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**Choose certainty.
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Report On

FCC and IC Testing of the Ericsson KRC 161 321/2 (RRUS 12 B5) LTE (850 MHz) Base Station in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 22, Industry Canada RSS-GEN and Industry Canada RSS-132

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161321-2
IC: 287AB-AS1613212

PREPARED BY

Natalie Bennett
Project Manager (RF
and Telecom)

APPROVED BY

Steve Scarfe
Authorised Signatory

DATED

08 January 2019

Document 75943170 Report 15 Issue 1

January 2019



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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 & Product Number | RRUS 12 B5 - KRC 161 321/2 |
| IC Model Name | AS1613212 |
| Serial Number(s) | C827002293 |
| Software Version | CXP9013268/9_ R73AM |
| Hardware Version | R1B |
| Test Specification/Issue/Date | FCC CFR 47 Part 2: 2017 FCC CFR 47 Part 22: 2017 Industry Canada RSS-GEN: Issue 5: 2018 Industry Canada RSS-132: Issue 3: 2013 |
| Start of Test | 01 October 2018 |
| Finish of Test | 31 October 2018 |
| Name of Engineer(s) | Neil Rousell and Graeme Lawler |
| Related Document(s) | KDB 971168 D01 v02r02 KDB 662911 D01 v02r01 |

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47 Part 2, FCC CFR 47 Part 22, Industry Canada RSS-GEN and Industry Canada RSS-132. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Neil Rousell

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

| Section | Specification Clause | | | | Test Description | Result |
|---------|----------------------|--------------------|---------|---------|---|--------|
| | FCC CFR 47 Part 2 | FCC CFR 47 Part 22 | RSS-GEN | RSS-132 | | |
| 2.1 | 2.1046 | 22.913 (a) | - | 6.4 | Maximum Peak Output Power and Peak to Average Ratio - Conducted | Pass |
| 2.2 | 2.1049 | 22.917 (b) | 6.6 | - | Occupied Bandwidth | Pass |
| 2.3 | 2.1051 | 22.905 | - | 6.5 | Band Edge | Pass |
| 2.4 | 2.1051 | 22.905 | - | 6.5 | Transmitter Spurious Emissions | Pass |
| 2.5 | 2.1051 | 22.917 | - | 6.5 | Radiated Emissions | Pass |

Measurement Uncertainty Decision Statement

Determination of conformity with the specification limits is based on the results of the compliance measurement and does not take into account measurement instrumentation uncertainty as defined in ANSI C63.26:2015 Clause 1.3.



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 | 874.0 | - | 889.0 |
| B | NB IoT SA | 1 | 0.18 MHz | 869.2 | 881.5 | 893.8 |



Product Service

1.4 DECLARATION OF BUILD STATUS

| | |
|--|---|
| MAIN EUT | |
| MANUFACTURING DESCRIPTION | Radio Unit |
| MANUFACTURER | Ericsson AB |
| PRODUCT NAME | RRUS 12 B5 |
| PART NUMBER | KRC 161 321/2 |
| IC Model Name | AS1613212 |
| SERIAL NUMBER | C827002293 |
| HARDWARE VERSION | R1B |
| SOFTWARE VERSION | CXP9013268_9 R73AM |
| TRANSMITTER OPERATING RANGE | 869 - 894 MHz |
| MODULATIONS | GSM: GMSK, 8PSK, 16QAM, 32QAM, AQPSK WCDMA and LTE: QPSK, 16QAM and 64QAM, + 256QAM LTE CDMA: QPSK, 8PSK and 16QAM |
| ITU DESIGNATION OF EMISSION | GSM: 250KGXW GSM: 250KG7W CDMA: 1M25F9W WCDMA: 4M18F9W 1,4 MHz BW channel: 1M40F9W 3 MHz BW channel: 3M00F9W 5 MHz BW channel: 5M00F9W 10 MHz BW channel ¹ : 9M41F9W NB-IoT SA 180 kHz BW channel: 224KW7D |
| OUTPUT POWER (RMS) (W or dBm) | 2 ports, 60 W ¹ per port NB-IoT SA 1 x 20W (per port) |
| FCC ID | TA8AKRC161321-2 |
| IC ID | 287AB-AS1613212 |
| TECHNICAL DESCRIPTION (a brief description of the intended use and operation) | Base station radio |

¹Including 2 NB-IoT GB carriers.

Signature

Audun B Helle

Audun Helle

Date

2018-11-30

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

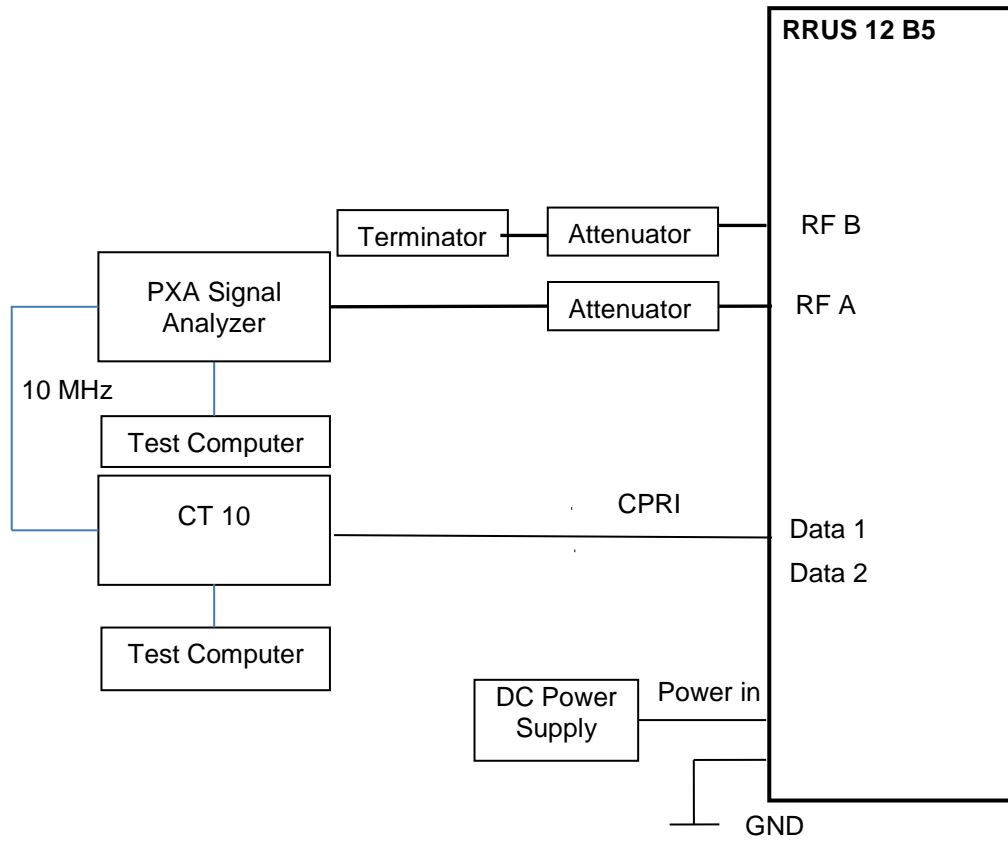
The Equipment Under Test (EUT) RRUS 12 B5 - KRC 161 321/2 is an Ericsson AB Radio Unit working in the public mobile service 850 MHz band which provides communication connections to 850 MHz network. The RRUS 12 B5 - KRC 161 321/2 operates from a -48V DC supply.

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

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.8 DEVIATION FROM THE STANDARD

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

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.10 TEST LOCATION

TÜV SÜD Product Service conducted the following tests at our 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 |
| Radiated Emissions | Graeme Lawler |

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom



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 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 6.4

2.1.2 Date of Test and Modification State

31 October 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 23.3°C
Relative Humidity 34.6%

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

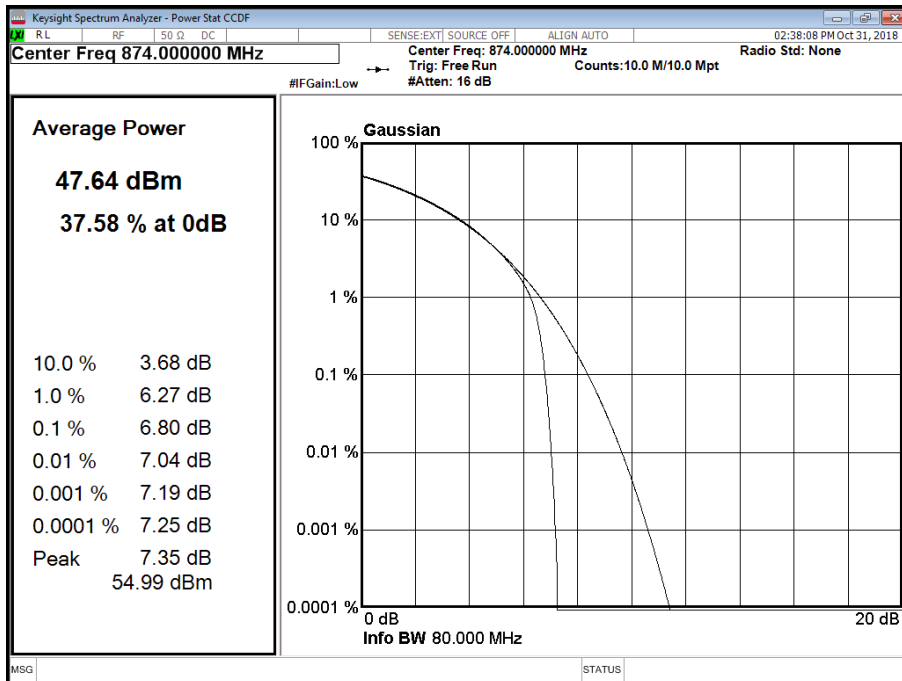
Maximum Output Power 47.8 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Peak to Average Ratio (PAR) / Output Power | | |
|---------|----------------|-----------------------|--|---------------|---|
| | | | Channel Position B | | |
| | | | PAR (dB) | Average Power | |
| dBm | dBm/MHz | | | | |
| A | 64QAM | 10.0 MHz | 6.80 | 47.74 | - |



Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B





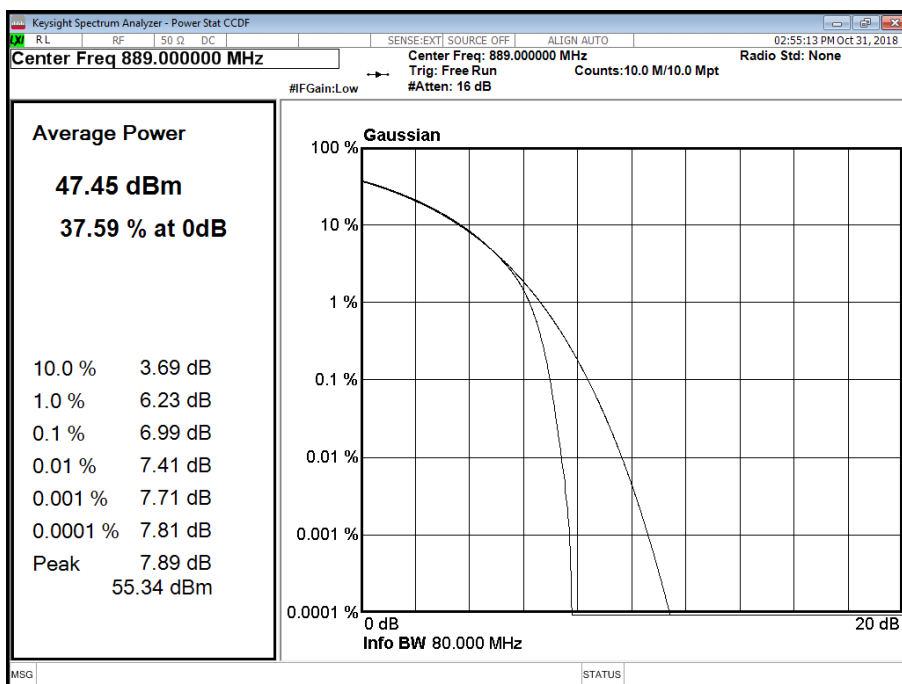
Product Service

Configuration A

Maximum Output Power 47.8 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Peak to Average Ratio (PAR) / Output Power | | |
|---------|----------------|-----------------------|--|---------------|---|
| | | | Channel Position T | | |
| | | | PAR (dB) | Average Power | |
| dBm | dBm/MHz | | | | |
| A | 64QAM | 10.0 MHz | 6.99 | 47.48 | - |

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T





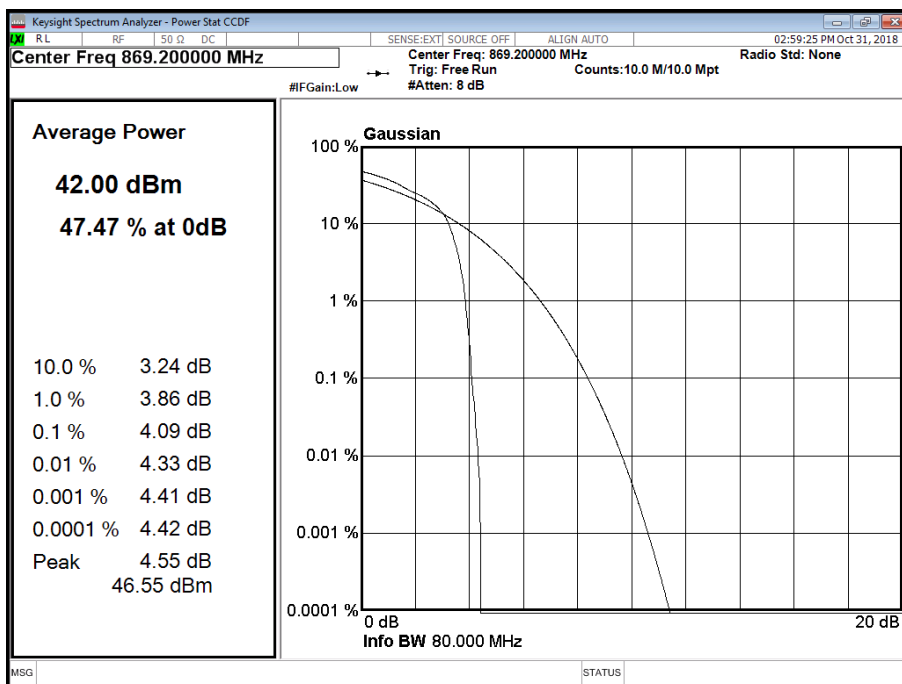
Product Service

Configuration B

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 | 4.09 | 42.05 | |

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





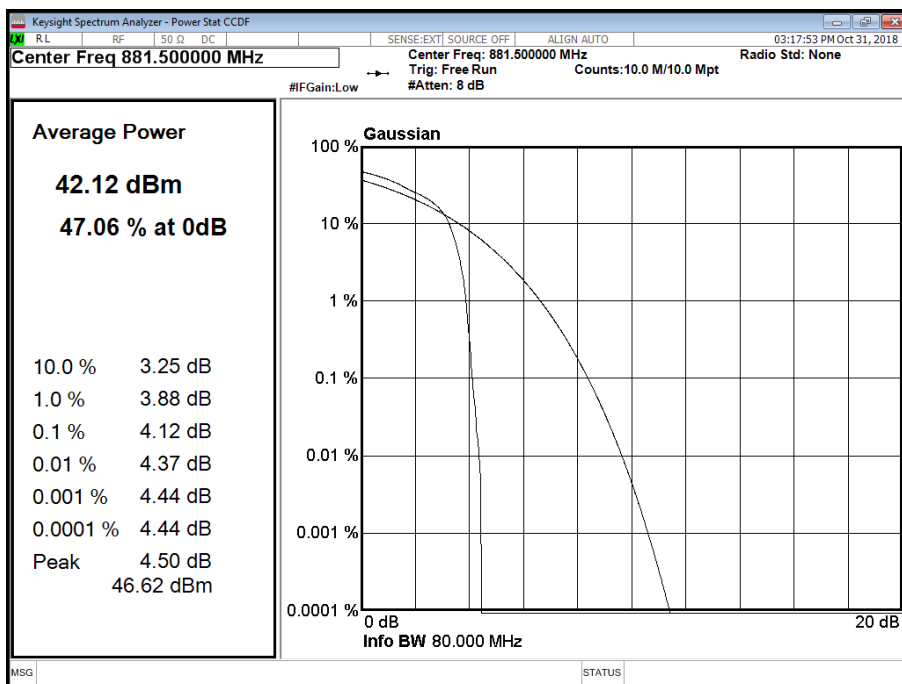
Product Service

Configuration B

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 | 4.12 | 42.20 | |

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





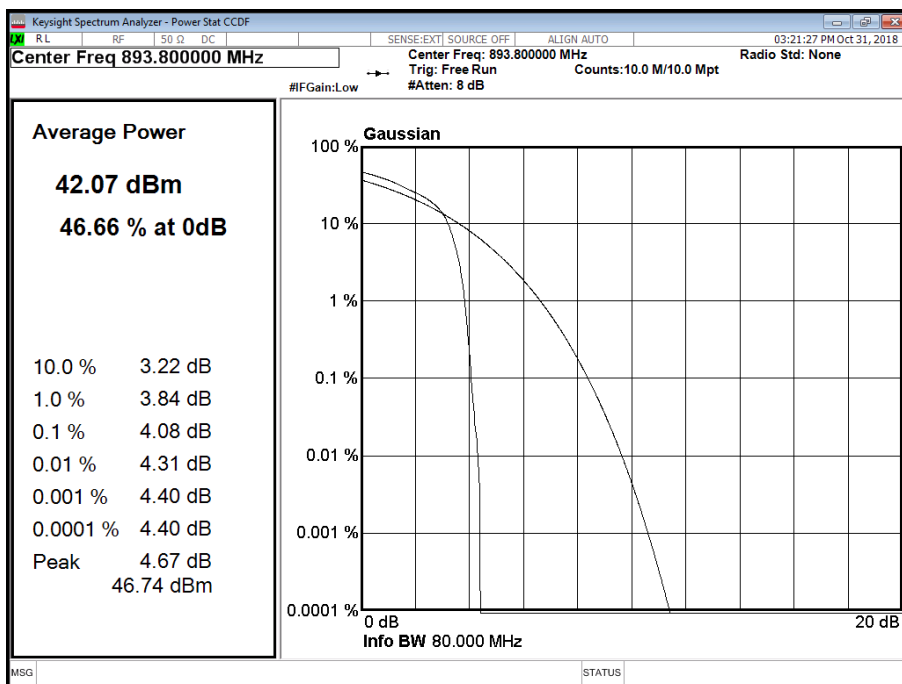
Product Service

Configuration B

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 | 4.08 | 42.15 | |

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

2.2.2 Date of Test and Modification State

31 October 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 23.3°C
Relative Humidity 34.6%

2.2.5 Test Method

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

2.2.6 Test Results

Configuration A

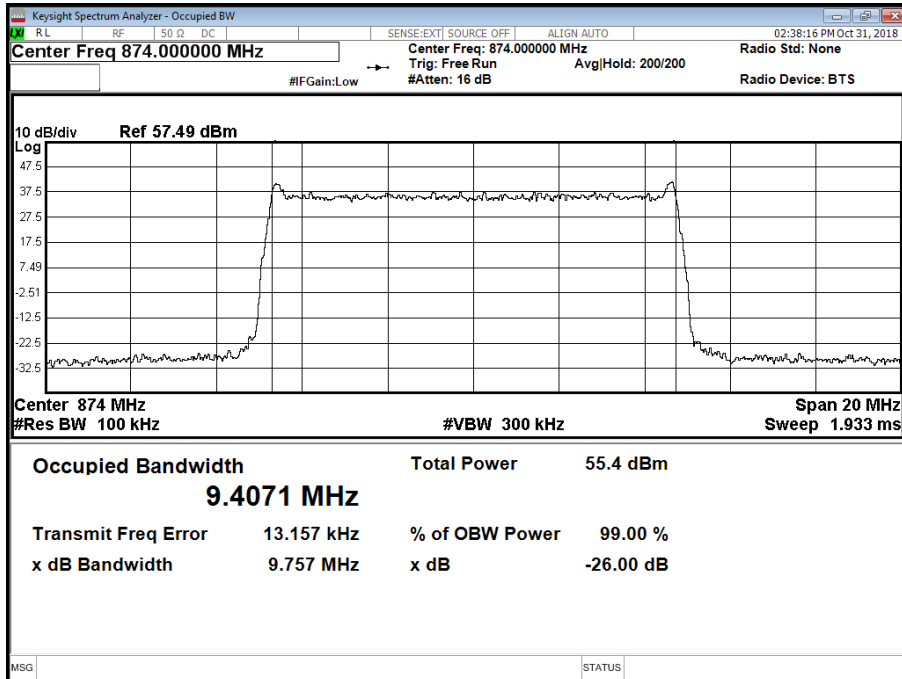
Maximum Output Power 47.8 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Result (KHz) | | | | | |
|---------|----------------|-----------------------|--------------------|------------------|--------------------|------------------|--------------------|------------------|
| | | | Channel Position B | | Channel Position M | | Channel Position T | |
| | | | Occupied Bandwidth | -26 dB Bandwidth | Occupied Bandwidth | -26 dB Bandwidth | Occupied Bandwidth | -26 dB Bandwidth |
| A | 64QAM | 10.0 MHz | 9,407.10 | 9,756.52 | - | - | 9,401.22 | 9,765.40 |

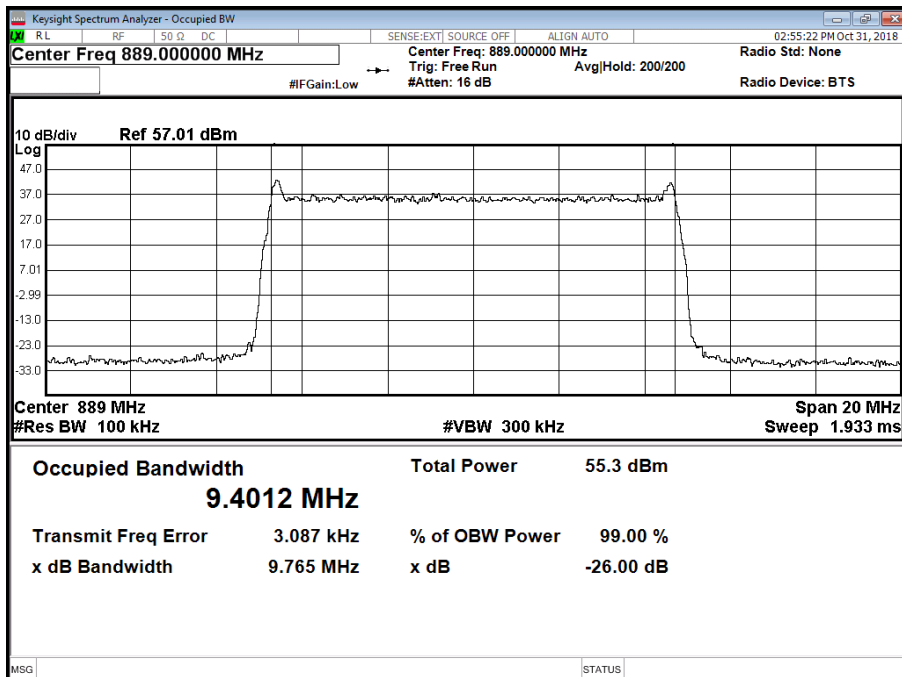


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T





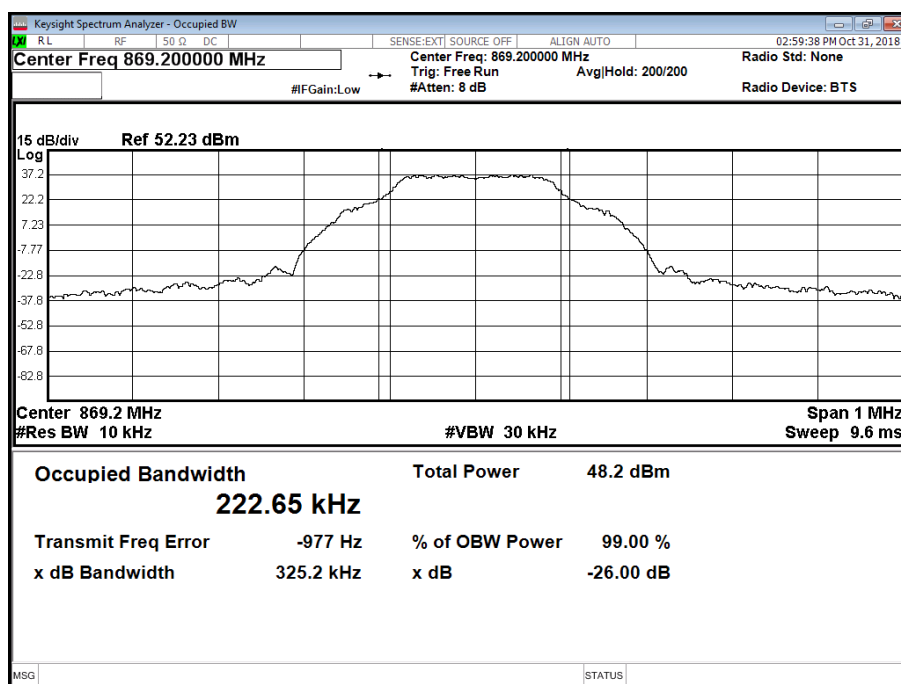
Product Service

Configuration B

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 | 222.65 | 325.23 | 222.29 | 323.30 | 223.02 | 323.85 |

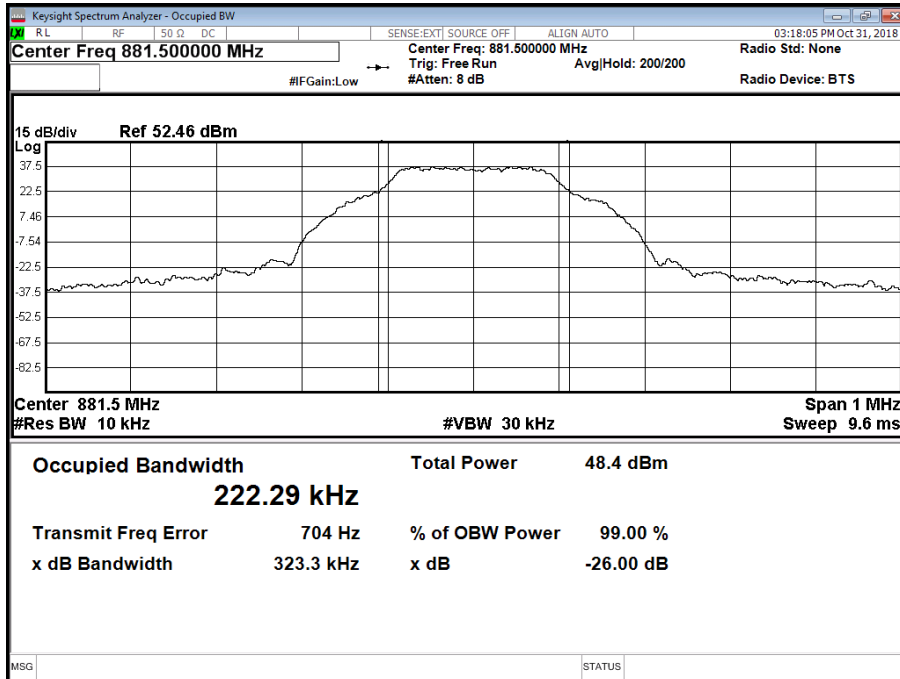
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B



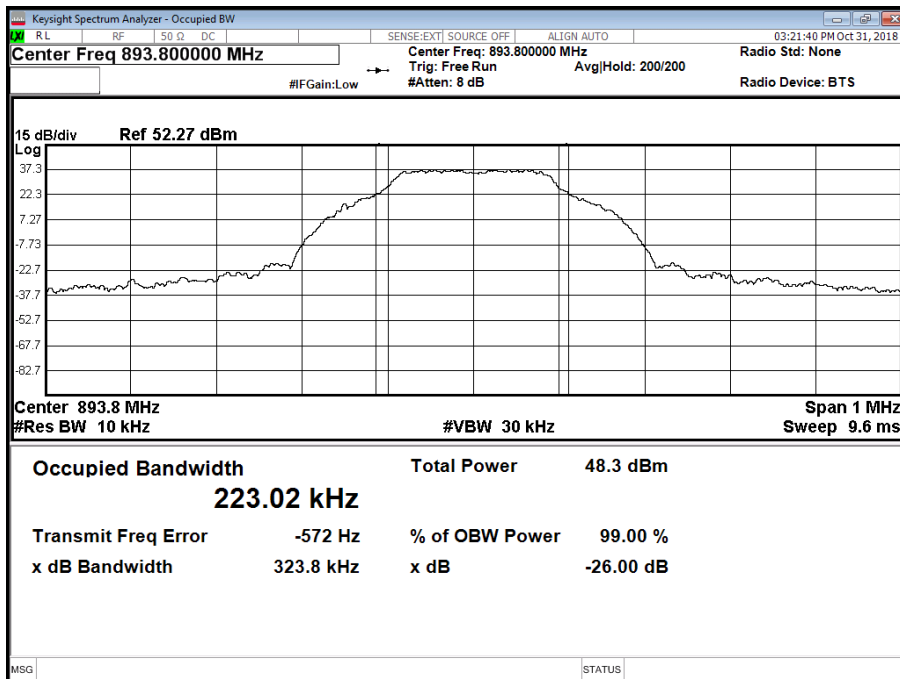


Product Service

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 22, Clause 22.905
Industry Canada RSS-132, Clause 6.5

2.3.2 Date of Test and Modification State

31 October 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 23.3°C
Relative Humidity 34.6%

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 $10 * \text{Log}(N)$, where N is equal to the number of MIMO antenna ports.

For single carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \text{Log}(4) = -19 \text{ dBm}$.

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

2.3.6 Test Results

Configuration A

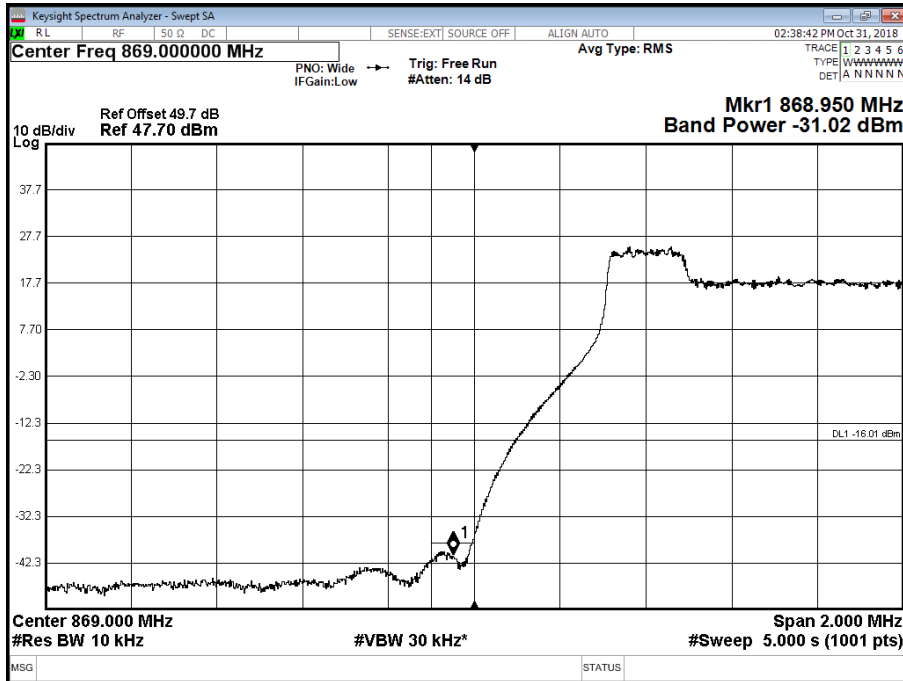
Maximum Output Power 47.8 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Band Edge (MHz) | |
|---------|----------------|-----------------------|--------------------|--------------------|
| | | | Channel Position B | Channel Position T |
| A | 64QAM | 10.0 MHz | 874.0 | 889.0 |

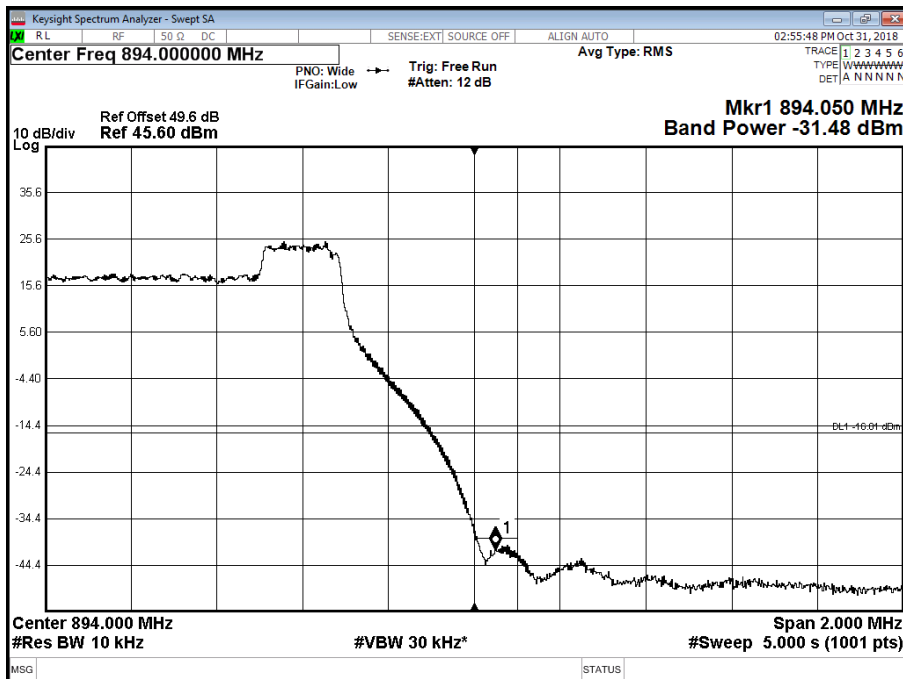


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T





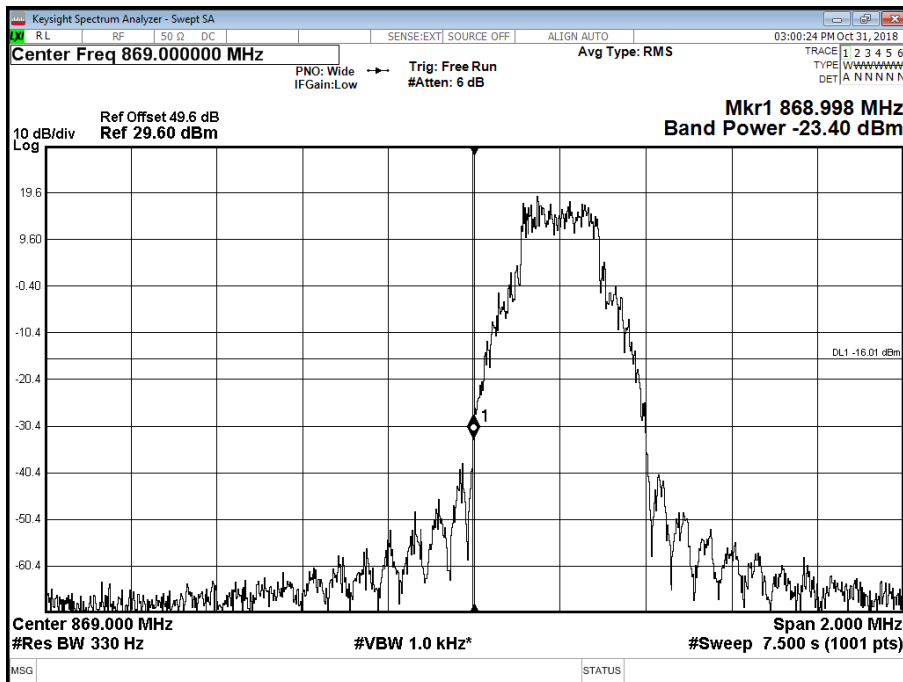
Product Service

Configuration B

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 | 869.2 | 893.8 |

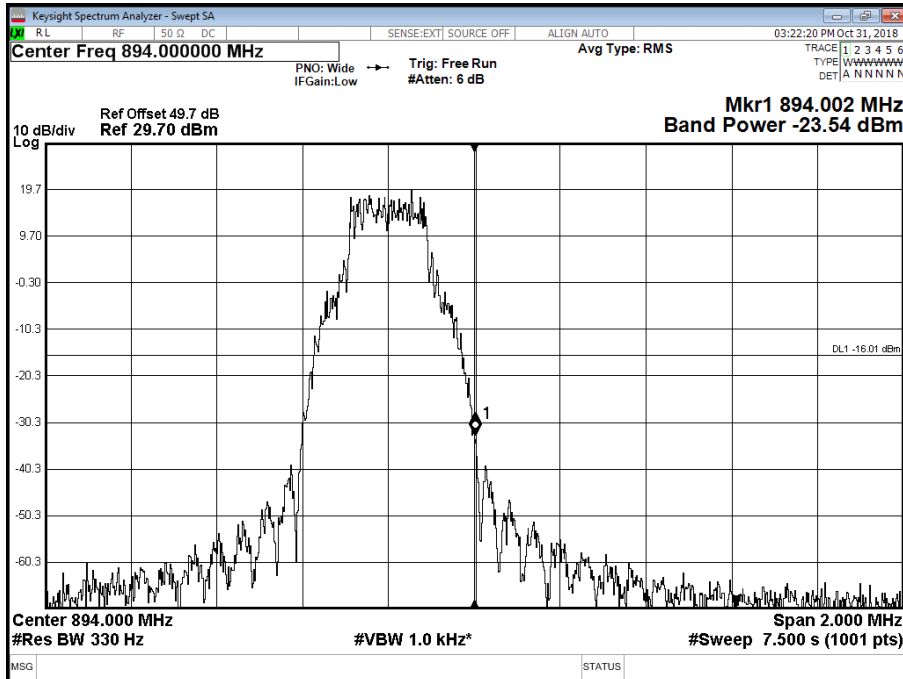
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B





Product Service

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



| | |
|-------|---------|
| Limit | -16 dBm |
|-------|---------|



Product Service

2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

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

2.4.2 Date of Test and Modification State

31 October 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 | 23.3°C |
| Relative Humidity | 34.6% |

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 $10 * \text{Log}(N)$, where N is equal to the number of MIMO antenna ports.

For single carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \text{Log}(4) = -19 \text{ dBm}$.

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



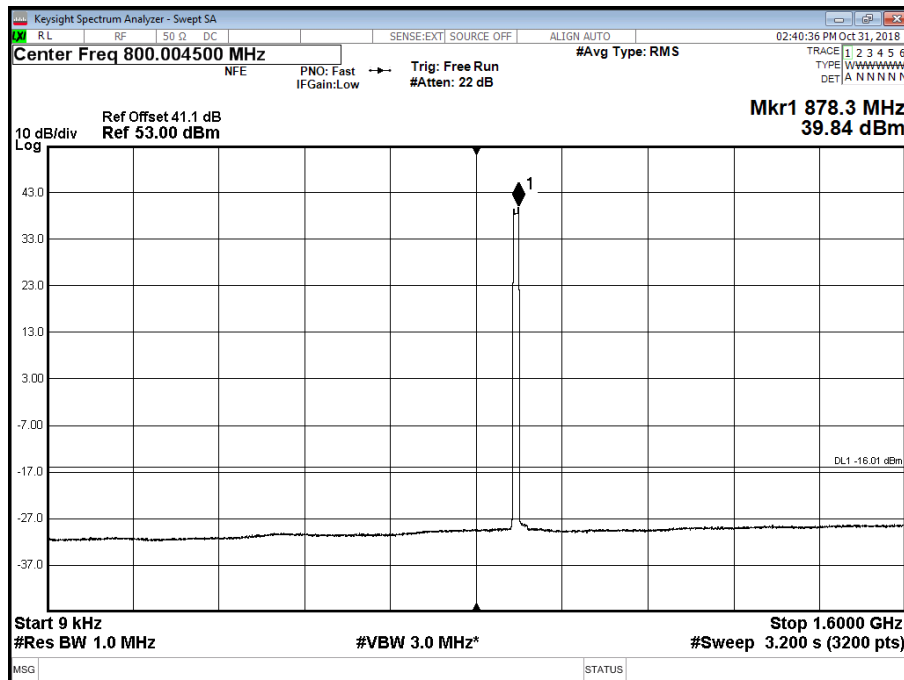
Product Service

2.4.6 Test Results

Configuration A

Maximum Output Power 47.8 dBm

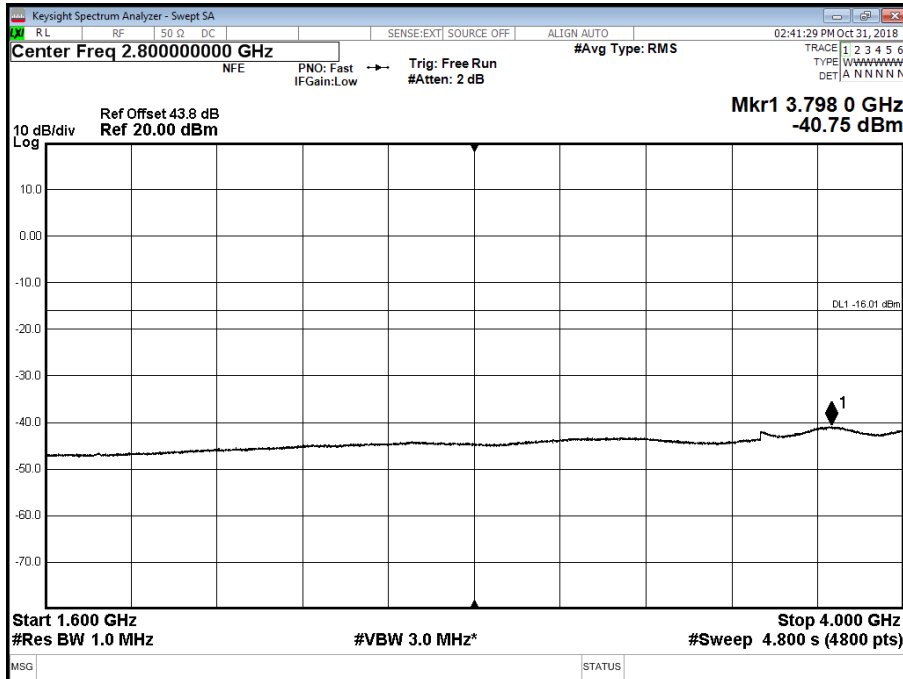
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 1 - Range 0.009 to 1600 MHz



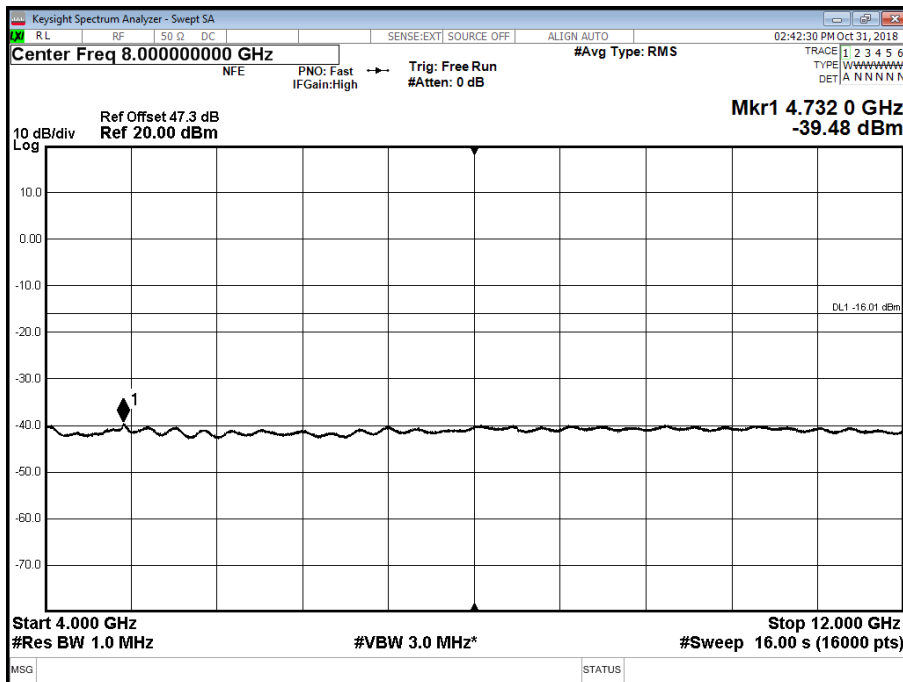


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 2 - Range 1600 to 4000 MHz



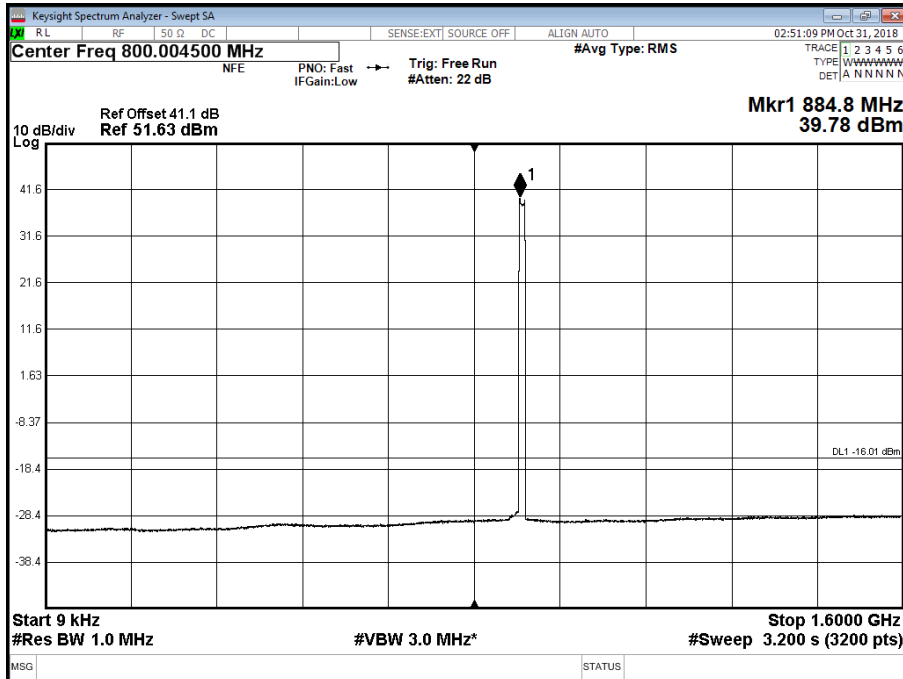
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 3 - Range 4000 to 12000 MHz



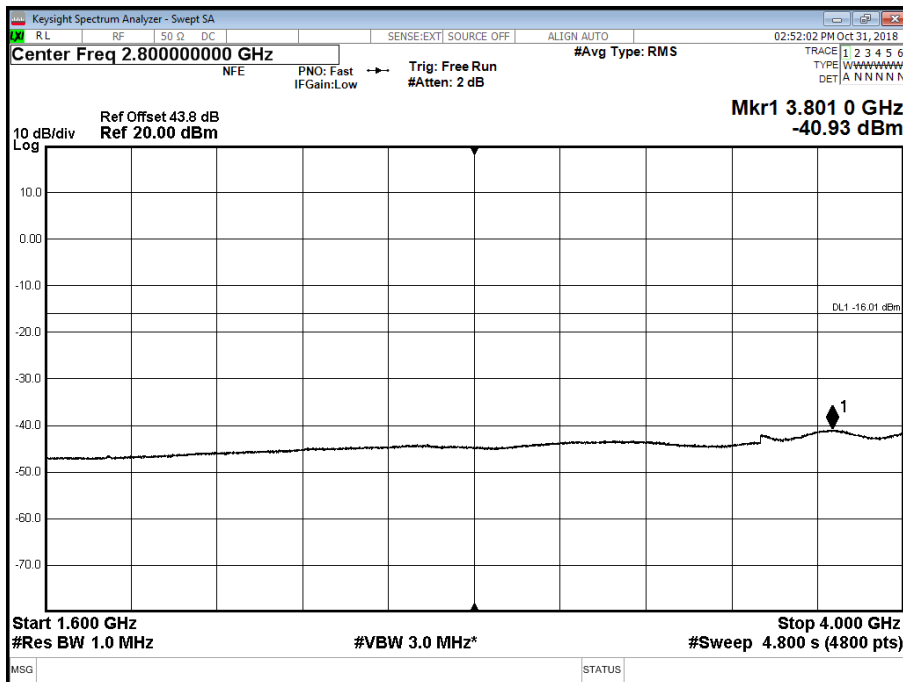


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 1 - Range 0.009 to 1600 MHz



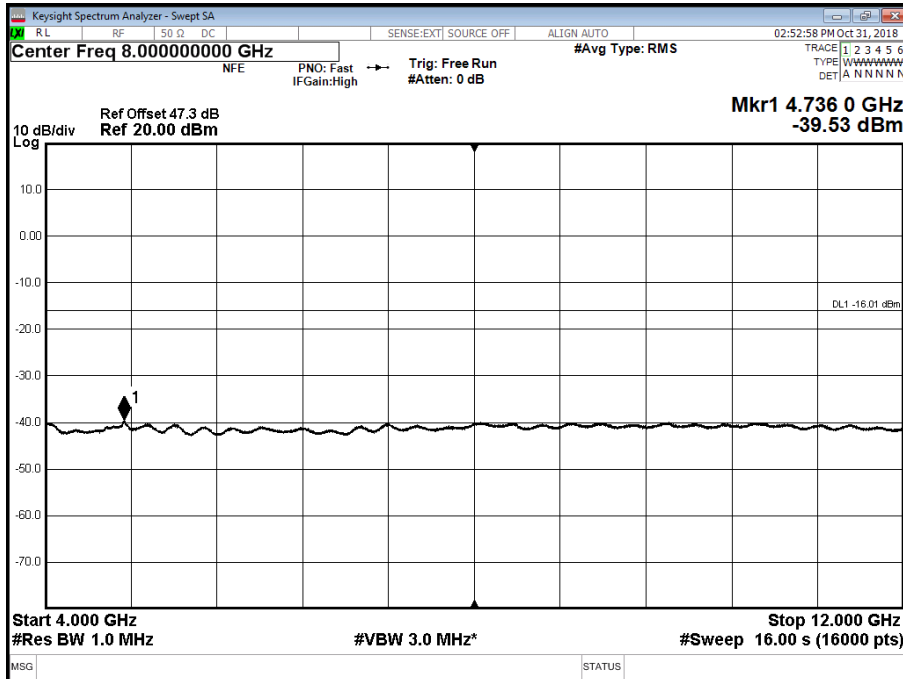
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 2 - Range 1600 to 4000 MHz





Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 3 - Range 4000 to 12000 MHz



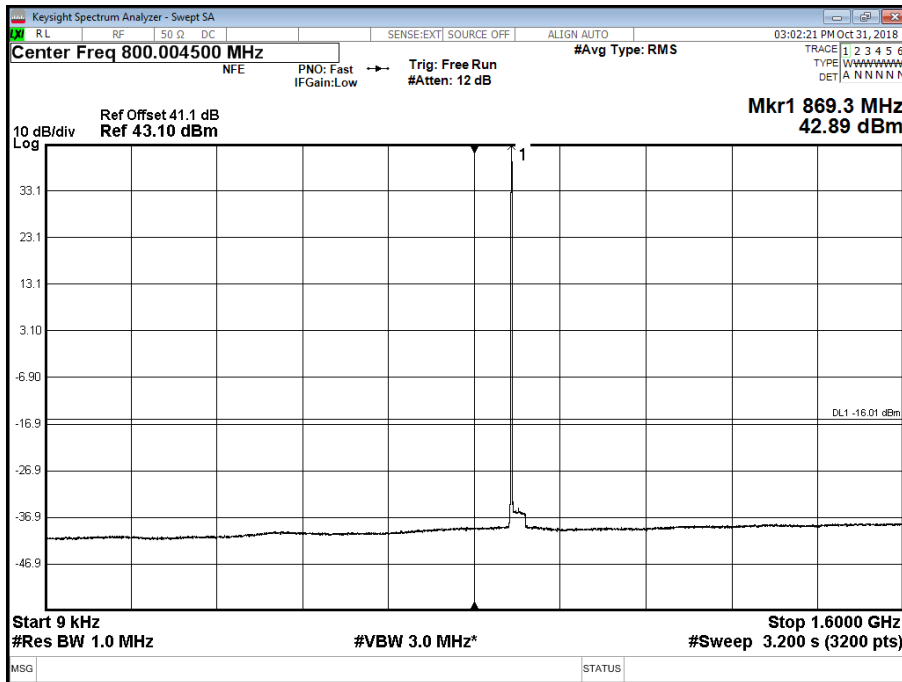


Product Service

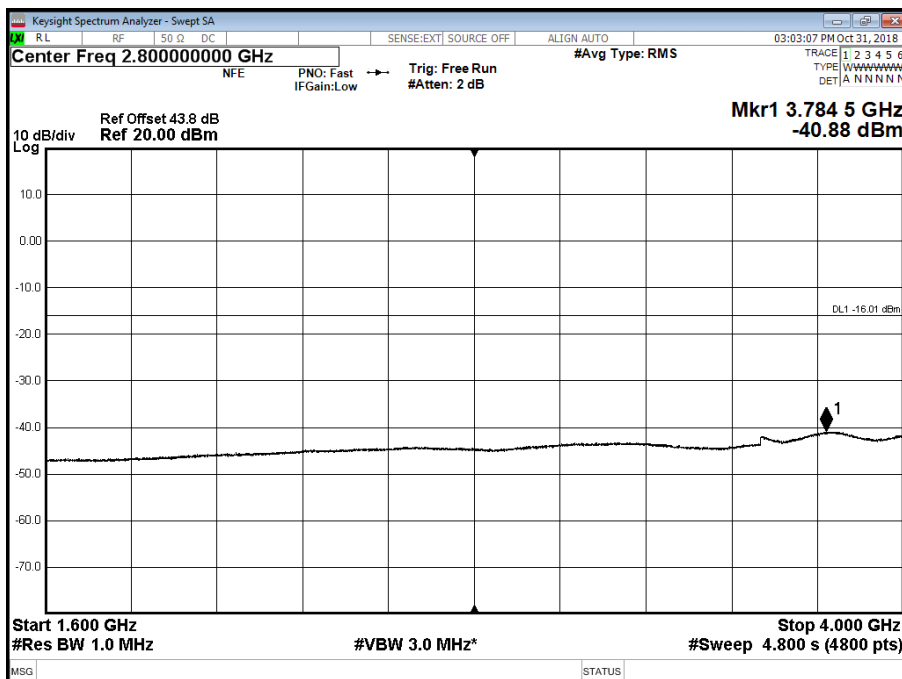
Configuration B

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 1600 MHz



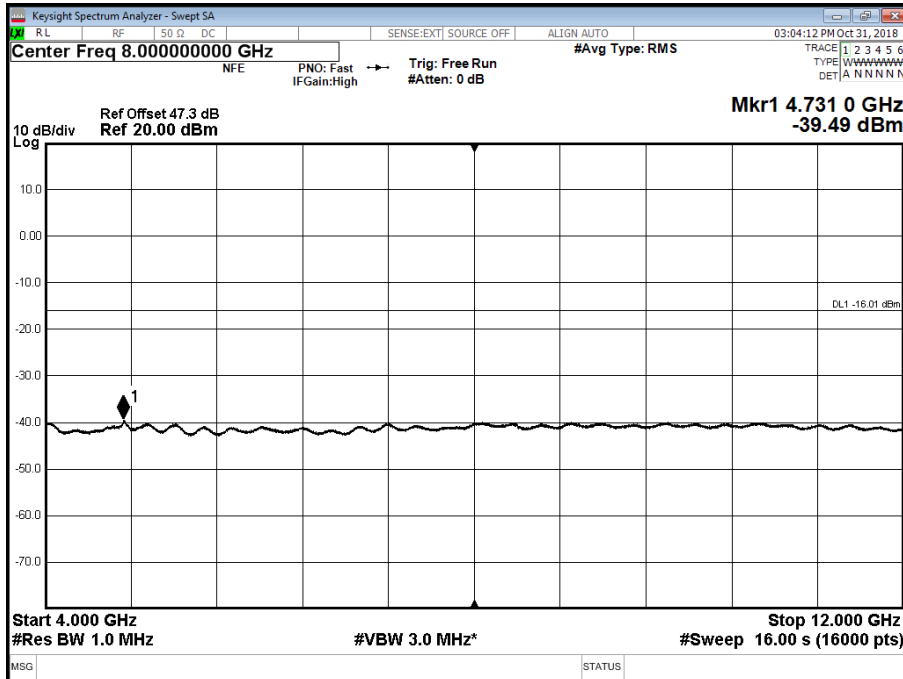
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 2 - Range 1600 to 4000 MHz



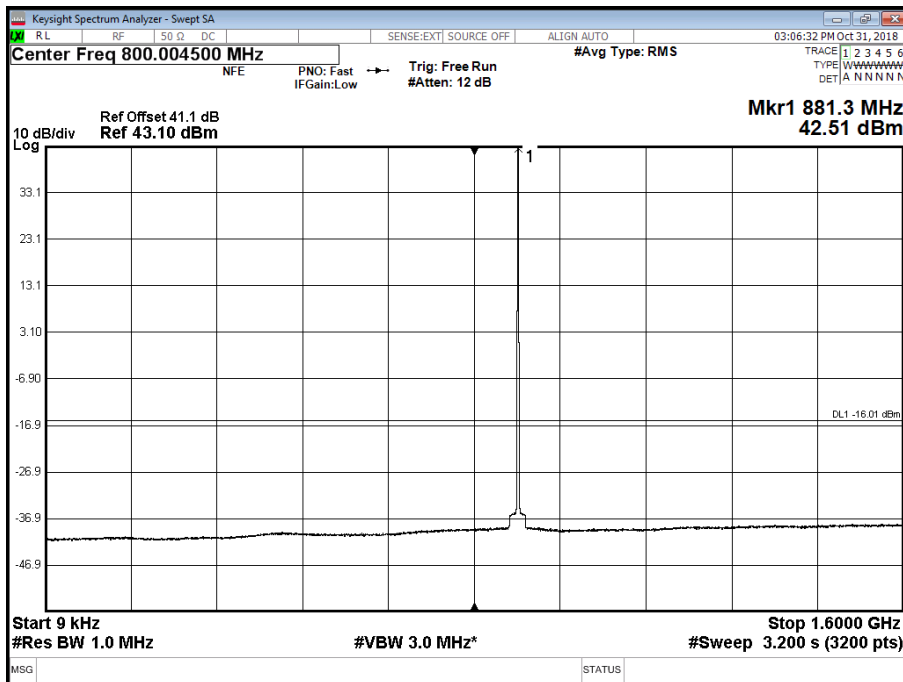


Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 3 - Range 4000 to 12000 MHz



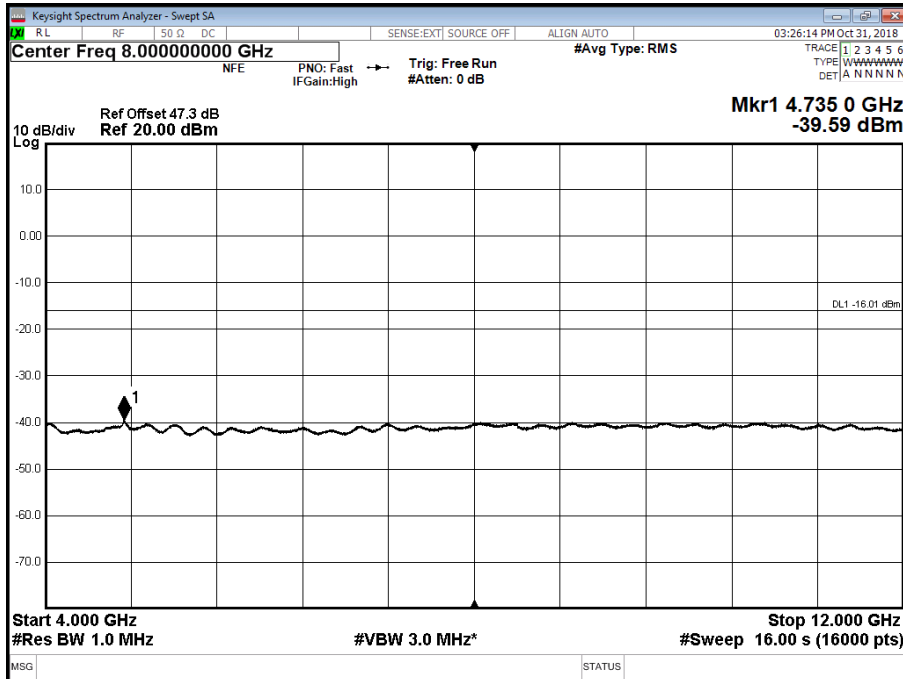
Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position M - Band 1 - Range 0.009 to 1600 MHz





Product Service

Antenna A - NB-IoT SA Modulation N:QPSK - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position T - Band 3 - Range 4000 to 12000 MHz



| | |
|-------|--------|
| Limit | -16dBm |
|-------|--------|



Product Service

2.5 RADIATED EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.917
Industry Canada RSS-132, Clause 6.5

2.5.2 Date of Test and Modification State

29 October 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 | 19.2°C |
| Relative Humidity | 34.4% |

2.5.5 Test Method

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 900MHz and so the upper limit for measurement was calculated at 10 times this, which is 9GHz.

Emissions identified within the range 30MHz – 9GHz 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 – 9GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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



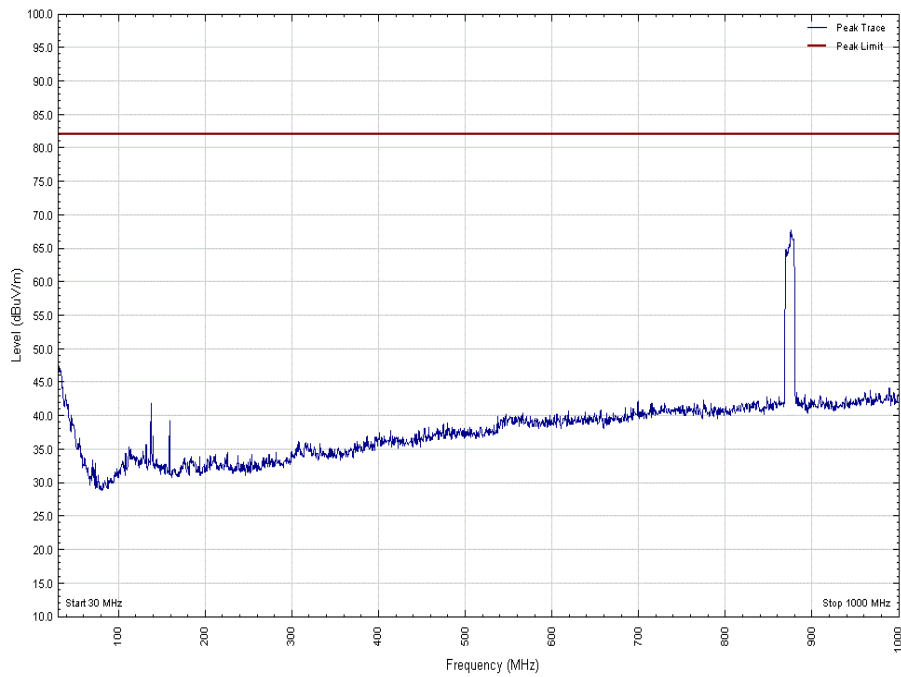
Product Service

2.5.6 Test Results

Configuration A

Maximum Output Power 47.8 dBm

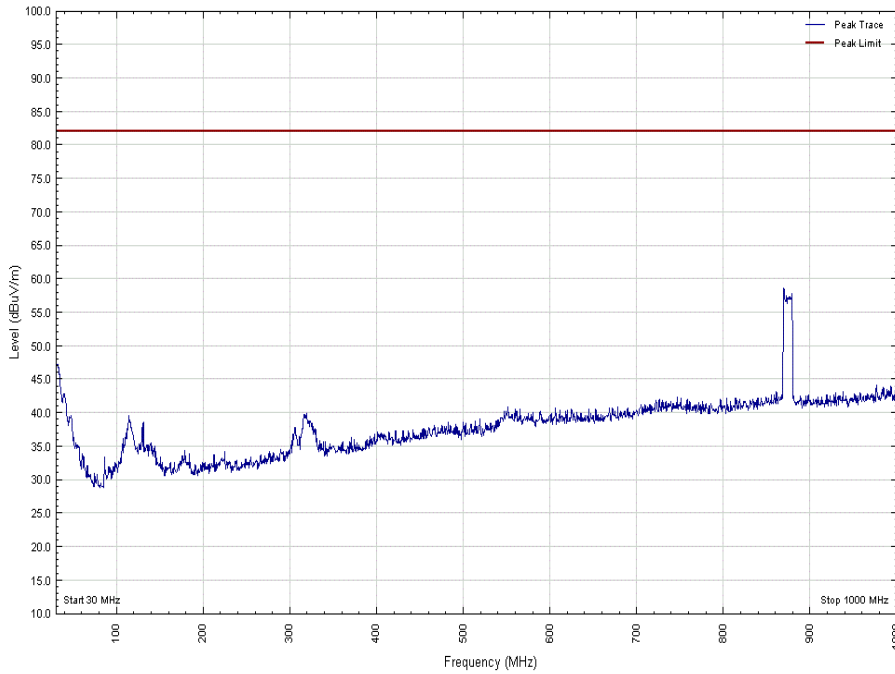
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 30 MHz to 1 GHz V



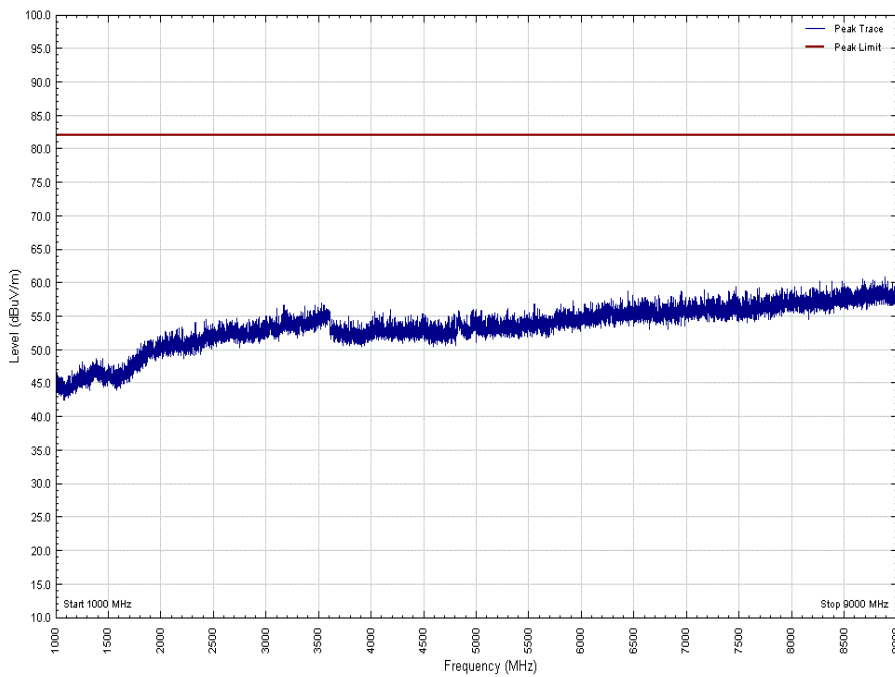


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 30 MHz to 1 GHz_H



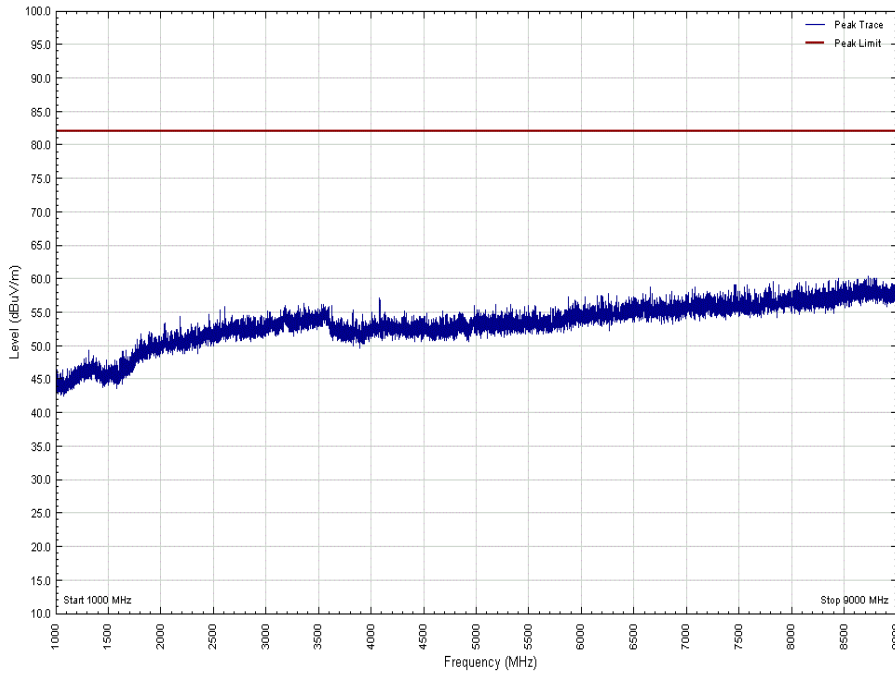
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 1 GHz to 9 GHz_V



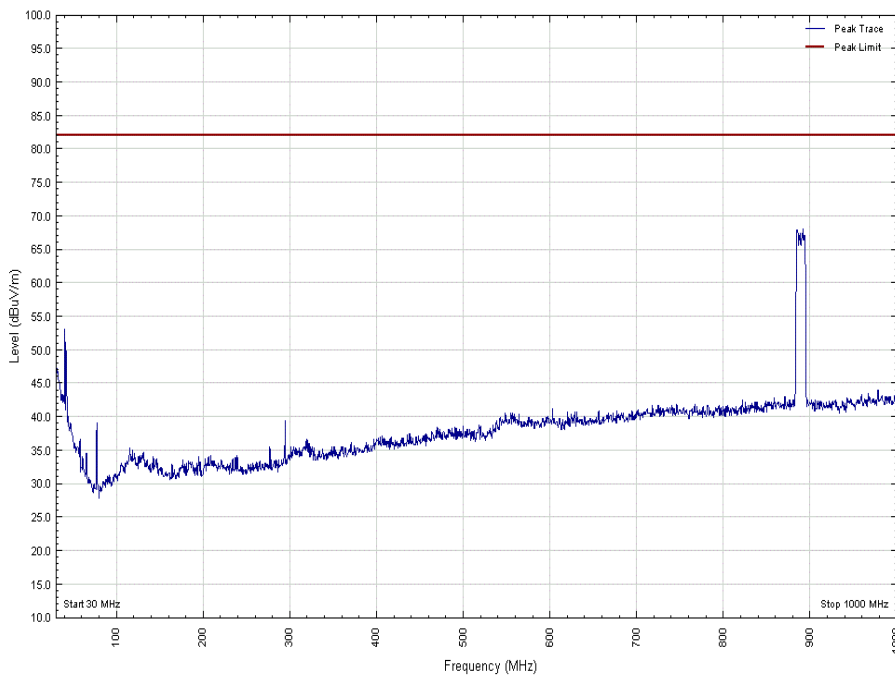


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 1 GHz to 9 GHz_H



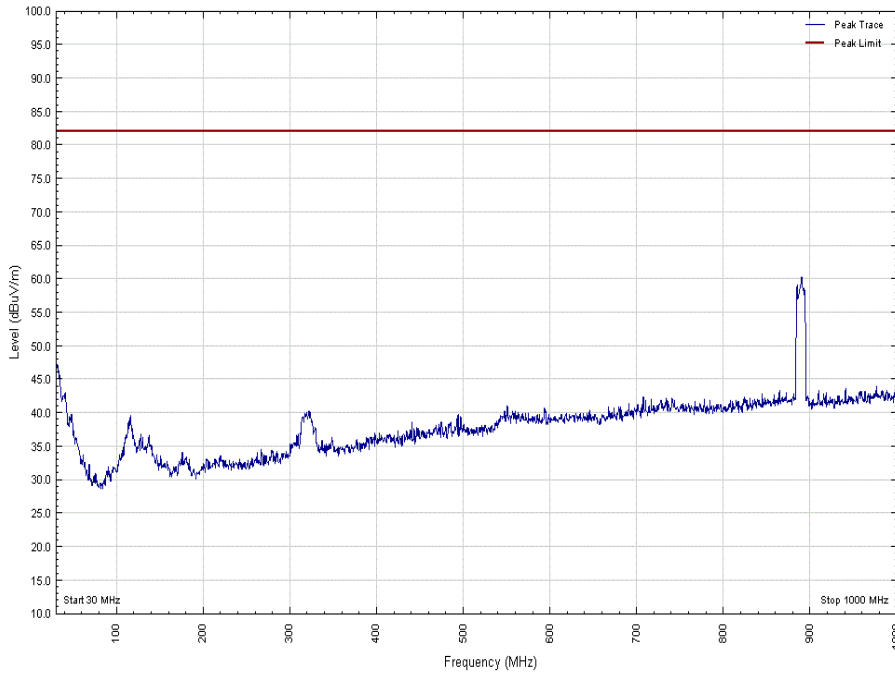
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 30 MHz to 1 GHz_V



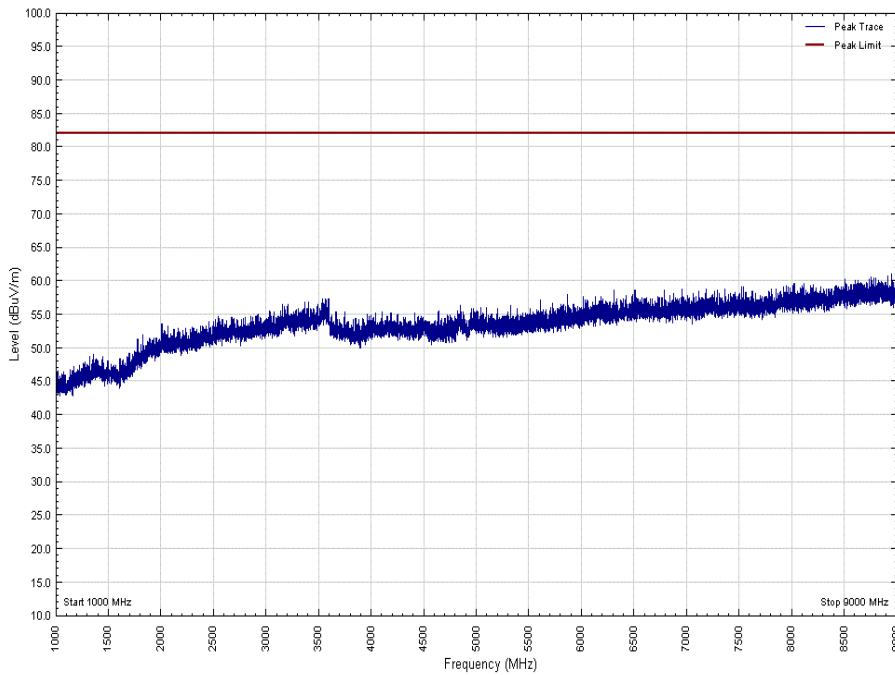


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 30 MHz to 1 GHz_H



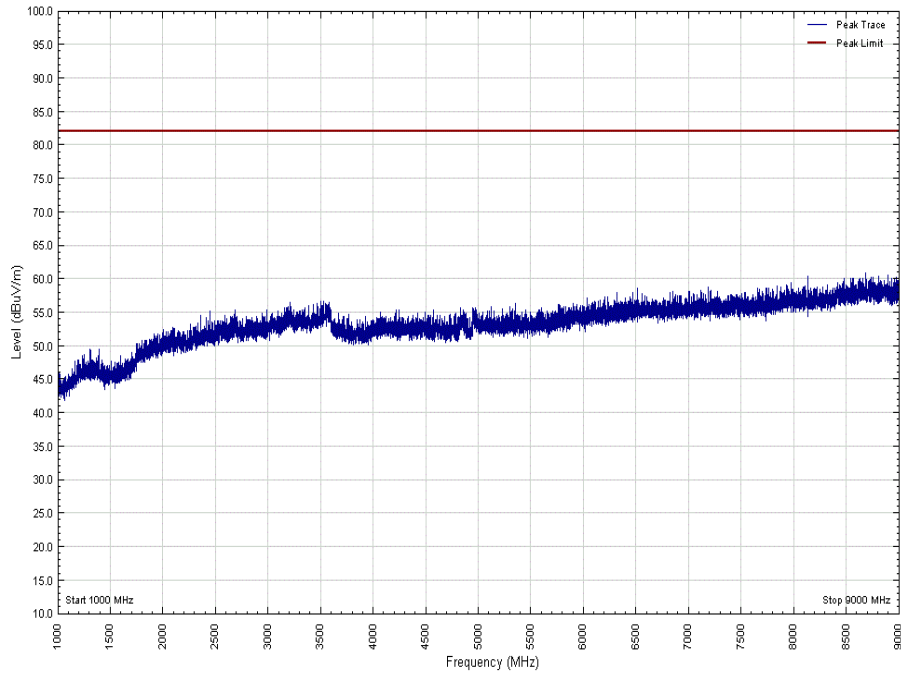
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 1 GHz to 9 GHz_V





Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 1 GHz to 9 GHz_H



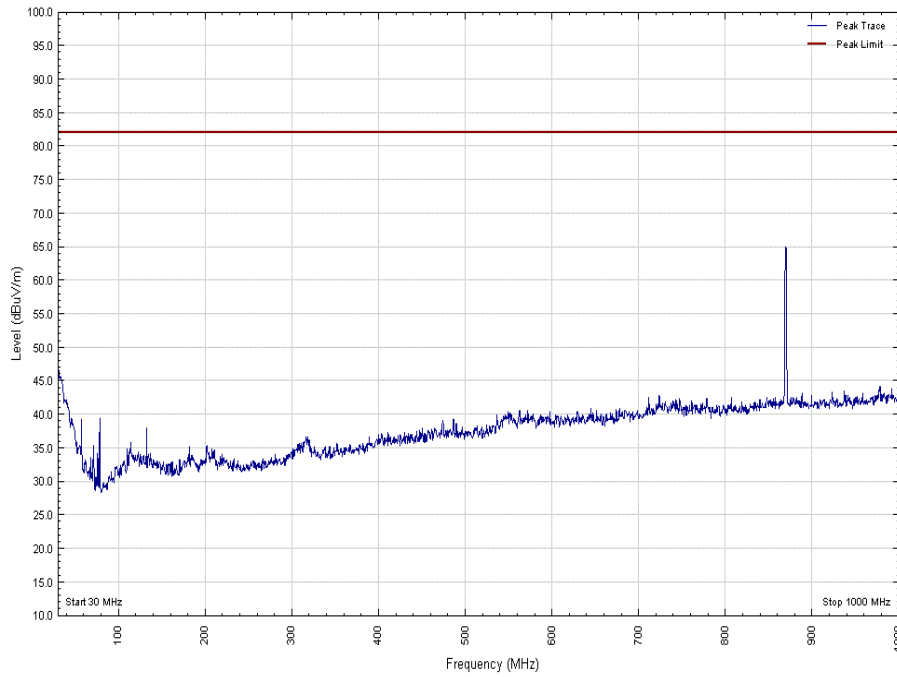


Product Service

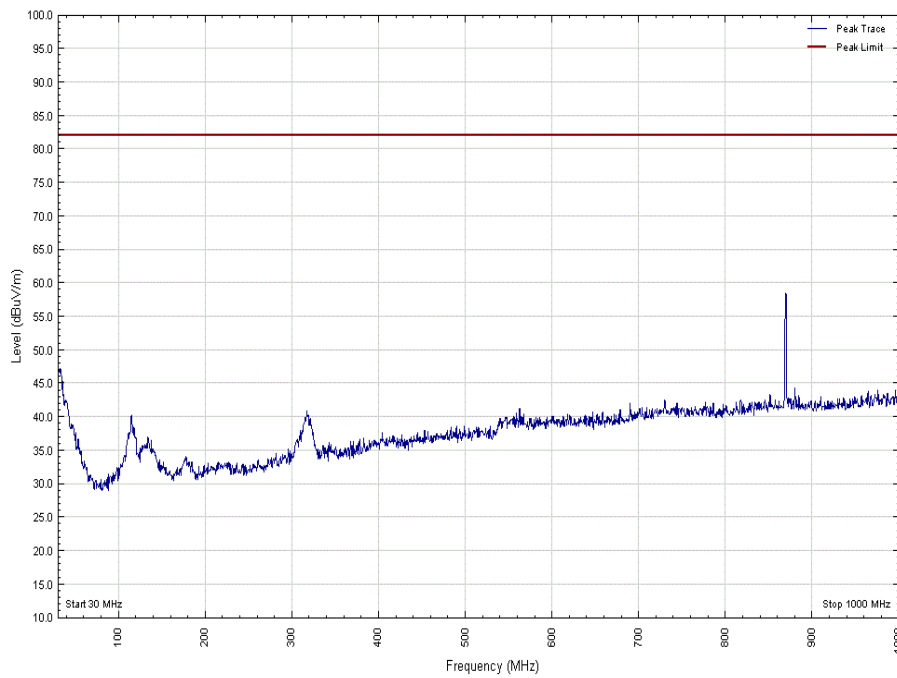
Configuration B

Maximum Output Power 43 dBm

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 5 - Range 30 MHz to 1 GHz_V



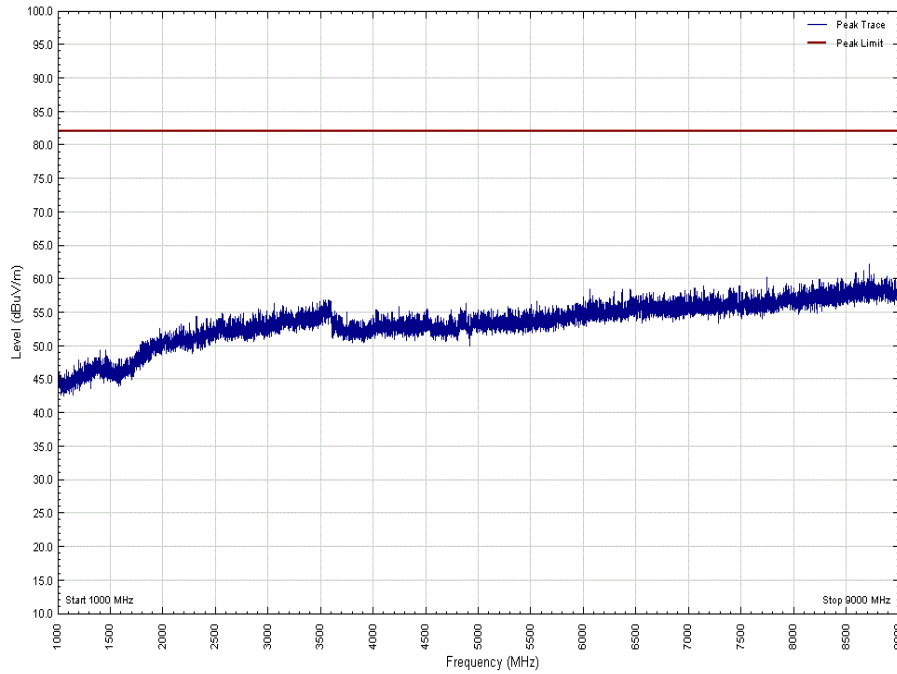
Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 5 - Range 30 MHz to 1 GHz_H



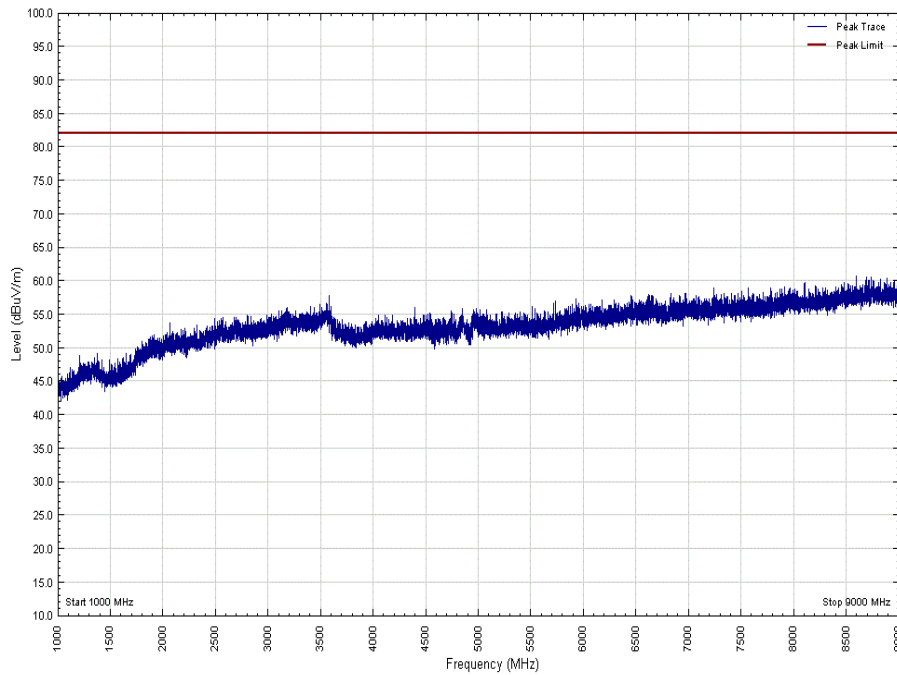


Product Service

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 5 - Range 1 GHz to 9 GHz V



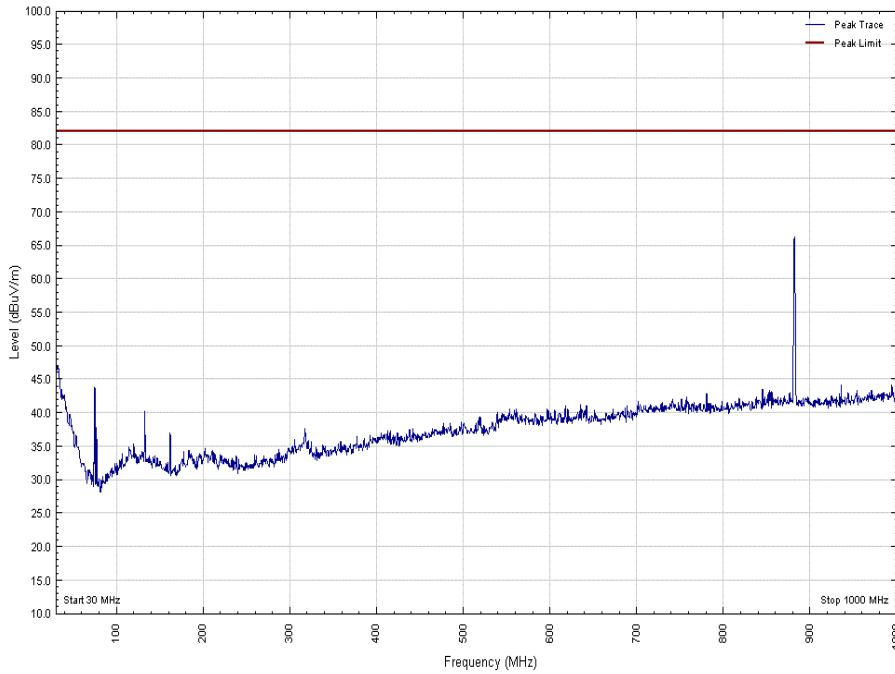
Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position B - Band 5 - Range 1 GHz to 9 GHz H



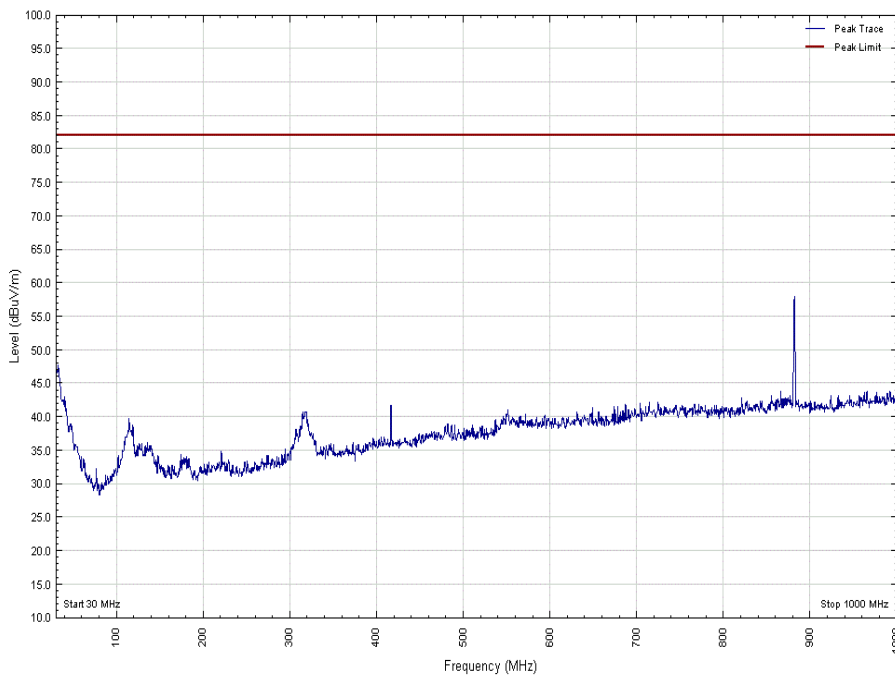


Product Service

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position M - Band 5 - Range 30 MHz to 1 GHz_V



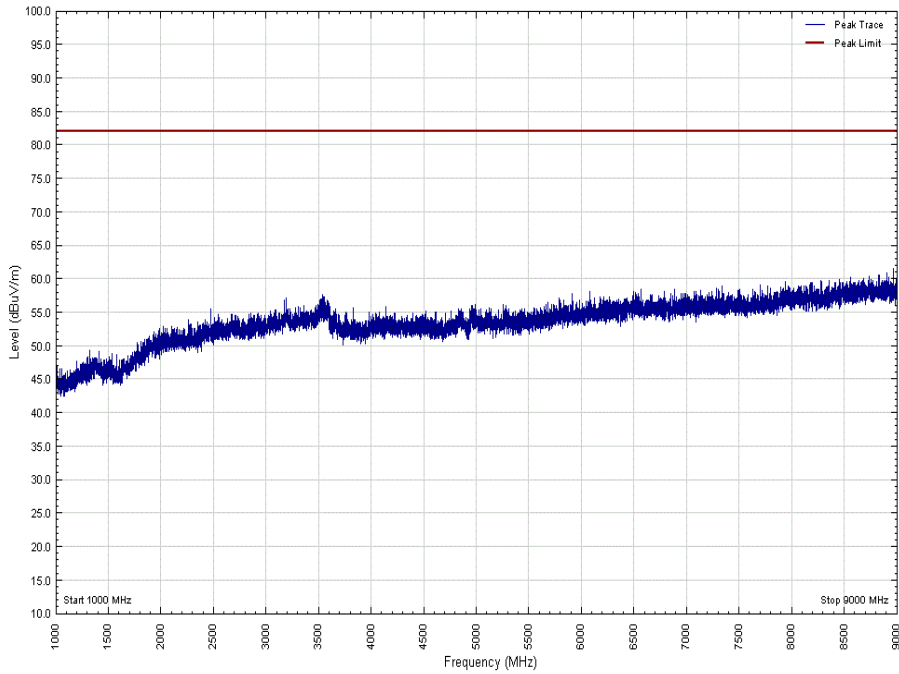
Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position M - Band 5 - Range 30 MHz to 1 GHz_H



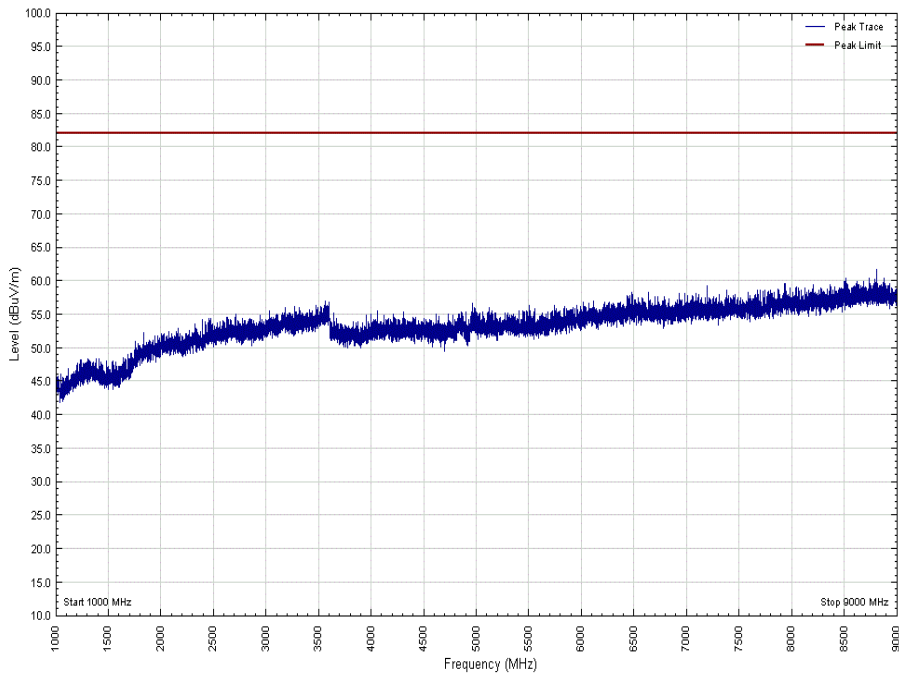


Product Service

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position M - Band 5 - Range 1 GHz to 9 GHz V



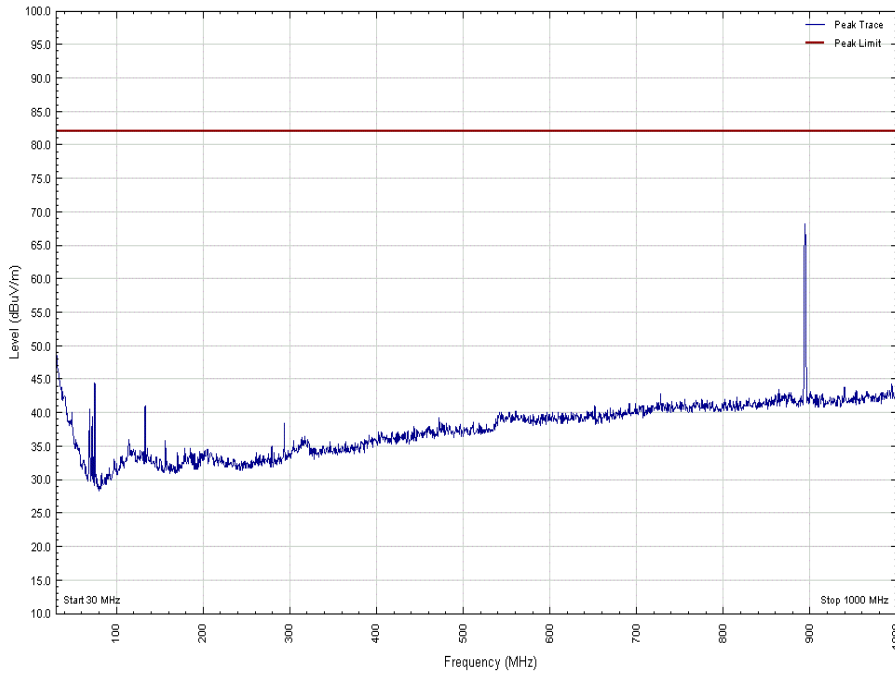
Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position M - Band 5 - Range 1 GHz to 9 GHz H



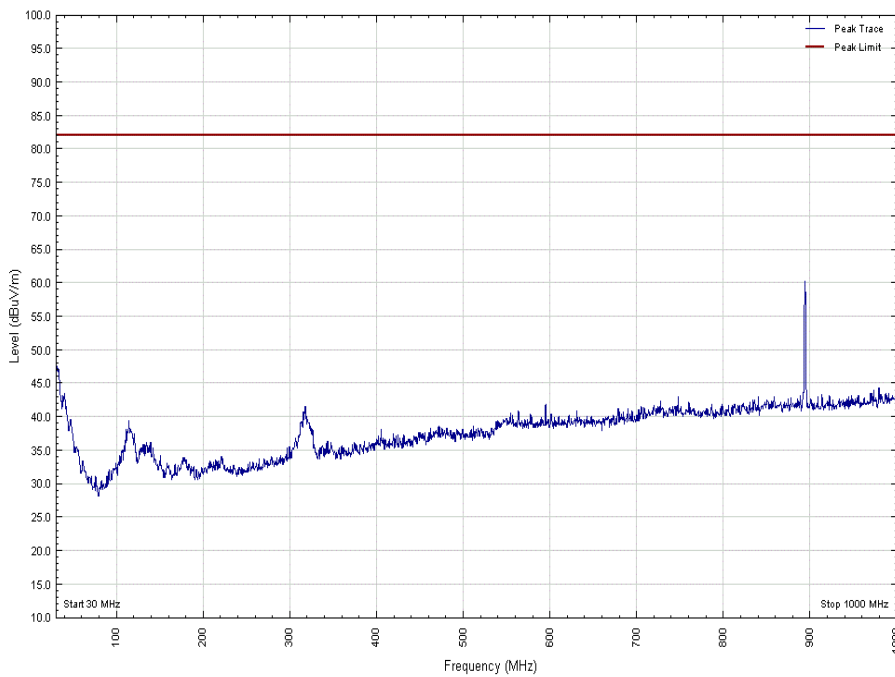


Product Service

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position T - Band 5 - Range 30 MHz to 1 GHz_V



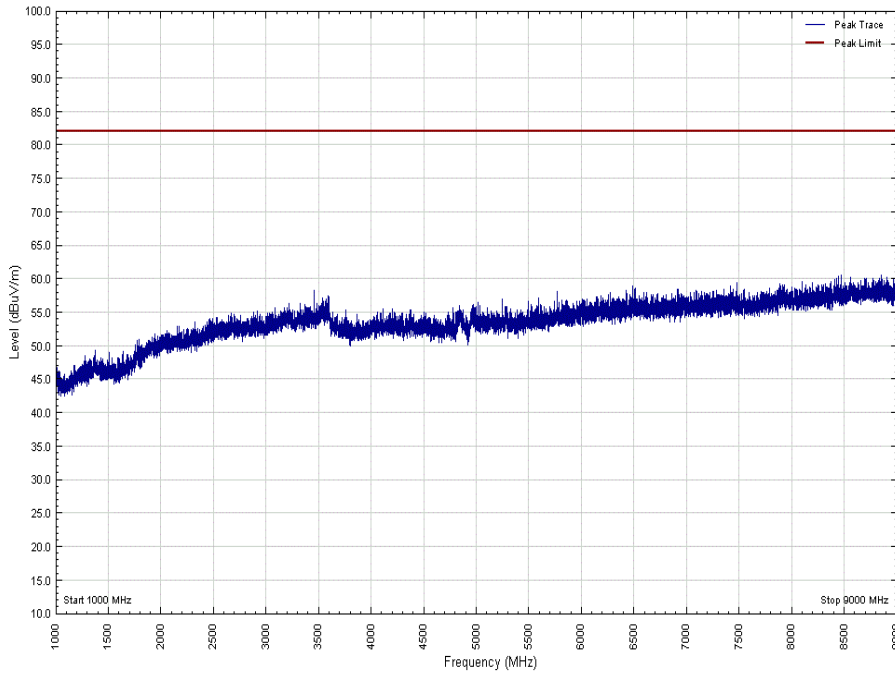
Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position T - Band 5 - Range 30 MHz to 1 GHz_H



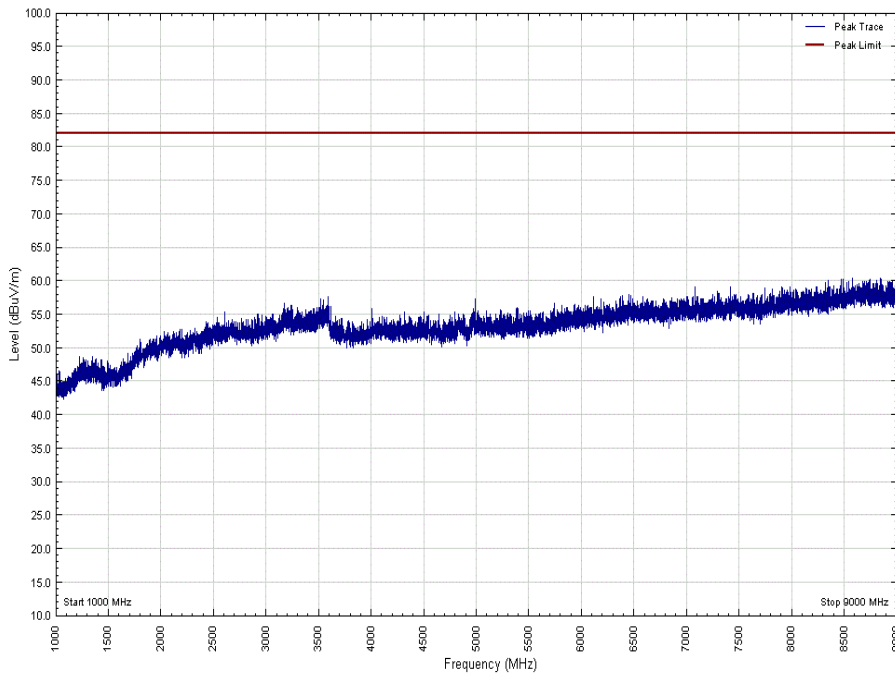


Product Service

Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position T - Band 5 - Range 1 GHz to 9 GHz_V



Antenna A - NB-IoT SA Modulation N:64QAM - NB-IoT SA Carrier Bandwidth N:180 kHz - Channel Position T - Band 5 - Range 1 GHz to 9 GHz_H



| | |
|-------|------------|
| Limit | 82.2dBµV/m |
|-------|------------|



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|--|--------------|-----------|--------|-----------------------------|-----------------|
| Maximum Peak Output Power and Peak to Average Ratio - Conducted | | | | | |
| Hygrometer | Rotronic | Hygropalm | 2404 | 12 | 26-Apr-2019 |
| Signal Analyser | N9030A | Keysight | 4653 | 12 | 05-Feb-2019 |
| PSU | Farnell | H60/25 | 1092 | - | OP Mon |
| DMM | Fluke | 179 | 4006 | 12 | 13-Dec-2018 |
| Attenuator | Weinschel | 48-10-43 | 4868 | 12 | 01-Nov-2018 |
| Attenuator | Weinschel | 48-30-43 | 4871 | 12 | 17-Jul-2019 |
| Attenuator | Weinschel | 48-10-43 | 3593 | 12 | 16-Jul-2019 |
| Network Analyser | R&S | ZVA 40 | *3548 | 12 | 02-Oct-2018 |
| Calibration unit | R&S | ZV Z54 | 4368 | 12 | 06-Mar-2019 |
| Network Analyser | Keysight | E5063A | 5018 | 12 | 04-May-2019 |
| Occupied Bandwidth | | | | | |
| Hygrometer | Rotronic | Hygropalm | 2404 | 12 | 26-Apr-2019 |
| Signal Analyser | N9030A | Keysight | 4653 | 12 | 05-Feb-2019 |
| PSU | Farnell | H60/25 | 1092 | - | OP Mon |
| DMM | Fluke | 179 | 4006 | 12 | 13-Dec-2018 |
| Attenuator | Weinschel | 48-10-43 | 4868 | 12 | 01-Nov-2018 |
| Attenuator | Weinschel | 48-30-43 | 4871 | 12 | 17-Jul-2019 |
| Attenuator | Weinschel | 48-10-43 | 3593 | 12 | 16-Jul-2019 |
| Network Analyser | R&S | ZVA 40 | *3548 | 12 | 02-Oct-2018 |
| Calibration unit | R&S | ZV Z54 | 4368 | 12 | 06-Mar-2019 |
| Network Analyser | Keysight | E5063A | 5018 | 12 | 04-May-2019 |
| Band Edge | | | | | |
| Hygrometer | Rotronic | Hygropalm | 2404 | 12 | 26-Apr-2019 |
| Signal Analyser | N9030A | Keysight | 4653 | 12 | 05-Feb-2019 |
| PSU | Farnell | H60/25 | 1092 | - | OP Mon |
| DMM | Fluke | 179 | 4006 | 12 | 13-Dec-2018 |
| Attenuator | Weinschel | 48-10-43 | 4868 | 12 | 01-Nov-2018 |
| Attenuator | Weinschel | 48-30-43 | 4871 | 12 | 17-Jul-2019 |
| Attenuator | Weinschel | 48-10-43 | 3593 | 12 | 16-Jul-2019 |
| Network Analyser | R&S | ZVA 40 | *3548 | 12 | 02-Oct-2018 |
| Calibration unit | R&S | ZV Z54 | 4368 | 12 | 06-Mar-2019 |
| Network Analyser | Keysight | E5063A | 5018 | 12 | 04-May-2019 |
| Transmitter Spurious Emissions | | | | | |
| Hygrometer | Rotronic | Hygropalm | 2404 | 12 | 26-Apr-2019 |
| Signal Analyser | N9030A | Keysight | 4653 | 12 | 05-Feb-2019 |
| PSU | Farnell | H60/25 | 1092 | - | OP Mon |
| DMM | Fluke | 179 | 4006 | 12 | 13-Dec-2018 |
| Attenuator | Weinschel | 48-10-43 | 4868 | 12 | 01-Nov-2018 |
| Attenuator | Weinschel | 48-30-43 | 4871 | 12 | 17-Jul-2019 |



Product Service

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|-------------------------|-----------------------------|--------|-----------------------------|-----------------|
| Attenuator | Weinschel | 48-10-43 | 3593 | 12 | 16-Jul-2019 |
| Network Analyser | R&S | ZVA 40 | *3548 | 12 | 02-Oct-2018 |
| Calibration unit | R&S | ZV Z54 | 4368 | 12 | 06-Mar-2019 |
| HPF | Wainright | WHKX12-1290-1500-18000-80SS | 4961 | 12 | 11-Oct-2019 |
| Network Analyser | Keysight | E5063A | 5018 | 12 | 04-May-2019 |
| Radiated Emissions | | | | | |
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 23-Jan-2021 |
| Turntable Controller | Inn-Co GmbH | CO 1000 | 1606 | - | TU |
| Multimeter | Iso-tech | IDM101 | 2419 | 12 | 23-Nov-2018 |
| Antenna with permanent attenuator (Bilog) | Chase | CBL6143 | 2904 | 24 | 08-Aug-2019 |
| EMI Receiver | Keysight Technologies | N9038A MXE | 4628 | 12 | 04-Jul-2019 |
| 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 |
| Hygrometer | Rotronic | HP21 | 4989 | 12 | 26-Apr-2019 |
| EmX Software | TUV SUD Product Service | EmX V.1.3.21 | 5125 | - | Software |
| 1.5m 40GHz RF Cable | Scott Cables | KPS-1501-2000-KPS | 5126 | 6 | 26-Apr-2019 |

O/P Mon – Output Monitored with Calibrated Equipment

TU – Traceability Unscheduled

* - This Network Analyser was only used to perform Calibrations prior to 02-Oct-2018.



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 4

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

| Configuration A and B | | | |
|-----------------------|---------------|-----------|------------|
| Product | Product No | R-State | Serial No |
| RRUS 12 B5 | KRC 161 321/2 | R1B | C827002293 |
| Software Version: | CXP9013268/9 | Revision: | R73AM |