



Product Service

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Report On

FCC Testing of the
Ericsson LTE and NB-IoT GB and NB-IoT SA KRC 161 699/1 and KRC
161 699/3 Radio 4478 B71 (700 MHz) Base Station in accordance with
FCC CFR 47 Part 2, FCC CFR 47 Part 27

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161699

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

09 August 2018

Document 75942505 Report 03 Issue 1

August 2018



Product Service

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Product Service

SECTION 1

REPORT INFORMATION



Product Service

1.1 REPORT DETAILS

Manufacturer	Ericsson
Address	Torshamnsgatan 23 Kista SE-16480 Stockholm Sweden
Product Name	Radio 4478 B71
Product Number	KRC 161 699/1 and KRC 161 699/3
Serial Number(s)	B441125597
Software Version	CXP9017316/7_ R71FA
Hardware Version	R1F
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2017 FCC CFR 47 Part 27: 2017
Start of Test	05 July 2018
Finish of Test	22 July 2018
Name of Engineer(s)	Neil Rousell Graeme Lawler
Related Document(s)	KDB 971168 D01 v02r02 KDB 662911 D01 v02r01 ANSI C63.26:2015

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 Parts 2 & 27. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

N Rousell

G Lawler



Product Service

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 is shown below.

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 27		
2.1	2.1046	27.50	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)	Transmitter Spurious Emissions	Pass
2.5	2.1053	27.53 (g)	Radiated Emissions	Pass



Product Service

1.3 CONFIGURATION DESCRIPTION

Configuration	RAT	No. Of carriers	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
				Bottom	Middle	Top
A	LTE+NB IoT GB	1	10MHz	622.0	-	647.0
A	LTE+NB IoT GB	1	15MHz	624.5	-	644.5
A	LTE+NB IoT GB	1	20MHz	627.0	-	642.0
B	LTE+NB IoT GB	1	35MHz	-	624.5+642.0	-
C	NB IoT SA	1	0.18 MHz	617.2	634.5	651.8

1.4 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	Radio 4478 B71
PART NUMBER	KRC 161 699/1 and KRC 161 699/3*
SERIAL NUMBER	B441125579
HARDWARE VERSION	R1F
SOFTWARE VERSION	CXP9017316%7_R71FA
TRANSMITTER OPERATING RANGE	617 to 652 MHz
MODULATIONS	QPSK, 16QAM, 64QAM, 256QAM
INTERMEDIATE FREQUENCIES	-
CPRI Speed	10.1 Gbit/s
ITU DESIGNATION OF EMISSION	10 MHz BW channel ¹ : 9M41F9W
	15 MHz BW channel ¹ : 14M1F9W
	20 MHz BW channel ¹ : 18M5F9W
	35 MHz BW channel ¹ : 33M8F9W
	NB-IoT SA 200 kHz BW channel: 210KW7D
OUTPUT POWER (RMS) (W or dBm)	4 ports, 40W ¹ per port
	NB-IoT SA 1x20W (per port)
FCC ID	TA8AKRC161699
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Base station radio

¹ Including 2 NB-IoT GB carriers.

Note*: KRC 161 699/1 and KRC 161 699/3 are identical, whereas KRC 161 699/1 is the test unit.

Signature


Linda Grell

Date

2018-08-06

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

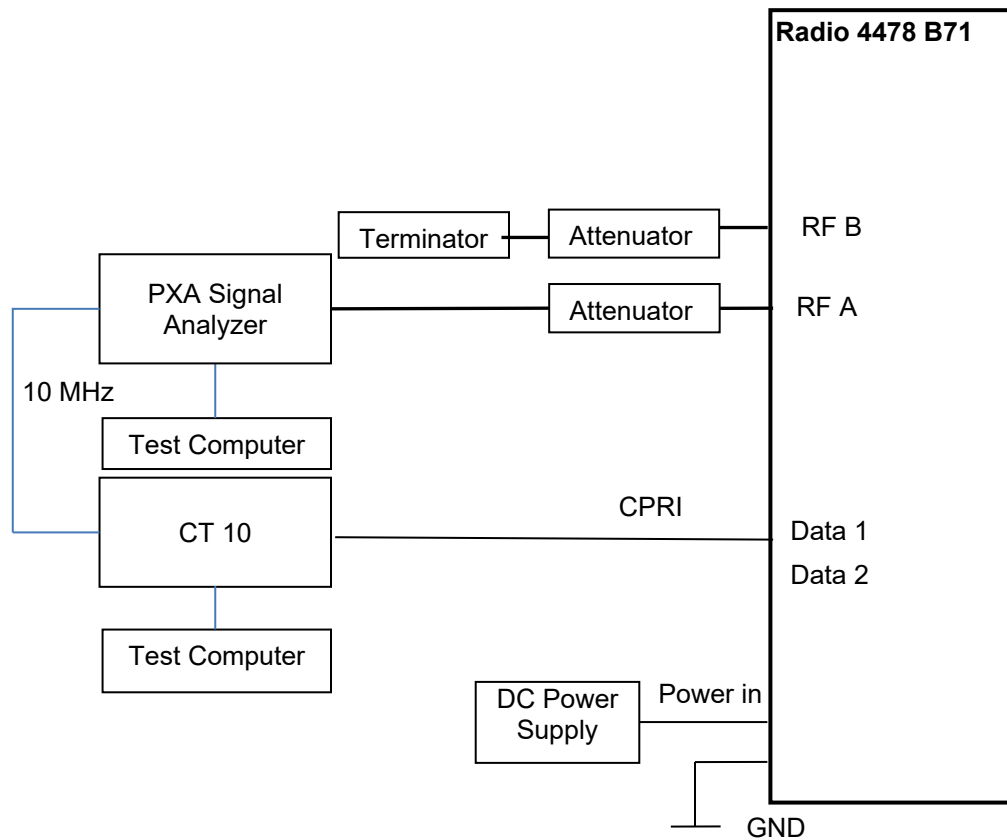
The Equipment Under Test (EUT) KRC 161 699/1 and KRC 161 699/3 is an Ericsson AB Radio Unit working in the public mobile service 700MHz band which provides communication connections to 700MHz network. The KRC 161 699/1 and KRC 161 699/3 operates from a -48V DC supply.

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



Equipment Under Test

1.6 TEST SETUP





Product Service

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.

1.10 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV SÜD Product Service 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	Neil Rousell
Occupied Bandwidth	Neil Rousell
Band Edge	Neil Rousell
Transmitter Spurious Emissions	Neil Rousell
Transmitter Spurious Radiated Emissions	Graeme Lawler



Product Service

SECTION 2

TEST DETAILS



Product Service

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

2.1.2 Date of Test and Modification State

05 July 2018 - Modification State 0

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

Ambient Temperature 21.2°C
Relative Humidity 43.3%

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.

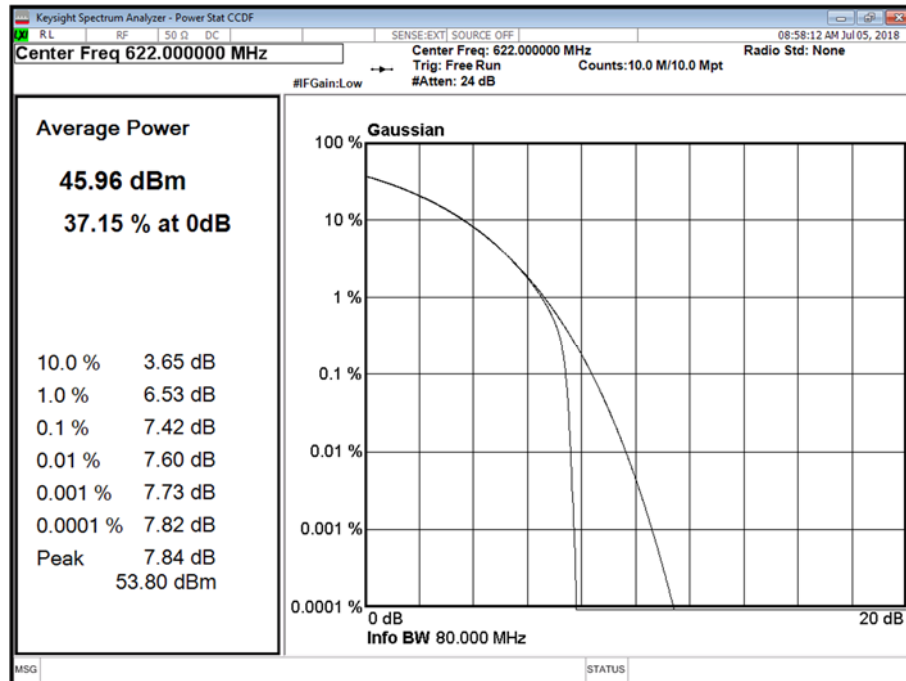
2.1.6 Test Results

Configuration A

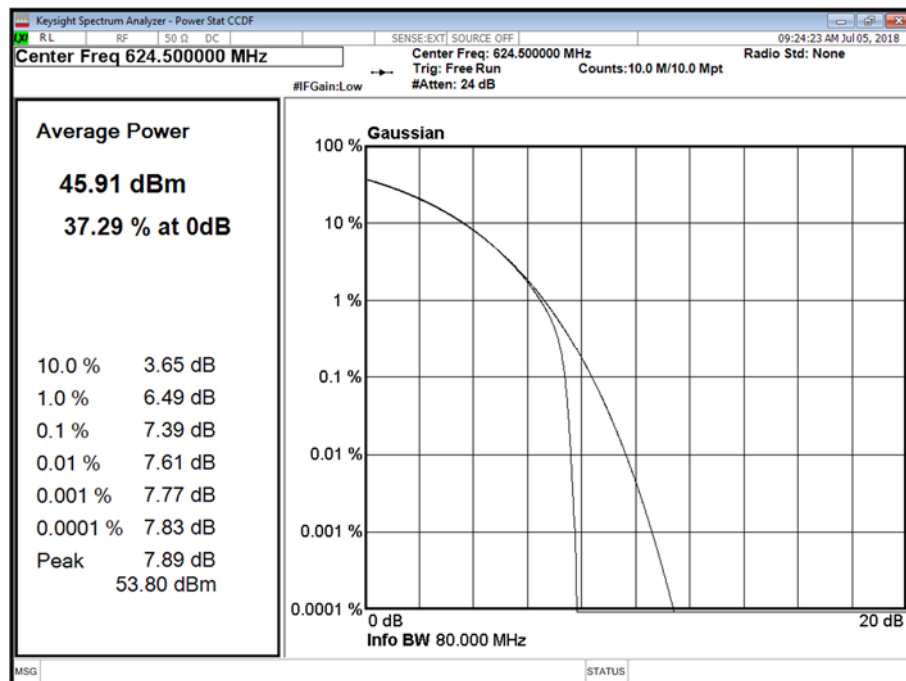
Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B_{RFBW}		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	E:64QAM / N:QPSK	E:10.0 MHz / N:180 kHz	7.42	45.95	-
A	E:64QAM / N:QPSK	E:15.0 MHz / N:180 kHz	7.39	45.91	-
A	E:64QAM / N:QPSK	E:20.0 MHz / N:180 kHz	7.38	45.87	-

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW



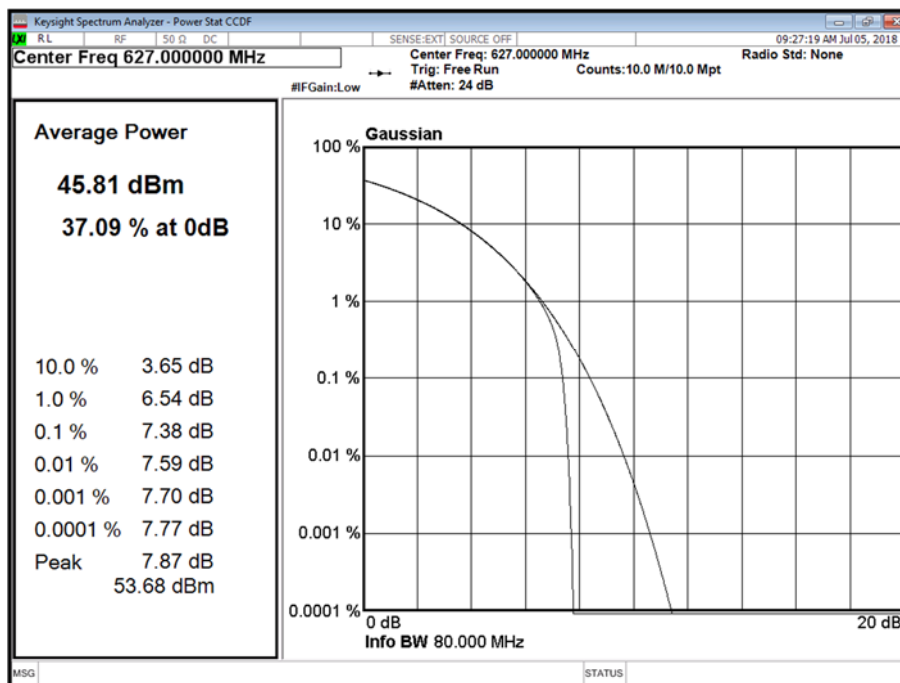
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW





Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW



Configuration A

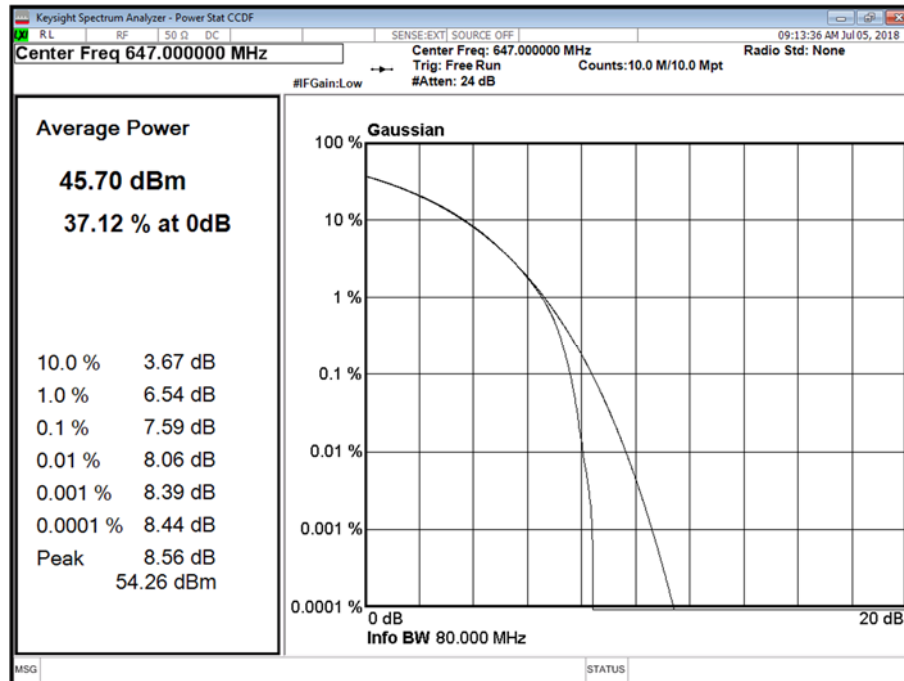
Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T_{RFBW}		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	E:64QAM / N:QPSK	E:10.0 MHz / N:180 kHz	7.59	45.77	-
A	E:64QAM / N:QPSK	E:15.0 MHz / N:180 kHz	7.61	45.73	-
A	E:64QAM / N:QPSK	E:20.0 MHz / N:180 kHz	7.69	45.71	-

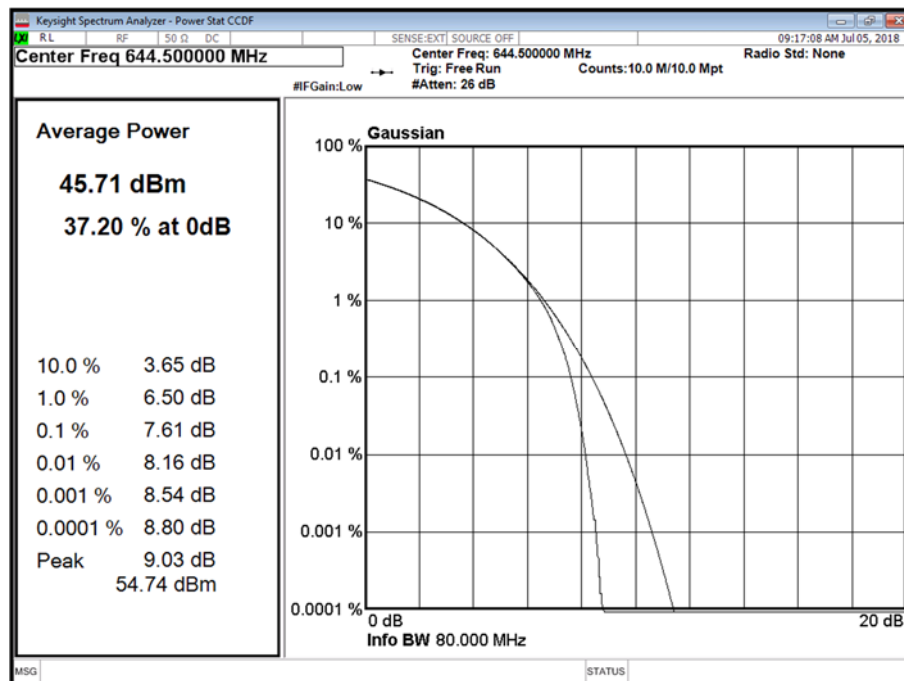


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW



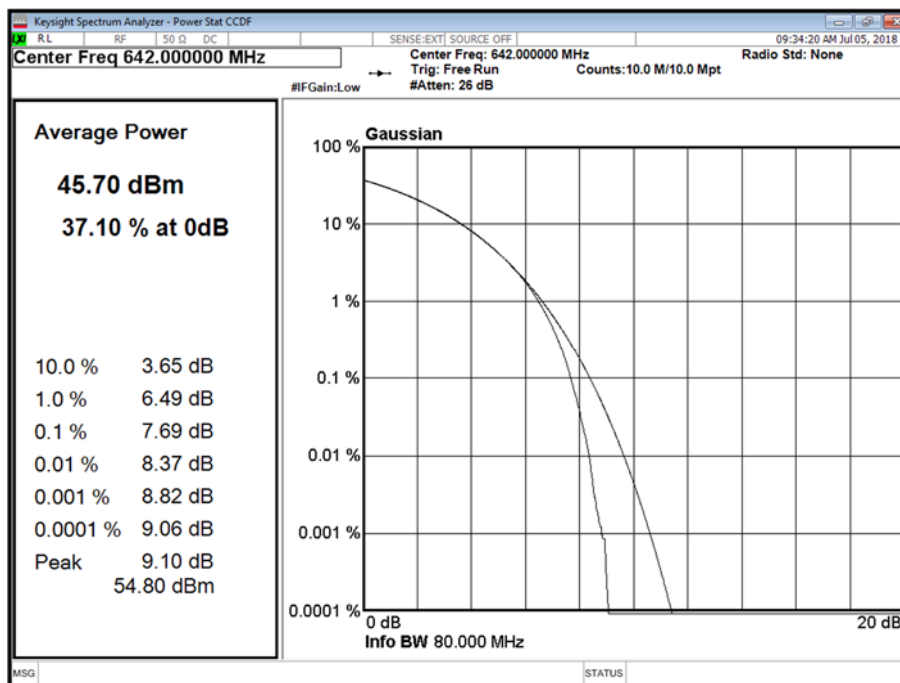
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW





Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW



Configuration B

Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position M _{TRFBW}		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	E:64QAM / N:QPSK	E:35.0 MHz / N:180 kHz	-	45.56	-

Remarks

CA - 20MHz + 15MHz = 35MHz

Configuration C

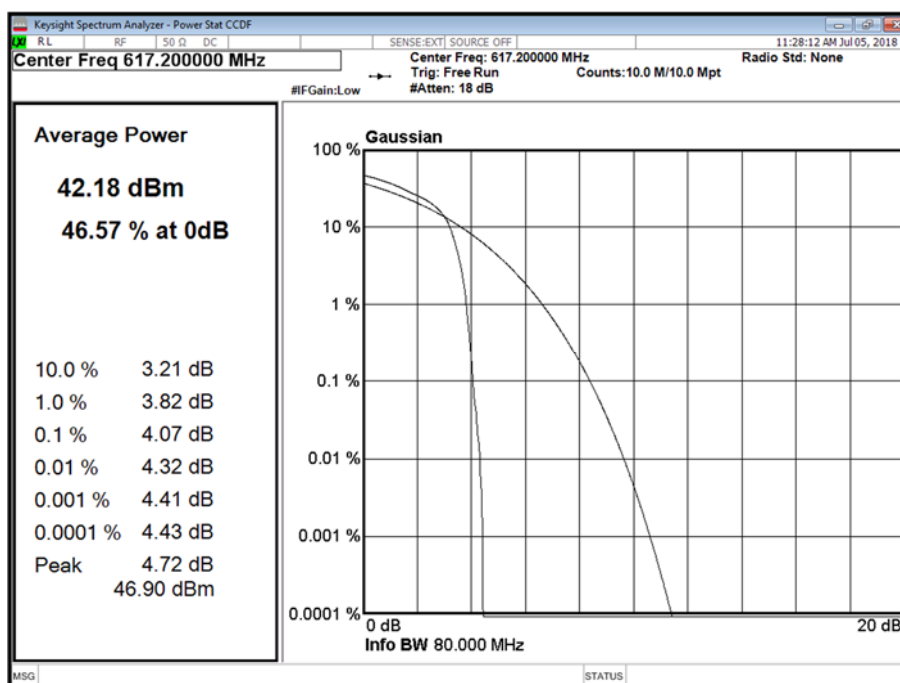
Maximum Output Power 43 dBm

Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	N:QPSK	N:180 kHz	4.07	42.16	-



Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B



Configuration C

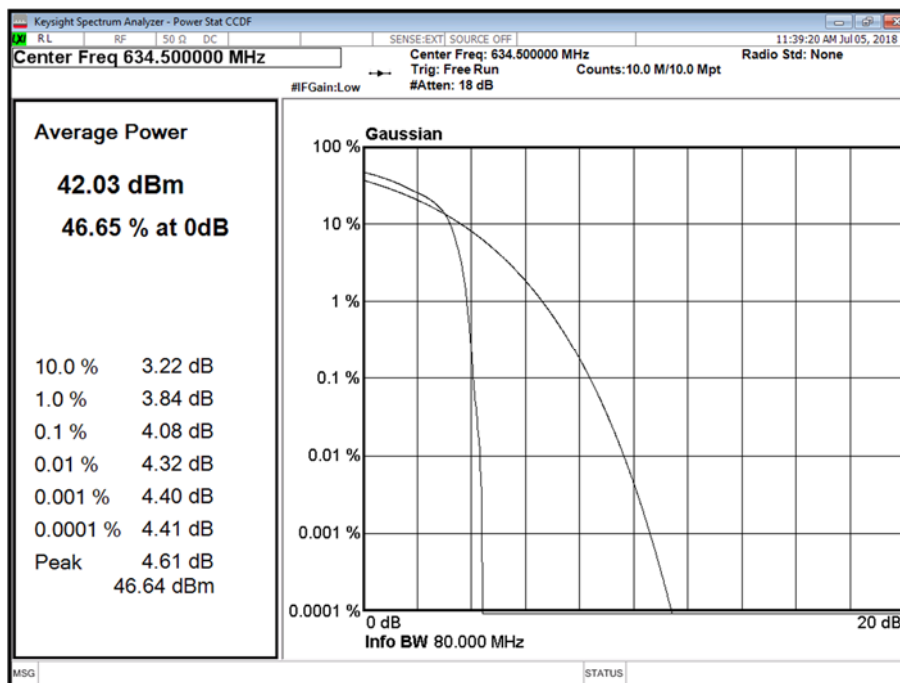
Maximum Output Power 43 dBm

Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position M		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	N:QPSK	N:180 kHz	4.08	42.06	-



Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M



Configuration C

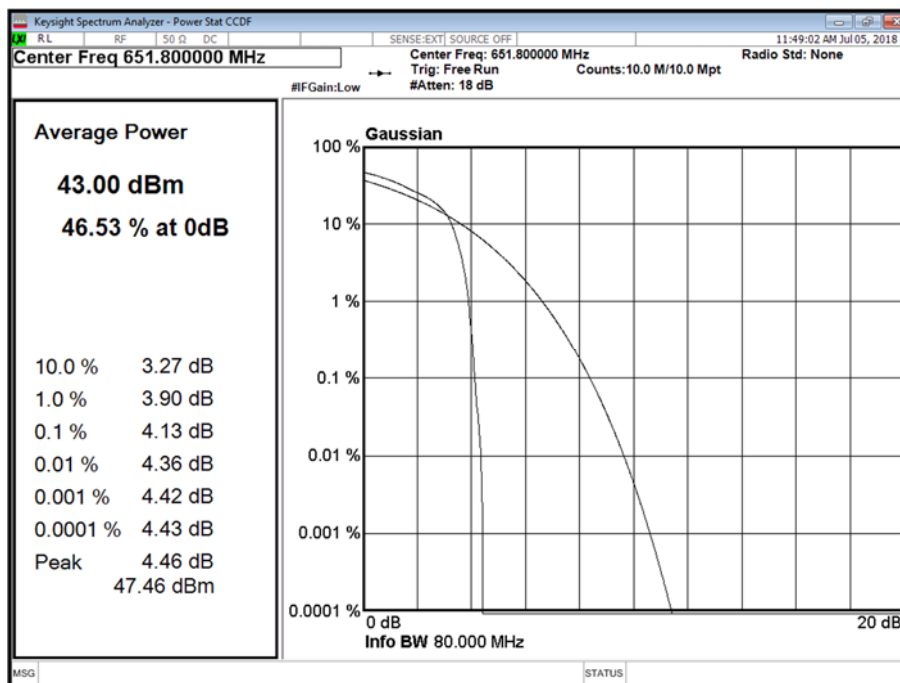
Maximum Output Power 43 dBm

Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	N:QPSK	N:180 kHz	4.13	43.10	-



Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T



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



Product Service

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

05 July 2018 - Modification State 0

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature 21.2°C
Relative Humidity 43.3%

2.2.5 Test Method

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

2.2.6 Test Results

Configuration A

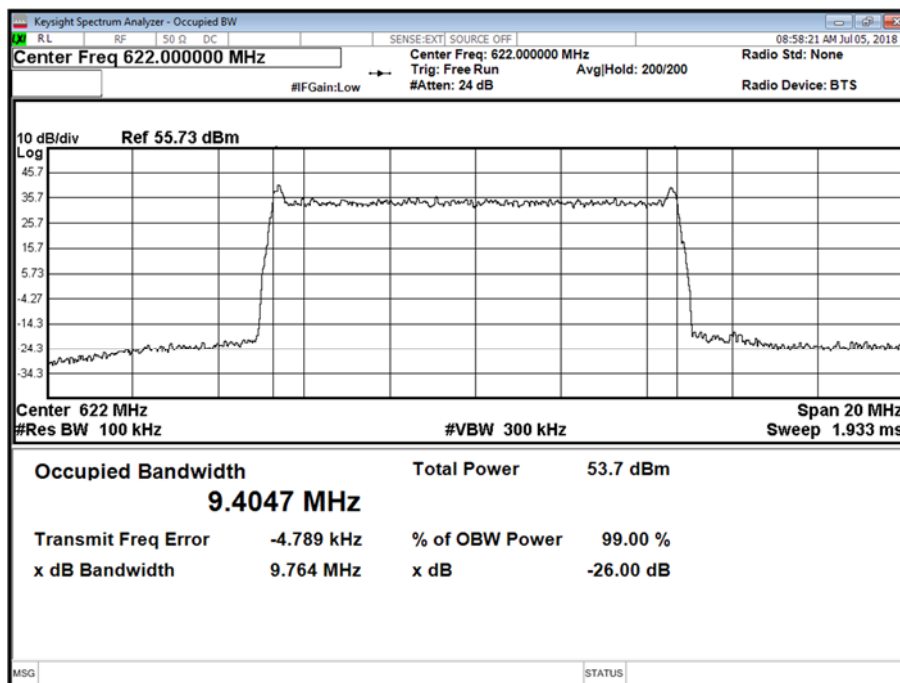
Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Result (KHz)			
			Channel Position BRFBW		Channel Position TRFBW	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	E:64QAM / N:QPSK	E:10.0 MHz / N:180 kHz	9,404.66	9,764.00	9,400.24	9,752.16
A	E:64QAM / N:QPSK	E:15.0 MHz / N:180 kHz	14,001.66	14,595.29	14,011.33	14,558.81
A	E:64QAM / N:QPSK	E:20.0 MHz / N:180 kHz	18,451.45	19,415.85	18,435.40	19,296.21

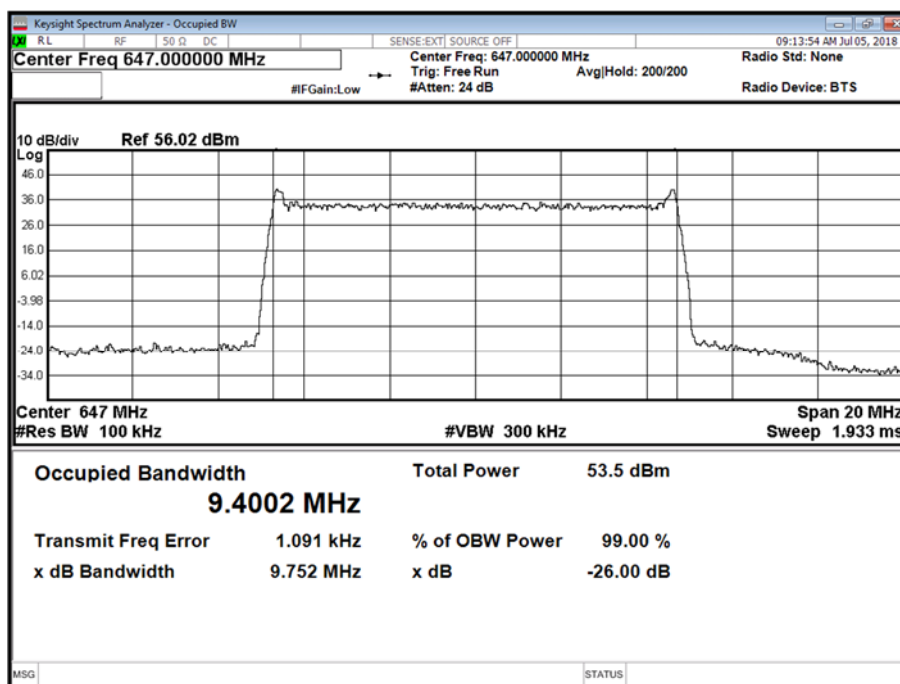


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW



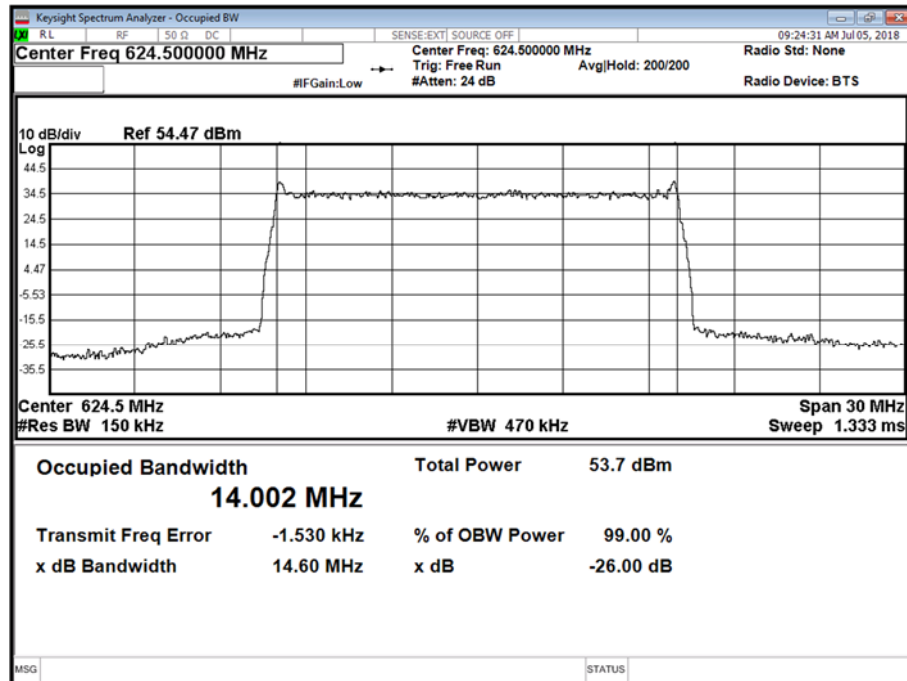
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW



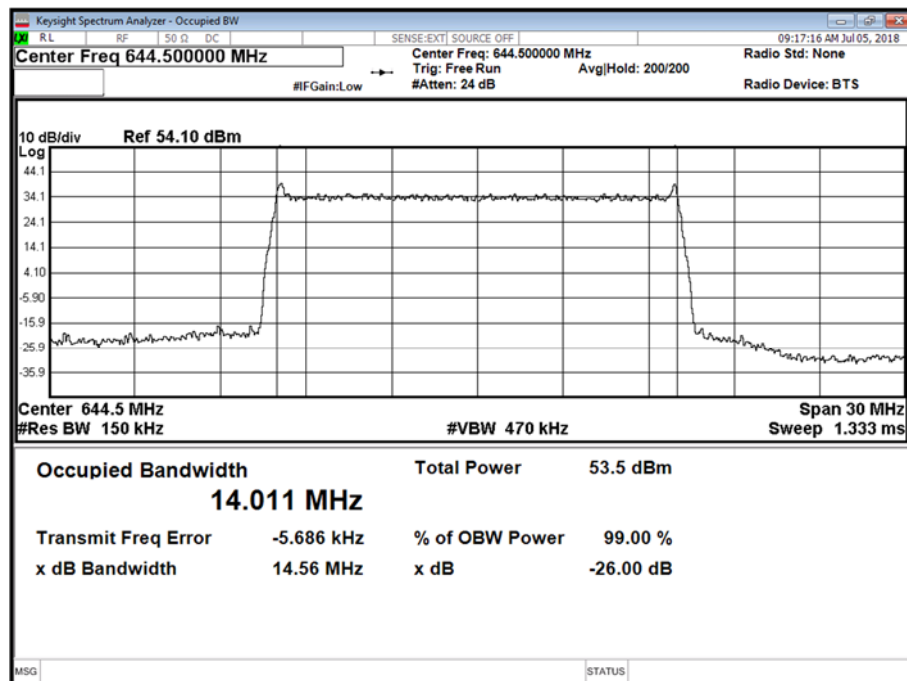


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW



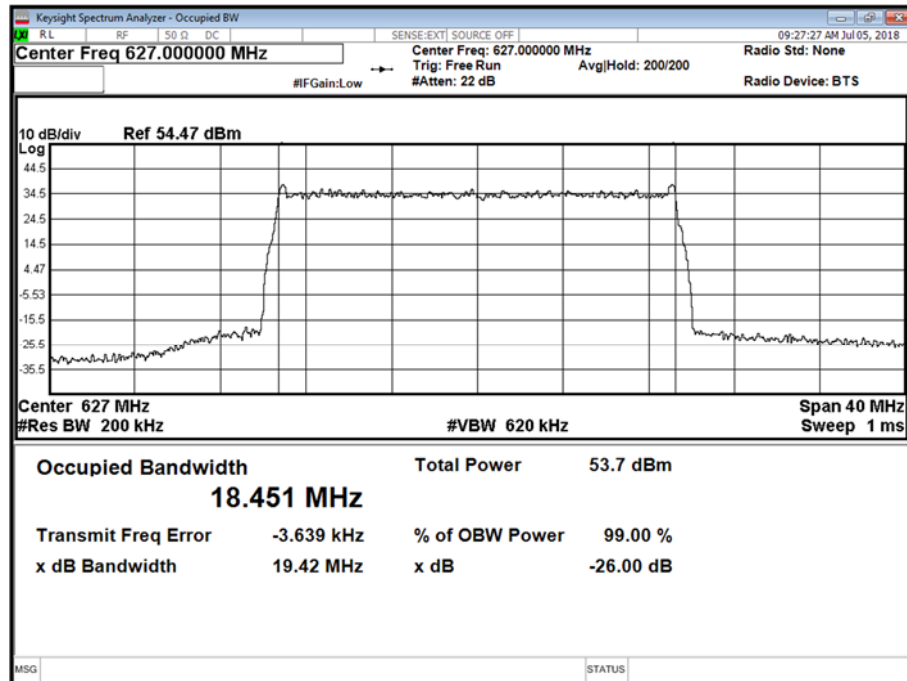
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW



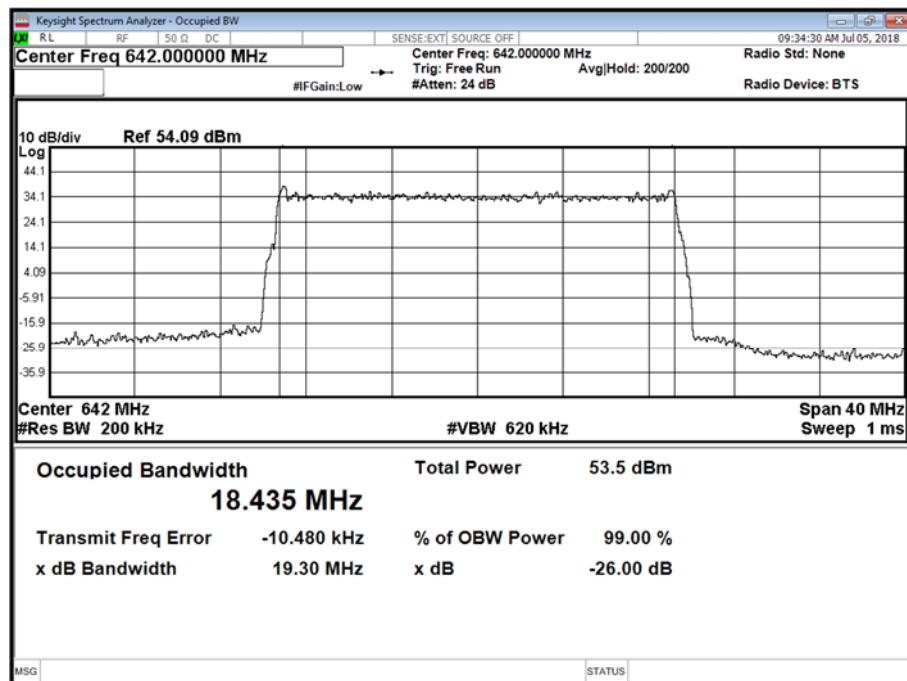


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW





Product Service

Configuration B

Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Result (KHz)	
			Channel Position MRFBW	
			Occupied Bandwidth	-26 dB Bandwidth
A	E:64QAM / N:QPSK	E:35.0 MHz / N:180 kHz	33,669.77	34,481.14

Remarks

CA

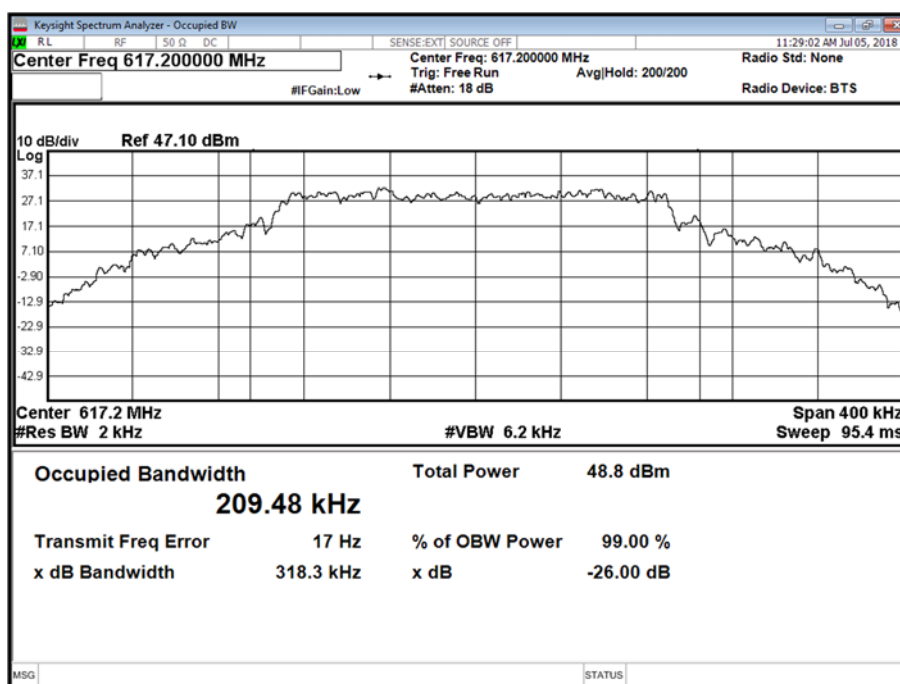
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW

Configuration C

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
A	N:QPSK	N:180 kHz	209.48	318.33	209.49	318.25	209.48	318.31

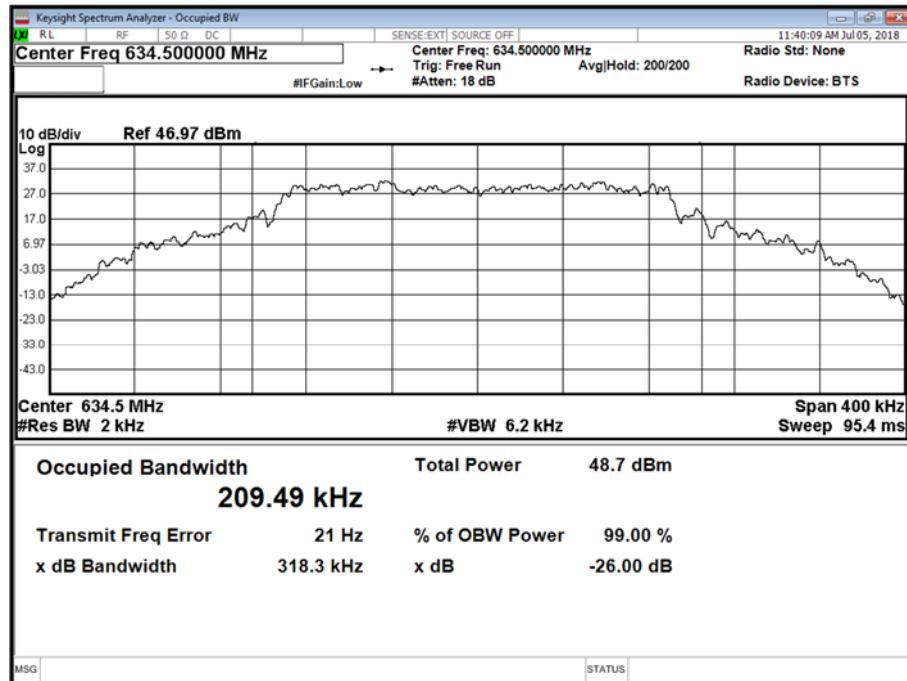
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B



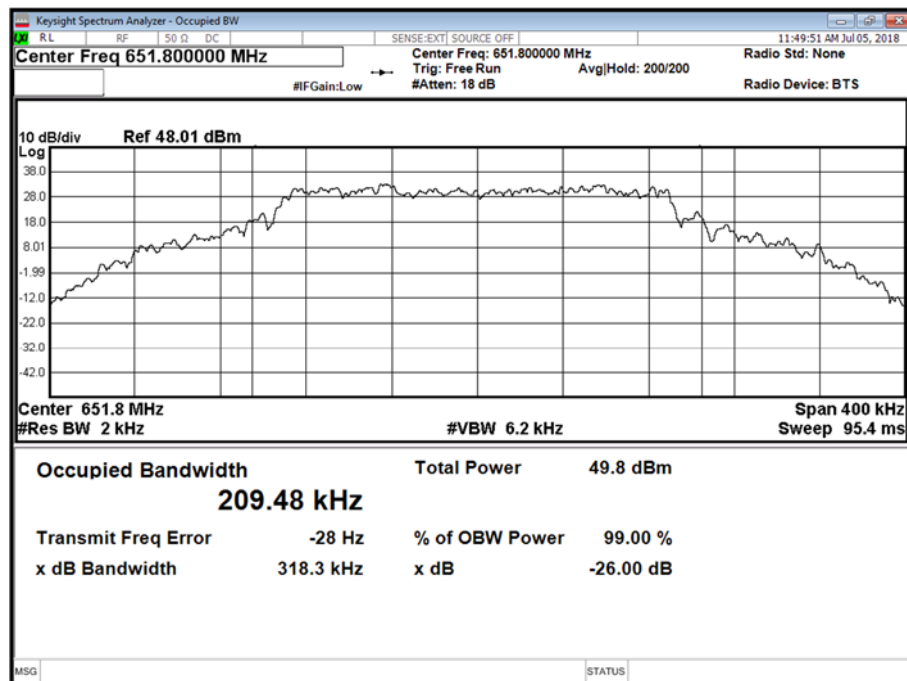


Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M



Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T





Product Service

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

05 July 2018 - Modification State 0

2.3.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.4 Environmental Conditions

Ambient Temperature 21.2°C
Relative Humidity 43.3%

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

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

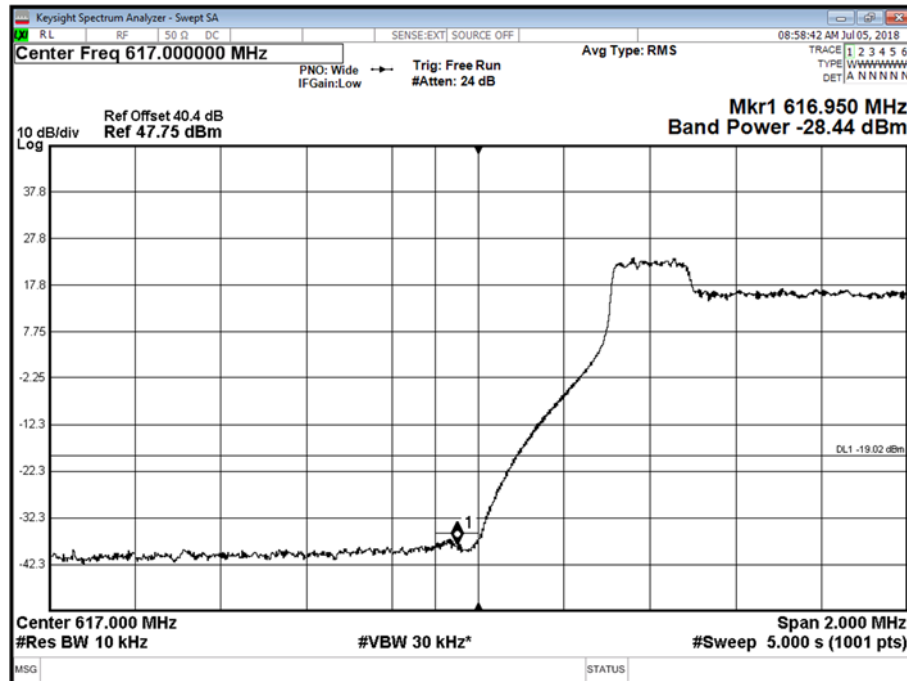
2.3.6 Test Results

Configuration A

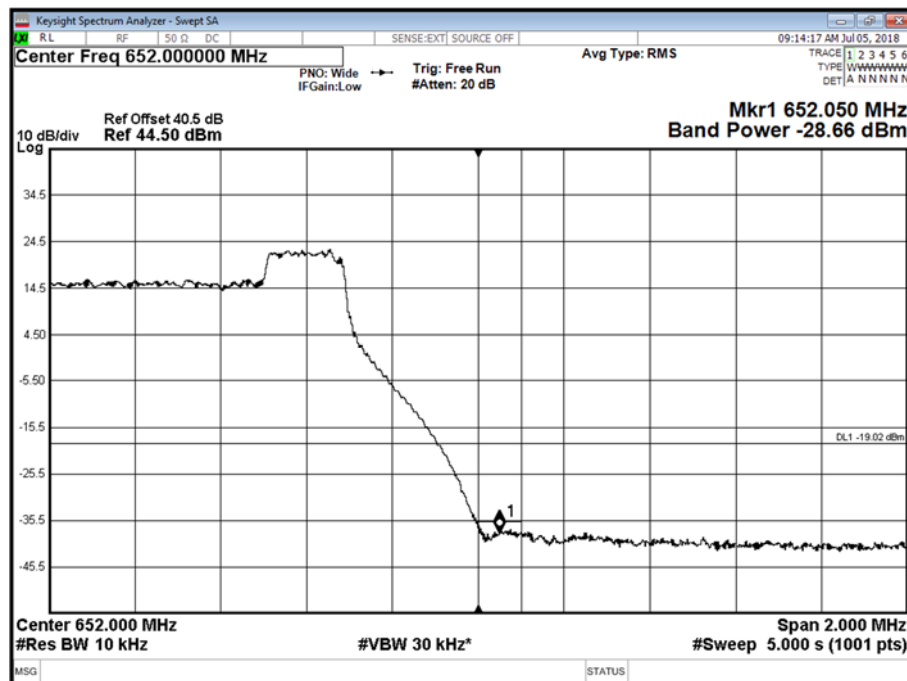
Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Band Edge (MHz)	
			Channel Position BRFBW	Channel Position TRFBW
A	E:64QAM / N:QPSK	E:10.0 MHz / N:180 kHz	622.0	647.0
A	E:64QAM / N:QPSK	E:15.0 MHz / N:180 kHz	624.5	644.5
A	E:64QAM / N:QPSK	E:20.0 MHz / N:180 kHz	627.0	642.0

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW



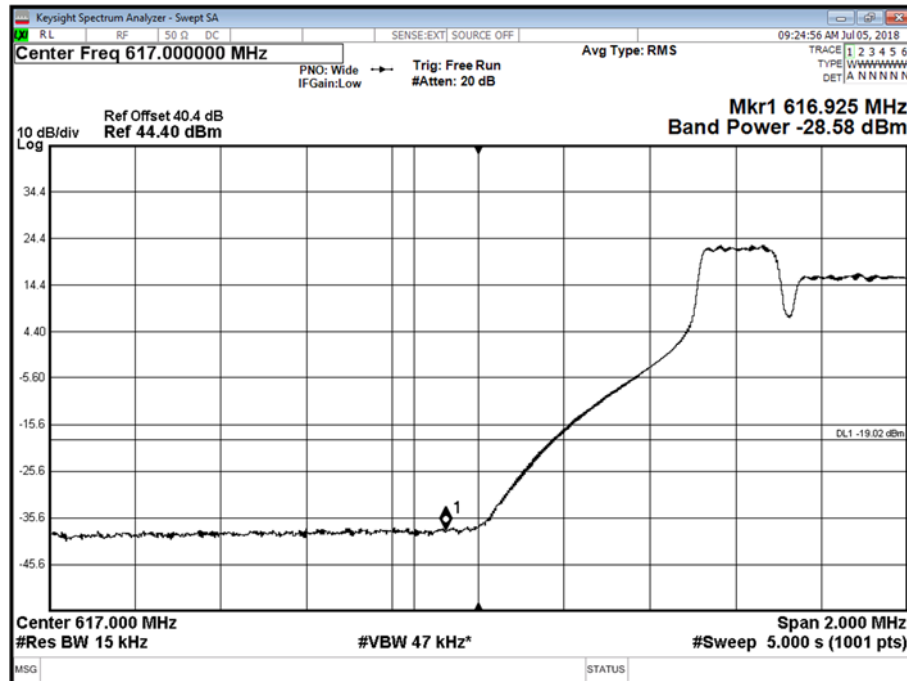
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW



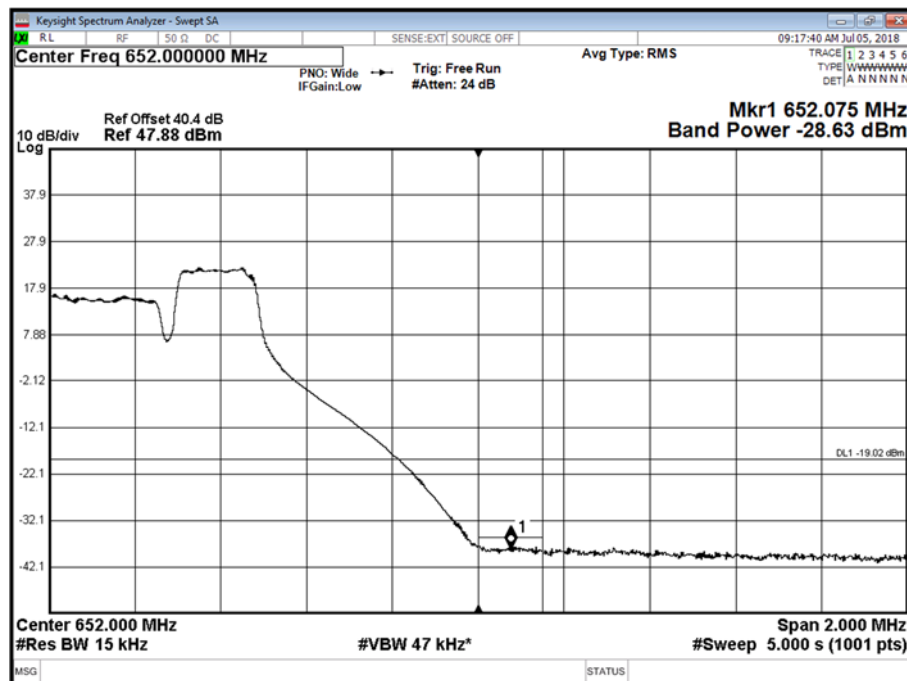


Product Service

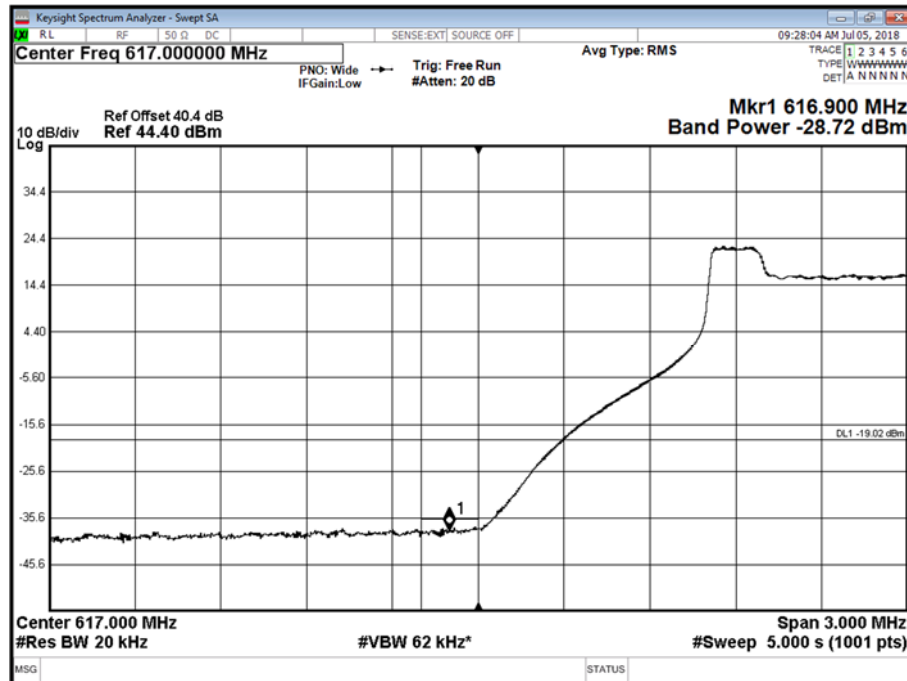
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW



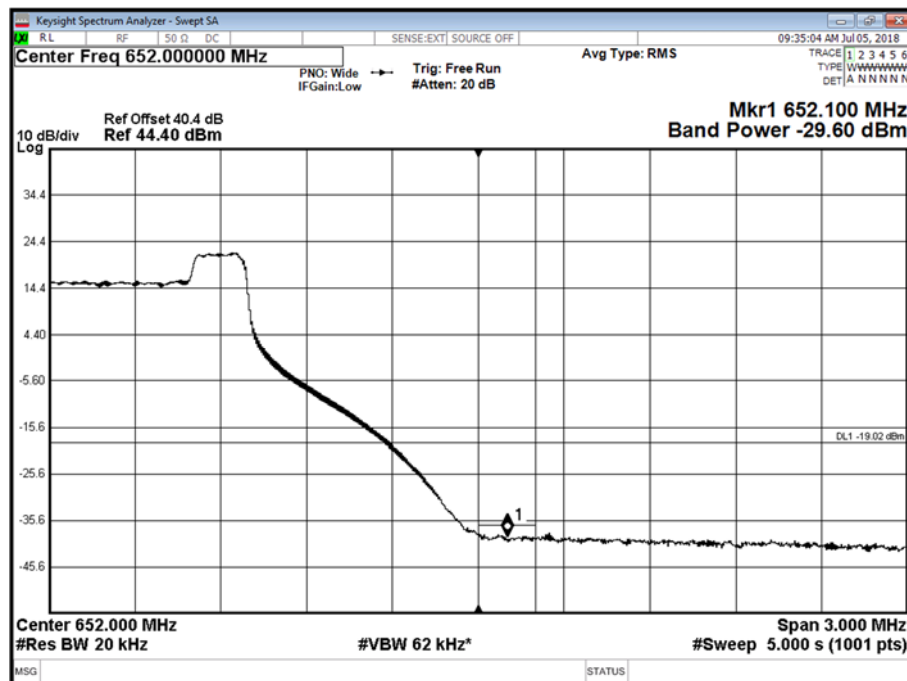
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW





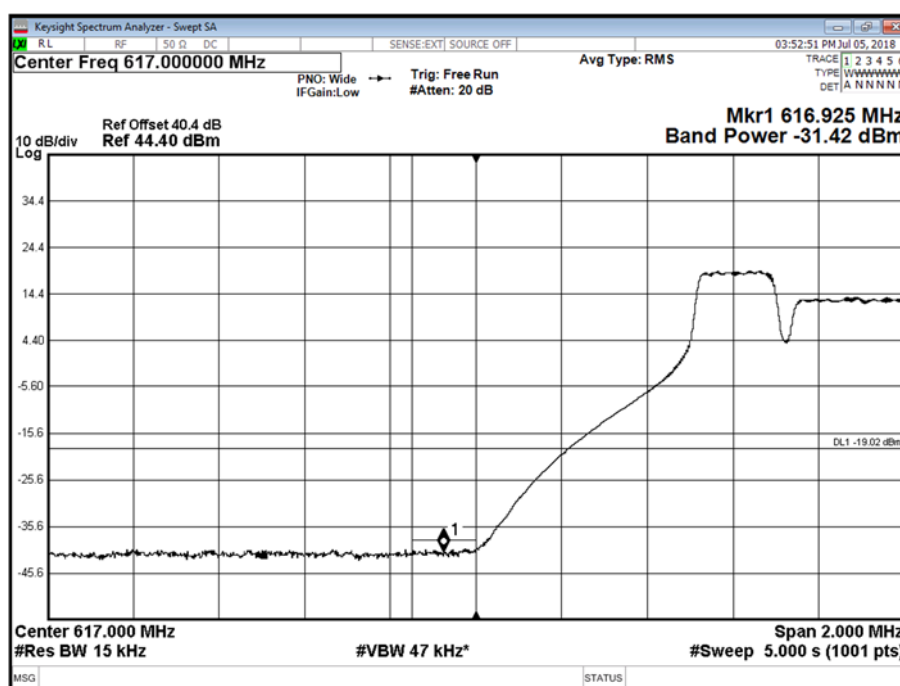
Product Service

Configuration B

Maximum Output Power 46 dBm

Antenna	E-UTRA / NB-IoT GB Modulation	E-UTRA / NB-IoT GB Carrier Bandwidth	Band Edge (MHz)	
			Channel Position BRFW	Channel Position TRFW
A	E:64QAM / N:QPSK	E:35.0 MHz / N:180 kHz	624.5	642.0

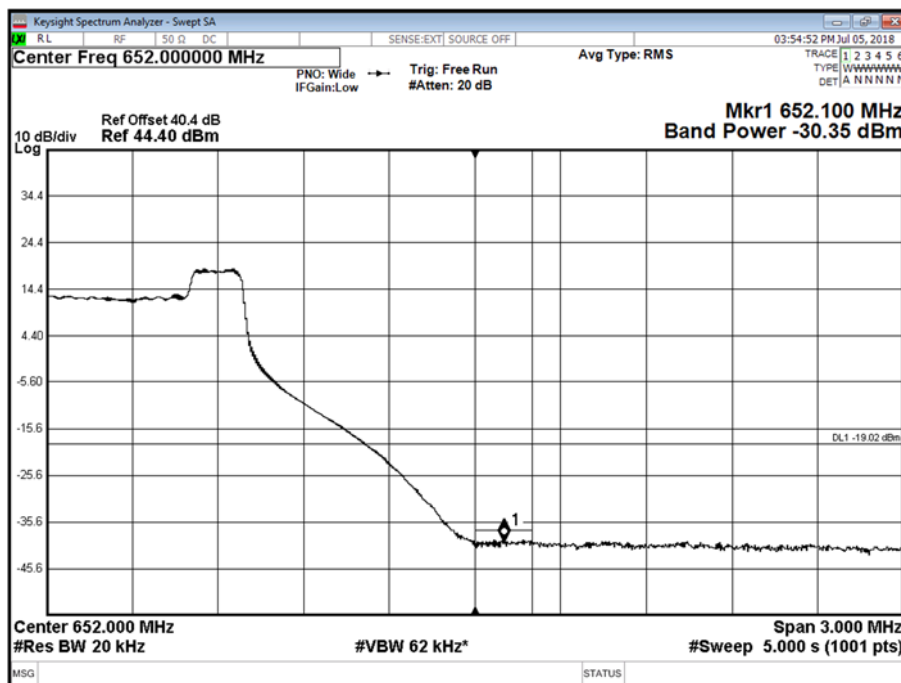
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position BRFW





Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position TRFBW



Configuration C

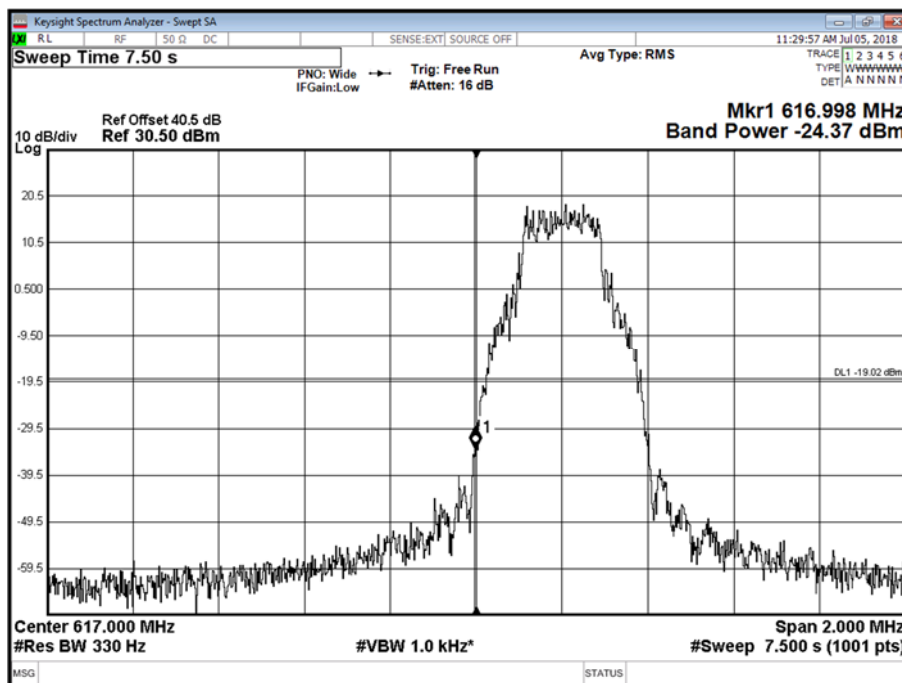
Maximum Output Power 43 dBm

Antenna	NB-IoT SA Modulation	NB-IoT SA Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	N:QPSK	N:180 kHz	617.2	651.8

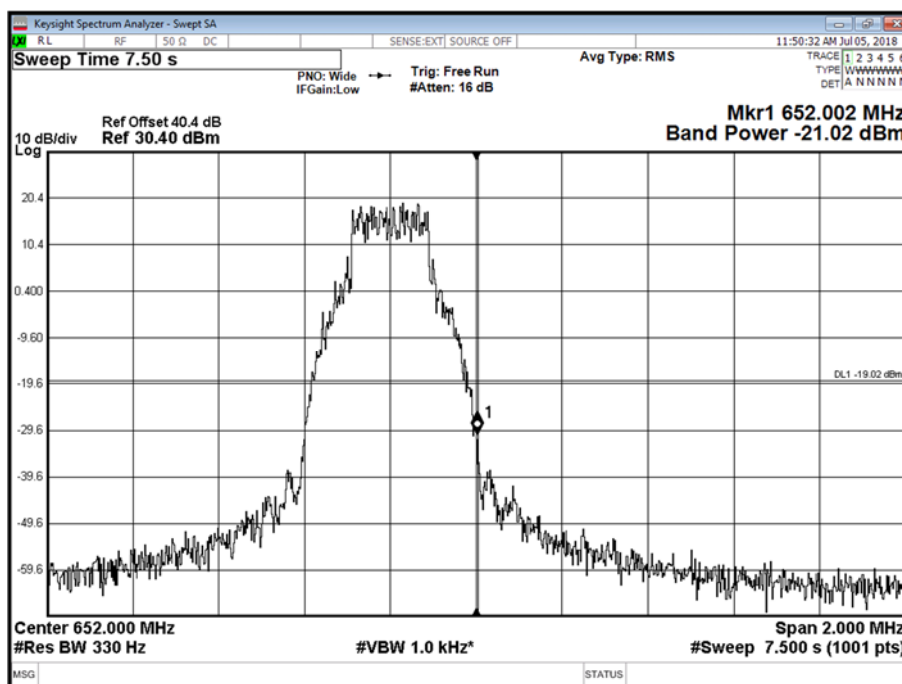


Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B



Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T



Limit	-19 dBm
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Product Service

2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

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

2.4.2 Date of Test and Modification State

05 July 2018 - Modification State 0

2.4.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.4 Environmental Conditions

Ambient Temperature	21.2°C
Relative Humidity	43.3%

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

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

2.4.6 Test Results

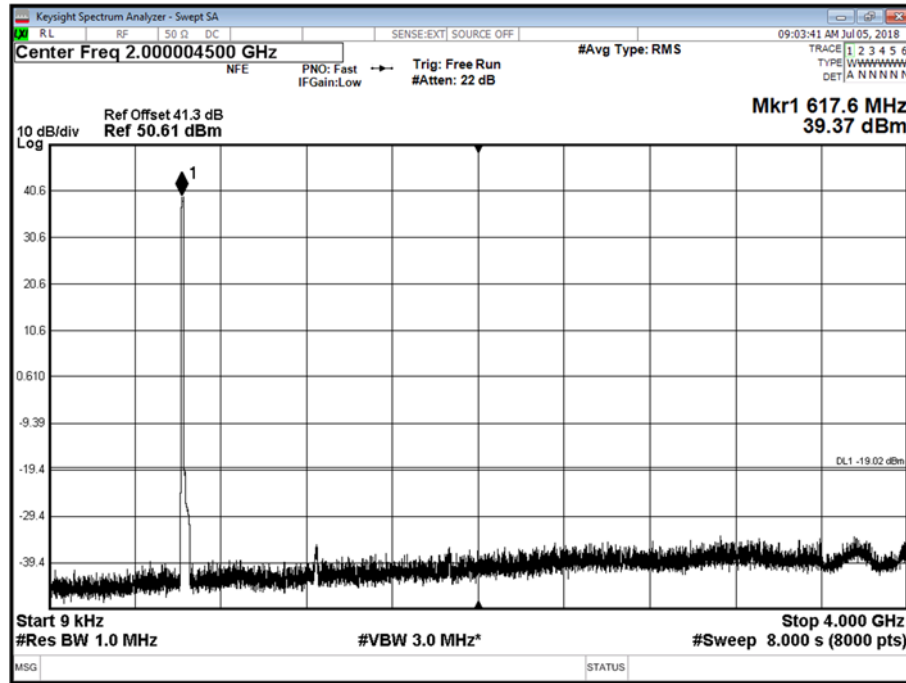
Configuration A

Maximum Output Power 46 dBm

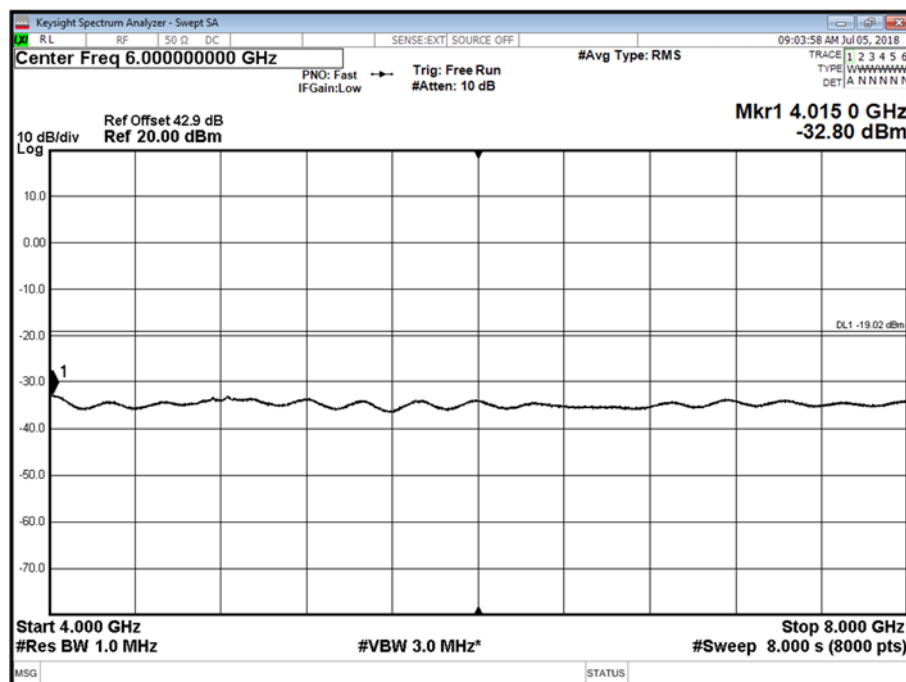


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 0.009
to 4000 MHz



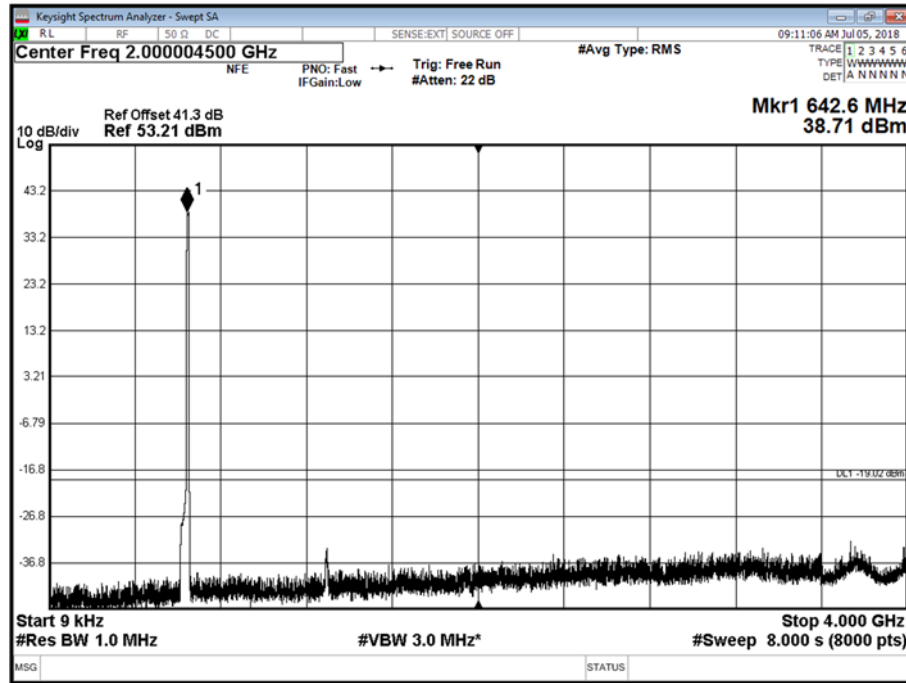
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 8000 MHz



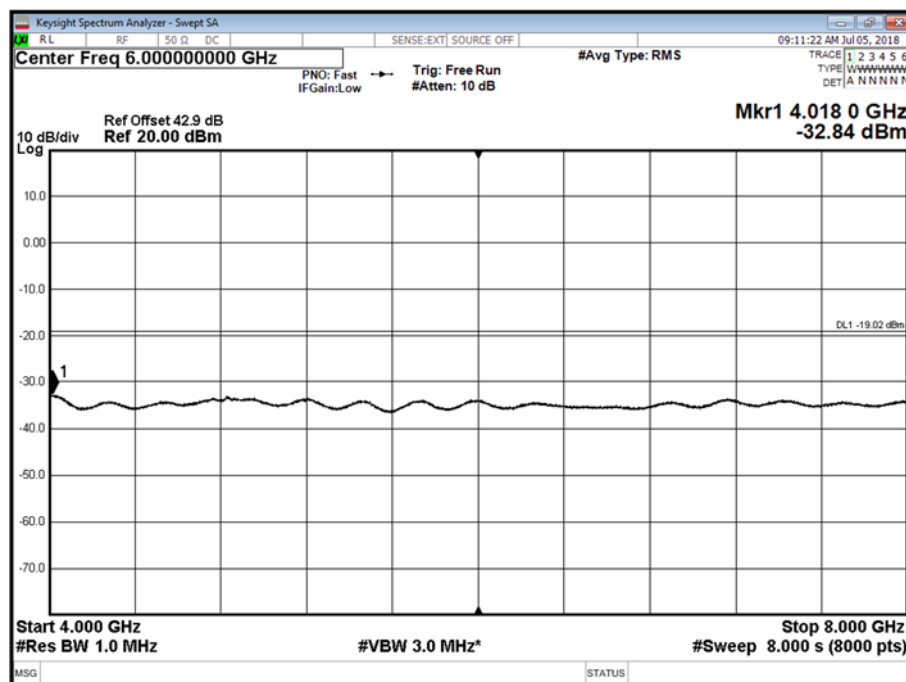


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 0.009
to 4000 MHz



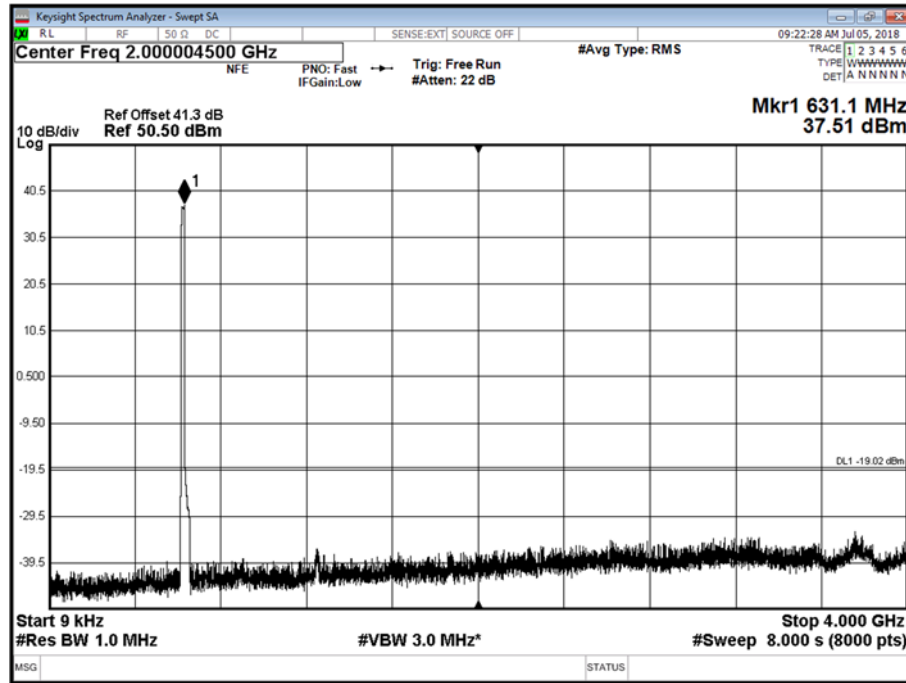
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 8000 MHz



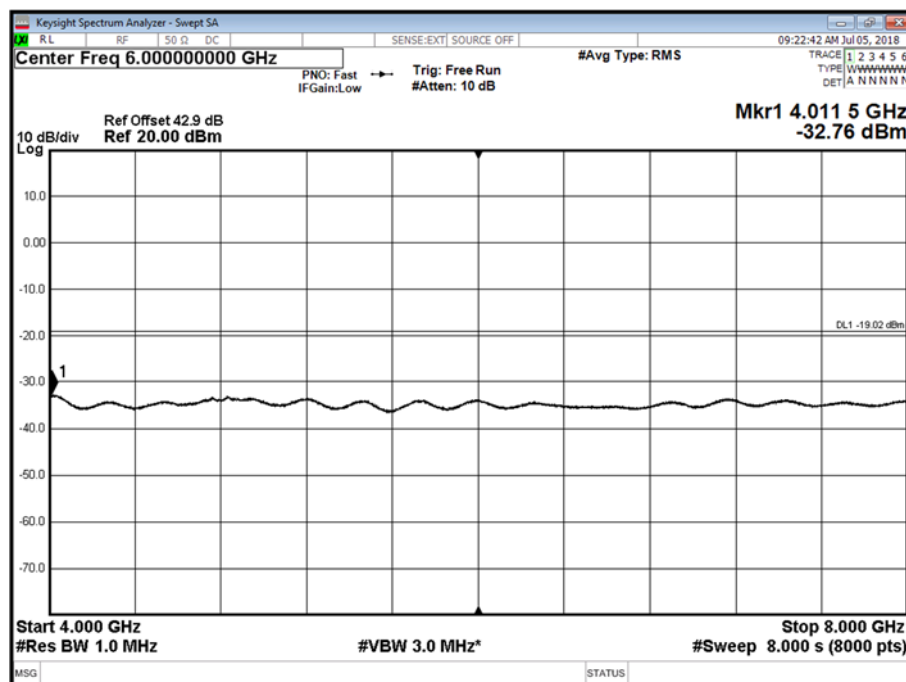


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 0.009
to 4000 MHz



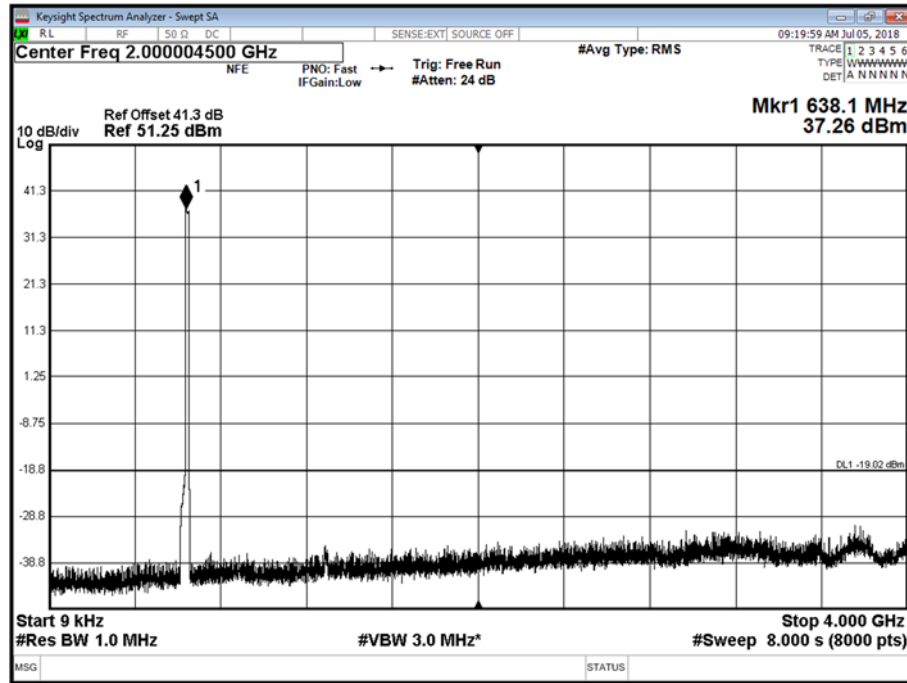
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 8000 MHz



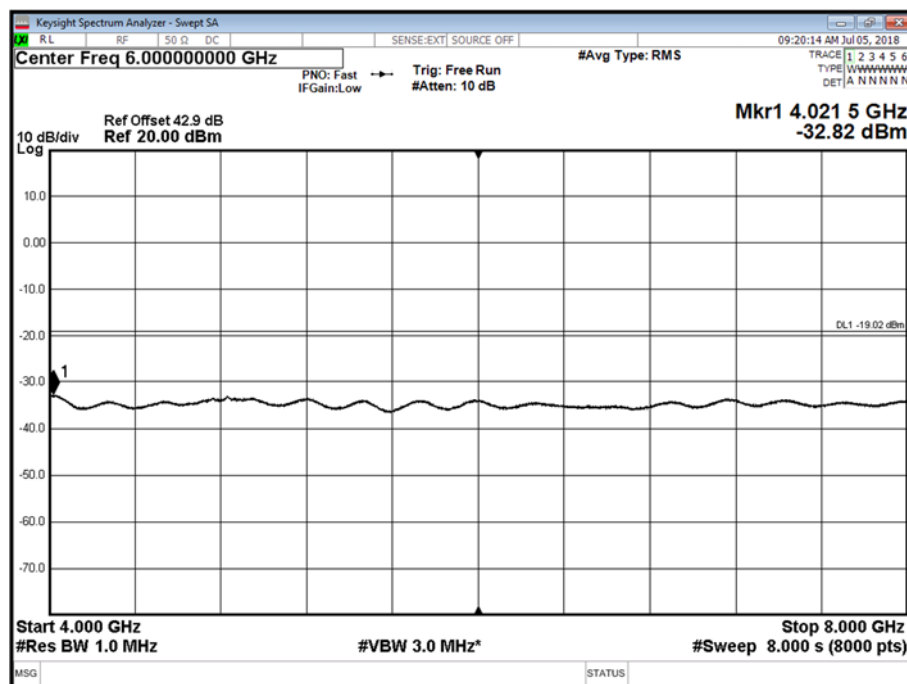


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 0.009
to 4000 MHz



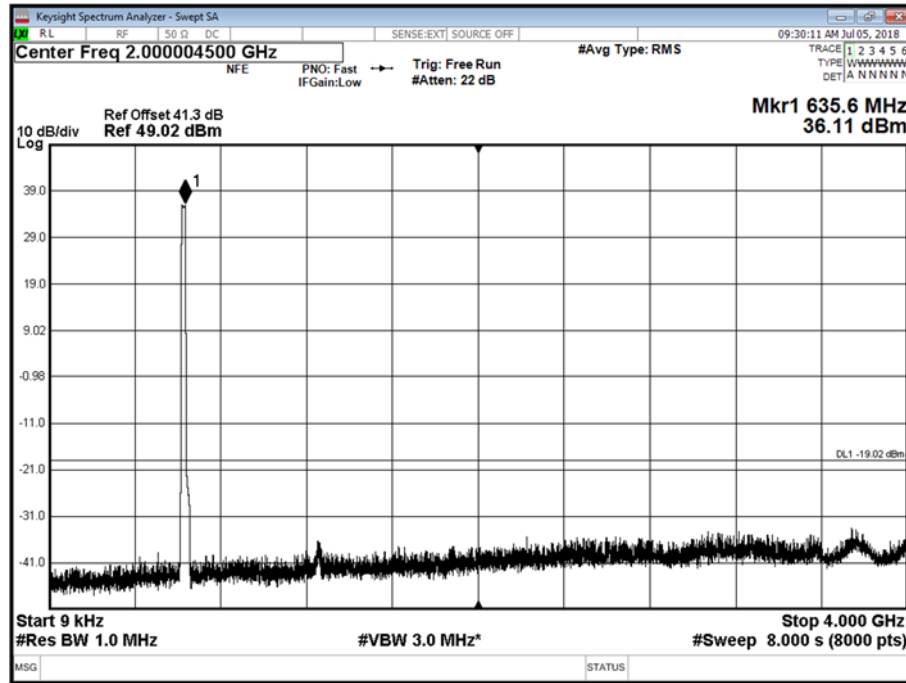
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 8000 MHz



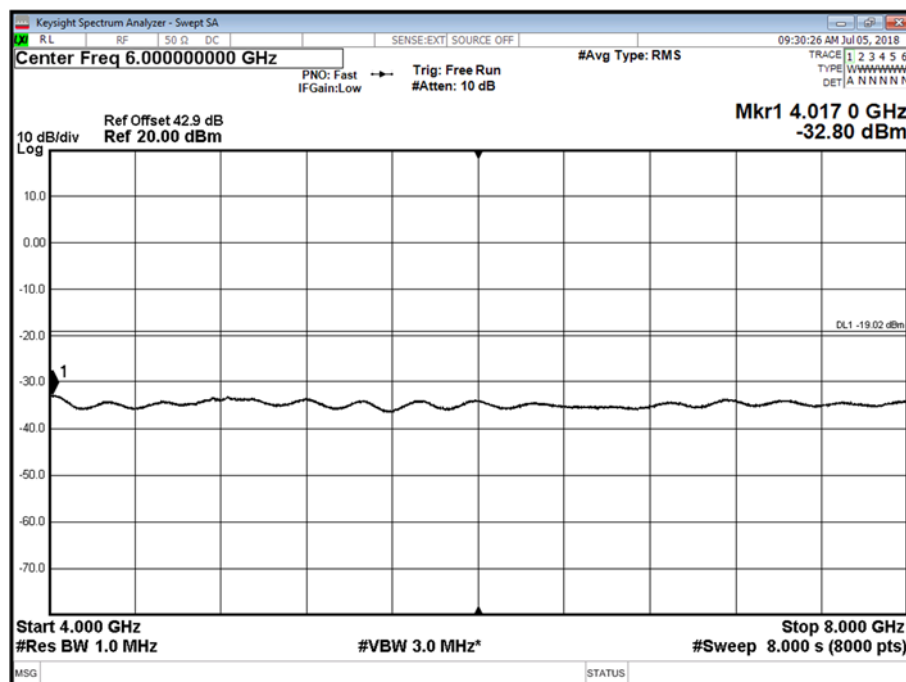


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 0.009
to 4000 MHz



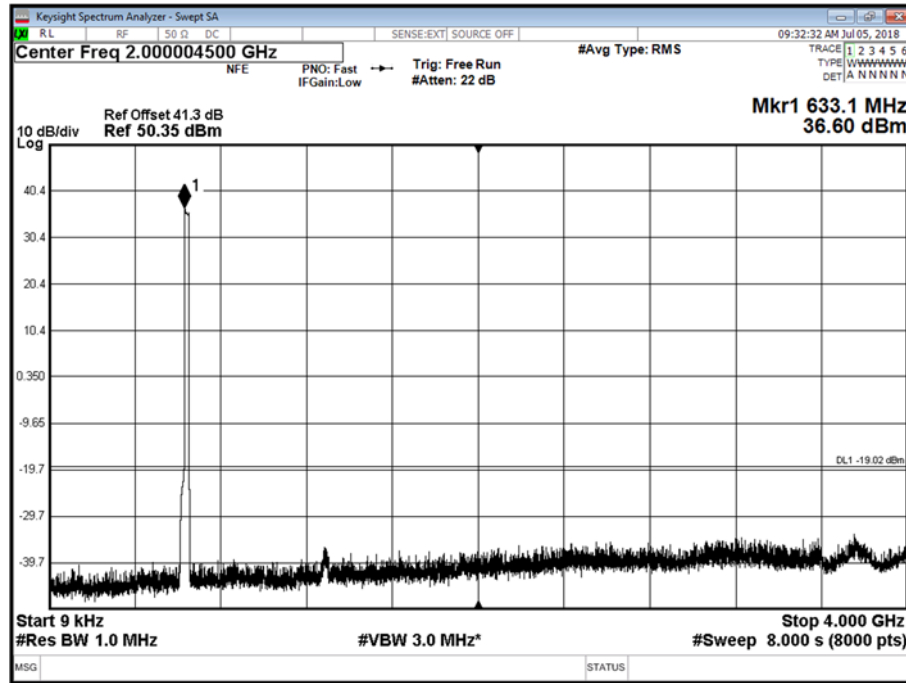
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 8000 MHz



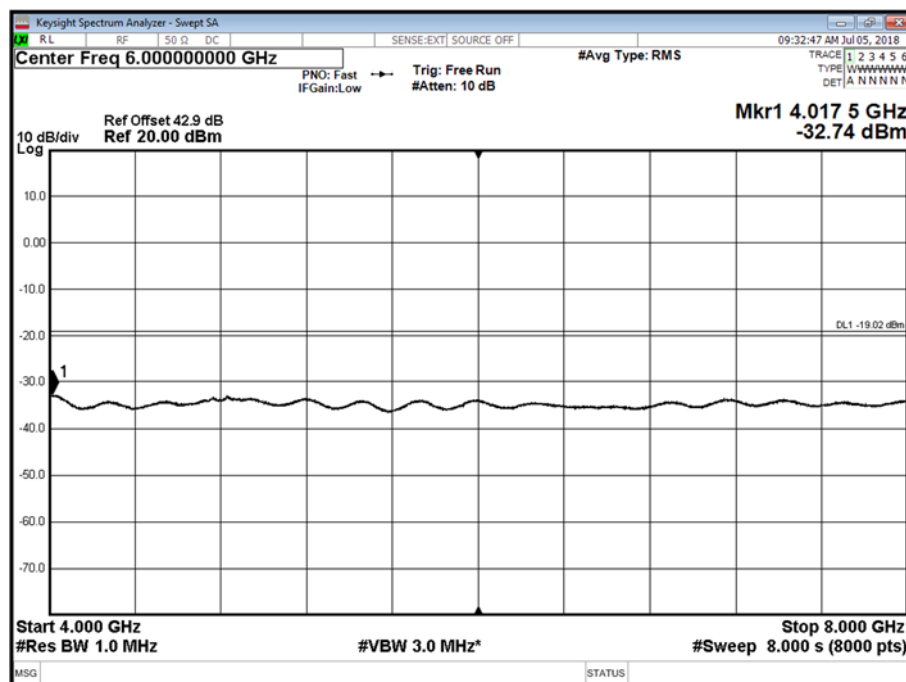


Product Service

Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 0.009
to 4000 MHz



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 8000 MHz



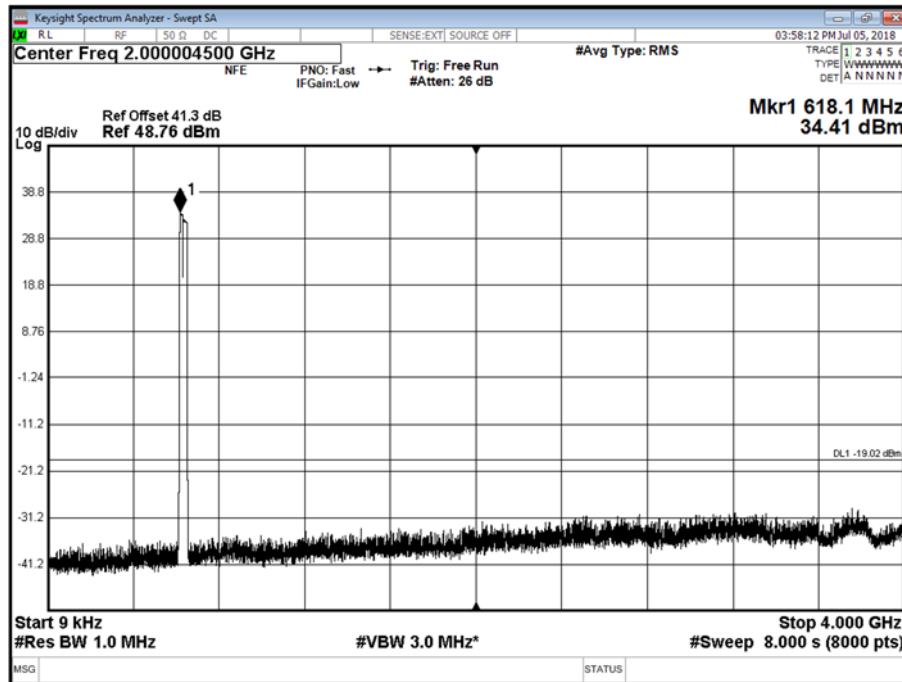


Product Service

Configuration B

Maximum Output Power 46 dBm

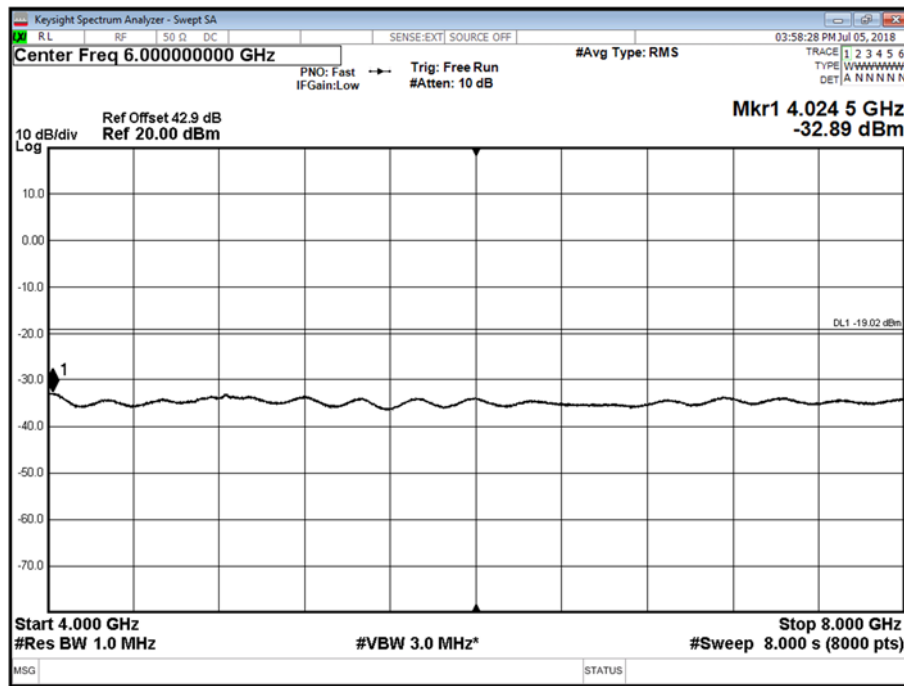
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 1 - Range 0.009
to 4000 MHz





Product Service

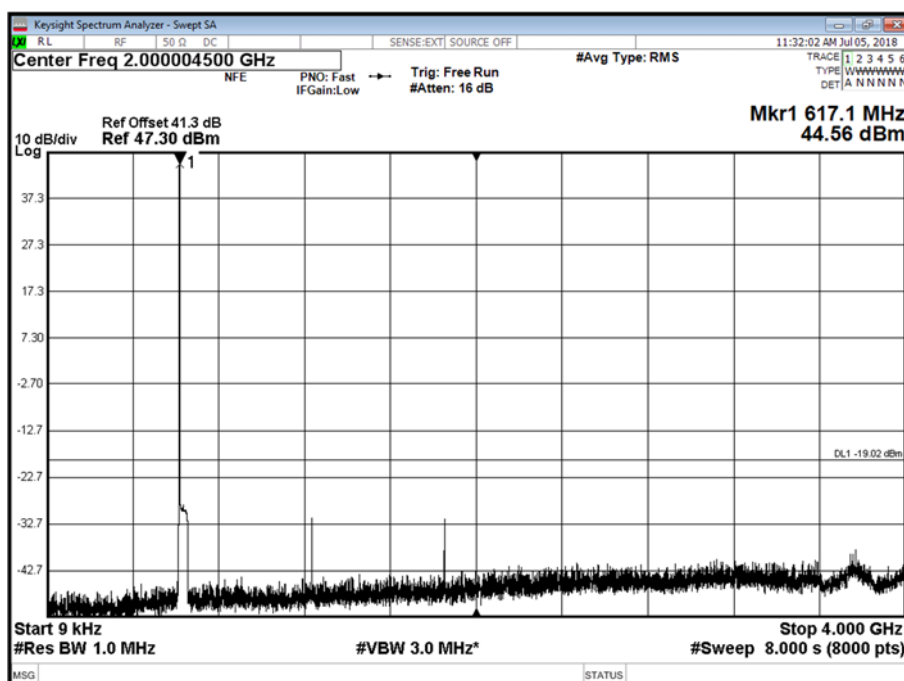
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 2 - Range 4000
to 8000 MHz



Configuration C

Maximum Output Power 43 dBm

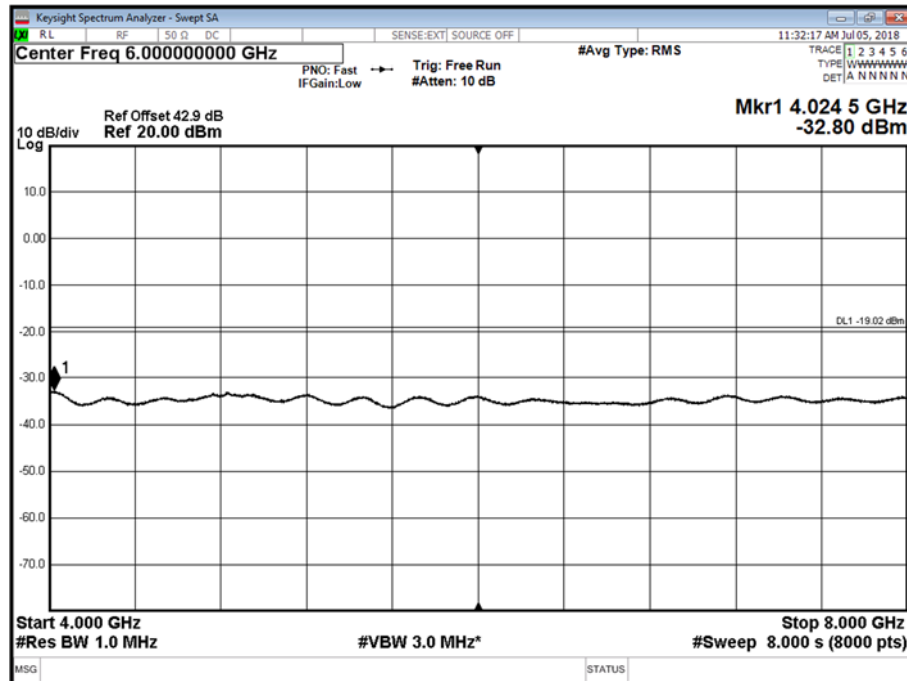
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 1 - Range 0.009 to 4000 MHz



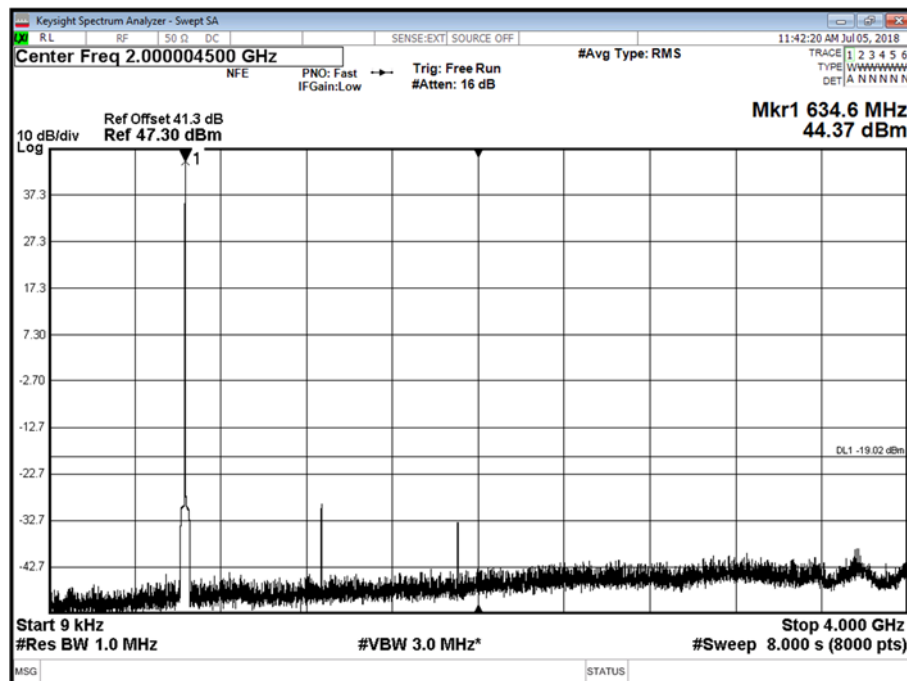


Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 2 - Range 4000 to 8000 MHz



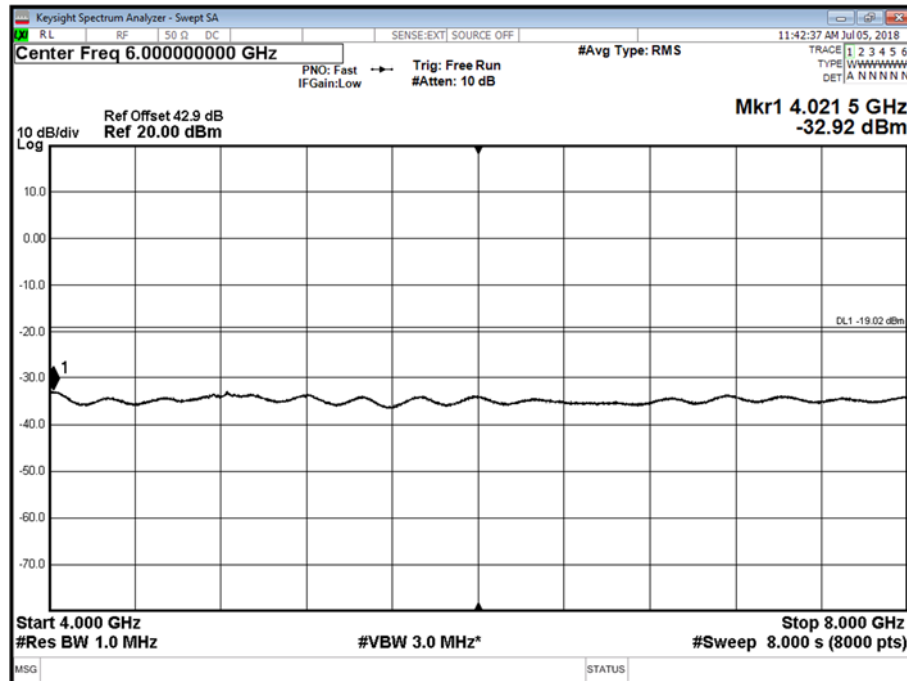
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 1 - Range 0.009 to 4000 MHz



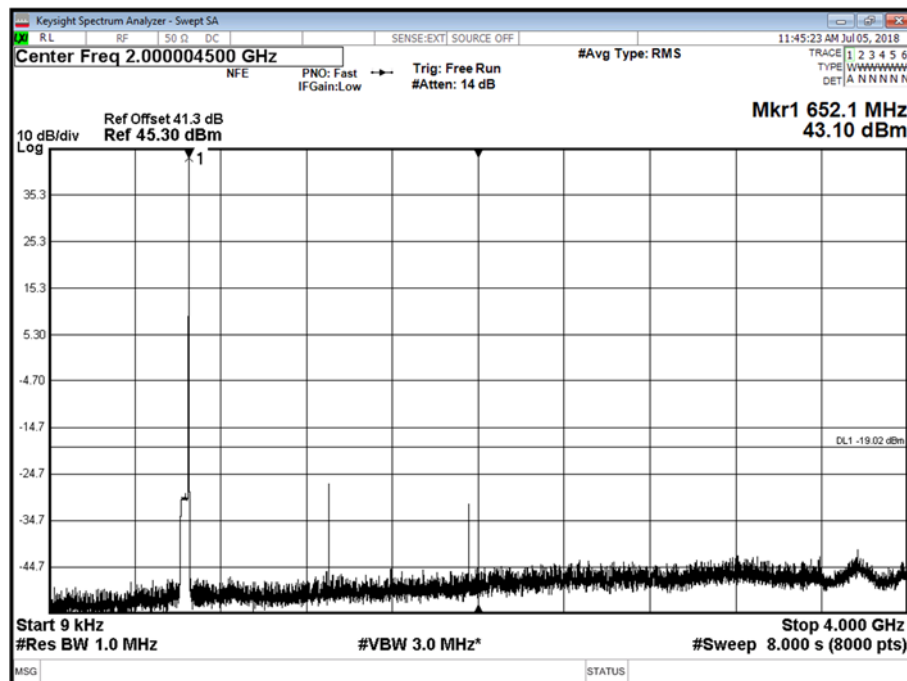


Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 2 - Range 4000 to 8000 MHz



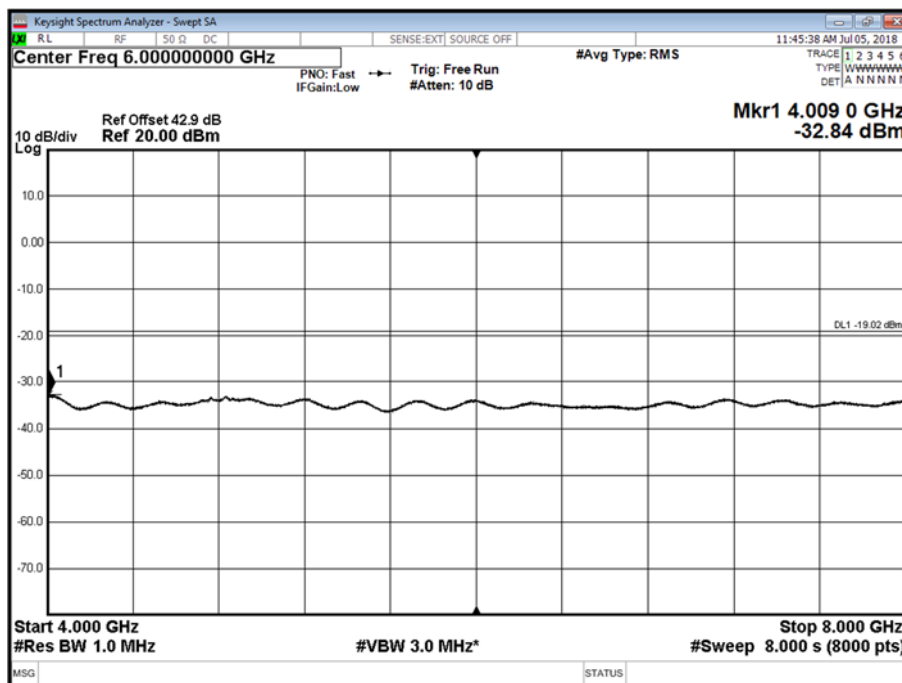
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 1 - Range 0.009 to 4000 MHz





Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 2 - Range 4000 to 8000 MHz



Limit	-19dBm
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Product Service

2.5 RADIATED EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 27, Clause 27.53 (g)

2.5.2 Date of Test and Modification State

22 July 2018 - Modification State 0

2.5.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.4 Environmental Conditions

Ambient Temperature	19.7°C
Relative Humidity	57.5%

2.5.5 Test Method

The measurements were performed at a 3m distance unless otherwise stated. The test was applied in accordance with test method requirements of ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

The Applicant declared that the highest internally generated frequency would be up to 652MHz and so the upper limit for measurement was calculated at 10 times this, which is 6.6GHz, the testing was actually performed up to 12GHz.

Emissions identified within the range 30MHz – 12GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 1GHz, the measurement was performed with a resolution bandwidth of 100kHz.

In the frequency Range 1GHz – 12GHz, the measurement was performed with a resolution bandwidth of 1MHz.

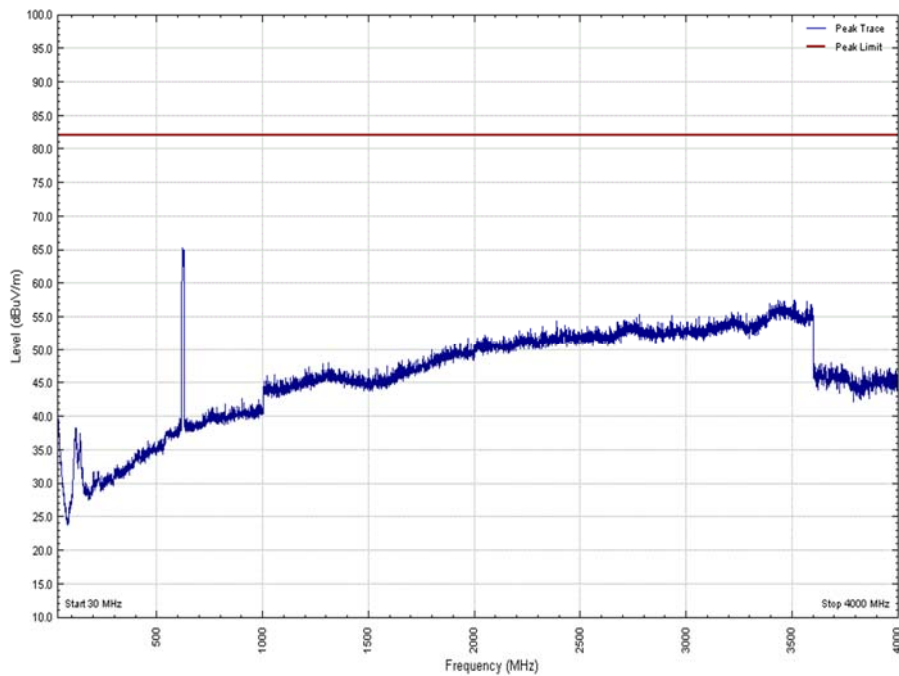
The measurements were performed at a 3m distance unless otherwise stated.

2.5.6 Test Results

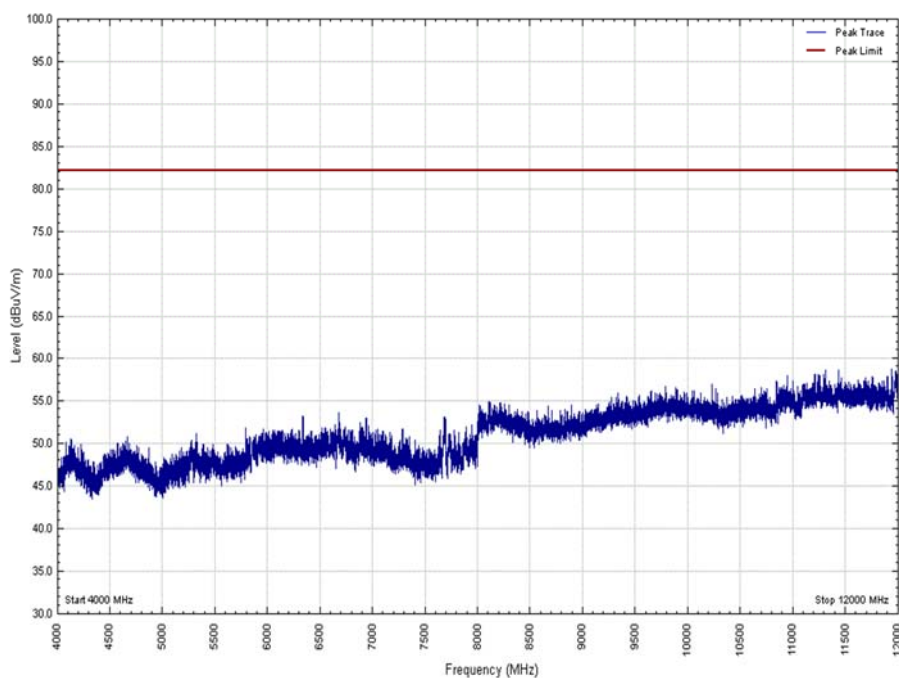
Configuration A

Maximum Output Power 46 dBm

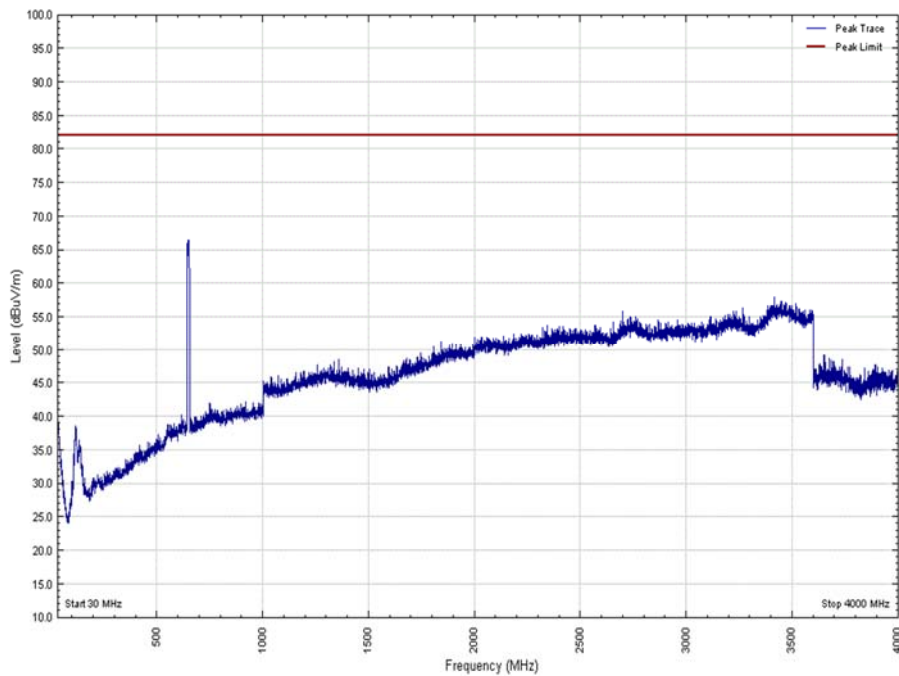
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



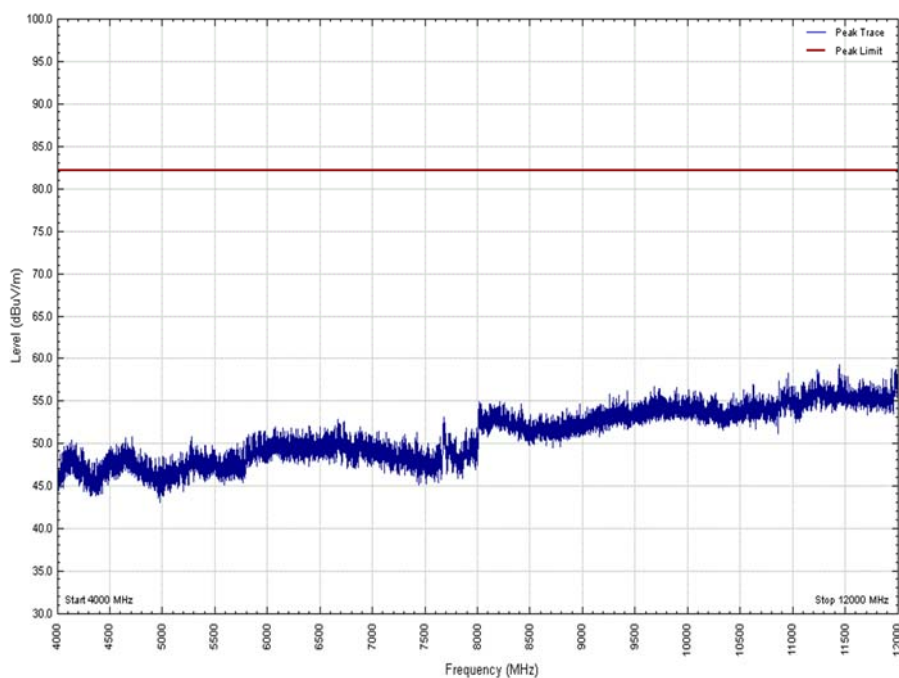
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



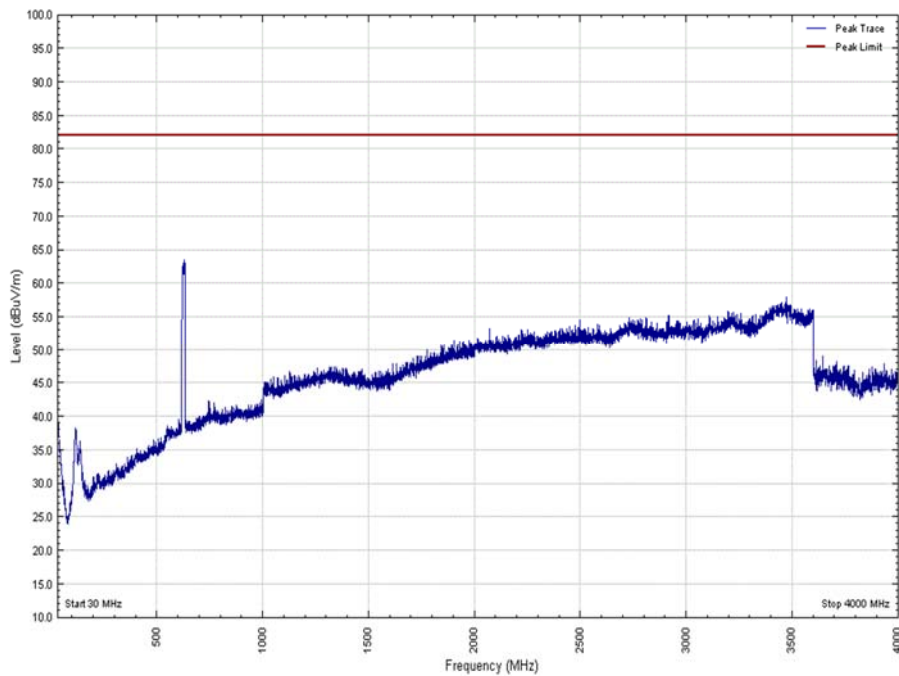
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



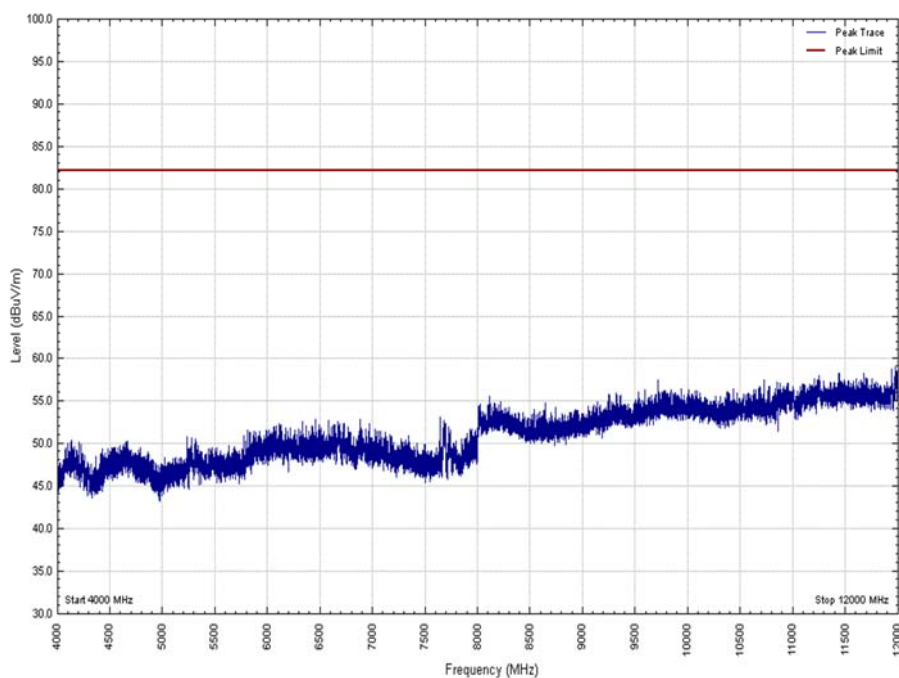
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



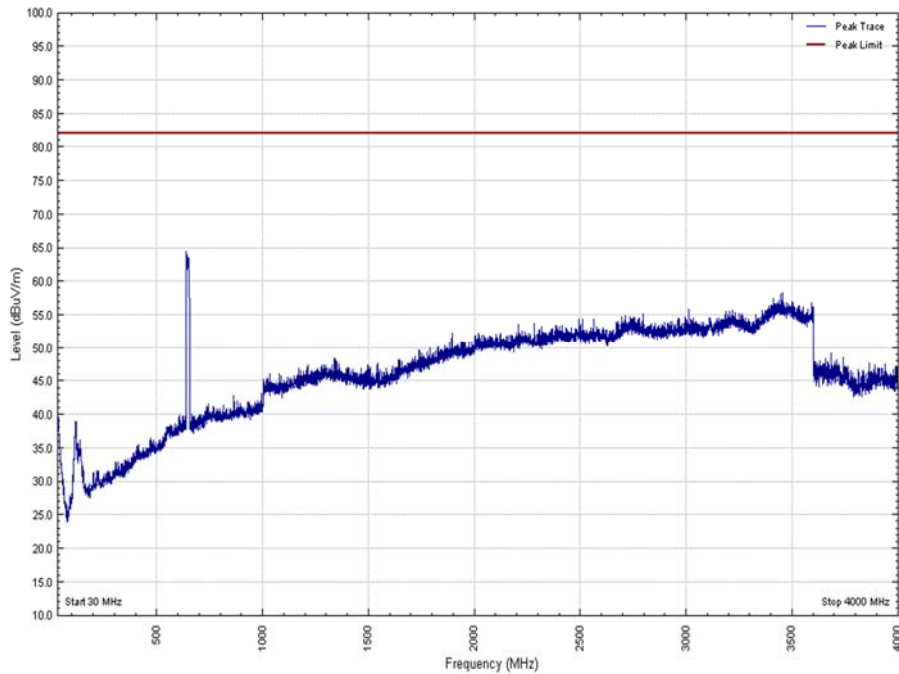
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



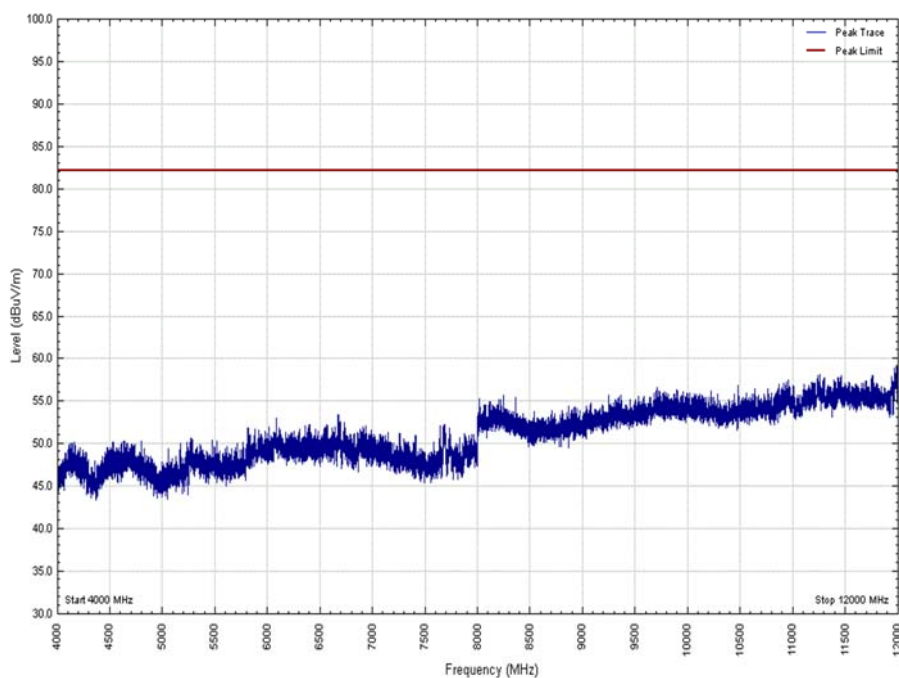
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



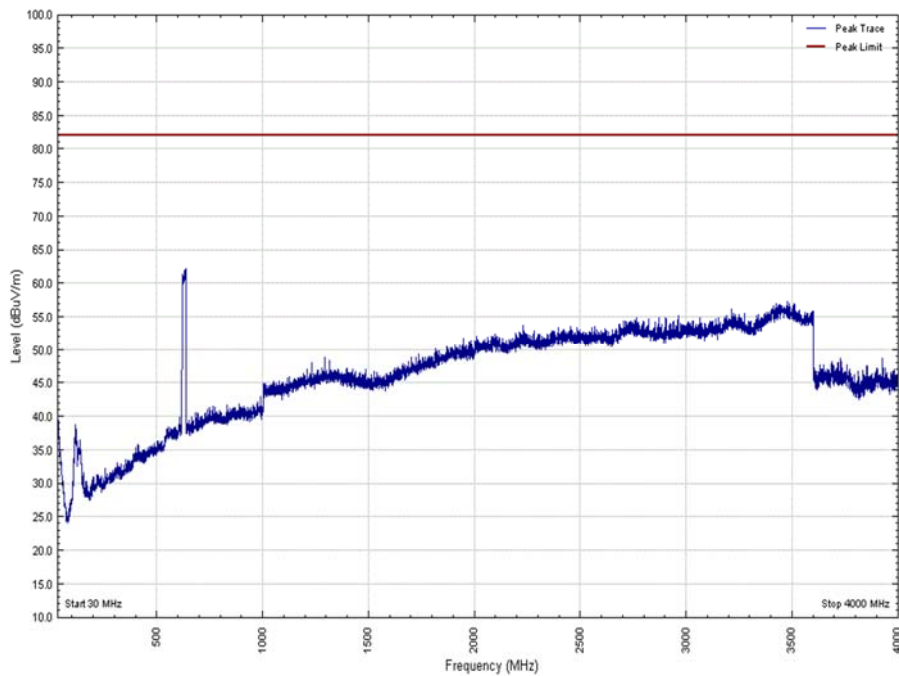
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



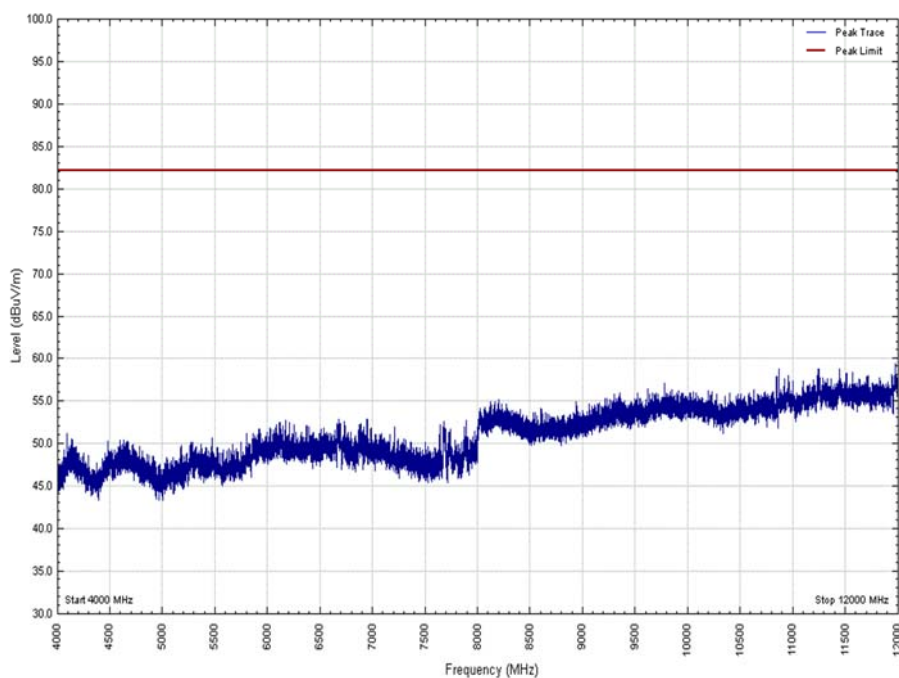
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



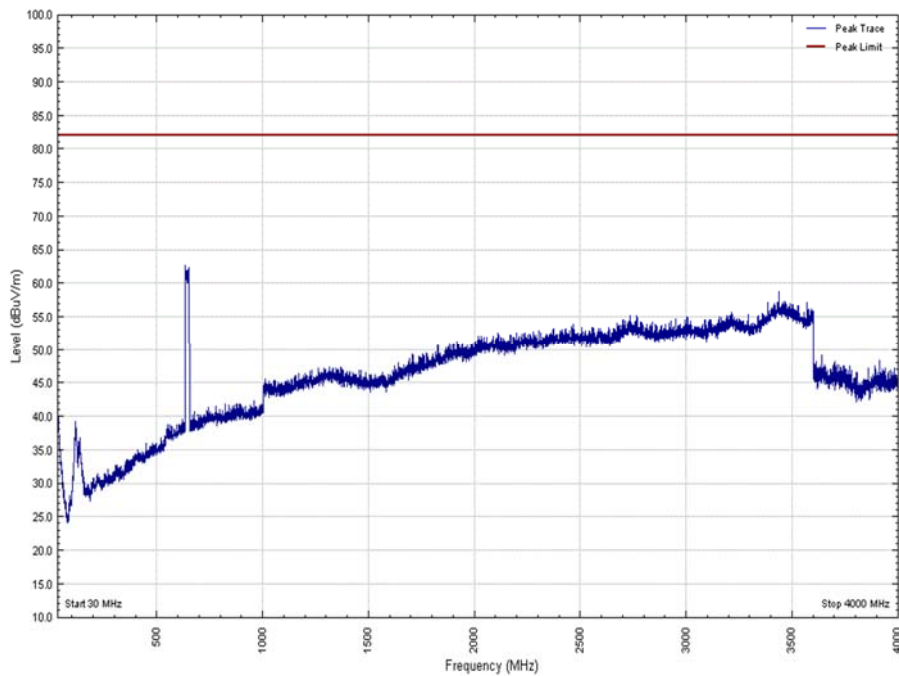
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



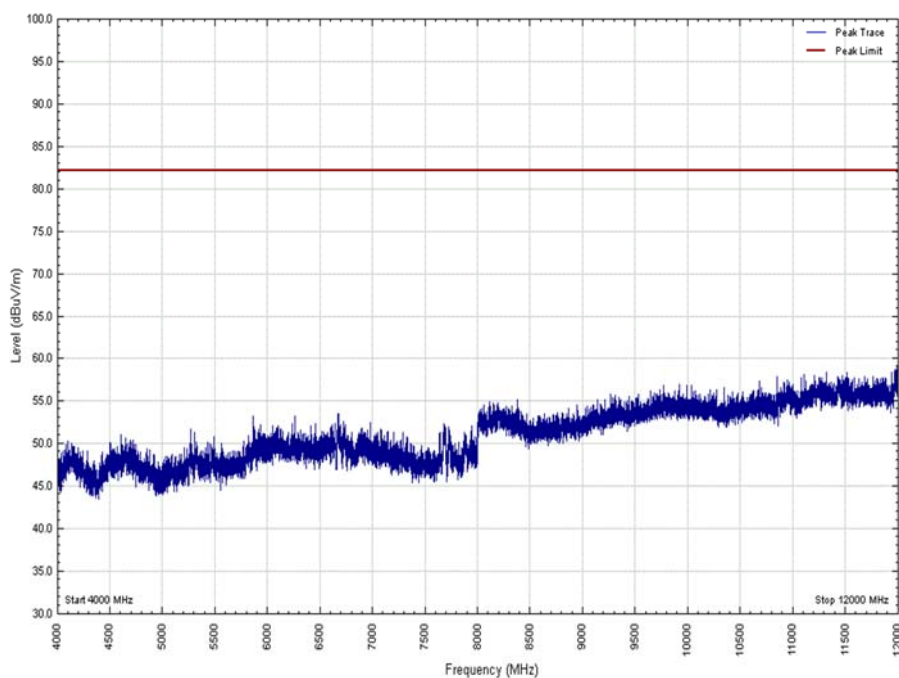
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



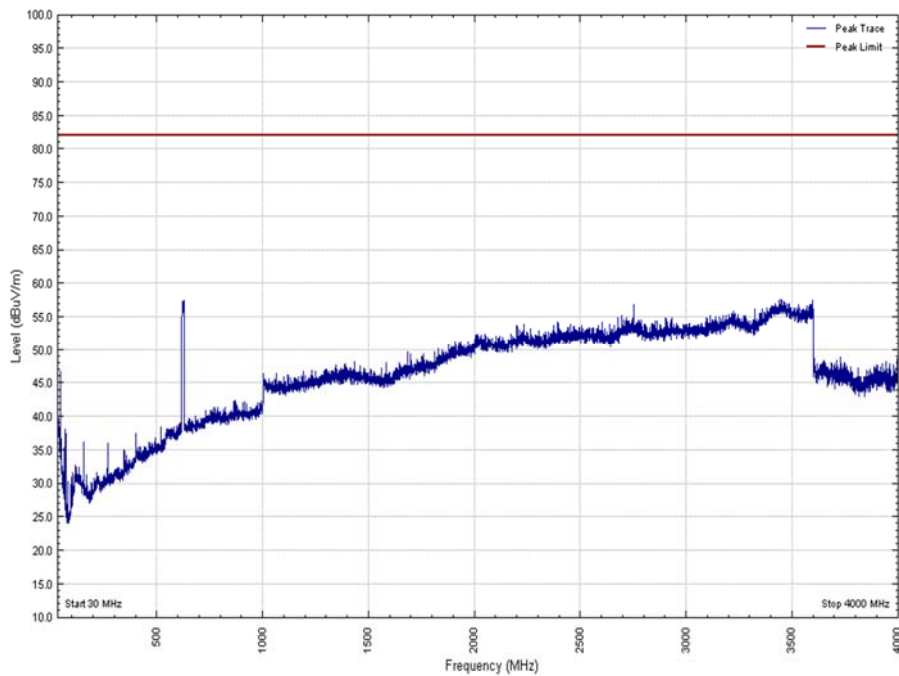
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



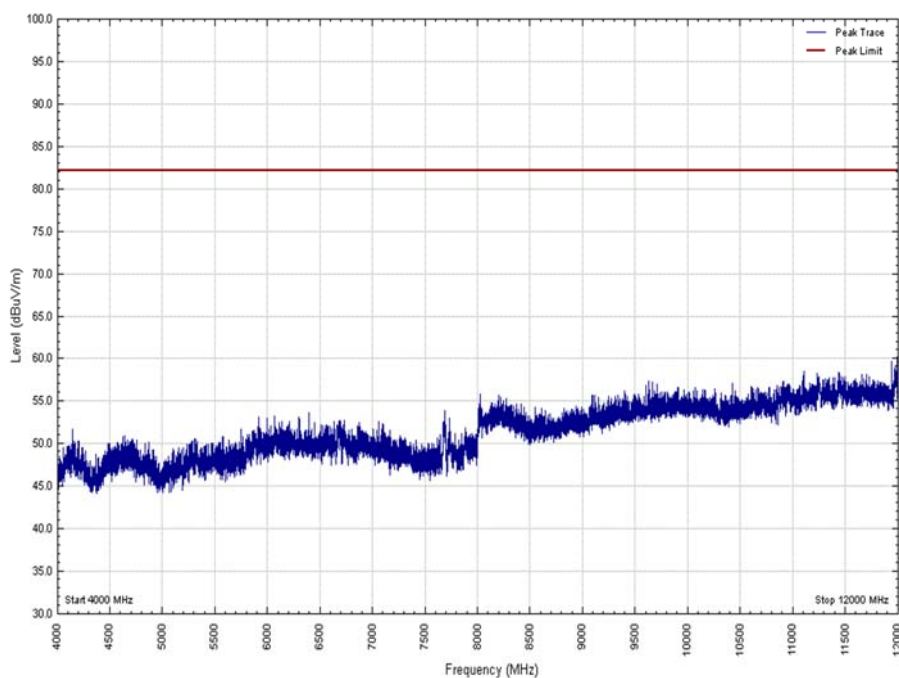
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



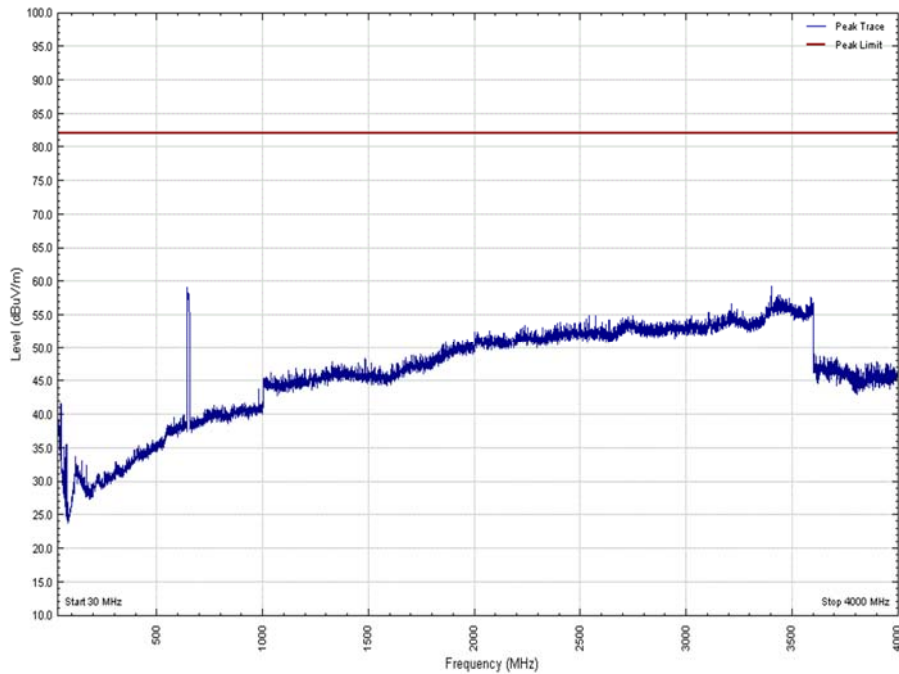
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



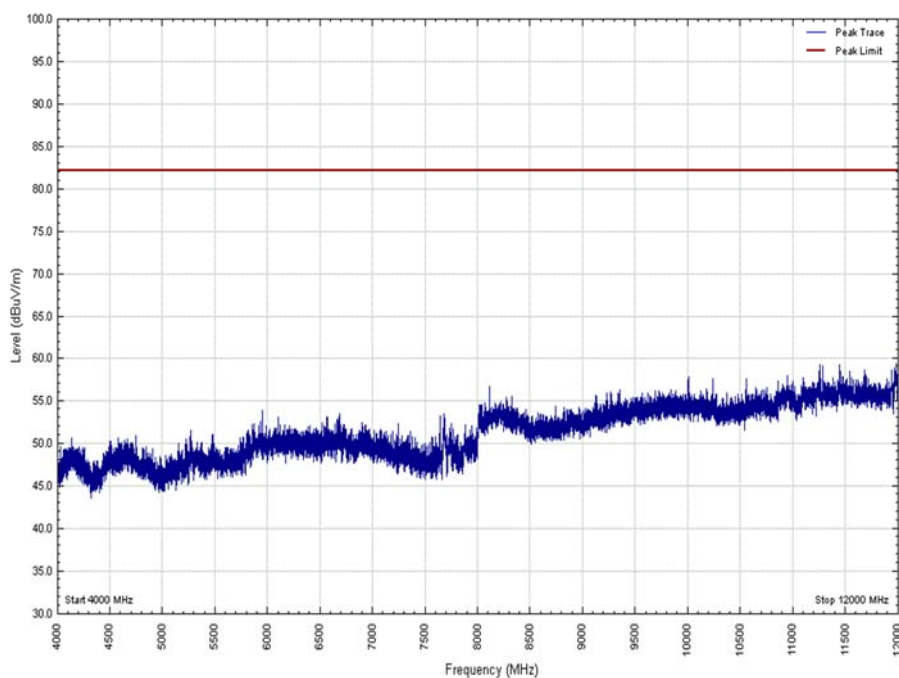
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



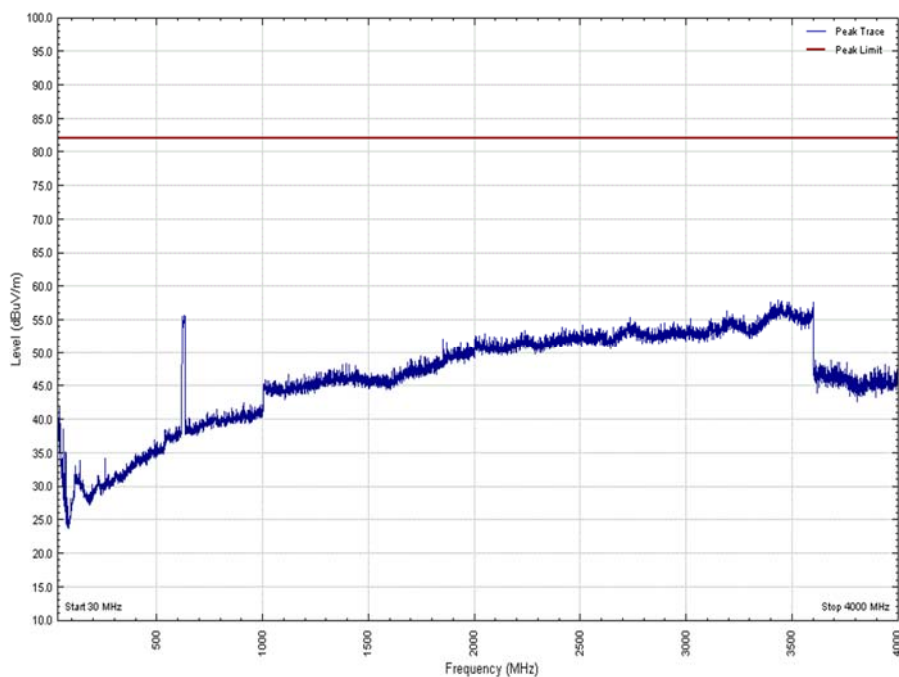
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



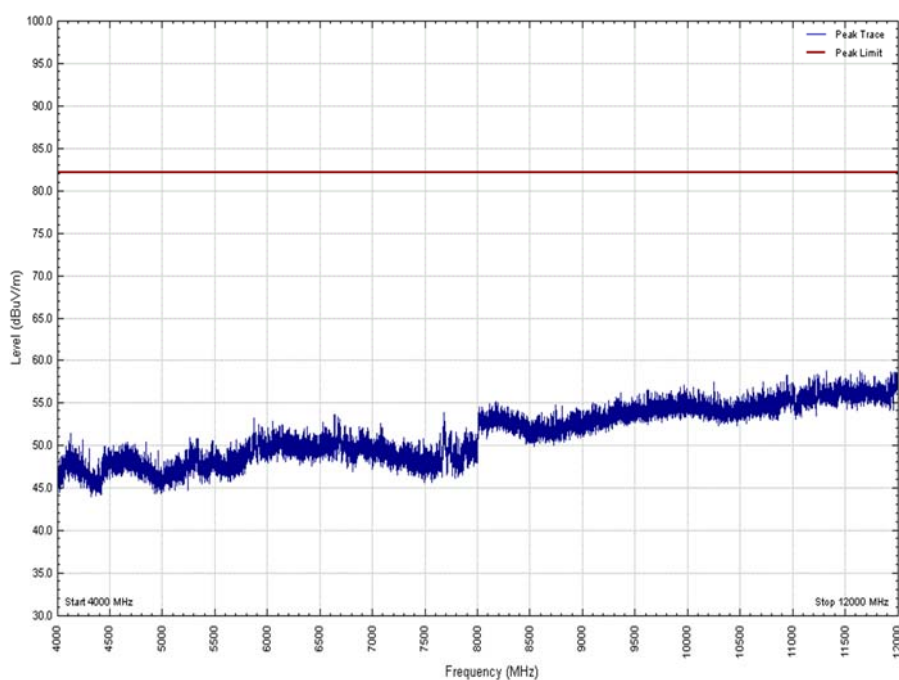
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:10.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



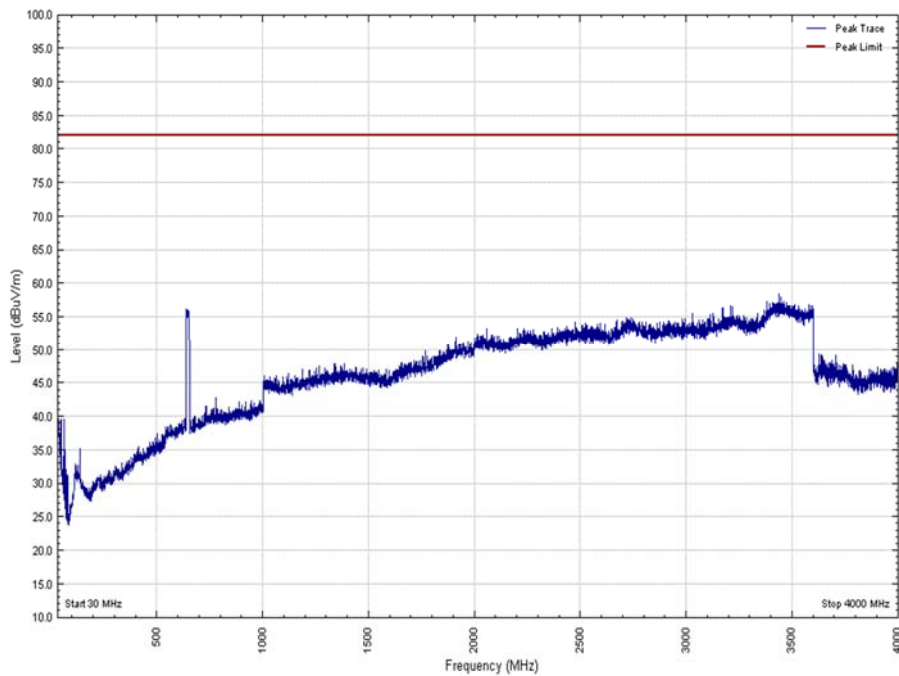
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



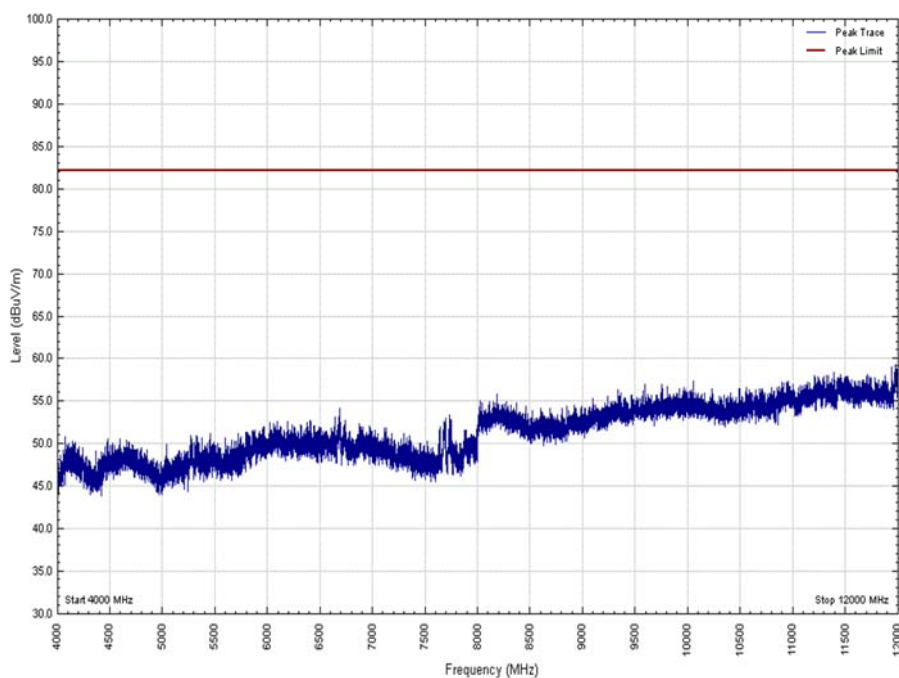
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



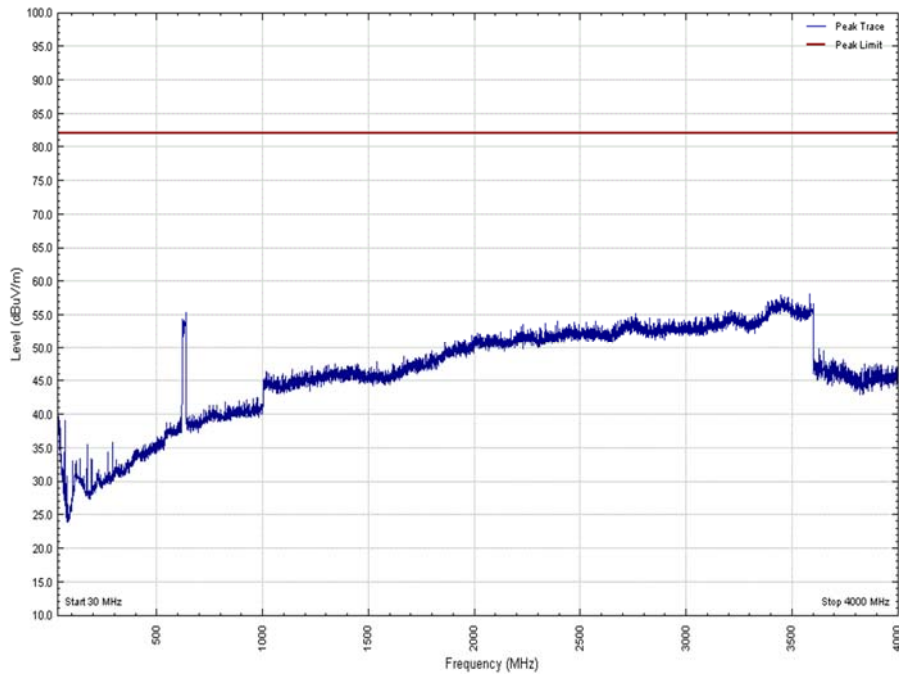
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



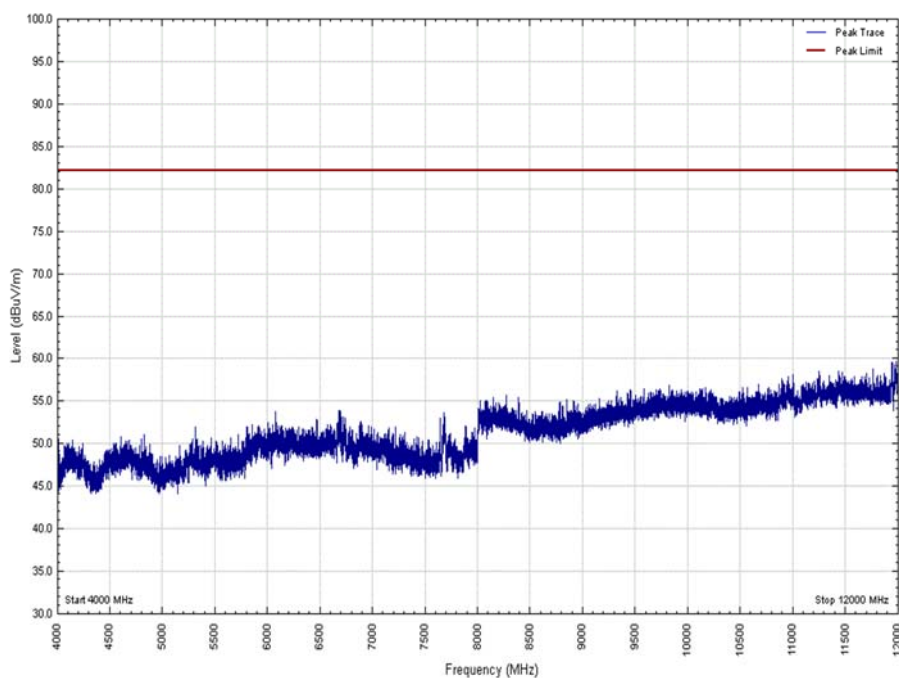
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:15.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



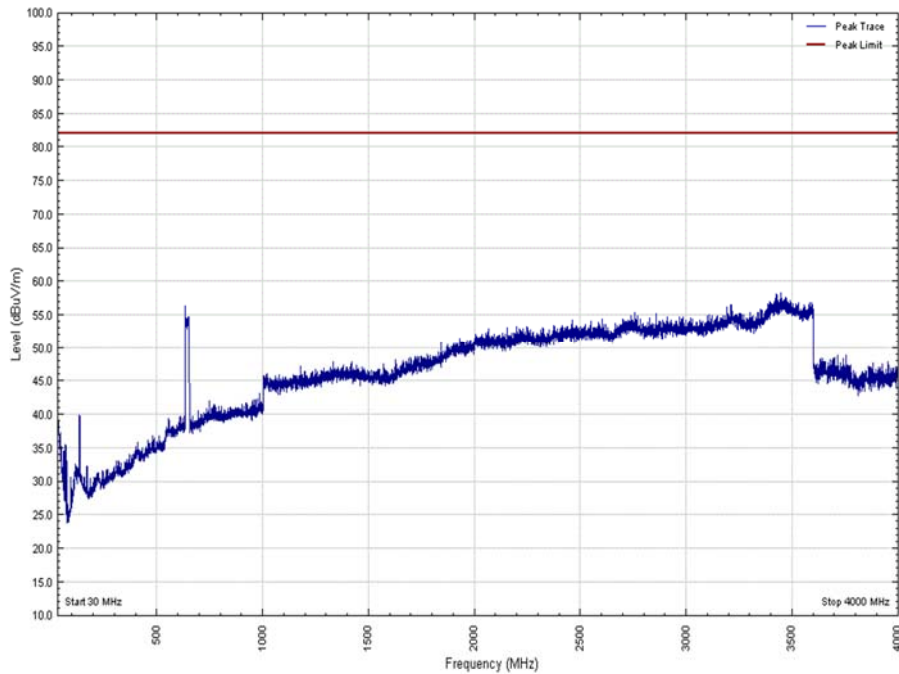
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



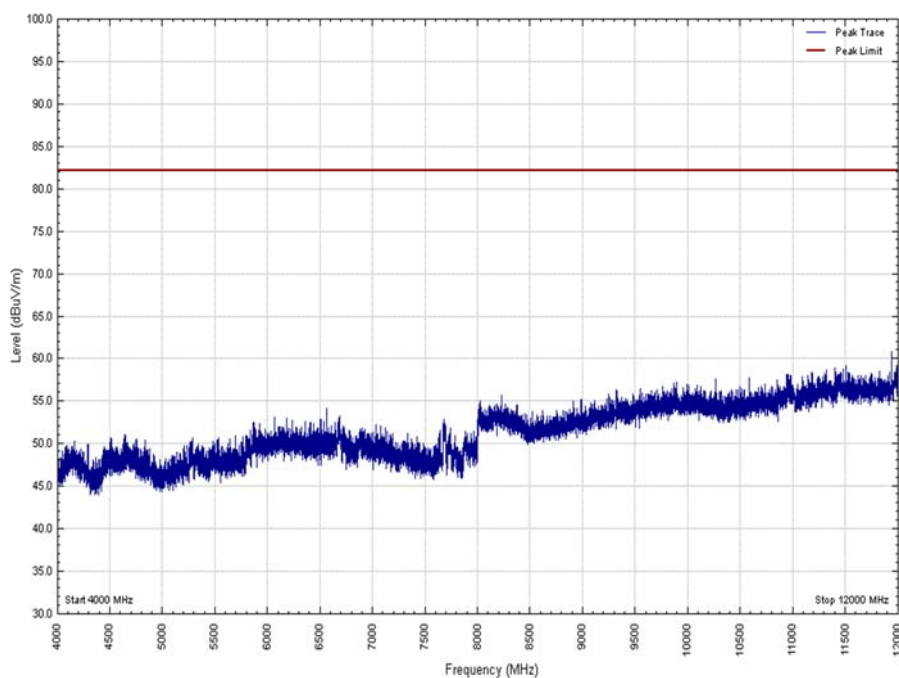
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position BRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 1 - Range 30 to
4000 MHz -Vertical



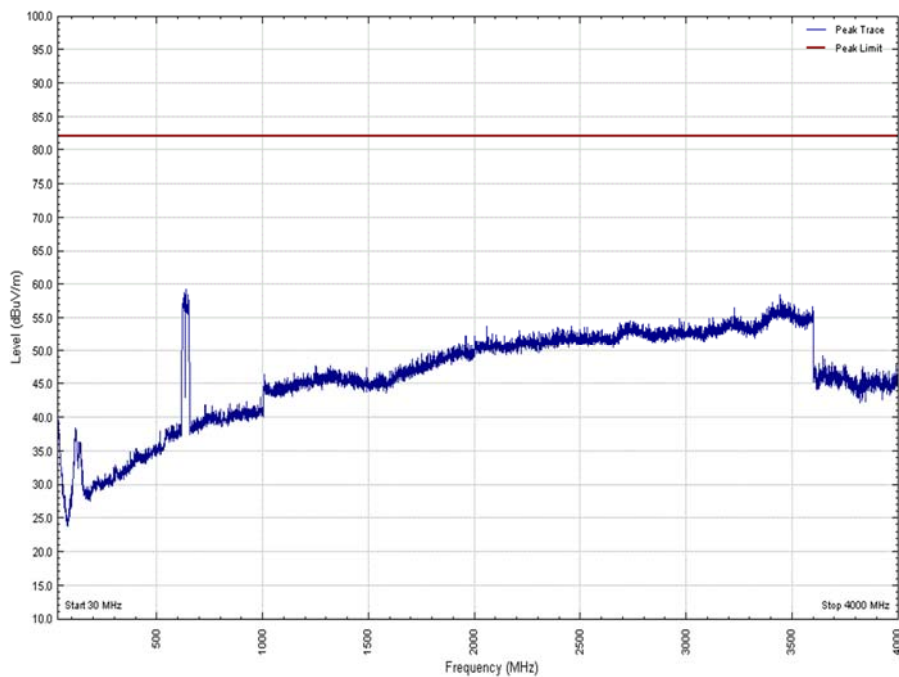
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:20.0 MHz / N:180 kHz - Channel Position TRFBW - Band 2 - Range 4000
to 12000 MHz-Vertical



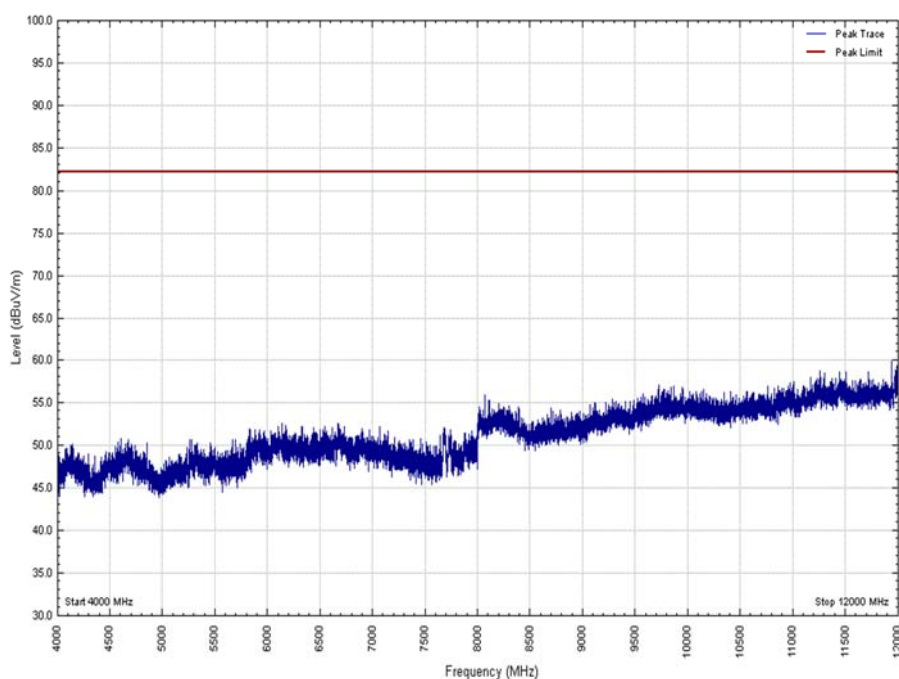
Configuration B

Maximum Output Power 46 dBm

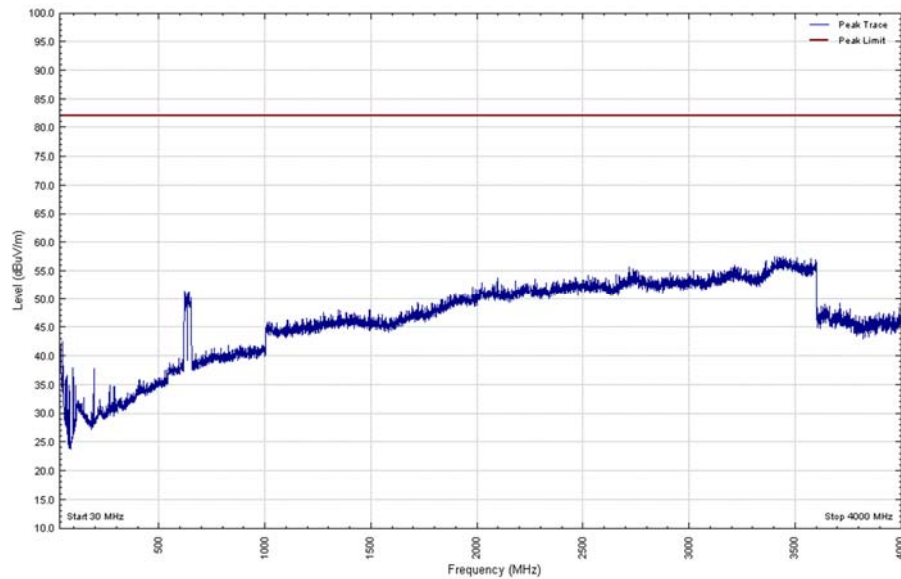
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



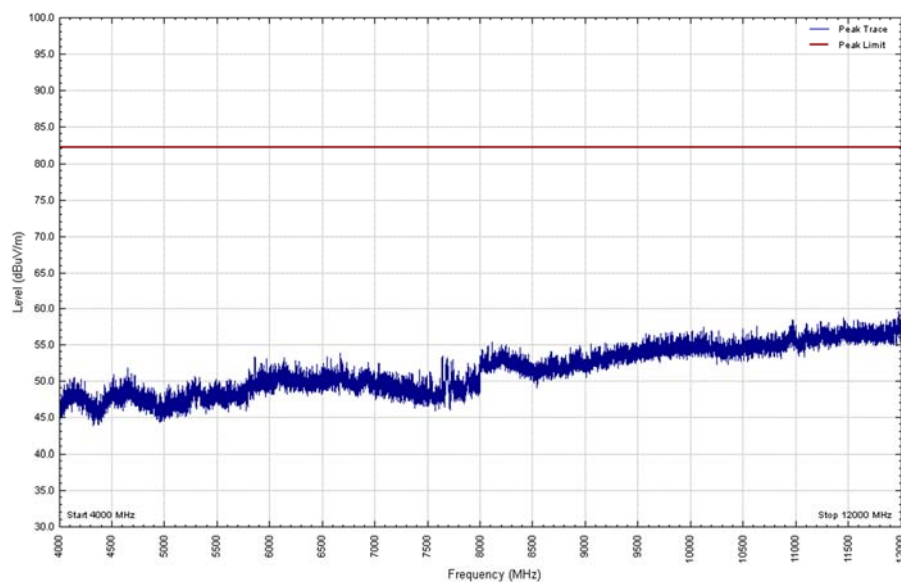
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 1 - Range 30 to
4000 MHz -Horizontal



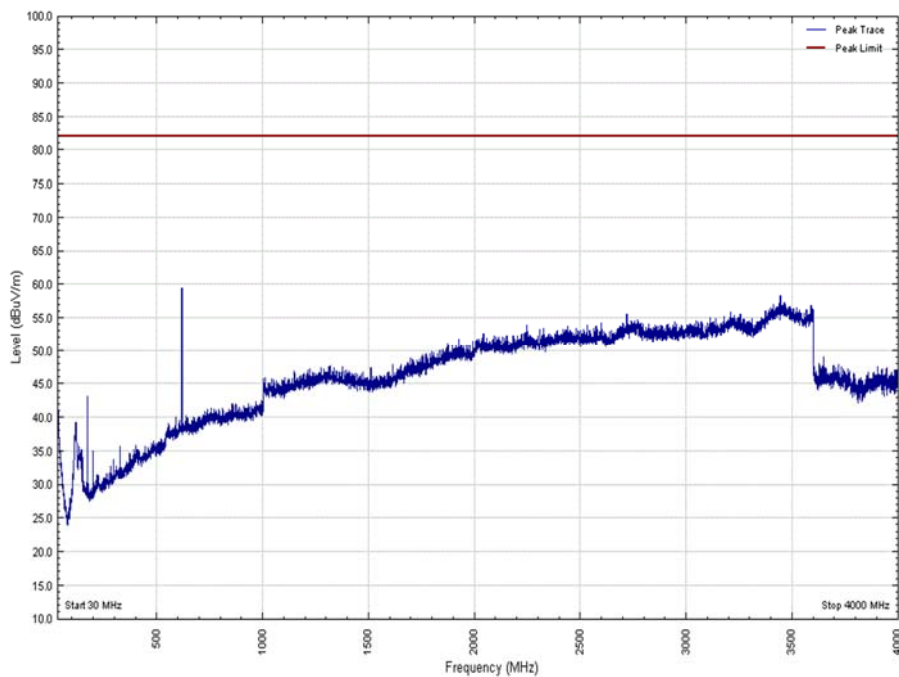
Antenna A - E-UTRA / NB-IoT GB Modulation E:64QAM / N:QPSK - E-UTRA / NB-IoT GB
Carrier Bandwidth E:35.0 MHz / N:180 kHz - Channel Position MRFBW - Band 2 - Range 4000
to 12000 MHz-Horizontal



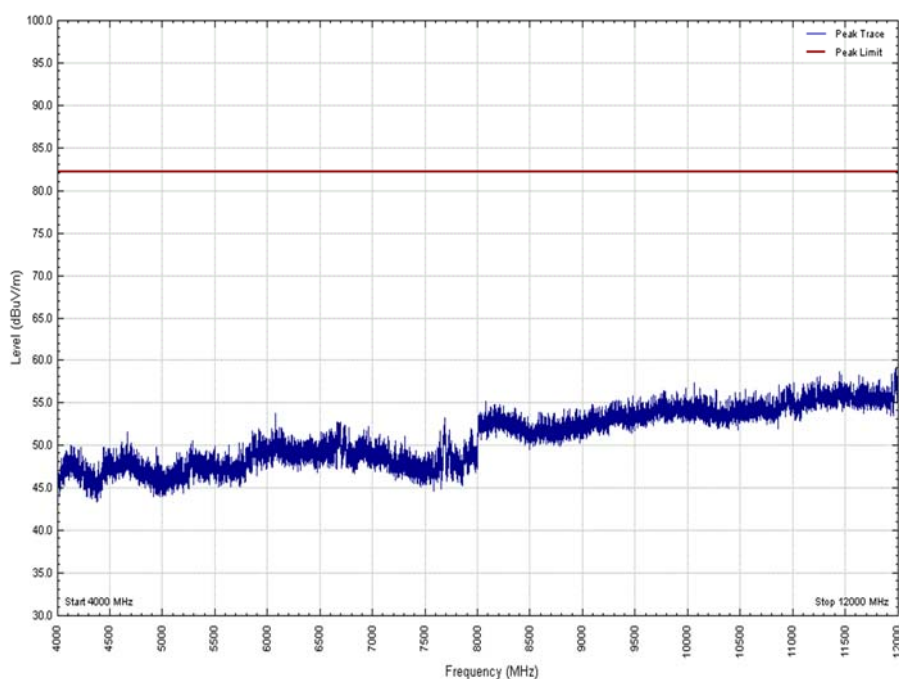
Configuration 3

Maximum Output Power 43 dBm

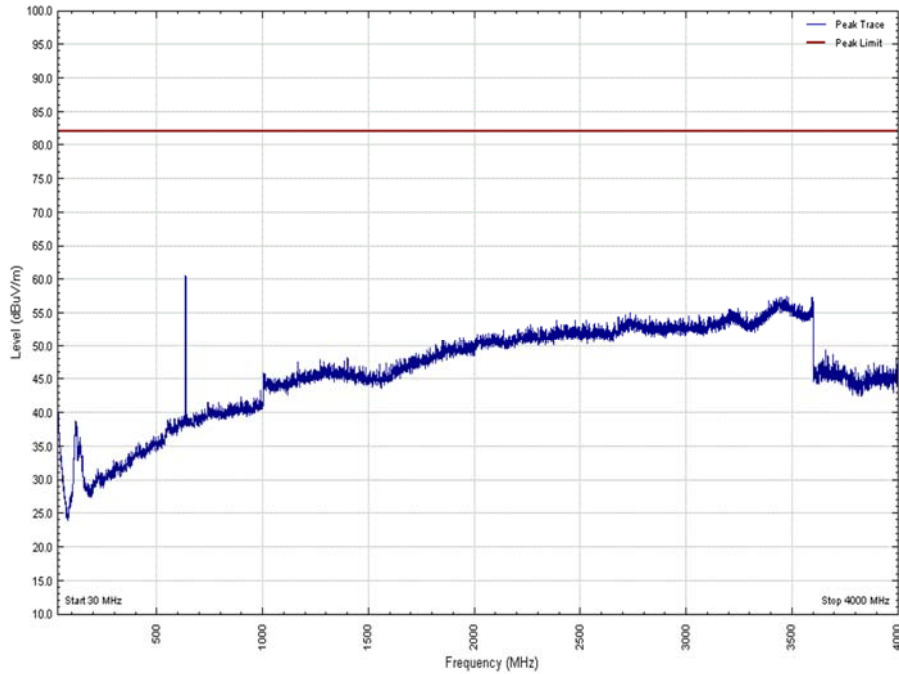
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 1 - Range 30 to 4000 MHz -Horizontal



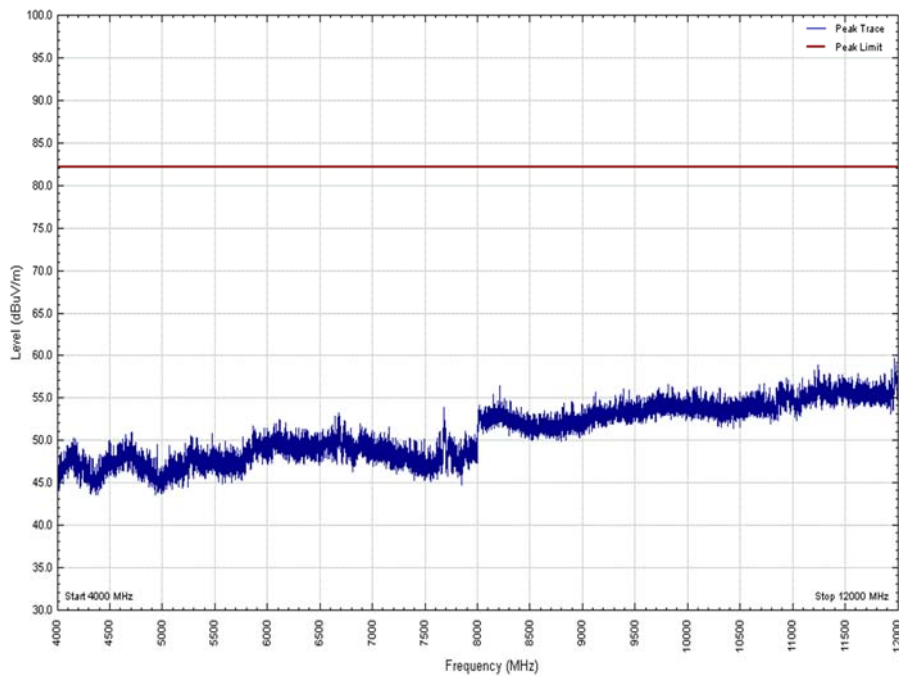
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 2 - Range 4000 to 12000 MHz-Horizontal



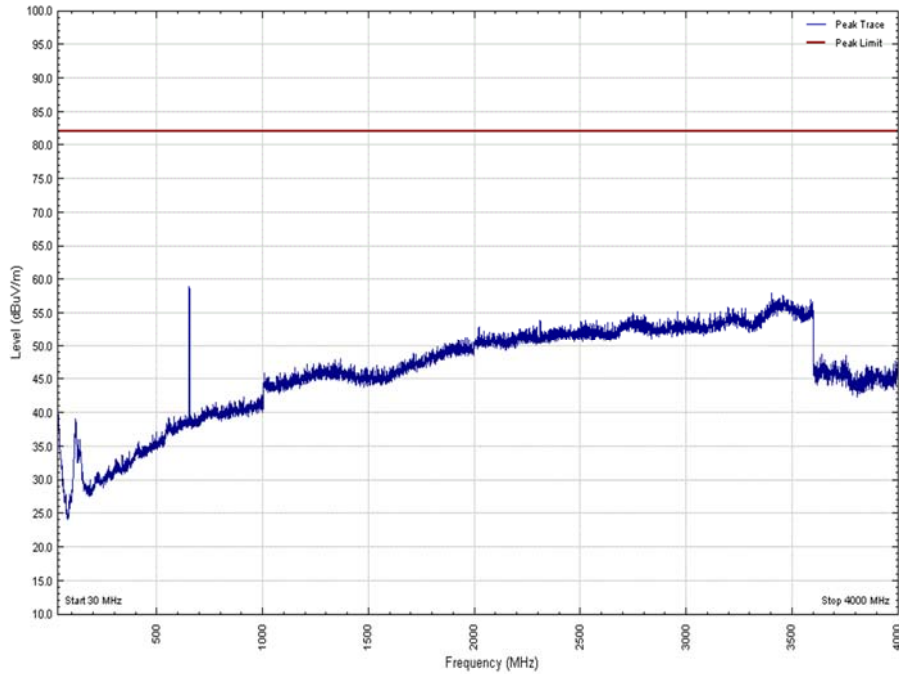
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 1 - Range 30 to 4000 MHz -Horizontal



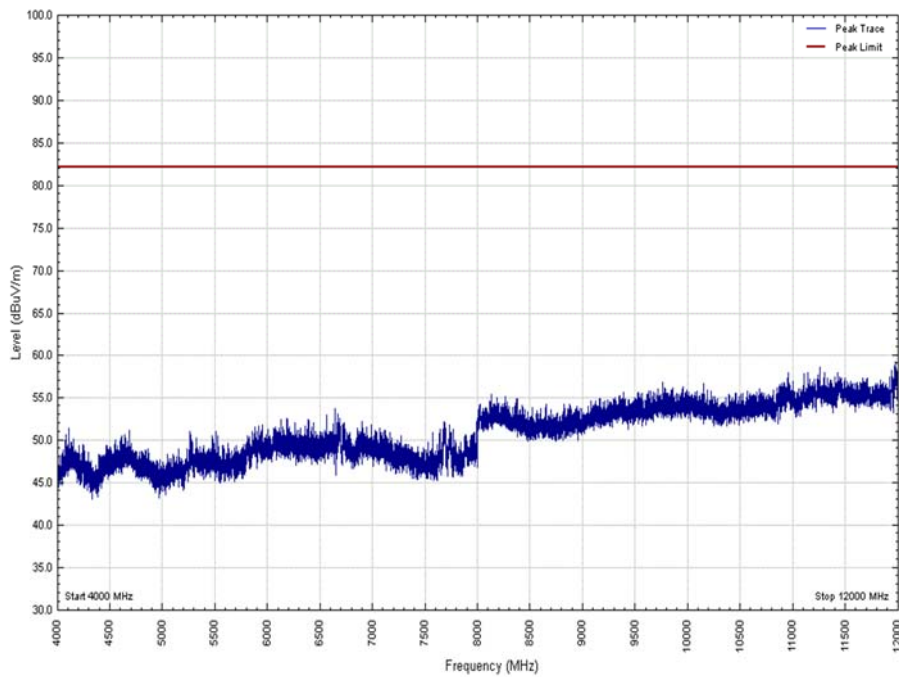
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 2 - Range 4000 to 12000 MHz-Horizontal



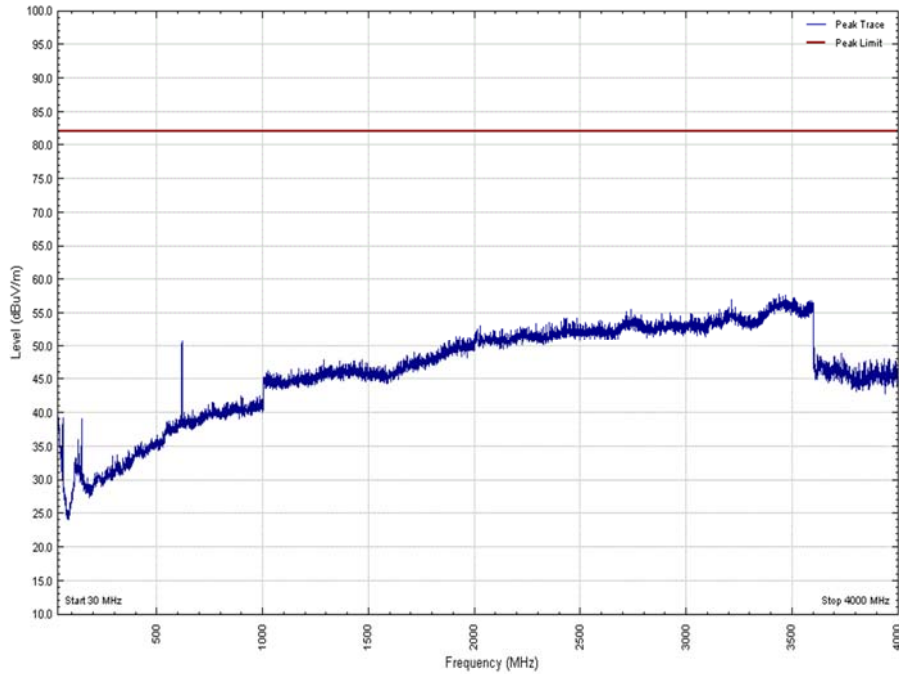
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 1 - Range 30 to 4000 MHz -Horizontal



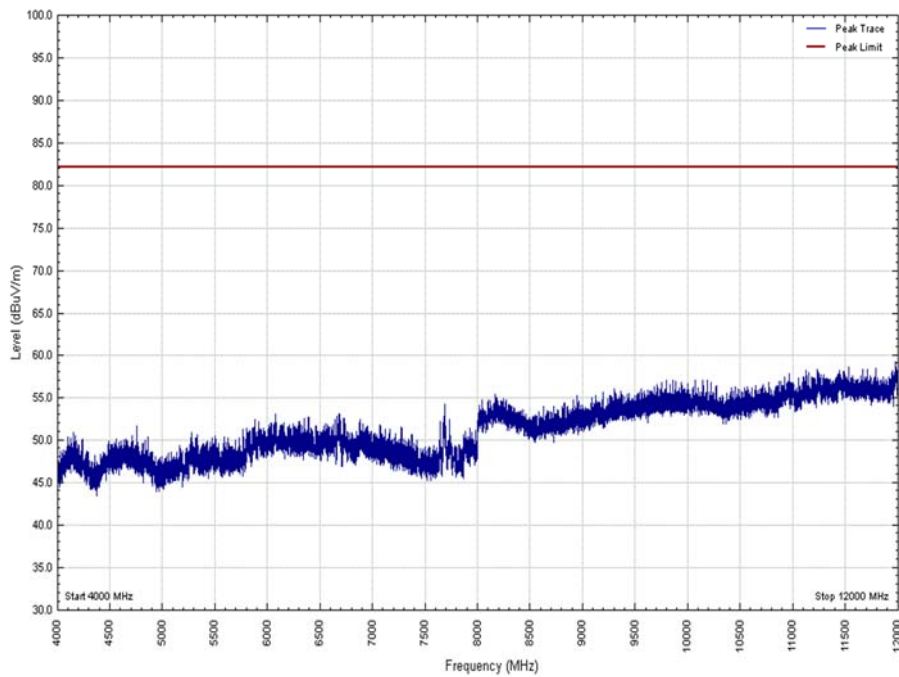
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 2 - Range 4000 to 12000 MHz-Horizontal



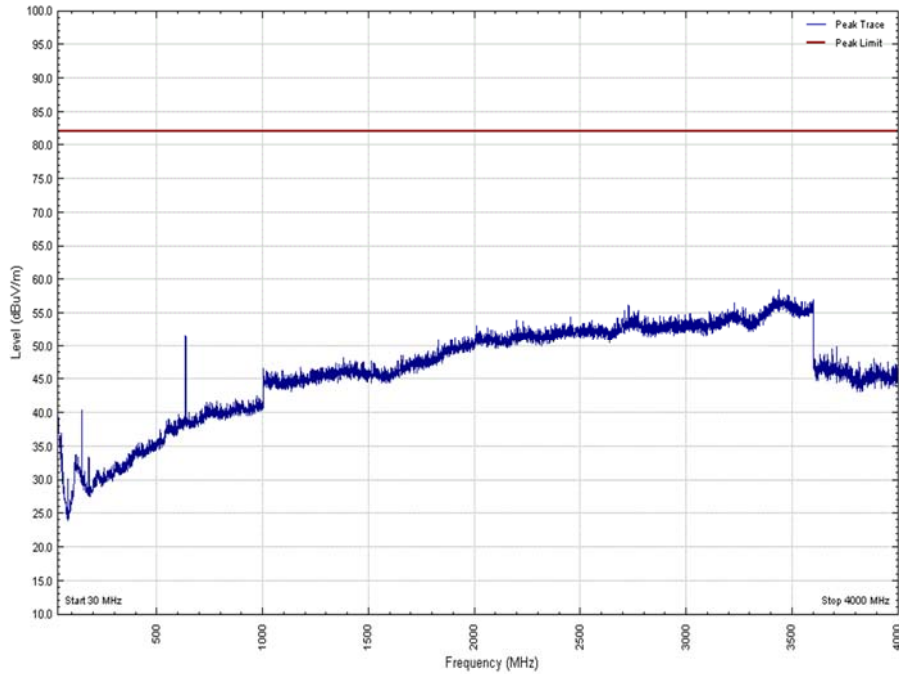
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 1 - Range 30 to 4000 MHz -Vertical



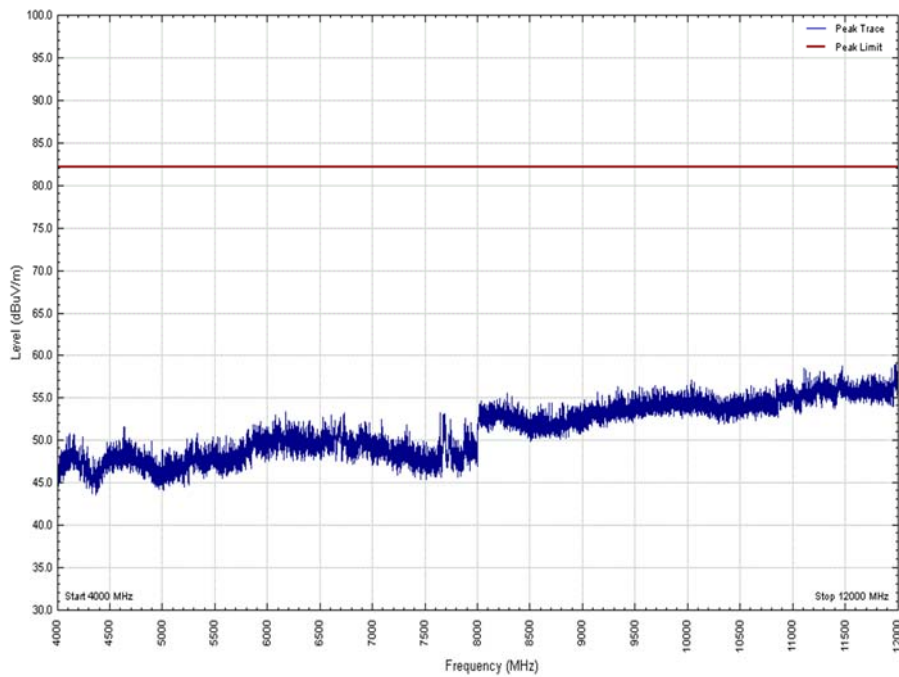
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position B - Band 2 - Range 4000 to 12000 MHz -Vertical



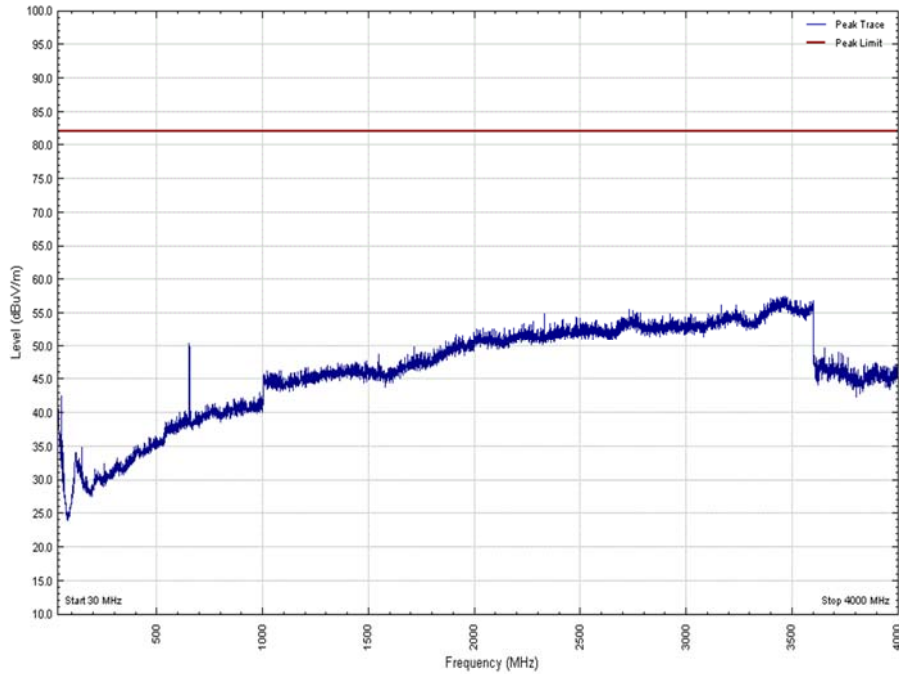
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 1 - Range 30 to 4000 MHz -Vertical



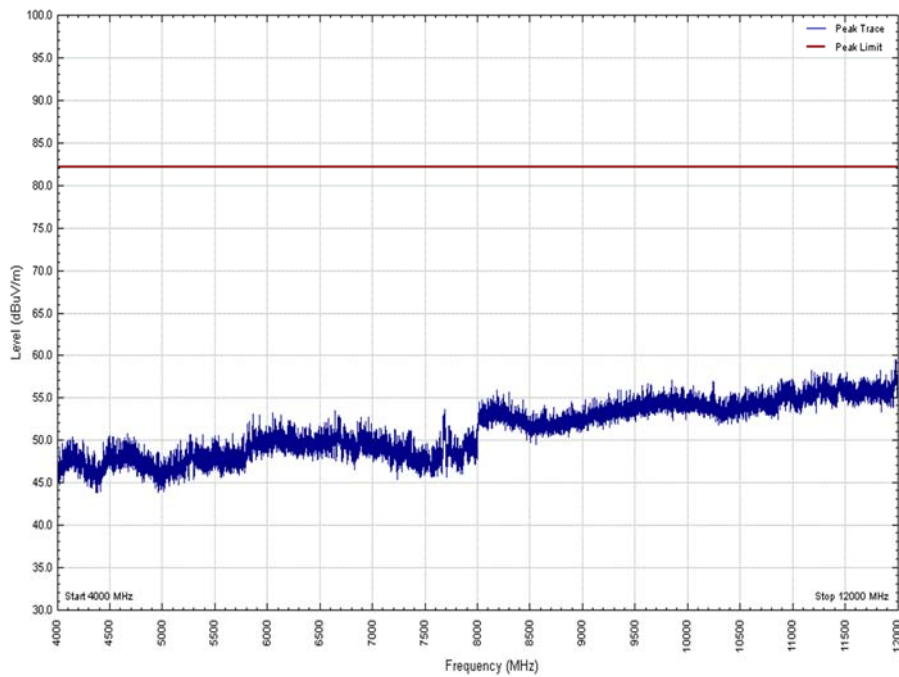
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position M - Band 2 - Range 4000 to 12000 MHz-Vertical



Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 1 - Range 30 to 4000 MHz -Vertical



Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz -
Channel Position T - Band 2 - Range 4000 to 12000 MHz-Vertical



Limit	82.2dBuV/m
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Product Service

SECTION 3

TEST EQUIPMENT USED



Product Service

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	Hygropalm	2404	12	26-Apr-2019
Analyser	Keysight	N9030A	4654	12	06-Oct-2018
Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration kit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2019
Power Supply	Farnell	H60-25	1092	-	O/P MON
DMM	White Gold	WG022	0190	12	24-Nov-2018
Occupied Bandwidth					
Hygrometer	Rotronic	Hygropalm	2404	12	26-Apr-2019
Analyser	Keysight	N9030A	4654	12	06-Oct-2018
Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration kit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2019
Power Supply	Farnell	H60-25	1092	-	O/P MON
DMM	White Gold	WG022	0190	12	24-Nov-2018
Band Edge					
Hygrometer	Rotronic	Hygropalm	2404	12	26-Apr-2019
Analyser	Keysight	N9030A	4654	12	06-Oct-2018
Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration kit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2019
Power Supply	Farnell	H60-25	1092	-	O/P MON
DMM	White Gold	WG022	0190	12	24-Nov-2018
Transmitter Spurious Emissions					
Hygrometer	Rotronic	Hygropalm	2404	12	26-Apr-2019
Analyser	Keysight	N9030A	4654	12	06-Oct-2018
Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration kit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2019
Power Supply	Farnell	H60-25	1092	-	O/P MON
DMM	White Gold	WG022	0190	12	24-Nov-2018
Transmitter Radiated Spurious Emissions					
Screened Room (5)	Rainford	Rainford	1545	36	18-Jul-2019
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2419	12	23-Nov-2018
Antenna (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	31-Aug-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811	-	TU
9m N type RF cable	Rosenberger	2303-0 9.0m PNm PNm	4827	6	04-Jan-2019
4dB Attenuator	Pasternack	PE7047-4	4935	12	28-Nov-2018

N/A – Not Applicable

O/P Mon – Output Monitored with Calibrated Equipment



Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 0.1 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 2.3 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Occupied Bandwidth	Up to 20 MHz Bandwidth	± 1.1 Hz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 dB
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

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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Product Service

ANNEX A

MODULE LIST



Product Service

Configurations A, B & C			
Product	Product No	R-State	Serial No
4478 B71	KRC161 699/1	R1F	B441125597
Software Version:	CXP9017316/7	Revision:	R71FA