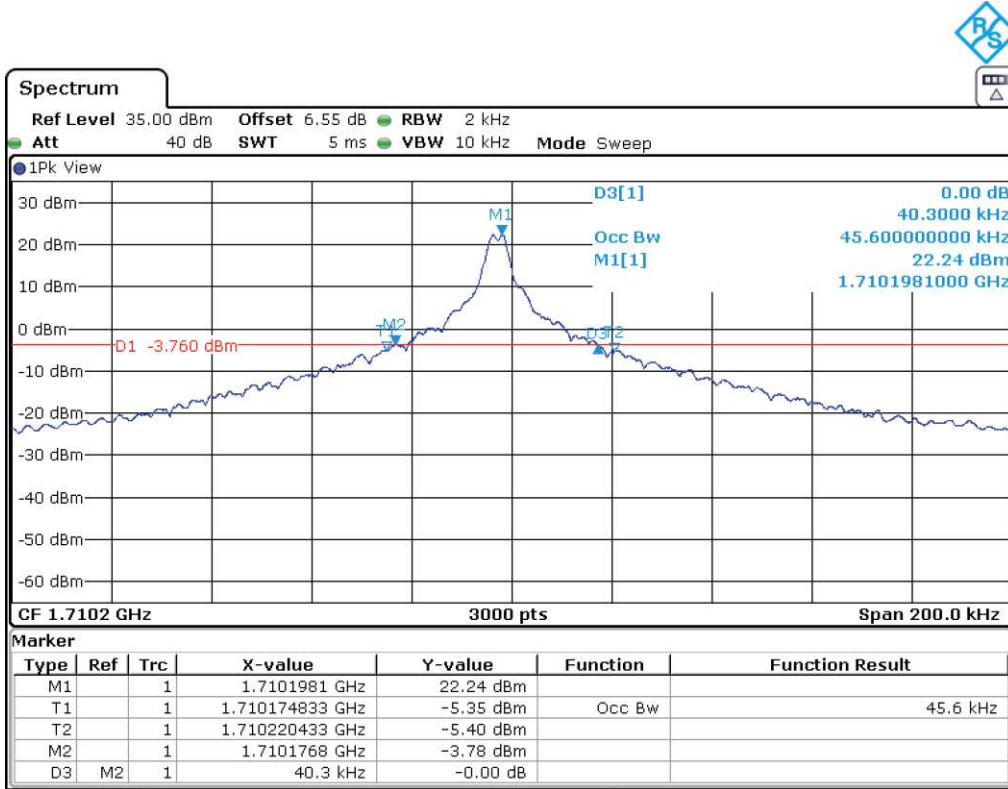


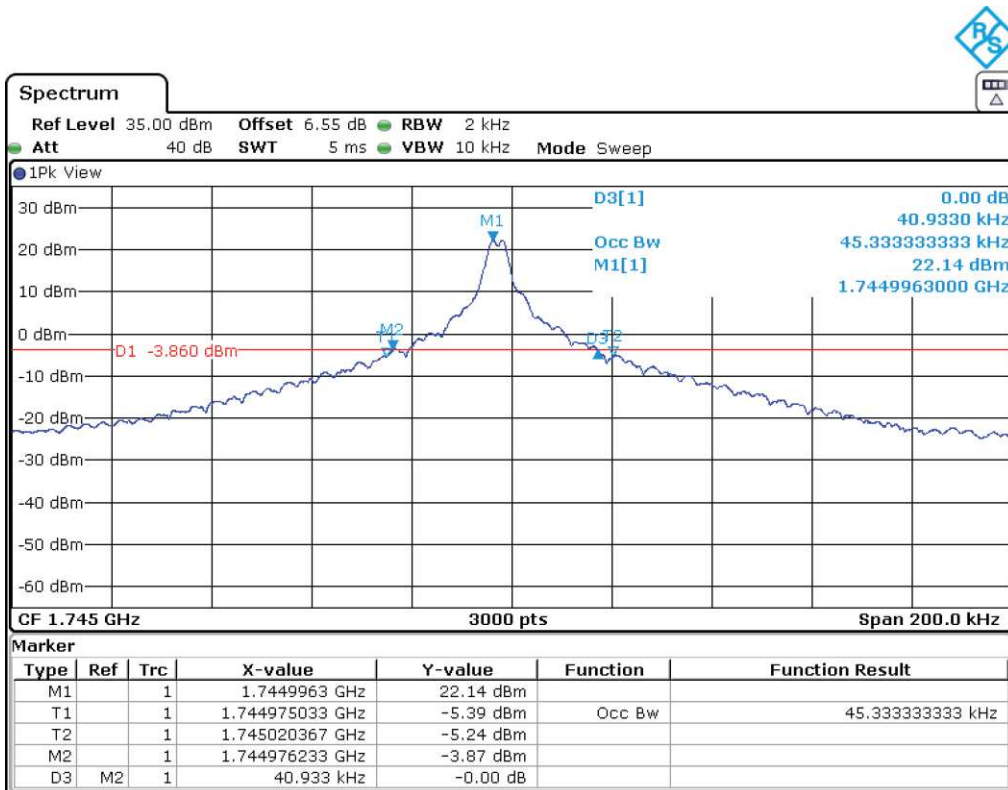
NB IoT BAND 66.

Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION

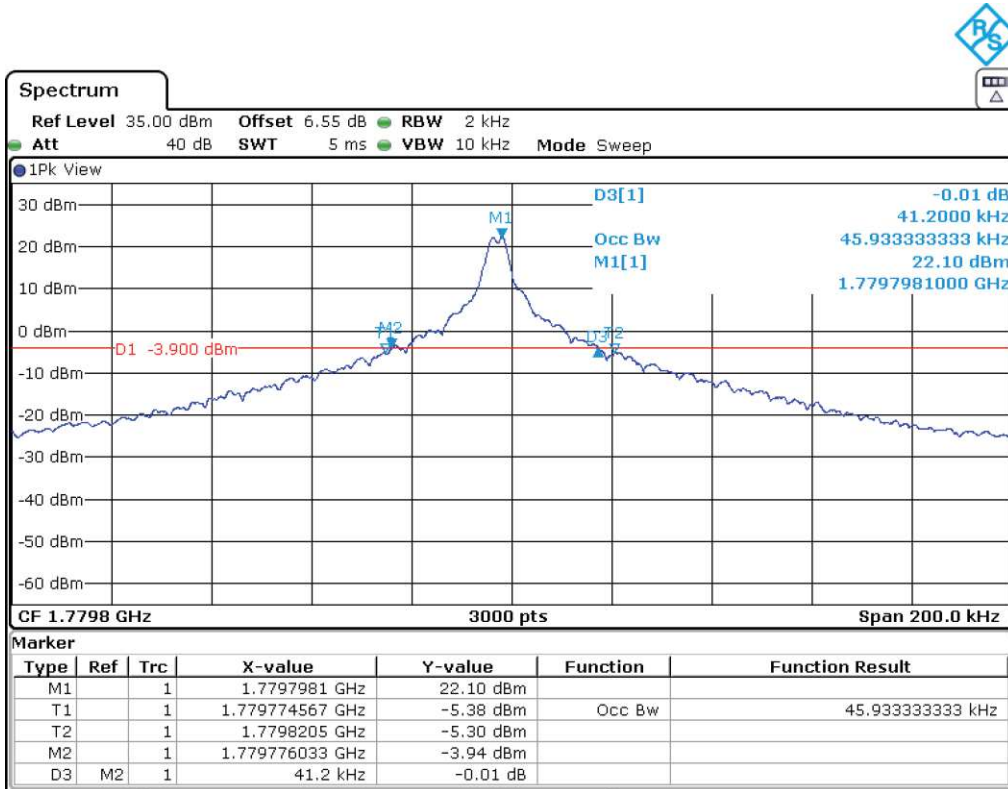
Lowest Channel



Middle Channel

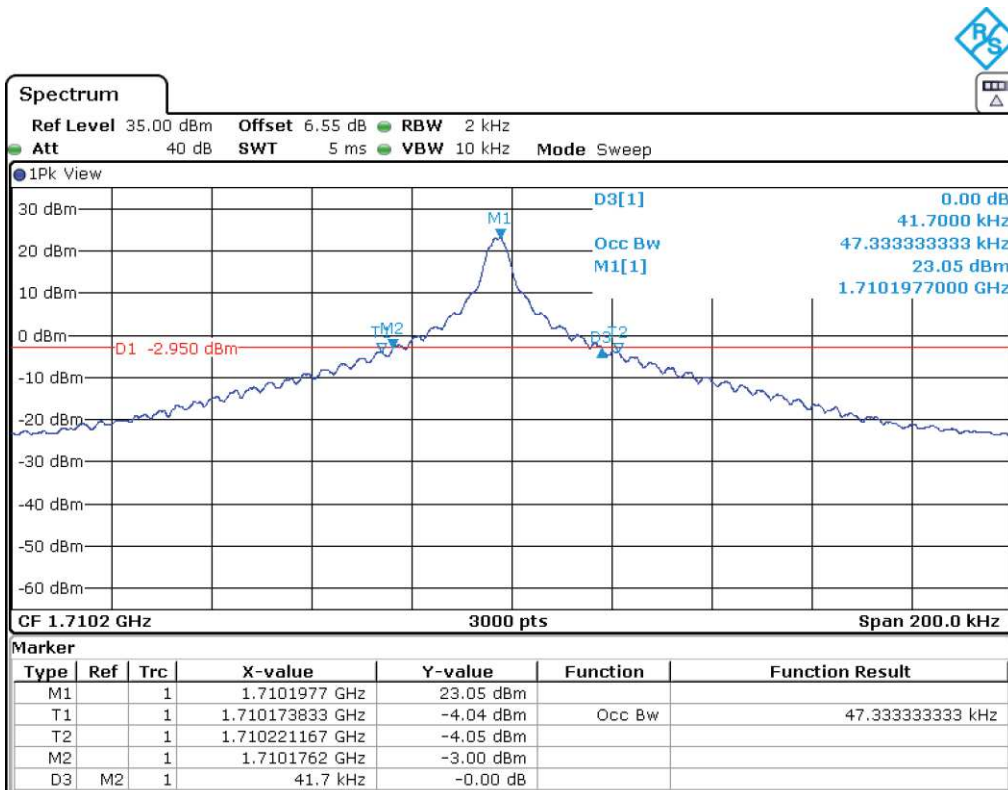


Highest Channel

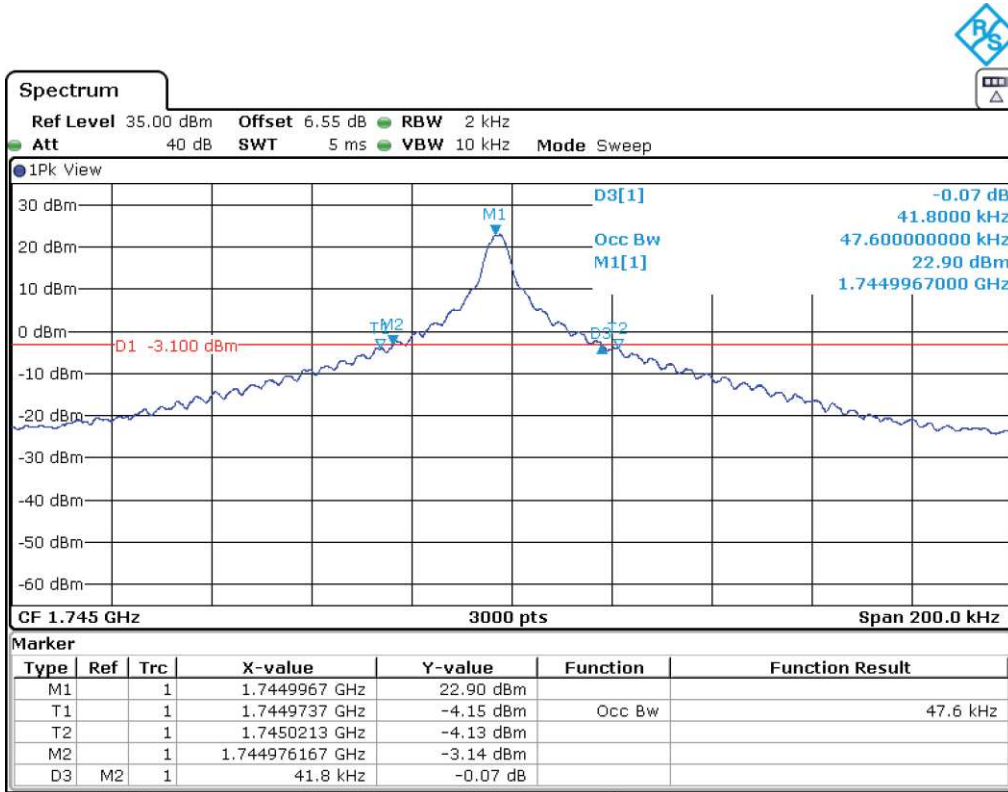


Tone 3.75 kHz.  $\pi/4$  - QPSK MODULATION

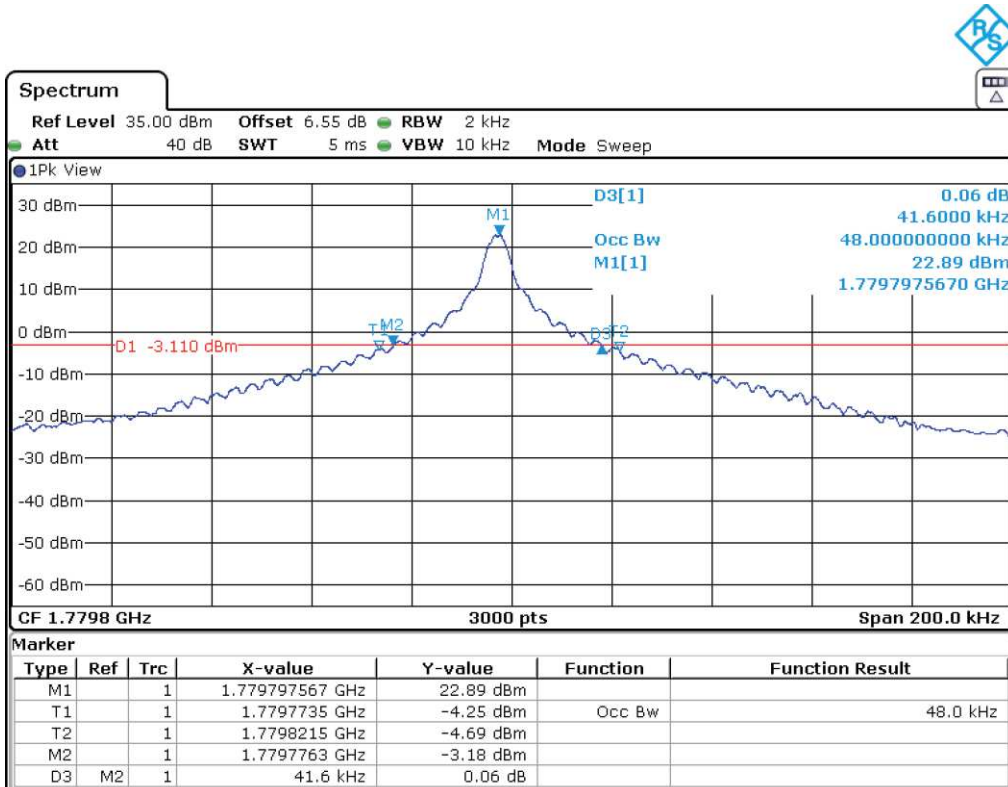
Lowest Channel



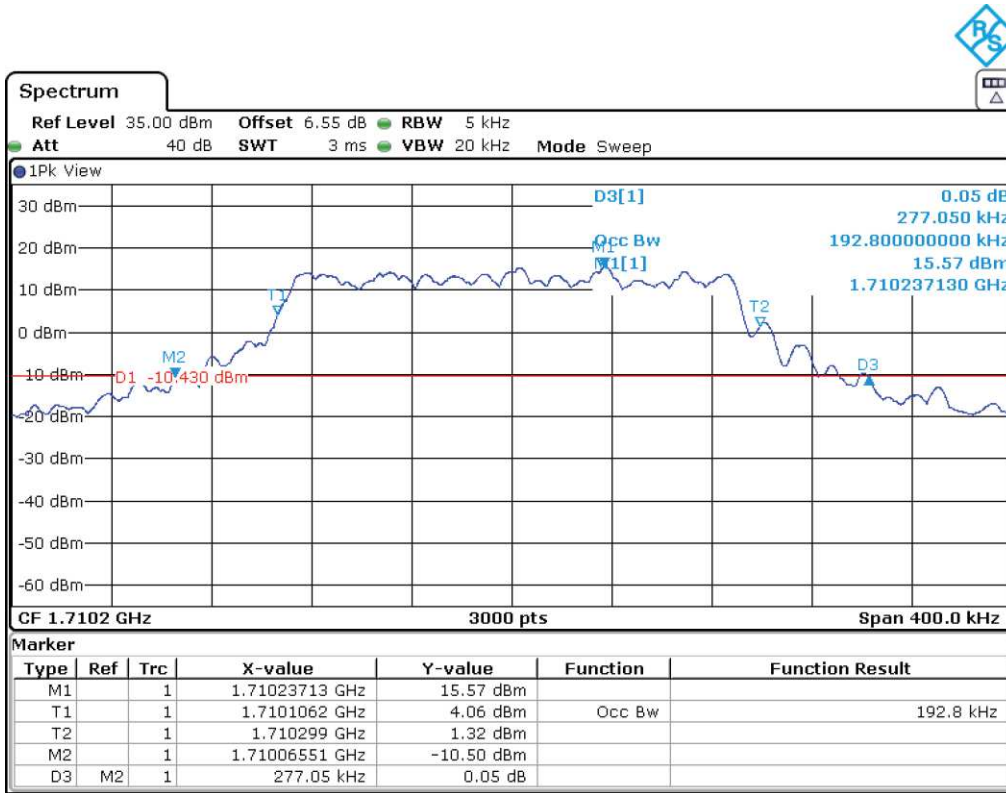
Middle Channel



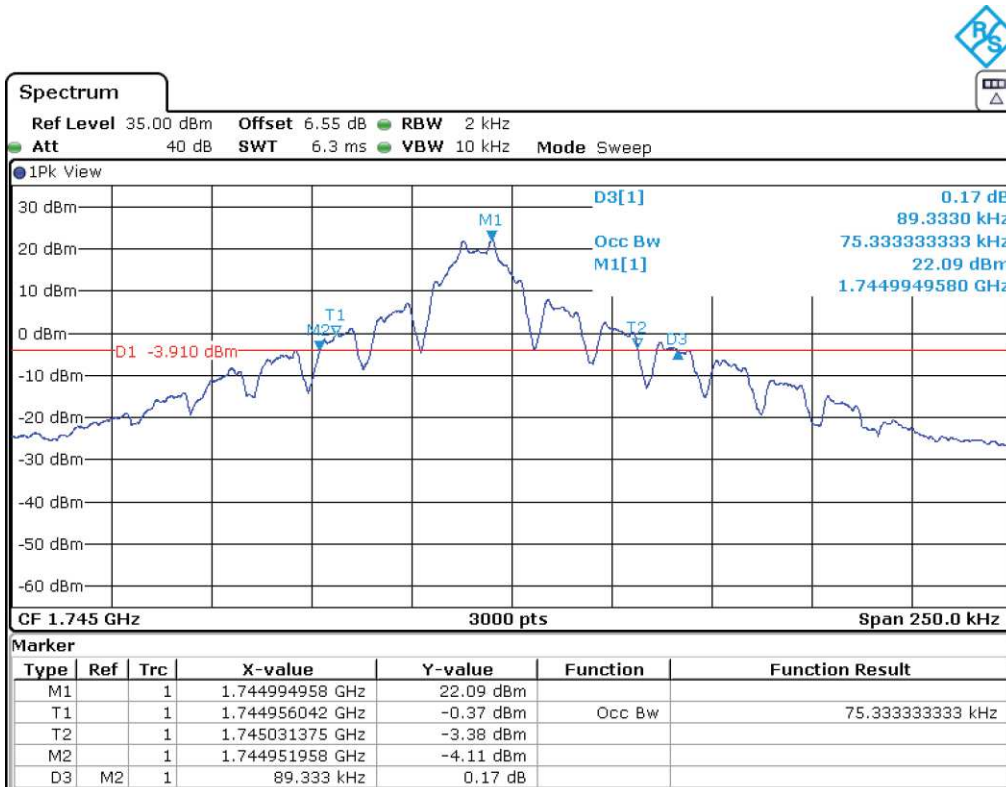
Highest Channel



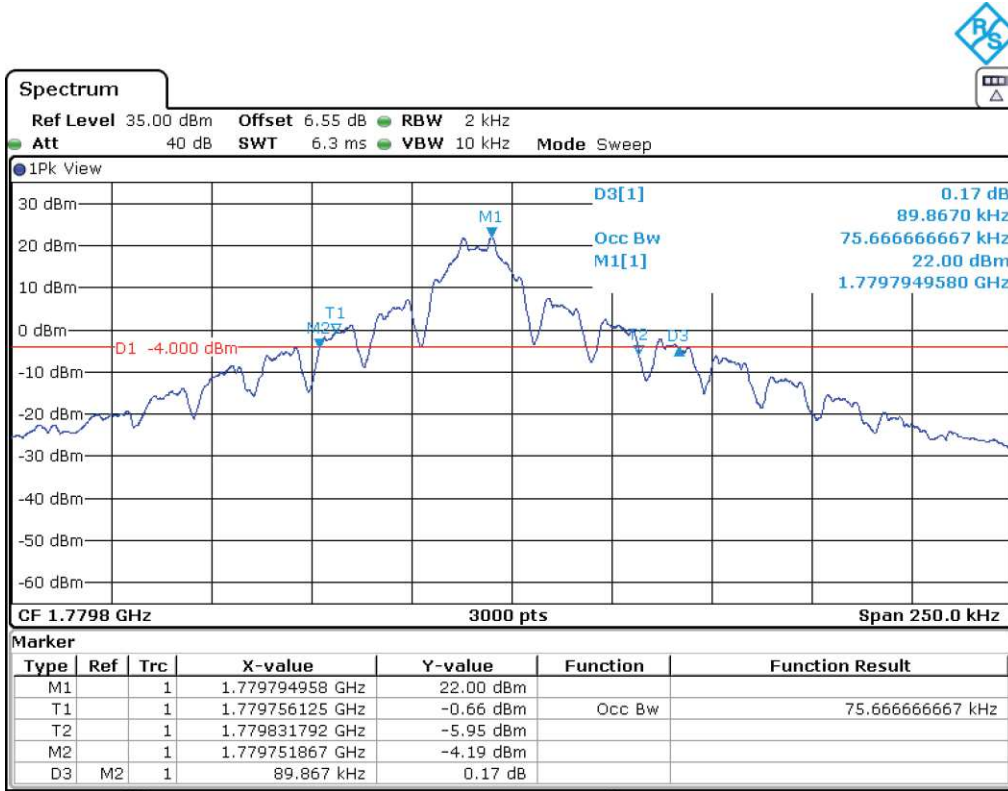
Tone 15 kHz.  $\pi/2$  - BPSK MODULATION  
 Lowest Channel



Middle Channel

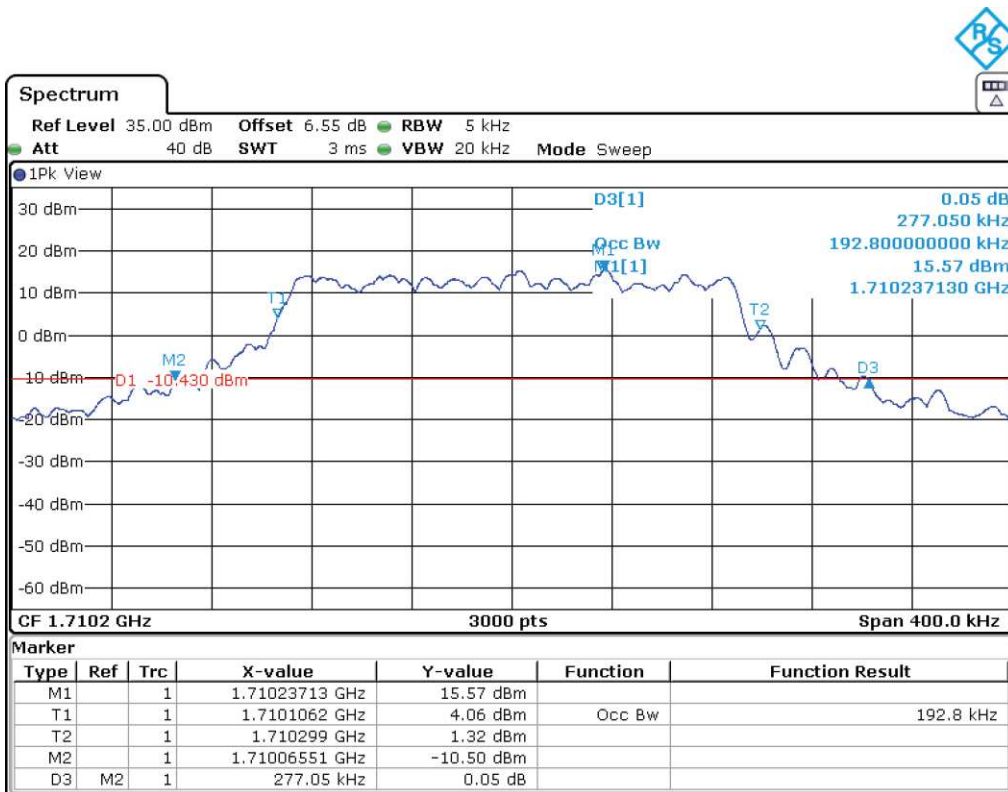


Highest Channel

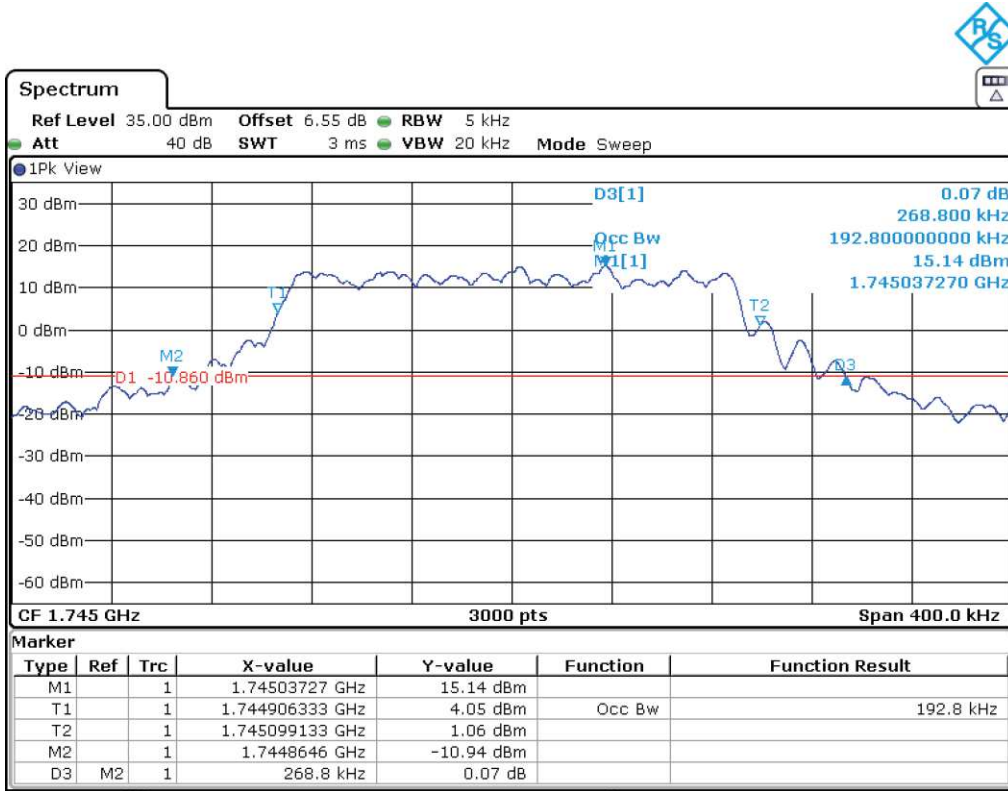


12 Tones 15 kHz.  $\pi/4$  - QPSK MODULATION

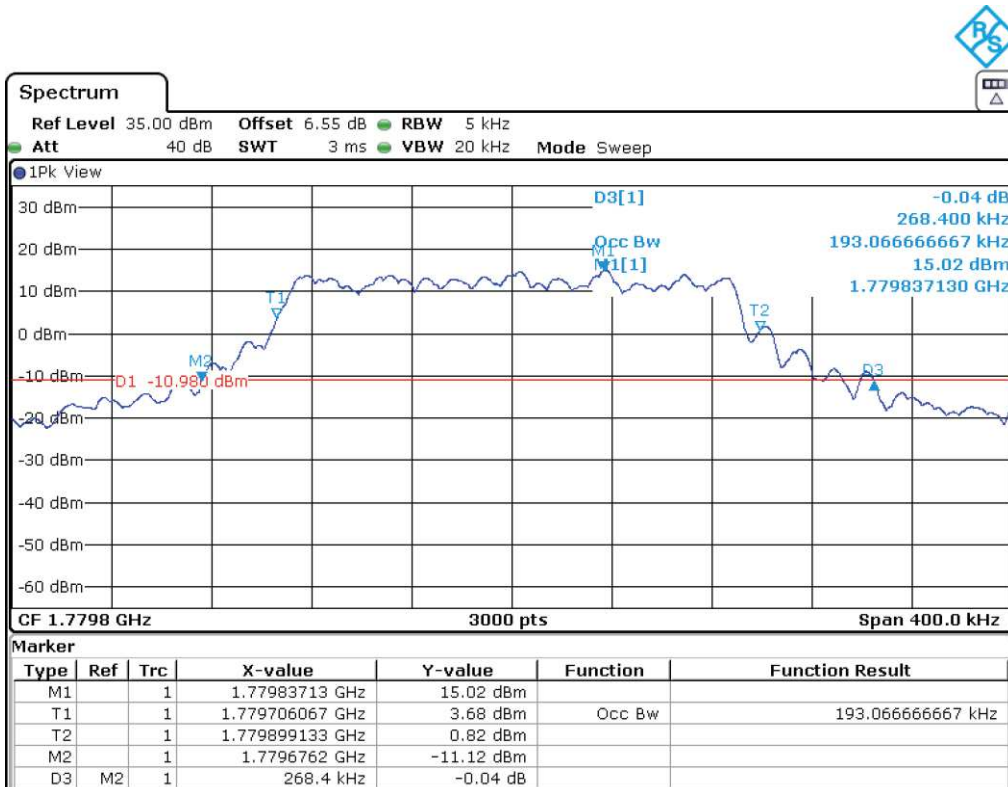
Lowest Channel



Middle Channel



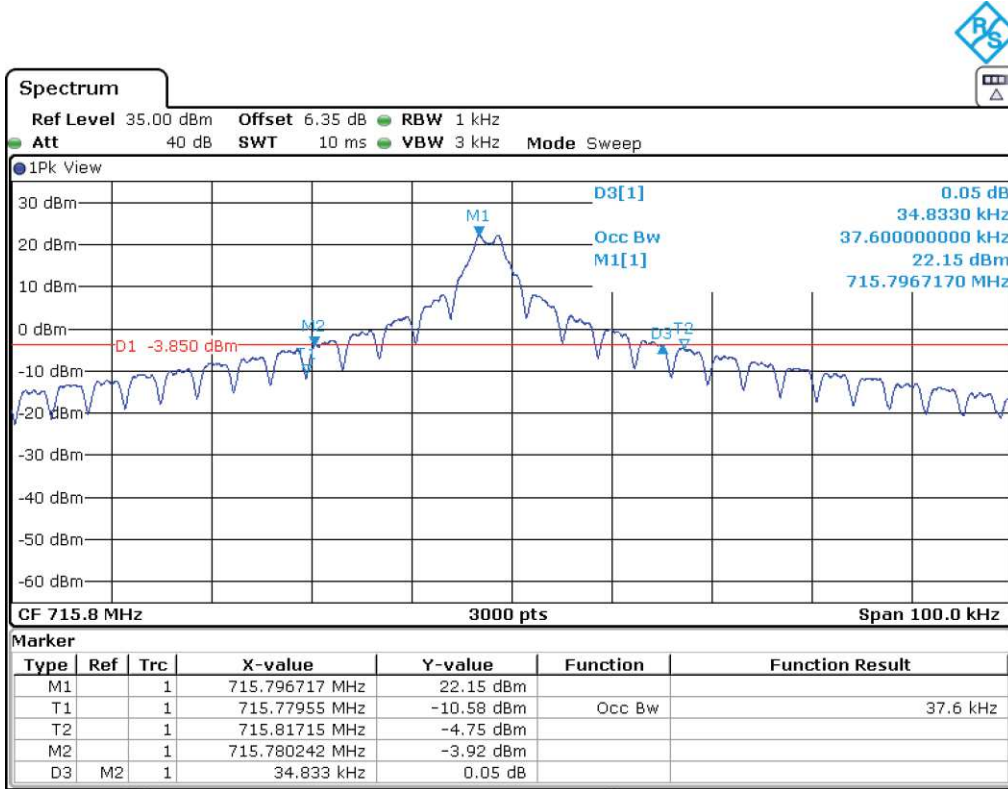
Highest Channel



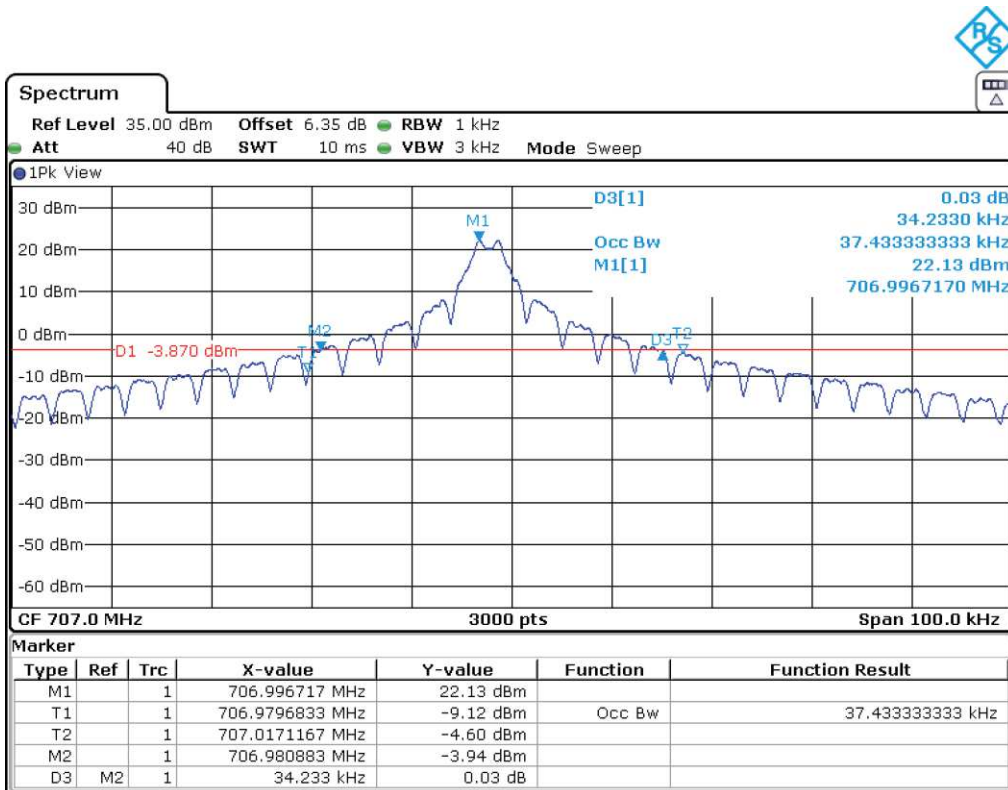
NB IoT BAND 85.

Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION

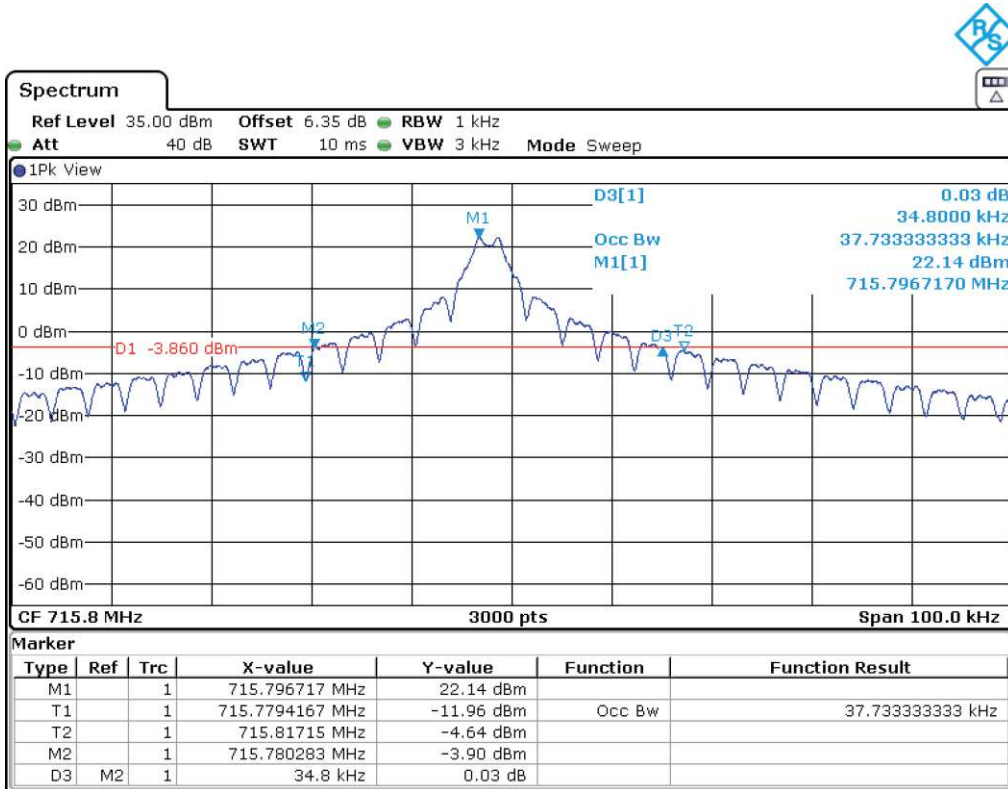
Lowest Channel



Middle Channel

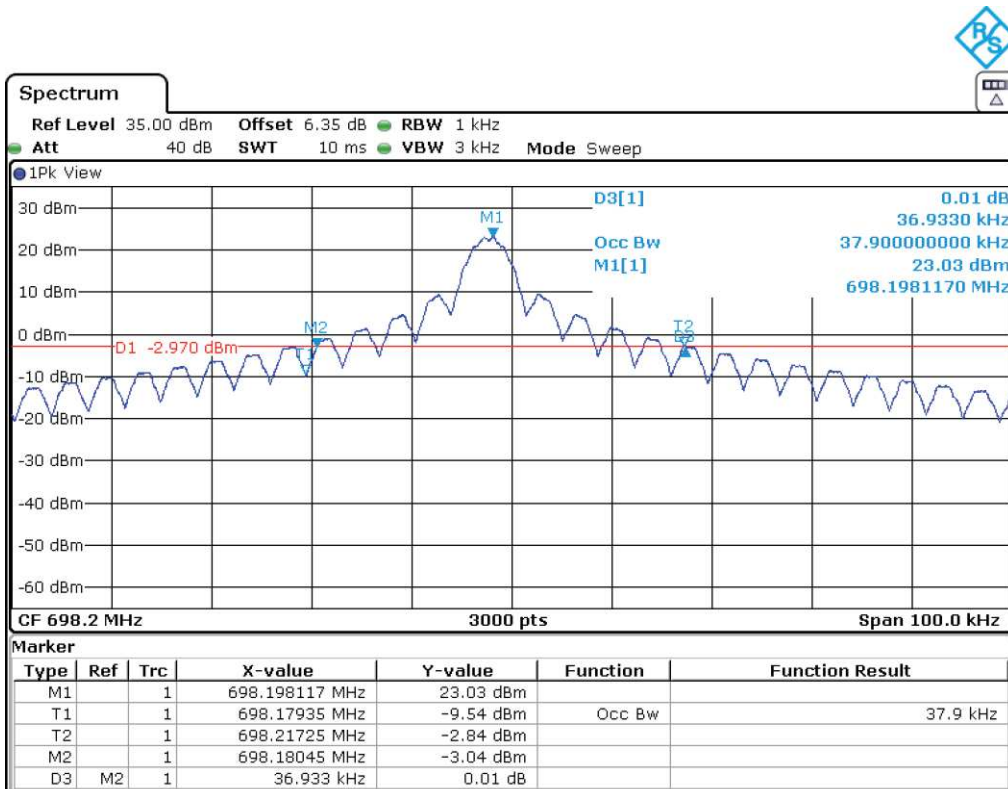


Highest Channel



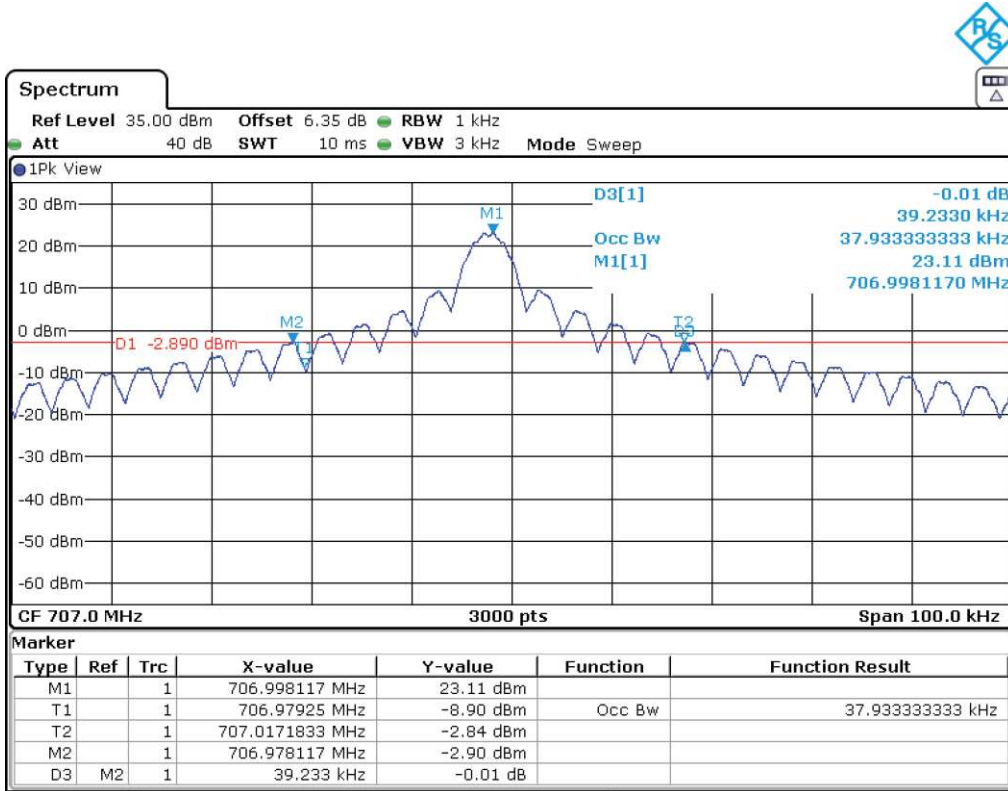
Tone 3.75 kHz.  $\pi/4$  - QPSK MODULATION

Lowest Channel

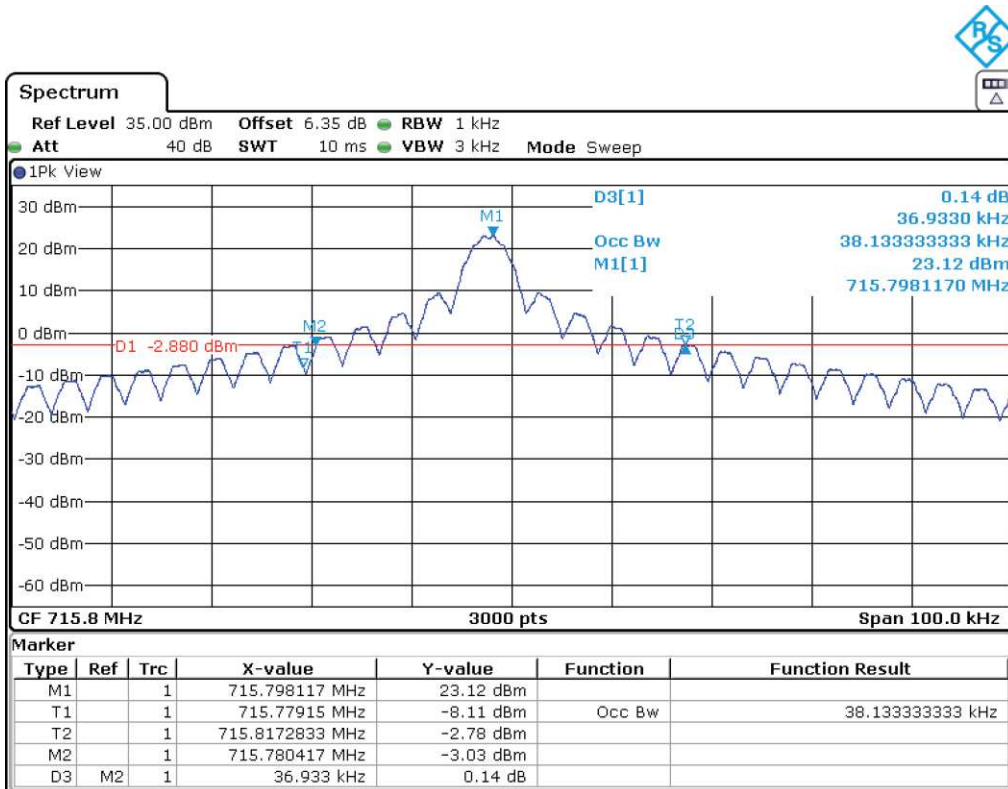




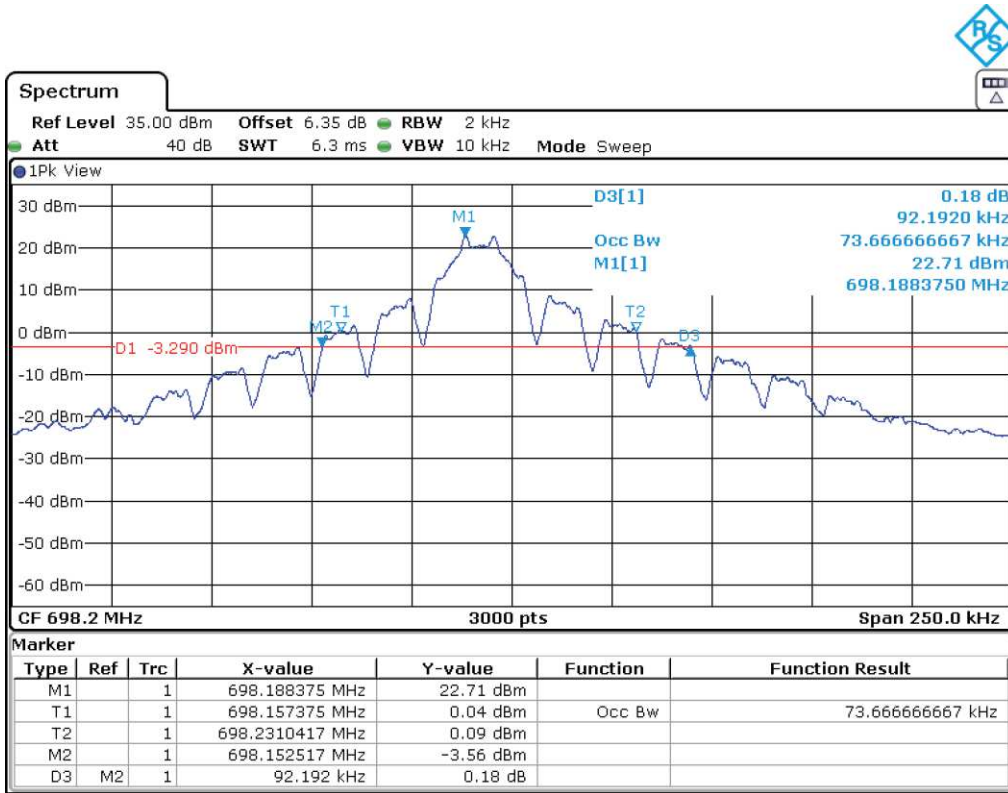
Middle Channel



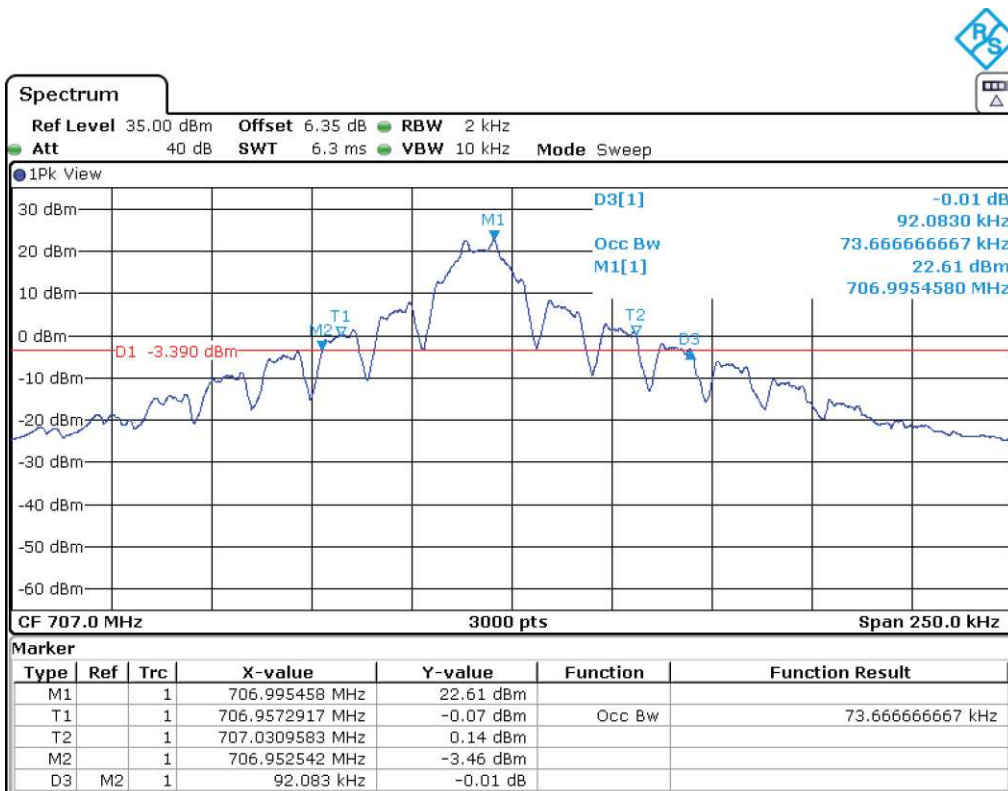
Highest Channel



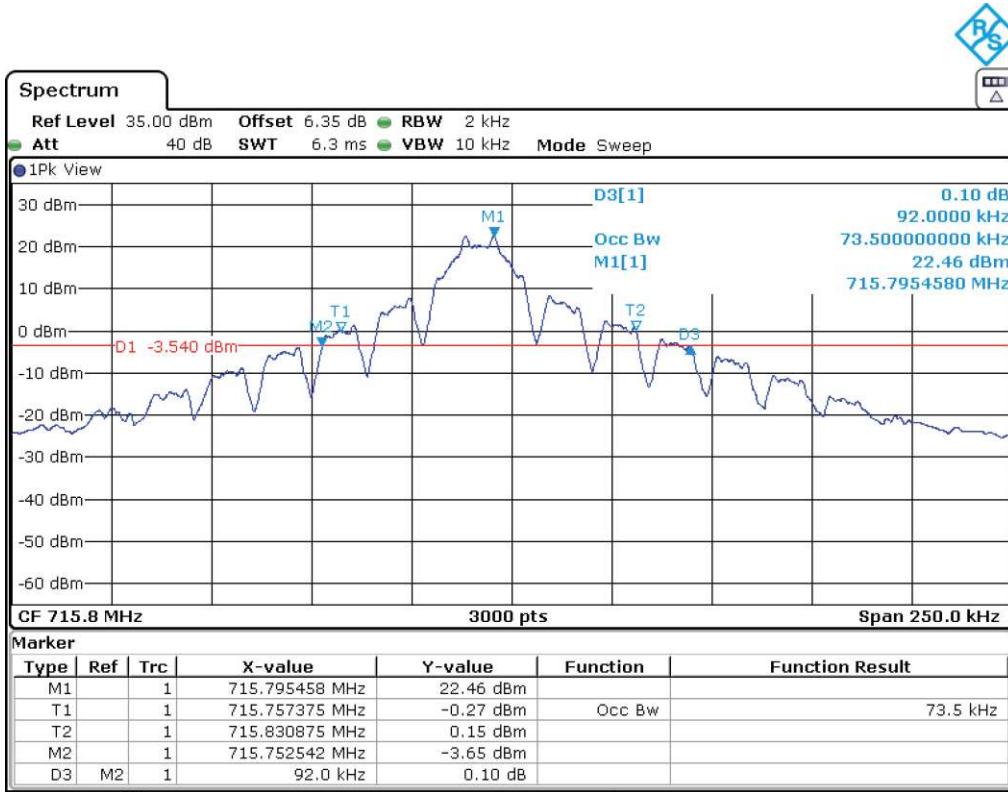
Tone 15 kHz.  $\pi/2$  - BPSK MODULATION  
 Lowest Channel



Middle Channel

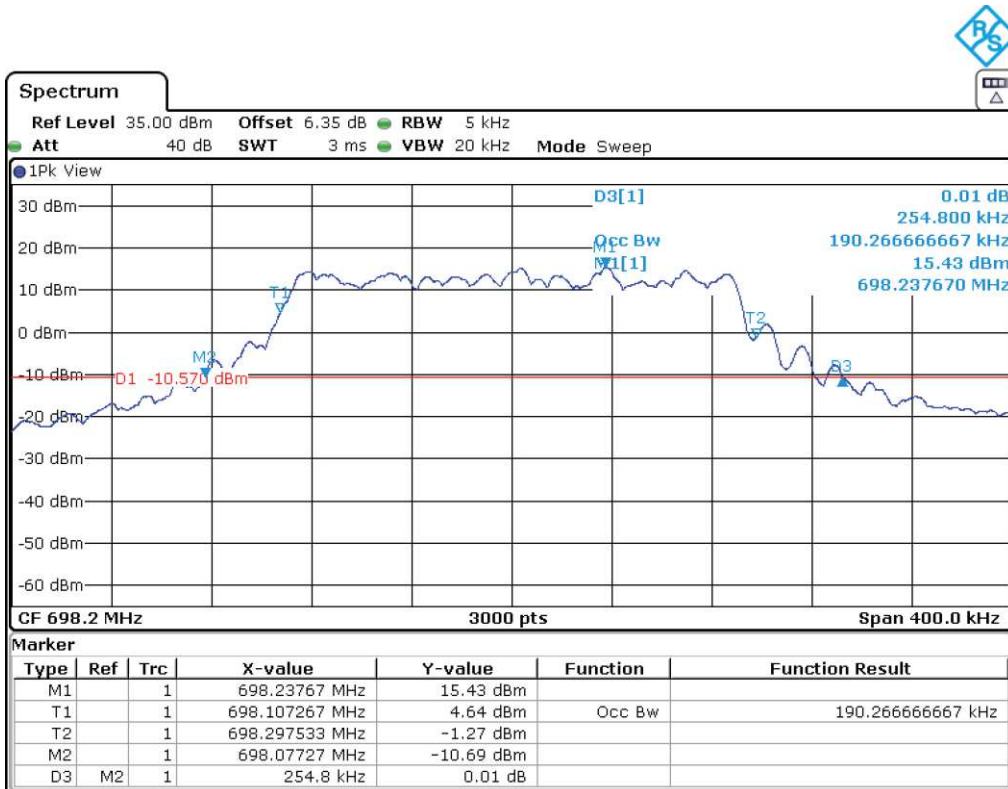


Highest Channel

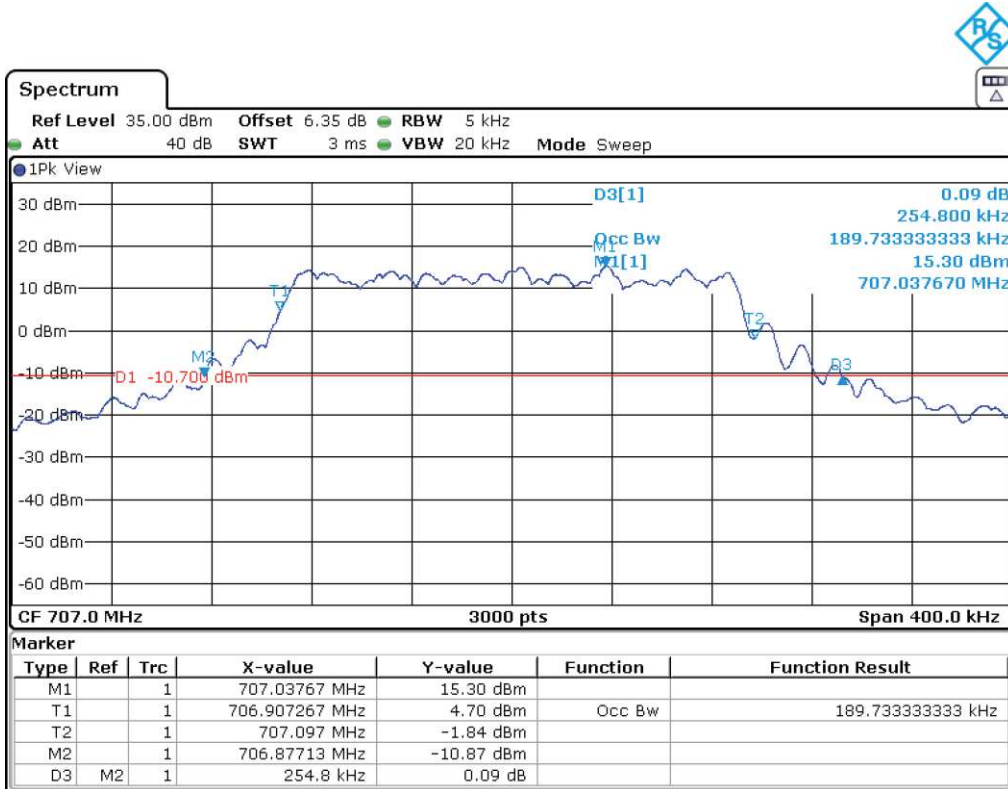


12 Tones 15 kHz.  $\pi/4$  - QPSK MODULATION

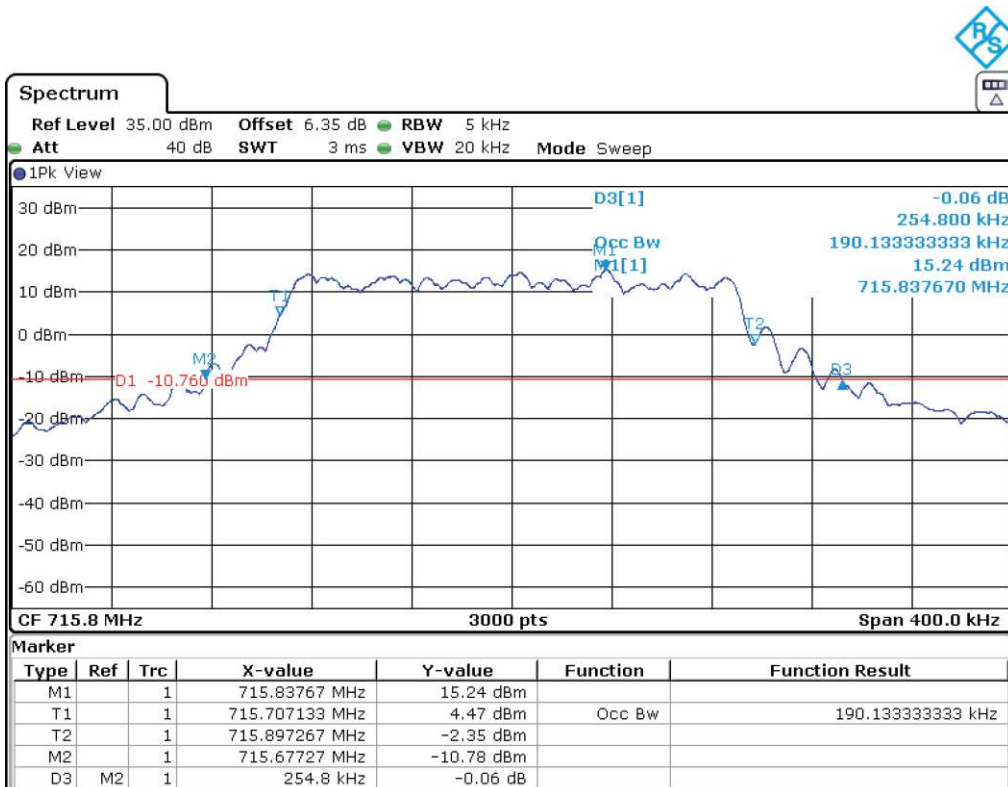
Lowest Channel



Middle Channel



Highest Channel



## Spurious emissions at antenna terminals

### SPECIFICATION

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 Clause 4.6.

The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB.

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.

FCC §27.53 (h), RSS-139 Clause 6.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB, P in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm.}$$

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $65 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [65 + 10 \log (P_o \text{ in mwatts}) - 30] = -35 \text{ dBm.}$$

### METHOD

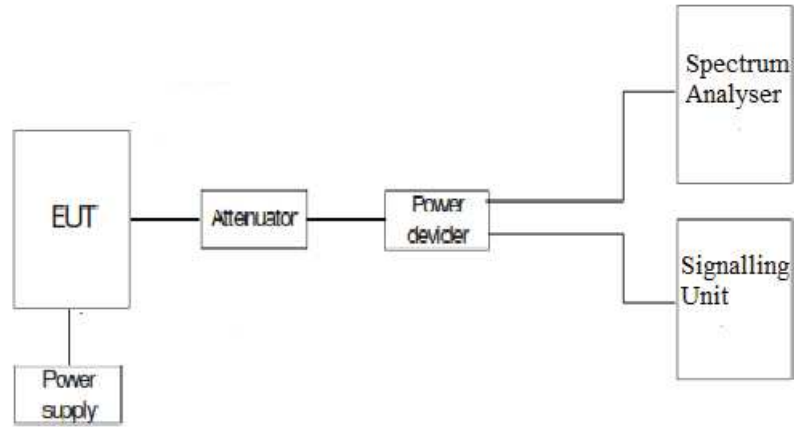
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power divider.

The spectrum was investigated from 9 kHz to 18 GHz for NB-IoT Band 66 and from 9 kHz to 8 GHz for NB-IoT Band 12 and 13.

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.

The configuration of tones and modulation which is the worst case for conducted power was used.

TEST SETUP



RESULTS (see plots in next pages)

NBLoT Band 12 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

Frequency (GHz)	Level (dBm)	Limit (dBm)
1.41508	-32.97	-13.00

3. CHANNEL: HIGHEST

Frequency (GHz)	Level (dBm)	Limit (dBm)
1.43188	-32.99	-13.00

NBLoT Band 12 (3 Tone 15 kHz.  $\pi/4$  - QPSK MODULATION)

1. CHANNEL: LOWEST

Frequency (GHz)	Level (dBm)	Limit (dBm)
1.39854	-30.86	-13.00

2. CHANNEL: MIDDLE

Frequency (GHz)	Level (dBm)	Limit (dBm)
1.41508	-30.4	-13.00

3. CHANNEL: HIGHEST

Frequency (GHz)	Level (dBm)	Limit (dBm)
1.43161	-29.62	-13.00

Measurement uncertainty (dB):  $< \pm 2.76$

Verdict: PASS

NBLoT Band 13 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

Frequency (MHz)	Level (dBm)	Limit (dBm)
774.999	-50.65	-35

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

NBLoT Band 13 (Tone 15 kHz.  $\pi/4$  - QPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

Measurement uncertainty (dB):  $< \pm 2.76$

Verdict: PASS

NBLoT Band 66 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found in all the range.

NBLoT Band 66 (Tone 15 kHz.  $\pi/4$  - QPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found in all the range.

Measurement uncertainty (dB):  $< \pm 2.76$

Verdict: PASS

NBLoT Band 85 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

NBLoT Band 85 (Tone 15 kHz.  $\pi/4$  - QPSK MODULATION)

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

Measurement uncertainty (dB):  $< \pm 2.76$

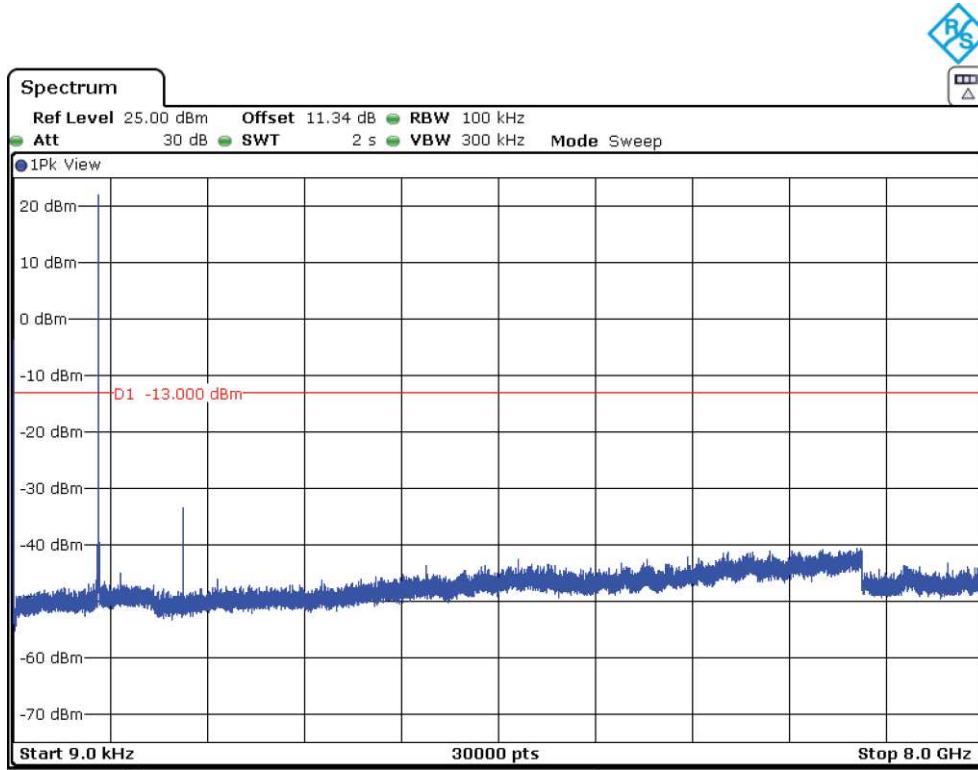
Verdict: PASS



NBLoT Band 12 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

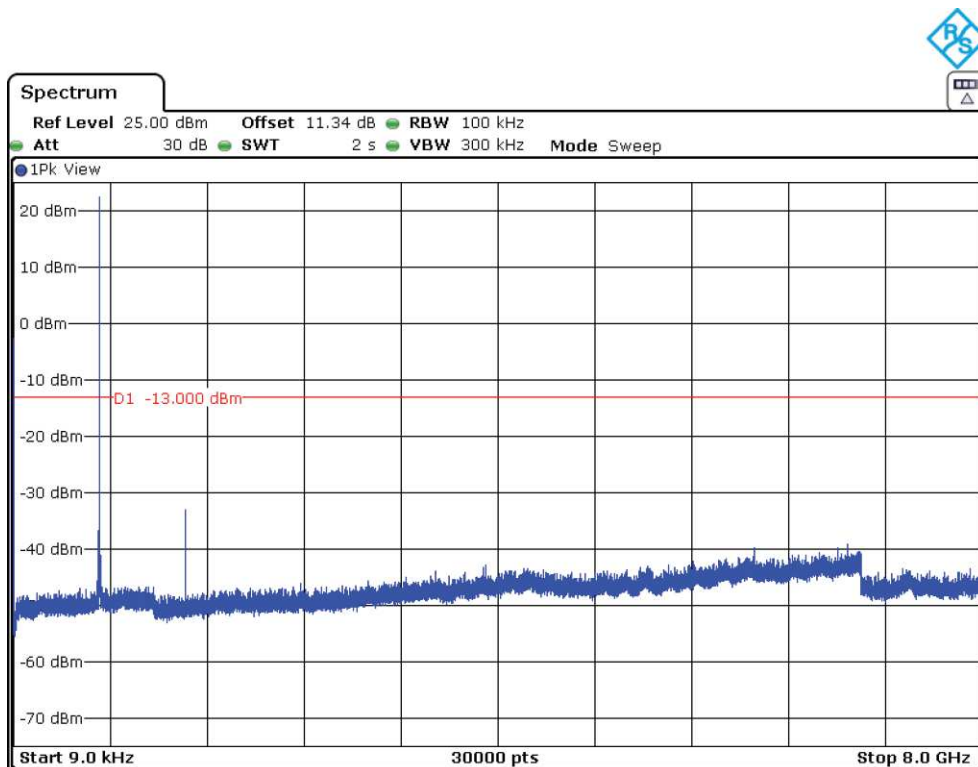
Frequency Range 9 kHz – 8 GHz



Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE

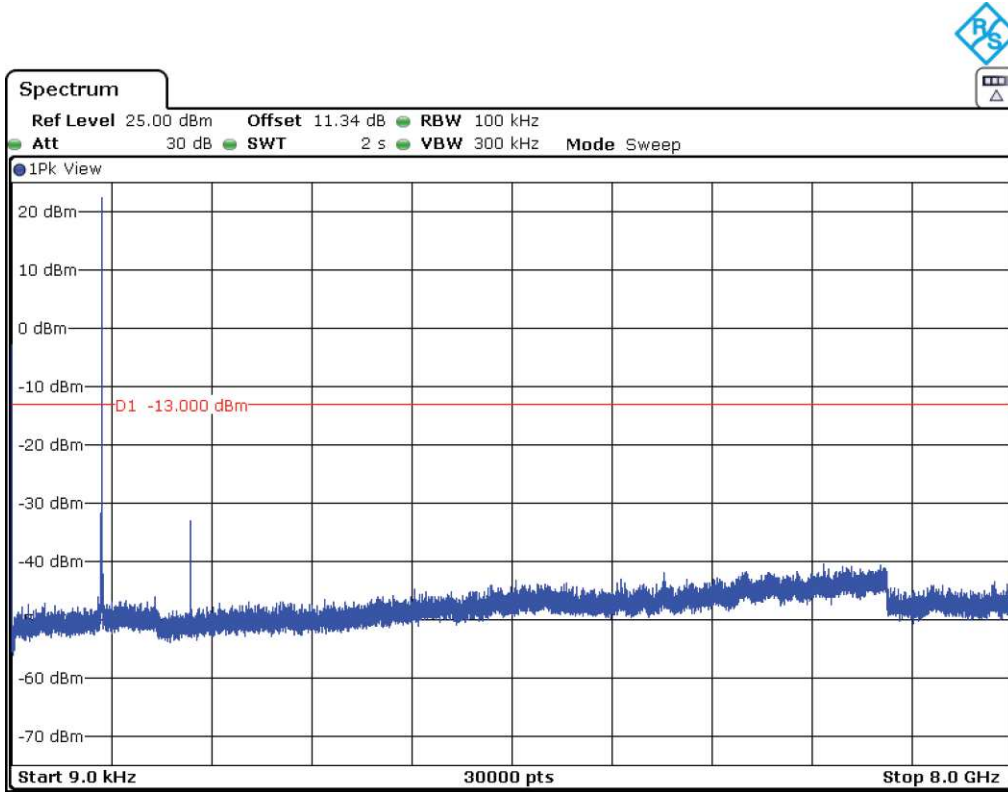
Frequency Range 9 kHz – 8 GHz



Note: The peak above the limit is the carrier frequency.

### 3. CHANNEL: HIGHEST

Frequency Range 9 kHz – 8 GHz

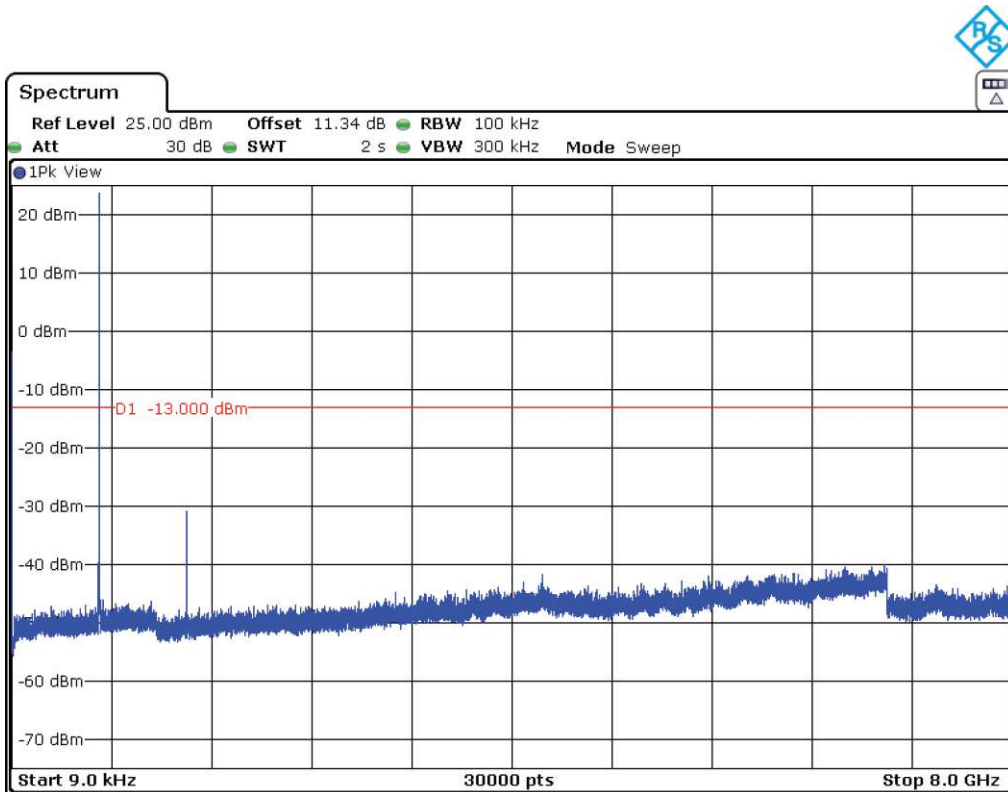


Note: The peak above the limit is the carrier frequency.

NBLoT Band 12 (3 Tones 15 kHz.  $\pi/4$  - QPSK MODULATION)

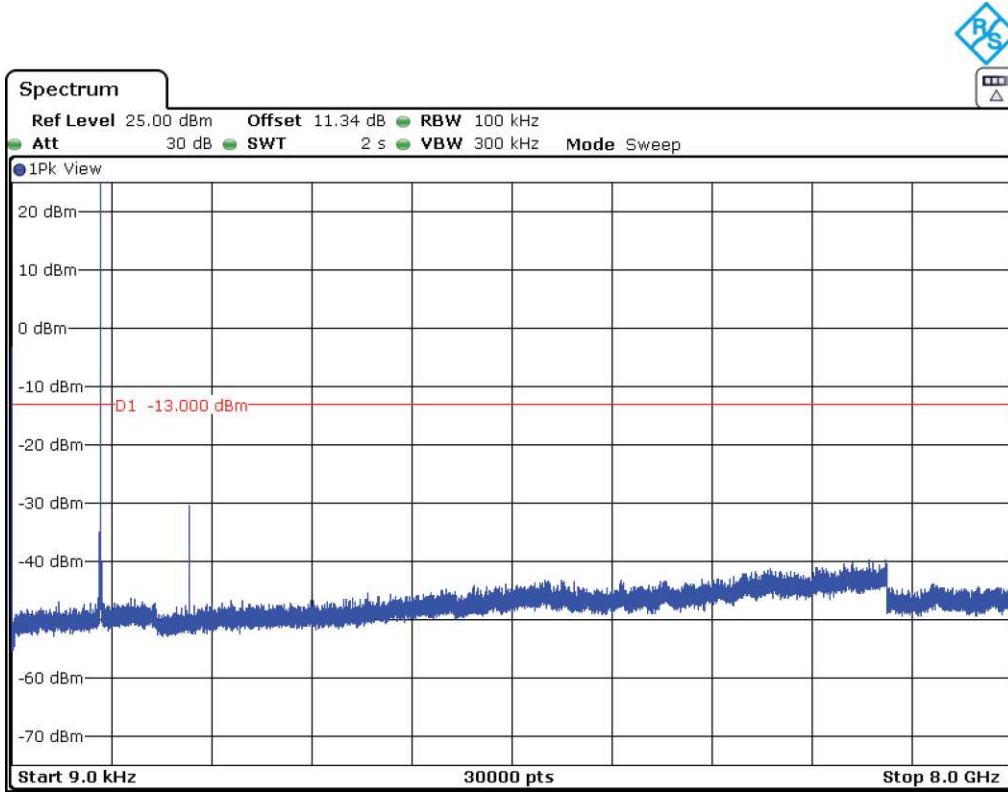
### 1. CHANNEL: LOWEST

Frequency Range 9 kHz – 8 GHz



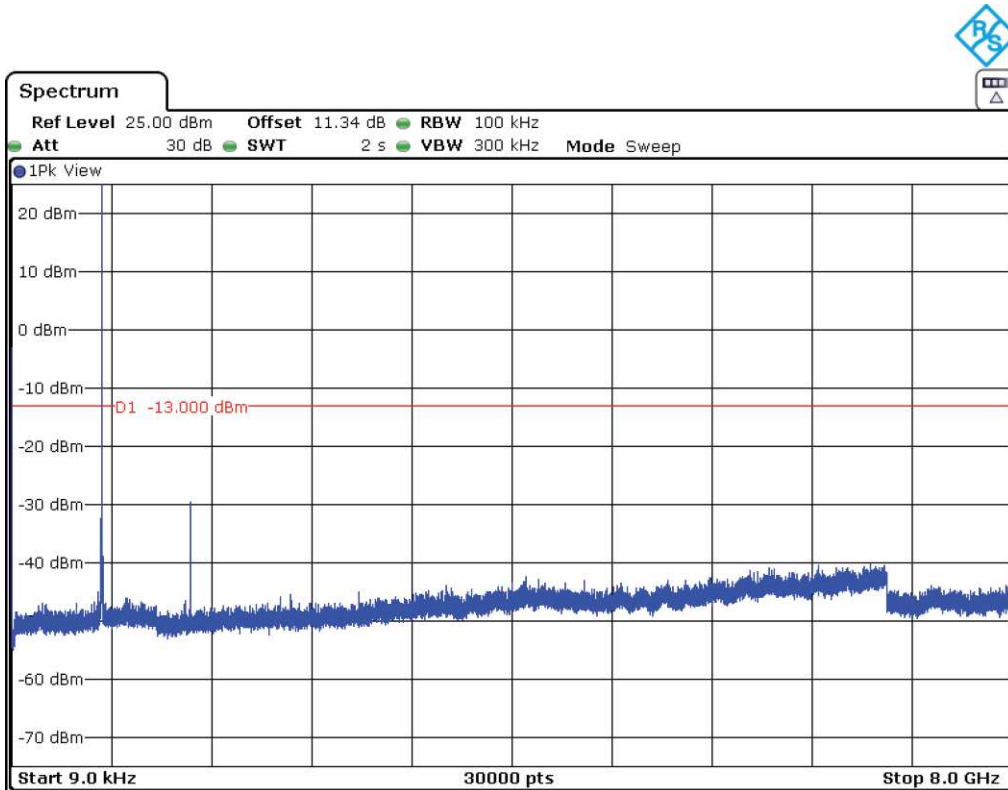
## 2. CHANNEL: MIDDLE

Frequency Range 9 kHz – 8 GHz



## 3. CHANNEL: HIGHEST

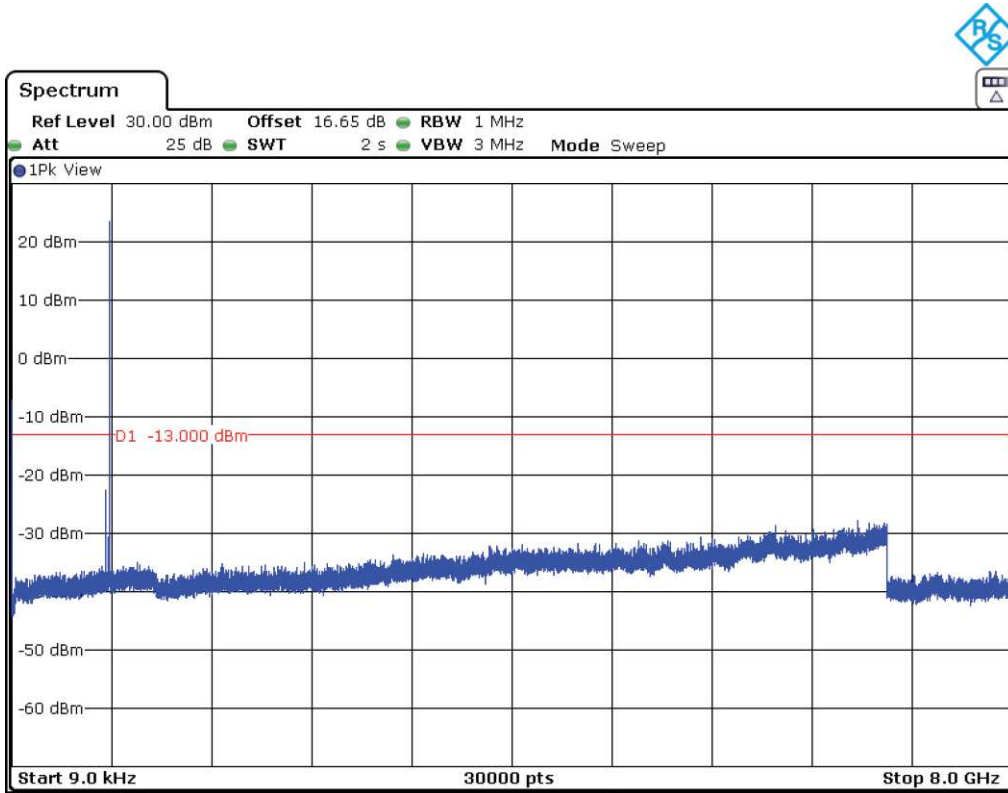
Frequency Range 9 kHz – 8 GHz



NBLoT Band 13 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

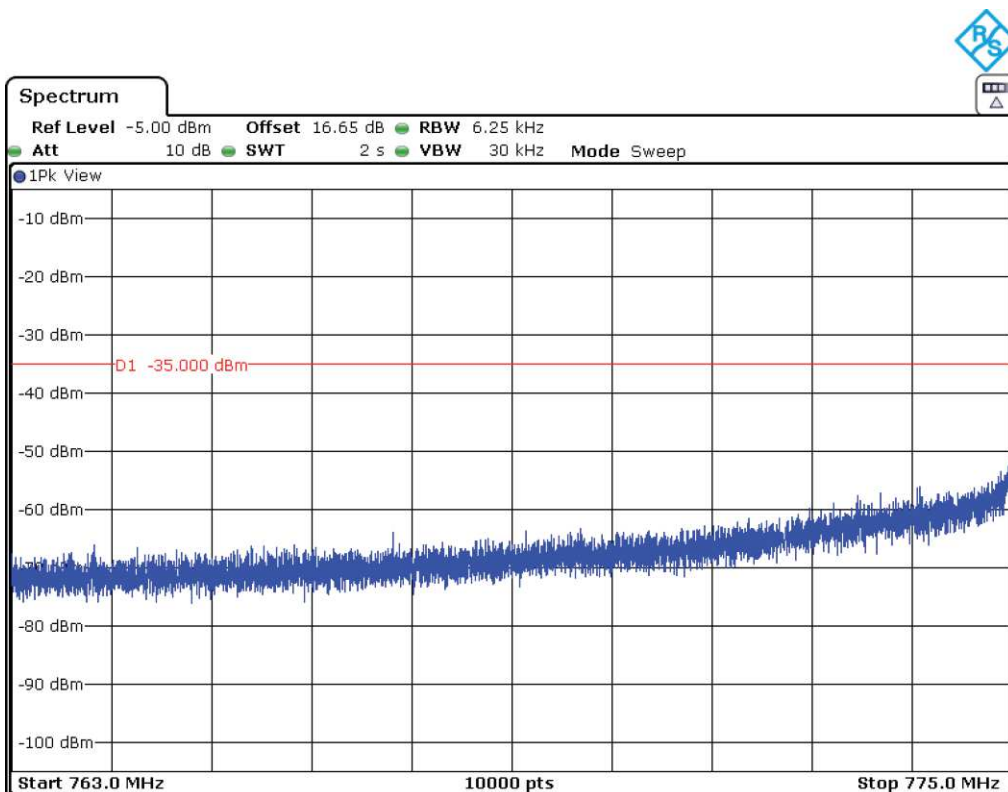
1. CHANNEL: LOWEST

Frequency Range 9 kHz – 8 GHz

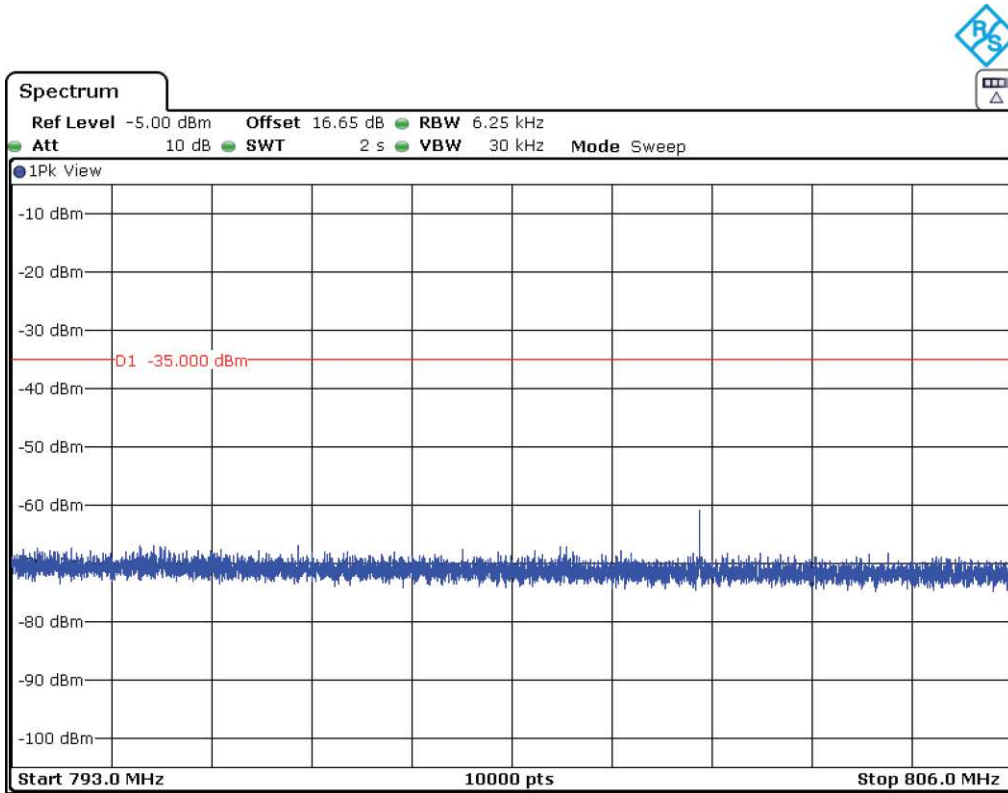


Note: The peak above the limit is the carrier frequency. The peak at 746MHz corresponds to the downlink signal.

Frequency Range 763 MHz - 775 MHz

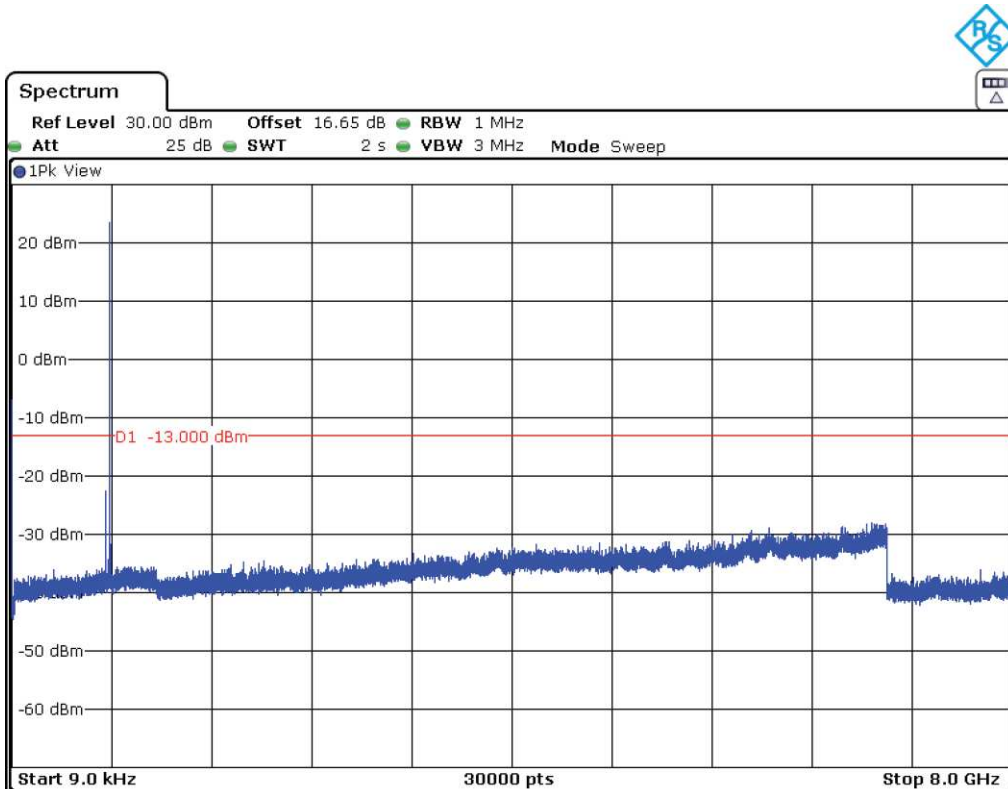


Frequency Range 793 MHz - 806 MHz



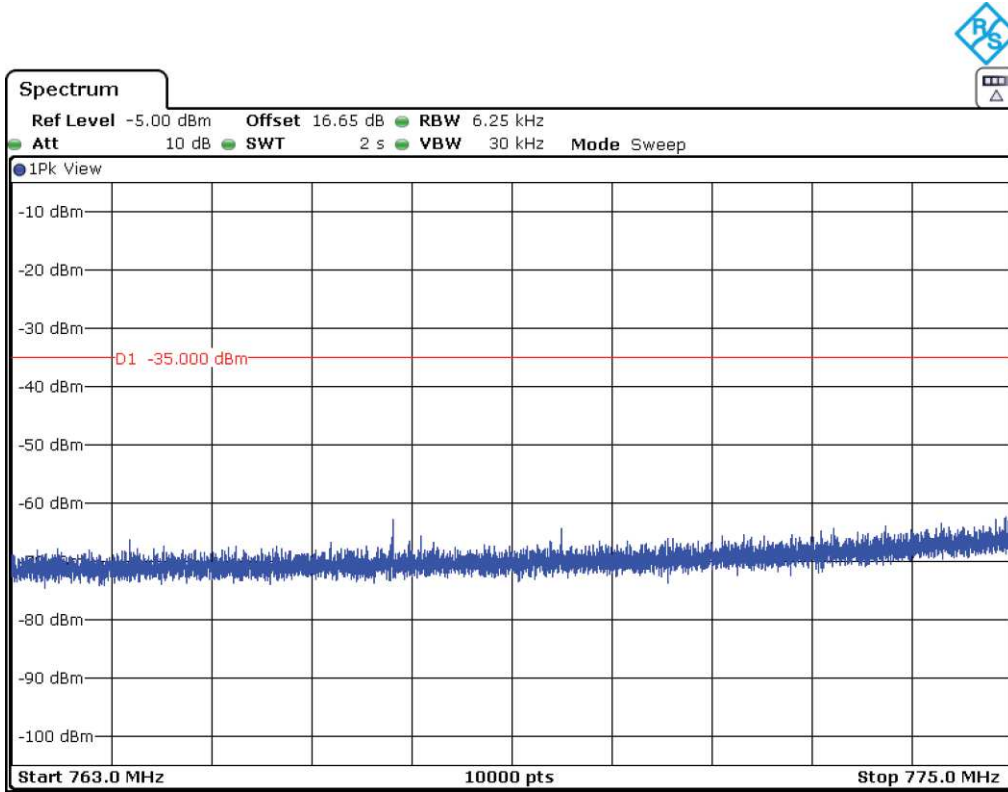
2. CHANNEL: MIDDLE

Frequency Range 9 kHz – 8 GHz

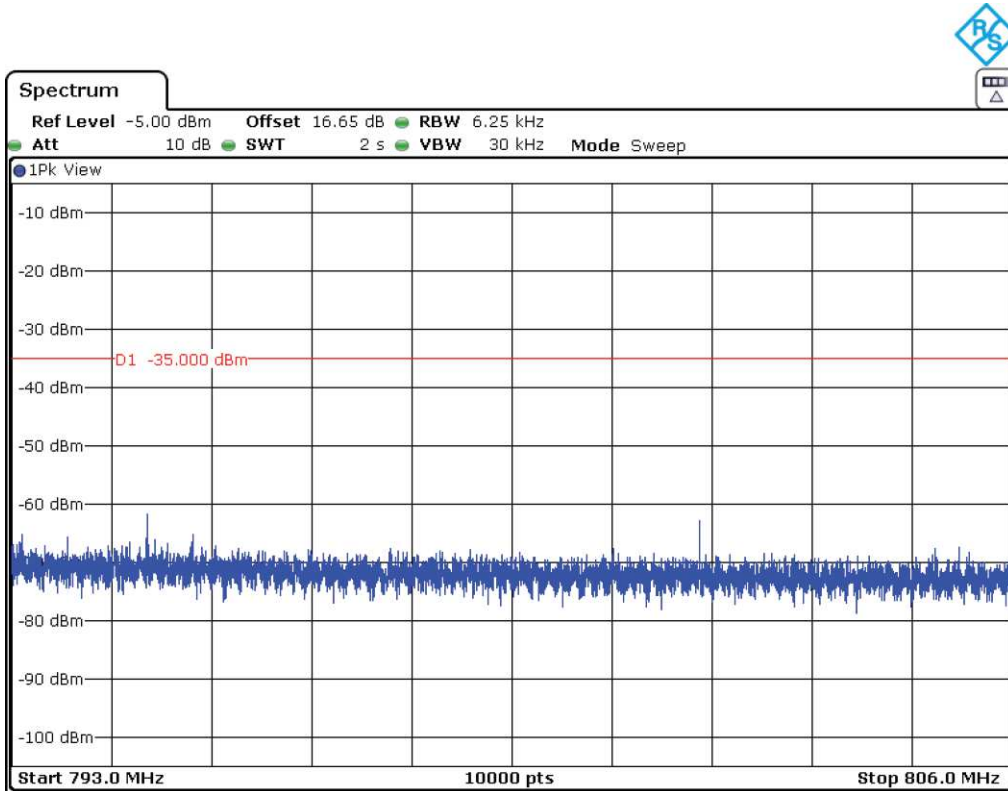


Note: The peak above the limit is the carrier frequency. The peak at 751MHz corresponds to the downlink signal.

Frequency Range 763 MHz - 775 MHz

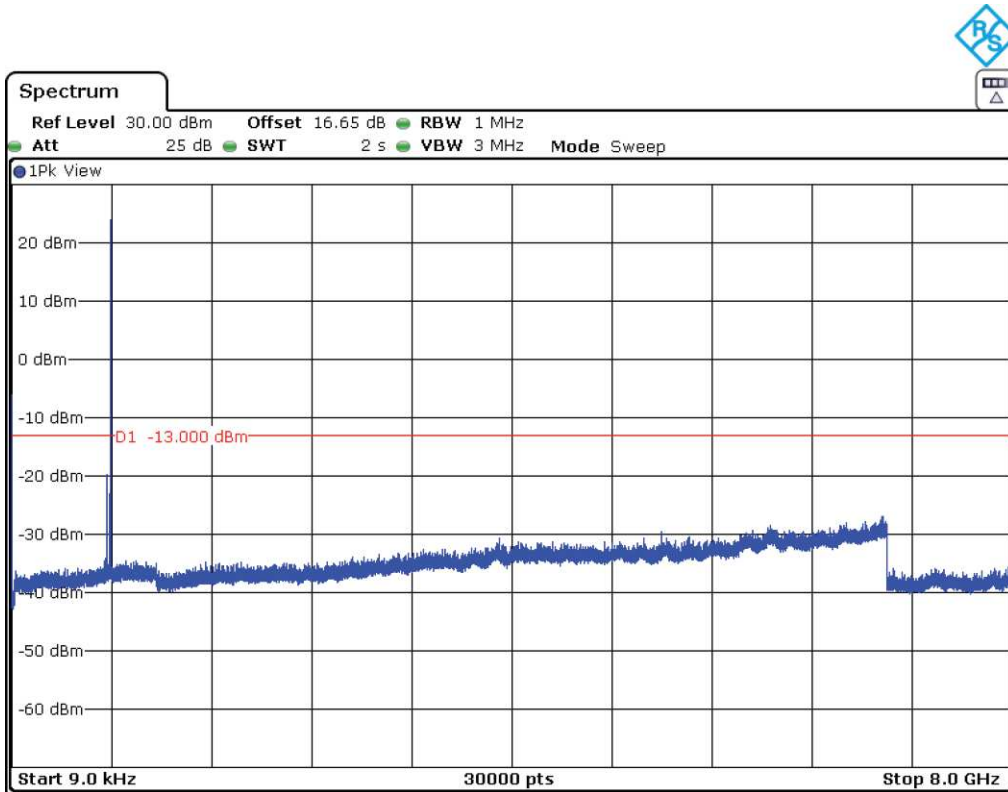


Frequency Range 793 MHz - 806 MHz



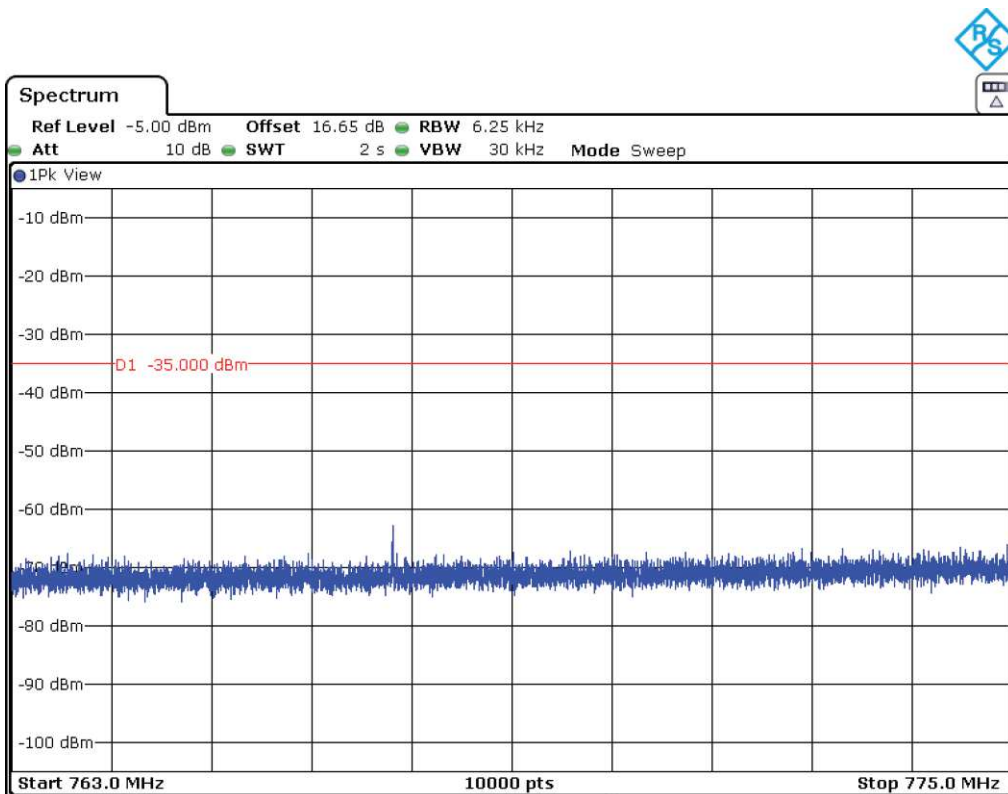
### 3. CHANNEL: HIGHEST

Frequency Range 9 kHz – 8 GHz

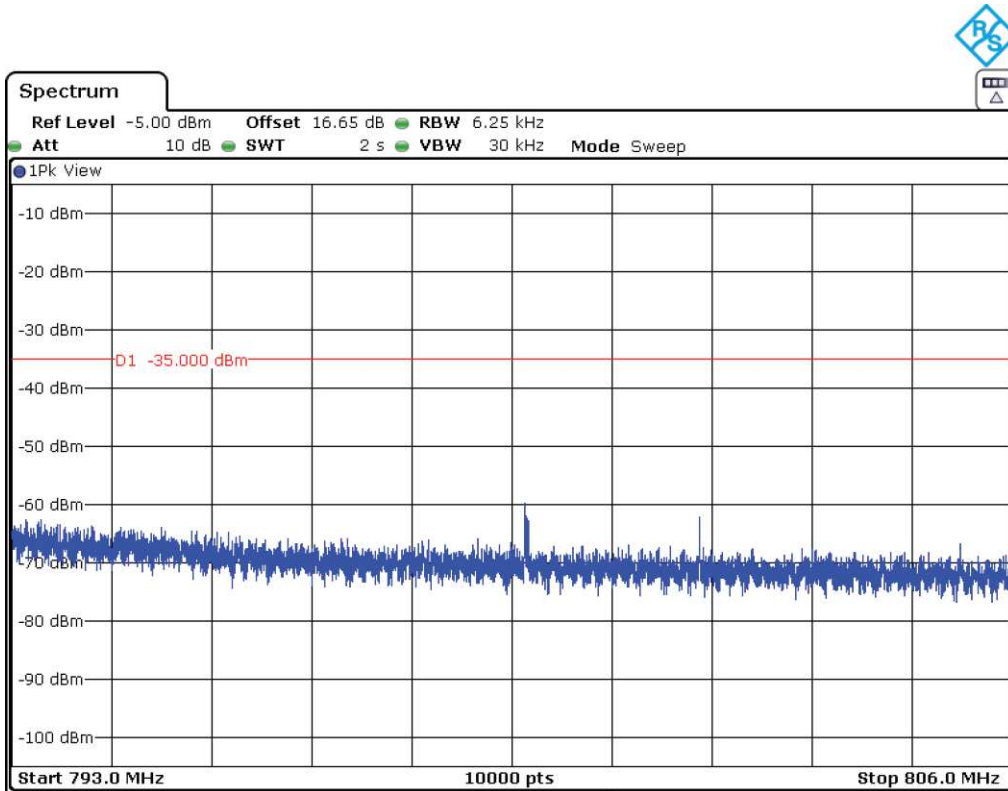


Note: The peak above the limit is the carrier frequency. The peak at 756MHz corresponds to the downlink signal.

Frequency Range 763 MHz - 775 MHz



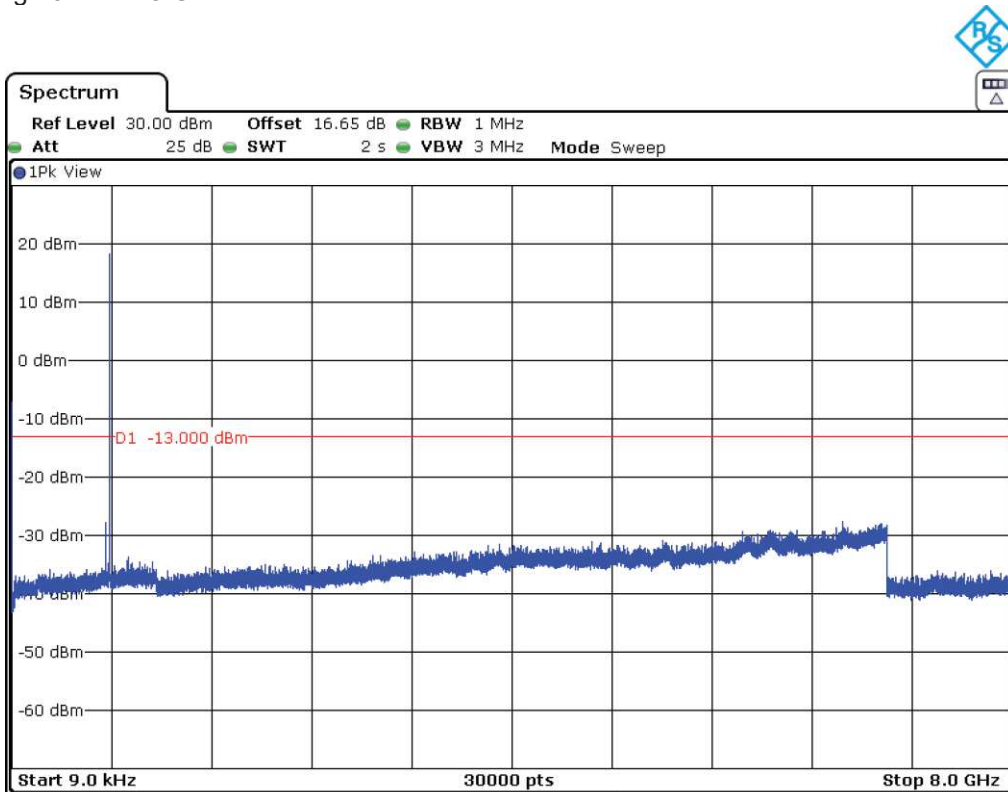
Frequency Range 793 MHz - 806 MHz



NBLoT Band 13 (1 Tone 15 kHz.  $\pi/4$  - QPSK MODULATION)

1. CHANNEL: LOWEST

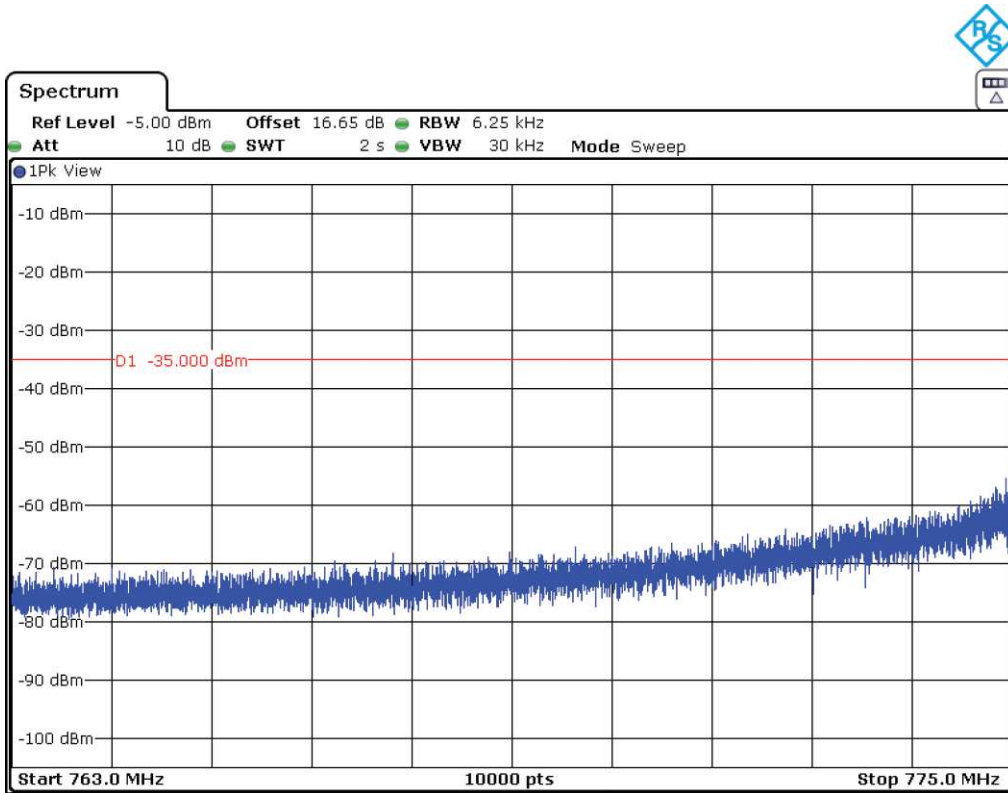
Frequency Range 9 kHz – 8 GHz



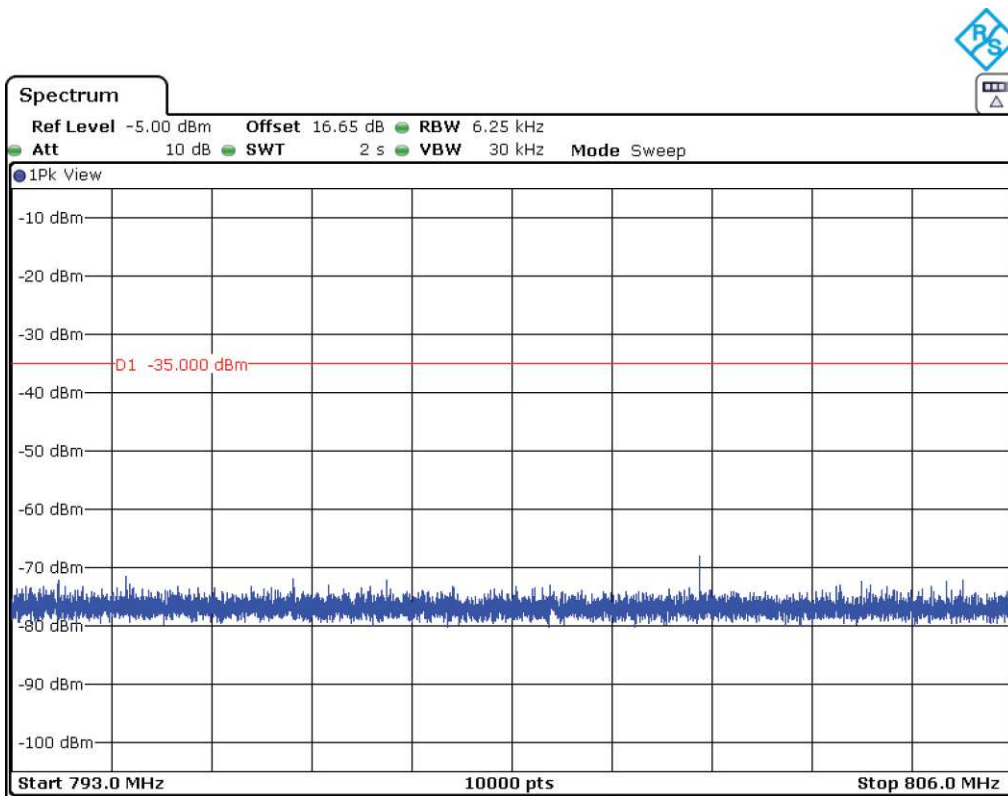
Note: The peak above the limit is the carrier frequency. The peak at 746MHz corresponds to the downlink signal.



Frequency Range 763 MHz - 775 MHz

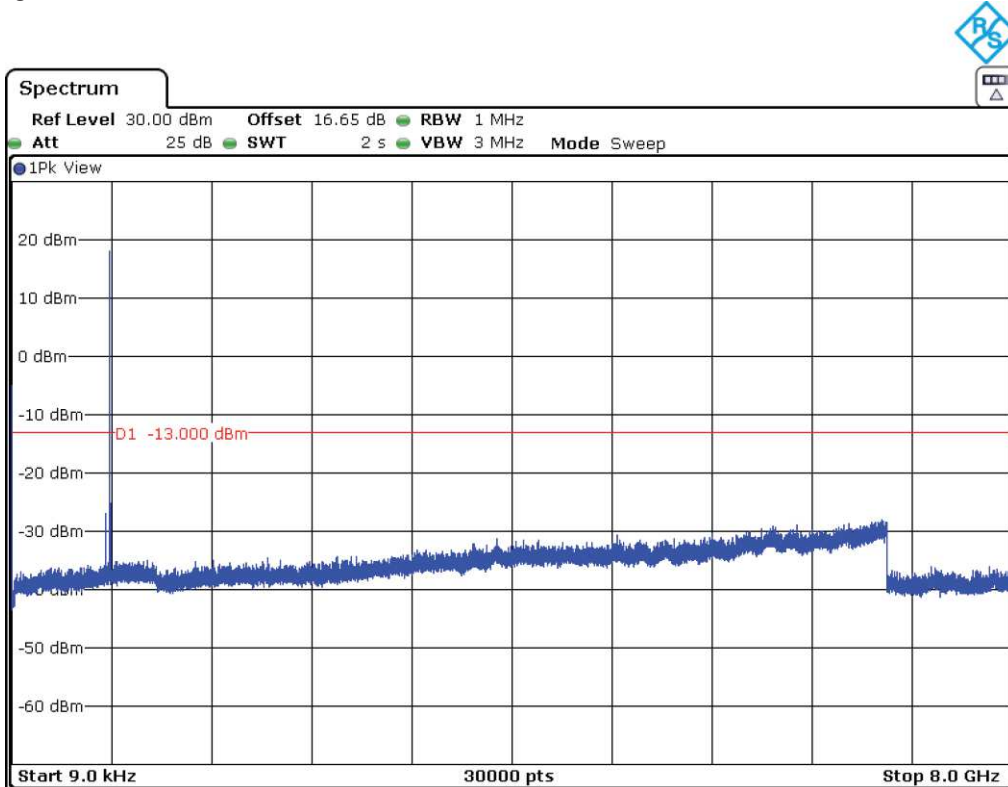


Frequency Range 793 MHz - 806 MHz



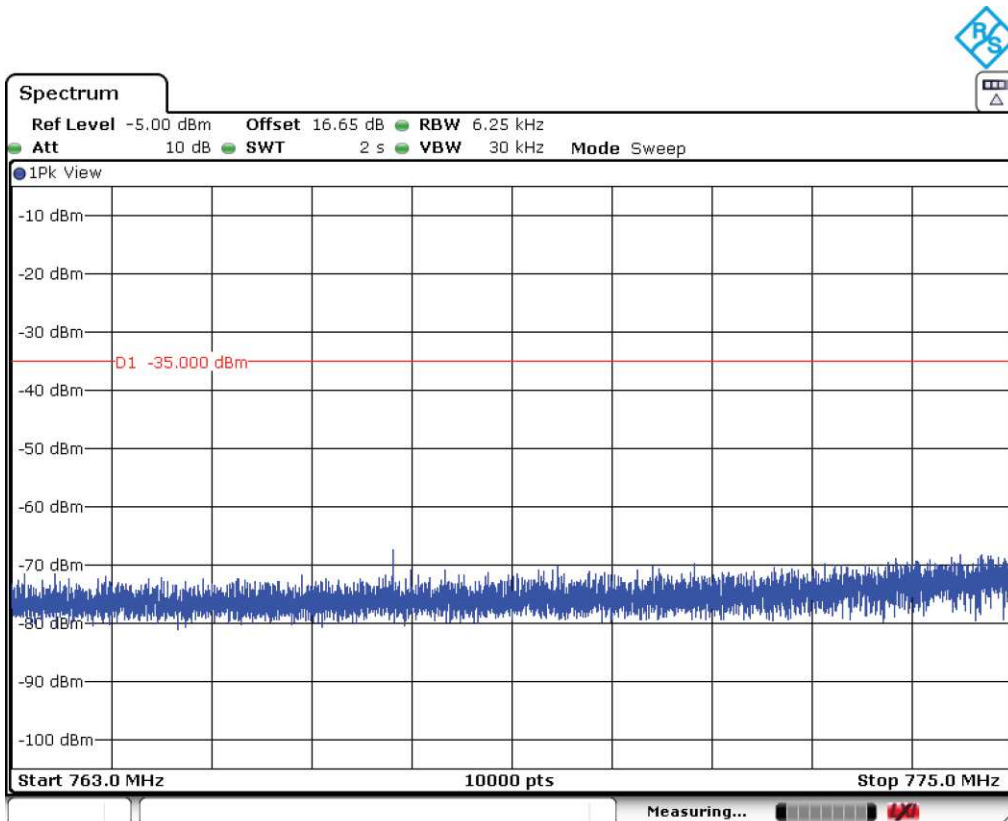
## 2. CHANNEL: MIDDLE

Frequency Range 9 kHz – 8 GHz

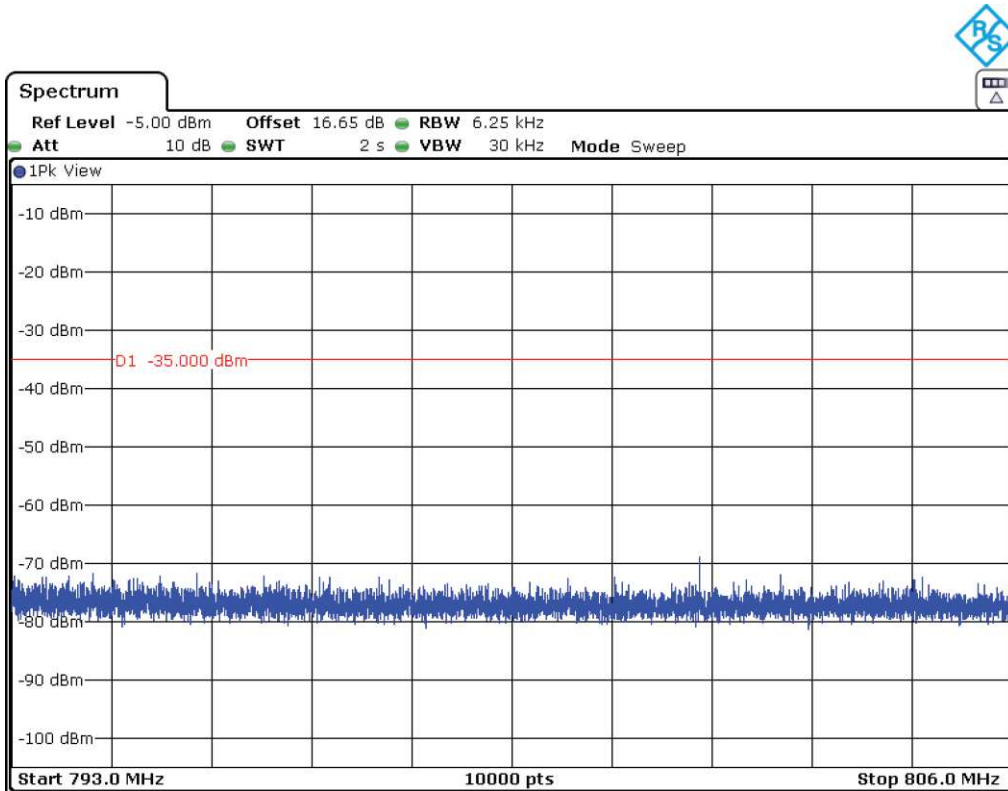


Note: The peak above the limit is the carrier frequency. The peak at 751MHz corresponds to the downlink signal.

Frequency Range 763 MHz - 775 MHz

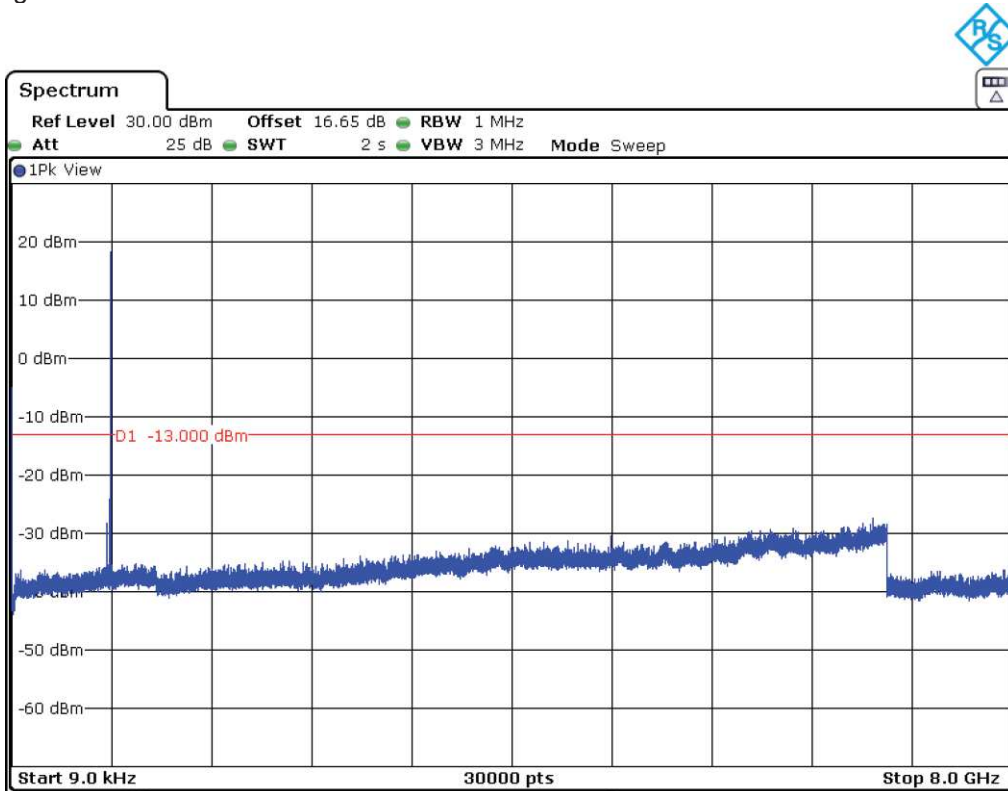


Frequency Range 793 MHz - 806 MHz



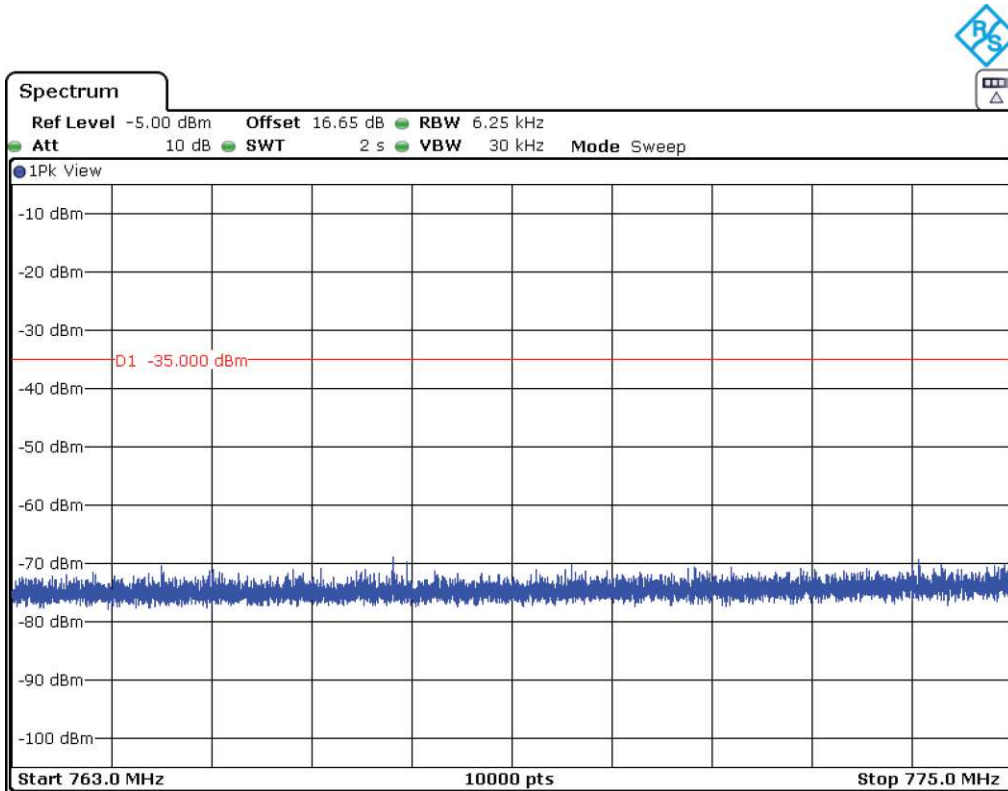
3. CHANNEL: HIGHEST

Frequency Range 9 kHz – 8 GHz

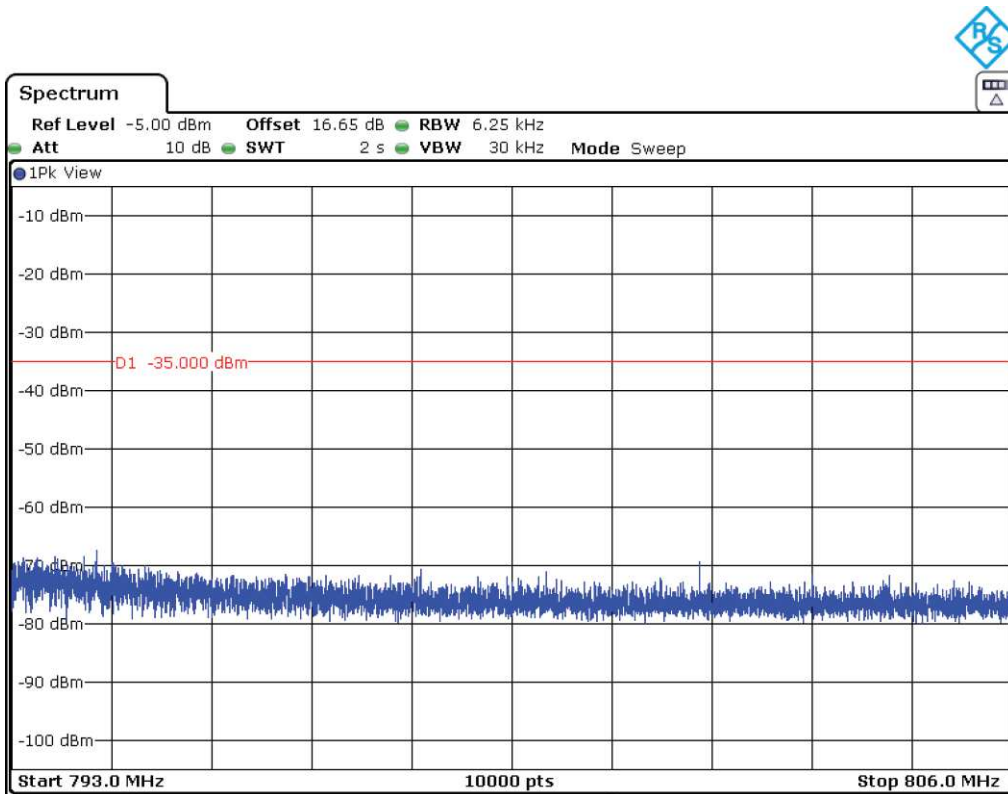


Note: The peak above the limit is the carrier frequency. The peak at 756MHz corresponds to the downlink signal.

Frequency Range 763 MHz - 775 MHz

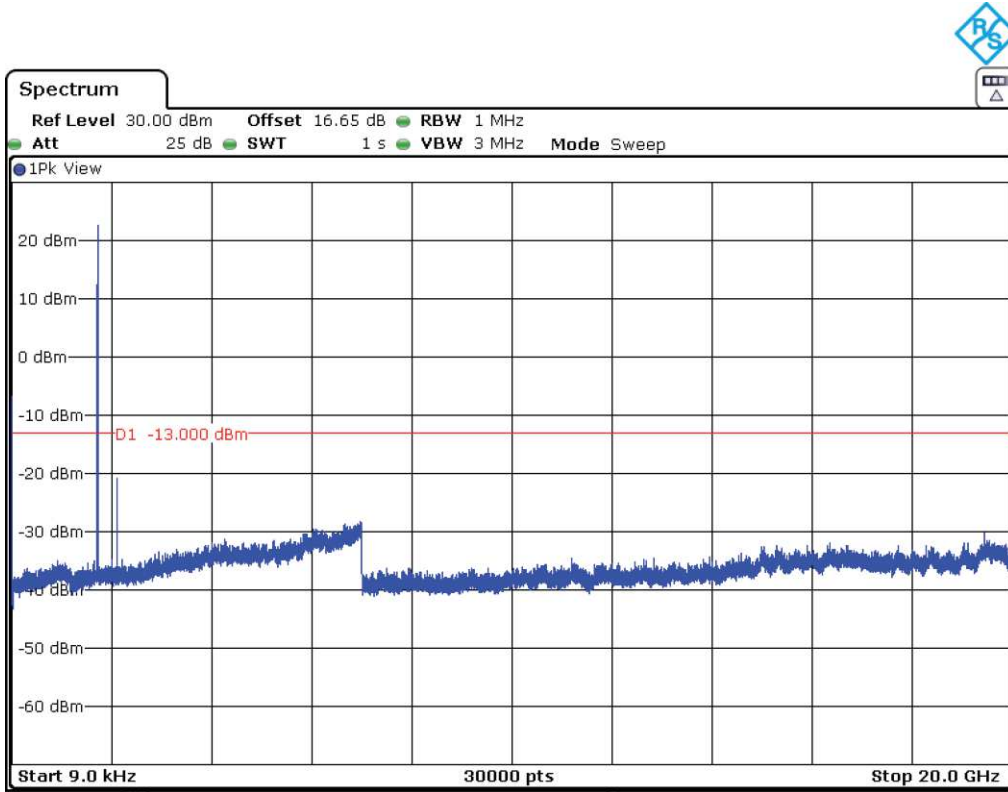


Frequency Range 793 MHz - 806 MHz



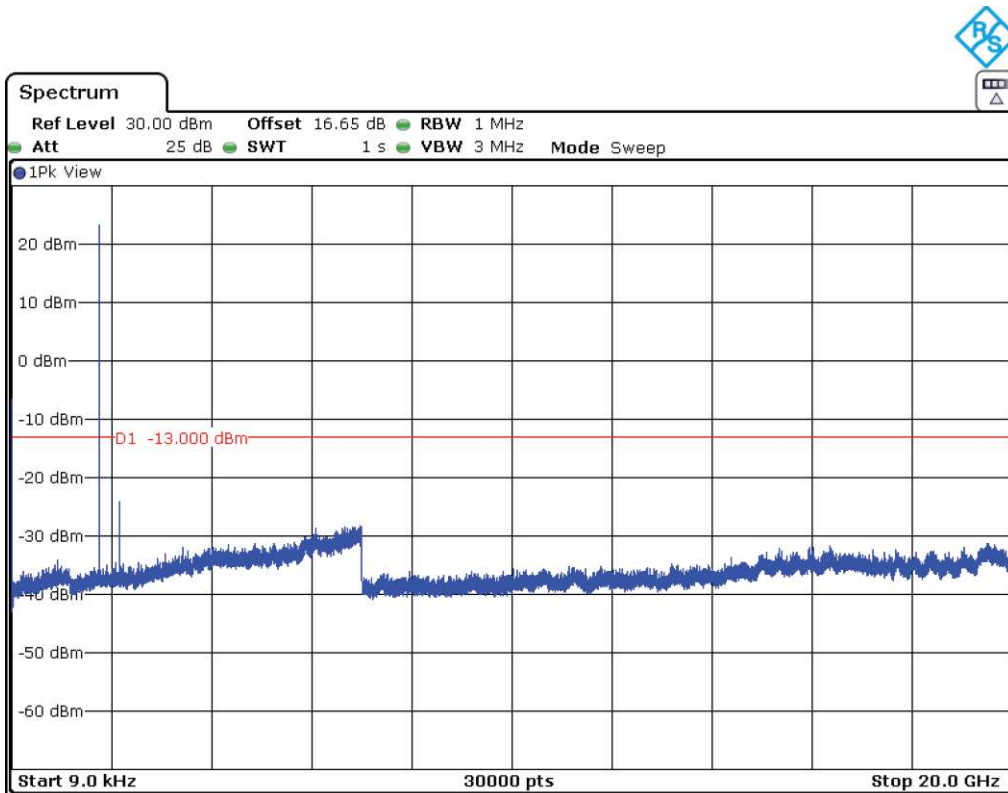
NBLoT Band 66(1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST



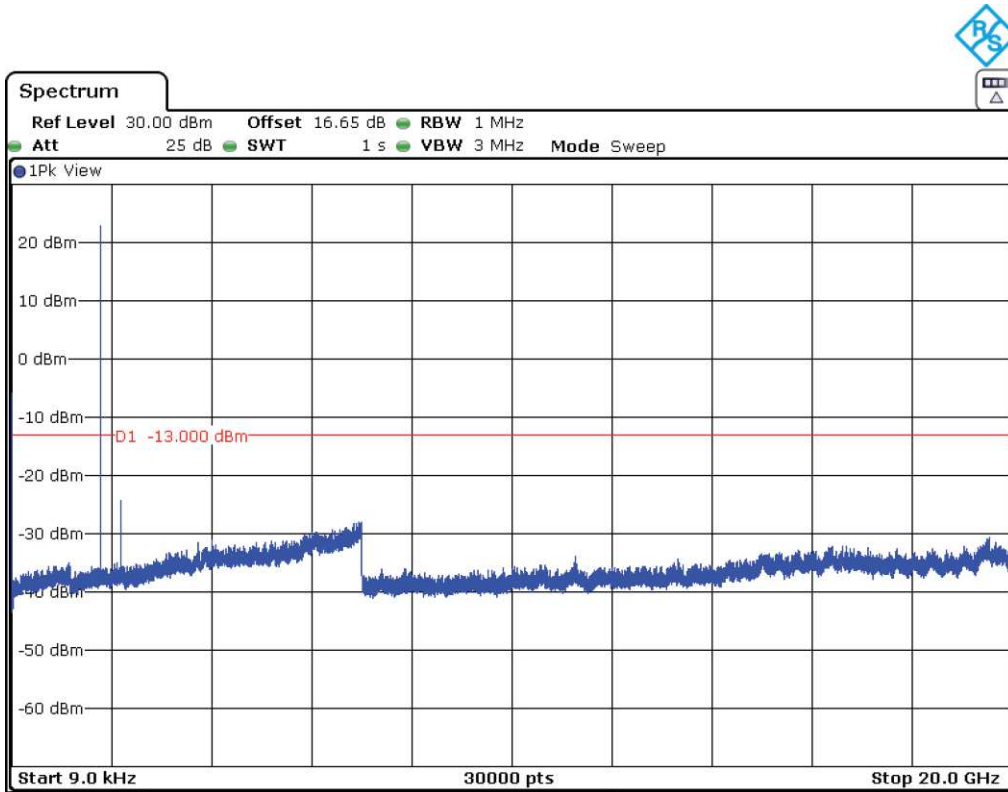
Note: The peak above the limit is the carrier frequency. The peak at 1805MHz corresponds to the downlink signal.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency. The peak at 1840MHz corresponds to the downlink signal.

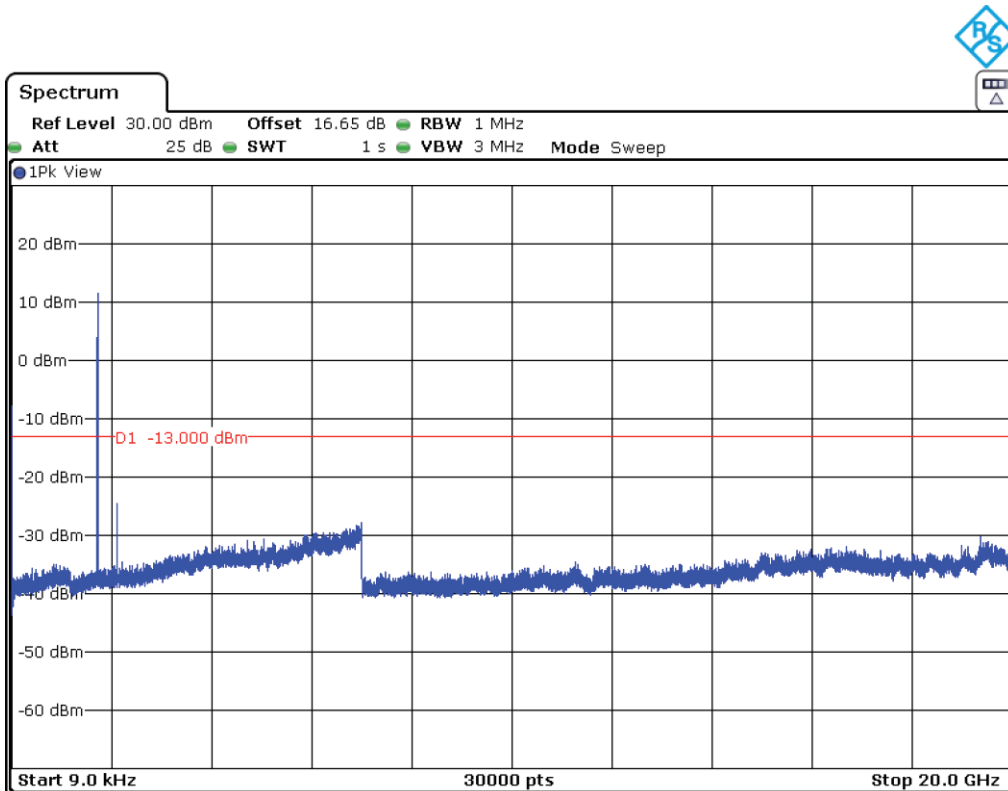
### 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency. The peak at 1875MHz corresponds to the downlink signal.

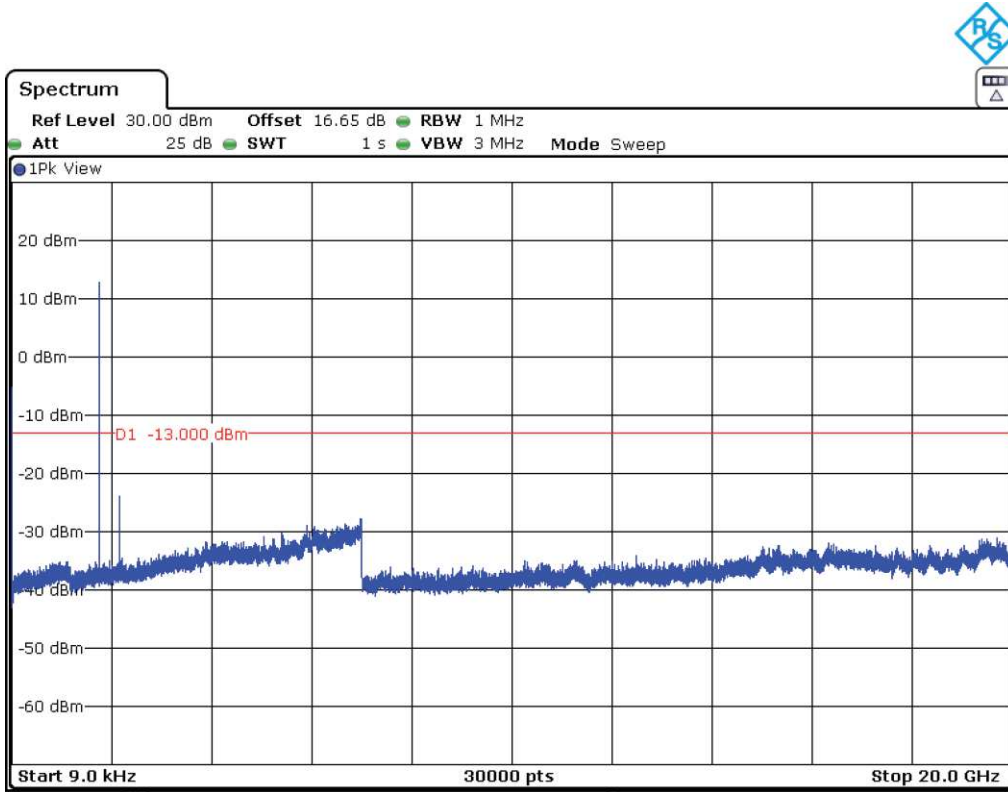
### NBLoT Band 66(1 Tone 15 kHz. $\pi/4$ - QPSK MODULATION)

#### 1. CHANNEL: LOWEST



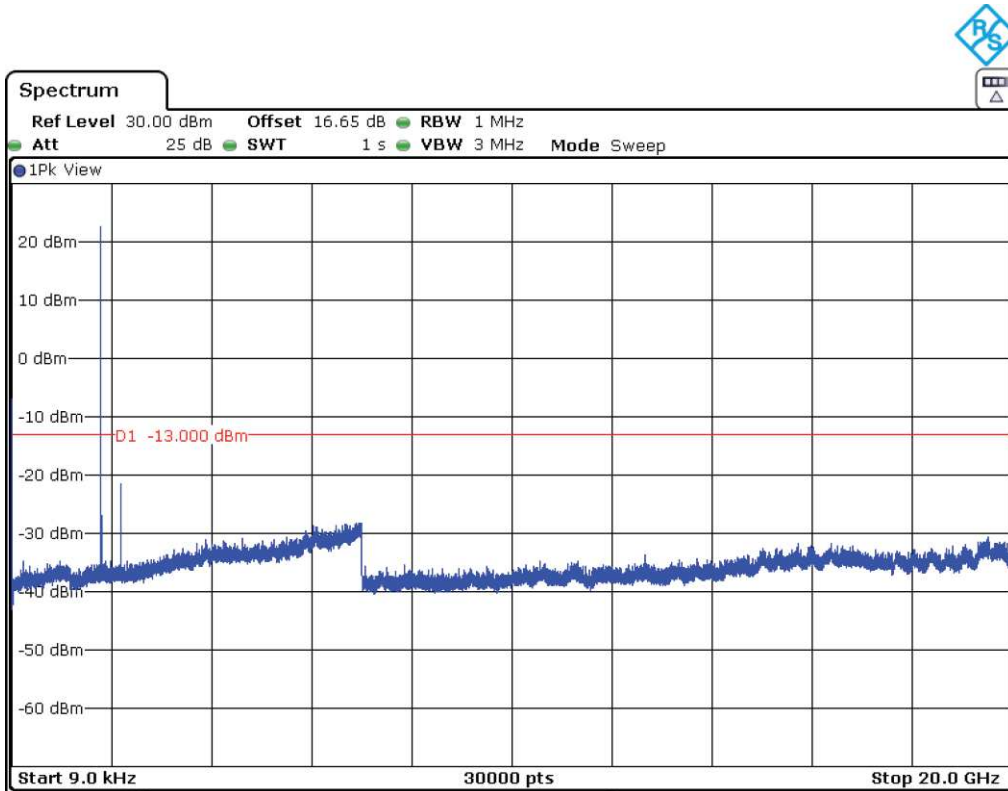
Note: The peak above the limit is the carrier frequency. The peak at 1805MHz corresponds to the downlink signal.

## 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency. The peak at 1840MHz corresponds to the downlink signal.

## 3. CHANNEL: HIGHEST

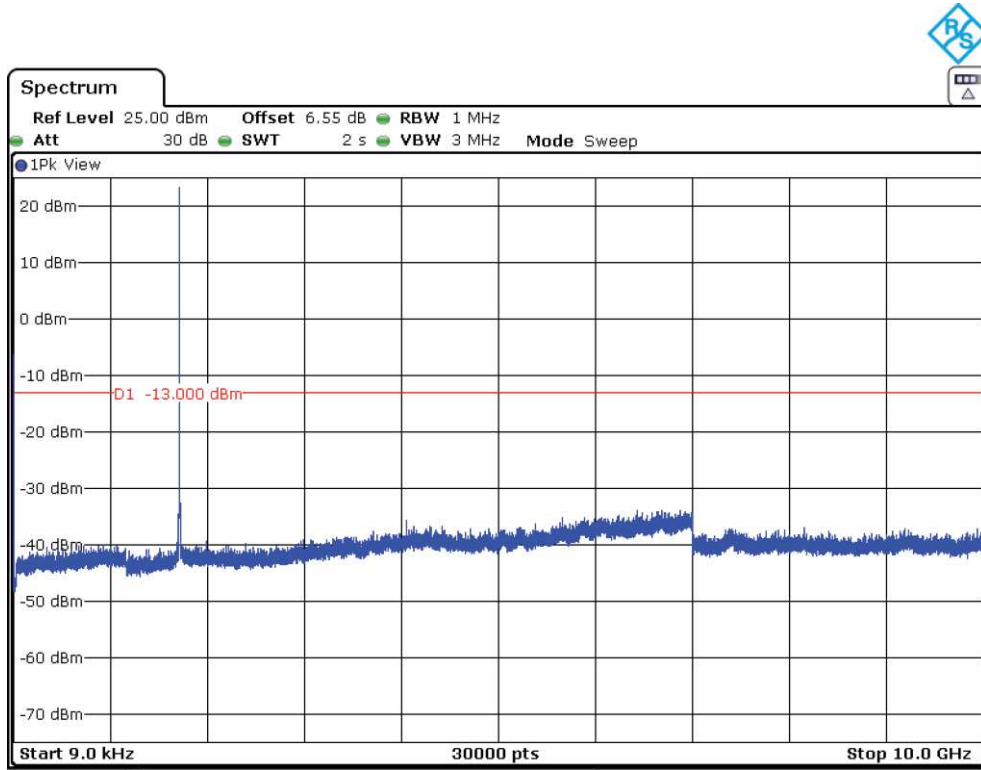


Note: The peak above the limit is the carrier frequency. The peak at 1875MHz corresponds to the downlink signal.

NBLoT Band 85 (1 Tone 3.75 kHz.  $\pi/2$  - BPSK MODULATION)

1. CHANNEL: LOWEST

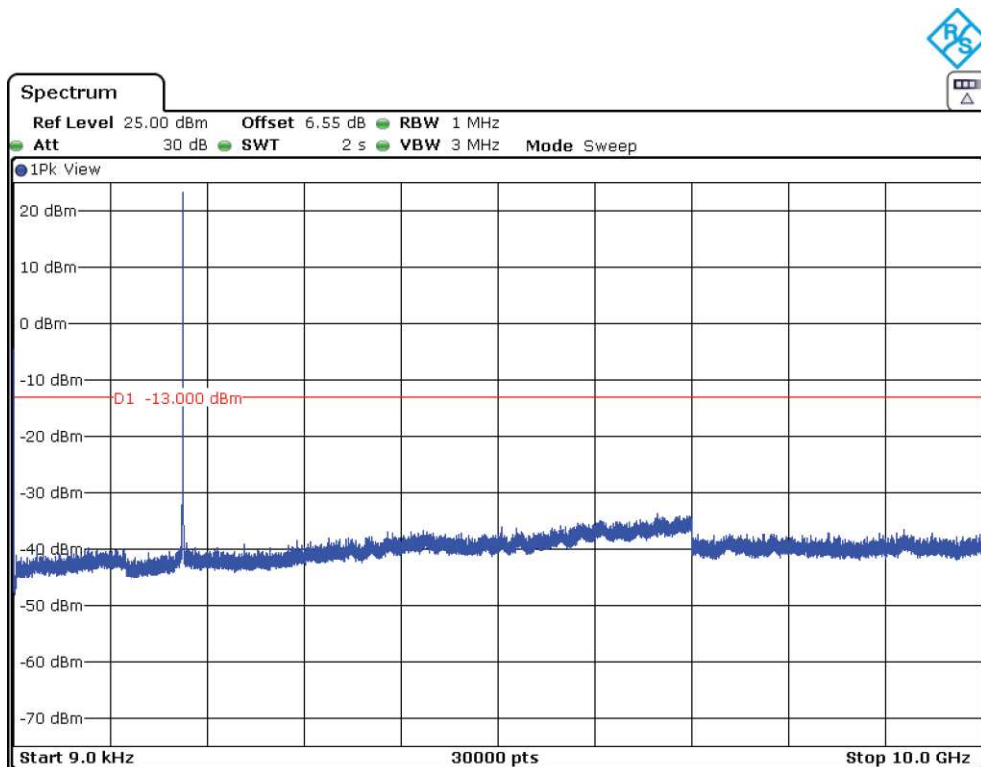
Frequency Range 9 kHz – 10 GHz



Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE

Frequency Range 9 kHz – 10 GHz

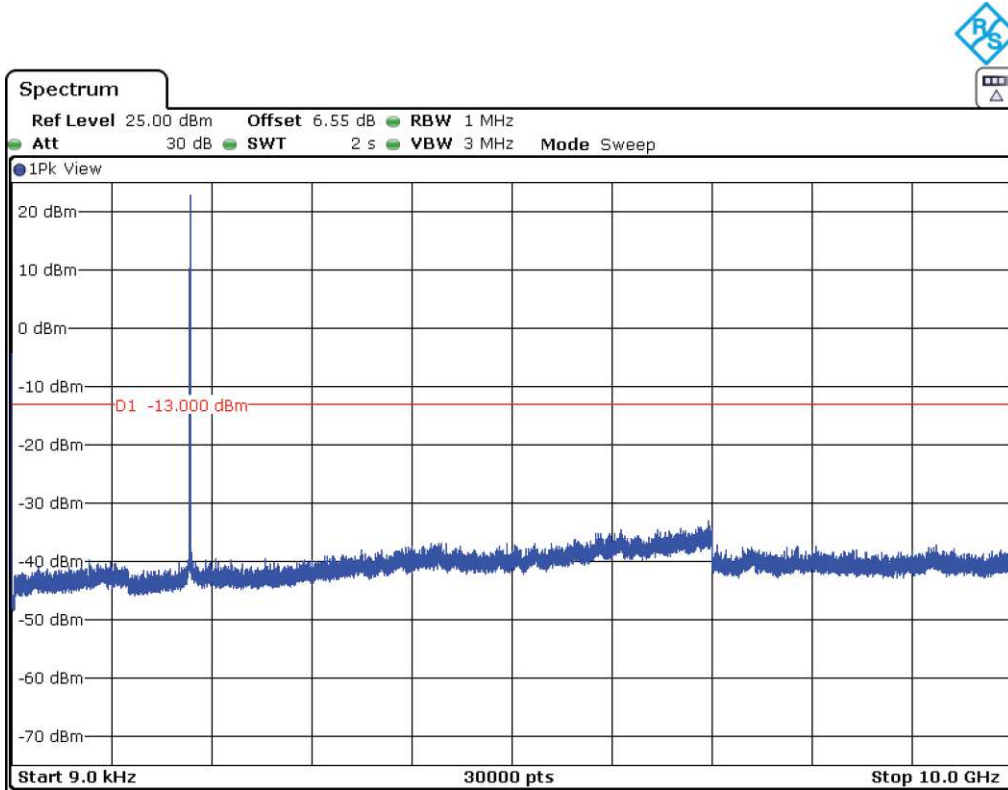


Note: The peak above the limit is the carrier frequency.



### 3. CHANNEL: HIGHEST

Frequency Range 9 kHz – 10 GHz

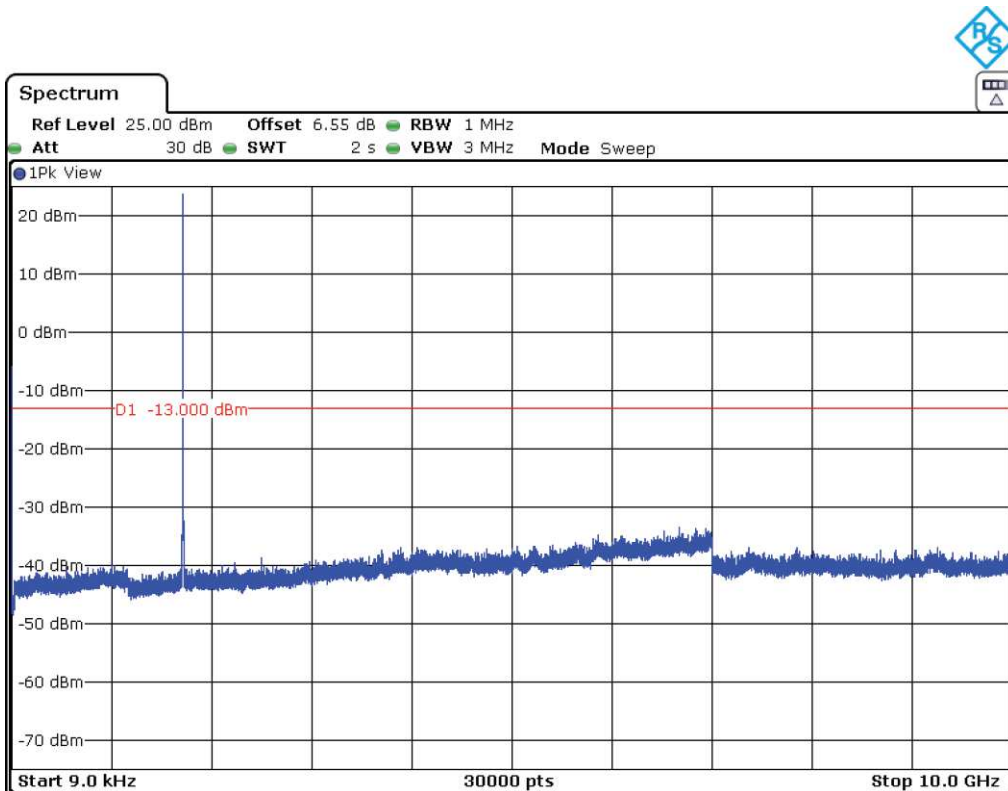


Note: The peak above the limit is the carrier frequency.

NB-IoT Band 85 (3 Tones 15 kHz.  $\pi/4$  - QPSK MODULATION)

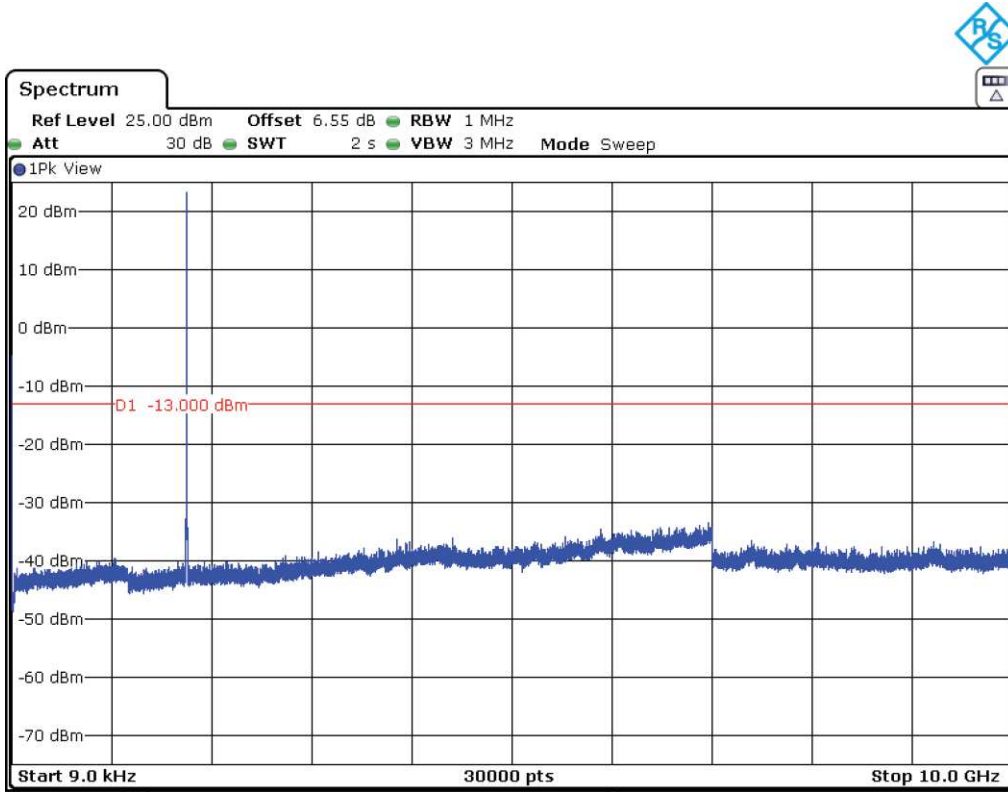
### 1. CHANNEL: LOWEST

Frequency Range 9 kHz – 10 GHz



## 2. CHANNEL: MIDDLE

Frequency Range 9 kHz – 10 GHz



## 3. CHANNEL: HIGHEST

Frequency Range 9 kHz – 10 GHz

