Product Service

Choose certainty.
Add value.

UKAS TESTING 0141

Report On

FCC Testing of the
Motorola Solutions LXN 500 LTE Band 14 Base Station
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 90

COMMERCIAL-IN-CONFIDENCE

FCC ID: AZ492FT7102

PREPARED BY	APPROVED BY	DATED
Simon Bennett Senior Engineer	Matthew Russell Authorised Signatory	29 November 2017

Document 75939219 Report 01 Issue 6 November 2017

Product Service

CONTENTS

Section		Page No
1	**REPORT INFORMATION**	**2**
1.1	Report Details	3
1.2	Brief Summary of Results	4
1.3	Configuration Description	5
1.4	Application Form	6
1.5	Product Information	8
1.6	Test Setup	10
1.7	Test Conditions	11
1.8	Deviation From The Standard	11
1.9	Modification Record	11
1.10	Test Location	11
1.11	Additional Information	12
2	**TEST DETAILS**	**13**
2.1	Maximum Peak Output Power and Peak to Average Ratio - Conducted	14
2.2	Occupied Bandwidth	31
2.3	Band Edge	50
2.4	Transmitter Conducted Spurious Emissions	64
2.5	Frequency Stability	151
2.6	Modulation Characteristics	153
2.7	Transmitter Radiated Spurious Emissions	155
3	**TEST EQUIPMENT USED**	**171**
3.1	Test Equipment Used	172
3.2	Measurement Uncertainty	174
4	**ACCREDITATION, DISCLAIMERS AND COPYRIGHT**	**175**
4.1	Accreditation, Disclaimers and Copyright	176

Product Service

SECTION 1

REPORT INFORMATION

1.1 REPORT DETAILS

Manufacturer	Motorola Solutions Israel Ltd.
Address	2 Hanegev St. Airport City Israel 70199
Product Name	LXN 500
Product Number	SQM01SUM0309A
FCC ID	AZ492FT7102
Serial Number(s)	569REG0001
Software Version	1.0.0
Hardware Version	1.0.0
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2016 FCC CFR 47 Part 90: 2016
Start of Test	28 June 2017
Finish of Test	11 July 2017
Name of Engineer(s)	Mohamed Toubella Simon Bennett Graeme Lawler
Related Document(s)	KDB 971168 D01 v02r02 KDB 662911 D01 v02r01

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 2 and FCC 47 CFR Part 90. The sample tested was found to comply with the requirements defined in the applied rules.

Mohamed Toubella	Simon Bennett	Graeme Lawler

This report has been up-issued, to Issue 6 to remove references to Backpack operation.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 90 is shown below.

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 90		
2.1	2.1046	90.542	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1049	-	Occupied Bandwidth	Pass
2.3	2.1051	90.543(e)	Band Edge	Pass
2.4	2.1051	90.543(e)(f)	Transmitter Conducted Spurious Emissions	Pass
2.5	2.1055	90.539(d)	Frequency Stability	Pass
2.6	2.1047	-	Modulation Characteristics	Pass
2.7	2.1051	90.543(e)(f)	Transmitter Radiated Spurious Emissions	Pass

1.3 CONFIGURATION DESCRIPTION

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting. The settings below were used for all measurements if not otherwise noted:

LTE:
MIMO mode single carrier: E-TM1.1, E-TM3.2, E-TM3.1
MIMO mode multi carrier (x2): E-TM1.1

The complete testing was performed with the EUT transmiting at maximum RF power unless otherwise stated.

The EUT consists of 2 antenna ports. All measurements were performed on both Antenna ports, (A & B).

Pre-test results were used to establish the worst-case configuration of the EUT for Frequency Stability. It was established that QPSK – 10 MHz was the worst case for Frequency Stability measurements. As the EUT can be powered by a DC supply, measurements were also conducted at voltage extremes at 20 °C.

The LXN 500 supports LTE Band 14 – 758 – 768 MHz, (downlink) and 788 – 798 MHz, (uplink), frequency bands.

Test Models as defined in 3GPP TS 25.141 and TS 36.141 were used to represent the required modulation for test.

The EUT was powered by an external 120 V AC 60 Hz Supply which provided power to the EUT.

Channel Configurations

LTE B14 (758 MHz – 768 MHz)

Configuration	RAT	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
				Bottom (BRFBW)	Middle (MRFBW)	Top (TRFBW)
1	LTE	1	5	760.5	763	765.5
1	LTE	1	10	-	763	-

1.4 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	LXN 500 B14
Part Number	SQM01SUM0309A
Hardware Version	1.0.0
Software Version	1.0.0
FCC ID (if applicable)	AZ492FT7102
Industry Canada ID (if applicable)	
Technical Description (Please provide a brief description of the intended use of the equipment)	The LXN 500 is an Ultra Deployable LTE System designed for on-demand coverage and public safety applications. The solution consists of a single portable unit that can be operated from a vehicle.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
LTE	758-768	30	6	5,10	64QAM	10M0G7D	760.5	763	765.5
Wi-Fi	2400-2500	tbc	10	5,20	OFDM	17M9GXW	2412	2442	2484

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	2484 MHz

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	Yes		110/240
External DC	Nominal Voltage		Maximum Current
	9-33VDC		5A
Battery	Nominal Voltage		Battery Operating End Point Voltage
	12-16.8v		
Can EUT transmit whilst being charged?			Yes ☒ No ☐

EXTREME CONDITIONS					
Maximum temperature	60	°C	Minimum temperature	-20	°C

Ancillaries
Please list all ancillaries which will be used with the device.
NP12/NP24 NAV PAC (UPS) 2 x USB flash drives and associated cables

ANTENNA CHARACTERISTICS						
☒	Antenna connector			State impedance	50	Ohm
☐	Temporary antenna connector			State impedance		Ohm
☐	Integral antenna	Type				
☒	External antenna	Type	VLQ69273			

I hereby declare that the information supplied is correct and complete.

Name: Darragh McShane
Position held: Project Manager Date: 07/06/2017

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) –is a Motorola LTE Portable Infrastructure working in the public mobile service Band 14 which provides communication connections to Band 14 network. The EUT can operate from a 120 V 60 Hz AC, 12 or 24 V DC supply.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.

Front View

Rear View

1.5.2 Antenna and ancillaries for use with the LXN 500

Vehicle 4 port antenna and cables:

AN000226A01	Laird Combo antenna VLQ69273 (4 ports)
CB000613A01	Laird Combo LTE antenna VLQ69273 (4 ports) cable
CB000548A01	Laird Combo WiFi antenna VLQ69273 (4 ports) cable
CB000133A01	Laird Combo GPS antenna VLQ69273 (4 ports) cable

Vehicle 3 port antenna and cables:

AN000036A01	Laird combo antenna (3 ports) - Base
85013016001	Laird combo antenna (3 ports) - Whip
CB000613A01	Laird combo antenna (3 ports) LTE cable
CB000133A01	Laird combo antenna (3 ports) GPS cable
CB000548A01	Laird combo antenna (3 ports) WiFi cable

Vehicle power cable

CB000540A01	Vehicle power cable

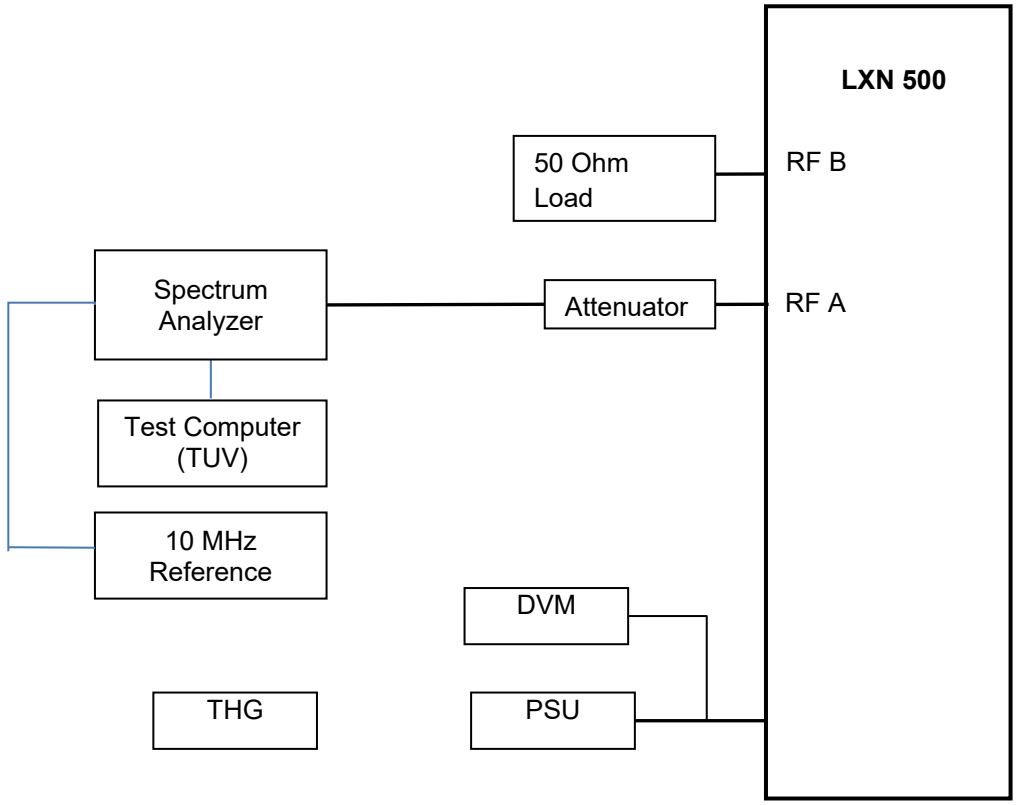
1.5.3 Details of antennas for use with LXN 500

APP	Type	LTE Freq (MHz)	Elec. length	Max Gain	cm	MOTOTOROLA p.n
Vehicle	3 port	LTE: 746 MHz -894MHz WiFi: 2400 MHz-2483 MHz	1/2 wave 1/4 wave	LTE:5 dBi Wifi:7 dBi	LTE mechanical length: 33cm WiFi radiated element : 60x50mm	**AN000036A01+ 85013016001(Whip)**
Vehicle/ In Building	4 port	LTE: 698-960 MHz , WiFi:2300-2700 MHz	1/4 wave 1/4 wave	LTE:6 dBi Wifi:10 dBi	LTE radiated element : 60x50mm WiFi radiated element : 25x45mm	**AN000226A01***

*Antenna used during testing

1.6 TEST SETUP

Conducted Testing Setup



1.7 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, test laboratories or a chamber as appropriate.

The EUT was powered from a 120 V 60 Hz AC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Designation Number: UK0010

1.8 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.9 MODIFICATION RECORD

All tests were performed in Modification State 0 – as supplied except for tests at -20 °C.

Modification State 1 – modifications to PA matching circuit to improve device linearity

1.10 TEST LOCATION

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)
Maximum Peak Output Power and Peak to Average Ratio - Conducted	M Toubella
Occupied Bandwidth	M Toubella
Band Edge	M Toubella S Bennett
Transmitter Spurious Emissions	M Toubella S Bennett
Frequency Stability	M Toubella S Bennett
Modulation Characteristics	S Bennett

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

1.11 ADDITIONAL INFORMATION

Testing performed in the presence of Pat O'Halloran

SECTION 2

TEST DETAILS

2.1 MAXIMUM PEAK OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 90, Clause 90.542(a)(3)(6)

2.1.2 Date of Test and Modification State

29 June 2017 - Modification State 0

2.1.3 Test Equipment Used

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

2.1.4 Environmental Conditions

Ambient Temperature	22.5°C
Relative Humidity	55.2%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 5.2.1 and 5.7.1 and summed in accordance with FCC KDB 662911 D01.

Measurements were performed with a Spectrum Analyser using the Band Power measurement function. The detector was set to RMS with an RBW of 300 kHz and VBW of 1 MHz. The detection bandwidth was configured to be wider than the total bandwidth of the carrier or combinations of carriers, (multi-carrier). Using a sweep time of 5 seconds, the average measurement was recorded.

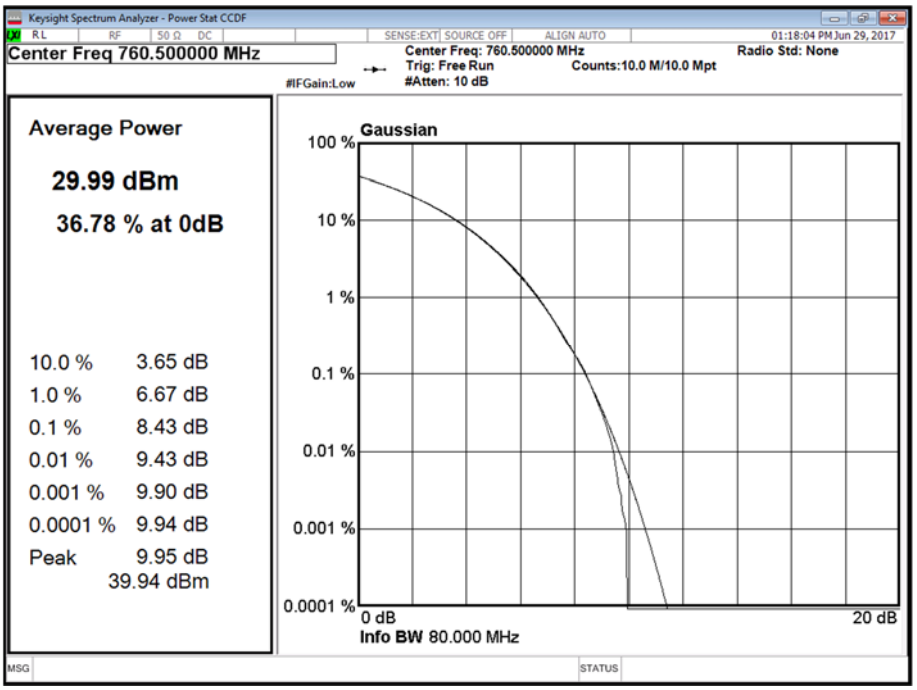
2.1.6 Test Results

Configuration 1

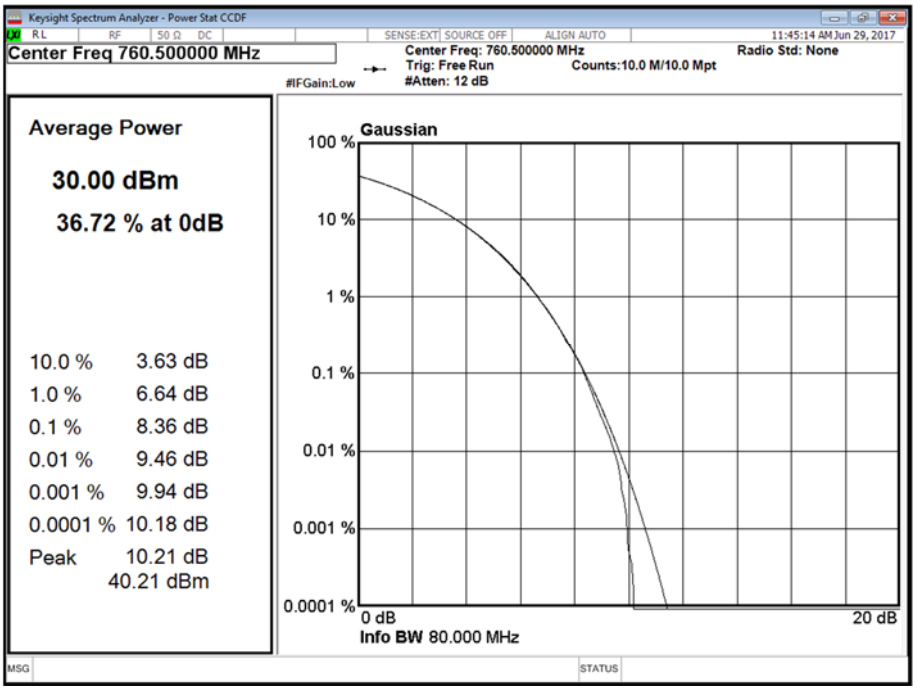
Maximum Output Power 30 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz	8.43	29.96	24.16
B	QPSK	5.0 MHz	8.36	29.97	24.05
Total			-	32.98	27.12
A	16QAM	5.0 MHz	8.38	29.86	24.22
B	16QAM	5.0 MHz	8.37	29.86	24.14
Total			-	32.87	27.19
A	64QAM	5.0 MHz	8.32	29.85	23.93
B	64QAM	5.0 MHz	8.38	29.85	23.93
Total			-	32.86	26.94

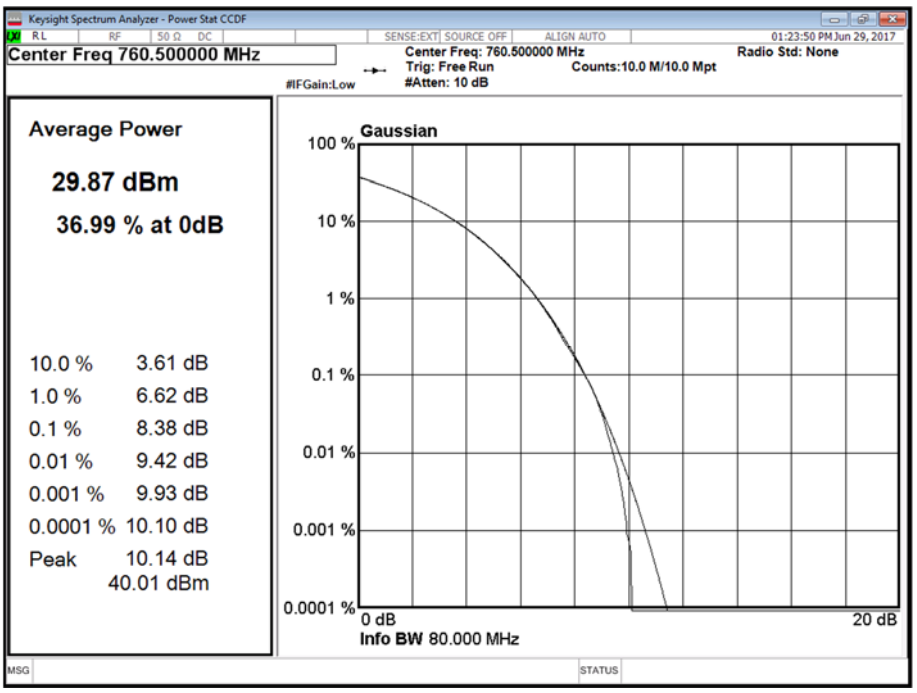
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



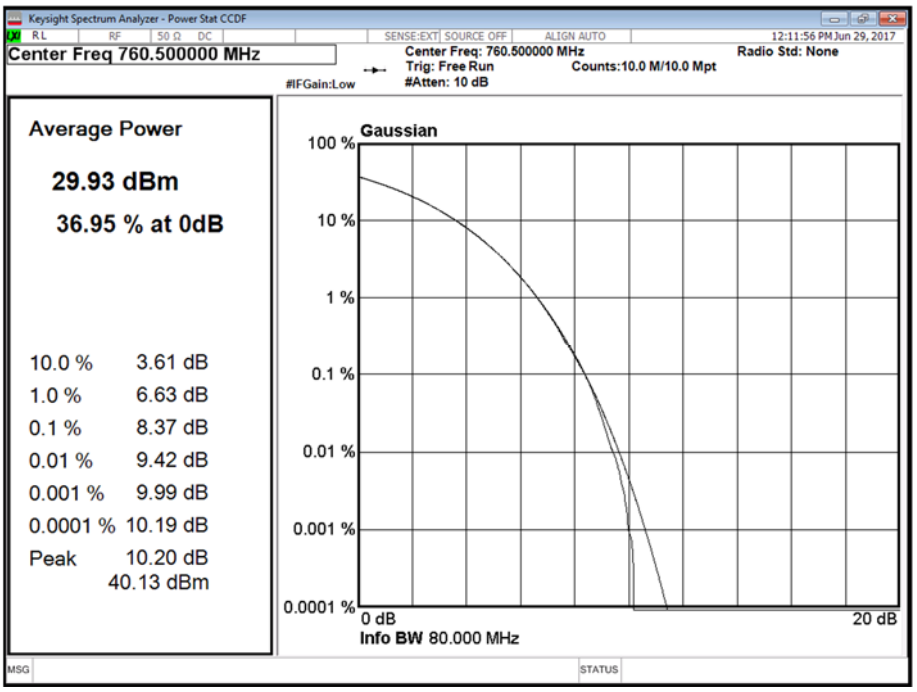
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



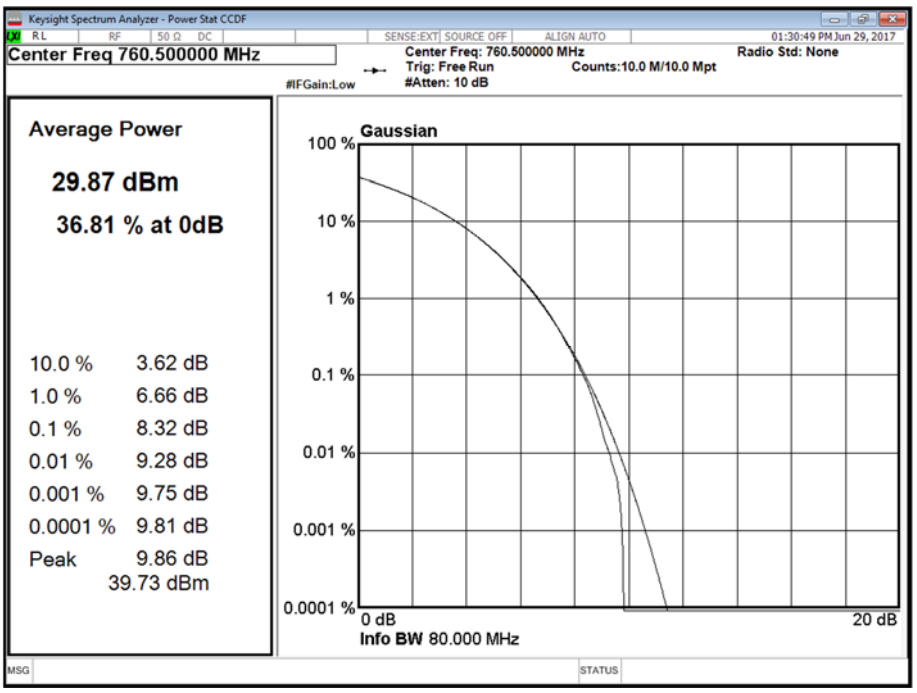
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



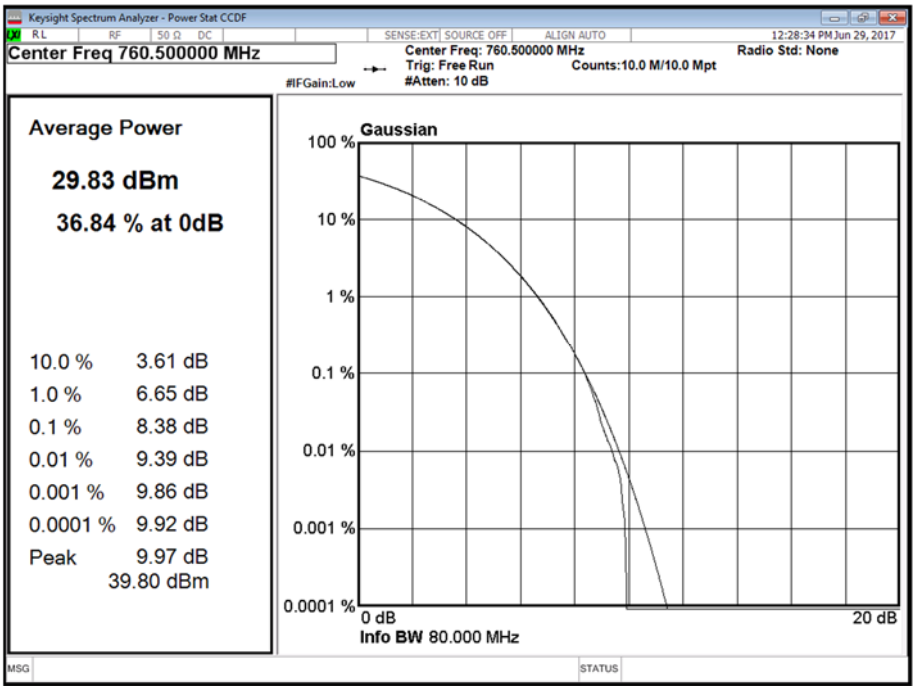
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B

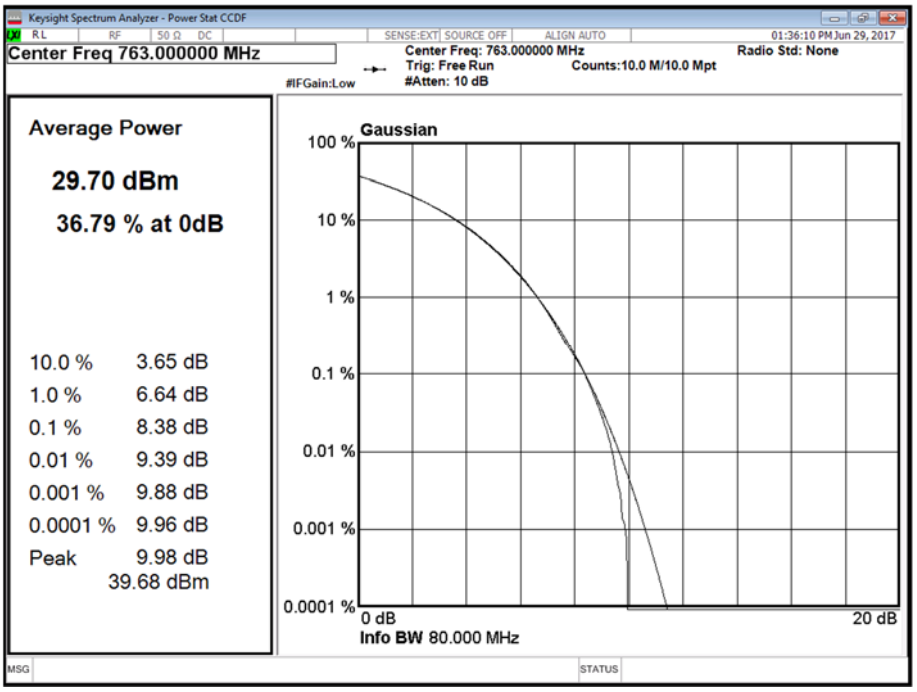


Configuration 1

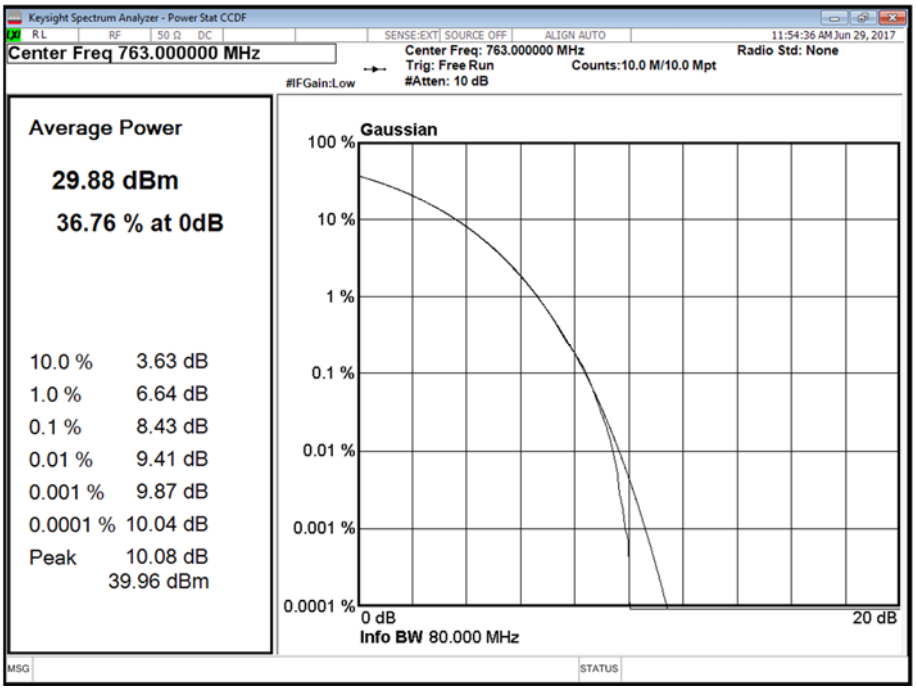
Maximum Output Power 30 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position M		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz	8.38	29.71	23.76
B	QPSK	5.0 MHz	8.43	29.82	23.96
Total			-	32.78	26.87
A	16QAM	5.0 MHz	8.36	29.74	23.93
B	16QAM	5.0 MHz	8.44	29.65	24.16
Total			-	32.71	27.06
A	64QAM	5.0 MHz	8.27	29.64	23.74
B	64QAM	5.0 MHz	8.34	29.64	23.82
Total			-	32.65	26.79
A	QPSK	10.0 MHz	8.35	29.44	20.86
B	QPSK	10.0 MHz	8.40	30.16	21.66
Total			-	32.83	24.29
A	16QAM	10.0 MHz	8.29	29.37	20.85
B	16QAM	10.0 MHz	8.32	30.01	21.59
Total			-	32.71	24.25
A	64QAM	10.0 MHz	8.40	29.38	20.72
B	64QAM	10.0 MHz	8.36	30.01	21.34
Total			-	32.72	24.05

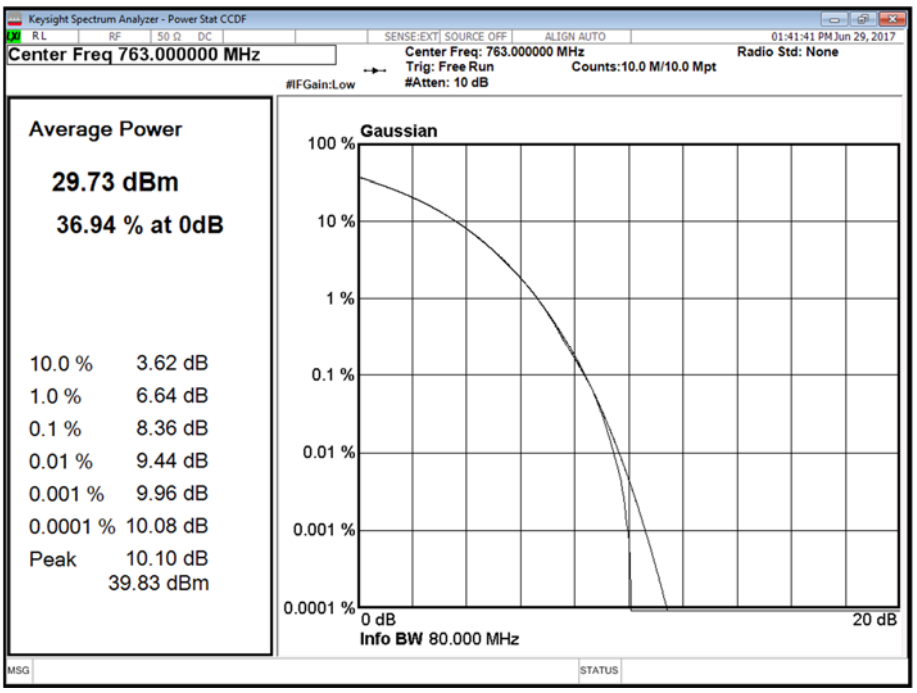
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



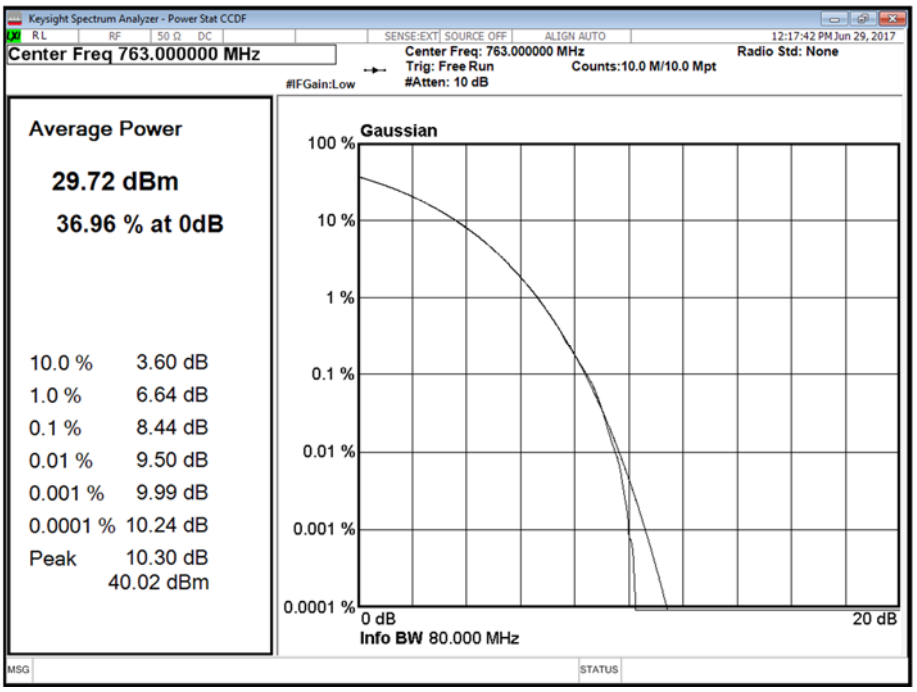
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



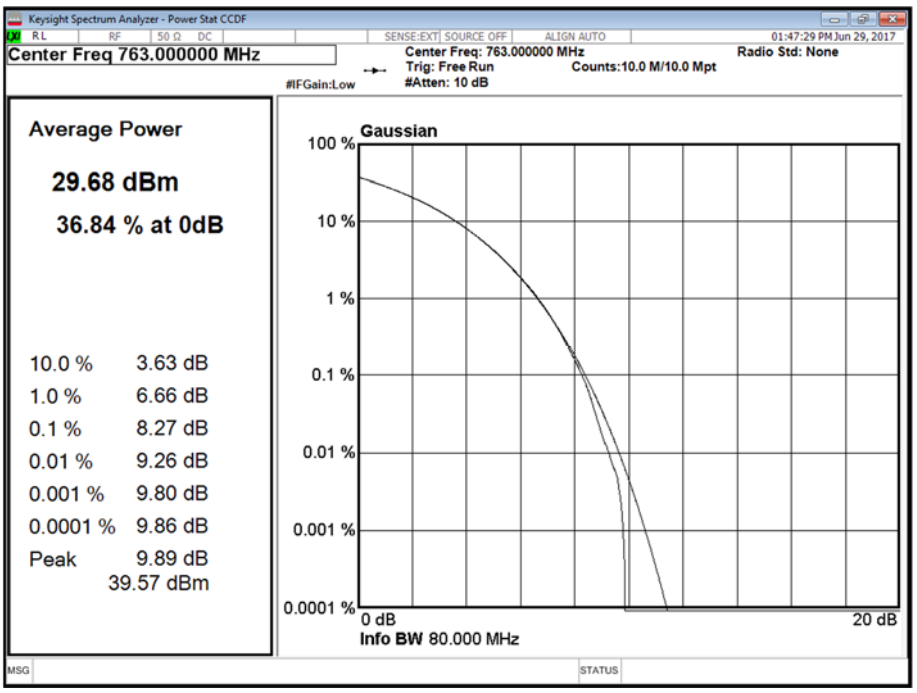
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



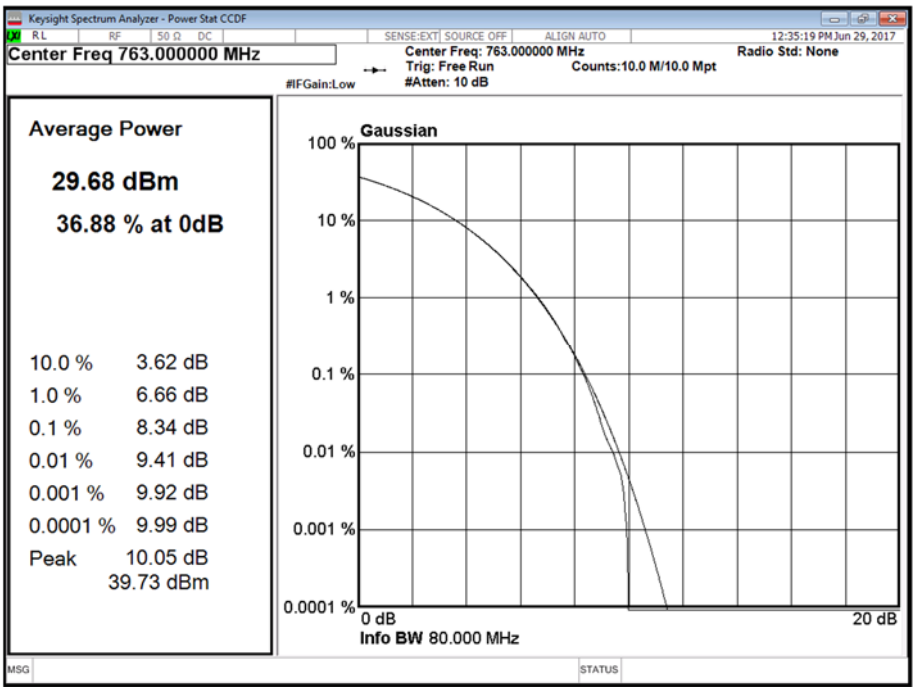
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



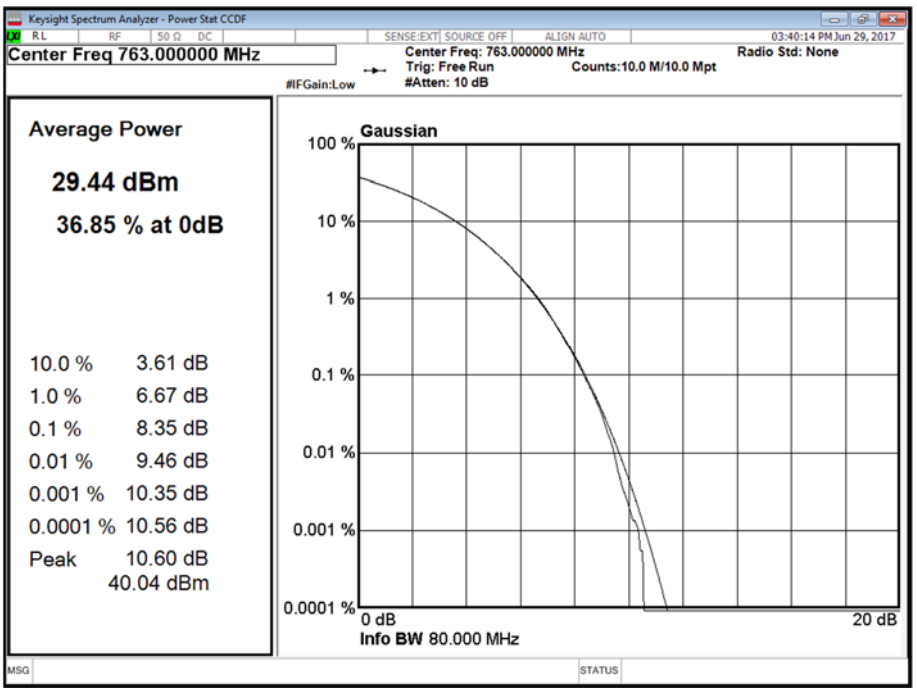
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



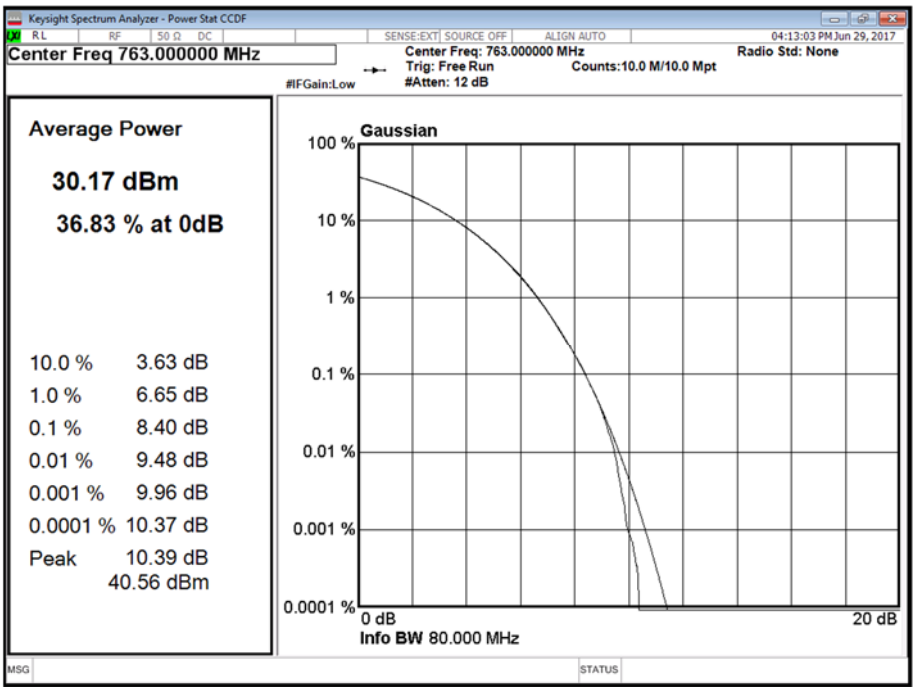
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



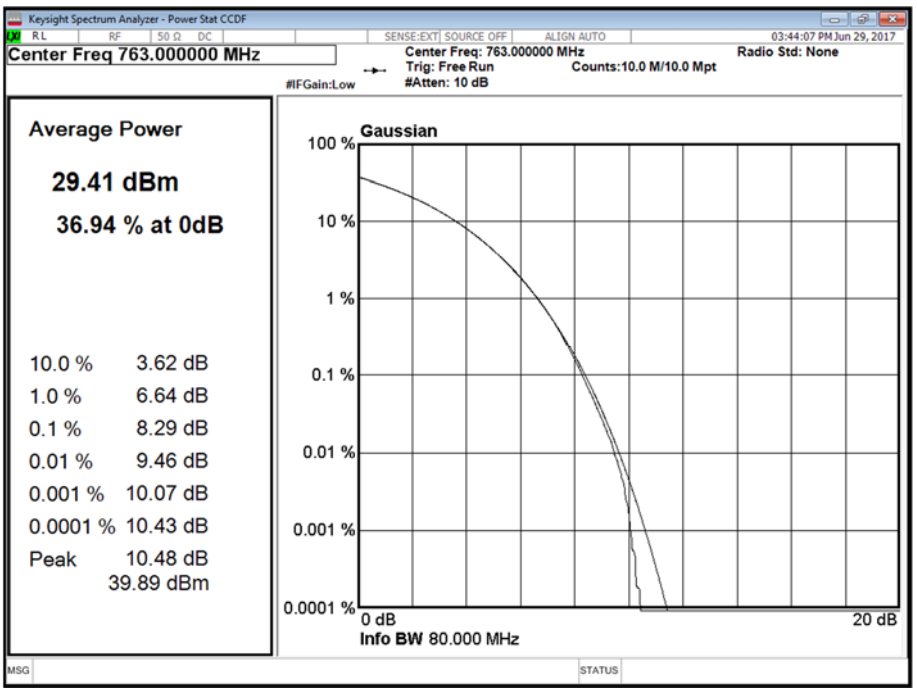
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



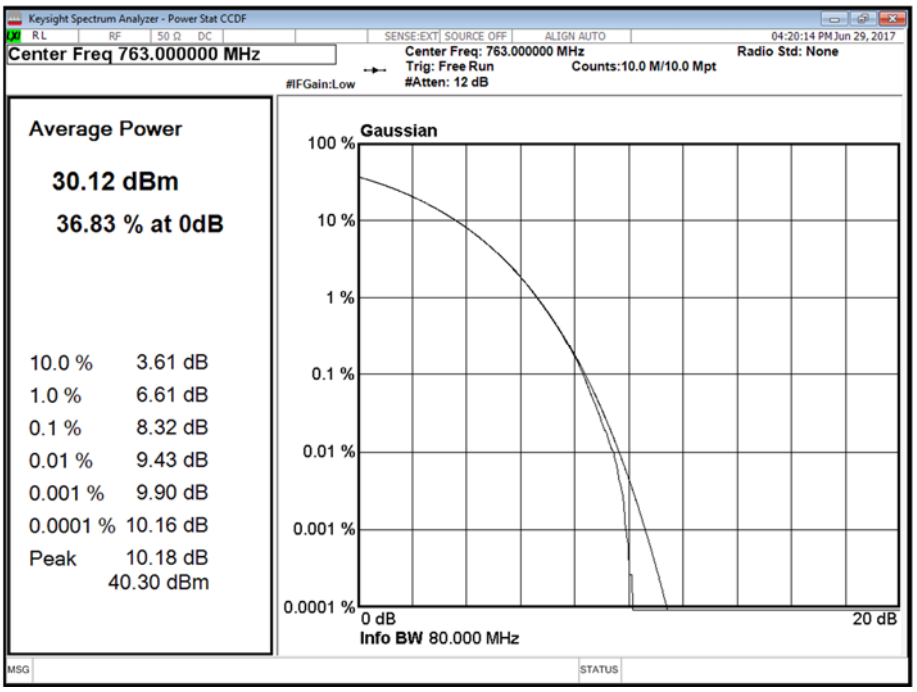
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



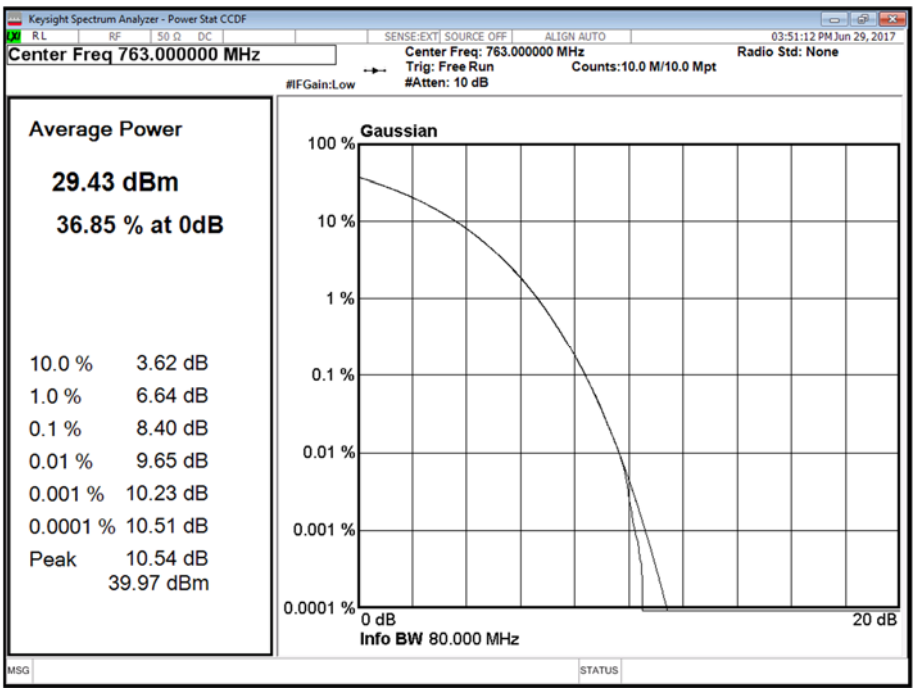
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



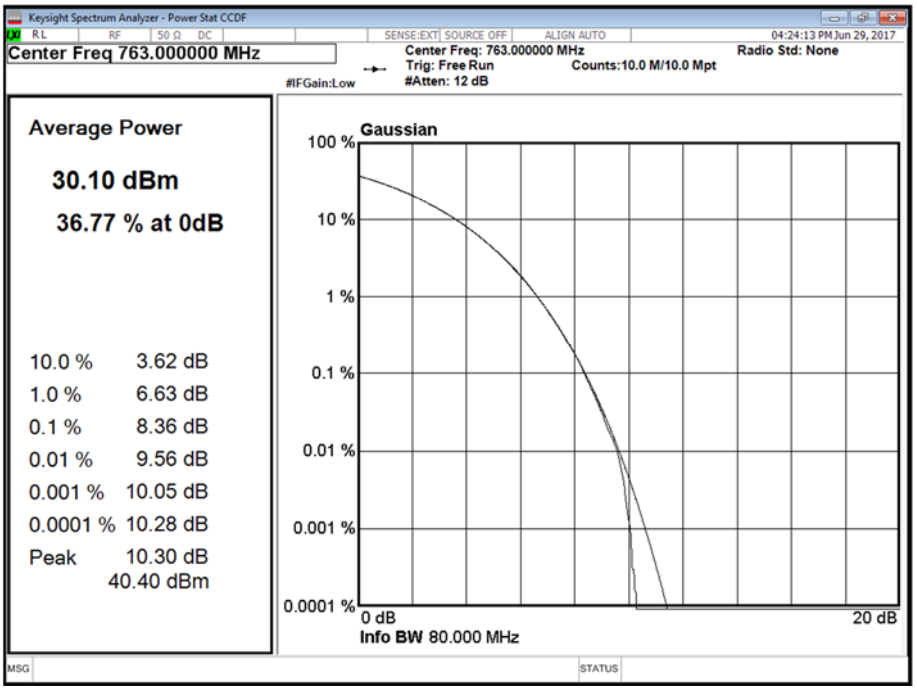
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M

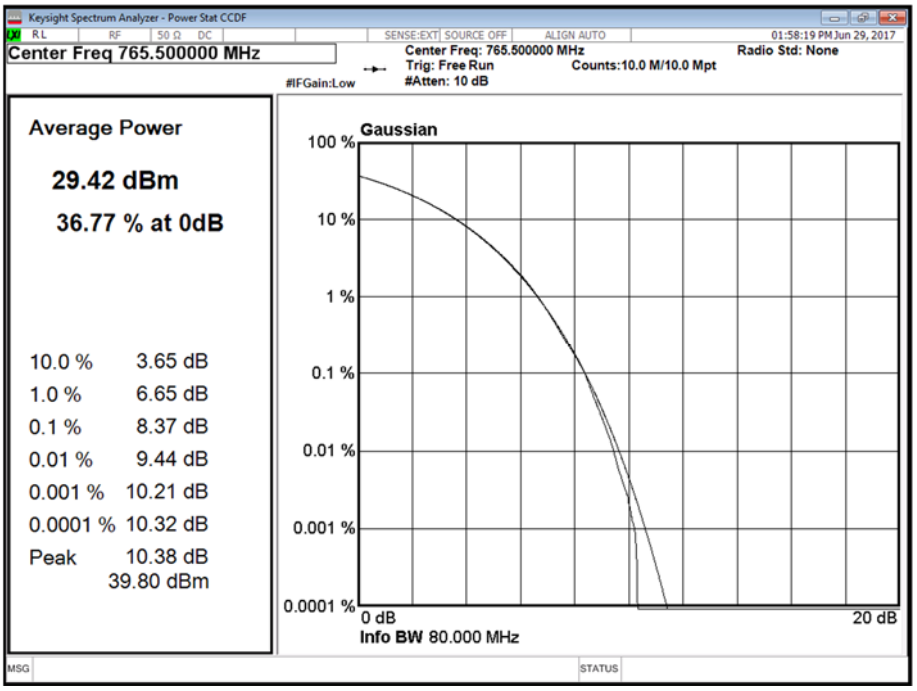


Configuration 1

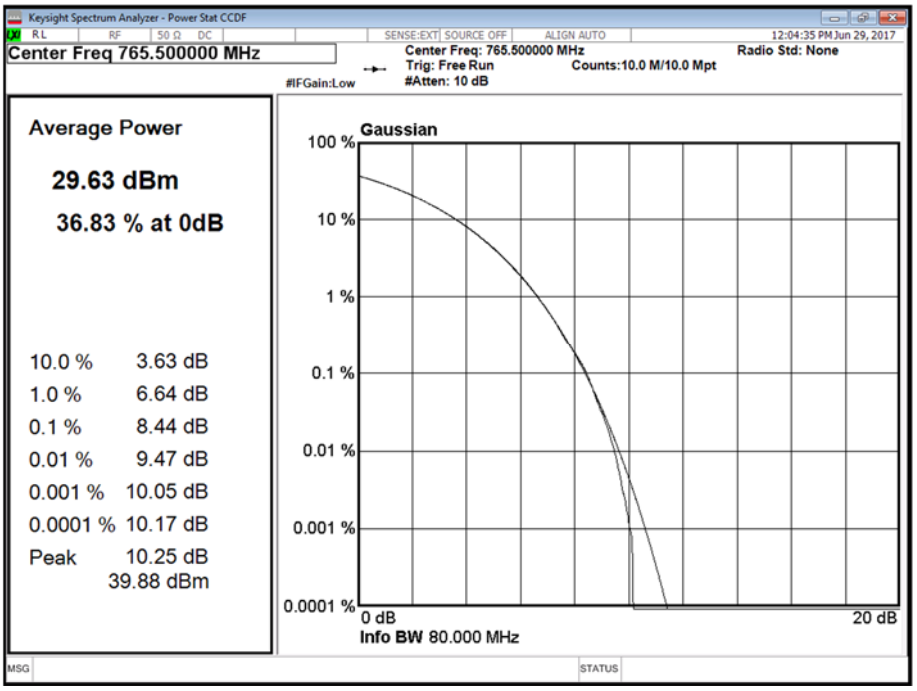
Maximum Output Power 30 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz	8.37	29.49	23.53
B	QPSK	5.0 MHz	8.44	29.54	23.65
Total			-	32.53	26.60
A	16QAM	5.0 MHz	8.33	29.57	23.79
B	16QAM	5.0 MHz	8.39	29.53	23.67
Total			-	32.56	26.74
A	64QAM	5.0 MHz	8.28	29.37	23.52
B	64QAM	5.0 MHz	8.35	29.53	23.60
Total			-	32.46	26.57

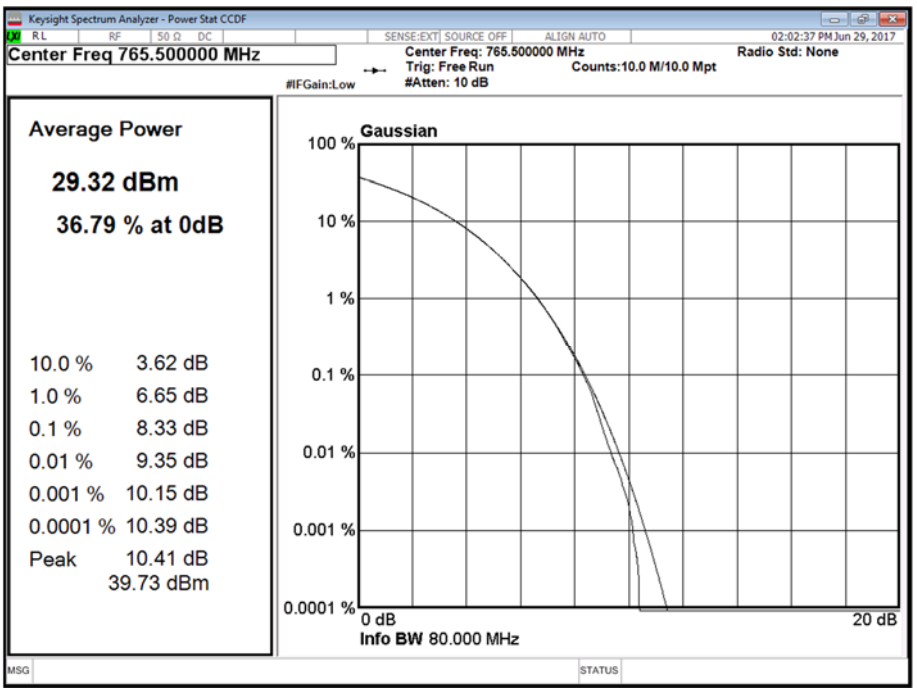
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



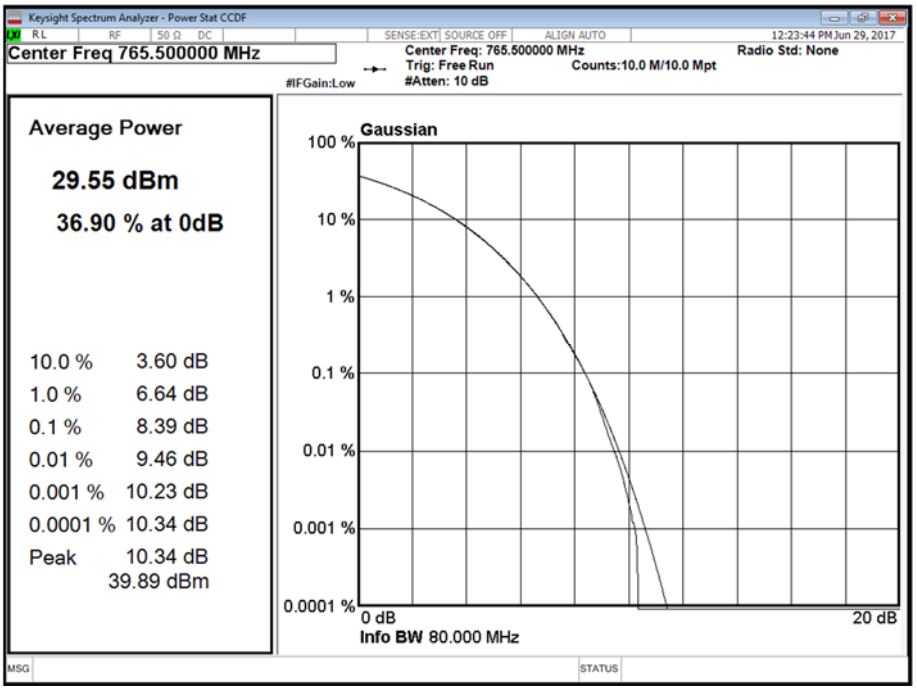
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



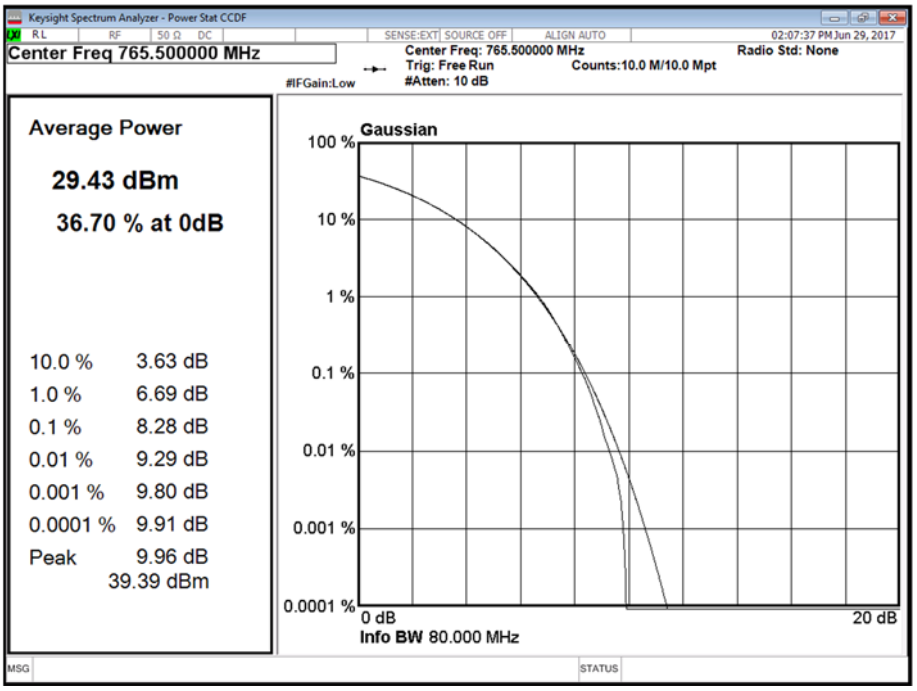
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



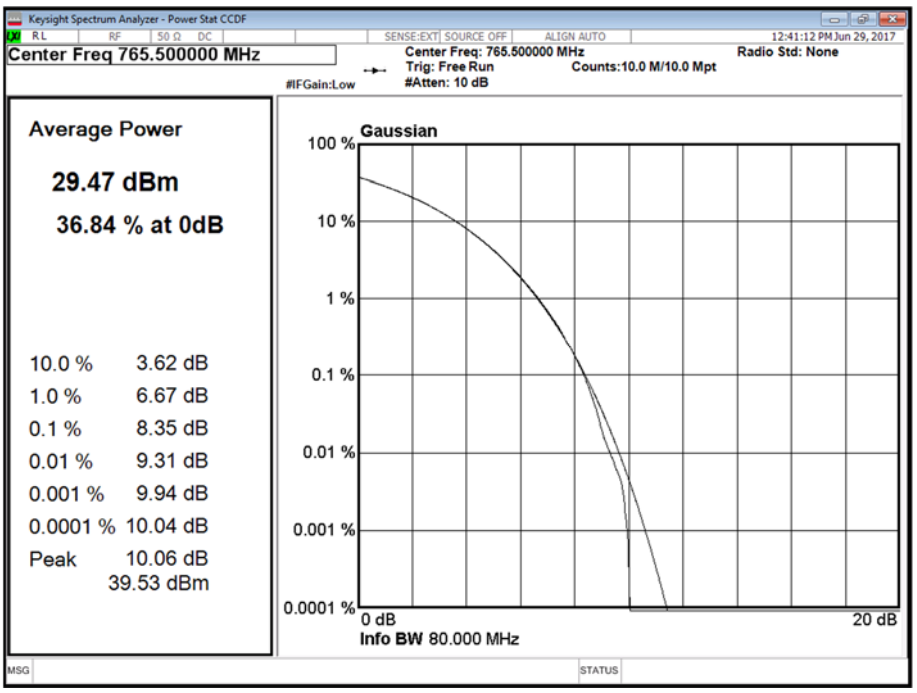
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



Limit	
Peak Power	≤65 W/MHz or ≤+48.13 dBm/MHz (FCC Part 90.542(3))* ≤30 W or ≤+44.77 dBm (FCC Part 90.542(6))
Peak to Average Ratio	Not specified
*Note: Limit is based on worst case Antenna height from Table 3.	

2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049

2.2.2 Date of Test and Modification State

29 June 2017 - Modification State 0

2.2.3 Test Equipment Used

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

2.2.4 Environmental Conditions

Ambient Temperature 22.5°C
Relative Humidity 55.2%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 4.2.

The Spectrum Analyser RBW was configured to be at least 1% of the channel bandwidth of the carrier to be measured. For 26 dB Bandwidth and 99% Occupied Bandwidth, in accordance with KDB 971168 D01, a peak detector and a trace setting of Max Hold were used with the Spectrum Analyser measurement function.

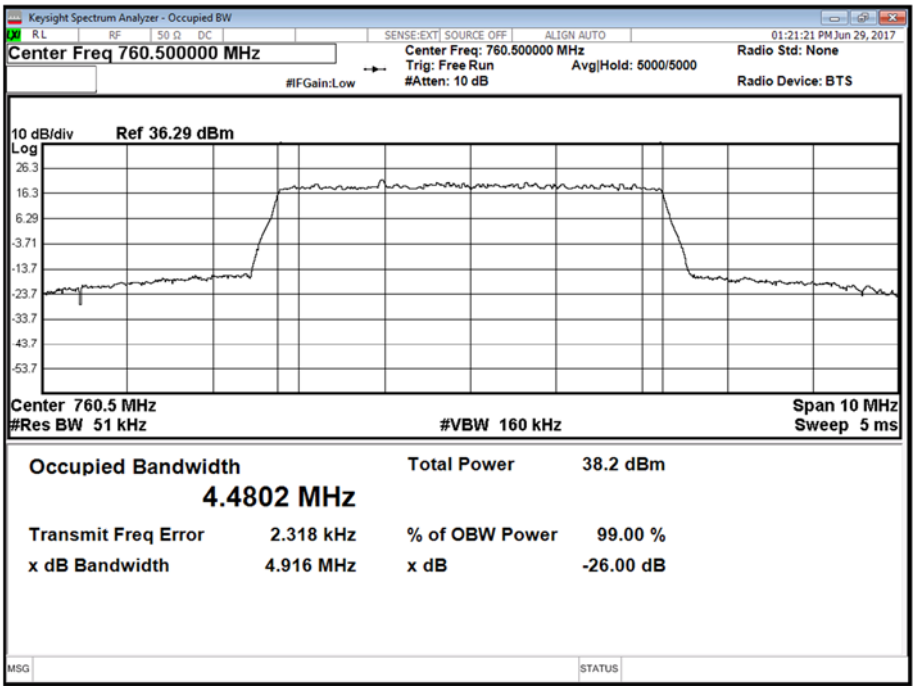
2.2.6 Test Results

Configuration 1

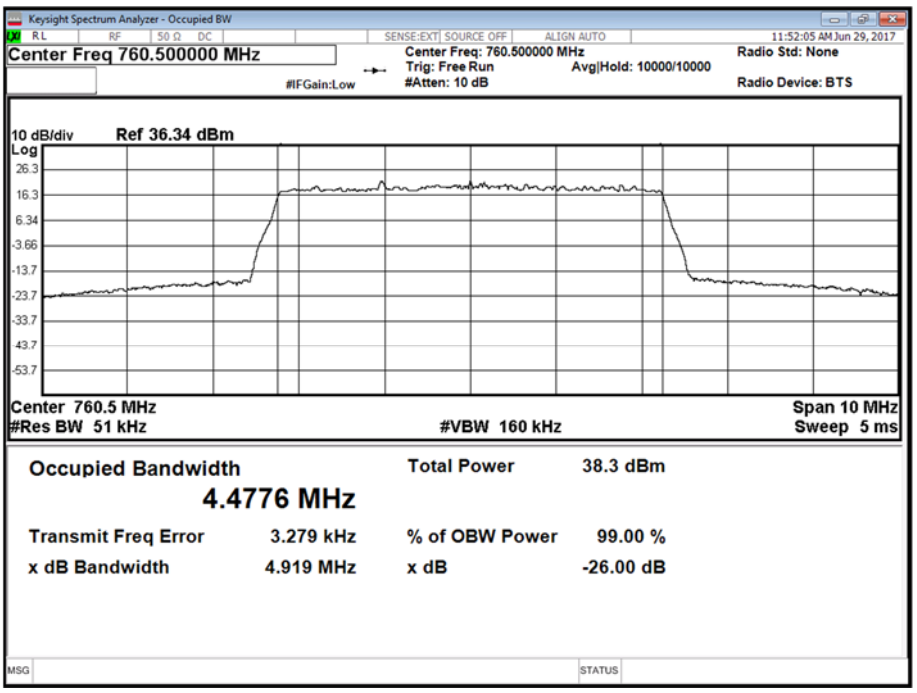
Maximum Output Power 30 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Result (kHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	5.0 MHz	4,480.22	4,916.32	4,481.69	4,920.42	4,480.11	4,922.22
B	QPSK	5.0 MHz	4,477.63	4,919.47	4,480.59	4,916.26	4,480.38	4,901.27
A	16QAM	5.0 MHz	4,481.33	4,908.75	4,482.75	4,910.18	4,481.15	4,888.99
B	16QAM	5.0 MHz	4,480.19	4,899.29	4,482.31	4,909.08	4,482.19	4,912.07
A	64QAM	5.0 MHz	4,501.23	4,953.54	4,502.48	4,946.50	4,498.96	4,953.12
B	64QAM	5.0 MHz	4,499.72	4,954.05	4,502.11	4,952.14	4,502.12	4,951.20
A	QPSK	10.0 MHz	8,969.52	9,832.44	8,971.30	9,819.62	8,970.33	9,820.38
B	QPSK	10.0 MHz	8,963.13	9,790.92	8,968.23	9,847.66	8,968.63	9,832.79
A	16QAM	10.0 MHz	8,970.85	9,801.32	8,974.19	9,799.30	8,972.78	9,802.65
B	16QAM	10.0 MHz	8,973.61	9,783.23	8,969.90	9,805.80	8,979.44	9,794.66
A	64QAM	10.0 MHz	8,977.30	9,831.94	8,981.94	9,814.93	8,980.65	9,823.14
B	64QAM	10.0 MHz	8,980.83	9,842.72	8,978.73	9,847.83	8,979.64	9,836.73

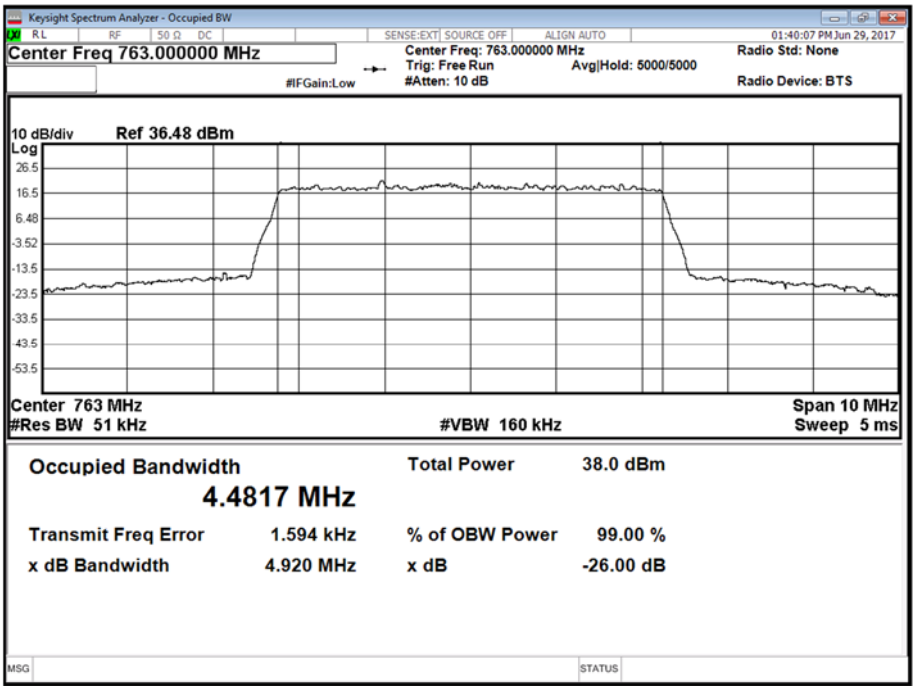
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



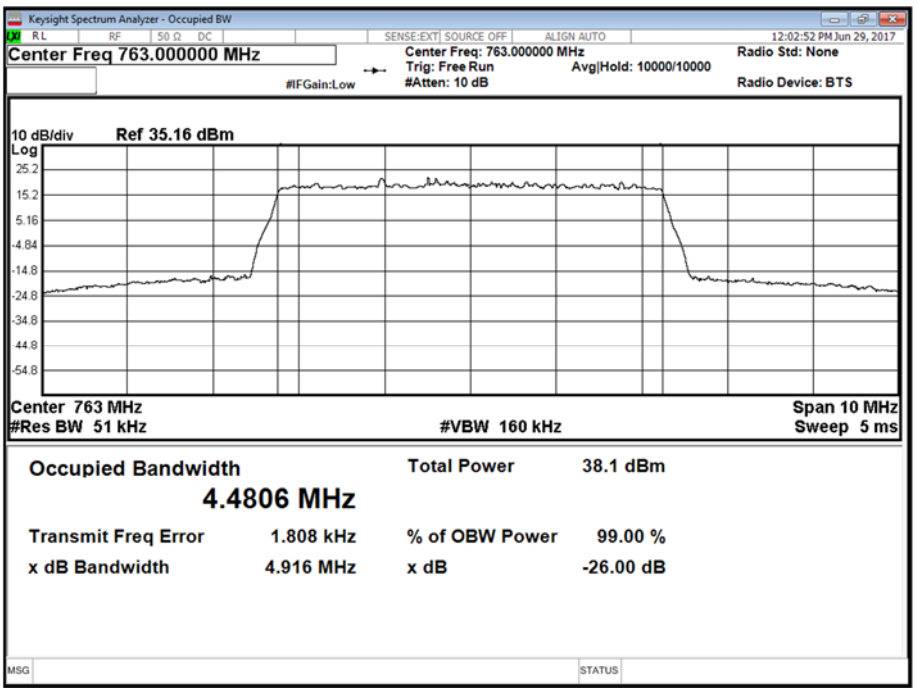
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



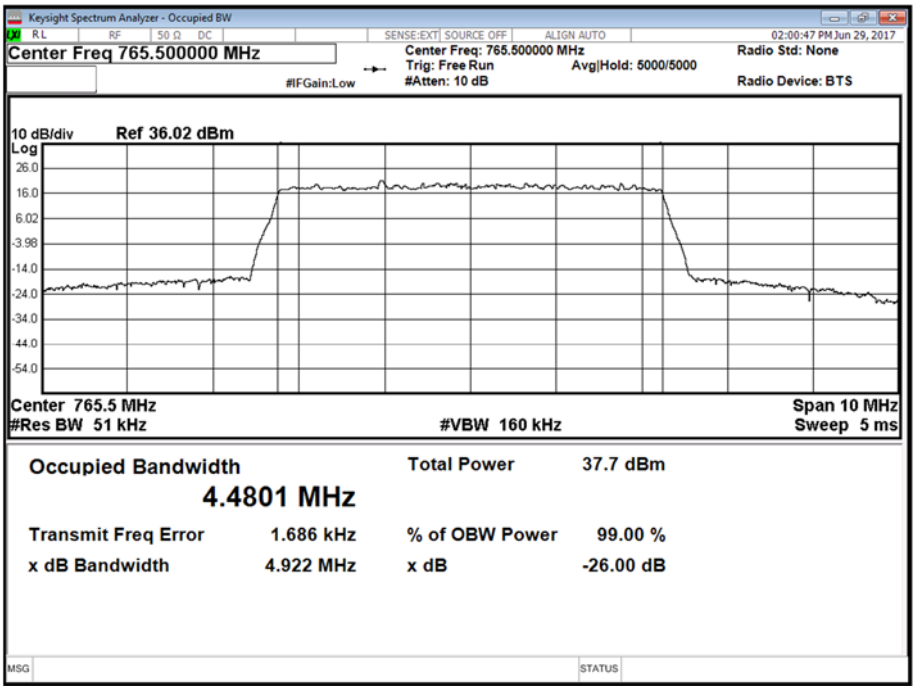
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



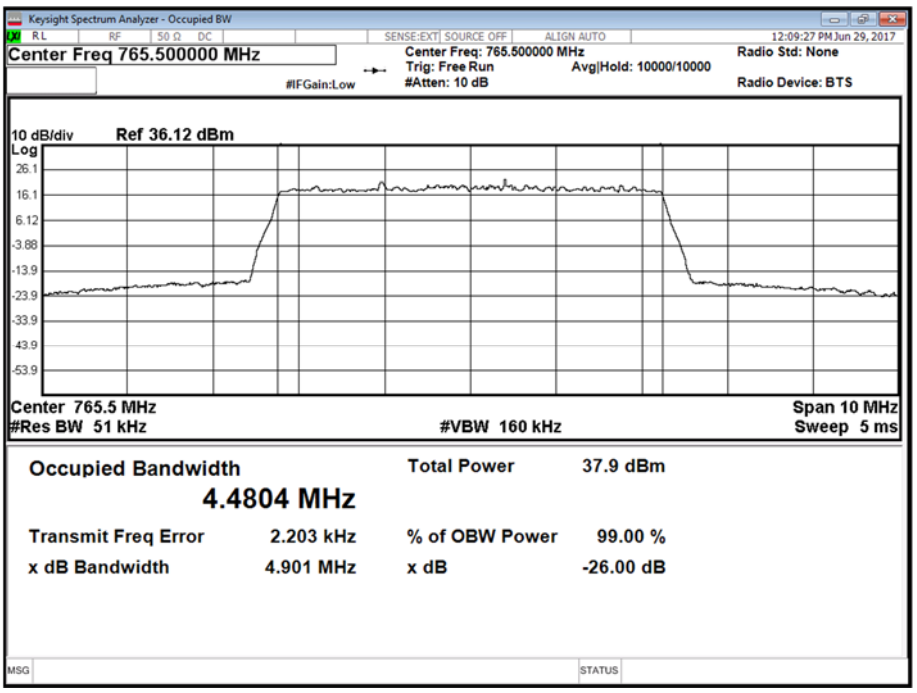
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



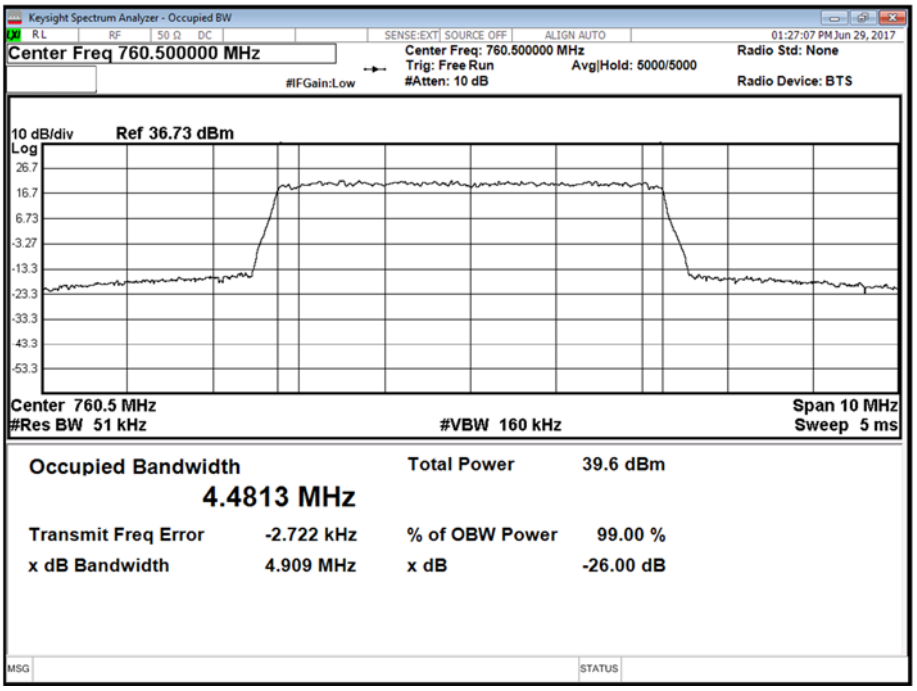
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



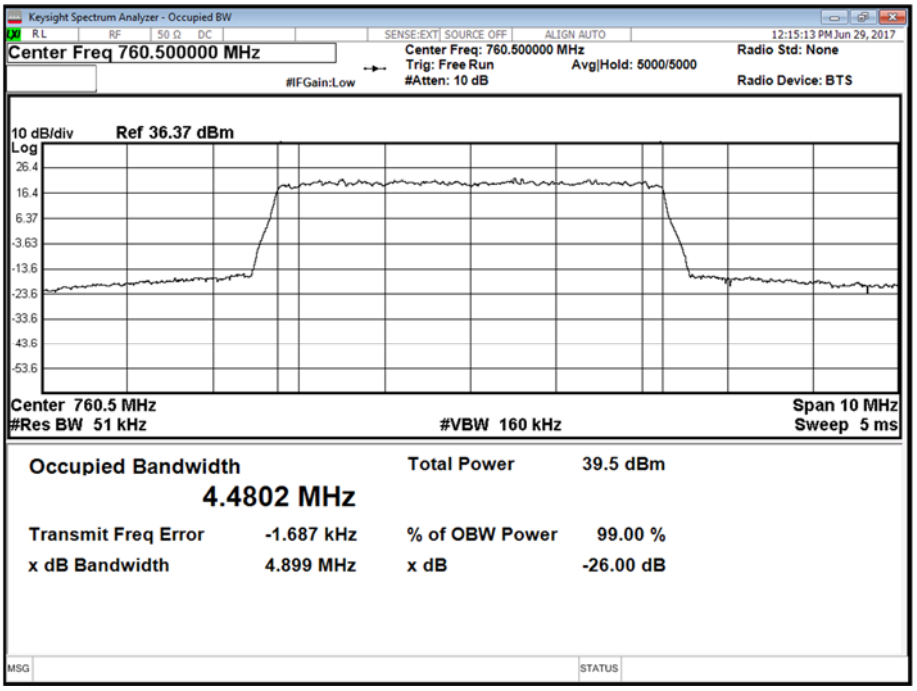
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



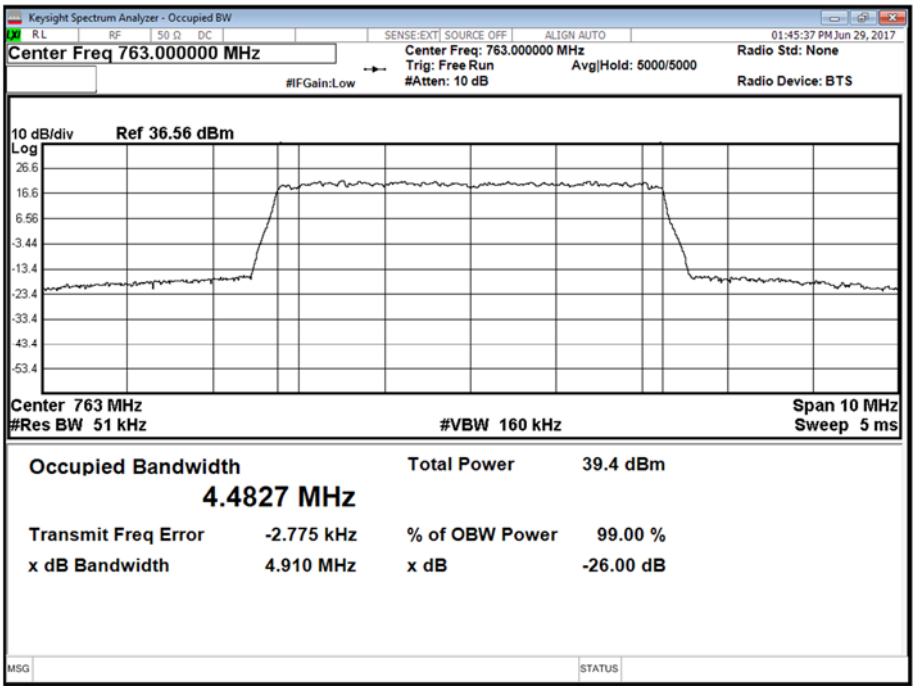
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



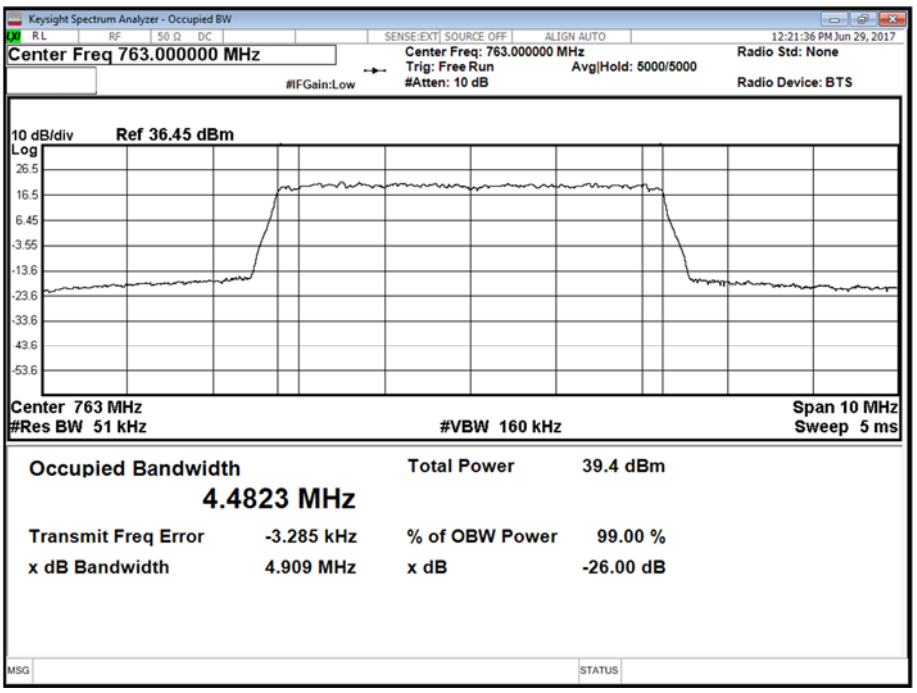
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



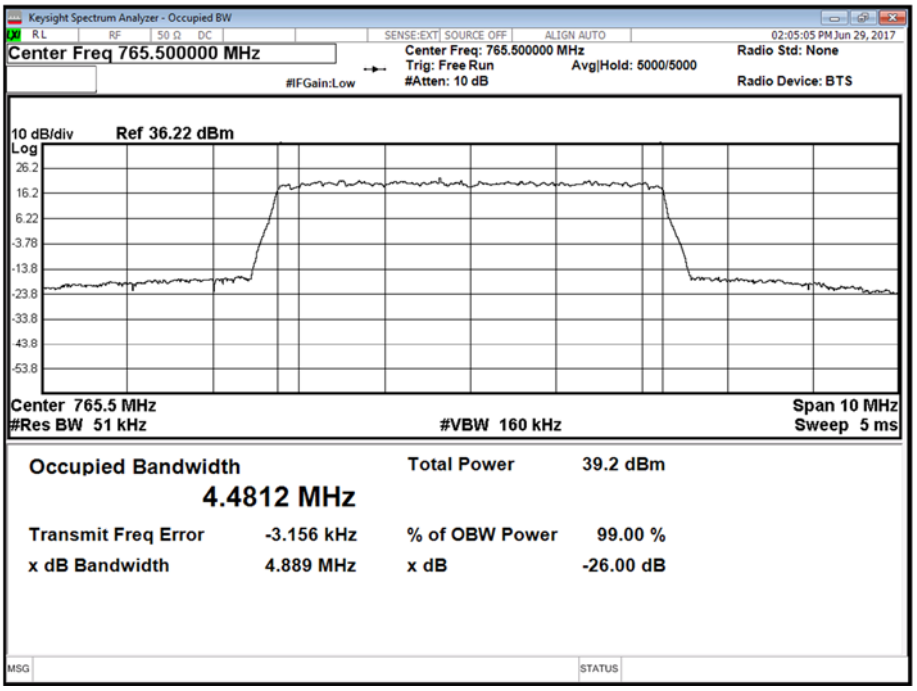
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



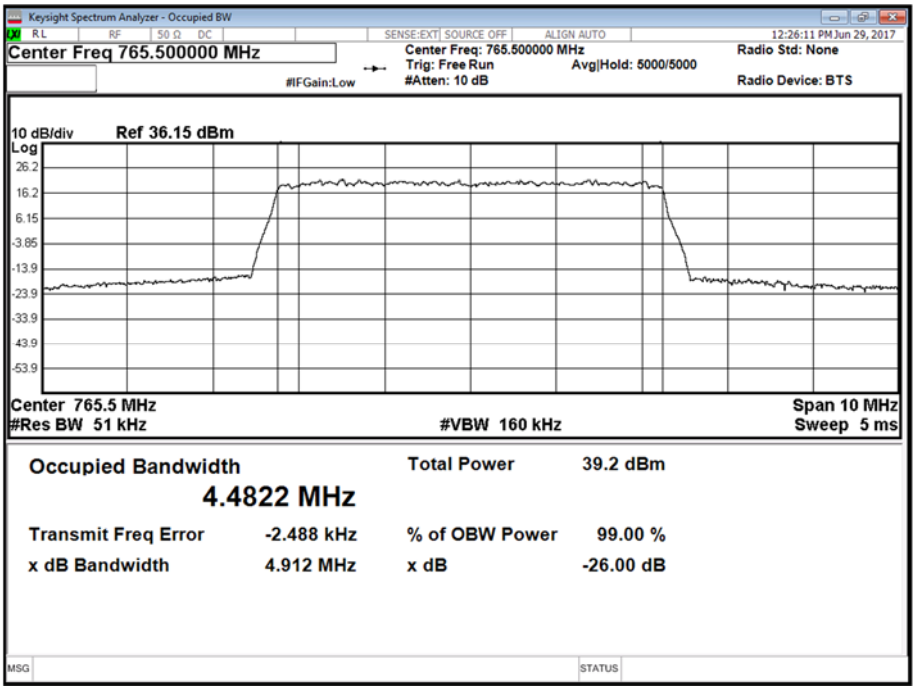
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



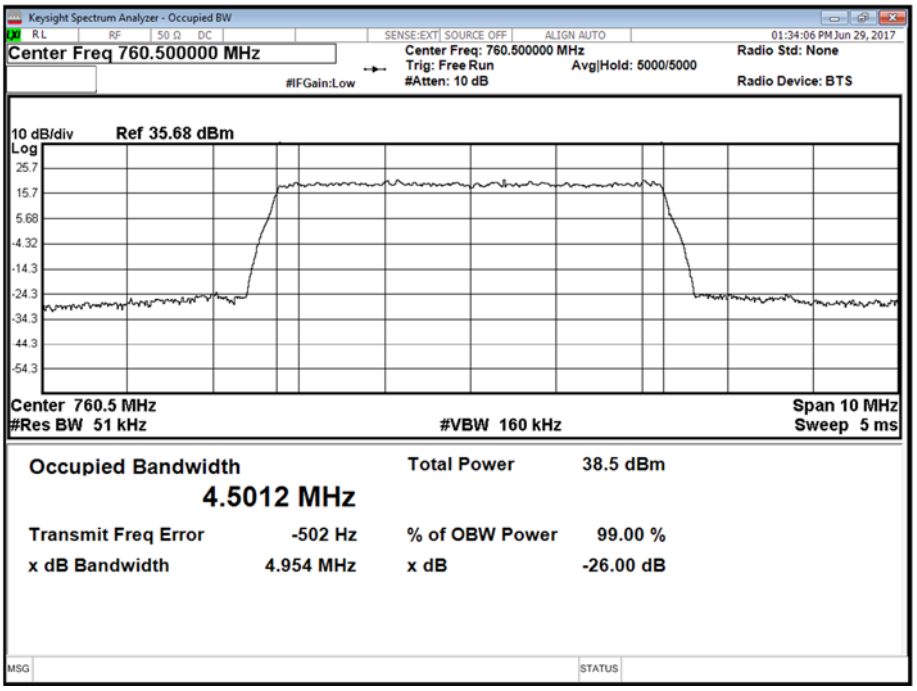
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



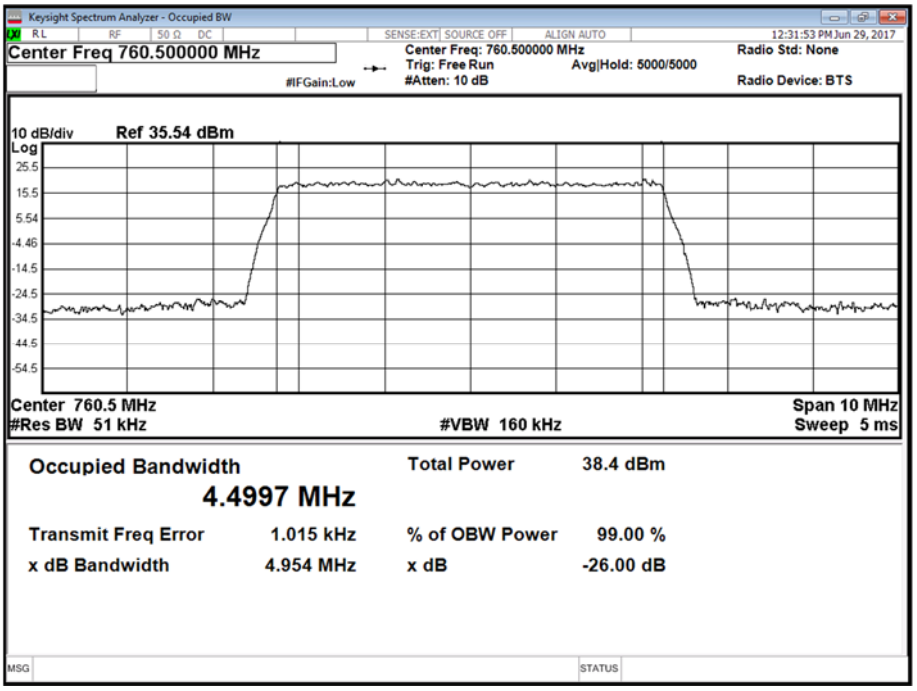
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



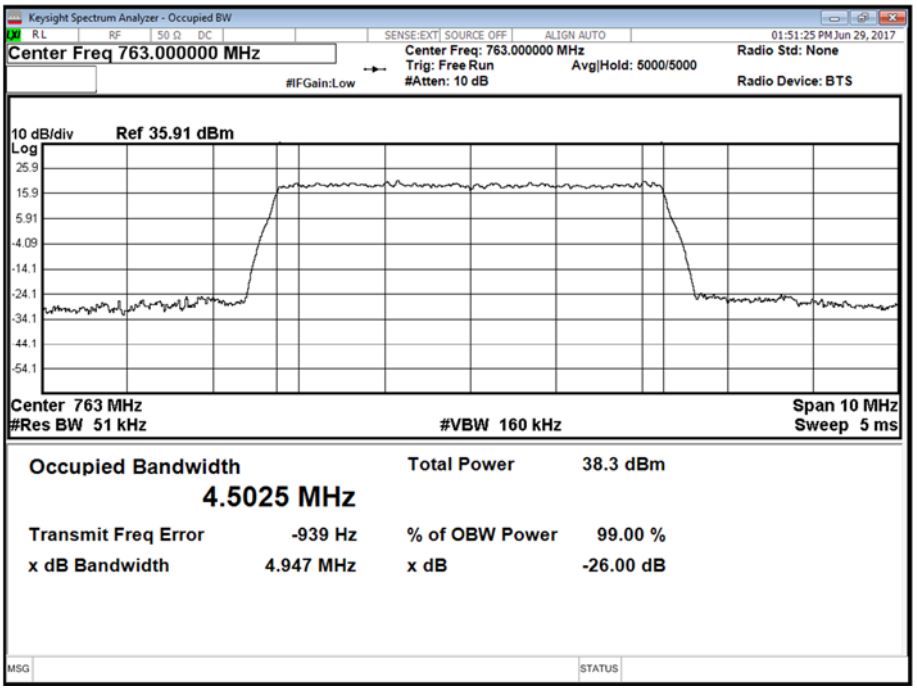
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



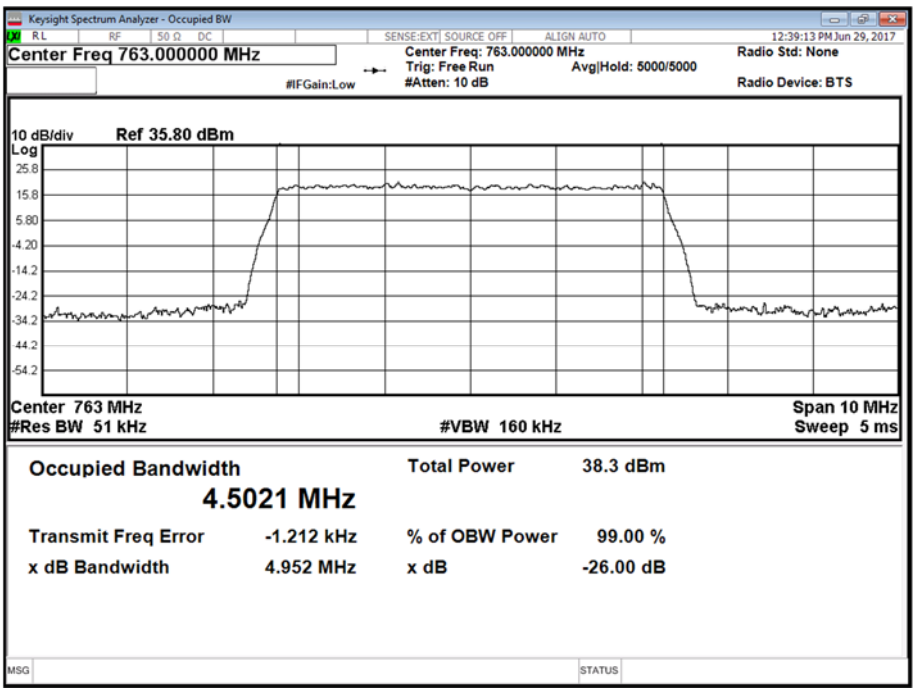
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



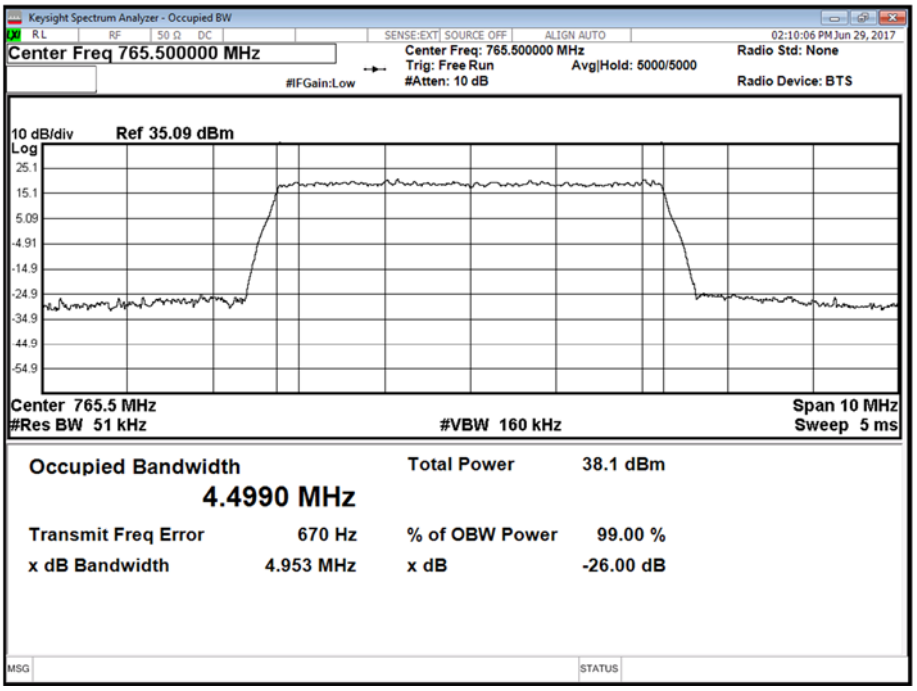
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



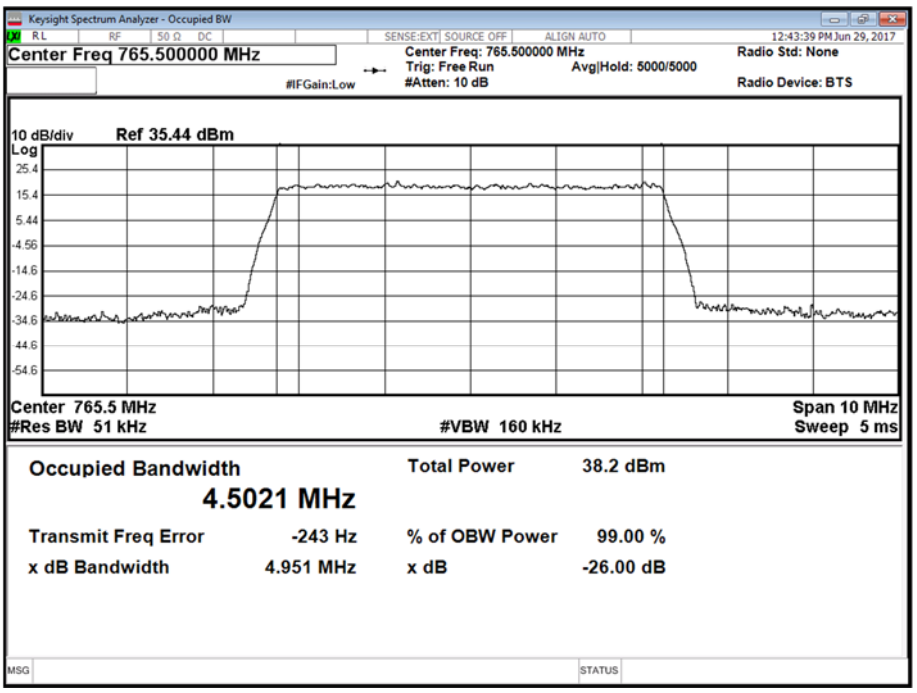
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



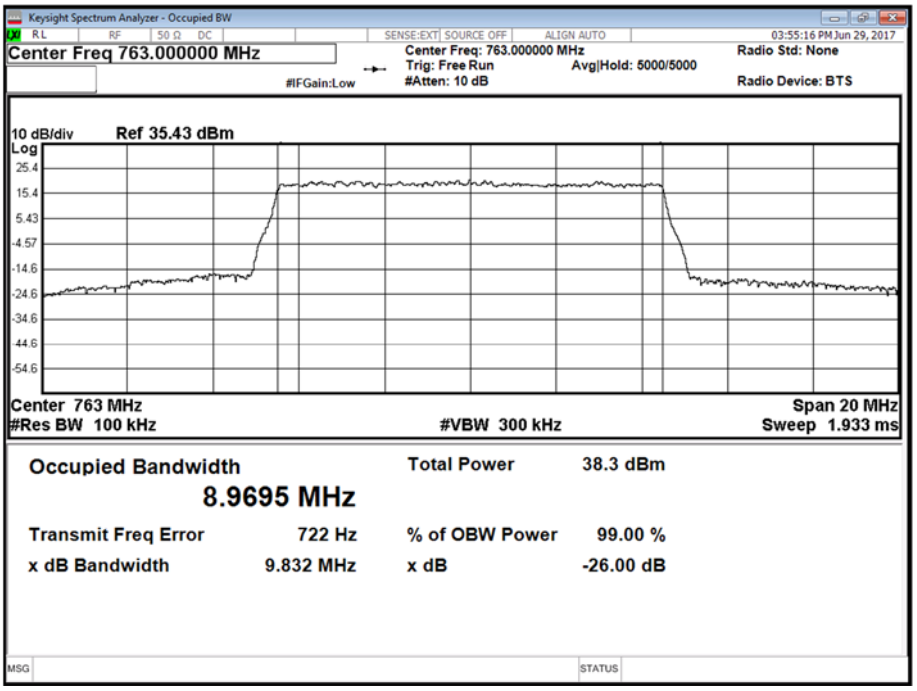
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



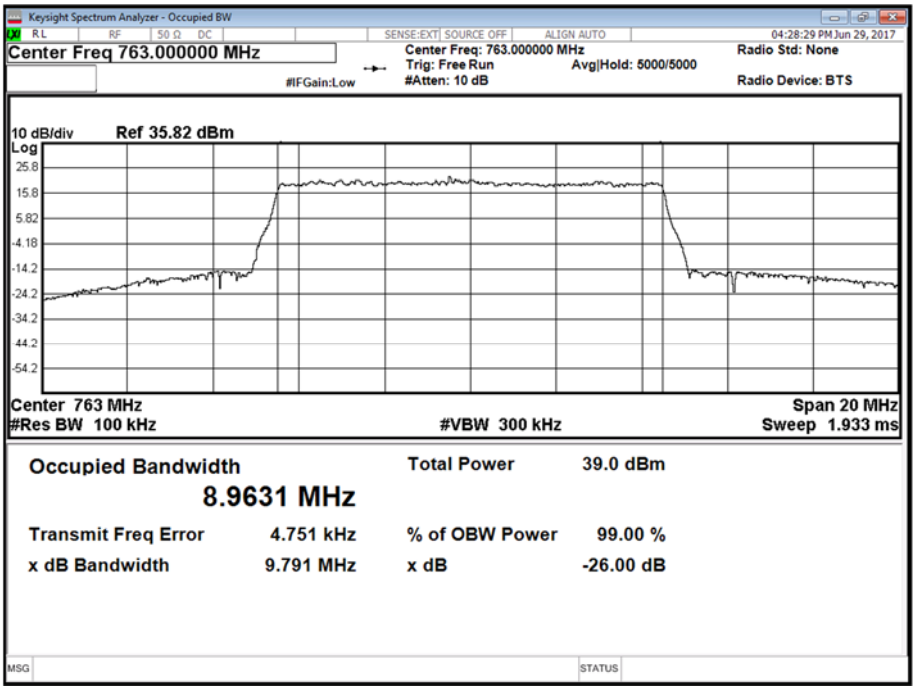
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



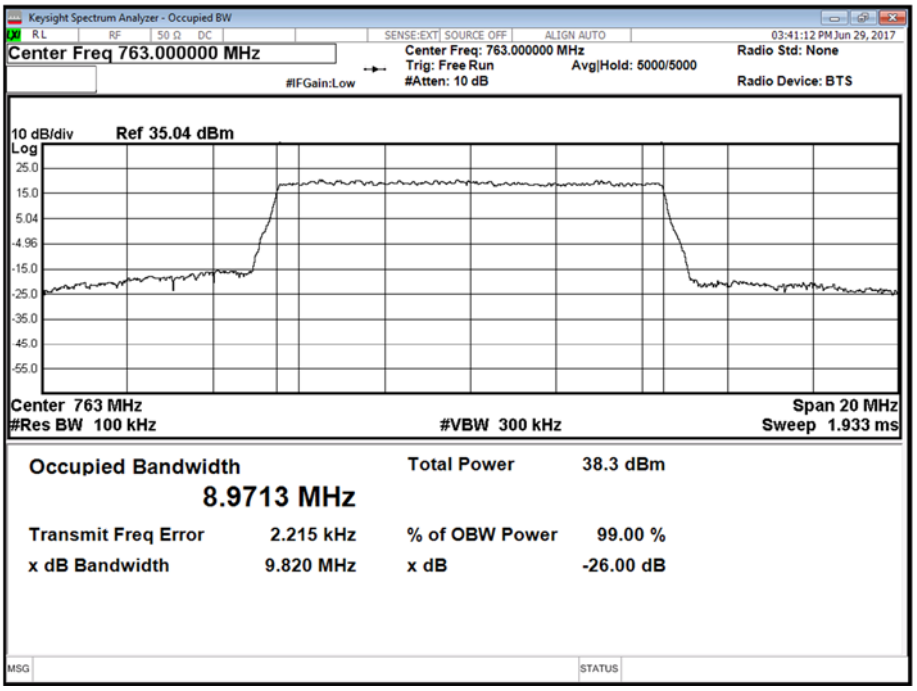
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



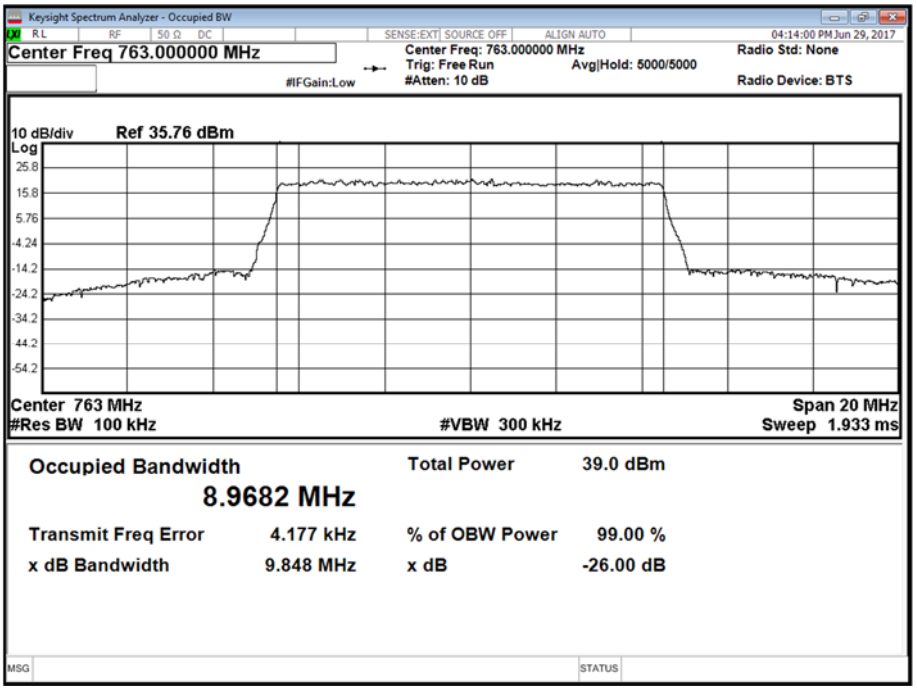
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



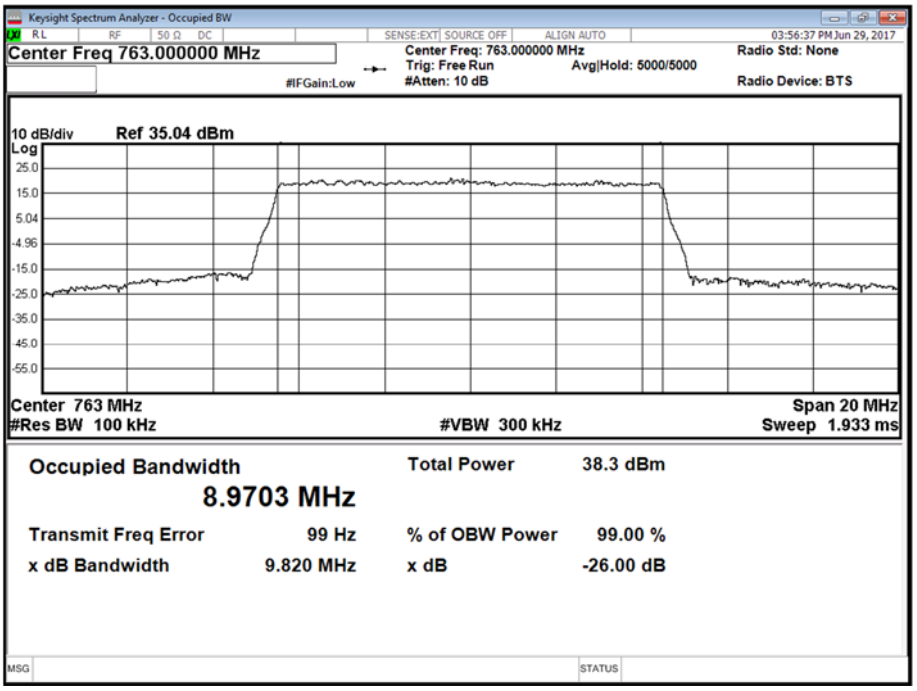
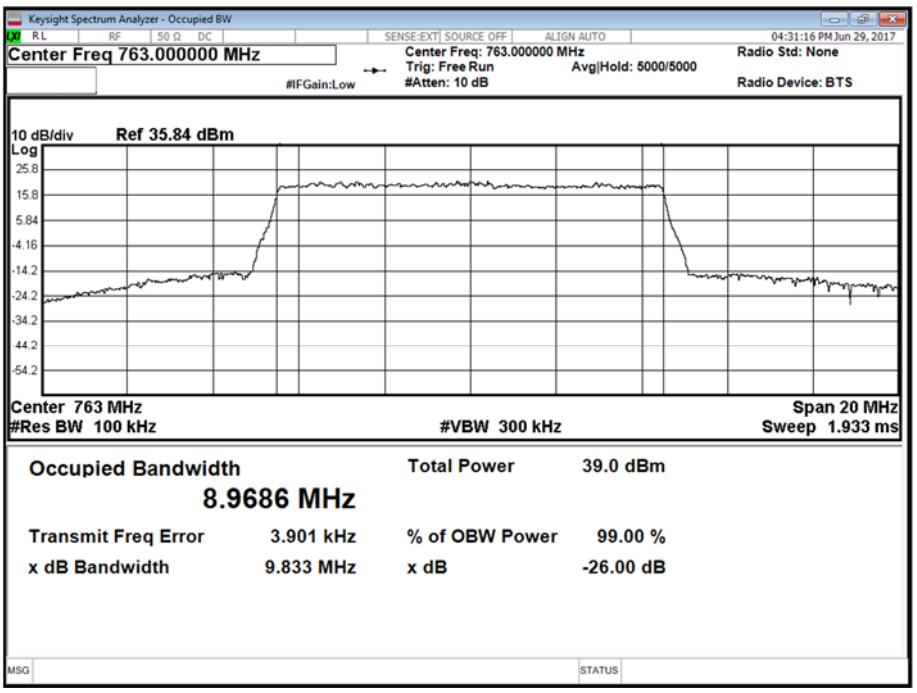
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T