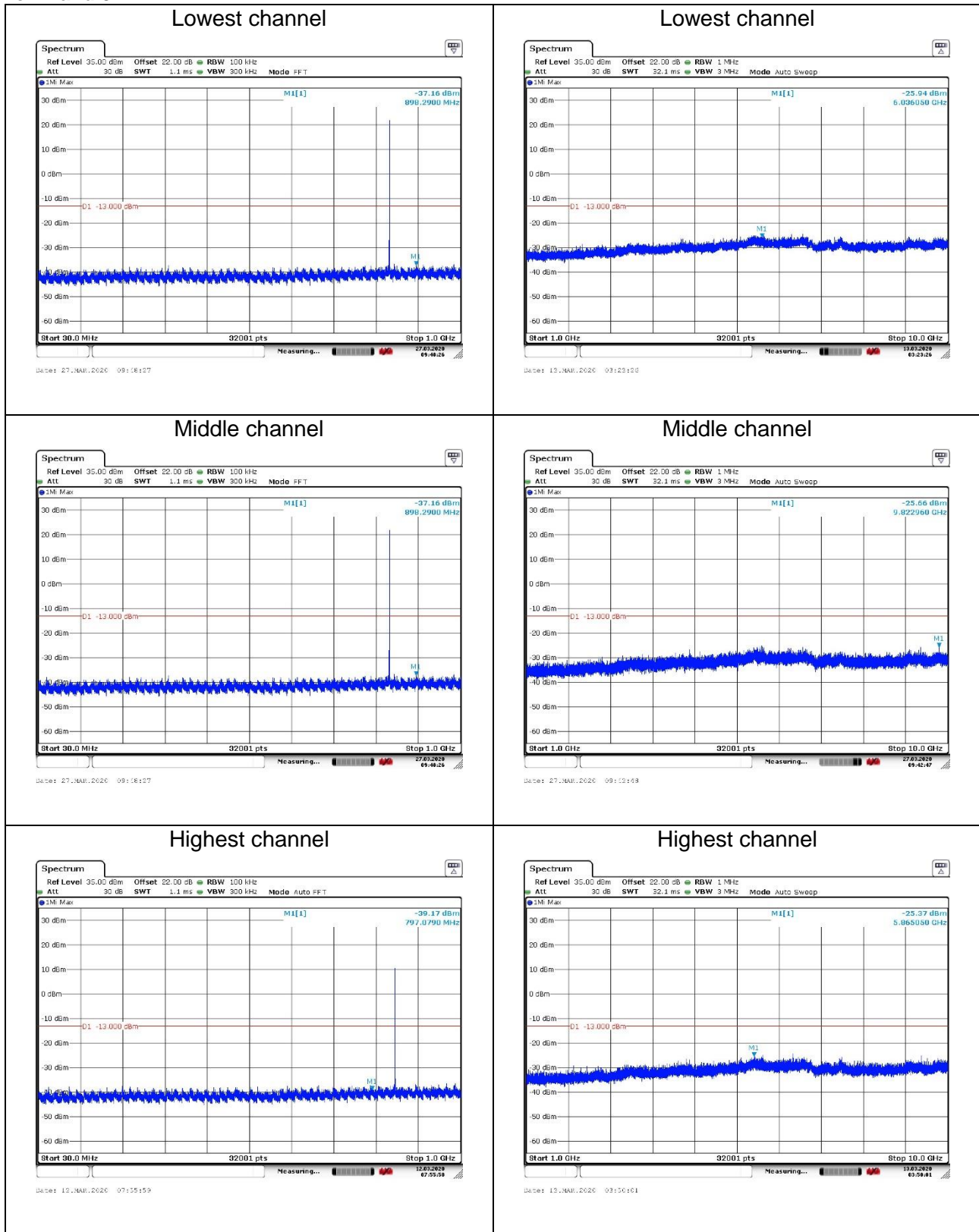
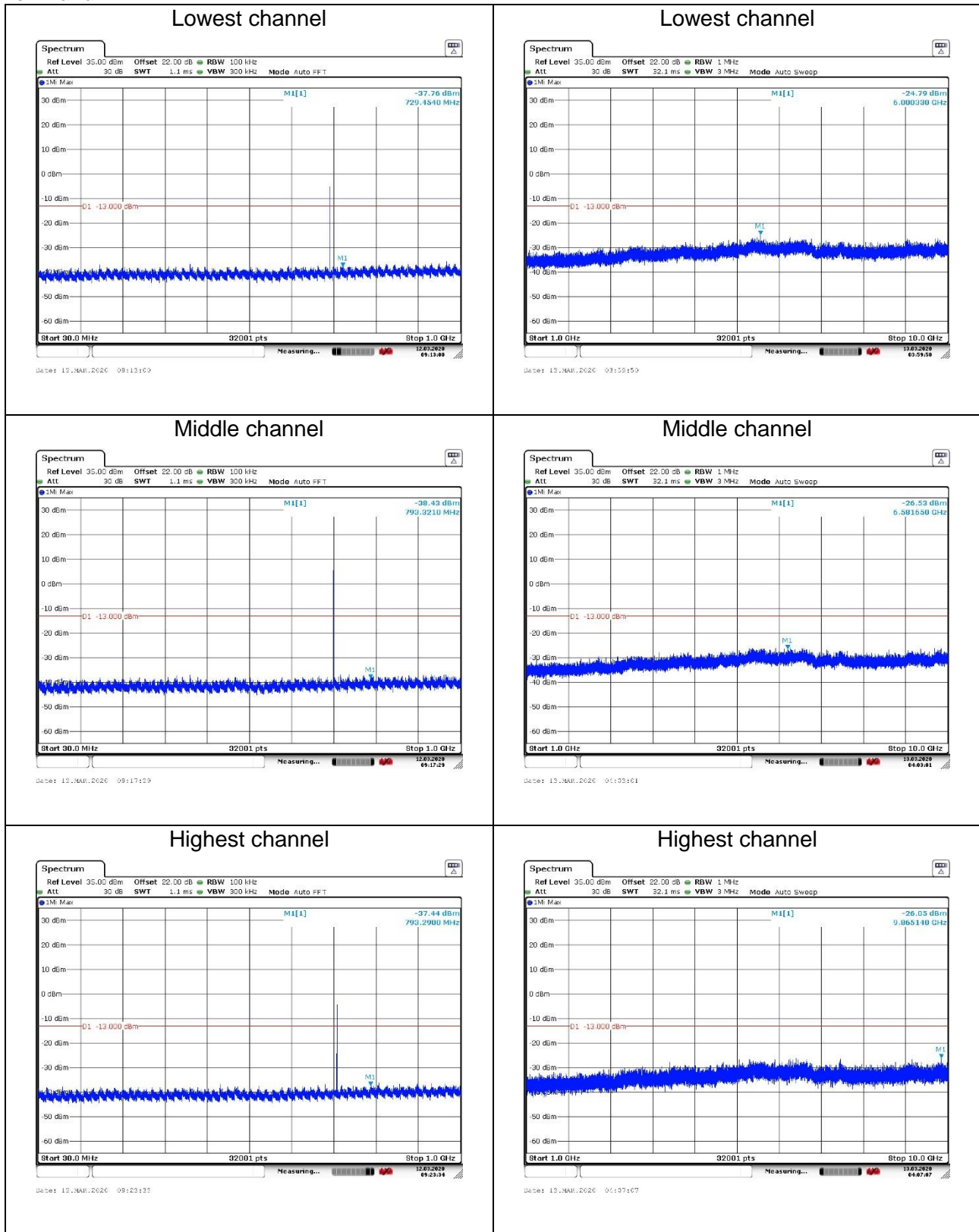


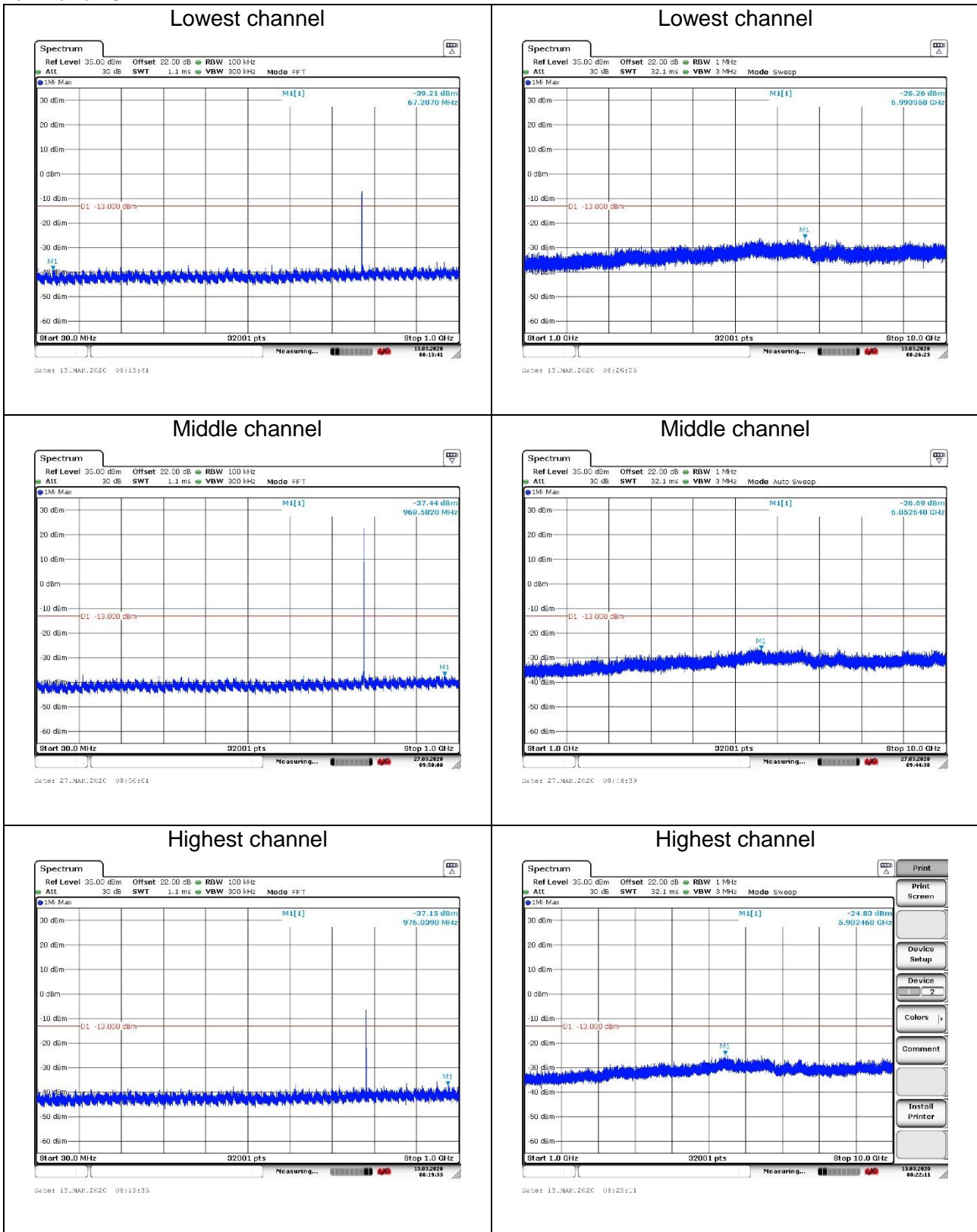
NB-IoT Band 5



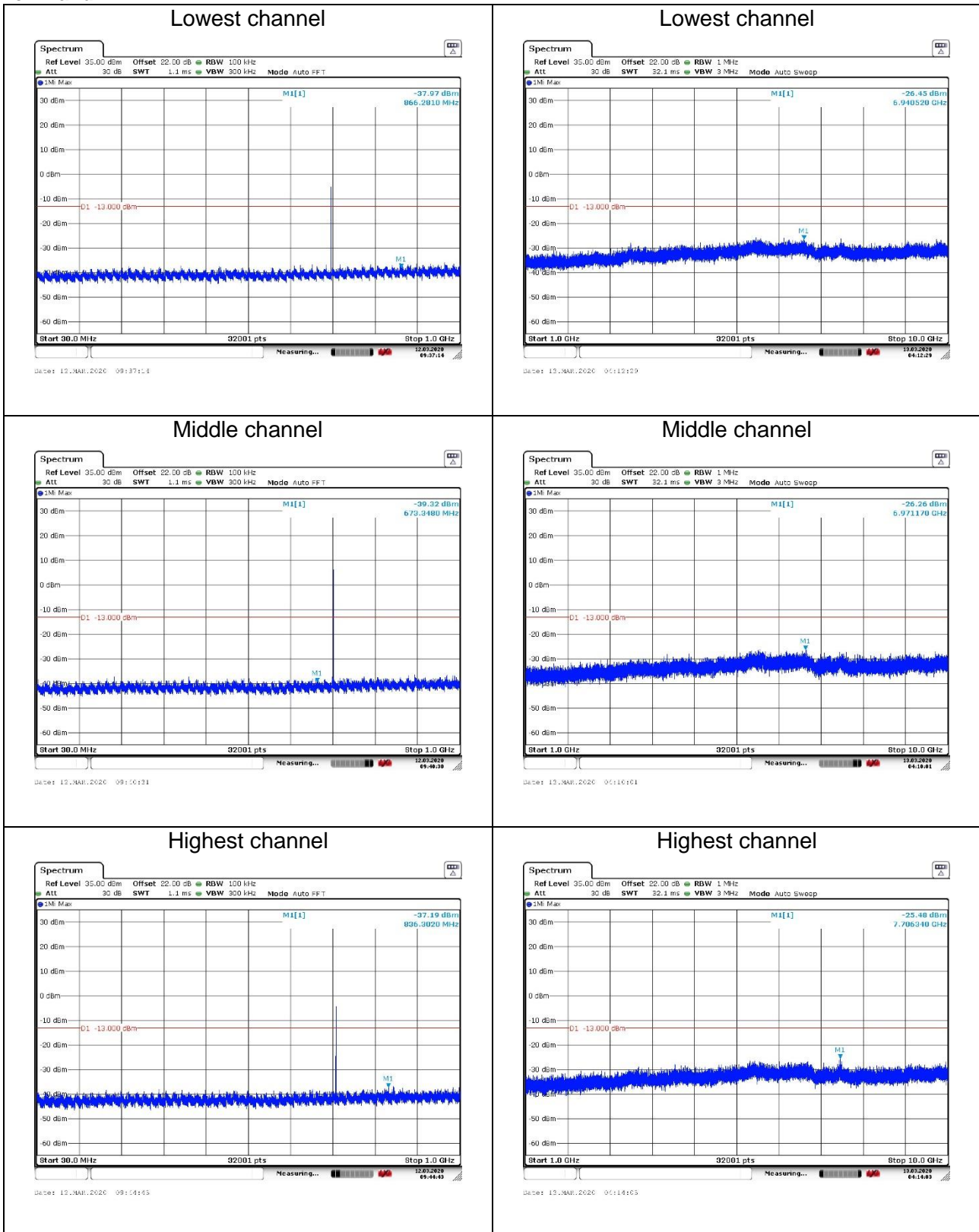
NB-IoT Band 12



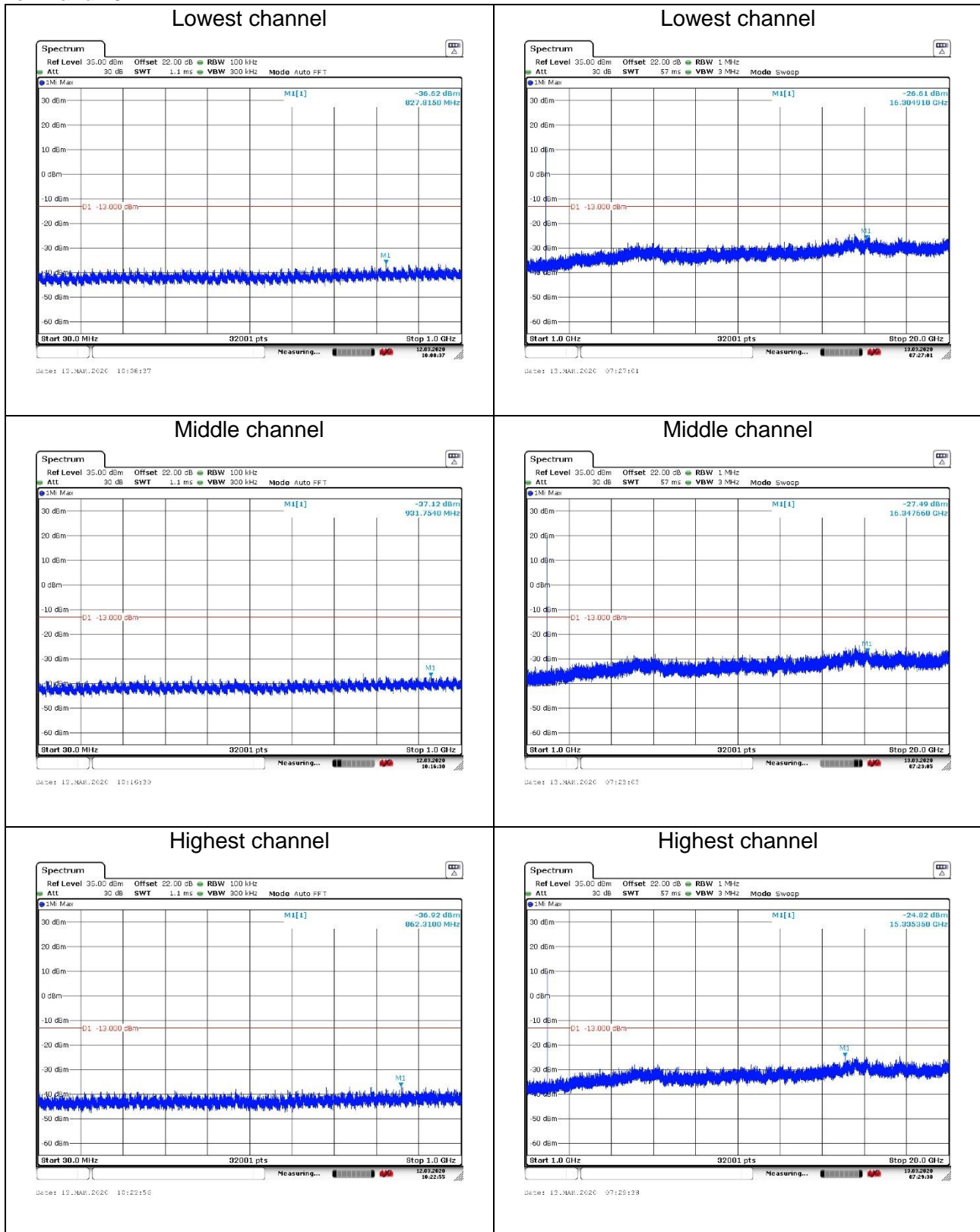
NB-IoT Band 13



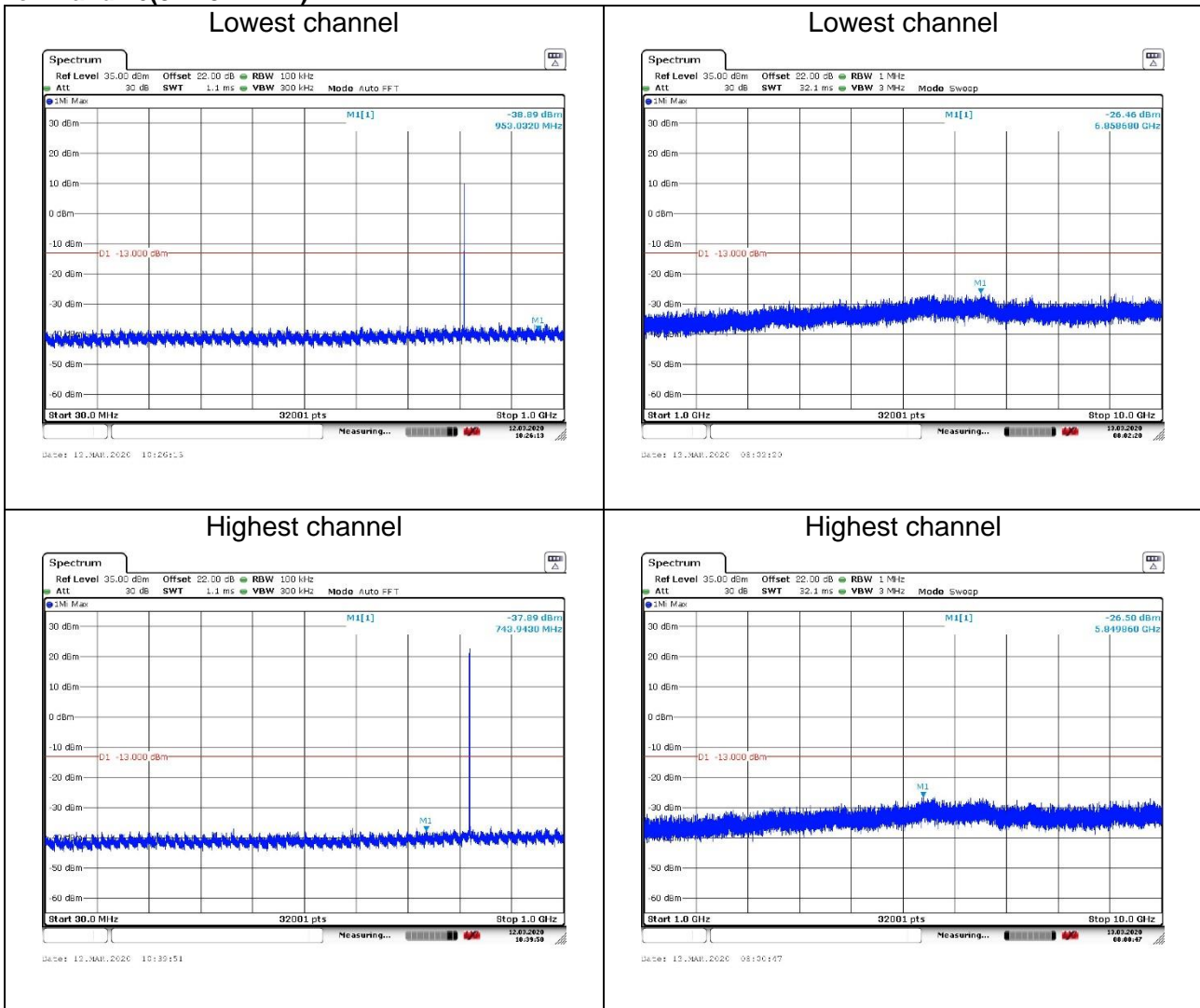
NB-IoT Band 17



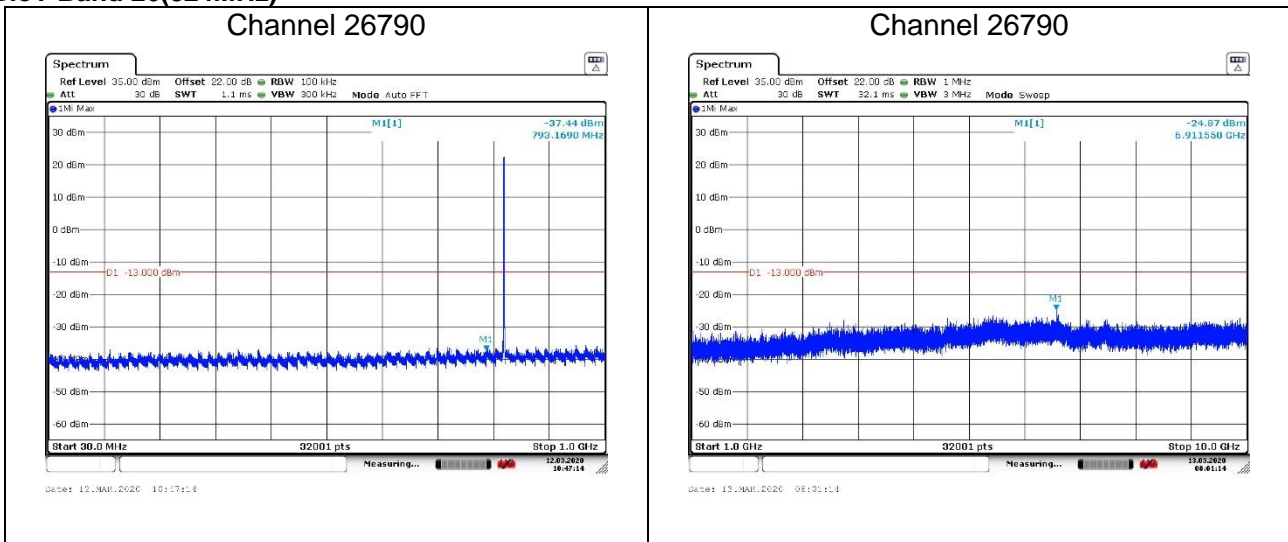
NB-IoT Band 25



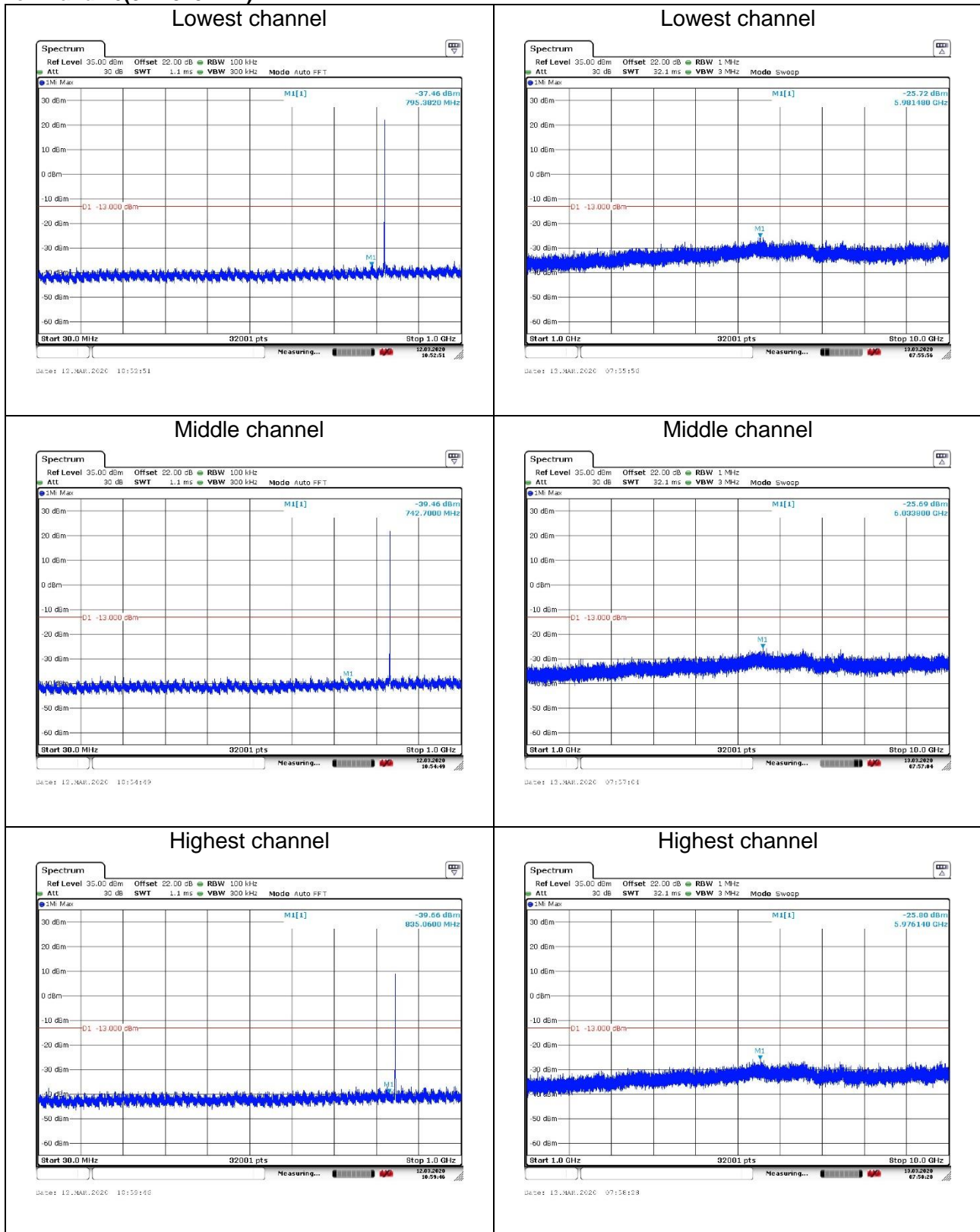
NB-IoT Band 26(814-824MHz)



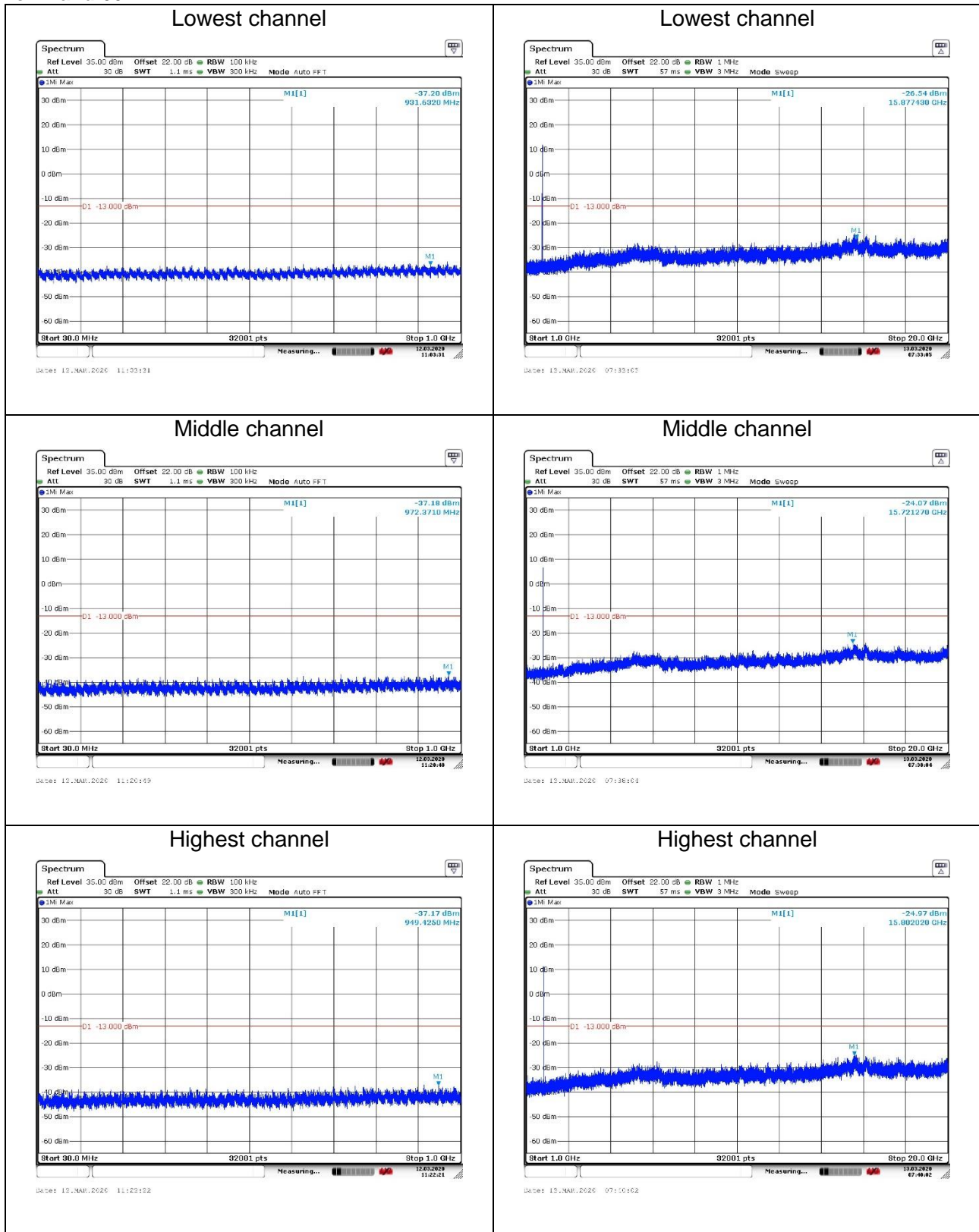
NB-IoT Band 26(824MHz)



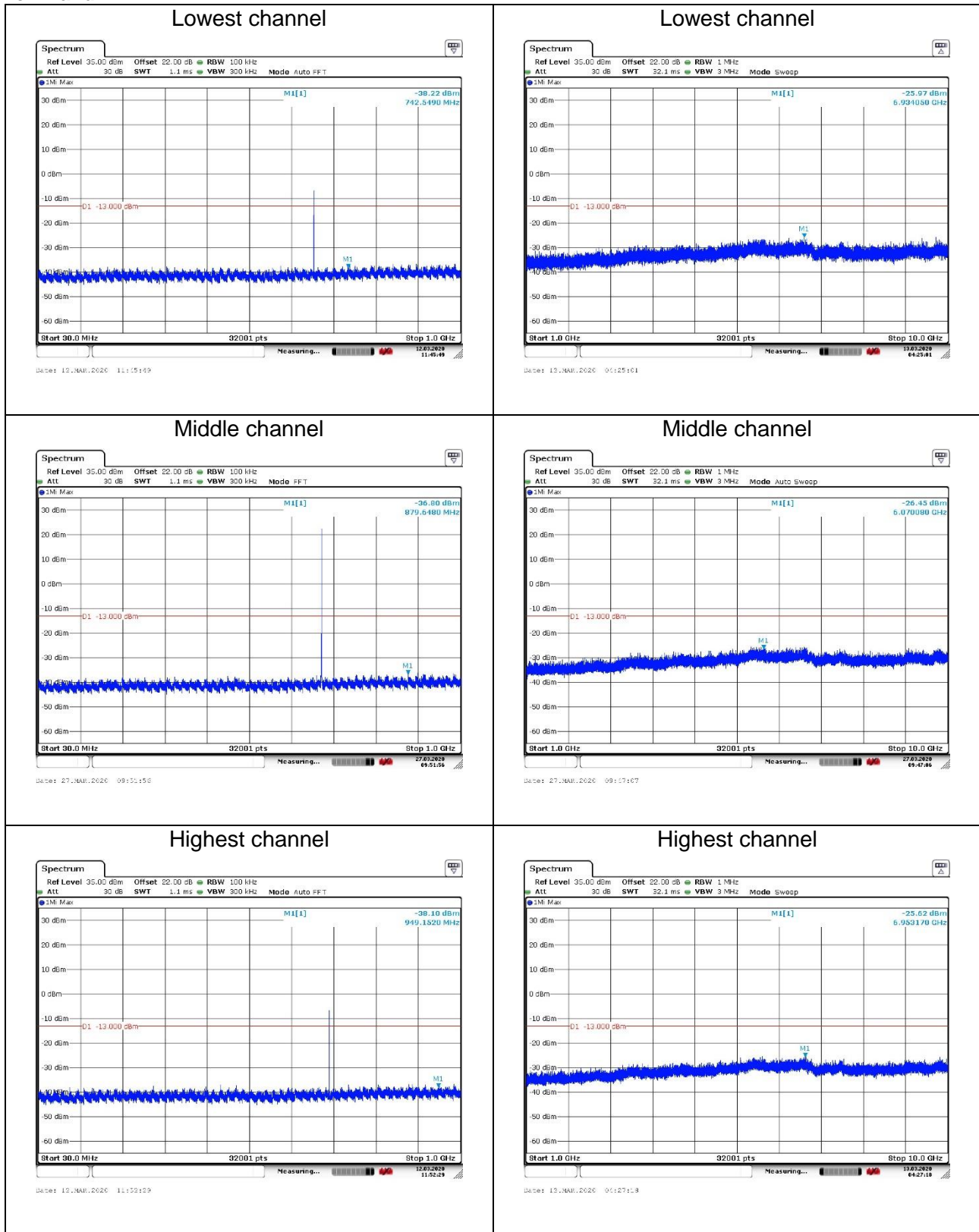
NB-IoT Band 26(824-849MHz)



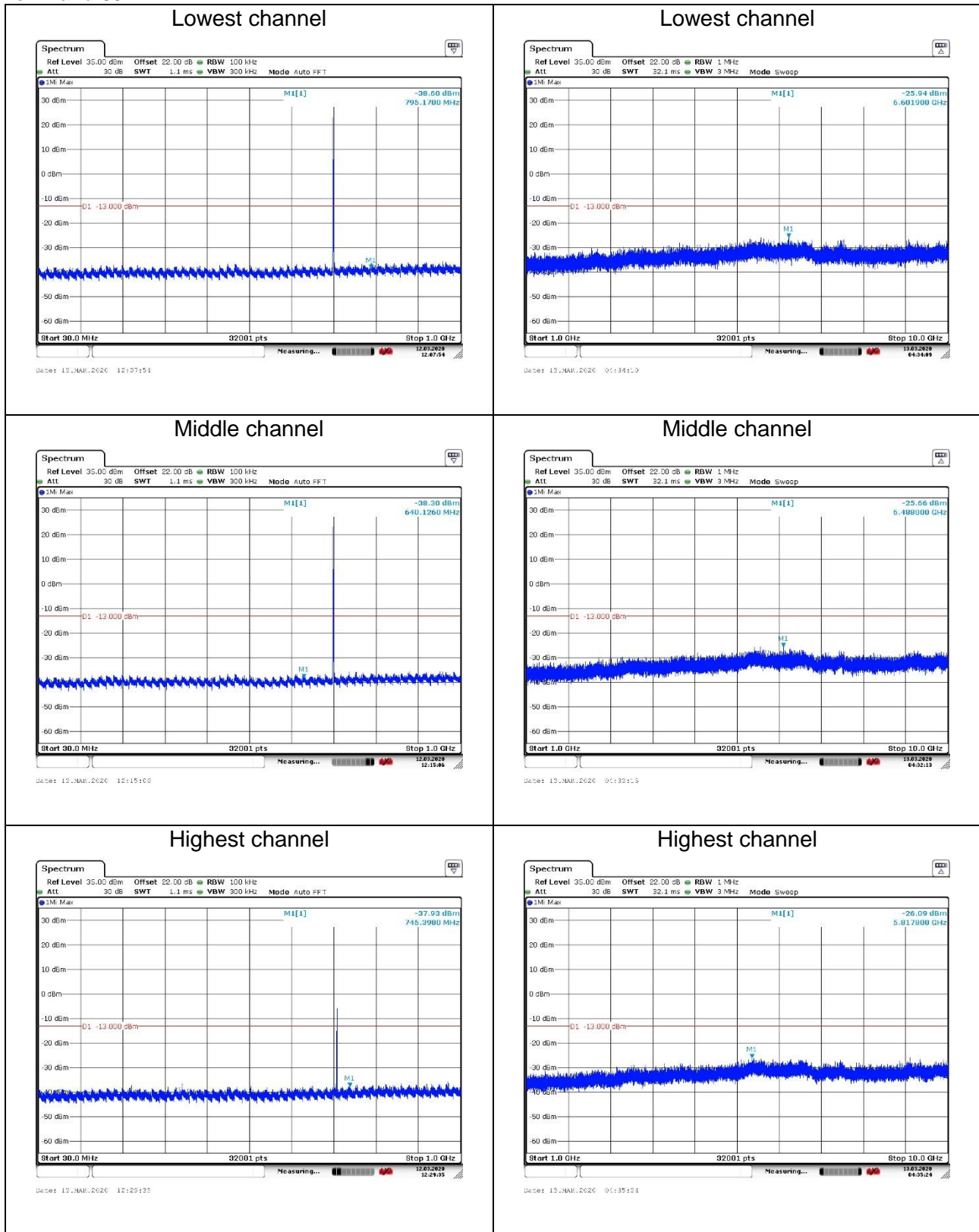
NB-IoT Band 66



NB-IoT Band 71



NB-IoT Band 85



4.5 Spurious Emissions at antenna terminals at Block Edges

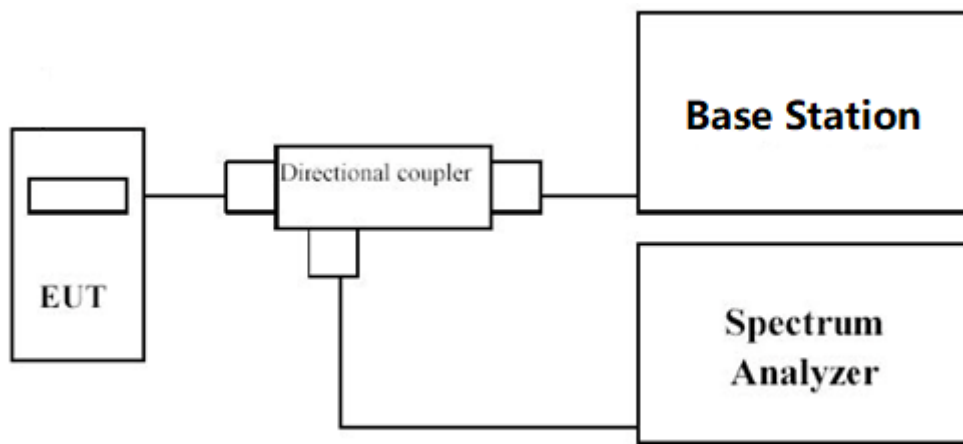
VERDICT: PASS

4.5.1 Limit	
NB IoT Band	Standard
5/26	FCC §2.1051: 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.
	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. Emission mask requirements for EA-based systems. 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: (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.
	RSS-132: Section 5.5: In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied 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 §2.1051: 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.
	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: In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission 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 §2.1051: 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.
	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.
	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. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
4/66	FCC §2.1051: 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.

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: In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

4.5.2 Test Setup



4.5.3 Test Procedure

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.26	5.7	Unwanted (out-of-band and spurious) conducted emissions measurement procedures (conducted test at antenna port)

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using directional coupler.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For NBLoT Band 5/26: For §22, in the 1 MHz bands immediately outside and adjacent to the frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. For §90, use RBW = 300 Hz for offsets less than 37.5 kHz from a channel edge; RBW = 100 kHz for offsets greater than 37.5 kHz is allowed.

For NBLoT Band 2/25: 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.

For NBLoT Band 12/17/71/85: 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.

For NBLoT Band 13: On any frequency outside the 746-758 MHz band and 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed; on all frequencies between 763-775 MHz and 793-805 MHz, any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25KHz segment.

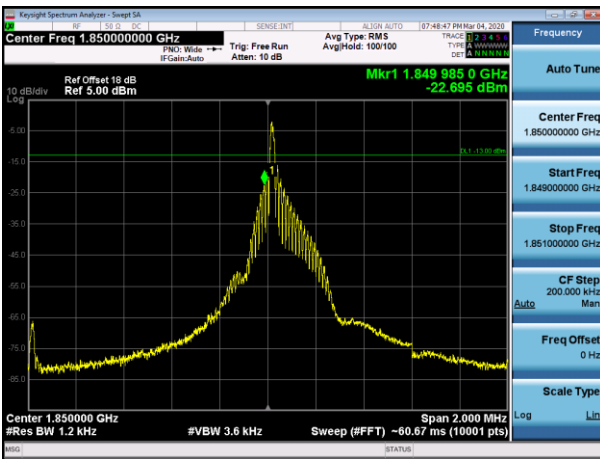
For NBloT Band 4/66: In the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

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].

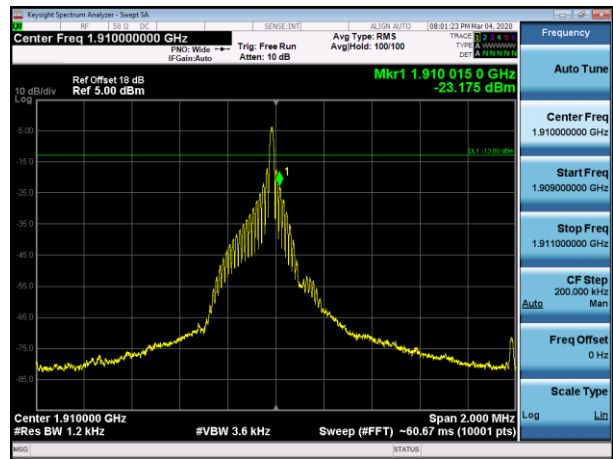
4.5.4 Test Data

NB IoT Band 2

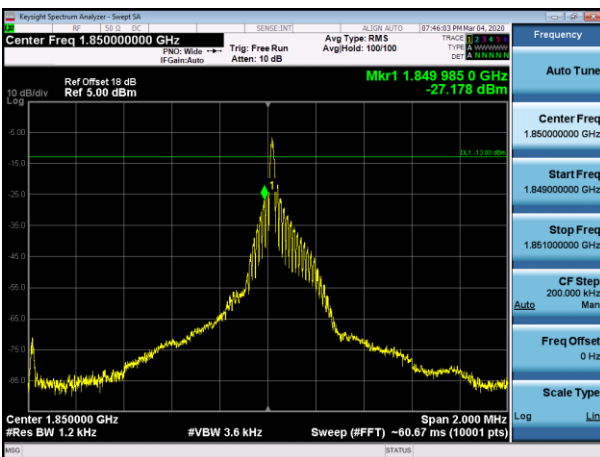
Channel 18601-1 tone offset 0, BW 15kHz, BPSK



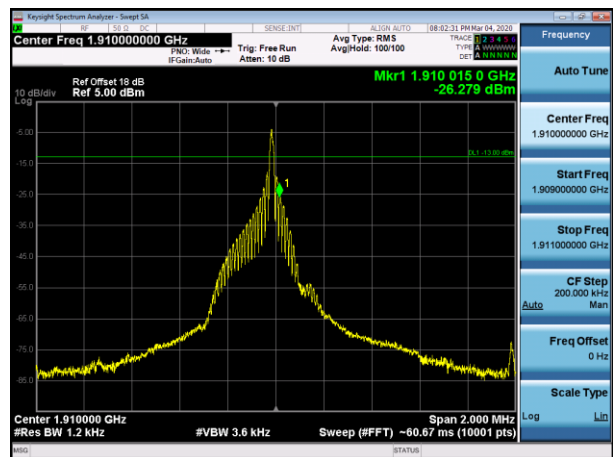
Channel 19199-1 tone offset 11, BW 15kHz, BPSK



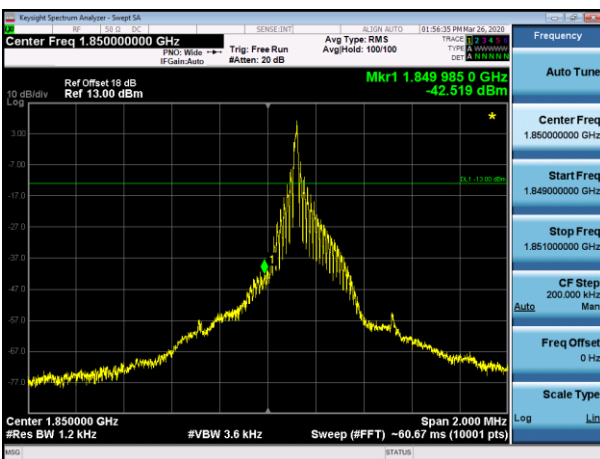
Channel 18601-1 tone offset 0, BW 15kHz, QPSK



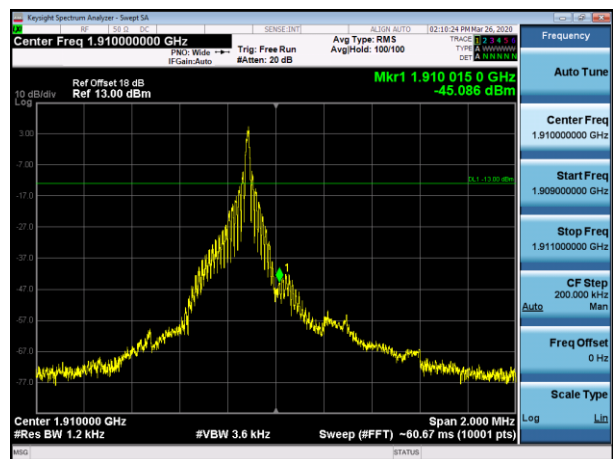
Channel 19199-1 tone offset 11, BW 15kHz, QPSK



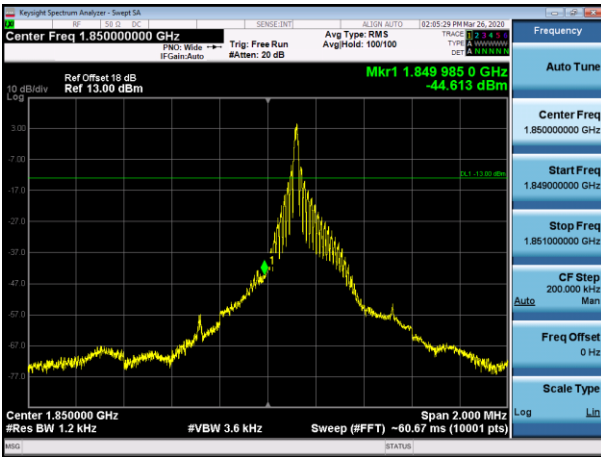
Channel 18602-1 tone offset 0, BW 15kHz, BPSK



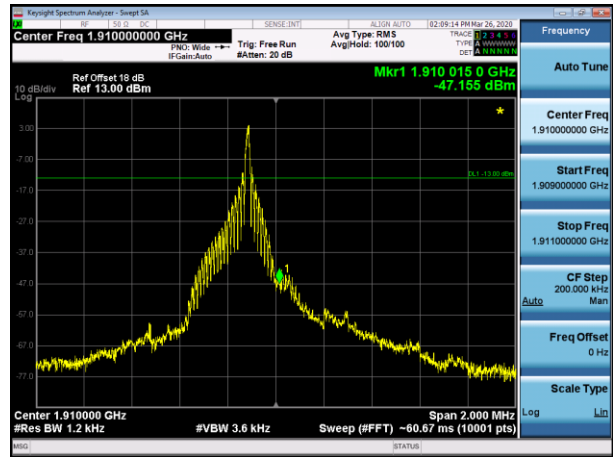
Channel 19198-1 tone offset 11, BW 15kHz, BPSK



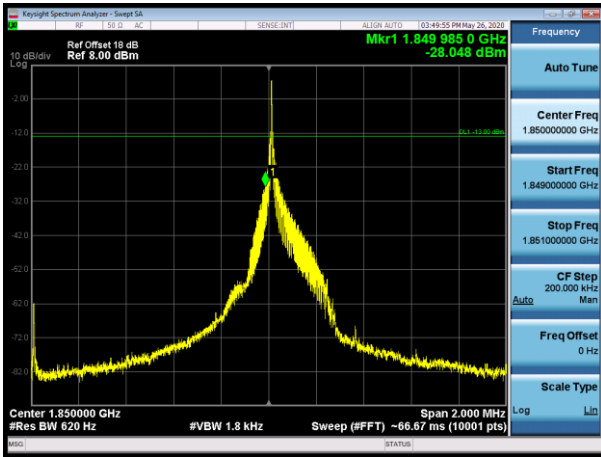
Channel 18602-1 tone offset 0, BW 15kHz, QPSK



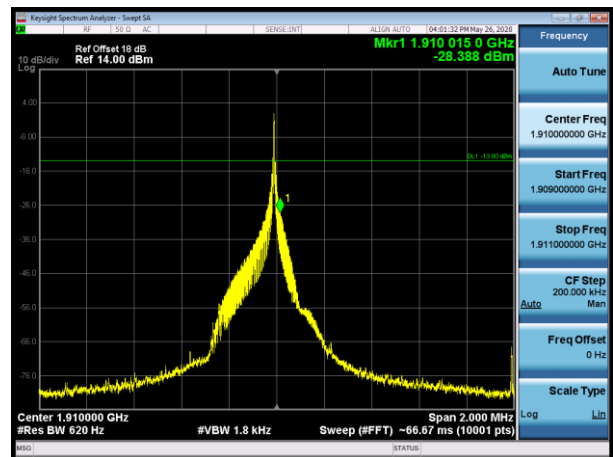
Channel 19198-1 tone offset 11, BW 15kHz, QPSK



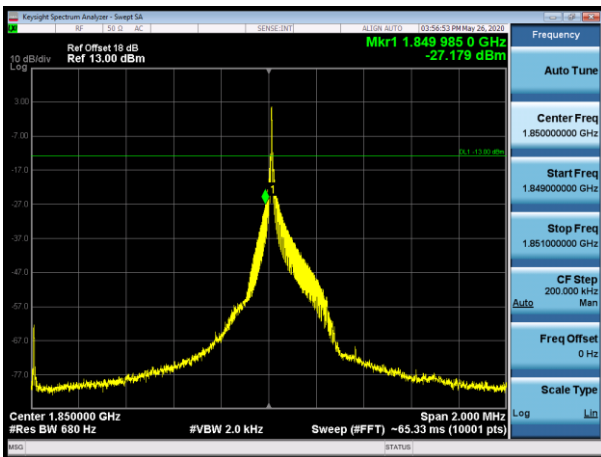
Channel 18601-1 tone offset 0, BW 3.75kHz, BPSK



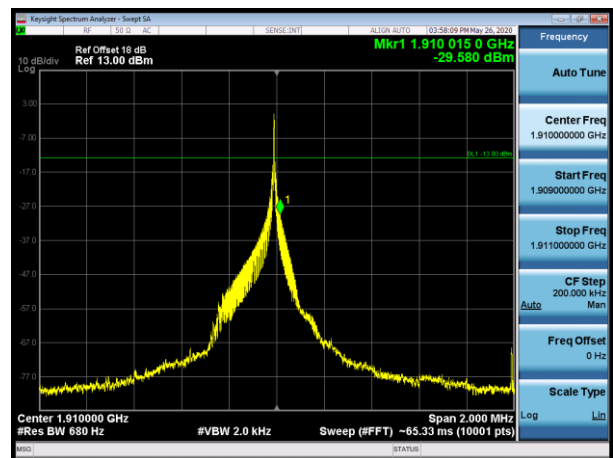
Channel 19199-1 tone offset 47, BW 3.75kHz, BPSK



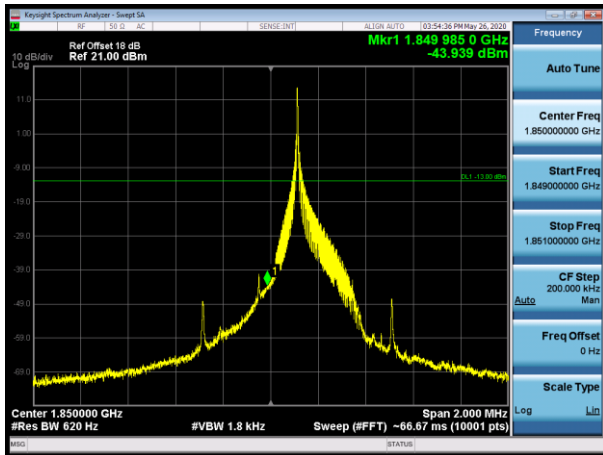
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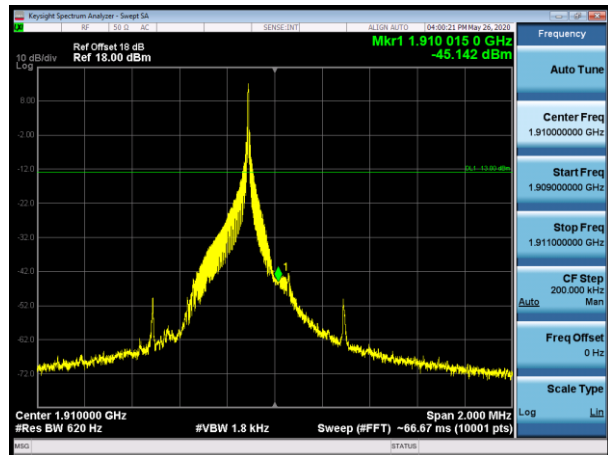
Channel 19199-1 tone offset 47, BW 3.75kHz, QPSK



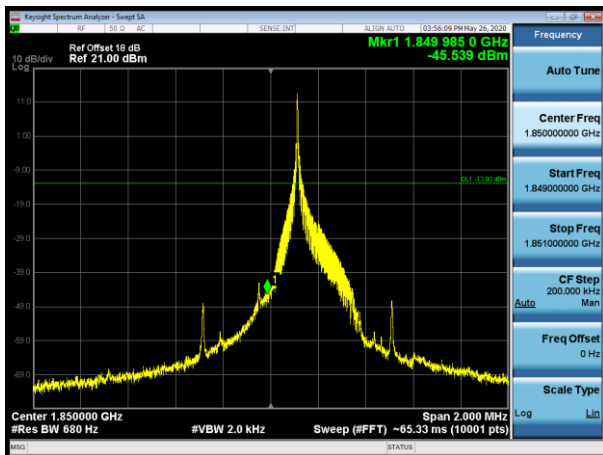
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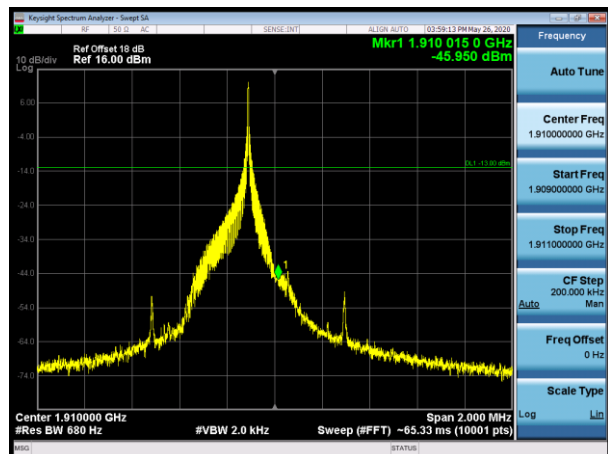
Channel 19198-1 tone offset 47, BW 3.75kHz, BPSK



Channel 18602-1 tone offset 0, BW 3.75kHz, QPSK



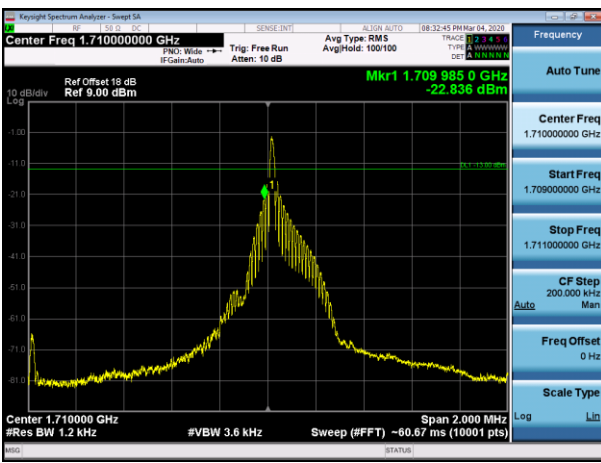
Channel 19198-1 tone offset 47, BW 3.75kHz, QPSK



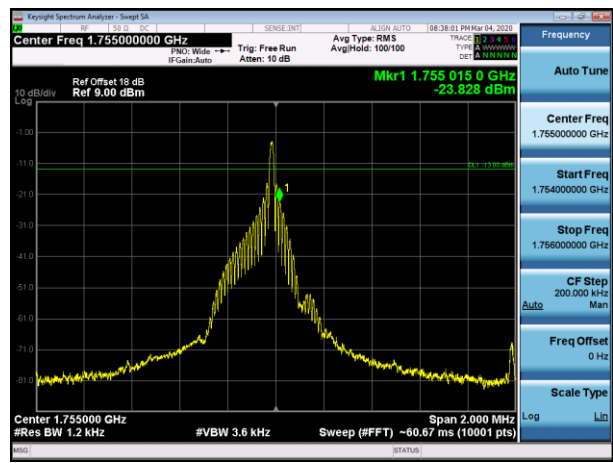
Note: All modes of operation were investigated, only the worst case results were shown in the report.

NB IoT Band 4

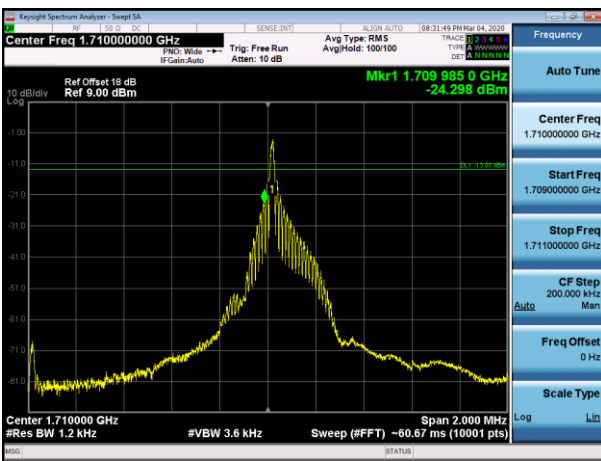
Channel 19951-1 tone offset 0, BW 15kHz, BPSK



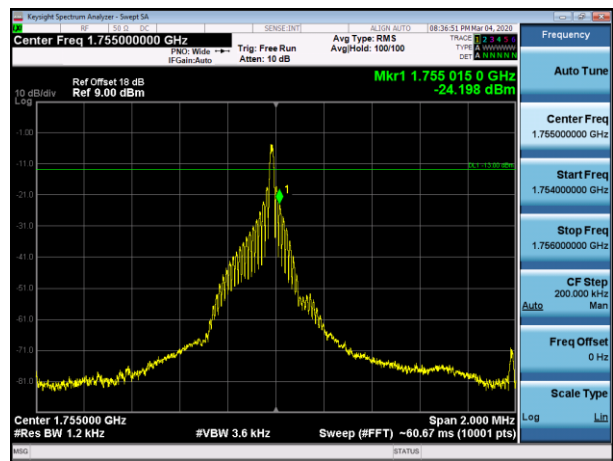
Channel 20399-1 tone offset 11, BW 15kHz, BPSK



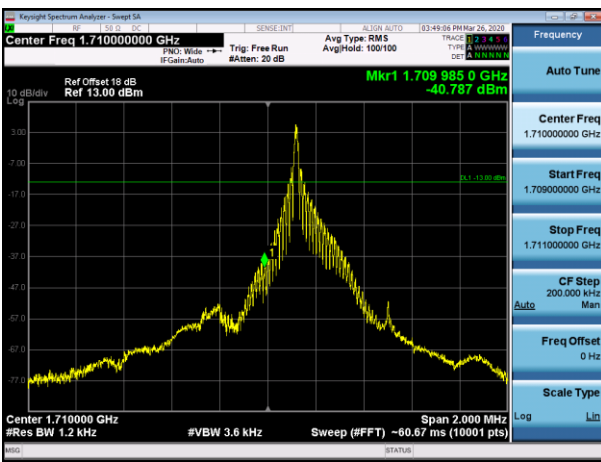
Channel 19951-1 tone offset 0, BW 15kHz, QPSK



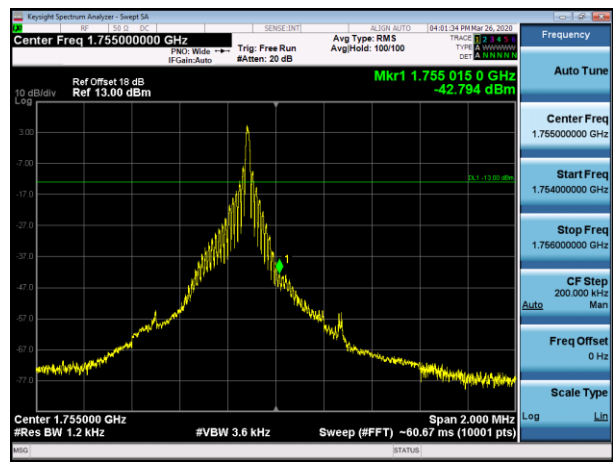
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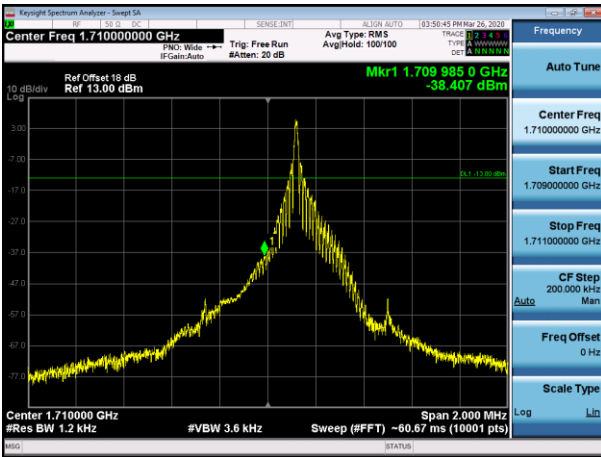
Channel 19952-1 tone offset 0, BW 15kHz, BPSK



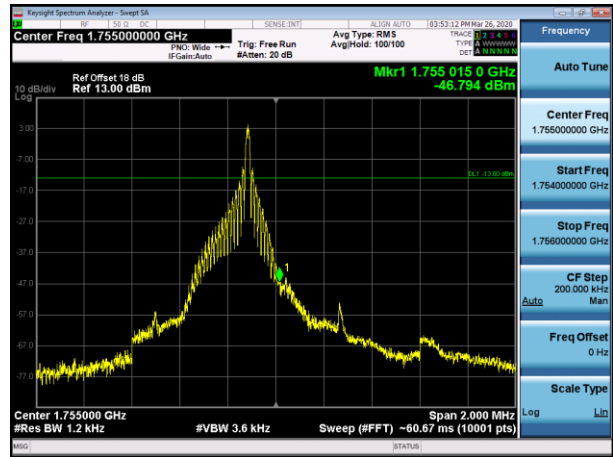
Channel 20398-1 tone offset 11, BW 15kHz, BPSK



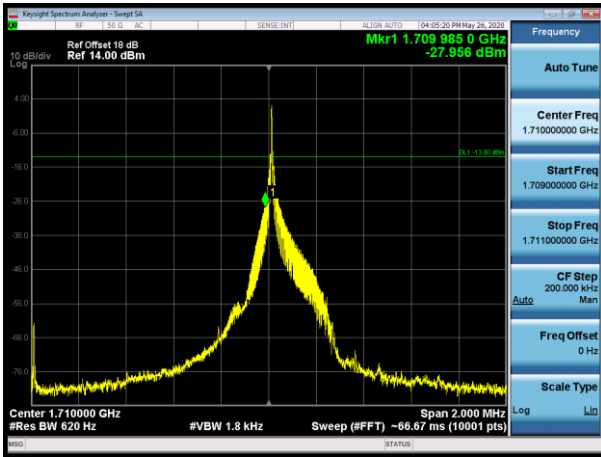
Channel 19952-1 tone offset 0, BW 15kHz, QPSK



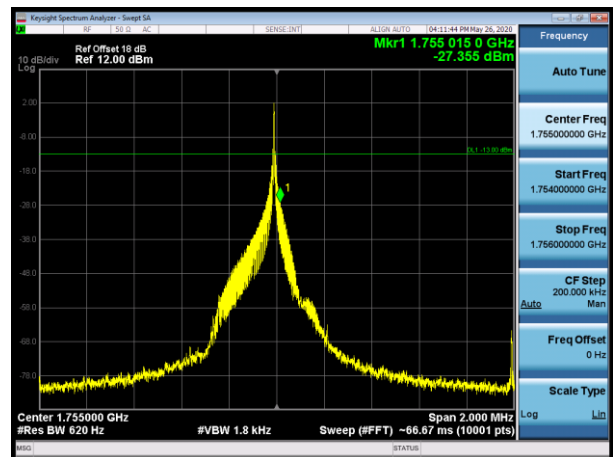
Channel 20398-1 tone offset 11, BW 15kHz, QPSK



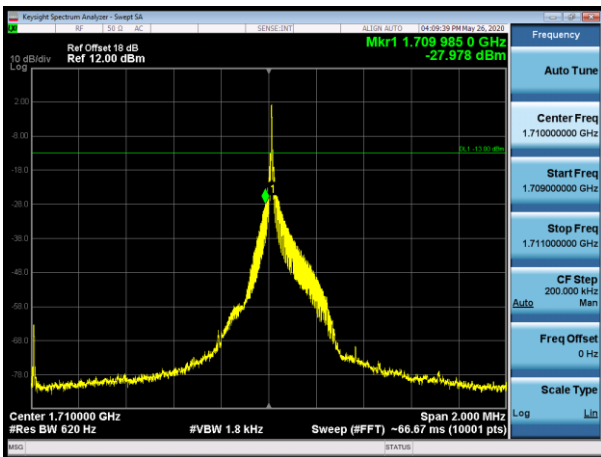
Channel 19951-1 tone offset 0, BW 3.75kHz, BPSK



Channel 20399-1 tone offset 47, BW 3.75kHz, BPSK



Channel 19951-1 tone offset 0, BW 3.75kHz, QPSK



Channel 20399-1 tone offset 47, BW 3.75kHz, QPSK

