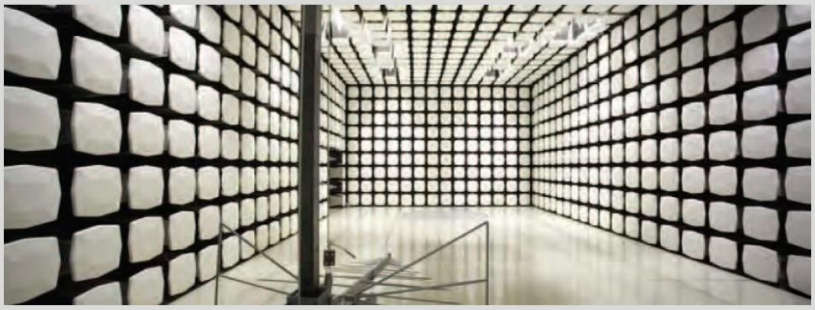
Radio Test Report
Application for Grant of Equipment Authorization
FCC Part 27 Subpart C and IC RSS-130
617MHz – 652MHz
And
728MHz – 746MHz

FCC ID: VBNAHLOB-01
IC ID: 661W-AHLOB
Nokia Solutions and Networks
Airscale Base Transceiver Station Remote Radio Head
Model: AHLOB
(Feature: CB013034)

Report: NOKI0083.0 Rev. 0, Issue Date: March 10, 2025



Element Plano
1701 E. Plano Parkway #150
Plano, TX 75074 USA

ACCREDITED
CERT #214.19

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element
2023.04.17

Section	Page Number

CERTIFICATE OF TEST

Last Date of Test: February 5, 2025
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Remote Radio Head

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 and (CFR) Title 47 Part 27 Subpart C (Radio Standards Specification) RSS-Gen Issue 5: April 2018 and RSS-130 Issue 2: February 2019	ANSI C63.26-2015 ANSI C63.4-2014 with FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01

Results

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

Deviations From Test Standards

None

Approved By:

Adam Bruno, Operations Manager
Signed for and on behalf of Element

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:

Texas

FACILITIES

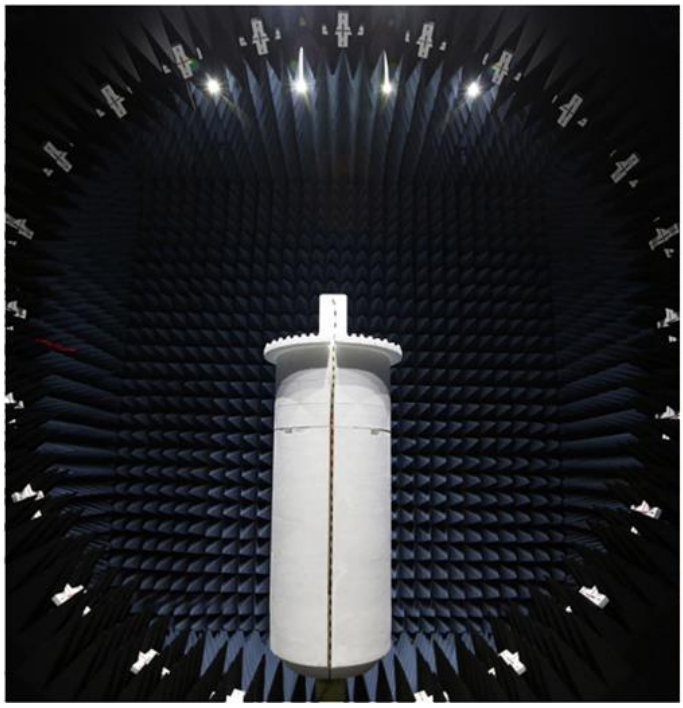
element
2025.01.03

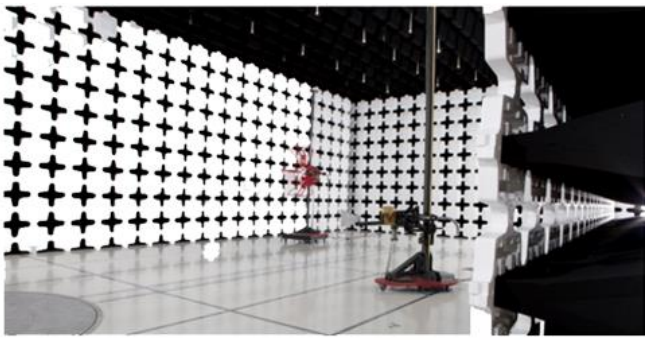
Testing was performed at the following location(s)

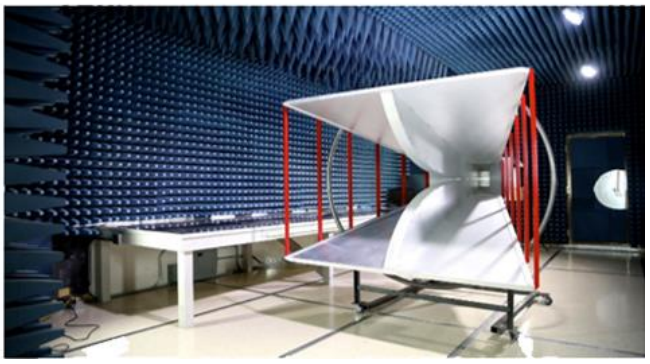
	Location	Labs (1)	Address	A2LA (2)	ISED (3)	BSMI (4)	VCCI (5)	CAB (6)	FDA (7)
☒	Plano Texas	PT01-15	1701 E Plano Pkwy, Ste 150 Plano, TX 75074 (972) 509-2566	214.19	32637	SL2-IN-E-057R	A-0426	US0054	TL-137
☐	Offsite	N/A	See Product Description	N/A	N/A	N/A	N/A	N/A	N/A

See data sheets for specific labs

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







MEASUREMENT UNCERTAINTY

element
MU 2024-12-12

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 reported is based on statistical analysis that was performed by the laboratory. 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.

Various Measurements

Test	All Labs (+/-)
Frequency Accuracy (%)	0.0007
Amplitude Accuracy (dB)	1.2
Conducted Power (dB)	1.2
Radiated Power via Substitution (dB)	0.7
Temperature (degrees C)	0.7
Humidity (% RH)	2.5
Voltage (AC) (%)	1
Voltage (DC) (%)	0.7

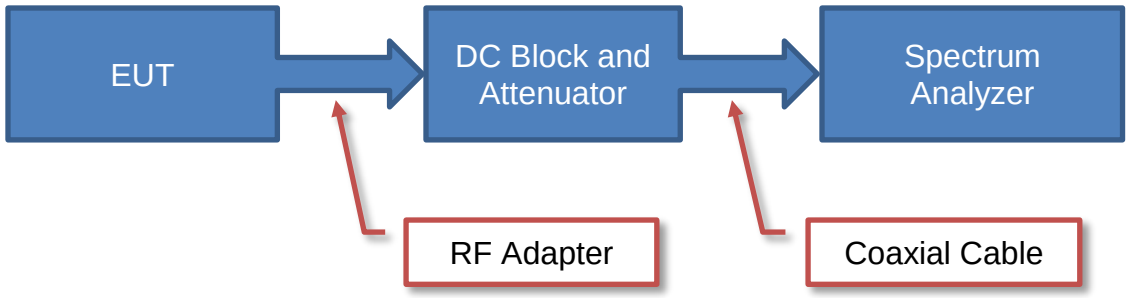
TEST SETUP BLOCK DIAGRAMS

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.

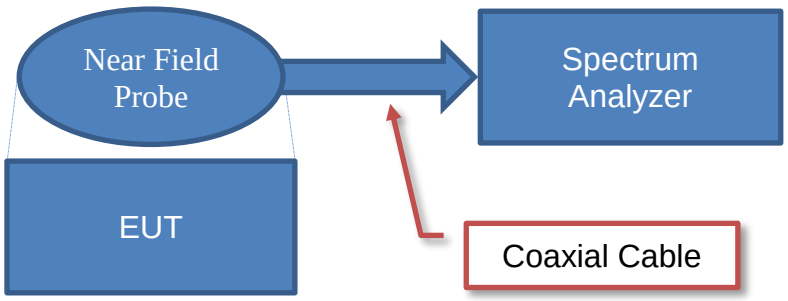
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

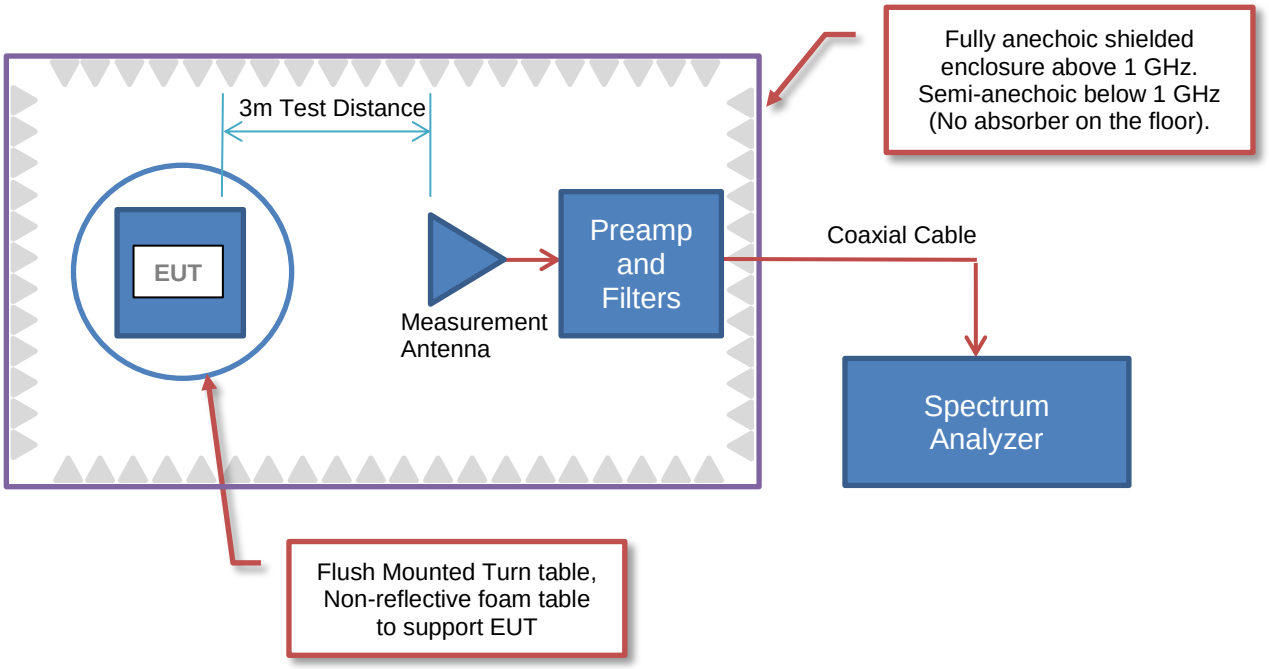


Sample Calculation (logarithmic units)

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**

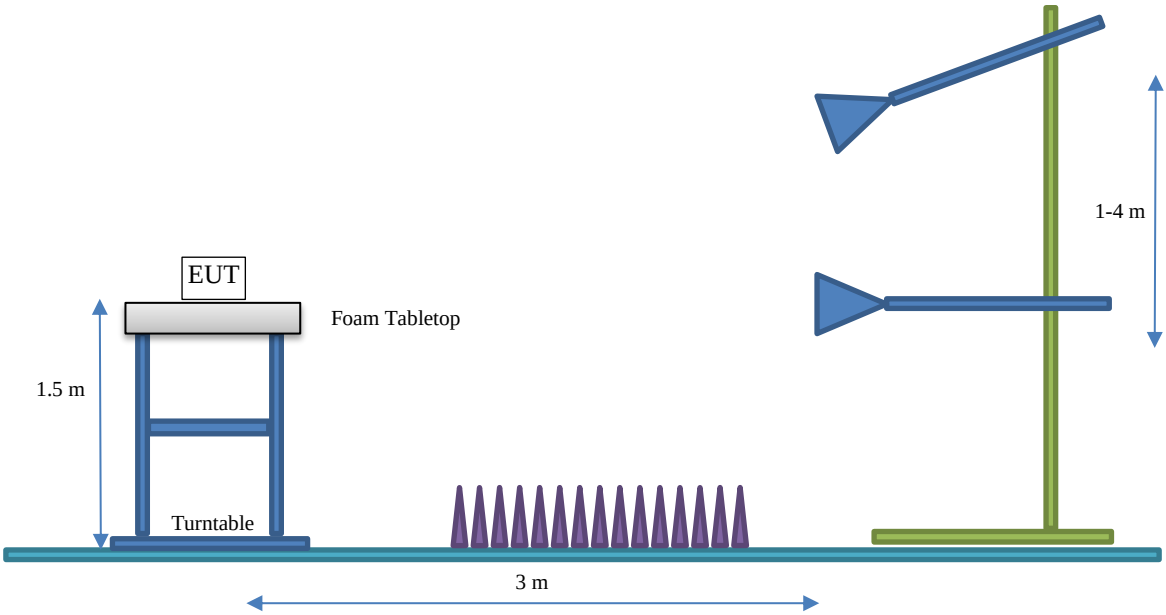
Radiated Power (ERP/EIRP) – Substitution Method:

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 AHLOB
First Date of Test:	February 5, 2025
Last Date of Test:	February 5, 2025
Receipt Date of Samples:	February 5, 2025
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) 35MHz channel bandwidth carriers to the Air Scale Base Transceiver Station Remote Radio Head Model AHLOB FCC and ISED radio certifications. The original test effort includes testing for 4G LTE technologies. Please refer to the test report on the original certification for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using 5G NR 35MHz channel bandwidth 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 (AHLOB) as the original certification test. The base station and remote radio head software for this testing is an updated release that includes 5G NR 35MHz channel bandwidth carrier support.
The radiated emission and frequency stability/accuracy results from the original certification had enough margin to preclude requiring additional testing. The frequency stability/accuracy radio design is the same across the radio technologies and modulation types.

Nokia Solutions and Networks Air Scale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHLOB is being developed under this effort. The AHLOB remote radio head is a multi-standard multi-carrier radio module designed to support GSM/EDGE, WCDMA, LTE, LTE Narrow Band Internet of Things (NB IoT) operations (in-band, guard band, standalone) and 5G NR. **The scope of testing in this effort is for the addition of 35MHz bandwidth in 5G NR FDD operations for band n71.**

The AHLOB RRH has four transmit/four receive antenna ports (4TX/4RX for Band n71 and 4TX/4RX for Band n85). Each antenna port supports 3GPP frequency band n71 (BTS Rx: 663 to 698 MHz/BTS TX: 617 to 652 MHz) and 3GPP frequency band n85 (BTS Rx: 698 to 716 MHz/BTS TX: 728 to 746 MHz). The maximum RF output power of the RRH is 320 Watts (80 watts per antenna port shared between Band n71 and Band n85). The TX and RX instantaneous bandwidth cover the full operational bandwidth. Multi-carrier operation is supported. The maximum RF output power for single carriers are proved below.

Single Carrier Maximum RF Output Power per Port for each Channel Bandwidth				
NB IoT SA	**LTE5 or NR5**	**LTE10 or NR10**	**LTE15 or NR15**	**LTE20, NR20, NR25, NR30, or NR35**
20.0 Watts or 43.0 dBm	40.0 Watts or 46.0 dBm	60.0 Watts or 47.8 dBm	80.0 Watts or 49.0 dBm	80.0 Watts or 49.0 dBm

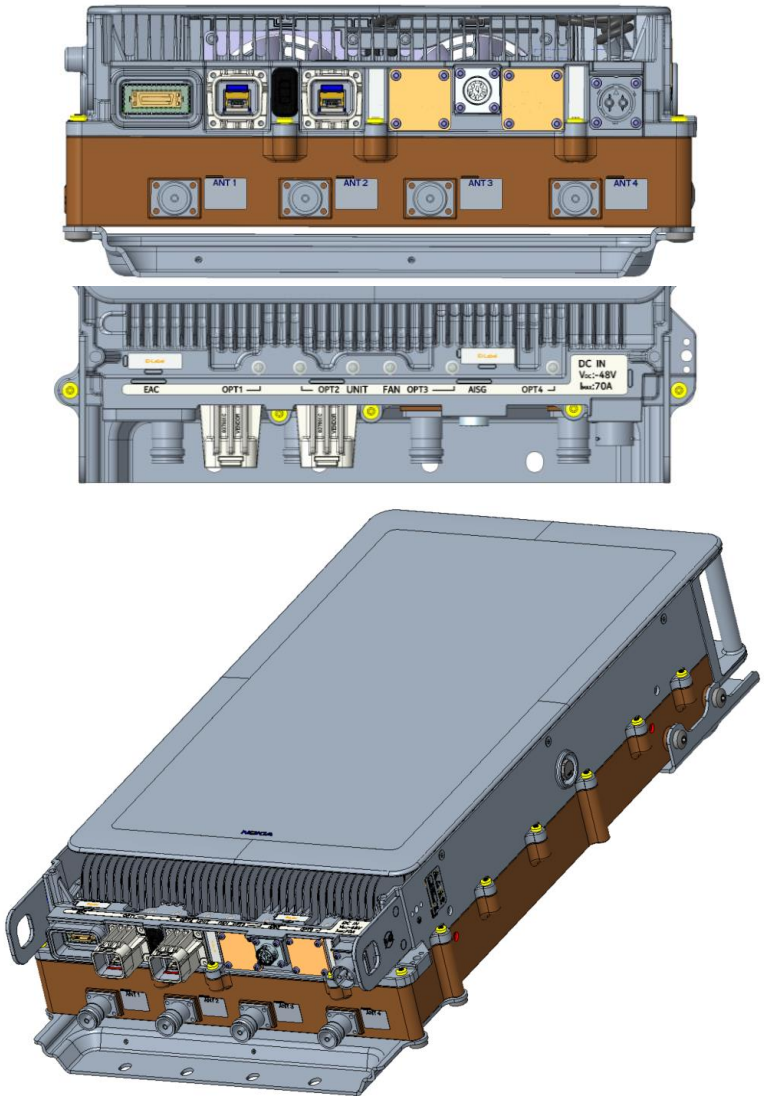
The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The RRH supports 5G NR bandwidths of 5, 10, 15, 20, 25, 30, and 35MHz for 3GPP frequency band n71 operations. The RRH supports 5G NR bandwidths of 5, 10, and 15MHz for 3GPP frequency band n85. The 5G NR carriers/modulation types for this testing are setup according to 3GPP TS 38.141-1 Test Models and are NR-FR1-TM 1.1 (QPSK modulation type), NR-FR1-TM 3.2 (16QAM modulation type), NR-FR1-TM 3.1 (64QAM modulation type), and NR-FR1-TM 3.1a (256QAM modulation type).
The RRH has external interfaces including DC power (DC In), ground, transmit/receive (ANT), external alarm (EAC), optical (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted.

The 3GPP frequency band n71 (617 to 652 MHz) band edge downlink (BTS Transmit) NR-ARFCNs for NR channel bandwidths (5, 10, 15, 20, 25, 30, 35MHz) are provided below. The NR-ARFCN is defined as Absolute Radio Frequency Channel Number. The channel spacing is 100 kHz between channel numbers. The formula for 5G NR ARFCN is described in 3GPP TS 38.104 chapter 5.4.2.1.

	Downlink NR-ARFCN	Downlink Frequency (MHz)	NR Channel Bandwidth						
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	35 MHz
Band n71 (Ant 1, 2, 3, 4)	123400	617.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge
	……								
	123900	619.5	Bottom Ch						
	……								
	124400	622.0		Bottom Ch					
	……								
	124900	624.5			Bottom Ch				
	……								
	125400	627.0				Bottom Ch			
	……								
	125900	629.5					Bottom Ch		
	……								
	126400	632.0						Bottom Ch	
	……								
	126900	634.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	……								
	127400	637.0						Top Channel	
	……								
	127900	639.5					Top Channel		
	……								
	128400	642.0				Top Channel			
	……								
	128900	644.5			Top Channel				
	……								
	129400	647.0		Top Channel					
	……								
	129900	649.5	Top Channel						
	……								
	130400	652.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge

Table 1 AHLOB Downlink Band Edge 5G NR Band n71 Frequency Channels

AHLOB Connector Layout:



AHLOB External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Quick Disconnect	2-pole Power Input Terminal
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	4	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
Unit	1	LED	Unit Status LED
EAC	1	MDR26	External Alarm Interface (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.

PRODUCT DESCRIPTION

Testing Objective:
Demonstrate FCC and ISED compliance of Airscale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, AHLOB for 5G NR FDD single carrier/multi carriers operating in 3GPP Band n71 (617MHz to 652MHz).

CONFIGURATIONS

NOKI0083-1

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version (25R2)	SBTS00_ENB_9999_250107_000008
5G RF_SW	RF. FRM6.trunk.20250103.005

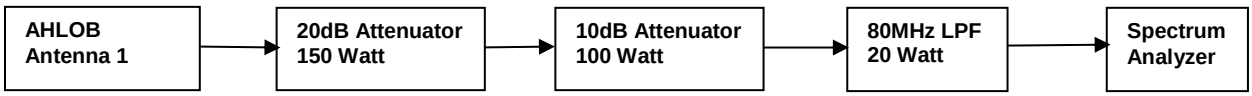
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.204	UK222201001
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	K9214331950
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
80MHz Low Pass Filter/20 Watt	Microwave Circuits, Inc.	VLFX-80+	15542
Attenuator 100W/10dB	Aeroflex Weinschel	48-10-43-LIM	BJ1771
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR214716952
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR213801728
Lenovo T470	HP	T470	PF26RVZ8
Keysight- DC System power supply	Keysight	N8757A	US21D4054S
FPAD (DC-pwr supply)	Nokia	472805A.X21.101	A9124600282
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531431/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531433/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC869
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
3 Meters RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN528836/6
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	2 meters	N	ABIO	AHLOB
GPS Receiver Cable	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e Cable	Y	7 meters	N	ASIB	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 2-4	250W -50ohm - Loads

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	3 meters	N	EUT [AHLOB] Ant port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	N/A	N	RF cable HS-SUCOFLEX_106	Attenuator 100W/10dB
Attenuator 100W/10dB	N	N/A	N	Attenuator 150W/20dB	Low Pass Filter 80MHz/20W
Low Pass Filter 80MHz/20W	N	N/A	N	Attenuator 100W/10dB	HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 20MHz/20W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

NOKI0083-2

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version (25R2)	SBTS00_ENB_9999_250107_000008
5G RF_SW	RF. FRM6.trunk.20250103.005

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
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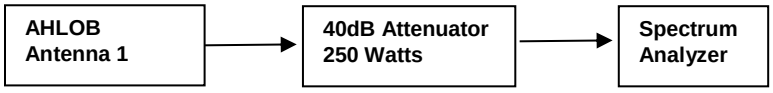
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	K9214331950
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
Attenuator 40dB/250 Watts	API Weinschel	58-40-43-LMI	TC909
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR214716952
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR213801728
Lenovo T470	HP	T470	PF26RVZ8
Keysight- DC System power supply	Keysight	N8757A	US21D4054S
FPAD (DC-pwr supply)	Nokia	472805A.X21.101	A9124600282
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531431/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531433/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC869
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
3 Meters RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN528836/6
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	2 meters	N	ABIO	AHLOB
GPS Receiver Cable	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e Cable	Y	7 meters	N	ASIB	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 2-4	250W -50ohm - Loads

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	3 meters	N	EUT [AHLOB] Ant port #1	Attenuator 250W/40dB
Attenuator 250W/40dB	N	NA	N	HS-SUCOFLEX_106	HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Attenuator 250W/40dB	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

NOKI0083-3

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version (25R2)	SBTS00_ENB_9999_250107_000008
5G RF_SW	RF. FRM6.trunk.20250103.005

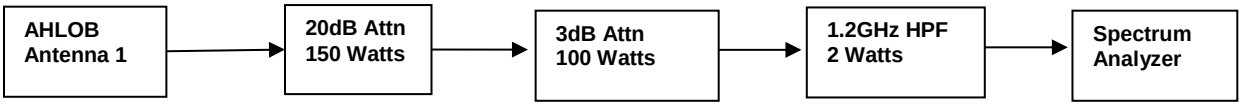
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.204	UK222201001
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	K9214331950
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
1.2 GHz HPF 2 Watts	Micro-Tronic	HPM11692	002
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
Attenuator 100W/3dB	Aeroflex Weinschel	47-3-33	CG5493
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR214716952
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	FR213801728
Lenovo T470	HP	T470	PF26RVZ8
Keysight- DC System power supply	Keysight	N8757A	US21D4054S
FPAD (DC-pwr supply)	Nokia	472805A.X21.101	A9124600282
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531431/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN531433/6
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC865
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC869
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
3 Meters RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN528836/6
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	2 meters	N	ABIO	AHLOB
GPS Receiver Cable	Y	100 meters	N	ASIB	FYGB GPS receiver
Cat-5e Cable	Y	7 meters	N	ASIB	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 2-4	250W -50ohm - Loads

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	3 meters	N	EUT [AHLOB] Ant port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	NA	N	HS-SUCOFLEX_106	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	Attenuator 150W/20dB	1.2GHz HPF 2Watts
1.2GHz HPF 2Watts	N	NA	N	Attenuator 100W/3dB	HS-SUCOFLEX_104
HS-SUCOFLEX_104	N	1 meter	N	3-18GHz HPF 15Watts	Spectrum Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2025-02-05	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.
2	2025-02-05	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2025-02-05	Peak To Average Power (PAPR) CCDF	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2025-02-05	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.
5	2025-02-25	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2025-02-05	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

AVERAGE POWER

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

The fundamental emission Output Power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

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

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

The output power was measured for a single carrier over the carrier channel bandwidth. The total output power for multiport (4x4 MIMO) operations was determined based per ANSI C63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log N_{out}). The total power for four port operations is single port power +6 dB [i.e. 10*log(4)].

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2024-04-12	2025-04-12
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

AVERAGE POWER

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-2

COMMENTS

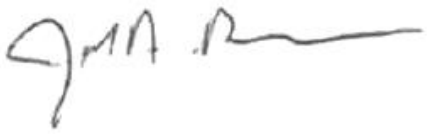
Losses in measurement path were accounted for; cables, attenuators, filters, and DC blocks.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



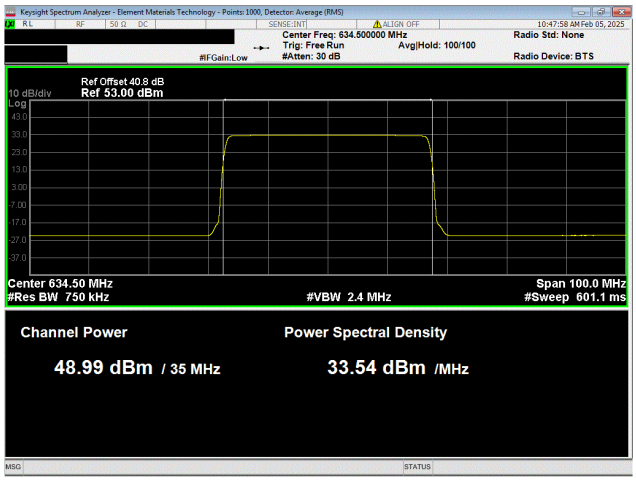
Tested By

TEST RESULTS

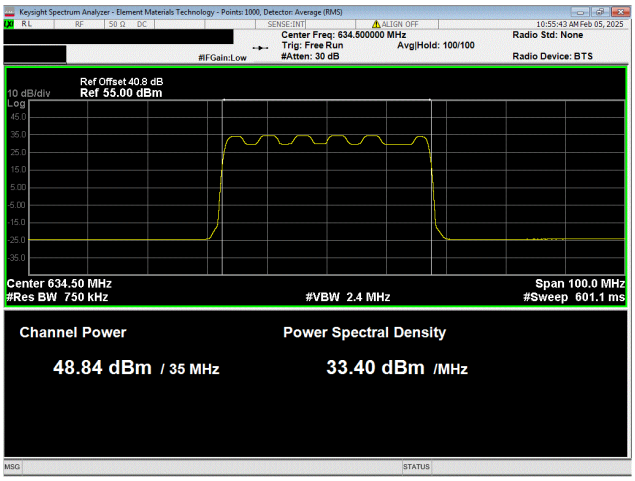
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Four Port (4x4 MIMO) dBm/carrier BW
Band n71, 617 MHz - 652 MHz				
35 MHz Channel Bandwidth				
QPSK Modulation				
Middle Channel, 634.5 MHz	48.985	0	49.0	55.0
16QAM Modulation				
Middle Channel, 634.5 MHz	48.836	0	48.8	54.9
64QAM Modulation				
Middle Channel, 634.5 MHz	48.882	0	48.9	54.9
256QAM Modulation				
Middle Channel, 634.5 MHz	48.856	0	48.9	54.9

AVERAGE POWER

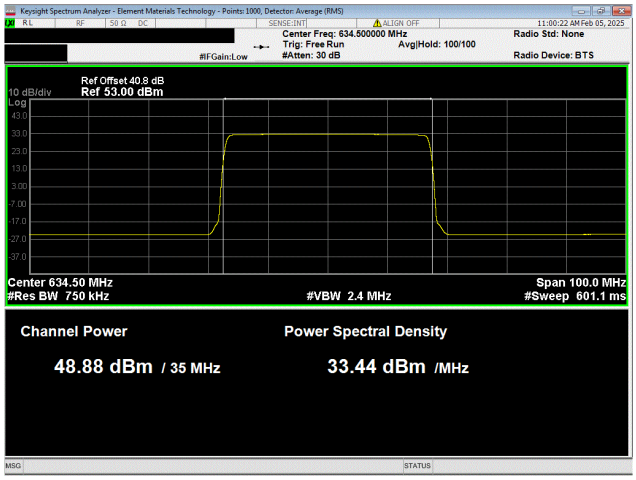
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



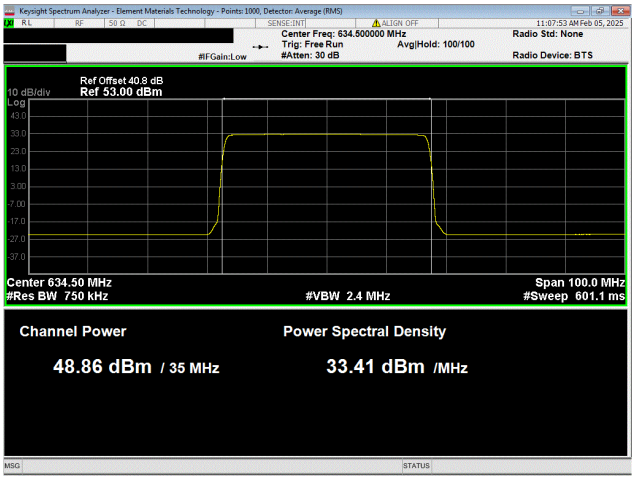
Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz

OCCUPIED BANDWIDTH

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

The fundamental emission Occupied Bandwidth was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

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

FCC 27.53(H)(3) defines the 26dB emission bandwidth requirement.

RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

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

FCC and ISED Emission Designators for Band n71 (617MHz to 652MHz)									
Ch BW	Radio Channel	5G-NR: QPSK		5G-NR: 16QAM		5G-NR: 64QAM		5G-NR: 256QAM	
		FCC	ISED	FCC	ISED	FCC	ISED	FCC	ISED
35MHz	Mid	35M4G7W	33M5G7W	35M4G7W	33M7G7W	35M5G7W	33M6G7W	35M5G7W	33M6G7W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.									

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2024-04-12	2025-04-12
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

OCCUPIED BANDWIDTH

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-2

COMMENTS

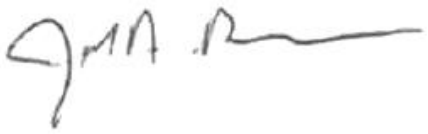
Losses in measurement path were accounted for; cables, attenuators, filters, and DC blocks.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



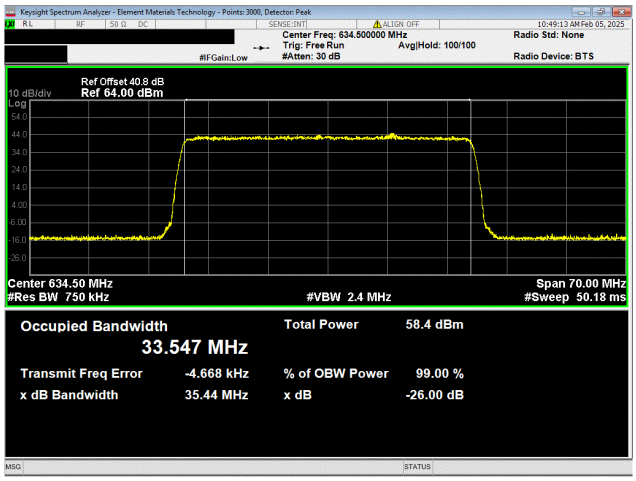
Tested By

TEST RESULTS

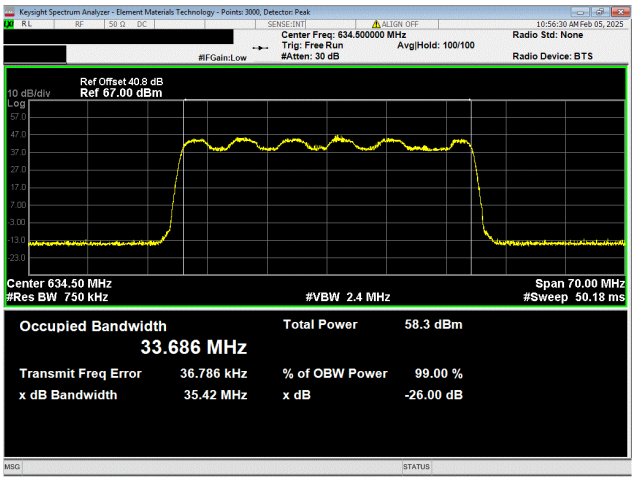
	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Band n71, 617 MHz - 652 MHz				
35 MHz Channel Bandwidth				
QPSK Modulation				
Middle Channel, 634.5 MHz	33.547 MHz	35.438 MHz	Within Band	Pass
16QAM Modulation				
Middle Channel, 634.5 MHz	33.686 MHz	35.418 MHz	Within Band	Pass
64QAM Modulation				
Middle Channel, 634.5 MHz	33.567 MHz	35.488 MHz	Within Band	Pass
256QAM Modulation				
Middle Channel, 634.5 MHz	33.554 MHz	35.528 MHz	Within Band	Pass

OCCUPIED BANDWIDTH

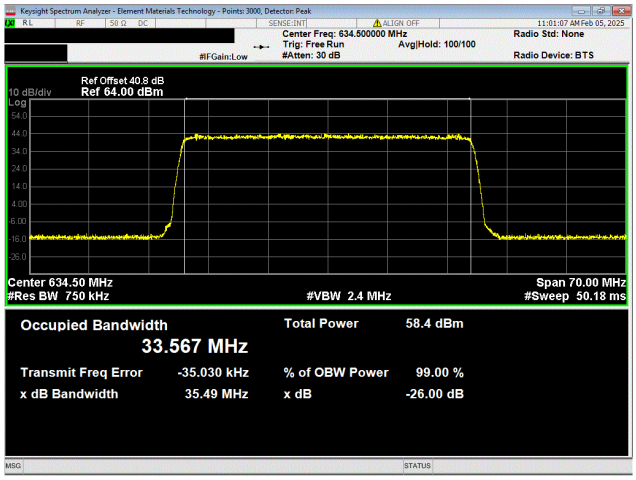
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



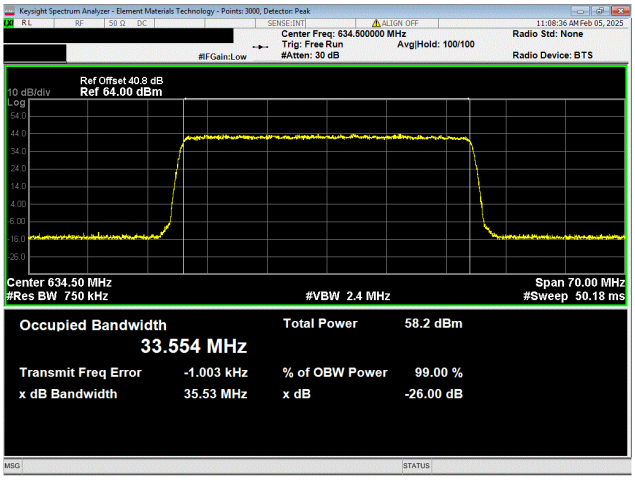
Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz

PEAK AND AVERAGE (PAPR) CCDF

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

The fundamental emission Peak to Average 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.

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

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

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

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

Per FCC 27.50(k) (4), the peak to average ratio may not exceed 13dB for more than the ANSI described 0.1% of the time.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Spectrum Analyzer	Keysight Technologies, Inc.	N9030B	R336	2024-10-03	2025-10-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

PEAK AND AVERAGE (PAPR) CCDF

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-2

COMMENTS

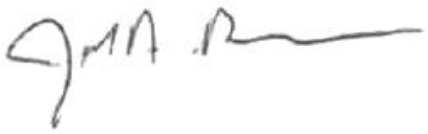
Losses in measurement path were accounted for; cables, attenuators, and filters.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

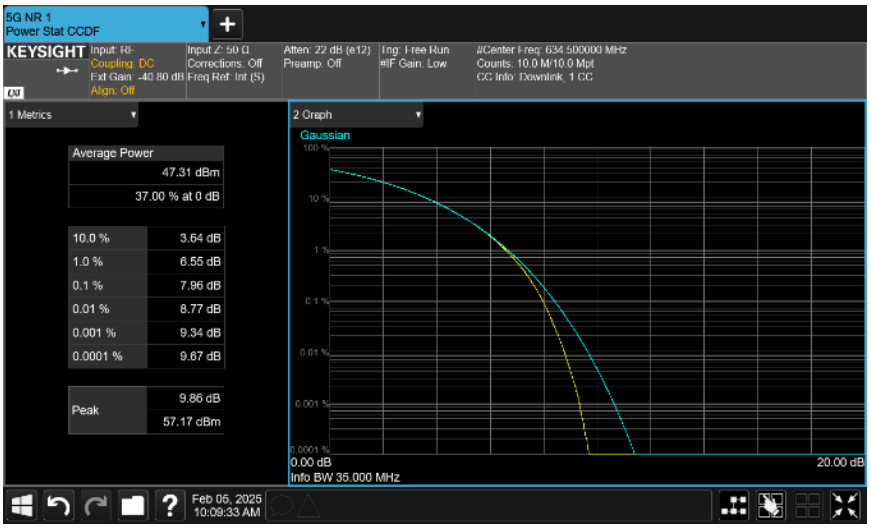


Tested By

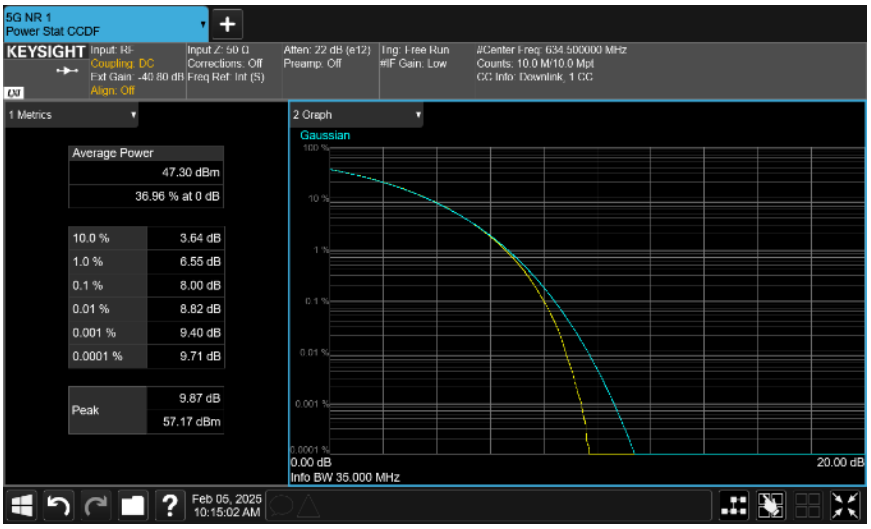
TEST RESULTS

	0.01% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
Port 1			
35 MHz Channel Bandwidth			
QPSK Modulation			
Middle Channel, 634.5 MHz	8.77	13	Pass
16QAM Modulation			
Middle Channel, 634.5 MHz	8.82	13	Pass
64QAM Modulation			
Middle Channel, 634.5 MHz	8.76	13	Pass
256QAM Modulation			
Middle Channel, 634.5 MHz	8.76	13	Pass

PEAK AND AVERAGE (PAPR) CCDF

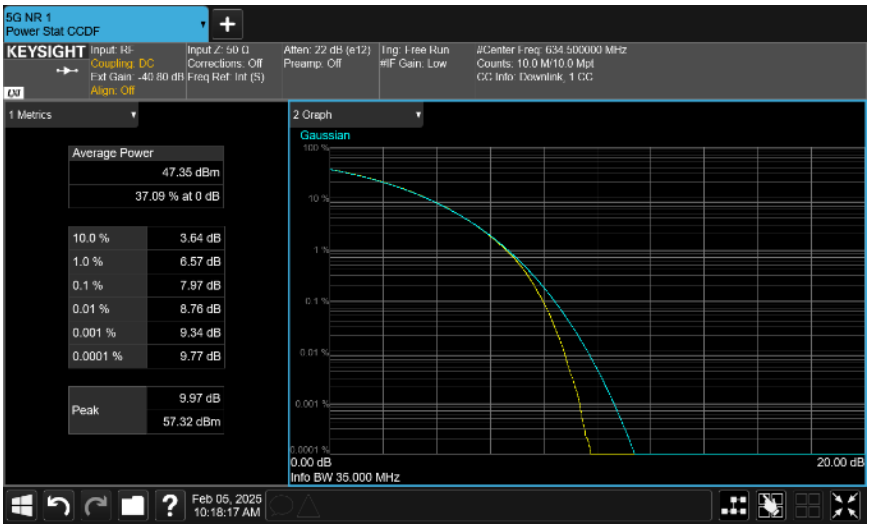


35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz

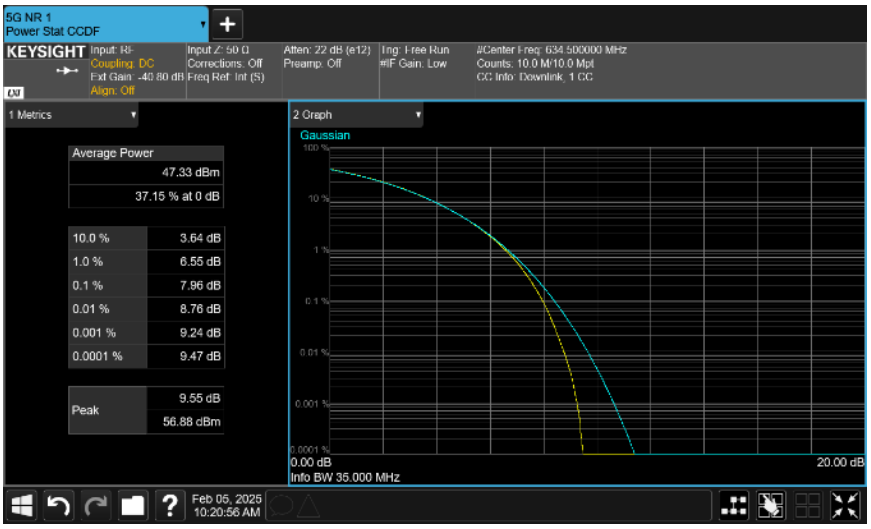


35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz

PEAK AND AVERAGE (PAPR) CCDF



35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz



35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz

BAND EDGE COMPLIANCE

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

The spurious RF conducted emissions at the edges of the authorized bands were measured on the low and high transmit frequencies of the available band. The channels closest to the band edges were selected. The EUT was transmitting at the power and data rate(s) listed in the datasheet.

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

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

Per RSS-130 4.7 and FCC section 27.53(g) the power of any emissions outside the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 [-13 dBm – 10 Log (4)] per FCC KDB 662911D01 v02r01 because BTS may operate as a 4 port MIMO transmitter.

RSS-130 4.7 and FCC section 27.53(g) requires >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. RSS-130 4.7 and FCC section 27.53(g) requires >30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2024-04-12	2025-04-12
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

BAND EDGE COMPLIANCE

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-2

COMMENTS

Losses in measurement path were accounted for; cables, attenuators, filters, and DC blocks.

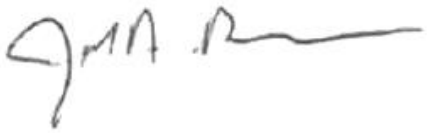
Band n71 is a total of 35MHz wide thus 35MHz carrier fills whole band. "Low Channel" references lower side of the carrier at the band edge. "High Channel" references higher side of the carrier at the band edge.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



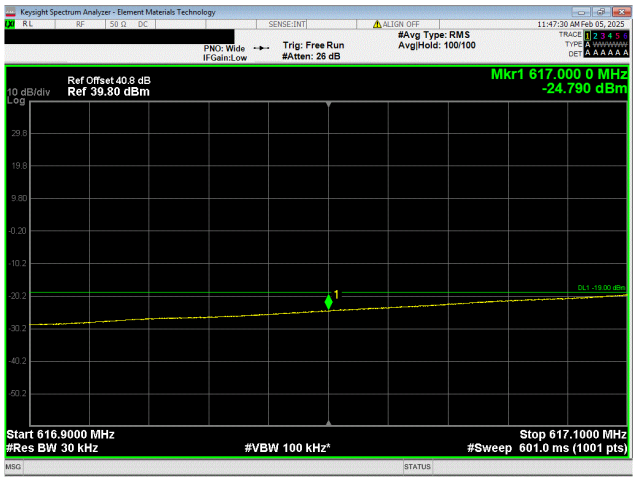
Tested By

TEST RESULTS

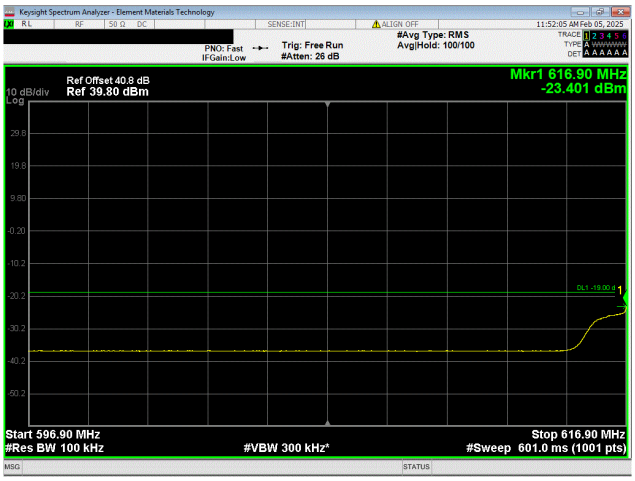
	Frequency Range	Frequency (MHz)	Value (dBm)	Limit (dBm)	Result
Port 1					
35 MHz Channel Bandwidth					
QPSK Modulation					
Low Channel, 634.5 MHz	616.9 MHz - 617.1 MHz	617	-24.79	-19	Pass
	596.9 MHz - 616.9 MHz	616.9	-23.401	-19	Pass
High Channel, 634.5 MHz	651.9 MHz - 652.1 MHz	652	-25.414	-19	Pass
	652.1 MHz - 672.1 MHz	652.1	-23.816	-19	Pass
16QAM Modulation					
Low Channel, 634.5 MHz	616.9 MHz - 617.1 MHz	617	-24.175	-19	Pass
	596.9 MHz - 616.9 MHz	616.9	-23.121	-19	Pass
High Channel, 634.5 MHz	651.9 MHz - 652.1 MHz	651.9	-24.807	-19	Pass
	652.1 MHz - 672.1 MHz	652.1	-23.466	-19	Pass
64QAM Modulation					
Low Channel, 634.5 MHz	616.9 MHz - 617.1 MHz	617	-24.371	-19	Pass
	596.9 MHz - 616.9 MHz	616.9	-23.251	-19	Pass
High Channel, 634.5 MHz	651.9 MHz - 652.1 MHz	652	-25.063	-19	Pass
	652.1 MHz - 672.1 MHz	652.1	-23.837	-19	Pass
256QAM Modulation					
Low Channel, 634.5 MHz	616.9 MHz - 617.1 MHz	617	-25.096	-19	Pass
	596.9 MHz - 616.9 MHz	616.9	-23.399	-19	Pass
High Channel, 634.5 MHz	651.9 MHz - 652.1 MHz	651.9	-25.399	-19	Pass
	652.1 MHz - 672.1 MHz	652.1	-23.646	-19	Pass

BAND EDGE COMPLIANCE

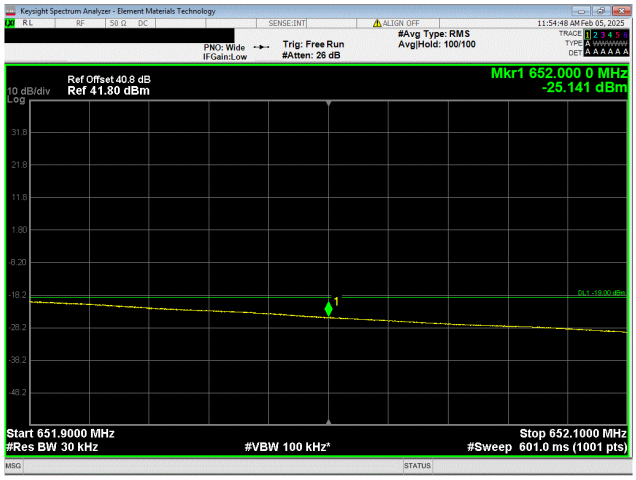
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



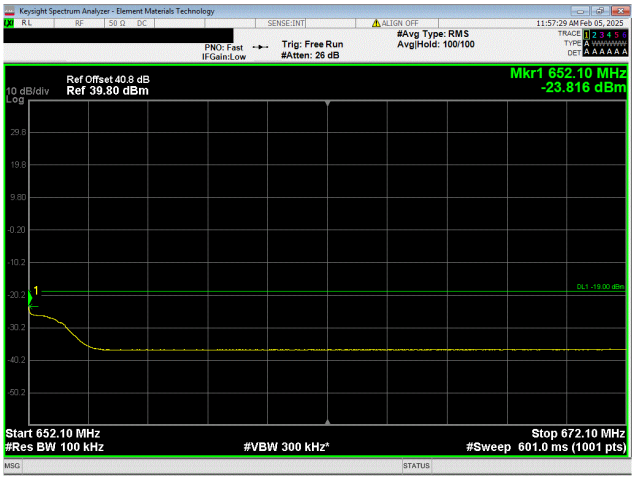
35 MHz Channel Bandwidth
QPSK Modulation
Low Channel, 634.5 MHz
616.9 MHz - 617.1 MHz



35 MHz Channel Bandwidth
QPSK Modulation
Low Channel, 634.5 MHz
596.9 MHz - 616.9 MHz



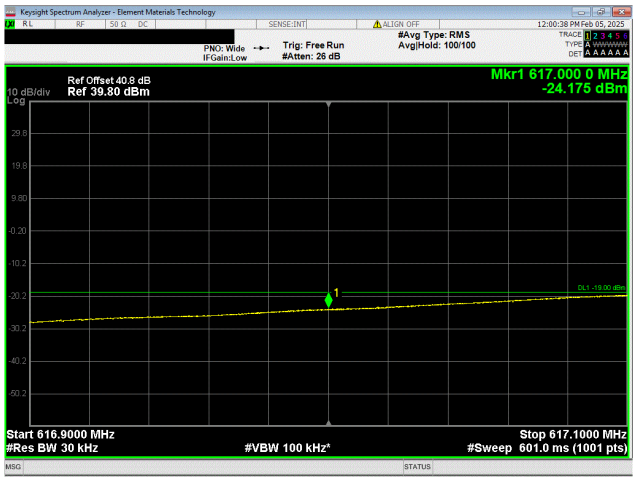
35 MHz Channel Bandwidth
QPSK Modulation
High Channel, 634.5 MHz
651.9 MHz - 652.1 MHz



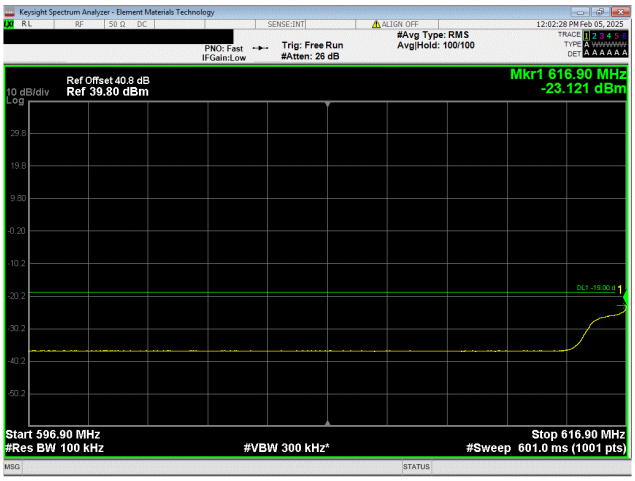
35 MHz Channel Bandwidth
QPSK Modulation
High Channel, 634.5 MHz
652.1 MHz - 672.1 MHz

BAND EDGE COMPLIANCE

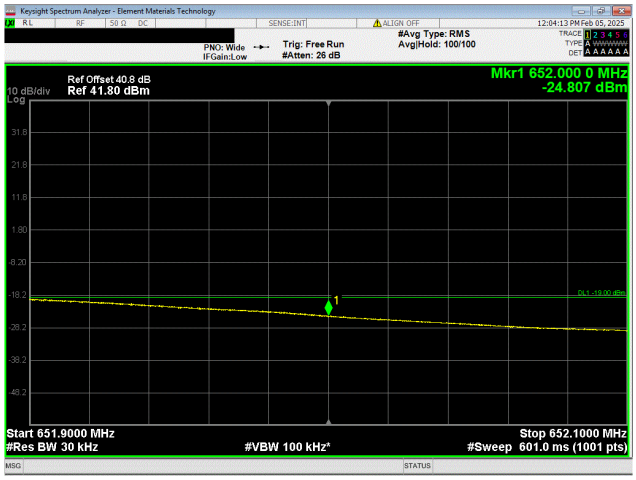
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



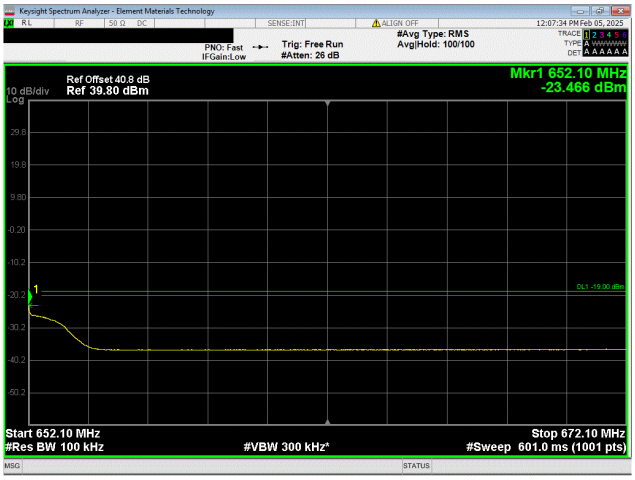
35 MHz Channel Bandwidth
16QAM Modulation
Low Channel, 634.5 MHz
616.9 MHz - 617.1 MHz



35 MHz Channel Bandwidth
16QAM Modulation
Low Channel, 634.5 MHz
596.9 MHz - 616.9 MHz



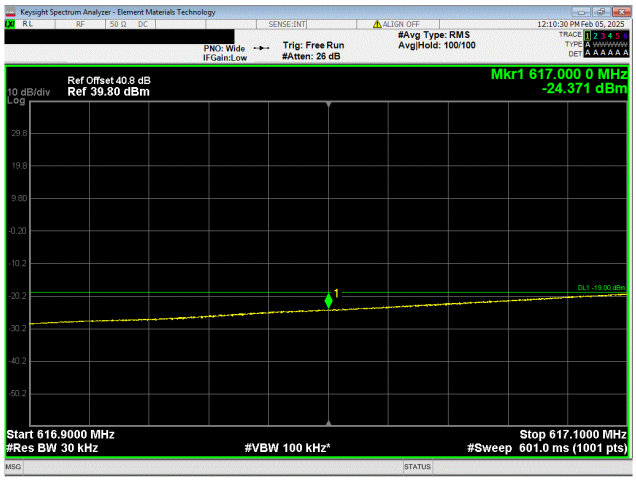
35 MHz Channel Bandwidth
16QAM Modulation
High Channel, 634.5 MHz
651.9 MHz - 652.1 MHz



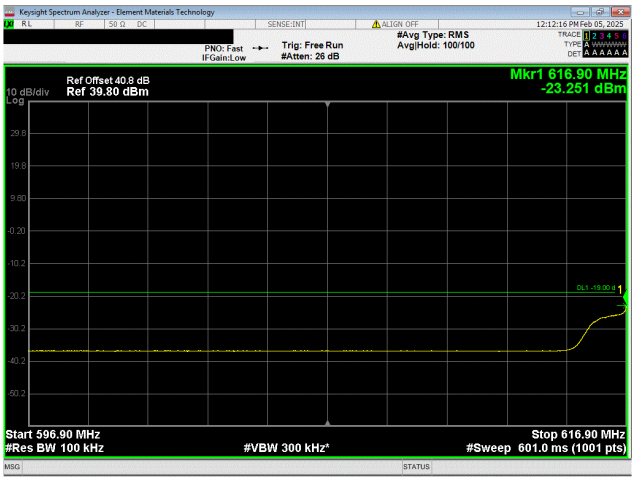
35 MHz Channel Bandwidth
16QAM Modulation
High Channel, 634.5 MHz
652.1 MHz - 672.1 MHz

BAND EDGE COMPLIANCE

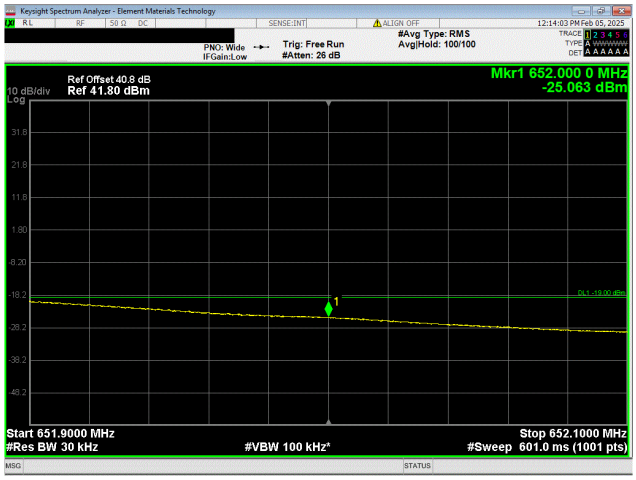
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



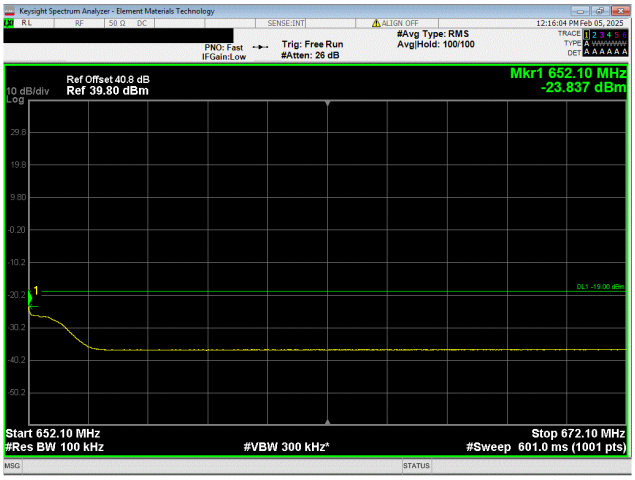
35 MHz Channel Bandwidth
64QAM Modulation
Low Channel, 634.5 MHz
616.9 MHz - 617.1 MHz



35 MHz Channel Bandwidth
64QAM Modulation
Low Channel, 634.5 MHz
596.9 MHz - 616.9 MHz



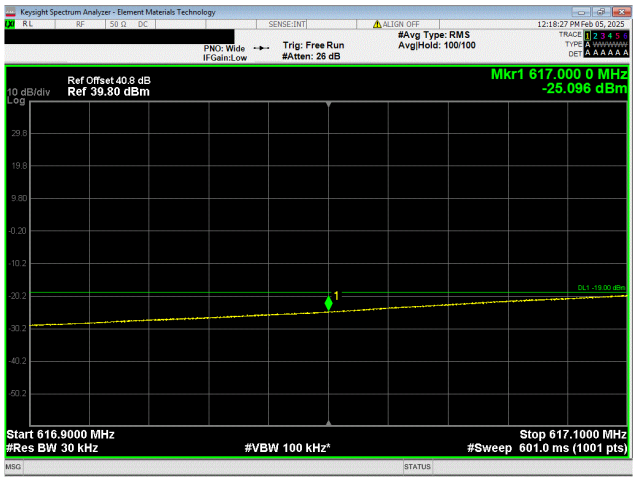
35 MHz Channel Bandwidth
64QAM Modulation
High Channel, 634.5 MHz
651.9 MHz - 652.1 MHz



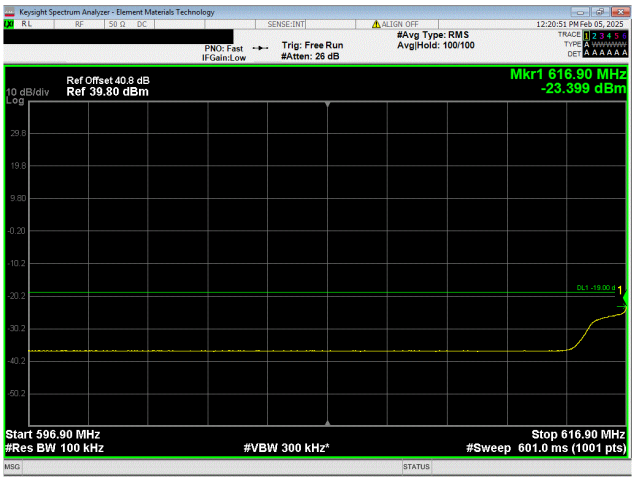
35 MHz Channel Bandwidth
64QAM Modulation
High Channel, 634.5 MHz
652.1 MHz - 672.1 MHz

BAND EDGE COMPLIANCE

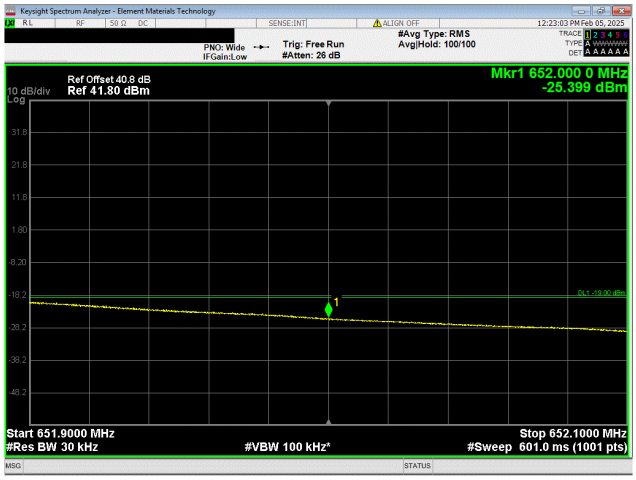
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



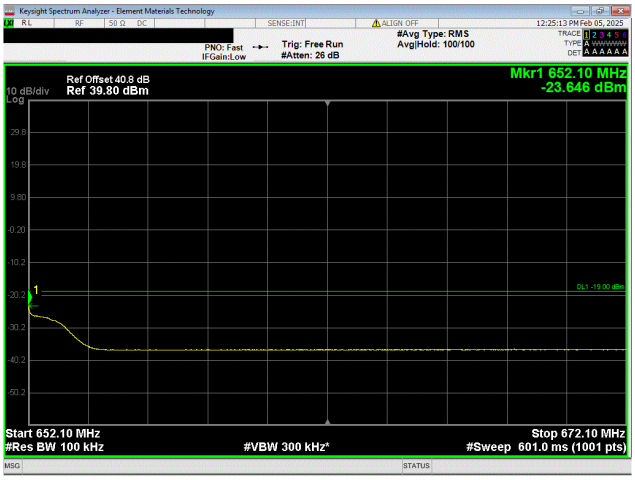
35 MHz Channel Bandwidth
256QAM Modulation
Low Channel, 634.5 MHz
616.9 MHz - 617.1 MHz



35 MHz Channel Bandwidth
256QAM Modulation
Low Channel, 634.5 MHz
596.9 MHz - 616.9 MHz



35 MHz Channel Bandwidth
256QAM Modulation
High Channel, 634.5 MHz
651.9 MHz - 652.1 MHz



35 MHz Channel Bandwidth
256QAM Modulation
High Channel, 634.5 MHz
652.1 MHz - 672.1 MHz

POWER SPECTRAL DENSITY

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

The RF conducted emission testing was performed on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power" report section) 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 fundamental emission Power Spectral Density (PSD) was measured using the channels and modes as called out on the following data sheets.

The total PSD for multiport (4x4 MIMO) operations was determined based per ANSI C63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log N_{out}). The total power for four port operations is single port power +6 dB [i.e. 10*log(4).

The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 for a four port MIMO base station.

FCC Requirements:

FCC 27.50(c) (3) Fixed and base stations transmitting a signal 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; FCC 27.50(c) (4) 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 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 Requirements RSS-130 Section 4.6/SRSP-518 section 5.1:

SRSP-518 section 5.1 Radiated power and antenna height limits for fixed and 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 meters.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centers and 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 metres.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2024-04-12	2025-04-12
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

POWER SPECTRAL DENSITY

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Commscope antenna assembly model “FF-65C-R1”. The maximum Band n71 gain (15.7dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of +45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated for four port MIMO (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.

POWER SPECTRAL DENSITY

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

Calculations of worst-case EIRP for four port MIMO are as follows:

Parameter	35 MHz Ch BW
Worst Case PSD/Antenna Port	35.8dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization 10*Log (2) = +3	38.8dBm/MHz
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	15.7 dBi
EIRP per Polarization	54.5dBm/MHz or 281.8Watts/MHz
Number of Polarizations	2
EIRP Total = R1 +45°and R2 +45° See Note 2	54.5dBm/MHz or 281.8Watts/MHz
Passing FCC and ISED EIRP Limits	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 AHLOB Band n71 four port MIMO EIRP levels using antenna assembly model “FF-65C-R1” are:

(1) Less than the ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 35MHz channel bandwidths
(2) Less than the ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 35MHz channel bandwidths

POWER SPECTRAL DENSITY

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-2

COMMENTS

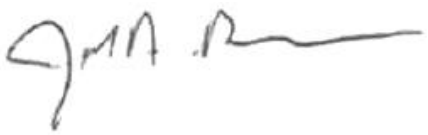
All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. The PSD was measured while transmitting one carrier on Port 1. The total PSD for multiport (2x2, 4x4 MIMO) operation was determined based upon ANSI 63.26 clause 6.4.3.2.4 (10 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 Log(4)]. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



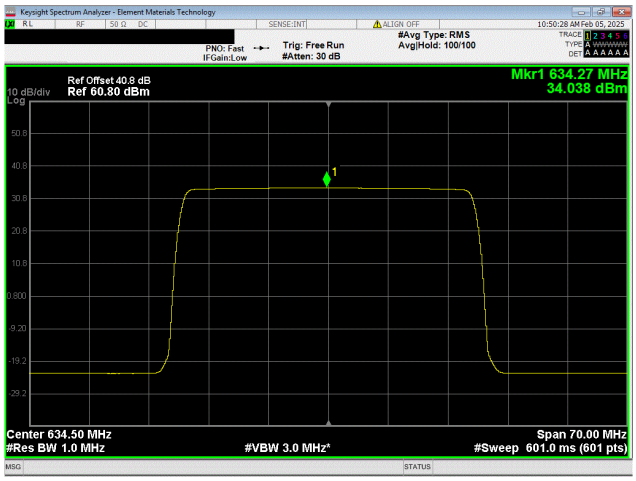
Tested By

TEST RESULTS

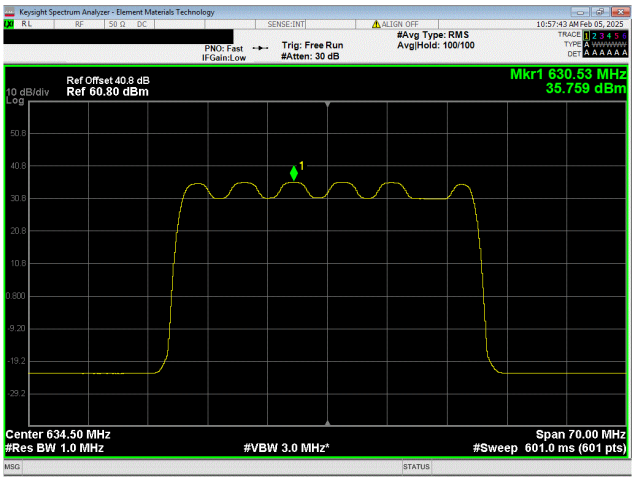
	Initial Value dBm/MHz	Duty cycle Factor (dB)	Single Port dBm/MHz == PSD	Four Port (4X4 MIMO) dBm/MHz == PSD	Result
Band n71, 617 MHz - 652 MHz					
35 MHz Channel Bandwidth					
QPSK Modulation					
Middle Channel, 634.5 MHz	34.038	0	34.0	40.1	Pass
16QAM Modulation					
Middle Channel, 634.5 MHz	35.759	0	35.8	41.8	Pass
64QAM Modulation					
Middle Channel, 634.5 MHz	34.003	0	34.0	40.0	Pass
256QAM Modulation					
Middle Channel, 634.5 MHz	33.962	0	34.0	40.0	Pass

POWER SPECTRAL DENSITY

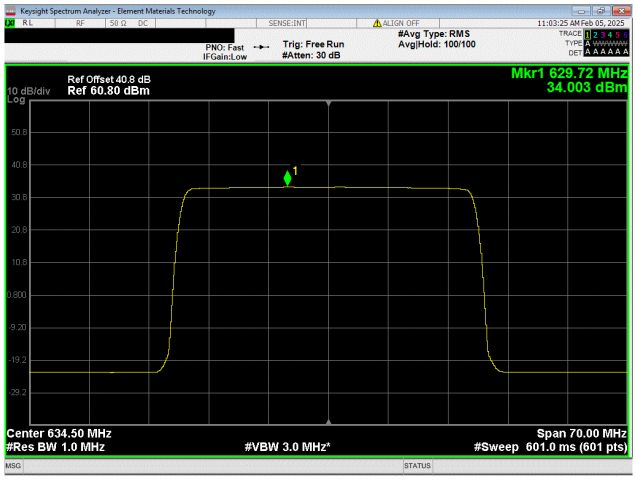
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



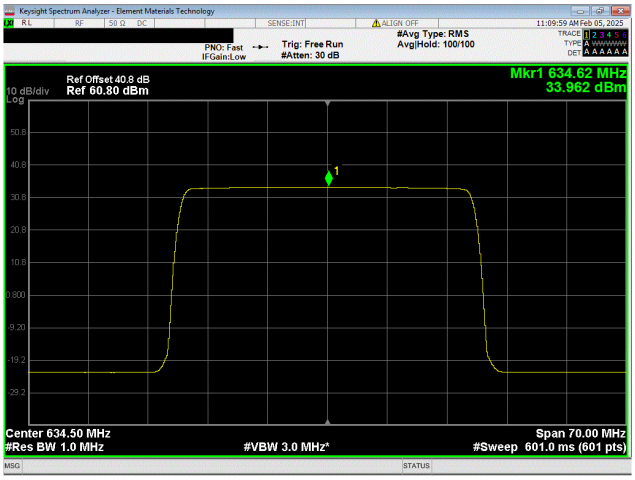
Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz



Band n71, 617 MHz - 652 MHz
35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

TEST DESCRIPTION

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

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.
The 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 approach were made for each modulation type from 9 kHz to 8 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.

C63.26 section 5.7.3 d), C63.26 section 5.7.4 c)
Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows: 1) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) × (symbol period) (e.g., by a factor of 10 × symbol period × number of points). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.

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.

Preliminary sweep using peak detector and auto

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 AHLOB 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.

Per section 27.53(g) and RSS 130 4.7, 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.

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 > 100kHz was used for all other frequency ranges.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2024-04-12	2025-04-12
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

EUT:	Airscale Base Transceiver Station Remote Radio Head. Model AHLOB	Work Order:	NOKI0083
Serial Number:	YK220900029	Date:	2025-02-05
Customer:	Nokia Solutions and Networks	Temperature:	25.3°C
Attendees:	Mitch Hill, John Rattanavong	Relative Humidity:	44.1%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54 VDC	Configuration:	NOKI0083-1 NOKI0083-2 NOKI0083-3

COMMENTS

Losses in measurement path were accounted for; cables, attenuators, filters, and DC blocks.

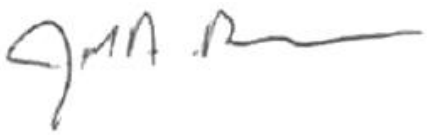
- Preliminary measurements are taken with peak detector.
- Measurements resulting in a minimal margin are re-measured with average detector method (*).

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



Tested By

TEST RESULTS

	Frequency Range	Frequency (MHz)	Value (dBm)	Limit (dBm)	Result
Port 1					
35 MHz Channel Bandwidth					
QPSK Modulation					
Middle Channel, 634.5 MHz	9 kHz to 150 kHz	0.030503	-45.853	-39	Pass
	150 kHz to 20 MHz	0.155	-52.575	-29	Pass
	20 MHz to 1400 MHz	737.324	-19.676	-19	Pass
	637.3 MHz to 837.3 MHz *	737.324	-26.119	-19	Pass
	1400 MHz to 8000 MHz	3812.96	-35.323	-19	Pass
16QAM Modulation					
Middle Channel, 634.5 MHz	9 kHz to 150 kHz	0.031014	-45.04	-39	Pass
	150 kHz to 20 MHz	0.015	-50.974	-29	Pass
	20 MHz to 1400 MHz	737.232	-19.766	-19	Pass
	637.3 MHz to 837.3 MHz *	737.278	-24.222	-19	Pass
	1400 MHz to 8000 MHz	3823.08	-34.791	-19	Pass
64QAM Modulation					
Middle Channel, 634.5 MHz	9 kHz to 150 kHz	0.031031	-46.125	-39	Pass
	150 kHz to 20 MHz	0.15	-50.424	-29	Pass
	20 MHz to 1400 MHz	737.278	-19.753	-19	Pass
	637.3 MHz to 837.3 MHz *	737.278	-24.049	-19	Pass

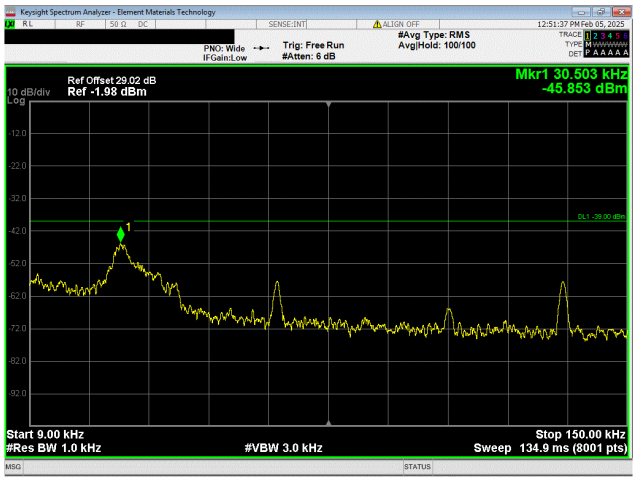
SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.05.24.1
WTD.2024.12.31.0

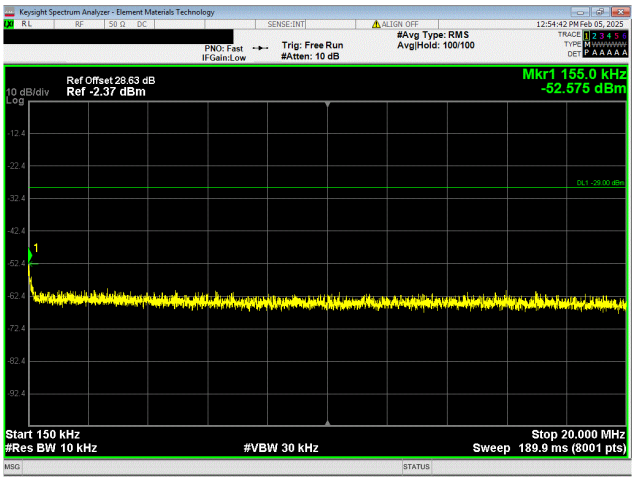
	Frequency Range	Frequency (MHz)	Value (dBm)	Limit (dBm)	Result
	1400 MHz to 8000 MHz	3773.8	-34.743	-19	Pass
256QAM Modulation					
Middle Channel, 634.5 MHz	9 kHz to 150 kHz	0.031	-45.816	-39	Pass
	150 kHz to 20 MHz	0.1525	-51.584	-29	Pass
	20 MHz to 1400 MHz	737.278	-19.832	-19	Pass
	637.3 MHz to 837.3 MHz *	737.278	-24.134	-19	Pass
	1400 MHz to 8000 MHz	3803.72	-34.477	-19	Pass

SPURIOUS CONDUCTED EMISSIONS

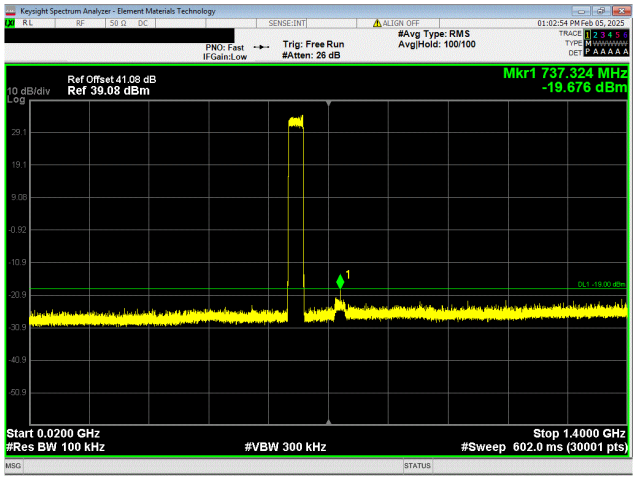
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



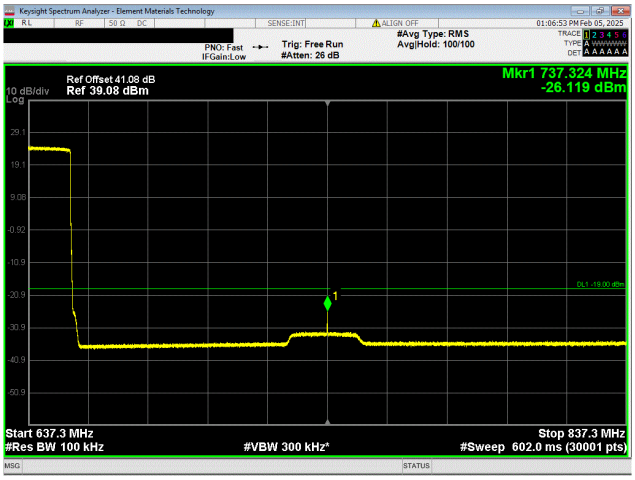
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz
9 kHz to 150 kHz



35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz
150 kHz to 20 MHz



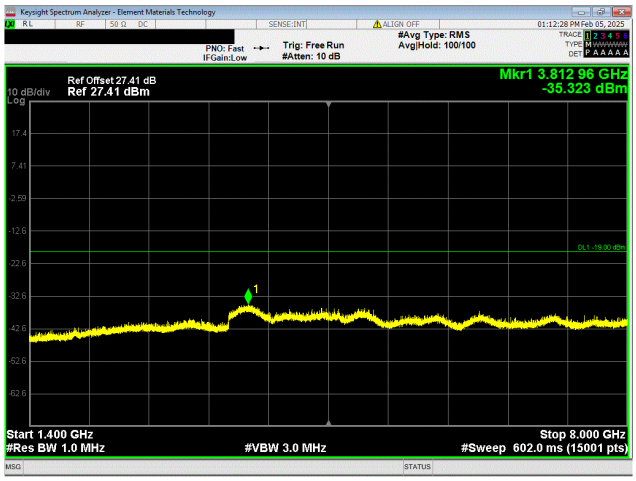
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz
20 MHz to 1400 MHz



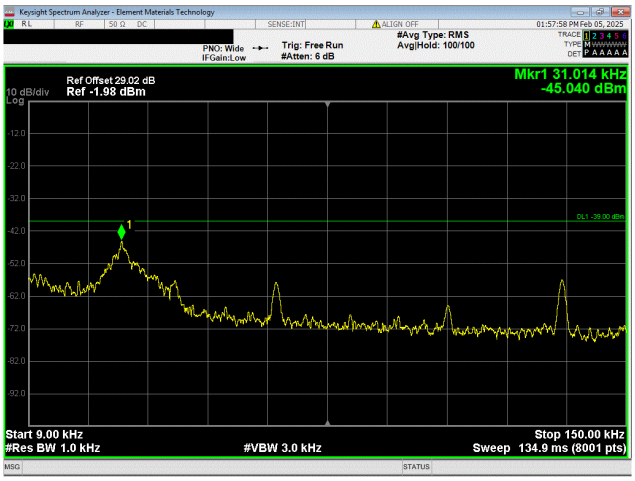
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz
637.3 MHz to 837.3 MHz *

SPURIOUS CONDUCTED EMISSIONS

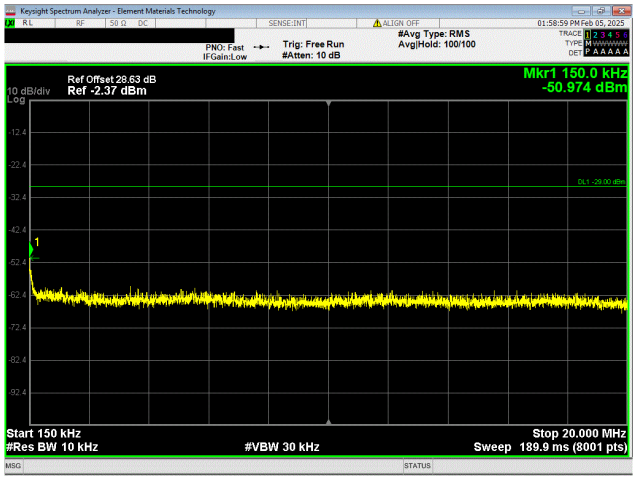
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



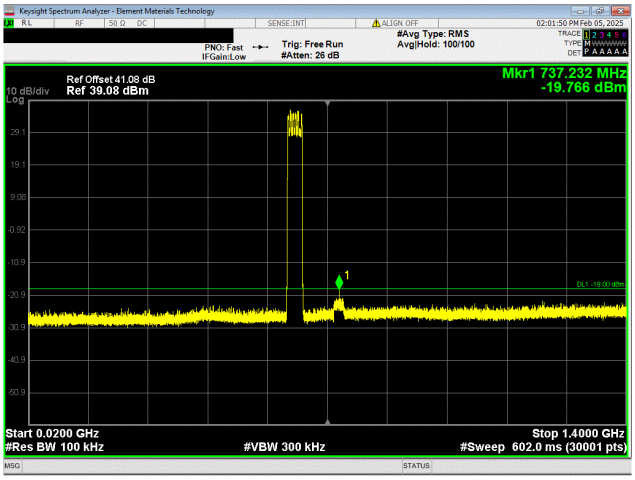
35 MHz Channel Bandwidth
QPSK Modulation
Middle Channel, 634.5 MHz
1400 MHz to 8000 MHz



35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz
9 kHz to 150 kHz



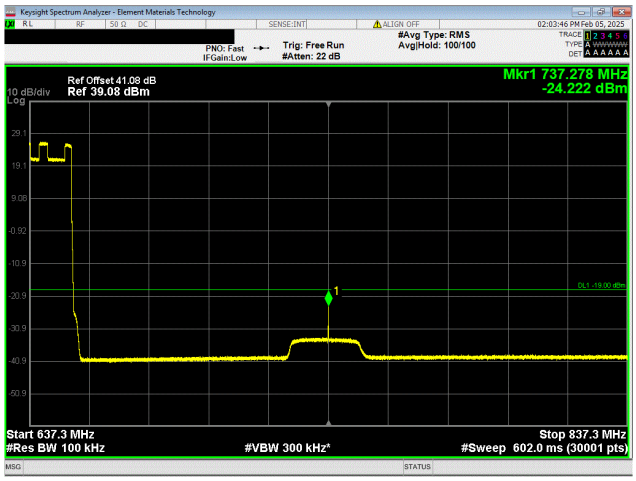
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz
150 kHz to 20 MHz



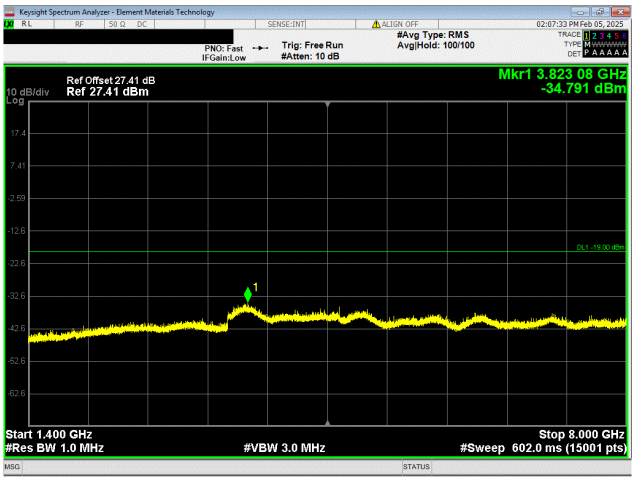
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz
20 MHz to 1400 MHz

SPURIOUS CONDUCTED EMISSIONS

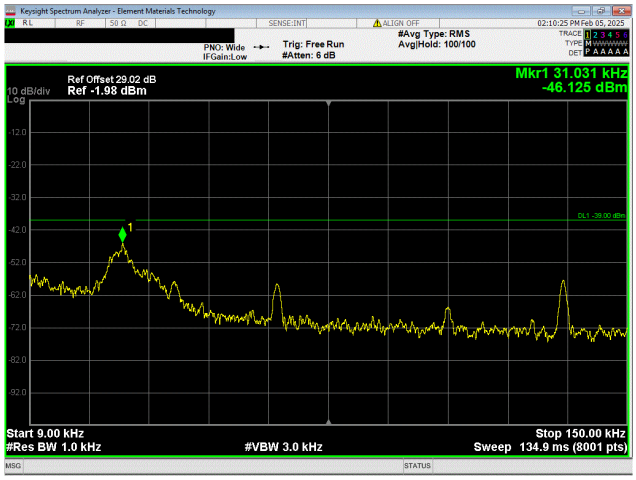
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



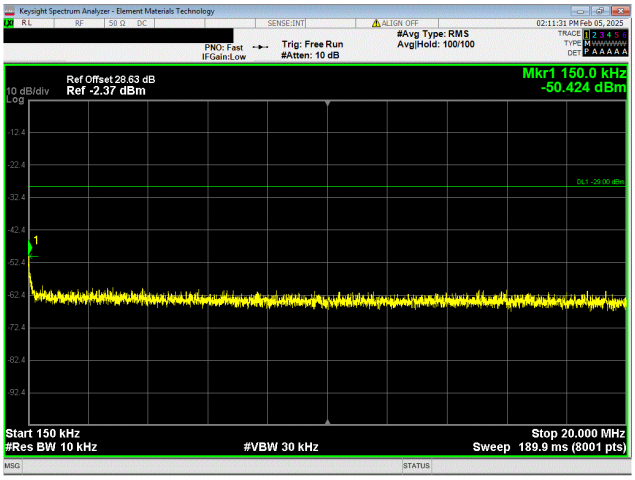
35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz
637.3 MHz to 837.3 MHz *



35 MHz Channel Bandwidth
16QAM Modulation
Middle Channel, 634.5 MHz
1400 MHz to 8000 MHz



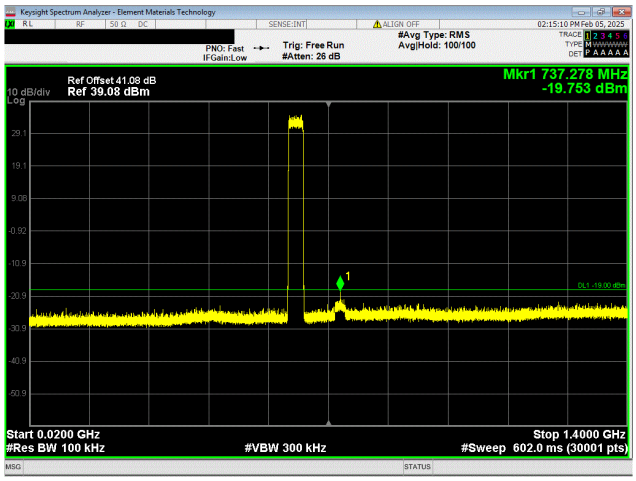
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz
9 kHz to 150 kHz



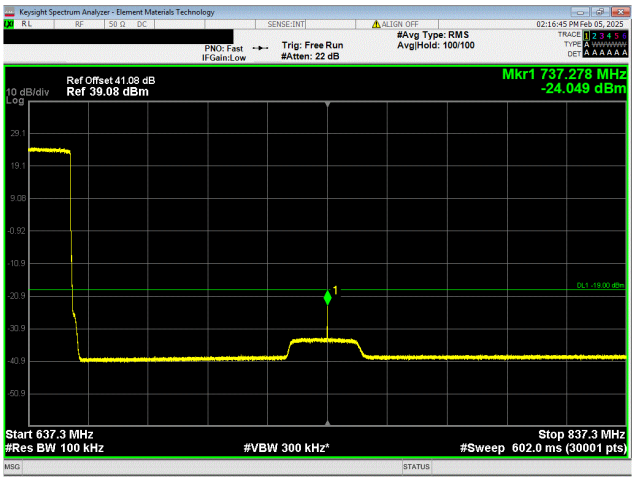
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz
150 kHz to 20 MHz

SPURIOUS CONDUCTED EMISSIONS

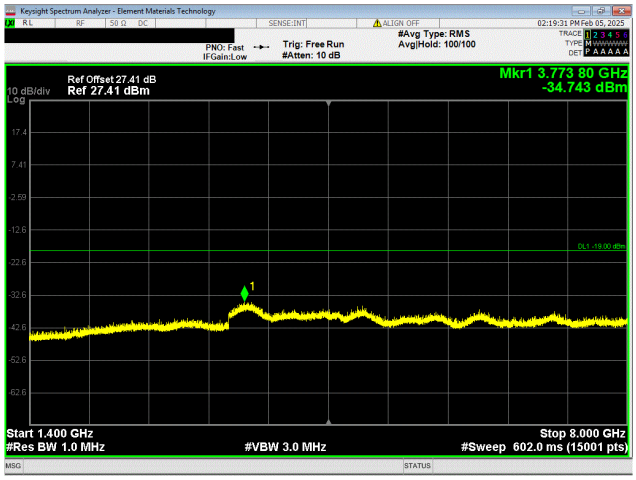
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



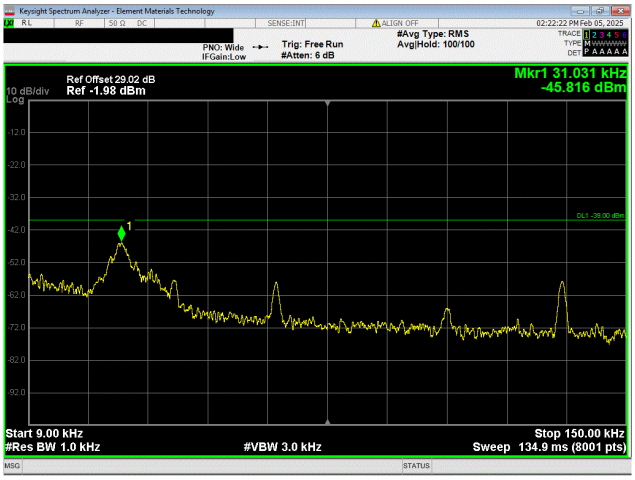
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz
20 MHz to 1400 MHz



35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz
637.3 MHz to 837.3 MHz *



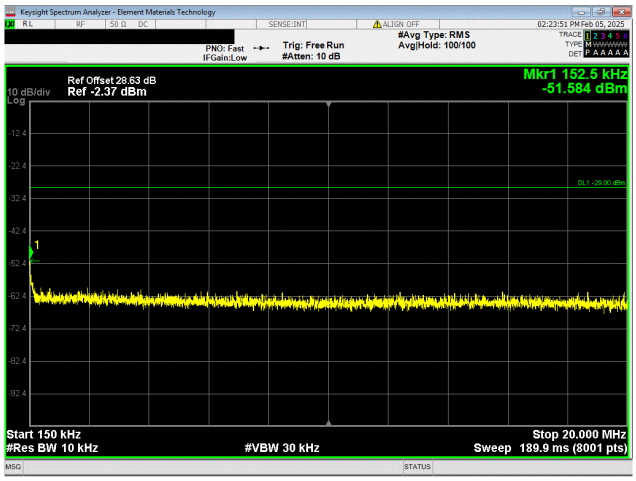
35 MHz Channel Bandwidth
64QAM Modulation
Middle Channel, 634.5 MHz
1400 MHz to 8000 MHz



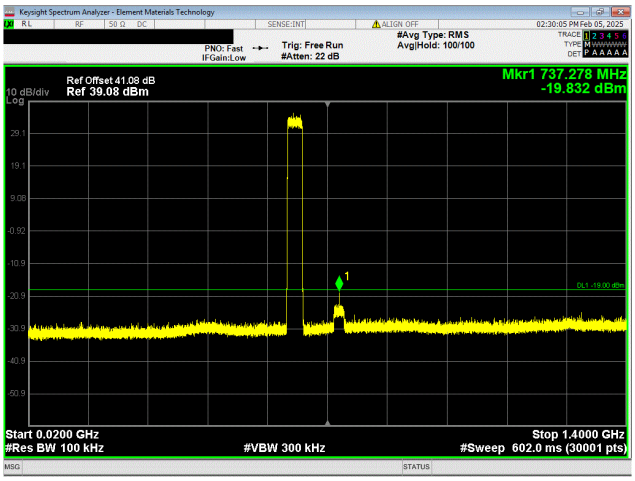
35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz
9 kHz to 150 kHz

SPURIOUS CONDUCTED EMISSIONS

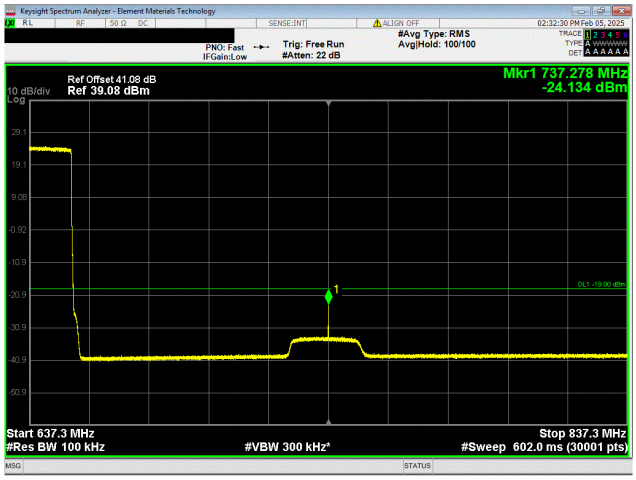
element
TbtTx 2024.05.24.1
WTD.2024.12.31.0



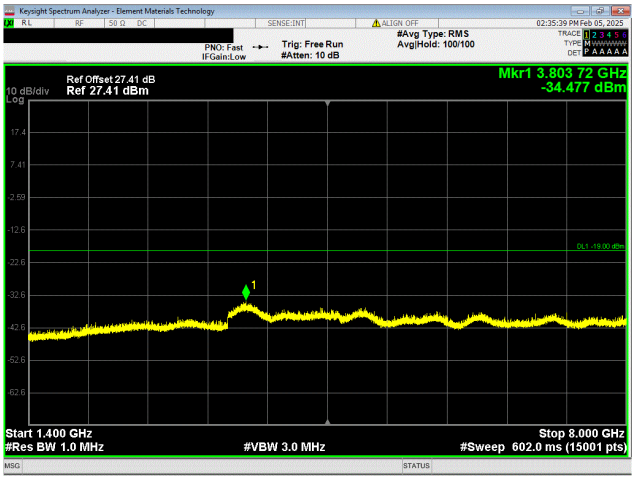
35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz
150 kHz to 20 MHz



35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz
20 MHz to 1400 MHz



35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz
637.3 MHz to 837.3 MHz *



35 MHz Channel Bandwidth
256QAM Modulation
Middle Channel, 634.5 MHz
1400 MHz to 8000 MHz

End of Test Report