

KCTL Inc.

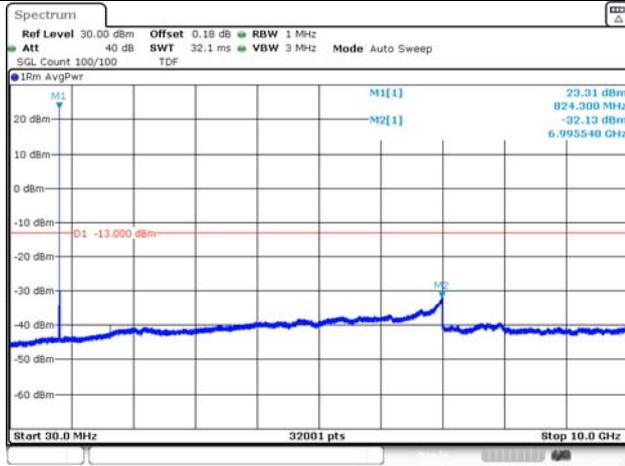
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR21-SRF0140
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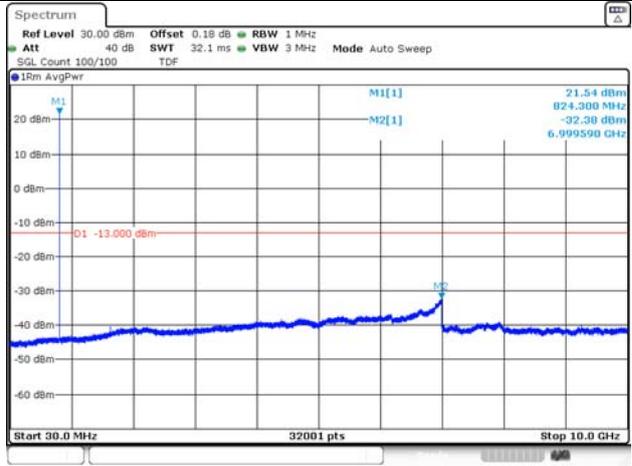


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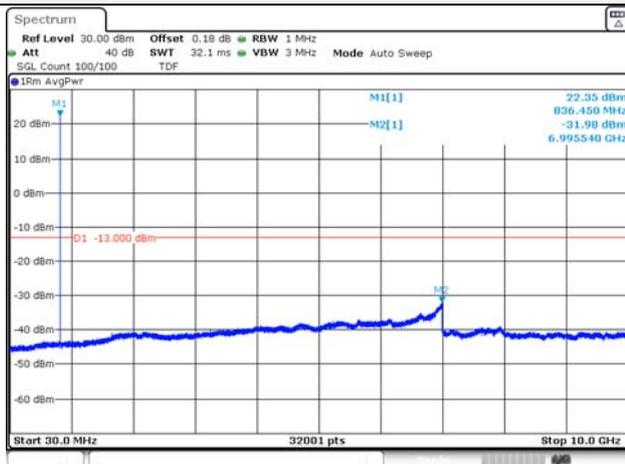
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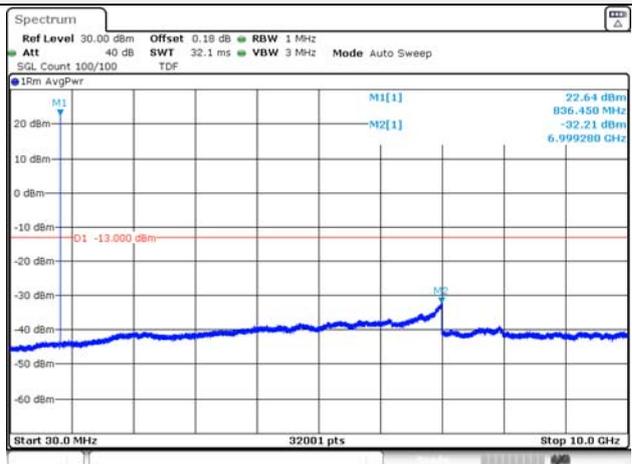
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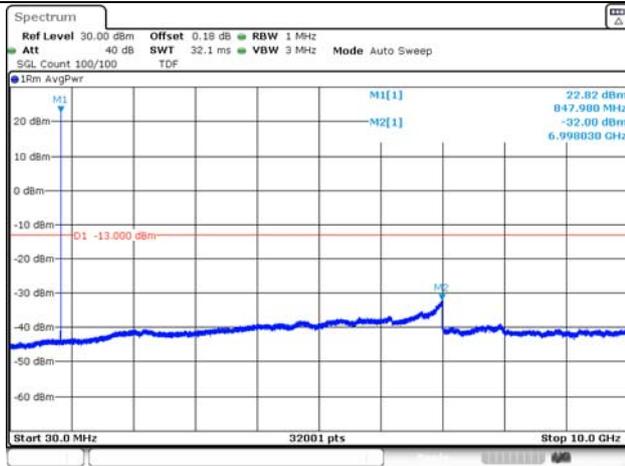
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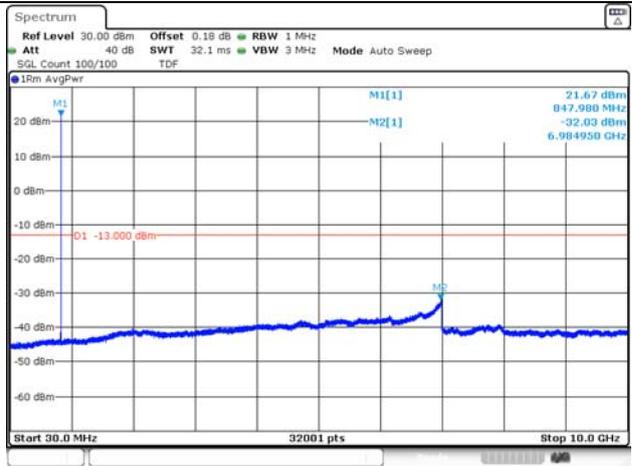
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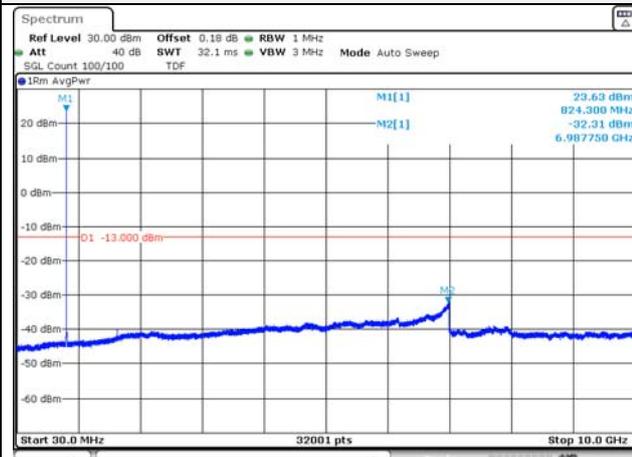
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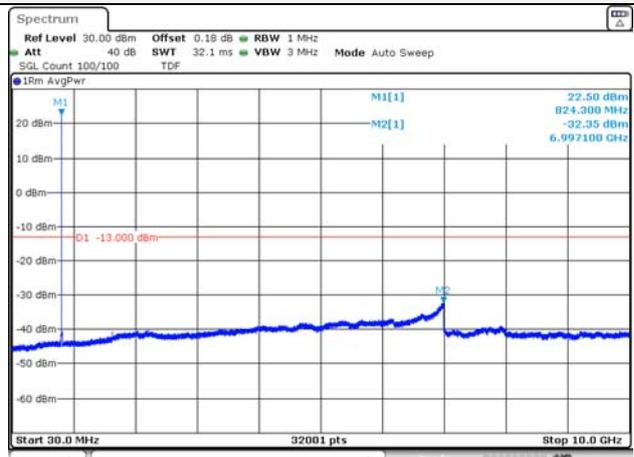
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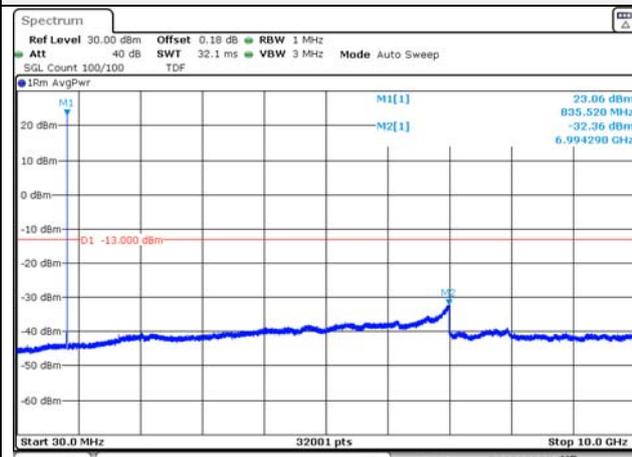
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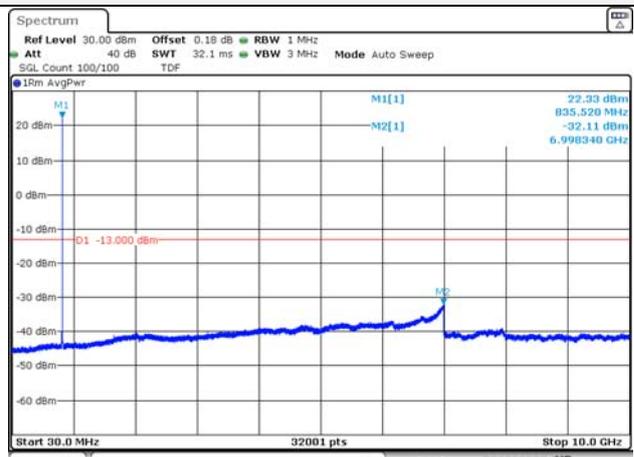
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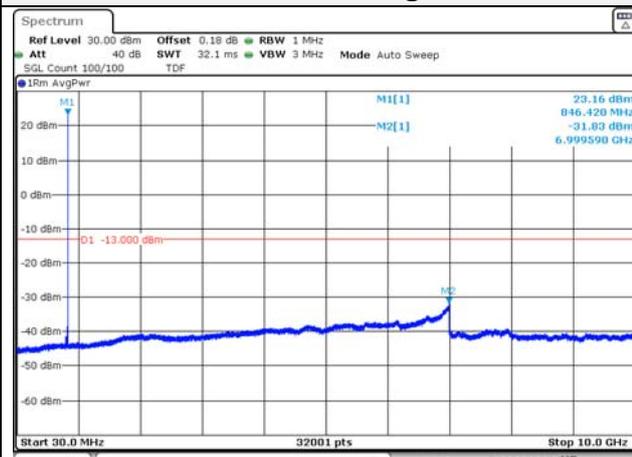
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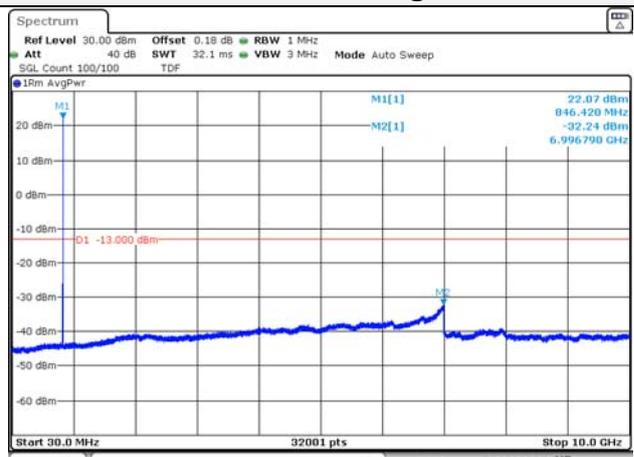
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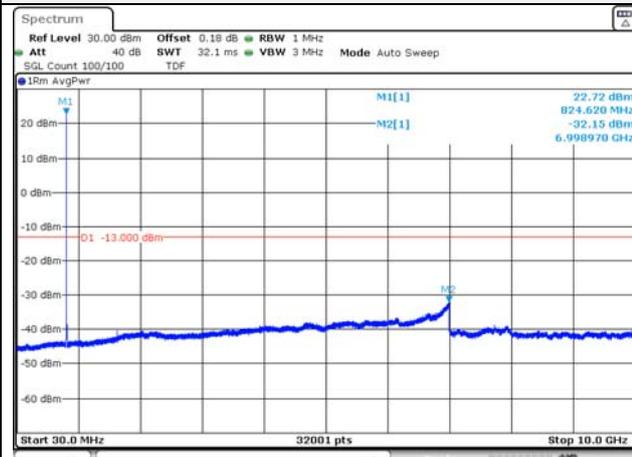
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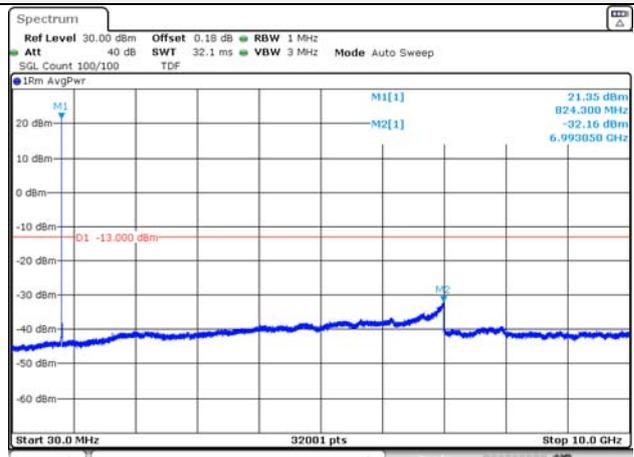
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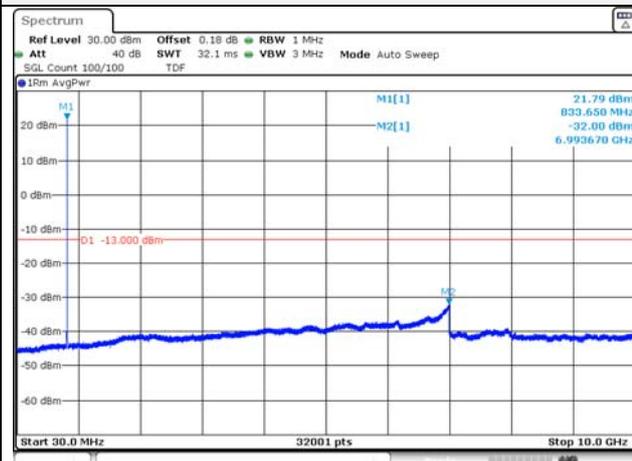
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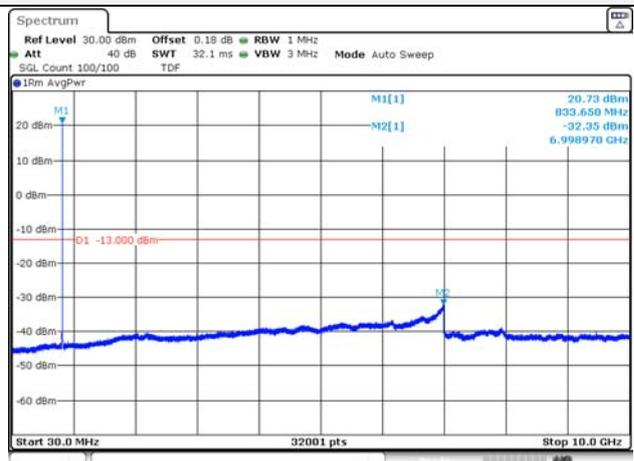
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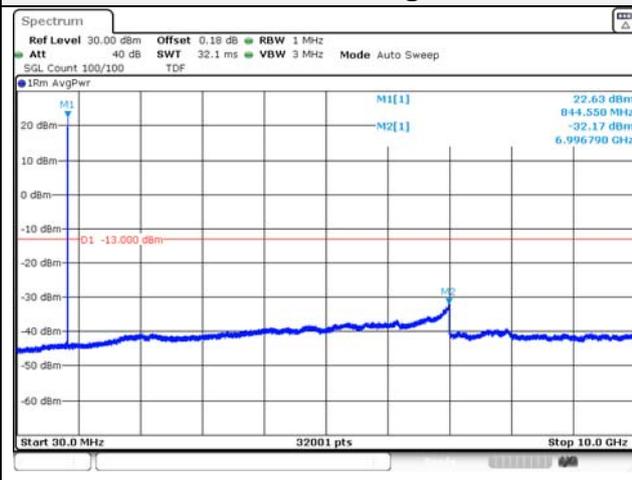
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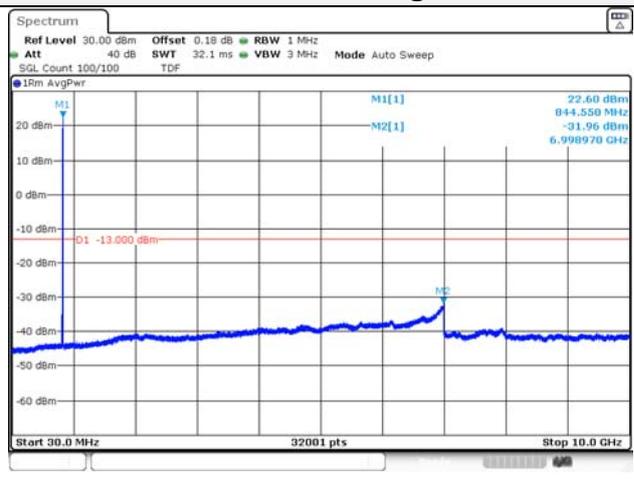
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5M BW 16QAM High ch.



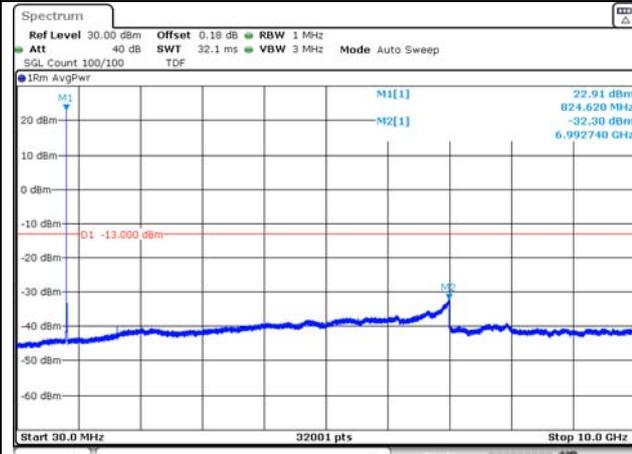
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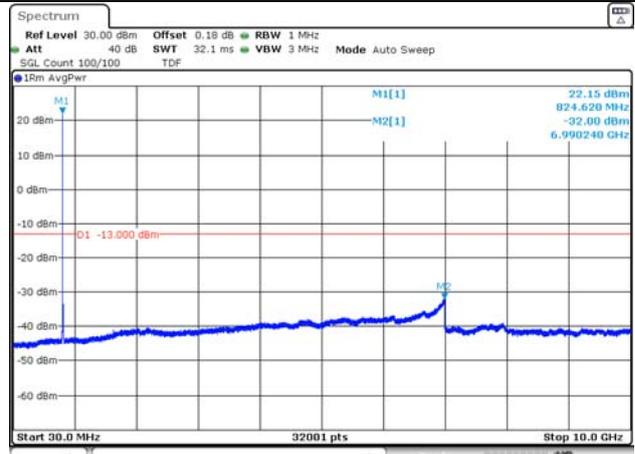
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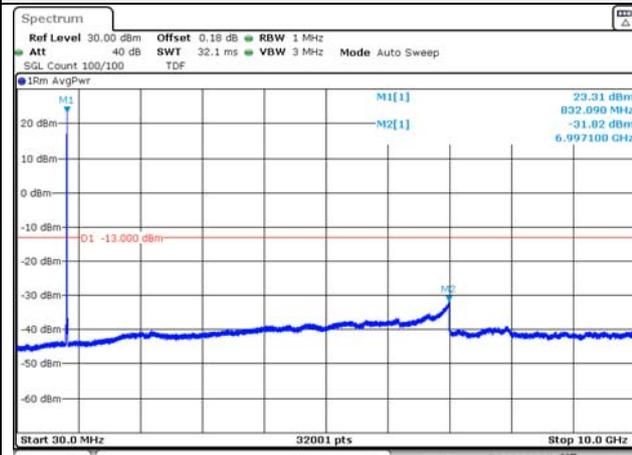
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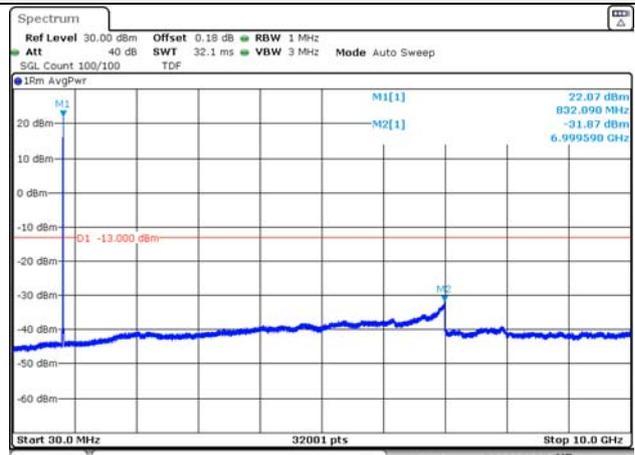
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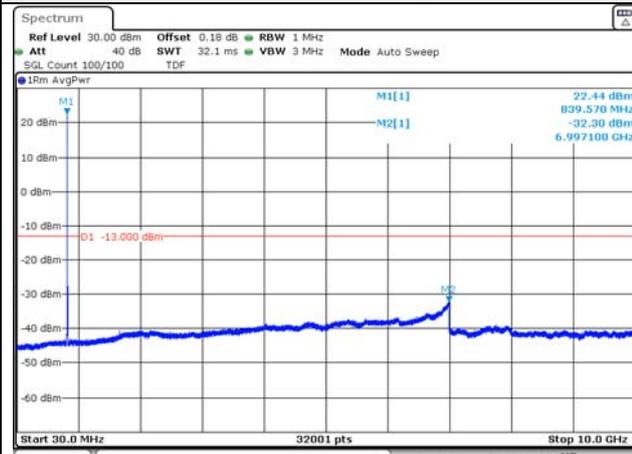
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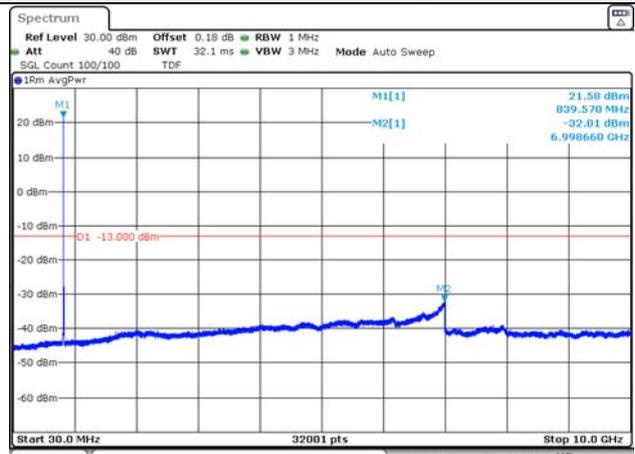
10M BW 16QAM Mid ch.



10M BW QPSK High ch.



10M BW 16QAM High ch.



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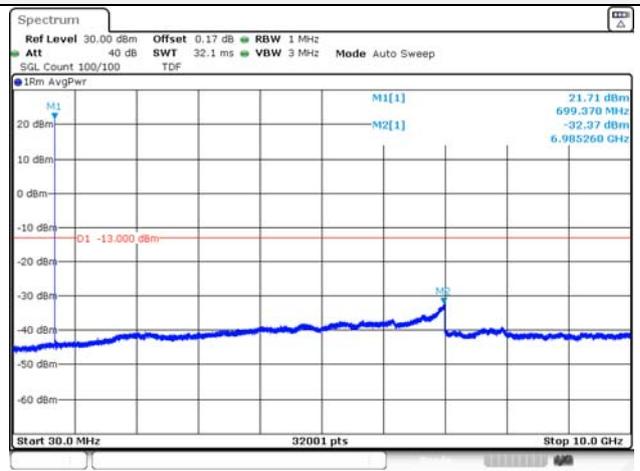


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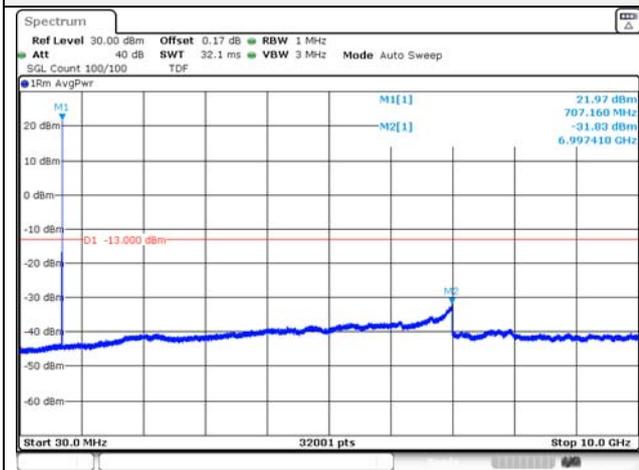
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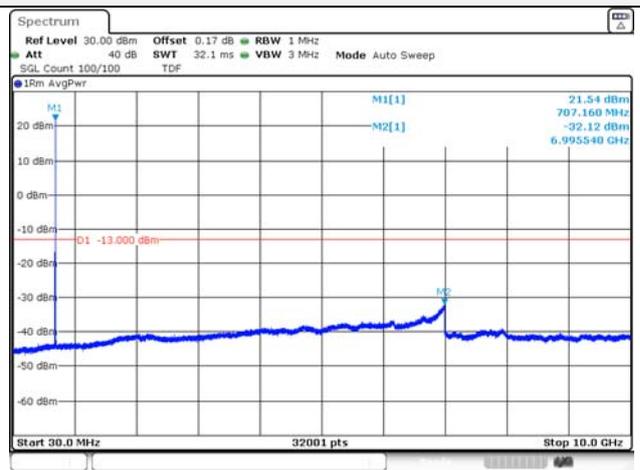
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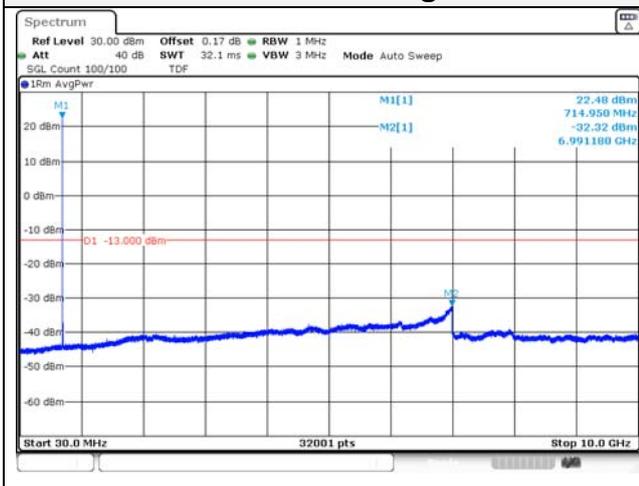
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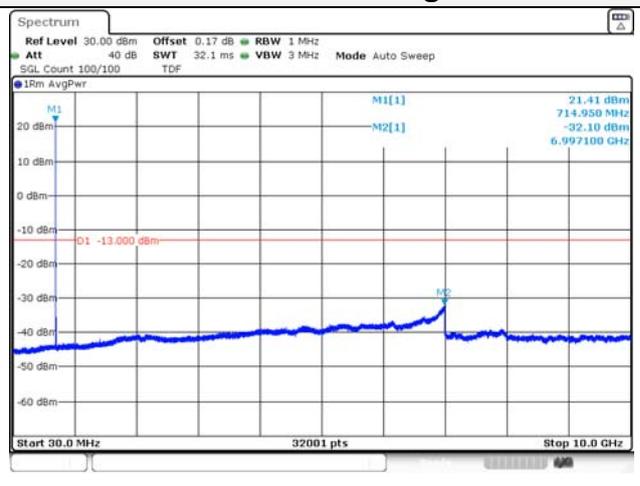
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1.4M BW QPSK High ch.



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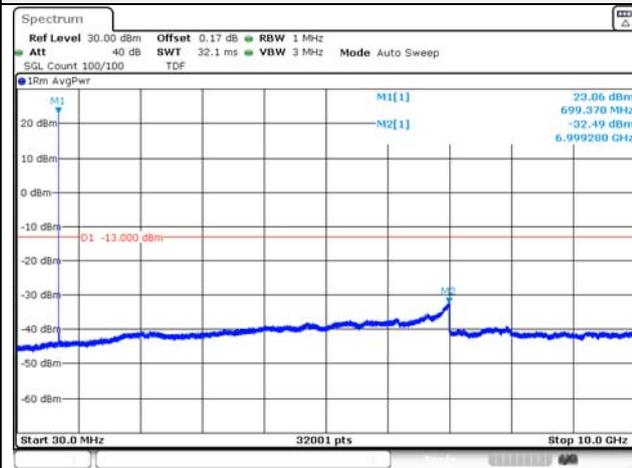
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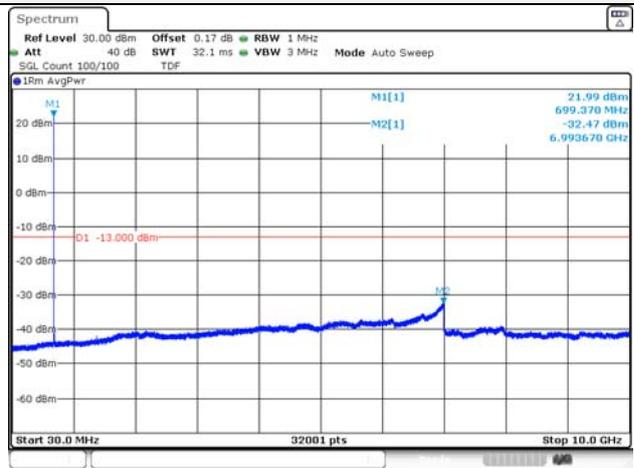
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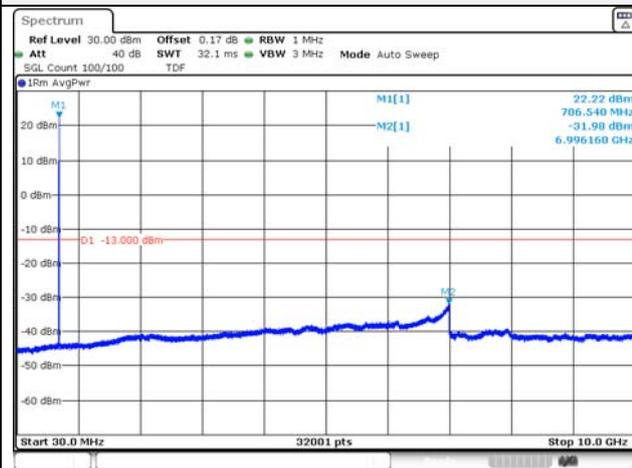
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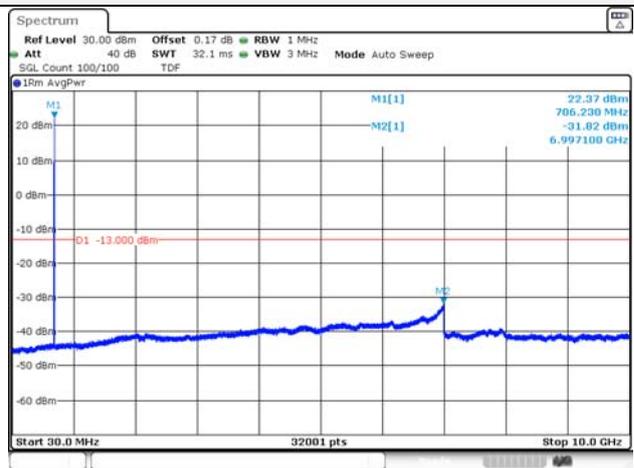
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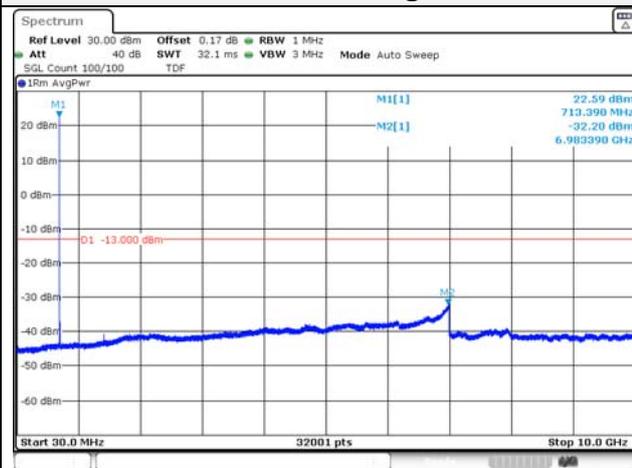
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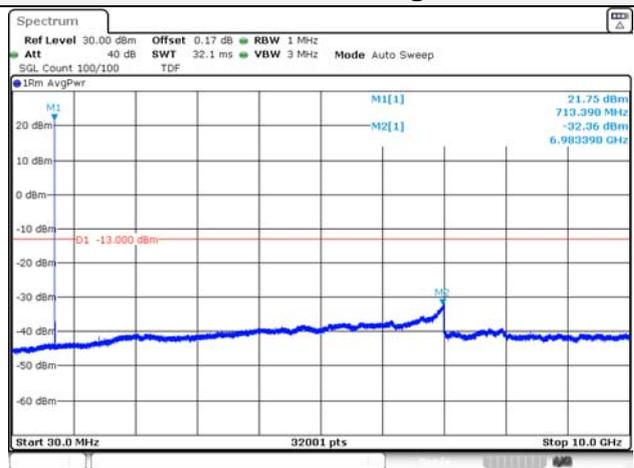
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3M BW 16QAM High ch.



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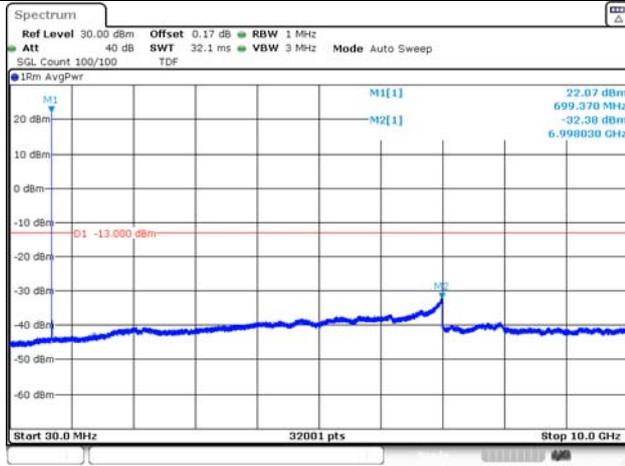
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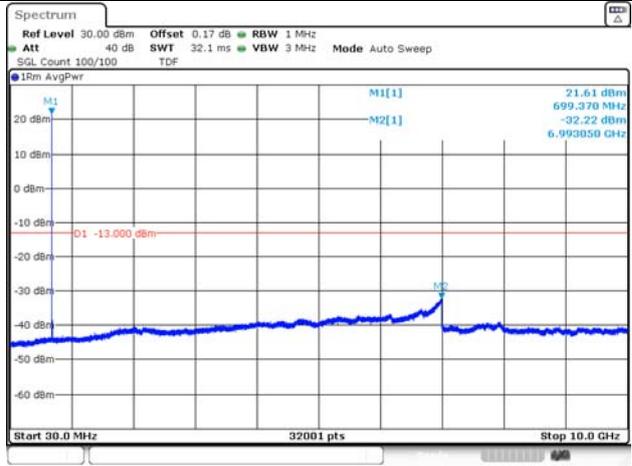


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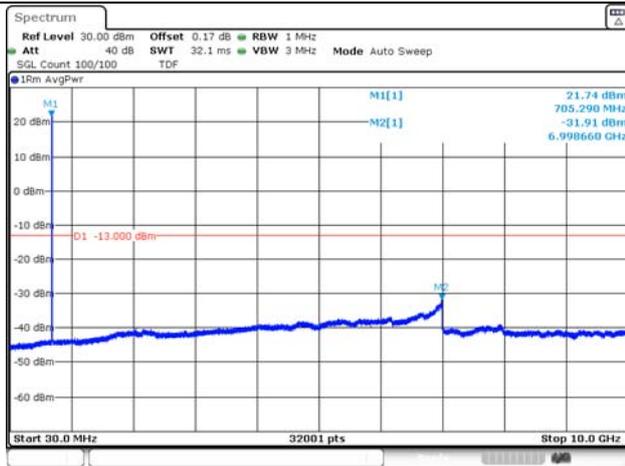
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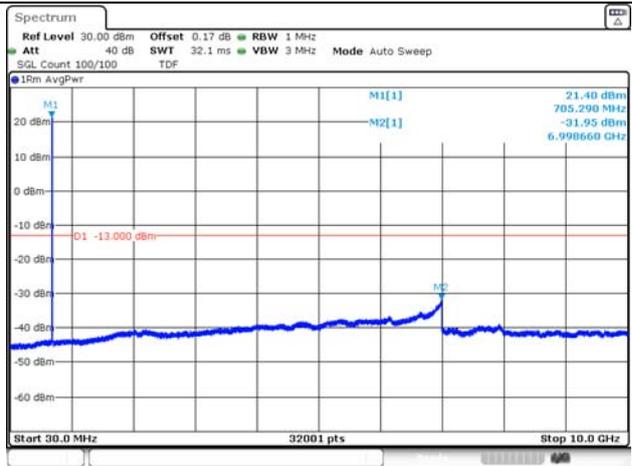
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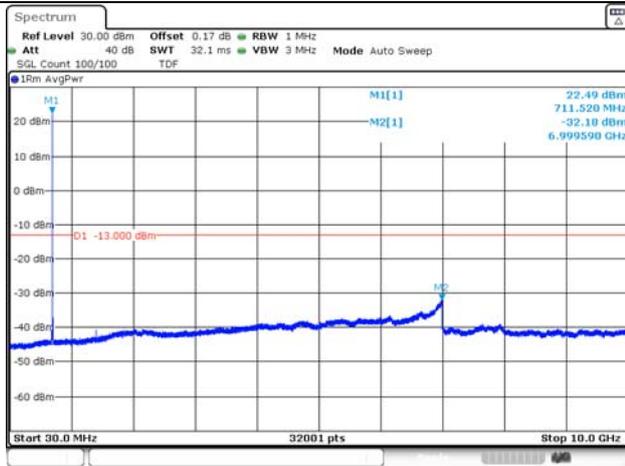
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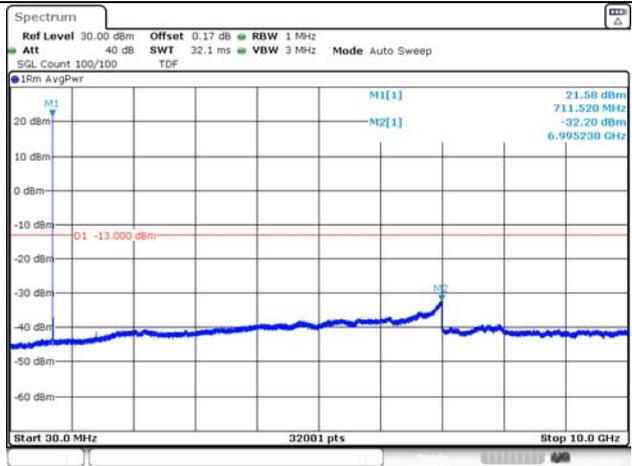
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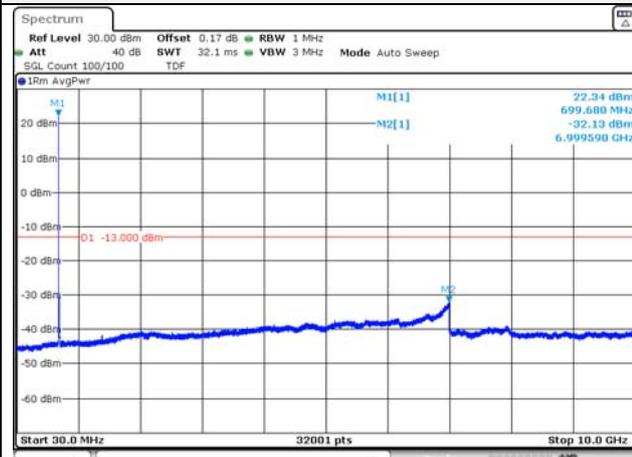
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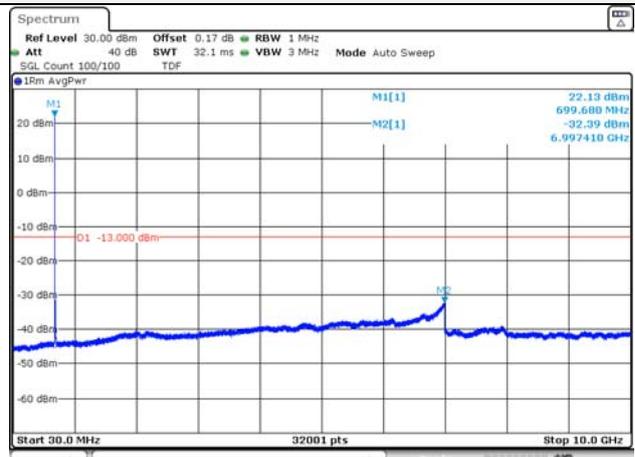
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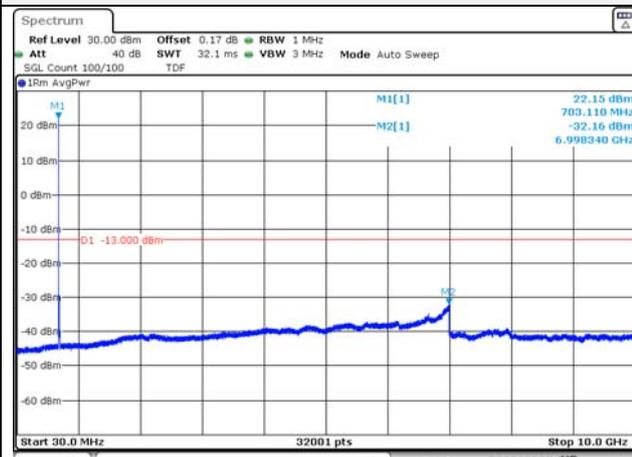
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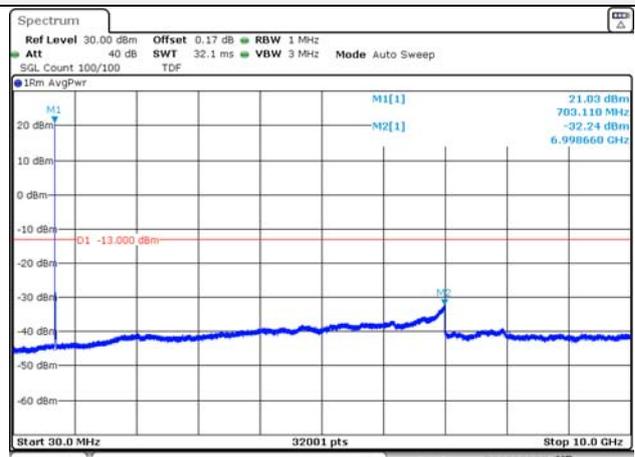
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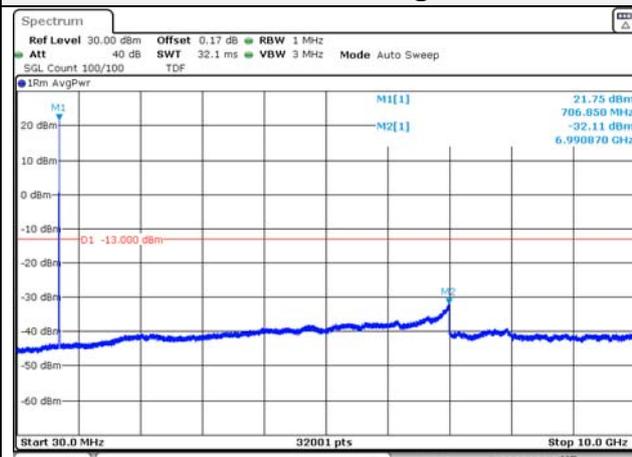
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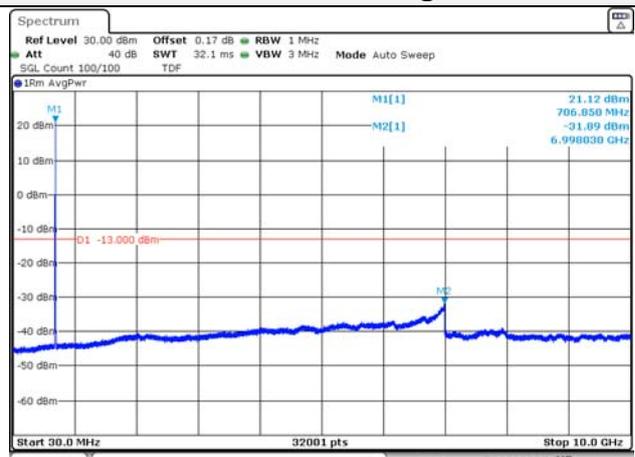
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10M BW QPSK High ch.



10M BW 16QAM High ch.



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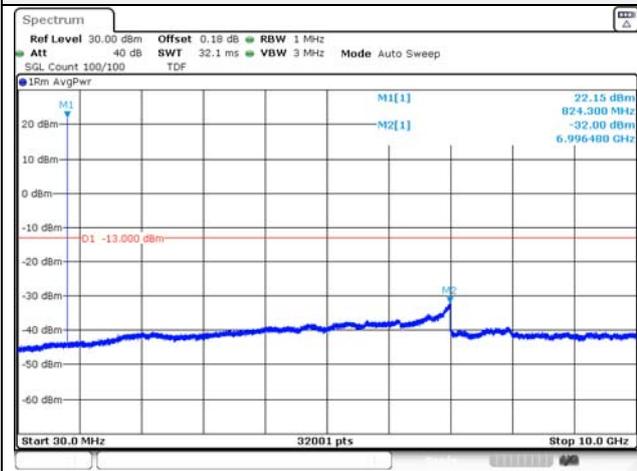
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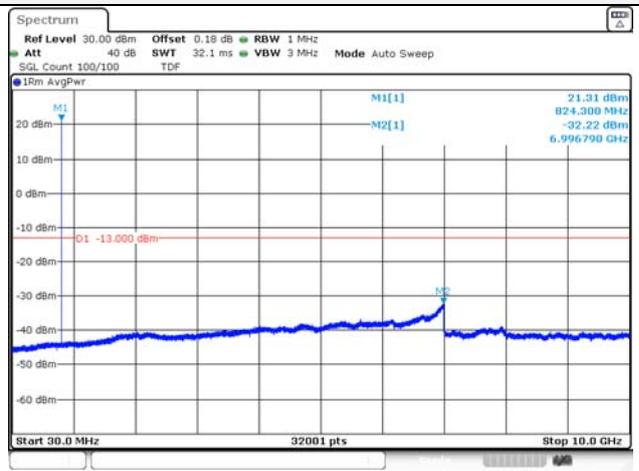


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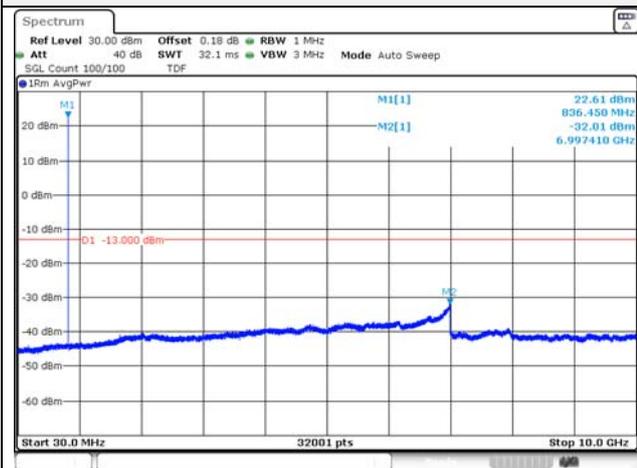
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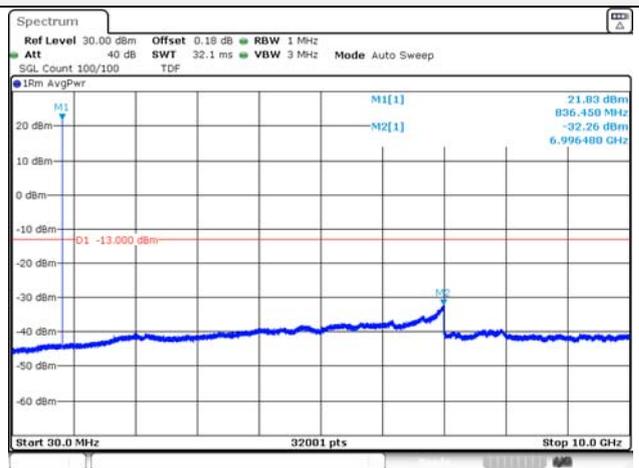
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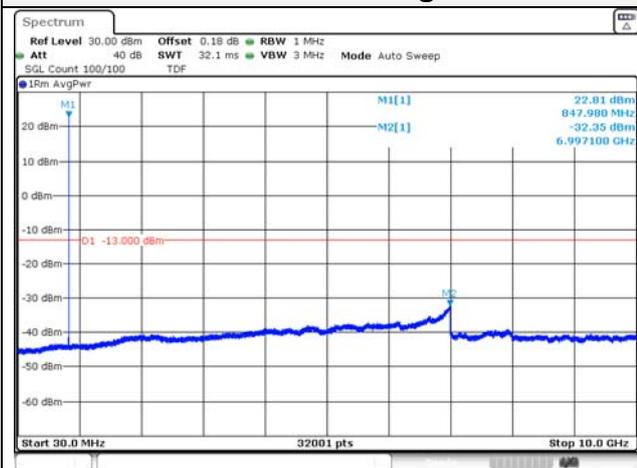
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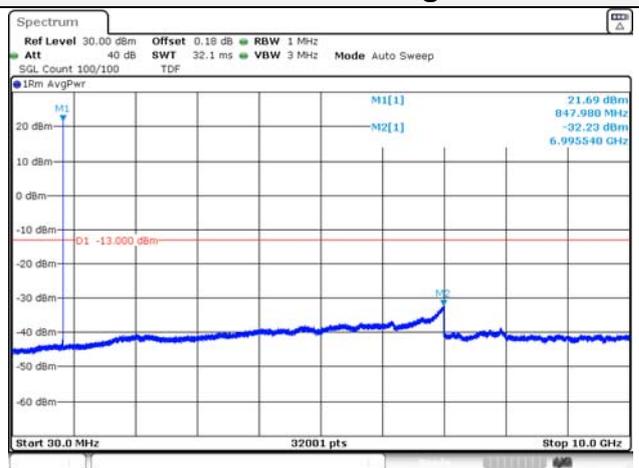
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1.4M BW QPSK High ch.



1.4M BW 16QAM High ch.



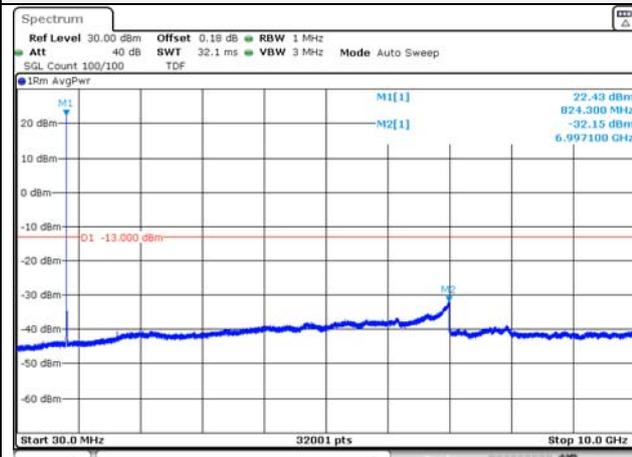
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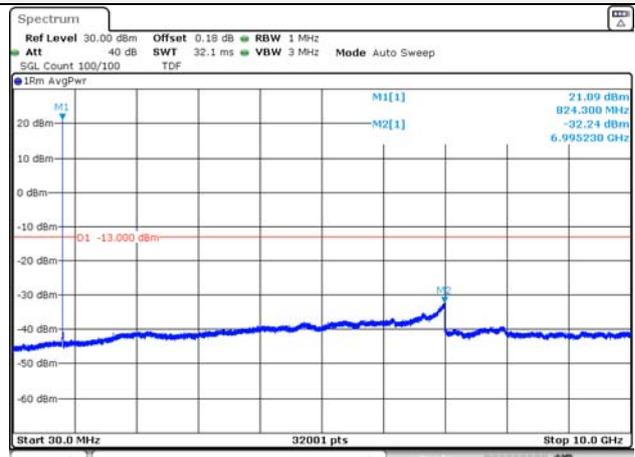
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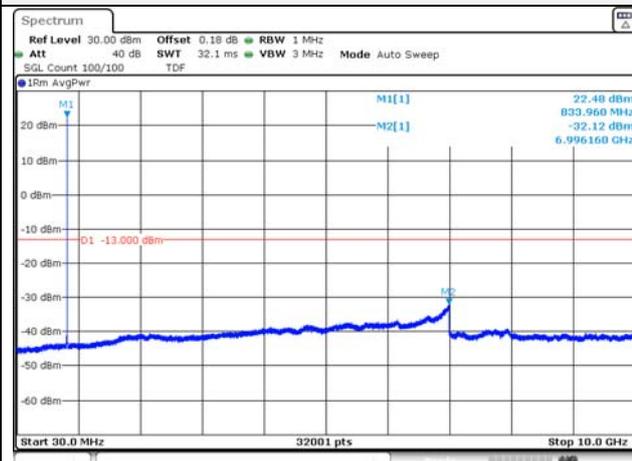
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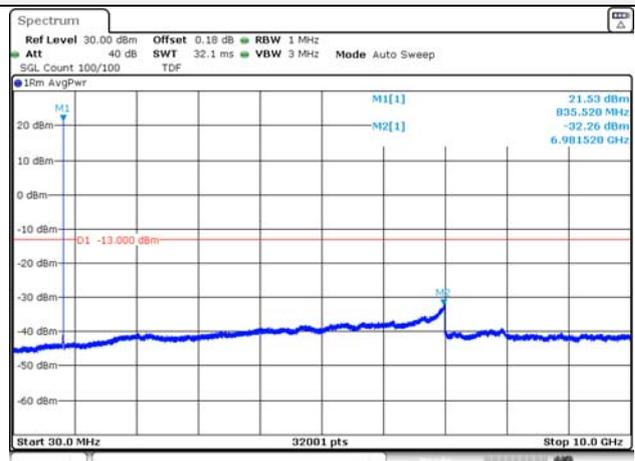
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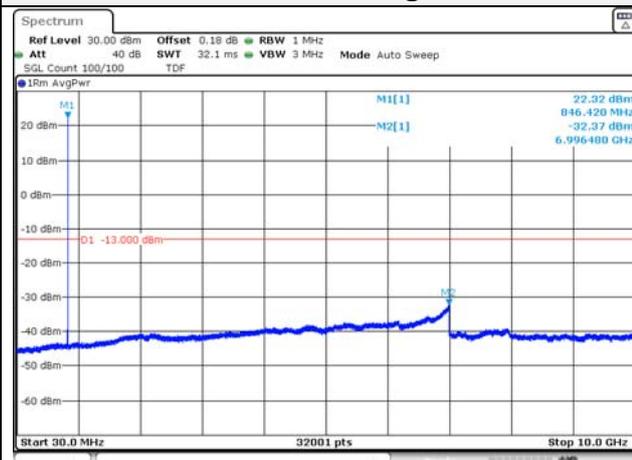
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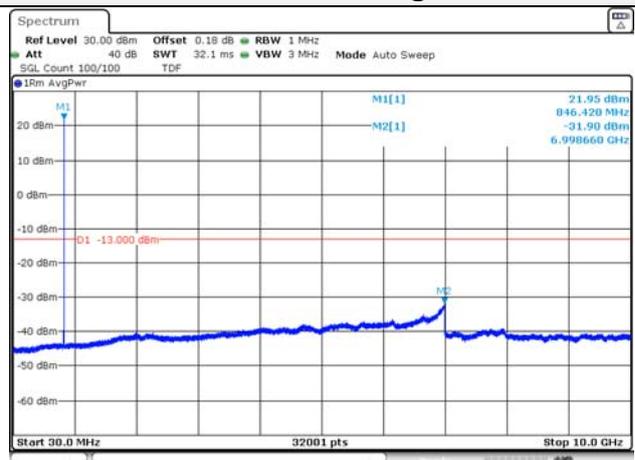
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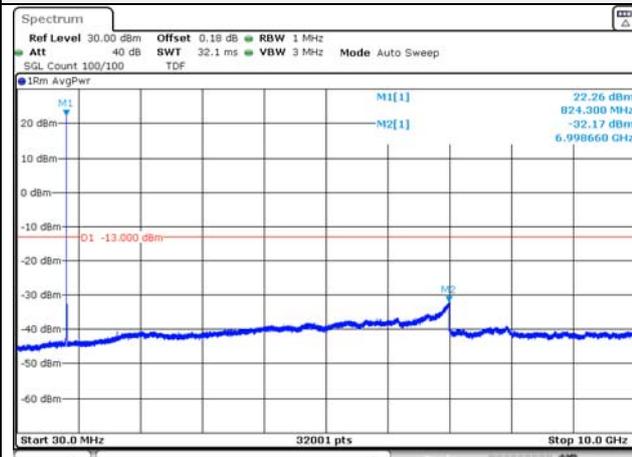
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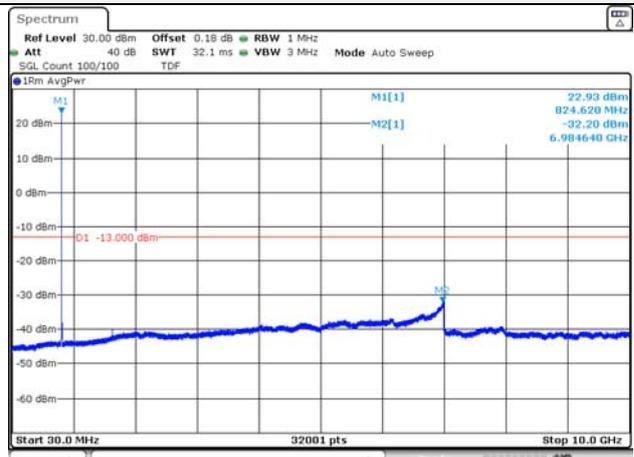
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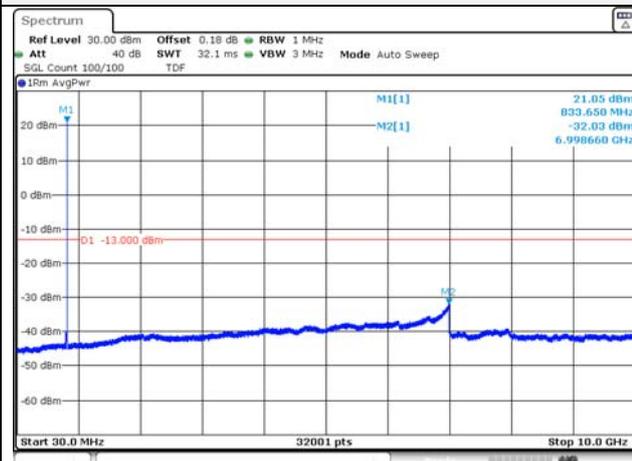
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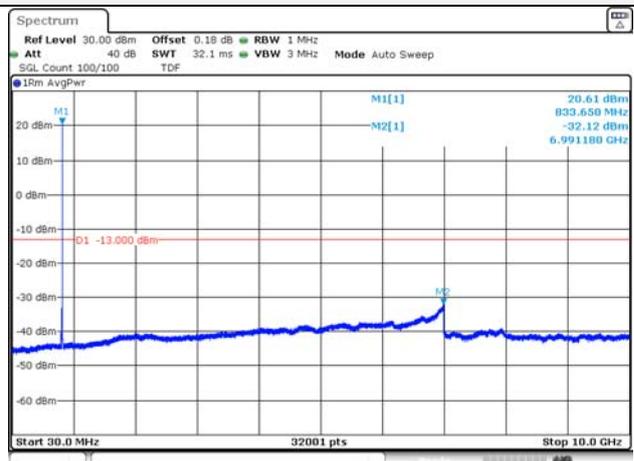
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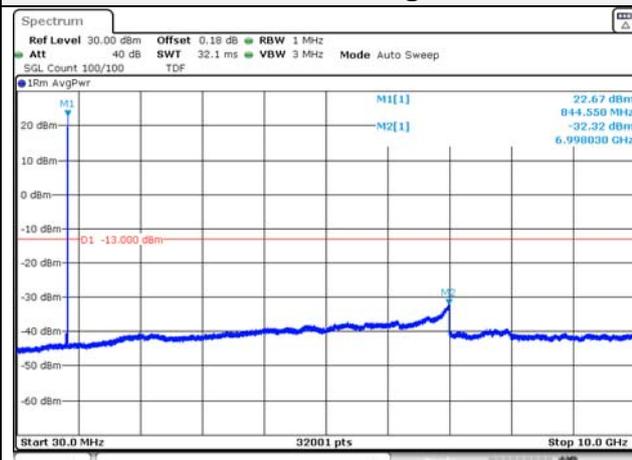
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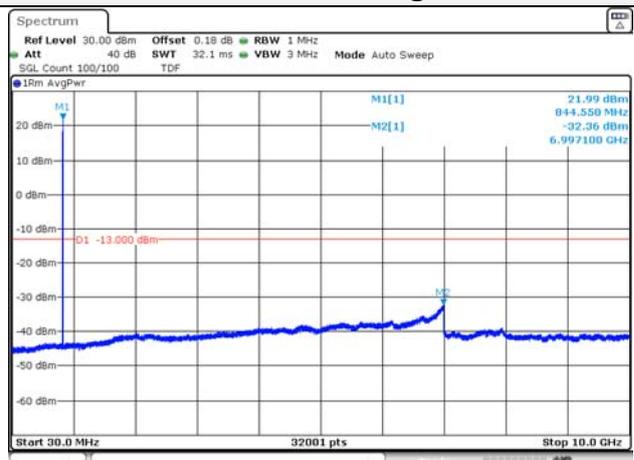
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5M BW 16QAM High ch.



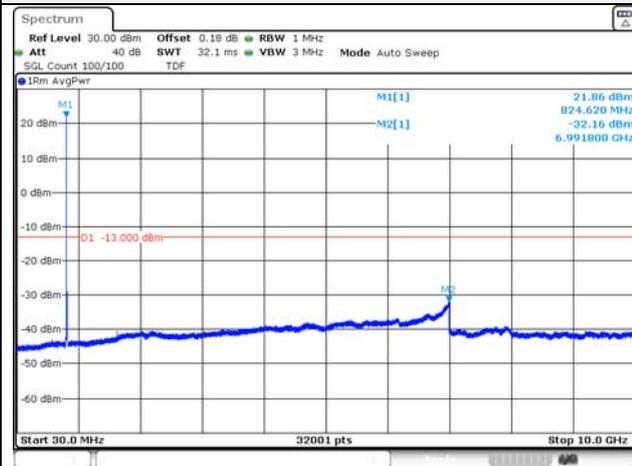
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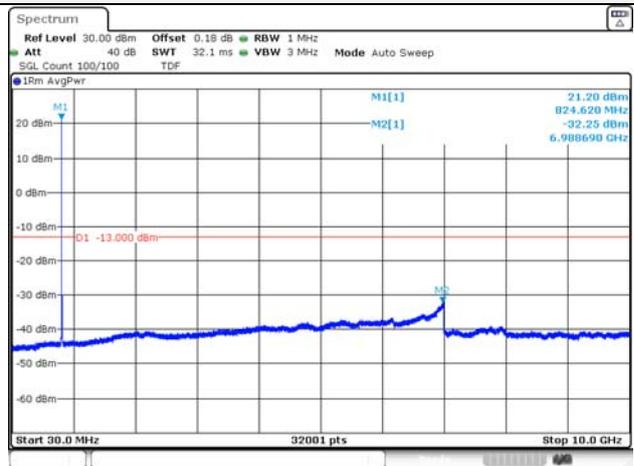
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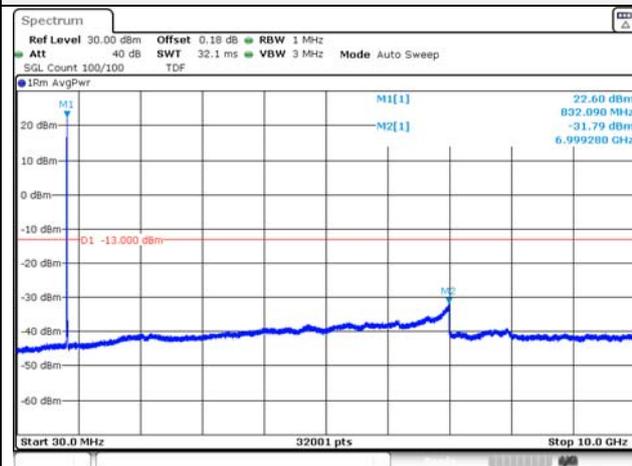
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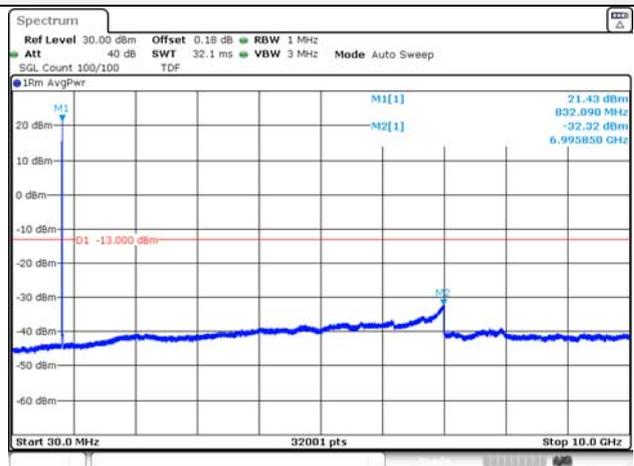
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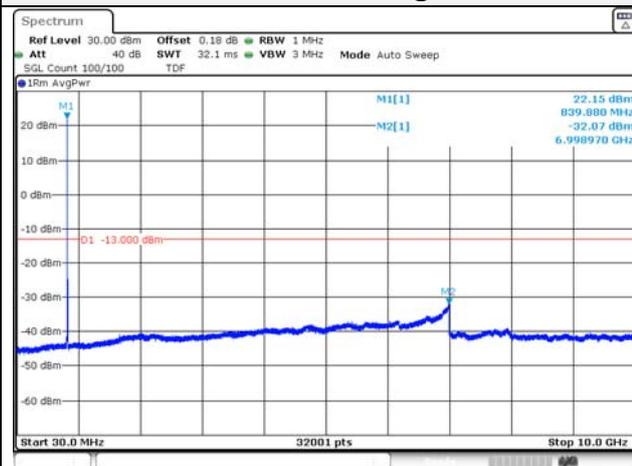
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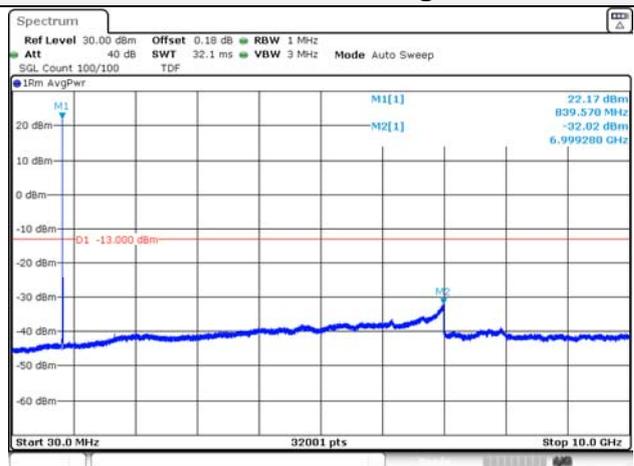
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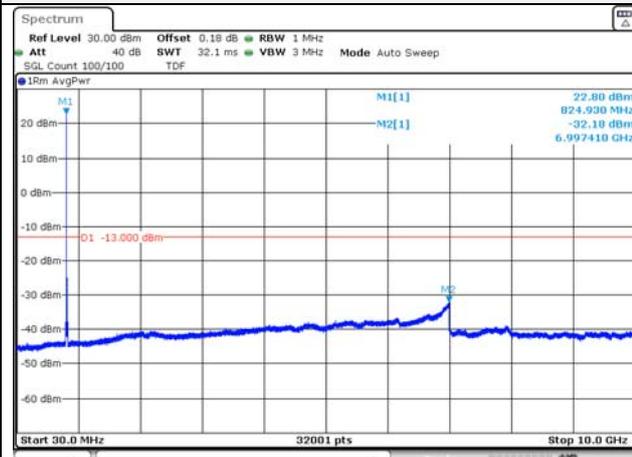
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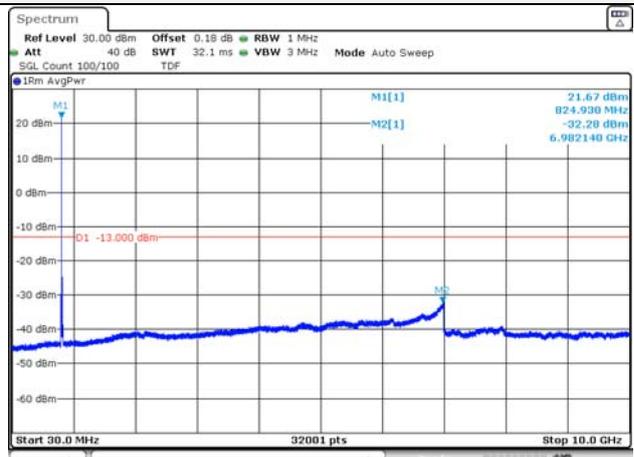
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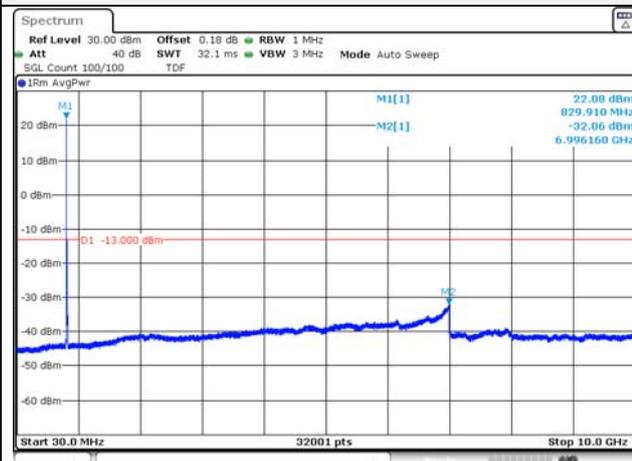
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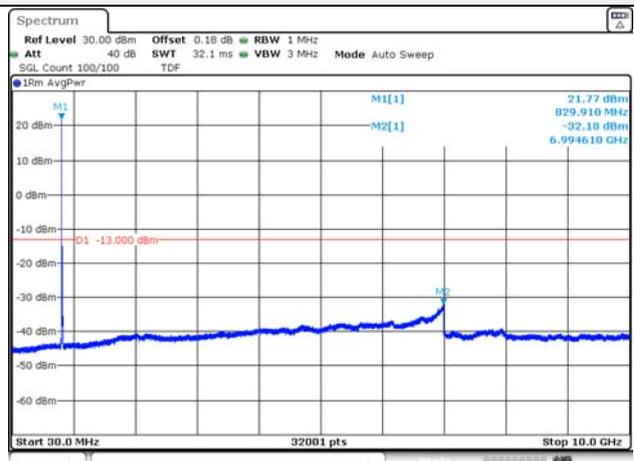
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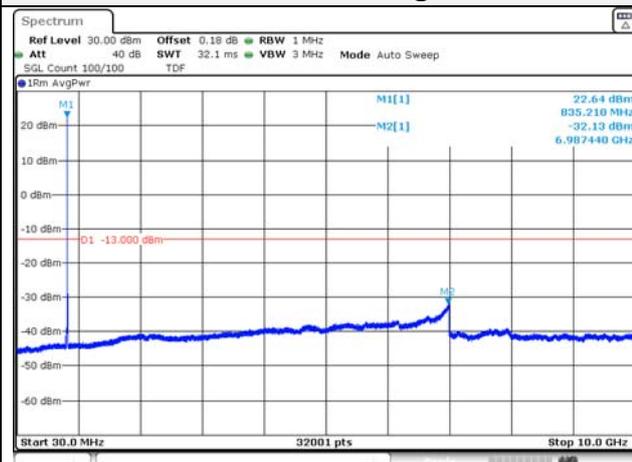
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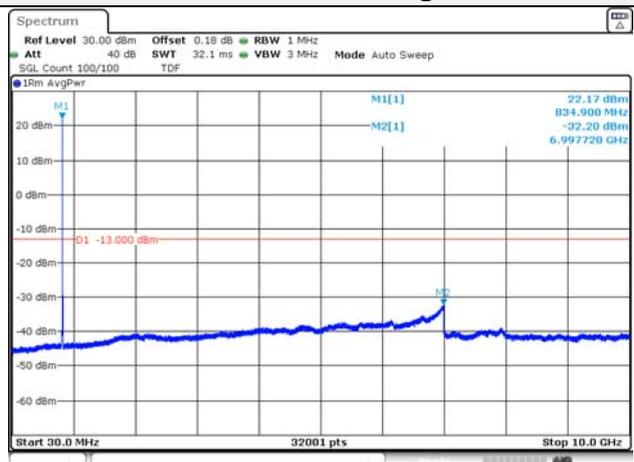
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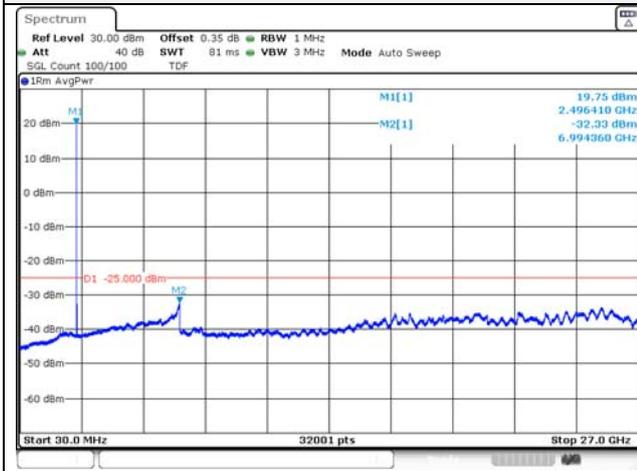
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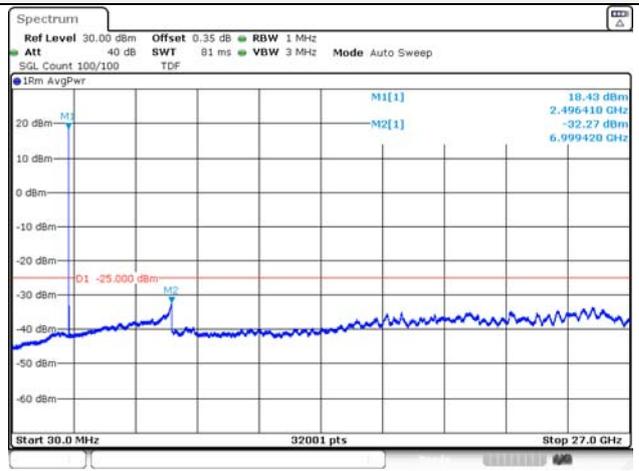
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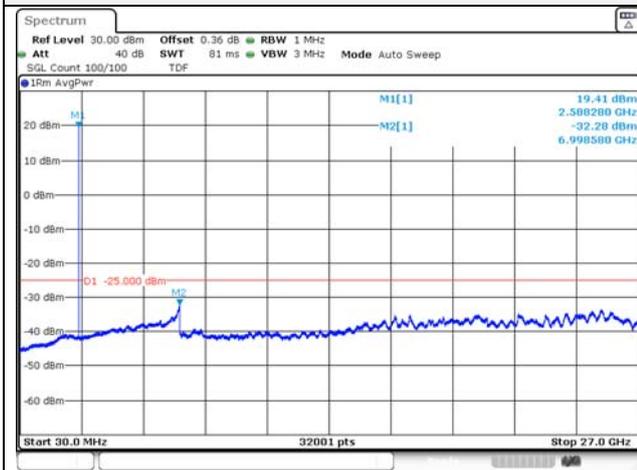
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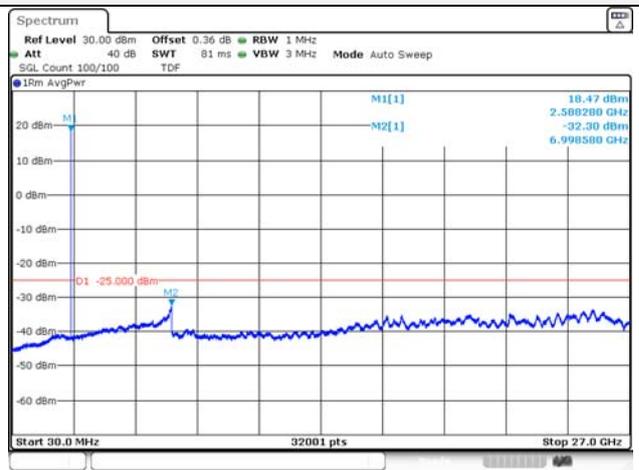
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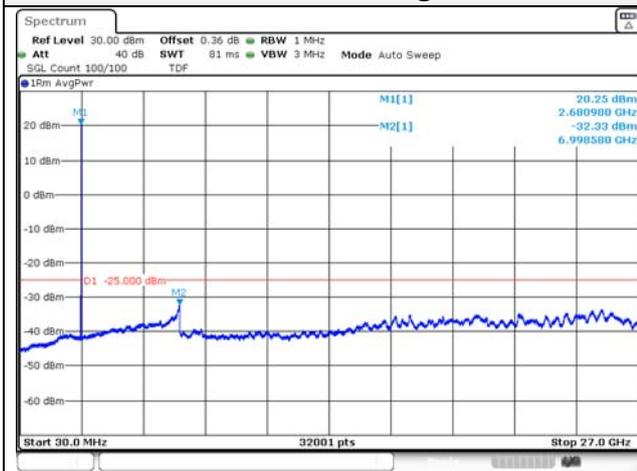
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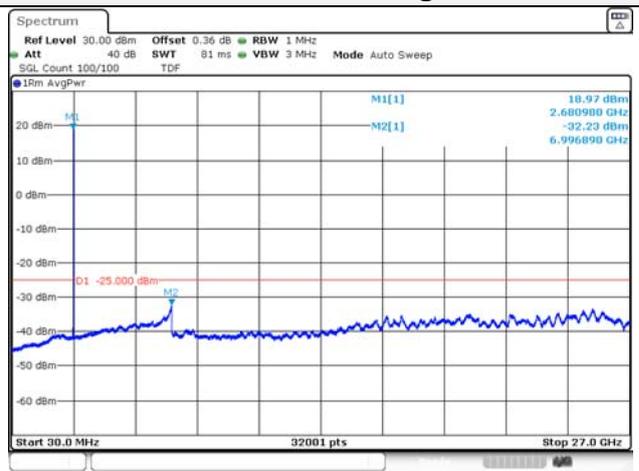
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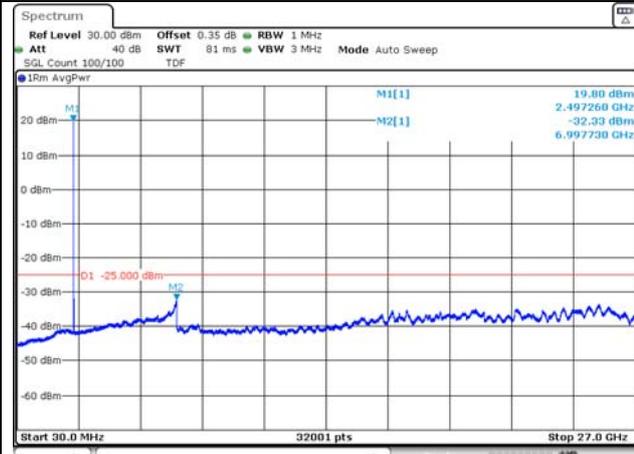
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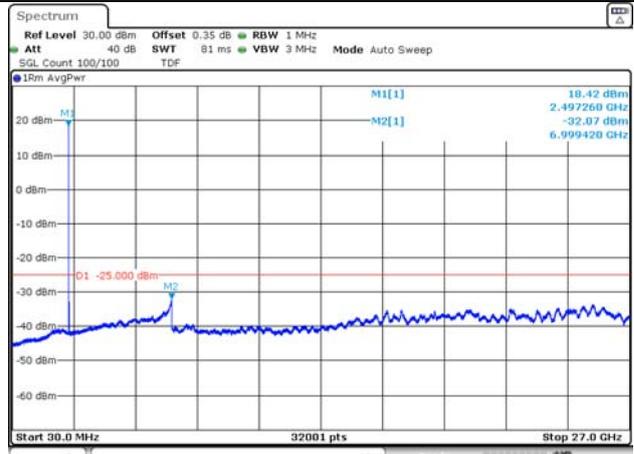
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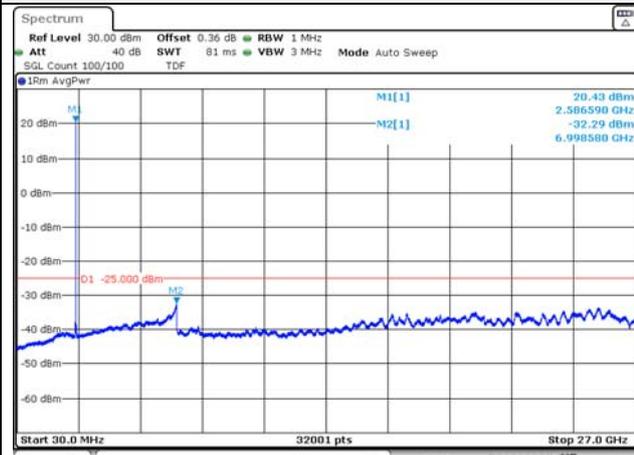
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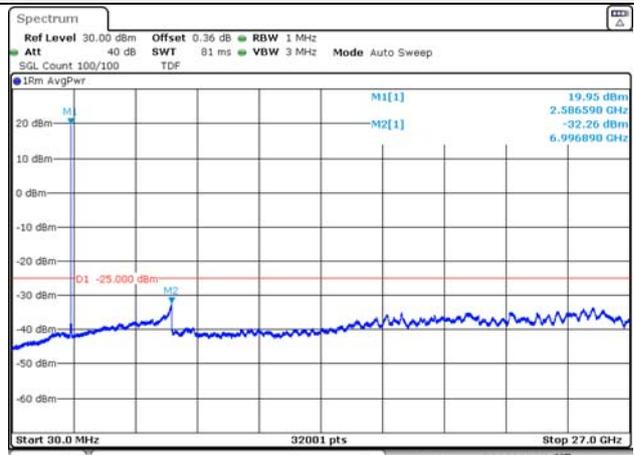
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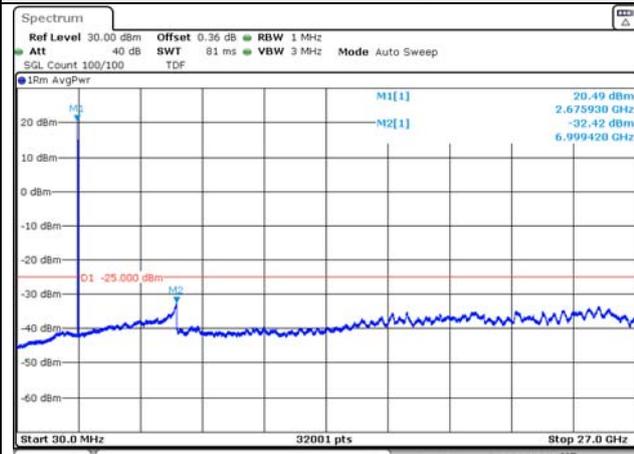
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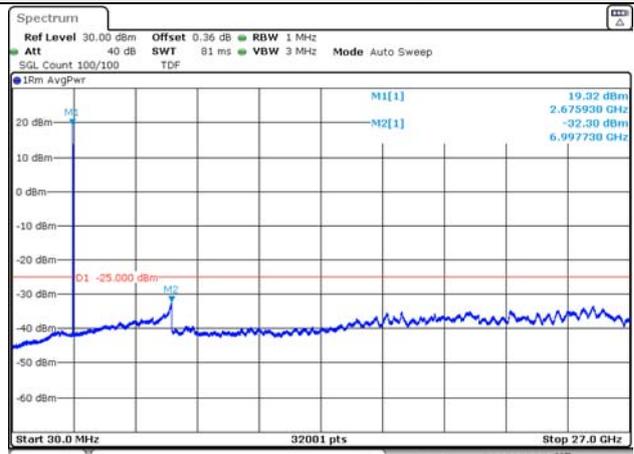
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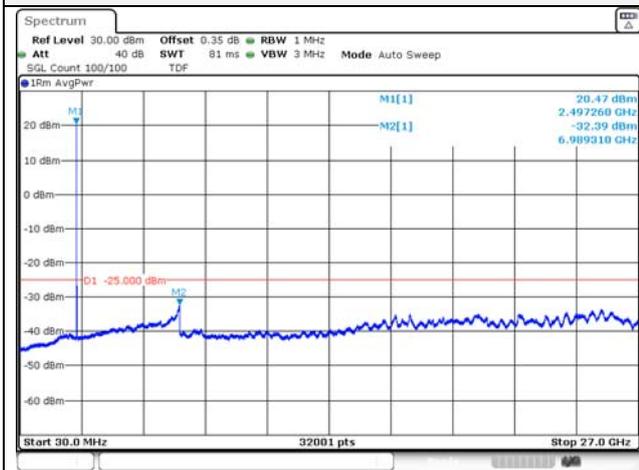
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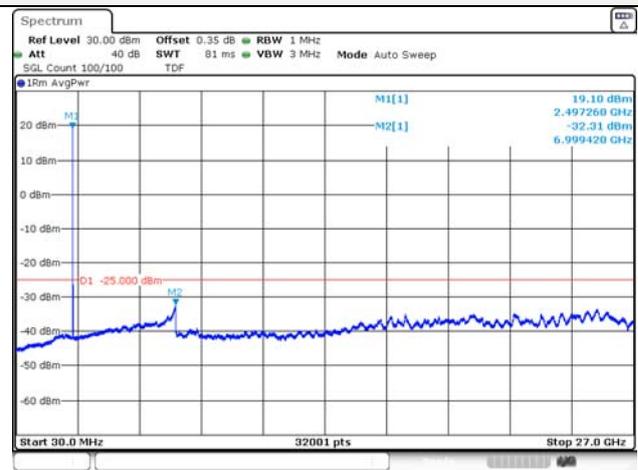
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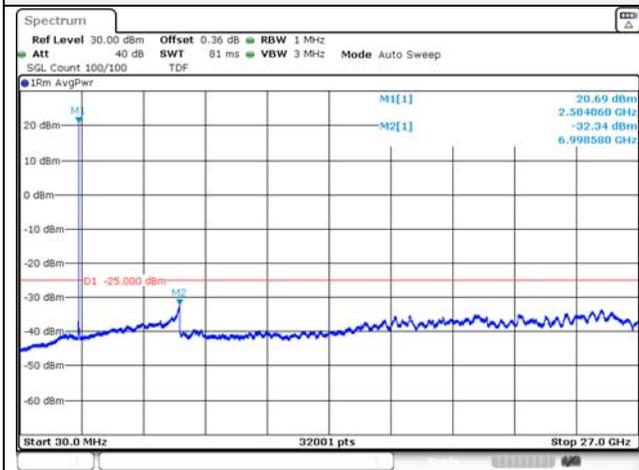
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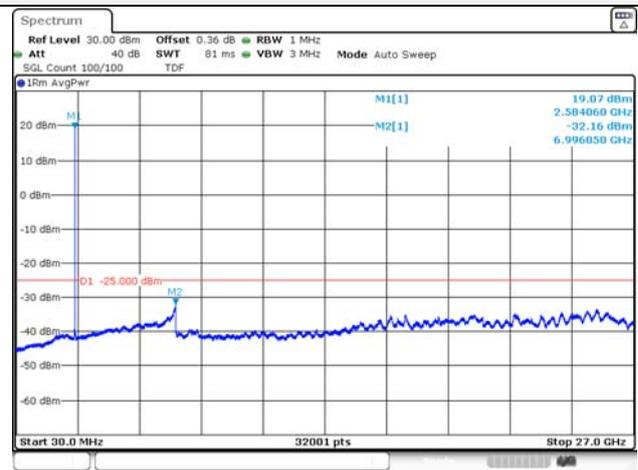
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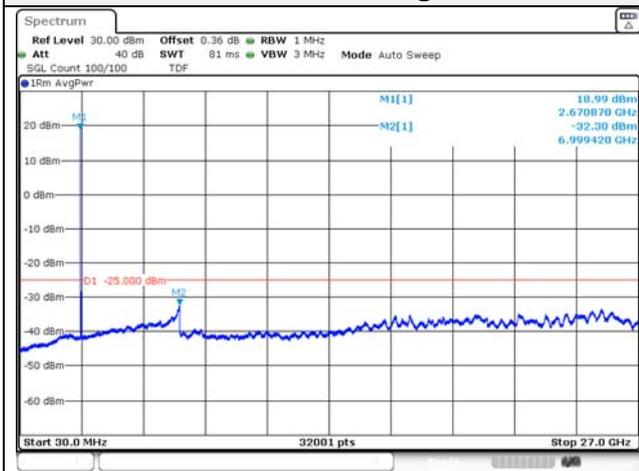
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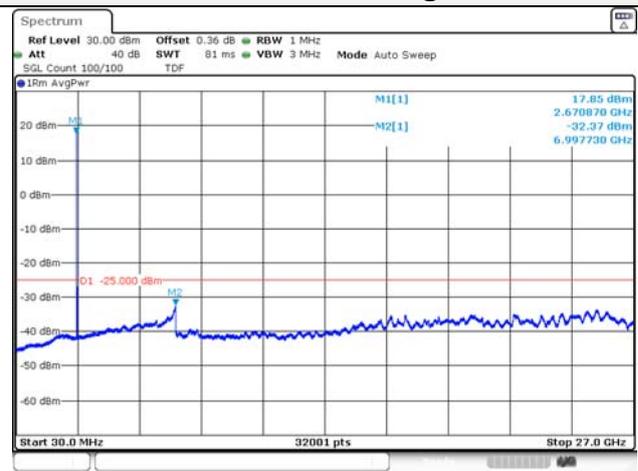
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20M BW 16QAM High ch.



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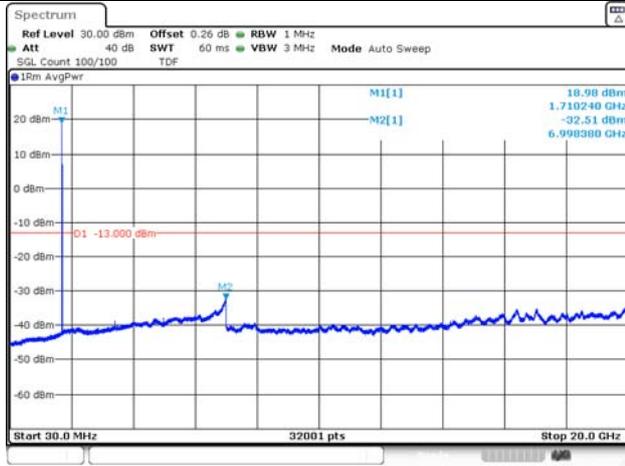
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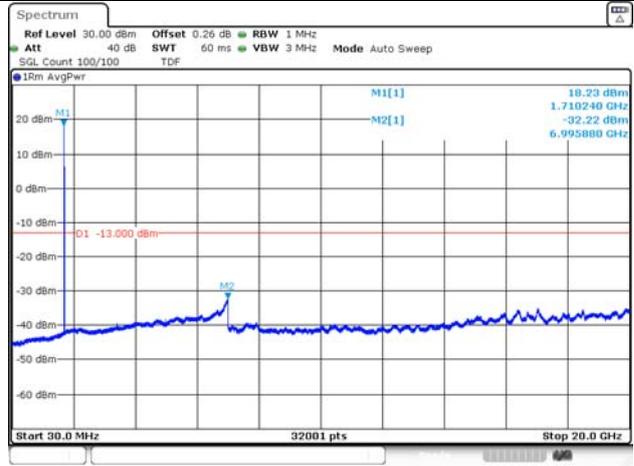


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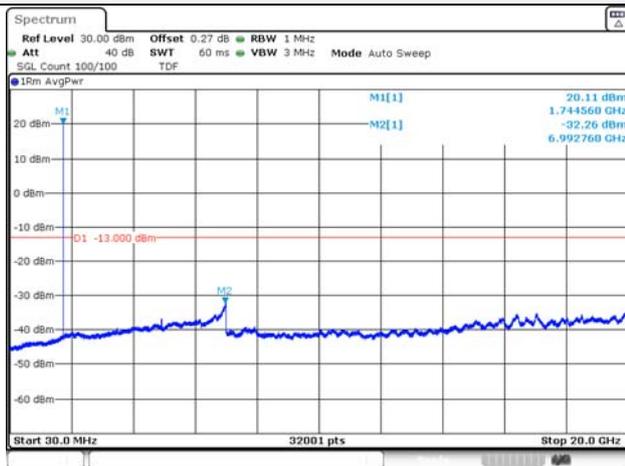
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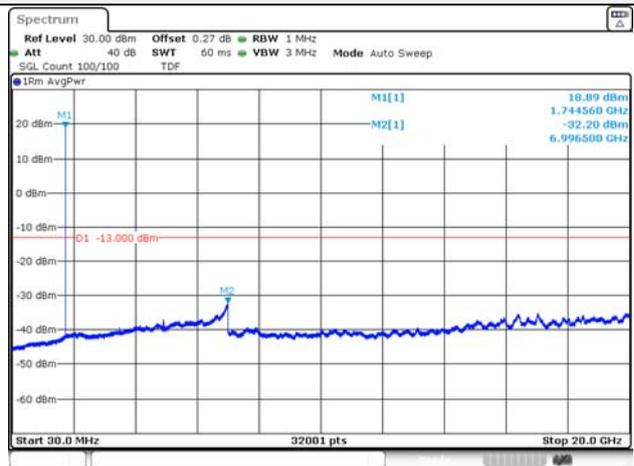
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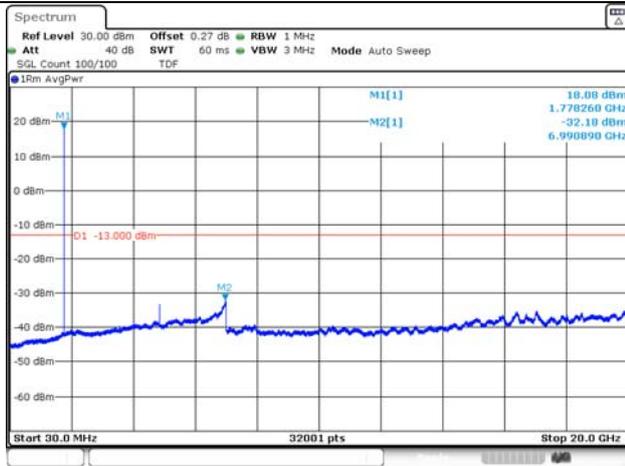
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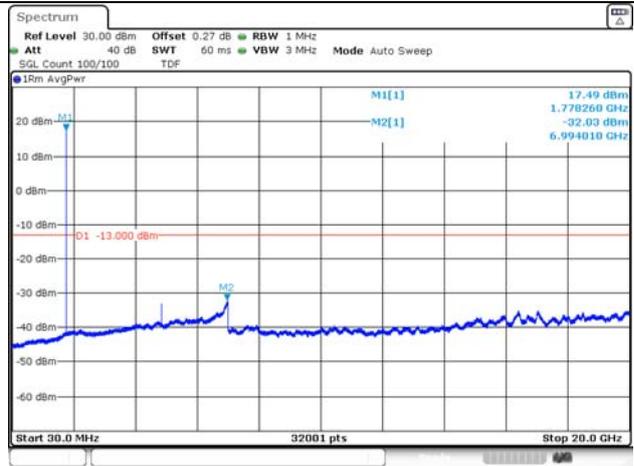
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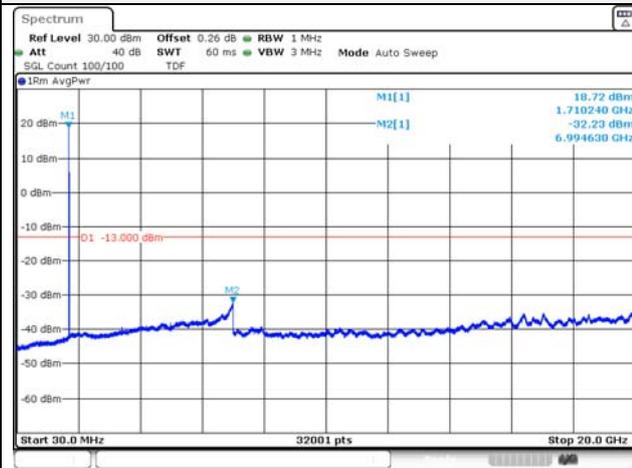
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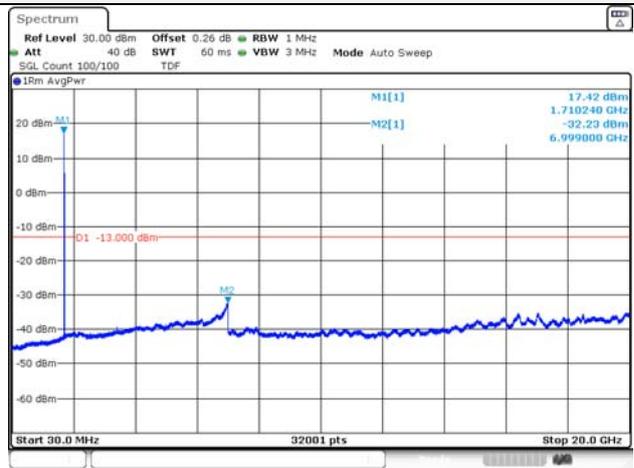
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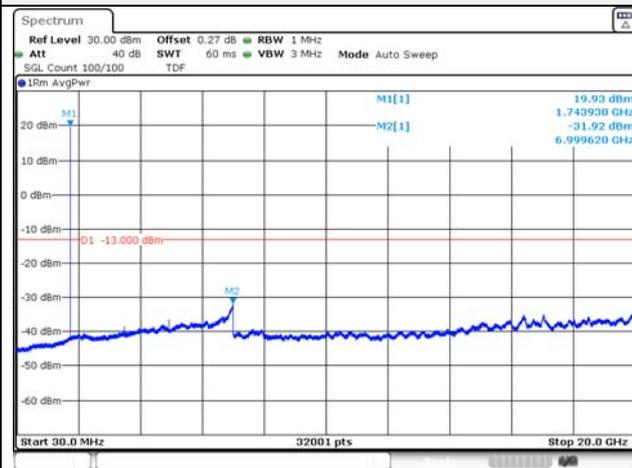
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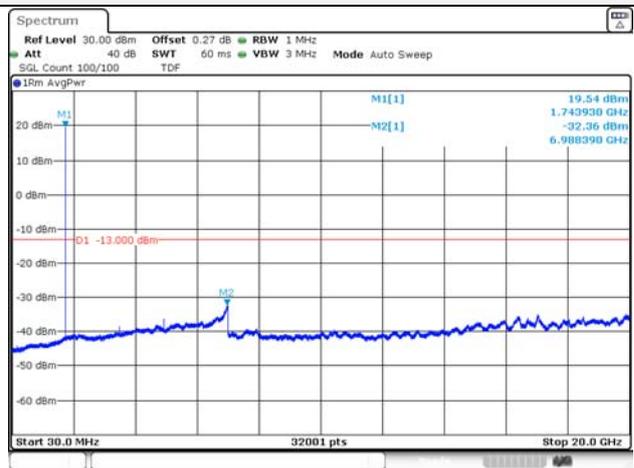
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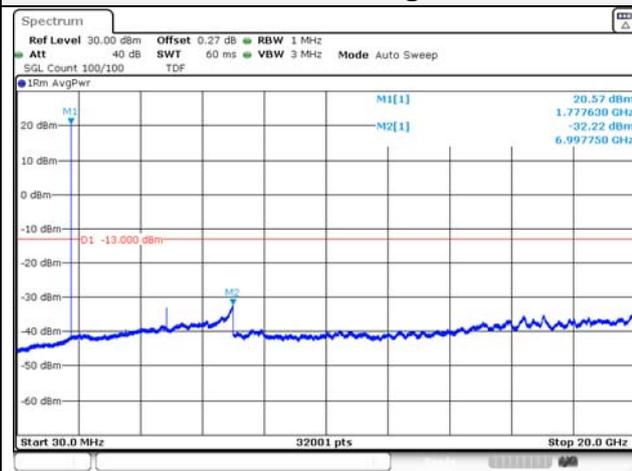
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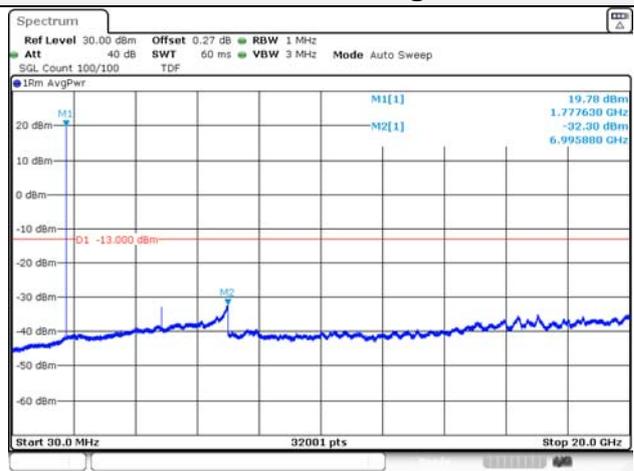
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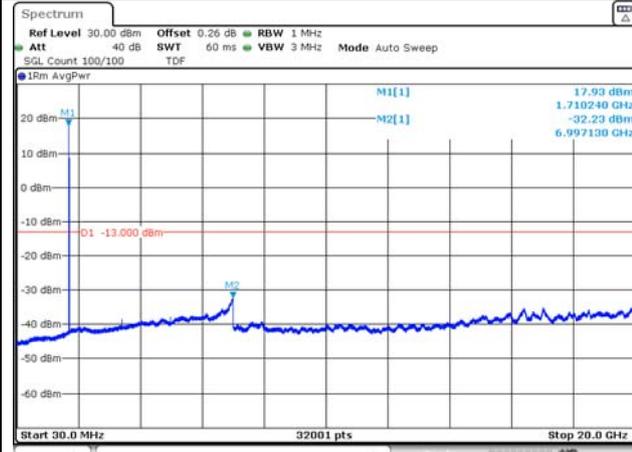
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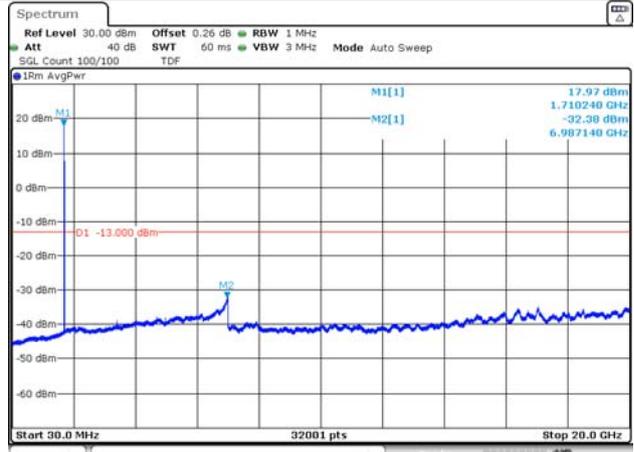
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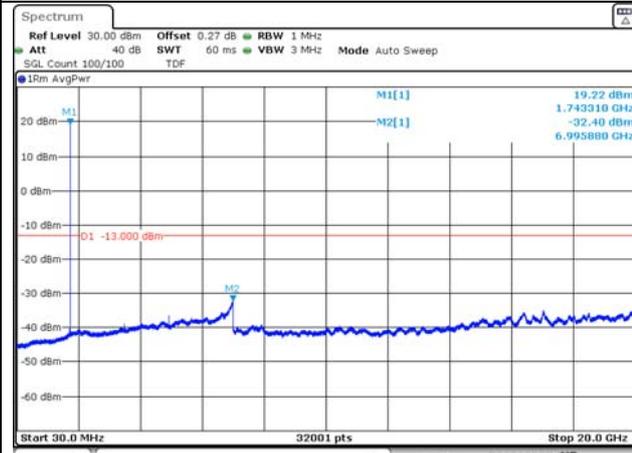
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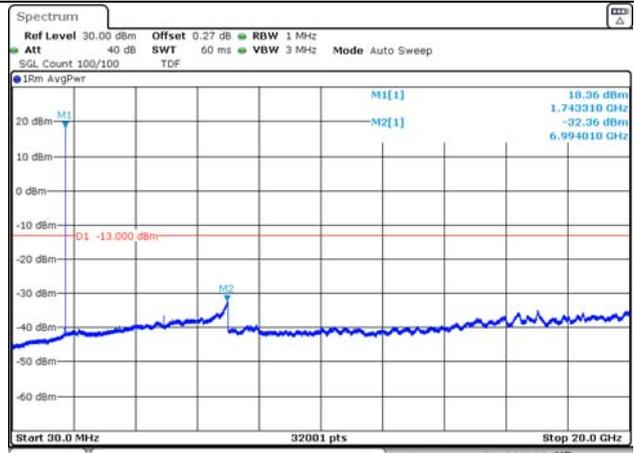
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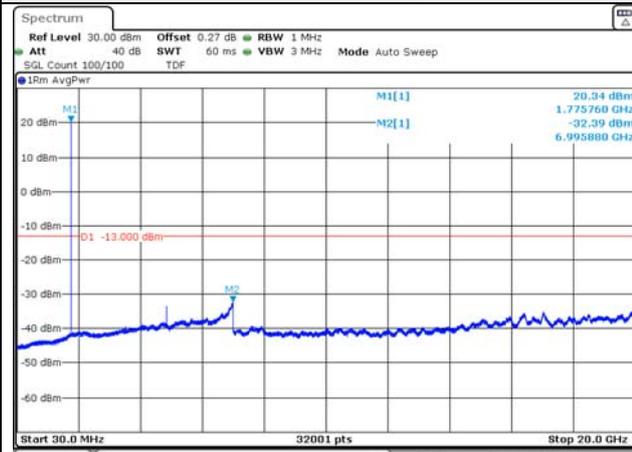
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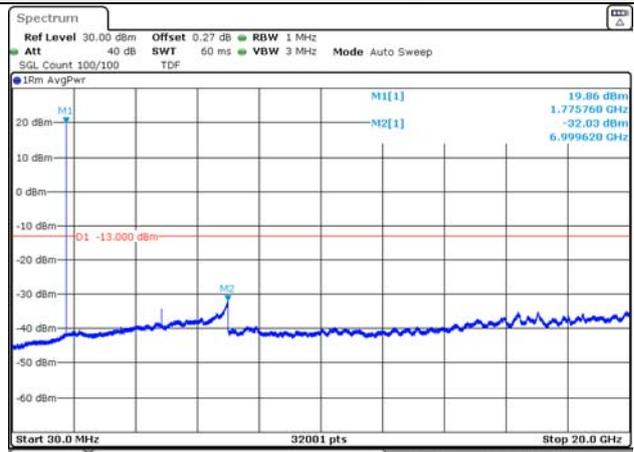
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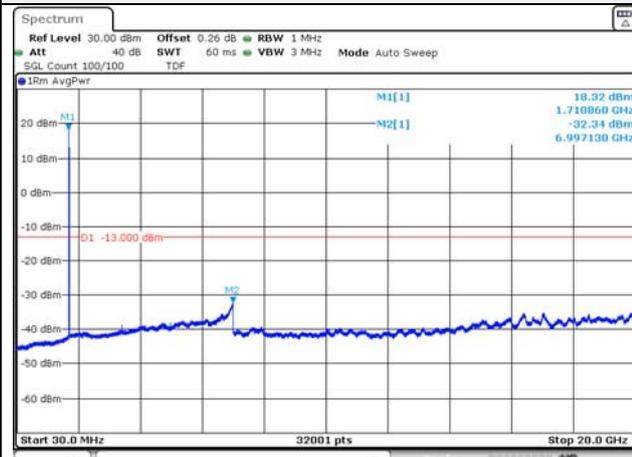
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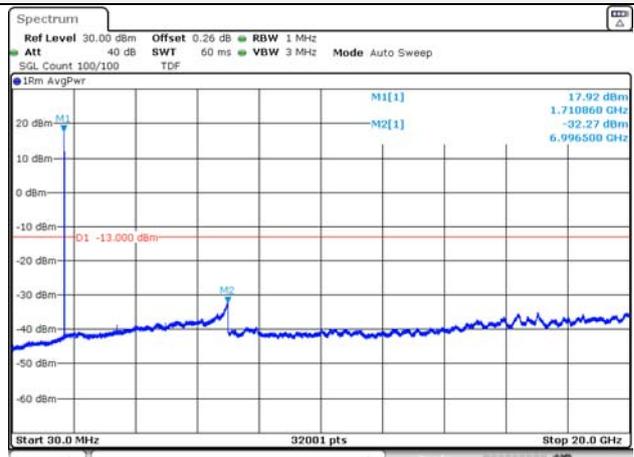
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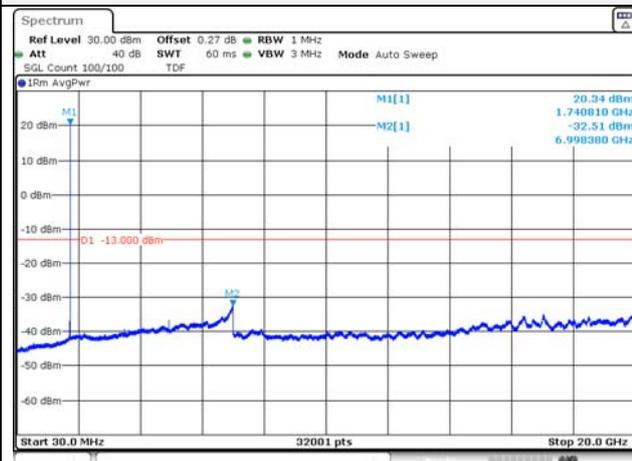
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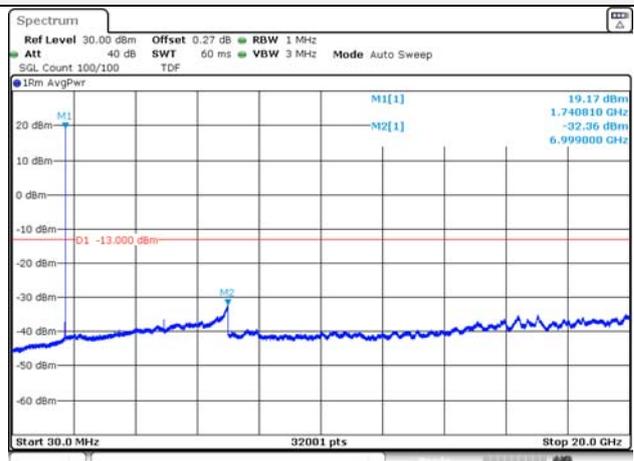
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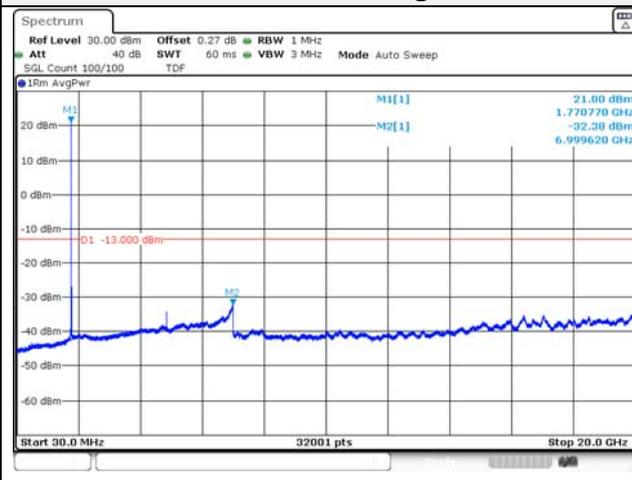
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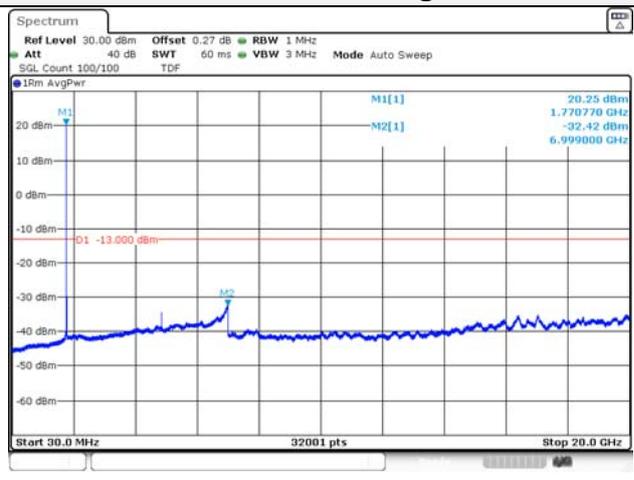
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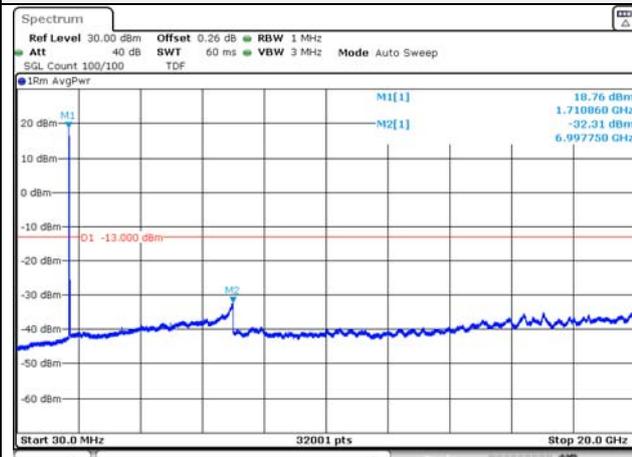
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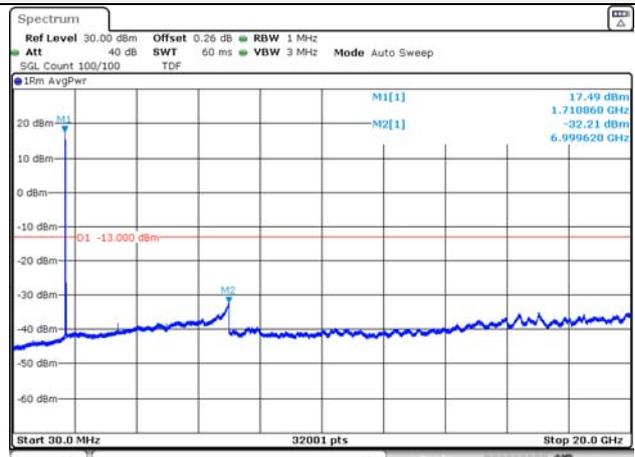
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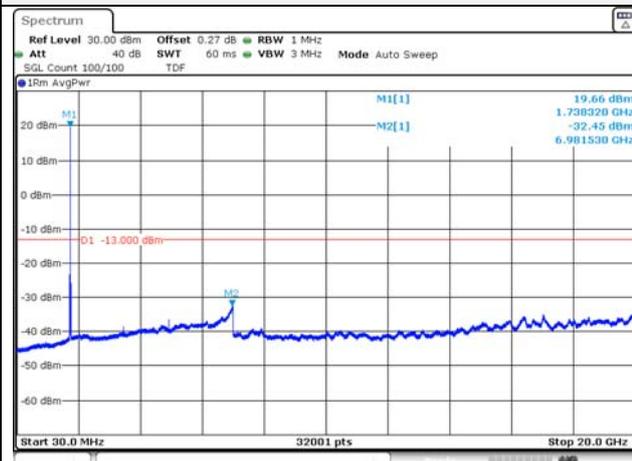
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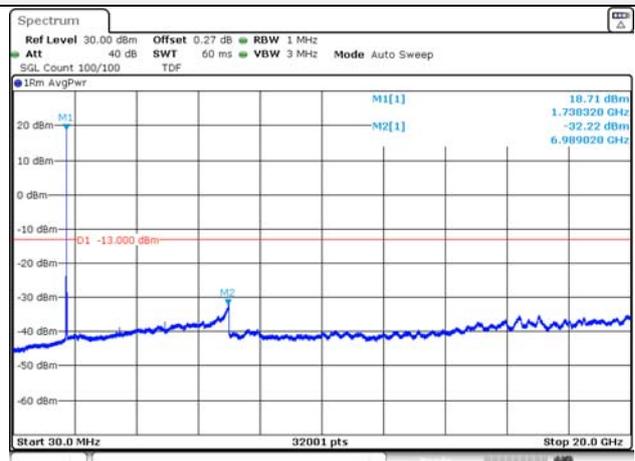
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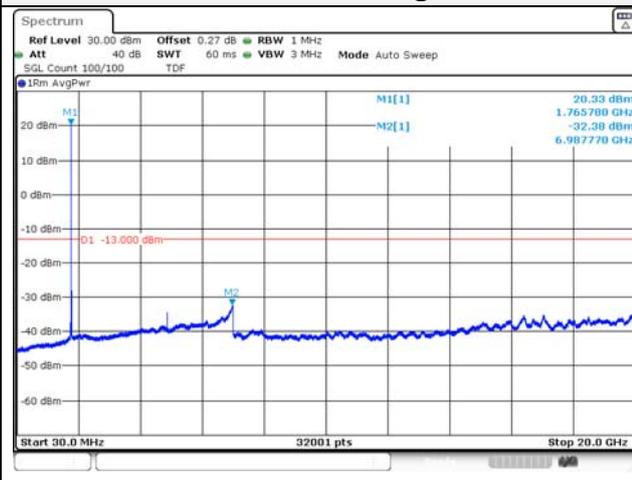
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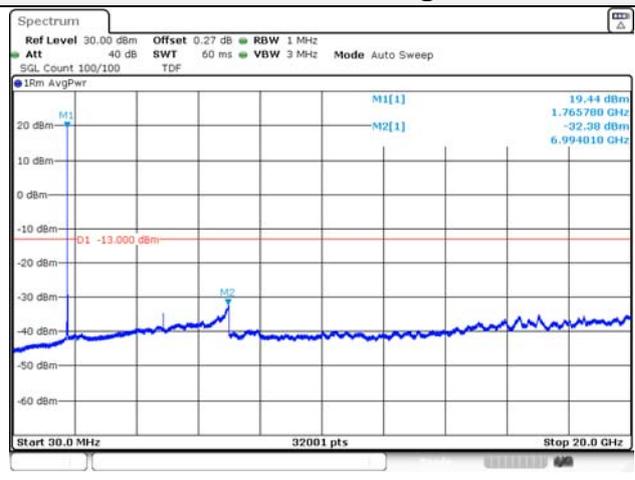
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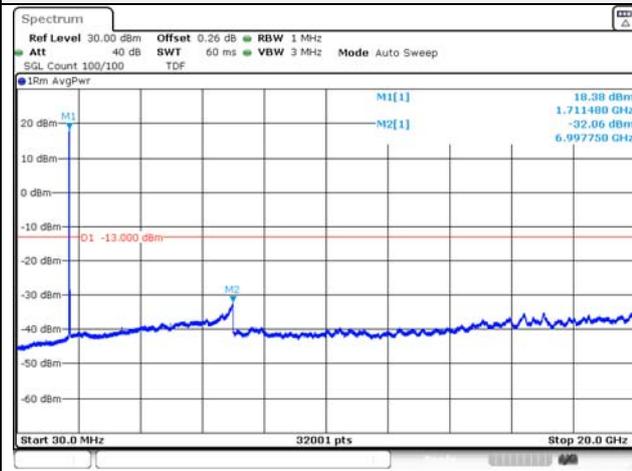
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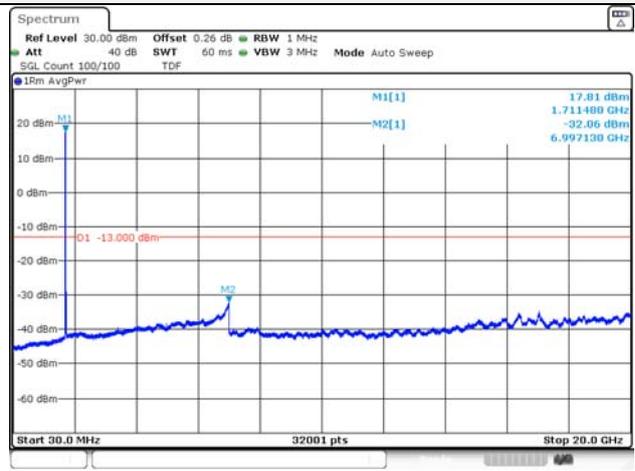
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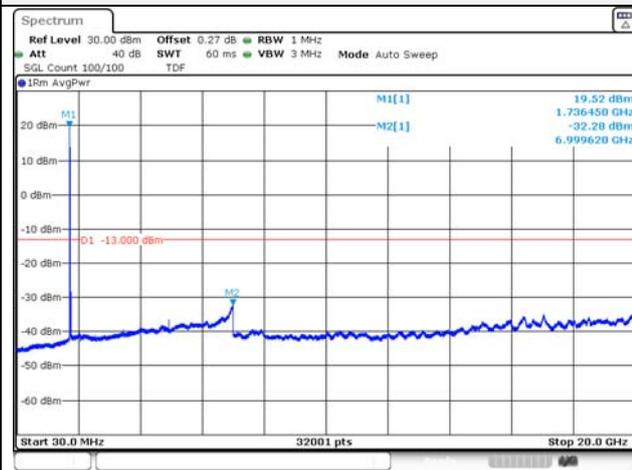
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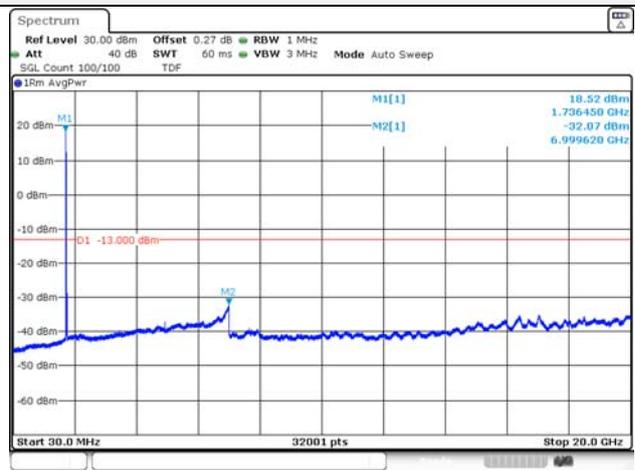
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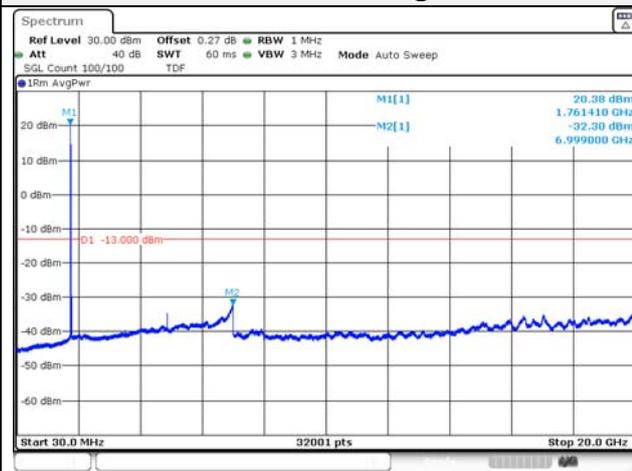
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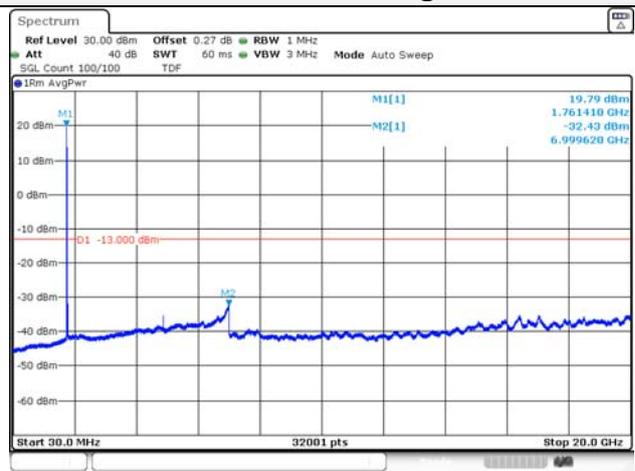
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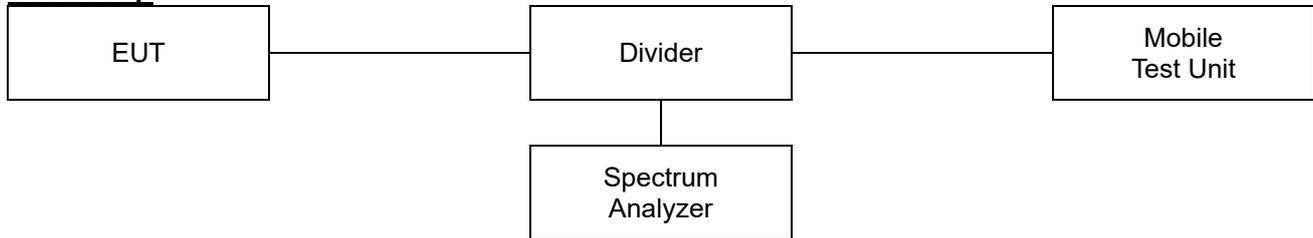


20M BW 16QAM High ch.



7.4. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), §24.238(a), 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 $43 + 10\log(P_{\text{Watts}})$ dB.

According to §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 $43 + 10\log(P_{\text{Watts}})$ dB.

According to §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 $43 + 10\log(P_{\text{Watts}})$ dB.

According to §27.53(m)(4), the attenuation factor shall be not less than $40 + 10\log(P_{\text{Watts}})$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10\log(P_{\text{Watts}})$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10\log(P_{\text{Watts}})$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10\log(P_{\text{Watts}})$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10\log(P_{\text{Watts}})$ dB at or below 2490.5 MHz.

Test procedure

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ANSI C63.26-2015 – Section 5.7

Test settings

- 1) Start frequency was set to 30 MHz and stop frequency was set to at least 10th the fundamental frequency.
- 2) Span was set large enough so as to capture all out of band emissions near the band edge.
- 3) Set the RBW > 1% of the emission bandwidth.
- 4) Set the VBW $\geq 3 \times$ RBW.
- 5) Set the number of sweep points $\geq 2 \times$ Span/RBW
- 6) Detector = RMS
- 7) Trace mode = trace average
- 8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
 - a) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) > (number of points in sweep) \times (symbol period) (e.g., by a factor of 10 \times symbol period \times number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
 - b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) \times (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time
 - c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) \times (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$).
 - d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > $\pm 2\%$), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) \times (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.
- 9) Allow trace to fully stabilize.

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**Notes:**

1. Per 22.917(b), 24.238(b), 27.53(h)(3), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, 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. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
2. Per 27.25(g), 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.
3. Per 27.53(m)(6), in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz).
4. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.

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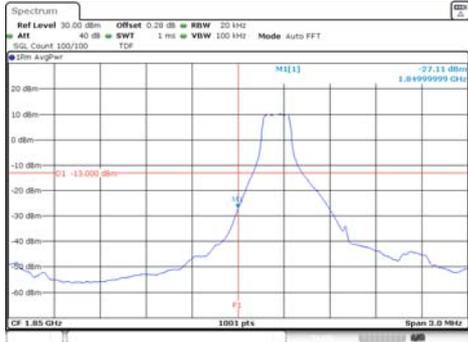
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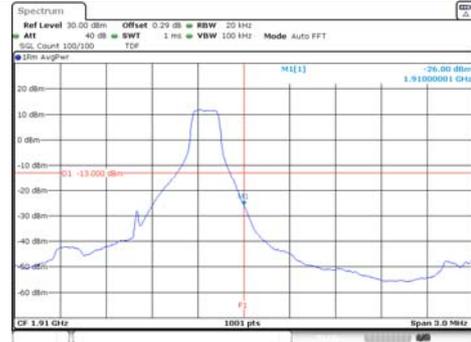
Test results

Test mode: LTE Band 2

1.4M BW QPSK Low ch. 1RB



1.4M BW QPSK High ch. 1RB



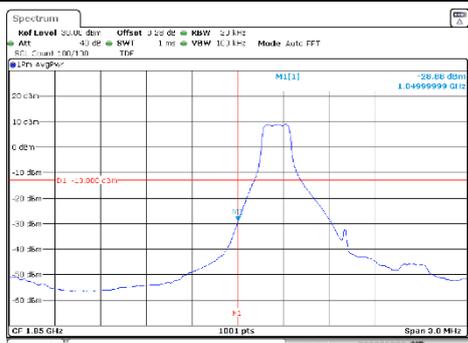
1.4M BW QPSK Low ch. FRB



1.4M BW QPSK High ch. FRB



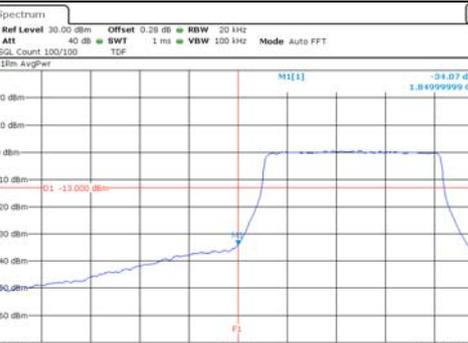
1.4M BW 16QAM Low ch. 1RB



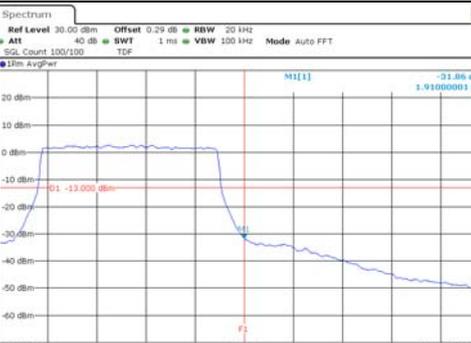
1.4M BW 16QAM High ch. 1RB



1.4M BW 16QAM Low ch. FRB



1.4M BW 16QAM High ch. FRB



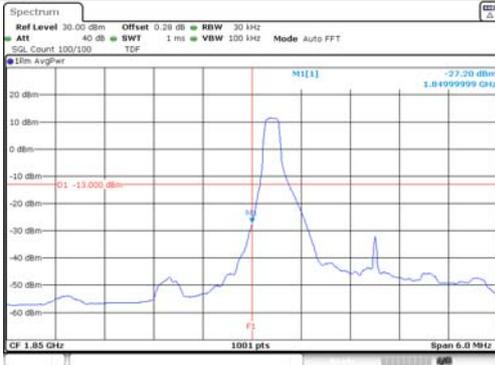
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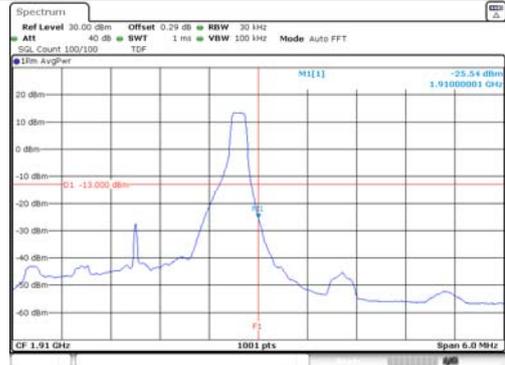
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3M BW QPSK Low ch. 1RB



3M BW QPSK High ch. 1RB



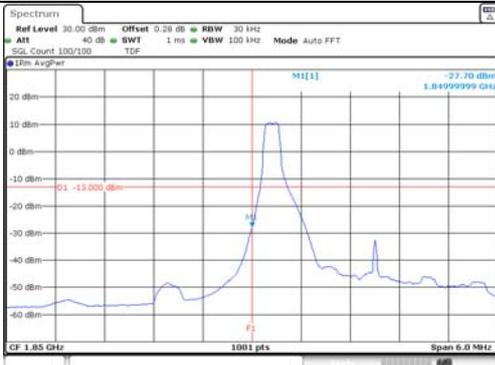
3M BW QPSK Low ch. FRB



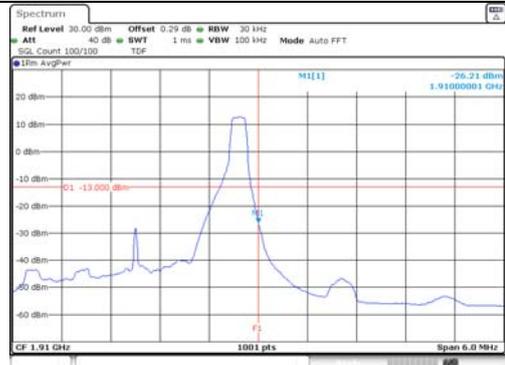
3M BW QPSK High ch. FRB



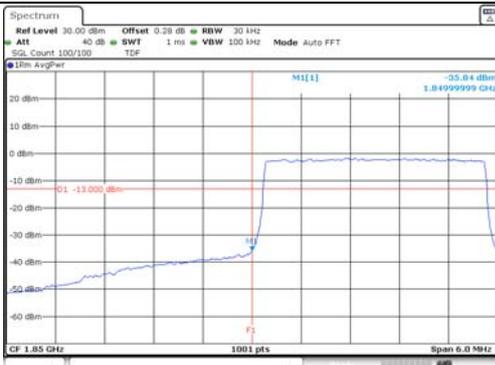
3M BW 16QAM Low ch. 1RB



3M BW 16QAM High ch. 1RB



3M BW 16QAM Low ch. FRB



3M BW 16QAM High ch. FRB



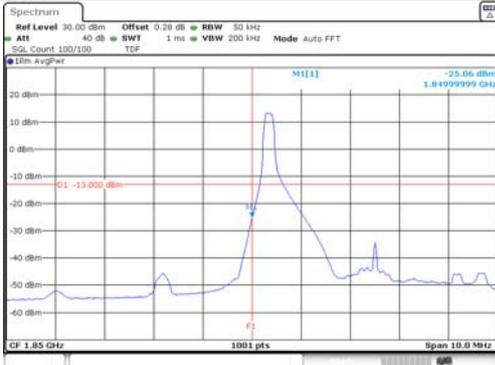
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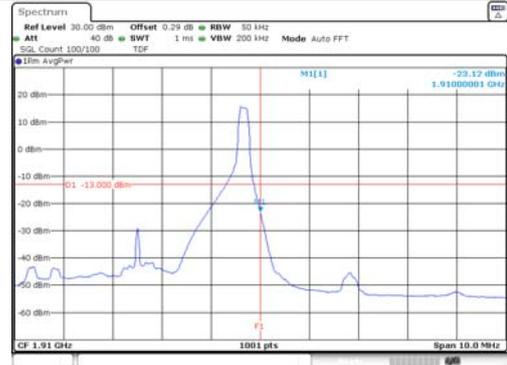
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5M BW QPSK Low ch. 1RB



5M BW QPSK High ch. 1RB



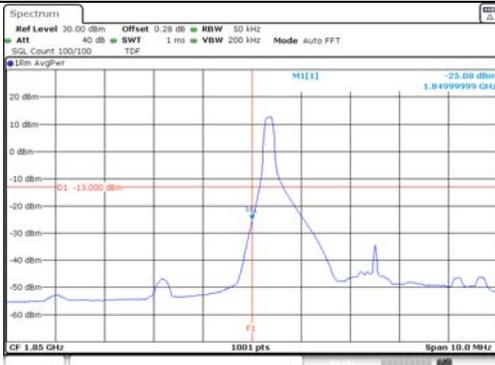
5M BW QPSK Low ch. FRB



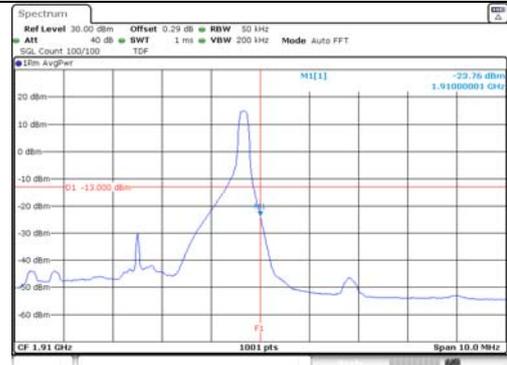
5M BW QPSK High ch. FRB



5M BW 16QAM Low ch. 1RB



5M BW 16QAM High ch. 1RB



5M BW 16QAM Low ch. FRB



5M BW 16QAM High ch. FRB



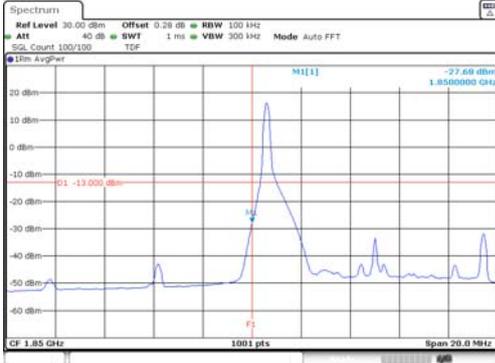
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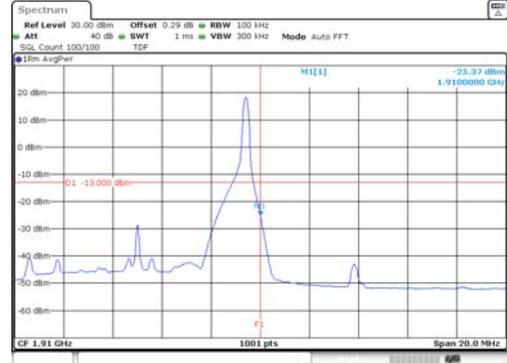
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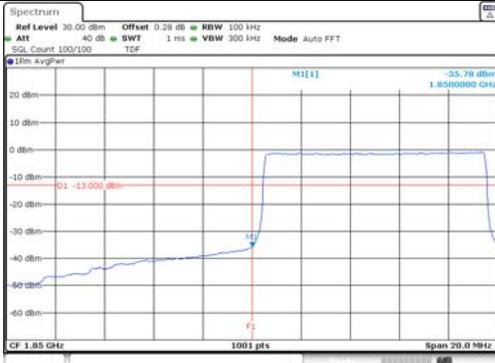
10M BW QPSK Low ch. 1RB



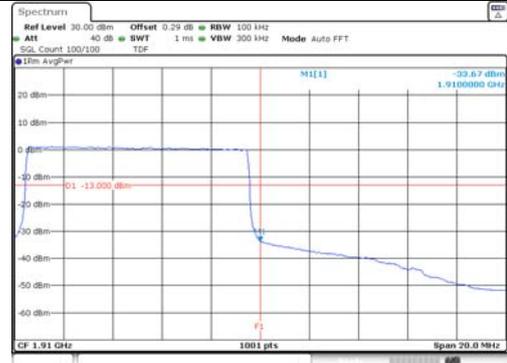
10M BW QPSK High ch. 1RB



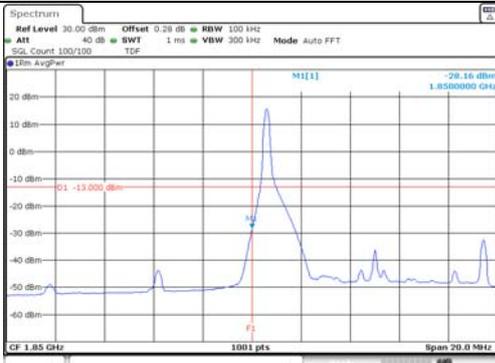
10M BW QPSK Low ch. FRB



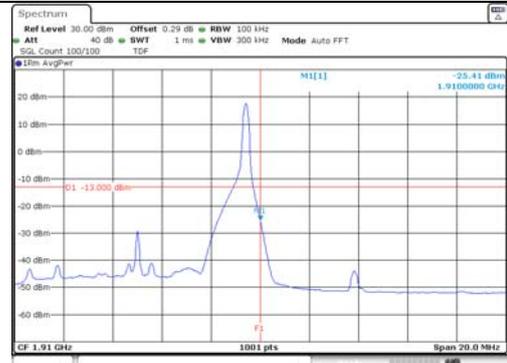
10M BW QPSK High ch. FRB



10M BW 16QAM Low ch. 1RB



10M BW 16QAM High ch. 1RB



10M BW 16QAM Low ch. FRB



10M BW 16QAM High ch. FRB



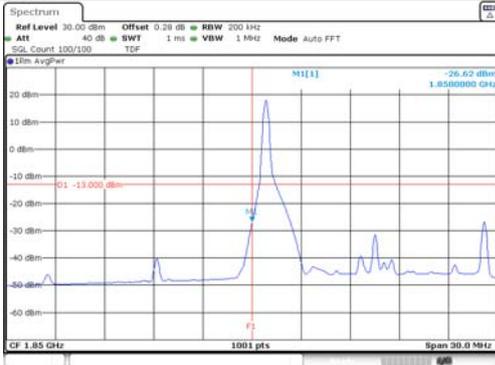
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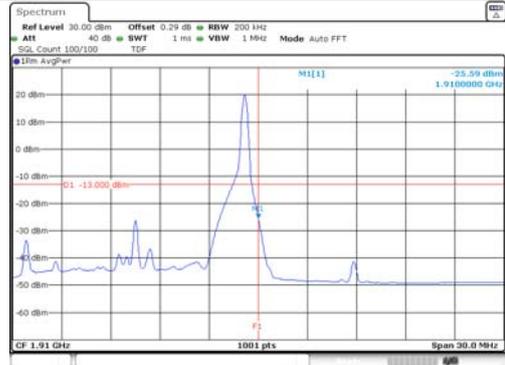
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15M BW QPSK Low ch. 1RB



15M BW QPSK High ch. 1RB



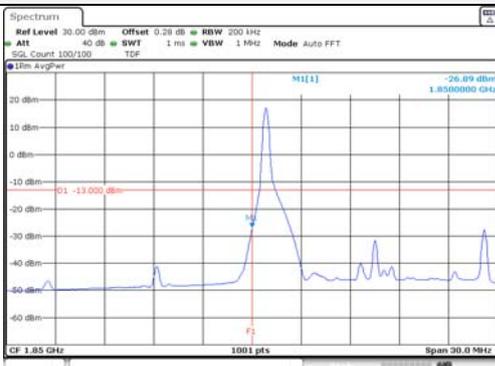
15M BW QPSK Low ch. FRB



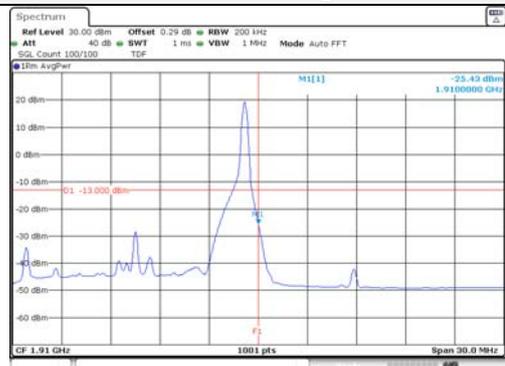
15M BW QPSK High ch. FRB



15M BW 16QAM Low ch. 1RB



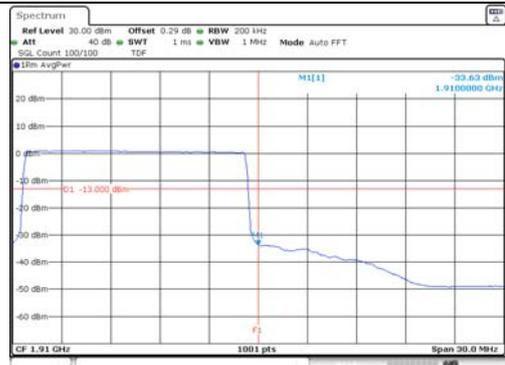
15M BW 16QAM High ch. 1RB



15M BW 16QAM Low ch. FRB



15M BW 16QAM High ch. FRB



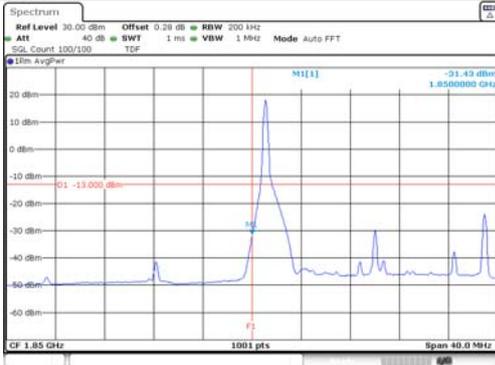
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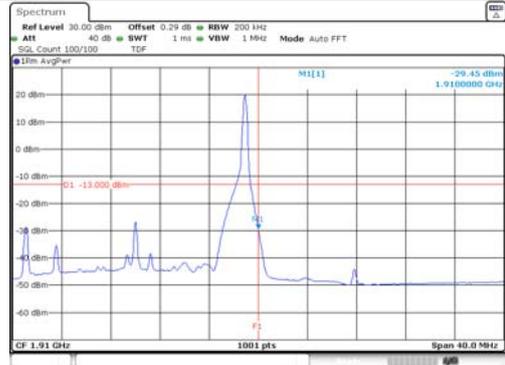
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20M BW QPSK Low ch. 1RB



20M BW QPSK High ch. 1RB



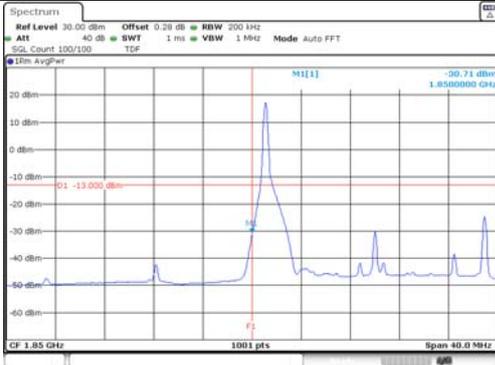
20M BW QPSK Low ch. FRB



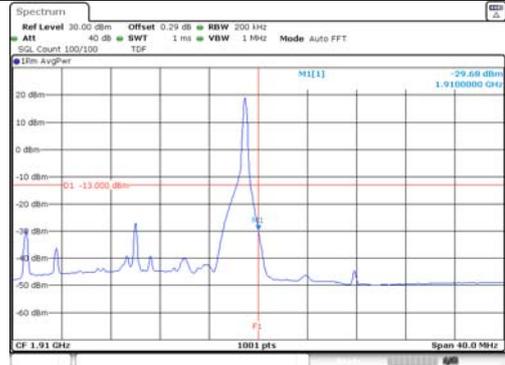
20M BW QPSK High ch. FRB



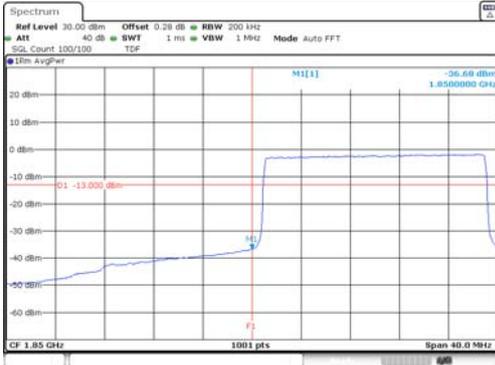
20M BW 16QAM Low ch. 1RB



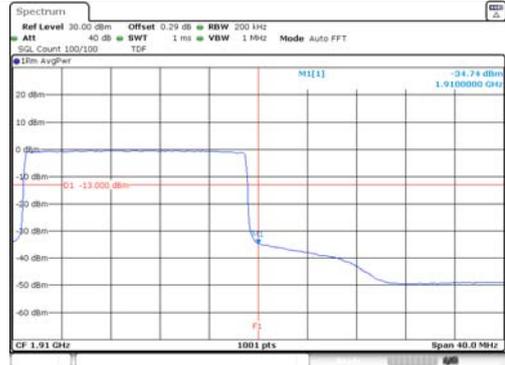
20M BW 16QAM High ch. 1RB



20M BW 16QAM Low ch. FRB



20M BW 16QAM High ch. FRB



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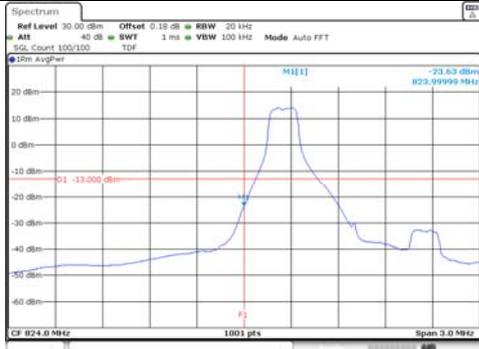
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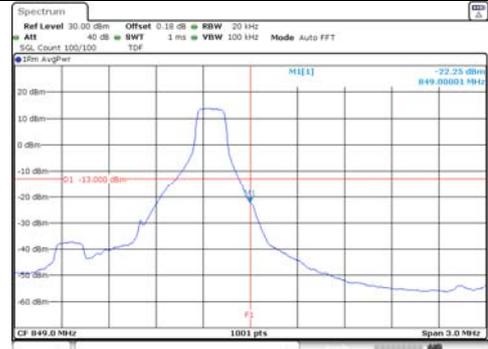


Test mode: LTE Band 5

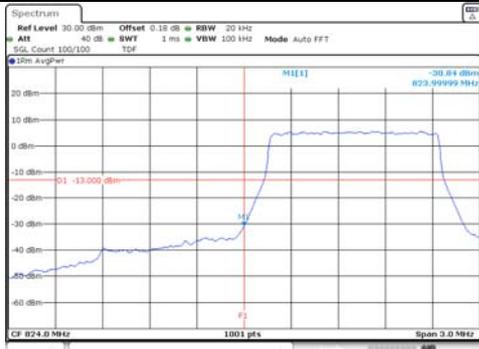
1.4M BW QPSK Low ch. 1RB



1.4M BW QPSK High ch. 1RB



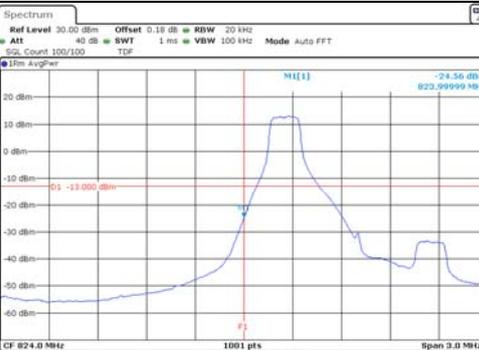
1.4M BW QPSK Low ch. FRB



1.4M BW QPSK High ch. FRB



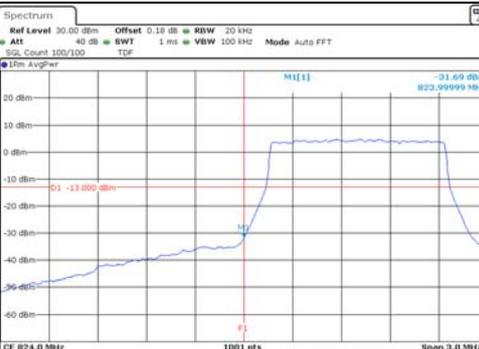
1.4M BW 16QAM Low ch. 1RB



1.4M BW 16QAM High ch. 1RB



1.4M BW 16QAM Low ch. FRB



1.4M BW 16QAM High ch. FRB

