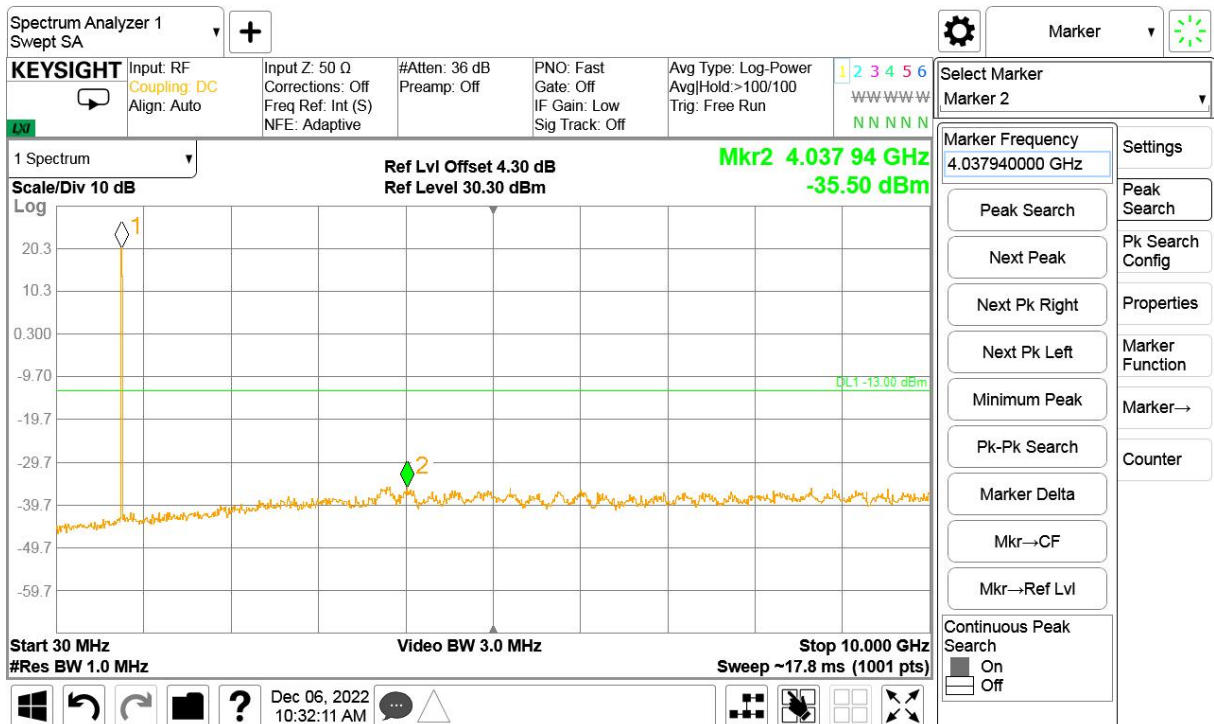
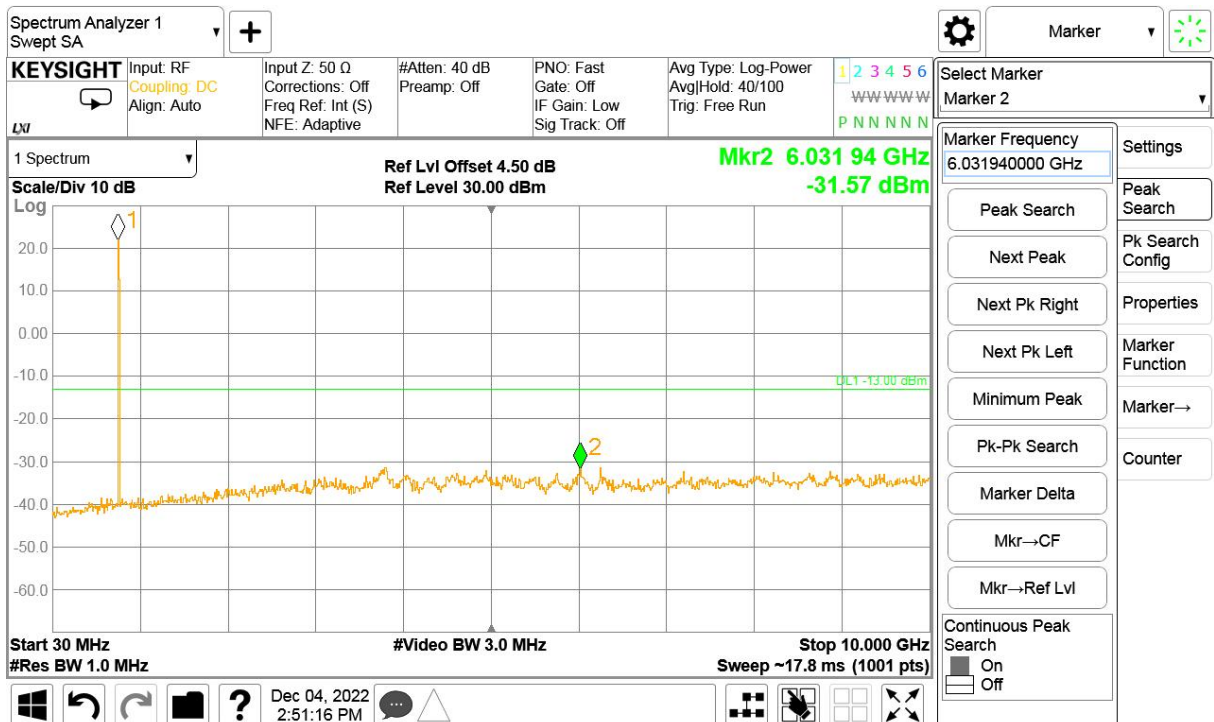




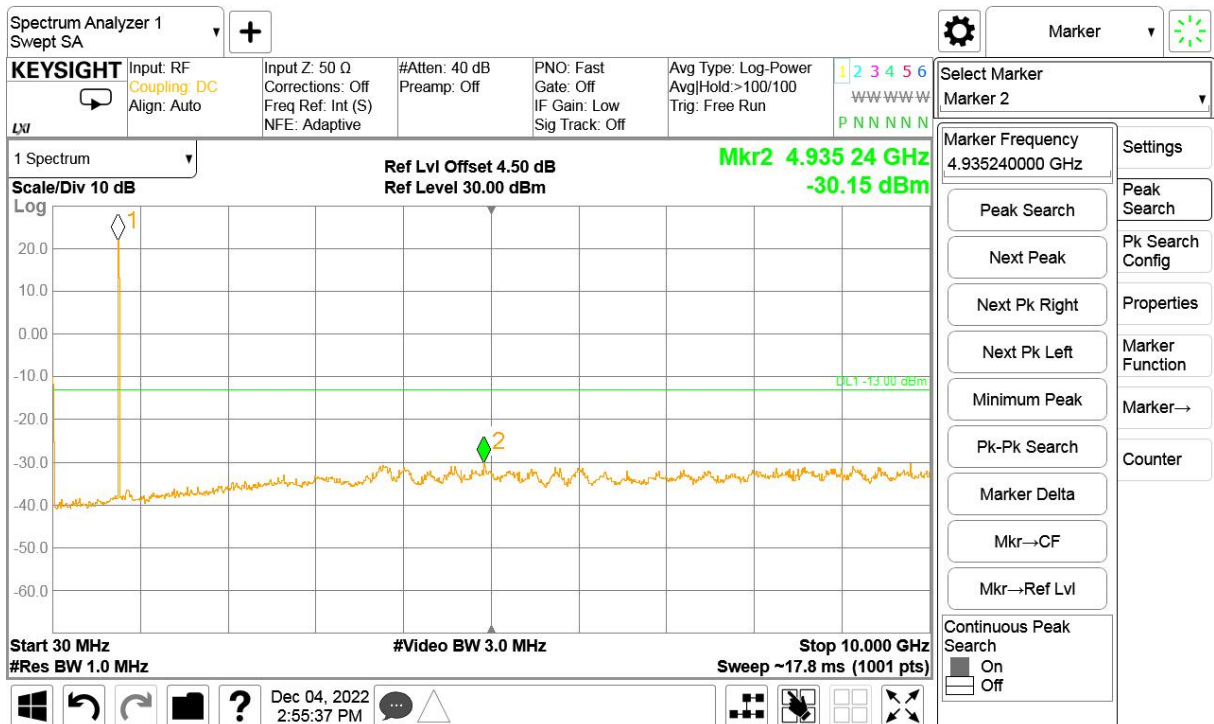
30MHz to 10GHz, Mid Channel, Subcarrier (15kHz), QPSK, 12@0



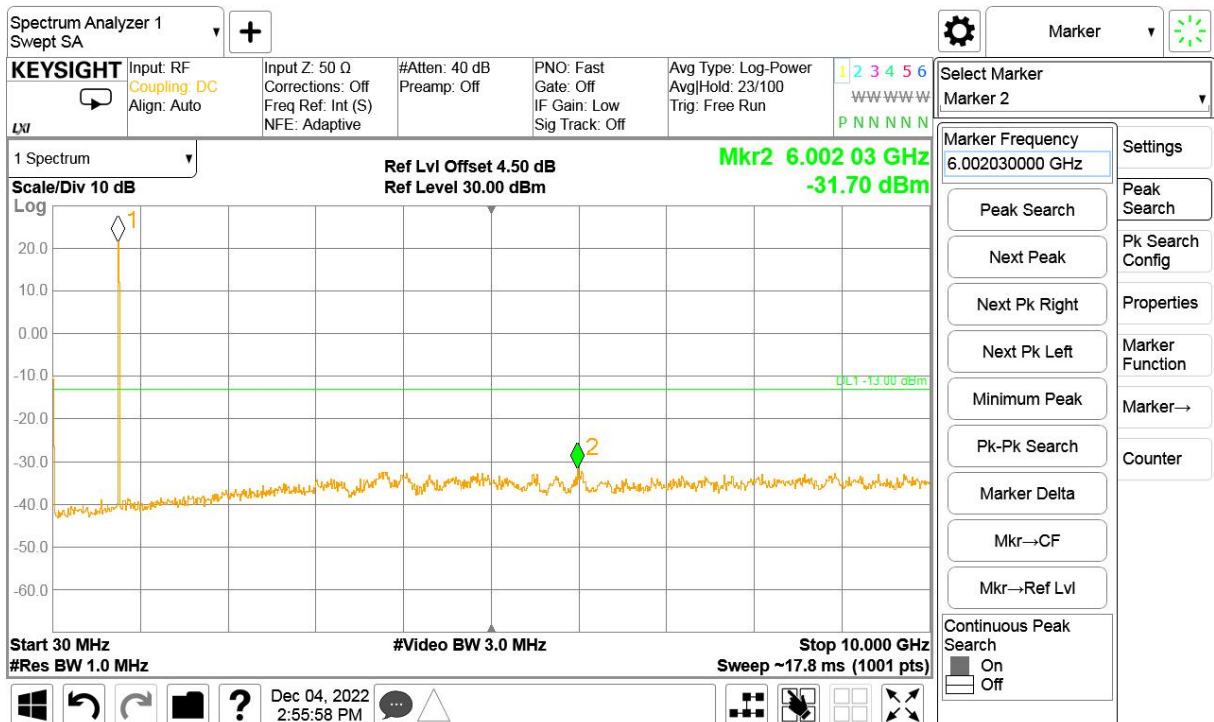
30MHz to 10GHz, Mid Channel, Subcarrier (15kHz), BPSK, 1@0

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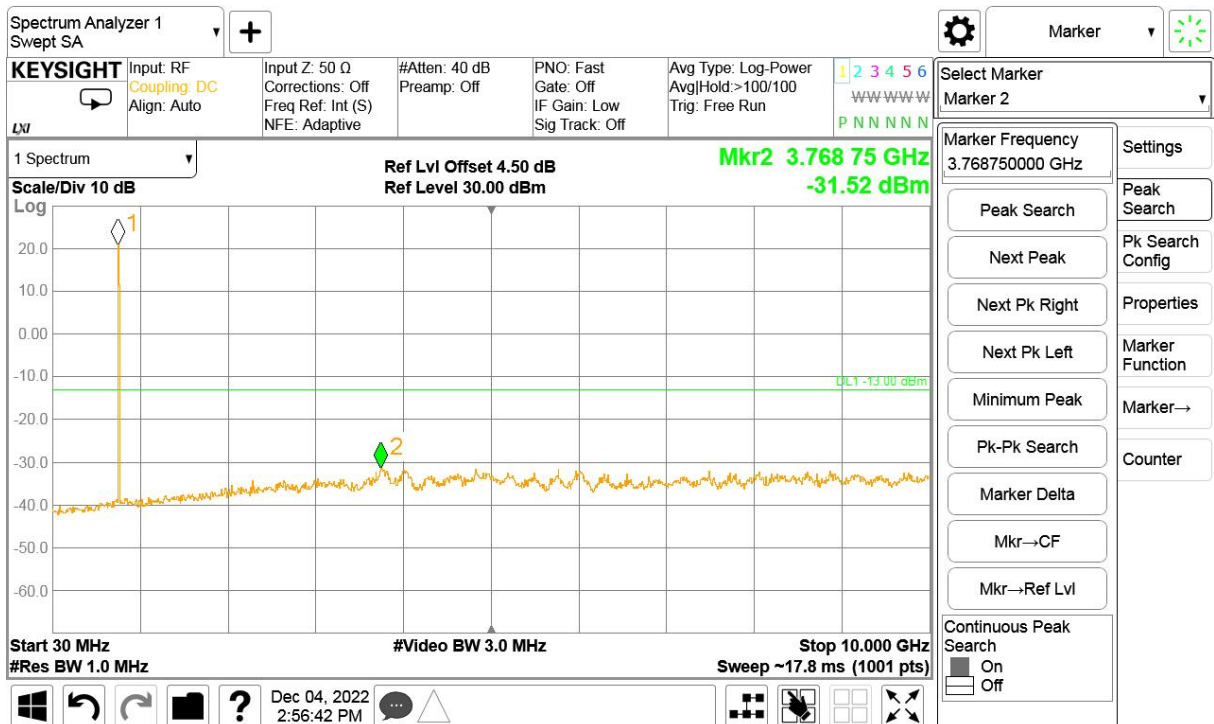
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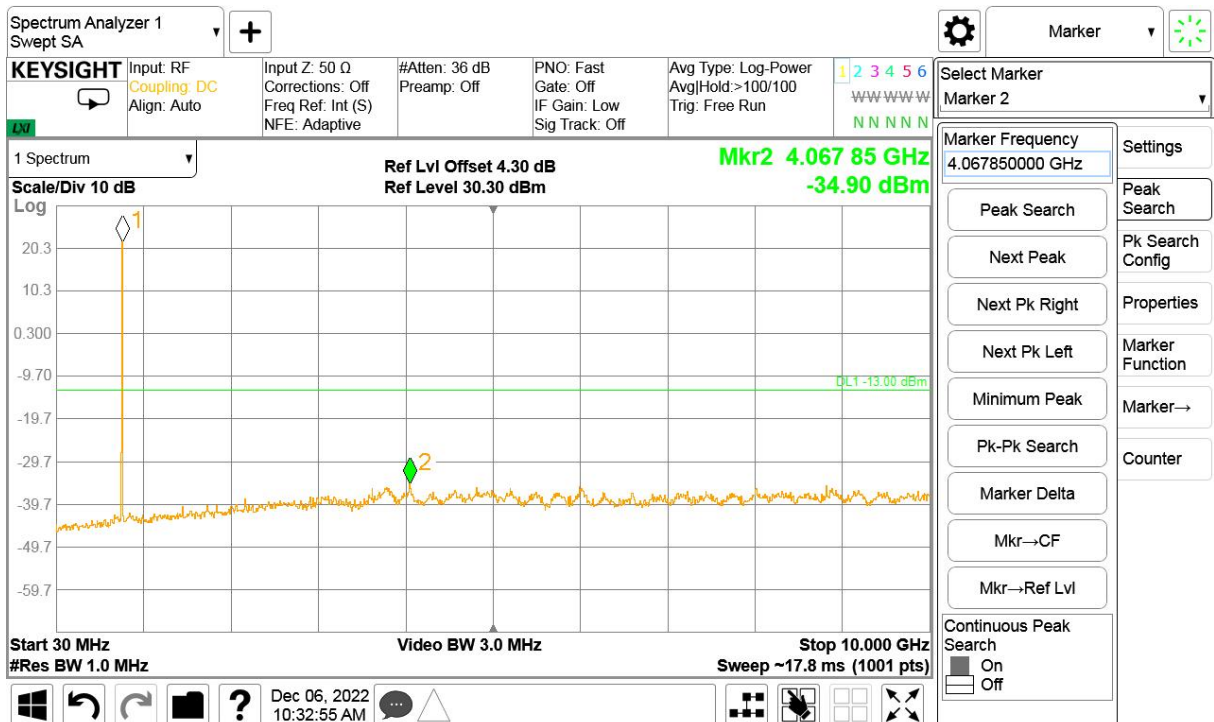
30MHz to 10GHz, High Channel, Subcarrier (3.75kHz), BPSK, 1@0

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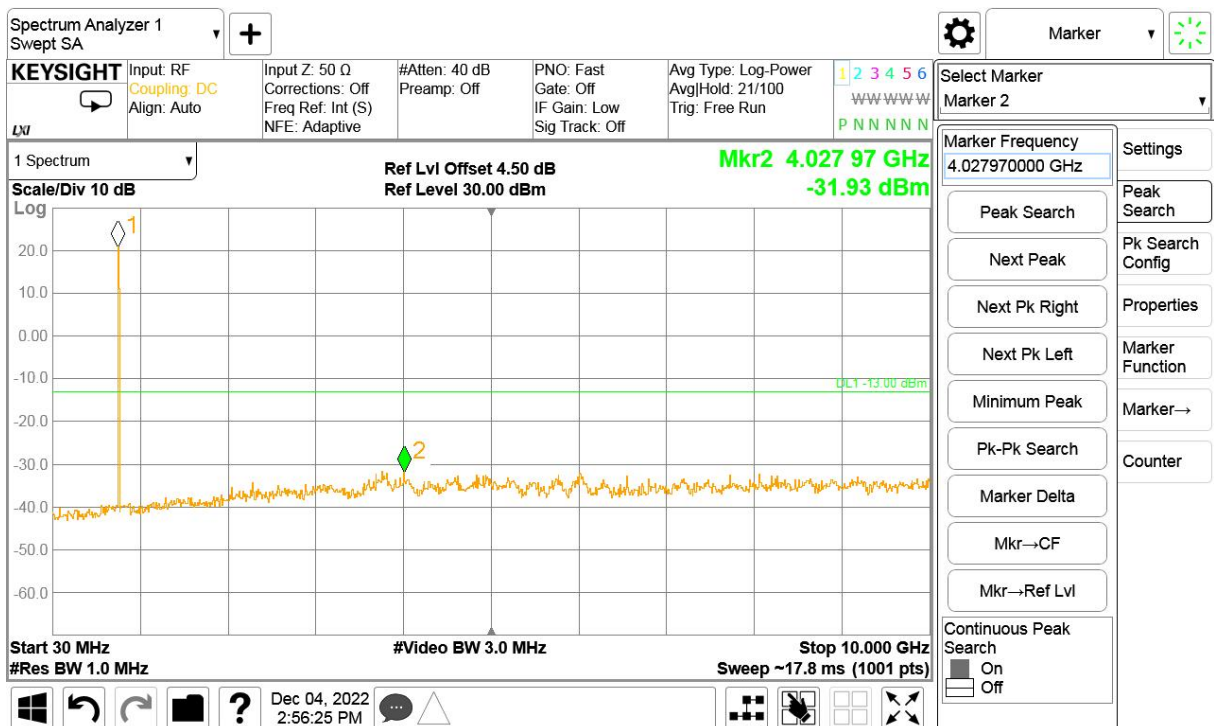
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30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 12@0

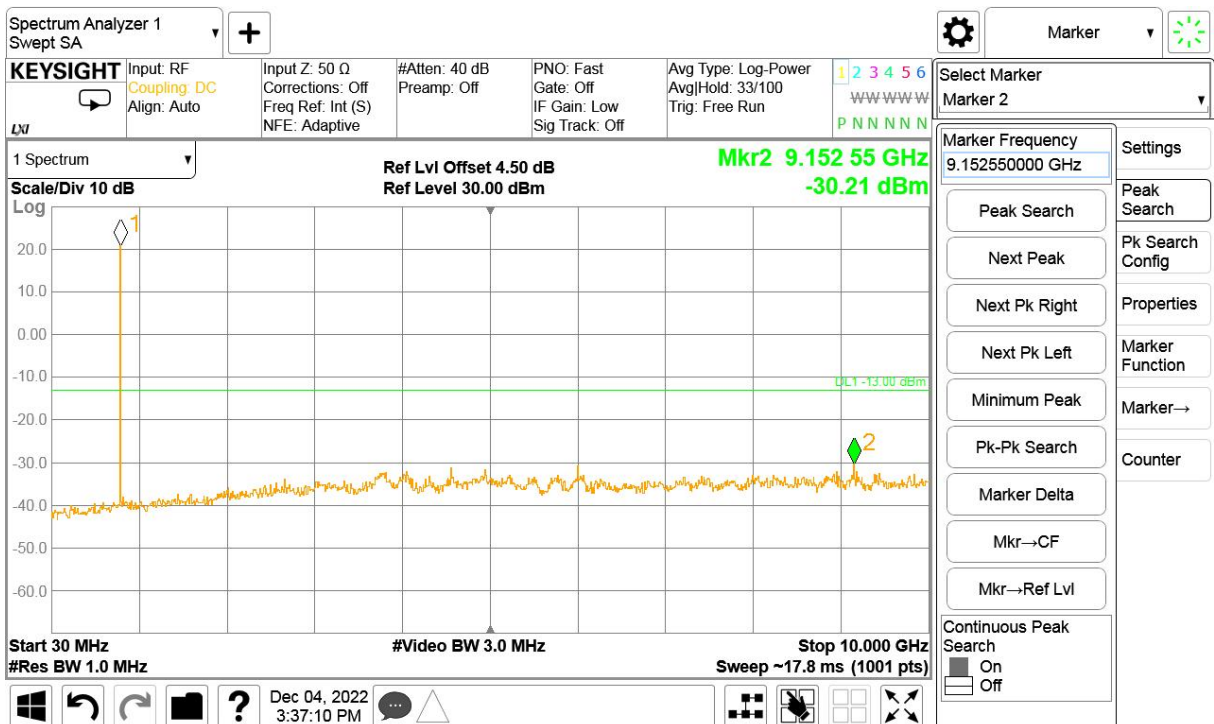
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30MHz to 10GHz, High Channel, Subcarrier (15kHz), BPSK, 1@0

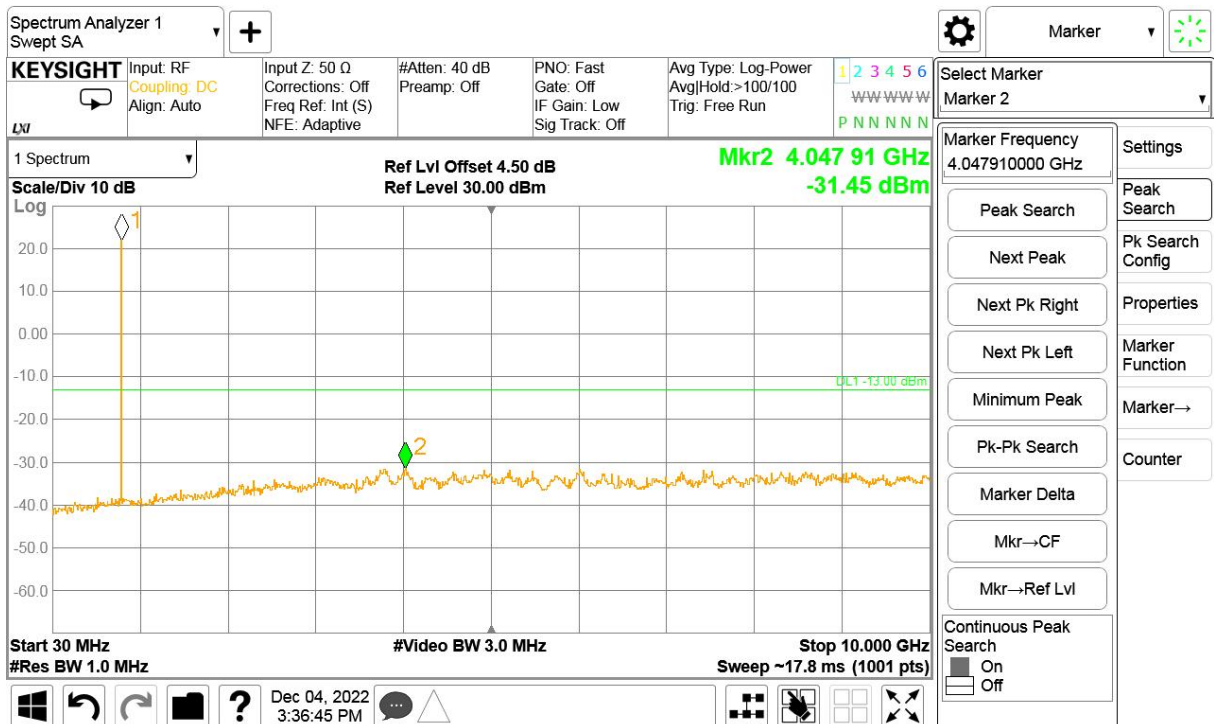
6.5.5 NB-IoT B26Conducted Spurious Emission Results (814MHz-824MHz)



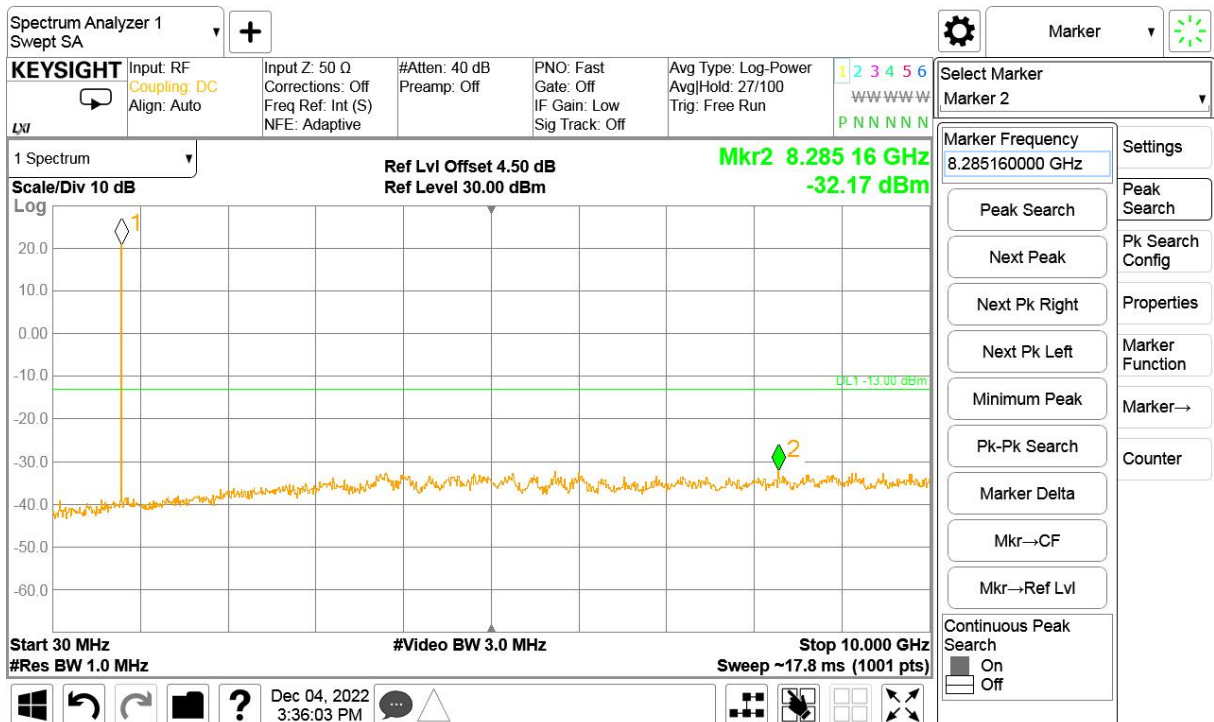
30MHz to 10GHz, Low Channel, Subcarrier (3.75kHz), QPSK, 1@0

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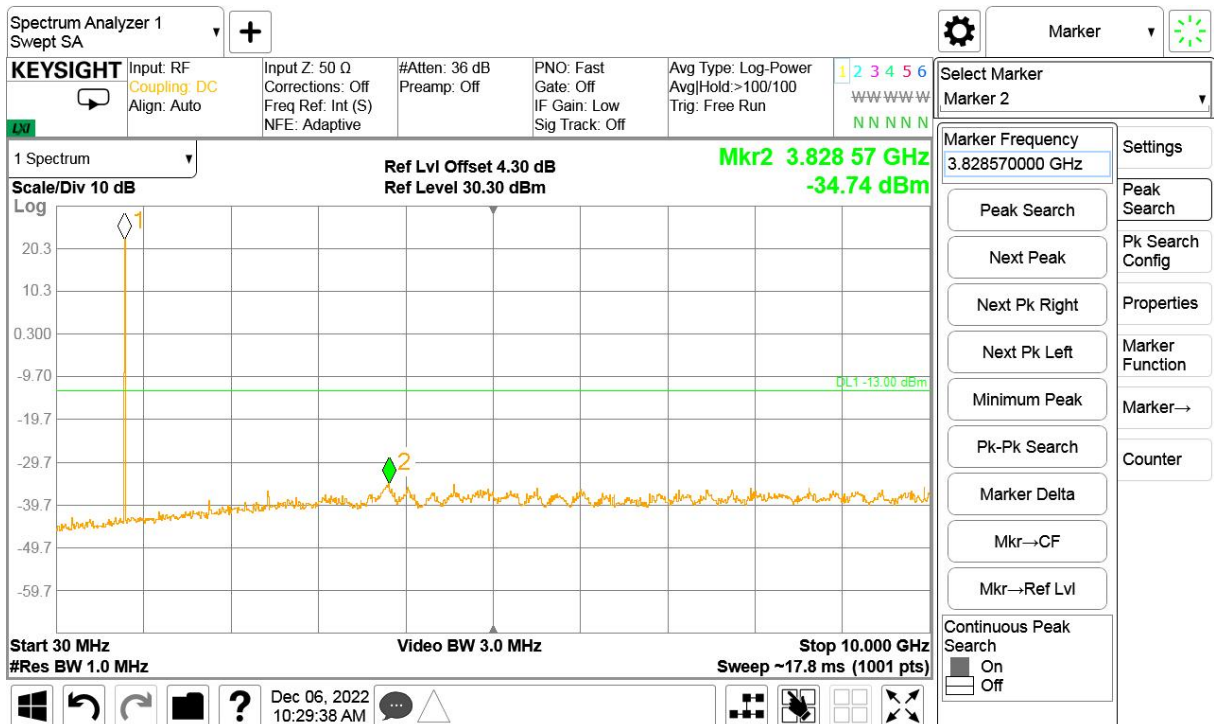
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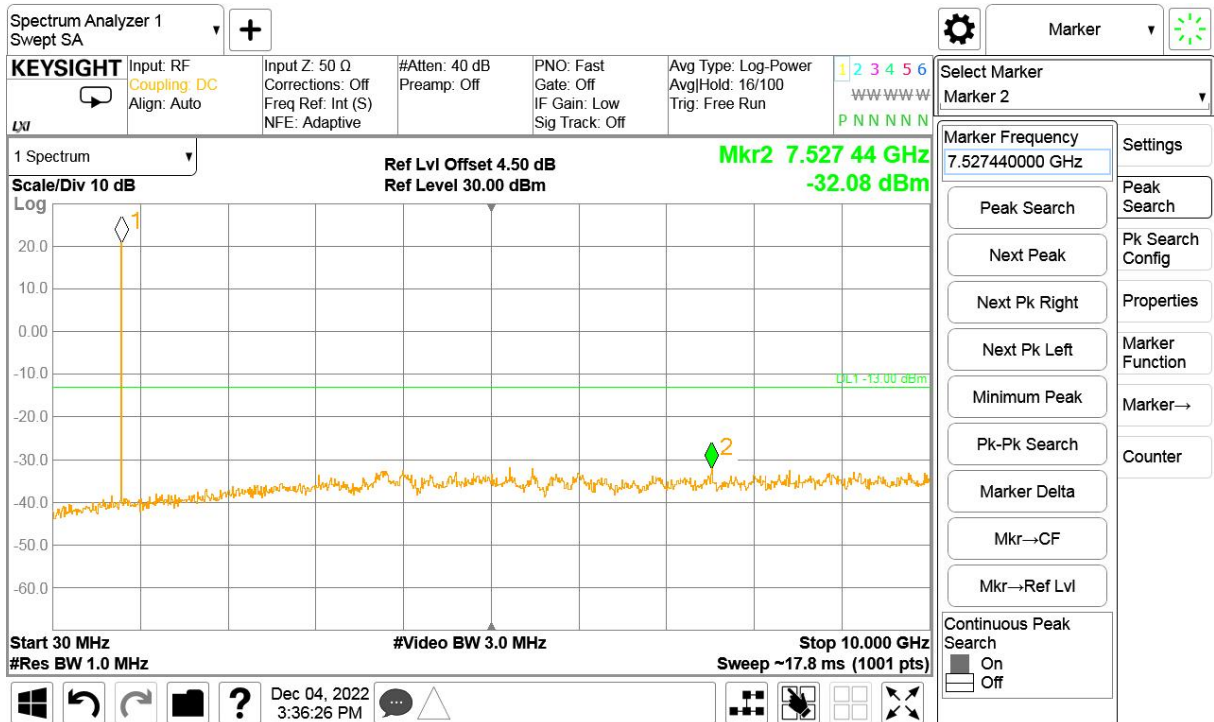
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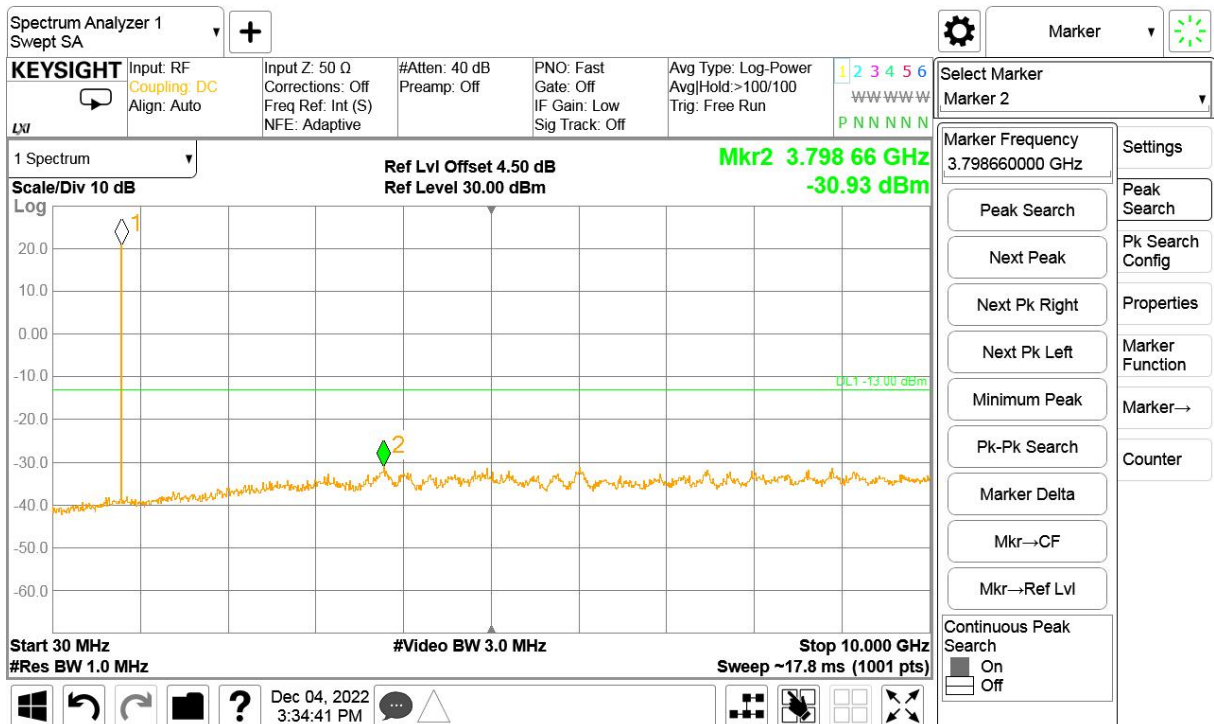
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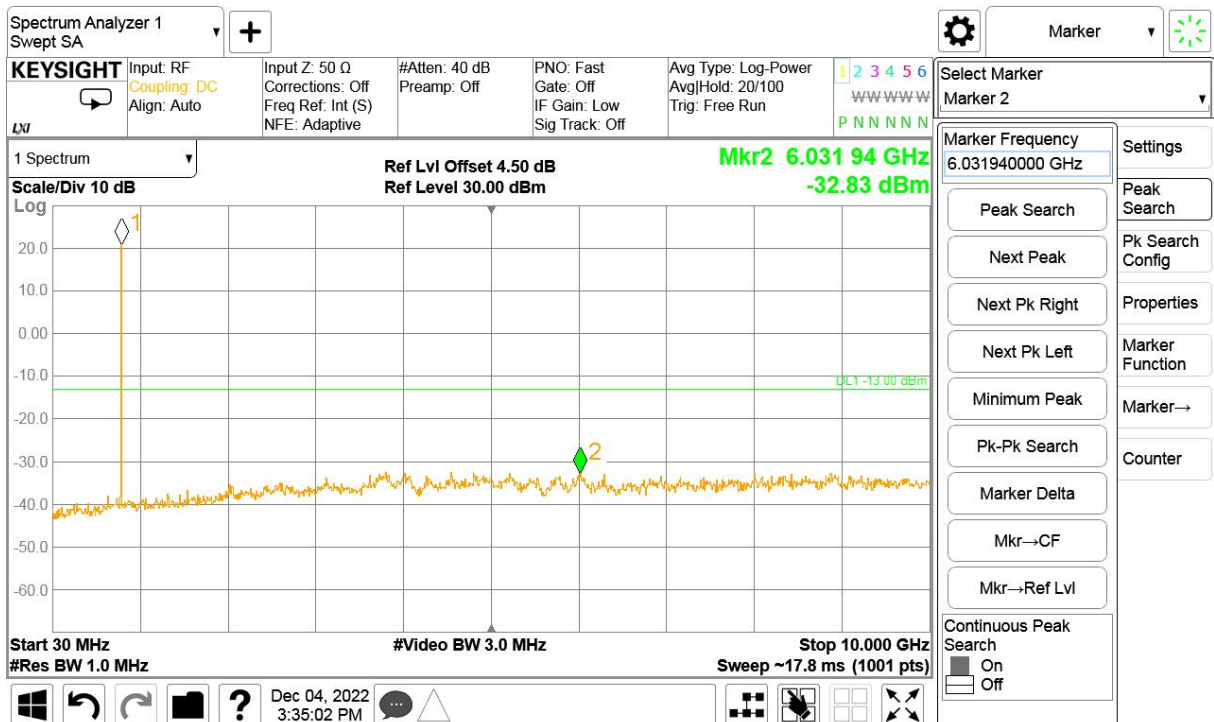
30MHz to 10GHz, Low Channel, Subcarrier (15kHz), BPSK, 1@0

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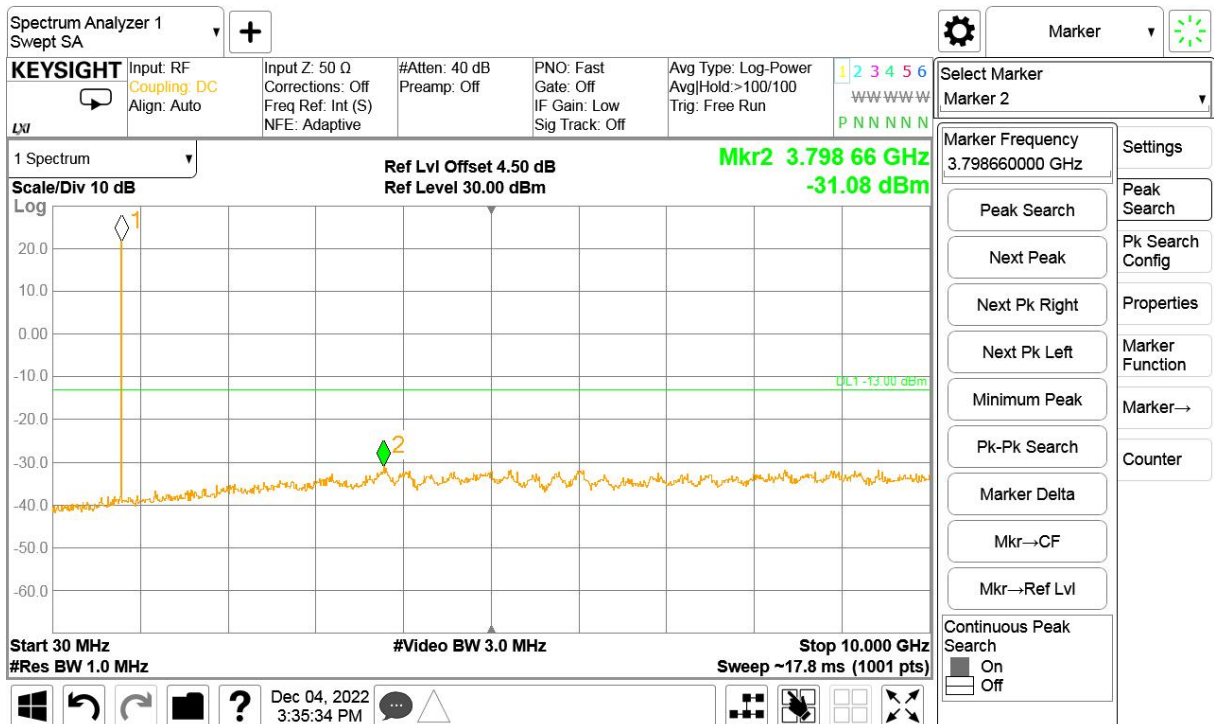
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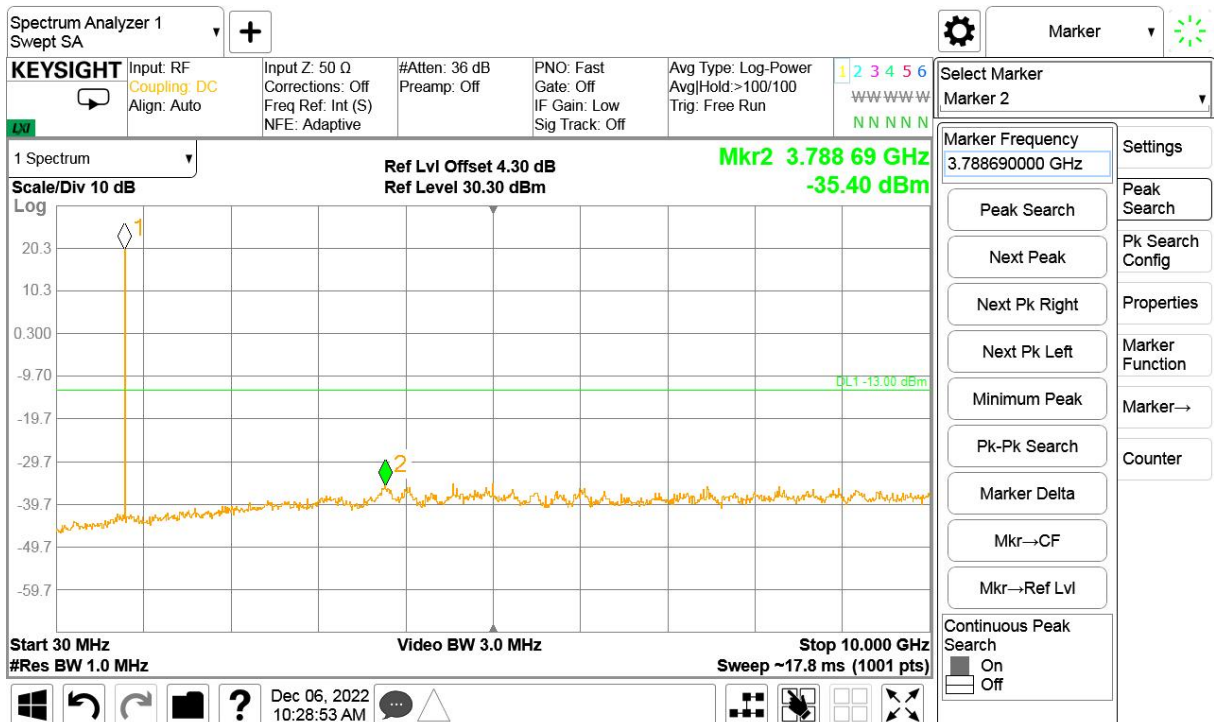
30MHz to 10GHz, Mid Channel, Subcarrier (3.75kHz), BPSK, 1@0

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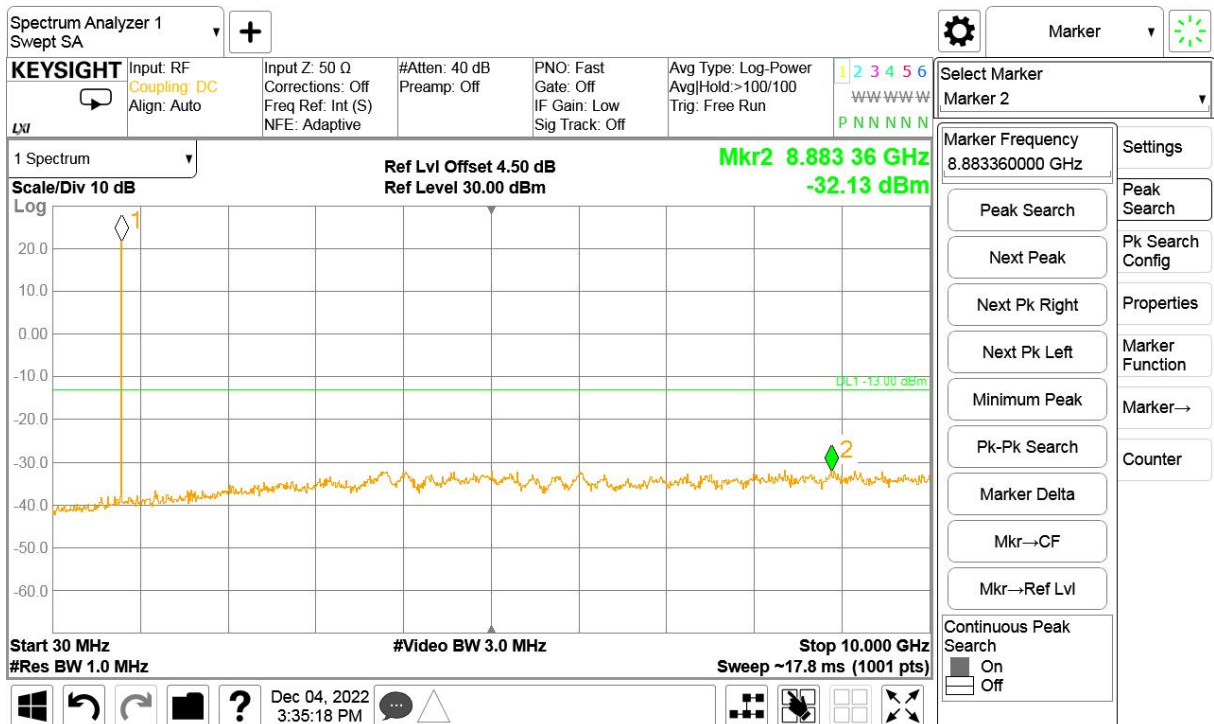
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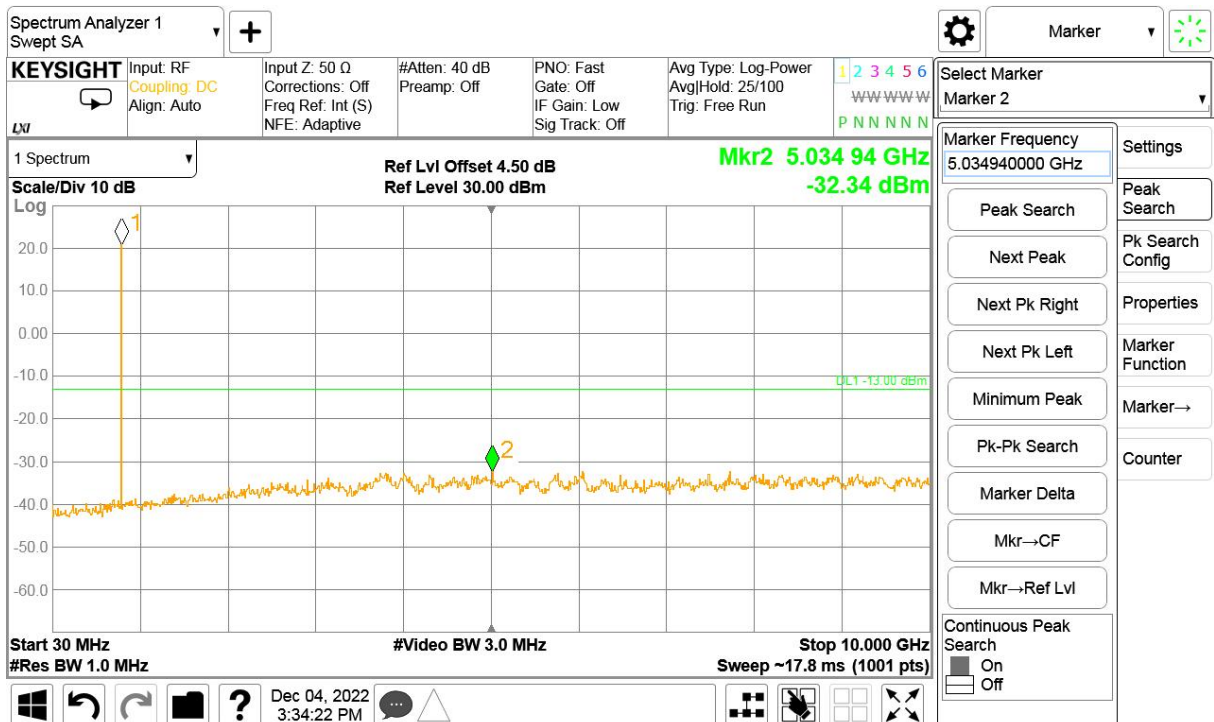
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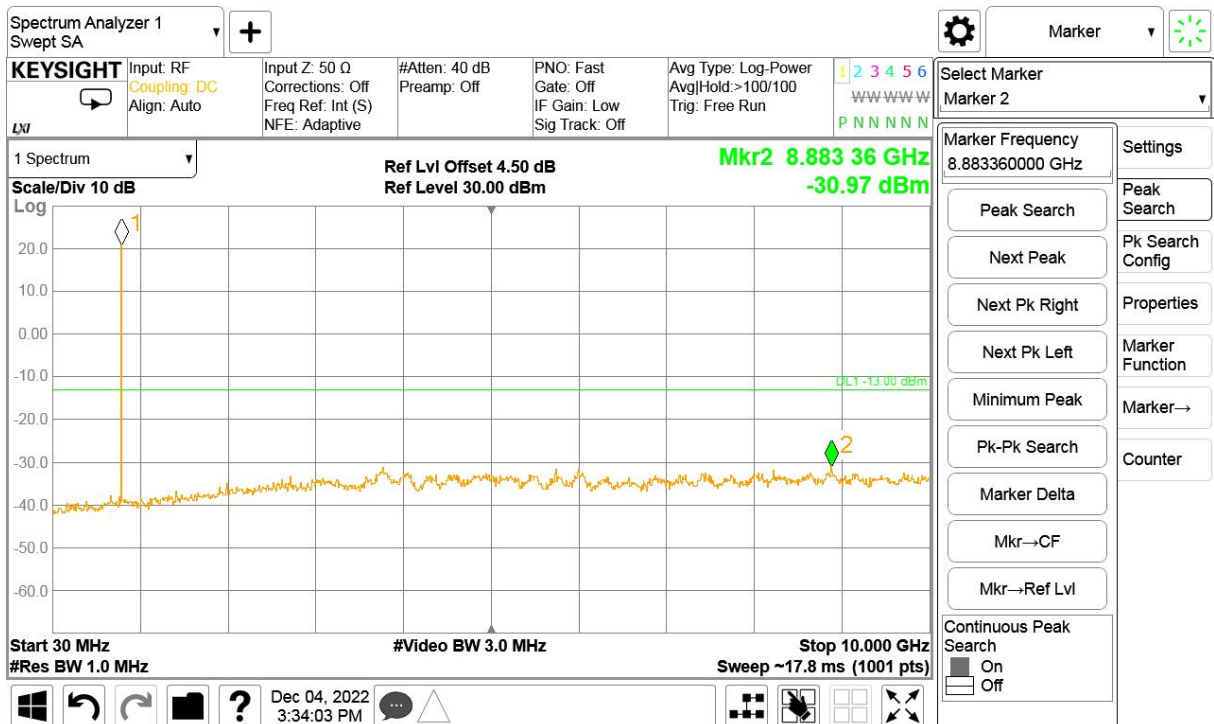
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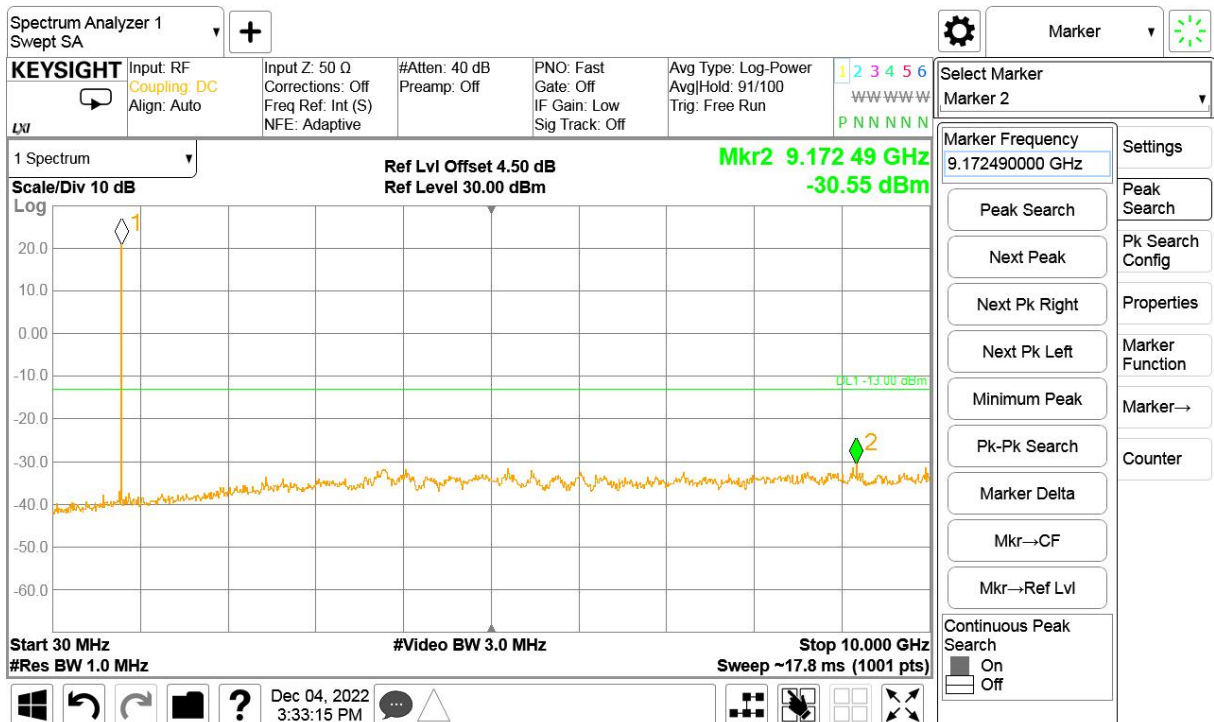
30MHz to 10GHz, High Channel, Subcarrier (3.75kHz), QPSK, 1@0

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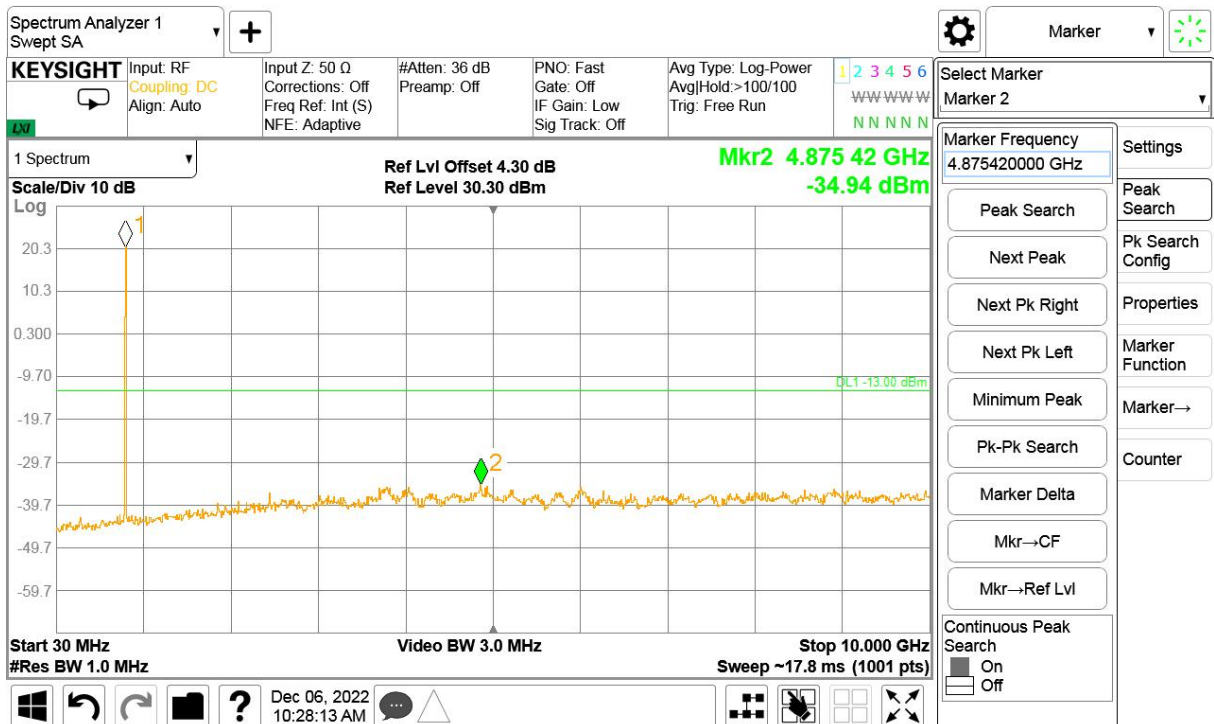
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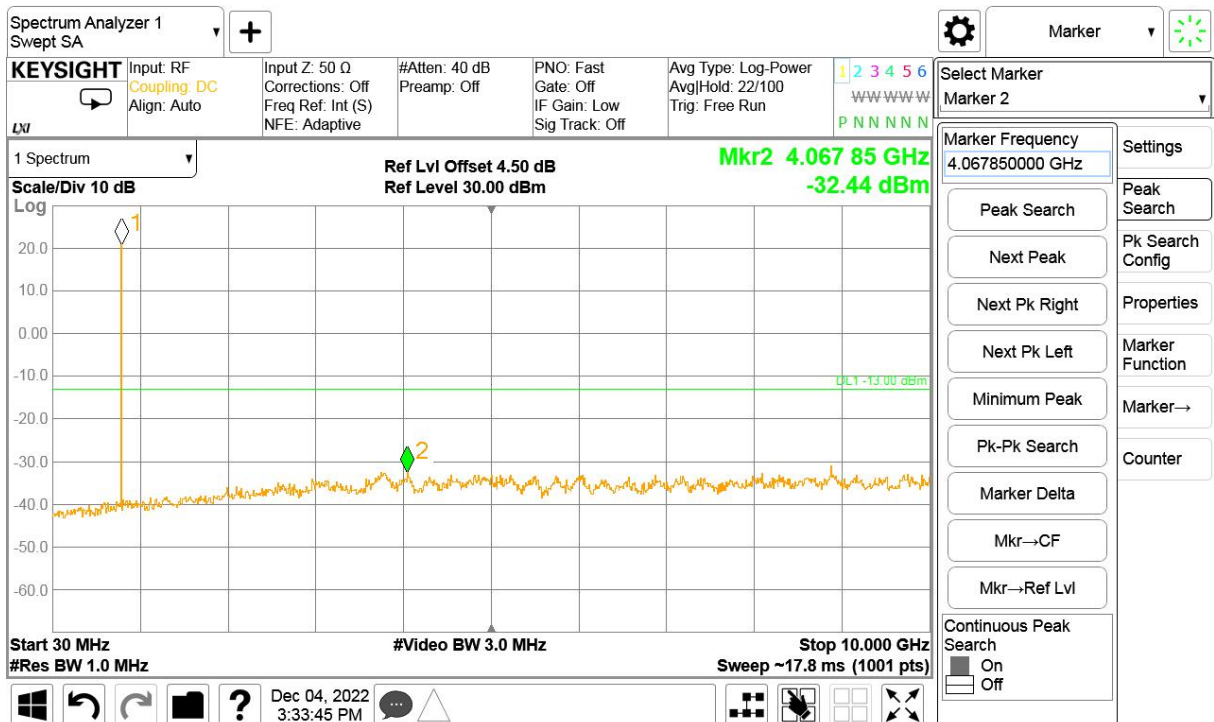
30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 1@0

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30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 12@0

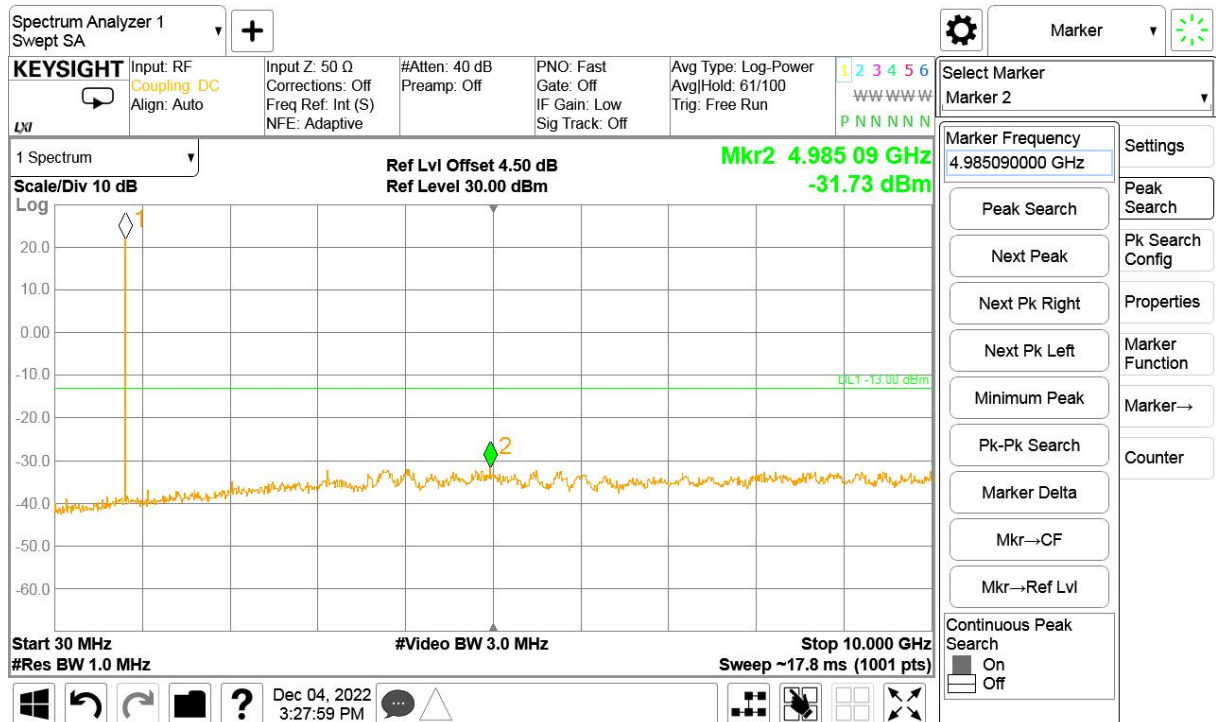


30MHz to 10GHz, High Channel, Subcarrier (15kHz), BPSK, 1@0

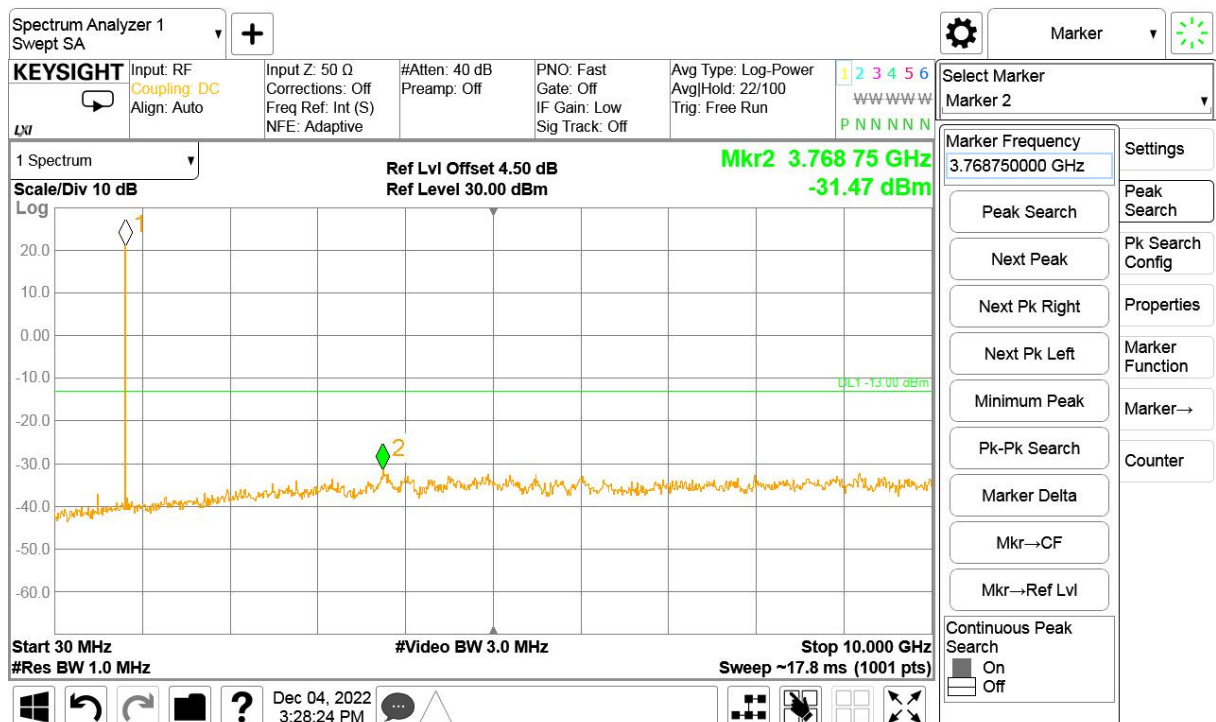
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(824MHz-849MHz)



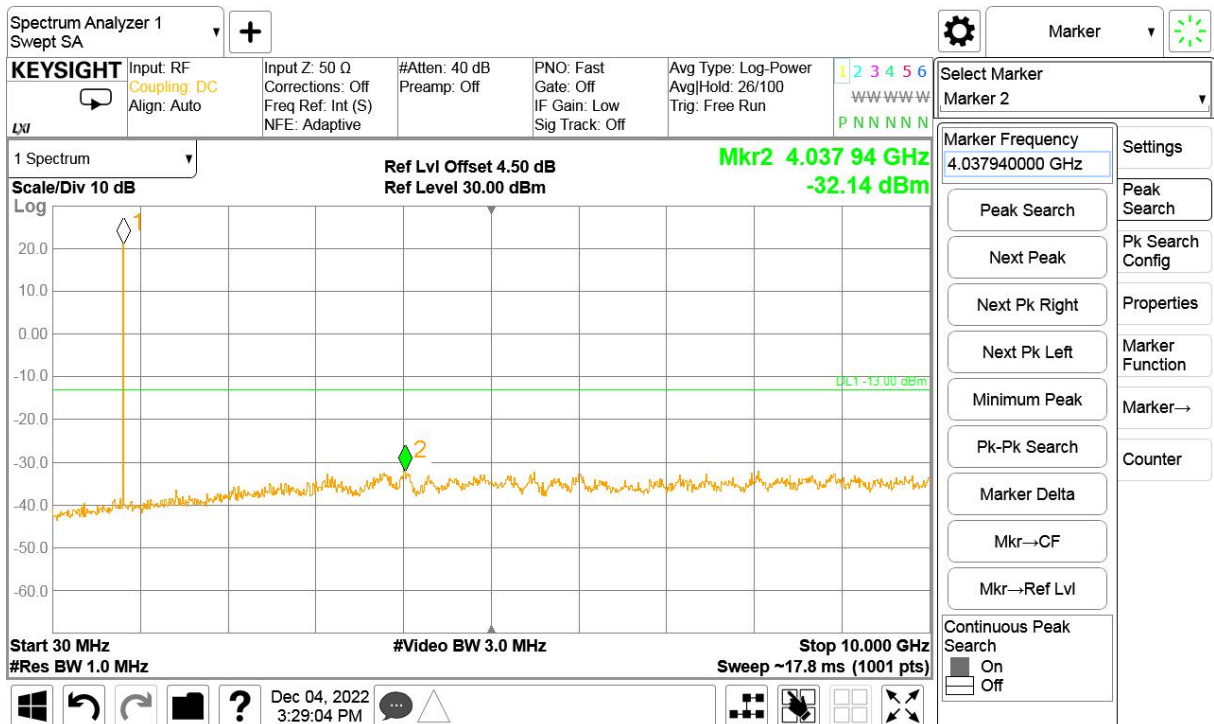
30MHz to 10GHz, Low Channel, Subcarrier (3.75kHz), QPSK, 1@0



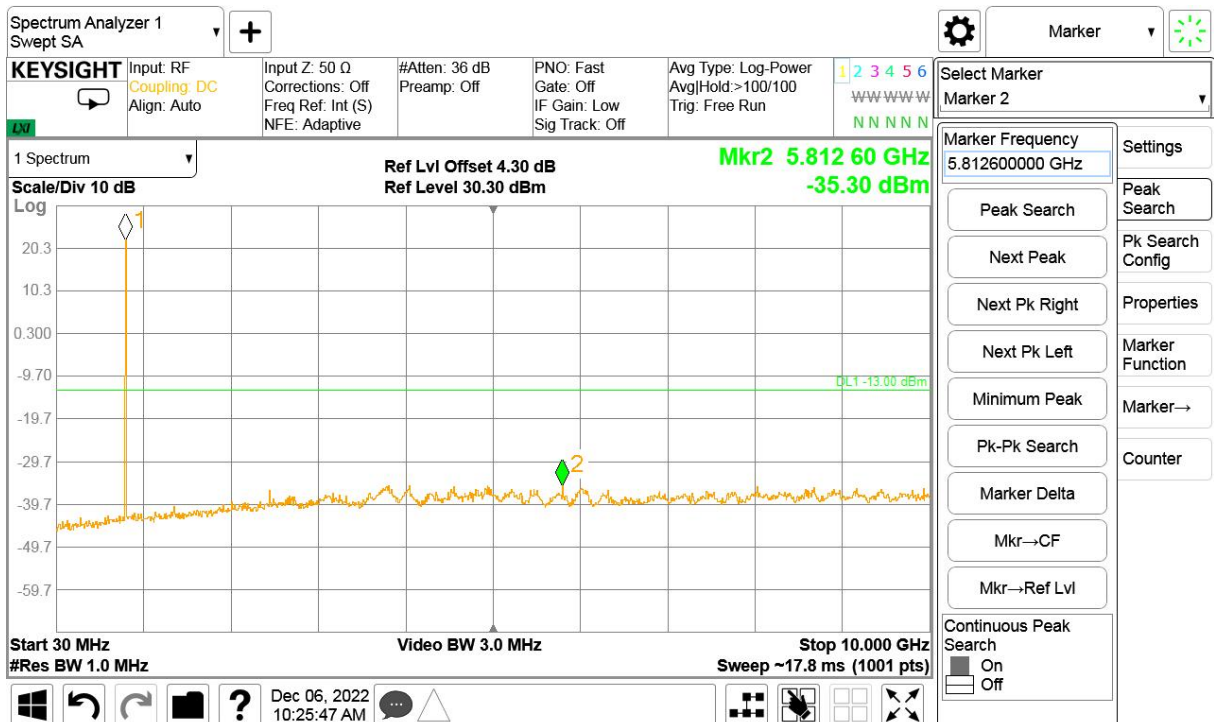
30MHz to 10GHz, Low Channel, Subcarrier (3.75kHz), BPSK, 1@0

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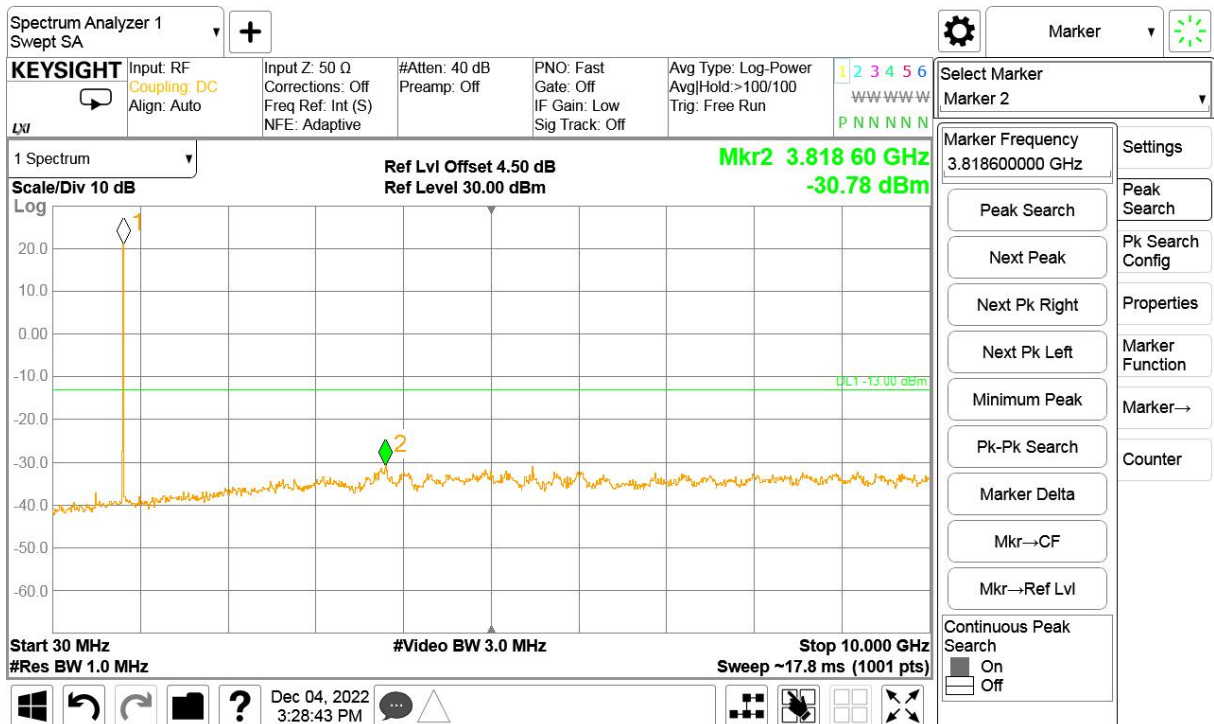
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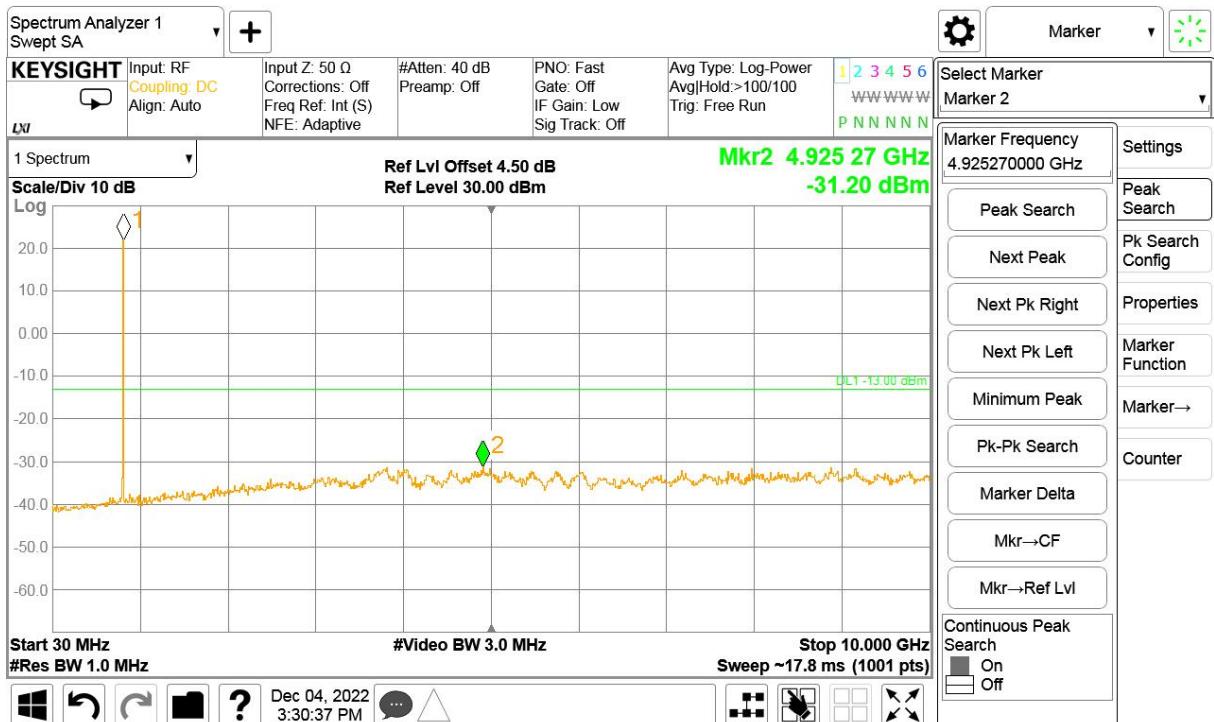
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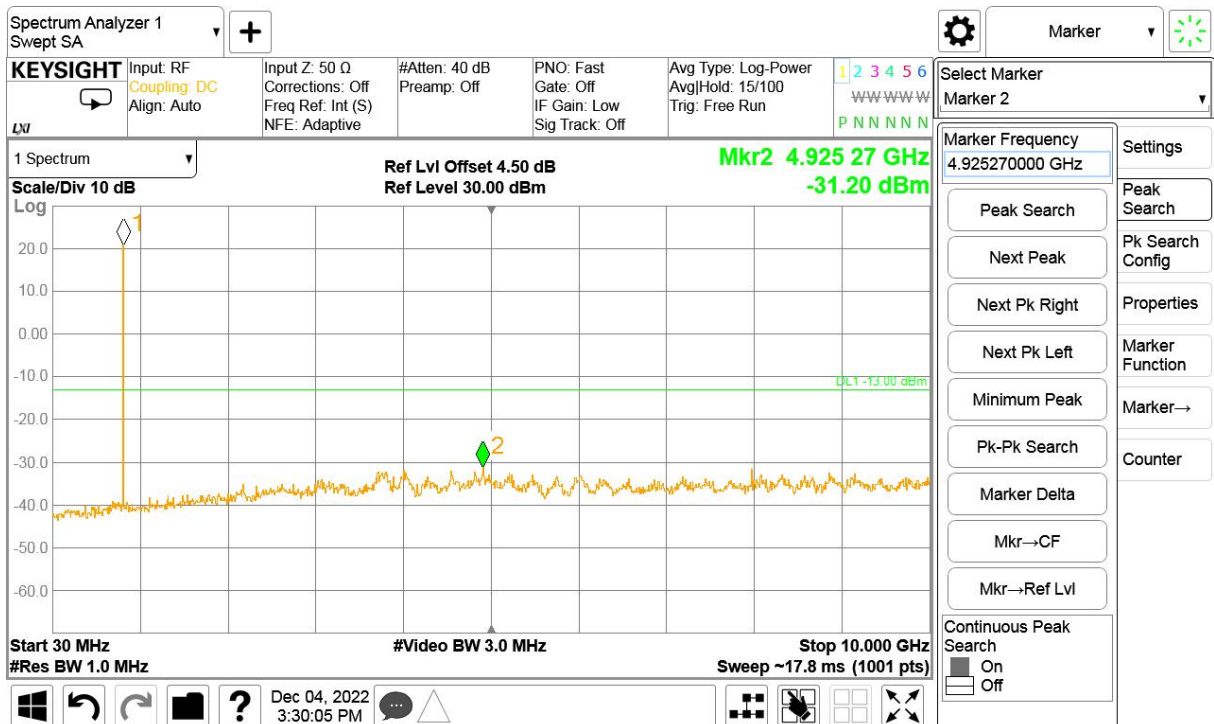
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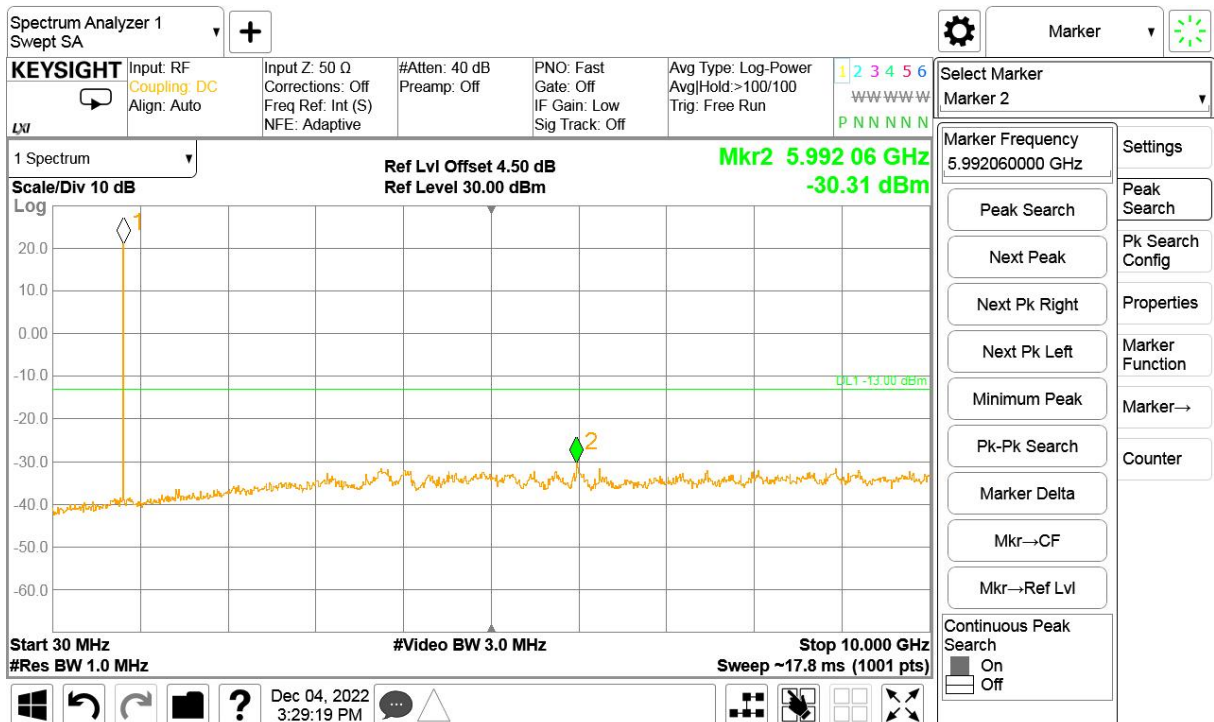
30MHz to 10GHz, Mid Channel, Subcarrier (3.75kHz), QPSK, 1@0

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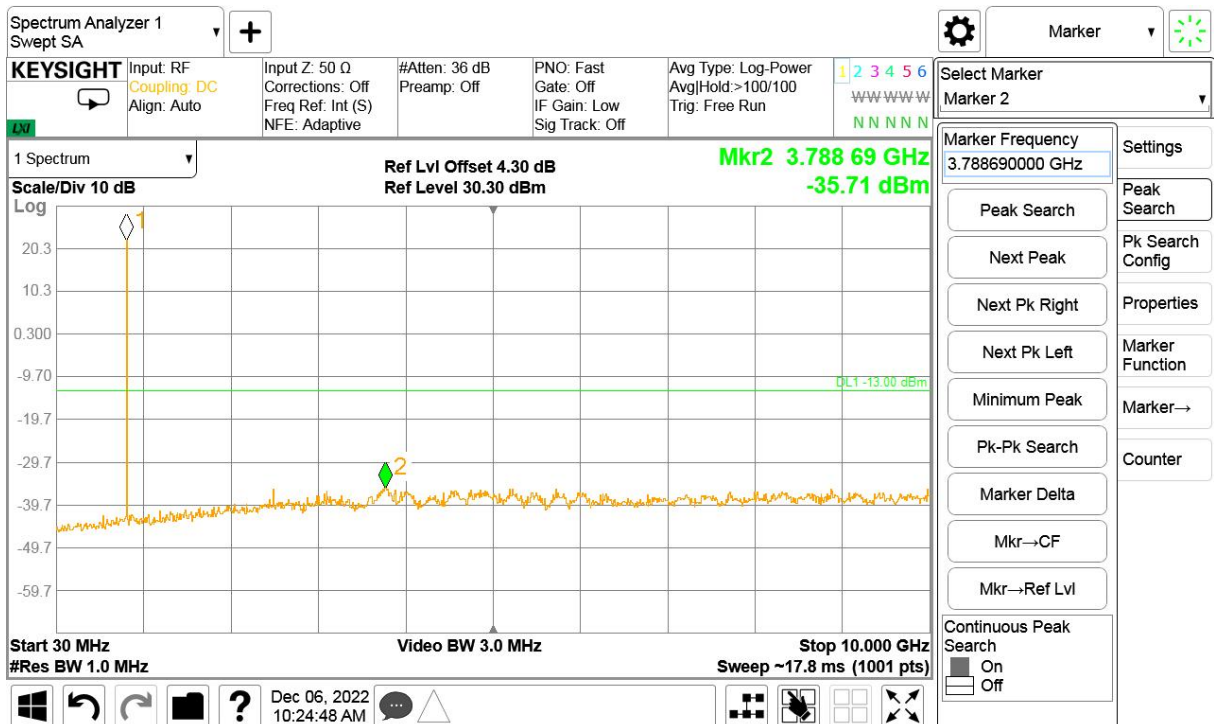
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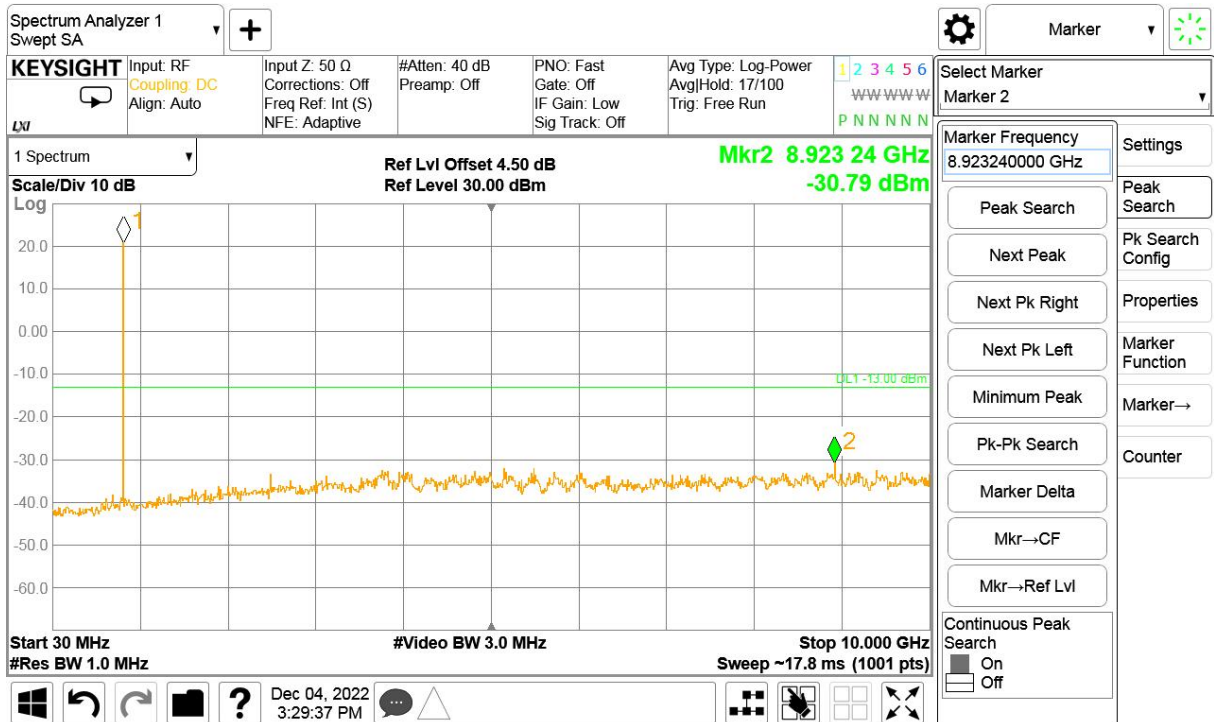
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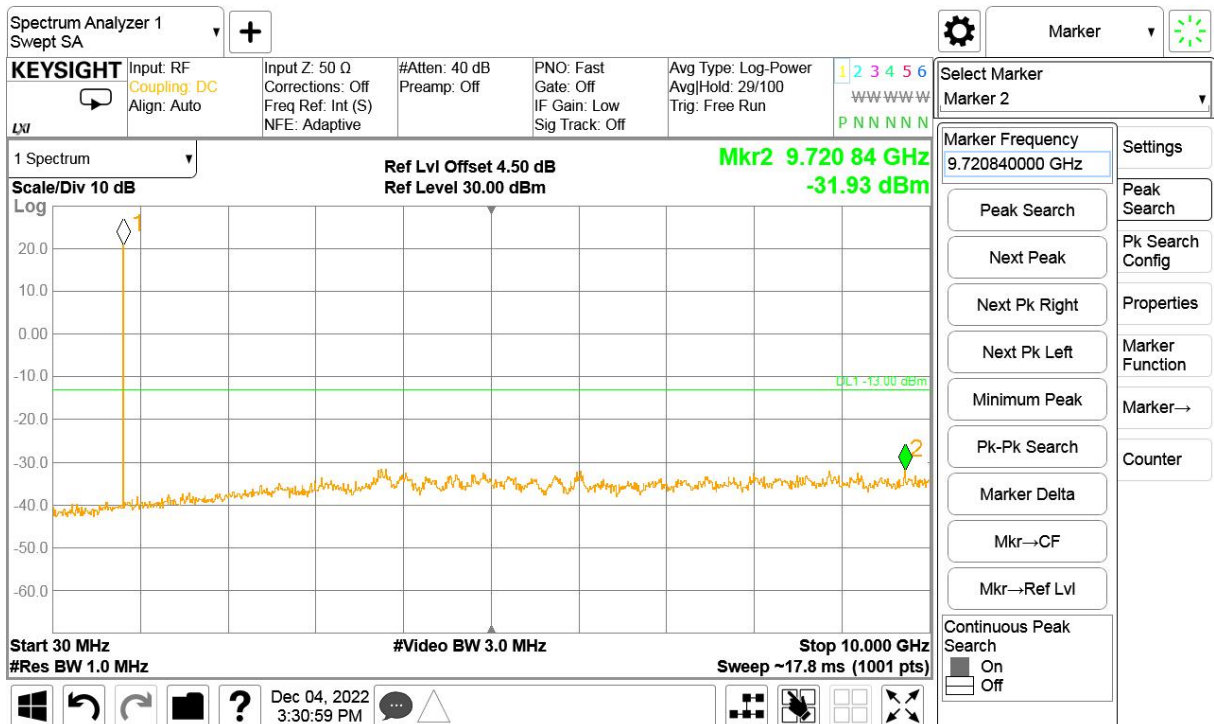
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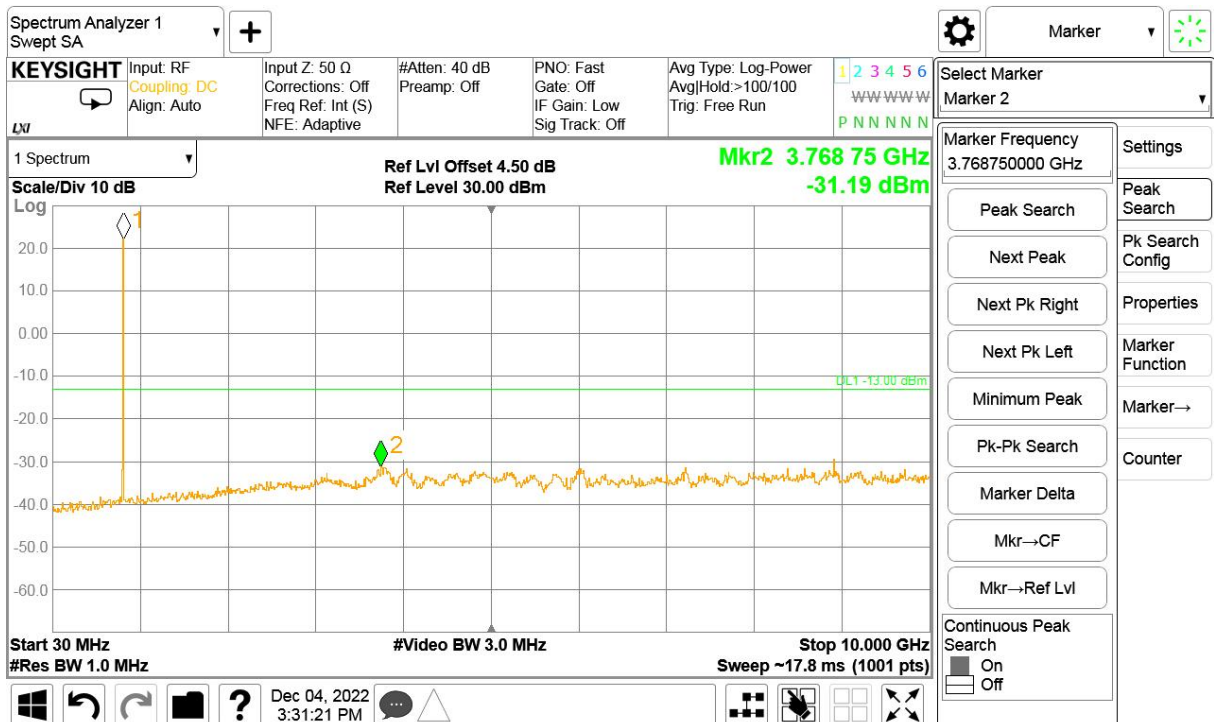
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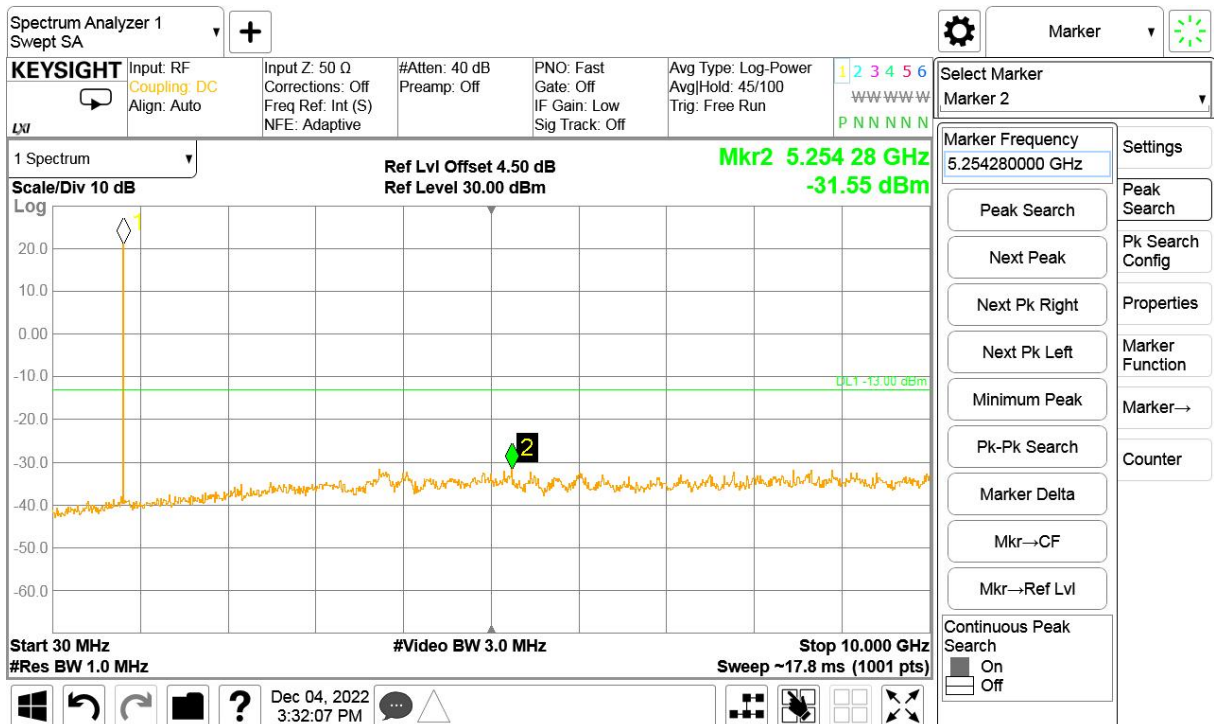
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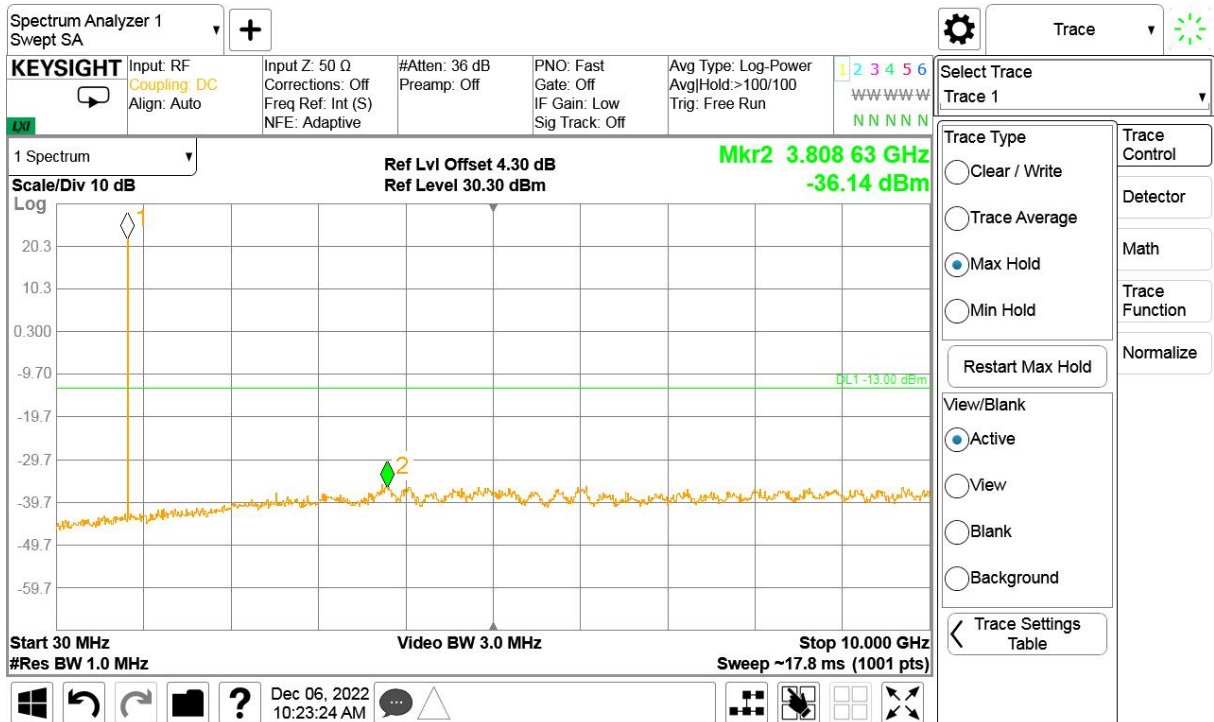
30MHz to 10GHz, High Channel, Subcarrier (3.75kHz), BPSK, 1@0

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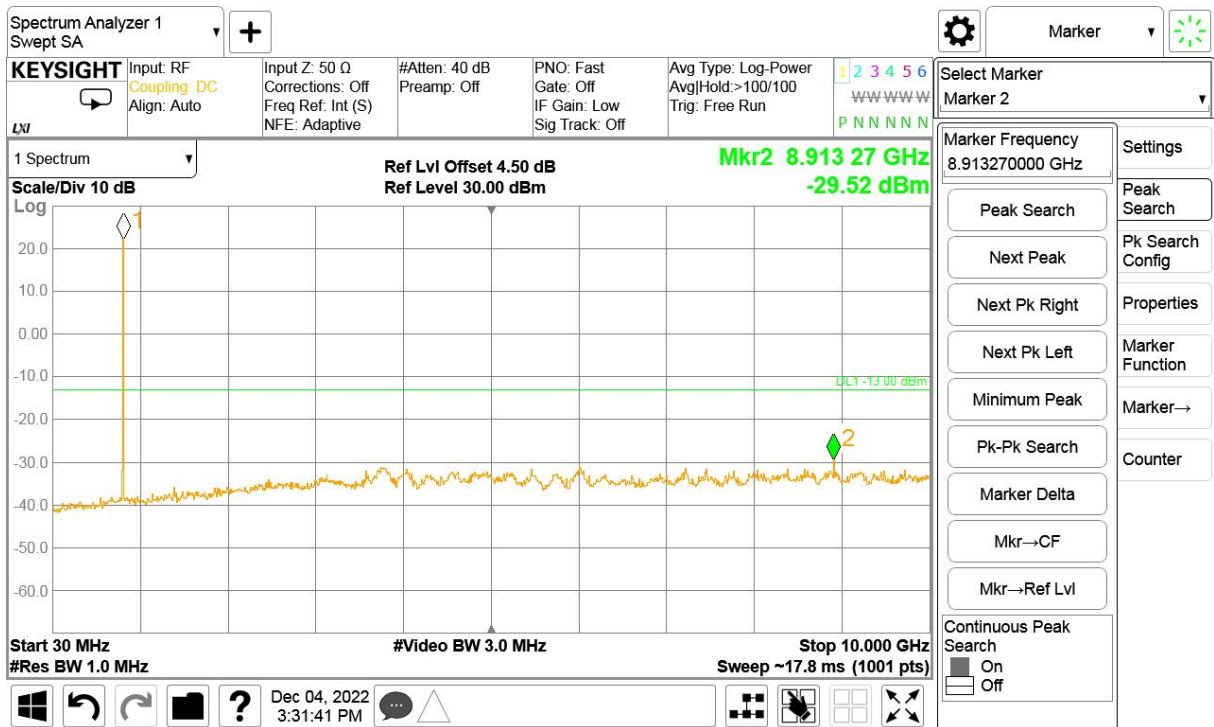
30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 1@0



30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 12@0

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6.5. Radiated Spurious Emission

Specifications:	FCC Part 2.1051, 2.1053, 22.917
DUT Serial Number:	866884049909625
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., 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.

According to Part 24.238 (a), i.e., 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, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

According to Part 27.53(c):

On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

According to Part 27.53(f):

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

According to Part 27.53(h):

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 Bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

According to Part 27.53(g):

For operations in the 600 MHz Band and the 698-746 MHz Band, the power of any emission outside a licensee's frequency Band(s) of operation shall be attenuated below the transmitter power (P) within the licensed Band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution Bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz Bands immediately outside and adjacent to a licensee's frequency block, a resolution Bandwidth of at least 30 kHz may be employed.

According to Part 90.691:

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as

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follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Limits for Radiated spurious emissions(UE)	
Frequency range	Limit Level /Resolution Bandwidth
30 MHz to 20000 MHz	-13dBm/1MHz

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty (30MHz-150MHz)	5.15 dB (k=2)
Expanded Uncertainty (150MHz-1GHz)	4.09dB (k=2)
Expanded Uncertainty (1GHz-3GHz)	2.92dB (k=2)
Expanded Uncertainty (3GHz-6GHz)	2.93dB (k=2)
Expanded Uncertainty (3GHz-20GHz)	2.69dB (k=2)

Test Setup:

The EUT was placed in an anechoic chamber. The Wireless Communications Test Set was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

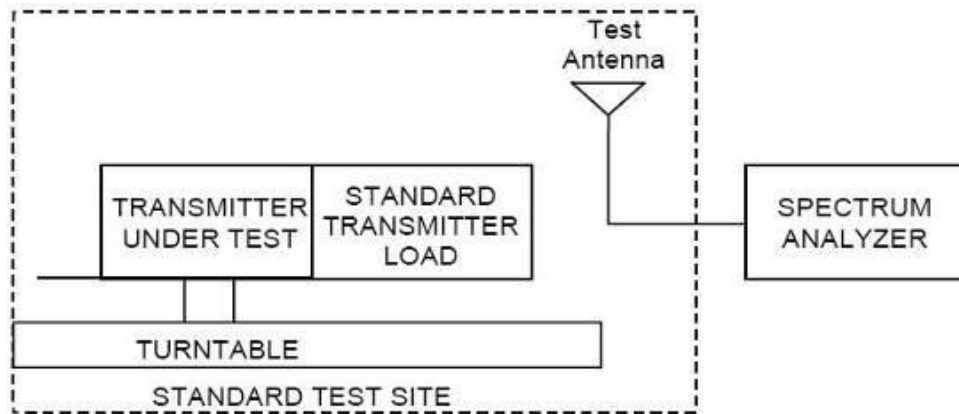
Test Method:

The measurement method is substitution method accordance with section 2.2.12 of ANSI/TIA-603-E: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

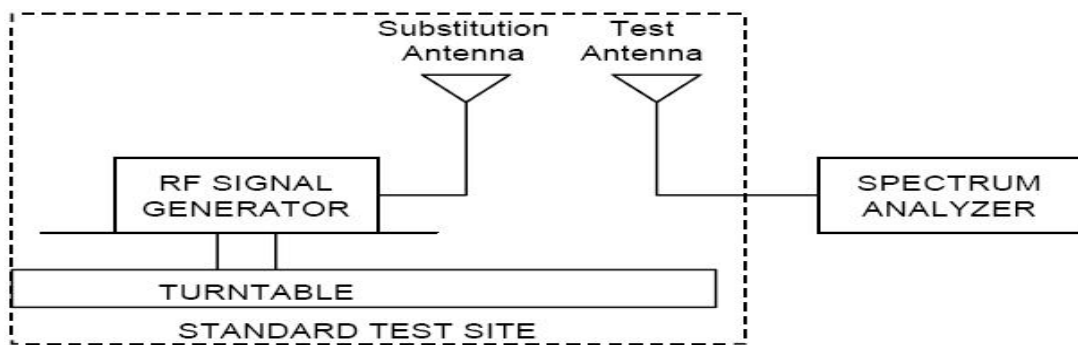
(a) Connect the equipment as illustrated and measure the spurious emissions as the method as above. The distance from the device to the antenna is 3 m .

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(b) Reconnect the equipment as illustrated.



(c) Remove the transmitter and replace it with a substitution antenna. The center of the substitution antenna should be approximately at the same location as the center of the transmitter.

(d) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

(e) Repeat step d) with both antennas vertically polarized for each spurious frequency.

(f) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps d) and e) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

where:

P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

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Test frequency: 30MHz-20GHz

All modes were tested,only the worst case was reported.

NB-IoT B2 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH18602)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
243.638	-83.10	0.37	5.31	-78.16	H
737.120	-85.41	0.67	6.81	-79.27	H
1256.800	-74.13	0.89	7.57	-67.45	V
4922.000	-71.70	1.92	9.46	-64.16	V
6442.400	-70.83	2.33	11.19	-61.97	V
9701.600	-69.20	3.19	12.77	-59.62	V

NB-IoT B2 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH18900)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
241.640	-76.90	0.37	-0.77	-78.04	H
741.760	-77.53	0.67	0.81	-77.39	H
1299.000	-67.09	0.91	1.01	-66.99	V
4931.200	-71.56	1.92	9.46	-64.02	V
7714.000	-69.73	2.63	11.47	-60.89	V
10192.000	-68.97	3.45	13.07	-59.35	V

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NB-IoT B2 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH19198)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
240.012	-83.13	0.37	5.23	-78.27	H
732.000	-85.80	0.66	7.00	-79.46	H
1302.00	-73.48	0.91	7.01	-67.38	V
4884.400	-71.66	1.95	9.46	-64.15	V
6546.000	-70.80	2.44	11.16	-62.08	V
10180.000	-68.96	3.41	13.07	-59.30	V

NB-IoT B4 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH19952)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
137.078	-87.42	0.27	4.76	-82.93	V
244.008	-83.54	0.37	5.31	-78.60	H
1271.000	-74.57	0.89	7.57	-67.89	V
4926.800	-72.59	1.92	9.46	-65.05	V
6493.200	-70.45	2.36	11.16	-61.65	V
9382.800	-69.01	3.26	12.27	-60.00	V

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NB-IoT B4 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH20175)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
237.570	-84.03	0.37	5.35	-79.05	H
900.832	-83.28	0.74	7.11	-76.91	V
1431.400	-73.09	0.95	7.76	-66.28	H
4926.800	-72.22	1.92	9.46	-64.68	V
7756.000	-70.12	2.59	11.69	-61.02	V
10175.600	-68.96	3.41	13.07	-59.30	V

NB-IoT B4 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH20338)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
243.046	-83.03	0.37	5.31	-78.09	H
741.680	-85.86	0.67	6.81	-79.72	H
2449.600	-64.42	1.27	6.31	-59.38	H
4926.000	-72.21	1.92	9.46	-64.67	V
6484.400	-70.67	2.36	11.16	-61.87	V
10202.400	-68.05	3.89	13.07	-58.87	V

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NB-IoT B12 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH23012)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
246.154	-82.59	0.37	5.31	-77.65	H
1194.400	-74.23	0.86	7.71	-67.38	H
1873.600	-68.49	1.10	6.57	-63.02	H
4412.400	-72.34	1.78	9.07	-65.05	V
6484.000	-70.78	2.36	11.16	-61.98	V
10207.600	-68.38	3.89	13.07	-59.20	V

NB-IoT B12 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH23095)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
241.862	-82.87	0.37	5.23	-78.01	H
736.240	-85.12	0.67	6.76	-79.03	H
1276.800	-73.61	0.89	7.01	-67.49	V
4922.400	-71.98	1.92	9.46	-64.44	V
8182.800	-68.91	2.74	11.71	-59.94	V
10222.400	-69.00	3.46	13.07	-59.39	V

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NB-IoT B12 Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH23178)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
242.158	-81.56	0.37	5.23	-76.70	H
1100.200	-73.50	0.83	6.76	-67.57	V
1871.000	-68.56	1.10	6.57	-63.09	H
4922.400	-72.28	1.92	9.46	-64.74	V
6462.000	-70.45	2.39	11.16	-61.68	V
10178.400	-68.89	3.41	13.07	-59.23	V

NB-IoT B13 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH23182)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
240.900	-83.47	0.37	5.23	-78.61	H
664.160	-88.05	0.64	7.09	-81.60	V
1279.600	-73.61	0.89	7.01	-67.49	V
4911.200	-72.37	1.95	9.46	-64.86	V
6493.600	-70.47	2.42	11.16	-61.73	V
9393.200	-68.45	3.45	12.27	-59.63	V

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NB-IoT B13 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH23230)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
244.304	-82.67	0.37	5.31	-77.73	H
1287.600	-73.71	0.90	7.01	-67.60	V
1945.000	-68.98	1.13	6.83	-63.28	H
4932.400	-72.32	1.92	9.46	-64.78	V
6488.800	-73.20	2.36	11.16	-64.40	V
10212.400	-68.46	3.89	13.07	-59.28	V

NB-IoT B13 Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH23278)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
242.158	-83.56	0.37	5.23	-78.70	H
680.000	-87.42	0.64	7.08	-80.98	V
1293.400	-73.77	0.91	7.01	-67.67	V
4930.400	-72.20	1.92	9.46	-64.66	V
6464.400	-70.33	2.39	11.16	-61.56	V
9426.000	-68.17	3.41	12.27	-59.31	V

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NB-IoT B26 (814MHz-824MHz) Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH26692)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
241.936	-75.64	0.37	5.23	-70.78	H
1194.200	-67.06	0.86	7.71	-60.21	H
2164.200	-59.79	1.20	6.68	-54.31	V
4940.800	-70.36	1.93	9.46	-62.83	V
6473.200	-69.82	2.36	11.16	-61.02	V
9373.200	-68.02	3.22	12.27	-58.97	V

NB-IoT B26 (814MHz-824MHz)Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH26740)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
241.344	-82.86	0.37	5.23	-78.00	H
722.960	-84.29	0.66	7.28	-77.67	H
1297.800	-73.40	0.91	7.01	-67.30	V
4920.400	-70.70	1.92	9.46	-63.16	V
6520.800	-70.27	2.40	11.16	-61.51	V
9385.600	-68.24	3.45	12.27	-59.42	V

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NB-IoT B26 (814MHz-824MHz)Radiated Spurious Emission Results

Test Data (15K bandwidth BPSK Mode CH26788)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
246.006	-83.55	0.37	5.31	-78.61	H
1266.000	-74.27	0.88	7.57	-67.58	V
2000.000	-69.29	1.14	7.55	-62.88	V
4928.000	-71.64	1.92	9.46	-64.10	V
6484.400	-70.41	2.36	11.16	-61.61	V
9464.800	-68.21	3.38	12.41	-59.18	V

NB-IoT B26 (824MHz-849MHz)Radiated Spurious Emission Results

Test Data (3.75K bandwidth BPSK Mode CH26792)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
242.824	-76.02	0.37	5.31	-71.08	H
1241.900	-67.69	0.88	7.57	-61.00	V
2153.100	-60.00	1.20	6.68	-54.52	H
4339.200	-71.37	1.76	8.76	-64.37	V
6525.600	-70.20	2.37	11.16	-61.41	V
9399.200	-68.22	3.28	12.27	-59.23	V

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NB-IoT B26 (824MHz-849MHz)Radiated Spurious Emission Results
Test Data (3.75K bandwidth BPSK Mode CH26915)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
244.156	-76.01	0.37	5.31	-71.07	H
579.040	-81.71	0.59	7.00	-75.30	V
1506.000	-65.37	0.97	7.45	-58.89	H
4920.400	-70.82	1.92	9.46	-63.28	V
6462.800	-69.80	2.39	11.16	-61.03	V
9371.200	-68.43	3.22	12.27	-59.38	V

NB-IoT B26 (824MHz-849MHz)Radiated Spurious Emission Results
Test Data (3.75K bandwidth BPSK Mode CH27038)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
242.306	-74.20	0.37	5.23	-69.34	H
1274.400	-67.79	0.89	7.57	-61.11	V
1979.400	-61.73	1.13	7.55	-55.31	H
4321.200	-70.68	1.80	8.76	-63.72	V
6486.800	-69.81	2.36	11.16	-61.01	V
9423.600	-68.36	3.30	12.27	-59.39	V

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6.6. Band Edge

Specifications:	FCC Part 2.1051,24.238, 2.1053, 22.917, 27.53,90.691
DUT Serial Number:	866884049909625
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., 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.

According to Part 24.238 (a), i.e., 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, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

According to Part 27.53(c):

On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

According to Part 27.53(f):

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

According to Part 27.53(h):

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 Bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

According to Part 27.53(g):

For operations in the 600 MHz Band and the 698-746 MHz Band, the power of any emission outside a licensee's frequency Band(s) of operation shall be attenuated below the transmitter power (P) within the licensed Band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution Bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz Bands immediately outside and adjacent to a licensee's frequency block, a resolution Bandwidth of at least 30 kHz may be employed.

According to Part 90.691:

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

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