

Nokia Solutions and Networks

Airscale Base Transceiver Station Remote Radio Head Model: AHBOA

FCC 27:2019

Report # NOKI0003.1 Rev. 1







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CERTIFICATE OF TEST



Last Date of Test: October 29, 2019 Nokia Solutions and Networks EUT: Airscale Base Transceiver Station Remote Radio Head Model AHBOA

Radio Equipment Testing

Standards

Specification	Method
	ANSI C63.26:2015 with
FCC 27:2019	FCC KDB 971168 D01 v03r01
FCC Part 2:2019	FCC KDB 971168 D03 v01
FCC 27.53:2019	FCC KDB 662911D01 v02r01
	ANSI C63.4:2014

Results

Method Clause	Test Description	Applied	Results	Comments
5.2.4	Average Output Power	Yes	Pass	
5.4	Occupied Bandwidth	Yes	Pass	
5.4 5.5	Spurious Radiated Emissions	Yes	Pass	
5.6	Frequency Stability	Yes	Pass	
5.7	Band Edge Compliance	Yes	Pass	
5.7	Spurious Conducted Emissions	Yes	Pass	
5.2.3.4	Peak to Average Power	Yes	Pass	Included for reference, not required by rule parts for the frequency band

Deviations From Test Standards

None

Approved By:

Jeremiah Darden, 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	Changed the table header from "617-652 MHz" to "746-756 MHz".	2019-12-05	103

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

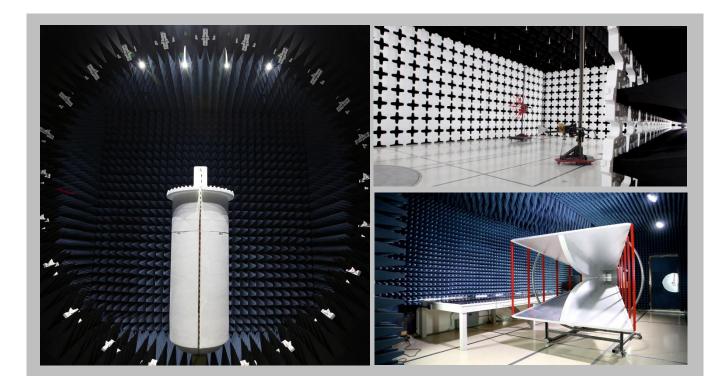
For details on the Scopes of our Accreditations, please visit: https://www.nwemc.com/emc-testing-accreditations

FACILITIES





California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th 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, Sci	ence and Economic Develop	ment 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



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.

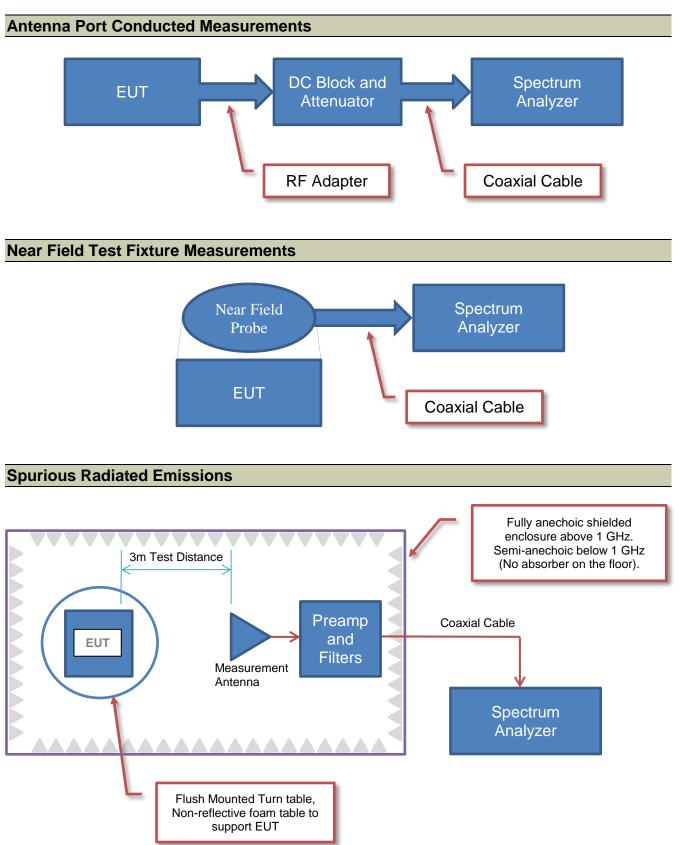
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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)	2.4 dB	-2.4 dB

Test Setup Block Diagrams





PRODUCT DESCRIPTION



Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, Texas 75019
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHBOA
First Date of Test:	October 21, 2019
Last Date of Test:	October 29, 2019
Receipt Date of Samples:	October 21, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Client and Equipment Under Test (EUT) Information

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

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

The AHBOA RRH has four transmit/four receive antenna ports (4TX/4RX for Band 71 and 4TX/4RX for Band 13). Each antenna port supports 3GPP frequency band 71 (BTS Rx: 663 to 698 MHz/BTS TX: 617 to 652 MHz) and 3GPP frequency band 13 (BTS Rx: 777 to 787 MHz/BTS TX: 746 to 756 MHz). The maximum RF output power of the RRH is 240 Watts (60 watts per carrier, 60 watts per antenna port). The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The TX and RX instantaneous bandwidth cover the full operational bandwidth. The RRH supports LTE bandwidths of 5, 10, 15 and 20MHz for 3GPP frequency band 71 operations. The RRH supports LTE bandwidths of 5 and 10MHz for 3GPP frequency band 13 operations. The RRH supports four LTE downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM). The LTE modulation types are setup according to 3GPP TS 36.141 E-UTRA Test Models (E-TM) as follows E-TM 1.1: QPSK, E-TM 3.1: 64QAM, E-TM3.1a: 256QAM and E-TM 3.2: 16QAM. Multi-carrier operation is supported.

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.

PRODUCT DESCRIPTION



	Downlink	Downlink		LTE Channel	Bandwidth	
	EARFCN	Frequency (MHz)	5 MHz	10 MHz	15 MHz	20 MHz
	68586	617.0	Band Edge	Band Edge	Band Edge	Band Edge
	68611	619.5	Bottom Ch			
	68636	622.0		Bottom Ch		
	68661	624.5			Bottom Ch	
, 4)	68686	627.0				Bottom Ch
2, 3						
ıt 1,	68761	634.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch
(An						
Band 71 (Ant 1, 2, 3, 4)	68836	642.0				Top Channel
ä						
	68861	644.5			Top Channel	
	68886	647.0		Top Channel		
	68911	649.5	Top Channel			
	68936	652.0	Band Edge	Band Edge	Band Edge	Band Edge

The AHBOA LTE downlink channel numbers and frequencies are as follows:

AHBOA Downlink Band Edge LTE Band 71 Frequency Channels

Notes:

Multicarrier operations in band 71 with three LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [649.5MHz] at the upper band edge. The smallest available LTE channel bandwidth (5MHz) was selected for multicarrier test cases because it has the highest spectral density (power/Hz).

PRODUCT DESCRIPTION



Multiband Multicarrier operations (band 71 and band 13) with three LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the band 71 lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [753.5MHz] at the band 13 upper band edge.

	Downlink	Downlink	LTE Channel Bandwidth		
	EARFCN	Frequency (MHz)	5 MHz	10 MHz	
	5180	746.0	Band Edge	Band Edge	
(4)					
2, 3,	5205	748.5	Bottom Channel		
t 1,					
AHBOA Band 13 (Ant 1, 2,	5230	751	Middle Channel	Bottom Channel	
13				Middle Channel	
pue				Top Channel	
A Ba					
BO/	5255	753.5	Top Channel		
AH					
	5280	756	Band Edge	Band Edge	

AHBOA Downlink Band Edge LTE Band 13 Frequency Channels

Notes:

Multicarrier operations in band 13 with two LTE5 carriers at the lower and upper band edge channels [748.5MHz (ARFCN 5205) and 753.5MHz (ARFCN 5255)]. Two carriers cover the entire channel bandwidth so three carrier operation is not available.

Multiband Multicarrier operations (band 71 and band 13) with three LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the band 71 lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [753.5MHz] at the band 13 upper band edge.

Testing Objective:

Seeking to demonstrate compliance of the radio (617-652MHz & 746-756MHz).



Configuration NOKI0003-1

Software/Firmware Running during test			
Description	Version		
BTS Software	SBTS00_ENB_9999_190814_002419		
RRH Software	FRM59.08.R08		

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Remote Radio Head Module	Nokia Solutions and Networks	AHBOA / 475250A.101	BL1934X1001	

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
SFP+ 9.8G 300m 850 nm	Nokia	473842A.101	KR16090020071	

Remote Equipment Outside of Test Setup Boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
40dB 250W Attenuator	API Weinschel, Inc.	58-40-53-LIM	TC909	
Electric Fan	Electrix	L908	None	
Power Supply(RRH)	HP	6032A	211754	
Power Supply(Base Station)	Emerson	AA27050L	None	
Laptop Computer	HP	ProBook 6470B	None	
Power Supply(Laptop)	HP	608428-002	F12941232064008	
USB Mouse	IBM	MO25UO	23-473462	
Antenna Load 1	API Weinschel, Inc.	1433-3-LIM	TC867	
Antenna Load 2	API Weinschel, Inc.	1433-3-LIM	TC870	
Antenna Load 3	API Weinschel, Inc.	1433-3-LIM	TC866	
AirScale Base Station (ASIA Module)	Nokia	473095A.203	AH173111443	
AirScale Base Station (ABIA Module 1)	Nokia	473096A.102	L1164015939	
AirScale Base Station (ABIA Module 2)	Nokia	473096A.103	AH173006372	



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
N Type SUCOFLEX_104	Yes	0.9m	No	40dB 250W Attenuator	Spectrum Analyzer
N Type SUCOFLEX_106	Yes	1.6m	No	40dB 250W Attenuator	Remote Radio Head Module
N Type SUCOFLEX_106 _Load 1	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 1
N Type SUCOFLEX_106 Load 2	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 2
N Type SUCOFLEX_106 Load 3	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 3
AC Power (Fan)	No	2m	No	AC Mains	Electric Fan
AC Power (PS RRH)	No	2.2m	No	AC Mains	Power Supply(RRH)
DC Power (PS RRH)	No	1.7m	No	Power Supply(RRH)	Remote Radio Head Module
AC Power (PS Base Station)	No	2m	No	AC Mains	Power Supply(Base Station)
DC Power (PS Base Station)	No	0.5m	No	Power Supply(Base Station)	AirScale Base Station (ASIA Module)
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply(Laptop)
DC Power (Laptop)	No	1.7m	Yes	Power Supply(Laptop)	Laptop Computer
USB (Mouse)	Yes	1.8m	No	USB Mouse	Laptop Computer
Ethernet	No	1.8	No	Laptop Computer	AirScale Base Station (ASIA Module)
Optical Fiber	No	2m	No	AirScale Base Station (ABIA Module 1)	Remote Radio Head Module



Configuration NOKI0003-2

Software/Firmware Running during test				
Description	Version			
BTS Software	SBTS00_ENB_9999_190814_002419			
RRH Software	FRM59.08.R08			

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Remote Radio Head Module	Nokia Solutions and Networks	AHBOA / 475250A.101	BL1934X1001	

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
SFP+ 9.8G 300m 850 nm	Nokia	473842A.101	KR16090020071	

Remote Equipment Outside of Test Setup Boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Electric Fan	Electrix	L908	None	
Power Supply(RRH)	HP	6032A	211754	
Power Supply(Base Station)	Emerson	AA27050L	None	
Laptop Computer	HP	ProBook 6470B	None	
Power Supply(Laptop)	HP	608428-002	F12941232064008	
USB Mouse	IBM	MO25UO	23-473462	
Antenna Load 1	API Weinschel, Inc.	1433-3-LIM	TC867	
Antenna Load 2	API Weinschel, Inc.	1433-3-LIM	TC870	
Antenna Load 3	API Weinschel, Inc.	1433-3-LIM	TC866	
20dB 150W Attenuator	Aeroflex/Weinschel	66-20-33	BZ1165	
10dB 150W Attenuator	Weinschel Corp.	6375	BJ2483	
Low Pass Filter 1	Mini-Circuits	NLP-550	None	
Low Pass Filter 2	Mini-Circuits	NLP-550	None	
Low Pass Filter 3	Mini-Circuits	NLP-550	None	
AirScale Base Station (ASIA Module)	Nokia	473095A.203	AH173111443	
AirScale Base Station (ABIA Module 1)	Nokia	473096A.102	L1164015939	
AirScale Base Station (ABIA Module 2)	Nokia	473096A.103	AH173006372	



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
N Type SUCOFLEX_106 Load 1	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 1
N Type SUCOFLEX_106 Load 2	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 2
N Type SUCOFLEX_106 Load 3	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 3
AC Power (Fan)	No	2m	No	AC Mains	Electric Fan
AC Power (PS RRH)	No	2.2m	No	AC Mains	Power Supply(RRH)
DC Power (PS RRH)	No	1.7m	No	Power Supply(RRH)	Remote Radio Head Module
AC Power (PS Base Station)	No	2m	No	AC Mains	Power Supply(Base Station)
DC Power (PS Base Station)	No	0.5m	No	Power Supply(Base Station)	AirScale Base Station (ASIA Module)
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply(Laptop)
DC Power (Laptop)	No	1.7m	Yes	Power Supply(Laptop)	Laptop Computer
USB (Mouse)	Yes	1.8m	No	USB Mouse	Laptop Computer
Ethernet	No	1.8	No	Laptop Computer	AirScale Base Station (ASIA Module)
Optical Fiber	No	2m	No	AirScale Base Station (ABIA Module 1)	Remote Radio Head Module
N Type SUCOFLEX_104	Yes	0.9m	No	Low Pass Filter 1	Spectrum Analyzer
N Type SUCOFLEX_106	Yes	1.6m	No	20dB 150W Attenuator	Remote Radio Head Module



Configuration NOKI0003-3

Software/Firmware Running during test			
Description	Version		
BTS Software	SBTS00_ENB_9999_190814_002419		
RRH Software	FRM59.08.R08		

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Remote Radio Head Module	Nokia Solutions and Networks	AHBOA / 475250A.101	BL1934X1001		

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
SFP+ 9.8G 300m 850 nm	Nokia	473842A.101	KR16090020071	

Remote Equipment Outside of Test Setup Boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Electric Fan	Electrix	L908	None	
Power Supply(RRH)	HP	6032A	211754	
Power Supply(Base Station)	Emerson	AA27050L	None	
Laptop Computer	HP	ProBook 6470B	None	
Power Supply(Laptop)	HP	608428-002	F12941232064008	
USB Mouse	IBM	MO25UO	23-473462	
Antenna Load 1	API Weinschel, Inc.	1433-3-LIM	TC867	
Antenna Load 2	API Weinschel, Inc.	1433-3-LIM	TC870	
Antenna Load 3	API Weinschel, Inc.	1433-3-LIM	TC866	
20dB 150W Attenuator	Aeroflex/Weinschel	66-20-33	BZ1165	
3dB Attenuator	Aeroflex/Weinschel	47-3-33	CG5493	
High Pass Filter	RLC ELECTRONICS	F-14699	0050	
AirScale Base Station (ASIA Module)	Nokia	473095A.203	AH173111443	
AirScale Base Station (ABIA Module 1)	Nokia	473096A.102	L1164015939	
AirScale Base Station (ABIA Module 2)	Nokia	473096A.103	AH173006372	



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
N Type SUCOFLEX_106 _Load 1	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 1
N Type SUCOFLEX_106 Load 2	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 2
N Type SUCOFLEX_106 Load 3	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 3
AC Power (Fan)	No	2m	No	AC Mains	Electric Fan
AC Power (PS RRH)	No	2.2m	No	AC Mains	Power Supply(RRH)
DC Power (PS RRH)	No	1.7m	No	Power Supply(RRH)	Remote Radio Head Module
AC Power (PS Base Station)	No	2m	No	AC Mains	Power Supply(Base Station)
DC Power (PS Base Station)	No	0.5m	No	Power Supply(Base Station)	AirScale Base Station (ASIA Module)
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply(Laptop)
DC Power (Laptop)	No	1.7m	Yes	Power Supply(Laptop)	Laptop Computer
USB (Mouse)	Yes	1.8m	No	USB Mouse	Laptop Computer
Ethernet	No	1.8	No	Laptop Computer	AirScale Base Station (ASIA Module)
Optical Fiber	No	2m	No	AirScale Base Station (ABIA Module 1)	Remote Radio Head Module
N Type SUCOFLEX_104	Yes	0.9m	No	High Pass Filter	Spectrum Analyzer
N Type SUCOFLEX_106	Yes	1.6m	No	20dB 150W Attenuator	Remote Radio Head Module



Configuration NOKI0003-4

Software/Firmware Running during test				
Description	Version			
BTS Software	SBTS00_ENB_9999_190814_002419			
RRH Software	FRM59.08.R08			

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
Remote Radio Head Module	Nokia Solutions and Networks	AHBOA / 475250A.101	BL1934X1001			

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
SFP+ 9.8G 300m 850 nm	Nokia	473842A.101	KR16090020071		

Remote Equipment Outside of Test Setup Boundary							
Description	Manufacturer	Model/Part Number	Serial Number				
Electric Fan	Electrix	L908	None				
Power Supply(Base Station)	Emerson	AA27050L	None				
Laptop Computer	HP	ProBook 6470B	None				
Power Supply(Laptop)	HP	608428-002	F12941232064008				
USB Mouse	IBM	MO25UO	23-473462				
Antenna Load 1	API Weinschel, Inc.	1433-3-LIM	TC867				
Antenna Load 2	API Weinschel, Inc.	1433-3-LIM	TC870				
Antenna Load 3	API Weinschel, Inc.	1433-3-LIM	TC866				
AirScale Base Station (ASIA Module)	Nokia	473095A.203	AH173111443				
AirScale Base Station (ABIA Module 1)	Nokia	473096A.102	L1164015939				
AirScale Base Station (ABIA Module 2)	Nokia	473096A.103	AH173006372				
DC Power Supply (Radiated)	Sorenson	SGA160X63C-0AAA	1421A03560				
Antenna Load 4	API Weinschel, Inc.	1433-3-LIM	TV066				



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power (Fan)	No	2m	No	AC Mains	Electric Fan
AC Power (PS Base Station)	No	2m	No	AC Mains	Power Supply(Base Station)
DC Power (PS Base Station)	No	0.5m	No	Power Supply(Base Station)	AirScale Base Station (ASIA Module)
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply(Laptop)
DC Power (Laptop)	No	1.7m	Yes	Power Supply(Laptop)	Laptop Computer
USB (Mouse)	Yes	1.8m	No	USB Mouse	Laptop Computer
Ethernet	No	1.8	No	Laptop Computer	AirScale Base Station (ASIA Module)
AC Power (Sorenson)	No	4m	No	AC Mains	DC Power Supply (Radiated)
DC Power Leads (Sorenson)	No	7.5m	No	DC Power Supply (Radiated)	Remote Radio Head Module
Optical Fiber (Radiated)	No	7.5m	No	AirScale Base Station (ABIA Module 1)	Remote Radio Head Module
RET	No	2.4m	No	Remote Radio Head Module	Unterminated
EAC	No	5.4m	No	Remote Radio Head Module	Unterminated
Grounding	No	2.3m	No	Remote Radio Head Module	Turntable Ground
N Type SUCOFLEX_106 Load 1	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 1
N Type SUCOFLEX_106 Load 2	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 2
N Type SUCOFLEX_106 Load 3	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 3
N Type SUCOFLEX_106 Load 4	Yes	1.6m	No	Remote Radio Head Module	Antenna Load 4



Configuration NOKI0003-5

Software/Firmware Running during test				
Description	Version			
BTS Software	SBTS00_ENB_9999_190814_002419			
RRH Software	FRM59.08.R08			

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Radio Head Module	Nokia Solutions and Networks	AHBOA / 475250A.101	BL1934X1001

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
SFP+ 9.8G 300m 850 nm	Nokia	473842A.101	KR16090020071		

Remote Equipment Outside of Test Setup Boundary							
Description	Manufacturer	Model/Part Number	Serial Number				
40dB 250W Attenuator	API Weinschel, Inc.	58-40-53-LIM	TC909				
Power Supply(RRH)	HP	6032A	211754				
Power Supply(Base Station)	Emerson	AA27050L	None				
Laptop Computer	HP	ProBook 6470B	None				
Power Supply(Laptop)	HP	608428-002	F12941232064008				
USB Mouse	IBM	MO25UO	23-473462				
AirScale Base Station (ASIA Module)	Nokia	473095A.203	AH173111443				
AirScale Base Station (ABIA Module 1)	Nokia	473096A.102	L1164015939				
AirScale Base Station (ABIA Module 2)	Nokia	473096A.103	AH173006372				



Cables	Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
AC Power (PS RRH)	No	2.2m	No	AC Mains	Power Supply(RRH)	
DC Power (PS RRH)	No	1.7m	No	Power Supply(RRH)	Remote Radio Head Module	
AC Power (PS Base Station)	No	2m	No	AC Mains	Power Supply(Base Station)	
DC Power (PS Base Station)	No	0.5m	No	Power Supply(Base Station)	AirScale Base Station (ASIA Module)	
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply(Laptop)	
DC Power (Laptop)	No	1.7m	Yes	Power Supply(Laptop)	Laptop Computer	
USB (Mouse)	Yes	1.8m	No	USB Mouse	Laptop Computer	
Ethernet	No	1.8	No	Laptop Computer	AirScale Base Station (ASIA Module)	
Optical Fiber	No	2m	No	AirScale Base Station (ABIA Module 1)	Remote Radio Head Module	
Grounding	No	2.3m	No	Remote Radio Head Module	Turntable Ground	
N Type MEGAPHASE (EUT to Atten)	Yes	2m	No	Remote Radio Head Module	40dB 250W Attenuator	
N Type (MEGAPHASE (Atten to Spec An)	Yes	1m	No	40dB 250W Attenuator	Spectrum Analyzer	

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-10-21	Average Output Power (Band 71 All Ports)	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	2019-10-21	Peak to Average Power (PAPR)CCDF (Band 71 All Ports)	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	2019-10-23	Peak to Average Power (PAPR)CCDF (Band 71 All Mods)	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	2019-10-23	Peak to Average Power (PAPR)CCDF (Band 71 All Bandwidths)	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	2019-10-23	Peak to Average Power (PAPR)CCDF (Band 13 All Ports)	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	2019-10-23	Average Output Power (Band 71 All Mods)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2019-10-23	Average Output Power (Band 71 All Bandwidths)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2019-10-23	Average Output Power (Band 71 Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2019-10-23	Average Output Power (Band 13 All Ports)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
10	2019-10-23	Average Output Power (Band 13 All Mods)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	2019-10-23	Average Output Power (Band 13 All Bandwidths)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
12	2019-10-23	Average Output Power (Band 13 Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
13	2019-10-23	Occupied Bandwidth (Band 71)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.

MODIFICATIONS



Item	Date	Test	Modification	Note	Disposition of EUT
14	2019-10-23	Occupied Bandwidth (Band 13)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
15	2019-10-23	Spurious Conducted Emissions (Band 71 Single, Band 13 Single)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
16	2019-10-24	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
17	2019-10-28	Band Edge Compliance (Band 71 Single Carrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
18	2019-10-28	Band Edge Compliance (Band 71 Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
19	2019-10-28	Band Edge Compliance (Band 13 Single Carrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
20	2019-10-28	Band Edge Compliance (Band 13 Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
21	2019-10-28	Band Edge Compliance (Band 71-13 Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
22	2019-10-28	Spurious Conducted Emissions (Multiband Multicarrier)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
23	2019-10-28	Peak to Average Power (PAPR)CCDF (Band 13 All Mods)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
24	2019-10-28	Peak to Average Power (PAPR)CCDF (Band 13 All Bandwidths)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
25	2019-10-29	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.



EUT:	AHBOA Remote Radio Head	i (RRH)			Work Order:	NOKI0003	
Serial Number:	BL1934X1001	• •			Date:	21-Oct-19	
Customer:	Nokia Solutions and Networ	rks			Temperature:	22.7 °C	
Attendees:	Hobert Smith, John Rattana	vong, Mitchell Hill			Humidity:		
Project:	None				Barometric Pres.:		
	Jonathan Kiefer		Power: 48VDC		Job Site:	TX09	
EST SPECIFICATIO	ONS		Test Method				
CC 27:2019			ANSI C63.26:2015				
OMMENTS							
and 71 average no	wer measurements on all fo	ur antenna ports. FUT is opera	ated at 100% duty cycle. ERP depends on a	antenna gain which is unk	nown		
EVIATIONS FROM	TEST STANDARD	Signature	Jonethan Niefer				
EVIATIONS FROM				Duty Cycle Factor (dB)	Avg Cond Pwr (dBm)	Limit (W ERP)	Results
EVIATIONS FROM one onfiguration #	TEST STANDARD		Jonathan Kiefer Avg Cond				Results
EVIATIONS FROM one onfiguration # and 71	1 256QAM Modulation	Signature	Jonathan Kiefer Avg Cond				Results
EVIATIONS FROM one onfiguration # and 71	1 256QAM Modulation LTE5 Bandwidth	Signature	Jonathan Kiefer Avg Cond				Results
EVIATIONS FROM one onfiguration #	1 256QAM Modulation LTE5 Bandwidth	Signature d Channel, 634.5 MHz	Jonathan Niefa Avg Cond Pwr (dBm)	Factor (dB)	Pwr (dBm)	(W ERP)	
EVIATIONS FROM one onfiguration #	1 256QAM Modulation LTE5 Bandwidth	Signature d Channel, 634.5 MHz Antenna Port 1	Jonsthan Kiefen Avg Cond Pwr (dBm) 47.925		Pwr (dBm) 47.9	(W ERP) 1000	Pass
EVIATIONS FROM one onfiguration #	1 256QAM Modulation LTE5 Bandwidth	Signature d Channel, 634.5 MHz Antenna Port 1 Antenna Port 2	Sonothan Niefer Avg Cond Pwr (dBm) 47.925 47.92	Factor (dB)	Pwr (dBm) 47.9 47.9	(W ERP) 1000 1000	Pass Pass
EVIATIONS FROM lone configuration #	1 256QAM Modulation LTE5 Bandwidth	Signature d Channel, 634.5 MHz Antenna Port 1	Jonsthan Kiefen Avg Cond Pwr (dBm) 47.925	Factor (dB)	Pwr (dBm) 47.9	(W ERP) 1000	Pass

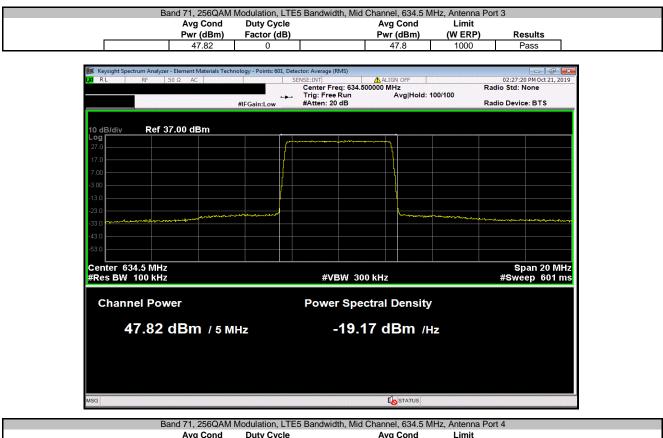




	Avg Cond	Duty Cycle	Avg Cond	Limit	
	Pwr (dBm)	Factor (dB)	Pwr (dBm)	(W ERP)	Results
	47.92	0	47.9	1000	Pass







	Avg Cond	Duty Cycle	Avg Cond	Limit	
	Pwr (dBm)	Factor (dB)	Pwr (dBm)	(W ERP)	Results
	47.927	0	47.9	1000	Pass



AVERAGE POWER



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

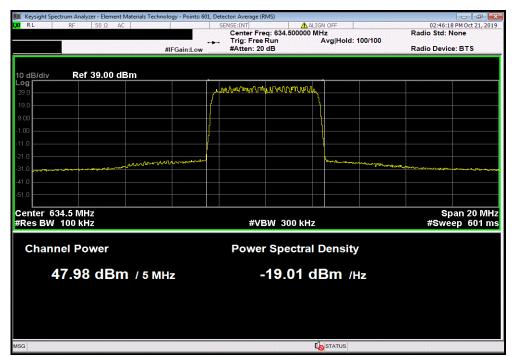


EUT:	AHBOA Remote Radio He	ead (RRH)			Work Order:	NOKI0003	
Serial Number:	BL1934X1001				Date:	23-Oct-19	
Customer:	Nokia Solutions and Netw	works			Temperature:	22 °C	
Attendees:	Hobert Smith, John Ratta	anavong, Mitchell Hill			Humidity:	38.7% RH	
Project:	None				Barometric Pres.:	1020 mbar	
Tested by:	Jonathan Kiefer		Power: 48VDC		Job Site:	TX09	
TEST SPECIFICATIO	ONS		Test Method				
CC 27:2019			ANSI C63.26:2015				
COMMENTS							
DEVIATIONS FROM	-	a gain, which is unknown.					
	-	Signature	Jonethan Kiefe				
DEVIATIONS FROM	-		Jonethan Kiefer Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
EVIATIONS FROM	-		Avg Cond				Results
DEVIATIONS FROM	-		Avg Cond				Results
EVIATIONS FROM	I TEST STANDARD	Signature	Avg Cond				Results
EVIATIONS FROM one onfiguration # and 71	1 TEST STANDARD	Signature	Avg Cond Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	
Configuration #	1 TEST STANDARD 1 QPSK Modulation LTE5 Bandwi	Signature	Avg Cond Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	
EVIATIONS FROM one onfiguration # and 71	1 TEST STANDARD 1 QPSK Modulation LTE5 Bandwi 16QAM Modulation	Signature	Avg Cond Pwr (dBm) 48.045	Factor (dB)	(dBm) 48	(W ERP) 1000	Pass
EVIATIONS FROM lone configuration #	1 TEST STANDARD 1 QPSK Modulation LTE5 Bandwi 16QAM Modulation LTE5 Bandwi	Signature	Avg Cond Pwr (dBm) 48.045	Factor (dB)	(dBm) 48	(W ERP) 1000	Pass
EVIATIONS FROM lone configuration #	1 TEST STANDARD 1 QPSK Modulation LTE5 Bandwi 16QAM Modulation LTE5 Bandwi 64QAM Modulation	Signature	Avg Cond Pwr (dBm) 48.045 47.979	Factor (dB) 0 0	(dBm) 48 48	(W ERP) 1000 1000	Pass Pass



	Avg Cond	Duty Cycle	SK Modulation, LT	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	48.045	0		48	1000	Pass
Keysight Spectrum Analyze	er - Element Materials Tech 50 Ω AC		ector: Average (RMS) ENSE:INT	ALIGN OFF		02:40:33 PM Oct 21, 20
10	0012 110		Center Freq: 634.5	00000 MHz		adio Std: None
		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold:		adio Device: BTS
and the second						
	37.00 dBm					
27.0						
17.0		/				
7.00						
-3.00						
-13.0						
-23.0					manufic	
-33.0 	And the second s					-halseningen ginnet man
-43.0						
-53.0						
Center 634.5 MHz						Span 20 M
#Res BW 100 kHz	2		#VBW 30	0 kHz		#Sweep 601 r
Channel Pov	ver		Power Spe	ctral Densit	У	
48.05	dBm / 5 M	IHz	-18.9	94 dBm /	Hz	
MSG				I STATUS		

	Avg Cond Duty Cycle			Value	Limit		
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results	
	47.979	0		48	1000	Pass	





	Avg Cond	Duty Cycle	AM Modulation, L	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	48.084	0		48.1	1000	Pass
💓 Keysight Spectrum Analyzer	- Element Materials Tech	nology - Points: 601, Det	ector: Average (RMS)			
	50 Ω AC		ENSE:INT	ALIGN OFF	_	02:50:39 PM Oct 21, 20
			Center Freq: 634.5 Trig: Free Run	00000 MHz Avg Hold:		adio Std: None
		#IFGain:Low	#Atten: 20 dB			adio Device: BTS
10 dB/div Ref 3	7.00 dBm					
Log		· · · ·	·····	soon and		
27.0				1		
17.0						
7.00						
-3.00						
-13.0						
-23.0						
-33.0	Wat Invation of the second				and and and the part of the	mo
-43.0						
-53.0						
Center 634.5 MHz						Span 20 M
#Res BW 100 kHz			#VBW 30	J KHZ		#Sweep 601 r
Channel Pow	ver		Power Spe	tral Densit	v	
			-		-	
48.08	dBm / 5 M	Hz	-18.9	1 dBm /	Hz	
MSG				To STATUS		

	Avg Cond Duty Cycle		Value	Limit		
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results	
	48	0	48	1000	Pass	





XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.



					TbtTx 2019.08.30.0	XMit 20
	AHBOA Remote Radio Head (RRH)			Work Order:		
Serial Number:					23-Oct-19	
Customer:	Nokia Solutions and Networks			Temperature:	22.4 °C	
Attendees:	Hobert Smith, John Rattanavong, Mitchell Hill				37.8% RH	
Project:				Barometric Pres.:		
	Jonathan Kiefer	Power: 48VDC		Job Site:	TX09	
ST SPECIFICATIO	ONS	Test Method				
C 27:2019		ANSI C63.26:2015				
OMMENTS						
	ower measurements for 256QAM modulation type at Low			. Tested at highest antenna p	ort (Port 1). EUT is	operated at
y cycle. Note: 25	56QAM LTE5 BW Mid Channel data shown elsewhere in	the report. ERP depends on antenna gain, v	vhich is unknown.			
VIATIONS FROM	TEST STANDARD					
ne						
nfiguration #	1	Jonathan Kiefer				
-	Signature					
		Avg Cond	Duty Cycle	Value	Limit	
		Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Result
and 71						
	256QAM Modulation					
	256QAM Modulation LTE5 Bandwidth					
		47.875	0	47.9	1000	Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz	47.875 47.856	0 0	47.9 47.9	1000 1000	Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz					
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz					Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth	47.856	0	47.9	1000	
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz	47.856 47.975	0	47.9	1000	Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz Mid Channel, 634.5 MHz	47.856 47.975 47.86	0 0 0	47.9 48 47.9	1000 1000 1000	Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz Mid Channel, 634.5 MHz High Channel, 647 MHz	47.856 47.975 47.86	0 0 0	47.9 48 47.9	1000 1000 1000	Pass Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz Mid Channel, 634.5 MHz High Channel, 647 MHz LTE15 Bandwidth Low Channel, 624.5 MHz	47.856 47.975 47.86 47.972 47.991	0 0 0 0	47.9 48 47.9 48 48	1000 1000 1000 1000 1000	Pass Pass Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz Mid Channel, 634.5 MHz High Channel, 647 MHz LTE15 Bandwidth Low Channel, 624.5 MHz Mid Channel, 634.5 MHz	47.856 47.975 47.86 47.972 47.991 47.991 47.847	0 0 0 0 0	47.9 48 47.9 48 48 48 47.8	1000 1000 1000 1000 1000	Pass Pass Pass Pass Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 624.5 MHz High Channel, 634.5 MHz LTE15 Bandwidth Low Channel, 624.5 MHz Mid Channel, 634.5 MHz High Channel, 644.5 MHz	47.856 47.975 47.86 47.972 47.991	0 0 0 0	47.9 48 47.9 48 48	1000 1000 1000 1000 1000	Pass Pass Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 622 MHz Mid Channel, 634.5 MHz High Channel, 647 MHz LTE15 Bandwidth Low Channel, 624.5 MHz Mid Channel, 634.5 MHz High Channel, 644.5 MHz LTE20 Bandwidth	47.856 47.975 47.86 47.972 47.991 47.847 47.99		47.9 48 47.9 48 48 47.8 48 48	1000 1000 1000 1000 1000 1000 1000	Pass Pass Pass Pass Pass Pass Pass
	LTE5 Bandwidth Low Channel, 619.5 MHz High Channel, 649.5 MHz LTE10 Bandwidth Low Channel, 624.5 MHz High Channel, 634.5 MHz LTE15 Bandwidth Low Channel, 624.5 MHz Mid Channel, 634.5 MHz High Channel, 644.5 MHz	47.856 47.975 47.86 47.972 47.991 47.991 47.847	0 0 0 0 0	47.9 48 47.9 48 48 48 47.8	1000 1000 1000 1000 1000	Pass Pass Pass Pass Pass Pass Pass



	Avg Cond	Duty Cycle		Value	Limit	Desults	
	Pwr (dBm) 47.875	Factor (dB)		(dBm) 47.9	(W ERP) 1000	Results Pass	
	11.013	0		47.5	1000	1 433	
📁 Keysight Spectrum Analyzer	Element Materials Tech	nology - Points: 601, Det	ector: Average (RMS)				P X
LXI RE 5	0Ω AC	S	ENSE:INT Center Freq: 61	ALIGN OFF		04:25:33 PM Oct 21 Radio Std: None	, 2019
		·••	Trig: Free Run	Avg Hold	: 100/100		
		#IFGain:Low	#Atten: 20 dB			Radio Device: BTS	
10 dB/div Ref 37	.00 dBm						
Log	.00 (18)						
27.0				1			
17.0							
-3.00							
-13.0							
-23.0							
-33.0		and the second s			and the second second	~}~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.
-43.0	and the second second second						
-53.0							
Center 619.5 MHz						Span 20	MHz
#Res BW 100 kHz			#VBW 3	300 kHz		#Sweep 60'	
Channel Pow	er		Power Sp	ectral Densit	ty		
47.00	ID		40	44			
47.88 (dBm / 5 M	Hz	-19	.11 dBm /	Hz		
100				T- are much			
MSG							

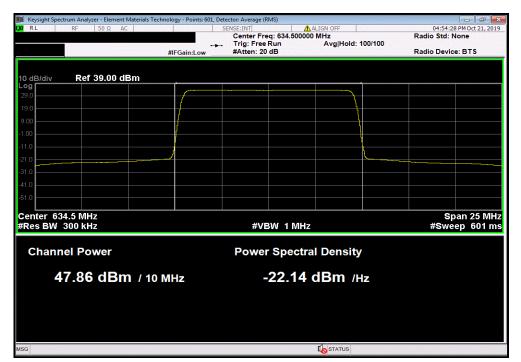
	Band 71, 25	6QAM Modulatio	on, LTE5 Bandwid	ith, High Channe	el, 649.5 MHz	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
ſ	47.856	0		47.9	1000	Pass





	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (W ERP)	Results
	47.975			48	1000	Pass
			1. I			
Discrete Keysight Spectrum Analyzer	r - Element Materials Tech	nology - Points: 601, Det	ector: Average (RMS)			
	50 Ω AC		ENSE:INT	ALIGN OFF		04:44:12 PM Oct 21, 20
			Center Freq: 622.00 Trig: Free Run	0000 MHz Avg Hold:		adio Std: None
		#IFGain:Low	#Atten: 20 dB	0.		adio Device: BTS
	9.00 dBm			-		
29.0						
19.0						
9.00						
-1.00		}				
-11.0						
-21.0		1			\	
-31.0						
-41.0						
-51.0						
Center 622 MHz #Res BW 300 kHz			#VBW 1M	U 7		Span 25 MH #Sweep 601 n
#Res DW JOO KIIZ			#VD9V 11V	112		#oweep oorn
Channel Pow	ver		Power Spec	tral Densit	y	
17 90	dBm / 10 I		22.0	2 dBm /		
47.30		VIHZ	-22.0		HZ	
l						
MSG				STATUS		

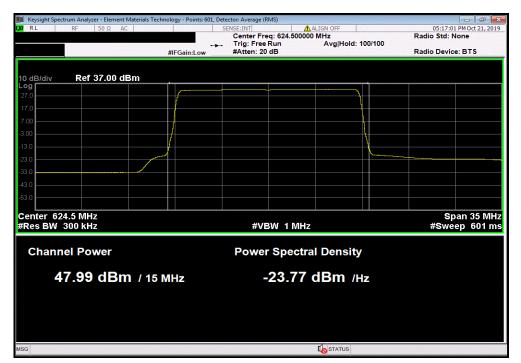
	, .		n, LTETU Bandwid		,	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	47.86	0		47.9	1000	Pass





	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)	1	(dBm)	(W ERP)	Results
	47.972	0		48	1000	Pass
Keysight Spectrum Analyze						
LXIRL RF	50 Ω AC	5	ENSE:INT Center Freq: 647.0	ALIGN OFF	R	05:02:23 PM Oct 21, 20 adio Std: None
		••·	Trig: Free Run	Avg Hold		
		#IFGain:Low	#Atten: 20 dB		Ri	adio Device: BTS
	39.00 dBm					
29.0						
19.0					l l	
9.00						
		/				
-1.00						
-11.0						
-21.0						
-31.0						
-41.0						
-51.0						
Center 647 MHz						Span 25 Mi
#Res BW 300 kHz			#VBW 11	√IHz		#Sweep 601 n
Channel Pov	ver		Power Spe	ctral Densit	y	
47.97	dBm / 10	MHz	-22.0)3 dBm /	Ήz	
MSG				TATUS		

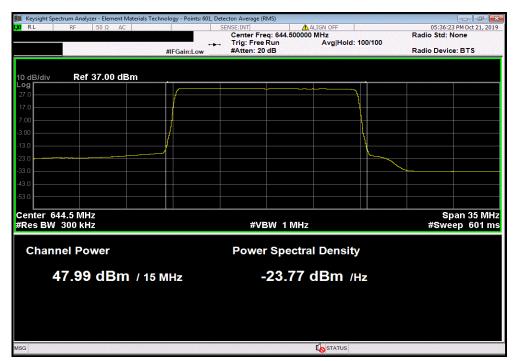
	Avg Cond	Duty Cycle	., 21210 Danam	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	47.991	0		48	1000	Pass





	Avg Cond	Duty Cycle		Value	Limit		
	Pwr (dBm)	Factor (dB)	-	(dBm)	(W ERP)	Results	
	47.847	0		47.8	1000	Pass	
	zer - Element Materials Tech						
LXI RL RF	50 Ω AC	S	ENSE:INT Center Freq: 634.5	ALIGN OFF	Pa	05:27:58 PM Oct 21, dio Std: None	2019
		·••	Trig: Free Run	Avg Hold	: 100/100		
		#IFGain:Low	#Atten: 20 dB		Ra	dio Device: BTS	
10 dB/div Ref	37.00 dBm						
27.0					`		
17.0							
7,00							
-3.00		1			<u>_</u>		
-13.0							
-23.0		-^-					
-33.0							
-43.0							
-53.0							
Center 634.5 MH			40 (P)147 4 B	a		Span 35 M	
#Res BW 300 kH	12		#VBW 1N	IIIZ		#Sweep 601	ms
			-				
Channel Po	wer		Power Spe	tral Densit	y		
47.05			00.0				
47.85	dBm / 15	MHz	-23.8	1 dBm /	Hz		
MSG							

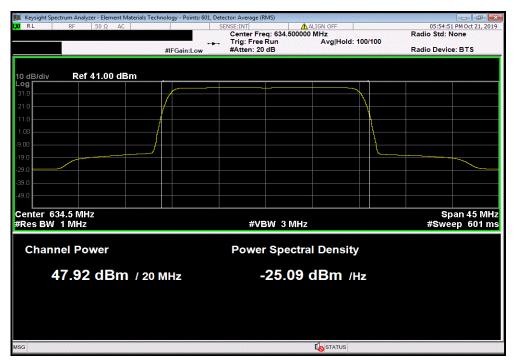
	Band 71, 250	5QAM Modulation	n, LTE15 Bandwi	dth, High Channe	el, 644.5 MHz	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	47.99	0		48	1000	Pass





	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (W ERP)	Results	
	48.029			48	1000	Pass	٦
	•		•	•		•	
🎉 Keysight Spectrum Analyze	r - Element Materials Tecl	nnology - Points: 601, Det	ector: Average (RMS)				X
LXI RL RF	50 Ω AC	S	ENSE:INT Center Freq: 627.0	ALIGN OFF		05:44:42 PM Oct 21, Radio Std: None	2019
		·•·	Trig: Free Run	Avg Hold	: 100/100		
		#IFGain:Low	#Atten: 20 dB		F	Radio Device: BTS	
l							
10 dB/div Ref 4	1.00 dBm					1	
31.0					\rightarrow		
21.0		/			\		
11.0							
1.00							
-9.00							
-19.0							
-29.0							
-39.0							
-49.0							
Center 627 MHz	l					Span 45 N	ЛHz
#Res BW 1 MHz			#VBW 31	MHz		#Sweep 601	
Channel Pov	ver		Power Spe	ctral Densit	y		
48.03	dBm / 20	MHz	-24.9	98 dBm /	Hz		
MSG				I STATUS			

	Band 71, 25	6QAM Modulatio	n, LTE20 Bandwi	dth, Mid Channe	, 634.5 MHz	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	47.923	0		47.9	1000	Pass





-	Cond	Duty Cycle		Value	Limit	Dtr	
	(dBm)	Factor (dB)		(dBm)	(W ERP)	Pass	-
40	8.064	0		48.1	1000	Pass	
	an pri						_
Keysight Spectrum Analyzer - Element			ector: Average (RMS) ENSE:INT	ALIGN OFF		06:05:02 PM Oct 21	
			Center Freq: 642.000	000 MHz	1	Radio Std: None	,2015
		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold	: 100/100	Radio Device: BTS	
		#IFGaIn:Low	#Atten: 20 GD			Radio Device. B13	_
10 dB/div Ref 41.00 dl	3						
31.0							
21.0		/			- \		_
11.0	<u> </u>				<mark>\</mark>		_
1.00	/				<u>\</u>		
-9.00	/				\ <u>\</u>		
-19.0							
-29.0							
-39.0							
-49.0							
Center 642 MHz				-		Span 45	
#Res BW 1 MHz			#VBW 3 MI	12		#Sweep 60	i ms
Channel Power			Power Spect	ral Densit	ty		
48.06 dBn	1 / 20 N	ЛНz	-24.9	5 dBm /	'Hz		
				I STATUS			

1000 Pass



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.



XMit 2019.09 EUT: AHBOA Remote Radio Head (RRH) Serial Number: BL1934X1001 Customer: Nokia Solutions and Networks Attendees: Hobert Smith, John Rattanavong, Mitchell Hill Project: None Tested by: Jonathan Kiefer TEST SPECIFICATIONS ECC 07:301 Work Order: NOKI0003 Date: 23-Oct-19 Temperature: 22.6 °C Humidity: 37.7% RH Barometric Pres.: 1020 mbar Power: 48VDC Test Method Job Site: TX09 FCC 27:2019 ANSI C63.26:2015

COMMENTS

Average power measurements were made for two multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM):

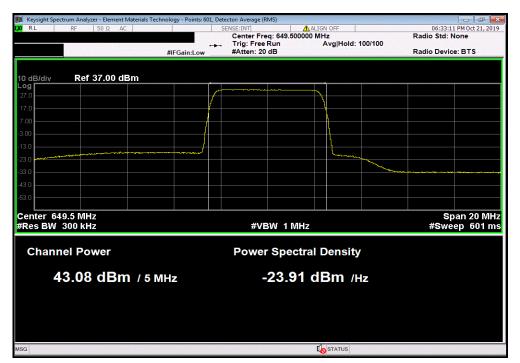
The first multicarrier test case is with three Band 71 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 71 lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [649.5MHz] at the Band 71 upper band edge. The second multicarrier test case is with three Band 71/Band 13 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 71 lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [753.5MHz] at the Band 13 upper band edge. The second multicarrier test case is with three Band 71/Band 13 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 71 lower band edge [619.5MHz and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [753.5MHz] at the Band 13 upper band edge. The second multicarrier test case is with three Band 71/Band 13 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 71 lower band edge [619.5MHz] and 624.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [753.5MHz] at the Band 13 upper band edge. The second tarrier test case is with the second base due to the test of the test of the second base due to the test of the second base due to the second b operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.

	M TEST STANDARD						
one	-						
			$\alpha \rightarrow 1$ $\alpha \geq 1$				
onfiguration #	1	Signature	Jonathan Kiefen				
		Signature	Avg Cond	Duty Cycle	Value	Limit	
			Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Result
nd 71			: iii (usiii)	1 dete: (u2)	(42)	(nooun
	QPSK Modulation						
	LTE5 Bandy	width					
		Multicarrier Test Case 1					
		622 MHz	46.327	0	46.3	1000	Pass
		649.5 MHz	43.081	0	43.1	1000	Pass
		Multicarrier Test Case 2					
		622 MHz	46.169	0	46.2	1000	Pass
		753.5 MHz	43.085	0	43.1	1000	Pass
	16QAM Modulation						
	LTE5 Bandy						
		Multicarrier Test Case 1	10.040	<u>^</u>	40.0	1000	Deer
		622 MHz 649.5 MHz	46.342 43.092	0 0	46.3 43.1	1000 1000	Pass
		Multicarrier Test Case 2	43.092	0	43.1	1000	Pass
		622 MHz	46.155	0	46.2	1000	Pass
		753.5 MHz	43.113	0	43.1	1000	Pass
	64QAM Modulation	700.0 10112	-0.110	0	-0.1	1000	1 433
	LTE5 Bandy	width					
		Multicarrier Test Case 1					
		622 MHz	46.365	0	46.4	1000	Pass
		649.5 MHz	43.103	0	43.1	1000	Pass
		Multicarrier Test Case 2					
		622 MHz	46.062	0	46.1	1000	Pass
		753.5 MHz	42.973	0	43	1000	Pass
	256QAM Modulation						
	LTE5 Bandy						
		Multicarrier Test Case 1		-			_
		622 MHz	46.281	0	46.3	1000	Pass
		649.5 MHz	43.083	0	43.1	1000	Pass
		Multicarrier Test Case 2	45.000	2	40	1000	Derr
		622 MHz 753.5 MHz	45.986 42.966	0	46	1000 1000	Pass
		753.5 MHZ	42.966	U	43	1000	Pass



	Avg Cond	Duty Cycle	FE5 Bandwidth, Mu	Value		
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	46.327			46.3	1000	Pass
RL RF	alyzer - Element Materials Tech 50 Ω AC		ector: Average (RMS) ENSE:INT Center Freq: 622.00 Trig: Free Run #Atten: 20 dB	ALIGN OFF 0000 MHz Avg Hold	: 100/100	06:30:41 PM Oct 21, 2 adio Std: None adio Device: BTS
10 dB/div Re	ef 37.00 dBm					
27.0						
3.00						
-23.0						
-53.0 Center 622 MH						Span 25 N
#Res BW 300 k			#VBW 1 M			#Sweep 601
Channel P	ower		Power Spec	tral Densit	y	
46.3	3 dBm / 10	MHz	-23.6	7 dBm /	'Hz	
MSG				STATUS		

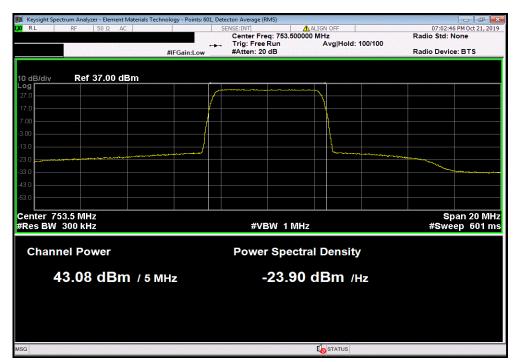
	Danu / I, QF SK	would all off, LTE	5 Banuwium, iviu	illuarier resi Ca	Se 1, 049.5 MINZ	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	43.081	0		43.1	1000	Pass





46.169 0 46.2 1000 Pass R Keysight Spectrum Analyzer - Element Materials Technology - Points 601, Detector: Average (BMS) 07:00:24 PM Oct 21, 22 R BF 50:00 AC Center Free: S22.000000 MHz Radio Std: None MIC Ref 37.00 dBm Center Free: S22.00000 MHz Radio Device: BTS 10 dB/div Ref 37.00 dBm Center Free: S2 Augithold: 100/100 300 Galaria Free Run Avgilhold: 100/100 301 Galaria Free Run Avgilhold: 100/100 Ref 37.00 dBm Galaria Galaria Galaria Center 622 MHz Span 25 MI Span 25 MI #Sweep 601 r Channel Power Power Spectral Density 46.17 dBm / 10 MHz -23.83 dBm /Hz	46.169 0 46.2 1000 Pass Ium Analyzer - Element Materials Technology - Points: 601, Detector. Average (RMS) 07:00:24 PMot 21, 22 PF 50.9 AC SENSE: INT AALIGN OFF 07:00:24 PMot 21, 22 Image: Analyzer - Element Materials Technology - Points: 601, Detector. Average (RMS) Center Freq: 622.000000 MHz Radio Std:: None Radio Device: BTS Center Freq: 622.00000 MHz Avg Hold:: 100/100 Radio Device: BTS Ref 37.00 dBm #FGain:Low #Atten: 20 dB Span 25 MI 20 MHz Span 25 MI Span 25 MI 300 KHz #VEW 1 MHz Span 25 MI 90 Wer Power Spectral Density 65.17 dBm / 10 MHz -23.83 dBm /Hz		Avg Cond	Duty Cycle		Value	Limit	
Keysight Spectrum Analyzer - Bement Materials Technology - Points: 601, Detector: Average (RMS) Conter Freq: 622,000000 MHz Radio Std:: None Ref 50 R #IFGain:Low SENSE.INT AugHodFr 07:00:24 PM 02:21,20 No #IFGain:Low Freq: 622,000000 MHz Radio Std:: None Radio Device: BTS No #IFGain:Low #Atten: 20 dB AvgHold:: 100/100 Radio Device: BTS No #Grading Std:: None Radio Device: BTS Radio Device: BTS No #Grading Std:: None Radio Device: BTS No #Atten: 20 dB Sense: Std:: None Ref 97.00 dBm Sense: Std:: None No #Grading Std:: None Sense: Std:: None Ref Std:: None Sense: Std:: None Ref Std:: None Sense: Std:: None Std:: None Maximum Std: None	num Analyzer - Element Materials Technology - Points 601, Detector: Average (RMS) RF 50 Ω AC SERVE: INIT Control of the server		Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
RL RF 50 Ω AC SENSE:INT Avg(Hold: 100/100 Radio Std: None #IFGain:Low #IFGain:Low Avg(Hold: 100/100 Radio Device: BTS	PF 50 Ω AC SENSELINT ALION OFF 07:00:24 PMOdt 21, 20 Radio Std: None #Adien 20 dB Avg Hold: 100/100 Radio Device: BTS Ref 37.00 dBm Image: Context Free; Sector 20 dB Avg Hold: 100/100 Radio Device: BTS Ref 37.00 dBm Image: Context Free; Sector 20 dB Image: Context Free; Sector 20 dB Span 25 MI 20 MHz Span 25 MI Span 25 MI Span 25 MI 300 kHz #VBW 1 MHz #Sweep 601 r 66.17 dBm / 10 MHz -23.83 dBm /Hz		46.169	0		46.2	1000	Pass
QY RL RF 50.9. AC SEXESTIMI Automore 07:00:24 PMOct21, 2C Radio Std: None Trig: Free Run Avg Hold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm Generation Automore Radio Device: BTS 10 dB/div Ref 37.00 dBm Generation Generation Generation Avg Hold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm Generation	PF 50 Ω AC SENSELINT ALION OFF 07:00:24 PMOdt 21, 20 Radio Std: None #Adien 20 dB Avg Hold: 100/100 Radio Device: BTS Ref 37.00 dBm Image: Context Free; Sector 20 dB Avg Hold: 100/100 Radio Device: BTS Ref 37.00 dBm Image: Context Free; Sector 20 dB Image: Context Free; Sector 20 dB Span 25 MI 20 MHz Span 25 MI Span 25 MI Span 25 MI 300 kHz #VBW 1 MHz #Sweep 601 r 66.17 dBm / 10 MHz -23.83 dBm /Hz	M. Kandalah Canada an Analan	- Flow out Materials Task	Delinter 601. Det	entre Augusto (DMC)			
Trig: Free Run #HEGain:Low - Trig: Free Run #Atten: 20 dB Radio Device: BTS Radio De	Ref 37.00 dBm HEGAIN:Low Trig: Free Run #Atten: 20 dB Radio Device: BTS Ref 37.00 dBm Avg Hold: 100/100 Radio Device: BTS Ref 37.00 dBm Atten: 20 dB Ref 37.00 dBm Atten: 20 dB Atten: 20 dB Att					ALIGN OFF		
#FGainLow #Atten: 20 dB Radio Device: BTS 10 dB/div Ref 37.00 dBm	#FGain:Low #Atten: 20 dB Radio Device: BTS Ref 37.00 dBm				Center Freq: 622.0			Radio Std: None
Log 27.0 7.0 13.0 14.0 14.0 14.0 14.0 15	All and a second					Avginoid		Radio Device: BTS
Log 270 700 300 300 300 300 300 300 3	All and a second							
27.0 7.0 3.0 3.0 3.0 4.3 5.0 Center 622 MHz #Res BW 300 kHz #Kes BW 300 kHz #VBW 1 MHz #VBW 1 MHz #VBW 1 MHz #Span 25 MHz #Sweep 601 r Channel Power 46.17 dBm / 10 MHz -23.83 dBm /Hz	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz		7.00 dBm					
10 10 <td< td=""><td>300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz</td><td></td><td></td><td>· · · · · · · · · · · · · · · · · · ·</td><td></td><td></td><td></td><td></td></td<>	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz			· · · · · · · · · · · · · · · · · · ·				
700 1	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz				V			
and a second sec	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz						l	
130 230 430 430 430 430 430 430 430 4	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
230 330 430 430 430 430 430 430 4	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
330 330 <td>300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz</td> <td></td> <td></td> <td><u>ل</u>ـ</td> <td></td> <td></td> <td>L</td> <td></td>	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz			<u>ل</u> ـ			L	
430 430 430 430 430 430 430 430 430 500 <td>300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
630 Span 25 Mi Center 622 MHz \$Span 25 Mi #Res BW 300 kHz #VBW 1 MHz Channel Power Power Spectral Density 46.17 dBm / 10 MHz -23.83 dBm /Hz	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
Center 622 MHz Span 25 M #Res BW 300 kHz #VBW 1 MHz #Sweep 601 r Channel Power Power Spectral Density 46.17 dBm / 10 MHz -23.83 dBm /Hz	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
#Res BW 300 kHz #VBW 1 MHz #Sweep 601 r Channel Power Power Spectral Density 46.17 dBm / 10 MHz -23.83 dBm /Hz	300 kHz #VBW 1 MHz #Sweep 601 r el Power Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz							
Channel Power Power Spectral Density 46.17 dBm / 10 MHz -23.83 dBm /Hz	el Power Spectral Density 6.17 dBm / 10 MHz -23.83 dBm /Hz					au		
46.17 dBm / 10 мнz -23.83 dBm /нz	6.17 dBm / 10 мнz -23.83 dBm /нz	#Res BW 300 KHZ			#VBW 11	/IHZ		#Sweep 601
	STATUS	Channel Pow	ver		Power Spe	ctral Densit	y	
	STATUS		-1D		00.0			
isg		40 47		MHZ	-23.8	is abm /	HZ	
rsg		46.17						
MSG Lostatus		46.17						
MSG Los STATUS		46.17						
MSG LASSING		46.17						
	Band 13, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz	46.17						
	Band 13, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz					I STATUS		

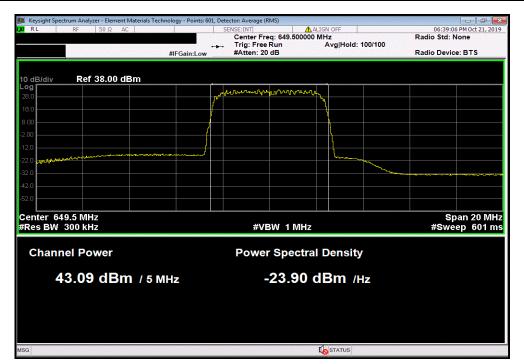
	Avg Cond	Duty Cycle	V	alue	Limit	
	Pwr (dBm)	Factor (dB)	(d	Bm)	(W ERP)	Results
	43.085	0		3.1	1000	Pass





	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	46.342	0		46.3	1000	Pass
Keysight Spectrum Analyze	er - Element Materials Tech	nology - Points: 601. Dete	ctor: Average (RMS)			
	50 Ω AC		ENSE:INT	ALIGN OFF		06:36:49 PM Oct 21, 20
			Center Freq: 622.000 Trig: Free Run	00 MHz Avg Hold		adio Std: None
		#IFGain:Low	#Atten: 20 dB	Arginoid		adio Device: BTS
10 dB/div Ref	38.00 dBm					
Log	50.00 UBIII					
28.0					\	
18.0			Y			
8.00		_			_ <mark></mark>	
-2.00						
-12.0						
-22.0		1				
-32.0						
-42.0						
-52.0						
Center 622 MHz						Span 25 M
#Res BW 300 kHz	z		#VBW 1 MH	z		#Sweep 601 r
Channel Pov	ver		Power Spect	ral Densit	y	
16 34	dBm / 10 I		-23 66	dBm /	U -	
-0.54		1172	-20.00		Π 2	
MSG				STATUS		
				<u> </u>		

	Dania / 1, 100, 11		Lo Danaman, m			
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	43.092	0		43.1	1000	Pass





	Avg Cond	Duty Cycle		Value	Limit		
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results	6
	46.155	0		46.2	1000	Pass	
📜 Keysight Spectrum Ana	alyzer - Element Materials Tech	nology - Points: 601, Det	ector: Average (RMS)				d X
LXI RL RF	50 Ω AC		ENSE:INT	ALIGN OFF		07:06:12 PM Oc	
			Center Freq: 622.000 Trig: Free Run	000 MHz Avg Hold	. 100/100	Radio Std: None	
		#IFGain:Low	#Atten: 20 dB	Aughiona	. 100/100	Radio Device: BT	s
10 dB/div Re	ef 38.00 dBm						
Log							
28.0					1		
18.0		-					
8.00							
-2.00					<u>l</u>		
-12.0							
-22.0		1			L		
-32.0							
-42.0							
-52.0							
Center 622 MH	7		L	I		Span 2	5 MHz
#Res BW 300 k			#VBW 1 M	lz		#Sweep 6	
Channel P	ower		Power Spect	ral Densit	y		
46 1	6 dBm / 10 I	MH7	-23.8/	l dBm /	Hz		
			20.0-				
MSG				STATUS			

	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	43.113	0	43.1	1000	Pass





	Avg Cond	Duty Cycle		Value	Limit		
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results	-
	46.365	0		46.4	1000	Pass	
🌉 Keysight Spectrum Analyz							
X RL RF	50 Ω AC	S	ENSE:INT Center Freq: 622.0	ALIGN OFF		06:42:07 PM Oct 21, 2 adio Std: None	2019
			Trig: Free Run	Avg Hold		adio Sta: None	
		#IFGain:Low	#Atten: 20 dB			adio Device: BTS	
10 dB/div Ref	37.00 dBm						
Log							
27.0			\sim		1		
17.0			v				
7.00							
-3.00							
-13.0							
					· · · · · · · · · · · · · · · · · · ·		
-23.0							
-33.0							
-43.0							
-53.0							
Center 622 MHz		I	L		L	Span 25 N	
#Res BW 300 kH	7		#VBW 1N	/Hz		#Sweep 601	
Channel Pov	Nor		Power Spec	tral Densit	N .		
enamer PO			- ower oper		2		
16 26	dBm / 10		22.6	4 dBm /			
40.30			-23.0		n Z		
MSG							

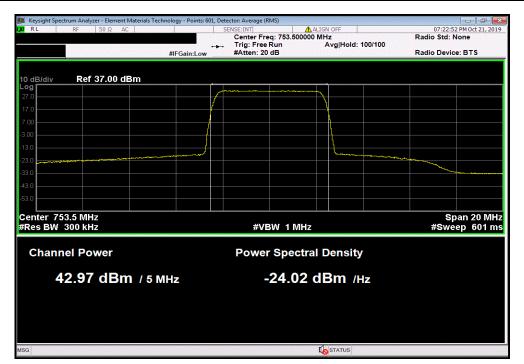
	Banu / I, 04QAN		ES Banuwiuth, Ivit		ISE 1, 049.5 MINZ	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	43.103	0		43.1	1000	Pass





	Avg Cond	Duty Cycle	TE5 Bandwidth, M	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	46.062	0		46.1	1000	Pass
RL RF	Analyzer - Element Materials Tech		ktor.Average (RMS) NSE:INT Center Freq: 622.0 Trig: Free Run #Atten: 20 dB	ALIGN OFF 000000 MHz Avg Hold	: 100/100	dio Device: BTS
53.0 Center 622 M Res BW 300			#VBW 11	MU7		Span 25 MH #Sweep 601 m
Channel				ctral Densit	Ŋ	
46.	06 dBm / 10 I	MHz	-23.9	94 dBm /	Hz	
MSG				STATUS		

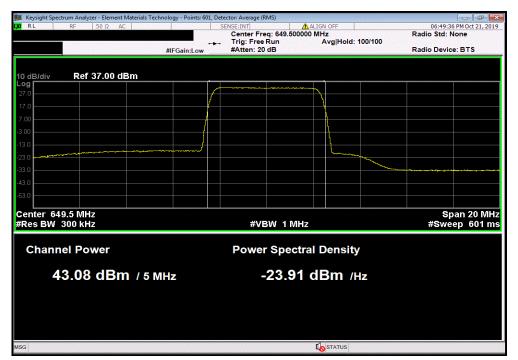
	Bana ro, ora, a		Lo Danaman, m			
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	42.973	0		43	1000	Pass





	Avg Cond	Duty Cycle	TE5 Bandwidth, N	Value	Limit	12
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
-	46.281	0		46.3	1000	Pass
Keysight Spectrum Analyzer				-		
LXI RL RF	50 Ω AC	S	ENSE:INT Center Freg: 622.00	ALIGN OFF	F	06:47:32 PM Oct 21, 201 Radio Std: None
			Trig: Free Run #Atten: 20 dB	Avg Hold		Radio Device: BTS
		#IFGain:Low	#Atten: 20 dB		F	Radio Device: B13
10 dB/div Ref 3	7.00 dBm					
Log	7.00 UBIN					1
27.0			\rightarrow		<u>}</u>	
17.0						
7.00						
-3.00					-1	
-13.0		}			- \	
-23.0						
-33.0						
-43.0						
-53.0						
Center 622 MHz	l				L	Span 25 MH
#Res BW 300 kHz			#VBW 11	1Hz		#Sweep 601 m
Channel Pow	ver		Power Spec	tral Densit	ty	
10.00						
46.28	dBm / 10 I	MHz	-23.7	2 dBm /	Hz	
				STATUS		
MSG						
	Band 71, 256QA Avg Cond	M Modulation, L Duty Cycle	TE5 Bandwidth, Mi	ulticarrier Test (Value	Case 1, 649.5 M Limit	Hz

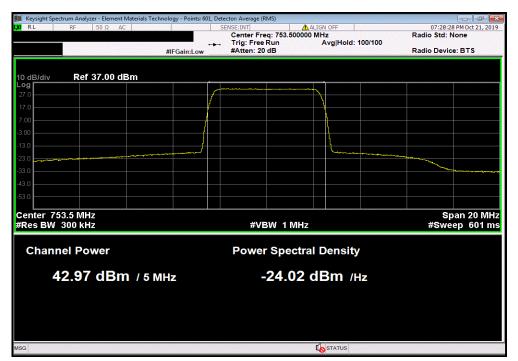
	Band 71, 256QAI	I Modulation, LT	E5 Bandwidth, M	ulticarrier Test C	ase 1, 649.5 MHz	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	43.083	0		43.1	1000	Pass





Pwr (dBm) Factor (dB) (dBm) (W ERP) Results 45.986 0 46 1000 Pass Keysight Spectrum Analyzer - Element Materials Technology - Points: 601, Detector Average (RMS) Center Freq: 522, 0000 MHz Radio Std: None Radio Std: Redio Std: None Radio Std: None Radio Device: BTS Center Freq: 622,000 dBm Center Freq: 622,000 dBm Span 25 M Kmark Center 622 MHz #VEW 1 MHz Span 25 M Span 25 M Kessight Job Khz Power Spectral Density Ads.001 dBm High System 100 MHz Channel Power Power Spectral Density 45.99 dBm / 10 MHz -24.01 dBm / Hz		Avg Cond	Duty Cycle	_TE5 Bandwidth, N	Value	Limit	
R RF S0.0 AC SENSE:INT ALIGN OFF 07.26:15 PM0(21).2 Radio Std: None #IFGain:Low #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Std: None 0 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 10 dB/div Ref 37.00 dBm #IFGain:Low #IFGain:Low #Atten: 20 dB AugHold: 100/100 Radio Device: BTS 130 General Figure:Low #IFGain:Low #IFGain:Low Span 25 M 20 Atten:E Bisso:Low #VBW 1 MHz #Span 25 M	F	wr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
RL RF 502 AC SENSE.INT Called OF 0726:15 PM of 21, 2 Radio Std: None Radio Device: BTS 10 dB/div Ref 37.00 dBm Log 27.0 10 dBm Log 27.0 10 dBm 10 dBm 1		45.986	0		46	1000	Pass
RL RF SD 2 AC SENSE INT Autom OF 0726:15 PMod 21, 2 Radio Std: None #IFGain:Low Ifference Avg Hold: 100/100 Radio Std: None 0 dB/div Ref 37,00 dBm Ifference Avg Hold: 100/100 Radio Device: BTS 0 dB/div Ref 37,00 dBm Ifference Ifference Ifference 0 dB/div Ifference Ifference Ifference Ifference <tr< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></tr<>							
Center Freq. 622.00000 MHz Trig: Freq Run Avg Hold: 100/100 Radio Std: None Radio Device: BTS Radio Dev		ent Materials Tech	nology - Points: 601, Det	ector: Average (RMS)			
Trig: Free Run #Atten: 20 dB Radio Device: BTS Radio Device: BTS	RL RF 50 Ω	AC	S				07:26:15 PM Oct 21, 2
10 dB/div Ref 37.00 dBm 27.3				Trig: Free Run			Radio Stu. None
Log 27.0 17.0 17.0 17.0 18.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 10.0 1			#IFGain:Low	#Atten: 20 dB			Radio Device: BTS
Log 27.3 7.0 7.0 13.0 14.2 14.2 14.2 15.2 14.2 15.							
22.0 17.0 700 300 130 330 430 430 430 Center 622 MHz #Res BW 300 KHz #Res BW 300 KHz #VBW 1 MHz #VBW 1 MHz #VBW 1 MHz #Sweep 601 Channel Power 45.99 dBm / 10 MHz -24.01 dBm /Hz		dBm					
170 130 130 130 130 130 130 130 13						×	
700 7			/	V		1	
300 40 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
130 120 120 120 120 120 120 120 12							
230 330 430 430 430 430 430 430 4	.00						
330 330 <td>3.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	3.0						
430 430 430 430 430 430 430 430 430 430 430 430 430 430 430 430 450 <td>3.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	3.0						
Center 622 MHz Span 25 W #Res BW 300 kHz #VBW 1 MHz Channel Power Power Spectral Density 45.99 dBm / 10 MHz -24.01 dBm /Hz	3.0						
Center 622 MHz Span 25 W #Res BW 300 kHz #VBW 1 MHz #Sweep 601 Channel Power Power Spectral Density 45.99 dBm / 10 MHz -24.01 dBm /Hz	3.0					_	
#Res BW 300 kHz #VBW 1 MHz #Sweep 601 Channel Power Power Spectral Density 45.99 dBm / 10 MHz -24.01 dBm /Hz	3.0					_	
#Res BW 300 kHz #VBW 1 MHz #Sweep 601 Channel Power Power Spectral Density 45.99 dBm / 10 MHz -24.01 dBm /Hz	antar 622 Milla						Chan 25 M
Channel Power Mer Spectral Density 45.99 dBm / 10 MHz -24.01 dBm /Hz				#VBW 11	1Hz		
45.99 dBm / 10 мнz -24.01 dBm /нz							and the second second
45.99 dBm / 10 мнz -24.01 dBm /нz	Channel Power			Power Spe	ctral Densit	v	
	45.99 dE	3m / 10 I	MHz	-24.0	1 dBm /	Hz	
ASG							
ма							
мза							
MSG							
					1		
	G				STATUS		

	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	42.966	0	43	1000	Pass



AVERAGE POWER



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

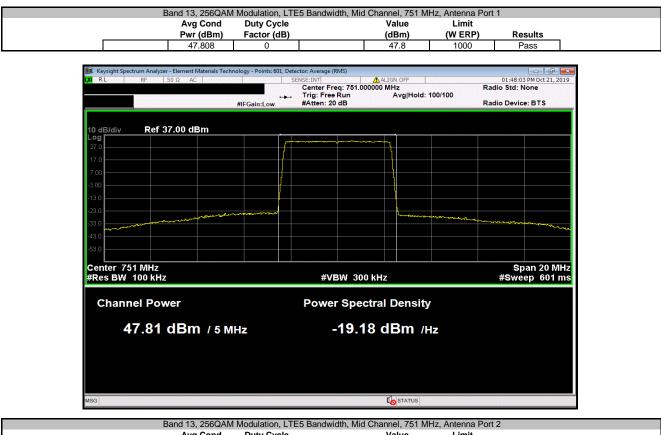
The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.



EUT: AHBOA Remote Radio Head (RRH) Work Order:: NOK10003 Serial Number: BL1934X1001 Date: 23-Oct-19 Customer: Noka Solutions and Networks Temperature: 22.9 °C °C Attendees: Hobert Smith, John Ratanavong, Mitchell Hill Humidity: 36.8% RH Project: None Barometric Pres: 1020 mbar Tested by: Jonathan Kiefer Power: 48VDC Job Site: TX09 Tested by: Jonathan Kiefer Power: 48VDC Job Site: TX09 Test SPECIFICATIONS Test Method FCC 27:2019 ANSI C63.26:2015 Configuration Configuration # 1 Signature Signature Signature Signature Signature Signature Eand 13 Signature Signature Avg Cond Duty Cycle Value Limit Re Band 13 Signature Signature Avg Cond Puty Cycle Value Limit Re Re Band 13 Signature Arterna Port 1 47.808 0 47.8 1000 F Anterna Port 2 47.698 <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>01011101</th></td<>								01011101
Serial Number: BL1934X1001 Date: 23-Oct-19 Customer: Nokia Solutions and Networks Temperature: 22.9 °C Attendees: Hobiert Smith, John Rattanavong, Mitchell Hill Hobiert Smith, John Rattanavong, Mitchell Hill Project: None Barometric Pres:: 1020 mbar Tested by: Jonathan Kiefer Jonathan Kiefer Project: None Jonathan Kiefer CZ 27:2019 ANSI CG3.26:2015 COMMENTS Secure of the thood Some Configuration # 1 Signature Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Signature Avg Cond Duty Cycle Value Limit Configuration # 1 Signature Avg Cond Duty Cycle Value Limit Andenna Port 1 47.808 0 47.8 1000 F								XMit 201
Customer: Nokia Solutions and Networks Temperature: 22.9 °C Attendees: Hobert Smith, John Rattanavong, Mitchell Hill Humidity: 36.8% RH Project: None Barometric Press: 1020 mbar Tested by: Jonathan Kiefer Job Site: TX09 EST SPECIFICATIONS Test Method Job Site: TX09 CC 27:2019 ANSI C63.26:2015 Interview Control Site: Signature OMMENTS Ansi C63.26:2015 Interview Control Site: Signature onfiguration # 1 Signature Signature Interview Control Site: Signature onfiguration # 1 Signature Signature Avg Cond Duty Cycle Value Limit and 13 Signature Avg Cond Duty Cycle Value Limit Mid Channel, 751 MHz Artenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F			lead (RRH)					
Attendees: Hobert Smith, John Rattanavong, Mitchell Hill Humidity: 56.8% RH Project: None Barometric Pres. 1020 mbar Tested by: Job Site: TX09 SC 27:2019 ANSI C63.26:2015 C OMMENTS ANSI C63.26:2015 C Support Rest Method Support Rest Method Support Rest Method CY:2019 ANSI C63.26:2015 C OMMENTS ANSI C63.26:2015 C Support Rest Method Support Rest Method Support Rest Method One Support Rest Standard Support Rest Method Support Rest Method Support Rest Standard Support Rest Standard Support Rest Method Support Rest Method One Support Rest Standard Support Rest Method Support Rest Method Support Rest Method Support Rest Standard Support Rest Method Support Rest Method Support Rest Method Support Rest Method One Support Rest Method Support Rest Method Support Rest Method Support Rest Method Support Rest Method <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Project: None Barometric Pres.: 1020 mbar Tested by: Job Site: TX09 EST SPECIFICATIONS Test Method OB CC 27:2019 ANSI C63.26:2015 Image: C63.26:2015 OMMENTS and 13 average power measurements for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is EVIATIONS FROM TEST STANDARD Onfiguration # 1 Signature Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Artenna Port 1 47.808 0 47.8 1000 F	Customer:	Nokia Solutions and Net	works					
Tested by: Jonathan Kiefer Job Site: TX09 EST SPECIFICATIONS Test Method CC 27:2019 ANSI C63.26:2015 COMMENTS ANSI C63.26:2015			anavong, Mitchell Hill					
EST SPECIFICATIONS Test Method CC 27:2019 ANSI C63.26:2015 OMMENTS								
CC 27:2019 ANSI C63.26:2015 ANSI C63.26:2015 COMMENTS comments for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is EVIATIONS FROM TEST STANDARD Dore Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re Avg Cond Duty Cycle Value Limit Limit Pwr (dBm) Factor (dB) (W ERP) Re Avg Cond Duty Cycle Value Limit LIMITES Bandwidth LTES Bandwidth Mid Channel, 751 MHz Antenna Port 1 47.808 0 47.8 1000 F						Job Site:	TX09	
SOMMENTS Sommer measurements for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is EVIATIONS FROM TEST STANDARD Interst STANDARD Signature Avg Cond Duty Cycle Value Limit Nonfiguration # 1 Signature Avg Cond Duty Cycle Value Limit Mark (dBm) Factor (dB) (W ERP) Re Avg Cond Duty Cycle Value Limit Mark (dBm) Factor (dB) (W ERP) Re Avg Cond Duty Cycle Value Limit USEGOAM Modulation LTES Bandwidth Mid Channel, 751 MHz Aritema Port 1 47.808 0 47.8 1000 F	EST SPECIFICATI	IONS		Test Method				
tand 13 average power measurements for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is DEVIATIONS FROM TEST STANDARD Jone Configuration # 1 Signature Avg Cond Pwr (dBm) Duty Cycle Value Limit (dBm) (W ERP) Re LITE5 Bandwidth LITE5 Bandwidth Mid Channel, 751 MHz Antenna Port 1 Artenna Port 2 47.698 0 47.7 1000 F	CC 27:2019			ANSI C63.26:2015				
And 13 average power measurements for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is some and the some antenna gain, which is some antenna gain, whic								
Avg Cond Signature Signature Avg Cond Pwr (dBm) Z56QAM Modulation LTES Bandwidth Mid Channel, 751 MHz Antenna Port 1 Antenna Port 2 Art 688 0 47.88 0 47.78 1000 Factor (dB) Cond Co	OMMENTS							
EVIATIONS FROM TEST STANDARD Dene Signature Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (W ERP) Re (dBm) (W ERP) Re (dBm) LTE5 Bandwidth LTE5 Bandwidth Mid Channel, 751 MHz Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F	and 13 average po	ower measurements for L	TE5 channel bandwidth at Mid c	channel using 256QAM on all four antenna r	oorts. EUT is operat	ed at 100% duty cycle. ERP depends	on antenna gain, w	hich is unkno
Avg Cond Duty Cycle Value Limit Pwr (dBm) Factor (dB) (dBm) (W ERP) Re 256QAM Modulation LTE5 Bandwidth Mid Channel, 751 MHz Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F		1		Jonethan Kiefer				
Pwr (dBm) Factor (dB) (dBm) (W ERP) Re land 13 256QAM Modulation Intense Port 1 Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F			Signature					
256QAM Modulation LTE5 Bandwidth Mid Channel, 751 MHz Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F								Results
LTE5 Bandwidth Mid Channel, 751 MHz 47.808 0 47.8 1000 F Antenna Port 1 47.698 0 47.7 1000 F	and 13							
Mid Channel, 751 MHz Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F		256QAM Modulation						
Antenna Port 1 47.808 0 47.8 1000 F Antenna Port 2 47.698 0 47.7 1000 F		LTE5 Bandw	/idth					
Antenna Port 2 47.698 0 47.7 1000 F			Mid Channel, 751 MHz					
						47.8		
Antenna Port 3 47 628 0 47 6 1000 F				47.808	0	47.0	1000	Pass
			Antenna Port 1		0 0			Pass Pass
Antenna Port 4 47.753 0 47.8 1000 F			Antenna Port 1		0 0 0			

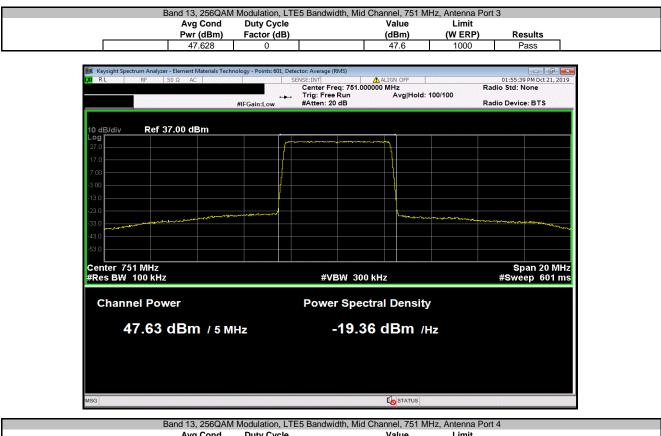




	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	47.698	0	47.7	1000	Pass







	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	47.753	0	47.8	1000	Pass





XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

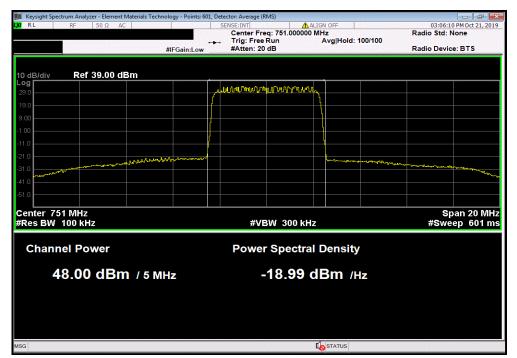


						TbtTx 2019.08.30.0	
	: AHBOA Remote Radio H	ead (RRH)			Work Order:		
Serial Number	r: BL1934X1001					23-Oct-19	
Customer	: Nokia Solutions and Net	works			Temperature:	22.7 °C	
Attendees	Hobert Smith, John Ratta	anavong, Mitchell Hill			Humidity:	37.2% RH	
Project	t: None				Barometric Pres.:	1020 mbar	
Tested by	: Jonathan Kiefer		Power: 48VDC		Job Site:	TX09	
EST SPECIFICAT	TIONS		Test Method				
CC 27:2019			ANSI C63.26:2015				
COMMENTS							
and 13 average	nower measurements for	TE5 channel bandwidth at Mid	channel 751MHz for four modulation types.	Tested on highest	nower antenna port (Port 1) EUT is o	perated at 100% du	ty cycle EPP
	na gain, which is unknown		chamer rommiz for four modulation types.	rested on highest	power antenna port (r ort i). Eor is o	perated at 100% au	ty cycle. Litti
epends on anten	ina gain, which is unknown	1.					
	M TEST STANDARD						
	INI TEST STANDARD						
None	MITEST STANDARD						
None	1		Jostha Kiela				
	1	Signatura	Jonathan Kiefe				
None	1	Signature		Duty Cycle	Value	Limit	
None	1	Signature	Avg Cond	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
lone	1	Signature		Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
lone	1	Signature	Avg Cond				Results
lone	1 QPSK Modulation	. <u> </u>	Avg Cond Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	
lone	1 QPSK Modulation LTE5 Bandw	. <u> </u>	Avg Cond				Results
lone	1 QPSK Modulation LTE5 Bandw 16QAM Modulation	idth	Avg Cond Pwr (dBm) 48.022	Factor (dB)	(dBm) 48	(W ERP) 1000	Pass
lone	1 QPSK Modulation LTE5 Bandw 16QAM Modulation LTE5 Bandw	idth	Avg Cond Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	
lone	1 QPSK Modulation LTE5 Bandw 16QAM Modulation LTE5 Bandw 64QAM Modulation	idth	Avg Cond Pwr (dBm) 48.022 48.001	Factor (dB) 0 0	(dBm) 48 48	(W ERP) 1000 1000	Pass Pass
lone	1 QPSK Modulation LTE5 Bandw 16QAM Modulation 64QAM Modulation LTE5 Bandw	idth	Avg Cond Pwr (dBm) 48.022	Factor (dB)	(dBm) 48	(W ERP) 1000	Pass
one onfiguration #	1 QPSK Modulation LTE5 Bandw 16QAM Modulation LTE5 Bandw 64QAM Modulation	idth idth idth	Avg Cond Pwr (dBm) 48.022 48.001	Factor (dB) 0 0	(dBm) 48 48	(W ERP) 1000 1000	Pass Pass



	Avg Cond	Duty Cycle	SK Modulation, L	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	48.022	0		48	1000	Pass
Keysight Spectrum Analyze	er - Element Materials Tech 50 Ω AC		ector: Average (RMS) ENSE:INT	ALIGN OFF		03:02:03 PM Oct 21, 20
	0012 110		Center Freq: 751.0	00000 MHz		dio Std: None
		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold:		dio Device: BTS
10 dB/div Ref 3	37.00 dBm					
27.0			·			
17.0				1		
7.00						
-3.00						
-13.0		le la				
-13.0						
-33.0	۵۰٬۰۰۱٬۰۰۰ میروند ارتقاد میروند. مراجع میروند می	Contraction of the second s		, ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.www.www.www.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
-43.0						
-53.0						
Center 751 MHz #Res BW 100 kHz			#VBW 30	0 247		Span 20 Mi #Sweep 601 n
#Res DW TOORH2	-		#VDVV J0			#Sweep 0011
Channel Pov	ver		Power Spe	ctral Densit	y	
48 02	dBm / 5 M	IH7	-18 9	97 dBm /	Hz	
		1112			112	
MSG				STATUS		
				<u> </u>		

	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	48.001	0	48	1000	Pass





	Avg Cond	Duty Cycle	AM Modulation, L	Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	48.012	0		48	1000	Pass
Keysight Spectrum Analyz	av Element Materials Tech	nalami Daintri 601 Dat	ster Aurones (PMC)			
	50 Ω AC		ENSE:INT	ALIGN OFF		03:09:38 PM Oct 21, 20
		·••	Center Freq: 751.0 Trig: Free Run	00000 MHz Avg Hold:	100/100	dio Std: None
		#IFGain:Low	#Atten: 20 dB		Ra	idio Device: BTS
	07.00					
10 dB/div Ref	37.00 dBm					
27.0						
17.0						
7.00						
-3.00		<mark>(</mark>				
-13.0						
-23.0	المسياكوا اسالو وموام وسيسو المساور والم			howen	mannen	
-33.0						Contraction of the Contraction o
-43.0						
-53.0						
Center 751 MHz						Span 20 MH
#Res BW 100 kH	Z		#VBW 30	0 KHZ		#Sweep 601 n
Channel Pov	wer		Power Spe	ctral Densit	y	
48.01	dBm / 5 N	IHz	-18.9	08 dBm ⊭	Hz	
MSG				STATUS		
mod				NO STATUS		

	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	47.99	0	48	1000	Pass





XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.



EUT. A							
	HBOA Remote Radio H	ead (RRH)			Work Order:		
Serial Number: B						23-Oct-19	
	lokia Solutions and Net				Temperature:		
	lobert Smith, John Ratta	anavong, Mitchell Hill			Humidity:		
Project: N					Barometric Pres.:		
	lonathan Kiefer		Power: 48VDC		Job Site:	TX09	
TEST SPECIFICATION	NS		Test Method				
FCC 27:2019			ANSI C63.26:2015				
COMMENTS							
and 13 average nov	ver for 256QAM modulat	tion type at Low, Mid and High chan	nels for LTE5 and LTE10 channel band	widths For Band 13 T	F10 only tested on Mid channel	Tested on highest	nower antenna
			hannel data shown elsewhere in the re				
DEVIATIONS FROM 1	TEAT ATANDADD						
	IESI SIANDARD						
None	IEST STANDARD						
	1	Signature	Jonathan Kiefen				
lone	1	Signature	Jonethan Kiefen Avg Cond	Duty Cycle	Value	Limit	
lone	1	Signature		Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
lone	1	Signature	Avg Cond				Results
None Configuration # Band 13	1 256QAM Modulation	Signature	Avg Cond				Results
Configuration #	1	¥	Avg Cond				Results
Configuration #	1 256QAM Modulation LTE5 Bandwi	¥	Avg Cond				Results
ione configuration #	1 256QAM Modulation LTE5 Bandwi	idth	Avg Cond Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	
None Configuration # Band 13	1 256QAM Modulation LTE5 Bandwi	idth Low Channel, 748.5 MHz High Channel, 753.5 MHz	Avg Cond Pwr (dBm) 48.03	Factor (dB)	(dBm) 48	(W ERP) 1000	Pass



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (W ERP)	Results	
	48.03			48	1000	Pass	٦
	40.05	0		40	1000	1 835	-
					en en len en len en len en len en len		
Keysight Spectrum Analyzer	- Element Materials Tech i0 Ω AC		Ector: Average (RMS)	ALIGN OFF		03:26:18 PM Oct 21,	
			Center Freq: 748.5	00000 MHz		Radio Std: None	
		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold	i: 100/100	Radio Device: BTS	
		In Guilleon					
10 dB/div Ref 3	7.00 dBm						
Log							
27.0							
17.0							
7.00							
-3.00							
-13.0							
-23.0	مىلىمىلىمىلە	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
-33.0	and the second s					~ har harden and the second	~~~
-43.0							
-53.0							
Center 748.5 MHz			#VBW 30			Span 20 P	
#Res BW 100 kHz			#VBW 30			#Sweep 601	liis
Channel Pow	er		Power Spe	ctral Densi	ty		
48.03	dBm / 5 M	IHz	-18.9	6 dBm	/Hz		
MSG				STATUS			

	Band 13, 25	6QAM Modulatio	on, LTE5 Bandwic	lth, High Channe	el, 753.5 MHz	
	Avg Cond	Duty Cycle		Value	Limit	
	Pwr (dBm)	Factor (dB)		(dBm)	(W ERP)	Results
	47.935	0		47.9	1000	Pass

Ceysight Spectrum Analyzer - Element Material	s Technology - Points: 601, E	Detector: Average (SENSE:INT					- P		
RL RF 50 Ω AC	++ #IFGain:Low	Center Freq: 753.500000 MHz Trig: Free Run Avg Hold: 100/				03:36: Radio Std: Radio Devi			
dB/div Ref 37.00 dBm									
	· · · · · · · · · · · · · · · · · · ·								
				1					
0				— L					
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D									
	wanter and an and and and and and and and and			L					
						and the second			
							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
ŋ									
nter 753.5 MHz		243.41	DW 200			S	pan 20 MH		
es BW 100 kHz		#v	BW 300	КПZ		#5W	eep 601 n		
Channel Power		Powe	r Spect	ral De	ensity				
		Power Spectral Density							
47.93 dBm / /	5 MHz		19 05	i dB	m /Hz				
		-19.05 dBm /нz							
		<b>I</b> O STATUS							



4	vg Cond	Duty Cycle		Value	Limit		
P	wr (dBm)	Factor (dB)		(dBm)	(W ERP)	Res	sults
	47.876	0		47.9	1000	Pa	ass
					-		
📜 Keysight Spectrum Analyzer - Elem	ent Materials Tech	nelemu Reintri 601 Dete	step Average (PMS)				
IN RL RF 50 Ω			ENSE:INT	ALIGN OFF		03:45:17	PM Oct 21, 2019
			Center Freq: 751.00	0000 MHz		Radio Std: N	
		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold		Radio Device	BTS
		#IFGain:Low	#Atten: 20 dB			Radio Device	
10 dB/div Ref 39.00	dBm						
29.0							
					l l		
19.0					}		
9.00							
-1.00					-		
-11.0							
-21.0							
-31.0							
-41.0							
-51.0							
Center 751 MHz						Sp	an 25 MHz
#Res BW 300 kHz			#VBW 1 N	Hz			ep 601 ms
							_
Channel Power			Power Spec	tral Densit	y		
47.88 dE	m / 10	MHz	-22.1	2 dBm /	Hz		
MSG				STATUS			



XMit 2019.09.05

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

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

### **TEST DESCRIPTION**

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

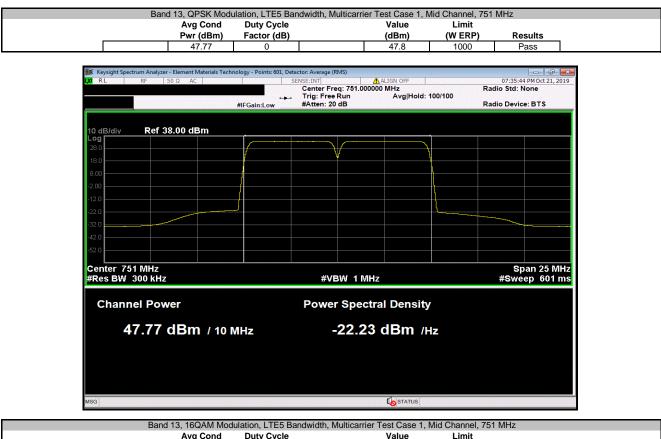
The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding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

Per FCC sections 27.50(c)(3) and 27.50(b)(4), the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

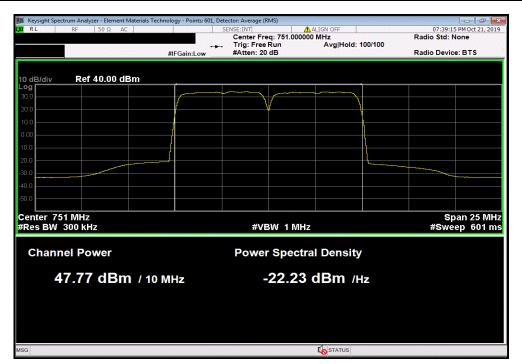


EUT: AHBOA Remote Radio Head (RRH)								
Serial Number: BL1934X1001								
Customer: Nokia Solutions and Networks								
Attendees: Hobert Smith, John Rattanavong, Mitchell Hill								
Project: None								
Tested by: Jonathan Kiefer Power: 48VDC								
TEST SPECIFICATIONS Test Method								
FCC 27:2019 ANSI C63.26:2015								
ulation types for LTE5 channel bandwidth	. This multicarrier test ca	ase is with two LTE5 carriers at t	he Band 13 lower	and upper band				
( ) ,								
Jonathan Kiefer								
0								
Avg Cond	Duty Cycle	Value	Limit					
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results				
lz 47.77	0	47.8	1000	Pass				
iz 47.77	0	47.8	1000	Pass				
iz 47.77	0	47.8	1000	Pass				
iz 47.77 Iz 47.766	0 0	47.8 47.8	1000	Pass Pass				
iz 47.766	0	47.8	1000	Pass				
iz 47.766	0	47.8	1000	Pass				
iz 47.766	0	47.8	1000	Pass				
iz 47.766	0	47.8	1000	Pass				
	Test Method ANSI C63.26:2015 ulation types for LTE5 channel bandwidth bort (Port 1). EUT is operated at 100% duty Sonothan Kiefon Avg Cond	Jonathan Kiefon Avg Cond Duty Cycle	Temperature:           Humidity:           Barometric Press.           Barometric Press.           Job Site:           Test Method           ANSI C63.26:2015           Job Site:           Value	Test Method ANSI C63.26:2015 ulation types for LTE5 channel bandwidth. This multicarrier test case is with two LTE5 carriers at the Band 13 lower a bort (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown. Souther the second seco				





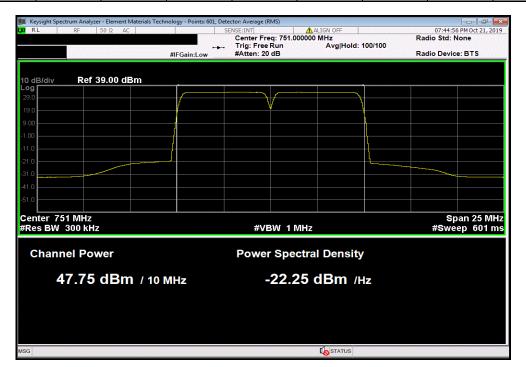
	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	47.766	0	47.8	1000	Pass







	Avg Cond	Duty Cycle	Value	Limit	
	Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results
	47.748	0	47.7	1000	Pass





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

### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

### **TEST DESCRIPTION**

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

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

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4. The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

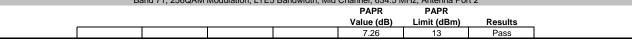


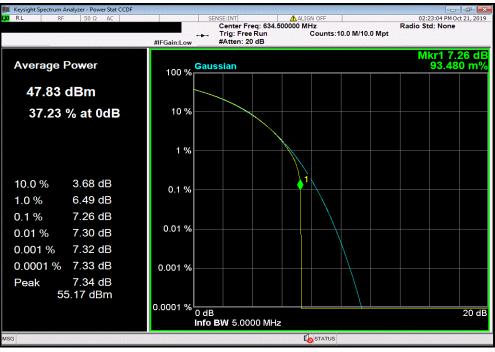
							TbtTx 2019.08.30.0	XMit 2019.09.05
	AHBOA Remote Radio H	lead (RRH)				Work Order:		
Serial Number:	BL1934X1001						21-Oct-19	
Customer	Nokia					Temperature:	22.7 °C	
Attendees	Hobert Smith, John Ratt	anavong, Mitchell Hill				Humidity:		
Project:					Ba	rometric Pres.:		
	: Jonathan Kiefer		Powers	48VDC		Job Site:	TX09	
TEST SPECIFICAT	IONS			Test Method				
FCC 27:2019				ANSI C63.26:2015				
COMMENTS								
Band 71 PAPR me	asurements for LTE5 char	nnel bandwidth at mid channel using	g 256QAM on all fou	r antenna ports. Using CCDF funct	on of spectrum analyzer.	EUT is operate	d at 100% duty cycle	).
DEVIATIONS FROM	M TEST STANDARD							
None								
Configuration #	1		Jonathar	Kiefer				
		Signature	0	0				
						PAPR	PAPR	
						Value (dB)	Limit (dBm)	Results
Band 71								
	256QAM Modulation							
	LTE5 Bandw							
		Mid Channel, 634.5 MHz						
		Antenna Port 1				7.26	13	Pass
		Antenna Port 2				7.26	13	Pass
		Antenna Port 3				7.25	13	Pass
		Antenna Port 4				7.26	13	Pass

# **PEAK-TO-AVERAGE POWER RATIO (PAPR)**









# **PEAK-TO-AVERAGE POWER RATIO (PAPR)**





