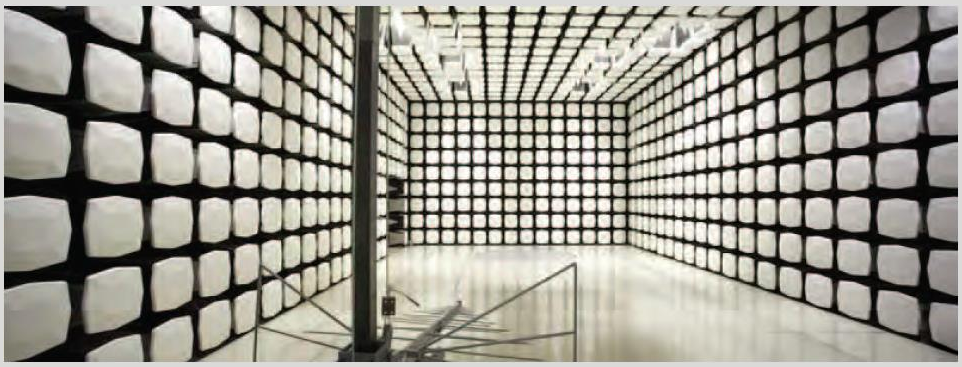
Radio Test Report
Application for a Class II Permissive Change of Equipment Authorization
FCC Part 24 and IC RSS-133
[1930MHz – 1990MHz]

FCC Part 27 and IC RSS-139
[2110MHz – 2180MHz]

FCC ID: VBNAHFIC-01
IC ID: 661W-AHFIC

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

Report: NOKI0007, Issue Date: April 24, 2020



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: April 8, 2020
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Remote Radio Head Model AHFIC

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 6: 2019 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 Subpart C RSS-139 Issue 3 - July 16, 2015 – Advanced Wireless Services (AWS)	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01

Results

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

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

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 – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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

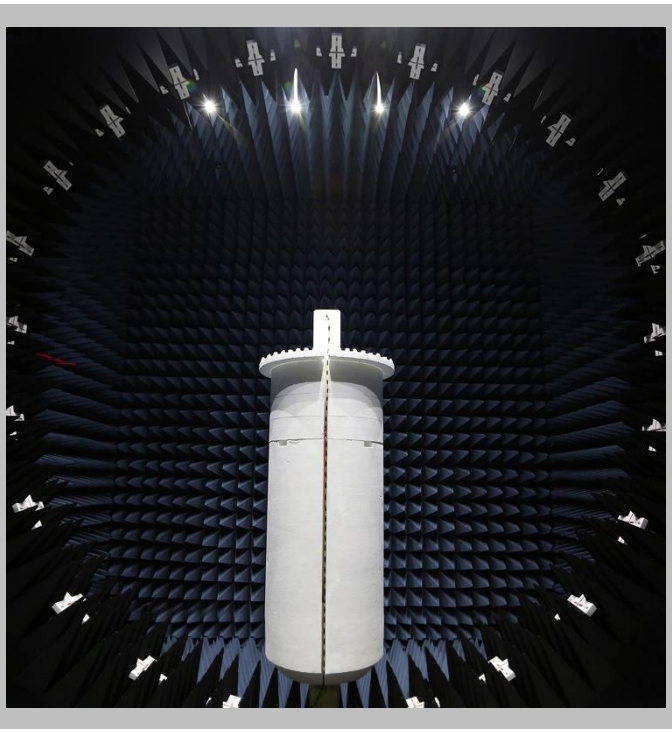
MIC – Recognized by MIC as a CAB for the acceptance of test data.

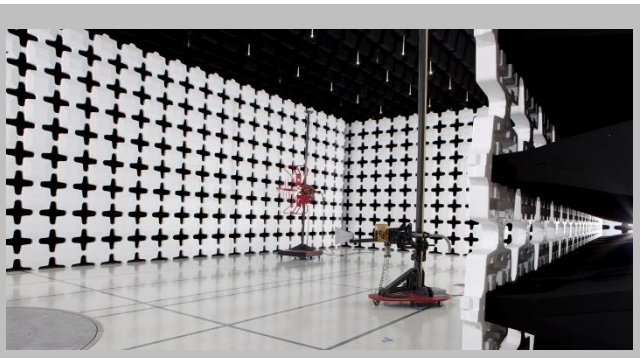
SCOPE

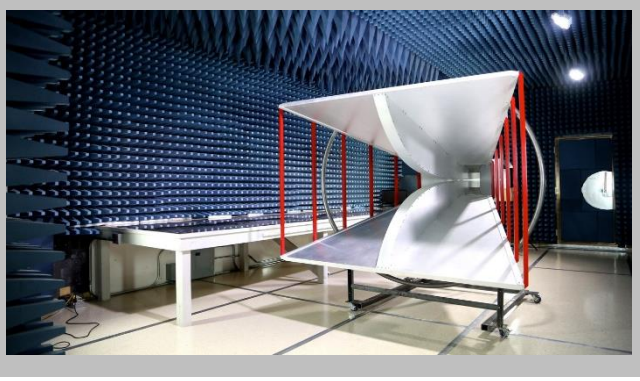
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 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
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
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.

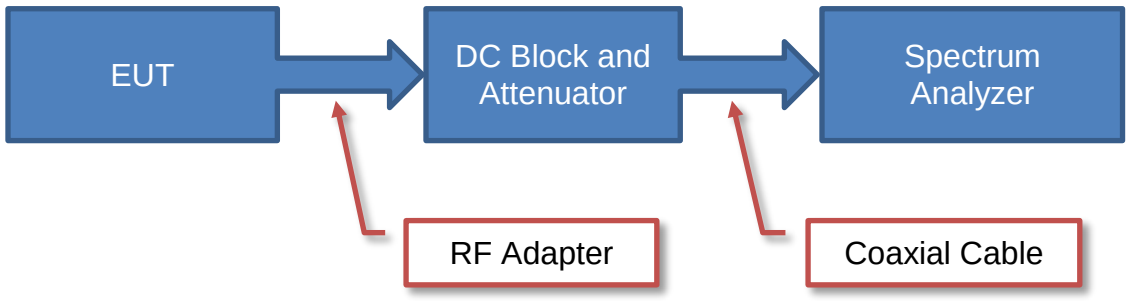
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

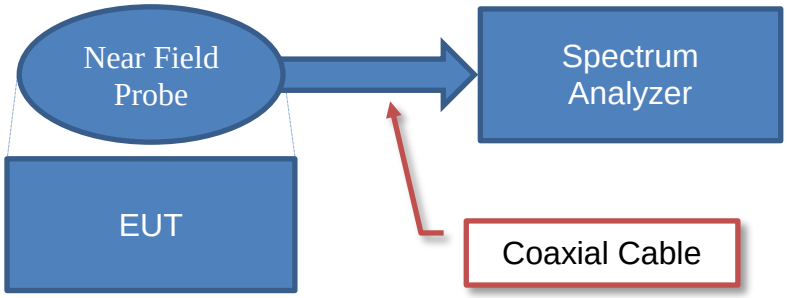
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field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

Test Setup Block Diagrams

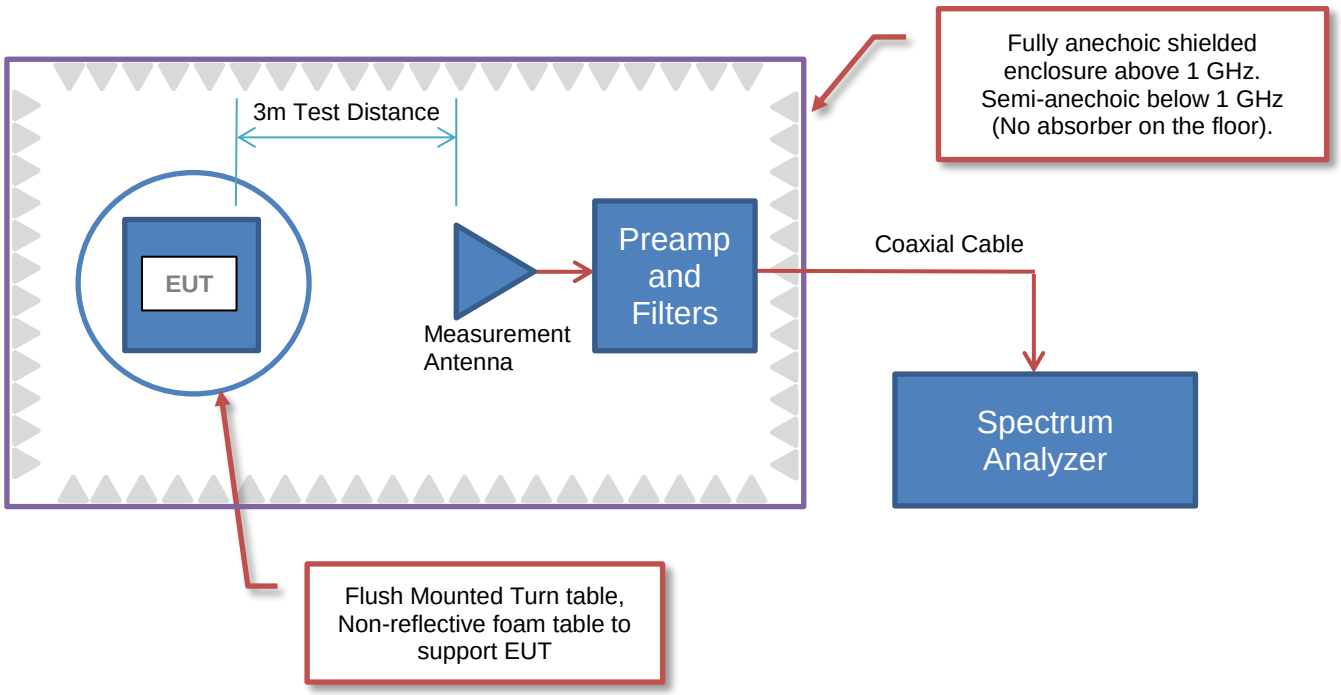
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



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 AHFIC
First Date of Test:	March 30, 2020
Last Date of Test:	April 8, 2020
Receipt Date of Samples:	March 30, 2020
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 class II permissive change on the original filing is being pursued to add 5G NR (new radio) carriers to the Airscale BTS RRH model AHFIC FCC and ISED radio certifications. The original FCC certification submittal (FCC ID: VBNAHFIC-01) and the original ISED certification submittal (IC ID: 661W-AHFIC) was NTS Test Report Number PR075288 Revision 1 dated March 30, 2018. The original test effort includes testing for 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 class II permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this class II permissive change test effort. 5G NR carrier bandwidths of 5MHz, 10MHz, 15MHz and 20MHz with QPSK, 16QAM, 64QAM and 256QAM modulation types were verified under this effort. Tests performed under the class II change effort include RF power, peak to average power ratio, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions. The 5G NR carriers/modulation types for this testing are based upon 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 testing was performed on the same hardware (AHFIC) as the original certification test. The same AHFIC RF ports (Ant 3 for AWS Band and Ant 7 for PCS Band) determined in the original certification testing to be the highest power ports were used for all testing in this effort. 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 was 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.

The equipment under test (EUT) is a Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHFIC. The AHFIC remote radio head is a multistandard multicarrier radio module designed to support LTE, narrow band IoT (internet of things) operations (in-band, guard band, standalone) and 5G NR. The scope of testing in this effort is for 5G NR operations.

The AHFIC RRH has eight transmit/eight receive antenna ports (4TX/4RX for Band 2 and 4TX/4RX for Band 66a). Antenna ports 1-4 supports 3GPP frequency band 66a (BTS Rx: 1710 to 1780 MHz/BTS TX: 2110 to 2180 MHz). Antenna ports 5-8 supports 3GPP frequency band 2 (BTS Rx: 1850 to 1910 MHz/BTS TX: 1930 to 1990 MHz). The maximum RF output power of the RRH is 320 Watts (40 watts per carrier for Band 2, 60 watts per carrier for Band 66a). The maximum power output per antenna pair (1&5, 2&6, 3&7, 4&8) is 80 watts. The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The TX and RX instantaneous bandwidth cover the full operational RRH bandwidth. The RRH supports 5G NR channel bandwidths of 5MHz, 10MHz, 15MHz and 20MHz for 3GPP frequency bands n2 and n66a operations. The RRH supports four 5G NR downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM).

The RRH has external interfaces including DC power (DC In), ground, transmit/receive (ANT), external alarm (EAC),

optical CPRI (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted. The RRH may be configured with optional cooling fan.
The 5G NR channel bandwidths are 5, 10, 15 and 20MHz. The channel spacing is 100 kHz between channel numbers. The AHFIC 5G NR downlink channel numbers and frequencies for Band n2 (PCS Band) are as follows:

	Downlink NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AHFIC PCS Band on Ant 5, 6, 7 and 8	386000	1930.0	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
	392500	1962.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	396000	1980.0				Top Channel
	396500	1982.5			Top Channel	
	397000	1985.0		Top Channel		
	397500	1987.5	Top Channel			
	398000	1990.0	Band Edge	Band Edge	Band Edge	Band Edge

AHFIC Downlink Band Edge 5G NR Band n2 Frequency Channels

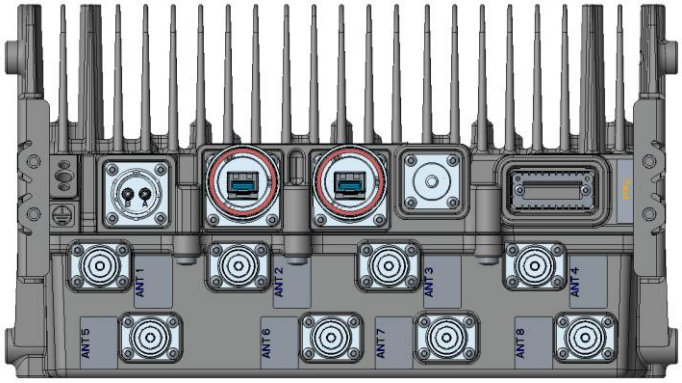
The AHFIC 5G NR downlink channel numbers and frequencies for Band n66a (AWS Band) are as follows:

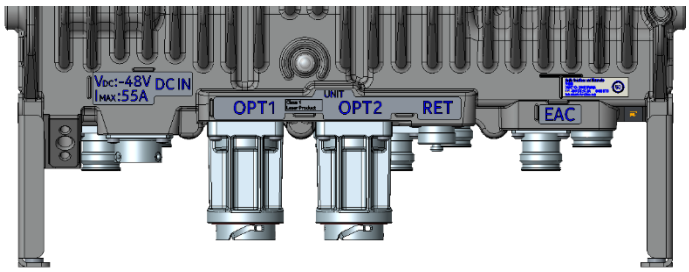
	Downlink NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AHFIC AWS Band on Ant 1, 2, 3 and 4	422000	2110.0	Band Edge	Band Edge	Band Edge	Band Edge
	422500	2112.5	Bottom Ch			
	423000	2115.0		Bottom Ch		
	423500	2117.5			Bottom Ch	
	424000	2120.0				Bottom Ch
	429000	2145.0	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	434000	2170.0				Top Channel
	434500	2172.5			Top Channel	
	435000	2175.0		Top Channel		
	435500	2177.5	Top Channel			
	436000	2180.0	Band Edge	Band Edge	Band Edge	Band Edge

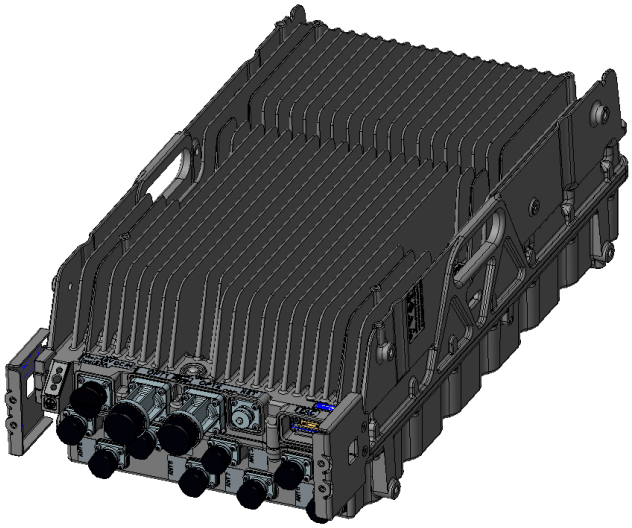
AHFIC Downlink Band Edge 5G NR Band n66a Frequency Channels

PRODUCT DESCRIPTION

AHFIC Connector Layout:







AHFIC External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Quick Disconnect	2-pole Power Circular Connector
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	8	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.
	1	8-pin circular connector conforming to IEC 60130-9 – Ed.3.0	AISG 2.0 to external devices
Fan	1	Molex Microfit	Power for RRH Fan. Located on the side of RRH.

Testing Objective:

A class II permissive change on the original filing is being pursued to add 5G NR (new radio) carriers to the Airscale BTS RRH model AHFIC FCC and ISED radio certifications.

CONFIGURATIONS

Configuration NOKI0007- 1

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

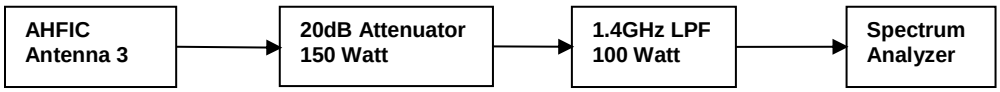
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
Low Pass Filter 1.4GHz/100W	Microwave Circuits,Inc.	L13502G1	SN2454-01
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 1, 2, 4	250W -50ohm - Load

CONFIGURATIONS

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #3	Attenuator 150W/20db [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	LowPass filter 1.4G/100W
Low Pass Filter 1.4G/100W	N	NA	N	Attenuator 150W/20dB [BZ2075]	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 1.4G/100W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 2

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

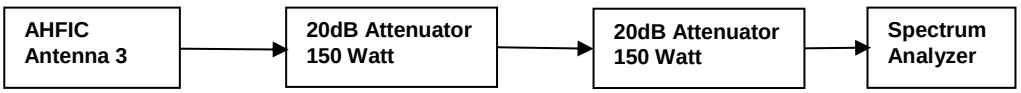
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ1165
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 1, 2, 4	250W -50ohm - Load

CONFIGURATIONS

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #3	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ1165]	N	NA	N	Attenuator 150W/20dB [BZ2075]	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Attenuator 150W/20dB [BZ2075]	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 3

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

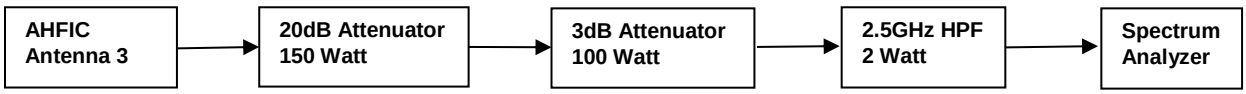
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
High Pass Filter 2.5GHz/2W	RLC Electronics	F-100-3000-5-R	0028
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 1, 2, 4	250W -50ohm - Load

CONFIGURATIONS

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [RRH] RF port #3	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	Attenuator 150W/20dB	High Pass Filter 2.5GHz
High Pass Filter 2.5GHz/2W	N	NA	N	Attenuator 100W/3dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 2.5GHz/2W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 4

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

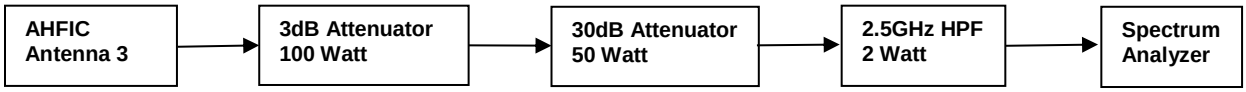
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
High Pass Filter 2.5GHz/2W	RLC Electronics	F-100-3000-5-R	0028
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Attenuator 50W/30dB	Narda	7768-30	1
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 1, 2, 4	250W -50ohm - Load

CONFIGURATIONS

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #3	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 50W/30dB
Attenuator 50W/30dB	N	NA	N	Attenuator 100W/3dB	High Pass Filter 2.5GHz
High Pass Filter 2.5GHz/2W	N	NA	N	Attenuator 50W/30dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 2.5GHz/2W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 5

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

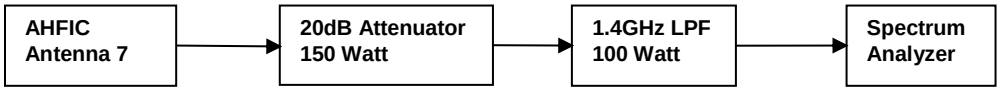
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
Low Pass Filter 1.4GHz/100W	Microwave Circuits,Inc.	L13502G1	SN2454-01
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 5, 6, 8	250W -50ohm - Load

CONFIGURATIONS

Cables/Loads/Attenuators/Filters					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #7	Attenuator 150W/20db [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	LowPass filter 1.4G/100W
Low Pass Filter 1.4G/100W	N	NA	N	Attenuator 150W/20dB [BZ2075]	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 1.4G/100W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 6

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

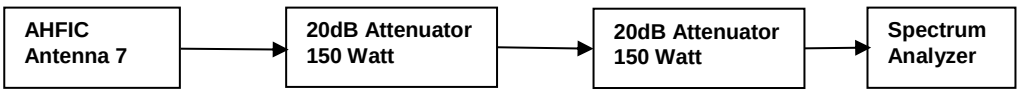
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ1165
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 5, 6, 8	250W -50ohm - Load

CONFIGURATIONS

Cables/Loads/Attenuators/Filters					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #7	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ1165]	N	NA	N	Attenuator 150W/20dB [BZ2075]	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Attenuator 150W/20dB [BZ2075]	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 7

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

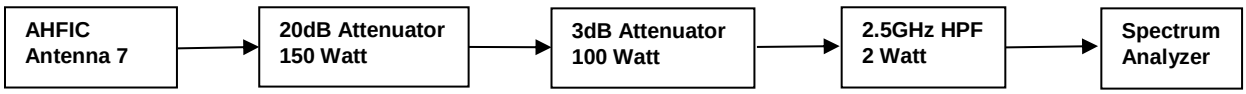
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
High Pass Filter 2.5GHz/2W	RLC Electronics	F-100-3000-5-R	0028
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 5, 6, 8	250W -50ohm - Load

CONFIGURATIONS

Cables/Loads/Attenuators/Filters					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [RRH] RF port #7	Attenuator 150W/20dB [BZ1165]
Attenuator 150W/20dB [BZ2075]	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	Attenuator 150W/20dB	High Pass Filter 2.5GHz
High Pass Filter 2.5GHz/2W	N	NA	N	Attenuator 100W/3dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 2.5GHz/2W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0007- 8

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM50_03_R01
BTS Software Version	5G20A_GNB_0000_000840_000637

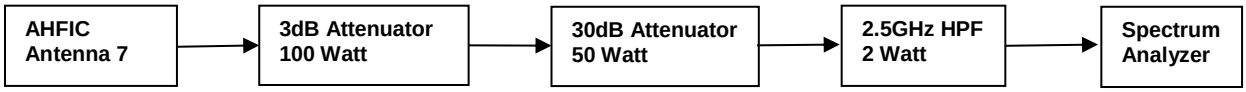
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIK (BTS System Module)	Nokia Solutions and Networks	474021A.101	L1183529610
ABIL (BTS System Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AHFIC (Radio Module Model)	Nokia Solutions and Networks	474239A.101	K9180317594
High Pass Filter 2.5GHz/2W	RLC Electronics	F-100-3000-5-R	0028
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Attenuator 50W/30dB	Narda	7768-30	1
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	KR16090020030
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610207
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP- DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 25m	Occfiber.com	BX002DAIS	334280
CAT5e data cable	BELKIN	#R7J304	E178882
CAT5e data cable	LEONI L	64867m	146180
CAT5e data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
Cat-5e cable	CSA	LL73189	E151955
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551123/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
Fiber Optic cable	N	25 meters	N	ASIK	AHFIC
Cat-5e cable (CSA)	Y	25 meters	N	ASIK	FYGB GPS receiver
Cat-5e cable	Y	25 meters	N	ASIK	WebEM- PC
Times Microwave Systems	Y	2 meters	N	EUT [RRH] Ant ports 5, 6, 8	250W -50ohm - Load

CONFIGURATIONS

Cables/Loads/Attenuators/Filters					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHFIC] Ant port #7	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	RF cable HS-SUCOFLEX_106	Attenuator 50W/30dB
Attenuator 50W/30dB	N	NA	N	Attenuator 100W/3dB	High Pass Filter 2.5GHz
High Pass Filter 2.5GHz/2W	N	NA	N	Attenuator 50W/30dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 2.5GHz/2W	Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-04-06	Conducted Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2020-04-08	Band Edge	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	2020-04-08	Occupied Bandwidth Emission Mask	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	2020-04-08	Spurious Emissions at the Antenna Terminals	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	2020-04-08	Peak to Average Power (PAPR)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.