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Report On

FCC Testing of the
Ericsson LTE KRC 118 56/1 RUL 01 B13 (700 MHz) Radio Equipment
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 27

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC11856-1

PREPARED BY	APPROVED BY	DATED
Maggie Whiting Key Account Manager	Steve Scarfe Authorised Signatory	11 August 2017

Document 75939460 Report 01 Issue 2 August 2017

Product Service

CONTENTS

Product Service

SECTION 1

REPORT INFORMATION

1.1 REPORT DETAILS

Manufacturer	Ericsson AB
Address	Borgarfjordsgatan 18 Kista SE-16480 Stockholm Sweden
Product Name	RUL 01 B13
Product Number	KRC 118 56/1
Serial Number(s)	CC43413367
Software Version	CXP9013268/6_R49AL
Hardware Version	R1D
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2016 FCC CFR 47 Part 27: 2016
Start of Test	23 June 2017
Finish of Test	28 June 2017
Name of Engineer(s)	Simon Bennett Jack Tuckwell
Related Document(s)	KDB 971168 D01 v02r02 ANSI C63.26: 2015

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. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

J Tuckwell S Bennett

This report has been up issued to Issue 2 and should be read in place of Issue 1. This report has been up issued to correct the Engineering Statement, to include x 4 on LTE MIMO mode Multi carrier, Section 1.3, to correct the FCC ID in Section 1.4 and update the R-state in the Module List.

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 27 is shown below.

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 27		
2.1	2.1046	27.50(b)	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
	-	27.50	Equivalent Isotropically Radiated Power (EIRP)	N/A[1]
2.2	2.1049	-	Occupied Bandwidth	Pass
2.3	2.1051	27.53 (c)	Band Edge	Pass
2.4	2.1051	27.53 (c)	Transmitter Spurious Emissions	Pass
2.5	2.1053	27.53 (c)	Radiated Spurious Emissions	Pass
2.6	2.1055	27.54	Frequency Stability	Pass
-	-	-	Receiver Spurious Emissions	N/A

N/A – Not Applicable
N/A[1]– Not Applicable, due to no integrated antenna

1.3 CONFIGURATION DESCRIPTION

Configuration Code	Carrier(s)	Configuration Description
1	1C	LTE Single Carrier
2	2C	LTE Multi Carrier x2

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, E-TM3.1a
MIMO mode multi carrier (x2, x4): 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 the single transmit antenna port A. Antenna port B is used for receive only.

Pre-test results were used to establish the worst case configuration of the EUT in the below mentioned operating modes. The reported results represent testing in the worst case modes of operation. It was established that QPSK was the worst case for power measurements with the Occupied Bandwidth being largest in 256 QAM.

The RUL 01 B13 – KRC 118 56/1 supports LTE Band 13 – 746 – 756 MHz, (downlink) and 777 – 787 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 48 V DC Supply which provided power to the PDU, (Power Distribution Unit). The PDU supplied power to the EUT and other accessories.

Channel Configurations

LTE B13 (746 MHz – 756 MHz)

Configuration	RAT	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
				Bottom (BRFBW)	Middle (MRFBW)	Top (TRFBW)
1	LTE	1	5	748.5	751	753.5
1	LTE	1	10	-	751	-
2	LTE	2	5 + 5	-	748.5 + 753.5	-

1.4 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	RUL 01 B13
PART NUMBER	KRC 118 56/1
SERIAL NUMBER	CC43318597
HARDWARE VERSION	R1D
SOFTWARE VERSION	CXP9013268/6_R49AL
TRANSMITTER OPERATING RANGE	746-787 MHz
HIGHEST INTERNALLY GENERATED FREQUENCY	800 MHz
MODULATIONS	OFDMA in FDD
OUTPUT POWER (RMS) (W or dBm)	1 x 60W
FCC ID	TA8AKRC11856-1
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Base Station Radio

Signature	Thomas Wahlman
Date	04 July 2017

No responsibility will be accepted by TÜV SÜD Product Service as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

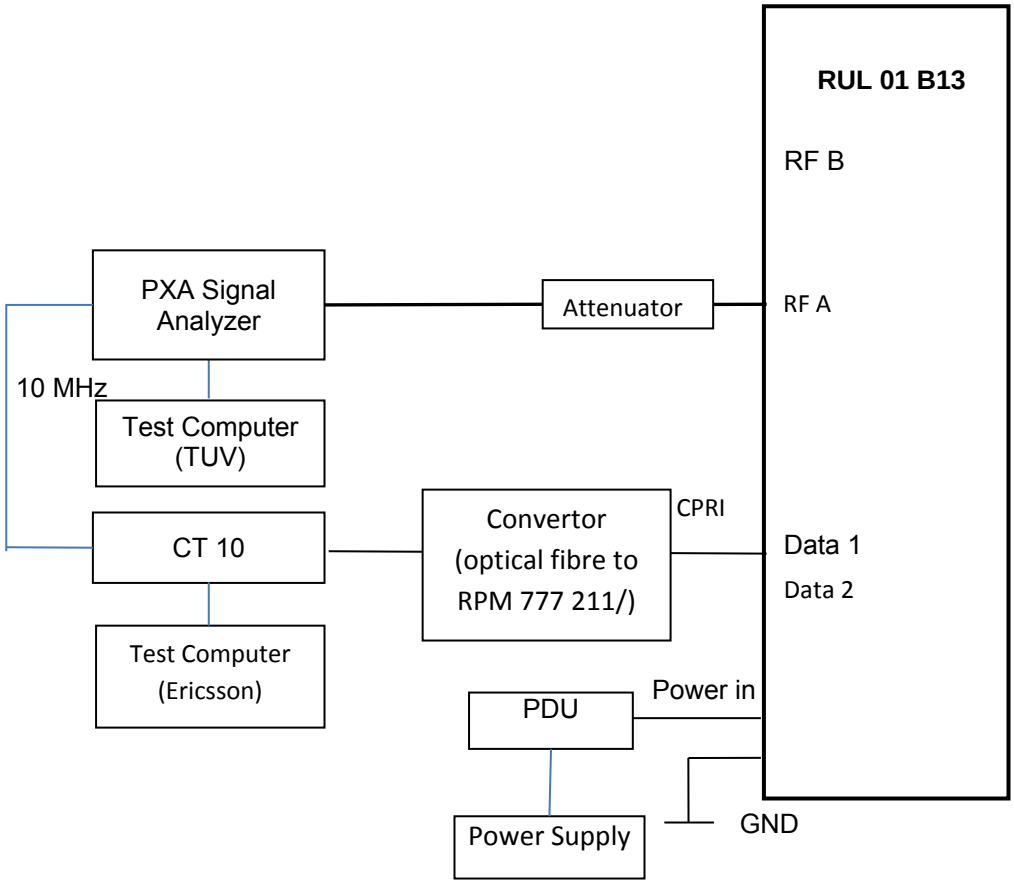
1.5.1 Technical Description

The Equipment Under Test (EUT) RUL 01 B13, KRC 118 56/1 is an Ericsson AB Radio Unit working in the public mobile service (Band) band which provides communication connections to FDD-LTE network. The RUL 01 B13, KRC 118 56/1 operates from a -48V 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.

Equipment Under Test

1.6 TEST 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 -48V DC supply.

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

Under our group UKAS Accreditation, TÜV SÜD Product Service conducted the following tests at TÜV SÜD Product in Fareham, UK.

Test Name	Name of Engineer(s)
Maximum Peak Output Power and Peak to Average Ratio - Conducted	Simon Bennett
Occupied Bandwidth	Simon Bennett
Band Edge	Simon Bennett
Transmitter Spurious Emissions	Simon Bennett
Radiated Spurious Emissions	Jack Tuckwell
Frequency Stability	Simon Bennett

1.8 DEVIATION FROM THE STANDARD

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

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.

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 27, Clause 27.50 (b)

2.1.2 Date of Test and Modification State

26 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	26°C
Relative Humidity	52.8%

2.1.5 Test Method

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

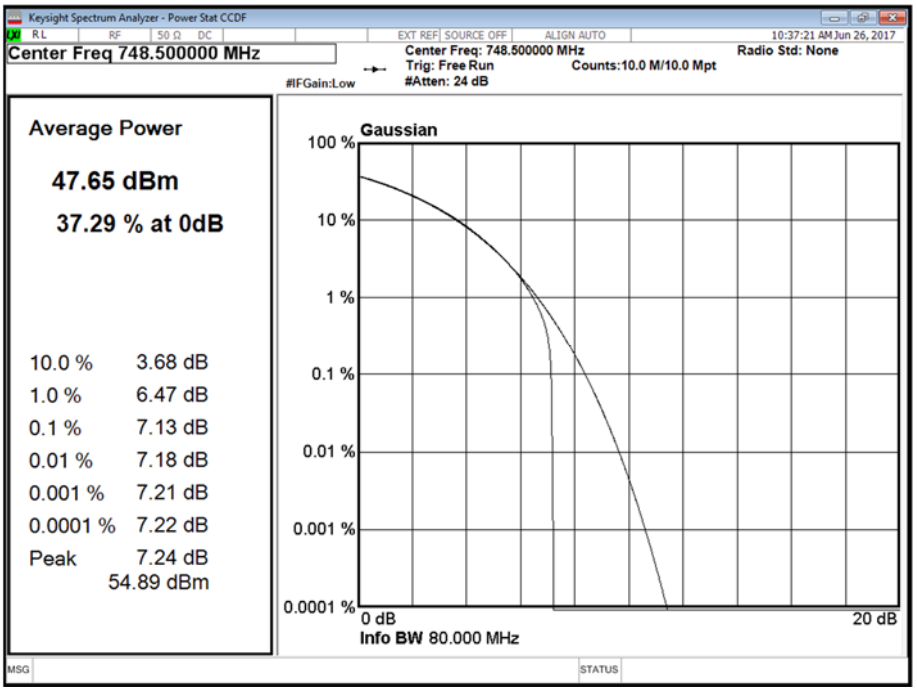
2.1.6 Test Results

Configuration 1

Maximum Output Power 47.8 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	7.13	47.64	41.66
A	QPSK	10.0 MHz	-	-	-

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



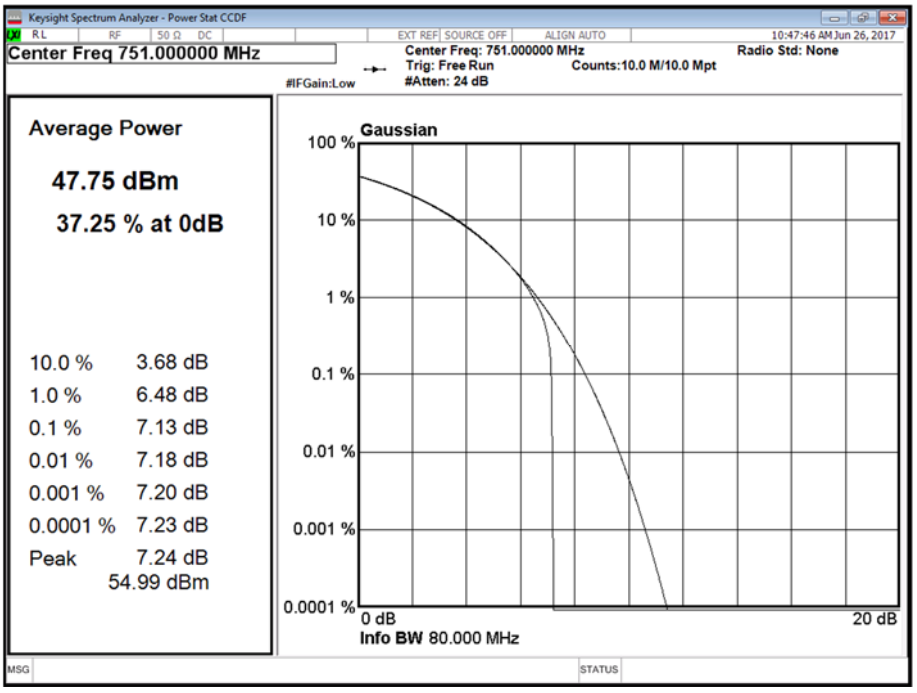
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B

Configuration 1

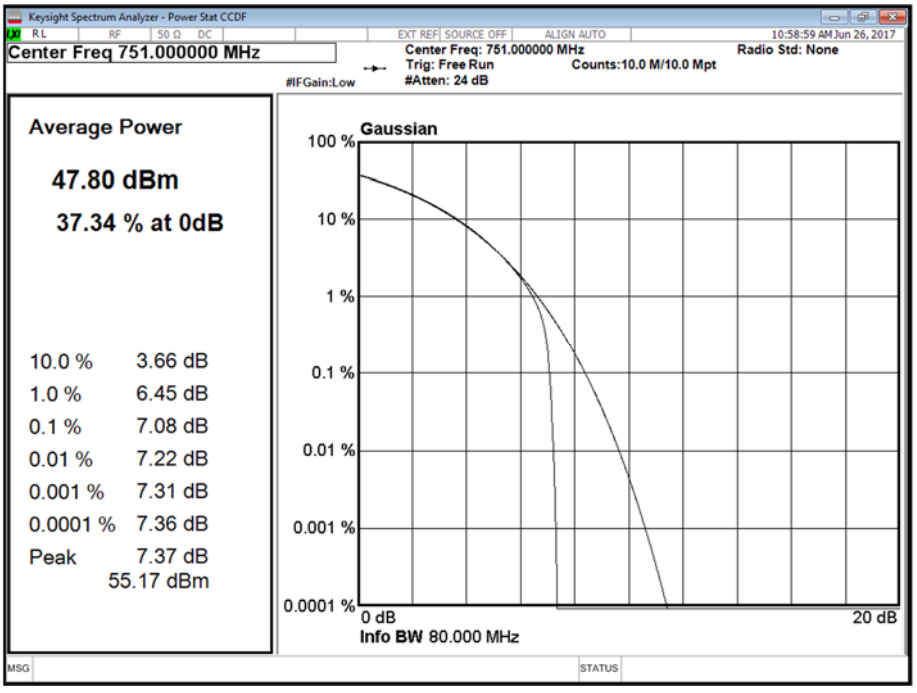
Maximum Output Power 47.8 dBm

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	7.13	47.72	41.73
A	QPSK	10.0 MHz	7.08	47.76	39.04

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



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

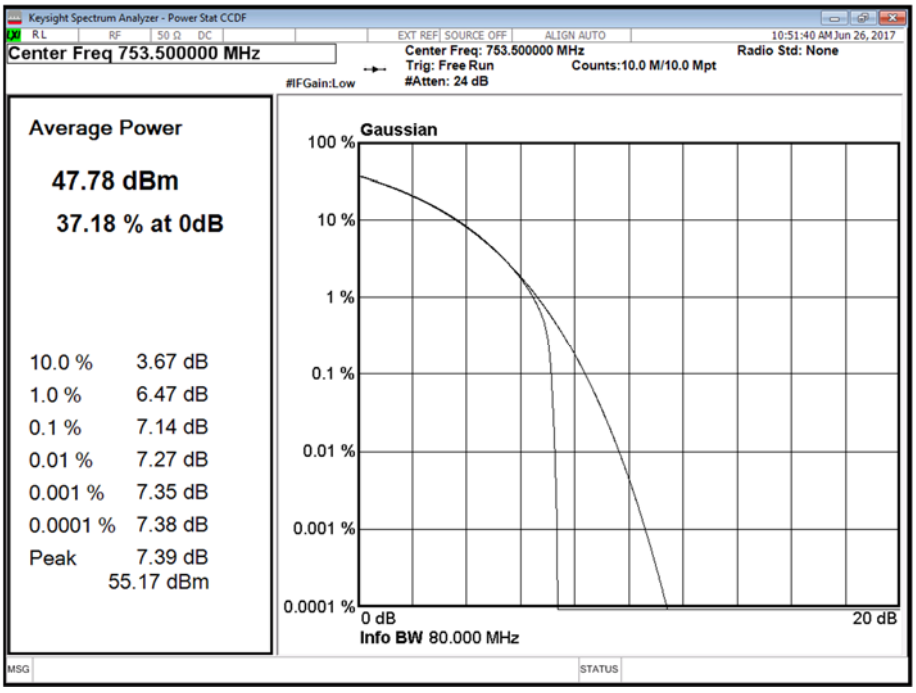


Configuration 1

Maximum Output Power 47.8 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	7.14	47.75	41.76
A	QPSK	10.0 MHz	-	-	-

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



Configuration 2

Maximum Output Power 47.8 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	-	47.79	39.10

Configuration 2

Limit	
Peak Power	≤1000 W or ≤+60 dBm
Peak to Average Ratio	13 dB*

*Note: Limit unspecified – in the requirements, therefore, 13 dB was used in line with other frequency band requirements.

2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

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

2.2.2 Date of Test and Modification State

26 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	26°C
Relative Humidity	52.8%

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 26dB Bandwidth, in accordance with KDB 971168 D01, a peak detector and a trace setting of Max Hold were used in conjunction with the Occupied Bandwidth/x dB Bandwidth measurement function. The trace was left to stabilise and the result was recorded.

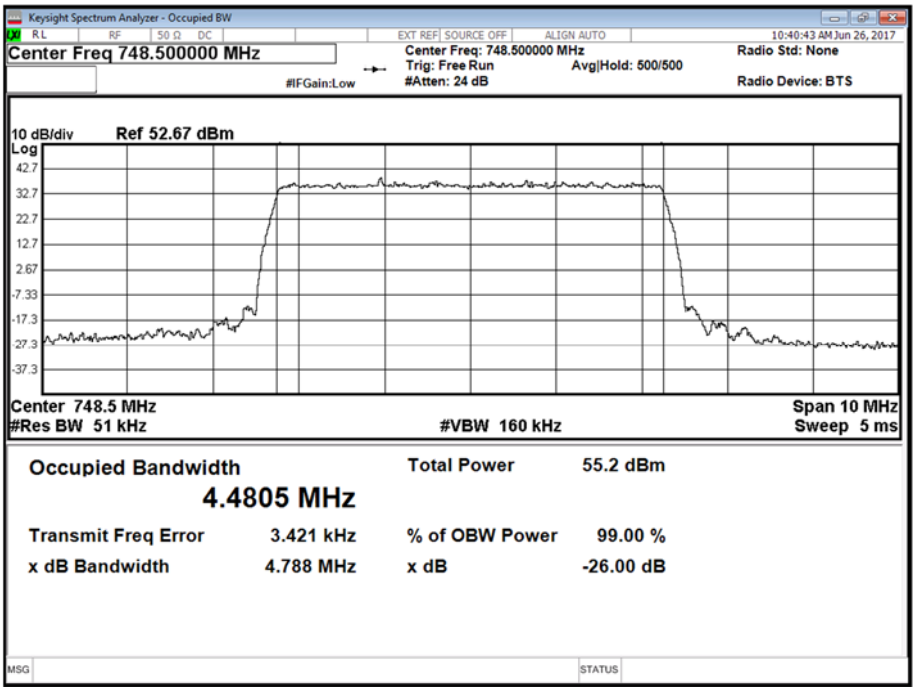
2.2.6 Test Results

Configuration 1

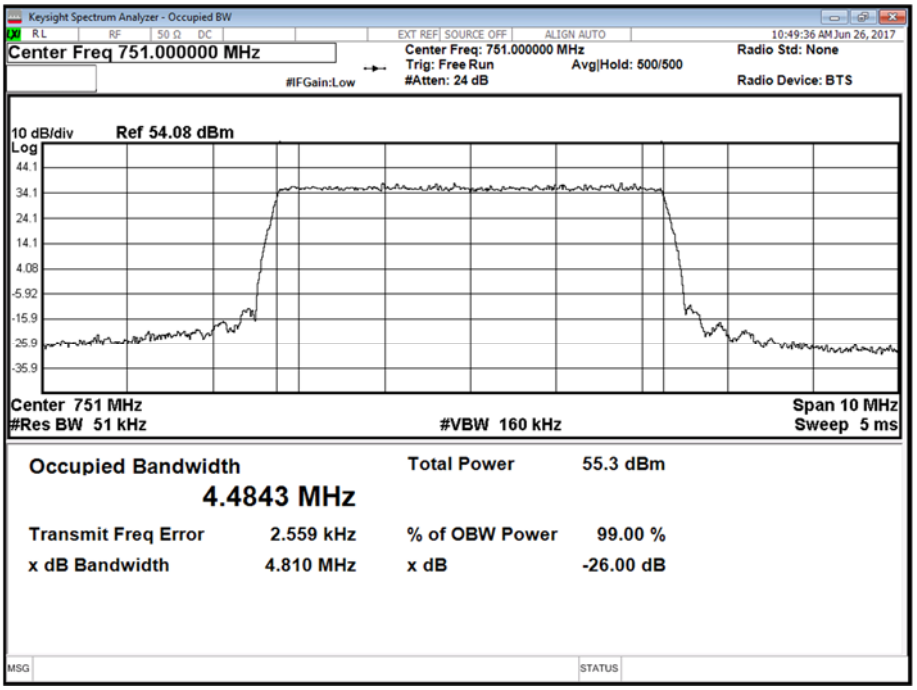
Maximum Output Power 47.8 dBm

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	4,480.46	4,788.04	4,484.29	4,809.97	4,478.73	4,781.40
A	QPSK	10.0 MHz	-	-	8,946.75	9,394.84	-	-

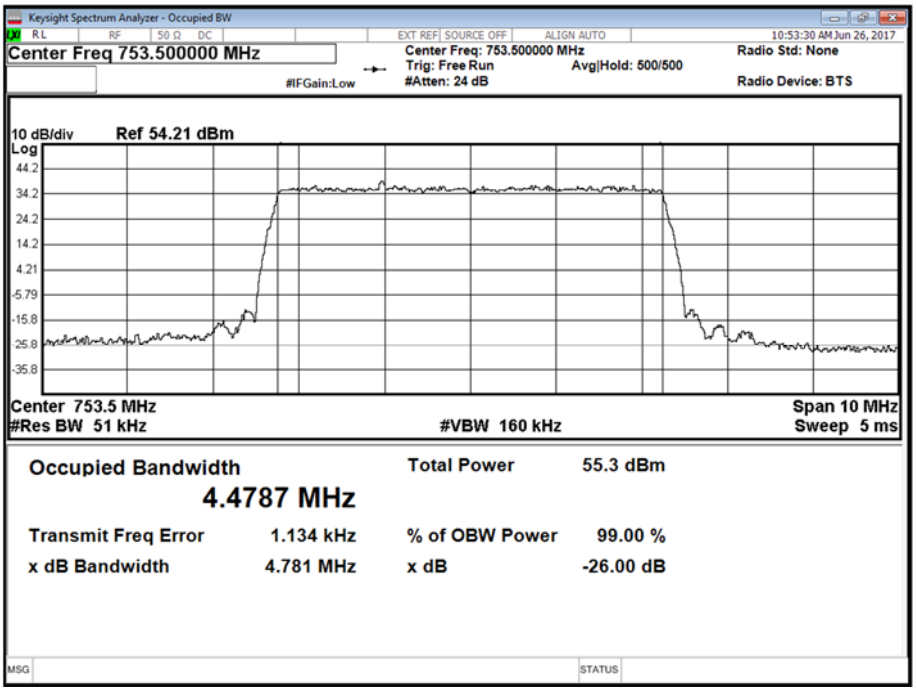
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



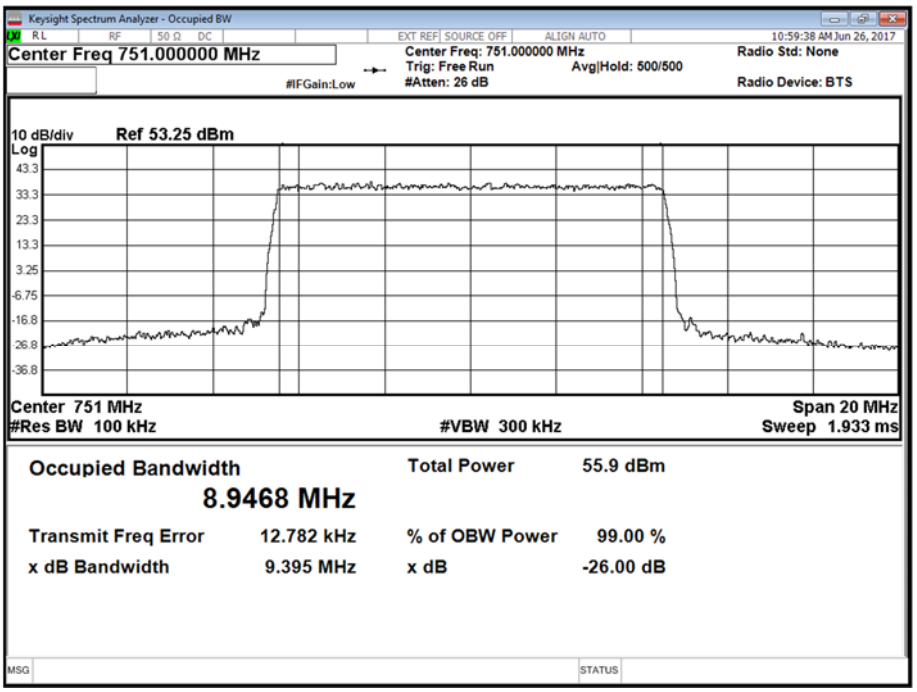
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



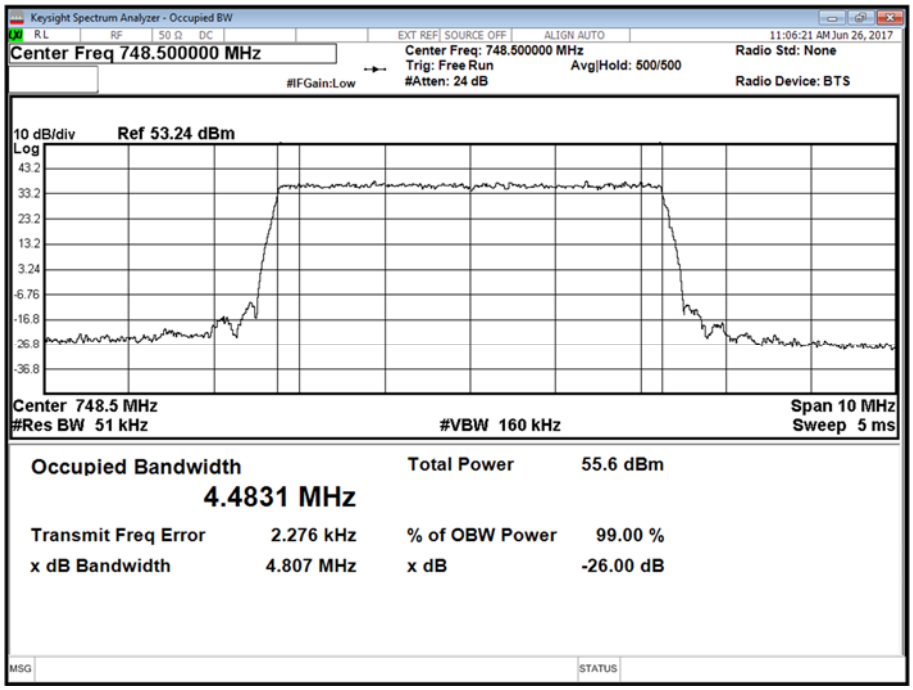
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



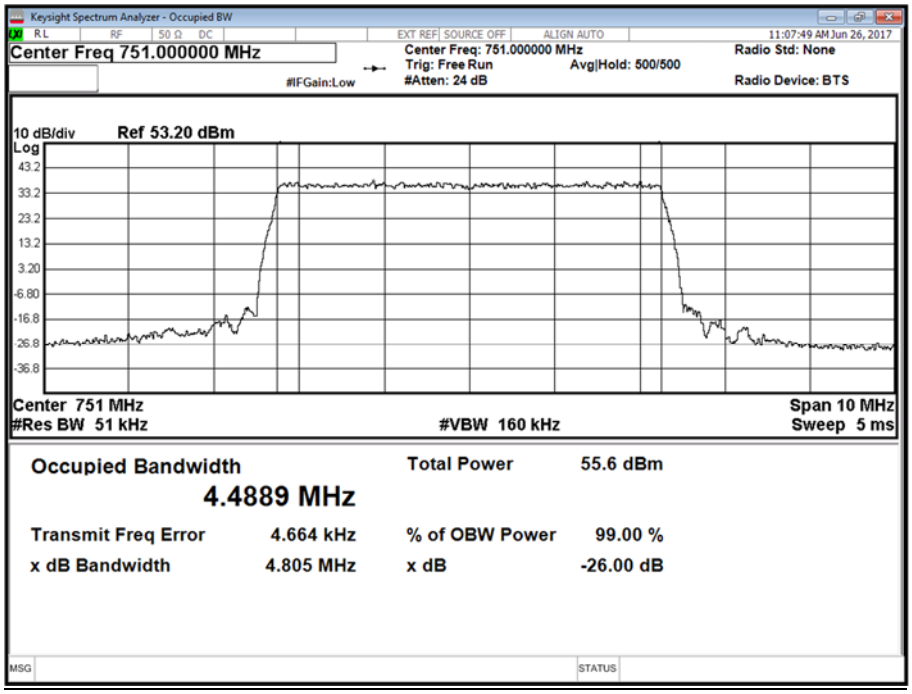
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



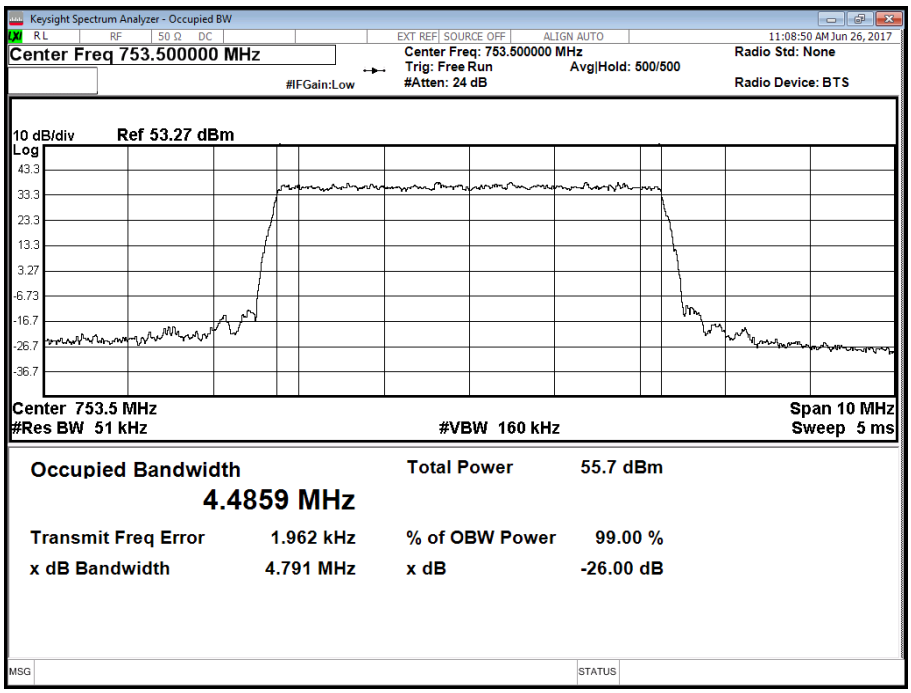
Antenna A - Antenna A - LTE Modulation 256QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



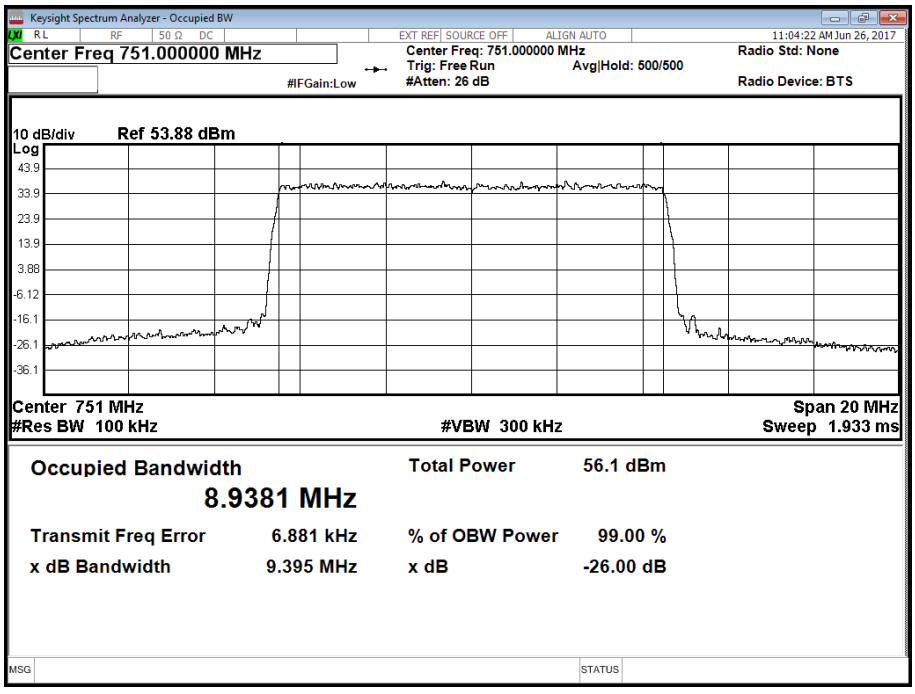
Antenna A - Antenna A - LTE Modulation 256QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



Antenna A - Antenna A - LTE Modulation 256QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



Antenna A - Antenna A - LTE Modulation 256QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (c)(1)

2.3.2 Date of Test and Modification State

26 June 2017 - Modification State 0

2.3.3 Test Equipment Used

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

2.3.4 Environmental Conditions

Ambient Temperature	26°C
Relative Humidity	52.8%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 6.

The EUT was connected to a Spectrum Analyser via 40 dB of attenuation. The path loss between the EUT and the Spectrum Analyser was measured using a Network Analyser. The measured path loss was entered as a Reference Level Offset in the Spectrum Analyser. The Spectrum Analyser RBW was adjusted to be at least 1% of the measured 26dB Bandwidth. Using an RMS detector, the frequency spectrum up to 1MHz away from the Band Edge was investigated. The display line was set to 43 + 10log(P) = -13 dBm.

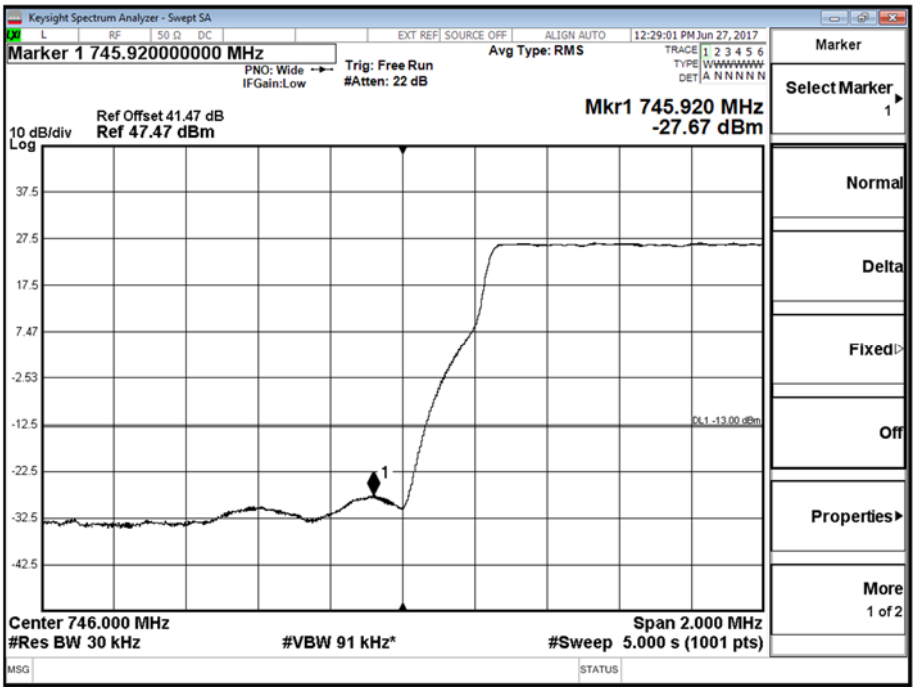
2.3.6 Test Results

Configuration 1

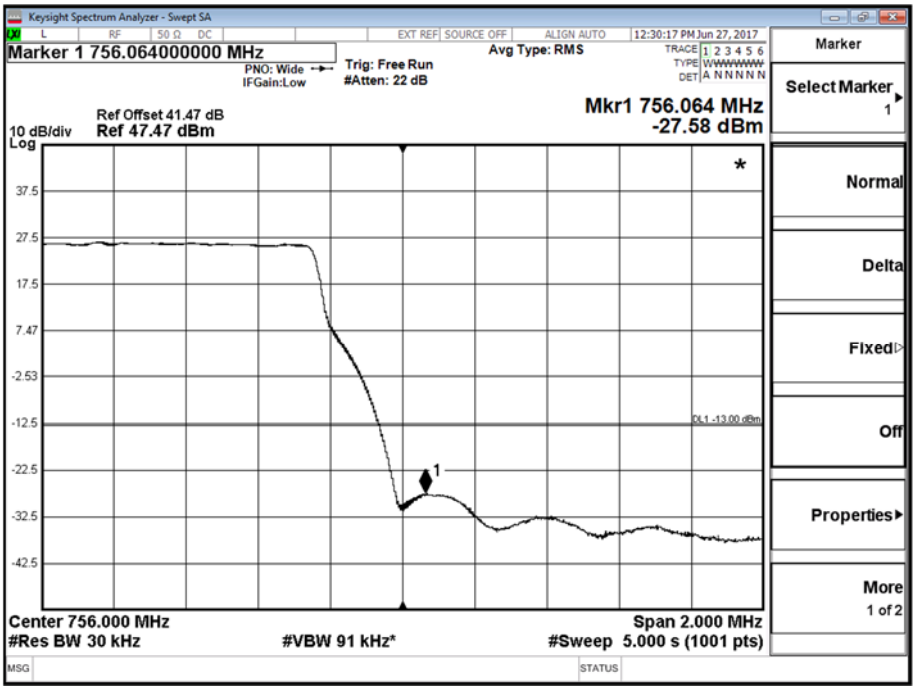
Maximum Output Power 47.8 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	5.0 MHz	748.5	753.5
A	QPSK	10.0 MHz	751.0	751.0

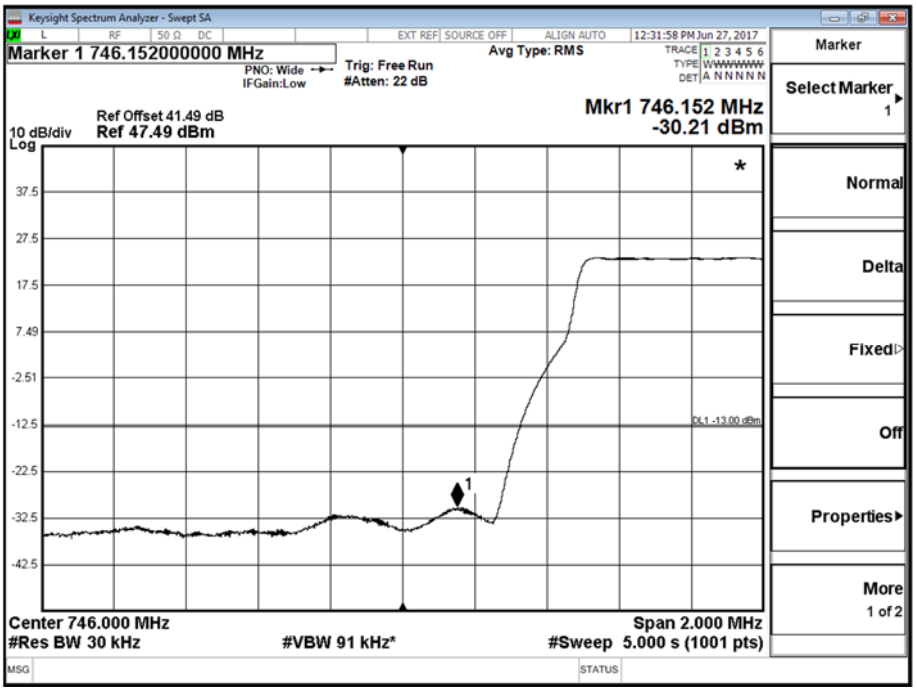
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



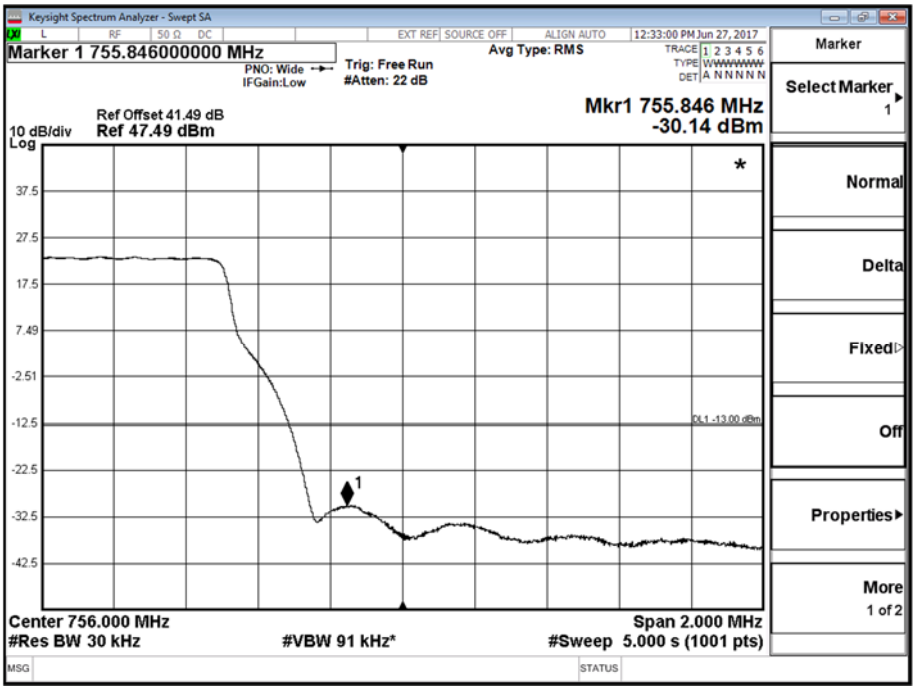
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



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



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

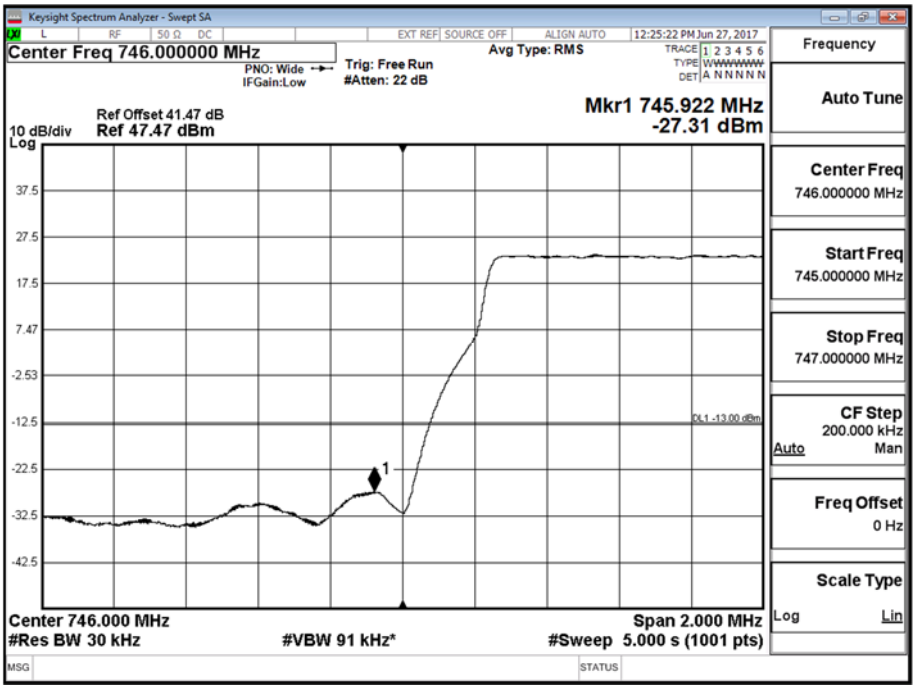


Configuration 2

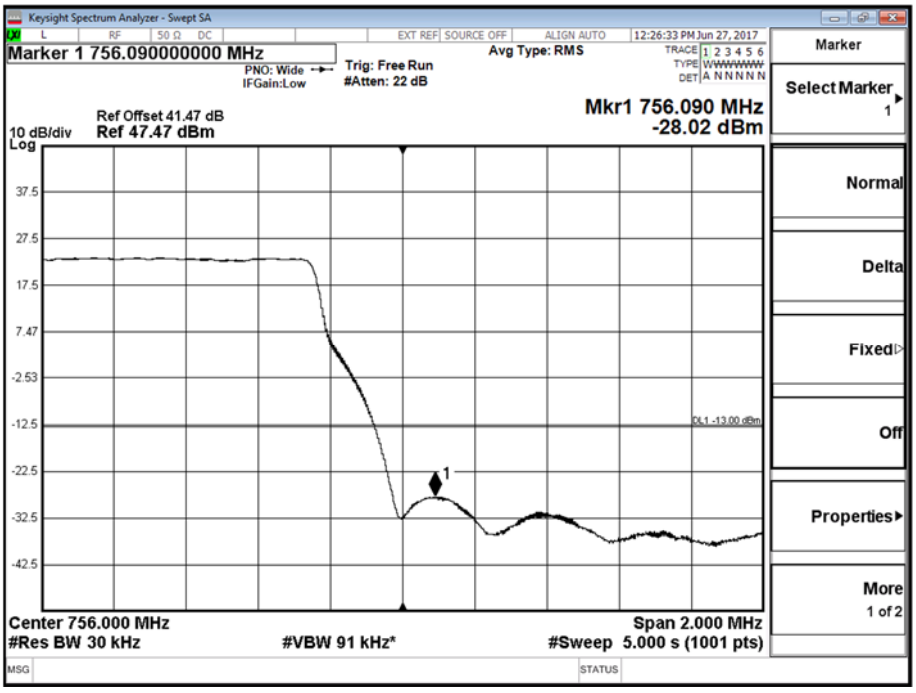
Maximum Output Power 47.8 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	5.0 MHz	748.5 + 753.5	748.5 + 753.5

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



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



Limit Single Antenna Port	-13 dBm,
Limit MIMO x2 Antenna Ports	-16 dBm,
Limit MIMO x4 Antenna Ports	-19 dBm,

2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (c)(1)(3)

2.4.2 Date of Test and Modification State

27 June 2017 - Modification State 0

2.4.3 Test Equipment Used

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

2.4.4 Environmental Conditions

Ambient Temperature	26°C
Relative Humidity	52.8%

2.4.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 6.

The EUT was connected to a Spectrum Analyser via 40dB of attenuation for measurements below 1.5GHz and up to 8 GHz using 40dB of attenuation and a high pass filter. Prior to testing, a Network Analyser was used to calibrate the path loss between the EUT and the Spectrum Analyser. The worst case path loss in the measured ranges was entered as a reference level offset. Over the measured ranges, the RBW was set to 1MHz with a VBW of 3MHz. All measurement results are specified as average with an RMS detector being used in conjunction with a trace setting of Max Hold. Measurements were performed in configurations of the EUT as reported below. The configurations chosen were worst case based on pre-test results carried out prior to the start of testing.

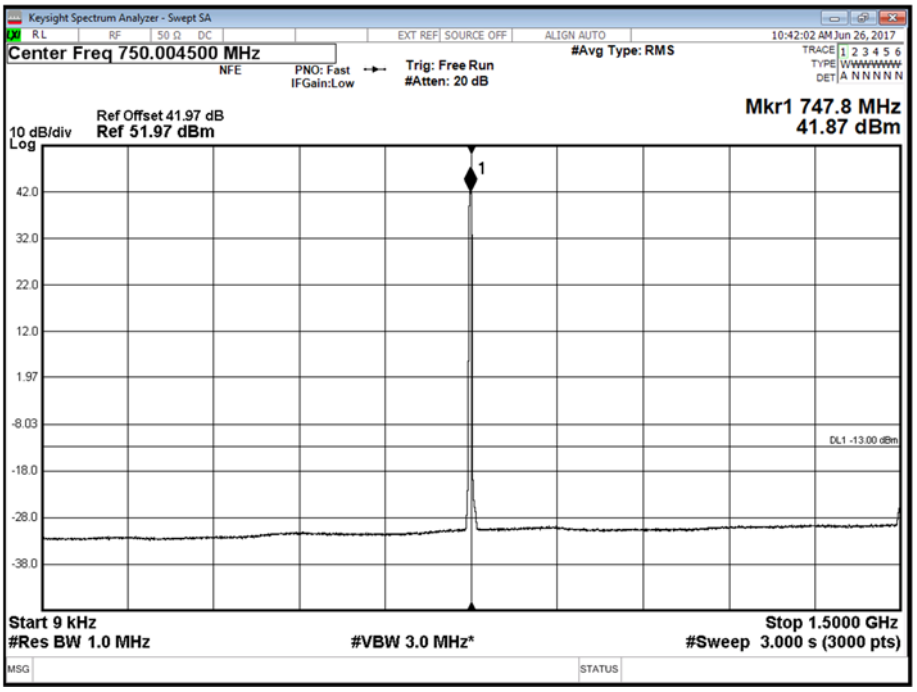
The EUT has only 1 transmit port. Testing was performed on this port with a test limit of 43+10log(P). In the frequency bands 763 – 775 MHz and 793 – 805 MHz, the limit was 65 + 10 log(P). Measurements were made using a RBW of 6.2 kHz. At the peak emission frequency, the power was integrated to 6.25 kHz using the Band Power Density function in the Spectrum Analyser.

2.4.6 Test Results

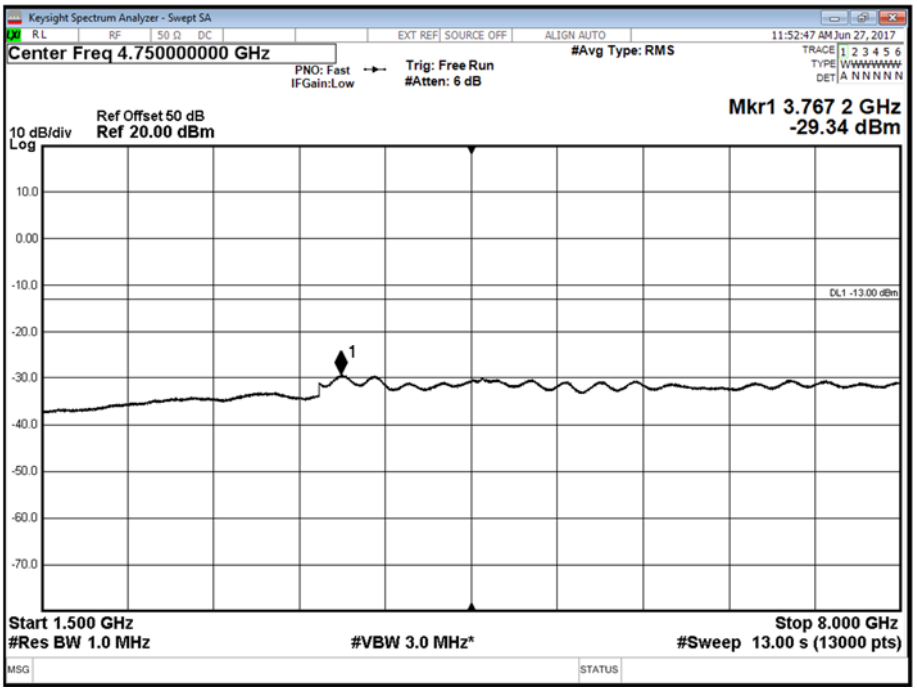
Configuration 1

Maximum Output Power 47.8 dBm

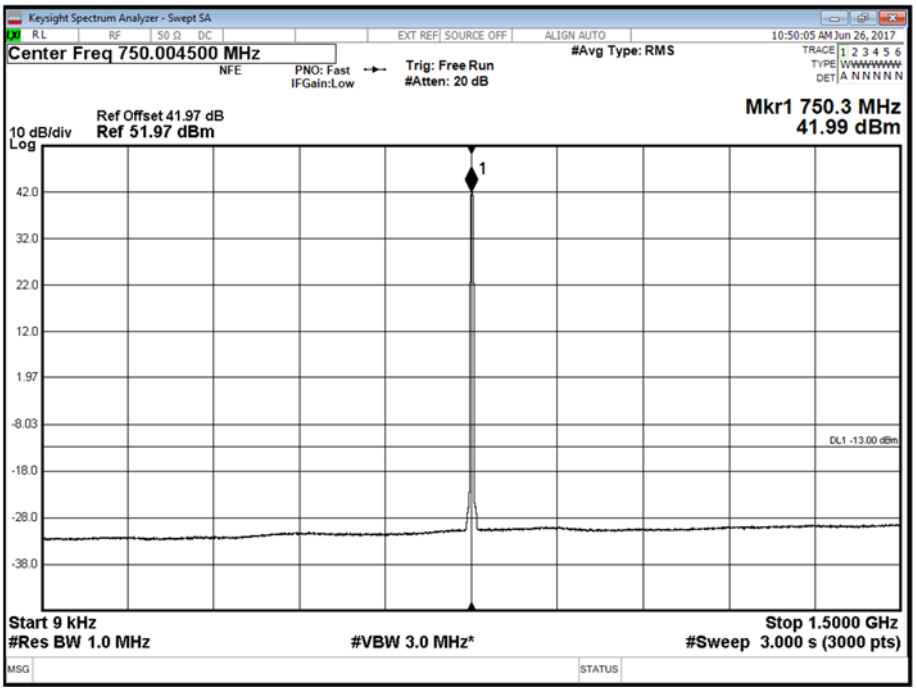
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B - Band 1 - Range 0.009 to 1500 MHz



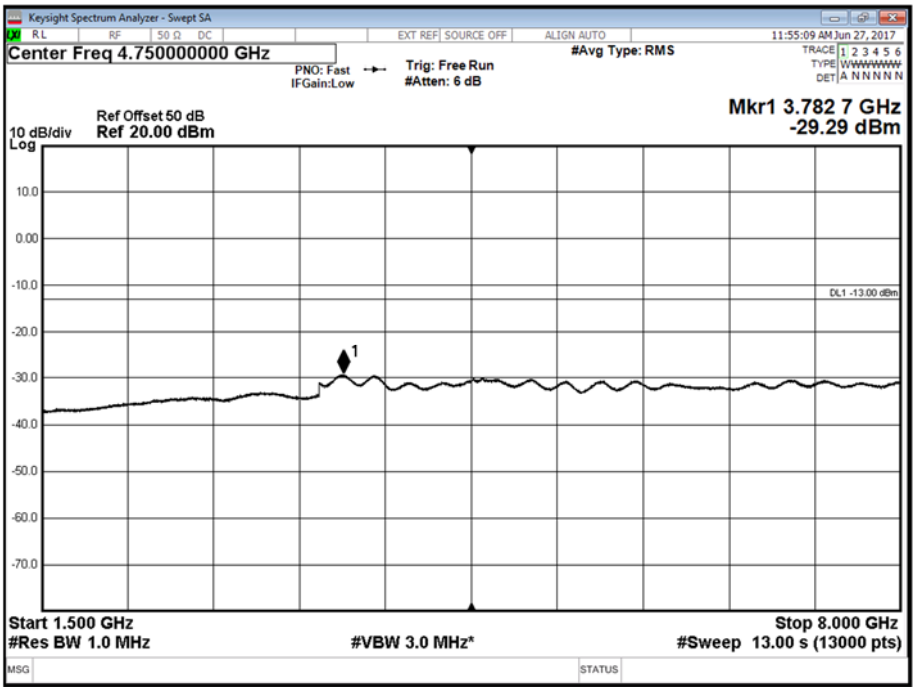
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B - Band 2 - Range 1500 to 8000 MHz



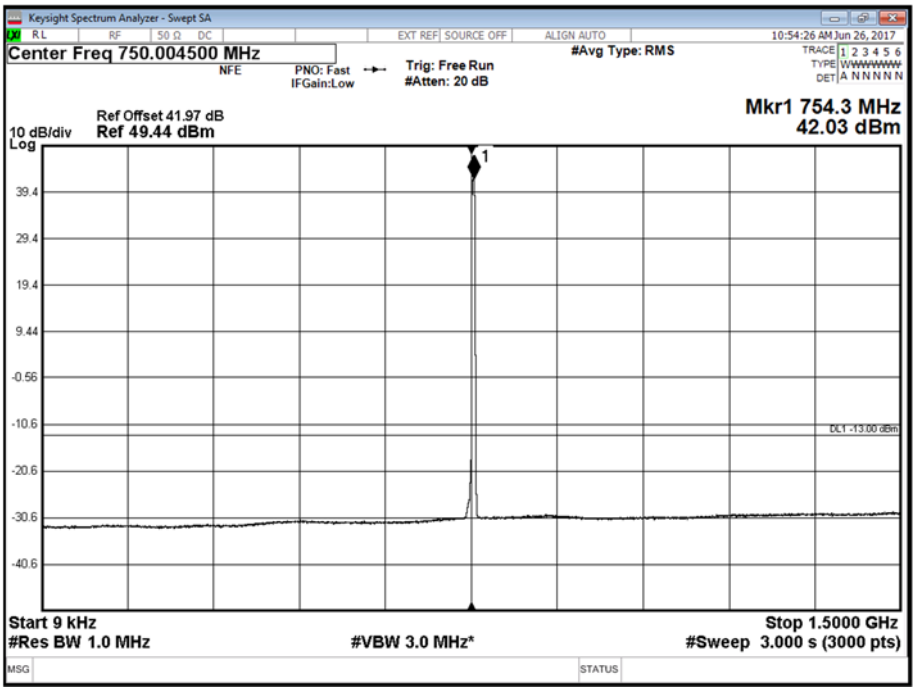
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Band 1 - Range 0.009 to 1500 MHz



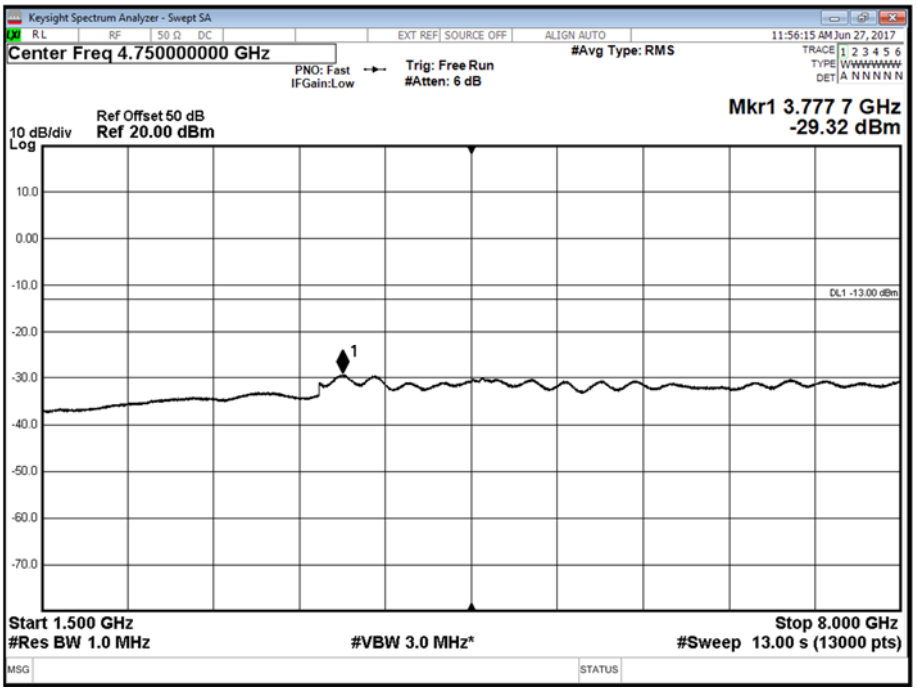
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Band 2 - Range 1500 to 8000 MHz



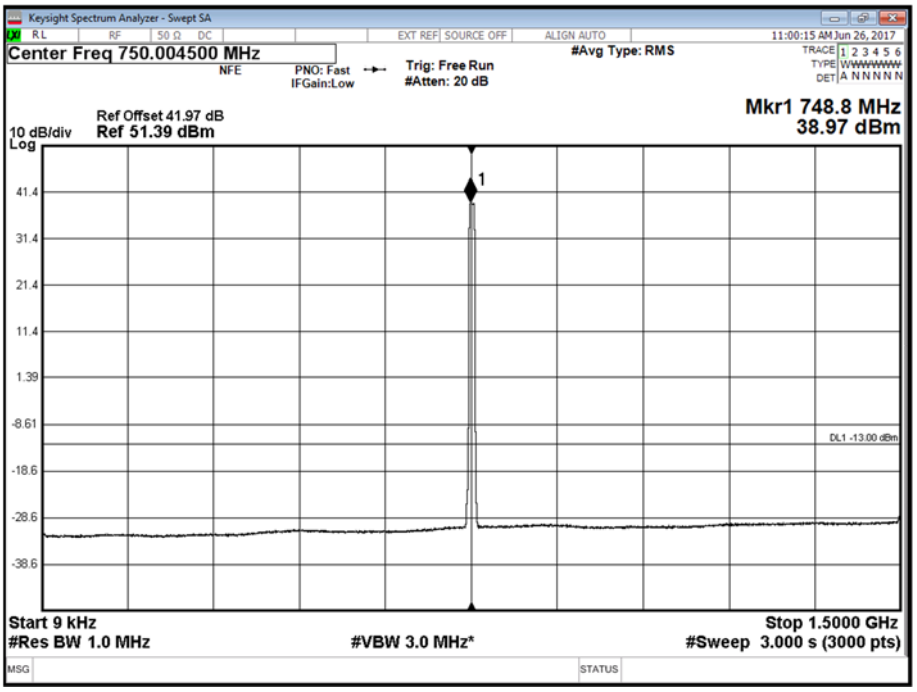
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T - Band 1 - Range 0.009 to 1500 MHz



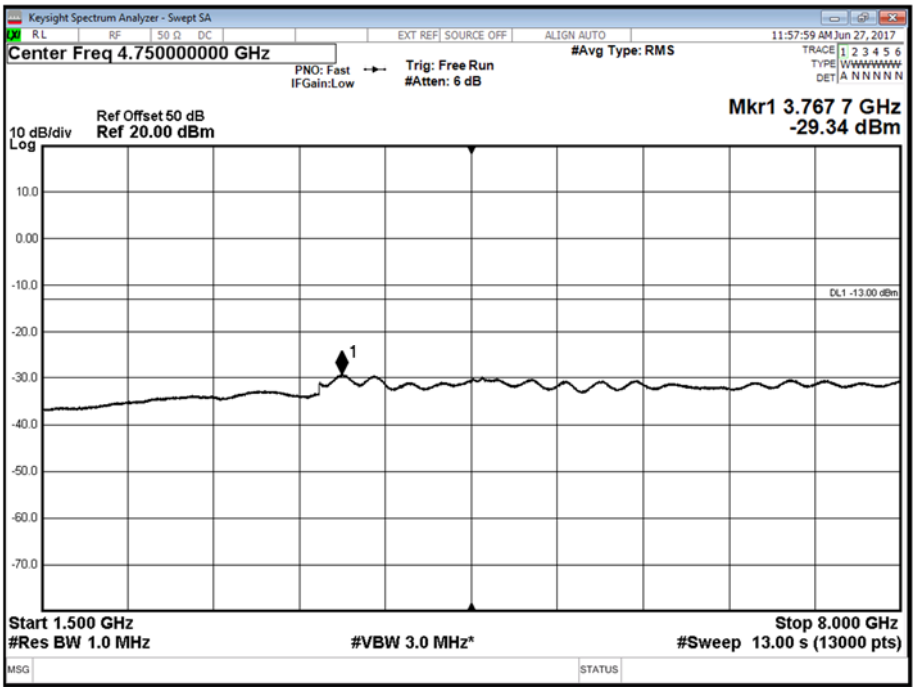
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T - Band 2 - Range 1500 to 8000 MHz



Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 1 - Range 0.009 to 1500 MHz



Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 2 - Range 1500 to 8000 MHz

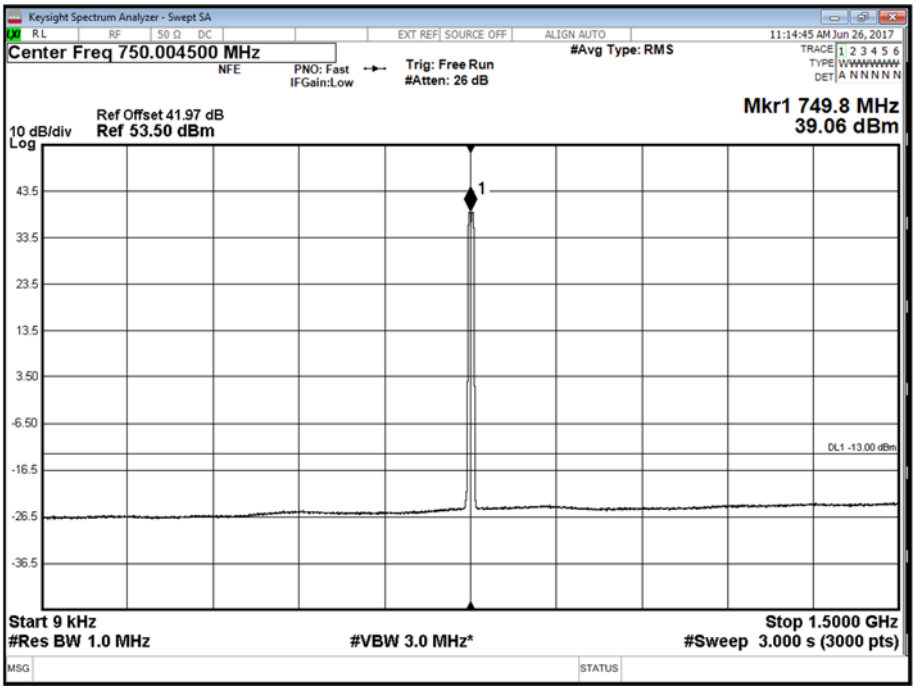


Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 1 - Range 0.009 to 4000 MHz

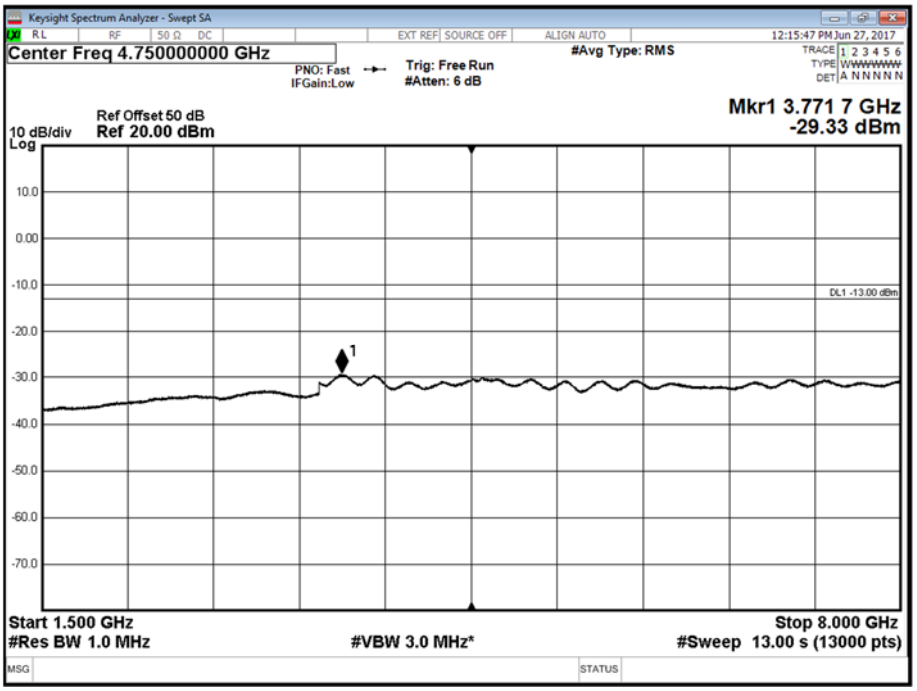
Configuration 2

Maximum Output Power 47.8 dBm

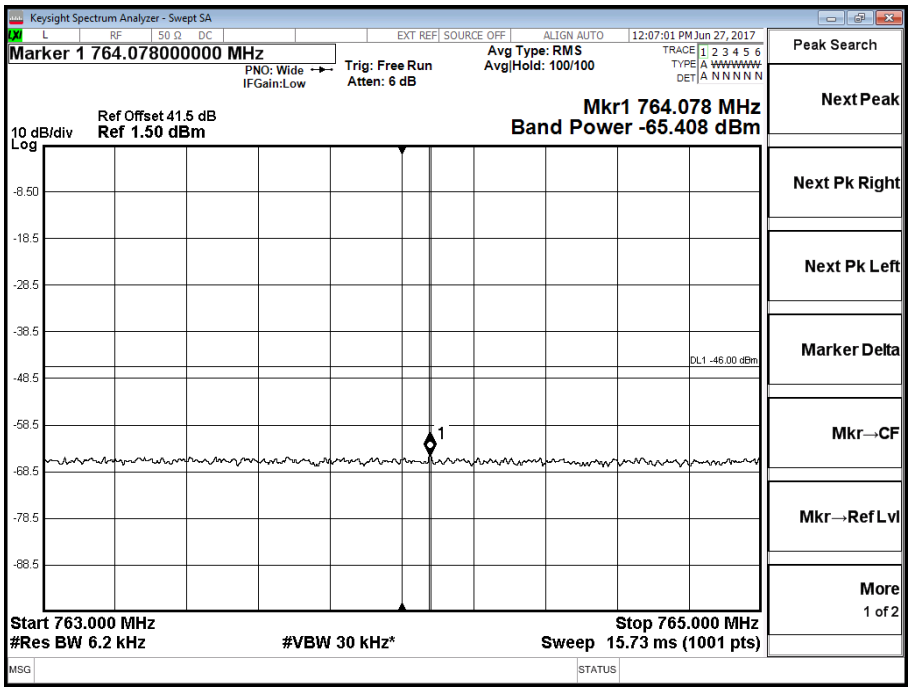
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Band 1 - Range 0.009 to 1500 MHz



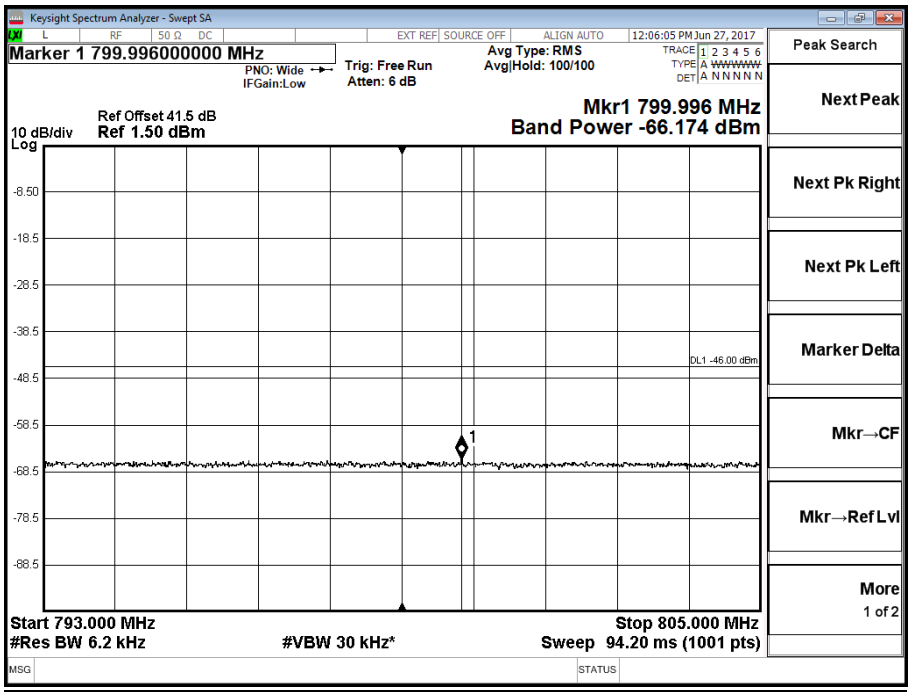
Antenna A - Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Band 2 - Range 1500 to 8000 MHz



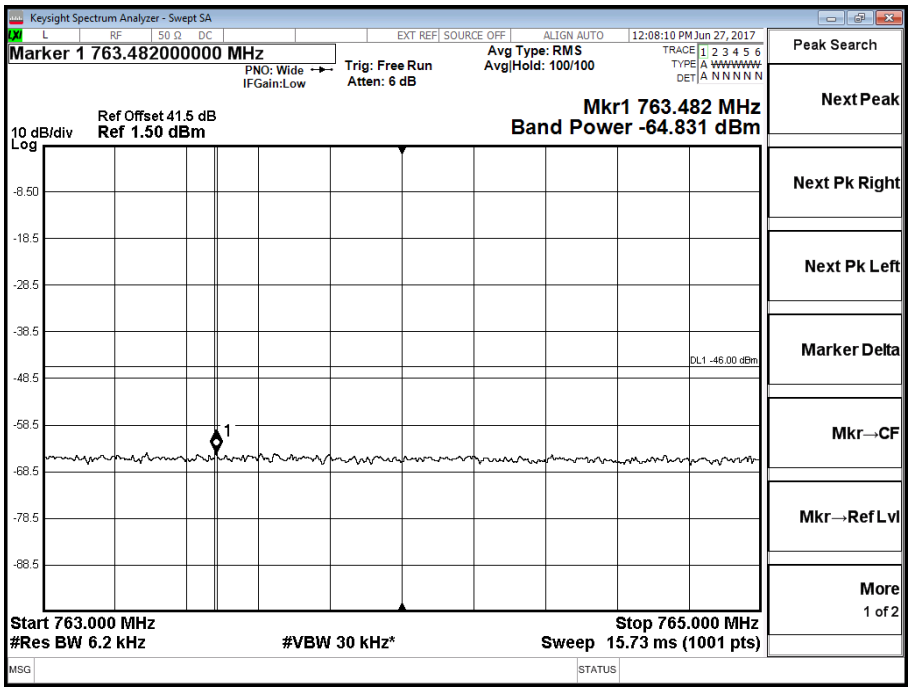
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B - Range 763 – 775 MHz



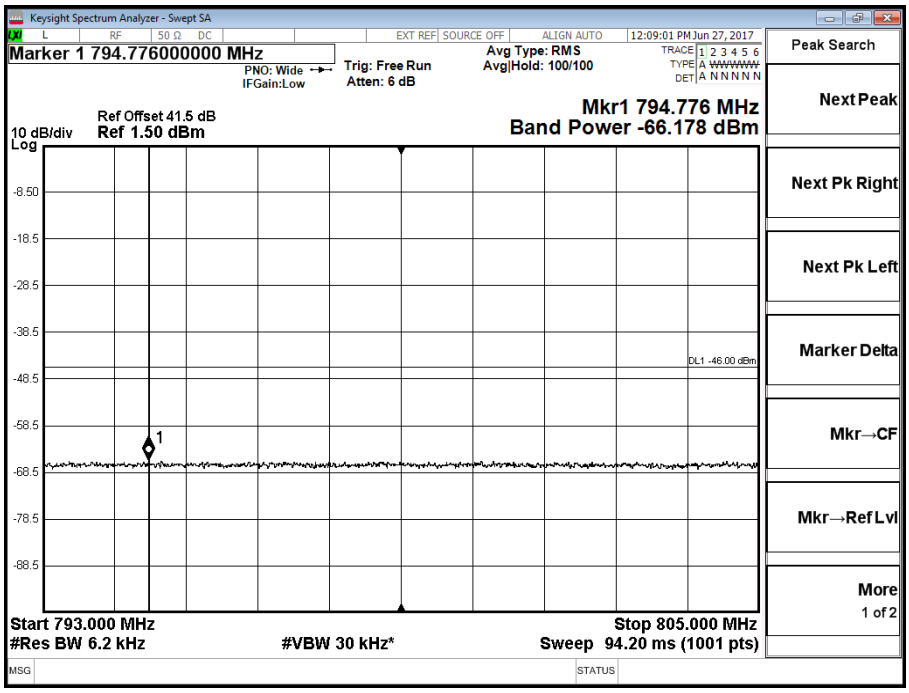
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B - Range 793 – 805 MHz



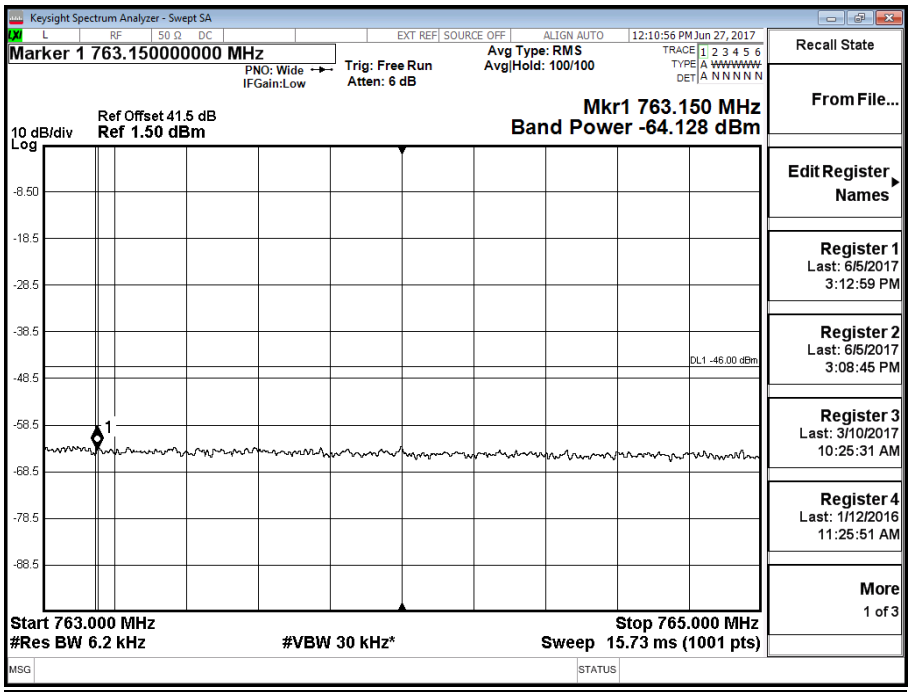
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Range 763 – 775 MHz



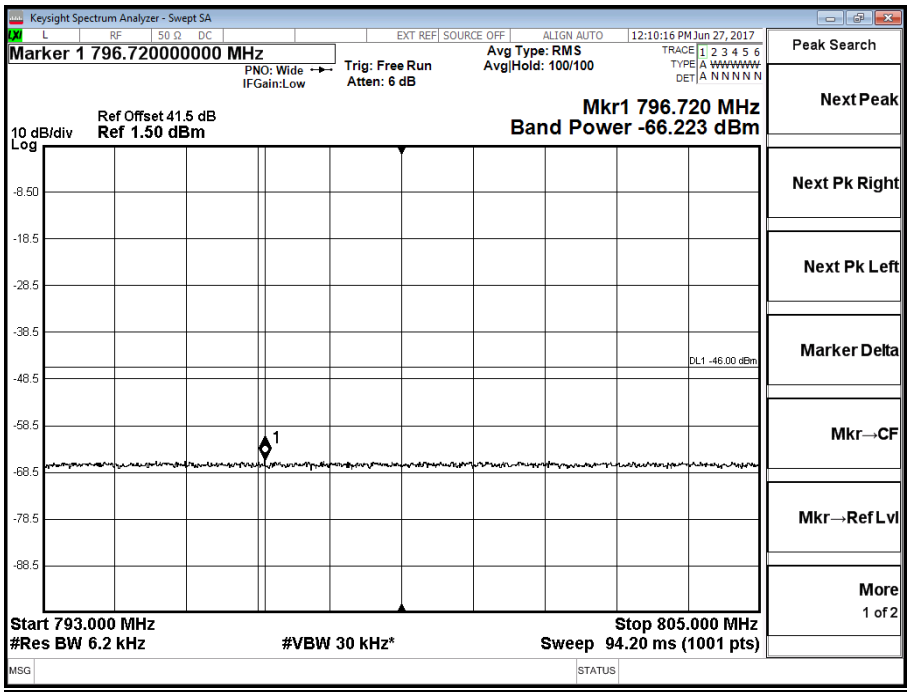
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Range 793 – 805 MHz



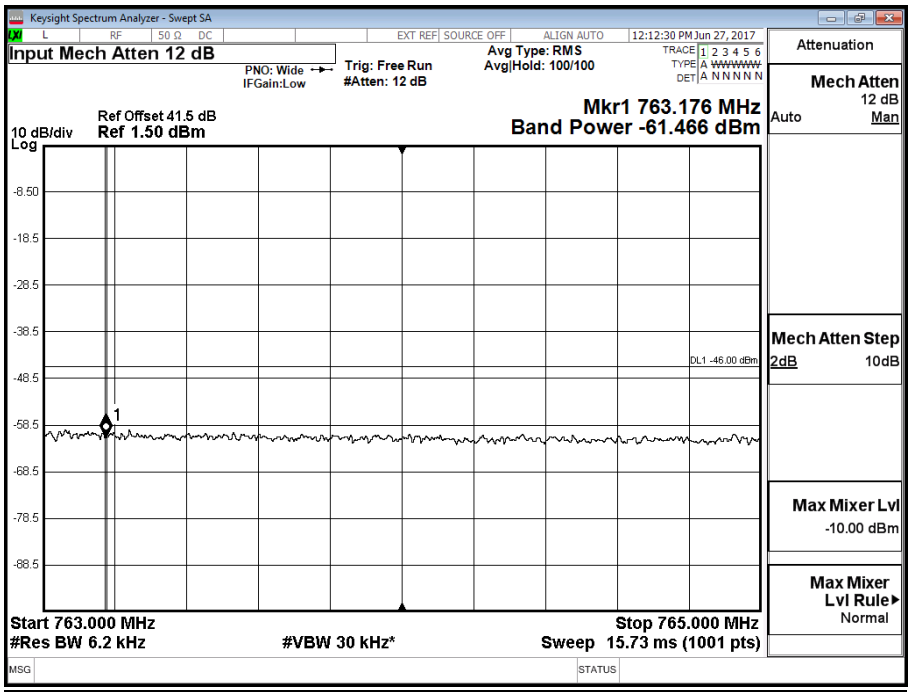
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T - Range 763 – 775 MHz



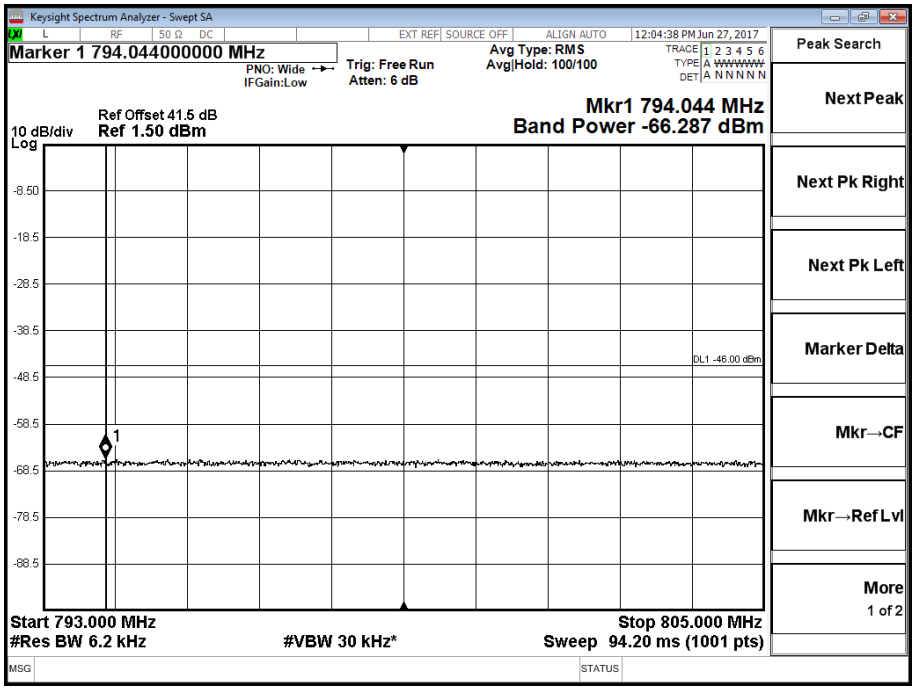
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T - Range 793 – 805 MHz



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Range 763 – 775 MHz

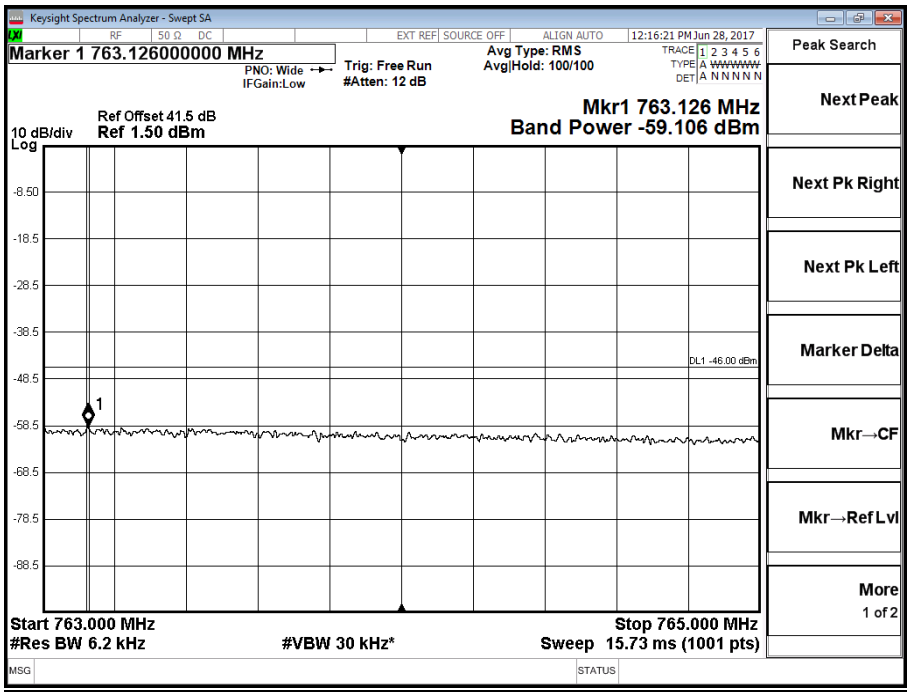


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Range 793 – 805 MHz

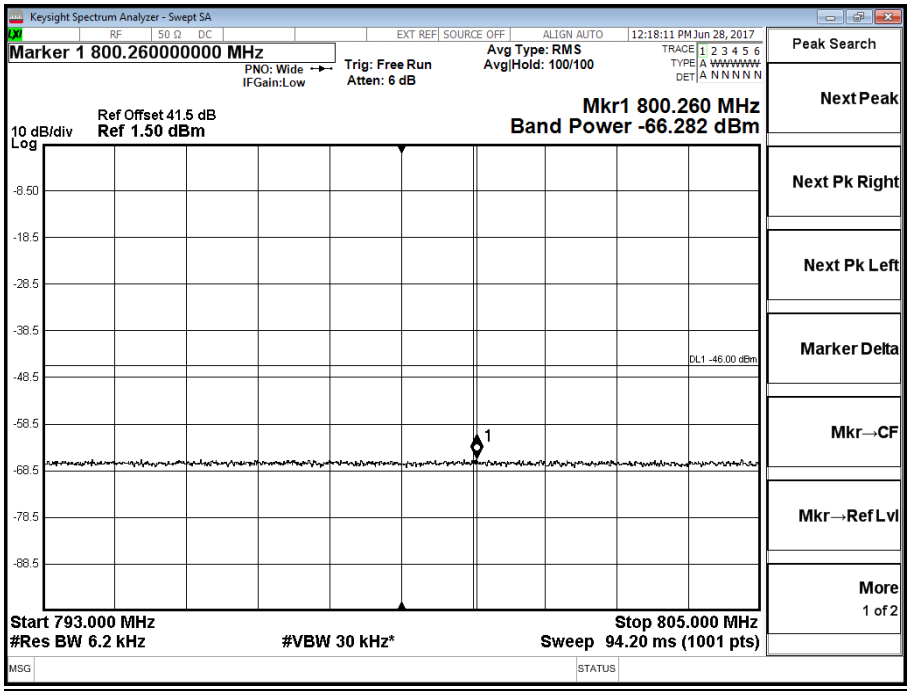


Configuration 2

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Range 763 – 775 MHz



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M - Range 793 – 805 MHz



Limit	
<746 MHz and >758 MHz	-13 dBm
<746 MHz and >758 MHz MIMO x2 Ports	-16 dBm
<746 MHz and >758 MHz MIMO x4 Ports	-19 dBm
763 – 775 MHz 793 – 805 MHz	-46 dBm
763 – 775 MHz MIMO x2 Ports 793 – 805 MHz	-49 dBm
763 – 775 MHz MIMO x4 Ports 793 – 805 MHz	-52 dBm

2.5 RADIATED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 27, Clause 27.53(m)

2.5.2 Date of Test and Modification State

23 June 2017 - Modification State 0

2.5.3 Test Equipment Used

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

2.5.4 Environmental Conditions

Ambient Temperature	20.2°C
Relative Humidity	67 %

2.5.5 Test Method

The test was applied in accordance with test method requirements of ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

The Applicant declared that the highest internally generated frequency would be up to 800MHz and so the upper limit for measurement was calculated at 10 times this, which is 8GHz.

Emissions identified within the range 30MHz – 8GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 1GHz, the measurement was performed with a resolution bandwidth of 100kHz.

In the frequency Ranges between 763-775MHz and 793-805MHz, the measurement was performed with a resolution bandwidth of 10kHz.

In the frequency Range 1GHz – 8GHz, the measurement was performed with a resolution bandwidth of 1MHz.

The measurements were performed at a 3m distance unless otherwise stated.

The limits for Spurious Emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:
Field Strength is measured in dBµV/m
P is measured Transmitter Power in Watts

Determination of Spurious Emission Limit

As the EUT does not have an integral antenna, the field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipole as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where G_i is the antenna gain of an ideal half-wave dipole,
P_o is the power out of the transceiver in W,
d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$E_{(v/m)}=(30 \times 1.64 \times 60)^{0.5} / 3 = 9.84V/m = 139.86dB\mu V/m$

As per 27.53 (c)(1)) the spurious emission must be attenuated by 43 + 10log (P_o) dB this gives:

43 + 10log(60) = 60.78dB

Therefore the limit at 3m measurement distance is:

139.86 – 60.78 = 79.08 dBµV/m

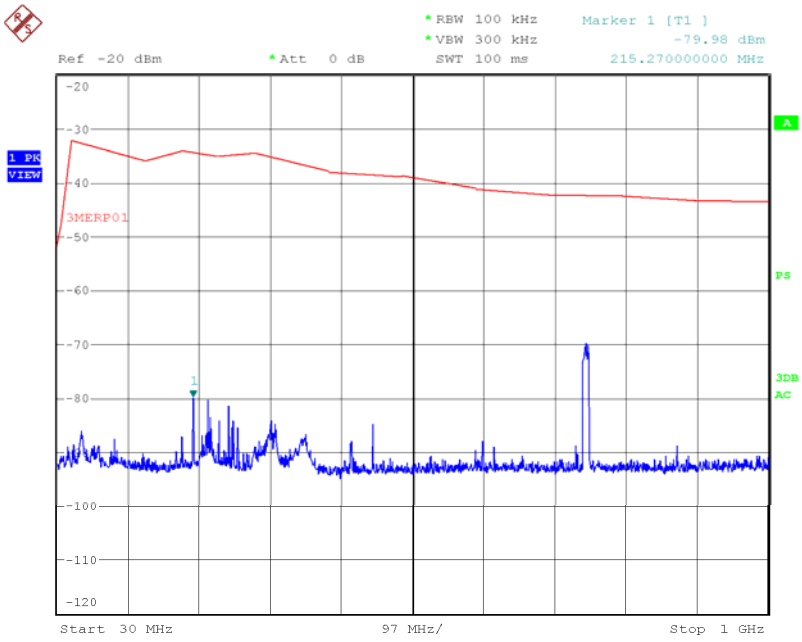
This limit has been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

2.5.6 Test Results

Configuration 1-SC (1C)

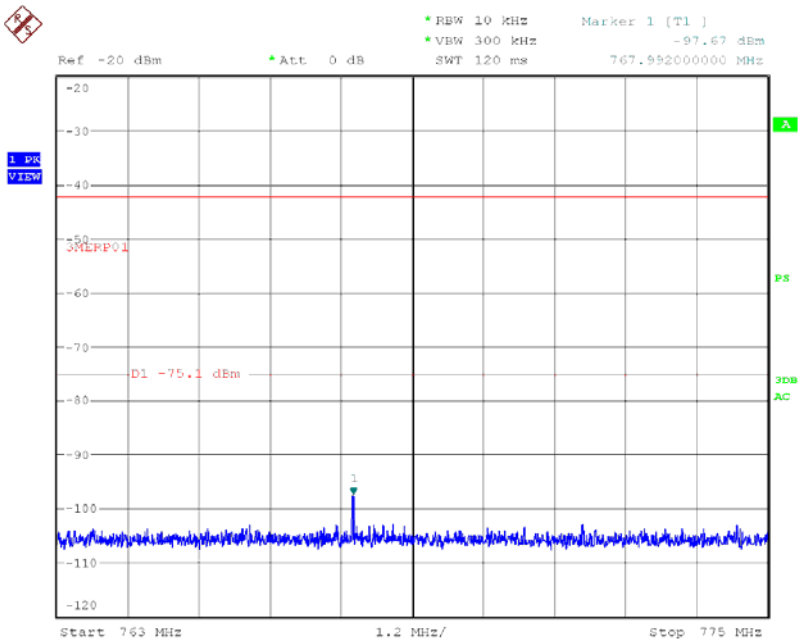
Maximum Output Power 47.8dBm per port, LTE Bandwidth 10.0MHz

Channel Position M – QPSK / Bandwidth 10.0MHz – 30MHz – 1GHz



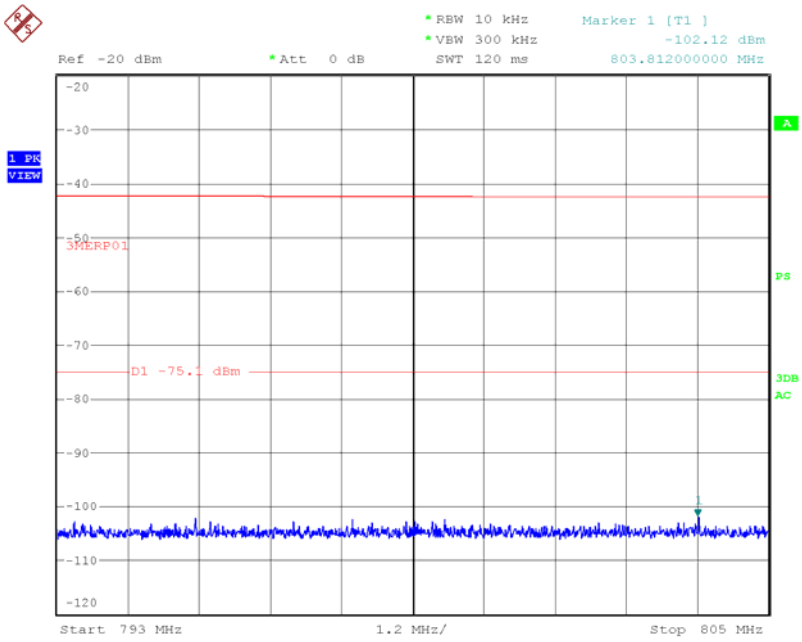
Date: 23.JUN.2017 13:51:23

Channel Position M – QPSK / Bandwidth 10.0MHz – 763MHz – 775MHz



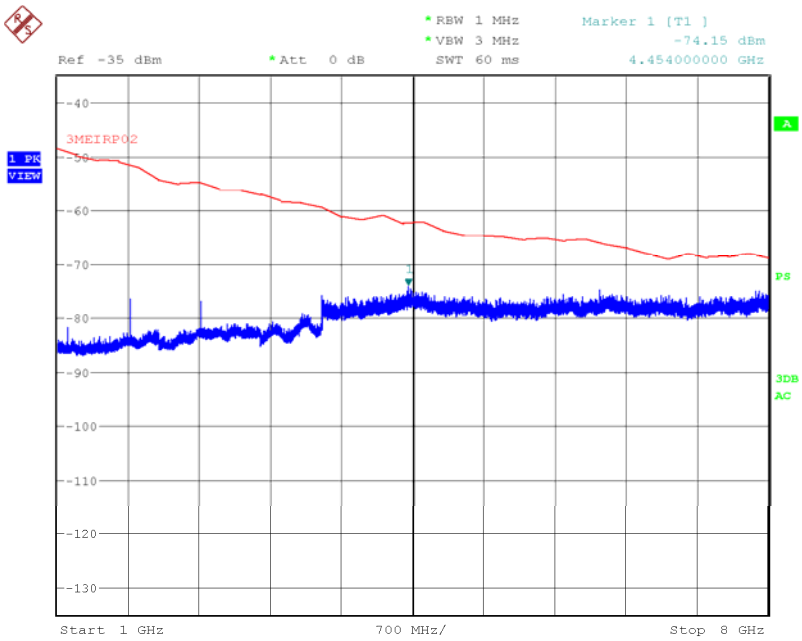
Date: 23.JUN.2017 14:21:47

Channel Position M – QPSK / Bandwidth 10.0MHz – 793MHz – 805MHz



Date: 23.JUN.2017 14:29:05

Channel Position M – QPSK / Bandwidth 10.0MHz – 1GHz – 8GHz

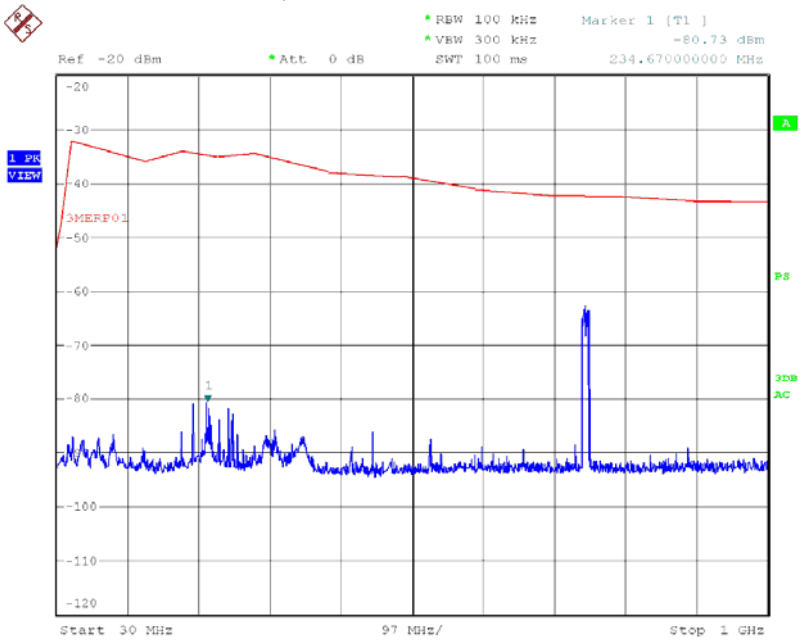


Date: 23.JUN.2017 16:25:03

Configuration 2-MC (2C)

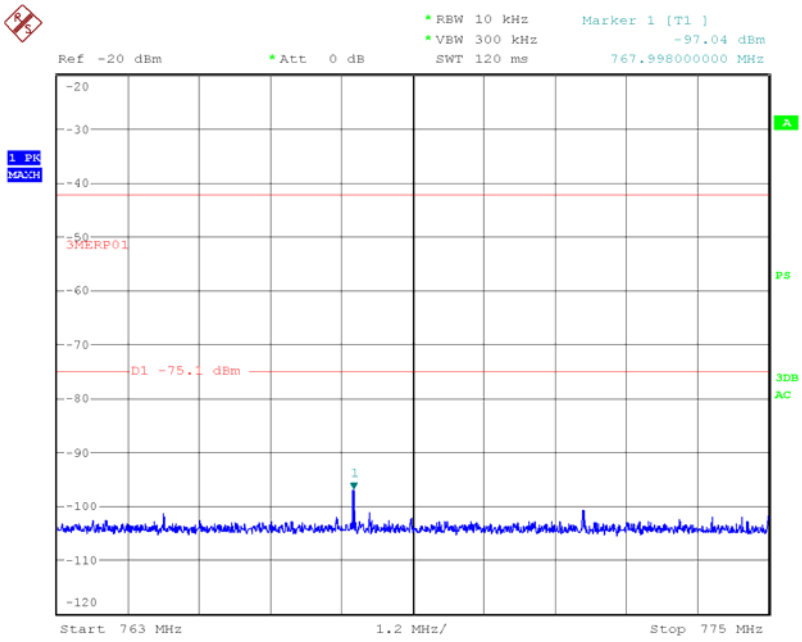
Maximum Output Power 47.8dBm per port, LTE Bandwidth 10.0MHz

Channel Position M – QPSK / Bandwidth 10.0MHz – 30MHz – 1GHz



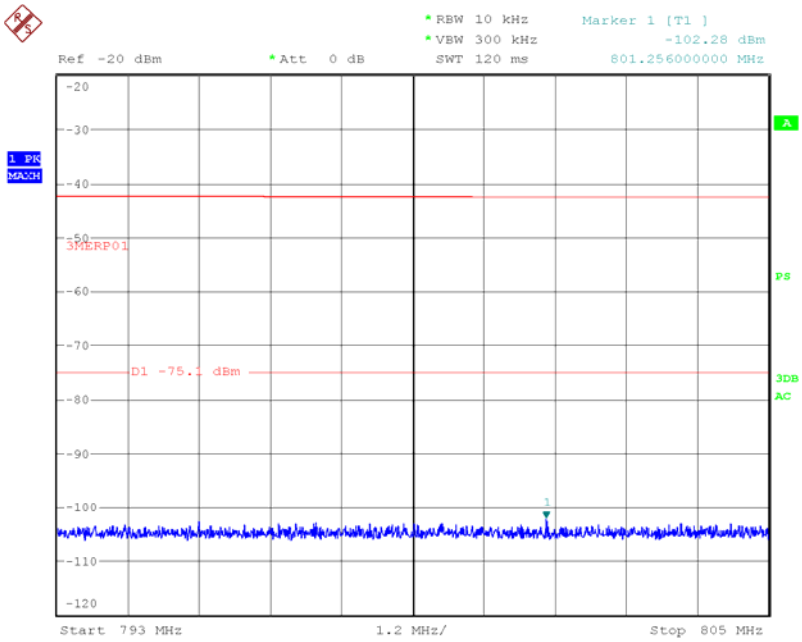
Date: 23.JUN.2017 15:15:46

Channel Position M – QPSK / Bandwidth 10.0MHz – 763MHz – 775MHz



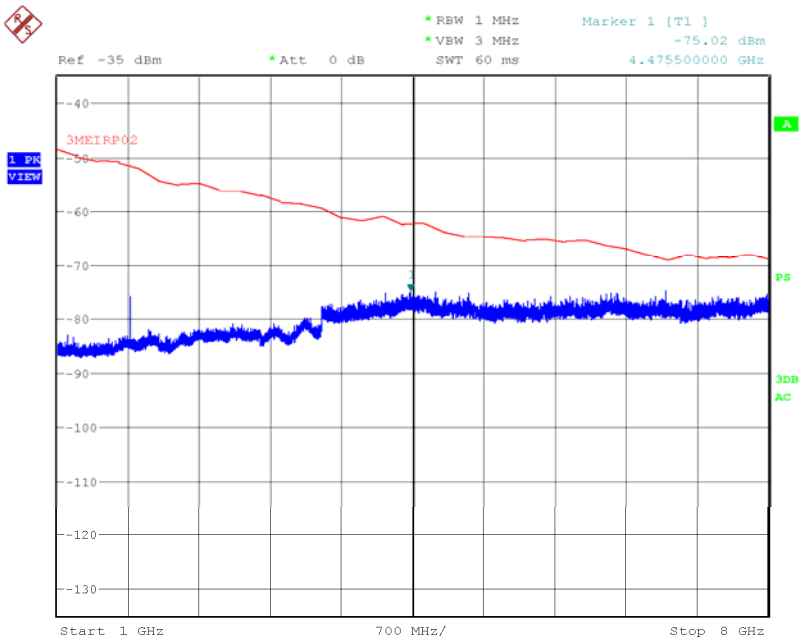
Date: 23.JUN.2017 15:11:51

Channel Position M – QPSK / Bandwidth 10.0MHz – 793MHz – 805MHz



Date: 23.JUN.2017 14:54:30

Channel Position M – QPSK / Bandwidth 10.0MHz – 1GHz – 8GHz



Date: 23.JUN.2017 16:27:18

Remarks

Limit	-13dBm / 79.08 dBµV/m

The EUT does not exceed -13dBm / 79.08dBµV/m at the measured frequencies.

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

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

2.6.2 Date of Test and Modification State

27 June 2017 - Modification State 0

2.6.3 Test Equipment Used

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

2.6.4 Environmental Conditions

Ambient Temperature	49.9°C
Relative Humidity	23.1%

2.6.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 9.

The EUT was setup in a Climatic Chamber and connected to a Vector Signal Analyser via attenuators. The temperature was varied over the range -30˚C to +50˚C in 10˚C steps. At each temperature interval, the EUT was left to stabilise. After this period of time, the maximum Frequency Error was measured and recorded on the Middle channel.

For LTE, testing was performed using a 5 MHz channel bandwidth with QPSK modulation and all Resource Blocks active.

At 20˚C, the voltage was varied between 85% and 115% of the nominal declared voltage. At each extreme voltage, the mean Frequency Error was measured and recorded.

2.6.6 Test Results

Configuration 1

Maximum Output Power 47.8 dBm

Temperature	Voltage	Frequency Error (Hz)
		Channel Position M
-30°C	-48.0 V DC	EUT does not operate*
-20°C	-48.0 V DC	EUT does not operate*
-10°C	-48.0 V DC	2.78
0°C	-48.0 V DC	2.82
+10°C	-48.0 V DC	1.99
+20°C	-40.8 V DC	2.69
+20°C	-48.0 V DC	2.48
+20°C	-55.2 V DC	2.80
+30°C	-48.0 V DC	-2.74
+40°C	-48.0 V DC	-2.44
+50°C	-48.0 V DC	-3.87

Remarks

* EUT did not operate at temperatures below -10 °C.

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

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
Maximum Peak Output Power and Peak to Average Ratio - Conducted					
Spectrum Analyser	Keysight	N9030A	4654	12	06-Oct-2017
Attenuator	Weinschel	49-40-33	SX796	-	O/P Mon
THG	Rotronic	I-1000	3220	12	23-Aug-2017
PSU	Farnell	H60-25	1092	-	O/P Mon
DVM	Fluke	179	4007	12	14-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA40	3548	12	15-Sep-2017
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	09-Aug-2017
Occupied Bandwidth					
Spectrum Analyser	Keysight	N9030A	4654	12	06-Oct-2017
Attenuator	Weinschel	49-40-33	SX796	-	O/P Mon
THG	Rotronic	I-1000	3220	12	23-Aug-2017
PSU	Farnell	H60-25	1092	-	O/P Mon
DVM	Fluke	179	4007	12	14-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA40	3548	12	15-Sep-2017
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	09-Aug-2017
Band Edge					
Spectrum Analyser	Keysight	N9030A	4654	12	06-Oct-2017
Attenuator	Weinschel	49-40-33	SX796	-	O/P Mon
THG	Rotronic	I-1000	3220	12	23-Aug-2017
PSU	Farnell	H60-25	1092	-	O/P Mon
DVM	Fluke	179	4007	12	14-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA40	3548	12	15-Sep-2017
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	09-Aug-2017
Transmitter Spurious Emissions					
High Pass Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	02-Jun-2018
Spectrum Analyser	Keysight	N9030A	4654	12	06-Oct-2017
Attenuator	Weinschel	49-40-33	SX796	-	O/P Mon
THG	Rotronic	I-1000	3220	12	23-Aug-2017
PSU	Farnell	H60-25	1092	-	O/P Mon
DVM	Fluke	179	4007	12	14-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA40	3548	12	15-Sep-2017
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	09-Aug-2017
Radiated Spurious Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	-	TU
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	12-Nov-2017
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Frequency Stability					
Climatic Chamber	Aralab	FitoTerm 300E45	4823	-	O/P Mon
Thermometer	Fluke	51	3172	12	16-Nov-2017
Spectrum Analyser	Keysight	N9030A	4654	12	06-Oct-2017
Attenuator	Weinschel	49-40-33	SX796	-	O/P Mon
THG	Rotronic	I-1000	3220	12	23-Aug-2017
PSU	Farnell	H60-25	1092	-	O/P Mon
DVM	Fluke	179	4007	12	14-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA40	3548	12	15-Sep-2017
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	09-Aug-2017

N/A – Not Applicable
O/P Mon – Output Monitored with Calibrated Equipment
TU – Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 0.68 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 2.3 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Occupied Bandwidth	5 MHz Bandwidth	± 11.5 kHz
	10 MHz Bandwidth	± 23.09 kHz
Band Edge	30 MHz to 20 GHz Amplitude	± 0.8 dB
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		

* In accordance with CISPR 16-4

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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).

Product Service

ANNEX A

MODULE LIST

Configuration A			
Product	Product No	R-State	Serial No
RUL 01 B13	KRC 118 56/1	R1D	CC43318597
Filter Unit	KRF 102 284/1	R2A	CC43331662
Tower Mounted Amplifier	KRY 112 169/1	R1B	CC43413367