

5. Spurious Emissions at Antenna Terminal

5.1. 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.

FCC §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.

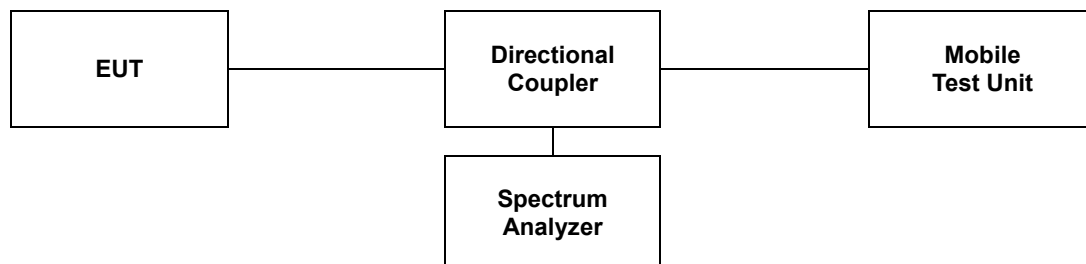
FCC §27.53(g), For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10\log(P)$ dB.

FCC §27.53(m)(4), For mobile digital stations, the attenuation factor shall be not less than $40 + 10\log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10\log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10\log(P)$ 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 $43 + 10\log(P)$ dB on all frequencies between 2 490.5 MHz and 2 496 MHz and $55 + 10\log(P)$ dB at or below 2 490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2 495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

5.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168_v02r02.

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10* the fundamental frequency.
2. Detector = RMS.
3. Trace mode = max hold.
4. Sweep time = auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 30 MHz to 27 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as correction factor.



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Notes;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. 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 point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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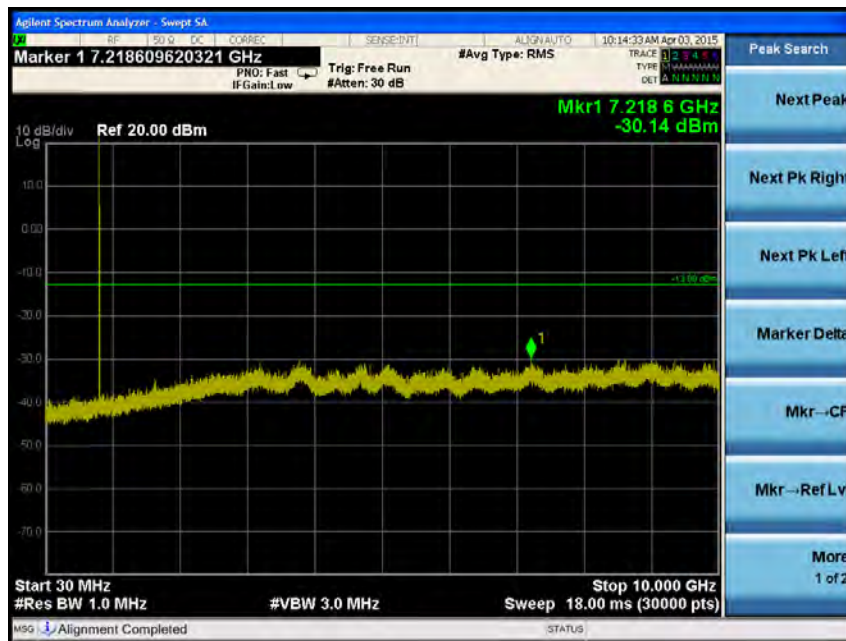
5.3. Test Results

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

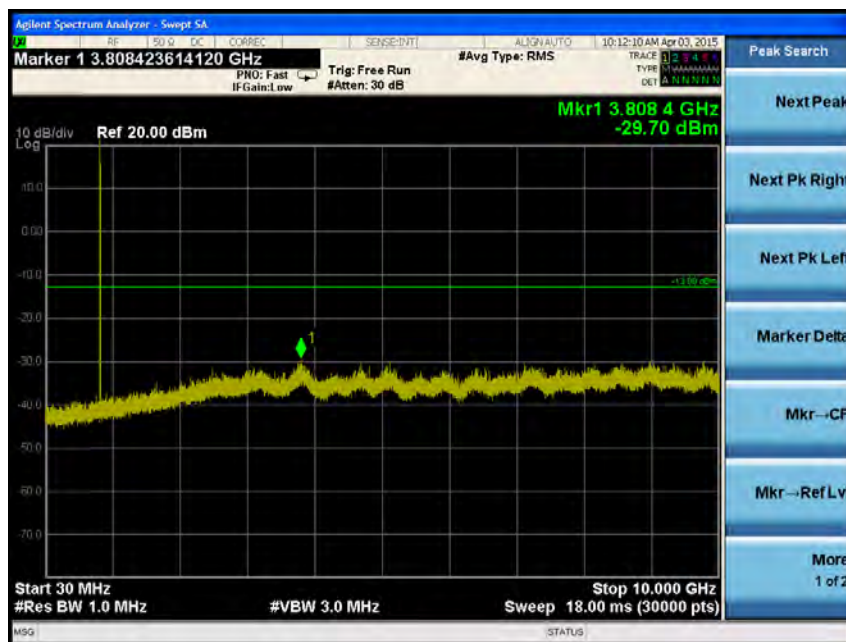
Please refer to the following plots.

GSM850

Low Channel

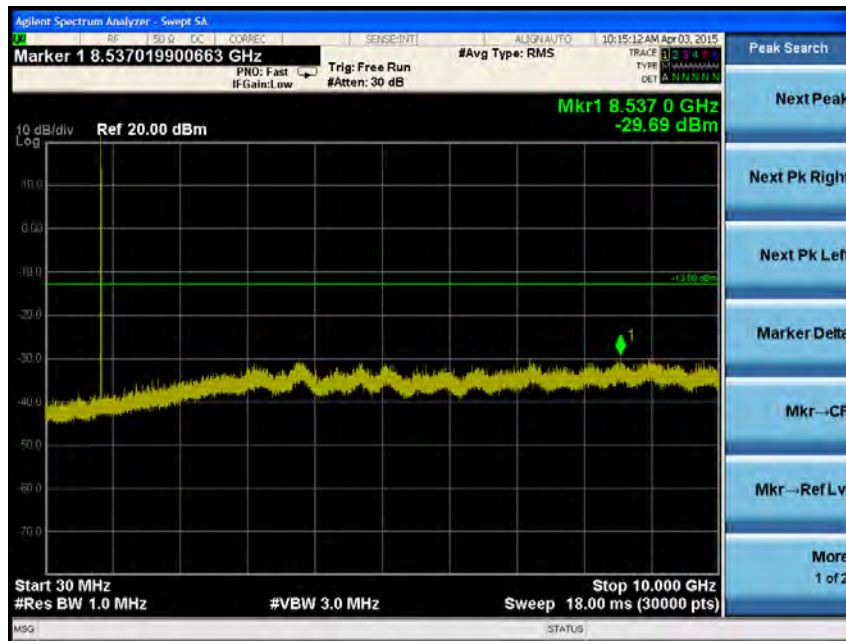


Middle Channel



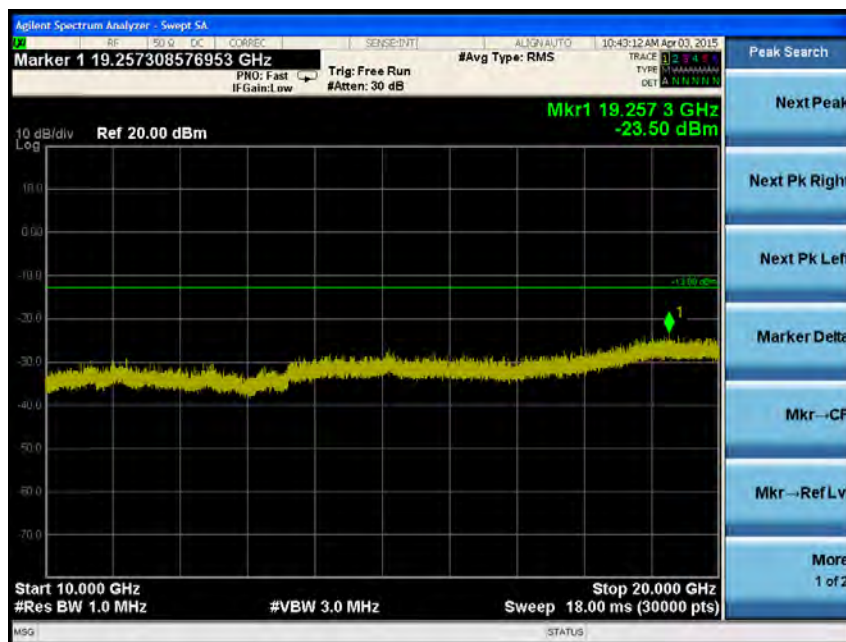
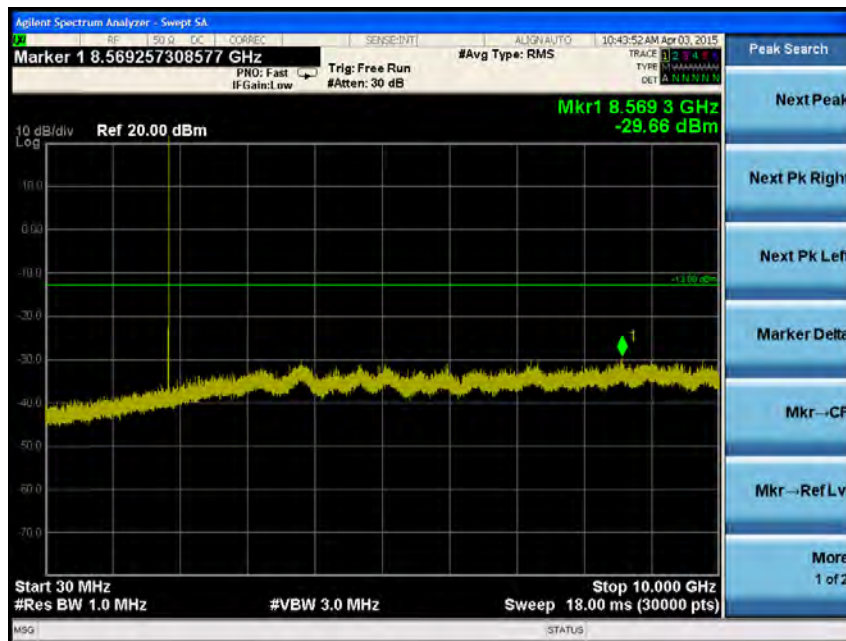
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High Channel



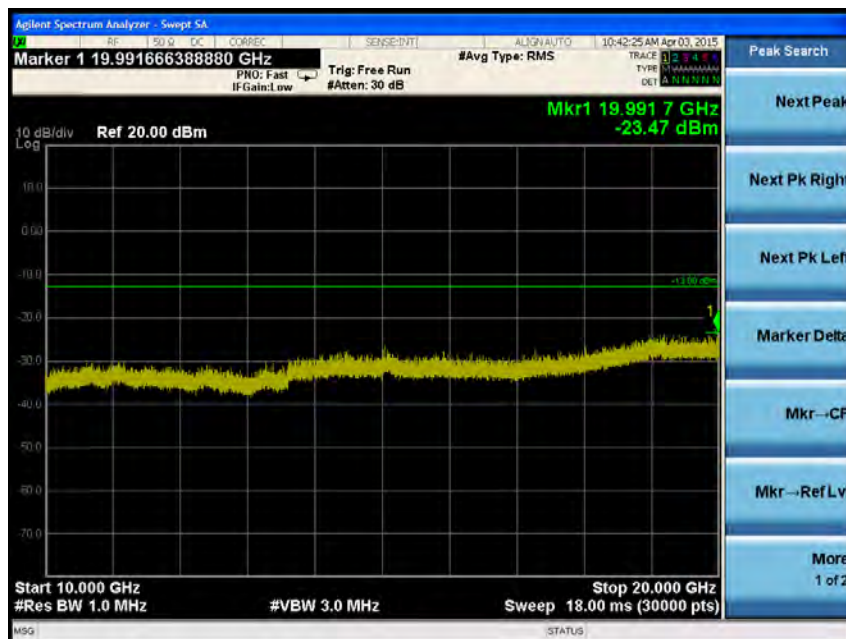
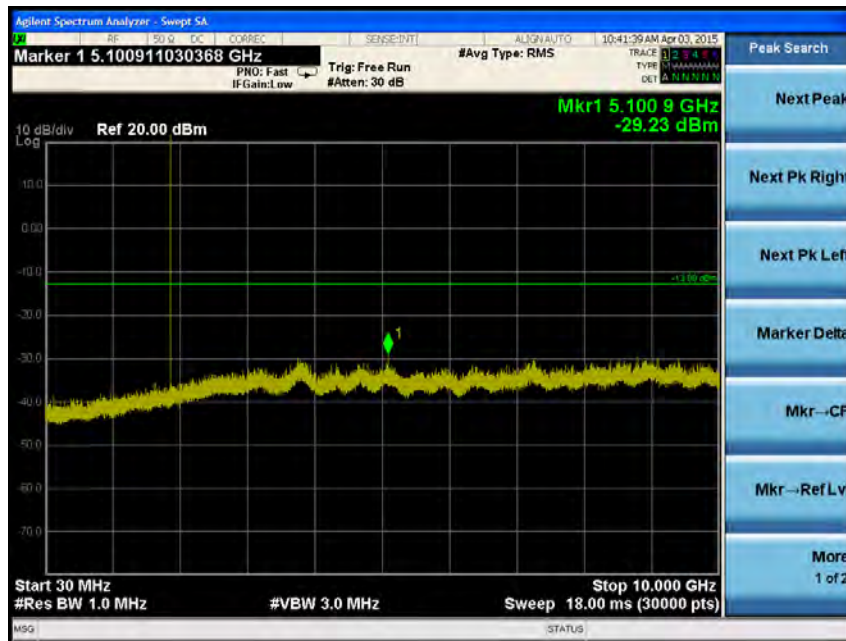
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GSM1900 Low Channel



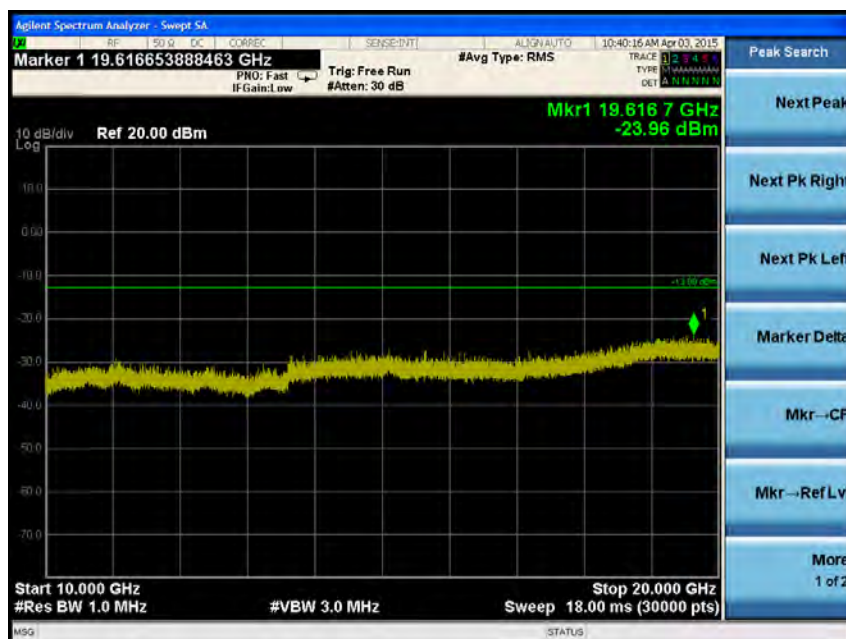
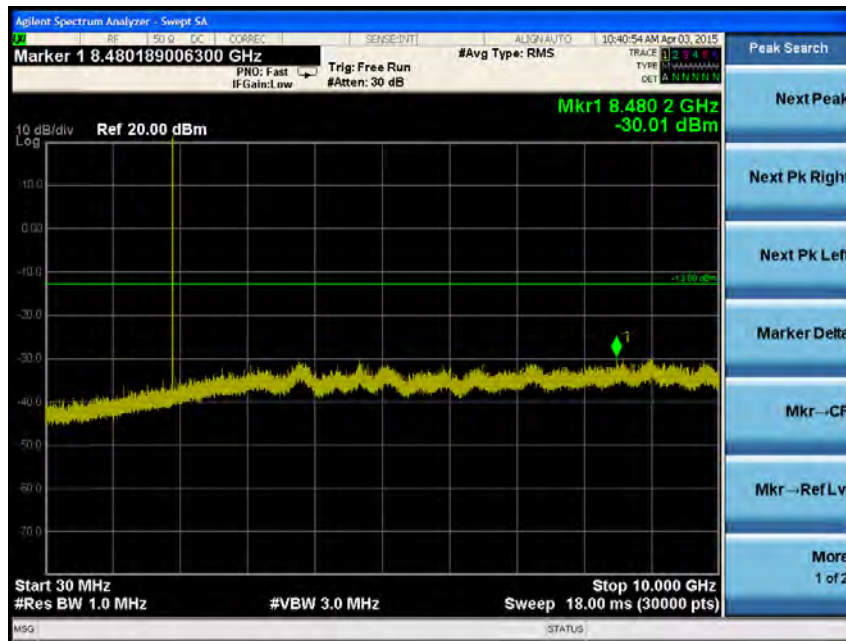
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Middle Channel



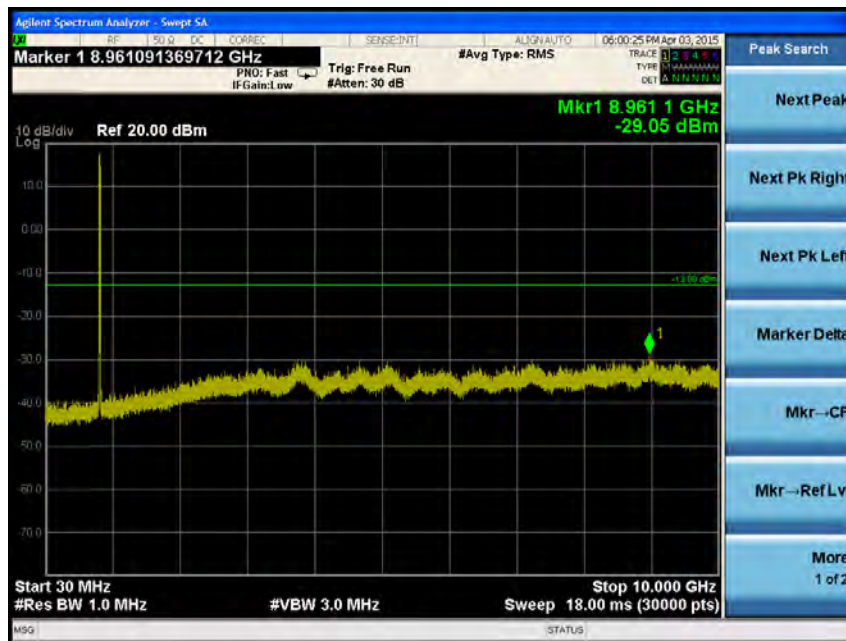
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High Channel

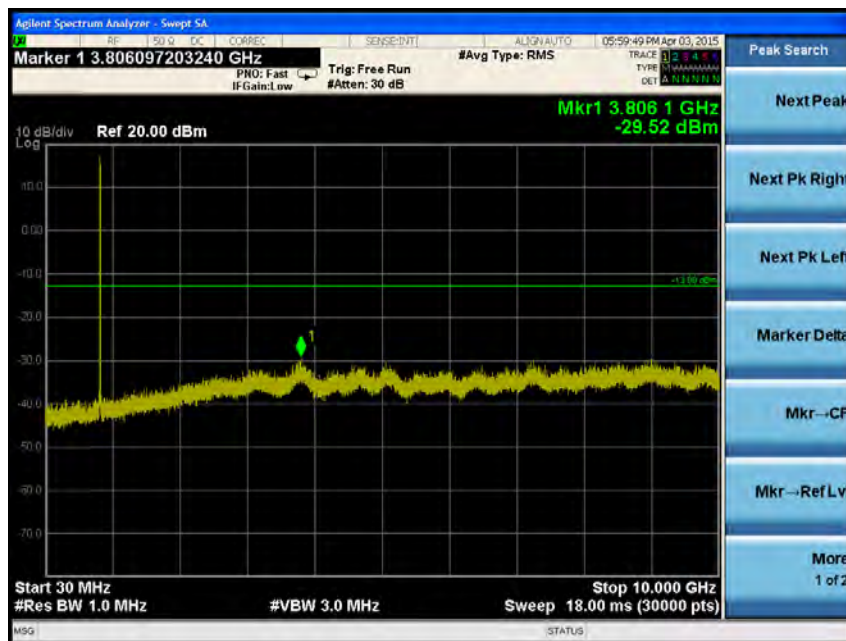


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WCDMA850 Low Channel

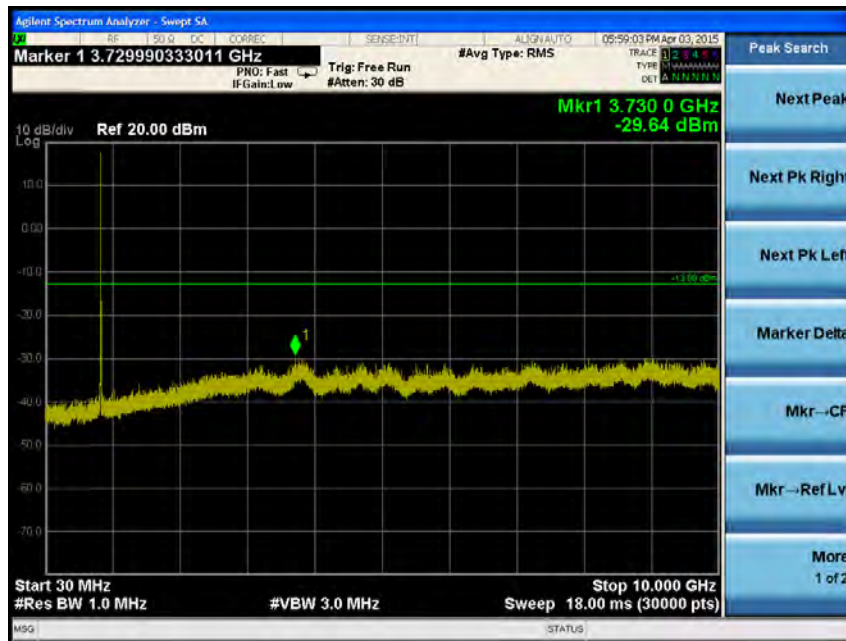


Middle Channel



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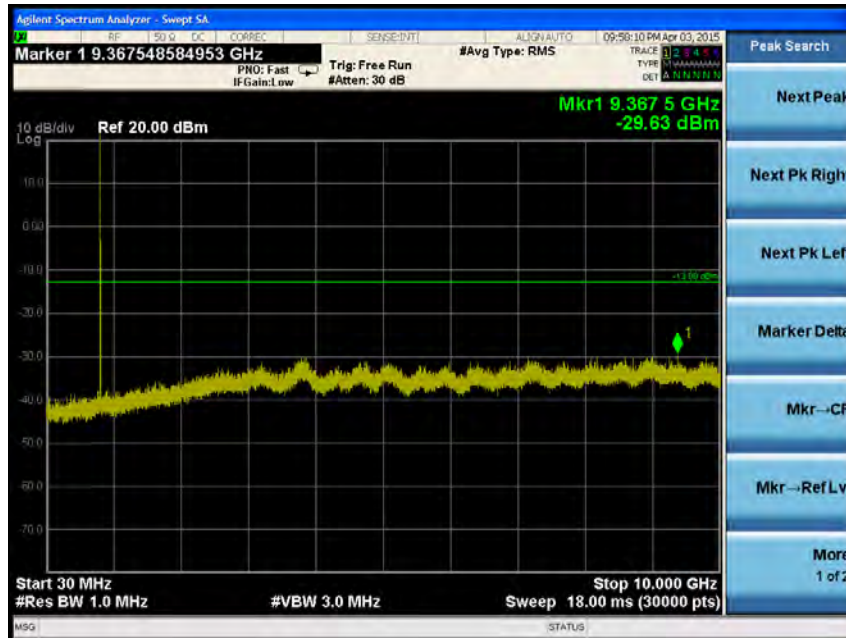
High Channel



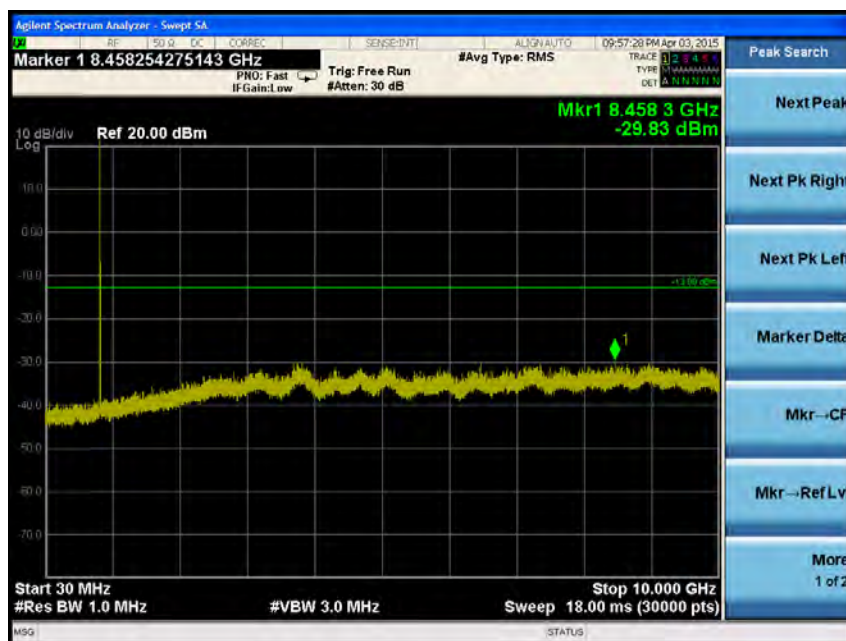
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LTE band 5 (1.4 MHz – QPSK_RB 1_Offset 0)

Low Channel

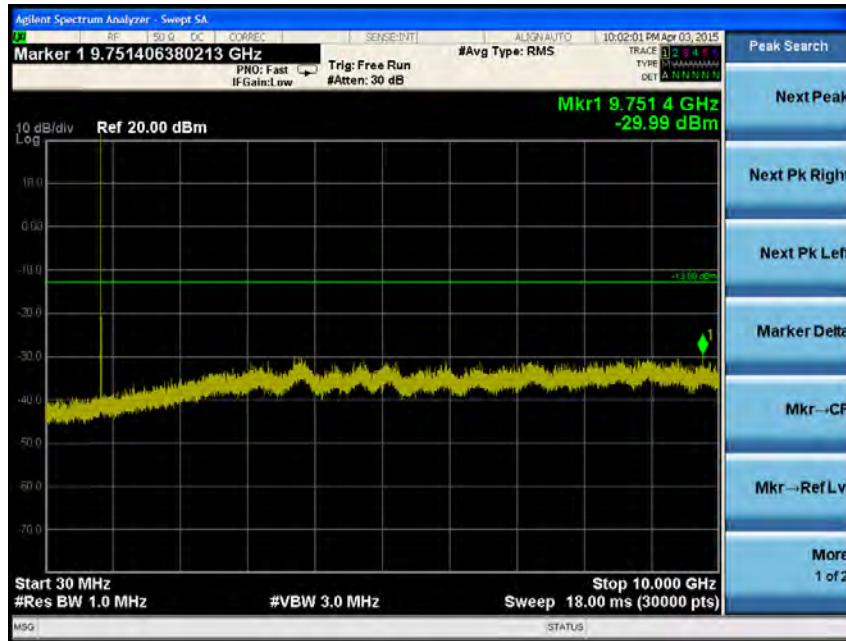


Middle Channel



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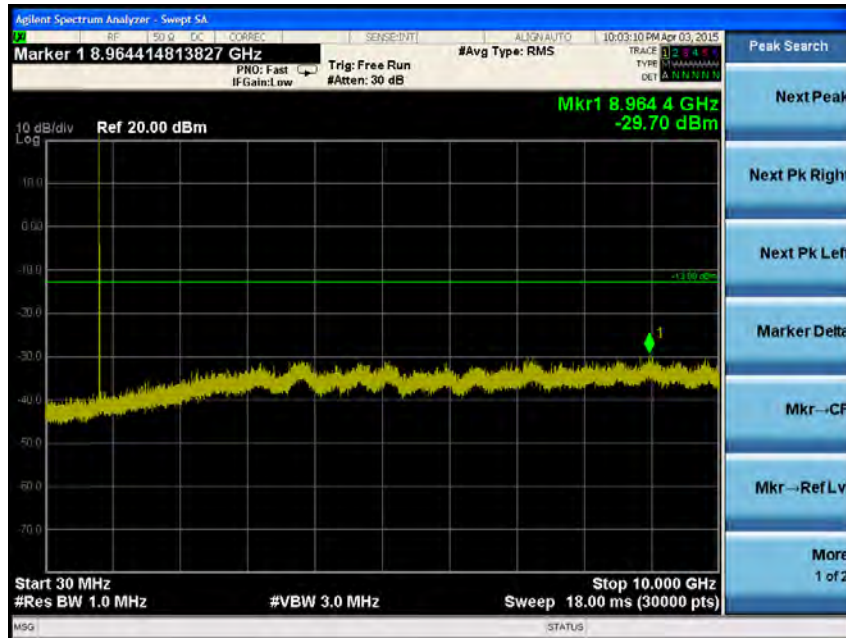
High Channel



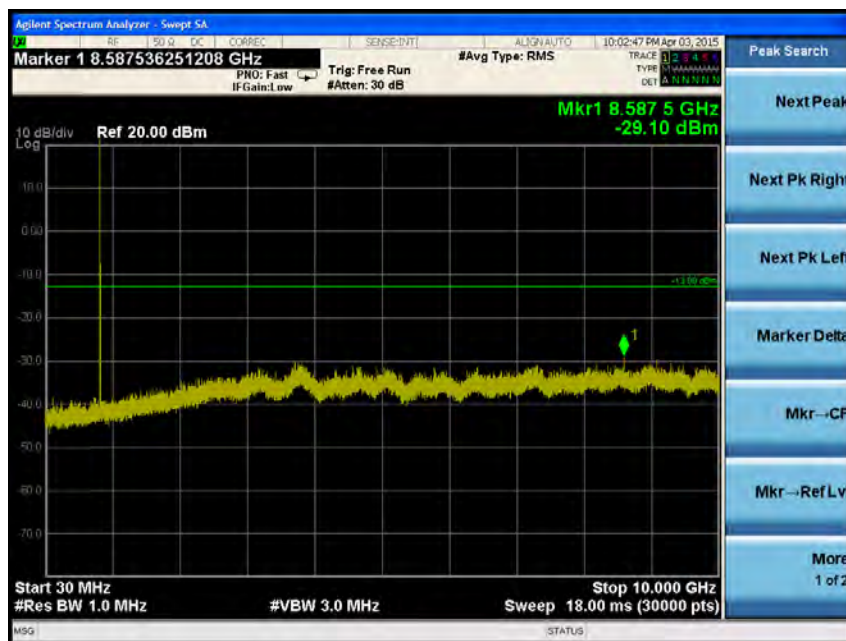
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LTE band 5 (1.4 MHz – 16QAM_RB 1_Offset 0)

Low Channel

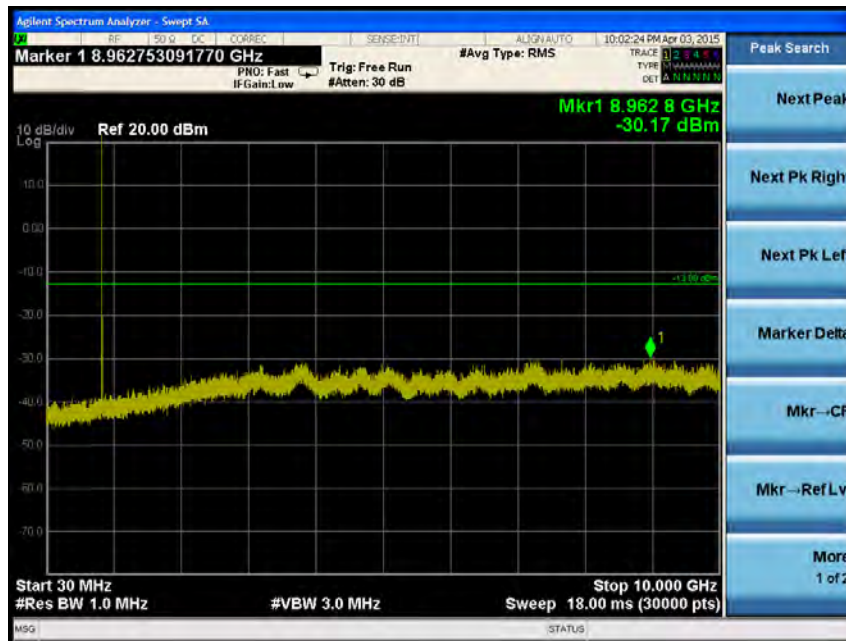


Middle Channel



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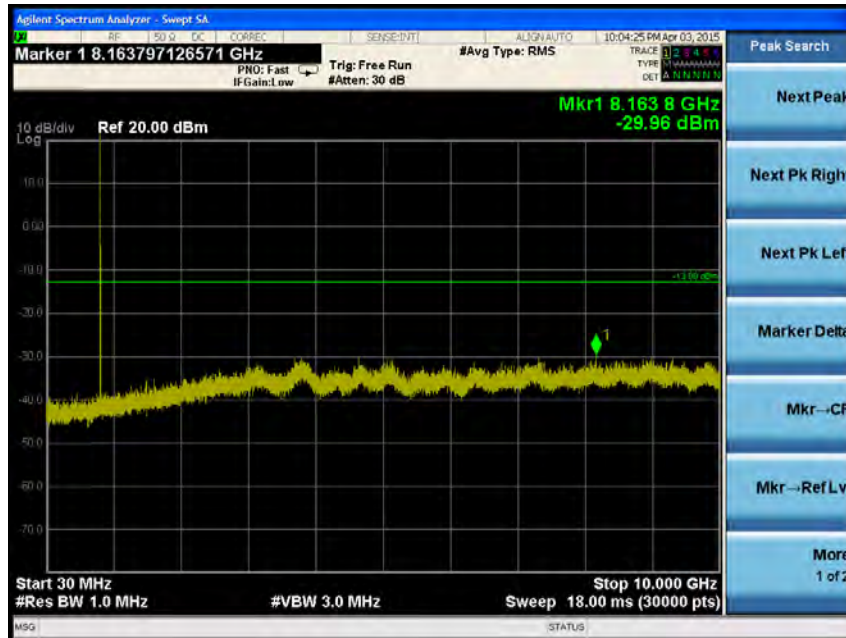
High Channel



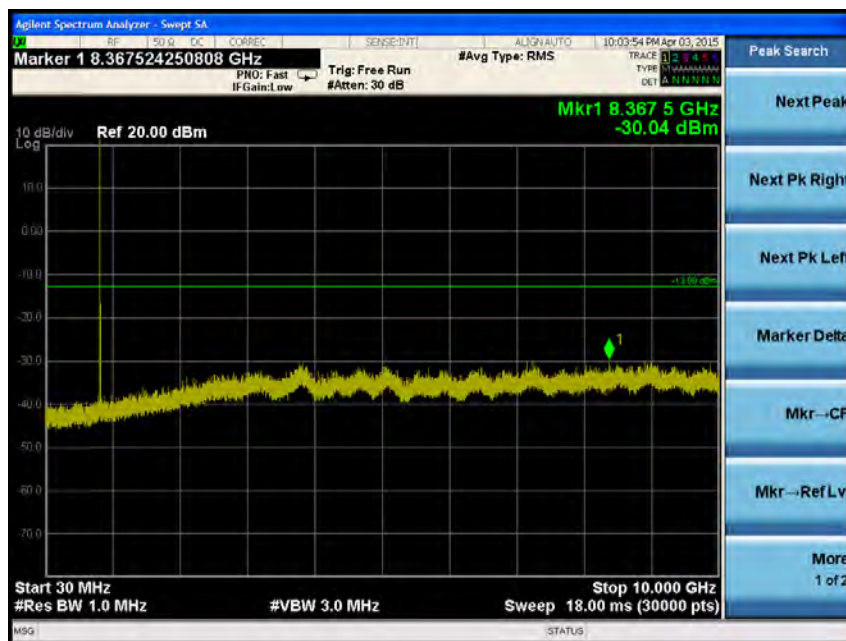
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LTE band 5 (3 MHz – QPSK_RB 1_Offset 0)

Low Channel

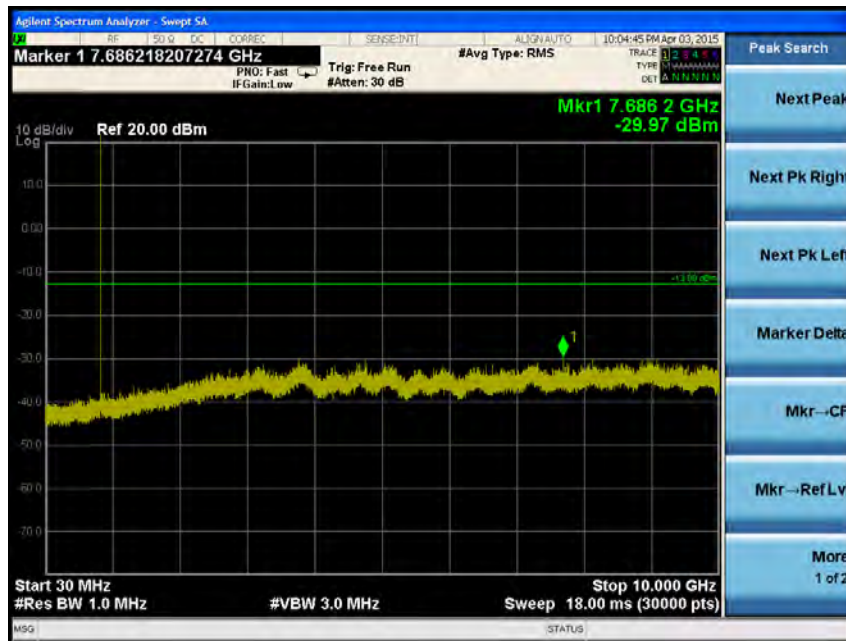


Middle Channel



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High Channel



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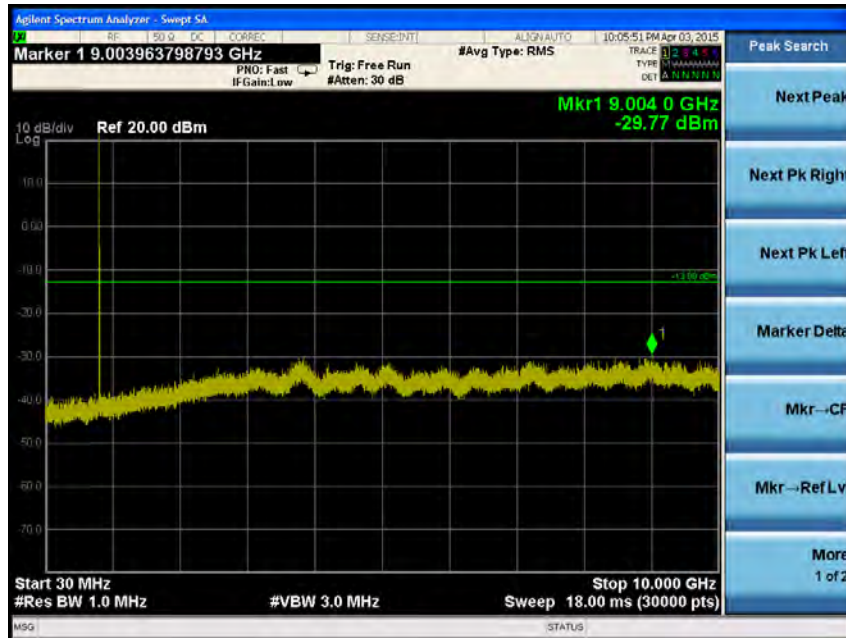
RTT5041-20(2014.01.20)(2)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

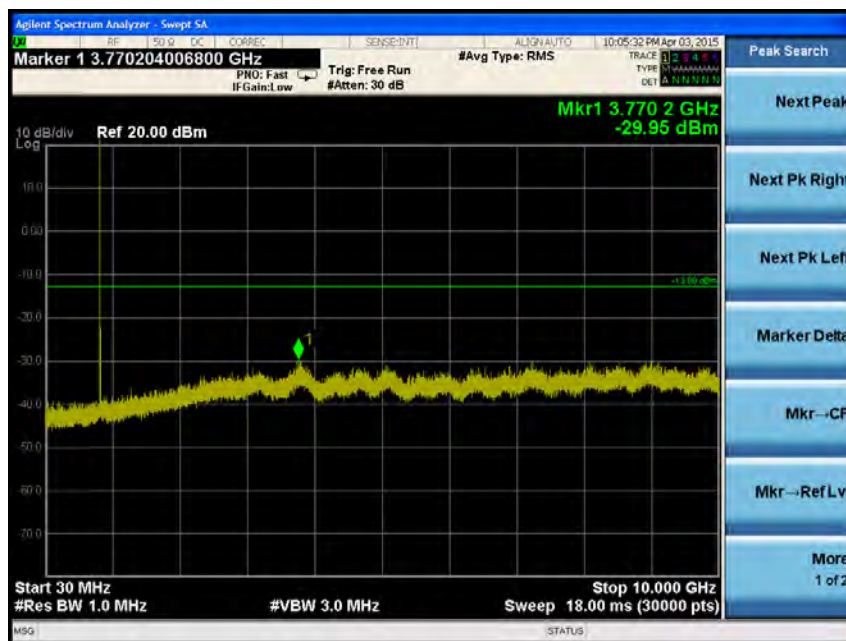
A4(210 mm x 297 mm)

LTE band 5 (3 MHz – 16QAM_RB 1_Offset 0)

Low Channel

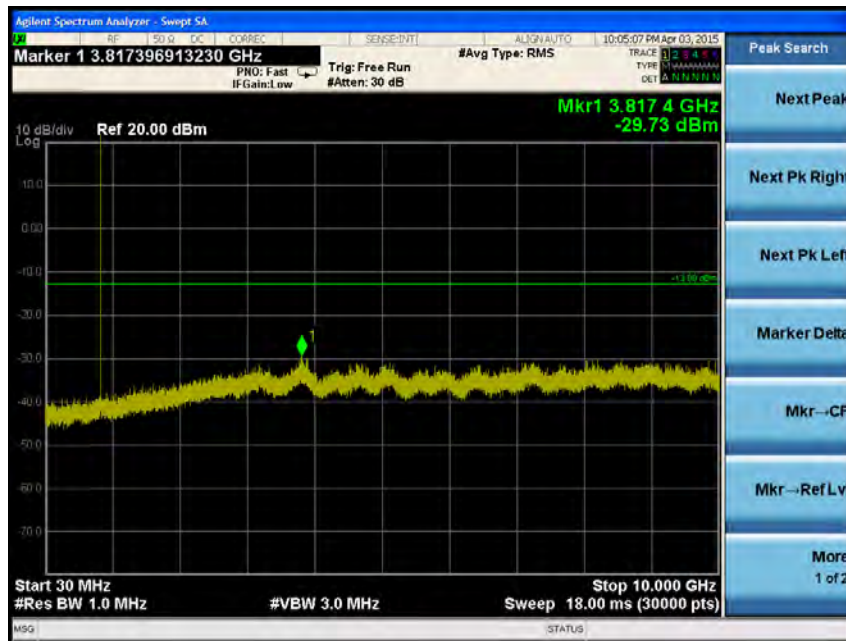


Middle Channel



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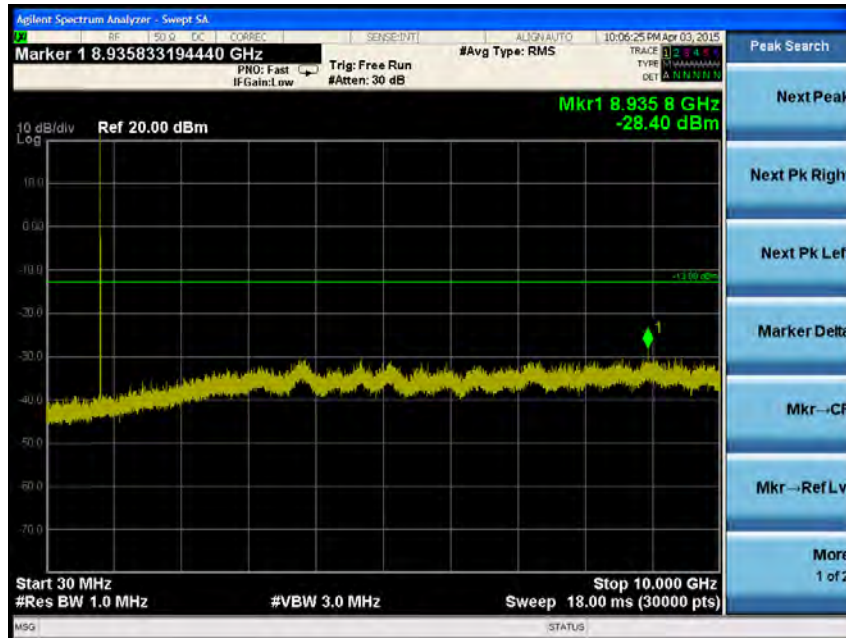
High Channel



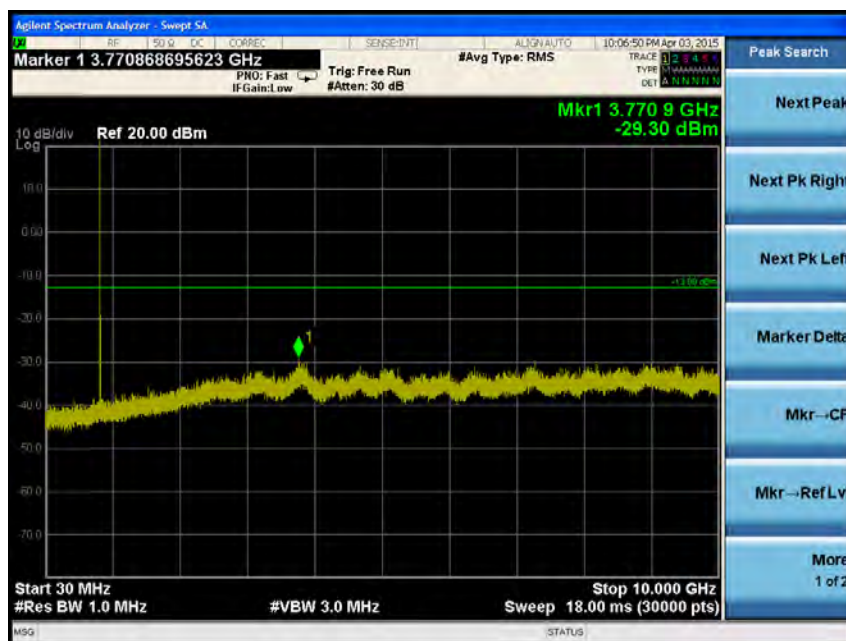
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LTE band 5 (5 MHz – QPSK_RB 1_Offset 0)

Low Channel

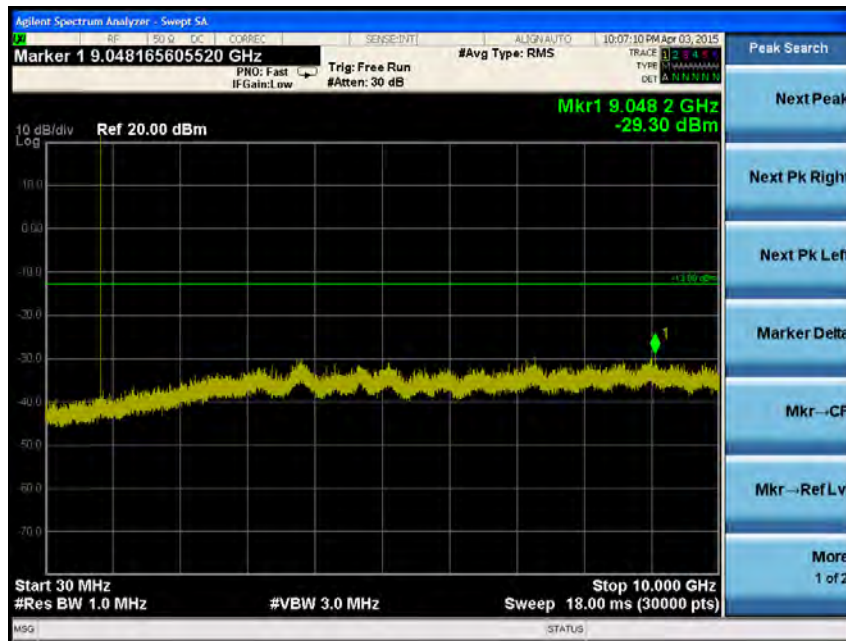


Middle Channel



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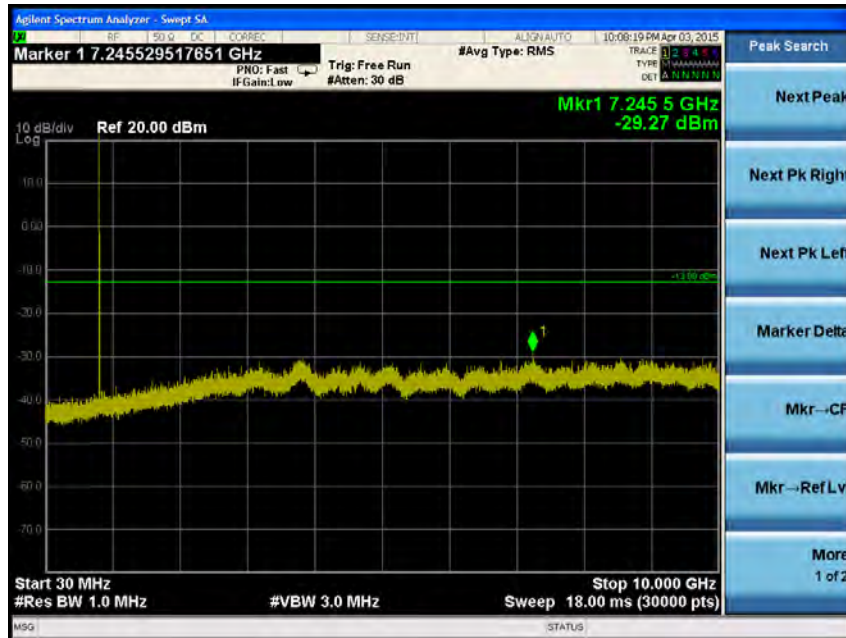
High Channel



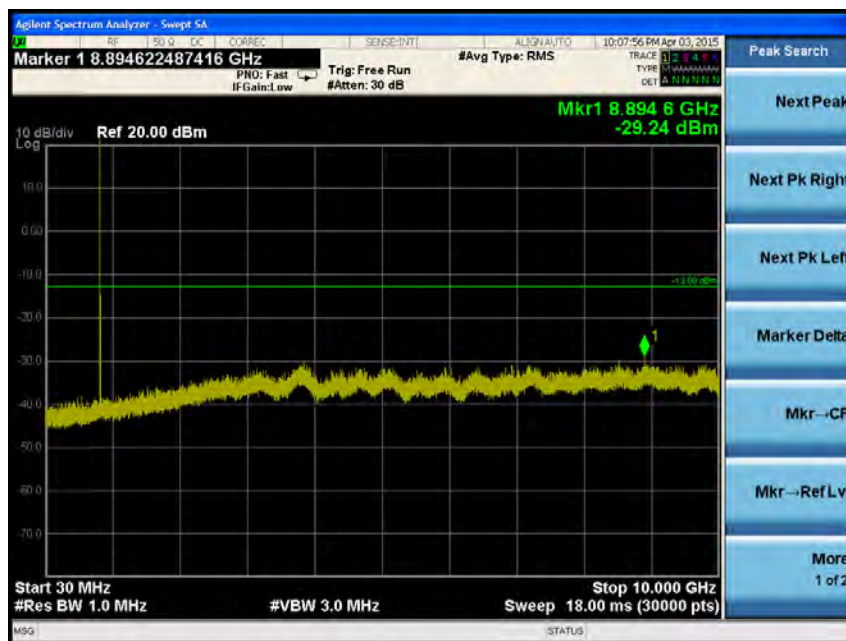
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LTE band 5 (5 MHz – 16QAM_RB 1_Offset 0)

Low Channel

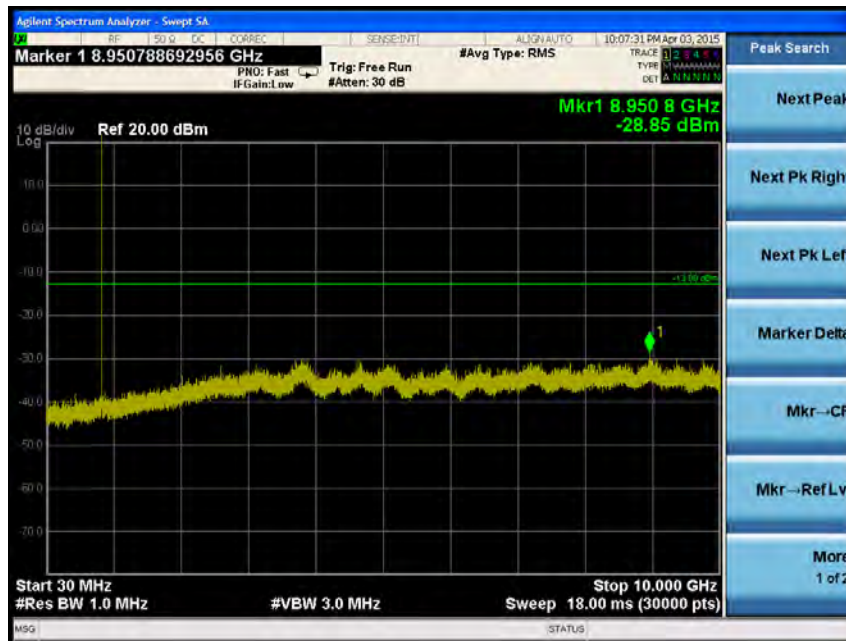


Middle Channel



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High Channel



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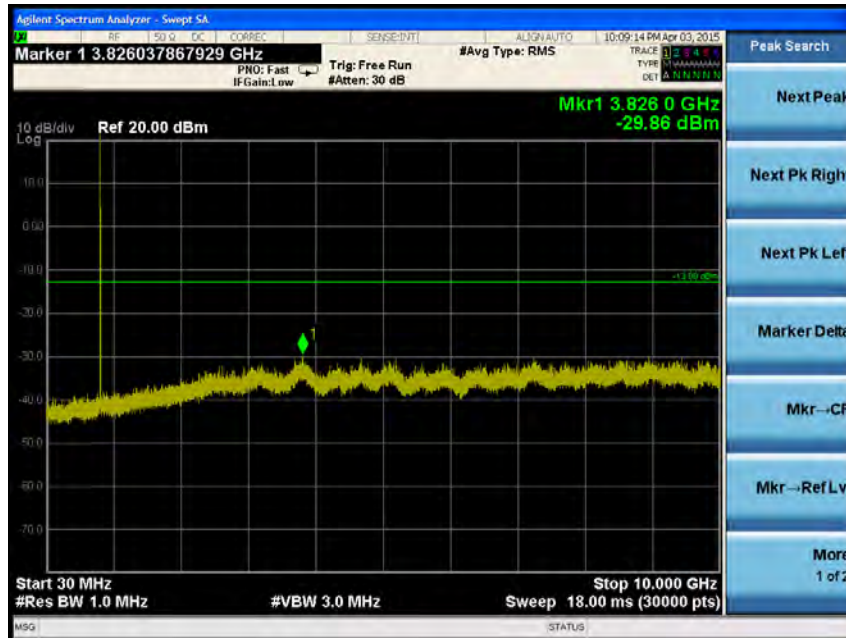
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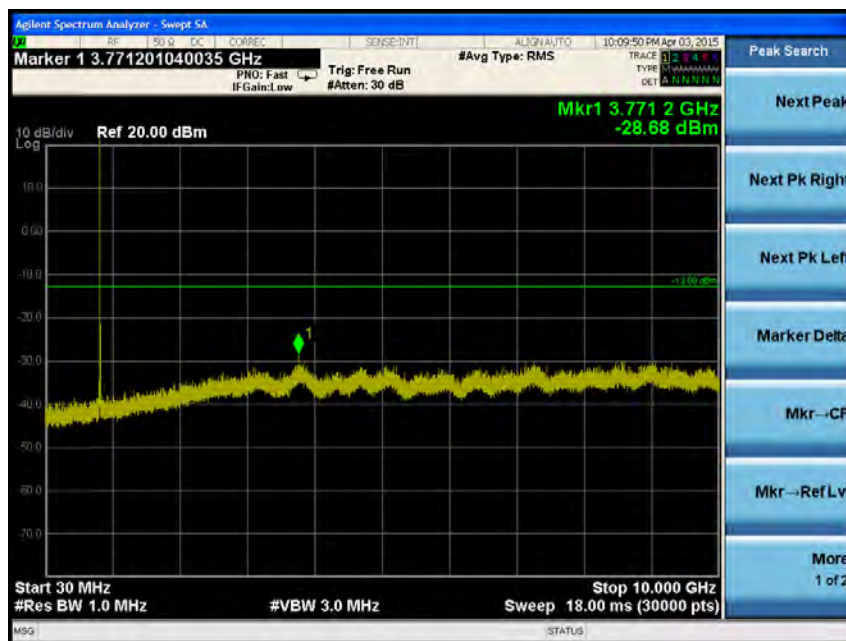
A4(210 mm x 297 mm)

LTE band 5 (10 MHz – QPSK_RB 1_Offset 0)

Low Channel

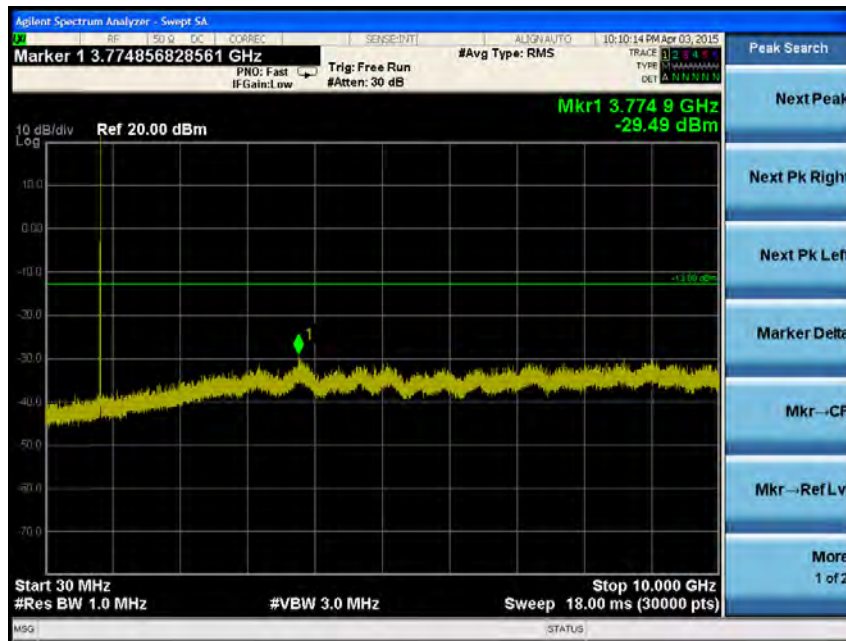


Middle Channel



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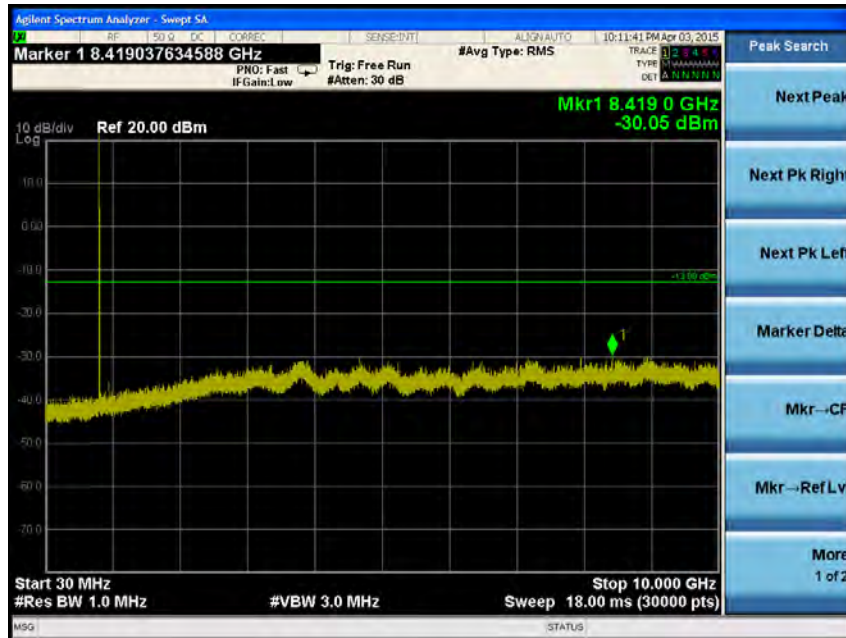
High Channel



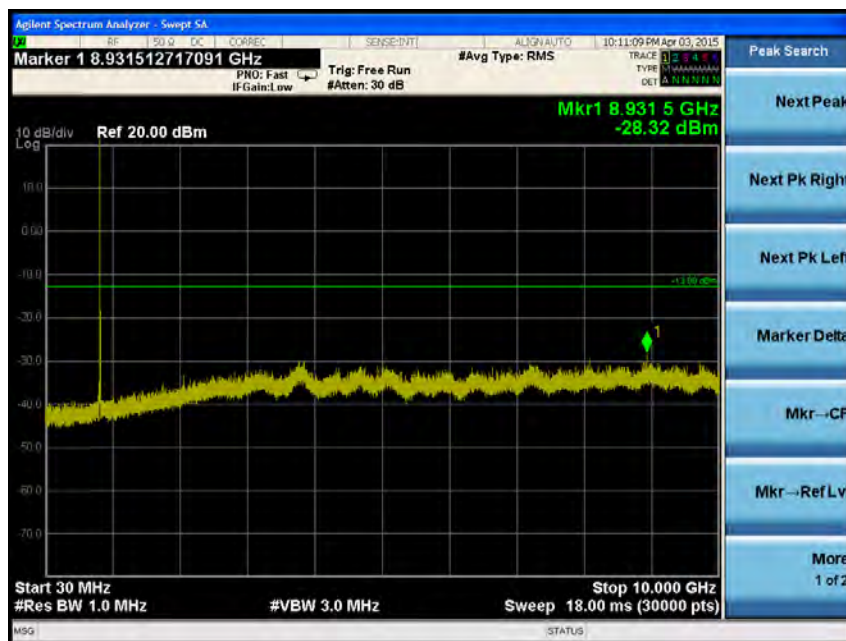
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LTE band 5 (10 MHz – 16QAM_RB 1_Offset 0)

Low Channel

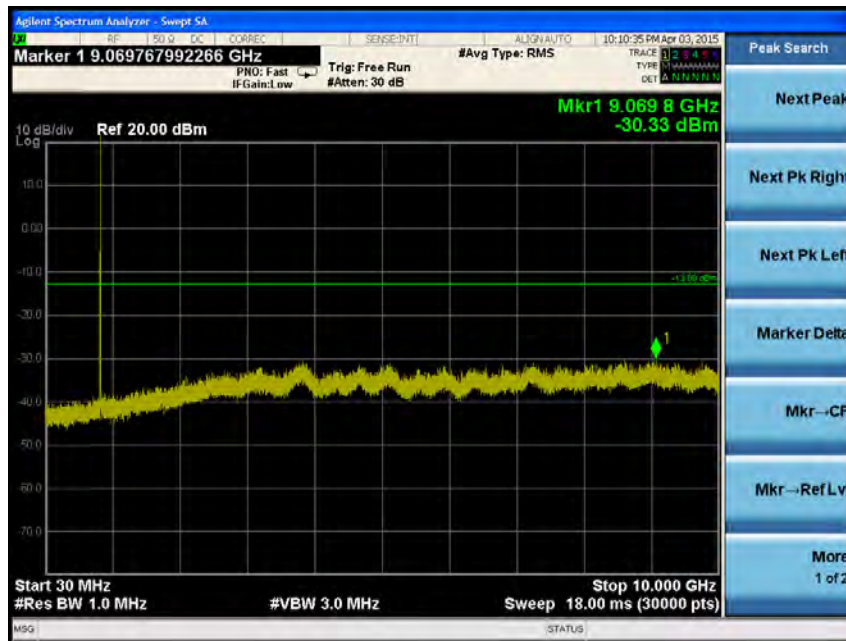


Middle Channel



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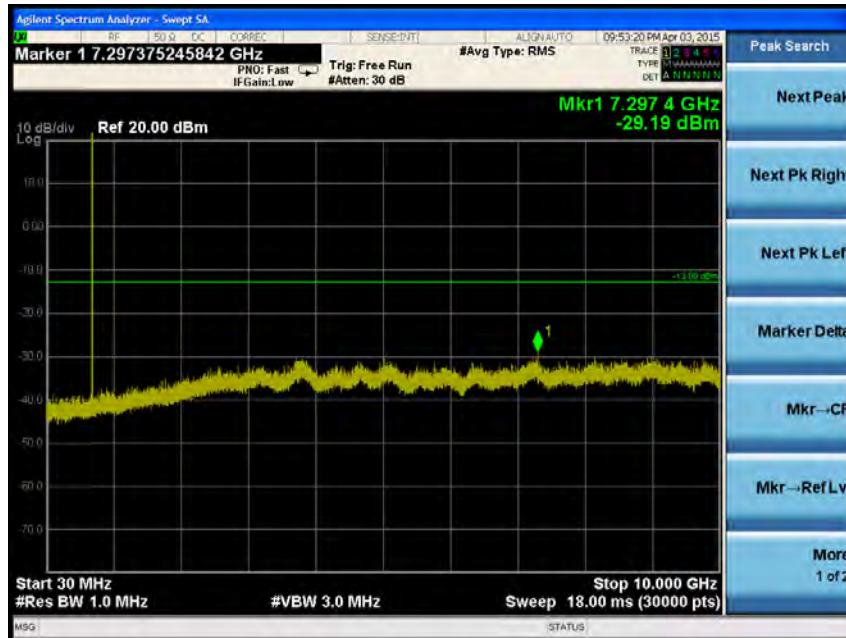
High Channel



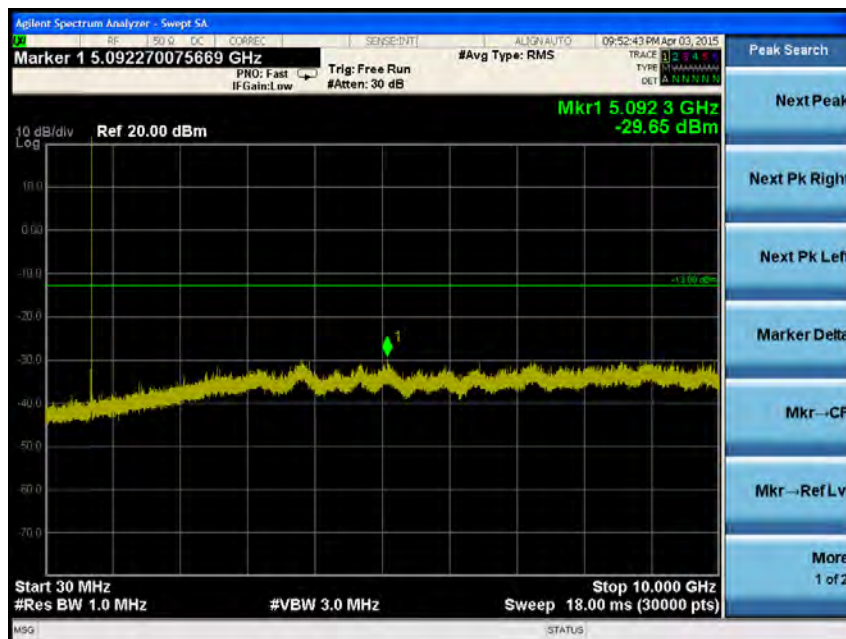
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LTE band 17 (5 MHz – QPSK_RB 1_Offset 0)

Low Channel

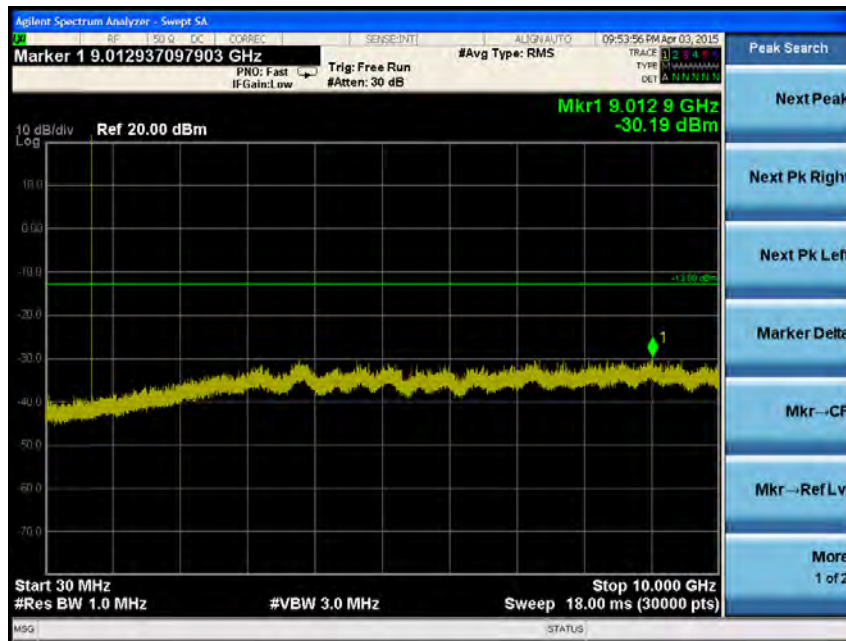


Middle Channel



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High Channel



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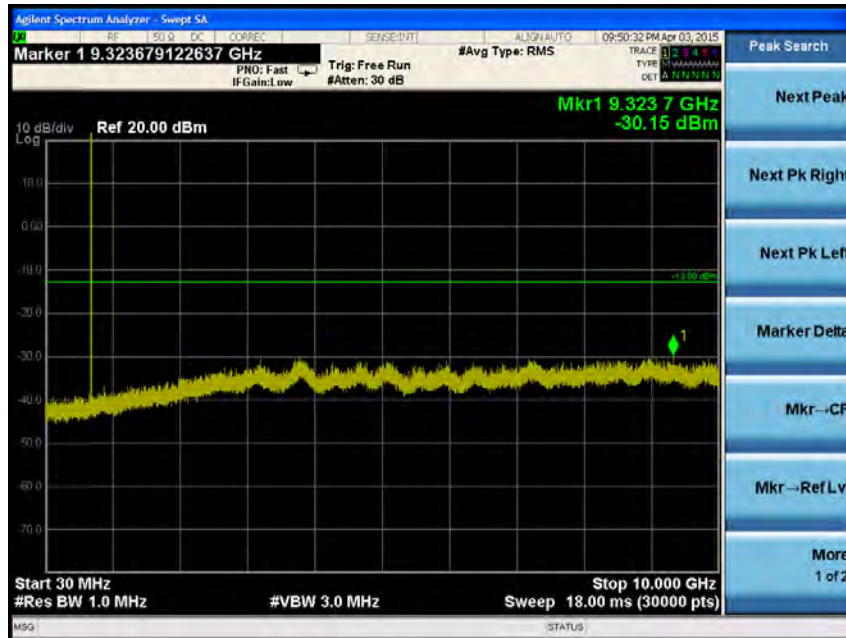
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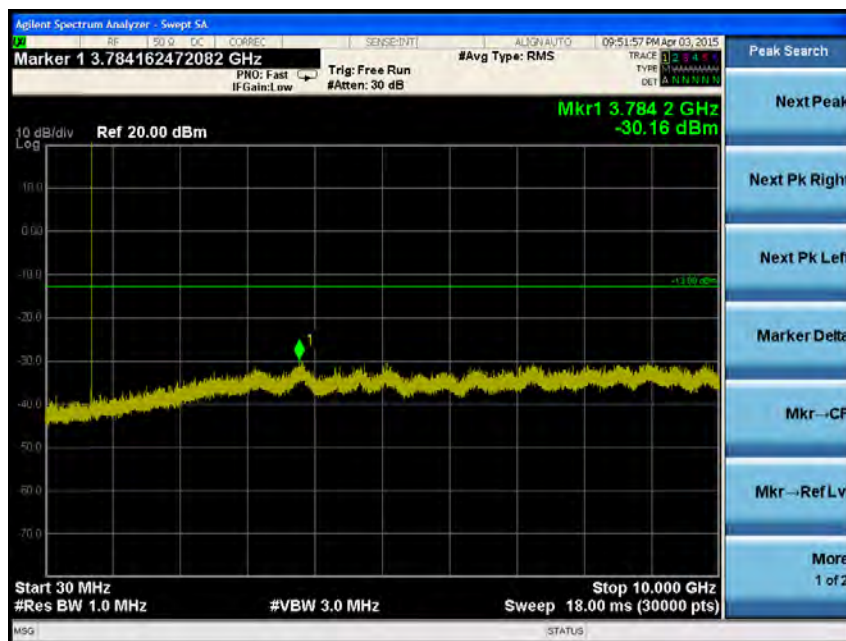
A4(210 mm x 297 mm)

LTE band 17 (5 MHz – 16QAM_RB 1_Offset 0)

Low Channel

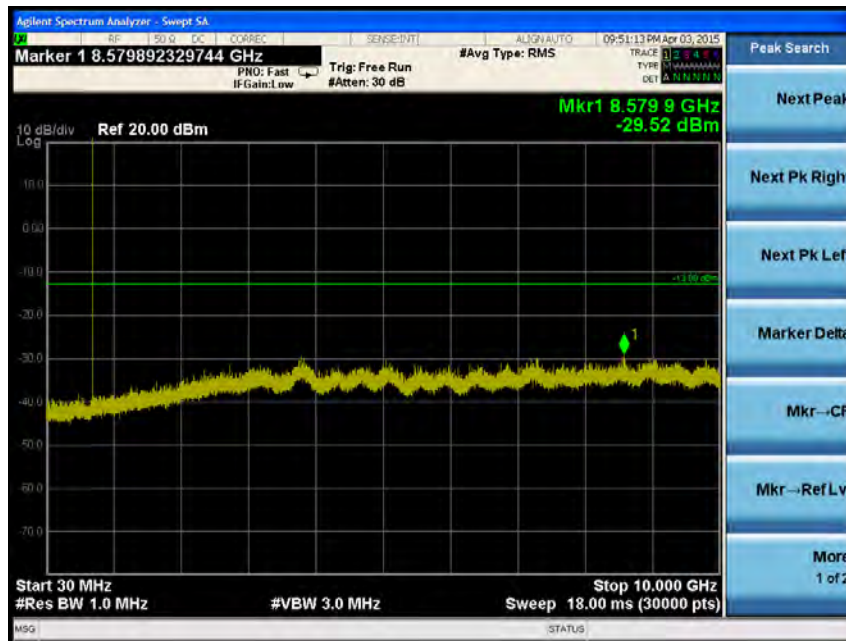


Middle Channel



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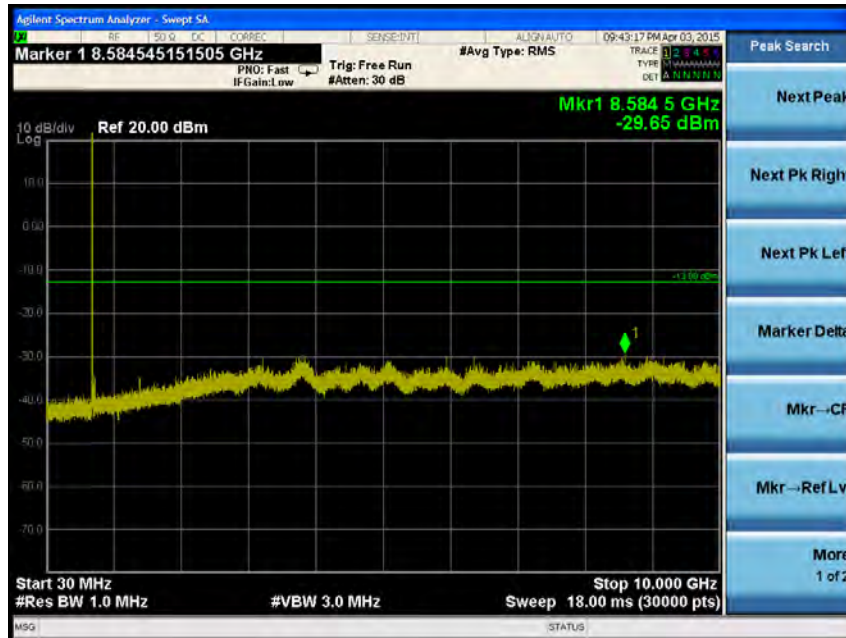
High Channel



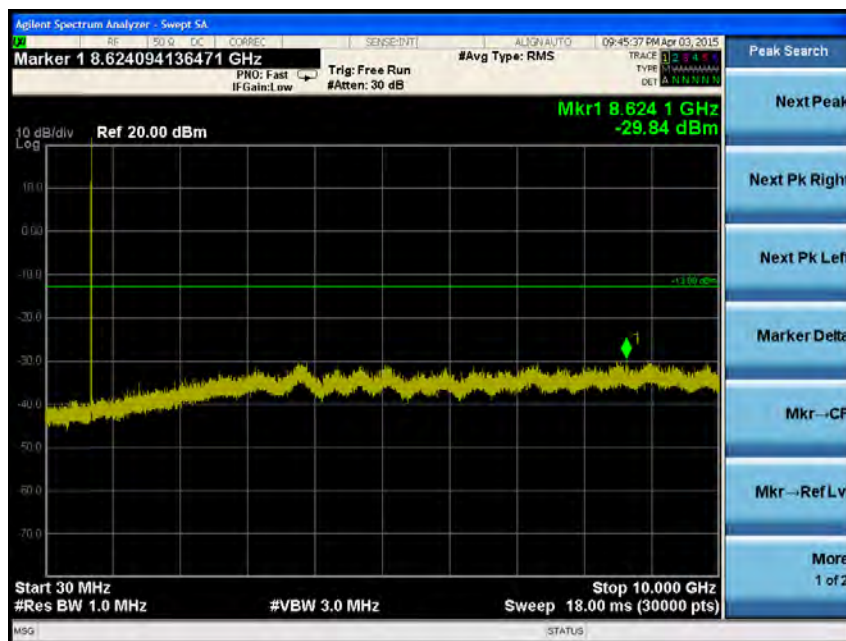
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LTE band 17 (10 MHz – QPSK_RB 1_Offset 0)

Low Channel

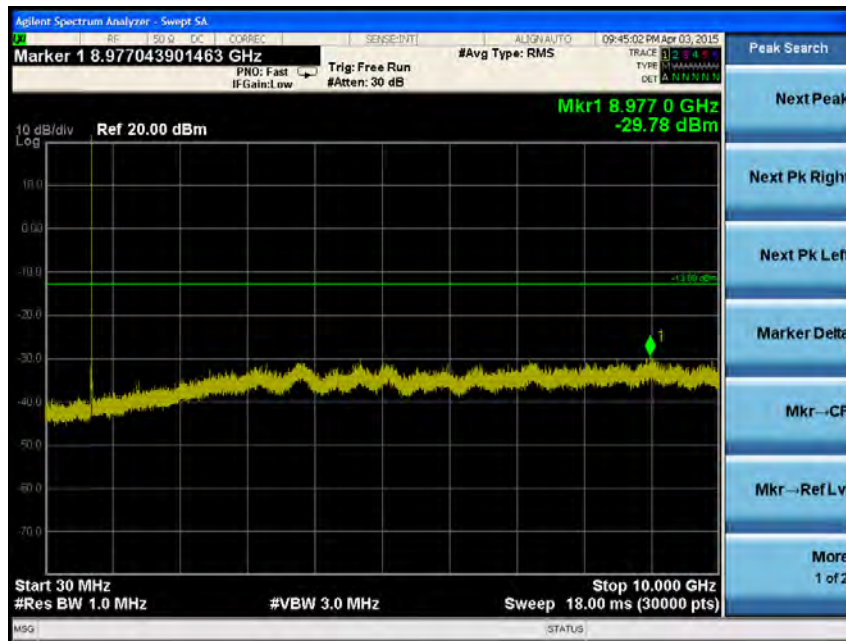


Middle Channel



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High Channel



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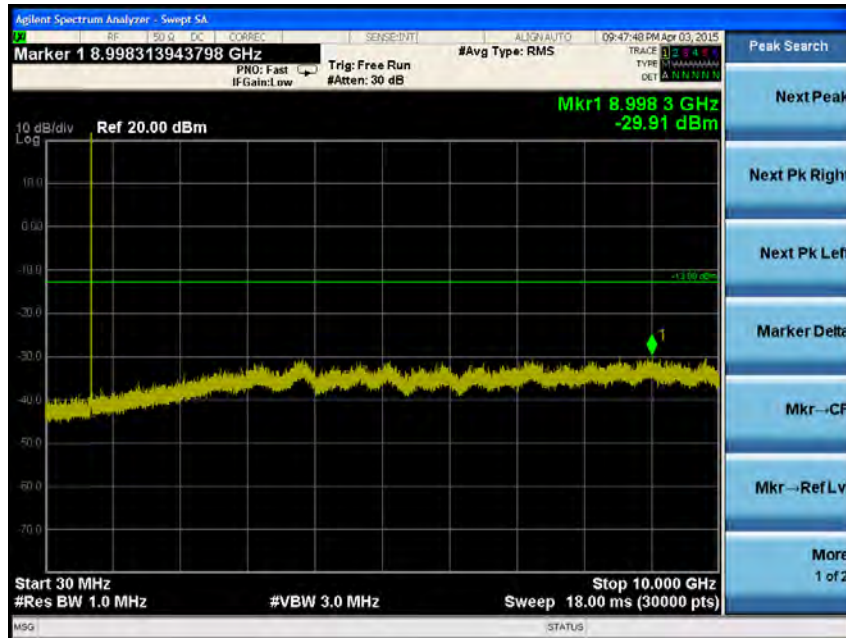
RTT5041-20(2014.01.20)(2)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

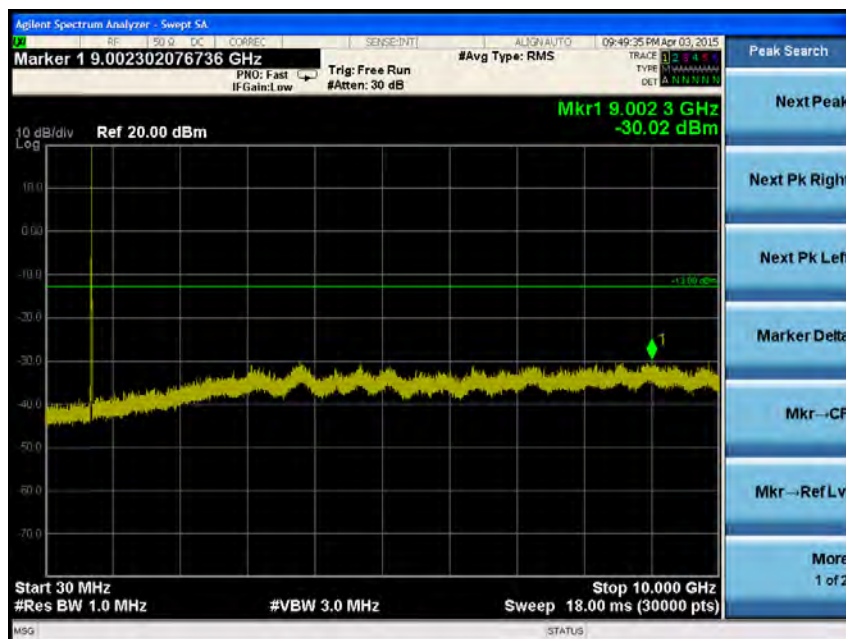
A4(210 mm x 297 mm)

LTE band 17 (10 MHz – 16QAM_RB 1_Offset 0)

Low Channel

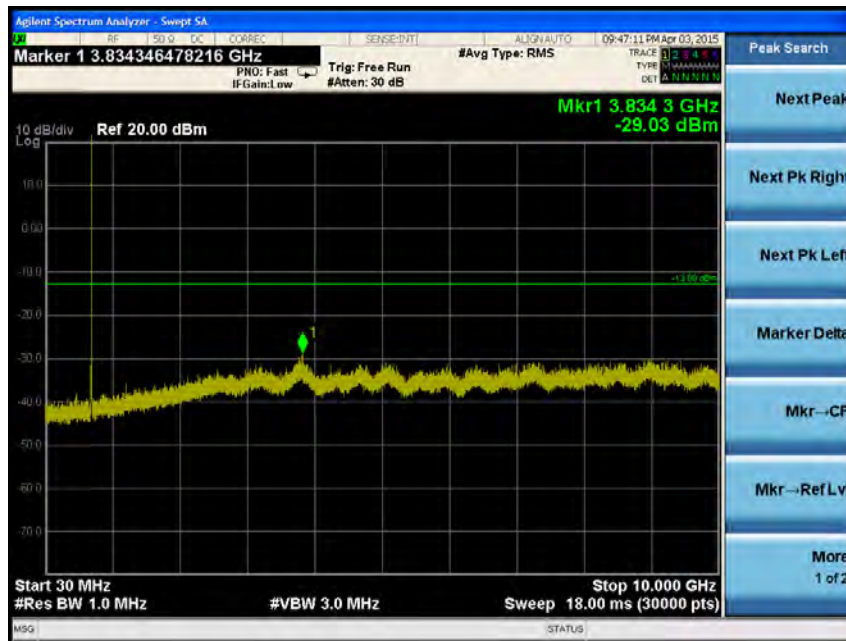


Middle Channel



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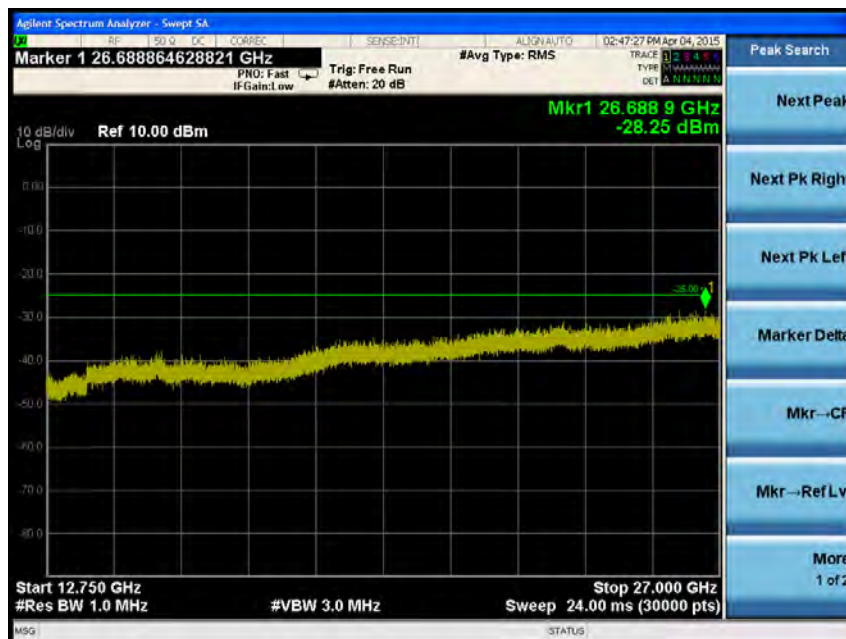
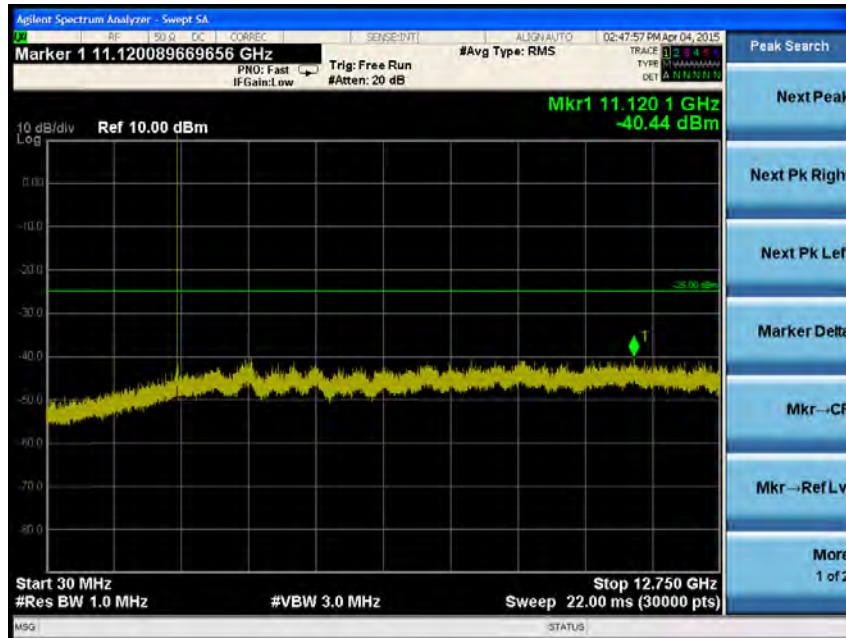
High Channel



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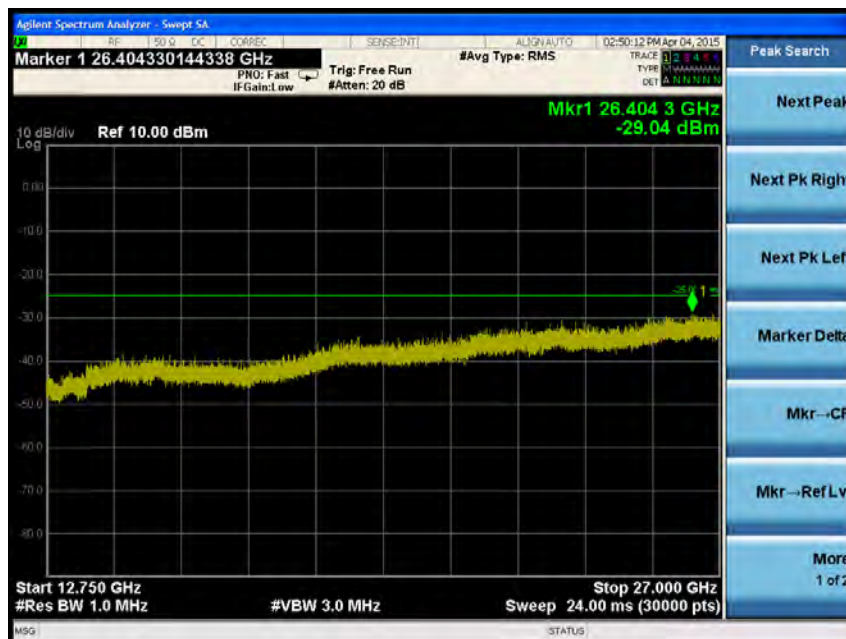
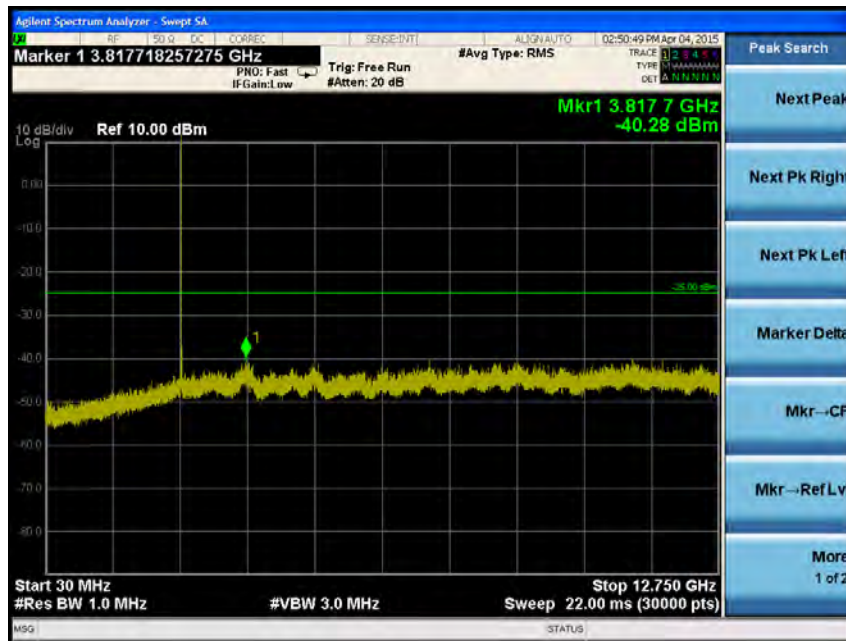
LTE band 41 (5 MHz – QPSK_RB 1_Offset 0)

Low Channel



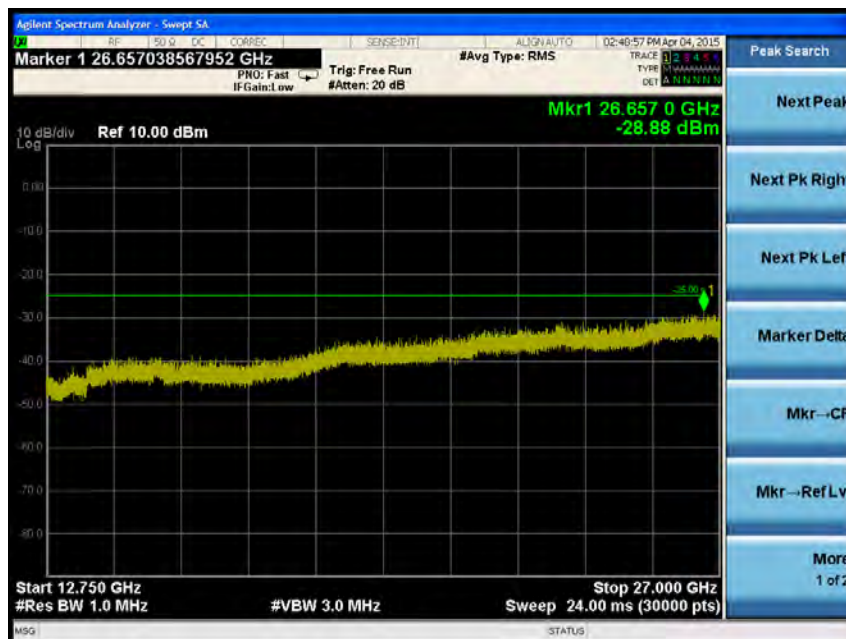
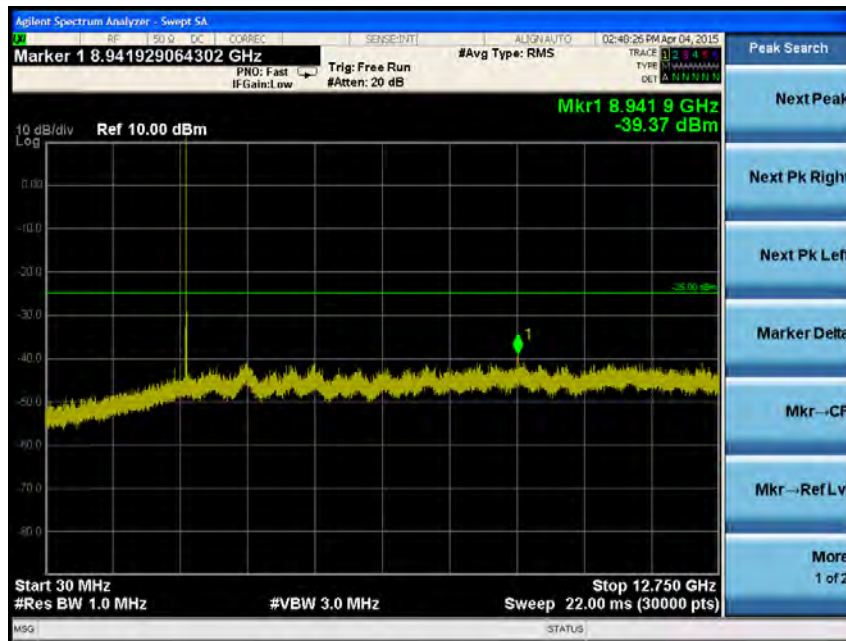
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Middle Channel



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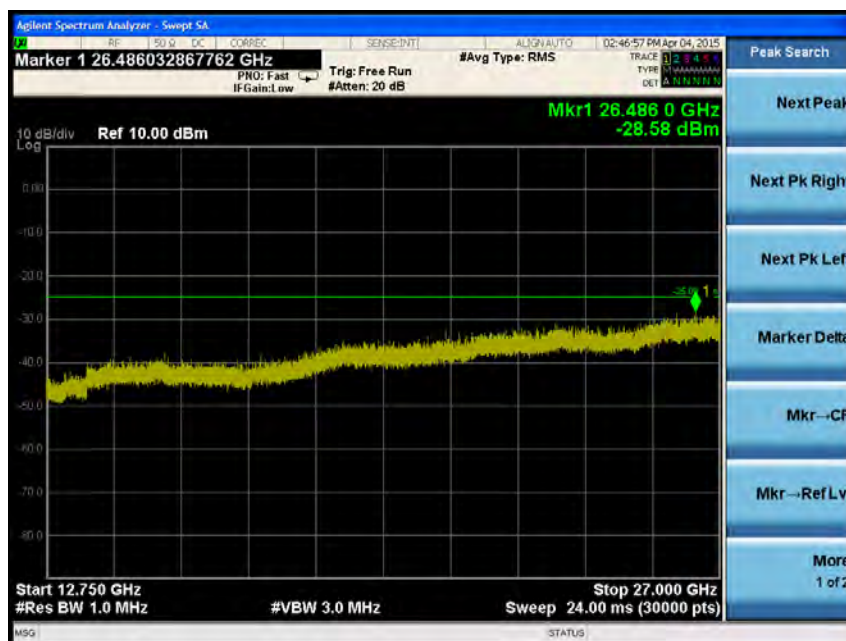
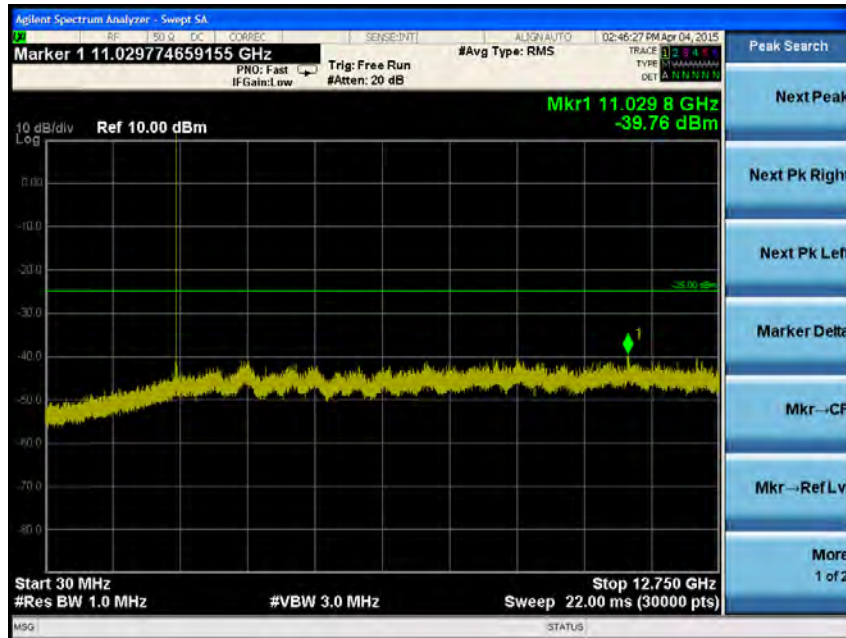
High Channel



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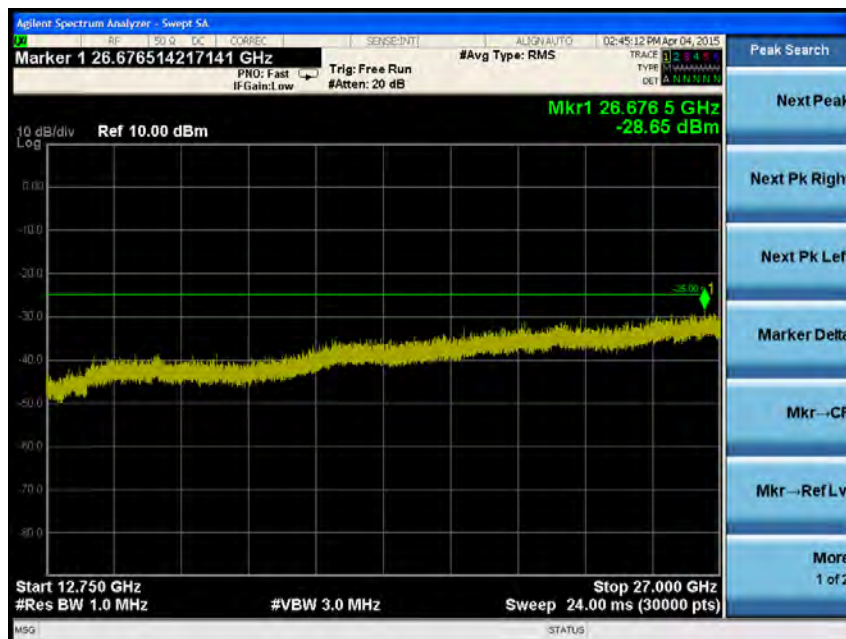
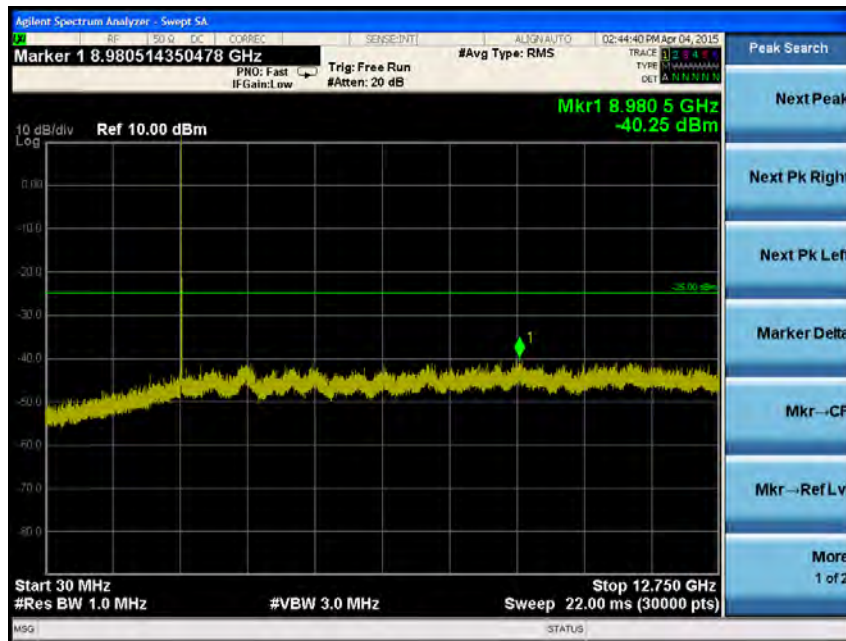
LTE band 41 (5 MHz – 16QAM_RB 1_Offset 0)

Low Channel



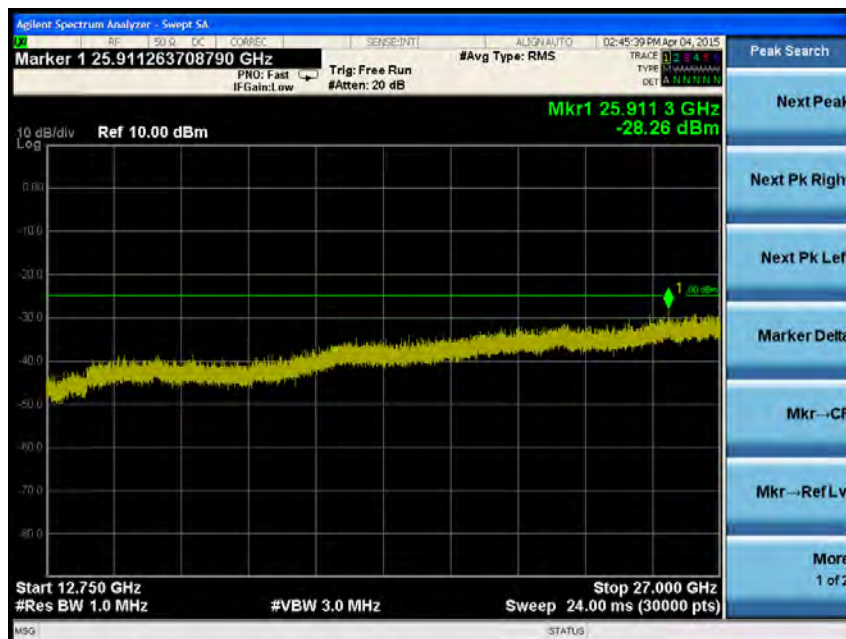
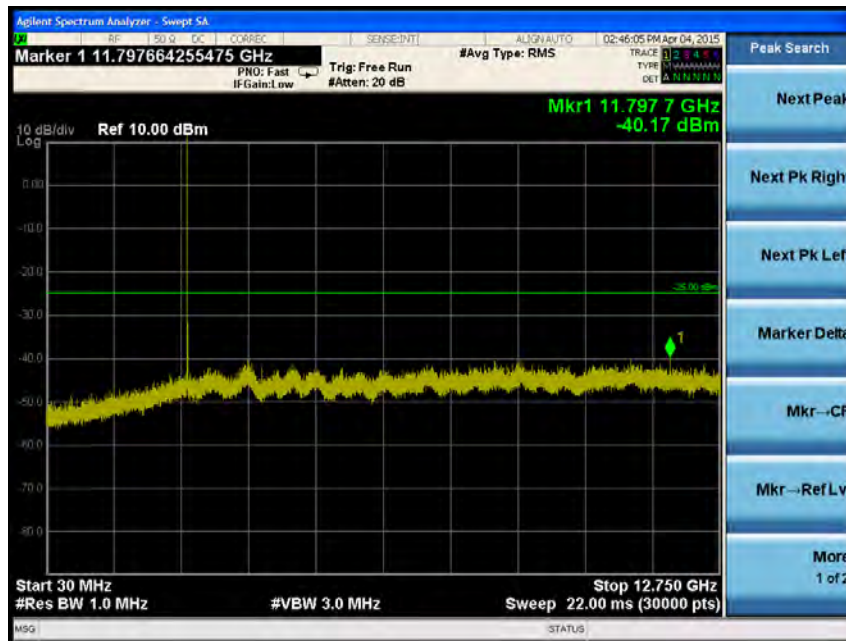
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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.

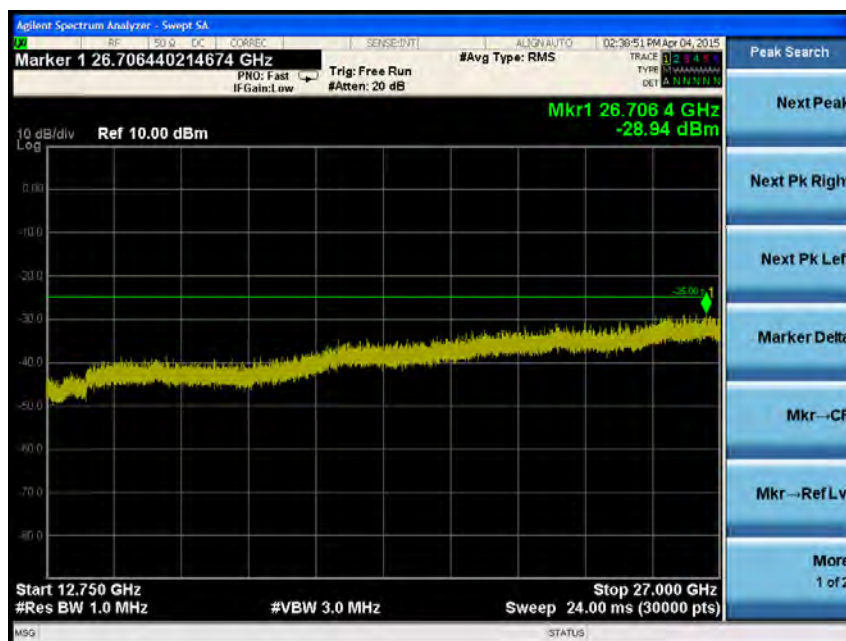
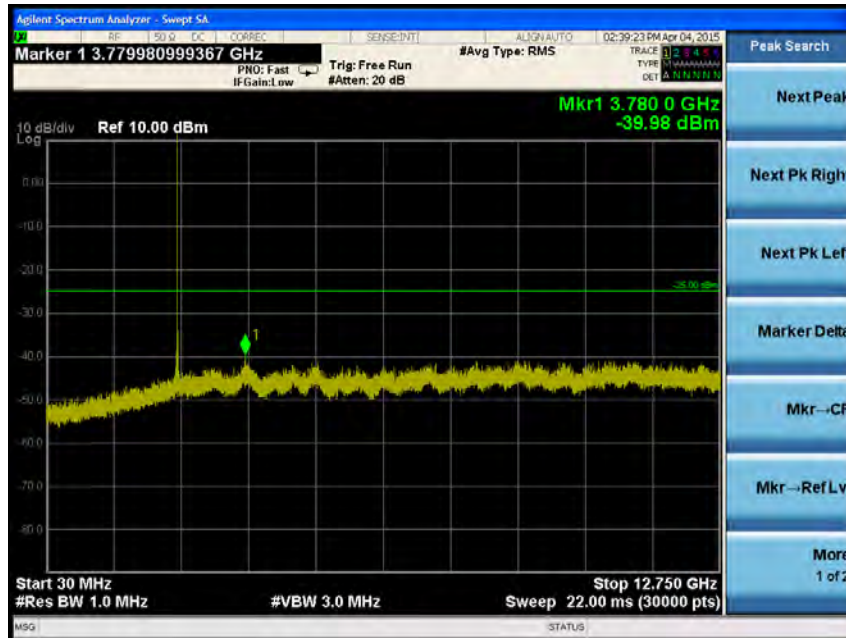
High Channel



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.

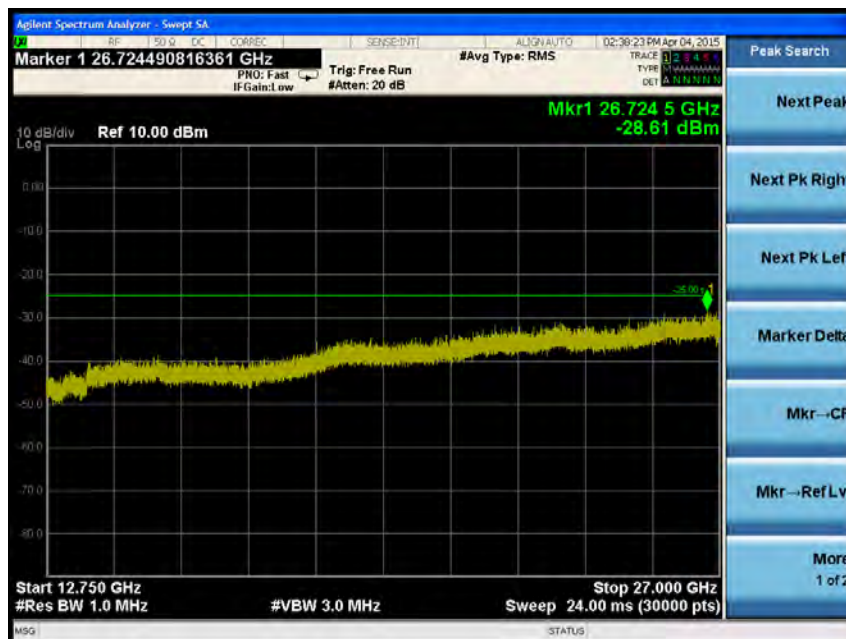
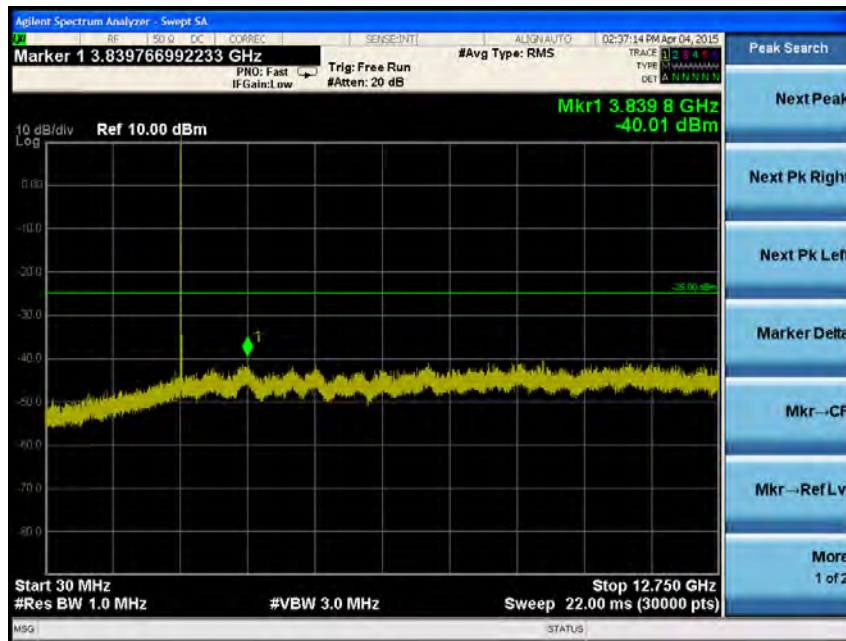
LTE band 41 (10 MHz – QPSK_RB 1_Offset 0)

Low Channel



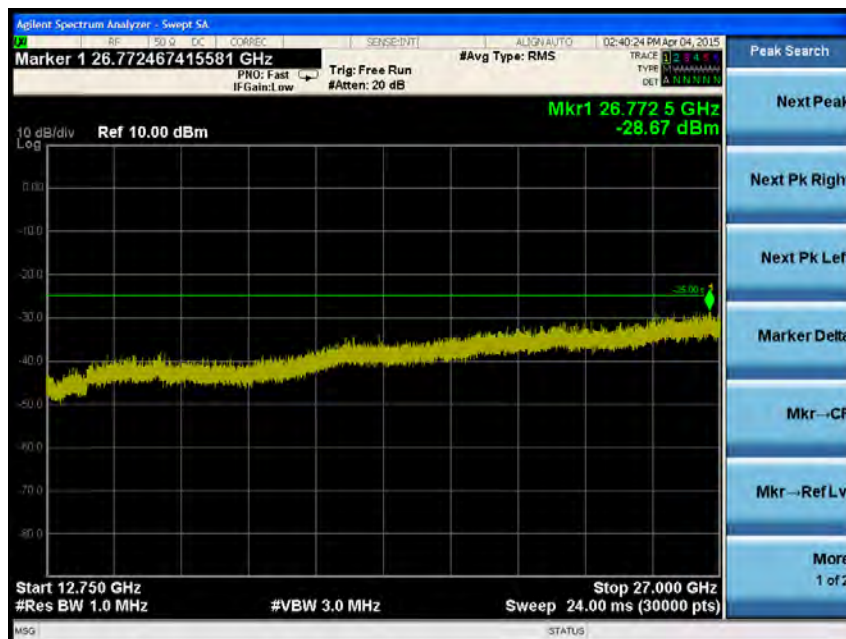
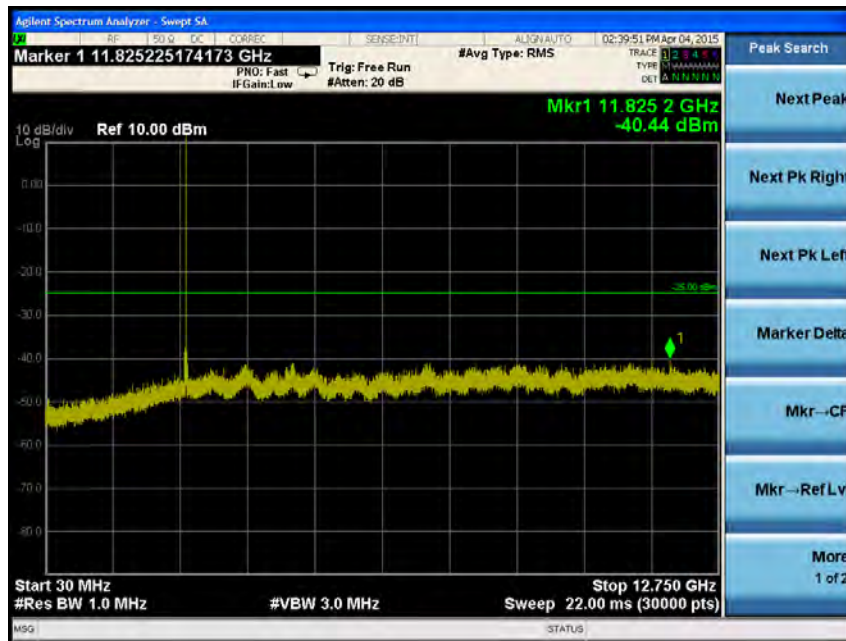
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Middle Channel



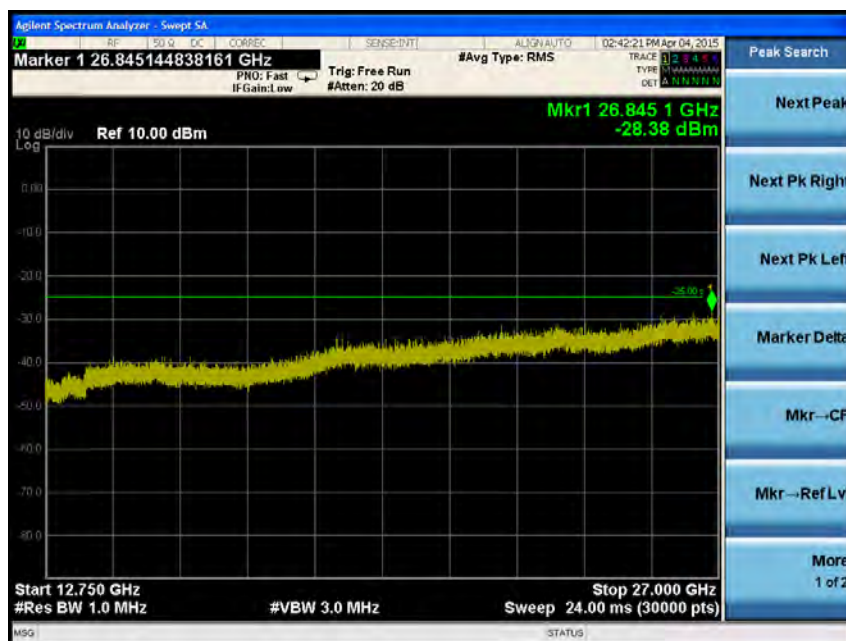
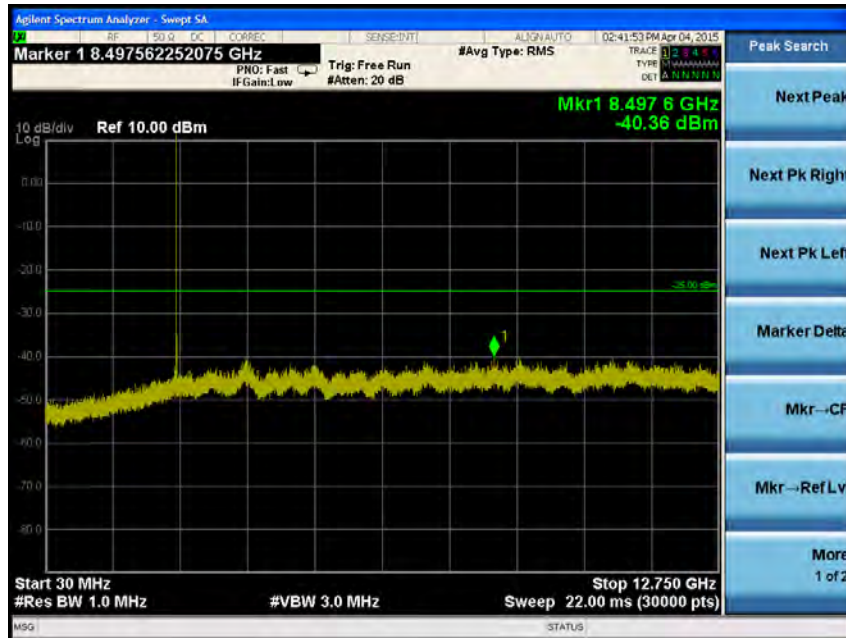
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

High Channel



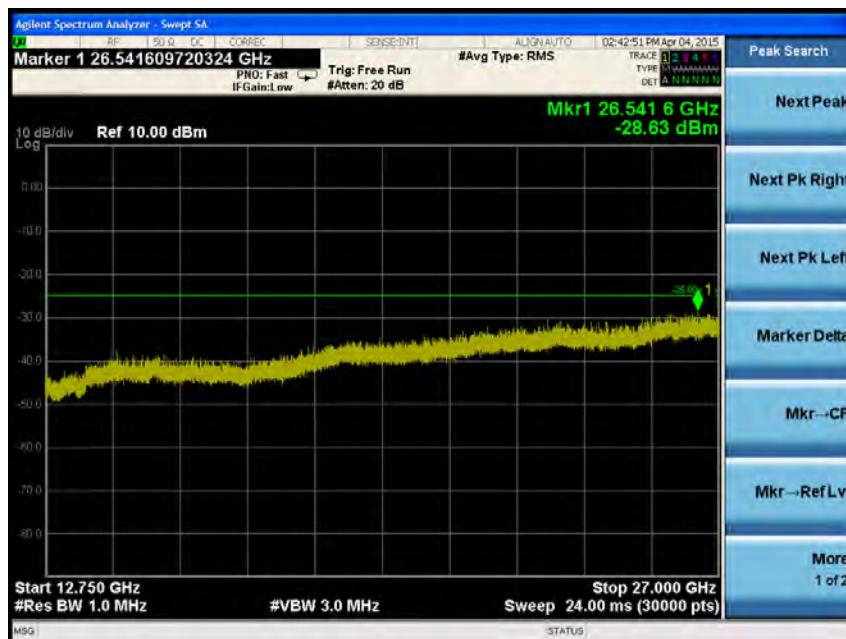
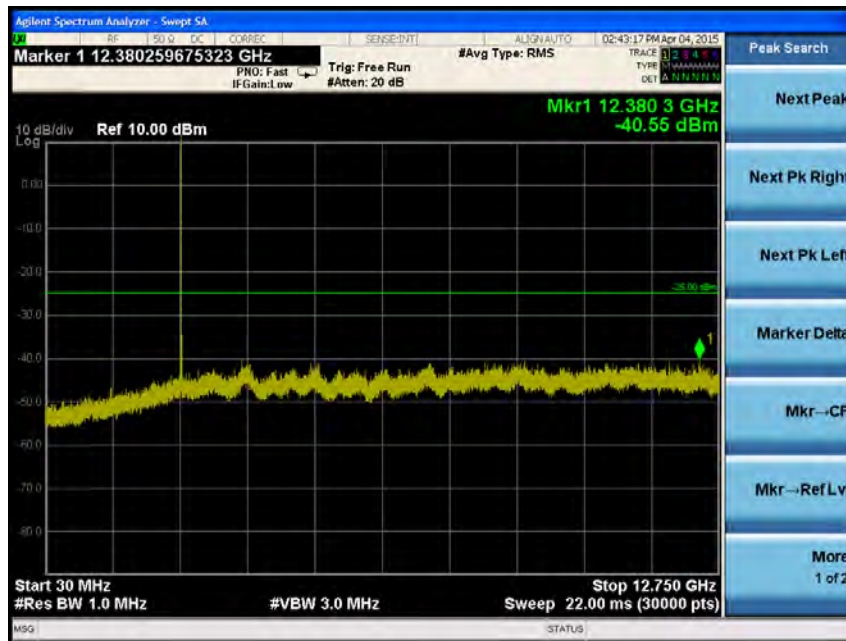
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (10 MHz – 16QAM_RB 1_Offset 0) Low Channel



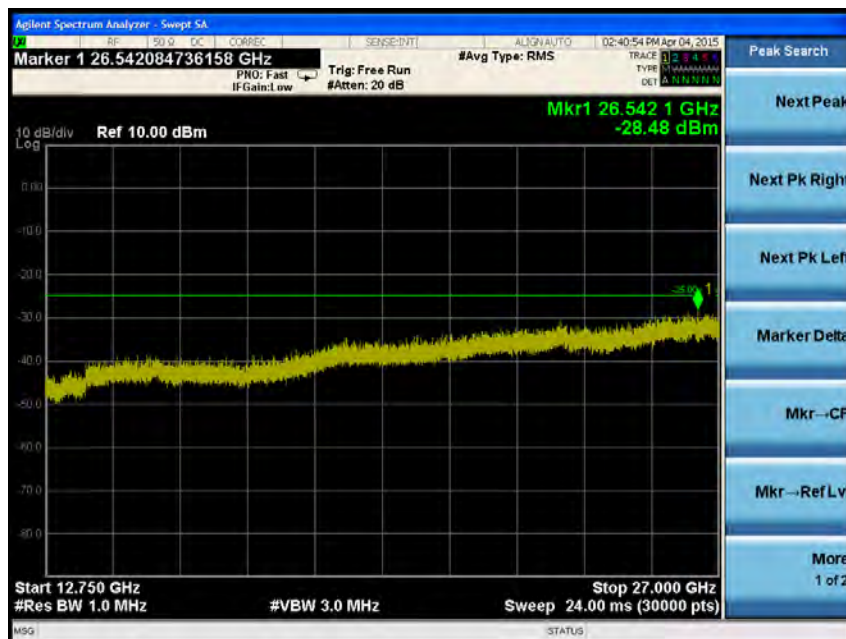
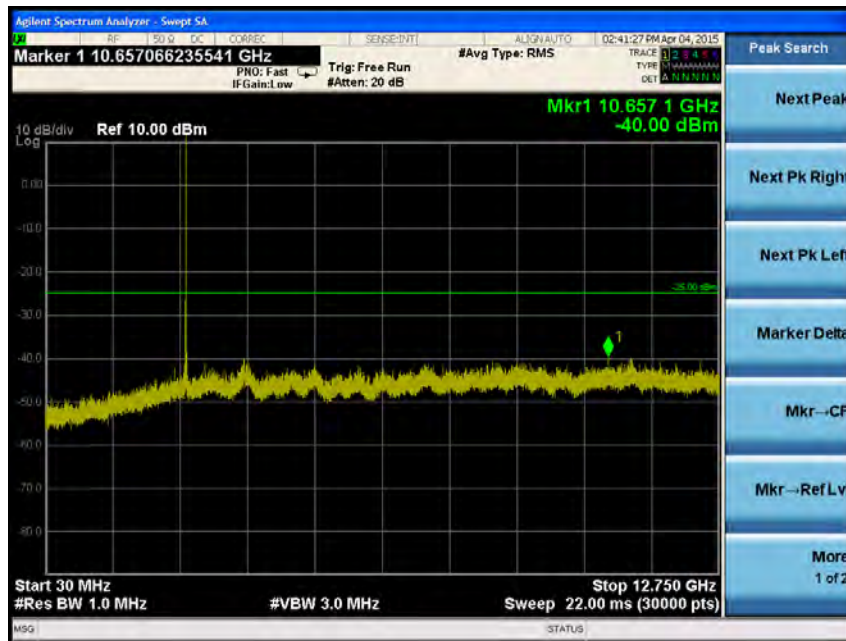
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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.

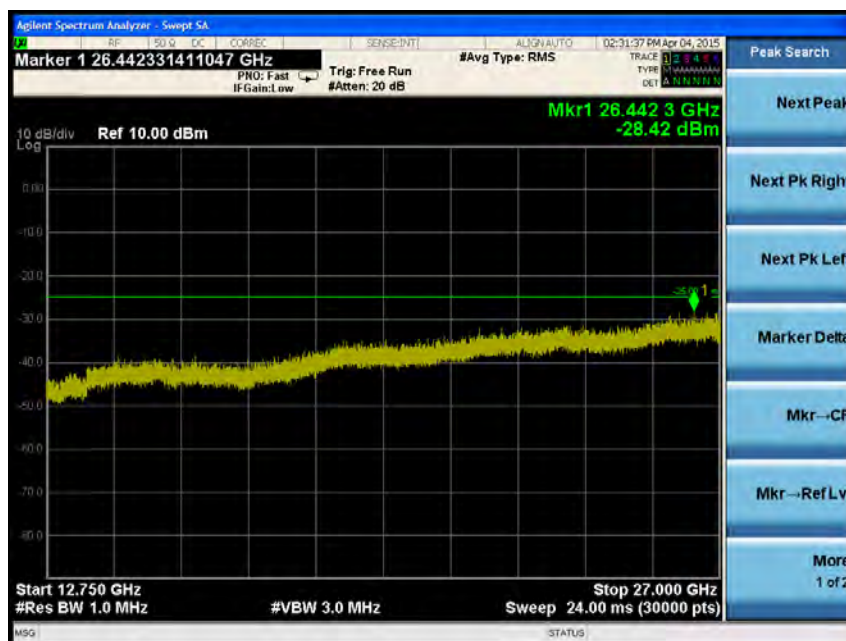
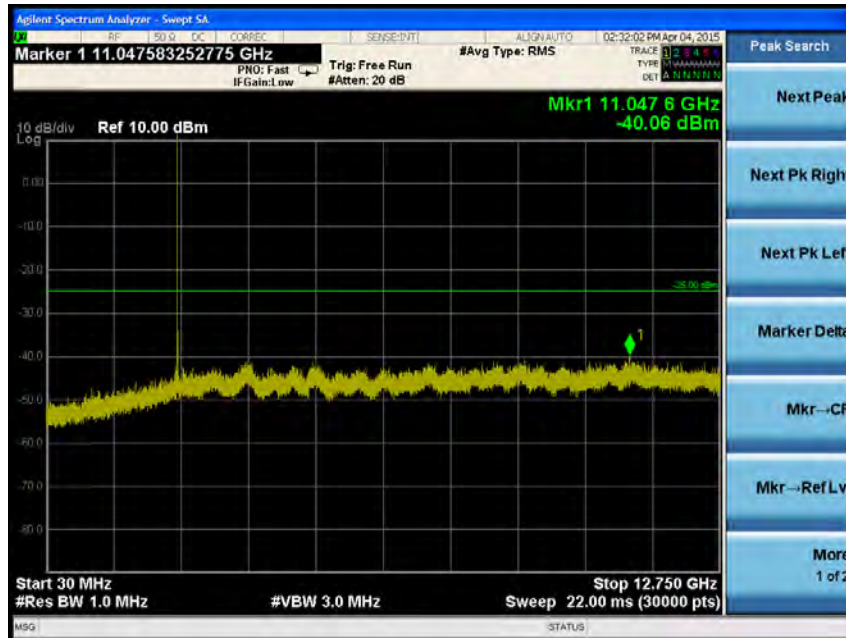
High Channel



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.

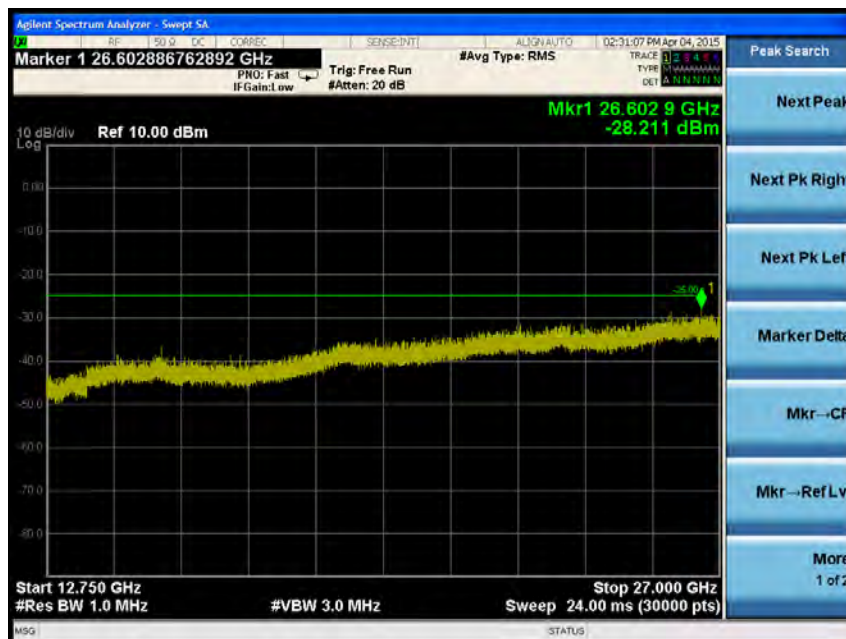
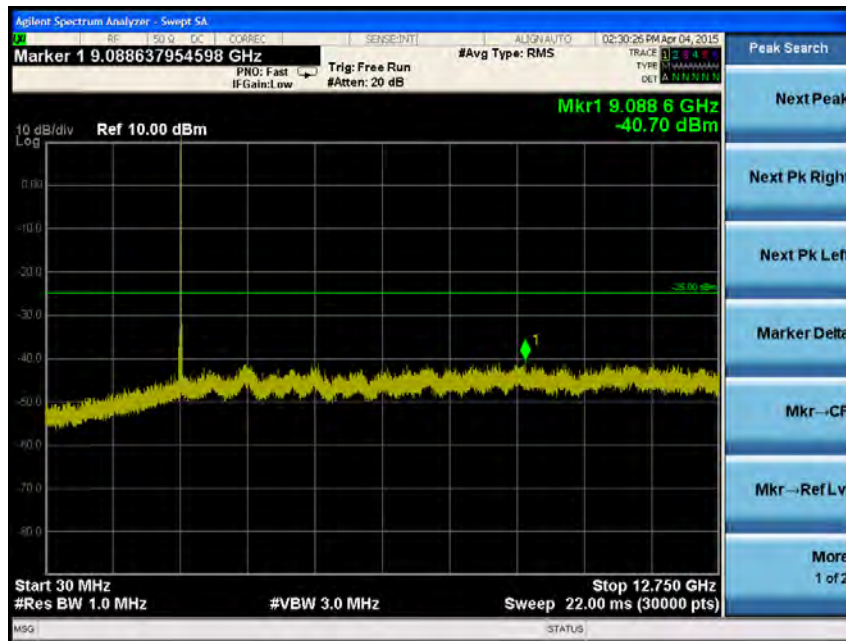
LTE band 41 (15 MHz – QPSK_RB 1_Offset 0)

Low Channel



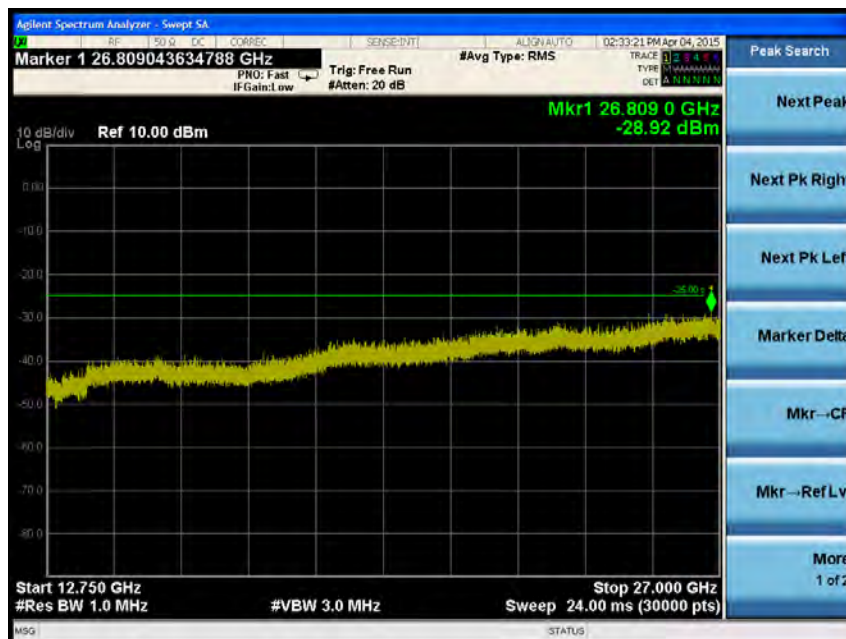
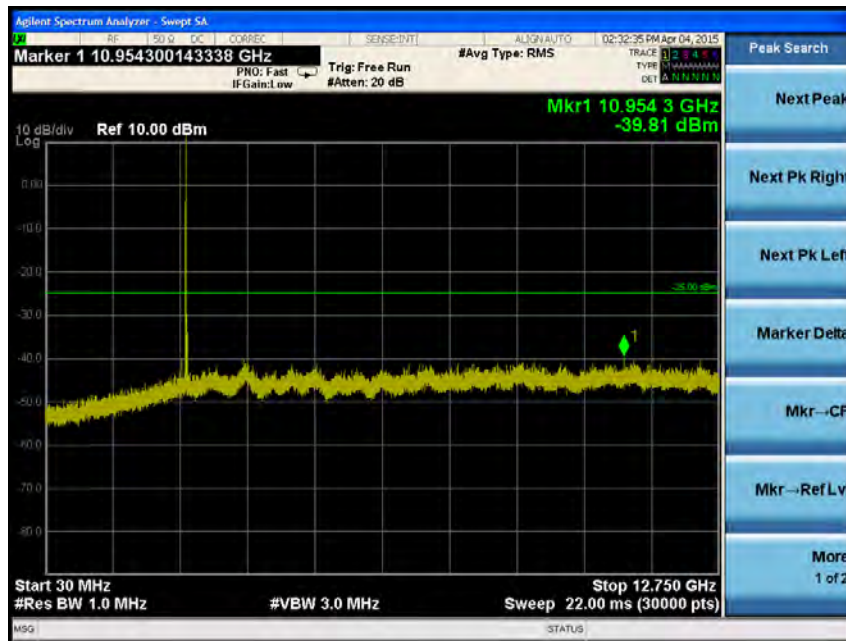
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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.

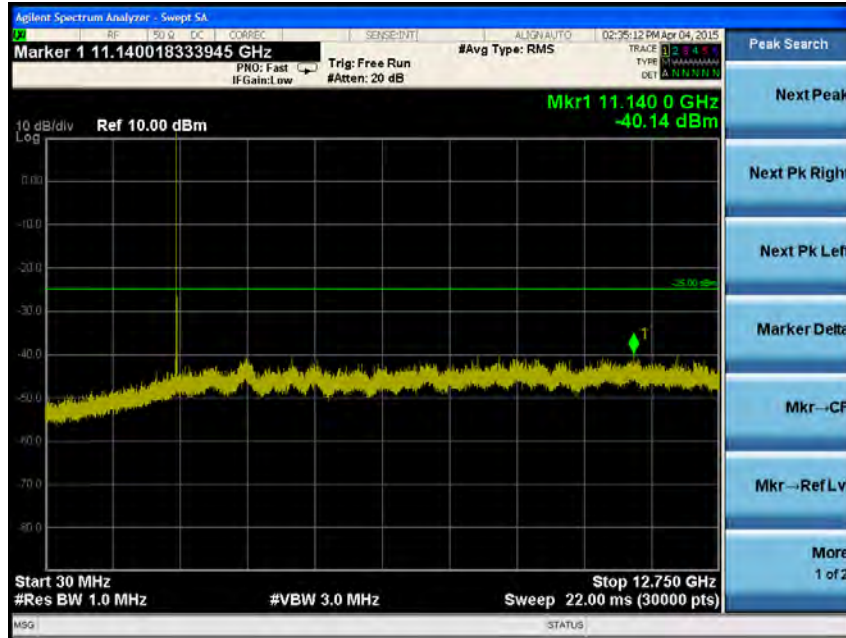
High Channel



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.

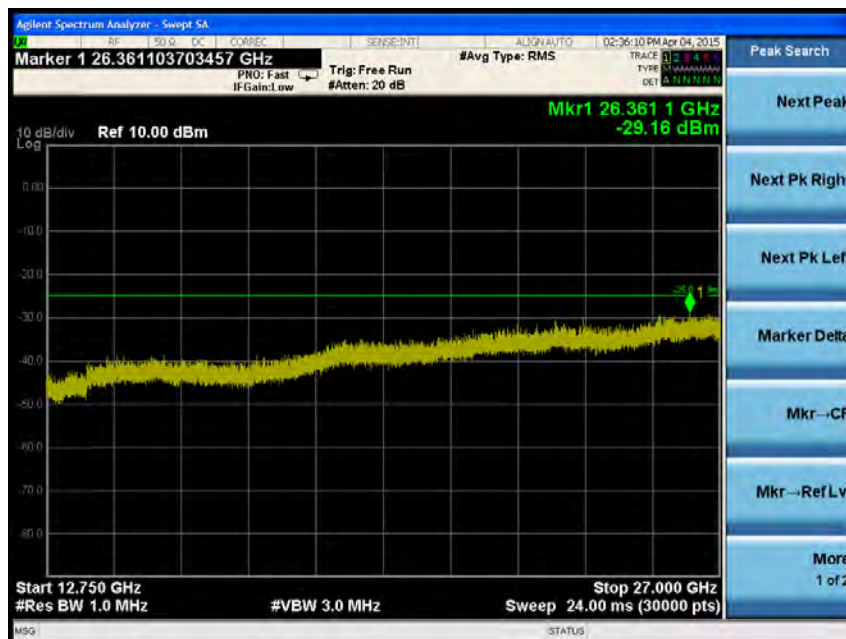
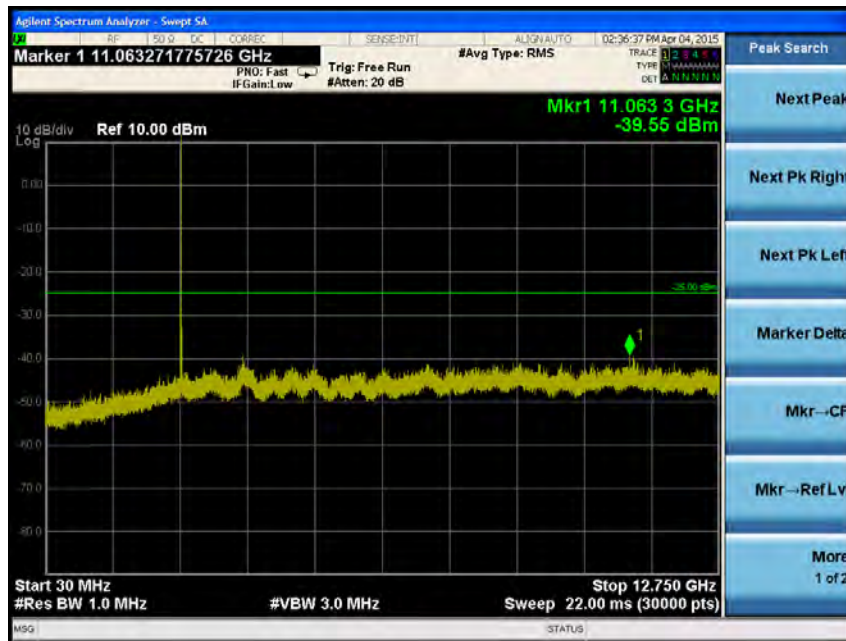
LTE band 41 (15 MHz – 16QAM_RB 1_Offset 0)

Low Channel



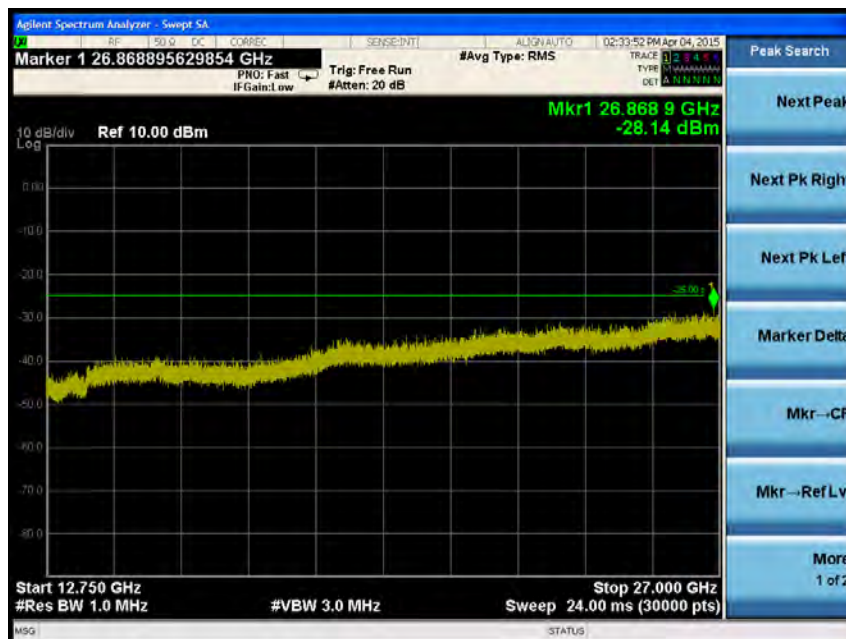
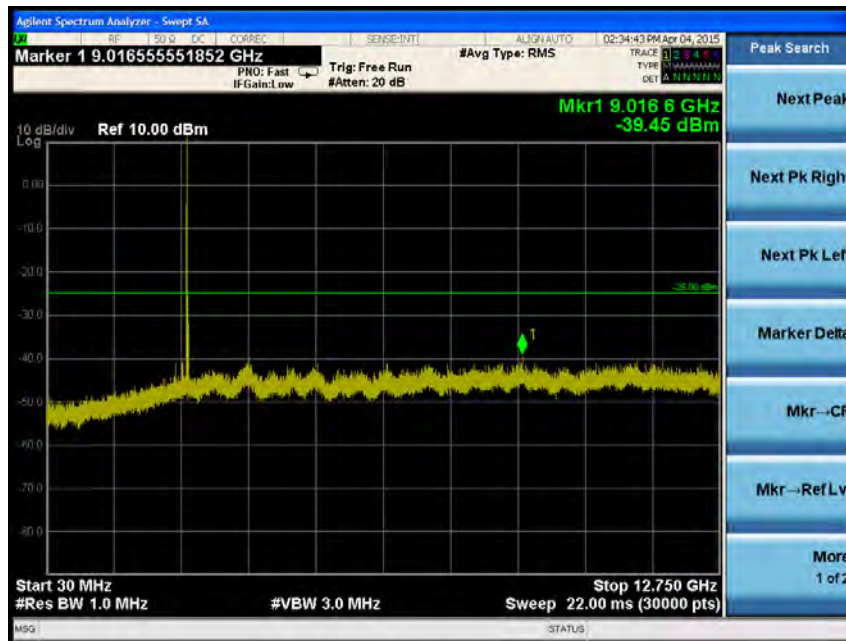
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Middle Channel



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.

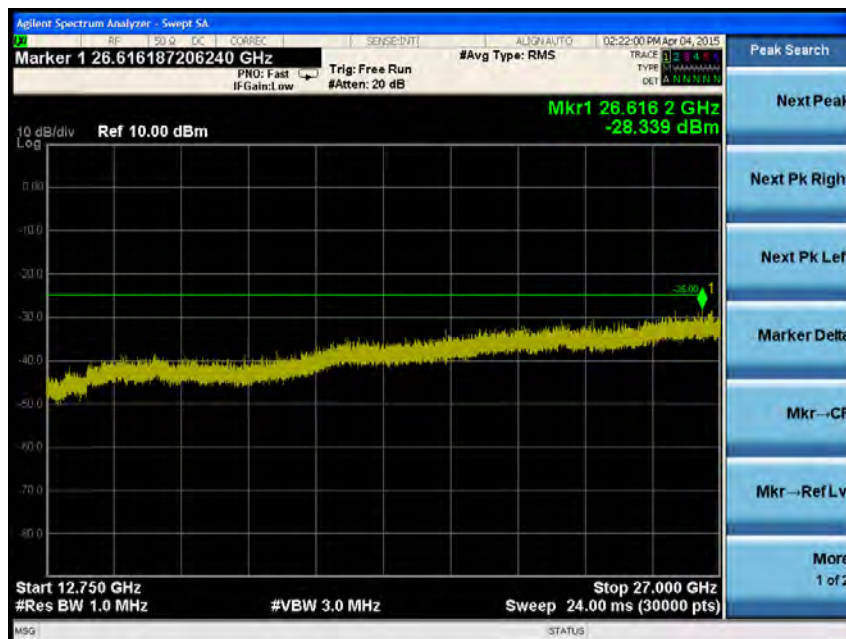
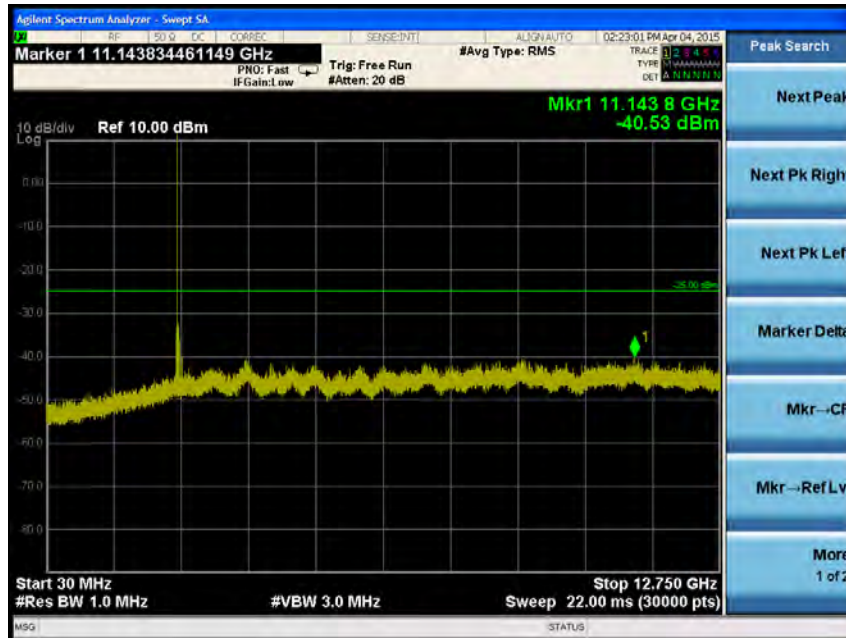
High Channel



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.

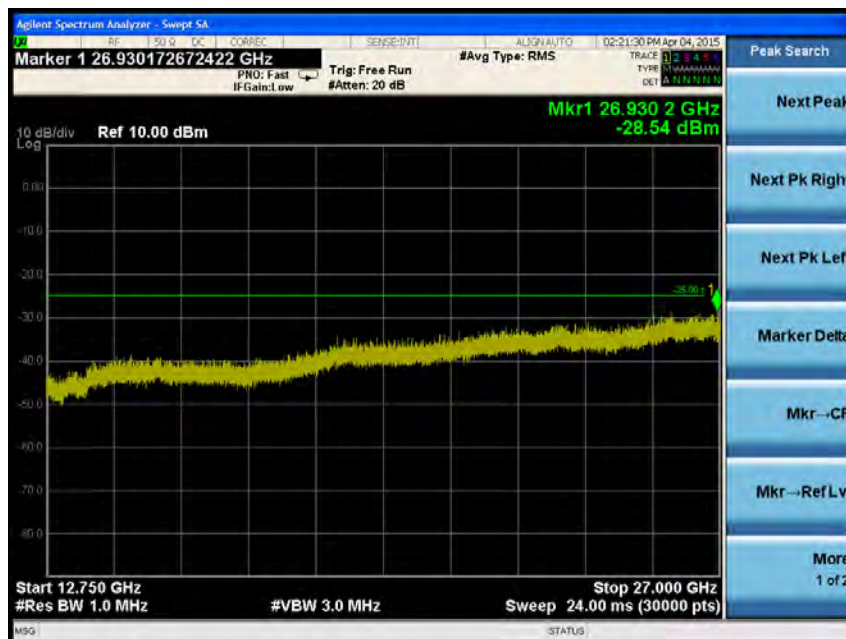
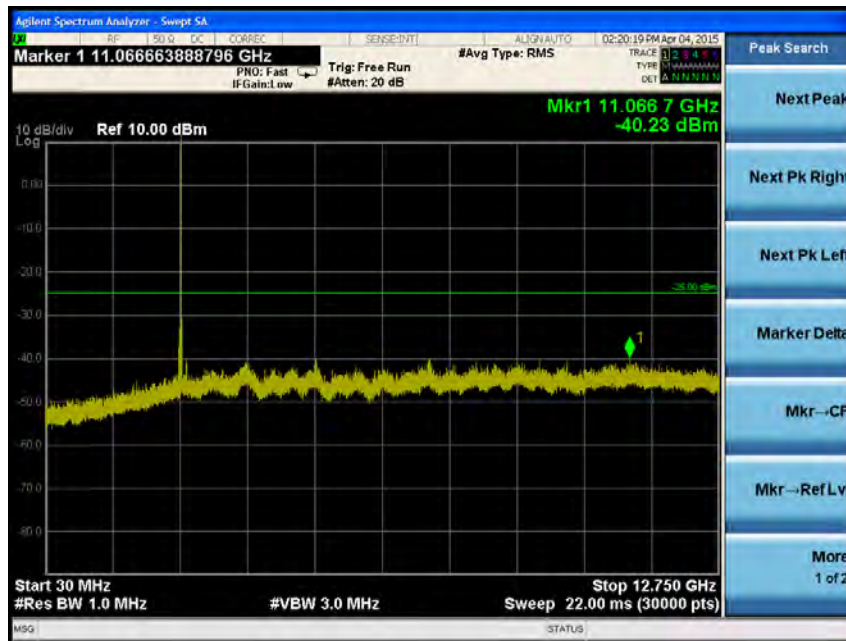
LTE band 41 (20 MHz – QPSK_RB 1_Offset 0)

Low Channel



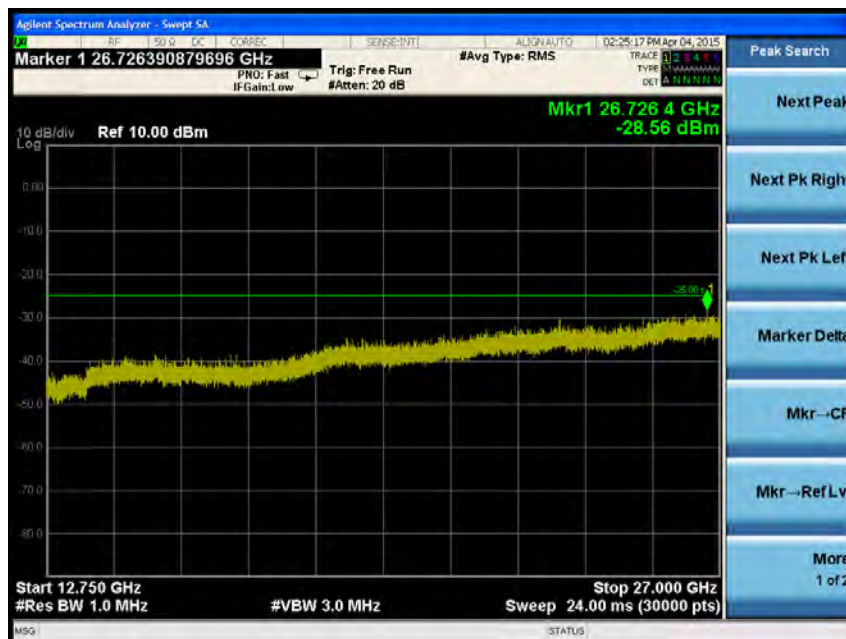
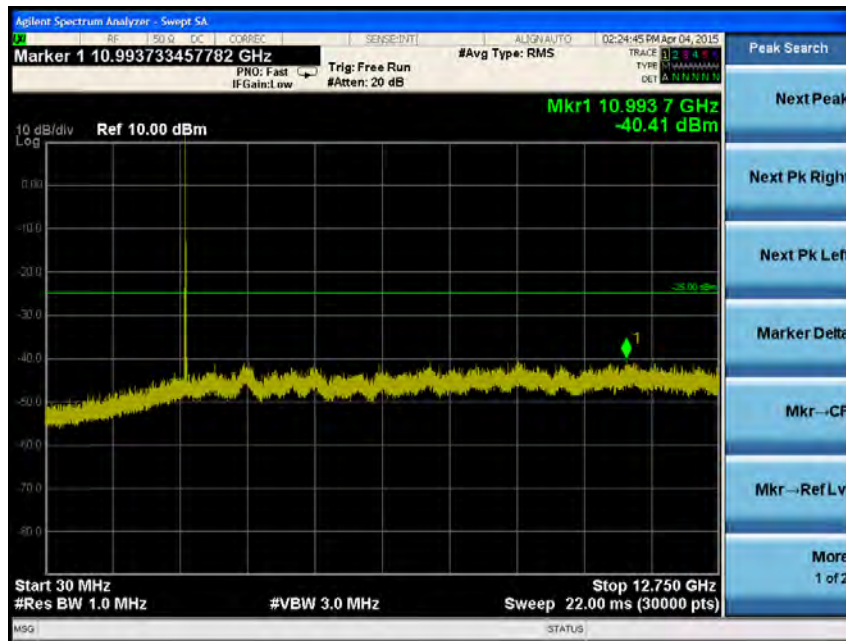
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Middle Channel



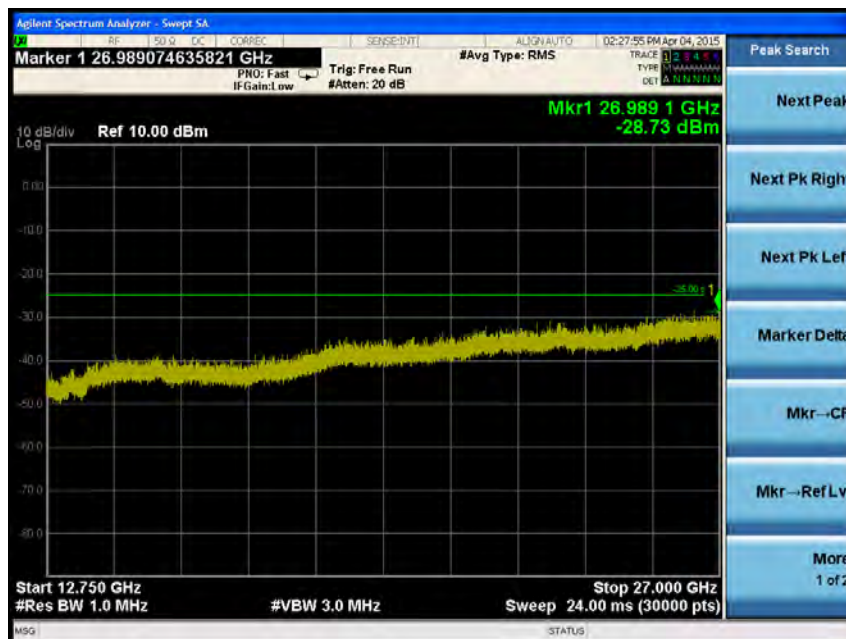
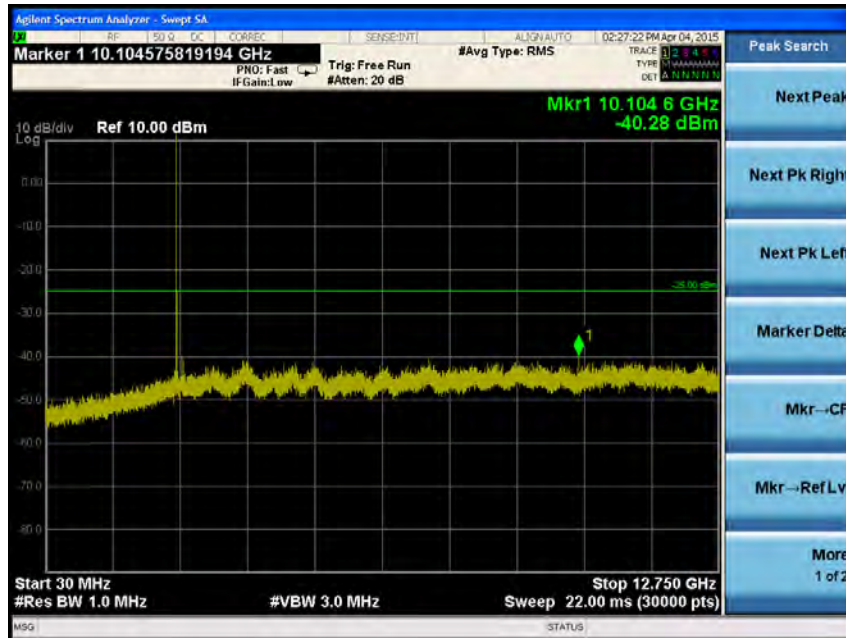
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

High Channel



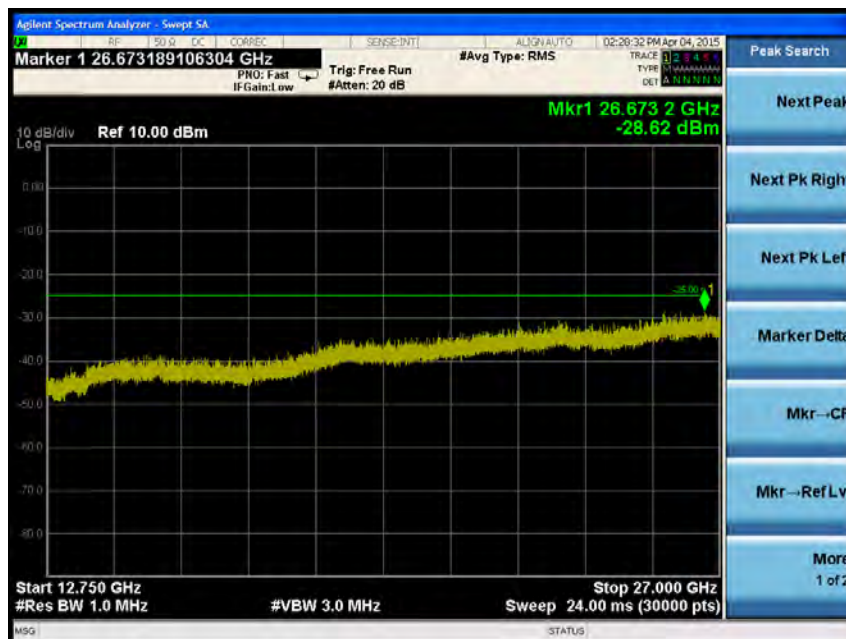
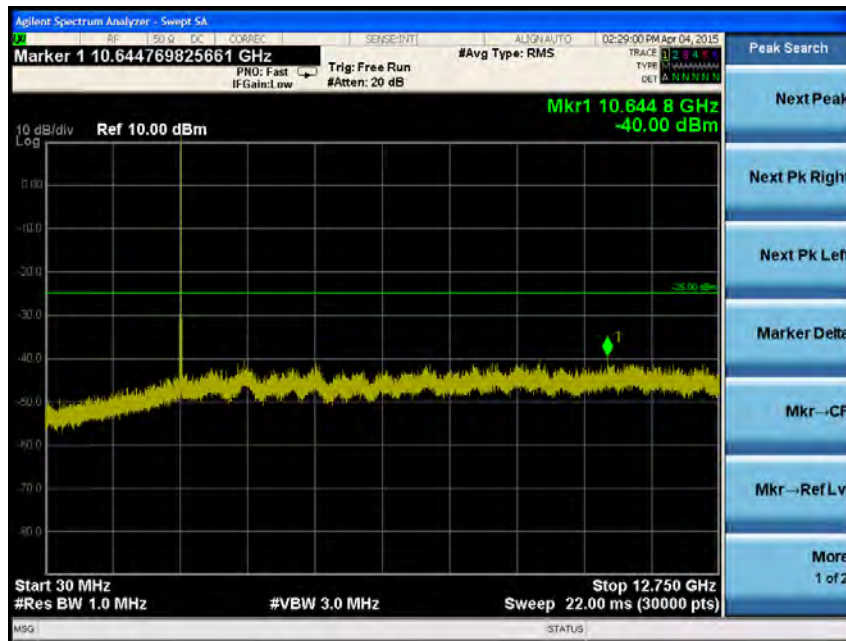
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (20 MHz – 16QAM_RB 1_Offset 0) Low Channel



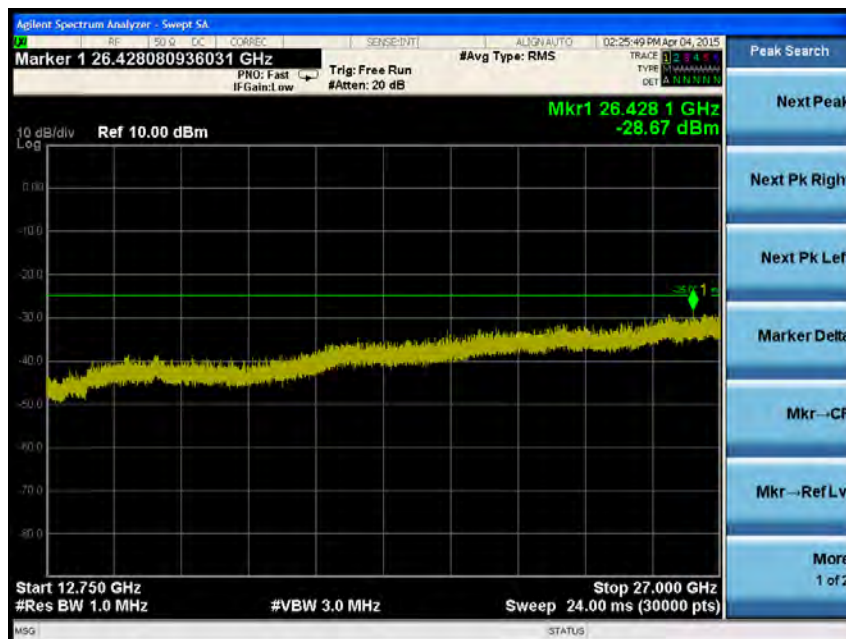
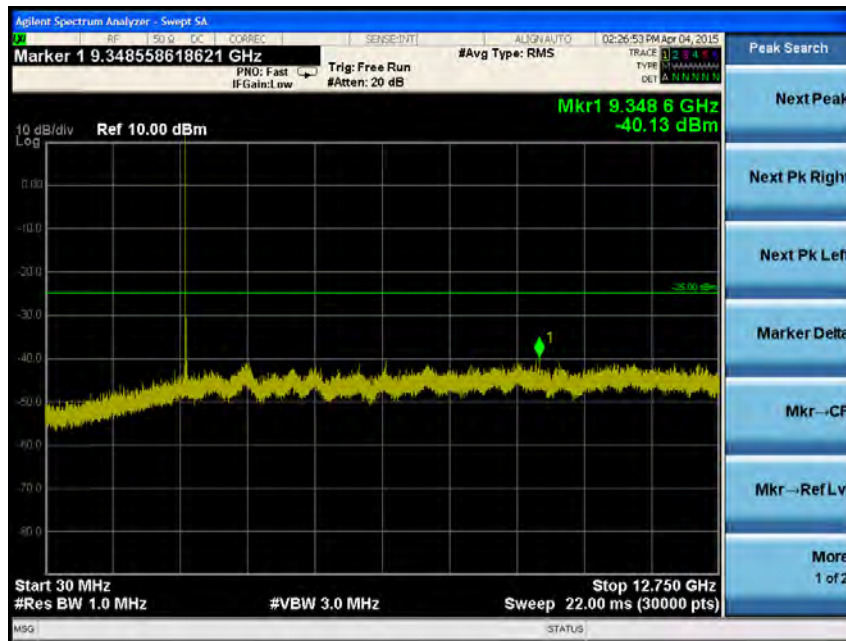
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Middle Channel



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High Channel



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6. Band Edge

6.1. 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.

FCC §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.

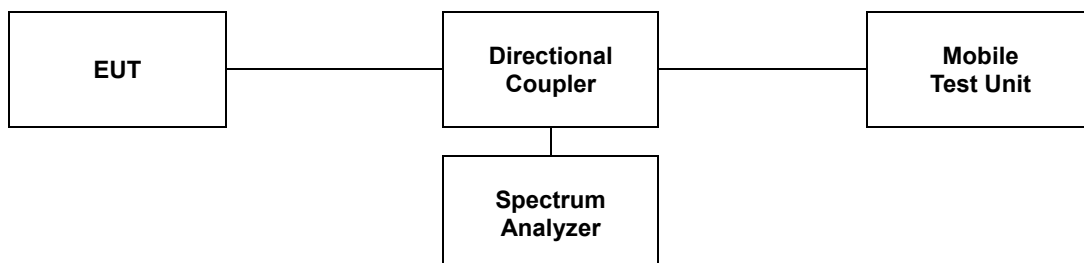
FCC §27.53(g), For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10\log(P)$ dB.

FCC §27.53(m)(4), For mobile digital stations, the attenuation factor shall be not less than $40 + 10\log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10\log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10\log(P)$ 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 $43 + 10\log(P)$ dB on all frequencies between 2 490.5 MHz and 2 496 MHz and $55 + 10\log(P)$ dB at or below 2 490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2 495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

6.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168_v02r02.

1. Span was set large enough so as to capture all out of band emissions near the band edge.
2. RBW $\geq 1\%$ of EBW
3. VBW $\geq$ RBW.
4. Detector = RMS.
5. Trace mode = max hold.
6. Sweep time = auto couple.
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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6.3. Test Results

Ambient temperature : (24 ± 1) °C

Relative humidity : 47 % R.H.

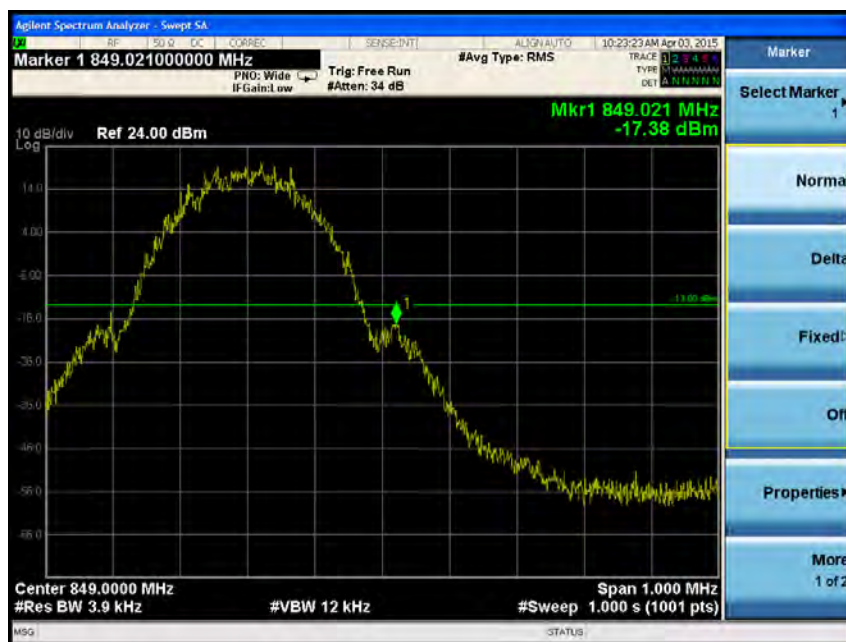
Please refer to the following plots.

GSM850

Low Channel



High Channel

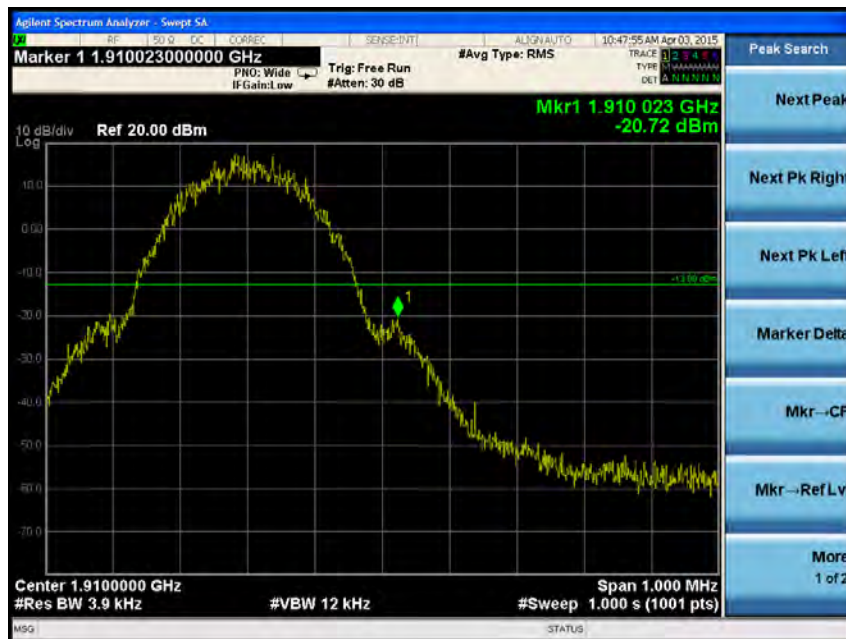


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GSM1900 Low Channel



High Channel



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WDCMA850 Low Channel



High Channel



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LTE band 5 (1.4 MHz – QPSK_RB 6)

Low Channel



High Channel



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LTE band 5 (1.4 MHz – 16QAM_RB 6)

Low Channel



High Channel



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LTE band 5 (3 MHz – QPSK_RB 15)

Low Channel



High Channel



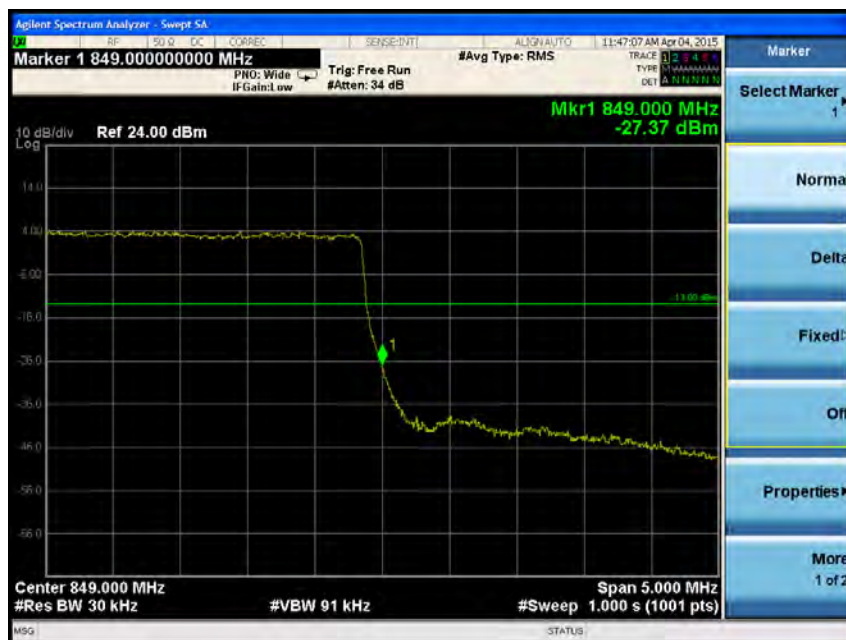
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 5 (3 MHz – 16QAM_RB 15)

Low Channel



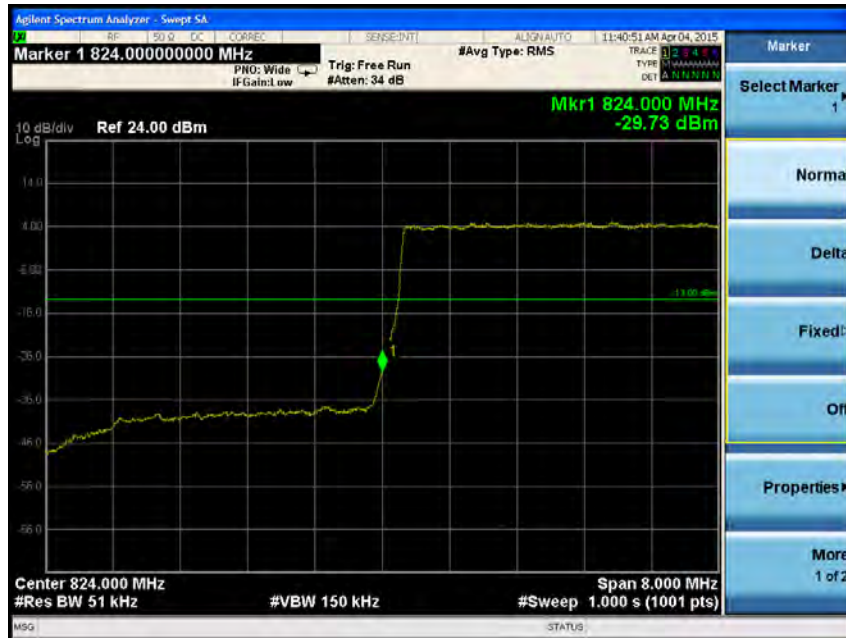
High Channel



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LTE band 5 (5 MHz – QPSK_RB 25)

Low Channel



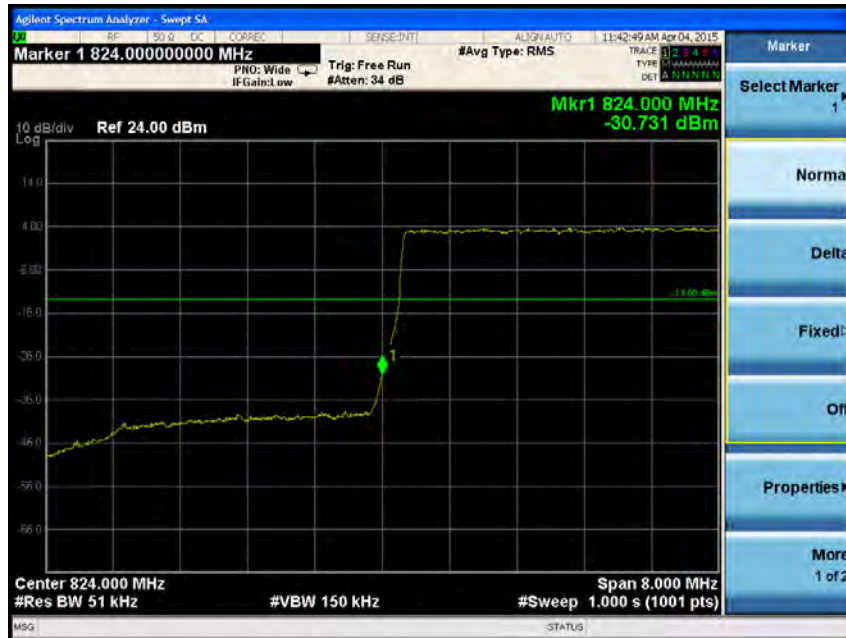
High Channel



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LTE band 5 (5 MHz – 16QAM_RB 25)

Low Channel



High Channel



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LTE band 5 (10 MHz – QPSK_RB 50)

Low Channel



High Channel



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LTE band 5 (10 MHz – 16QAM_RB 50)

Low Channel



High Channel



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LTE band 17 (5 MHz – QPSK_RB 25)

Low Channel



High Channel



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LTE band 17 (5 MHz – 16QAM_RB 25)

Low Channel



High Channel



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LTE band 17 (10 MHz – QPSK_RB 50)

Low Channel



High Channel



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LTE band 17 (10 MHz – 16QAM_RB 50)

Low Channel



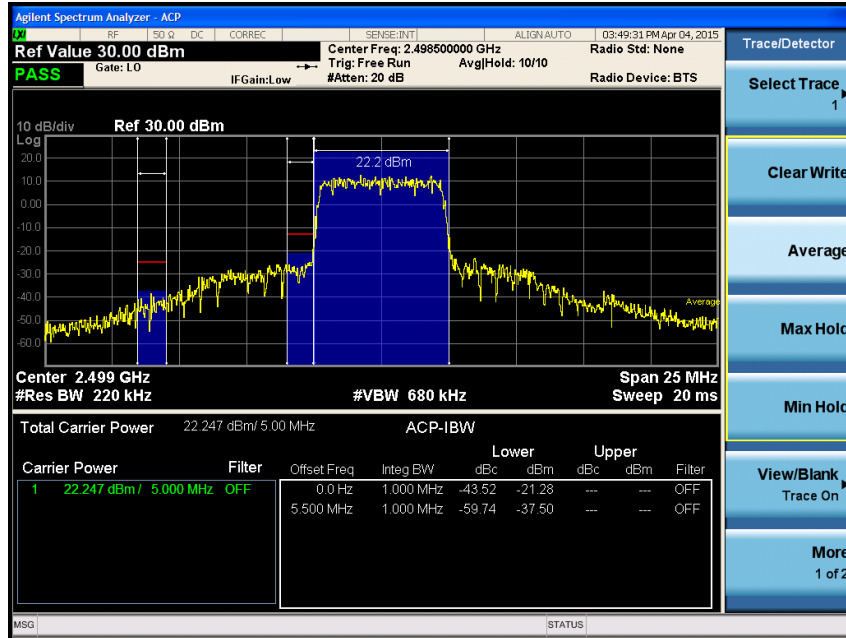
High Channel



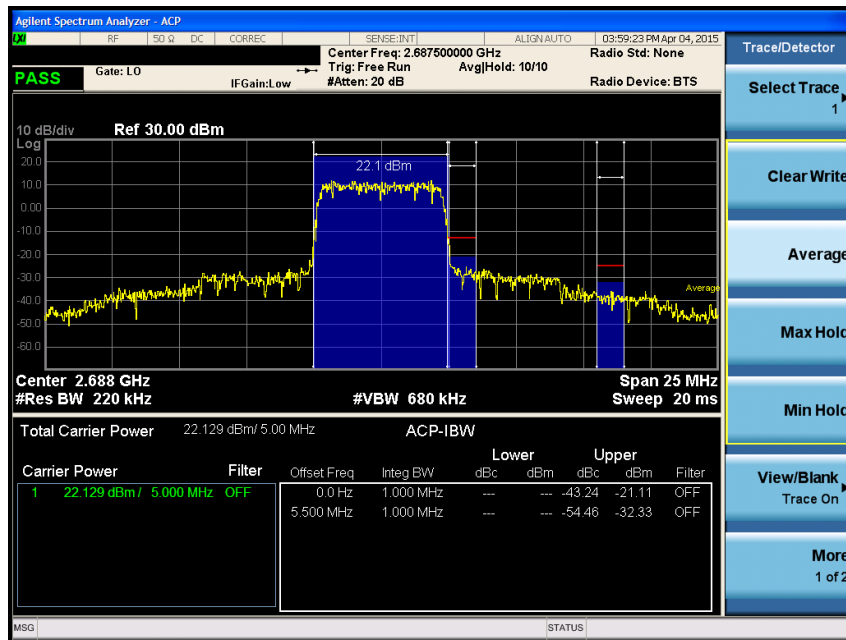
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (5 MHz – QPSK_RB 25)

Low Channel



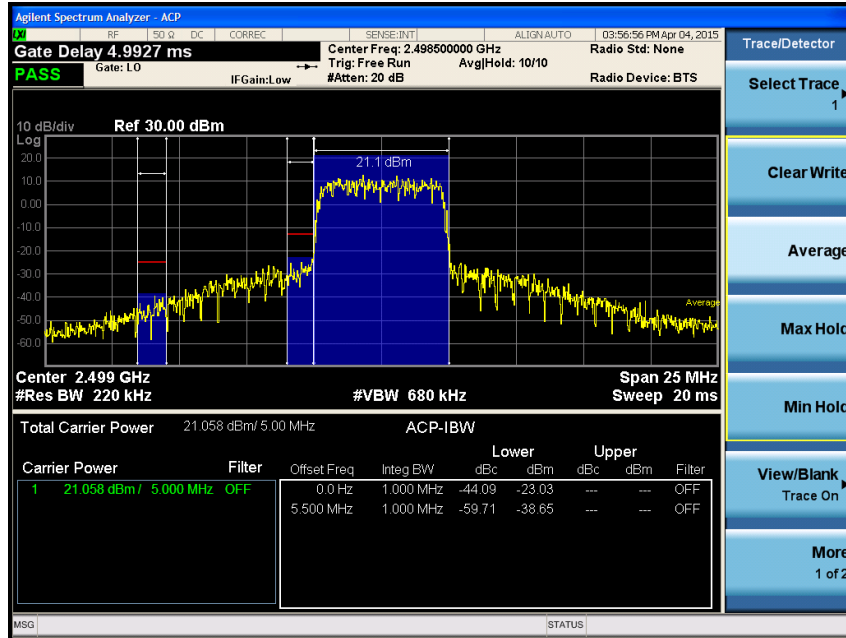
High Channel



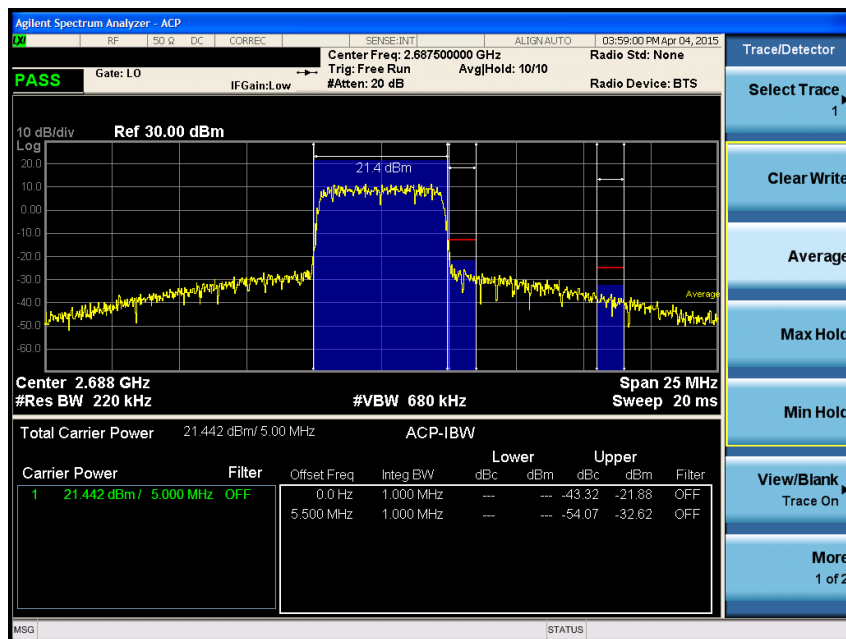
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (5 MHz – 16QAM_RB 25)

Low Channel



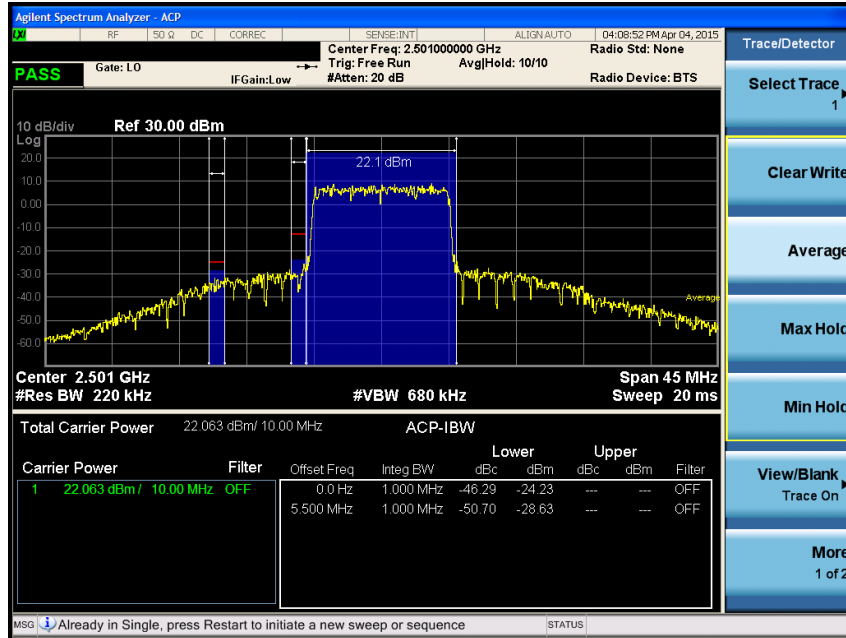
High Channel



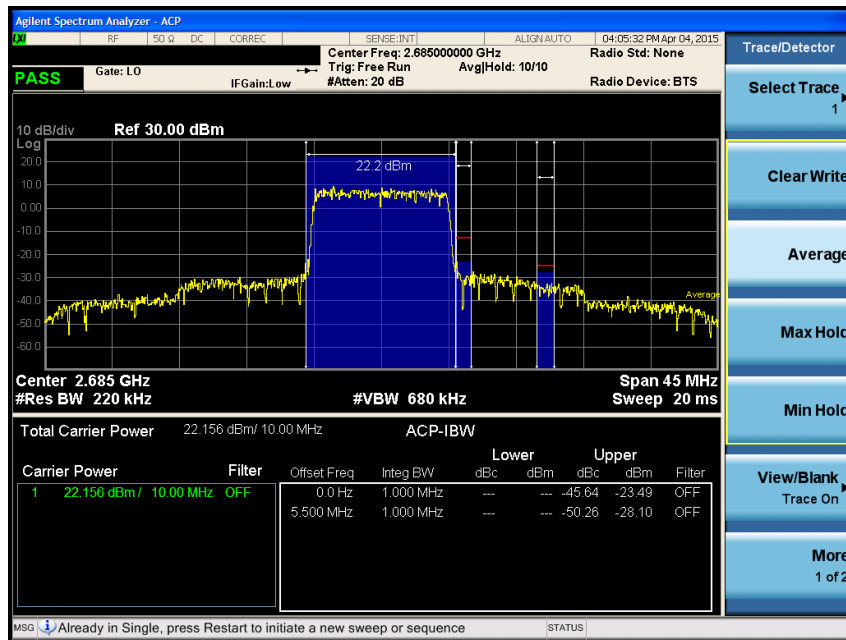
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (10 MHz – QPSK_RB 50)

Low Channel



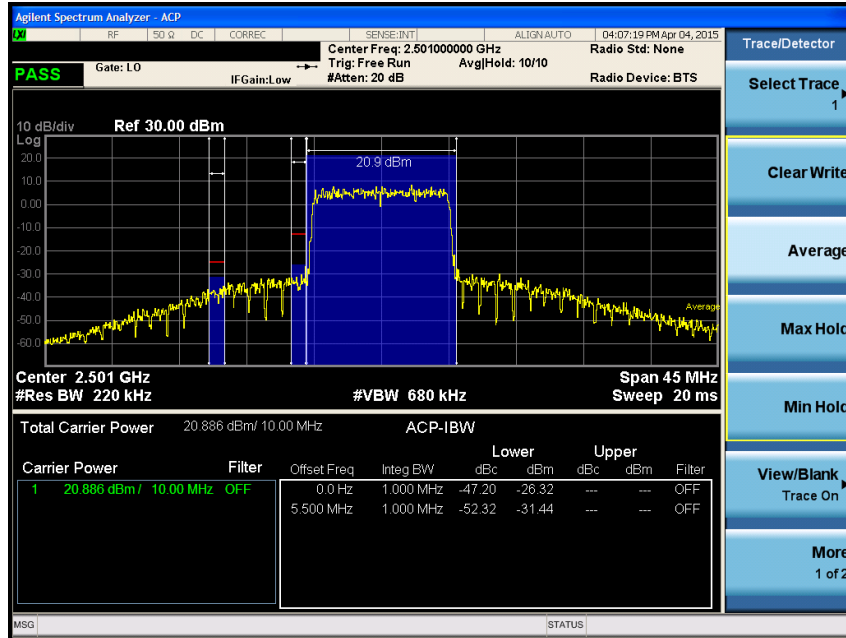
High Channel



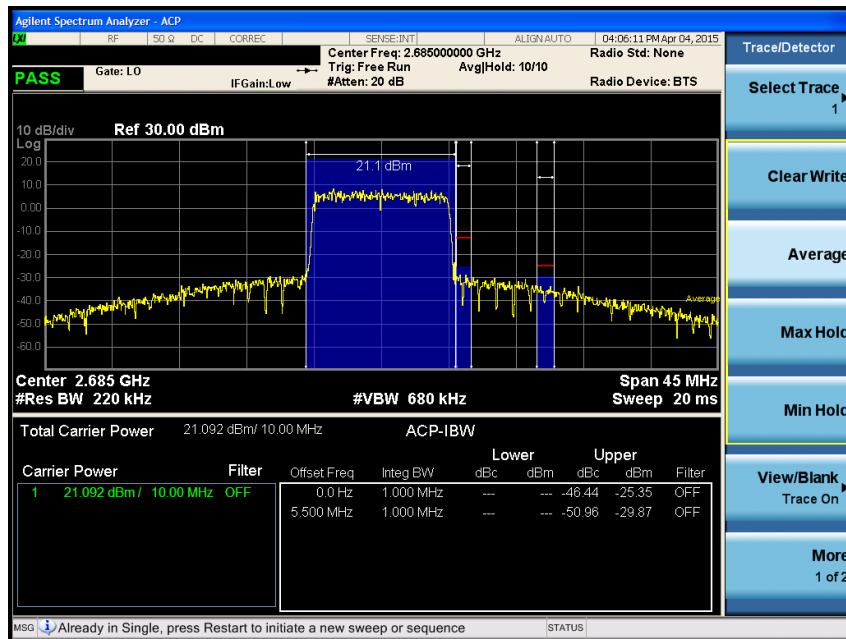
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (10 MHz – 16QAM_RB 50)

Low Channel



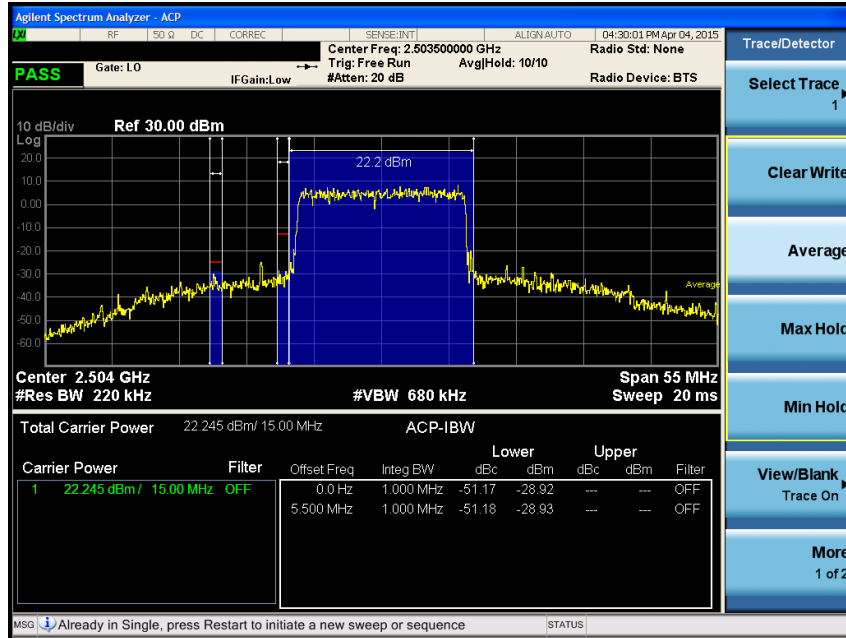
High Channel



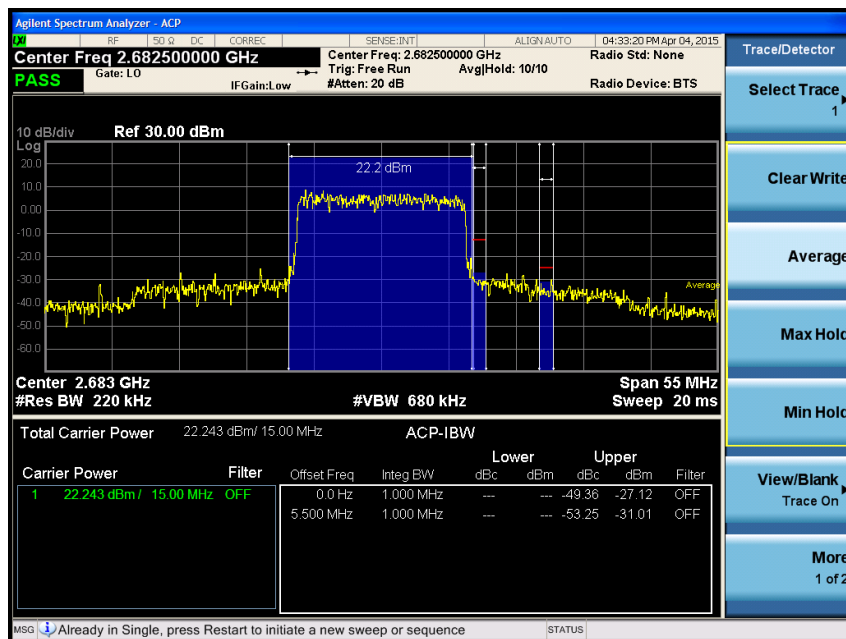
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (15 MHz – QPSK_RB 75)

Low Channel



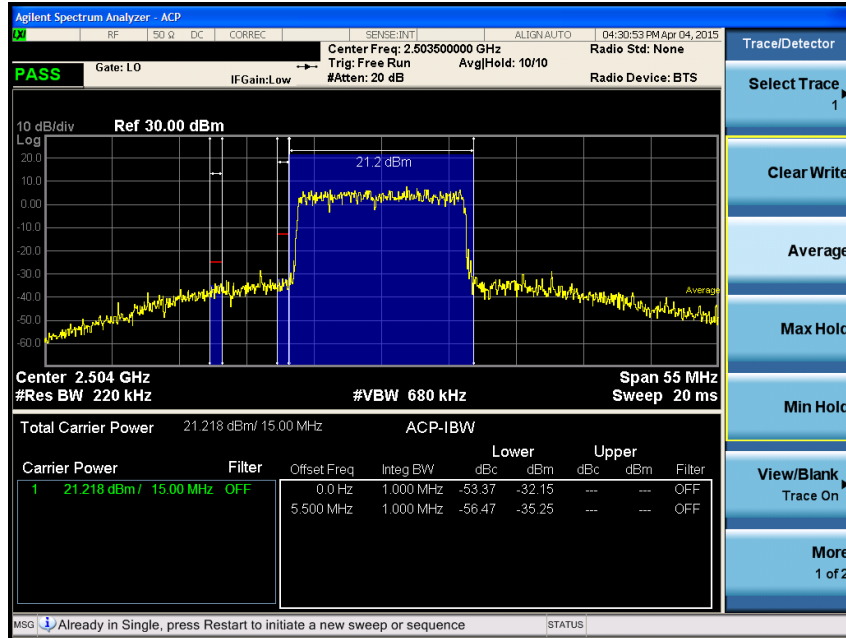
High Channel



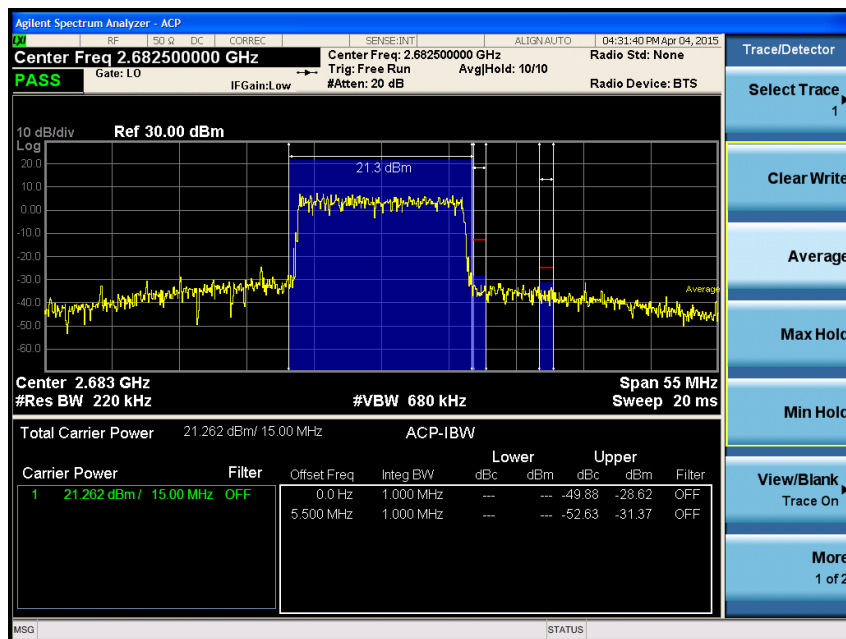
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (15 MHz – 16QAM_RB 75)

Low Channel



High Channel



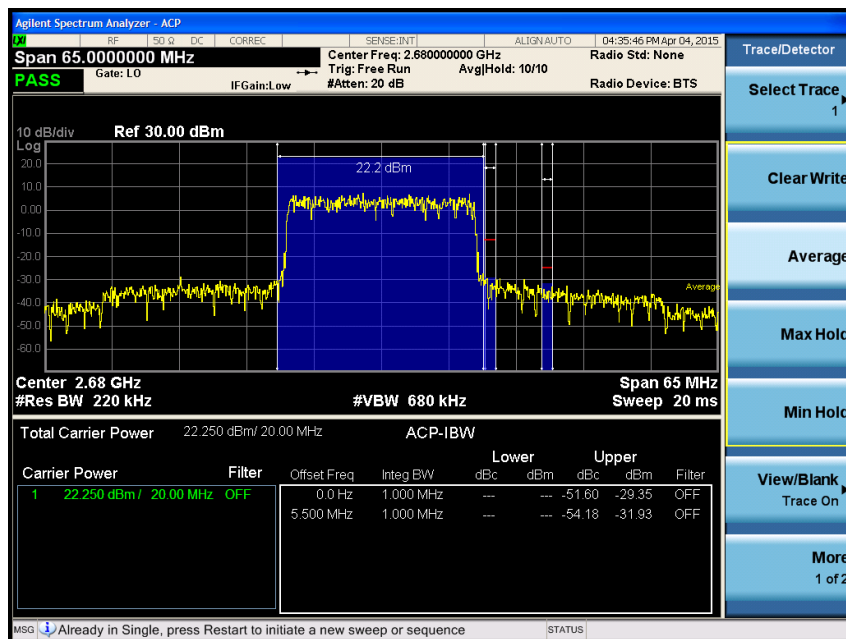
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (20 MHz – QPSK_RB 100)

Low Channel



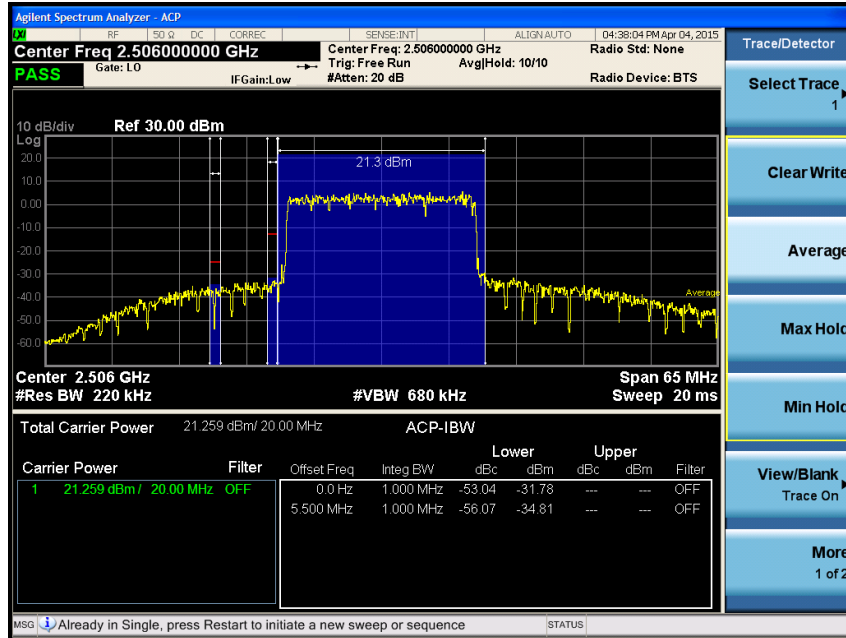
High Channel



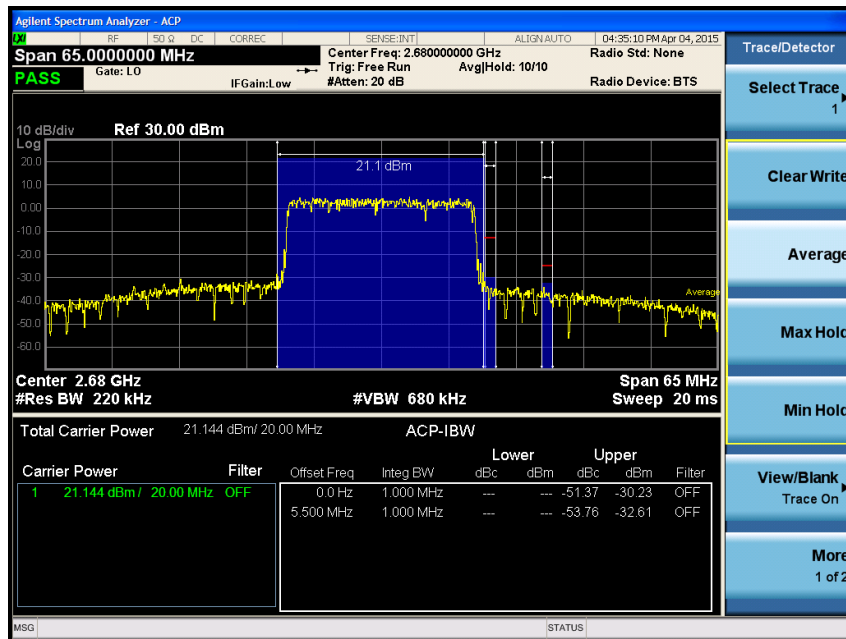
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

LTE band 41 (20 MHz – 16QAM_RB 100)

Low Channel



High Channel



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7. Frequency Stability

7.1. Limit

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

FCC §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.

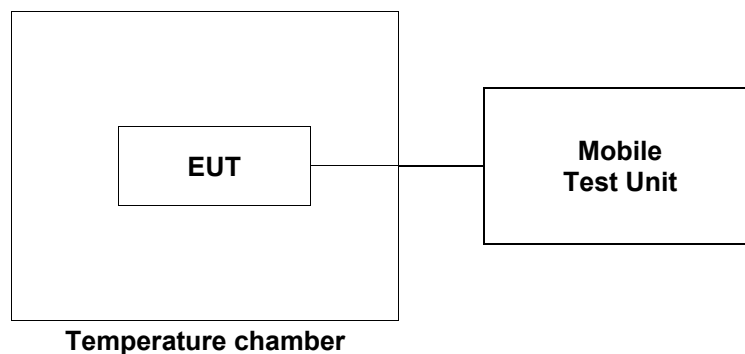
For Mobile devices operating in the 824 to 849 MHz band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is ± 2.5 ppm.

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

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

7.2. 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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7.3. Test Results

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

GSM850 mode at middle channel

Reference Frequency: 836.6 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.85	-1	-0.001 2
40		10	0.012 0
30		3	0.003 6
24		2	0.002 4
10		-2	-0.002 4
0		4	0.004 8
-10		2	0.002 4
-20		4	0.004 8
-30		-2	-0.002 4
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.45 (batt. End point)	7	0.008 4

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GSM1900 mode 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	3.85	8	0.004 3
40		7	0.003 7
30		-5	-0.002 7
24		-3	-0.001 6
10		2	0.001 1
0		1	0.000 5
-10		6	0.003 2
-20		-5	-0.002 7
-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
24	3.45 (batt. End point)	3	0.001 6

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WCDMA850 mode at middle channel

Reference Frequency: 836.6 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.85	4	0.004 8
40		7	0.008 4
30		1	0.001 2
24		-5	-0.006 0
10		8	0.009 6
0		11	0.013 1
-10		-2	-0.002 4
-20		13	0.015 5
-30		10	0.012 0
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.45 (batt. End point)	3	0.003 6

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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	3.85	-4	-0.004 8
40		-1	-0.001 2
30		-10	-0.012 0
24		5	0.006 0
10		-8	-0.009 6
0		-3	-0.003 6
-10		-1	-0.001 2
-20		4	0.004 8
-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
24	3.45 (batt. End point)	-3	-0.003 6

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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	3.85	5	0.007 0
40		10	0.014 1
30		-11	-0.015 5
24		-10	-0.014 1
10		-2	-0.002 8
0		-3	-0.004 2
-10		5	0.007 0
-20		-1	-0.001 4
-30		6	0.008 5
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.45 (batt. End point)	11	0.015 5

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LTE band 41 at middle channel

Reference Frequency: 2 593.0 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.85	7	0.002 7
40		6	0.002 3
30		-1	-0.000 4
24		3	0.001 2
10		-6	-0.002 3
0		-3	-0.001 2
-10		8	0.003 1
-20		2	0.000 8
-30		2	0.000 8
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.45 (batt. End point)	-7	-0.002 7

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