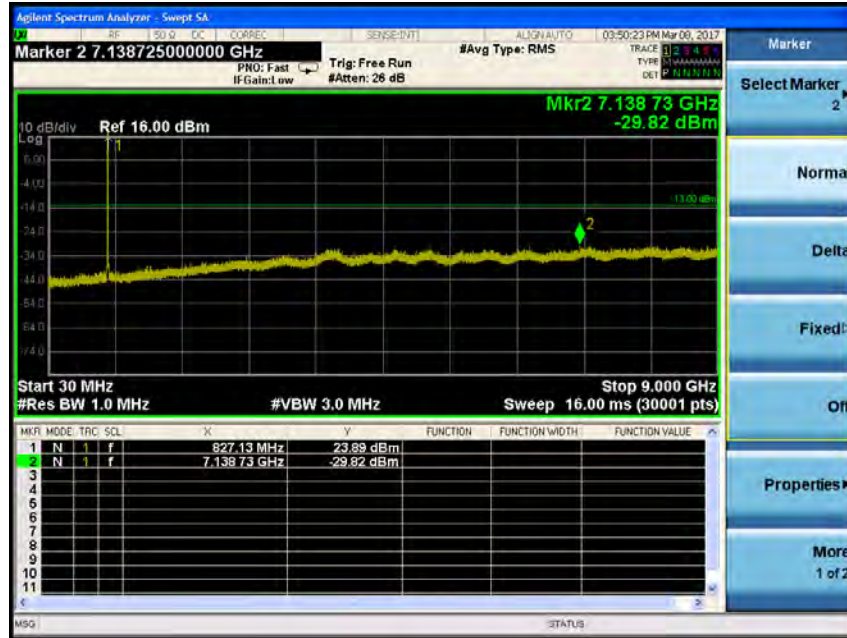


LTE band 5 (3 MHz - QPSK)

Low Channel

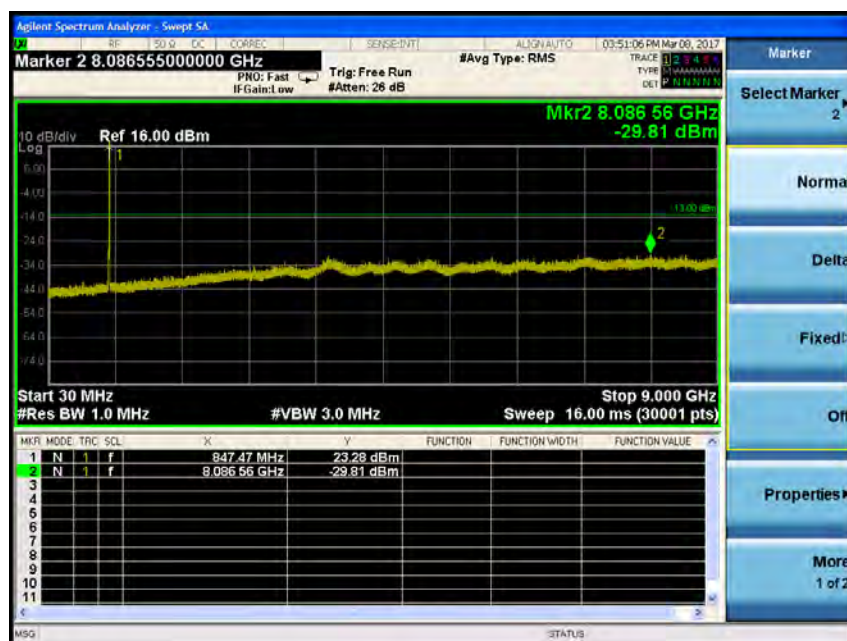


Middle Channel



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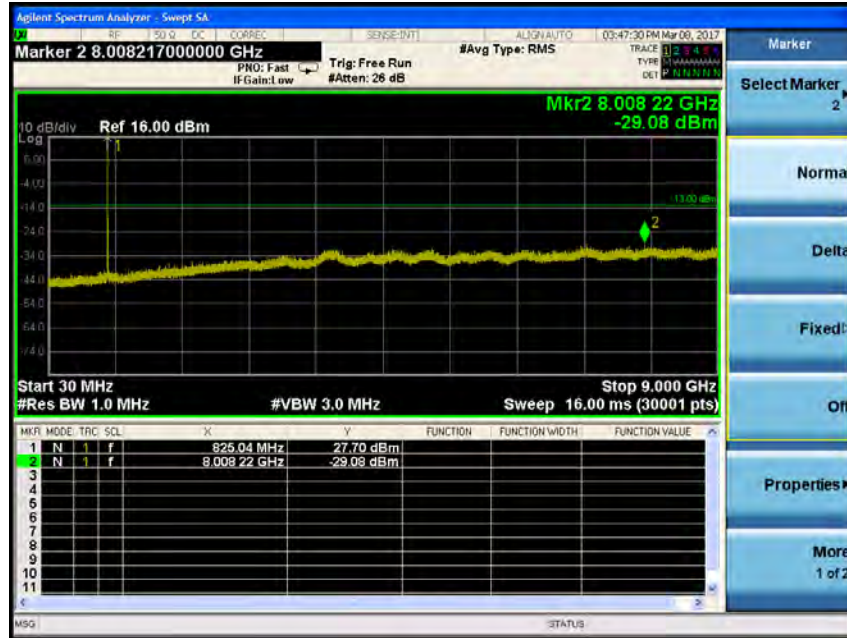
High Channel



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LTE band 5 (5 MHz - QPSK)

Low Channel

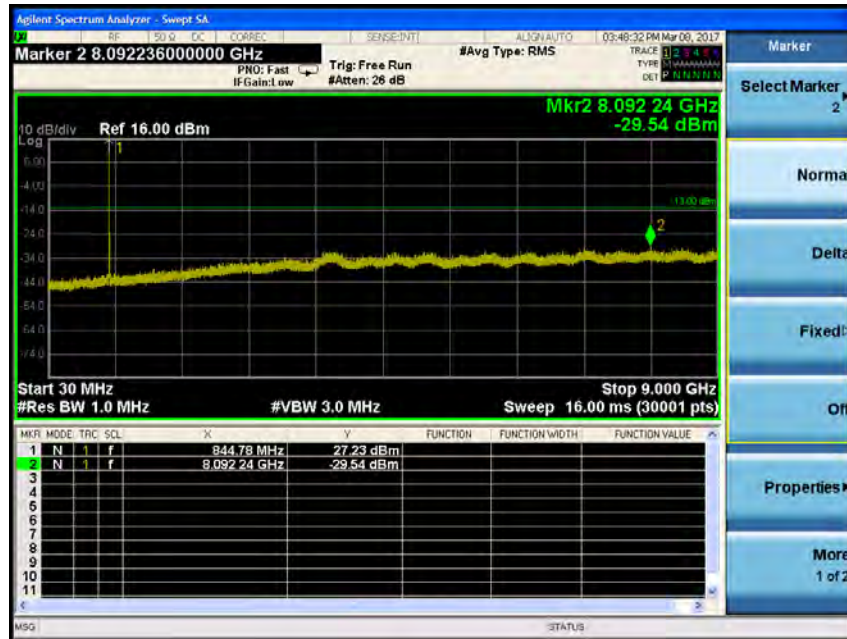


Middle Channel



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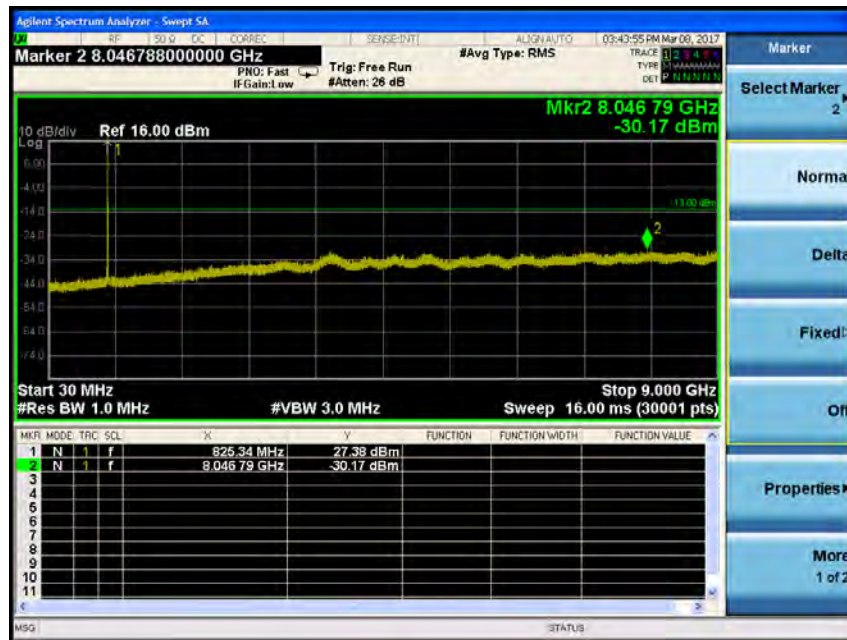
High Channel



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LTE band 5 (10 MHz - QPSK)

Low Channel

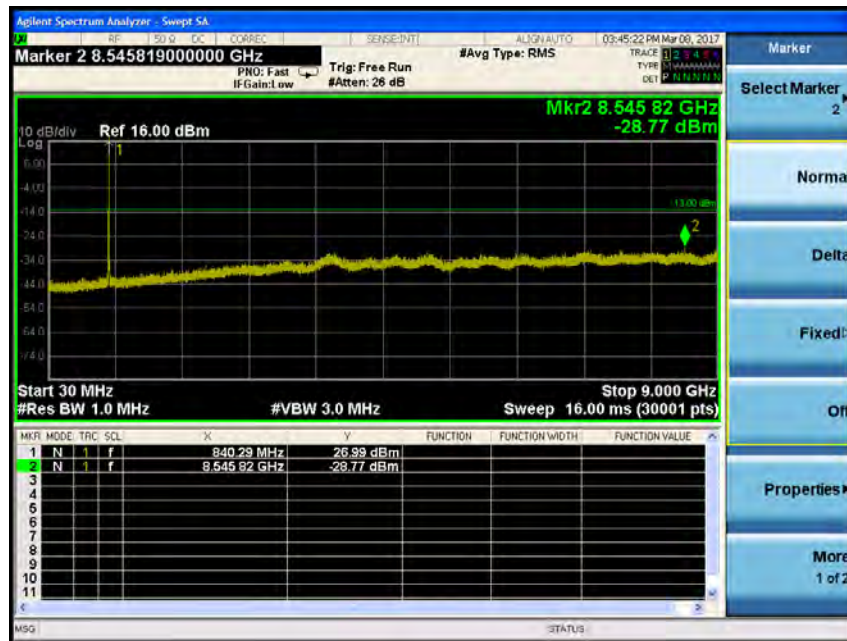


Middle Channel



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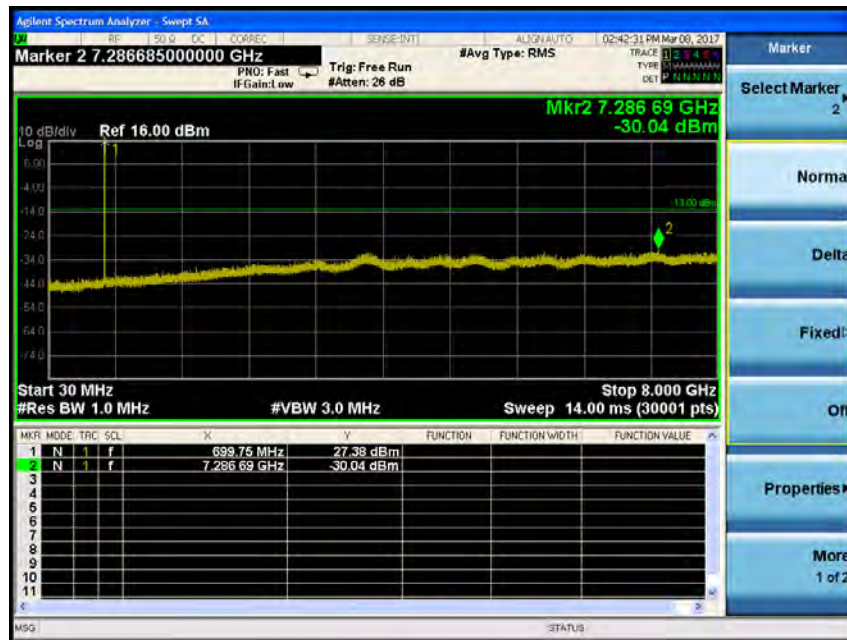
High Channel



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LTE band 12 (1.4 MHz - QPSK)

Low Channel



Middle Channel



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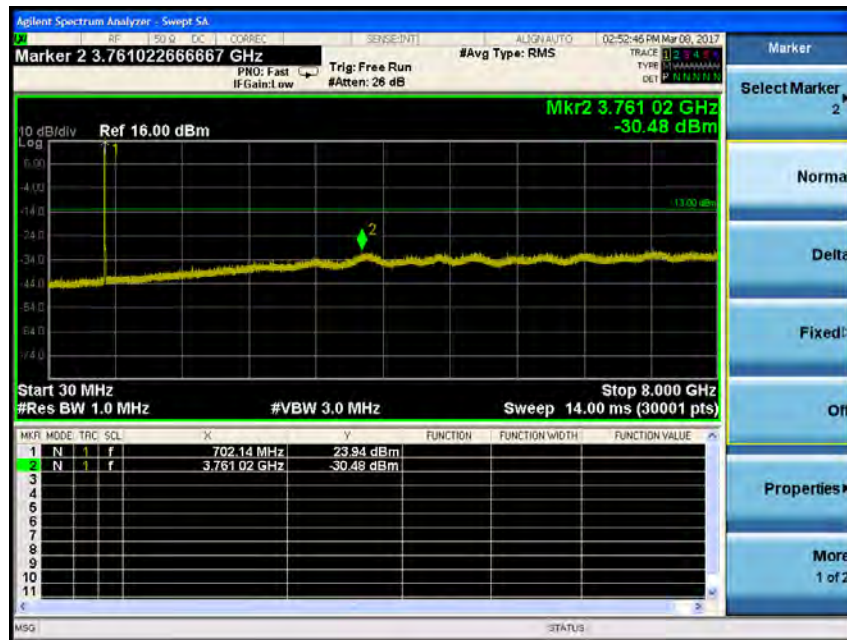
High Channel



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LTE band 12 (3 MHz - QPSK)

Low Channel

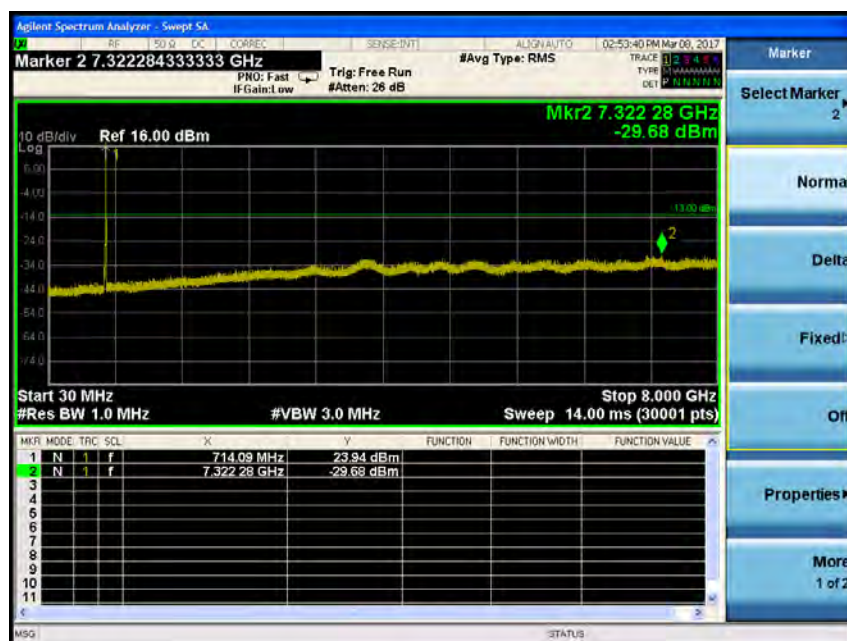


Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

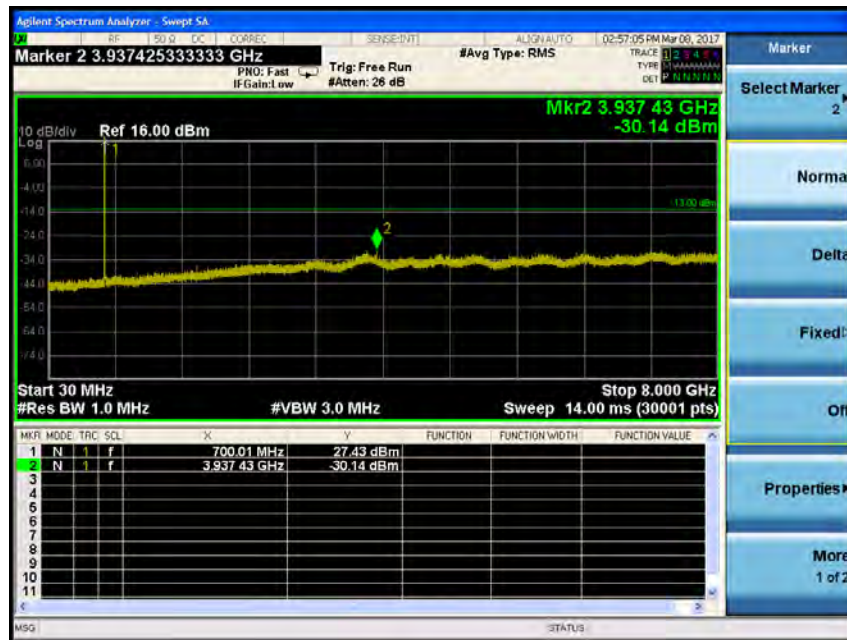
High Channel



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LTE band 12 (5 MHz - QPSK)

Low Channel



Middle Channel



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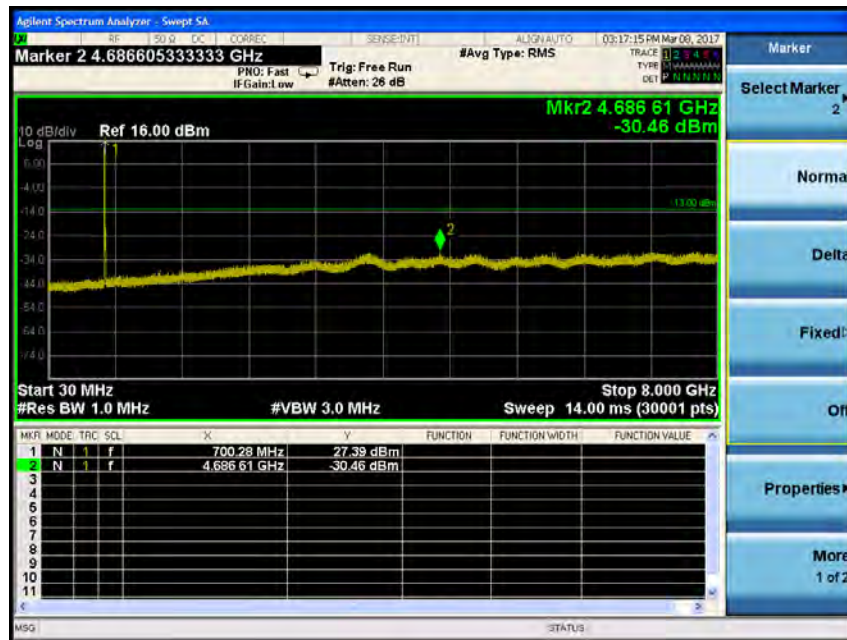
High Channel



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LTE band 12 (10 MHz - QPSK)

Low Channel



Middle Channel



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High Channel



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LTE band 13 (5 MHz - QPSK)

Low Channel

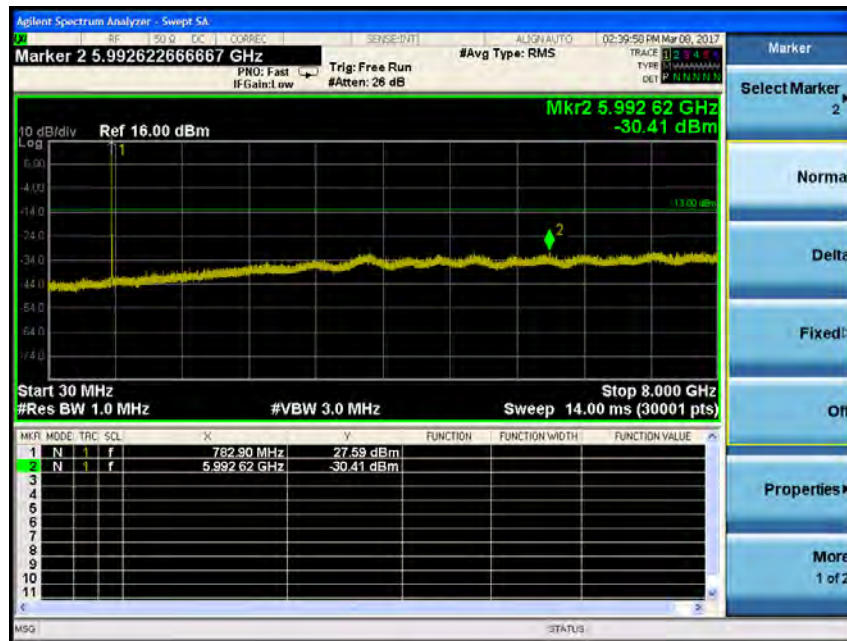


Middle Channel



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High Channel



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LTE band 13 (10 MHz - QPSK)

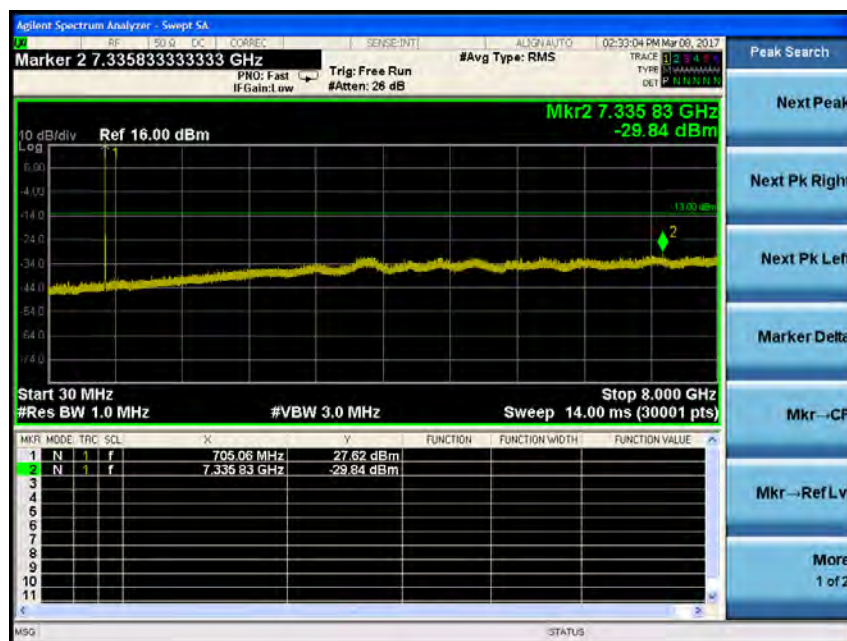
Middle Channel



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LTE band 17 (5 MHz - QPSK)

Low Channel



Middle Channel



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High Channel



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LTE band 17 (10 MHz - QPSK)

Low Channel

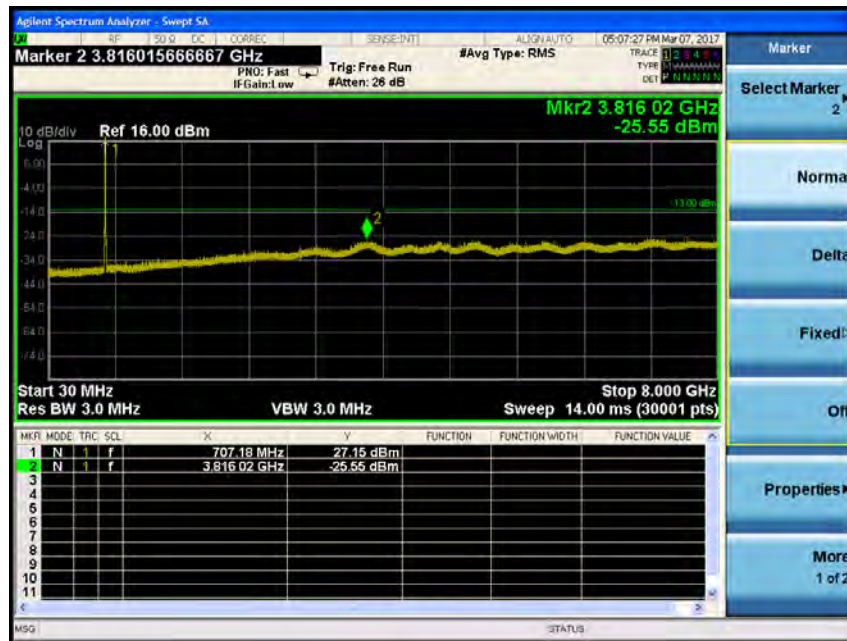


Middle Channel



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High Channel



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7. Band Edge

7.1. Limit

FCC

- §22.917(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 $43 + 10\log(P)$ dB.

- §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 $43 + 10\log(P)$ dB.

- §27.53(c)(2), 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.

- §27.53(g), 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.

- §27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 bands, 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.

IC

- RSS-130 Issue 1

4.6.1, 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 (dB W), by at least $43 + 10\log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

4.6.2, In addition to the limit outlined in Section 4.6.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) 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 (dB W), by at least:

- (i) $76 + 10\log_{10} p$ (watts), dB, for base and fixed equipment, and
- (ii) $65 + 10\log_{10} p$ (watts), dB, for mobile and portable equipment.

(b) The e.i.r.p. in the band 1 559-1 610 MHz shall not exceed -70 dB W/MHz for wideband signal and -80 dB W for discrete emission with bandwidth less than 700 Hz.

- RSS-132 Issue 3

5.5, Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10\log_{10} p$ (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10\log_{10} p$ (watts). If the measurement is performed using 1 % of the occupied bandwidth, power

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integration over 100 kHz is required.

- RSS-133 Issue 6

6.5, Equipment shall comply with the limits in (i) and (ii) below.

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

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10 \log_{10} p(\text{watts})$. If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 MHz is required.

- RSS-139 Issue 3

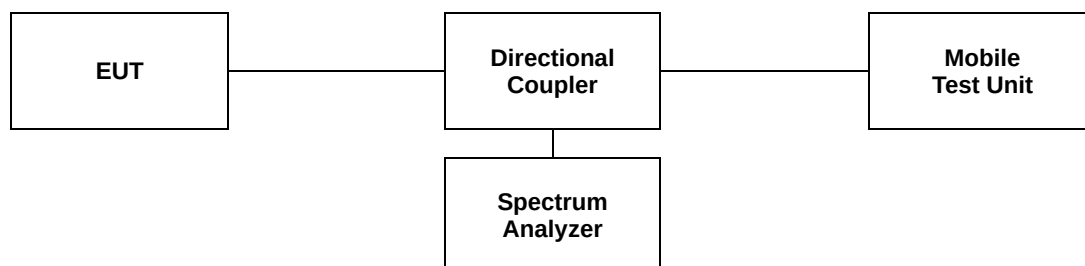
6.6, (i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1 % of the emission bandwidth shall be attenuated below the transmitter output power P (in dB W)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

7.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03.

1. Span was set large enough so as to capture all out of band emissions near the band edge.
2. RBW ≥ 1 % of OBW.
3. VBW $\geq 3 \times$ RBW.
4. Detector = RMS.
5. Trace mode = Average.
6. Sweep time = Auto.
7. The trace was allowed to stabilize.
8. All path loss of frequency range was investigated and compensated to spectrum analyzer as correction factor.



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7.3. Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Please refer to the following plots.

LTE band 2 (1.4 MHz - QPSK_RB 6)

Low Channel



LTE band 2 (1.4 MHz - QPSK_RB 1)

Low Channel

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LTE band 2 (1.4 MHz - QPSK_RB 6)
High Channel



LTE band 2 (1.4 MHz - QPSK_RB 1)
High Channel

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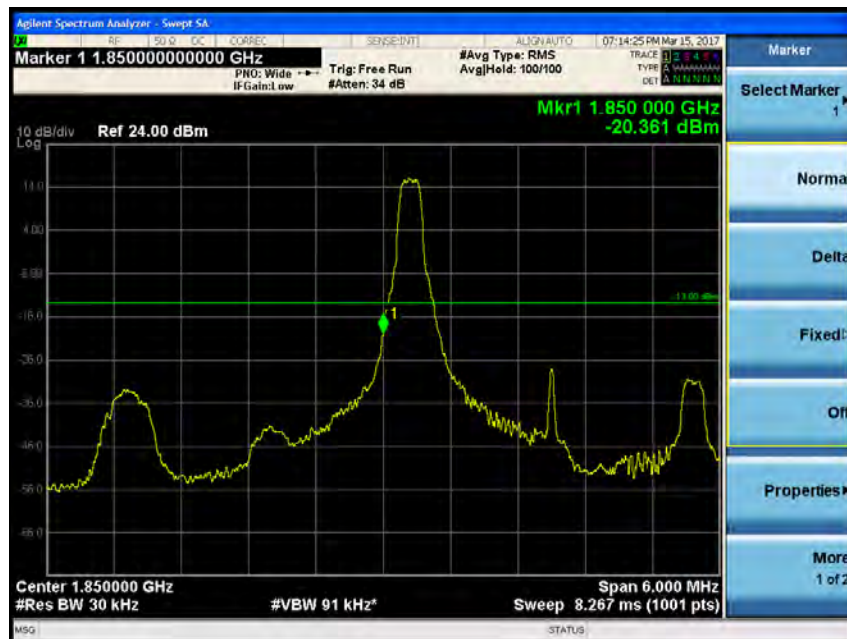
LTE band 2 (3 MHz - QPSK_RB 15)

Low Channel



LTE band 2 (3 MHz - QPSK_RB 1)

Low Channel



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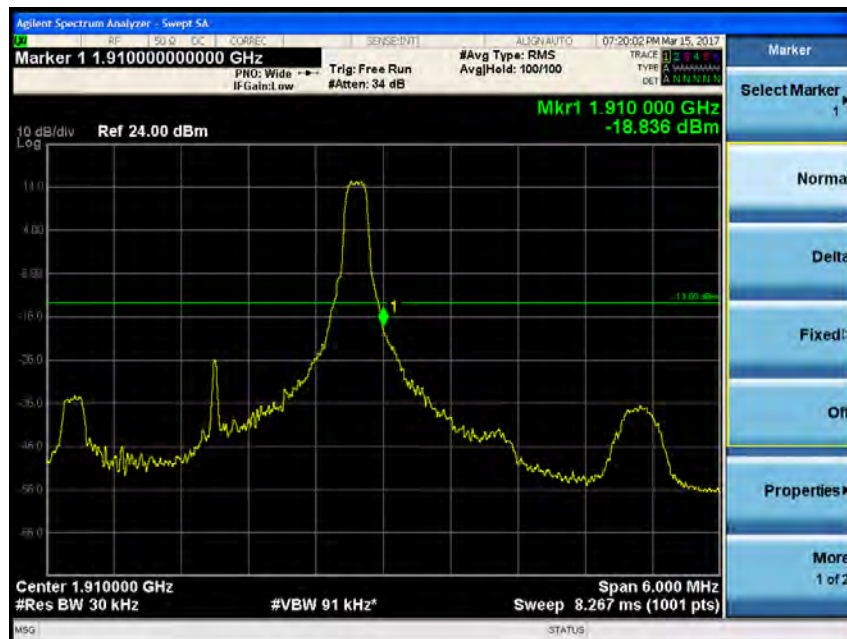
LTE band 2 (3 MHz - QPSK_RB 15)

High Channel



LTE band 2 (3 MHz - QPSK_RB 1)

High Channel



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LTE band 2 (5 MHz - QPSK_RB 25)

Low Channel



LTE band 2 (5 MHz - QPSK_RB 1)

Low Channel



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LTE band 2 (5 MHz - QPSK_RB 25)

High Channel



LTE band 2 (5 MHz - QPSK_RB 1)

High Channel



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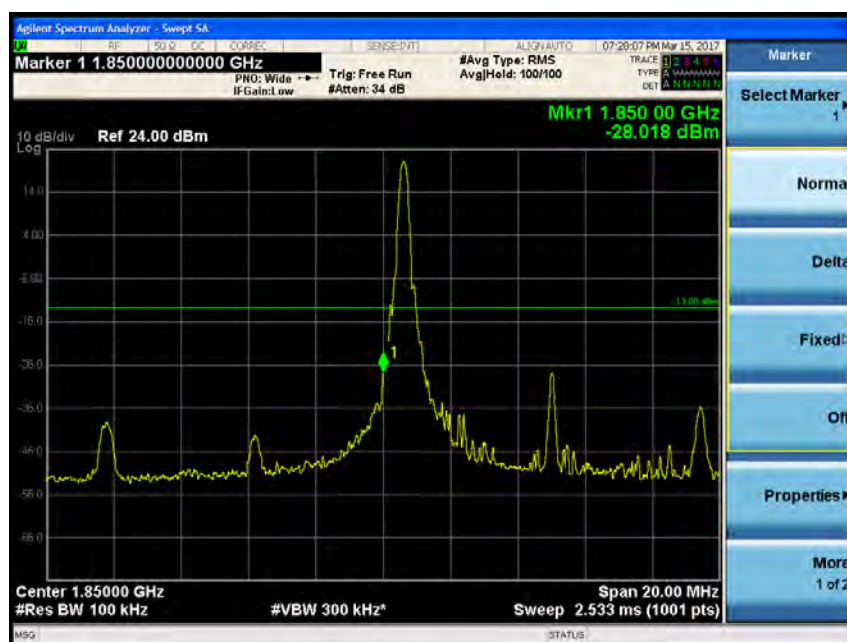
LTE band 2 (10 MHz - QPSK_RB 50)

Low Channel



LTE band 2 (10 MHz - QPSK_RB 1)

Low Channel

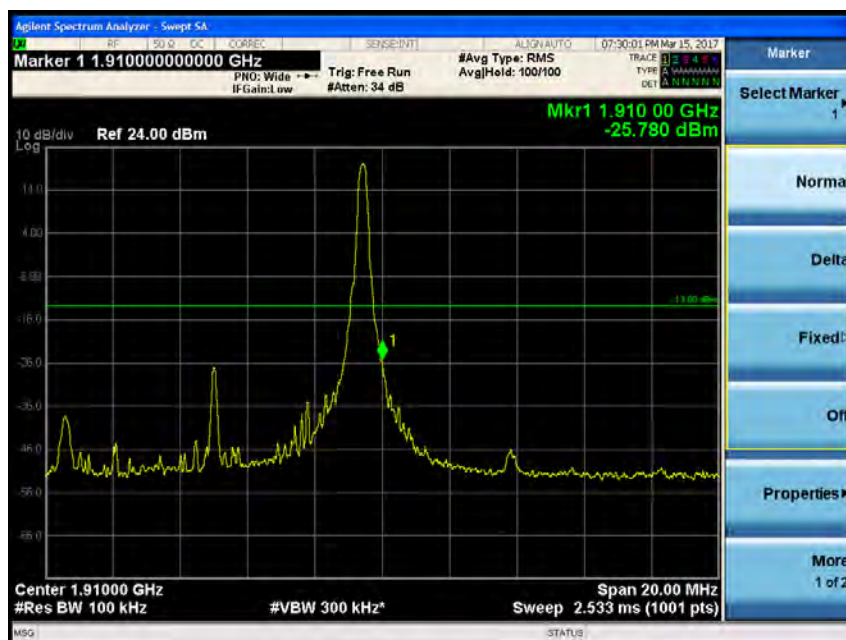


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

LTE band 2 (10 MHz - QPSK_RB 50) High Channel



LTE band 2 (10 MHz - QPSK_RB 1) High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

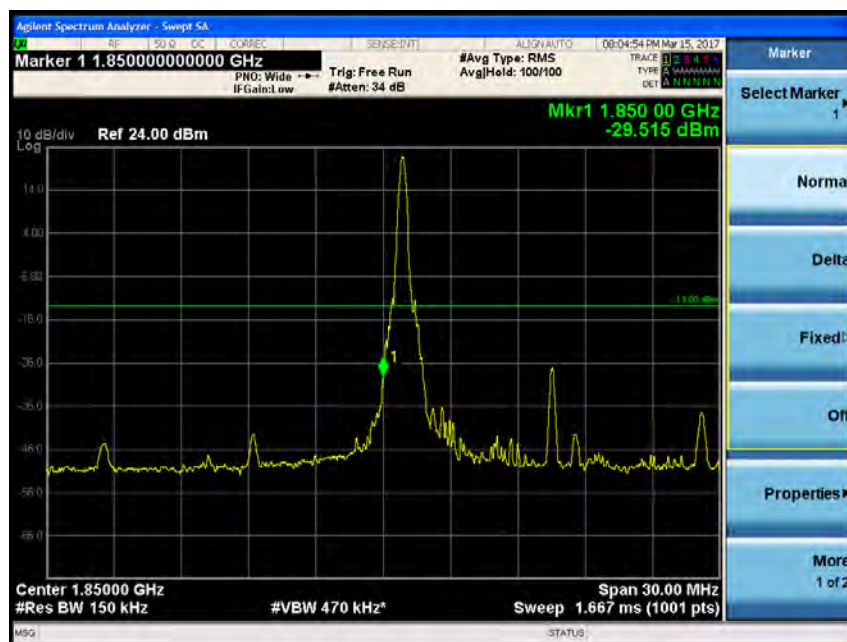
LTE band 2 (15 MHz - QPSK_RB 75)

Low Channel



LTE band 2 (15 MHz - QPSK_RB 1)

Low Channel



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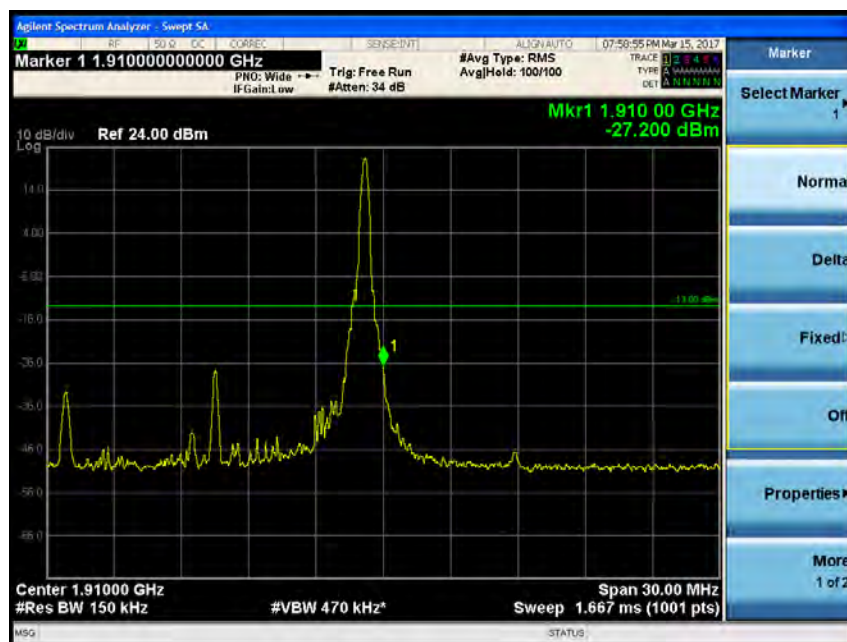
LTE band 2 (15 MHz - QPSK_RB 75)

High Channel



LTE band 2 (15 MHz - QPSK_RB 1)

High Channel

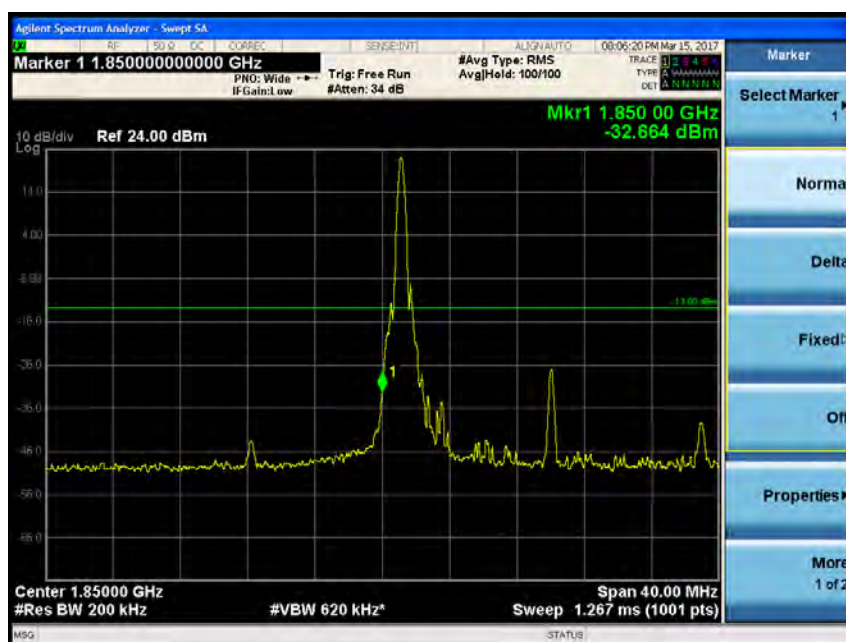


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

LTE band 2 (20 MHz - QPSK_RB 100) Low Channel



LTE band 2 (20 MHz - QPSK_RB 1) Low Channel

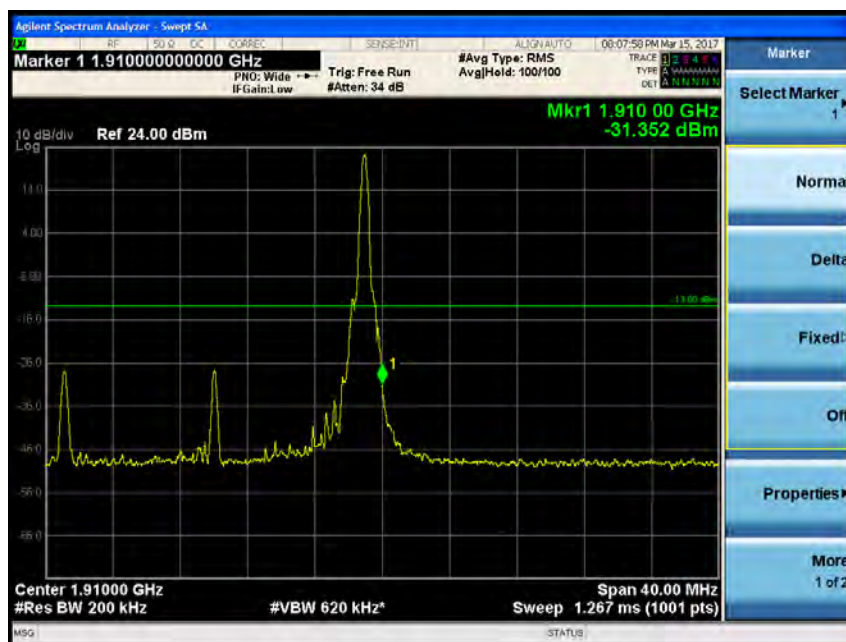


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LTE band 2 (20 MHz - QPSK_RB 100) High Channel



LTE band 2 (20 MHz - QPSK_RB 1) High Channel



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LTE band 4 (1.4 MHz - QPSK_RB 6)

Low Channel



LTE band 4 (1.4 MHz - QPSK_RB 1)

Low Channel



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LTE band 4 (1.4 MHz - QPSK_RB 6)

High Channel



LTE band 4 (1.4 MHz - QPSK_RB 1)

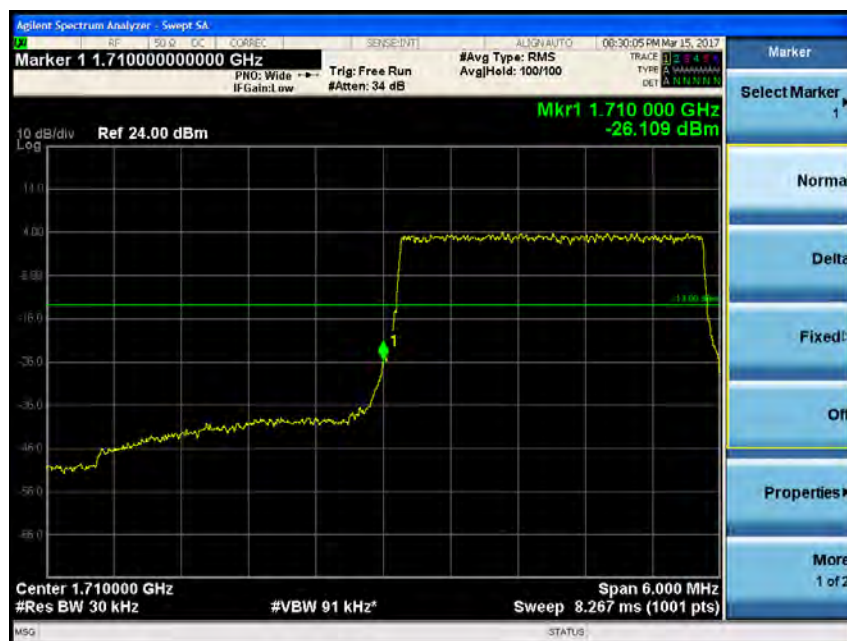
High Channel



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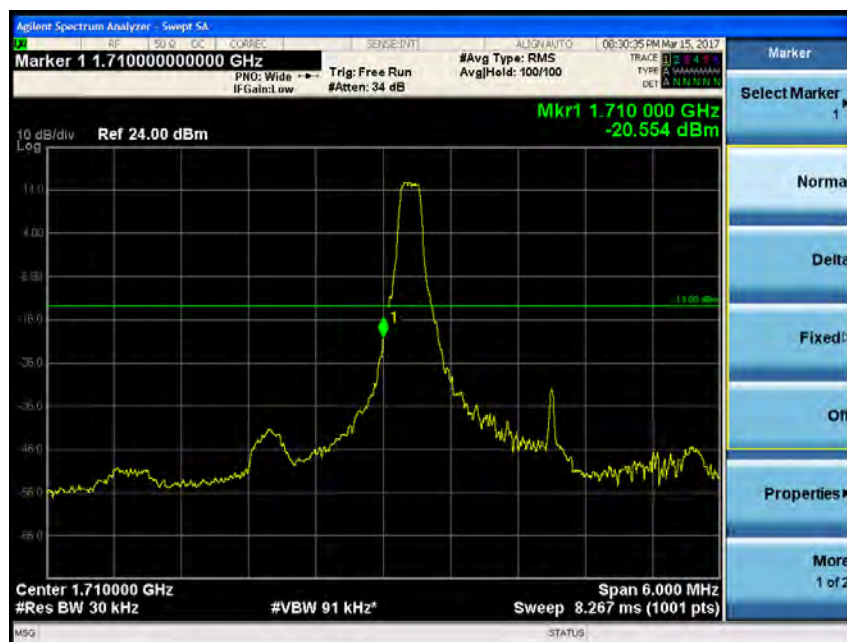
LTE band 4 (3 MHz - QPSK_RB 15)

Low Channel



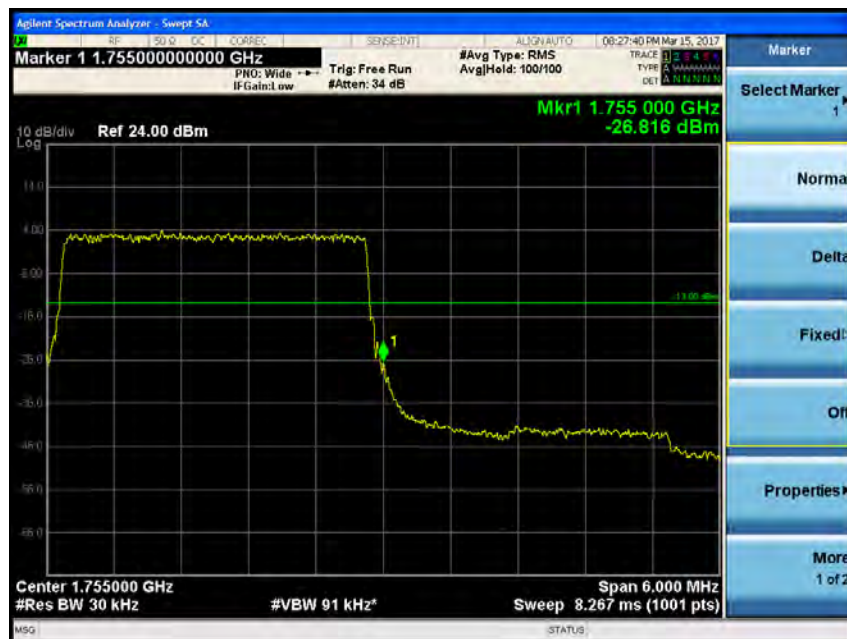
LTE band 4 (3 MHz - QPSK_RB 1)

Low Channel

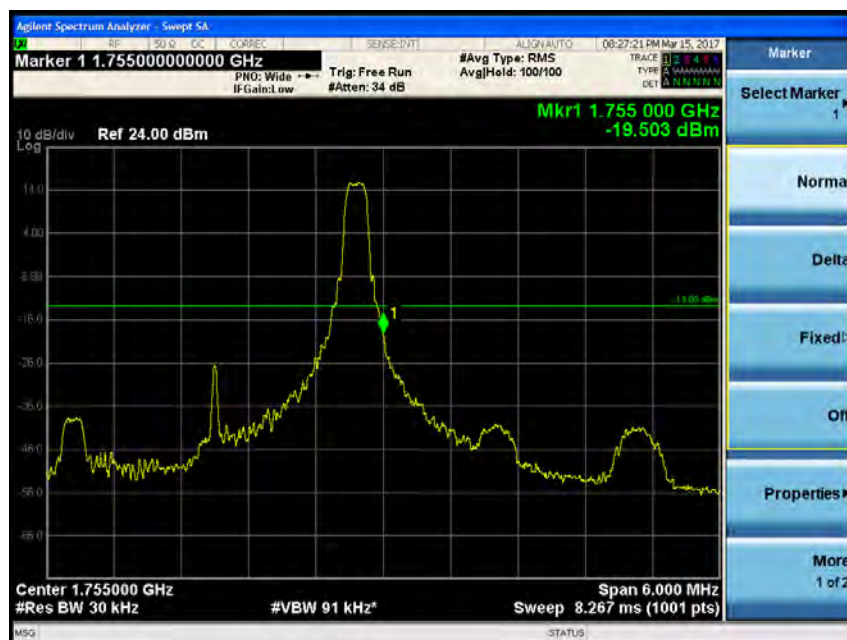


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LTE band 4 (3 MHz - QPSK_RB 15) High Channel



LTE band 4 (3 MHz - QPSK_RB 1) High Channel



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LTE band 4 (5 MHz - QPSK_RB 25)

Low Channel



LTE band 4 (5 MHz - QPSK_RB 1)

Low Channel

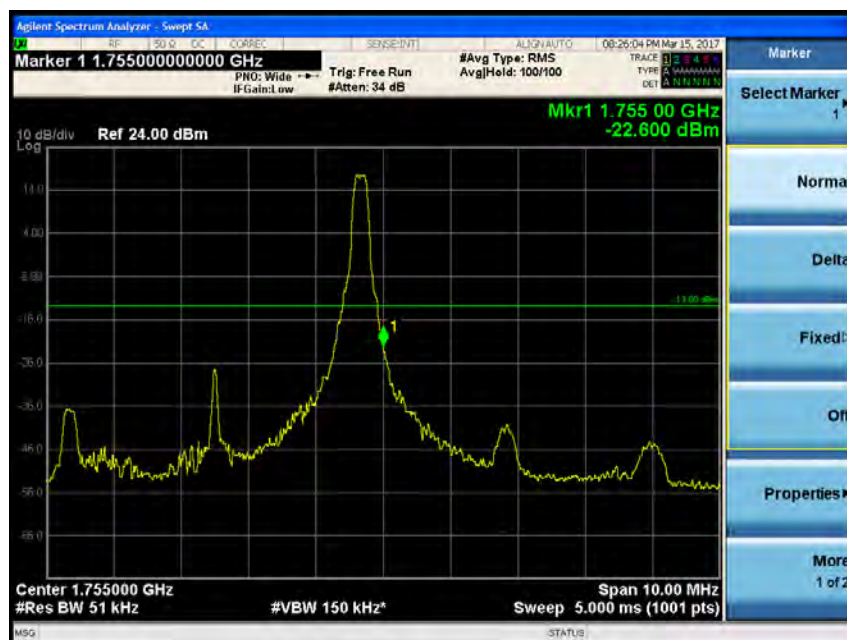


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

LTE band 4 (5 MHz - QPSK_RB 25) High Channel



LTE band 4 (5 MHz - QPSK_RB 1) High Channel



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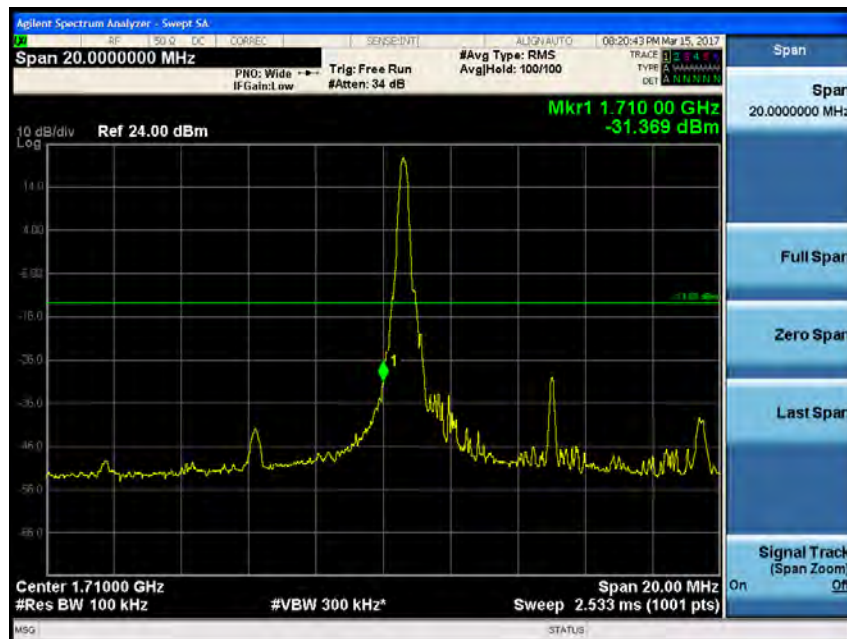
LTE band 4 (10 MHz - QPSK_RB 50)

Low Channel



LTE band 4 (10 MHz - QPSK_RB 1)

Low Channel

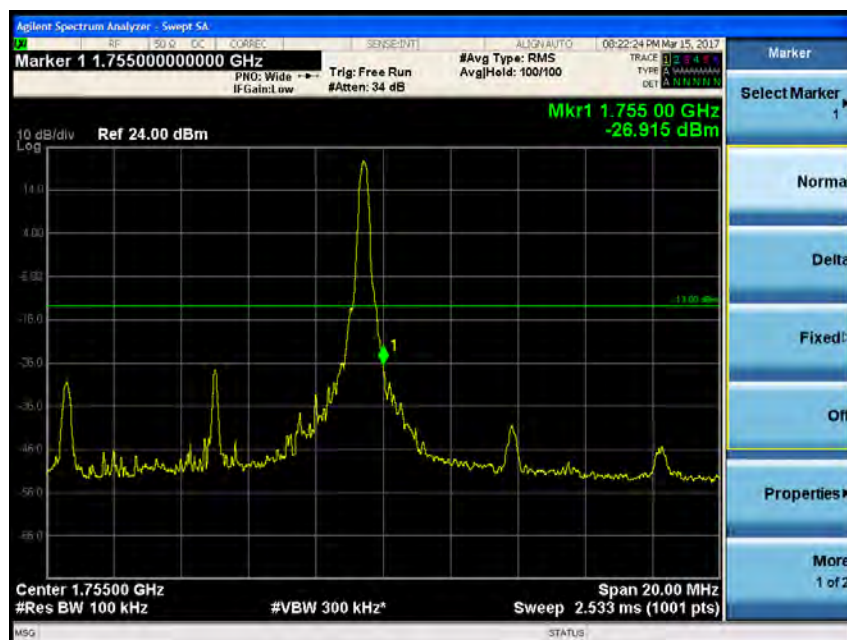


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LTE band 4 (10 MHz - QPSK_RB 50) High Channel



LTE band 4 (10 MHz - QPSK_RB 1) High Channel



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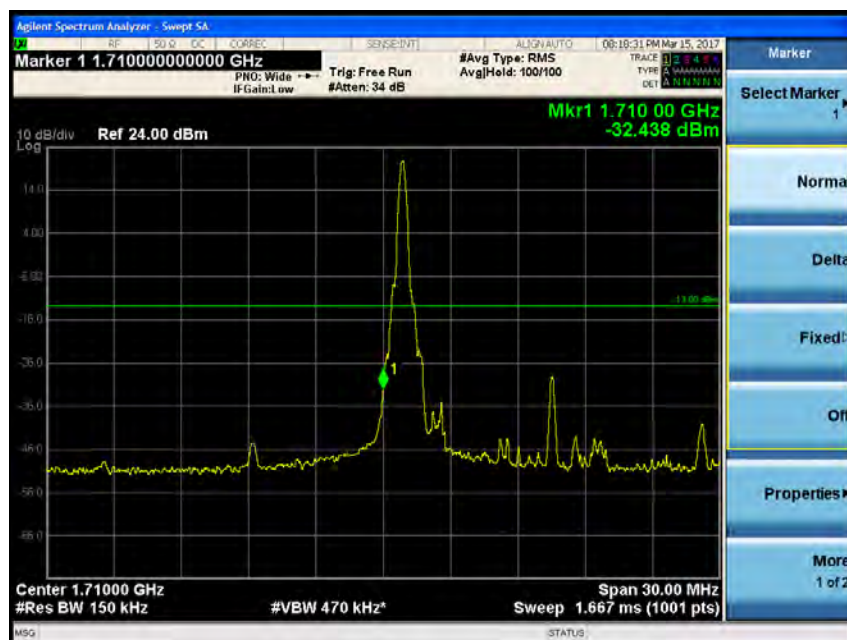
LTE band 4 (15 MHz - QPSK_RB 75)

Low Channel



LTE band 4 (15 MHz - QPSK_RB 1)

Low Channel



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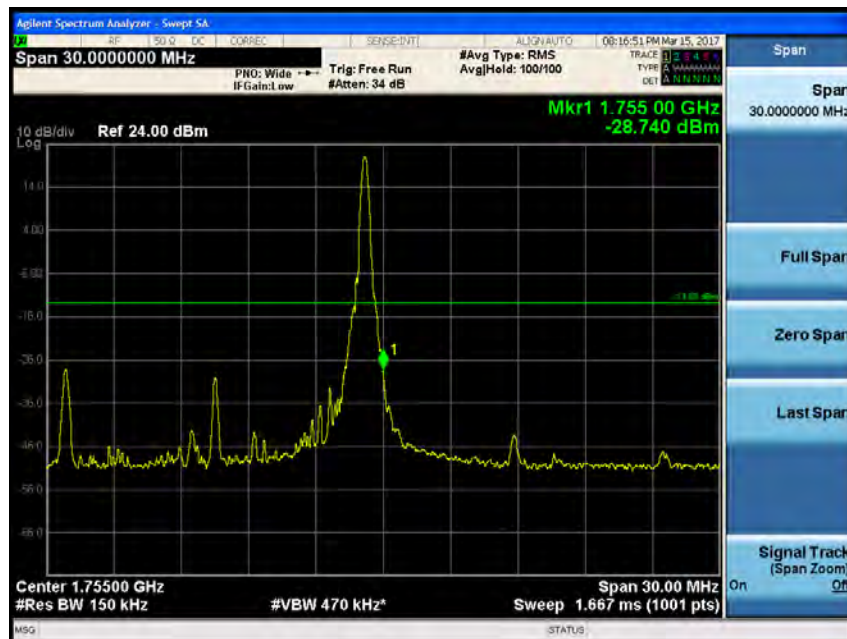
LTE band 4 (15 MHz - QPSK_RB 75)

High Channel



LTE band 4 (15 MHz - QPSK_RB 1)

High Channel

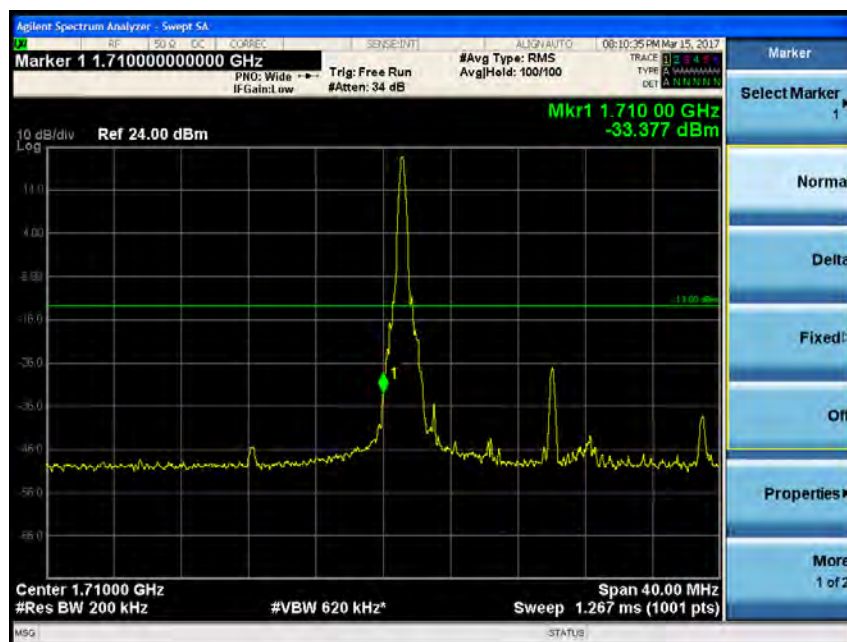


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LTE band 4 (20 MHz - QPSK_RB 100) Low Channel



LTE band 4 (20 MHz - QPSK_RB 1) Low Channel

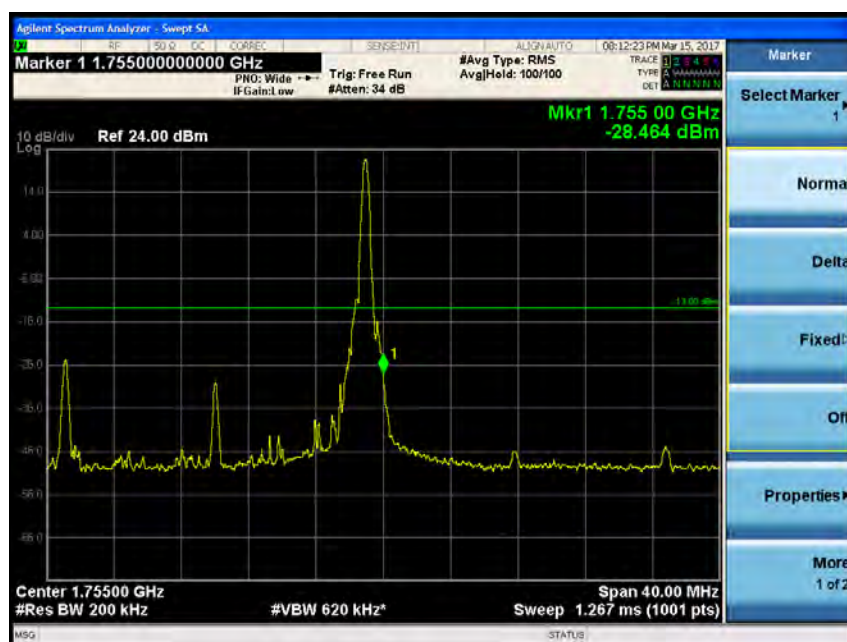


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LTE band 4 (20 MHz - QPSK_RB 100) High Channel



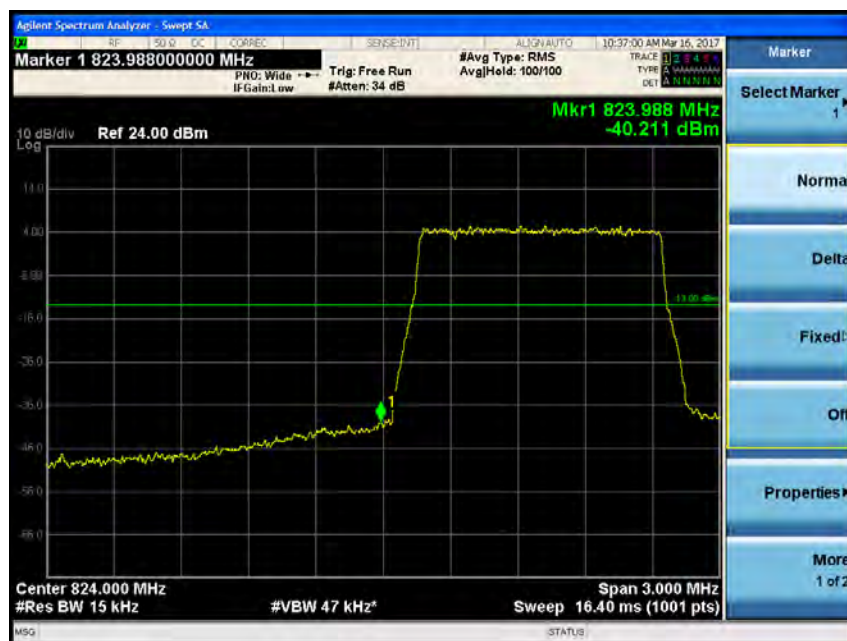
LTE band 4 (20 MHz - QPSK_RB 1) High Channel



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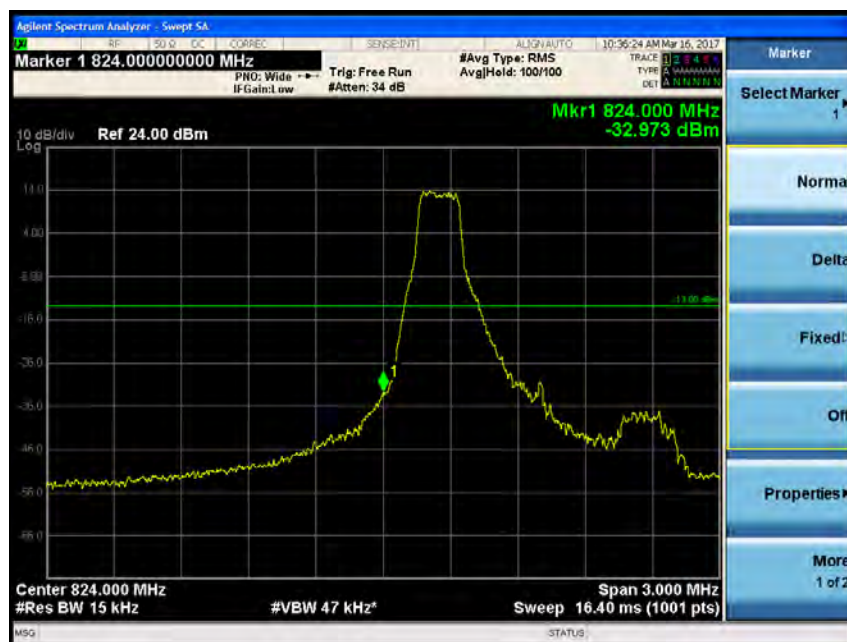
LTE band 5 (1.4 MHz - QPSK_RB 6)

Low Channel



LTE band 5 (1.4 MHz - QPSK_RB 1)

Low Channel



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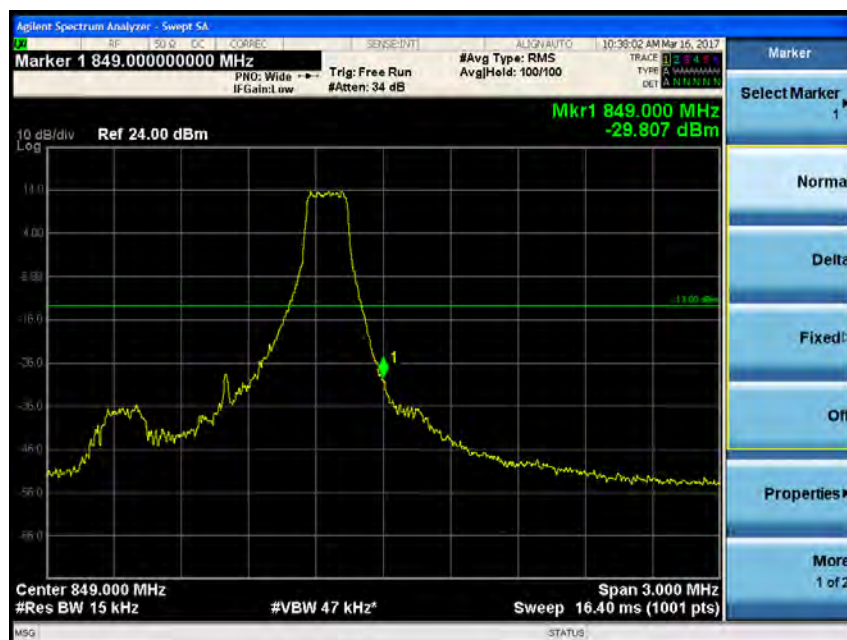
LTE band 5 (1.4 MHz - QPSK_RB 6)

High Channel



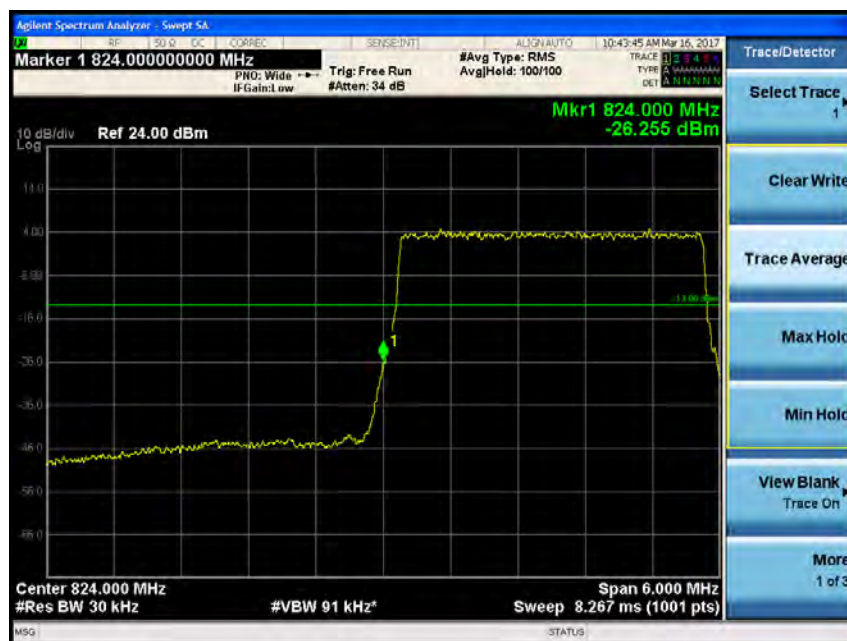
LTE band 5 (1.4 MHz - QPSK_RB 1)

High Channel

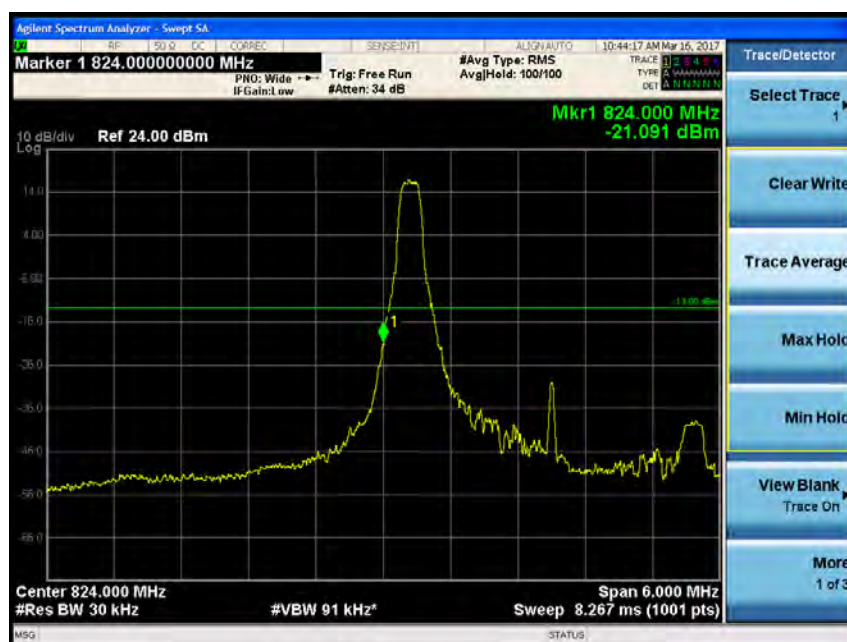


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LTE band 5 (3 MHz - QPSK_RB 15) Low Channel



LTE band 5 (3 MHz - QPSK_RB 1) Low Channel



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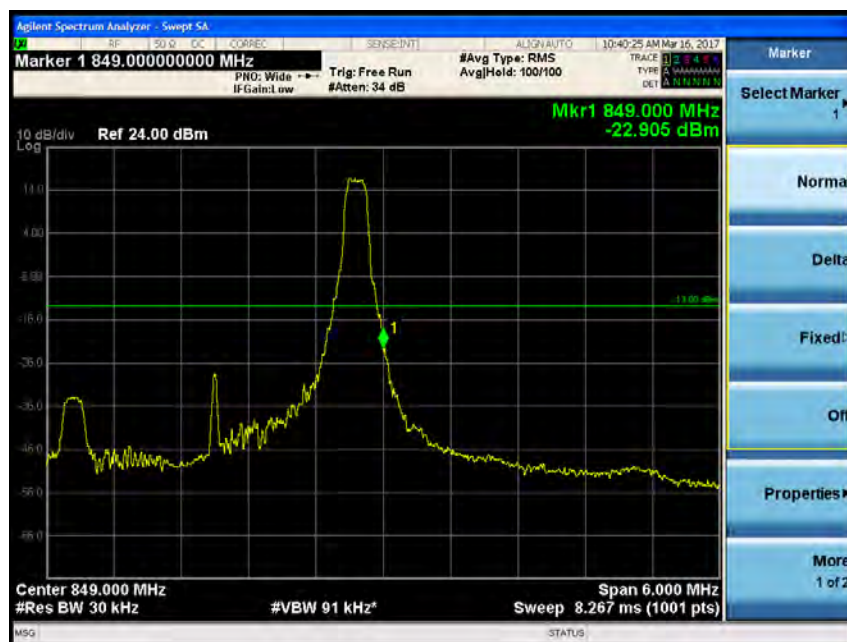
LTE band 5 (3 MHz - QPSK_RB 15)

High Channel



LTE band 5 (3 MHz - QPSK_RB 1)

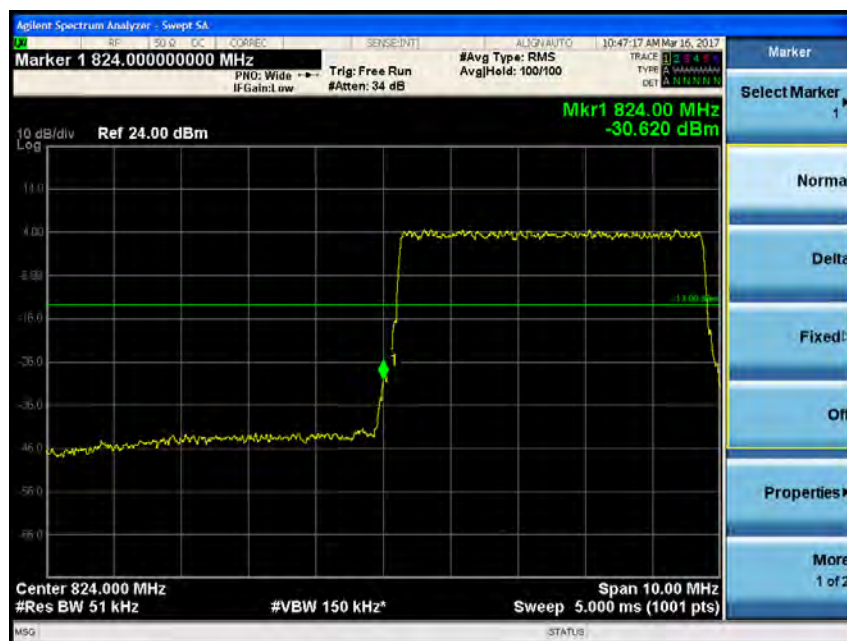
High Channel



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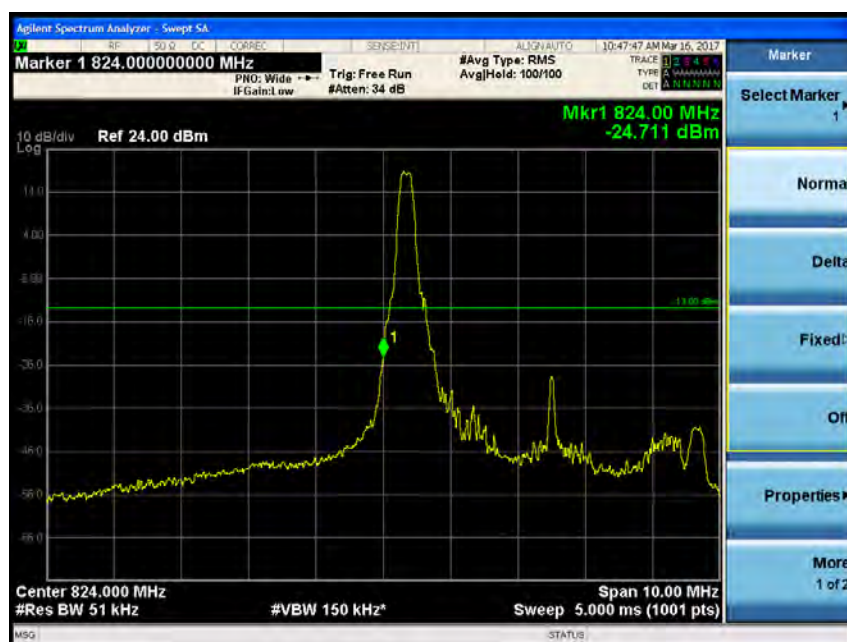
LTE band 5 (5 MHz - QPSK_RB 25)

Low Channel



LTE band 5 (5 MHz - QPSK_RB 1)

Low Channel



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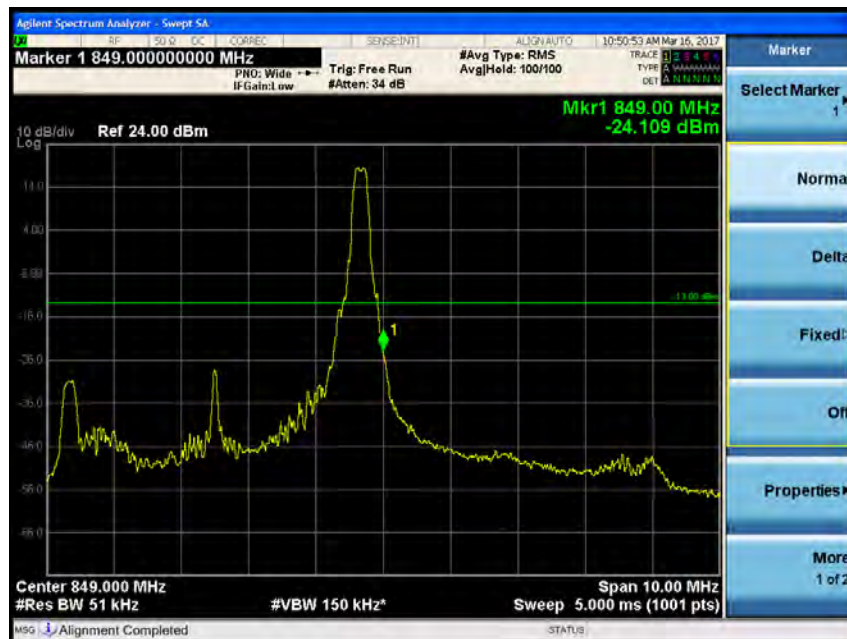
LTE band 5 (5 MHz - QPSK_RB 25)

High Channel



LTE band 5 (5 MHz - QPSK_RB 1)

High Channel

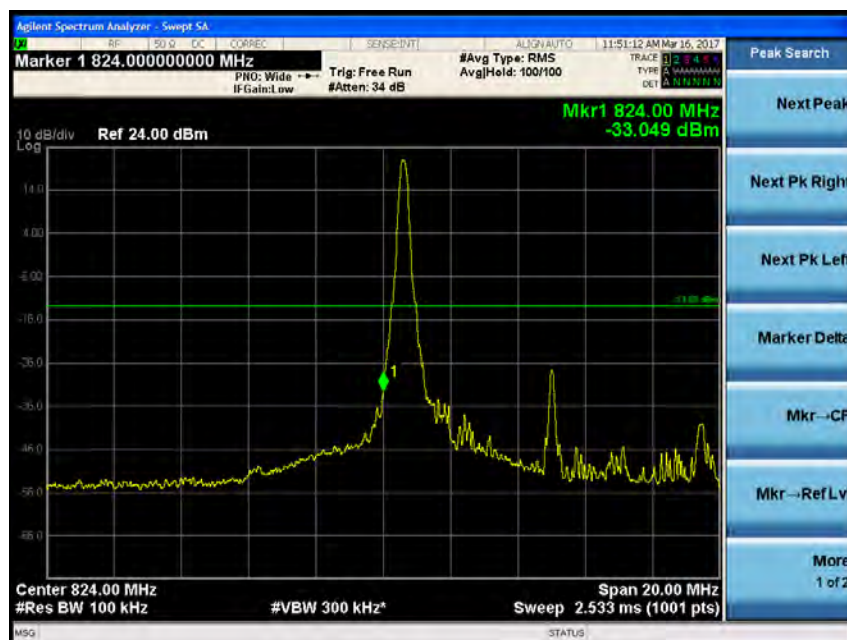


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

LTE band 5 (10 MHz - QPSK_RB 50) Low Channel



LTE band 5 (10 MHz - QPSK_RB 1) Low Channel



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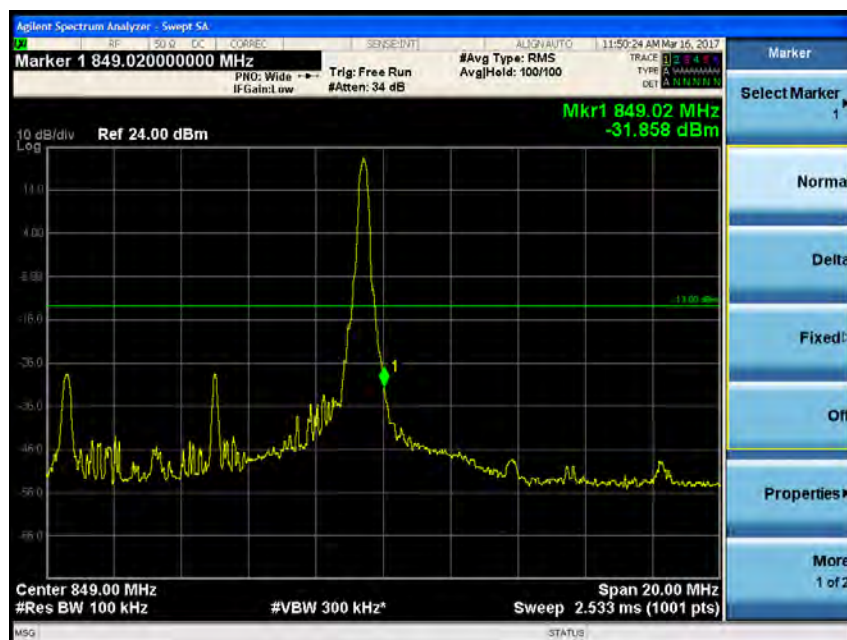
LTE band 5 (10 MHz - QPSK_RB 50)

High Channel



LTE band 5 (10 MHz - QPSK_RB 1)

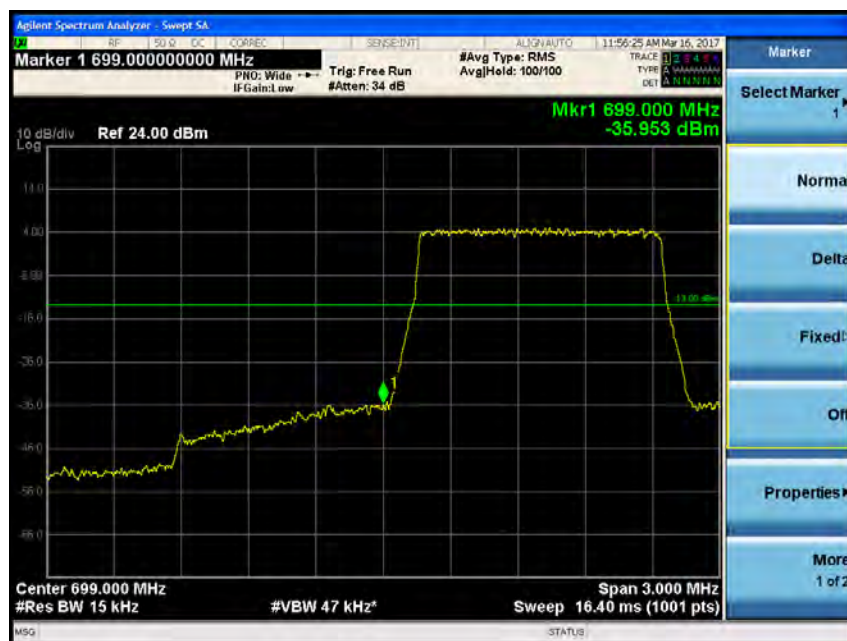
High Channel



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LTE band 12 (1.4 MHz - QPSK_RB 6)

Low Channel



LTE band 12 (1.4 MHz - QPSK_RB 1)

Low Channel



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LTE band 12 (1.4 MHz - QPSK_RB 6)

High Channel



LTE band 12 (1.4 MHz - QPSK_RB 1)

High Channel



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LTE band 12 (3 MHz - QPSK_RB 15)

Low Channel



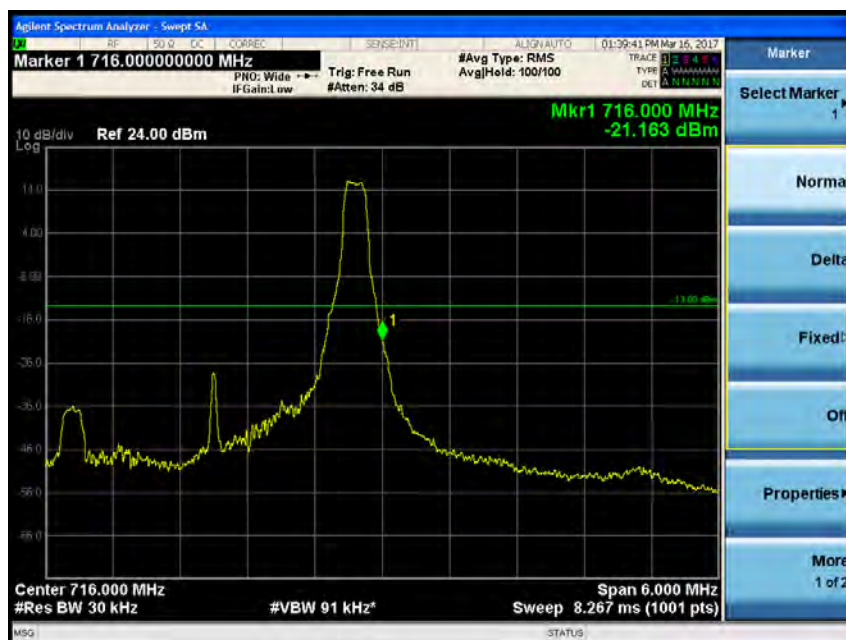
LTE band 12 (3 MHz - QPSK_RB 15)

High Channel



LTE band 12 (3 MHz - QPSK_RB 1)

High Channel

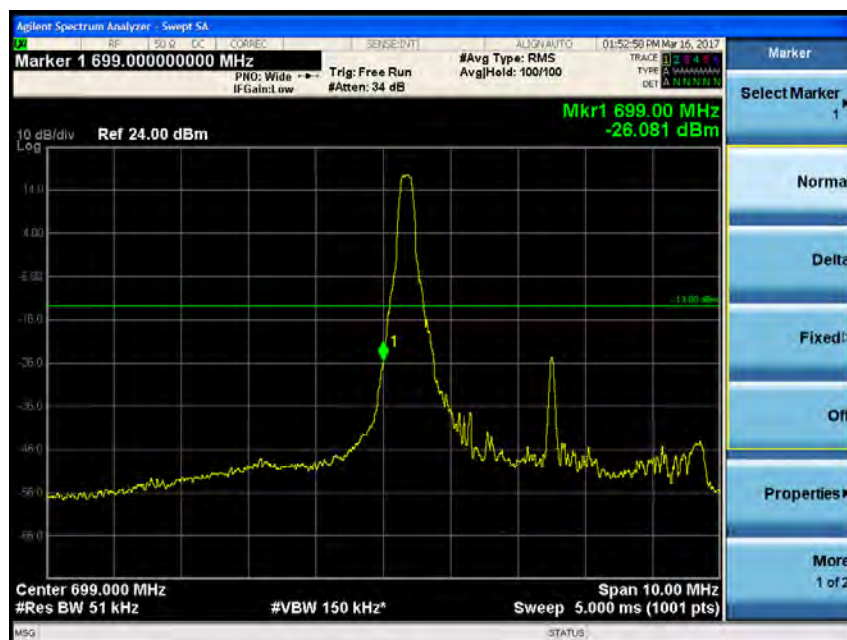


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LTE band 12 (5 MHz - QPSK_RB 25) Low Channel



LTE band 12 (5 MHz - QPSK_RB 1) Low Channel

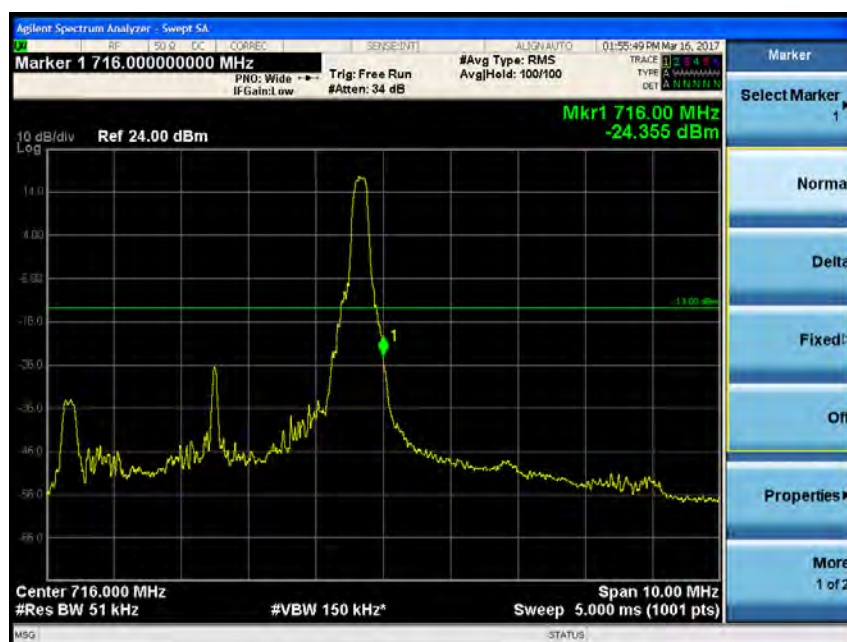


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LTE band 12 (5 MHz - QPSK_RB 25) High Channel



LTE band 12 (5 MHz - QPSK_RB 1) High Channel

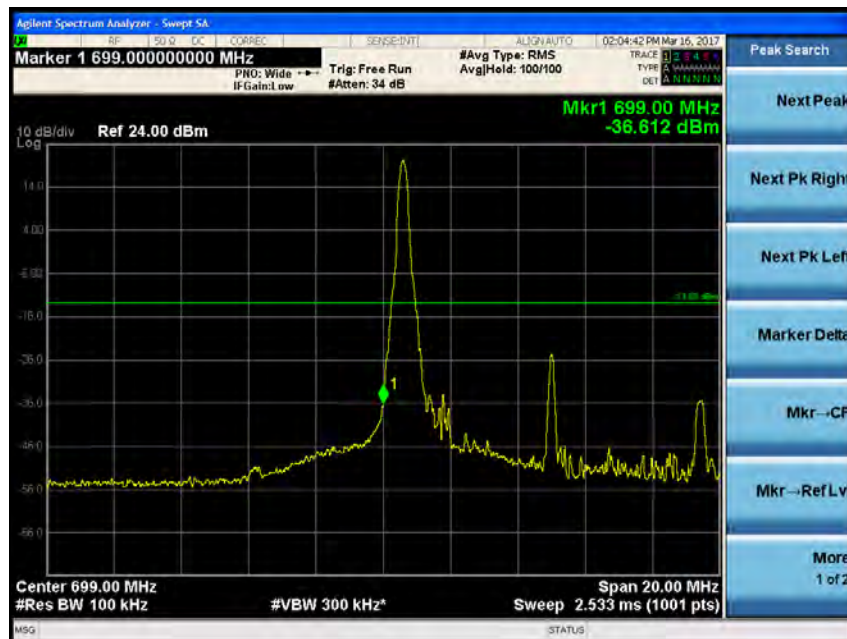


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

LTE band 12 (10 MHz - QPSK_RB 50) Low Channel



LTE band 12 (10 MHz - QPSK_RB 1) Low Channel



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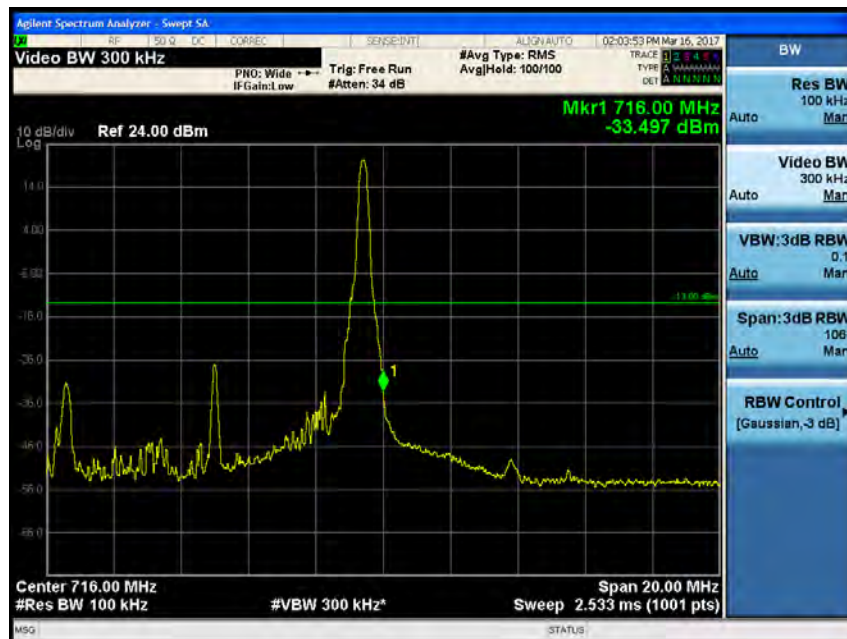
LTE band 12 (10 MHz - QPSK_RB 50)

High Channel



LTE band 12 (10 MHz - QPSK_RB 1)

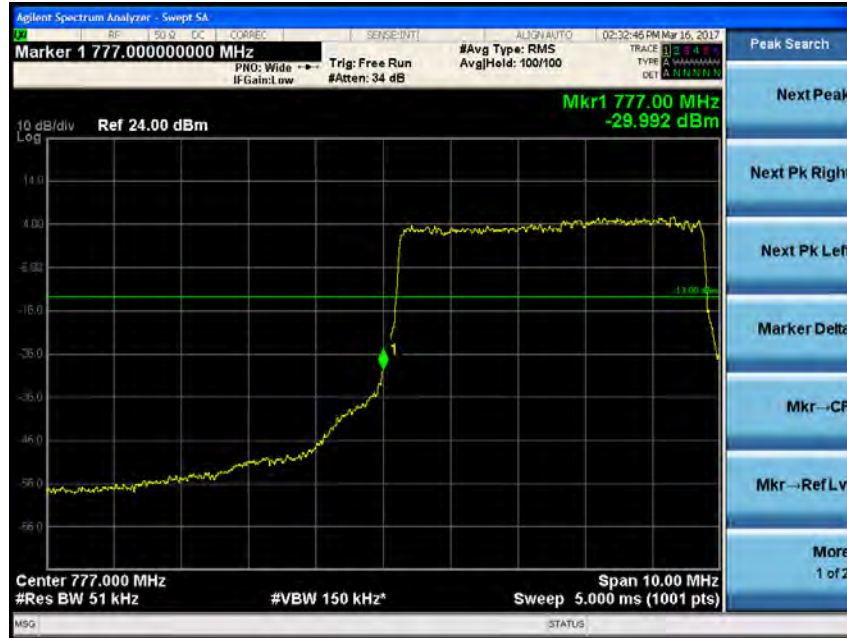
High Channel



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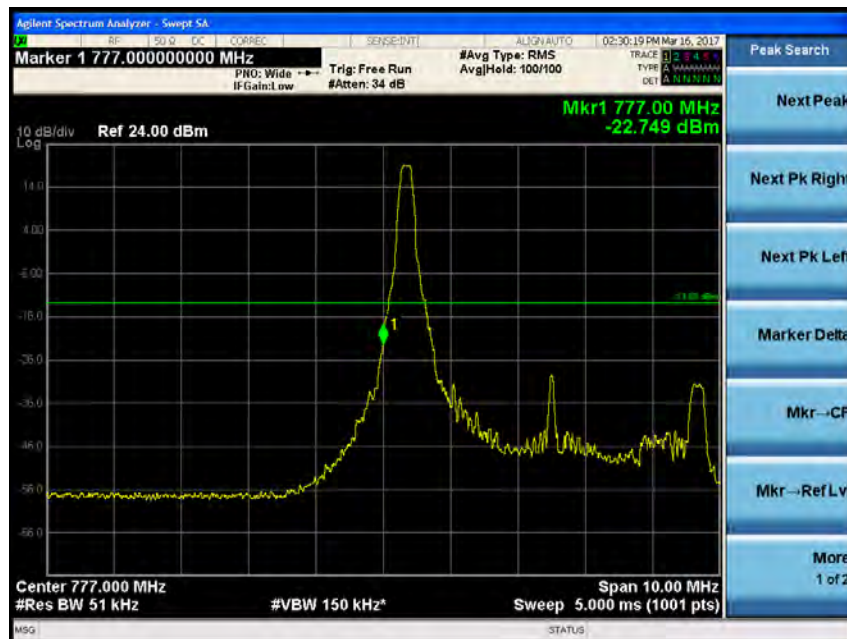
LTE band 13 (5 MHz - QPSK_RB 25)

Low Channel



LTE band 13 (5 MHz - QPSK_RB 1)

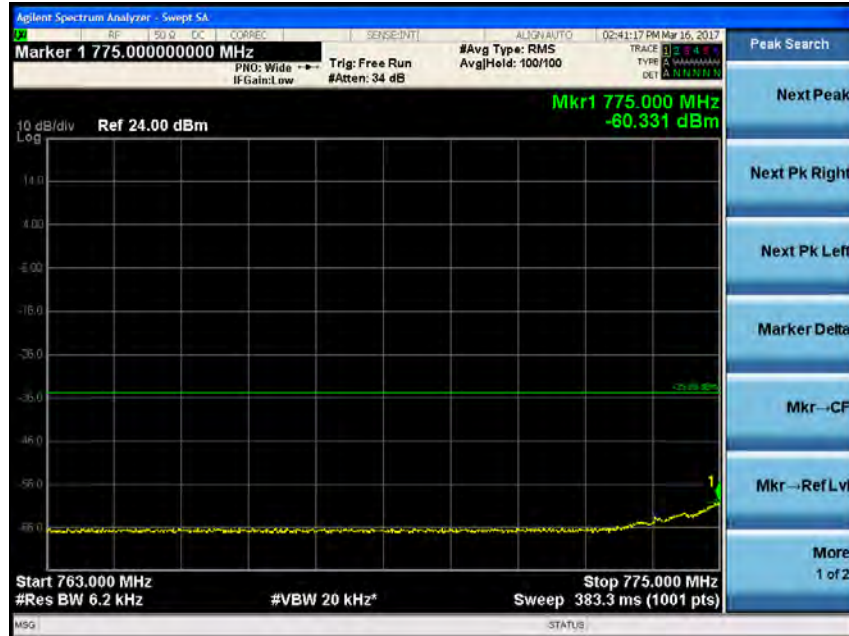
Low Channel



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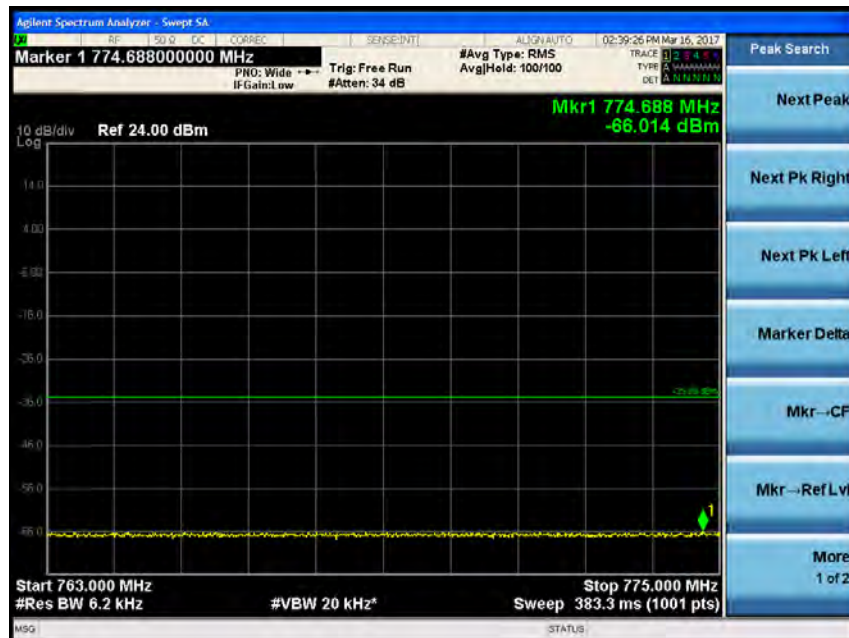
LTE band 13 (5 MHz - QPSK_RB 25)

Low Channel (763-775 MHz)



LTE band 13 (5 MHz - QPSK_RB 1)

Low Channel (763-775 MHz)



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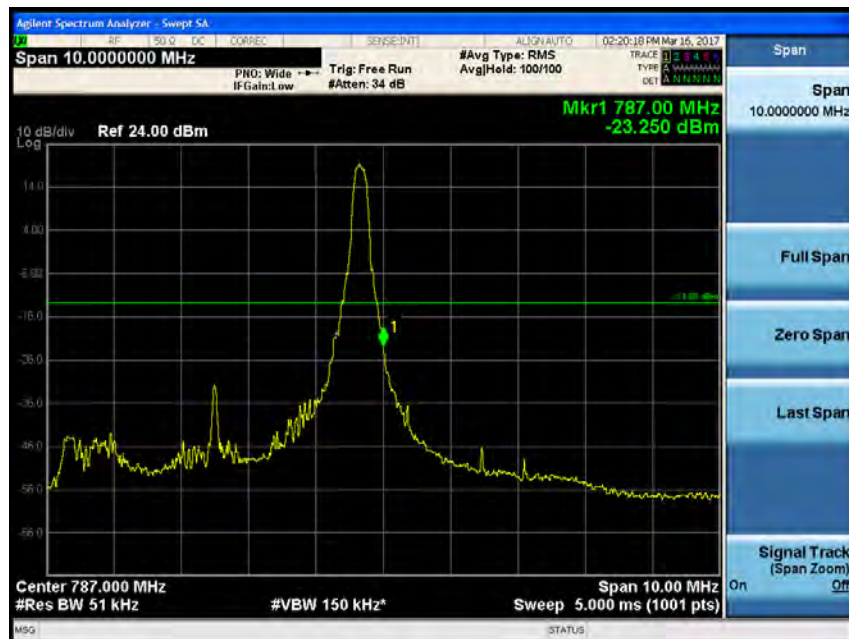
LTE band 13 (5 MHz - QPSK_RB 25)

High Channel



LTE band 13 (5 MHz - QPSK_RB 1)

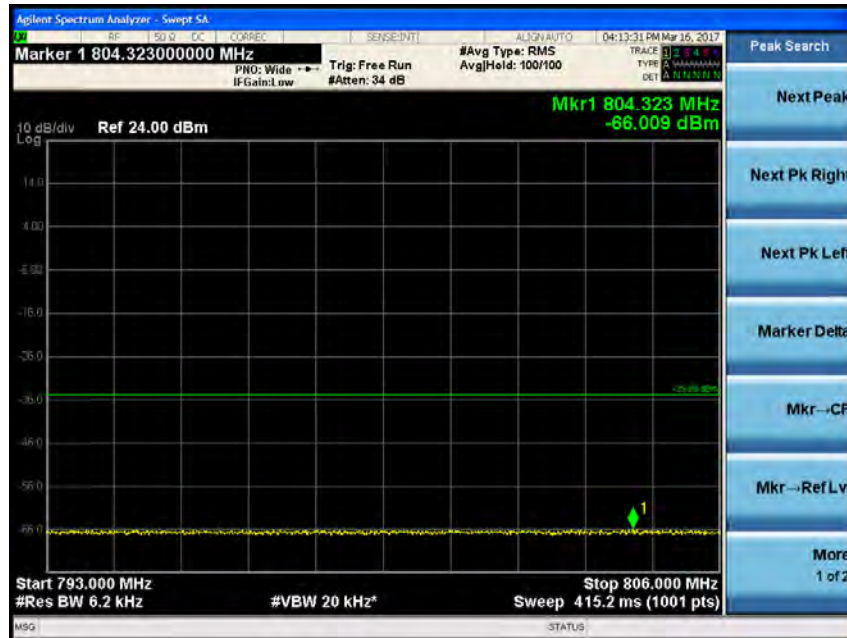
High Channel



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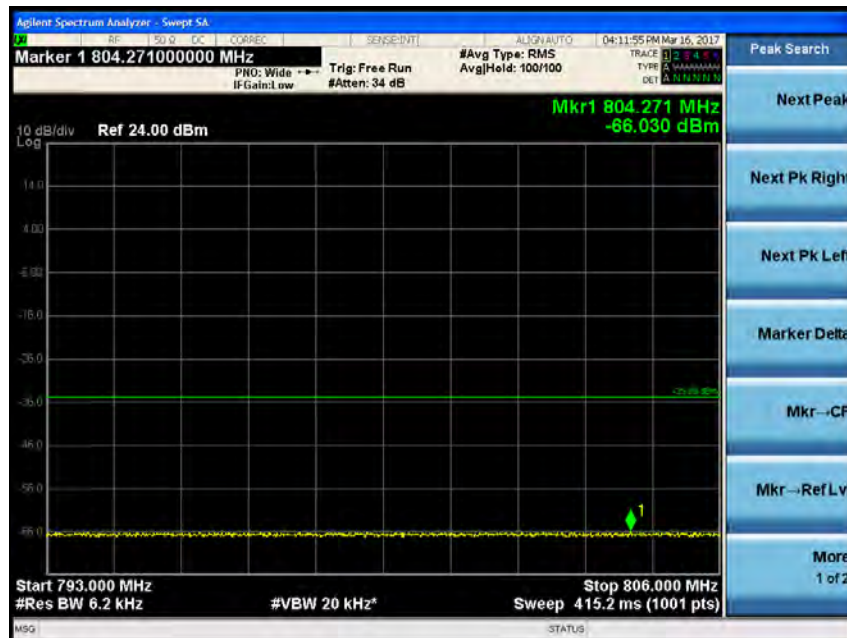
LTE band 13 (5 MHz - QPSK_RB 25)

High Channel (793-806 MHz)



LTE band 13 (5 MHz - QPSK_RB 1)

High Channel (793-806 MHz)



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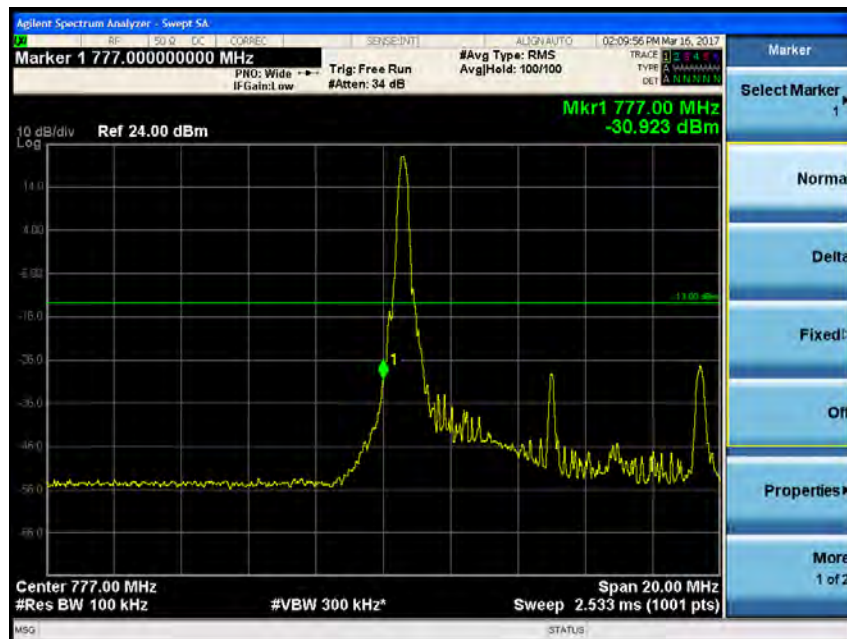
LTE band 13 (10 MHz - QPSK_RB 50)

Low Channel



LTE band 13 (10 MHz - QPSK_RB 1)

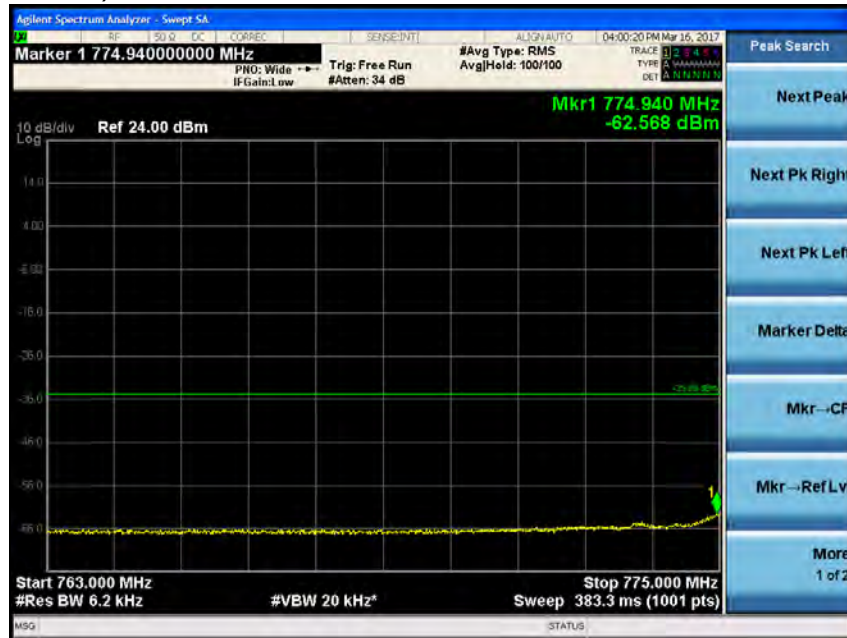
Low Channel



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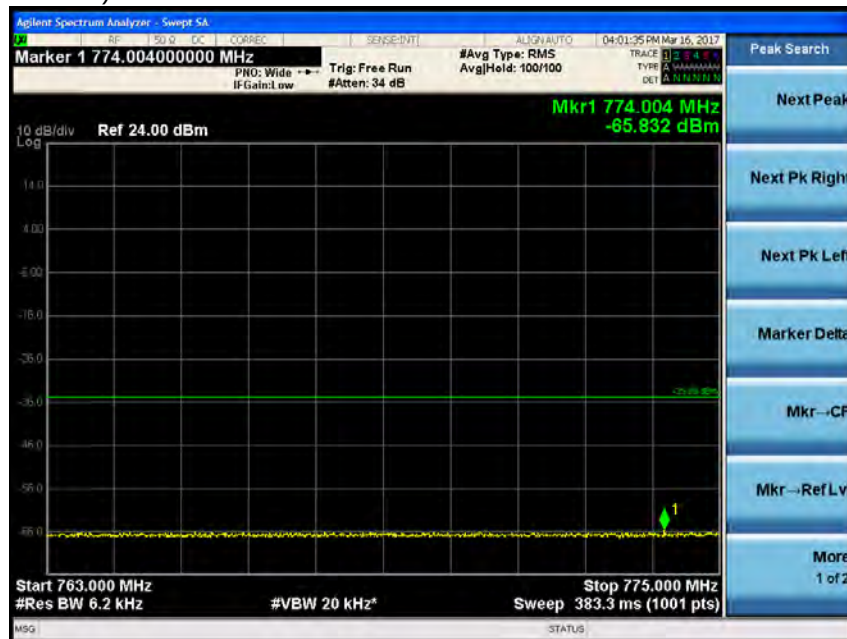
LTE band 13 (10 MHz - QPSK_RB 50)

Low Channel (763-775 MHz)



LTE band 13 (10 MHz - QPSK_RB 1)

Low Channel (763-775 MHz)

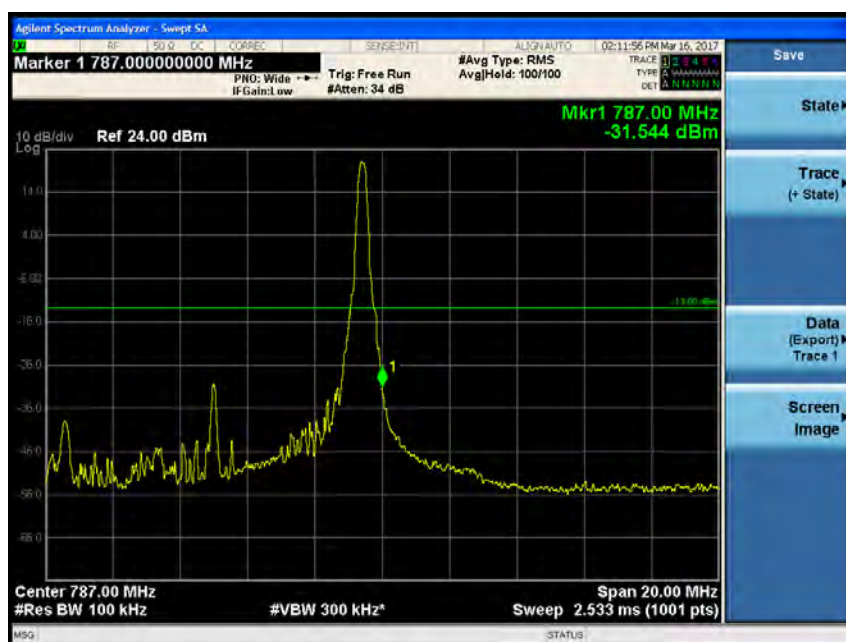


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LTE band 13 (10 MHz - QPSK_RB 50) High Channel



LTE band 13 (10 MHz - QPSK_RB 1) High Channel



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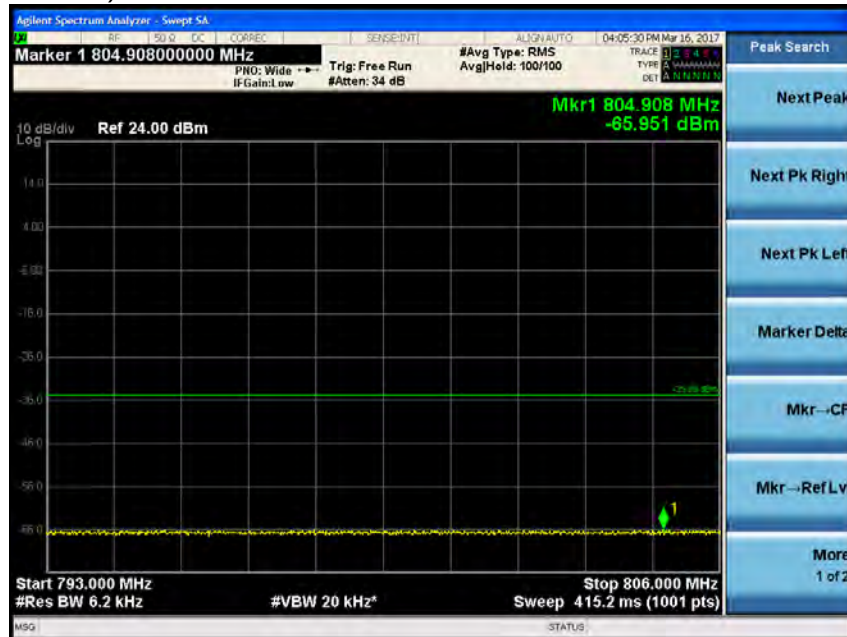
LTE band 13 (10 MHz - QPSK_RB 50)

High Channel (763-775 MHz)



LTE band 13 (10 MHz - QPSK_RB 1)

High Channel (763-775 MHz)



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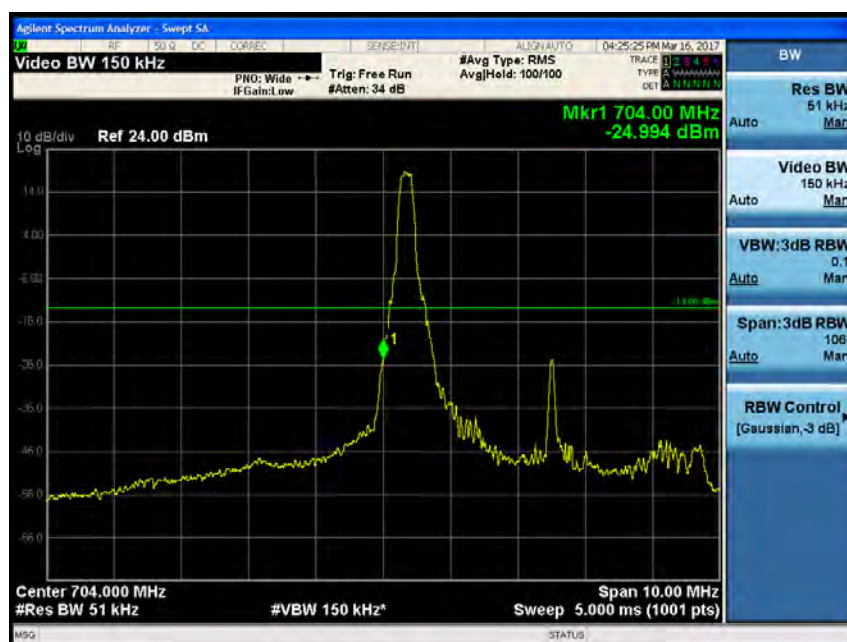
LTE band 17 (5 MHz - QPSK_RB 25)

Low Channel



LTE band 17 (5 MHz - QPSK_RB 1)

Low Channel

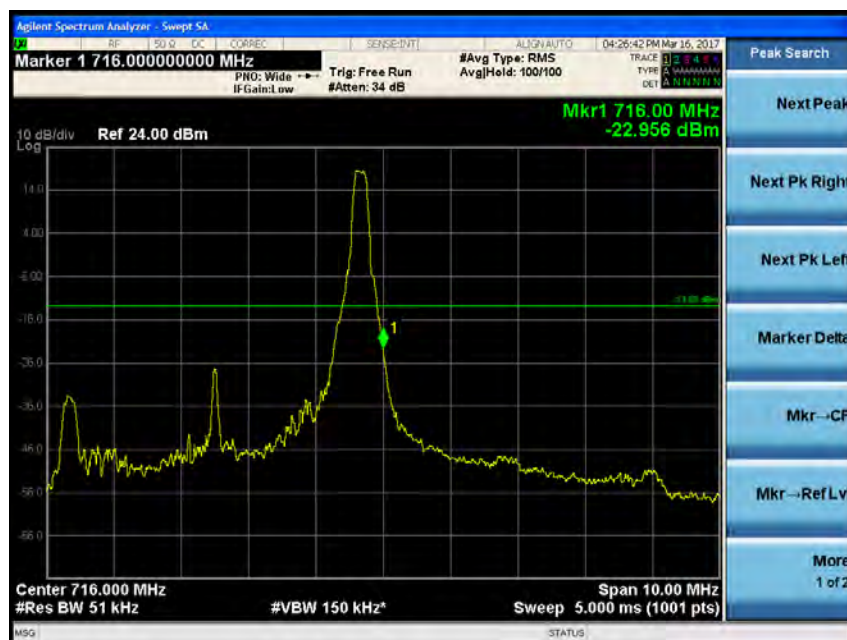


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LTE band 17 (5 MHz - QPSK_RB 25) High Channel



LTE band 17 (5 MHz - QPSK_RB 1) High Channel

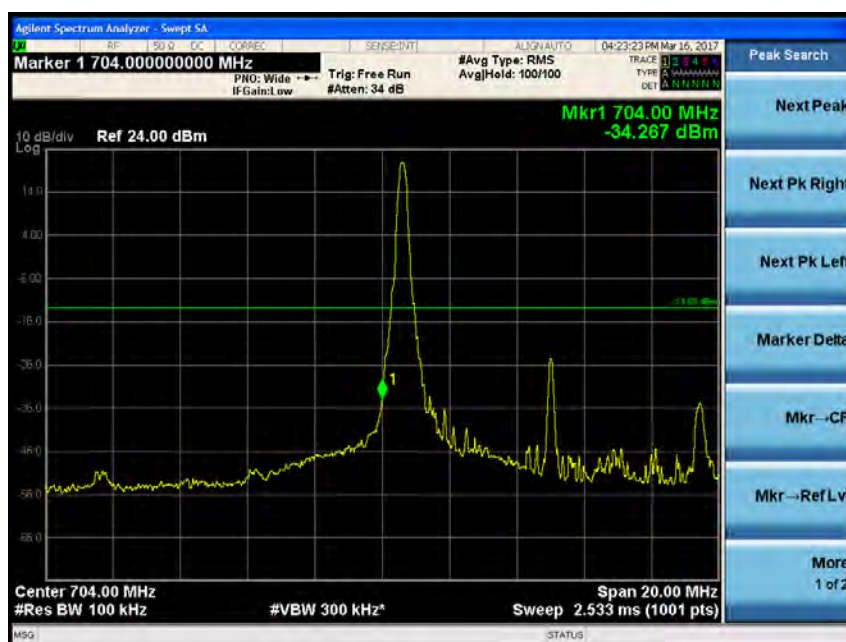


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LTE band 17 (10 MHz - QPSK_RB 50) Low Channel



LTE band 17 (10 MHz - QPSK_RB 1) Low Channel

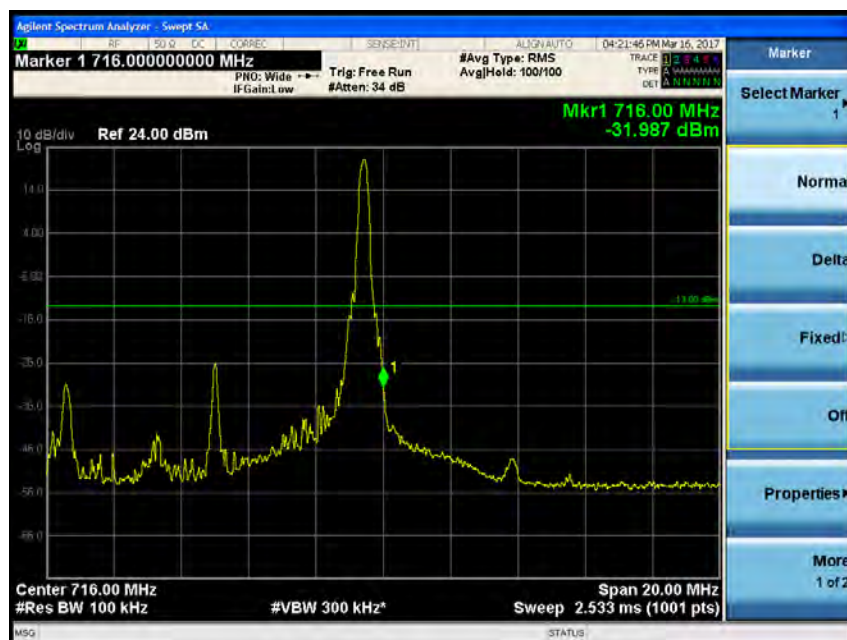


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LTE band 17 (10 MHz - QPSK_RB 50) High Channel



LTE band 17 (10 MHz - QPSK_RB 1) High Channel



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8. Frequency Stability

8.1. Limit

FCC

- § 2.1055 (a), § 2.1055 (d) & following:

- §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.

For Mobile devices operating in the 824 to 849 MHz band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

- §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

- §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

IC

- RSS-130 Issue 1

4.3, the transmitter frequency stability limit shall be determined as follows:

(a) The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;

(b) Using a resolution bandwidth of 1 % of the occupied bandwidth, a reference point at the unwanted emission level which complies with the attenuation of $43 + 10 \log_{10} p$ (watts) on the emission mask of the lowest and highest channel shall be selected, and the frequency at these points shall be recorded as f_L and f_H respectively.

The applicant shall ensure frequency stability by showing that f_L minus the frequency offset and f_H plus the frequency offset shall be within the frequency range in which the equipment is designed to operate.

- RSS-132 Issue 3

5.3, The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations and ± 1.5 ppm for base stations.

- RSS-133 Issue 6

6.3, the carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations.

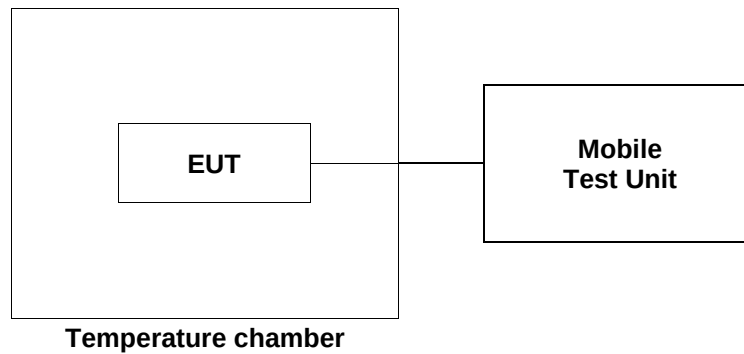
- RSS-139 Issue 3

6.4, the frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

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8.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Mobile Test Unit via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from Mobile Test Unit.



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8.3. Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

LTE band 2 at middle channel

Reference Frequency: 1 880.0 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	-1	-0.000 5
40		10	0.005 3
30		3	0.001 6
23		2	0.001 1
10		-2	-0.001 1
0		4	0.002 1
-10		6	0.003 2
-20		-11	-0.005 9
-30		-7	-0.003 7
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
23	13.8	7	0.003 7
	10.2	5	0.002 7

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LTE band 4 at middle channel

Reference Frequency: 1 732.5 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	8	0.004 6
40		7	0.004 0
30		-5	-0.002 9
23		-3	-0.001 7
10		2	0.001 2
0		1	0.000 6
-10		6	0.003 5
-20		-5	-0.002 9
-30		12	0.006 9
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	Ppm
23	13.8	3	0.001 7
	10.2	10	0.005 8

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LTE band 5 at middle channel

Reference Frequency: 836.5 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	8	0.009 6
40		7	0.008 4
30		-5	-0.006 0
23		-3	-0.003 6
10		2	0.002 4
0		1	0.001 2
-10		6	0.007 2
-20		-5	-0.006 0
-30		7	0.008 4
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	Ppm
23	13.8	12	0.014 3
	10.2	-6	0.007 2

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LTE band 12 at middle channel

Reference Frequency: 707.5 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	8	0.011 3
40		7	0.009 9
30		-5	-0.007 1
23		-3	-0.004 2
10		2	0.002 8
0		1	0.001 4
-10		-10	-0.014 1
-20		-5	-0.007 1
-30		7	0.009 9
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	Ppm
23	13.8	3	0.004 2
	10.2	-1	-0.001 4

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LTE band 13 at middle channel

Reference Frequency: 782.0 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	8	0.010 2
40		7	0.009 0
30		-5	-0.006 4
23		-3	-0.003 8
10		2	0.002 6
0		1	0.001 3
-10		15	0.019 2
-20		-10	-0.012 8
-30		7	0.009 0
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	Ppm
23	13.8	12	0.015 3
	10.2	9	0.011 5

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LTE band 17 at middle channel

Reference Frequency: 710.0 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	10	0.014 1
40		7	0.009 9
30		-5	-0.007 0
23		-3	-0.004 2
10		2	0.002 8
0		1	0.001 4
-10		6	0.008 5
-20		-5	-0.007 0
-30		7	0.009 9
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	Ppm
23	13.8	3	0.004 2
	10.2	-11	-0.015 5

- End of the Test Report -

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