



element

Nokia Solutions and Networks

Airscale Base Transceiver Station Remote Radio Head

Model: AHBOA

FCC 27:2019

Report # NOKI0003.1 Rev. 1



NVLAP LAB CODE: 201049-0



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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
FCC 27:2019	ANSI C63.26:2015 with
FCC Part 2:2019	FCC KDB 971168 D01 v03r01
FCC 27.53:2019	FCC KDB 971168 D03 v01 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	
5.5	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

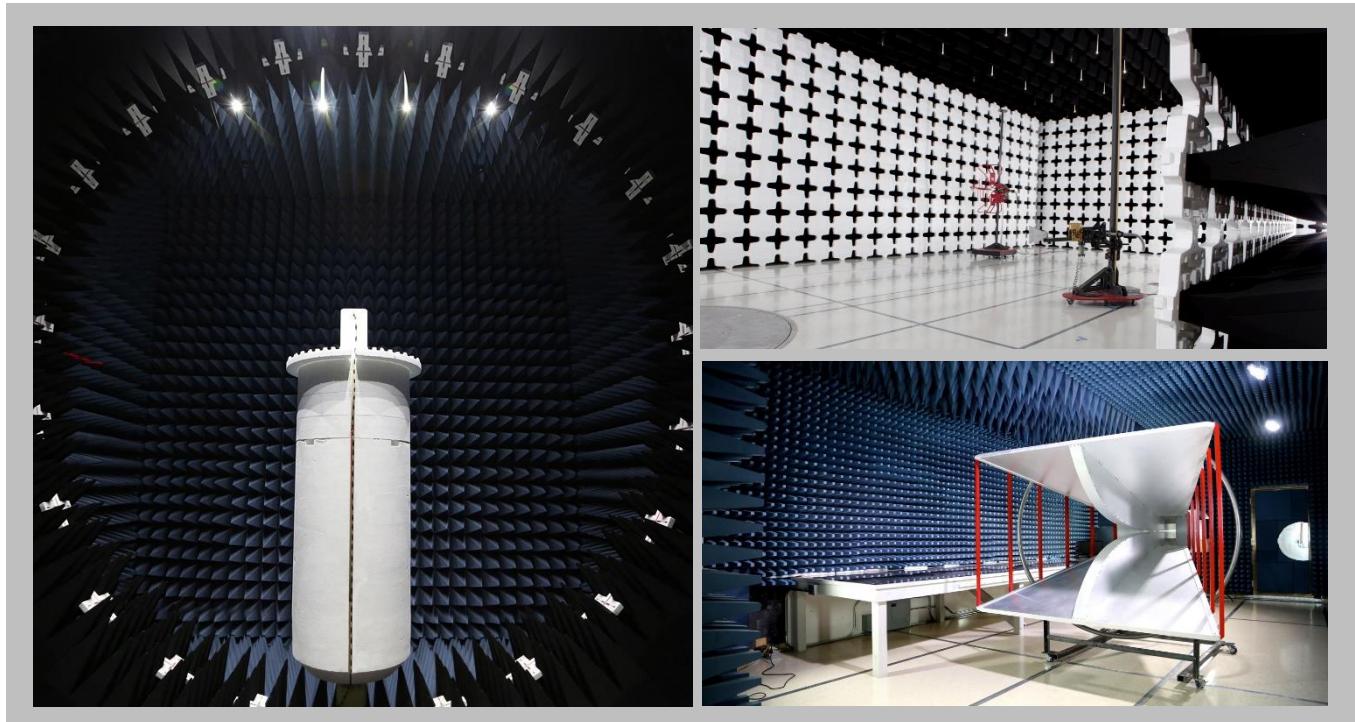
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

FACILITIES



California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 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, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157



MEASUREMENT UNCERTAINTY



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.

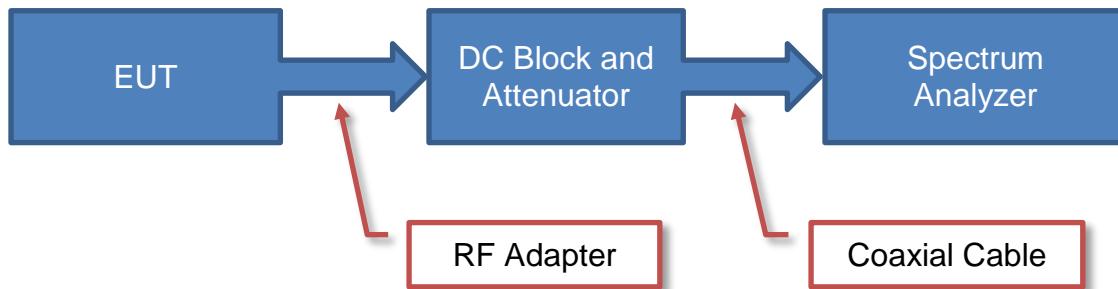
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty ($K=2$) can be found included as part of the applicable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

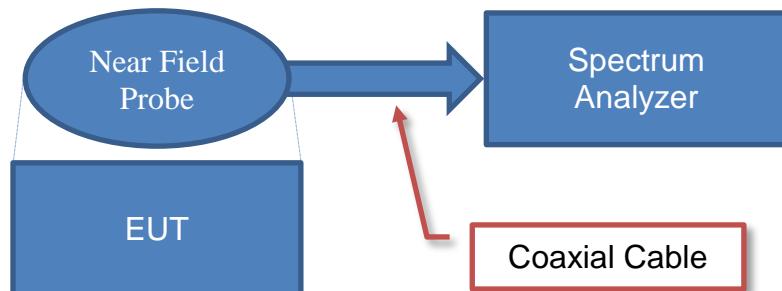
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

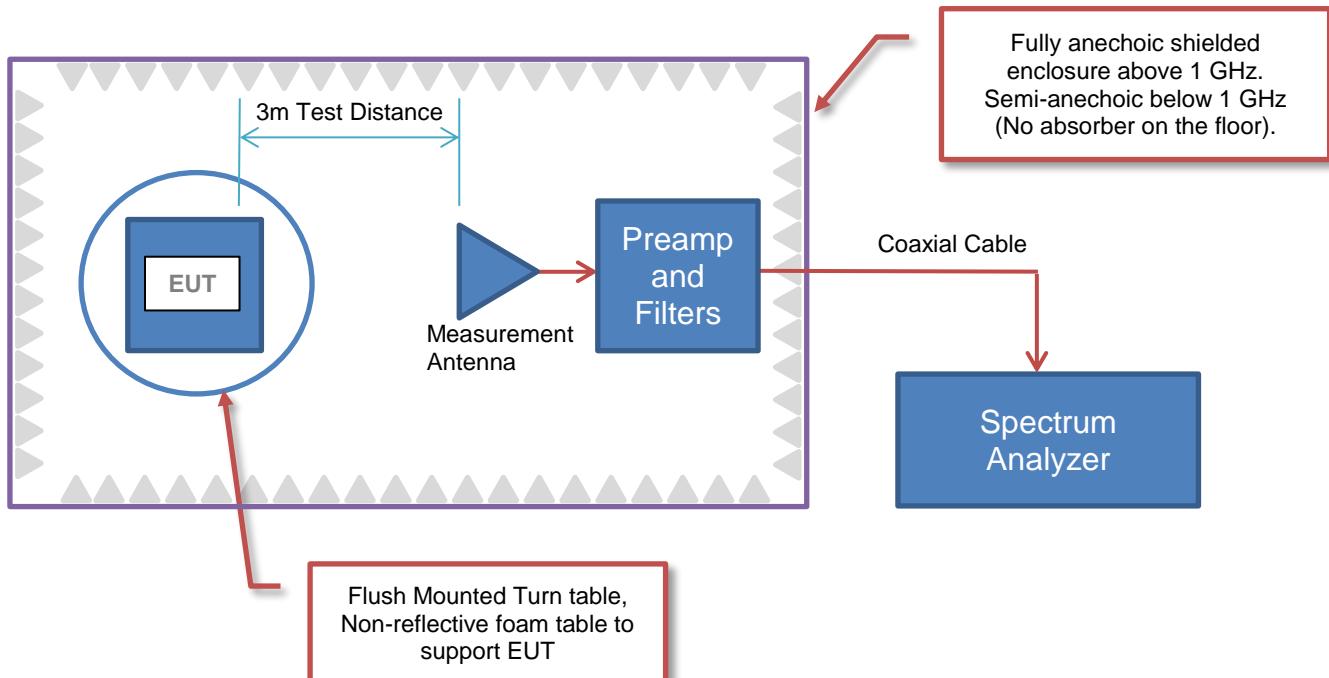
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, 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

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



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

	Downlink EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
Band 71 (Ant 1, 2, 3, 4)	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	
					
	68686	627.0				Bottom Ch
					
	68761	634.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch
					
	68836	642.0				Top Channel
					
	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

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 EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth	
			5 MHz	10 MHz
AHBOA Band 13 (Ant 1, 2, 3, 4)	5180	746.0	Band Edge	Band Edge
			
	5205	748.5	Bottom Channel	
			
	5230	751	Middle Channel	Bottom Channel Middle Channel Top Channel
			
	5255	753.5	Top Channel	
			
	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).

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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

CONFIGURATIONS



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.

AVERAGE OUTPUT 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.

AVERAGE OUTPUT POWER



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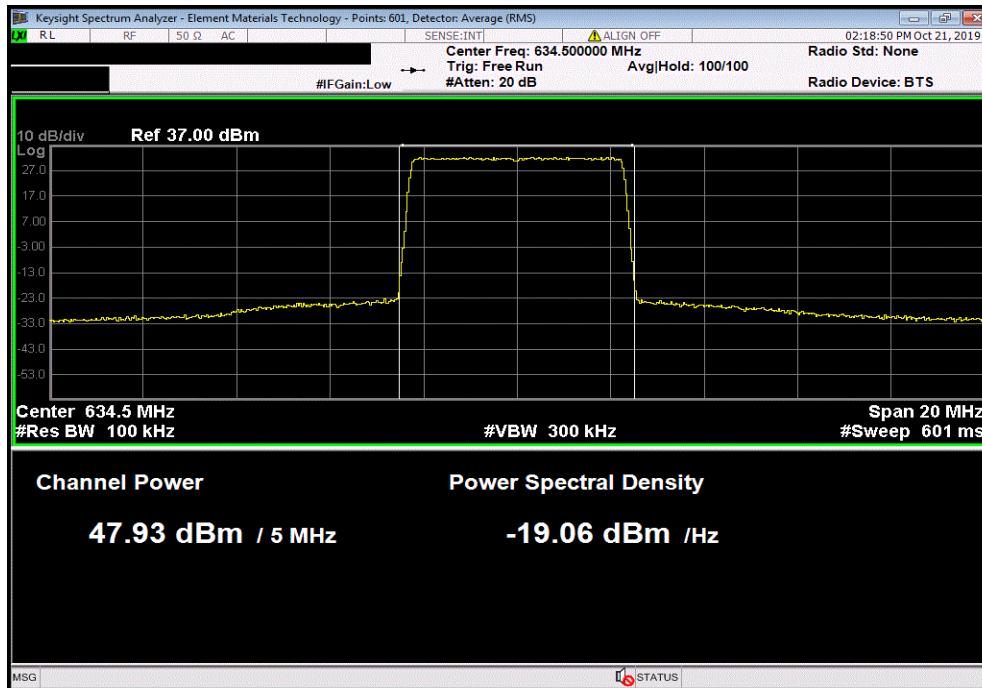
EUT: AHBOA Remote Radio Head (RRH)				Work Order: NOKI0003
Serial Number: BL1934X1001				Date: 21-Oct-19
Customer: Nokia Solutions and Networks				Temperature: 22.7 °C
Attendees: Robert Smith, John Rattanavong, Mitchell Hill				Humidity: 36.6% RH
Project: None				Barometric Pres.: 1020 mbar
Tested by: Jonathan Kiefer	Power: 48VDC			Job Site: TX09
TEST SPECIFICATIONS				
FCC 27:2019		Test Method ANSI C63.26:2015		
COMMENTS Band 71 average power measurements on all four antenna ports. EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	1	 Signature		
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Pwr (dBm) Limit (W ERP) Results
Band 71				
256QAM Modulation				
LTE5 Bandwidth				
Mid Channel, 634.5 MHz				
Antenna Port 1		47.925	0	47.9 1000 Pass
Antenna Port 2		47.92	0	47.9 1000 Pass
Antenna Port 3		47.82	0	47.8 1000 Pass

AVERAGE OUTPUT POWER

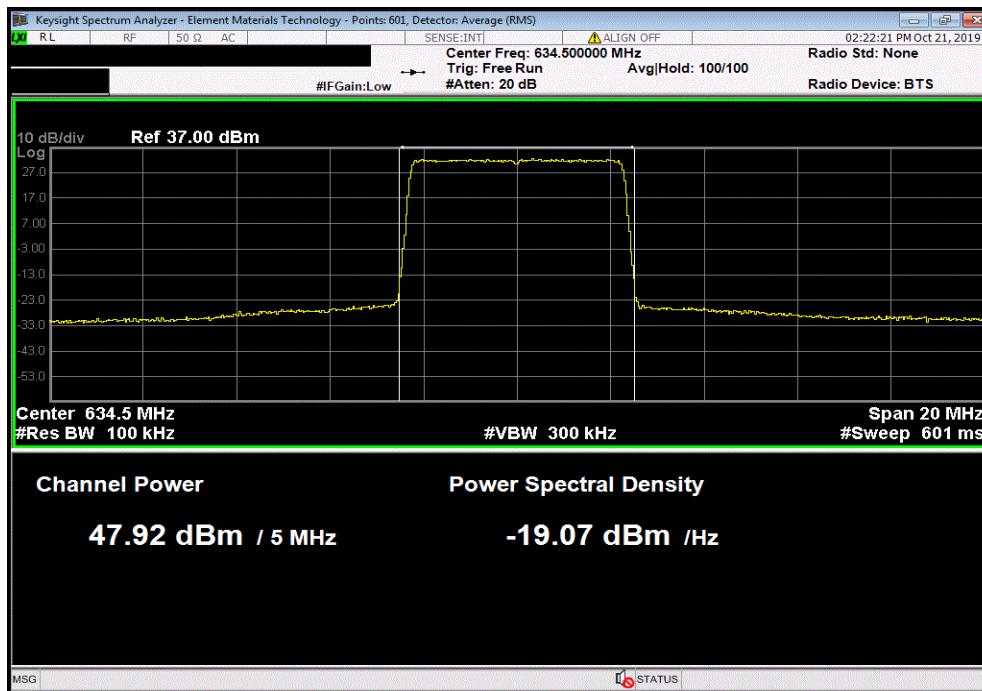


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Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 1					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Pwr (dBm)	Limit (W ERP)	Results	
47.925	0	47.9	1000	Pass	



Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 2					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Pwr (dBm)	Limit (W ERP)	Results	
47.92	0	47.9	1000	Pass	



AVERAGE OUTPUT POWER

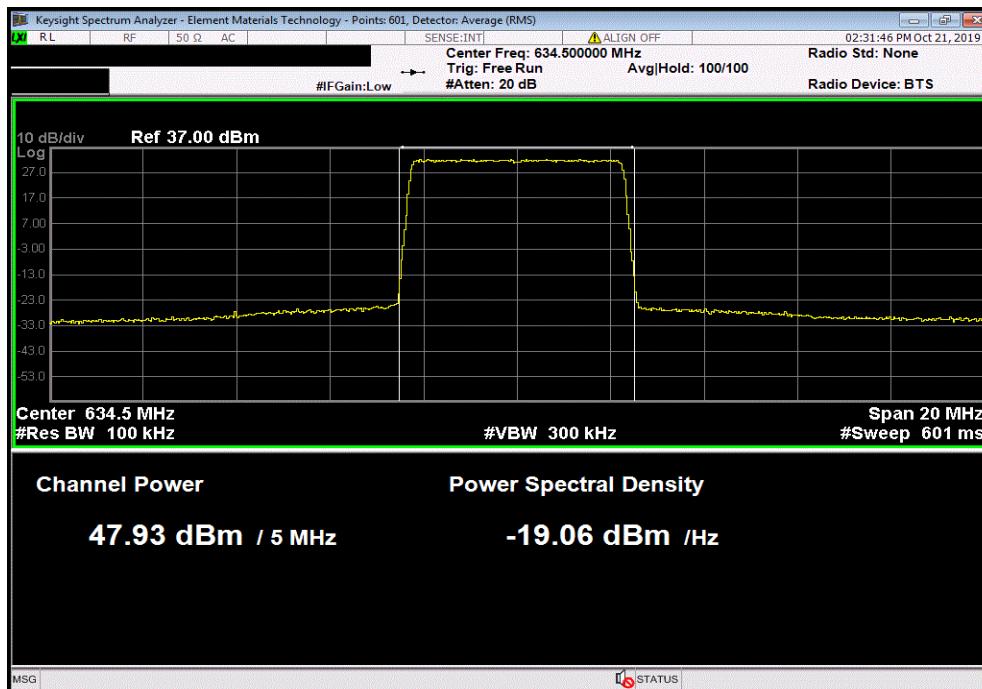


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 3					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Pwr (dBm)	Limit (W ERP)	Results	
47.82	0	47.8	1000	Pass	



Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 4					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Pwr (dBm)	Limit (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.

AVERAGE OUTPUT POWER



TbTx 2019.08.30.0

XMI 2019.08.05

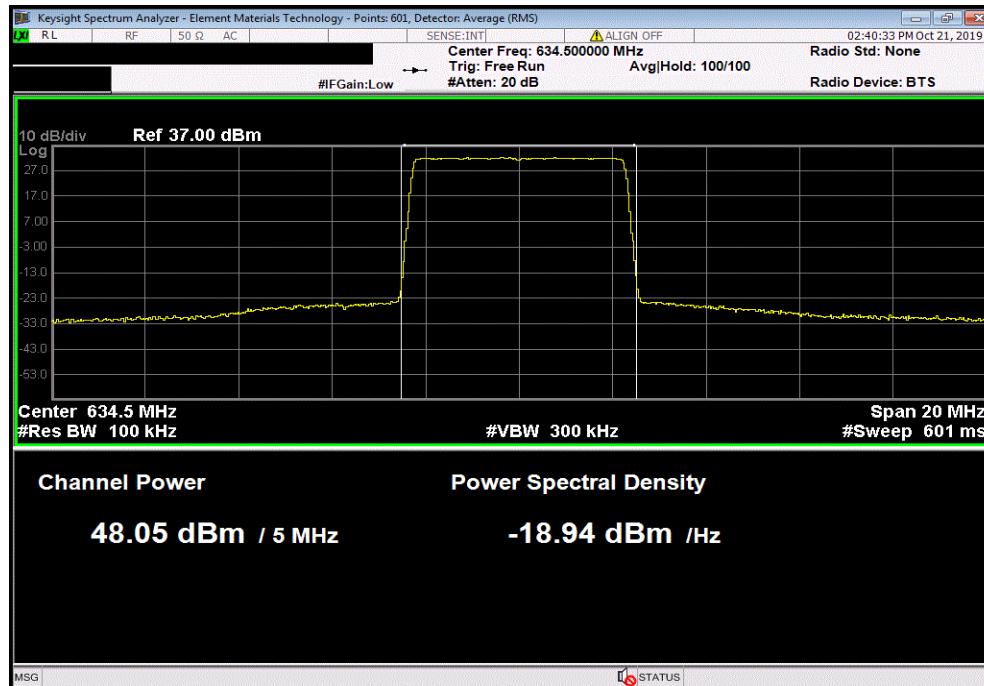
EUT:	AHBOA Remote Radio Head (RRH)	Work Order:	NOKI0003			
Serial Number:	BL1934X1001	Date:	23-Oct-19			
Customer:	Nokia Solutions and Networks	Temperature:	22 °C			
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill	Humidity:	38.7% RH			
Project:	None	Barometric Pres.:	1020 mbar			
Tested by:	Jonathan Kiefer	Power:	48VDC			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 27:2019						
COMMENTS	Band 71 average power measurements for LTE5 channel bandwidth at Mid Channel 634.5MHz for four modulation types (QPSK, 16QAM, 64QAM, 256QAM). Tested at highest antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.					
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature				
		<i>Jonathan Kiefer</i>				
Band 71		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
QPSK Modulation	LTE5 Bandwidth	48.045	0	48	1000	Pass
16QAM Modulation	LTE5 Bandwidth	47.979	0	48	1000	Pass
64QAM Modulation	LTE5 Bandwidth	48.084	0	48.1	1000	Pass
256QAM Modulation	LTE5 Bandwidth	48	0	48	1000	Pass

AVERAGE OUTPUT POWER

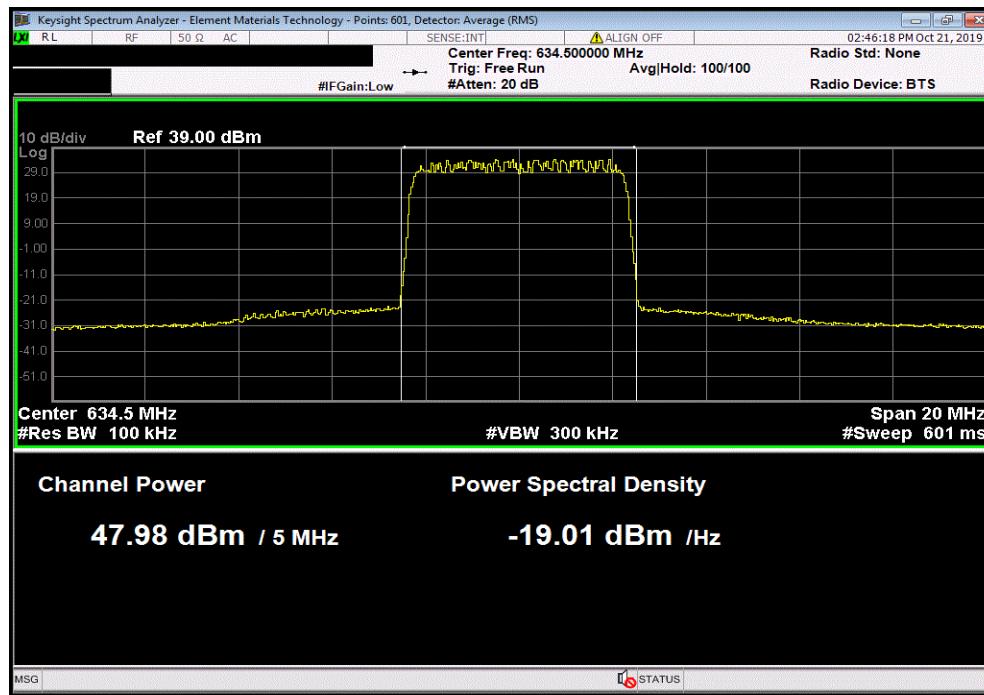


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, QPSK Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48.045	0	48	1000	Pass	



Band 71, 16QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.979	0	48	1000	Pass	

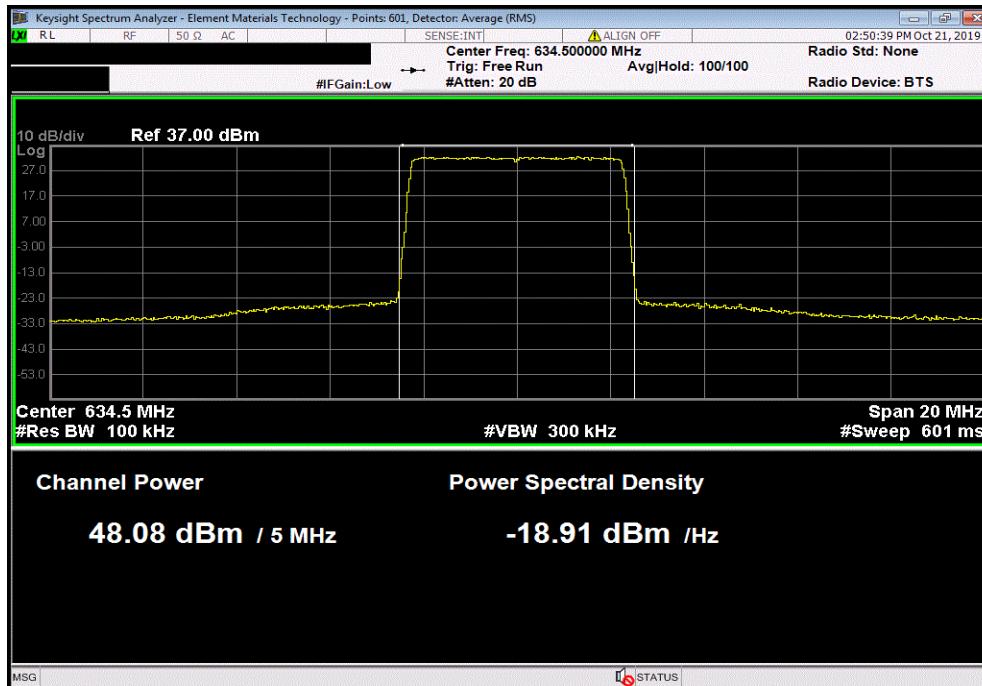


AVERAGE OUTPUT POWER

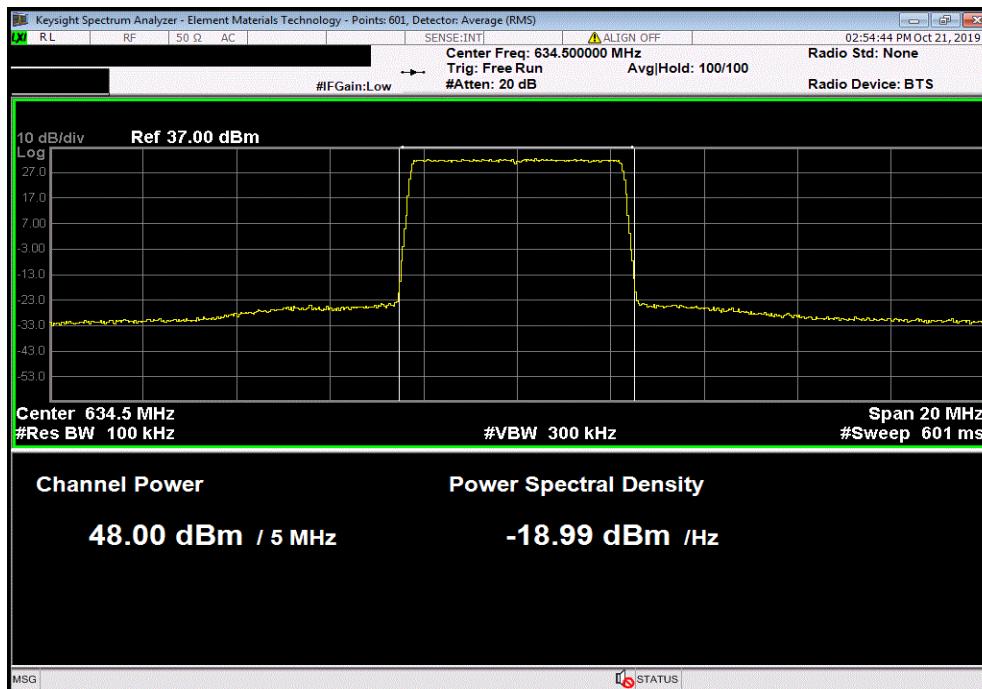


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 64QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48.084	0	48.1	1000	Pass	



Band 71, 256QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48	0	48	1000	Pass	



AVERAGE OUTPUT POWER



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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. 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.

AVERAGE OUTPUT POWER



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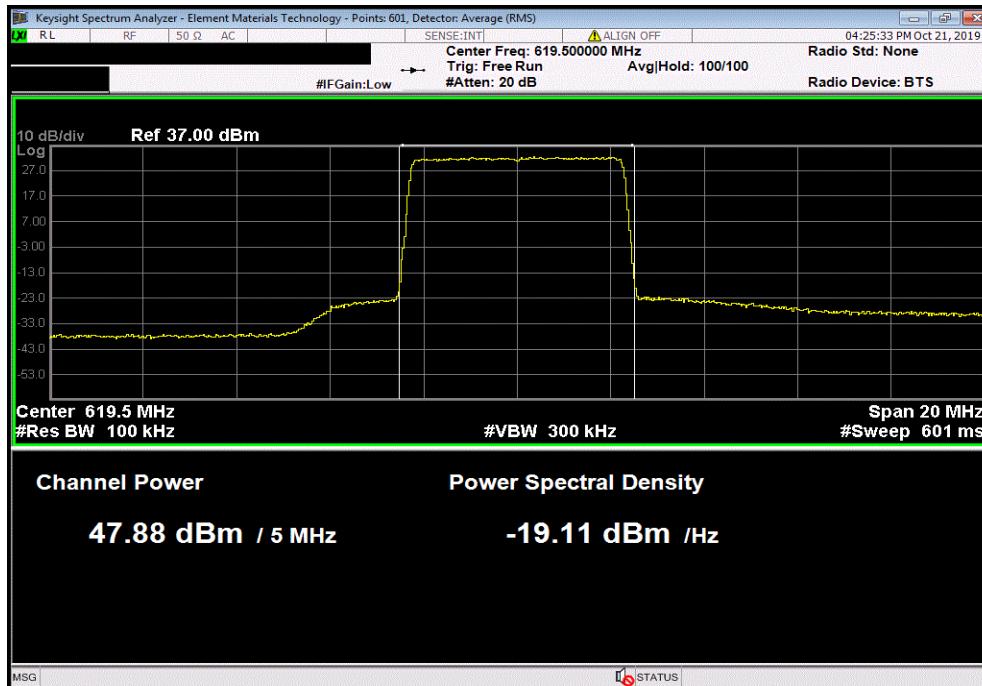
EUT:	AHBOA Remote Radio Head (RRH)	Work Order:	NOKI0003			
Serial Number:	BL1934X1001	Date:	23-Oct-19			
Customer:	Nokia Solutions and Networks	Temperature:	22.4 °C			
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill	Humidity:	37.8% RH			
Project:	None	Barometric Pres.:	1020 mbar			
Tested by:	Jonathan Kiefer	Power:	48VDC			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 27:2019						
COMMENTS						
Band 71 average power measurements for 256QAM modulation type at Low, Mid and High channels for four (5,10,15, 20MHz) channel bandwidths. Tested at highest antenna port (Port 1). EUT is operated at 100% duty cycle. Note: 256QAM LTE5 BW Mid Channel data shown elsewhere in the report. ERP depends on antenna gain, which is unknown.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature				
		Jonathan Kiefer				
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
Band 71						
256QAM Modulation						
LTE5 Bandwidth						
Low Channel, 619.5 MHz 47.875 0 47.9 1000 Pass						
High Channel, 649.5 MHz 47.856 0 47.9 1000 Pass						
LTE10 Bandwidth						
Low Channel, 622 MHz 47.975 0 48 1000 Pass						
Mid Channel, 634.5 MHz 47.86 0 47.9 1000 Pass						
High Channel, 647 MHz 47.972 0 48 1000 Pass						
LTE15 Bandwidth						
Low Channel, 624.5 MHz 47.991 0 48 1000 Pass						
Mid Channel, 634.5 MHz 47.847 0 47.8 1000 Pass						
High Channel, 644.5 MHz 47.99 0 48 1000 Pass						
LTE20 Bandwidth						
Low Channel, 627 MHz 48.029 0 48 1000 Pass						
Mid Channel, 634.5 MHz 47.923 0 47.9 1000 Pass						
High Channel, 642 MHz 48.064 0 48.1 1000 Pass						

AVERAGE OUTPUT POWER

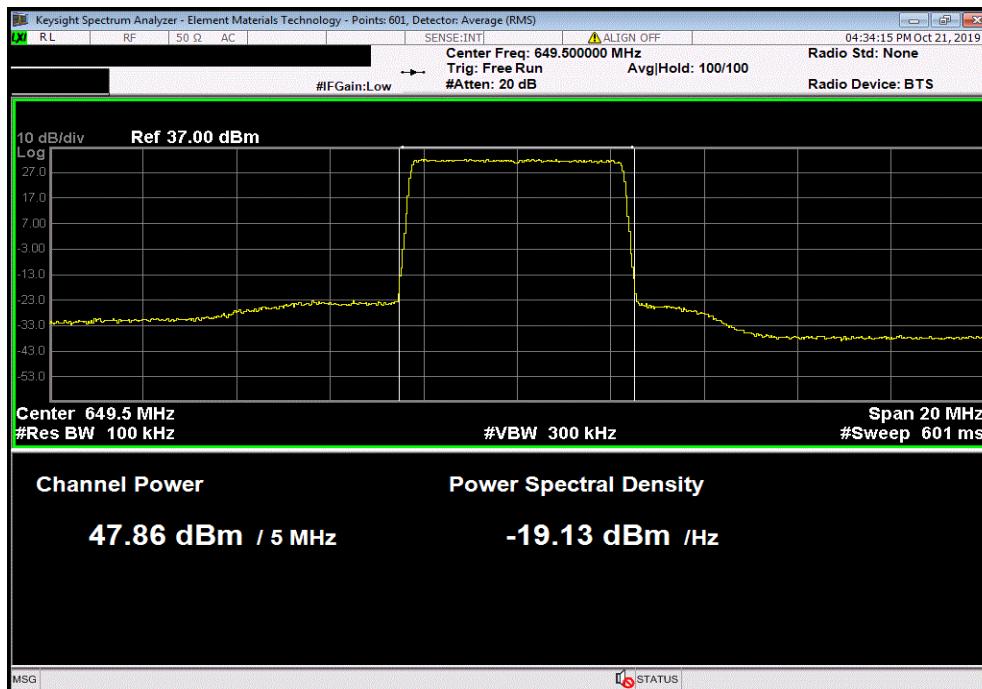


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Band 71, 256QAM Modulation, LTE5 Bandwidth, Low Channel, 619.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.875	0	47.9	1000		Pass



Band 71, 256QAM Modulation, LTE5 Bandwidth, High Channel, 649.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.856	0	47.9	1000		Pass

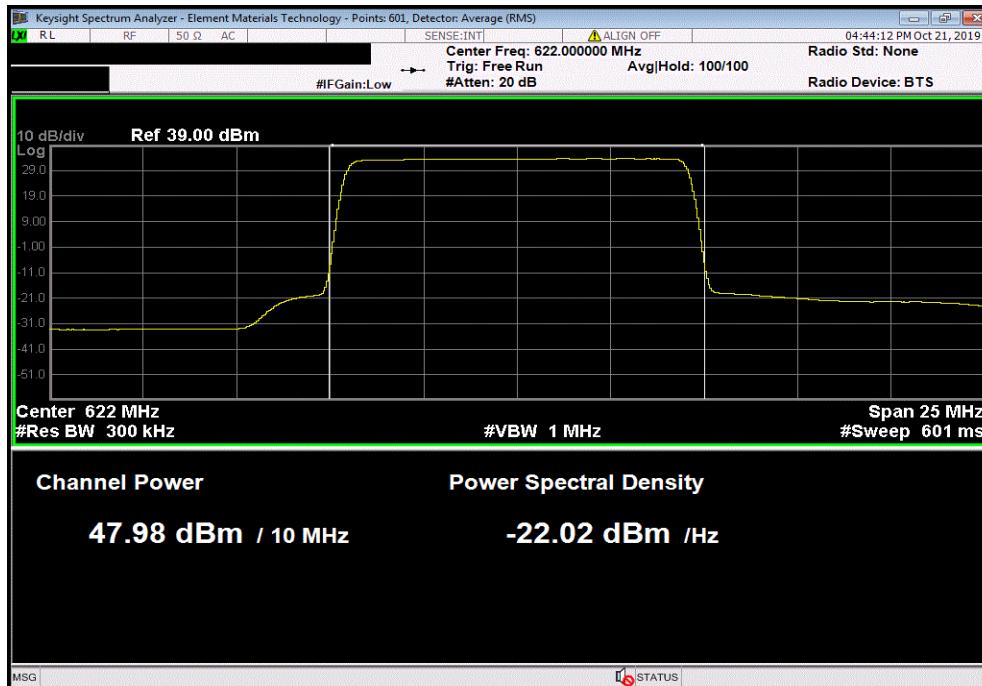


AVERAGE OUTPUT POWER

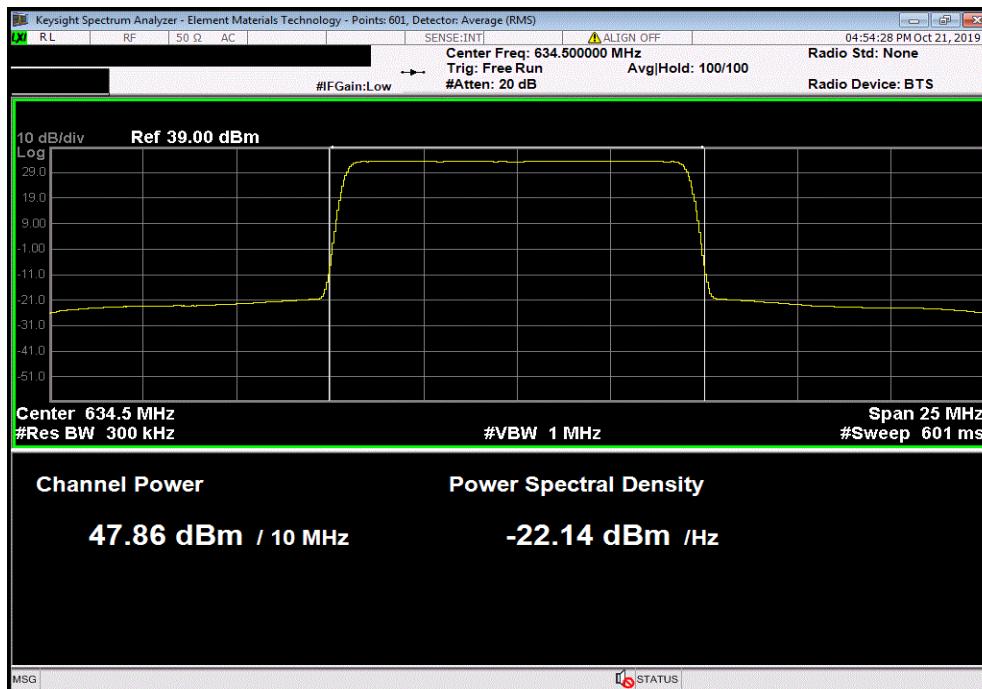


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE10 Bandwidth, Low Channel, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.975	0	48	1000		Pass



Band 71, 256QAM Modulation, LTE10 Bandwidth, Mid Channel, 634.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.86	0	47.9	1000		Pass

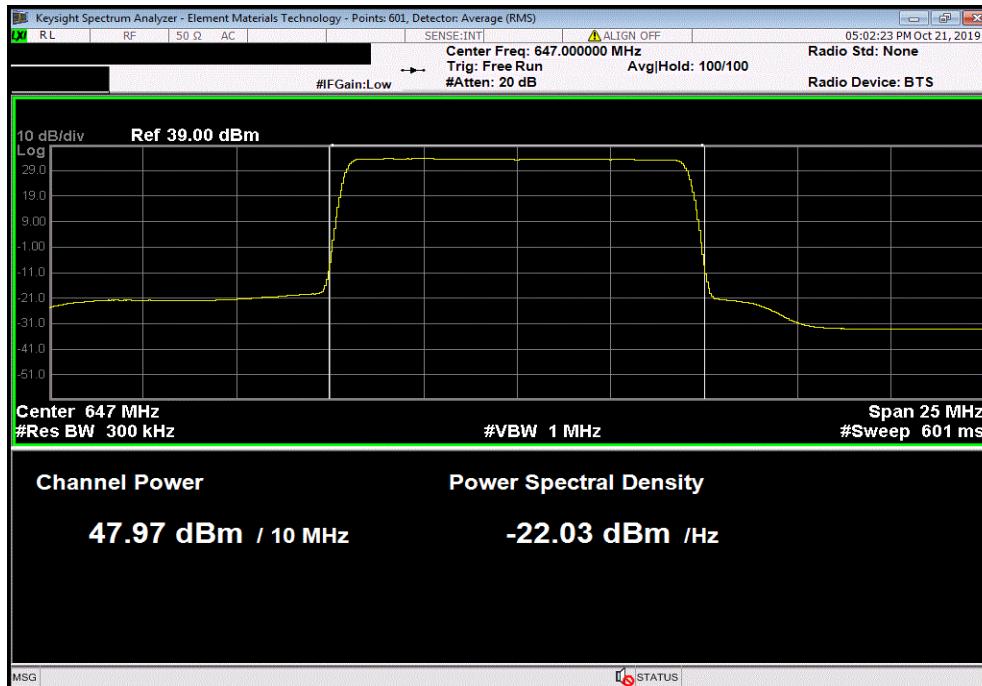


AVERAGE OUTPUT POWER

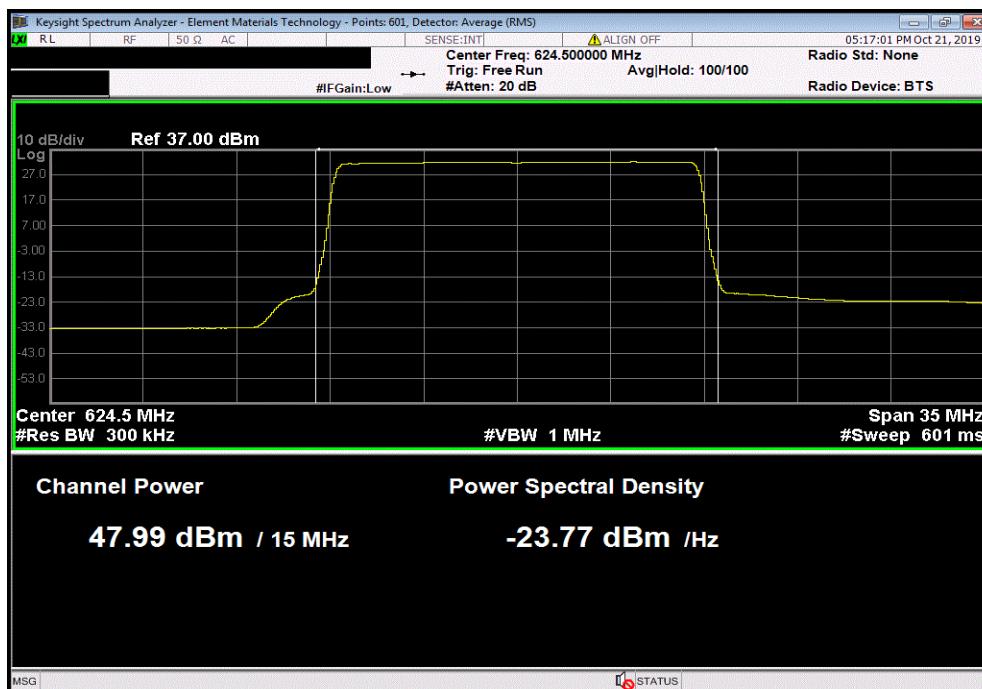


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE10 Bandwidth, High Channel, 647 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.972	0	48	1000	Pass	



Band 71, 256QAM Modulation, LTE15 Bandwidth, Low Channel, 624.5 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.991	0	48	1000	Pass	

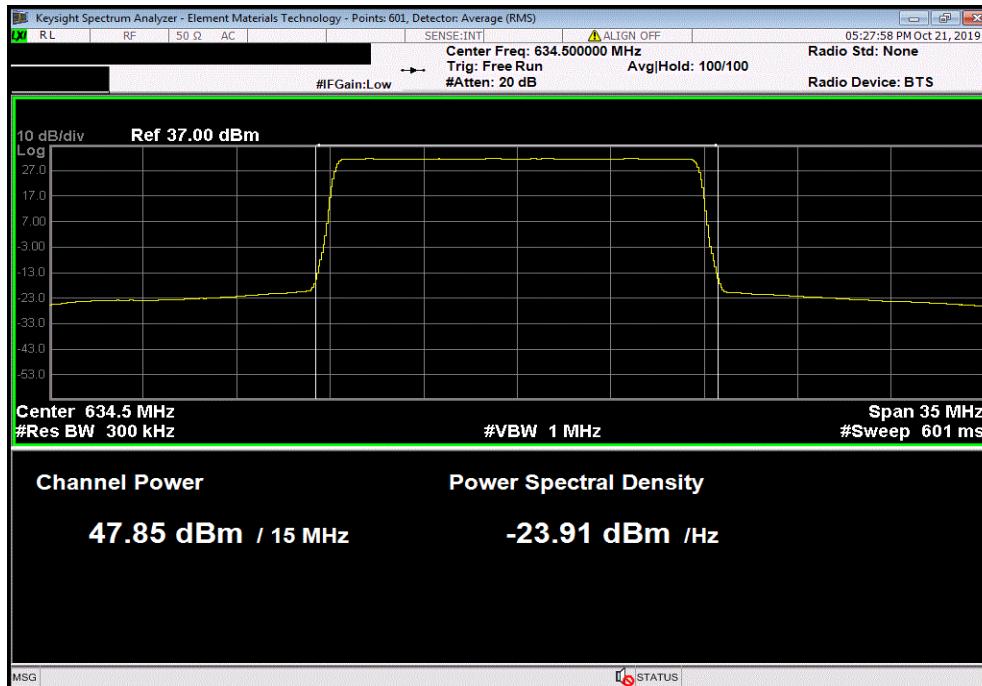


AVERAGE OUTPUT POWER

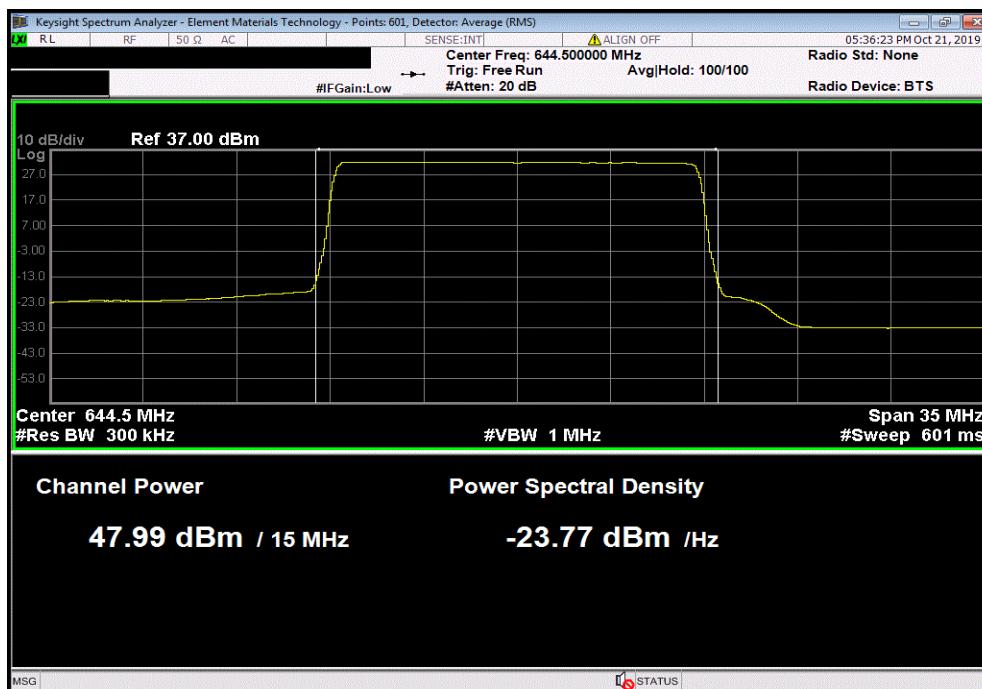


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE15 Bandwidth, Mid Channel, 634.5 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.847	0	47.8	1000	Pass	



Band 71, 256QAM Modulation, LTE15 Bandwidth, High Channel, 644.5 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.99	0	48	1000	Pass	

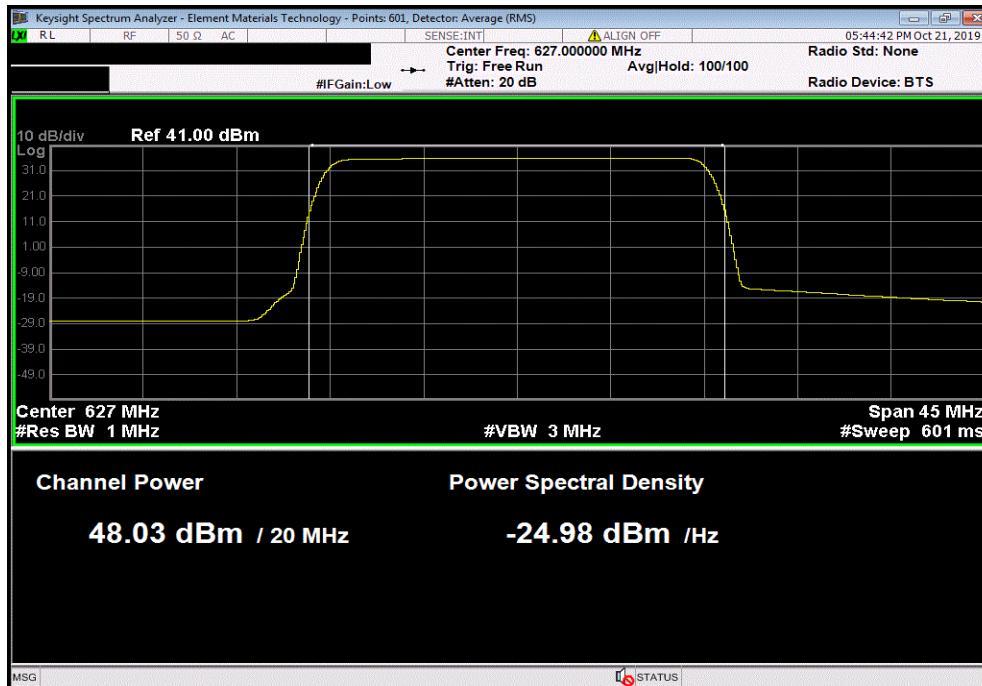


AVERAGE OUTPUT POWER

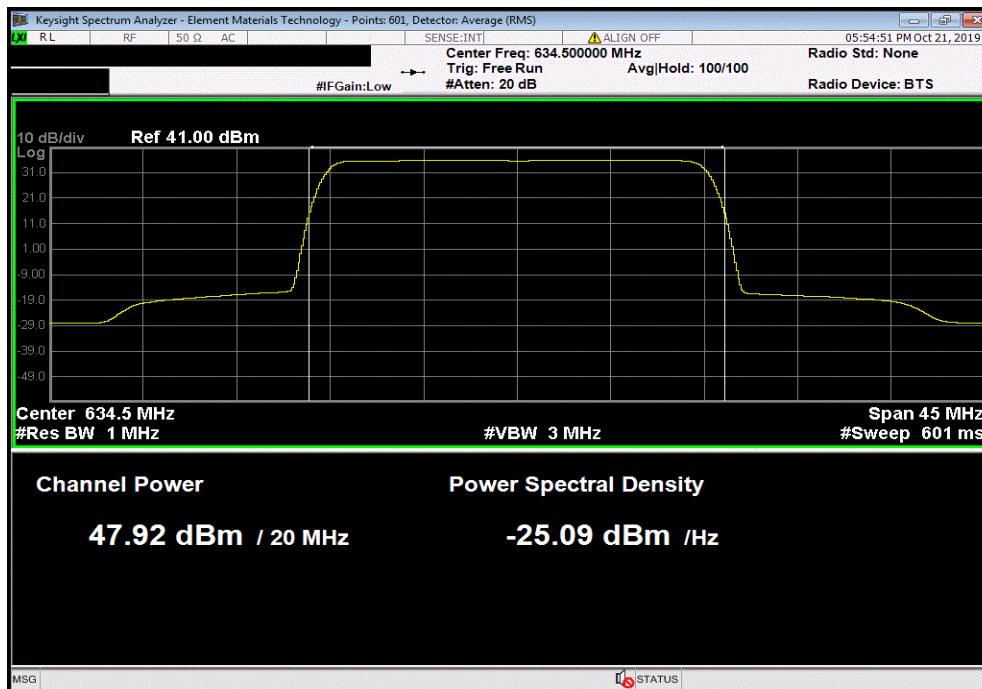


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE20 Bandwidth, Low Channel, 627 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
48.029	0	48	1000		Pass



Band 71, 256QAM Modulation, LTE20 Bandwidth, Mid Channel, 634.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.923	0	47.9	1000		Pass

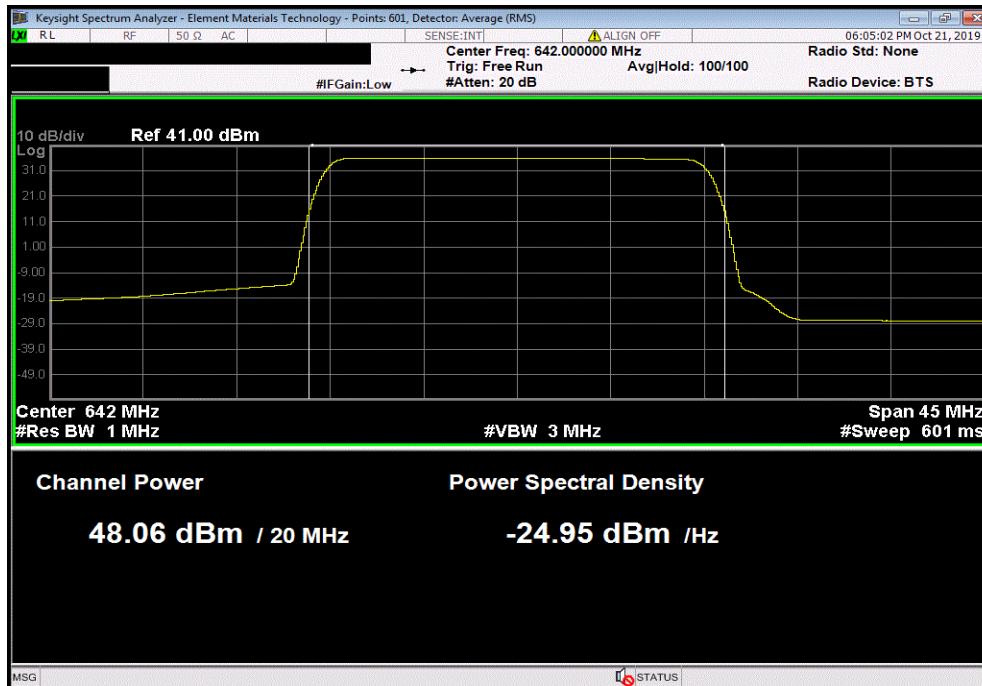


AVERAGE OUTPUT POWER



TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE20 Bandwidth, High Channel, 642 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results	
48.064	0	48.1	1000	Pass	



1000	Pass
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AVERAGE OUTPUT 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.

AVERAGE OUTPUT POWER



TxRx 2019.08.30.0

XMI 2019.08.05

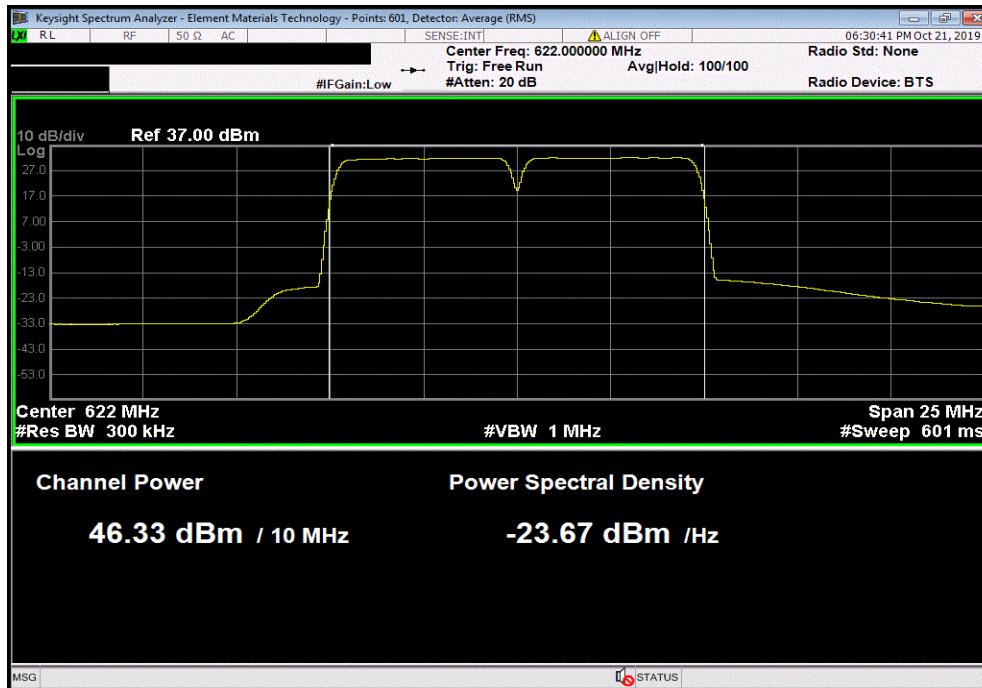
EUT:	AHBOA Remote Radio Head (RRH)		Work Order:	NOKI0003			
Serial Number:	BL1934X1001		Date:	23-Oct-19			
Customer:	Nokia Solutions and Networks		Temperature:	22.6 °C			
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill		Humidity:	37.7% RH			
Project:	None		Barometric Pres.:	1020 mbar			
Tested by:	Jonathan Kiefer	Power:	48VDC	Job Site:	TX09		
TEST SPECIFICATIONS	Test Method						
FCC 27:2019	ANSI C63.26:2015						
COMMENTS	<p>Average power measurements were made for two multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM):</p> <p>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.</p> <p>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. Tested at highest antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.</p>						
DEVIATIONS FROM TEST STANDARD	None						
Configuration #	1	Signature	<i>Jonathan Kiefer</i>				
Band 71			Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
QPSK Modulation							
LTE5 Bandwidth							
Multicarrier Test Case 1							
622 MHz						46.327	0
649.5 MHz						43.081	0
Multicarrier Test Case 2							
622 MHz						46.169	0
753.5 MHz						43.085	0
16QAM Modulation							
LTE5 Bandwidth							
Multicarrier Test Case 1							
622 MHz						46.342	0
649.5 MHz						43.092	0
Multicarrier Test Case 2							
622 MHz						46.155	0
753.5 MHz						43.113	0
64QAM Modulation							
LTE5 Bandwidth							
Multicarrier Test Case 1							
622 MHz						46.365	0
649.5 MHz						43.103	0
Multicarrier Test Case 2							
622 MHz						46.062	0
753.5 MHz						42.973	0
256QAM Modulation							
LTE5 Bandwidth							
Multicarrier Test Case 1							
622 MHz						46.281	0
649.5 MHz						43.083	0
Multicarrier Test Case 2							
622 MHz						45.986	0
753.5 MHz						42.966	0

AVERAGE OUTPUT POWER

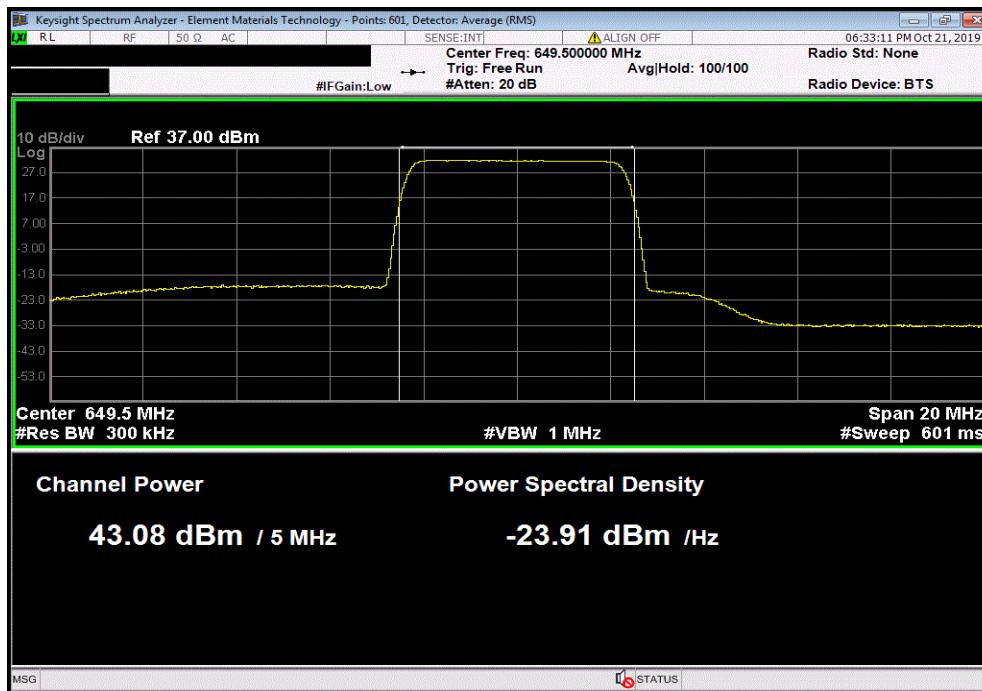


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.327	0	46.3	1000		Pass



Band 71, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 649.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.081	0	43.1	1000		Pass

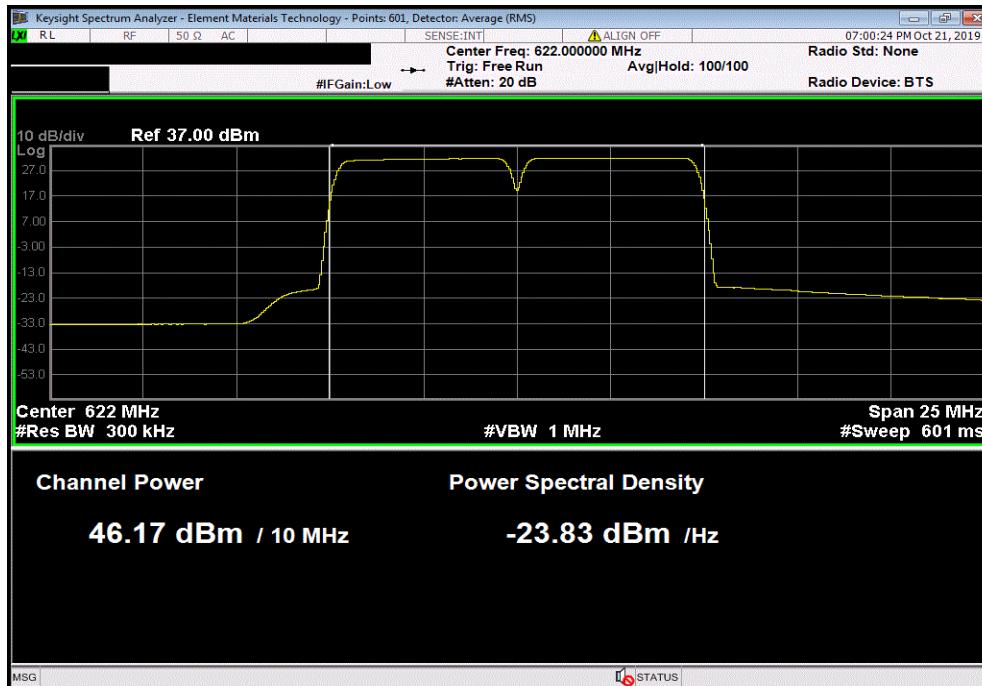


AVERAGE OUTPUT POWER

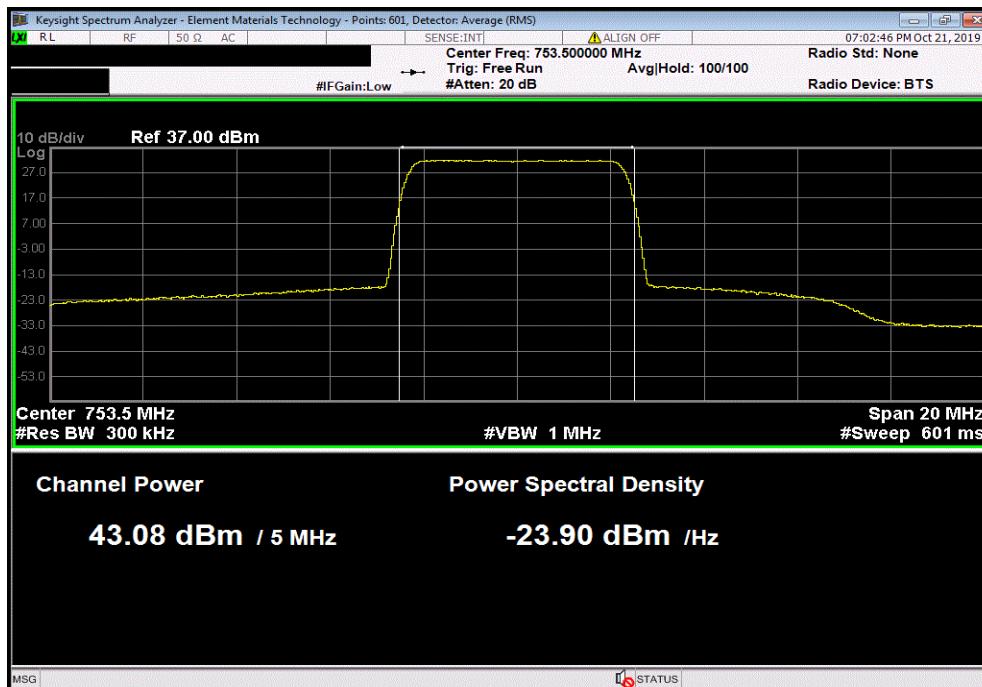


TbTx 2019.08.30.0 XMI 2019.09.05

Band 71, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.169	0	46.2	1000		Pass



Band 13, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.085	0	43.1	1000		Pass

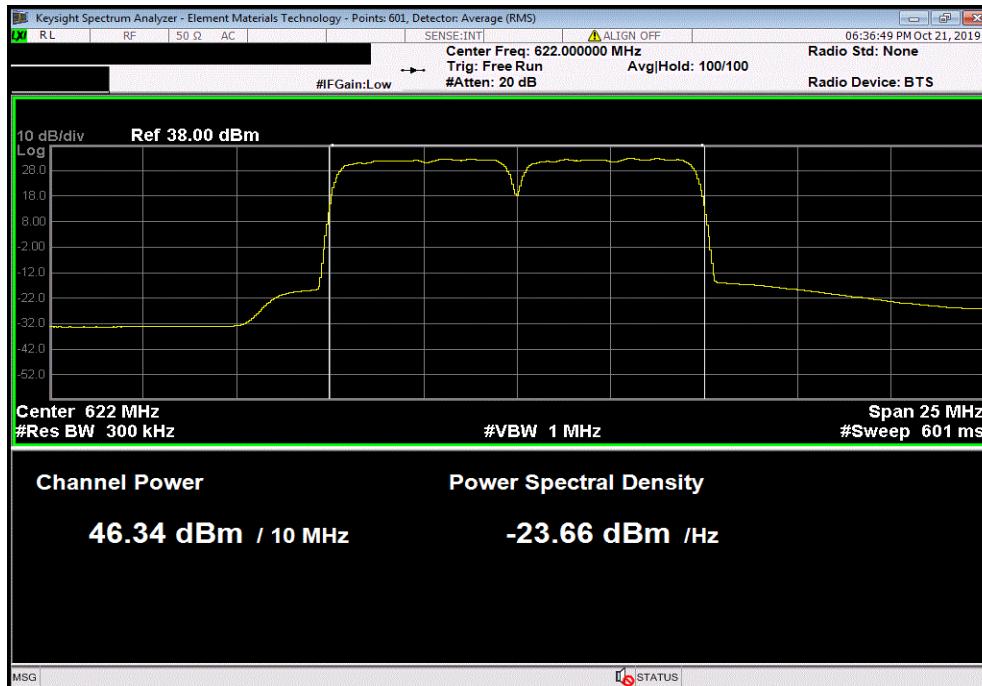


AVERAGE OUTPUT POWER

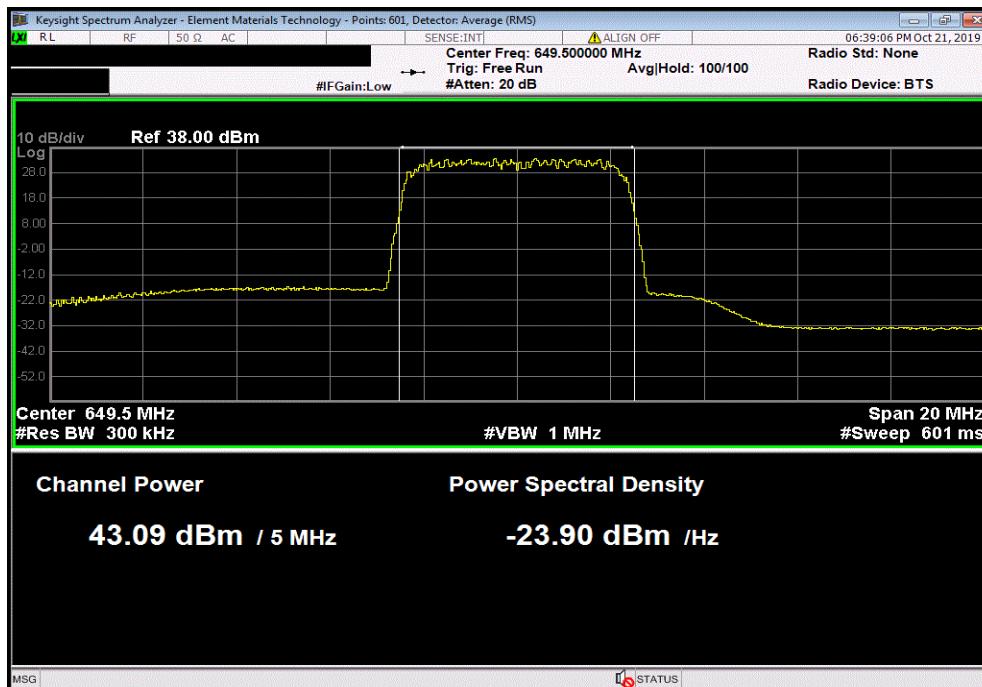


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.342	0	46.3	1000		Pass



Band 71, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 649.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.092	0	43.1	1000		Pass

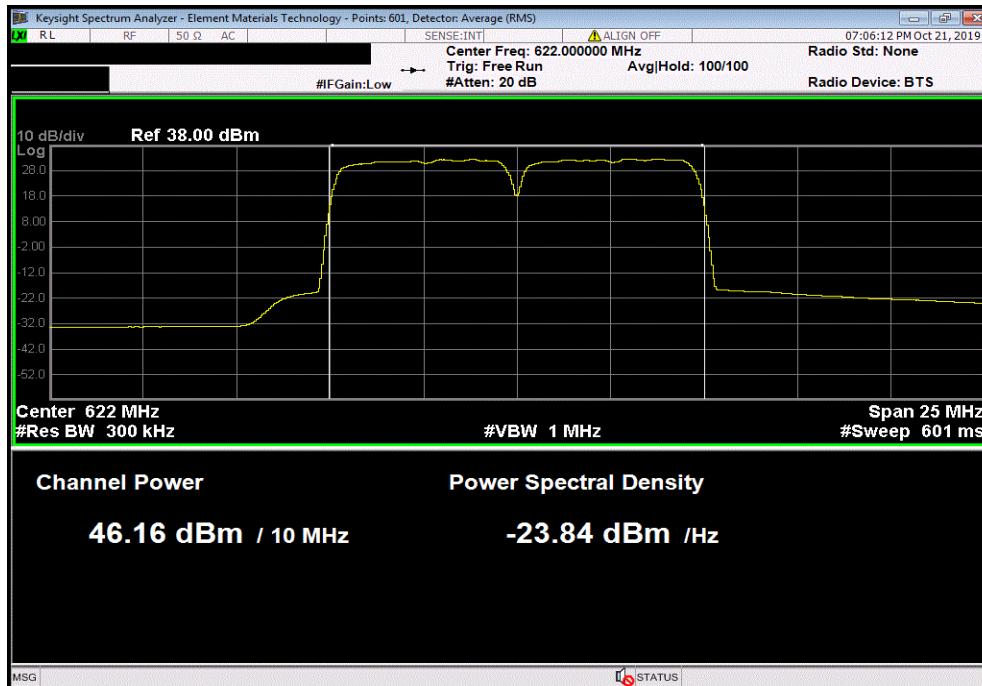


AVERAGE OUTPUT POWER

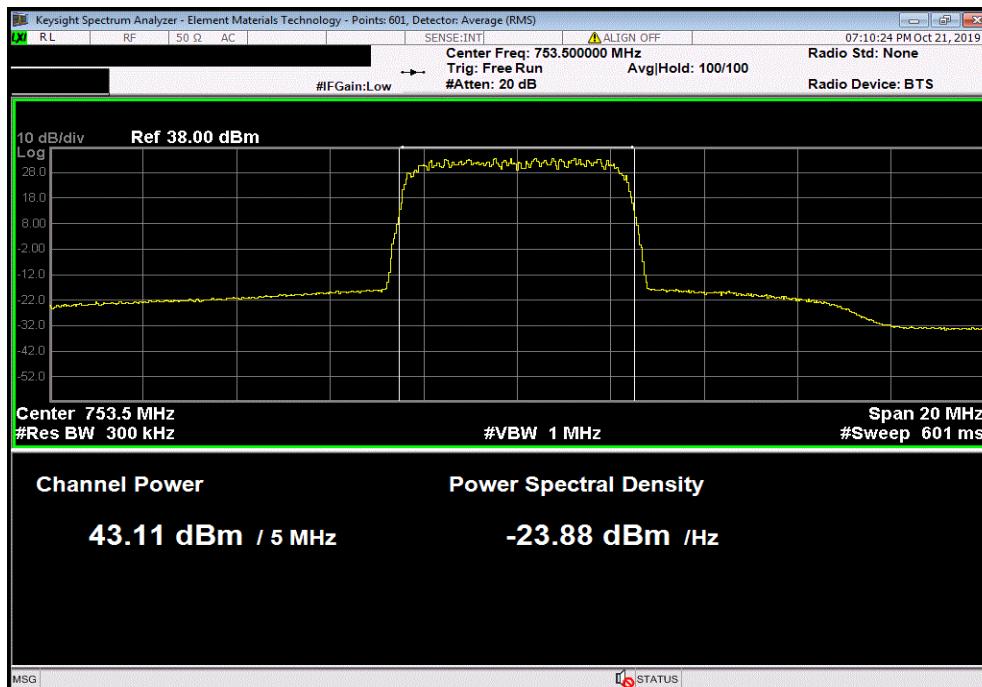


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.155	0	46.2	1000		Pass



Band 13, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.113	0	43.1	1000		Pass

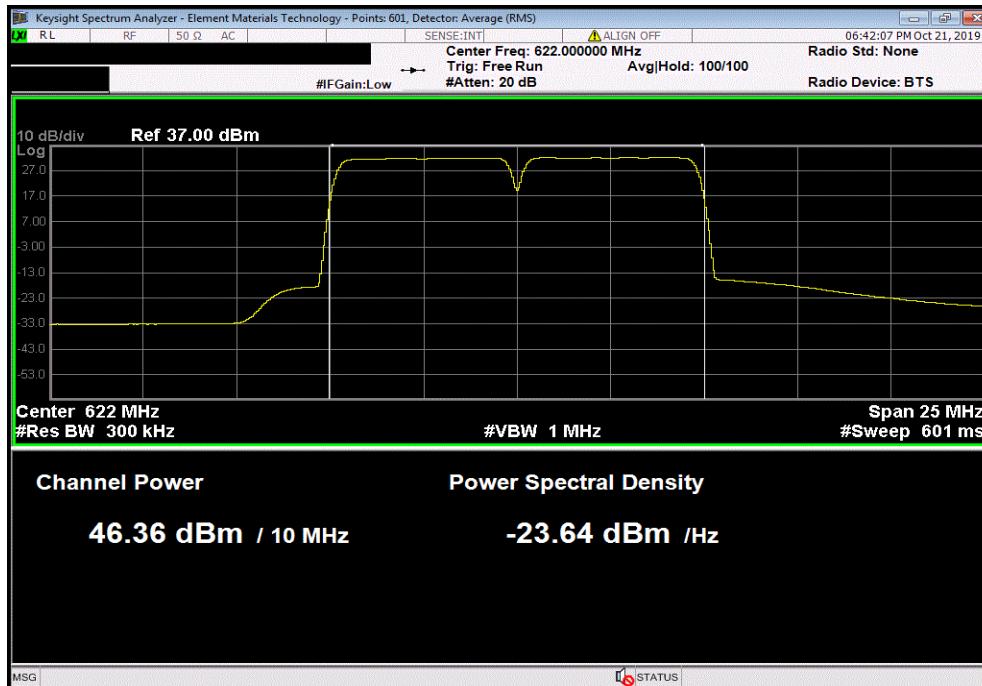


AVERAGE OUTPUT POWER



TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.365	0	46.4	1000		Pass



Band 71, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 649.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.103	0	43.1	1000		Pass

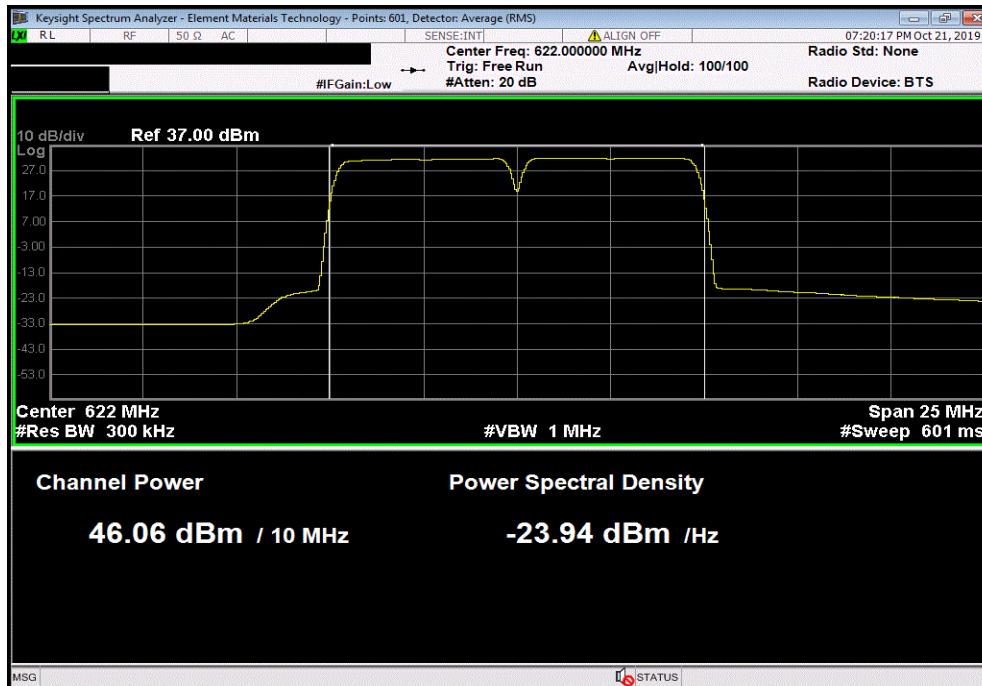


AVERAGE OUTPUT POWER

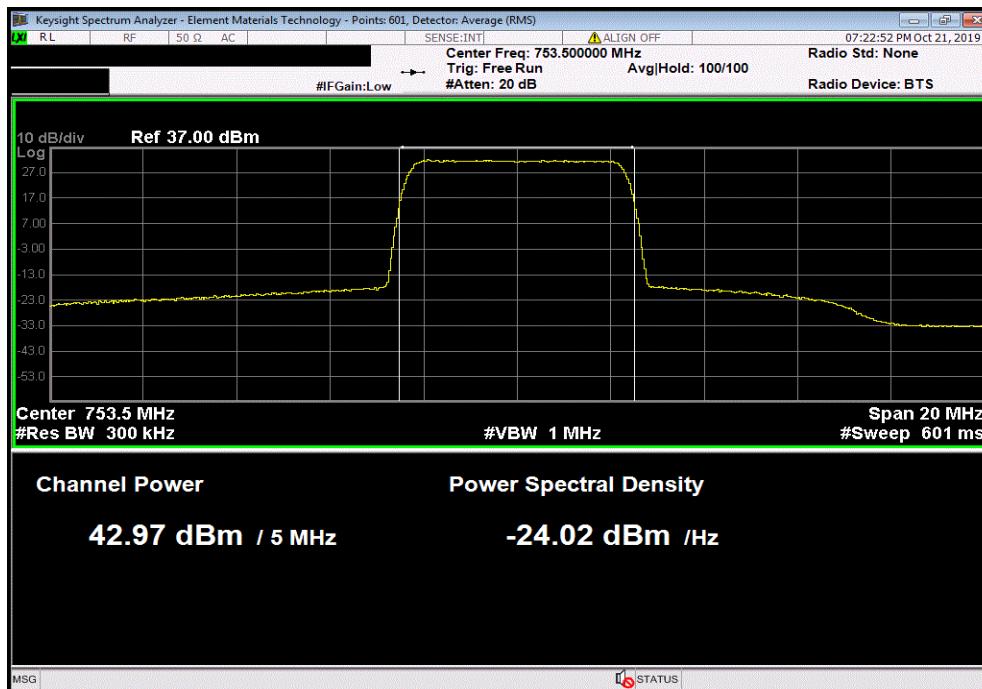


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.062	0	46.1	1000		Pass



Band 13, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
42.973	0	43	1000		Pass

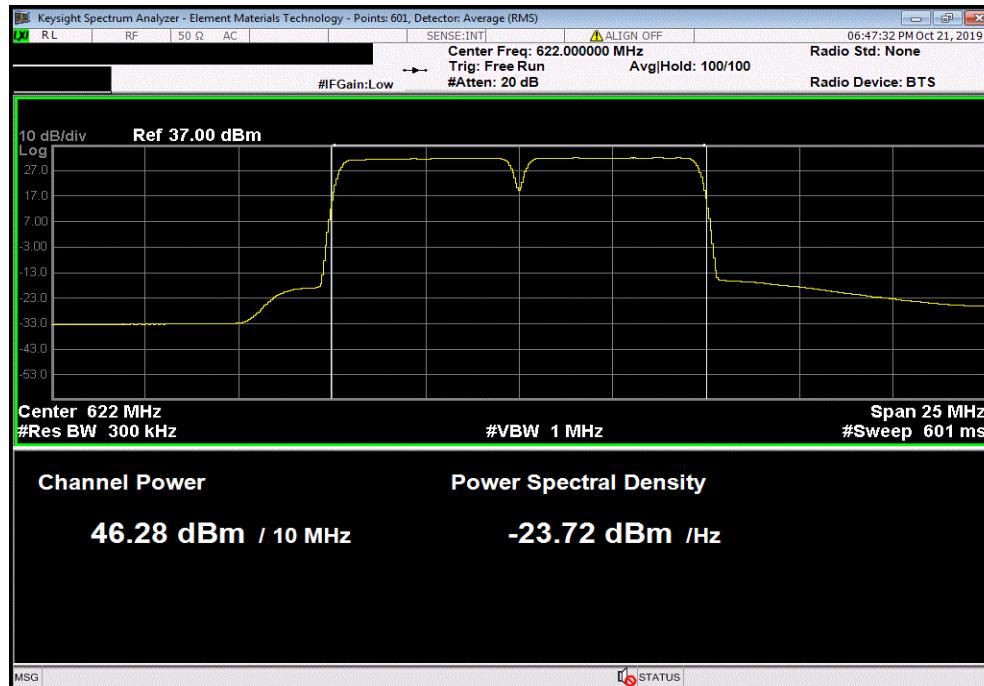


AVERAGE OUTPUT POWER

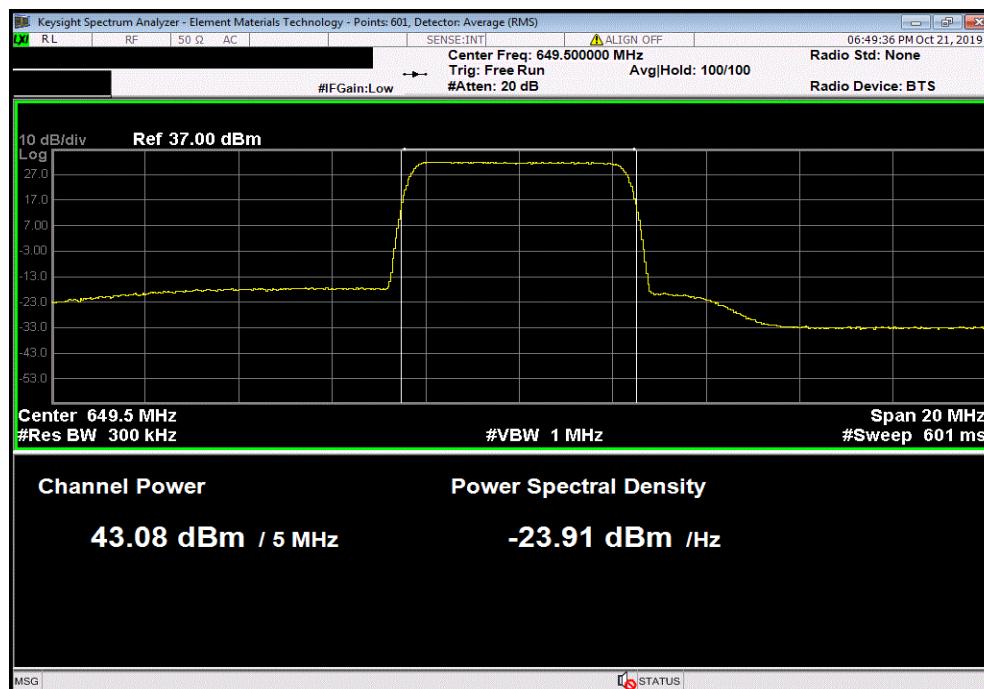


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
46.281	0	46.3	1000		Pass



Band 71, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, 649.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
43.083	0	43.1	1000		Pass

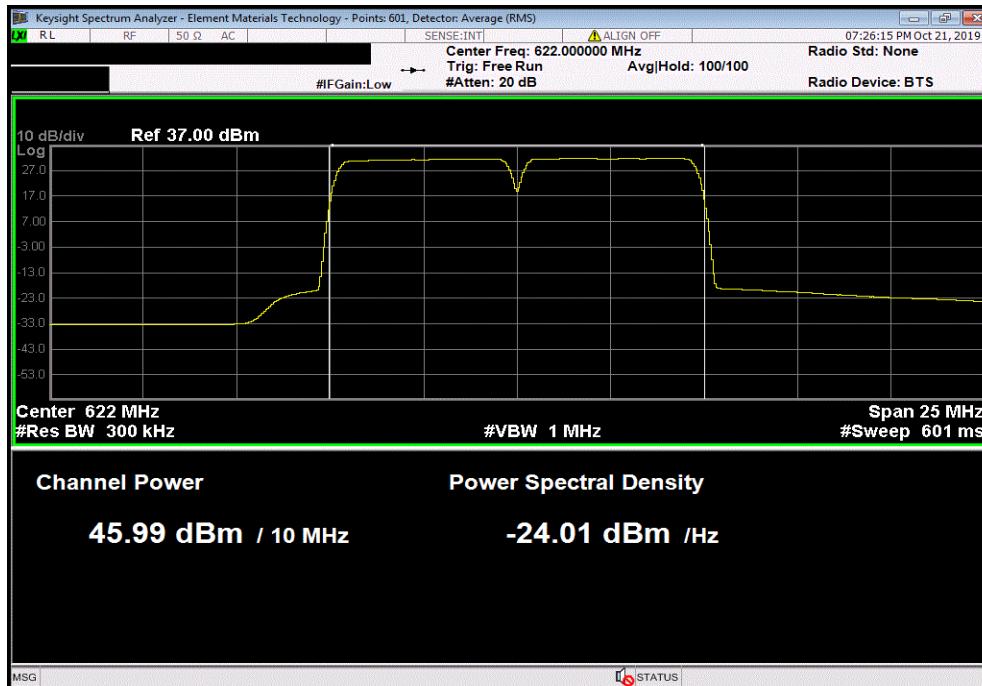


AVERAGE OUTPUT POWER

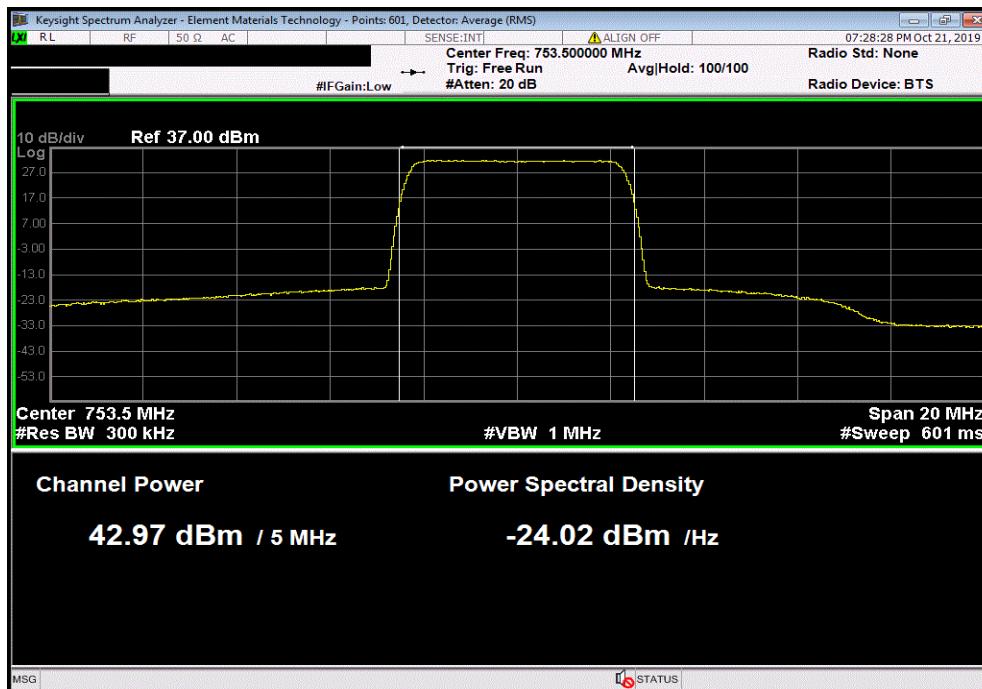


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 622 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
45.986	0	46	1000		Pass



Band 13, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, 753.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
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.

AVERAGE OUTPUT POWER



TbTx 2019.08.30.0

XMI 2019.08.05

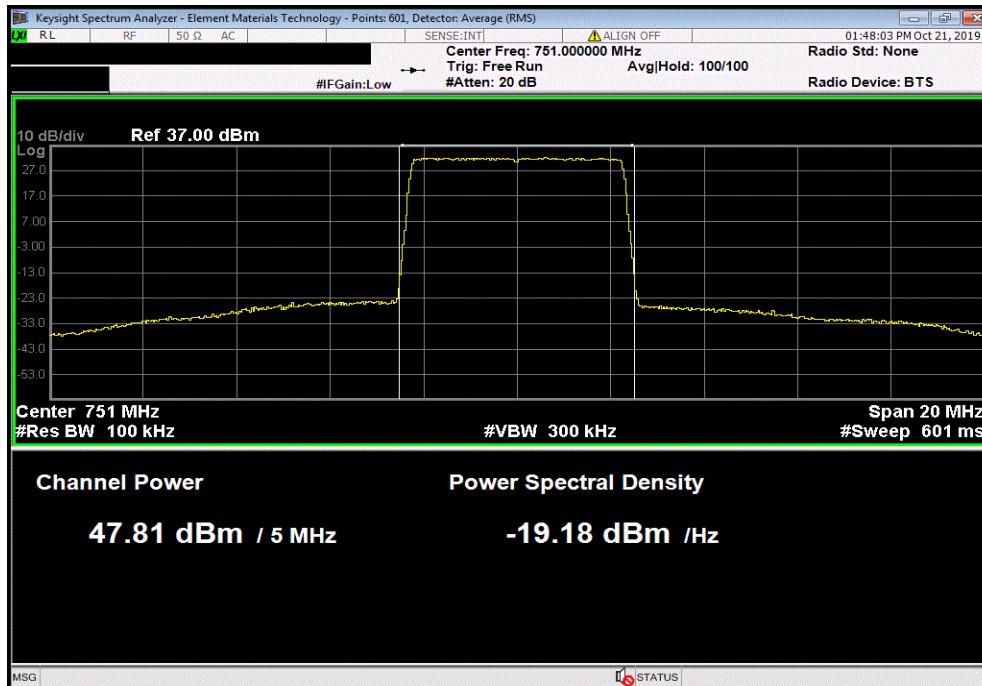
EUT:	AHBOA Remote Radio Head (RRH)		Work Order:	NOKI0003																													
Serial Number:	BL1934X1001		Date:	23-Oct-19																													
Customer:	Nokia Solutions and Networks		Temperature:	22.9 °C																													
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill		Humidity:	36.8% RH																													
Project:	None		Barometric Pres.:	1020 mbar																													
Tested by:	Jonathan Kiefer	Power:	48VDC	Job Site:	TX09																												
TEST SPECIFICATIONS			Test Method																														
FCC 27:2019			ANSI C63.26:2015																														
COMMENTS																																	
Band 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 unknown.																																	
DEVIATIONS FROM TEST STANDARD																																	
None																																	
Configuration #	1	Signature																															
		<i>Jonathan Kiefer</i>	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm) Limit (W ERP) Results																												
Band 13																																	
256QAM Modulation																																	
LTE5 Bandwidth																																	
Mid Channel, 751 MHz																																	
<table border="1"> <thead> <tr> <th></th> <th>Antenna Port 1</th> <th>47.808</th> <th>0</th> <th>47.8</th> <th>1000</th> <th>Pass</th> </tr> <tr> <th></th> <th>Antenna Port 2</th> <th>47.698</th> <th>0</th> <th>47.7</th> <th>1000</th> <th>Pass</th> </tr> <tr> <th></th> <th>Antenna Port 3</th> <th>47.628</th> <th>0</th> <th>47.6</th> <th>1000</th> <th>Pass</th> </tr> <tr> <th></th> <th>Antenna Port 4</th> <th>47.753</th> <th>0</th> <th>47.8</th> <th>1000</th> <th>Pass</th> </tr> </thead> </table>							Antenna Port 1	47.808	0	47.8	1000	Pass		Antenna Port 2	47.698	0	47.7	1000	Pass		Antenna Port 3	47.628	0	47.6	1000	Pass		Antenna Port 4	47.753	0	47.8	1000	Pass
	Antenna Port 1	47.808	0	47.8	1000	Pass																											
	Antenna Port 2	47.698	0	47.7	1000	Pass																											
	Antenna Port 3	47.628	0	47.6	1000	Pass																											
	Antenna Port 4	47.753	0	47.8	1000	Pass																											

AVERAGE OUTPUT POWER

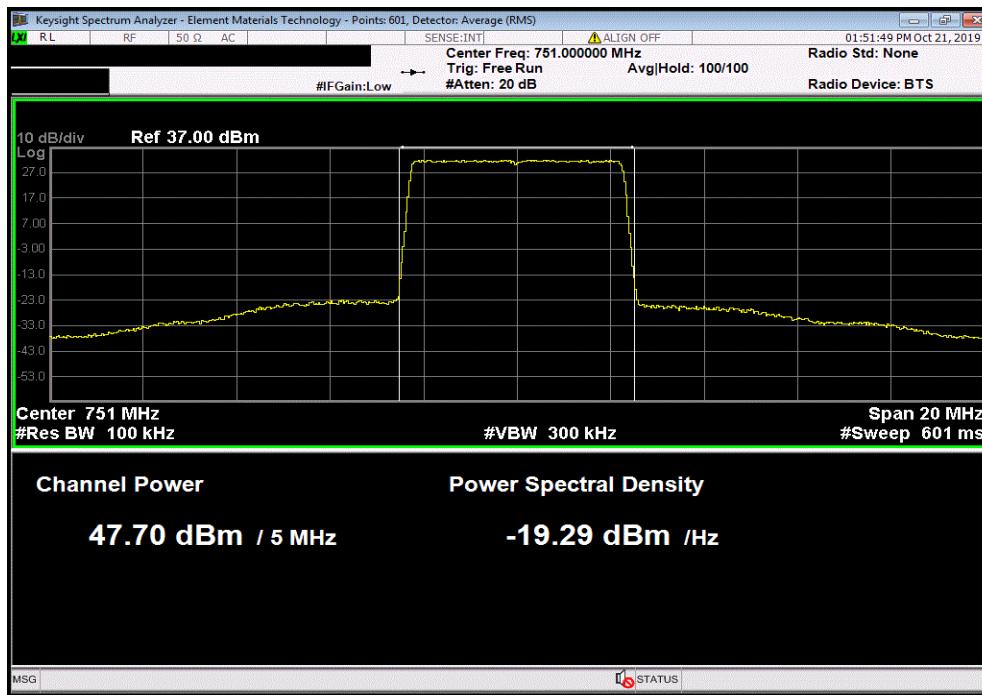


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 13, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 751 MHz, Antenna Port 1					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.808	0	47.8	1000		Pass



Band 13, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 751 MHz, Antenna Port 2					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.698	0	47.7	1000		Pass

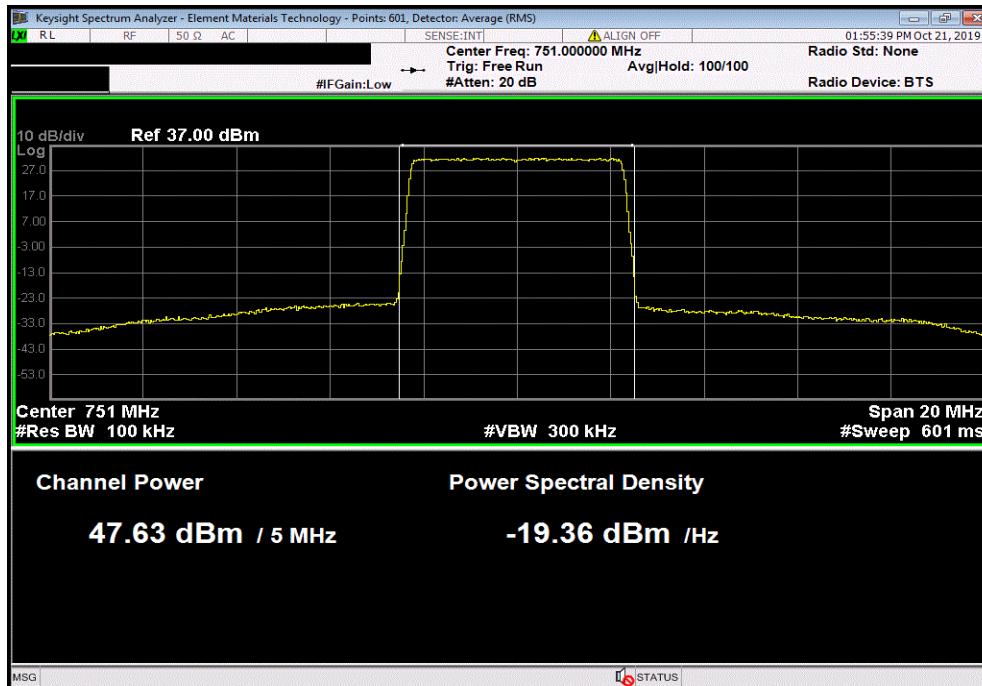


AVERAGE OUTPUT POWER

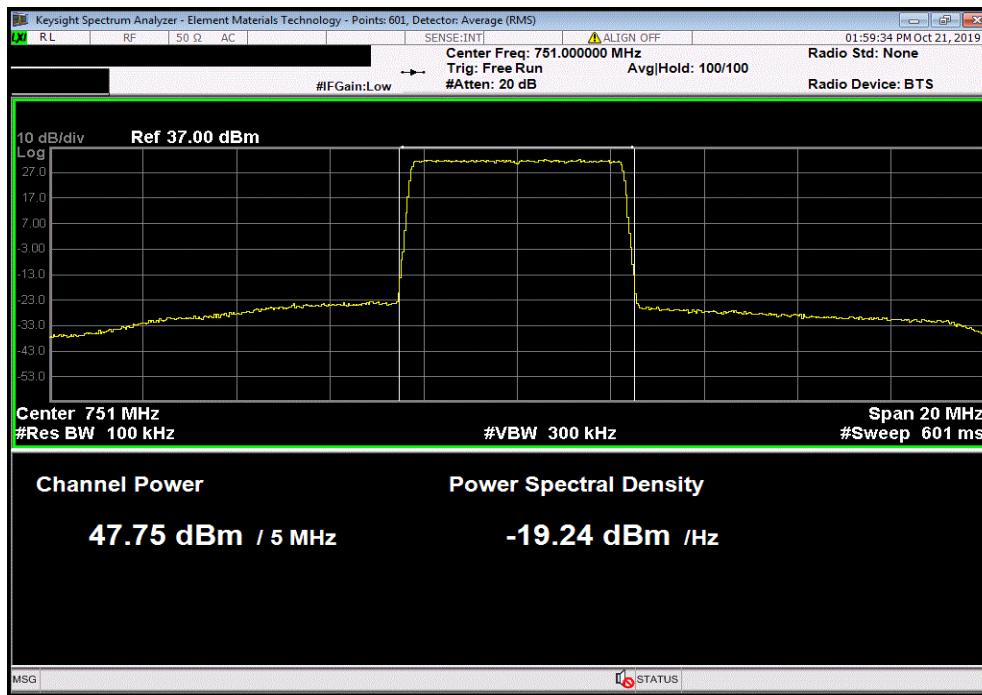


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 13, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 751 MHz, Antenna Port 3					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.628	0	47.6	1000		Pass



Band 13, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 751 MHz, Antenna Port 4					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.753	0	47.8	1000		Pass



AVERAGE OUTPUT 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.

AVERAGE OUTPUT POWER



TbTx 2019.08.30.0

XMI 2019.08.05

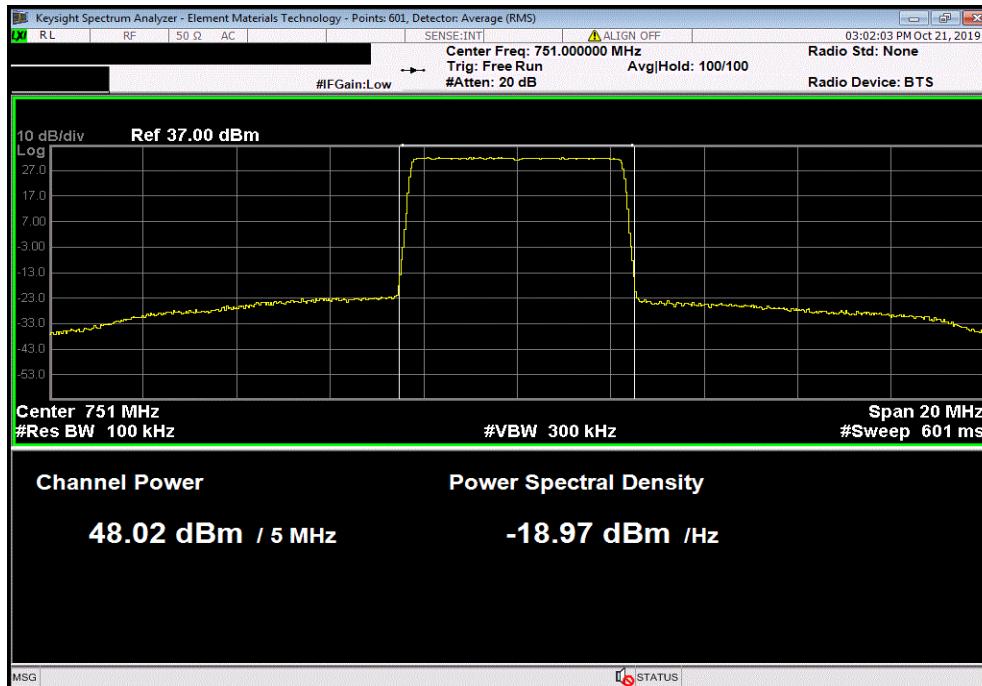
EUT:	AHBOA Remote Radio Head (RRH)		Work Order:	NOKI0003				
Serial Number:	BL1934X1001		Date:	23-Oct-19				
Customer:	Nokia Solutions and Networks		Temperature:	22.7 °C				
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill		Humidity:	37.2% RH				
Project:	None		Barometric Pres.:	1020 mbar				
Tested by:	Jonathan Kiefer	Power:	48VDC	Job Site:	TX09			
TEST SPECIFICATIONS	Test Method		FCC 27:2019	ANSI C63.26:2015				
COMMENTS	Band 13 average power measurements for LTE5 channel bandwidth at Mid channel 751MHz for four modulation types. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.							
DEVIATIONS FROM TEST STANDARD	None							
Configuration #	1	Signature	Jonathan Kiefer	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
Band 13								
QPSK Modulation	LTE5 Bandwidth			48.022	0	48	1000	Pass
16QAM Modulation	LTE5 Bandwidth			48.001	0	48	1000	Pass
64QAM Modulation	LTE5 Bandwidth			48.012	0	48	1000	Pass
256QAM Modulation	LTE5 Bandwidth			47.99	0	48	1000	Pass

AVERAGE OUTPUT POWER

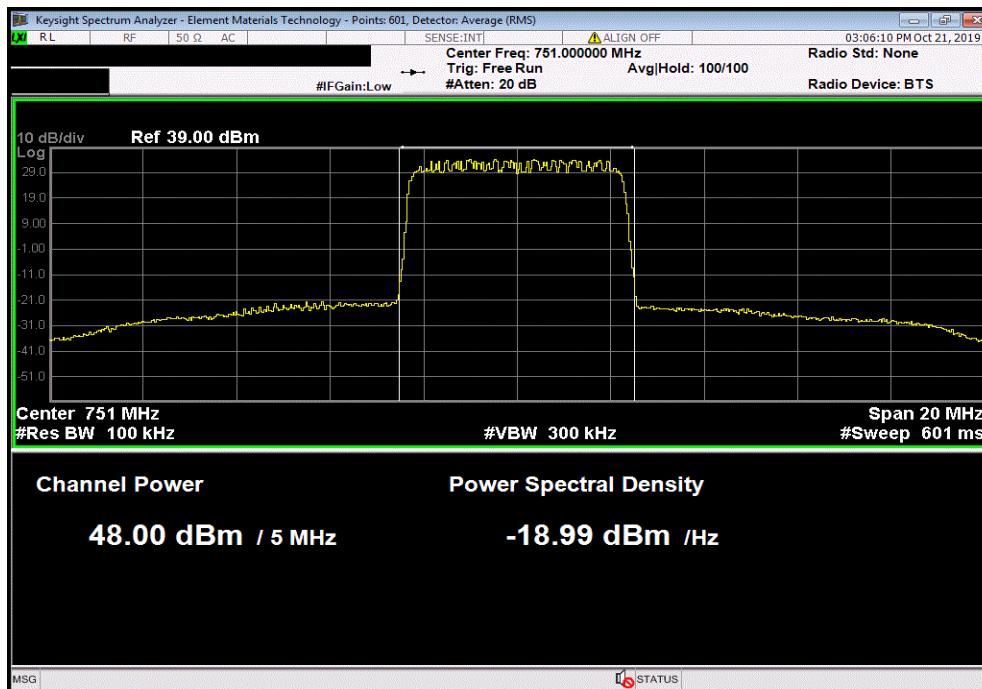


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 13, QPSK Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48.022	0	48	1000	Pass	



Band 13, 16QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48.001	0	48	1000	Pass	

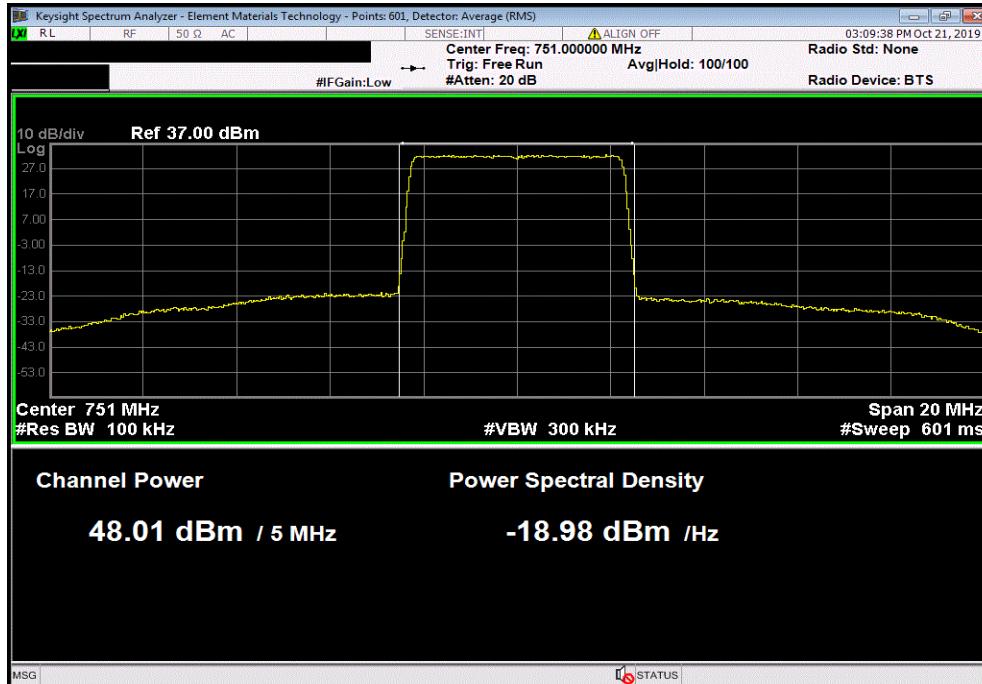


AVERAGE OUTPUT POWER



TbtTx 2019.08.30.0 XMI 2019.09.05

Band 13, 64QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
48.012	0	48	1000	Pass	



Band 13, 256QAM Modulation, LTE5 Bandwidth					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.99	0	48	1000	Pass	



AVERAGE OUTPUT 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.

AVERAGE OUTPUT POWER



TbTx 2019.08.30.0

XMI 2019.08.05

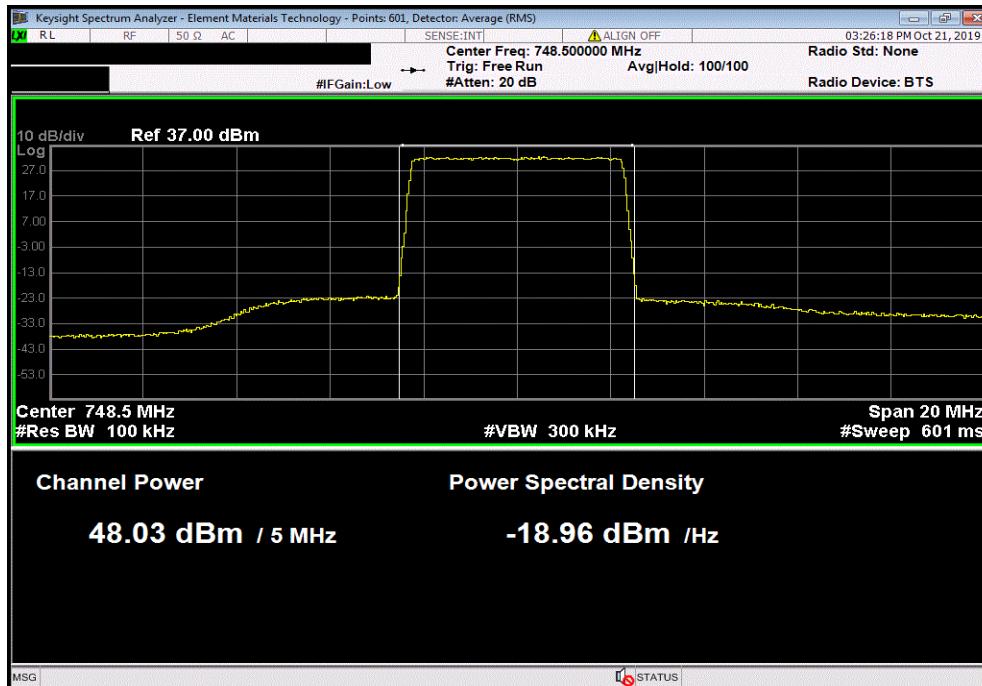
EUT:	AHBOA Remote Radio Head (RRH)		Work Order:	NOKI0003				
Serial Number:	BL1934X1001		Date:	23-Oct-19				
Customer:	Nokia Solutions and Networks		Temperature:	22.2 °C				
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill		Humidity:	38.2% RH				
Project:	None		Barometric Pres.:	1020 mbar				
Tested by:	Jonathan Kiefer	Power:	48VDC	Job Site:	TX09			
TEST SPECIFICATIONS	Test Method							
FCC 27:2019	ANSI C63.26:2015							
COMMENTS	Band 13 average power for 256QAM modulation type at Low, Mid and High channels for LTE5 and LTE10 channel bandwidths. For Band 13, LTE10 only tested on Mid channel. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. Note: 256QAM LTE5 BW Mid Channel data shown elsewhere in the report. ERP depends on antenna gain, which is unknown.							
DEVIATIONS FROM TEST STANDARD	None							
Configuration #	1	Signature	Jonathan Kiefer	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
Band 13	256QAM Modulation							
	LTE5 Bandwidth	Low Channel, 748.5 MHz High Channel, 753.5 MHz		48.03 47.935	0 0	48 47.9	1000 1000	Pass Pass
	LTE10 Bandwidth	Mid Channel, 751 MHz		47.876	0	47.9	1000	Pass

AVERAGE OUTPUT POWER

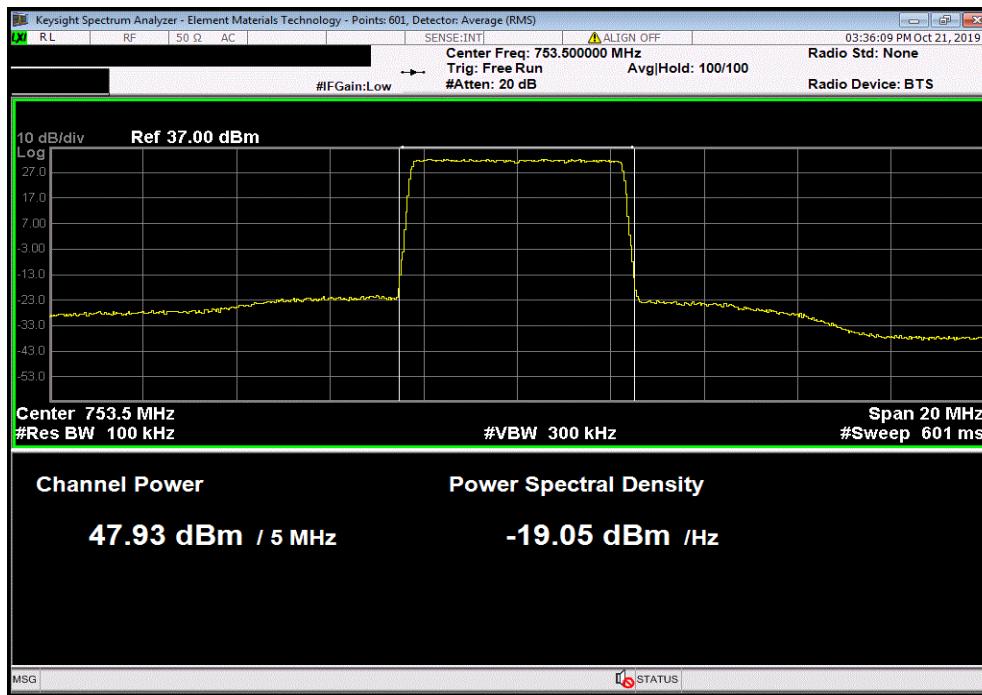


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Band 13, 256QAM Modulation, LTE5 Bandwidth, Low Channel, 748.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
48.03	0	48	1000		Pass



Band 13, 256QAM Modulation, LTE5 Bandwidth, High Channel, 753.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.935	0	47.9	1000		Pass

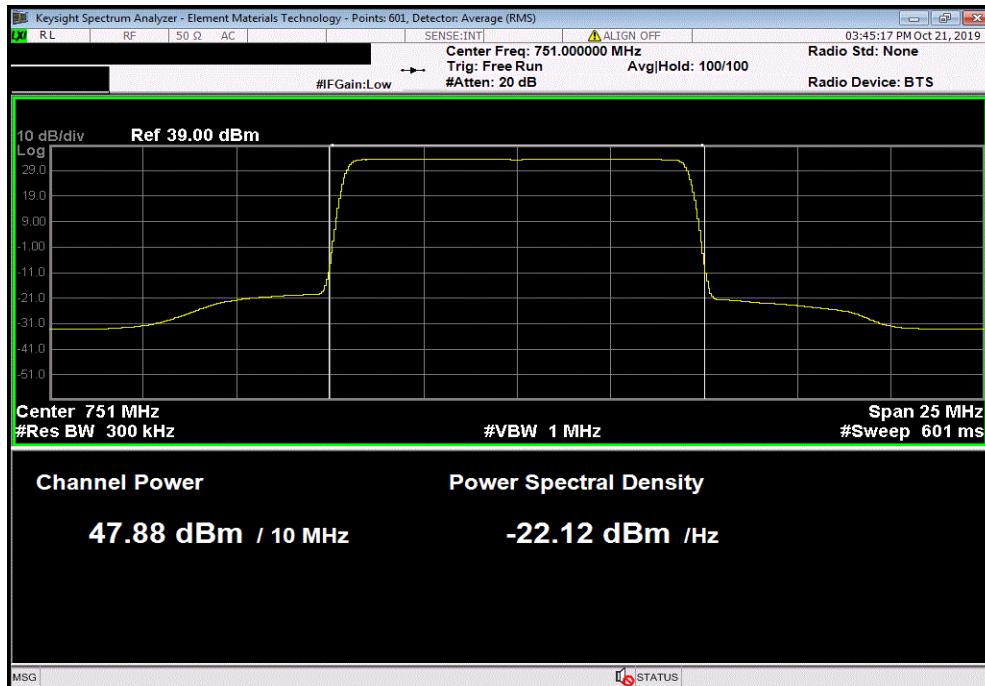


AVERAGE OUTPUT POWER



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Band 13, 256QAM Modulation, LTE10 Bandwidth, Mid Channel, 751 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)	Results	
47.876	0	47.9	1000	Pass	



AVERAGE OUTPUT POWER



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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. 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.

AVERAGE OUTPUT POWER



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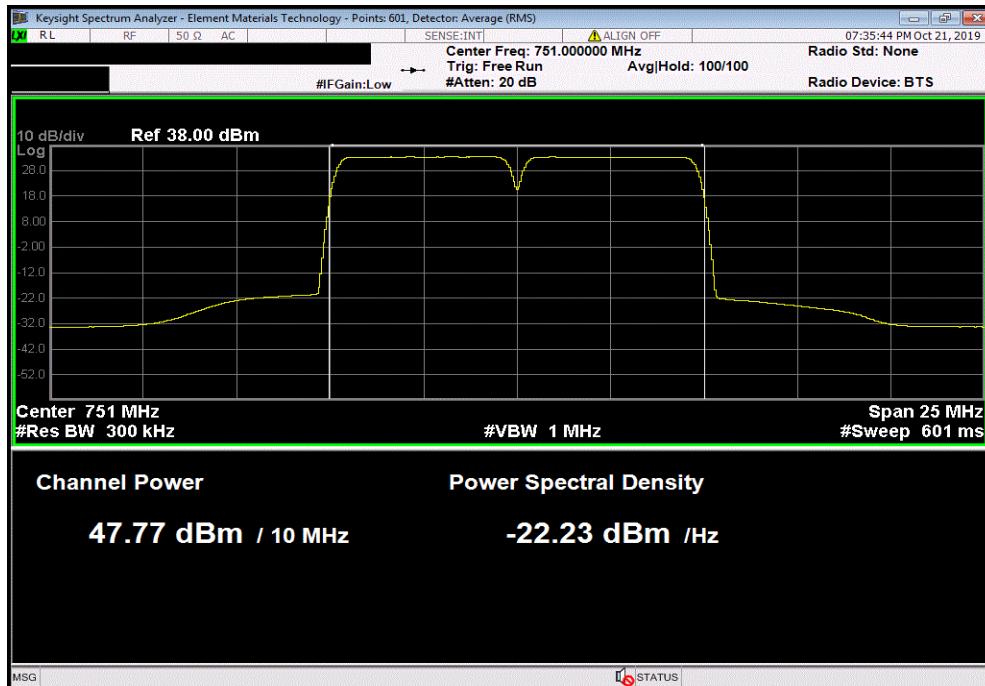
EUT:	AHBOA Remote Radio Head (RRH)	Work Order:	NOKI0003			
Serial Number:	BL1934X1001	Date:	23-Oct-19			
Customer:	Nokia Solutions and Networks	Temperature:	22.1 °C			
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill	Humidity:	38.8% RH			
Project:	None	Barometric Pres.:	1020 mbar			
Tested by:	Jonathan Kiefer	Power:	48VDC			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 27:2019						
COMMENTS						
Band 13 average power measurements for multicarrier test case on four modulation types for LTE5 channel bandwidth. This multicarrier test case is with two LTE5 carriers at the Band 13 lower and upper band edge channels [748.5MHz and 753.5MHz]. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature				
		Jonathan Kiefer				
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results
Band 13						
QPSK Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 751 MHz						
47.77 0 47.8 1000 Pass						
16QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 751 MHz						
47.766 0 47.8 1000 Pass						
64QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 751 MHz						
47.763 0 47.8 1000 Pass						
256QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 751 MHz						
47.748 0 47.7 1000 Pass						

AVERAGE OUTPUT POWER

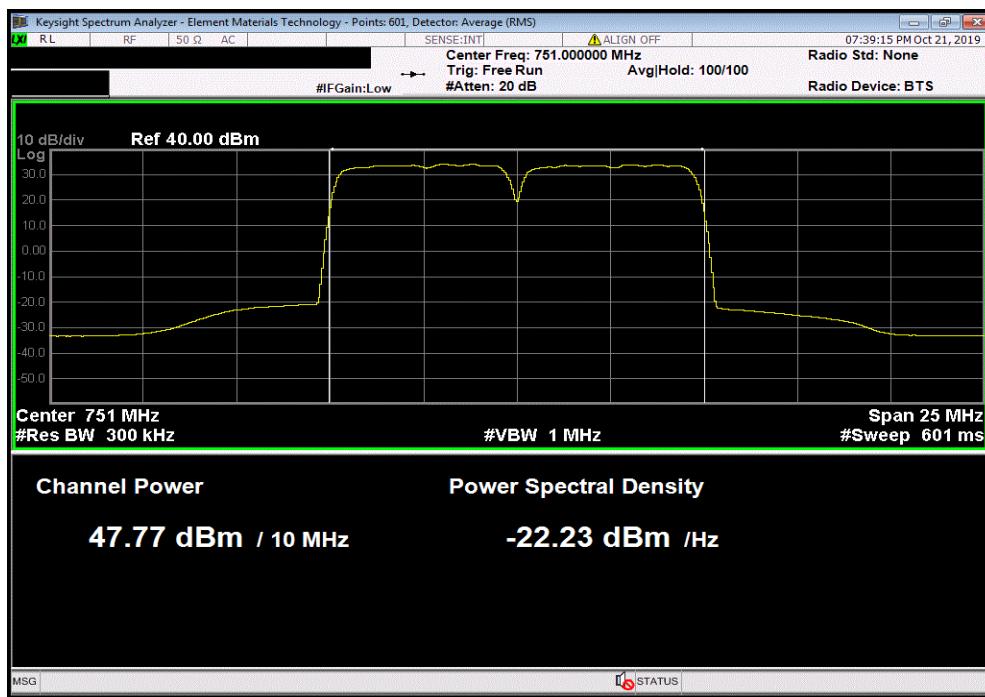


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Band 13, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 751 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.77	0	47.8	1000		Pass



Band 13, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 751 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP)		
47.766	0	47.8	1000		Pass

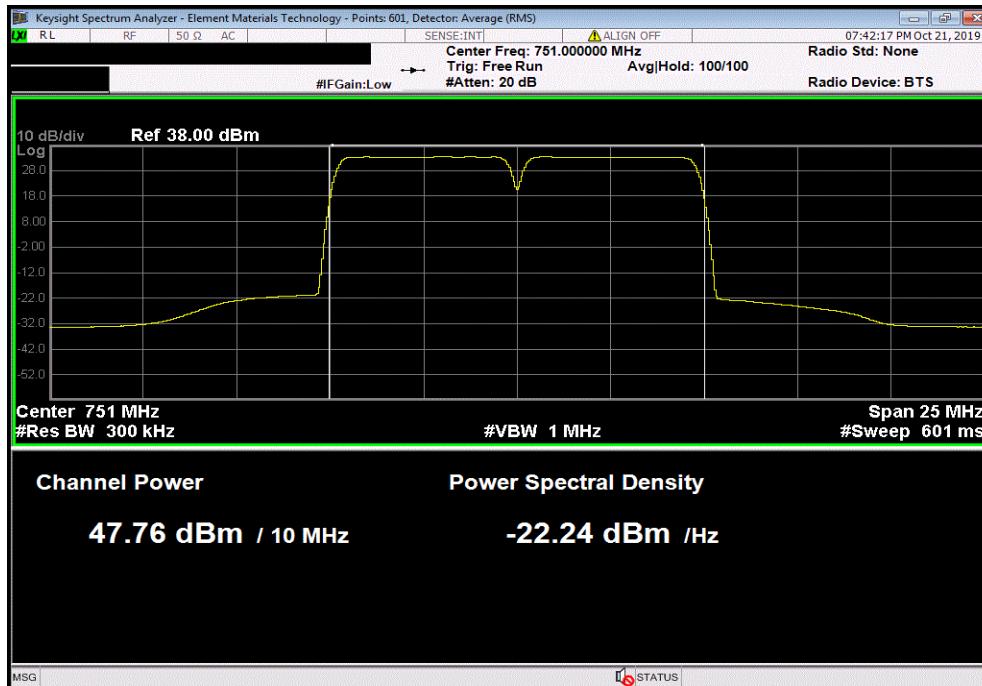


AVERAGE OUTPUT POWER

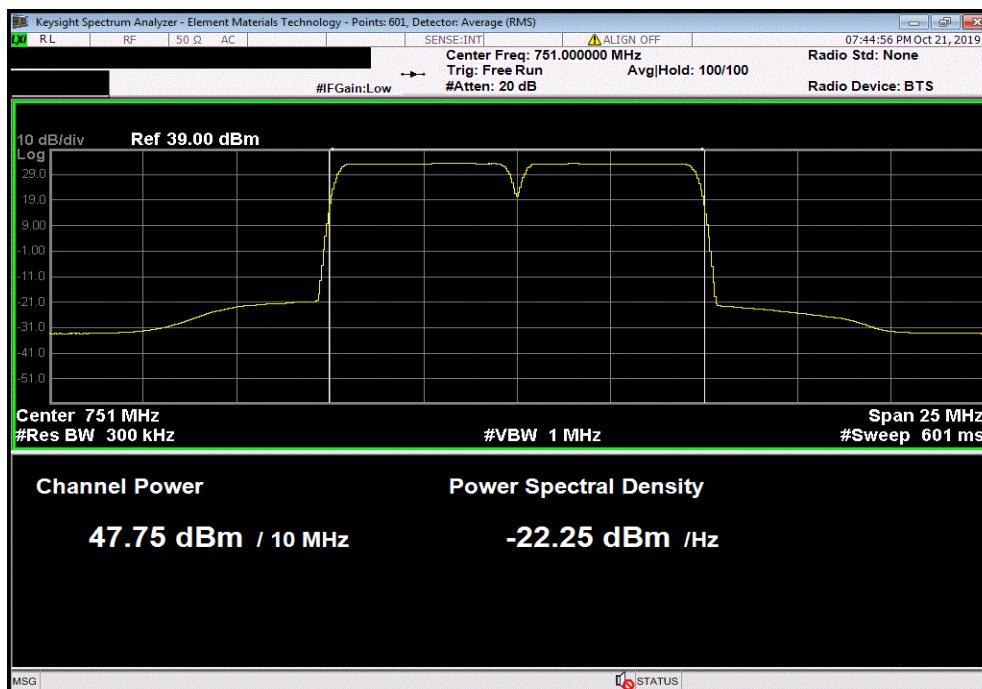


TbtTx 2019.08.30.0 XMU 2019.09.05

Band 13, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 751 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.763	0	47.8	1000	Pass	



Band 13, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 751 MHz					
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP)	Results	
47.748	0	47.7	1000	Pass	



PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

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)



TbTx 2019.08.30.0

XMI 2019.08.05

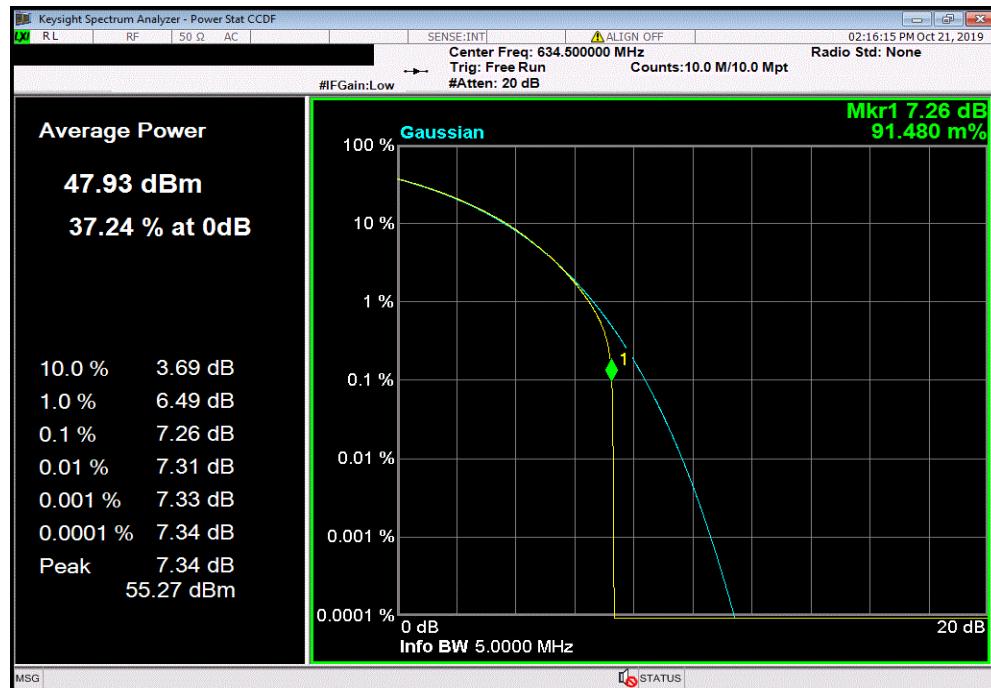
EUT:	AHBOA Remote Radio Head (RRH)	Work Order:	NOKI0003																	
Serial Number:	BL1934X1001	Date:	21-Oct-19																	
Customer:	Nokia	Temperature:	22.7 °C																	
Attendees:	Robert Smith, John Rattanavong, Mitchell Hill	Humidity:	36.6% RH																	
Project:	None	Barometric Pres.:	1020 mbar																	
Tested by:	Jonathan Kiefer	Power:	48VDC																	
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015																	
FCC 27:2019																				
COMMENTS																				
Band 71 PAPR measurements for LTE5 channel bandwidth at mid channel using 256QAM on all four antenna ports. Using CCDF function of spectrum analyzer. EUT is operated at 100% duty cycle.																				
DEVIATIONS FROM TEST STANDARD																				
None																				
Configuration #	1	Signature																		
		<i>Jonathan Kiefer</i>																		
		PAPR Value (dB)	PAPR Limit (dBm)	Results																
Band 71																				
256QAM Modulation																				
LTE5 Bandwidth																				
Mid Channel, 634.5 MHz																				
<table> <tbody> <tr> <td>Antenna Port 1</td><td>7.26</td><td>13</td><td>Pass</td></tr> <tr> <td>Antenna Port 2</td><td>7.26</td><td>13</td><td>Pass</td></tr> <tr> <td>Antenna Port 3</td><td>7.25</td><td>13</td><td>Pass</td></tr> <tr> <td>Antenna Port 4</td><td>7.26</td><td>13</td><td>Pass</td></tr> </tbody> </table>					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
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)

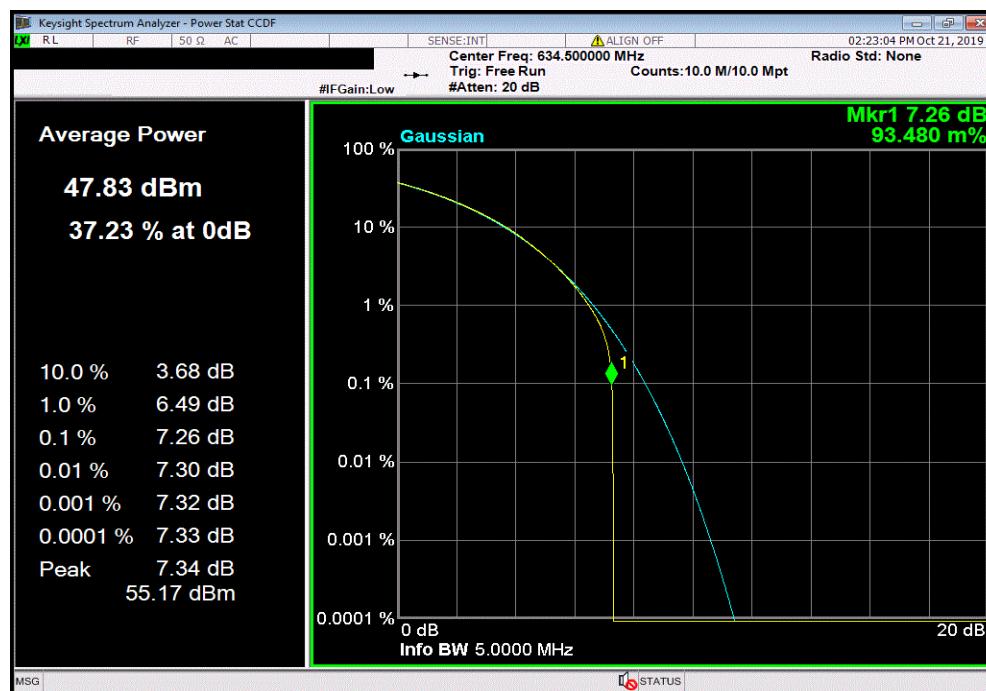


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Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 1			
PAPR Value (dB)	PAPR Limit (dBm)	Results	
7.26	13	Pass	



Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 2			
PAPR Value (dB)	PAPR Limit (dBm)	Results	
7.26	13	Pass	

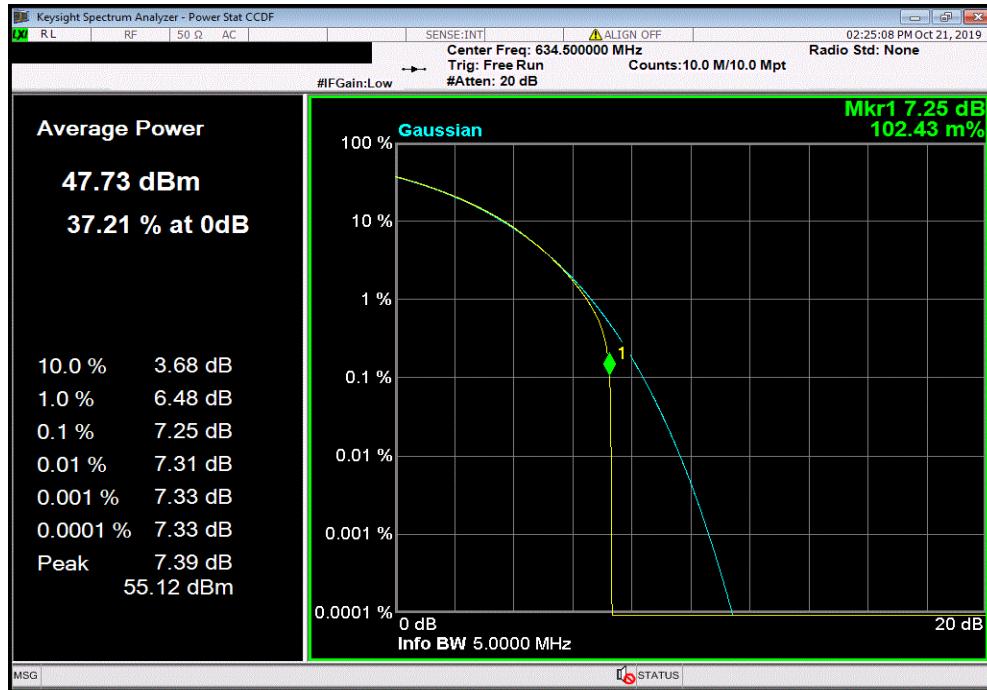


PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbtTx 2019.08.30.0 XMI 2019.09.05

Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 3			
PAPR Value (dB)	PAPR Limit (dBm)	Results	
7.25	13	Pass	



Band 71, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 634.5 MHz, Antenna Port 4			
PAPR Value (dB)	PAPR Limit (dBm)	Results	
7.26	13	Pass	

