Radio Test Report
Application for a Permissive Change of Equipment Authorization

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

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

FCC ID: VBNAHFII-01
IC ID: 661W-AHFII

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

Report: NOKI0038 Rev. 1, Issue Date: May 20, 2022

ACCREDITED
CERT #3310.03

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CERTIFICATE OF TEST

Last Date of Test: April 7, 2022
Nokia Solutions and Networks
EUT: AirScale Base Transceiver Station Remote Radio Head Model AHFII

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 5 CFR Title 47 Part 24 Subpart E – Broadband PCS RSS-133 Issue 6 - January 18, 2018 – 2GHz Personal Communications Services CFR Title 47 Part 27 RSS-139 Issue 3 - July 16, 2015 – Advanced Wireless Services (AWS) RSS-170 Issue 3 – July 9, 2015	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 971168 D03 v01 FCC KDB 662911D01 v02r01 FCC KDB 662911D02 v01

Results

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

Deviations From Test Standards

None

Approved By:

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
01	Updated test description	2022-05-18	115, 148
	Updated EIRP Calculations for Four Port MIMO Operations for Band n25 Single NR Carriers comments, table, and Calculations Summary	2022-05-18	131
	Updated EIRP Calculations for Four Port MIMO Operations for Band n66 Single NR Carriers comments, table, and Calculations Summary	2022-05-18	147

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.

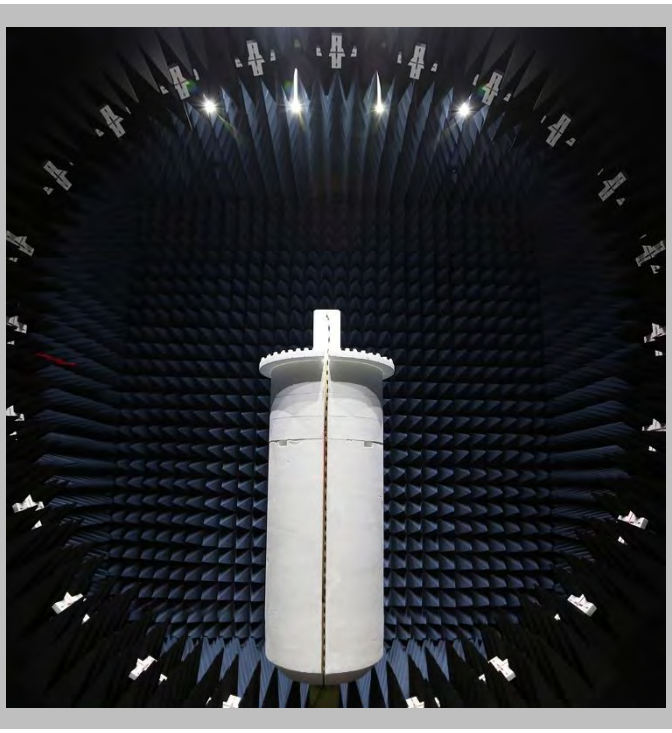
SCOPE

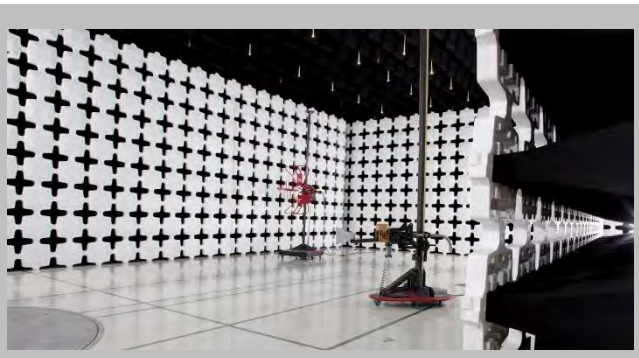
For details on the Scopes of our Accreditations, please visit:

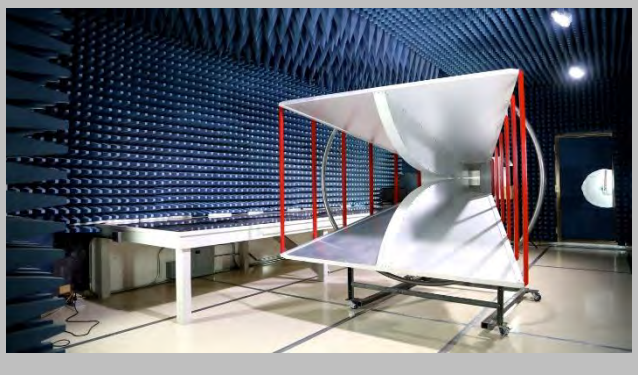
California Minnesota Oregon Texas Washington

FACILITIES

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

element
TMU.2015.07.10

Measurement Uncertainty

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

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

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

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

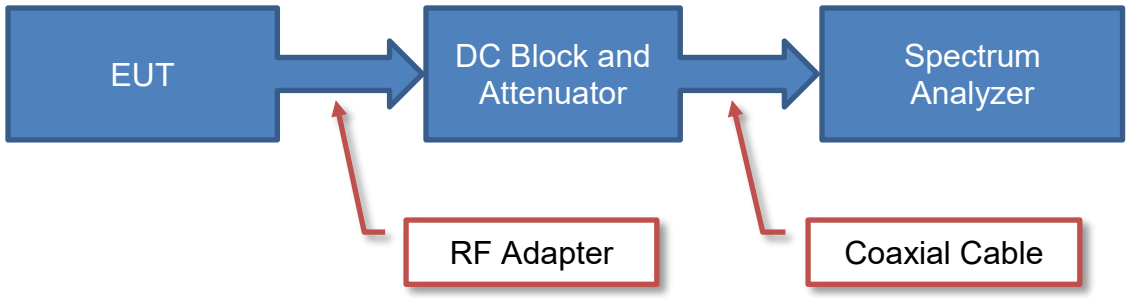
TEST SETUP BLOCK DIAGRAMS

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.

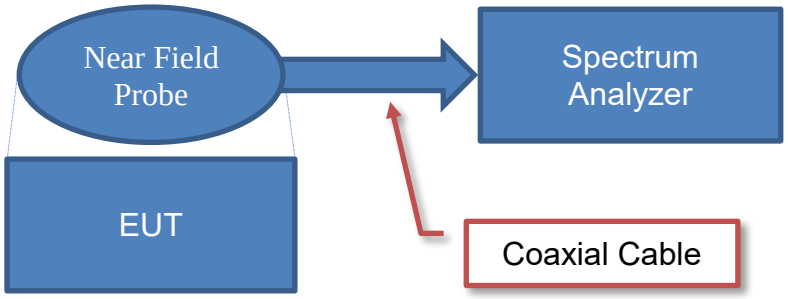
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

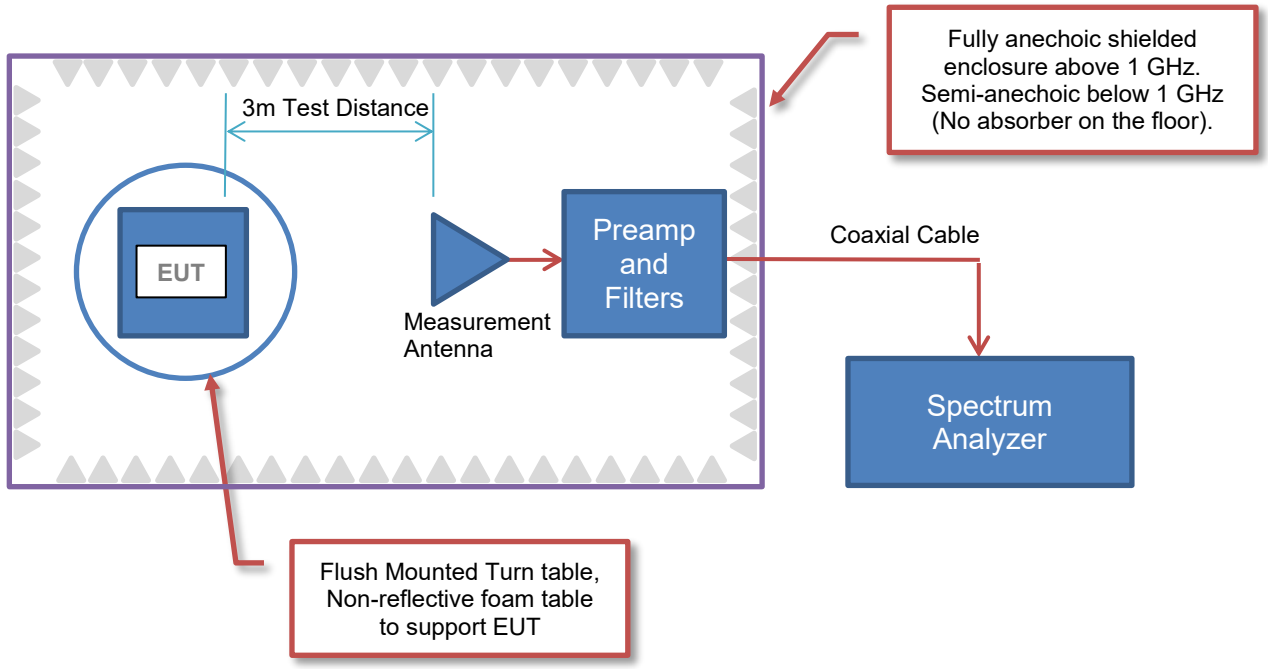


Sample Calculation (logarithmic units)

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**

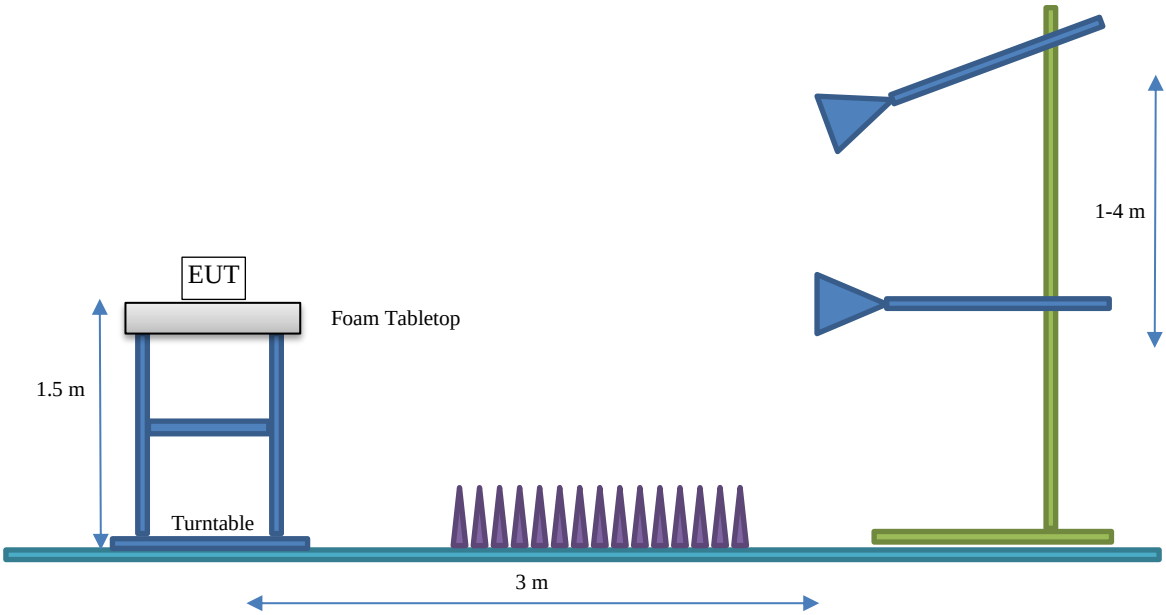
Conducted Emissions:

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

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

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



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, TX 75019
Test Requested By:	Steve Mitchell
EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFII
First Date of Test:	March 22, 2022
Last Date of Test:	April 7, 2022
Receipt Date of Samples:	March 22, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

A permissive change on the original filing is being pursued to add 5G NR (new radio) carriers to the AirScale Base Transceiver Station Remote Radio Head Model AHFII FCC and ISED radio certifications. The original test effort includes testing for 4G LTE technologies. Please refer to the test report on the original certification for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using 5G NR 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 (AHFII) as the original certification test. The base station and remote radio head software for this testing is an updated release that includes 5G NR carrier support.

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

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

The AHFII RRH has four transmit/four receive antenna ports (4TX/4RX for Band n25 and 4TX/4RX for Band n66). Each antenna port supports 3GPP frequency band n25 (BTS Rx: 1850 to 1915 MHz/BTS TX: 1930 to 1995 MHz) and 3GPP frequency band n66 (BTS Rx: 1710 to 1780 MHz/BTS TX: 2110 to 2200 MHz). The maximum RF output power of the RRH is 480 Watts (120 watts per port x 4 ports). The maximum power per band (Band n25 or Band n66) is 80 watts. The maximum single carrier power level is 80 watts. The TX and RX instantaneous bandwidth cover the full operational RRH bandwidth. Multi-carrier operation is supported.

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

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

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

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

AHFII Downlink Band Edge 5G NR Band n25 Frequency Channels

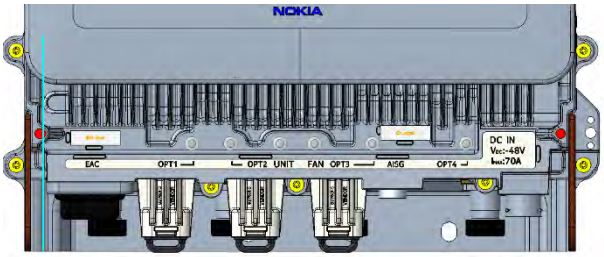
The AWS Band 5G NR channel bandwidths are 5, 10, 15, 20 and 30MHz. The downlink channel numbers are provided below.

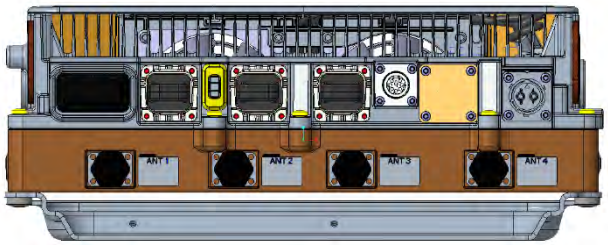
	Downlink 5G NR NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth				
			5 MHz	10 MHz	15 MHz	20 MHz	30 MHz
AHFII 5G NR Band n66 (Ant 1 through 4)	422000	2110.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge
	422500	2112.5	Bottom Ch				
	423000	2115.0		Bottom Ch			
	423500	2117.5			Bottom Ch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

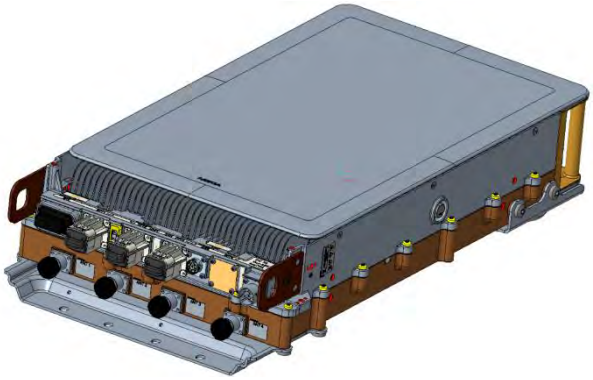
AHFII Downlink Band Edge 5G NR Band n66 Frequency Channels

PRODUCT DESCRIPTION

AHFII Connector Layout







EUT External Interfaces

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

Testing Objective:

A permissive change on the original filing is being pursued to add 5G NR (new radio) carrier operations to the Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) model AHFII FCC and ISED radio certifications.

CONFIGURATIONS

Test Configuration 1 RF Conducted Emissions

Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R3)	SBTS22R3_ENB_9999_220224_000010
5G RF_SW	RF.FRM6.TRUNK.20220223.001

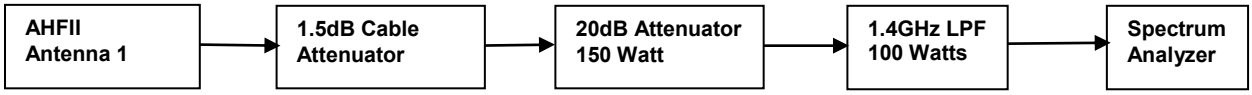
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105870
AHFII (Radio Module Model)	Nokia Solutions and Networks	475656A.101	YK214000035
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
1.4GHz Low Pass Filter/100 Watt	Microwave Circuits, Inc.	L13502G1	SN2454-01
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20180016Z
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023002SU
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023004CK
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297373
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV068
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
(3x) 2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372/ SN297373/ SN297389
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	1 meter	N	ABIO-1	AHFII
Fiber Optic Cable	N	1 meter	N	ABIO-2	AHFII
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 CABLE	Y	2 meters	N	EUT [AHFII] Ant ports 2-4	250W -50ohm -Load

CONFIGURATIONS

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	Y	6 meters	N	EUT [AHLOA] Ant port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	N/A	N	RF cable HS-SUCOFLEX_106 1.4dB attenuator	Low Pass Filter 1.4GHz/100W
Low Pass Filter 1.4GHz/100W	N	N/A	N	Attenuator 150W/20dB	1 meter HS-SUCOFLEX_104
1 meter HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 1.4GHz/100W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Test Configuration 2 RF Conducted Emissions

Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R3)	SBTS22R3_ENB_9999_220224_000010
5G RF_SW	RF.FRM6.TRUNK.20220223.001

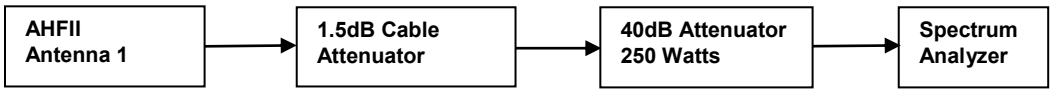
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105870
AHFII (Radio Module Model)	Nokia Solutions and Networks	475656A.101	YK214000035
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
Attenuator 40dB/250 Watts	API Weinschel	58-40-43-LMI	TC909
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20180016Z
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023002SU
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023004CK
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297373
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV068
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
(3x) 2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372/ SN297373/ SN297389
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	1 meter	N	ABIO-1	AHFII
Fiber Optic Cable	N	1 meter	N	ABIO-2	AHFII
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 CABLE	Y	2 meters	N	EUT [AHFII] Ant ports 2-4	250W -50ohm -Load

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	Y	2 meters	N	EUT [AHFII] Ant port #1	Attenuator 250W/40dB
Attenuator 250W/40dB	N	NA	N	(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	RF cable 1meter HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Attenuator 150W/40dB	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Test Configuration 3 RF Conducted Emissions

Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R3)	SBTS22R3_ENB_9999_220224_000010
5G RF_SW	RF.FRM6.TRUNK.20220223.001

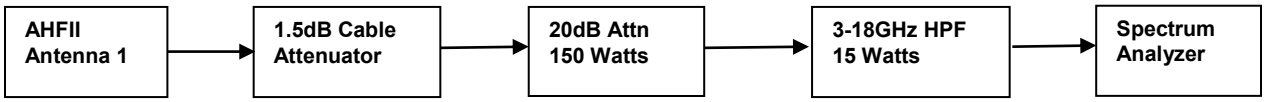
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105870
AHFII (Radio Module Model)	Nokia Solutions and Networks	475656A.101	YK214000035
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
3-18GHz HPF 15 Watts	RLC Electronics	0011	F-100-3500-5-R
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20180016Z
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023002SU
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023004CK
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297373
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV068
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
(3x) 2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372/ SN297373/ SN297389
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	1 meter	N	ABIO-1	AHFII
Fiber Optic Cable	N	1 meter	N	ABIO-2	AHFII
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 CABLE	Y	2 meters	N	EUT [AHFII] Ant ports 2-4	250W -50ohm -Load

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	Y	6 meters	N	EUT [AHFII] Ant port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	NA	N	RF cable HS-SUCOFLEX_106 1.5dB attenuator	3-18GHz HPF 15Watts
3-18GHz HPF 15Watts	N	NA	N	Attenuator 150W/20dB	1 meter HS-SUCOFLEX_104
HS-SUCOFLEX_104	N	1 meter	N	3-18GHz HPF 15Watts	Spectrum Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Test Configuration 4 RF Conducted Emissions

Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R3)	SBTS22R3_ENB_9999_220224_000010
5G RF_SW	RF.FRM6.TRUNK.20220223.001

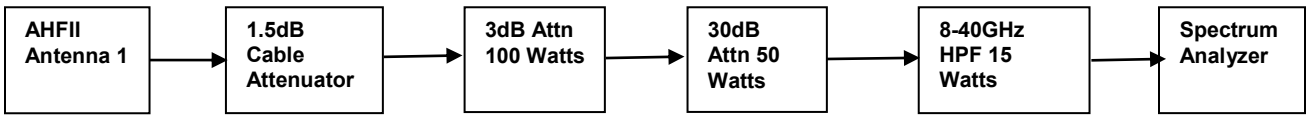
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIB (BTS System Module)	Nokia Solutions and Networks	473764A.102	DH211165881
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105845
ABIO (BTS Baseband Module)	Nokia Solutions and Networks	475266A.102	L1205105870
AHFII (Radio Module Model)	Nokia Solutions and Networks	475656A.101	YK214000035
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
Fiber optic cable	Nokia Solutions and Networks	P/N995741A	Lot:V21701
8-40GHz HPF 15Watts	RF Lambda	RHPF23G08G40	17102700014
Attenuator 100W/3dB	Aeroflex Weinschel	47-3-33	CC7387
Attenuator 50W/30dB	Narda	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20180016Z
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023002SU
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF20470022K
SFP+ 9.8G,300M,850NM	FINISAR CORP.	FTLF8536W4BTV-NS	VF2023004CK
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297373
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV068
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TC863
250W -50ohm -Terminating Load	API Weinschel	1433-3-LIM	TV065
GPS cable 100m	FTSH	472577A.103	CA2029
FYGC GPS receiver	Nokia	474074A	1294000684
Cat-5e cable	CSA	LL73189	E151955
(3x) 2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372/ SN297373/ SN297389
1 Meter RF-LAMBDA cable	RF-LAMBDA	RFC6767A-B7RU1219	AC20040004

CONFIGURATIONS

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

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	Y	6 meters	N	EUT [AHFII] Ant port #1	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	(3x)HS-SUCOFLEX_106 /1.5dB cable attenuation	30dB Attn 50 Watts
30dB Attn 50 Watts	N	NA	N	Attenuator 100W/3dB	8-40GHz HPF 15Watts
8-40GHz HPF 15Watts	N	NA	N	30dB Attn 50 Watts	1 Meter RF-LAMBDA cable
RF-LAMBDA cable		1 meter		8-40GHz HPF 15Watts	Spectrum Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-03-19	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	2022-03-19	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.
3	2022-03-22	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.
4	2022-04-06	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2022-04-06	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2022-04-07	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.