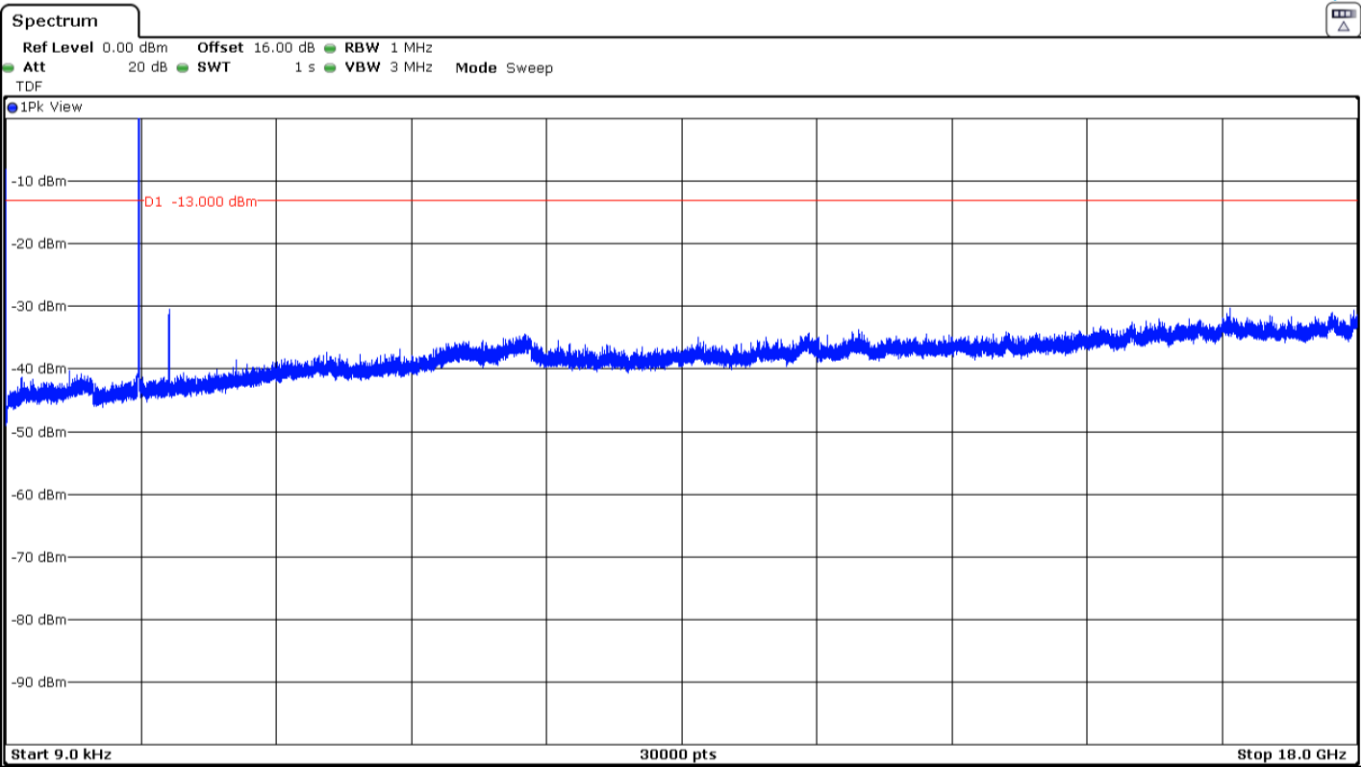


High Channel:



The peak above the limit is the carrier frequency.

Spurious emissions at antenna terminals at Block Edges

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 (h):

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:

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

RSS-130 Clause 4.7.1:

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.

RSS-139 Clause 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.

After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, 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.

METHOD:

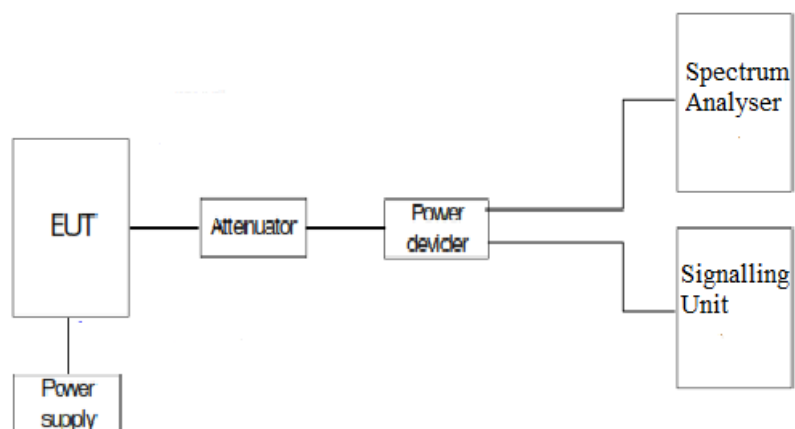
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 Ohm attenuator and a power splitter.

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 modulation which is the worst case for conducted power was used.

For LTE Band 12, as indicated in FCC part 27.53 (g), in the 100 kHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of 30 kHz may be employed.

TEST SETUP:



RESULTS:

LTE Band 4.

LTE QPSK MODULATION:	RB=1, Offset=Max, BW=1.4 MHz	RB=1, Offset=Max, BW=3 MHz	RB=1, Offset=Max, BW=5 MHz	RB=1, Offset =Max, BW = 10 MHz	RB=1, Offset=Max, BW=15 MHz	RB=1 , Offset =Max, BW = 20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-20.49	-19.04	-20.43	-28.50	-30.03	-35.33

LTE QPSK MODULATION:	RB=All, Offset=0, BW=1.4 MHz	RB=All, Offset=0, BW=3 MHz	RB=All, Offset=0, BW=5 MHz	RB=All, Offset =0, BW = 10 MHz	RB=All, Offset=0, BW=15 MHz	RB=All, Offset =0, BW = 20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-23.55	-24.91	-24.60	-25.01	-25.40	-27.41

Measurement uncertainty: $\leq \pm 2.57$ dB

Verdict: PASS

LTE Band 12.

LTE QPSK MODULATION:	RB=1, Offset=0, BW=1.4 MHz	RB=1 , Offset =0, BW = 3 MHz	RB=1, Offset=0, BW=5 MHz	RB=1 , Offset =0, BW = 10 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-24.20	-23.52	-22.75	-36.52

LTE QPSK MODULATION:	RB=All, Offset=0, BW=1.4 MHz	RB=All, Offset=0, BW = 3 MHz	RB=All, Offset=0, BW=5 MHz	RB=All, Offset=0, BW = 10 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-25.01	-26.04	-28.68	-34.03

LTE QPSK MODULATION:	RB=1, Offset=Max, BW=1.4 MHz	RB=1 , Offset =Max, BW = 3 MHz	RB=1, Offset =Max, BW=5 MHz	RB=1 , Offset =Max, BW = 10 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-23.82	-23.09	-22.13	-36.25

LTE QPSK MODULATION:	RB=All, Offset=0, BW=1.4 MHz	RB=All, Offset=0, BW = 3 MHz	RB=All, Offset=0, BW=5 MHz	RB=All, Offset=0, BW = 10 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-26.55	-26.06	-28.28	-32.44

Measurement uncertainty: $\leq \pm 2.57$ dB

Verdict: PASS

LTE Band 66.

LTE QPSK MODULATION:	RB=1, Offset=0, BW=1.4 MHz	RB=1, Offset=0, BW=3 MHz	RB=1, Offset=0, BW=5 MHz	RB=1, Offset =0, BW = 10 MHz	RB=1, Offset=0, BW=15 MHz	RB=1 , Offset =0, BW = 20 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-23.97	-21.12	-20.73	-31.66	-30.13	-33.8

LTE QPSK MODULATION:	RB=All, Offset=0, BW=1.4 MHz	RB=All, Offset=0, BW=3 MHz	RB=All, Offset=0, BW=5 MHz	RB=All, Offset =0, BW = 10 MHz	RB=All, Offset=0, BW=15 MHz	RB=All, Offset =0, BW = 20 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-26.73	-26.06	-26.35	-27.38	-29.74	-30.26

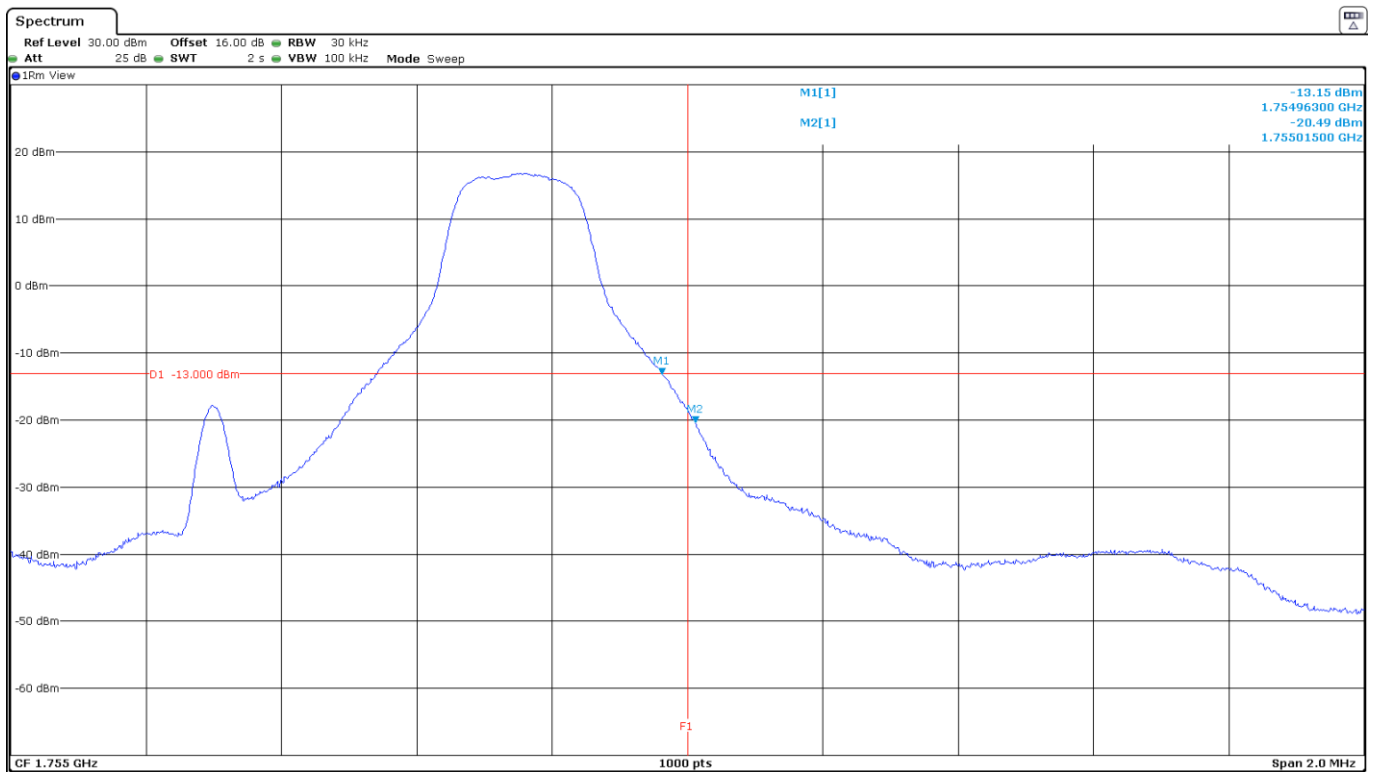
LTE QPSK MODULATION:	RB=1, Offset=Max, BW=1.4 MHz	RB=1, Offset=Max, BW=3 MHz	RB=1, Offset=Max, BW=5 MHz	RB=1, Offset =Max, BW = 10 MHz	RB=1, Offset=Max, BW=15 MHz	RB=1 , Offset =Max, BW = 20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-22.34	-17.75	-21.69	-30.25	-29.23	-33.5

LTE QPSK MODULATION:	RB=All, Offset=0, BW=1.4 MHz	RB=All, Offset=0, BW=3 MHz	RB=All, Offset=0, BW=5 MHz	RB=All, Offset =0, BW = 10 MHz	RB=All, Offset=0, BW=15 MHz	RB=All, Offset =0, BW = 20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-24.84	-25.9	-25.01	-26.35	-26.47	-28.86

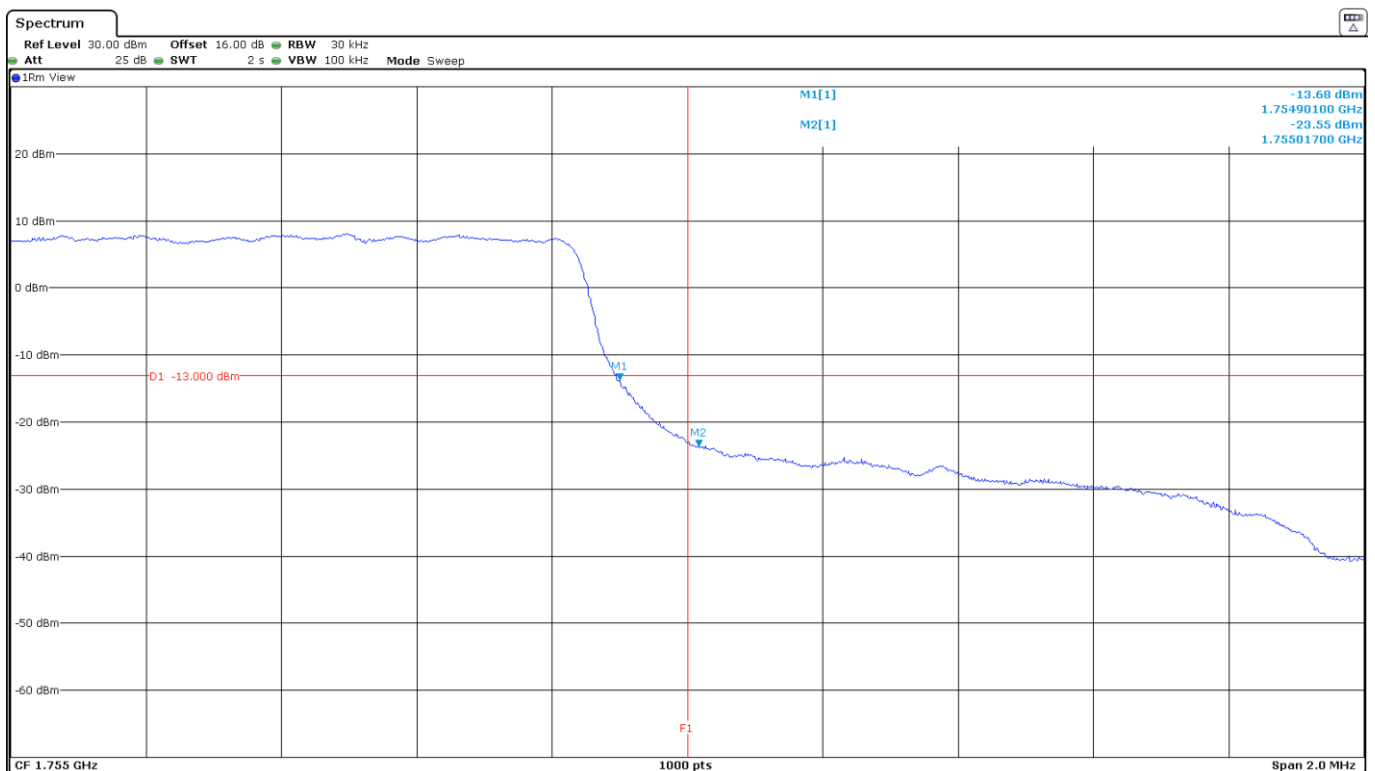
Measurement uncertainty: $\leq \pm 2.57$ dB

Verdict: PASS

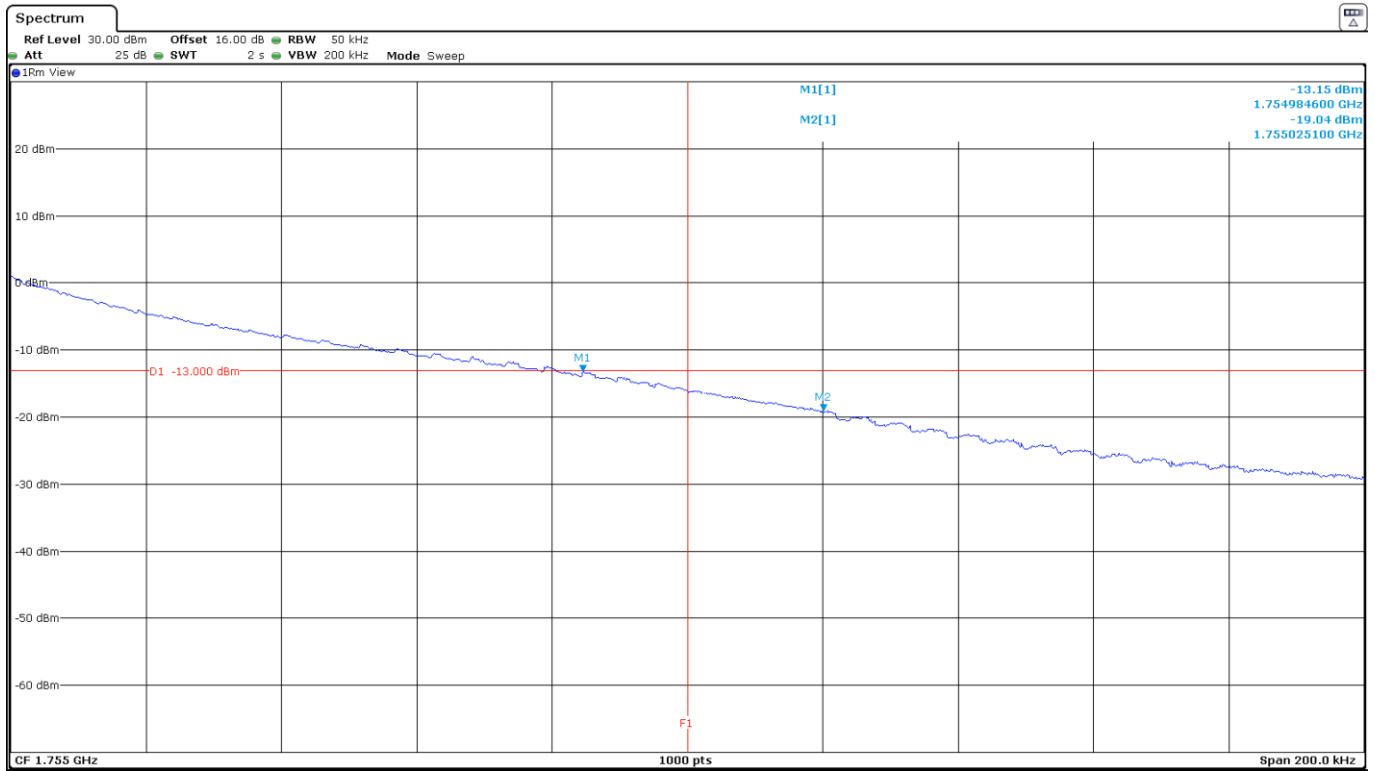
LTE Band 4. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=Max. High Block Edge:



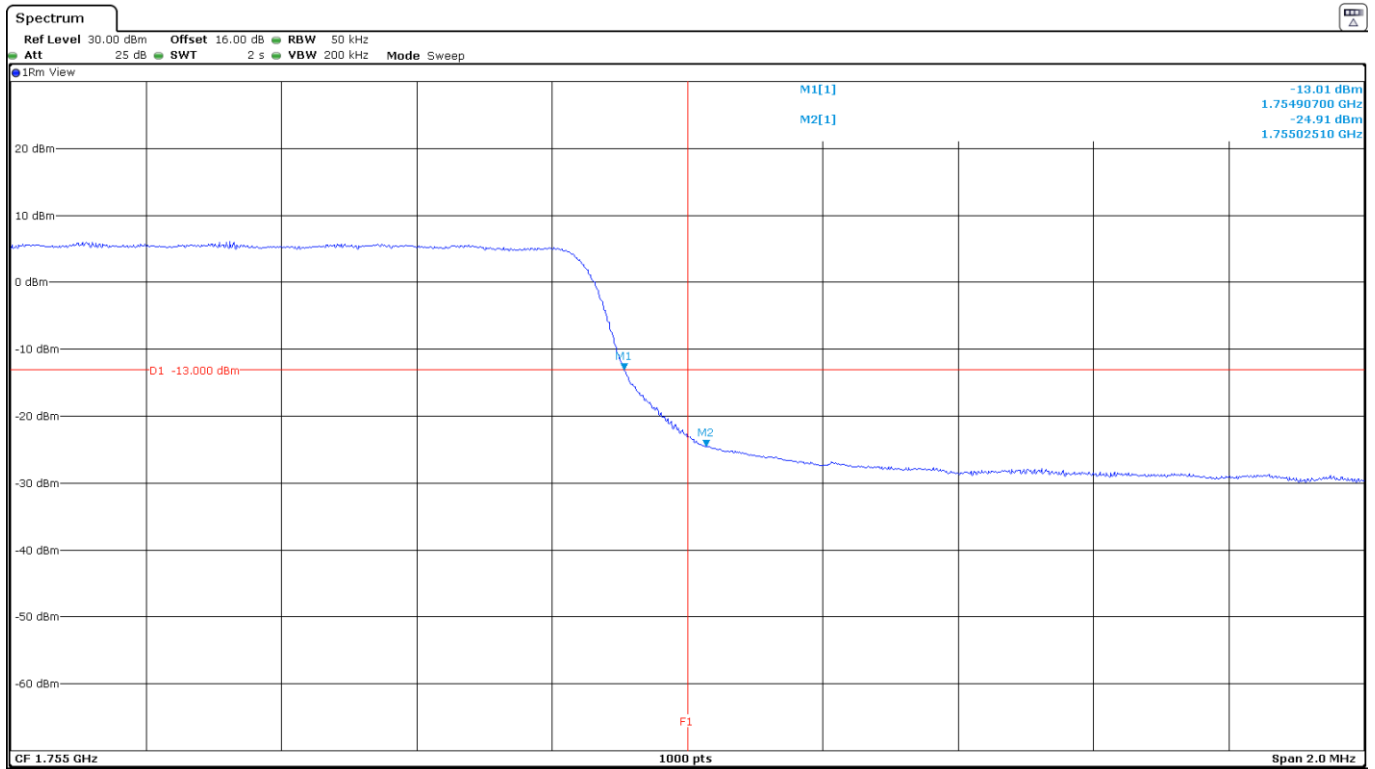
LTE Band 4. QPSK MODULATION. BW=1.4 MHz. RB=All. Offset=0. High Block Edge:



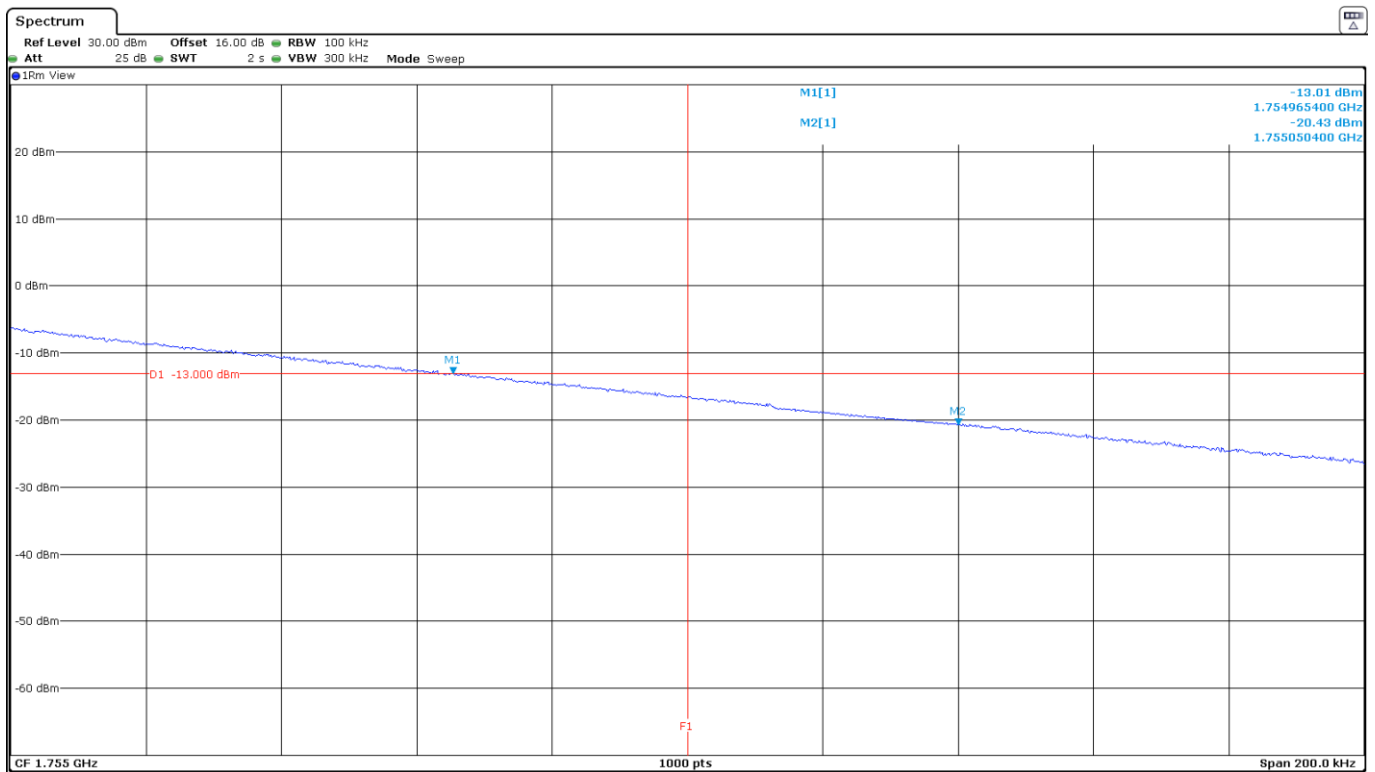
LTE Band 4. QPSK MODULATION. BW=3 MHz. RB=1. Offset=Max. High Block Edge:



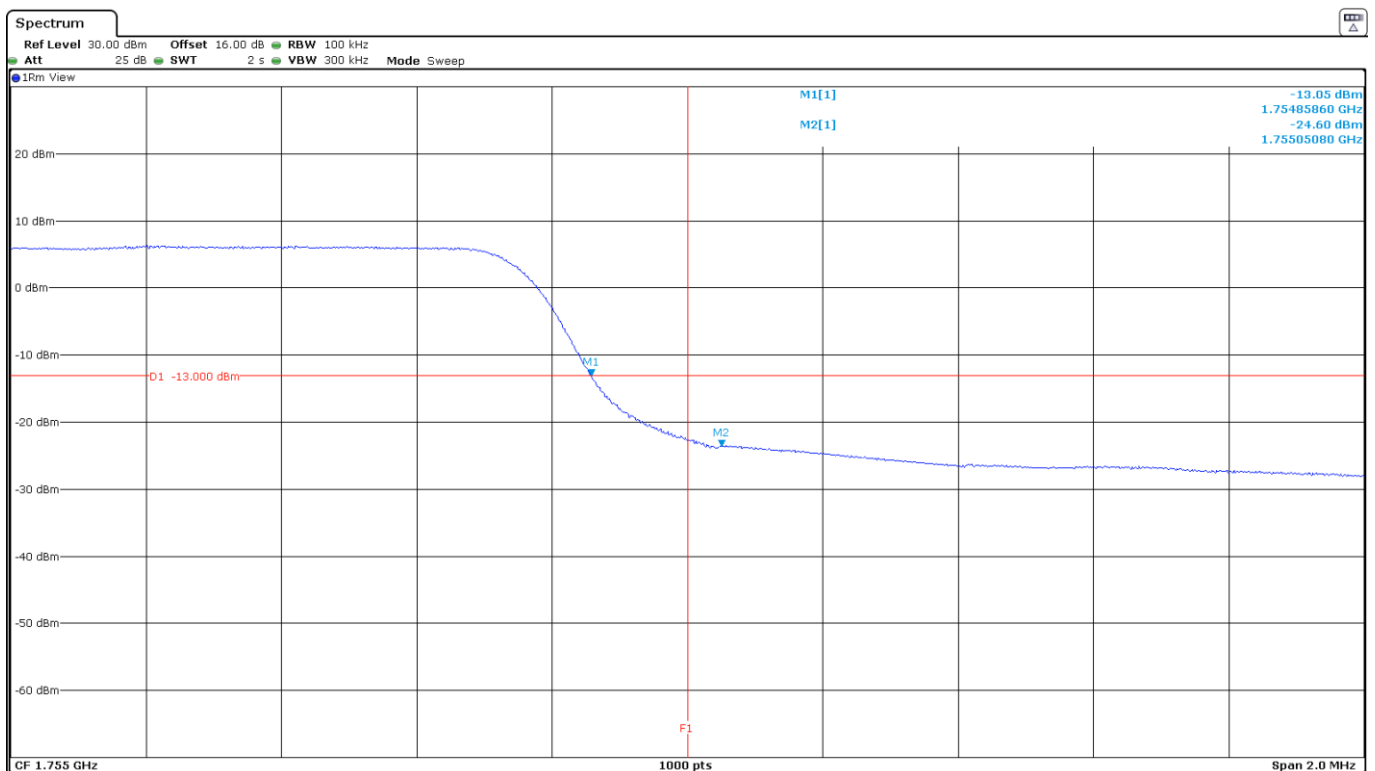
LTE Band 4. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. High Block Edge:



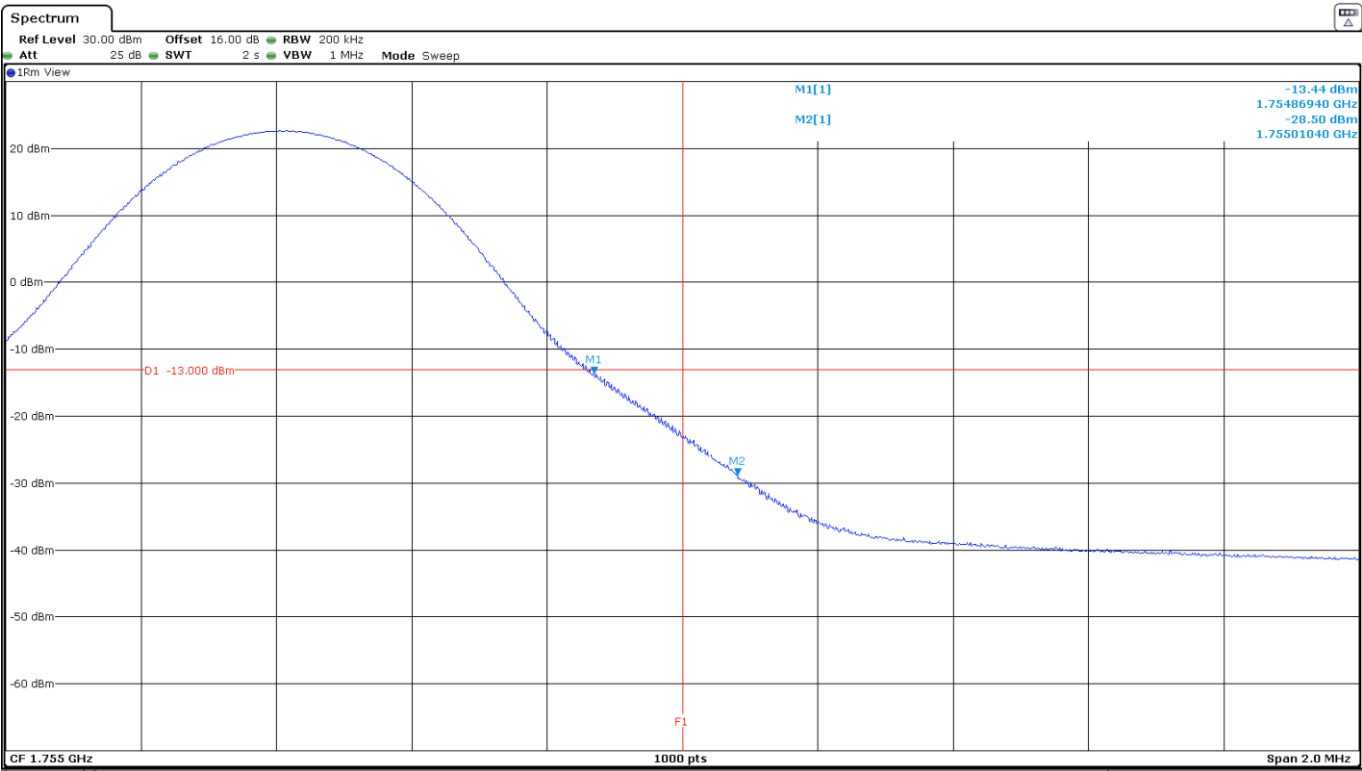
LTE Band 4. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. High Block Edge:



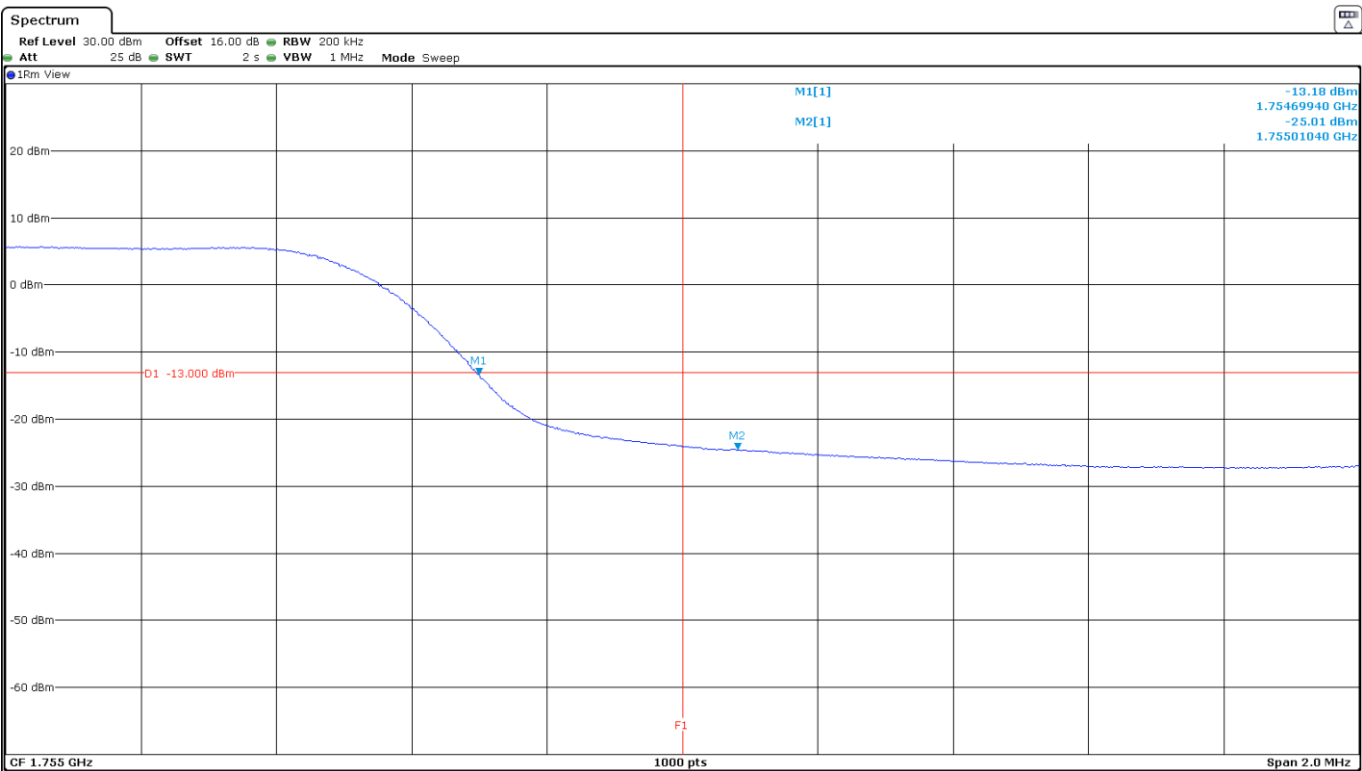
LTE Band 4. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. High Block Edge:



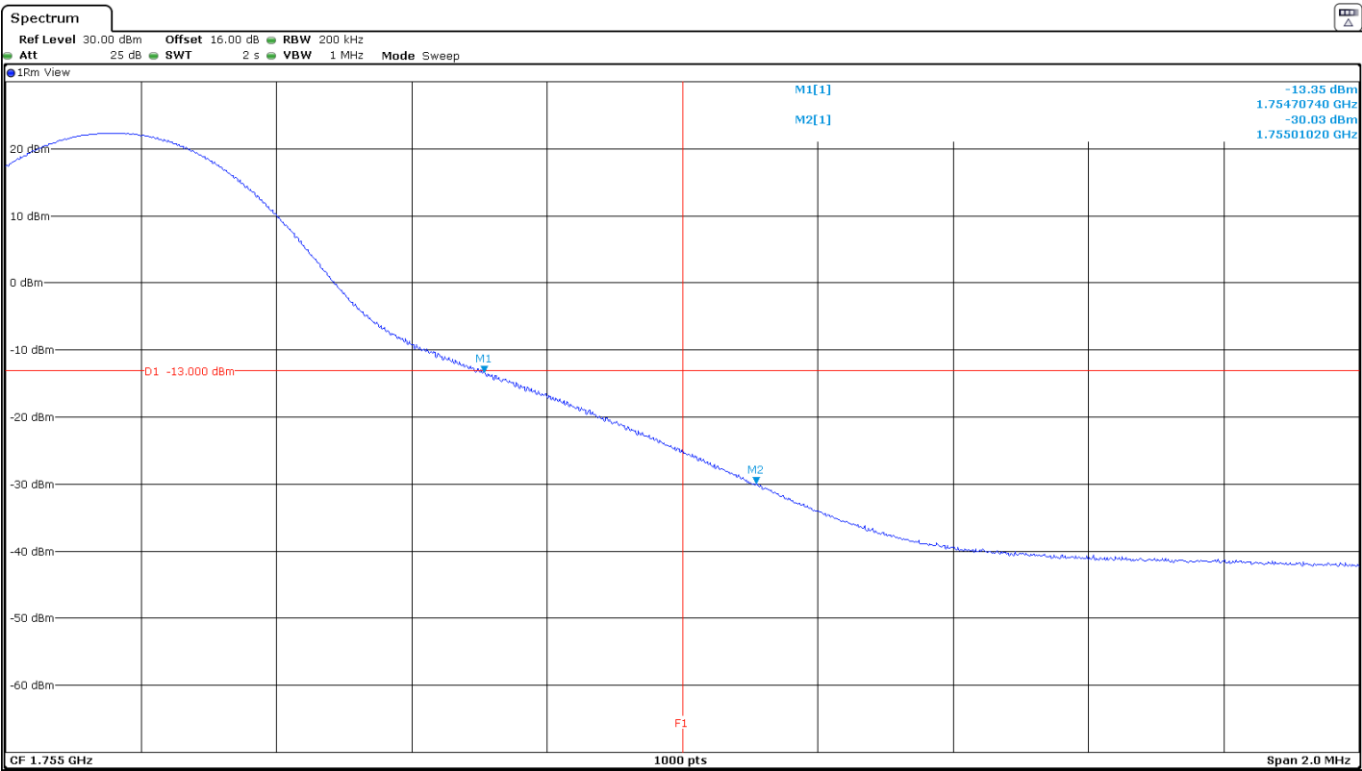
LTE Band 4. QPSK MODULATION. BW=10 MHz. RB=1. Offset=Max. High Block Edge:



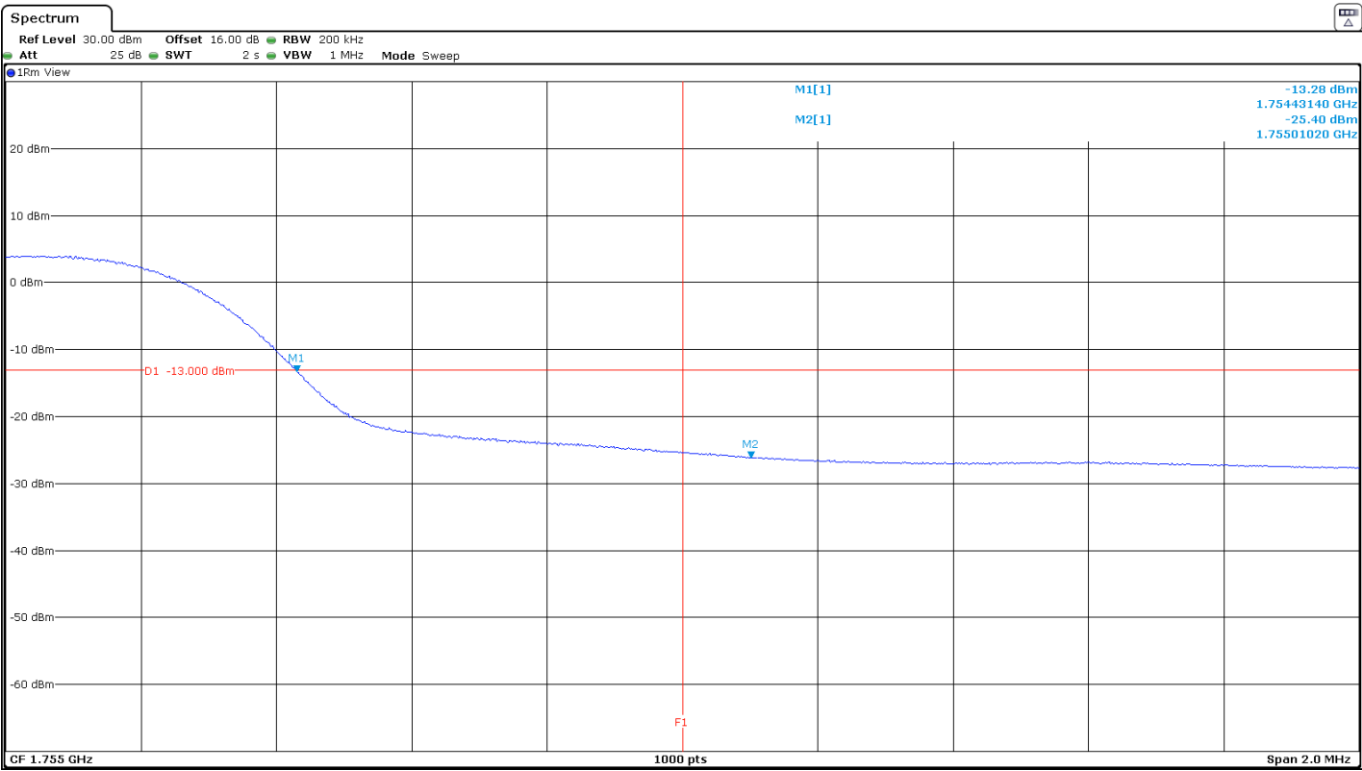
LTE Band 4. QPSK MODULATION. BW=10 MHz. RB=All. Offset=0. High Block Edge:



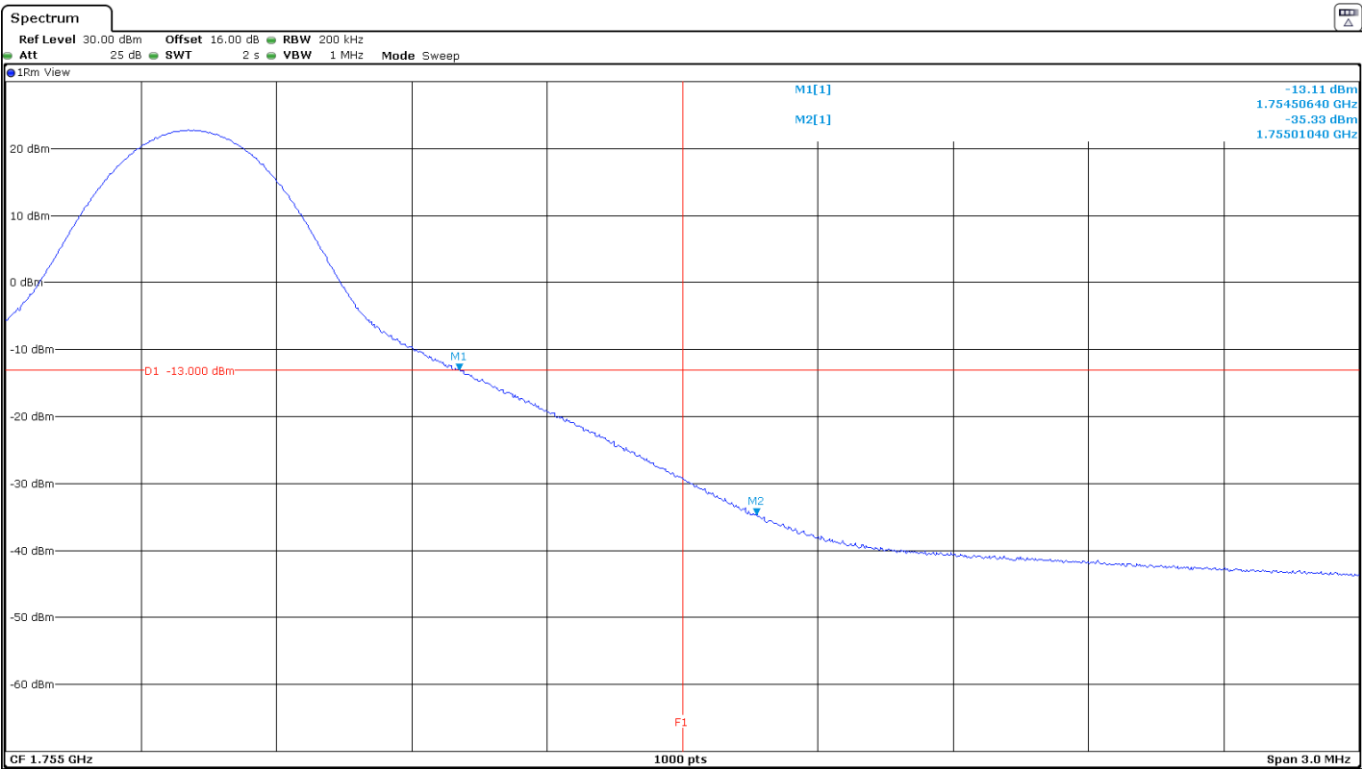
LTE Band 4. QPSK MODULATION. BW=15 MHz. RB=1. Offset=Max. High Block Edge:



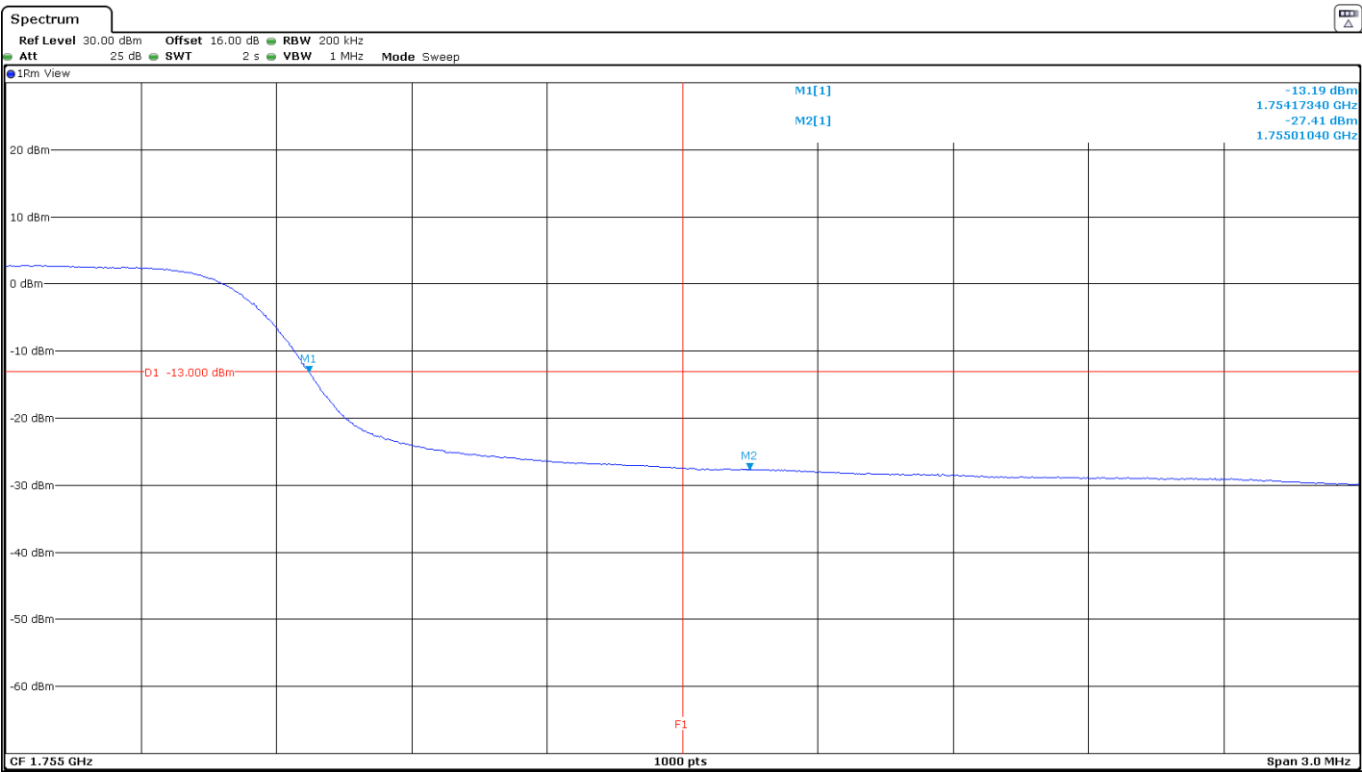
LTE Band 4. QPSK MODULATION. BW=15 MHz. RB=All. Offset=0. High Block Edge:



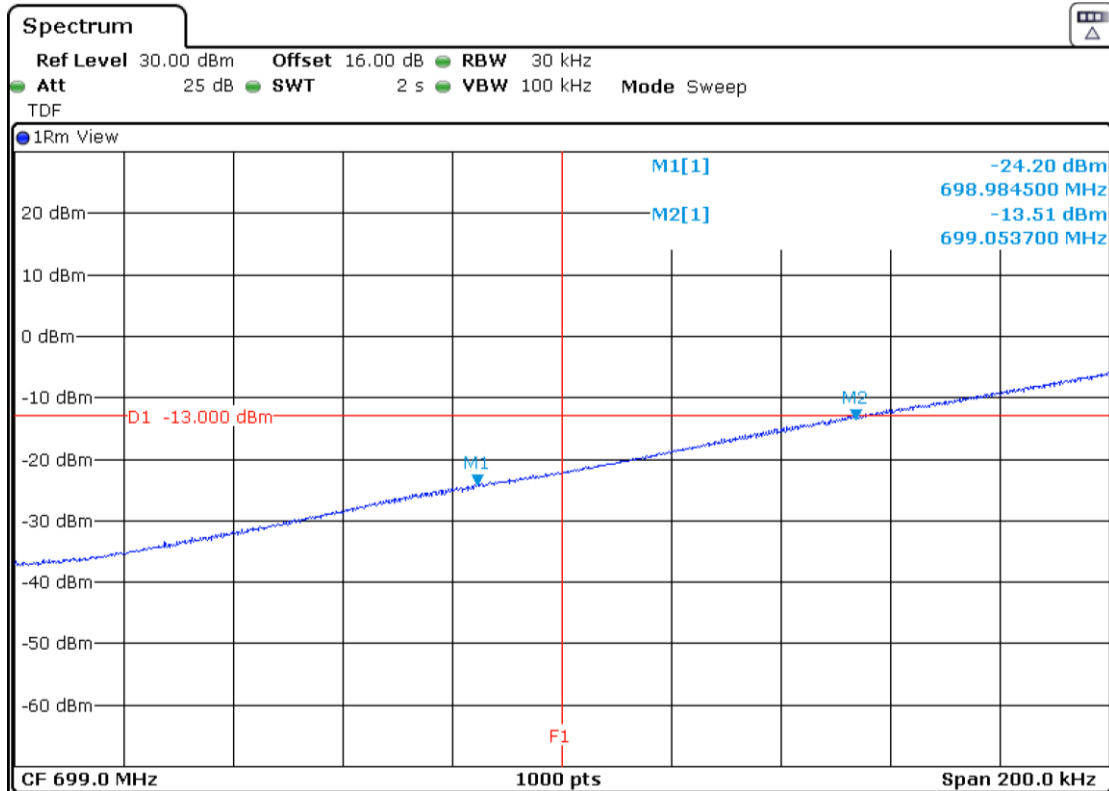
LTE Band 4. QPSK MODULATION. BW=20 MHz. RB=1. Offset=Max. High Block Edge:



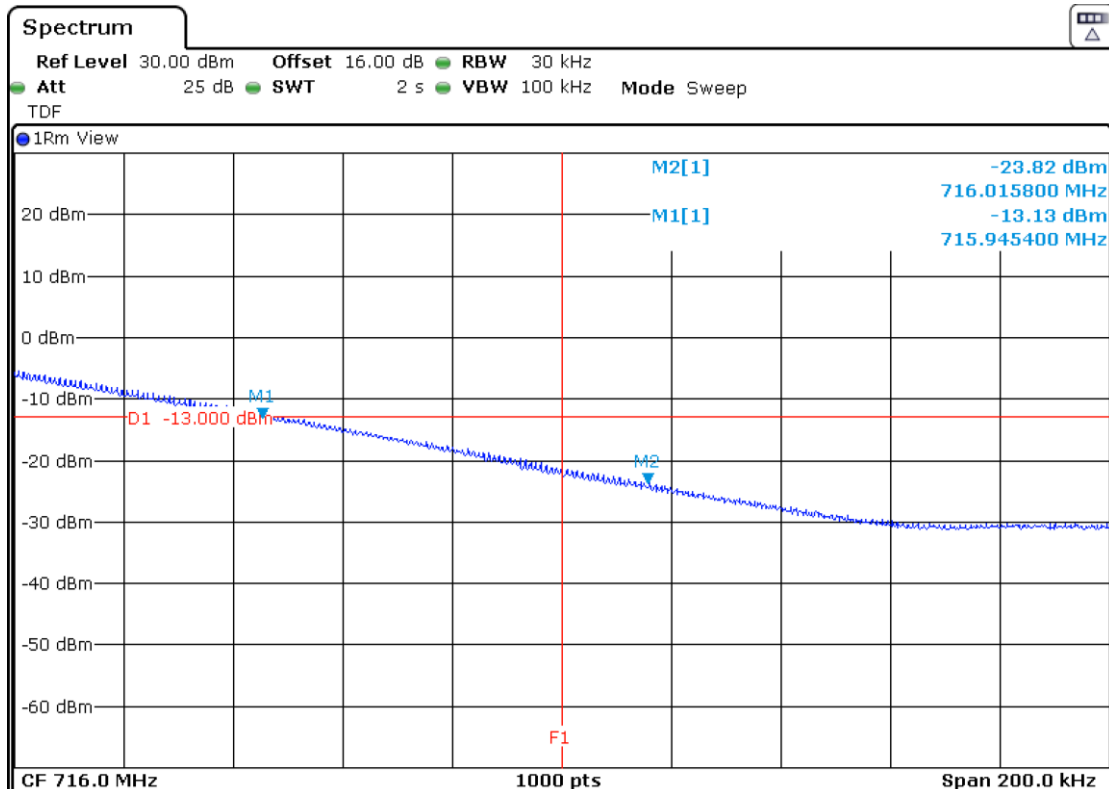
LTE Band 4. QPSK MODULATION. BW=20 MHz. RB=All. Offset=0. High Block Edge:



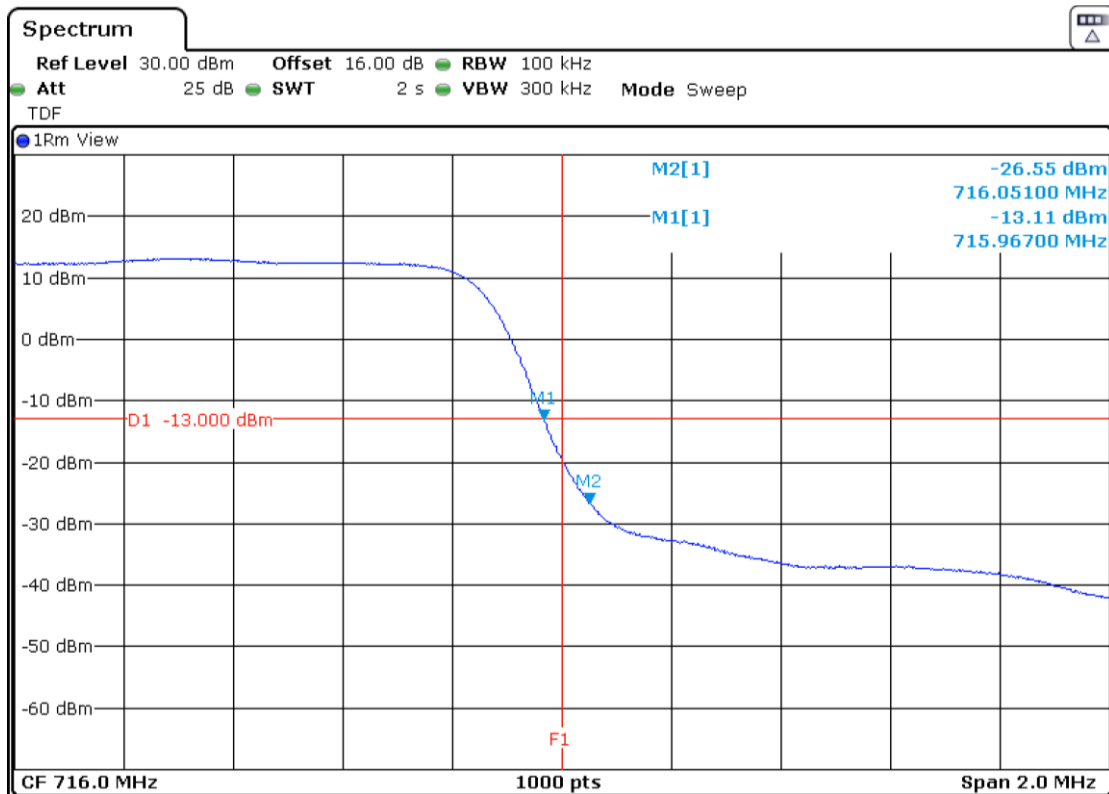
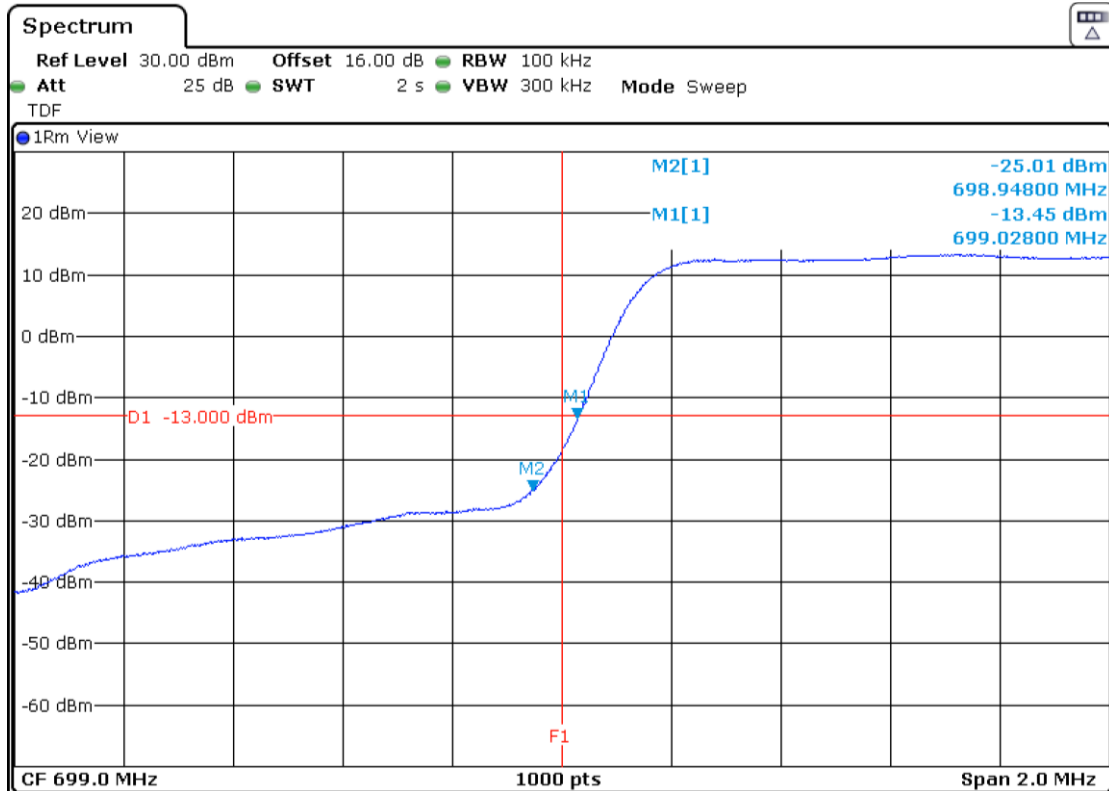
LTE Band 12. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=0. Low Block Edge:



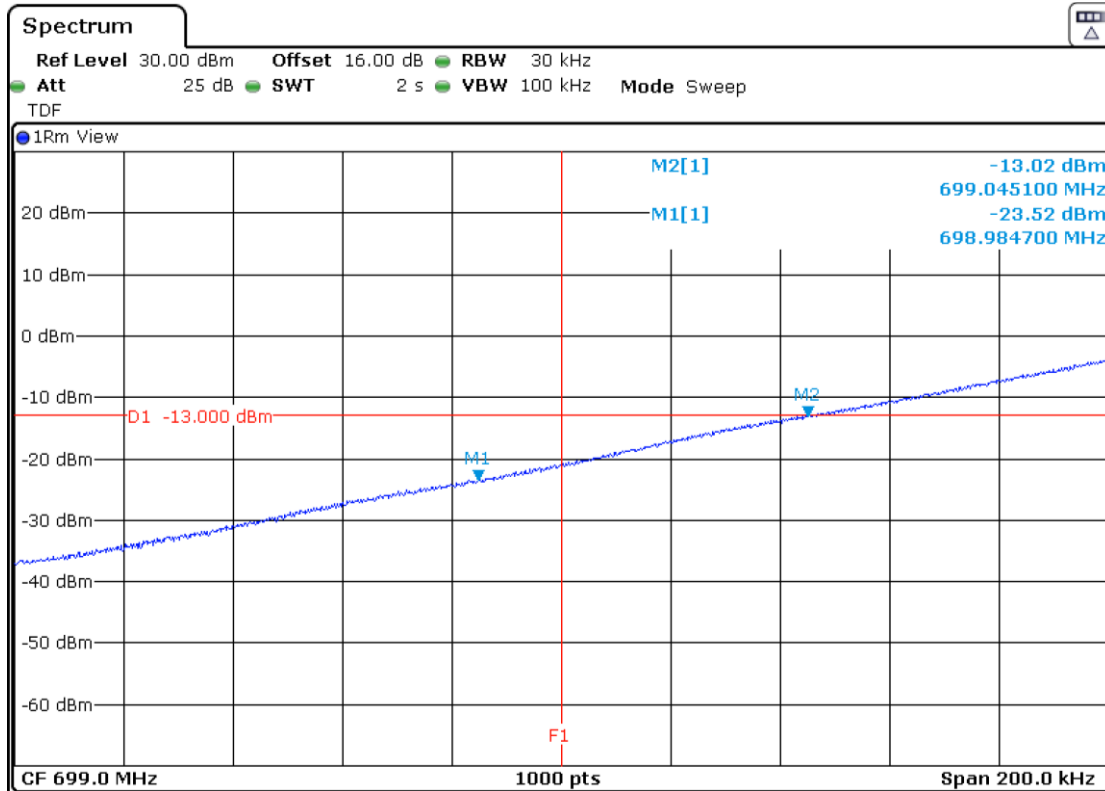
LTE Band 12. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=Max. High Block Edge:



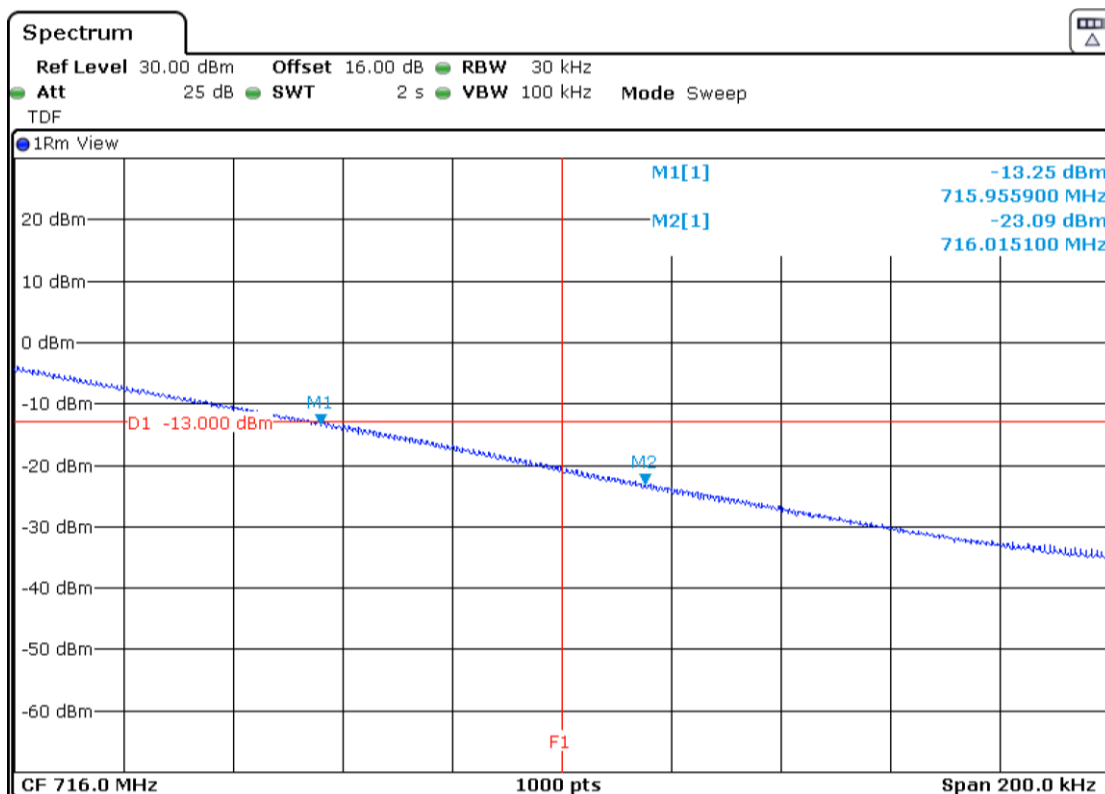
LTE Band 12. QPSK MODULATION. BW=1.4 MHz. RB=All. Offset=0. Low and High Block Edges:



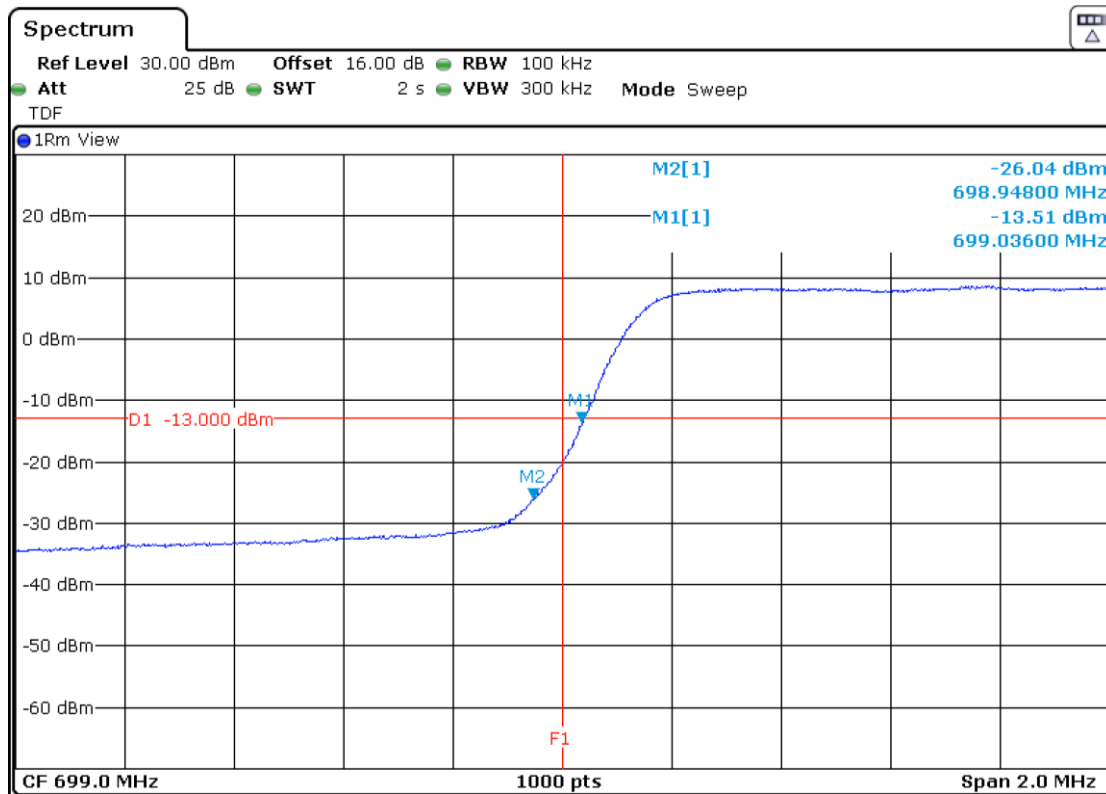
LTE Band 12. QPSK MODULATION. BW=3 MHz. RB=1. Offset=0. Low Block Edge:



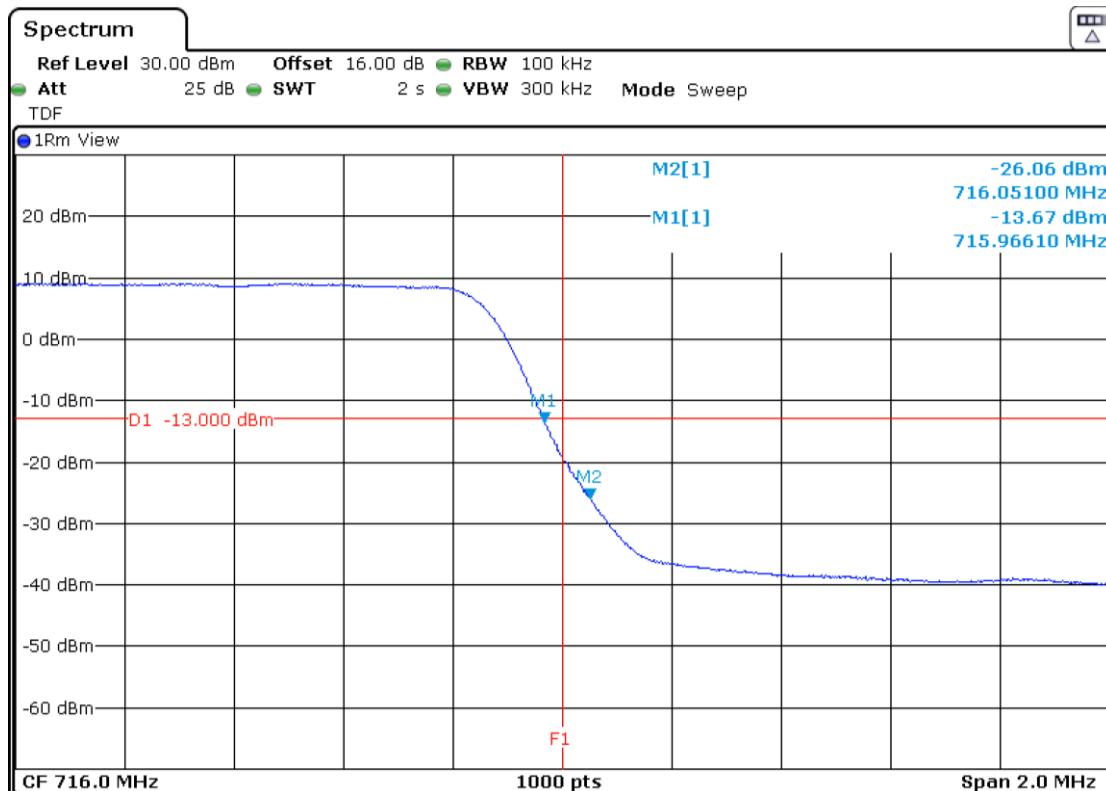
LTE Band 12. QPSK MODULATION. BW=3 MHz. RB=1. Offset=Max. High Block Edge:



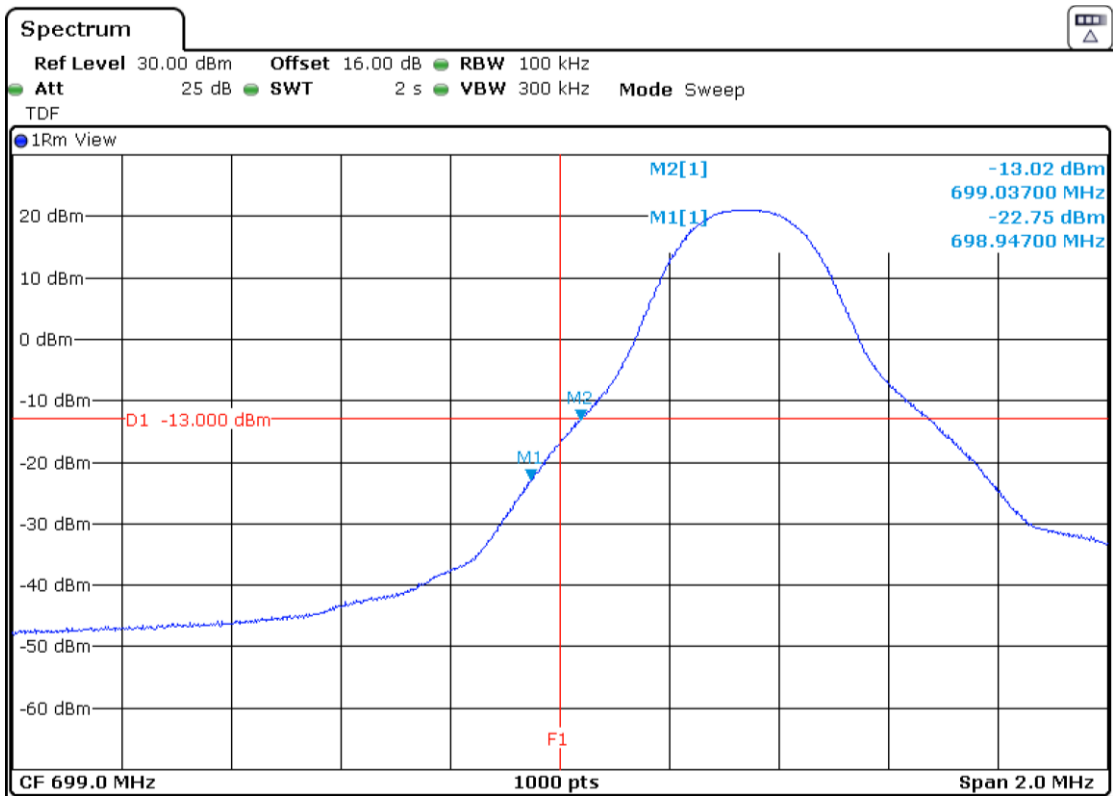
LTE Band 12. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. Low Block Edges:



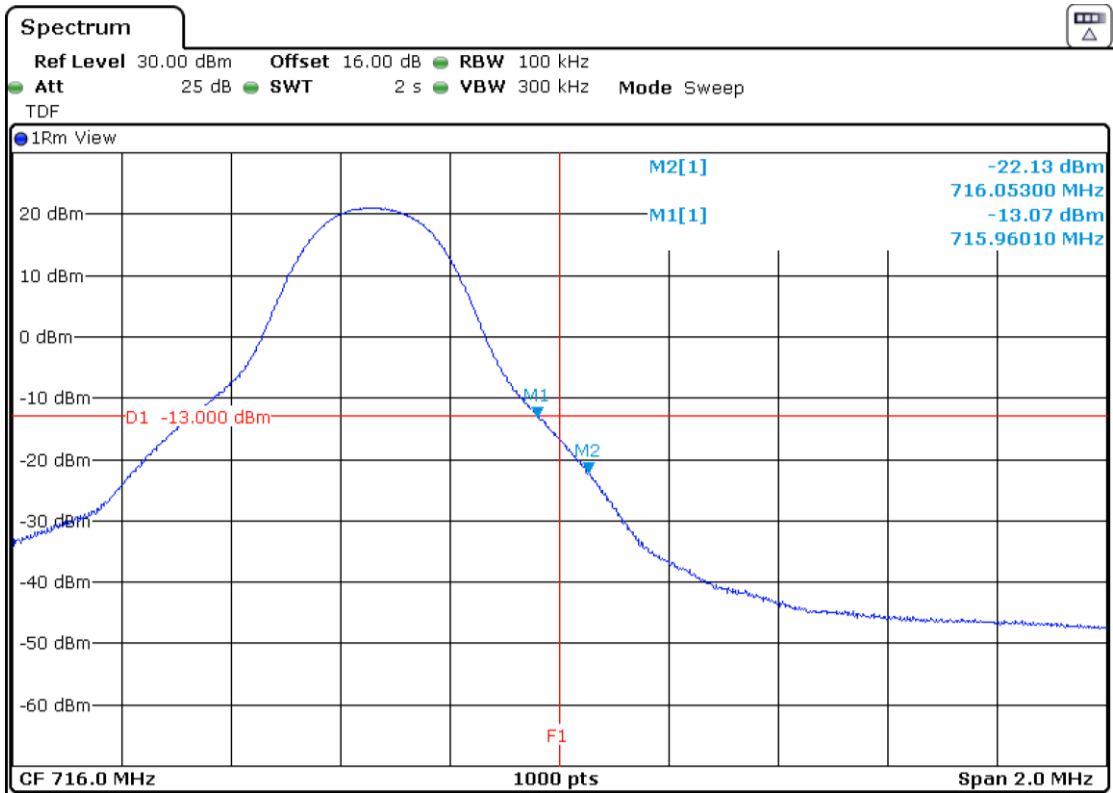
LTE Band 12. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. High Block Edges:



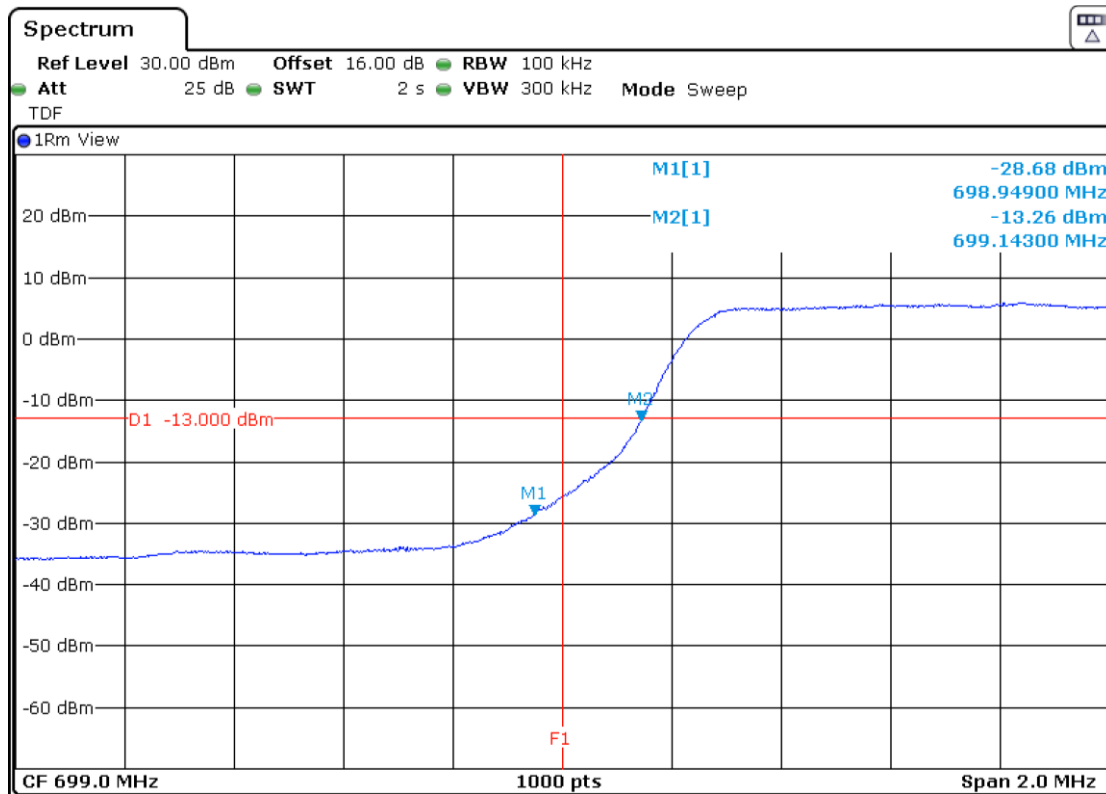
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=1. Offset=0. Low Block Edge:



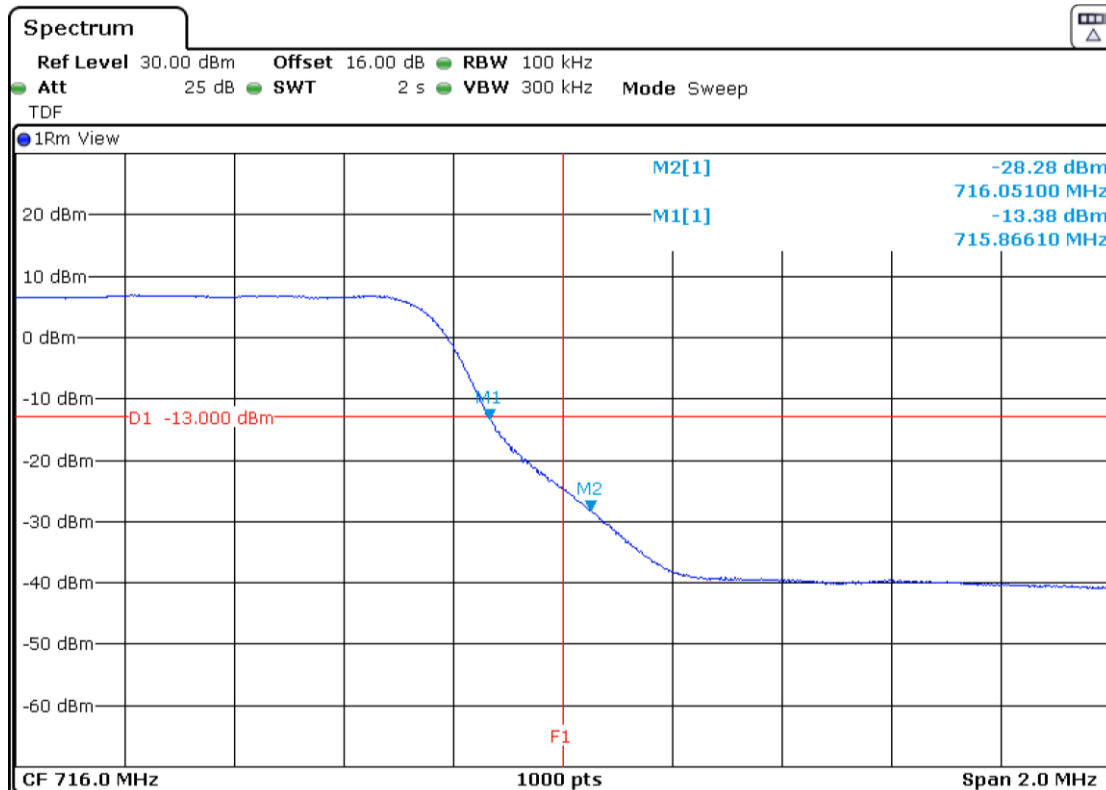
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. High Block Edge:



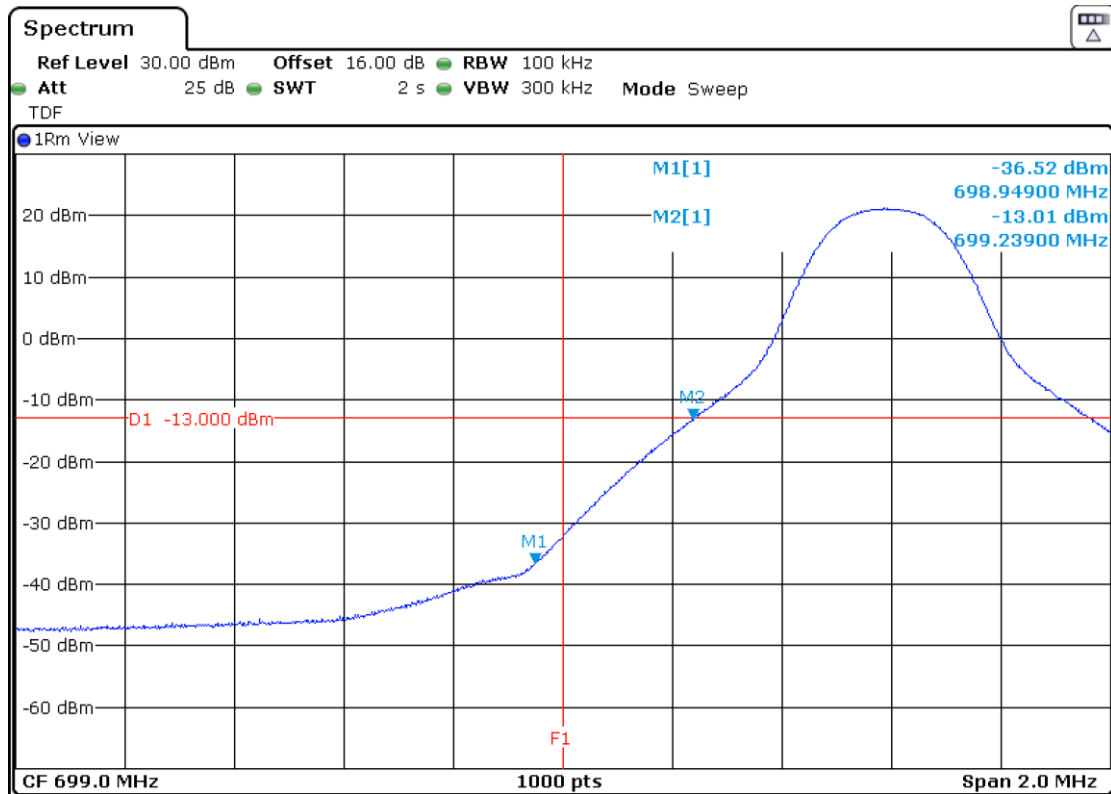
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. Low Block Edges:



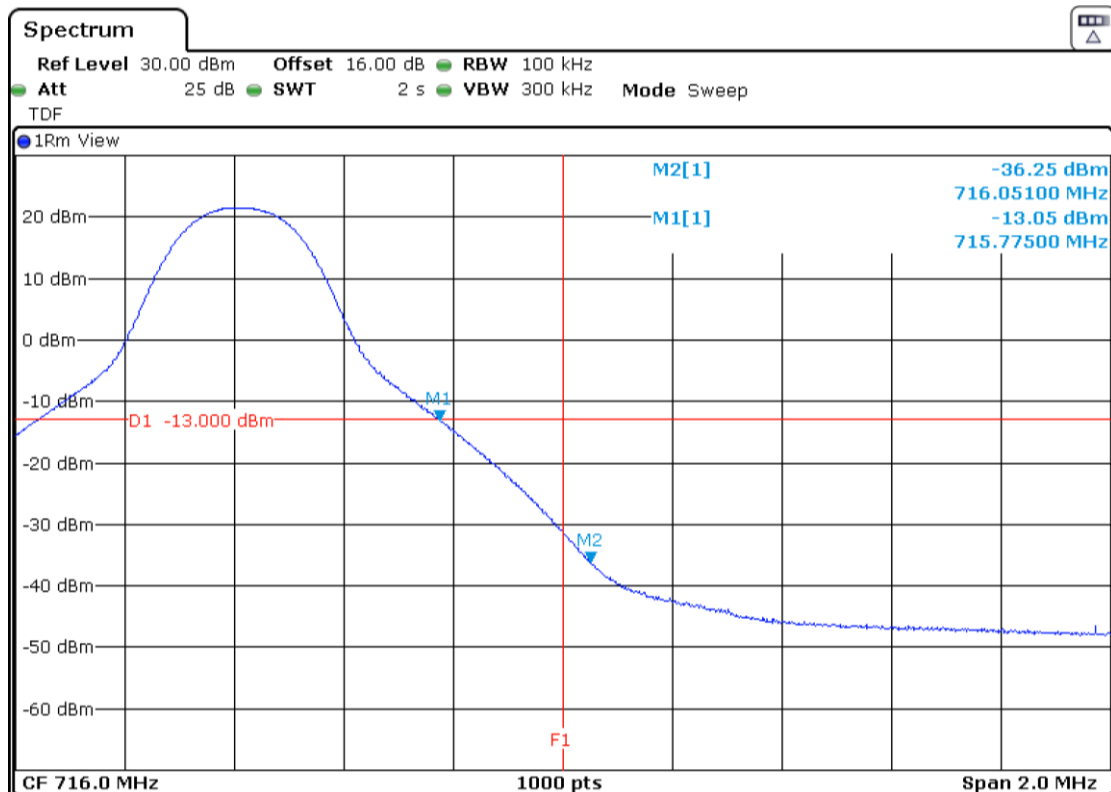
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. High Block Edges:



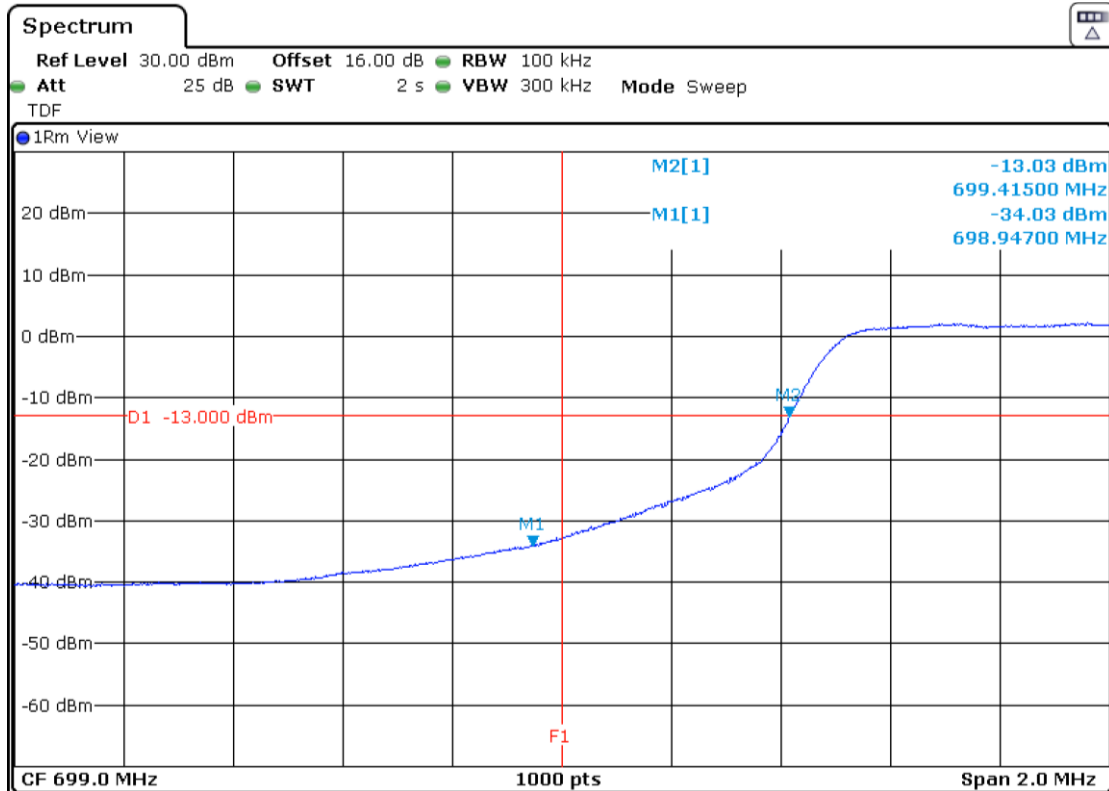
LTE Band 12. QPSK MODULATION. BW=10 MHz. RB=1. Offset=0. Low Block Edge:



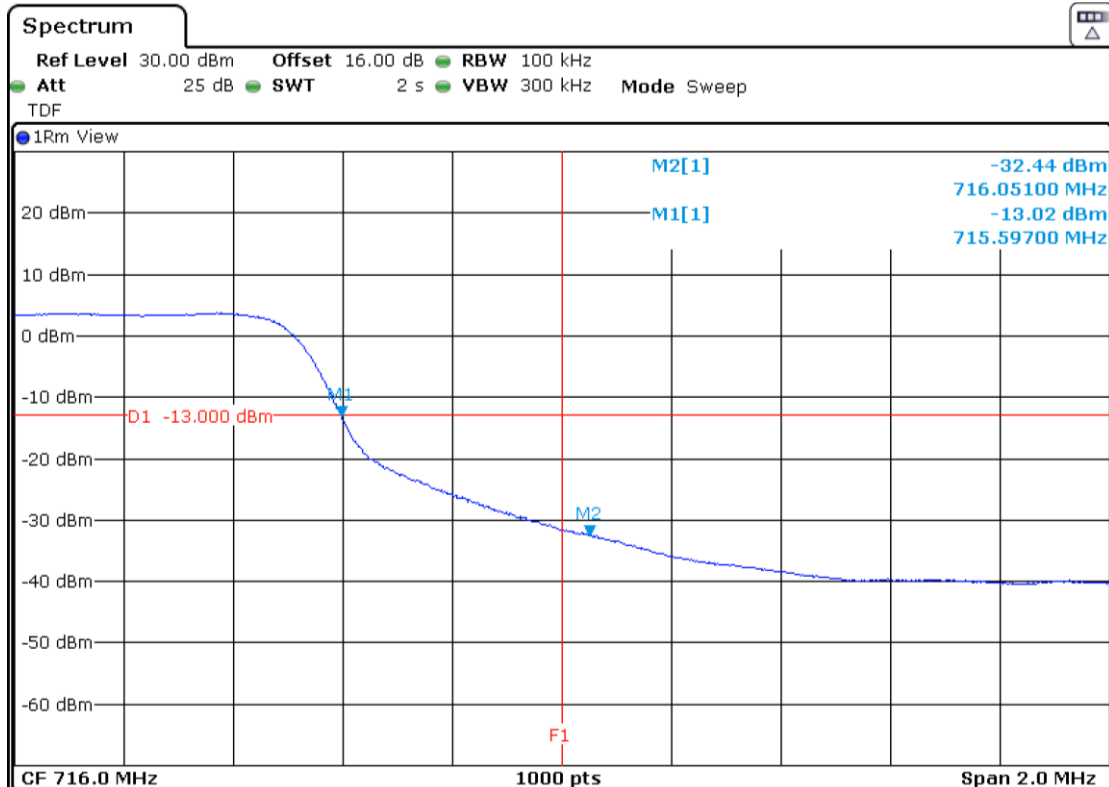
LTE Band 12. QPSK MODULATION. BW=10 MHz. RB=1. Offset=Max. High Block Edge:



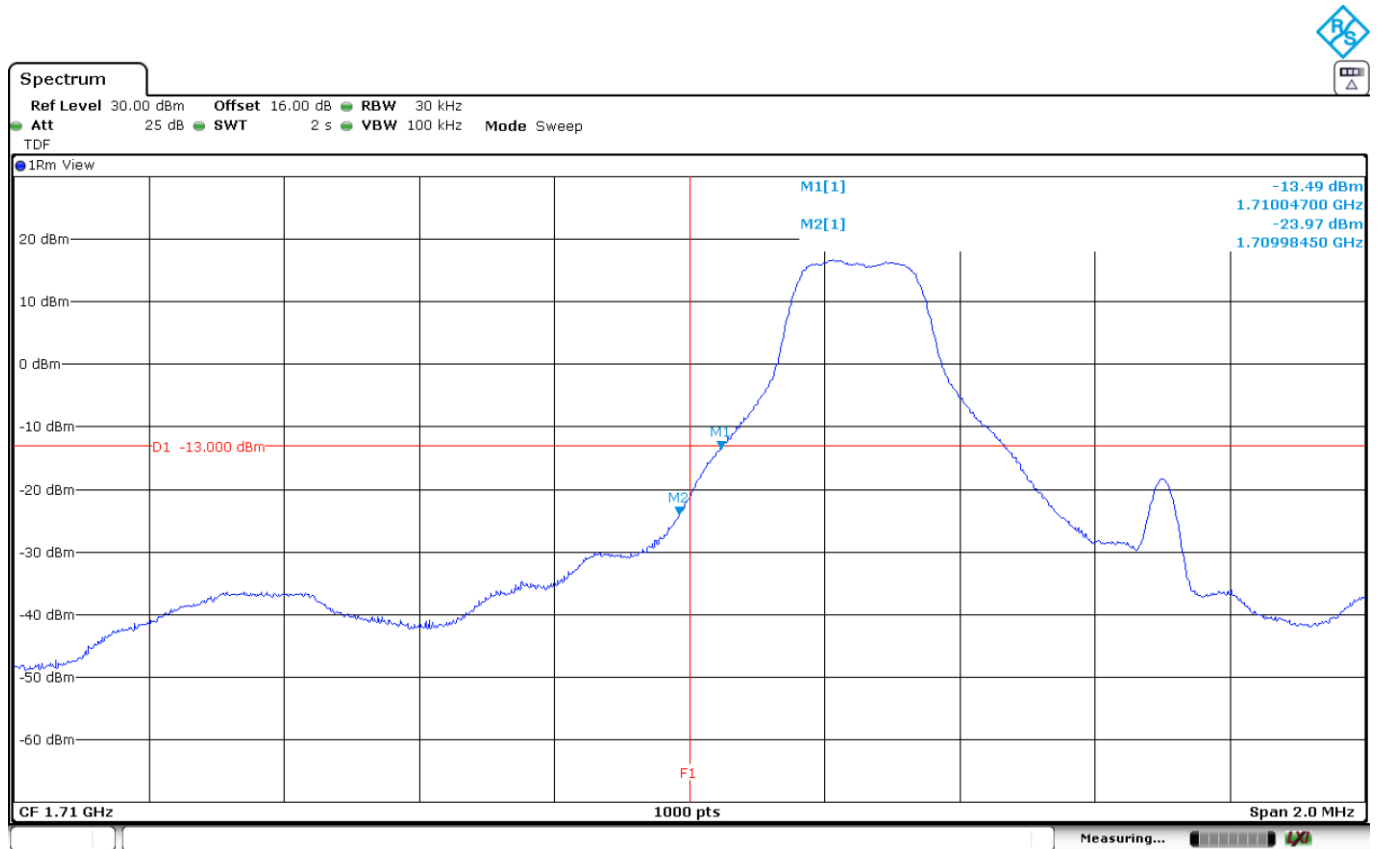
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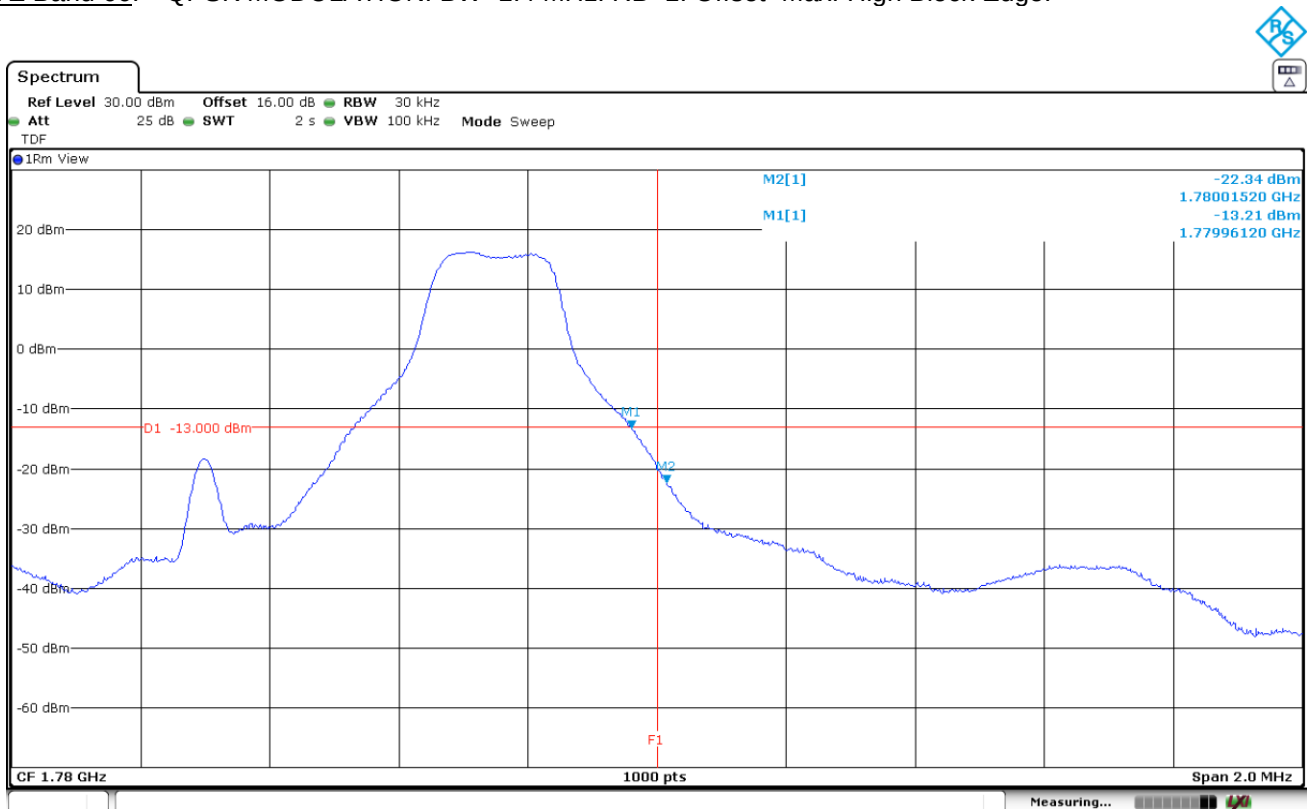
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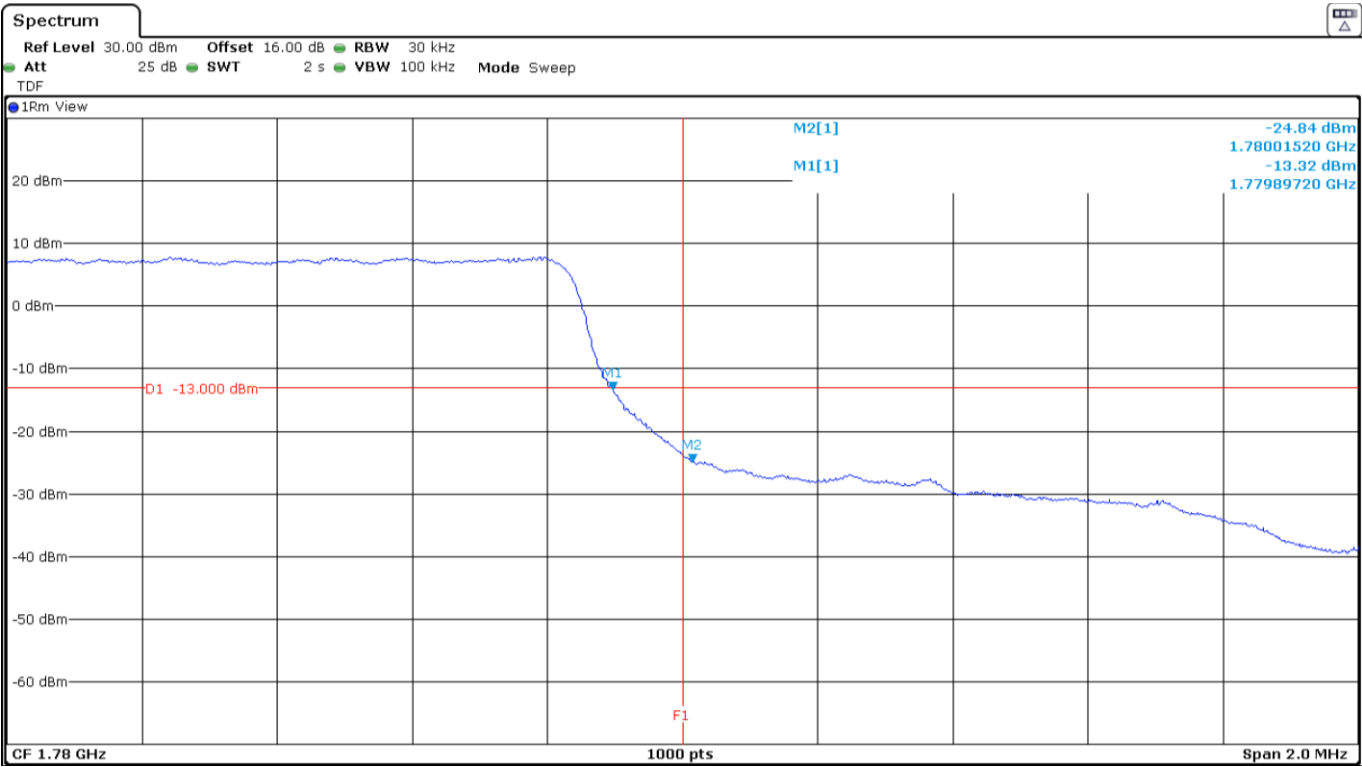
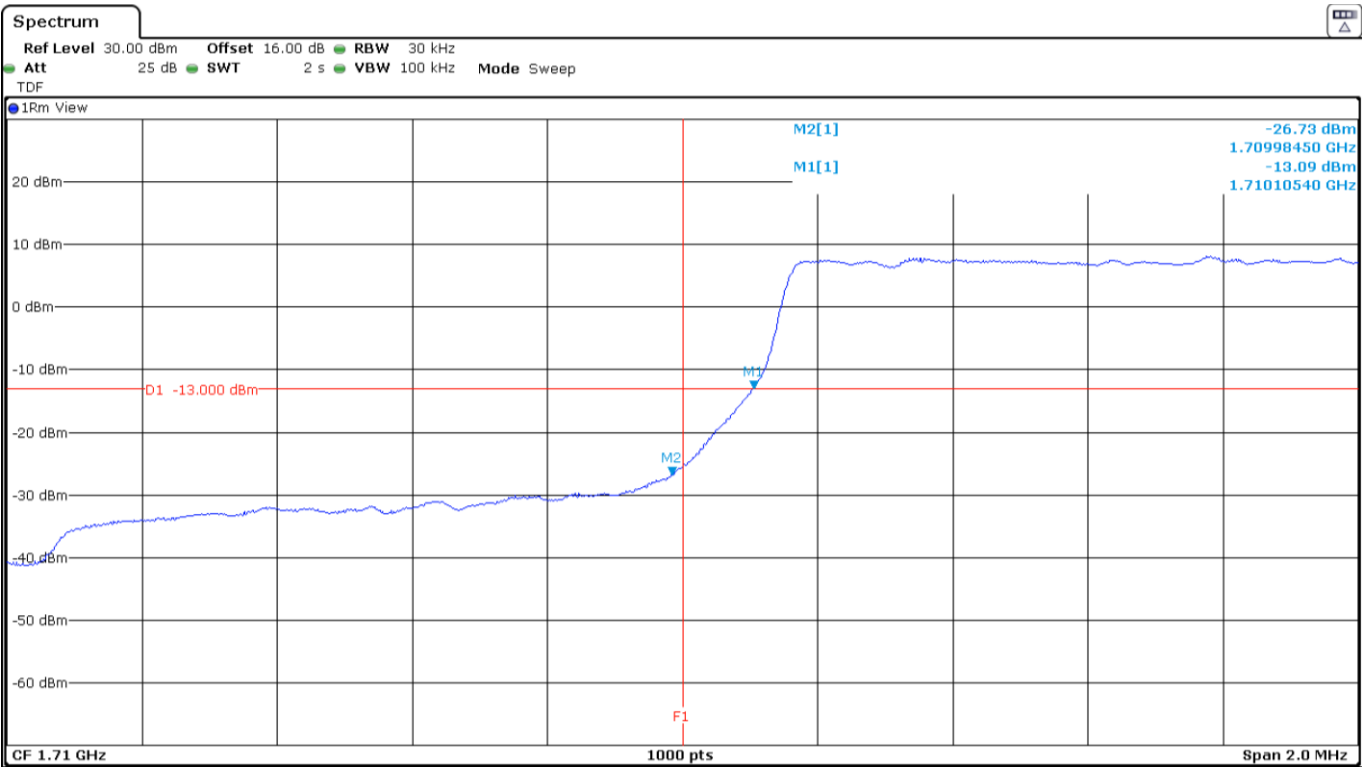
LTE Band 66. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=0. Low Block Edge:



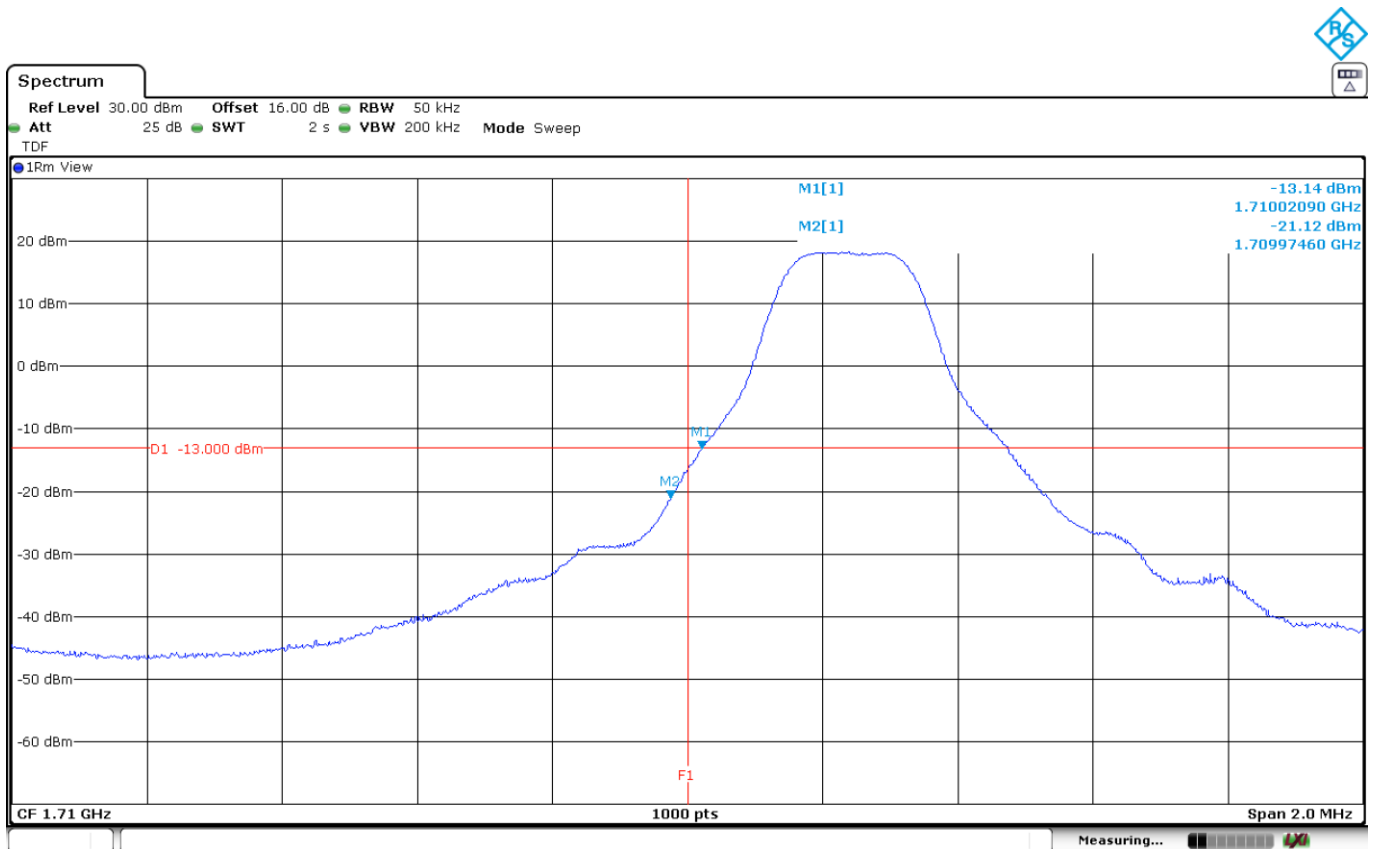
LTE Band 66. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=Max. High Block Edge:



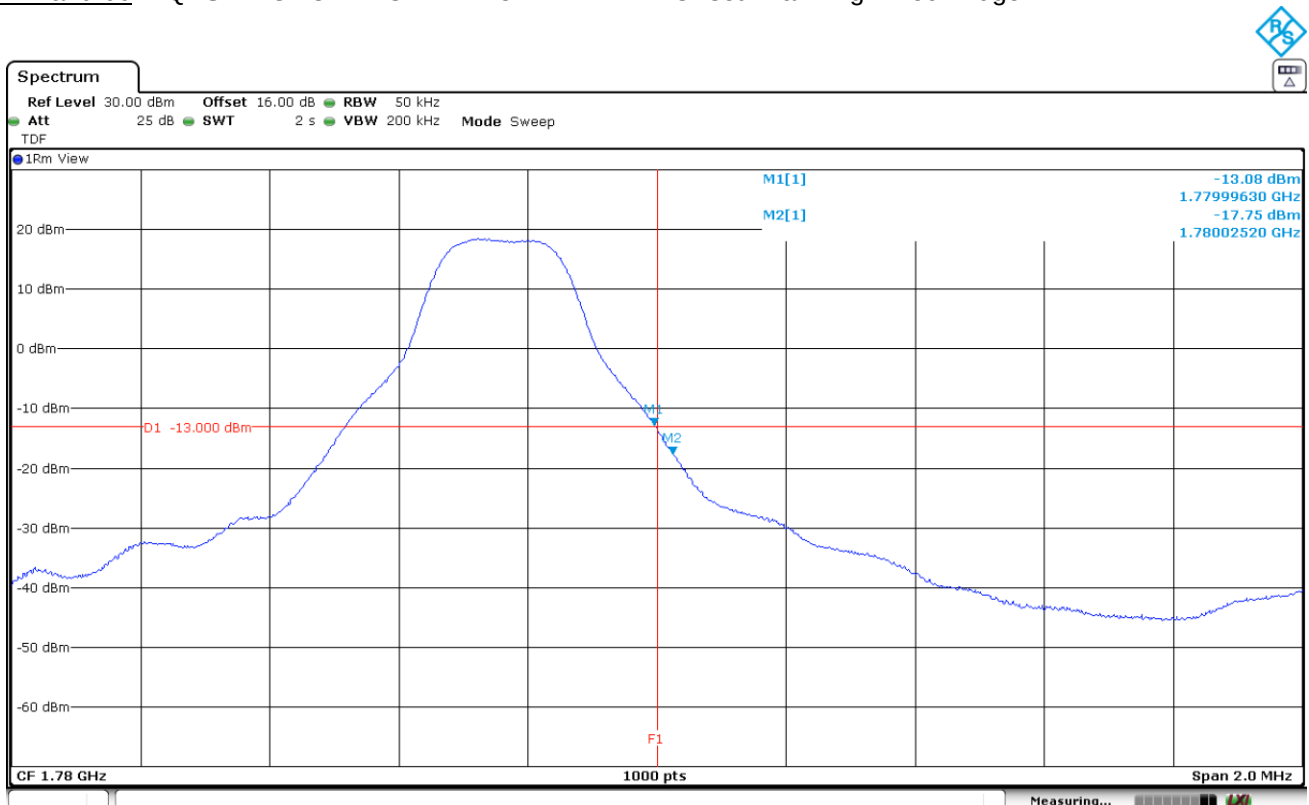
LTE Band 66. QPSK MODULATION. BW=1.4 MHz. RB=All. Offset=0. Low and High Block Edges:



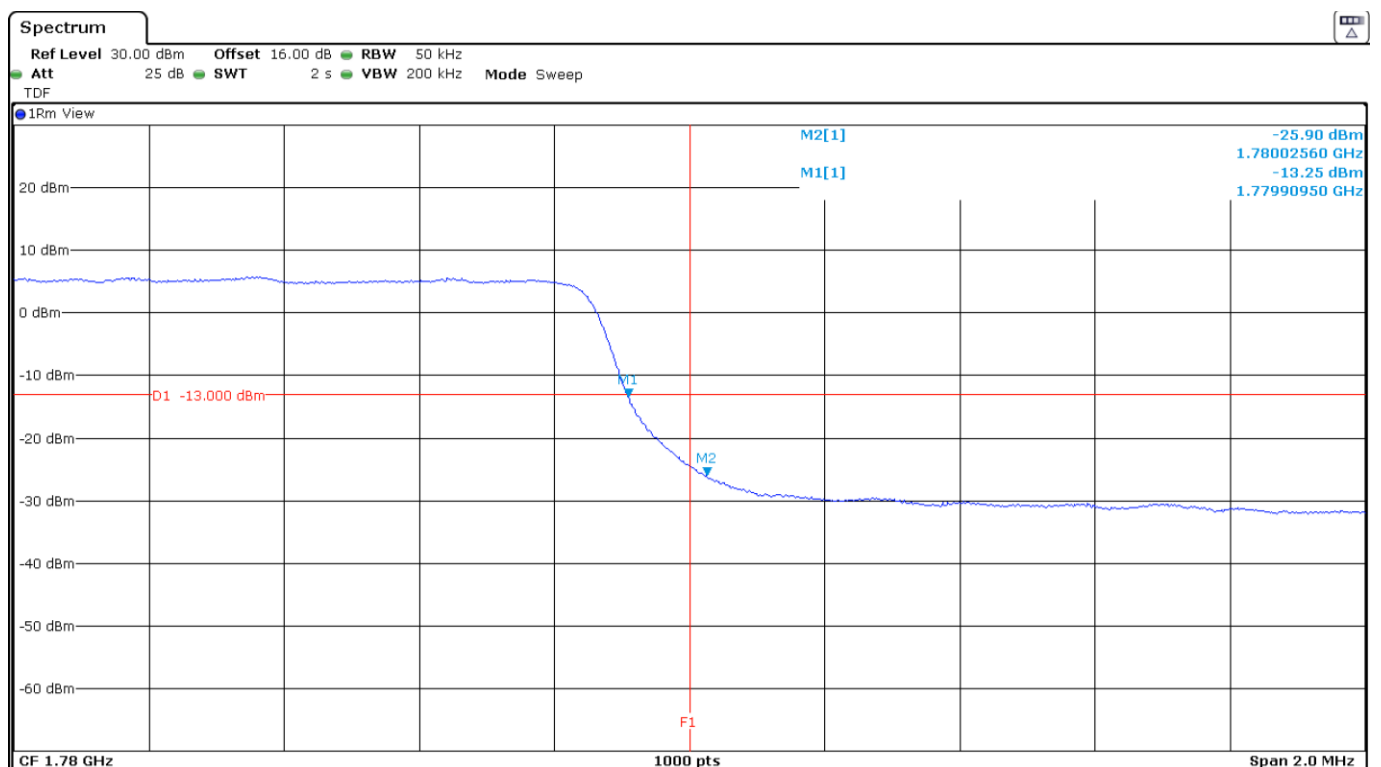
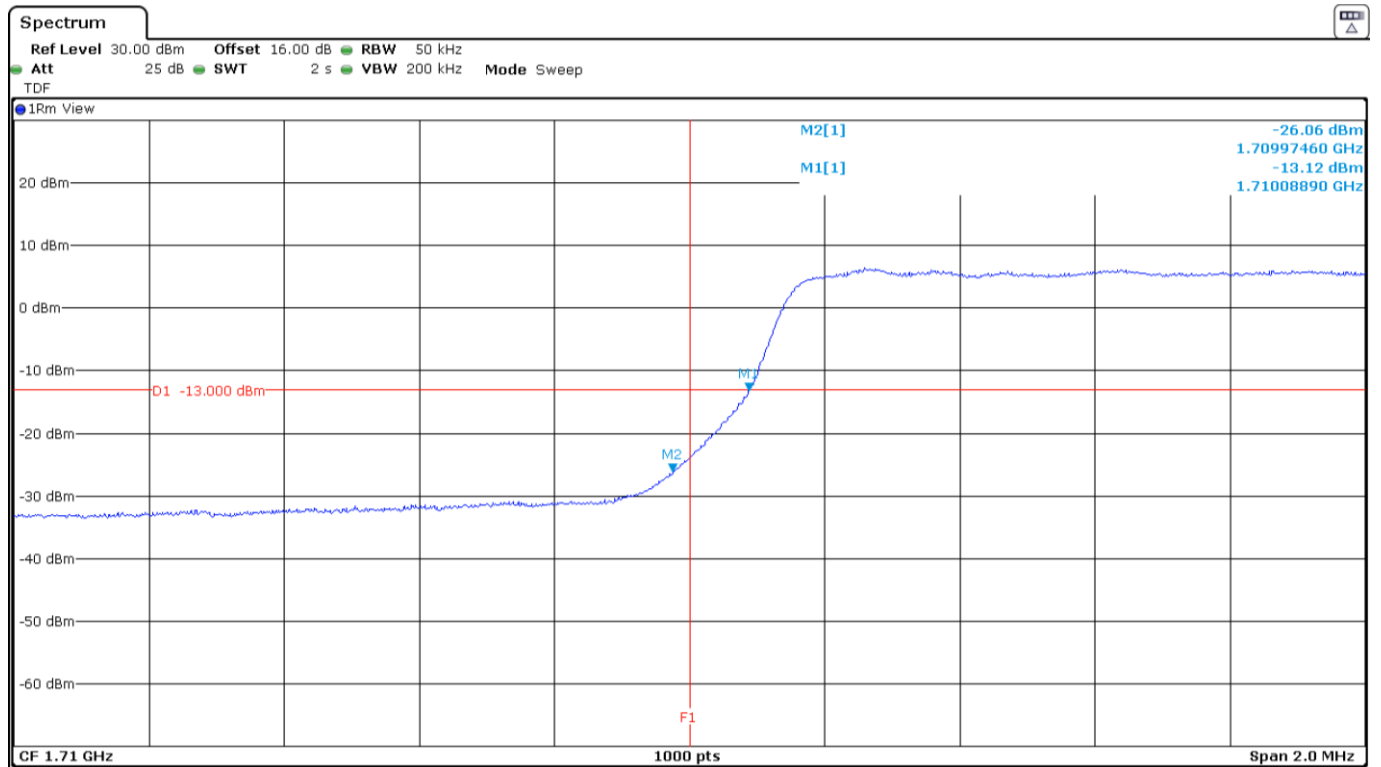
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=1. Offset=0. Low Block Edge:



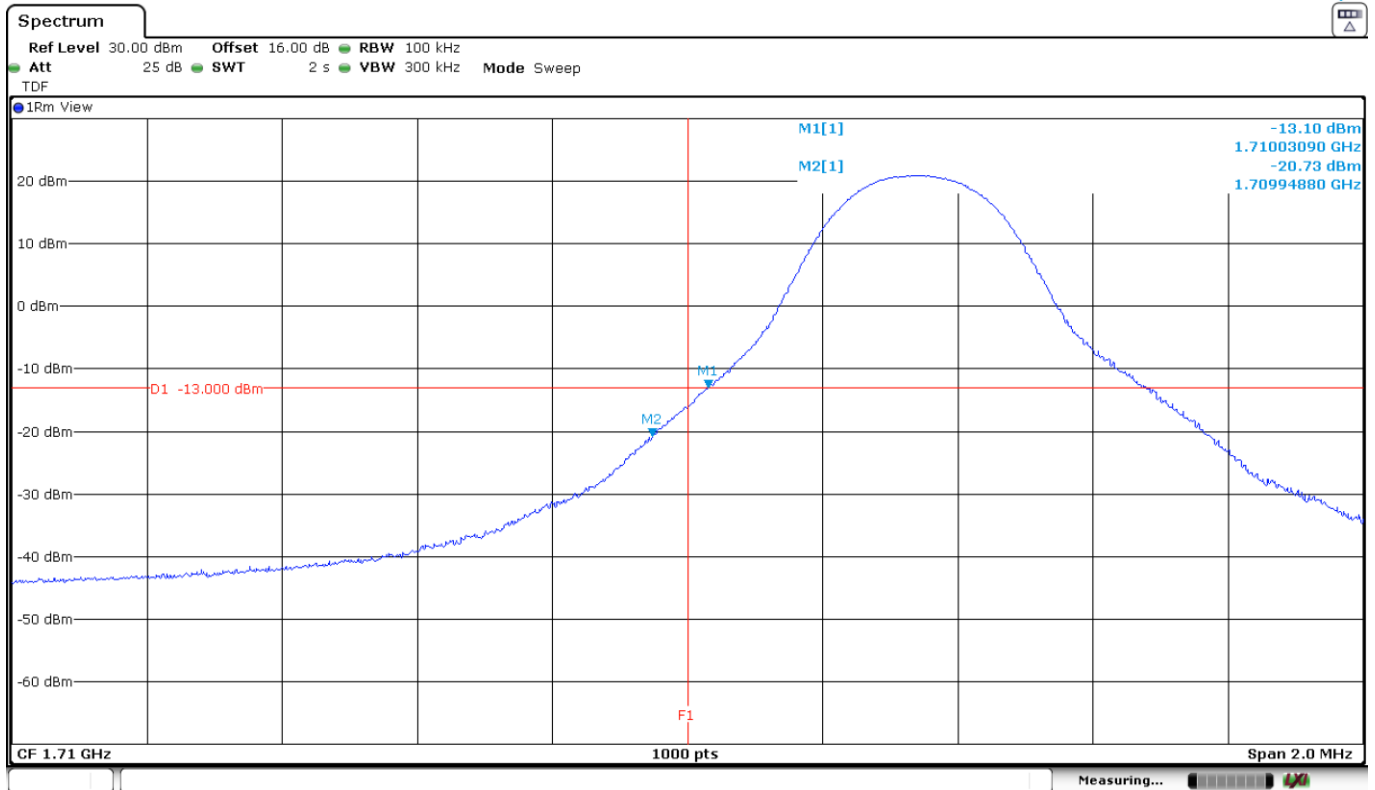
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=1. Offset=Max. High Block Edge:



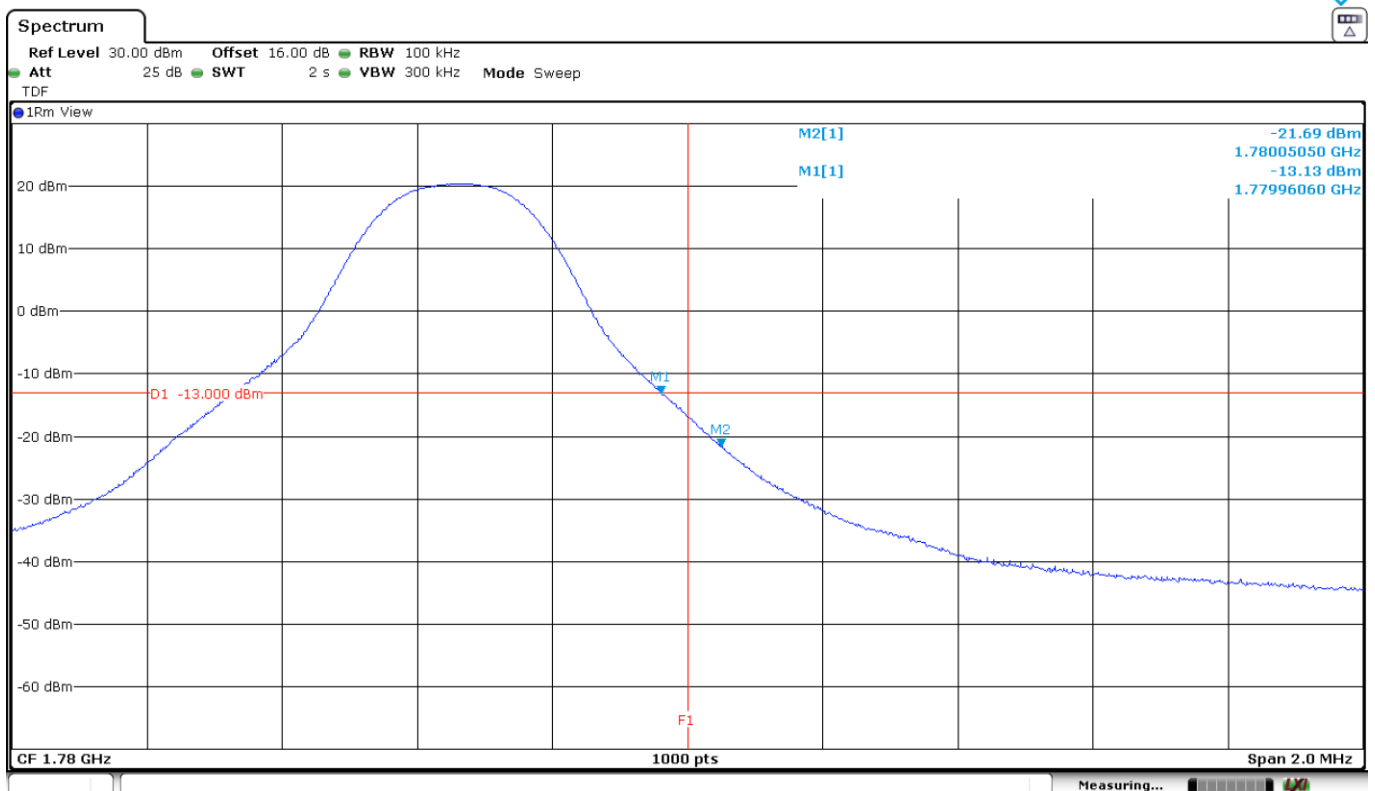
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. Low and High Block Edges:



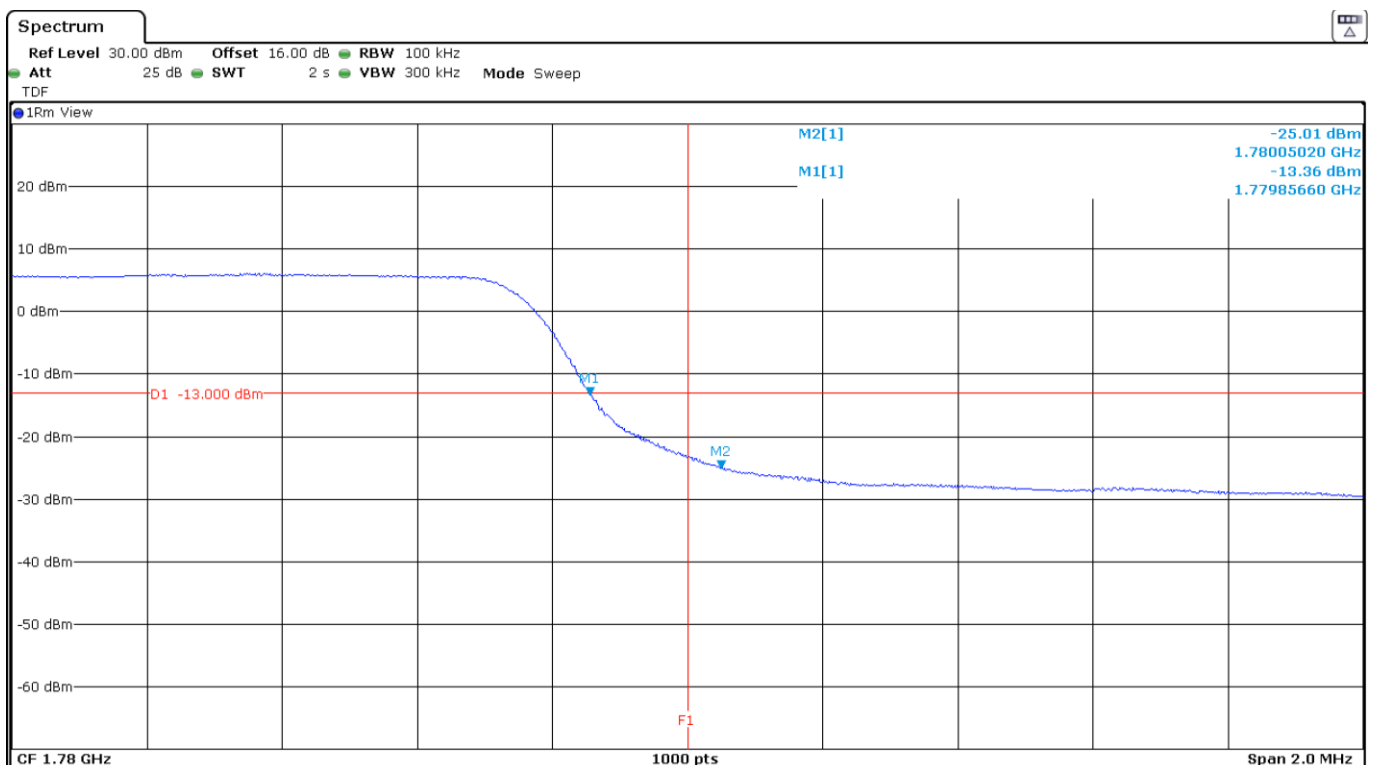
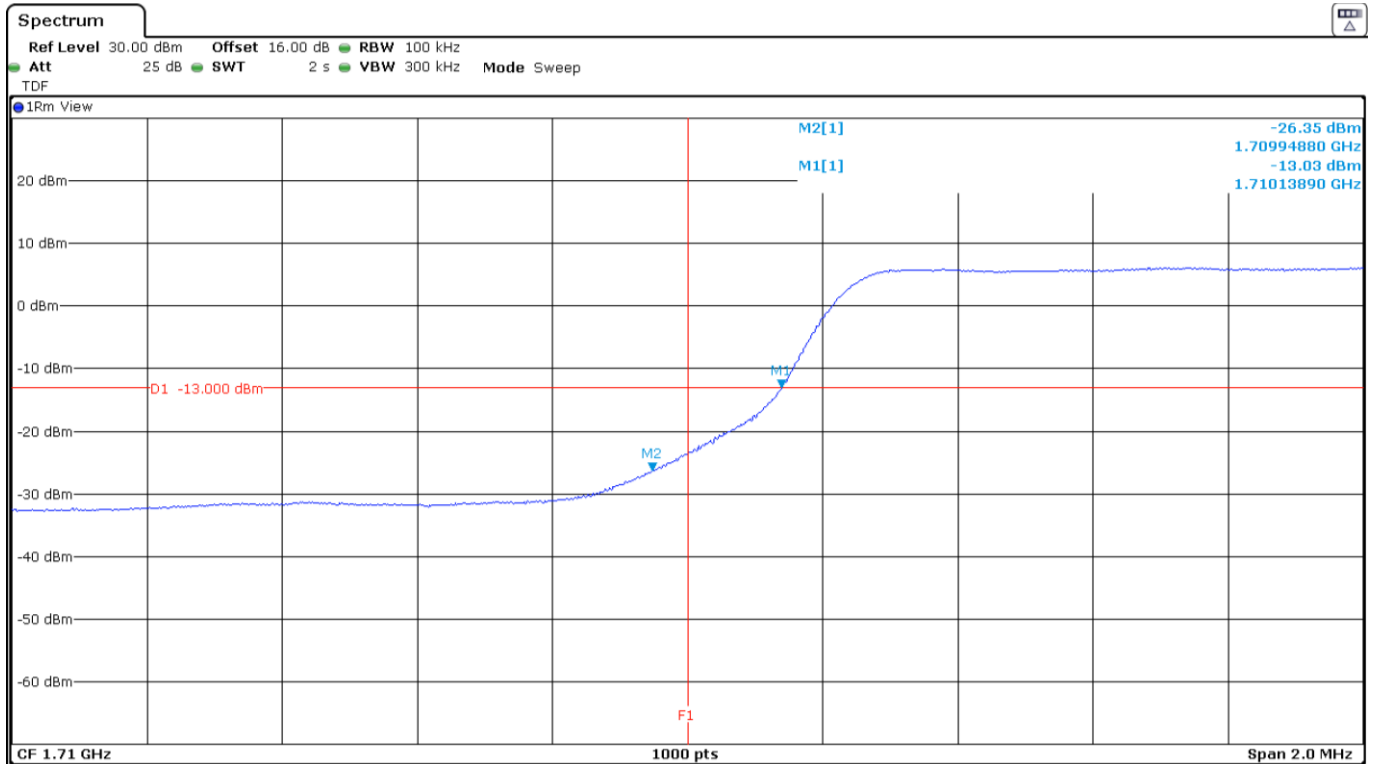
LTE Band 66. QPSK MODULATION. BW=5 MHz. RB=1. Offset=0. Low Block Edge:



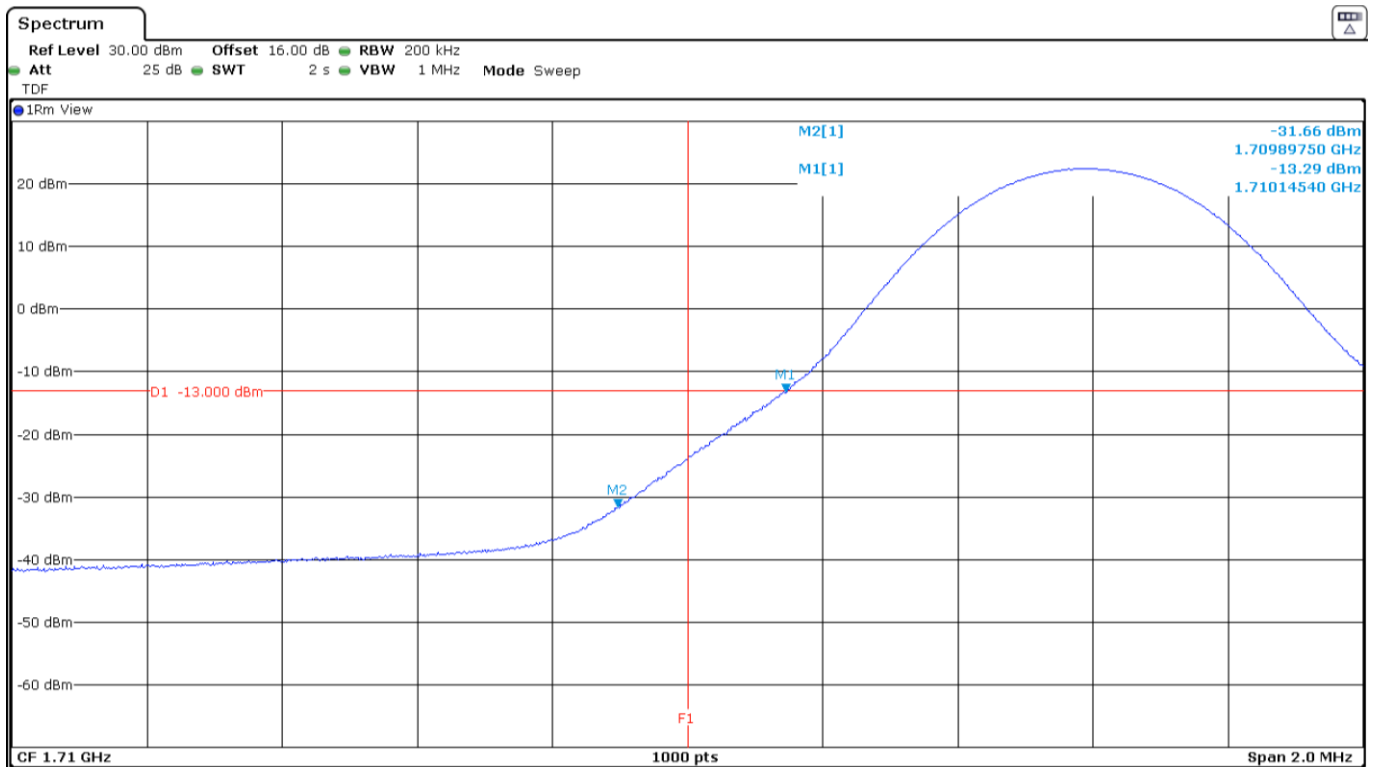
LTE Band 66. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. High Block Edge:



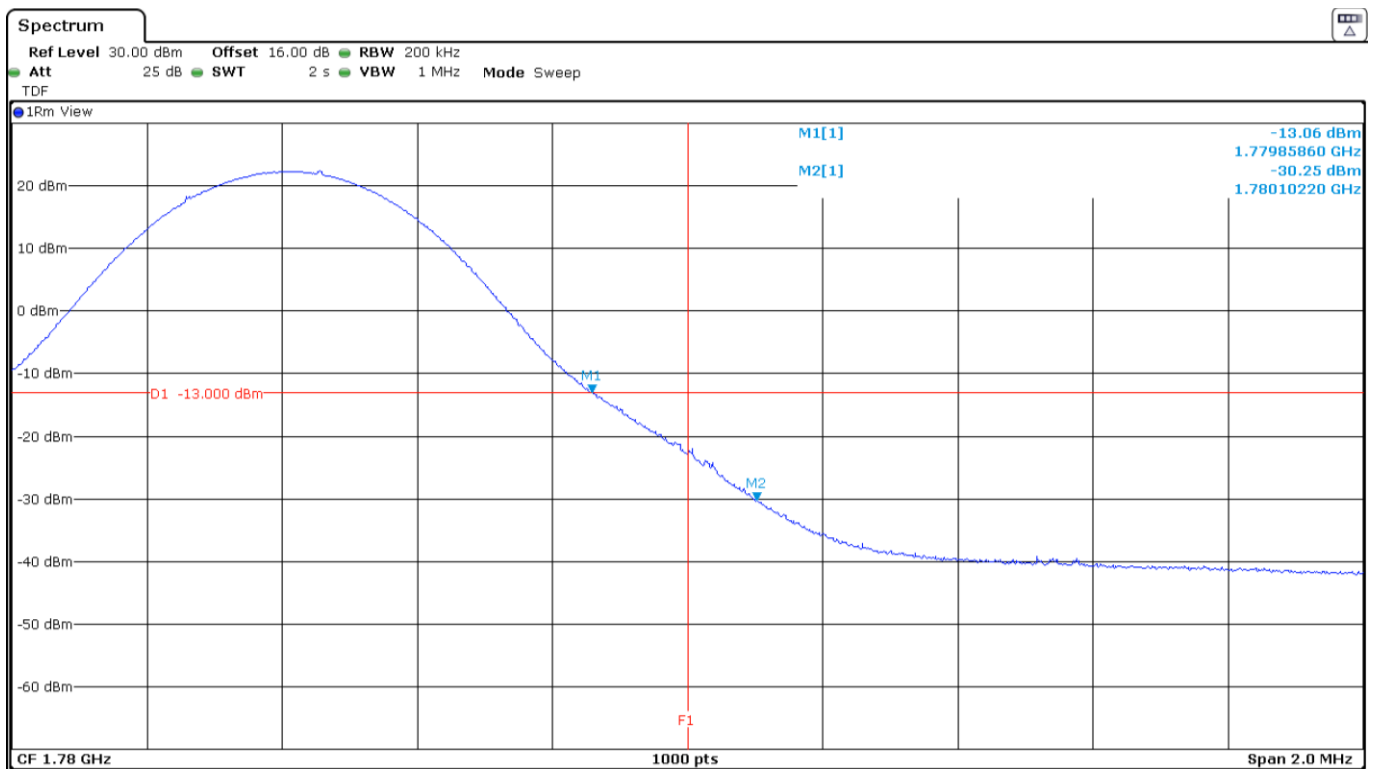
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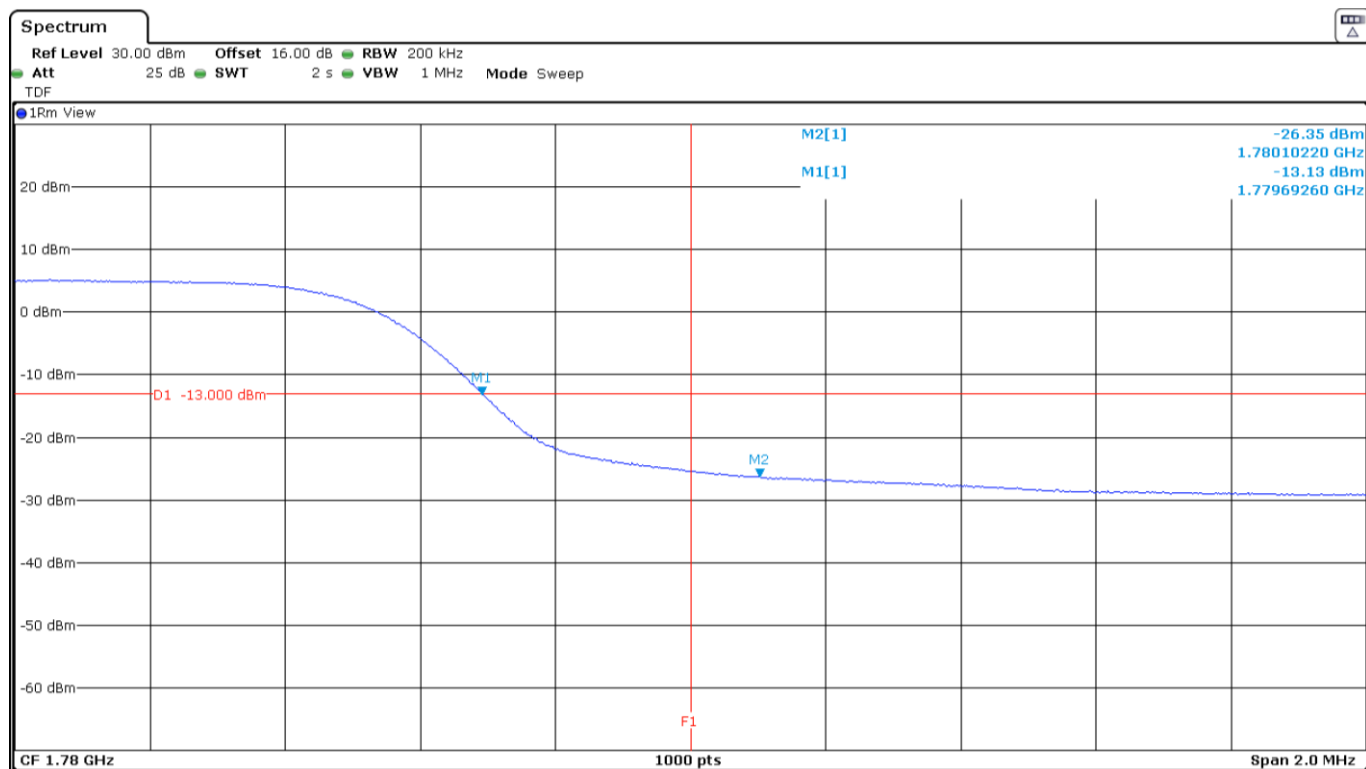
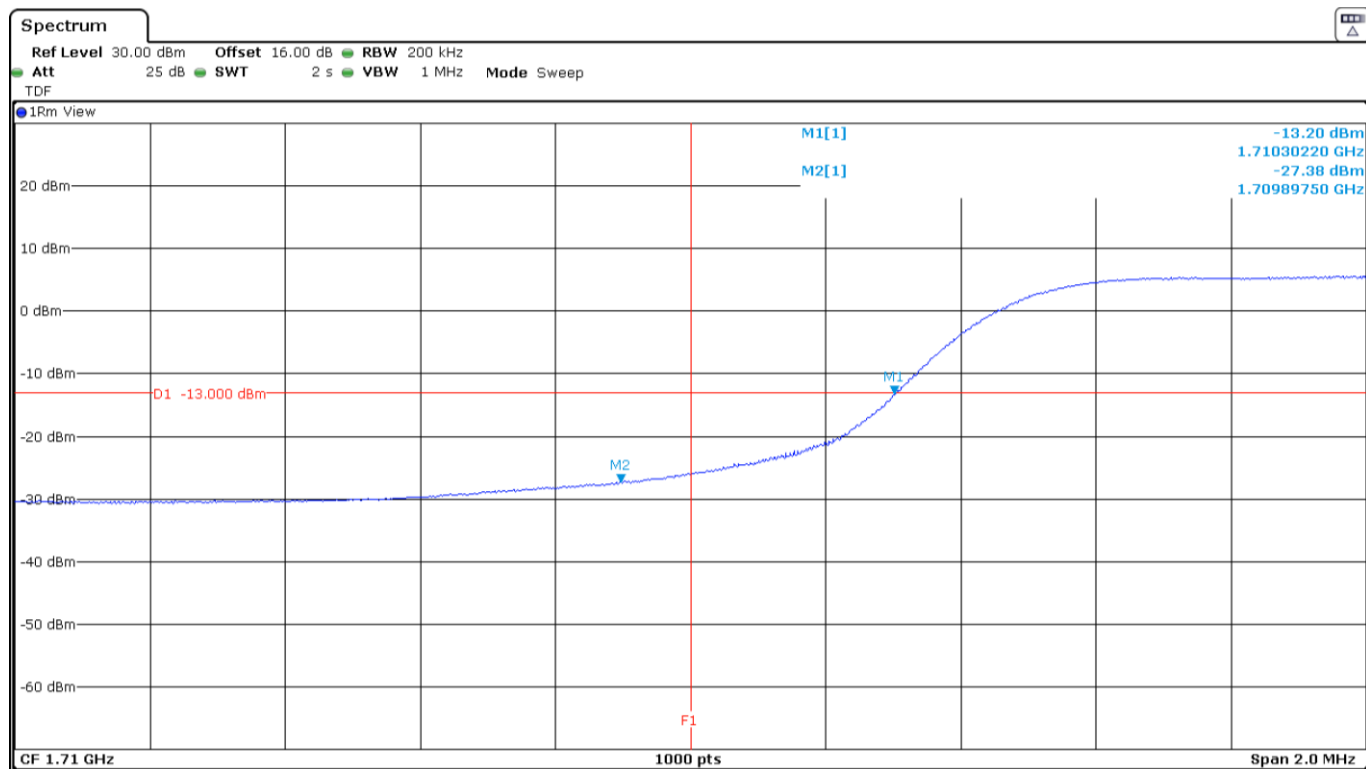
LTE Band 66. QPSK MODULATION. BW=10 MHz. RB=1. Offset=0. Low Block Edge:



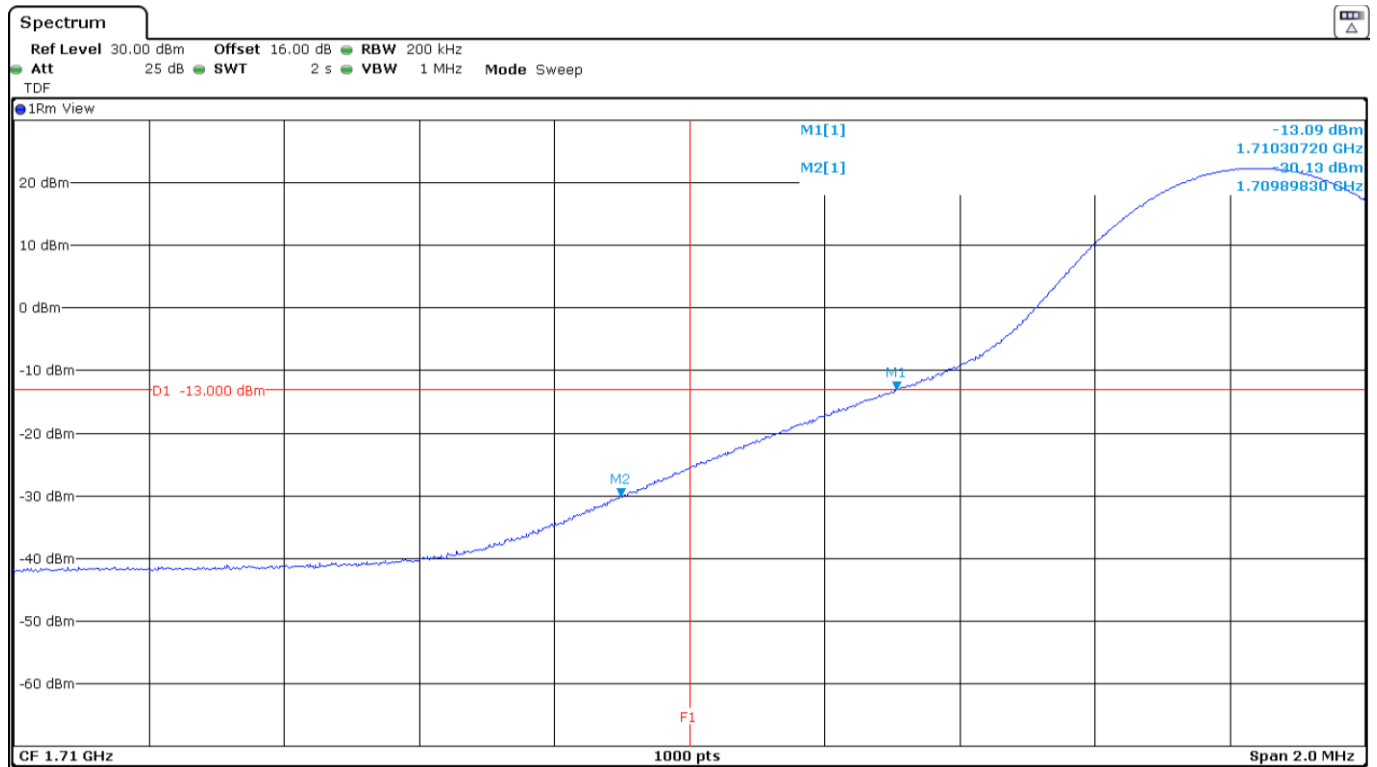
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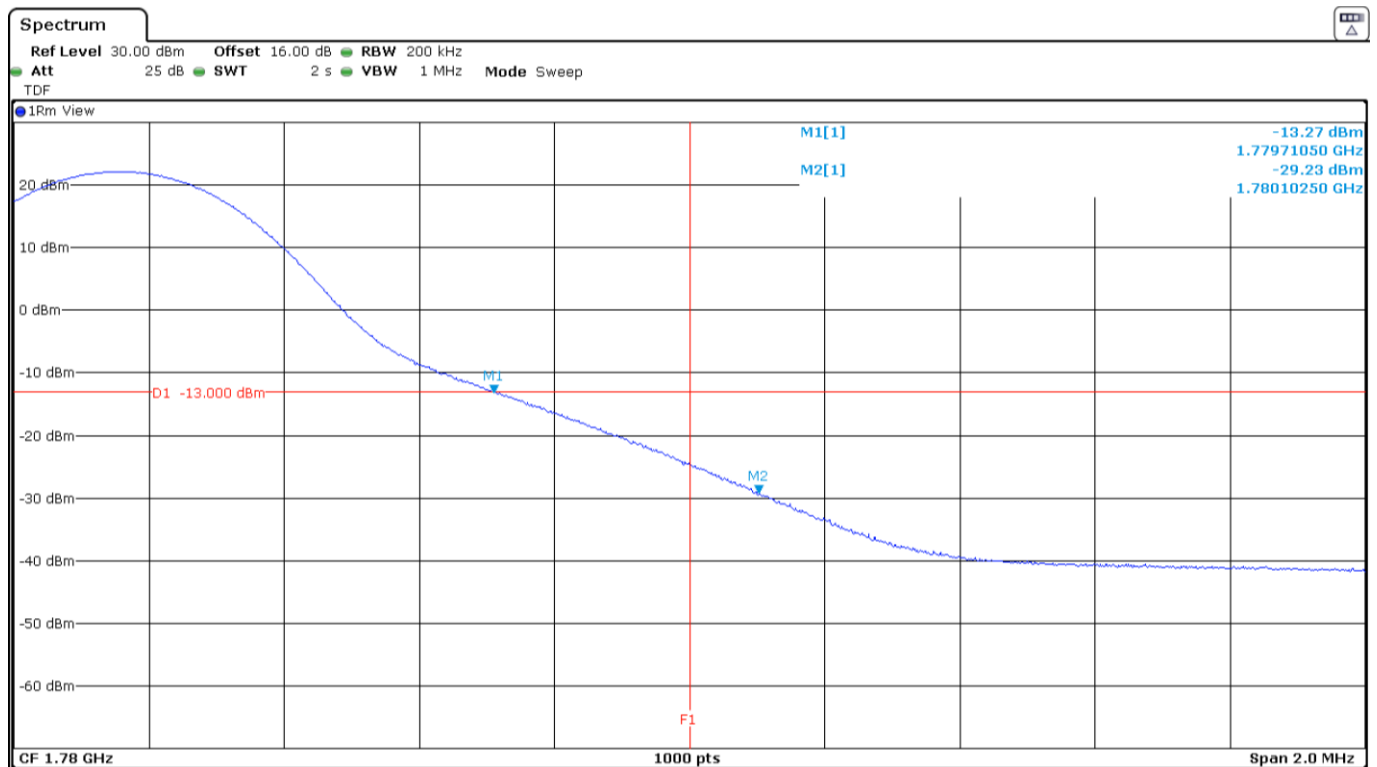
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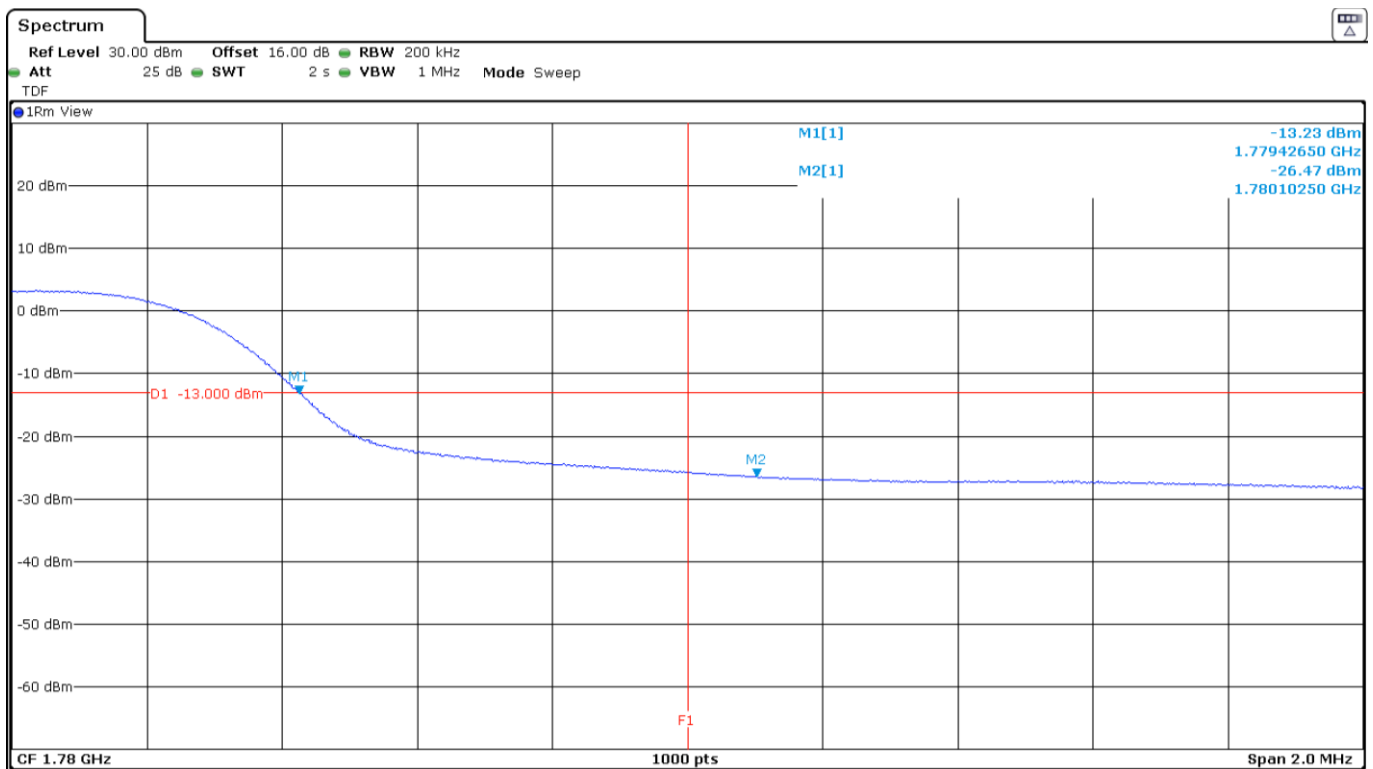
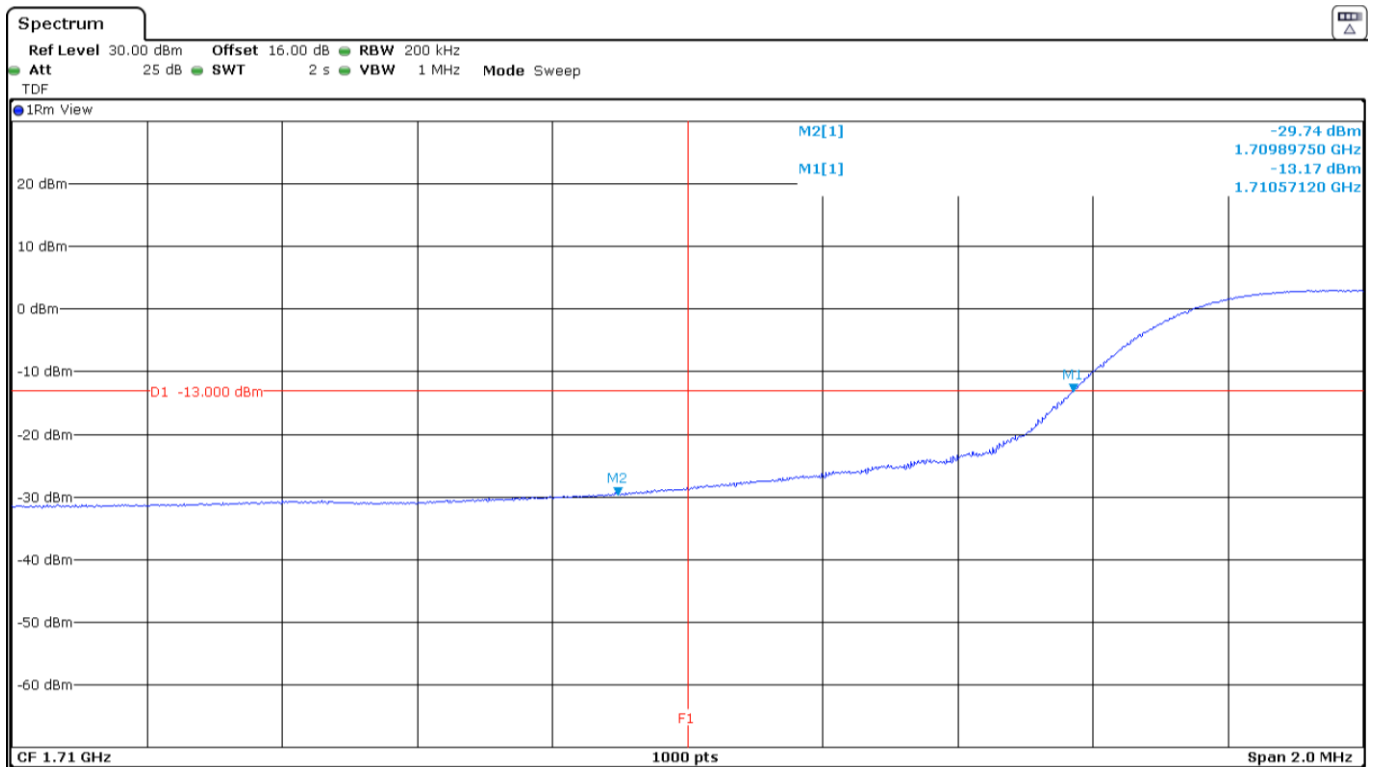
LTE Band 66. QPSK MODULATION. BW=15 MHz. RB=1. Offset=0. Low Block Edge:



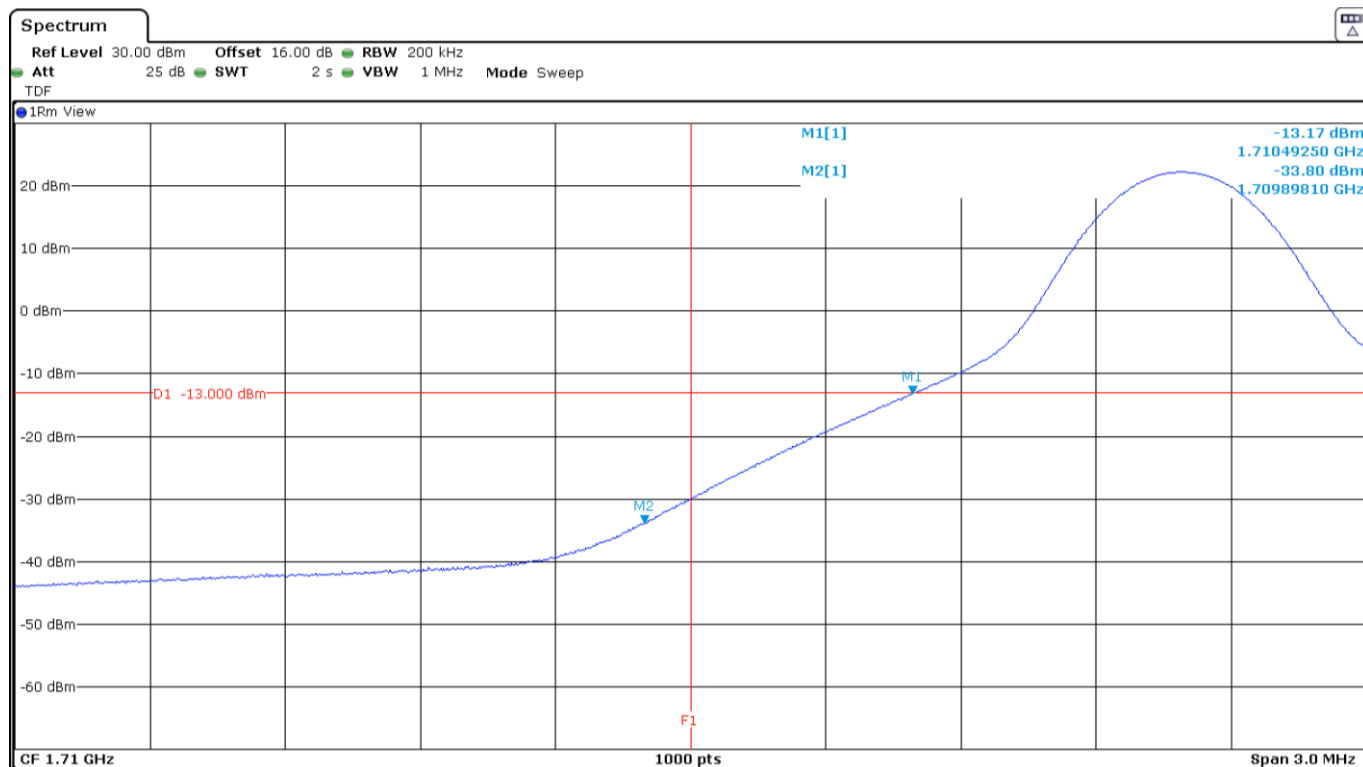
LTE Band 66. QPSK MODULATION. BW=15 MHz. RB=1. Offset=Max. High Block Edge:



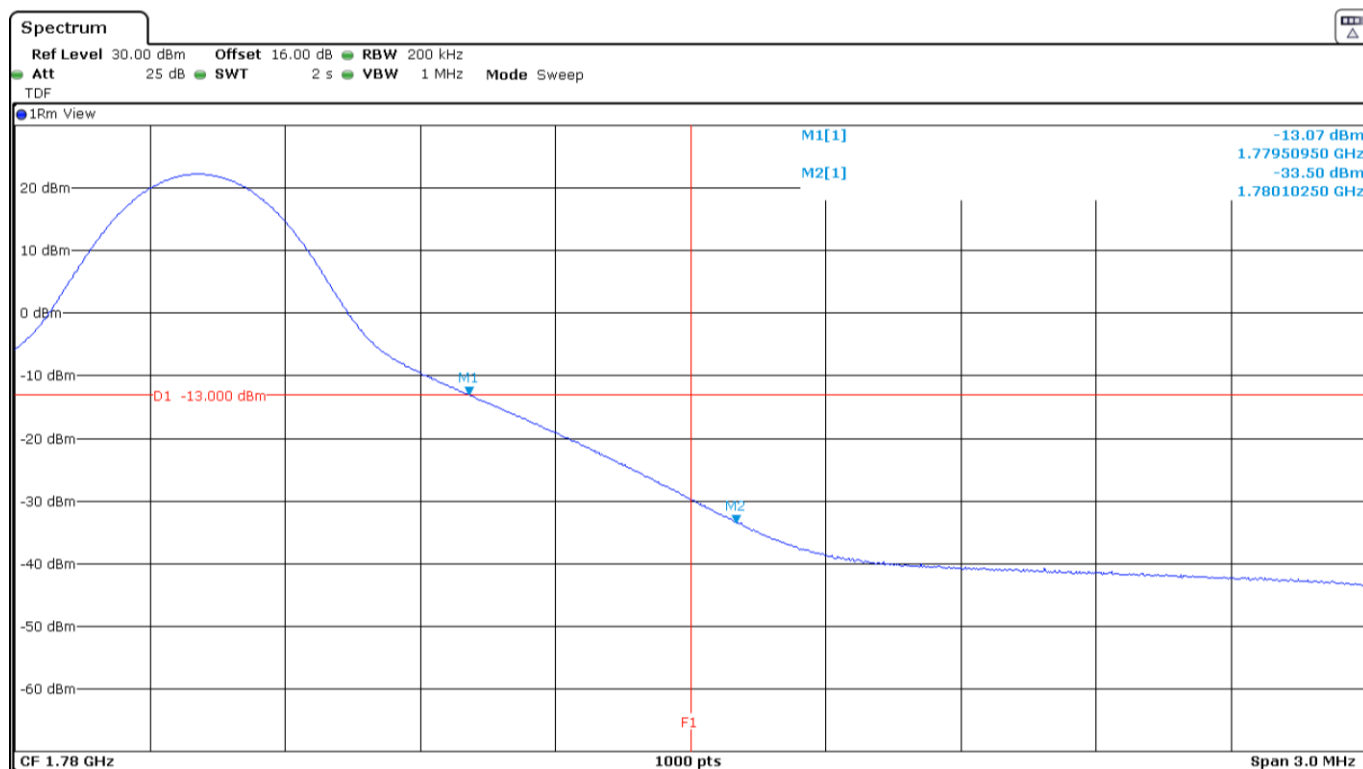
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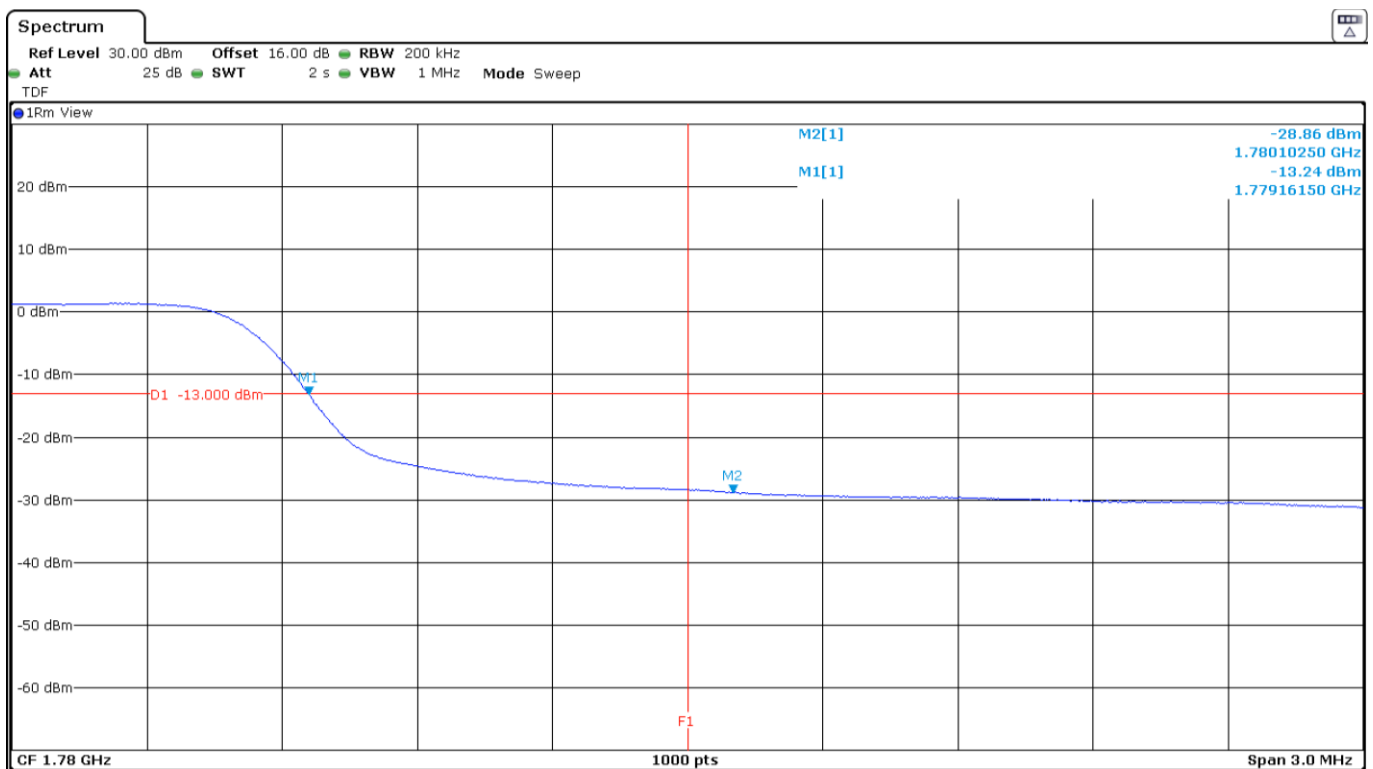
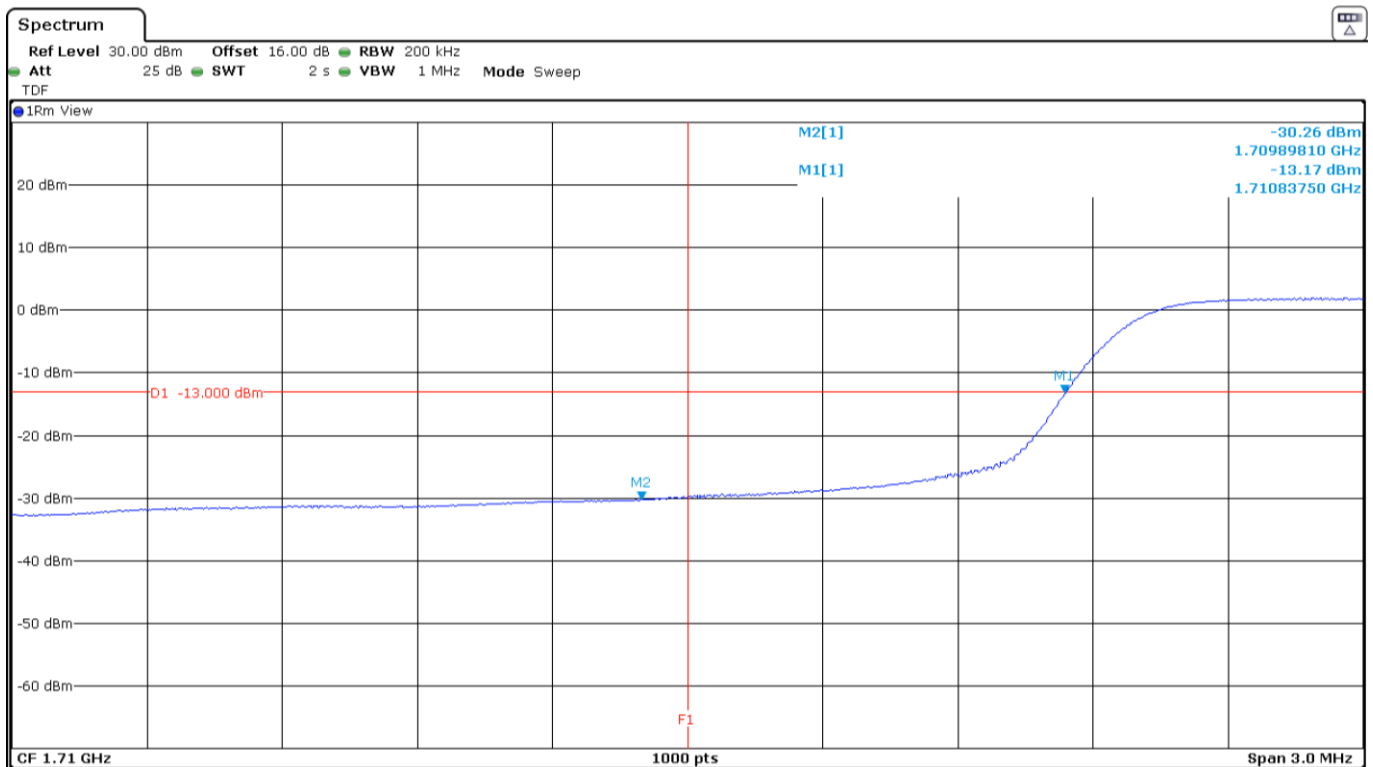
LTE Band 66. QPSK MODULATION. BW=20 MHz. RB=1. Offset=0. Low Block Edge:



LTE Band 66. QPSK MODULATION. BW=20 MHz. RB=1. Offset=Max. High Block Edge:



LTE Band 66. QPSK MODULATION. BW=20 MHz. RB=All. Offset=0. Low and High Block Edges:



Radiated emissions

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 (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 MHz, 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-130 Clause 4.7.1:

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.

LTE Band 12 MEASUREMENT LIMIT:

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

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

RSS-139 Clause 6.6:

i. 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.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, 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.

LTE Band 66 MEASUREMENT LIMIT:

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

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

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

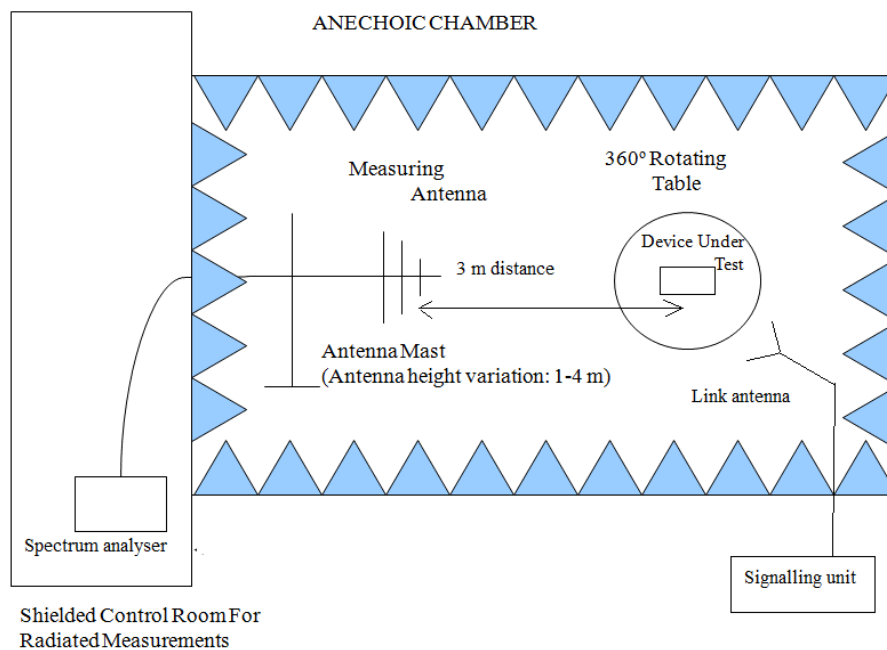
The spectrum was scanned from 30 MHz to at least the 10th harmonic of the High frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz up to 18 GHz.

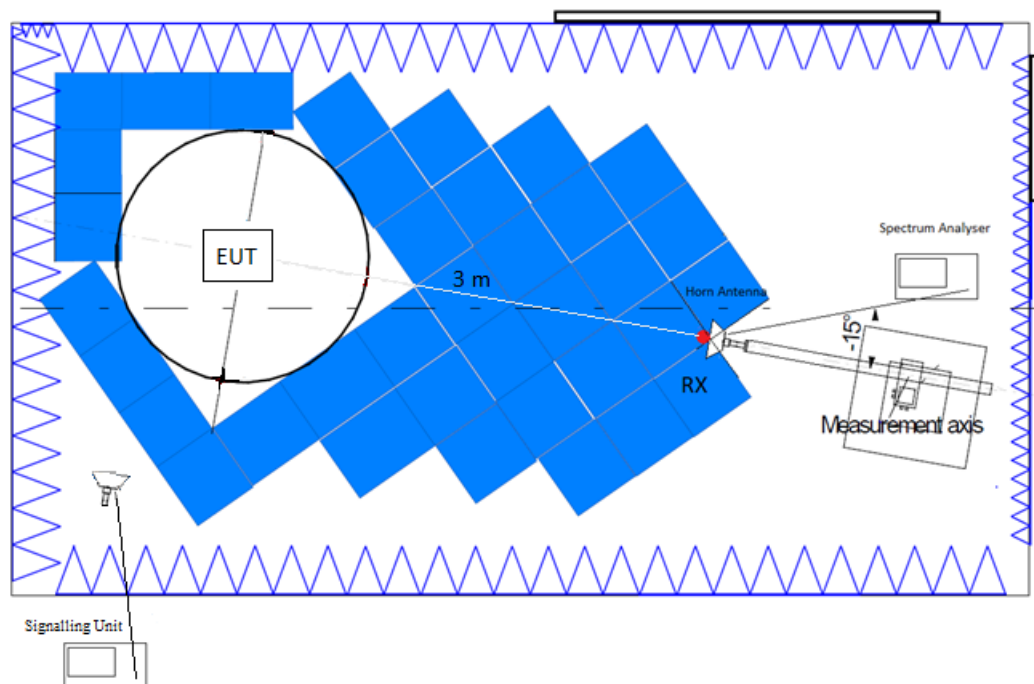
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

TEST SETUP:

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS:

LTE Band 12:

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=24 as the worst case.

- Low Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 8 GHz

No spurious frequencies at less than 20 dB below the limit.

- Middle Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 8 GHz

No spurious frequencies at less than 20 dB below the limit.

- High Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 8 GHz

Spurious frequencies at less than 20 dB below the limit:

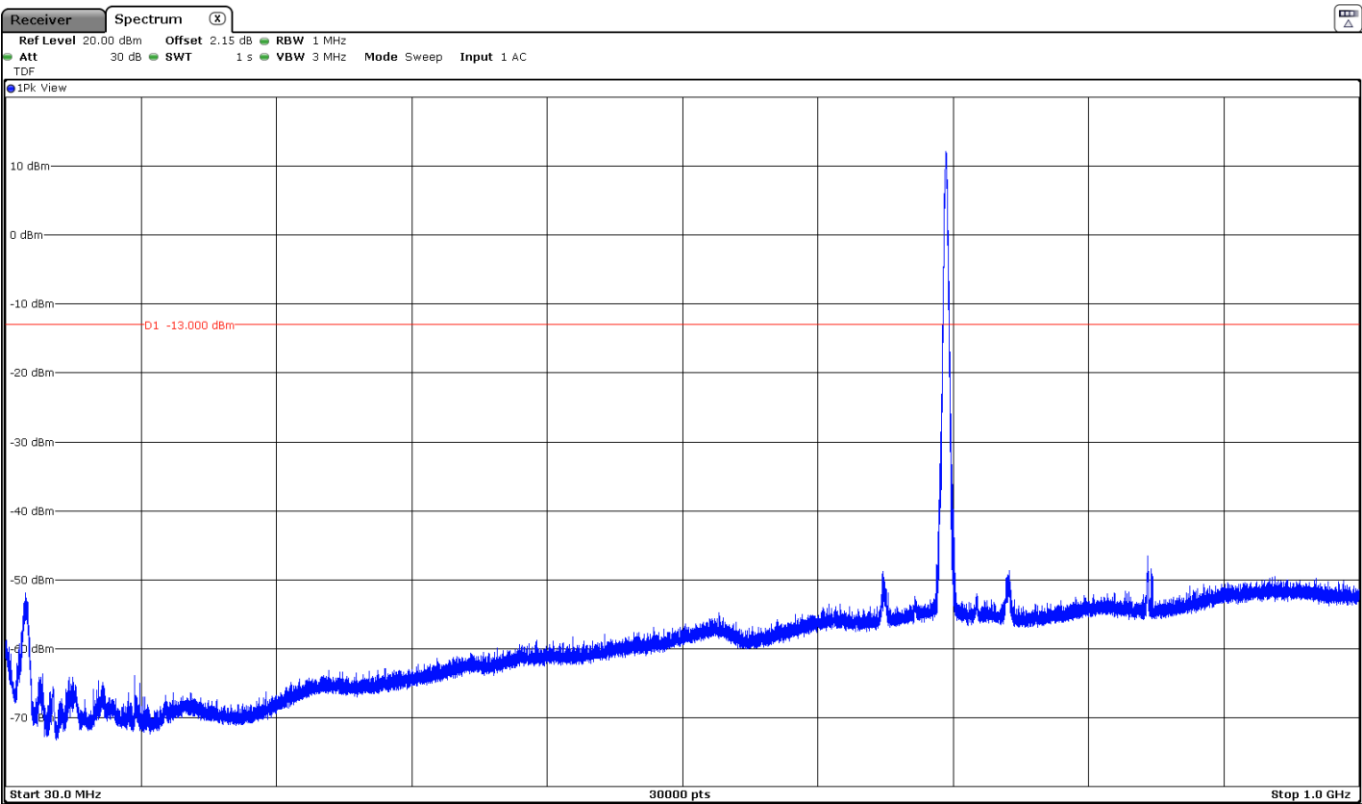
Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
2.132833	-32.9	V	Peak	<±4.98

Measurement uncertainty (dB)	<±4.99 for f < 1GHz <±4.98 for f ≥ 1 GHz up to 8 GHz
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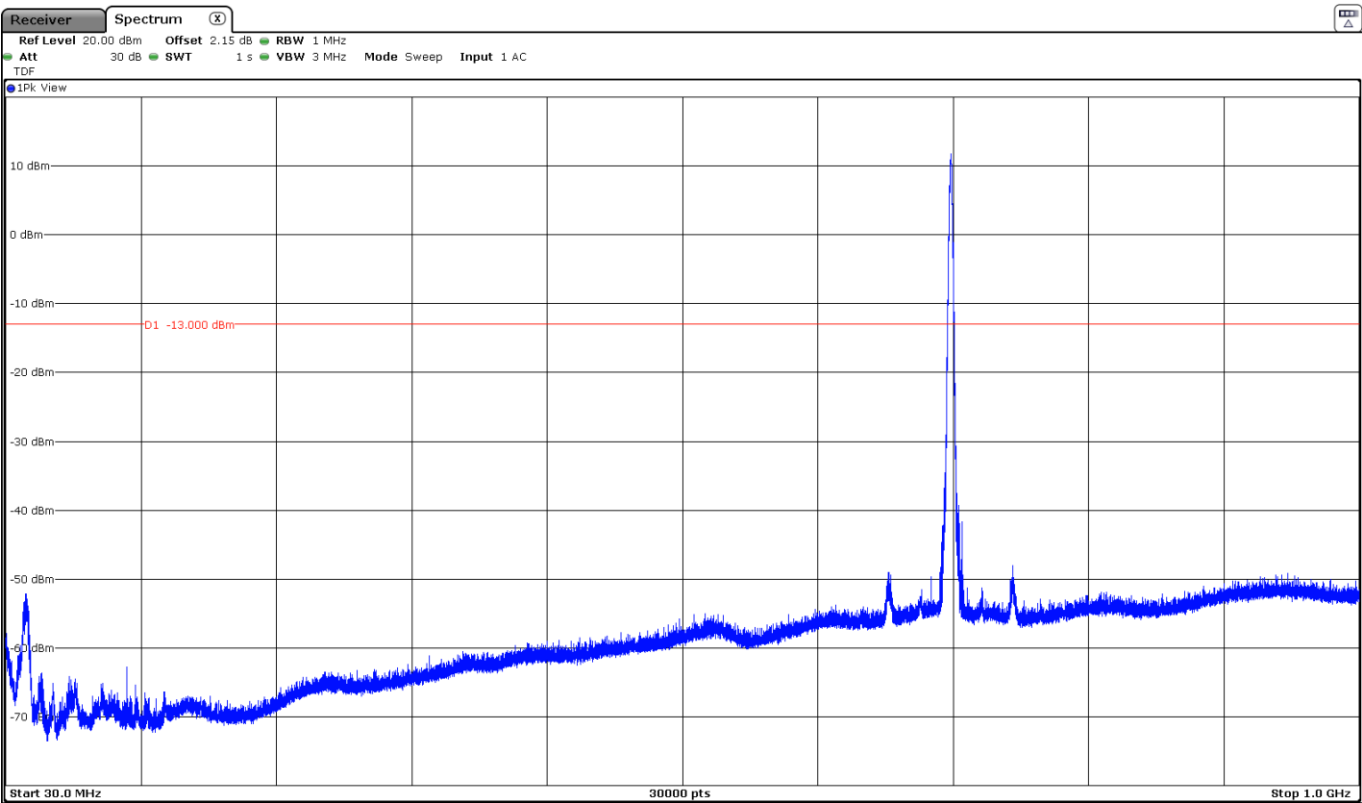
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

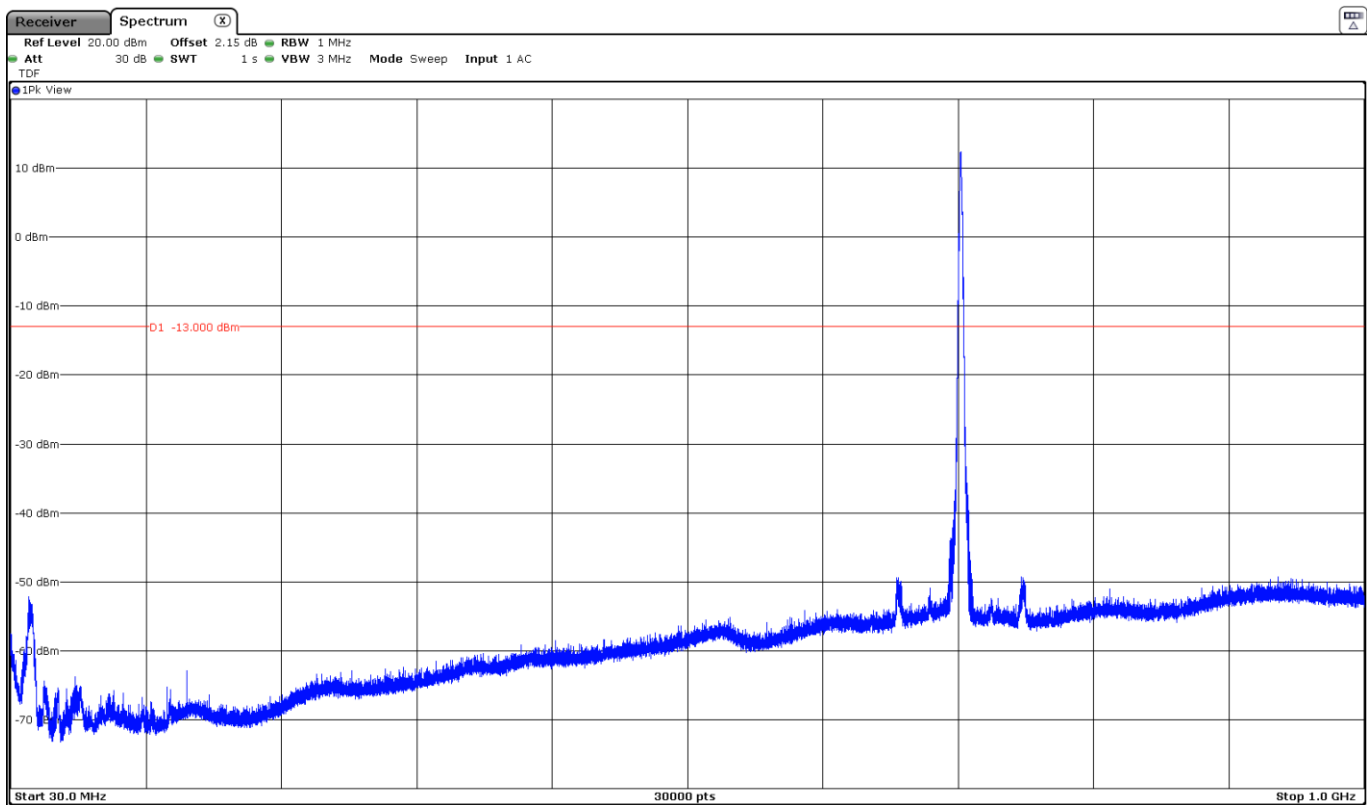
- Low Channel:



- Middle Channel:

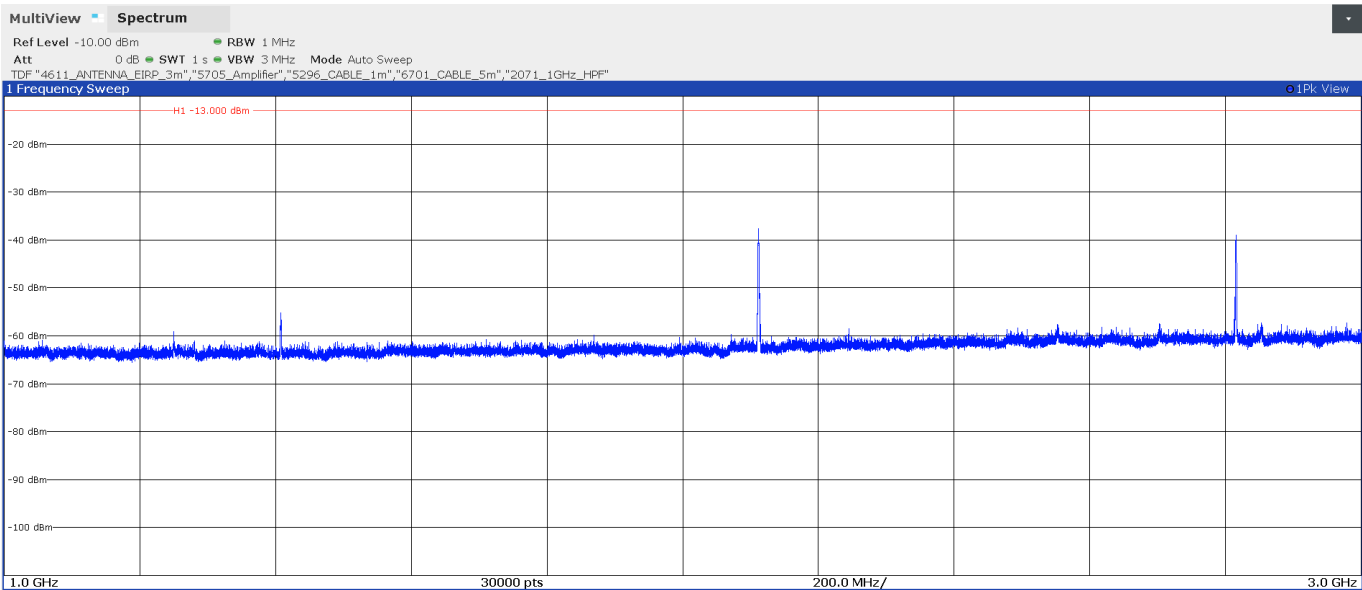


- High Channel:



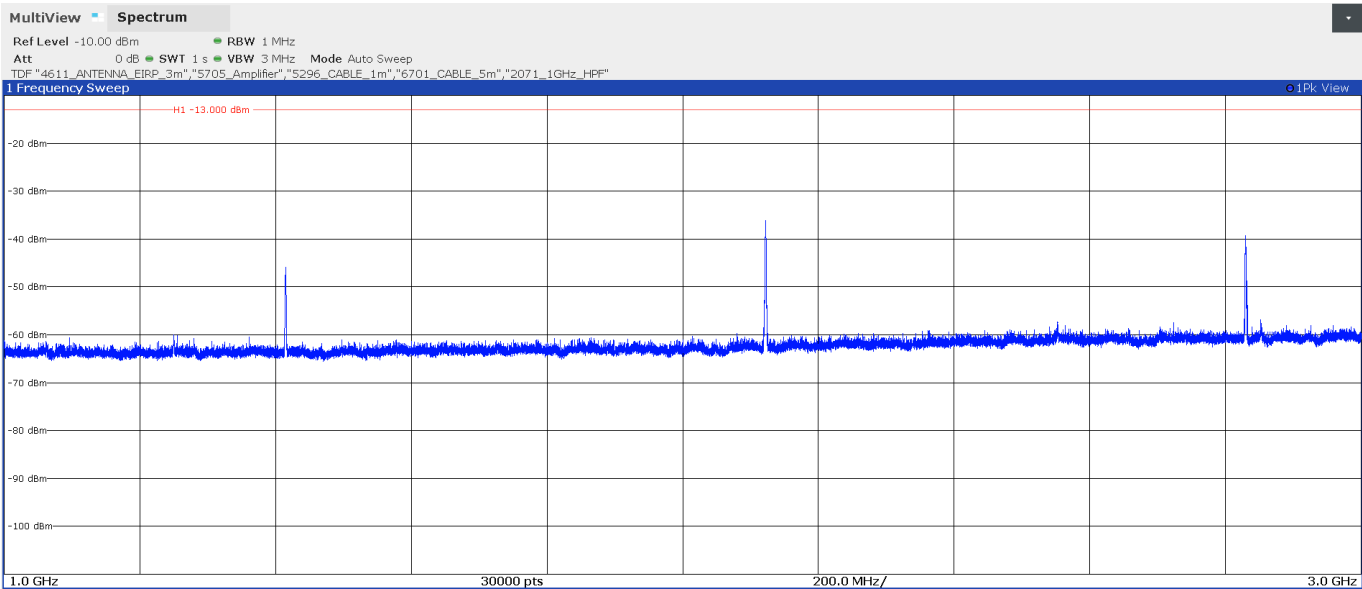
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



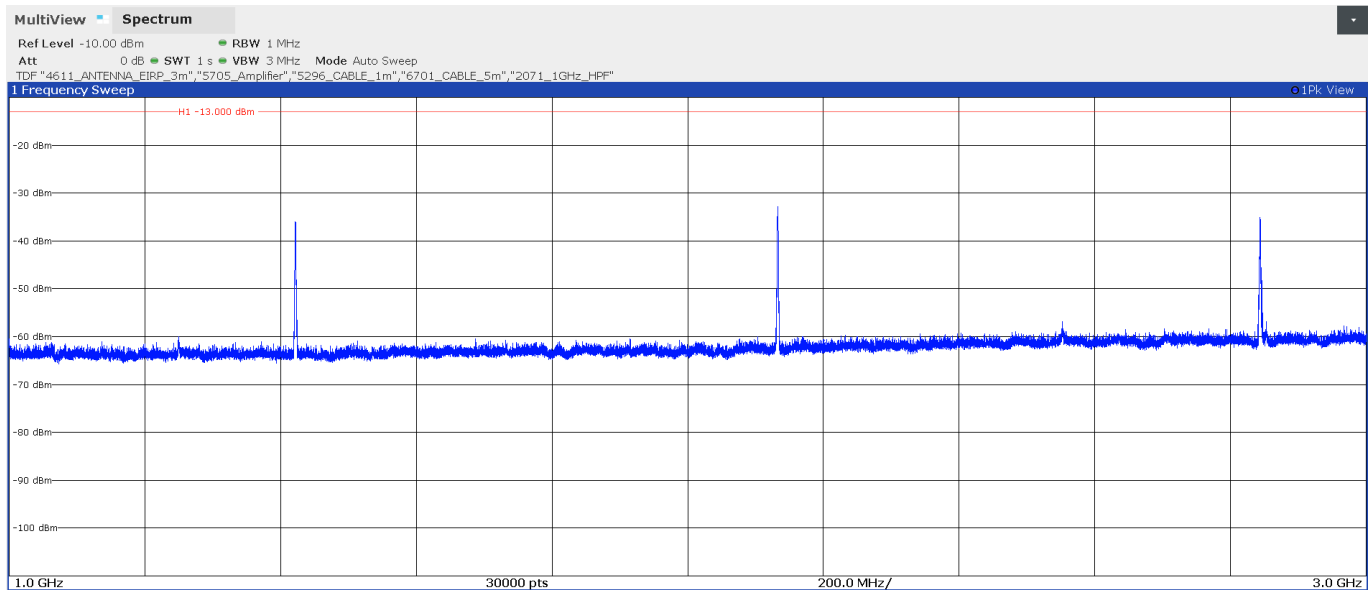
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

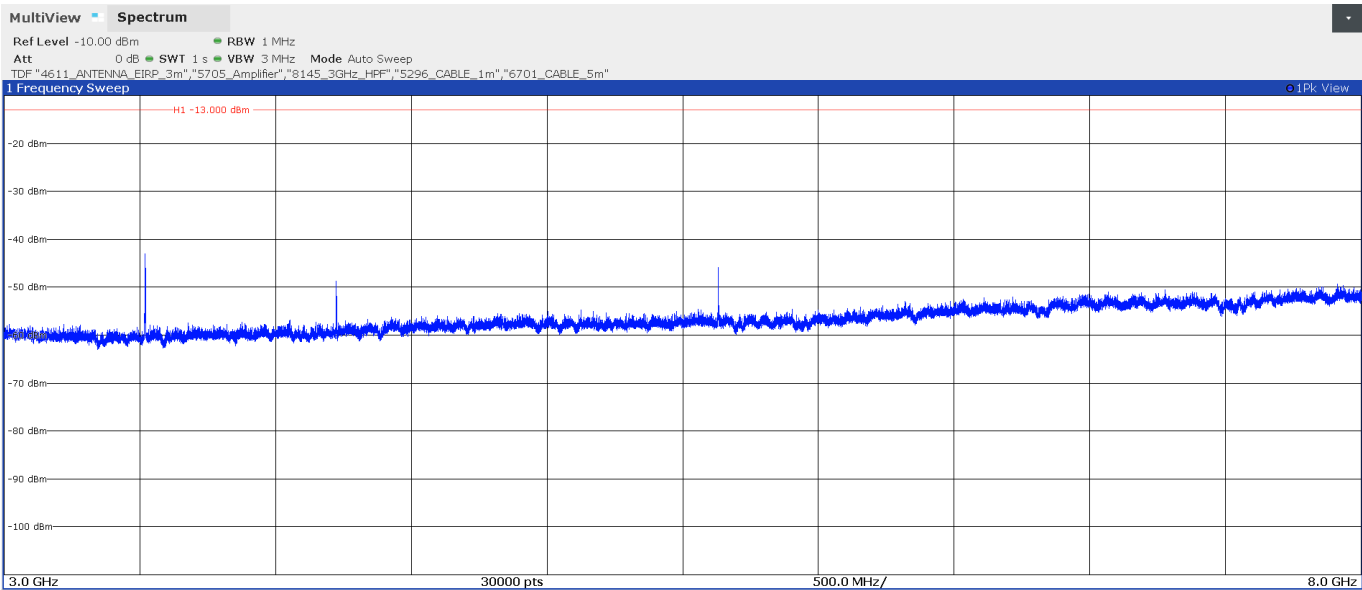
- High Channel:



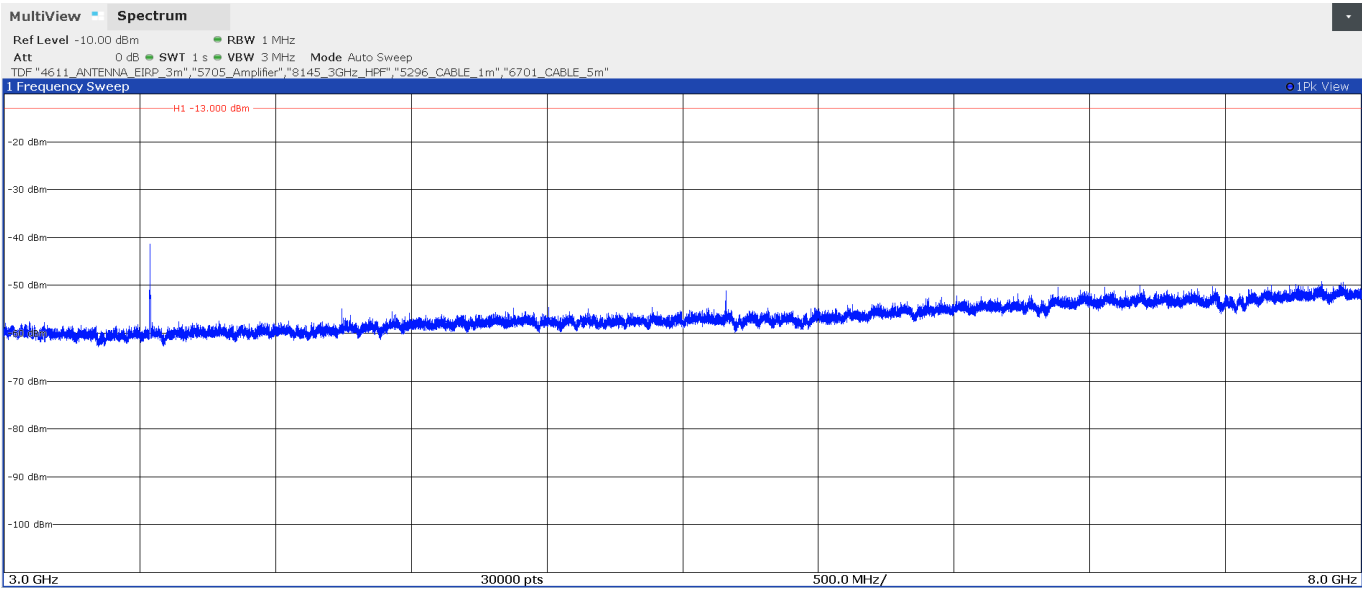
The peak above the limit is the carrier frequency:

FREQUENCY RANGE 3 – 8 GHz (worst case):

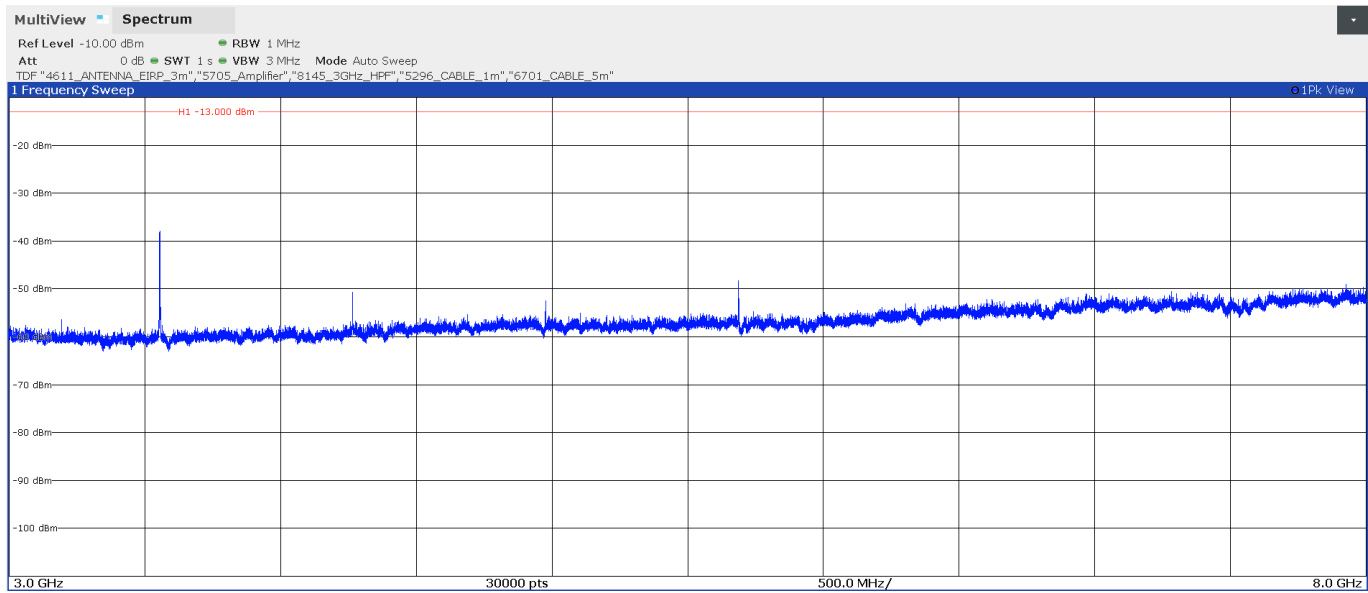
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 66:

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=0 as the worst case.

- Low Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 18 GHz

No spurious frequencies at less than 20 dB below the limit.

- Middle Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 18 GHz

No spurious frequencies at less than 20 dB below the limit.

- High Channel:

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 - 18 GHz

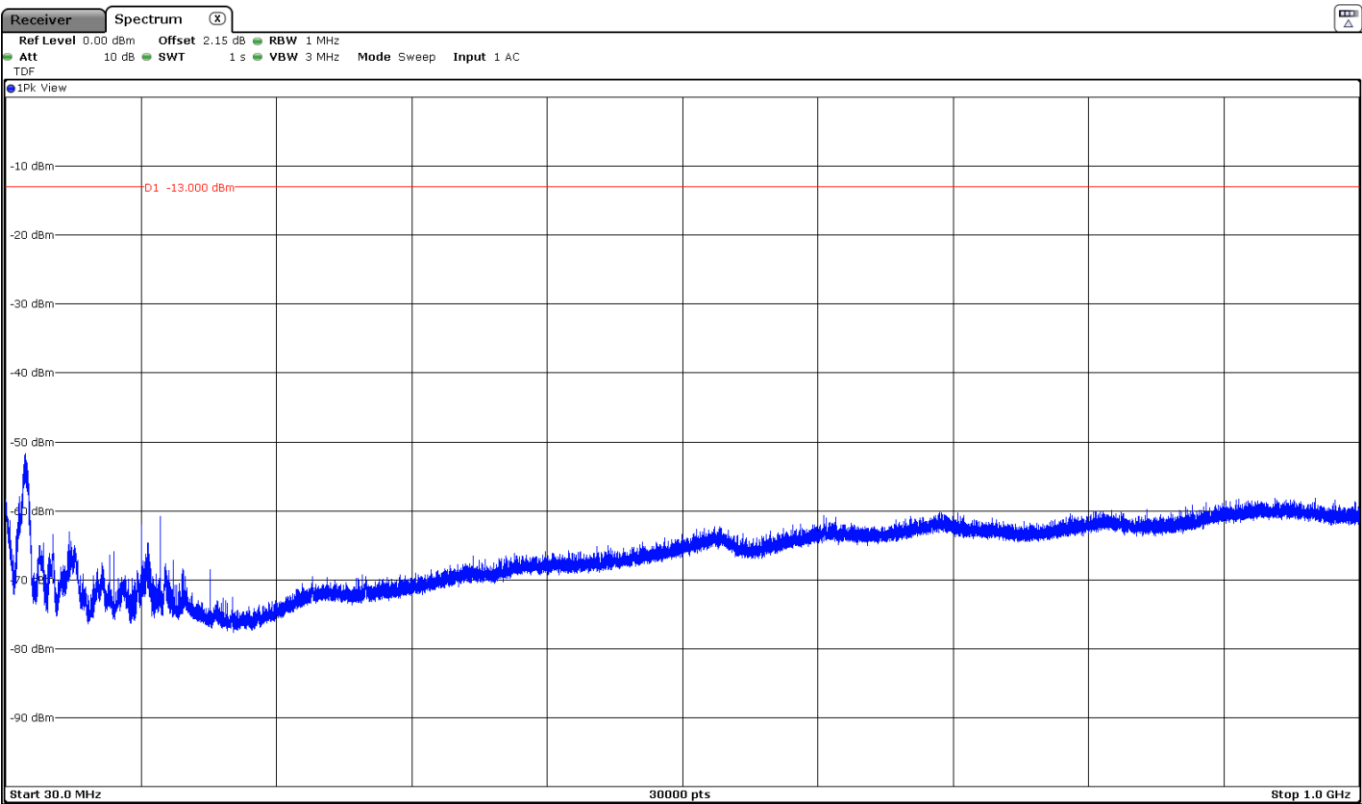
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)	<±4.99 for f < 1GHz <±3.98 for f ≥ 1 GHz up to 3 GHz <±4.98 for f ≥ 3 GHz up to 18 GHz
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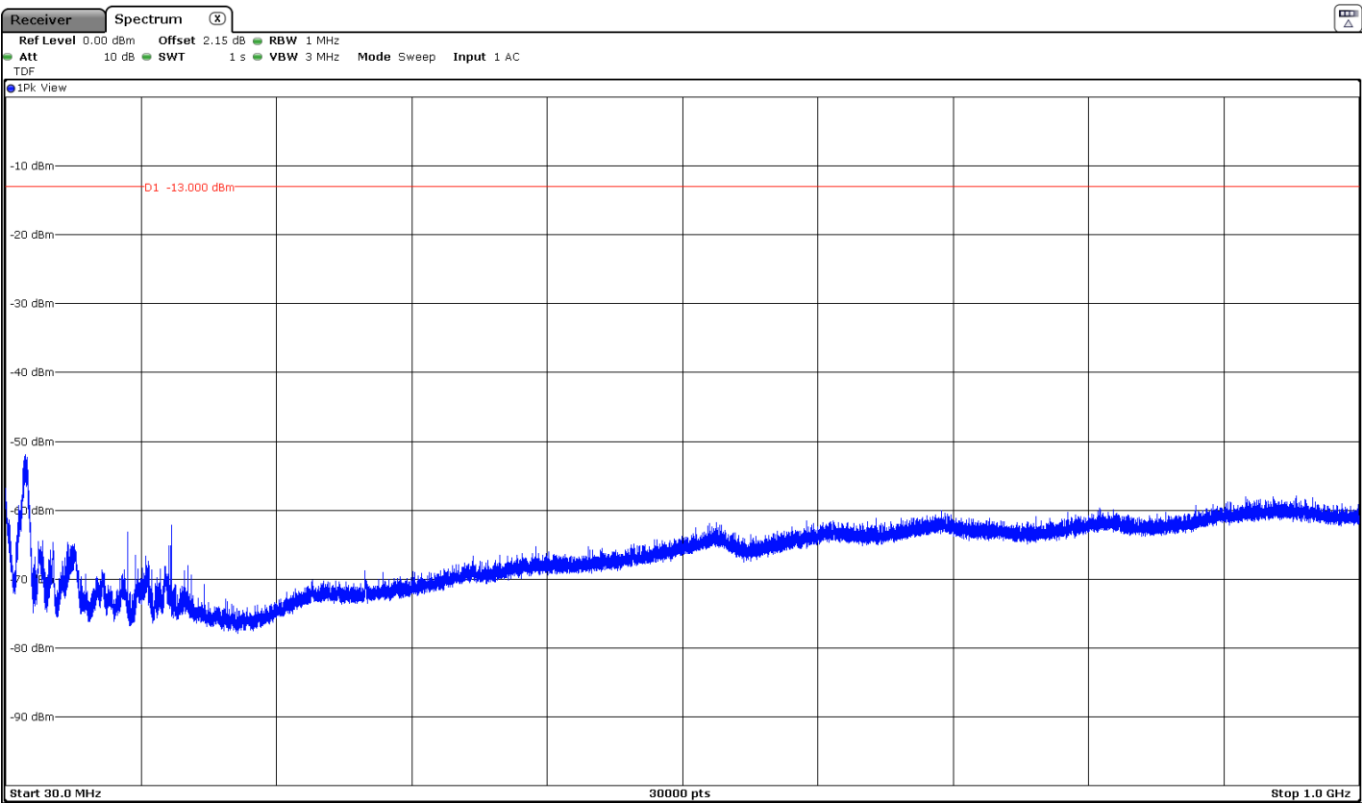
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

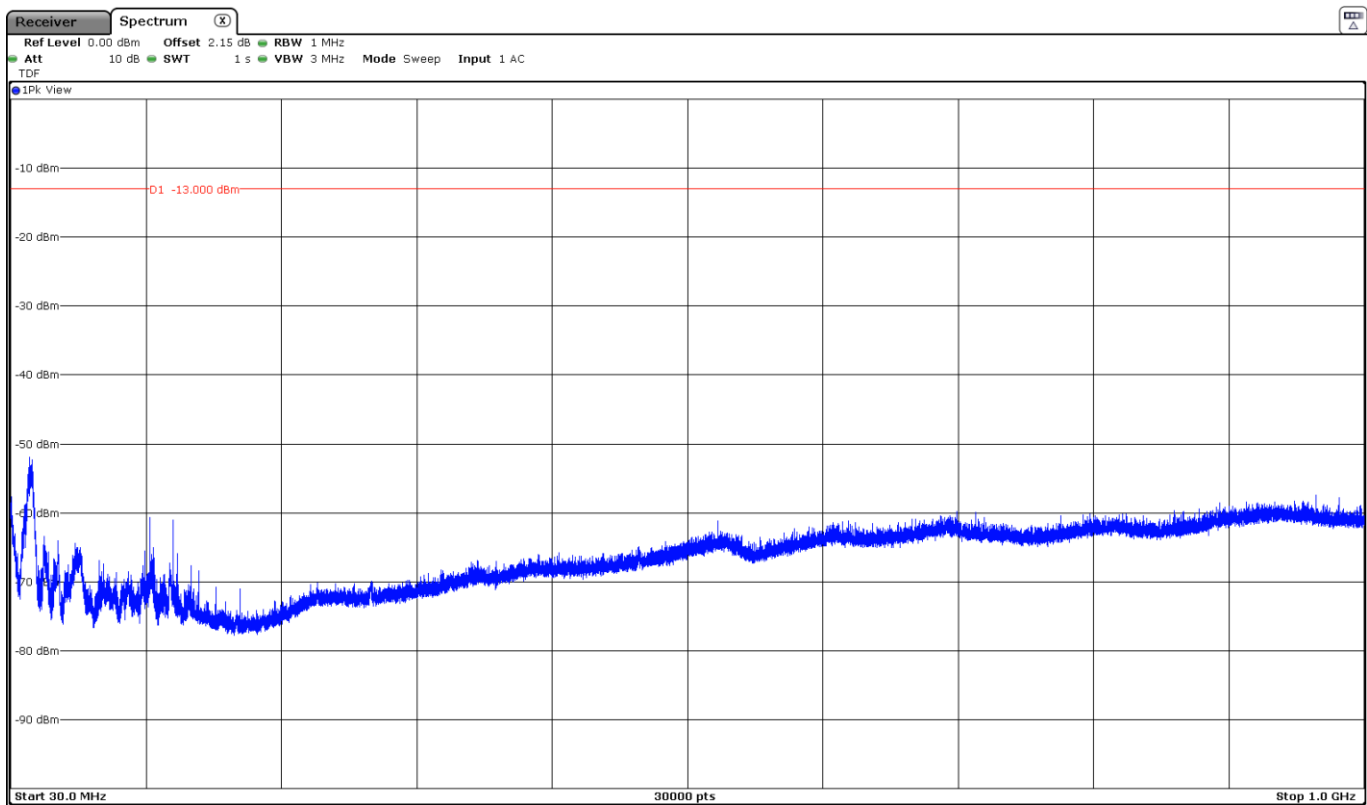
- Low Channel:



- Middle Channel:

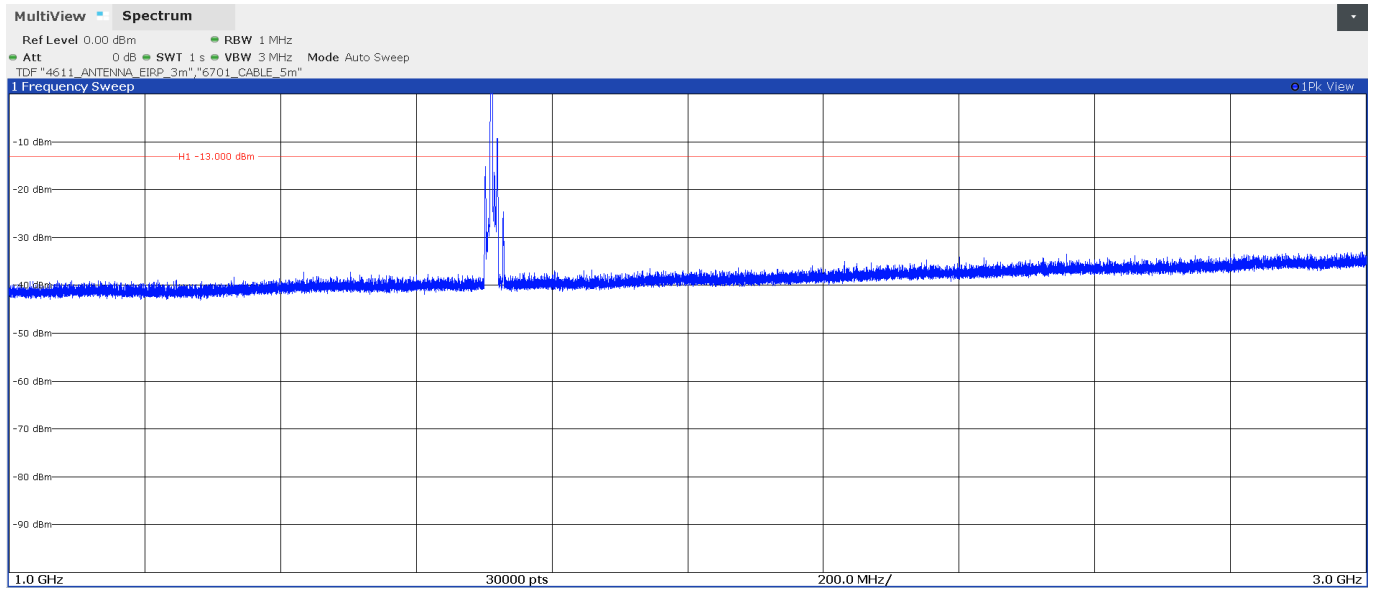


- High Channel:



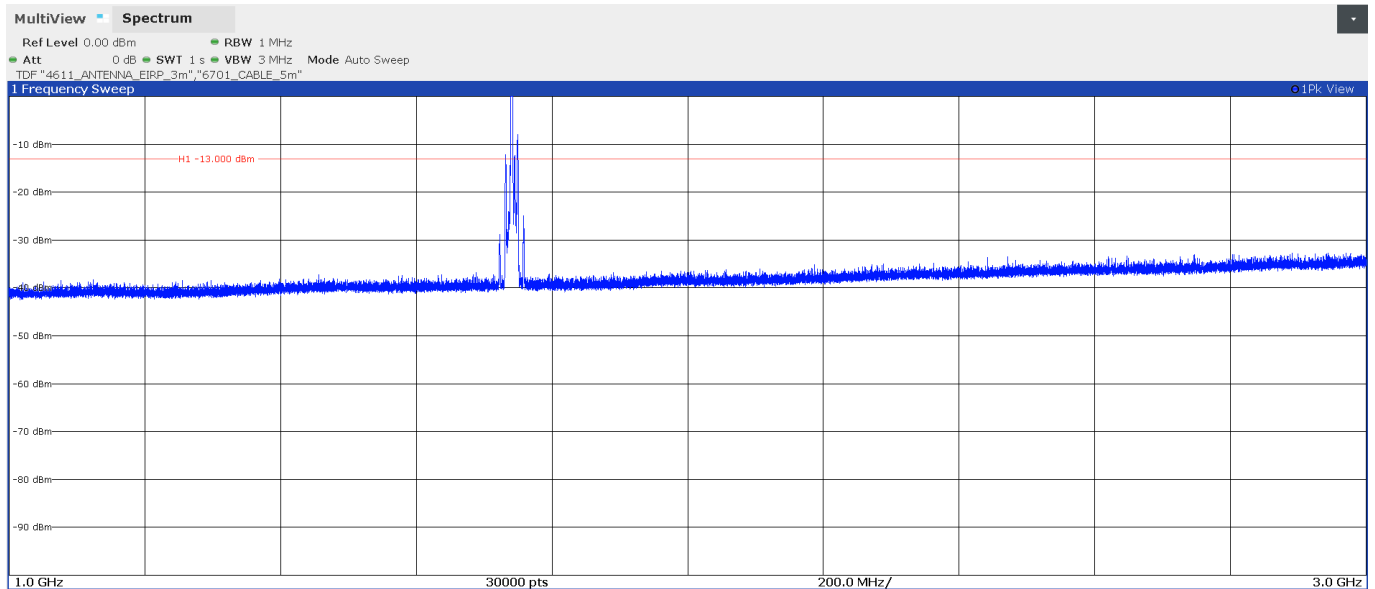
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



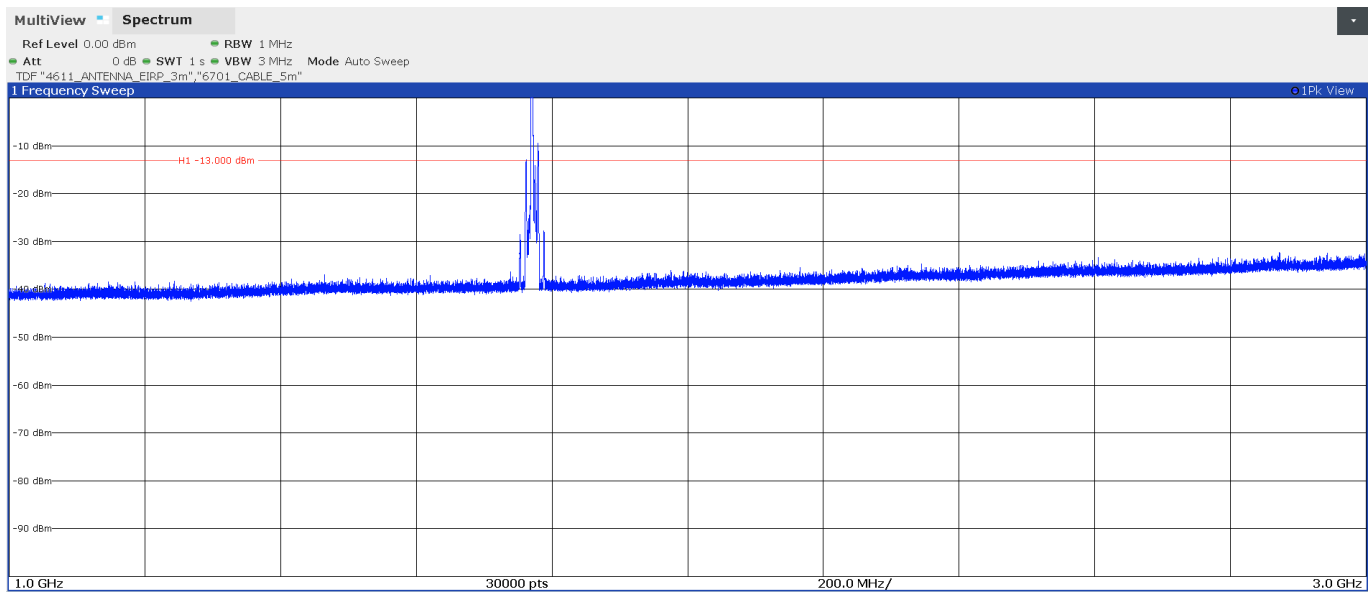
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

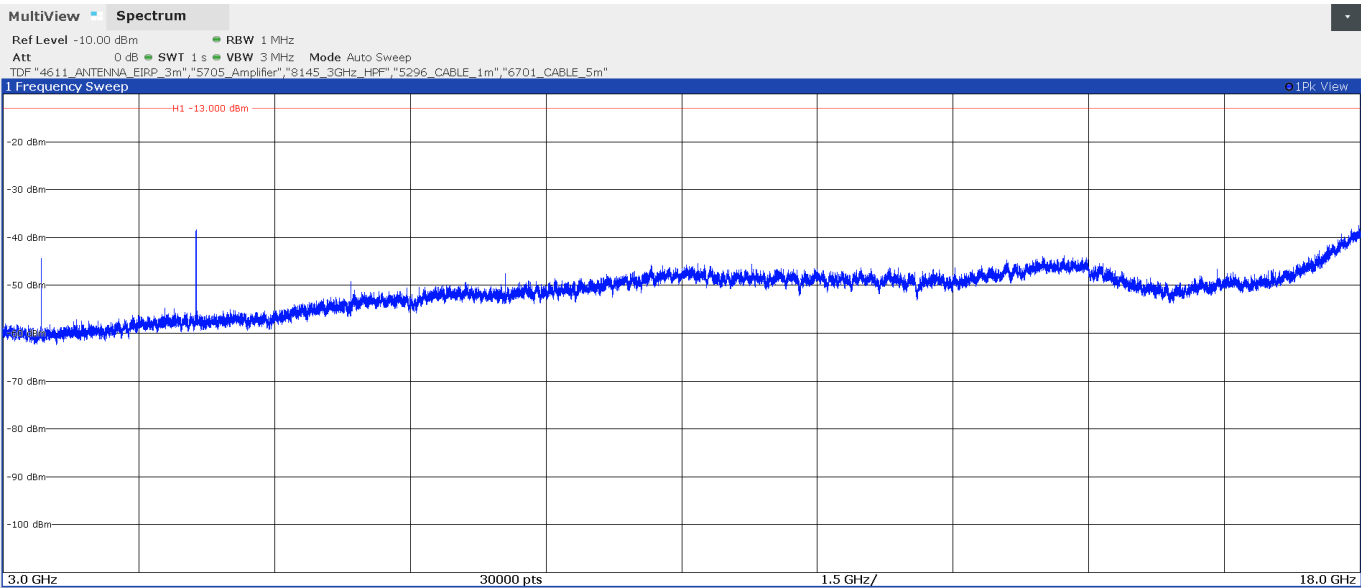
- High Channel:



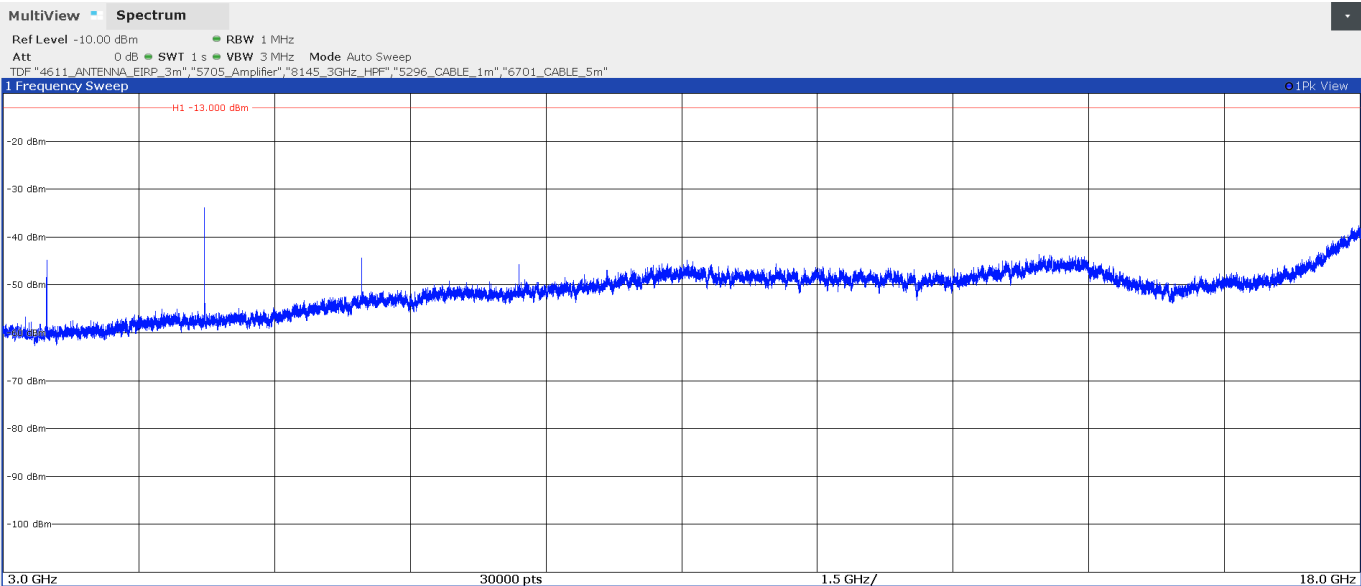
The peak above the limit is the carrier frequency:

FREQUENCY RANGE 3 – 18 GHz (worst case):

- Low Channel:



- Middle Channel:



- High Channel:

