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Report On

FCC and IC Testing of the
Ericsson KRC 161 678/1 (Radio 2219 B5) NR (850 MHz) Base Station
configuration 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: TA8AKRC161678-1

IC ID: 287AB-AS1616781

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

05 July 2019

Document 75946096 Report 01 Issue 1

July 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 2219 B5 & KRC 161 678/1
IC Model Name	AS1616781
Serial Number(s)	CA74058105
Software Version	CXP9013268/9 Rev R77FC
Hardware Version	R1A
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2018 FCC CFR 47 Part 22: 2018 Industry Canada RSS-GEN: Issue 5: 2019 Industry Canada RSS-132: Issue 3: 2013
Start of Test	12 June 2019
Finish of Test	13 June 2019
Name of Engineer(s)	Brian Scarfe
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 with FCC CFR 47 Part 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

A handwritten signature in black ink, appearing to read 'Brian Scarfe', written over a horizontal line.

Brian Scarfe



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)	-	5.4	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	-	5.5	Band Edge	Pass
2.4	2.1051	22.905	-	5.5	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	5 MHz – SCS 15kHz	871.5	-	891.5
	NR	1	10 MHz – SCS 15kHz	874.0	-	889.0
	NR	1	15 MHz – SCS 15kHz	876.5	-	886.5
	NR	1	20 MHz – SCS 15kHz	879.0	-	884.0
	NR	1	20 MHz – SCS 30kHz	879.0	-	884.0



1.4 DECLARATION OF BUILD STATUS

DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	Radio 2219 B5
PART NUMBER	KRC 161 678/1
IC Model Name	AS1616781
SERIAL NUMBER	CA74058105
HARDWARE VERSION	R1A
SOFTWARE VERSION	CXP9013268/9-R77FC
TRANSMITTER OPERATING RANGE	869 - 894 MHz
MODULATIONS	GSM: GMSK, AQPSK, 8PSK WCDMA: QPSK, 16QAM, 64QAM LTE & NR: QPSK, 16QAM, 64QAM, 256QAM
ITU DESIGNATION OF EMISSION	GSM: 245KGXW ²
	GSM: 245KG7W ²
	WCDMA: 4M20F9W
	LTE 1,4 MHz BW channel: 1M11W7D ³
	LTE 3 MHz BW channel: 2M70W7D ³
	LTE 5 MHz BW channel: 4M50W7D
	LTE 10 MHz BW channel ¹ : 9M40W7D
	LTE 15 MHz BW channel ¹ : 14M1W7D
	LTE 20 MHz BW channel ^{1,4} : 19M5W7D
	NB-IoT SA 180 kHz BW channel: 224KW7D ²
	NR 5 MHz BW channel: 4M47W7D
	NR 10 MHz BW channel: 9M29W7D
	NR 15 MHz BW channel: 14M1W7D
	NR 20 MHz BW channel: 18M9W7D
OUTPUT POWER (RMS) (W or dBm)	2 ports, 80 W ¹ per port NB-IoT SA 1 x 20W (per port)
FCC ID	TA8AKRC161678-1
IC ID	287AB-AS1616781
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Base station radio

¹Including 2 NB-IoT GB carriers.

²20W

³40W

⁴Carrier aggregation 2 x 10MHz

Signature

Audun B Helle
Audun Helle

Date

2019-06-27

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.

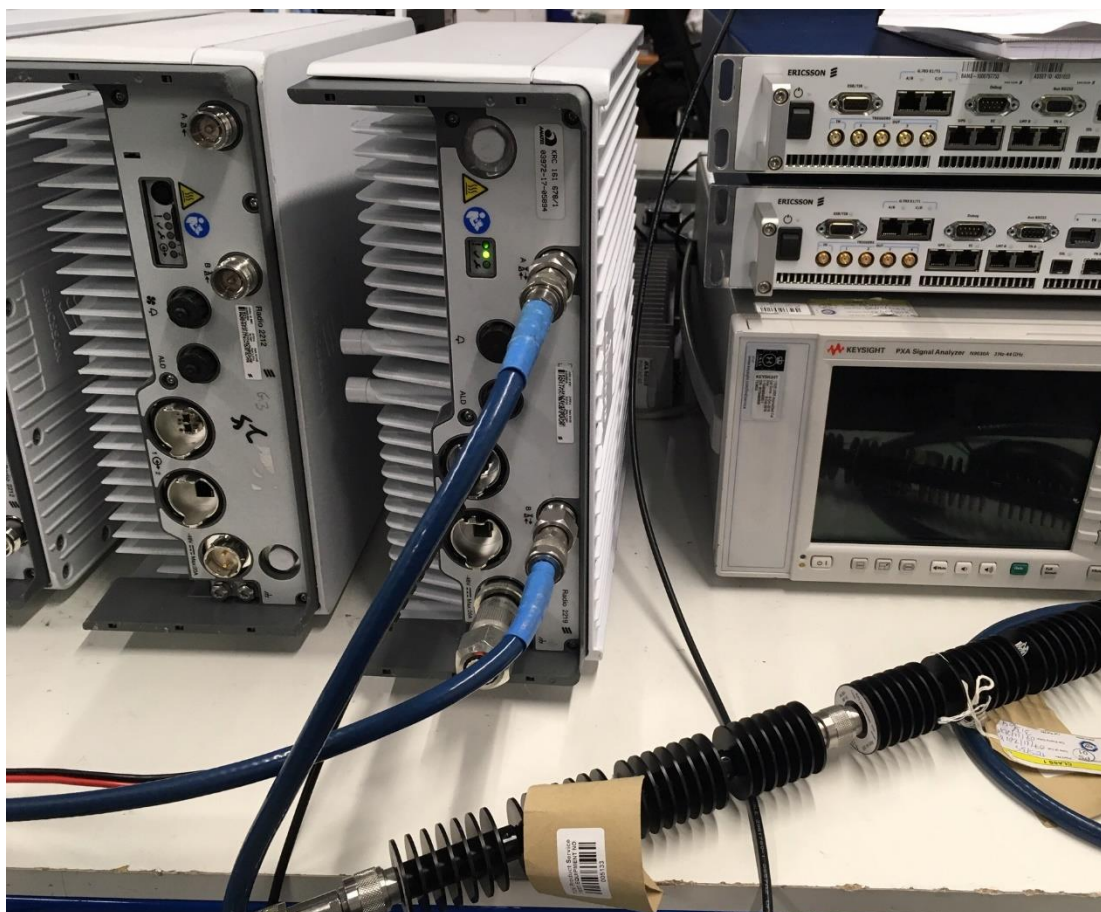
1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) Radio 2219 B5 is an Ericsson AB Radio Unit working in the public mobile service 850 MHz band which provides communication connections to 850 MHz network.

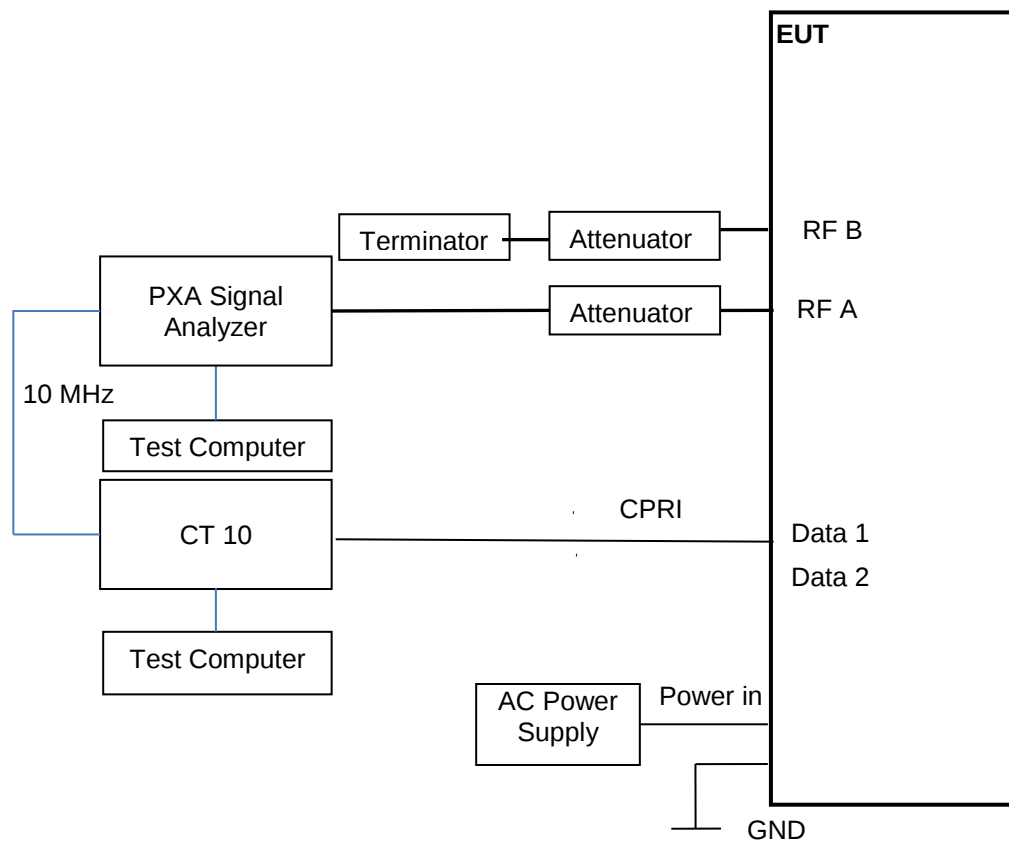
The EUT was powered from a 240V AC Supply.

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 240V AC 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 ALTERNATIVE TEST SITE

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

Test Name	Name of Engineer(s)
Maximum Peak Output Power and Peak to Average Ratio - Conducted	Brian Scarfe
Occupied Bandwidth	Brian Scarfe
Band Edge	Brian Scarfe
Transmitter Spurious Emissions	Brian Scarfe

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 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 5.4

2.1.2 Date of Test and Modification State

12 June 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 22.5°C
Relative Humidity 47%

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

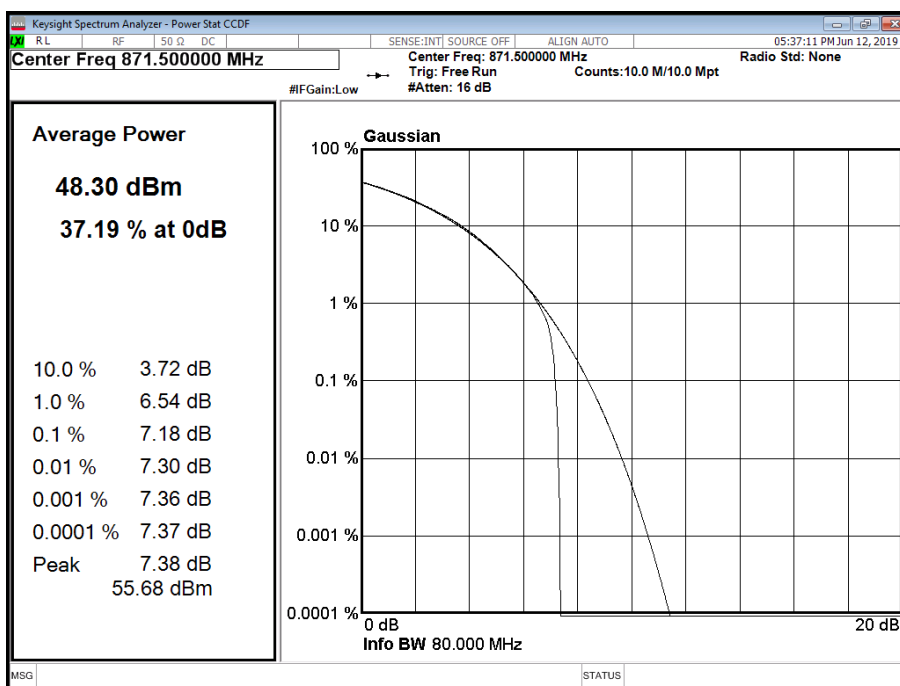
Configuration A

Maximum Output Power 49 dBm

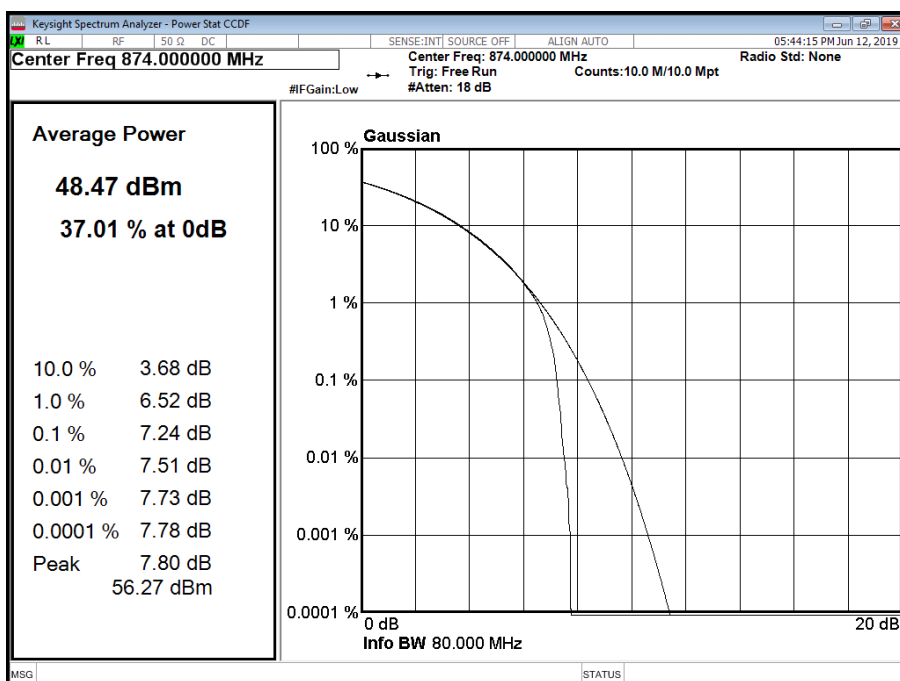
Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz 15 kHz SCS	7.18	48.20	42.33
A	QPSK	10.0 MHz 15 kHz SCS	7.24	48.35	39.45
A	QPSK	15.0 MHz 15 kHz SCS	7.40	48.28	37.77
A	QPSK	20.0 MHz 15 kHz SCS	7.29	48.45	36.61
A	QPSK	20.0 MHz 30 kHz SCS	7.26	48.49	36.85



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

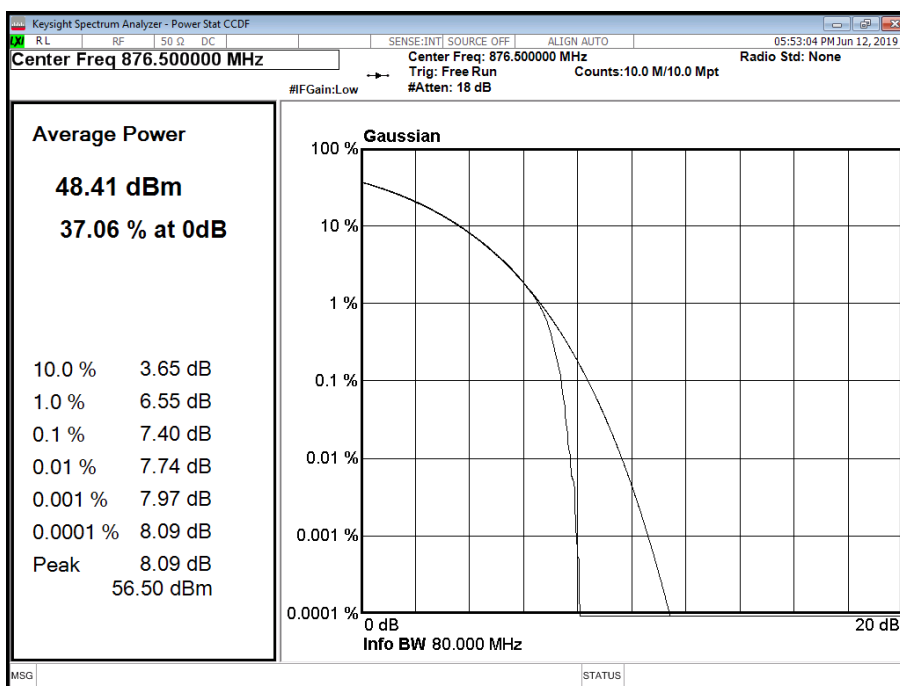


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B

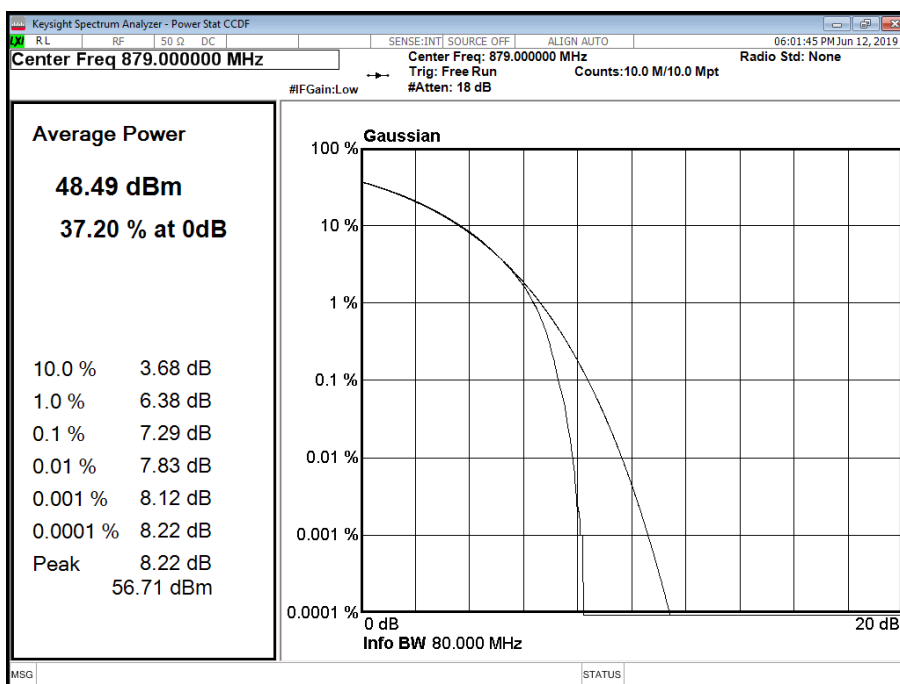




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B

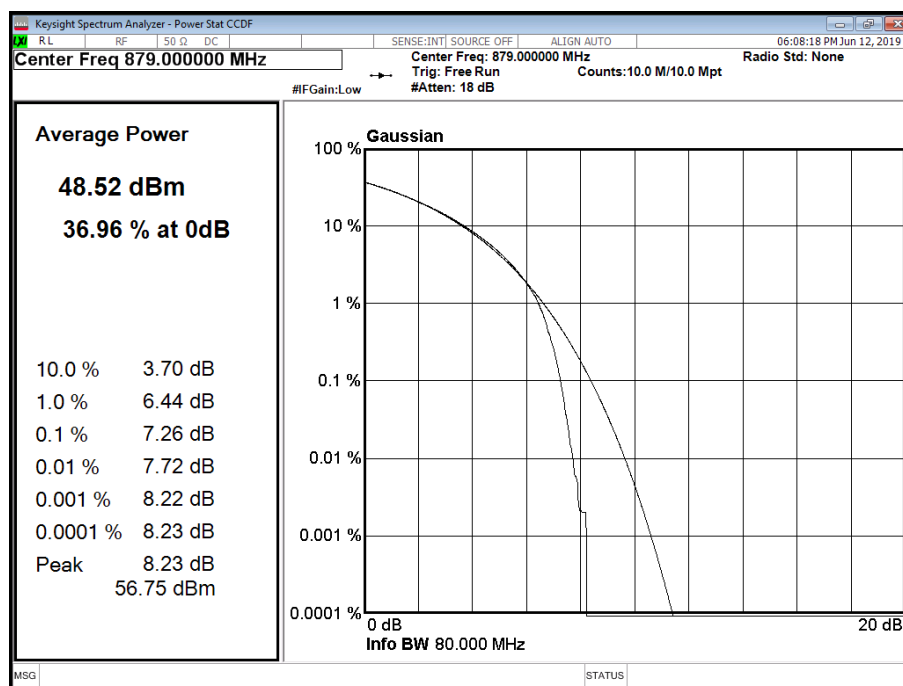


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 30 kHz SCS - Channel Position B



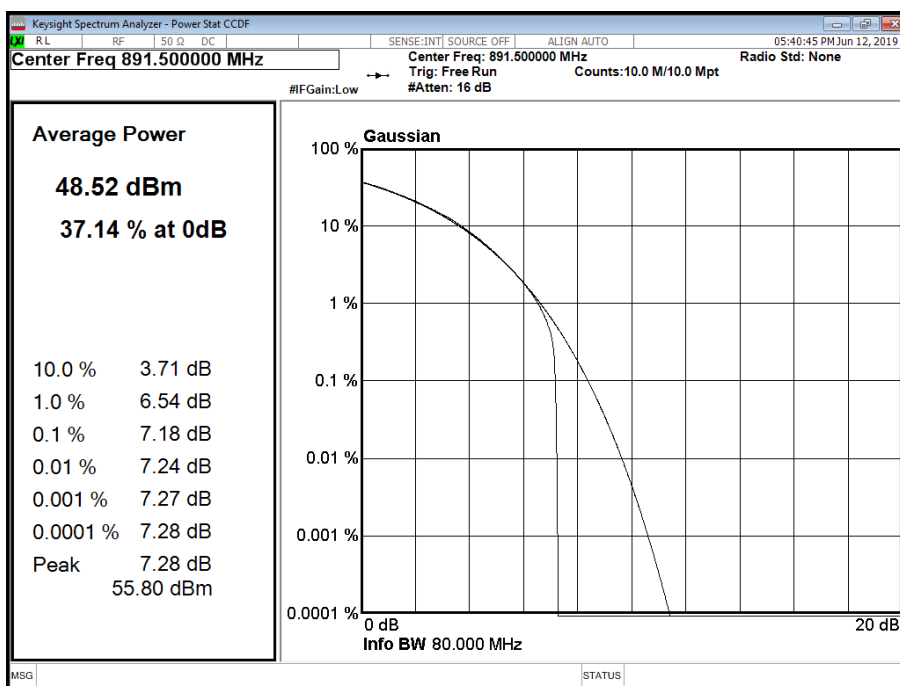
Configuration A

Maximum Output Power 49 dBm

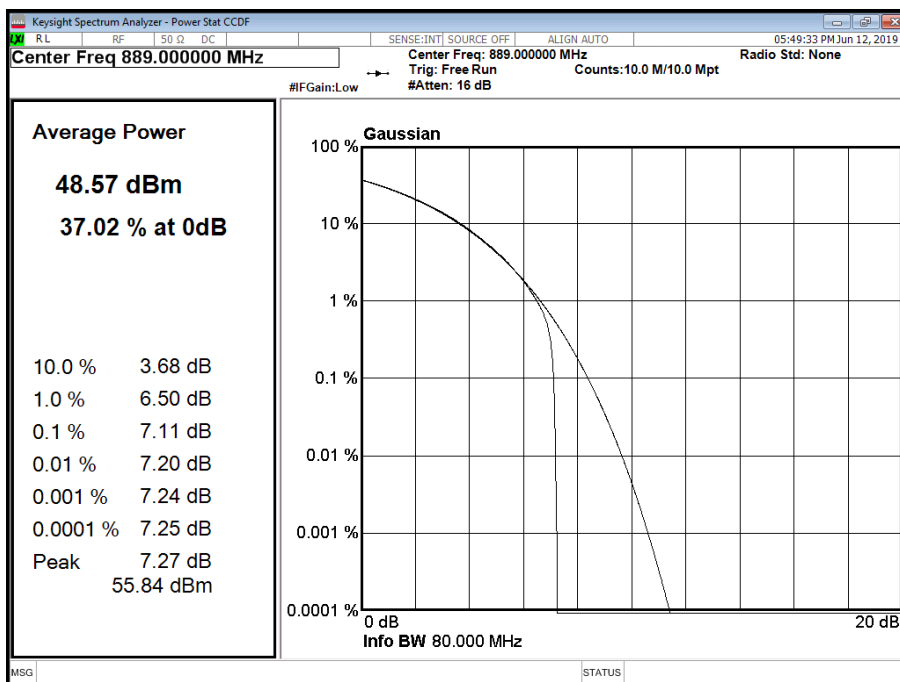
Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	5.0 MHz 15 kHz SCS	7.18	48.42	42.45
A	QPSK	10.0 MHz 15 kHz SCS	7.11	48.45	39.54
A	QPSK	15.0 MHz 15 kHz SCS	7.18	48.43	37.76
A	QPSK	20.0 MHz 15 kHz SCS	7.05	48.58	36.79
A	QPSK	20.0 MHz 30 kHz SCS	7.03	48.54	36.90



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

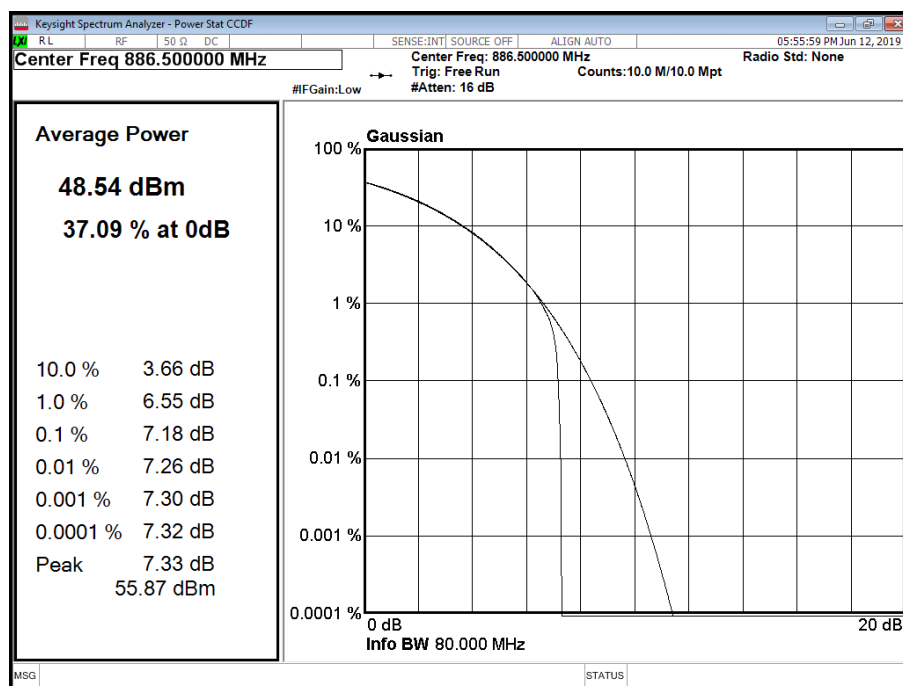


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T

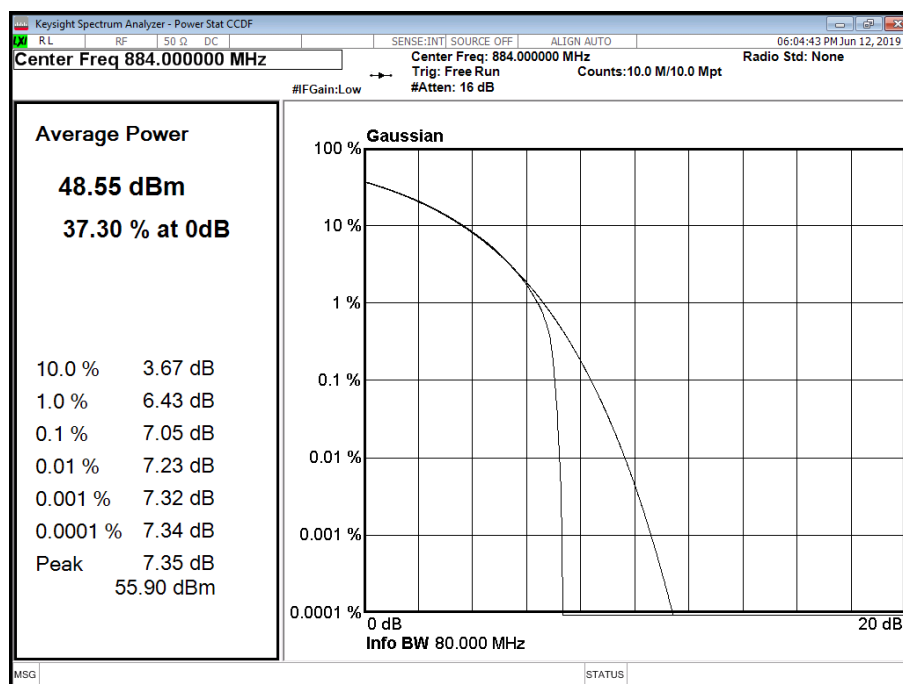




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T

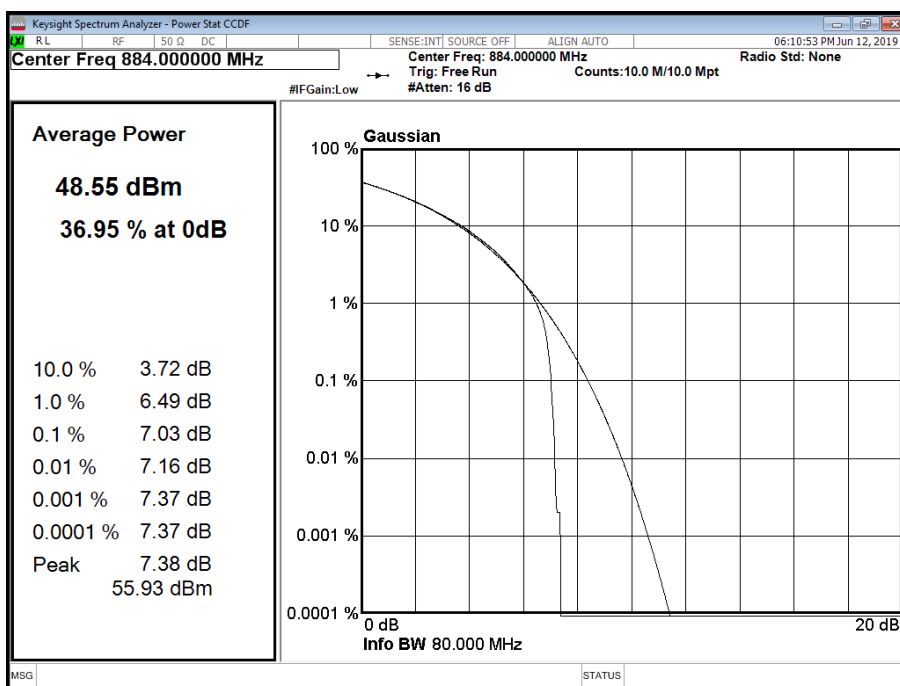


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 30 kHz SCS - 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 22, Clause 22.917 (b)
Industry Canada RSS-GEN, Clause 6.6

2.2.2 Date of Test and Modification State

12 June 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 22.5°C
Relative Humidity 47%

2.2.5 Test Method

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

2.2.6 Test Results

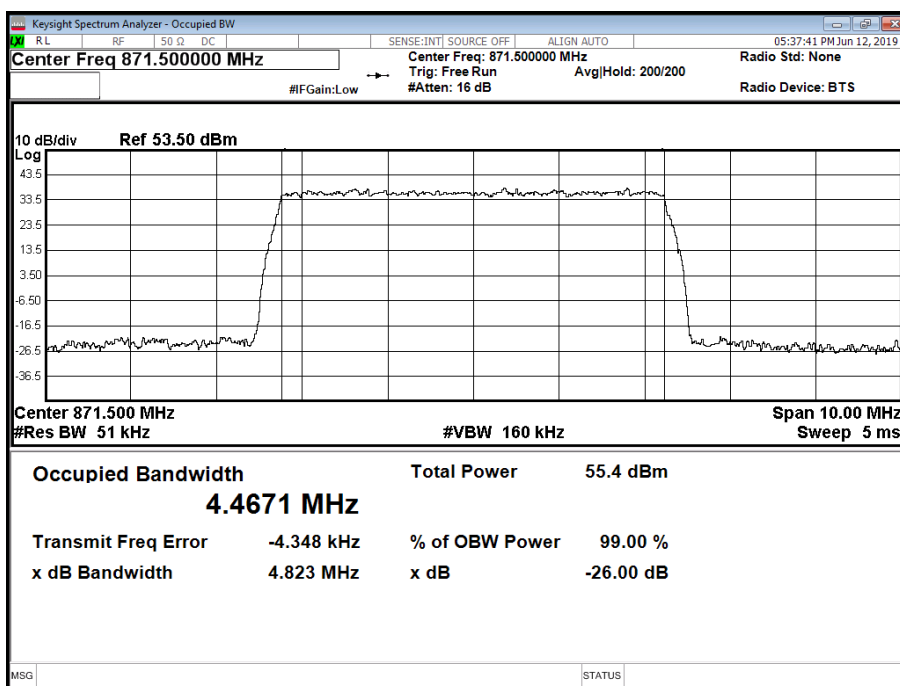
Configuration A

Maximum Output Power 49 dBm

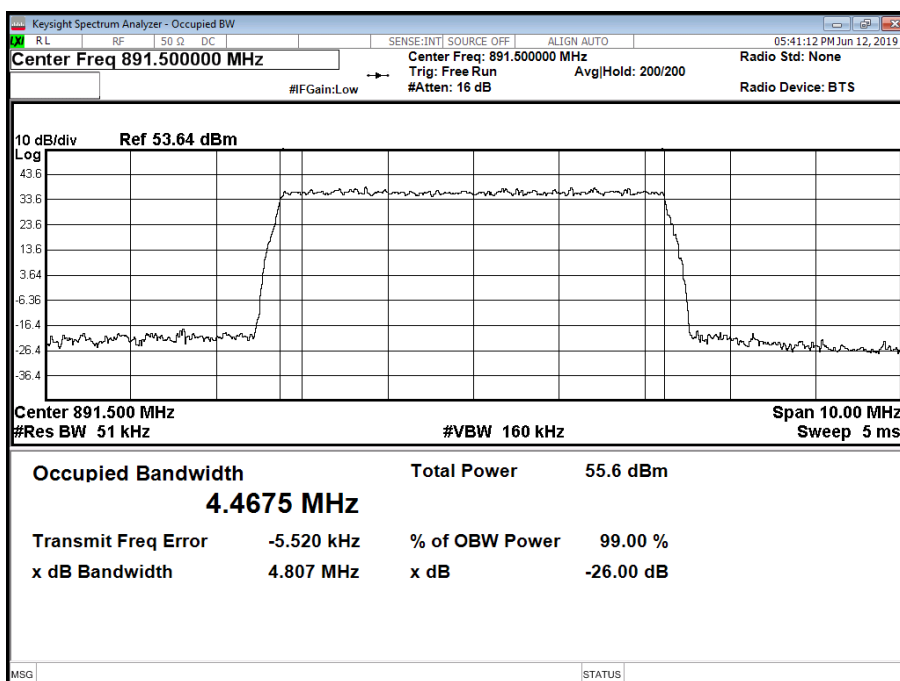
Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	5.0 MHz 15 kHz SCS	4,467.09	4,623.02	-	-	4,467.47	4,806.67
A	QPSK	10.0 MHz 15 kHz SCS	9,285.35	9,757.19	-	-	9,286.75	9,776.53
A	QPSK	15.0 MHz 15 kHz SCS	14,085.58	14,740.90	-	-	14,099.58	14,690.78
A	QPSK	20.0 MHz 15 kHz SCS	18,936.71	19,753.51	-	-	18,912.46	19,745.45
A	QPSK	20.0 MHz 30 kHz SCS	18,272.48	19,621.24	-	-	18,282.43	19,560.39



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

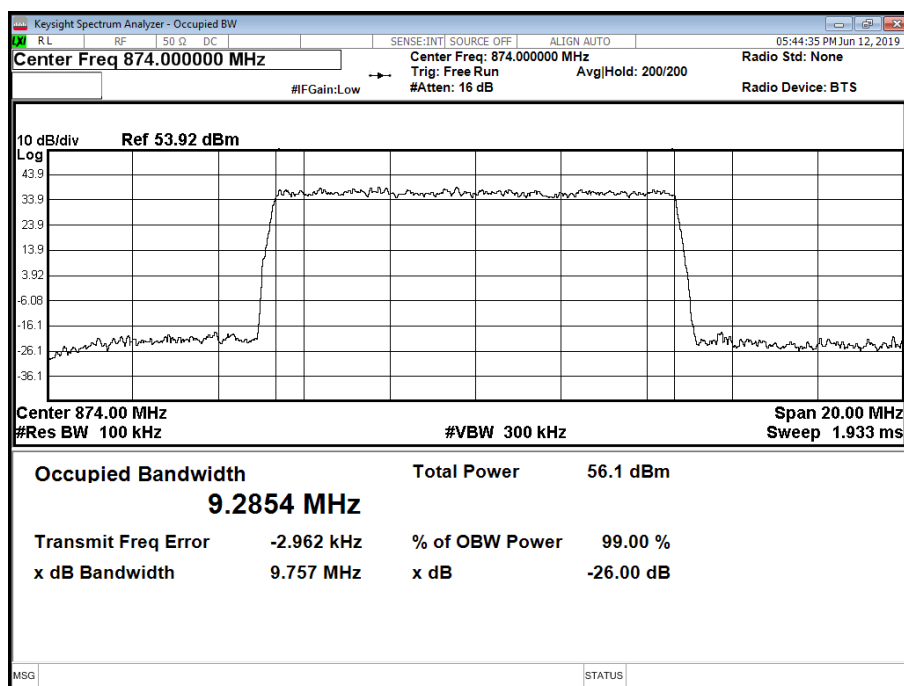


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T

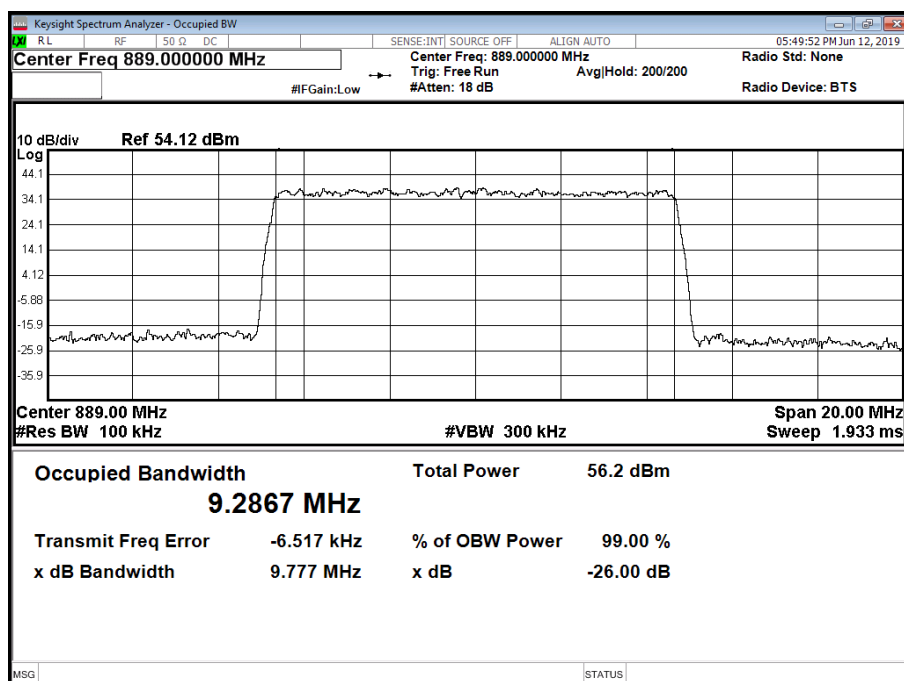




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B

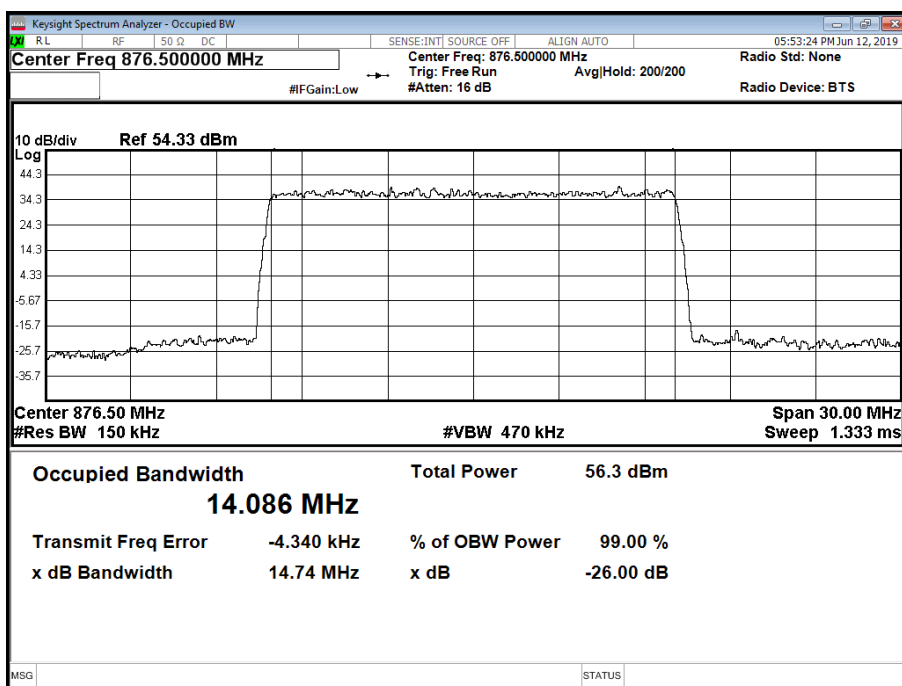


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T

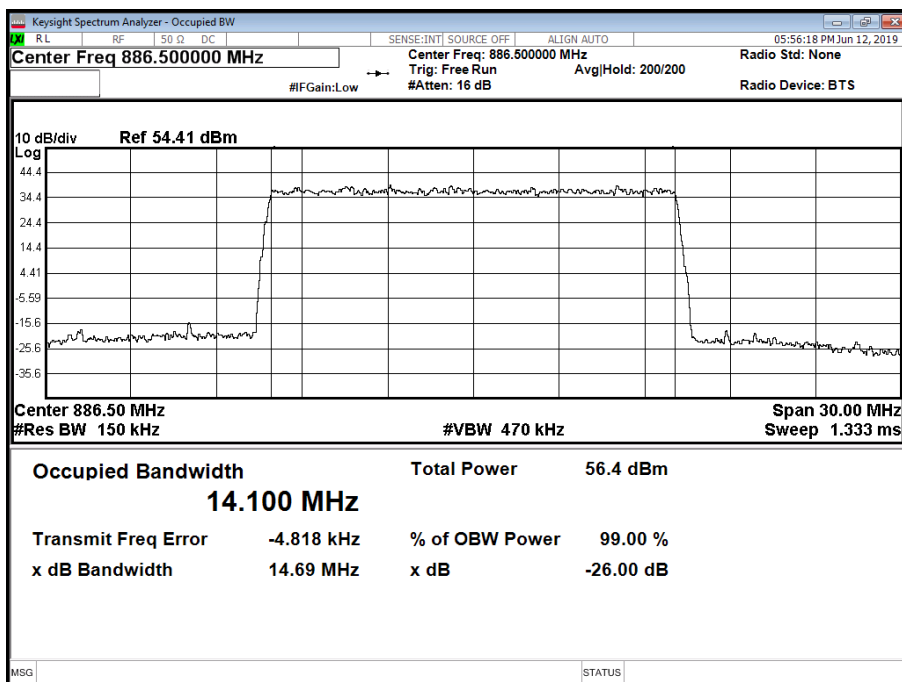




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B

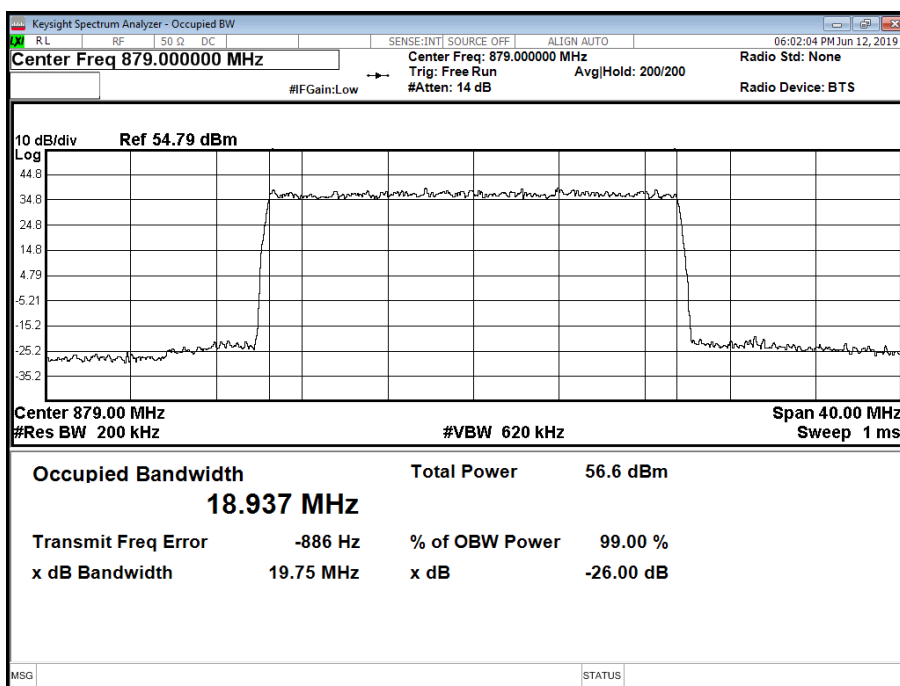


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T

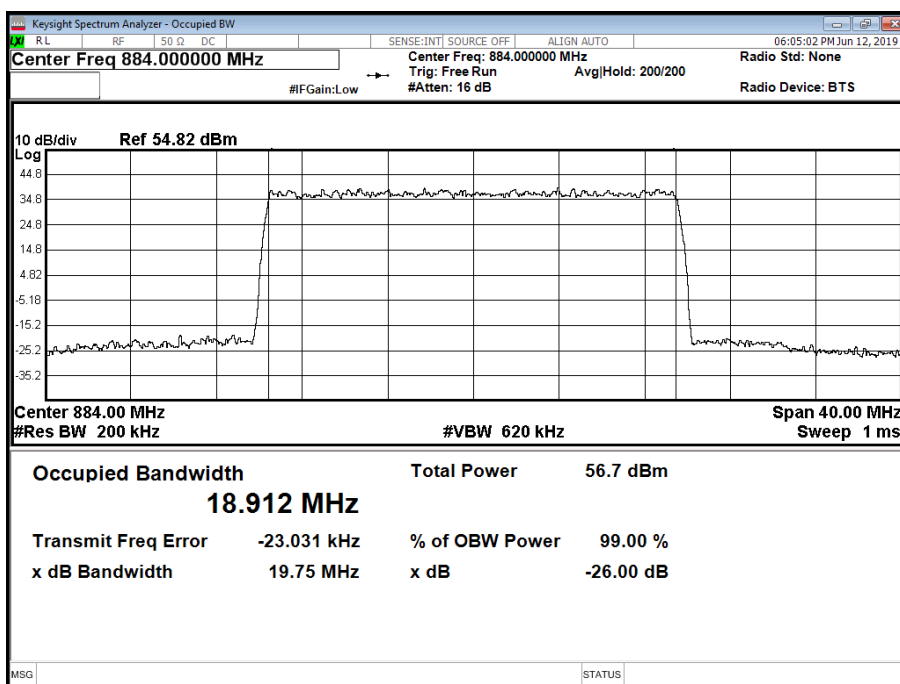




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B

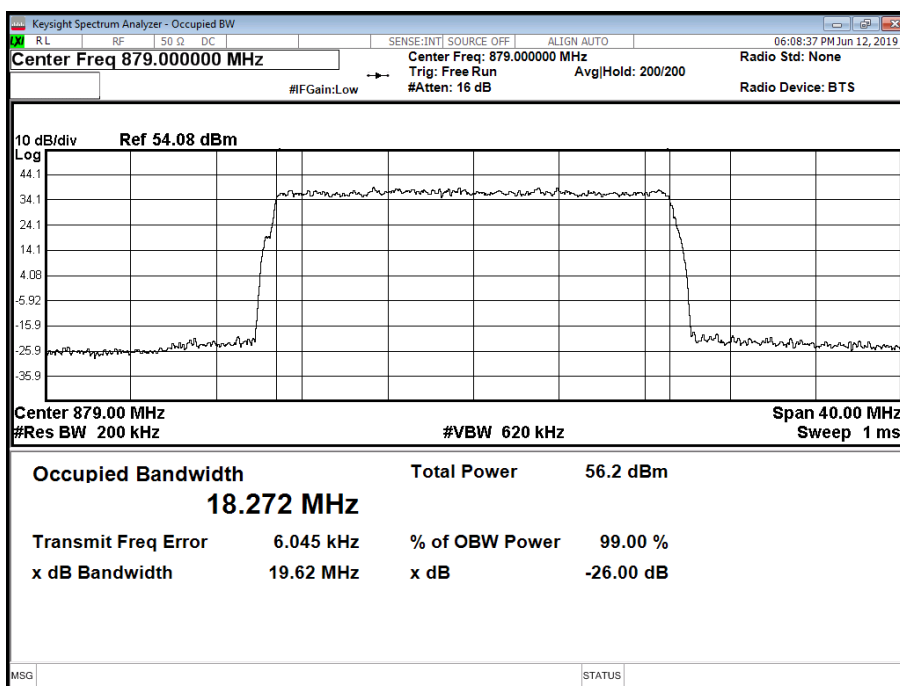


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T

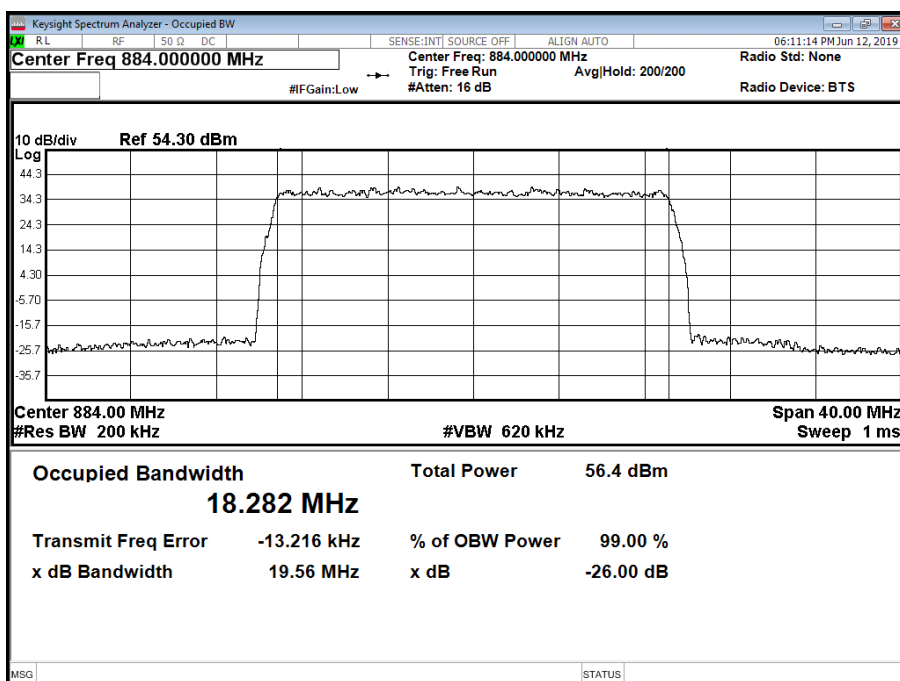




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 30 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 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

2.3.2 Date of Test and Modification State

12 June 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 22.5°C
Relative Humidity 47%

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 $-13 \text{ dBm} - 10 * \log(1) = -13 \text{ dBm}$.

For dual carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \log(2) = -16 \text{ dBm}$.

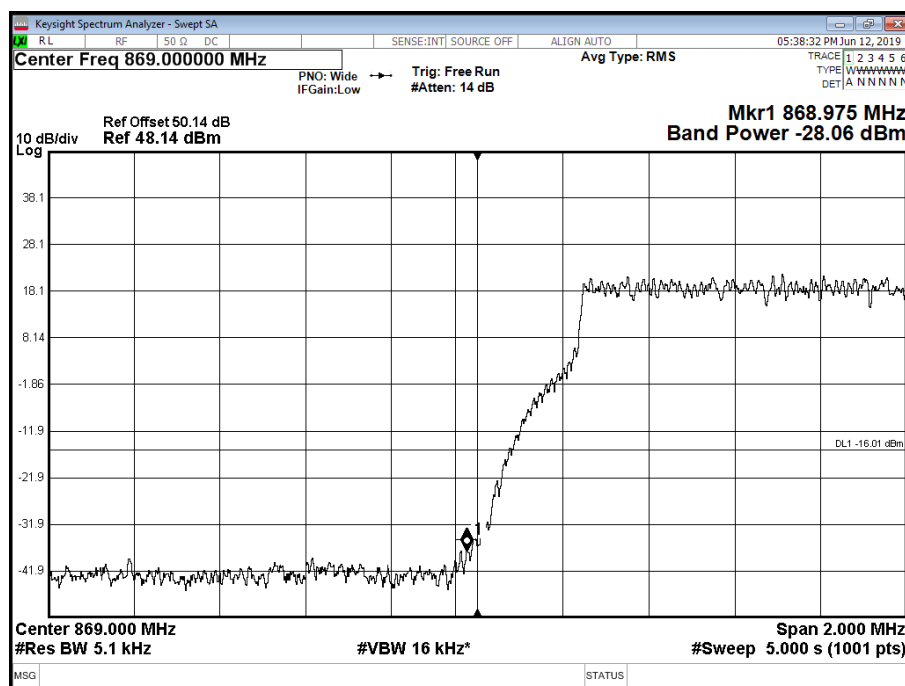
2.3.6 Test Results

Configuration A

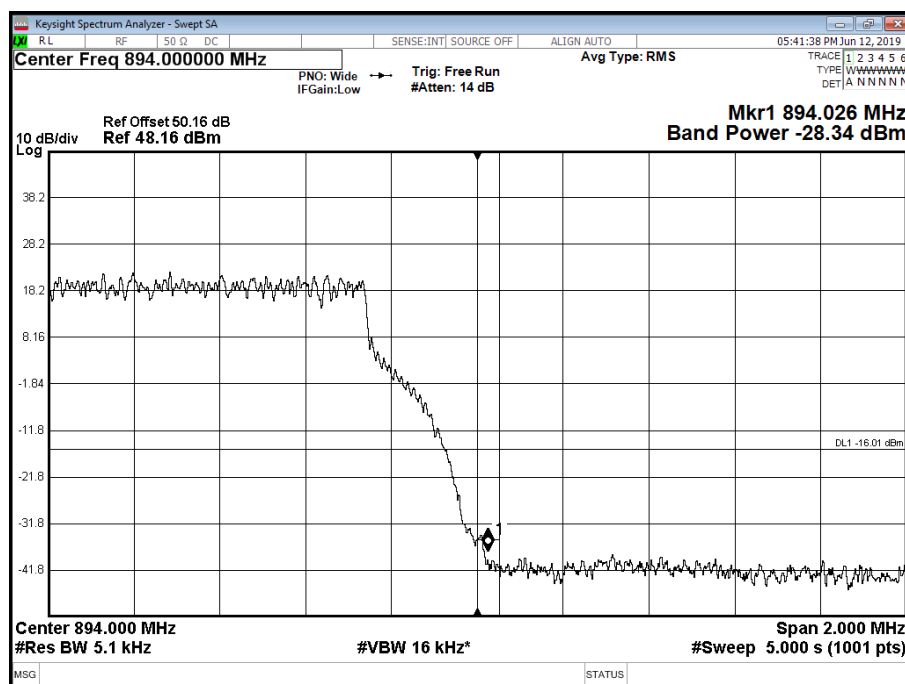
Maximum Output Power 49 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	5.0 MHz 15 kHz SCS	871.5	891.5
A	QPSK	10.0 MHz 15 kHz SCS	874.0	889.0
A	QPSK	15.0 MHz 15 kHz SCS	876.5	886.5
A	QPSK	20.0 MHz 15 kHz SCS	879.0	884.0
A	QPSK	20.0 MHz 30 kHz SCS	879.0	884.0

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

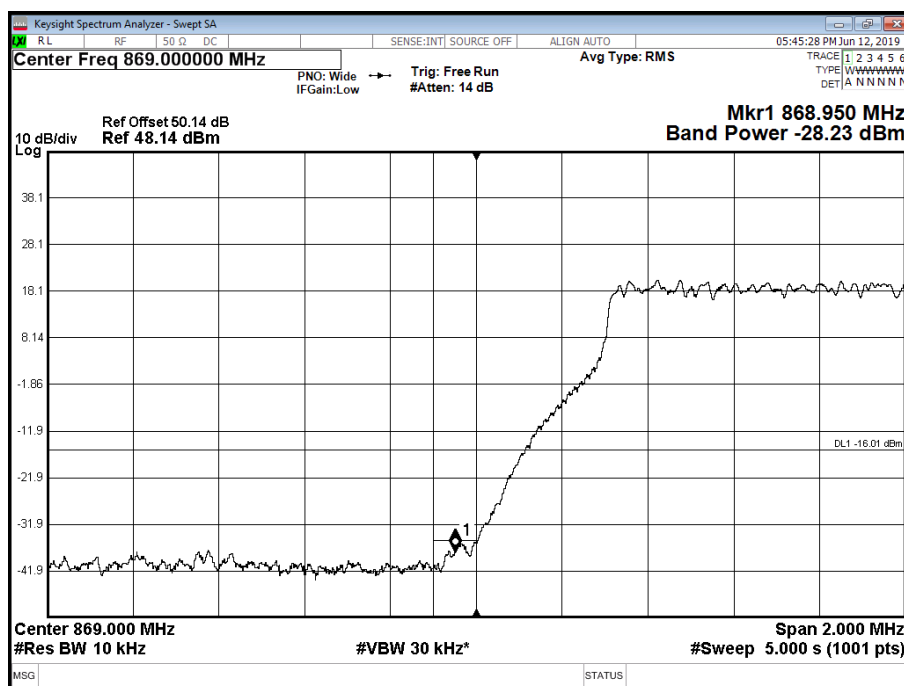


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T

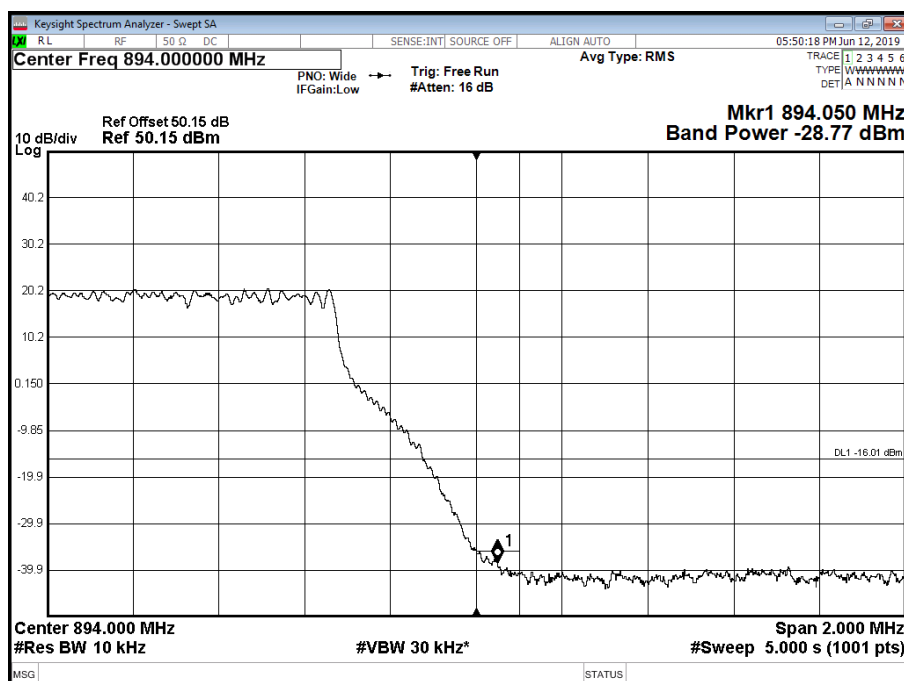




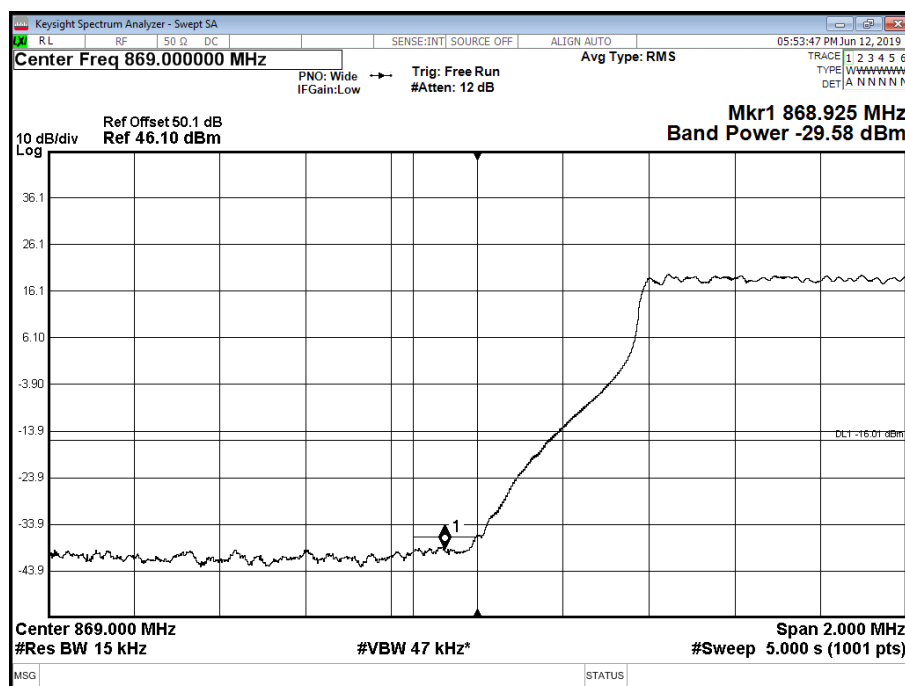
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B



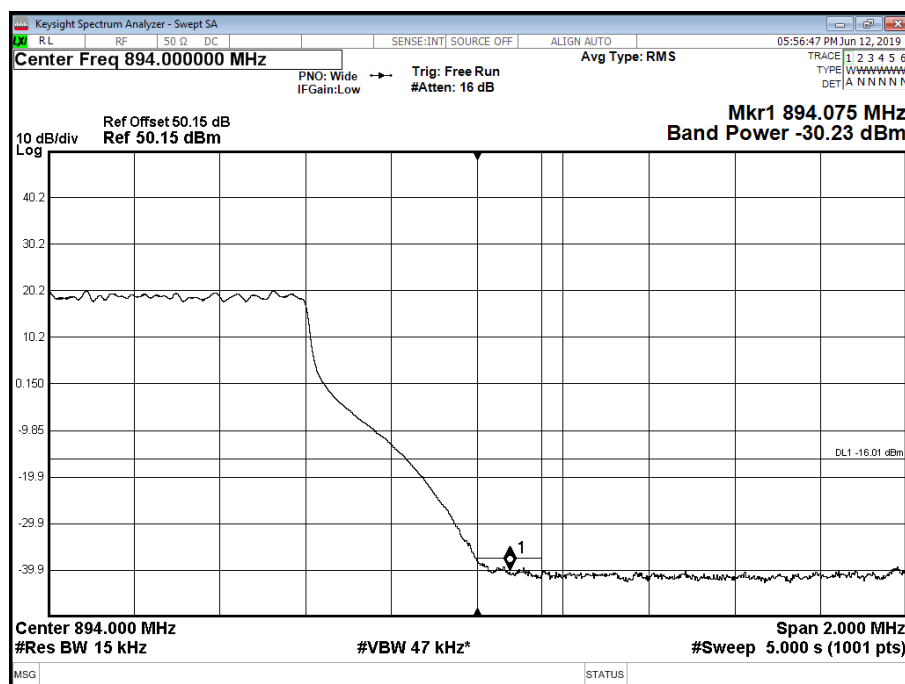
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B

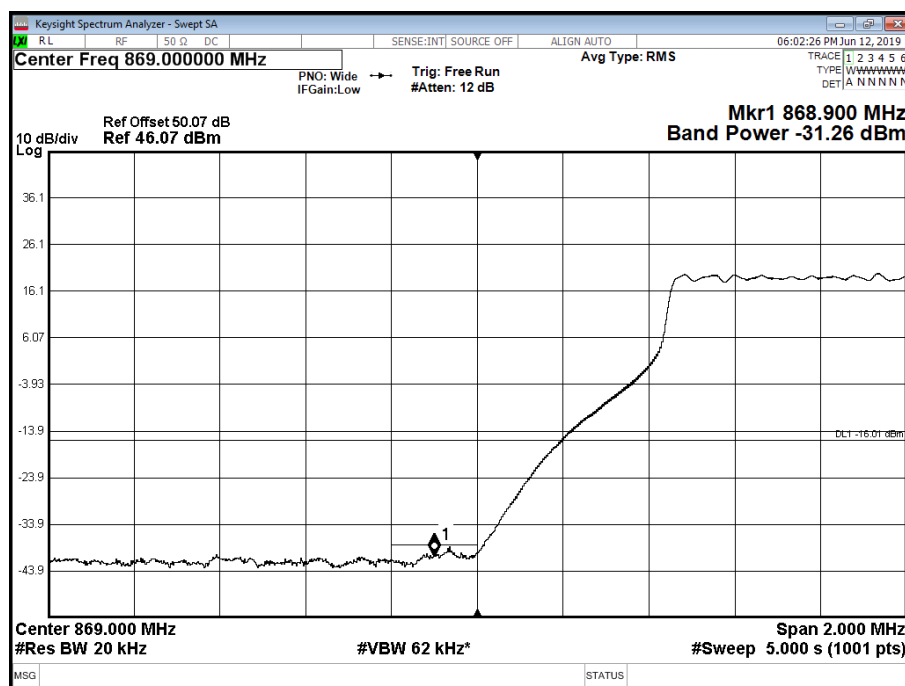


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T

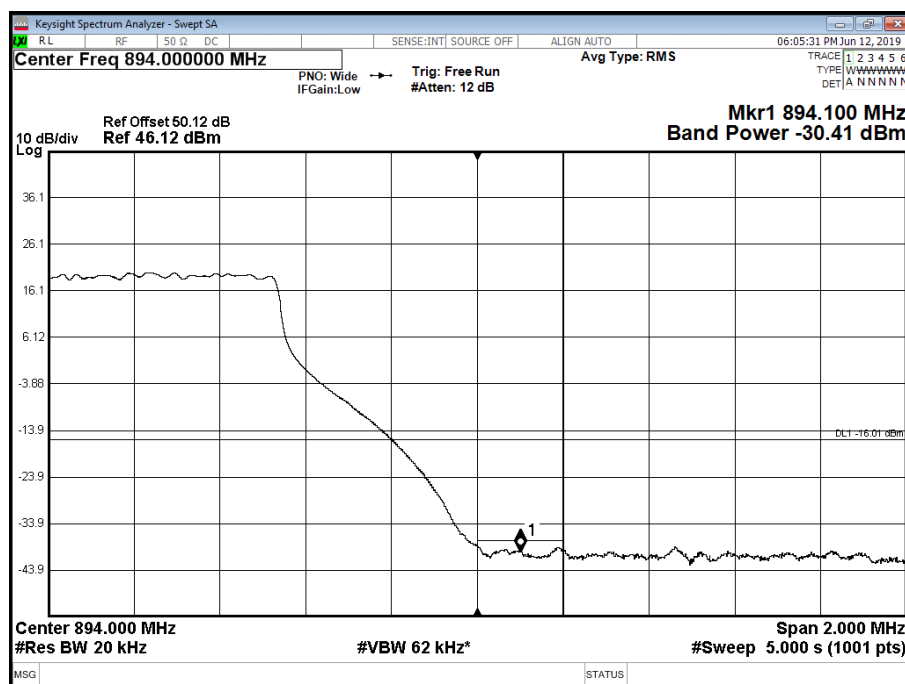




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B

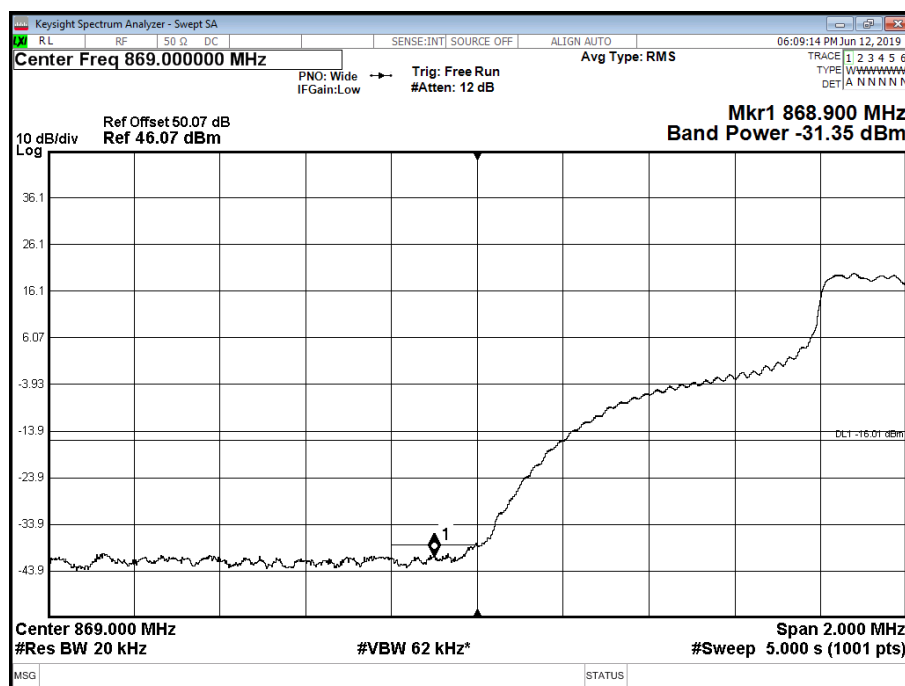


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T

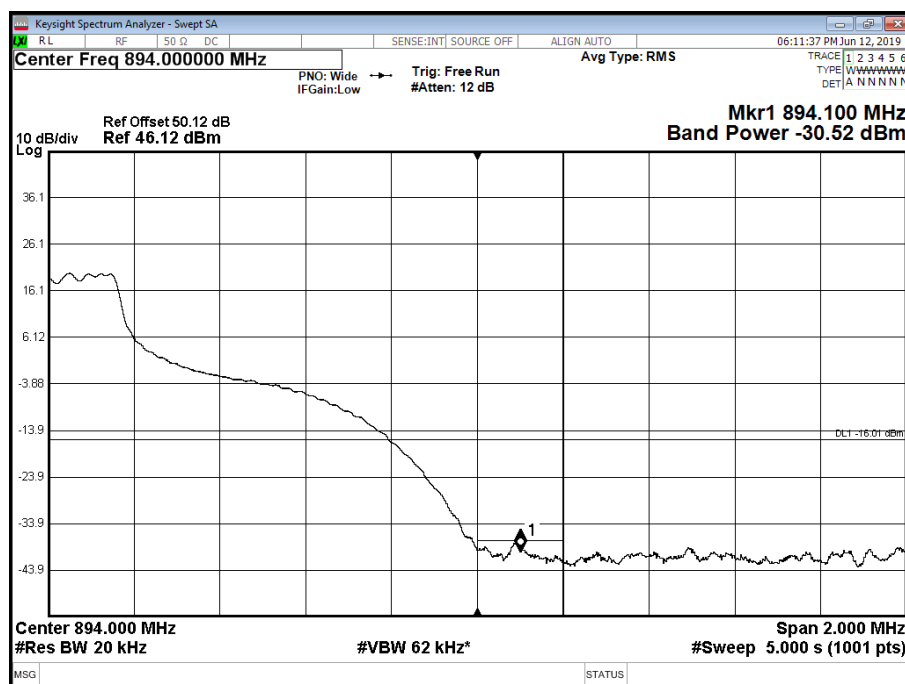




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 30 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 30 kHz SCS - Channel Position T



Limit	-16 dBm
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2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.905
Industry Canada RSS-132, Clause 5.5

2.4.2 Date of Test and Modification State

13 June 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	22.25.2°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 single carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \log(1) = -13 \text{ dBm}$.

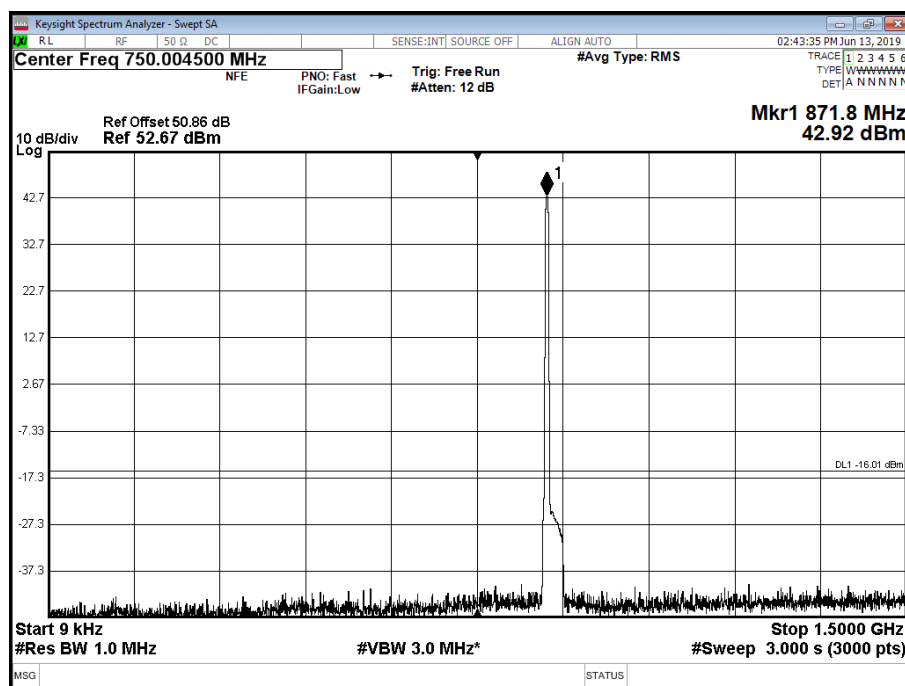
For dual carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \log(2) = -16 \text{ dBm}$.

2.4.6 Test Results

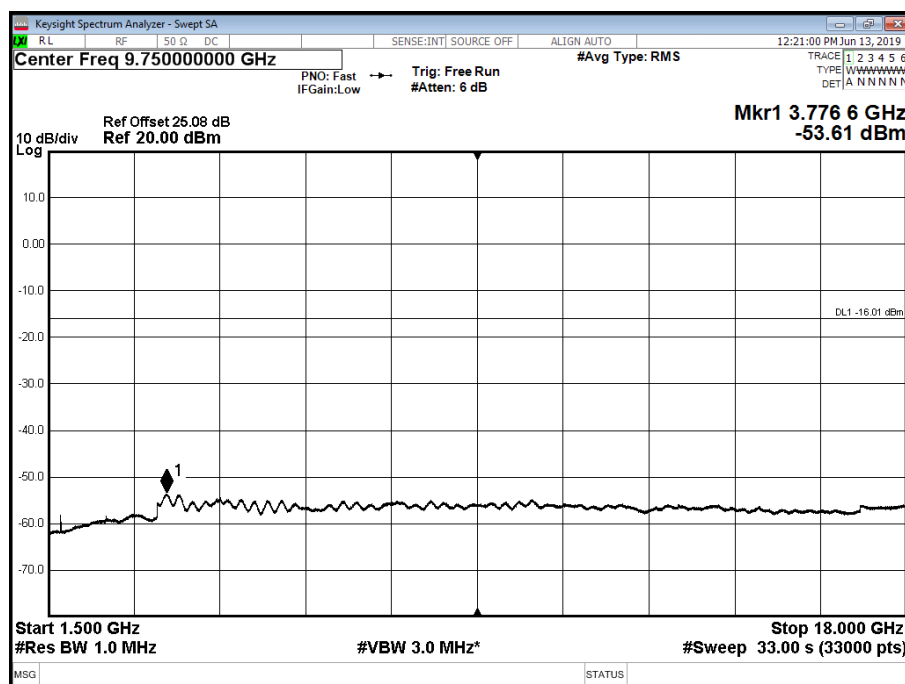
Configuration A

Maximum Output Power 49 dBm

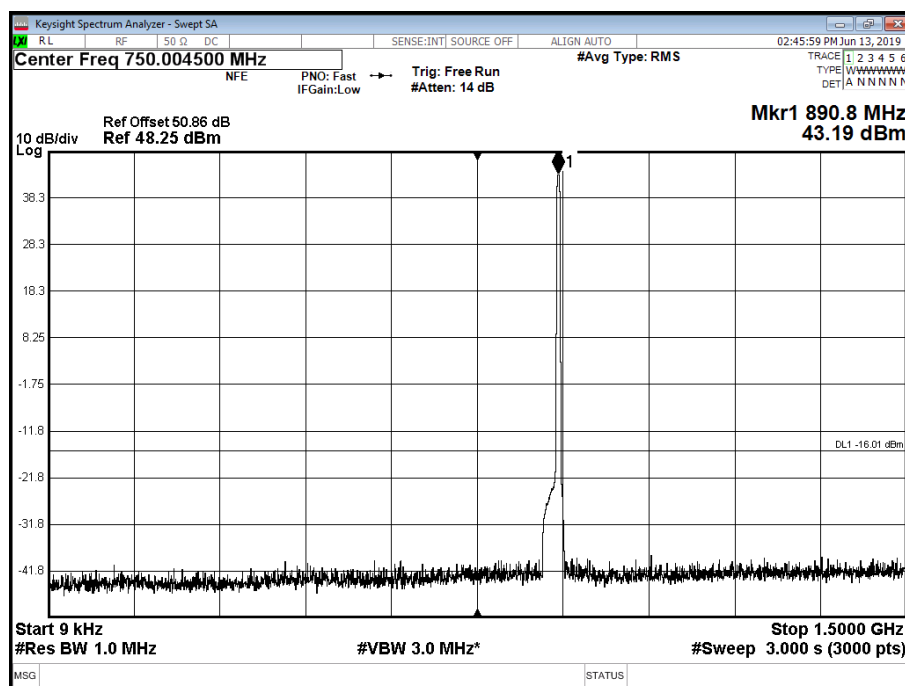
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B - Band 1 - Range 0.009 to 1500 MHz



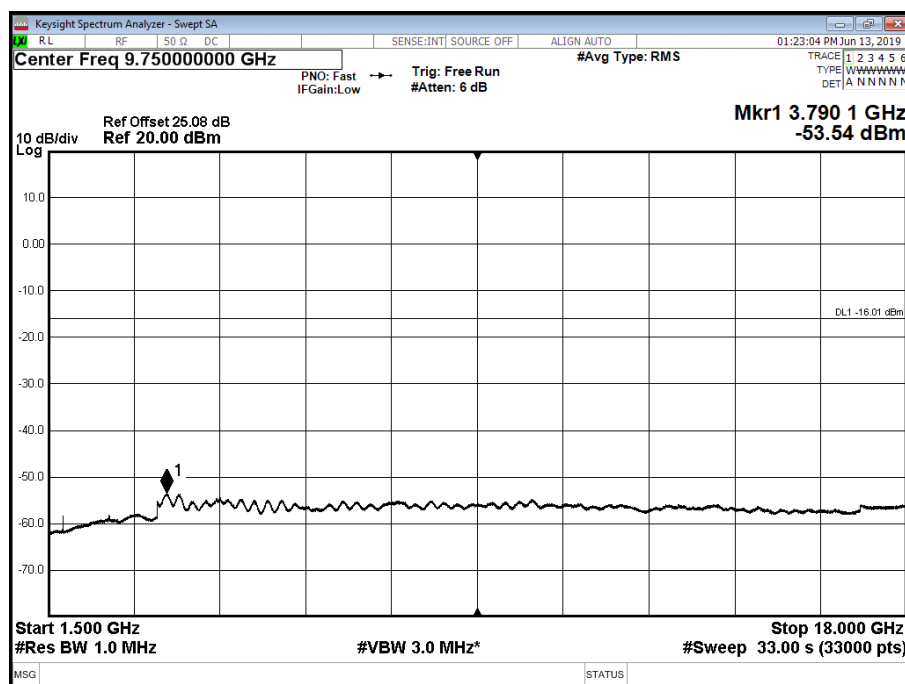
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B - Band 2 - Range 1500 to 18000 MHz



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 18000 MHz



Limit	-16dBm
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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					
PXA Signal Analyser	Keysight	N9030A	TE 004654	12	08-Oct-2019
Attenuator	API weinschel inc.	30dB	TE 005135	12	07-Nov-2019
Attenuator	API weinschel inc.	20dB	TE 005133	12	07-Nov-2019
Hydrometer	Rotronic	Hygropalm	TE 005264	12	02-May-2020
Occupied Bandwidth					
PXA Signal Analyser	Keysight	N9030A	TE 004654	12	08-Oct-2019
Attenuator	API weinschel inc.	30dB	TE 005135	12	07-Nov-2019
Attenuator	API weinschel inc.	20dB	TE 005133	12	07-Nov-2019
Hydrometer	Rotronic	Hygropalm	TE 005264	12	02-May-2020
Band Edge					
PXA Signal Analyser	Keysight	N9030A	TE 004654	12	08-Oct-2019
Attenuator	API weinschel inc.	30dB	TE 005135	12	07-Nov-2019
Attenuator	API weinschel inc.	20dB	TE 005133	12	07-Nov-2019
Hydrometer	Rotronic	Hygropalm	TE 005264	12	02-May-2020
Transmitter Spurious Emissions					
PXA Signal Analyser	Keysight	N9030A	TE 004654	12	08-Oct-2019
Attenuator	API weinschel inc.	30dB	TE 005135	12	07-Nov-2019
Attenuator	API weinschel inc.	20dB	TE 005133	12	07-Nov-2019
Highpass Filter	Wainwright	1500-18000Mhz	TE 004961	12	11-Oct-2019
Hydrometer	Rotronic	Hygropalm	TE 005264	12	02-May-2020



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			
Product	Product No	R-State	Serial No
Radio 2219 B5	KRC161678/1	R1A	CA74058105
CT10	LPC102487/1	R1C	T01F375047
Software Version:	CXP9013268/9	Revision:	R77FC