element

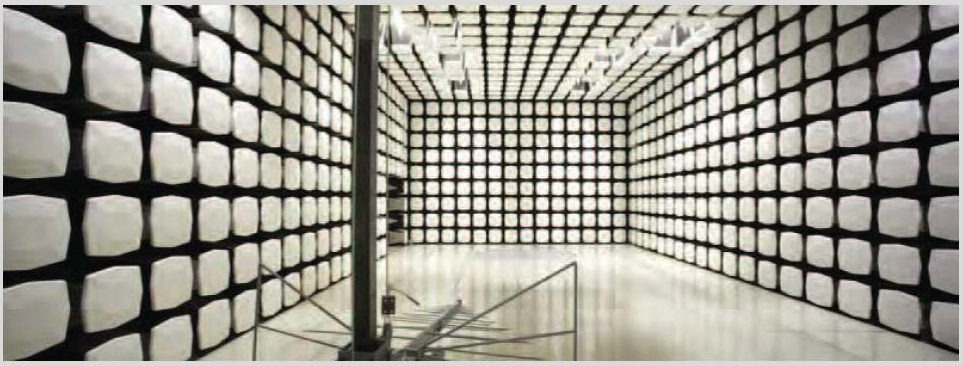
Radio Test Report
Application for a Permissive Change of Equipment Authorization
FCC Part 22 and IC RSS-132
[869MHz – 894MHz]

FCC Part 27 and IC RSS-130
[746MHz – 756MHz]

FCC ID: VBNAHBCC-01
IC ID: 661W-AHBCC

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

Report: NOKI0069.0 Rev. 0, Issue Date: September 19, 2023



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A2LA ACCREDITED
CERT #3310.03

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2023.04.17

CERTIFICATE OF TEST

Last Date of Test: August 15, 2023
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Remote Radio Head
Model: AHBCC

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 FCC CFR 47 Part 22 subpart H FCC CFR 47 Part 27 subpart C (Radio Standards Specification) RSS-Gen Issue 5– April 2018 IC RSS-130 Issue 2 – February 2019 IC RSS-132 Issue 4 - January 31, 2023 SRSP-518 Issue 2 – February 2019	ANSI C63.26-2015 FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01 FCC KDB 662911D02 v01

Results

Test Description	Result	Comments
Duty Cycle	N/A	Not requested.
Power Spectral Density	Pass	
Occupied Bandwidth	Pass	
Average Power	Pass	
Peak to Average Power (PAPR)CCDF	Pass	
Band Edge Compliance	Pass	
Spurious Conducted Emissions	Pass	
Spurious Radiated Emissions	N/A	Not requested.

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

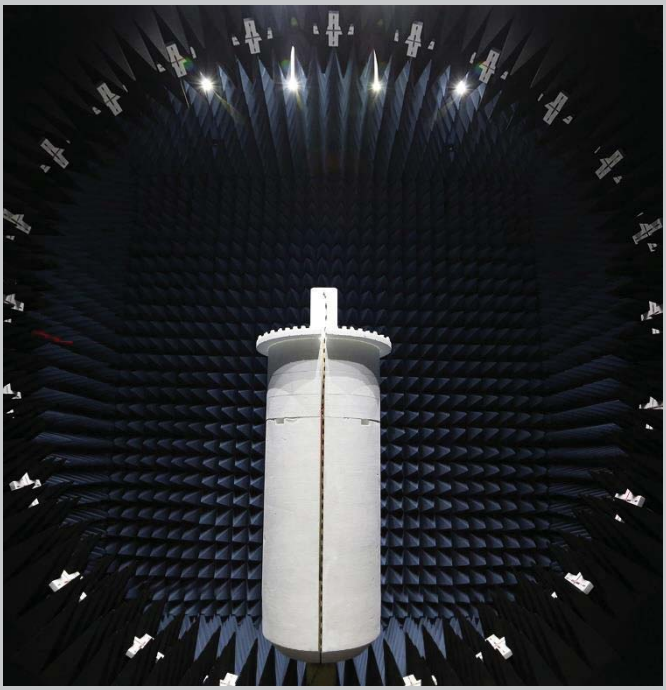
For details on the Scopes of our Accreditations, please visit:

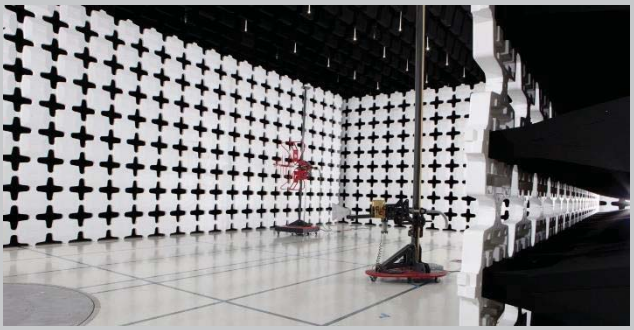
California Minnesota Oregon Texas Washington

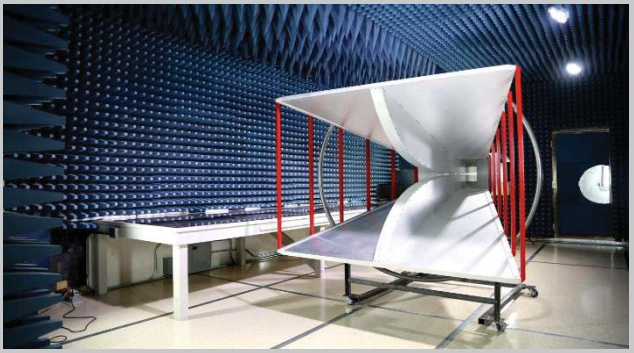
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425) 984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

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RP.2023.05.08.0

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 Location: Texas

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	3.1 dB	-3.1 dB

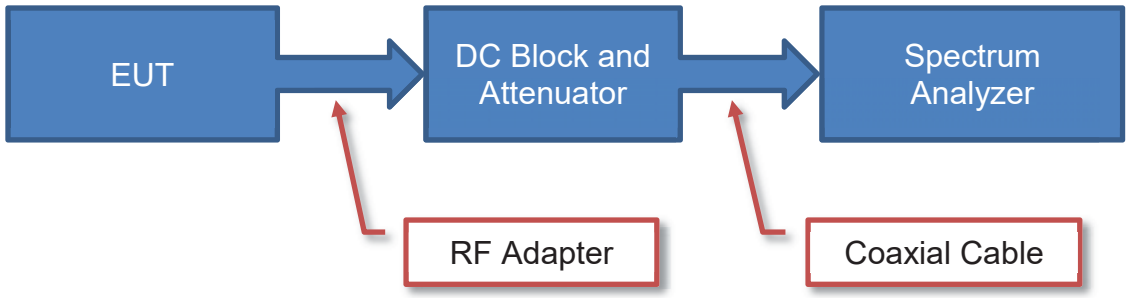
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

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

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

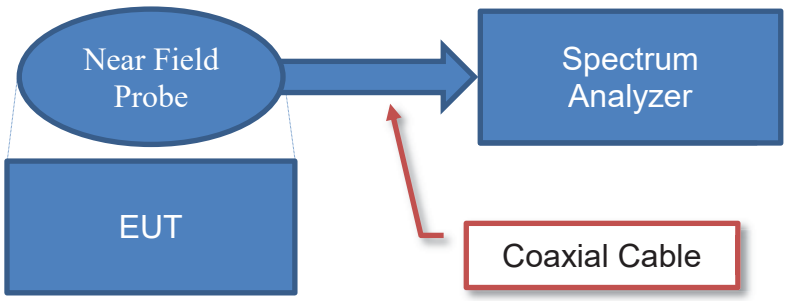
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

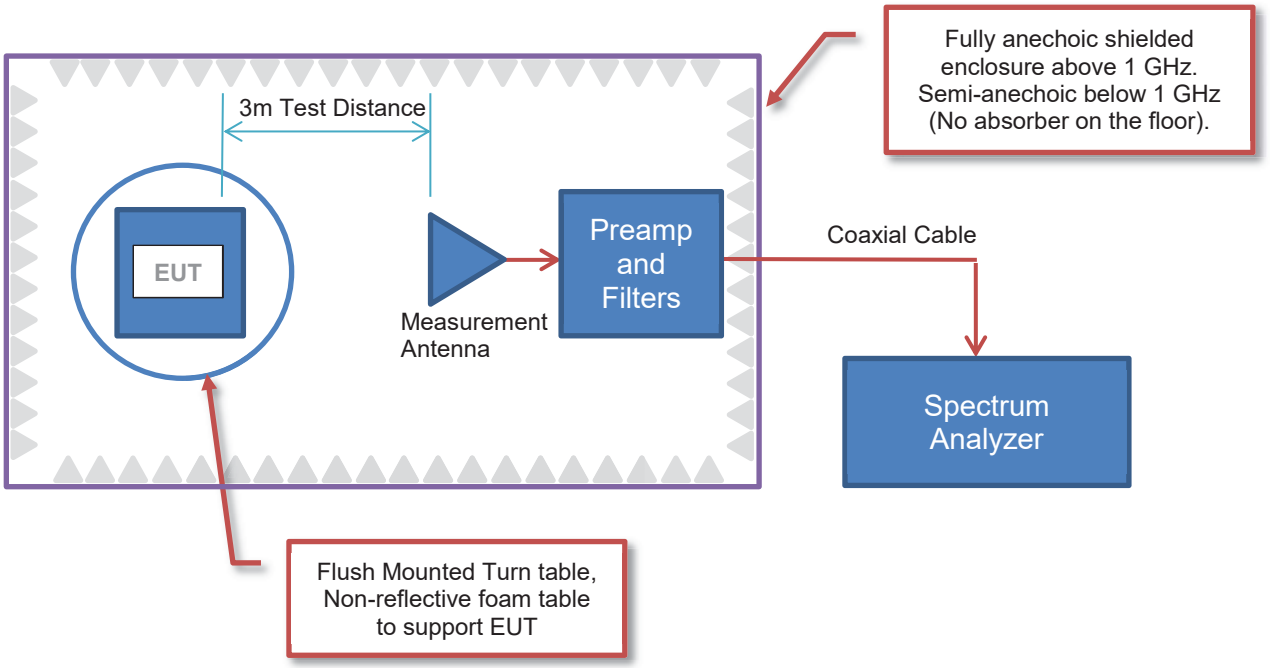


Sample Calculation (logarithmic units)

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

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

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

Conducted Emissions:

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

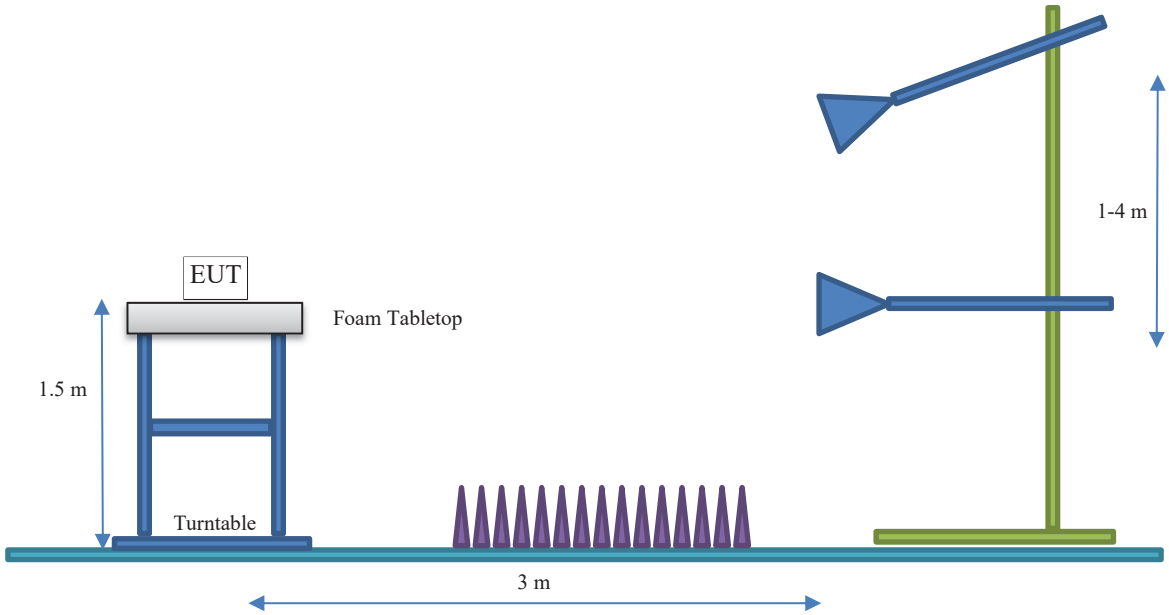
Radiated Power (ERP/EIRP) – Substitution Method:

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

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

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



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, TX 75019
Test Requested By:	Steve Mitchell
EUT:	AirScale Base Transceiver Station remote Radio Head Model AHBCC
First Date of Test:	August 11, 2023
Last Date of Test:	August 15, 2023
Receipt Date of Samples:	August 11, 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:

A permissive change on the original filing is being pursued to add 5G NR (new radio) 5MHz and 10MHz channel bandwidth Band n13 carriers along with 5G NR multicarrier operations to the AirScale Base Transceiver Station Remote Radio Head Model AHBCC FCC and ISED radio certifications. Please refer to test reports on the original/previous certifications for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using 5G NR 5MHz and 10MHz channel bandwidth Band n13 carriers for this permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this permissive change test effort. Tests performed under the change effort include RF power, PSD, CCDF, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions.

The testing was performed on the same hardware version (AHBCC) as the original certification test. The base station and remote radio head software for this testing is an updated release that includes 5G NR 5MHz and 10MHz channel bandwidth carrier support to 5GNR band n13.

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

Remote Radio Head (RRH) variant AHBCC is being developed under this effort. The AHBCC remote radio head is a multi-standard multi-carrier radio module designed to support 4G LTE and 5G NR FCC/ISED within Bands n/5 and n/13. The scope of this testing is to add NR5 and NR10 bandwidths to band n13 along with n5/n13 multiband/multicarrier support for FCC/ISED certification.

The AHBCC RRH has four transmit/four receive antenna ports (4TX/4RX for Band n5 and 4TX/4RX for Band n13). Each antenna port supports 3GPP 5G NR frequency band n5 (BTS Rx: 824 to 849 MHz/ BTS TX:869 to 894MHz) and 3GPP 5G NR frequency band n13 (BTS Rx: 777 to 787 MHz/BTS TX: 746 to 756 MHz). The maximum RF output power of the RRH is 320 Watts (40 watts per carrier, 80 watts per antenna port). The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The TX and RX instantaneous bandwidth covers the full operational RRH bandwidth. The RRH supports 5 and 10MHz 5G-NR bandwidths. The RRH supports four 5G-NR downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM). The 5G-NR modulation types are setup according to 3GPP TS 38.141 NR FR1 Test Models 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). Multi-carrier operation is supported within this permissive change.

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

The 3GPP frequency band n13 (746 - 756 MHz) band edge downlink (BTS Transmit) ARFCNs for 5G NR channel bandwidths (5 and 10 MHz) are provided below for the AHBCC. The ARFCN is defined as an Absolute Radio Frequency Channel Number. The channel spacing is 100 kHz between channel numbers.

	Downlink ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth	
			5 MHz	10 MHz
AHBCC Band n13 (Ant 1, 2, 3, 4)	149200	746.0	Band Edge	Band Edge
	……			
	149700	748.5	Bottom Channel	
	……			
	150200	751	Middle Channel	Bottom Channel Middle Channel Top Channel
	……			
	150700	753.5	Top Channel	
	……			
	151200	756	Band Edge	Band Edge

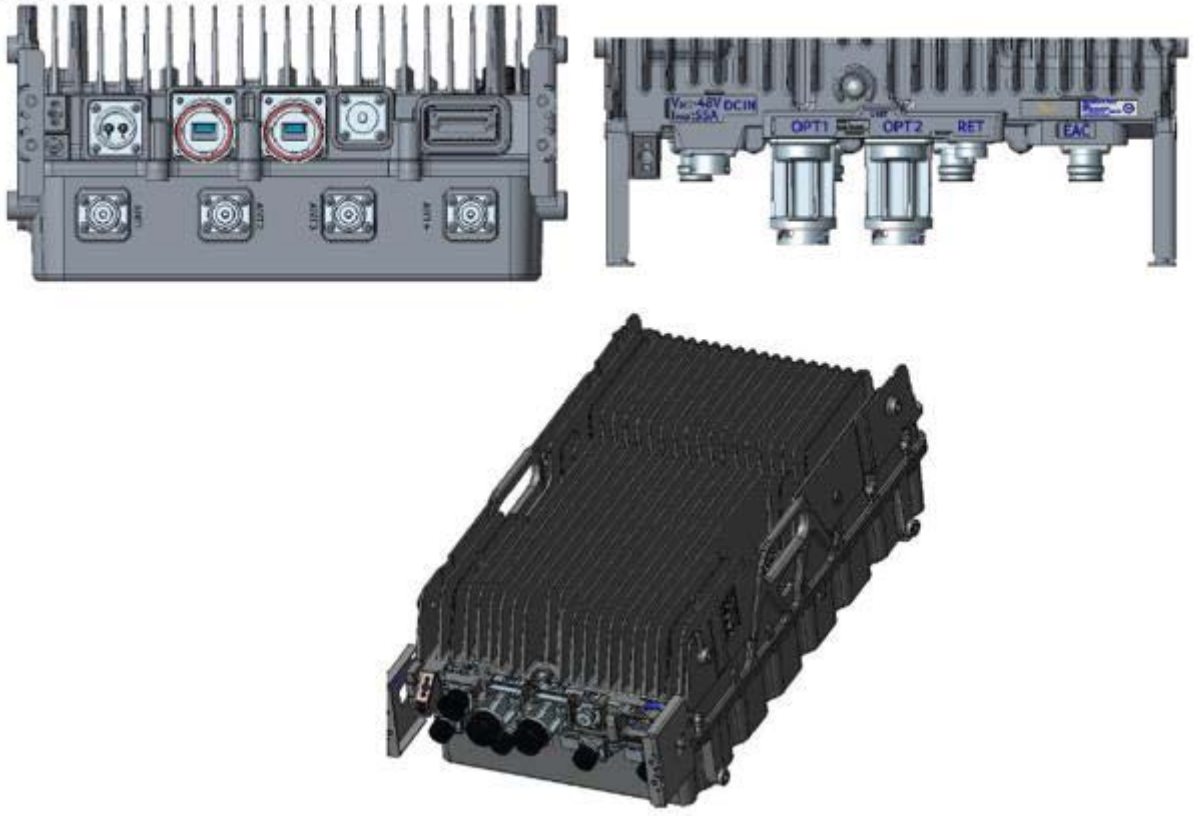
AHBCC Downlink Band Edge 5GNR Band n13 Frequency Channels

The 3GPP frequency band n5 (869-894 MHz) band edge downlink (BTS Transmit) ARFCNs for 5G NR channel bandwidths (5 and 10MHz) are provided below. The ARFCN is defined as Absolute Radio Frequency Channel Number.

	Downlink ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth	
			5 MHz	10 MHz
AHBCC Band n5 (Ant 1, 2, 3, 4)	173800	869.0	Band Edge	Band Edge
	……			
	174300	871.5	Bottom Ch	
	……			
	174800	874.0		Bottom Ch
	……			
	174100	876.5		
	……			
	176300	881.5	Middle Ch	Middle Ch
	……			
	177800	886.5		
	……			
	177800	889.0		Top Channel
	……			
	178300	891.5	Top Channel	
	……			

PRODUCT DESCRIPTION

AHBCC Connector Layout



EUT External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Quick Disconnect	2-pole Power Circular Connector
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	4	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
Unit	1	LED	Unit Status LED
EAC	1	MDR26	External Alarm Interface (4 alarms)
OPT	2	SFP+ cage	Optical CPRI Interface up to 10 Gps.
RET	1	8-pin circular connector conforming to IEC 60130-9 – Ed.3.0	AISG 2.0 to external devices
Fan	1	Molex Microfit	Power for RRH Fan. Located on the side of RRH.

Testing Objective:

A permissive change on the original filing is being pursued to add 5G NR (new radio) band n13 carriers along with 5G NR multicarrier functionality to the AirScale Base Transceiver Station Remote Radio Head Model AHBCC FCC and ISED radio certifications.

CONFIGURATIONS

CONFIGURATION – NOKI0069-1

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	RF.FRM5.23R3.20230719.003
BTS Software Version: 23r3	SBTS23R3_ENB_0000_000530

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098.204	UK222201001
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	L1224904439
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103H	DH223246457
AHBCC (Radio Module Model)	Nokia Solutions and Networks	474341A.101	K9180332366
Low Pass Filter 80MHz/10W	Mini-Circuits,Inc.	VLFX-80+	RUU9571952
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ1165
SFP+ 9.8G,300M,850NM	Finisar Corp.	474900A	VF2023004CF
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR17030010027
SFP+ 9.8G,300M,850NM	FINISAR CORP.	474900A	VF20180016Z
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR16180020006
Lenovo	HP	Thinkpad	PF26RVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 528837 /6
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
Fiber Optic cable 3m	AMPHENOL Fiber	995109C	E201648
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

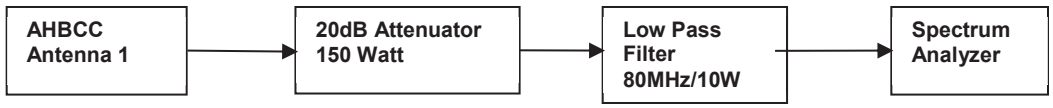
CONFIGURATIONS

element
2018-07-17

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable 2 pc	N	3 meters	N	ASIB	AHBCC
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	40MHz/ 250W -50ohm -Load

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	6 meters	N	EUT [AHBCC] Ant port #1	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/40dB [BZ1165]	N	NA	N	RF cable HS-SUCOFLEX_106	Low Pass Filter 80MHz/10W
Low Pass Filter 80MHz/10W	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

CONFIGURATION – NOKI0069-2

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	RF.FRM5.23R3.20230719.003
BTS Software Version: 23r3	SBTS23R3_ENB_0000_000530

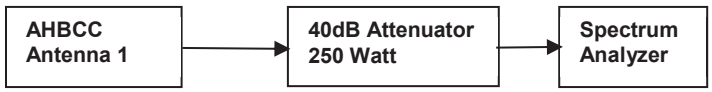
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098.204	UK222201001
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	L1224904439
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	DH223246457
AHBCC (Radio Module Model)	Nokia Solutions and Networks	474341A.101	K9180332366
Attenuator 250W/40dB	AeroflexWeinschel	58-40-43	UN619
SFP+ 9.8G,300M,850NM	Finisar Corp.	474900A	VF2023004CF
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR17030010027
SFP+ 9.8G,300M,850NM	FINISAR CORP.	474900A	VF20180016Z
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR16180020006
Lenovo	HP	Thinkpad	PF26RVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 528837 /6
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
Fiber Optic cable 3m	AMPHENOL Fiber	995109C	E201648
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 2 pc	N	3 meters	N	ASIB	AHBCC
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	250W -50ohm -Load

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

RF Test Setup Diagram:



CONFIGURATIONS

element
2018-07-17

CONFIGURATION – NOKI0069-3

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	RF.FRM5.23R3.20230719.003
BTS Software Version: 23r3	SBTS23R3_ENB_0000_000530

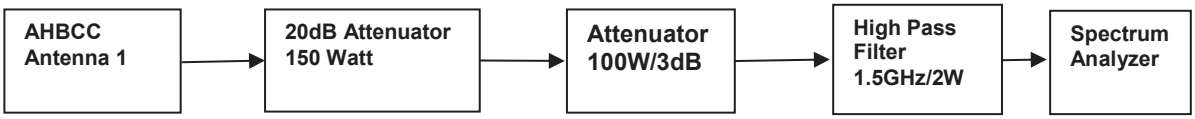
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098.204	UK222201001
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	L1224904439
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103	L1205105870
ABIO (BTS System Module)	Nokia Solutions and Networks	475266A.103H	DH223246457
AHBCC (Radio Module Model)	Nokia Solutions and Networks	474341A.101	K9180332366
High Pass Filter 1.5GHz/2W	Microwave Circuits, Inc.	H1G513G5	SN 8015-01 DC0434
Attenuator 100W/3dB	Weinschel Corp.	24-3-43-LIM	BH5812
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Finisar Corp.	474900A	VF2023004CF
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR17030010027
SFP+ 9.8G,300M,850NM	FINISAR CORP.	474900A	VF20180016Z
SFP+ 9.8G,300M,850NM	HG GENUINE	P306180	KR16180020006
Lenovo	HP	Thinkpad	PF26RVZ0
Keysight- DC System power supply	HP	N8757A	US21D5054S
FPAD (DC-pwr supply)	Nokia	472805A.101	A9124600282
1 Meter RF cable	Huber+suhner	SUCOFLEX 104	SN 551432 /4
6 Meter RF cable	Huber+suhner	SUCOFLEX 106	SN 528837 /6
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
Fiber Optic cable 3m	AMPHENOL Fiber	995109C	E201648
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 2 pc	N	3 meters	N	ASIB	AHBCC
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	250W -50ohm -Load

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	6 meters	N	EUT [AHBCC] RF port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	NA	N	HS-SUCOFLEX_106	Attenuator 100W/3dB
Attenuator 100W/3dB				Attenuator 150W/20dB	High Pass Filter 1.5GHz/2W
High Pass Filter 1.5GHz/2W	N	NA	N	Attenuator 100W/3dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 1.5GHz/2W	Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-08-11	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.
2	2023-08-11	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.
3	2023-08-11	Average Power - Multicarrier	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	2023-08-11	Peak to Average Power (PAPR) CCDF	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2023-08-11	Power Spectral Density and EIRP Calculation	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	2023-08-15	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	2023-08-15	Band Edge Compliance - Multicarrier	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Schedule testing was completed.

POWER SPECTRAL DENSITY AND EIRP CALCULATION

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

The method of section 5.2.4.5 of ANSI C63.26 was used to make the measurement. The method uses trace averaging across ON and OFF times of EUT transmissions using the spectrum analyzer's RMS detector. Following the measurement, a duty cycle correction was applied by adding [10log(1/D)], where D is the duty cycle, to the measured power to compute the PSD during the transmit times.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHBCC) as the original certification test. The AHBCC antenna ports are essentially electrically identical and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4. The total PSD of all antenna ports (at the radio output) were determined per ANSI C63.26-2015 paragraph 6.4.3.2.4. The EIRP calculations were based upon ANSI C63.26-2015 paragraph 6.4 for a four port MIMO

FCC EIRP Requirements:
Part 27 subpart C 27.50
27.50(b) The following power and antenna height limits apply to transmitters operating in the 746–758 MHz, 775–788 MHz and 805–806 MHz bands:
(4) Fixed and base stations transmitting a signal in the 746–757 MHz and 776–787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section.
(5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746–757 MHz and 776–787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

Note: EIRP = ERP + 2.15dB
1000 watts = 60.00 dBm, EIRP = (60 dBm + 2.15dB) /MHz = 62.15dBm/MHz or 1640W/MHz
2000 watts = 63.01 dBm, EIRP = (63 dBm + 2.15dB) /MHz = 65.16dBm/MHz or 3280W/MHz

ISED EIRP Requirements:
RSS-130 Section 4.6.3
4.6.3 Frequency bands **698-756 MHz** and **777-787 MHz**
The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.
For base and fixed equipment other than fixed subscriber equipment, refer to SRSP-518 for the e.i.r.p. limits.

SRSP-518 section 5.1 Radiated power and antenna height limits for base stations
21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centresand transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 meters.

POWER SPECTRAL DENSITY AND EIRP CALCULATION

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/11/2023
Customer:	Nokia Solutions and Networks			Temperature:	21.7°C
Attendees:	Mitchell Hill			Humidity:	53.3%
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Band n13 carriers are enabled at maximum power (40 watts/carrier). The following is the power spectral density (PSD) measurements at the radio output ports. The PSD was measured for a single carrier on port 1. The total PSD for multiport (2x2 MIMO & 4x4 MIMO) operation was determinded based upon ANSI 63.26 clause 6.4.3.2.4 (10 Log Nout). The total PSD for two port operation is single port PSD +3dB [i.e. 10 Log(2)]. The total PSD for four port operation is single port PSD +6dB [i.e. 10

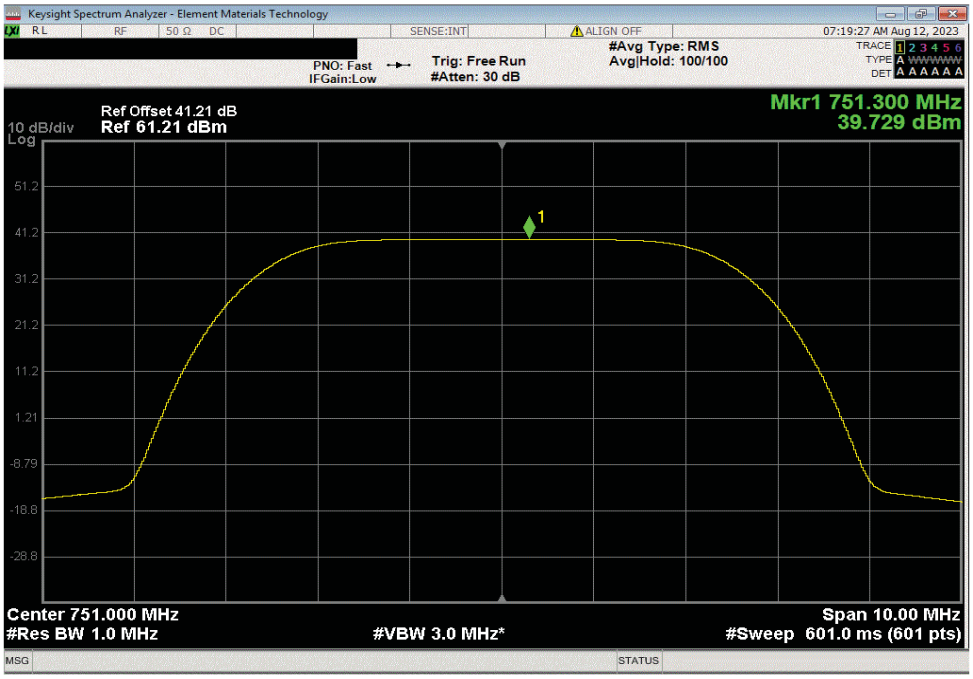
DEVIATIONS FROM TEST STANDARD

None

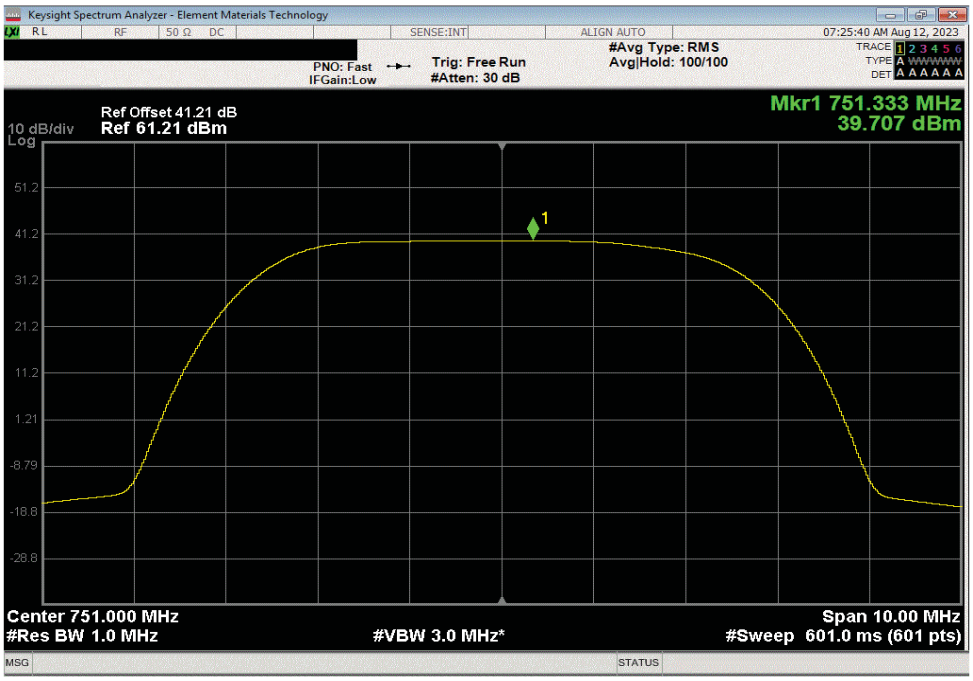
Configuration #	NOKI0069-2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
Port 1					
Band n13, 746 - 756 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 751 MHz	39.729	0	39.7	42.7	45.7
16QAM Modulation					
Mid Channel, 751 MHz	39.707	0	39.7	42.7	45.7
64QAM Modulation					
Mid Channel, 751 MHz	39.751	0	39.8	42.8	45.8
256QAM Modulation					
Low Channel, 748.5 MI	39.746	0	39.7	42.7	45.7
Mid Channel, 751 MHz	39.755	0	39.8	42.8	45.8
High Channel, 753.5 M	39.699	0	39.7	42.7	45.7
10 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 751 MHz	36.509	0	36.5	39.5	42.5
16QAM Modulation					
Mid Channel, 751 MHz	37.159	0	37.2	40.2	43.2
64QAM Modulation					
Mid Channel, 751 MHz	36.51	0	36.5	39.5	42.5
256QAM Modulation					
Mid Channel, 751 MHz	36.533	0	36.5	39.5	42.5

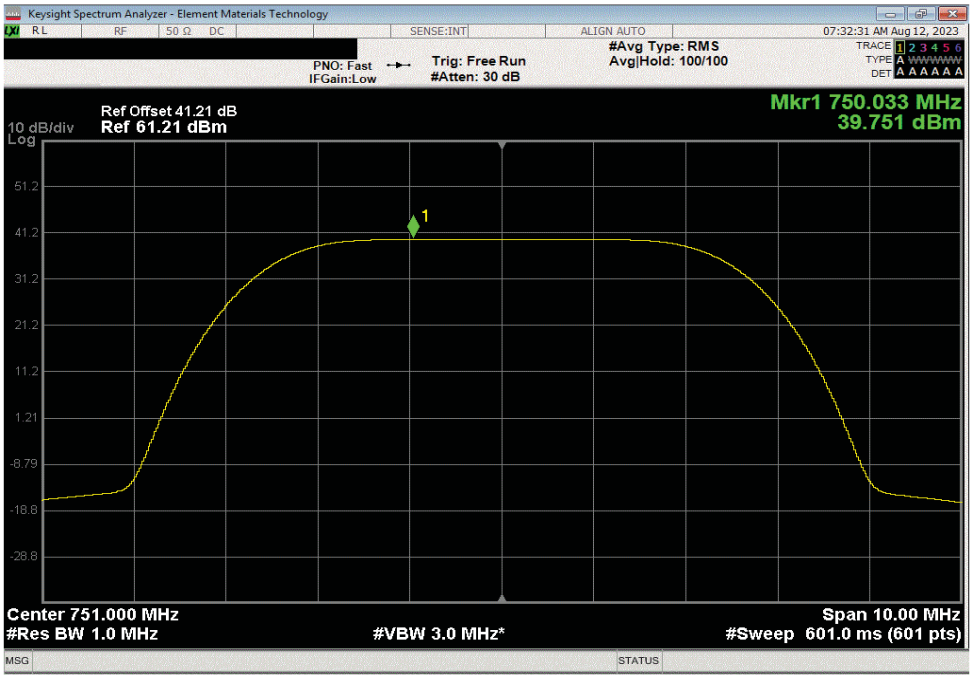
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.729	0	39.729	42.729	45.729	



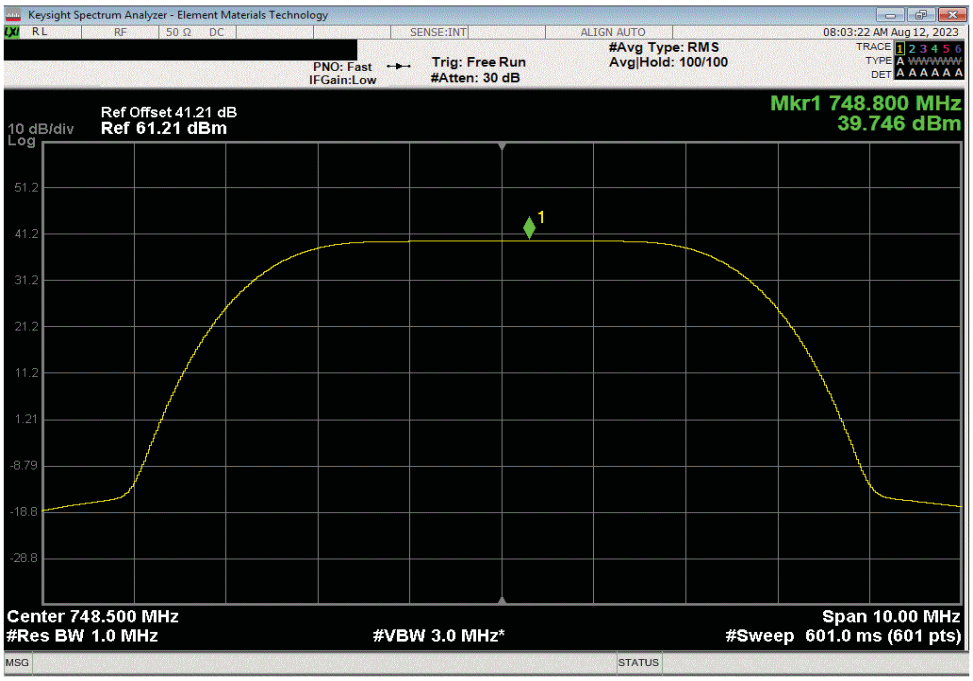
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.707	0	39.707	42.707	45.707	



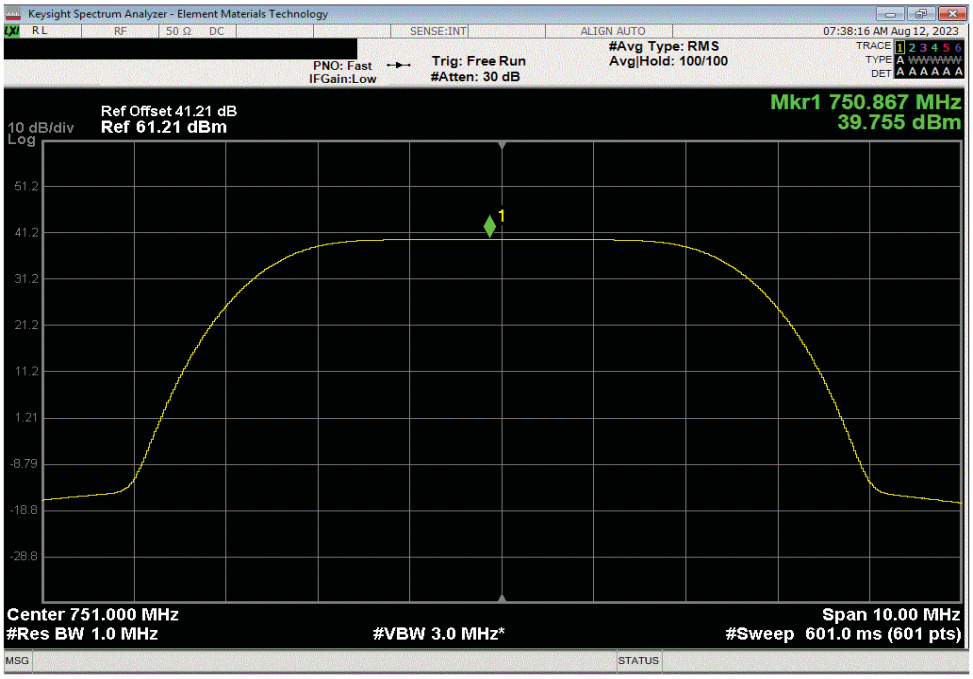
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.751	0	39.751	42.751	45.751	



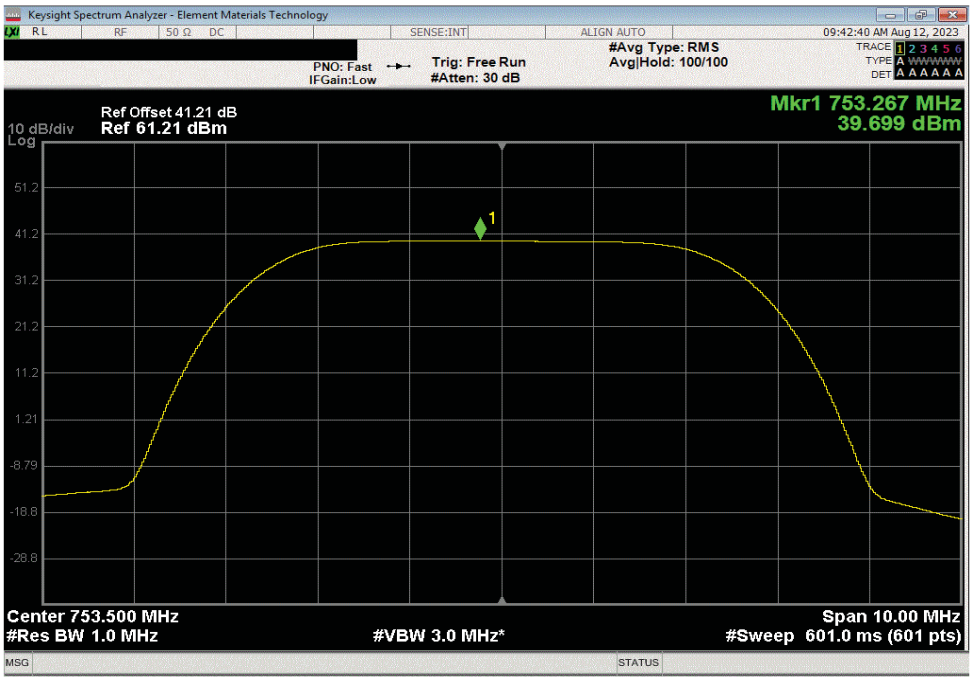
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.746	0	39.746	42.746	45.746	



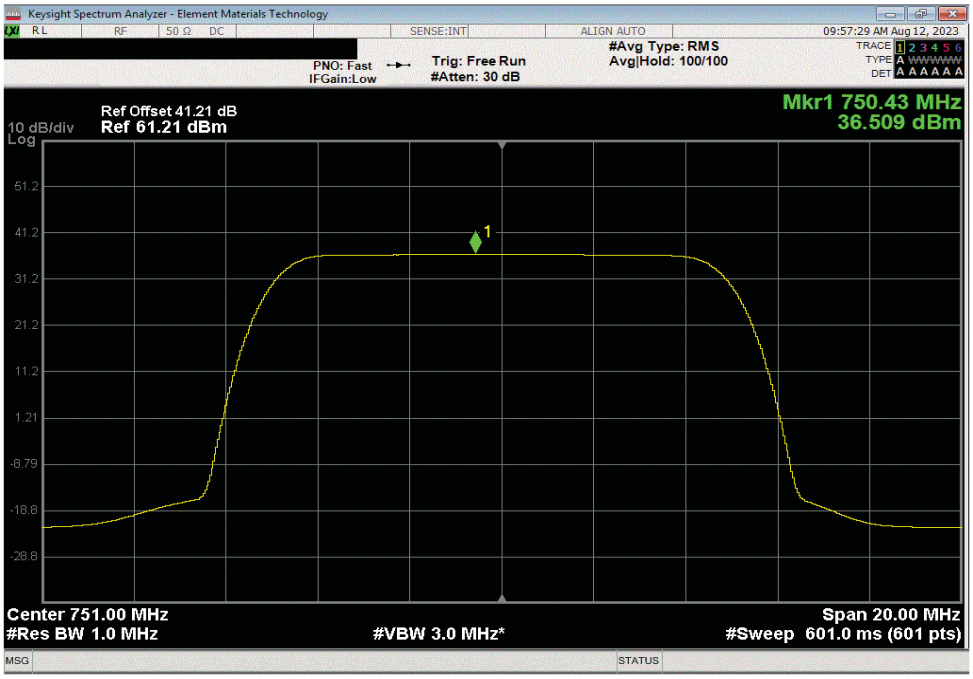
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.755	0	39.755	42.755	45.755	



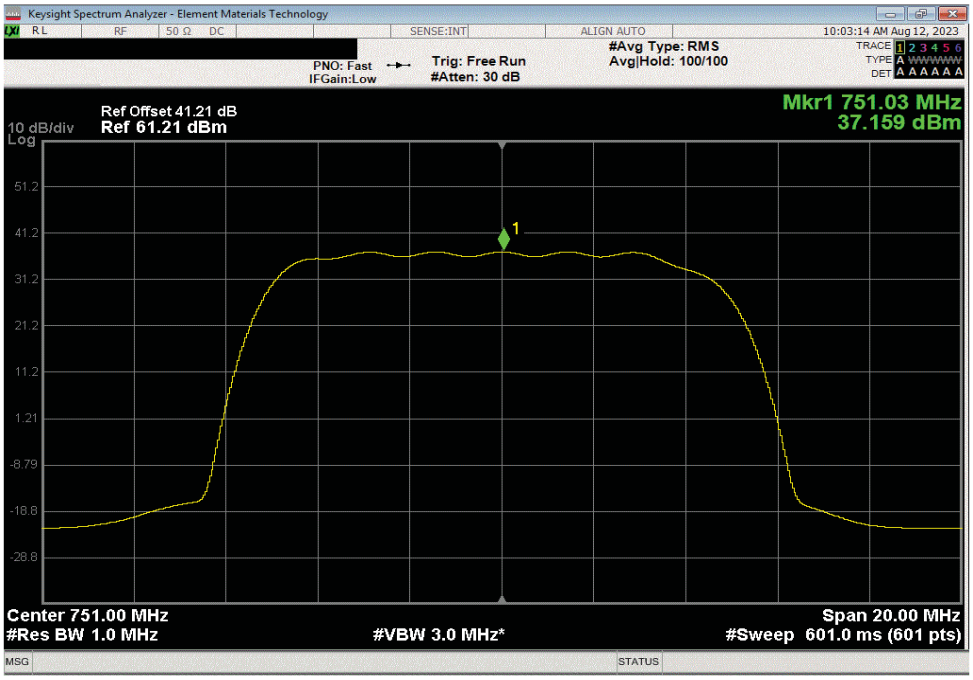
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.699	0	39.699	42.699	45.699	



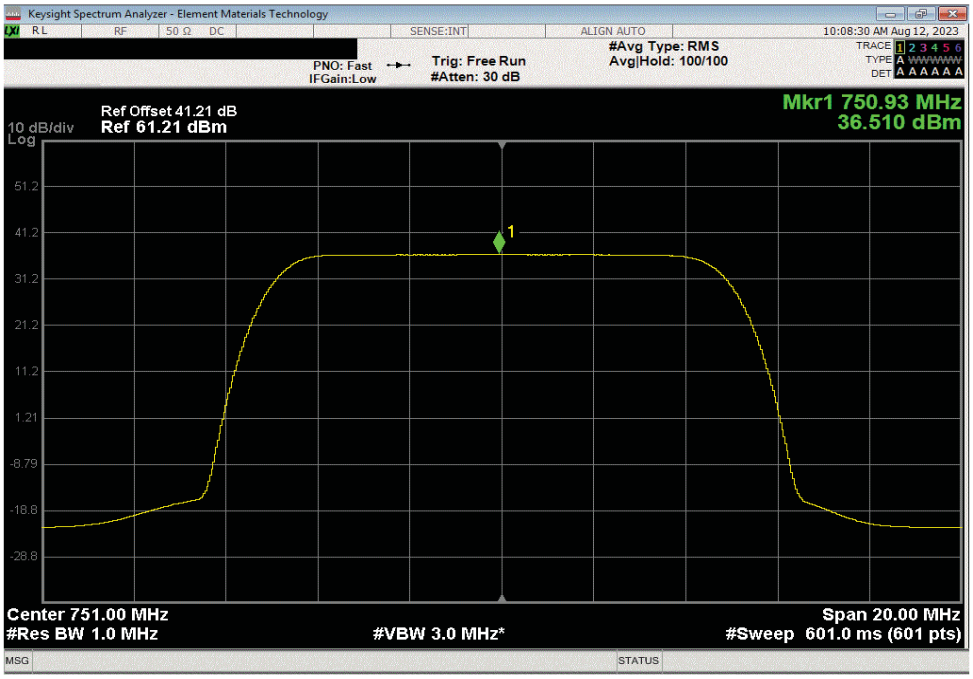
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.509	0	36.509	39.509	42.509	



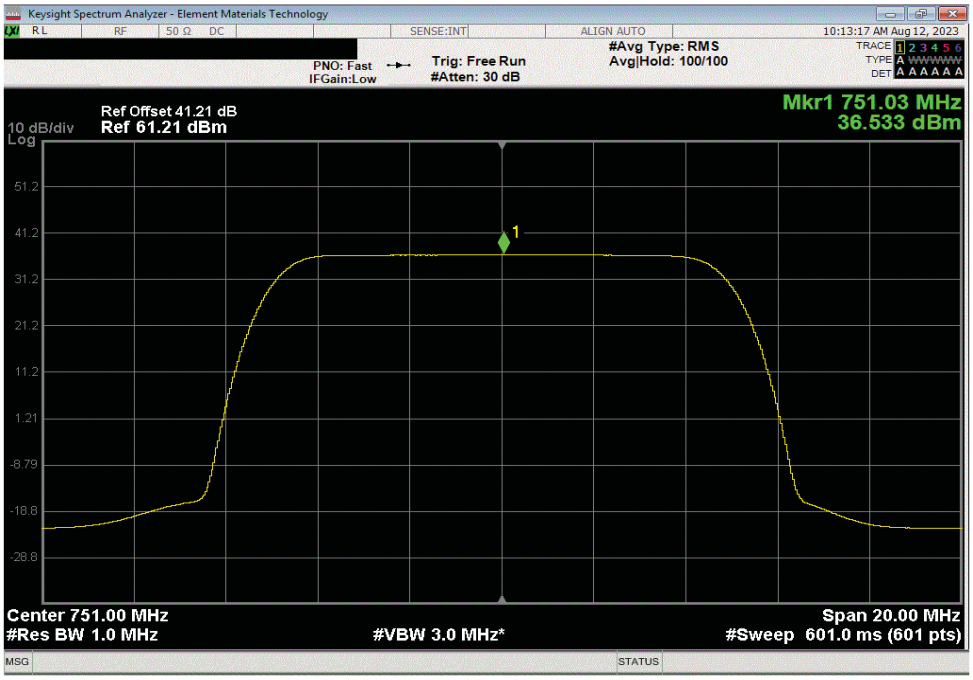
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	37.159	0	37.159	40.159	43.159	



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.51	0	36.51	39.51	42.51	



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.533	0	36.533	39.533	42.533	



EIRP Calculations for Four Port MIMO Operations for Band n13 Single NR Carriers

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon CommScope antenna assembly model "FF-65C-R1". The maximum Band n13 gain (15.8dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators used for Band n13. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHBCC transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	5 MHz Ch BW	10 MHz Ch BW
Worst Case PSD/Antenna Port	39.8dBm/MHz	37.2dBm/MHz
Number of Ant Ports per Polarization	2	2
Total PSD per Polarization 10*Log (2) = +3	42.8	40.2
Cable Loss (site dependent)	0 dB	0dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	15.8 dBi	15.8 dBi
EIRP per Polarization	58.6dBm/MHz	56.0dBm/MHz
Number of Polarizations	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	58.6dBm/MHz	56.0dBm/MHz
Passing FCC and ISED EIRP Limits	62.15 & 65.16 dBm/MHz	62.15 & 65.16 dBm/MHz

Note 1: The directional gain is equal to antenna gain since the transmit signals are completely uncorrelated. See ANSI C63.26 sections 6.4.5.2.3b) and 6.4.5.3.1b) for guidance.
Note 2: The EIRP per antenna polarity is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

EIRP Calculation Summary

The worst case AHBCC four port MIMO Band n13 EIRP levels using antenna assembly model "FF-65C-R1" are:
(1) Less than the FCC and ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 5 and 10MHz channel bandwidths.
(2) Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 5 and 10MHz channel bandwidths.

OCCUPIED BANDWIDTH

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

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

- RBW is 1% - 5% of the occupied bandwidth
- VBW is ≥ 3x the RBW
- Peak Detector was used
- Trace max hold was used

RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown during output power testing on the original certification effort) 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, 6.4.

A plot was taken to show the occupied bandwidth is contained within the allowable transmit band. FCC 27.53 defines the emission bandwidth to be used as 26dB down. RSS Gen Section 6.6 defines the 99% emission bandwidth requirement.

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

Band n13 (746 MHz to 756 MHz) Emission Designators derived from the measurement results

FCC and ISED Emission Designators for Band n13 (746MHz to 756MHz)									
Ch BW	Radio Channel	5G-NR: QPSK		5G-NR: 16QAM		5G-NR: 64QAM		5G-NR: 256QAM	
		FCC	ISED	FCC	ISED	FCC	ISED	FCC	ISED
5MHz	Low							4M85G7W	4M50G7W
	Mid	4M85G7W	4M48G7W	4M83G7W	4M51G7W	4M85G7W	4M47G7W	4M83G7W	4M48G7W
	High							4M83G7W	4M48G7W
10MHz									
	Mid	9M88G7W	9M29G7W	9M82G7W	9M22G7W	9M87G7W	9M29G7W	9M89G7W	9M32G7W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.									

OCCUPIED BANDWIDTH

TbtTx 2022.06.03.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			**Work Order:**	NOKI0069
Serial Number:	See Configuration			**Date:**	08/11/2023
Customer:	Nokia Solutions and Networks			**Temperature:**	21.6°C
Attendees:	Mitchell Hill			**Humidity:**	55.2%
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Brandon Hobbs	**Power:**	54VDC	**Job Site:**	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n13 carriers are enabled at maximum power (40 Watts/carrier).

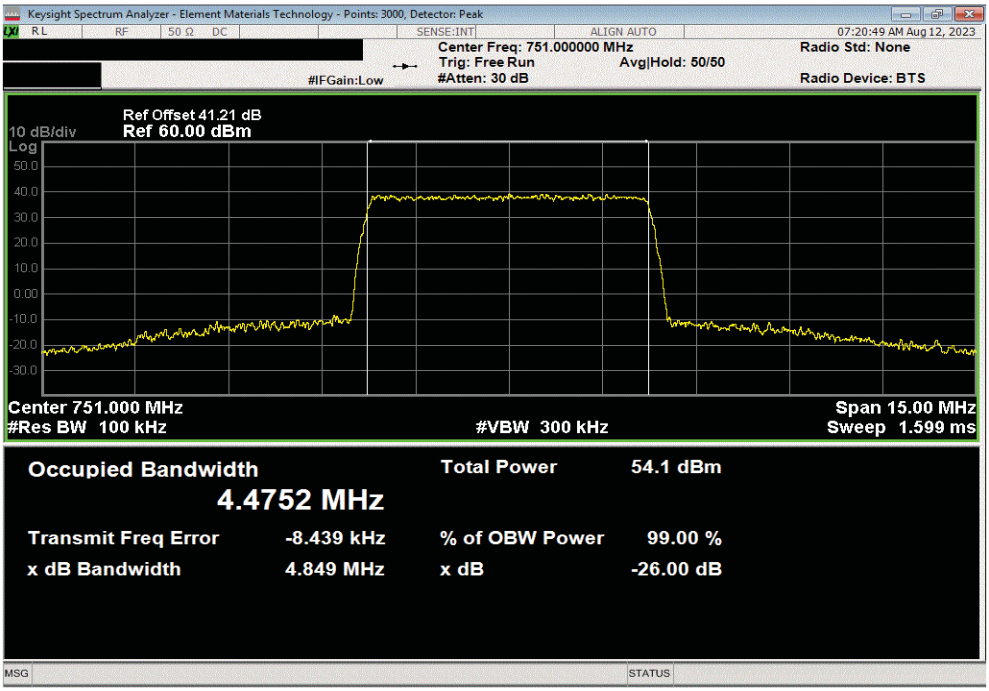
DEVIATIONS FROM TEST STANDARD

None

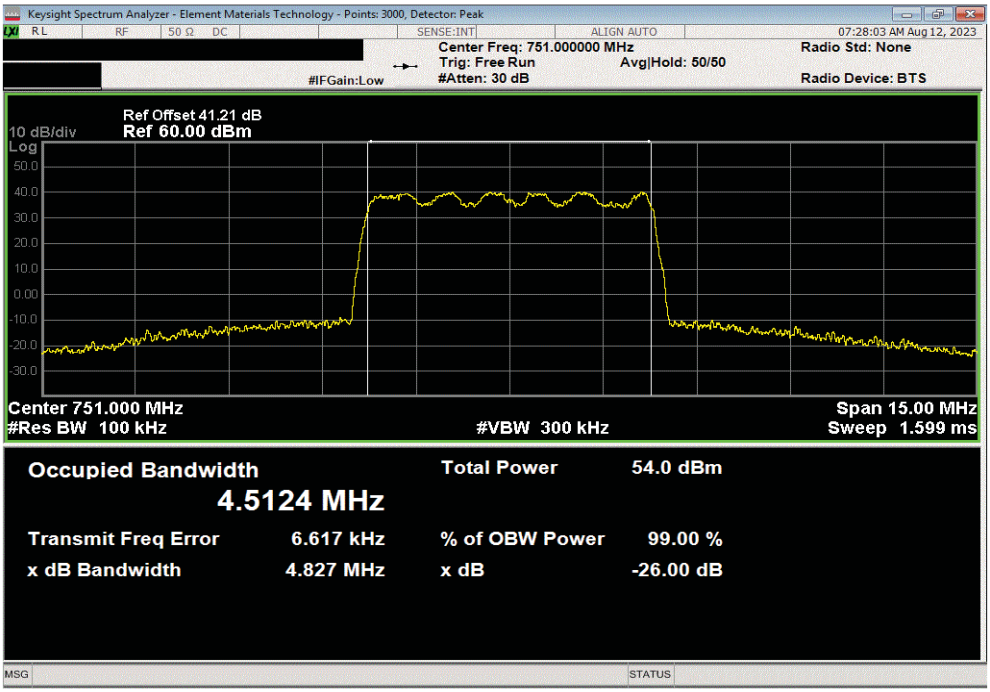
Configuration #	NOKI0069-2	Signature

	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 1				
Band n13, 746 - 756 MHz				
5 MHz Bandwidth				
QPSK Modulation				
Mid Channel, 751 MHz	4.48	4.85	Within Band	Pass
16QAM Modulation				
Mid Channel, 751 MHz	4.51	4.83	Within Band	Pass
64QAM Modulation				
Mid Channel, 751 MHz	4.47	4.85	Within Band	Pass
256QAM Modulation				
Low Channel, 748.5 MHz	4.50	4.85	Within Band	Pass
Mid Channel, 751 MHz	4.48	4.83	Within Band	Pass
High Channel, 753.5 MHz	4.48	4.83	Within Band	Pass
10 MHz Bandwidth				
QPSK Modulation				
Mid Channel, 751 MHz	9.29	9.88	Within Band	Pass
16QAM Modulation				
Mid Channel, 751 MHz	9.22	9.82	Within Band	Pass
64QAM Modulation				
Mid Channel, 751 MHz	9.29	9.87	Within Band	Pass
256QAM Modulation				
Mid Channel, 751 MHz	9.32	9.89	Within Band	Pass

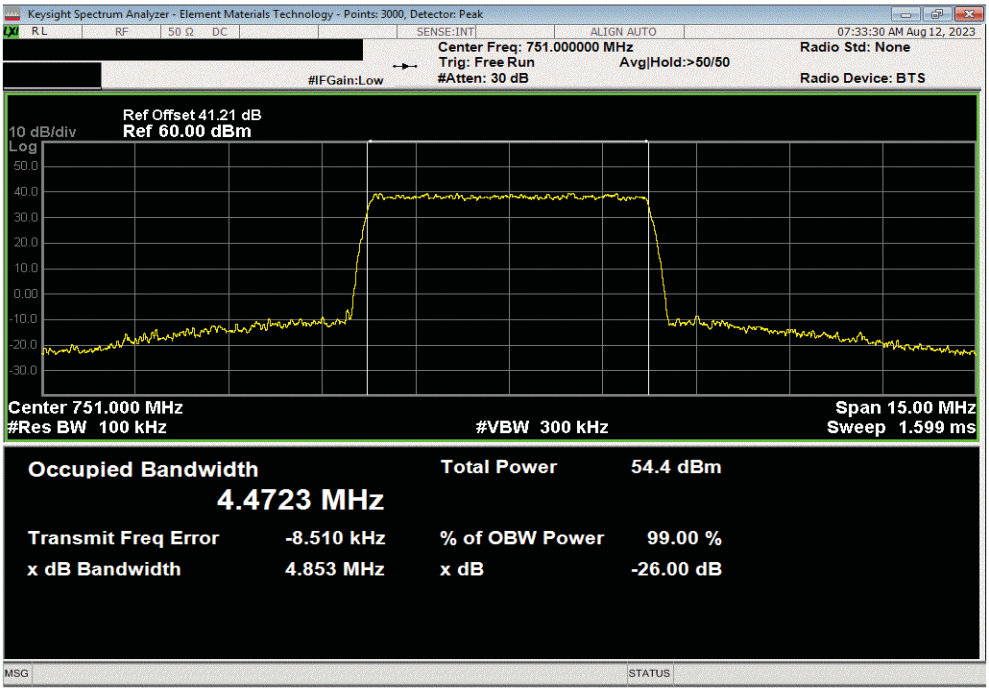
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.475	4.849	Within Band	Pass



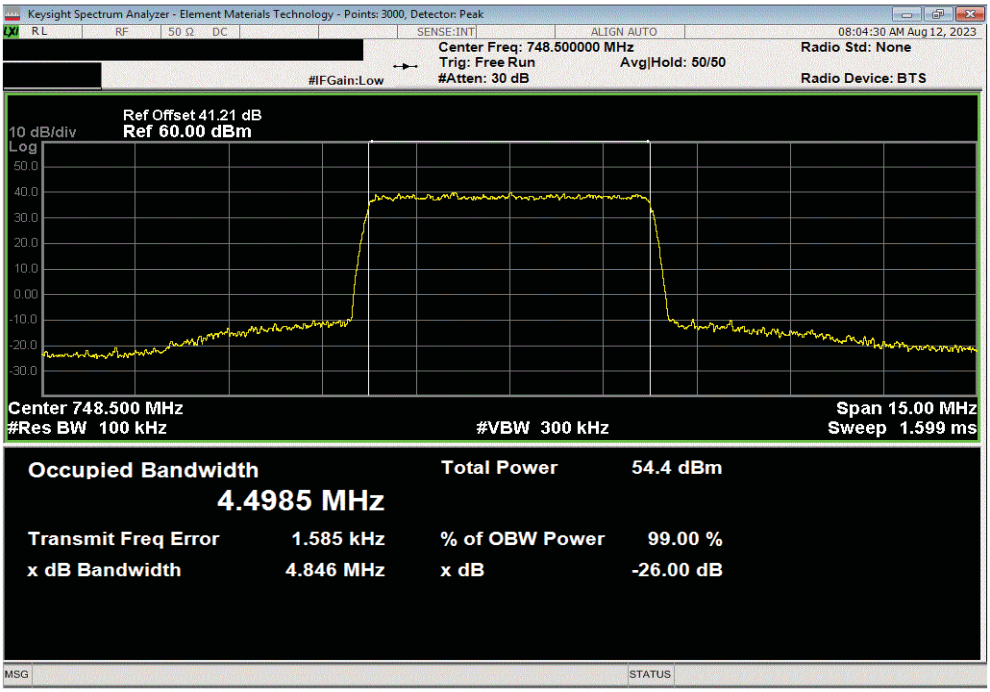
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.512	4.827	Within Band	Pass



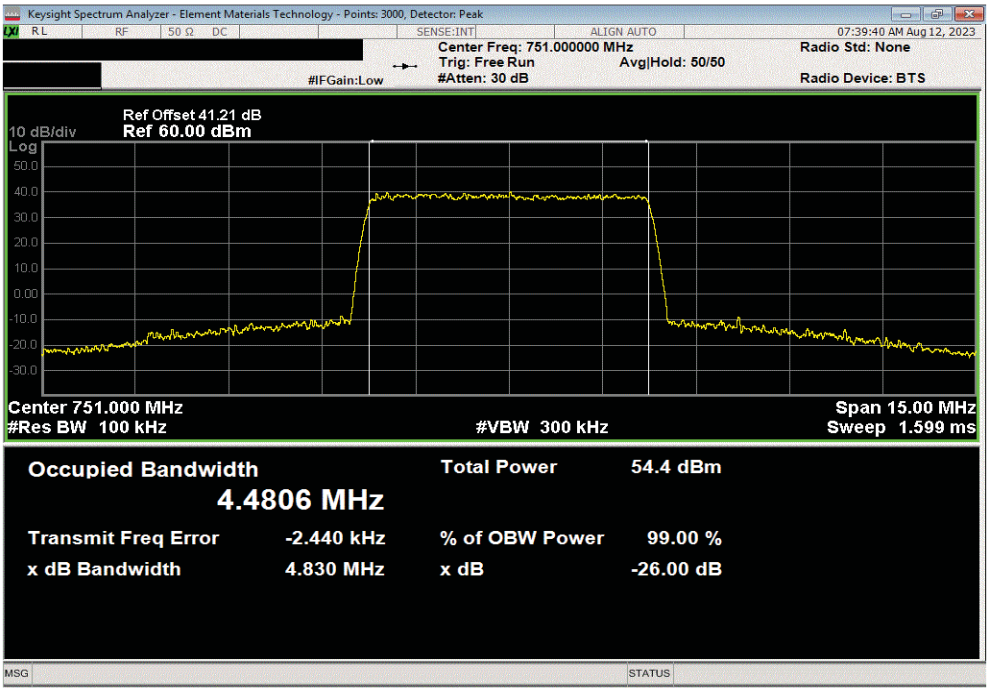
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.472	4.853	Within Band	Pass



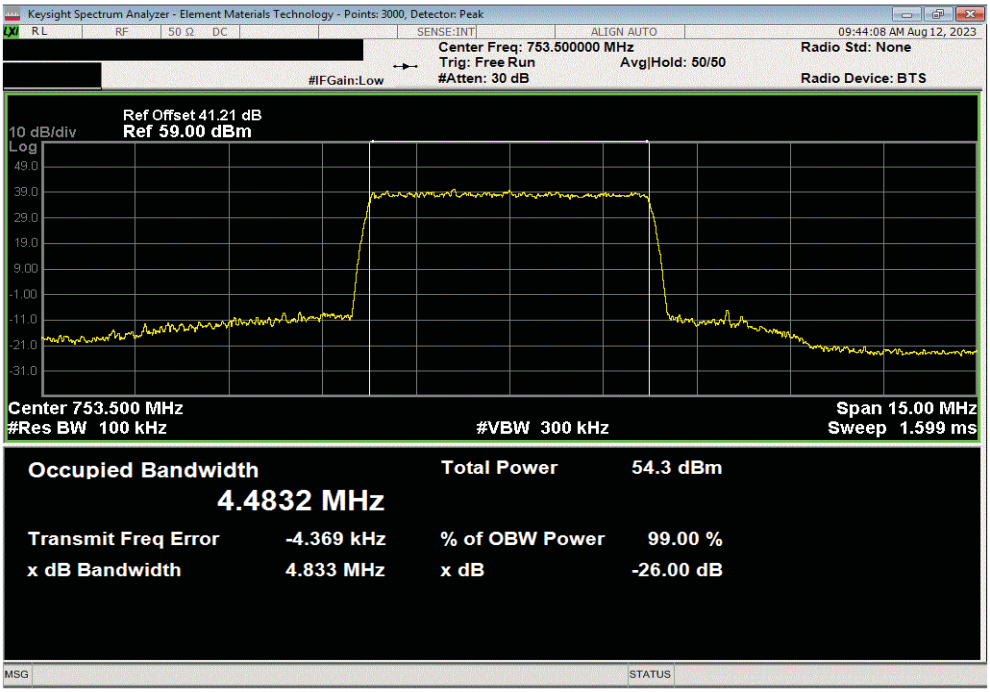
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.498	4.846	Within Band	Pass



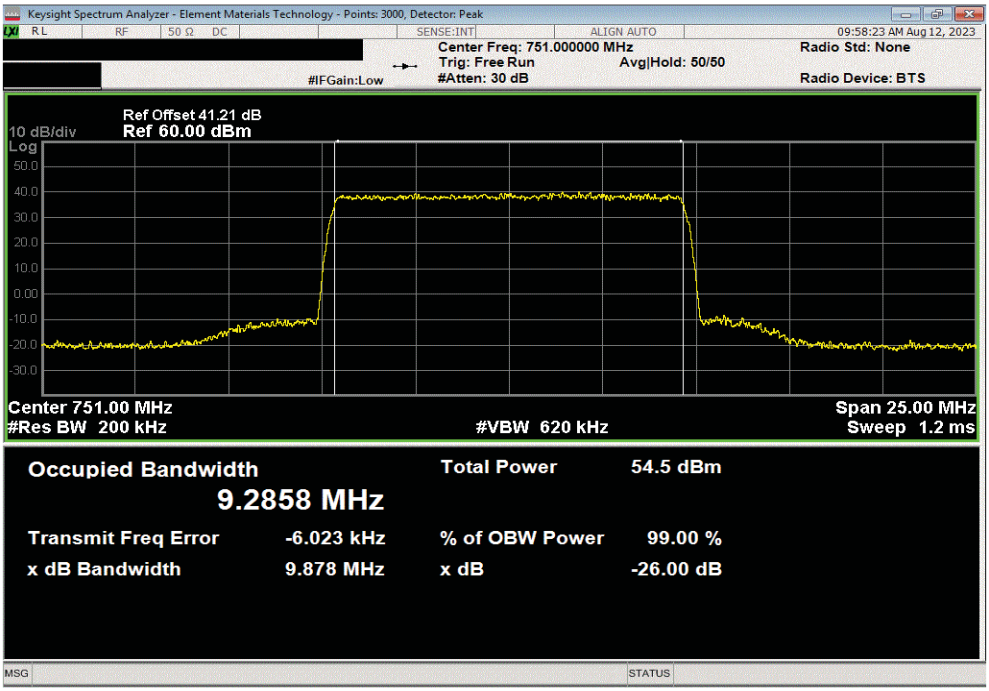
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.481	4.83	Within Band	Pass



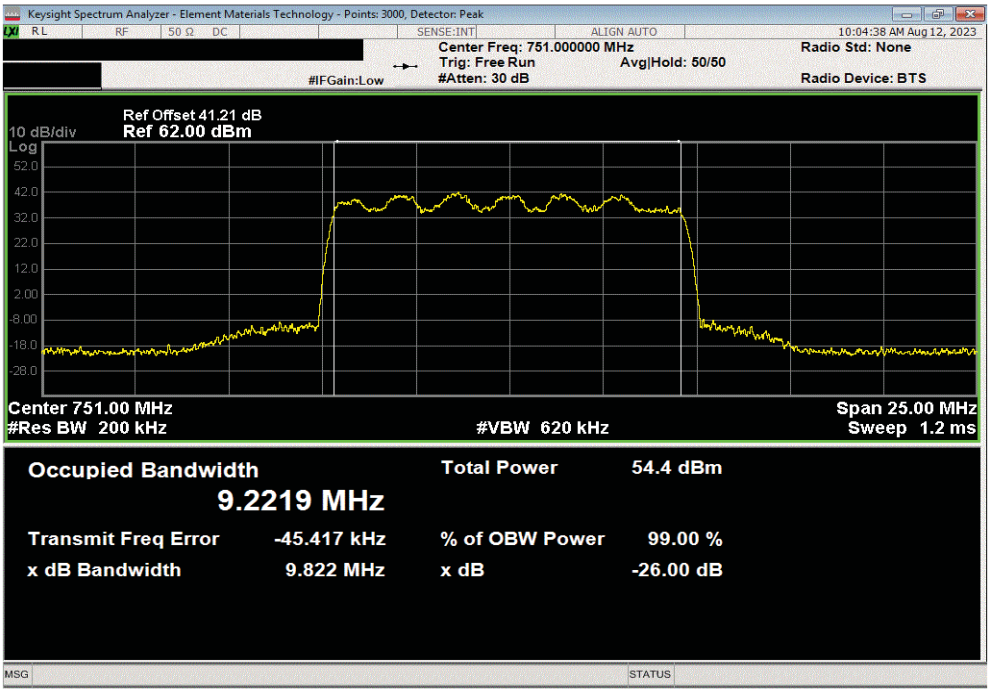
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.483	4.833	Within Band	Pass



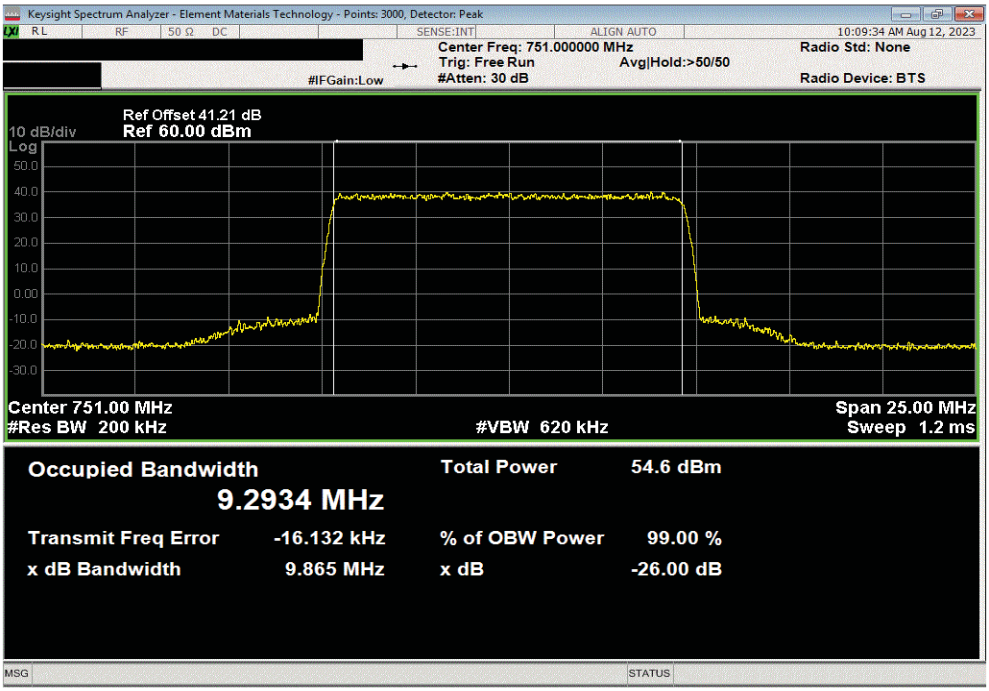
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.286	9.878	Within Band	Pass



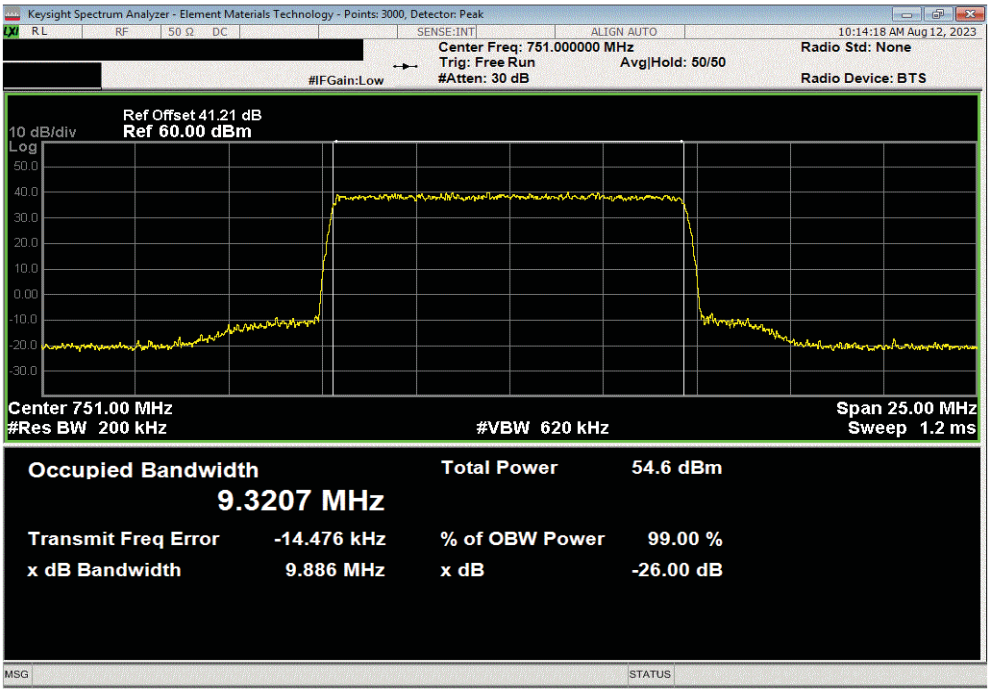
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.222	9.822	Within Band	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.293	9.865	Within Band	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.321	9.886	Within Band	Pass



AVERAGE POWER

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

AVERAGE POWER

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/11/2023
Customer:	Nokia Solutions and Networks			Temperature:	21.8°C
Attendees:	Mitchell Hill			Humidity:	53.8%
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

The total output power for multiport (2x2 MIMO, 4x4 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for two port operation is single port power + 3dB [i.e. 10log(2)]. The total output power for four port operation is single port + 6db [i.e. 10log(4)]. All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. Band n13 carriers are enabled at maximum power (40 watts/carrier).

DEVIATIONS FROM TEST STANDARD

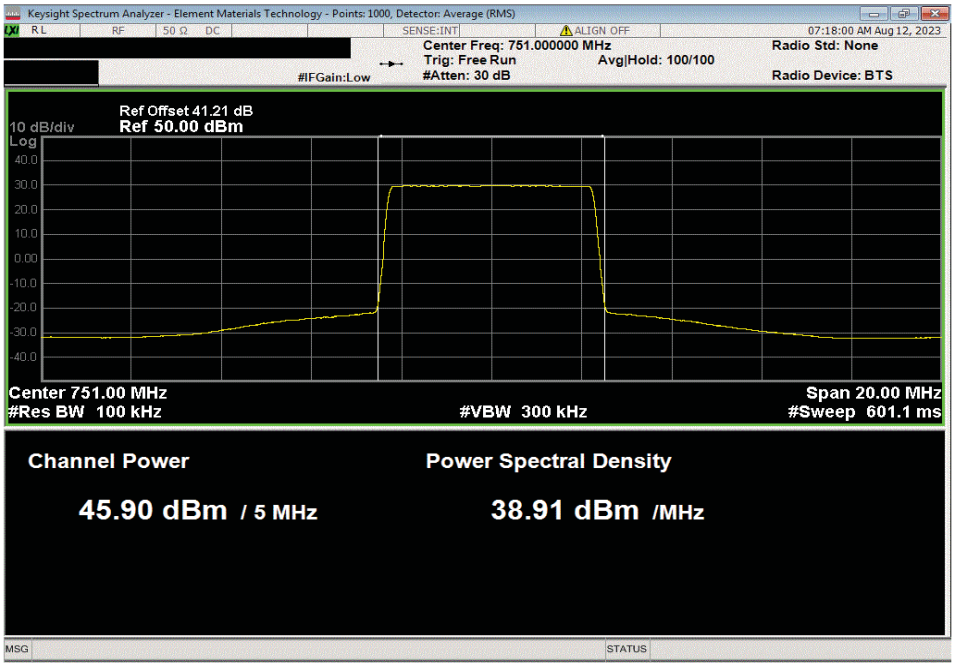
None

Configuration #	NOKI0069-2	Signature

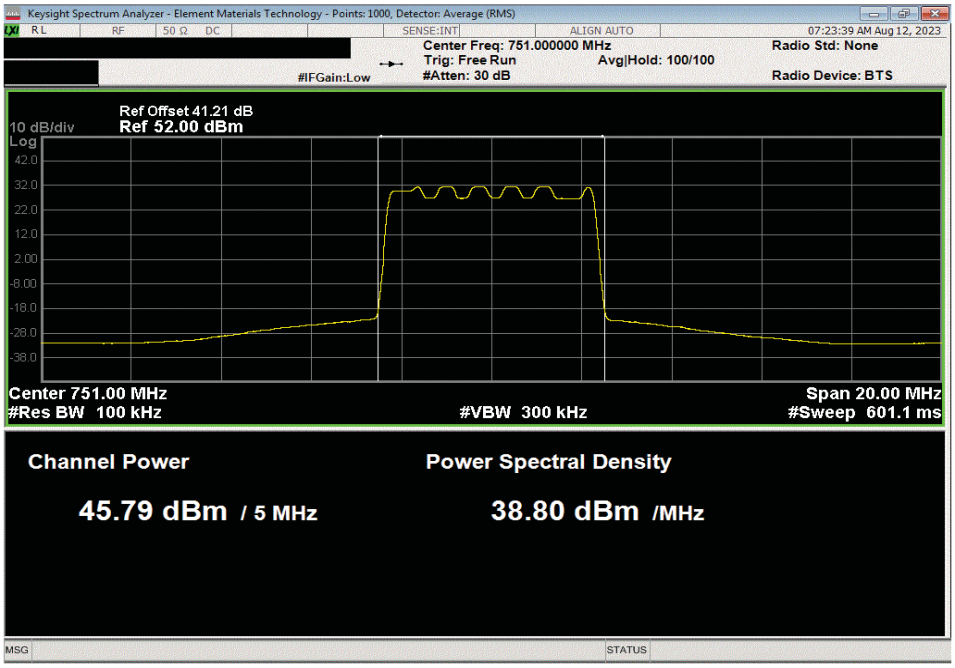
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
Port 1						
Band n13, 746 - 756 MHz						
5 MHz Bandwidth						
QPSK Modulation						
Mid Channel, 751 MHz	45.903	0	45.9	48.9	51.9	Pass
16QAM Modulation						
Mid Channel, 751 MHz	45.793	0	45.8	48.8	51.8	Pass
64QAM Modulation						
Mid Channel, 751 MHz	46.022	0	46.0	49.0	52.0	Pass
256QAM Modulation						
Low Channel, 748.5 MHz	45.986	0	46.0	49.0	52.0	Pass
Mid Channel, 751 MHz	45.990	0	46.0	49.0	52.0	Pass
High Channel, 753.5 MHz	45.775	0	45.8	48.8	51.8	Pass
10 MHz Bandwidth						
QPSK Modulation						
Mid Channel, 751 MHz	45.899	0	45.9	48.9	51.9	Pass
16QAM Modulation						
Mid Channel, 751 MHz	45.767	0	45.8	48.8	51.8	Pass
64QAM Modulation						
Mid Channel, 751 MHz	45.855	0	45.9	48.9	51.9	Pass
256QAM Modulation						
Mid Channel, 751 MHz	45.867	0	45.9	48.9	51.9	Pass

AVERAGE POWER

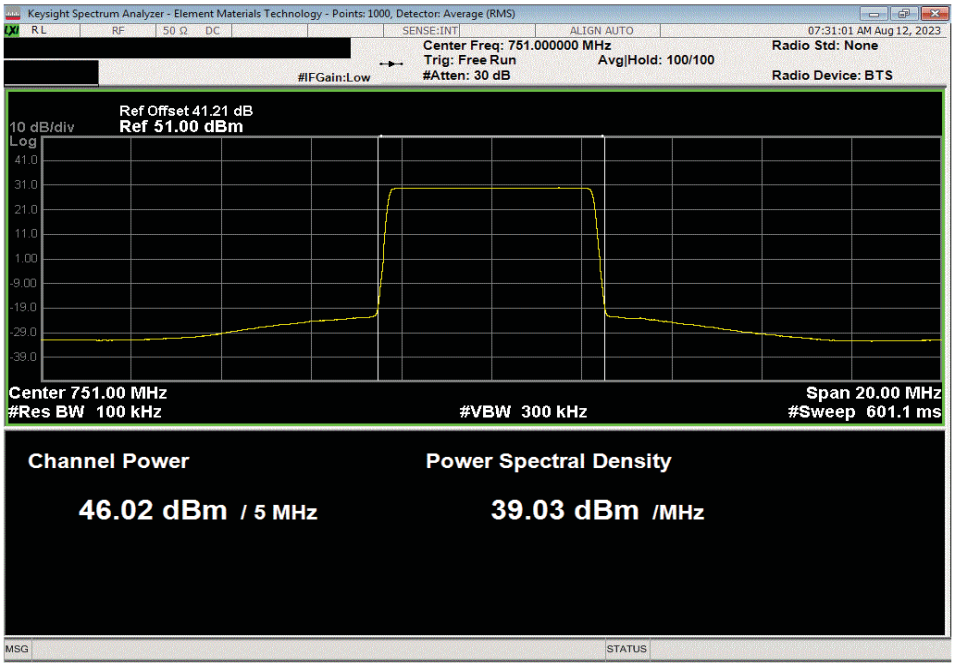
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.903	0	45.903	48.903	51.903	Pass



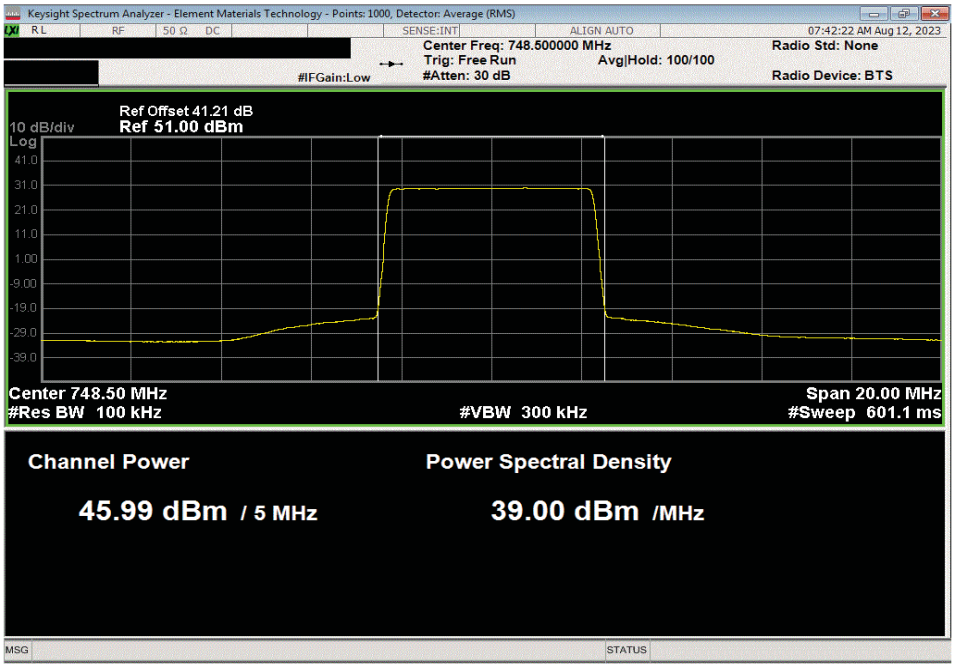
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.793	0	45.793	48.793	51.793	Pass



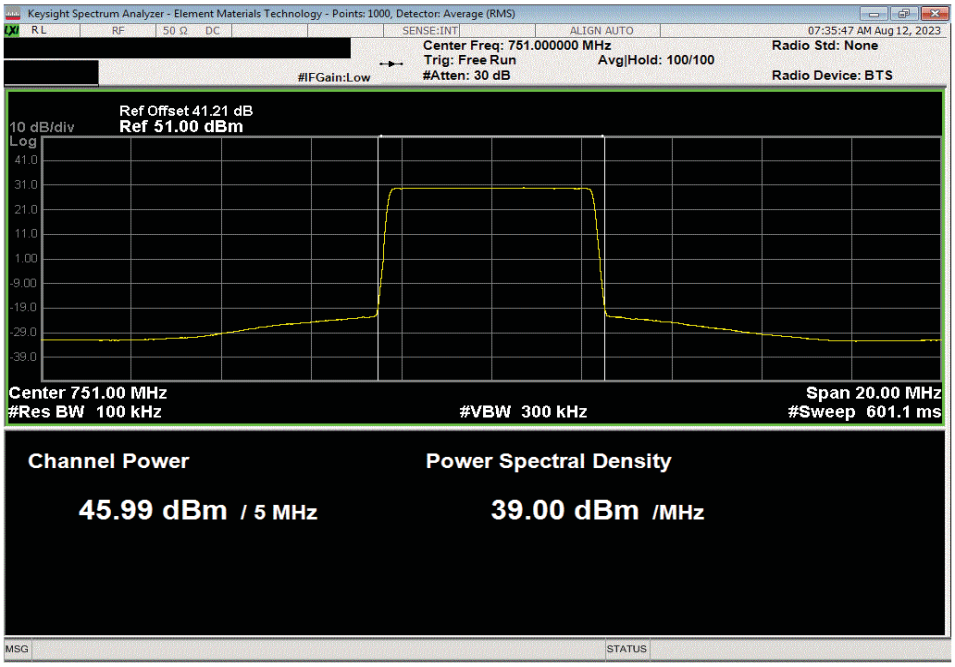
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	46.022	0	46.022	49.022	52.022	Pass



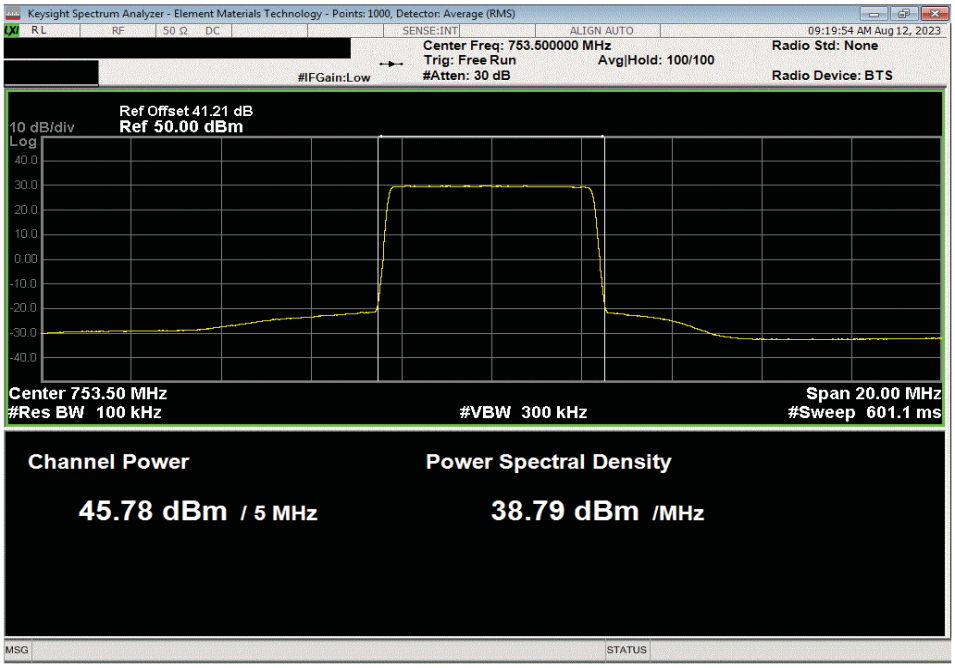
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.986	0	45.986	48.986	51.986	Pass



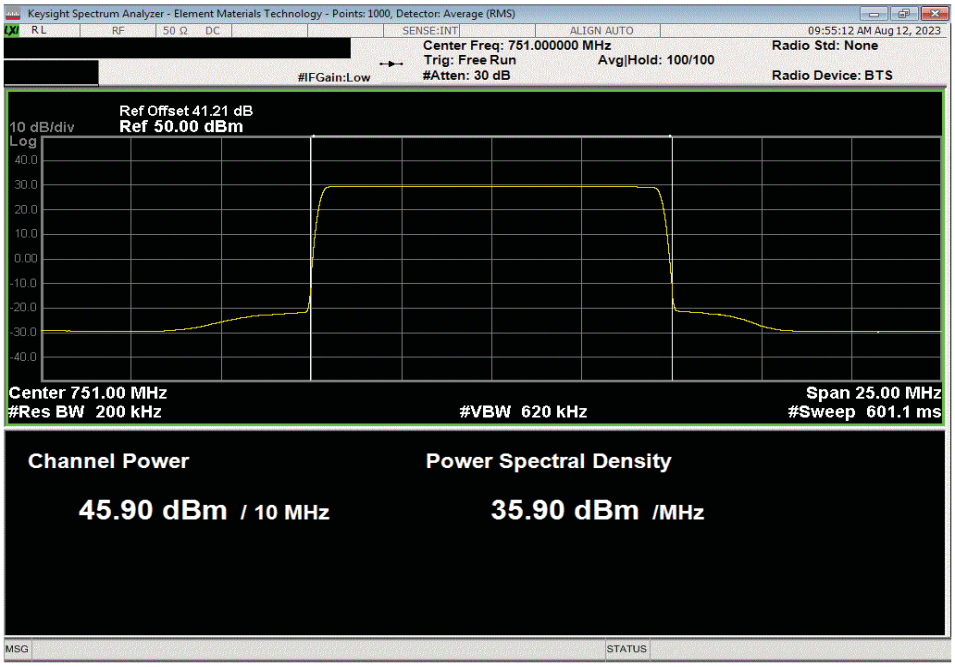
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.99	0	45.99	48.99	51.99	Pass



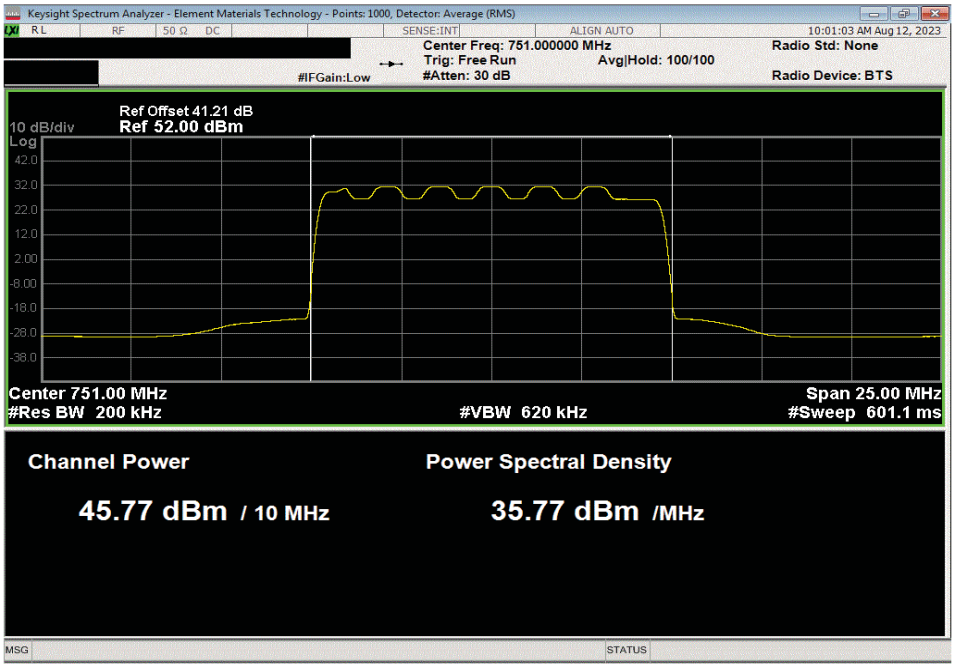
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.775	0	45.775	48.775	51.775	Pass



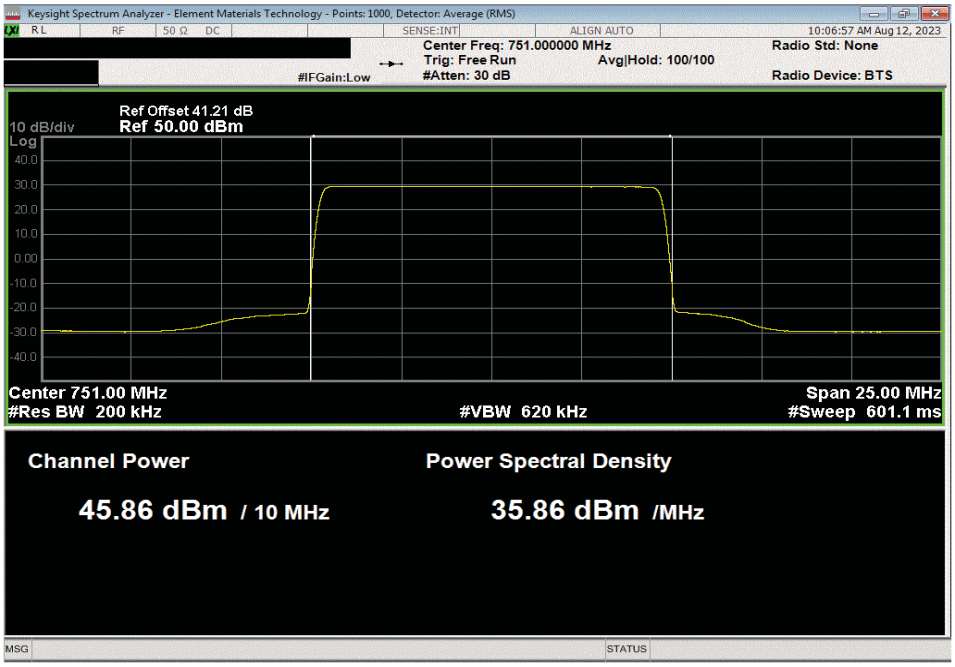
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.899	0	45.899	48.899	51.899	Pass



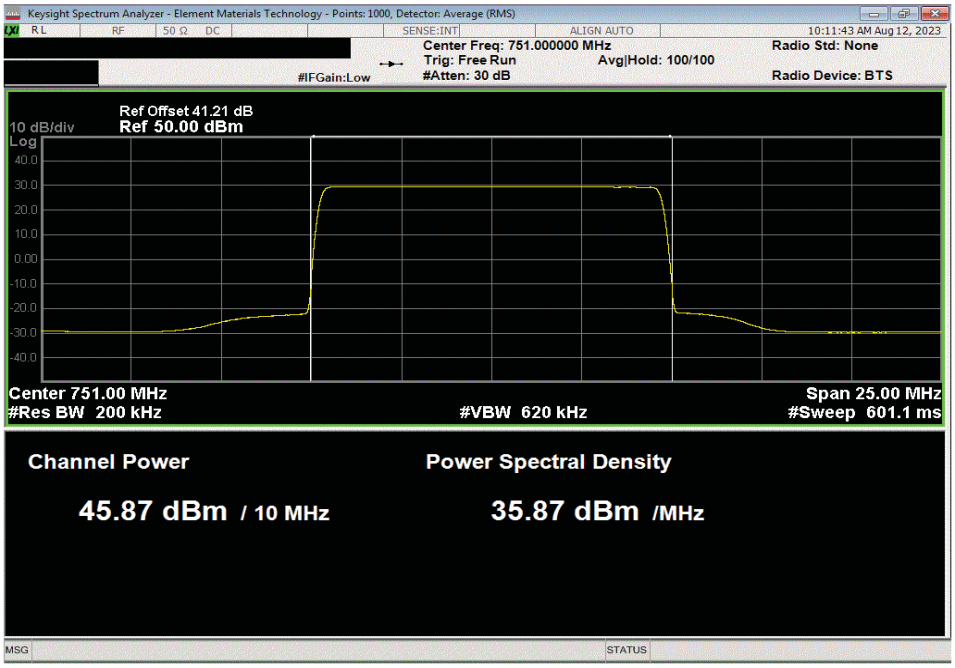
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.767	0	45.767	48.767	51.767	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.855	0	45.855	48.855	51.855	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	45.867	0	45.867	48.867	51.867	Pass



AVERAGE POWER - MULTICARRIER

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

Multicarrier Test Cases are comprised of Band n5 and Band n13 carriers operate simultaneously.

Three 5MHz carriers with 2 carriers at the Bottom (871.5MHz and 876.5MHz) and 1 at the top (891.5MHz) of the Band n5 are operated at (13.3W/Carrier). Two NR 5MHz carriers in Band n13 (748.5 & 753.5MHz) are operated at (20W/carrier) to provide a total maximum port power of 80 watts.

The smallest channel bandwidth was selected to maximize carrier power spectral density.

AVERAGE POWER - MULTICARRIER

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/11/2023
Customer:	Nokia Solutions and Networks			Temperature:	21.2°C
Attendees:	Mitchell Hill			Humidity:	54%
Project:	None			Barometric Pres.:	1009 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023, FCC 22H:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019, RSS-132 Issue 4:2023	ANSI C63.26:2015

COMMENTS

The total output power for multiport (2x2 MIMO, 4x4 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for two port operation is single port power + 3dB [i.e. 10log(2)]. The total output power for four port operation is single port + 6db [i.e. 10log(4)]. All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. Band n13 carriers are operating at (20 watts/carrier), Band n5 are operating at (13.3 watts/carrier) for a total port power of 80 watts.

DEVIATIONS FROM TEST STANDARD

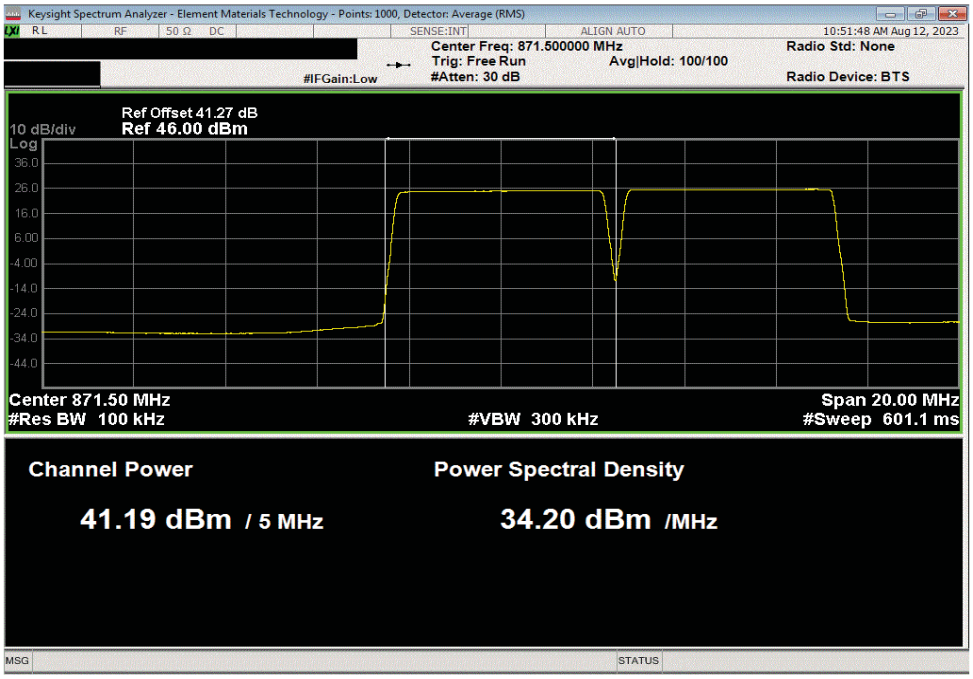
None

Configuration #	NOKI0069-2	*Signature*

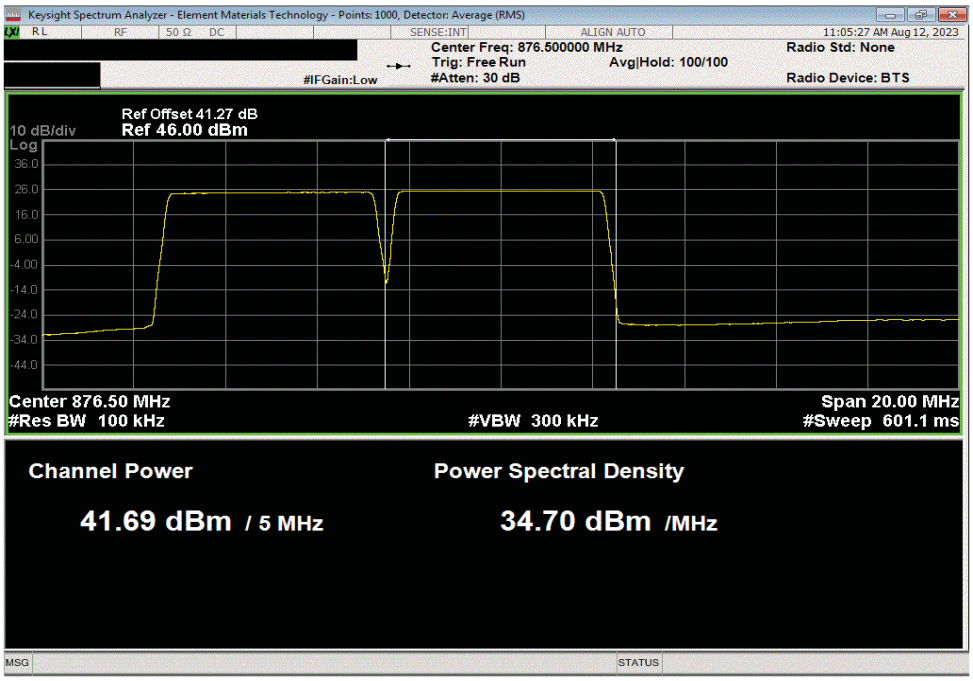
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
Port 1						
Multi-Carrier Test Case 1						
QPSK Modulation						
Low 871.5 MHz n5 NR5 13.3W	41.189	0	41.2	44.2	47.2	Pass
Mid 876.5 MHz n5 NR5 13.3W	41.687	0	41.7	44.7	47.7	Pass
High 891.5 MHz n5 NR5 13.3W	41.125	0	41.1	44.1	47.1	Pass
Low 748.5 MHz n13 NR5 20W	42.910	0	42.9	45.9	48.9	Pass
High 753.5 MHz n13 NR5 20W	42.687	0	42.7	45.7	48.7	Pass

AVERAGE POWER - MULTICARRIER

Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 871.5 MHz n5 NR5 13.3W						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	41.189	0	41.189	44.189	47.189	Pass

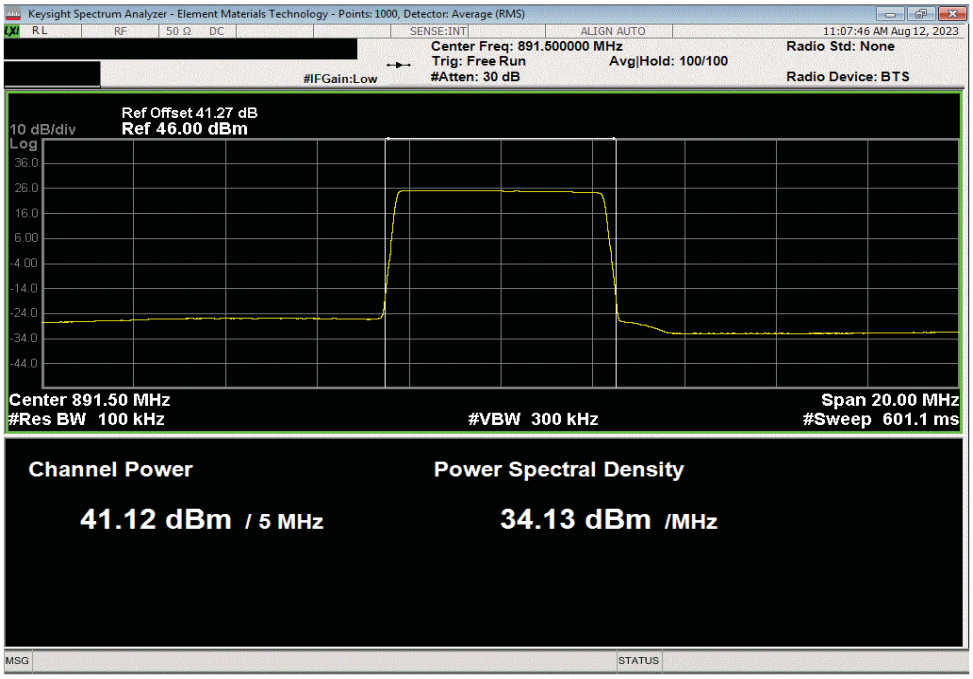


Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Mid 876.5 MHz n5 NR5 13.3W						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	41.687	0	41.687	44.687	47.687	Pass

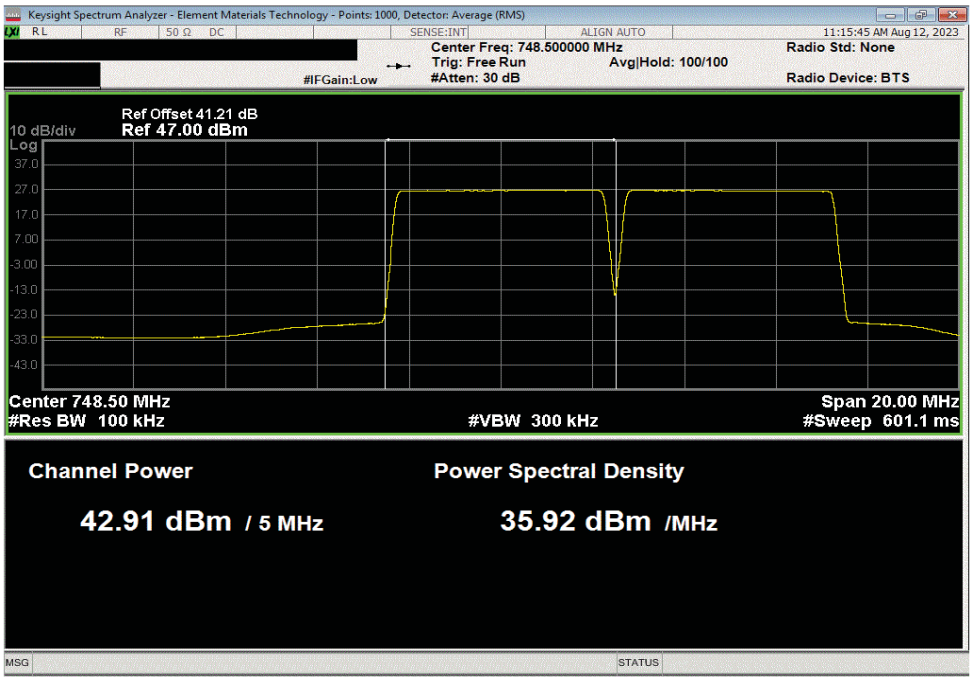


AVERAGE POWER - MULTICARRIER

Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 891.5 MHz n5 NR5 13.3W						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	41.125	0	41.125	44.125	47.125	Pass

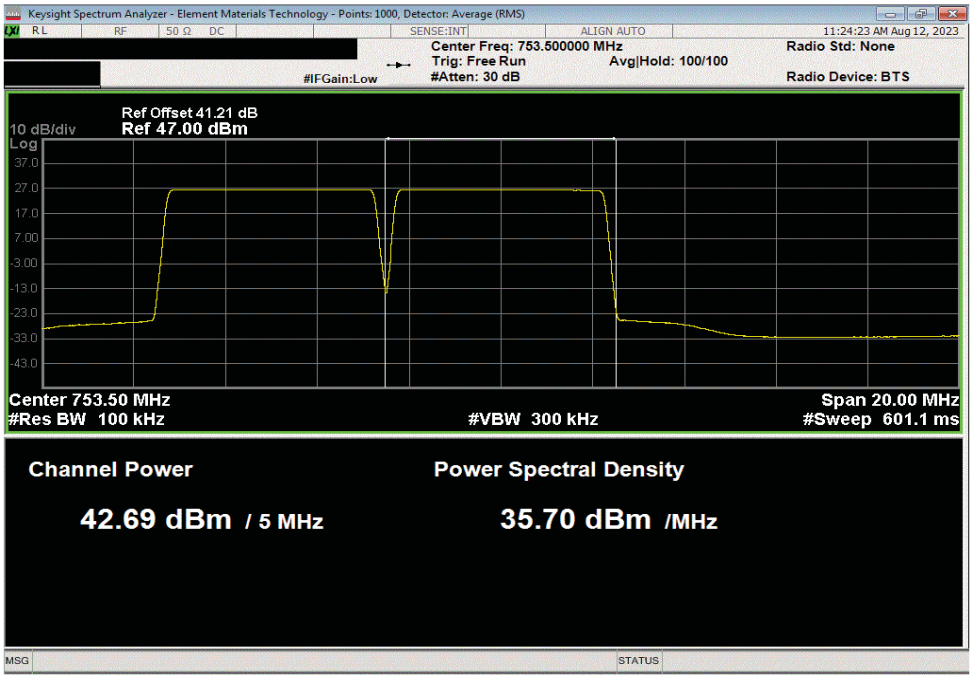


Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 748.5 MHz n13 NR5 20W						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	42.91	0	42.91	45.91	48.91	Pass



AVERAGE POWER - MULTICARRIER

Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 753.5 MHz n13 NR5 20W						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Results
	42.687	0	42.687	45.687	48.687	Pass



PEAK TO AVERAGE POWER (PAPR) CCDF

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

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

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC Part 27.50 and RSS-130 section 4.4, the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.

RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

PEAK TO AVERAGE POWER (PAPR) CCDF

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			**Work Order:**	NOKI0069
Serial Number:	See Configuration			**Date:**	08/11/2023
Customer:	Nokia Solutions and Networks			**Temperature:**	21.8°C
Attendees:	Mitchell Hill			**Humidity:**	53.3%
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Brandon Hobbs	**Power:**	54VDC	**Job Site:**	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n13 carriers are enabled at maximum power (40 Watts/carrier).

DEVIATIONS FROM TEST STANDARD

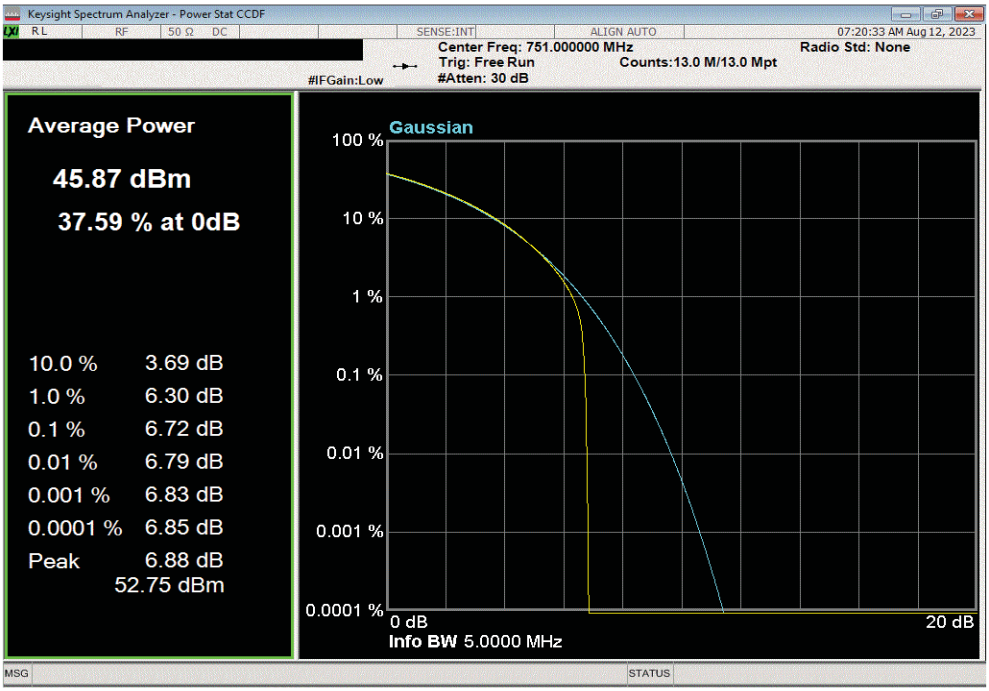
None

Configuration #	NOKI0069-2	Signature

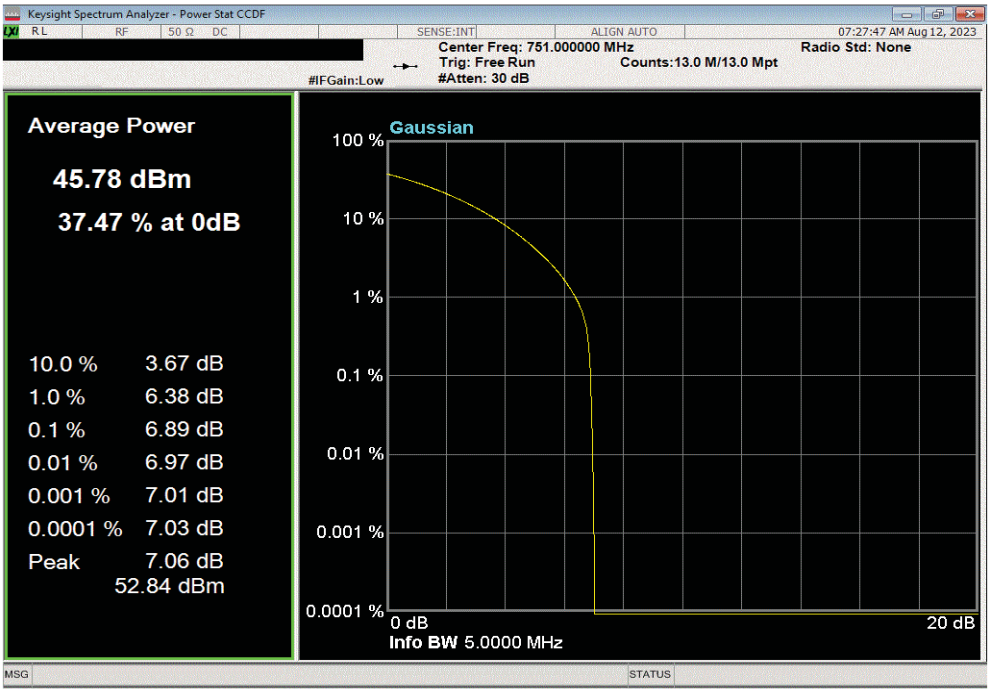
	0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
Port 1			
Band n13, 746 - 756 MHz			
5 MHz Bandwidth			
QPSK Modulation			
Mid Channel, 751 MHz	6.72	13	Pass
16QAM Modulation			
Mid Channel, 751 MHz	6.89	13	Pass
64QAM Modulation			
Mid Channel, 751 MHz	6.66	13	Pass
256QAM Modulation			
Low Channel, 748.5 MHz	6.71	13	Pass
Mid Channel, 751 MHz	6.70	13	Pass
High Channel, 753.5 MHz	6.74	13	Pass
10 MHz Bandwidth			
QPSK Modulation			
Mid Channel, 751 MHz	6.83	13	Pass
16QAM Modulation			
Mid Channel, 751 MHz	6.93	13	Pass
64QAM Modulation			
Mid Channel, 751 MHz	6.82	13	Pass
256QAM Modulation			
Mid Channel, 751 MHz	6.83	13	Pass

PEAK TO AVERAGE POWER (PAPR) CCDF

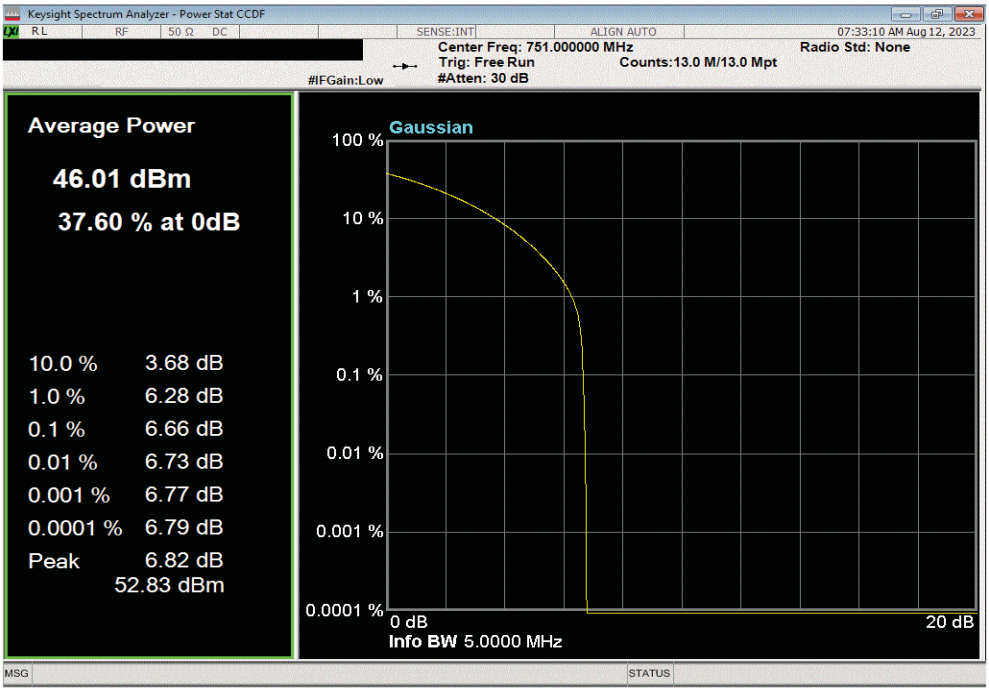
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.72	13	Pass



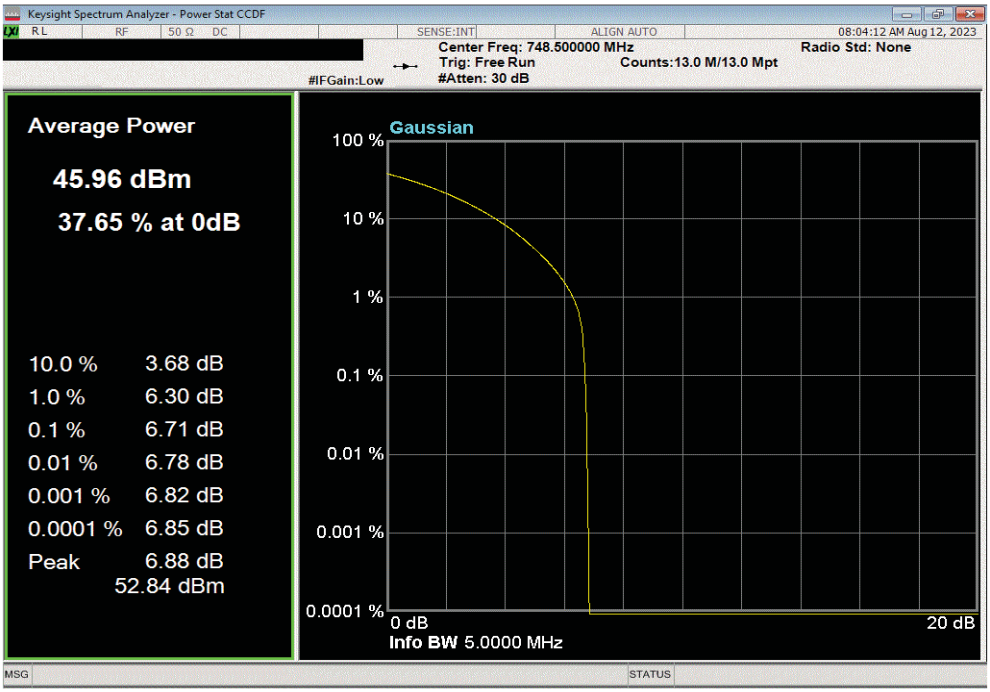
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.89	13	Pass



Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.66	13	Pass



Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.71	13	Pass

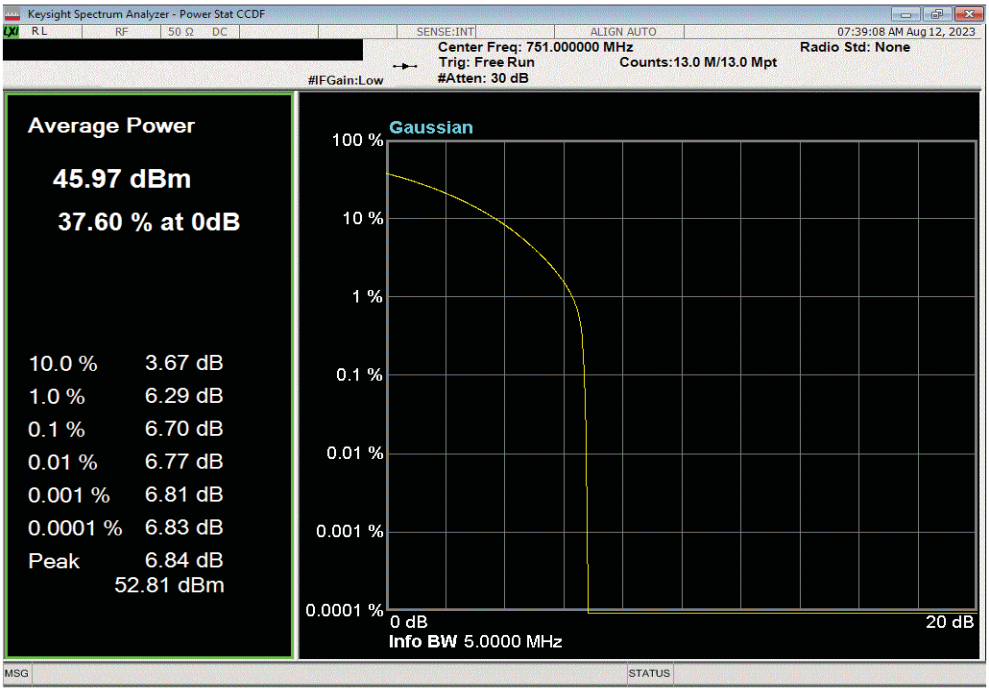


PEAK TO AVERAGE POWER (PAPR) CCDF

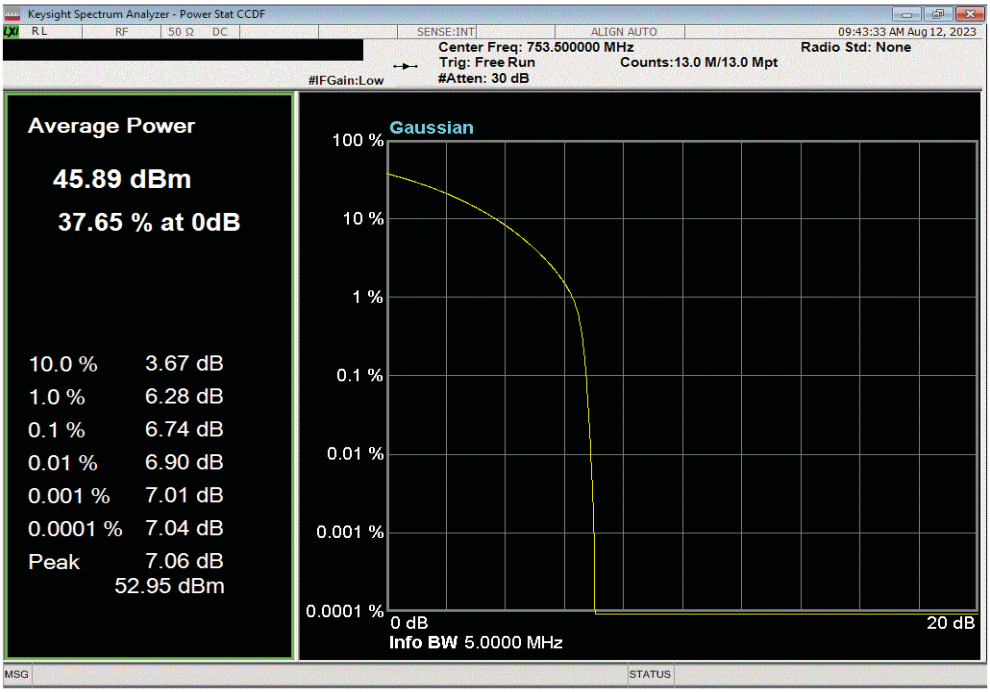
element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

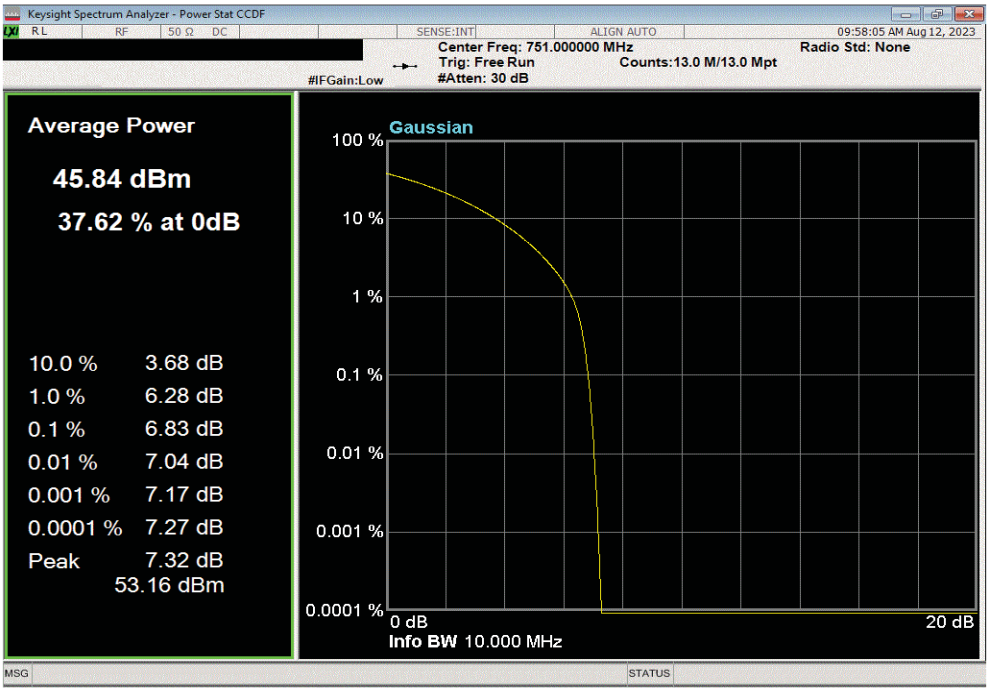
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.7	13	Pass



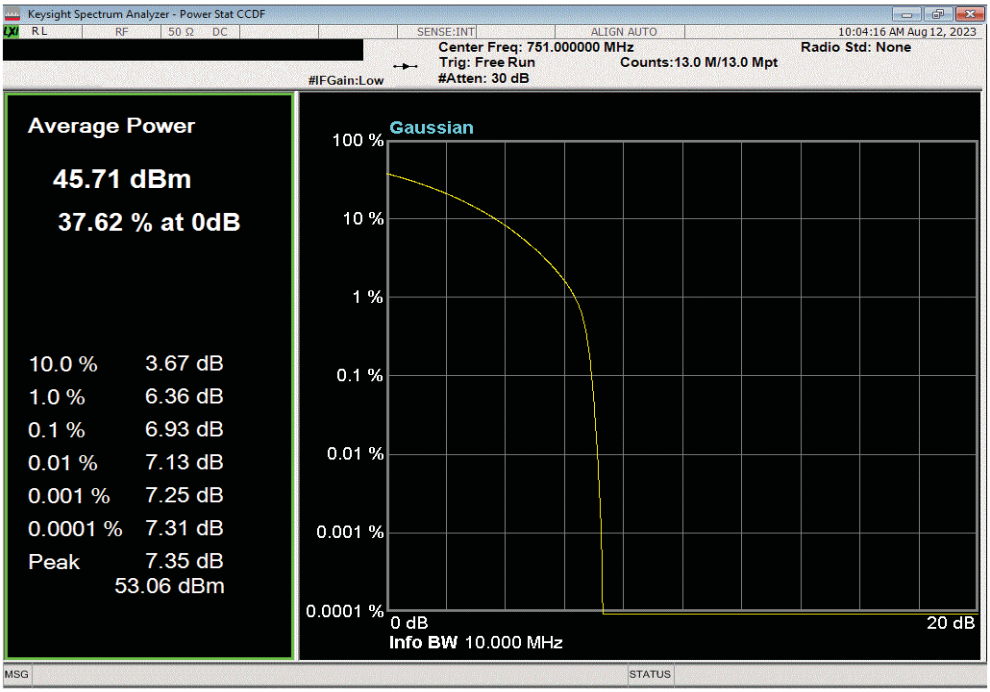
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.74	13	Pass



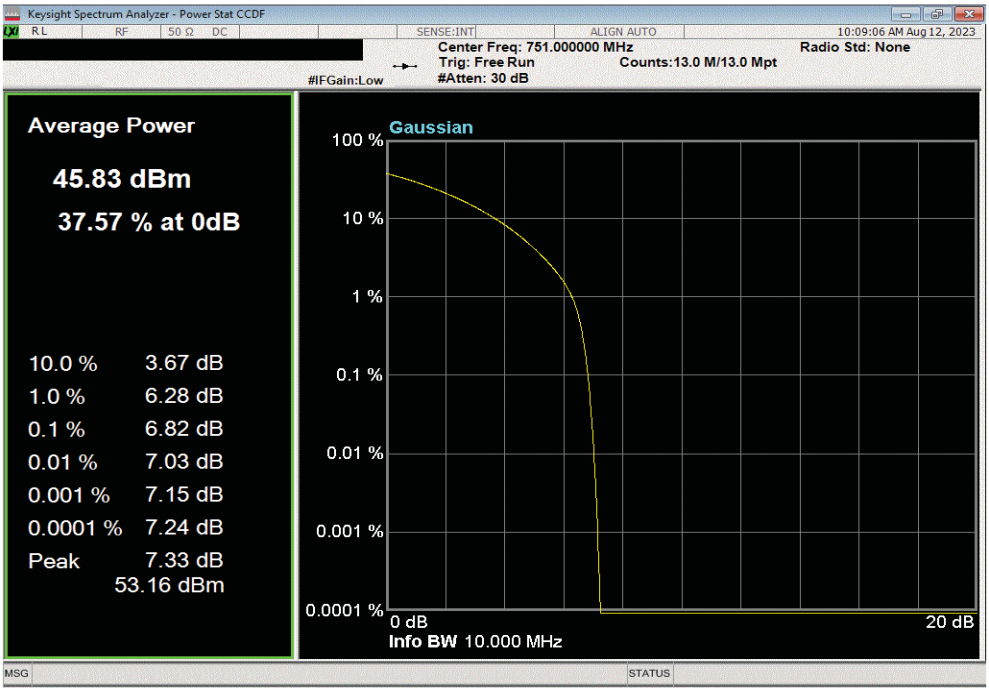
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 751 MHz							
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.83	13	Pass



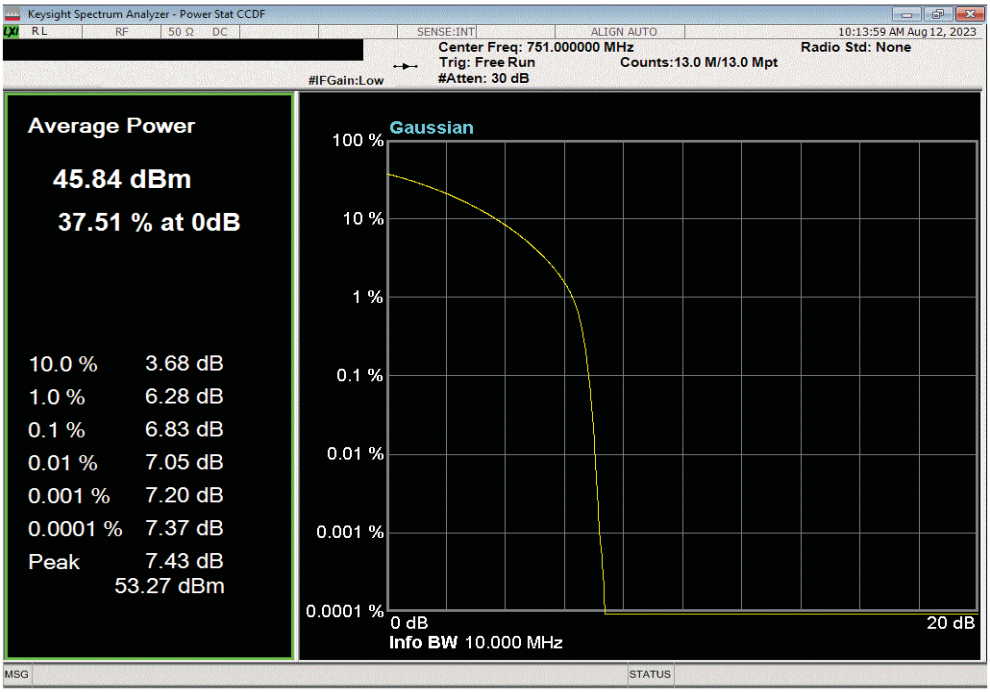
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 16QAM Modulation, Mid Channel, 751 MHz							
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.93	13	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 64QAM Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.82	13	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz						
				0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
				6.83	13	Pass



BAND EDGE COMPLIANCE

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

All limits were adjusted by a factor of [-10*log(4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Per FCC section 27.53(c) and RSS-130 section 4.7.1, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

FCC 27.53(c) and RSS-130 section 4.7.1 requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(c) and RSS-130 section 4.7.1 requires a >30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range.

Section 27.53(c)(3) and RSS-130 4.7.2(a) requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 763-775 MHz and 793-806MHz. Adjusting for the four port MIMO requirement the emission limit in these frequency ranges is -52 dBm [i.e.: Limit = -46 dBm/6.25kHz (FCC/IC Limit) - 6dB (4 port MIMO)].

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHBCC) as the original certification test. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original 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 testing was performed using only one modulation type because the Occupied Bandwidth variation between modulation types is small, the average output power variation between modulation types is small, there is good passing margins, and there was small variation in measurements over modulation types from previous certification testing for other channel types. (See ANSI C63.26. clause 5.7.2e).

BAND EDGE COMPLIANCE

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/15/2023
Customer:	Nokia solutions and Networks			Temperature:	20.7°C
Attendees:	Mitchell Hill			Humidity:	49.7%
Project:	None			Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n13 carriers are enabled at maximum power (40 Watts/carrier).

DEVIATIONS FROM TEST STANDARD

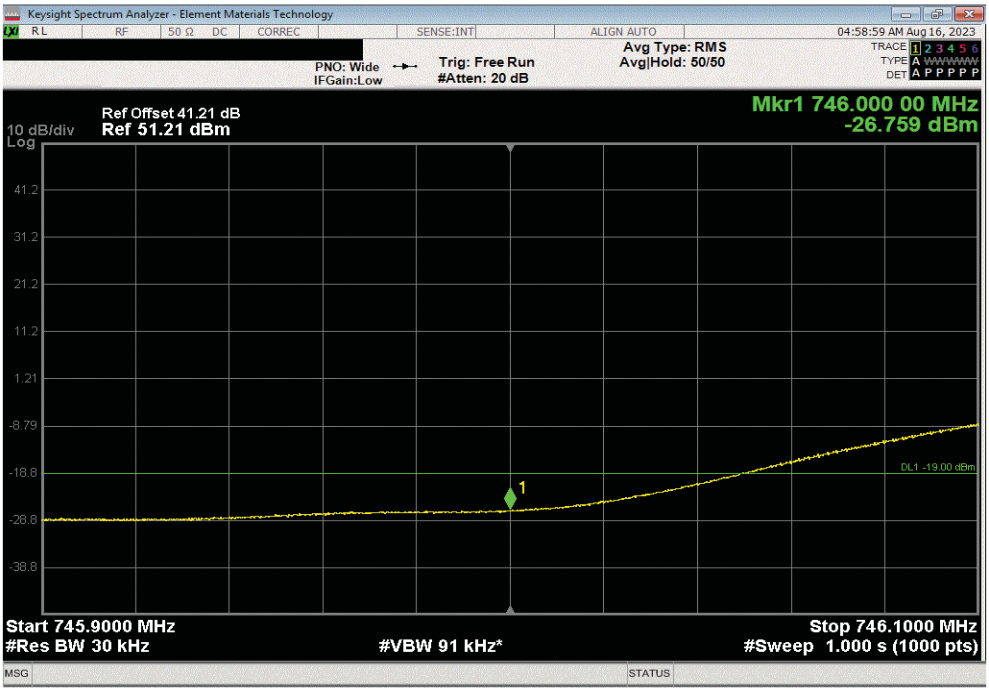
None

Configuration #	NOKI0069-2	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
Band n13, 746 - 756 MHz						
5 MHz Bandwidth						
256QAM Modulation						
Low Channel, 748.5 MHz		1	746.0	-26.76	-19	Pass
Low Channel, 748.5 MHz		2	745.9	-22.97	-19	Pass
High Channel, 753.5 MHz		1	756.0	-25.29	-19	Pass
High Channel, 753.5 MHz		2	756.1	-21.28	-19	Pass
High Channel, 753.5 MHz		3	763.1	-60.87	-52	Pass
10 MHz Bandwidth						
256QAM Modulation						
Low Channel, 748.5 MHz		1	746.0	-29.9	-19	Pass
Low Channel, 748.5 MHz		2	745.9	-24.83	-19	Pass
High Channel, 753.5 MHz		1	756.0	-29.46	-19	Pass
High Channel, 753.5 MHz		2	756.1	-24.05	-19	Pass
High Channel, 753.5 MHz		3	763.1	-58.07	-52	Pass

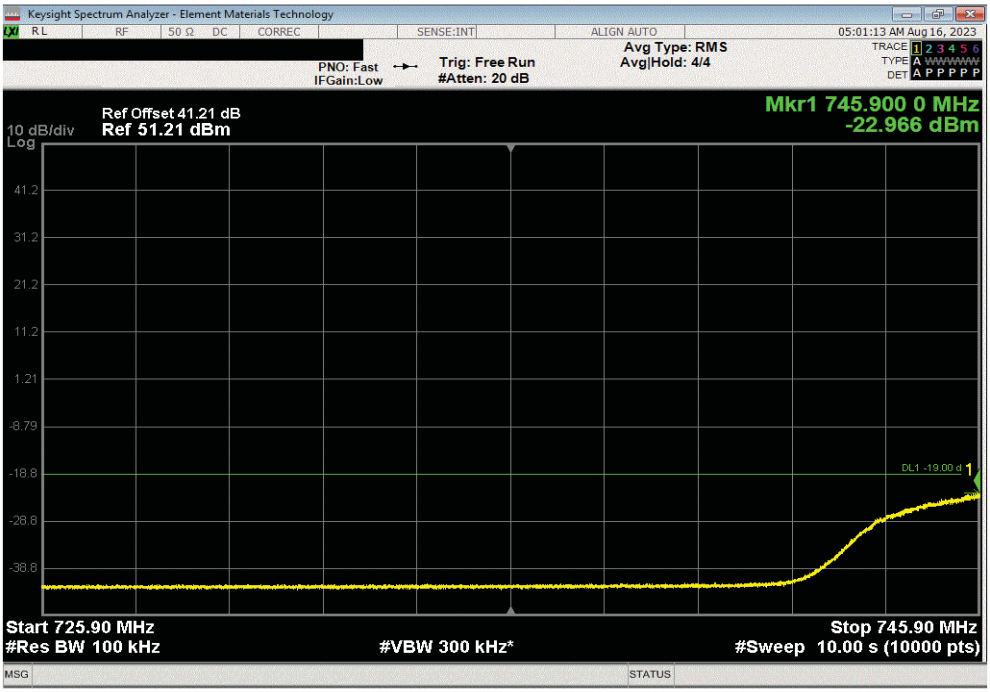
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz

	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		746	-26.76	-19	Pass

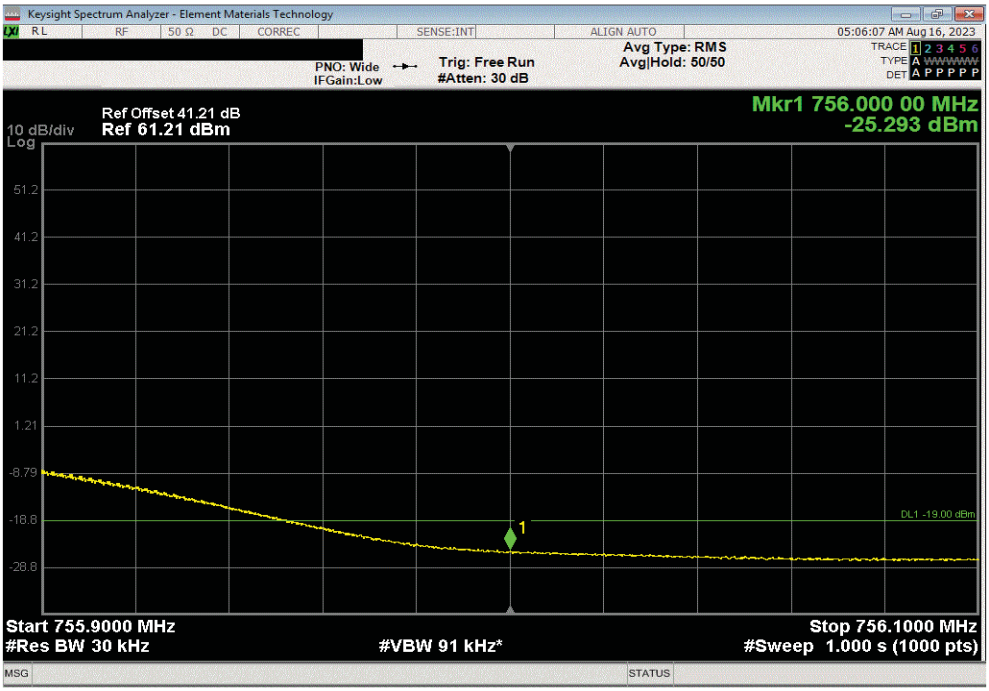


Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz

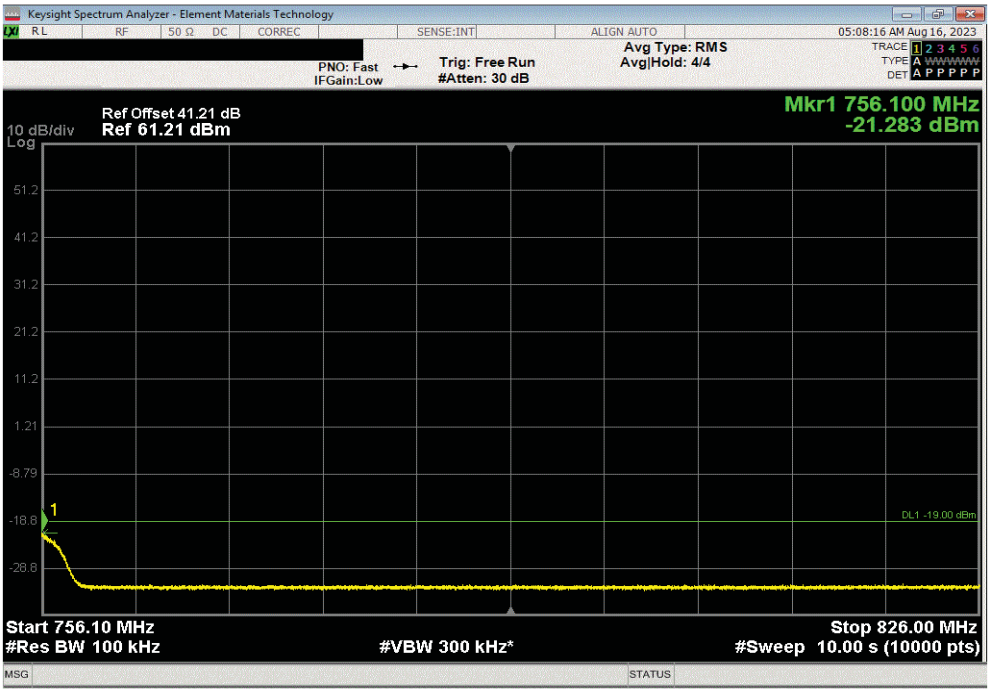
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.9	-22.97	-19	Pass



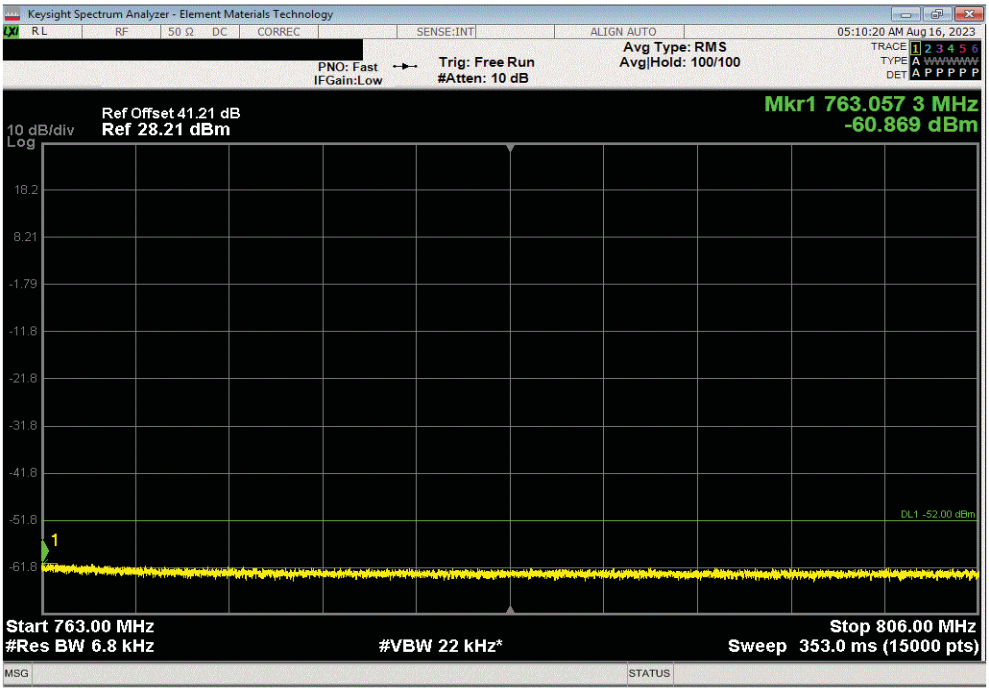
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		756	-25.29	-19	Pass



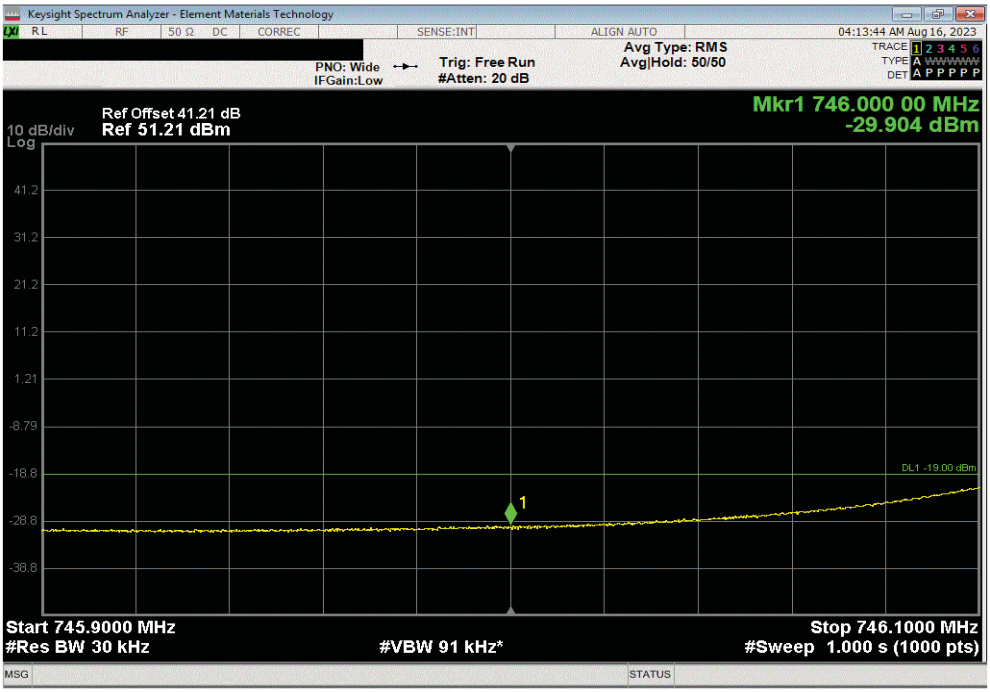
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		756.1	-21.28	-19	Pass



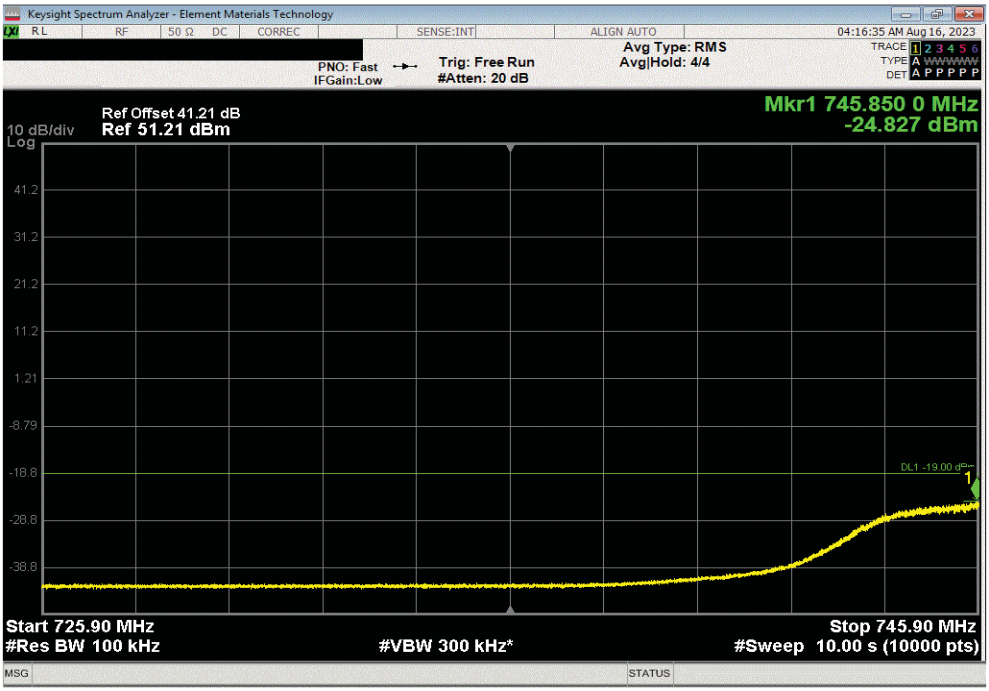
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		763.06	-60.87	-52	Pass



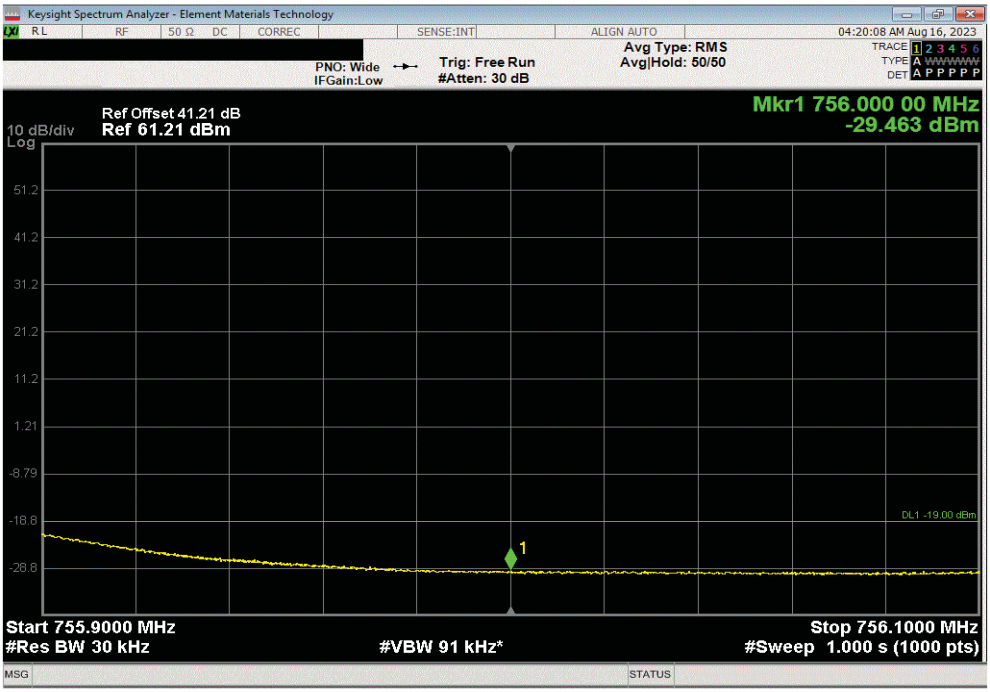
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		746	-29.9	-19	Pass



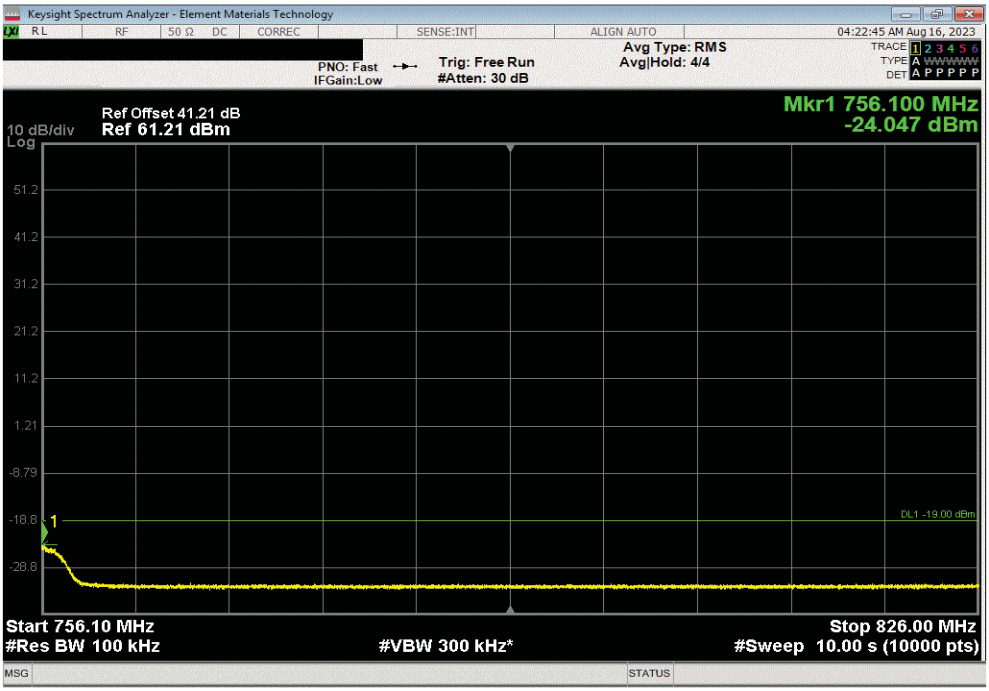
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 748.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.85	-24.83	-19	Pass



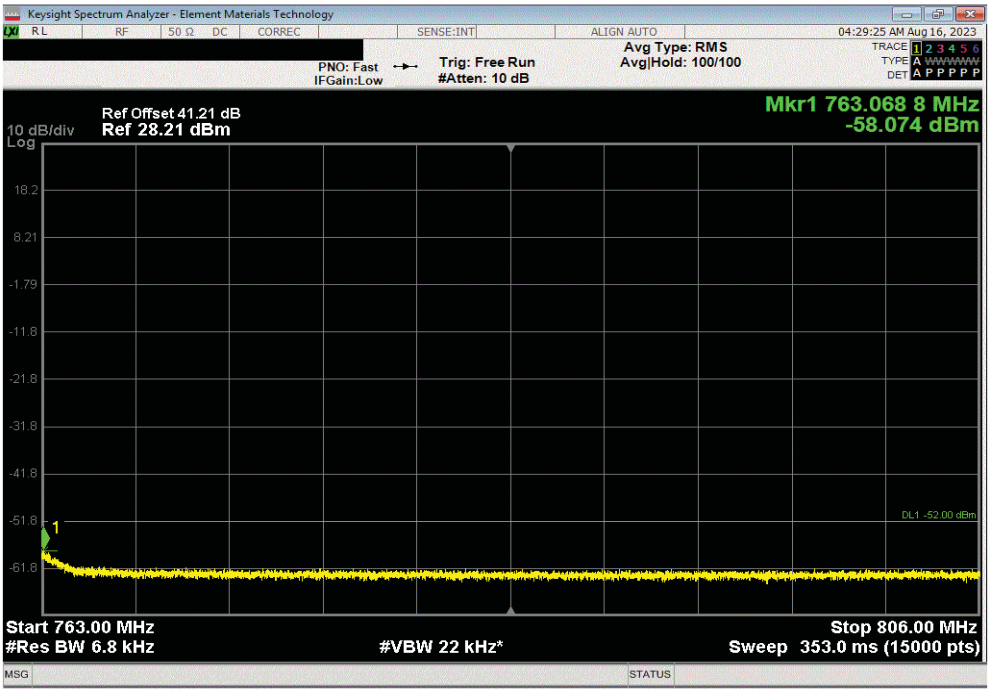
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		756	-29.46	-19	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		756.1	-24.05	-19	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 753.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		763.07	-58.07	-52	Pass



BAND EDGE COMPLIANCE - MULTICARRIER

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

All limits were adjusted by a factor of [-10*log(4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Per FCC section 27.53(c) and RSS-130 section 4.7.1, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

FCC 27.53(c) and RSS-130 section 4.7.1 requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(c) and RSS-130 section 4.7.1 requires a >30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range.

Section 27.53(c)(3) and RSS-130 4.7.2(a) requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 763-775 MHz and 793-806MHz. Adjusting for the four port MIMO requirement the emission limit in these frequency ranges is -52 dBm [i.e.: Limit = -46 dBm/6.25kHz (FCC/IC Limit) - 6dB (4 port MIMO)].

Per section FCC 22.917 and RSS 132 5.5, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. In the first 1.0 MHz bands immediately outside and adjacent to the frequency block, the RBW is 1% of the measured emission bandwidth per FCC 22.917(b) and RSS 132 5.5i. After the first 1.0 MHz bands immediately outside and adjacent to the frequency block, the RBW is 100kHz per 22.917(b) and RSS 132 5.5ii.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHBCC) as the original certification test. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original 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 testing was performed using only one modulation type because the Occupied Bandwidth variation between modulation types is small, the average output power variation between modulation types is small, there is good passing margins, and there was small variation in measurements over modulation types from previous certification testing for other channel types. (See ANSI C63.26. clause 5.7.2e).

Three 5MHz carriers with 2 carriers at the Bottom (871.5MHz and 876.5MHz) and 1 at the top (891.5MHz) of the Band n5 are operated at (13.3W/Carrier). Two NR 5MHz carriers in Band n13 (748.5 & 753.5MHz) are operated at (20W/Carrier) to provide a total maximum port power of 80Watts.

BAND EDGE COMPLIANCE - MULTICARRIER

element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/15/2023
Customer:	Nokia Solutions and Networks			Temperature:	20.9°C
Attendees:	Mitchell Hill			Humidity:	49.3%
Project:	None			Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023, FCC 22H:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019, RSS-132 Issue 4:2023	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. Band n13 carriers are operating at (20 watts/carrier), Band n5 are operating at (13.3 watts/carrier) for a total port power of 80 watts.

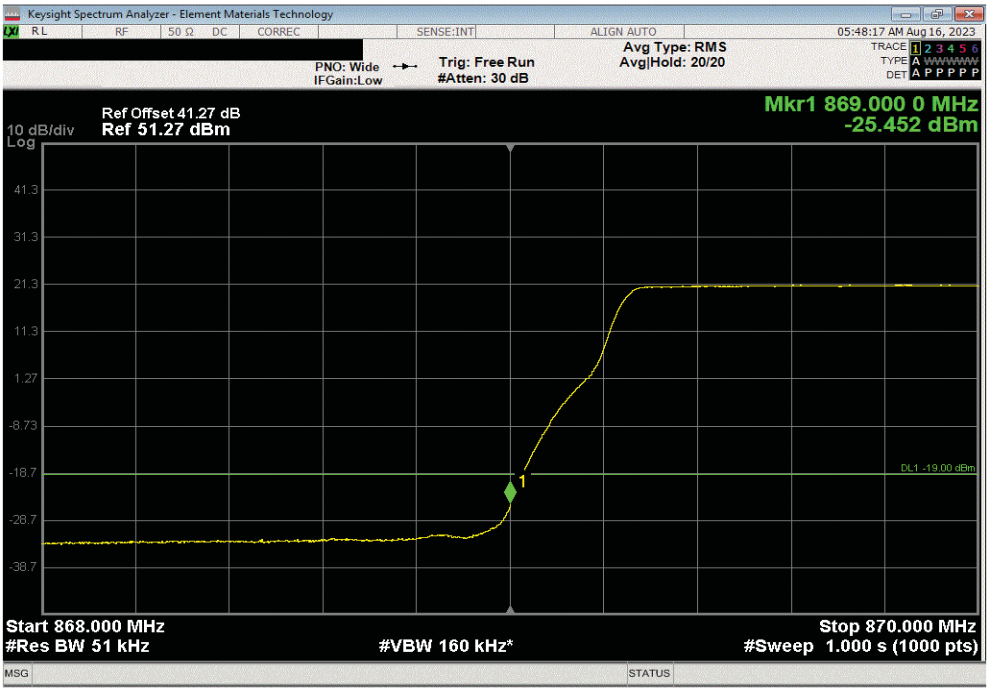
DEVIATIONS FROM TEST STANDARD

None

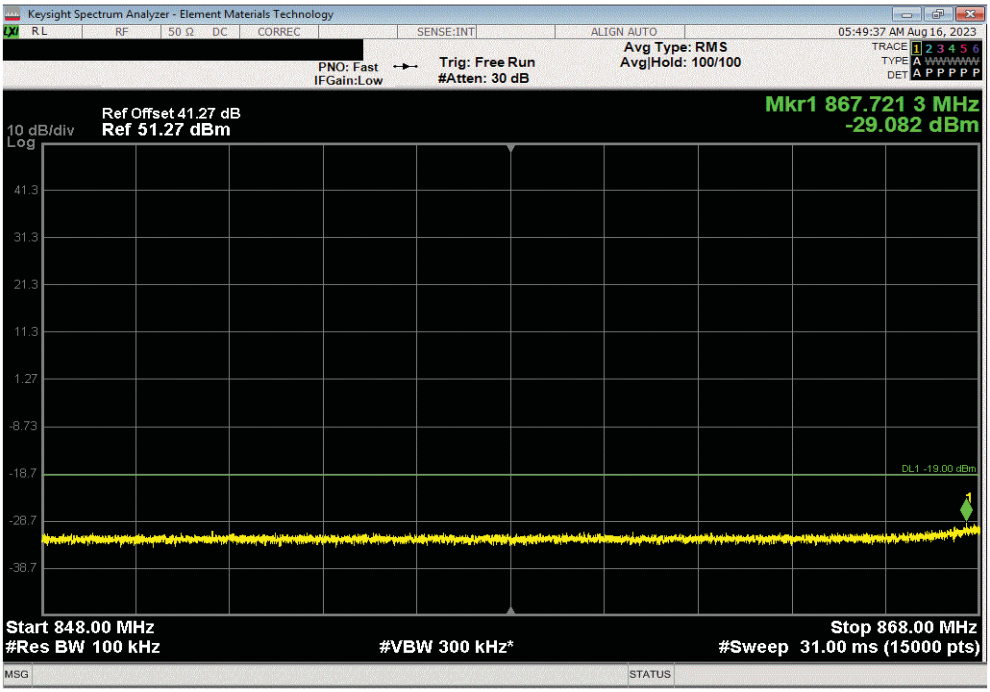
Configuration #	NOKI0069-2	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
	Multi-Carrier Test Case 1					
	QPSK Modulation					
	Low 871.5 MHz n5 NR5 13.3W	1	869.0	-25.45	-19	Pass
	Low 871.5 MHz n5 NR5 13.3W	2	867.7	-29.08	-19	Pass
	High 891.5 MHz n5 NR5 13.3W	1	894.0	-25.55	-19	Pass
	High 891.5 MHz n5 NR5 13.3W	2	895.0	-30.36	-19	Pass
	Low 748.5 MHz n13 NR5 20W	1	746.0	-29.79	-19	Pass
	Low 748.5 MHz n13 NR5 20W	2	745.8	-26.12	-19	Pass
	High 753.5 MHz n13 NR5 20W	1	756.0	-29.41	-19	Pass
	High 753.5 MHz n13 NR5 20W	2	756.3	-25.43	-19	Pass
	High 753.5 MHz n13 NR5 20W	3	766.9	-56.22	-52	Pass

Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 871.5 MHz n5 NR5 13.3W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		869	-25.45	-19	Pass

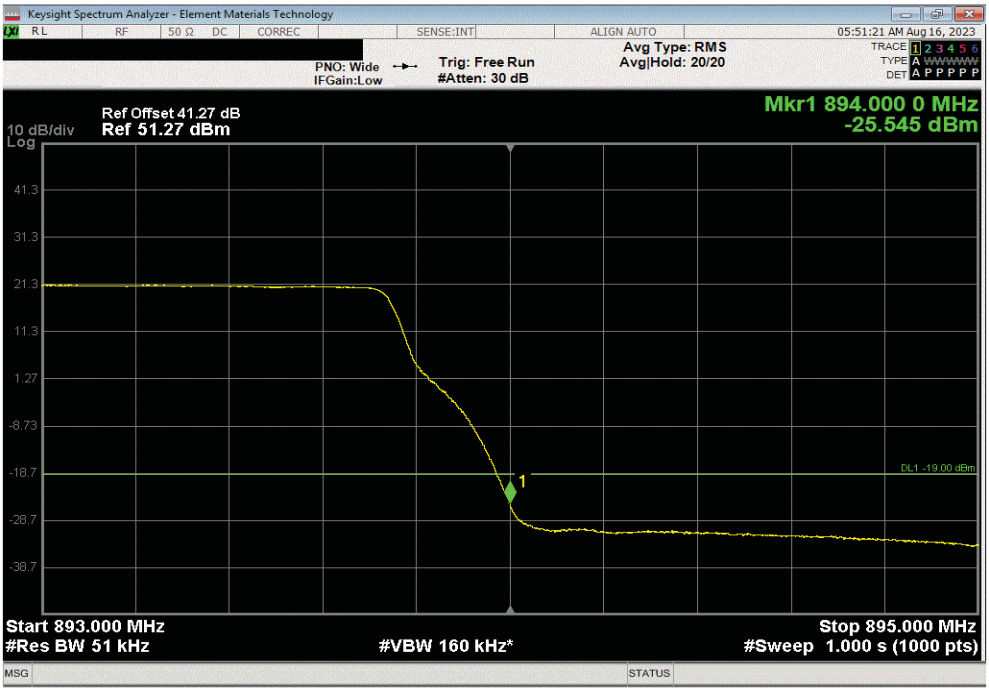


Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 871.5 MHz n5 NR5 13.3W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		867.72	-29.08	-19	Pass

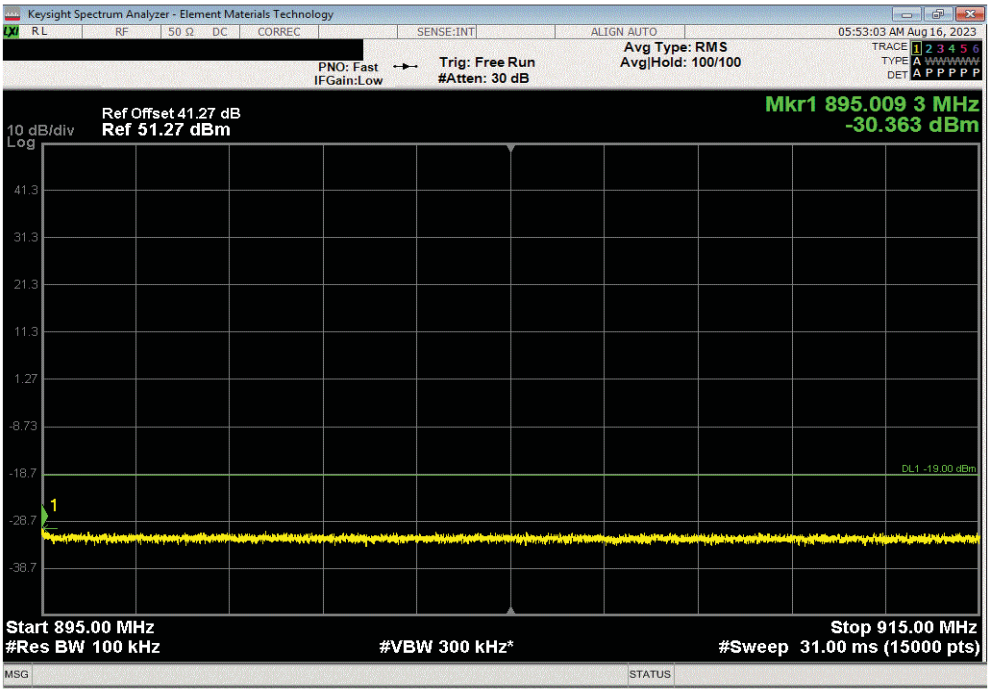


BAND EDGE COMPLIANCE - MULTICARRIER

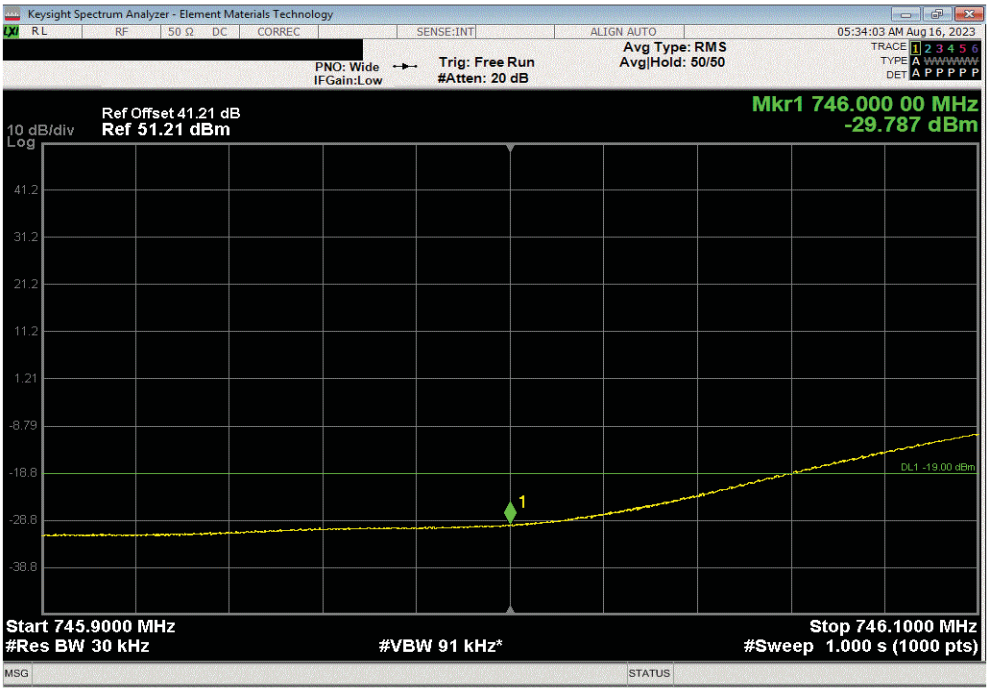
Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 891.5 MHz n5 NR5 13.3W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		894	-25.55	-19	Pass



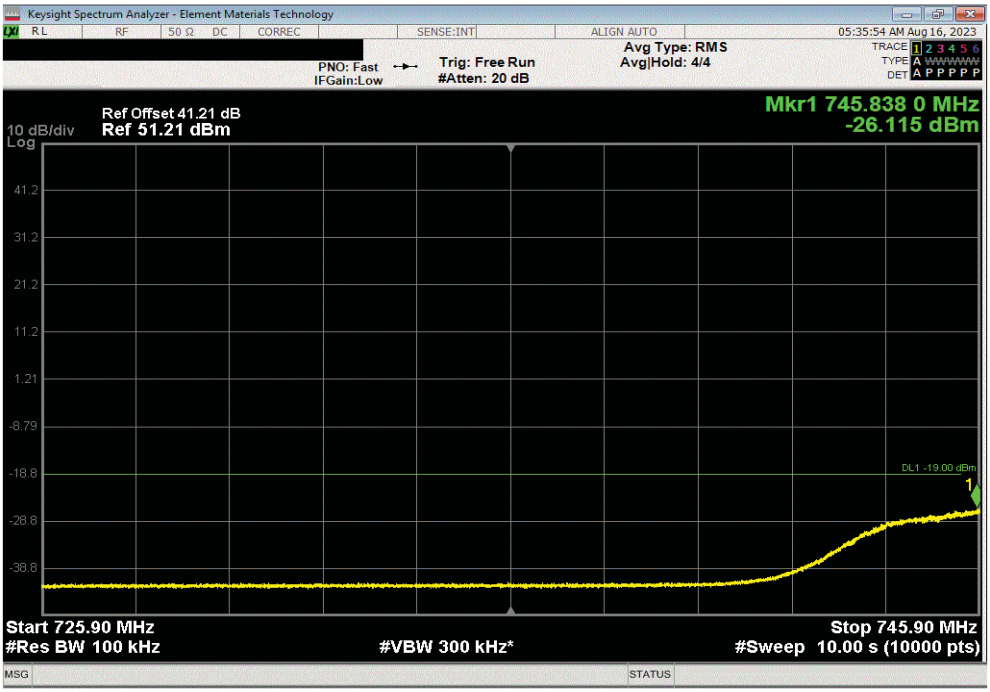
Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 891.5 MHz n5 NR5 13.3W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		895.01	-30.36	-19	Pass



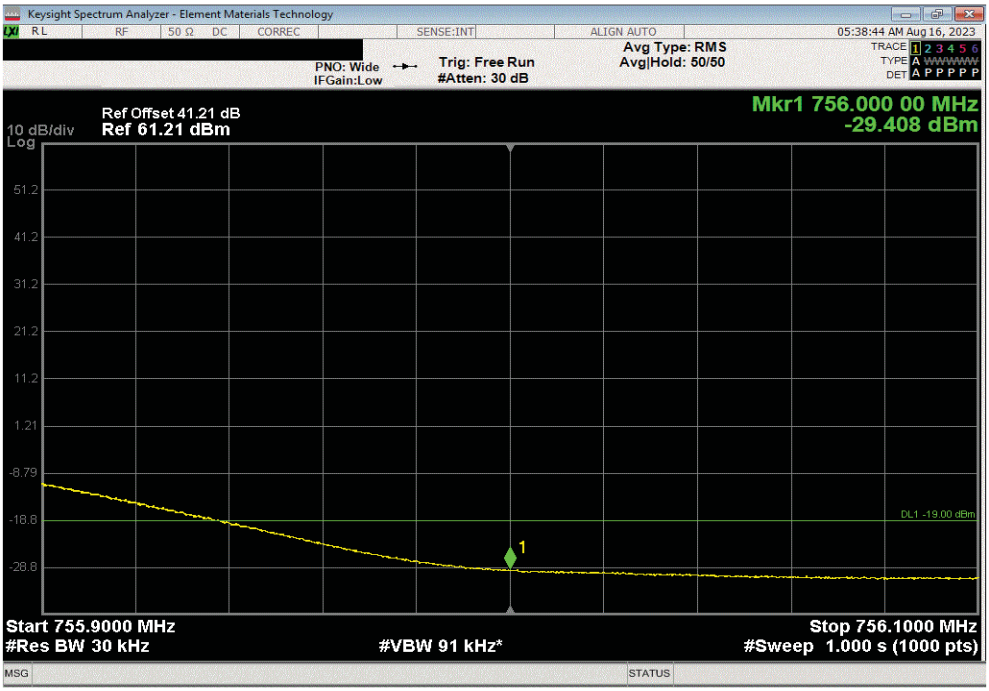
Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 748.5 MHz n13 NR5 20W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		746	-29.79	-19	Pass



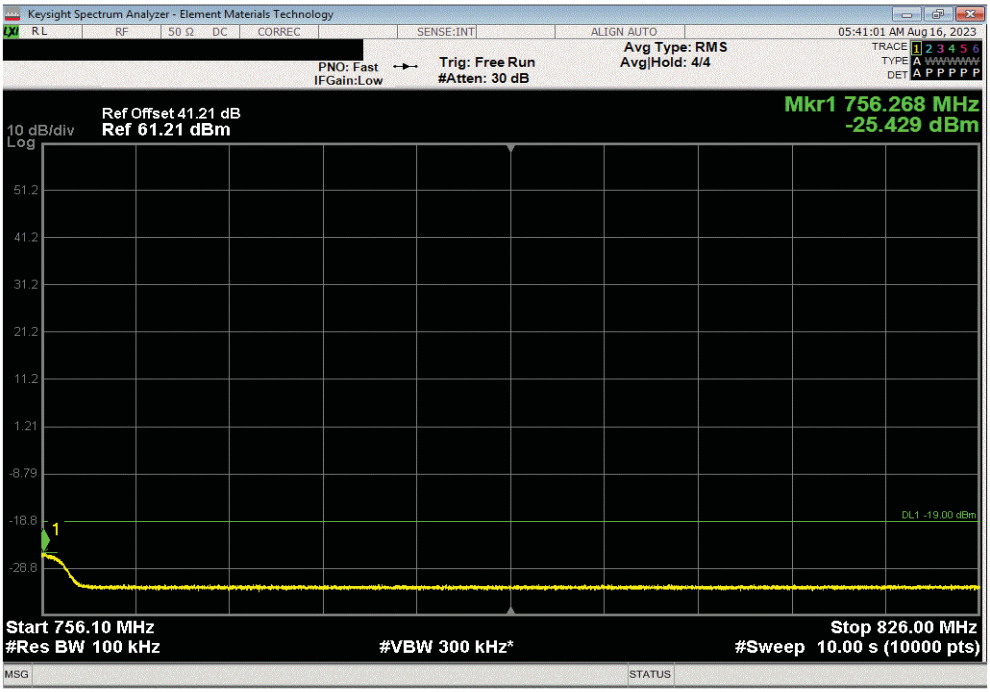
Port 1, Multi-Carrier Test Case 1, QPSK Modulation, Low 748.5 MHz n13 NR5 20W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.84	-26.12	-19	Pass



Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 753.5 MHz n13 NR5 20W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		756	-29.41	-19	Pass

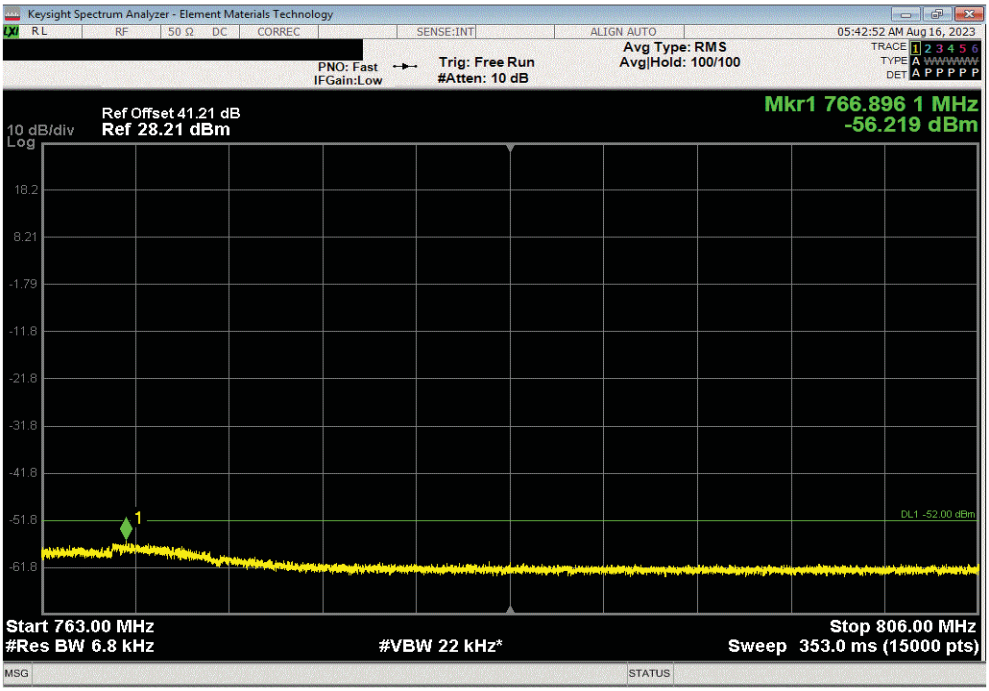


Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 753.5 MHz n13 NR5 20W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		756.27	-25.43	-19	Pass



BAND EDGE COMPLIANCE - MULTICARRIER

Port 1, Multi-Carrier Test Case 1, QPSK Modulation, High 753.5 MHz n13 NR5 20W						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		766.9	-56.22	-52	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 3 different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test plan were made for each modulation type from 9 KHz to 9 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan shown below.

The measurement methods are detailed in KDB 971168 D01v03 section 6 and ANSI C63.26-2015.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.

These measurements are for the frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

Per section 27.53(c) and RSS 130 4.7.1, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. FCC 27.53(c) and RSS 130 4.7.1 requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10^{th} harmonic of the highest fundamental frequency. As such, the upper level of the measurement is approximately 9 GHz (highest fundamental frequency is Band n5 @894 MHz * 10).

Per section 27.53(f) and RSS 130 4.7.2(b), for the frequency range 1559-1610 MHz the EIRP limit is -70dBW/MHz for wideband signals and -80dBW for discrete emissions of bandwidths less than 700Hz. This equates to an EIRP of -40dBm/MHz for wideband emissions and -50dBm/MHz for discrete emissions. The limit is adjusted to -46 dBm [-40 dBm -10 log (4)] for wideband signals and -56dBm [-50 dBm -10 log (4)] for discrete emissions per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. See spurious emission measurements.

The limit for the 9kHz to 150kHz frequency range was adjusted to –39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to –29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)]. The required limit of -19dBm with a RBW of $\geq$ 100kHz was used for all other frequency ranges.

The testing was performed using only one modulation type because the Occupied Bandwidth variation between modulation types is small, the average output power variation between modulation types is small, there is good passing margins, and there was small variation in measurements over modulation types from previous certification testing for other channel types. (See ANSI C63.26. clause 5.7.2e).

SPURIOUS CONDUCTED EMISSIONS

element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/15/2023
Customer:	Nokia Solutions and Networks			Temperature:	21.3°C
Attendees:	Mitchell Hill			Humidity:	48.6%
Project:	None			Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n13 carriers are enabled at maximum power (40 Watts/carrier).

DEVIATIONS FROM TEST STANDARD

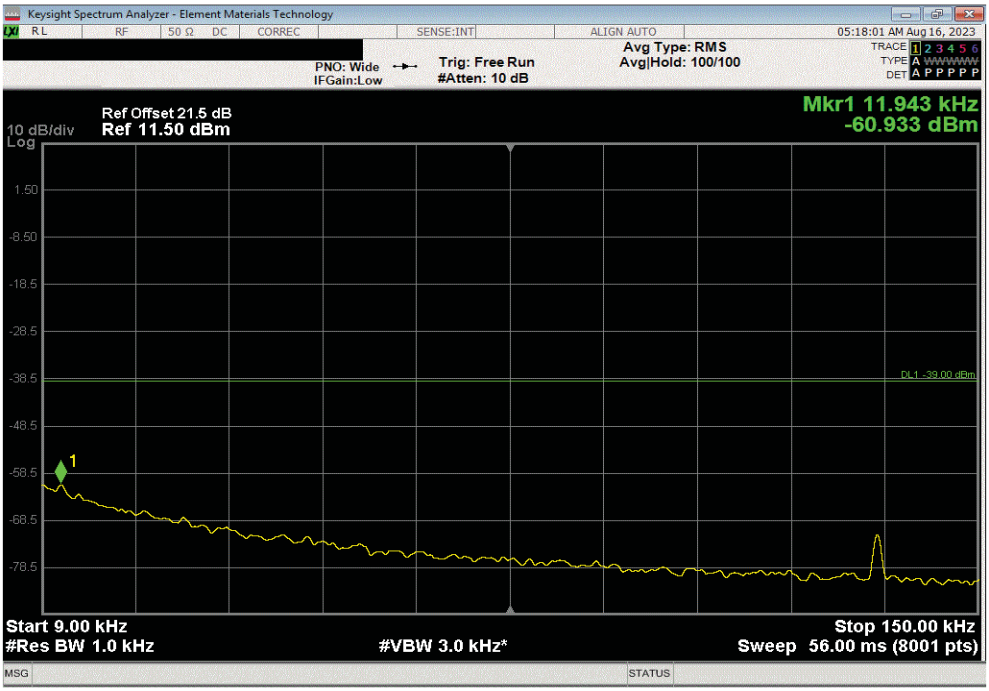
None

Configuration #	
	NOKI0069-1
	NOKI0069-2
	NOKI0069-3

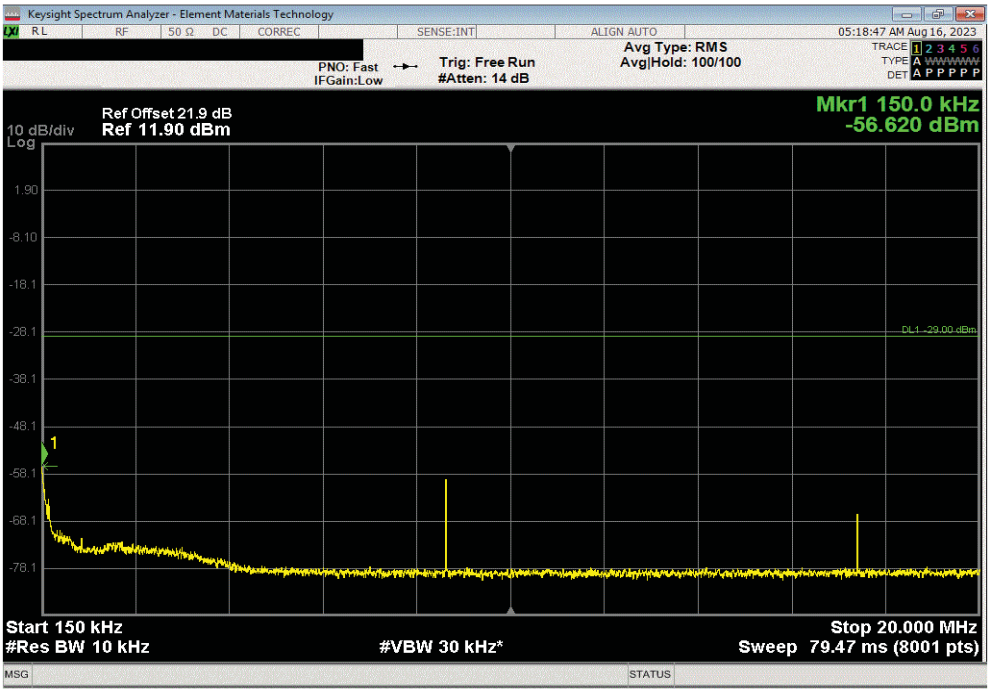
Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
Band n13, 746 - 756 MHz						
5 MHz Bandwidth						
256QAM Modulation						
	Mid Channel, 751 MHz	9kHz to 150kHz	0.01	-60.9	-39	Pass
	Mid Channel, 751 MHz	150kHz to 20MHz	0.15	-56.6	-29	Pass
	Mid Channel, 751 MHz	20MHz to 1.5GHz	906.47	-33.5	-19	Pass
	Mid Channel, 751 MHz	1559MHz to 1610MHz	1595.76	-61.4	-56	Pass
	Mid Channel, 751 MHz	1.5GHz to 9GHz	2254.13	-46.8	-19	Pass
10 MHz Bandwidth						
256QAM Modulation						
	Mid Channel, 751 MHz	9kHz to 150kHz	0.01	-60.4	-39	Pass
	Mid Channel, 751 MHz	150kHz to 20MHz	0.15	-56.8	-29	Pass
	Mid Channel, 751 MHz	20MHz to 1.5GHz	919.89	-33.7	-19	Pass
	Mid Channel, 751 MHz	1559MHz to 1610MHz	1593.99	-61.2	-56	Pass
	Mid Channel, 751 MHz	1.5GHz to 9GHz	2252.63	-49.4	-19	Pass

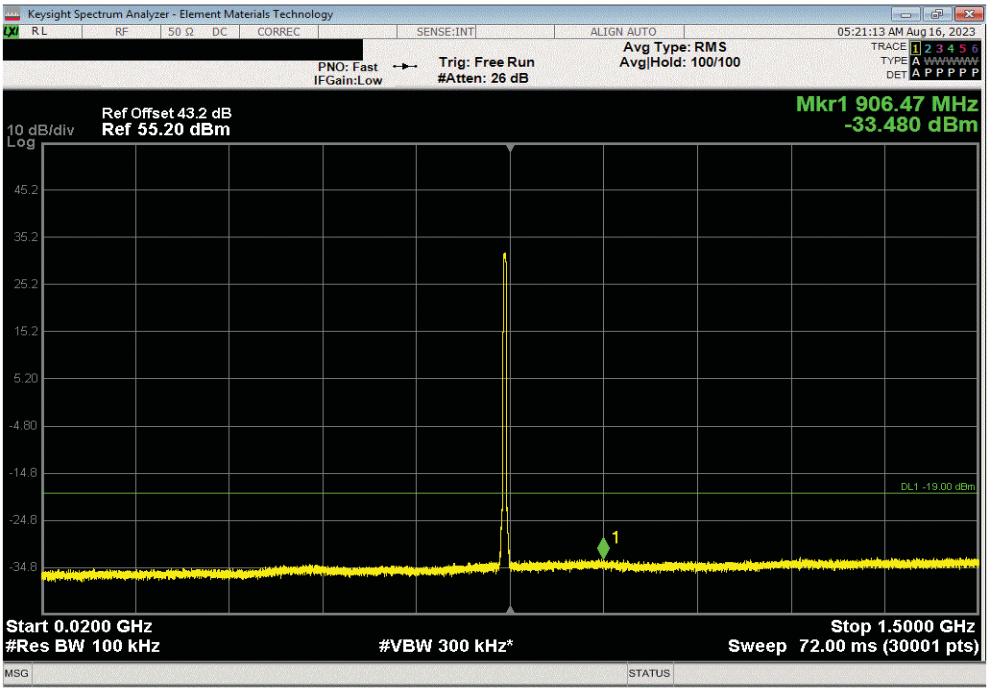
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
9kHz to 150kHz		0.01	-60.93	-39	Pass



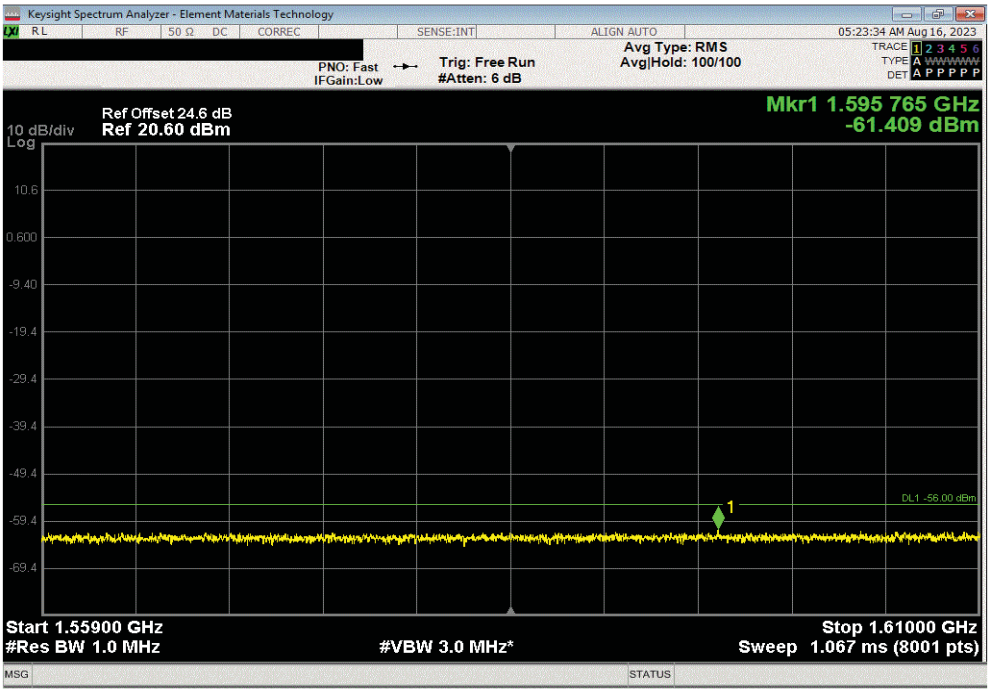
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150kHz to 20MHz	0.15	-56.62	-29	Pass



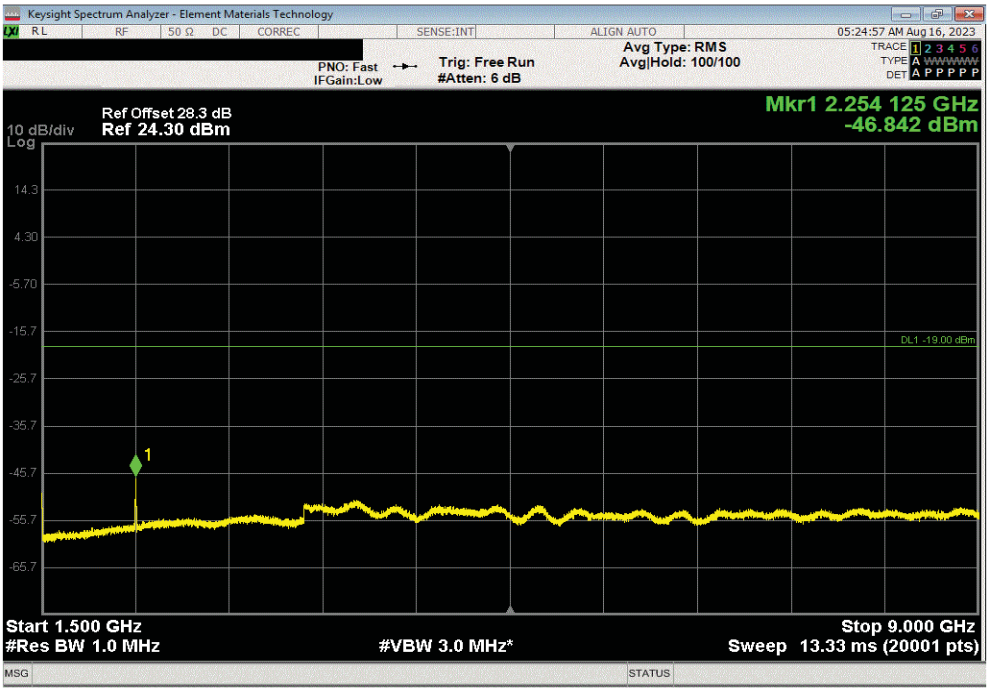
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20MHz to 1.5GHz	906.47	-33.48	-19	Pass



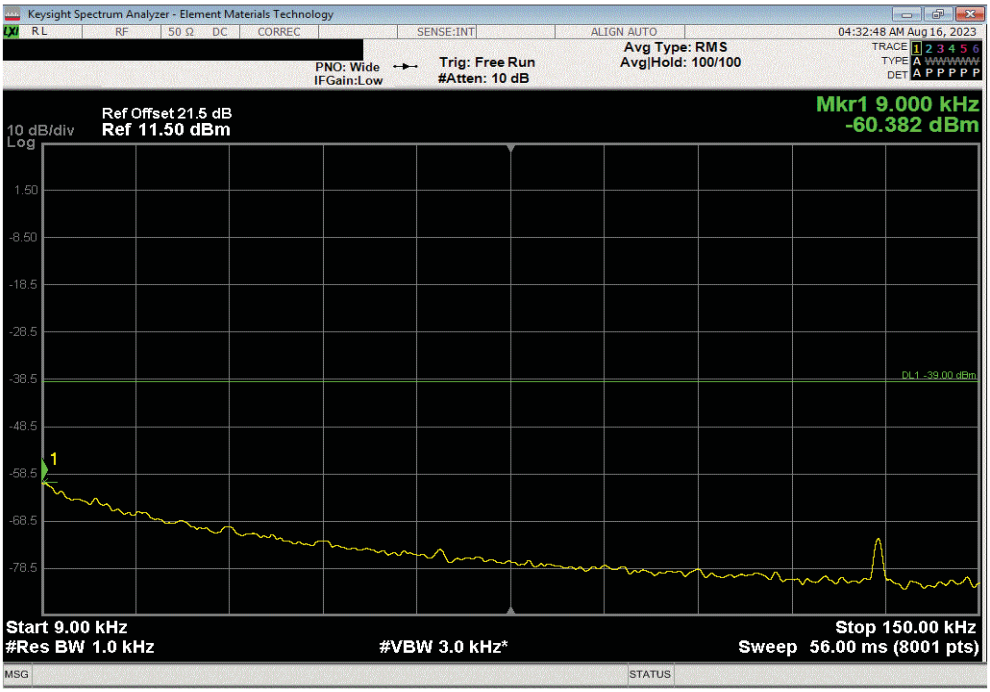
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1559MHz to 1610MHz	1595.76	-61.41	-56	Pass



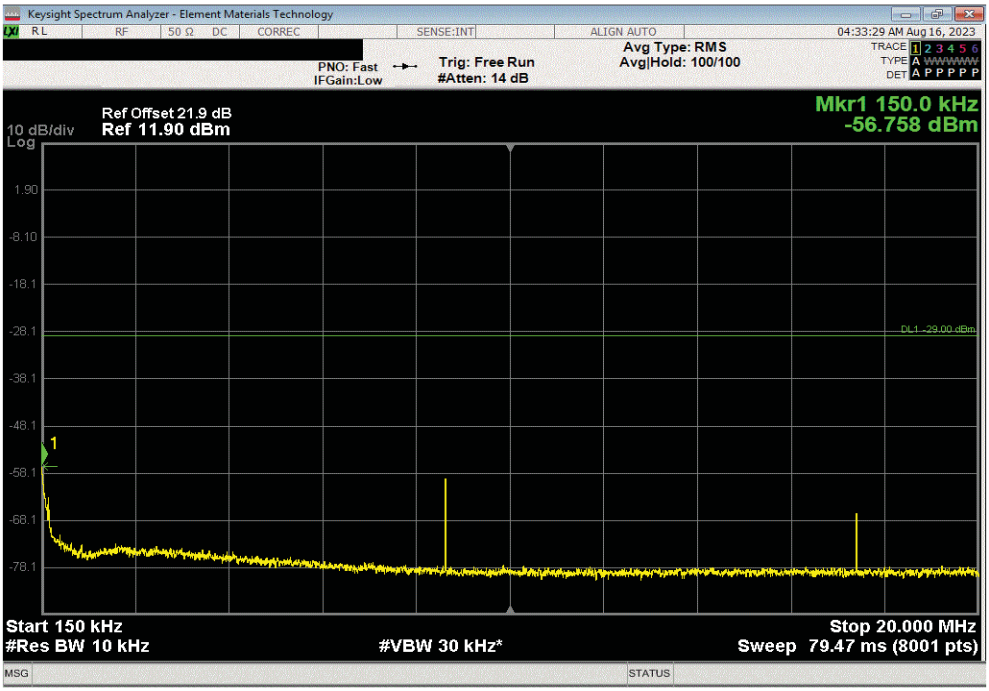
Port 1, Band n13, 746 - 756 MHz, 5 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1.5GHz to 9GHz	2254.13	-46.84	-19	Pass



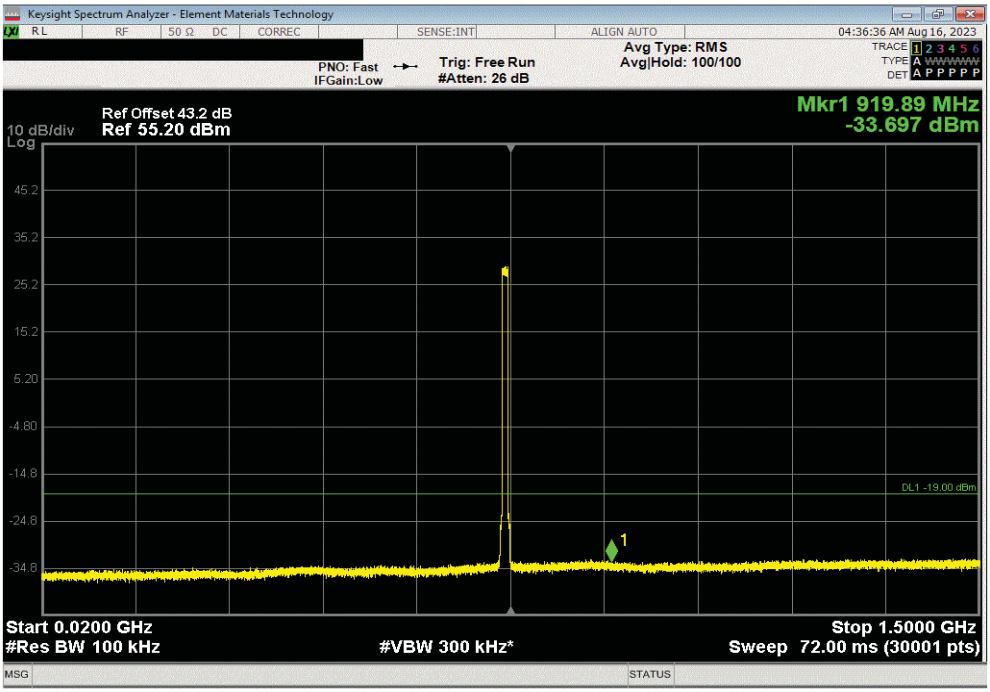
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	9kHz to 150kHz	0.01	-60.38	-39	Pass



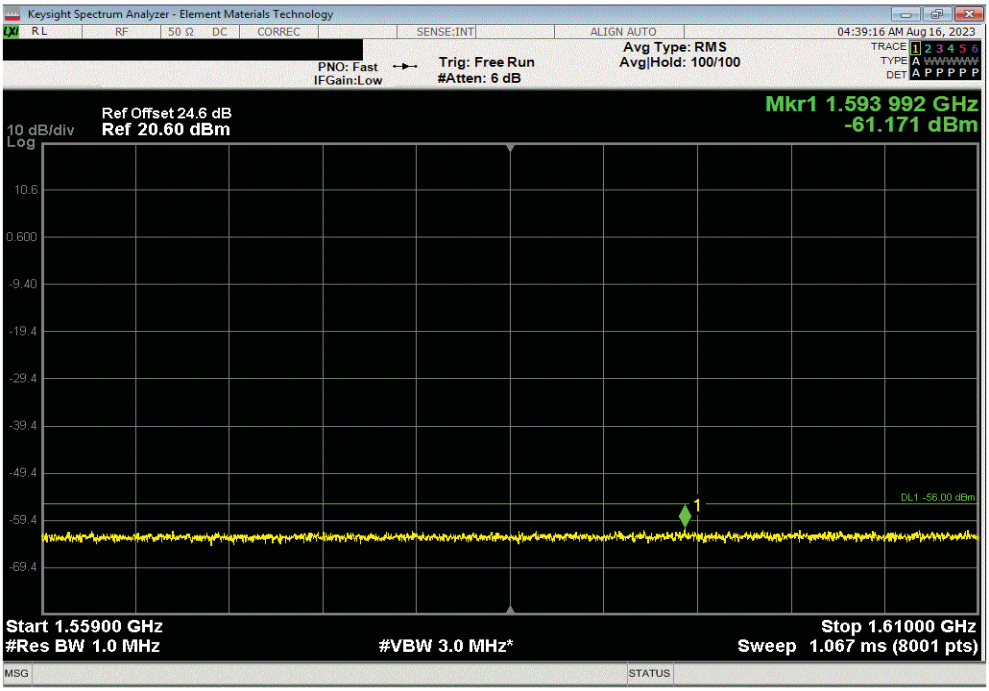
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150kHz to 20MHz	0.15	-56.76	-29	Pass



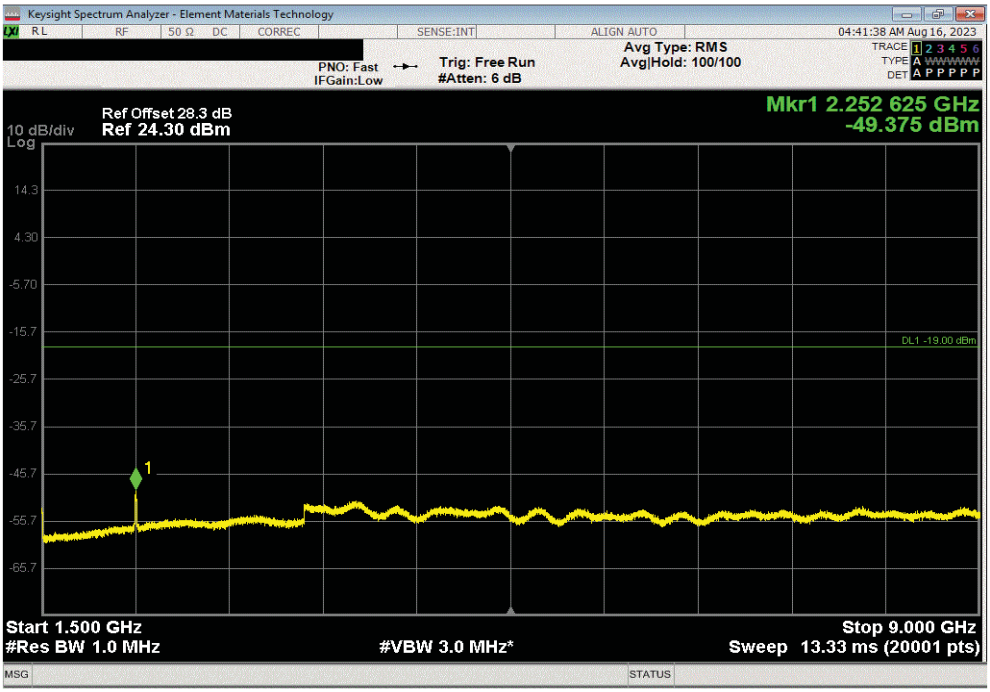
Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20MHz to 1.5GHz	919.89	-33.7	-19	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1559MHz to 1610MHz	1593.99	-61.17	-56	Pass



Port 1, Band n13, 746 - 756 MHz, 10 MHz Bandwidth, 256QAM Modulation, Mid Channel, 751 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1.5GHz to 9GHz	2252.63	-49.38	-19	Pass



SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER

XMit 2023.02.14.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 3 different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test plan were made for each modulation type from 9 KHz to 9 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan shown below.
The measurement methods are detailed in KDB 971168 D01v03 section 6 and ANSI C63.26-2015.
Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.
These measurements are for the frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.
RF conducted emissions testing was performed only on one port. The AHBCC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.
Per section 27.53(c) and RSS 130 4.7.1, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10^{th} harmonic of the highest fundamental frequency. As such, the upper level of the measurement is approximately 9 GHz (highest fundamental frequency is Band n5 @894 MHz * 10).

Per section 27.53(f) and RSS 130 4.7.2(b), for the frequency range 1559-1610 MHz the EIRP limit is -70dBW/MHz for wideband signals and -80dBW for discrete emissions of bandwidths less than 700Hz. This equates to an EIRP of -40dBm/MHz for wideband emissions and -50dBm/MHz for discrete emissions. The limit is adjusted to -46 dBm [-40 dBm -10 log (4)] for wideband signals and -56dBm [-50 dBm -10 log (4)] for discrete emissions per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. See spurious emission measurements.

The limit for the 9kHz to 150kHz frequency range was adjusted to –39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to –29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)]. The required limit of -19dBm with a RBW of $\geq$ 100kHz was used for all other frequency ranges.

Per section FCC 22.917 and RSS 132 5.5, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. In the first 1.0 MHz bands immediately outside and adjacent to the frequency block, the RBW is 1% of the measured emission bandwidth per FCC 22.917(b) and RSS 132 5.5i. After the first 1.0 MHz bands immediately outside and adjacent to the frequency block, the RBW is 100kHz per 22.917(b) and RSS 132 5.5ii.

The testing was performed using only one modulation type because the Occupied Bandwidth variation between modulation types is small, the average output power variation between modulation types is small, there is good passing margins, and there was small variation in measurements over modulation types from previous certification testing for other channel types. (See ANSI C63.26. clause 5.7.2e).

Three 5MHz carriers with 2 carriers at the Bottom (871.5MHz and 876.5MHz) and 1 at the top (891.5MHz) of the Band n5 are operated at (13.3W/Carrier). Two NR 5MHz carriers in Band n13 (748.5 & 753.5MHz) are operated at (20W/Carrier) to provide a total maximum port power of 80Watts.

SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHBCC			Work Order:	NOKI0069
Serial Number:	See Configuration			Date:	08/15/2023
Customer:	Nokia Solutions and Networks			Temperature:	21.7°C
Attendees:	Mitchell Hill			Humidity:	48.2%
Project:	None			Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Power:	54VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. Band n13 carriers are operating at (20 watts/carrier), Band n5 are operating at (13.3 watts/carrier) for a total port power of 80 watts.

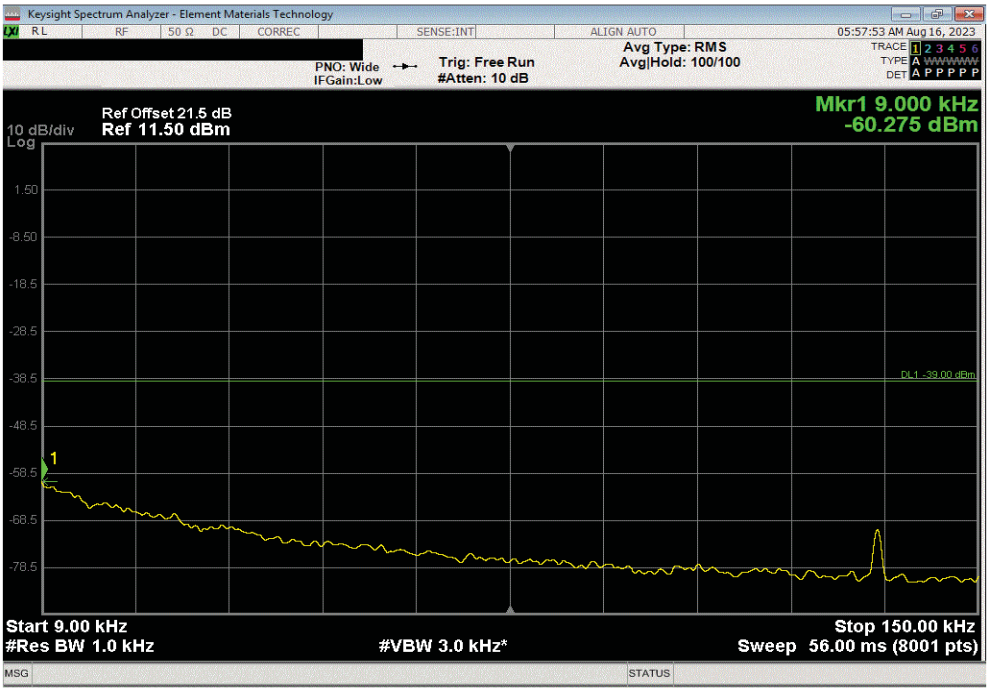
DEVIATIONS FROM TEST STANDARD

None

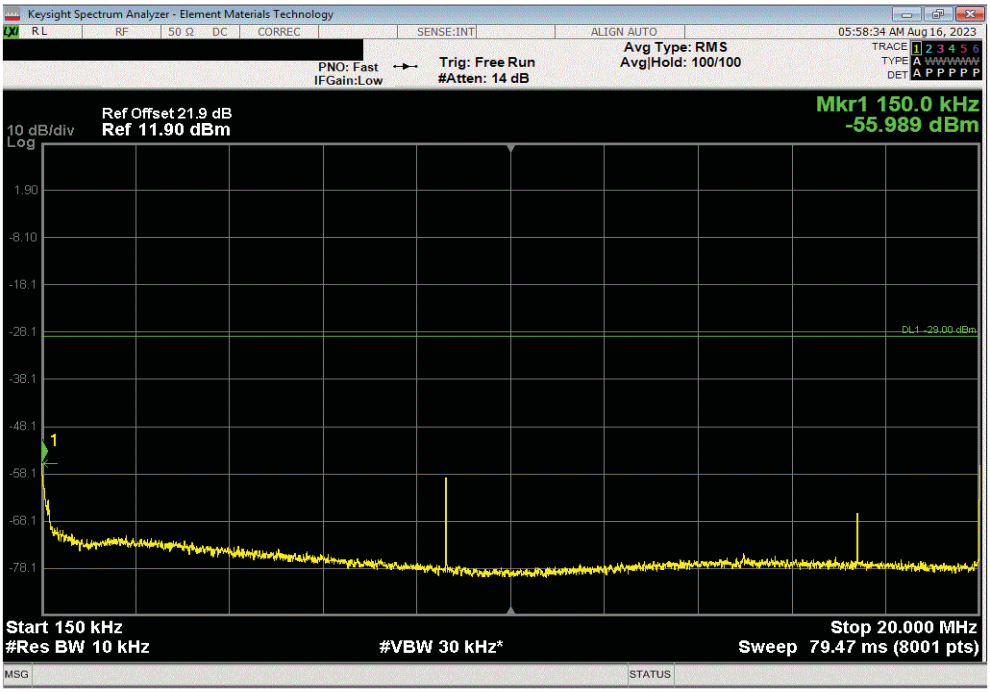
Configuration #	NOKI0069-1 NOKI0069-2 NOKI0069-3	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
	QPSK Modulation					
	Multi-Carrier Test Case 1	9kHz to 150kHz	0.01	-60.3	-39	Pass
	Multi-Carrier Test Case 1	150kHz to 20MHz	0.15	-56.0	-29	Pass
	Multi-Carrier Test Case 1	20MHz to 1.5GHz	1120.58	-33.8	-19	Pass
	Multi-Carrier Test Case 1	1559MHz to 1610MHz	1567.04	-61.5	-56	Pass
	Multi-Carrier Test Case 1	1.5GHz to 9GHz	2375.63	-48.9	-19	Pass

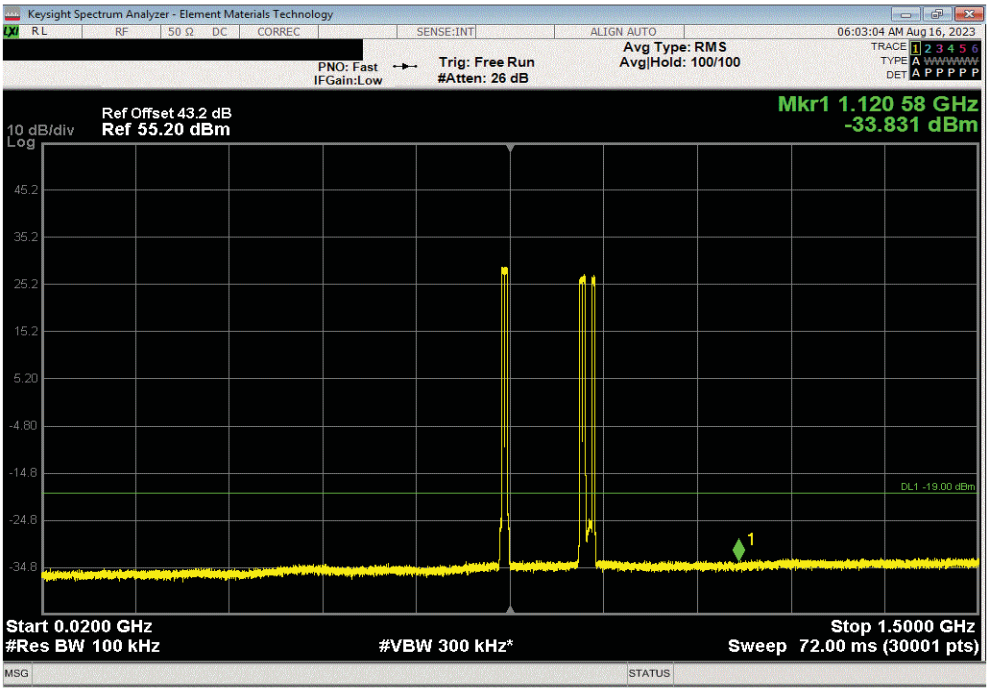
Port 1, QPSK Modulation, Multi-Carrier Test Case 1					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9kHz to 150kHz	0.01	-60.28	-39	Pass	



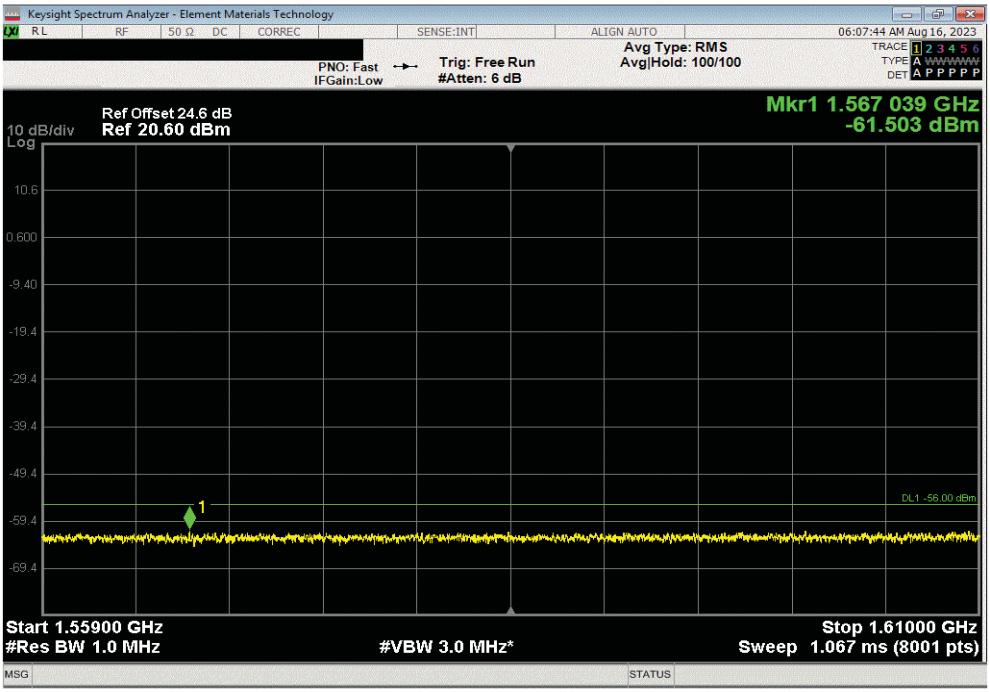
Port 1, QPSK Modulation, Multi-Carrier Test Case 1				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150kHz to 20MHz	0.15	-55.99	-29	Pass



Port 1, QPSK Modulation, Multi-Carrier Test Case 1				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20MHz to 1.5GHz	1120.58	-33.83	-19	Pass

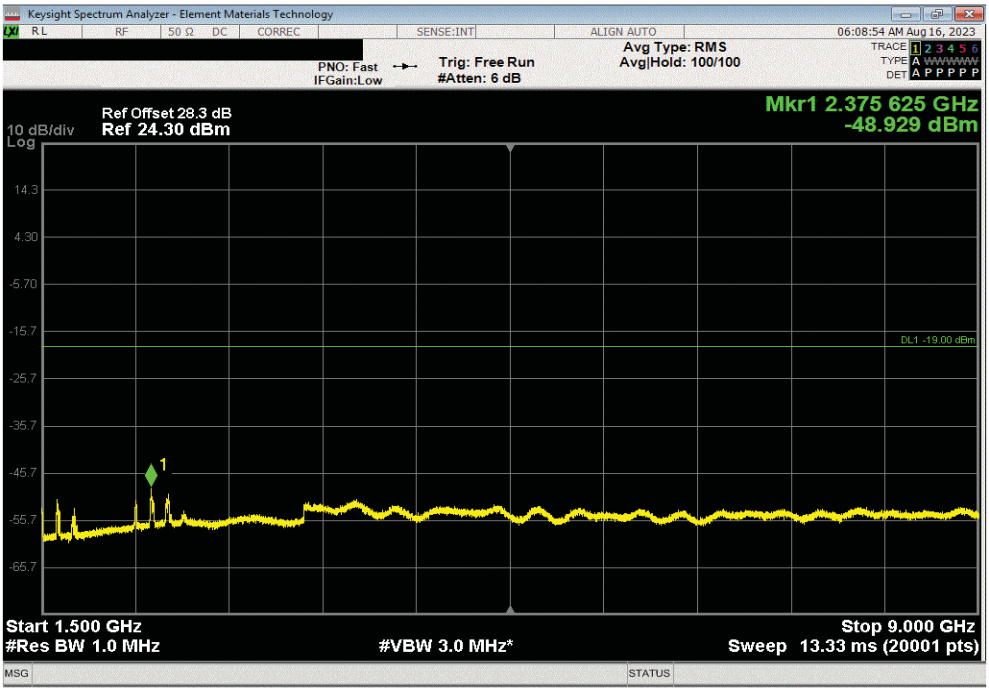


Port 1, QPSK Modulation, Multi-Carrier Test Case 1				
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1559MHz to 1610MHz	1567.04	-61.5	-56	Pass



SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER

Port 1, QPSK Modulation, Multi-Carrier Test Case 1					
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1.5GHz to 9GHz	2375.63	-48.93	-19	Pass



End of Test Report