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Report On

FCC Testing of the Ericsson Radio 2212 B8, KRC 161 650/1 LTE and NB-IoT Stand Alone and NB-IoT In Band (936.5-939.5 MHz), Remote Radio Unit, with compatible Main Unit in a Base Station configuration in accordance with FCC CFR 47 Part 2 and FCC CFR Part 27

COMMERCIAL-IN-CONFIDENCE

FCC: TA8AKRC161650

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 'Steve Scarfe'.

Steve Scarfe
Authorised Signatory

DATED

13 April 2021

Document 75950445 Report 02 Issue 2

April 2021



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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 B8 – KRC 161 650/1
IC Model Name	AS161650
Serial Number(s)	E238996984
Software Version	CXP9013268/15 Rev R85BS
Hardware Version	R5H
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2019 FCC CFR 47 Part 27: 2019
Test Plan	Radio 2212 B8 for MANA FCC test plan V 0.5
Start of Test	01 December 2020
Finish of Test	08 December 2020
Name of Engineer(s)	Neil Rousell Graeme Lawler
Related Document(s)	KDB 971168 D01 v03r01 ANSI C63.26:2015 FCC -20-67A1: May 2020

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 2: 2019, and FCC CFR Part 27. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Neil Rousell

Graeme Lawler

This report has been revised to Issue 2 and should be read in place of Issue 1. This report has been revised to issue 2 to make minor corrections in the Manufacturers Declaration of Build Status.



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 Part 27 is shown below.

Section	Specification Clause			Test Description	Result
	FCC CFR 47 Part 2	FCC CFR Part 27	FCC CFR Part 27, Subpart P (FCC-20-67A1)		
-	2.1046	-	27.1507	Effective radiated power limits for 900 MHz Broadband systems	N/A ¹
-	2.1046	-	27.1508	Field Strength	N/A ¹
-	-	-	-	Receiver Emission Limits	N/A ²
2.1	2.1051	27.53 (h)	27.1506	Band Edge	Pass
2.2	2.1049	27.53	27.1506	Occupied Bandwidth	Pass
2.3	2.1046	27.50	27.1507	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.4	2.1051	27.53 (h)	27.1509	Transmitter Spurious Emissions	Pass
2.5	2.1053	27.53 (h)	27.1509	Radiated Emissions	Pass
2.6	2.1055	27.54	-	Frequency Stability	Pass

N/A¹ – Not Applicable, due to no integral antenna

N/A² – Not Applicable, due to no stand alone receive mode. Testing has been performed to FCC Part 15B and is recorded in the TUV SUD Document 75950445 Report 01.

N/A – Not Applicable

This unit was tested without an antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible IC Bureau(s). Licensees are required to take into account the maximum allowed antenna gain used in combination with the power settings to prevent the radiated output power exceeding the limits.



1.3 CONFIGURATION DESCRIPTION

Configuration	RAT	No. Of carriers	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
				Bottom	Middle	Top
A1	NB-IoT IB	1	3MHz (+NB-IoT IB PRB)	-	938.00	-
A2	LTE	1	1.4 MHz	937.20	938.00	938.80
A3	LTE	2	1.4 MHz + 1.4 MHz	-	937.20+938.80	-
A4	NB-IoT SA	1	400 kHz	936.70	938.0	939.30



1.4 DECLARATION OF BUILD STATUS

Equipment Description

Technical Description: <i>(Please provide a brief description of the intended use of the equipment)</i>	Multi Standard Remote Radio
Manufacturer:	Ericsson AB
Model:	Radio 2212 B8
Part Number:	KRC 161 650/1
Hardware Version:	R5H
Software Version:	CXP9013268/15-R85BS
FCC ID (if applicable)	TA8AKRC161650

Intentional Radiators

Technology	NB IoT	LTE
Frequency Band (MHz)	897,5 – 900,5 Mhz (UL) 936,5-939,5 Mhz (DL)	897,5 – 900,5 Mhz (UL) 936,5-939,5 Mhz (DL)
Output Power (W or dBm)	2 ports, 40 W per port, total max 80 W, (49dBm)	2 ports, 40 W per port, total max 80 W, (49dBm)
Antenna Gain (dBi)	15,2 dBi	15,2 dBi
Supported Bandwidth(s) (MHz)	200 kHz	1,4, 3 MHz
Modulation Scheme(s)	QPSK, 16QAM, 64QAM, 256QAM	QPSK, 16QAM, 64QAM, 256QAM
ITU Emission Designator	205KW7D	1M10W7D 2M68W7D
Bottom Frequency (MHz)	936,70 MHz	937,20 MHz
Middle Frequency (MHz)	938,00 MHz	938,00 MHz
Top Frequency (MHz)	939,30 MHz	938,80 MHz

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	CPRI 10,1 Gbit/s
Lowest frequency generated or used in the device or on which the device operates or tunes	-
Class A Digital Device (Use in commercial, industrial or business environment) <input type="checkbox"/>	
Class B Digital Device (Use in residential environment only) <input checked="" type="checkbox"/>	



DC Power Source

Nominal voltage:	-48	V
Extreme upper voltage:	-36	V
Extreme lower voltage:	-58,5	V
Max current:	32	A

Temperature

Minimum temperature:	-40	°C
Maximum temperature:	+55	°C

Antenna Characteristics

Antenna connector <input type="checkbox"/>		State impedance		Ohm
Temporary antenna connector <input checked="" type="checkbox"/>		State impedance	50	Ohm
Integral antenna <input type="checkbox"/>	Type:	Gain		dBi
External antenna <input checked="" type="checkbox"/>	Type: Macro cell, directional, 2 ports (single column, X-polarized)	Gain	15,2	dBi
For external antenna only: Standard Antenna Jack <input type="checkbox"/> If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed <input type="checkbox"/> Non-standard Antenna Jack <input type="checkbox"/>				

Ancillaries (if applicable)

Manufacturer:	CT10	Part Number:	T01F265031
Model:	LPC 102487/1	Country of Origin:	-

Manufacturer:	Delta PSU AC 02	Part Number:	BW96903167
Model:	BML 901 250/1	Country of Origin:	

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

Faysal Pirmohamed

Name: Faysal Pirmohamed
Position held: Regulatory Engineer
Date: 2021-04-13

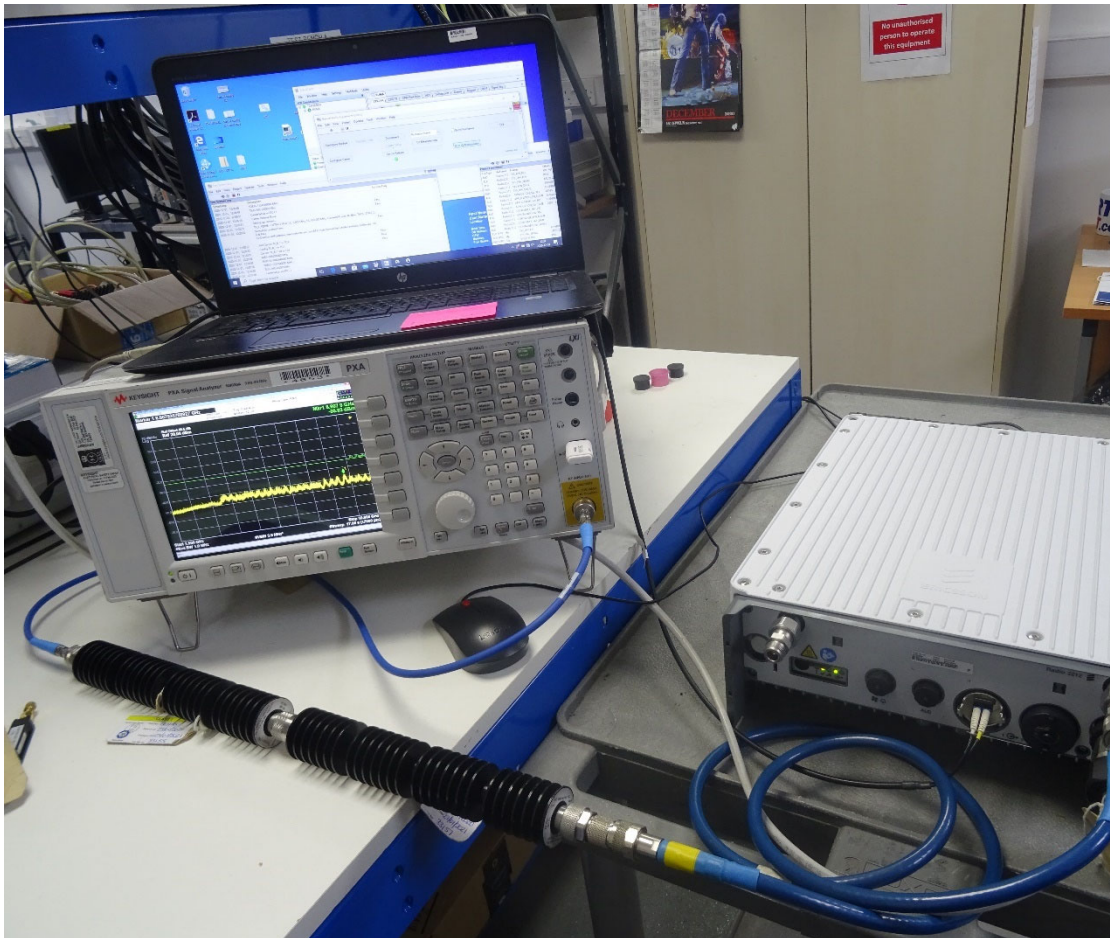
No responsibility will be accepted by TÜV SÜD UK Limited as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) Radio 2212 B8 is an Ericsson AB Radio Unit working in the public mobile service 936.5-939.5 MHz band which provides communication connections to (Band) network. The Radio 2212 B8 operates from a -48V DC supply.

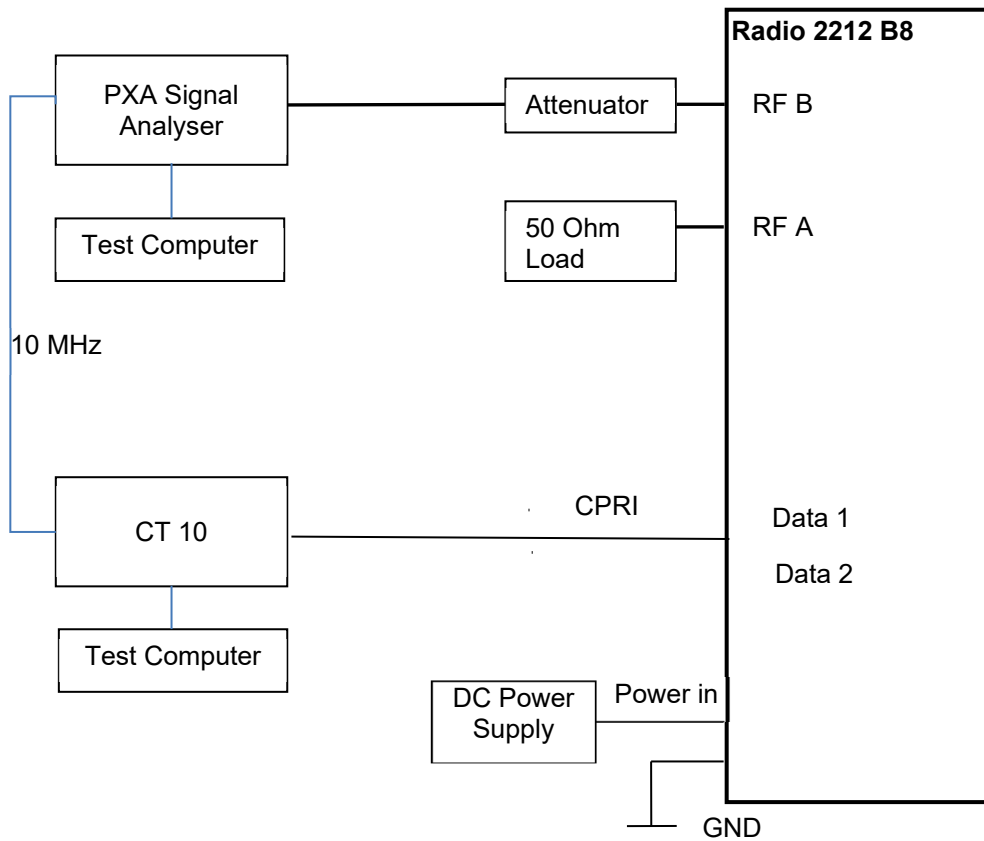
The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



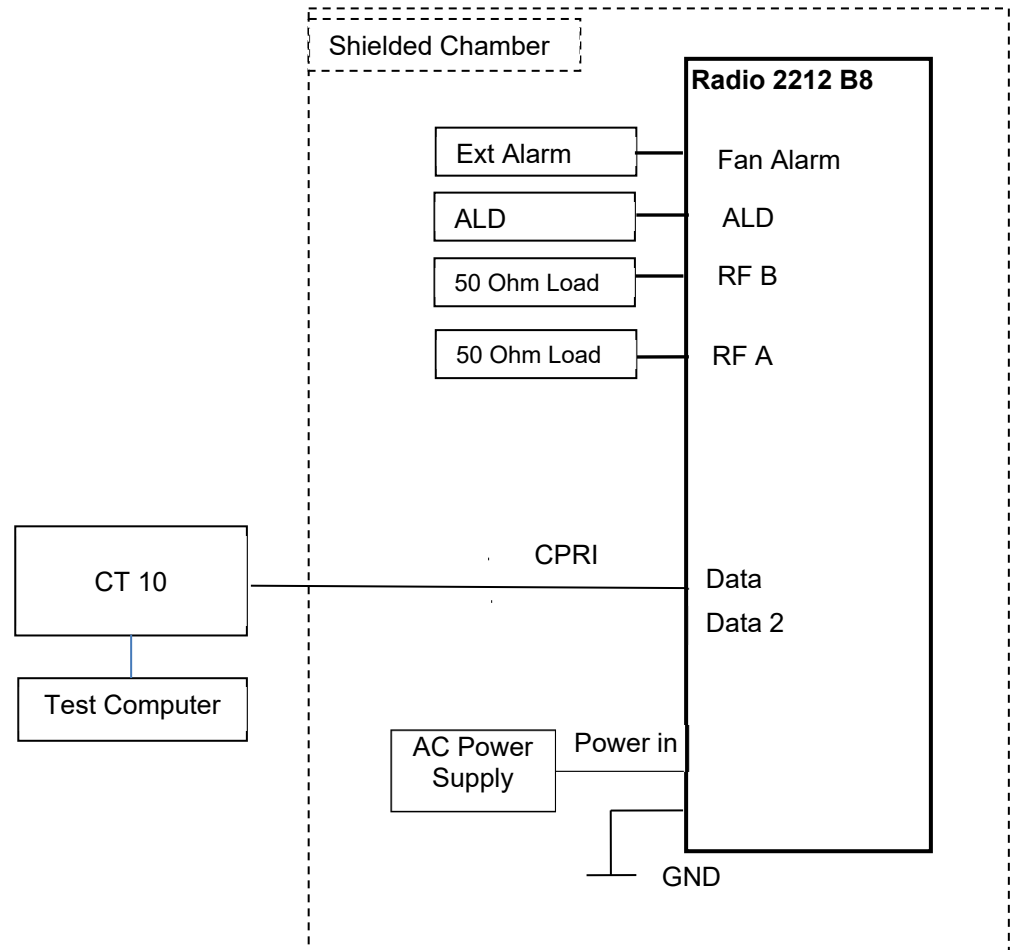
Equipment Under Test

1.6 TEST SETUP

Conducted Testing



Radiated Emissions Testing





1.7 TEST CONDITIONS

Testing was performed to establish the worst case modulation scheme and carrier bandwidth before any other measurements were carried out. It was established that 16QAM modulation and 3MHz bandwidth for LTE gave the highest output power and therefore deemed to be worst case operating modes.

QPSK modulation is the only supported modulation for NB-IoT.

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 as described in the Test Method for each Test.

The EUT was powered from a -48V DC supply.

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

Test Name	Name of Engineer(s)
Radiated Emissions	Graeme Lawler
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
Frequency Stability	Neil Rousell

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 ADDITIONAL INFORMATION

Ericsson will limit this product through the software from operating across the whole of Band 8, it will be limited to 936.5-939.5 MHz.

Some plots for Conducted Spurious Emissions have an Asterisk in the top right corner of the display. This indicates that settings have been changed on the Spectrum Analyser post sweep which may alter the measurement result/displayed trace data. In the cases displayed in this report, a setting was changed post sweep which was the display line. This did not result in any impact on the measurement results.



SECTION 2

TEST DETAILS



2.1 BAND EDGE

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR Part 27, Clause 27.53
FCC-20-67A1, FCC CFR Part 27, Subpart P, Clause 27.1506

2.1.2 Date of Test and Modification State

01 and 07 December 2020 - 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 20.7-22.2°C
Relative Humidity 35.6 - 36.0%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01 Clause 6. The measurements were performed using resolution bandwidths <1 % of the 26dB bandwidth and then integrated over at least 1 % of the 26 dB bandwidth.

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.

For this EUT with 2 antenna ports, the limit was calculated as being $-20 \text{ dBm} - 10 * \text{Log}(2) = -23 \text{ dBm}$.

2.1.6 Test Results

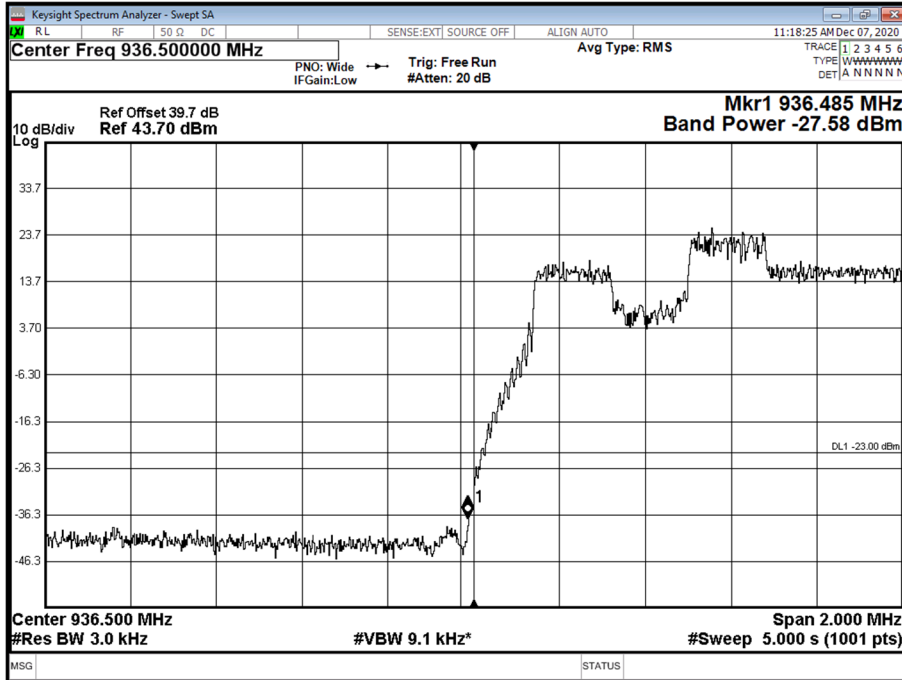
Configuration A1

Maximum Output Power 46 dBm

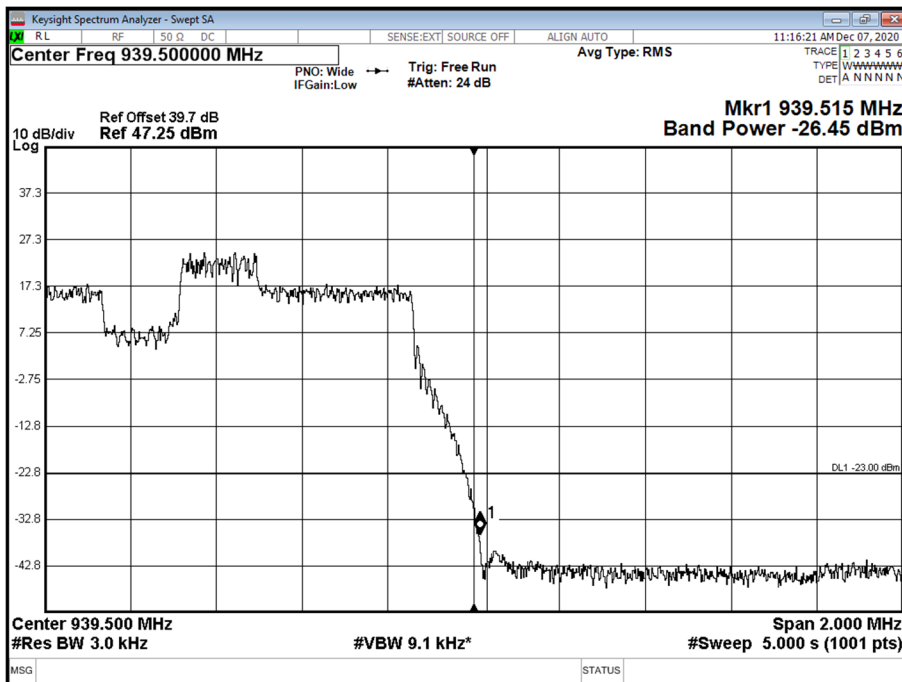
Antenna	LTE + NB-IoT IB Modulation	LTE + NB-IoT IB Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
B	QPSK	3.0 MHz + NB-IoT IB	938.0	938.0



Antenna B - LTE +NB-IoT IB Modulation QPSK - LTE +NB-IoT IB Carrier Bandwidth 3.0 MHz + NB-IoT IB - Channel Position B



Antenna B - LTE +NB-IoT IB Modulation QPSK - LTE +NB-IoT IB Carrier Bandwidth 3.0 MHz + NB-IoT IB - Channel Position T



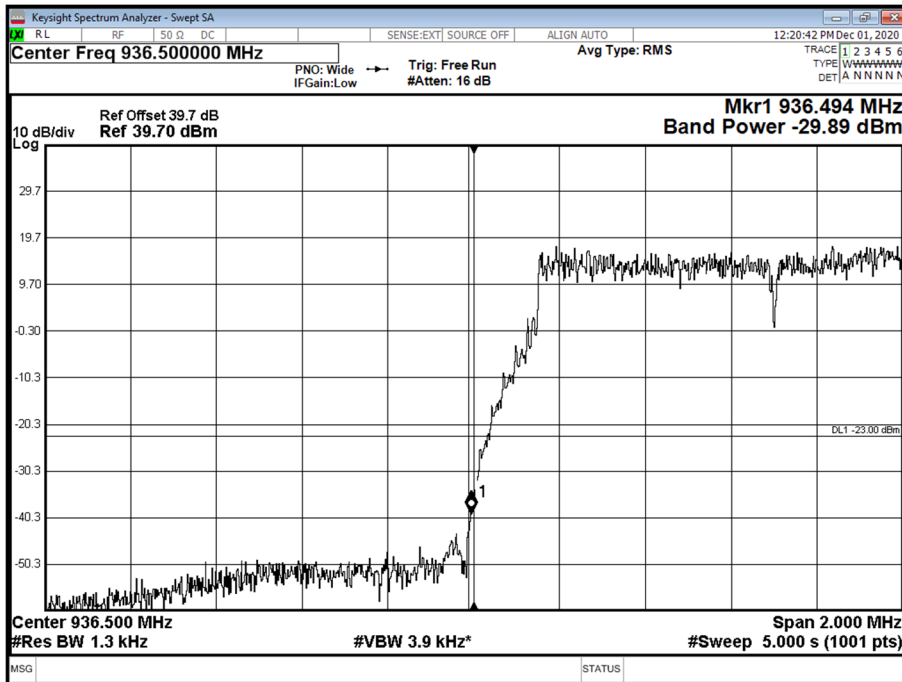


Configuration A2

Maximum Output Power 43 dBm

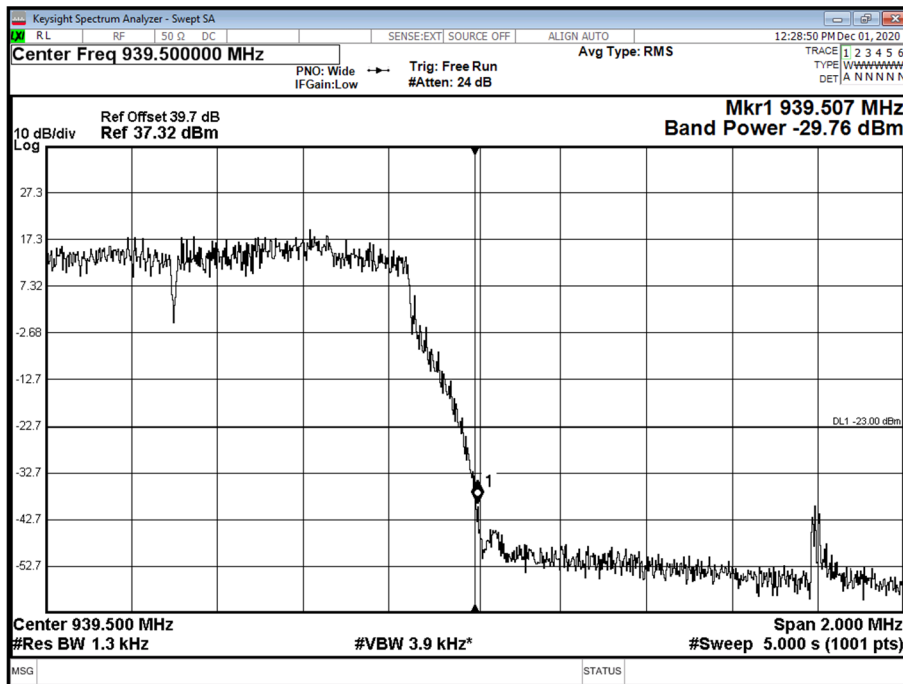
Antenna	LTE-Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
B	16QAM	1.4 MHz	937.2	938.8

Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position B





Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position T



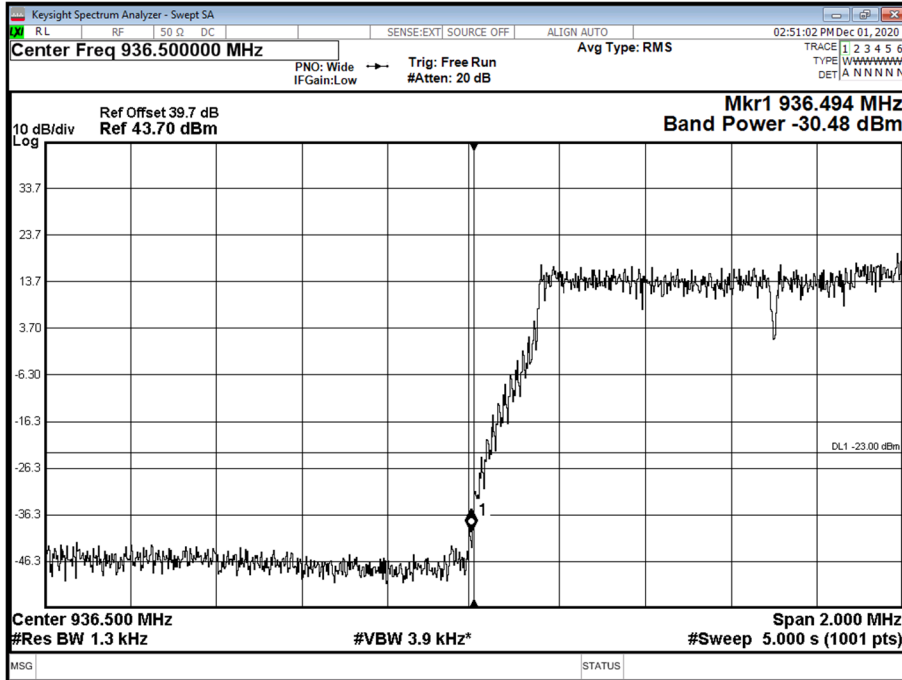
Configuration A3

Maximum Output Power 46 dBm

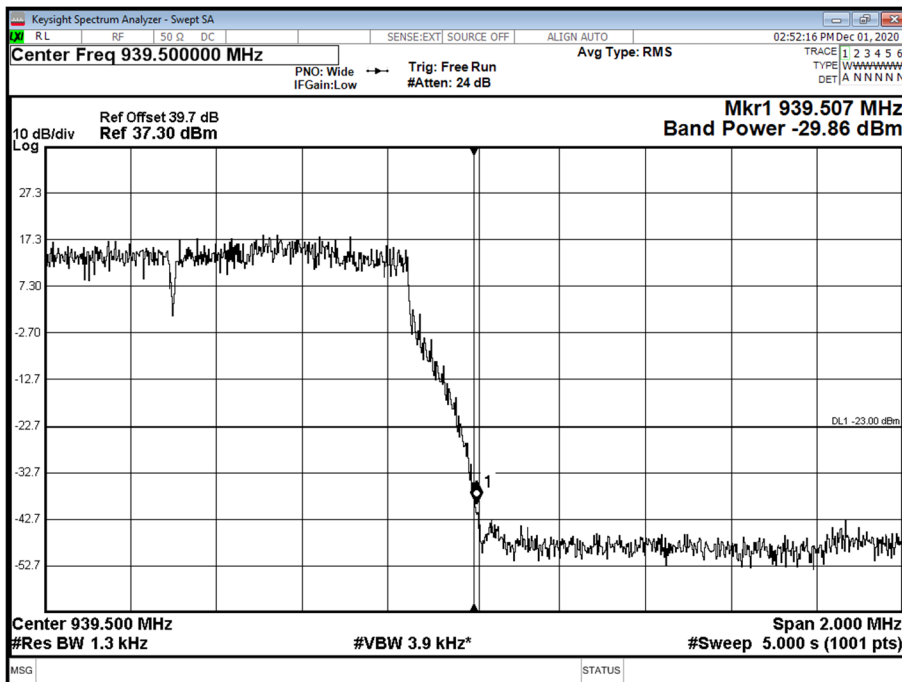
Antenna	LTE-Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
B	16QAM	1.4 MHz + 1.4 MHz	937.2 + 938.8	937.2 + 938.8



Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz +1.4 MHz - Channel Position B



Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz +1.4 MHz - Channel Position T



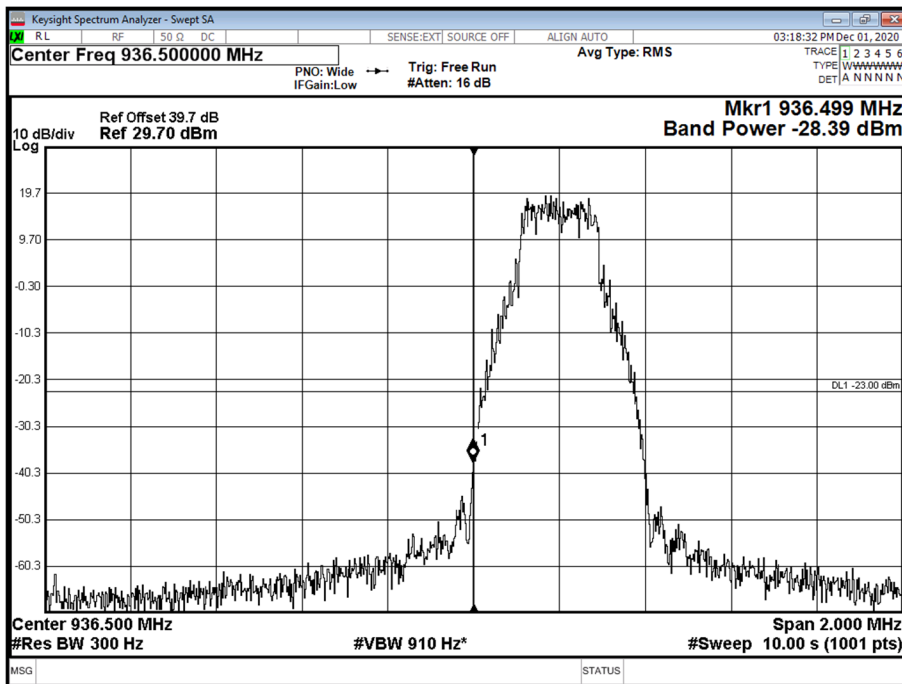


Configuration A4

Maximum Output Power 43 dBm

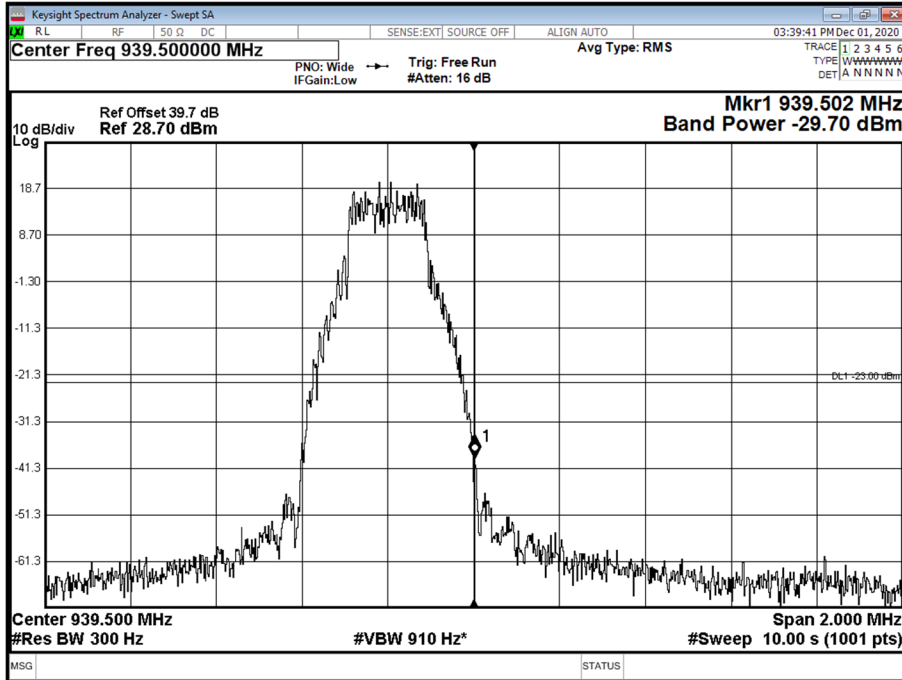
Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
B	QPSK	400 kHz	936.7	939.3

Antenna B - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position B





Antenna B - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position T



For 900 MHz broadband operations in the 936.5-939.5 MHz band, by at least $50 + 10 \log (P)$ dB	Limit
	-23dBm



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
FCC-20-67A1, FCC CFR Part 27, Subpart P, Clause 27.1506

2.2.2 Date of Test and Modification State

01 and 07 December 2020 - 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	20.7-22.2°C
Relative Humidity	35.6 - 36.0%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, Clause 5.4.3.

The Spectrum Analyser RBW was configured to be at least 1% of the channel bandwidth of the carrier to be measured.

For 26 dB Bandwidth, in accordance with KDB 971168 D01, a peak detector and a trace setting of Max Hold were used. The trace was allowed to stabilise. Using the Spectrum Analyser function, the 26 dB measurement result was obtained.

2.2.6 Test Results

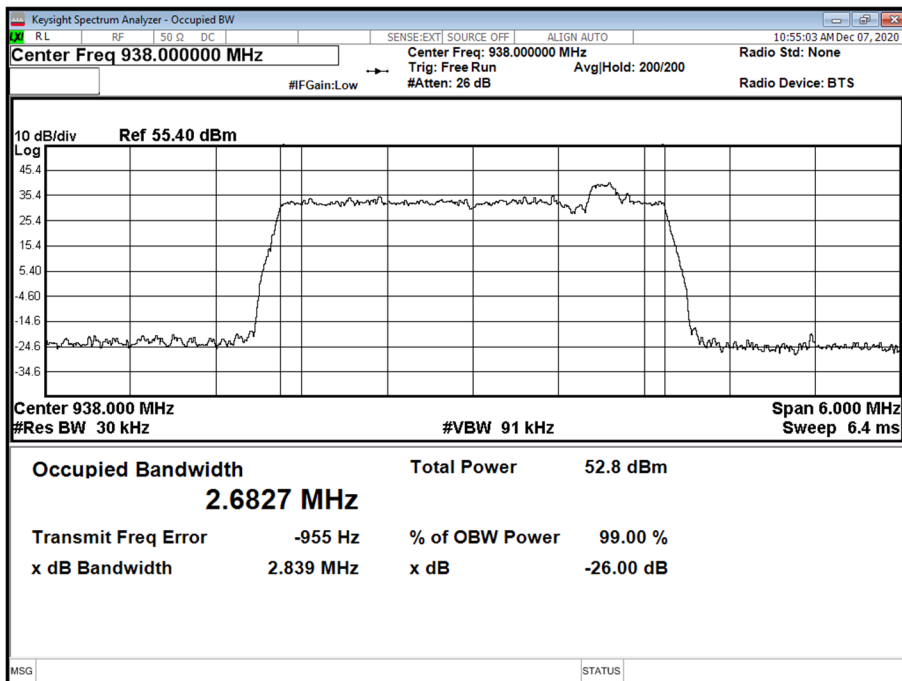


Configuration A1

Maximum Output Power 46 dBm

Antenna	LTE +NB- IoT IB Modulation	LTE +NB- IoT IB 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
B	QPSK	3.0 MHz + NB-IoT IB	-	-	2,682.71	2,838.68	-	-

Antenna B - LTE +NB-IoT IB Modulation QPSK - LTE +NB-IoT IB Carrier Bandwidth 3.0 MHz + NB-IoT IB - Channel Position M



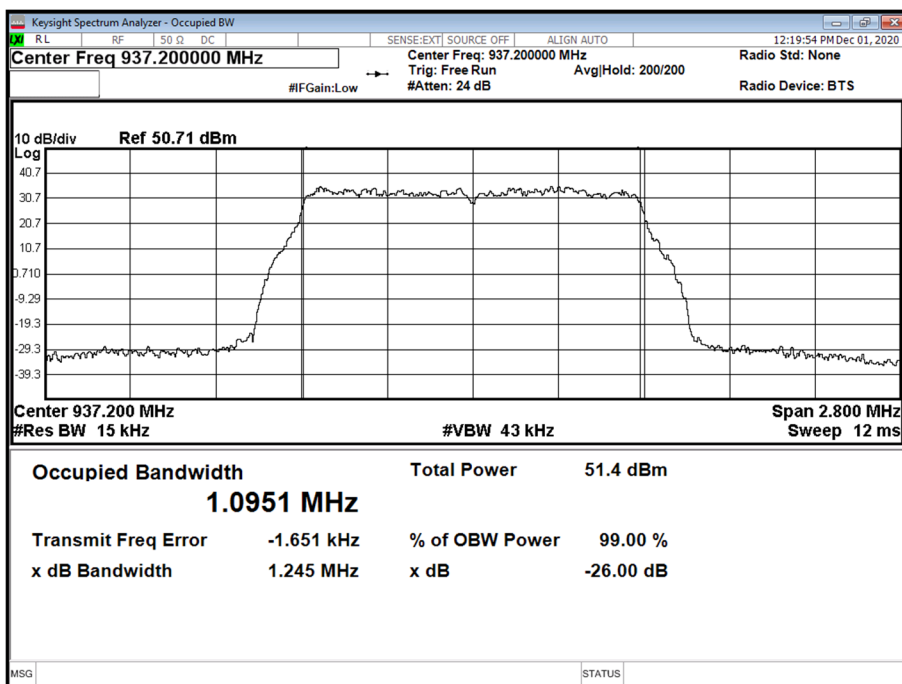


Configuration A2

Maximum Output Power 43 dBm

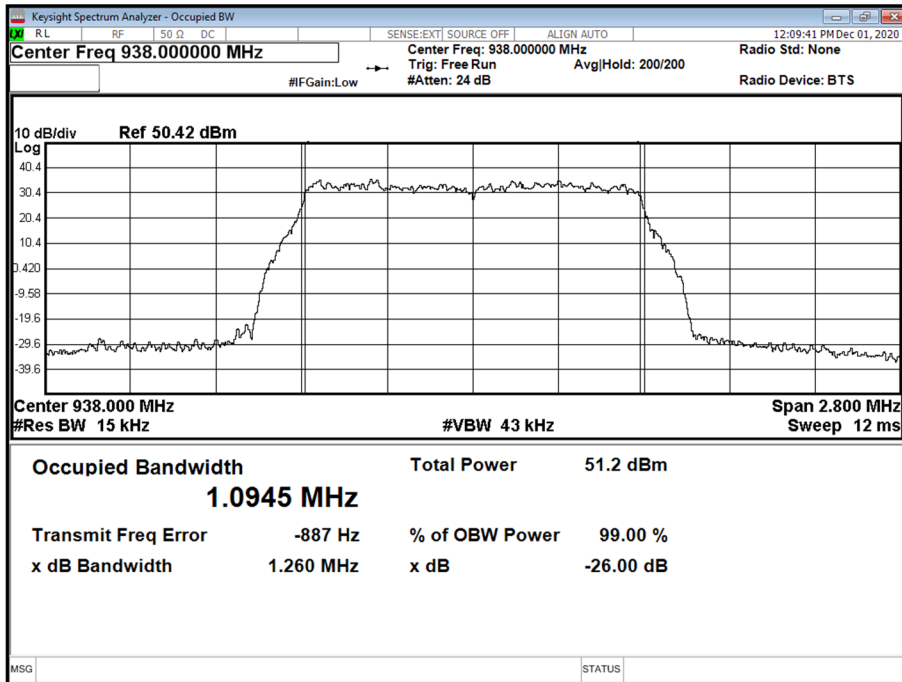
Antenna	LTE-Modulation	LTE Carrier Bandwidth	Result (kHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
B	16QAM	1.4 MHz	1,095.06	1,244.89	1,094.49	1,260.12	1,095.72	1,255.36

Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position B

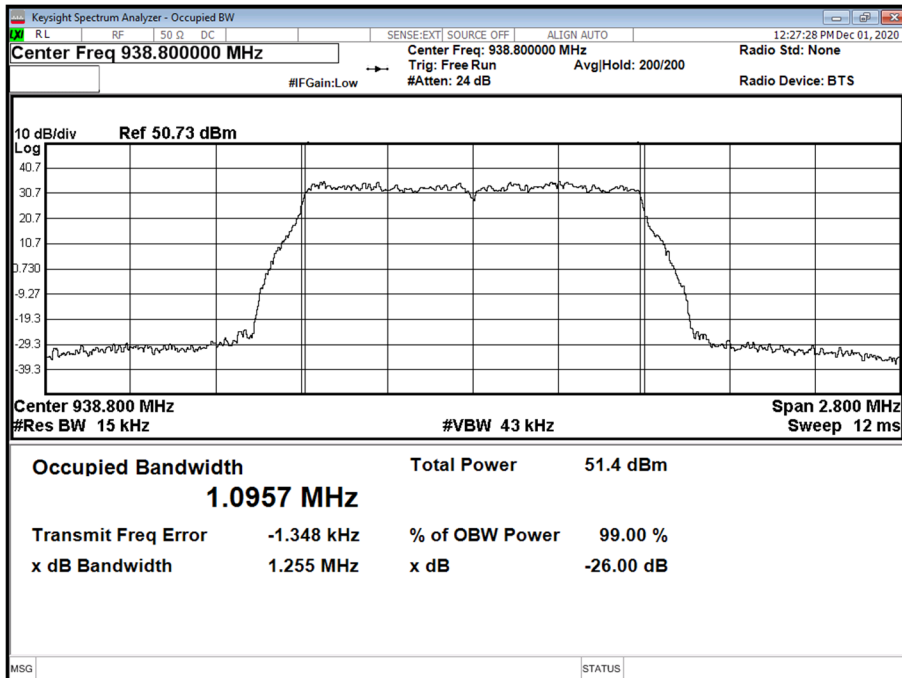




Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position M



Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position T



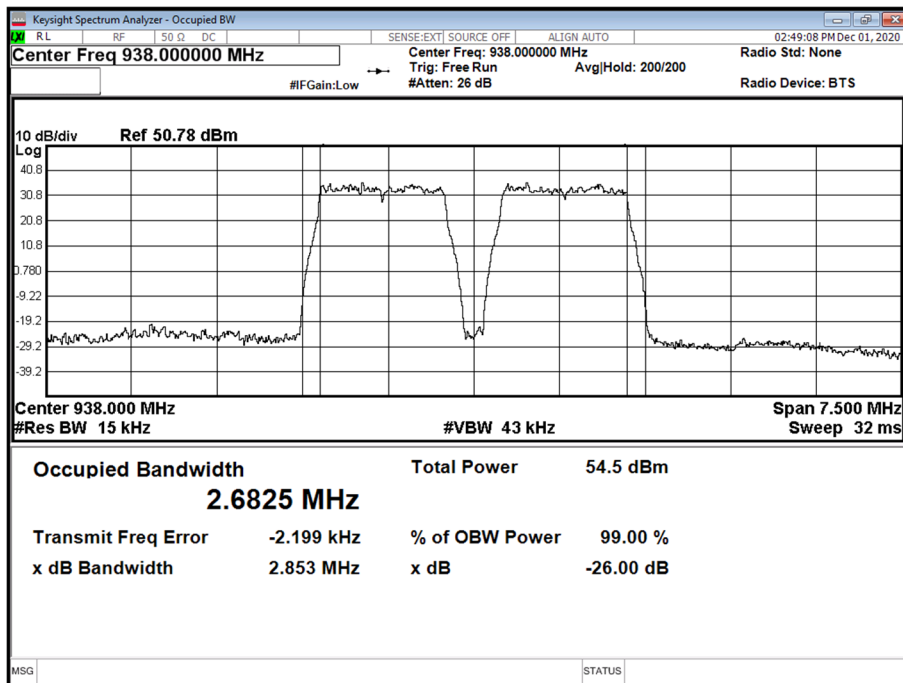


Configuration A3

Maximum Output Power 46 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
B	16QAM	1.4 MHz +1.4 MHz	-	-	2,682.48	2,852.71	-	-

Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz +1.4 MHz - Channel Position M



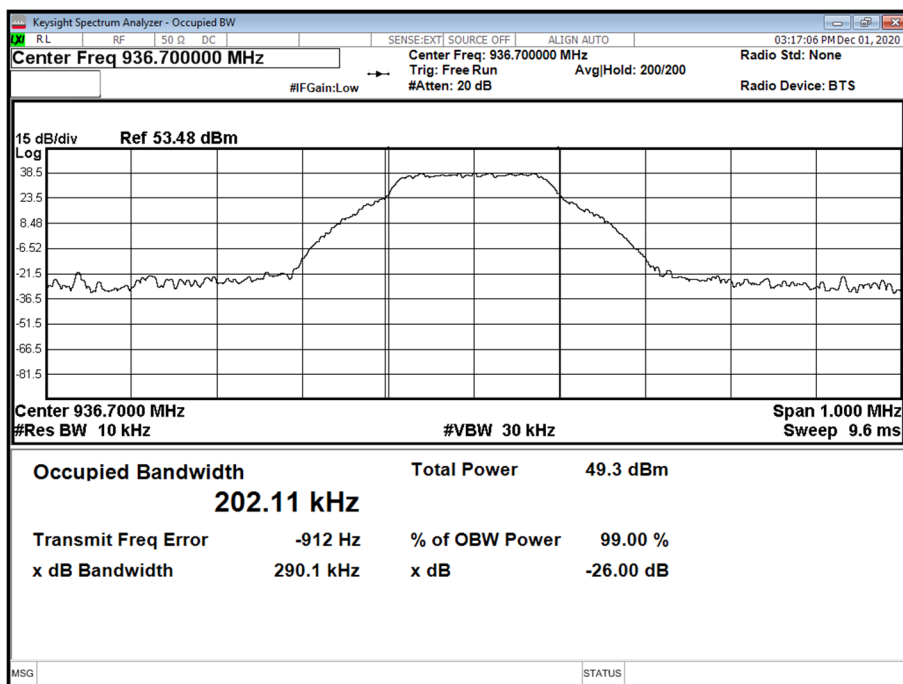


Configuration A4

Maximum Output Power 43 dBm

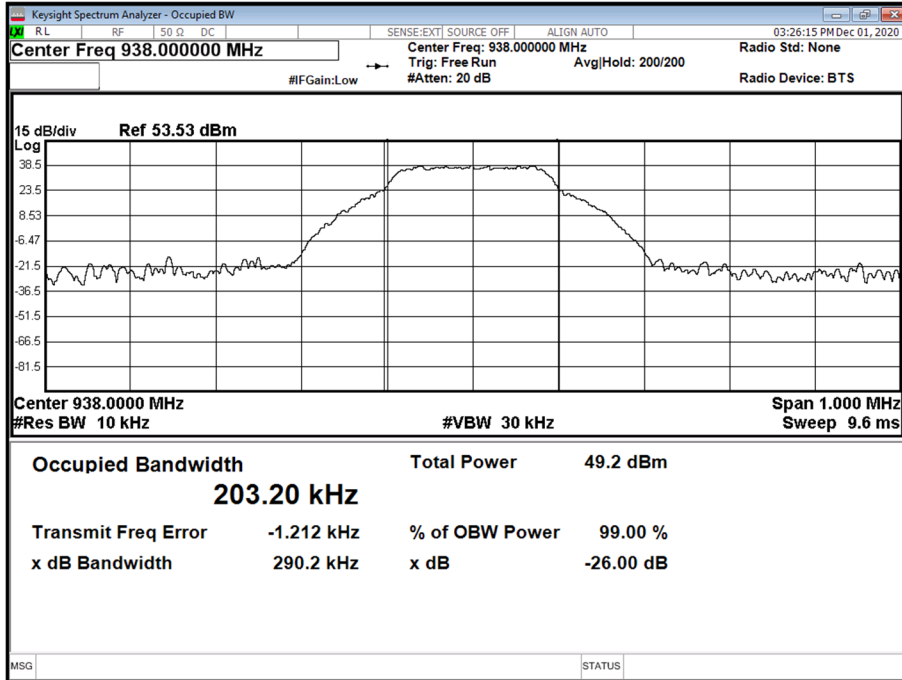
Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Result (kHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
B	QPSK	400 kHz	202.11	290.07	203.20	290.18	204.51	293.29

Antenna B - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position B

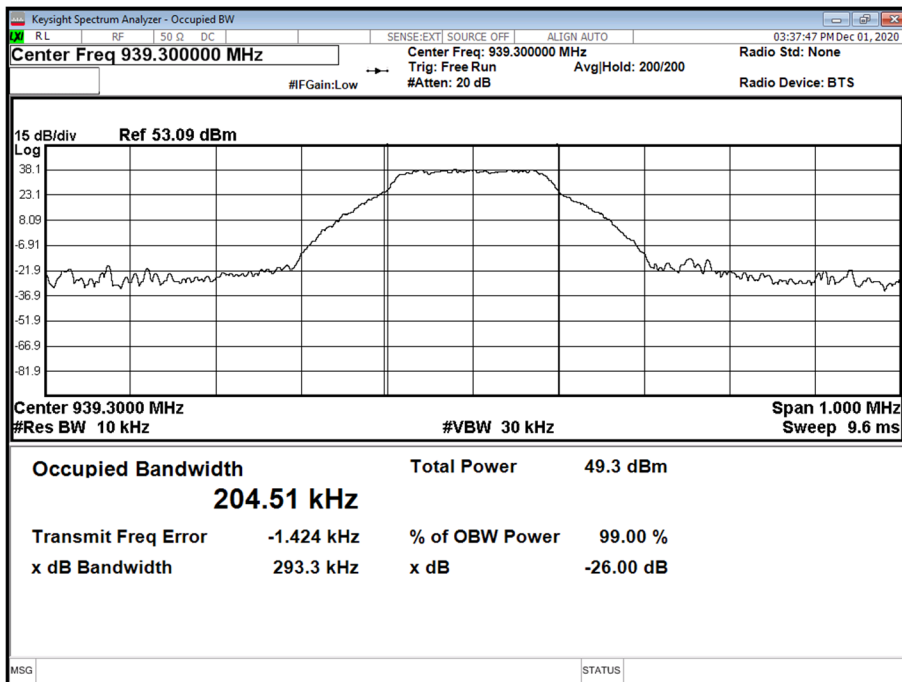




Antenna B - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position M



Antenna B - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position T





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

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR Part 27, Clause 27.50
FCC-20-67A1, FCC CFR Part 27, Subpart P, Clause 27.1507

2.3.2 Date of Test and Modification State

01 and 07 December 2020 - 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	20.7-22.2°C
Relative Humidity	35.6 - 36.0%

2.3.5 Test Method

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

2.3.6 Test Results

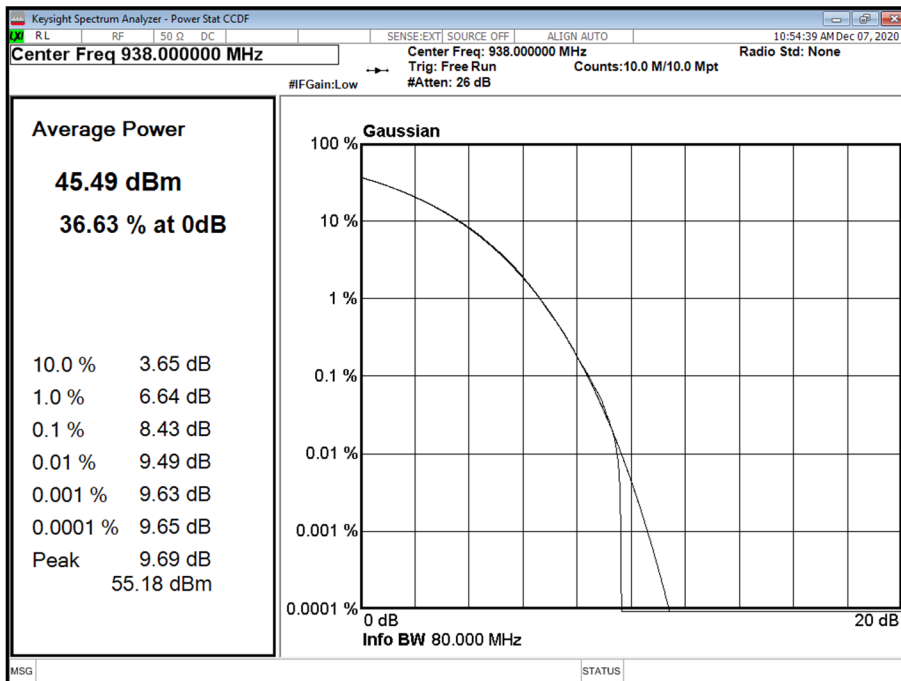


Configuration A1

Maximum Output Power 46 dBm

Antenna	LTE + NB-IoT IB Modulation	LTE + NB-IoT IB Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			PAR (dB)	Channel Position M	
				Average Power	
			dBm	dBm/MHz	
B	QPSK	3.0 MHz + NB-IoT IB	8.43	45.53	42.62

Antenna B - LTE + NB-IoT IB Modulation QPSK - LTE + NB-IoT IB Carrier Bandwidth 3.0 MHz + NB-IoT IB - Channel Position M





Configuration A2

Maximum Output Power 43 dBm

Antenna	LTE-Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
dBm	dBm/MHz				
B	16QAM	1.4 MHz	8.33	43.08	42.68

Antenna B - LTE-Modulation 16QAM - LTE Carrier Bandwidth 1.4 MHz - Channel Position B

