



element

**Radio Test Report
Application for Grant of Equipment Authorization**

**FCC Part 24 and IC RSS-133
[1930MHz - 1995MHz]**

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

**FCC Part 27 and IC RSS-199
[2620MHz - 2690MHz]
FCC ID: VBNAHFIHA-01
ICID: 661W-AHFIHA**

**Nokia Solutions and Networks
Airscale Base Transceiver Station Remote Radio Head
Model: AHFIHA**

Report: NOKI0072.0 Rev. 0, Issue Date: February 22, 2024



This report must not be used to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government. This Report shall not be reproduced, except in full without written approval of the laboratory.

TABLE OF CONTENTS



Section	Page Number
Certificate of Test	3
Revision History	4
Accreditations.....	5
Facilities	6
Measurement Uncertainty	7
Test Setup Block Diagrams.....	8
Product Description.....	11
Configurations	17
Modifications	31
Average Power - All Ports	32
Average Power - Single Port.....	38
Average Power - Multicarrier.....	77
Power Spectral Density and EIRP Calculations	93
Peak to Average Power.....	132
Occupied Bandwidth	171
Band Edge	212
Band Edge - Multicarrier.....	257
Spurious Conducted Emissions	272
Spurious Conducted Emissions - Multicarrier.....	310
Spurious Radiated Emissions	329
Frequency Stability.....	344
End of Report.....	352

CERTIFICATE OF TEST



Last Date of Test: January 25, 2024

Nokia Solutions and Networks

EUT: AirScale Base Transceiver Station Remote Radio Head Model AHFIHA

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 5 CFR Title 47 Part 24 Subpart E – Broadband PCS RSS-133 Issue 6 - January 18, 2018 – 2GHz Personal Communications Services CFR Title 47 Part 27 RSS-139 Issue 4 – September 29, 2022 – Advanced Wireless Services (AWS) RSS-199 Issue 4 – July 2023 SRSP-510 Issue 5 – February 2009 SRSP-513 Issue 4 – September 29, 2022 SRSP-517 Issue 2 – July 2023 SRSP-519 Issue 2 – September 29, 2022	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 971168 D03 v01 FCC KDB 662911D01 v02r01 FCC KDB 662911D02 v01

Results

Test Description	Result	Comments
Average Power	Pass	
Power Spectral Density and EIRP Calculations	Pass	
Peak to Average Power	Pass	
Occupied Bandwidth	Pass	
Band Edge Compliance	Pass	
Spurious Conducted Emissions	Pass	
Spurious Radiated Emissions	Pass	
Frequency Stability	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



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](#)

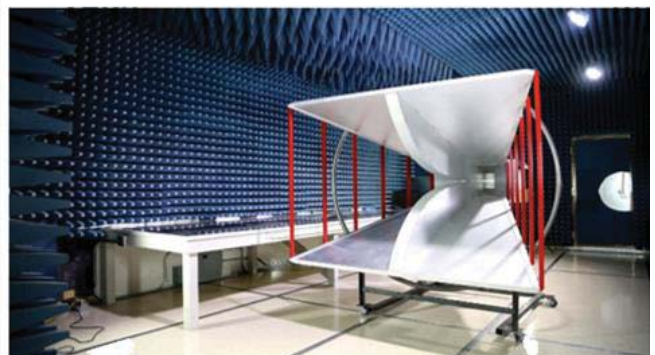
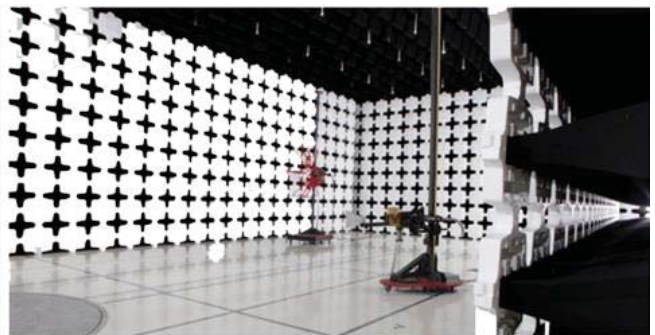
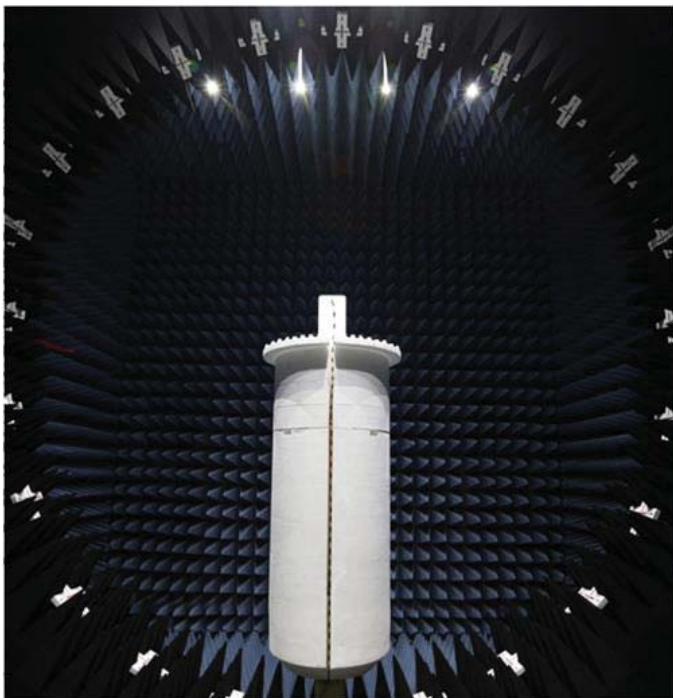
FACILITIES

Testing was performed at the following location(s)

Location	Labs ⁽¹⁾	Address	A2LA ⁽²⁾	ISED ⁽³⁾	BSMI ⁽⁴⁾	VCCI ⁽⁵⁾	CAB ⁽⁶⁾	FDA ⁽⁷⁾
<input type="checkbox"/> California	OC01-17	41 Tesla Irvine, CA 92618 (949) 861-8918	3310.04	2834B	SL2-IN-E-1154R	A-0029	US0158	TL-55
<input type="checkbox"/> Minnesota	MN01-11	9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	3310.05	2834E	SL2-IN-E-1152R	A-0109	US0175	TL-57
<input type="checkbox"/> Oregon	EV01-12	6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	3310.02	2834D	SL2-IN-E-1017	A-0108	US0017	TL-56
<input checked="" type="checkbox"/> Texas	TX01-09	3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	3310.03	2834G	SL2-IN-E-1158R	A-0201	US0191	TL-54
<input type="checkbox"/> Washington	NC01-05	19201 120th Ave NE Bothell, WA 98011 (425) 984-6600	3310.06	2834F	SL2-IN-E-1153R	A-0110	US0157	TL-67
<input type="checkbox"/> Offsite	N/A	See Product Description	N/A	N/A	N/A	N/A	N/A	N/A

See data sheets for specific labs

- (1) The lab designations denote individual rooms within each location. (OC01, OC02, OC03, etc.)
- (2) A2LA Certificate No.
- (3) ISED Company No.
- (4) BSMI No.
- (5) VCCI Site Filing No.
- (6) CAB Identifier. Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA
- (7) FDA ASCA No.



MEASUREMENT UNCERTAINTY



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

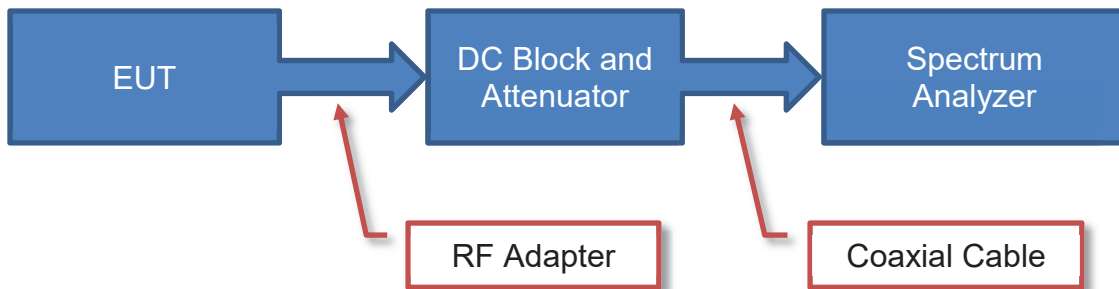
TEST SETUP BLOCK DIAGRAMS

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.

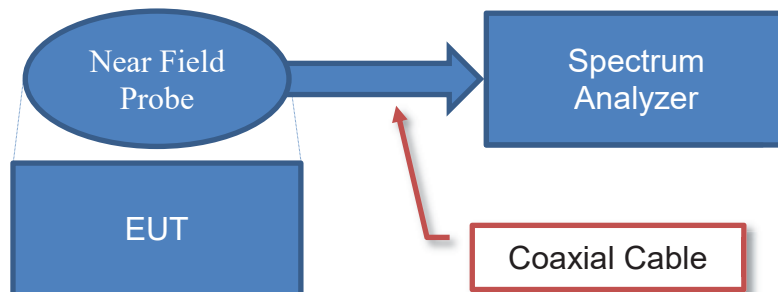
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value	=	Measured Level	+	Reference Level Offset
71.2		42.6		28.6

Near Field Test Fixture Measurements

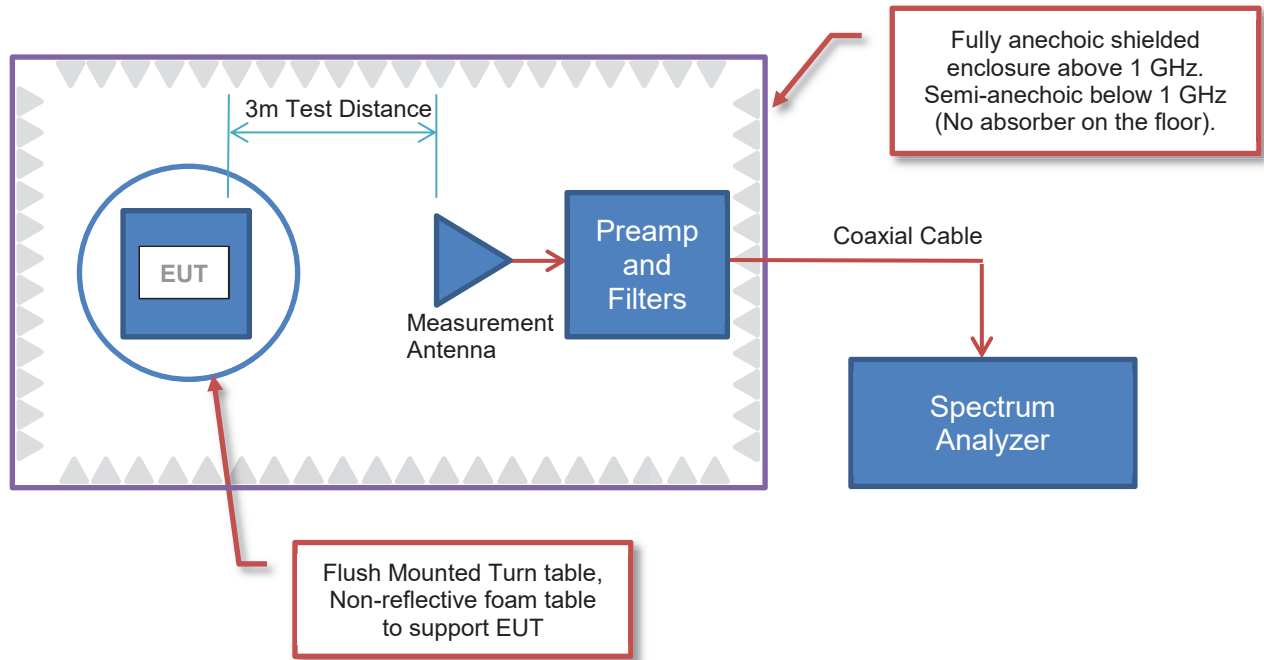


Sample Calculation (logarithmic units)

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			Distance Adjustment Factor	External Attenuation	Field Strength
	Antenna Factor	Cable Factor	Amplifier Gain			
42.6	28.6	3.1	40.8	0.0	0.0	33.5

42.6 + 28.6 + 3.1 - 40.8 + 0.0 + 0.0 = 33.5

Conducted Emissions:

Measured Level (Amplitude)	Factor		External Attenuation	Adjusted Level
	Transducer Factor	Cable Factor		
26.7	0.3	0.1	20.0	47.1

26.7 + 0.3 + 0.1 + 20.0 = 47.1

Radiated Power (ERP/EIRP) – Substitution Method:

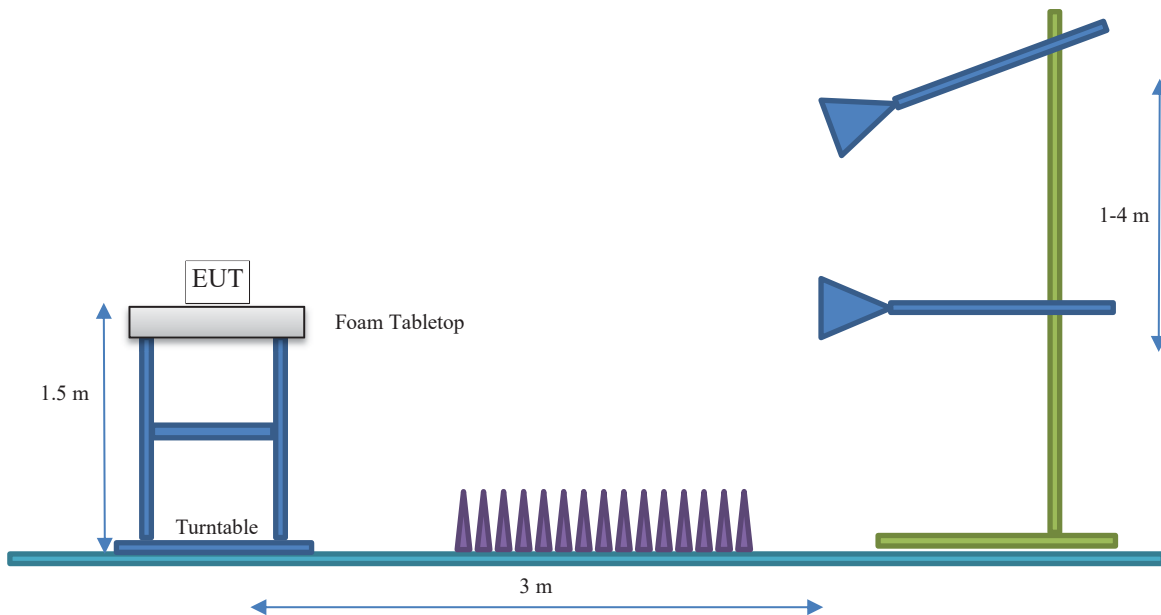
Measured Level into Substitution Antenna (Amplitude dBm)	Substitution Antenna Factor (dBi)	EIRP to ERP (if applicable)	Measured power (dBm ERP/EIRP)
10.0	6.0	2.15	13.9/16.0

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 AHFIHA
First Date of Test:	October 24, 2023
Last Date of Test:	January 25, 2024
Receipt Date of Samples:	November 29, 2023
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHFIHA is being developed under this effort. The AHFIHA 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 for in-band, guard band, standalone), and 5G NR FDD (Frequency Division Duplex) operations. The scope of testing in this effort is for 5G NR FDD operations.

The AHFIHA RRH has four transmit/four receive antenna ports (4TX/4RX for Band n25, 4TX/4RX for Band n66 and 4TX/4RX for Band n7). Each antenna port supports 3GPP frequency band n25 (BTS Rx: 1850 to 1915 MHz/BTS TX: 1930 to 1995 MHz), 3GPP frequency band n66 (BTS Rx: 1710 to 1780 MHz/BTS TX: 2110 to 2200 MHz, and 3GPP frequency band n7 (BTS Rx: 2500 to 2570 MHz/BTS TX: 2620 to 2690 MHz). The maximum RF output power of the RRH is 640 Watts (160 watts per port x 4 ports). The maximum power per band is 60 watts. The maximum single carrier power level is 60 watts. The TX and RX instantaneous bandwidth cover the full operational RRH bandwidth. Multi-carrier operation is supported. The maximum RF output power for single carriers is provided below.

Single Carrier Maximum RF Output Power per Port for each Channel Bandwidth		
LTE1.4, LTE3, NB IoT SA, GSM	LTE5, NR5, WCDMA	LTE10, NR10, LTE15, NR15, LTE20, NR20, NR25, NR30, NR40
20.0 Watts or 43.0 dBm	40.0 Watts or 46.0 dBm	60.0 Watts or 47.8 dBm

The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO for 5G NR FDD. The RRH supports 5, 10, 15, 20, 25, 30 and 40MHz 5G NR bandwidths. The RRH supports four 5G NR downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM). The 5G NR carriers/modulation types for this testing are setup according to 3GPP TS 38.141-1 Test Models and are NR-FR1-TM 1.1 (QPSK modulation type), NR-FR1-TM 3.2 (16QAM modulation type), NR-FR1-TM 3.1 (64QAM modulation type), and NR-FR1-TM 3.1a (256QAM modulation type).

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.

Tests performed include RF power, peak to average power ratio, power spectral density (power/1MHz), emission bandwidth (99% and 26 dB down), band edge spurious emissions (+ 1MHz), spurious emissions (conducted and radiated), and frequency stability (over required voltage/temperature ranges).

PRODUCT DESCRIPTION



Single carriers were tested at the bottom, middle and top channels provided in the Band n25, Band n66, and Band n7 frequency channel tables. Multicarrier operations were tested with the antenna port power enabled at maximum (160 watts) using QPSK modulation. The multicarrier test cases are as follows:

- a) PCS Multicarrier Multiband Test Case 1: In the PCS band _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (1932.5 & 1937.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (1992.5MHz) at the upper band edge. In the AWS & BRS band _ Single NR10 & NR5 carrier at the middle channel (2155.0MHz & 2655.0MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~20W/PCS carrier, 60W/AWS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carriers + 60W for AWS band carrier + 40W for BRS band carrier).
 - b) PCS Multicarrier Multiband Test Case 2: In the PCS band _Two NR30 carriers (with minimum spacing between carrier frequencies) at the lower band edge (1945.0 & 1975.0MHz). In the AWS & BRS bands _ Single NR40 carrier at the middle channel (2155.0MHz & 2655.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/PCS carrier, 60W/AWS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carriers + 60W for AWS band carrier + 40W for BRS band carrier).
 - c) PCS Multicarrier Multiband Test Case 3: In the PCS band _Two NR30 carriers (with minimum spacing between carrier frequencies) at the upper band edge (1950.0 & 1980.0MHz). In the AWS & BRS bands _ Single NR40 carrier at the middle channel (2155.0MHz & 2655.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/PCS carrier, 60W/AWS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carriers + 60W for AWS band carrier + 40W for BRS band carrier).
 - d) AWS Multicarrier Multiband Test Case 1: In the AWS band _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (2112.5 & 2117.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (2197.5MHz) at the upper band edge. In the PCS and BRS bands: Single NR10 & NR5 carrier at the middle channel (1962.5MHz and 2655.0MHz). The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power (~20W/AWS carrier, 60W/PCS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for AWS band carriers + 40W for BRS band carrier)
 - e) AWS Multicarrier Multiband Test Case 2: In the AWS band _Two NR40 carriers (with minimum spacing between carrier frequencies) at the lower band edge (2130.0 & 2170.0MHz). In the PCS & BRS bands _ Single NR40 carrier at the middle channel (1962.5MHz & 2655.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/AWS carrier, 60W/PCS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for AWS band carriers + 40W for BRS band carrier).
 - f) AWS Multicarrier Multiband Test Case 3: In the AWS band _Two NR40 carriers (with minimum spacing between carrier frequencies) at the upper band edge (2140.0 & 2180.0MHz). In the PCS & BRS bands _ Single NR40 carrier at the middle channel (1962.5MHz & 2655.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/AWS carrier, 60W/PCS carrier and 40W/BRS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for AWS band carriers + 40W for BRS band carrier).
 - g) BRS Multicarrier Multiband Test Case 1: In the BRS band _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (2622.5 & 2627.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (2687.5MHz) at the upper band edge. In the PCS and AWS bands: Single NR10 & NR5 carrier at the middle channel
-

PRODUCT DESCRIPTION



(1962.5MHz and 2155.0MHz). The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power (~20W/BRS carrier, 60W/PCS carrier, and 40W/AWS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for BRS band carriers + 40W for AWS band carrier)

- h) BRS Multicarrier Multiband Test Case 2: In the BRS band _Two NR30 carriers (with minimum spacing between carrier frequencies) at the lower band edge (2635.0 & 2665.0MHz). In the PCS & AWS bands _ Single NR40 carrier at the middle channel (1962.5MHz & 2155.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/BRS carrier, 60W/PCS carrier, and 40W/AWS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for BRS band carriers + 40W for AWS band carrier).
- i) BRS Multicarrier Multiband Test Case 3: In the BRS band _Two NR30 carriers (with minimum spacing between carrier frequencies) at the upper band edge (2645.0 & 2675.0MHz). In the PCS & AWS bands _ Single NR40 carrier at the middle channel (1962.5MHz & 2155.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power (~30W/BRS carrier, 60W/PCS carrier, and 40W/AWS carrier) with a total port power of 160 watts (60W for PCS band carrier + 60W for BRS band carriers + 40W for AWS band carrier).

The PCS Band 5G NR channel bandwidths are 5, 10, 15, 20, 25, 30 and 40MHz. The downlink channel numbers are provided below.

	Downlink 5G NR NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth						
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz
AHIHA Band n25 (Ant 1 through 4)	386000	1930.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge
	386500	1932.5	Bottom Ch						
	387000	1935.0		Bottom Ch					
	387500	1937.5			Bottom Ch				
	388000	1940.0				Bottom Ch			
	388500	1942.5					Bottom Ch		
	389000	1945.0						Bottom Ch	
	390000	1950.0							Bottom Ch
	392500	1962.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	395000	1975.0							Top Channel
	396000	1980.0						Top Ch	
	396500	1982.5					Top Ch		
	397000	1985.0				Top Ch			
	397500	1987.5			Top Ch				
	398000	1990.0		Top Ch					
	398500	1992.5	Top Ch						
399000	1995.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	

AHIHA Downlink Band Edge 5G NR Band n25 Frequency Channels

PRODUCT DESCRIPTION



The AWS Band 5G NR channel bandwidths are 5, 10, 15, 20, 25, 30 and 40MHz. The downlink channel numbers are provided below.

	Downlink 5G NR NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth						
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz
AHLIHA 5G NR Band n66 (Ant 1 through 4)	422000	2110.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge
	422500	2112.5	Bottom Ch						
	423000	2115.0		Bottom Ch					
	423500	2117.5			Bottom Ch				
	424000	2120.0				Bottom Ch			
	424500	2122.5					Bottom Ch		
	425000	2125.0						Bottom Ch	
	426000	2130.0							Bottom Ch
	431000	2155.0	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	436000	2180.0							Top Channel
	437000	2185.0						Top Ch	
	437500	2187.5					Top Ch		
	438000	2190.0				Top Ch			
	438500	2192.5			Top Ch				
	439000	2195.0		Top Ch					
	439500	2197.5	Top Ch						
440000	2200.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	

AHLIHA Downlink Band Edge 5G NR Band n66 Frequency Channels

PRODUCT DESCRIPTION



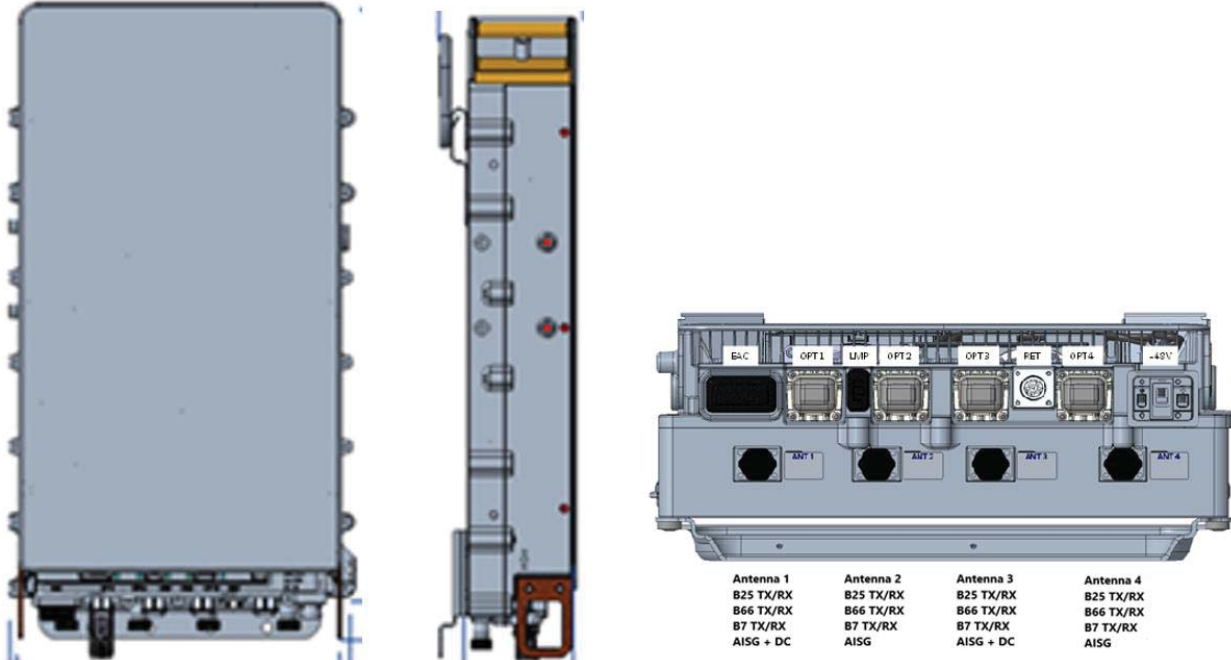
The BRS Band 5G NR channel bandwidths are 5, 10, 15, 20, 25, 30 and 40MHz. The downlink channel numbers are provided below.

	Downlink 5G NR NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth						
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz
AHFIHA 5G NR Band n7 (Ant 1 through 4)	524000	2620.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge
	524500	2622.5	Bottom Ch						
	525000	2625.0		Bottom Ch					
	525500	2627.5			Bottom Ch				
	526000	2630.0				Bottom Ch			
	526500	2632.5					Bottom Ch		
	527000	2635.0						Bottom Ch	
	528000	2640.0							Bottom Ch
	531000	2655.0	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	534000	2670.0							Top Channel
	535000	2675.0						Top Ch	
	535500	2677.5					Top Ch		
	536000	2680.0				Top Ch			
	536500	2682.5			Top Ch				
	537000	2685.0		Top Ch					
	537500	2687.5	Top Ch						
538000	2690.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	

AHFIHA Downlink Band Edge 5G NR Band n7 Frequency Channels

PRODUCT DESCRIPTION

AHFIHA 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	4	SFP	Optical Interfaces
RET	1	8-pin circular connector	AISG 3.0 to external devices_ RET RS-485

AHFIHA External Interfaces

Testing Objective:

FCC and ISED radio certifications of the Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHFIHA for 5G NR FDD operations.

CONFIGURATIONS



Test Configuration 1 – RF Conducted

Software/Firmware Running during test	
Description	Version
Radio Module Software	RF.FRM6.23R4.20231126.001 RF.FRM6.23R4.20231202.001
BTS Software Version: 23R4	SBTS23R4_ENB_0000_000894 SBTS23R4_ENB_0000_000936

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J8164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.102	L1205105881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.104	DH223246455
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.X21	RW233403213
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.A101	RW233800370
Low Pass Filter 1.4GHz/100W	Microwave Circuits, INC.	L13502G1	SN2454-01
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297373
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297372 2pc
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN528837 /6
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719846
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719868
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214716512
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20180015S
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719852
Lenovo	HP	Thinkpad	PF26RRVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US880
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	6304m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	1081m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	0593m
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297387
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388

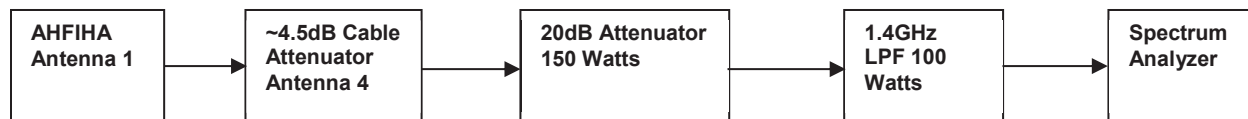
CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
Fiber Optic cable 3 pc	N	25 meters	N	ABIO	AHFIHA
Cat-5e cable (CSA)	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIB	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 2, 3, 4	500W -50ohm - Load

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX Cable attenuation 15m	Y	15 meters	N	EUT [AHFIHA] Ant port #1	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ1165]	N	NA	N	RF cable HS-SUCOFLEX_104	Low Pass Filter 1.4GHz/100W
Low Pass Filter 1.4GHz/100W	N	NA	N	Attenuator 150W/20dB [BZ21165]	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 80MHz/10W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 2 – RF Conducted

Software/Firmware Running during test	
Description	Version
Radio Module Software	RF.FRM6.23R4.20231126.001 RF.FRM6.23R4.20231202.001
BTS Software Version: 23R4	SBTS23R4_ENB_0000_000894 SBTS23R4_ENB_0000_000936

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J8164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.102	L1205105881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.104	DH223246455
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.X21	RW233403213
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.A101	RW233800370
Attenuator 500W/40dB	API Weinschel, Inc.	253-40-33-LIM	UP093
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297373
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297372 2pc
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN528837 /6
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719846
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719868
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214716512
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20180015S
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719852
Lenovo	HP	Thinkpad	PF26RRVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US880
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	6304m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	1081m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	0593m
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297387
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388

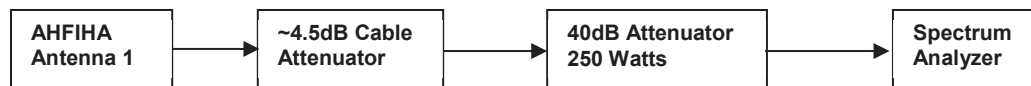
CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
Fiber Optic cable 3 pc	N	25 meters	N	ABIO	AHFIHA
Cat-5e cable (CSA)	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIB	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 2, 3, 4	500W -50ohm - Load

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX Cable attenuation 15m	Y	15 meters	N	EUT [AHFIHA] Ant port #1	Attenuator 500W/40dB [UP093]
Attenuator 500W/40dB [UP093]	N	NA	N	HS-SUCOFLEX Cable attenuation 15m	RF cable HS-SUCOFLEX_104
RF cable HS-SUCOFLEX_104	N	NA	N	Attenuator 500W/40dB [UP093]	Spectrum Analyzer

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 3 – RF Conducted

Software/Firmware Running during test	
Description	Version
Radio Module Software	RF.FRM6.23R4.20231126.001 RF.FRM6.23R4.20231202.001
BTS Software Version: 23R4	SBTS23R4_ENB_0000_000894 SBTS23R4_ENB_0000_000936

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J8164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.102	L1205105881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.104	DH223246455
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.X21	RW233403213
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.A101	RW233800370
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
3-18GHz HPF 15 Watts	RF-Lambda	RHPF23G03G18	20121400045
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297373
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297372 2pc
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN528837 /6
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719846
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719868
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214716512
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20180015S
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719852
Lenovo	HP	Thinkpad	PF26RRVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US880
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	6304m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	1081m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	0593m
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297387
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388

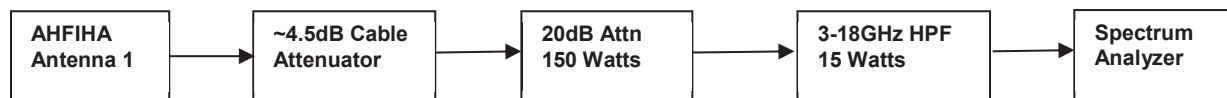
CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
Fiber Optic cable 3 pc	N	25 meters	N	ABIO	AHFIHA
Cat-5e cable (CSA)	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIB	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 2, 3, 4	500W -50ohm - Load

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX Cable attenuation 15m	Y	15 meters	N	EUT [AHFIHA] Ant port #1	Attenuator 150W/20dB [60-23-33]
Attenuator 150W/20dB [60-23-33]	N	NA	N	HS-SUCOFLEX Cable attenuation 15m	3-18GHz HPF 15 Watts
3-18GHz HPF 15 Watts	N	NA	Na	Attenuator 150W/20dB [60-23-33]	RF cable HS-SUCOFLEX_104
RF cable HS-SUCOFLEX_104	N	NA	N	3-18GHz HPF 15 Watts	Spectrum Analyzer

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 4 – RF Conducted

Software/Firmware Running during test	
Description	Version
Radio Module Software	RF.FRM6.23R4.20231202.001 RF.FRM6.23R4.20231202.001
BTS Software Version: 23R4	SBTS23R4_ENB_0000_000894 SBTS23R4_ENB_0000_000936

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J8164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.102	L1205105881
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.104	DH223246455
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.X21	RW233403213
AHFIHA (Radio Module Model)	Nokia Solutions and Networks	475964A.A101	RW233800370
Attenuator 100W/3dB	Aeroflex Weinschel	47-3-33	CG5493
Attenuator 50W/10dB	RF-Lambda	RFS50G26S10FF	200331701
8-40GHz HPF 15 Watts	RF-Lambda	RHPF23G08G40	17102700014
1 Meter RF cable	RF-Lambda	RFC6767A-B7RU1219	AC20040003
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297373
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 297372 2pc
2 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN528837 /6
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719846
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719868
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214716512
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	Finisar corp.	FTLF8536W4BTV-NS	VF20180015S
SFP+ 9.8G,300M,850NM	WTD	RTXM330-541-C39	FR214719852
Lenovo	HP	Thinkpad	PF26RRVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US880
500W -50ohm -Terminating Load	API Weinschel inc	1434-3-LIM	US882
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	6304m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	1081m
Fiber Optic cable 25 meters	Rosenberger Fiber Optical	RFC-C002-559 LSZH	0593m
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297387
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388

CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
Fiber Optic cable 3 pc	N	25 meters	N	ABIO	AHFIHA
Cat-5e cable (CSA)	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIB	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 2, 3, 4	500W -50ohm - Load

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX Cable attenuation 15m	Y	15 meters	N	EUT [AHFIHA] Ant port #1	Attenuator 100W/dB [47-3-33]
Attenuator 150W/20dB [47-3-33]	N	NA	N	HS-SUCOFLEX Cable attenuation 15m	50W/10dB Attenuator
50W/10dB Attenuator	N	NA	Na	Attenuator 100W/dB [47-3-33]	RF-Lambda RF cable RFC6767A-B7RU1219
RF-Lambda RF cable RFC6767A-B7RU1219	N	NA	N	3-18GHz HPF 15 Watts	Spectrum Analyzer

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 5 – 5G NR Radiated Emissions

Software/Firmware Running during test	
Description	Version
BTS Software Version (23R4)	SBTS23R4 ENB_0000_000631_00000
RF_SW	RF.FRM6.23R4.20231012.015

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Radio Head	Nokia Solutions and Networks	AHFIHA/475964.21	RW233403199

Peripherals in the test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20470022K
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719846
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719868
FOSP SFP+ 9.8G,10KM, 1310nm (Single-Mode - Radio)	Nokia	472949A.101	MA17010181301
FOSP SFP+ 9.8G,10KM, 1310nm (Single-Mode - Radio)	Nokia	472949A.101	MA17010180101
FOSP SFP+ 9.8G,10KM, 1310nm (Single-Mode - Radio)	Nokia	472949A.101	FR161312223
FOSP SFP+ 9.8G,10KM, 1310nm (Single-Mode - Radio)	Nokia	472949A.101	U2170503301

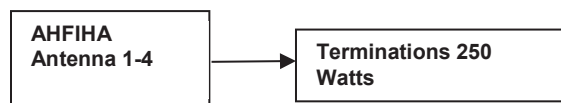
CONFIGURATIONS



Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J6164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205185881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	DH223246455
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC864
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC866
Electric Fan (AC PWR)	Electric	L908	None
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
Keysight N8757- DC System power supply	Keysight	N8757A	US21D4053S
Cat-5e cable	CSA	LL73189	E151955

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
TMS Load 1	Y	2m	N	EUT [AHFIHA] Ant port #1	Antenna Load 1
TMS Load 2	Y	2m	N	EUT [AHFIHA] Ant port #2	Antenna Load 2
TMS Load 3	Y	2m	N	EUT [AHFIHA] Ant port #3	Antenna Load 3
TMS Load 4	Y	2m	N	EUT [AHFIHA] Ant port #4	Antenna Load 4
AC Power (PS Base Station)	N	2m	N	AC mains	Power Supply (Base Station)
AC Power (Laptop)	N	1.65m	N	AC Mains	Power Supply (Laptop)
DC Power Leads	N	7.5m	Y	DC Power Supply (Keysight)	Remote Radio Head Module
AC Power (KeySight)	N	4m	N	AC mains	DC Power Supply (Radio)
Optical Fiber (MM + SM)	N	30m	N	Airscale Base Station (ABIO)	Remote Radio Head Module
RET	N	2.4m	N	Remote Radio Head Module	Unterminated
EAC	N	5.4m	N	Remote Radio Head Module	Unterminated
Grounding	N	3m	N	Remote Radio Head Module	Turntable Ground
Cat-5e Data cable	Y	2m	N	ASIB	WebEM- PC

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 6 – 4G LTE Radiated Emissions

Software/Firmware Running during test	
Description	Version
BTS Software Version (23R4)	SBTS23R4_ENB_0000_000631_00000
RF_SW	RF.FRM6.23R4.20231012.015

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Radio Head	Nokia Solutions and Networks	AHFIHA/475964.21	RW233403199

Peripherals in the test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20470022K
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719846
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719868

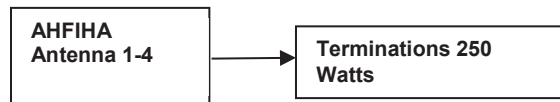
Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J6164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIA (BTS Baseband Module)	Nokia Solutions and Networks	473096A.102	AH173006385
ABIA (BTS Baseband Module)	Nokia Solutions and Networks	473096A.103	AH173006372
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC864
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC866
Electric Fan (AC PWR)	Electric	L908	None
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
Keysight N8757- DC System power supply	Keysight	N8757A	US21D4053S
Cat-5e cable	CSA	LL73189	E151955

CONFIGURATIONS



Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
TMS Load 1	Y	2m	N	EUT [AHFIHA] Ant port #1	Antenna Load 1
TMS Load 2	Y	2m	N	EUT [AHFIHA] Ant port #2	Antenna Load 2
TMS Load 3	Y	2m	N	EUT [AHFIHA] Ant port #3	Antenna Load 3
TMS Load 4	Y	2m	N	EUT [AHFIHA] Ant port #4	Antenna Load 4
AC Power (PS Base Station)	N	2m	N	AC mains	Power Supply (Base Station)
AC Power (Laptop)	N	1.65m	N	AC Mains	Power Supply (Laptop)
DC Power Leads	N	7.5m	Y	DC Power Supply (Keysight)	Remote Radio Head Module
AC Power (KeySight)	N	4m	N	AC mains	DC Power Supply (Radio)
Optical Fiber (MM + SM)	N	30m	N	Airscale Base Station (ABIO)	Remote Radio Head Module
RET	N	2.4m	N	Remote Radio Head Module	Unterminated
EAC	N	5.4m	N	Remote Radio Head Module	Unterminated
Grounding	N	3m	N	Remote Radio Head Module	Turntable Ground
Cat-5e Data cable	Y	2m	N	ASIB	WebEM- PC

RF Test Setup Diagram:



CONFIGURATIONS



Test Configuration 7 – Frequency Stability

Software/Firmware Running during test	
Description	Version
BTS Software Version (23R4)	SBTS23R4 ENB 0000 000631 00000
RF_SW	RF.FRM6.23R4.20231012.015

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.101	J6164063259
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205185881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	DH223246455
Attenuator 40dB/250 Watts	API Weinschel	58-40-43-LMI	TC909
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20470022K
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719846
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	FR214719868
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007170
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV065
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Digital Multimeter	Fluke	77IV	CAL: 27210148
Thermometer	Omega Engineering Inc	HH31	1130101855

CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (4G)	Connection 2
Fiber Optic Cable	N	2 meters	N	ABIO	AHFIHA
Cat-5e Cable	Y	7 meters	N	ASIB	WebEM- PC
HS-SUCOFLEX_106	Y	2 meters	N	AHFIHA Ant 1	Attenuator 250W/40dB
Attenuator 250W/40dB	N	NA	N	RF cable HS-SUCOFLEX_106	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	2 meters	N	Attenuator 250W/40dB	Analyzer
HS-SUCOFLEX_106 – RF CABLE	Y	2 meters	N	EUT [AHFIHA] Ant 3	250W -50ohm - Load
Reference cables (Frame Clock & Trigger)	Y	1 meter	N	ASIB	Analyzer
Grounding	N	3 meters	N	Remote Radio Head Module	Interior Temp Chamber wall

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIHA] 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:



MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-10-25	Spurious Radiated Emissions	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	2023-10-27	Frequency Stability	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	2023-11-29	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	2023-12-04	Peak and 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	2023-12-04	Power Spectral Density and EIRP Calculations	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	2024-01-24	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.
7	2024-01-25	Average 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.
8	2024-01-25	Spurious Conducted Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

AVERAGE POWER - ALL PORTS



TEST DESCRIPTION

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.

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 at 40 MHz middle channel in order to prove the AHFIHA antenna ports are all within the manufacturer's rate output power tolerances (the RF power variation between antenna ports is small as shown in this certification testing).

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2023-03-17	2024-03-17
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

AVERAGE POWER - ALL PORTS



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0072
Serial Number:	RW233403213	Date:	2023-11-29
Customer:	Nokia Solutions and Networks	Temperature:	20.7°C
Attendees:	John Rattanavong, Mitch Hill	Relative Humidity:	34%
Customer Project:	None	Bar. Pressure (PMSL):	1030 mbar
Tested By:	Jarrold Brenden	Job Site:	TX07
Power:	54VDC	Configuration:	NOKI0072-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
FCC 27:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015
RSS-199 Issue 4:2023	ANSI C63.26:2015
RSS139 Issue 4:2022	ANSI C63.26:2015

COMMENTS

Losses in the measurement path were accounted for: DC Block, attenuators, cables, and filters where used. PCS Band n25, AWS Band n66, and BRS Band n7 carriers are enabled individually at maximum power (60 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.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

Tested By

TEST RESULTS

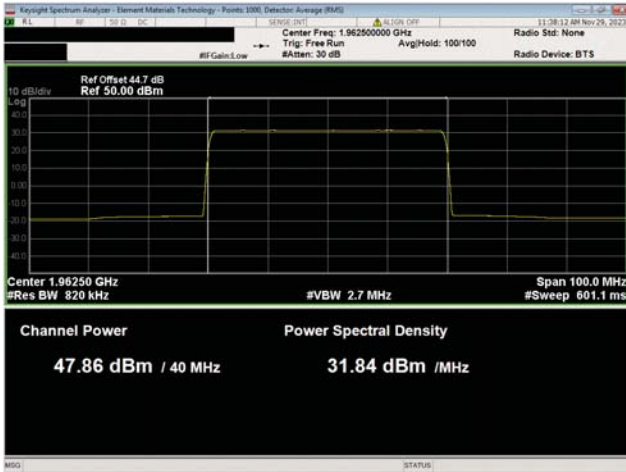
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Value (Watts)	All Ports Value (dBm)	Limit
PCS Band n25, 1930-1995 MHz						
40 MHz Bandwidth						
256QAM Modulation						
Mid Channel, 1962.5 MHz						
Port 1	47.863	0	47.9	61.7	N/A	Within Tolerance
Port 2	47.702	0	47.7	58.9	N/A	Within Tolerance
Port 3	48.27	0	48.3	67.6	N/A	Within Tolerance
Port 4	47.607	0	47.6	57.5	N/A	Within Tolerance
All Ports	N/A	N/A	N/A	245.7	53.9	Within Tolerance

AVERAGE POWER - ALL PORTS



		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Value (Watts)	All Ports Value (dBm)	Limit
AWS Band n66, 2110-2200 MHz							
40 MHz Bandwidth							
256QAM Modulation							
Mid Channel, 2155.0 MHz							
Port 1		47.915	0	47.9	61.7	N/A	Within Tolerance
Port 2		48.014	0	48.0	63.1	N/A	Within Tolerance
Port 3		48.06	0	48.1	64.6	N/A	Within Tolerance
Port 4		47.876	0	47.9	61.7	N/A	Within Tolerance
All Ports		N/A	N/A	N/A	251.0	54.0	Within Tolerance
BRS Band n7, 2620-2690 MHz							
40 MHz Bandwidth							
256QAM Modulation							
Mid Channel, 2655.0 MHz							
Port 1		47.708	0	47.7	58.9	N/A	Within Tolerance
Port 2		47.66	0	47.7	58.9	N/A	Within Tolerance
Port 3		47.71	0	47.7	58.9	N/A	Within Tolerance
Port 4		47.51	0	47.5	56.2	N/A	Within Tolerance
All Ports		N/A	N/A	N/A	232.9	53.7	Within Tolerance

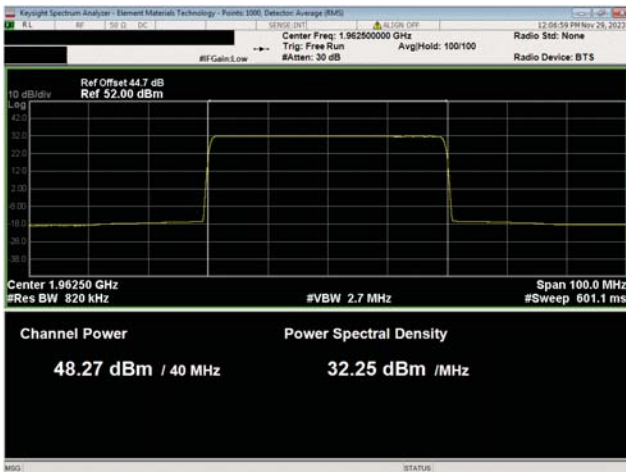
AVERAGE POWER - ALL PORTS



PCS Band n25, 1930-1995 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 1962.5 MHz
Port 1



PCS Band n25, 1930-1995 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 1962.5 MHz
Port 2



PCS Band n25, 1930-1995 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 1962.5 MHz
Port 3



PCS Band n25, 1930-1995 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 1962.5 MHz
Port 4

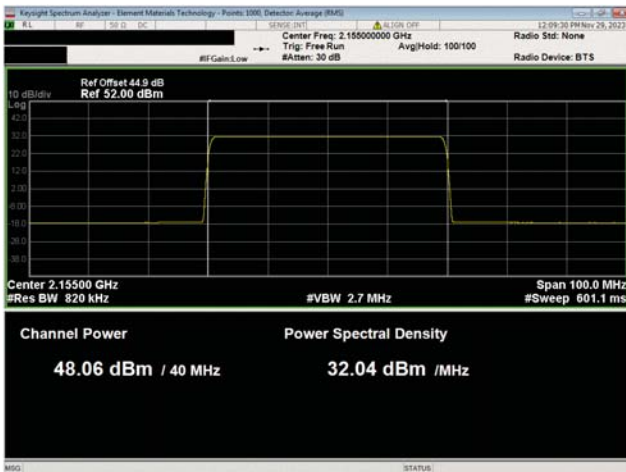
AVERAGE POWER - ALL PORTS



AWS Band n66, 2110-2200 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2155.0 MHz
Port 1



AWS Band n66, 2110-2200 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2155.0 MHz
Port 2



AWS Band n66, 2110-2200 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2155.0 MHz
Port 3



AWS Band n66, 2110-2200 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2155.0 MHz
Port 4

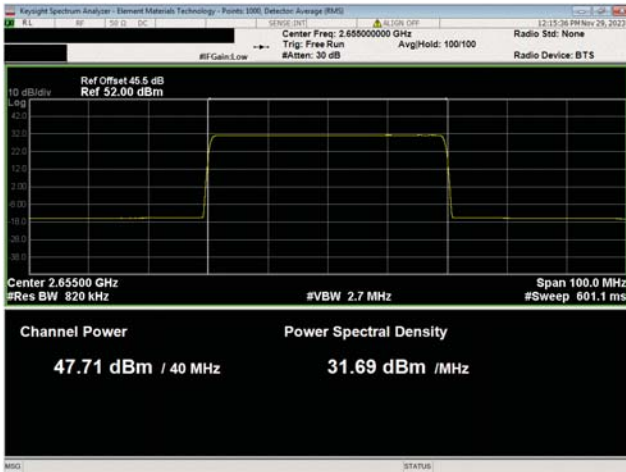
AVERAGE POWER - ALL PORTS



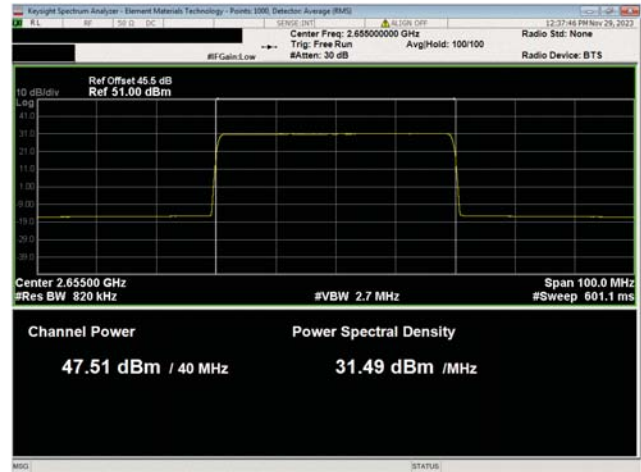
BRS Band n7, 2620-2690 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2655.0 MHz
Port 1



BRS Band n7, 2620-2690 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2655.0 MHz
Port 2



BRS Band n7, 2620-2690 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2655.0 MHz
Port 3



BRS Band n7, 2620-2690 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Channel, 2655.0 MHz
Port 4

AVERAGE POWER – SINGLE PORT

TEST DESCRIPTION

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.

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 AHFIHA 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 output power was measured for a single carrier over the carrier channel bandwidth. The total output power for multipoint (2x2 MIMO, 4x4 MIMO) operations was determined based per ANSI C63.26 clauses 6.4.3.1 and 6.4.3.2.4 ($10 \log N_{out}$). The total output power for two port operation is the single port power +3 dB [i.e. $10 \log(2)$]. The total power for four port operations is single port power +6 dB [i.e. $10 \log(4)$].

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2023-03-17	2024-03-17
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Keysight	N5182B	TES	2021-09-14	2024-09-14

AVERAGE POWER – SINGLE PORT



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0072
Serial Number:	RW233403213	Date:	2023-12-04
Customer:	Nokia Solutions and Networks	Temperature:	21.8°C
Attendees:	John Rattanavong, Mitch Hill	Relative Humidity:	33%
Customer Project:	None	Bar. Pressure (PMSL):	1026 mbar
Tested By:	Jarrold Brenden	Job Site:	TX07
Power:	54VDC	Configuration:	NOKI0072-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
FCC 27:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015
RSS-199 Issue 4:2023	ANSI C63.26:2015
RSS139 Issue 4:2022	ANSI C63.26:2015

COMMENTS

Losses in the measurement path were accounted for: DC Block, attenuators, cables, and filters where used. PCS Band n25, AWS Band n66, and BRS Band n7 carriers are enabled individually at maximum power (40 watts/carrier for 5MHz carrier and 60W/carrier for 10MHz to 40MHz carriers).

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

Tested By

TEST RESULTS

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
Port 1					
PCS Band n25, 1930 MHz - 1995 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	46.502	0	46.5	49.5	52.5
16QAM Modulation					
Mid Ch, 1962.5 MHz	46.327	0	46.3	49.3	52.3
64QAM Modulation					
Mid Ch, 1962.5 MHz	46.572	0	46.6	49.6	52.6
256QAM Modulation					
Low Ch, 1932.5 MHz	46.56	0	46.6	49.6	52.6
Mid Ch, 1962.5 MHz	46.348	0	46.3	49.3	52.3
High Ch, 1992.5 MHz	46.535	0	46.5	49.5	52.5
10 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.143	0	48.1	51.1	54.1
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.085	0	48.1	51.1	54.1

AVERAGE POWER – SINGLE PORT



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.212	0	48.2	51.2	54.2
256QAM Modulation					
Low Ch, 1935.0 MHz	48.162	0	48.2	51.2	54.2
Mid Ch, 1962.5 MHz	48.217	0	48.2	51.2	54.2
High Ch, 1990.0 MHz	48.194	0	48.2	51.2	54.2
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.226	0	48.2	51.2	54.2
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.156	0	48.2	51.2	54.2
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.214	0	48.2	51.2	54.2
256QAM Modulation					
Low Ch, 1937.5 MHz	48.156	0	48.2	51.2	54.2
Mid Ch, 1962.5 MHz	48.155	0	48.2	51.2	54.2
High Ch, 1987.5 MHz	48.236	0	48.2	51.2	54.2
20 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.248	0	48.2	51.2	54.2
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.132	0	48.1	51.1	54.1
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.159	0	48.2	51.2	54.2
256QAM Modulation					
Low Ch, 1940.0 MHz	48.34	0	48.3	51.3	54.3
Mid Ch, 1962.5 MHz	48.029	0	48	51	54
High Ch, 1985.0 MHz	48.17	0	48.2	51.2	54.2
25 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.283	0	48.3	51.3	54.3
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.087	0	48.1	51.1	54.1
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.273	0	48.3	51.3	54.3
256QAM Modulation					
Low Ch, 1942.5 MHz	48.211	0	48.2	51.2	54.2
Mid Ch, 1962.5 MHz	48.174	0	48.2	51.2	54.2
High Ch, 1982.5 MHz	48.236	0	48.2	51.2	54.2
30 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.273	0	48.3	51.3	54.3
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.105	0	48.1	51.1	54.1
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.236	0	48.2	51.2	54.2
256QAM Modulation					
Low Ch, 1945.0 MHz	48.345	0	48.3	51.3	54.3
Mid Ch, 1962.5 MHz	48.205	0	48.2	51.2	54.2
High Ch, 1980.0 MHz	48.304	0	48.3	51.3	54.3
40 MHz Bandwidth					

AVERAGE POWER – SINGLE PORT



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
QPSK Modulation					
Mid Ch, 1962.5 MHz	48.256	0	48.3	51.3	54.3
16QAM Modulation					
Mid Ch, 1962.5 MHz	48.196	0	48.2	51.2	54.2
64QAM Modulation					
Mid Ch, 1962.5 MHz	48.295	0	48.3	51.3	54.3
256QAM Modulation					
Low Ch, 1950.0 MHz	48.293	0	48.3	51.3	54.3
Mid Ch, 1962.5 MHz	48.246	0	48.2	51.2	54.2
High Ch, 1975.0 MHz	48.375	0	48.4	51.4	54.4
AWS Band n66, 2110 Mhz - 2200 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	46.185	0	46.2	49.2	52.2
16QAM Modulation					
Mid Ch, 2155.0 MHz	45.994	0	46	49	52
64QAM Modulation					
Mid Ch, 2155.0 MHz	46.186	0	46.2	49.2	52.2
256QAM Modulation					
Low Ch, 2112.5 MHz	46.33	0	46.3	49.3	52.3
Mid Ch, 2155.0 MHz	46.188	0	46.2	49.2	52.2
High Ch, 2197.5 MHz	46.105	0	46.1	49.1	52.1
10 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.842	0	47.8	50.8	53.8
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.726	0	47.7	50.7	53.7
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.859	0	47.9	50.9	53.9
256QAM Modulation					
Low Ch, 2115.0 MHz	47.962	0	48	51	54
Mid Ch, 2155.0 MHz	47.856	0	47.9	50.9	53.9
High Ch, 2195.0 MHz	47.797	0	47.8	50.8	53.8
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.867	0	47.9	50.9	53.9
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.799	0	47.8	50.8	53.8
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.854	0	47.9	50.9	53.9
256QAM Modulation					
Low Ch, 2117.5 MHz	47.976	0	48	51	54
Mid Ch, 2155.0 MHz	47.855	0	47.9	50.9	53.9
High Ch, 2192.5 MHz	47.816	0	47.8	50.8	53.8
20 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.963	0	48	51	54
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.835	0	47.8	50.8	53.8
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.936	0	47.9	50.9	53.9

AVERAGE POWER – SINGLE PORT



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
256QAM Modulation					
Low Ch, 2120.0 MHz	47.927	0	47.9	50.9	53.9
Mid Ch, 2155.0 MHz	47.816	0	47.8	50.8	53.8
High Ch, 2190.0 MHz	47.771	0	47.8	50.8	53.8
25 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.933	0	47.9	50.9	53.9
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.831	0	47.8	50.8	53.8
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.91	0	47.9	50.9	53.9
256QAM Modulation					
Low Ch, 2122.5 MHz	48.03	0	48	51	54
Mid Ch, 2155.0 MHz	47.877	0	47.9	50.9	53.9
High Ch, 2187.5 MHz	47.869	0	47.9	50.9	53.9
30 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.955	0	48	51	54
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.821	0	47.8	50.8	53.8
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.913	0	47.9	50.9	53.9
256QAM Modulation					
Low Ch, 2125.0 MHz	48.069	0	48.1	51.1	54.1
Mid Ch, 2155.0 MHz	47.953	0	48	51	54
High Ch, 2185.0 MHz	47.967	0	48	51	54
40 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2155.0 MHz	47.968	0	48	51	54
16QAM Modulation					
Mid Ch, 2155.0 MHz	47.866	0	47.9	50.9	53.9
64QAM Modulation					
Mid Ch, 2155.0 MHz	47.97	0	48	51	54
256QAM Modulation					
Low Ch, 2130.0 MHz	48.081	0	48.1	51.1	54.1
Mid Ch, 2155.0 MHz	47.947	0	47.9	50.9	53.9
High Ch, 2180.0 MHz	47.961	0	48	51	54
BRS Band n7, 2620 MHz - 2690 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	46.084	0	46.1	49.1	52.1
16QAM Modulation					
Mid Ch, 2655.0 MHz	45.911	0	45.9	48.9	51.9
64QAM Modulation					
Mid Ch, 2655.0 MHz	46.099	0	46.1	49.1	52.1
256QAM Modulation					
Low Ch, 2622.5 MHz	46.087	0	46.1	49.1	52.1
Mid Ch, 2655.0 MHz	46.11	0	46.1	49.1	52.1
High Ch, 2687.5 MHz	46.02	0	46	49	52
10 MHz Bandwidth					
QPSK Modulation					

AVERAGE POWER – SINGLE PORT



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
Mid Ch, 2655.0 MHz	47.7	0	47.7	50.7	53.7
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.579	0	47.6	50.6	53.6
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.701	0	47.7	50.7	53.7
256QAM Modulation					
Low Ch, 2625.0 MHz	47.722	0	47.7	50.7	53.7
Mid Ch, 2655.0 MHz	47.704	0	47.7	50.7	53.7
High Ch, 2685.0 MHz	47.671	0	47.7	50.7	53.7
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	47.737	0	47.7	50.7	53.7
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.66	0	47.7	50.7	53.7
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.727	0	47.7	50.7	53.7
256QAM Modulation					
Low Ch, 2627.5 MHz	47.73	0	47.7	50.7	53.7
Mid Ch, 2655.0 MHz	47.698	0	47.7	50.7	53.7
High Ch, 2682.5 MHz	47.658	0	47.7	50.7	53.7
20 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	47.804	0	47.8	50.8	53.8
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.697	0	47.7	50.7	53.7
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.79	0	47.8	50.8	53.8
256QAM Modulation					
Low Ch, 2630.0 MHz	47.689	0	47.7	50.7	53.7
Mid Ch, 2655.0 MHz	47.659	0	47.7	50.7	53.7
High Ch, 2680.0 MHz	47.606	0	47.6	50.6	53.6
25 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	47.795	0	47.8	50.8	53.8
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.783	0	47.8	50.8	53.8
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.871	0	47.9	50.9	53.9
256QAM Modulation					
Low Ch, 2632.5 MHz	47.9	0	47.9	50.9	53.9
Mid Ch, 2655.0 MHz	47.865	0	47.9	50.9	53.9
High Ch, 2677.5 MHz	47.814	0	47.8	50.8	53.8
30 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	47.692	0	47.7	50.7	53.7
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.678	0	47.7	50.7	53.7
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.762	0	47.8	50.8	53.8
256QAM Modulation					
Low Ch, 2635.0 MHz	47.8	0	47.8	50.8	53.8

AVERAGE POWER – SINGLE PORT



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
Mid Ch, 2655.0 MHz	48.101	0	48.1	51.1	54.1
High Ch, 2675.0 MHz	47.797	0	47.8	50.8	53.8
40 MHz Bandwidth					
QPSK Modulation					
Mid Ch, 2655.0 MHz	47.799	0	47.8	50.8	53.8
16QAM Modulation					
Mid Ch, 2655.0 MHz	47.719	0	47.7	50.7	53.7
64QAM Modulation					
Mid Ch, 2655.0 MHz	47.805	0	47.8	50.8	53.8
256QAM Modulation					
Low Ch, 2640.0 MHz	47.839	0	47.8	50.8	53.8
Mid Ch, 2655.0 MHz	47.785	0	47.8	50.8	53.8
High Ch, 2670.0 MHz	47.826	0	47.8	50.8	53.8

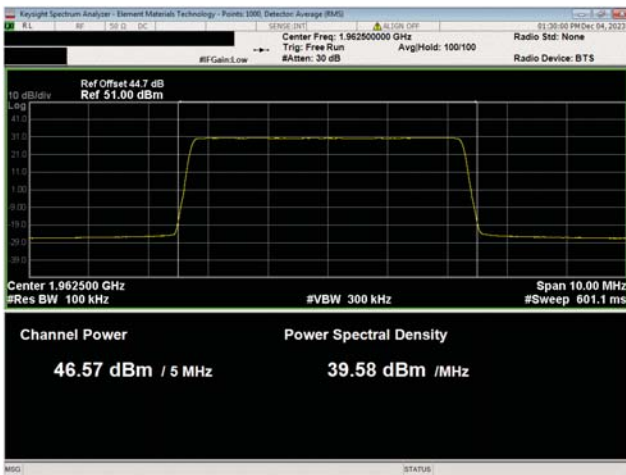
AVERAGE POWER – SINGLE PORT



PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

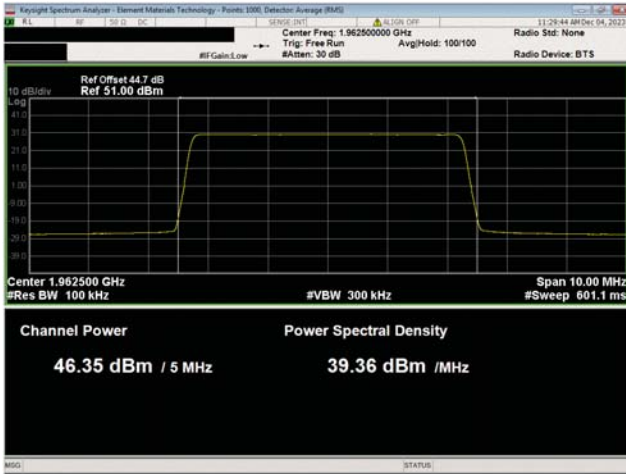


PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
256QAM Modulation
Low Ch, 1932.5 MHz

AVERAGE POWER – SINGLE PORT



PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
5 MHz Bandwidth
256QAM Modulation
High Ch, 1992.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

AVERAGE POWER – SINGLE PORT



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
256QAM Modulation
Low Ch, 1935.0 MHz



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
10 MHz Bandwidth
256QAM Modulation
High Ch, 1990.0 MHz

AVERAGE POWER – SINGLE PORT



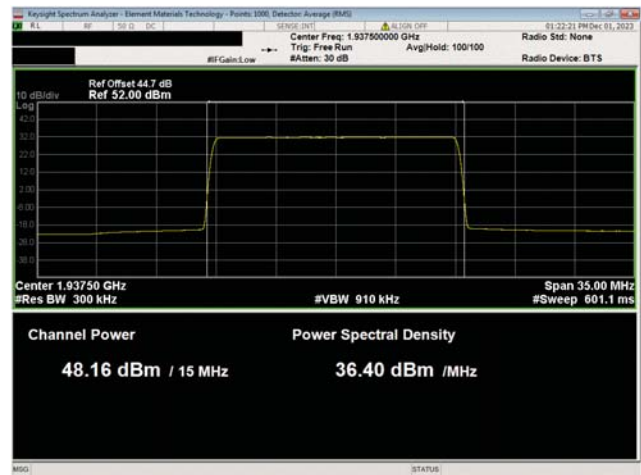
PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

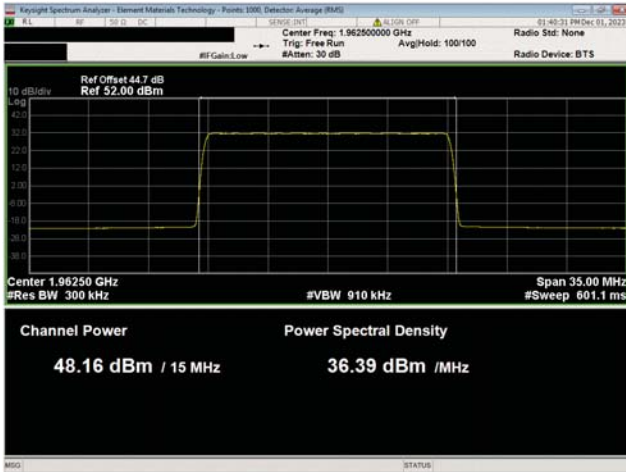


PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
256QAM Modulation
Low Ch, 1937.5 MHz

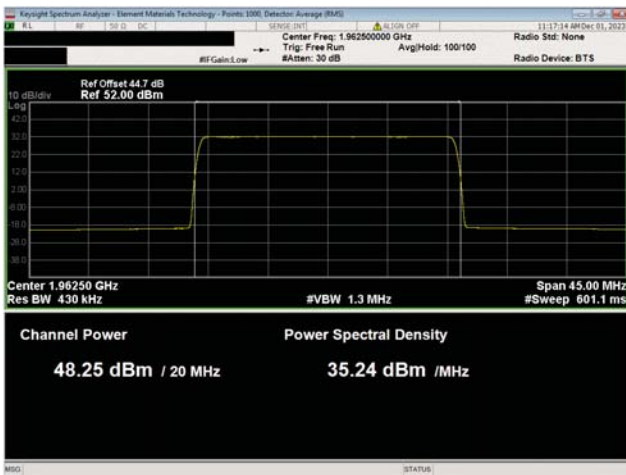
AVERAGE POWER – SINGLE PORT



PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
15 MHz Bandwidth
256QAM Modulation
High Ch, 1987.5 MHz

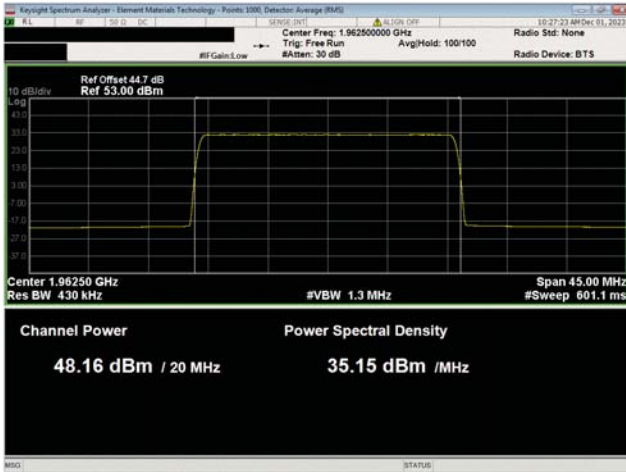


PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz

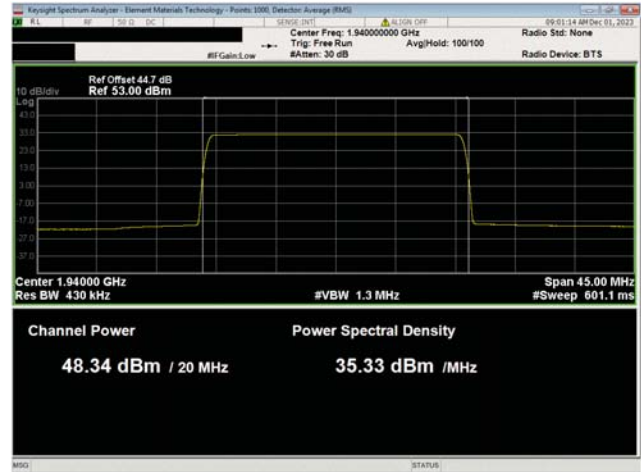


PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

AVERAGE POWER – SINGLE PORT



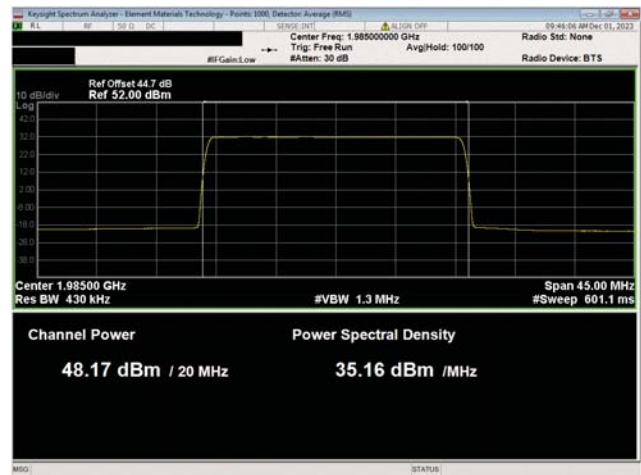
PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
256QAM Modulation
Low Ch, 1940.0 MHz



PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz

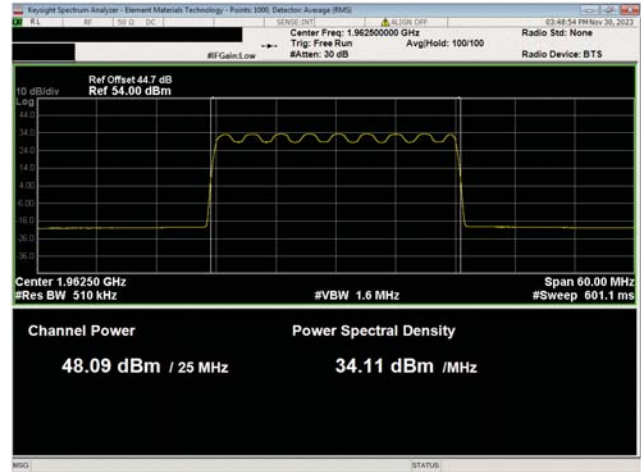


PCS Band n25, 1930 MHz - 1995 MHz
20 MHz Bandwidth
256QAM Modulation
High Ch, 1985.0 MHz

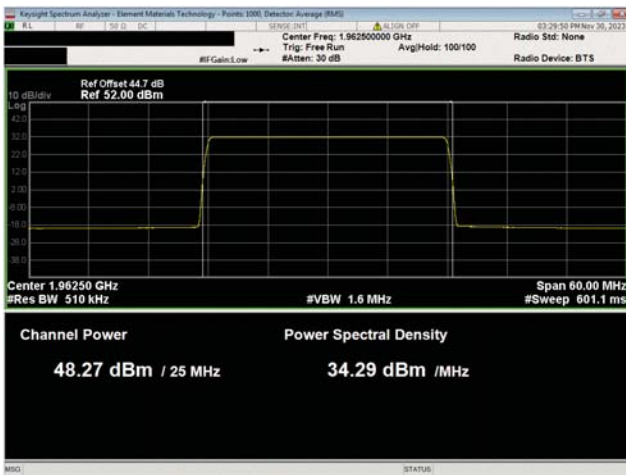
AVERAGE POWER – SINGLE PORT



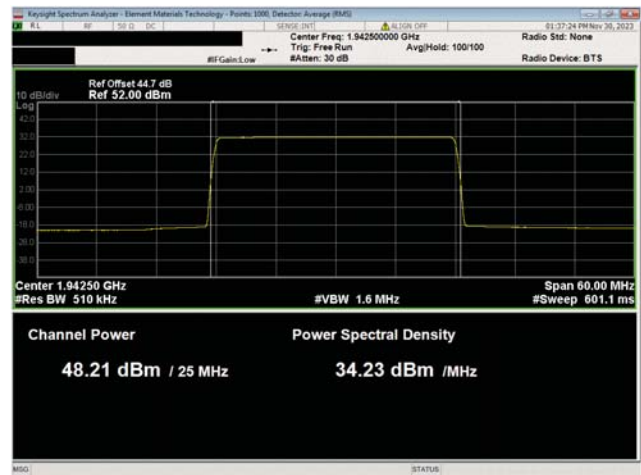
PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

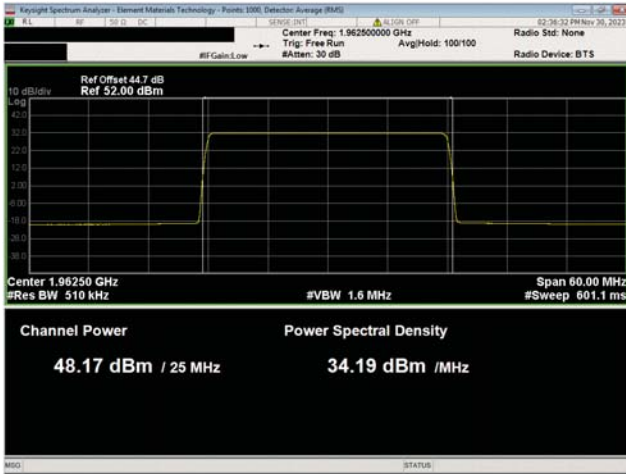


PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
256QAM Modulation
Low Ch, 1942.5 MHz

AVERAGE POWER – SINGLE PORT



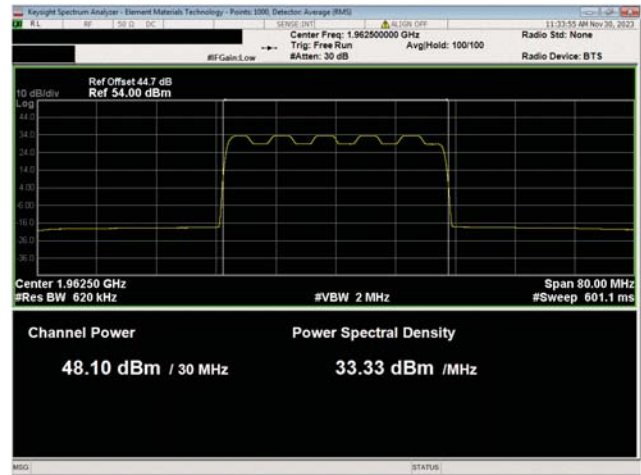
PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
25 MHz Bandwidth
256QAM Modulation
High Ch, 1982.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz

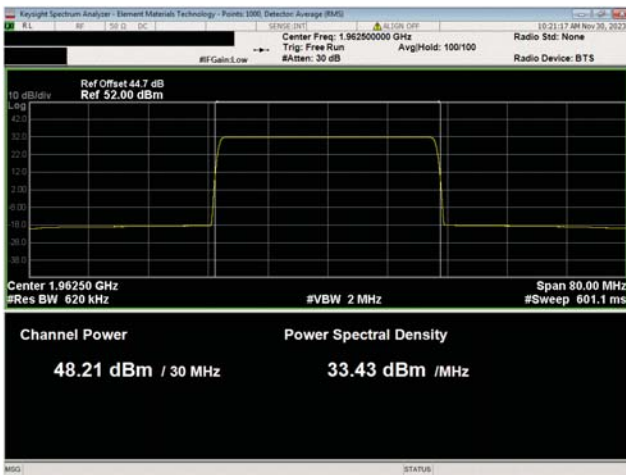
AVERAGE POWER – SINGLE PORT



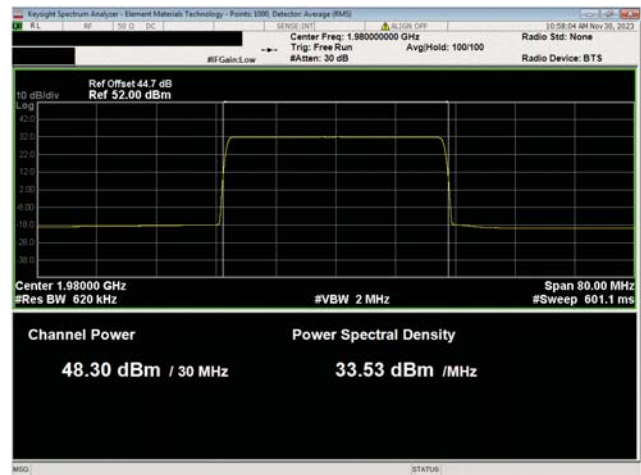
PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
256QAM Modulation
Low Ch, 1945.0 MHz



PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz

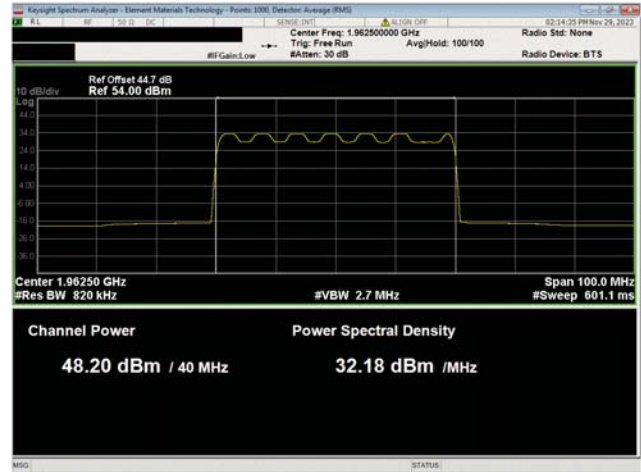


PCS Band n25, 1930 MHz - 1995 MHz
30 MHz Bandwidth
256QAM Modulation
High Ch, 1980.0 MHz

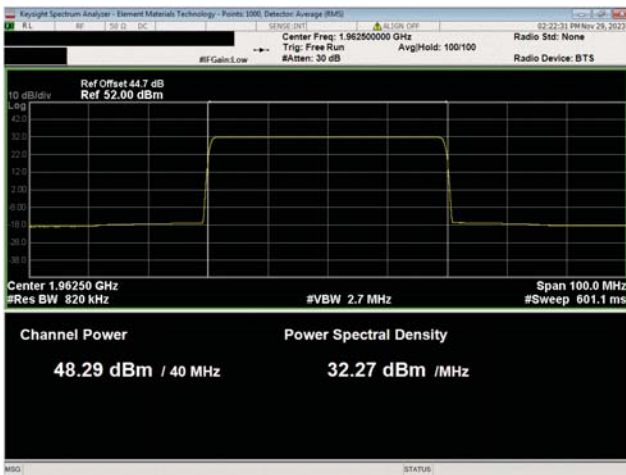
AVERAGE POWER – SINGLE PORT



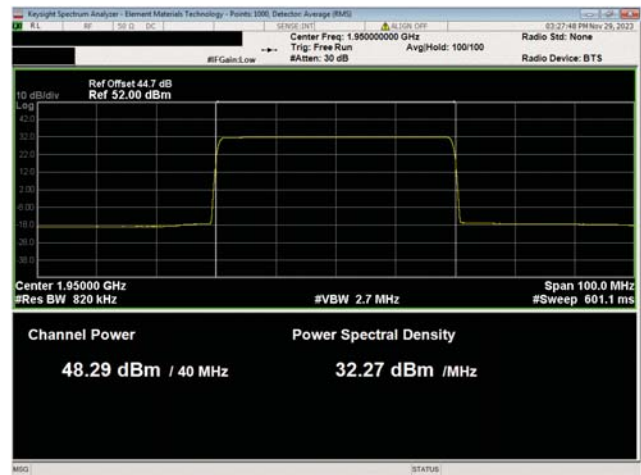
PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
QPSK Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
16QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
64QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
256QAM Modulation
Low Ch, 1950.0 MHz

AVERAGE POWER – SINGLE PORT



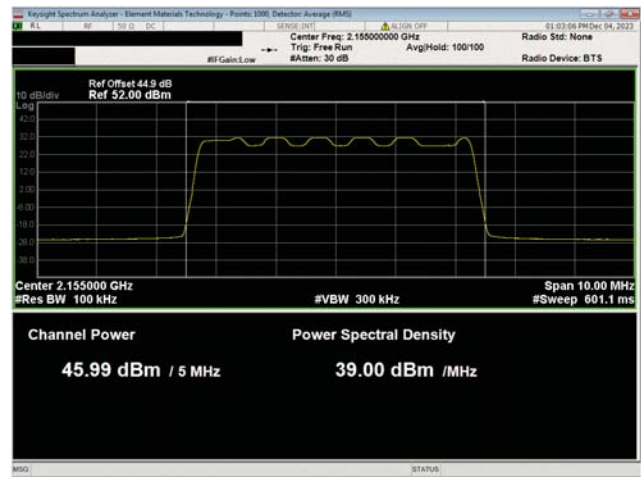
PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Ch, 1962.5 MHz



PCS Band n25, 1930 MHz - 1995 MHz
40 MHz Bandwidth
256QAM Modulation
High Ch, 1975.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz

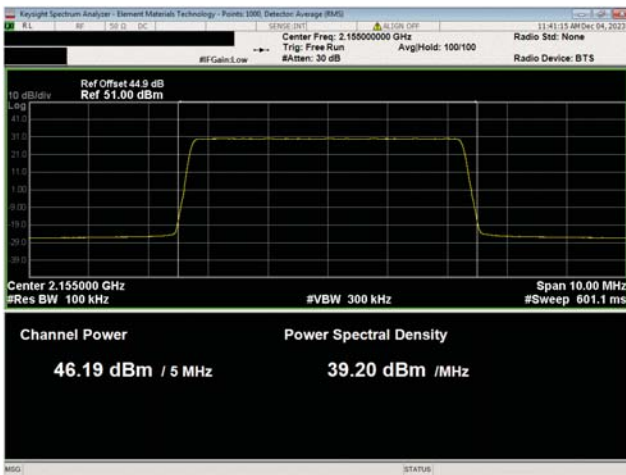
AVERAGE POWER – SINGLE PORT



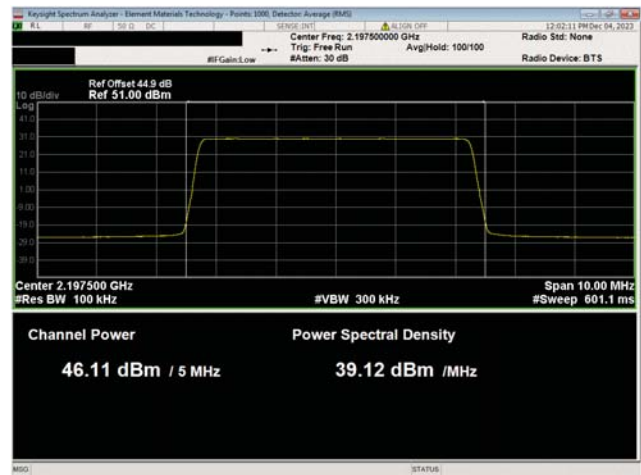
AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
256QAM Modulation
Low Ch, 2112.5 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz

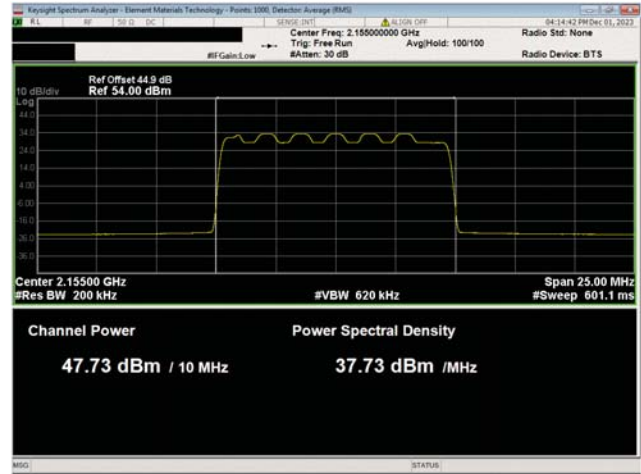


AWS Band n66, 2110 Mhz - 2200 MHz
5 MHz Bandwidth
256QAM Modulation
High Ch, 2197.5 MHz

AVERAGE POWER – SINGLE PORT



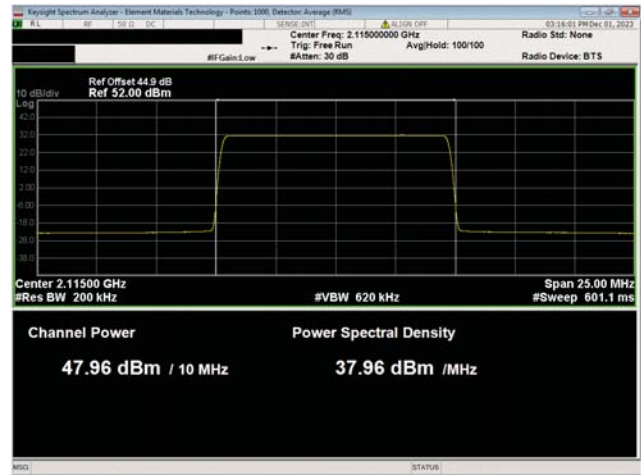
AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
256QAM Modulation
Low Ch, 2115.0 MHz

AVERAGE POWER – SINGLE PORT



AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
10 MHz Bandwidth
256QAM Modulation
High Ch, 2195.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz

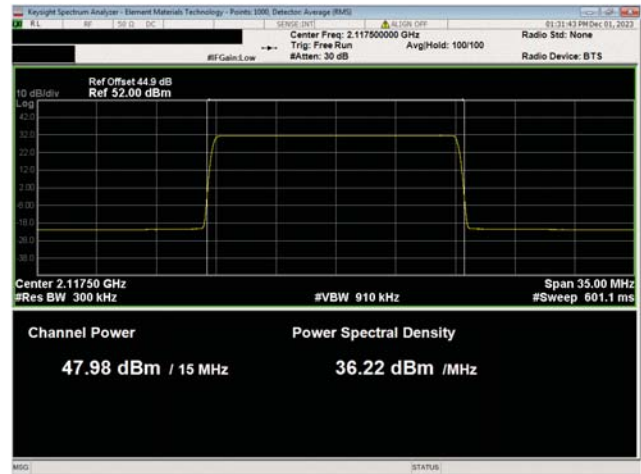


AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz

AVERAGE POWER – SINGLE PORT



AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
15 MHz Bandwidth
256QAM Modulation
Low Ch, 2117.5 MHz

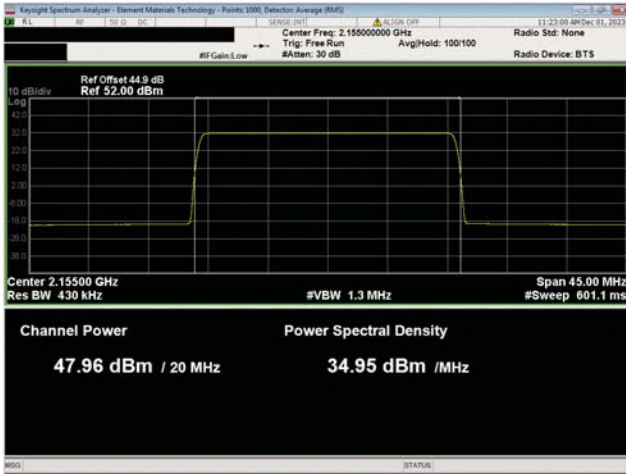


AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
15 MHz Bandwidth
15 MHz Bandwidth
256QAM Modulation
High Ch, 2192.5 MHz

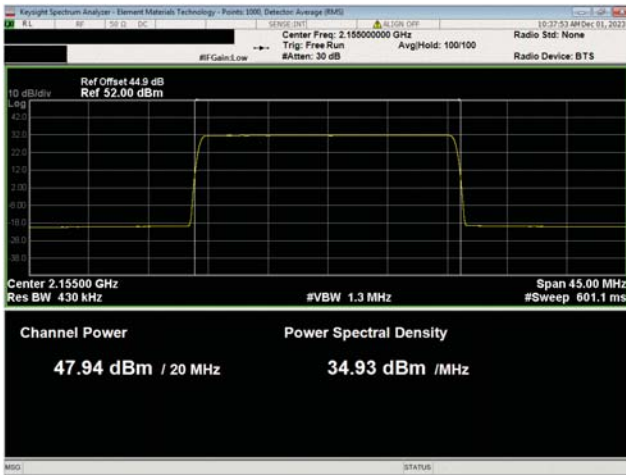
AVERAGE POWER – SINGLE PORT



AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
256QAM Modulation
Low Ch, 2120.0 MHz

AVERAGE POWER – SINGLE PORT



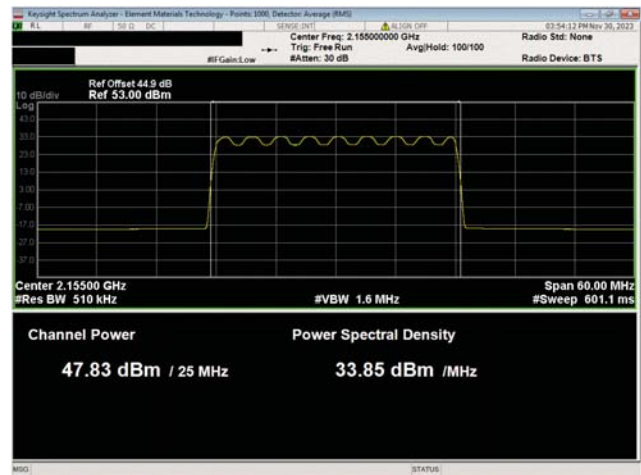
AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
20 MHz Bandwidth
256QAM Modulation
High Ch, 2190.0 MHz

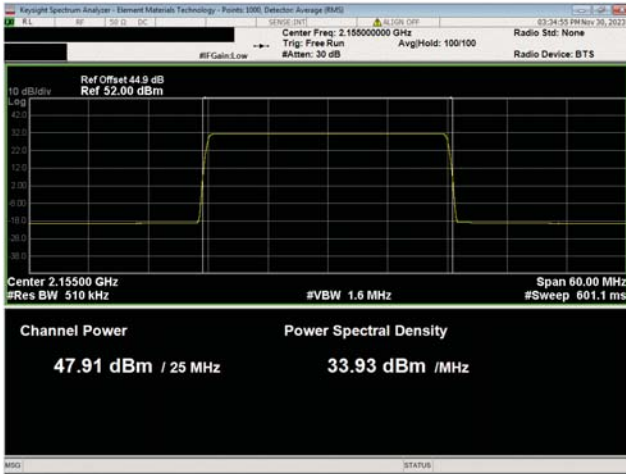


AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz

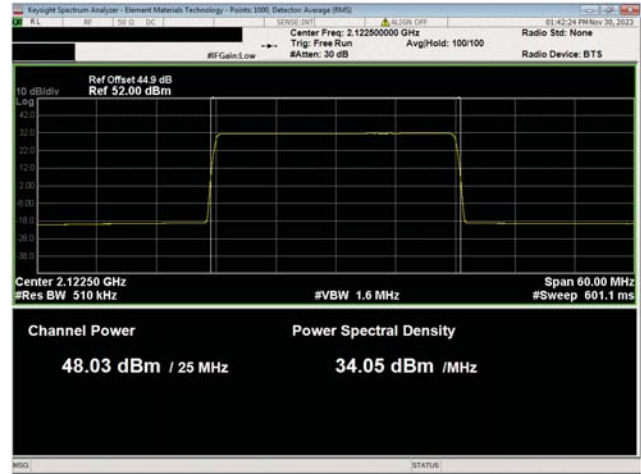


AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz

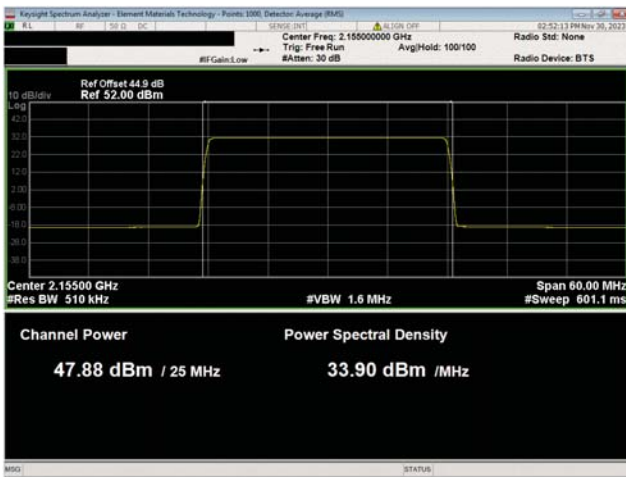
AVERAGE POWER – SINGLE PORT



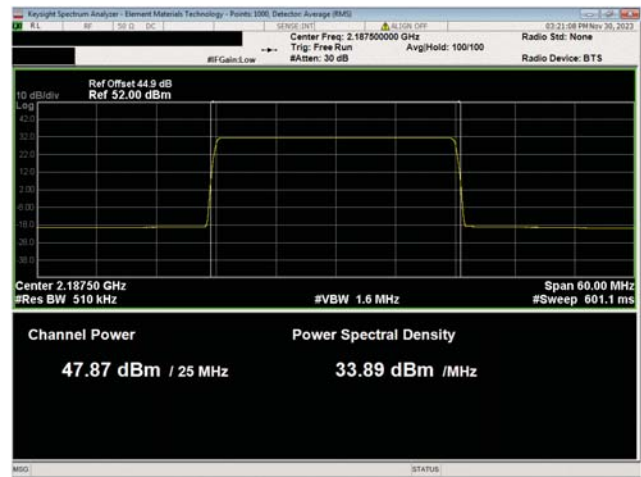
AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
256QAM Modulation
Low Ch, 2122.5 MHz

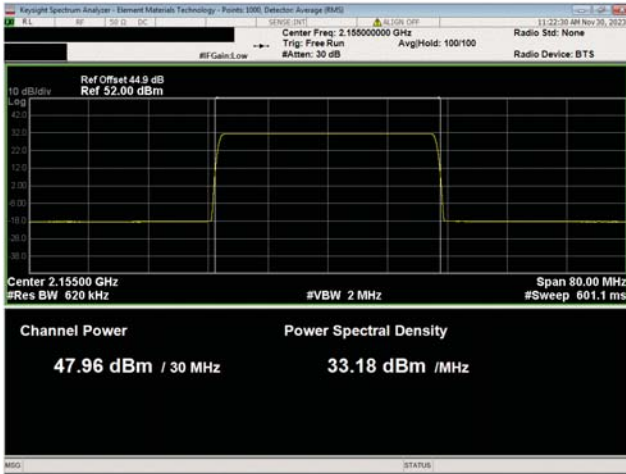


AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz

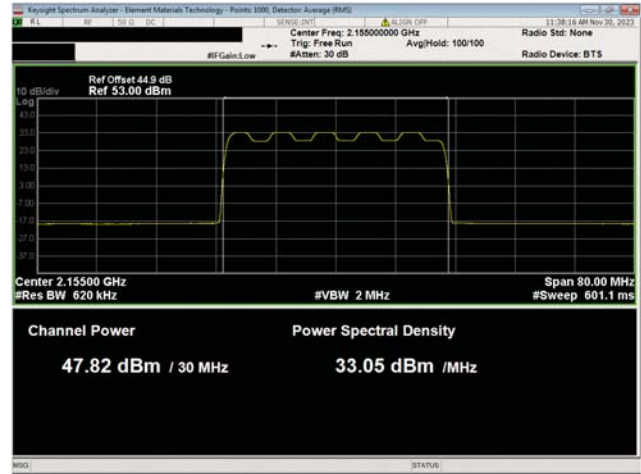


AWS Band n66, 2110 Mhz - 2200 MHz
25 MHz Bandwidth
256QAM Modulation
High Ch, 2187.5 MHz

AVERAGE POWER – SINGLE PORT



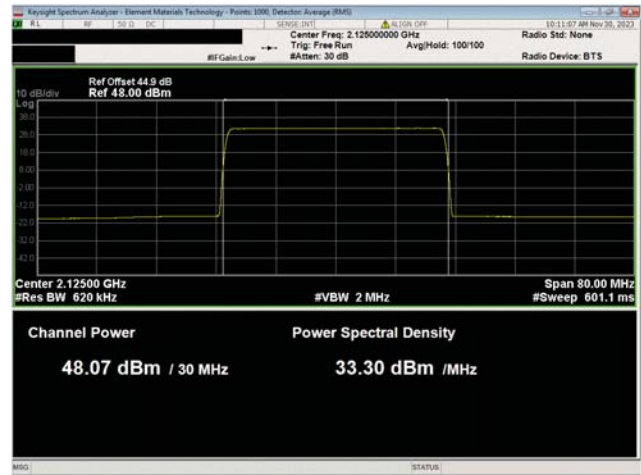
AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz

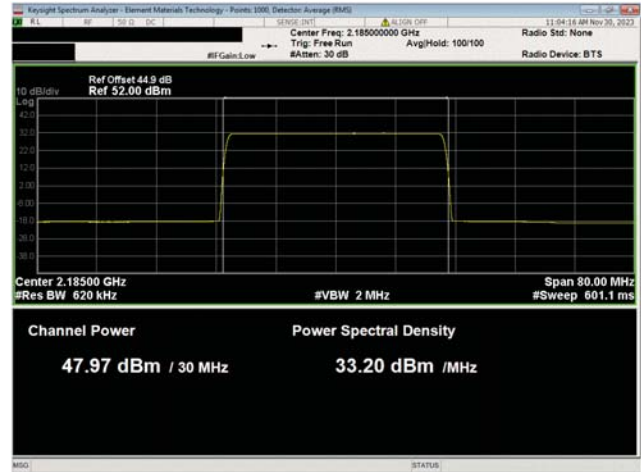


AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
256QAM Modulation
Low Ch, 2125.0 MHz

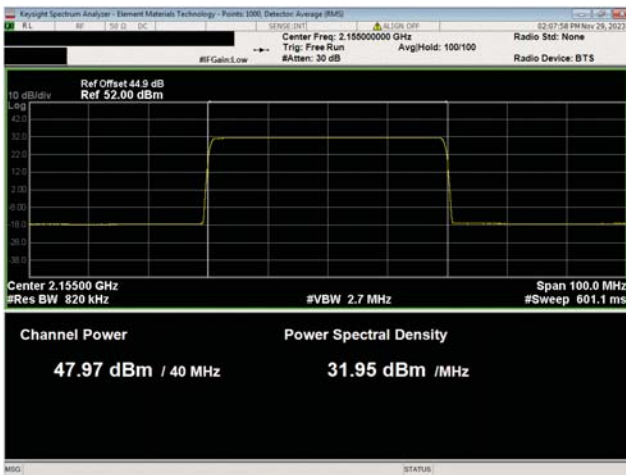
AVERAGE POWER – SINGLE PORT



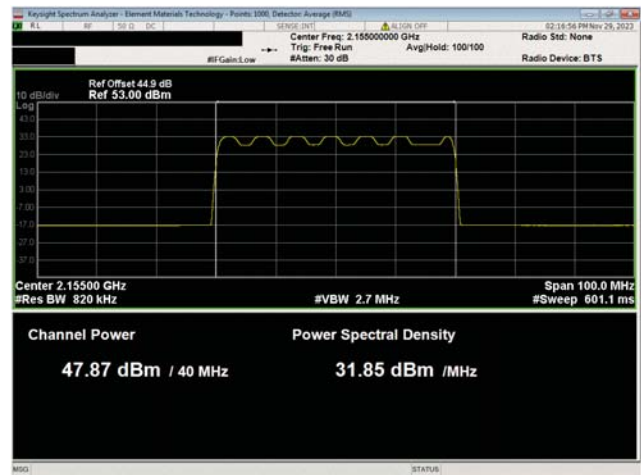
AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
30 MHz Bandwidth
256QAM Modulation
High Ch, 2185.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
QPSK Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
16QAM Modulation
Mid Ch, 2155.0 MHz

AVERAGE POWER – SINGLE PORT



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
64QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
256QAM Modulation
Low Ch, 2130.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Ch, 2155.0 MHz



AWS Band n66, 2110 Mhz - 2200 MHz
40 MHz Bandwidth
256QAM Modulation
High Ch, 2180.0 MHz

AVERAGE POWER – SINGLE PORT



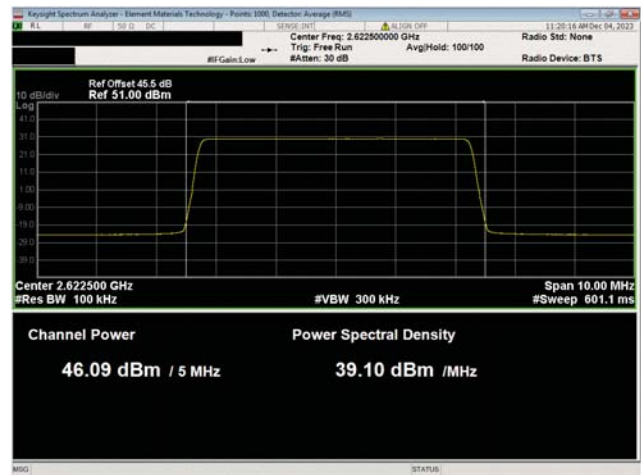
BRS Band n7, 2620 Mhz - 2690 MHz
5 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
5 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz

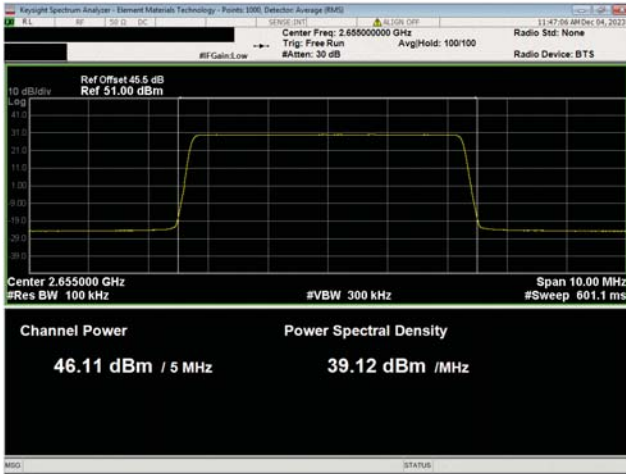


BRS Band n7, 2620 Mhz - 2690 MHz
5 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
5 MHz Bandwidth
256QAM Modulation
Low Ch, 2622.5 MHz

AVERAGE POWER – SINGLE PORT



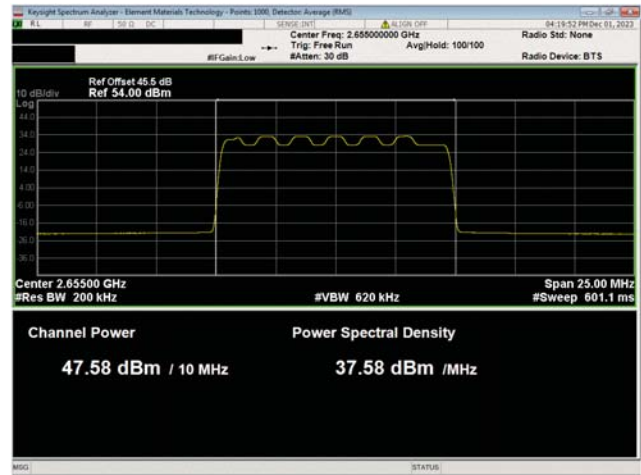
BRS Band n7, 2620 MHz - 2690 MHz
5 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 MHz - 2690 MHz
5 MHz Bandwidth
256QAM Modulation
High Ch, 2687.5 MHz



BRS Band n7, 2620 MHz - 2690 MHz
10 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 MHz - 2690 MHz
10 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz

AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
10 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
10 MHz Bandwidth
256QAM Modulation
Low Ch, 2625.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
10 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
10 MHz Bandwidth
256QAM Modulation
High Ch, 2685.0 MHz

AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
256QAM Modulation
Low Ch, 2627.5 MHz

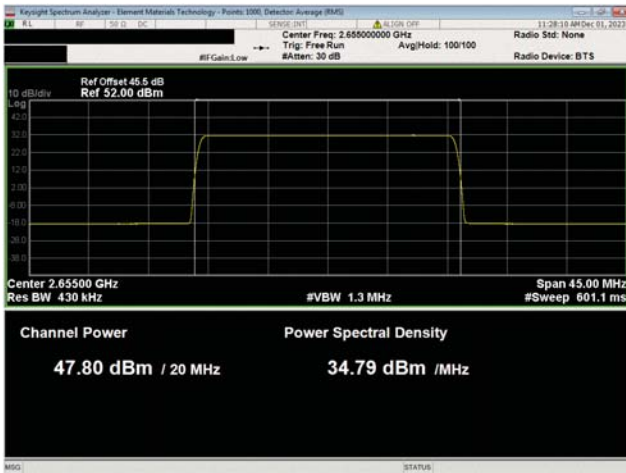
AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
15 MHz Bandwidth
256QAM Modulation
High Ch, 2682.5 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz

AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
256QAM Modulation
Low Ch, 2630.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz

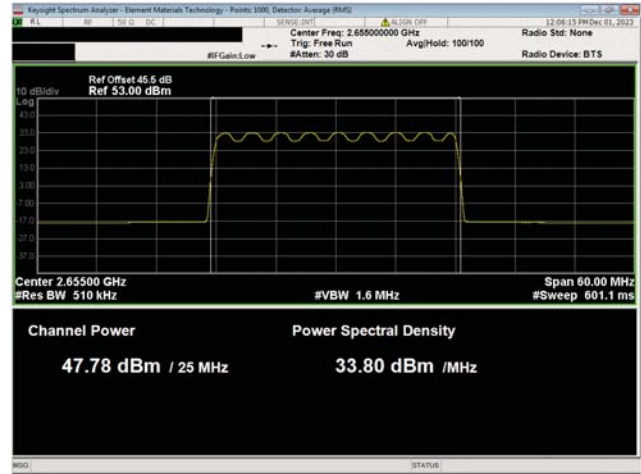


BRS Band n7, 2620 Mhz - 2690 MHz
20 MHz Bandwidth
256QAM Modulation
High Ch, 2680.0 MHz

AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
256QAM Modulation
Low Ch, 2632.5 MHz

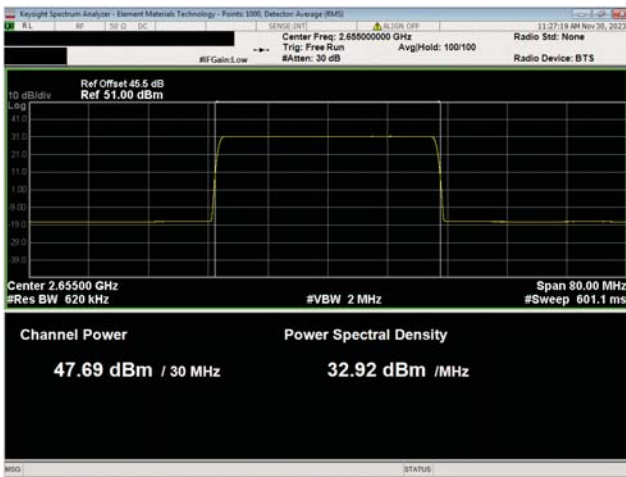
AVERAGE POWER – SINGLE PORT



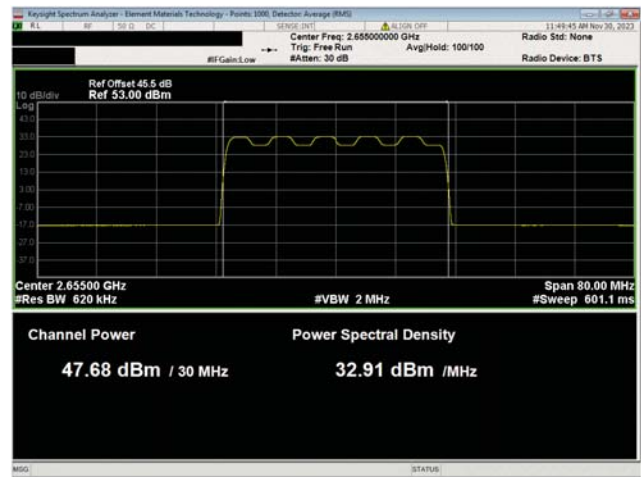
BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
25 MHz Bandwidth
256QAM Modulation
High Ch, 2677.5 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz

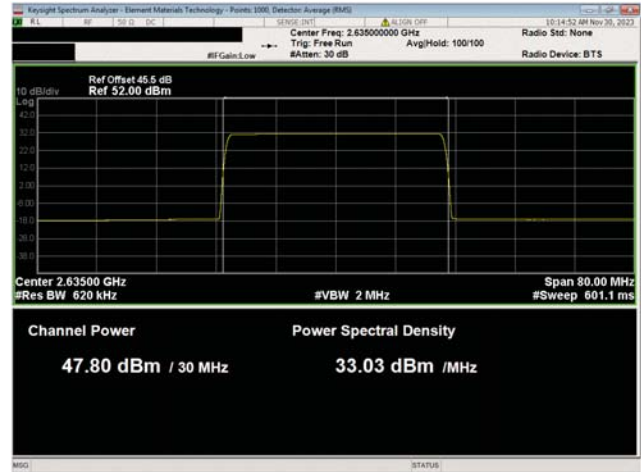


BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz

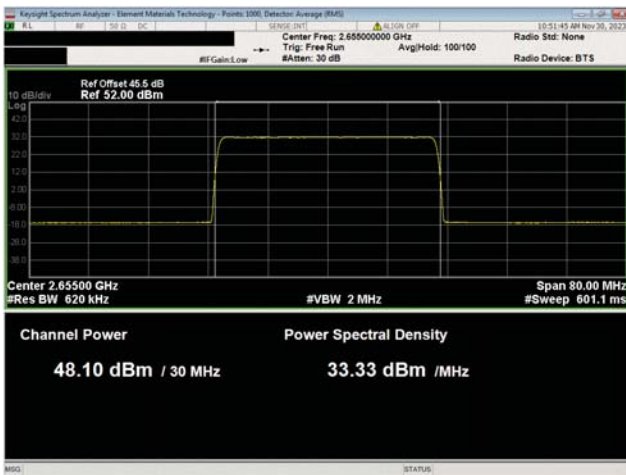
AVERAGE POWER – SINGLE PORT



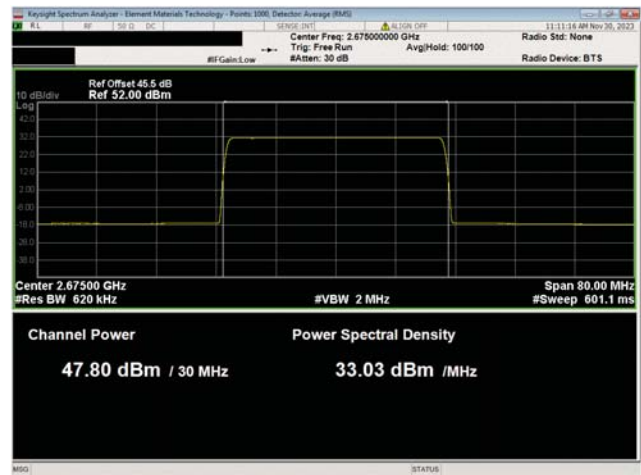
BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
256QAM Modulation
Low Ch, 2635.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz

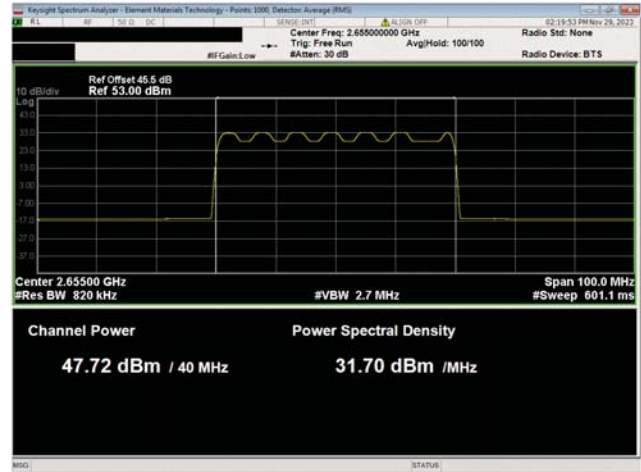


BRS Band n7, 2620 Mhz - 2690 MHz
30 MHz Bandwidth
256QAM Modulation
High Ch, 2675.0 MHz

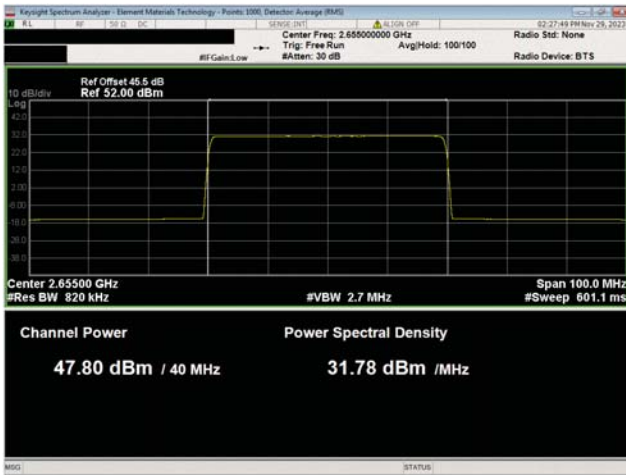
AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
QPSK Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
16QAM Modulation
Mid Ch, 2655.0 MHz

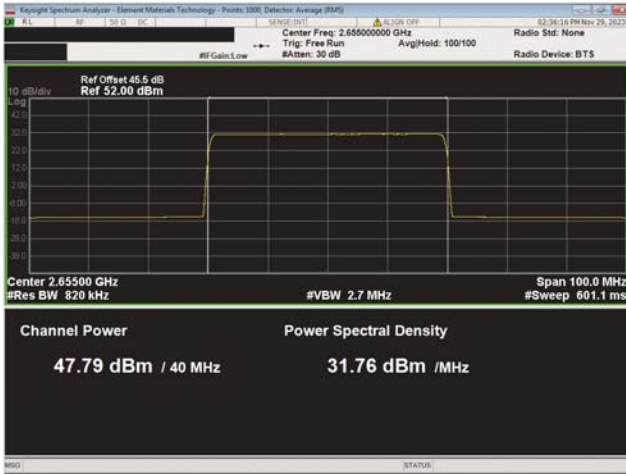


BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
64QAM Modulation
Mid Ch, 2655.0 MHz

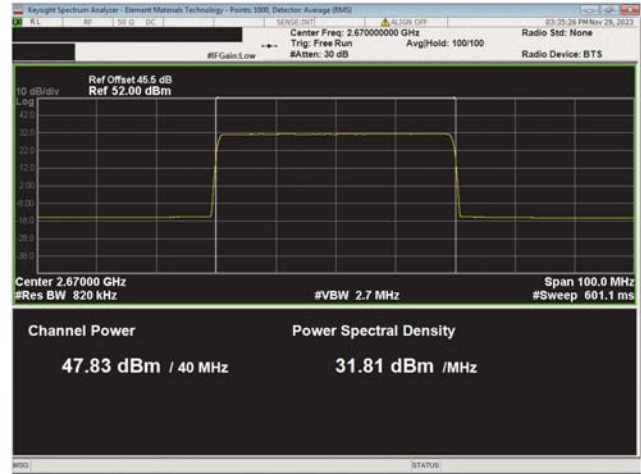


BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
256QAM Modulation
Low Ch, 2640.0 MHz

AVERAGE POWER – SINGLE PORT



BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
256QAM Modulation
Mid Ch, 2655.0 MHz



BRS Band n7, 2620 Mhz - 2690 MHz
40 MHz Bandwidth
256QAM Modulation
High Ch, 2670.0 MHz