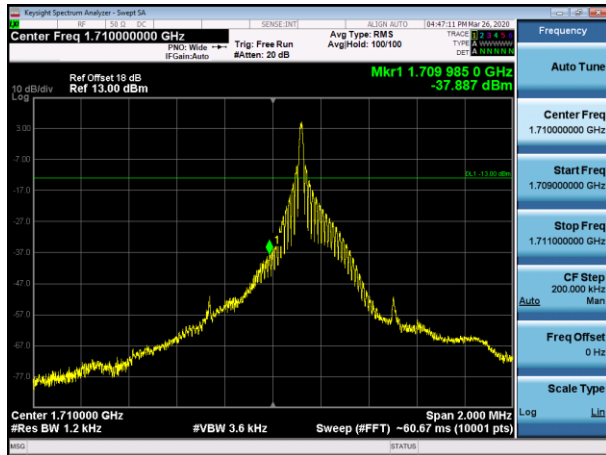
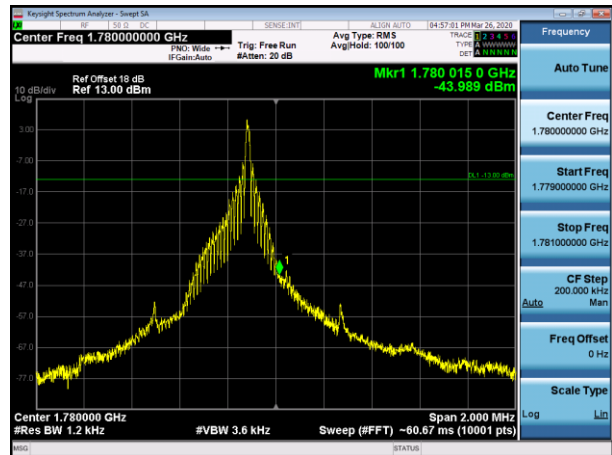


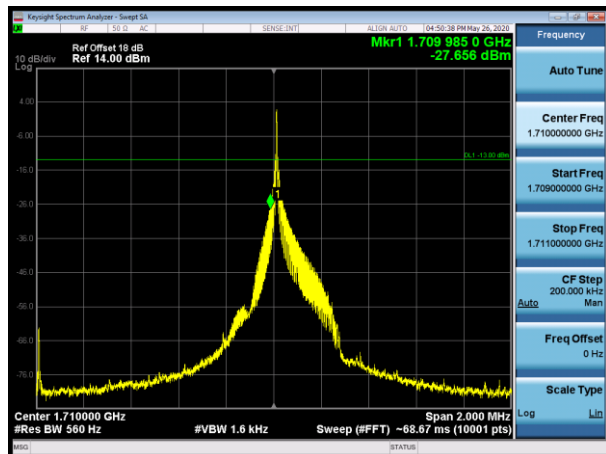
Channel 131974-1 tone offset 0, BW 15kHz, QPSK



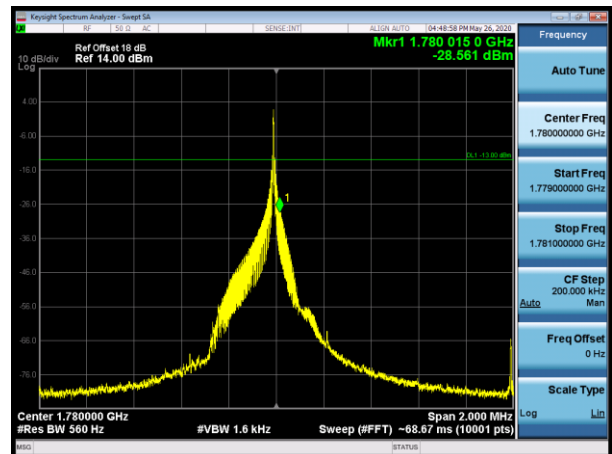
Channel 132670-1 tone offset 11, BW 15kHz, QPSK



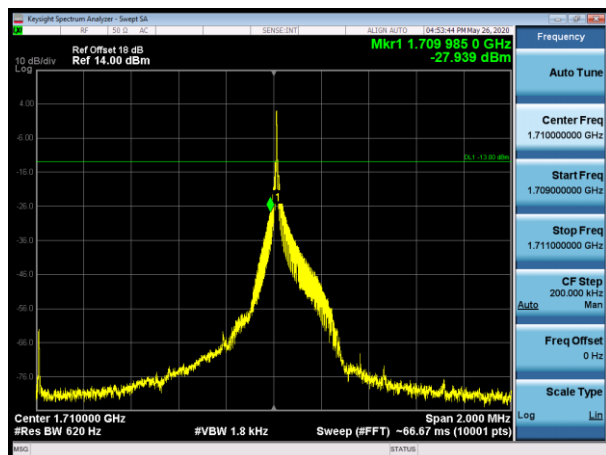
Channel 131973-1 tone offset 0, BW 3.75kHz, BPSK



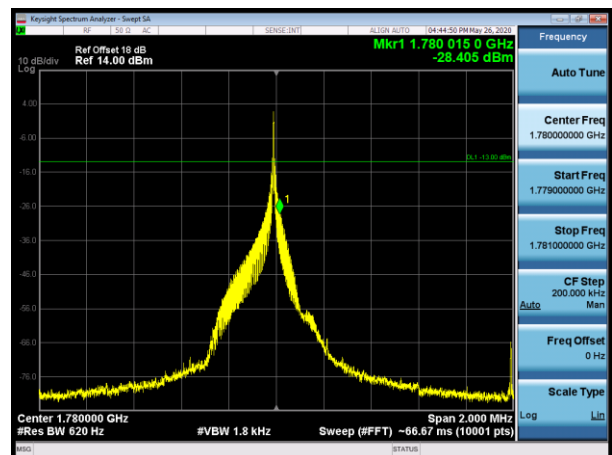
Channel 132671-1 tone offset 47, BW 3.75kHz, BPSK



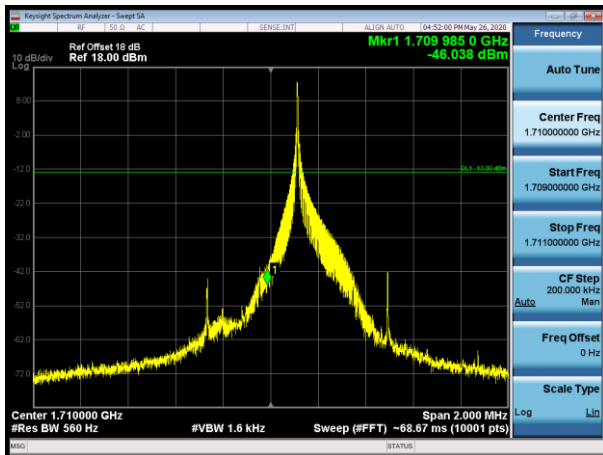
Channel 131973-1 tone offset 0, BW 3.75kHz, QPSK



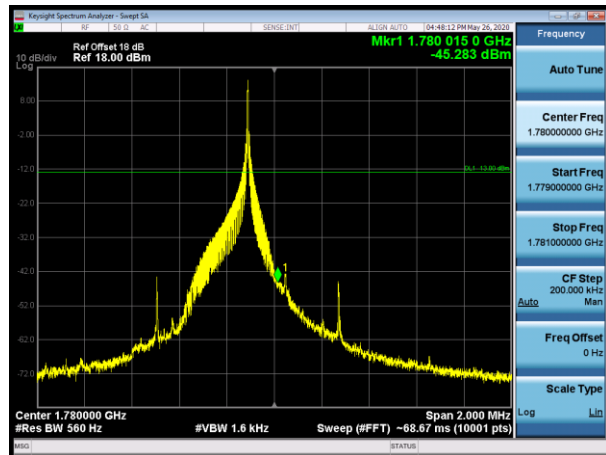
Channel 132671-1 tone offset 47, BW 3.75kHz, QPSK



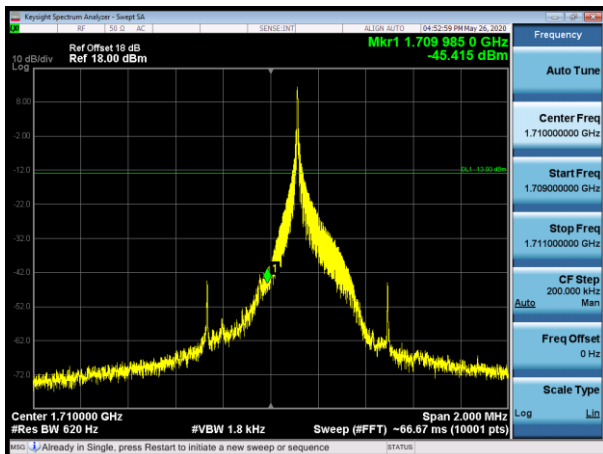
Channel 131974-1 tone offset 0, BW 3.75kHz,
BPSK



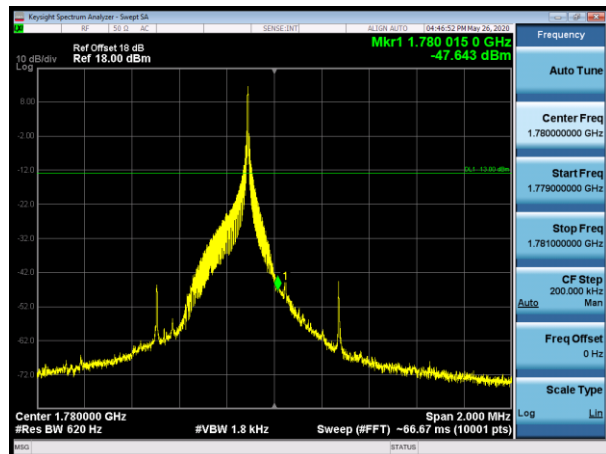
Channel 132670-1 tone offset 47, BW 3.75kHz,
BPSK



Channel 131974-1 tone offset 0, BW 3.75kHz,
QPSK



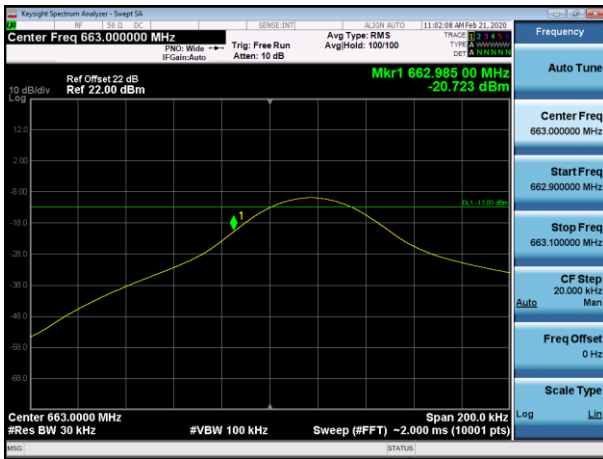
Channel 132670-1 tone offset 47, BW 3.75kHz,
QPSK



Note: All modes of operation were investigated, only the worst case results were shown in the report.

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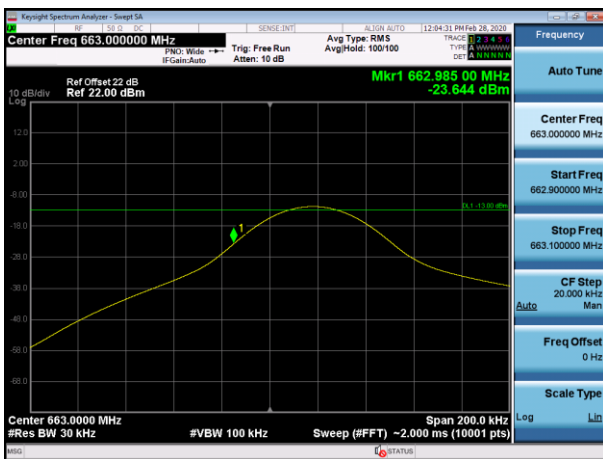
Channel 133123-1 tone offset 0, BW 15kHz, BPSK



Channel 133471-1 tone offset 11, BW 15kHz, BPSK



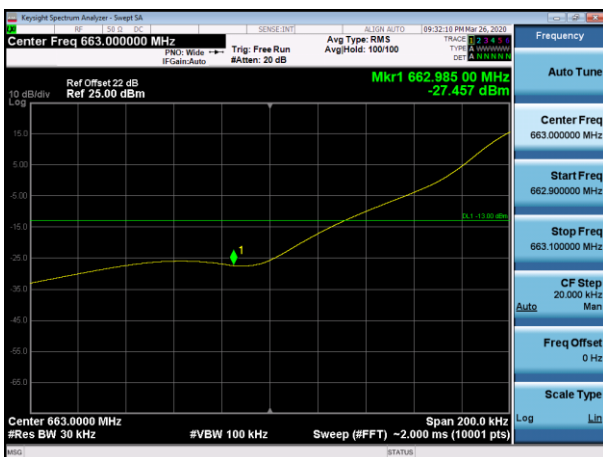
Channel 133123-1 tone offset 0, BW 15kHz, QPSK



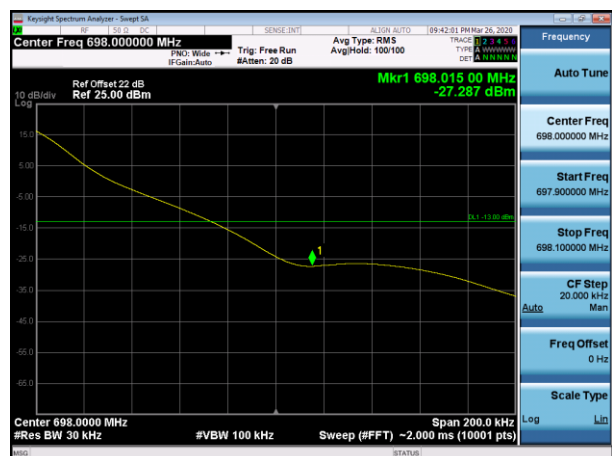
Channel 133471-1 tone offset 11, BW 15kHz, QPSK



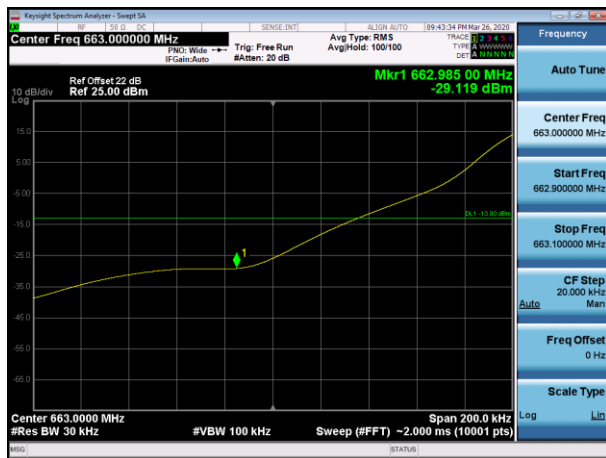
Channel 133124-1 tone offset 0, BW 15kHz, BPSK



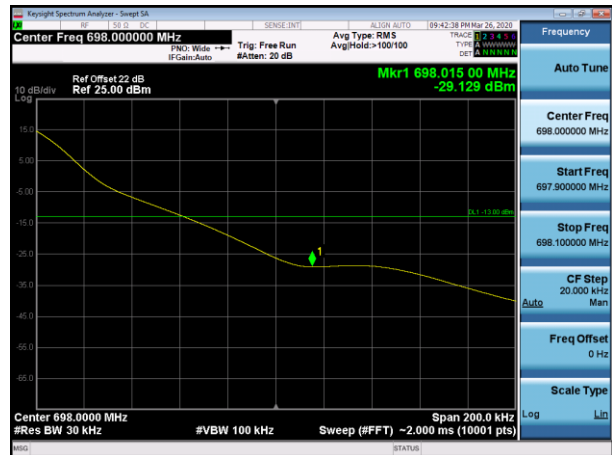
Channel 133470-1 tone offset 11, BW 15kHz, BPSK



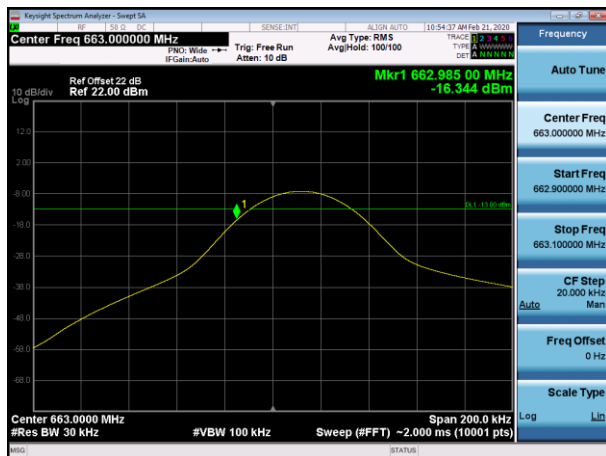
Channel 133124-1 tone offset 0, BW 15kHz, QPSK



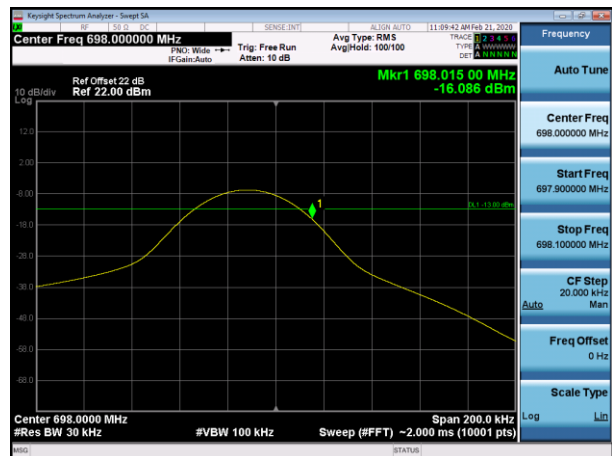
Channel 133470-1 tone offset 11, BW 15kHz, QPSK



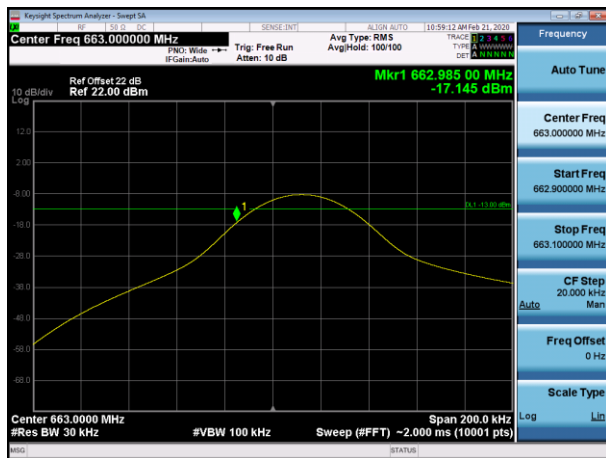
Channel 133123-1 tone offset 0, BW 3.75kHz, BPSK



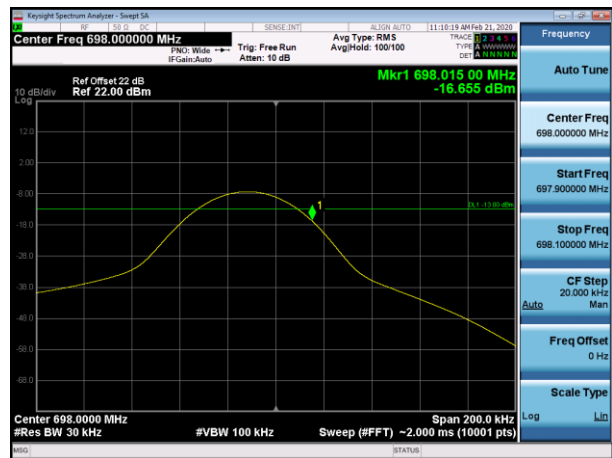
Channel 133471-1 tone offset 47, BW 3.75kHz, BPSK



Channel 133123-1 tone offset 0, BW 3.75kHz, QPSK



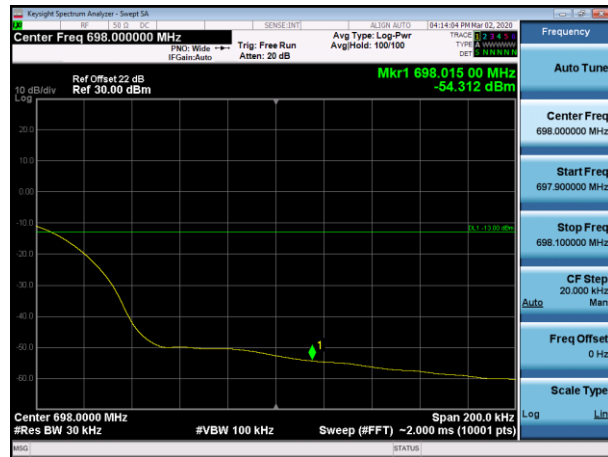
Channel 133471-1 tone offset 47, BW 3.75kHz, QPSK



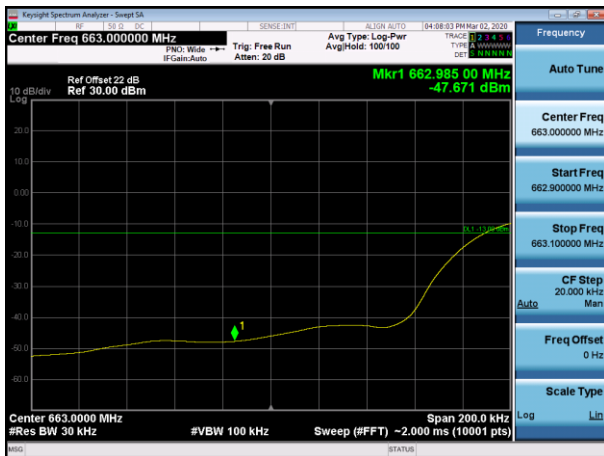
Channel 133124-1 tone offset 0, BW 3.75kHz,
BPSK



Channel 133470-1 tone offset 47, BW 3.75kHz,
BPSK



Channel 133124-1 tone offset 0, BW 3.75kHz,
QPSK



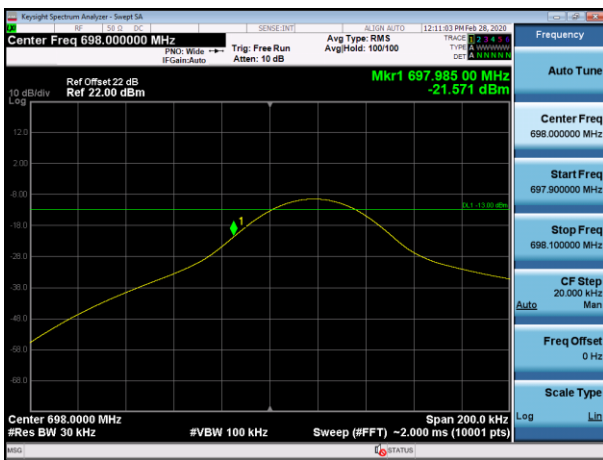
Channel 133470-1 tone offset 47, BW 3.75kHz,
QPSK



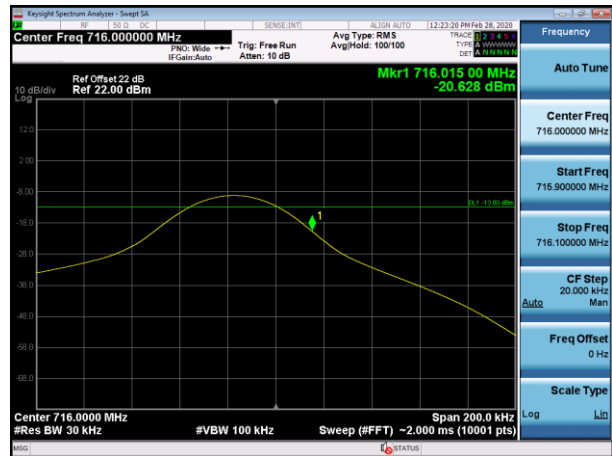
Note: All modes of operation were investigated, only the worst case results were shown in the report.

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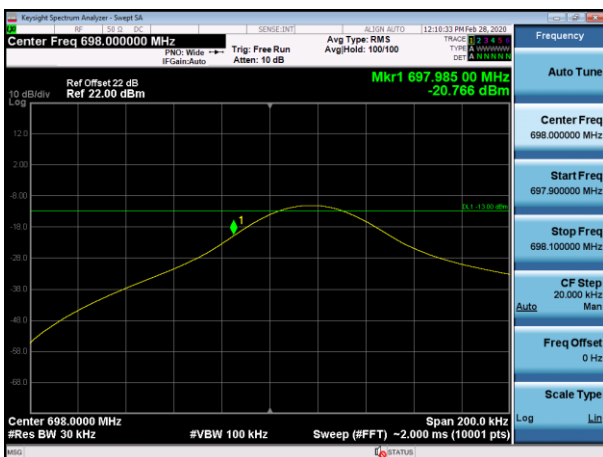
Channel 134003-1 tone offset 0, BW 15kHz, BPSK



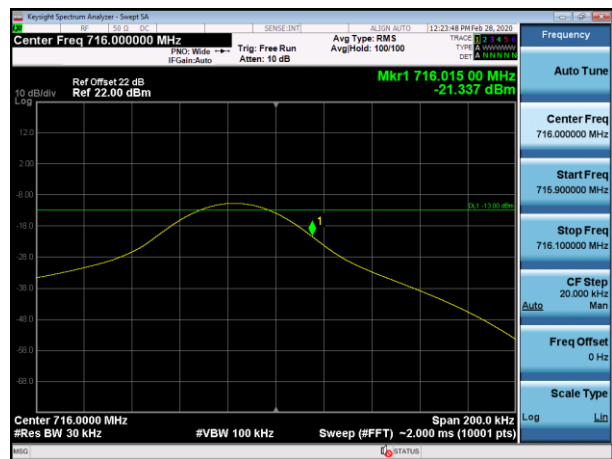
Channel 134181-1 tone offset 11, BW 15kHz, BPSK



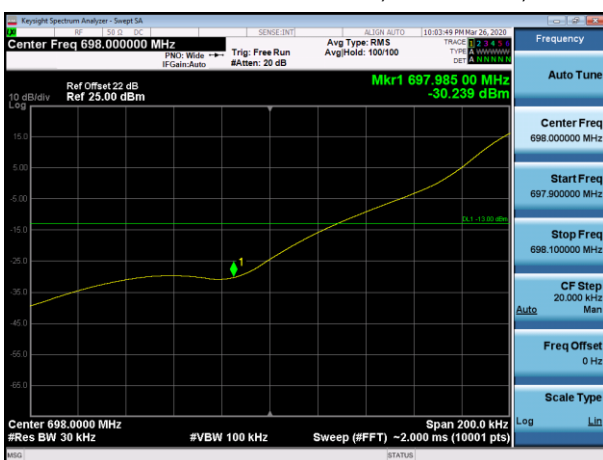
Channel 134003-1 tone offset 0, BW 15kHz, QPSK



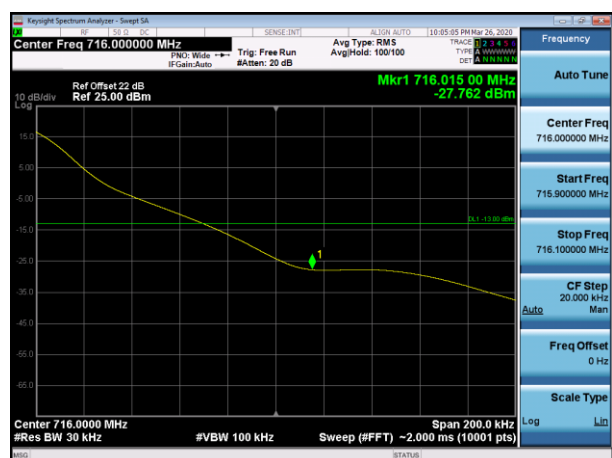
Channel 134181-1 tone offset 11, BW 15kHz, QPSK



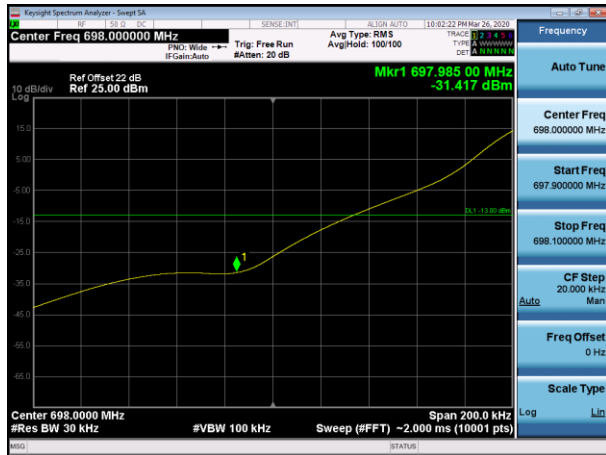
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Channel 134180-1 tone offset 11, BW 15kHz, BPSK



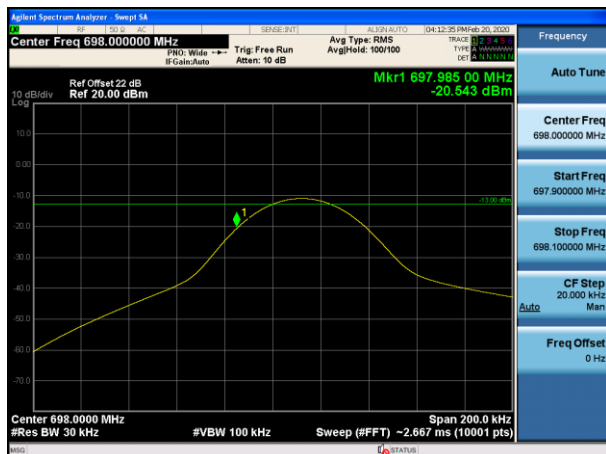
Channel 134004-1 tone offset 0, BW 15kHz, QPSK



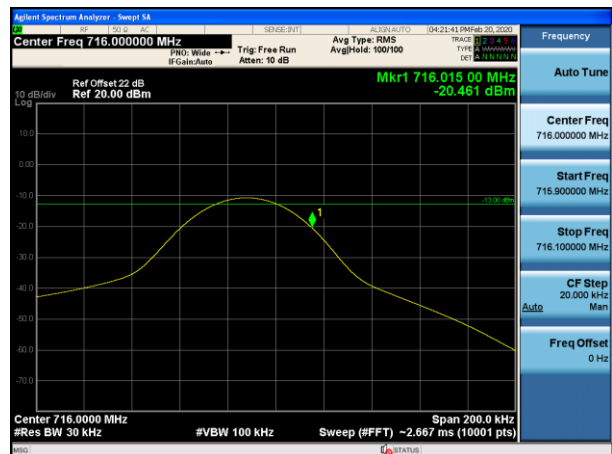
Channel 134180-1 tone offset 11, BW 15kHz, QPSK



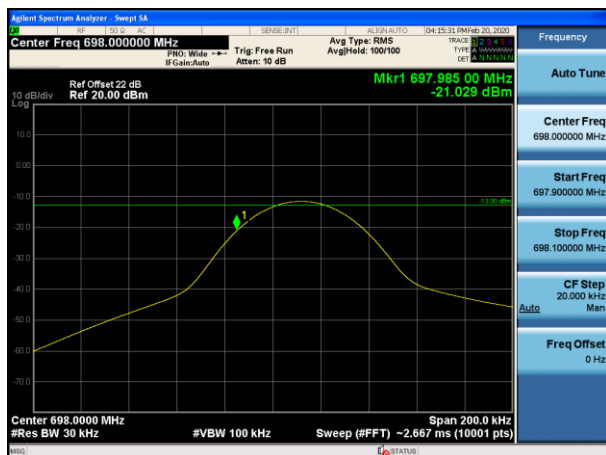
Channel 134003-1 tone offset 0, BW 3.75kHz, BPSK



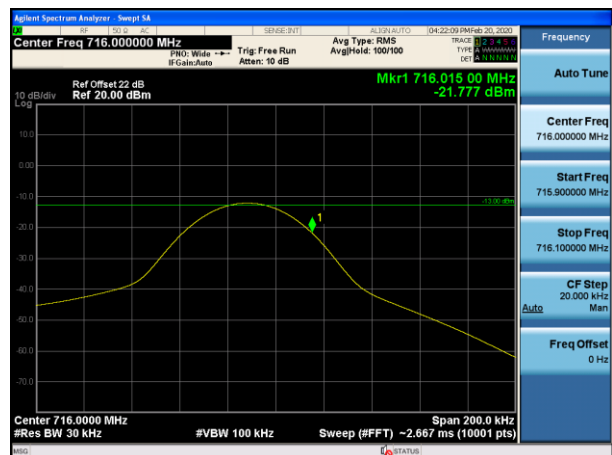
Channel 134181-1 tone offset 47, BW 3.75kHz, BPSK



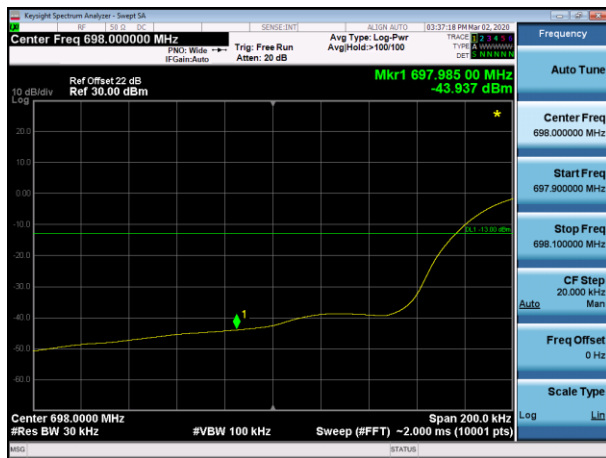
Channel 134003-1 tone offset 0, BW 3.75kHz, QPSK



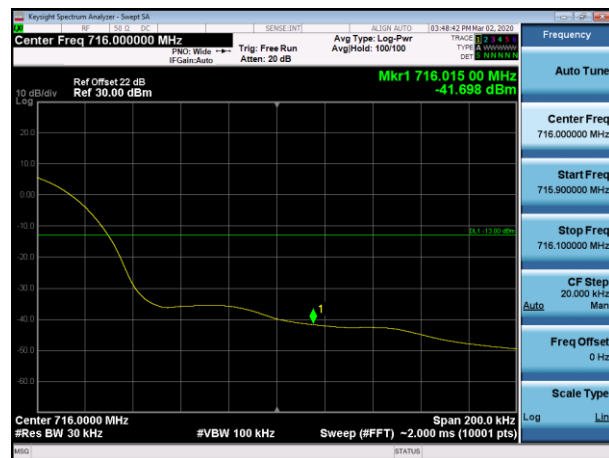
Channel 134181-1 tone offset 47, BW 3.75kHz, QPSK



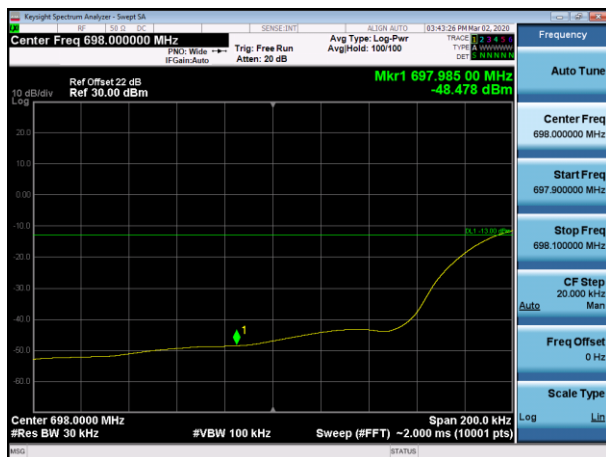
134004-1 tone offset 0, BW 3.75kHz, BPSK



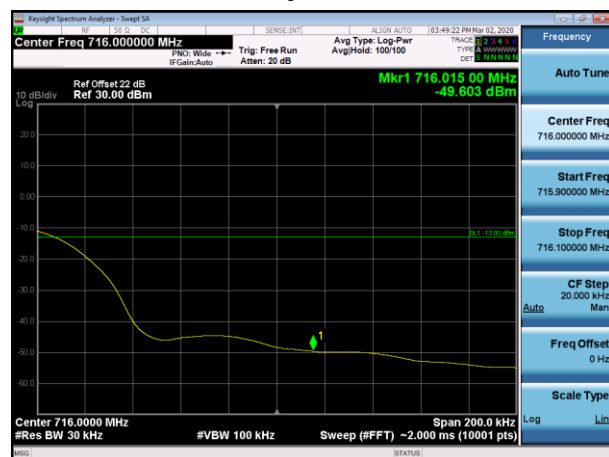
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134004-1 tone offset 0, BW 3.75kHz, QPSK



Channel 134180-1 tone offset 47, BW 3.75kHz, QPSK



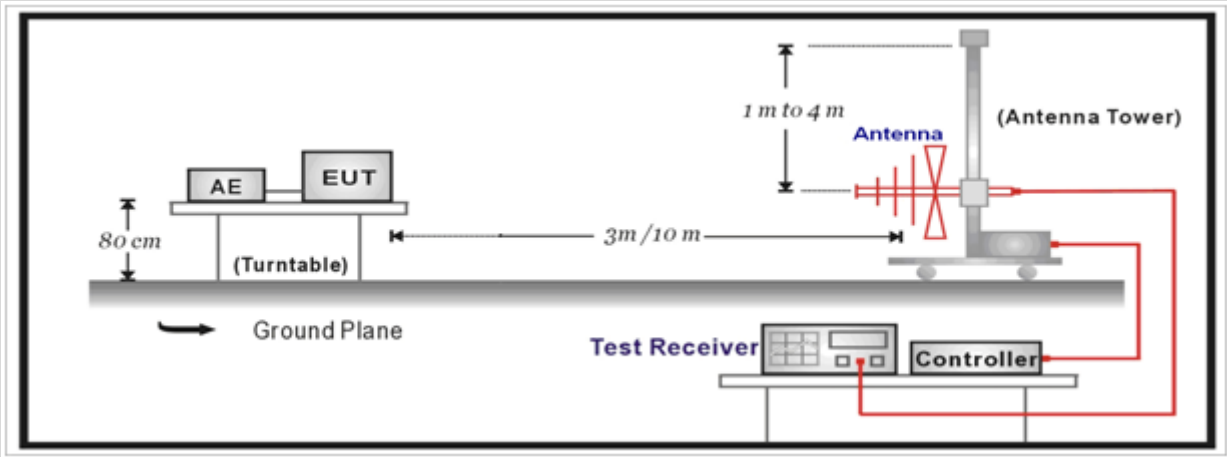
Note: All modes of operation were investigated, only the worst case results were shown in the report.

4.6 Radiated Emissions**VERDICT: PASS****4.6.1 Limit**

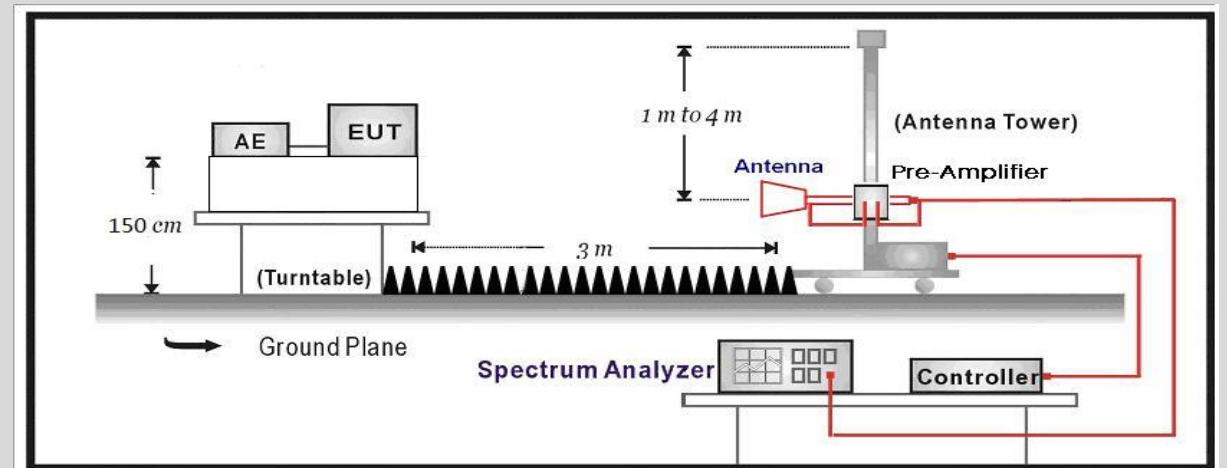
NB IoT Band	Standard
5/26	FCC §22.917: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
	FCC §90.691: For any frequency removed from the EA licensee's frequency block greater 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.
	RSS-132: Section 5.5: The power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts).
2/25	FCC §24.238: 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.
	RSS-133 Section 6.5: The emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts).
12/13/17 /71/85	FCC §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.
	FCC §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.
	On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
	RSS-130 Section 4.7: The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. Equipment operating in the frequency bands 746- 756 MHz and 777-787 MHz shall also comply with the following restrictions: The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least: $65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment. The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.
4/66	FCC §27.53(h): 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.
	RSS-139 Section 6.6: The emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

4.6.2 Test Setup

30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.6.3 Test Procedure

	Reference Rule	Chapter	Description
☒	ANSI C63.26	5.5	Radiated emissions testing
The spectrum was scanned from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment. Emissions below 18 GHz were measured at a 3 meter test distance. The EUT was tested in three orthogonal axes and in all possible test configurations and poisoning when measurement antenna is oriented in both horizontal and vertical polarization, the worst case emissions was showed in the report. Radiated emissions were used the substitution method descried in ANSI/TIA-603-E-2016. Radiated emissions were measured with 100kHz RBW below 1GHz and 1MHz RBW above 1GHz. According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $X + 10 \log (P)$ dB. P in watts. The specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., $10 \log P - \{X + 10 \log P\}$], resulting in an absolute level of -X dBW [or $(-X + 30)$ dBm].			

4.6.4 Test Data

NB IoT Band 2

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
3700.2	H	-58.5	-13	-45.5
5550.3	H	-52.8	-13	-39.8
3700.2	V	-57.6	-13	-44.6
5550.3	V	-52.3	-13	-39.3
Middle channel				
3760.0	H	-55.5	-13	-42.5
5640.0	H	-52.0	-13	-39.0
3760.0	V	-54.3	-13	-41.3
5640.0	V	-51.3	-13	-38.3
Highest channel				
3819.8	H	-56.8	-13	-43.8
5729.7	H	-52.2	-13	-39.2
3819.8	V	-56.7	-13	-43.7
5729.7	V	-52.3	-13	-39.3

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 4

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
3420.2	H	-57.2	-13	-44.2
5130.3	H	-53.8	-13	-40.8
3420.2	V	-55.8	-13	-42.8
5130.3	V	-53.2	-13	-40.2
Middle channel				
3465.0	H	-56.4	-13	-43.4
5197.5	H	-53.8	-13	-40.8
3465.0	V	-57.5	-13	-44.5
5197.5	V	-54.3	-13	-41.3
Highest channel				
3509.8	H	-54.9	-13	-41.9
5264.7	H	-53.5	-13	-40.5
3509.8	V	-56.3	-13	-43.3
5264.7	V	-54.7	-13	-41.7

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 5

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1648.2	H	-63.0	-13	-50.0
2472.3	H	-60.1	-13	-47.1
1648.2	V	-61.0	-13	-48.0
2472.3	V	-57.5	-13	-44.5
Middle channel				
1673.0	H	-58.8	-13	-45.8
2509.5	H	-56.9	-13	-43.9
1673.0	V	-59.2	-13	-46.2
2509.5	V	-57.7	-13	-44.7
Highest channel				
1697.8	H	-57.9	-13	-44.9
2546.7	H	-55.2	-13	-42.2
1697.8	V	-58.3	-13	-45.3
2546.7	V	-56.0	-13	-43.0

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 12

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1398.2	H	-58.5	-13	-45.5
2097.3	H	-57.2	-13	-44.2
1398.2	V	-58.2	-13	-45.2
2097.3	V	-55.8	-13	-42.8
Middle channel				
1415.0	H	-61.0	-13	-48.0
2122.5	H	-57.0	-13	-44.0
1415.0	V	-61.2	-13	-48.2
2122.5	V	-58.0	-13	-45.0
Highest channel				
1431.8	H	-61.3	-13	-48.3
2147.7	H	-55.0	-13	-42.0
1431.8	V	-61.9	-13	-48.9
2147.7	V	-56.1	-13	-43.1

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 13

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1554.2	H	-61.7	-13	-48.7
2331.3	H	-58.9	-13	-45.9
1554.2	V	-61.6	-13	-48.6
2331.3	V	-59.1	-13	-46.1
Middle channel				
1564.0	H	-61.8	-13	-48.8
2346.0	H	-56.8	-13	-43.8
1564.0	V	-61.5	-13	-48.5
2346.0	V	-58.6	-13	-45.6
Highest channel				
1573.8	H	-63.1	-13	-50.1
2360.7	H	-58.8	-13	-45.8
1573.8	V	-63.3	-13	-50.3
2360.7	V	-58.4	-13	-45.4

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 17

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1408.2	H	-59.5	-13	-46.5
2112.3	H	-57.2	-13	-44.2
1408.2	V	-59.7	-13	-46.7
2112.3	V	-56.7	-13	-43.7
Middle channel				
1420.0	H	-60.6	-13	-47.6
2130.0	H	-54.4	-13	-41.4
1420.0	V	-62.7	-13	-49.7
2130.0	V	-56.7	-13	-43.7
Highest channel				
1431.8	H	-62.7	-13	-49.7
2147.7	H	-55.9	-13	-42.9
1431.8	V	-61.8	-13	-48.8
2147.7	V	-55.8	-13	-42.8

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB-IoT Band 25

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
3700.2	H	-59.2	-13	-46.2
5550.3	H	-52.6	-13	-39.6
3700.2	V	-59.2	-13	-46.2
5550.3	V	-53.2	-13	-40.2
Middle channel				
3765.0	H	-55.0	-13	-42.0
5647.5	H	-51.2	-13	-38.2
3765.0	V	-55.5	-13	-42.5
5647.5	V	-53.1	-13	-40.1
Highest channel				
3829.8	H	-55.6	-13	-42.6
5744.7	H	-51.6	-13	-38.6
3829.8	V	-56.1	-13	-43.1
5744.7	V	-51.7	-13	-38.7

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB-IoT Band 26 814-824MHz

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1628.2	H	-62.6	-13	-49.6
2442.3	H	-59.8	-13	-46.8
1628.2	V	-62.3	-13	-49.3
2442.3	V	-59.6	-13	-46.6
Highest channel				
1647.8	H	-62.5	-13	-49.5
2471.7	H	-60.7	-13	-47.7
1647.8	V	-62.1	-13	-49.1
2471.7	V	-59.4	-13	-46.4

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 26 824-849MHz

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1648.2	H	-62.5	-13	-49.5
2472.3	H	-60.4	-13	-47.4
1648.2	V	-62.1	-13	-49.1
2472.3	V	-61.1	-13	-48.1
Middle channel				
1673.0	H	-58.1	-13	-45.1
2509.5	H	-56.2	-13	-43.2
1673.0	V	-59.6	-13	-46.6
2509.5	V	-58.3	-13	-45.3
Highest channel				
1697.8	H	-57.7	-13	-44.7
2546.7	H	-56.3	-13	-43.3
1697.8	V	-58.4	-13	-45.4
2546.7	V	-56.4	-13	-43.4

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 66

Frequency (MHz)	Ant. Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
3420.2	H	-56.0	-13	-43.0
5130.3	H	-53.4	-13	-40.4
3420.2	V	-57.1	-13	-44.1
5130.3	V	-53.8	-13	-40.8
Middle channel				
3490.0	H	-54.7	-13	-41.7
5235.0	H	-53.4	-13	-40.4
3490.0	V	-55.8	-13	-42.8
5235.0	V	-54.6	-13	-41.6
Highest channel				
3559.8	H	-55.8	-13	-42.8
5339.7	H	-53.9	-13	-40.9
3559.8	V	-56.1	-13	-43.1
5339.7	V	-52.737	-13	-39.7

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 71

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1326.2	H	-59.6	-13	-46.6
1989.3	H	-58.2	-13	-45.2
1326.2	V	-58.5	-13	-45.5
1989.3	V	-58.4	-13	-45.4
Middle channel				
1361.0	H	-59.3	-13	-46.3
2041.5	H	-60.1	-13	-47.1
1361.0	V	-58.5	-13	-45.5
2041.5	V	-59.1	-13	-46.1
Highest channel				
1395.8	H	-61.5	-13	-48.5
2093.7	H	-59.4	-13	-46.4
1395.8	V	-61.5	-13	-48.5
2093.7	V	-58.9	-13	-45.9

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)

NB IoT Band 85

Frequency (MHz)	Ant.Pol. (H/V)	Spurious Emissions Level (dBm)	Limit (dBm)	Margin (dB)
Lowest channel				
1396.2	H	-59.2	-13	-46.2
2094.3	H	-57.2	-13	-44.2
1396.2	V	-59.4	-13	-46.4
2094.3	V	-58.0	-13	-45.0
Middle channel				
1414.0	H	-60.2	-13	-47.2
2121.0	H	-56.4	-13	-43.4
1414.0	V	-61.5	-13	-48.5
2121.0	V	-57.5	-13	-44.5
Highest channel				
1431.8	H	-61.7	-13	-48.7
2147.7	H	-54.6	-13	-41.6
1431.8	V	-62.0	-13	-49.0
2147.7	V	-56.0	-13	-43.0

Note: Spurious emissions level = Signal Generator Reading(dBm) – Cable loss(dB) + substitute antenna gain(dBi)



4.7 Test setup photo and EUT Photo	VERDICT: PASS
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Remark: The test setup photo and EUT Photo please see appendix.

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