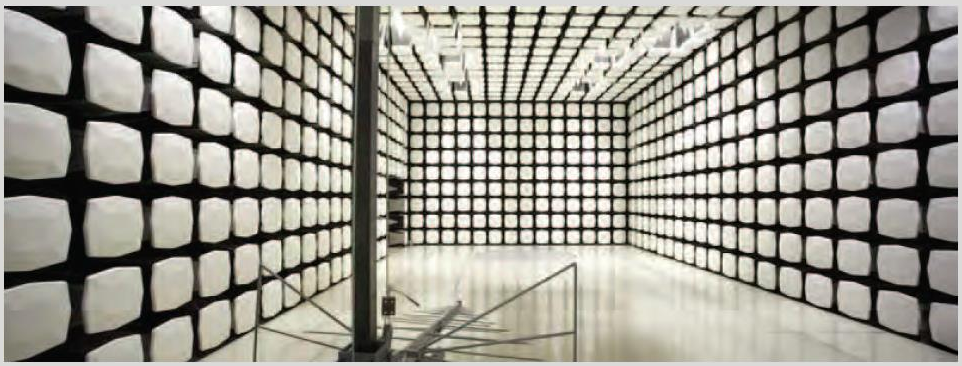
Radio Test Report
Application for a Class II Permissive Change of Equipment Authorization
FCC Part 27 Subpart C and IC RSS -130
[717MHz to 728 MHz and 729MHz to 745MHz]
FCC Part 90 Subpart R and IC RSS -140
[758MHz to 768MHz]

FCC ID: VBNAHLBBA-01
IC ID: 661W-AHLBBA

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

Report: NOKI0013, Issue Date: April 27, 2020



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: March 26, 2020
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Remote Radio Head Model AHLBBA

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 6: 2019 CFR Title 47 Part 27 Subpart C – Miscellaneous Wireless Communication Services CFR Title 47 Part 90 Subpart R – Private Land Mobile Radio Services RSS-130 Issue 2 - February 2019 RSS-140 Issue 1 - April 2018	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01

Results

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

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

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

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

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

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

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

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

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

Israel

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

Hong Kong

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

Vietnam

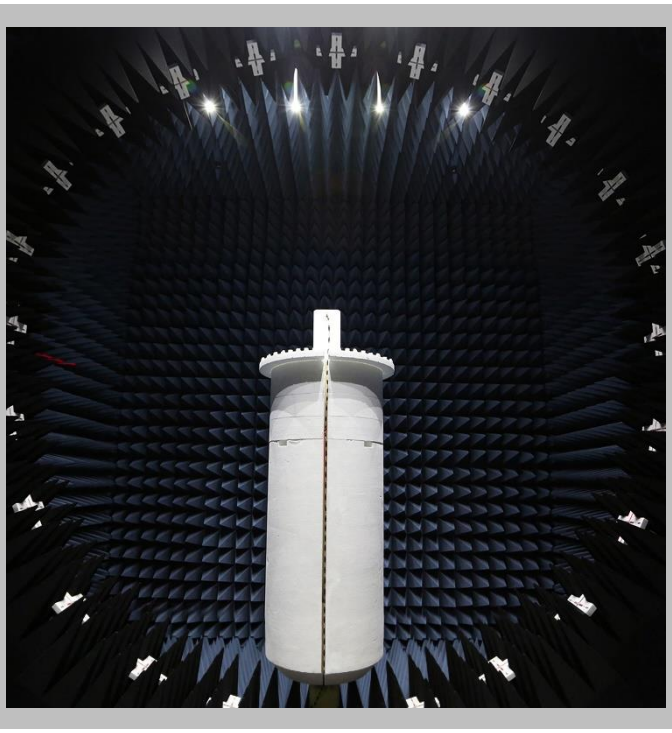
MIC – Recognized by MIC as a CAB for the acceptance of test data.

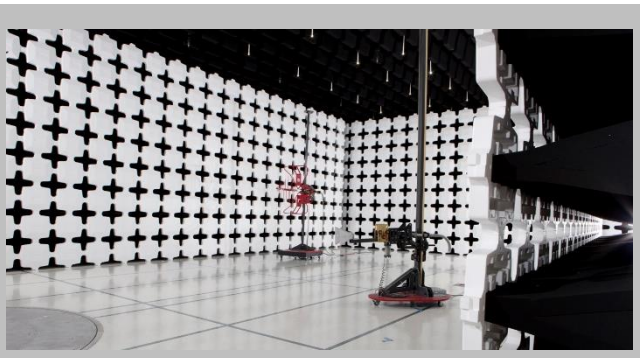
SCOPE

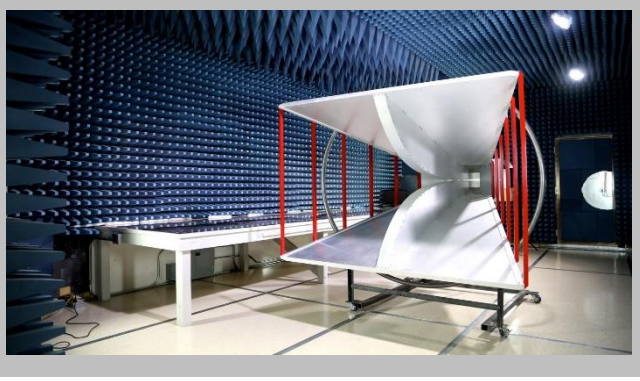
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

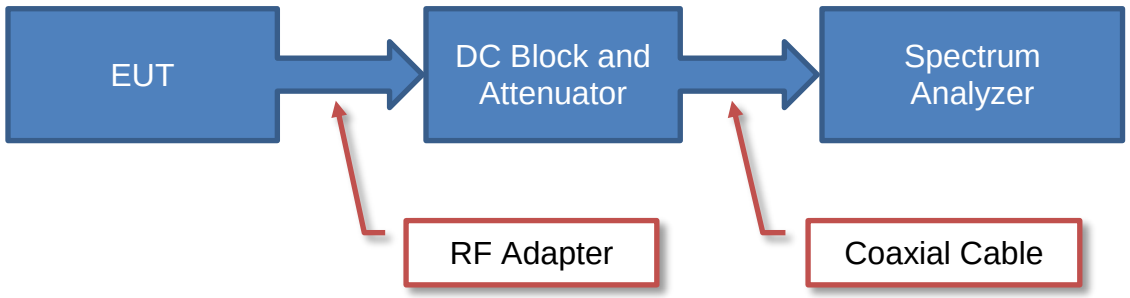
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

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

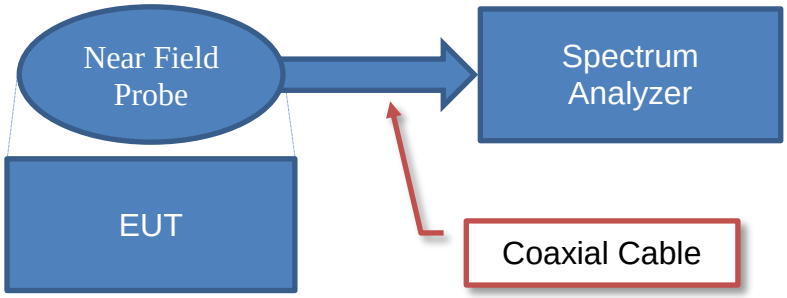
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field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

Test Setup Block Diagrams

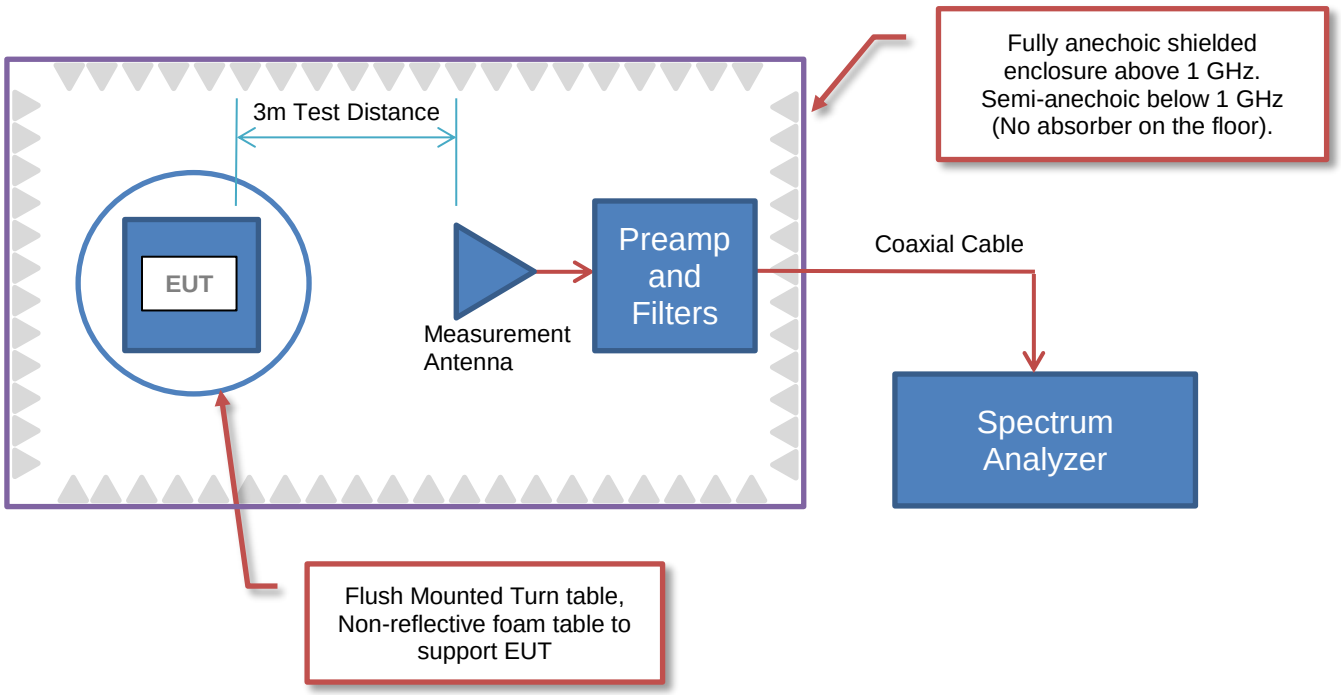
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	6000 Connection Drive
City, State, Zip:	Irving, 75039
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHLBBA
First Date of Test:	March 23, 2020
Last Date of Test:	March 26, 2020
Receipt Date of Samples:	March 23, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

A class II permissive change on the original Airscale BTS RRH model AHLBBA FCC and ISED radio certifications is being pursued as follows:

(1) LTE Band 12 frequency definition is changed from (BTS Rx: 699 to 714 MHz/BTS TX: 729 to 744 MHz) to (BTS Rx: 699 to 715 MHz/BTS TX: 729 to 745 MHz). Band 12 upper band edge increased by 1MHz.
(2) LTE Band 29 frequency definition is changed from (BTS TX: 718 to 728 MHz) to (BTS TX: 717 to 728 MHz). Band 29 lower band edge extended by 1MHz.
(3) LTE Narrow Band IoT Guard Band operations are added for Band 12, Band 14 and Band 29.
(4) LTE Narrow Band IoT In-Band operations are added for Band 12

The original FCC certification submittal (FCC ID: VBNAHLBBA-01) was Element Test Report Number NOKI0004.1 Revision 00 and the original ISED certification submittal (IC ID: 661W-AHLBBA) was Element Test Report Number NOKI0004.2 Revision 00. The original test effort includes testing for LTE technologies. Please refer to the test report on the original certification for details on all required testing. The testing in this effort was performed on the same hardware (AHLBBA) as the original certification. The same RF ports determined in the original certification testing to be the highest power ports were used for all testing in this effort [Antenna 1 (measurements between Ant Ports 1 & 4) and Antenna 2 (measurements between Ant Ports 2 & 3)].
For changes 1 & 2 noted above, the band 12 and band 29 downlink frequency range changes are small (1MHz) so the conducted emission testing was limited to measurements at the new band edge frequencies per correspondence/guidance from Nemko TCB. The RF conducted emission measurements (at the new band 12 and band 29 band edges) include average power, CCDF and band edge spurious emissions. The emission bandwidth (99% and 26dB down) and conducted spurious emissions were not repeated since the band edge definition changes do not affect these measurements. The AHLBBA LTE Band 14 frequency definition has not changed from the original test effort.
For changes 3 & 4 noted above, the conducted RF testing performed for the original certification testing has been repeated using NB IoT Guard Band and In-Band operations per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this class II permissive change test effort. The RF conducted emission measurements (at the new band 12 and band 29 band edges) include average power, CCDF, emission

bandwidth (99% and 26dB down), band edge spurious emissions and conducted spurious emissions. The radiated emissions and frequency stability measurements performed in the original certification were not repeated under this effort per TCB guidance. The radiated emission and frequency stability/accuracy results from the original certification had enough margin to preclude requiring additional testing. The same frequency stability/accuracy radio design is the same for all radio technologies/modulation types.

The equipment under test (EUT) is a Nokia Solutions and Networks Airscale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AHLBBA. The AHLBBA remote radio head is a multi-standard multi-carrier radio module designed to support LTE, LTE narrow band IoT (internet of things) operations (in-band, guard band, standalone) and 5G-NR (fifth generation – new radio). The scope of testing in this effort is for LTE-FDD operations (including NB IoT GB and NB IoT In-Band).

The AHLBBA RRH has four transmit/four receive antenna ports (4TX/4RX for Band 12, 4TX/4RX for Band 14 and 2TX for Band 29). Antenna ports 1-4 support 3GPP frequency band 12 (BTS Rx: 699 to 715 MHz/BTS TX: 729 to 745 MHz) and 3GPP frequency band 14 (BTS Rx: 788 to 798 MHz/BTS TX: 758 to 768 MHz) at 80 watts/carrier. Antenna ports 1 & 4 support 3GPP frequency band 29 downlink (BTS TX: 717 to 728 MHz) at 25 watts/carrier. The total output power is 105 watts for antenna ports 1 & 4 (supports frequency bands 12, 14 & 29) and 80 watts for antenna ports 2 & 3 (supports frequency bands 12 & 14 only). The maximum RRH RF output power for all antenna ports (1 – 4) is 370 Watts. The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO for Bands 12 & 14 and 2port MIMO or as non-MIMO for Band 29. The TX and RX instantaneous bandwidth cover the full operational bandwidth.

The RRH supports LTE bandwidths of 5 and 10MHz for 3GPP frequency band 12, band 14 and band 29 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 LTE modulation type for IoT testing are setup according to 3GPP TS 36.141 E-UTRA Test Models and is “E-TM 1.1 (QPSK modulation type) with N-TM (narrow band IoT)”. Narrow band IoT Guard Band operations are supported in AHLBBA bands 12, 14, and 29 for the LTE10 channel bandwidth. Narrow band IoT In-Band operations are supported in AHLBBA band 12 for LTE5 and LTE10 channel bandwidths.
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 AHLBBA LTE Band 12 downlink channel numbers and frequencies are provided below.

	Downlink EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth	
			5 MHz	10 MHz
Band 12 (Ant 1, 2, 3, 4)	5010	729.0	Band Edge	Band Edge
	……			
	5035	731.5	Bottom Ch	
	……			
	5060	734.0		Bottom Ch
	……			
	5090	737.0	Middle Ch	Middle Ch
	……			
	5120	740.0		Top Channel
	……			
	5145	742.5	Top Channel	
	……			
	5170	745.0	Band Edge	Band Edge

AHLBBA Downlink Band Edge LTE Band 12 Frequency Channels

The AHLBBA LTE Band 14 downlink channel numbers and frequencies are provided below.

	Downlink EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth	
			5 MHz	10 MHz
Band 14 (Ant 1, 2, 3, 4)	5280	758.0	Band Edge	Band Edge
	……			
	5305	760.5	Bottom Ch	
	……			
	5330	763.0	Middle Ch	Bottom Ch Middle Ch Top Channel
	……			
	5355	765.5	Top Channel	
	……			
	5380	768.0	Band Edge	Band Edge

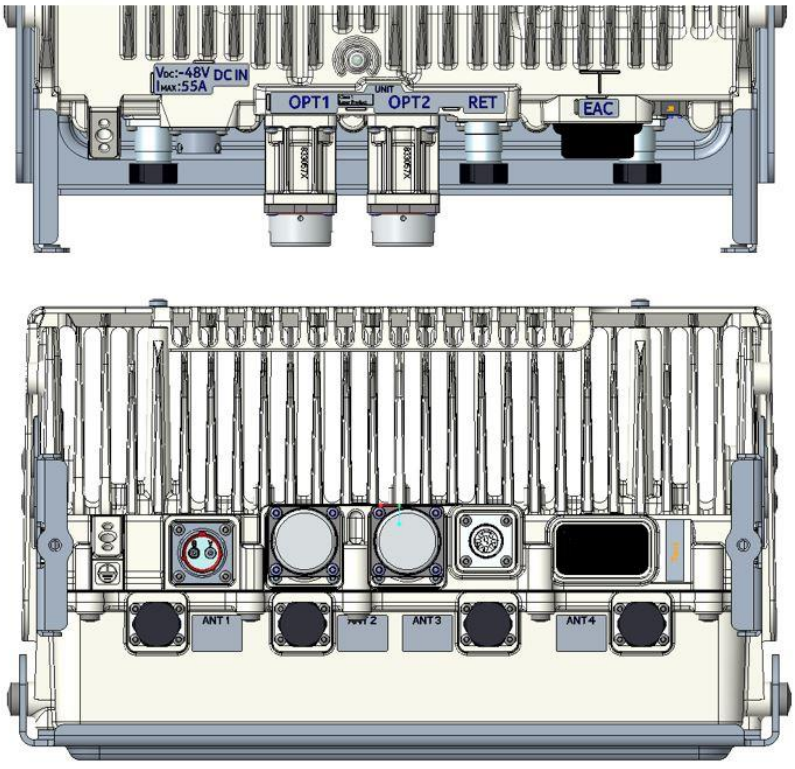
AHLBBA Downlink Band edge LTE Band 14 Frequency Channels

The AHLBBA LTE Band 29 downlink channel numbers and frequencies are provided below:

	Downlink EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth	
			5 MHz	10 MHz
AHLBBA Band 29 (Ant 1, 4)	9660	717.0	Band Edge	Band Edge
	……			
	9685	719.5	Bottom Channel	
	……			
	9710	722.0		Bottom Channel
	……			
	9715	722.5	Middle Channel	Middle Channel
	……			
	9720	723.0		Top Channel
	……			
	9745	725.5	Top Channel	
	……			
	9770	728.0	Band Edge	Band Edge

AHLBBA Downlink Band Edge LTE Band 29 Frequency Channels

AHLBBA Connector Layout:



PRODUCT DESCRIPTION

AHLBBA External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Quick Disconnect	2-pole Power Circular Connector
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	4	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
Unit	1	LED	Unit Status LED
EAC	1	MDR26	External Alarm Interface (4 alarms)
OPT	2	SFP+ cage	Optical CPRI Interface up to 10 Gps.
RET	1	8-pin circular connector conforming to IEC 60130-9 – Ed.3.0	AISG 2.0 to external devices

Testing Objective:

A class II permissive change on the original filing is being pursued to increase the AHLBBA LTE band 12 & 29 operational frequency ranges and to add LTE narrow band IoT Guard Band & In-Band carrier capability to the Airscale BTS RRH model AHLBBA FCC and ISED radio certifications.

CONFIGURATIONS

Configuration NOKI0013- 1

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 100W/10dB	Aeroflex Weinschel	48-10-34-LIM	BJ1771
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Low Pass Filter (3 Pieces)	Mimi-Circuits Inc.	NLP-550	None
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 1	Attenuator 150W/20dB
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHLBBA RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Low Pass Filter (3 Pieces)	Analyzer

CONFIGURATIONS

Configuration NOKI0013- 2

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 250W/40dB	Aeroflex Weinschel	58-40-53-LIM	TC909
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

CONFIGURATIONS

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHLBBA RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 1	Attenuator 250W/40dB
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Attenuator 250W/40dB	Spectrum Analyzer

CONFIGURATIONS

Configuration NOKI0013- 3

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None
High Pass Filter 2W	RLC Electronics	F-14699	0050

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 1	Attenuator 150W/20dB
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHLBBA RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	High Pass Filter 2W	Analyzer

CONFIGURATIONS

Configuration NOKI0013- 4

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 250W/40dB	Aeroflex Weinschel	58-40-53-LIM	TC909
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
Carrier Blocking Filter	Nokia Solutions and Networks	TRI-BSBP	None
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHLBBA RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 1	Attenuator 250W/40dB
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Carrier Filter TRI-BSBP	Spectrum Analyzer

CONFIGURATIONS

Configuration NOKI0013- 5

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 100W/10dB	Aeroflex Weinschel	48-10-34-LIM	BJ1771
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Low Pass Filter (3 Pieces)	Mimi-Circuits Inc.	NLP-550	None
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Low Pass Filter (3 Pieces)	Analyzer
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 2	Attenuator 150W/20dB
RF cable Port 1	Yes	2.0 m	No	AHLBBA RF Port 1	250W 50 ohm Load

CONFIGURATIONS

Configuration NOKI0013- 6

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 250W/40dB	Aeroflex Weinschel	58-40-53-LIM	TC909
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

CONFIGURATIONS

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 1	Yes	2.0 m	No	AHLBBA RF Port 1	250W 50 ohm Load
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 2	Attenuator 250W/40dB
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Attenuator 250W/40dB	Spectrum Analyzer

CONFIGURATIONS

Configuration NOKI0013- 7

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None
High Pass Filter 2W	RLC Electronics	F-14699	0050

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	High Pass Filter 2W	Analyzer
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 2	Attenuator 150W/20dB
RF cable Port 1	Yes	2.0 m	No	AHLBBA RF Port 1	250W 50 ohm Load

CONFIGURATIONS

Configuration NOKI0013- 8

Software/Firmware Running during test	
Description	**Version**
Radio module Software	FRM 59.10.R32L
BTS Software Version	SBTS19B_ENB_0000_001124_00000

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Airscale BTS Remote Radio Head Model AHLBBA	Nokia Solutions and Networks	475082A.101	K9193514835

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIA (BTS system Module)	Nokia Solutions and Networks	473095A.101	L1164105428
ABIA (BTS system Module)	Nokia Solutions and Networks	473096A.102	L1164121378
Attenuator 250W/40dB	Aeroflex Weinschel	58-40-53-LIM	TC909
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
Carrier Blocking Filter	Nokia Solutions and Networks	TRI-BSBP	None
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR3.0M	463695-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_106	SN297372
Fiber Optic cable 0300 mm	Amphenol	E201648	2701M
CATe data cable	LEONI L	64867m	146180
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLex_104	SN551123/4
WebEM- PC	Lenovo	20HES2141X	None

CONFIGURATIONS

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Amphenol Fiber Optic cable	No	7.0 m	No	ABIA	AHLBBA
CAT5e data cable	Yes	7.0 m	No	ASIA	WebEM - PC
RF cable Port 4	Yes	2.0 m	No	AHLBBA RF Port 4	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHLBBA RF Port 3	250W 50 ohm Load
RF cable Port 1	Yes	2.0 m	No	AHLBBA RF Port 1	250W 50 ohm Load
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHLBBA RF Port 2	Attenuator 250W/40dB
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Carrier Filter TRI-BSBP	Spectrum Analyzer

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-03-23	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2020-03-24	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2020-03-24	Peak to Average Power (PAPR) CCDF	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2020-03-25	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2020-03-26	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH LTE BAND 14 (GUARDBAND)

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21

TEST DESCRIPTION

The 99% bandwidth was measured utilizing the analyzer's peak detector and measuring the carrier's 26 dB occupied bandwidth based on the peak output power level measured. A plot was taken to show the occupied bandwidth is contained within the allowable transmit band.

The measurement was made using a direct connection between the RF output of the EUT and the specturm analyzer. The method in section 5.4 of ANSI C63.26 was used to make this measurement. The specturm analyzer settings were as follows:

- RBW is 1% - 5% of the occupied bandwidth
- VBW is ≥ 3x the RBW
- Peak Dectector was used
- Trace max hold was used

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.

FCC 2.1049 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement

Band 14 Emission Designators:

Band 14 (758MHz to 768MHz) Emission Designators for NB IoT Guard Band			
Channel Bandwidth	**Port Assignment**	**LTE: QPSK, Single Ch.**	
		FCC	IC
10M	Port 1	10M19F9W	9M68F9W
	Port 2	10M20F9W	9M71F9W
Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.			

OCCUPIED BANDWIDTH LTE BAND 14 (GUARDBAND)

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHLBBA			**Work Order:**	NOKI0013
Serial Number:	K9193514835			**Date:**	24-Mar-20
Customer:	Nokia Solutions and Networks			**Temperature:**	22.6 °C
Attendees:	Mitch Hill, John Rattanavong			**Humidity:**	50% RH
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Brandon Hobbs	**Power:**	54 VDC	**Job Site:**	TX03

TEST SPECIFICATIONS	Test Method
FCC 2.1049:2020, FCC 90:2020	ANSI C63.26:2015
RSS-140: 2018, RSS-Gen:2019	RSS-140: 2018, RSS-Gen:2019

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The hottest port per power amplifier (PA) was used for testing. The worst case port was determined in the original client provided test report. The carrier power was set to maximum for all testing.

DEVIATIONS FROM TEST STANDARD

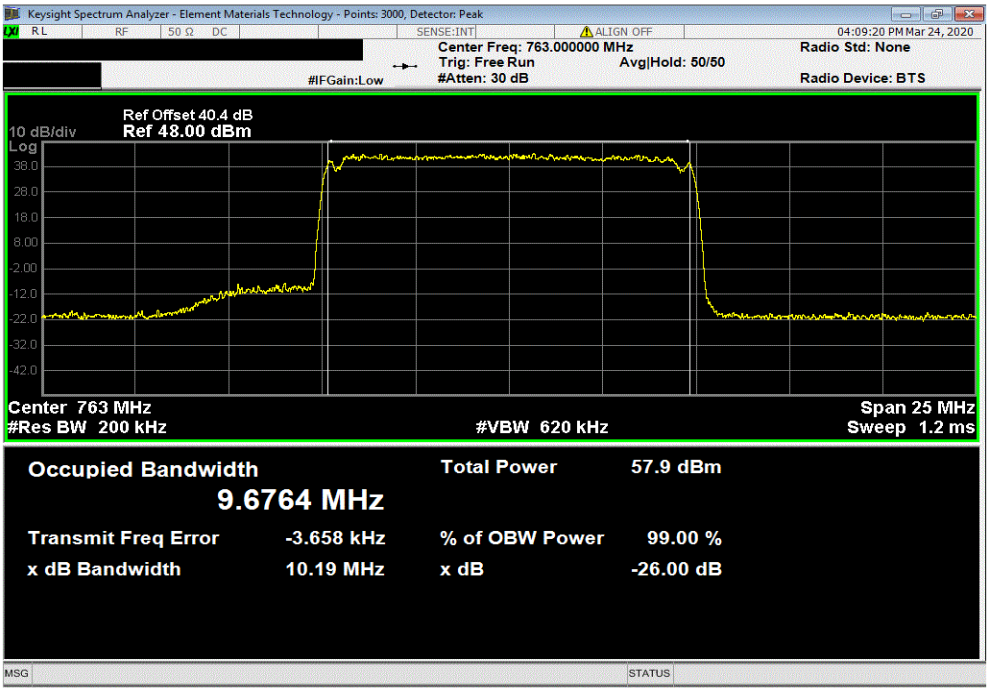
None

Configuration #	2,6	Signature

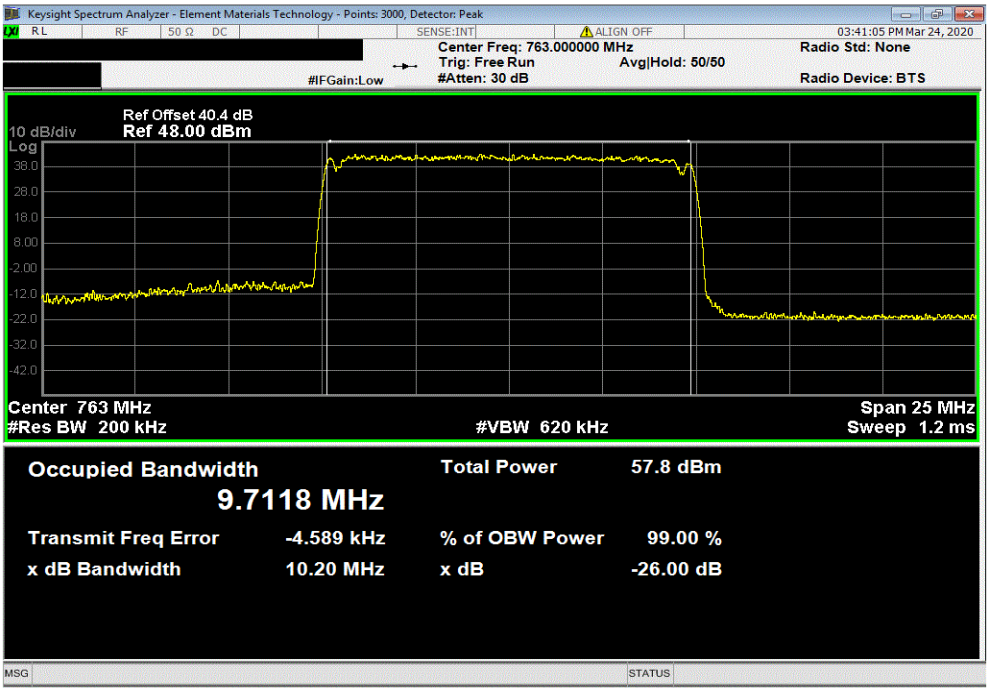
	Value 99%(MHz)	Value 26dB(MHz)	Limit	Result
Band 14, 758 MHz - 768 MHz, LTE				
Port 1				
10 MHz Bandwidth				
QPSK Modulation				
Mid Channel 763 MHz	9.676	10.19	Within Band	Pass
Port 2				
10 MHz Bandwidth				
QPSK Modulation				
Mid Channel 763 MHz	9.712	10.202	Within Band	Pass

OCCUPIED BANDWIDTH LTE BAND 14 (GUARDBAND)

Band 14, 758 MHz - 768 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 763 MHz						
			Value 99%(MHz)	Value 26dB(MHz)	Limit	Result
			9.676	10.19	Within Band	Pass



Band 14, 758 MHz - 768 MHz, LTE, Port 2, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 763 MHz						
			Value 99%(MHz)	Value 26dB(MHz)	Limit	Result
			9.712	10.202	Within Band	Pass



OCCUPIED BANDWIDTH LTE BANDS 29,12 (GUARDBAND)

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	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21

TEST DESCRIPTION

The 99% bandwidth was measured utilizing the analyzer's peak detector and measuring the carrier's 26 dB occupied bandwidth based on the peak output power level measured. A plot was taken to show the occupied bandwidth is contained within the allowable transmit band.

The measurement was made using a direct connection between the RF output of the EUT and the specturm analyzer. The method in section 5.4 of ANSI C63.26 was used to make this measurement. The specturm analyzer settings were as follows:

- RBW is 1% - 5% of the occupied bandwidth
- VBW is ≥ 3x the RBW
- Peak Dectector was used
- Trace max hold was used

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.

FCC 2.1049 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement

Band 12 Emission Designators:

Band 12 (729MHz to 745MHz) Emission Designators for NB IoT Guard Band							
Channel Bandwidth	Port Assignment	LTE: QPSK, Low Ch.		LTE: QPSK, Mid Ch.		LTE: QPSK, High Ch.	
		FCC	IC	FCC	IC	FCC	IC
10M	Port 1	10M21F9W	9M72F9W	10M21F9W	9M73F9W	10M20F9W	9M72F9W
	Port 2	10M20F9W	9M72F9W	10M20F9W	9M72F9W	10M21F9W	9M72F9W
Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.							

Band 29 Emission Designators :

Band 29 (717MHz to 728MHz) Emission Designators for NB IoT Guard Band							
Channel Bandwidth	Port Assignment	LTE: QPSK, Low Ch.		LTE: QPSK, Mid Ch.		LTE: QPSK, High Ch.	
		FCC	IC	FCC	IC	FCC	IC
10M	Port 1	10M17F9W	9M65F9W	10M18F9W	9M69F9W	10M19F9W	9M69F9W
Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.							

OCCUPIED BANDWIDTH LTE BANDS 29,12 (GUARDBAND)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Airscale Base Transceiver Station Remote Radio Head Model AHLBBA**			**Work Order:**	**NOKI0013**
Serial Number:	**K9193514835**			**Date:**	**24-Mar-20**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**23 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**49.2% RH**
Project:	**None**			**Barometric Pres.:**	
Tested by:	**Brandon Hobbs**	**Power:**	**54 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 27:2020, FCC 2.1049:2020	ANSI C63.26:2015
RSS-130:2019, RSS-Gen:2019	RSS-130:2019, RSS-Gen:2019

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The hottest port per power amplifier (PA) was used for testing. The worst case port was determined in the original client provided test report. The carrier power was set to maximum for all testing.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**2,6**	*Signature*

	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Band 12, 729 MHz - 745 MHz, LTE				
Port 1				
10 MHz Bandwidth				
QPSK Modulation				
Low Channel 734 MHz	9.72	10.21	Within Band	Pass
Mid Channel 737 MHz	9.73	10.21	Within Band	Pass
High Channel 740 MHz	9.72	10.20	Within Band	Pass
Port 2				
10 MHz Bandwidth				
QPSK Modulation				
Low Channel 734 MHz	9.72	10.20	Within Band	Pass
Mid Channel 737 MHz	9.72	10.20	Within Band	Pass
High Channel 740 MHz	9.72	10.21	Within Band	Pass
Band 29, 717 MHz - 728 MHz, LTE				
Port 1				
10 MHz Bandwidth				
QPSK Modulation				
Low Channel 722 MHz	9.65	10.17	Within Band	Pass
Mid Channel 722.5 MHz	9.69	10.18	Within Band	Pass
High Channel 723 MHz	9.69	10.19	Within Band	Pass

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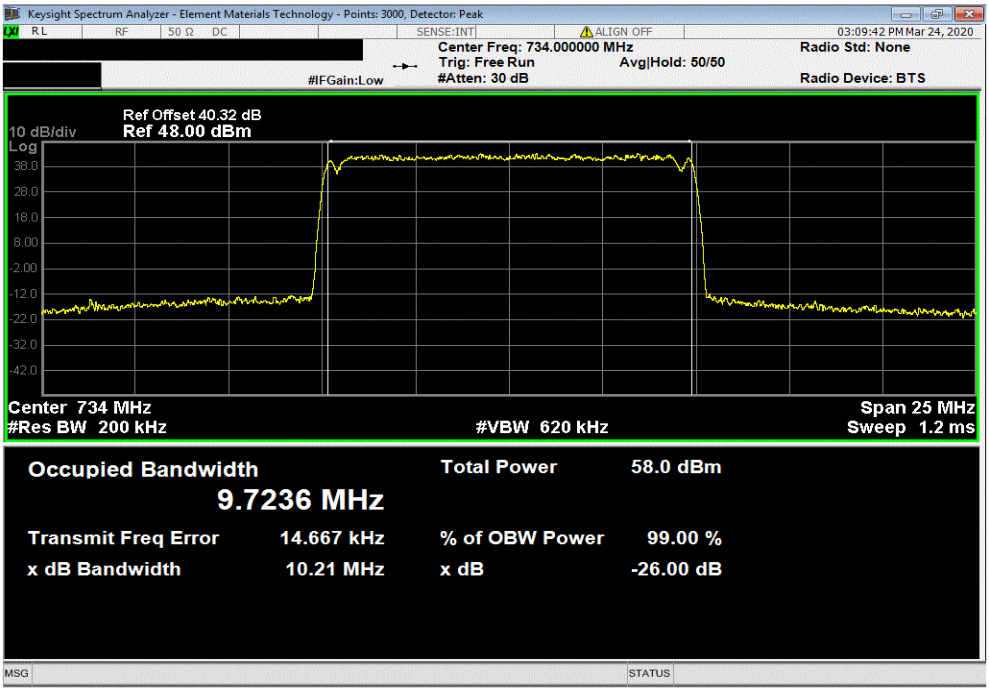
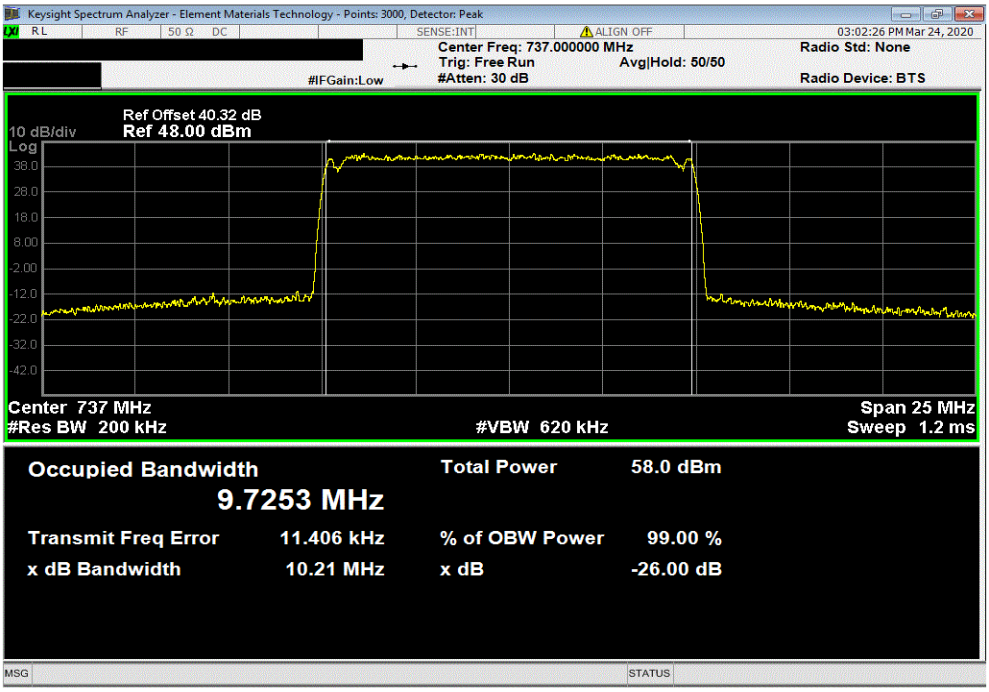
Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, Low Channel 734 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.724	10.205	Within Band	Pass

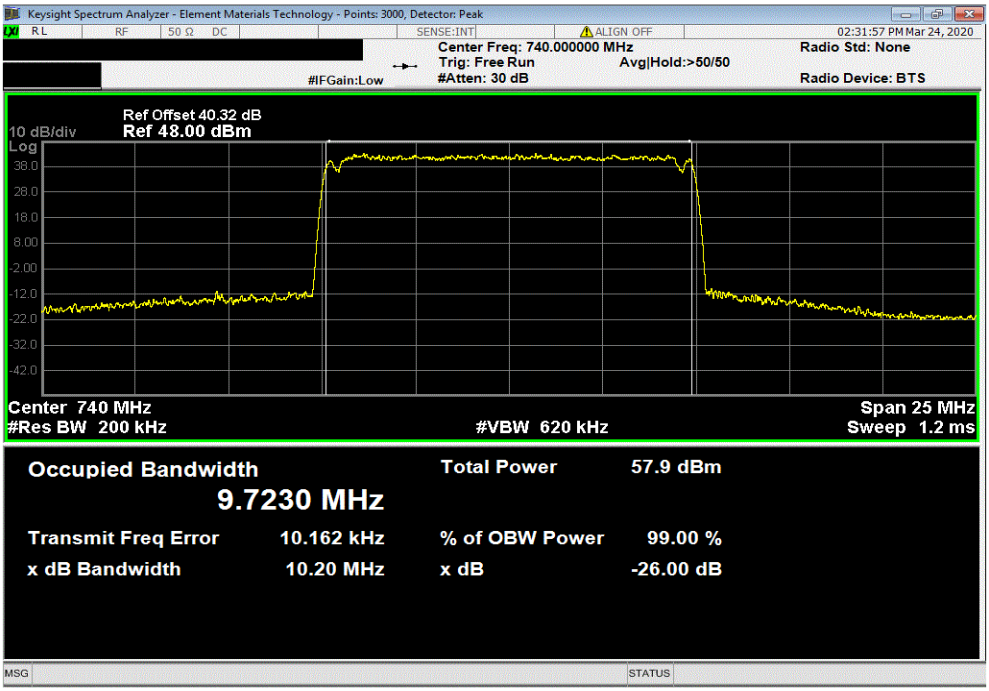


Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.725	10.205	Within Band	Pass

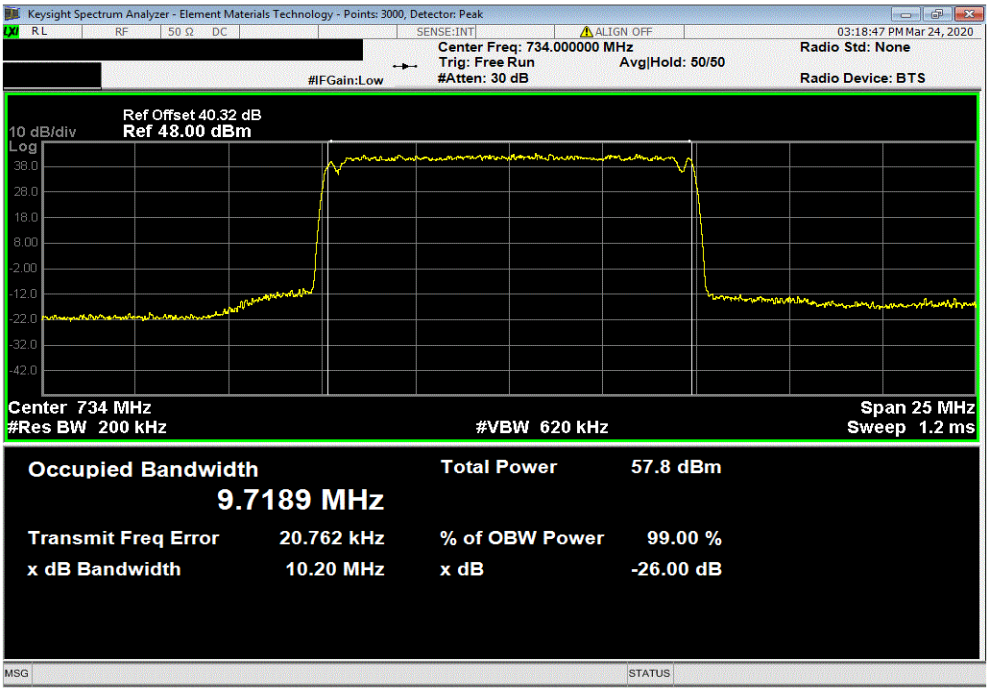


OCCUPIED BANDWIDTH LTE BANDS 29,12 (GUARDBAND)

Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, High Channel 740 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.723	10.204	Within Band	Pass



Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth, QPSK Modulation, Low Channel 734 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.719	10.203	Within Band	Pass



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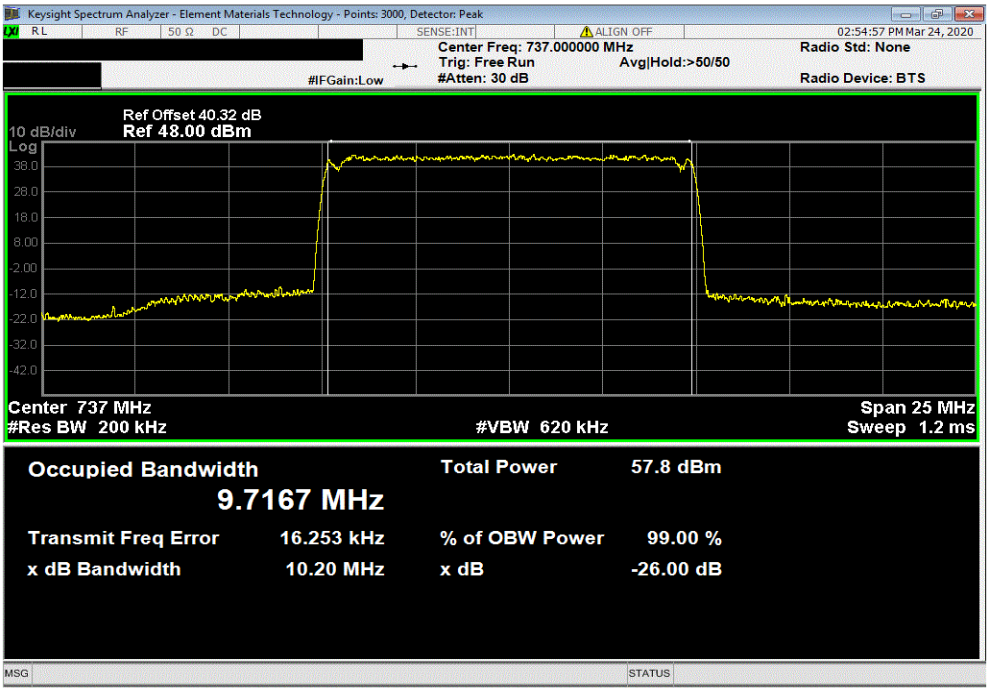
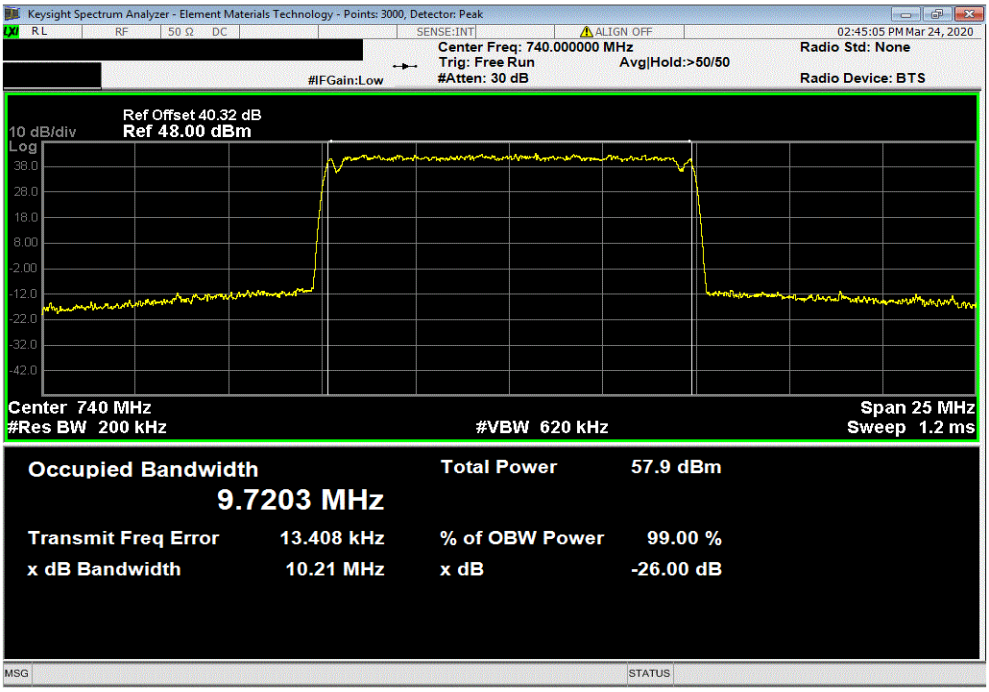
Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.717	10.203	Within Band	Pass



Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth, QPSK Modulation, High Channel 740 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.72	10.207	Within Band	Pass



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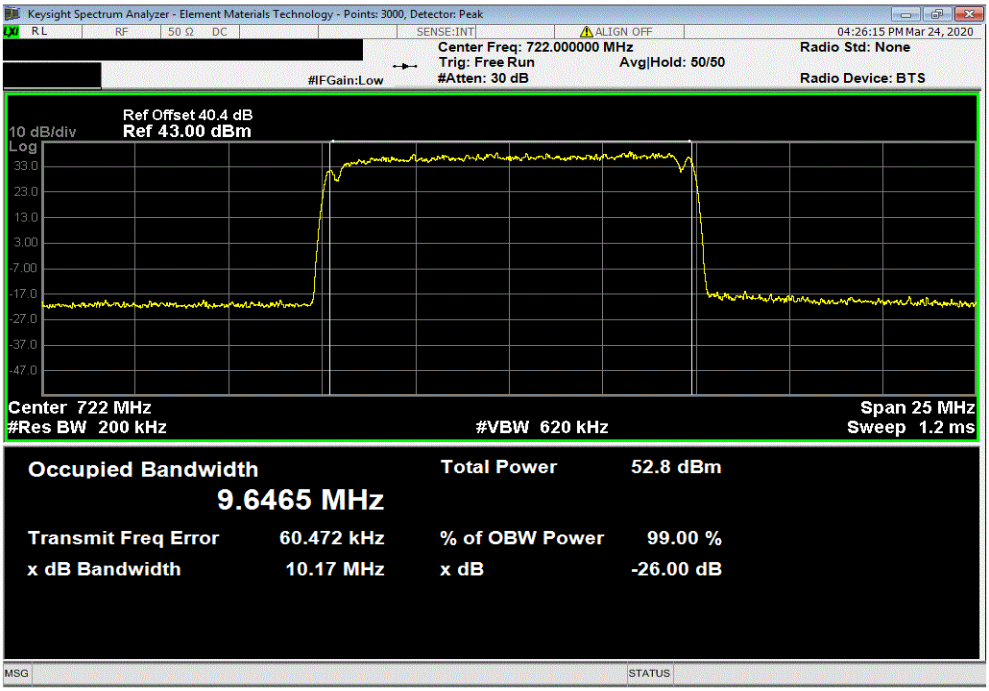
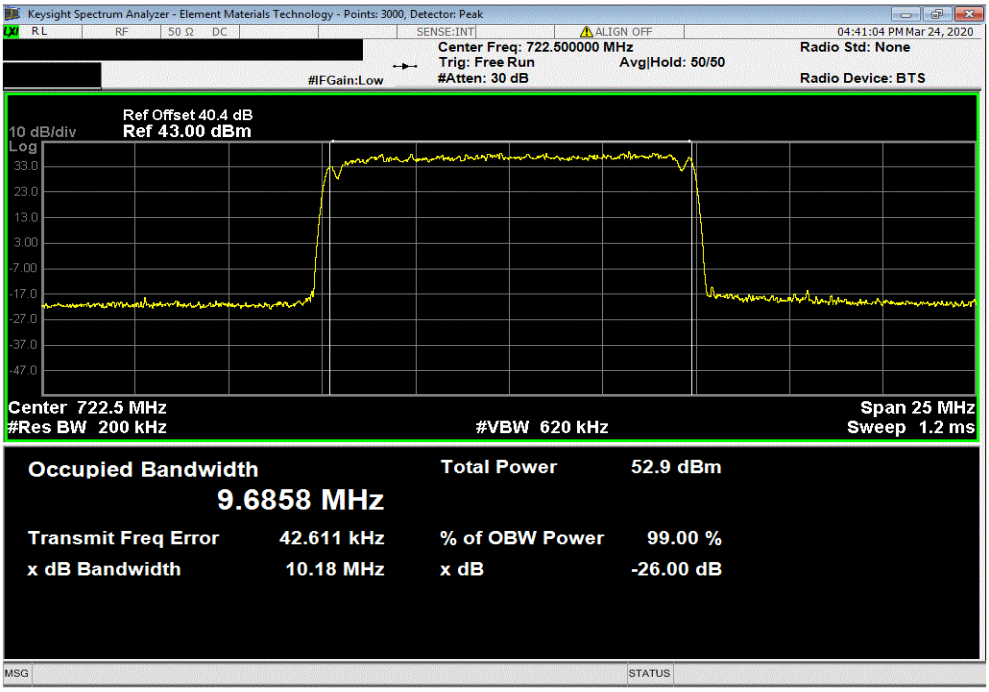
Band 29, 717 MHz - 728 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, Low Channel 722 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.647	10.17	Within Band	Pass

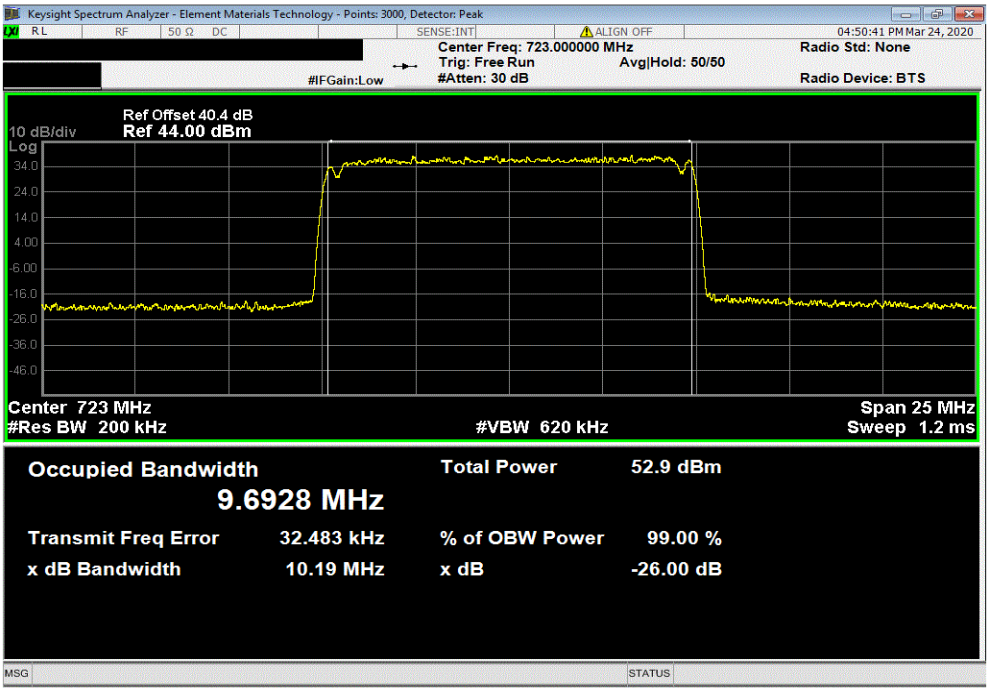


Band 29, 717 MHz - 728 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 722.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.686	10.18	Within Band	Pass



OCCUPIED BANDWIDTH LTE BANDS 29,12 (GUARDBAND)

Band 29, 717 MHz - 728 MHz, LTE, Port 1, 10 MHz Bandwidth, QPSK Modulation, High Channel 723 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.693	10.19	Within Band	Pass



OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21

TEST DESCRIPTION

The 99% bandwidth was measured utilizing the analyzer's peak detector and measuring the carrier's 26 dB occupied bandwidth based on the peak output power level measured. A plot was taken to show the occupied bandwidth is contained within the allowable transmit band.

The measurement was made using a direct connection between the RF output of the EUT and the specturm analyzer. The method in section 5.4 of ANSI C63.26 was used to make this measurement. The specturm analyzer settings were as follows:

- RBW is 1% - 5% of the occupied bandwidth
- VBW is ≥ 3x the RBW
- Peak Dectector was used
- Trace max hold was used

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.

FCC 2.1049 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement

Band 12 Emission Designators:

Band 12 (729MHz to 745MHz) Emission Designators for NB IoT In-Band							
Port Assignment	Channel Bandwidth	LTE: QPSK, Low Ch.		LTE: QPSK, Mid Ch.		LTE: QPSK, High Ch.	
		FCC	IC	FCC	IC	FCC	IC
Port 1	5M	4M83F9W	4M51F9W	4M82F9W	4M51F9W	4M82F9W	4M51F9W
	10M	9M65F9W	8M99F9W	9M62F9W	9M00F9W	9M63F9W	8M98F9W
Port 2	5M	4M83F9W	4M52F9W	4M82F9W	4M52F9W	4M82F9W	4M52F9W
	10M	9M60F9W	8M99F9W	9M65F9W	9M01F9W	9M64F9W	8M99F9W
Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.							

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EUT:	**Airscale Base Transceiver Station Remote Radio Head Model AHLBBA**			**Work Order:**	**NOKI0013**
Serial Number:	**K9193514835**			**Date:**	**24-Mar-20**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**22.8 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**49.9% RH**
Project:	**None**			**Barometric Pres.:**	**1008 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**54 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 27:2020, FCC 2.1049:2020	ANSI C63.26:2015
RSS-130:2019, RSS-Gen:2019	RSS-130:2019, RSS-Gen:2019

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The hottest port per power amplifier (PA) was used for testing. The worst case port was determined in the original client provided test report. The carrier power was set to maximum for all testing.

DEVIATIONS FROM TEST STANDARD

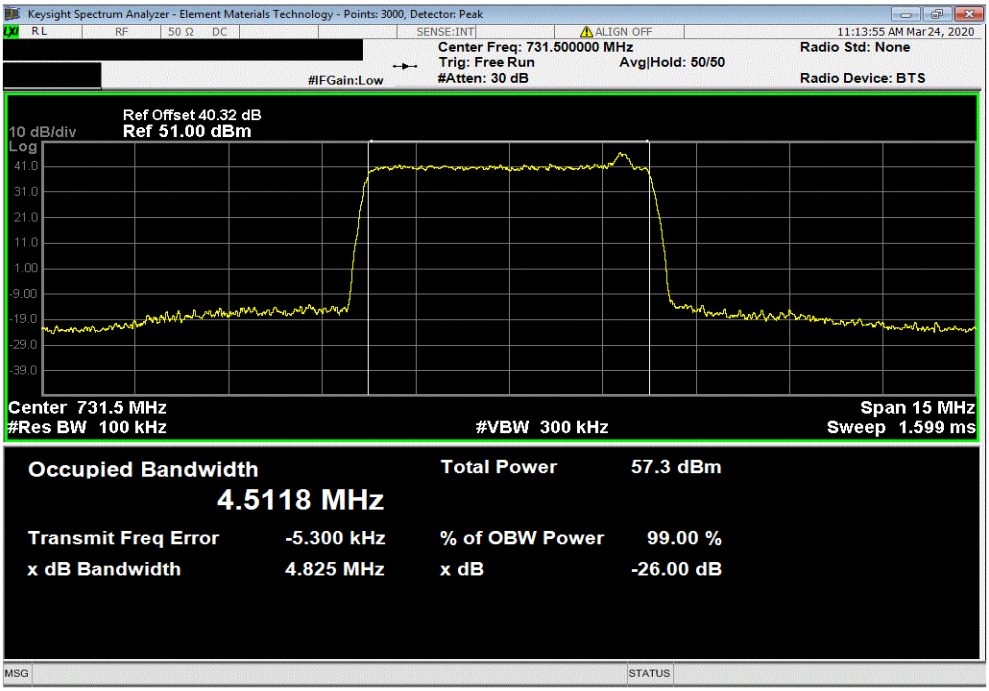
None

Configuration #	**2,6**	*Signature*

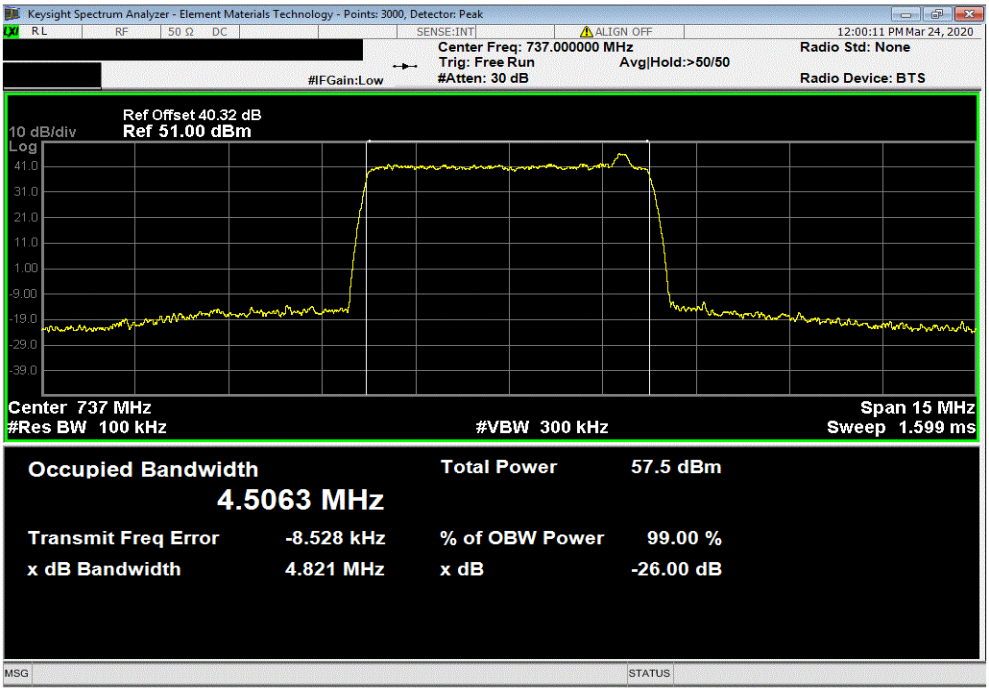
	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
IOT NB, Band 12, 729 MHz - 745 MHz, LTE				
Port 1				
5 MHz Bandwidth				
QPSK Modulation				
Low Channel 731.5 MHz	4.512	4.825	Within Band	Pass
Mid Channel 737 MHz	4.506	4.821	Within Band	Pass
High Channell 742.5 MHz	4.513	4.822	Within Band	Pass
10 MHz Bandwidth				
QPSK Modulation				
Low Channel 734 MHz	8.993	9.645	Within Band	Pass
Mid Channel 737 MHz	8.998	9.623	Within Band	Pass
High Channell 740 MHz	8.984	9.632	Within Band	Pass
Port 2				
5 MHz Bandwidth				
QPSK Modulation				
Low Channel 731.5 MHz	4.522	4.828	Within Band	Pass
Mid Channel 737 MHz	4.524	4.823	Within Band	Pass
High Channell 742.5 MHz	4.522	4.817	Within Band	Pass
10 MHz Bandwidth				
QPSK Modulation				
Low Channel 734 MHz	8.989	9.601	Within Band	Pass
Mid Channel 737 MHz	9.008	9.646	Within Band	Pass
High Channell 740 MHz	8.992	9.641	Within Band	Pass

OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 5 MHz Bandwidth , QPSK Modulation , Low Channel 731.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.512	4.825	Within Band	Pass

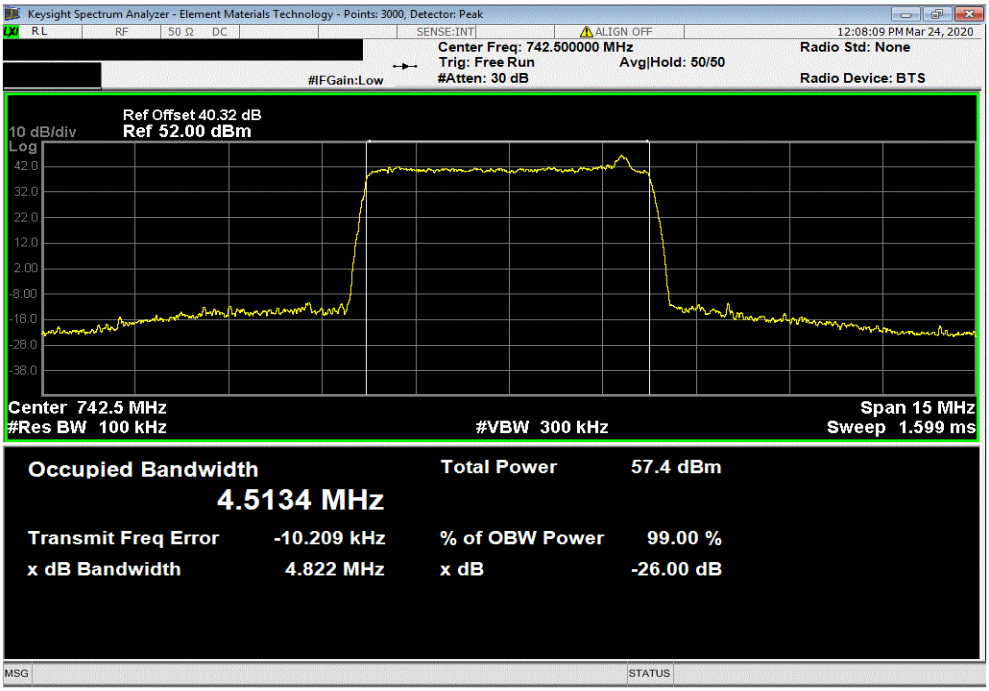


IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 5 MHz Bandwidth , QPSK Modulation , Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.506	4.821	Within Band	Pass

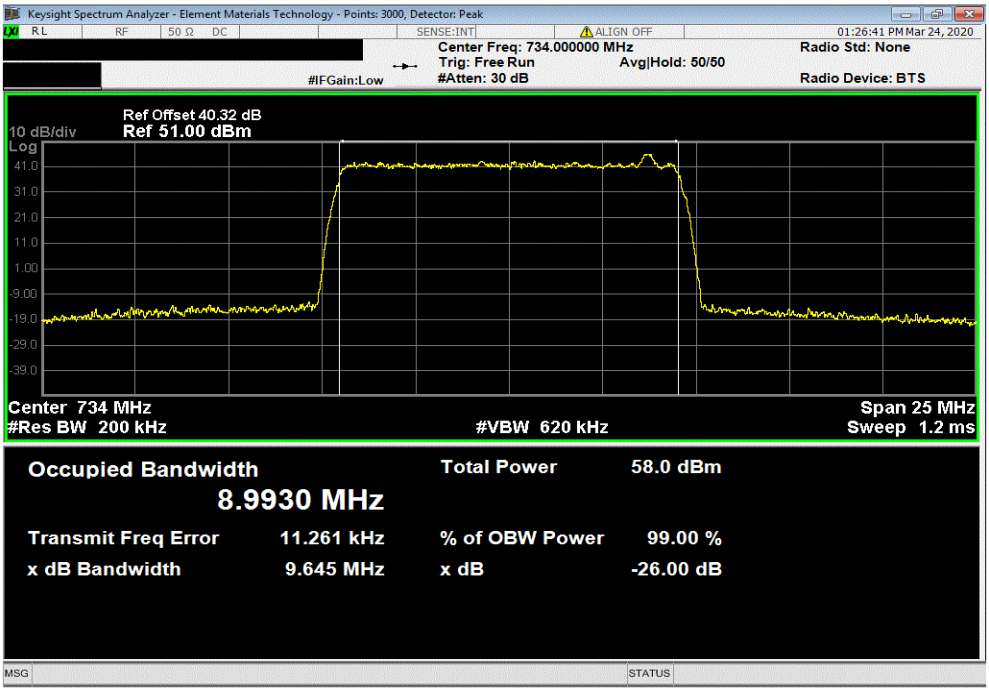


OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 5 MHz Bandwidth , QPSK Modulation , High Channell 742.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.513	4.822	Within Band	Pass

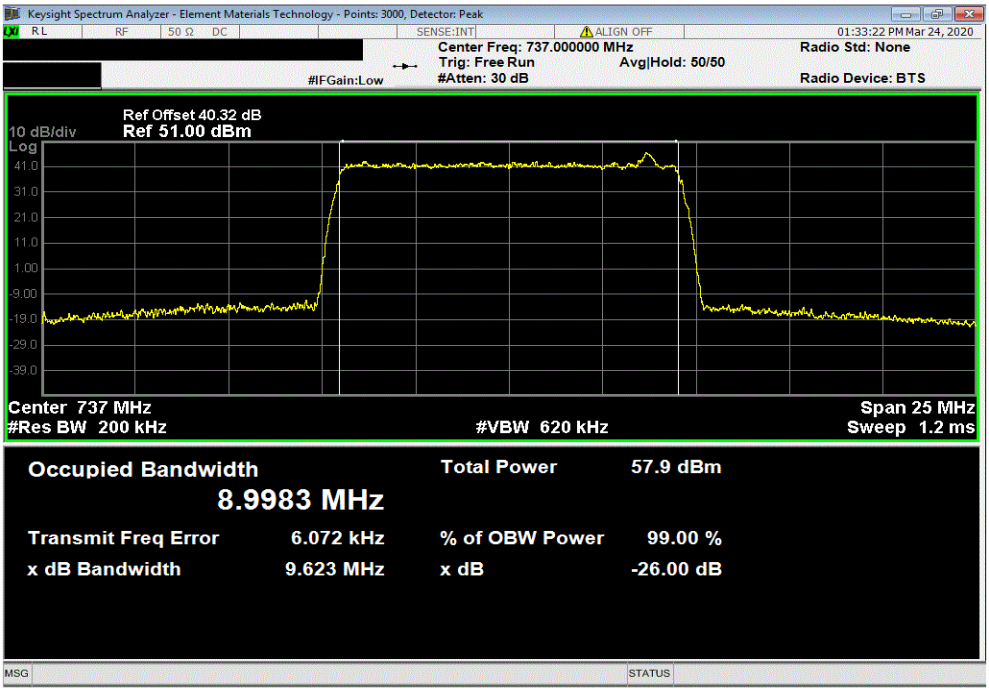


IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth , QPSK Modulation , Low Channel 734 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.993	9.645	Within Band	Pass

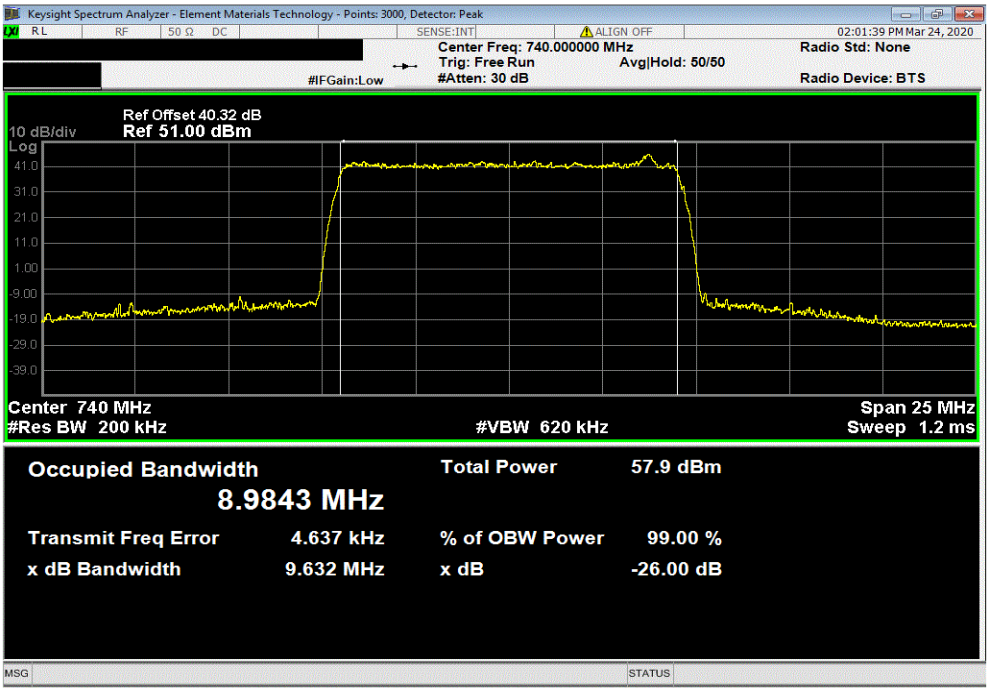


OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth , QPSK Modulation , Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.998	9.623	Within Band	Pass

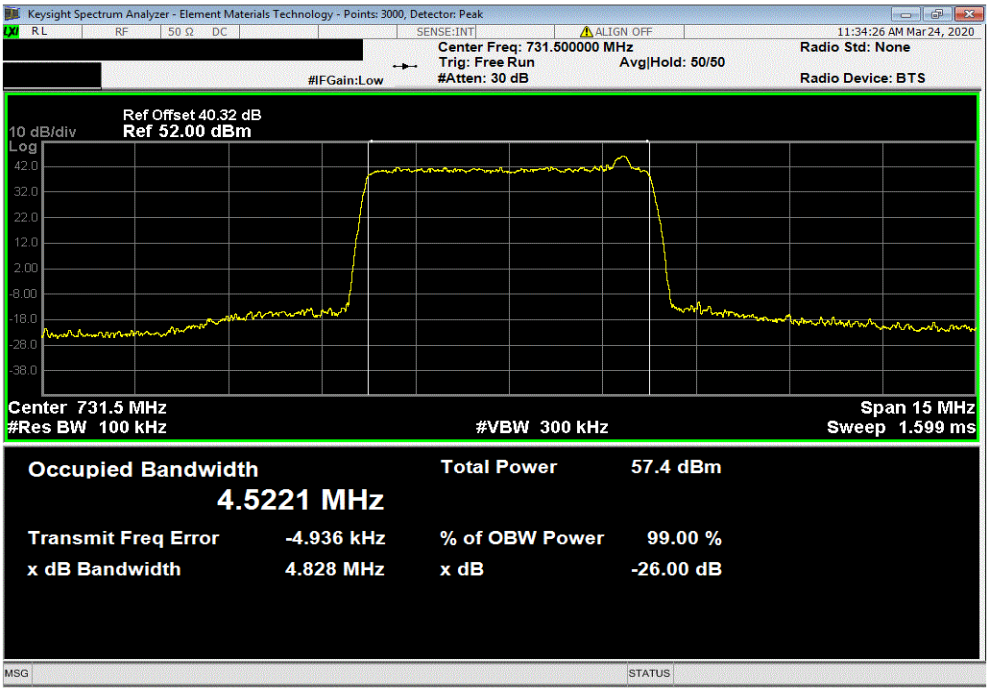


IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 1, 10 MHz Bandwidth , QPSK Modulation , High Channell 740 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.984	9.632	Within Band	Pass

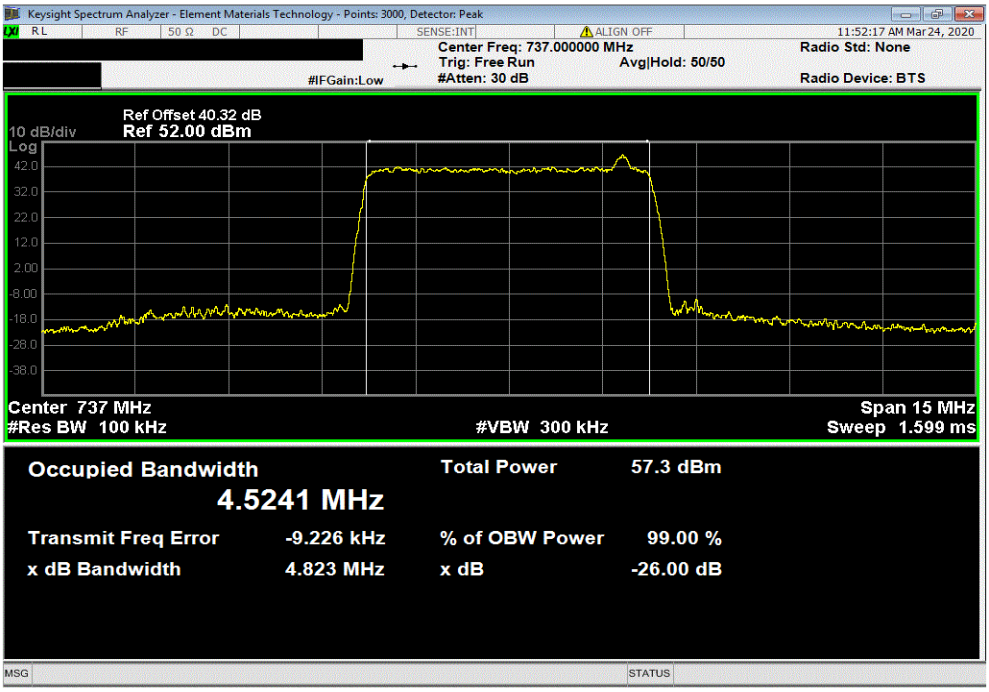


OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 5 MHz Bandwidth , QPSK Modulation , Low Channel 731.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.522	4.828	Within Band	Pass

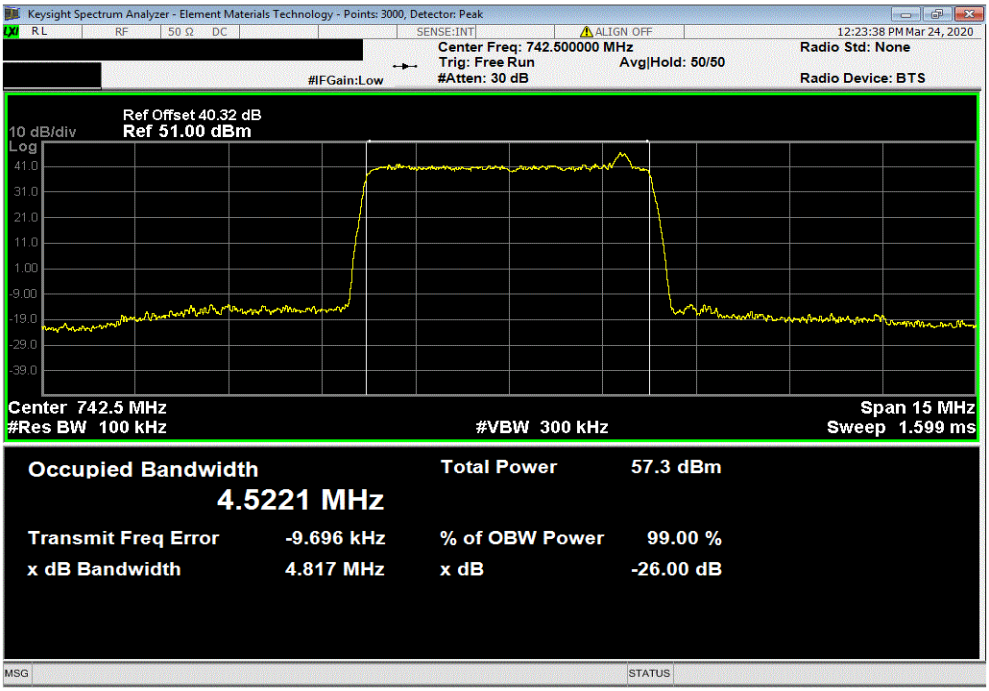


IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 5 MHz Bandwidth , QPSK Modulation , Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.524	4.823	Within Band	Pass

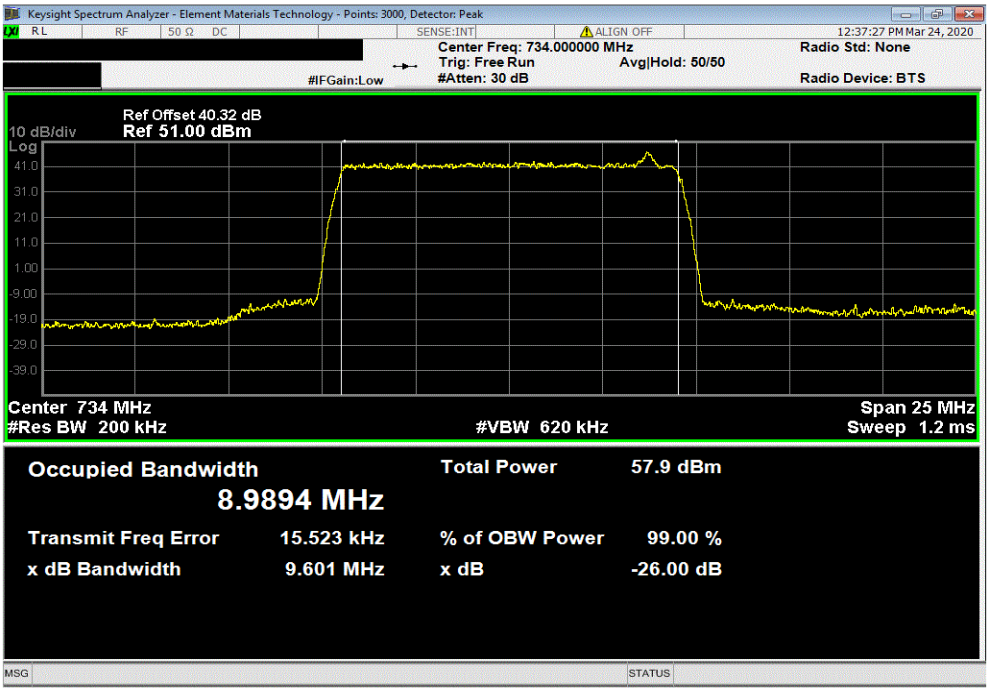


OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 5 MHz Bandwidth , QPSK Modulation , High Channell 742.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.522	4.817	Within Band	Pass

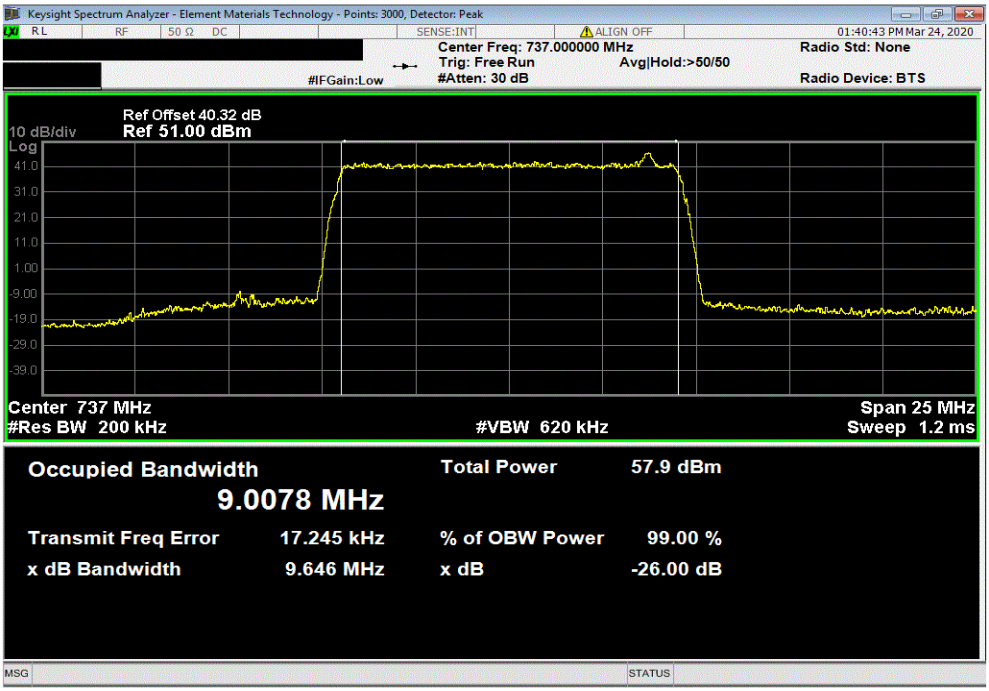


IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth , QPSK Modulation , Low Channel 734 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.989	9.601	Within Band	Pass



OCCUPIED BANDWIDTH LTE BAND 12 (INBAND)

IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth , QPSK Modulation , Mid Channel 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.008	9.646	Within Band	Pass



IOT NB, Band 12, 729 MHz - 745 MHz, LTE, Port 2, 10 MHz Bandwidth , QPSK Modulation , High Channell 740 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.992	9.641	Within Band	Pass