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Report On

FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS in accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 (LTE FDD 17)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00238

Document 75934711 Report 16 Issue 1

June 2016



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS in accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 (LTE FDD 17)

Document 75934711 Report 16 Issue 1

June 2016

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DATED

24 June 2016

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell

G Lawler





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM
(850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and
GPS

In accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 (LTE FDD 17)



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS to the requirements of FCC 47 CFR Part 27 and FCC 47 CFR Part 2.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Serial Number(s)	IMEI 004401115813277 IMEI 004401115813475
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 27 (2015) FCC 47 CFR Part 2 (2015)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10829
Date	31 May 2016
Start of Test	31 May 2016
Finish of Test	5 June 2016
Name of Engineer(s)	M Russell G Lawler
Related Document(s)	ANSI C63.4 (2014) ANSI TIA-603-C (2004)



Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 27	Part 2			
LTE FDD 17					
2.1	27.50	2.1046	Maximum Conducted Output Power	Pass	
2.2	27.53	2.1049	Emission Limitations	Pass	
2.3	27.53	2.1051	Spurious Emissions at Antenna Terminals	Pass	
2.4	27.53 (h)	2.1051	Spurious Emissions at Band Edge	Pass	
2.5	27.53 (h)(3)	2.1051	26 dB Bandwidth	Pass	
2.6	27.54	2.1055	Frequency Stability	Pass	
2.7	-	2.1047 (d)	Modulation Characteristics	-	Customer Declaration



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1.3 PRODUCT TECHNICAL DESCRIPTION

Refer to Model Description APYHRO00238 Rev 4.0 document.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM
(850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and
GPS

In accordance with FCC 47 CFR Part 27 and FCC 47 CFR Part 2 (LTE FDD 17)



2.1 MAXIMUM CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.50
FCC 47 CFR Part 2, Clause 2.1046

2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813277 - Modification State 0

2.1.3 Date of Test

31 May 2016

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

Carrier power measurements were performed in accordance with KDB 971168 D01 v02r02, Clause 5.2.1

Peak to average ratio measurements were performed in accordance with KDB 971168 D01 v02r02, Clause 5.7.1

Remarks

The antenna gain was declared by the manufacturer as 2.0 dBi. As per KDB 412172 D01 v01r01 carrier power results are recorded in ERP therefore reported results are calculated as per the following calculation:

$$\text{ERP} = \text{Pout (dBm)} + \text{ANT Gain (dBi)} - 2.15 \text{ (dB)}.$$

2.1.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	47.5%



Product Service

2.1.7 Test Results

LTE FDD 17, Maximum Average Conducted Output Power Results
5.0 MHz Bandwidth - QPSK

Resource Block Allocation	Resource Block Offset	Carrier Power – ERP (dBm)		
		706.5 MHz	710.0 MHz	713.5 MHz
1	Low	22.43	22.66	22.34
1	Mid	22.82	22.83	22.46
1	High	22.53	22.52	22.63
12	Low	21.55	21.63	21.54
12	Mid	21.57	21.65	21.59
12	High	21.71	21.70	21.69
25	-	21.63	21.58	21.62

5.0 MHz Bandwidth - 16-QAM

Resource Block Allocation	Resource Block Offset	Carrier Power – ERP (dBm)		
		706.5 MHz	710.0 MHz	713.5 MHz
1	Low	21.27	20.79	21.09
1	Mid	21.20	21.55	21.11
1	High	21.26	20.92	21.15
12	Low	20.41	20.46	20.32
12	Mid	20.58	20.38	20.26
12	High	20.43	20.23	20.31
25	-	20.74	20.53	20.62



Product Service

10.0 MHz Bandwidth - QPSK

Resource Block Allocation	Resource Block Offset	Carrier Power – ERP (dBm)		
		709.0 MHz	710.0 MHz	711.0 MHz
1	Low	22.70	22.55	22.43
1	Mid	22.56	22.73	22.71
1	High	22.38	22.73	22.66
25	Low	21.61	21.68	21.80
25	Mid	21.68	21.71	21.67
25	High	21.55	21.50	21.51
50	-	21.79	21.64	21.84

10.0 MHz Bandwidth - 16-QAM

Resource Block Allocation	Resource Block Offset	Carrier Power – ERP (dBm)		
		709.0 MHz	710.0 MHz	711.0 MHz
1	Low	21.49	21.17	21.48
1	Mid	22.09	21.35	21.35
1	High	21.70	20.63	21.27
25	Low	20.69	20.62	20.74
25	Mid	20.70	20.65	20.73
25	High	20.42	20.47	20.56
50	-	20.58	20.56	20.55

FCC 47 CFR Part 27, Limit Clause 27.50 (c)(10)

Fixed, Mobile and Portable Stations: <3 W ERP



Product Service

2.2 EMISSION LIMITATIONS

2.2.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53
FCC 47 CFR Part 2, Clause 2.1049

2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813475 - Modification State 0

2.2.3 Date of Test

5 June 2016

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

Tested in accordance with FCC 47 CFR Part 27, clause 27.53 and ANSI 63.26, clause 5.5.

2.2.6 Environmental Conditions

Ambient Temperature	16.9°C
Relative Humidity	70.0%



Product Service

2.2.7 Test Results

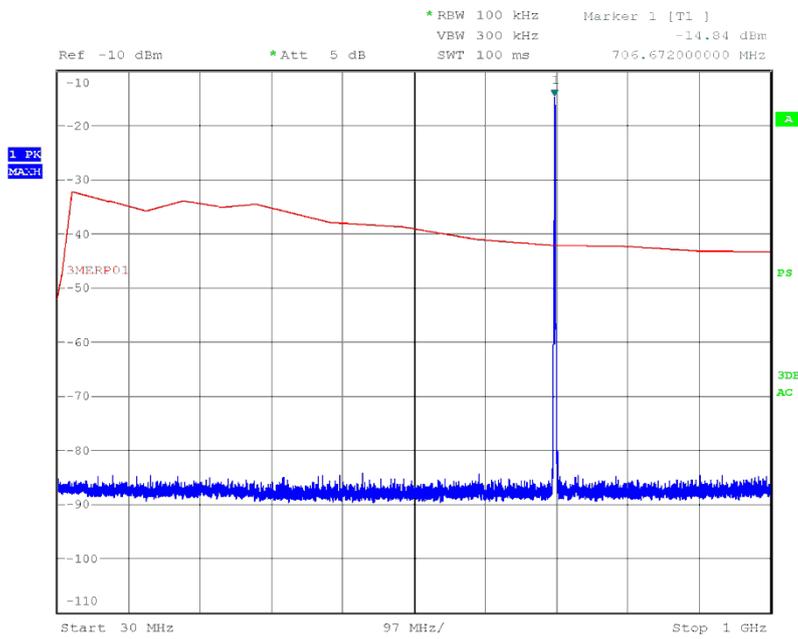
LTE FDD 17, Radiated Spurious Emisison Results

5.0 MHz Bandwidth – QPSK

706.5 MHz

1 Resource Block - Mid

30 MHz to 1 GHz

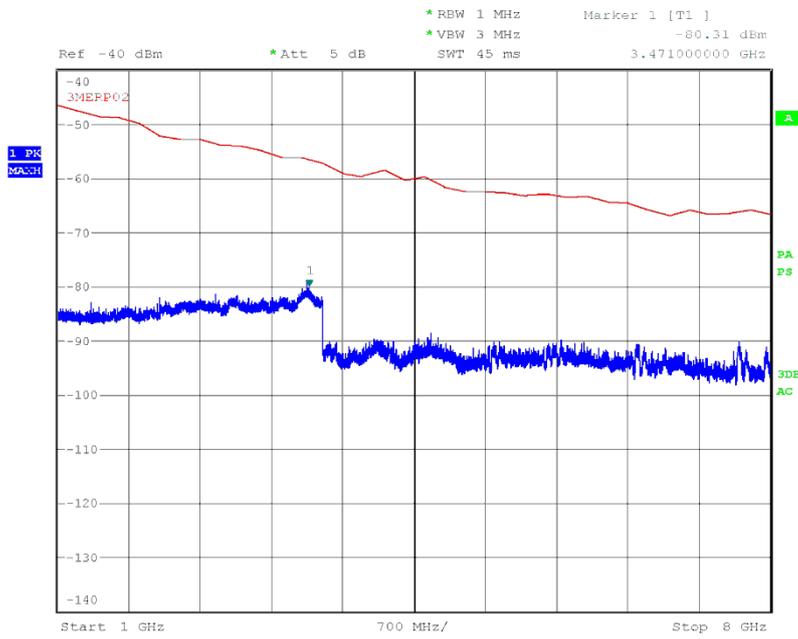


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Product Service

1 GHz to 8 GHz



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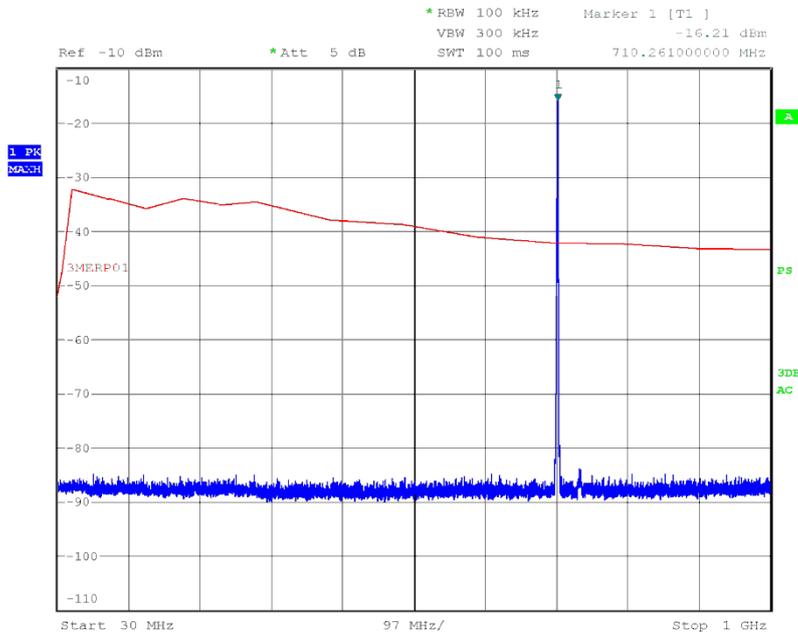


Product Service

710.0 MHz

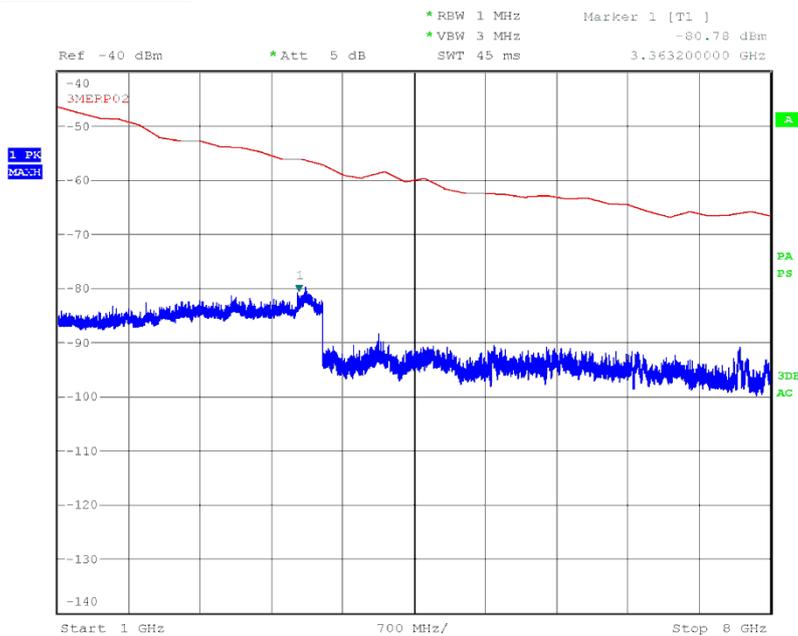
1 Resource Block – Mid

30 MHz to 1 GHz



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1 GHz to 8 GHz



Date: 1.JUN.2016 21:31:57

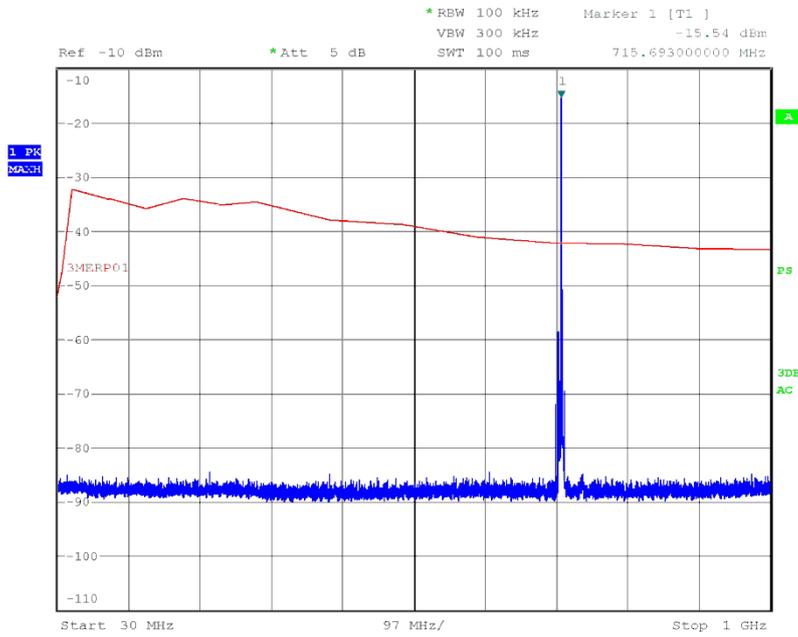


Product Service

713.5 MHz

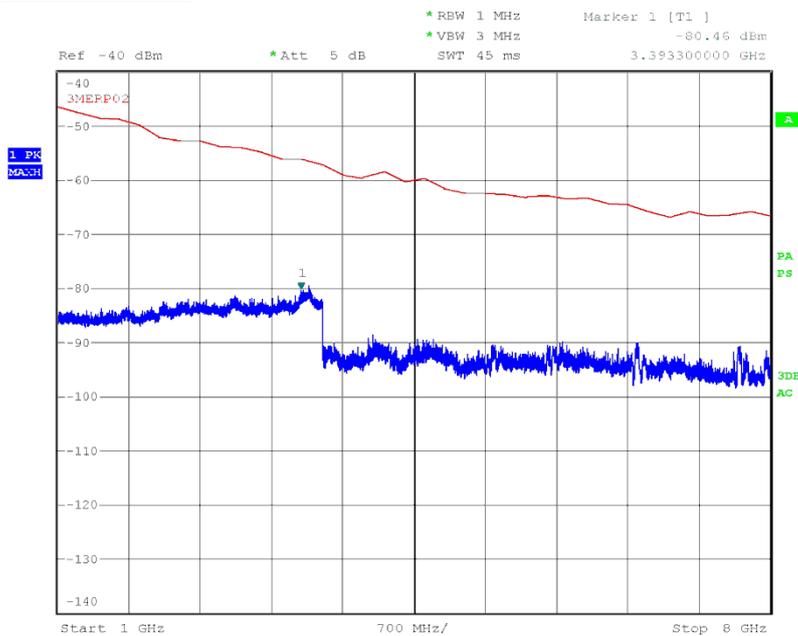
1 Resource Block – High

30 MHz to 1 GHz



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1 GHz to 8 GHz



Date: 1.JUN.2016 21:38:14



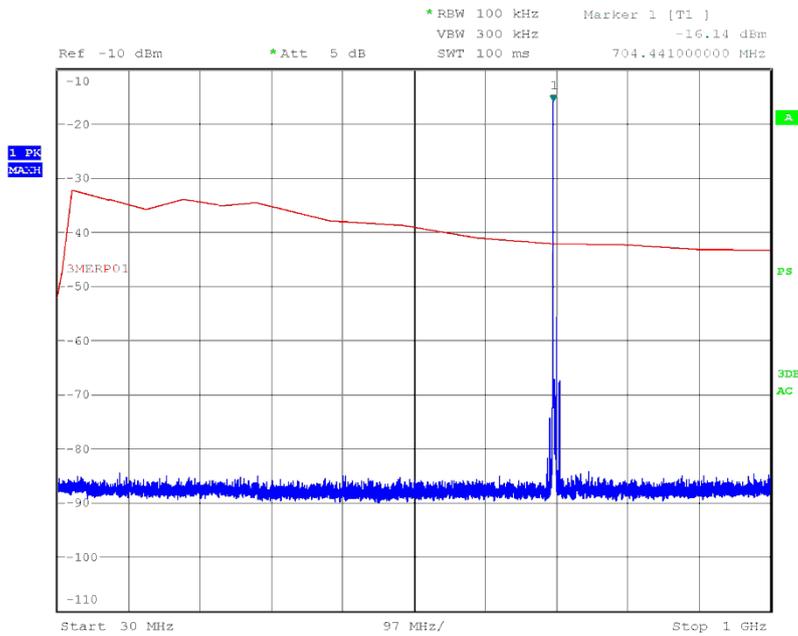
Product Service

5.0 MHz Bandwidth – 16-QAM

706.5 MHz

1 Resource Block – Low

30 MHz to 1 GHz

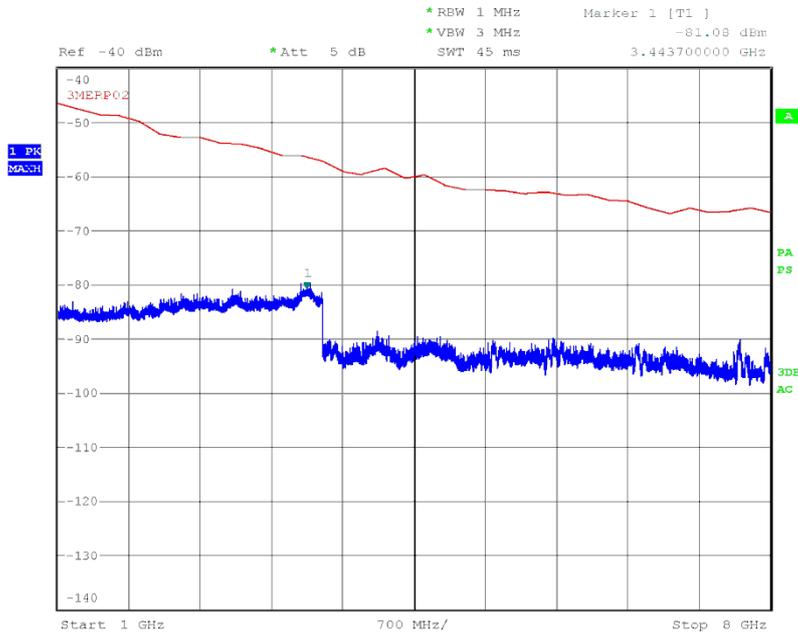


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Product Service

1 GHz to 8 GHz



Date: 1.JUN.2016 21:50:52

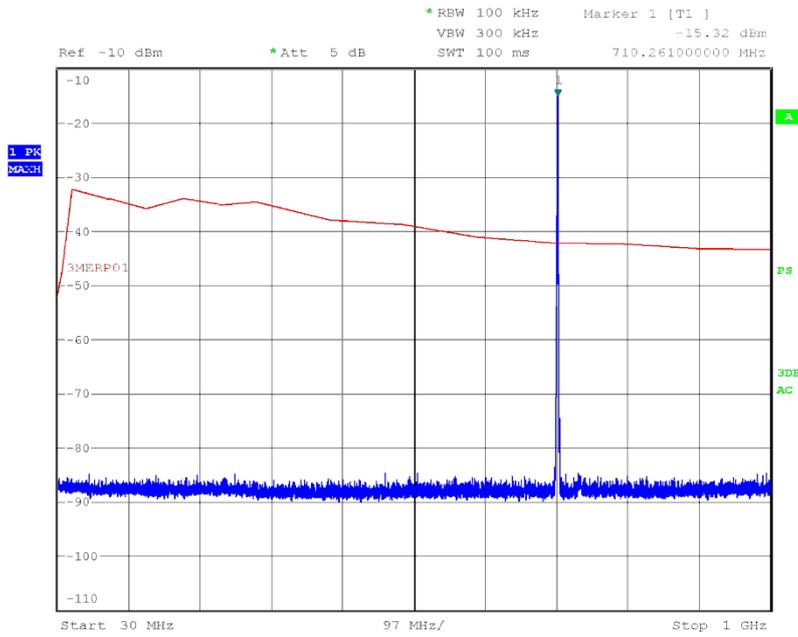


Product Service

710.0 MHz

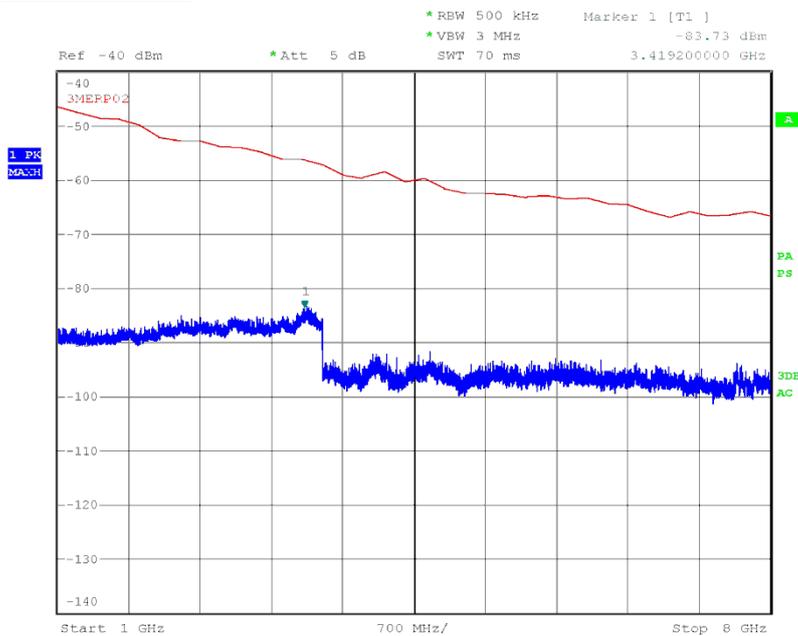
1 Resource Block – Mid

30 MHz to 1 GHz



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1 GHz to 8 GHz



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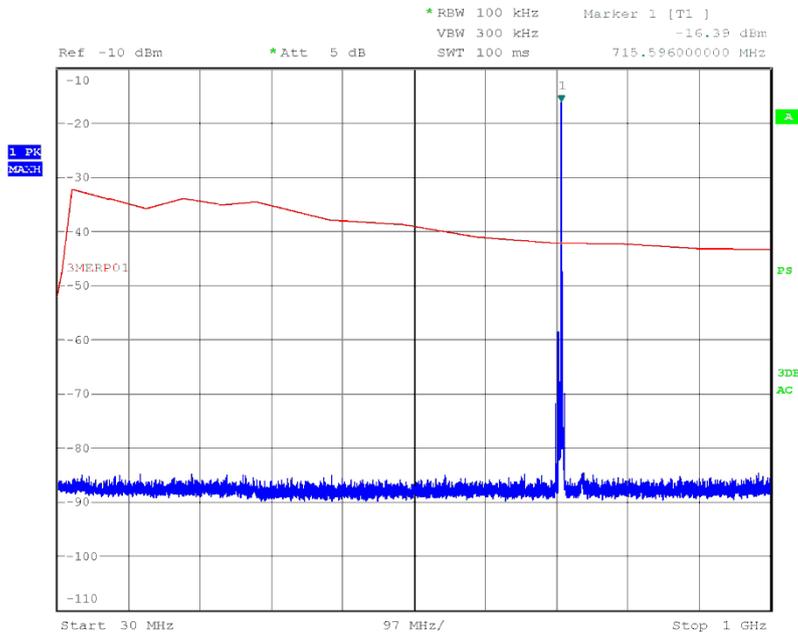


Product Service

713.5 MHz

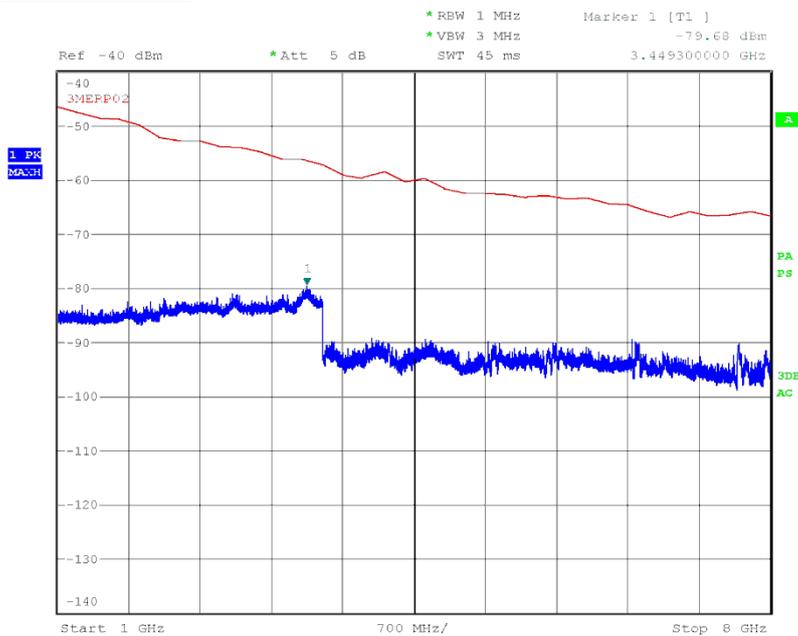
1 Resource Block – High

30 MHz to 1 GHz



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1 GHz to 8 GHz



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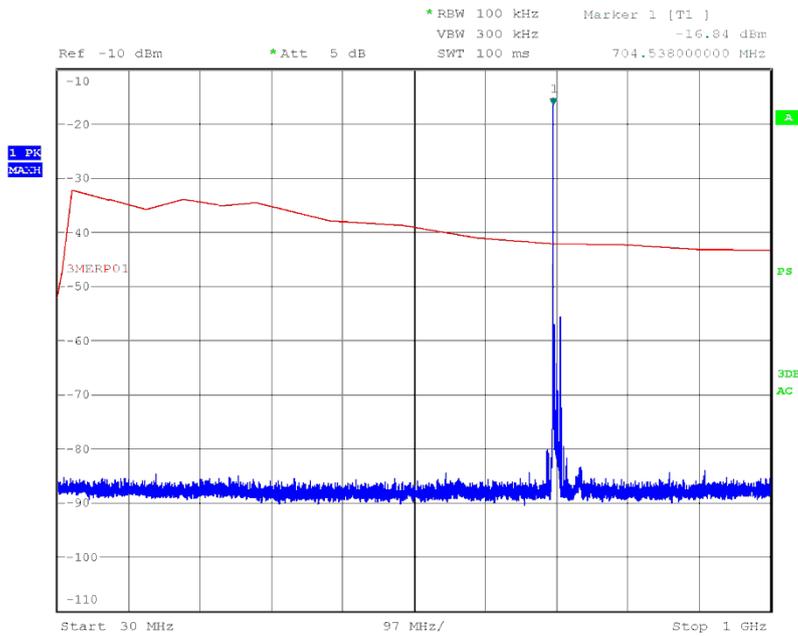
Product Service

10.0 MHz Bandwidth – QPSK

709.0 MHz

1 Resource Block – Low

30 MHz to 1 GHz

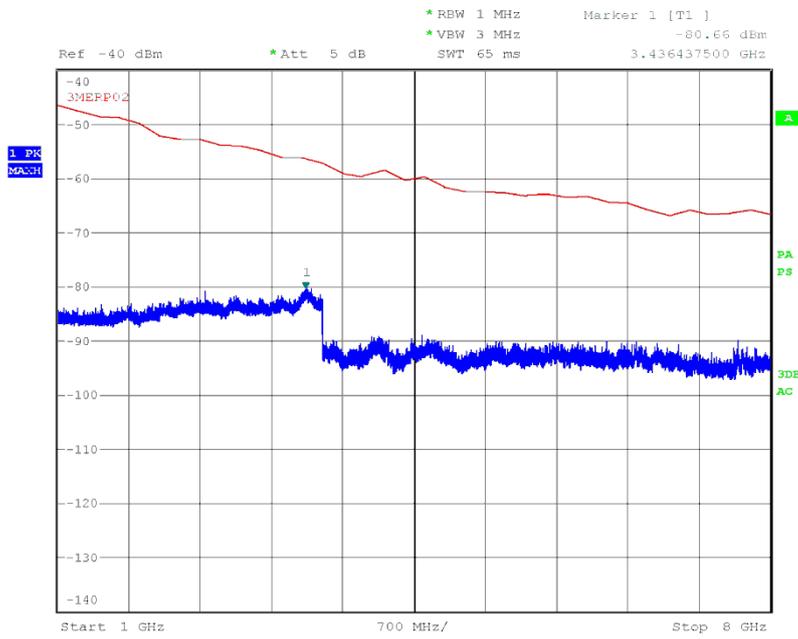


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Product Service

1 GHz to 8 GHz



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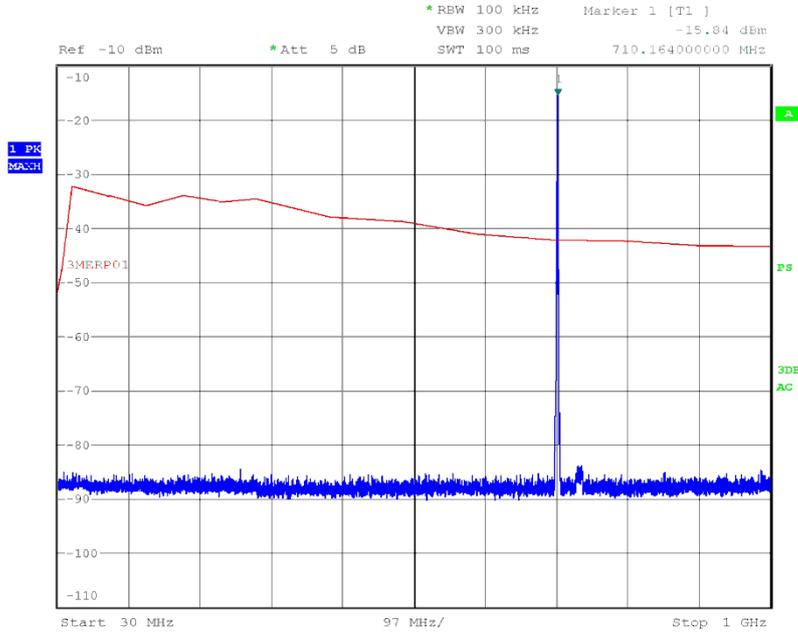


Product Service

710.0 MHz

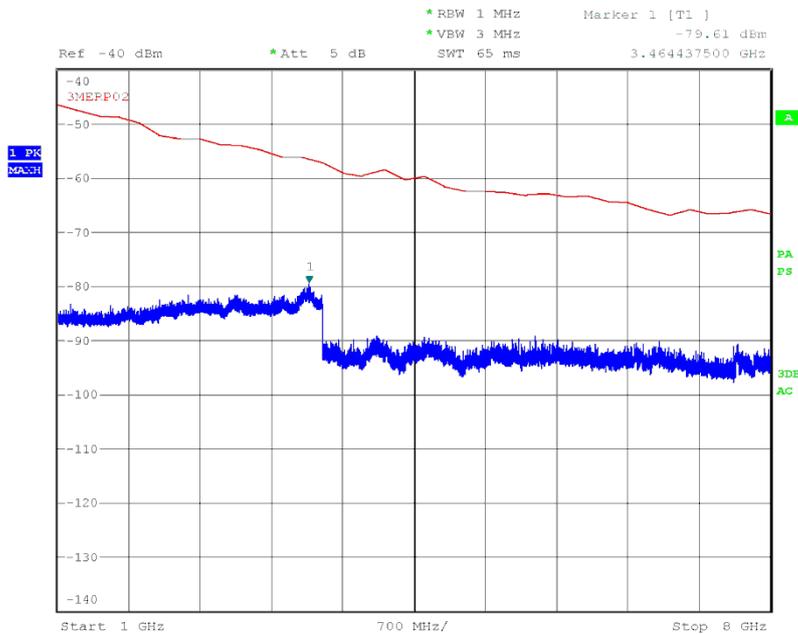
1 Resource Block – Mid

30 MHz to 1 GHz



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1 GHz to 8 GHz



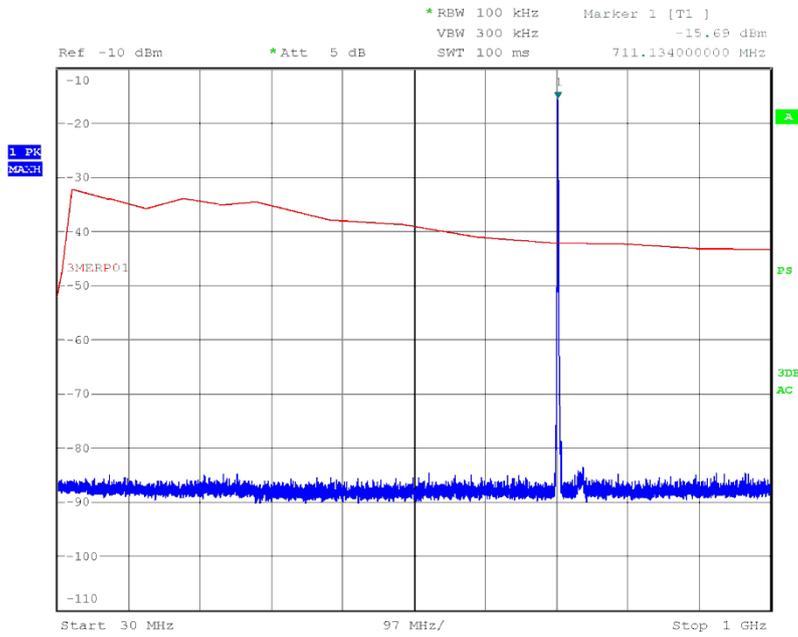
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711.0 MHz

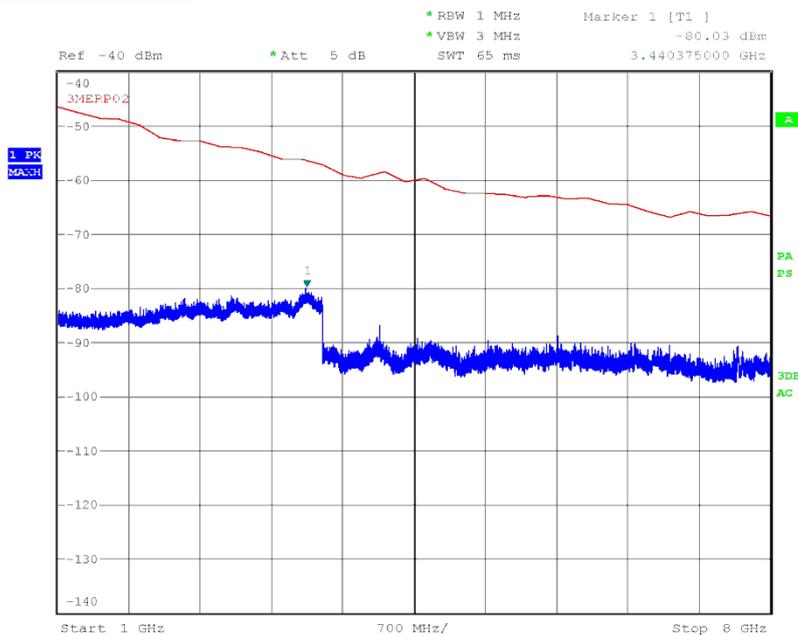
1 Resource Block – Mid

30 MHz to 1 GHz



Date: 5.JUN.2016 09:52:43

1 GHz to 8 GHz



Date: 1.JUN.2016 20:43:04



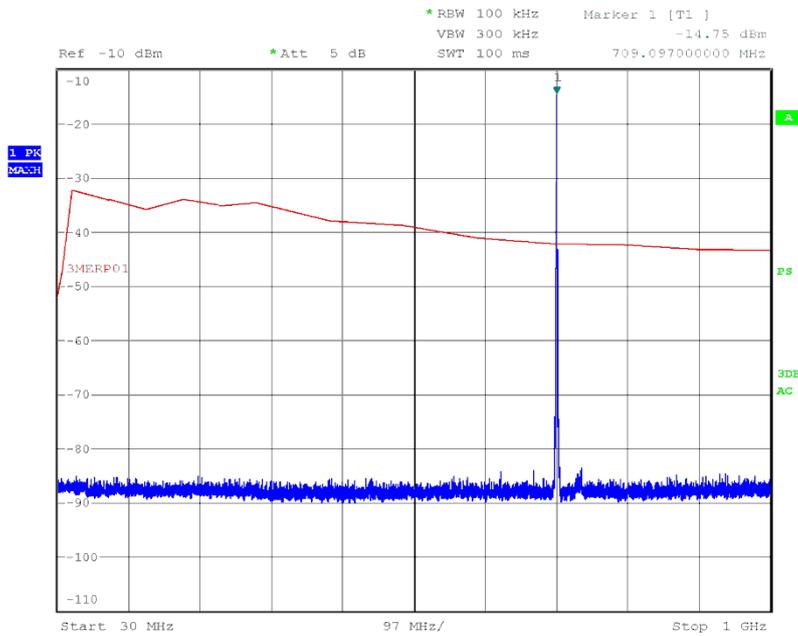
Product Service

10.0 MHz Bandwidth – 16-QAM

709.0 MHz

1 Resource Block – Mid

30 MHz to 1 GHz

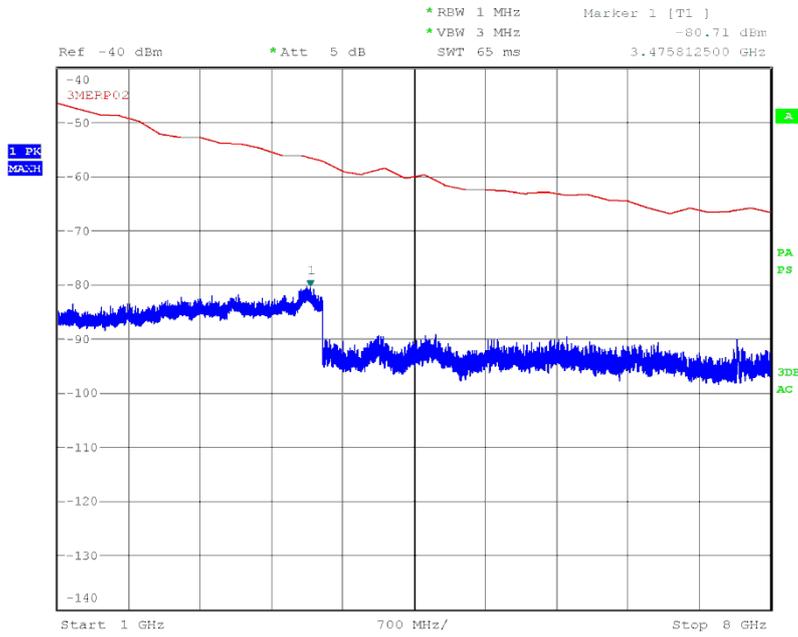


Date: 5.JUN.2016 09:56:18



Product Service

1 GHz to 8 GHz



Date: 1.JUN.2016 20:47:03

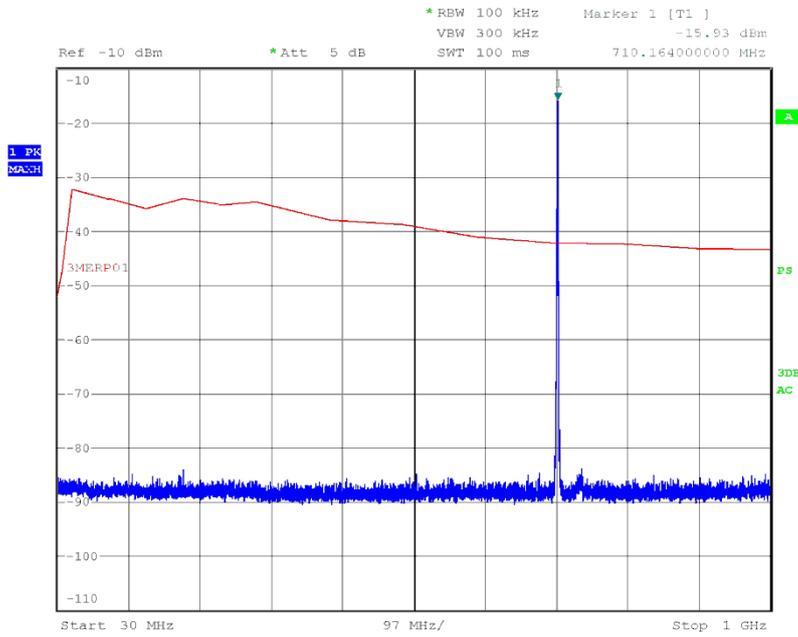


Product Service

710.0 MHz

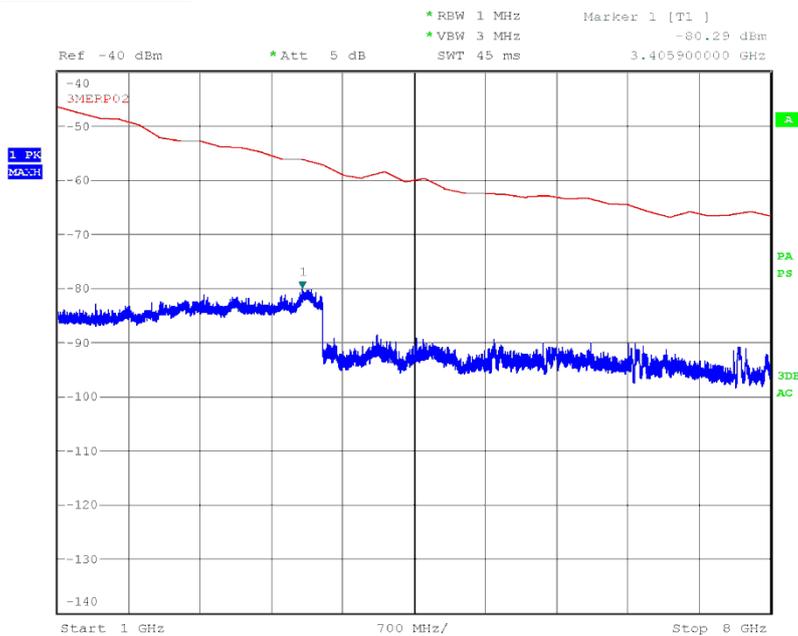
1 Resource Block – Mid

30 MHz to 1 GHz



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1 GHz to 8 GHz



Date: 1.JUN.2016 20:52:36

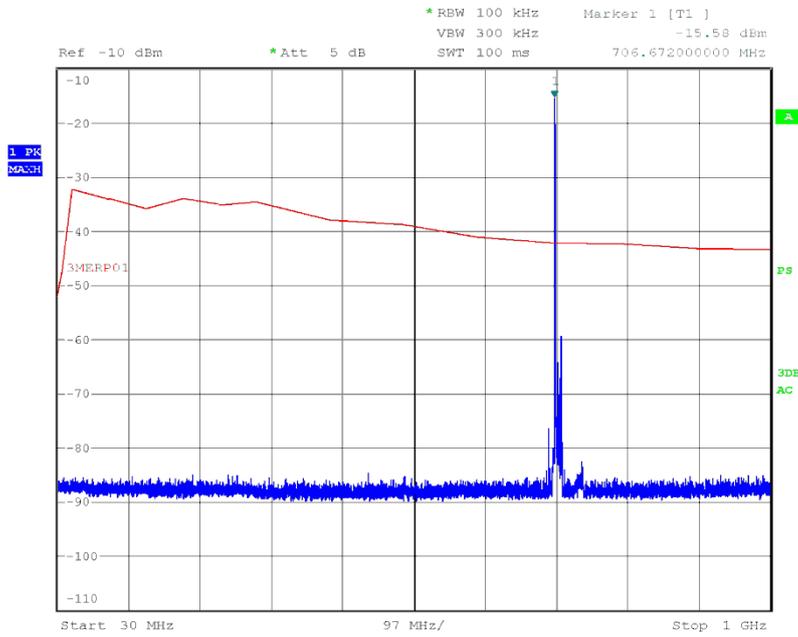


Product Service

711.0 MHz

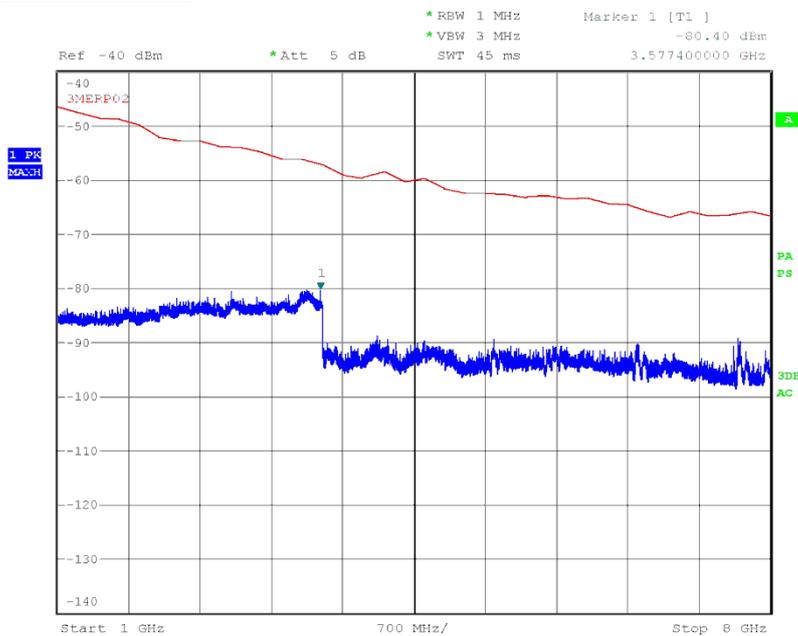
1 Resource Block – Low

30 MHz to 1 GHz



Date: 5.JUN.2016 09:59:41

1 GHz to 8 GHz



Date: 1.JUN.2016 20:59:29



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FCC 47 CFR Part 27, Limit Clause 27.53 (g)

-13 dBm



Product Service

2.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

2.3.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53
FCC 47 CFR Part 2, Clause 2.1051

2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813277 - Modification State 0

2.3.3 Date of Test

1 June 2016

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02 r02, clause 6.

Measurements were only performed on the combination of resource block allocation and offset that yielded the highest conducted output power on the bottom, middle and top channels for each bandwidth and modulation supported by the UE.

2.3.6 Environmental Conditions

Ambient Temperature	23.1°C
Relative Humidity	47.8%



Product Service

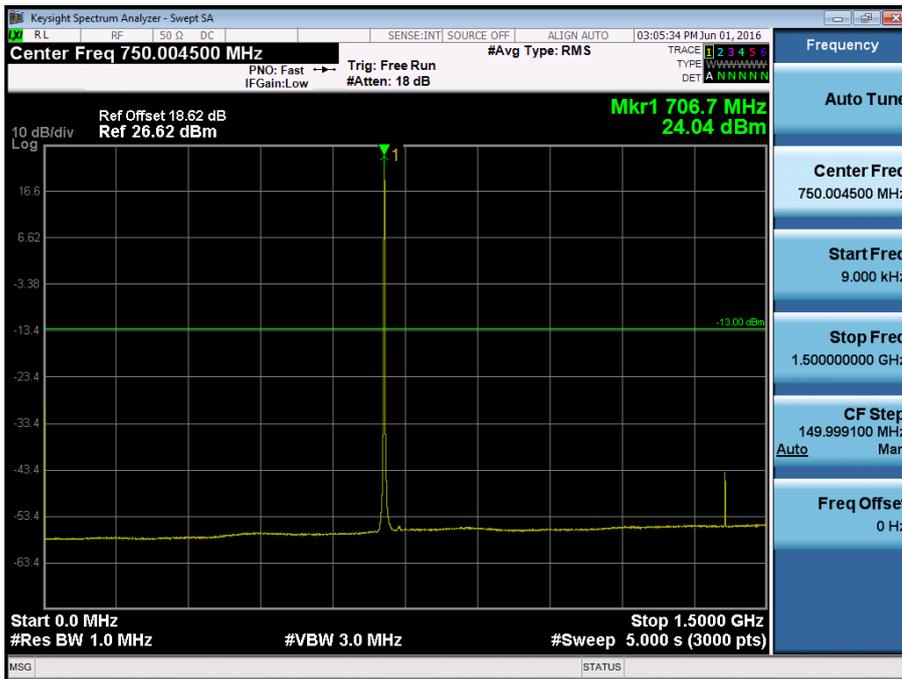
2.3.7 Test Results

4.0 V DC Supply

LTE FDD 17, Spurious Emissions at Antenna Terminals Results

5.0 MHz Bandwidth - QPSK

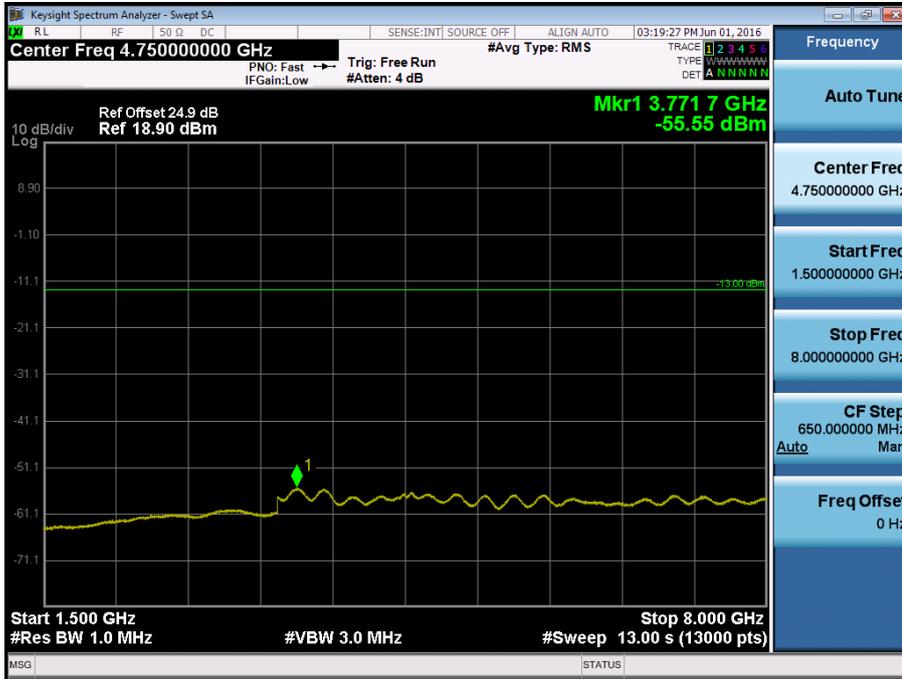
706.5 MHz - 1 Resource Block – Mid – 9 kHz to 1.5 GHz





Product Service

706.5 MHz - 1 Resource Block – Mid – 1.5 GHz to 8.0 GHz

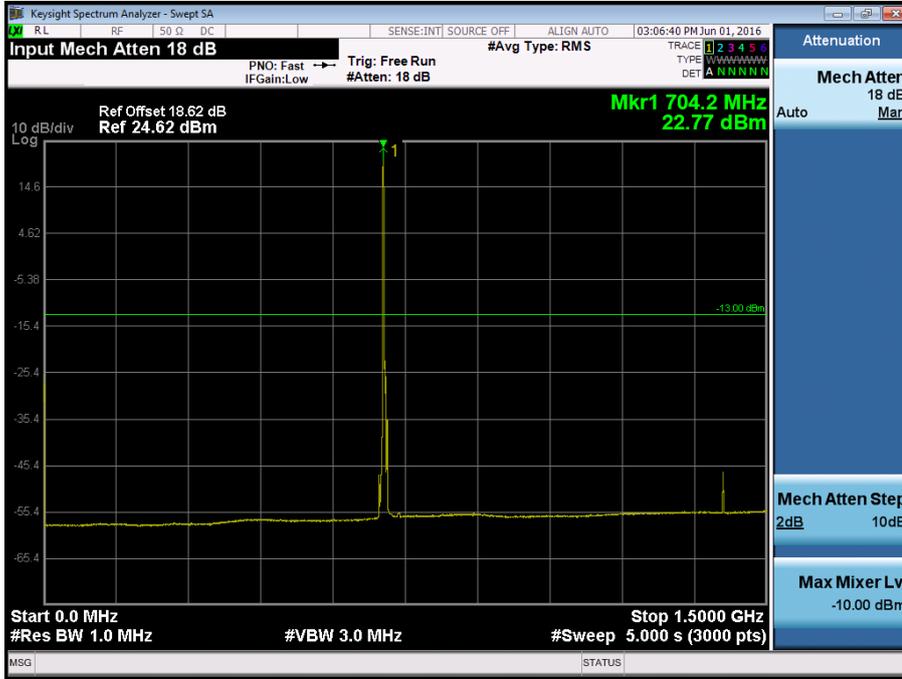




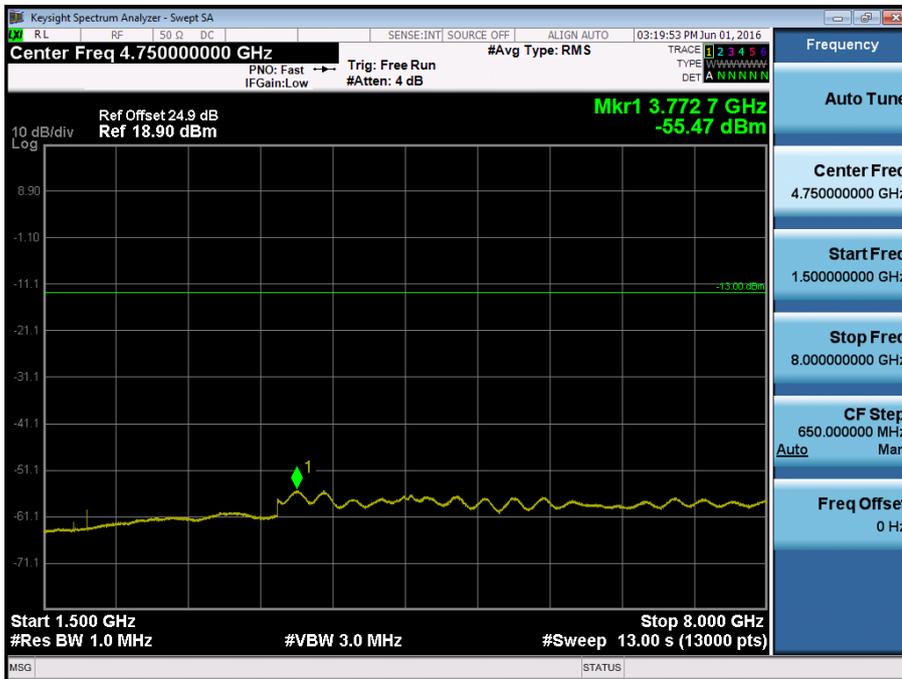
Product Service

5.0 MHz Bandwidth - 16-QAM

706.5 MHz - 1 Resource Block – Low – 9 kHz to 1.5 GHz



706.5 MHz - 1 Resource Block – Low – 1.5 GHz to 8.0 GHz

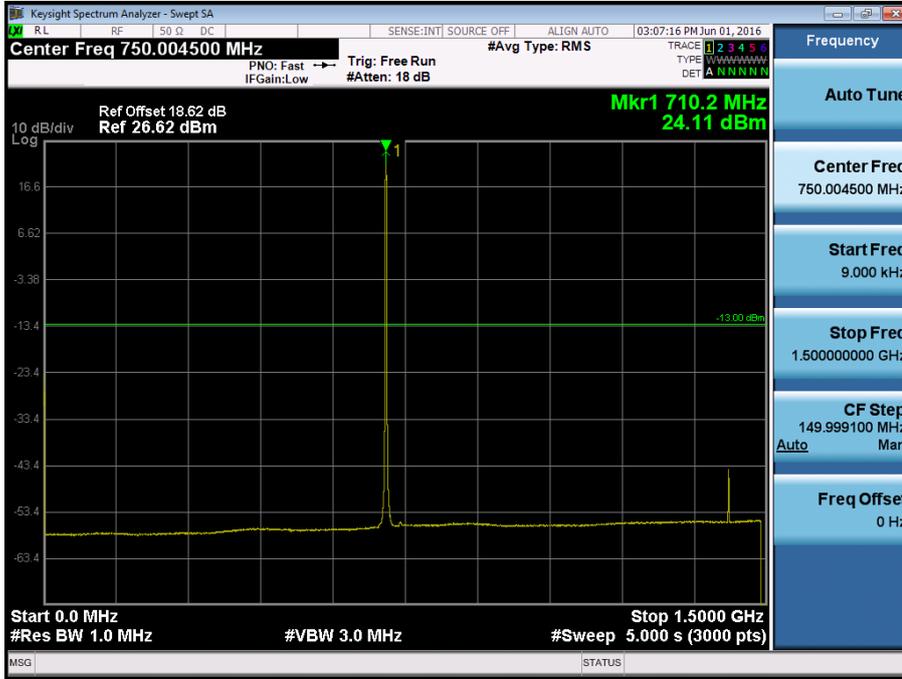




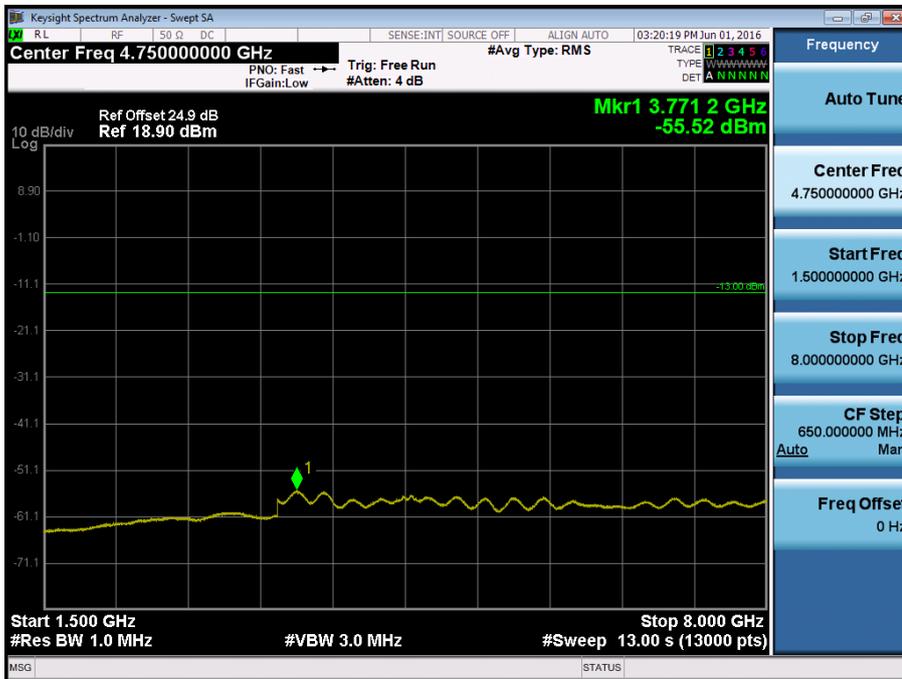
Product Service

5.0 MHz Bandwidth - QPSK

710.0 MHz - 1 Resource Block - Mid – 9 kHz to 1.5 GHz



710.0 MHz - 1 Resource Block - Mid – 1.5 GHz to 8.0 GHz

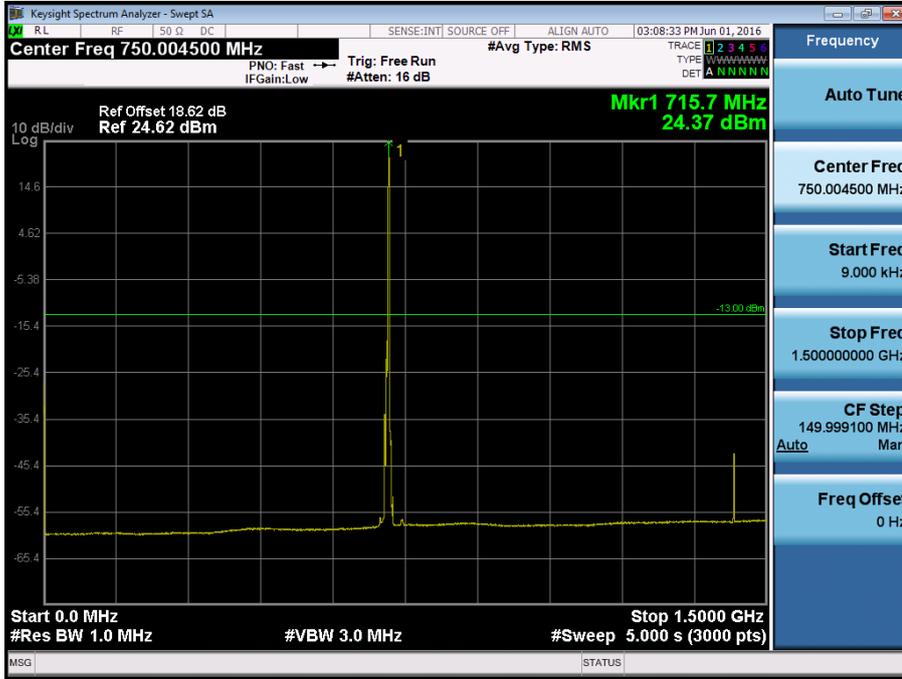




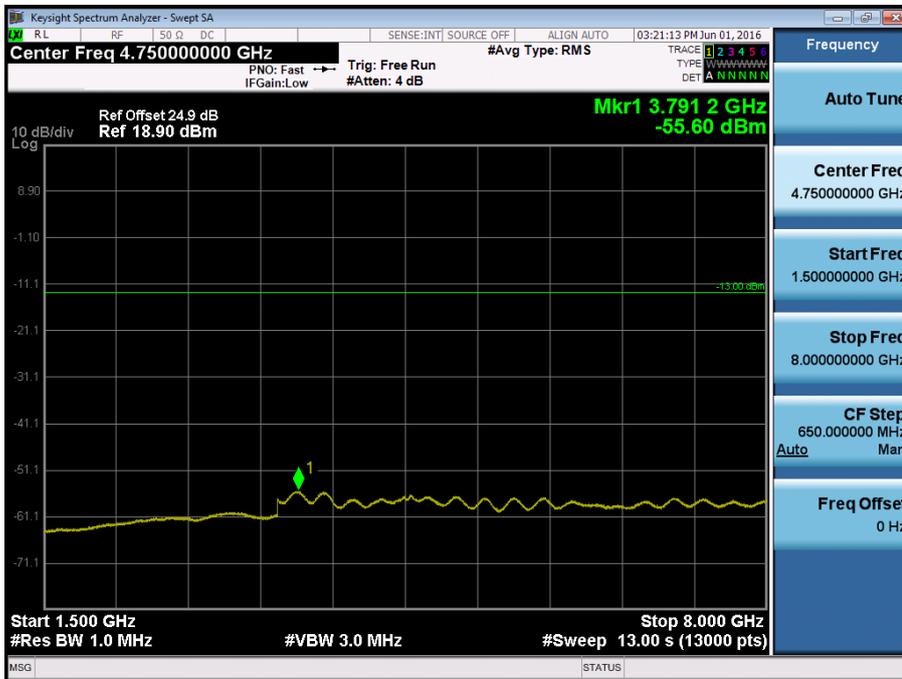
Product Service

5.0 MHz Bandwidth - QPSK

713.5 MHz - 1 Resource Block - High – 9 kHz to 1.5 GHz



713.5 MHz - 1 Resource Block - High – 1.5 GHz to 8.0 GHz

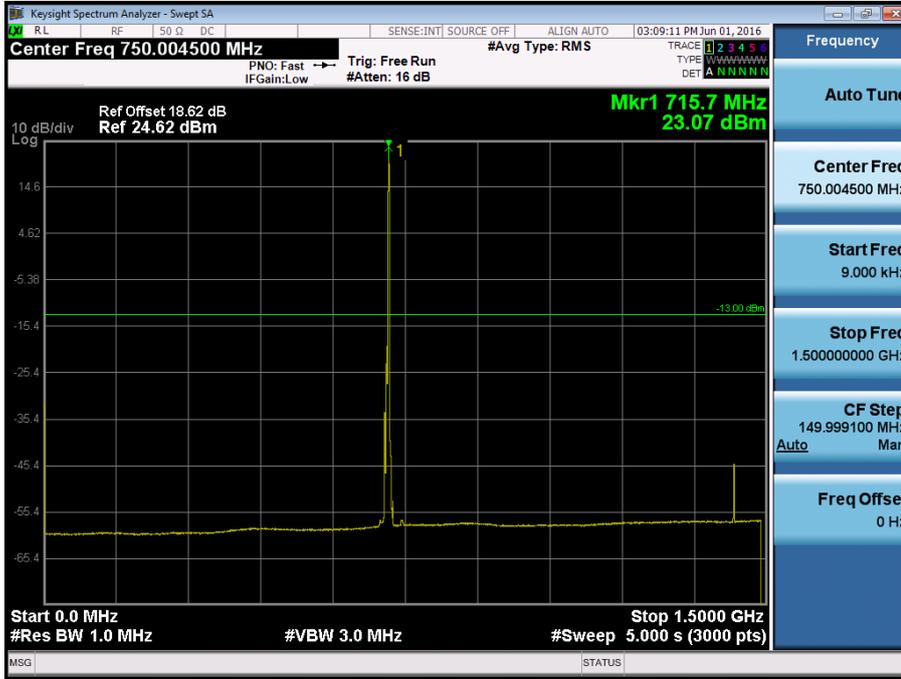




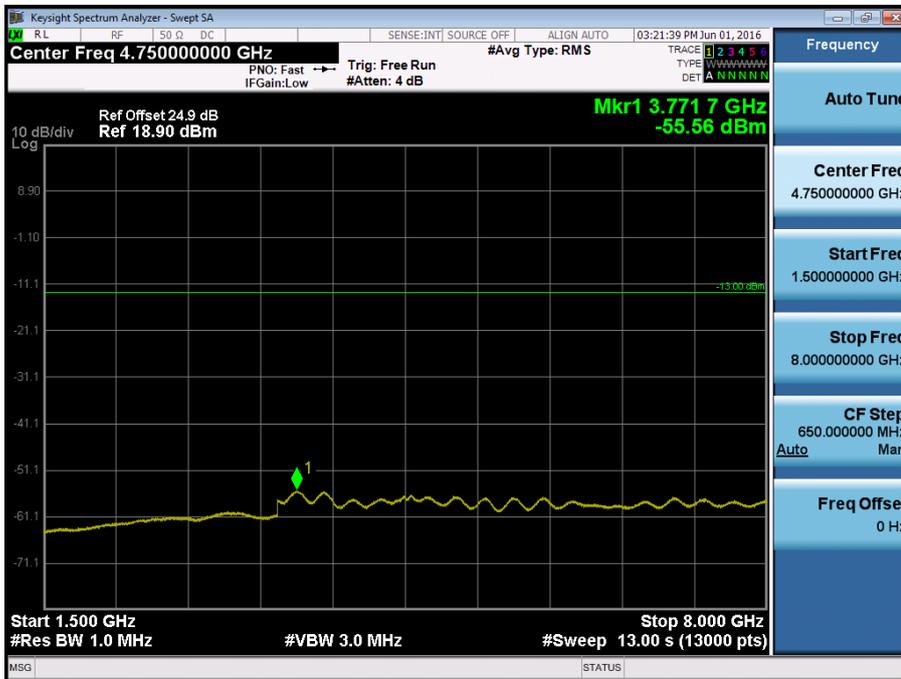
Product Service

5.0 MHz Bandwidth - 16-QAM

713.5 MHz - 1 Resource Block - High – 9 kHz to 1.5 GHz



713.5 MHz - 1 Resource Block - High – 1.5 GHz to 8.0 GHz

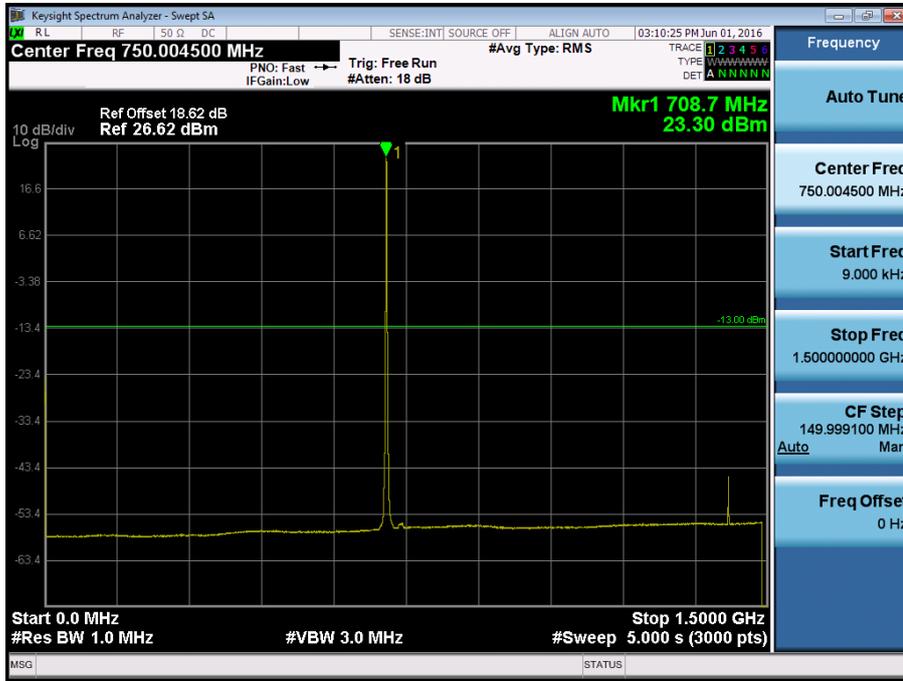




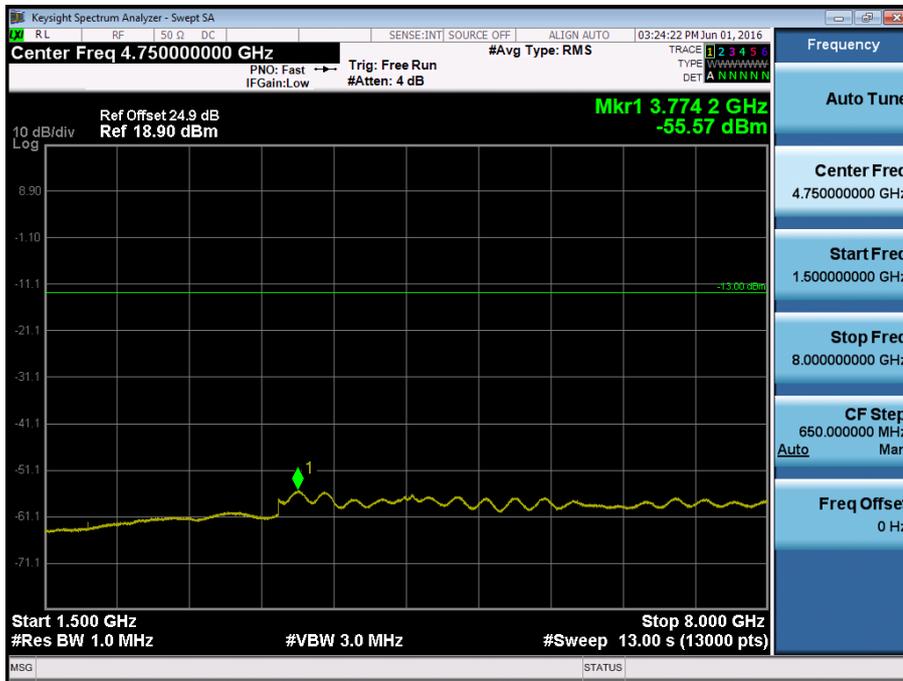
Product Service

10.0 MHz Bandwidth - 16-QAM

709 MHz - 1 Resource Block - Mid – 9 kHz to 1.5 GHz



709 MHz - 1 Resource Block – Mid – 1.5 GHz to 8.0 GHz

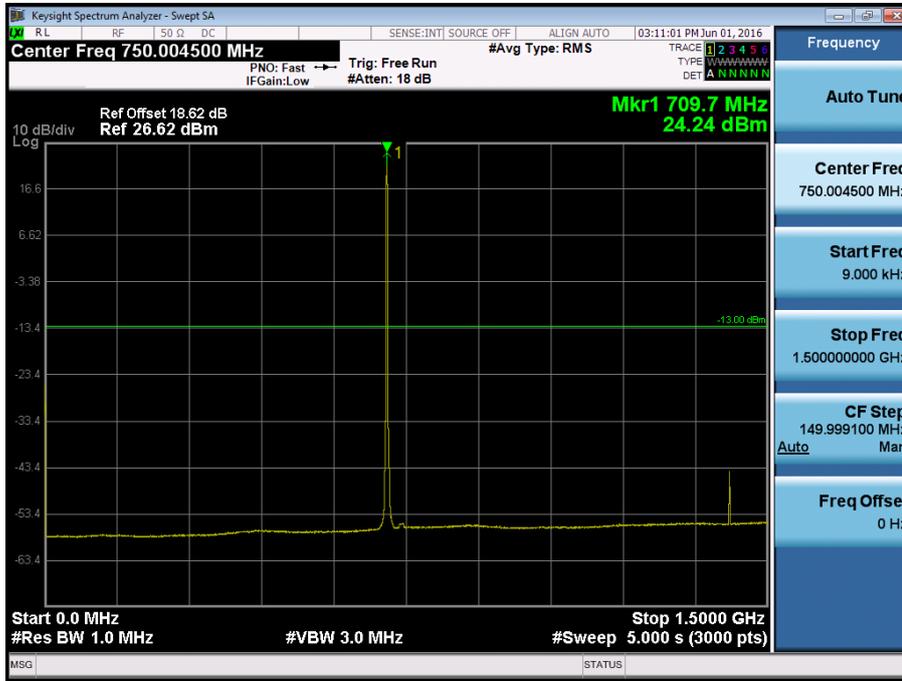




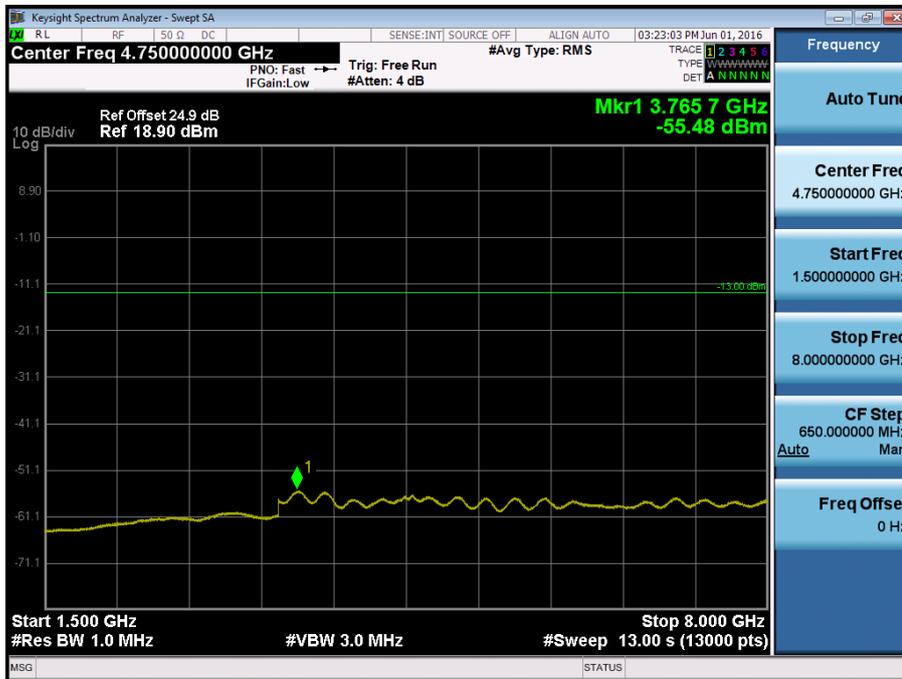
Product Service

10.0 MHz Bandwidth - QPSK

710.0 MHz - 1 Resource Block - Mid – 9 kHz to 1.5 GHz



710.0 MHz - 1 Resource Block - Mid – 1.5 GHz to 8.0 GHz

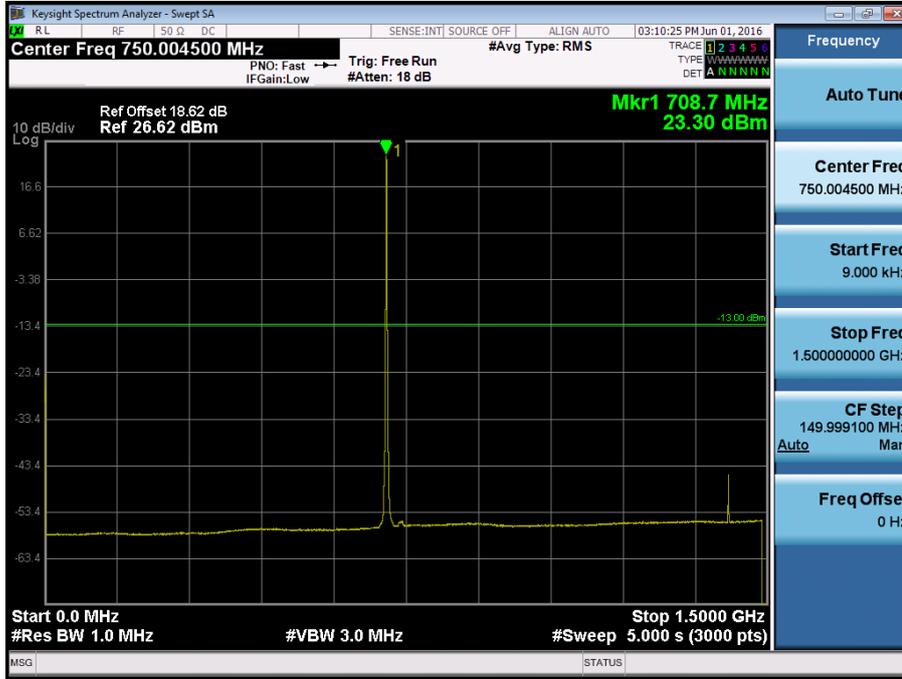




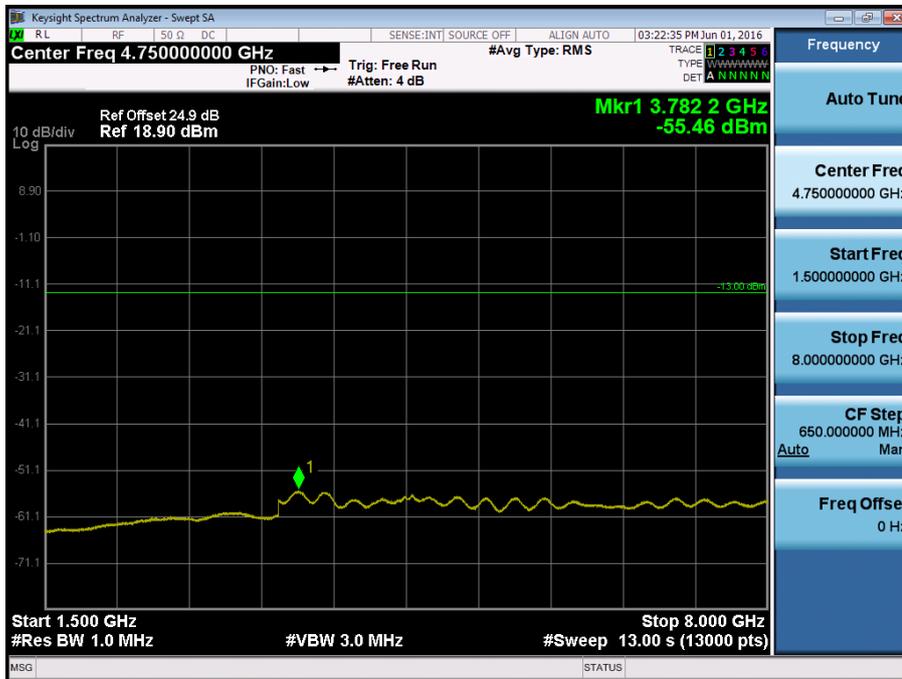
Product Service

10.0 MHz Bandwidth - 16-QAM

710.0 MHz - 1 Resource Block - Mid – 9 kHz to 1.5 GHz



710.0 MHz - 1 Resource Block - Mid – 1.5 GHz to 8.0 GHz

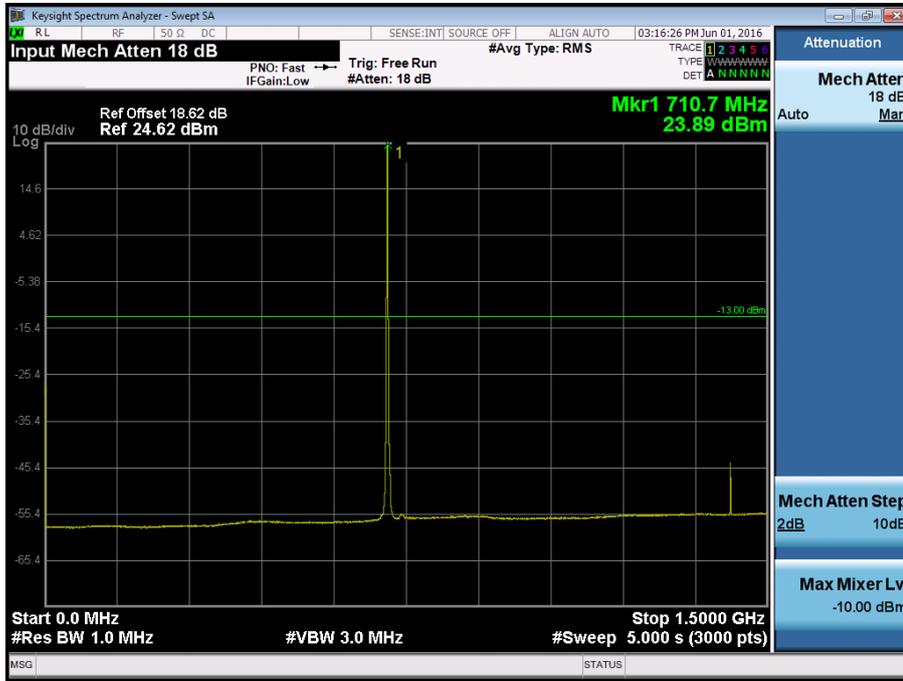




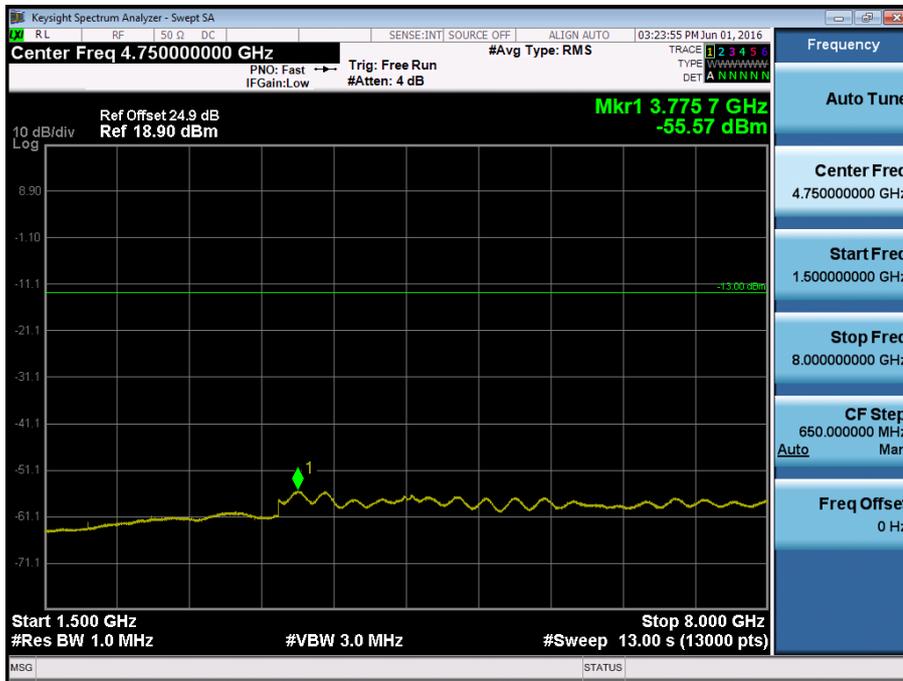
Product Service

10.0 MHz Bandwidth - QPSK

711 MHz - 1 Resource Block - Mid – 9 kHz to 1.5 GHz



711 MHz - 1 Resource Block - Mid – 1.5 GHz to 8.0 GHz

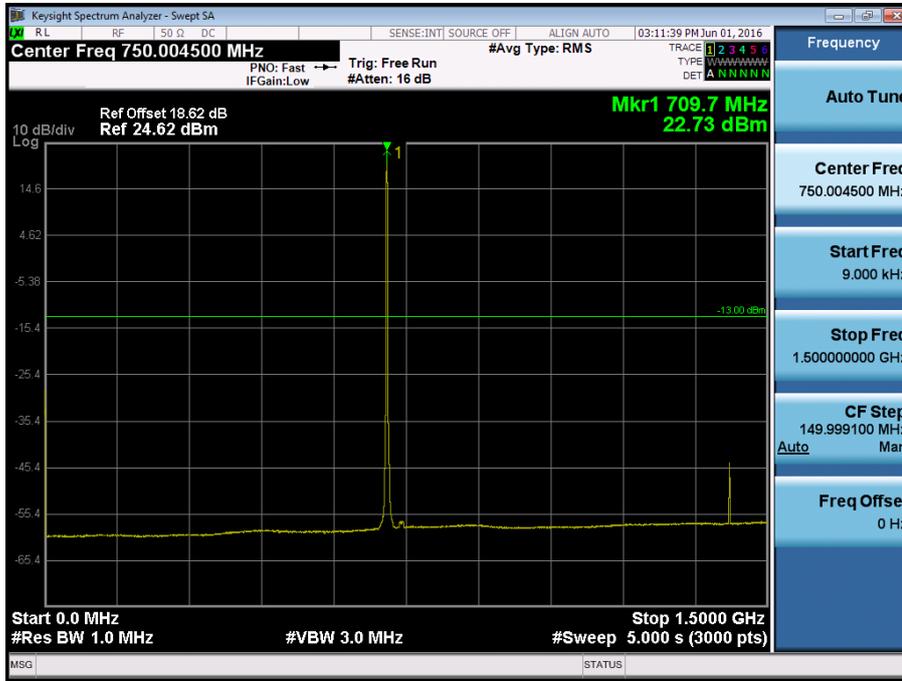




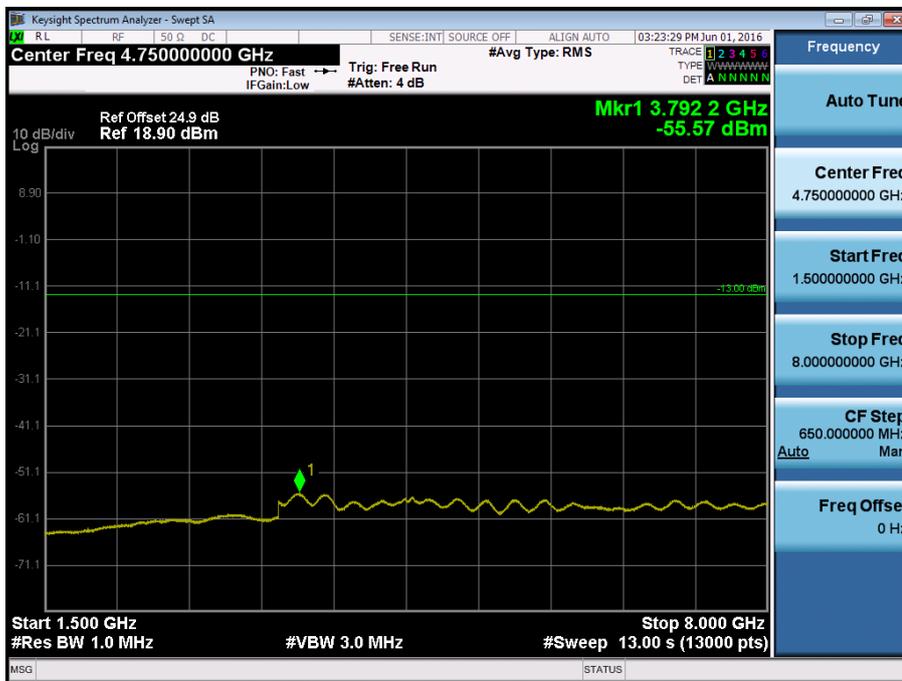
Product Service

10.0 MHz Bandwidth – 16-QAM

711.0 MHz - 1 Resource Block - Low – 9 kHz to 1.5 GHz



711.0 MHz - 1 Resource Block - Low – 1.5 GHz to 8.0 GHz



FCC 47 CFR Part 27 Limit Clause 27.53 (g)

-13 dBm



Product Service

2.4 SPURIOUS EMISSIONS AT BAND EDGE

2.4.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53 (h)
FCC 47 CFR Part 2, Clause 2.1051

2.4.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813277 - Modification State 0

2.4.3 Date of Test

1 June 2016

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02 r02, clause 6.

The band power measurement function was used at the band edge to integrate the power over 1% of the emission bandwidth as an RBW less than 1% of the emission bandwidth was used to improve the measurement accuracy.

2.4.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	47.5%



Product Service

2.4.7 Test Results

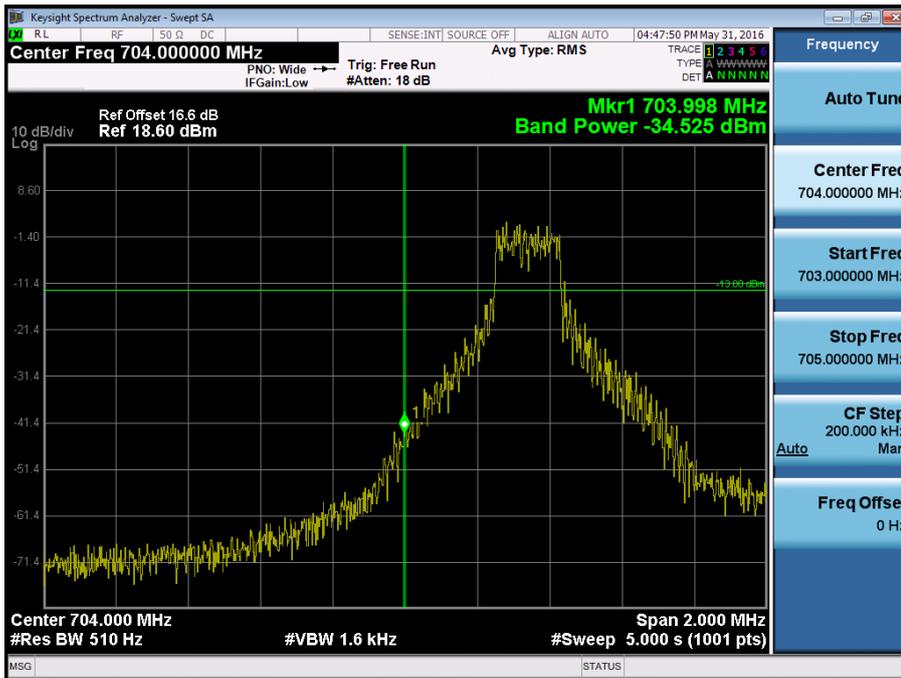
4.0 V DC Supply

LTE FDD 17, Spurious Emissions at Band Edge Results

5.0 MHz Bandwidth - QPSK

Band Edge (dBm)			
706.5 MHz		713.5 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-34.53	-30.38	-35.42	-32.09

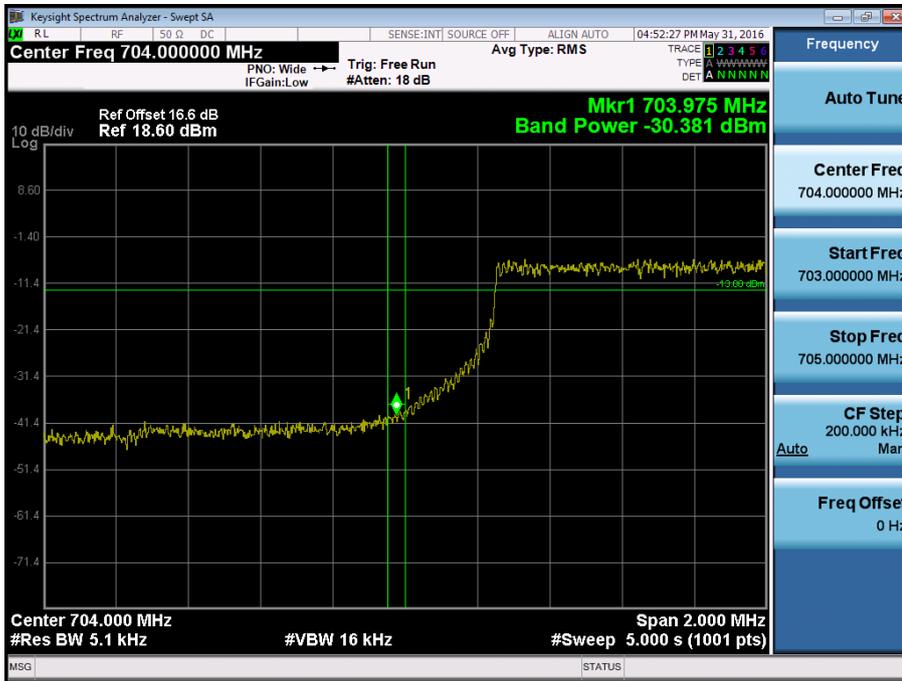
706.5 MHz - 1 Resource Block - Low



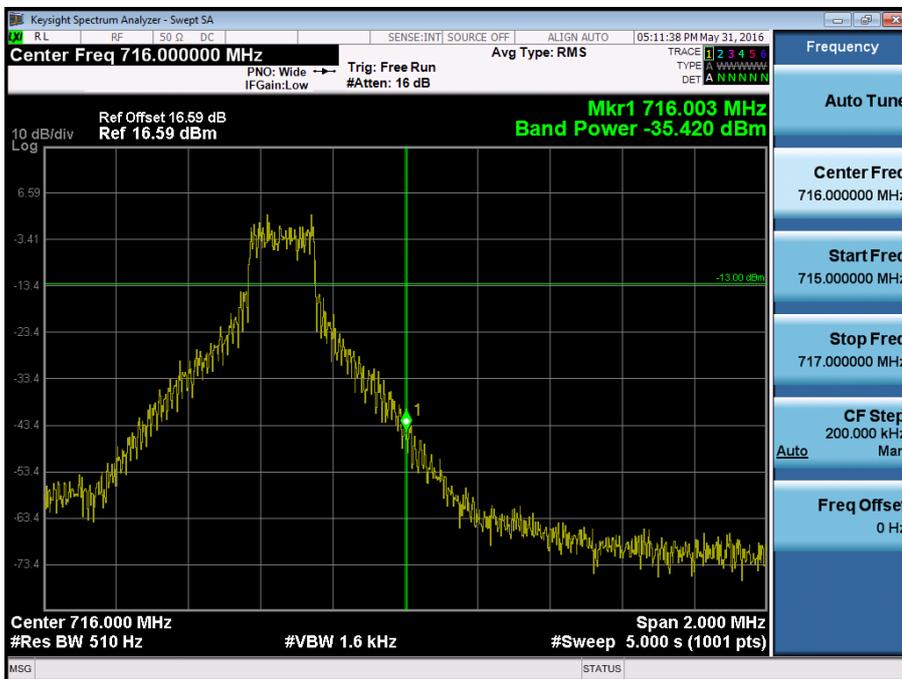


Product Service

706.5 MHz - All Resource Blocks



713.5 MHz - 1 Resource Block - High



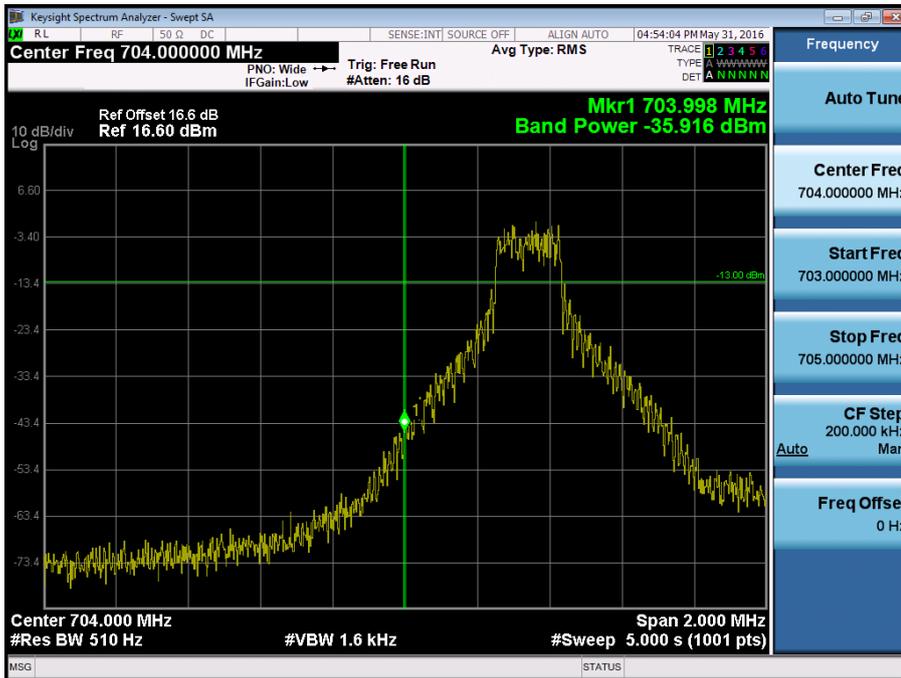


Product Service

5.0 MHz Bandwidth - 16-QAM

Band Edge (dBm)			
706.5 MHz		713.5 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-35.92	-31.22	-35.19	-33.11

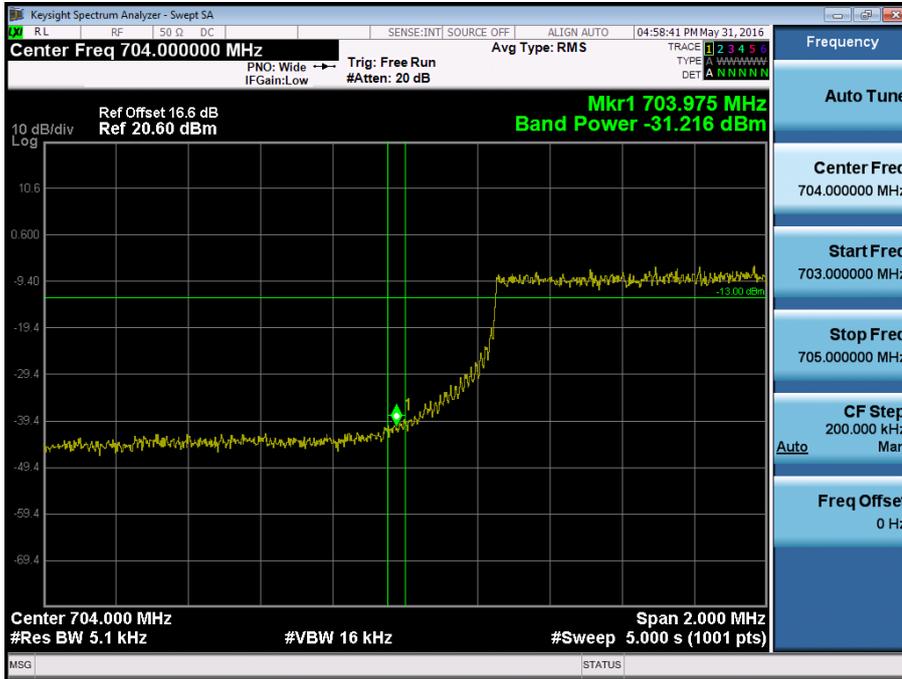
706.5 MHz - 1 Resource Block - Low



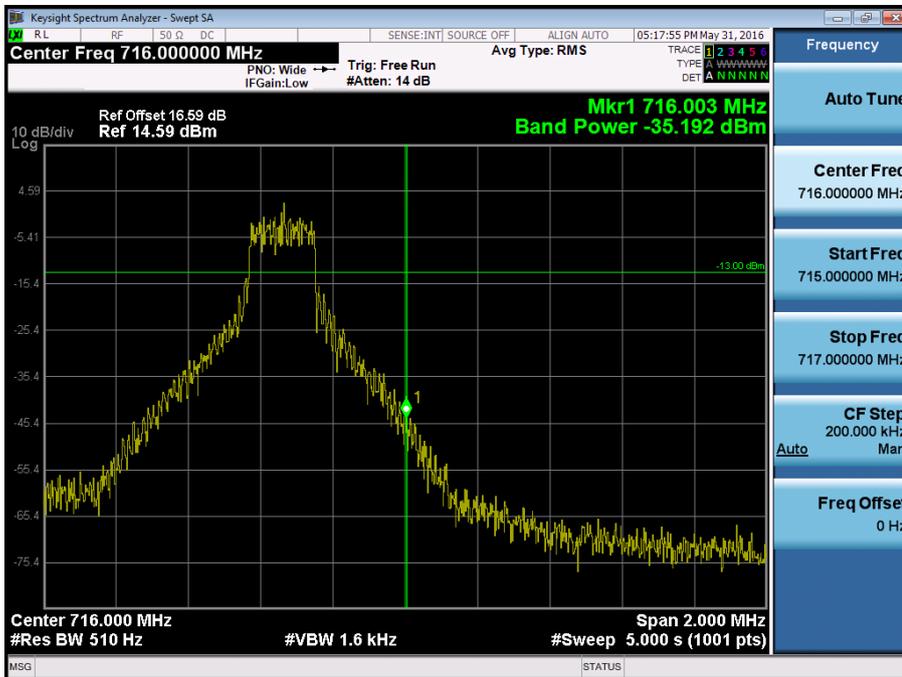


Product Service

706.5 MHz - All Resource Blocks



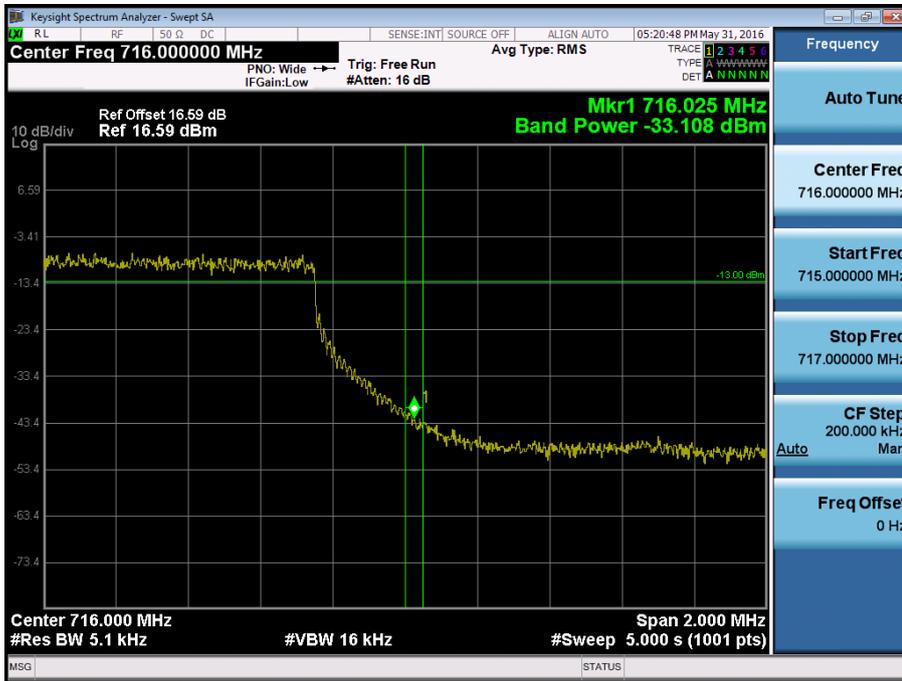
713.5 MHz - 1 Resource Block - High





Product Service

713.5 MHz - All Resource Blocks



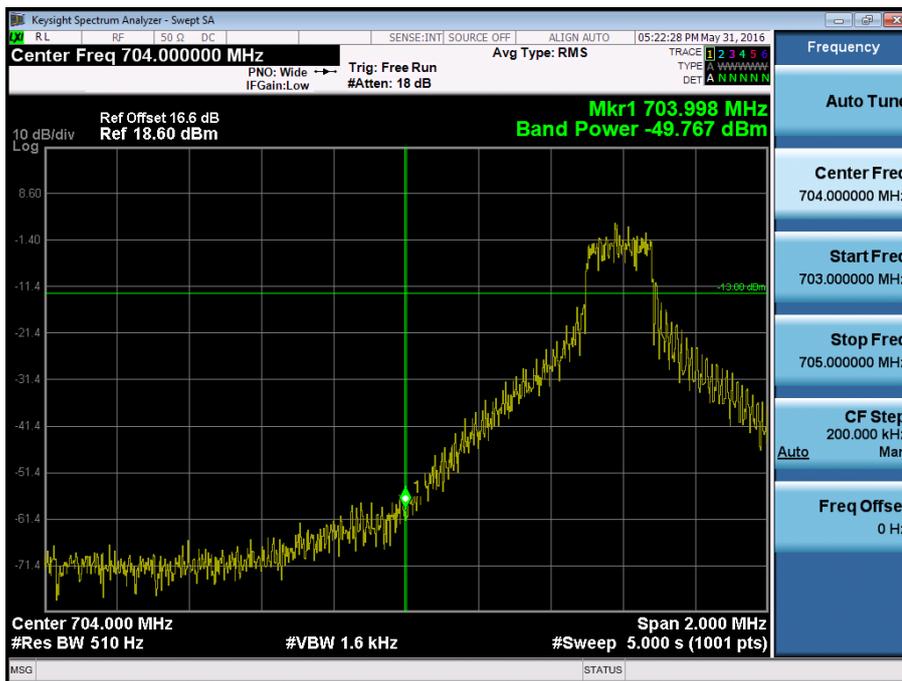


Product Service

10.0 MHz Bandwidth - QPSK

Band Edge (dBm)			
709.0 MHz		711.0 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-49.77	-32.34	-45.39	-34.24

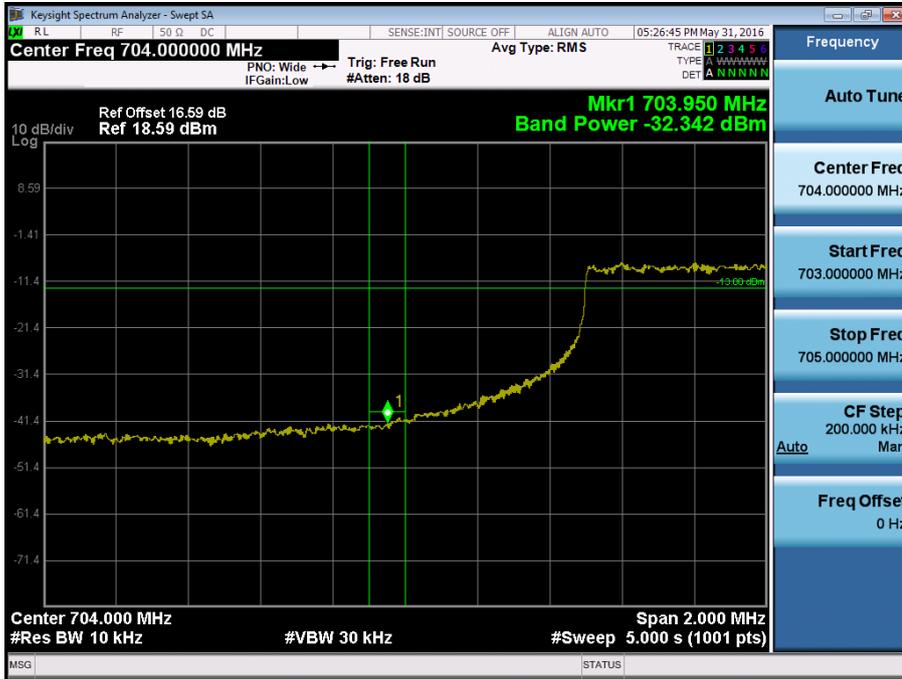
709 MHz - 1 Resource Block - Low



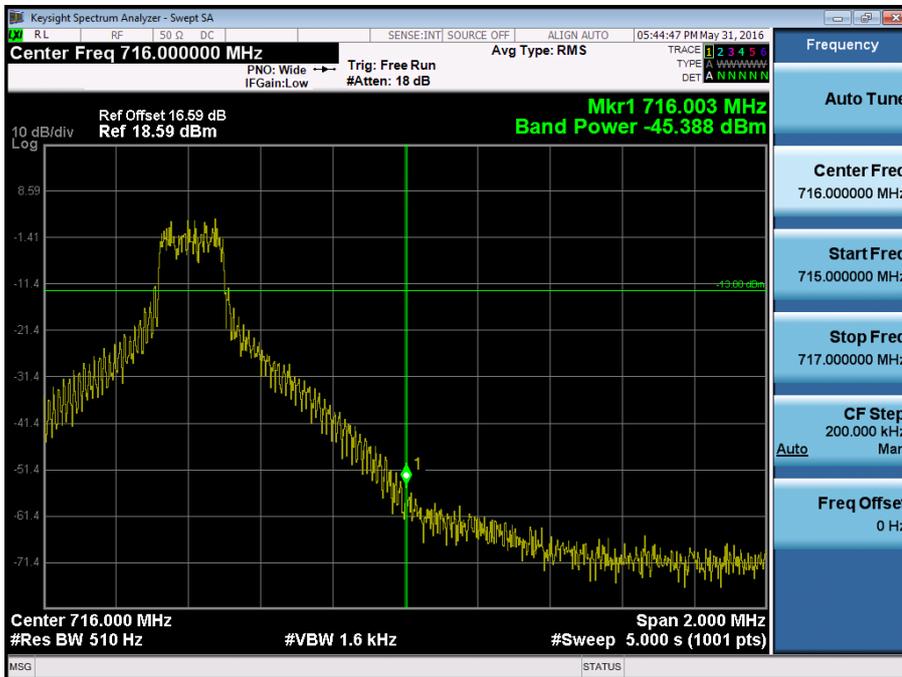


Product Service

709 MHz - All Resource Blocks



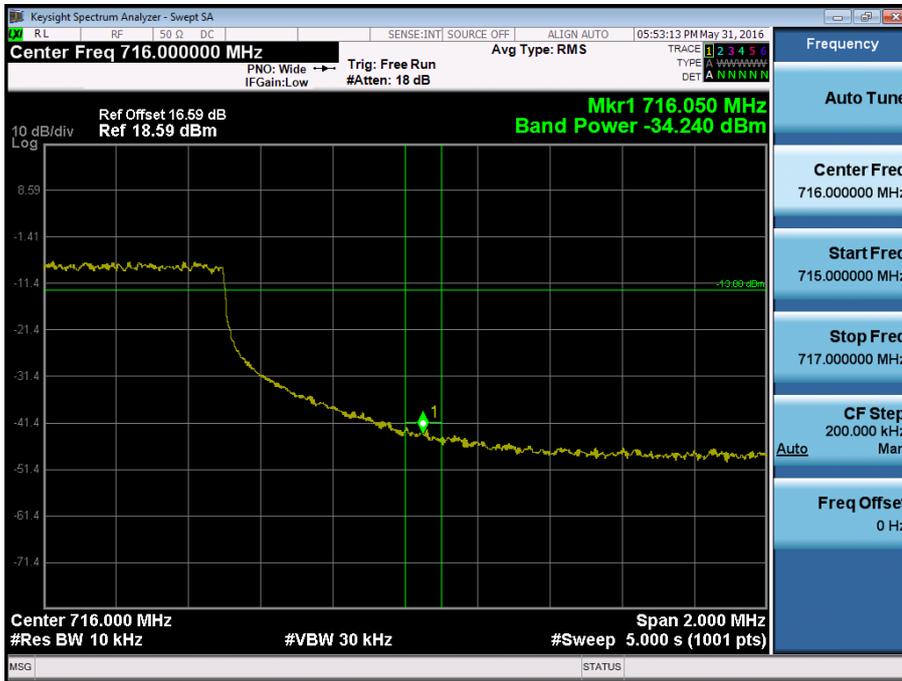
711 MHz - 1 Resource Block - High





Product Service

711 MHz - All Resource Blocks



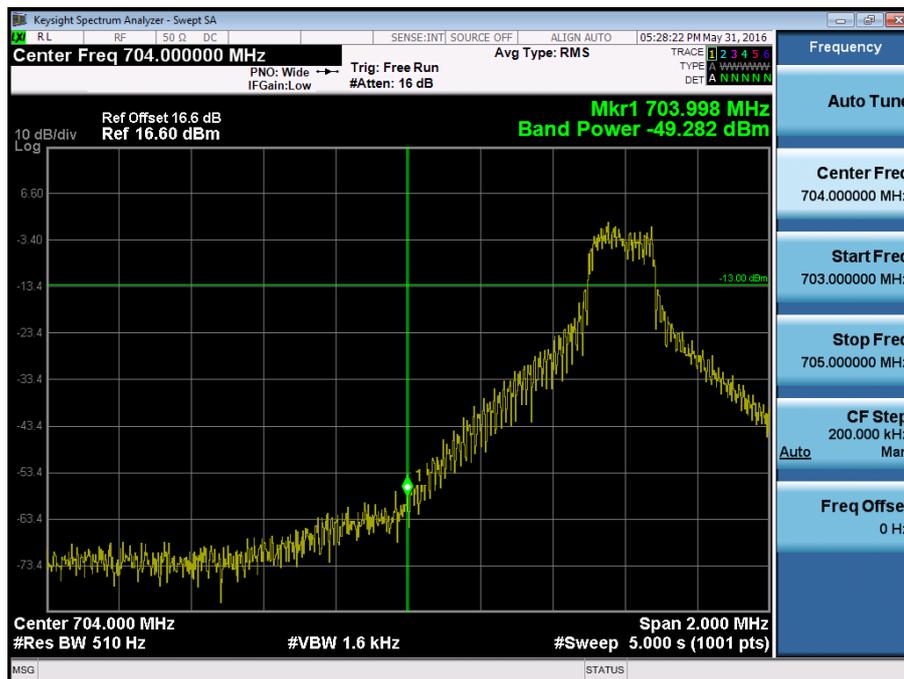


Product Service

10.0 MHz Bandwidth - 16-QAM

Band Edge (dBm)			
709.0 MHz		711.0 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-49.28	-33.52	-47.12	-35.50

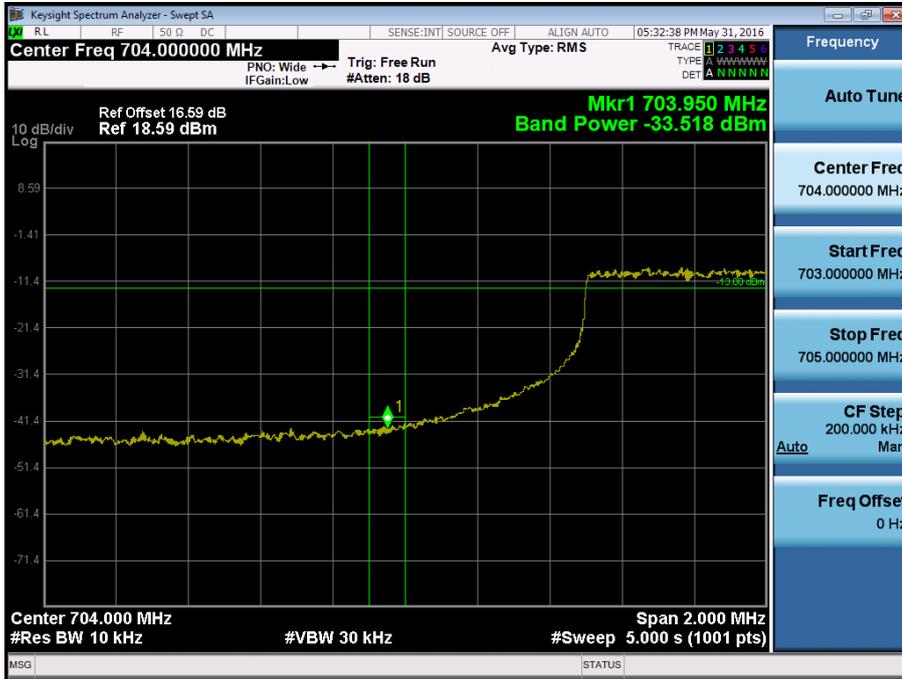
709 MHz - 1 Resource Block - Low



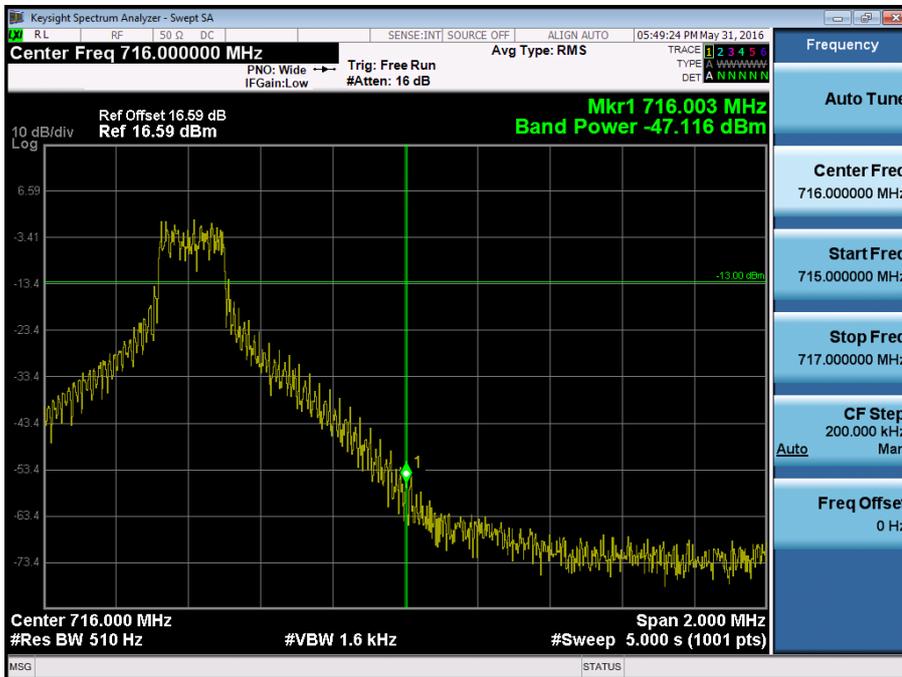


Product Service

709 MHz - All Resource Blocks



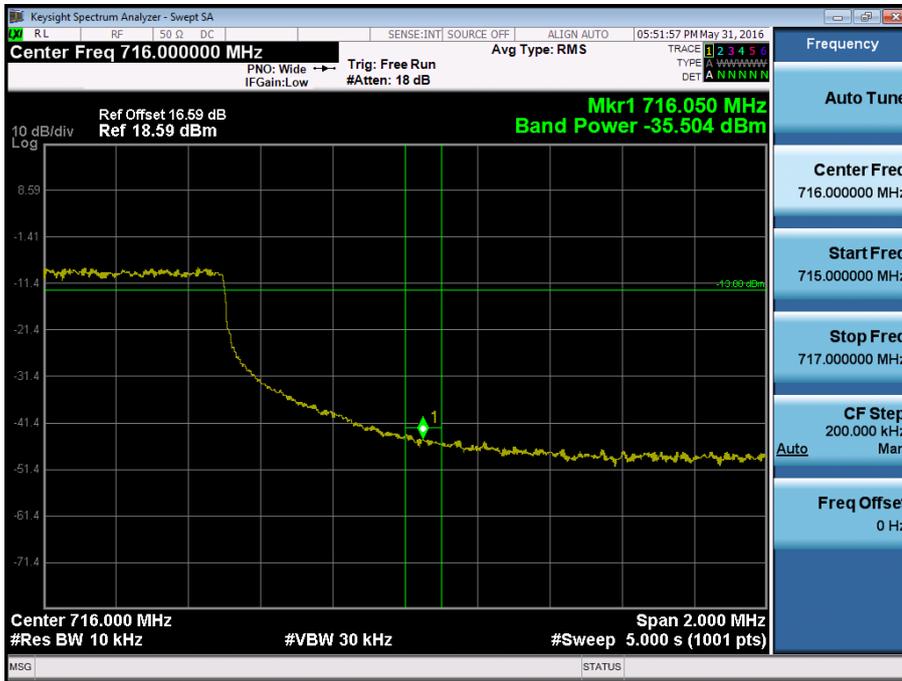
711 MHz - 1 Resource Block - High





Product Service

711 MHz - All Resource Blocks



FCC 47 CFR Part 27, Limit Clause 27.53 (h)

Out of band emissions: 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.



Product Service

2.5 26 dB BANDWIDTH**2.5.1 Specification Reference**

FCC 47 CFR Part 27, Clause 27.53 (h)(3)
FCC 47 CFR Part 2, Clause 2.1051

2.5.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813277 - Modification State 0

2.5.3 Date of Test

31 May 2016

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02 r02, clause 4.1.

Testing was performed with the resource blocks configured for the widest 26 dB bandwidth (i.e. 100% resource blocks). Testing was repeated with the resource blocks configured to produce the narrowest 26 dB bandwidth (i.e. a single resource block). Testing with a single resource block was configured with a mid-offset as the declared nominal bandwidth is the same for a single resource block regardless of the offset.

2.5.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	47.5%



Product Service

2.5.7 Test Results

4.0 V DC Supply

LTE FDD 17, 26 dB Bandwidth Results

5.0 MHz Bandwidth - QPSK

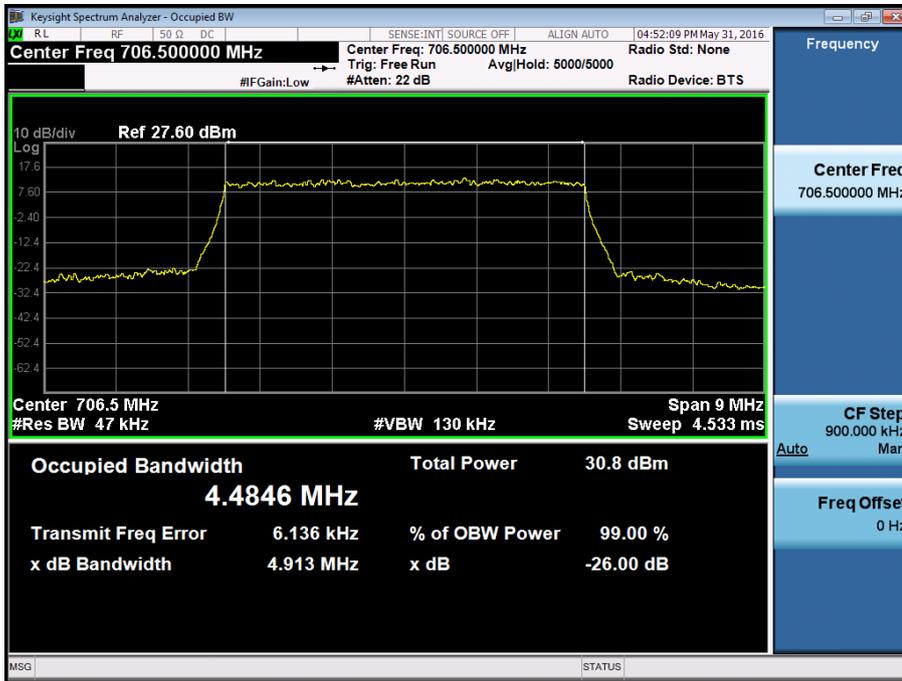
26 dB Bandwidth (kHz)											
706.5 MHz				710.0 MHz				713.5 MHz			
1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks
Low	Mid	High		Low	Mid	High		Low	Mid	High	
N/T	389.6	N/T	4912.8	N/T	362.5	N/T	4901.7	N/T	413.9	N/T	4892.9

706.5 MHz - 1 Resource Block - Middle





706.5 MHz - All Resource Blocks

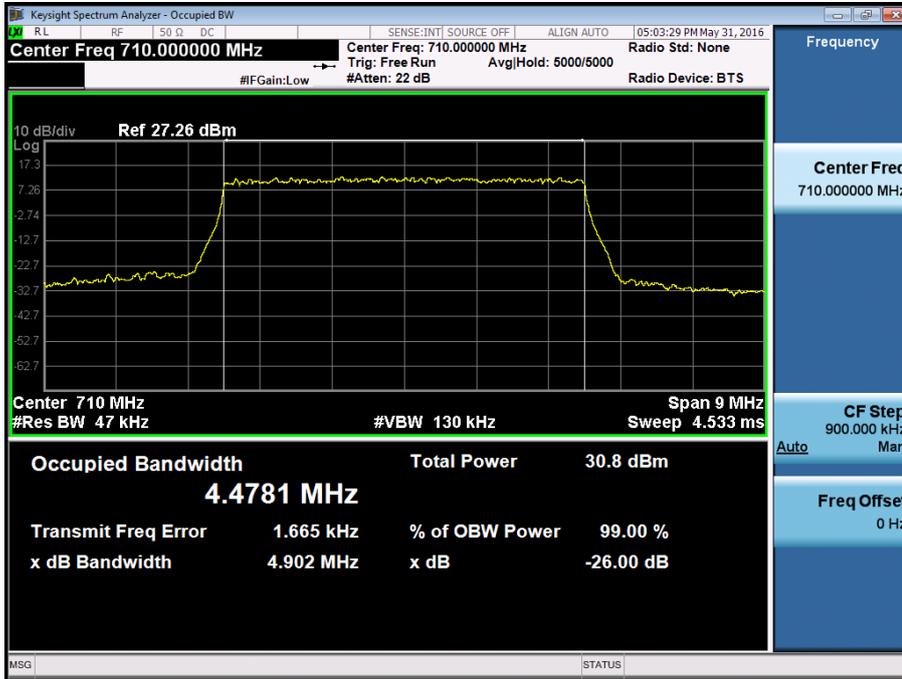


710 MHz - 1 Resource Block - Middle

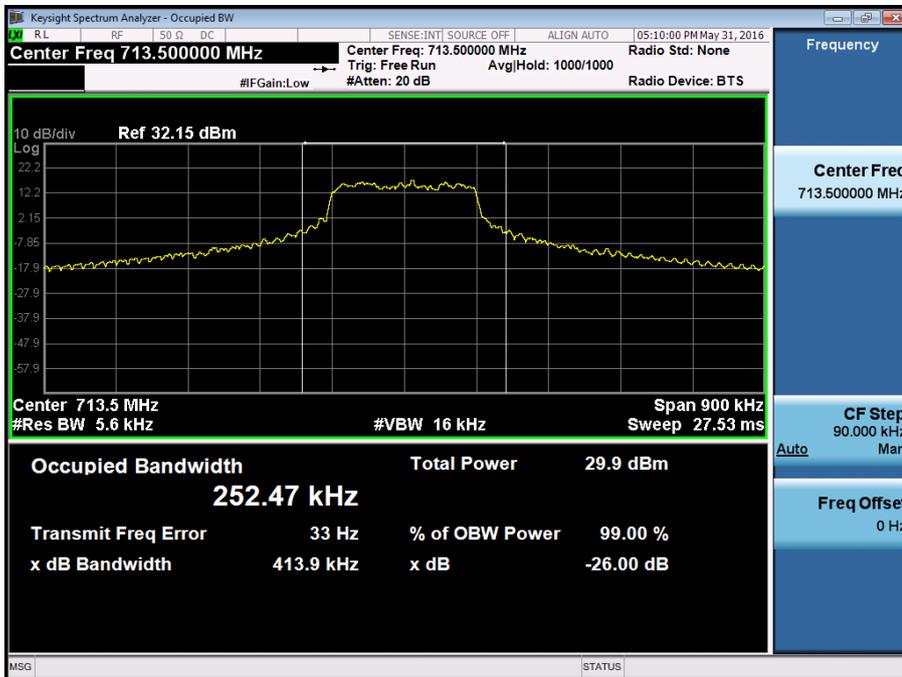




710 MHz - All Resource Blocks



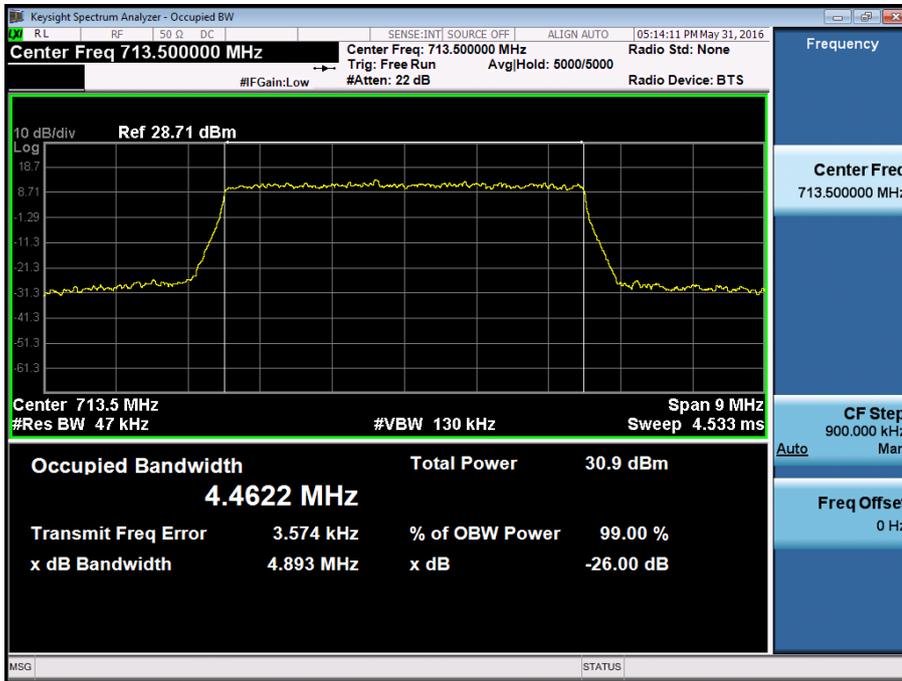
713.5 MHz - 1 Resource Block - Middle





Product Service

713.5 MHz - All Resource Blocks





Product Service

5.0 MHz Bandwidth - 16-QAM

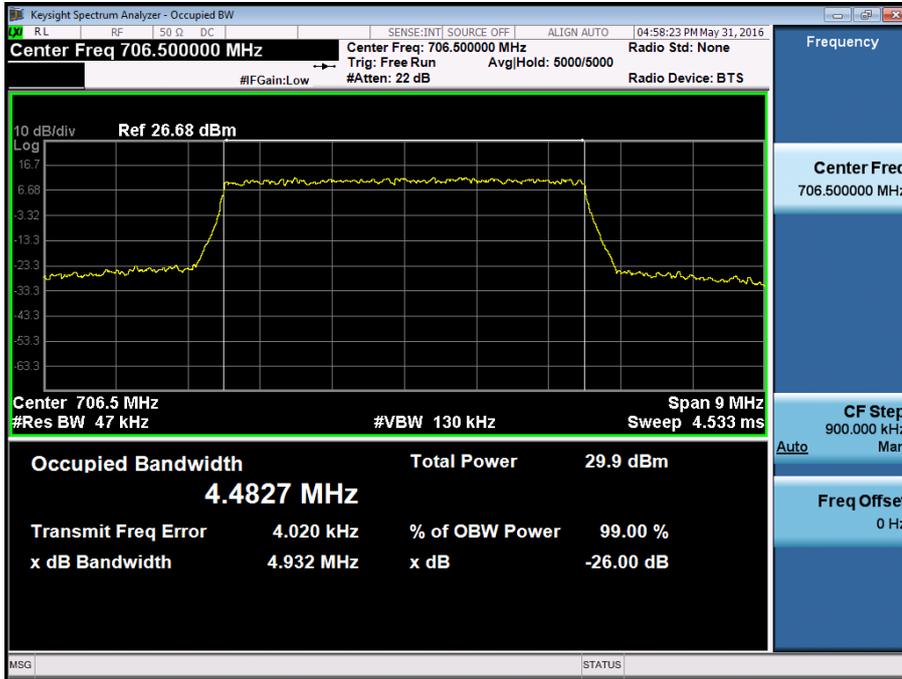
26 dB Bandwidth (kHz)											
706.5 MHz				710.0 MHz				713.5 MHz			
1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks
Low	Mid	High		Low	Mid	High		Low	Mid	High	
N/T	430.7	N/T	4932.4	N/T	415.8	N/T	4878.8	N/T	435.2	N/T	4831.3

706.5 MHz - 1 Resource Block - Middle

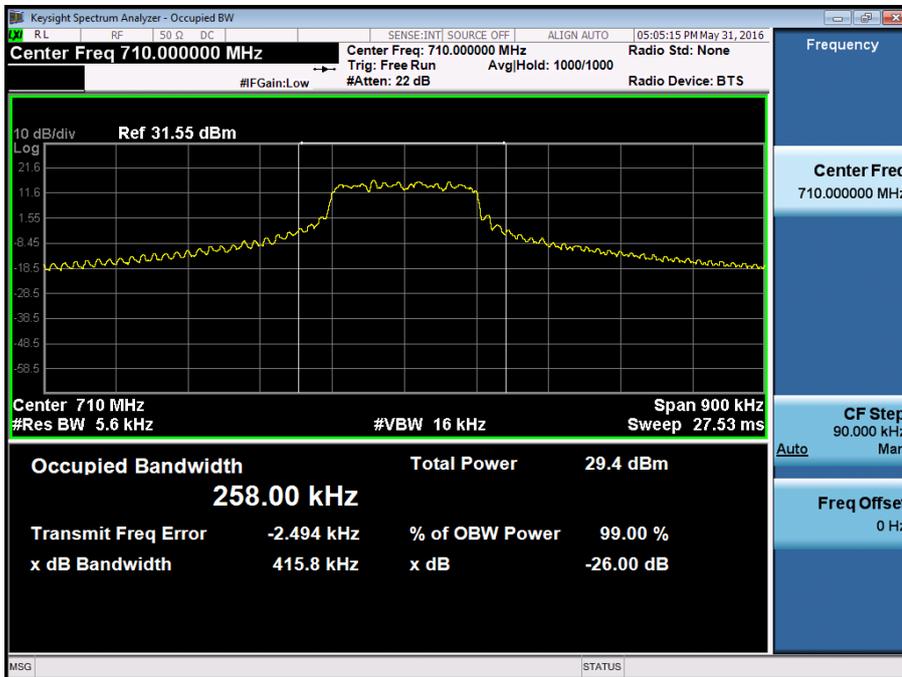




706.5 MHz - All Resource Blocks



710 MHz - 1 Resource Block - Middle

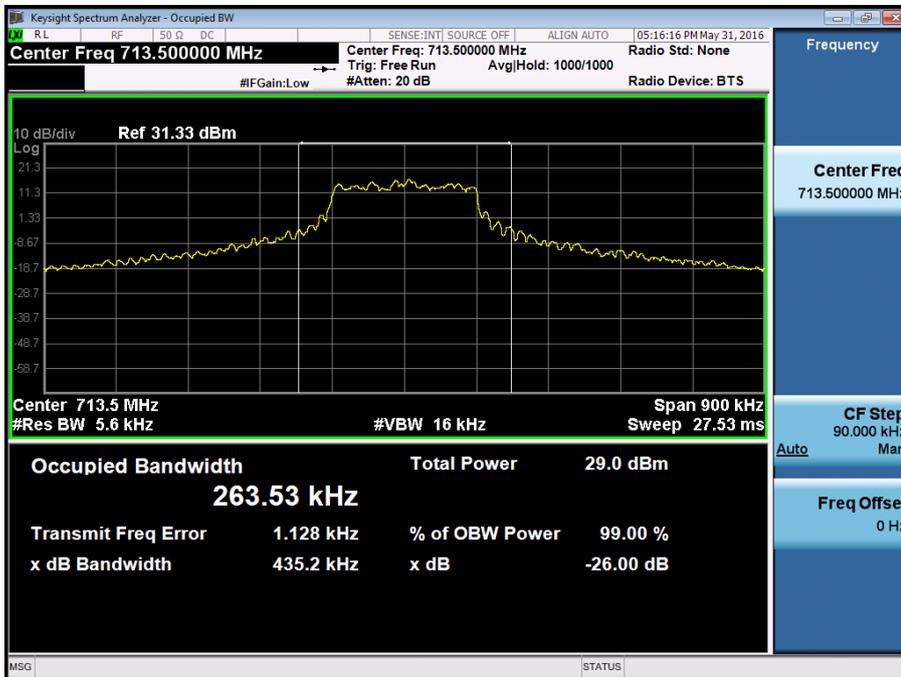




710 MHz - All Resource Blocks



713.5 MHz - 1 Resource Block - Middle





Product Service

713.5 MHz - All Resource Blocks





Product Service

10.0 MHz Bandwidth - QPSK

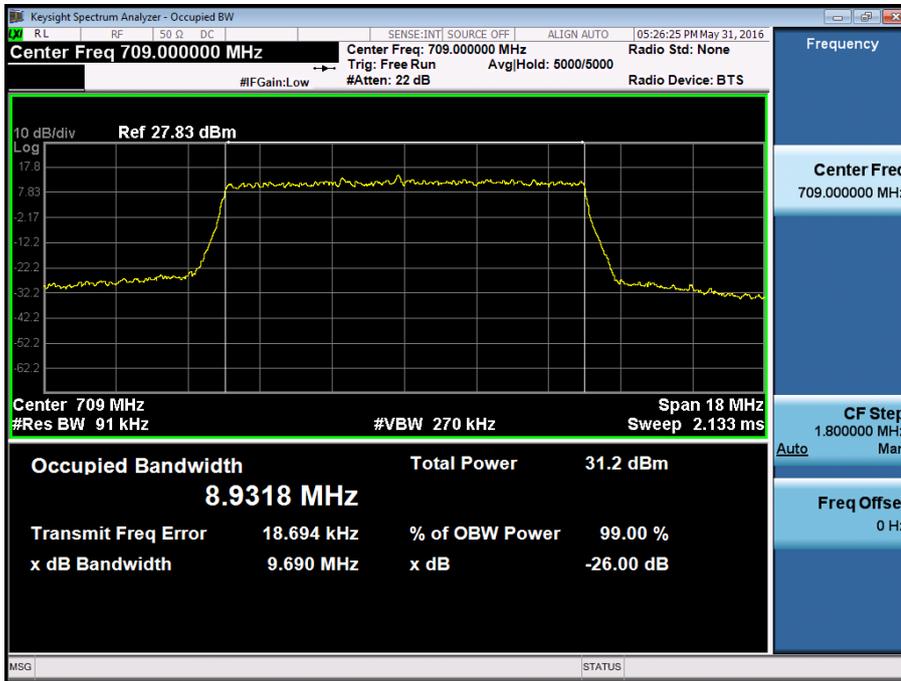
26 dB Bandwidth (kHz)											
709.0 MHz			710.0 MHz				711.0 MHz				
1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks
Low	Mid	High		Low	Mid	High		Low	Mid	High	
N/T	373.7	N/T	9689.6	N/T	365.5	N/T	9642.6	N/T	402.5	N/T	9647.4

709 MHz - 1 Resource Block - Middle





709 MHz - All Resource Blocks



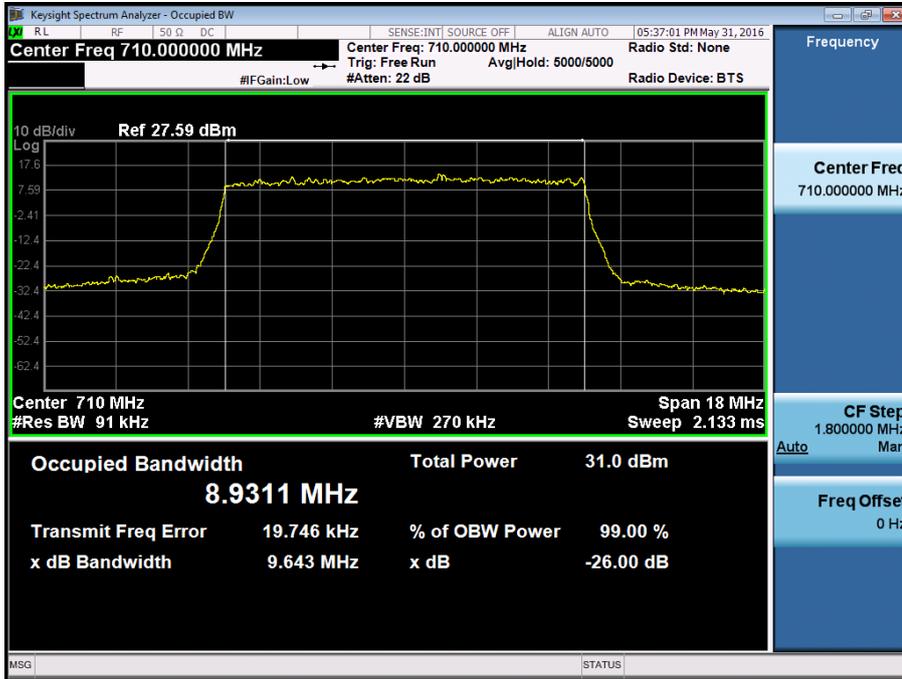
710 MHz - 1 Resource Block - Middle



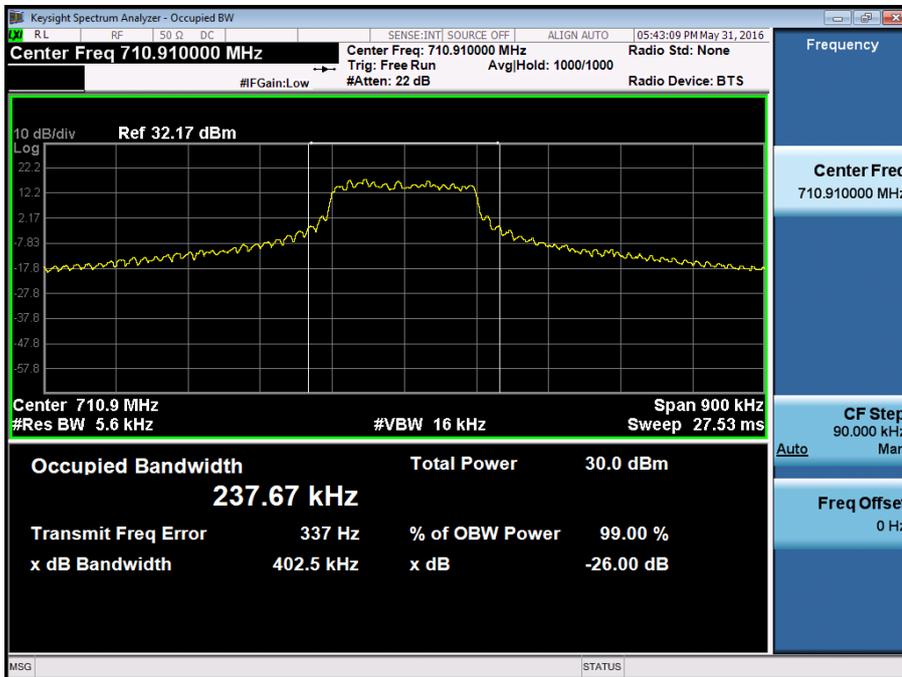


Product Service

710 MHz - All Resource Blocks



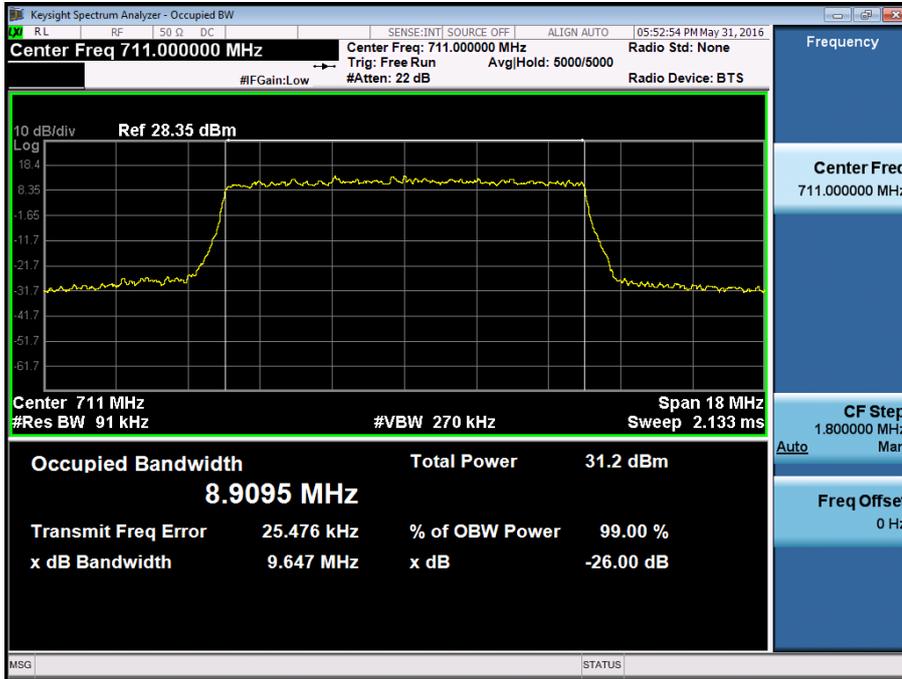
711 MHz - 1 Resource Block - Middle





Product Service

711 MHz - All Resource Blocks





Product Service

10.0 MHz Bandwidth - 16-QAM

26 dB Bandwidth (kHz)											
709.0 MHz			710.0 MHz				711.0 MHz				
1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks	1 Resource Block			All Resource Blocks
Low	Mid	High		Low	Mid	High		Low	Mid	High	
N/T	430.5	N/T	9712.5	N/T	428.9	N/T	9645.1	N/T	402.8	N/T	9663.9

709 MHz - 1 Resource Block - Middle





709 MHz - All Resource Blocks

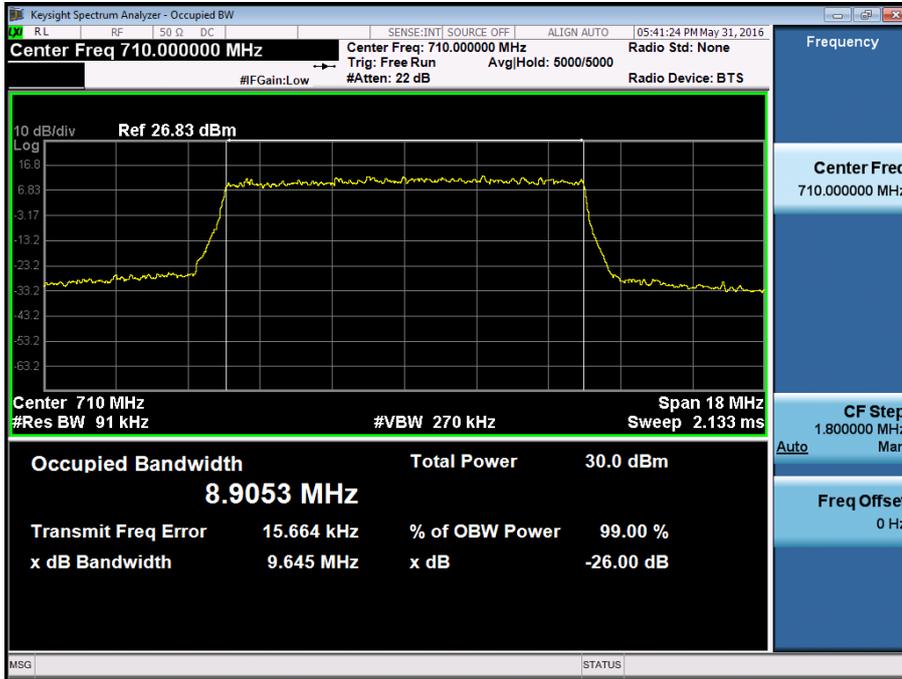


710 MHz - 1 Resource Block - Middle





710 MHz - All Resource Blocks



711 MHz - 1 Resource Block - Middle





Product Service

711 MHz - All Resource Blocks



FCC 47 CFR Part 27, Limit Clause

None specified



Product Service

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.54
FCC 47 CFR Part 2, Clause 2.1055

2.6.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813277 - Modification State 0

2.6.3 Date of Test

3 June 2016

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

This test was performed in accordance with FCC 47 CFR Part 2, clause 2.1055.

Remarks

The frequency error was recorded using the measurement function of the communications test set. The frequency reference was set to external to improve the measurement accuracy. The EUT was configured with a 10 MHz bandwidth with 50 resource blocks for each modulation supported by the EUT as the frequency stability is not dependent on the bandwidth and resource block configuration.

2.6.6 Environmental Conditions

Ambient Temperature	23.5°C
Relative Humidity	39.8%



Product Service

2.6.7 Test Results

LTE FDD 17, Frequency Stability Results

Under Temperature Variations

10 MHz Bandwidth - QPSK

Frequency Error (Hz)		
710.0 MHz		
Supply Voltage	Temperature Interval °C	All Resource Blocks
3.7 V DC	+20	8.13
4.0 V DC	-30	11.47
4.0 V DC	-20	-9.66
4.0 V DC	-10	10.67
4.0 V DC	0	8.83
4.0 V DC	+10	6.11
4.0 V DC	+20	10.14
4.0 V DC	+30	-10.41
4.0 V DC	+40	6.74
4.0 V DC	+50	14.88

10 MHz Bandwidth - 16-QAM

Frequency Error (Hz)		
710.0 MHz		
Supply Voltage	Temperature Interval °C	All Resource Blocks
3.7 V DC	+20	9.16
4.0 V DC	-30	10.83
4.0 V DC	-20	11.13
4.0 V DC	-10	10.27
4.0 V DC	0	-9.01
4.0 V DC	+10	7.81
4.0 V DC	+20	8.31
4.0 V DC	+30	-8.81
4.0 V DC	+40	-8.61
4.0 V DC	+50	-12.02

FCC 47 CFR Part 27, Limit Clause 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorised bands of operation.



2.7 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.7.2 Test Results

LTE FDD 17, 10.0 MHz Bandwidth, QPSK, Transmitter Summary, Modulation Characteristic Plot

LTE Measurement - V3.2.60 - TX Measurement

Multi Evaluation PRACH SRS

FDD Freq.: 710.0 MHz Ref. Level: 41.20 dBm Bandwidth: 10.0 MHz Cyclic Prefix: Normal Meas Subfr.: 0

TX Measurement

Detected Allocation NoRB: 50 OffsetRB: 0

	Current		Average		Extreme		StdDev	
EVM RMS [%] /h	1.74	1.75	1.84	1.91	2.22	2.37	0.11	0.13
EVM Peak [%] /h	18.02	17.99	19.58	20.06	23.10	35.31	1.51	2.06
EVM DMRS [%] /h	1.28	1.57	1.39	1.58	1.68	1.92	0.09	0.03
MErr RMS [%] /h	1.48	1.47	1.57	1.62	1.95	2.06	0.11	0.14
MErr Peak [%] /h	-17.59	-17.58	19.40	19.77	-23.10	-35.12	1.67	2.14
MErr DMRS [%] /h	0.94	1.15	1.01	1.16	1.22	1.37	0.07	0.02
PhErr RMS [°] /h	0.53	0.55	0.55	0.58	0.62	0.69	0.02	0.02
PhErr Peak [°] /h	6.58	5.74	6.51	7.16	8.32	14.35	0.62	1.24
PhErr DMRS [°] /h	0.50	0.61	0.54	0.61	0.70	0.79	0.04	0.02
IQ Offset	-41.87 dBc	-41.75 dBc	-41.75 dBc	-41.75 dBc	-39.47 dBc	-39.47 dBc	0.22 dBc	0.22 dBc
Freq Error	2.57 Hz	-0.63 Hz	-0.63 Hz	-0.63 Hz	-5.11 Hz	-5.11 Hz	1.16 Hz	1.16 Hz
Timing Error	11.59 Ts	10.43 Ts	10.43 Ts	10.43 Ts	13.23 Ts	13.23 Ts	1.05 Ts	1.05 Ts
OBW	8.89 MHz	8.89 MHz	0.01 MHz	0.01 MHz				
	Current		Average		Min Max		StdDev	
TX Power [dBm]	22.24		22.23		-11.99 24.27		0.00	
Peak Power [dBm]	27.64		27.50		-6.57 30.64		0.08	

Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %

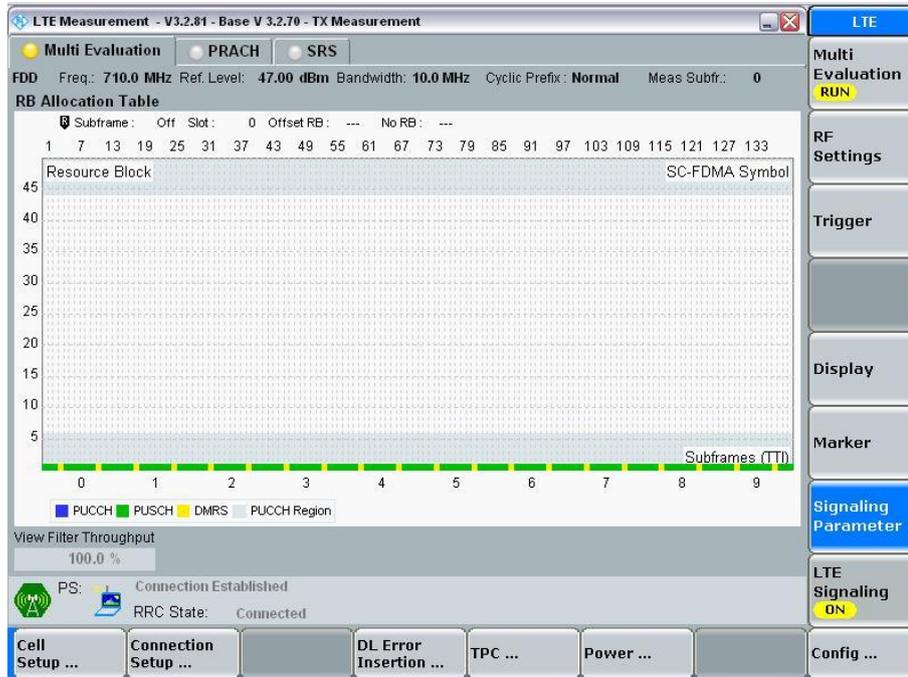
PS: Connection Established RRC State: Connected

Buttons: Repetition ... Stop Condition ... Statistic Count ... Channel Bandwidth ... Measurement Subframes ... Assign Views Config ...

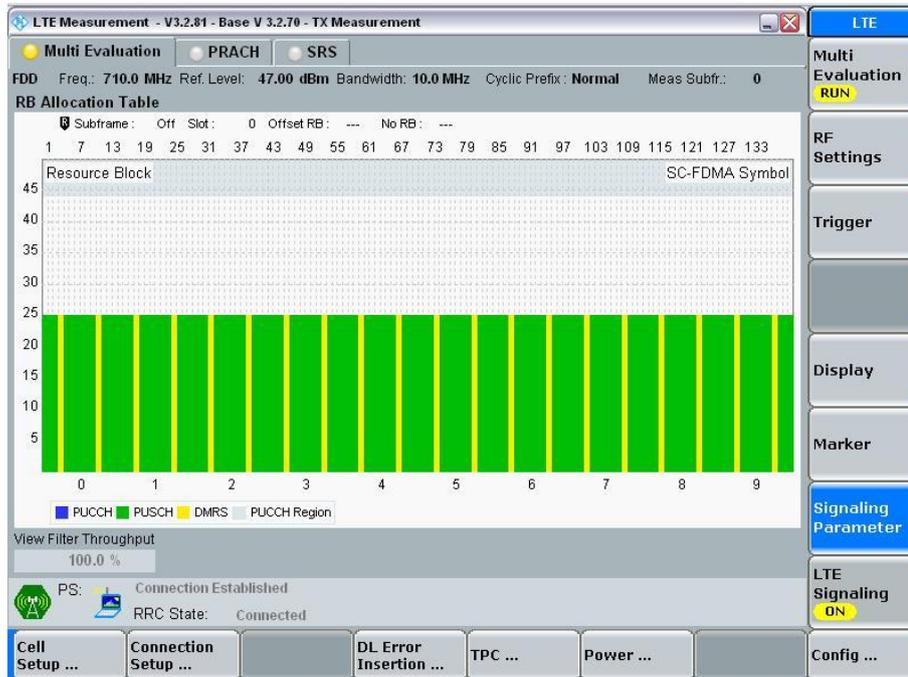
Right Panel: LTE Multi Evaluation RUN RF Settings Trigger Display Signaling Parameter LTE Signaling ON



LTE FDD 17, 10.0 MHz Bandwidth, QPSK, 1 Resource Block Allocation, Modulation Characteristic Plot

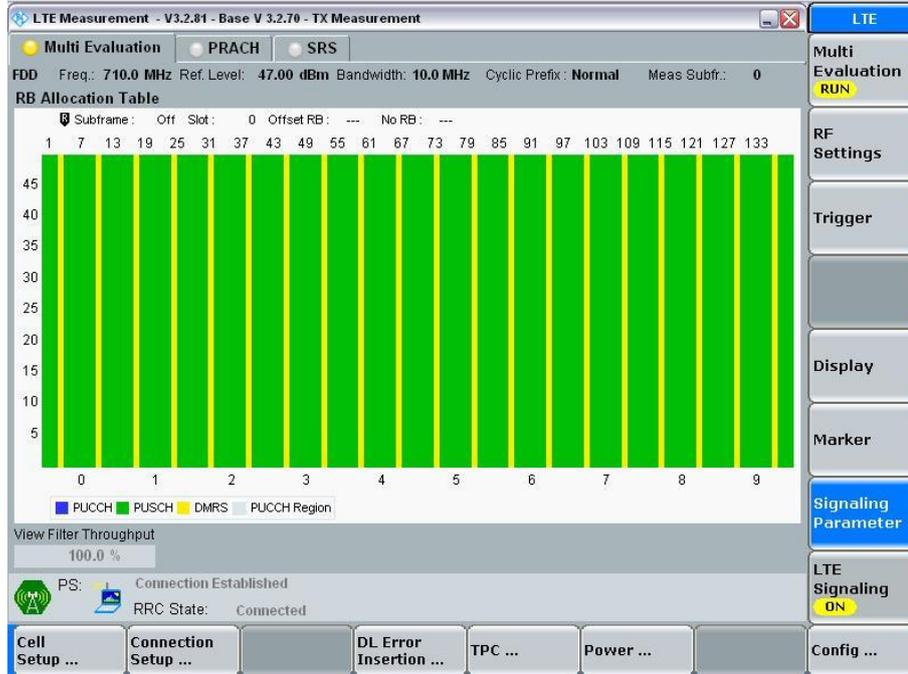


LTE FDD 17, 10.0 MHz Bandwidth, QPSK, 25 Resource Block Allocation, Modulation Characteristic Plot





LTE FDD 17, 10.0 MHz Bandwidth, QPSK, 50 Resource Block Allocation, Modulation Characteristic Plot

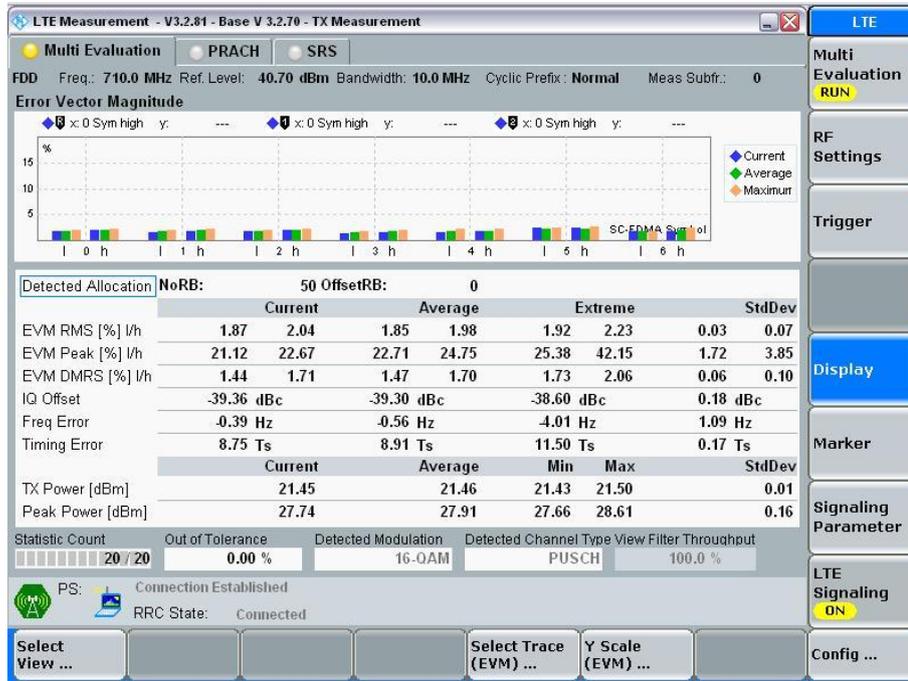


LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, Transmitter Summary, Modulation Characteristic Plot

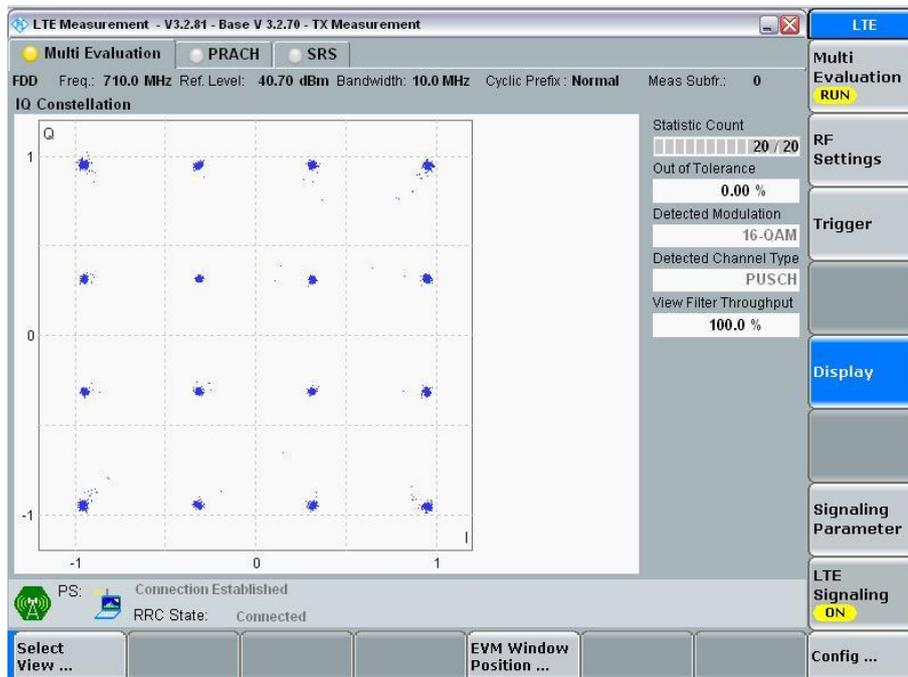




LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, EVM, Modulation Characteristic Plot

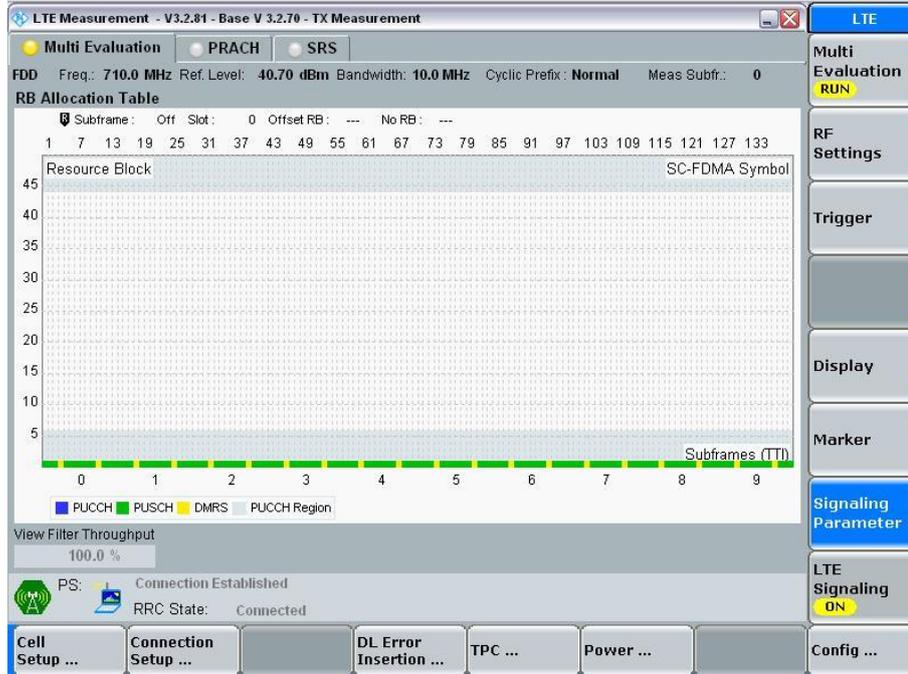


LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, IQ Constellation, Modulation Characteristic Plot

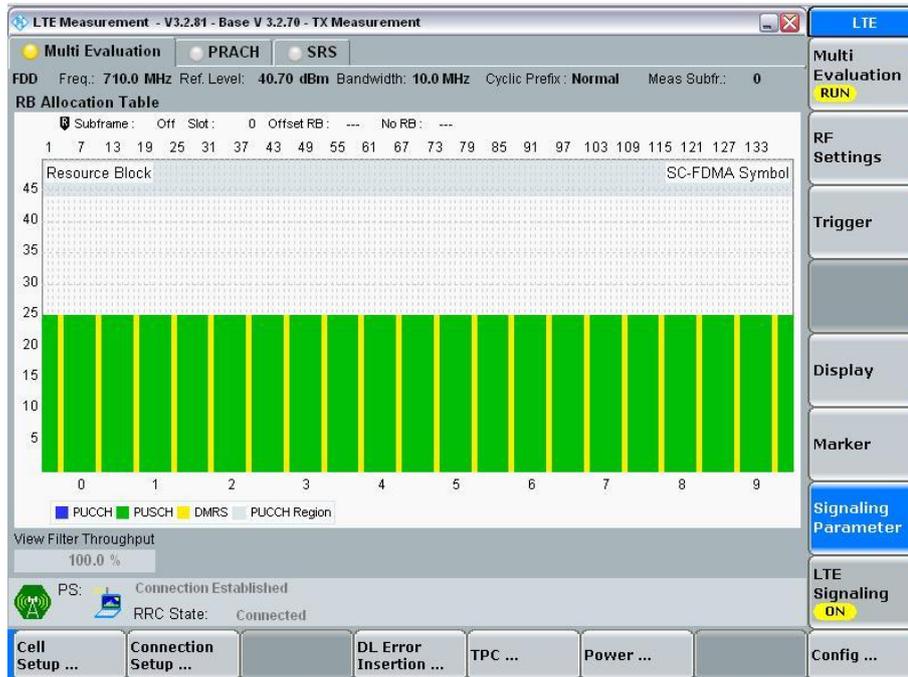




LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, 1 Resource Block Allocation, Modulation Characteristic Plot

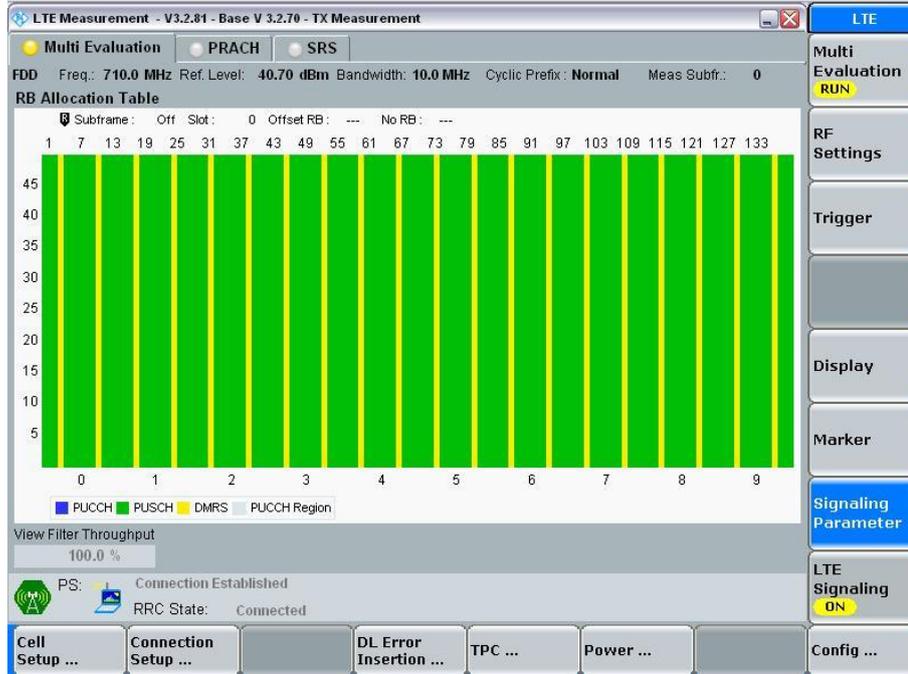


LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, 25 Resource Block Allocation, Modulation Characteristic Plot





LTE FDD 17, 10.0 MHz Bandwidth, 16-QAM, 50 Resource Block Allocation, Modulation Characteristic Plot



FCC 47 CFR Part 27, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Maximum Conducted Output Power					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
P-Series Power Meter	Agilent Technologies	N1911A	3981	12	25-Sep-2016
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3983	12	25-Sep-2016
True RMS Multimeter	Fluke	179	4006	12	9-Dec-2016
Fan Heater	Master	B 3 EPB	4363	-	TU
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
Section 2.1 - Emission Limitations					
Hygrometer	Rotronic	A1	1388	12	13-Apr-2017
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	27-Apr-2017
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016
Section 2.3 - Spurious Emissions at Antenna Terminals					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	5-Feb-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
True RMS Multimeter	Fluke	179	4006	0	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	23-Mar-2017
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 - Spurious Emissions at Band Edge					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
True RMS Multimeter	Fluke	179	4006	12	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
Section 2.5 - 26 dB Bandwidth					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
True RMS Multimeter	Fluke	179	4006	12	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
Section 2.6 - Frequency Stability					
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	2809	12	9-Jul-2016
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
True RMS Multimeter	Fluke	179	4006	12	9-Dec-2016
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	16-Nov-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Programmable Power Supply	Rohde & Schwarz	HMP2020	-	-	O/P Mon

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Modulation Characteristics	-
Spurious Emissions at Antenna Terminals	± 3.454 dB
26 dB Bandwidth	84.51 kHz
Emission Limitations	Radiated Emissions ; 30 MHz to 1 GHz ; ± 5.1 dB Radiated Emissions ; 1 GHz to 40 GHz ; 6.2 dB ERP / EIRP ; ± 3.0 dB
Frequency Stability	± 37.73 Hz
Spurious Emissions at Band Edge	± 2.20 dB
Maximum Conducted Output Power	± 0.7 dB



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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