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Report On

FCC Testing of the
Ericsson Remote Radio Unit LTE KRC 161 711/1, Radio 2208 B48
(3650-3675 MHz) in accordance with FCC CFR 47 Part 2, FCC CFR 47
Part 90Z

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161711-1

PREPARED BY

A handwritten signature in black ink, appearing to read 'Maggie Whiting'.

Maggie Whiting
Key Account Manager

APPROVED BY

A handwritten signature in black ink, appearing to read 'Simon Bennett'.

Simon Bennett
Authorised Signatory

DATED

30 October 2019

Document 75941015 Report 05 Issue 1

October 2019



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SECTION 1

REPORT INFORMATION



1.1 REPORT DETAILS

Manufacturer	Ericsson
Address	Torshamnsgatan 23 Kista SE-16480 Stockholm Sweden
Product Name & Product Number	Radio 2208 B48
Serial Number(s)	D827120517
Software Version	CXP9034711/2 Revision R1K
Hardware Version	R1B
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2018 FCC CFR 47 Part 90: 2018
Start of Test	09 October 2019
Finish of Test	14 October 2019
Name of Engineer(s)	Neil Rousell
Related Document(s)	KDB 971168 D01 v03r01 KDB 662911 D01 v02r01 ANSI C63.26-2015 ANSI/TIA-603-E-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 compliance with FCC CFR 47 Part 90. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

A handwritten signature in blue ink, appearing to read 'Neil Rousell', written over a horizontal line.

Neil Rousell



1.2 BRIEF SUMMARY OF RESULTS

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

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 90		
2.1	2.1046	90.1321 (a)	Output Power and Peak to Average Ratio	Pass
2.2	2.1049(h)	90.1323	Occupied Bandwidth	Pass
2.3	2.1051	90.1323	Band Edge	Pass
2.4	2.1051	90.1323	Transmitter Spurious Emissions	Pass
2.5	2.1055	90.213	Frequency Stability	Pass
2.6	2.1053	90.1323	Radiated Emissions	Pass

Measurement Uncertainty Decision Statement

Determination of conformity with the specification limits is based on the results of the compliance measurement and does not take into account measurement instrumentation uncertainty as defined in ANSI C63.26:2015 Clause 1.3.



1.3 CONFIGURATION DESCRIPTION

Configuration				Configuration A	Configuration B
Single carrier					
Bandwidth (MHz)	Bottom (MHz)	Middle (MHz)	Top (MHz)	Output power per port with Antenna 4x4 MIMO (dBm)	Output power per port without Antenna (dBm)
20	3660	3662.5	3665	23	36
2 Carriers - all cases except Band Edge					
Bandwidth (MHz)	Bottom (MHz)	Middle (MHz)	Top (MHz)	Output power per port with Antenna 4x4 MIMO (dBm)	Output power per port without Antenna (dBm)
20+5	-	3660 + 3672.5	-	23 + 17	36 + 30
2 Carriers - Band edge					
Bandwidth (MHz)	Bottom (MHz)	Middle (MHz)	Top (MHz)	Output power per port with Antenna 4x4 MIMO (dBm)	Output power per port without Antenna (dBm)
20+5	-	3660 + 3672.5	-	23 + 17	36 + 30
5+20	-	3652.5 + 3665	-	17 + 23	30 + 36

Testing on single carrier 5 MHz bandwidth, was conducted with the EUT operating in a 2-carrier configuration, 20 MHz + 5 MHz bandwidths. The single carrier 5 MHz configuration measurements were performed on the 5 MHz carrier only.

The 20 MHz bandwidth, single carrier was tested on B, M and T channels. The 20 MHz + 5 MHz or 5 MHz + 20 MHz configurations, could not be tested in B, M, T configurations, (3650 – 3675 MHz = 25 MHz bandwidth). Therefore, this configuration was detailed as M.



1.4 DECLARATION OF BUILD STATUS

MANUFACTURING DESCRIPTION	Remote Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	Radio 2208 B48
PRODUCT NUMBER	KRC 161 711/1
TRANSMITTER OPERATING RANGE	TX/RX: 3650 - 3675 MHz
MODULATIONS	LTE: QPSK, 16QAM, 64QAM, 256QAM
ITU DESIGNATION OF EMISSION	LTE: 5M00F9W, 20M0F9W
NUMBER OF CARRIERS	Maximum 2 carriers
SUPPORTED CHANNEL BANDWIDTH CONFIGURATION	LTE: 5MHz, 20MHz
MAX OUTPUT POWER (RMS) (W or dBm)	40.0dBm (5W) per port 36.0dBm (4W) for 20MHz and 30.0dBm (1W) for 5MHz per port
OUTPUT POWER TOLERANCE	+0.6/-2.0 dB
INSTANTANEOUS BANDWIDTH	60MHz
NUMBER OF ANTENNA PORTS	2 TX/RX ports
MIMO supported	2x2 and 4x4
Integrated Antenna name	Antenna 6550
Integrated Antenna product number	KRE 101 2251/2
Integrated Antenna Gain	11.5 ± 0.5dBi
FCC ID	TA8AKRC161711-1
Power source	36V DC
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Remote Radio Part of TDD LTE Base Station.

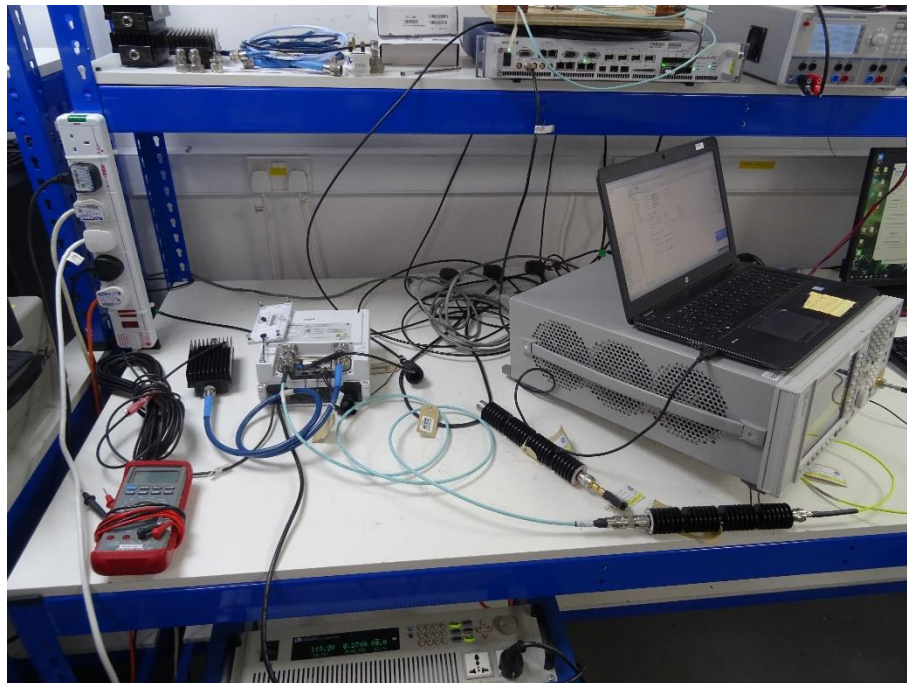
No responsibility will be accepted by TÜV SÜD UK Limited as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) KRC 161 711/1 is an Ericsson AB Radio Unit working in the public mobile service 3650-3675 MHz band which provides communication connections to 3650-3675 MHz network. The KRC 161 711/1 operates from a -48V DC or a 120V AC power supply.

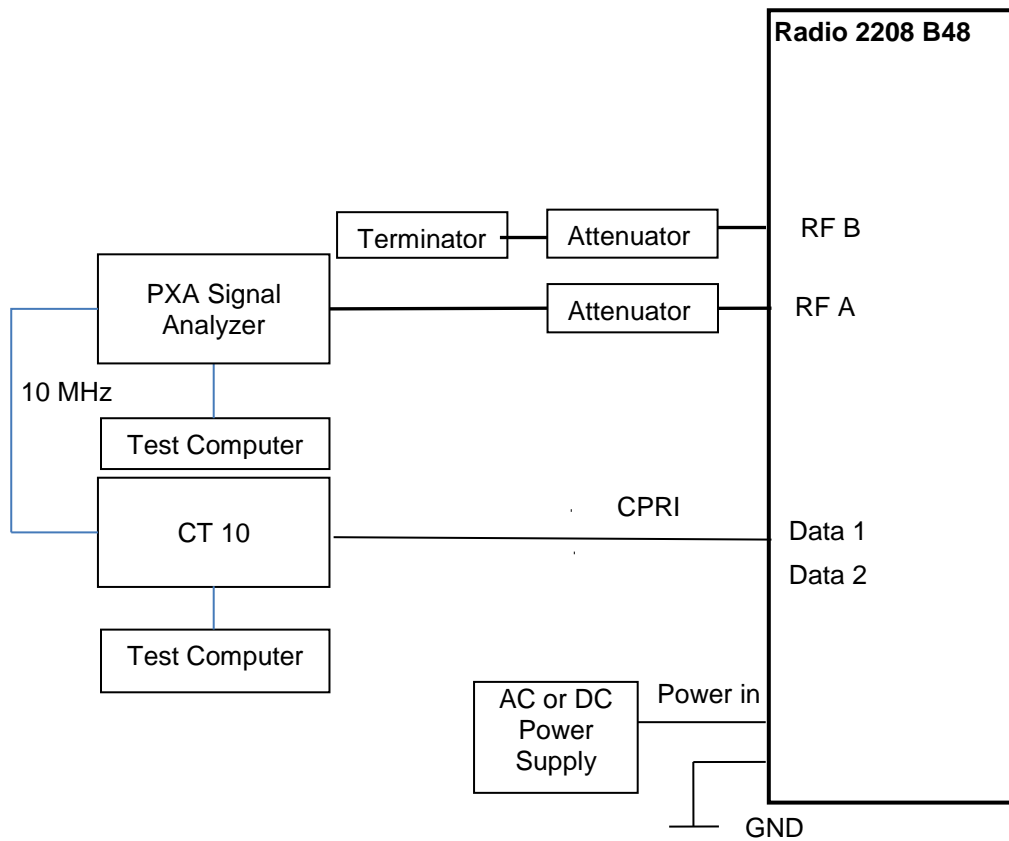
The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



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 120V, 60Hz AC supply.

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

1.8 DEVIATION FROM THE STANDARD

FCC Part 90.1321(a) states that “Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any 1 MHz slice of spectrum.” Testing detailed in this report was performed using an average (RMS) detector, as there is a frequency overlap with FCC Part 90.41(e)(3)(iii), which allows for either peak or average measurements.

No other 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.

1.10 ADDITIONAL INFORMATION

Initial pre-testing was carried out to determine the worst case modulation scheme by measuring the output power from QPSK, 16QAM, 64QAM and 256QAM on the middle channel of both antenna ports. From these tests, it was determined that 64QAM on antenna port A was the worst case and was used for all testing.



SECTION 2

TEST DETAILS



2.1 AVERAGE OUTPUT POWER AND PEAK TO AVERAGE RATIO

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 90, Clause 90.1321(a)

2.1.2 Date of Test and Modification State

14 October 2019 - 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	22.1°C
Relative Humidity	51.3%

2.1.5 Test Method

Measurements were performed with a Spectrum Analyser using the Band Power measurement function. The detector was set to RMS with an RBW of at least 1 % of the carrier bandwidth and a VBW of at least 3 times the RBW. The integration bandwidth was configured to be 25 MHz as defined in 90.1321(a). Measurements were performed in accordance with ANSI C63.26 Clause 5.2.4.4.1.

For PSD measurements in a 1 MHz bandwidth, measurements were made in accordance with ANSI C63.26 Clause 5.7.2(a). A resolution bandwidth of at least 1 % of the emission bandwidth was chosen in conjunction with an Integration Bandwidth of 1 MHz. An RMS detector was used with a single slow sweep utilised. The highest PSD was established over the entire emission bandwidth and the result recorded.

The measured results were summed in accordance with FCC KDB 662911 to account for 2 port MIMO operation.

CCDF measurements were carried out in accordance with ANSI C63.26 Clause 5.2.3.4.

2.1.6 Test Results

Configuration A

Maximum Output Power 20 MHz, 23 dBm and 5 MHz, 17.00 dBm

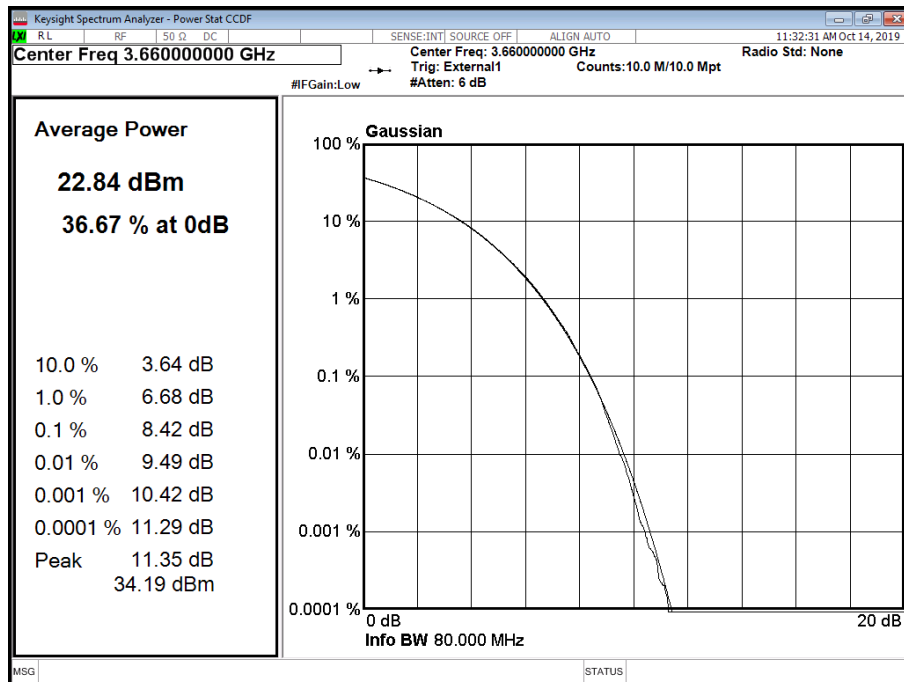


Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power / EIRP							
			PAR (dB)	Channel Position B						
				Average Power						
			dBm	dBm / MHz	EIRP/MHz		dBm / 25MHz	EIRP/25MHz		
			dBm	W	dBm	W	dBm	W		
A	64QAM	5.0	*	16.95	10.38	22.38	0.17	-	-	-
MIMO 2 x 2 (+3dB)			-	-	-	25.38	0.35	-	-	-
MIMO 4 x 4 (+6dB)			-	-	-	28.38	0.69	-	-	-
A	64QAM	20.0	8.42	22.87	10.47	22.47	0.18	22.91	34.91	3.10
MIMO 2 x 2 (+3dB)			-	-	-	25.47	0.35	-	37.91	6.18
MIMO 4 x 4 (+6dB)			-	-	-	28.47	0.70	-	40.91	12.33

Remarks

* Not possible to measure the PAR of the 5 MHz carrier in a 2 carrier configuration.
Antenna gain 12 dBi.

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B





Configuration A

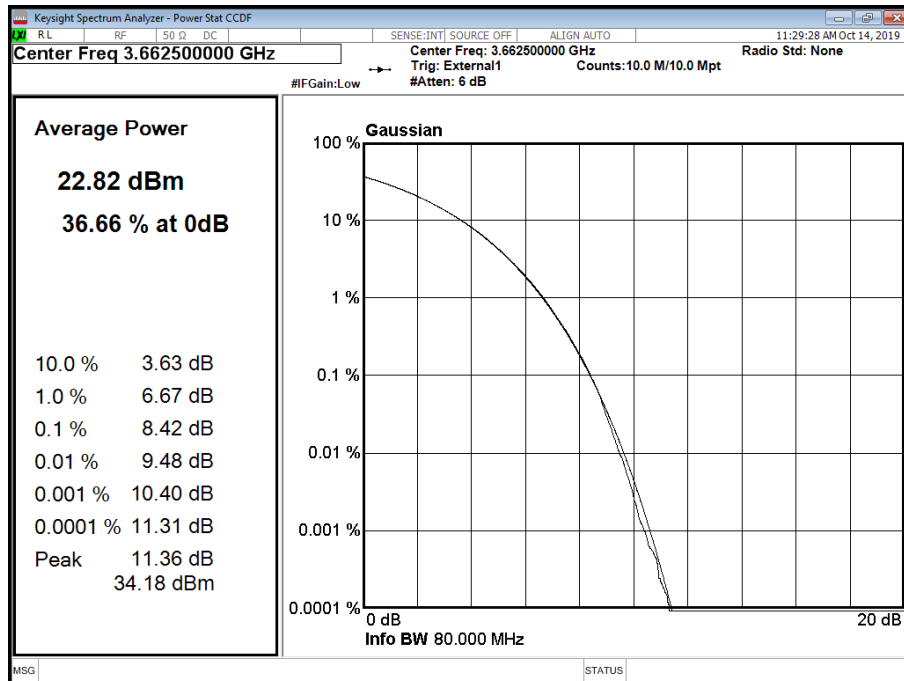
Maximum Output Power 23.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power / EIRP							
			Channel Position M							
			PAR (dB)	Average Power						
				dBm	dBm/M Hz	EIRP/MHz		dBm / 25MHz	EIRP/25MHz	
dBm	W	dBm	W							
A	64QAM	20.0	8.42	22.83	10.40	22.40	0.17	22.85	34.85	3.05
MIMO 2 x 2 (+3dB)			-	-	-	25.40	0.35	-	37.85	6.10
MIMO 4 x 4 (+6dB)			-	-	-	28.40	0.69	-	40.85	12.16

Remarks

Antenna gain 12 dBi.

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M





Configuration A

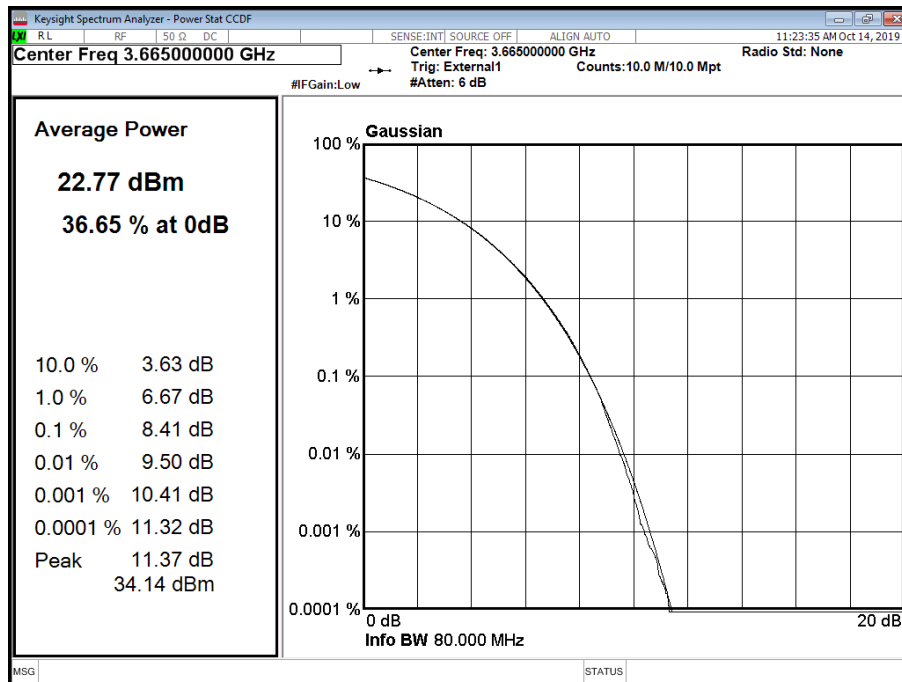
Maximum Output Power 20 MHz, 23 dBm and 5 MHz, 17.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power / EIRP							
			PAR (dB)	Channel Position T						
				Average Power				EIRP/25MHz		
				dBm	dBm / MHz	dBm	W	dBm / 25MHz	dBm	W
A	64QAM	5.0	*	17.28	10.68	22.68	0.19	-	-	-
	MIMO 2 x 2 (+3dB)		-	-	-	25.68	0.37	-	-	-
	MIMO 4 x 4 (+6dB)		-	-	-	28.68	0.74	-	-	-
A	64QAM	20.0	8.41	22.84	10.37	22.37	0.17	22.83	34.83	3.04
	MIMO 2 x 2 (+3dB)		-	-	-	25.37	0.34	-	37.83	6.07
	MIMO 4 x 4 (+6dB)		-	-	-	28.37	0.69	-	40.83	12.11

Remarks

* Not possible to measure the PAR of the 5 MHz carrier in a 2 carrier configuration. Antenna gain 12 dBi.

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T





Configuration A

Maximum Output Power 20 MHz, 23.00 dBm + 5 MHz, 17.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power / EIRP								
			PAR (dB)	Channel Position M							
				Average Power				EIRP/25MHz			
				dBm	dBm / MHz	EIRP/MHz dBm	W	dBm / 25MHz	EIRP/25MHz dBm	W	
A	64QAM	5.0 + 20.0	-	23.79	10.43	22.43	0.17	23.81	35.81	3.81	
MIMO 2 x 2 (+3dB)			-	-	-	25.43	0.35	-	38.81	7.60	
MIMO 4 x 4 (+6dB)			-	-	-	28.43	0.70	-	41.81	15.17	
A	64QAM	20.0 + 5.0	-	23.78	10.61	22.61	0.18	23.80	35.80	3.80	
MIMO 2 x 2 (+3dB)			-	-	-	25.61	0.36	-	38.80	7.59	
MIMO 4 x 4 (+6dB)			-	-	-	28.61	0.73	-	41.80	15.14	

Remarks

Antenna gain 12 dBi.



Configuration B

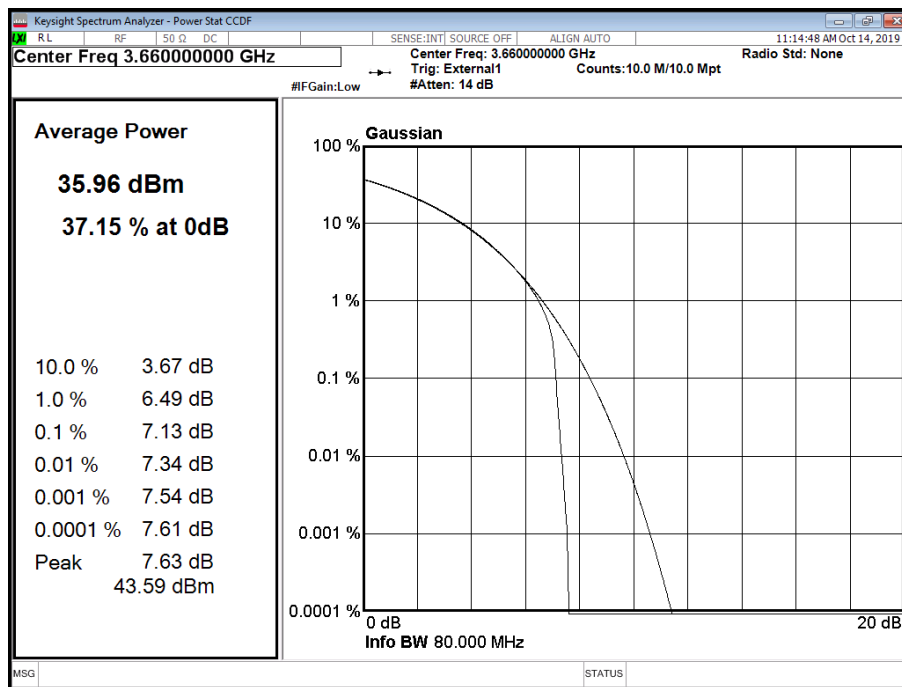
Maximum Output Power 20 MHz, 36.00 dBm, 5 MHz, 30.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power							
			Channel Position B							
			PAR (dB)	Average Power						
				dBm	dBm / MHz	/MHz		dBm / 25MHz	/25MHz	
					W			W		
A	64QAM	5.0	*	29.96	23.38	23.38	0.22	-	-	-
MIMO 2 x 2 (+3dB)			-	-	-	26.38	0.43	-	-	-
MIMO 4 x 4 (+6dB)			-	-	-	29.38	0.87	-	-	-
A	64QAM	20.0	7.13	36.09	23.65	23.65	0.23	36.08	36.08	4.06
MIMO 2 x 2 (+3dB)			-	-	-	26.65	0.46	-	39.08	8.09
MIMO 4 x 4 (+6dB)			-	-	-	29.65	0.92	-	42.08	16.14

Remarks

* Not possible to measure the PAR of the 5 MHz carrier in a 2 carrier configuration.

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



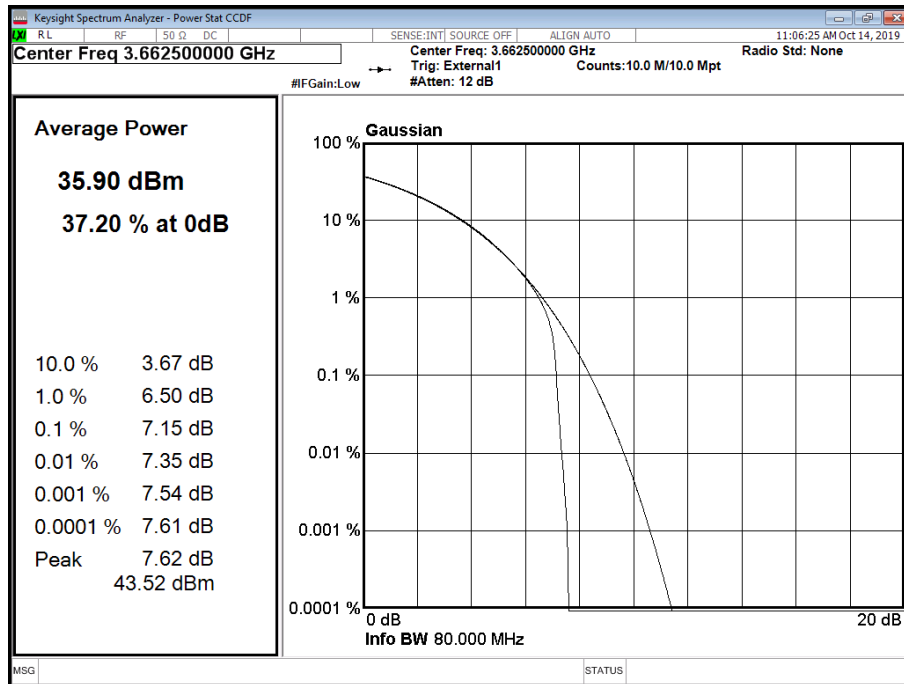


Configuration B

Maximum Output Power 36.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power							
			Channel Position M							
			PAR (dB)	Average Power						
				dBm	dBm / MHz	/MHz		dBm / 25MHz	/25MHz	
dBm	W	dBm	W							
A	64QAM	20.0	7.15	35.96	23.55	0.23	35.95	35.95	3.94	
MIMO 2 x 2 (+3dB)			-	-	-	26.55	0.45	-	38.95	7.85
MIMO 4 x 4 (+6dB)			-	-	-	29.55	0.90	-	41.95	15.67

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M





Configuration B

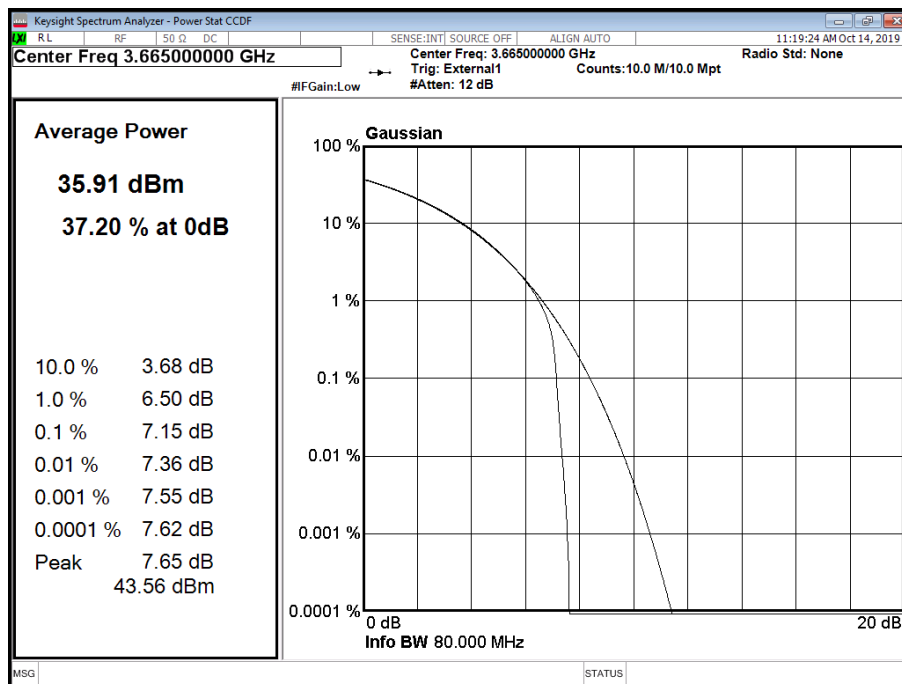
Maximum Output Power 20 MHz, 36.00 dBm, 5 MHz, 30.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power							
			Channel Position T							
			PAR (dB)	Average Power						
				dBm	dBm / MHz	/MHz		dBm / 25MHz	/25MHz	
dBm	W	dBm	W							
A	64QAM	5.0	*	30.29	23.73	23.73	0.24	-	-	-
MIMO 2 x 2 (+3dB)			-	-	-	26.73	0.47	-	-	-
MIMO 4 x 4 (+6dB)			-	-	-	29.73	0.94	-	-	-
A	64QAM	20.0	7.15	36.00	23.65	23.65	0.23	35.97	35.97	3.95
MIMO 2 x 2 (+3dB)			-	-	-	26.65	0.46	-	38.97	7.89
MIMO 4 x 4 (+6dB)			-	-	-	29.65	0.92	-	41.97	15.74

Remarks

* Not possible to measure the PAR of the 5 MHz carrier in a 2 carrier configuration.

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T





Configuration B

Maximum Output Power 20 MHz, 36.00 dBm + 5 MHz, 30.00 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Peak to Average Ratio (PAR) / Output Power									
			PAR (dB)	Channel Position M								
				Average Power						dBm / 25MHz	/25MHz	
				dBm	dBm / MHz	/MHz		dBm	W			
				dBm	W			dBm	W			
A	64QAM	5.0 + 20.0	-	37.03	23.72	23.72	0.24	37.03	37.03	5.05		
MIMO 2 x 2 (+3dB)			-	-	-	26.72	0.47	-	40.03	10.07		
MIMO 4 x 4 (+6dB)			-	-	-	29.72	0.94	-	43.03	20.09		
A	64QAM	20.0 + 5.0	-	36.92	23.81	23.81	0.24	36.90	36.90	4.90		
MIMO 2 x 2 (+3dB)			-	-	-	26.81	0.48	-	39.90	9.77		
MIMO 4 x 4 (+6dB)			-	-	-	29.81	0.96	-	42.90	19.50		

Limit	
EIRP	≤25 W / 25 MHz, Peak EIRP ≤ 1 W / MHz



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049(h)
 FCC CFR 47 Part 90, Clause 90.1323

2.2.2 Date of Test and Modification State

08 October 2019 - 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 23.3°C
 Relative Humidity 48.6%

2.2.5 Test Method

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

2.2.6 Test Results

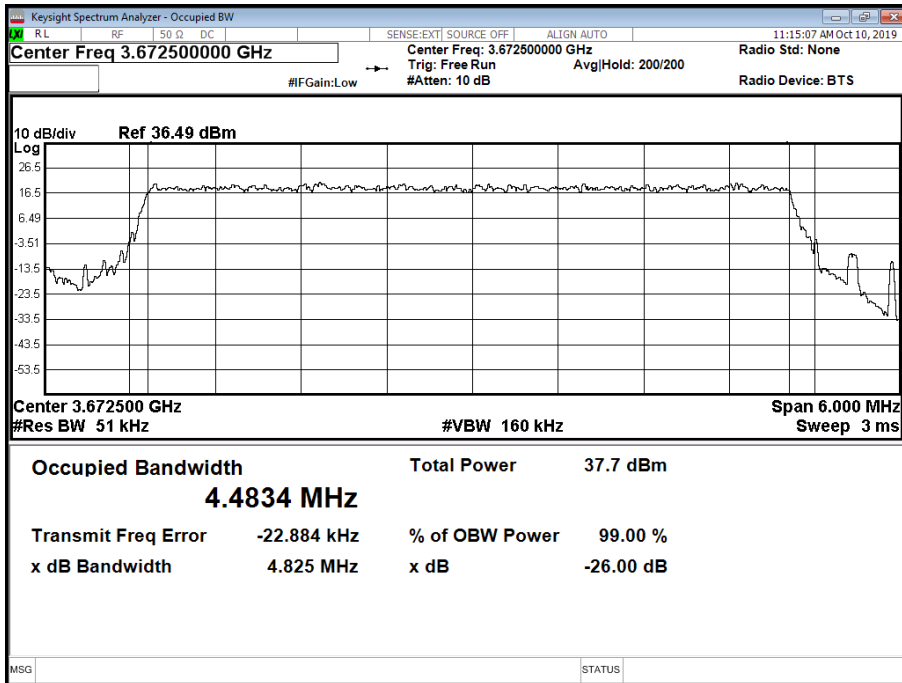
Configuration B

Maximum Output Power 20MHz 36.00 dBm, 5 MHz 36.00 dBm + 30.00 dBm

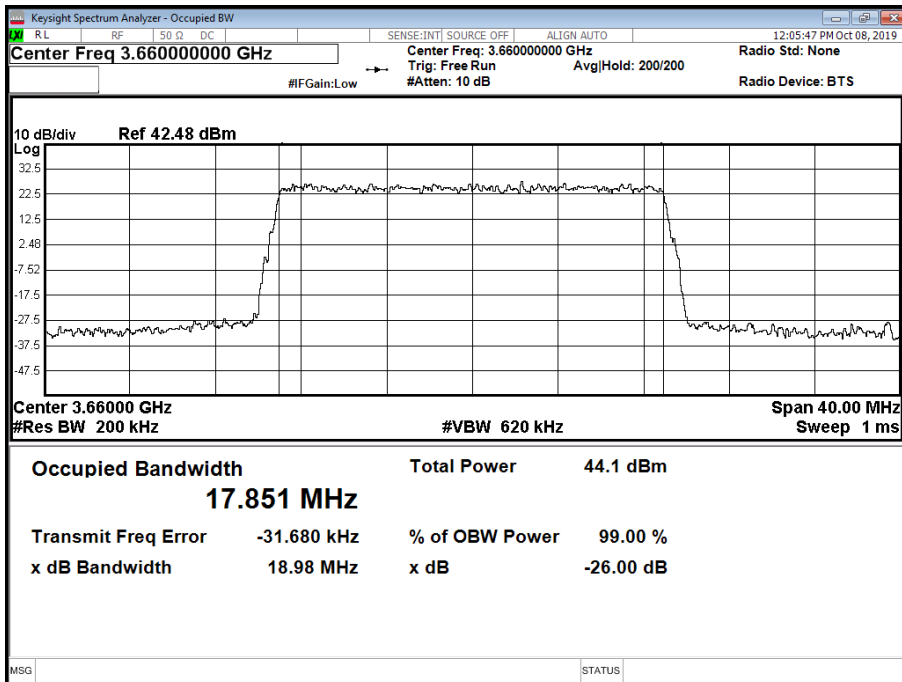
Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	64QAM	5.0	-	-	4.48	4.83	-	-
A	64QAM	20.0	17.85122	18.97931	17.87371	19.05650	17.92406	18.90256



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

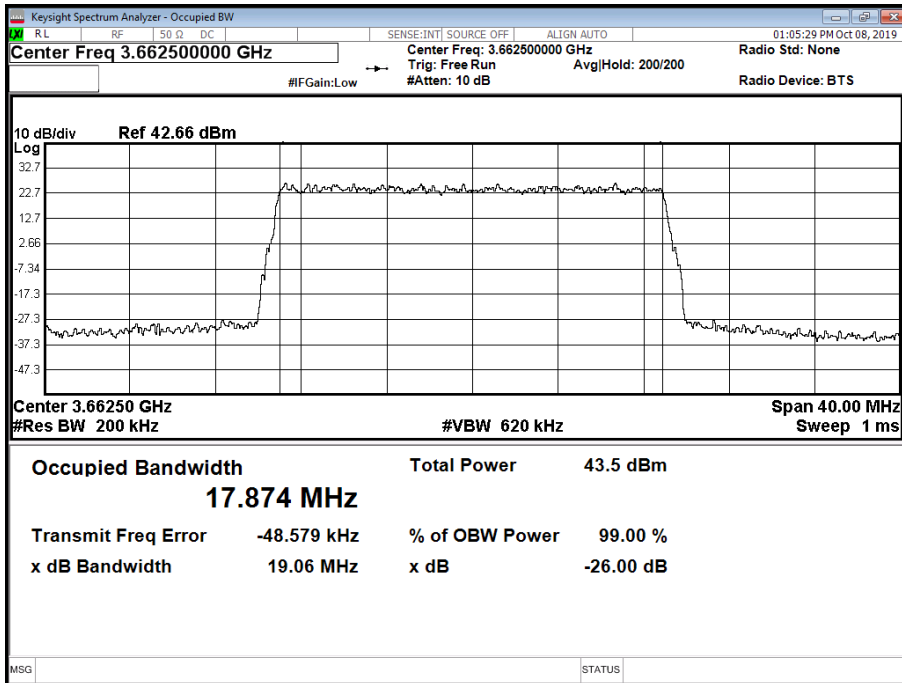


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B

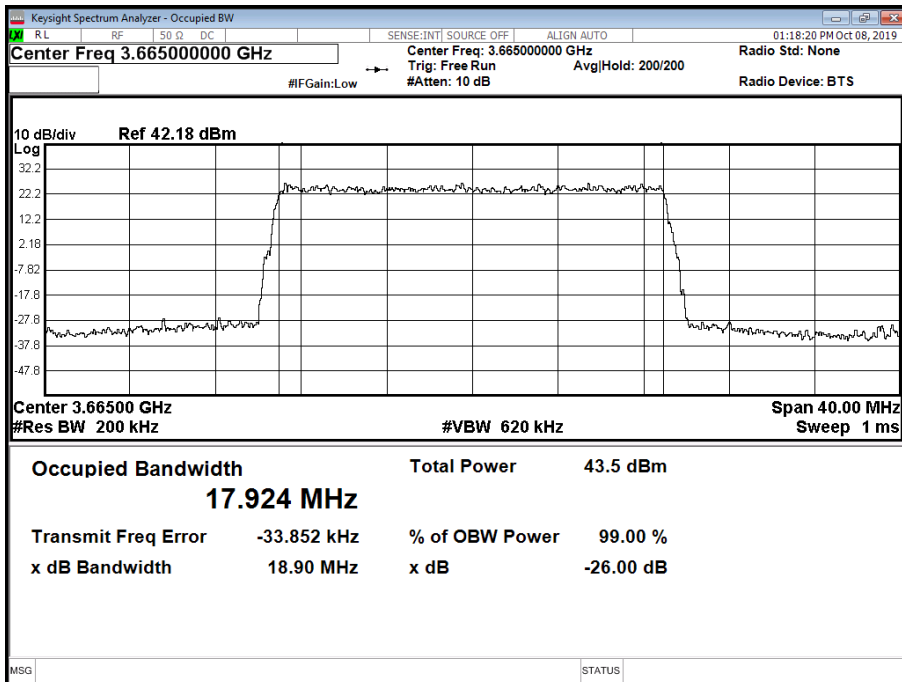




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T





2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90, Clause 90.1323

2.3.2 Date of Test and Modification State

10 October 2019 - 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 21.7°C
Relative Humidity 40%

2.3.5 Test Method

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

Each antenna port has been declared as being equivalent, therefore measurements were made on one antenna port only. To account for this, the limit was tightened by $10 * \text{Log}(N)$, where N is equal to the number of MIMO antenna ports.

The limit was calculated as being $-13 \text{ dBm} - 10 * \text{Log}(4) = -19 \text{ dBm}$.

2.3.6 Test Results

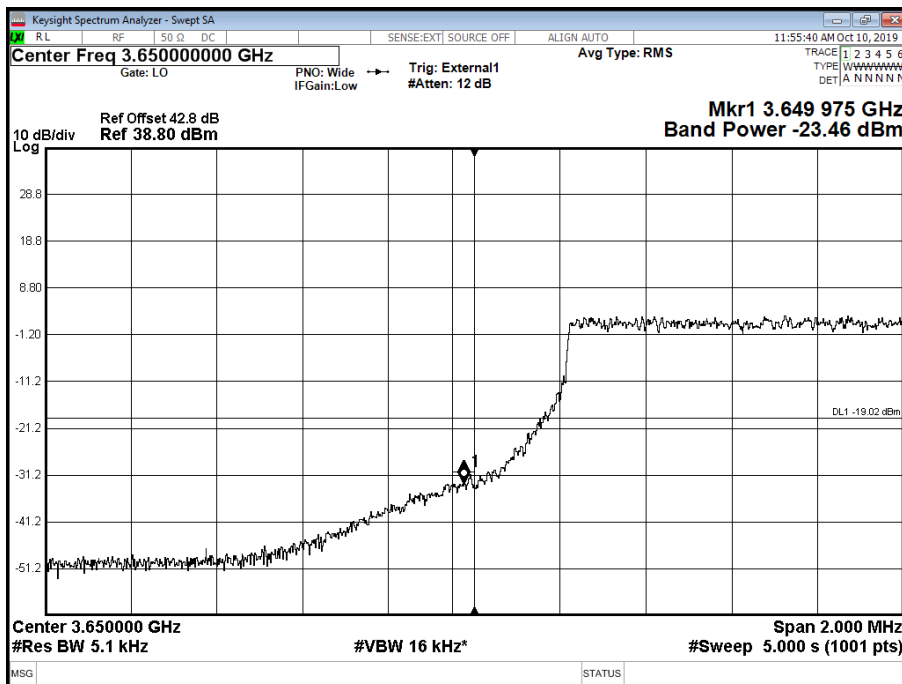
Configuration B

Maximum Output Power 36.00 dBm

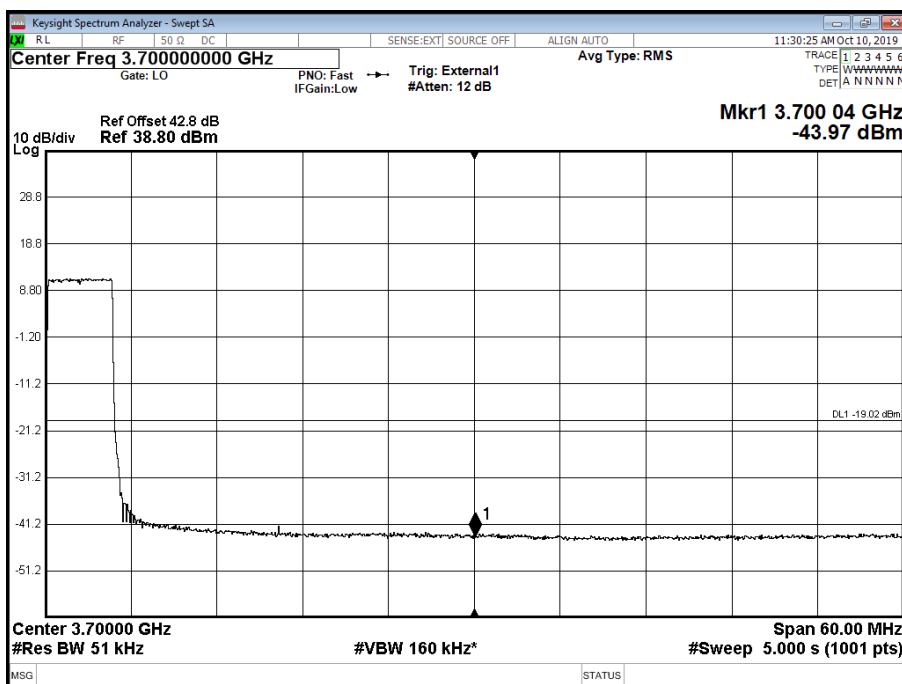
Antenna	LTE Modulation	LTE Carrier Bandwidth (MHz)	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	64QAM	5.0	3,652.5	3,672.5
A	64QAM	20.0	3,660.0	3,665.0



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz + 20 MHz - Channel Position B

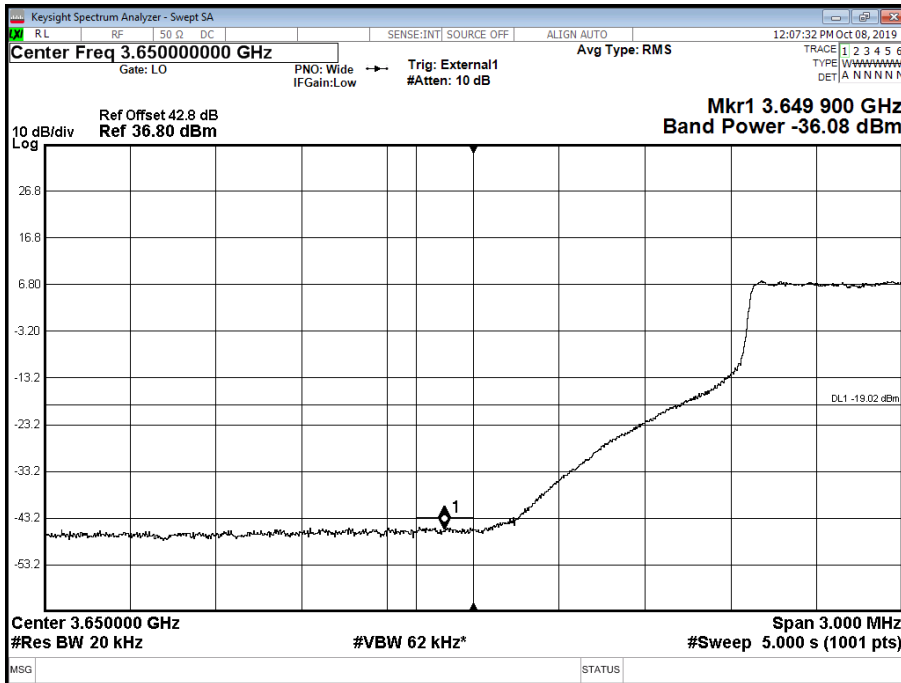


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20 MHz + 5.0 MHz - Channel Position T

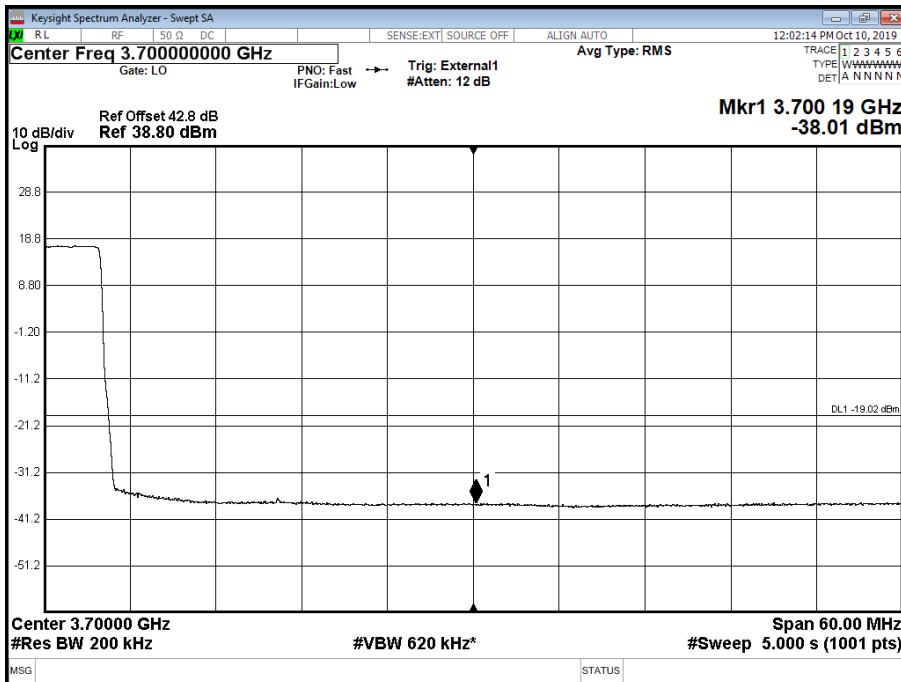




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



Limit	-19 dBm
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2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90, Clause 90.1323

2.4.2 Date of Test and Modification State

08 October 2019 - 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	23.3°C
Relative Humidity	48.6%

2.4.5 Test Method

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

Each antenna port has been declared as being equivalent, therefore measurements were made on one antenna port only. To account for this, the limit was tightened by $10 * \text{Log}(N)$, where N is equal to the number of MIMO antenna ports.

The limit was calculated as being $-13 \text{ dBm} - 10 * \text{Log}(4) = -19 \text{ dBm}$.

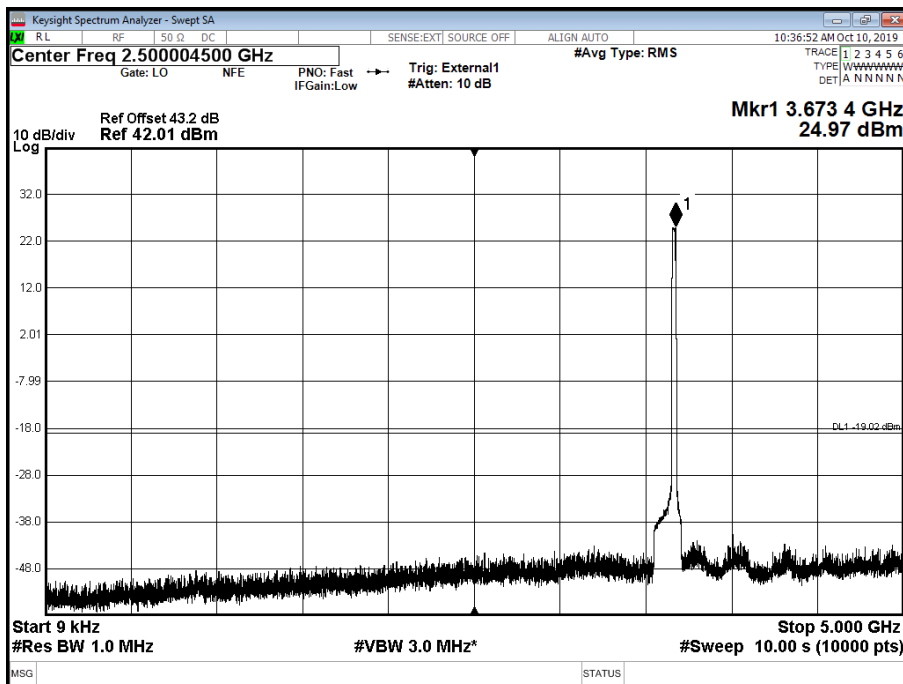
2.4.6 Test Results

Configuration B

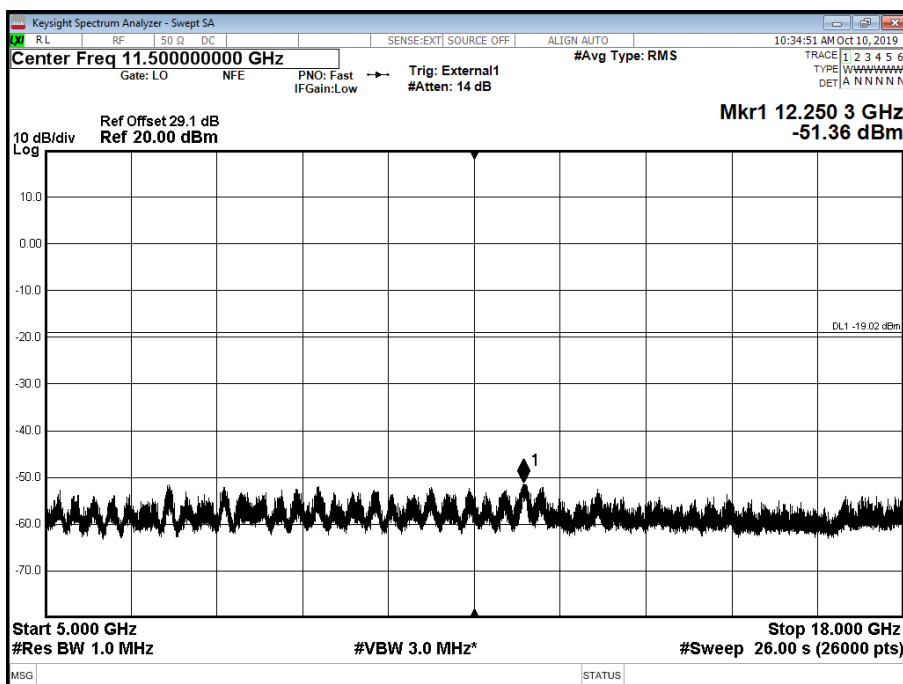
Maximum Output Power 20 MHz, 36.00 dBm and 5 MHz, 30 dBm



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20 MHz + 5.0 MHz - Channel Position M - Range 0.009 to 5000 MHz

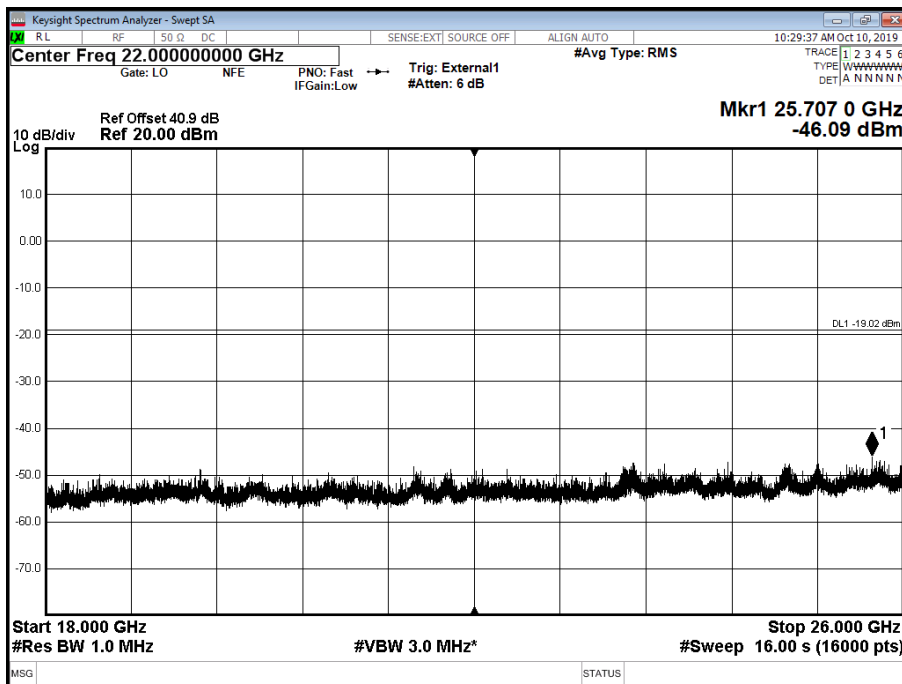


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20 MHz + 5.0 MHz - Channel Position M - Range 5000 to 18000 MHz

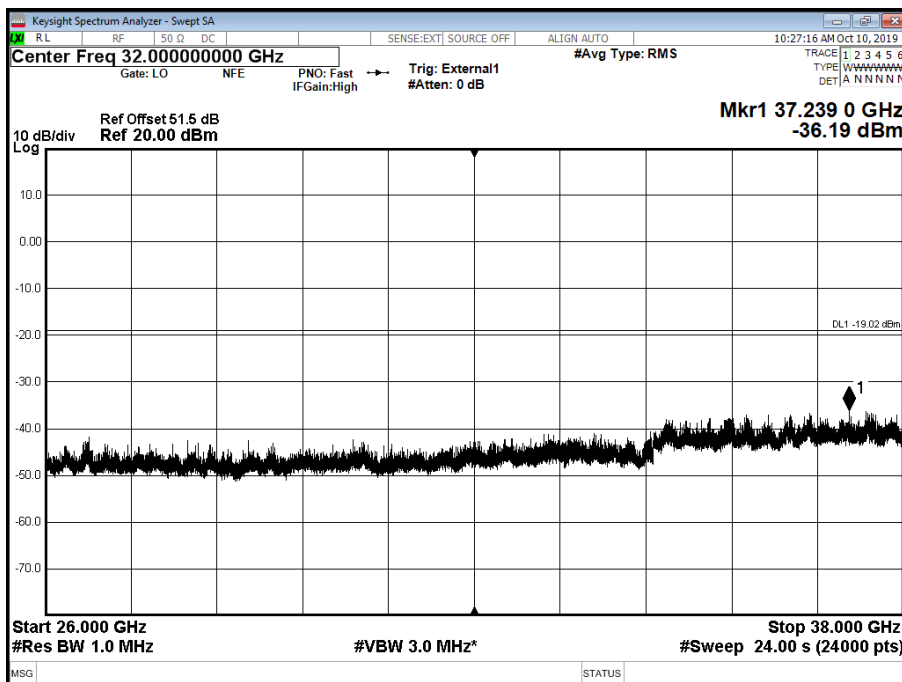




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20 MHz + 5.0 MHz - Channel Position M - Range 18000 to 26000 MHz

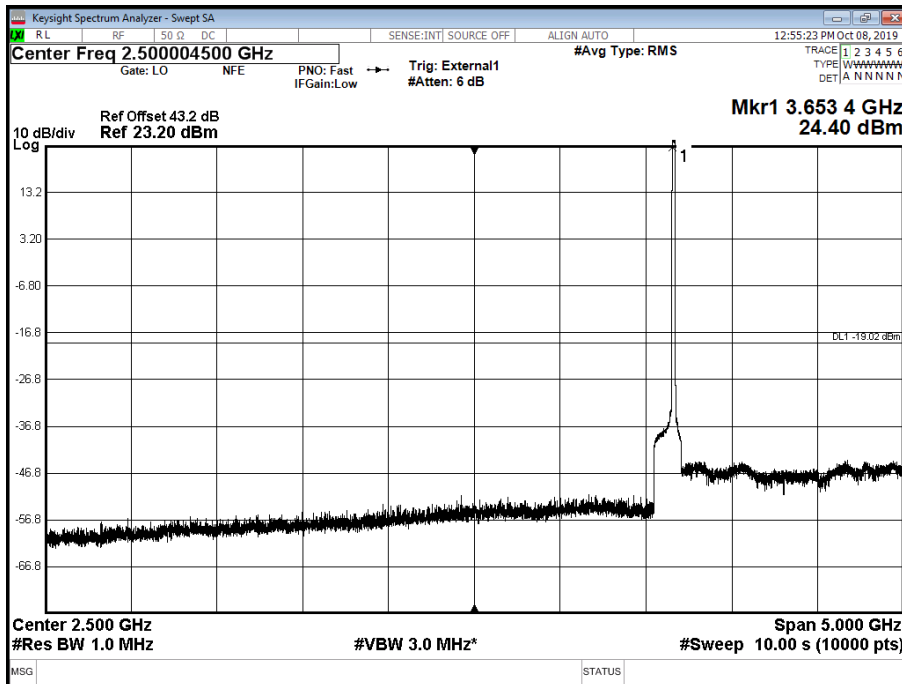


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20 MHz + 5.0 MHz - Channel Position M - Range 26000 to 38000 MHz

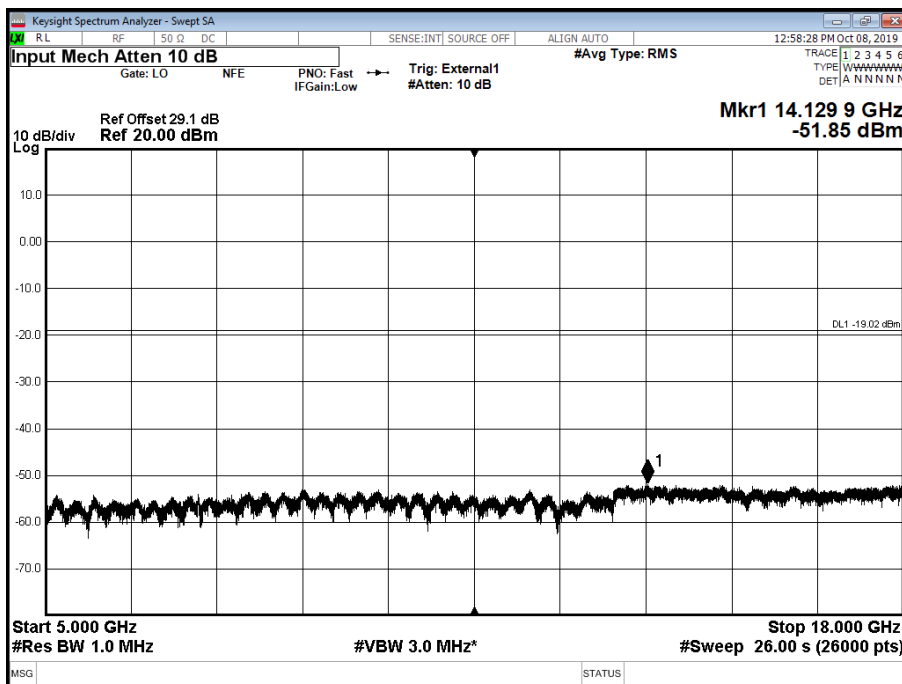




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Range 0.009 to 5000 MHz

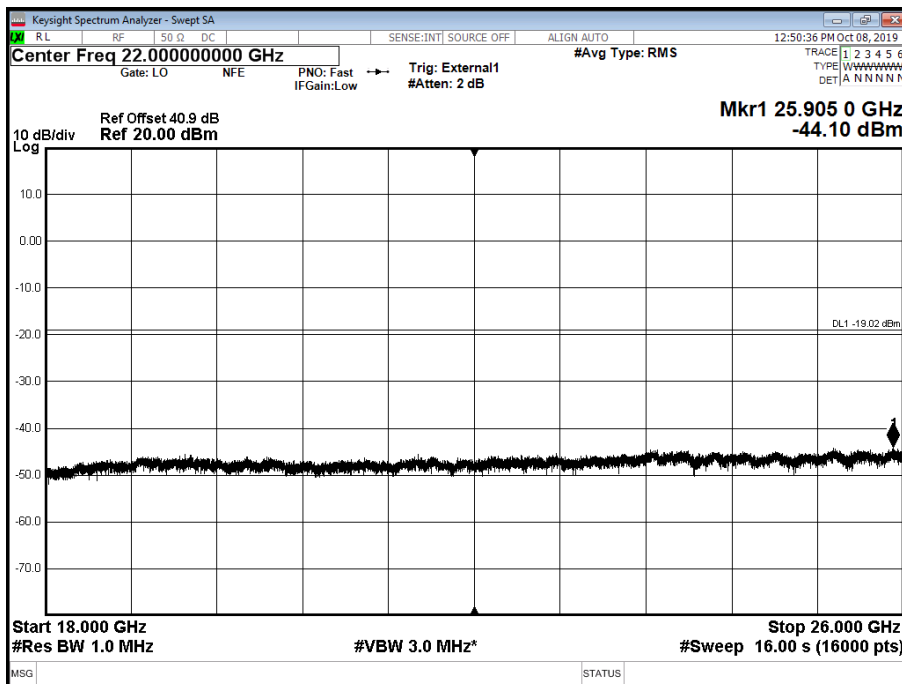


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Range 5000 to 18000 MHz

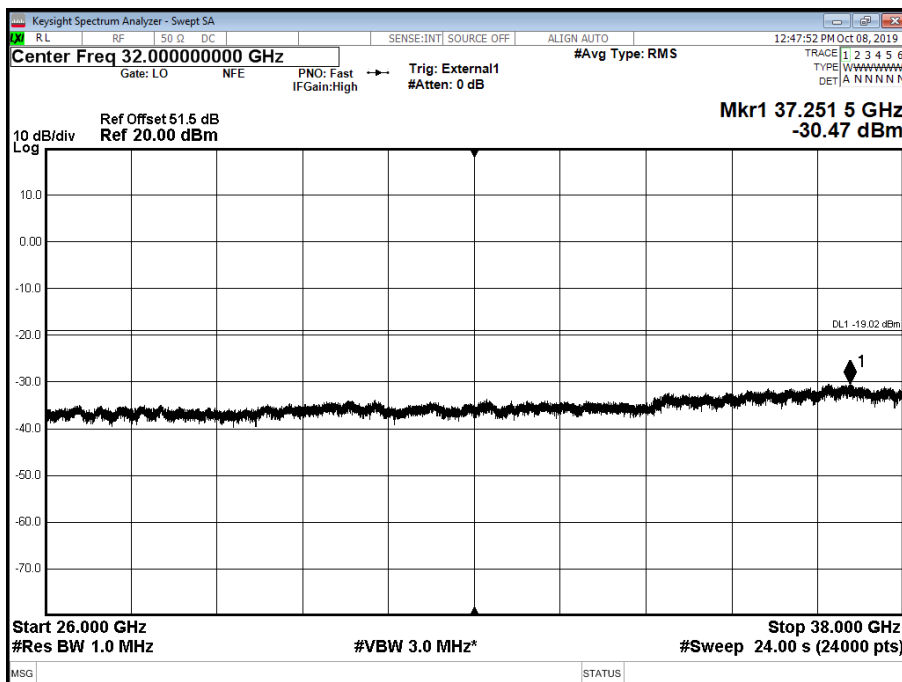




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Range 18000 to 26000 MHz

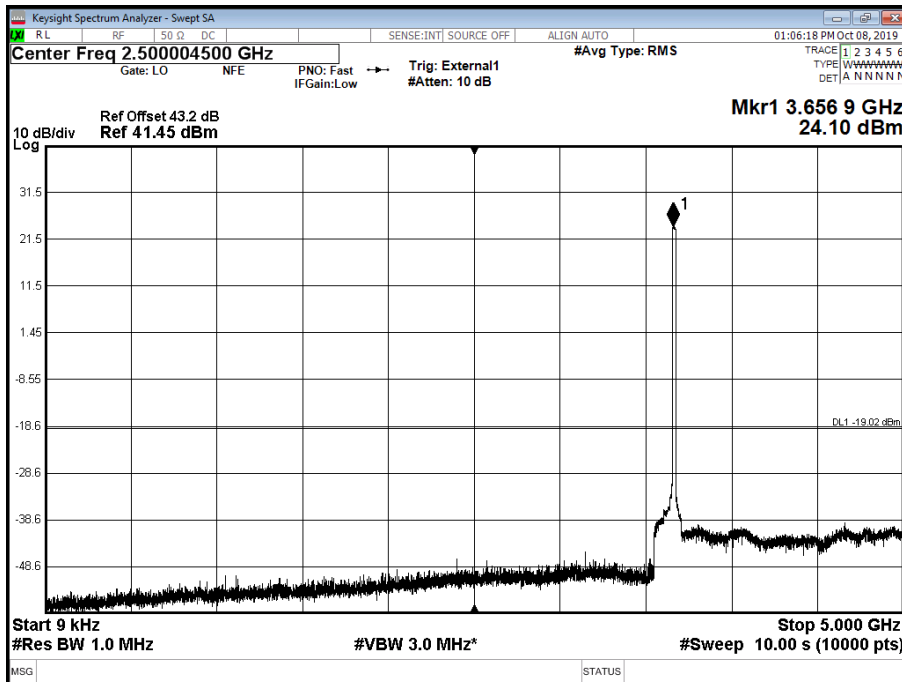


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Range 26000 to 38000 MHz

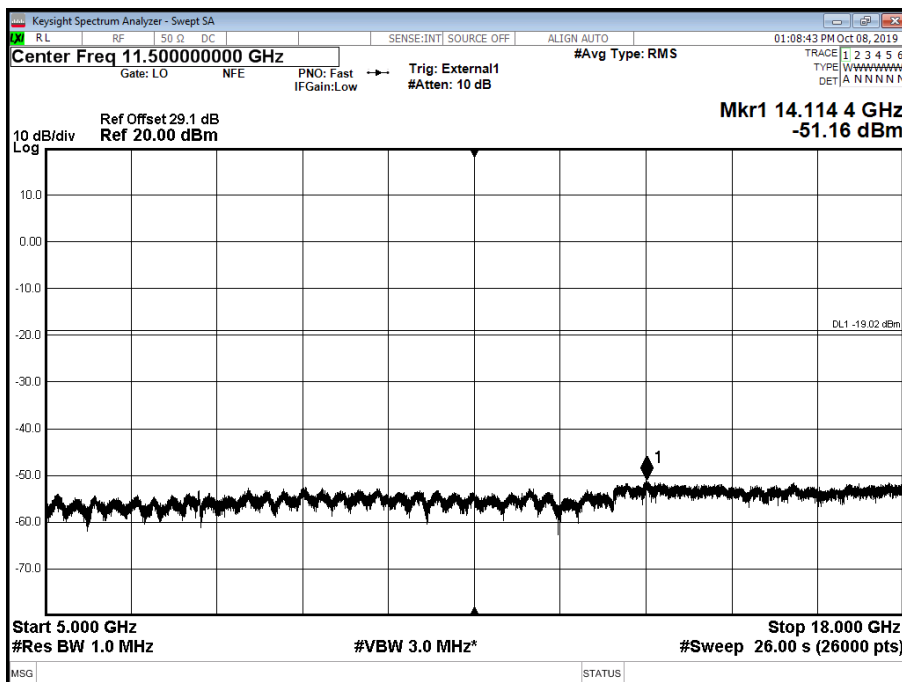




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Range 0.009 to 5000 MHz

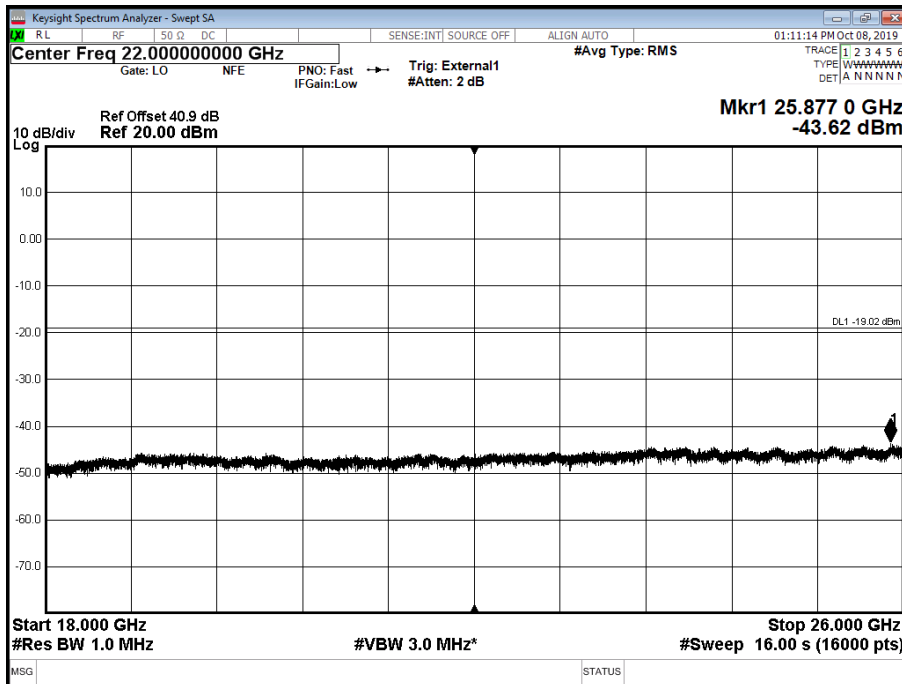


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Range 5000 to 18000 MHz

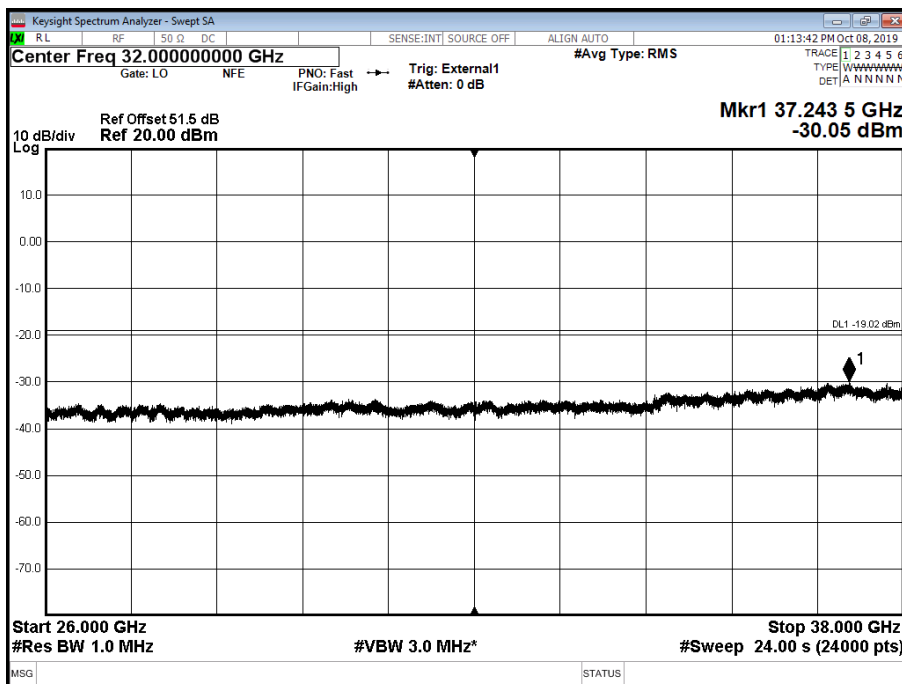




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Range 18000 to 26000 MHz

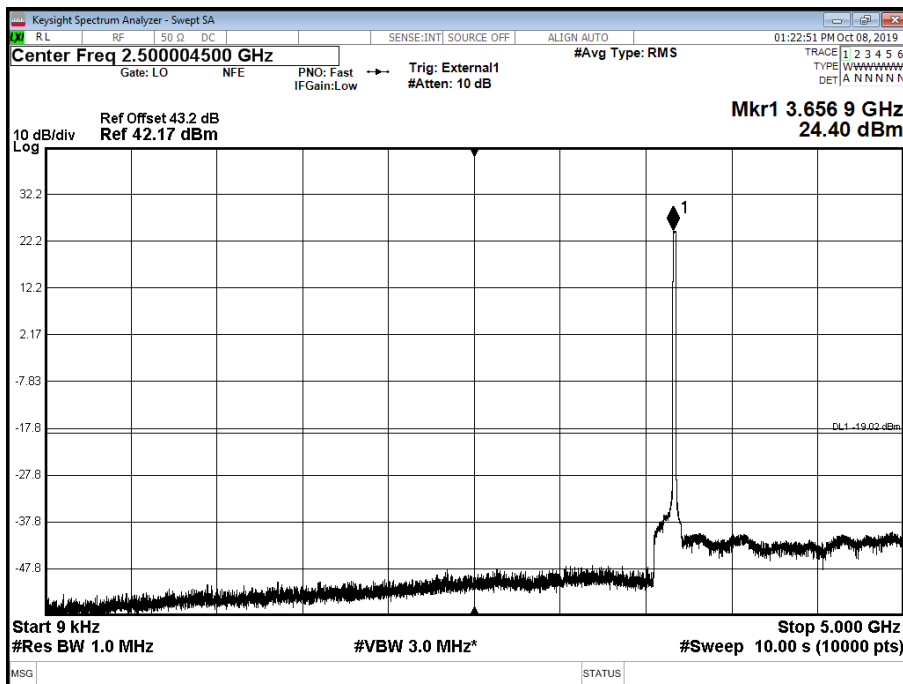


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Range 26000 to 38000 MHz

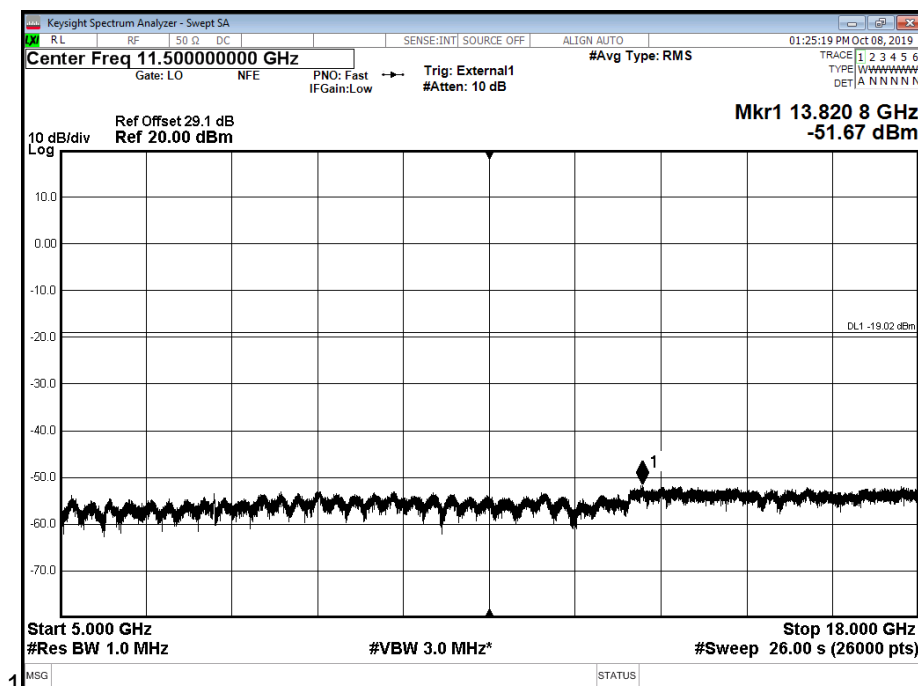




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Range 0.009 to 5000 MHz

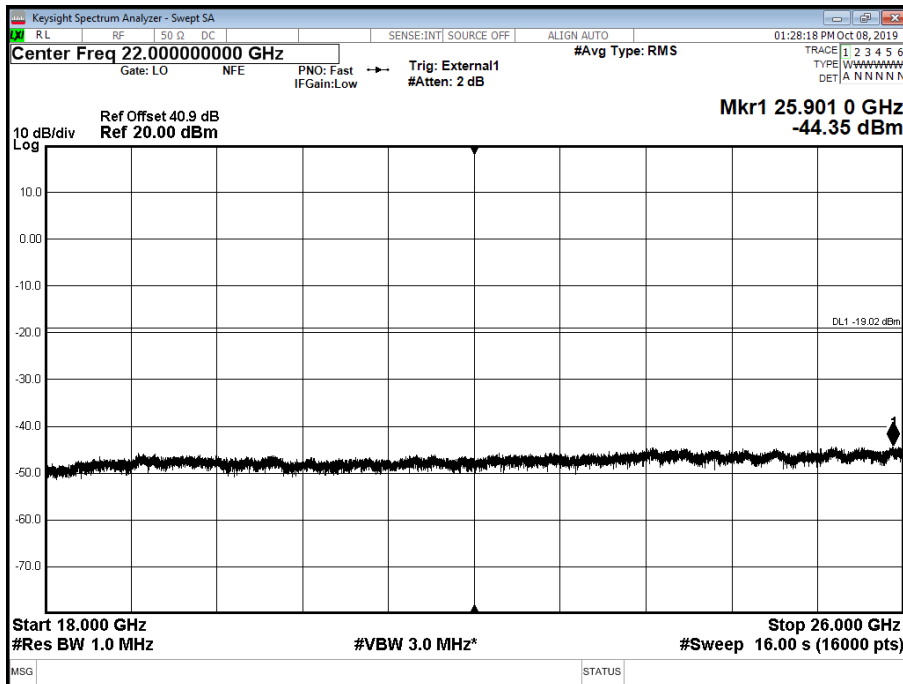


Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Range 5000 to 18000 MHz

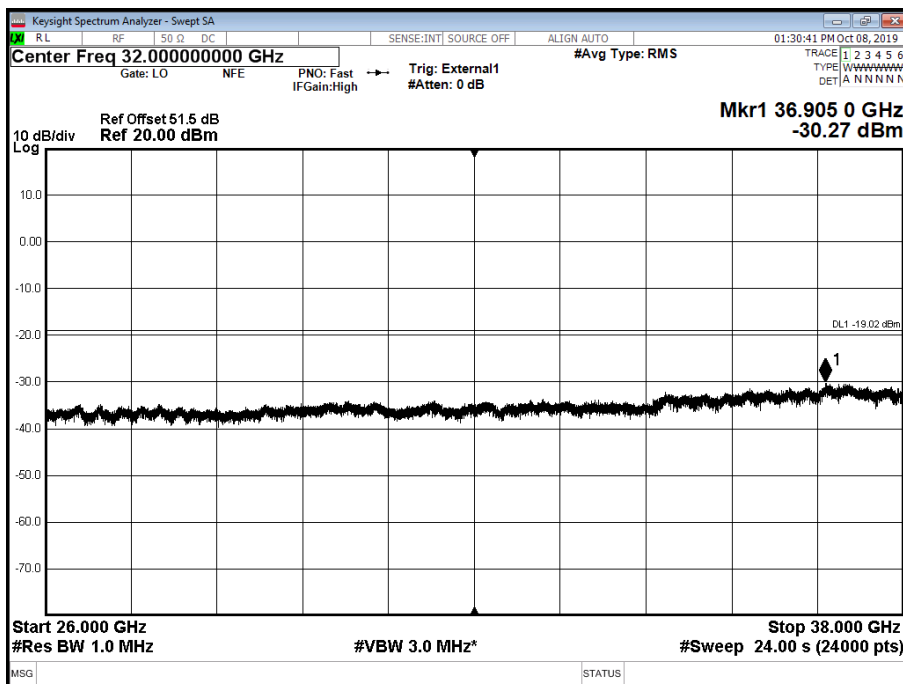




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Range 18000 to 26000 MHz



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Range 26000 to 38000 MHz



Limit	-19dBm
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2.5 FREQUENCY STABILITY

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
 FCC CFR 47 Part 90, Clause 90.213

2.5.2 Date of Test and Modification State

11 October 2019 - 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 22.6°C
 Relative Humidity 49.7%

2.5.5 Test Method

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

2.5.6 Test Results

Configuration B

Maximum Output Power 36.00 dBm

Temperature	Voltage	Frequency Error (Hz)
		Channel Position M
-30°C	120.0 V AC 60 Hz	9.92
-20°C	120.0 V AC 60 Hz	10.88
-10°C	120.0 V AC 60 Hz	15.90
0°C	120.0 V AC 60 Hz	10.13
+10°C	120.0 V AC 60 Hz	7.42
+20°C	102.0 V AC 60 Hz	10.50
+20°C	120.0 V AC 60 Hz	8.03
+20°C	138.0 V AC 60 Hz	11.79
+30°C	120.0 V AC 60 Hz	9.14
+40°C	120.0 V AC 60 Hz	13.21
+50°C	120.0 V AC 60 Hz	10.13

Remarks

Single carrier, 64QAM, bandwidth 20MHz



Limit

Limit	90.213 Note 10: Except for DSRCS equipment in the 5850–5925 MHz band, frequency stability is to be specified in the station authorization. In the absence of test limits, the Frequency Stability has been tested and recorded in accordance with 2.1055.
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2.6 RADIATED EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 90, Clause 90.1323

2.6.2 Date of Test and Modification State

10 October 2019 - 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	19.9°C
Relative Humidity	58.4%

2.6.5 Test Method

The test was applied in accordance with test method requirements of ANSI C63.26-2015/TIA-603-E-2016.

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 Polarizations.

The Applicant declared that the highest internally generated frequency would be up to 4000MHz and so the upper limit for measurement was calculated at 10 times this, which is 40GHz.

Emissions identified within the range 30MHz – 40GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 40GHz, measurements were performed with a resolution bandwidth of 1MHz.

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



Determination of Spurious Emission Limit

The limits given in the standard are converted from EIRP to field strength using equation c) in ANSI C63.26 clause 5.2.7

$EIRP[dBm] + 95.2 = E[dB\mu V/m]$, for measurement distance (d) = 3 m.

For example

$-40[dBm] + 95.2 = 55.2[dB\mu V/m]$, measurement distance (d) = 3m

The limits which are displayed in the plots are for ERP which is 2.15dB higher than stated above for EIRP. When assessing the plots for compliance, the limit needs to be reduced accordingly.

When testing in-band the most stringent limit was applied.

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

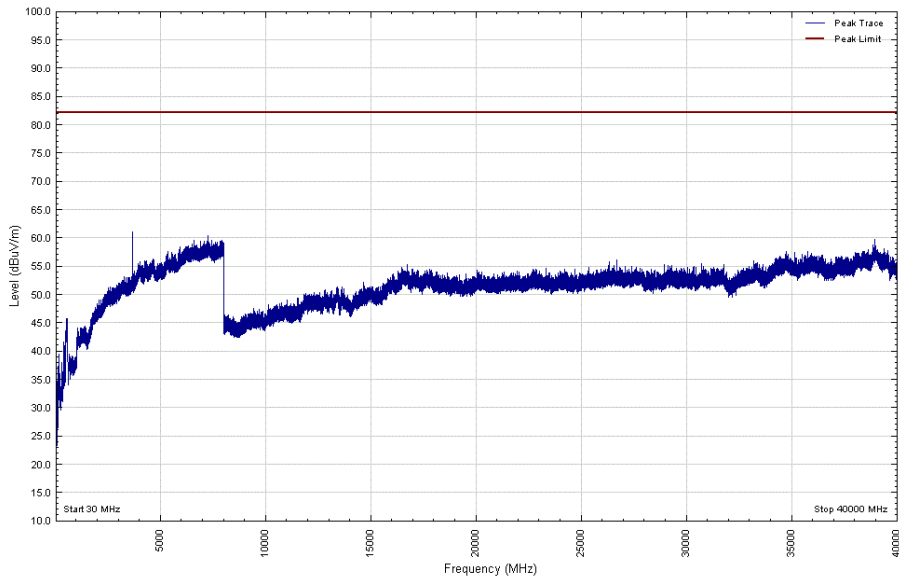
2.6.6 Test Results

Configuration A

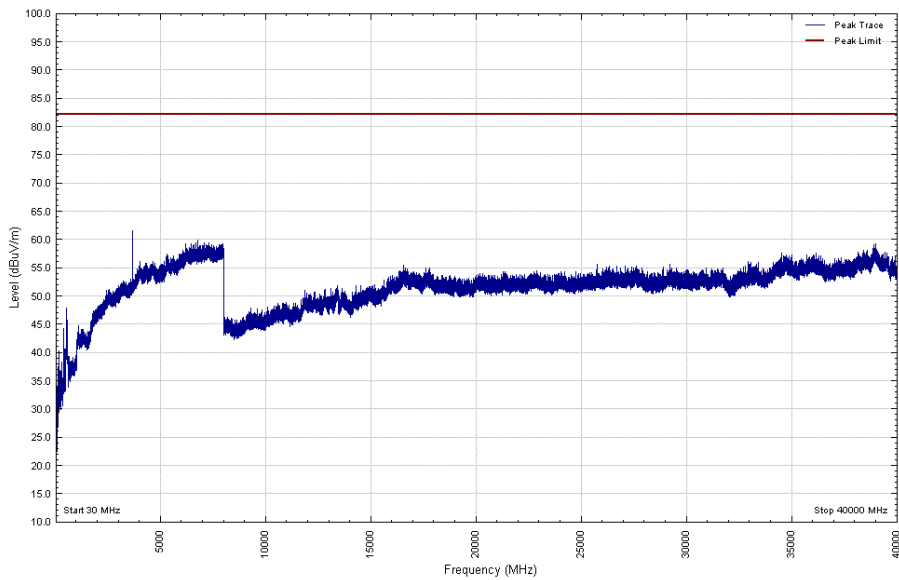
Maximum Output Power 36.00 dBm



Antenna - LTE Modulation QPSK - LTE Carrier Bandwidth 20 MHz - Channel Position B - Band 1 - Range 30MHz-40GHz

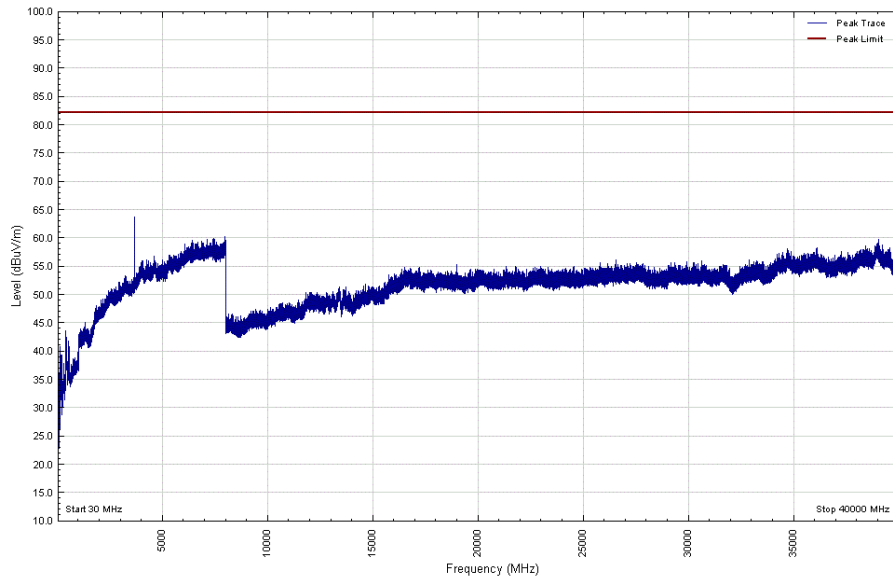


Antenna - LTE Modulation QPSK - LTE Carrier Bandwidth 20 MHz - Channel Position M - Band 2 - Range 30MHz-40GHz





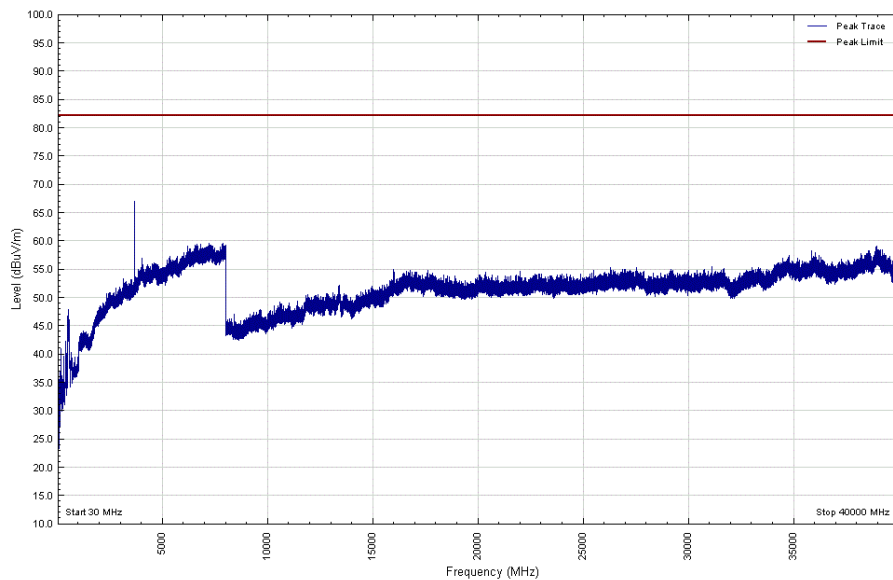
Antenna - LTE Modulation QPSK - LTE Carrier Bandwidth 20 MHz - Channel Position T - Band 3 - Range 30MHz-40GHz



Configuration B

Maximum Output Power 20 MHz, 36.00 dBm and 5 MHz, 30 dBm

Antenna - LTE Modulation QPSK - LTE Carrier Bandwidth 20 MHz + 5 MHz - Channel Position M - Band 1 - Range 30 MHz-40 GHz



Remarks

No emissions were measured.



Limit

Limit	$43 + 10\log(P) = -13 \text{ dBm} = 82.2 \text{ dBuV/m}$
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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					
Hygrometer	Rotronic	A1	2138	12	05-Mar-2020
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Analyser	Keysight	N9030A	4654	12	22-Oct-2019
Attenuator	Weinschel	48-40-43LM	5134	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	ISO Tech	DM101	2424	12	12-Dec-2019
Occupied Bandwidth					
Hygrometer	Rotronic	A1	2138	12	05-Mar-2020
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Analyser	Keysight	N9030A	4654	12	22-Oct-2019
Attenuator	Weinschel	48-40-43LM	5134	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	ISO Tech	DM101	2424	12	12-Dec-2019
Band Edge					
Hygrometer	Rotronic	A1	2138	12	05-Mar-2020
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Analyser	Keysight	N9030A	4654	12	22-Oct-2019
Attenuator	Weinschel	48-40-43LM	5134	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	ISO Tech	DM101	2424	12	12-Dec-2019
Transmitter Spurious Emissions					
Hygrometer	Rotronic	A1	2138	12	05-Mar-2020
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Analyser	Keysight	N9030A	4654	12	22-Oct-2019
Attenuator	Weinschel	48-40-43LM	5134	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	ISO Tech	DM101	2424	12	12-Dec-2019
Attenuator	Weinschel	48-20-43LM	5133	12	07-Nov-2019
HPF	K&L	11SH10-4000/X18000	4599	12	05-Sep-2020
Cable attenuator	Aralab	CSF6767C-C2S6500	5175	-	O/P Mon
Waveguide	FMI UK	18-26GHz	-	-	O/P Mon
Waveguide	FMI UK	26-40GHz	-	-	O/P Mon
Frequency Stability					
Hygrometer	Rotronic	A1	2138	12	05-Mar-2020
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Analyser	Keysight	N9030A	4654	12	22-Oct-2019
Attenuator	Weinschel	48-40-43LM	5134	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
DMM	ISO Tech	DM101	2424	12	12-Dec-2019
Climatic chamber	Votsch	VT4002	0161	12	O/P Mon
Thermometer	Digitron	T208	2340	12	22-Nov-2019
Radiated Emissions					
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230.00	24.00	02-May-2020
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287.00	24.00	15-May-2020
Pre-Amplifier	Phase One	PS04-0086	1533.00	12.00	08-Feb-2020
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534.00	12.00	05-Feb-2020
Screened Room (5)	Rainford	Rainford	1545.00	36.00	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606.00	0.00	TU
Hygromer	Rotronic	A1	2677.00	12.00	20-Feb-2020
Comb Generator	Schaffner	RSG1000	3034.00	0.00	TU
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293.00	12.00	26-Oct-2019
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526.00	6.00	11-Dec-2019
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117.00	4722.00	12.00	05-Mar-2020
Mast Controller	Maturo GmbH	NCD	4810.00	0.00	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811.00	0.00	TU
EmX Emissions Software	TUV SUD	EmX V.V1.4.8.3	5125.00	0.00	N/A - Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5127.00	6.00	11-Dec-2019
8 Meter Cable	Teledyne	PR90-088-8MTR	5212.00	12.00	30-Aug-2020
Test Receiver (ESW)	Rohde & Schwarz	ESW44	5351.00	12.00	31-Jul-2020

N/A – Not Applicable

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	Frequency / Parameter	MU	
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 2.3 dB	
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 3.2 dB	
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz	
Occupied Bandwidth	Up to 20 MHz Bandwidth	5 MHz Bandwidth	± 11547 Hz
		20 MHz Bandwidth	± 46188 Hz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 dB	



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).

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ANNEX A

MODULE LIST



Configuration A, B			
Product	Product No	R-State	Serial No
Radio 2208 B48	KRC 161 711/1	R1B	D827120517
Software Version:	CXP9034711/2	Revision:	R1K