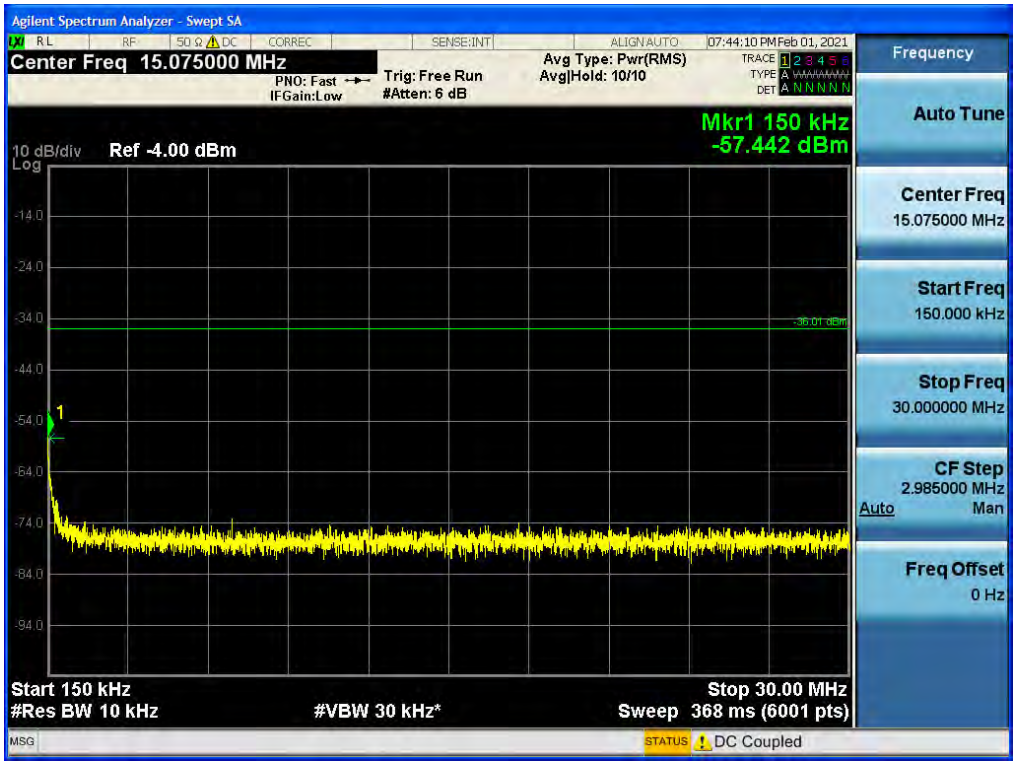
Antenna 0 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 64QAM



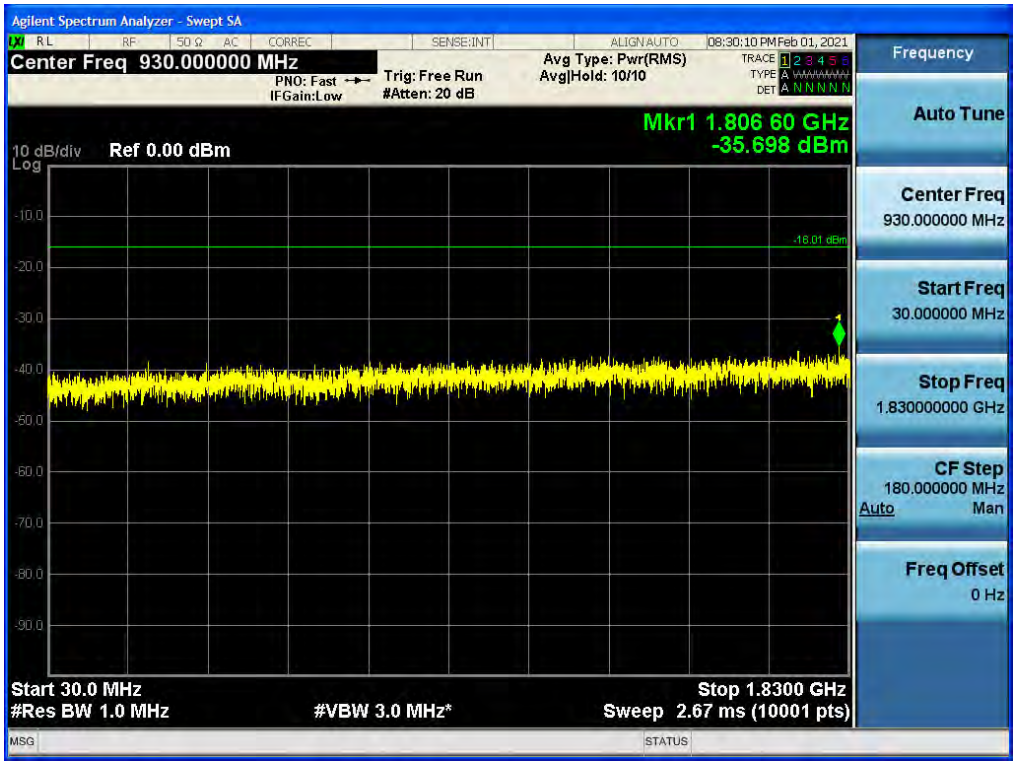
Antenna 1 / 10 GHz ~ 26.5 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

Antenna 0 / 9 kHz ~ 150 kHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 64QAM

Antenna 1 / 150 kHz ~ 30 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 256QAM



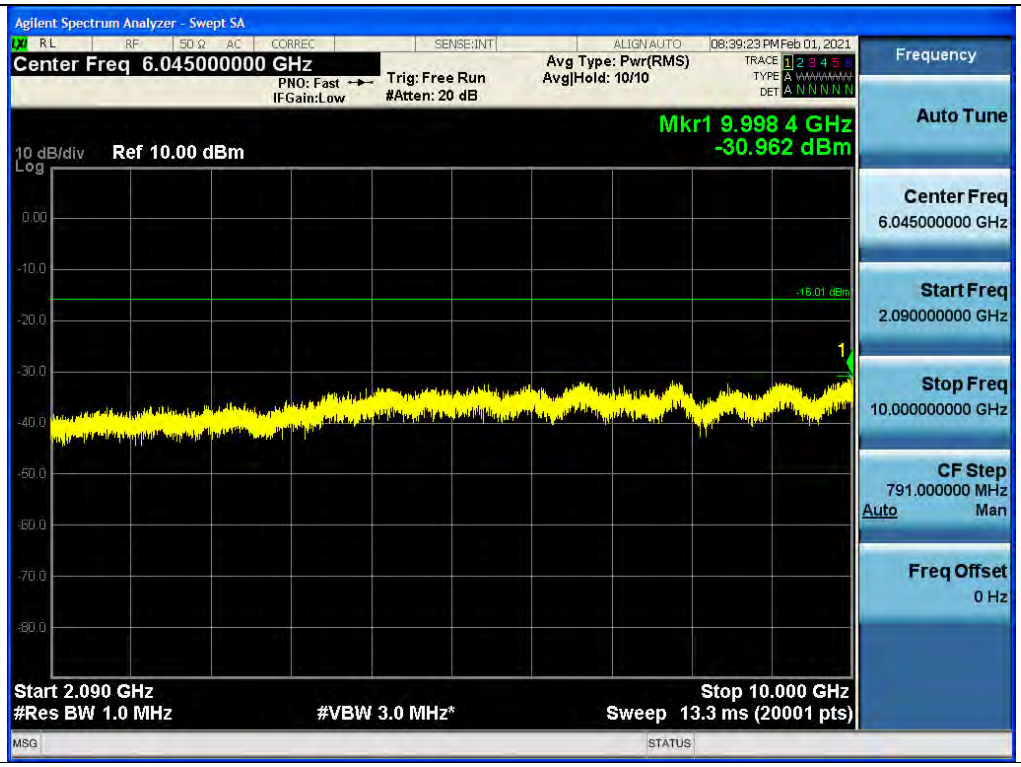
Antenna 0 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 16QAM



Antenna 0 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 256QAM

Antenna 1 / High Edge ~ High Edge+100 MHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 16QAM

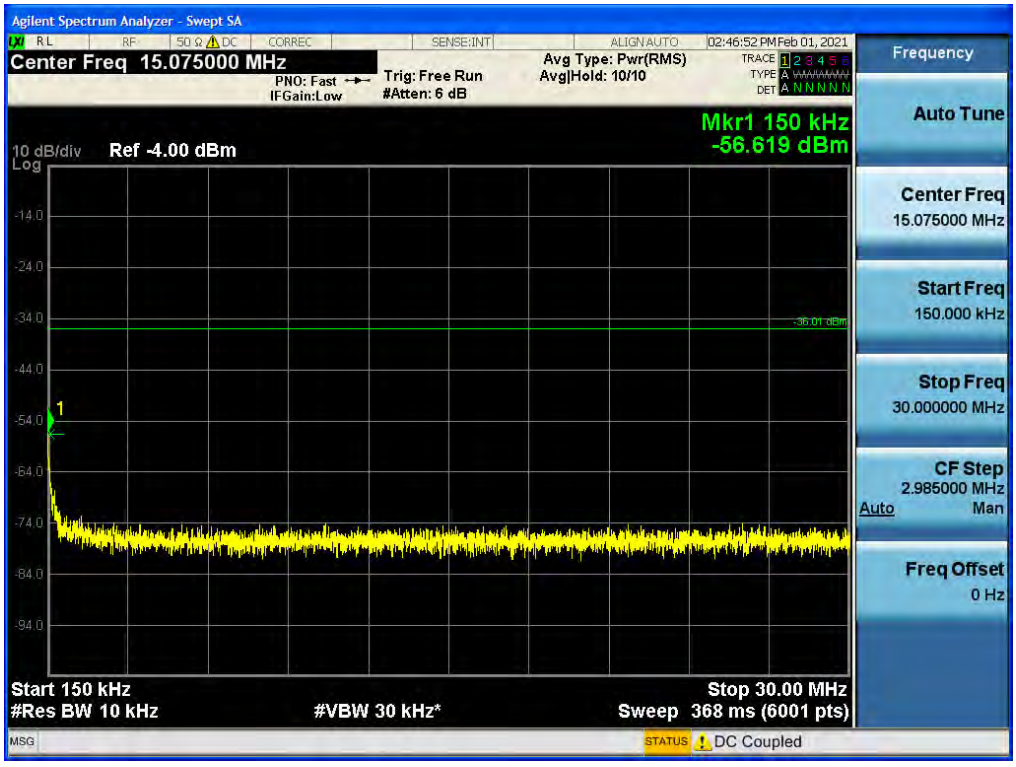
Antenna 0 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / 256QAM



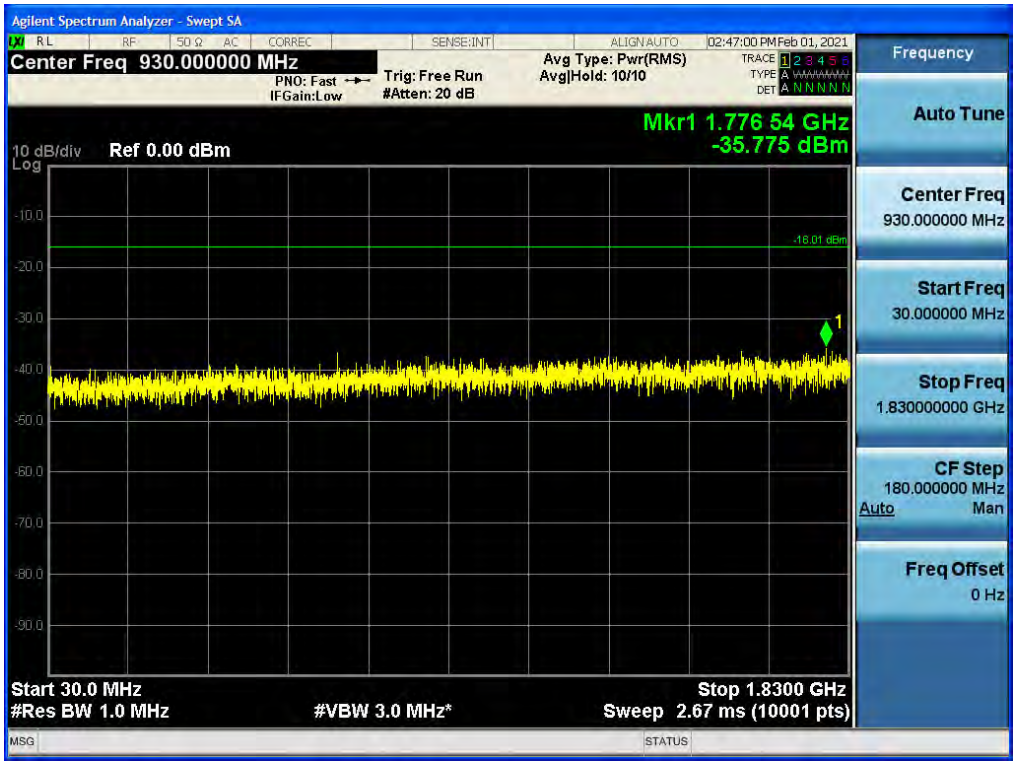
Antenna 0 / 10 GHz ~ 26.5 GHz / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz / Non-Contiguous / QPSK

Antenna 1 / 9 kHz ~ 150 kHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

Antenna 0 / 150 kHz ~ 30 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

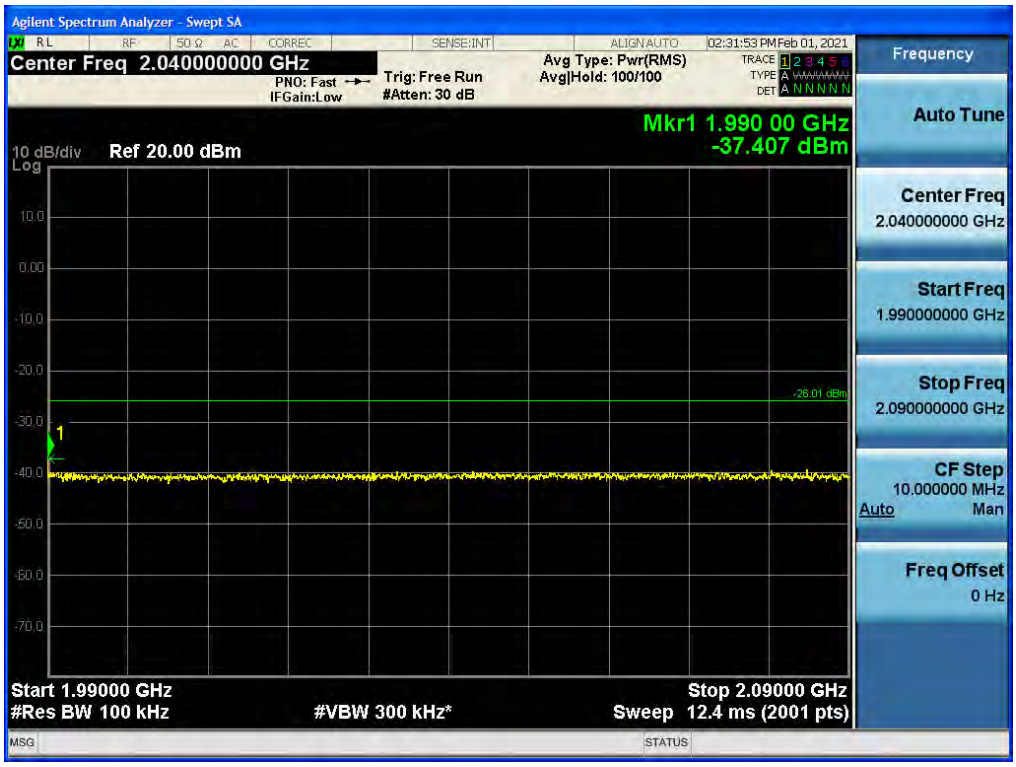


Antenna 0 / 30 MHz ~ Low Edge-100 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

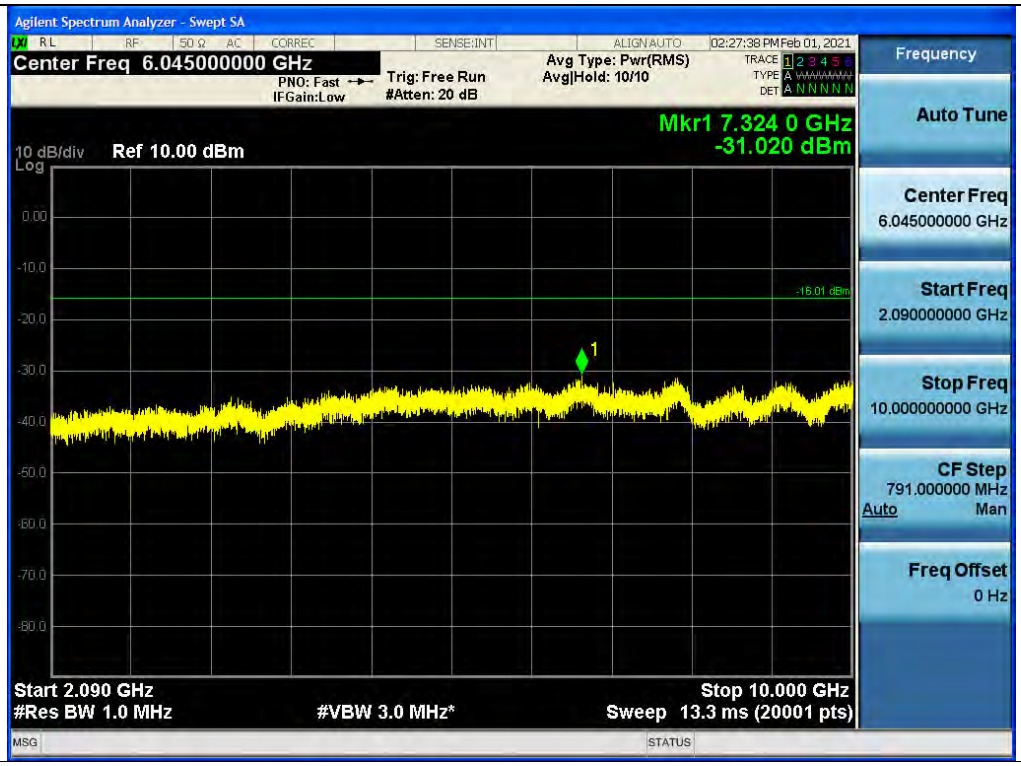


Antenna 0 / Low Edge-100 MHz ~ Low Edge / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / QPSK

Antenna 1 / High Edge ~ High Edge+100 MHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 256QAM



Antenna 1 / High Edge+100 MHz ~ 10 GHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / QPSK



Antenna 1 / 10 GHz ~ 26.5 GHz / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz / Non-Contiguous / 16QAM

5.4. BAND EDGE

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.

§ 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

(c) *Alternative out of band emission limit.* Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) *Interference caused by out of band emissions.* If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

§ 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) *Alternative out of band emission limit.* Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) *Interference caused by out of band emissions.* If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

Test Procedures:

The measurement is performed in accordance with Section 5.7.3 and 5.7.4 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) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) × (symbol period) (e.g., by a factor of 10 × symbol period × number of points). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols

2) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a freerunning 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%).

3) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a freerunning 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) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2%), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.

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.

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.

Test Results:

Tabular Data of Band Edge

5G NR n2 5 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-31.96
		High	1990.00	-32.27
	16QAM	Low	1930.00	-31.42
		High	1990.00	-32.11
	64QAM	Low	1930.00	-31.53
		High	1990.00	-31.87
	256QAM	Low	1930.00	-31.57
		High	1990.00	-32.43
1	QPSK	Low	1930.00	-32.58
		High	1990.00	-32.00
	16QAM	Low	1930.00	-31.60
		High	1990.00	-33.41
	64QAM	Low	1930.00	-31.07
		High	1990.00	-32.60
	256QAM	Low	1930.00	-30.67
		High	1990.00	-33.07

5G NR n2 10 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-30.74
		High	1990.00	-29.88
	16QAM	Low	1930.00	-30.10
		High	1990.00	-31.05
	64QAM	Low	1930.00	-30.89
		High	1990.00	-30.86
	256QAM	Low	1930.00	-29.95
		High	1990.00	-30.78
1	QPSK	Low	1930.00	-30.13
		High	1990.00	-29.29
	16QAM	Low	1930.00	-29.25
		High	1990.00	-30.71
	64QAM	Low	1930.00	-30.46
		High	1990.00	-30.05
	256QAM	Low	1930.00	-29.64
		High	1990.00	-29.84

5G NR n2 15 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-28.43
		High	1990.00	-28.38
	16QAM	Low	1930.00	-28.48
		High	1990.00	-27.67
	64QAM	Low	1930.00	-29.07
		High	1990.00	-29.80
	256QAM	Low	1930.00	-28.93
		High	1990.00	-28.33
1	QPSK	Low	1930.00	-28.23
		High	1990.00	-28.41
	16QAM	Low	1930.00	-29.29
		High	1990.00	-28.87
	64QAM	Low	1930.00	-28.64
		High	1990.00	-28.79
	256QAM	Low	1930.00	-28.39
		High	1990.00	-28.45

5G NR n2 20 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-28.25
		High	1990.00	-27.36
	16QAM	Low	1930.00	-27.24
		High	1990.00	-27.88
	64QAM	Low	1930.00	-27.54
		High	1990.00	-27.92
	256QAM	Low	1930.00	-27.25
		High	1990.00	-27.99
1	QPSK	Low	1930.00	-28.02
		High	1990.00	-28.22
	16QAM	Low	1930.00	-27.74
		High	1990.00	-27.04
	64QAM	Low	1930.00	-27.91
		High	1990.00	-26.95
	256QAM	Low	1930.00	-27.01
		High	1990.00	-27.29

5G NR n5 5 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	869.00	-32.60
		High	894.00	-32.71
	16QAM	Low	869.00	-33.60
		High	894.00	-33.38
	64QAM	Low	869.00	-33.11
		High	894.00	-33.26
	256QAM	Low	869.00	-32.40
		High	894.00	-33.65
1	QPSK	Low	869.00	-33.28
		High	894.00	-33.18
	16QAM	Low	869.00	-33.64
		High	894.00	-32.54
	64QAM	Low	869.00	-32.76
		High	894.00	-32.95
	256QAM	Low	869.00	-32.53
		High	894.00	-32.56

5G NR n5 10 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	869.00	-30.91
		High	894.00	-30.92
	16QAM	Low	869.00	-30.67
		High	894.00	-31.55
	64QAM	Low	869.00	-31.84
		High	894.00	-31.15
	256QAM	Low	869.00	-31.24
		High	894.00	-30.93
1	QPSK	Low	869.00	-31.33
		High	894.00	-31.84
	16QAM	Low	869.00	-31.39
		High	894.00	-31.38
	64QAM	Low	869.00	-31.26
		High	894.00	-31.43
	256QAM	Low	869.00	-31.51
		High	894.00	-31.62

Tabular Data of Contiguous Band Edge

5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-33.18
		High	1990.00	-32.89
	16QAM	Low	1930.00	-33.13
		High	1990.00	-33.16
	64QAM	Low	1930.00	-32.97
		High	1990.00	-33.05
	256QAM	Low	1930.00	-32.97
		High	1990.00	-33.28
1	QPSK	Low	1930.00	-33.35
		High	1990.00	-32.93
	16QAM	Low	1930.00	-32.40
		High	1990.00	-33.54
	64QAM	Low	1930.00	-31.98
		High	1990.00	-33.43
	256QAM	Low	1930.00	-32.95
		High	1990.00	-32.63

5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-33.25
		High	1990.00	-30.10
	16QAM	Low	1930.00	-32.95
		High	1990.00	-30.56
	64QAM	Low	1930.00	-33.24
		High	1990.00	-30.36
	256QAM	Low	1930.00	-33.17
		High	1990.00	-30.70
1	QPSK	Low	1930.00	-32.54
		High	1990.00	-29.81
	16QAM	Low	1930.00	-33.21
		High	1990.00	-30.27
	64QAM	Low	1930.00	-33.53
		High	1990.00	-30.68
	256QAM	Low	1930.00	-32.87
		High	1990.00	-30.03

5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-33.95
		High	1990.00	-29.67
	16QAM	Low	1930.00	-33.83
		High	1990.00	-28.28
	64QAM	Low	1930.00	-33.75
		High	1990.00	-28.42
	256QAM	Low	1930.00	-33.50
		High	1990.00	-28.88
1	QPSK	Low	1930.00	-32.80
		High	1990.00	-28.37
	16QAM	Low	1930.00	-32.80
		High	1990.00	-28.25
	64QAM	Low	1930.00	-32.97
		High	1990.00	-28.52
	256QAM	Low	1930.00	-34.20
		High	1990.00	-28.55

5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-31.05
		High	1990.00	-30.53
	16QAM	Low	1930.00	-30.38
		High	1990.00	-31.08
	64QAM	Low	1930.00	-30.73
		High	1990.00	-30.29
	256QAM	Low	1930.00	-31.19
		High	1990.00	-30.25
1	QPSK	Low	1930.00	-30.68
		High	1990.00	-31.12
	16QAM	Low	1930.00	-30.10
		High	1990.00	-30.33
	64QAM	Low	1930.00	-30.18
		High	1990.00	-31.49
	256QAM	Low	1930.00	-29.64
		High	1990.00	-30.61

Tabular Data of Non-Contiguous Band Edge

5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-33.68
		High	1990.00	-33.20
	16QAM	Low	1930.00	-33.76
		High	1990.00	-32.95
	64QAM	Low	1930.00	-33.48
		High	1990.00	-33.28
	256QAM	Low	1930.00	-33.67
		High	1990.00	-33.93
1	QPSK	Low	1930.00	-33.75
		High	1990.00	-33.67
	16QAM	Low	1930.00	-32.80
		High	1990.00	-32.05
	64QAM	Low	1930.00	-32.87
		High	1990.00	-32.72
	256QAM	Low	1930.00	-33.12
		High	1990.00	-32.65

5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-32.78
		High	1990.00	-30.46
	16QAM	Low	1930.00	-32.68
		High	1990.00	-30.01
	64QAM	Low	1930.00	-33.29
		High	1990.00	-29.97
	256QAM	Low	1930.00	-33.68
		High	1990.00	-30.30
1	QPSK	Low	1930.00	-32.72
		High	1990.00	-30.69
	16QAM	Low	1930.00	-32.72
		High	1990.00	-31.13
	64QAM	Low	1930.00	-33.60
		High	1990.00	-31.39
	256QAM	Low	1930.00	-33.55
		High	1990.00	-30.54

5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier [2 Carrier]

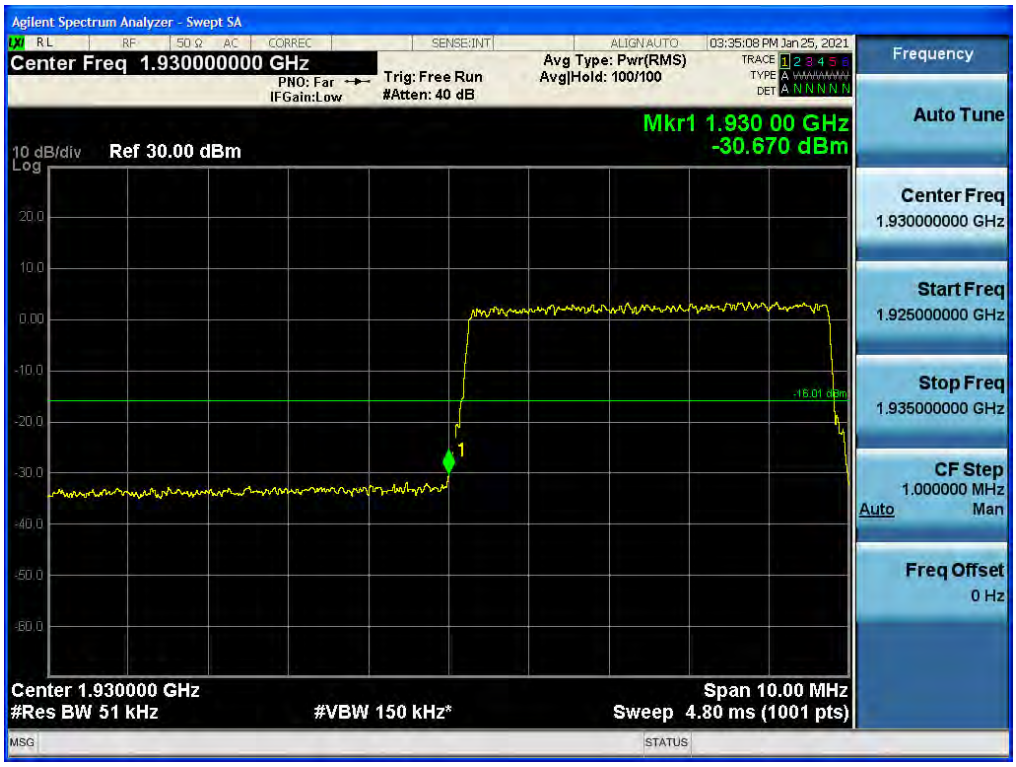
Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-34.11
		High	1990.00	-29.20
	16QAM	Low	1930.00	-33.29
		High	1990.00	-28.21
	64QAM	Low	1930.00	-34.34
		High	1990.00	-28.84
	256QAM	Low	1930.00	-34.01
		High	1990.00	-27.78
1	QPSK	Low	1930.00	-33.07
		High	1990.00	-28.35
	16QAM	Low	1930.00	-33.44
		High	1990.00	-28.50
	64QAM	Low	1930.00	-32.92
		High	1990.00	-28.68
	256QAM	Low	1930.00	-33.83
		High	1990.00	-28.83

5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	1930.00	-30.47
		High	1990.00	-31.01
	16QAM	Low	1930.00	-30.26
		High	1990.00	-30.72
	64QAM	Low	1930.00	-30.73
		High	1990.00	-30.69
	256QAM	Low	1930.00	-30.71
		High	1990.00	-31.08
1	QPSK	Low	1930.00	-31.03
		High	1990.00	-30.81
	16QAM	Low	1930.00	-30.41
		High	1990.00	-30.72
	64QAM	Low	1930.00	-30.73
		High	1990.00	-30.46
	256QAM	Low	1930.00	-30.80
		High	1990.00	-30.90

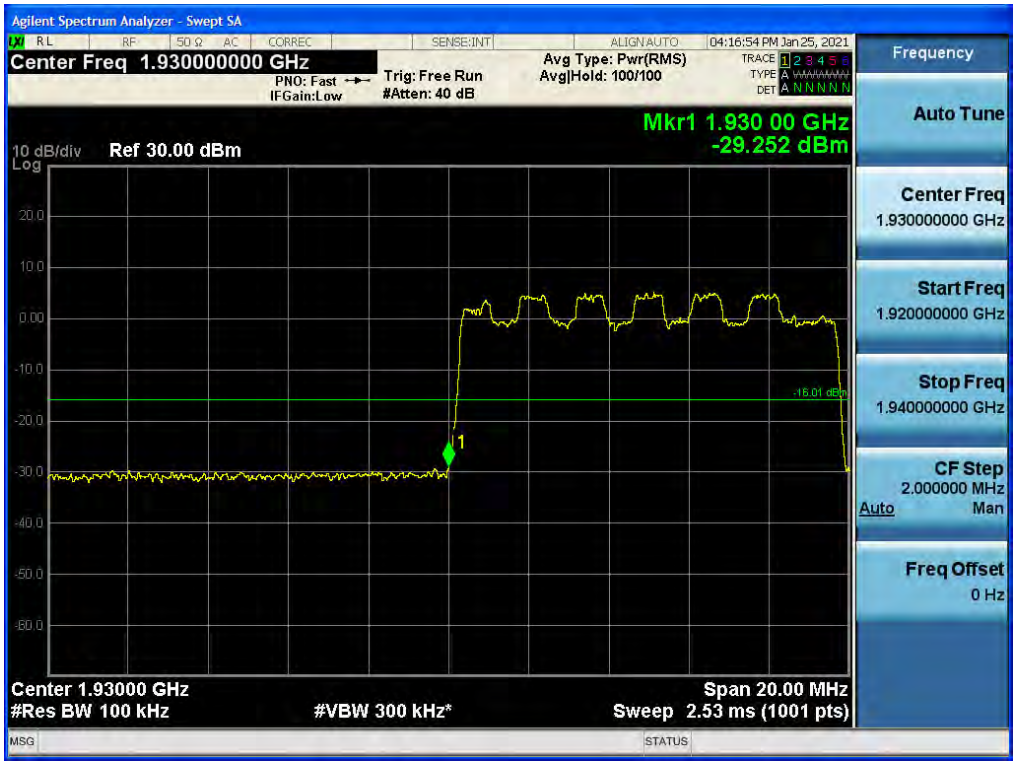
Plot Data of Band Edge

Antenna 1 / 5G NR n2 5 MHz 1 Carrier / 256QAM / Low

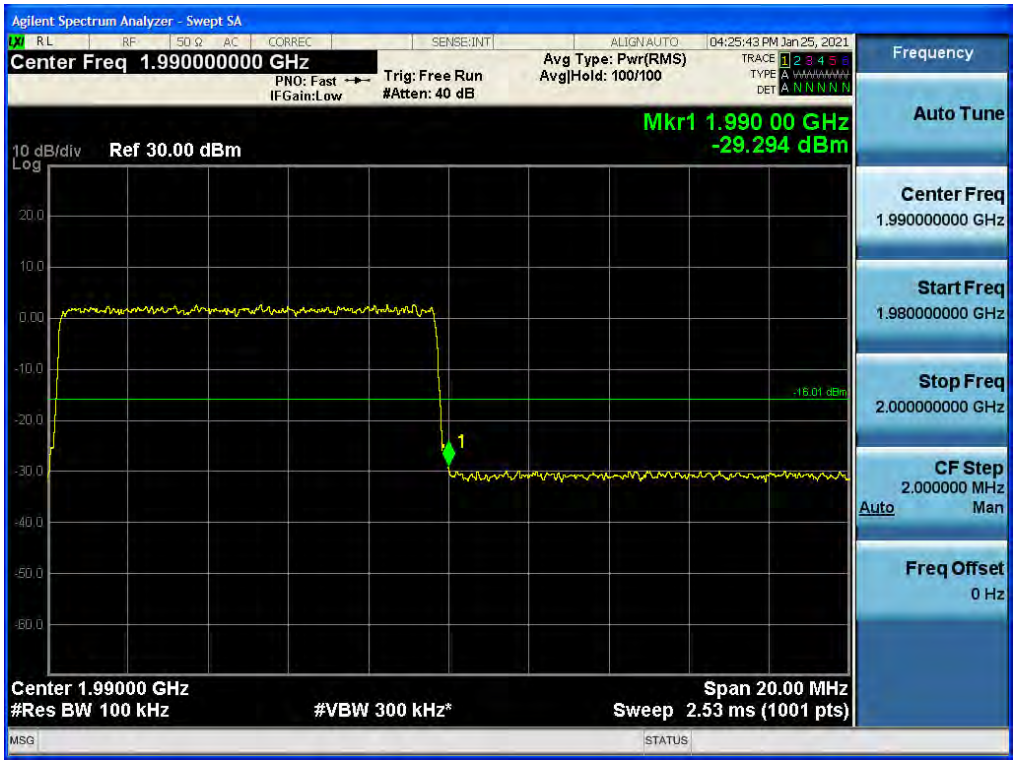


Antenna 0 / 5G NR n2 5 MHz 1 Carrier / 64QAM / High

Antenna 1 / 5G NR n2 10 MHz 1 Carrier / 16QAM / Low

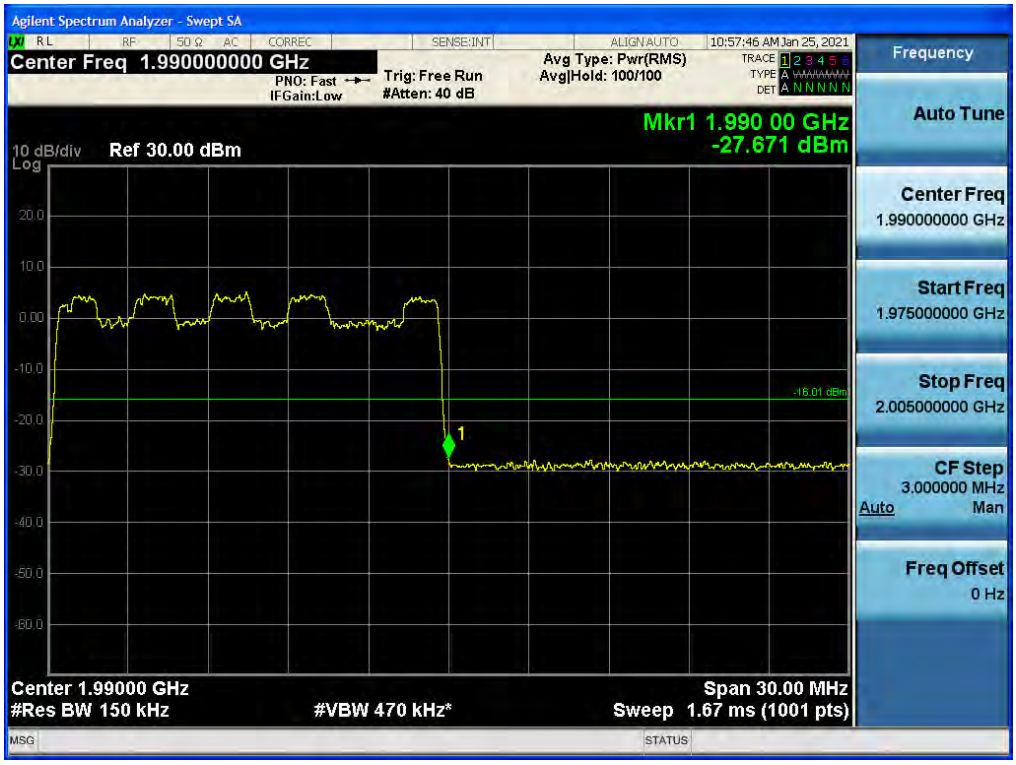


Antenna 1 / 5G NR n2 10 MHz 1 Carrier / QPSK / High



Antenna 1 / 5G NR n2 15 MHz 1 Carrier / QPSK / Low

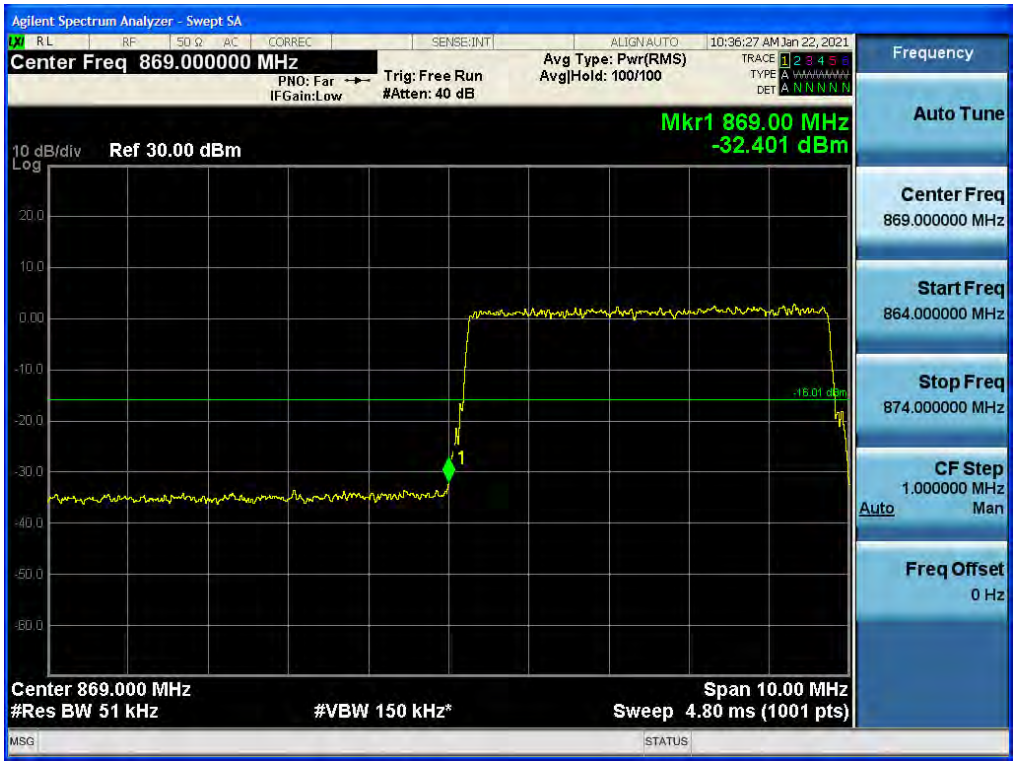
Antenna 0 / 5G NR n2 15 MHz 1 Carrier / 16QAM / High



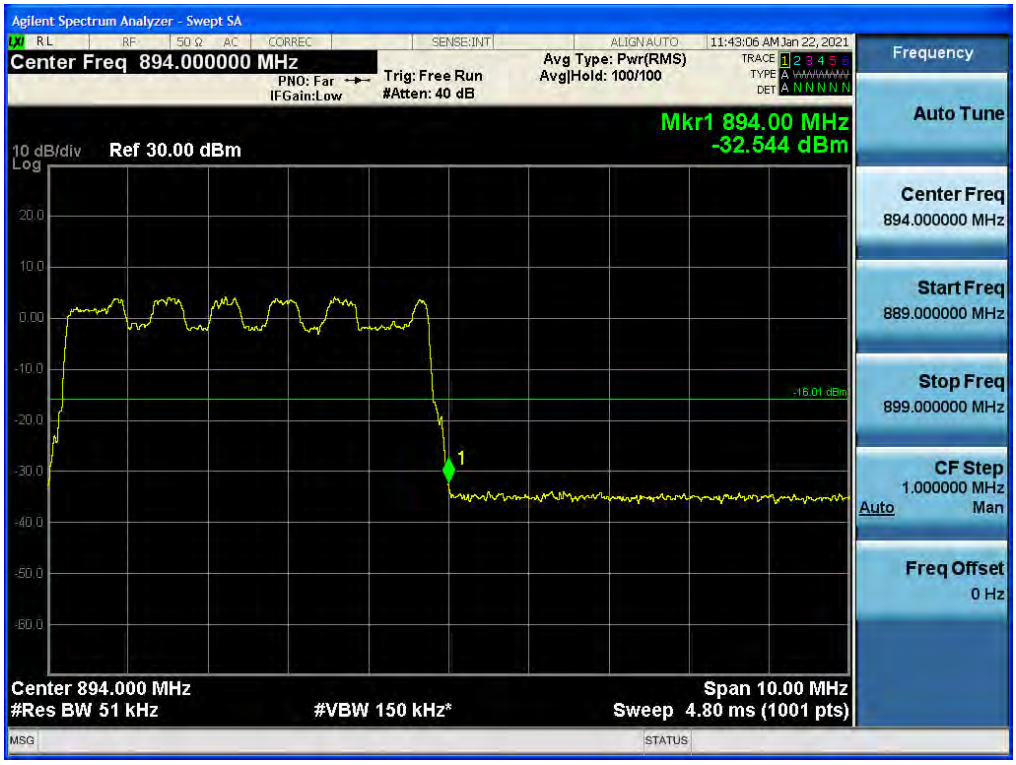
Antenna 1 / 5G NR n2 20 MHz 1 Carrier / 256QAM / Low

Antenna 1 / 5G NR n2 20 MHz 1 Carrier / 64QAM / High

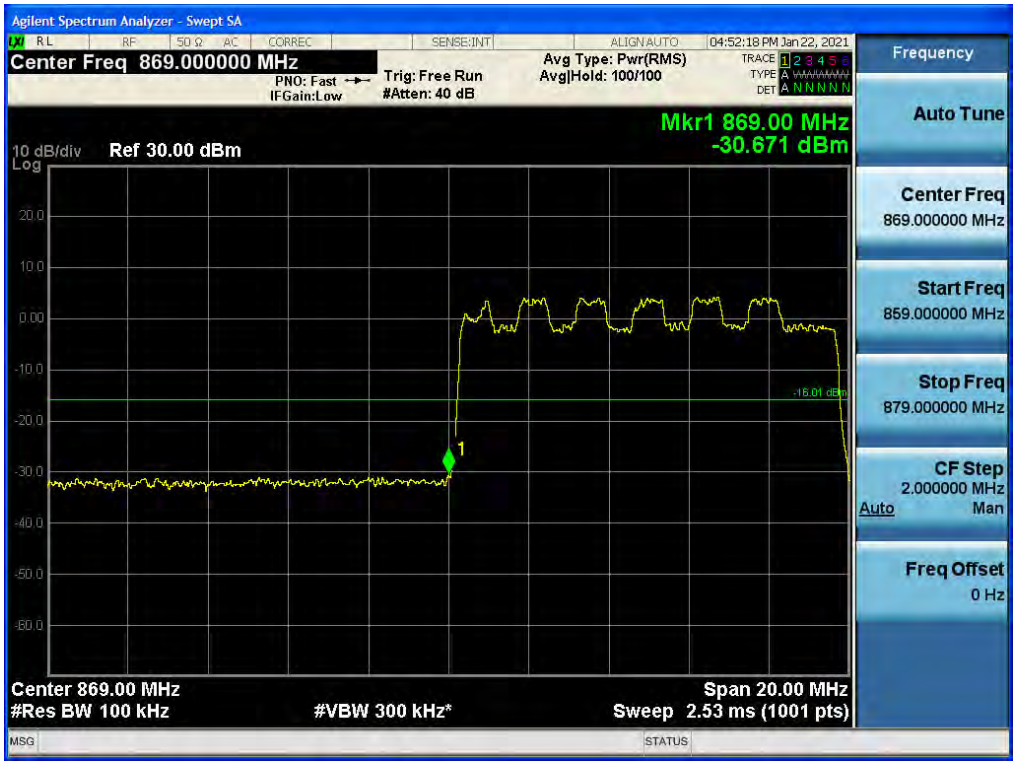
Antenna 0 / 5G NR n5 5 MHz 1 Carrier / 256QAM / Low



Antenna 1 / 5G NR n5 5 MHz 1 Carrier / 16QAM / High



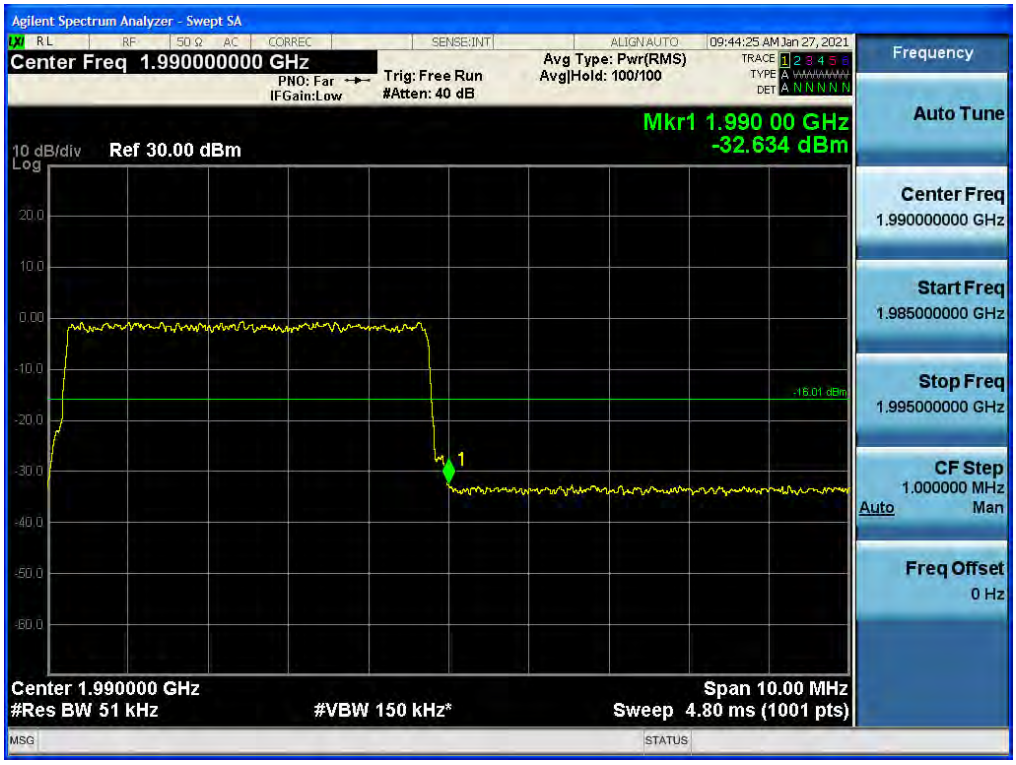
Antenna 0 / 5G NR n5 10 MHz 1 Carrier / 16QAM / Low



Antenna 0 / 5G NR n5 10 MHz 1 Carrier / QPSK / High

Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier / Contiguous / 64QAM / Low

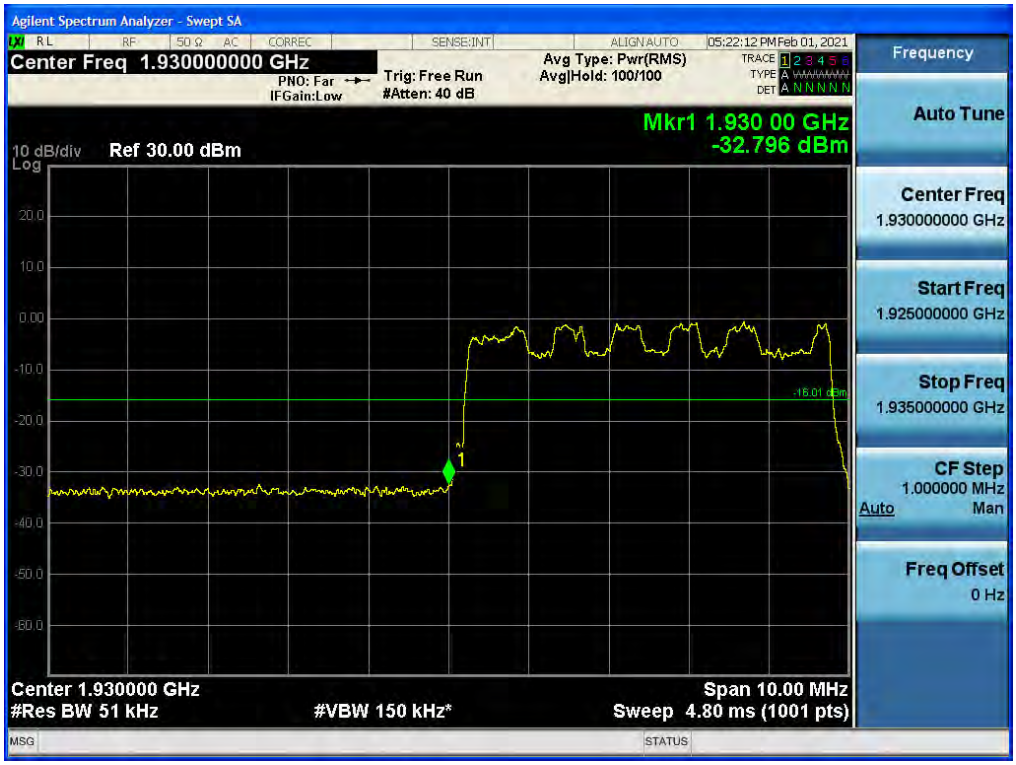
Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier / Contiguous / 256QAM / High



Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Contiguous / QPSK / Low

Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Contiguous / QPSK / High

Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier / Contiguous / 16QAM / Low

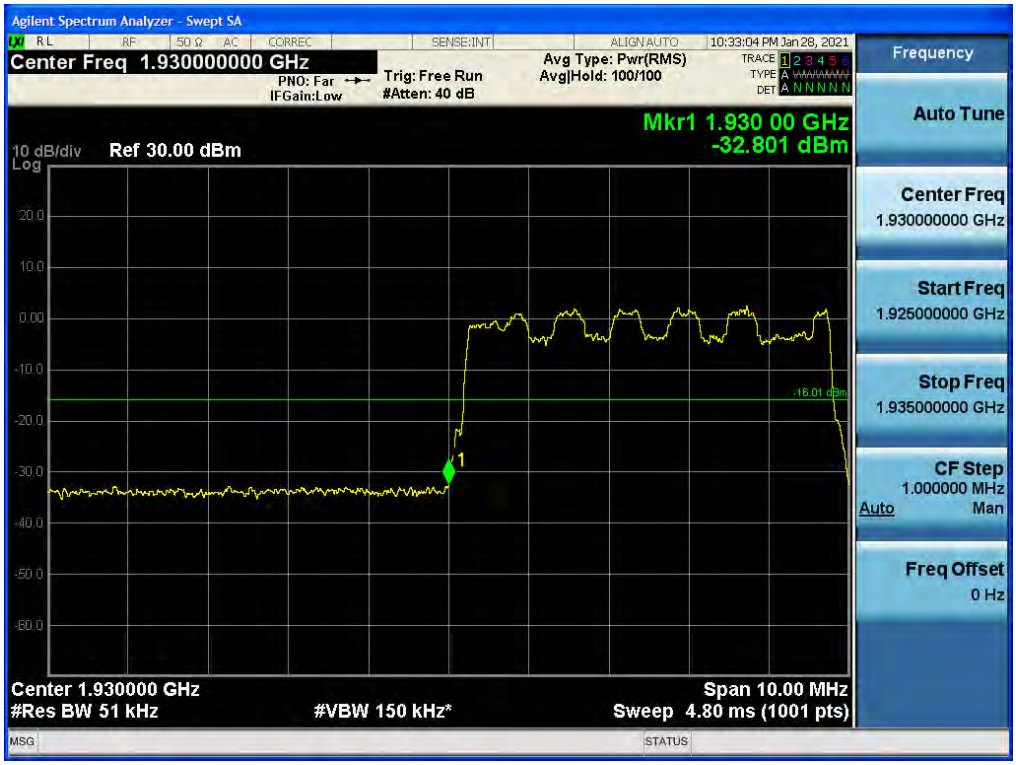


Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier / Contiguous / 16QAM / High

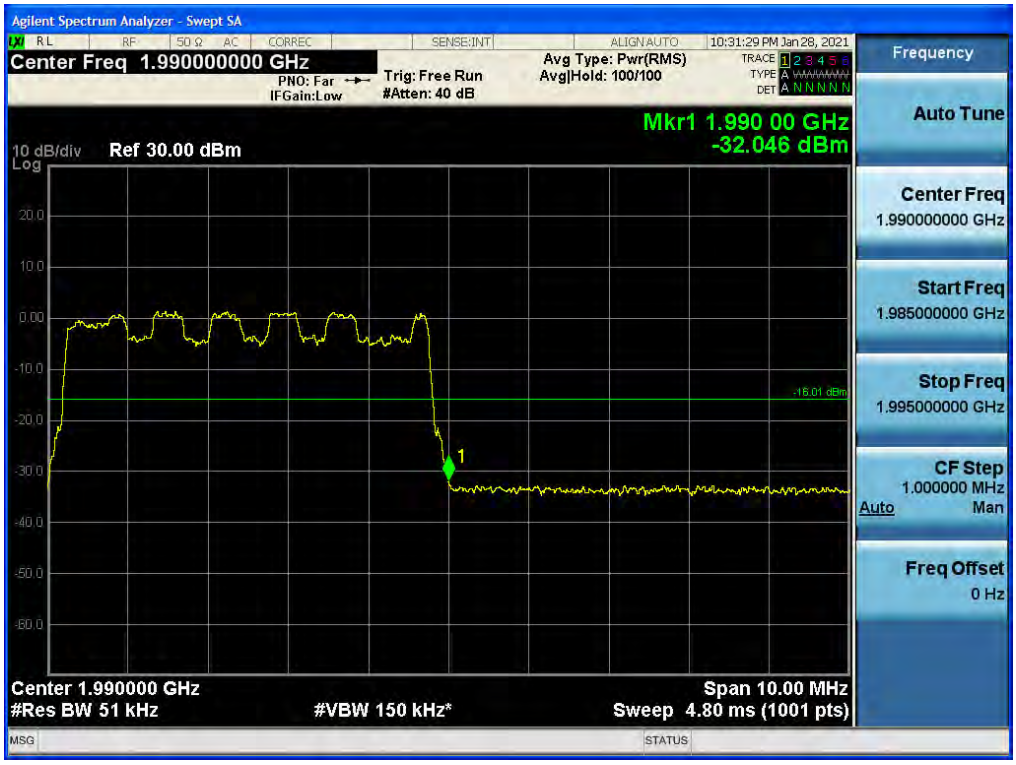
Antenna 1 / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Contiguous / 256QAM / Low

Antenna 0 / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Contiguous / 256QAM / High

Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier / Non-Contiguous / 16QAM / Low



Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 5 MHz 1 Carrier / Non-Contiguous / 16QAM / High



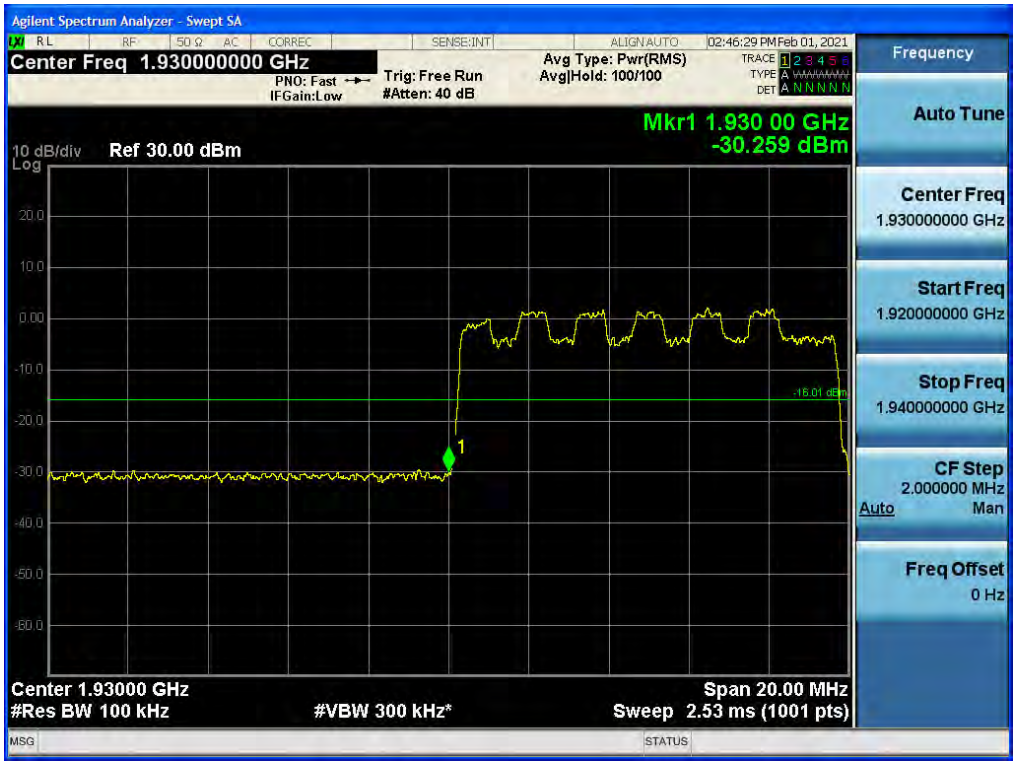
Antenna 0 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Non-Contiguous / 16QAM / Low

Antenna 0 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Non-Contiguous / 64QAM / High

Antenna 1 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier / Non-Contiguous / 64QAM / Low

Antenna 0 / 5G NR n2 5 MHz 1 Carrier + 5G NR n2 15 MHz 1 Carrier / Non-Contiguous / 256QAM / High

Antenna 0 / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Non-Contiguous / 16QAM / Low



Antenna 1 / 5G NR n2 10 MHz 1 Carrier + 5G NR n2 10 MHz 1 Carrier / Non-Contiguous / 64QAM / High

5.5. RADIATED EMISSIONS

Test Requirements:

§ 2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

Test Procedures:

The measurement is performed in accordance with Section 5.5.3.2 of ANSI C63.26.

a) Place the EUT in the center of the turntable. The EUT shall be configured to transmit into the standard non-radiating load (for measuring radiated spurious emissions), connected with cables of minimal length unless specified otherwise. If the EUT uses an adjustable antenna, the antenna shall be positioned to the length that produces the worst case emission at the fundamental operating frequency.

b) Each emission under consideration shall be evaluated:

1) Raise and lower the measurement antenna in accordance 5.5.2, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.

2) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.

3) Return the turntable to the azimuth where the highest emission amplitude level was observed.

4) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.

5) Record the measured emission amplitude level and frequency using the appropriate RBW.

c) Repeat step b) for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.

d) ~ j) Omitted

k) Provide the complete measurement results as a part of the test report.

Note:

1) Measure distance: 3 m

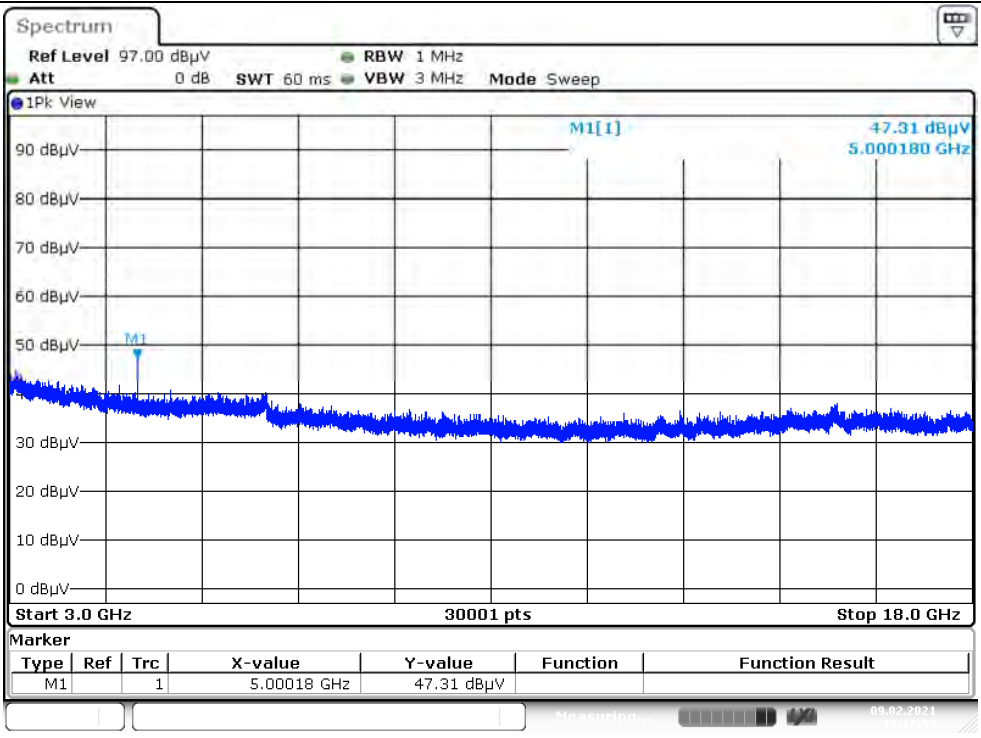
Test Results:

5G NR n2 5 MHz + 5 MHz 2 Carrier (Non-Contiguous)_ QPSK

Freq.(MHz)	Measured Level	Ant. Factor	C.L	Amp. Gain (+ 1G H.P.F.)	Pol.	Measured Power	Result	Limit	Margin
	[dBuV]	[dB/m]	[dB]	[dB]		[dBm]	[dBm/m]	[dBm]	[dB]
5 000.18	47.31	31.40	0.00	26.54	H	-47.89	-43.03	-13.00	30.030

* C.L.: Cable Loss / A.G.: Amp Gain / H.P.F.: High Pass Filter

Plot data of radiated spurious emissions



Note : Only the worst case plots for Radiated Spurious Emissions.

5.6. FREQUENCY STABILITY

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.

§ 22.355 Frequency tolerance.

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

§ 24.235 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each port, so we are attached only the worst case data.

Test Results:

Reference: - 48 Vdc at 20°C **Freq.** = 1,960,000,000 Hz

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1960 000 003	2.539	0.000	0.00000
	-30	1960 000 003	0.058	-2.482	-0.00127
	-20	1960 000 009	6.191	3.652	0.00186
	-10	1960 000 008	5.854	3.315	0.00169
	0	1960 000 012	9.540	7.001	0.00357
	+10	1960 000 007	4.091	1.551	0.00079
	+30	1960 000 007	4.652	2.113	0.00108
	+40	1960 000 012	9.725	7.186	0.00367
	+50	1960 000 012	9.594	7.055	0.00360
115%	+20	1960 000 004	1.639	-0.901	-0.00046
85%	+20	1960 000 011	8.203	5.663	0.00289

Note:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similer trend for each port, so attached datas were only the port 0.

Reference: - 48 Vdc at 20°C **Freq.** = 881,500,000 Hz

Voltage	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	+20(Ref)	881 500 008	8.222	0.000	0.00000
	-30	881 500 017	9.240	7.807	0.00398
	-20	881 500 013	4.487	3.054	0.00156
	-10	881 500 016	8.139	6.706	0.00342
	0	881 500 014	5.545	4.112	0.00210
	+10	881 500 013	4.614	3.181	0.00162
	+30	881 500 017	8.909	7.476	0.00381
	+40	881 500 016	8.015	6.581	0.00336
	+50	881 500 016	7.796	6.362	0.00325
115%	+20	881 500 016	8.175	6.742	0.00344
85%	+20	881 500 012	3.315	1.882	0.00096

Note:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similer trend for each port, so attached datas were only the port 0.

6. Annex B_EUT AND TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2104-FC012-P