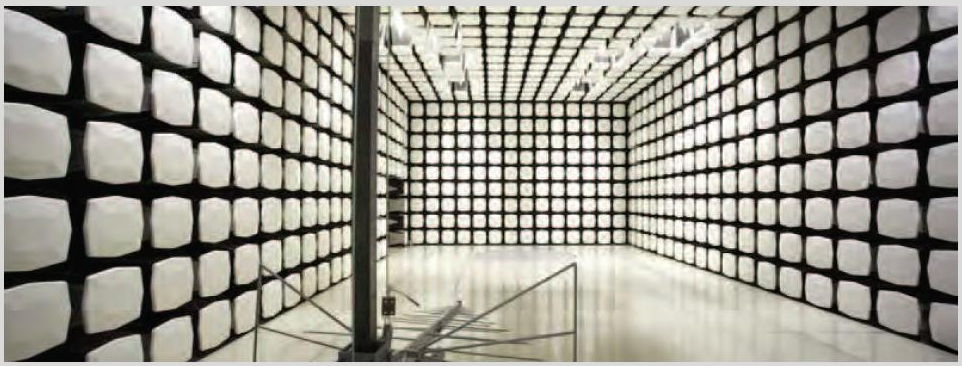
# Radio Test Report
## Application for a Class II Permissive Change of Equipment Authorization

**FCC Part 27, IC RSS-139, and RSS-170**
**[2110MHz – 2200MHz]**

**FCC ID: VBNAAIB-01**
**IC ID: 661W-AAIB**

**Nokia Solutions and Networks**
**Airscale Base Transceiver Station Radio Module**
**Model: AAIB**

**Report # NOKI0006**



NVLAP LAB CODE: 201049-0

# CERTIFICATE OF TEST

**Last Date of Test: January 30, 2020**
**Nokia Solutions and Networks**
**EUT: Airscale Base Transceiver Station Radio Module Model AAIB**

## Radio Equipment Testing

### Standards

| Specification | Method |
|---|---|
| Code of Federal Regulations (CFR) Title 47 Part 2<br>(Radio Standards Specification) RSS-Gen Issue 6: 2019<br>CFR Title 47 Part 27 Subpart C<br>RSS-139 Issue 3 - July 16, 2015 – Advanced Wireless Services (AWS)<br>RSS-170 Issue 3- July 9, 2015 | ANSI C63.26-2015 with<br>FCC KDB 971168 D01 v03r01<br>FCC KDB 662911D01 v02r01 |

### Results

| Test Description | Applied | Results | Comments |
|---|---|---|---|
| Duty Cycle | No | N/A | Not requested. |
| Occupied Bandwidth | Yes | Pass | |
| Output Power | Yes | Pass | |
| Output Power – Worst Case Port | Yes | Pass | |
| Peak to Average Power (PAPR)/CCDF | Yes | Pass | |
| Band Edge Compliance | Yes | Pass | |
| Spurious Conducted Emissions | Yes | Pass | |
| Spurious Radiated Emissions | No | N/A | Not requested. |

### Deviations From Test Standards

None

### Approved By:

*Jeremiah Darden, Operations Manager*

***Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.***

# REVISION HISTORY

| Revision Number | Description | Date (yyyy-mm-dd) | Page Number |
|---|---|---|---|
| 00 | None | | |

# ACCREDITATIONS AND AUTHORIZATIONS

## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

## Vietnam

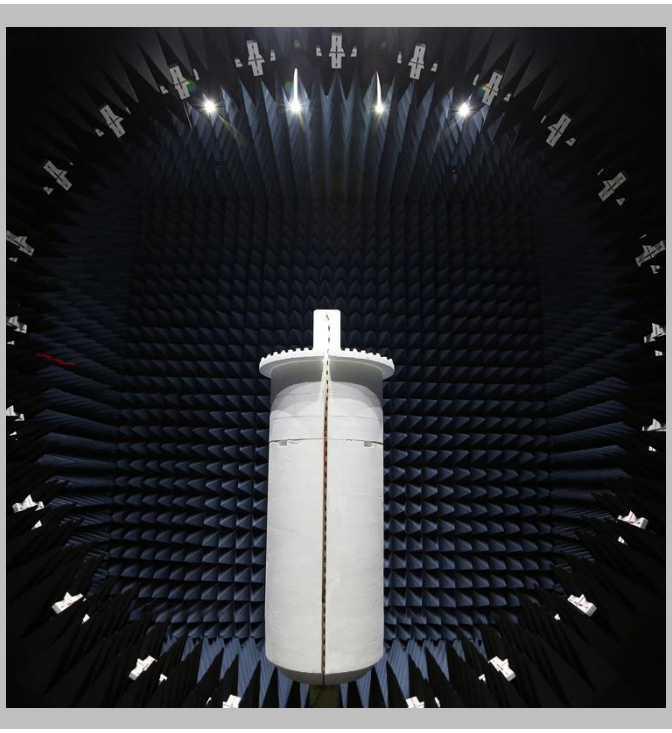
**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

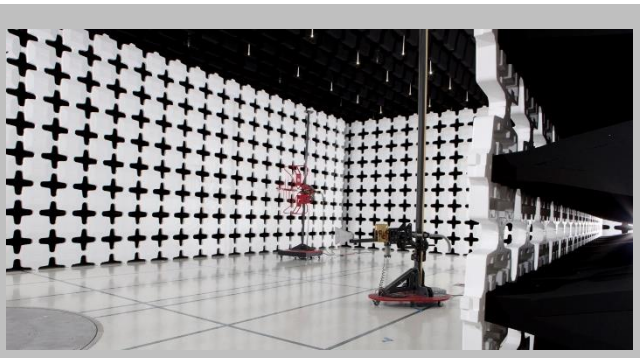
## SCOPE

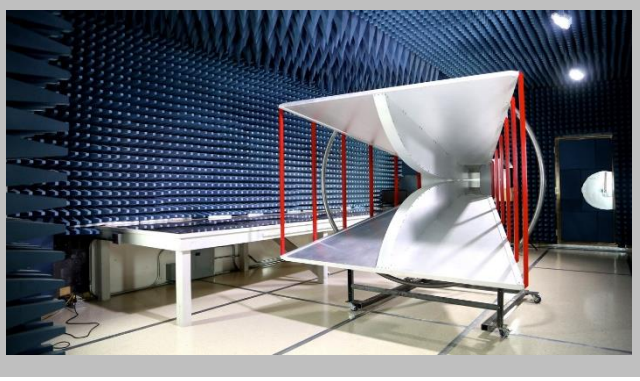
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

# FACILITIES

| California | Minnesota | Oregon | Texas | Washington |
|---|---|---|---|---|
| Labs OC01-17<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | Labs MN01-10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | Labs EV01-12<br>6775 NE Evergreen Pkwy #400<br>Hillsboro, OR 97124<br>(503) 844-4066 | Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | Labs NC01-05<br>19201 120th Ave NE<br>Bothell, WA 98011<br>(425)984-6600 |
| **NVLAP** | | | | |
| NVLAP Lab Code: 200676-0 | NVLAP Lab Code: 200881-0 | NVLAP Lab Code: 200630-0 | NVLAP Lab Code:201049-0 | NVLAP Lab Code: 200629-0 |
| **Innovation, Science and Economic Development Canada** | | | | |
| 2834B-1, 2834B-3 | 2834E-1, 2834E-3 | 2834D-1 | 2834G-1 | 2834F-1 |
| **BSMI** | | | | |
| SL2-IN-E-1154R | SL2-IN-E-1152R | SL2-IN-E-1017 | SL2-IN-E-1158R | SL2-IN-E-1153R |
| **VCCI** | | | | |
| A-0029 | A-0109 | A-0108 | A-0201 | A-0110 |
| **Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA** | | | | |
| US0158 | US0175 | US0017 | US0191 | US0157 |







# MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

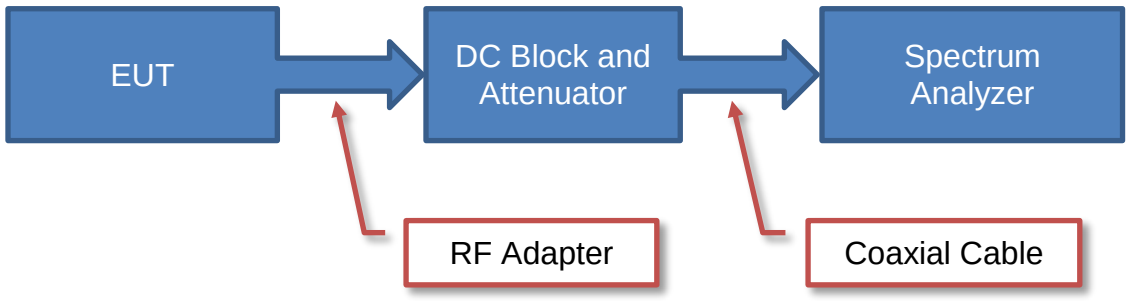
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

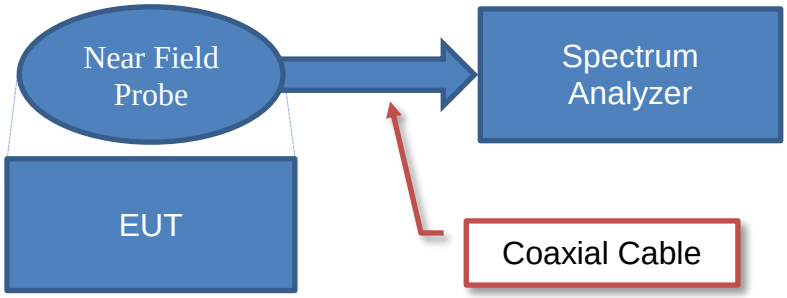
| Test | + MU | - MU |
|---|---|---|
| Frequency Accuracy | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB) | 1.2 dB | -1.2 dB |
| Conducted Power (dB) | 1.2 dB | -1.2 dB |
| Radiated Power via Substitution (dB) | 0.7 dB | -0.7 dB |
| Temperature (degrees C) | 0.7°C | -0.7°C |
| Humidity (% RH) | 2.5% RH | -2.5% RH |
| Voltage (AC) | 1.0% | -1.0% |
| Voltage (DC) | 0.7% | -0.7% |
| Field Strength (dB) | 5.1 dB | -5.1 dB |
| AC Powerline Conducted Emissions (dB) | 2.4 dB | -2.4 dB |

# Test Setup Block Diagrams

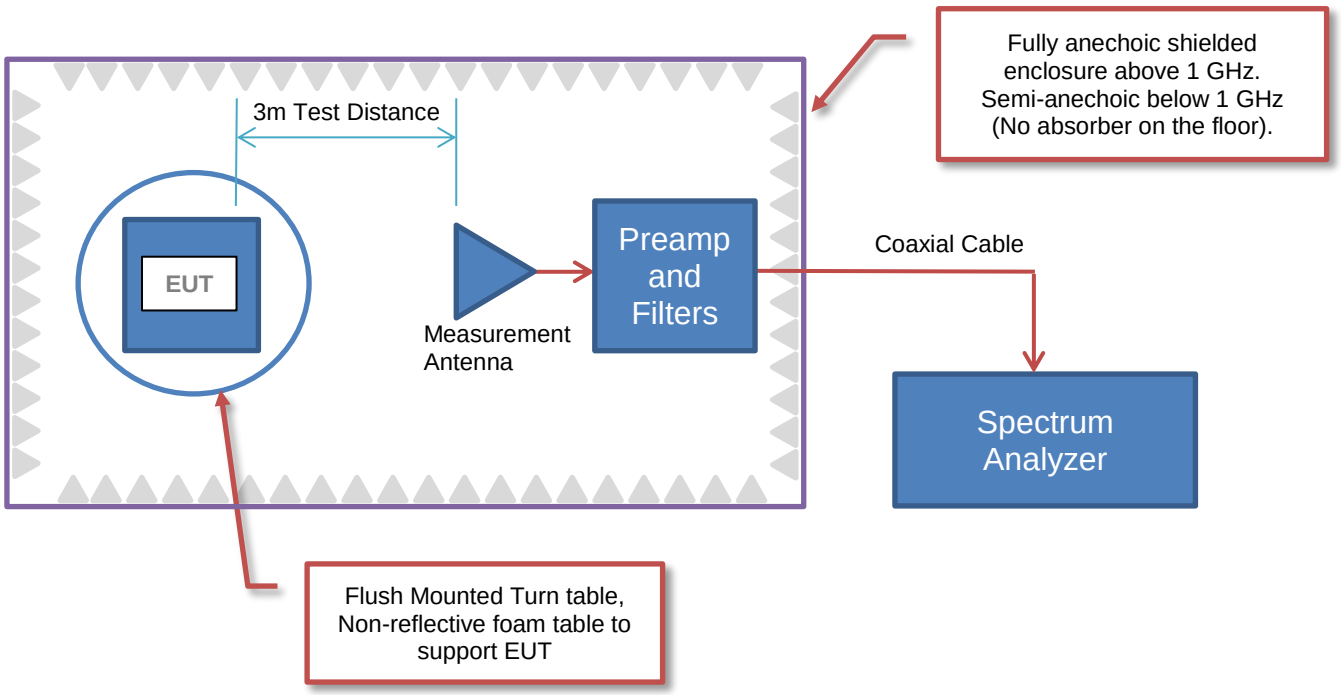
## Antenna Port Conducted Measurements




## Near Field Test Fixture Measurements




## Spurious Radiated Emissions



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

| | |
|---|---|
| **Company Name:** | Nokia Solutions and Networks |
| **Address:** | 6000 Connection Drive |
| **City, State, Zip:** | Irving, TX 75039 |
| **Test Requested By:** | Steve Mitchell |
| **EUT:** | Airscale Base Transceiver Station Radio Module Model AAIB |
| **First Date of Test:** | January 29, 2020 |
| **Last Date of Test:** | January 30, 2020 |
| **Receipt Date of Samples:** | January 28, 2020 |
| **Equipment Design Stage:** | Production |
| **Equipment Condition:** | No Damage |
| **Purchase Authorization:** | Verified |

## Information Provided by the Party Requesting the Test

**Functional Description of the EUT:**

A class II permissive change on the original filing is being pursued to add Narrow Band IoT Guard Band (NB IoT GB) to the LTE carrier for the Airscale BTS Radio Module AAIB Federal Communication Commission and Industry Canada certifications. The original FCC and IC radio certification submittal was NTS Test Report Number PR083556 Revision 1 dated August 27, 2018. The original test effort included testing for LTE technologies. Please refer to the test report on the original certification (FCC ID: VBNAAIB-01) for details on all required testing. The scope of testing in this effort is for narrow band IoT guard band operations for 10, 15 and 20MHz LTE channel bandwidths.

All conducted RF testing performed for the original certification testing will be repeated using NB IoT GB for this class II permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing will be used in this class II permissive change test effort. Tests performed under the class II change effort include RF power, CCDF, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions. The LTE modulation type for this testing was setup according to 3GPP TS 36.141 E-UTRA Test Models and is “E-TM 1.1 (QPSK modulation type) with N-TM (narrow band IoT)”. The base station and radio module software for this testing is an updated release that includes Narrow Band IoT Guard Band support.

The radiated emissions and frequency stability measurements performed in the original certification was not repeated under this effort per TCB guidance. The radiated emission and frequency stability/accuracy results from the original certification had enough margin to preclude requiring additional testing. The same frequency stability/accuracy radio design is the same for all radio technologies/modulation types.

The equipment under test (EUT) is a Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) radio module, model AAIB. The AAIB has 16 transmit/receive antenna ports that supports 3GPP frequency band 66 operations (BTS RX: 1710 to 1780 MHz/BTS TX: 2110 to 2200 MHz). The maximum RF output power of the radio module antenna port is 6.25 watts. The total RF output power for the AAIB radio module is 100 watts (16 x 6.25 watts). The radio module supports LTE-FDD, and narrow band IoT (internet of things) operations (in-band, guard band, standalone). The TX and RX instantaneous bandwidth cover the full operational (Band 66) bandwidth. The radio module supports 5, 10, 15, and 20MHz LTE bandwidths. The radio module supports four LTE downlink modulation types

(QPSK, 16QAM, 64QAM and 256QAM) and NB-IoT.

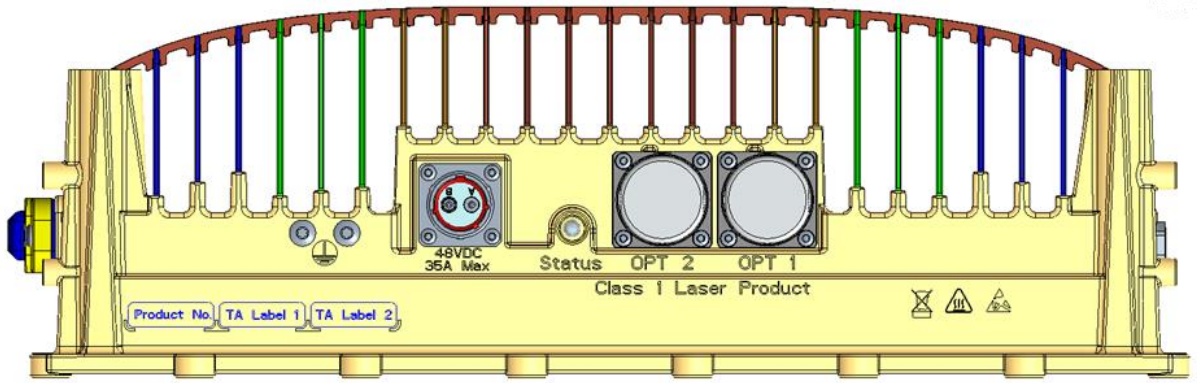
The AAIB LTE channel numbers and frequencies are as follows:

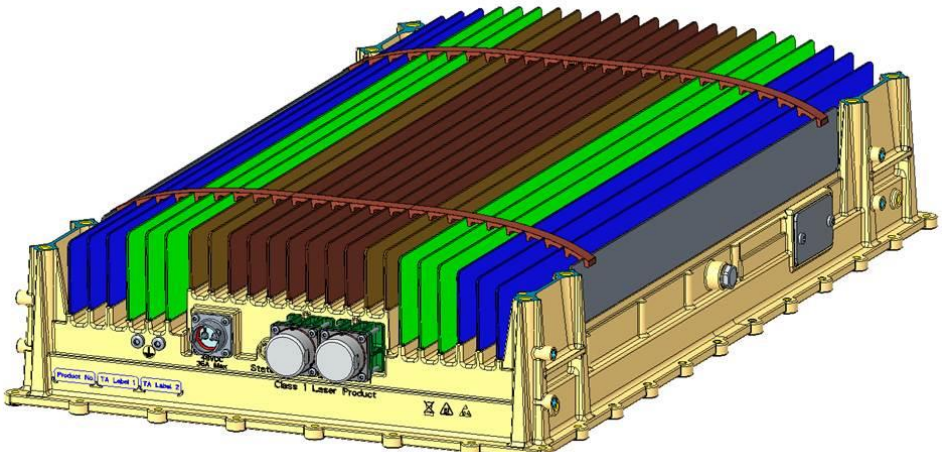
| | Downlink EARFCN | Downlink Frequency (MHz) | LTE Channel Bandwidth | | | |
|---|---|---|---|---|---|---|
| | | | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| AAIB Band 66 (Antennas 1 through 16) | 66436 | 2110.0 | Band Edge | Band Edge | Band Edge | Band Edge |
| | …… | | | | | |
| | 66461 | 2112.5 | Bottom Ch | | | |
| | …… | | | | | |
| | 66486 | 2115.0 | | Bottom Ch | | |
| | …… | | | | | |
| | 66511 | 2117.5 | | | Bottom Ch | |
| | …… | | | | | |
| | 66536 | 2120.0 | | | | Bottom Ch |
| | …… | | | | | |
| | 66886 | 2155.0 | Middle Ch | Middle Ch | Middle Ch | Middle Ch |
| | …… | | | | | |
| | 67236 | 2190.0 | | | | Top Channel |
| | …… | | | | | |
| | 67261 | 2192.5 | | | Top Channel | |
| | …… | | | | | |
| | 67286 | 2195.0 | | Top Channel | | |
| | …… | | | | | |
| | 67311 | 2197.5 | Top Channel | | | |
| | …… | | | | | |
| | 67336 | 2200.0 | Band Edge | Band Edge | Band Edge | Band Edge |

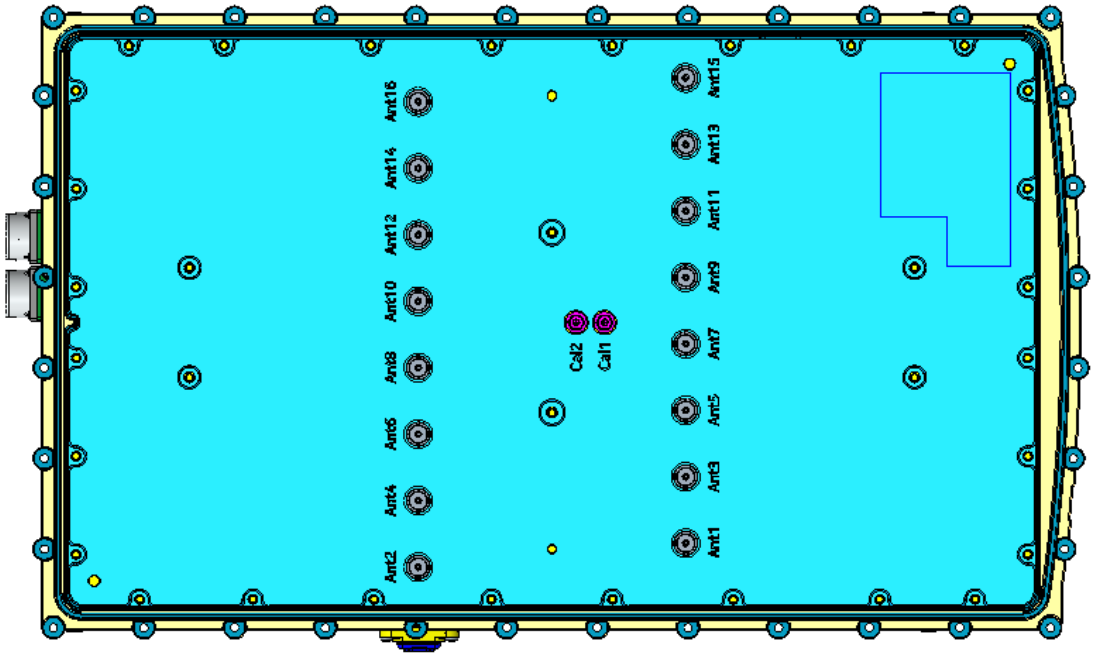
AAIB Downlink Band Edge LTE Band 66 Frequency Channels

Note: AAIB narrow band IoT guard band operations for 10, 15 and 20MHz LTE channel bandwidths are supported.

AAIB Connector Layout:





# PRODUCT DESCRIPTION

**External Interfaces**

| Name | Qty | Connector Type | Purpose (and Description) |
|---|---|---|---|
| DC In | 1 | Quick Disconnect | 2-pole Power Circular Connector |
| GND | 1 | Screw lug (2xM5/1xM8) | Ground |
| ANT | 16 | 4.3-10 Blind Mate/Quick Disconnect | RF signal for Transmitter/Receiver (50 Ohm) |
| Unit | 1 | LED | Unit Status LED |
| OPT | 2 | SFP+ cage | Optical Interface |
| Fan | 1 | Microfit | Power for fan on the side of radio module. |

**Testing Objective:**

A class II permissive change on the original filing is being pursued to add Narrow Band IoT Guard Band to the LTE carrier for the Airscale BTS Radio Module AAIB Federal Communication Commission and Industry Canada certifications.

# CONFIGURATIONS

## Configuration NOKI0006-1

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| Radio Module Software | FRM 59.10.R28L |
| BTS Software Version | SBTS19B_ENB_0000_000904 |

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AAIB (Radio Module Model) | Nokia | 090147A.101 | YK183800029 |

| Peripherals in test setup boundary | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| 30dB Attenuator (50W) | Narda | 776B-30 | None |
| Antenna Load 1 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 2 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 3 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 4 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 5 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 6 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 7 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 8 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 9 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 10 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 11 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 12 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 13 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 14 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 15 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| AMIA (BTS system Module) | Nokia | 473098A.101 | RK16401509 |
| ASIA (BTS system Module) | Nokia | 473095A.203 | AH173111443 |
| ABIA (BTS system Module) | Nokia | 473096A.102 | L1164015939 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | Kr16180020006 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | MA17331610206 |
| HP ProBook 6470b | HP | B2G14EC#ABA | CNU246B8XP |
| Power Supply (Laptop) | HP | 608428-002 | F12941232064008 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| RF cable<br>HS-SUCOFLEX_106 | Y | 2m | N | EUT [AAIB]<br>RF port 2<br>(port under test) | Narda 30dB<br>Attenuator (50W) |
| RF cable<br>HS-SUCOFLEX_104 | Y | 1m | N | Narda 30dB<br>Attenuator (50W) | Spectrum Analyzer |
| RF cable<br>R&D Microwaves<br>CBL-6ft-NMNM-402J-N<br>15 places | Y | ~1.8m | N | EUT [AAIB]<br>RF ports 1, and 3<br>thru 16 | Antenna Loads<br>(1 through 15) |

# CONFIGURATIONS

## Configuration NOKI0006-2

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| Radio Module Software | FRM 59.10.R28L |
| BTS Software Version | SBTS19B_ENB_0000_000904 |

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AAIB (Radio Module Model) | Nokia | 090147A.101 | YK183800029 |

| Peripherals in test setup boundary | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| 10dB Attenuator (100W) | API Weinschel | 48-10-34-LIM | BJ1771 |
| Low Pass Filter (100W) | Microwave Circuits, INC. | L13502G1 | SN24254-01 |
| Antenna Load 1 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 2 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 3 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 4 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 5 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 6 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 7 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 8 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 9 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 10 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 11 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 12 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 13 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 14 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 15 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| AMIA (BTS system Module) | Nokia | 473098A.101 | RK16401509 |
| ASIA (BTS system Module) | Nokia | 473095A.203 | AH173111443 |
| ABIA (BTS system Module) | Nokia | 473096A.102 | L1164015939 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | Kr16180020006 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | MA17331610206 |
| HP ProBook 6470b | HP | B2G14EC#ABA | CNU246B8XP |
| Power Supply (Laptop) | HP | 608428-002 | F12941232064008 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| RF cable<br>HS-SUCOFLEX_106 | Y | 2m | N | EUT [AAIB]<br>RF port 2<br>(port under test) | 10dB Attenuator<br>(100W) |
| RF cable<br>HS-SUCOFLEX_104 | Y | 1m | N | Low Pass Filter<br>(100W) | Spectrum Analyzer |
| RF cable<br>R&D Microwaves<br>CBL-6ft-NMNM-402J-N<br>15 places | Y | ~1.8m | N | EUT [AAIB]<br>RF ports 1, and 3<br>thru 16 | Antenna Loads<br>(1 through 15) |

# CONFIGURATIONS

## Configuration NOKI0006-3

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| Radio Module Software | FRM 59.10.R28L |
| BTS Software Version | SBTS19B_ENB_0000_000904 |

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AAIB (Radio Module Model) | Nokia | 090147A.101 | YK183800029 |

| Peripherals in test setup boundary | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| 30dB Attenuator (50W) | Narda | 776B-30 | None |
| High Pass Filter (2W) | RLC Electronics | F-100-3000-5-R | 0028 |
| Antenna Load 1 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 2 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 3 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 4 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 5 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 6 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 7 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 8 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 9 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 10 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 11 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 12 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 13 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 14 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| Antenna Load 15 | R&D Microwaves LLC | TA-A40NFCB-BR | N/A |
| AMIA (BTS system Module) | Nokia | 473098A.101 | RK16401509 |
| ASIA (BTS system Module) | Nokia | 473095A.203 | AH173111443 |
| ABIA (BTS system Module) | Nokia | 473096A.102 | L1164015939 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | Kr16180020006 |
| SFP+ 9.8G,300M,850NM | Nokia | 473842.A101 | MA17331610206 |
| HP ProBook 6470b | HP | B2G14EC#ABA | CNU246B8XP |
| Power Supply (Laptop) | HP | 608428-002 | F12941232064008 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| RF cable<br>HS-SUCOFLEX_106 | Y | 2m | N | EUT [AAIB]<br>RF port 2<br>(port under test) | Narda 30dB<br>Attenuator (50W) |
| RF cable<br>HS-SUCOFLEX_104 | Y | 1m | N | High Pass Filter<br>(2W) | Spectrum Analyzer |
| RF cable<br>R&D Microwaves<br>CBL-6ft-NMNM-402J-N<br>15 places | Y | ~1.8m | N | EUT [AAIB]<br>RF ports 1, and 3<br>thru 16 | Antenna Loads<br>(1 through 15) |

# MODIFICATIONS

## Equipment Modifications

| Item | Date | Test | Modification | Note | Disposition of EUT |
|---|---|---|---|---|---|
| 1 | 2020-01-29 | Output Power – Worst Case Port | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 2 | 2020-01-30 | Output Power | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 3 | 2020-01-30 | Occupied Bandwidth | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 4 | 2020-01-30 | Peak to Average Power (PAPR)/CCDF | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 5 | 2020-01-30 | Band Edge Compliance | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 6 | 2020-01-30 | Spurious Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed. |

# OCCUPIED BANDWIDTH

XMit 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

**TEST EQUIPMENT**

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|---|---|---|---|---|---|
| Generator - Signal | Keysight | N5171B-506 | TEW | 2-May-18 | 2-May-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 19-Mar-19 | 19-Mar-20 |

**TEST DESCRIPTION**

The 99% bandwidth was measured utilizing the analyzer's peak detector and measuring the carrier's 26 db occupied bandwidth based on the peak output power level measured. A plot was taken to show the occupied bandwiddth is contianed within the allowable transmit band.

The measurement was made using a direct connection between the RF output of the EUT and the specturm analyzer. the method in section 5.4 of ANSI C63.26 was used to make this measurement. The specturm analyzer setting were as follows:

- RBW is 1% - 5% of the Occupied Bandwidth
- VBW is ≥ 3x the RBW
- Peak Dectector was used
- Trace max hold was used

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets

FCC 27.53(h)(3) defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

# OCCUPIED BANDWIDTH

element

TbtTx 2019.08.30.0 XMit 2019.09.05

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **AAIB** | | | **Work Order:** | **NOKI0006** |
| **Serial Number:** | **YK183800029** | | | **Date:** | **30-Jan-20** |
| **Customer:** | **Nokia Solutions and Networks** | | | **Temperature:** | **21.8 °C** |
| **Attendees:** | **Mitch Hill, John Rattanavong** | | | **Humidity:** | **34.3% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1016 mbar** |
| **Tested by:** | **Willie Love, Brandon Hobbs** | **Power:** | **54VDC** | **Job Site:** | **TX09** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 27:2020** | ANSI C63.26:2015 |
| **RSS-Gen:2019** | RSS-Gen:2019 |

**COMMENTS**

**All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel shown elsewhere in the report.**

**DEVIATIONS FROM TEST STANDARD**

**None**

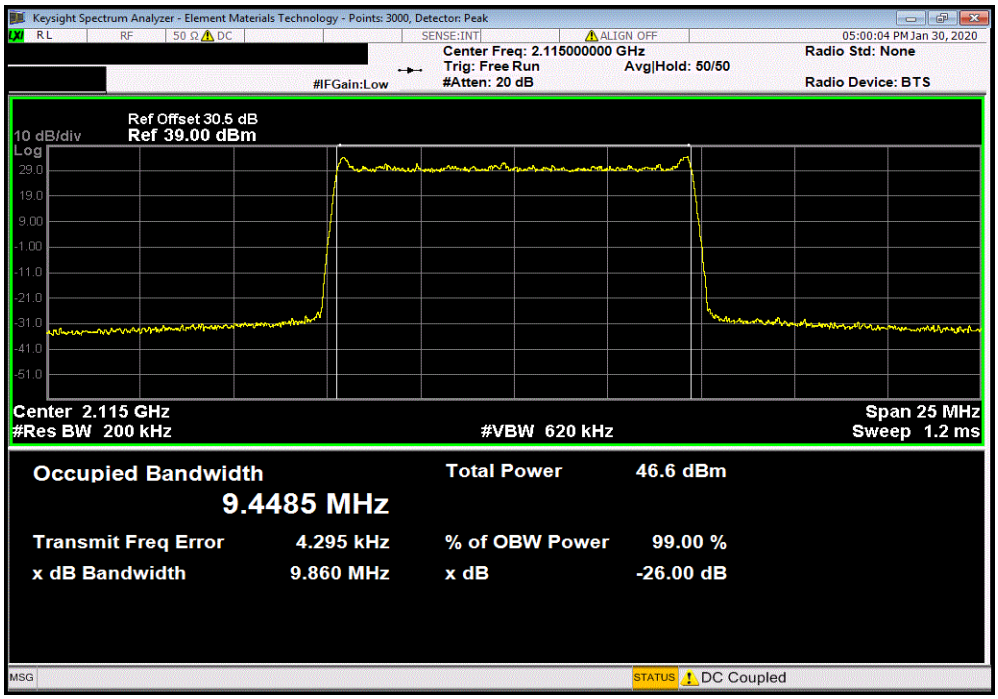
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | | | **Value 99% (MHz)** | **Value -26dB (MHz)** | **Limit (>)** | **Result** |
|---|---|---|---|---|---|---|
| Band 66 (Single Carrier) Port 2 | | | | | | |
| | 10 MHz | | | | | |
| | | NB IOT | | | | |
| | | Low Channel, 2115 MHz | 9.45 | 9.86 | Within Band | Pass |
| | | Mid Channel, 2155 MHz | 9.44 | 9.86 | Within Band | Pass |
| | | High Channel, 2195 MHz | 9.43 | 9.84 | Within Band | Pass |
| | 15 MHz | | | | | |
| | | NB IOT | | | | |
| | | Low Channel, 2117.5 MHz | 14.06 | 14.66 | Within Band | Pass |
| | | Mid Channel, 2155 MHz | 14.12 | 14.71 | Within Band | Pass |
| | | High Channel, 2192.5 MHz | 14.13 | 14.70 | Within Band | Pass |
| | 20 MHz | | | | | |
| | | NB IOT | | | | |
| | | Low Channel, 2120 MHz | 18.65 | 19.35 | Within Band | Pass |
| | | Mid Channel, 2155 MHz | 18.60 | 19.54 | Within Band | Pass |
| | | High Channel, 2190 MHz | 18.60 | 19.55 | Within Band | Pass |

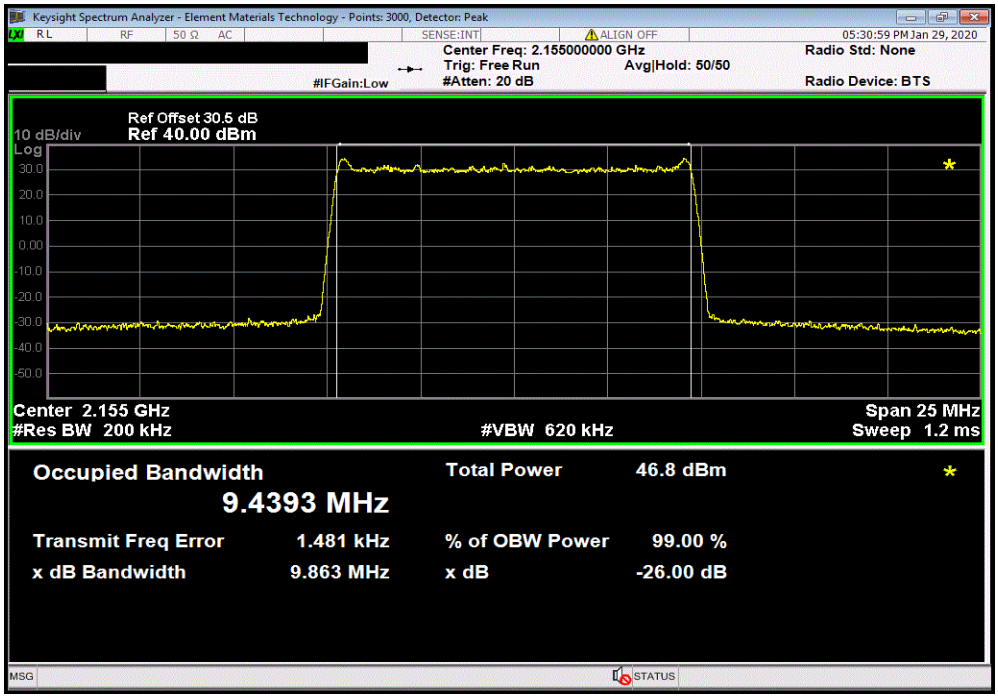
Band 66 Emission Designators:

| Band 66 (2110MHz to 2200MHz) Emission Designators | | | | | | |
|---|---|---|---|---|---|---|
| LTE Narrow Band IoT Guard Band | | | | | | |
| **LTE Channel Bandwidth** | **Low Channel** | | **Middle Channel** | | **High Channel** | |
| | **FCC** | **IC** | **FCC** | **IC** | **FCC** | **IC** |
| 10M | 9M86F9W | 9M45F9W | 9M86F9W | 9M44F9W | 9M84F9W | 9M43F9W |
| 15M | 14M7F9W | 14M1F9W | 14M7F9W | 14M1F9W | 14M7F9W | 14M1F9W |
| 20M | 19M4F9W | 18M6F9W | 19M5F9W | 18M6F9W | 19M6F9W | 18M6F9W |
| Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth. | | | | | | |

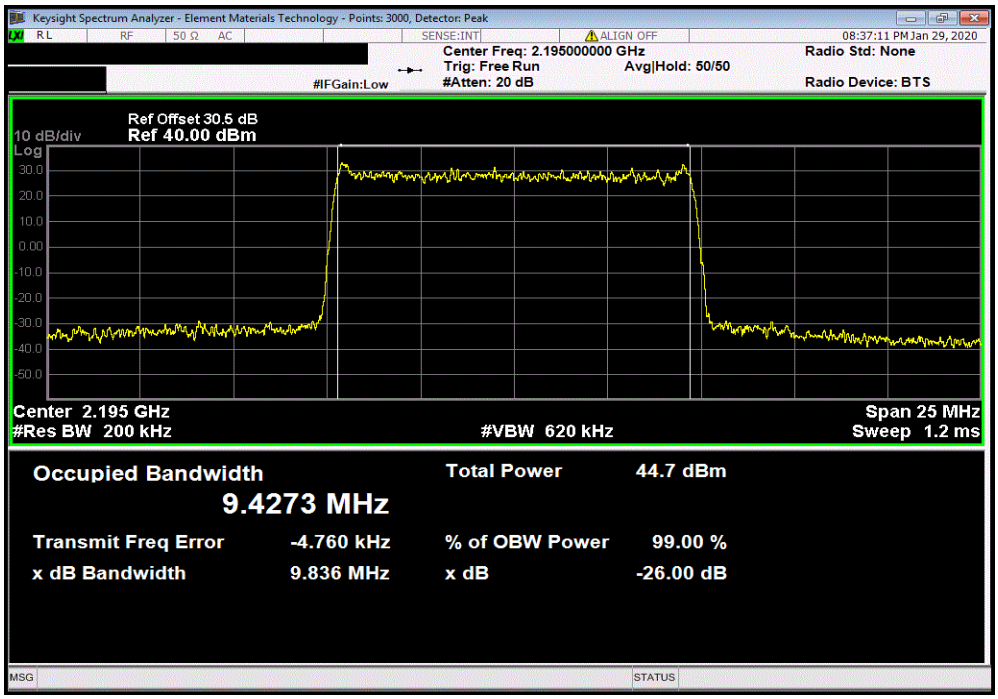
| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Low Channel, 2115 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 9.448 | 9.86 | Within Band | Pass |



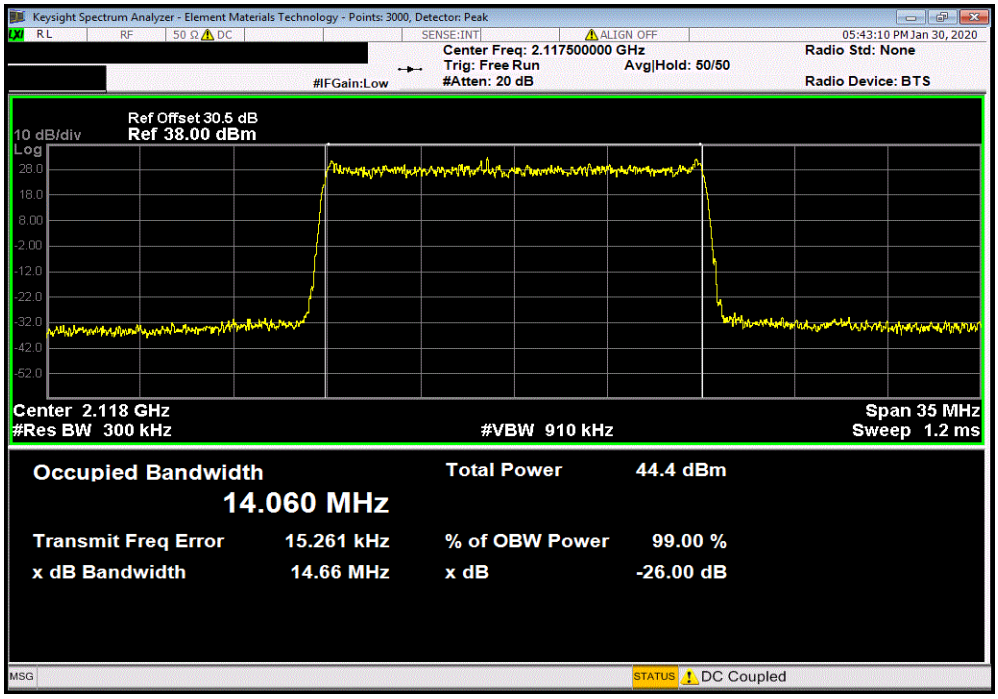

| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 9.439 | 9.863 | Within Band | Pass |



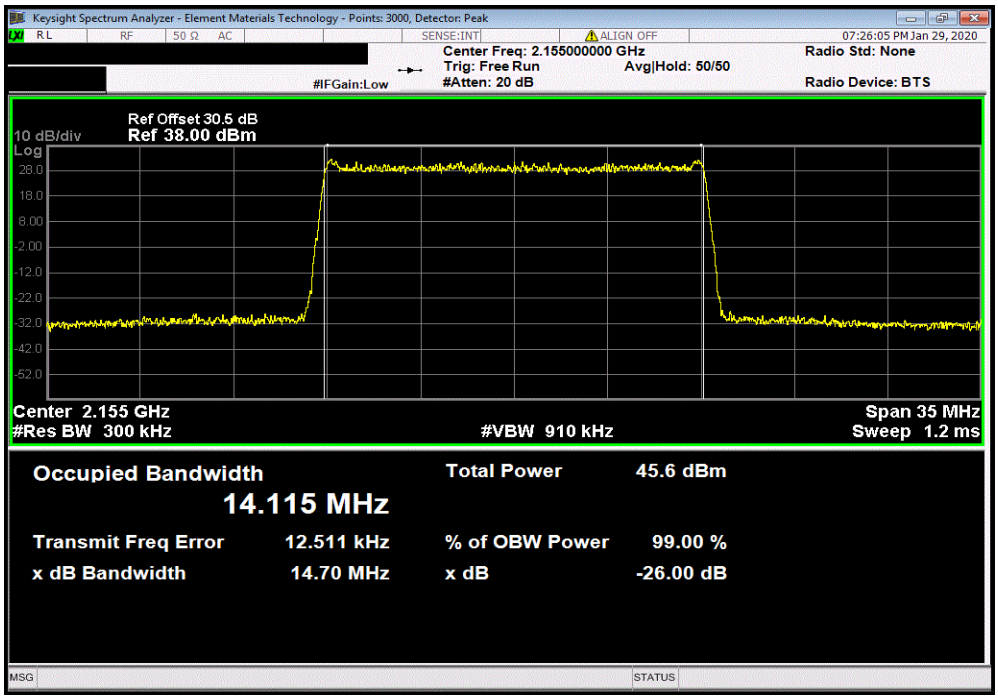
| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, High Channel, 2195 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 9.427 | 9.836 | Within Band | Pass |



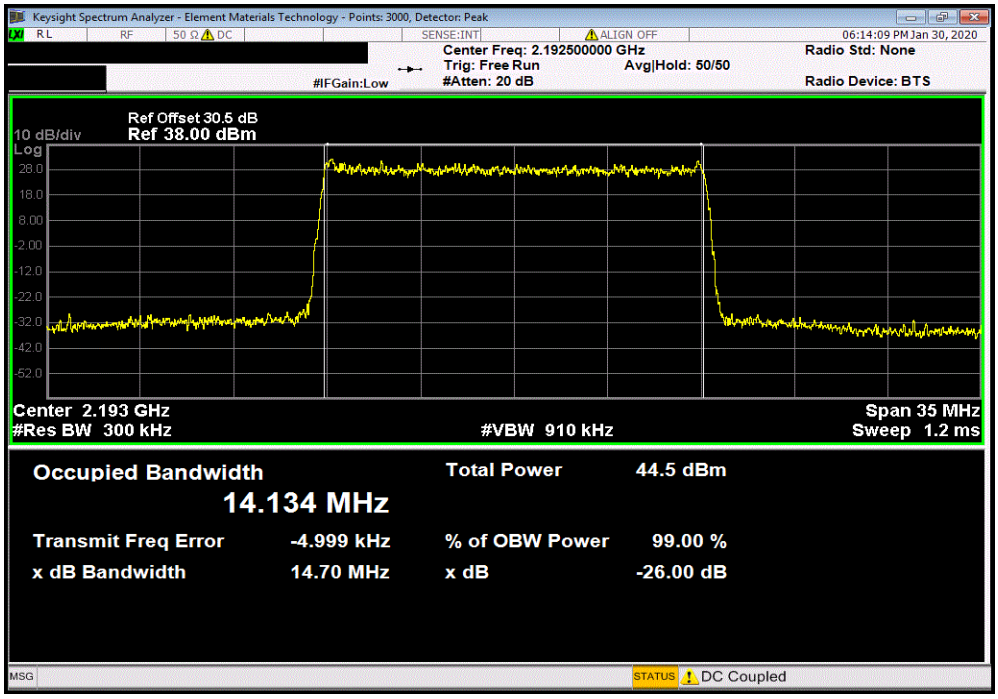

| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Low Channel, 2115 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 14.06 | 14.658 | Within Band | Pass |



| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 14.115 | 14.705 | Within Band | Pass |



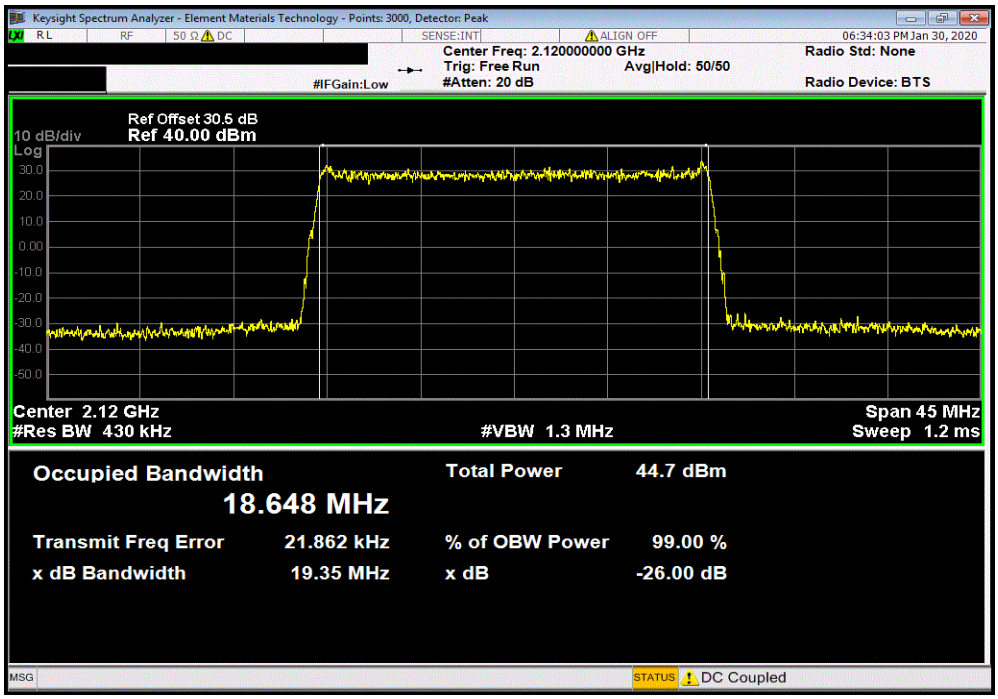

| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, High Channel, 2192.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 14.134 | 14.697 | Within Band | Pass |



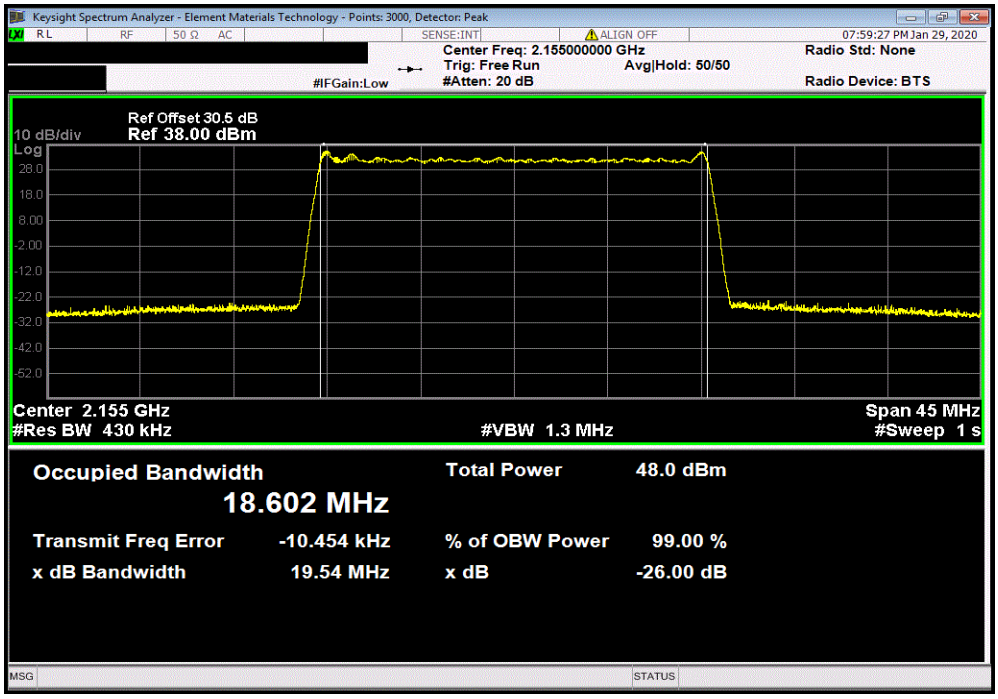
# OCCUPIED BANDWIDTH



| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Low Channel, 2120 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 18.648 | 19.35 | Within Band | Pass |



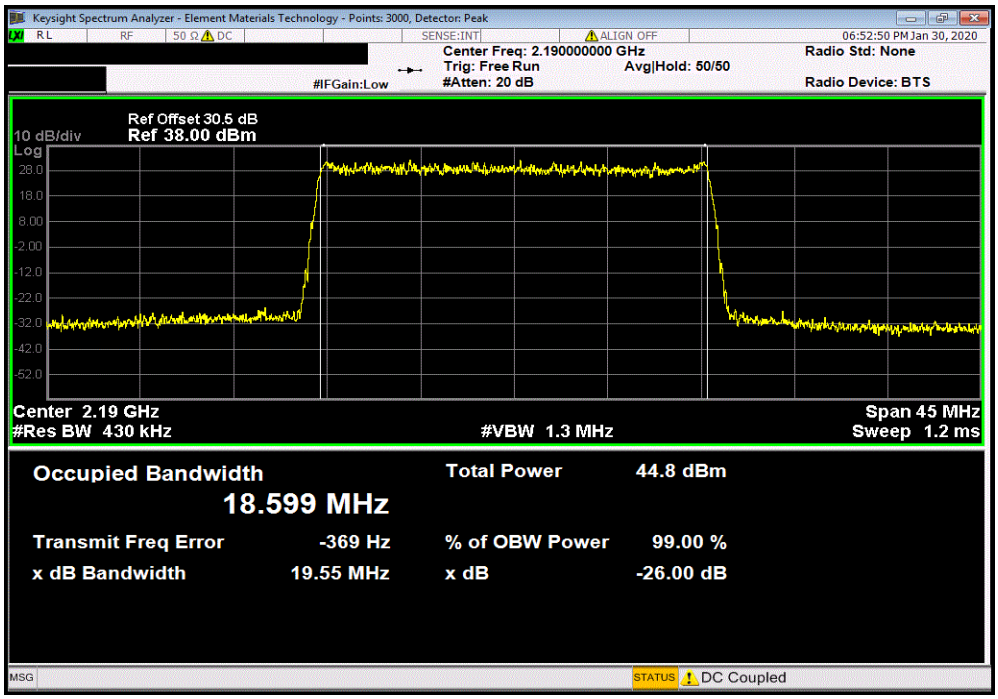

| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 18.602 | 19.543 | Within Band | Pass |



# OCCUPIED BANDWIDTH



| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, High Channel, 2190 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | Value 99% (MHz) | Value -26dB (MHz) | Limit (>) | Result |
| | | | 18.599 | 19.55 | Within Band | Pass |



# OUTPUT POWER

XMit 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

**TEST EQUIPMENT**

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|---|---|---|---|---|---|
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 19-Mar-19 | 19-Mar-20 |
| Generator - Signal | Keysight | N5171B-506 | TEW | 2-May-18 | 2-May-21 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Per FCC sections 27.50(d), 27.55(a)(1), RSS-139 6.5, RSS-170 5.3.1, the Equivalent Isotropically Radiated Power (EIRP) of the transceiver cannot exceed 1640 Watts/MHz.

# OUTPUT POWER

element

TbtTx 2019.08.30.0 XMit 2019.09.05

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **AAIB** | | | **Work Order:** | **NOKI0006** |
| **Serial Number:** | **YK183800029** | | | **Date:** | **30-Jan-20** |
| **Customer:** | **Nokia Solutions and Networks** | | | **Temperature:** | **22 °C** |
| **Attendees:** | **Mitch Hill, John Rattanavong** | | | **Humidity:** | **33.5% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1013 mbar** |
| **Tested by:** | **Willie Love, Brandon Hobbs** | **Power:** | **54VDC** | **Job Site:** | **TX09** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 27:2020** | ANSI C63.26:2015 |
| **RSS-139:2015, RSS-170:2015** | RSS-Gen:2019 |

**COMMENTS**

**All losses in the measurement path were accounted for. Per ANSI C63.26-2015 section 4.2.3 a correction factor was used to determine the Power/MHz value based on a measured dBm/OBW with a reduced Integration BW from the specification required reference bandwidth. CF= 10*Log(ref BW/measured Integration channel BW) The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel shown elsewhere in the report.**

**DEVIATIONS FROM TEST STANDARD**

**None**

| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | | | Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | Final w/o Ant Gain Value (dBm/MHz) | Limit EIRP (dBm/MHz) | Results |
|---|---|---|---|---|---|---|---|---|---|
| Band 66 (Single Carrier) Port 2 | | | | | | | | | |
| | 10 MHz | | | | | | | | |
| | | NB IOT | | | | | | | |
| | | Low Channel, 2115 MHz | Not Provided | 37.9 | 0.0 | -10.0 | 27.9 | 62.2 | Pass |
| | | Mid Channel, 2155 MHz | Not Provided | 38.1 | 0.0 | -10.0 | 28.1 | 62.2 | Pass |
| | | High Channel, 2195 MHz | Not Provided | 38.0 | 0.0 | -10.0 | 28.0 | 62.2 | Pass |
| | 15 MHz | | | | | | | | |
| | | NB IOT | | | | | | | |
| | | Low Channel, 2117.5 MHz | Not Provided | 37.8 | 0.0 | -11.8 | 26.1 | 62.2 | Pass |
| | | Mid Channel, 2155 MHz | Not Provided | 38.0 | 0.0 | -11.8 | 26.2 | 62.2 | Pass |
| | | High Channel, 2192.5 MHz | Not Provided | 38.1 | 0.0 | -11.8 | 26.3 | 62.2 | Pass |
| | 20 MHz | | | | | | | | |
| | | NB IOT | | | | | | | |
| | | Low Channel, 2120 MHz | Not Provided | 38.1 | 0.0 | -13.0 | 25.1 | 62.2 | Pass |
| | | Mid Channel, 2155 MHz | Not Provided | 38.2 | 0.0 | -13.0 | 25.2 | 62.2 | Pass |
| | | High Channel, 2190 MHz | Not Provided | 38.2 | 0.0 | -13.0 | 25.2 | 62.2 | Pass |

# OUTPUT POWER

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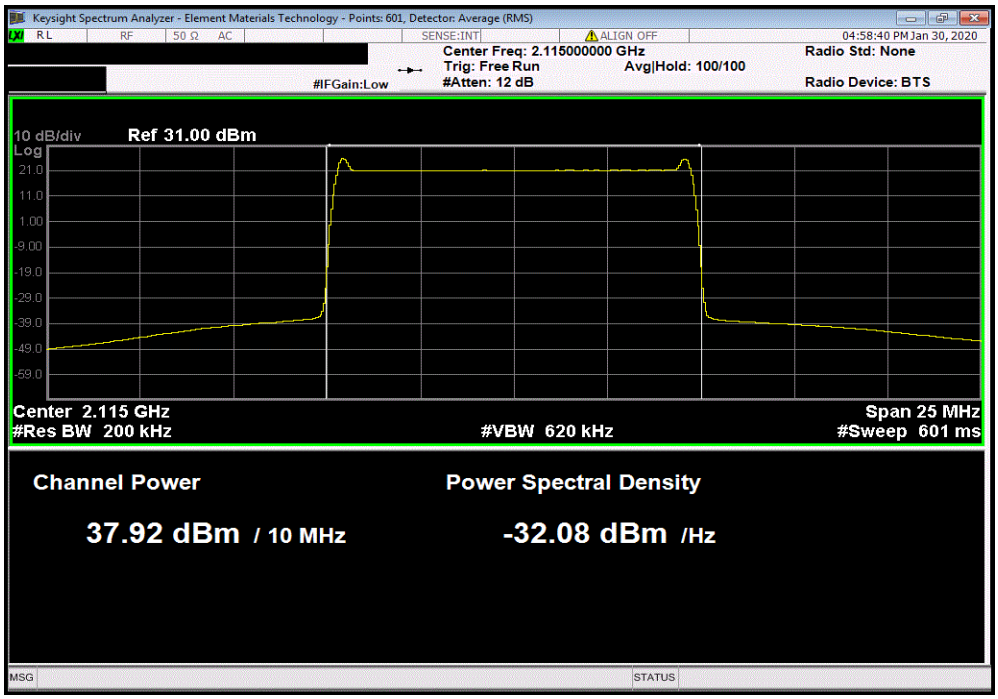
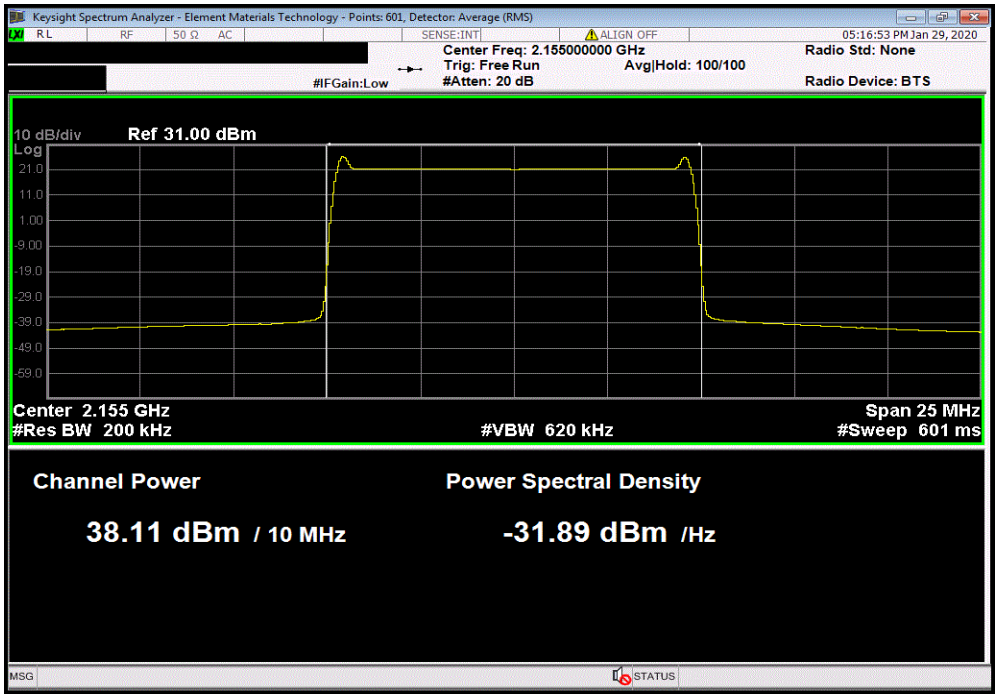
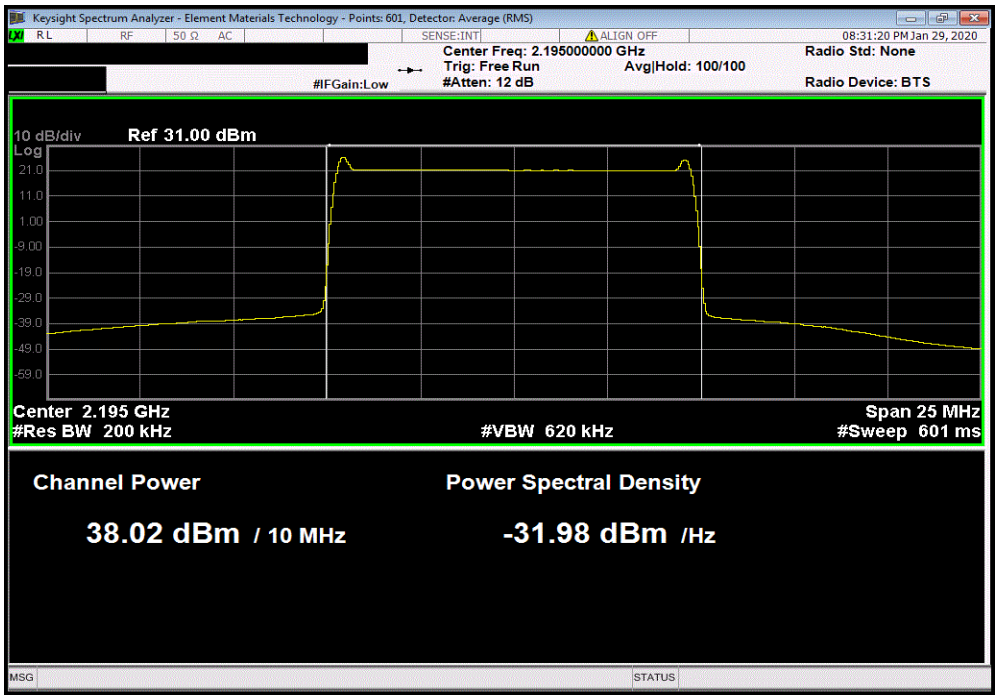
| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Low Channel, 2115 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 37.916 | 0 | -10.00 | 27.92 | 62.15 | Pass |



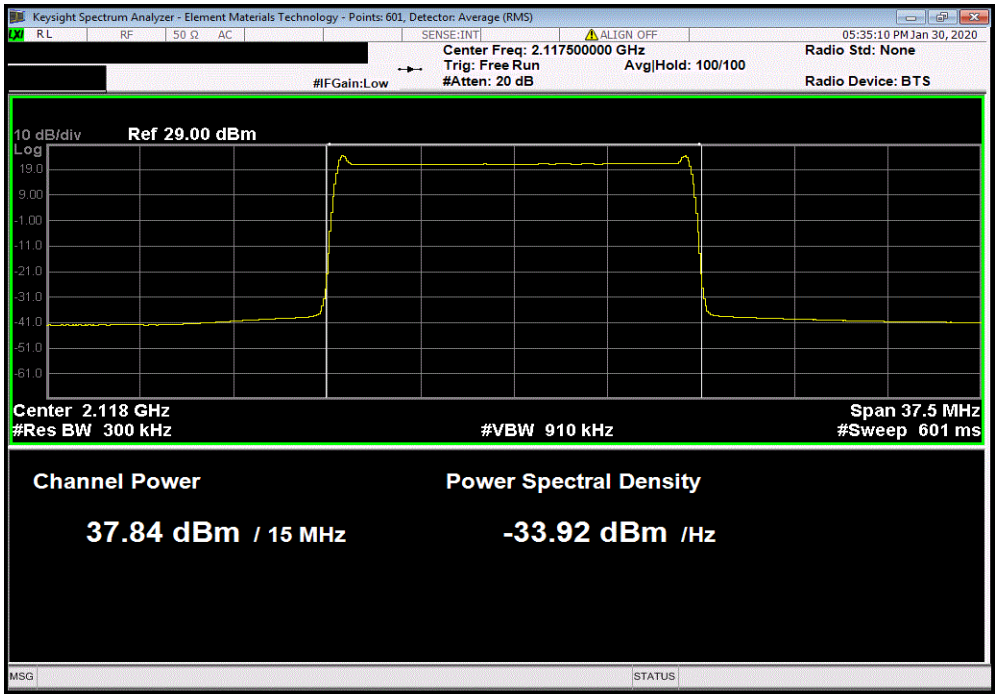

| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.115 | 0 | -10.00 | 28.12 | 62.15 | Pass |



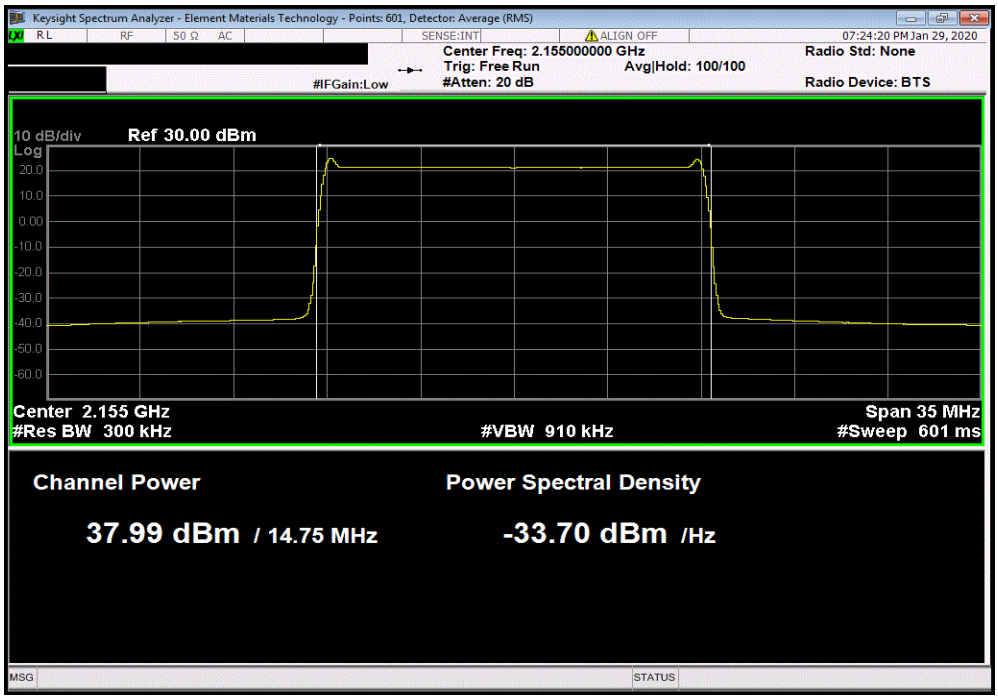
| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, High Channel, 2195 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.019 | 0 | -10.00 | 28.02 | 62.15 | Pass |



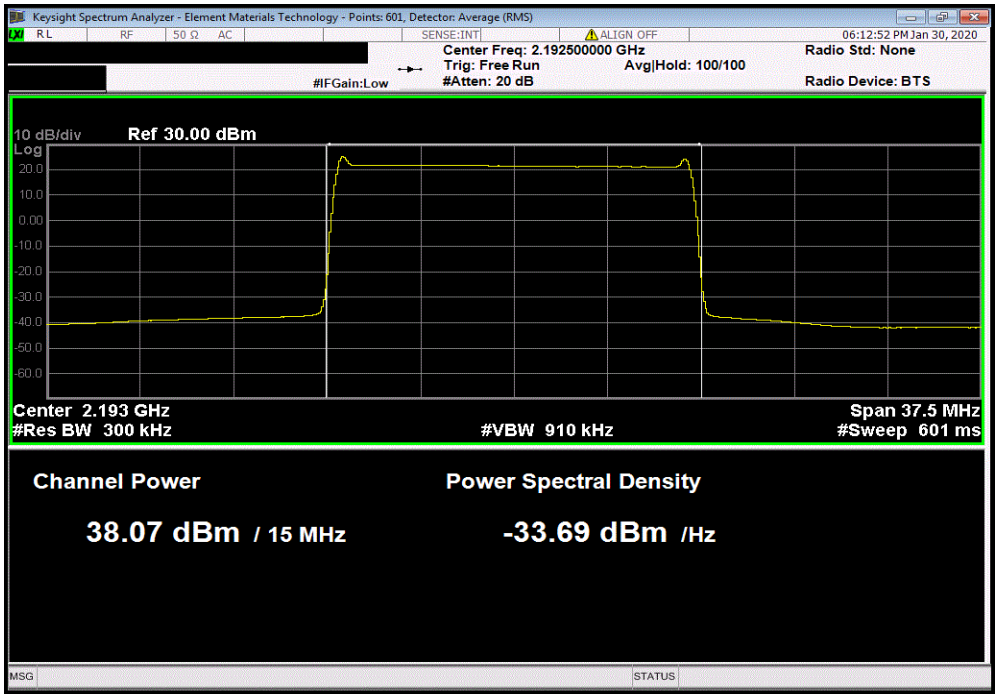

| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Low Channel, 2117.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 37.84 | 0 | -11.76 | 26.08 | 62.15 | Pass |



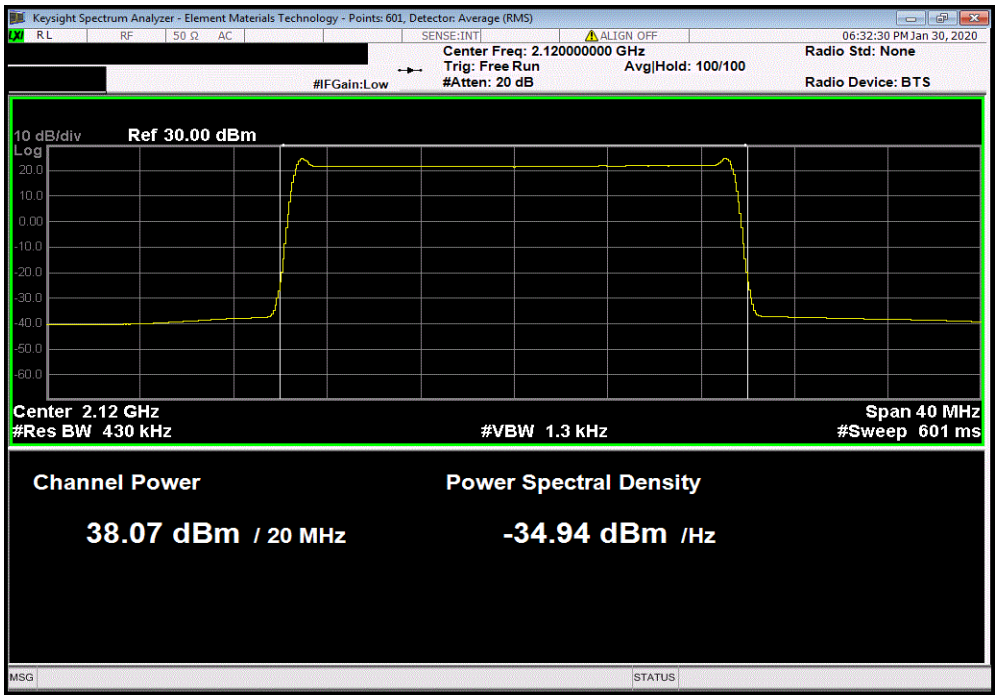
| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 37.989 | 0 | -11.76 | 26.23 | 62.15 | Pass |



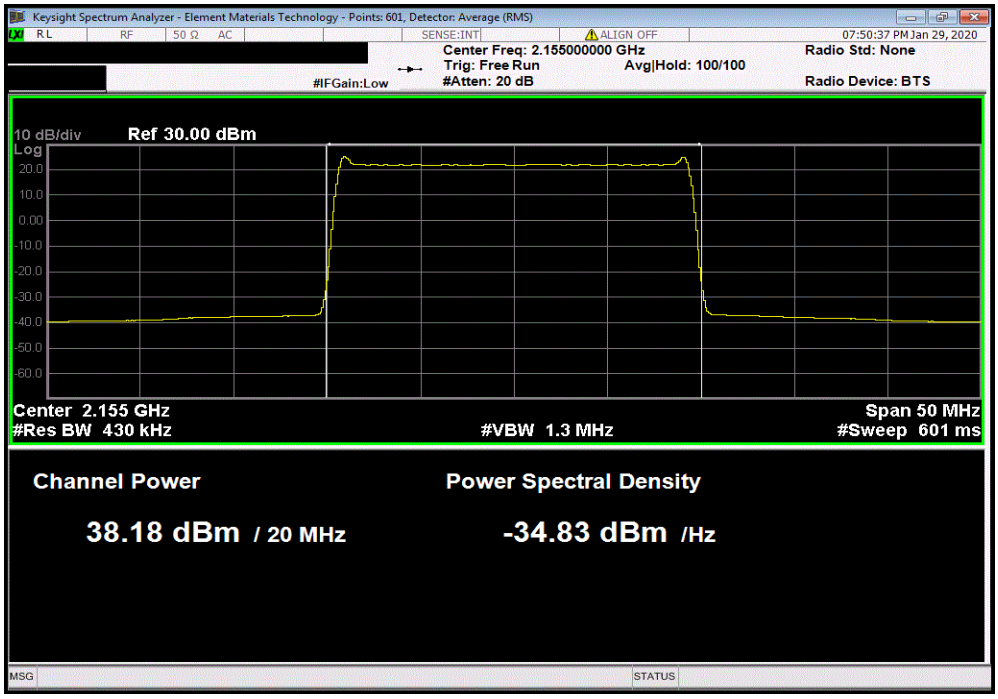

| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, High Channel, 2192.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.071 | 0 | -11.76 | 26.31 | 62.15 | Pass |



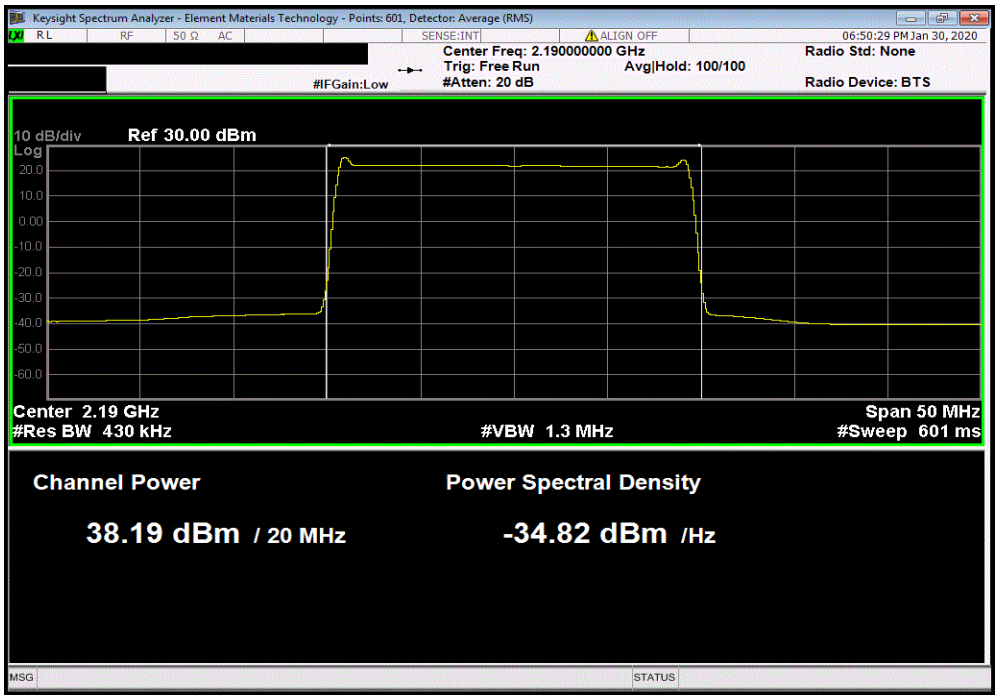
| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Low Channel, 2120 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.068 | 0 | -13.01 | 25.06 | 62.15 | Pass |




| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai /alue (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.183 | 0 | -13.01 | 25.17 | 62.15 | Pass |



| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, High Channel, 2190 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Gain (dBi) | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Correction Factor (dB) | inal w/o Ant Gai Value (dBm/MHz | Limit EIRP (dBm/MHz) | Results |
| Not Provided | 38.187 | 0 | -13.01 | 25.18 | 62.15 | Pass |



# OUTPUT POWER (WORST CASE PORT)

XMit 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

**TEST EQUIPMENT**

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|---|---|---|---|---|---|
| Generator - Signal | Keysight | N5171B-506 | TEW | 2-May-18 | 2-May-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 19-Mar-19 | 19-Mar-20 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Per FCC sections 27.50(d), 27.55(a)(1), RSS-139 6.5, RSS-170 5.3.1, the Equivalent Isotropically Radiated Power (EIRP) of the transceiver cannot exceed 1640 Watts/MHz.

# OUTPUT POWER (WORST CASE PORT)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | AAIB | | | **Work Order:** | NOKI0006 |
| **Serial Number:** | YK183800029 | | | **Date:** | 29-Jan-20 |
| **Customer:** | Nokia | | | **Temperature:** | 22.7 °C |
| **Attendees:** | Mitch Hill, John Rattanavong | | | **Humidity:** | 28.2% RH |
| **Project:** | None | | | **Barometric Pres.:** | 1041 mbar |
| **Tested by:** | Willie Love, Brandon Hobbs | **Power:** | 54VDC | **Job Site:** | TX09 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 27:2020 | ANSI C63.26:2015 |
| RSS-139:2015, RSS-170:2015 | RSS-139:2015, RSS-170:2015 |

**COMMENTS**

All loses in the measurement path were accounted for. Wort case port was found to be port 2

**DEVIATIONS FROM TEST STANDARD**

None

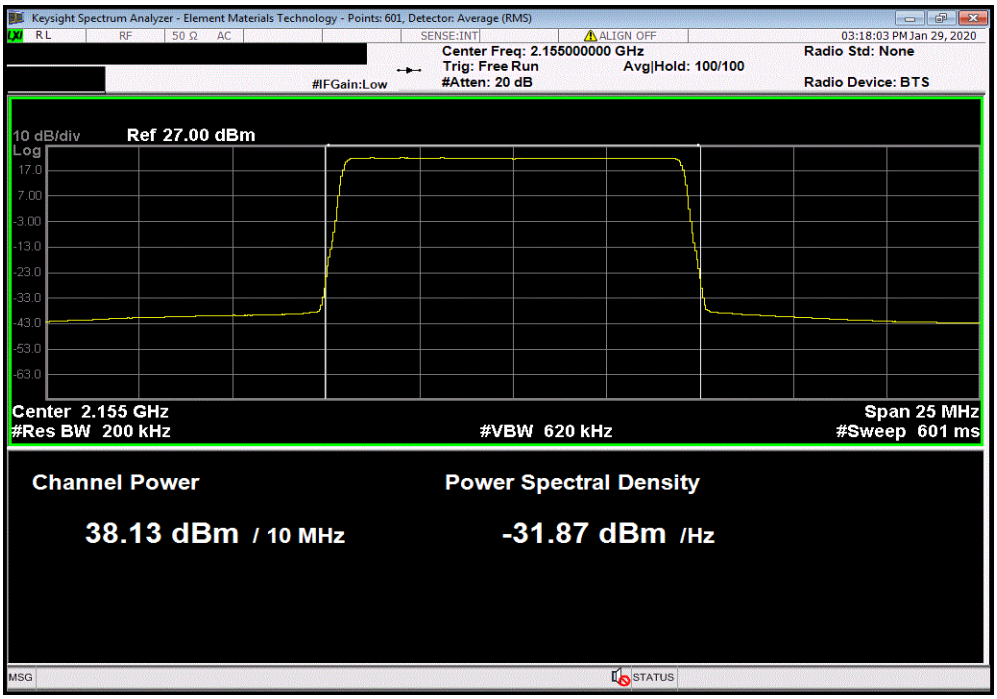
| Configuration # | 1 | Signature |
|---|---|---|

| | | | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
|---|---|---|---|---|---|---|---|---|
| Band 66 (Single Carrier) Port 1 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.13 | 0 | Not Provided | 38.1 | N/A | N/A |
| Band 66 (Single Carrier) Port 2 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.17 | 0 | Not Provided | 38.2 | N/A | N/A |
| Band 66 (Single Carrier) Port 3 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.01 | 0 | Not Provided | 38.0 | N/A | N/A |
| Band 66 (Single Carrier) Port 4 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 37.95 | 0 | Not Provided | 37.9 | N/A | N/A |
| Band 66 (Single Carrier) Port 5 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 37.96 | 0 | Not Provided | 38.0 | N/A | N/A |
| Band 66 (Single Carrier) Port 6 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.08 | 0 | Not Provided | 38.1 | N/A | N/A |
| Band 66 (Single Carrier) Port 7 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 37.93 | 0 | Not Provided | 37.9 | N/A | N/A |
| Band 66 (Single Carrier) Port 8 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.04 | 0 | Not Provided | 38.0 | N/A | N/A |
| Band 66 (Single Carrier) Port 9 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.10 | 0 | Not Provided | 38.1 | N/A | N/A |
| Band 66 (Single Carrier) Port 10 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.20 | 0 | Not Provided | 38.2 | N/A | N/A |
| Band 66 (Single Carrier) Port 11 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 37.95 | 0 | Not Provided | 37.9 | N/A | N/A |
| Band 66 (Single Carrier) Port 12 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.09 | 0 | Not Provided | 38.1 | N/A | N/A |
| Band 66 (Single Carrier) Port 13 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.00 | 0 | Not Provided | 38.0 | N/A | N/A |
| Band 66 (Single Carrier) Port 14 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.06 | 0 | Not Provided | 38.1 | N/A | N/A |
| Band 66 (Single Carrier) Port 15 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 37.85 | 0 | Not Provided | 37.8 | N/A | N/A |
| Band 66 (Single Carrier) Port 16 | 10 MHz | 256QAM | | | | | | |
| | | Mid Channel, 2155 MHz | 38.19 | 0 | Not Provided | 38.2 | N/A | N/A |

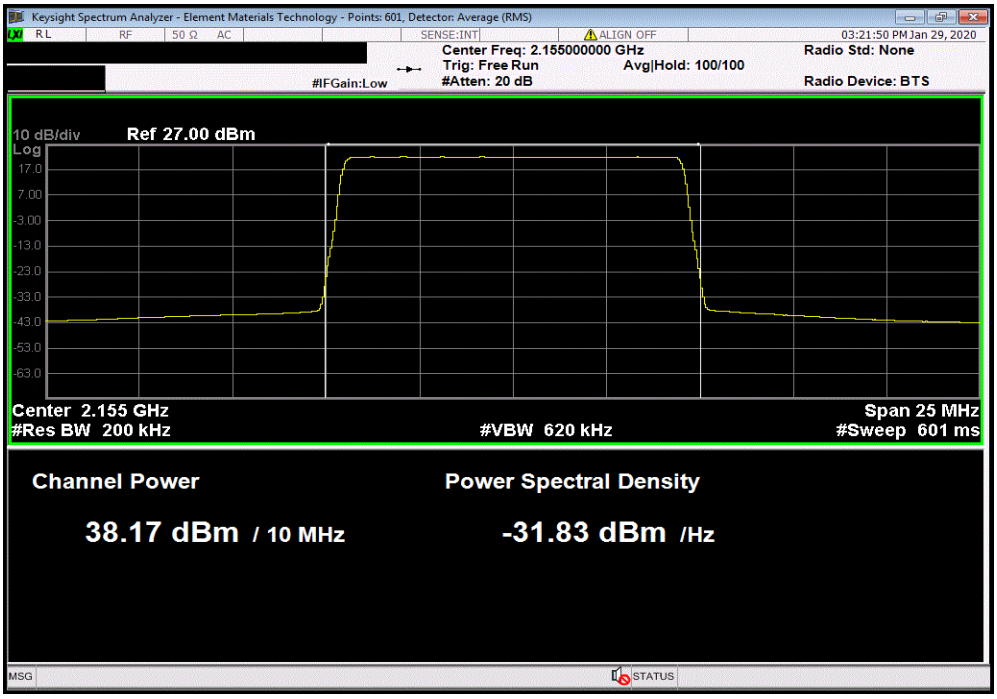
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 1, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.13 | 0 | Not Provided | 38.1 | N/A | N/A |



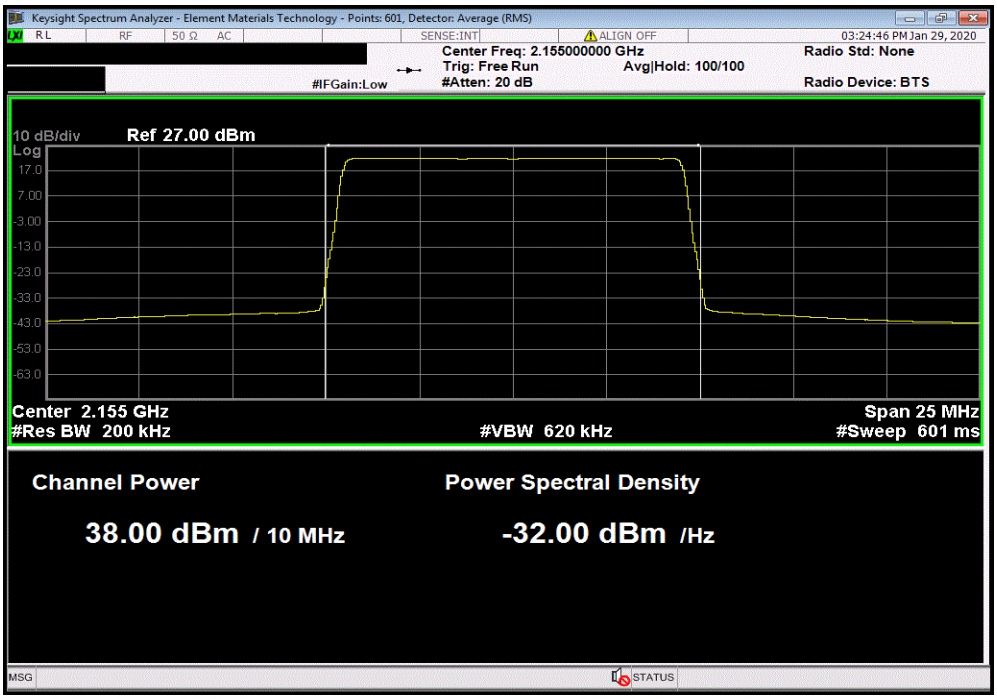

| Band 66 (Single Carrier) Port 2, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.165 | 0 | Not Provided | 38.2 | N/A | N/A |



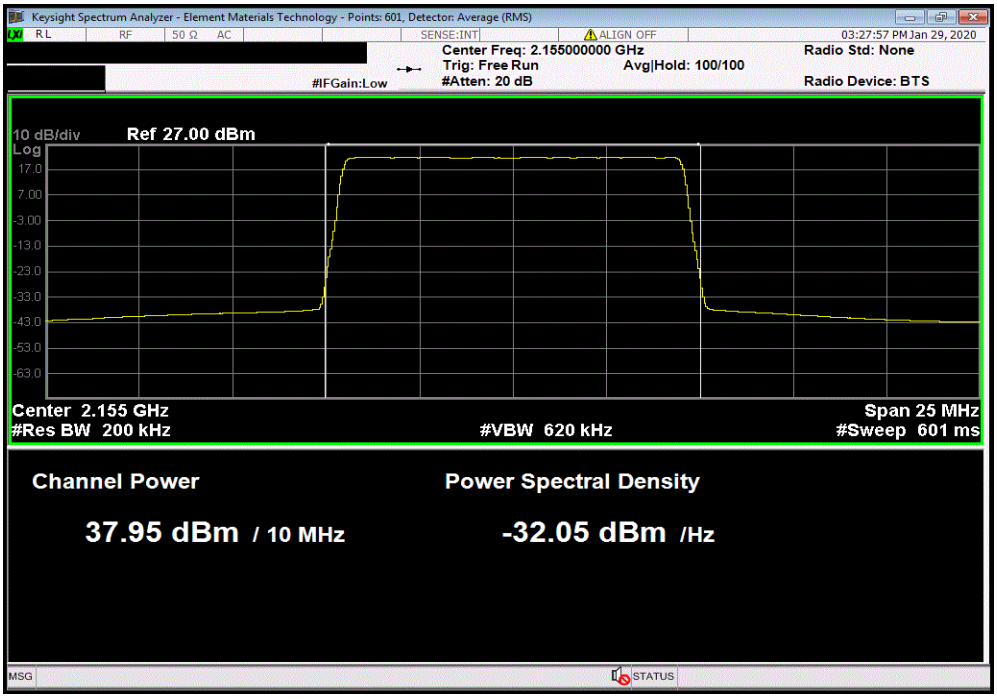
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 3, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.005 | 0 | Not Provided | 38 | N/A | N/A |



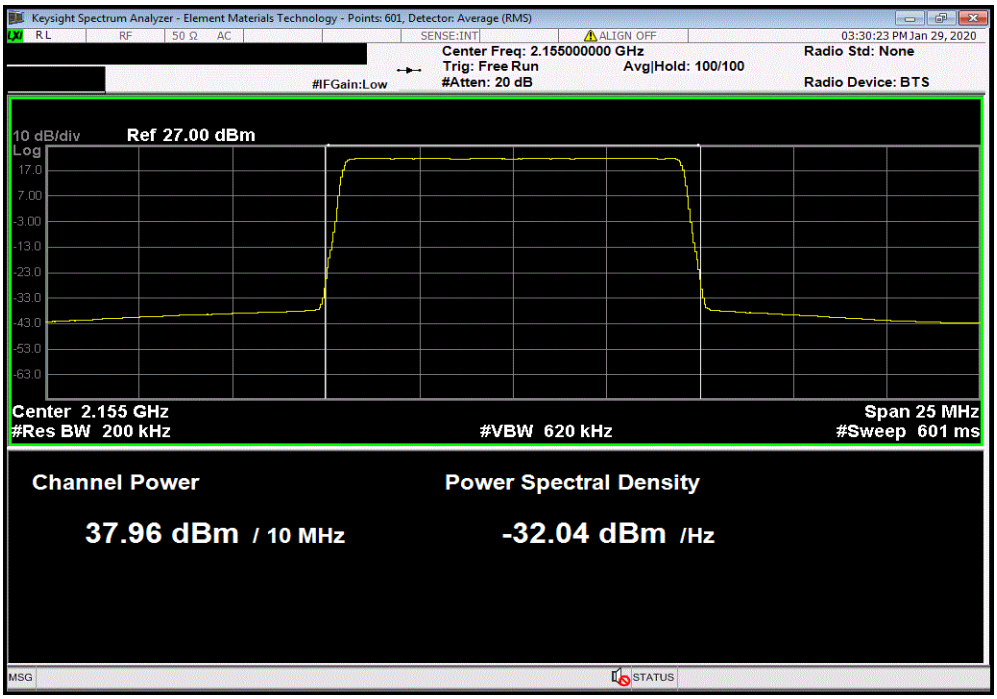

| Band 66 (Single Carrier) Port 4, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.949 | 0 | Not Provided | 37.9 | N/A | N/A |



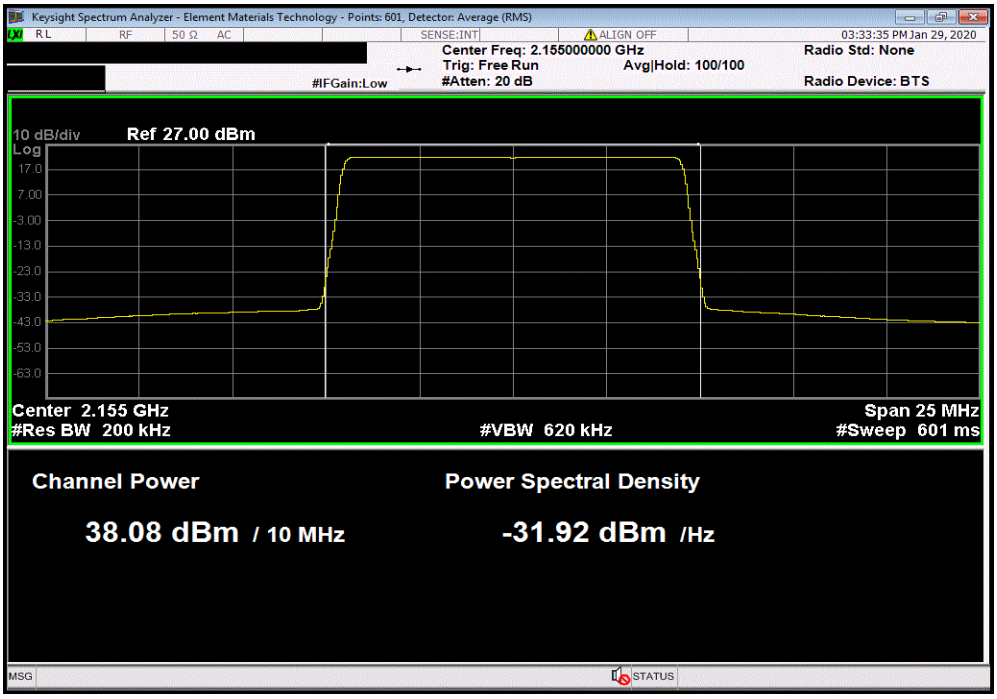
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 5, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.961 | 0 | Not Provided | 38 | N/A | N/A |



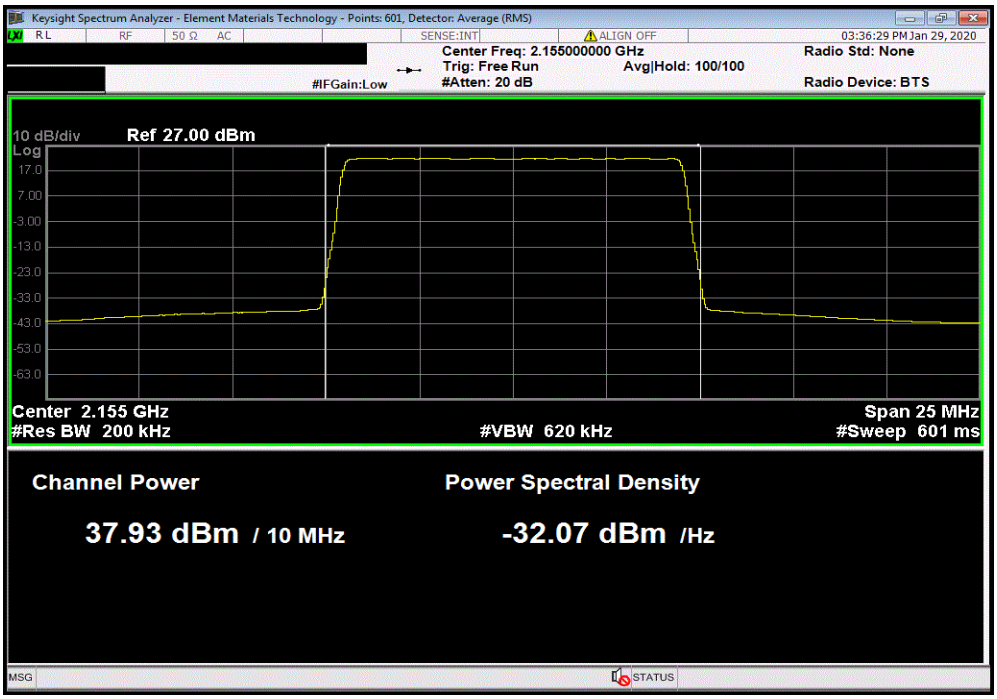

| Band 66 (Single Carrier) Port 6, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.08 | 0 | Not Provided | 38.1 | N/A | N/A |



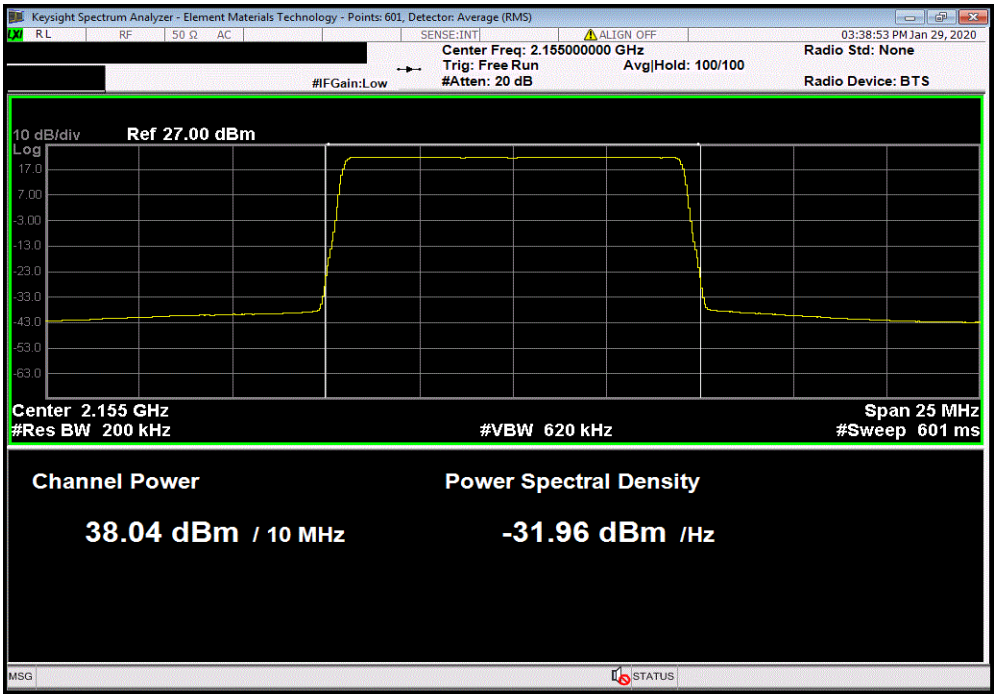
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 7, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.927 | 0 | Not Provided | 37.9 | N/A | N/A |



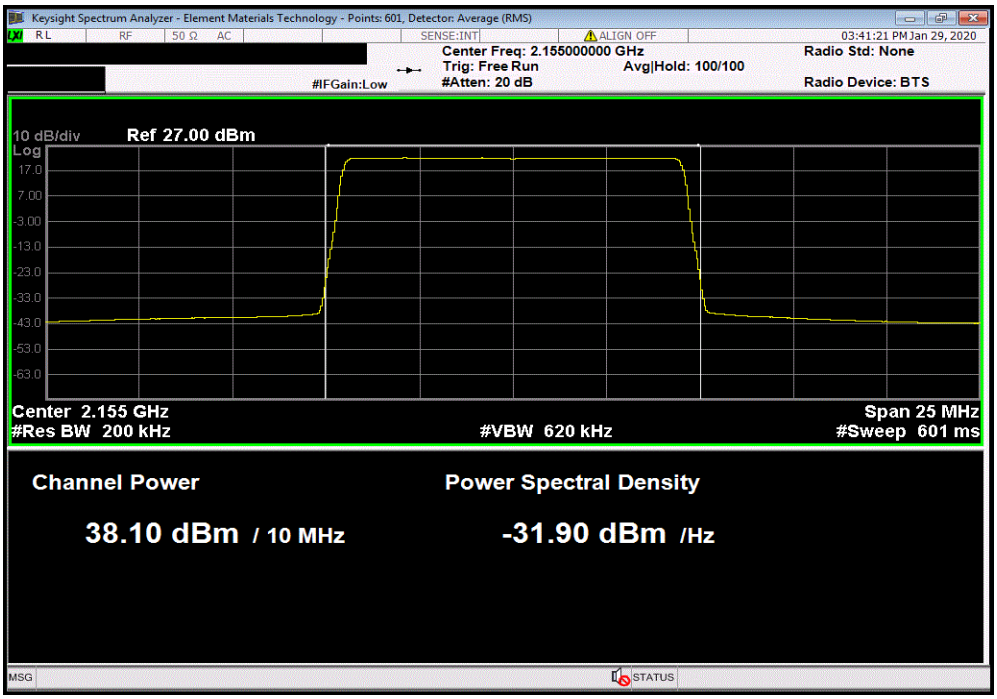

| Band 66 (Single Carrier) Port 8, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.037 | 0 | Not Provided | 38 | N/A | N/A |



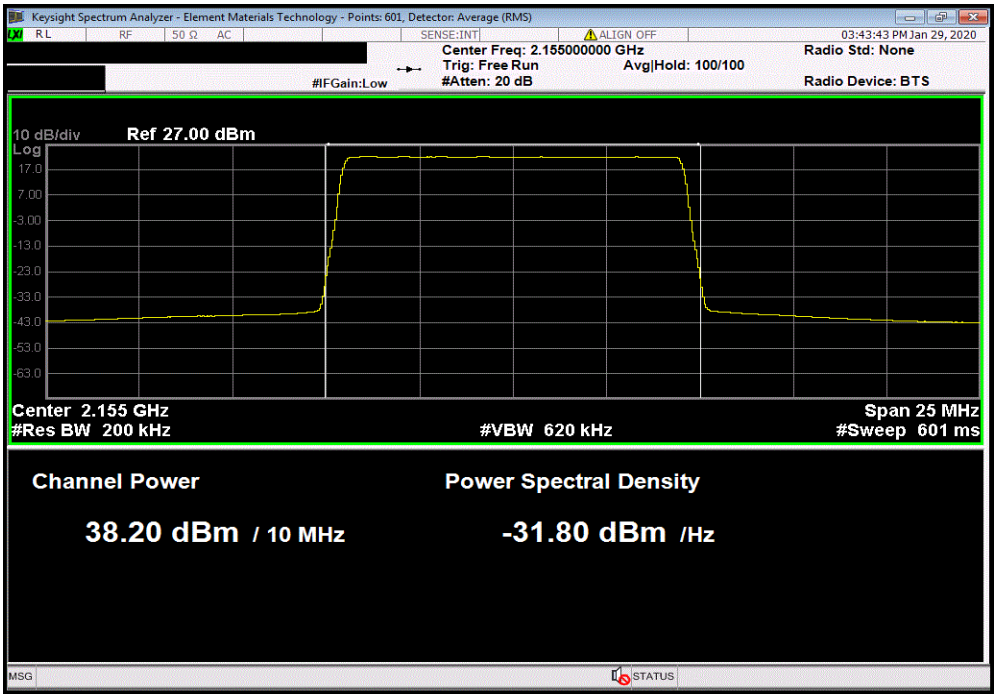
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 9, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.1 | 0 | Not Provided | 38.1 | N/A | N/A |



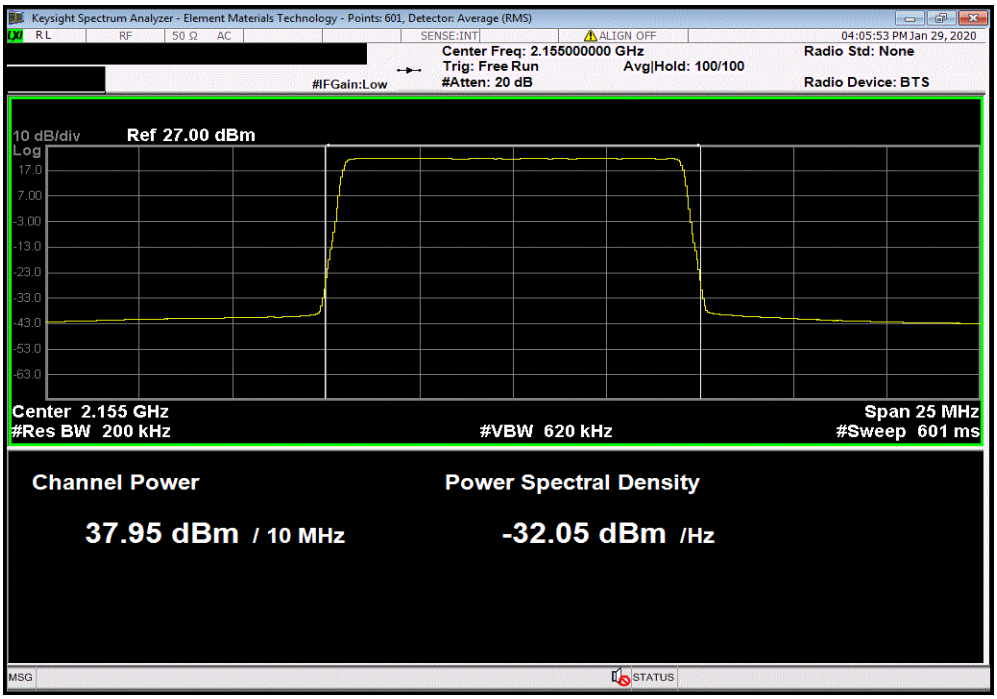

| Band 66 (Single Carrier) Port 10, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.196 | 0 | Not Provided | 38.2 | N/A | N/A |



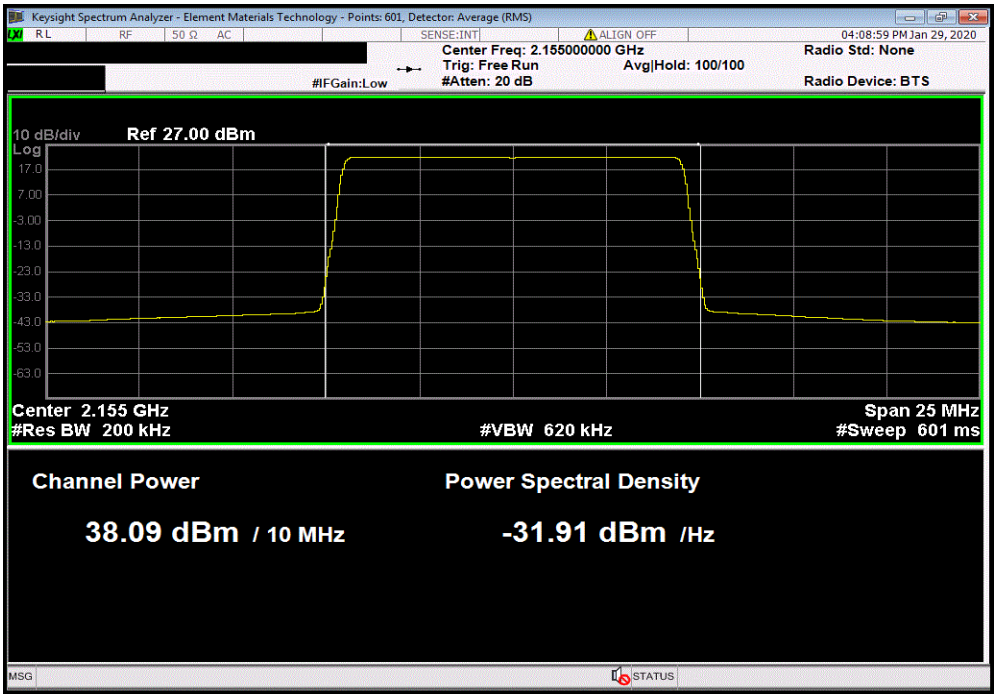
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 11, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.949 | 0 | Not Provided | 37.9 | N/A | N/A |



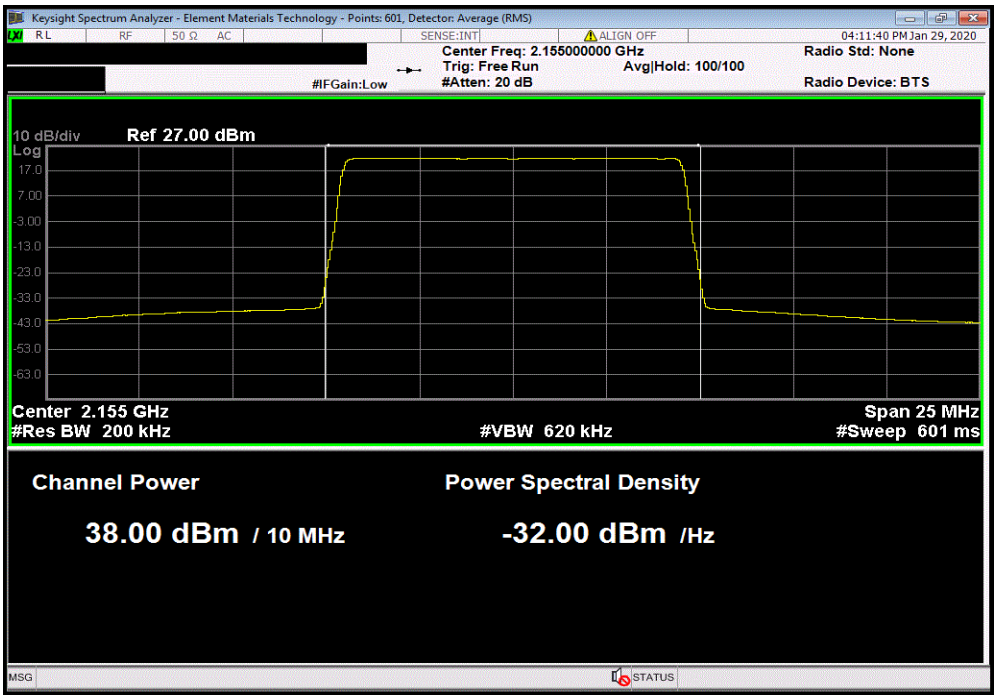

| Band 66 (Single Carrier) Port 12, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.092 | 0 | Not Provided | 38.1 | N/A | N/A |



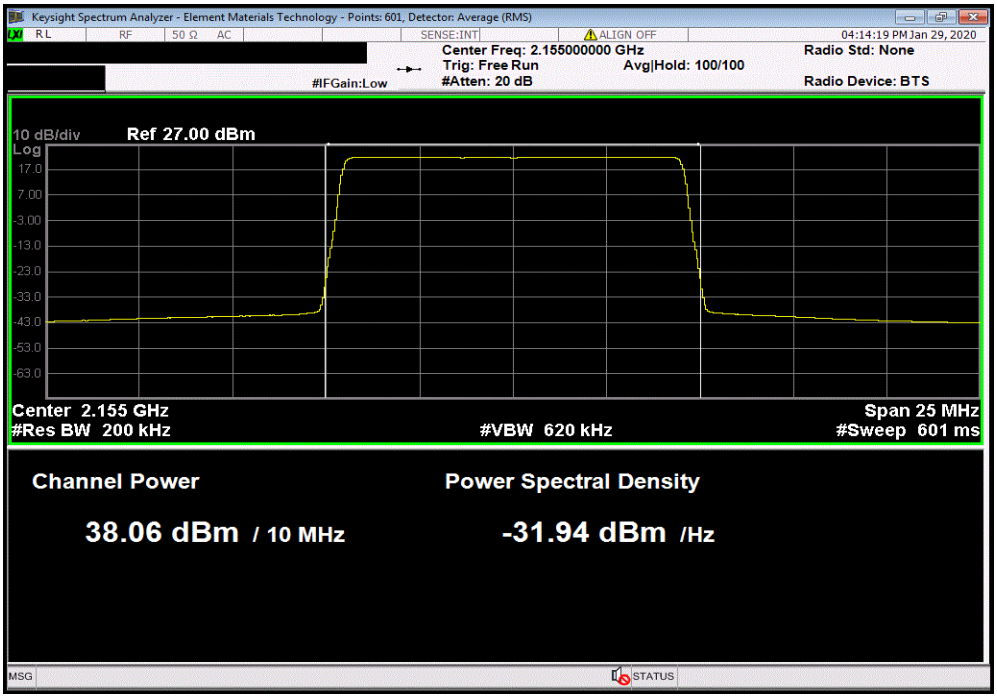
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 13, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.996 | 0 | Not Provided | 38 | N/A | N/A |



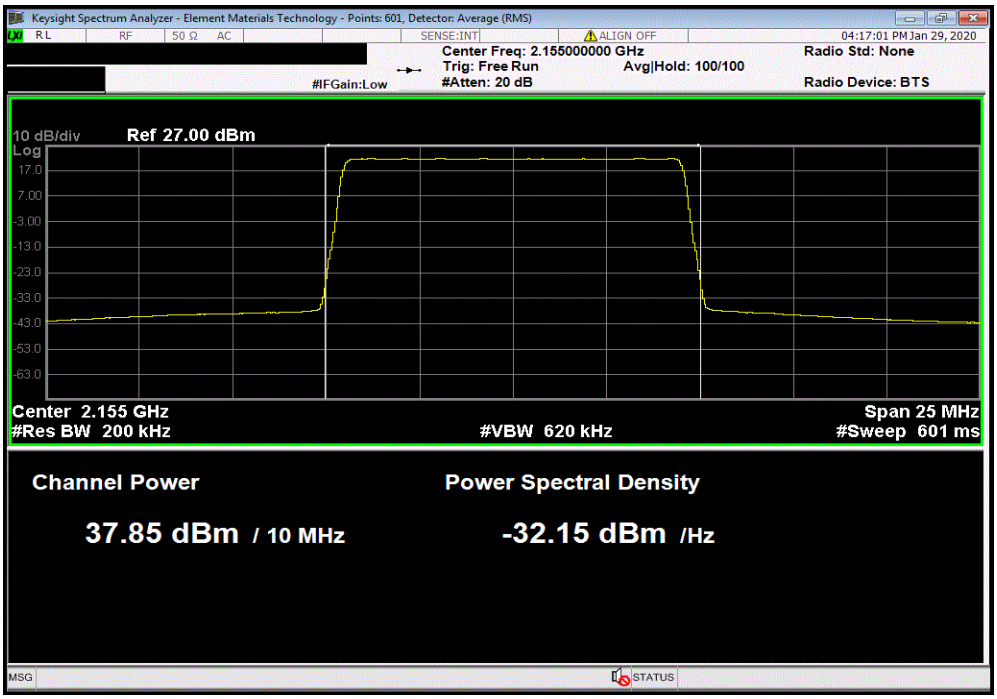

| Band 66 (Single Carrier) Port 14, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.062 | 0 | Not Provided | 38.1 | N/A | N/A |



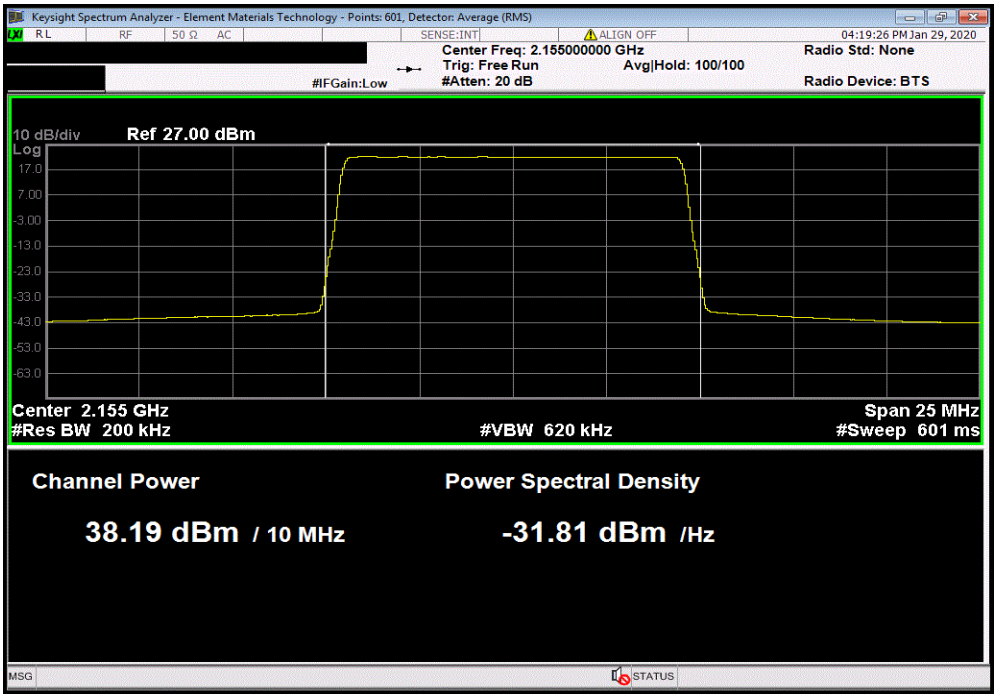
# OUTPUT POWER (WORST CASE PORT)



| Band 66 (Single Carrier) Port 15, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 37.849 | 0 | Not Provided | 37.8 | N/A | N/A |




| Band 66 (Single Carrier) Port 16, 10 MHz, 256QAM, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Power (dBm/OBW) | Duty Cycle Factor (dB) | Antenna Gain (dBi) | Final w/o Ant Gain Value (dBm/OBW) | Limit (dBm) | Results |
| | 38.186 | 0 | Not Provided | 38.2 | N/A | N/A |



# PEAK TO AVERAGE POWER (CCDF)

XMit 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

**TEST EQUIPMENT**

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|---|---|---|---|---|---|
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 19-Mar-19 | 19-Mar-20 |
| Generator - Signal | Keysight | N5171B-506 | TEW | 2-May-18 | 2-May-21 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.
The PAPR was measured using the CCDF function of the spectrum analyzer.

Per 27.50(d)(5), RSS-139 section 6.5, and RSS-170 section 5.3.1, the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.

# PEAK TO AVERAGE POWER (CCDF)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **AAIB** | | | **Work Order:** | **NOKI0006** |
| **Serial Number:** | **YK183800029** | | | **Date:** | **30-Jan-20** |
| **Customer:** | **Nokia Solutions and Networks** | | | **Temperature:** | **21.9 °C** |
| **Attendees:** | **Mitch Hill, John Rattanavong** | | | **Humidity:** | **34.4% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1016 mbar** |
| **Tested by:** | **Willie Love, Brandon Hobbs** | **Power:** | **54VDC** | **Job Site:** | **TX09** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 27:2020** | ANSI C63.26:2015 |
| **RSS-139:2015, RSS-170:2015** | RSS-Gen:2019 |

**COMMENTS**

**All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel shown elsewhere in the report.**

**DEVIATIONS FROM TEST STANDARD**

**None**

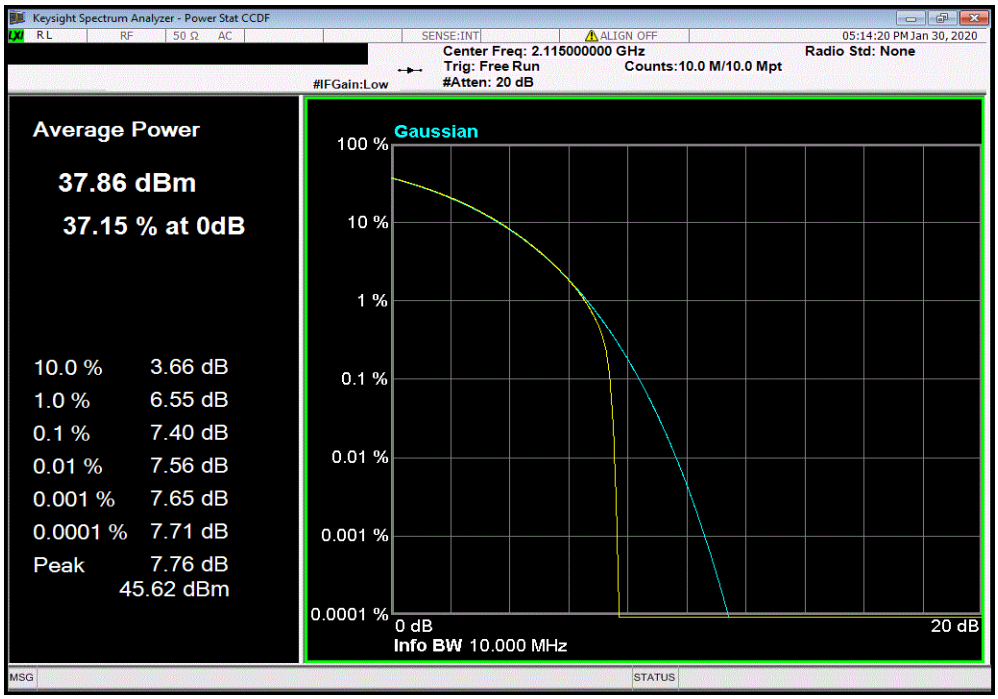
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | | | **PAPR Value (dB)** | **PAPR Limit (dB)** | **Results** |
|---|---|---|---|---|---|
| Band 66 (Single Carrier) Port 2 | | | | | |
| 10 MHz | | | | | |
| | NB IOT | | | | |
| | | Low Channel, 2115 MHz | 7.40 | 13 | Pass |
| | | Mid Channel, 2155 MHz | 7.38 | 13 | Pass |
| | | High Channel, 2195 MHz | 7.40 | 13 | Pass |
| 15 MHz | | | | | |
| | NB IOT | | | | |
| | | Low Channel, 2117.5 MHz | 7.37 | 13 | Pass |
| | | Mid Channel, 2155 MHz | 7.34 | 13 | Pass |
| | | High Channel, 2192.5 MHz | 7.40 | 13 | Pass |
| 20 MHz | | | | | |
| | NB IOT | | | | |
| | | Low Channel, 2120 MHz | 7.28 | 13 | Pass |
| | | Mid Channel, 2155 MHz | 7.22 | 13 | Pass |
| | | High Channel, 2190 MHz | 7.34 | 13 | Pass |

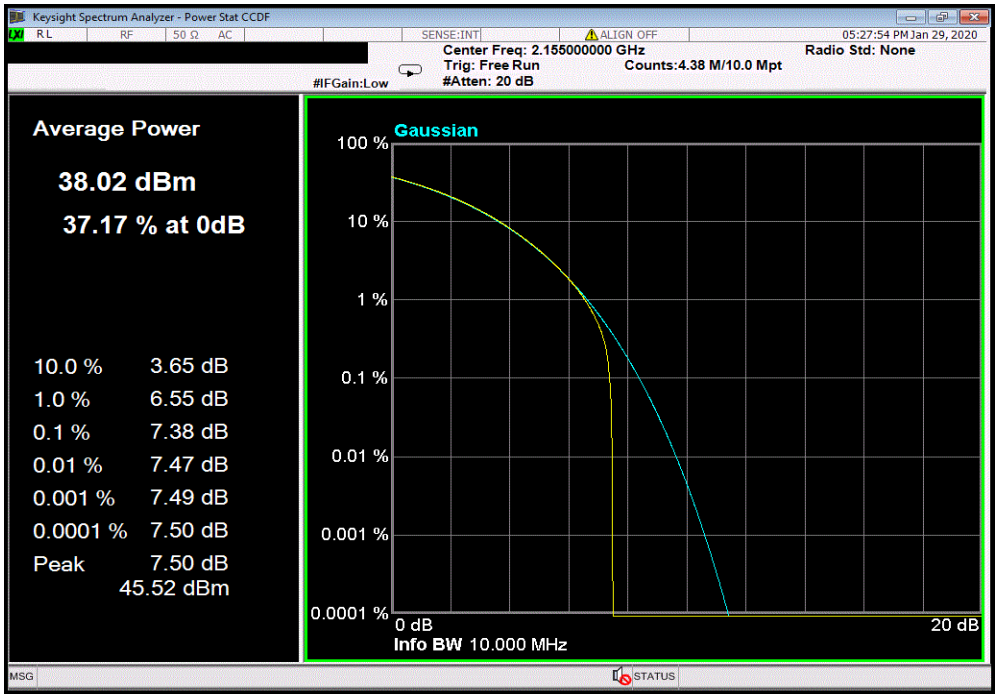
# PEAK TO AVERAGE POWER (CCDF)



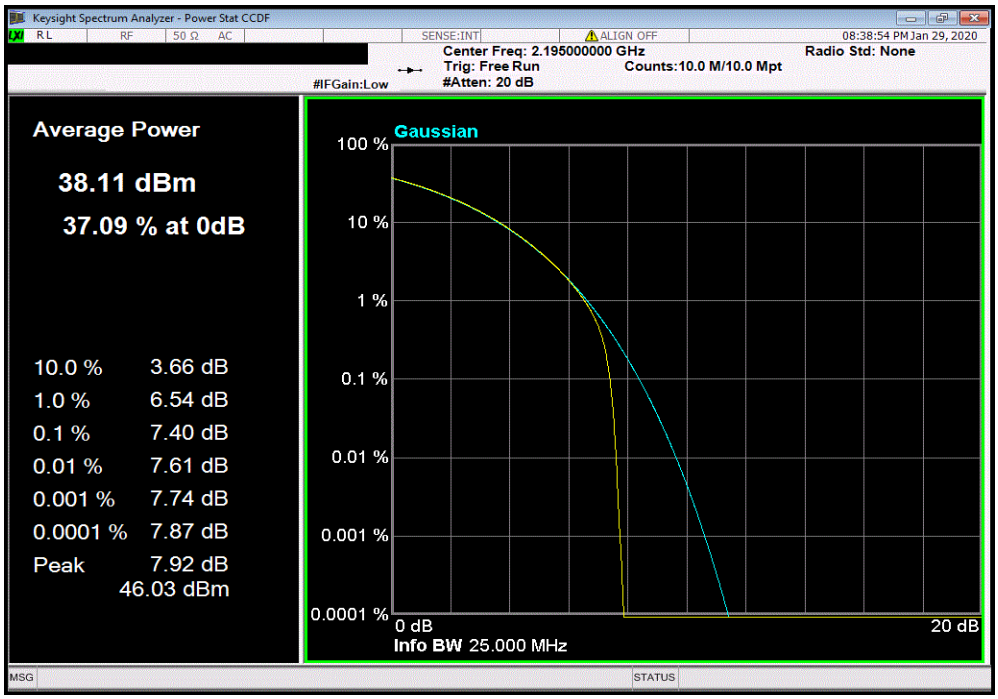
| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Low Channel, 2115 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.4 | 13 | Pass |



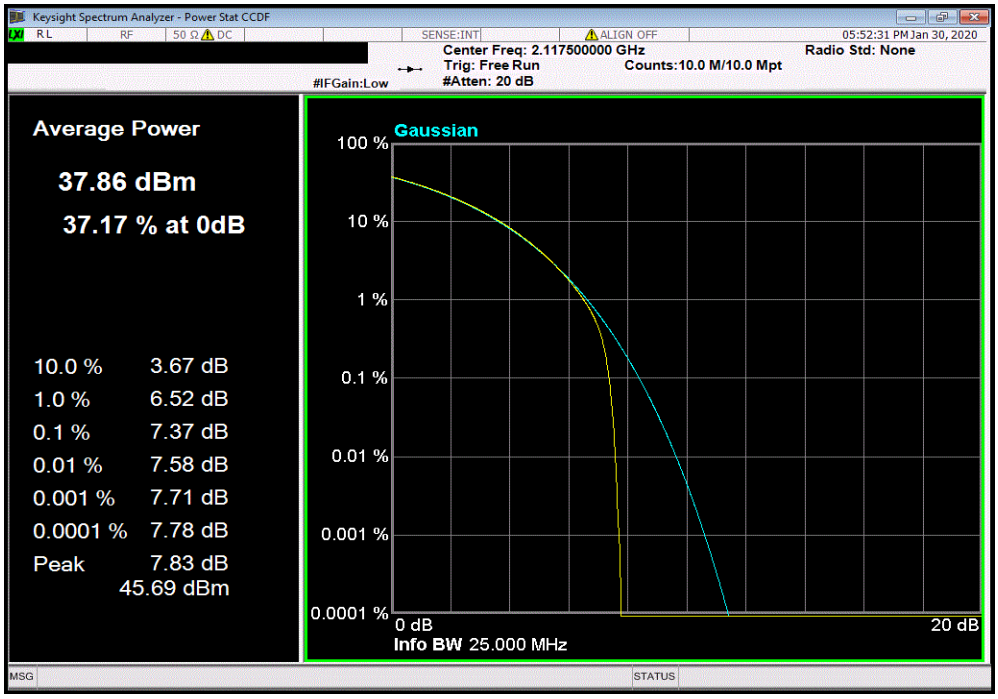

| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.38 | 13 | Pass |



| Band 66 (Single Carrier) Port 2, 10 MHz, NB IOT, High Channel, 2195 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.4 | 13 | Pass |



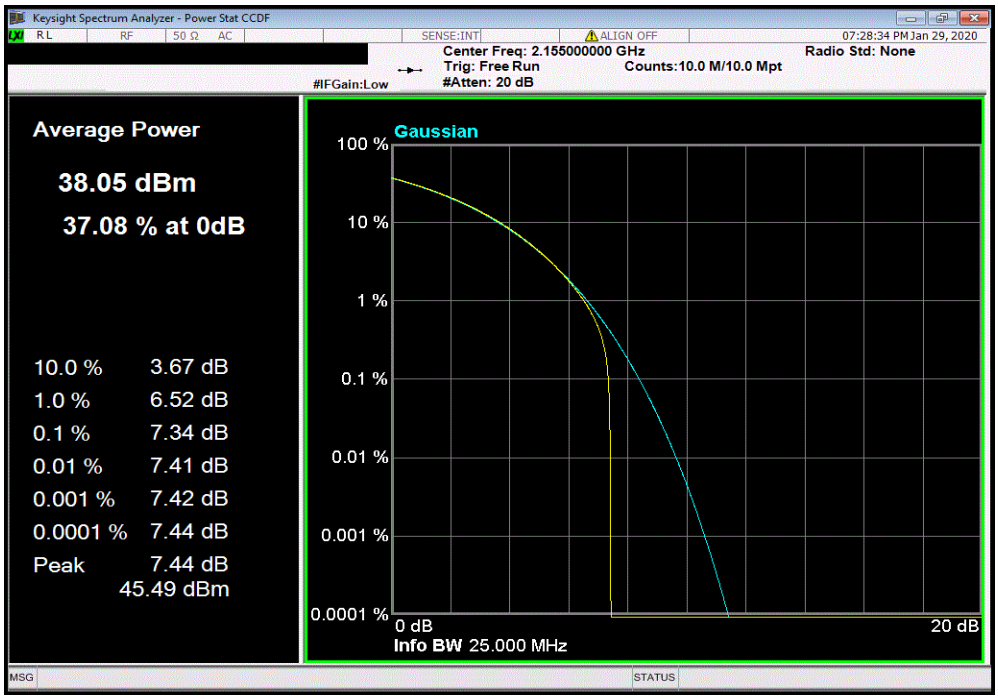

| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Low Channel, 2117.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.37 | 13 | Pass |



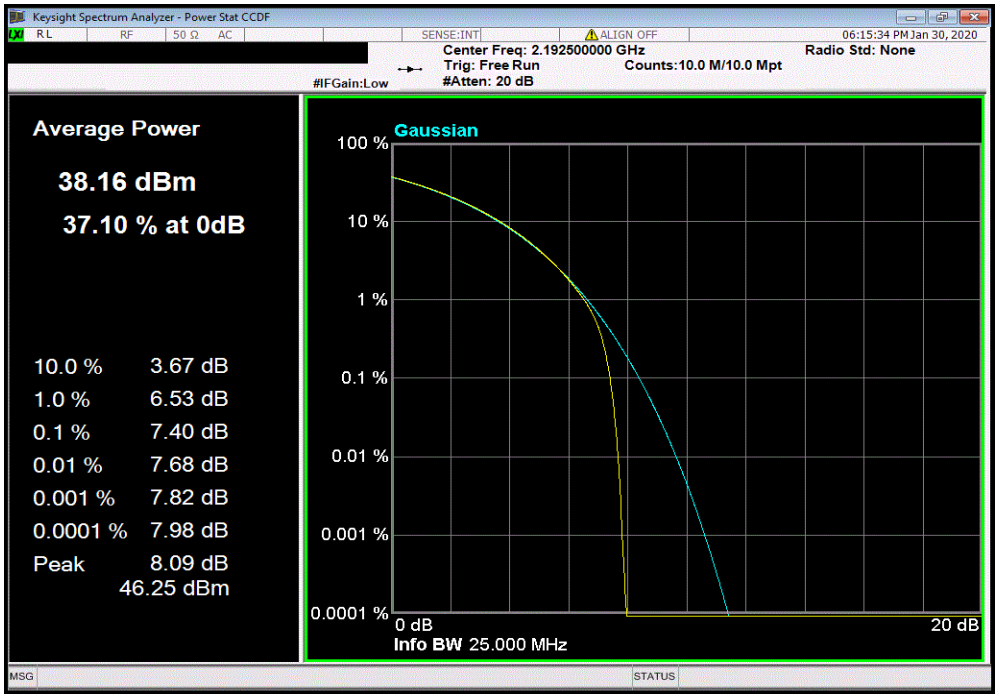
# PEAK TO AVERAGE POWER (CCDF)



| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.34 | 13 | Pass |

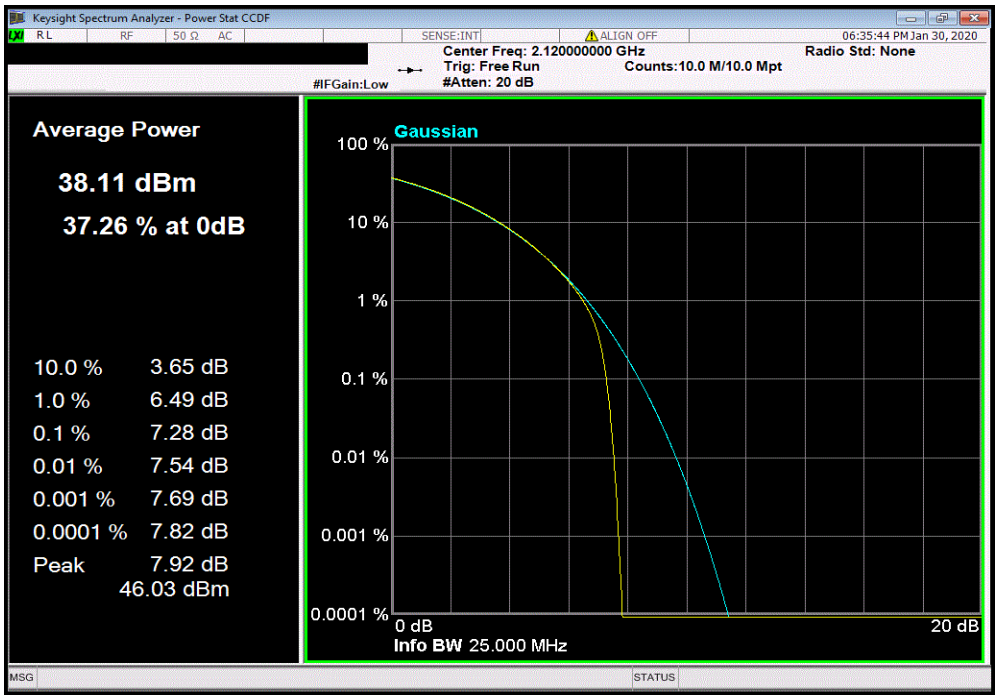



| Band 66 (Single Carrier) Port 2, 15 MHz, NB IOT, High Channel, 2192.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.4 | 13 | Pass |

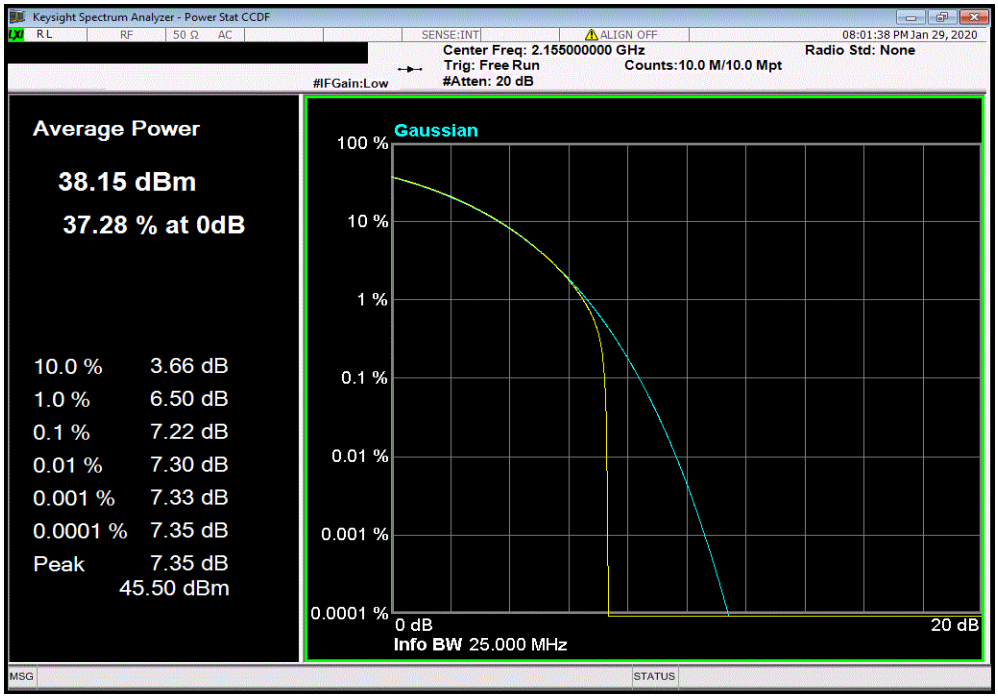


# PEAK TO AVERAGE POWER (CCDF)

| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Low Channel, 2120 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.28 | 13 | Pass |




| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, Mid Channel, 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.22 | 13 | Pass |



# PEAK TO AVERAGE POWER (CCDF)



| Band 66 (Single Carrier) Port 2, 20 MHz, NB IOT, High Channel, 2190 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | PAPR Value (dB) | PAPR Limit (dB) | Results |
| | | | | 7.34 | 13 | Pass |