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# Report On

FCC and IC Testing of the Ericsson KRC 161 688/3 (Radio 2212 B2/B25 (B2)) LTE (1900 MHz) Base Station in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 24, Industry Canada RSS-GEN and Industry Canada RSS-133

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161688 IC: 287AB-AS161688

PREPARED BY

NEARES Natalie Bennett

Natalie Bennett Project Manager (RF and Telecom)

APPROVED BY

Steve Scarfe Authorised Signatory DATED

15 January 2019

Document 75943170 Report 18 Issue 1

January 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 2212 B2/B25 (B2) - KRC 161 688/3
IC Model Name	AS161688
Serial Number(s)	D826860358
Software Version	CXP9013268/15_ R73AM
Hardware Version	R1B
Non-Tested Variant	Radio 2212 B2/B25 (B2) - KRC 161 688/1
Non-Tested FCC ID	TA8AKRC161688
Non-Tested IC ID	287AB-AS161688
Non-Tested IC Model Name	AS161688
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2017 FCC CFR 47 Part 24: 2017 Industry Canada RSS-GEN: Issue 5: 2018 Industry Canada RSS-133: Issue 6: 2013
Start of Test	01 October 2018
Finish of Test	02 November 2018
Name of Engineer(s)	Neil Rousell and 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 compliance FCC CFR 47 Part 2, FCC CFR 47 Part 24, Industry Canada RSS-GEN and Industry Canada RSS-133. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Neil Rousell

Graeme Lawler

(Hawler



# 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 24, Industry Canada RSS-GEN and Industry Canada RSS-133 is shown below.

		Specificati	on Clause			
Section	FCC CFR 47 Part 2	FCC CFR 47 Part 24	RSS- GEN	RSS- 133		
2.1	2.1046	24.232 (a)	-	6.4	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1049	24.238 (b)	6.6	-	Occupied Bandwidth	Pass
2.3	2.1051	24.238 (b)	-	6.5	Band Edge	Pass
2.4	2.1051	24.238 (a)	-	6.5	Transmitter Spurious Emissions	Pass
2.5	2.1051	24.238 (a)	-	6.5	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	DAT	No. Of carriers	Corrier Dendwidth	Carrier Frequency Configuration (MHz)			
Configuration	Configuration RAT No.		Carrier Bandwidth	Bottom	Middle	Тор	
А	LTE+NB IoT GB	1	10MHz	1935.0	-	1985.0	
А	LTE+NB IoT GB	1	15MHz	1937.5	-	1982.5	
А	LTE+NB IoT GB	1	20MHz	1940.0	-	1980.0	



# 1.4 DECLARATION OF BUILD STATUS

MAIN EUT			
MANUFACTURING DESCRIPTION	Radio Unit		
MANUFACTURER	Ericsson AB		
PRODUCT NAME	Radio 2212 B2/B25 (G2)		
PART NUMBER	KRC 161 688/1	KRC 161 688/3 <sup>2</sup>	
IC Model Name	AS161688		
SERIAL NUMBER	- D826860358		
HARDWARE VERSION	- R1B		
SOFTWARE VERSION	-	CXP9013268_15 R73AM	
TRANSMITTER OPERATING RANGE	1930 - 1995 MHz		
MODULATIONS	WCDMA: QPSK, 16QAM, 64QAM LTE: QPSK,		
	16QAM, 64QAM, 256QAM		
ITU DESIGNATION OF EMISSION	WCDMA: 5M00F9W		
	1,4 MHz BW channel: 1M	40F9W	
	3 MHz BW channel: 3M00	DF9W	
	5 MHz BW channel: 5M00	DF9W	
	10 MHz BW channel <sup>1</sup> : 9M	43F9W	
	15 MHz BW channel <sup>1</sup> : 14	M1F9W	
	20 MHz BW channel <sup>1</sup> : 18	M5F9W	
	NB-IoT SA 180 kHz BW ch	annel: 224KW7D	
OUTPUT POWER (RMS) (W or dBm)	2 ports, 80W <sup>1</sup> per port		
	NB-IoT SA 1 x 20W (per port)		
FCC ID	TA8AKRC161688		
IC ID	287AB-AS161688		
TECHNICAL DESCRIPTION	Base station radio		
(a brief description of the intended use and operation)			

<sup>1</sup>Including 2 NB-IoT GB carriers.

<sup>2</sup> KRC 161 688/3 is the test object, both variants are electrically equivalent, with only mechanical differences in the enclosure.

Signature

nden B Helle Audun Helle

Date

2019-01-10

No responsibility will be accepted by TÜV SÜD Product Service 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) Radio 2212 B2/B25 (B2) - KRC 161 688/3 is an Ericsson AB Radio Unit working in the public mobile service 1900 MHz band which provides communication connections to 1900 MHz network. The Radio 2212 B2/B25 (B2) - KRC 161 688/3 operates from a -48V DC supply.

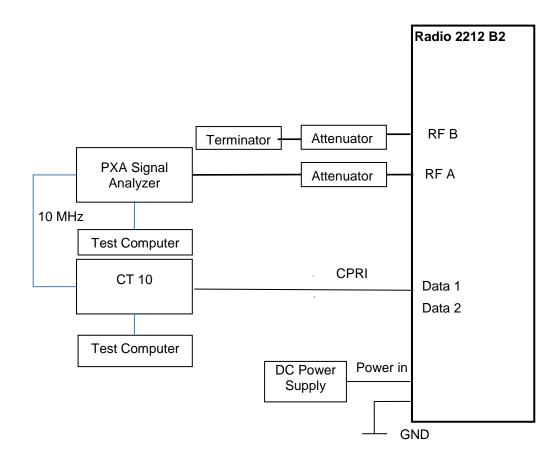
The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



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

Industry Canada Accreditation IC2932B-1 Octagon House, Fareham Test Laboratory

#### 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.

#### 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	Neil Rousell
Occupied Bandwidth	Neil Rousell
Band Edge	Neil Rousell
Transmitter Spurious Emissions	Neil Rousell
Radiated Emissions	Graeme Lawler

Office Address:

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



**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 24, Clause 24.232 (a) Industry Canada RSS-133, Clause 6.4

#### 2.1.2 Date of Test and Modification State

02 November 2018 - 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 Temperature22.6°CRelative Humidity35.9%

#### 2.1.5 Test Method

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

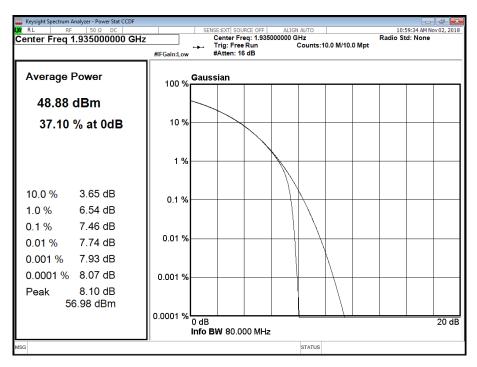
#### 2.1.6 Test Results

Configuration A

Maximum Output Power 49 dBm

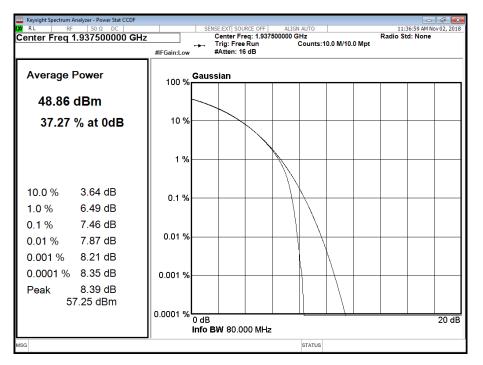
Antenna			Peak to Average Ratio (PAR) / Output Power			
	LTE Modulation	LTE Carrier	Channel Position B			
		Bandwidth	PAR (dB)	Average Power		
				dBm	dBm/MHz	
A	64QAM	10.0 MHz	7.46	49.03	-	
A	64QAM	15.0 MHz	7.46	48.98	-	
A	64QAM	20.0 MHz	7.54	49.02	-	



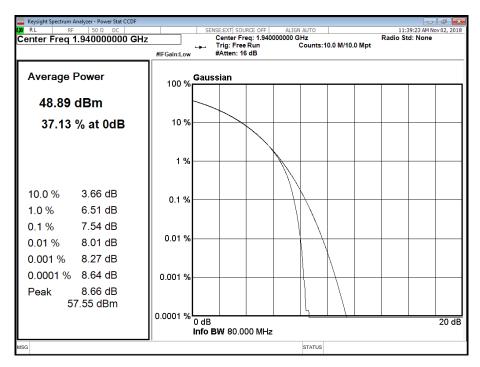


## Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B









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

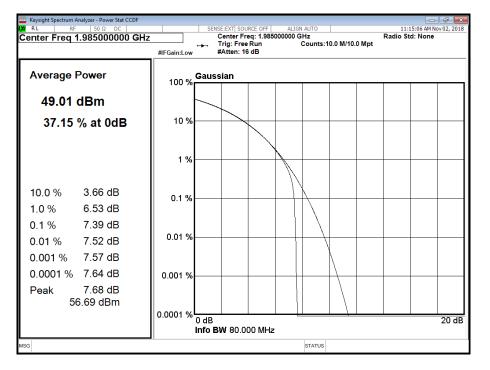


# Configuration A

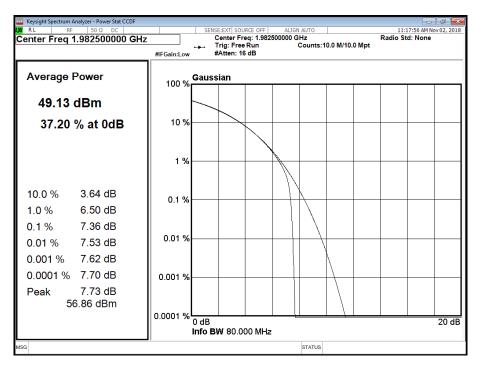
#### Maximum Output Power 49 dBm

			Peak to Average Ratio (PAR) / Output Power			
Antonno		LTE Carrier		Channel Position	Т	
Antenna	LTE Modulation	Bandwidth	PAR (dB)	Average Power		
				dBm	dBm/MHz	
A	64QAM	10.0 MHz	7.39	49.07	-	
A	64QAM	15.0 MHz	7.36	49.17	-	
А	64QAM	20.0 MHz	7.38	49.21	-	

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

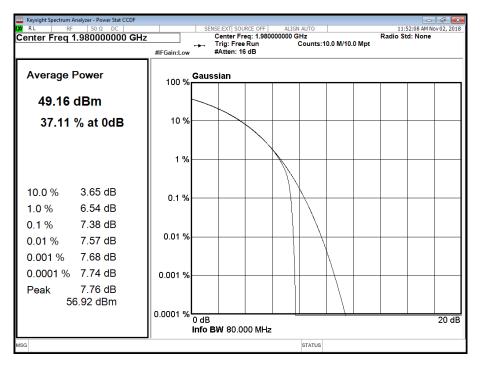






## Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T





Limit		
Peak Power	≤500 W or ≤+57 dBm	
Peak to Average Ratio	13 dB	



#### 2.2 OCCUPIED BANDWIDTH

#### 2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 FCC CFR 47 Part 24, Clause 24.238 (b) Industry Canada RSS-GEN, Clause 6.6

#### 2.2.2 Date of Test and Modification State

02 November 2018 - 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 Temperature22.6°CRelative Humidity35.9%

#### 2.2.5 Test Method

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

#### 2.2.6 Test Results

Configuration A

Maximum Output Power 49 dBm

			Result (KHz)					
Antenna LTE	LTE Carrier	Channel Position B		Channel Position M		Channel Position T		
, unternite	Modulation Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	
A	64QAM	10.0 MHz	9,397.42	9,754.37	-	-	9,418.82	9,757.59
A	64QAM	15.0 MHz	14,019.91	14,552.33	-	-	14,042.43	14,576.10
A	64QAM	20.0 MHz	18,429.59	19,374.47	-	-	18,472.64	19,274.99



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

Keysight Spectrum Analyzer - Occupied BW K K K L K F 50 Ω DC			gn auto	10:59:51 AM Nov 02, 2018
Center Freq 1.935000000	GHz	Center Freq: 1.935000000	GHz	Radio Std: None
	#IFGain:Low	→ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS
10 dB/div Ref 58.60 dBm				
Log				
48.6	~			
38.6	hanne	genery after a second and a second and a second and a second and a second a second a second a second a second a	www.www.	
18.6	1			
8.60	{			
-1.40				
-11.4				
-21.4 Myral Bary March March March	wood		- Lura	and a new water and a low and an
-31.4				
Center 1.935 GHz				Span 20 MHz
#Res BW 100 kHz		#VBW 300 kHz		Sweep 1.933 ms
Occupied Bandwidt	h	Total Power	56.6 dBm	
9.3	3974 MHz			
Transmit Freq Error	19.525 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	9.754 MHz	x dB	-26.00 dB	
SG			STATUS	

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

Keysight Spectrum Analyzer - Occupied BW				- 7 -
X RL RF 50 Ω DC Center Freq 1.985000000	GHz	Center Freq: 1.985000000		11:15:15 AM Nov 02, 2018 Radio Std: None
	#IFGain:Low	→ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS
15 dB/div Ref 58.24 dBm	<b>)</b>			
43.2				
28.2				
13.2				
1.76				
16.8 monorman Manakar	~		\	water for the second
31.8				
46.8				
61.8				
76.8				
Center 1.985 GHz		I I I		Span 20 MHz
#Res BW 100 kHz		#VBW 300 kHz		Sweep 1.933 m
Occupied Bandwidt	h	Total Power	56.7 dBm	
9.4	4188 MHz			
Transmit Freq Error	7.964 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	9.758 MHz	x dB	-26.00 dB	
SG			STATUS	



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B

Keysight Spectrum Analyzer - Occupied BW			GN AUTO	11:37:07 AM Nov 02, 2018
KL RF 50 Ω DC     Center Freq 1.937500000	GHz	Center Freq: 1.937500000	GHz	Radio Std: None
	#IFGain:Low	→ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS
10 dB/div Ref 58.18 dBm				
Log				
48.2				
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18.2				
8.18				
-1.82				
-11.8				
-21.8 Low ward low war war and have	~~ <sup>/</sup>		ետկ	Marker and the second s
-31.8				
Center 1.938 GHz #Res BW 150 kHz		#VBW 470 kHz		Span 30 MHz Sweep 1.333 ms
Res DW IJU KHZ				Sweep 1.333 In:
Occupied Bandwidt	h	Total Power	56.7 dBm	
14	.020 MHz			
Transmit Freq Error	20.652 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	14.55 MHz	x dB	-26.00 dB	
SG			STATUS	

# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T

Keysight Spectrum Analyzer - Occupied BW	V			- 6 -		
RL RF 50 Ω DC Center Freq 1.982500000	GHz	Center Freq: 1.982500000		11:18:04 AM Nov 02, 2018 Radio Std: None		
	#IFGain:Low	.↓ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS		
10 dB/div Ref 58.19 dBn	<u>^</u>					
Log	·····					
48.2	n		0			
28.2		www.wherewerewerewerewerewerewerewerewerewer	- Contraction of L			
18.2						
3.19	۲					
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1.8						
1.8 moundation margins	A./			unanna almanna		
11.8						
enter 1.983 GHz				Span 30 MH		
Res BW 150 kHz		#VBW 470 kHz		Sweep 1.333 m		
Occupied Bandwidt	h	Total Power	57.0 dBm			
14	4.042 MHz					
Transmit Freq Error	16.177 kHz	% of OBW Power	99.00 %			
x dB Bandwidth	14.58 MHz	x dB	-26.00 dB			
G			STATUS			



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

Keysight Spectrum Analyzer - Occupied BV	V			
X RL RF 50 Ω DC Center Freg 1.940000000	GHz	Center Freq: 1.94000000	GN AUTO GHz	11:39:31 AM Nov 02, 2018 Radio Std: None
	#IFGain:Low	→ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS
10 dB/div Ref 57.44 dBn	n			
Log 47.4				
37.4	No. 8	and the second and the second second		
27.4		de la come de la come a come		
17.4	4		h,	
7.44				
2.56				
12.6				
22.6 antronomental and and and	ma		lun,	walnung to make parte googe
32.6				
Center 1.94 GHz #Res BW 200 kHz		#VBW 620 kHz		Span 40 MHz Sweep 1 ms
Occupied Bandwidt	'n	Total Power	56.9 dBm	
18	3.430 MHz			
Transmit Freq Error	67.910 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	19.37 MHz	x dB	-26.00 dB	
sg			STATUS	

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

Keysight Spectrum Analyzer - Occupied BW				
RL RF 50Ω DC Center Freq 1.980000000	GHz	Center Freq: 1.98000000		11:52:16 AM Nov 02, 201 Radio Std: None
	₩FGain:Low	→ Trig: Free Run #Atten: 16 dB	Avg Hold: 200/200	Radio Device: BTS
5 dB/div Ref 56.83 dBm	1			
og 1.8				
5.8		Wern Marson por and the many	have we want the second	
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17				
2 Australian and annormalian			\	And and a state of the state of
.2				and the second s
1.2				
3.2				
3.2				
enter 1.98 GHz				Span 40 MH
Res BW 200 kHz		#VBW 620 kHz		Sweep 1 m
Occupied Bandwidt	h	Total Power	57.2 dBm	
18	.473 MHz			
Transmit Freq Error	32.874 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	19.27 MHz	x dB	-26.00 dB	
G			STATUS	



## 2.3 BAND EDGE

#### 2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051 FCC CFR 47 Part 24, Clause 24.238 (b) Industry Canada RSS-133, Clause 6.5

#### 2.3.2 Date of Test and Modification State

02 November 2018 - 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 Temperature22.6°CRelative Humidity35.9%

#### 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 \* Log(N), where N is equal to the number of MIMO antenna ports.

For single carrier, the limit was calculated as being -13 dBm - 10 \* Log (4) = -19 dBm.

For dual carrier, the limit was calculated as being -13 dBm - 10 \* Log(2) = -16 dBm.

#### 2.3.6 Test Results

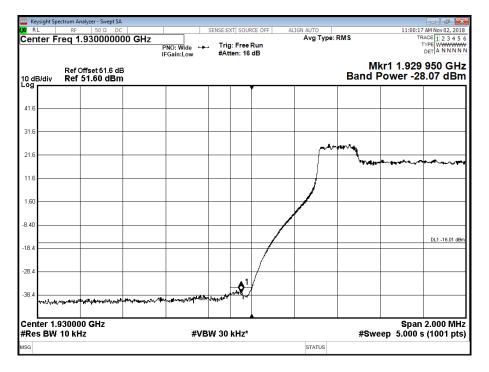
Configuration A

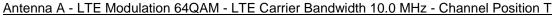
Maximum Output Power 49 dBm

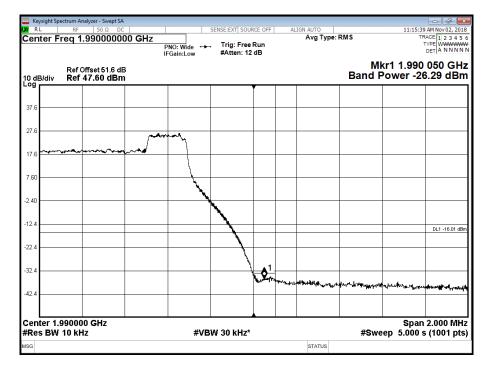
Antonno	LTE Madulation	LTE Corrier Denduidth	Band Edge (MHz)			
Antenna	LTE Modulation	LTE Carrier Bandwidth	Channel Position B	Channel Position T		
A	64QAM	10.0 MHz	1,935.0	1,985.0		
A	64QAM	15.0 MHz	1,937.5	1,982.5		
A	64QAM	20.0 MHz	1,940.0	1,980.0		



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

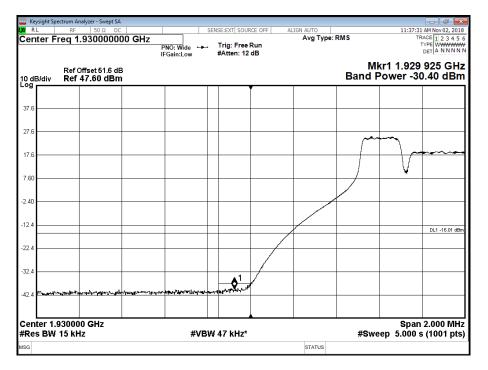




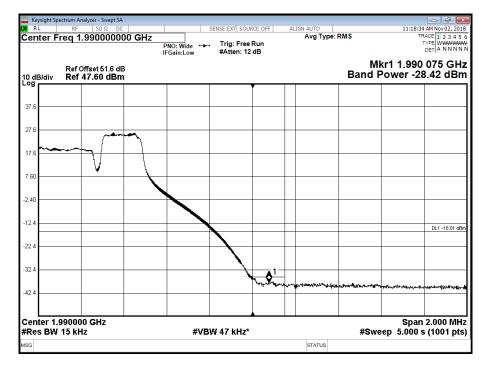




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B

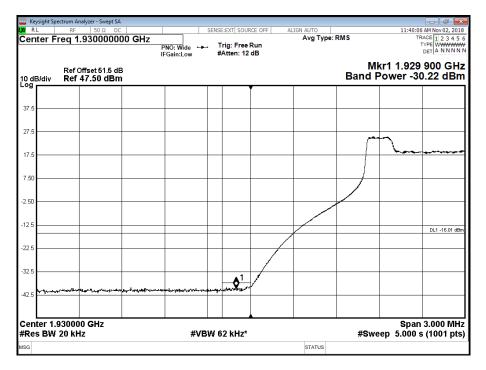




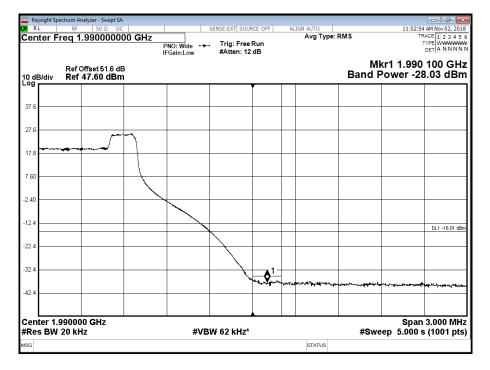




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B







-16 dBm

Limit



## 2.4 TRANSMITTER SPURIOUS EMISSIONS

#### 2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051 FCC CFR 47 Part 24, Clause 24.238 (a) Industry Canada RSS-133, Clause 6.5

#### 2.4.2 Date of Test and Modification State

11 February 2018 - 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 Temperature22.6°CRelative Humidity35.9%

#### 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 \* Log(N), where N is equal to the number of MIMO antenna ports.

For single carrier, the limit was calculated as being -13 dBm - 10 \* Log (4) = -19 dBm.

For dual carrier, the limit was calculated as being -13 dBm - 10 \* Log(2) = -16 dBm.



# 2.4.6 Test Results

Configuration A

Maximum Output Power 49 dBm

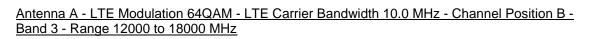
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 1 - Range 0.009 to 3500 MHz

	ectrum Analyzer -								- 0 ×
X RL Center F		004500 GHz		SENSE:EXT SOURCE		IGN AUTO #Avg Type: R	MS	11:02:	AM Nov 02, 2018
		NFE	PNO: Fast ↔	Trig: Free Ru #Atten: 18 dl					DET A N N N N
10 dB/div	Ref Offset Ref 50.50		in Gam. Low						939 3 GHz 0.71 dBm
					<b>♦</b> <sup>1</sup>				
40.5					ĺ				
30.5									
20.5									
10.5									
500									
9.50									
9.5									DL1 -16.01 dBr
29.5									
19.5									
	750 GHz 1.0 MHz		#VI	BW 3.0 MHz*			#Sw	Spa eep 7.000	n 3.500 GHz s (7000 pts)
SG						STATUS			



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 2 - Range 3500 to 12000 MHz

	ectrum Analyzer - Swept SA								
RL	RF 50 Ω DC			SENSE:EXT SOUR	RCE OFF AI	LIGN AUTO			2 AM Nov 02, 2018
Center F	req 7.7500000	NFE	PNO: Fast ++- FGain:Low	Trig: Free #Atten: 2 c		#Avg Type:	RMS	1	TYPE WWWWW DET A NNNN
10 dB/div Log	Ref Offset 48 dB Ref 20.00 dBn	1						Mkr1 4.7 -30	33 6 GHz 6.71 dBm
10.0									
0.00									
-10.0									DL1 -16.01 dB
-20.0									
30.0	1								
40.0	$\sim$	$\sim\sim$	<u> </u>	$\sim$		~~~			~~~~
50.0									
60.0									
70.0									
Start 3.50								Stop 1	12.000 GH
#Res BW	1.U IVIMZ		#VB	W 3.0 MHz	•	STATUS	#Swee	p 17.00 s	(17000 pts



	ectrum Analyzer - Swept						
XI RL Center F	RF 50Ω ແ req 15.000000			SENSE:EXT SOURCE OFF	ALIGN AUTO	RMS	11:04:44 AM Nov 02, 2018 TRACE 1 2 3 4 5 6
o on tor r	100 10.00000	NFE	PNO: Fast ↔ IFGain:High	. Trig: Free Run #Atten: 0 dB	•		DET A NNNN
10 dB/div	Ref Offset 50.7 d Ref 20.00 dB					Mk	r1 14.309 2 GHz -35.49 dBm
10.0							
0.00							
10.0							DL1 -16.01 dBm
20.0							
30.0				1			
40.0							
50.0							
60.0							
70.0							
Start 12.0 Res BW			#VE	W 3.0 MHz*		#Sweep	Stop 18.000 GHz 12.00 s (12000 pts)
ISG					STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 4 - Range 18000 to 22000 MHz

LXI RL	ctrum Analyzer - Swept S RF 50 Ω D req 20.000000	C 1000 GHz NFE	PNO: Fast ++		Run	ILIGN AUTO #Avg Type:	RMS		13 AM Nov 02, 2018 TRACE 1 2 3 4 5 TYPE WWWWW DET A N N N N
10 dB/div Log	Ref Offset 28.4 d Ref 8.40 dBm	в	FGain:High	#Atten: 0 d	в				580 9 GH 55.54 dBn
-1.60									
-11.6									DL1 -16.01 dB
-21.6									
-31.6									
-51.6									_ <b>↓</b> 1
-61.6				**************************************					
-71.6									
-81.6									
Start 18.0 #Res BW			#VB	W 3.0 MHz	ĸ	STATUS	#Sw	Stop eep 8.000	22.000 GH s (8000 pts

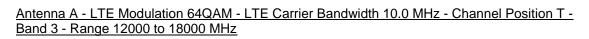
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -Band 1 - Range 0.009 to 3500 MHz

XI RL	ectrum Analyzer - Swe RF 50 Ω req 1.75000	DC		SENSE:EXT SOUR	CE OFF AL	IGN AUTO #Avg Type: R	MS	11:11:40 AM Nov 02, 2018 TRACE 1 2 3 4 5 6
	104 1.70000	NFE	PNO: Fast ++	Trig: Free F #Atten: 18	Run dB	• //		DET A N N N N
10 dB/div	Ref Offset 42. Ref 50.50 d						M	kr1 1.989 3 GHz 40.53 dBm
40.5					<b>1</b>			
30.5								
20.5								
10.5								
.500								
9.50								DL1 -16.01 dBm
19.5								
29.5			~					
39.5								
	750 GHz 1.0 MHz		#VB	W 3.0 MHz*			#Swee	Span 3.500 GHz 5 7.000 s (7000 pts)
ISG						STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -Band 2 - Range 3500 to 12000 MHz

	ectrum Analyzer - Swept SA								
Center F	RF 50 Ω DC req 7.75000000			SENSE:EXT SOUF		IGN AUTO #Avg Type:	RMS	TR	AM Nov 02, 2018 ACE 1 2 3 4 5 6
		NFE I	PNO: Fast ++-	Trig: Free #Atten: 2 c	Run IB			1	DET A NNNN
	Ref Offset 48 dB							Mkr1 4.7	39 6 GHz
10 dB/div	Ref 20.00 dBm	ı –						-36	6.57 dBm
10.0									
0.00									
0.00									
-10.0									
-20.0									DL1 -16.01 dBr
-20.0									
-30.0	1								
-40.0	$\sim$ $\sim$	$\sim$	L	$\sim$					~~~~
-40.0									
-50.0									
-60.0									
-60.0									
-70.0									
Start 3.50 #Res BW			#\/B	W 3.0 MHz	*		#Swoo	Stop 1 p 17.00 s	2.000 GHz
MSG	1.0 MITZ		#VD	VV J.U IVINZ		STATUS	#Swee	p 17.00 S	(17000 pts)
						0.11100			

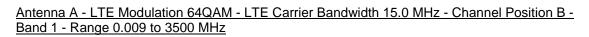


enter F	RF 50 Ω req 15.00000	PNO: Fast	. Trig: Free #Atten: 0 c	Run	ALIGN AUTO #Avg Type	RMS	TF	9 AM Nov 02, 2018 RACE 1 2 3 4 5 TYPE WWWWW DET A N N N N
0 dB/div	Ref Offset 50.7 Ref 20.00 dE	-1		•		м		85 2 GHz 5.41 dBm
10.0								
0.00		 						
10.0								DL1 -16.01 dBm
20.0		 						
30.0			1					
40.0								
50.0								
60.0								
70.0								
		#VB	W 3.0 MHz	*		#Swee	Stop ′ p 12.00 s	18.000 GHz (12000 pts
Start 12.( #Res BW		#VB	W 3.0 MHz	*	STATUS	#Swee	Stop ′ p 12.00 s	18.000 (1200



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -Band 4 - Range 18000 to 22000 MHz

Keysight Spe	ectrum Analyzer - Swept SA RF 50 Ω DC		SENSE:EXT SOUR	CE OFF AL	IGN AUTO		11:27:37 AM Nov 02, 201
	req 20.00000000	D GHz E PNO: Fast ↔ IFGain:High	Taine Free F	tun	#Avg Type: F	MS	TRACE 1 2 3 4 5 TYPE DET A NNNN
10 dB/div Log	Ref Offset 28.4 dB Ref 8.40 dBm					Mk	r1 21.581 9 GH: -55.48 dBn
-1.60							
-11.6							DL1 -16.01 dE
21.6							
31.6							
41.6							
51.6							1
71.6							
81.6							
Start 18.0	00 GHz						Stop 22.000 GH
#Res BW		#VE	3W 3.0 MHz*		STATUS	#Sweep	8.000 s (8000 pts

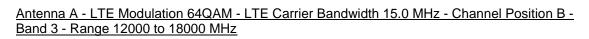


RL RF 50 Ω Center Freq 1.75000	PNO: Fast	SENSE:EXT SOUR Trig: Free #Atten: 18	Run	IGN AUTO #Avg Type: RMS		TRACE 1 2 3 4 5 TYPE WWWWW DET A NNNN
Ref Offset 42. 0 dB/div Ref 50.50 d						.944 3 GH 38.25 dBn
40.5			<b>1</b>			
30.5						
0.5						
0.5	 					
500						
.50						DL1 -16.01 dB
9.5						
9.5	 					
9.5						
enter 1.750 GHz Res BW 1.0 MHz	#VB	W 3.0 MHz	*	 :	Sp: #Sweep 7.00	an 3.500 GHz 0 s (7000 pts



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B -Band 2 - Range 3500 to 12000 MHz

	ectrum Analyzer - Swept SA								
Center F	RF 50 Ω DC req 7.75000000	0 GHz		SENSE:EXT SOUF		IGN AUTO #Avg Type:	RMS	TR	AM Nov 02, 2018
		NFE PI	NO: Fast ++-	Trig: Free #Atten: 2 c	Run IB			1	
	Ref Offset 48 dB							Mkr1 4.7	
10 dB/div	Ref 20.00 dBm							-36	6.66 dBm
10.0									
0.00									
-10.0									
									DL1 -16.01 dBr
-20.0									
-30.0									
	<b>♦</b> <sup>1</sup>								
-40.0	$\sim$	$\sim\sim$	~~~	~~~~					~~~~
-50.0									
00.0									
-60.0									
-70.0									
-70.0									
Start 3.50								Stop 1	2.000 GHz
#Res BW			#VB	W 3.0 MHz	*		#Swee	ep 17.00 s	
MSG						STATUS			



IFGain:High     #Atten: 0 dB       Mkr1       OdB/div     Ref 20:00 dBm       Og     Image: Comparison of the second	14.248 7 GHz -35.48 dBm
	DL1 -16.01 dB#
	DL1 -16.01 dBr
	DL1 -16.01 dBr
50.0	
	·
60.0	
70.0	
start 12.000 GHz Start 12.0000 GHZ Start 12.0000 GHZ Start 12.0000 GHZ Start 12.0000 GHZ St	Stop 18.000 GHz



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B -Band 4 - Range 18000 to 22000 MHz

	ectrum Analyzer - Swept SA								
	RF 50 Ω DC req 20.000000			SENSE:EXT SOUR	CE OFF AI	IGN AUTO #Avg Type:	RMS		7 AM Nov 02, 2018 RACE 1 2 3 4 5 6
Center F	req 20.000000	NFE I	PNO: Fast ++-	. Trig: Free #Atten: 0 d	Run IB	mitg type.			TYPE WWWWW DET A NNNN
10 dB/div Log	Ref Offset 28.4 di Ref 8.40 dBm	3					Ν	/lkr1 21.5 -5	84 9 GHz 5.45 dBm
-1.60									
-11.6									DL1 -16.01 dB
-21.6									
-31.6									
-41.6									
-51.6									1
61.6									
71.6									
-81.6									
Start 18.0	00 GHz							Ston	22.000 GH:
#Res BW			#VB	W 3.0 MHz	*		#Swe	eep 8.000	s (8000 pts
ISG						STATUS			

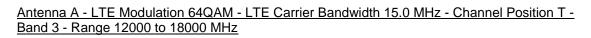
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T -Band 1 - Range 0.009 to 3500 MHz

X RL	ectrum Analyzer - Swep RF 50 Ω req 1.750004	DC 4500 GHz		SENSE:EXT SOUR		IGN AUTO #Avg Type: RI	иs	11:20:41 AM Nov 02, 2018 TRACE 1 2 3 4 5 6 TYPE WWWWW
	Ref Offset 42.5		PNO: Fast ↔ IFGain:Low	. Trig: Free R #Atten: 18 c	dB		М	kr1 1.975 8 GHz 39.11 dBm
0 dB/div	Ref 50.50 d	Bm		Ţ				39.11 dBm
40.5					1			
30.5								
20.5								
10.5								
.500								
9.50								
19.5								DL1 -16.01 dBm
29.5								
39.5								
Center 1. Res BW			#VB	W 3.0 MHz*			#Sweep	Span 3.500 GHz 5 7.000 s (7000 pts)
ISG						STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T -Band 2 - Range 3500 to 12000 MHz

	ectrum Analyzer - Swept SA								
Center F	RF 50 Ω DC req 7.75000000	NFE PN	IO: Fast 🔸	Trig: Free	Run	IGN AUTO #Avg Type:	RMS	TR	AM Nov 02, 2018 ACE 1 2 3 4 5 6 TYPE WWWWWA DET A N N N N
10 dB/div	Ref Offset 48 dB Ref 20.00 dBm	IFG	ain:Low	#Atten: 2 d				Mkr1 4.7	,
10.0									
0.00									
-10.0									
-20.0									DL1 -16.01 dB
-30.0	1								
-40.0	~~~	$\sim \rightarrow$	~~	~~~~					~~~~
-50.0									
-60.0									
-70.0									
Start 3.50 #Res BW			#VB	W 3.0 MHz	k	1	#Swee	Stop 1 p 17.00 s	2.000 GHz (17000 pts
MSG						STATUS			

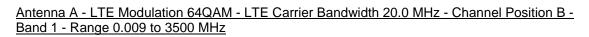


Keysight Sp	RF 50 Ω	SA DC		SENSE:EXT SOUP		ALIGN AUTO		11:22:25 AM Nov 02, 2018
	req 15.00000	0000 GHz	PNO: Fast ++ FGain:High	Tains Franc	Run	#Avg Type:	RMS	TRACE 1 2 3 4 5 6 TYPE WWWWW DET A N N N N
I0 dB/div	Ref Offset 50.7 Ref 20.00 dB		1		-		Mk	r1 14.404 7 GHz -35.46 dBm
10.0								
0.00								
10.0								DL1 -16.01 dBm
20.0								
30.0				1				
40.0								
60.0								
70.0								
Start 12.0	000 CH2							Stop 19 000 CHz
#Res BW	1.0 MHz		#VB	W 3.0 MHz	*		#Sweep	Stop 18.000 GHz 12.00 s (12000 pts)
ISG						STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T -Band 4 - Range 18000 to 22000 MHz

Keysight Spe	ectrum Analyzer - Swept SA RF 50 Ω DC		SENSE:EXT SOUR	CE OFE AI	IGN AUTO	115	25:45 AM Nov 02, 2018
	req 20.0000000		Trig: Free F #Atten: 0 d	Run	#Avg Type: RM	15	TRACE 1 2 3 4 5 TYPE WWWWW DET A N N N N
10 dB/div Log	Ref Offset 28.4 dB Ref 8.40 dBm						.577 9 GHz -55.50 dBm
-1.60							
-11.6							DL1 -16.01 dB
-21.6							
-31.6							
-41.6							
-51.6							▲ <sup>1</sup>
-61.6							
-81.6							
Start 18.0						Sto	p 22.000 GH:
#Res BW	1.0 MHz	#\	/BW 3.0 MHz*	k	STATUS	#Sweep 8.00	10 s (8000 pts

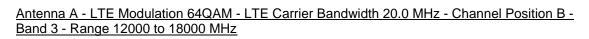


Center Fr	RF 50 Ω Teq 1.75000	PNO: Fast	SENSE:EXT SOUR Trig: Free   #Atten: 18	Run	IGN AUTO #Avg Type:	RMS	11:42:00 AM Nov 02, 2018 TRACE 1 2 3 4 5 6 TYPE WWWWWW DET A N N N N N
10 dB/div	Ref Offset 42. Ref 47.18 d	ii Gain.Low				Μ	kr1 1.948 8 GHz 38.07 dBm
37.2				<b>∮</b> <sup>1</sup>			
27.2		 					
17.2							
7.18							
2.82		 					
12.8							DL1 -16.01 dBm
22.8							
32.8		 		``			
42.8		 					
Center 1.7 Res BW		#VB	W 3.0 MHz	*		#Sweet	Span 3.500 GHz 5 7.000 s (7000 pts)
ISG					STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -Band 2 - Range 3500 to 12000 MHz

X RL RF 50 Ω DC						
Center Freq 7.7500000	0 GHz	SENSE:EXT SOURCE C	#Avg Ty	pe: RMS	TF	AM Nov 02, 2018
	NFE PNO: Fast ++ IFGain:Low	Trig: Free Run #Atten: 2 dB				DET A N N N N
	IFGail.LOW	Writen. 2 db			Mkr1 4.7	22 6 C H-
Ref Offset 48 dB 10 dB/div Ref 20.00 dBm						6.66 dBm
Log						
10.0						
0.00						
-10.0						
						DL1 -16.01 dB
-20.0						
-30.0						
→→→ → → → → → → → → → → → → → → → → →						
40.0	$\sim \sim \sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<u> </u>		
-50.0						
60.0						
70.0						
Start 3.500 GHz #Res BW 1.0 MHz	#VF	3W 3.0 MHz*		#Swe	Stop ′ ep 17.00 s	12.000 GH: (17000 pts
MSG	<i>"•</i> <b>-</b>		STATUS	<i>"</i> онс	op	(



Keysight Sp	ectrum Analyzer - Swept S RF 50 Ω 0		1	SENSE:EXT SOUR		ALIGN AUTO		11:43:49 AM Nov 02, 201
	req 15.000000	0000 GHz	PNO: Fast ↔ IFGain:High		Run	#Avg Type	RMS	TRACE 1 2 3 4 5 TYPE WWWW DET A NNNN
I0 dB/div	Ref Offset 50.7 d Ref 20.00 dB						Mł	r1 14.379 2 GH -35.41 dBr
10.0								
0.00								
10.0								DL1 -16.01 dB
20.0								
30.0				1				
40.0								
50.0								
70.0								
Start 12.0 #Res BW	000 GHz 1.0 MHz		#VB	W 3.0 MHz*			#Sweep	Stop 18.000 GH 12.00 s (12000 pts
ISG						STATUS		



# Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -Band 4 - Range 18000 to 22000 MHz

Keysight Spe	ctrum Analyzer - Swept SA RF 50 Ω DC		SENSE:EXT SOURCE	OFF ALIGN A	UTO	11:45:	🗖 💣 💌
	req 20.000000000	) GHz	Taine Free De	## In	vg Type: RMS		TYPE WWWWW DET A NNNN
10 dB/div Log	Ref Offset 28.4 dB Ref 8.40 dBm					Mkr1 21.5 -5	573 4 GH: 5.44 dBm
-1.60							
-11.6							DL1 -16.01 dB
-21.6							
-31.6							
41.6							
-51.6							1
-61.6							
-81.6							
Start 18.0	00 GHz					Stop	22.000 GH
#Res BW		#VB	SW 3.0 MHz*	5	#	Sweep 8.000	s (8000 pts

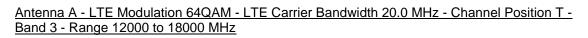
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -Band 1 - Range 0.009 to 3500 MHz

Keysight Spect	rum Analyzer - Swept SA RF 50 Ω DC	1	CENCE	EXT SOURCE OFF	ALIC	IN AUTO		11:48:58 AM Nov 02, 2018
	q 1.75000450	0 GHz NFE PNO	∙Fast ⊷ Tr	ig: Free Run	ALIG	#Avg Type: I	RMS	TRACE 1 2 3 4 5 6 TYPE WWWWWW DET A N N N N N
	Ref Offset 42.5 dB Ref 46.08 dBm	IFGa	n:Low #A	tten: 18 dB			M	kr1 1.971 3 GHz 37.89 dBm
	Kei 40.08 UDIII				<u>1</u>			
36.1				•	•			
26.1								
16.1								
6.08								
3.92								
13.9								DL1-16.01 dBm
23.9					$\parallel$			
33.9					·			
43.9								
Center 1.75 #Res BW 1			#VBW 3.	0 MHz*			#Sweep	Span 3.500 GHz 7.000 s (7000 pts)
ISG						STATUS		



## Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -Band 2 - Range 3500 to 12000 MHz

Keysight Spec	ctrum Analyzer - Swept S RF 50 Ω D		1	SENSE:EXT SOUR		LIGN AUTO		11:40:5	6 AM Nov 02, 201
	eq 7.7500000	NFE	PNO: Fast ↔ IFGain:Low	Tain: Face	Run	#Avg Type:	RMS	TI	TYPE WWWWW DET A NNNN
10 dB/div	Ref Offset 48 dB Ref 20.00 dB		1					Mkr1 4.7 -3	38 6 GH 6.43 dBr
10.0									
0.00									
10.0									Did 4001
20.0									DL1 -16.01 c
80.0	1								
40.0	- in	$\rightarrow$		~~~		<u> </u>	<u> </u>	<u> </u>	<u> </u>
0.0									
i0.0									
70.0									
Start 3.500 Res BW			#VB	W 3.0 MHz	ĸ		#Swe	Stop ep 17.00 s	12.000 GH (17000 pt
SG						STATUS			



Keysight Sp	ectrum Analyzer - Swept RF 50 Ω	SA DC		SENSE:EXT SOUR	CE OFE	ALIGN AUTO		11:50:48 AM Nov 02, 2018
	req 15.00000	0000 GHz	PNO: Fast ↔ IFGain:High		Run	#Avg Type:	RMS	TRACE 1 2 3 4 5 0 TYPE WWWWW DET A N N N N
I0 dB/div	Ref Offset 50.7 Ref 20.00 dB						Mk	r1 14.316 7 GHz -35.30 dBm
10.0								
0.00								
10.0								DL1 -16.01 dBm
20.0								
30.0			•	1				
40.0								
60.0								
70.0								
Start 12.0 #Res BW	000 GHz 1.0 MHz		#VB	W 3.0 MHz*			#Sweep	Stop 18.000 GHz 12.00 s (12000 pts
ISG						STATUS		



## Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -Band 4 - Range 18000 to 22000 MHz

RL	RF 50 Ω	DC 00000 GHz NFE	PNO: Fast ↔ FGain:High	SENSE:EXT SOURCE O . Trig: Free Run #Atten: 0 dB	F ALI	GN AUTO #Avg Type:	RMS	11:46	56 AM Nov 02, 2018 TRACE 1 2 3 4 5 TYPE WWWWW DET A N N N N
0 dB/div	Ref Offset 28.4 Ref 8.40 dB	dB	g.						594 4 GHz 55.38 dBm
1.60									
11.6									DL1 -16.01 dBr
21.6									
31.6									
41.6									
51.6									↓1
51.6									
71.6									
81.6									
tart 18.0 Res BW	000 GHz 1.0 MHz		#VE	SW 3.0 MHz*			#Sw	Stop veep 8.000	22.000 GHz s (8000 pts
SG						STATUS			

Limit	-16dBm
-------	--------



### 2.5 RADIATED EMISSIONS

#### 2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051 FCC CFR 47 Part 24, Clause 24.238 (a) Industry Canada RSS-133, Clause 6.5

#### 2.5.2 Date of Test and Modification State

30 October 2018 - 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 Temperature18.7°CRelative Humidity36%

#### 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 2000MHz and so the upper limit for measurement was calculated at 10 times this, which is 20GHz.

Emissions identified within the range 30MHz - 20GHz 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 Range 1GHz - 20GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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

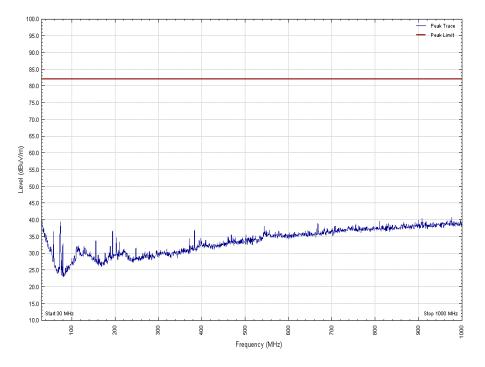


## 2.5.6 Test Results

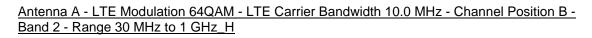
Configuration A

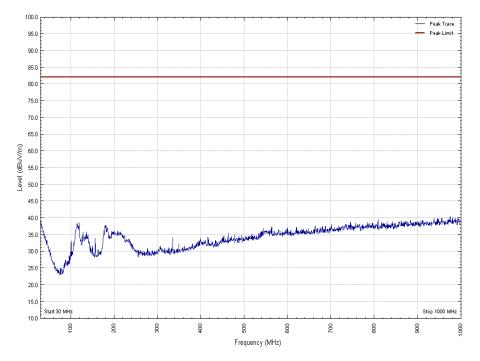
Maximum Output Power 49 dBm

### Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 2 - Range 30 MHz to 1 GHz\_V

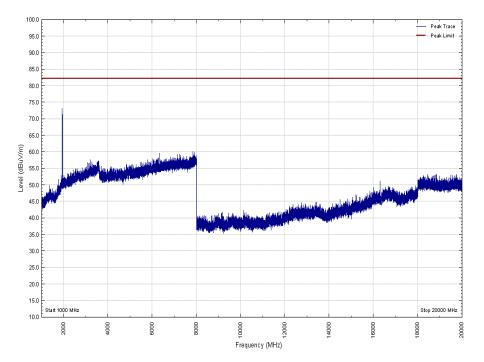




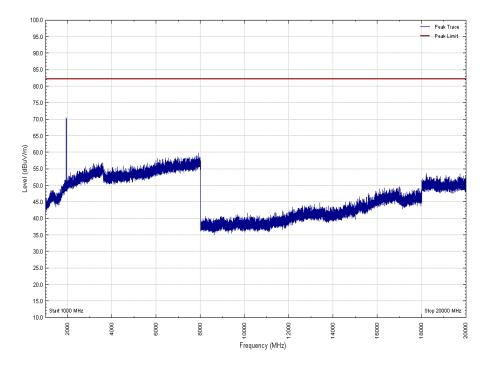




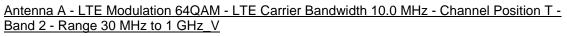
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 2 - Range 1 GHz to 20 GHz\_V

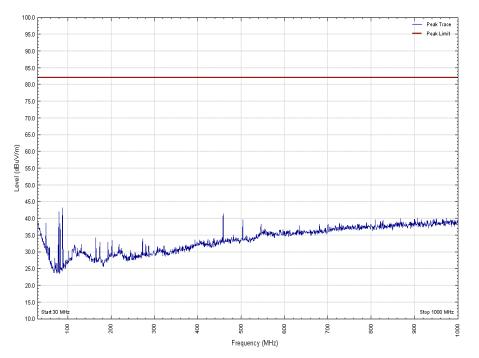




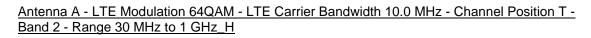


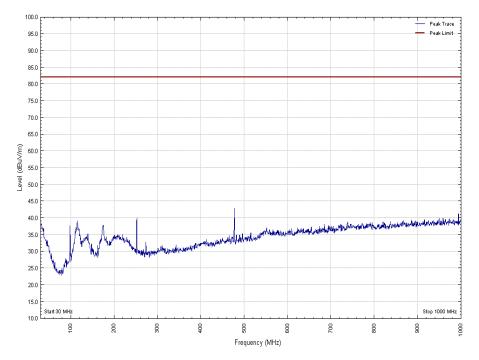
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -Band 2 - Range 1 GHZ to 20 GHz\_H



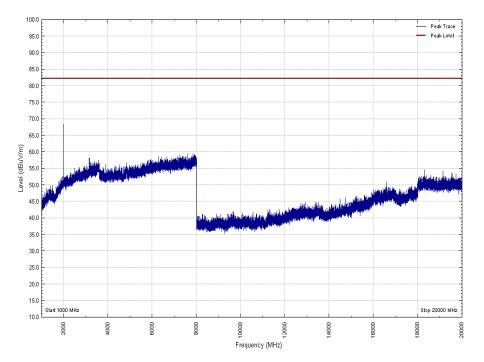




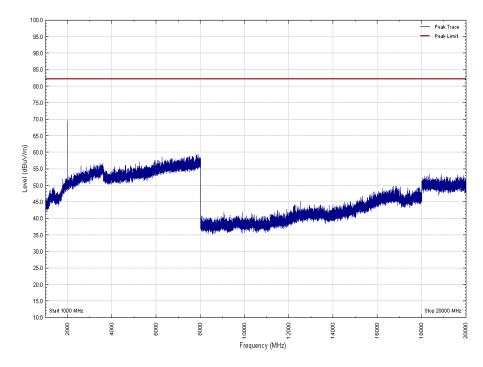




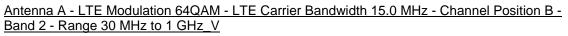
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -Band 2 - Range 1 GHz to 20 GHz\_V

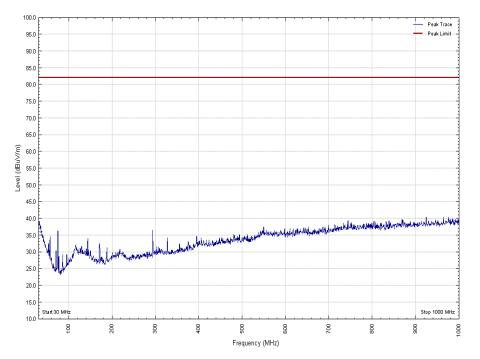




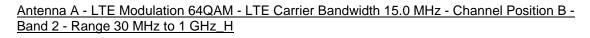


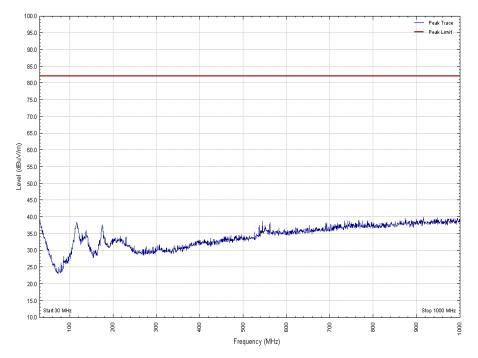
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -Band 2 - Range 1 GHZ to 20 GHz\_H



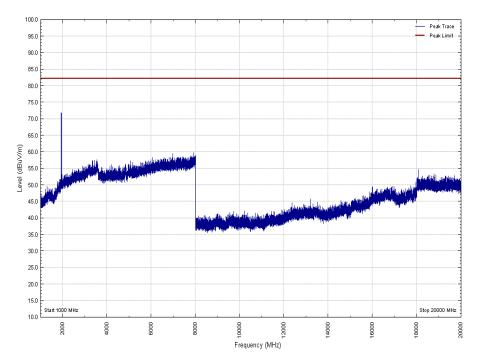




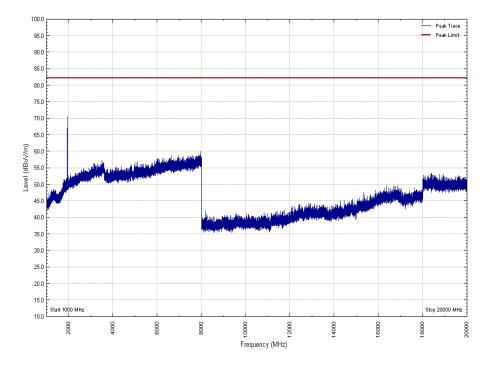




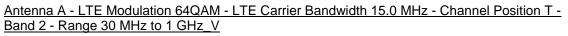
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B -Band 2 - Range 1 GHz to 20 GHz\_V

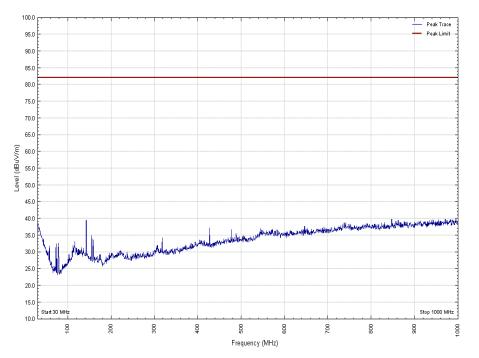




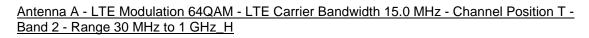


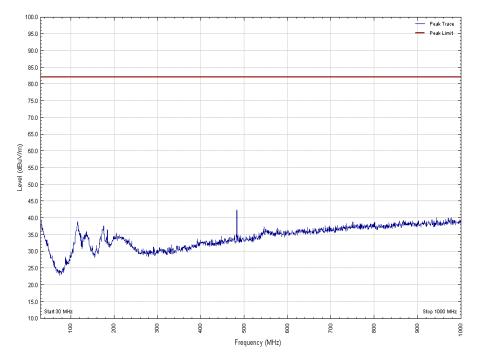
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B -Band 2 - Range 1 GHZ to 20 GHz\_H



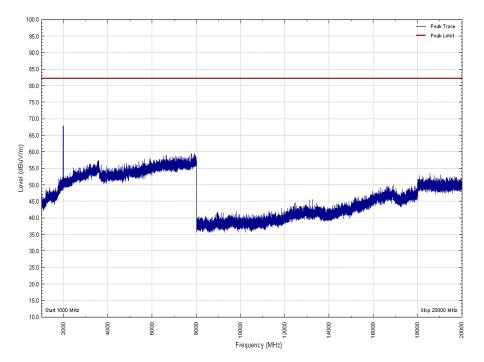




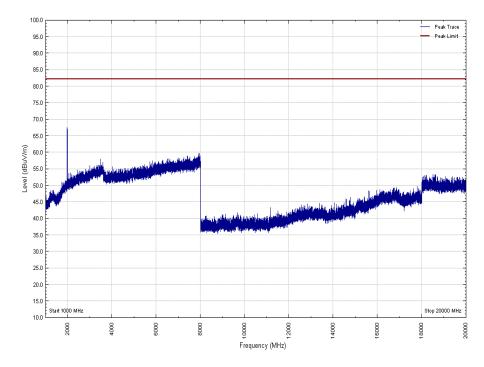




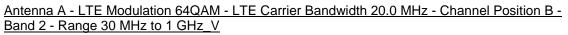
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T -Band 2 - Range 1 GHz to 20 GHz\_V

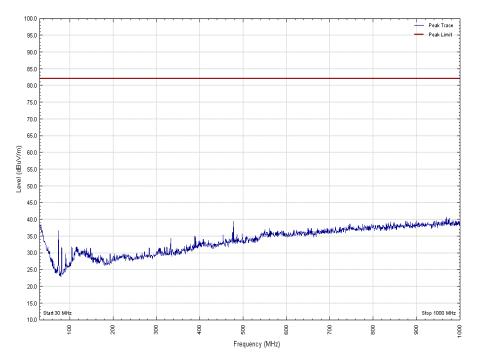




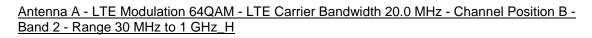


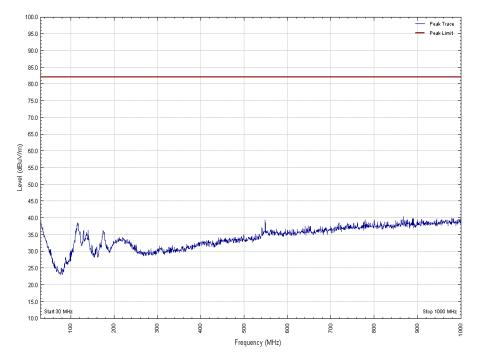
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T -Band 2 - Range 1 GHZ to 20 GHz\_H



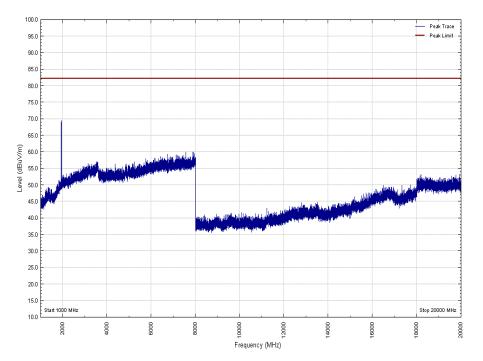




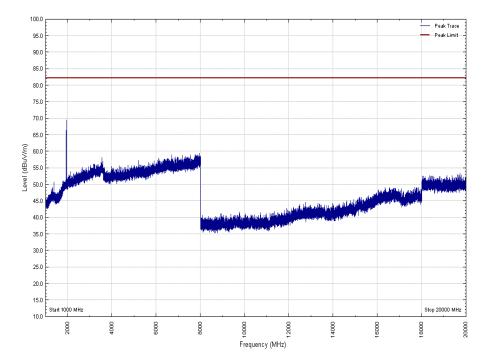




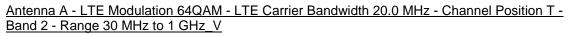
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -Band 2 - Range 1 GHz to 20 GHz\_V

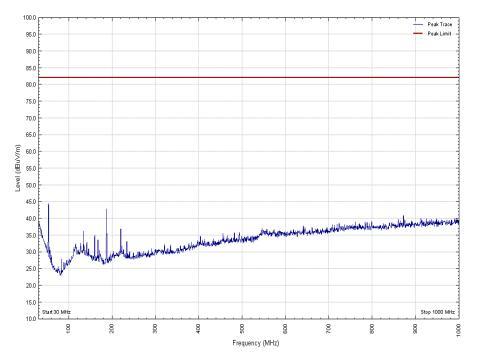




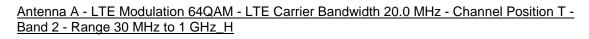


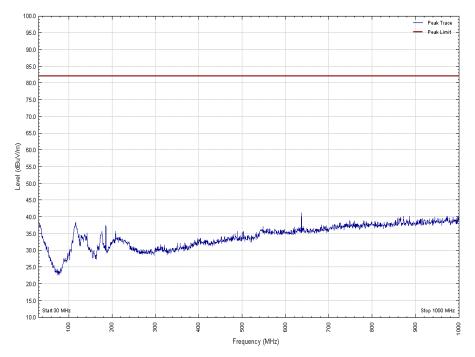
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -Band 2 - Range 1 GHZ to 20 GHz\_H



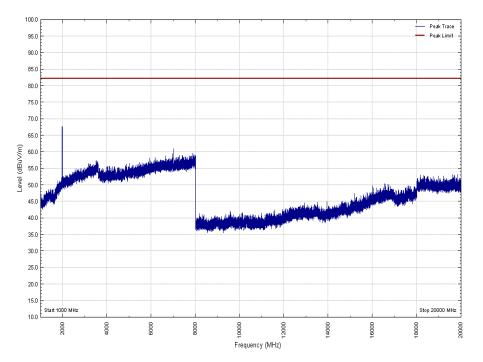




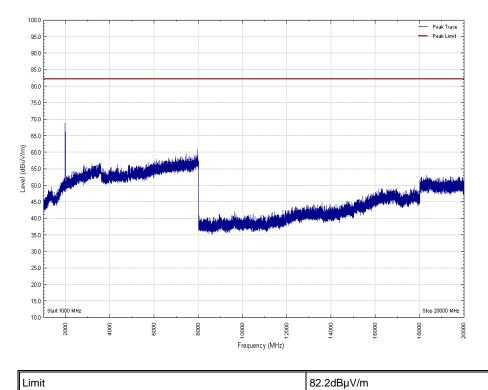




Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -Band 2 - Range 1 GHz to 20 GHz\_V







Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -Band 2 - Range 1 GHZ to 20 GHz\_H



**SECTION 3** 

# TEST EQUIPMENT USED



## 3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Туре No.	TE No.	Calibration Period (months)	Calibration Due
Maximum Peak Outpu	t Power and Peak to Av	verage Ratio - Conducte	d		
Hygrometer	Rotronic	A1	2138	12	21-Feb-2019
Signal Analyser	N9030A	Keysight	4653	12	05-Feb-2019
PSU	Farnell	H60/25	1092	-	OP Mon
DMM	Fluke	179	4006	12	13-Dec-2018
Attenuator	Weinschel	48-10-43	4868	12	01-Nov-2018
Attenuator	Weinschel	48-30-43	4871	12	17-Jul-2019
Attenuator	Weinschel	48-10-43	3593	12	16-Jul-2019
Network Analyser	R&S	ZVA 40	*3548	12	02-Oct-2018
Calibration unit	R&S	ZV Z54	4368	12	06-Mar-2019
Occupied Bandwidth		-			-
Hygrometer	Rotronic	A1	2138	12	21-Feb-2019
Signal Analyser	N9030A	Keysight	4653	12	05-Feb-2019
PSU	Farnell	H60/25	1092	-	OP Mon
DMM	Fluke	179	4006	12	13-Dec-2018
Attenuator	Weinschel	48-10-43	4868	12	01-Nov-2018
Attenuator	Weinschel	48-30-43	4871	12	17-Jul-2019
Attenuator	Weinschel	48-10-43	3593	12	16-Jul-2019
Network Analyser	R&S	ZVA 40	*3548	12	02-Oct-2018
Calibration unit	R&S	ZV Z54	4368	12	06-Mar-2019
Band Edge					•
Hygrometer	Rotronic	A1	2138	12	21-Feb-2019
Signal Analyser	N9030A	Keysight	4653	12	05-Feb-2019
PSU	Farnell	H60/25	1092	-	OP Mon
DMM	Fluke	179	4006	12	13-Dec-2018
Attenuator	Weinschel	48-10-43	4868	12	01-Nov-2018
Attenuator	Weinschel	48-30-43	4871	12	17-Jul-2019
Attenuator	Weinschel	48-10-43	3593	12	16-Jul-2019
Network Analyser	R&S	ZVA 40	*3548	12	02-Oct-2018
Calibration unit	R&S	ZV Z54	4368	12	06-Mar-2019
Transmitter Spurious E	missions	-	<u> </u>	<u> </u>	-
Hygrometer	Rotronic	A1	2138	12	21-Feb-2019
Signal Analyser	N9030A	Keysight	4653	12	05-Feb-2019
PSU	Farnell	H60/25	1092	-	OP Mon
DMM	Fluke	179	4006	12	13-Dec-2018
Attenuator	Weinschel	48-10-43	4868	12	01-Nov-2018
Attenuator	Weinschel	48-30-43	4871	12	17-Jul-2019
Attenuator	Weinschel	48-10-43	3593	12	16-Jul-2019
WaveGudde	FMI UK	18-26GHz	-	-	OP Mon
HPF	RLC electronics	F-100-3000-5-R	3349	-	OP Mon



Instrument	Manufacturer	Туре No.	TE No.	Calibration Period (months)	Calibration Due
Network Analyser	R&S	ZVA 40	*3548	12	02-Oct-2018
Calibration unit	R&S	ZV Z54	4368	12	06-Mar-2019
Radiated Emissions					
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	02-May-2020
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
18GHz - 40GHz Pre- Amplifier	Phase One	PSO4-0087	1534	12	02-Feb-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2419	12	23-Nov-2018
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
1501A 4.0M Km Km Cable	Rhophase	KPS-1501A-4000- KPS	4301	12	19-Feb-2019
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4- KMS	4520	12	13-Feb-2019
EMI Receiver	Keysight Technologies	N9038A MXE	4628	12	04-Jul-2019
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
9m N type RF cable	Rosenberger	2303-0 9.0m PNm PNm	4827	6	04-Jan-2019
4dB Attenuator	Pasternack	PE7047-4	4935	12	28-Nov-2018
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019
EmX Software	TUV SUD Product Service	EmX V.1.3.21	5125	-	N/A - Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000- KPS	5126	6	26-Apr-2019

N/A – Not Applicable

O/P Mon – Output Monitored with Calibrated Equipment TU – Traceability Unscheduled

\* - This Network Analyser was only used to perform Calibrations prior to 02-Oct-2018.



## 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	± 0.1 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 2.3 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Occupied Bandwidth	Up to 20 MHz Bandwidth	± 1.1 Hz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 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 <sup>6</sup>	



**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							
Product	Product No	R-State	Serial No				
Radio 2212 B2 B25	KRC 161 688/3	R1B	D826860358				
Software Version:	CXP9013268/15	Revision:	R73AM				