# Radio Test Report

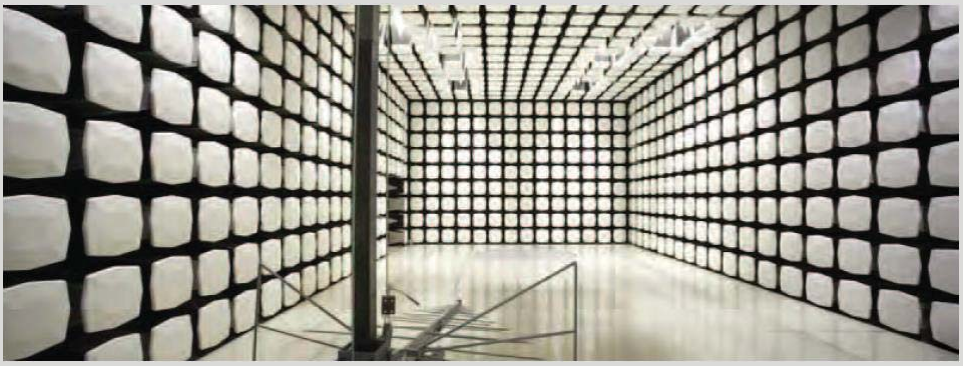
## Application for a permissive Change of Equipment Authorization

## FCC Part 24E, ISED RSS-133 Issue 6
## [1930MHz – 1990MHz]

## FCC ID: VBNAHFII-01
## ISED ID: 661W-AHFII

## Nokia Solutions and Networks
## Airscale Base Transceiver Station Remote Radio Head
## Model: AHFII

## Report: NOKI0044.0, Issue Date: August 12, 2022



CERT #3310.03

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# CERTIFICATE OF TEST

**Last Date of Test: July 21, 2022**
**Nokia Solutions and Networks**
**EUT: Airscale Base Transceiver Station Remote Radio Head Model AHFII**

## Radio Equipment Testing

### Standards

| Specification | Method |
|---|---|
| Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 5<br>CFR Title 47 Part 24 Subpart E – Broadband PCS<br>RSS-133 Issue 6 - January 18, 2018 – 2GHz Personal Communications Services | ANSI C63.26-2015 with<br>FCC KDB 971168 D01 v03r01<br>FCC KDB 971168 D03 v01<br>FCC KDB 662911D01 v02r01<br>FCC KDB 662911D02 v01 |

### Results

| Test Description | Applied | Results | Comments |
|---|---|---|---|
| Conducted Output Power | Yes | Pass | |
| Frequency Stability | No | N/A | Not requested. |
| Occupied Bandwidth | Yes | Pass | |
| Peak to Average Power (PAPR)CCDF | Yes | Pass | |
| Spurious Radiated Emissions | No | N/A | Not requested. |
| Band Edge Compliance | Yes | Pass | |
| Spurious Emissions at the Antenna Terminals | Yes | Pass | |
| Power Spectral Density | Yes | Pass | |

### Deviations From Test Standards

None

### Approved By:

*Adam Bruno, 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

element
2021.09.01

## 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** - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

## 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** – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

## United Kingdom

**BEIS** – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

## 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.

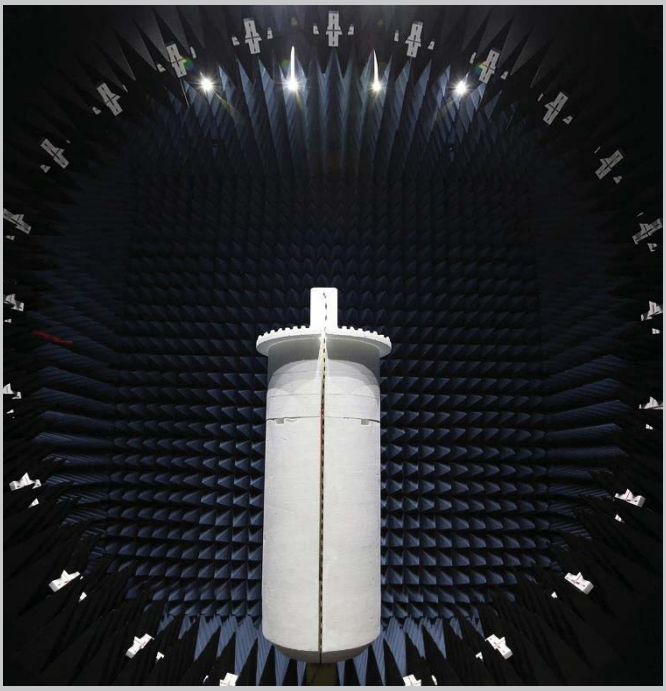
## SCOPE

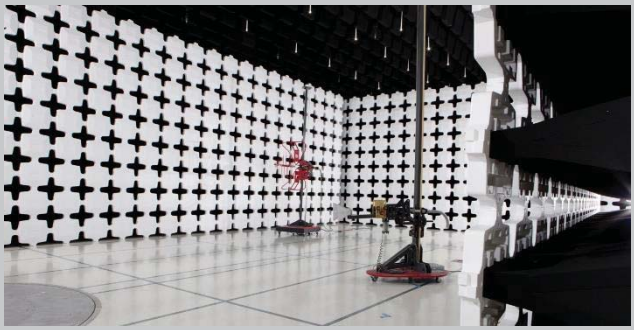
For details on the Scopes of our Accreditations, please visit:

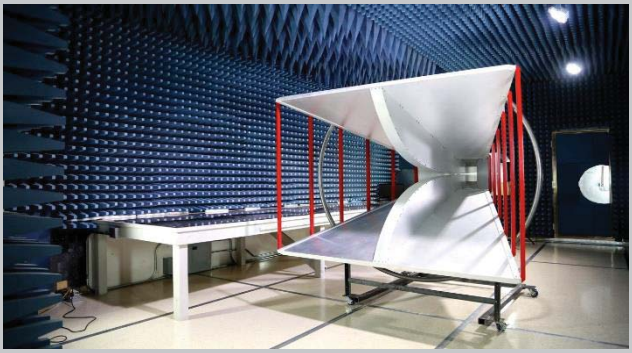
California Minnesota Oregon Texas Washington

# FACILITIES

| California | Minnesota | Oregon | Texas | Washington |
|---|---|---|---|---|
| Labs OC01-17<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | Labs MN01-11<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 |
| **A2LA** | | | | |
| Lab Code: 3310.04 | Lab Code: 3310.05 | Lab Code: 3310.02 | Lab Code: 3310.03 | Lab Code: 3310.06 |
| **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 in the table below. A lab specific value may also be found in the applicable test description section. 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) | 3.1 dB | -3.1 dB |

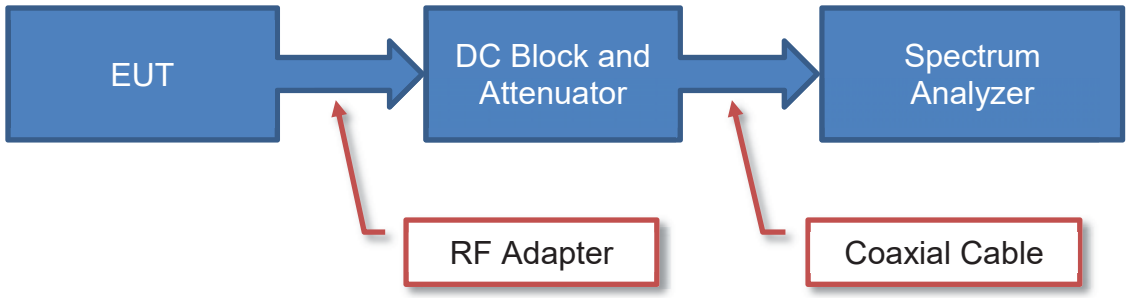
# TEST SETUP BLOCK DIAGRAMS

## Measurement Bandwidths

| Frequency Range (MHz) | Peak Data (kHz) | Quasi-Peak Data (kHz) | Average Data (kHz) |
|---|---|---|---|
| 0.01 - 0.15 | 1.0 | 0.2 | 0.2 |
| 0.15 - 30.0 | 10.0 | 9.0 | 9.0 |
| 30.0 - 1000 | 100.0 | 120.0 | 120.0 |
| Above 1000 | 1000.0 | N/A | 1000.0 |

*Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.*

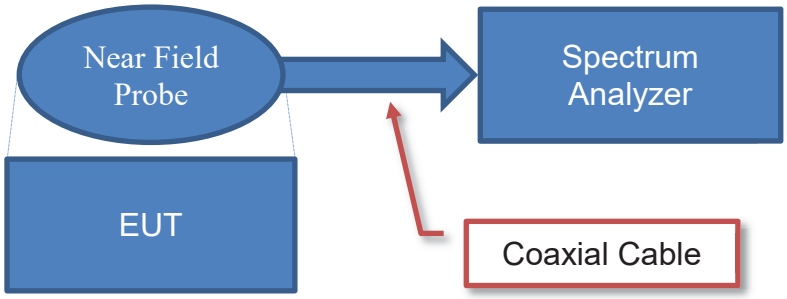
## Antenna Port Conducted Measurements




### Sample Calculation (logarithmic units)

| Measured Value | | Measured Level | | Reference Level Offset |
|---|---|---|---|---|
| **71.2** | = | 42.6 | + | 28.6 |

## Near Field Test Fixture Measurements

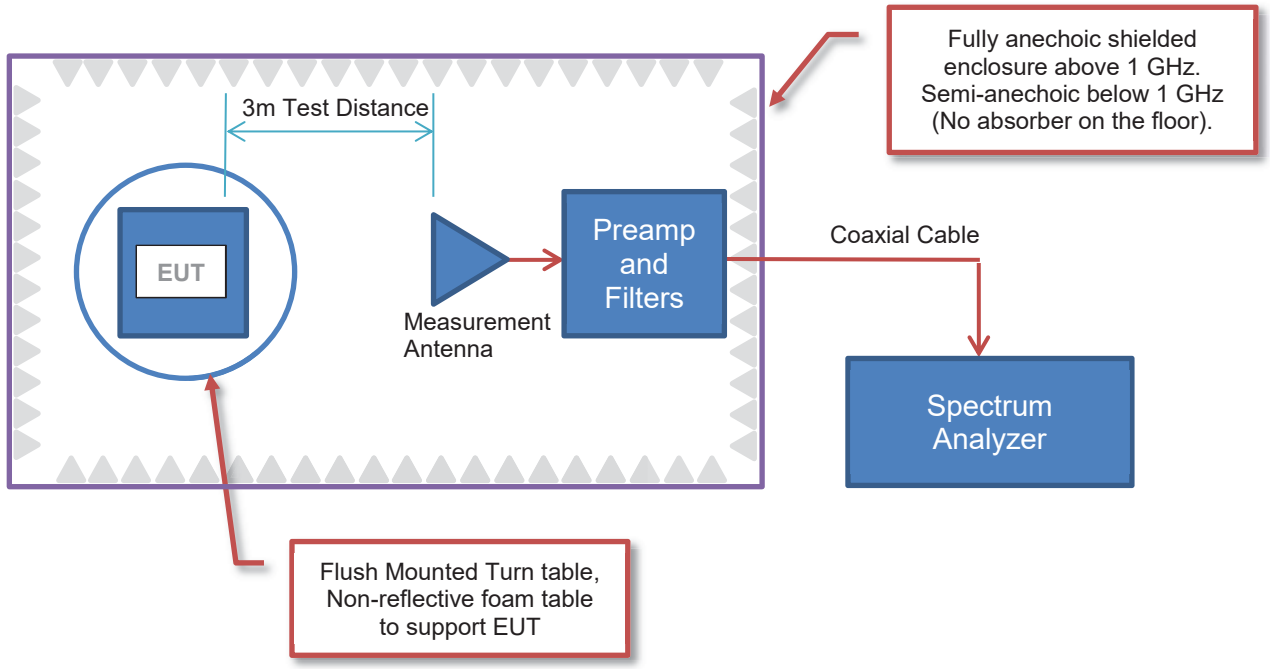



### Sample Calculation (logarithmic units)

| Measured Value | | Measured Level | | Reference Level Offset |
|---|---|---|---|---|
| **71.2** | = | 42.6 | + | 28.6 |

# TEST SETUP BLOCK DIAGRAMS

## Emissions Measurements




### Sample Calculation (logarithmic units)

**Radiated Emissions:**

| Measured Level (Amplitude) | | Factor: Antenna Factor | | Factor: Cable Factor | | Factor: Amplifier Gain | | Distance Adjustment Factor | | External Attenuation | | Field Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42.6 | + | 28.6 | + | 3.1 | - | 40.8 | + | 0.0 | + | 0.0 | = | **33.5** |

**Conducted Emissions:**

| Measured Level (Amplitude) | | Factor: Transducer Factor | | Factor: Cable Factor | | External Attenuation | | Adjusted Level |
|---|---|---|---|---|---|---|---|---|
| 26.7 | + | 0.3 | + | 0.1 | + | 20.0 | = | **47.1** |

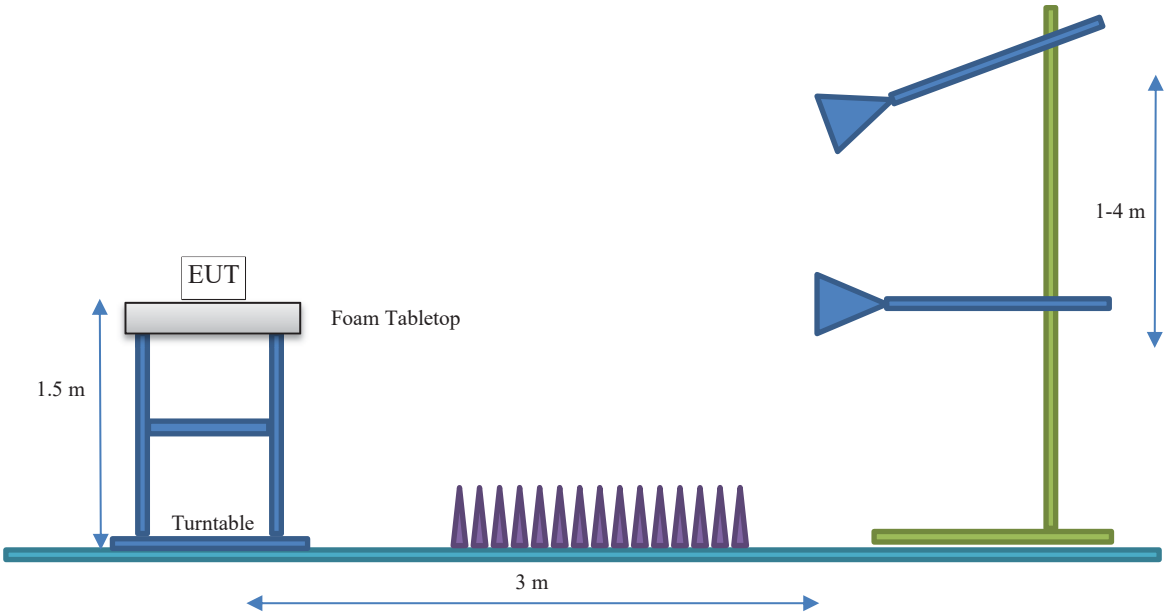
**Radiated Power (ERP/EIRP) – Substitution Method:**

| Measured Level into Substitution Antenna (Amplitude dBm) | | Substitution Antenna Factor (dBi) | | EIRP to ERP (if applicable) | | Measured power (dBm ERP/EIRP) |
|---|---|---|---|---|---|---|
| 10.0 | + | 6.0 | - | 2.15 | = | **13.9/16.0** |

# TEST SETUP BLOCK DIAGRAMS

## Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



# PRODUCT DESCRIPTION

## Client and Equipment under Test (EUT) Information

| | |
|---|---|
| **Company Name:** | Nokia Solutions and Networks |
| **Address:** | 3201 Olympus Blvd |
| **City, State, Zip:** | Dallas, TX 75019 |
| **Test Requested By:** | Steve Mitchell |
| **EUT:** | Airscale Base Transceiver Station Remote Radio Head Model AHFII |
| **First Date of Test:** | July 21, 2022 |
| **Last Date of Test:** | July 21, 2022 |
| **Receipt Date of Samples:** | July 21, 2022 |
| **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 permissive change on the original filing is being pursued to add 2G GSM carriers to the AirScale Base Transceiver Station Remote Radio Head Model AHFII FCC and ISED radio certifications. The original test effort includes testing for 4G LTE technologies. Please refer to the test report on the original certification for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using 2G GSM carriers for this permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this permissive change test effort. Tests performed under the change effort include RF power, peak power, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions.

The testing was performed on the same hardware version (AHFII) as the original certification test. The base station and remote radio head software for this testing is an updated release that includes 2G GSM carrier support. The radiated emissions and frequency stability measurements performed in the original certification were 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.

Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHFII is being developed under this effort. The AHFII remote radio head is a multi-standard multi-carrier radio module designed to support GSM/EDGE, WCDMA, LTE, LTE Narrow Band Internet of Things (NB IoT) operations (in-band, guard band, standalone) and 5G NR. **The scope of testing in this effort is for 2G GSM/EDGE FDD operations.**

The AHFII RRH has four transmit/four receive antenna ports (4TX/4RX for Band 25 and 4TX/4RX for Band 66). Each antenna port supports 3GPP frequency band 25 (BTS Rx: 1850 to 1915 MHz/BTS TX: 1930 to 1995 MHz) and 3GPP frequency band 66 (BTS Rx: 1710 to 1780 MHz/BTS TX: 2110 to 2200 MHz). The maximum RF output power of the RRH is 480 Watts (120 watts per port x 4 ports). The maximum power per band (Band 25 or Band 66) is 80 watts. The maximum single GSM/EDGE carrier power level is 20 watts. The TX and RX instantaneous bandwidth cover the full operational RRH bandwidth. Multi-carrier operation is supported.

The RRH is operated as non-MIMO for GSM/EDGE over 3GPP Band “PCS 1900” (BTS Rx: 1850 to 1910 MHz/BTS TX: 1930 to 1990 MHz). The RRH supports two GSM/EDGE downlink modulation types (GMSK and 8PSK).

Single GSM carriers are tested at the bottom, middle and top channels provided in PCS frequency channel table. Multicarrier testing is performed at maximum port/carrier power per KDB 971168 D03v01 guidance.

The RRH has external interfaces including DC power (DC In), ground, transmit/receive (ANT), external alarm (EAC), optical (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted.

The PCS Band GSM/EDGE channel bandwidth is 200kHz. The minimum spacing between adjacent GSM/EDGE carriers is 400kHz. The spacing is 200 kHz between channel numbers. The PCS Band GSM/EDGE downlink channel numbers are provided below.

| | Downlink ARFCN UTRA Band 2 | Downlink Frequency (MHz) | GSM/EDGE Channels |
|---|---|---|---|
| PCS Band_ AHFII Antennas 1, 2, 3, 4 | …… | 1930.0 | Band Edge |
| | 512 | 1930.2 | Bottom Channel |
| | 513 | 1930.4 | Bottom Channel + 1 |
| | …… | | |
| | 661 | 1960.0 | Middle Channel |
| | …… | | |
| | 809 | 1989.6 | Top Channel - 1 |
| | 810 | 1989.8 | Top Channel |
| | …… | 1990.0 | Band Edge |

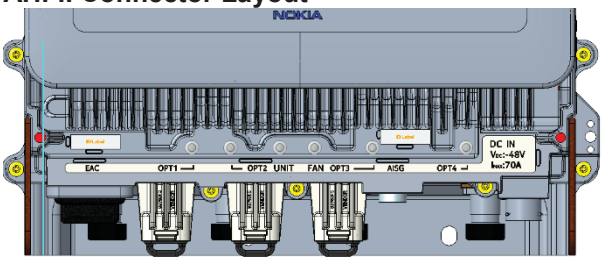
AHFII Downlink Band Edge 2G GSM/EDGE Band 2 Frequency Channels

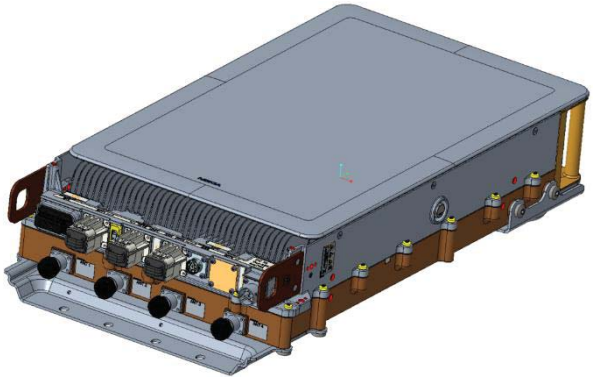
*Multicarrier Test Case 1:* In the PCS band (Band 2) _Three GSM/EDGE carriers (operating at maximum power ~ 20W/carrier) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge +1 (1930.4 & 1930.8MHz) and a third carrier with maximum spacing between the other two carrier frequencies at the upper band edge -1 (1989.6MHz). A single LTE1.4 carrier operating at maximum power (20W) at Band 2 middle channel (1960.0MHz).
In the AWS band _ Single LTE10 carrier at 40W at the middle channel (2155.0MHz).
The carriers are operated at maximum power (~20W/PCS carrier and 40W/AWS carrier) with at total port power of 120 watts (80W for PCS band carriers + 40W for AWS band carrier).

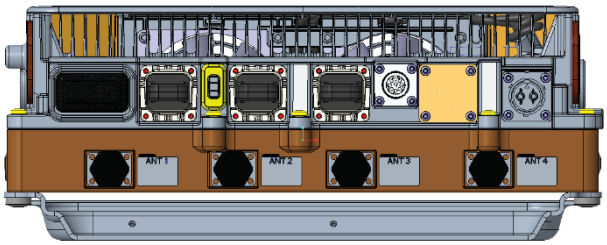
*Multicarrier Test Case 2:* In the PCS band (Band 2) _Three GSM/EDGE carriers (operating at reduced power level) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (1930.2 & 1930.6MHz) and a third carrier with maximum spacing between the other two carrier frequencies at the upper band edge (1989.8MHz). A single LTE1.4 carrier operating at maximum power (20W) at Band 2 middle channel (1960.0MHz).
In the AWS band _ Single LTE10 carrier at 40W at the middle channel (2155.0MHz).
The GSM carriers are operated at reduced power level that will pass at upper and lower band edges.

# PRODUCT DESCRIPTION

**AHFII Connector Layout**






| Name | Qty | Connector Type | Purpose (and Description) |
|---|---|---|---|
| DC In | 1 | APPG Amphenol | 2-pole Power Input Terminal |
| GND | 1 | Screw lug (2xM5/1xM8) | Ground |
| ANT | 4 | 4.3-10 | RF signal for Transmitter/Receiver (50 Ohm) |
| Unit | 1 | LED | Unit Status LED |
| EAC | 1 | MDR26 | External Alarm Interface |
| OPT | 3 | SFP | Optical Interfaces |
| RET | 1 | 8-pin circular connector | AISG 3.0 to external devices_ RET RS-485 |

**EUT External Interfaces**

**Testing Objective:**

A permissive change on the original filing is being pursued to add 2G GSM carrier operations to the Nokia Solutions and Networks Airscale Base Transceiver Station Remote Radio Head Model AHFII for FCC and ISED radio certifications.

# CONFIGURATIONS

## Configuration NOKI0044- 1

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| 2G BTS Software Version (22R3) | SBTS22R3_ENB_0000_000890_000000 |
| 2G RF_SW | RF.FRM6.22R3.20220708.005 |

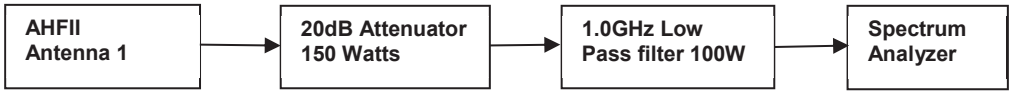
| Equipment being tested (include Peripherals) | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AMIA (BTS Cabinet) | Nokia Solutions and Networks | 473098A.101 | J8164063259 |
| ASIA (2G BTS System Module) | Nokia Solutions and Networks | 473095A.101 | L1164105428 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473095A.103 | AH173006385 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473096A.103 | AH173006372 |
| AHFII (Radio Remote Head) | Nokia Solutions and Networks | 475656A.101 | YK214000036 |
| Low Pass Filter 1.4GHz/100W | Microwave Circuits,Inc. | L1G006G1 | SN3972-01-DC0430 |
| Attenuator 150W/20dB | Weinschel Corp | 66-20-33 | BZ1165 |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023004CK |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023000RM |
| Lenovo T490 | HP | T490 | PF26RVZ0 |
| Keysight N8757- DC System power supply | Keysight | N8757A | US21D4054S |
| FPAC (DC-pwr supply) | Nokia | 472438A.101 | G7111007170 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297384 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297374 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297373 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC865 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC863 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC866 |
| Cat-5e cable | CSA | LL73189 | E151955 |
| 6 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN528836/6 |
| 1 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_104 | SN551432/4 |
| (2) Fiber Optic cable 2m | Amphenol Fiber Optic | VZ1701 | 995741A |

# CONFIGURATIONS

| Cables (Peripheral) | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| (2) Fiber Optic Cable | N | 2 meters | N | ABIA | AHFII |
| Cat-5e Cable | Y | 7 meters | N | ASIA | WebEM- PC |
| HS-SUCOFLEX_106 – RF CABLE | Y | 2 meters | N | EUT [AHFII] Ant 2-4 | 250W -50ohm - Load |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| HS-SUCOFLEX_106 | Y | 6 meters | N | EUT [AHFII] Ant port #1 | Attenuator 150W/20dB |
| Attenuator 150W/20dB | N | N/A | N | RF cable HS-SUCOFLEX_106 | 1.0GHz Low Pass filter 100W |
| 1.0GHz Low Pass filter 100W | N | N/A | N | Attenuator 150W/20dB | RF cable HS-SUCOFLEX_104 |
| HS-SUCOFLEX_104 | Y | 1 meter | N | 1.0GHz Low Pass filter 100W | Analyzer |

**RF Test Setup Diagram:**



# CONFIGURATIONS

## Configuration NOKI0044- 2

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| 2G BTS Software Version (22R3) | SBTS22R3_ENB_0000_000890_000000 |
| 2G RF_SW | RF.FRM6.22R3.20220708.005 |

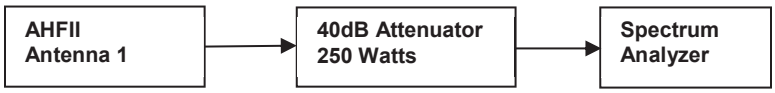
| Equipment being tested (include Peripherals) | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AMIA (BTS Cabinet) | Nokia Solutions and Networks | 473098A.101 | J8164063259 |
| ASIA (2G BTS System Module) | Nokia Solutions and Networks | 473095A.101 | L1164105428 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473095A.103 | AH173006385 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473096A.103 | AH173006372 |
| AHFII (Radio Remote Head) | Nokia Solutions and Networks | 475656A.101 | YK214000036 |
| Attenuator 40dB/250W | API Weinschel | 58-40-43-LIM | TC909 |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023004CK |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023000RM |
| Lenovo T490 | HP | T490 | PF26RVZ0 |
| Keysight N8757- DC System power supply | Keysight | N8757A | US21D4054S |
| FPAC (DC-pwr supply) | Nokia | 472438A.101 | G7111007170 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297384 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297374 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297373 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC865 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC863 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC866 |
| Cat-5e cable | CSA | LL73189 | E151955 |
| 6 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN528836/6 |
| 1 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_104 | SN551432/4 |
| Fiber Optic cable 2m | Amphenol Fiber Optic | VZ1701 | 995741A |

# CONFIGURATIONS

| Cables (Peripheral) | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| (2) Fiber Optic Cable | N | 2 meters | N | ABIA | AHFII |
| Cat-5e Cable | Y | 7 meters | N | ASIA | WebEM- PC |
| HS-SUCOFLEX_106 – RF CABLE | Y | 2 meters | N | EUT [AHFII] Ant 2-4 | 250W -50ohm - Load |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| HS-SUCOFLEX_106 | Y | 6 meters | N | EUT [AHFII] Ant port #1 | Attenuator 250W/40dB |
| Attenuator 250W/40dB | N | NA | N | RF cable HS-SUCOFLEX_106 | RF cable HS-SUCOFLEX_104 |
| HS-SUCOFLEX_104 | Y | 1 meter | N | Attenuator 250W/40dB | Analyzer |

**RF Test Setup Diagram:**



# CONFIGURATIONS

## Configuration NOKI0044- 3

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| 2G BTS Software Version (22R3) | SBTS22R3_ENB_0000_000890_000000 |
| 2G RF_SW | RF.FRM6.22R3.20220708.005 |

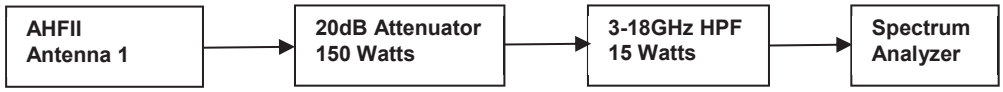
| Equipment being tested (include Peripherals) | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AMIA (BTS Cabinet) | Nokia Solutions and Networks | 473098A.101 | J8164063259 |
| ASIA (2G BTS System Module) | Nokia Solutions and Networks | 473095A.101 | L1164105428 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473095A.103 | AH173006385 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473096A.103 | AH173006372 |
| AHFII (Radio Remote Head) | Nokia Solutions and Networks | 475656A.101 | YK214000036 |
| High Pass Filter 3-18GHz/15W | RLC Electronics | F-100-3500-5-R | 0011 |
| Attenuator 150W/20dB | Aeroflex Weinschel | 66-20-33 | BZ2075 |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023004CK |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023000RM |
| Lenovo T490 | HP | T490 | PF26RVZ0 |
| Keysight N8757- DC System power supply | Keysight | N8757A | US21D4054S |
| FPAC (DC-pwr supply) | Nokia | 472438A.101 | G7111007170 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297384 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297374 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297373 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC865 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC863 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC866 |
| Cat-5e cable | CSA | LL73189 | E151955 |
| 6 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN528836/6 |
| 1 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_104 | SN551432/4 |
| Fiber Optic cable 2m | Amphenol Fiber Optic | VZ1701 | 995741A |

# CONFIGURATIONS

| Cables (Peripheral) | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| (2) Fiber Optic Cable | N | 2 meters | N | ABIA | AHFII |
| Cat-5e Cable | Y | 7 meters | N | ASIA | WebEM- PC |
| HS-SUCOFLEX_106 – RF CABLE | Y | 2 meters | N | EUT [AHFII] Ant 2-4 | 250W -50ohm - Load |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| HS-SUCOFLEX_106 | Y | 6 meters | N | EUT [AHFII] Ant port #1 | Attenuator 150W/20dB |
| Attenuator 150W/20dB | N | NA | N | RF cable HS-SUCOFLEX_106 | High Pass Filter 3-18GHz/15W |
| High Pass Filter 3-18GHz/15W | N | NA | N | Attenuator 150W/20dB | RF cable HS-SUCOFLEX_104 |
| HS-SUCOFLEX_104 | Y | 1 meter | N | High Pass Filter 3-18GHz/15W | Analyzer |

**RF Test Setup Diagram:**



# CONFIGURATIONS

## Configuration NOKI0044- 4

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| 2G BTS Software Version (22R3) | SBTS22R3_ENB_0000_000890_000000 |
| 2G RF_SW | RF.FRM6.22R3.20220708.005 |

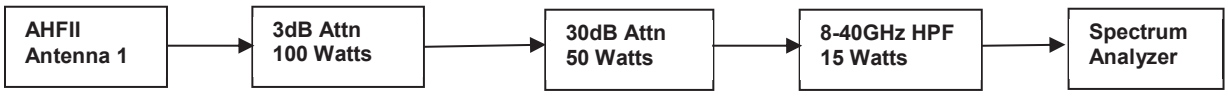
| Equipment being tested (include Peripherals) | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| AMIA (BTS Cabinet) | Nokia Solutions and Networks | 473098A.101 | J8164063259 |
| ASIA (2G BTS System Module) | Nokia Solutions and Networks | 473095A.101 | L1164105428 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473095A.103 | AH173006385 |
| ABIA (2G BTS Baseband Module) | Nokia Solutions and Networks | 473096A.103 | AH173006372 |
| AHFII (Radio Remote Head) | Nokia Solutions and Networks | 475656A.101 | YK214000036 |
| Attenuator 100W/3dB | API Weinschel | 47-3-33 | CC7387 |
| Attenuator 50W/30dB | Narda | 776B | 30 |
| High Pass Filter 8-40GHz/15W | RF-Lambda | RHPF22G08G40 | 17102700014 |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023004CK |
| SFP+ 9.8G,300M,850NM | Nokia | 474900A.101 | VF2023000RM |
| Lenovo T490 | HP | T490 | PF26RVZ0 |
| Keysight N8757- DC System power supply | Keysight | N8757A | US21D4054S |
| FPAC (DC-pwr supply) | Nokia | 472438A.101 | G7111007170 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297384 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297374 |
| 2 Meter RF cable (Load Cable) | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN297373 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC865 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC863 |
| 250W -50ohm -Terminating Load | API Weinschel | 1433-3-LIM | TC866 |
| Cat-5e cable | CSA | LL73189 | E151955 |
| 6 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_106 | SN528836/6 |
| 1 Meter RF cable | Huber + Suhner, Inc. | HS-SUCOFLEX_104 | SN551432/4 |
| Fiber Optic cable 2m | Amphenol Fiber Optic | VZ1701 | 995741A |

# CONFIGURATIONS

| Cables (Peripheral) | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| (2) Fiber Optic Cable | N | 2 meters | N | ABIA | AHFII |
| Cat-5e Cable | Y | 7 meters | N | ASIA | WebEM- PC |
| HS-SUCOFLEX_106 – RF CABLE | Y | 2 meters | N | EUT [AHFII] Ant 2-4 | 250W -50ohm - Load |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Description** | **Shield (Y/N)** | **Length (m)** | **Ferrite (Y/N)** | **Connection 1** | **Connection 2** |
| HS-SUCOFLEX_106 | Y | 6 meters | N | EUT [AHFII] Ant port #1 | Attenuator 100W/3dB |
| Attenuator 100W/3dB | N | NA | N | RF cable HS-SUCOFLEX_106 | Attenuator 50W/30dB |
| Attenuator 50W/30dB | N | NA | N | Attenuator 100W/3dB | High Pass Filter 8-40GHz/15W |
| HS-SUCOFLEX_104 | Y | 1 meter | N | Attenuator 250W/40dB | Analyzer |

**RF Test Setup Diagram:**



# MODIFICATIONS

## Equipment Modifications

| Item | Date | Test | Modification | Note | Disposition of EUT |
|---|---|---|---|---|---|
| 1 | 2022-07-21 | Conducted 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. |
| 2 | 2022-07-21 | 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. |
| 3 | 2022-07-21 | 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. |
| 4 | 2022-07-21 | Power Spectral Density | 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 | 2022-07-21 | 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 | 2022-07-21 | Spurious Emissions at the Antenna Terminals | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed. |

# CONDUCTED OUTPUT POWER AND EIRP CALCULATIONS

XMit 2022.02.07.0

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 |
|---|---|---|---|---|---|
| Block - DC | Fairview Microwave | SD3239 | ANC | 2022-03-02 | 2023-03-02 |
| Generator - Signal | Agilent | N5173B | TIW | 2020-07-17 | 2023-07-17 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFQ | 2022-01-17 | 2023-01-17 |

**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 measurements. This method uses trace averaging across the 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 in decimal, to the measured power to compute the average power during the actual transmission times

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFII) as the original certification test. The AHFII antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The total average transmit power of all antenna ports was determined per ANSI C63.26-2105 paragraph 6.4.3.1.

**EIRP Requirements for the PCS Band:**
**FCC Requirements: Part 24.232 Power and antenna height limits.**
(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
(a)(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Tables 1 and 2 of this section.
(b)(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth of 1 MHz or less are limited to 3280 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

**ISED Requirements RSS-133 Section 6.4/SRSP-510 section 5.1.1:**
**SRSP-510 section 5.1.1 Radiated power and antenna height limits for base stations**
For base stations with channel bandwidth equal to or less than 1 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) is limited to 3280 watts with an antenna height above average terrain (HAAT) up to 300 metres. Base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table: …

# CONDUCTED OUTPUT POWER AND EIRP CALCULATIONS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| | | | | | |
|---|---|---|---|---|---|
| EUT: | AHFII (FCC/ISED C2PC) | | | Work Order: | NOKI0044 |
| Serial Number: | YK214000036 | | | Date: | 21-Jul-22 |
| Customer: | Nokia Solutions and Networks | | | Temperature: | 19.9 °C |
| Attendees: | David Le | | | Humidity: | 59.1% RH |
| Project: | None | | | Barometric Pres.: | 1016 mbar |
| Tested by: | Marty Martin | Power: | 54 VDC | Job Site: | TX07 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 24E:2022 | ANSI C63.26:2015 |
| RSS-133 Issue 6:2013+A1:2018 | ANSI C63.26:2015 |

**COMMENTS**

**All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. PCS Band II GSM carriers are enabled at maximum power (20 watts/carrier). The following is the output power measurements at the radio output ports. The output power was measured for a single carrier over the carrier channel bandwidth on port 1.**

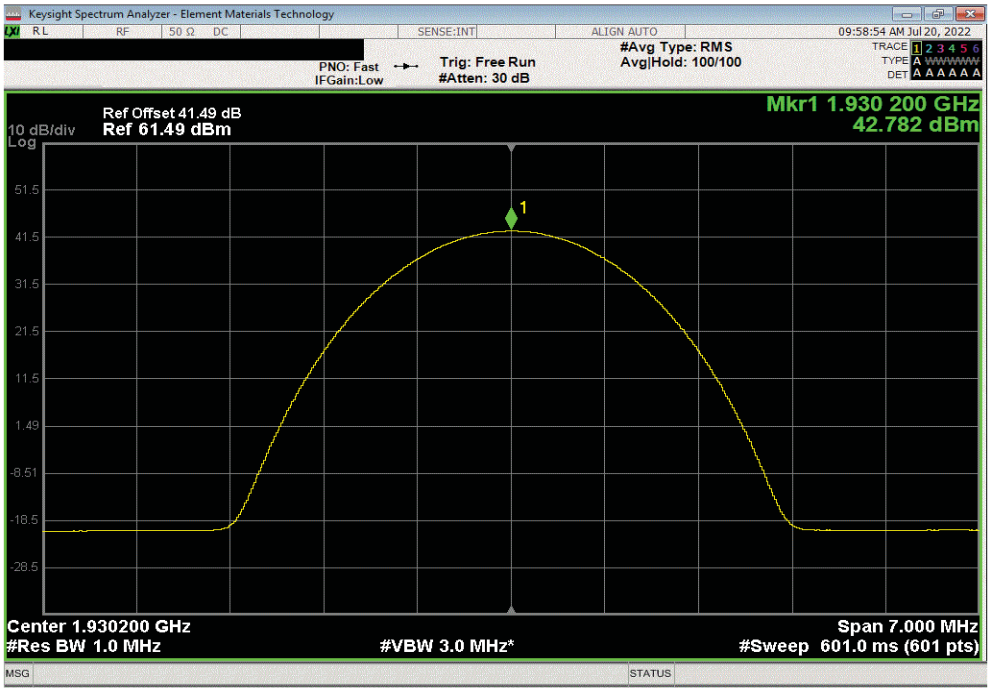
**DEVIATIONS FROM TEST STANDARD**

**None**

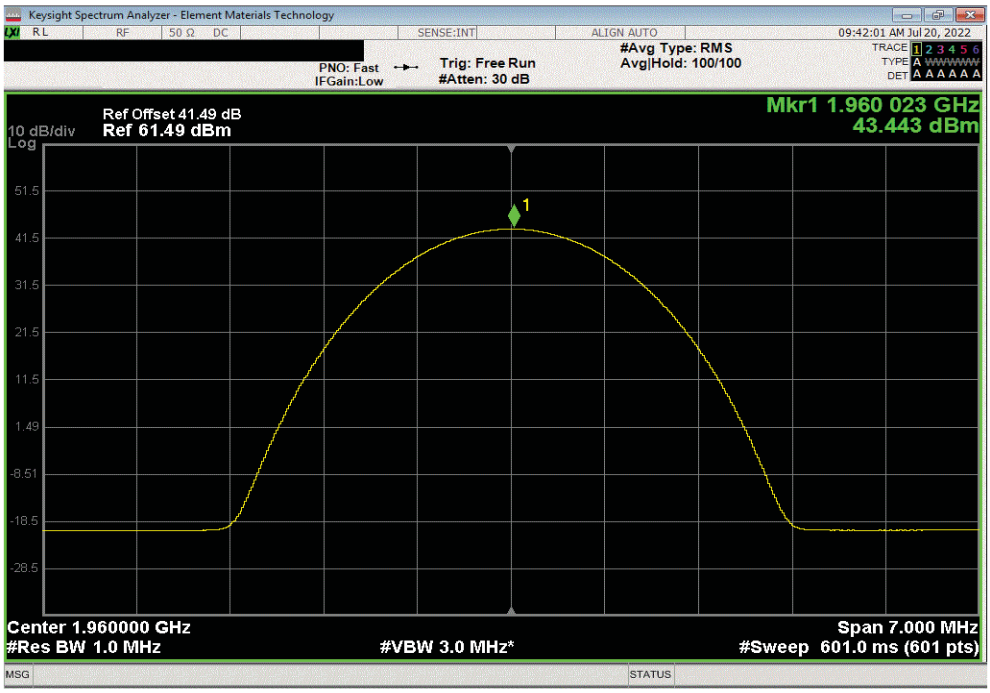
| Configuration # | 2 | Signature |
|---|---|---|

| | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
|---|---|---|---|
| Port 1 | | | |
| Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz | | | |
| GMSK Modulation | | | |
| Low Channel - 1930.2 MHz | 42.782 dBm | 0 | 42.78 |
| Mid Channel - 1960 MHz | 43.443 dBm | 0 | 43.44 |
| High Channel - 1989.8 MHz | 43.614 dBm | 0 | 43.61 |
| 8PSK Modulation | | | |
| Low Channel - 1930.2 MHz | 42.73 dBm | 0 | 42.73 |
| Mid Channel - 1960 MHz | 43.391 dBm | 0 | 43.39 |
| High Channel - 1989.8 MHz | 43.545 dBm | 0 | 43.55 |

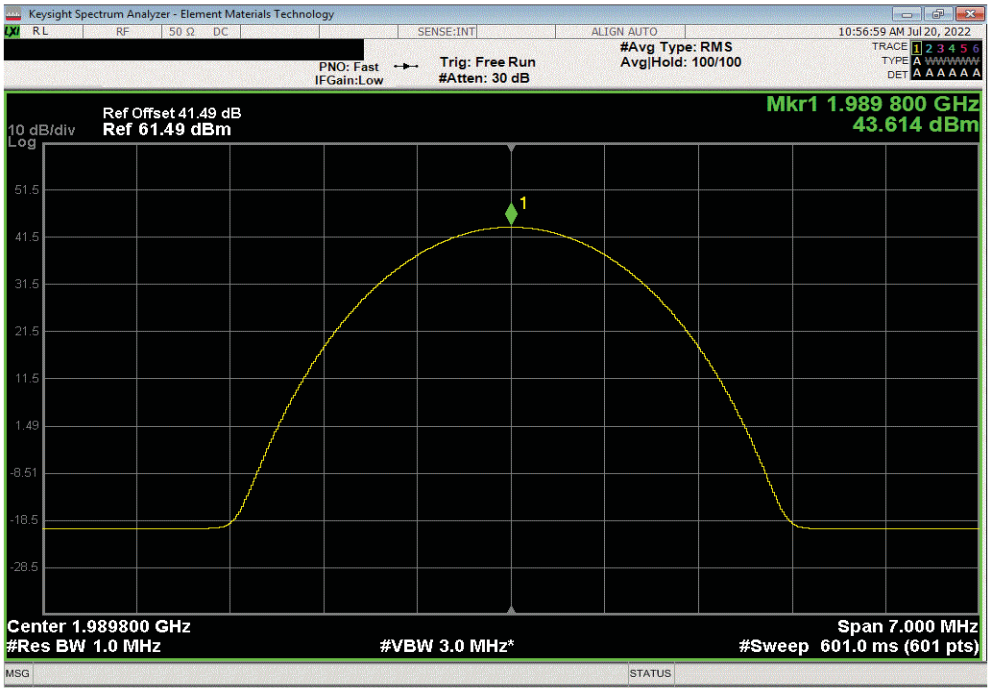
| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, GMSK Modulation, Low Channel - 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 42.782 dBm | 0 | 42.78 |



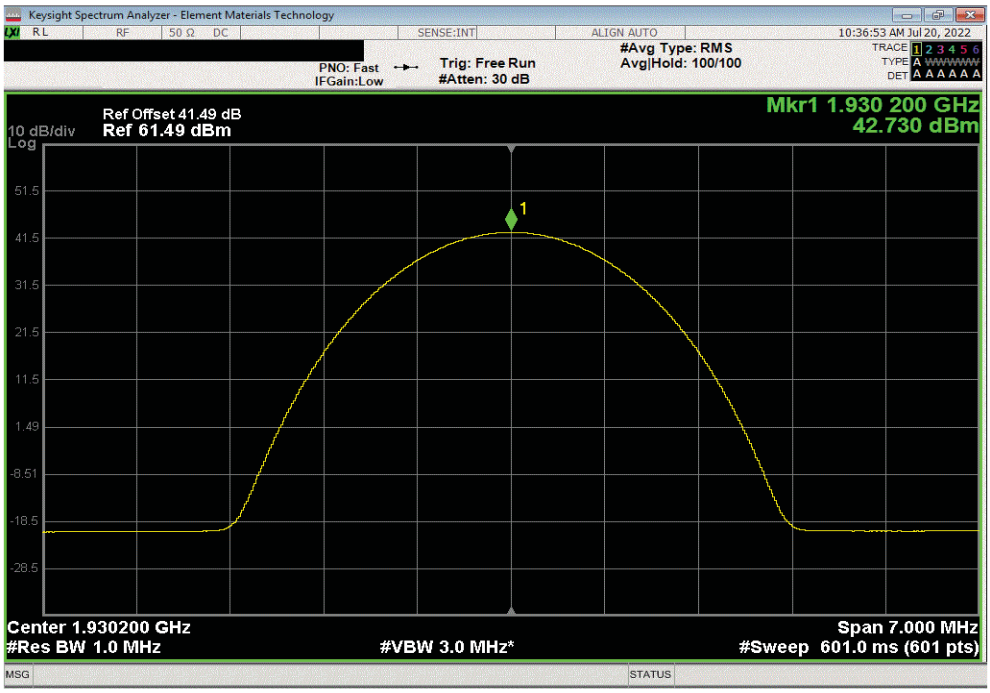

| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, GMSK Modulation, Mid Channel - 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 43.443 dBm | 0 | 43.44 |



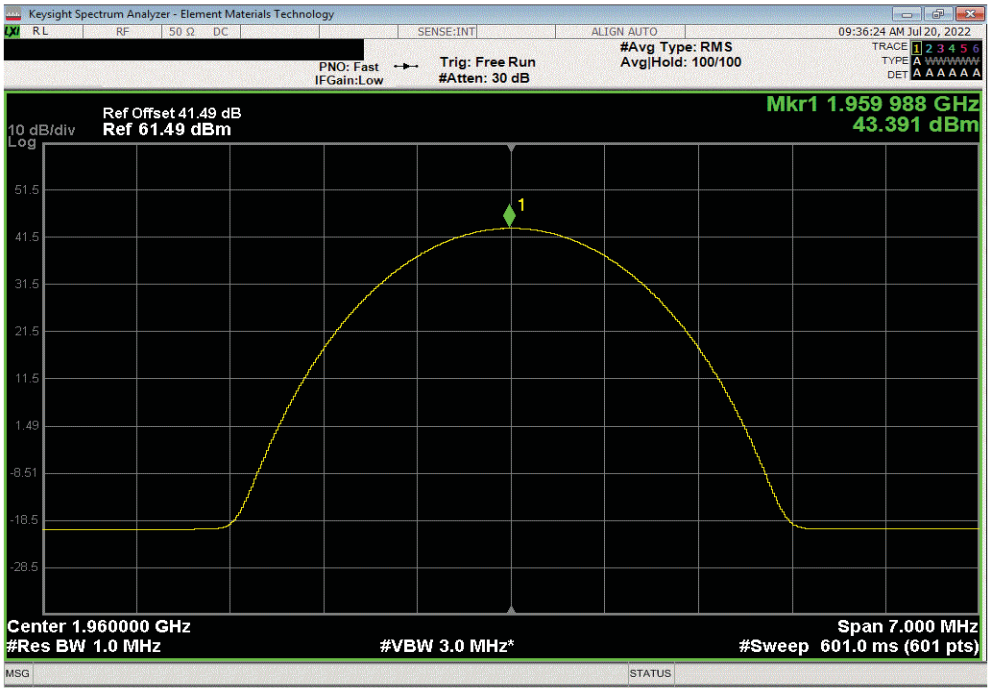
| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, GMSK Modulation, High Channel - 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 43.614 dBm | 0 | 43.61 |



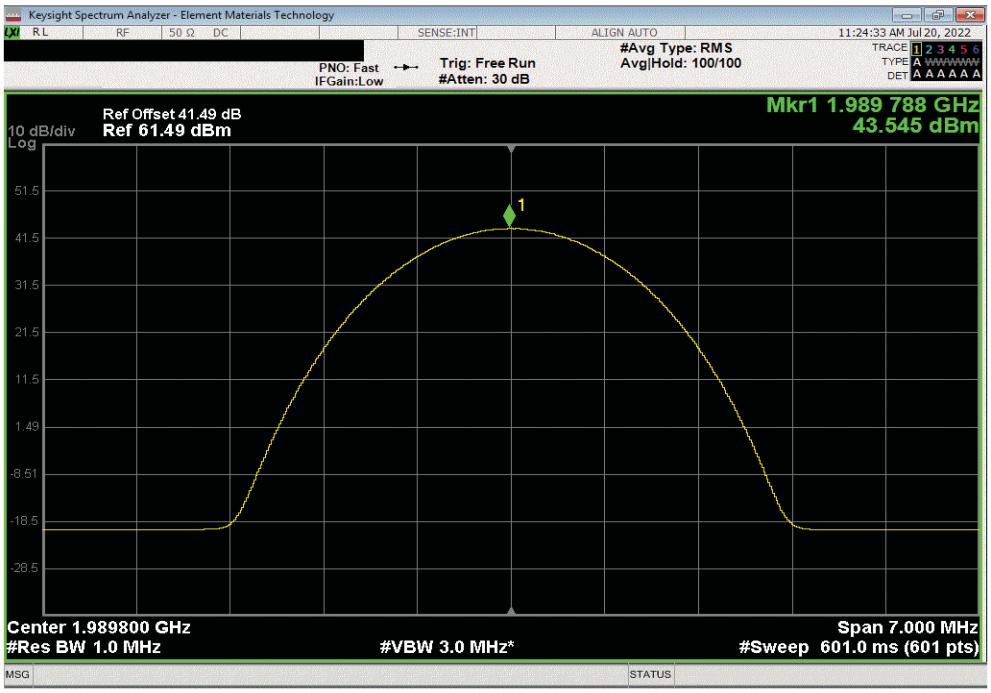

| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, 8PSK Modulation, Low Channel - 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 42.73 dBm | 0 | 42.73 |



| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, 8PSK Modulation, Mid Channel - 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 43.391 dBm | 0 | 43.39 |




| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, 8PSK Modulation, High Channel - 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Initial Value/MHz | Duty Cycle Factor (dB) | Single Port dBm/Carrier BW |
| | | | | 43.545 dBm | 0 | 43.55 |



# CONDUCTED OUTPUT POWER AND EIRP CALCULATIONS

XMit 2022.02.07.0

**EIRP Calculations**

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters. Base station antennas are selected by the customer.

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Kathrein antenna assembly model "80011867". The maximum PCS Band gain (17.9dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators used for the PCS Band. The four antenna RF inputs (used for PCS Band) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four AHFII transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna gain was used for this calculation. The cable loss between the antenna and transmitter is site dependent (will not be 0 dB) but for this worst case EIRP calculation 0 dB was used. Calculations of worst-case EIRP for single port operation are as follows:

| Parameter | GSM/EDGE Carrier |
|---|---|
| **Worst Case PSD/Antenna Port** | 43.6 dBm |
| **Cable Loss (site dependent)** | 0 dB |
| **Maximum Antenna Gain ($G_{Ant}$)** | 17.9 dBi |
| **EIRP Total = PSD/ant port - Cable Loss + Ant Gain** | 61.5 dBm |

**Calculation Summary**

The worst case AHFII PCS Band EIRP levels for GSM carriers using antenna assembly model "80011867" are under the FCC/ISED (65.16 dBm and 62.15 dBm) EIRP Regulatory Limits.

# CONDUCTED OUTPUT POWER - ALL PORTS

XMit 2022.02.07.0

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 |
|---|---|---|---|---|---|
| Block - DC | Fairview Microwave | SD3239 | ANC | 2022-03-02 | 2023-03-02 |
| Generator - Signal | Agilent | N5173B | TIW | 2020-07-17 | 2023-07-17 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFQ | 2022-01-17 | 2023-01-17 |

**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 measurements. This method uses trace averaging across the 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 in decimal, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed on all ports for GSM carrier at middle channel in order to prove the AHFII antenna ports are essentially electrically identical. Antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

# CONDUCTED OUTPUT POWER - ALL PORTS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| | | | | | |
|---|---|---|---|---|---|
| EUT: | AHFII (FCC/ISED C2PC) | | | Work Order: | NOKI0044 |
| Serial Number: | YK214000036 | | | Date: | 21-Jul-22 |
| Customer: | Nokia Solutions and Networks | | | Temperature: | 18.4 °C |
| Attendees: | David Le | | | Humidity: | 65% RH |
| Project: | None | | | Barometric Pres.: | 1016 mbar |
| Tested by: | Marty Martin | Power: | 54 VDC | Job Site: | TX07 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 24E:2022 | ANSI C63.26:2015 |
| RSS-133 Issue 6:2013+A1:2018 | ANSI C63.26:2015 |

**COMMENTS**

All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. AHFII GSM carriers are required to be operated with a 3G, 4G or 5G RAT carrier in the PCS band. PCS Band GSM carriers were enabled at maximum power (20 watts/carrier). A PCS Band LTE10 carrier was enabled at maximum power (60W) at 1970.0 MHz to allow operation of the GSM carrier. The AHFII PCS Band is set at maximum power (80W) for this testing.

**DEVIATIONS FROM TEST STANDARD**

None

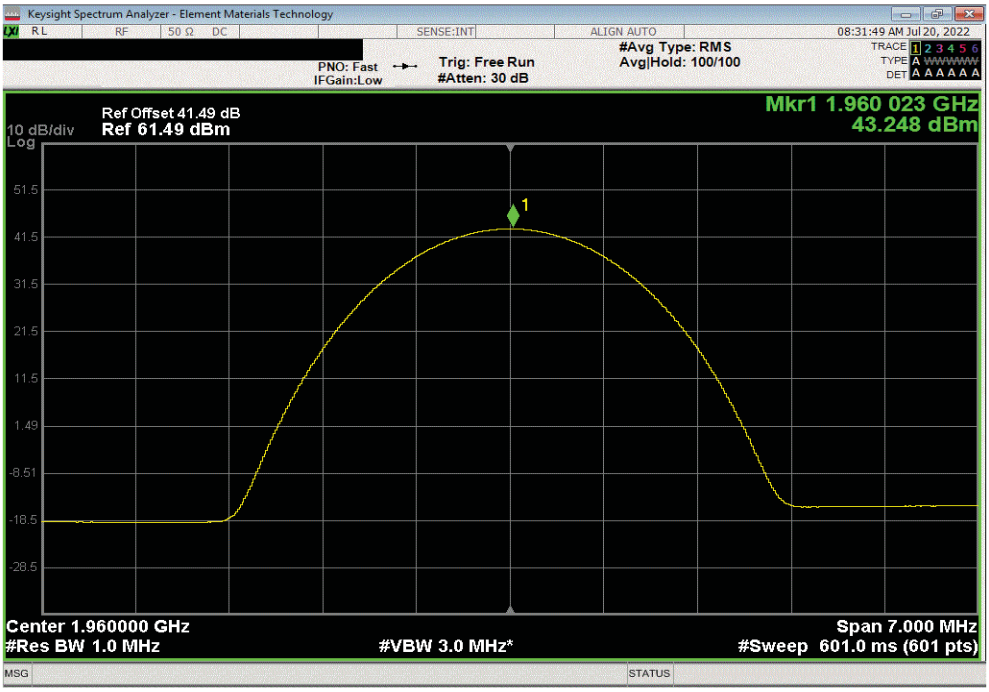
| Configuration # | 2 | Signature |
|---|---|---|

| | | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
|---|---|---|---|---|---|---|---|
| Port 1 | | | | | | | |
| | Band 2, GSM EDGE Carrier, GMSK Modulation | | | | | | |
| | Mid Channel | 43.248 | 0 | 43.25 | N/A | Within Tolerance | N/A |
| | Band 2, LTE 10 Carrier, QPSK Modulation 1970.0 MHz | | | | | | |
| | | 48.271 | 0 | 48.3 | N/A | Within Tolerance | N/A |
| Port 2 | | | | | | | |
| | Band 2, GSM EDGE Carrier, GMSK Modulation | | | | | | |
| | Mid Channel | 42.56 | 0 | 42.56 | N/A | Within Tolerance | N/A |
| | Band 2, LTE 10 Carrier, QPSK Modulation 1970.0 MHz | | | | | | |
| | | 47.55 | 0 | 47.6 | N/A | Within Tolerance | N/A |
| Port 3 | | | | | | | |
| | Band 2, GSM EDGE Carrier, GMSK Modulation | | | | | | |
| | Mid Channel | 42.533 | 0 | 42.53 | N/A | Within Tolerance | N/A |
| | Band 2, LTE 10 Carrier, QPSK Modulation 1970.0 MHz | | | | | | |
| | | 47.468 | 0 | 47.5 | N/A | Within Tolerance | N/A |
| Port 4 | | | | | | | |
| | Band 2, GSM EDGE Carrier, GMSK Modulation | | | | | | |
| | Mid Channel | 42.523 | 0 | 42.52 | N/A | Within Tolerance | N/A |
| | Band 2, LTE 10 Carrier, QPSK Modulation 1970.0 MHz | | | | | | |
| | | 47.507 | 0 | 47.5 | N/A | Within Tolerance | N/A |
| All Ports | | | | | | | |
| | Band 2, GSM EDGE Carrier, GMSK Modulation | N/A | 0 | N/A | 48.7 | N/A | N/A |
| | Band 2, LTE 10 Carrier, QPSK Modulation 1970.0 MHz | N/A | 0 | N/A | 53.8 | N/A | N/A |

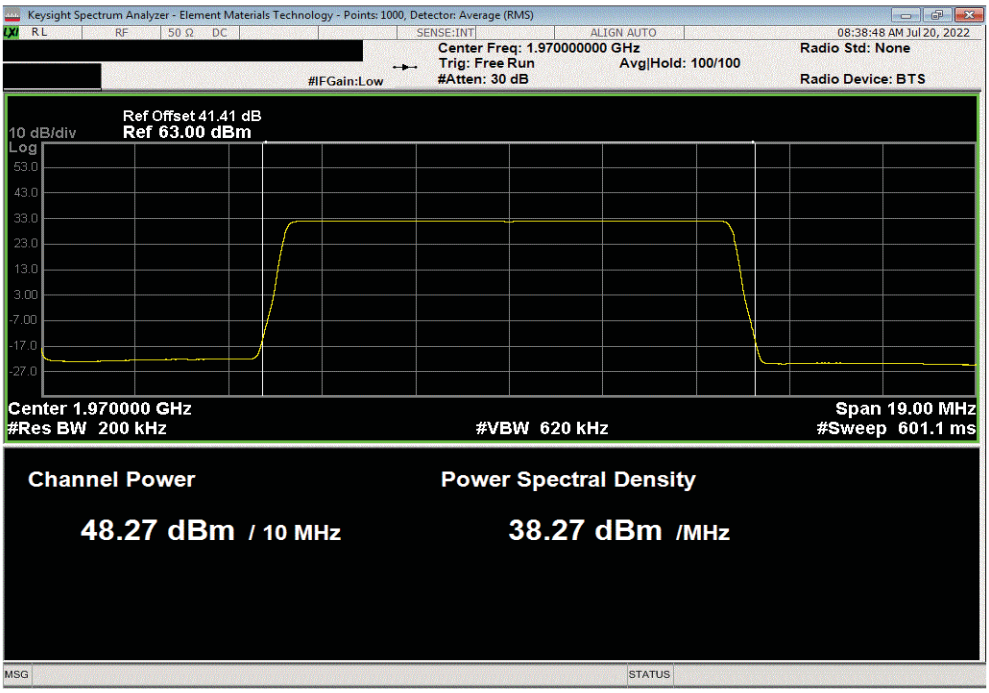
# CONDUCTED OUTPUT POWER - ALL PORTS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| Port 1, Band 2, GSM EDGE Carrier, GMSK Modulation , Mid Channel | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 43.248 | 0 | 43.25 | N/A | Within Tolerance | N/A |



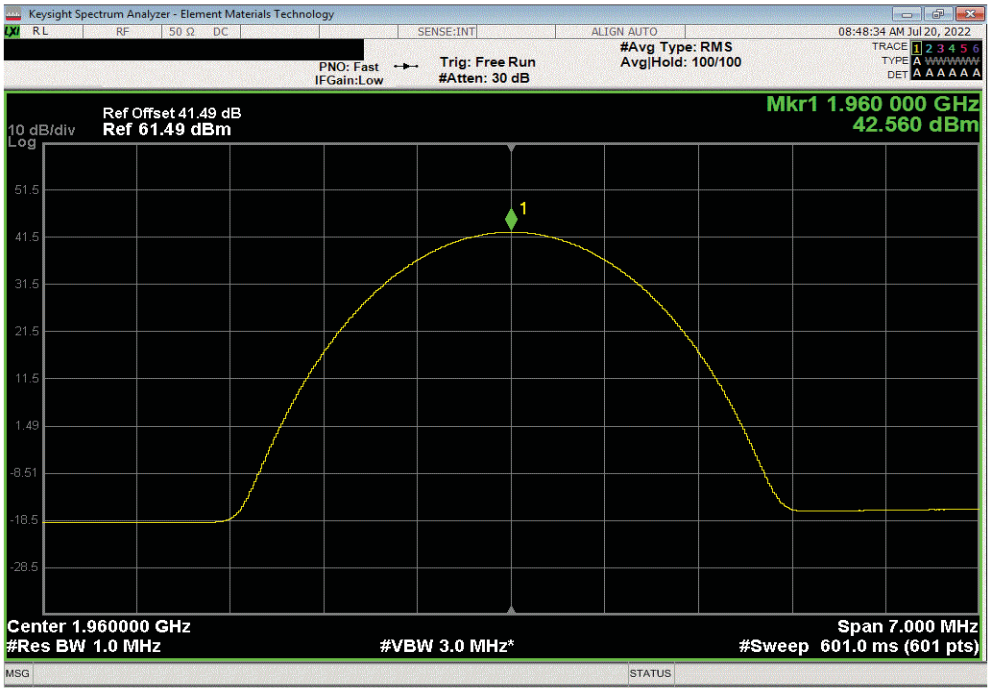

| Port 1, Band 2, LTE10 Carrier, QPSK Modulation , 1970.0 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 48.271 | 0 | 48.27 | N/A | Within Tolerance | N/A |



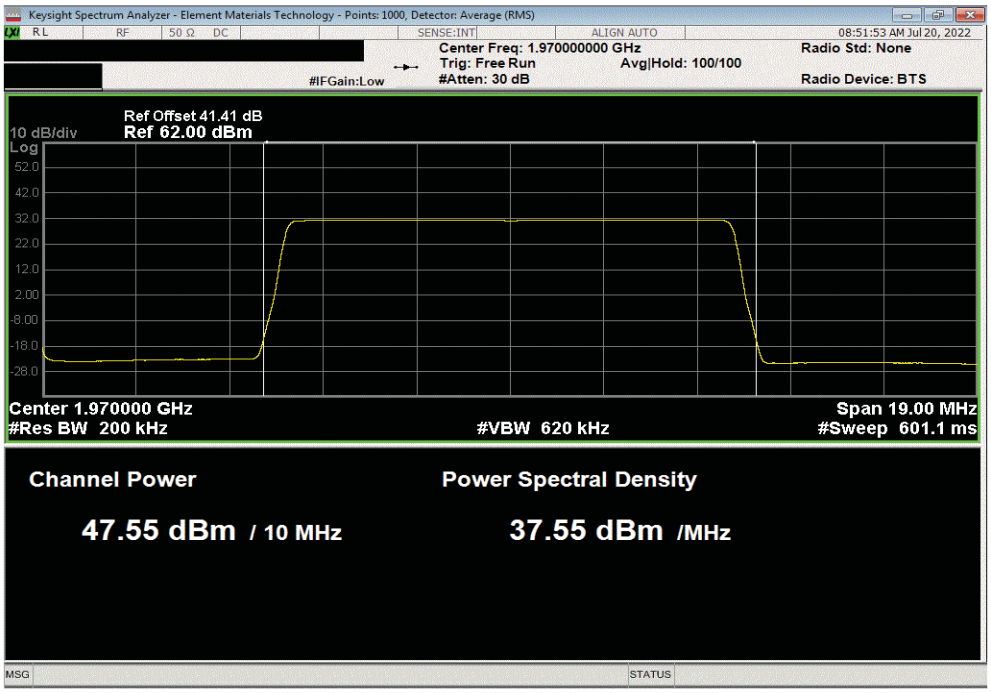
# CONDUCTED OUTPUT POWER - ALL PORTS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| Port 2, Band 2, GSM EDGE Carrier, GMSK Modulation , Mid Channel | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 42.56 | 0 | 42.56 | N/A | Within Tolerance | N/A |



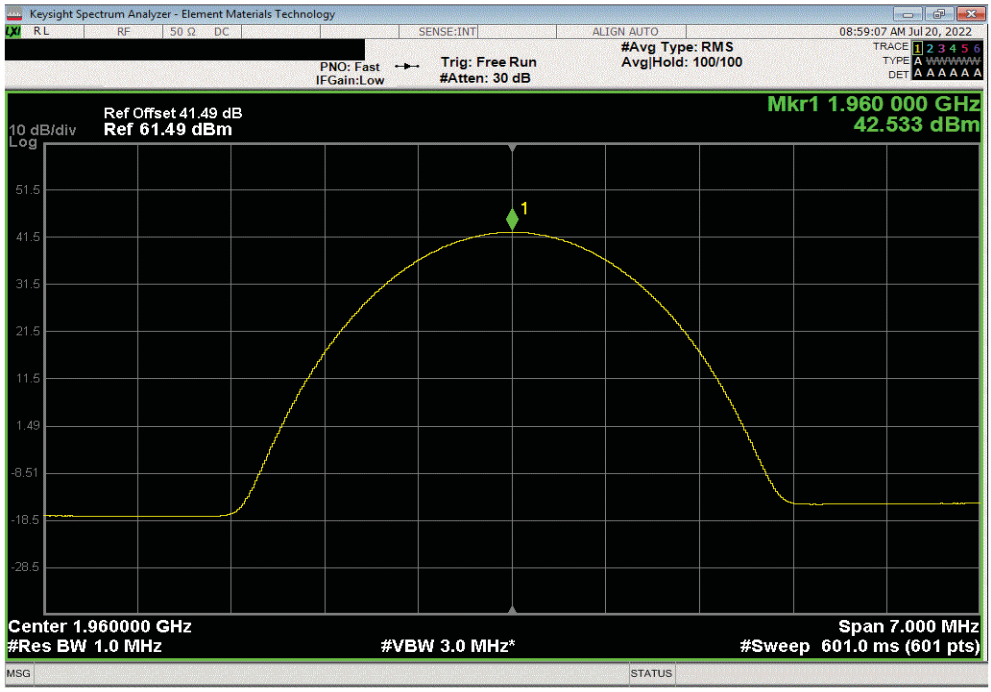

| Port 2, Band 2, LTE10 Carrier, QPSK Modulation , 1970.0 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 47.55 | 0 | 47.55 | N/A | Within Tolerance | N/A |



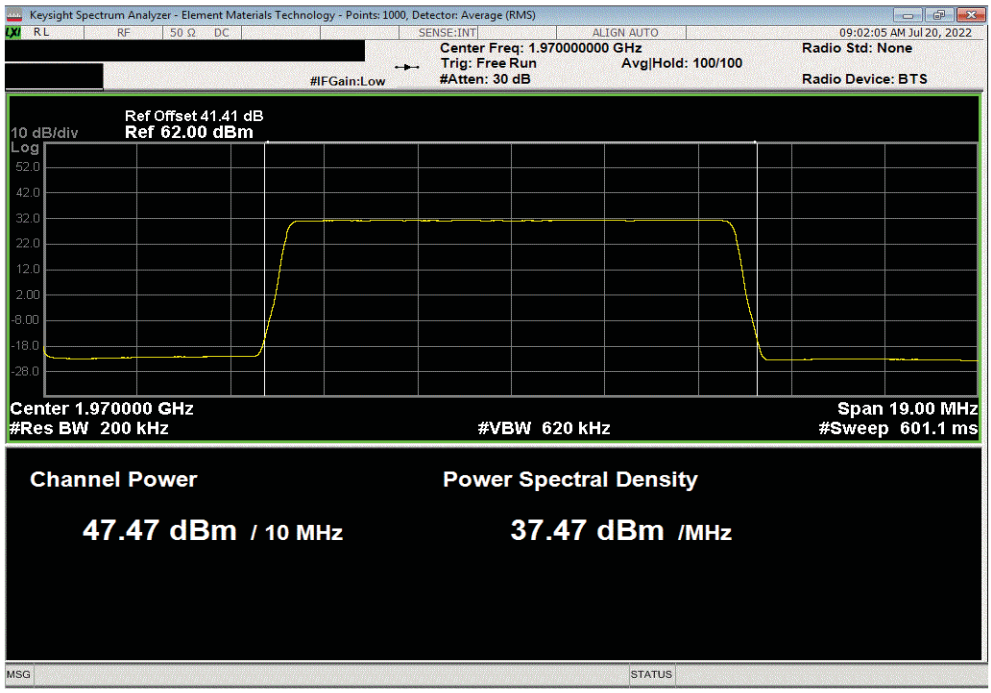
# CONDUCTED OUTPUT POWER - ALL PORTS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

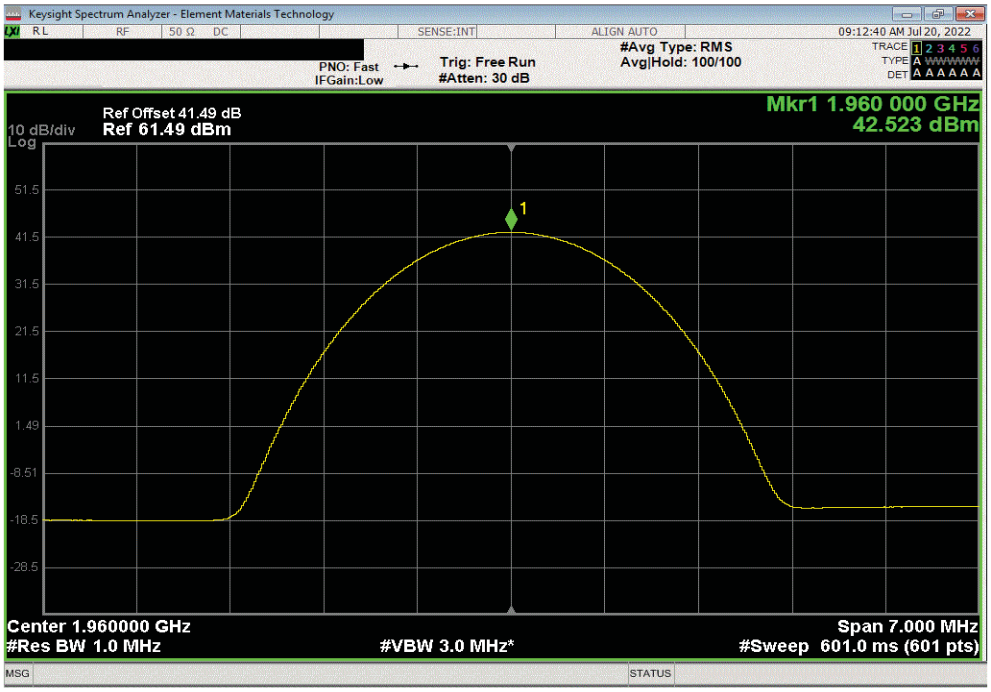
| Port 3, Band 2, GSM EDGE Carrier, GMSK Modulation , Mid Channel | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 42.533 | 0 | 42.53 | N/A | Within Tolerance | N/A |



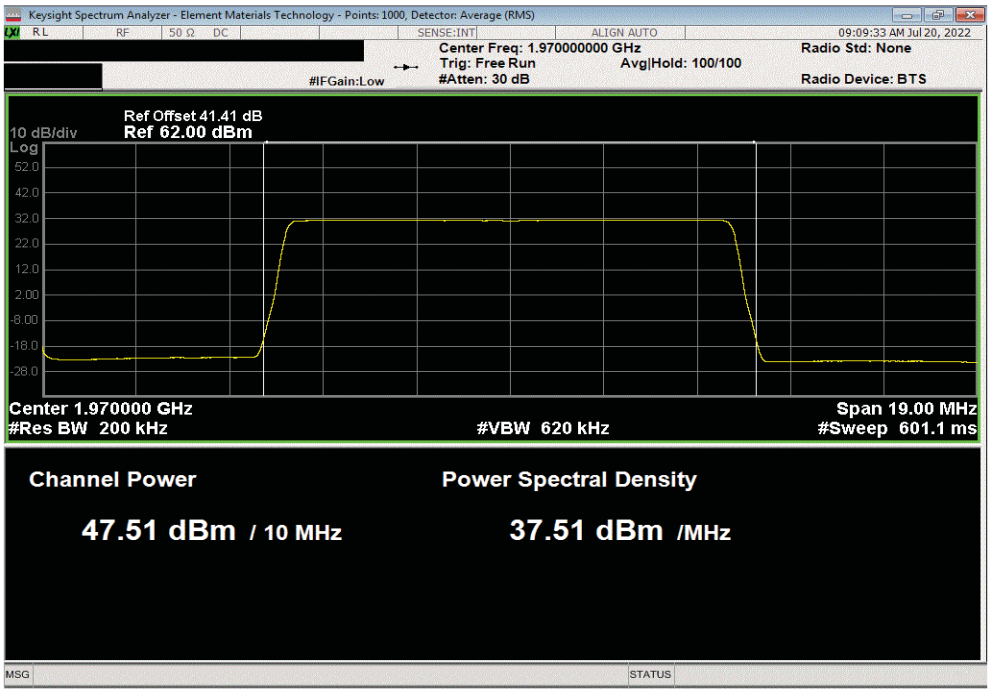

| Port 3, Band 2, LTE10 Carrier, QPSK Modulation , 1970.0 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 47.468 | 0 | 47.47 | N/A | Within Tolerance | N/A |



| Port 4, Band 2, GSM EDGE Carrier, GMSK Modulation , Mid Channel | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 42.523 | 0 | 42.52 | N/A | Within Tolerance | N/A |




| Port 4, Band 2, LTE10 Carrier, QPSK Modulation , 1970.0 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | 47.507 | 0 | 47.51 | N/A | Within Tolerance | N/A |



# CONDUCTED OUTPUT POWER - ALL PORTS

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| Band 2, GSM EDGE Carrier, GMSK Modulation , Mid Channel | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | N/A | 0 | N/A | 48.7 | N/A | N/A |

| AVERAGE POWER PORT SUMMING | | | | | |
|---|---|---|---|---|---|
| | PORT 1 | PORT 2 | PORT 3 | PORT 4 | SUM TOTAL |
| INITIAL VALUE (dBm) | 43.3 | 42.6 | 42.5 | 42.5 | N/A |
| INITIAL VALUE (Watts) | 21.1 | 18.0 | 17.9 | 17.9 | 74.9 |
| TOTAL VALUE (dBm) | N/A | N/A | N/A | N/A | 48.7 |

| Band 2, LTE10 Carrier, QPSK Modulation , 1970.0 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Value (dBm) | All Ports Value (dBm) | Limit (dBm) | Results |
| | N/A | 1 | N/A | 53.8 | N/A | N/A |

| AVERAGE POWER PORT SUMMING | | | | | |
|---|---|---|---|---|---|
| | PORT 1 | PORT 2 | PORT 3 | PORT 4 | SUM TOTAL |
| INITIAL VALUE (dBm) | 48.3 | 47.6 | 47.5 | 47.5 | N/A |
| INITIAL VALUE (Watts) | 67.6 | 57.5 | 56.2 | 56.2 | 237.6 |
| TOTAL VALUE (dBm) | N/A | N/A | N/A | N/A | 53.8 |

# CONDUCTED OUTPUT POWER - MULTICARRIER MULTIBAND

XMit 2022.02.07.0

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 | Agilent | N5173B | TIW | 2020-07-17 | 2023-07-17 |
| Block - DC | Fairview Microwave | SD3239 | ANC | 2022-03-02 | 2023-03-02 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFQ | 2022-01-17 | 2023-01-17 |

**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 follwoing 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 measurements. This method uses trace averaging across the 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 in decimal, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed only on one port. The AHFII antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown during 4 port output power testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

**Multicarrier test cases have been developed as shown below.**
Multicarrier Test Case 1: In the PCS band (Band 2) _Three GSM/EDGE carriers (operating at maximum power ~ 20W/carrier) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge +1 (1930.4 & 1930.8MHz) and a third carrier with maximum spacing between the other two carrier frequencies at the upper band edge -1 (1989.6MHz). A single LTE1.4 carrier operating at maximum power (20W) at Band 2 middle channel (1960.0MHz).
In the AWS band _ Single LTE10 carrier at 40W at the middle channel (2155.0MHz).
The carriers are operated at maximum power (~20W/PCS carrier and 40W/AWS carrier) with at total port power of 120 watts (80W for PCS band carriers + 40W for AWS band carrier).

Multicarrier Test Case 2: In the PCS band (Band 2) _Three GSM/EDGE carriers (operating at reduced power level) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (1930.2 & 1930.6MHz) and a third carrier with maximum spacing between the other two carrier frequencies at the upper band edge (1989.8MHz). A single LTE1.4 carrier operating at maximum power (20W) at Band 2 middle channel (1960.0MHz).
In the AWS band _ Single LTE10 carrier at 40W at the middle channel (2155.0MHz).
The GSM carriers are operated at reduced power level that will pass at upper and lower band edges.

# CONDUCTED OUTPUT POWER - MULTICARRIER MULTIBAND

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| | | | | | |
|---|---|---|---|---|---|
| EUT: | AHFII (FCC/ISED C2PC) | | | Work Order: | NOKI0044 |
| Serial Number: | YK214000036 | | | Date: | 21-Jul-22 |
| Customer: | Nokia Solutions and Networks | | | Temperature: | 20.7 °C |
| Attendees: | David Le | | | Humidity: | 57.6% RH |
| Project: | None | | | Barometric Pres.: | 1017 mbar |
| Tested by: | Marty Martin | Power: | 54 VDC | Job Site: | TX07 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 24E:2022 | ANSI C63.26:2015 |
| RSS-133 Issue 6:2013+A1:2018 | RSS-102 Issue 5:2015 |

**COMMENTS**

All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. AHFII GSM carriers are required to be operated with a 3G, 4G or 5G RAT carrier in the PCS band. Carrier are enabled as described in test description. Test Case 1 GSM carriers were operated at maximum power (20W/carrier or 43.0 dBm/carrier), with maximum band and port power. Test Case 2 GSM carrier power level was reduced by 4.0 dB (39.0 dBm/carrier or 8.0W/carrier).

**DEVIATIONS FROM TEST STANDARD**

None

| Configuration # | 2 | Signature Marty Martin |
|---|---|---|

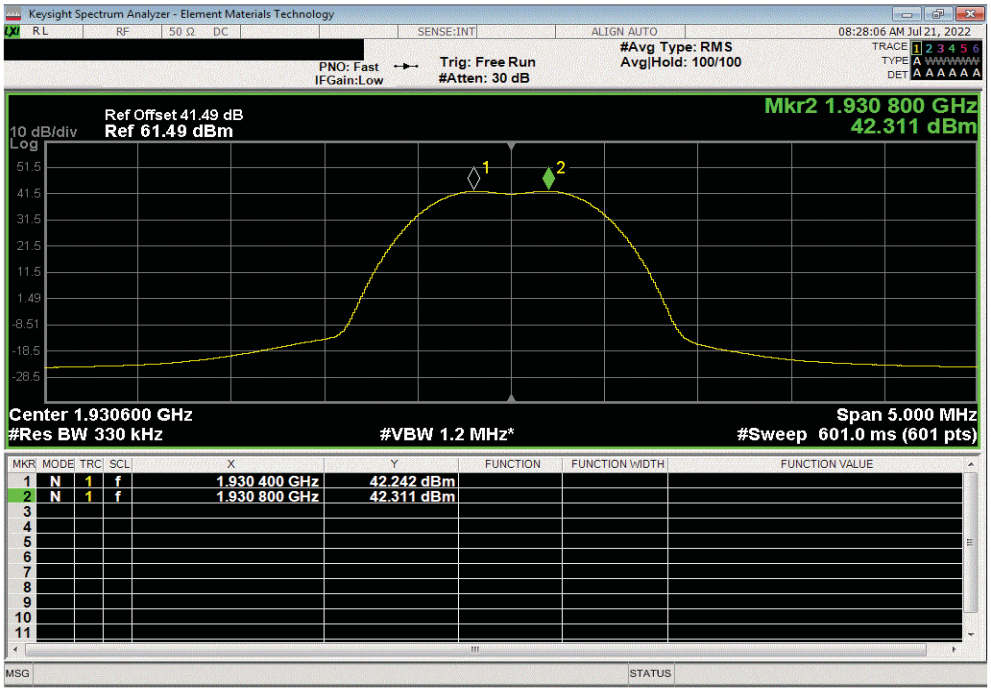
| | | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
|---|---|---|---|---|---|---|---|---|
| Port 1 | | | | | | | | |
| | GMSK Modulation | | | | | | | |
| | Test Case 1: Band 2 GSM_EDGE Low Channel 1930.4 MHz | 42.242 | 0 | 42.24 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 GSM_EDGE Low Channel 1930.8 MHz | 42.311 | 0 | 42.31 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 GSM_EDGE High Channel 1989.6 MHz | 43.34 | 0 | 43.34 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE Low Channel 1930.2 MHz | 38.453 | 0 | 38.45 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE Low Channel 1930.6 MHz | 38.491 | 0 | 38.49 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE High Channel 1989.8 MHz | 39.585 | 0 | 39.59 | N/A | N/A | Within Tolerance | Pass |
| | 8PSK Modulation | | | | | | | |
| | Test Case 1: Band 2 GSM_EDGE Low Channel 1930.4 MHz | 42.213 | 0 | 42.21 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 GSM_EDGE Low Channel 1930.8 MHz | 42.261 | 0 | 42.26 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 GSM_EDGE High Channel 1989.6 MHz | 43.282 | 0 | 43.28 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE Low Channel 1930.2 MHz | 38.424 | 0 | 38.42 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE Low Channel 1930.6 MHz | 38.497 | 0 | 38.5 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 GSM_EDGE High Channel 1989.8 MHz | 39.562 | 0 | 39.56 | N/A | N/A | Within Tolerance | Pass |
| | QPSK Modulation | | | | | | | |
| | Test Case 1: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | 45.64 | 0 | 45.64 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | 43.54 | 0 | 43.54 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | 45.678 | 0 | 45.68 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | 43.806 | 0 | 43.81 | N/A | N/A | Within Tolerance | Pass |
| Port 1 | | | | | | | | |
| | QPSK Modulation | | | | | | | |
| | Test Case 1: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | 45.7 | 0 | 45.7 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 1: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | 43.65 | 0 | 43.65 | N/A | N/A | Within Tolerance | Pass |
| | QPSK Modulation | | | | | | | |
| | Test Case 2: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | 45.69 | 0 | 45.69 | N/A | N/A | Within Tolerance | Pass |
| | Test Case 2: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | 43.8 | 0 | 43.8 | N/A | N/A | Within Tolerance | Pass |

# CONDUCTED OUTPUT POWER - MULTICARRIER MULTIBAND

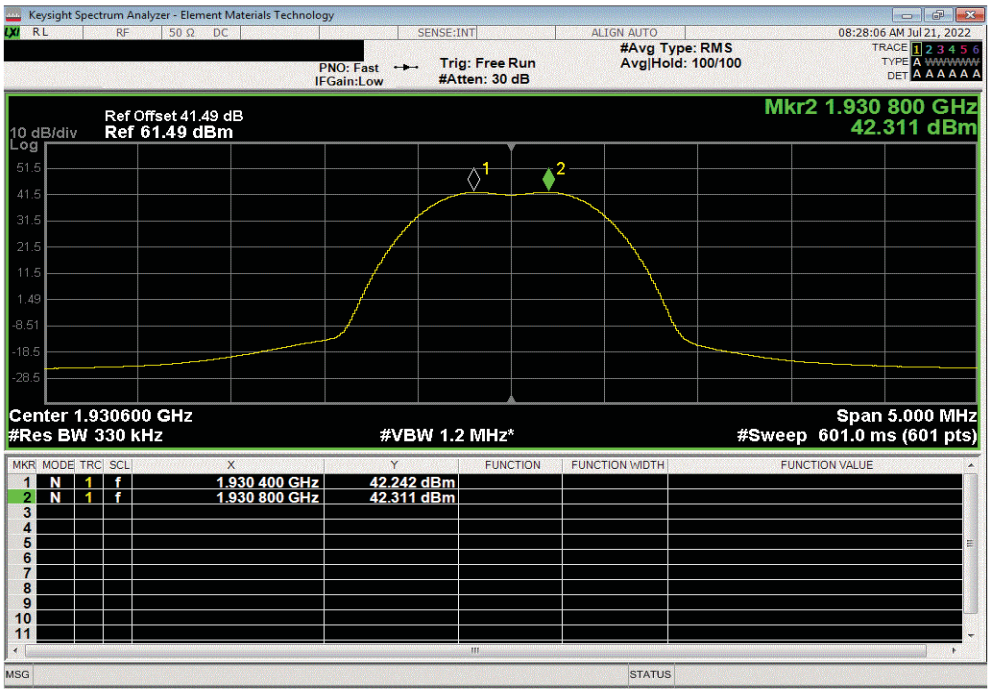
element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

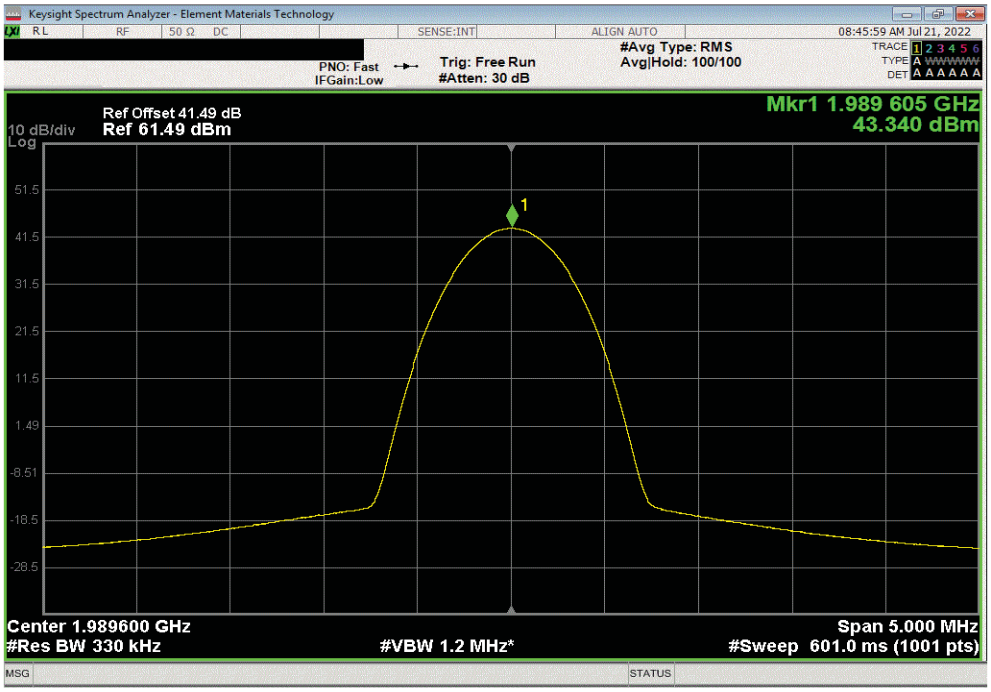
| Port 1, GMSK Modulation, Test Case 1: Band 2 GSM_EDGE Low Chanel 1930.4 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 42.242 | 0 | 42.24 | N/A | N/A | Within Tolerance | Pass |



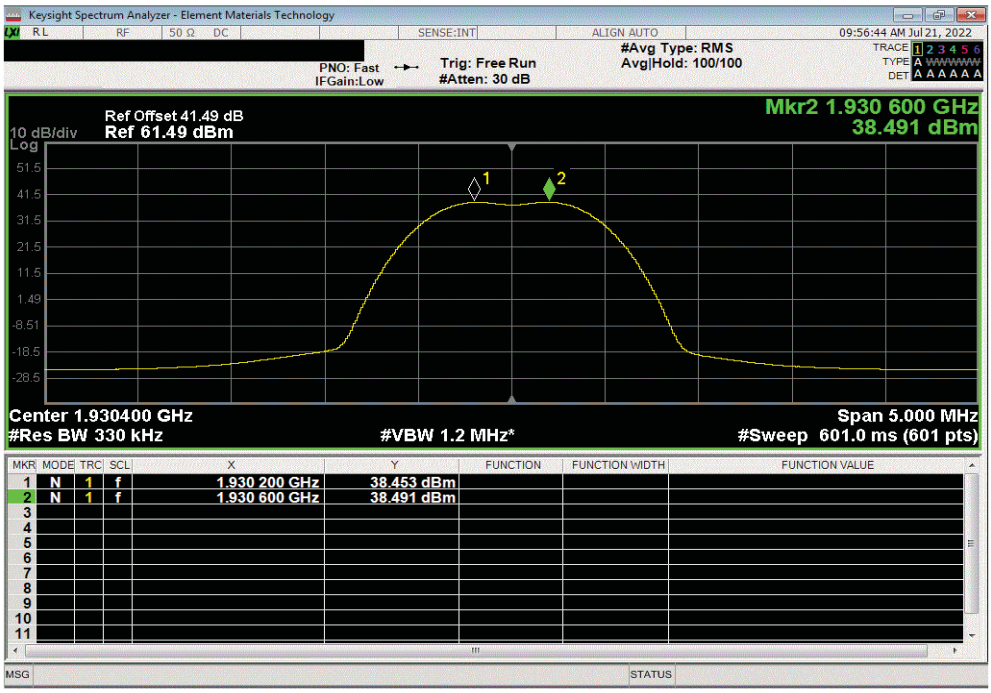

| Port 1, GMSK Modulation, Test Case 1: Band 2 GSM_EDGE Low Chanel 1930.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 42.311 | 0 | 42.31 | N/A | N/A | Within Tolerance | Pass |



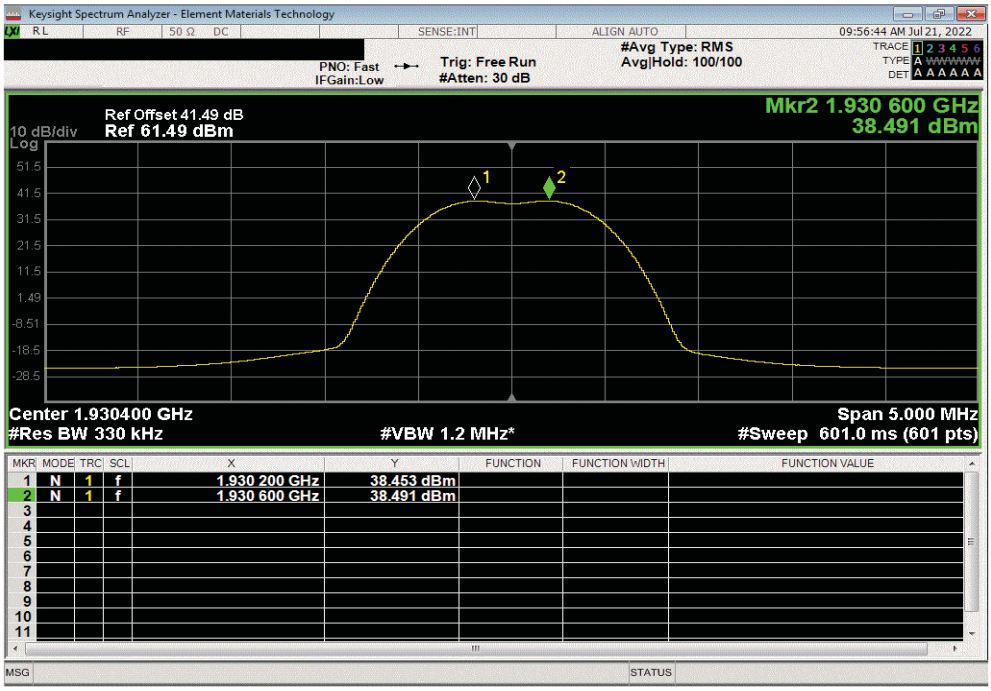
| Port 1, GMSK Modulation, Test Case 1: Band 2 GSM_EDGE High Channel 1989.6 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.34 | 0 | 43.34 | N/A | N/A | Within Tolerance | Pass |



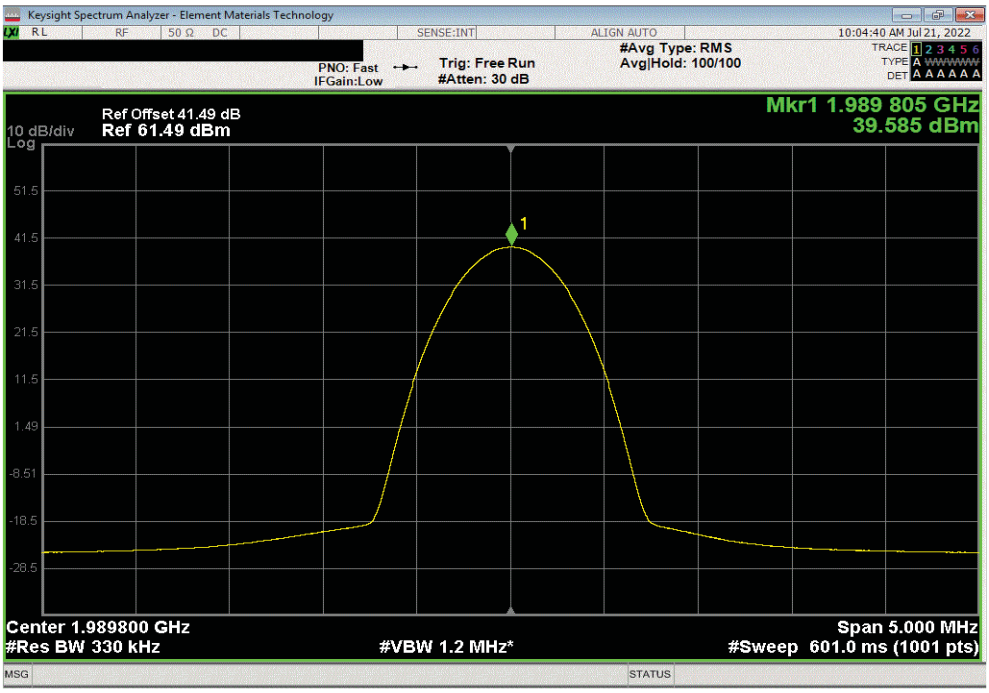

| Port 1, GMSK Modulation, Test Case 2: Band 2 GSM_EDGE Low Chanel 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 38.453 | 0 | 38.49 | N/A | N/A | Within Tolerance | Pass |



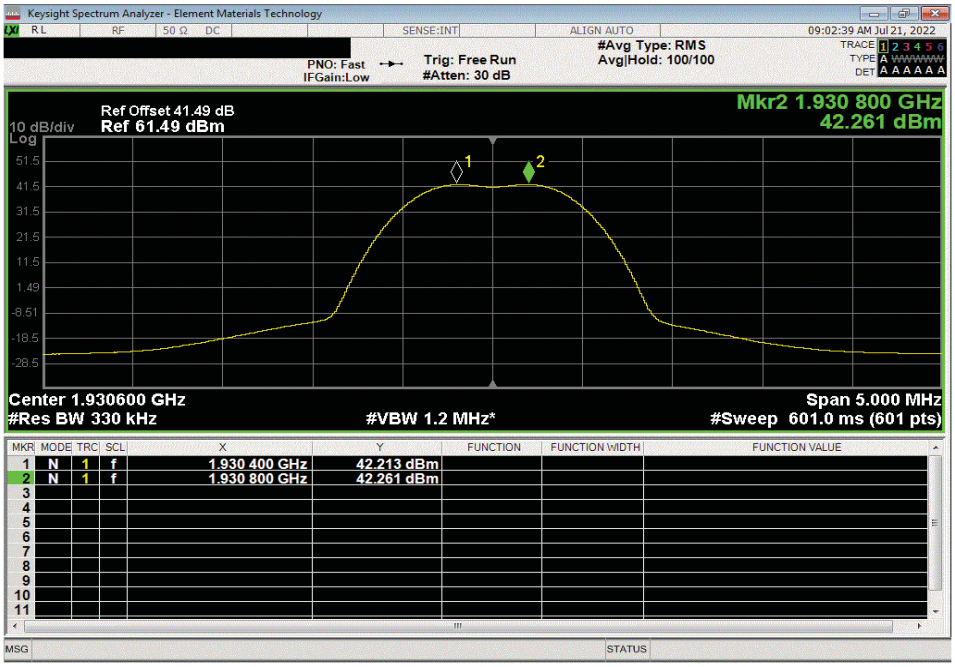
| Port 1, GMSK Modulation, Test Case 2: Band 2 GSM_EDGE Low Chanel 1930.6 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 38.491 | 0 | 38.49 | N/A | N/A | Within Tolerance | Pass |



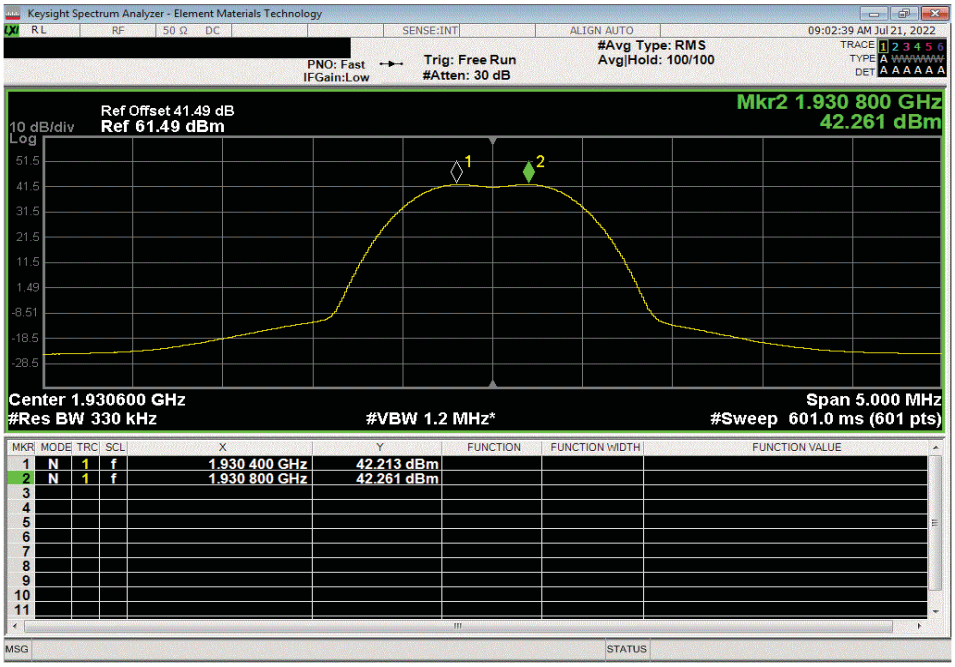

| Port 1, GMSK Modulation, Test Case 2: Band 2 GSM_EDGE High Channel 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 39.585 | 0 | 39.59 | N/A | N/A | Within Tolerance | Pass |



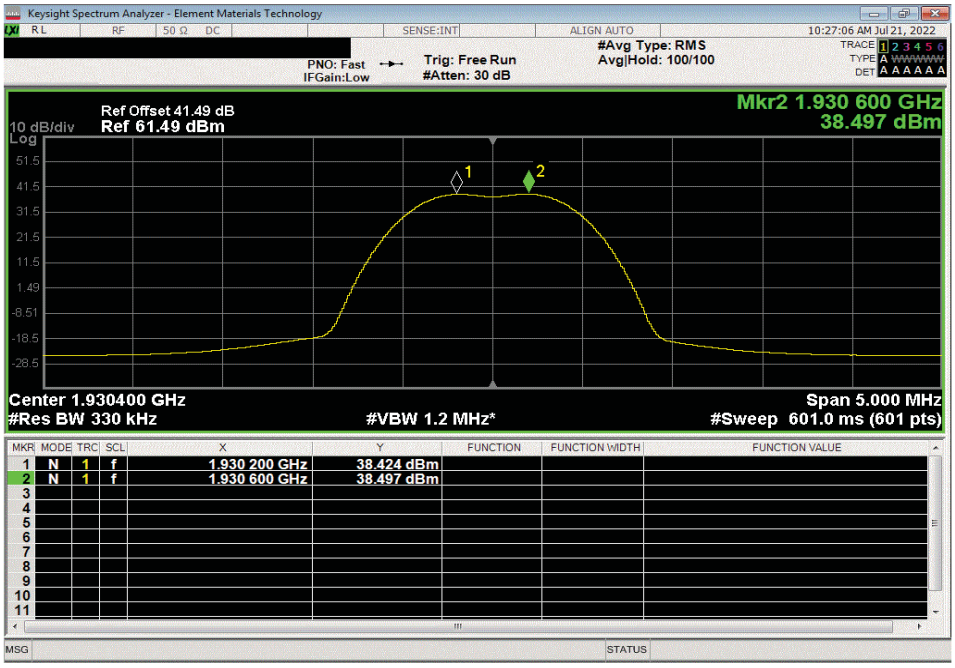
| Port 1, 8PSK Modulation, Test Case 1: Band 2 GSM_EDGE Low Chanel 1930.4 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 42.213 | 0 | 42.21 | N/A | N/A | Within Tolerance | Pass |



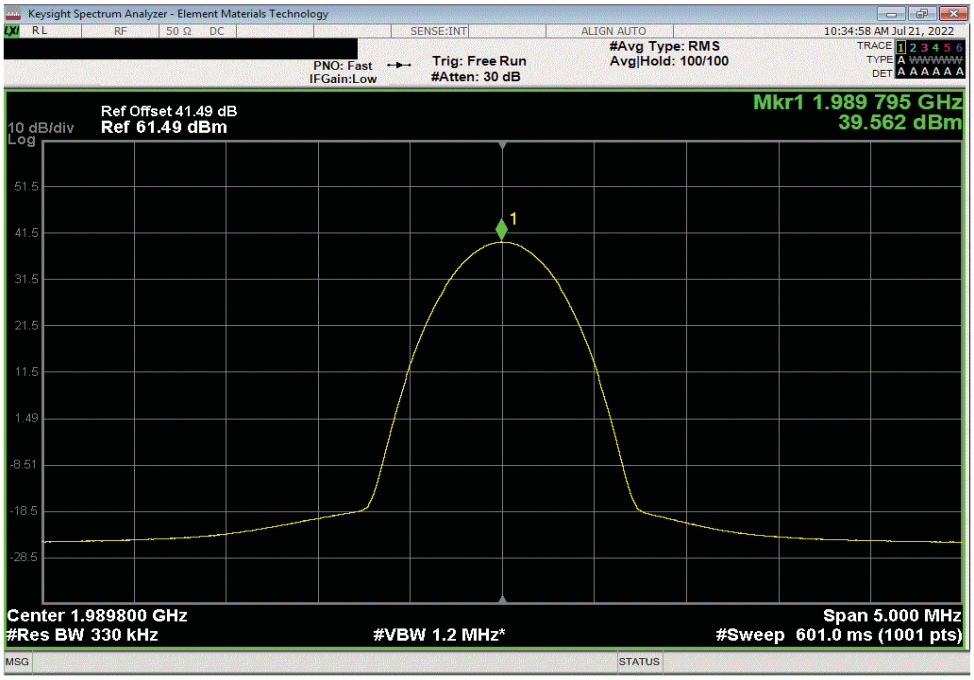

| Port 1, 8PSK Modulation, Test Case 1: Band 2 GSM_EDGE Low Chanel 1930.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 42.261 | 0 | 42.26 | N/A | N/A | Within Tolerance | Pass |



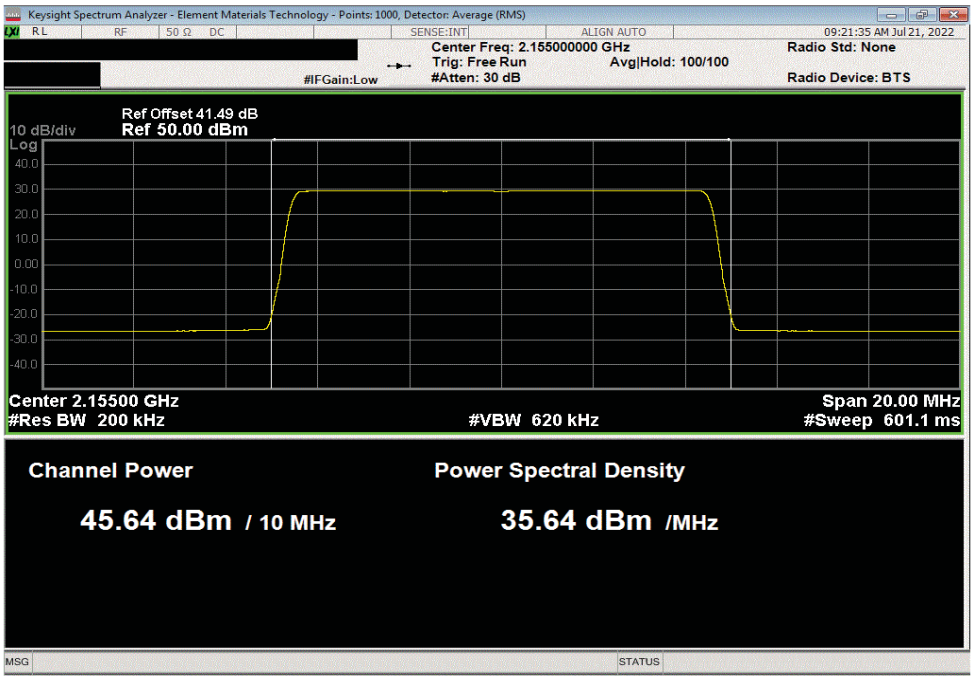
| Port 1, 8PSK Modulation, Test Case 2: Band 2 GSM_EDGE Low Chanel 1930.6 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 38.497 | 0 | 38.497 | N/A | N/A | Within Tolerance | Pass |



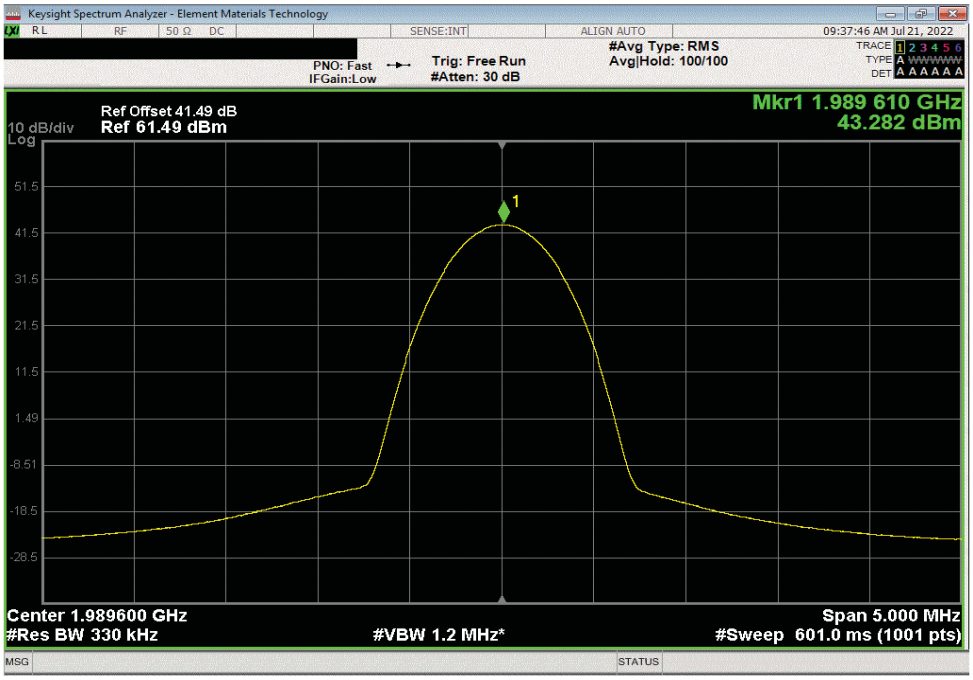
| Port 1, 8PSK Modulation, Test Case 2: Band 2 GSM_EDGE High Channel 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 39.562 | 0 | 39.56 | N/A | N/A | Within Tolerance | Pass |



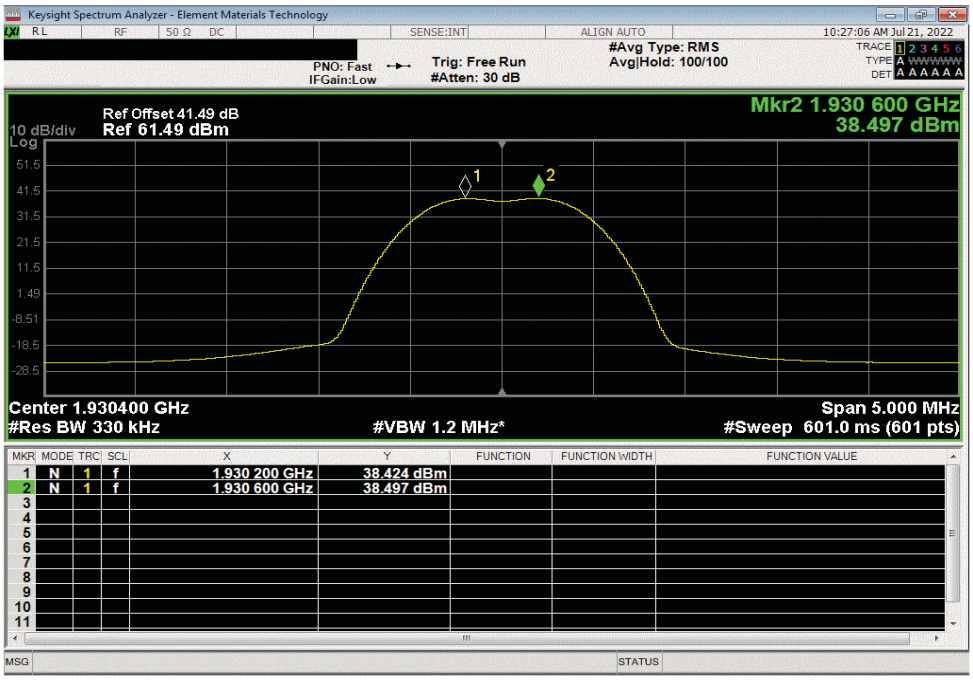

| Port 1, QPSK Modulation, Test Case 1: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 45.64 | 0 | 45.64 | N/A | N/A | Within Tolerance | Pass |



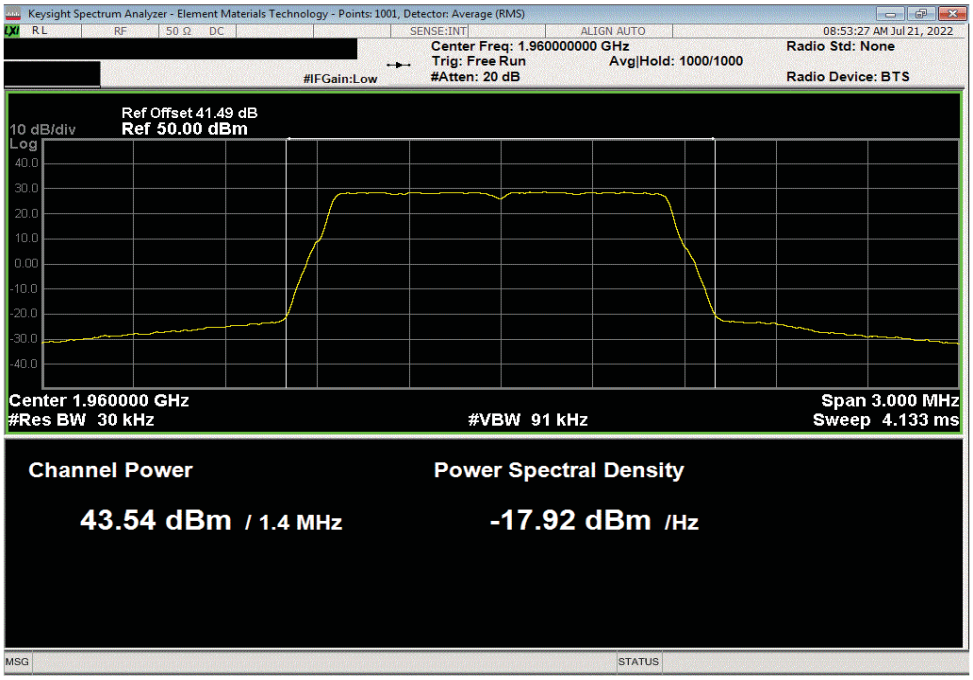
| Port 1, 8PSK Modulation, Test Case 1: Band 2 GSM_EDGE High Channel 1989.6 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.282 | 0 | 43.28 | N/A | N/A | Within Tolerance | Pass |



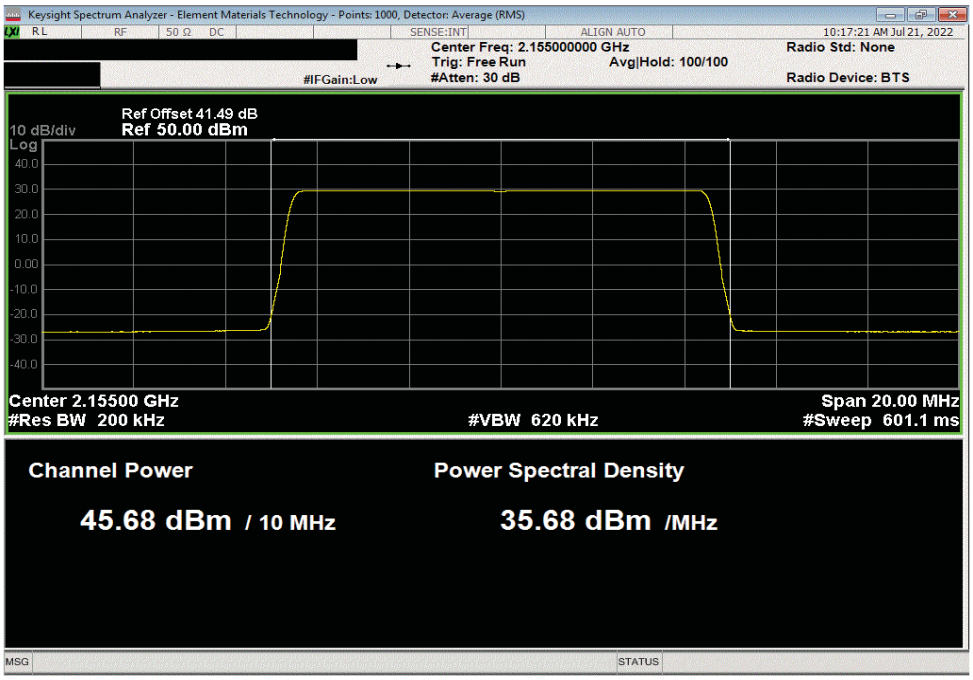

| Port 1, 8PSK Modulation, Test Case 2: Band 2 GSM_EDGE Low Chanel 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 38.424 | 0 | 38.42 | N/A | N/A | Within Tolerance | Pass |



| Port 1, QPSK Modulation, Test Case 1: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.54 | 0 | 43.54 | N/A | N/A | Within Tolerance | Pass |



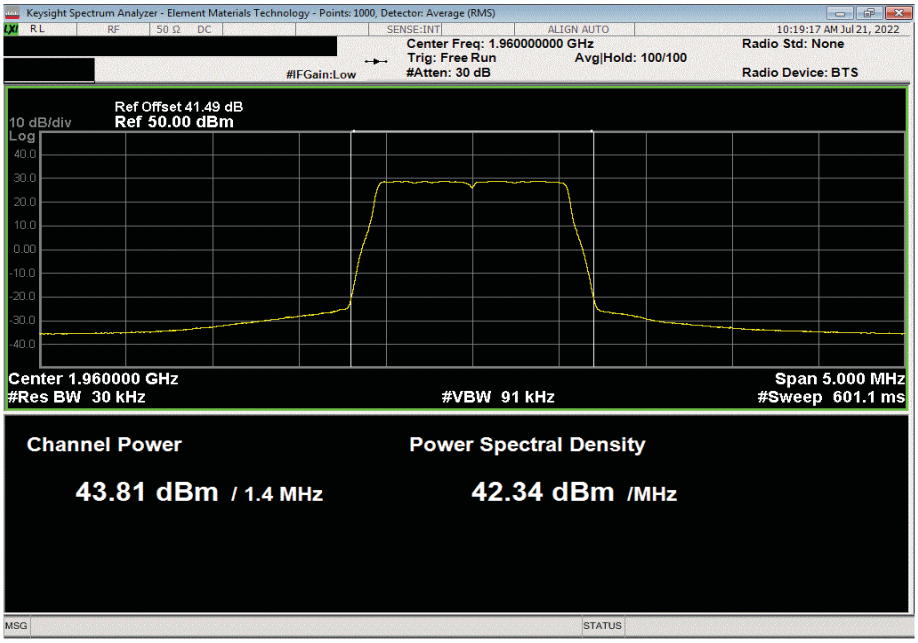

| Port 1, QPSK Modulation, Test Case 2: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 45.68 | 0 | 45.68 | N/A | N/A | Within Tolerance | Pass |



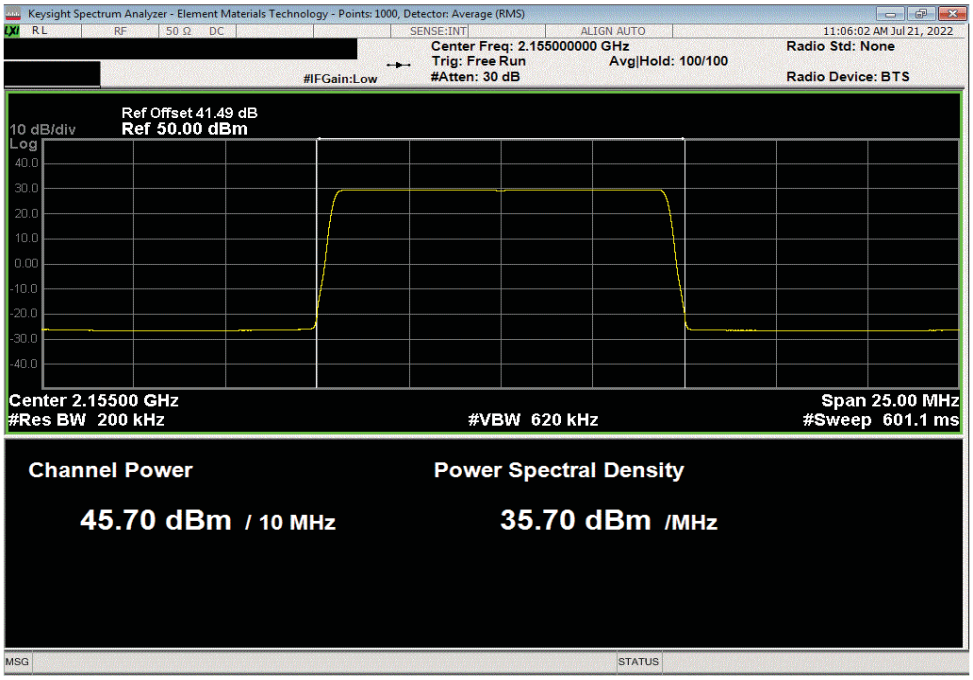
# CONDUCTED OUTPUT POWER - MULTICARRIER MULTIBAND

TbtTx 2022.05.02.0 XMit 2022.02.07.0

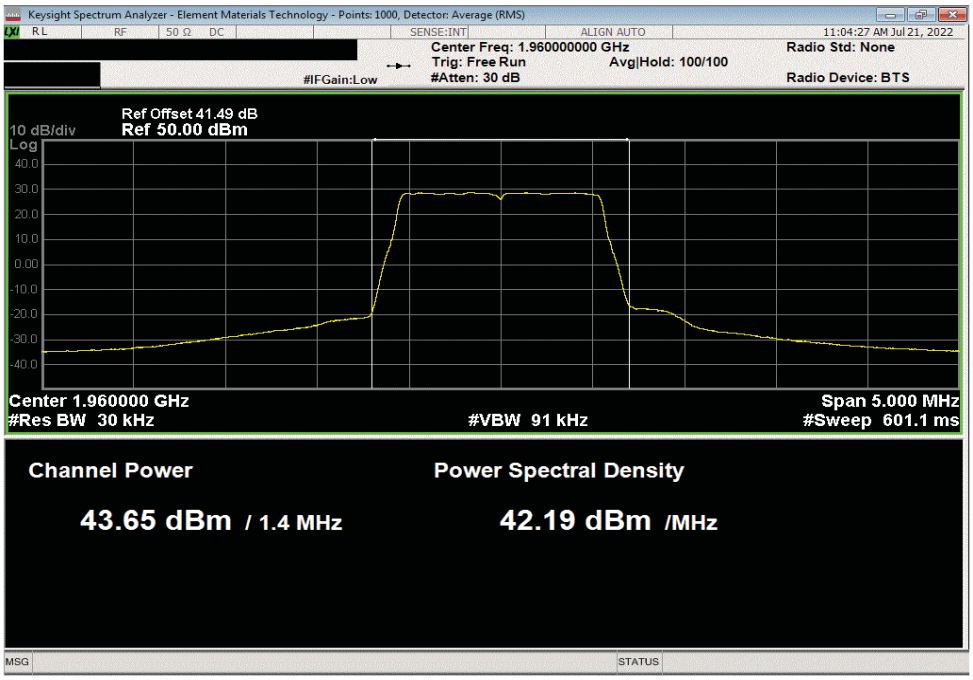
| Port 1, QPSK Modulation, Test Case 2: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.81 | 0 | 43.81 | N/A | N/A | Within Tolerance | Pass |



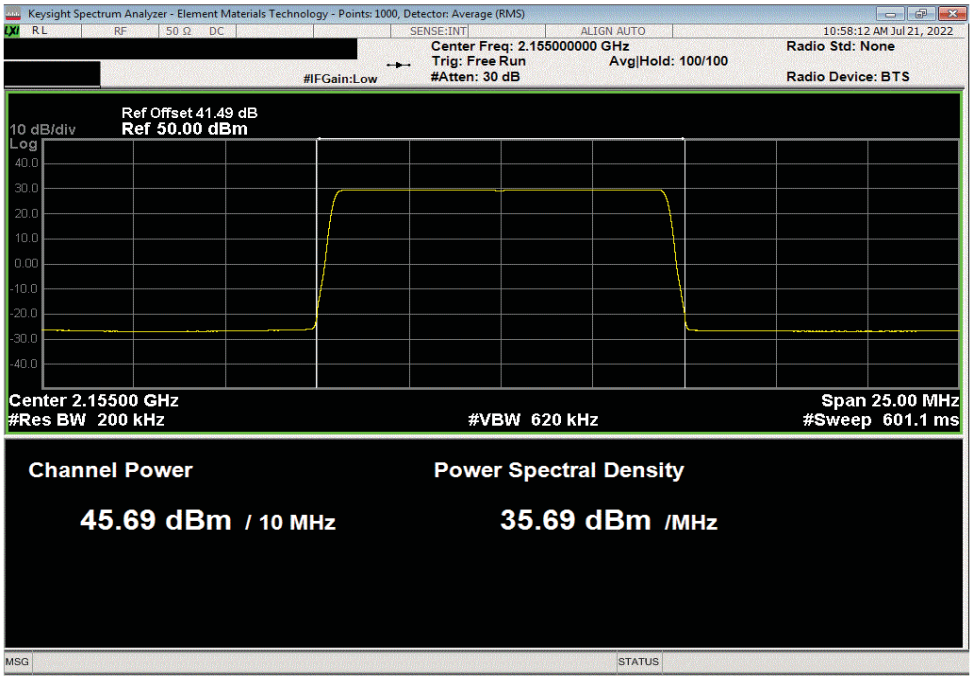
| Port 1, QPSK Modulation, Test Case 1: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 45.7 | 0 | 45.7 | N/A | N/A | Within Tolerance | Pass |



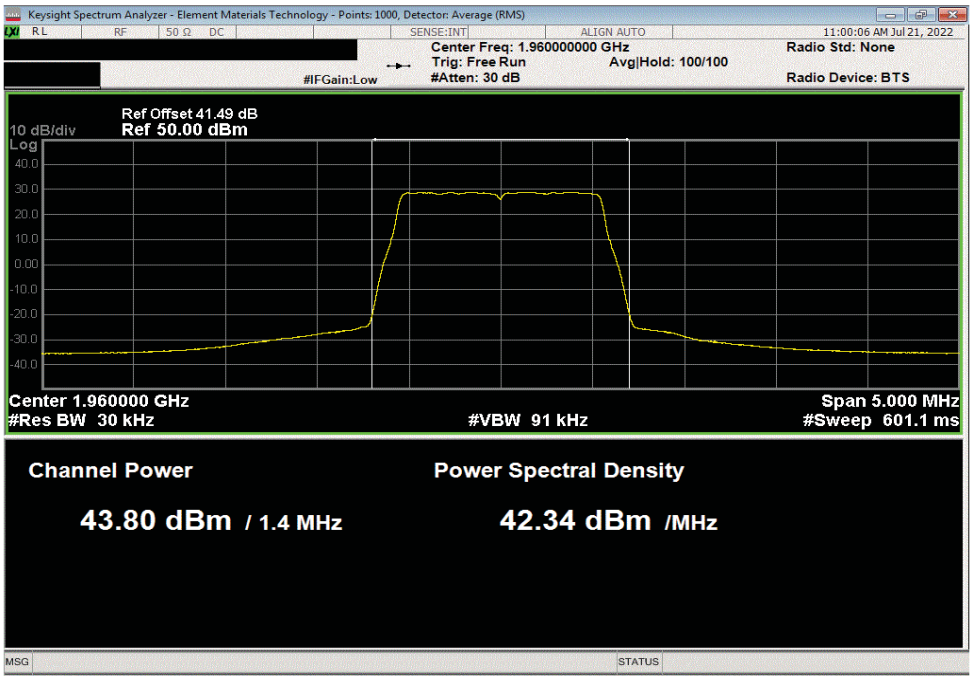

| Port 1, QPSK Modulation, Test Case 1: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.65 | 0 | 43.65 | N/A | N/A | Within Tolerance | Pass |



| Port 1, QPSK Modulation, Test Case 2: Band 66 Bandwidth LTE10 Mid Channel 2155 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 45.69 | 0 | 45.69 | N/A | N/A | Within Tolerance | Pass |




| Port 1, QPSK Modulation, Test Case 2: Band 2 Bandwidth LTE1.4 Mid Channel 1960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Avg Cond Carrier Pwr (dBm) | Avg Cond Band Pwr (dBm) | Avg Cond Port Pwr (dBm) | Limit (dBm) | Results |
| 43.8 | 0 | 43.8 | N/A | N/A | Within Tolerance | Pass |



# CONDUCTED OUTPUT POWER - REDUCED POWER

XMit 2022.02.07.0

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 |
|---|---|---|---|---|---|
| Block - DC | Fairview Microwave | SD3239 | ANC | 2022-03-02 | 2023-03-02 |
| Generator - Signal | Agilent | N5173B | TIW | 2020-07-17 | 2023-07-17 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFQ | 2022-01-17 | 2023-01-17 |

**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 measurements. This method uses trace averaging across the 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 in decimal, to the measured power to compute the average power during the actual transmission times

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFII) as the original certification test. The AHFII antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The total average transmit power of all antenna ports was determined per ANSI C63.26-2105 paragraph 6.4.3.1.

# CONDUCTED OUTPUT POWER - REDUCED POWER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| | | | | | |
|---|---|---|---|---|---|
| EUT: | AHFII (FCC/ISED C2PC) | | | Work Order: | NOKI0044 |
| Serial Number: | YK214000036 | | | Date: | 21-Jul-22 |
| Customer: | Nokia Solutions and Networks | | | Temperature: | 20.1 °C |
| Attendees: | David Le | | | Humidity: | 59.4% RH |
| Project: | None | | | Barometric Pres.: | 1016 mbar |
| Tested by: | Marty Martin | Power: | 54 VDC | Job Site: | TX07 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 24E:2022 | ANSI C63.26:2015 |
| RSS-133 Issue 6:2013+A1:2018 | ANSI C63.26:2015 |

**COMMENTS**

**All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. PCS Band II GSM carrier power level were reduced by 4dB from maximum to meet band edge limits. The carrier power level were set to 39.0dBm or 8W. The following is the output power measurements at the radio output ports. The output power was measured for a single carrier over the carrier channel bandwidth on port 1.**

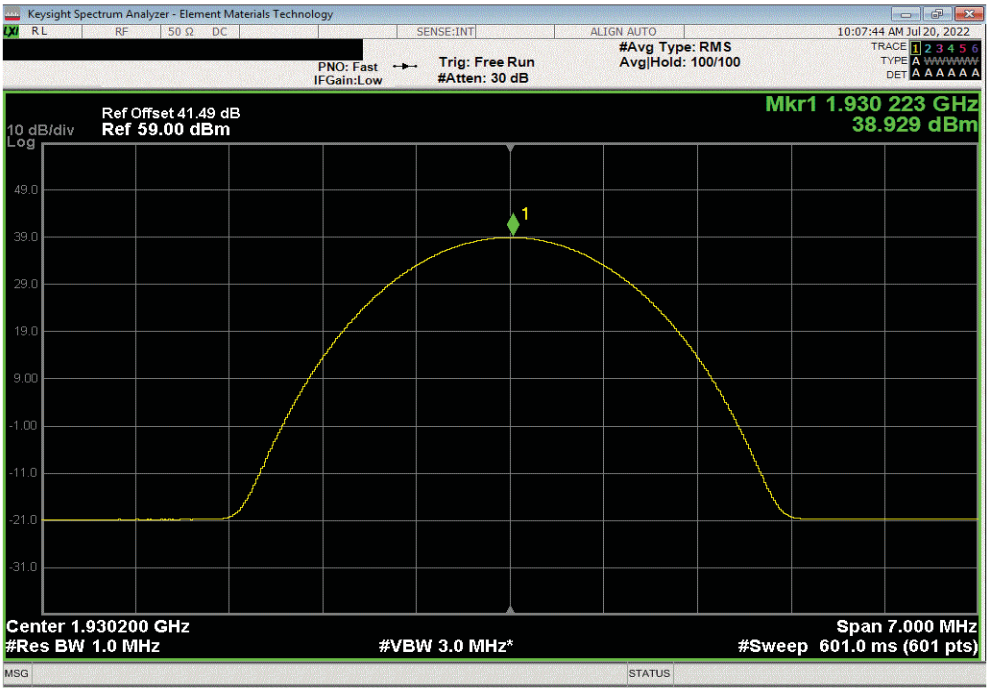
**DEVIATIONS FROM TEST STANDARD**

**None**

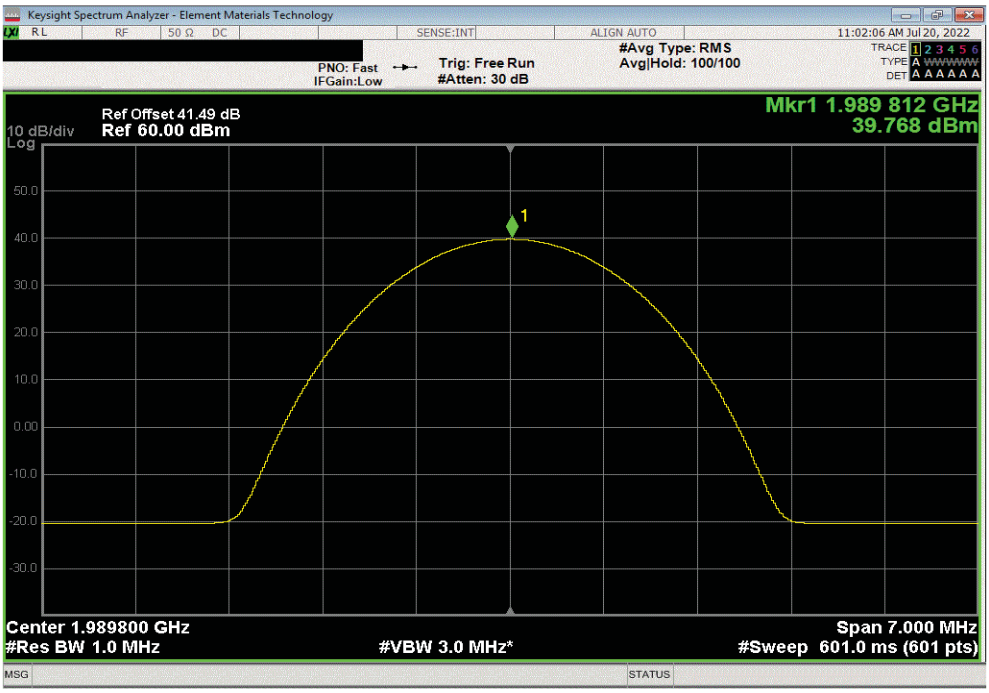
| Configuration # | 2 | Signature |
|---|---|---|

| | AVG Cond Pwr (dBm) | Duty Cycle | Value (dBm) | Limit | Result |
|---|---|---|---|---|---|
| Port 1 | | | | | |
| Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz | | | | | |
| GMSK Modulation | | | | | |
| Low Channel - 1930.2 MHz | 38.929 | 0 | 38.93 | Within Tolerance | Pass |
| High Channel - 1989.8 MHz | 39.768 | 0 | 39.77 | Within Tolerance | Pass |
| 8PSK Modulation | | | | | |
| Low Channel - 1930.2 MHz | 38.889 | 0 | 38.89 | Within Tolerance | Pass |
| High Channel - 1989.8 MHz | 39.703 | 0 | 39.7 | Within Tolerance | Pass |

| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, GMSK Modulation, Low Channel - 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | AVG Cond Pwr (dBm) | Duty Cycle | Value (dBm) | Limit | Result |
| | | 38.929 | 0 | 38.93 | N/A | Pass |



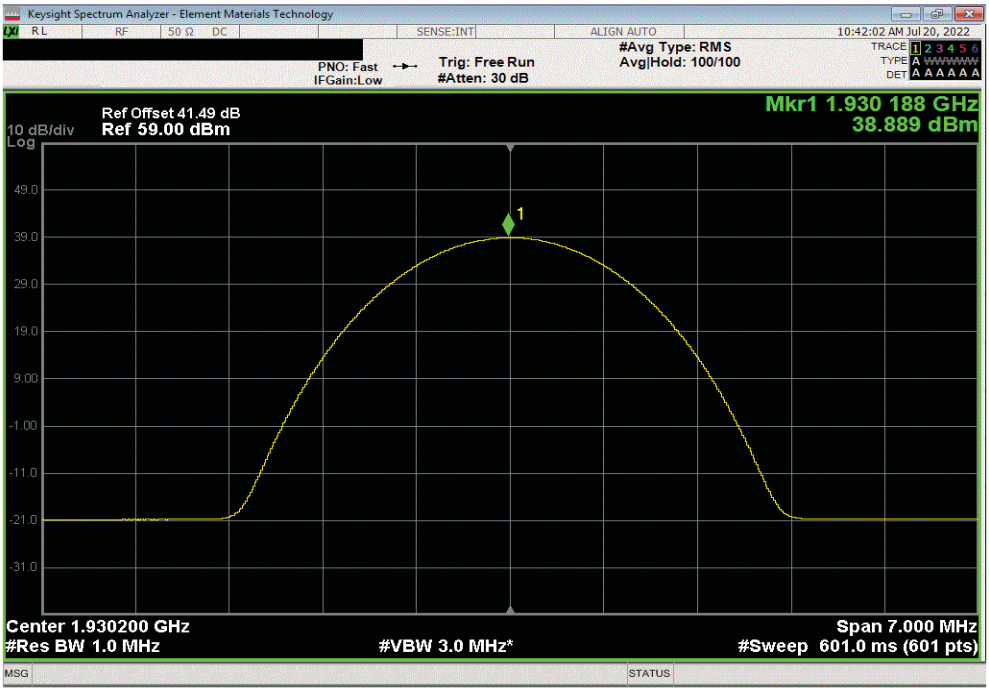

| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, GMSK Modulation, High Channel - 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | AVG Cond Pwr (dBm) | Duty Cycle | Value (dBm) | Limit | Result |
| | | 39.768 | 0 | 39.77 | N/A | Pass |

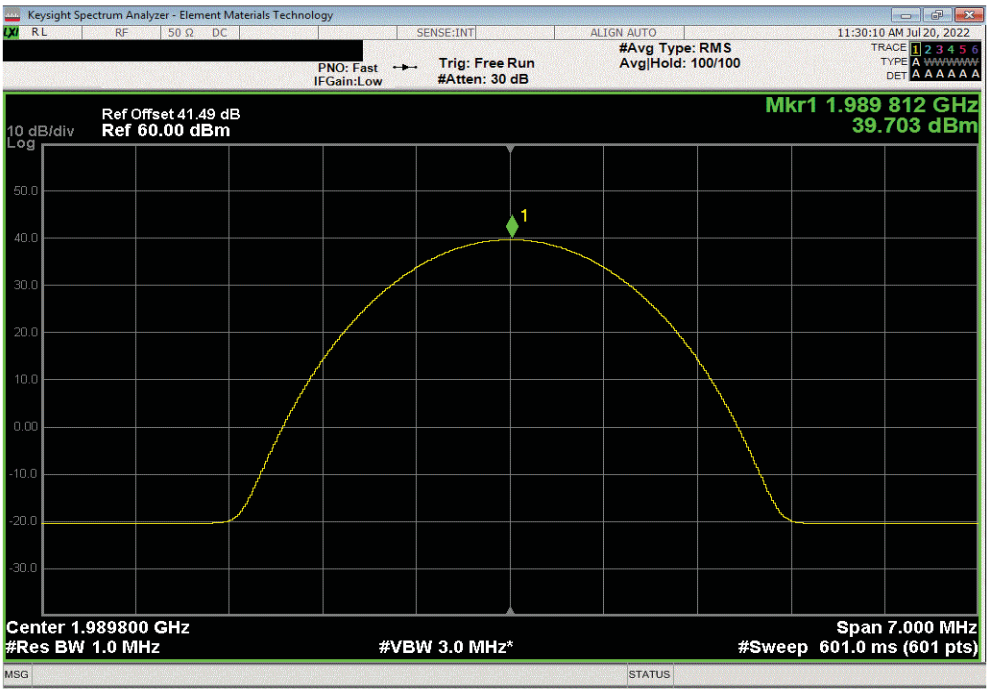


# CONDUCTED OUTPUT POWER - REDUCED POWER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, 8PSK Modulation, Low Channel - 1930.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | AVG Cond Pwr (dBm) | Duty Cycle | Value (dBm) | Limit | Result |
| | | 38.889 | 0 | 38.89 | N/A | Pass |




| Port 1, Band 2 2G_GSM EDGE_1930.0 - 1990.0 MHz, 8PSK Modulation, High Channel - 1989.8 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | AVG Cond Pwr (dBm) | Duty Cycle | Value (dBm) | Limit | Result |
| | | 39.703 | 0 | 39.7 | N/A | Pass |