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Report On

FCC and IC Testing of the
Ericsson NR KRC 161689/3 Radio 4478 B5 (850 MHz) Base Station in
accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 22, Industry
Canada RSS-GEN and Industry Canada RSS-132

COMMERCIAL-IN-CONFIDENCE

FCC ID:TA8AKRC161689

IC ID: 287AB-AS161689

PREPARED BY

APPROVED BY

DATED

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Senior Administrator
(Technical)

Steve Scarfe
Authorised Signatory

15 April 2019

Document 75945338 Report 3 Issue 2

April 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 4478 B5 & KRC 161689/3
IC Model Name	AS 161689
Serial Number(s)	B440820312
Software Version	CXP9013268/15
Hardware Version	R78AN+
Non-tested Variant	Radio 4478 B5 & KRC 161 689/1
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2016 FCC CFR 47 Part 22: 2016 Industry Canada RSS-GEN: Issue 4: 2014 Industry Canada RSS-132: Issue 3: 2013
Start of Test	06 March 2019
Finish of Test	06 March 2019
Name of Engineer(s)	Neil Rousell
Related Document(s)	KDB 971168 D01 v02r02 KDB 662911 D01 v02r01

This report has been up issued to issue 2 and should be read in place of Issue 1 to correct typographical error.

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

Test Engineer(s);

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 22, Industry Canada RSS-GEN and Industry Canada RSS-132 is shown below.

Section	Specification Clause				Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 22	RSS-GEN	RSS-132		
2.1	2.1046	22.913 (a)	-	6.4	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1049	22.917 (b)	6.6	-	Occupied Bandwidth	Pass
2.3	2.1051	22.905	-	6.5	Band Edge	Pass
2.4	2.1051	22.905	-	6.5	Transmitter Spurious 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	RAT	No. Of carriers	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
				Bottom	Middle	Top
A	NR	1	5MHz, SCS 15 kHz	871.5	-	891.5
B	NR	1	10MHz, SCS 15 kHz	874.0	-	889.0
C	NR	1	10MHz, SCS 30 kHz	874.0	-	889.0



1.4 DECLARATION OF BUILD STATUS

DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	Radio 4478 B5
PART NUMBER	KRC 161 689/1 KRC 161 689/3 ²
IC Model Name	AS161689
SERIAL NUMBER	B440820312
HARDWARE VERSION	R2A
SOFTWARE VERSION	CXP9013268%15_R78AN+
TRANSMITTER OPERATING RANGE	869 - 894 MHz
MODULATIONS	WCDMA: QPSK, 16QAM, 64QAM LTE & NR: QPSK, 16QAM, 64QAM, 256QAM
ITU DESIGNATION OF EMISSION	WCDMA: 4M19F9W
	LTE 1,4 MHz BW channel: 1M11W7D
	LTE 3 MHz BW channel: 2M70W7D
	LTE 5 MHz BW channel: 4M50W7D
	LTE 10 MHz BW channel: 8M98W7D
	LTE 20 MHz BW channel: 18M9W7D ³
	NB IoT SA: 224KW7D
	NR 5 MHz BW channel: 4M47W7D
	NR 10 MHz BW channel: 9M29W7D
OUTPUT POWER (RMS) (W or dBm)	4 ports, 40W per port
	NB-IoT SA 1 x 20W (per port)
FCC ID	TA8AKRC161689
IC ID	287AB-AS161689
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Base station radio

¹ LTE carriers 10MHz and above supports NB IoT

² KRC 161 689/3 is the test object, both variants are electrically equivalent, with only mechanical differences in the enclosure.

³ Carrier aggregation 2 x 10MHz

Signature

Audun B Helle

Audun Helle

Date

2019-03-25

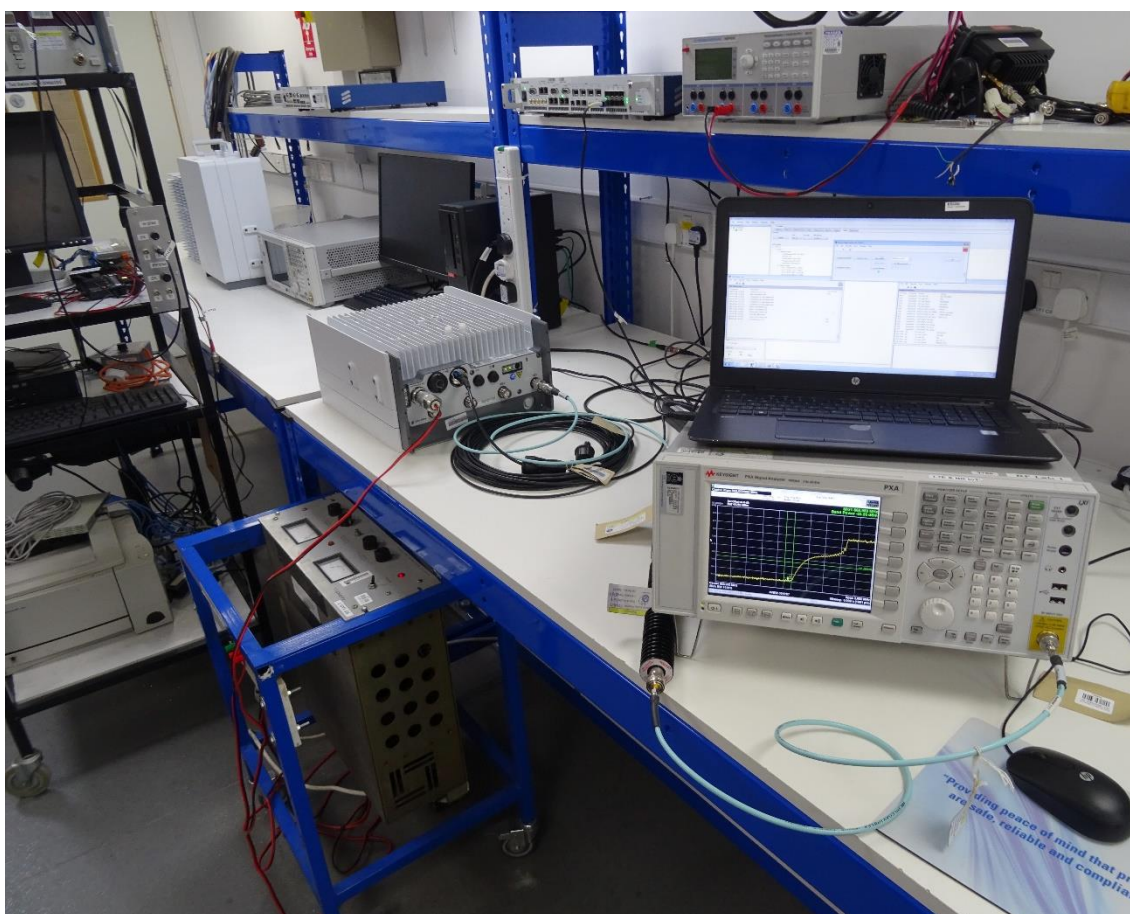
No responsibility will be accepted by TÜV SÜD Product Service UK Limited as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

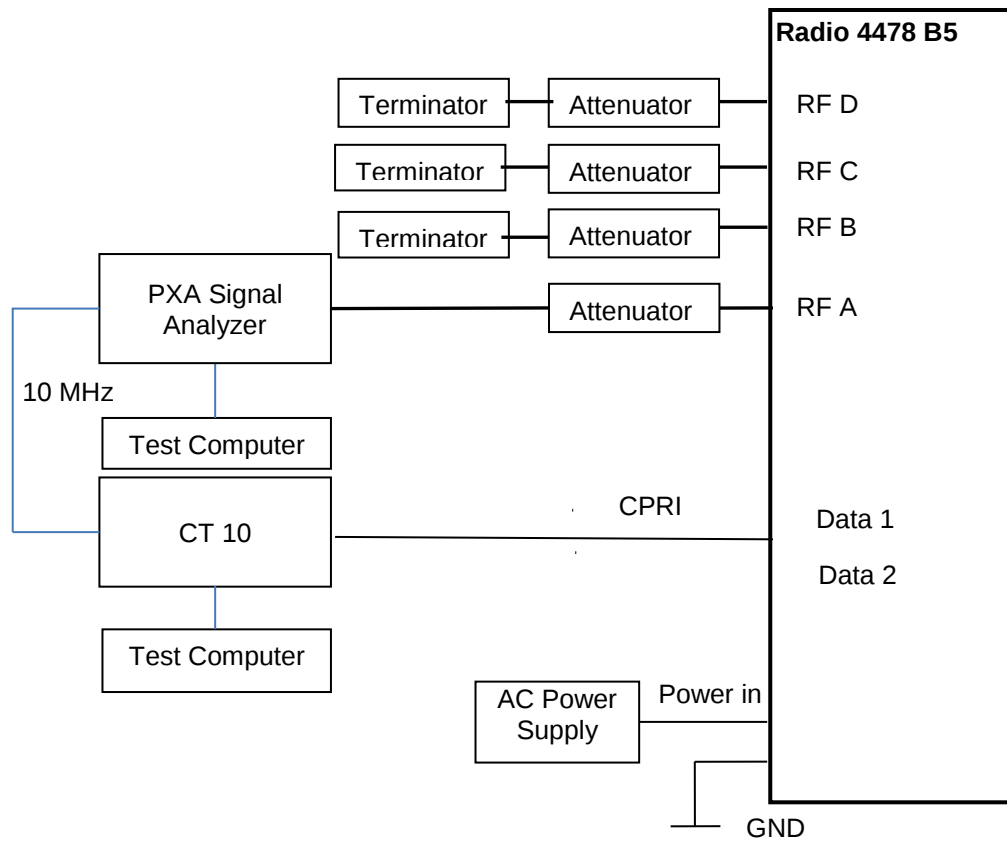
The Equipment Under Test (EUT) Radio 4478 B5 is an Ericsson AB Radio Unit working in the public mobile service 850 MHz band which provides communication connections to 850 MHz network. The Radio 4478 B5 operates from a -48V DC supply.

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

1.8 DEVIATION FROM THE STANDARD

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

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.



SECTION 2

TEST DETAILS



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

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 6.4

2.1.2 Date of Test and Modification State

06 March 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 22.6°C
Relative Humidity 42.3%

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

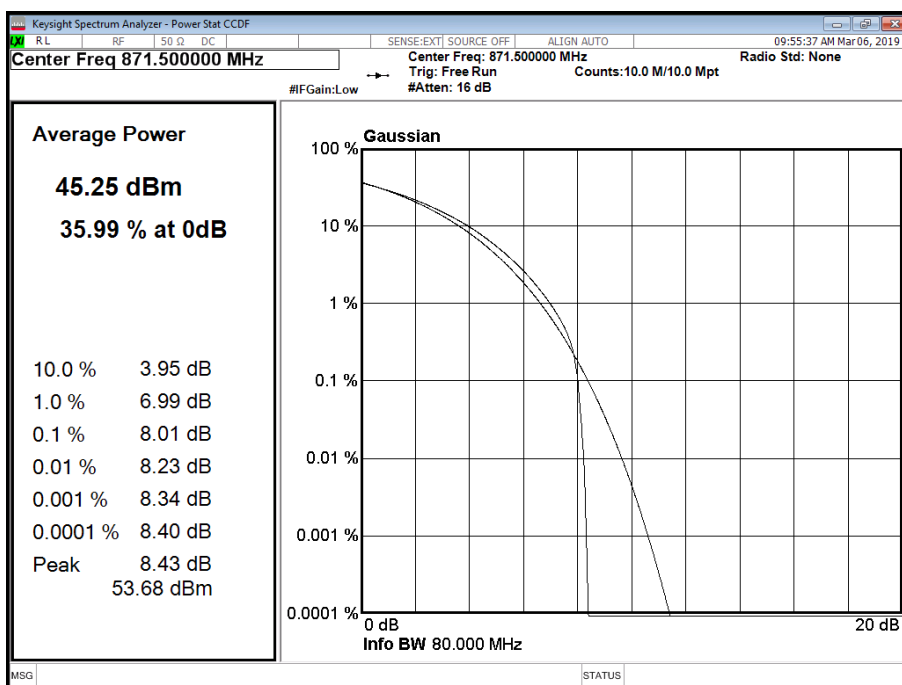
Configuration A

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz 15 kHz SCS	8.01	45.29	39.31



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B



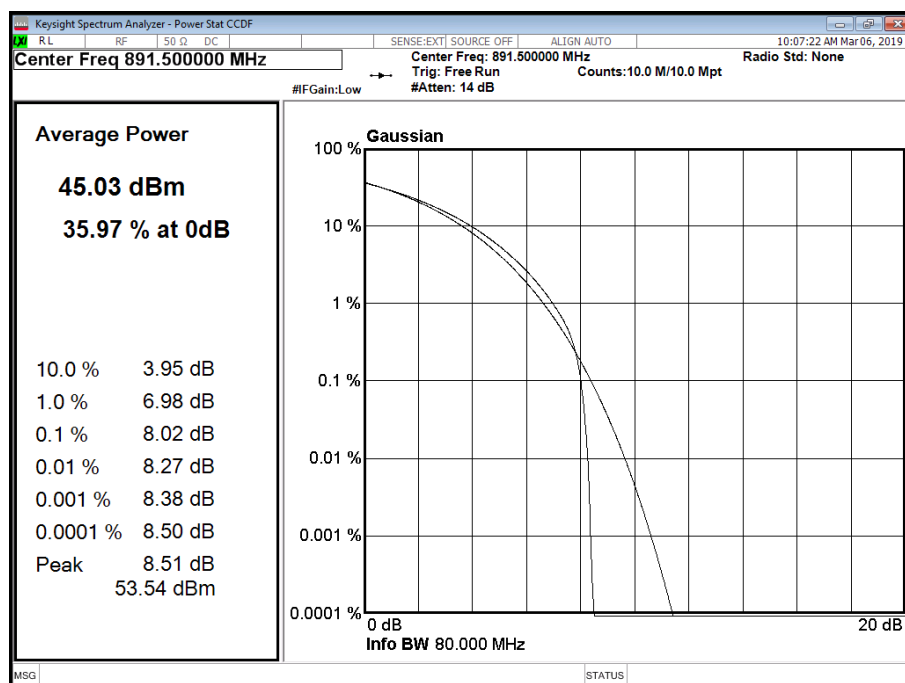
Configuration A

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz 15 kHz SCS	8.02	45.05	39.21



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T



Configuration B

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz 15 kHz SCS	-	45.68	-

Configuration B

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz 15 kHz SCS	-	45.50	-



Configuration C

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz 30 kHz SCS	-	45.30	-

Configuration C

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz 30 kHz SCS	-	45.18	-

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 22, Clause 22.917 (b)
Industry Canada RSS-GEN, Clause 6.6

2.2.2 Date of Test and Modification State

06 March 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 22.6°C
Relative Humidity 42.3%

2.2.5 Test Method

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

2.2.6 Test Results

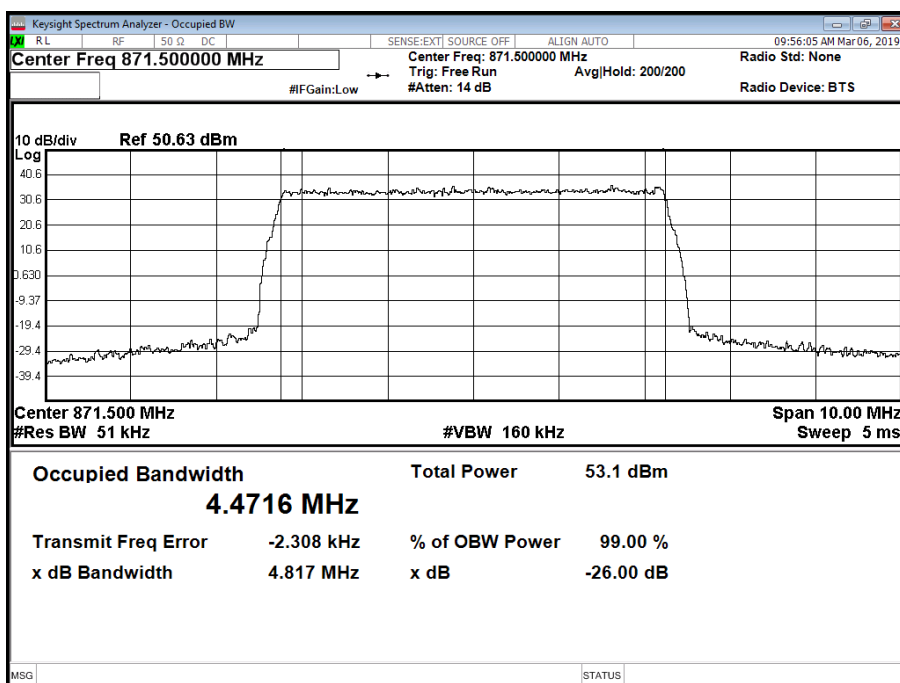
Configuration A

Maximum Output Power 46.0 dBm

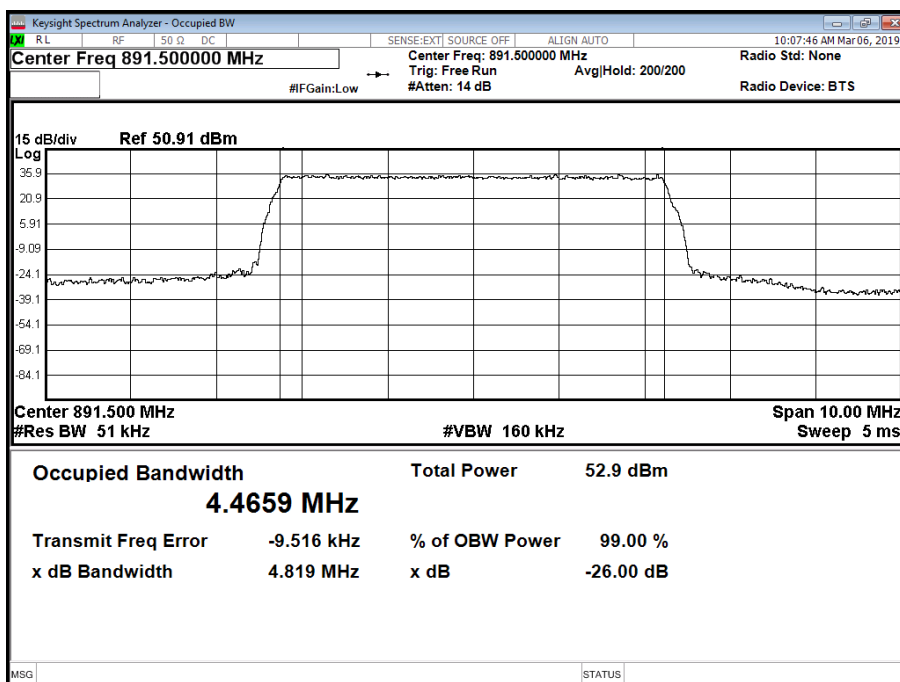
Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	5.0 MHz 15 kHz SCS	4,471.62	4,817.30	-	-	4,465.90	4,819.40



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T



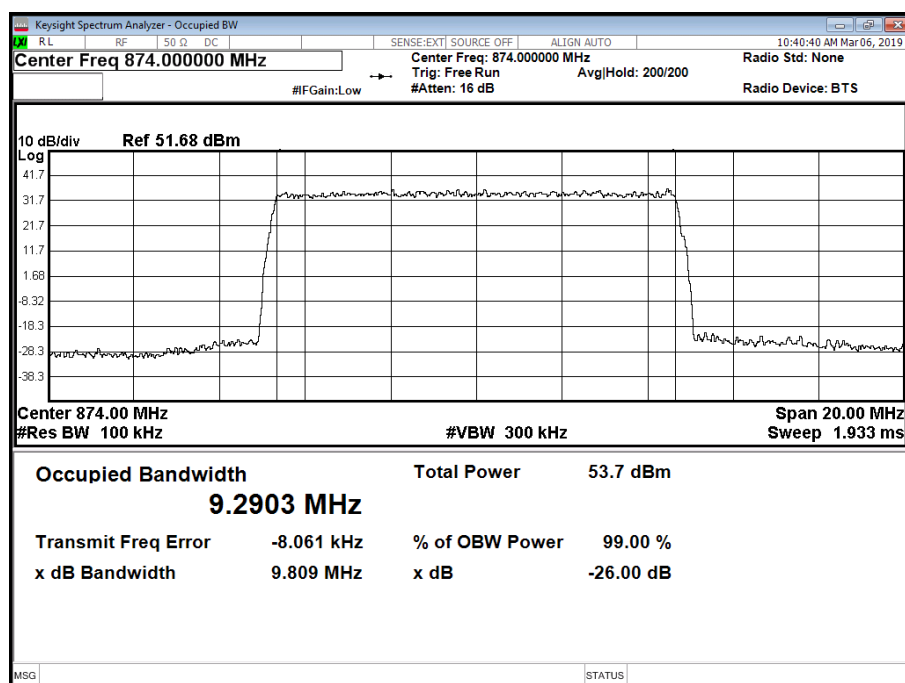


Configuration B

Maximum Output Power 46.0 dBm

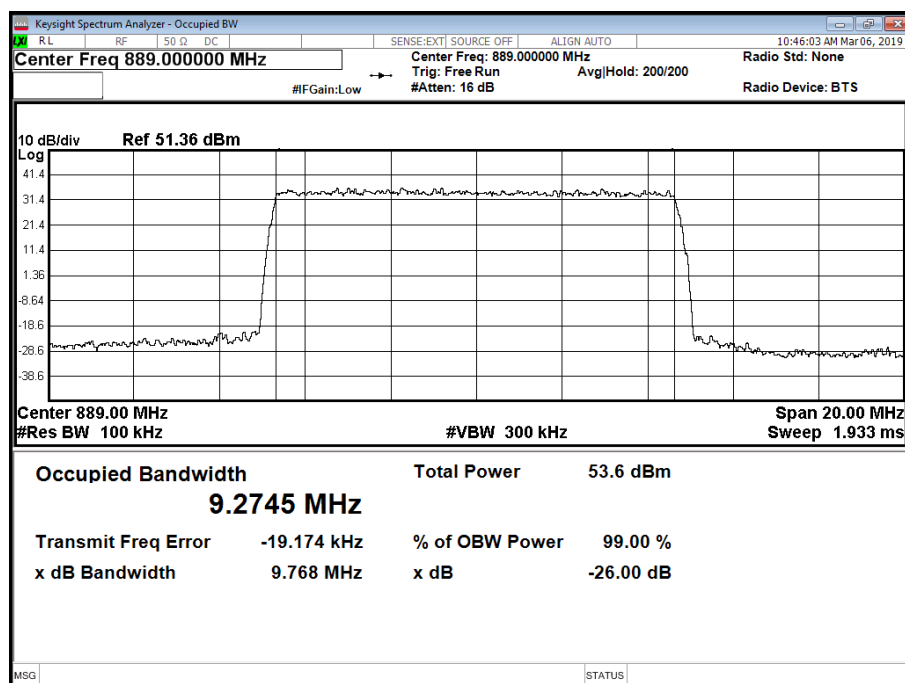
Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	10.0 MHz 15 kHz SCS	9,290.27	9,808.53	-	-	9,274.48	9,768.23

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T



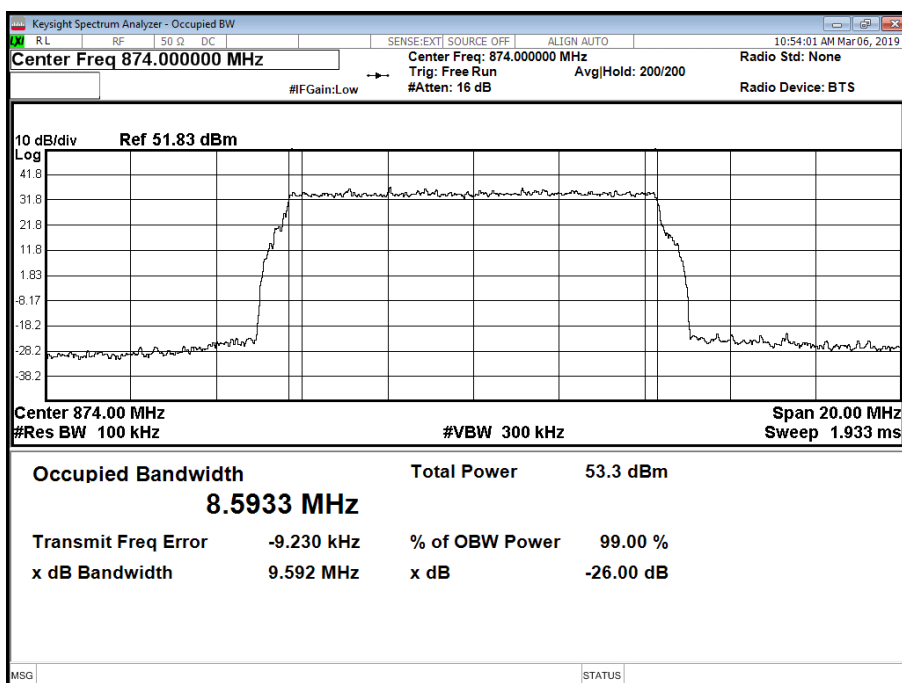
Configuration C

Maximum Output Power 46.0 dBm

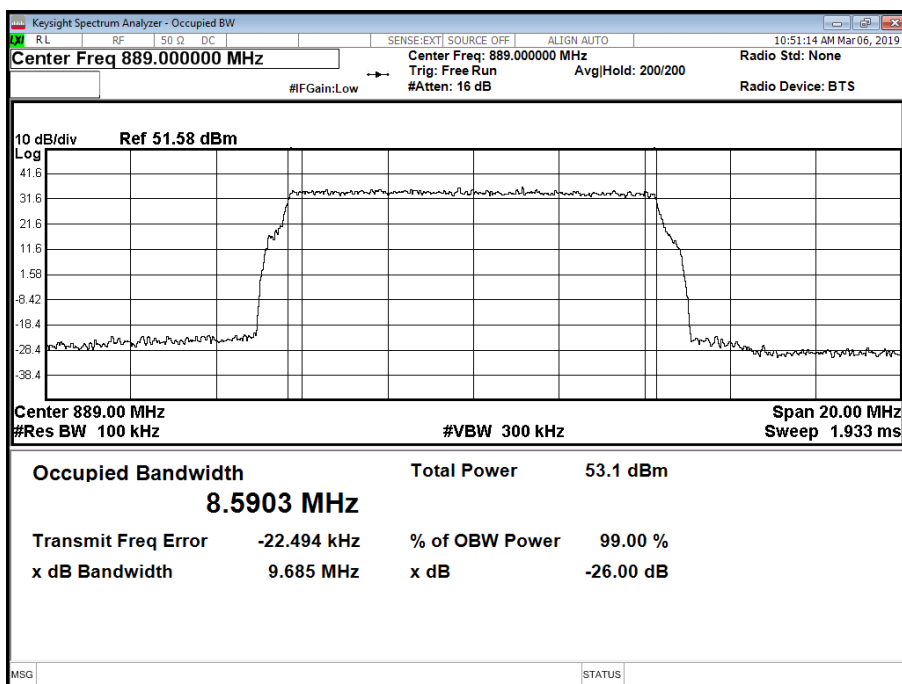
Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	10.0 MHz 30 kHz SCS	8,593.26	9,592.44	-	-	8,590.31	9,684.96



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 30 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 30 kHz SCS - Channel Position T





2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.905
Industry Canada RSS-132, Clause 6.5

2.3.2 Date of Test and Modification State

06 March 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 22.6°C
Relative Humidity 42.3%

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 dual port, the limit was calculated as being $-13 - 10 * \log(2) = -16$ dBm.

For four ports, the limit was calculated as being $-13 - 10 * \log(4) = -19$ dBm.

2.3.6 Test Results

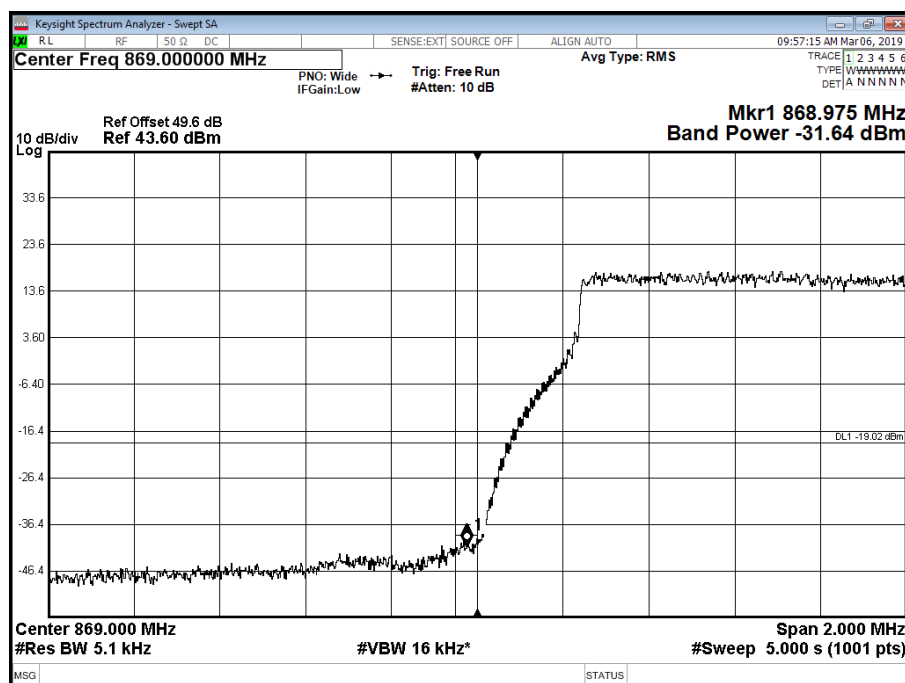
Configuration A

Maximum Output Power 46.0 dBm

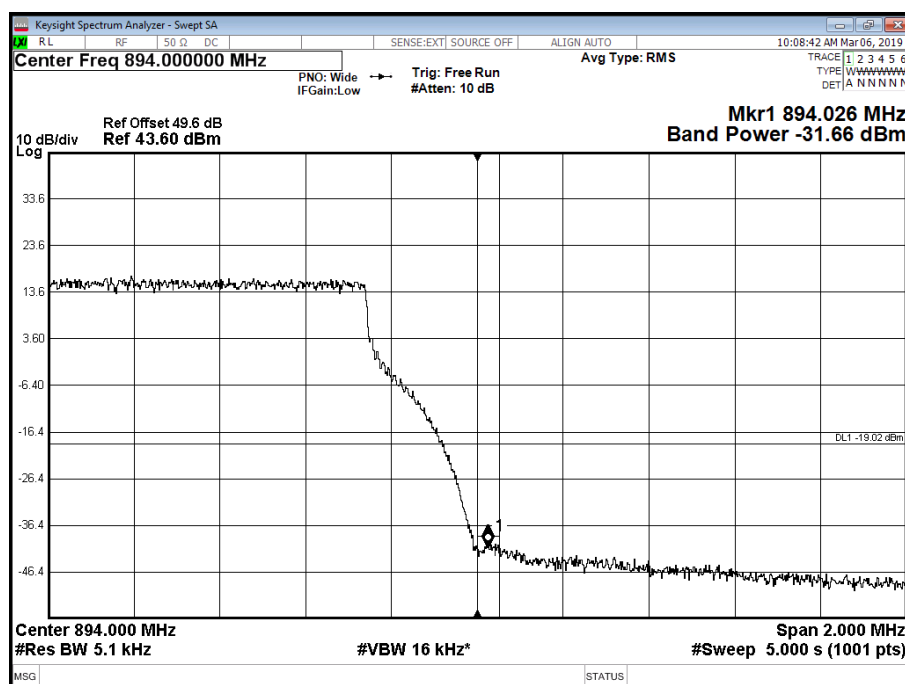
Antenna	NR Modulation	NR Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	5.0 MHz 15 kHz SCS	869.0	894.0



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T



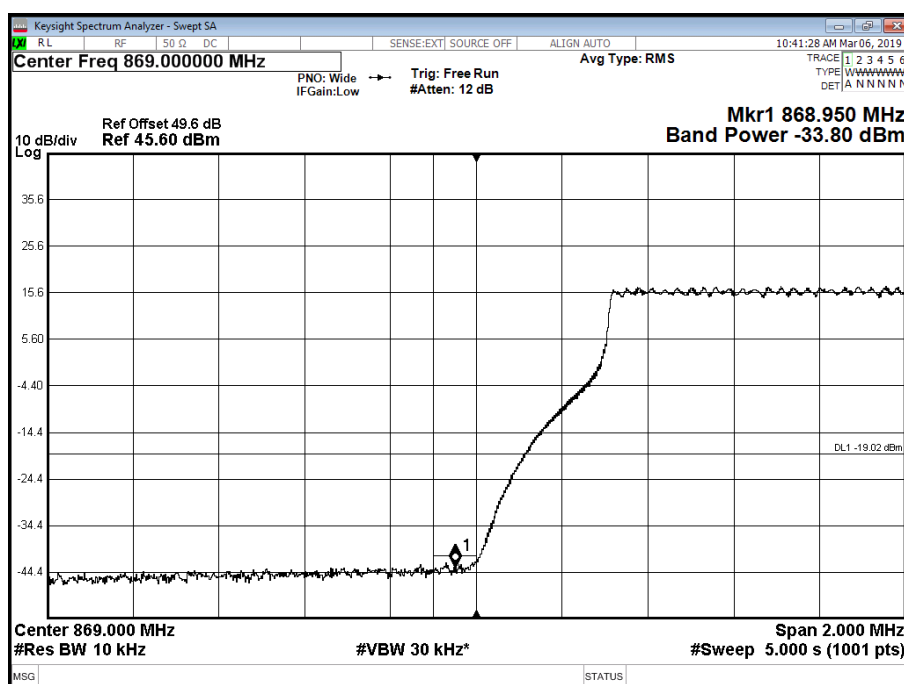


Configuration B

Maximum Output Power 46.0 dBm

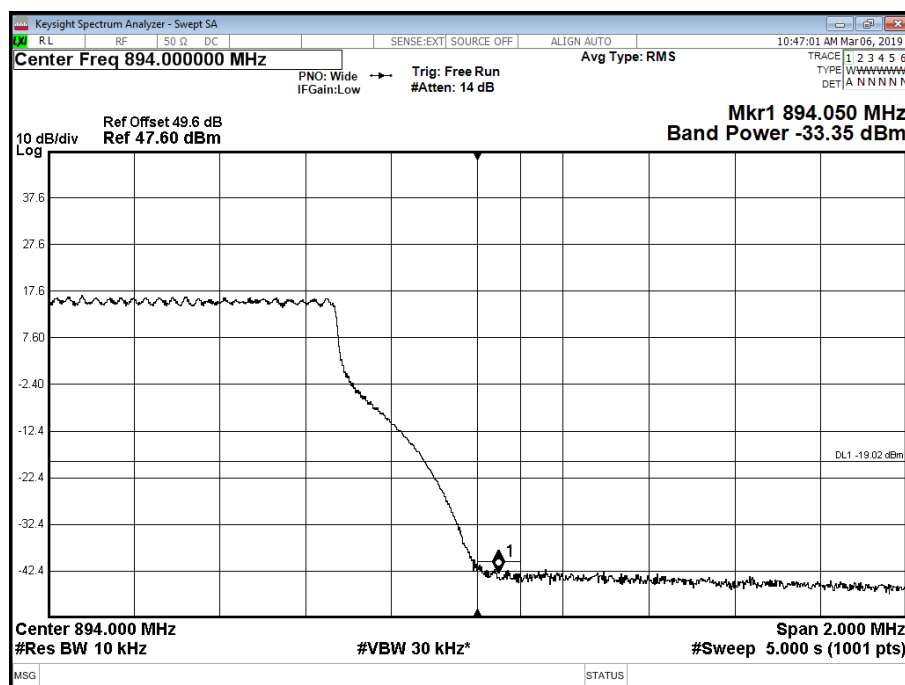
Antenna	NR Modulation	NR Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	10.0 MHz 15 kHz SCS	869.0	894.0

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T



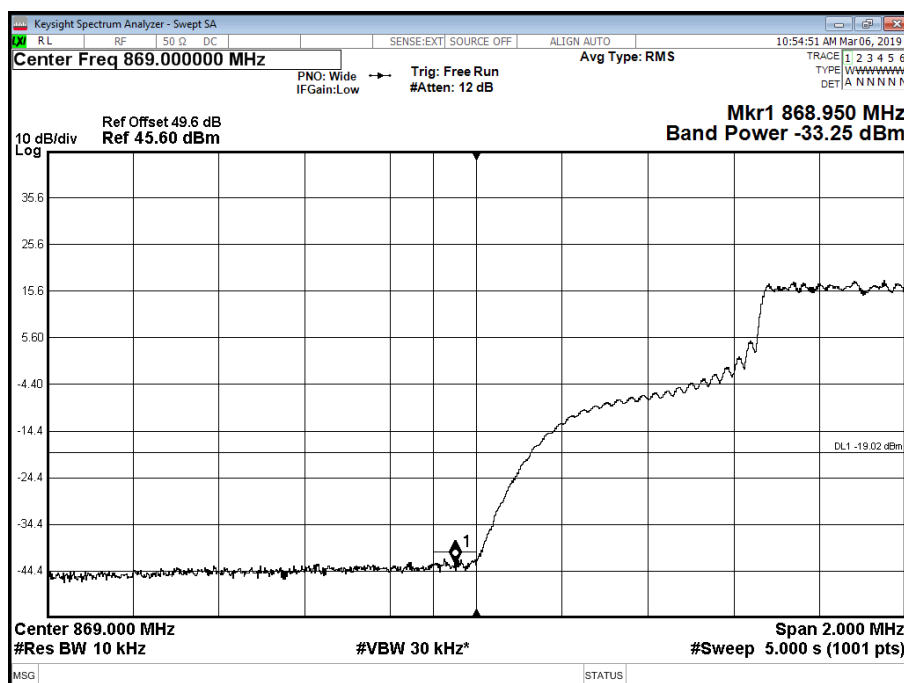
Configuration C

Maximum Output Power 46.0 dBm

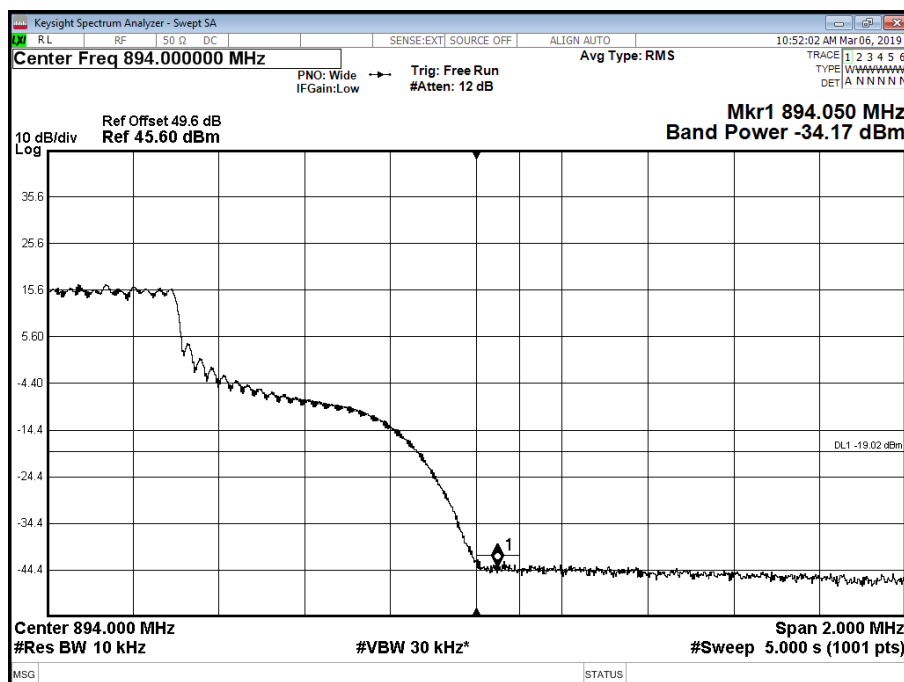
Antenna	NR Modulation	NR Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	10.0 MHz 30 kHz SCS	869.0	894.0



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 30 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 30 kHz SCS - Channel Position T



Limit	-19dBm
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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 22, Clause 22.905
Industry Canada RSS-132, Clause 6.5

2.4.2 Date of Test and Modification State

06 March 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	22.6°C
Relative Humidity	42.3%

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 dual port, the limit was calculated as being $-13 - 10 * \log(2) = -16$ dBm.

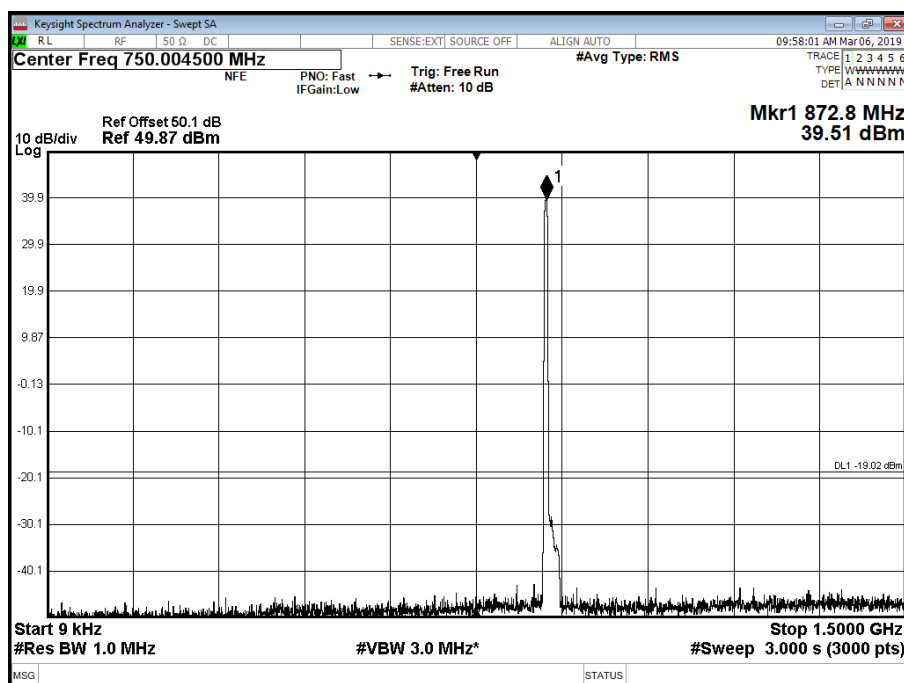
For four port, the limit was calculated as being $-13 - 10 * \log(4) = -19$ dBm.

2.4.6 Test Results

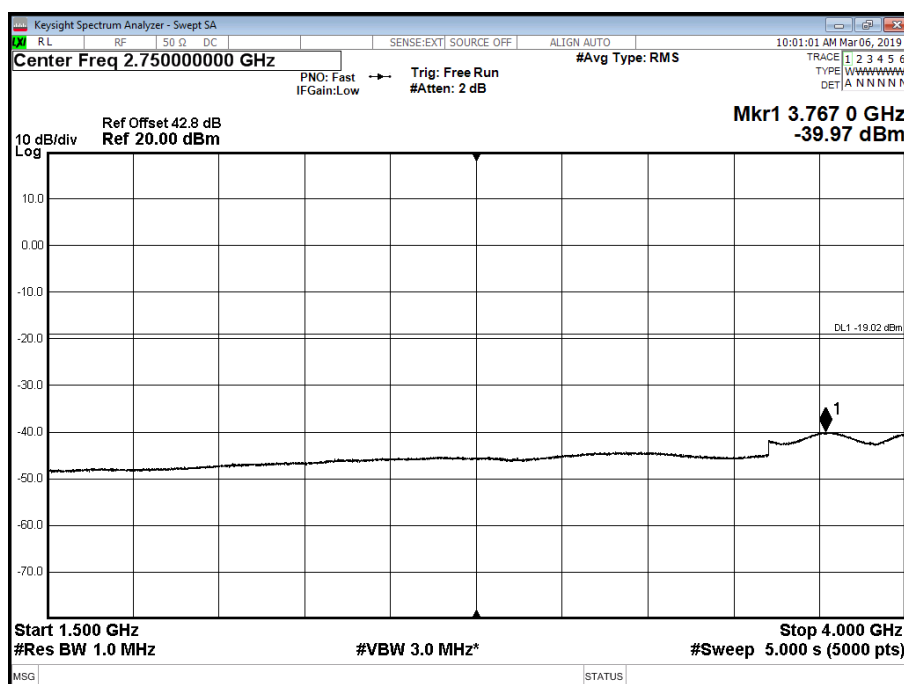
Configuration A

Maximum Output Power 46.0 dBm

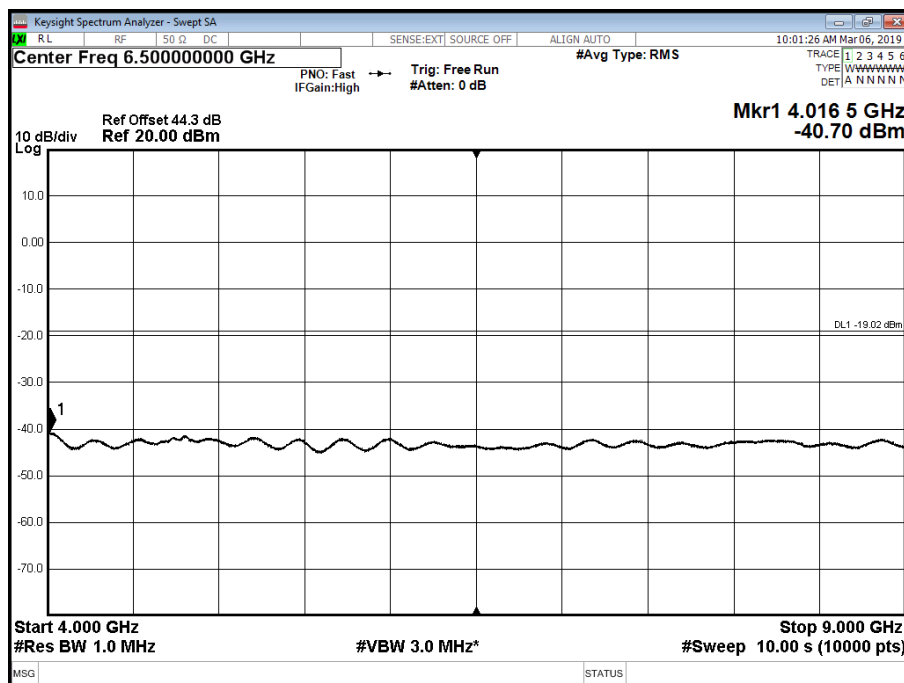
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B - Band 1 - Range 0.009 to 1500 MHz



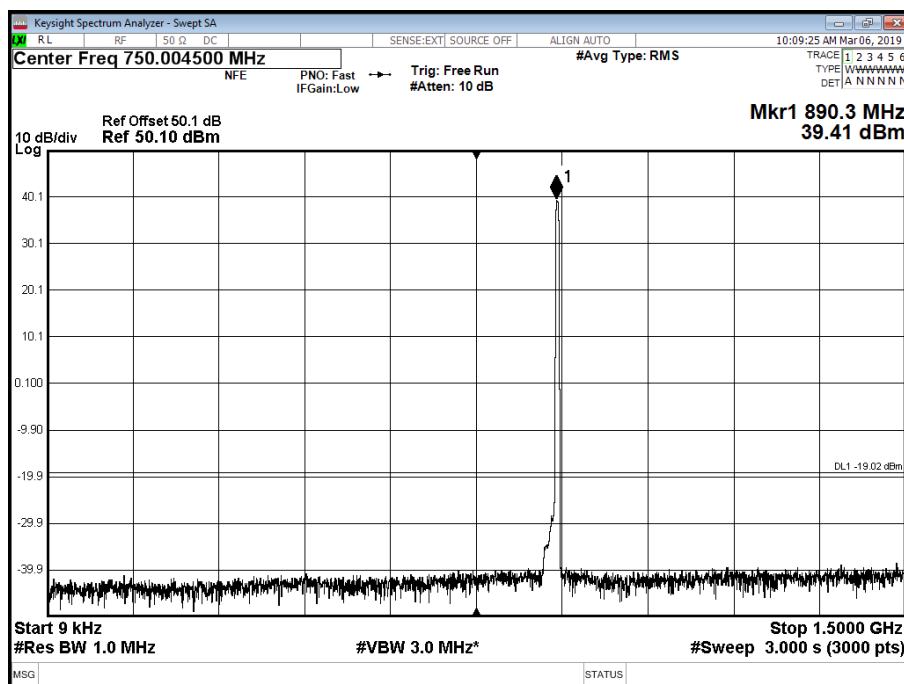
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B - Band 2 - Range 1500 to 4000 MHz



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B - Band 3 - Range 4000 to 9000 MHz

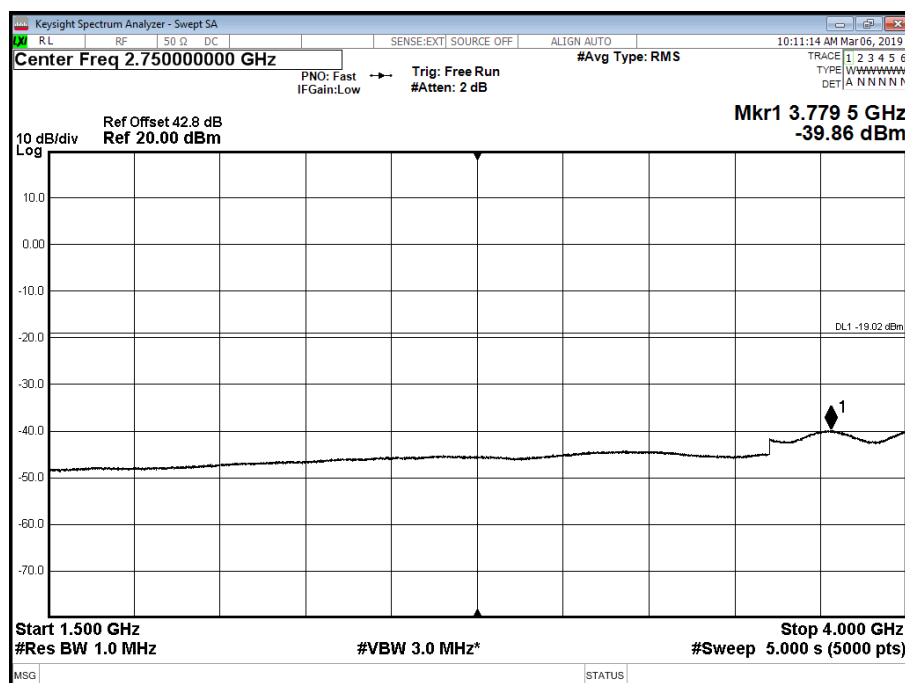


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T - Band 1 - Range 0.009 to 1500 MHz

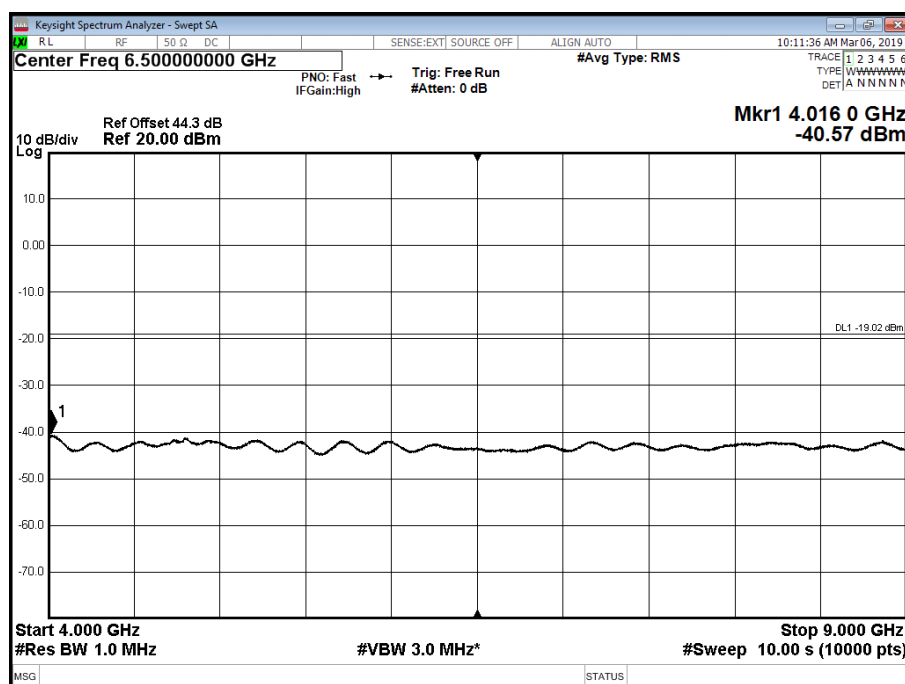




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T - Band 2 - Range 1500 to 4000 MHz



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T - Band 3 - Range 4000 to 9000 MHz



Limit	-19dBm
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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	HP21	4740	12	17-Jan-2020
Analyser	Keysight	N9030A	4654	12	06-Oct-2019
Attenuator	Weinschel	48-10-43	4867	12	06-Nov-2019
Attenuator	Weinschel	48-40-43-LIM	5134	12	07-Nov-2019
Cable	Rosenberger	LU7-036-2000	5038	-	O/P MON
Cable	Rosenberger	LU7-071-1000	5100	12	04-Oct-2019
PSU	Farnell	H60/25	1092	-	O/P MON
DVM	Fluke	79	0611	12	07-Sep-2019
Analyser	R&S	ZVA 40	3548	12	17-Oct-2019
Cal kit	R&S	ZV-Z54	4368	12	22-Oct-2019
-	-	-	-	-	-
Occupied Bandwidth					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Analyser	Keysight	N9030A	4654	12	06-Oct-2019
Attenuator	Weinschel	48-10-43	4867	12	06-Nov-2019
Attenuator	Weinschel	48-40-43-LIM	5134	12	07-Nov-2019
Cable	Rosenberger	LU7-036-2000	5038	-	O/P MON
Cable	Rosenberger	LU7-071-1000	5100	12	04-Oct-2019
PSU	Farnell	H60/25	1092	-	O/P MON
DVM	Fluke	79	0611	12	07-Sep-2019
Analyser	R&S	ZVA 40	3548	12	17-Oct-2019
Cal kit	R&S	ZV-Z54	4368	12	22-Oct-2019
-	-	-	-	-	-
Band Edge					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Analyser	Keysight	N9030A	4654	12	06-Oct-2019
Attenuator	Weinschel	48-10-43	4867	12	06-Nov-2019
Attenuator	Weinschel	48-40-43-LIM	5134	12	07-Nov-2019
Cable	Rosenberger	LU7-036-2000	5038	-	O/P MON
Cable	Rosenberger	LU7-071-1000	5100	12	04-Oct-2019
PSU	Farnell	H60/25	1092	-	O/P MON
DVM	Fluke	79	0611	12	07-Sep-2019
Analyser	R&S	ZVA 40	3548	12	17-Oct-2019
Cal kit	R&S	ZV-Z54	4368	12	22-Oct-2019
-	-	-	-	-	-
Transmitter Spurious Emissions					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Analyser	Keysight	N9030A	4654	12	06-Oct-2019
Attenuator	Weinschel	48-10-43	4867	12	06-Nov-2019



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Attenuator	Weinschel	48-40-43-LIM	5134	12	07-Nov-2019
Cable	Rosenberger	LU7-036-2000	5038	-	O/P MON
Cable	Rosenberger	LU7-071-1000	5100	12	04-Oct-2019
PSU	Farnell	H60/25	1092	-	O/P MON
DVM	Fluke	79	0611	12	07-Sep-2019
Analyser	R&S	ZVA 40	3548	12	17-Oct-2019
Cal kit	R&S	ZV-Z54	4368	12	22-Oct-2019
HPF	Wainwright	WHKX12-1290-1500-18000-80SS	4961	12	11-Oct-2019

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	± 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



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-C			
Product	Product No	R-State	Serial No
Radio 4478 B5	KRC 161689/3	R2A	B440820312
Software Version:	CXP9013268/15	Revision:	R78AN+