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0141

Report On

FCC and ISED Testing of the
Ericsson Remote Radio Unit Radio 2012 B29, KRC 161 914/1, LTE and NB-IoT SA and NR (717-728 MHz), with compatible Main Unit in a Base Station configuration in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 27, ISED RSS-GEN and ISED RSS-130

COMMERCIAL-IN-CONFIDENCE

FCC : TA8AKRC161914
ISED ID : 287AB-AS161914

PREPARED BY	APPROVED BY	DATED
Maggie Whiting Key Account Manager	Steve Scarfe Authorised Signatory	06 May 2021

Document 75951082 Report 01 Issue 4 **May 2021**

CONTENTS

Section **Page No**

SECTION 1

REPORT INFORMATION

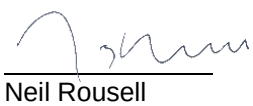
1.1 REPORT DETAILS

Manufacturer	Ericsson AB
Address	Torshamnsgatan 23 Kista SE-16480 Stockholm Sweden
Product Name & Product Number	Radio 2012 B29 KRC 161 914/1
IC Model Name	AS161914
Serial Number(s)	E23C233732
Software Version	CXP9017316/7 Rev R84KA
Hardware Version	R5B
Non-Tested Variant (See Section 1.10 Additional Information)	Radio 2012 B29 KRC 161 914/3
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2019 FCC CFR 47 Part 27: 2019 ISED RSS-GEN: Issue 5: 2019 ISED RSS-130: Issue 4: 2019
Test Plan	Radio 2012 B29 for FCC ISED test plan V 0.8
Start of Test	03 February 2021
Finish of Test	10 February 2021
Name of Engineer(s)	Neil Rousell
Related Document(s)	KDB 971168 D01 v03r01 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 2: 2019, FCC CFR 47 Part 27: 2019, ISED RSS-GEN: Issue 5: 2019, ISED RSS-130: Issue 4: 2019 The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);



Neil Rousell

This report has been revised to Issue 4 and should be read in place of Issue 3. This report has been revised to Issue 4 to update the 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, FCC CFR 47 Part 27, ISED RSS-GEN and ISED RSS-130 is shown below.

Section	Specification Clause				Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 27	RSS-GEN	ISED RSS-130		
-	-	-	-	4.6	Equivalent Isotropically Radiated Power (EIRP)	N/A[1]
2.1	2.1046	27.50	-	4.6	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1049	27.53	-	-	Occupied Bandwidth	Pass
2.3	2.1051	27.53 (h)	-	-	Band Edge	Pass
2.4	2.1051	27.53 (h)	-	4.7	Transmitter Spurious Emissions	Pass
2.5	2.1055	27.54	6.11	4.5	Frequency Stability	Pass

N/A[1] – Not Applicable, due to no integral antenna
N/A – Not Applicable

1.3 CONFIGURATION DESCRIPTION

Configuration	RAT	No. Of carriers	Carrier Bandwidth	Tests	Carrier Frequency Configuration (MHz)		
					Bottom	Middle	Top
1	LTE	1	3 MHz	All	718.5	722.5	726.5
			5 MHz	All	719.5	722.5	725.5
			10 MHz	All	722.0	722.5	723.0
2	NB-IoT SA	1	400 kHz	All	717.2	722.5	727.8
3	LTE	2	2 x 3 MHz	PO,PSD,SE	-	718.5+726.5	-
				BE,OBW	718.5+721.5	721.0+724.0	723.5+726.5
			2 x 5 MHz	PO,PSD,SE	-	719.5+725.5	-
				BE,OBW	719.5+724.5	720.0+725.0	720.5+725.5
4	LTE	3	3 x 3 MHz	PO,PSD,SE	-	718.5+725.0+ 726.5	-
				BE,OBW	718.5 + 721.5 + 724.5	719.5+722.5+ 725.5	720.5 + 723.5 + 726.5
5	NR	1	5 MHz	All	719.5	722.5	725.5
			10 MHz	All	722.0	722.5	723.0
6	NR	2	2 x 5 MHz	PO,PSD,SE	719.5+722.0	719.5+725.5	720.0+725.5
				BE,OBW	719.5+724.5	720.5+725.0	720.5+725.5
7	NR +LTE	2	2 x 5 MHz	PO,PSD,SE	719.5+722.0	720.0+725.0	720.0+725.5
				BE,OBW	719.5+722.0	722.5+725.0	720.0+725.5

1.4 DECLARATION OF BUILD STATUS

Equipment Description			
Technical Description: (Please provide a brief description of the intended use of the equipment including the technologies the product supports)	Multi Standard Remote Radio		
Manufacturer:	Ericsson AB		
Model:	Radio 2012 B29		
Part Number:	KRC 161 914/1		
	KRC 161 914/3		
Hardware Version:	R5B		
Software Version:	CXP9017316/7 R84KA		
FCC ID of the product under test	TA8AKRC161914		
IC ID of the product under test	287AB-AS161914		
Intentional Radiators			
Technology	NB IoT SA	LTE	NR
Frequency Range (MHz to MHz)	717-728 MHz	717-728 MHz	717-728 MHz
Conducted Declared Output Power (W)	80 (2 ports x40W)	80 (2 ports x40W)	80 (2 portsx40W)
Conducted Declared Output Power (dBm)	49	49	49
Supported Bandwidth(s) (MHz)	200 kHz	3, 5, 10 MHz	5, 10 MHz (Sub Carrier Spacing 15kHz)
Maximum Power for Supported Bandwidth(s) (dBm)	43	43, 46, 46	46, 46
Maximum number of carriers for each Bandwidth/RAT per port	SRO and MRO max 2	SRO and MRO max 3	SRO and MRO max 2
Modulation Scheme(s)(e.g GFSK, QPSK etc)	QPSK	QPSK, 16QAM, 64QAM, 256QAM	QPSK, 16QAM, 64QAM, 256QAM
MIMO Support	SU and MU MIMO Layers x 2	SU and MU MIMO Layers x 2	SU and MU MIMO Layers x 2
ITU Emission Designator	NB IoT 200 kHz BW channel: 203KW7D	LTE 3 MHz BW, channel: 2M69W7D. LTE 5 MHz BW channel: 4M48W7D, LTE 10 MHz BW channel: 9M43W7D	NR 5 MHz BW channel:4M48W7D, NR 10 MHz BW channel: 9M45W7D
Bottom Frequency (MHz)	717.2	718.5	719.5
Middle Frequency (MHz)	722.5	722.5	722.5
Top Frequency (MHz)	727.8	726.5	725.5
Maximum number of supported carriers per port	5 Combinations limited by IBW of 11MHz., e.g. 3 LTE + 2 NB-IoT SA		
DC Power Supply			
Nominal voltage:	-48V		
Extreme upper voltage:	-36V		
Extreme lower voltage:	-58.5V		
Max current:	20A		
Temperature			
Minimum temperature:	-40°C		
Maximum temperature:	55°C		
Antenna Characteristics			
Antenna connector - Yes/~~No~~	State impedance	50	Ohm

Temporary antenna connector - ~~Yes~~/No	State impedance			N/A	Ohm
Integral antenna - ~~Yes~~/No	Type:	N/A	Gain	N/A	dBi
External antenna - Yes/~~No~~	Type:	No integrated Antenna	Gain	N/A	dBi
For external antenna only:					
Standard Antenna Jack	~~Yes~~/No	If yes, describe how user is prohibited from changing antenna (if not professional installed):			
Equipment is only ever professionally installed	Yes/~~No~~				
Non-standard Antenna Jack	Yes/~~No~~				
Note	The radio 2012 has no integrated antenna. It has no RX and only TX.				
Antenna detail specification	Not Applicable				
Ancillaries					
Manufacturer:	Model:	Part Number:	Country of Origin:		
CT10	LPC 102487/1	T01F265031	Sweden		
Delta PSU AC 02	BML 901 250/1	BW96903167	Sweden		
Port/Cable Identification					
Port	Type	Usage	Max Cable Length specified		
Alarm/Fan	Signal cable	Signal cable connected to the the alarm/fan port	Refer to part no. RPM 513 2350/15000		
ALD	RET Cable, RET, and Signal Cable	RET-cable 1/TSR 484 21/3000 connected to the ALD -port and also a signal cable which is connected to the RET ATM200-A20	Refer to part no. 1/TSR 484 21/3000, ATM200-A20		
I hereby declare that I am entitled to sign on behalf of the manufacturer and that the information supplied is correct and complete.					
Name:	Maria Shoaib				
Position held:	Regulatory Approval Engineer				
Email address:	maria.shoaib@ericsson.com				
Telephone number:	46724675234				
Date:	23/03/2021				

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

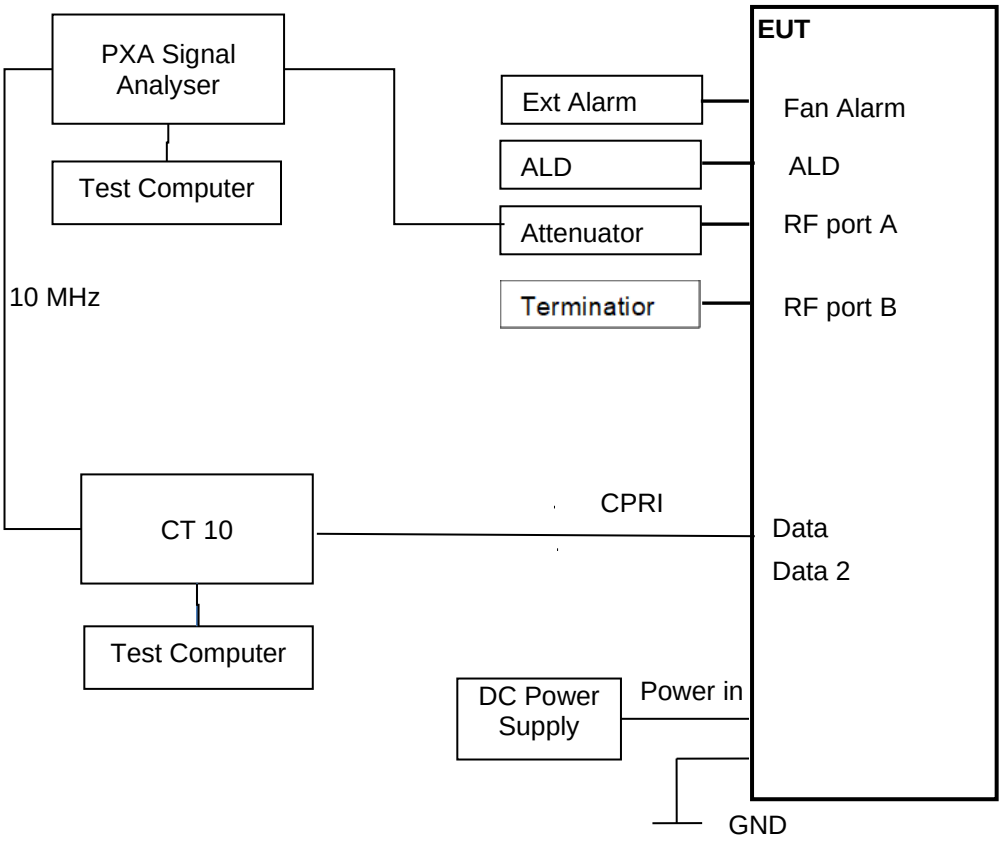
The Equipment Under Test (EUT) Radio 2012 B29 is an Ericsson AB Radio Unit working in the public mobile service 717-728 MHz band which provides communication connections to 717-728 MHz network. The Radio 2012 B29 operates from a -48V DC supply.

The Equipment Under Test (EUT) Radio 2012 B29 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 Test Set Up



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 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

ISED Accreditation
IC#12669A Octagon House, 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
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 have provided the following details about the variants of the Radio 2012 B29
*KRC 161 914/1 - has 4 ports with 2 ports being antenna ports and 2 ports being the diplexer ports.
KRC 161 914/3 – has 2 antenna ports, no diplexer, a new NEBS cover and a different overlay.
Note*: Tests have been performed on this unit.

Therefore, KRC 161 914/3 is equivalent to KRC 161 914/1 in radio performance terms, as such no extra testing is required to prove conformity.

The Test Plan is based on the TUV SUD Document FCC and ISED Test Plan Rationale for Base Station Equipment.
Pre-testing was performed in accordance with the Test Plan to establish the worst-case Port, modulation schemes and bandwidths.
The port with the highest power, worst case port = Port A
Worst case modulation was QPSK (LTE), 16QAM (NR)
Worst case bandwidth was 5 MHz (LTE, NR)

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 27, Clause 27.50
ISED RSS-130, Clause 4.6

2.1.2 Date of Test and Modification State

03 and 04 February 2021 - 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	22.0 - 22.5°C
Relative Humidity	36.1 - 42.1%

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.

The Total EIRP is calculated as the sum of the measured PSD + 10log(2) + Antenna gain.

The PSD plots have been included for each of the worst case PSDs in each configuration.

2.1.6 Test Results

Configuration 1

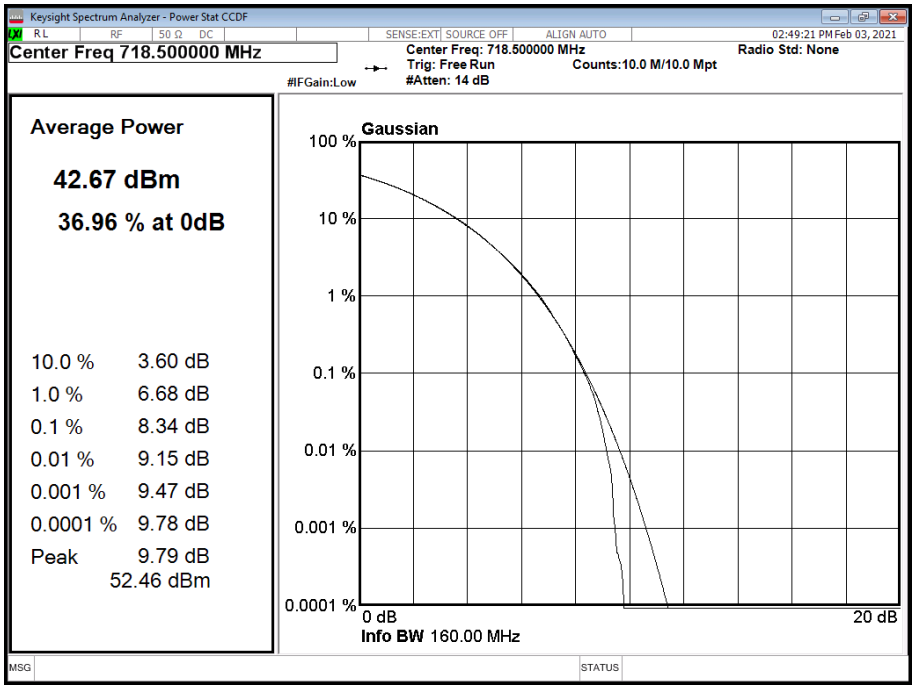
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position B					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	3.0 MHz	8.34	42.64	39.17	45.65	42.18	22.97
A	QPSK	5.0 MHz	7.57	45.82	40.11	48.83	43.12	22.03
A	QPSK	10.0 MHz	7.72	45.75	37.23	48.75	40.24	24.91

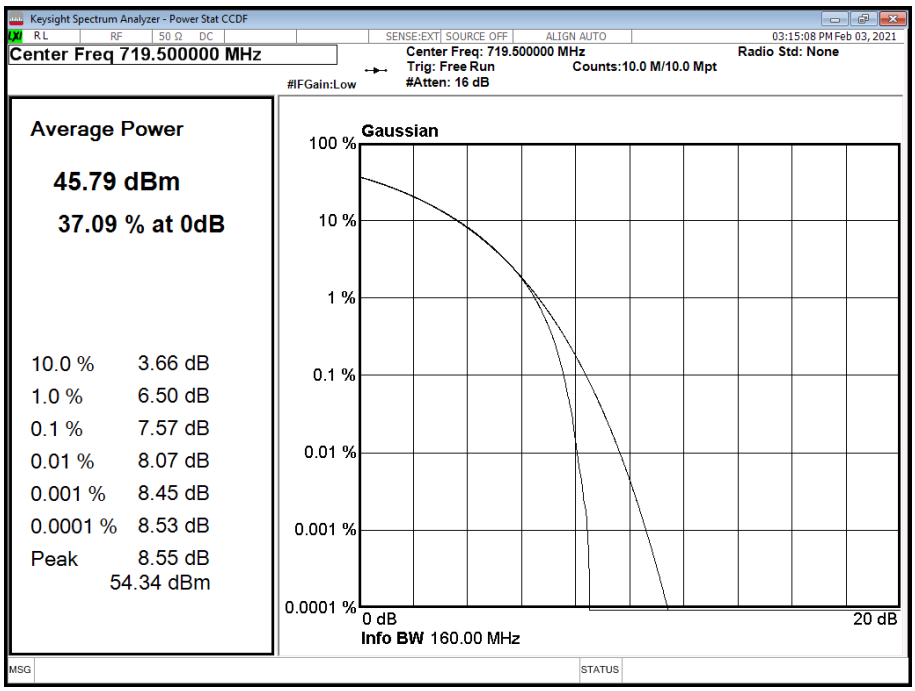
Remarks

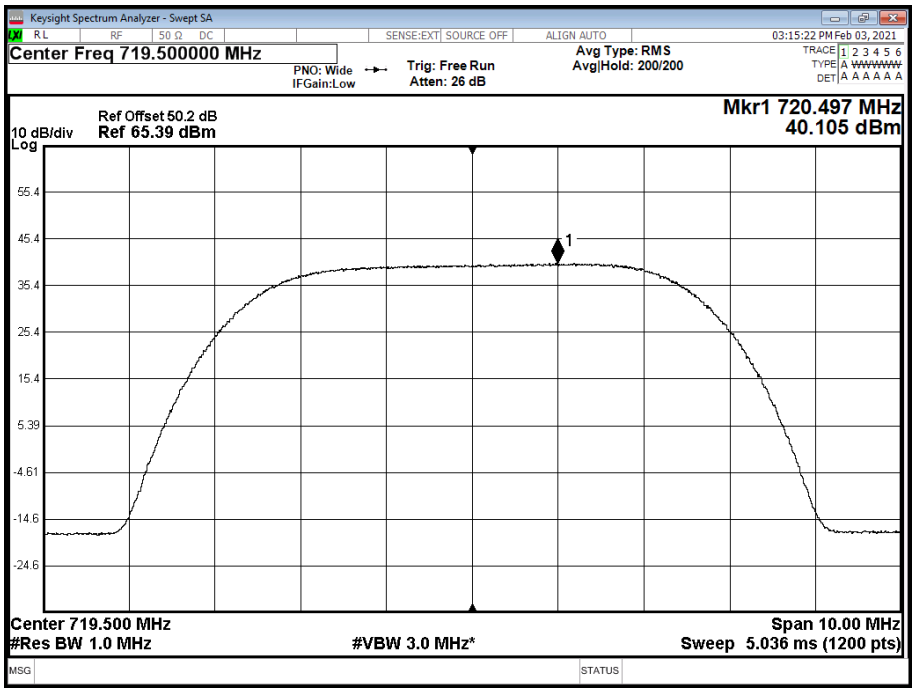
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B

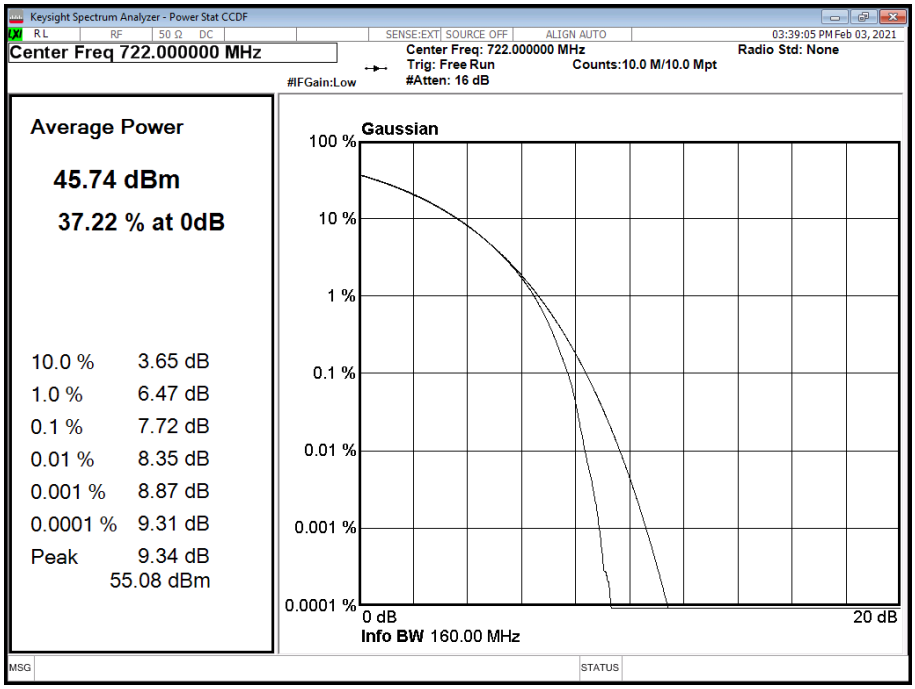


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B





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



Configuration 1

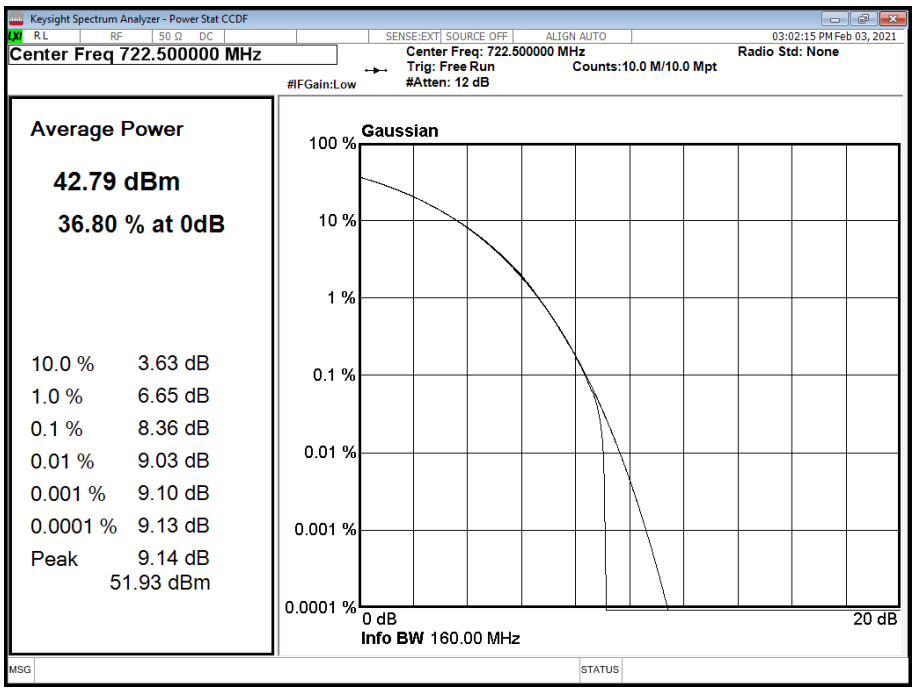
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	3.0 MHz	8.36	42.75	39.03	45.76	42.04	23.11
A	QPSK	5.0 MHz	7.29	45.81	39.75	48.82	42.76	22.39
A	QPSK	10.0 MHz	7.62	45.63	37.03	48.64	40.04	25.11

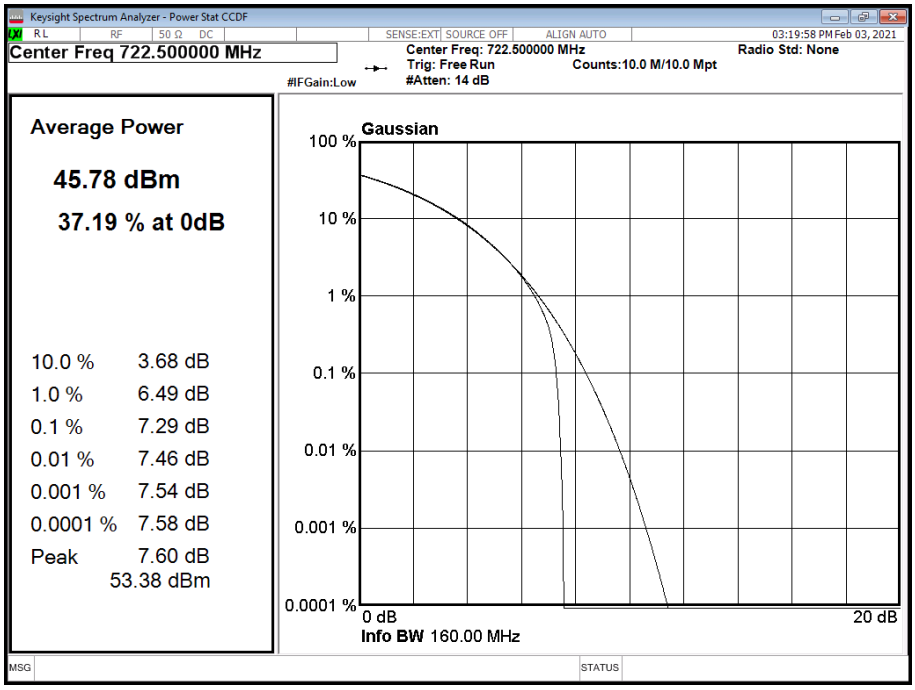
Remarks

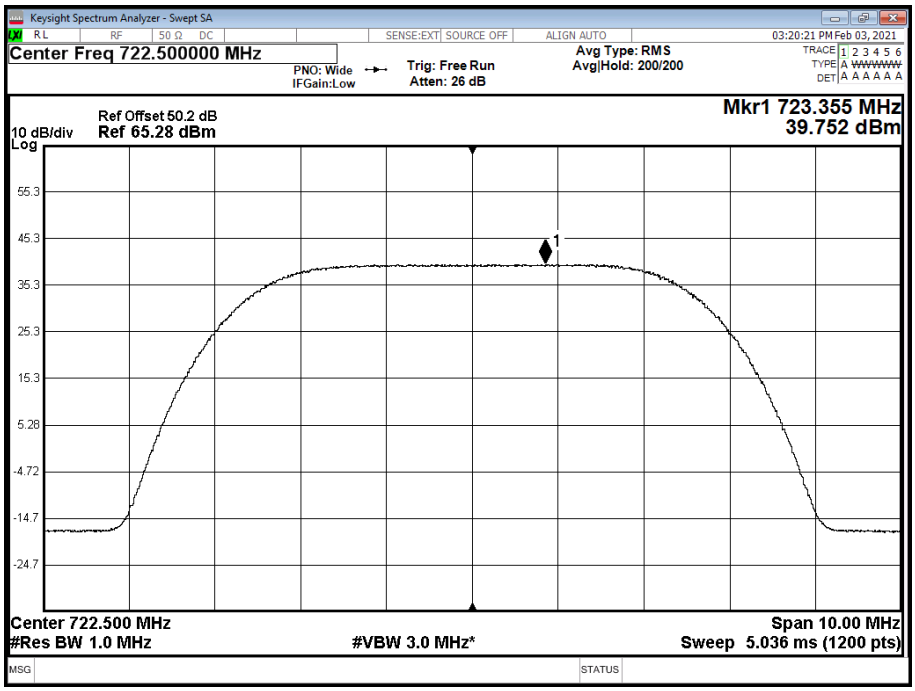
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M

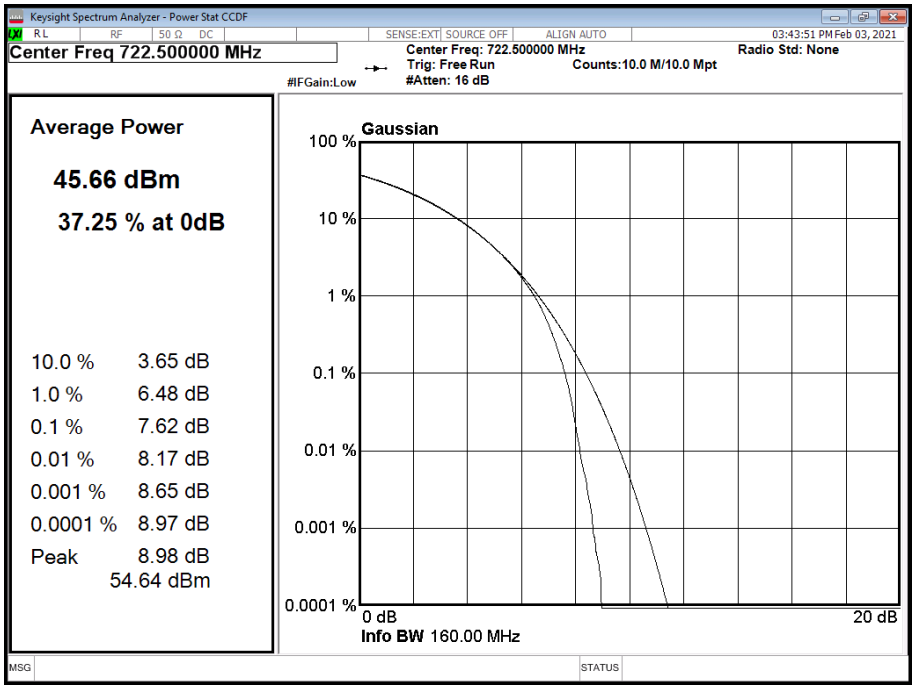


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M





Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Configuration 1

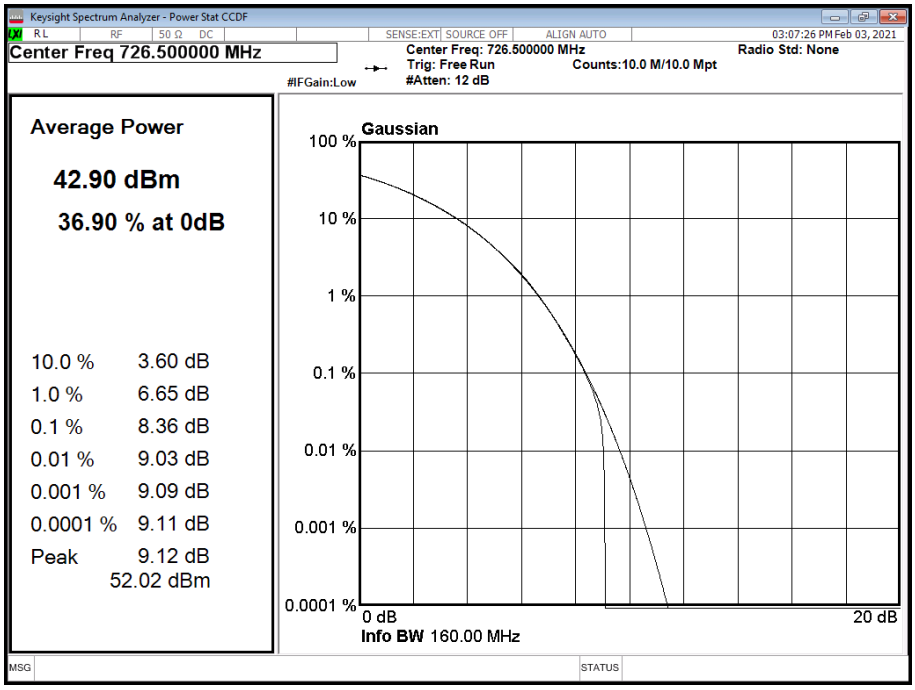
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position T					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	3.0 MHz	8.36	42.89	39.09	45.90	42.10	23.05
A	QPSK	5.0 MHz	7.26	45.82	39.80	48.83	42.81	22.34
A	QPSK	10.0 MHz	7.52	45.73	37.19	48.74	40.20	24.95

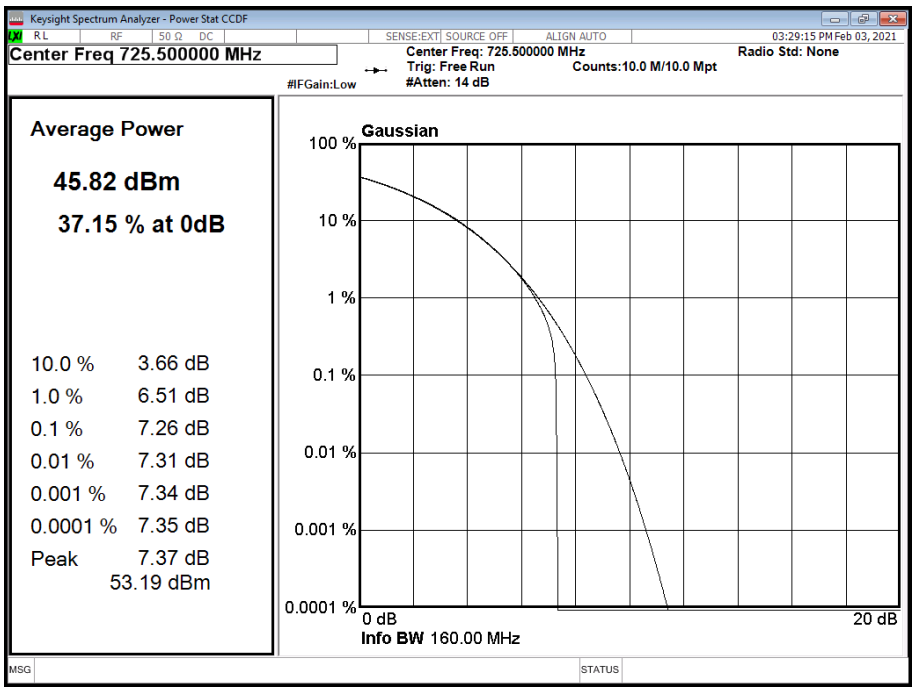
Remarks

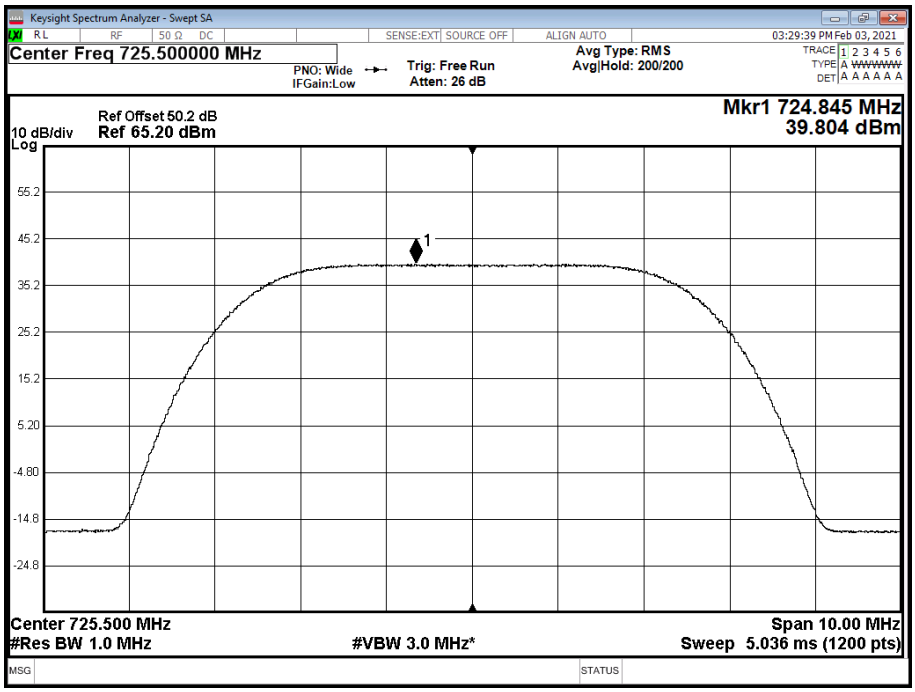
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T

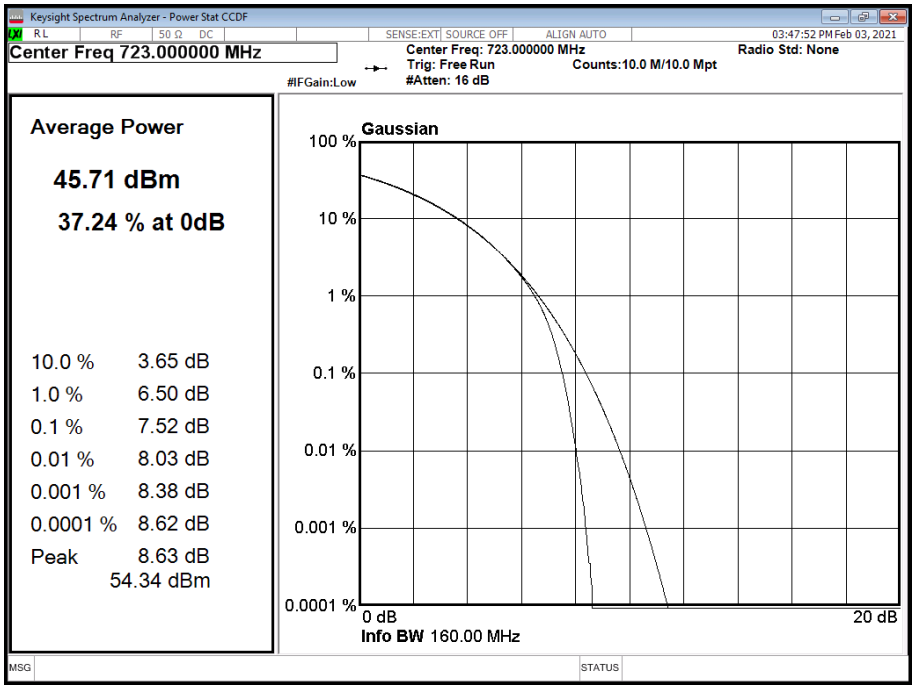


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T





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



Configuration 2

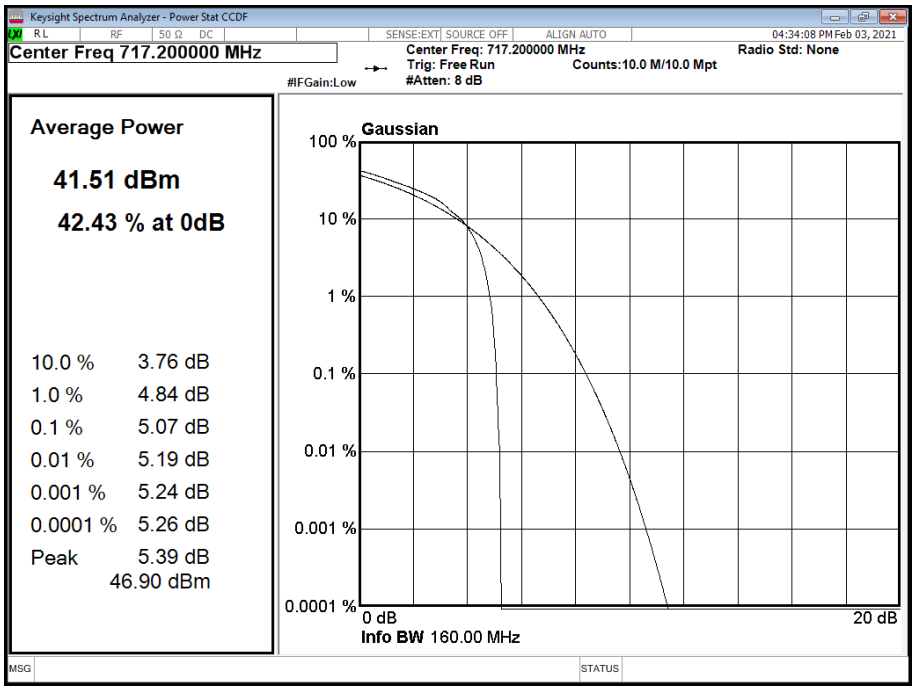
Maximum Output Power 43 dBm

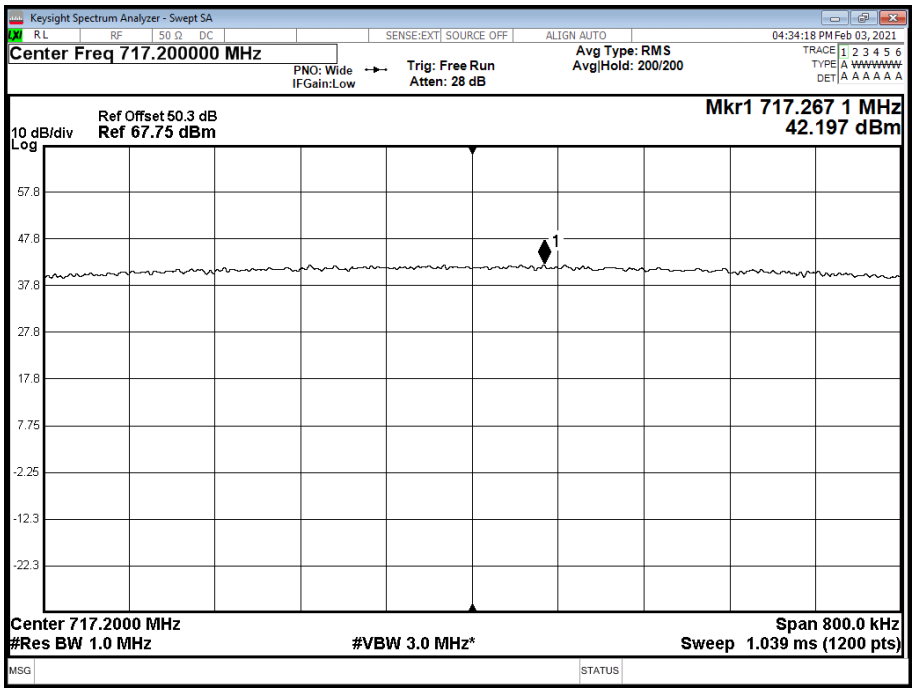
Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position B					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	400 kHz	5.07	41.51	42.20	44.52	45.21	19.94

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

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





Configuration 2

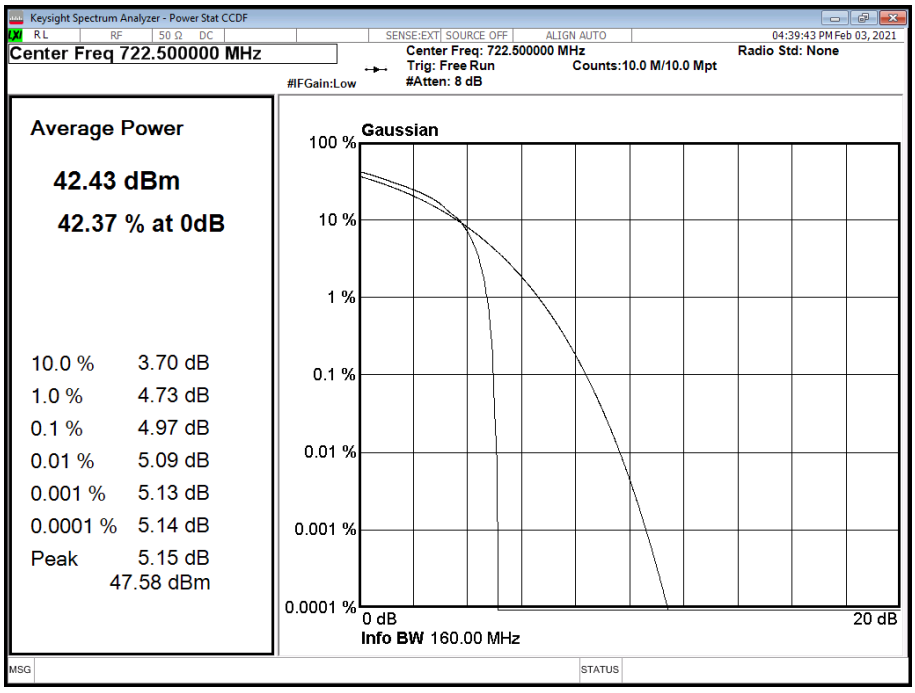
Maximum Output Power 43 dBm

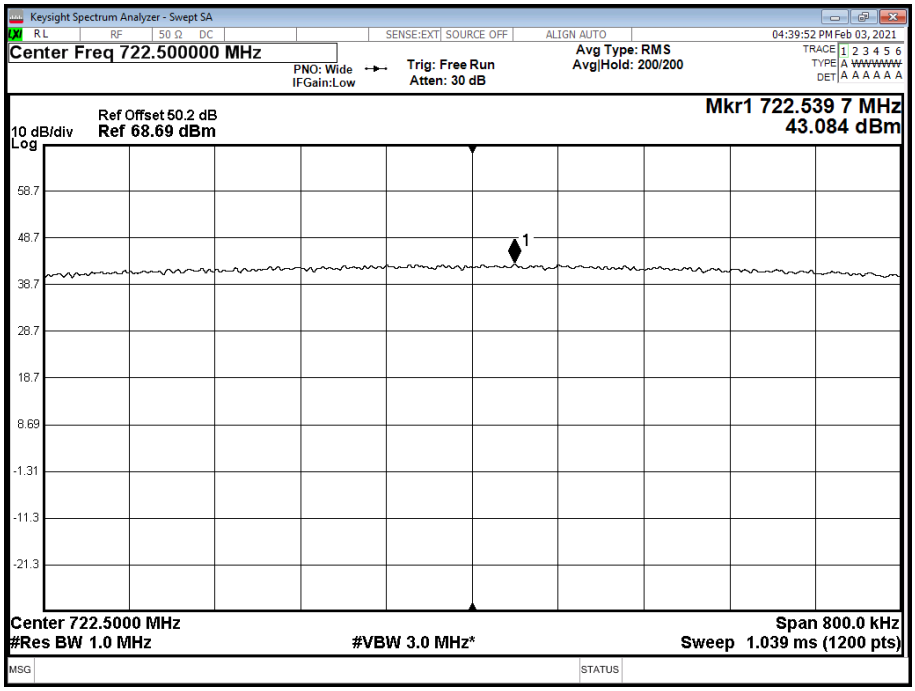
Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	400 kHz	4.97	42.45	43.08	45.46	46.09	19.06

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

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





Configuration 2

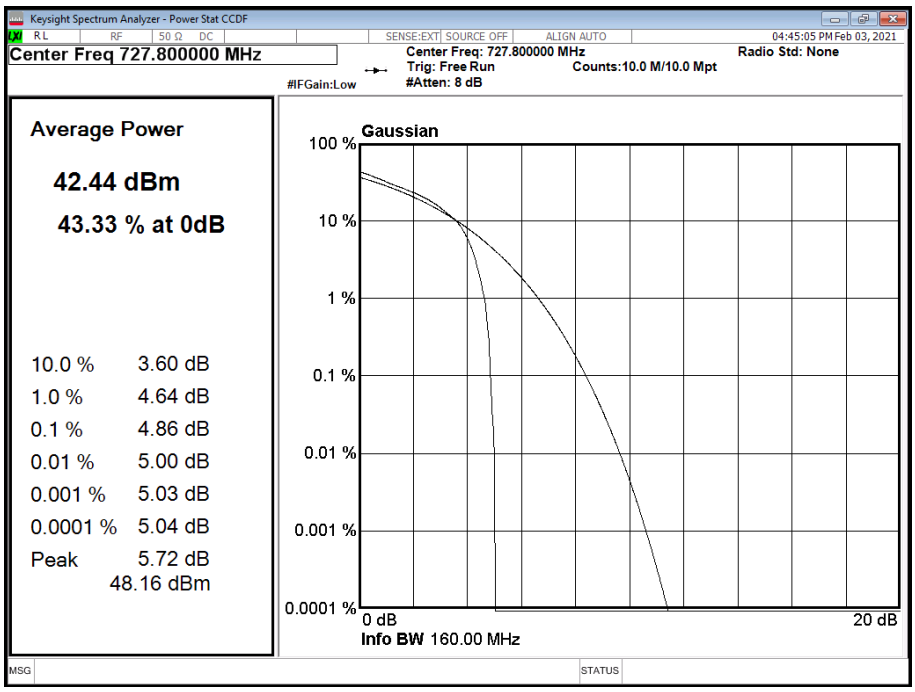
Maximum Output Power 43 dBm

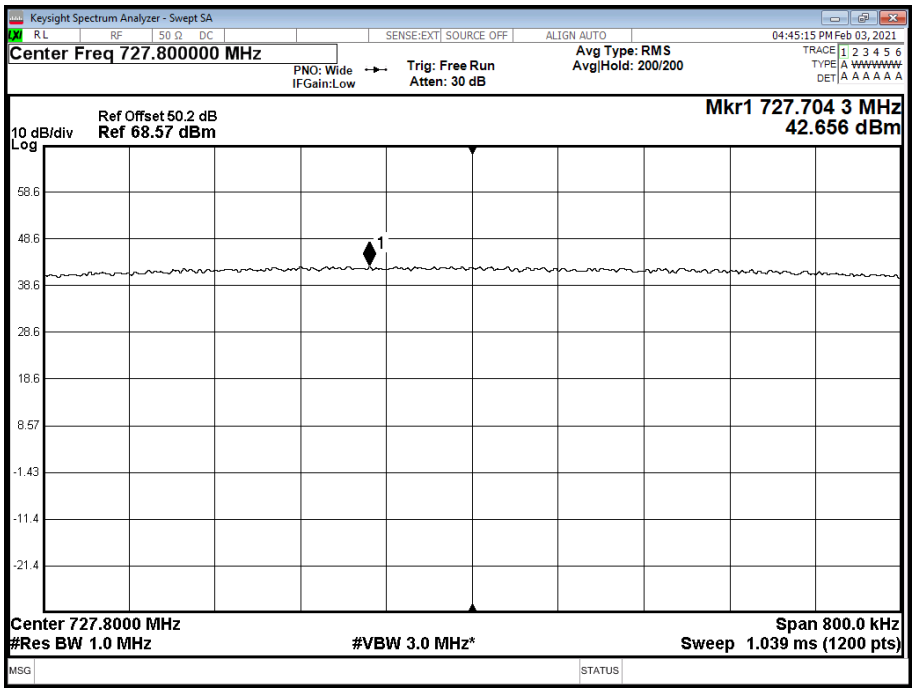
Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position T					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	400 kHz	4.86	42.33	42.66	45.34	45.67	19.48

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

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

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RL
RF
50 Ω DC
SENSE:EXT
SOURCE OFF
ALIGN AUTO
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Center Freq 727.800000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: RMS
Avg|Hold: 200/200
TRACE 1 2 3 4 5 6
TYPE A WWWWW
DET A A A A A
Ref Offset 50.2 dB
10 dB/div
Log
Ref 68.57 dBm
Mkr1 727.704 3 MHz
42.656 dBm
58.6
48.6
38.6
28.6
18.6
8.57
-1.43
-11.4
-21.4
1
Center 727.8000 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 800.0 kHz
Sweep 1.039 ms (1200 pts)
MSG
STATUS

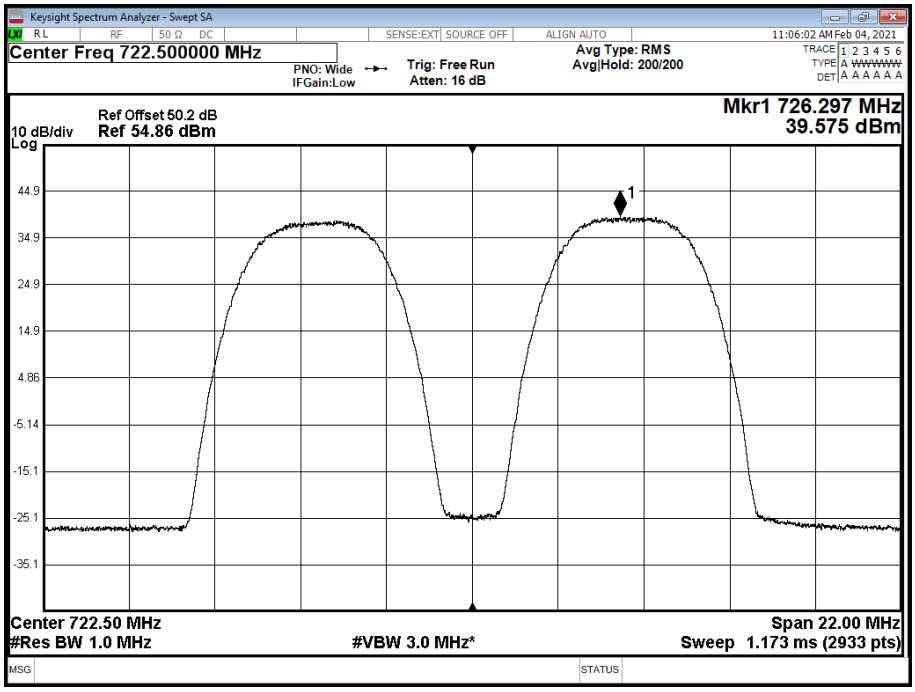
Configuration 3

Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	3.0 MHz	-	45.46	39.58	48.47	42.59	22.56
A	QPSK	5.0 MHz	-	45.63	37.33	48.64	40.34	24.81

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.



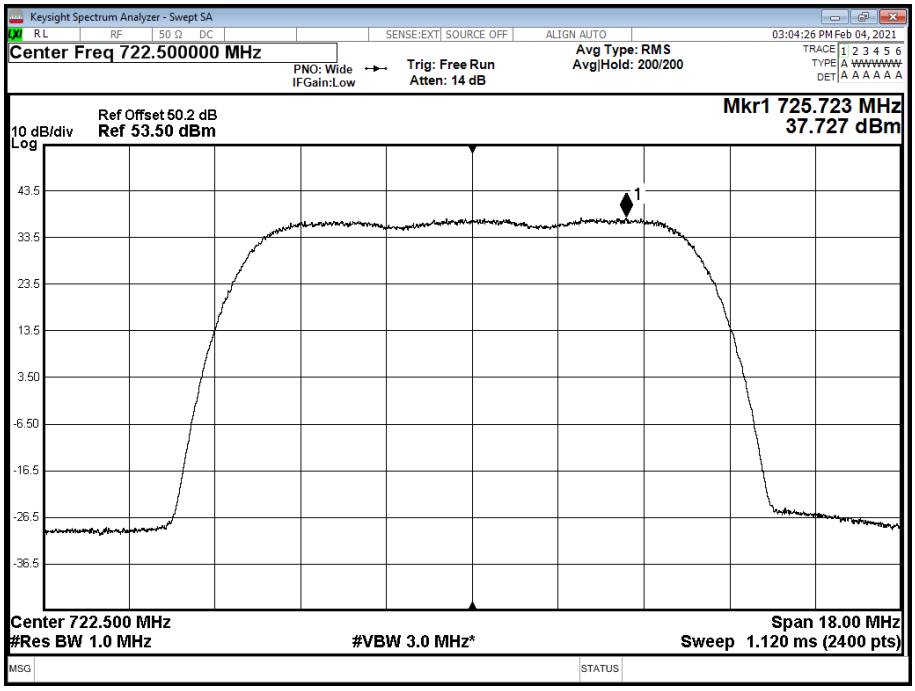
Configuration 4

Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK	3.0 MHz	-	45.65	37.73	48.66	40.74	24.41

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.



Configuration 5

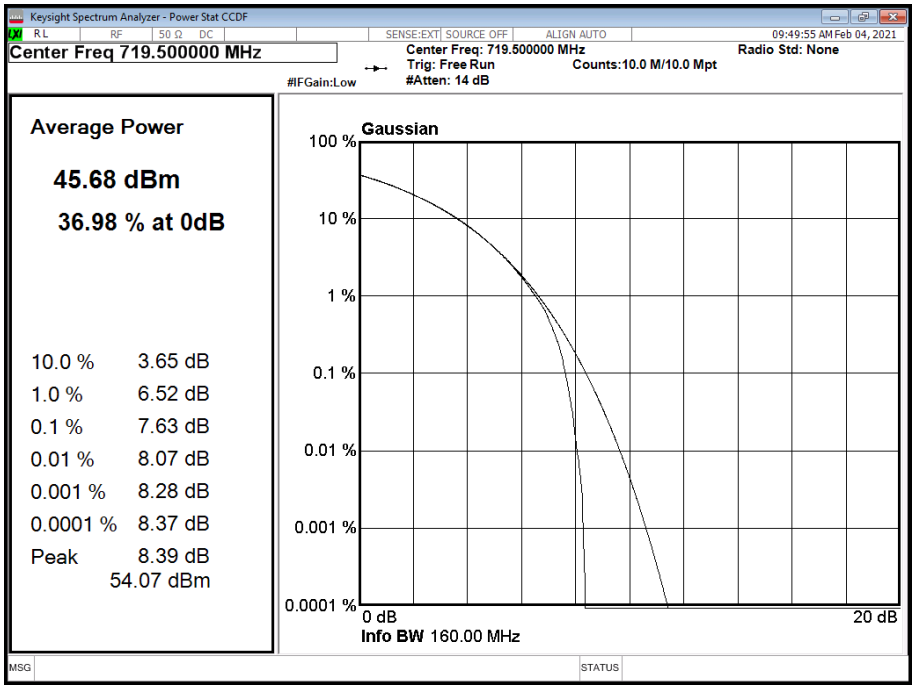
Maximum Output Power 46 dBm

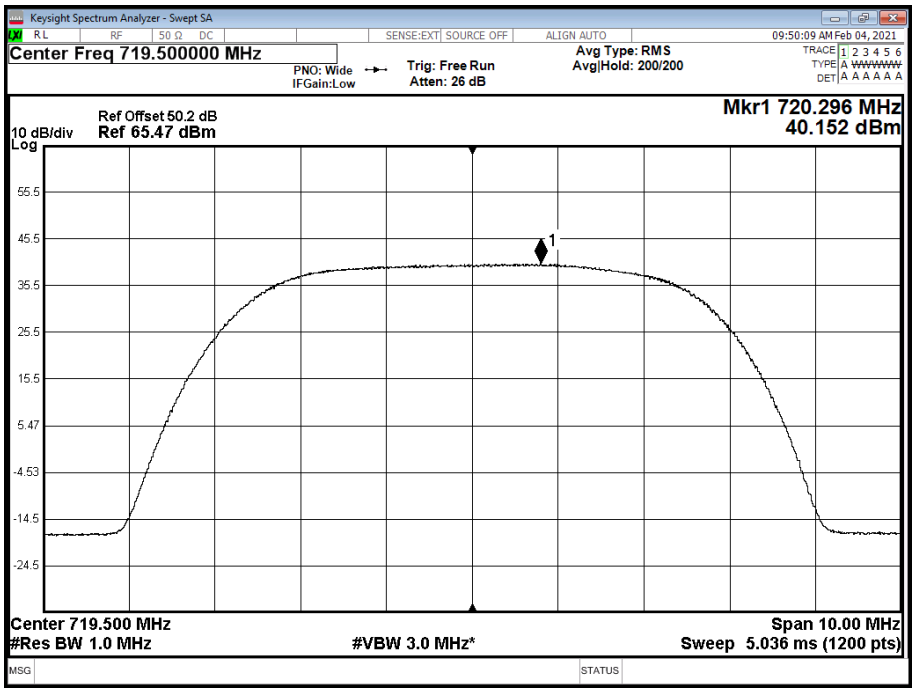
Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position B					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	16QAM	5.0 MHz 15 kHz SCS	7.63	45.71	40.15	48.72	43.16	21.99
A	16QAM	10.0 MHz 15 kHz SCS	7.74	45.53	37.74	48.54	40.75	24.40

Remarks

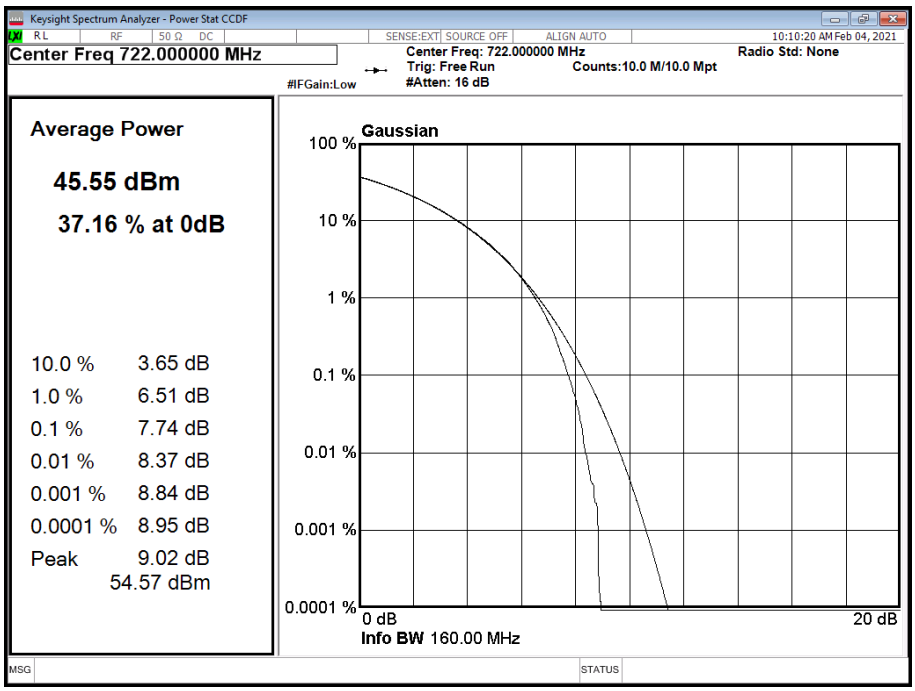
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B





Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B



Configuration 5

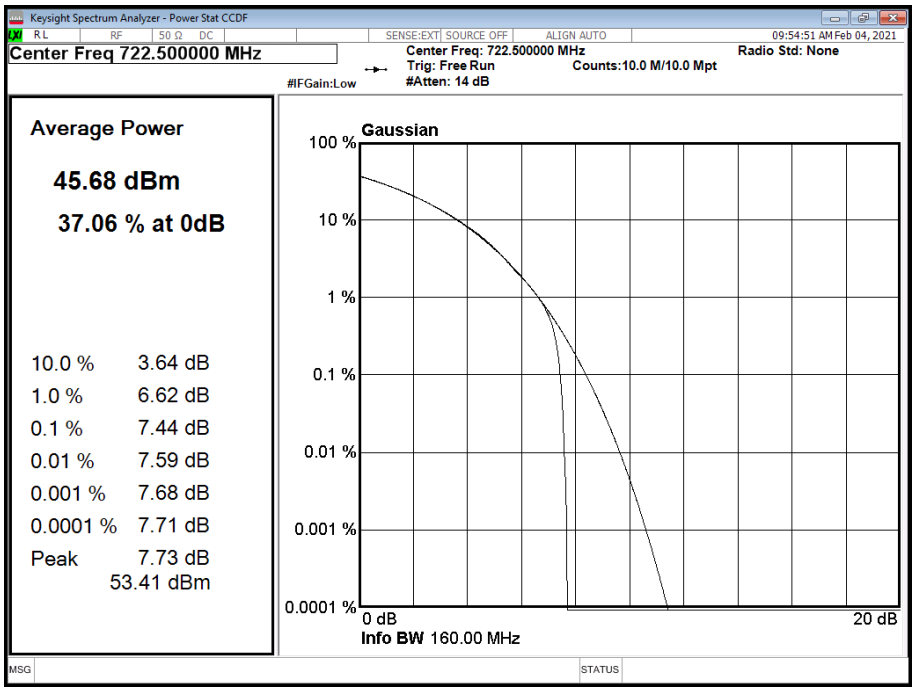
Maximum Output Power 46 dBm

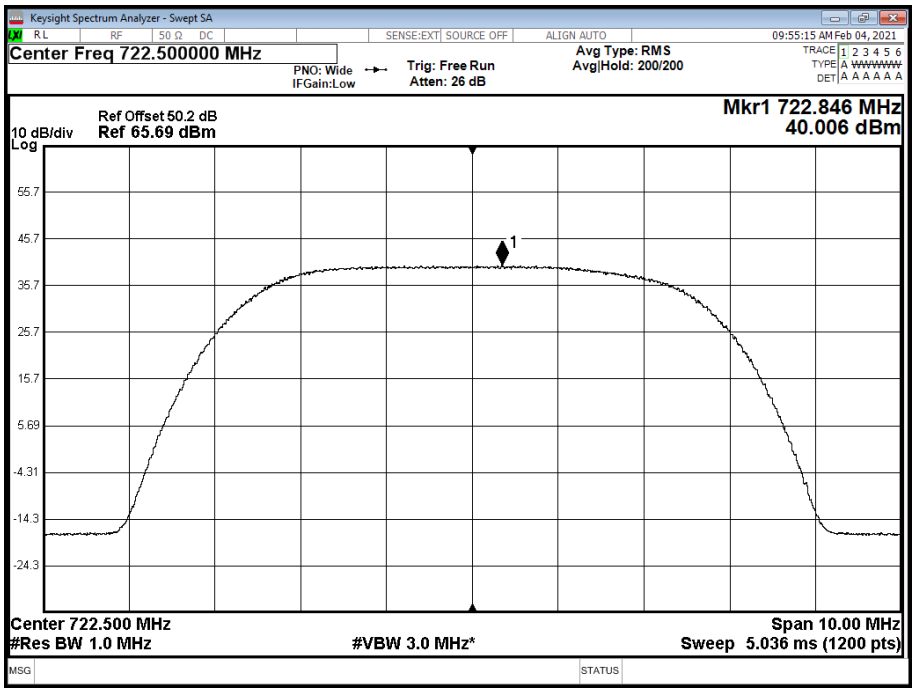
Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	16QAM	5.0 MHz 15 kHz SCS	7.44	45.71	40.01	48.72	43.02	22.13
A	16QAM	10.0 MHz 15 kHz SCS	7.66	45.52	37.65	48.53	40.66	24.49

Remarks

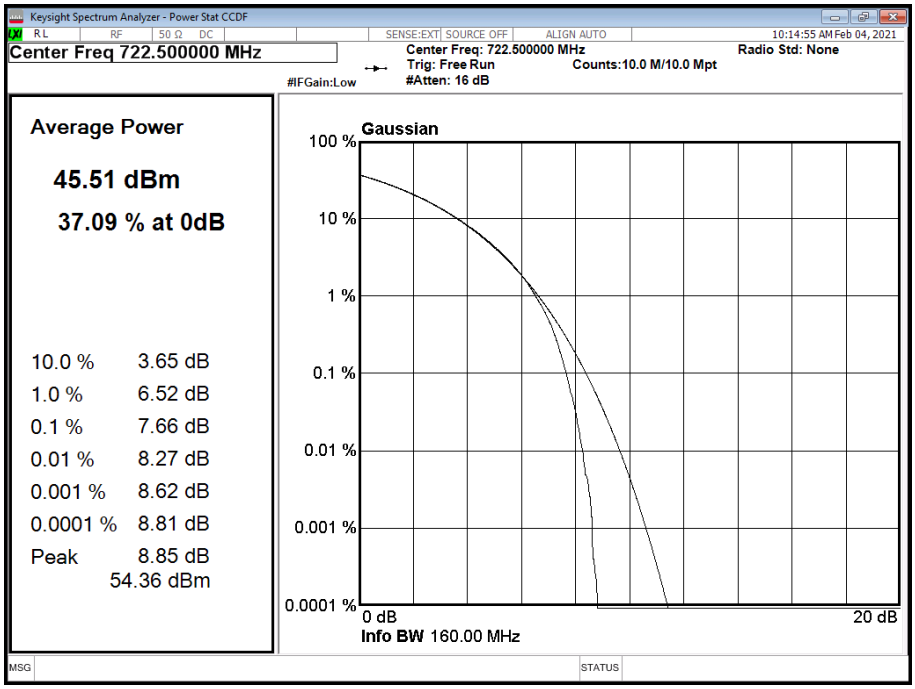
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position M





Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position M



Configuration 5

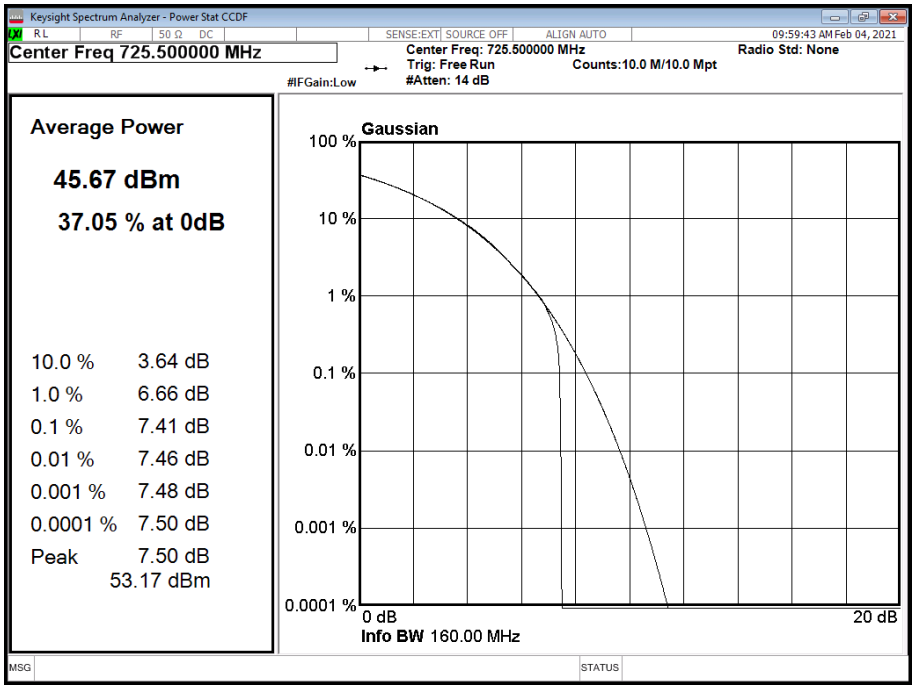
Maximum Output Power 46 dBm

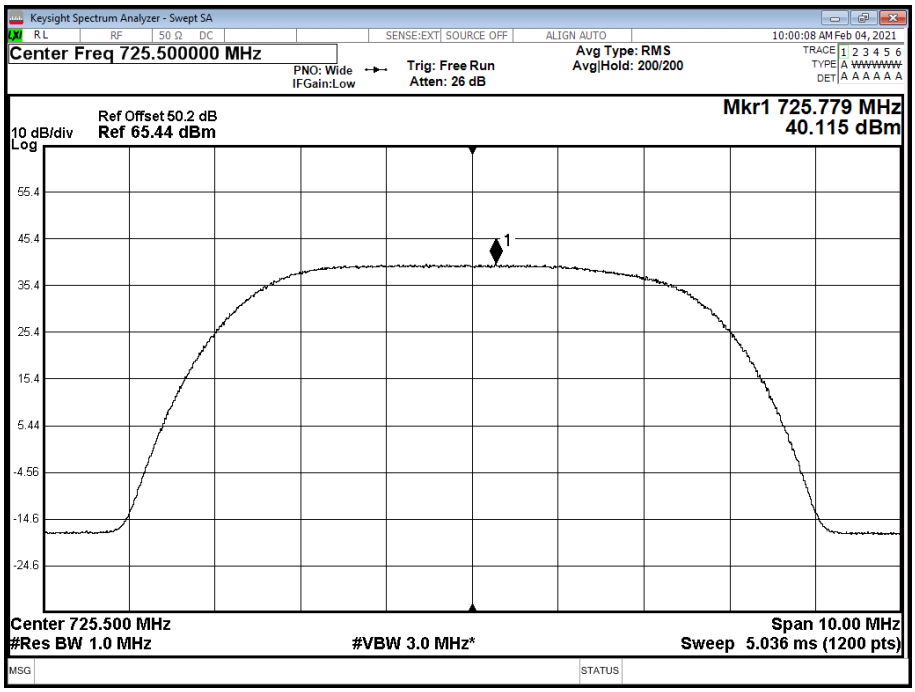
Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position T					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	16QAM	5.0 MHz 15 kHz SCS	7.41	45.67	40.12	48.68	43.13	22.02
A	16QAM	10.0 MHz 15 kHz SCS	7.58	45.54	38.34	48.55	41.35	23.80

Remarks

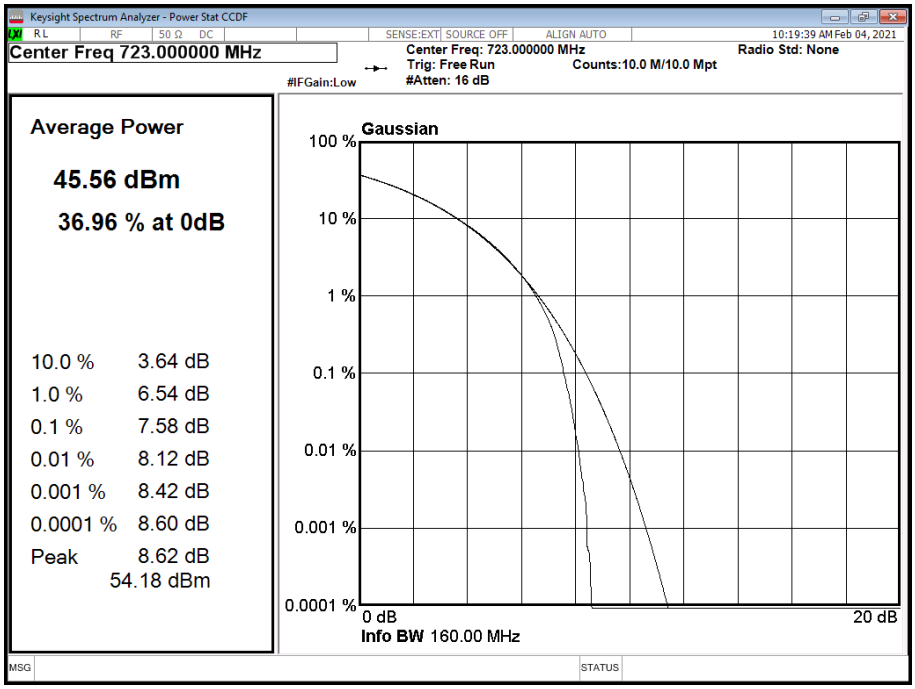
Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.

Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T





Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T



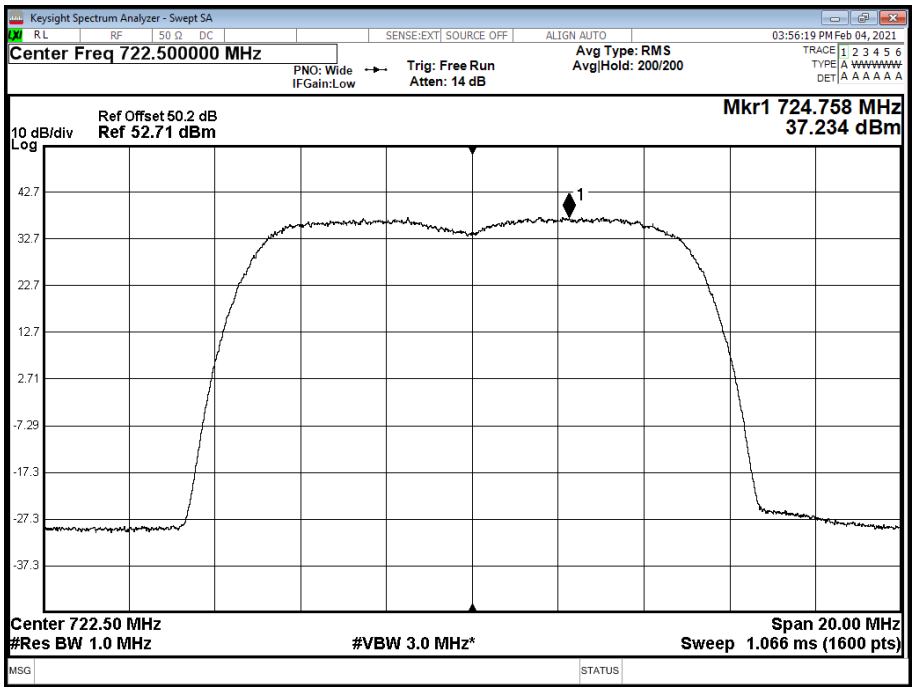
Configuration 6

Maximum Output Power 46 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	16QAM	5.0 MHz 15 kHz SCS	-	45.56	37.23	48.57	40.24	24.91

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.



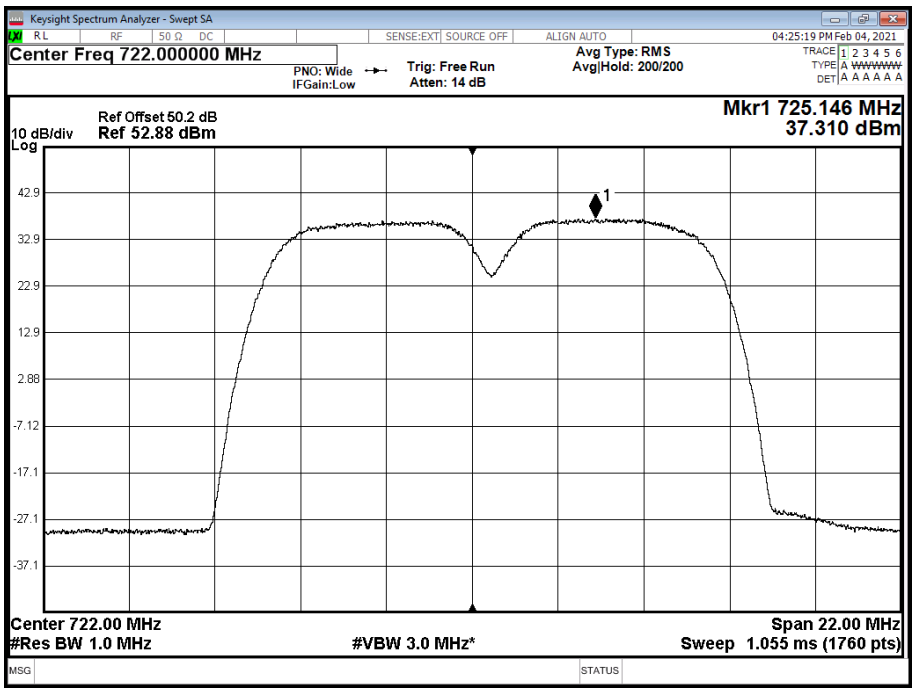
Configuration 7

Maximum Output Power 46 dBm

Antenna	LTE / NR Modulation	LTE / NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power					
			Channel Position M_{RFBW}					
			PAR (dB)	Average Power/PSD		Total Power/PSD Ports A + B		*G_{ANT}
				dBm	dBm/MHz	dBm	dBm/MHz	dBi
A	QPSK / 16QAM	5.0 MHz / 5.0 MHz 15 kHz SCS	-	45.59	37.31	48.60	40.32	24.83

Remarks

Total Power = Output Power (port A, worst case) + 10log (N_{ANT})
N_{ANT} = 2
* Maximum antenna system gain (including cable loss), G_{ANT} (dBi) 50 ohm, for the tested configurations, to comply with Maximum radiated output power in ISED SRSP-518.



Limit	
Maximum rated output power	≤ 3280 W/MHz or ≤+65.15 dBm/MHz
Peak to Average Ratio	13 dB

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

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

2.2.2 Date of Test and Modification State

03 and 04 February 2021 - 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	22.0 - 22.5°C
Relative Humidity	36.1 - 42.1%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, Clause 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 26dB measurement result was obtained.

Clause 4.3 Occupied bandwidth – power bandwidth (99 %) measurement procedure Subclause 5.4.4 of ANSI C63.26-2015 is applicable (wherein the recommendation is to use the 99 % power bandwidth function of a spectrum analyzer).

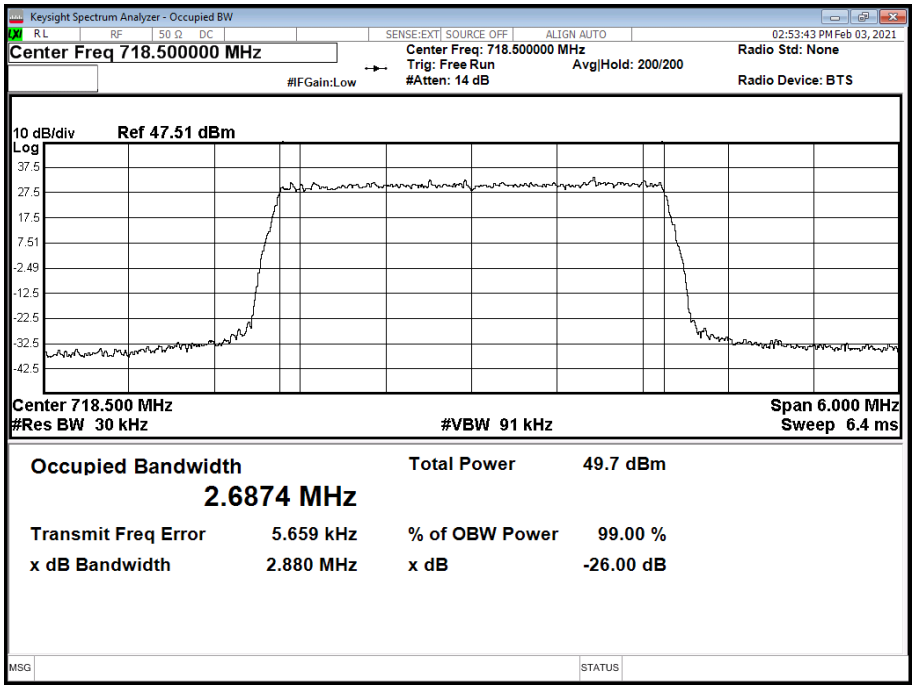
2.2.6 Test Results

Configuration 1

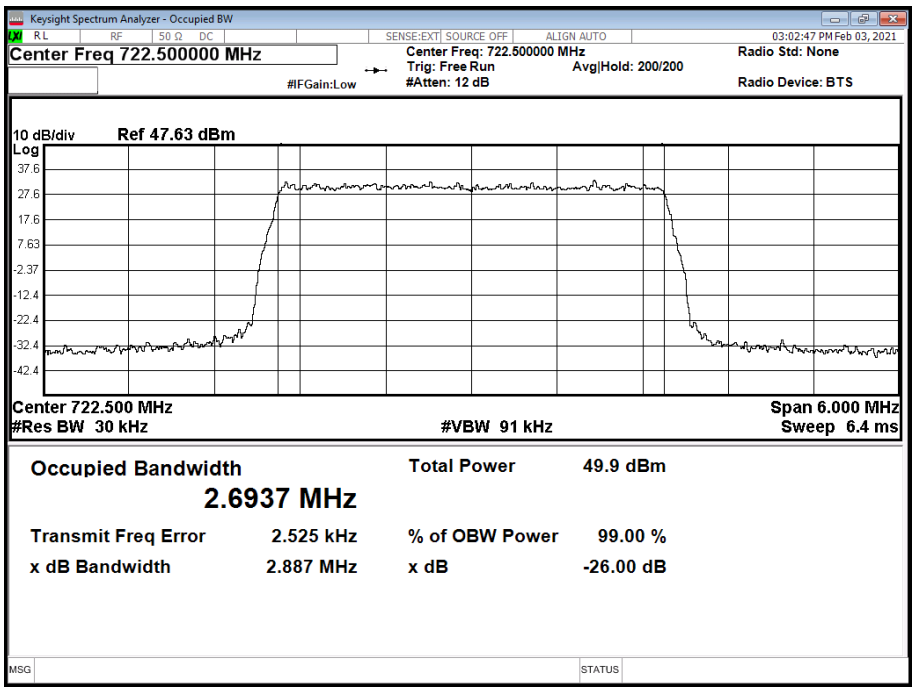
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	3.0 MHz	2,687.39	2,880.29	2,693.75	2,886.94	2,695.58	2,890.80
A	QPSK	5.0 MHz	4,477.14	4,806.47	4,485.57	4,791.87	4,480.41	4,799.26
A	QPSK	10.0 MHz	8,935.35	9,612.91	8,942.13	9,601.03	8,952.68	9,605.38

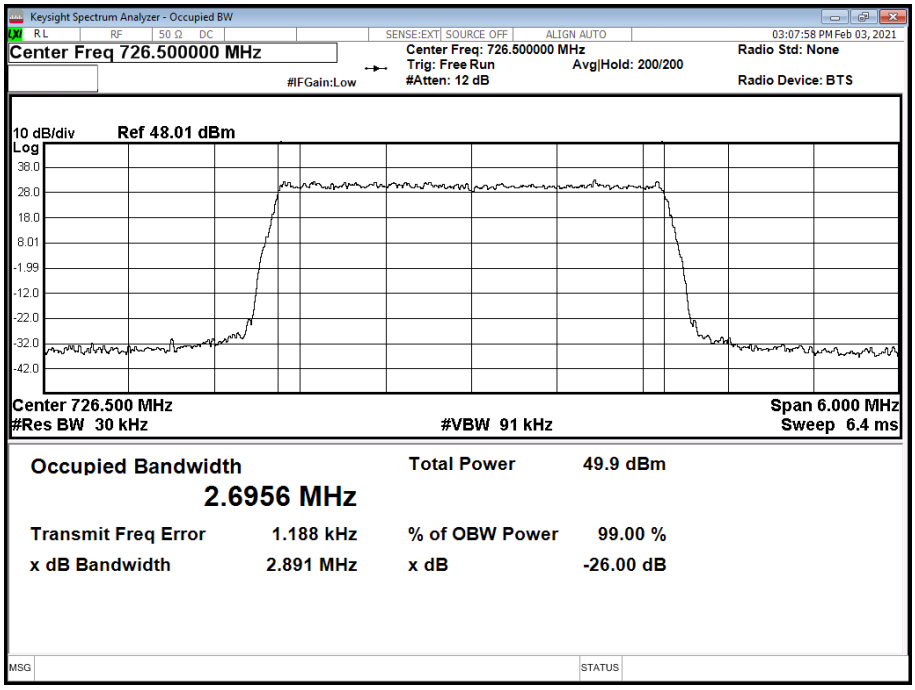
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



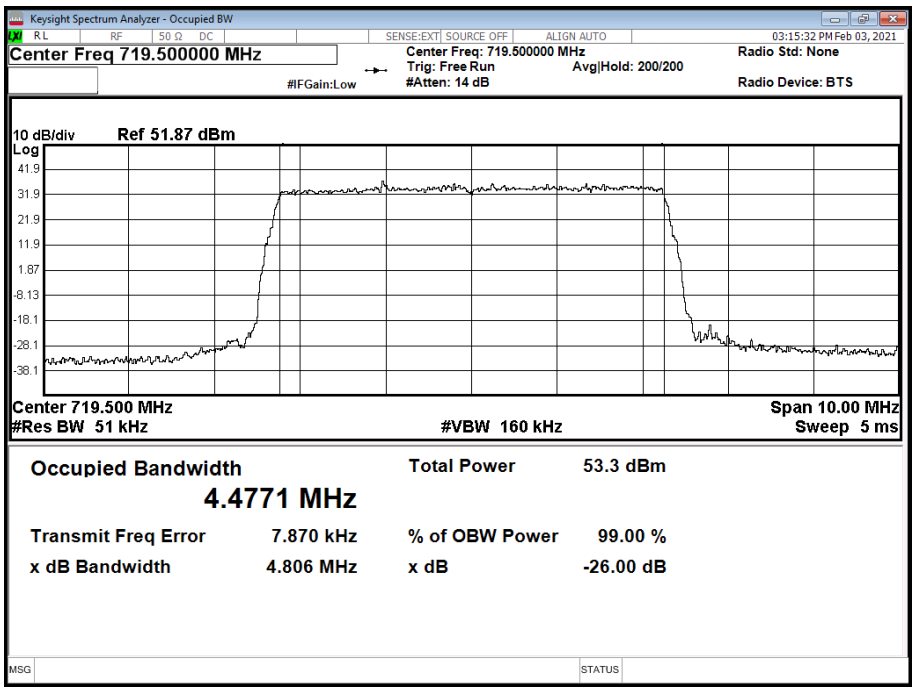
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



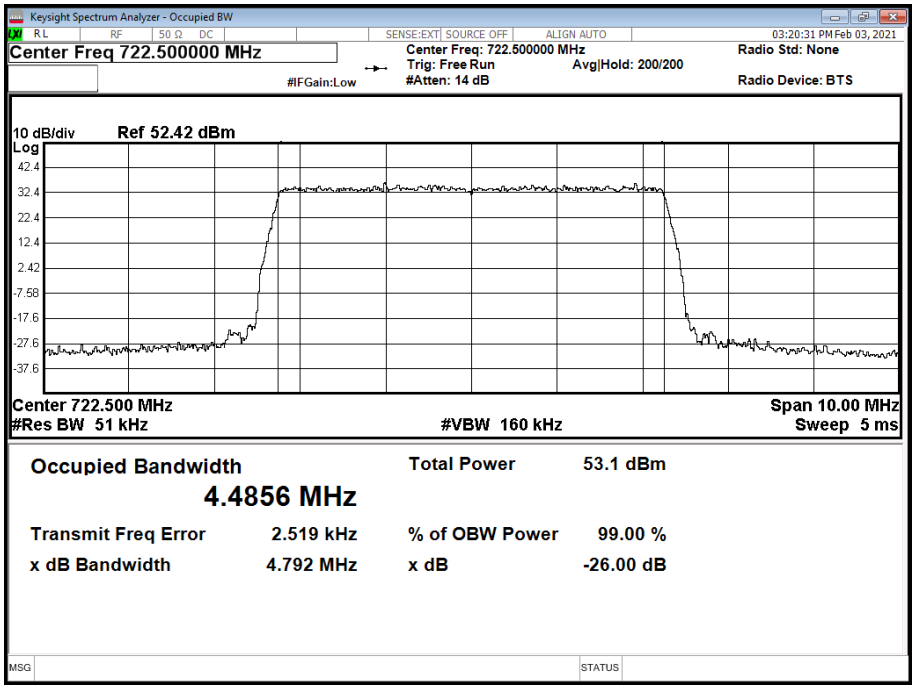
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



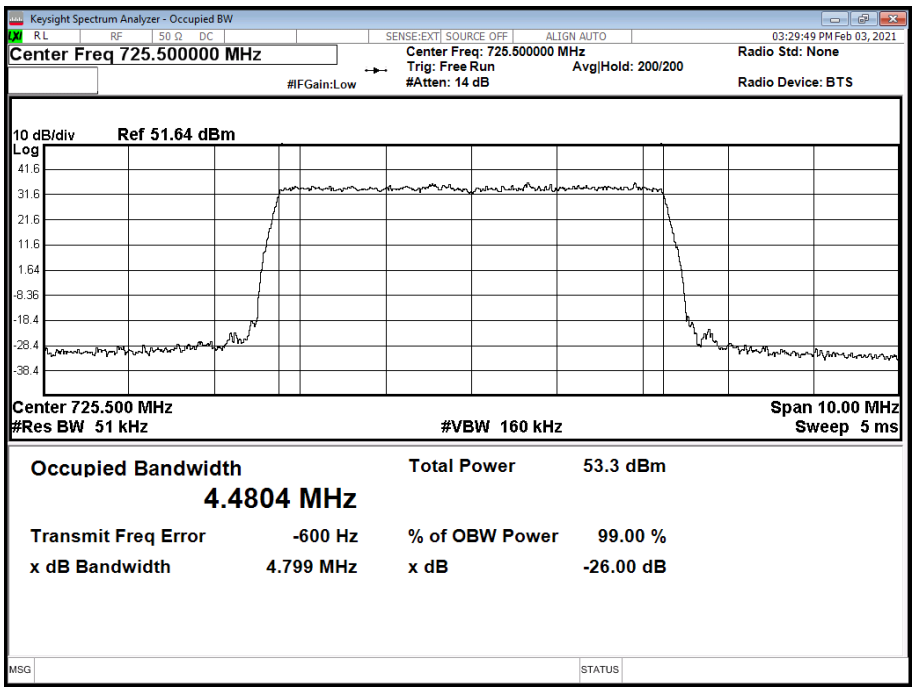
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



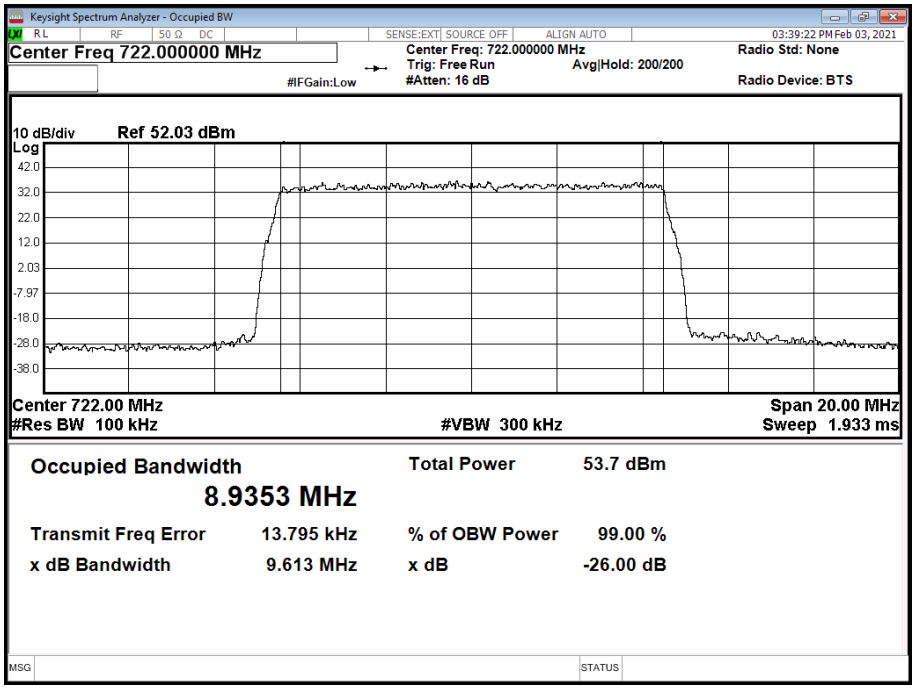
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



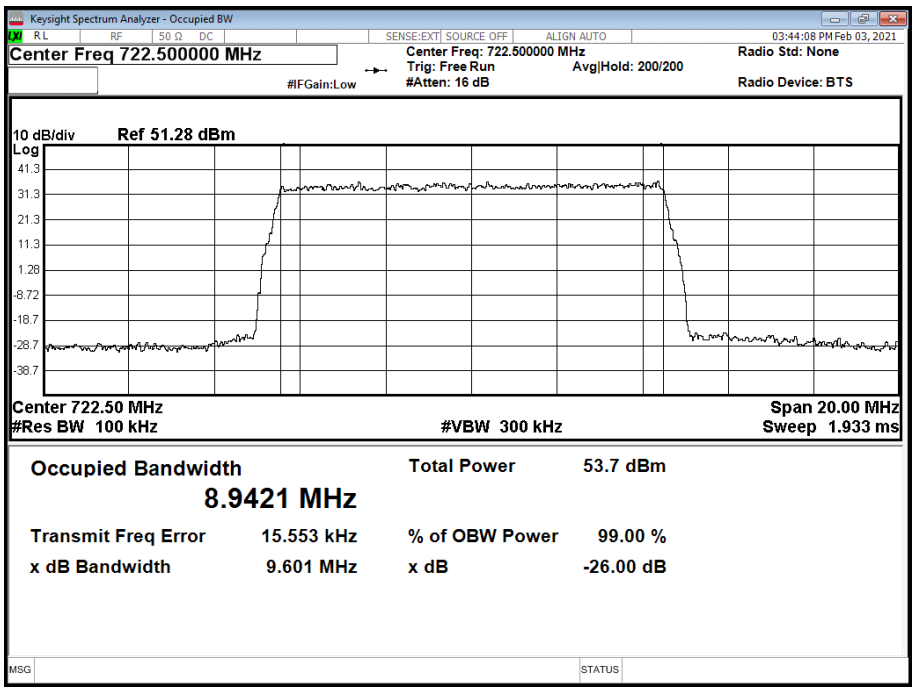
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



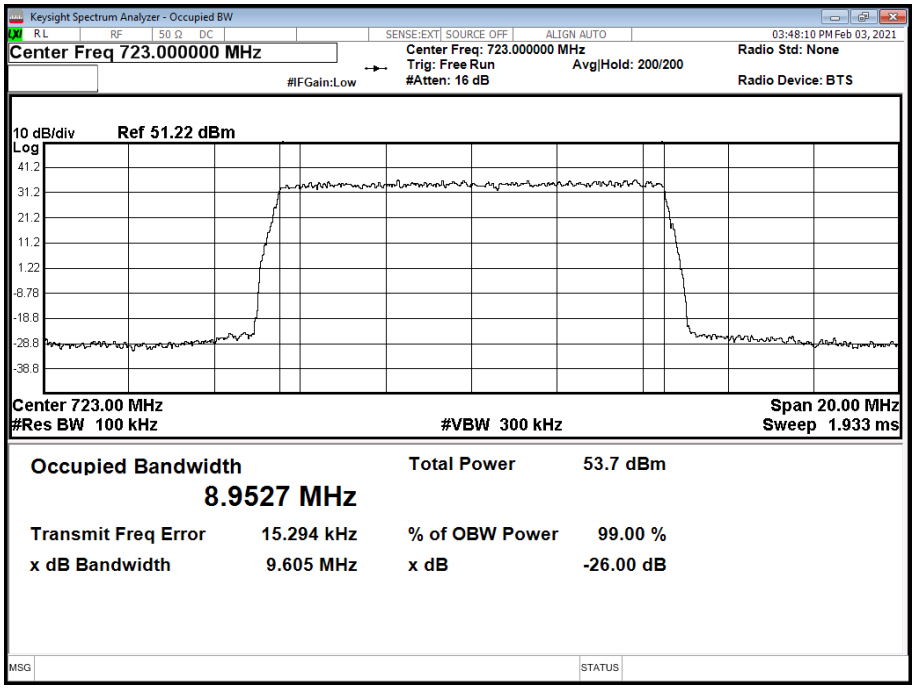
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



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

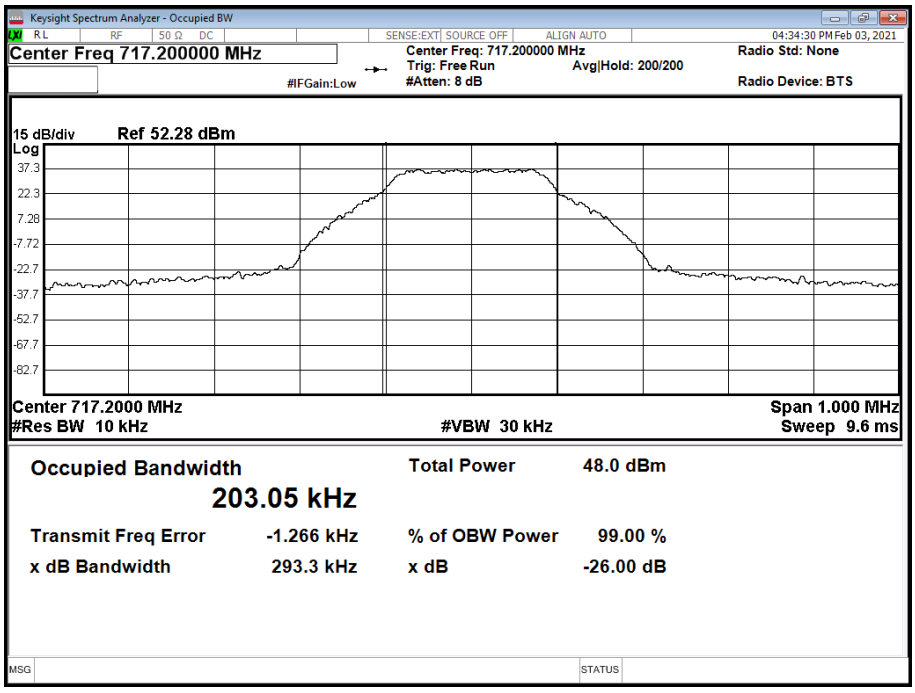


Configuration 2

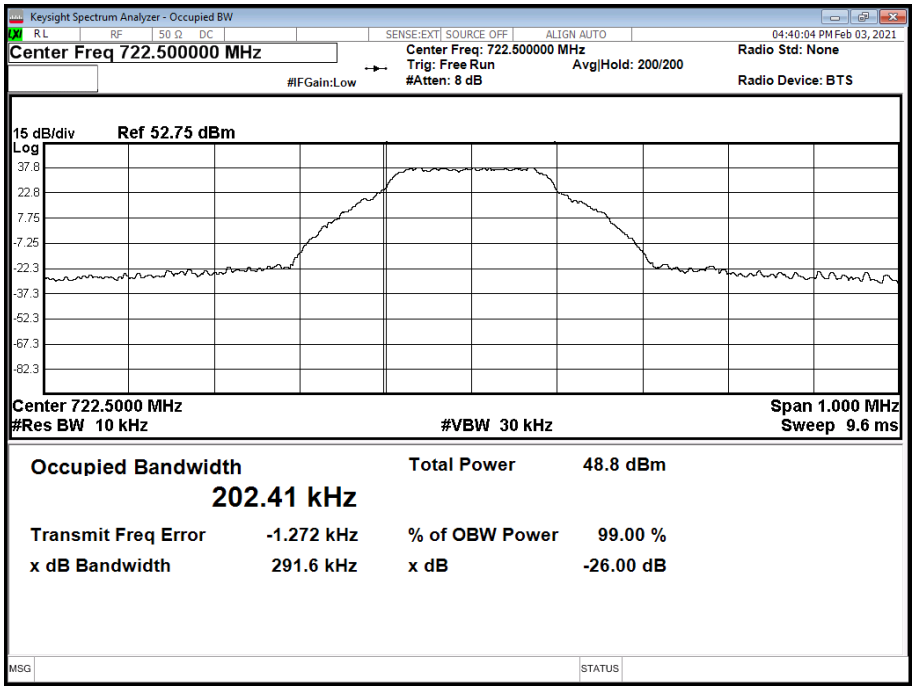
Maximum Output Power 43 dBm

Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	400 kHz	203.05	293.27	202.41	291.65	202.52	287.22

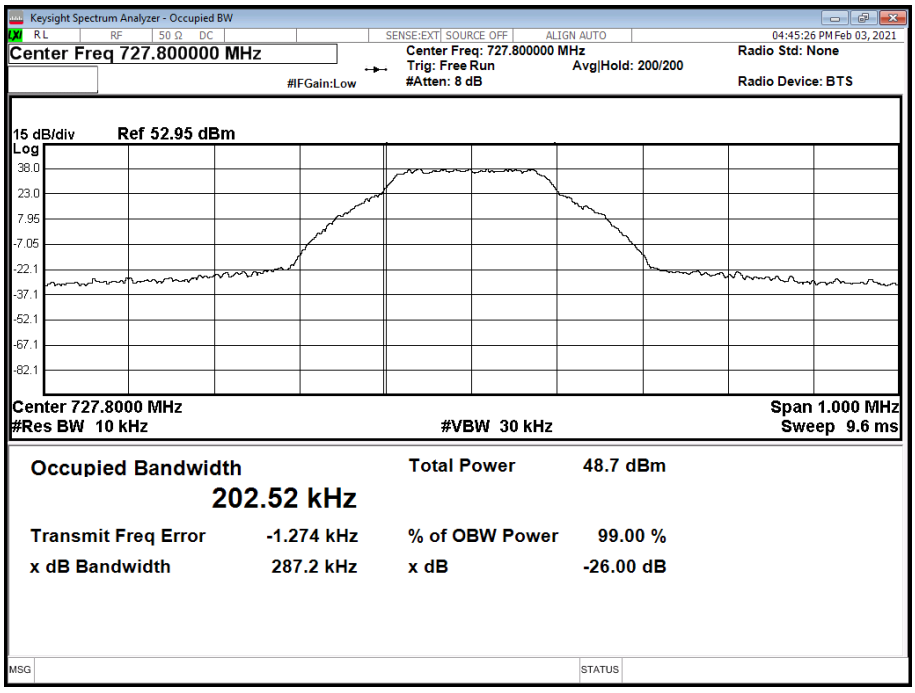
Antenna A - NB-IoT SA Modulation QPSK - NB-IoT SA Carrier Bandwidth 400 kHz - Channel Position B



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



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

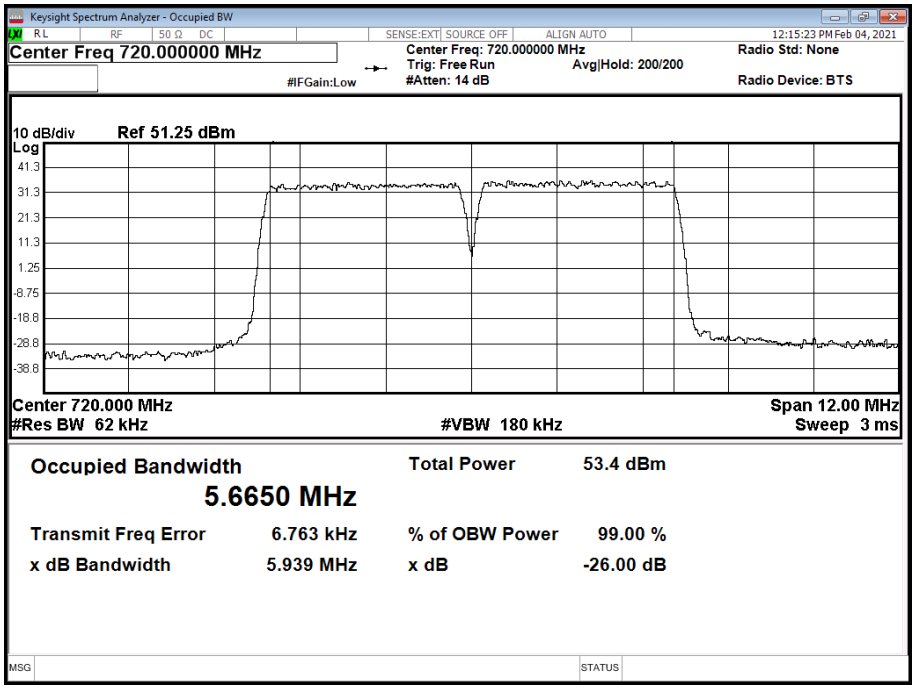


Configuration 3

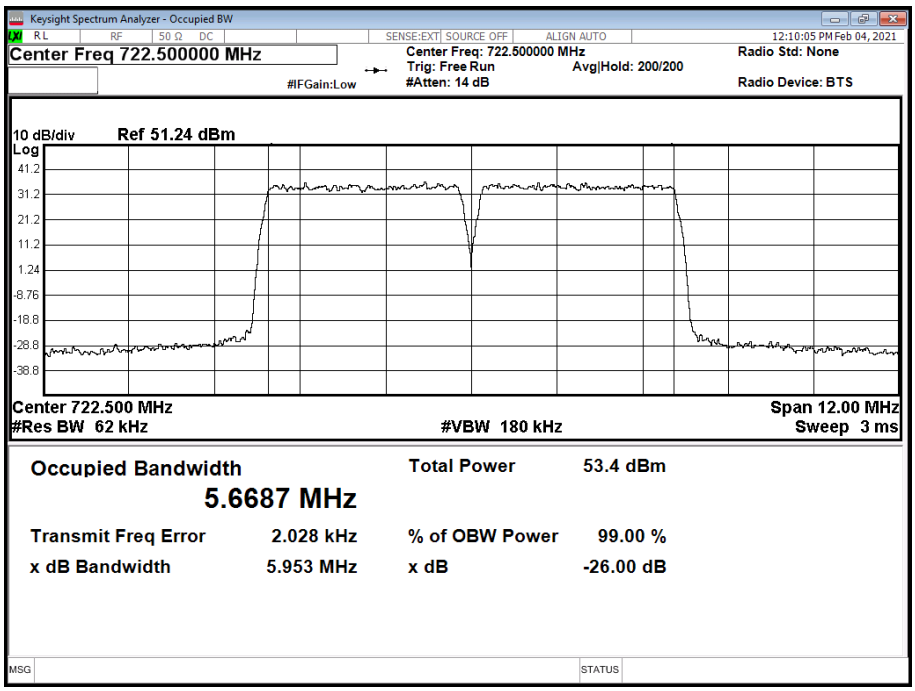
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	3.0 MHz	5,664.99	5,938.62	5,668.66	5,952.82	5,671.09	5,960.02
A	QPSK	5.0 MHz	9,423.45	9,872.35	9,427.91	9,804.39	9,432.95	9,867.33

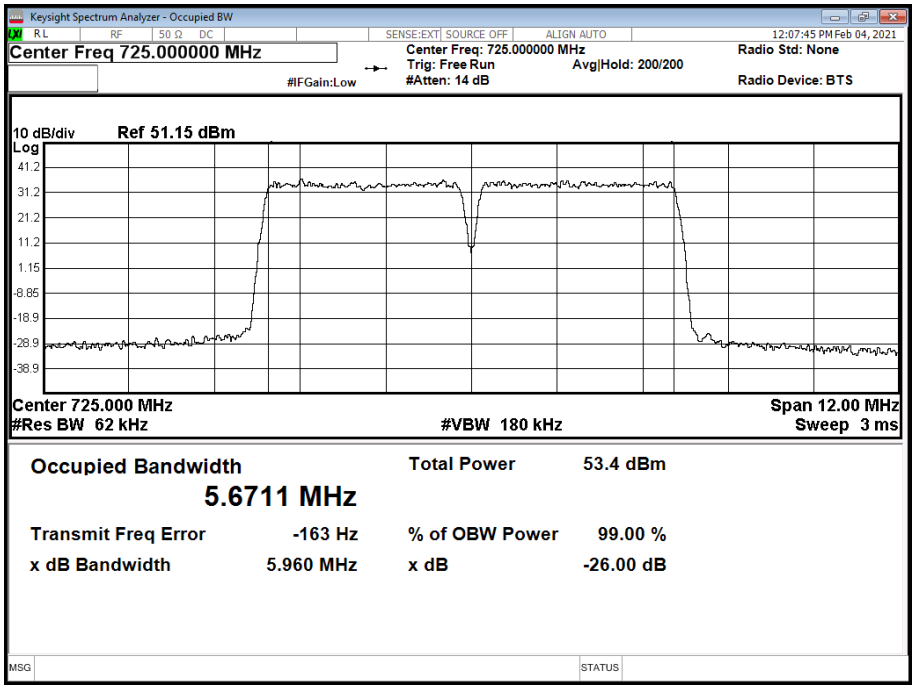
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



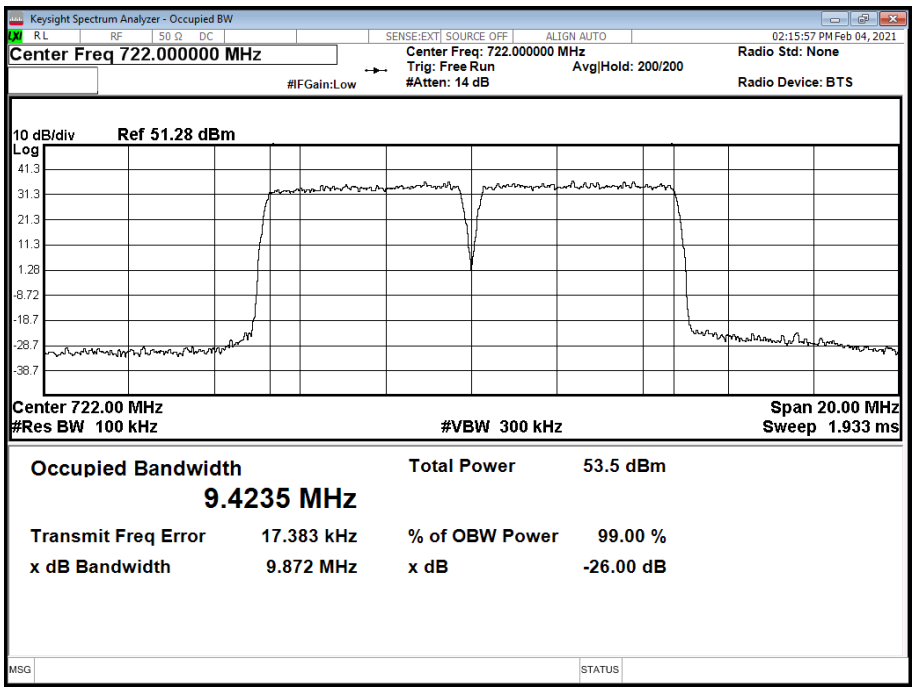
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



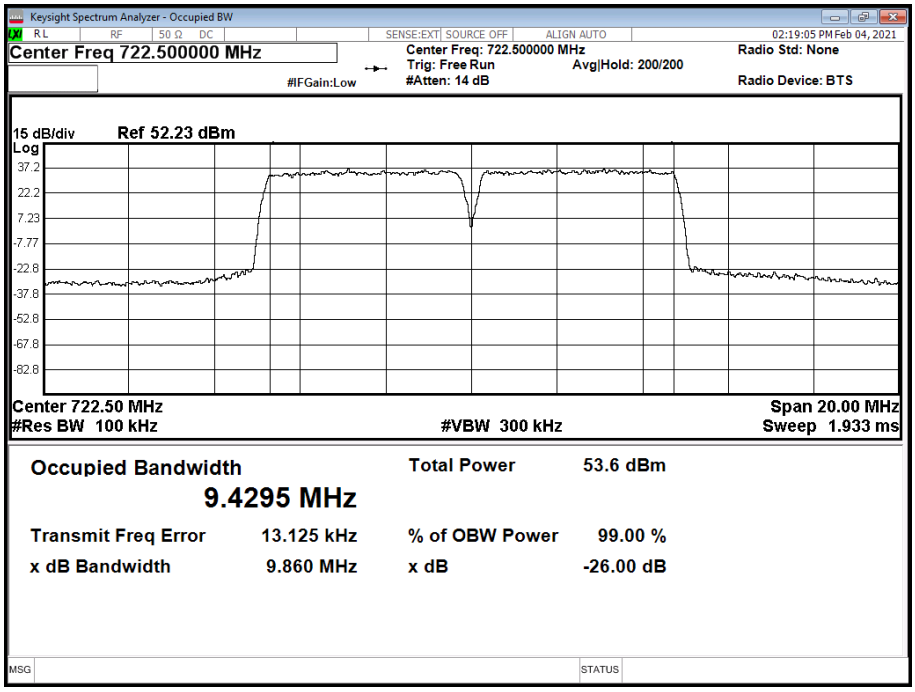
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



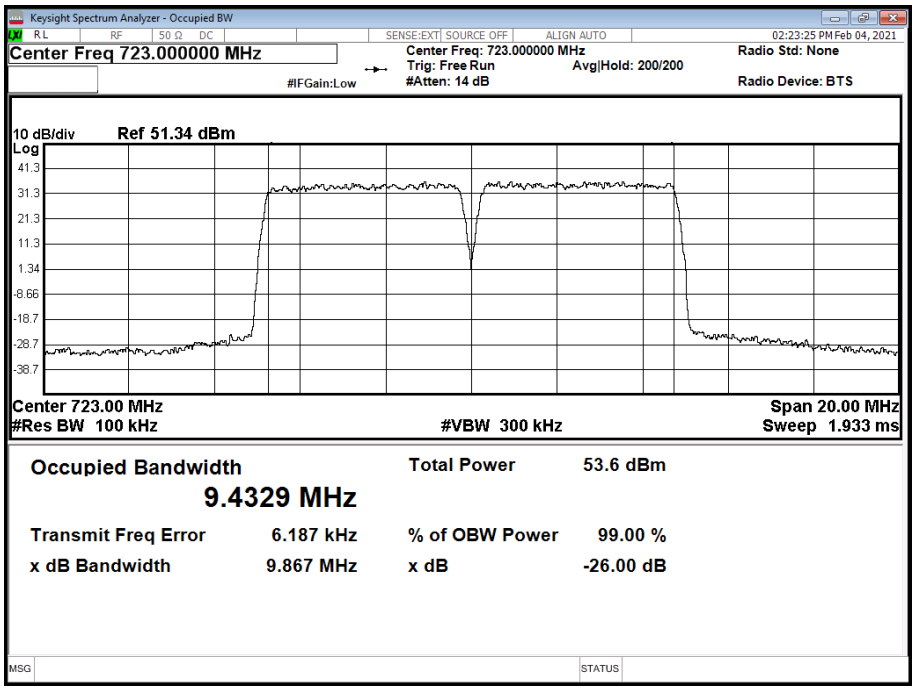
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



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



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T

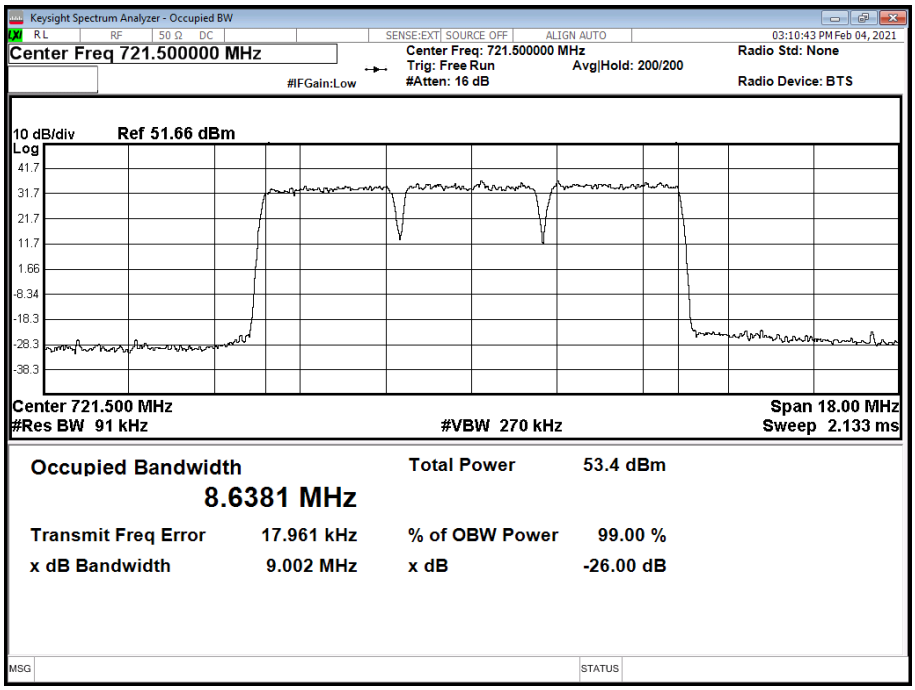


Configuration 4

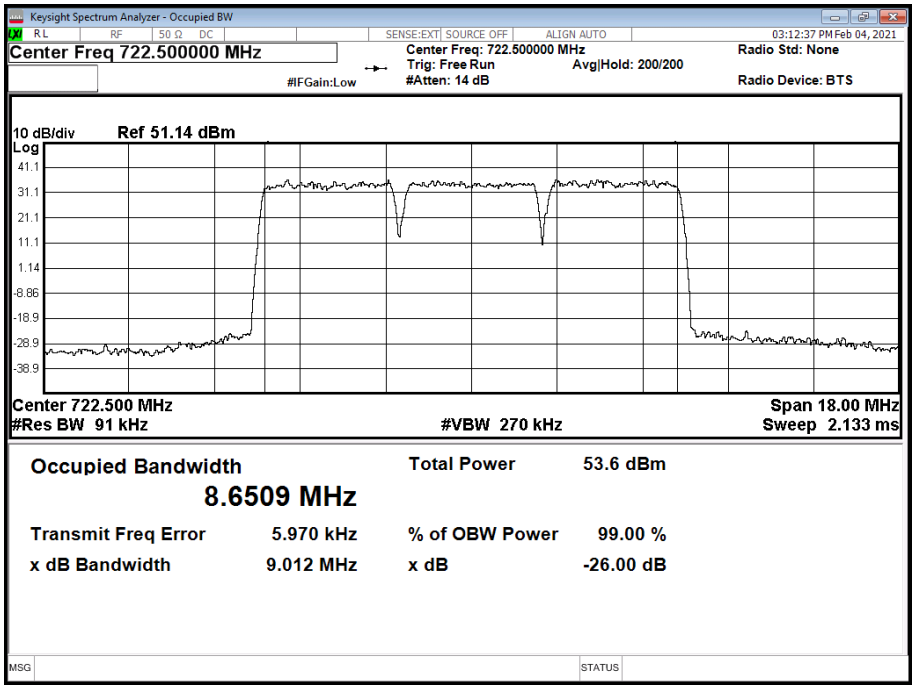
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	3.0 MHz	8,638.07	9,001.74	8,650.87	9,011.60	8,642.61	9,011.72

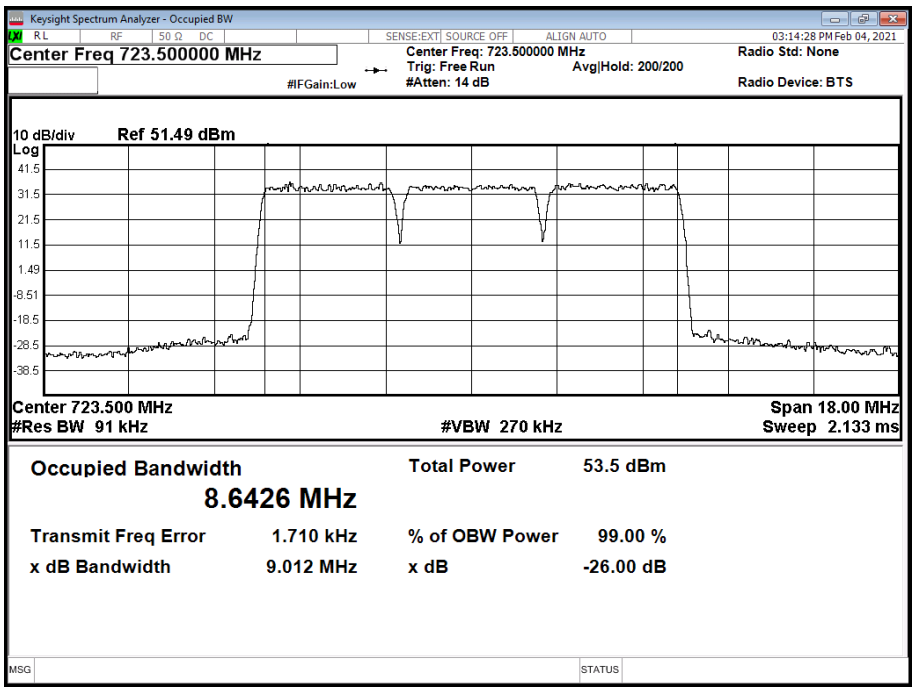
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T

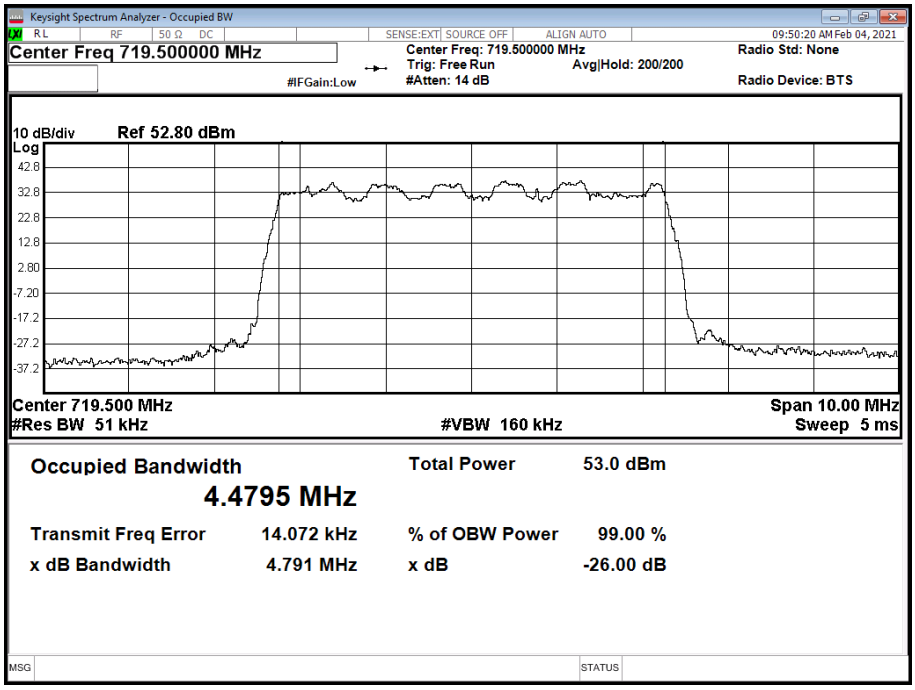


Configuration 5

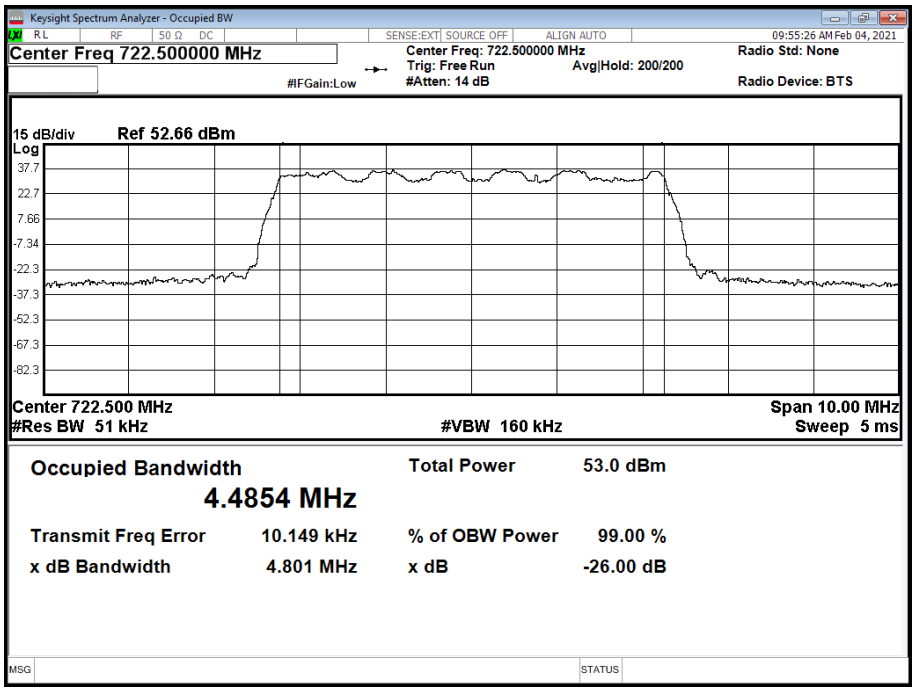
Maximum Output Power 46 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	16QAM	5.0 MHz 15 kHz SCS	4,479.50	4,790.59	4,485.38	4,800.60	4,478.19	4,804.38
A	16QAM	10.0 MHz 15 kHz SCS	9,219.67	9,723.36	9,230.32	9,733.76	9,219.10	9,699.70

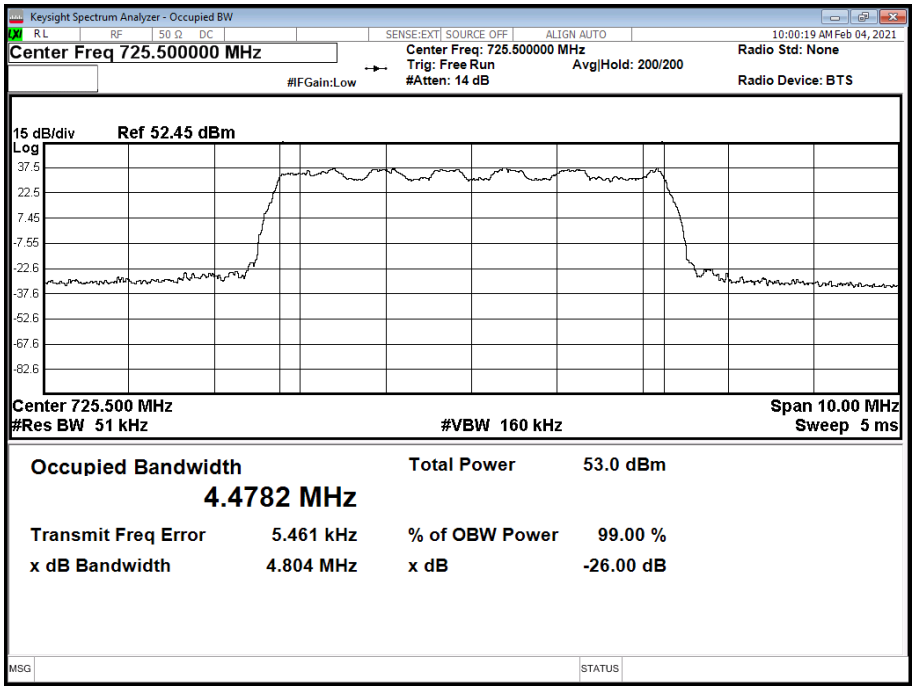
Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B



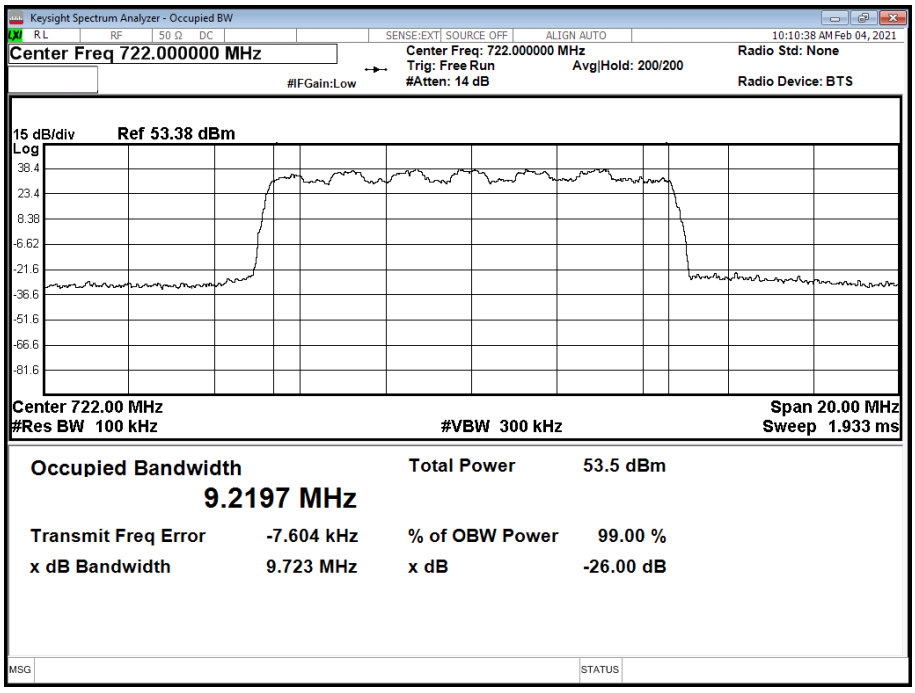
Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position M



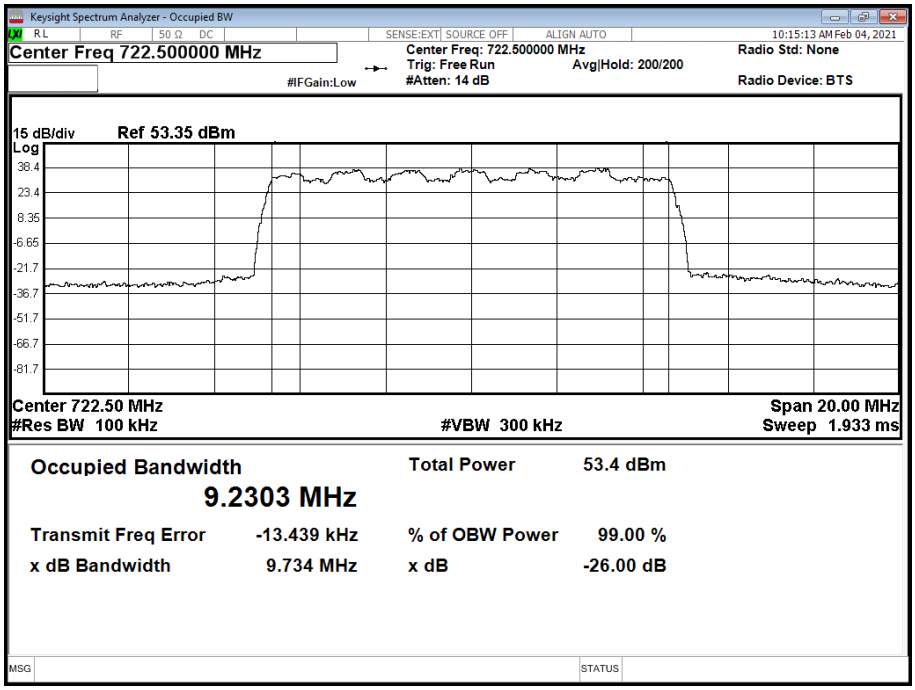
Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T



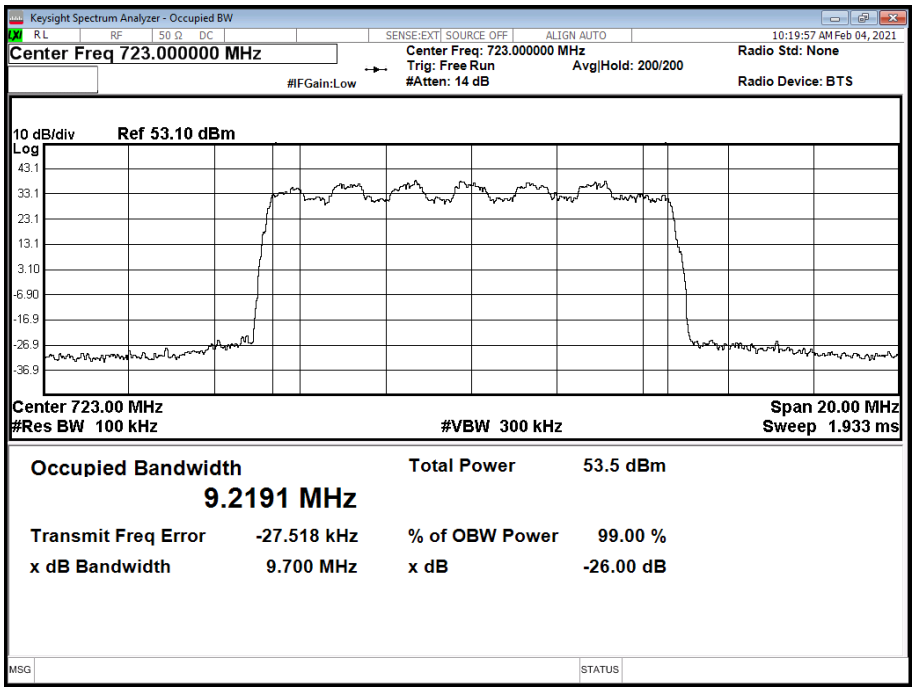
Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position B



Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position M



Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 10.0 MHz 15 kHz SCS - Channel Position T

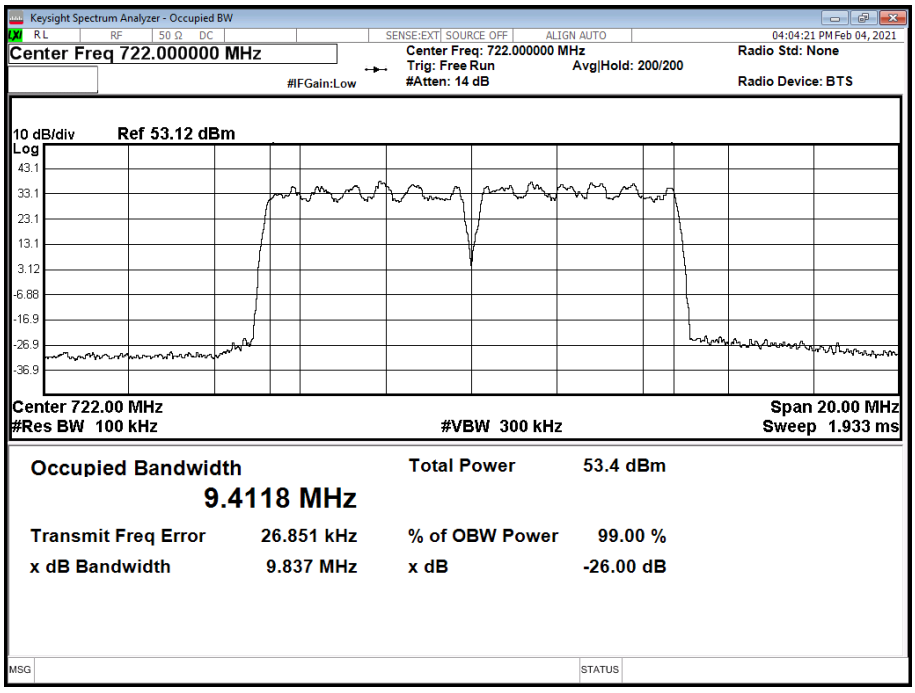


Configuration 6

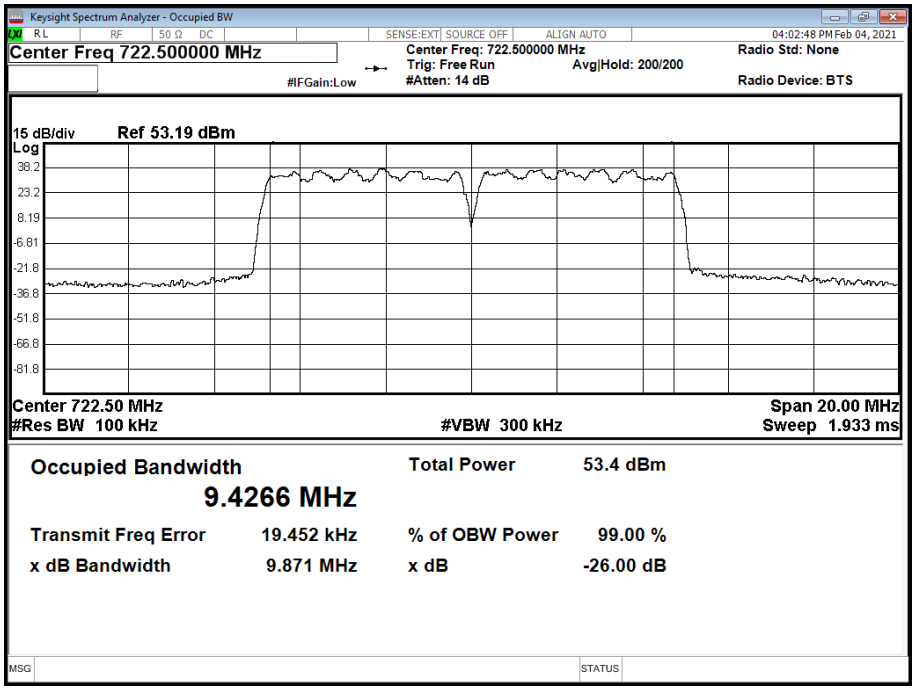
Maximum Output Power 46 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Result (MHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	16QAM	5.0 MHz 15 kHz SCS	9,411.79	9,836.88	9,426.58	9,870.99	9,427.81	9,833.42

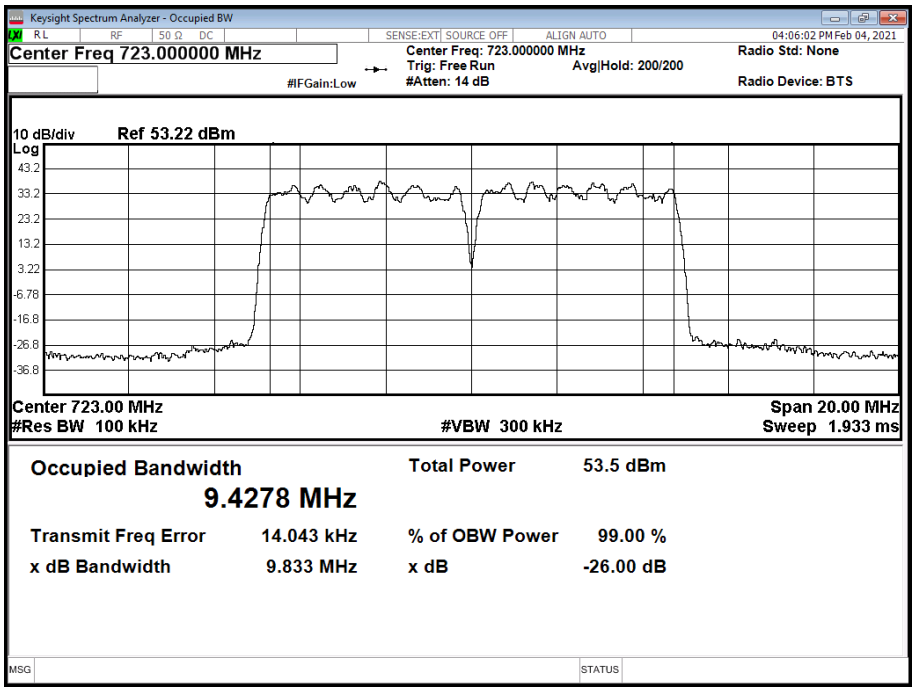
Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position B



Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position M



Antenna A - NR Modulation 16QAM - NR Carrier Bandwidth 5.0 MHz 15 kHz SCS - Channel Position T

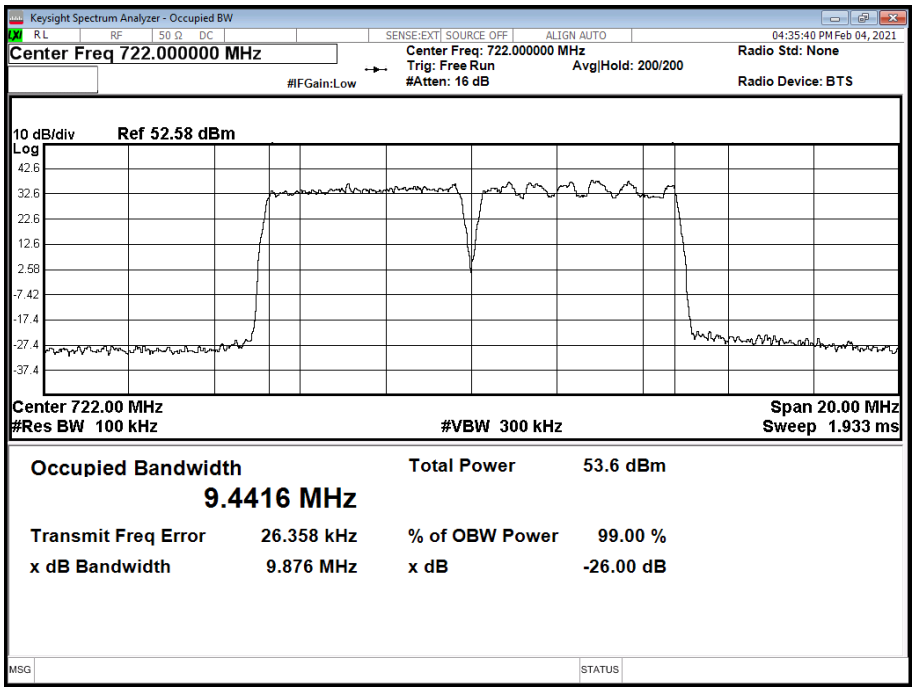


Configuration 7

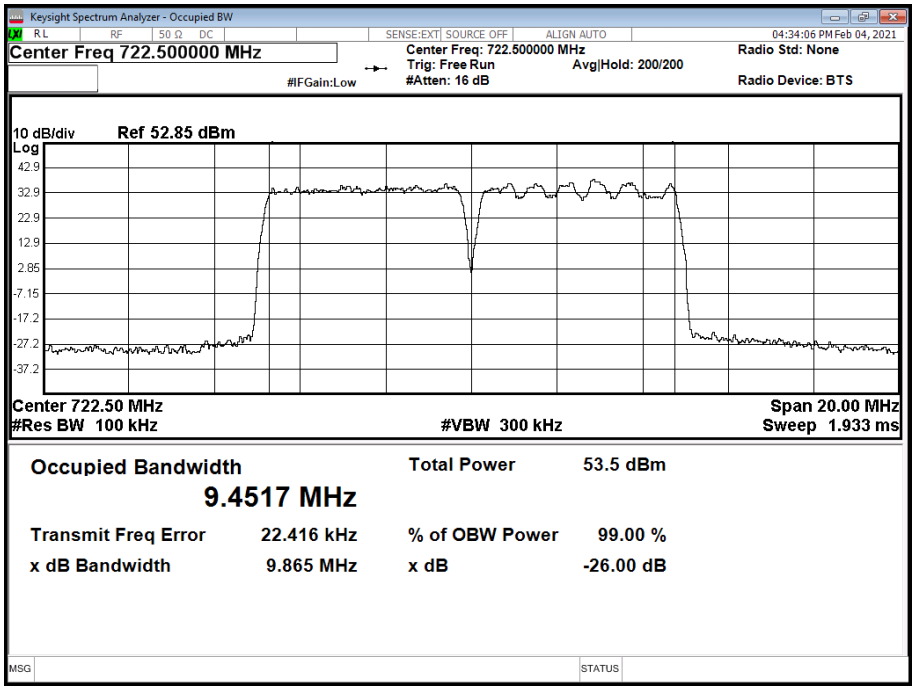
Maximum Output Power 46 dBm

Antenna	LTE / NR Modulation	LTE / NR Carrier Bandwidth	Result (MHz)					
			Channel Position B_{RFBW}		Channel Position M_{RFBW}		Channel Position T_{RFBW}	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK / 16QAM	5.0 MHz / 5.0 MHz 15 kHz SCS	9,441.61	9,875.97	9,451.75	9,865.14	9,442.27	9,876.42

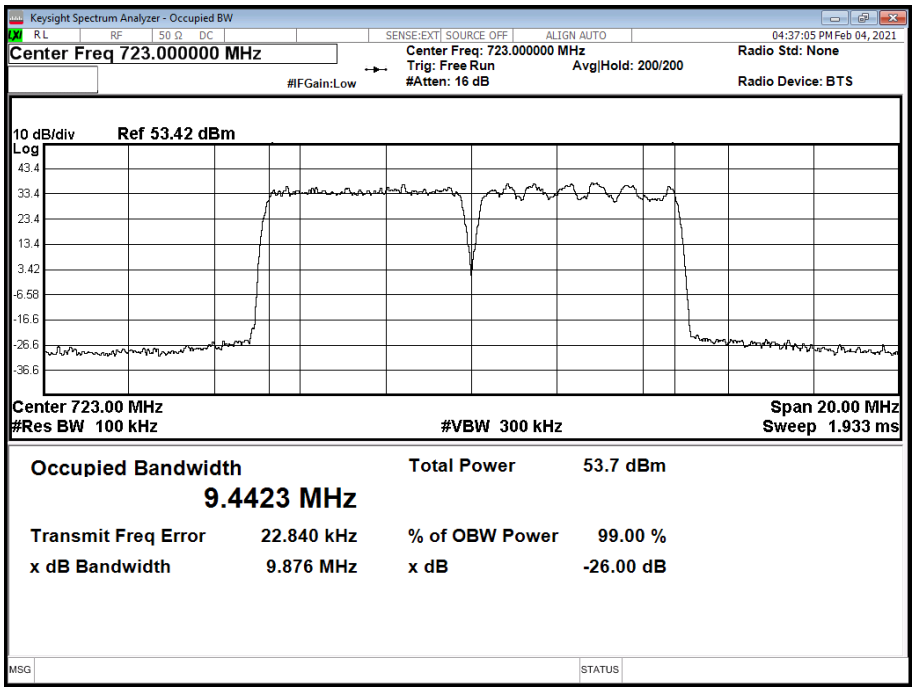
Antenna A - LTE / NR Modulation QPSK / 16QAM - LTE / NR Carrier Bandwidth 5.0 MHz / 5.0 MHz 15 kHz SCS - Channel Position BRFBW



Antenna A - LTE / NR Modulation QPSK / 16QAM - LTE / NR Carrier Bandwidth 5.0 MHz / 5.0 MHz 15 kHz SCS - Channel Position MRFBW



Antenna A - LTE / NR Modulation QPSK / 16QAM - LTE / NR Carrier Bandwidth 5.0 MHz / 5.0 MHz 15 kHz SCS - Channel Position TRFBW



2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (h)

2.3.2 Date of Test and Modification State

03 and 04 February 2021 - 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	22.0 – 22.5°C
Relative Humidity	36.1 - 42.1%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, Clause 6.0.

Band Edge measurements were used an Integration Bandwidth of at least 1% of the measured 26dB 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 * Log(N), where N is equal to the number of MIMO antenna ports.

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

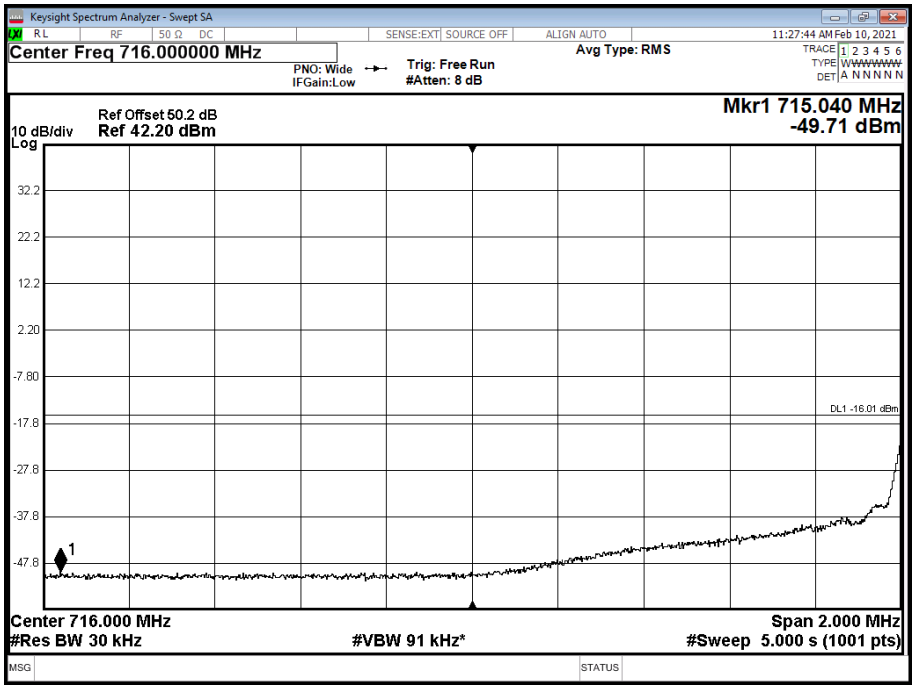
2.3.6 Test Results

Configuration 1

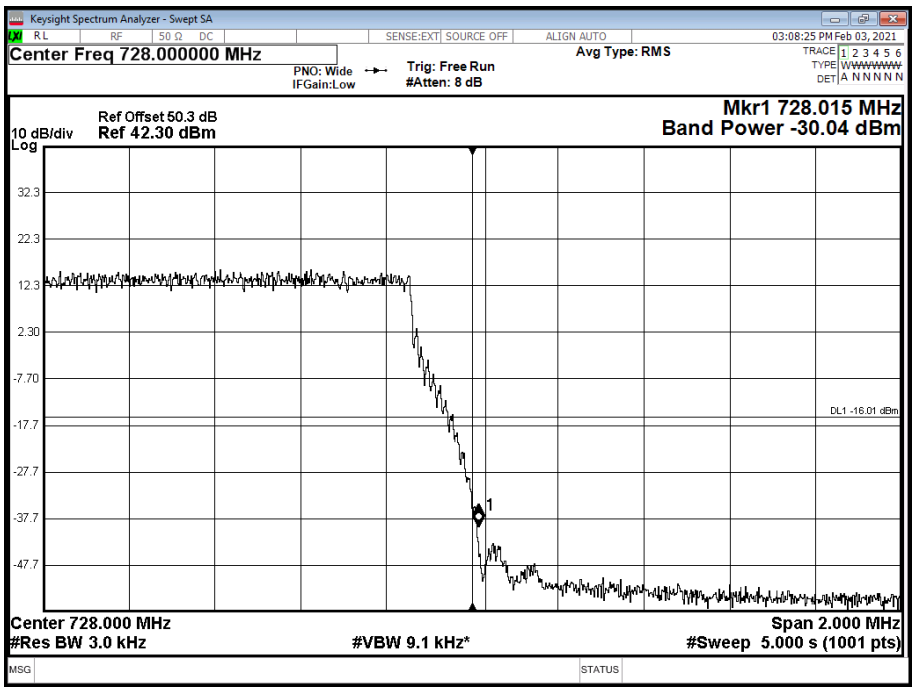
Maximum Output Power 46 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	3.0 MHz	718.5	726.5
A	QPSK	5.0 MHz	719.5	725.5
A	QPSK	10.0 MHz	722.0	723.0

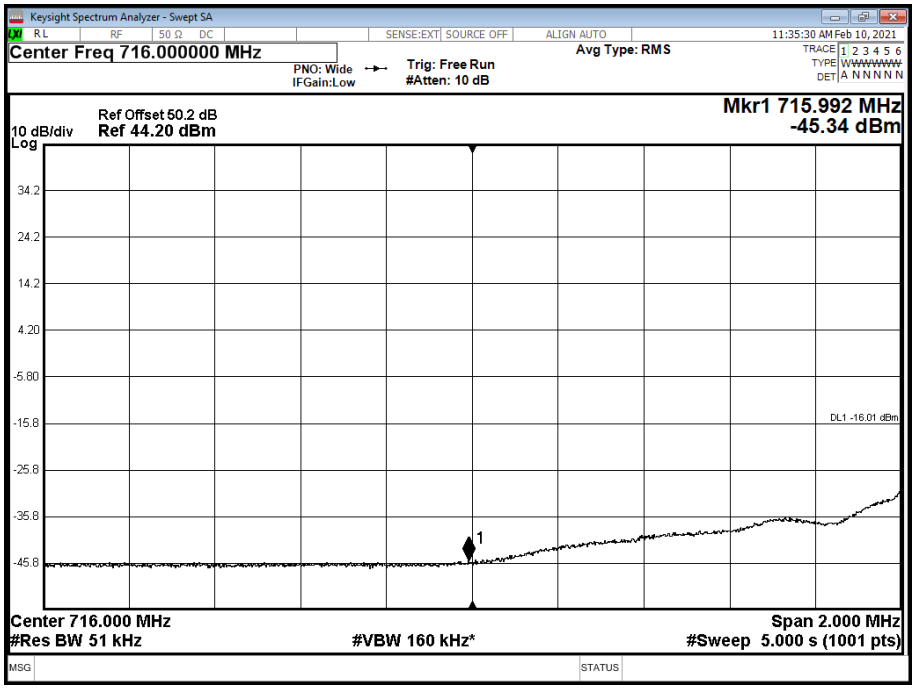
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T