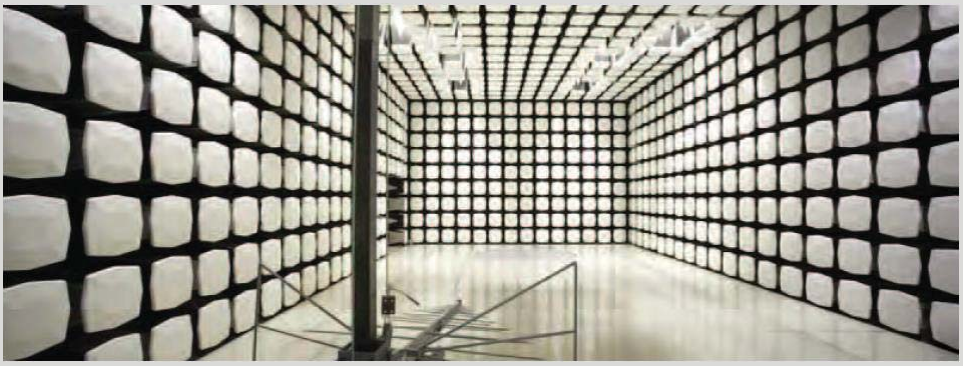
Radio Test Report
Application for Permissive Change of Equipment Authorization
FCC Part 27 Subpart C and IC RSS-130
617MHz – 652MHz
And
728MHz – 746MHz

FCC ID: VBNAHLOB-01
IC ID: 661W-AHLOB

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

Report: NOKI0043.0 Rev.1, Issue Date: August 24, 2022



ACCREDITED
CERT #3310.03

CERTIFICATE OF TEST

Last Date of Test: August 18, 2022
Nokia of America Corporation
EUT: Airscale Base Transceiver Station Remote Head Model AHLOB

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 and (CFR) Title 47 Part 27 Subpart C (Radio Standards Specification) RSS-Gen Issue 5: April 2018 RSS-130 Issue 2: February 2019	ANSI C63.26-2015 FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01

Results

Test Description	Applied	Results	Comments
Occupied Bandwidth	Yes	Pass	
Frequency Stability	No	N/A	Not requested when using pre-certified radio
Output Power	Yes	Pass	
Peak to Average Power (PAPR)CCDF	Yes	Pass	
Power Spectral Density	Yes	Pass	
Band Edge Compliance	Yes	Pass	
Spurious Conducted Emissions	Yes	Pass	
Spurious Radiated Emissions	No	N/A	Not requested when using pre-certified radio

Approved By:

Adam Bruno, Operations Manager

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

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated Test plots on data	2022-08-19	108, 109, 112, 113, 191, 192, 197
01	Replaced EIRP Calculation table	2022-08-19	194, 199

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

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

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

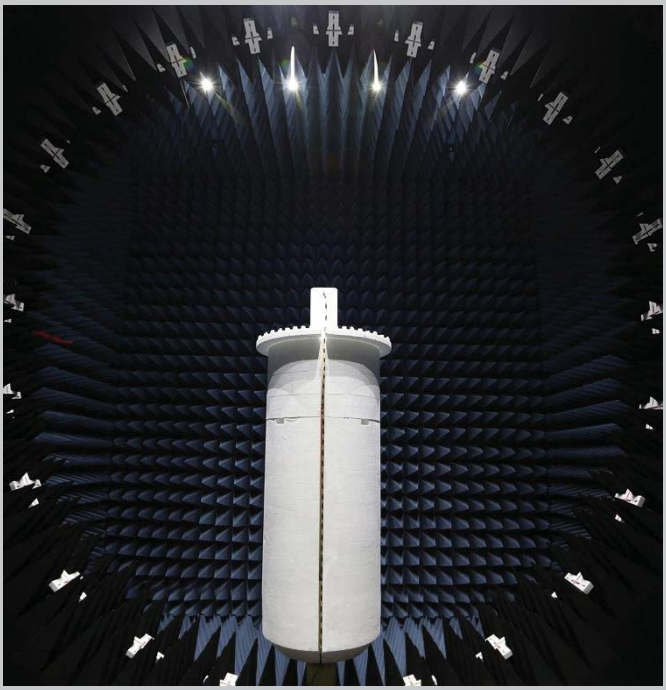
SCOPE

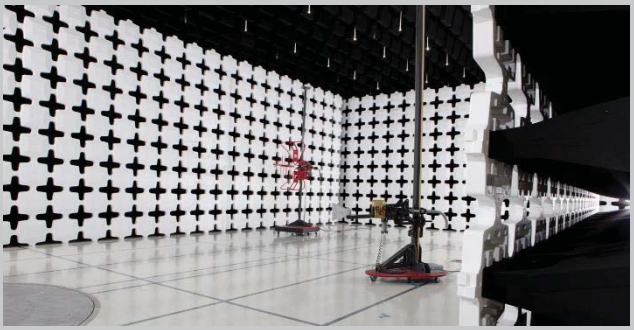
For details on the Scopes of our Accreditations, please visit:

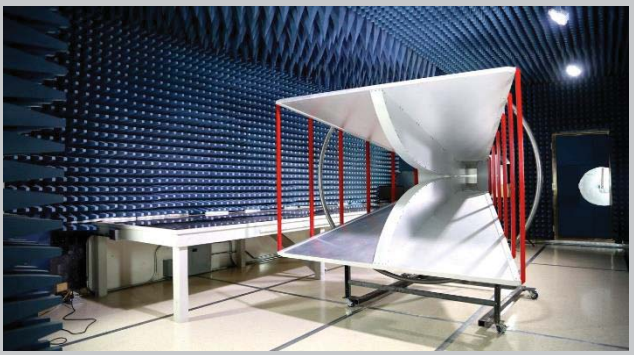
California Minnesota Oregon Texas Washington

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

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

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

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	3.1 dB	-3.1 dB

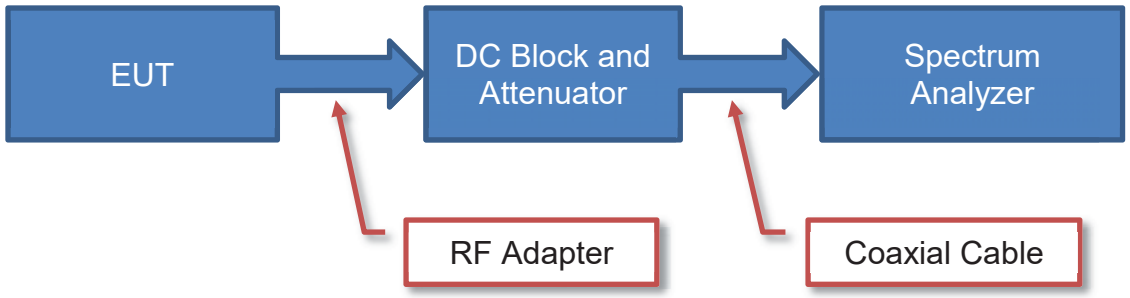
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

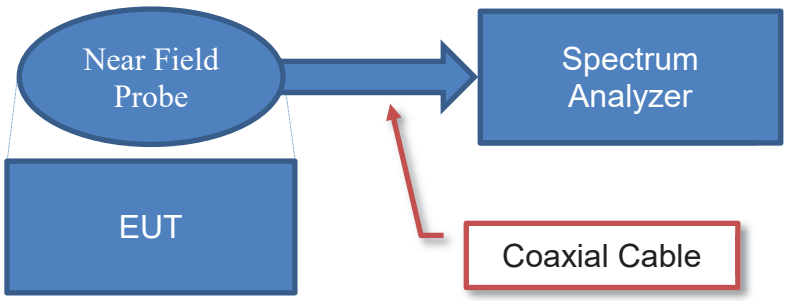
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

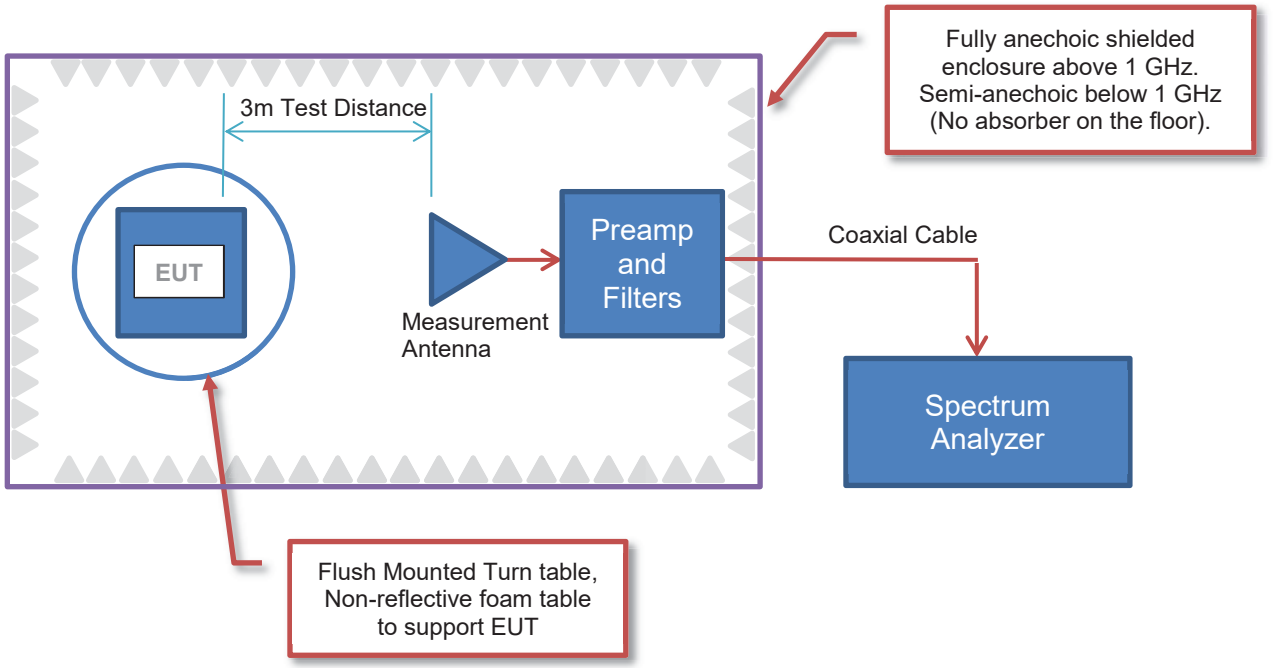


Sample Calculation (logarithmic units)

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

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)		Factor: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

Conducted Emissions:

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

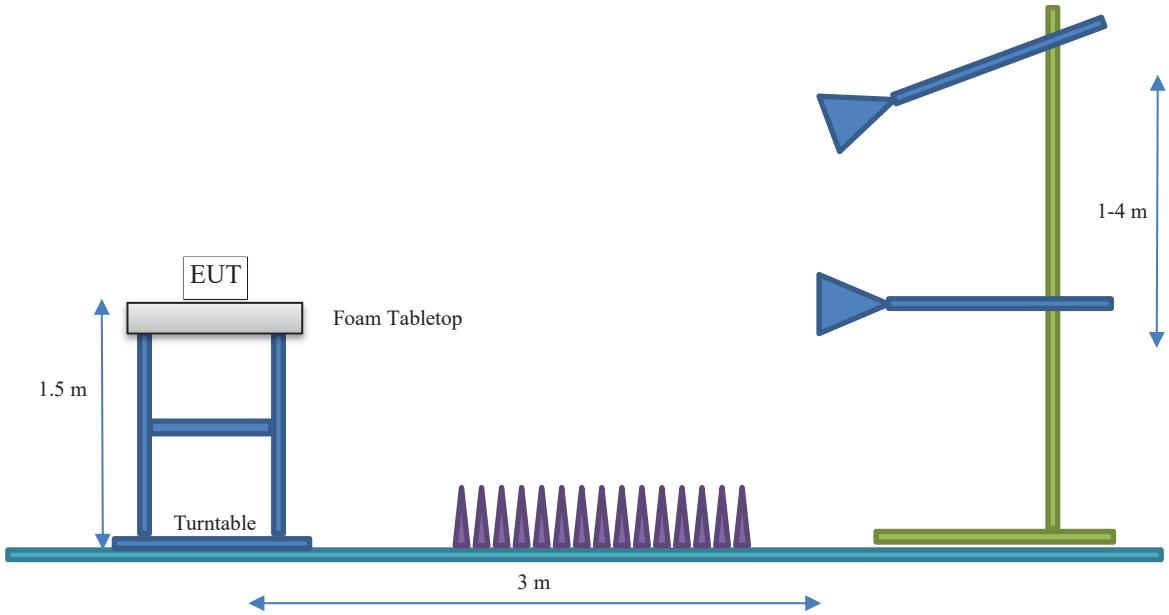
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)		Substitution Antenna Factor (dBi)		EIRP to ERP (if applicable)		Measured power (dBm ERP/EIRP)
10.0	+	6.0	-	2.15	=	**13.9/16.0**

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

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



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, TX 75019
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHLOB
First Date of Test:	July 11, 2022
Last Date of Test:	August 18, 2022
Receipt Date of Samples:	July 11, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

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

All conducted RF testing performed for the original certification testing has been repeated using 4G LTE carriers for this permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this permissive change test effort. Tests performed under the change effort include RF power, PSD, CCDF, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions.

The testing was performed on the same hardware version (AHLOB) and software version as the original certification test.

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

Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) variant AHLOB is being developed under this effort. The AHLOB remote radio head is a multi-standard multi-carrier radio module designed to support 4G LTE, 5G NR (new radio), narrow band IoT (internet of things) operations (in-band, guard band, standalone) and Dynamic Spectrum Sharing (DSS). **The scope of testing in this effort is for 4G LTE-FDD operations and 4G LTE narrow band IoT (guard band and standalone) operations.**

The AHLOB RRH has four transmit/four receive antenna ports (4TX/4RX for Band 71 and 4TX/4RX for Band 85). Each antenna port supports 3GPP frequency band 71 (BTS Rx: 663 to 698 MHz/BTS TX: 617 to 652 MHz) and 3GPP frequency band 85 (BTS Rx: 698 to 716 MHz/BTS TX: 728 to 746 MHz). The maximum RF output power of the RRH is 320 Watts (80 watts per antenna port shared between Band 71 and Band 85). The TX and RX instantaneous bandwidth cover the full operational bandwidth. Multi-carrier operation is supported. The maximum RF output power for single carriers are as follows.

Single Carrier Maximum RF Output Power per Port for each Channel Bandwidth				
NB IoT SA	LTE5 or NR5	LTE10 or NR10	LTE15 or NR15	LTE20 or NR20
20.0 Watts or 43.0 dBm	40.0 Watts or 46.0 dBm	60.0 Watts or 47.8 dBm	80.0 Watts or 49.0 dBm	80.0 Watts or 49.0 dBm

PRODUCT DESCRIPTION

The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The RRH supports 4G LTE bandwidths of 5, 10, 15, and 20MHz for 3GPP frequency band 71 operations. The RRH supports 4G LTE bandwidths of 5, 10, and 15MHz for 3GPP frequency band 85 operations. The RRH supports four LTE downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM).

The 4G LTE carriers/modulation types for this testing are setup according to 3GPP TS 36.141 E-UTRA Test Models (E-TM) as follows E-TM 1.1: (QPSK modulation type), E-TM 3.1: (64QAM modulation type), E-TM3.1a: (256QAM modulation type) and E-TM 3.2: (16QAM modulation type).

The 4G LTE modulation type for IoT testing is 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)". The Narrow band IoT Standalone (NB IoT SA) carrier operations support a 200kHz bandwidth. The Narrow Band Internet of Things Guard Band (NB IoT GB) carrier operations supports 10, 15, and 20MHz LTE bandwidths. The Narrow Band Internet of Things In-Band (NB IoT IB) carrier operations supports 5, 10, 15, and 20MHz LTE bandwidths.

Single carriers are tested at the bottom, middle and top channels provided in Band 71 and Band 85 frequency channel tables. Multicarrier testing is performed at maximum port/carrier power per KDB 971168 D03v01 guidance.

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

Multicarrier test cases:

Multi-Carrier Test Case 1): 3GPP Band 71 Multicarrier: In the Band71 _Three LTE5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (649.5MHz) at the upper band edge. The LTE5 channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 80 watts (~26.6W/Band 71 carriers). 3GPP Band 85 carrier is not enable.

Multi-Carrier Test Case 2): 3GPP Band 71 Multicarrier: In the Band 71 _One LTE 20MHz carrier and one LTE 15MHz carrier (with minimum spacing between carrier frequencies) at the lower band edge (627.0 & 644.5.0MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power for a total port power of 80 watts (~40W/Band 71 carriers). 3GPP Band 85 carrier is not enable.

Multi-Carrier Test Case 3): 3GPP Band 85 Multicarrier: In the Band 85 _Two LTE5 carriers using two carriers (with maximum spacing between carrier frequencies) at the lower band edge (730.5MHz) and a second carrier at maximum spacing at the upper band edge (743.5MHz). The LTE5 channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 80 watts (~40W/Band 85 carrier). 3GPP Band 71 carrier is not enable.

Multi-Carrier Test Case 4): 3GPP Band 71 and Band 85 Multicarrier Multiband: Three LTE5 carriers using two carriers (with minimum spacing between carrier frequencies) at the Band 71 lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (743.5MHz) at the Band 85 upper band edge. The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers were operated at maximum power (~26.6W/ Band 71 carrier and ~26.6W Band 85 carrier) for a total port power of 80 watts.

AHLOB 3GPP frequency band 71 LTE Downlink Band Edge EARFCNs

The 3GPP frequency band 71 (617 to 652 MHz) band edge downlink (BTS Transmit) EARFCNs for LTE channel bandwidths (5, 10, 15 and 20 MHz) are provided in table below. The NB IoT SA carrier channel bandwidth is 200kHz. The EARFCN is defined as E-UTRA Absolute Radio Frequency Channel Number. The channel spacing is 100 kHz between channel numbers. The formula for 4G LTE EARFCN is described in 3GPP TS 36.104 chapter 5.7.3.

	Downlink EARFCN	Downlink Frequency (MHz)		LTE Channel Bandwidth			
			IoT SA 200kHz	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	Band Edge
	.....						
	68588	617.2	Bottom Ch				
	.....						
	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	Middle Ch
	.....						
	68836	642.0					Top Channel
	.....						
	68861	644.5				Top Channel	
	.....						
	68886	647.0			Top Channel		
	.....						
	68911	649.5		Top Channel			
	.....						
	68934	651.8	Top Channel				
	.....						
	68936	652.0	Band Edge	Band Edge	Band Edge	Band Edge	Band Edge

AHLOB LTE Downlink Band Edge Band 71 Frequency Channels

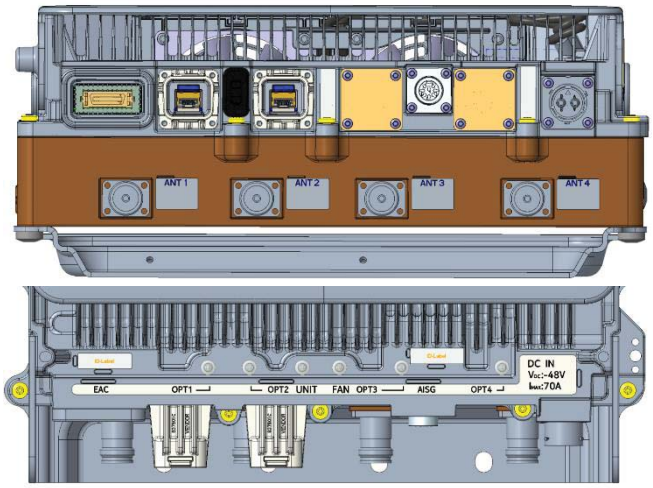
AHLOB 3GPP Frequency Band 85 LTE Downlink Band Edge EARFCNs

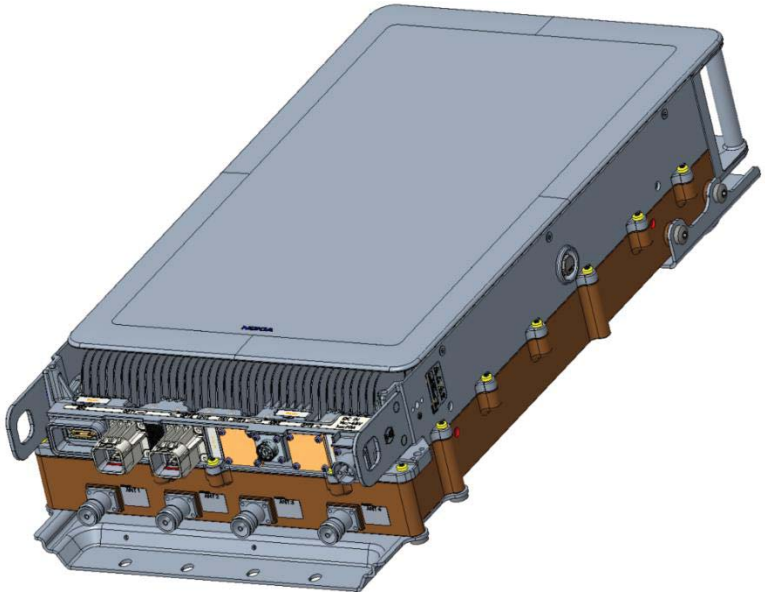
The 3GPP frequency band 85 (728 - 746 MHz) band edge downlink (BTS Transmit) EARFCNs for LTE channel bandwidths (5 , 10 and 15 MHz) are provided in table below. for the AHLOB. The NB IoT SA carrier channel bandwidth is 200kHz. The EARFCN is defined as E-UTRA Absolute Radio Frequency Channel Number. The channel spacing is 100 kHz between channel numbers. The formula for 4G LTE EARFCN is described in 3GPP TS 36.104 chapter 5.7.3.

	Downlink EARFCN	Downlink Frequency (MHz)		LTE Channel Bandwidth		
			IoT SA 200kHz	5 MHz	10 MHz	15 MHz
Band 85 (Ant 1, 2, 3, 4)	70366	728.0	Band Edge	Band Edge	Band Edge	Band Edge
	……					
	70368	728.2	Bottom Ch			
	……					
	70391	730.5		Bottom Ch		
	……					
	70416	733.0			Bottom Ch	
	……					
	70441	735.5				Bottom Ch
	……					
	70456	737.0	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	……					
	70471	738.5				Top Channel
	……					
	70496	741.0			Top Channel	
	……					
	70521	743.5		Top Channel		
	……					
	70544	745.8	Top Channel			
	……					
	70546	746.0	Band Edge	Band Edge	Band Edge	Band Edge

AHLOB LTE Downlink Band Edge Band 85 Frequency Channels

AHLOB Connector Layout:





AHLOB External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Quick Disconnect	2-pole Power Input Terminal
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	4	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
Unit	1	LED	Unit Status LED
EAC	1	MDR26	External Alarm Interface (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
Fan	1	Molex Microfit	Power for RRH Fan. Located on the side of RRH.

Testing Objective:

A permissive change on the original filing is being pursued to add 4G LTE and NB IoT operations to the Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) model AHLOB FCC and ISED radio certifications.

EUT & Equipment List

element
2018-07-17

Test Configuration 1 RF Conducted Emissions

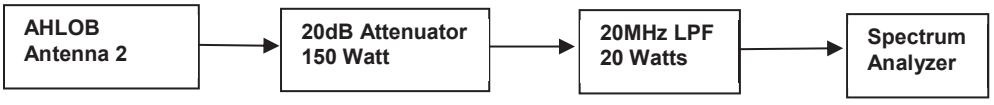
Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R4)	SBTS22R4_ENB_9999_220607_000006
RF_SW	RF.FRM6.trunk.20220602.020

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIA (BTS System Module)	Nokia Solutions and Networks	473095A.101	AH173111443
ABIA (BTS Baseband Module)	Nokia Solutions and Networks	473096A.103	L1164126378
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
20MHz Low Pass Filter/20 Watt	Microwave Circuits, Inc.	VLFX-80+	15542
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023004CF
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023003TA
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007170
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV065
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	3 meters	N	ABIA	AHLOB
Cat-5e Cable	Y	7 meters	N	ASIA	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 2-4	250W -50ohm - Loads

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHLOB] Ant port #1	Attenuator 150W/20dB
Attenuator 150W/20dB	N	N/A	N	RF cable HS-SUCOFLEX_106	Low Pass Filter 20MHz/20W
Low Pass Filter 20MHz/20W	N	N/A	N	Attenuator 150W/20dB	HS SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 20MHz/20W	Analyzer

RF Test Setup Diagram:



EUT & Equipment List

Test Configuration 2 RF Conducted Emissions

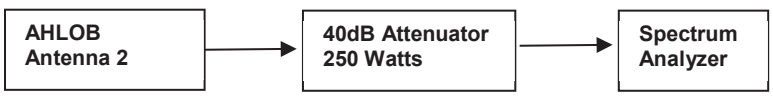
Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R4)	SBTS22R4_ENB_9999_220607_000006
RF_SW	RF.FRM6.TRUNK.20220602.020

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIA (BTS System Module)	Nokia Solutions and Networks	473095A.101	AH173111443
ABIA (BTS Baseband Module)	Nokia Solutions and Networks	473096A.103	L1164126378
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
Attenuator 40dB/250 Watts	API Weinschel	58-40-43-LMI	TC909
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023004CF
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023003TA
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007170
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV065
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	3 meters	N	ABIA	AHLOB
Cat-5e Cable	Y	7 meters	N	ASIA	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 1,3,4	250W -50ohm -Loads

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

RF Test Setup Diagram:



EUT & Equipment List

Test Configuration 3 RF Conducted Emissions

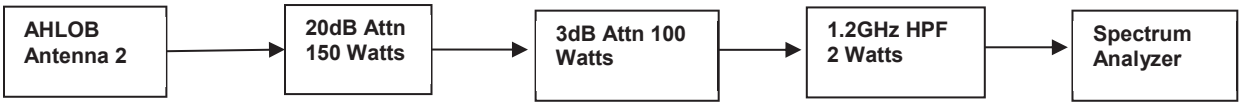
Software/Firmware Running during test	
Description	**Version**
BTS Software Version (22R4)	SBTS22R4_ENB_9999_220607_000006
RF_SW	RF.FRM6.TRUNK.20220602.020

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	RK182307104
ASIA (BTS System Module)	Nokia Solutions and Networks	473095A.101	AH173111443
ABIA (BTS Baseband Module)	Nokia Solutions and Networks	473096A.103	L1164126378
AHLOB (Radio Module Model)	Nokia Solutions and Networks	475910A.101	YK220900029
1.2 GHz HPF 2 Watts	Micro-Tronic	HPM11692	002
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
Attenuator 100W/3dB	Aeroflex Weinschel	47-3-33	CG5493
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023004CF
SFP+ 9.8G,300M,850NM	Nokia	474900A.101	VF2023003TA
Lenovo T470	HP	T470	N-20HEPF17B91U
Keysight- DC System power supply	Keysight	N8757A	US21D4053S
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007170
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297388
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297386
2 Meter RF cable (Load Cable)	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297389
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV065
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC864
Cat-5e cable	CSA	LL73189	E151955
Fiber Optic cable 2m	Amphenol Fiber Optic	VZ1701	995741A
2 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297372
1 Meter RF cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	3 meters	N	ABIA	AHLOB
Cat-5e Cable	Y	7 meters	N	ASIA	WebEM- PC
HS-SUCOFLEX_106 – RF CABLES	Y	2 meters	N	EUT [AHLOB] Ant ports 1,3,4	250W -50ohm - Loads

Cables, Filters, Attenuators					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AHLOB] Ant port #2	Attenuator 150W/20dB
Attenuator 150W/20dB	N	NA	N	HS-SUCOFLEX_106	Attenuator 100W/3dB
Attenuator 100W/3dB	N	NA	N	Attenuator 150W/20dB	1.2GHz HPF 2Watts
1.2GHz HPF 2Watts	N	NA	N	Attenuator 100W/3dB	HS-SUCOFLEX_104
HS-SUCOFLEX_104	N	1 meter	N	1.2GHz HPF 2 Watts	Spectrum Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-07-11	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2022-07-13	Peak to Average Power (PAPR)CCDF	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2022-07-13	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.
4	2022-07-14	Spurious Conducted 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.
5	2022-08-19	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.
6	2022-08-19	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH - Band 71 LTE

XMit 2022.02.07.0

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
Block - DC	Fairview Microwave	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOB) as the original certification test. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 27.53 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band 71 LTE Carriers (617MHz to 652MHz)									
Ch BW	Radio Channel	LTE: QPSK		LTE: 16QAM		LTE: 64QAM		LTE: 256QAM	
		FCC	ISED	FCC	ISED	FCC	ISED	FCC	ISED
5MHz	Low							4M88F9W	4M51F9W
	Mid	4M90F9W	4M51F9W	4M83F9W	4M49F9W	4M84F9W	4M50F9W	4M87F9W	4M51F9W
	High							4M88F9W	4M51F9W
10MHz	Low							9M67F9W	8M98F9W
	Mid	9M66F9W	8M98F9W	9M63F9W	8M99F9W	9M59F9W	8M98F9W	9M64F9W	8M99F9W
	High							9M65F9W	8M97F9W
15MHz	Low							14M3F9W	13M4F9W
	Mid	14M4F9W	13M5F9W	14M3F9W	13M5F9W	14M4F9W	13M5F9W	14M4F9W	13M4F9W
	High							14M5F9W	13M4F9W
20MHz	Low							19M1F9W	17M9F9W
	Mid	19M1F9W	17M9F9W	19M1F9W	17M9F9W	18M9F9W	17M8F9W	19M1 F9W	17M9F9W
	High							18M8F9W	17M9F9W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.									

OCCUPIED BANDWIDTH - Band 71 LTE

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			**Work Order:**	NOKI0043
Serial Number:	YK220900029			**Date:**	11-Jul-22
Customer:	Nokia Solutions and Networks			**Temperature:**	20.9 °C
Attendees:	Mitchell Hill, John Rattanavong			**Humidity:**	59.2% RH
Project:	None			**Barometric Pres.:**	1015 mbar
Tested by:	Marty Martin	**Power:**	54 VDC	**Job Site:**	TX07

TEST SPECIFICATIONS	**Test Method**
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

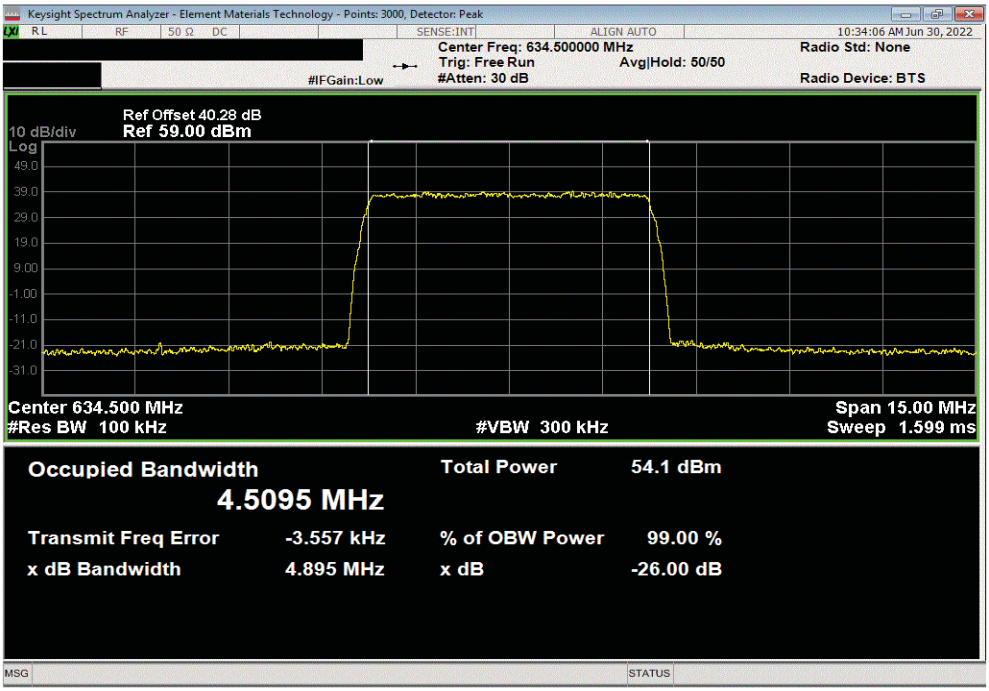
None

Configuration #	2	*Signature* Marty Martin

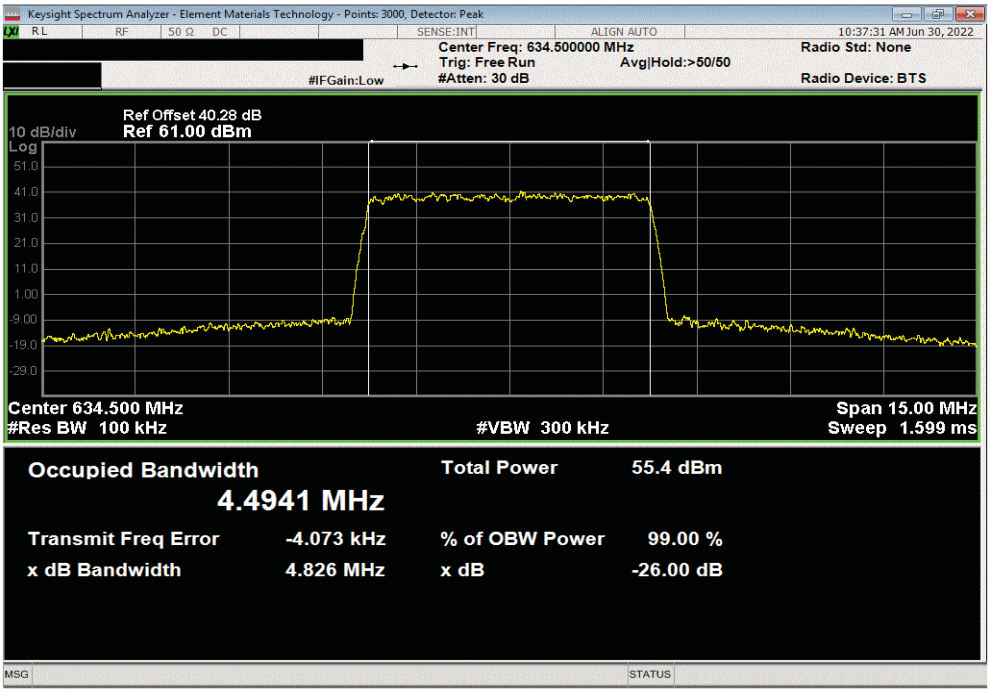
	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 2, LTE, Band 71, 617 MHz - 652 MHz				
5 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 634.5 MHz	4.51 MHz	4.895 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 634.5 MHz	4.494 MHz	4.826 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 634.5 MHz	4.499 MHz	4.844 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 619.5 MHz	4.511 MHz	4.877 MHz	Within Band	Pass
Mid Ch. 634.5 MHz	4.51 MHz	4.87 MHz	Within Band	Pass
High Ch. 649.5 MHz	4.507 MHz	4.878 MHz	Within Band	Pass
10 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 634.5 MHz	8.983 MHz	9.661 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 634.5 MHz	8.991 MHz	9.63 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 634.5 MHz	8.981 MHz	9.594 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 622 MHz	8.976 MHz	9.665 MHz	Within Band	Pass
Mid Ch. 634.5 MHz	8.987 MHz	9.642 MHz	Within Band	Pass
High Ch. 647 MHz	8.971 MHz	9.648 MHz	Within Band	Pass
15 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 634.5 MHz	13.459 MHz	14.378 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 634.5 MHz	13.47 MHz	14.301 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 634.5 MHz	13.453 MHz	14.405 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 624.5 MHz	13.413 MHz	14.286 MHz	Within Band	Pass
Mid Ch. 634.5 MHz	13.445 MHz	14.401 MHz	Within Band	Pass
High Ch. 644.5 MHz	13.442 MHz	14.528 MHz	Within Band	Pass
20 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 634.5 MHz	17.9 MHz	19.126 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 634.5 MHz	17.901 MHz	19.119 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 634.5 MHz	17.844 MHz	18.907 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 627 MHz	17.875 MHz	19.113 MHz	Within Band	Pass
Mid Ch. 634.5 MHz	17.852 MHz	19.107 MHz	Within Band	Pass
High Ch. 642 MHz	17.855 MHz	18.822 MHz	Within Band	Pass

OCCUPIED BANDWIDTH - Band 71 LTE

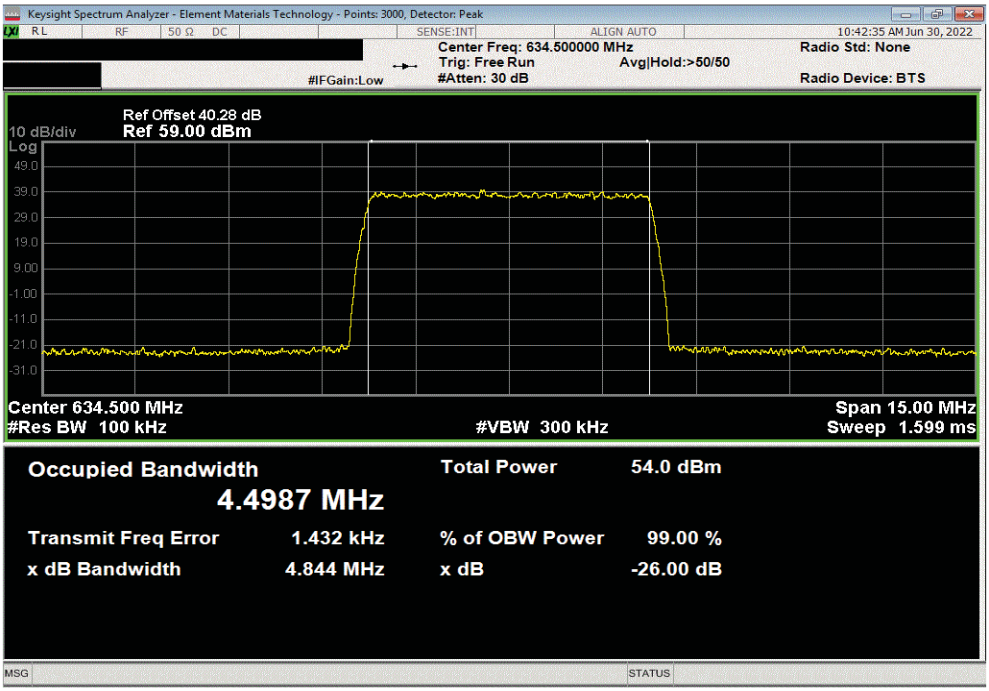
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.51 MHz	4.895 MHz	Within Band	Pass



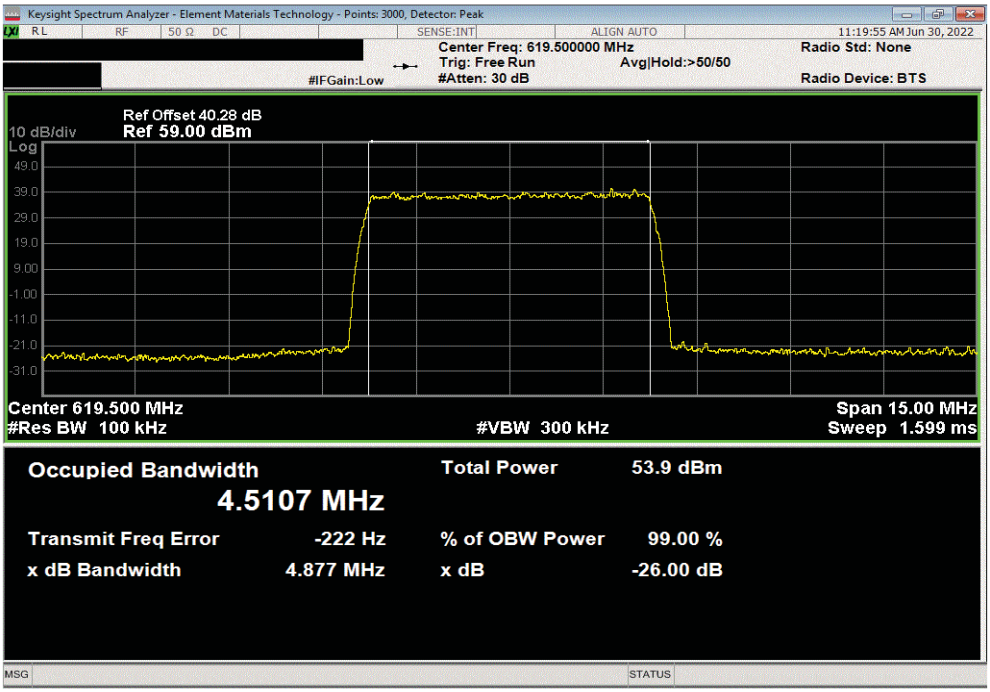
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.494 MHz	4.826 MHz	Within Band	Pass



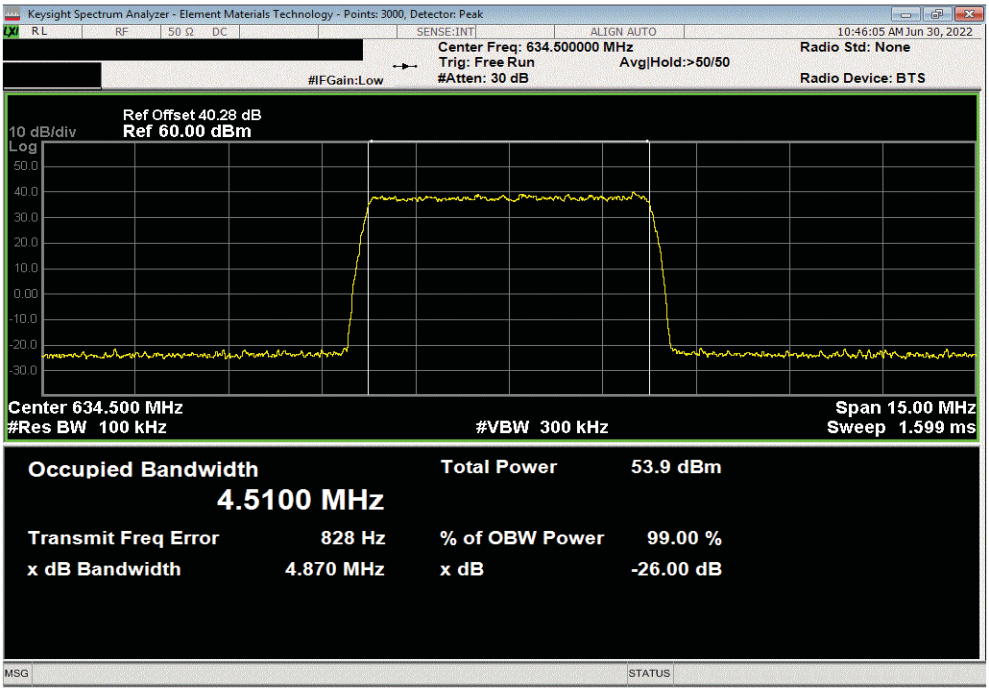
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.499 MHz	4.844 MHz	Within Band	Pass



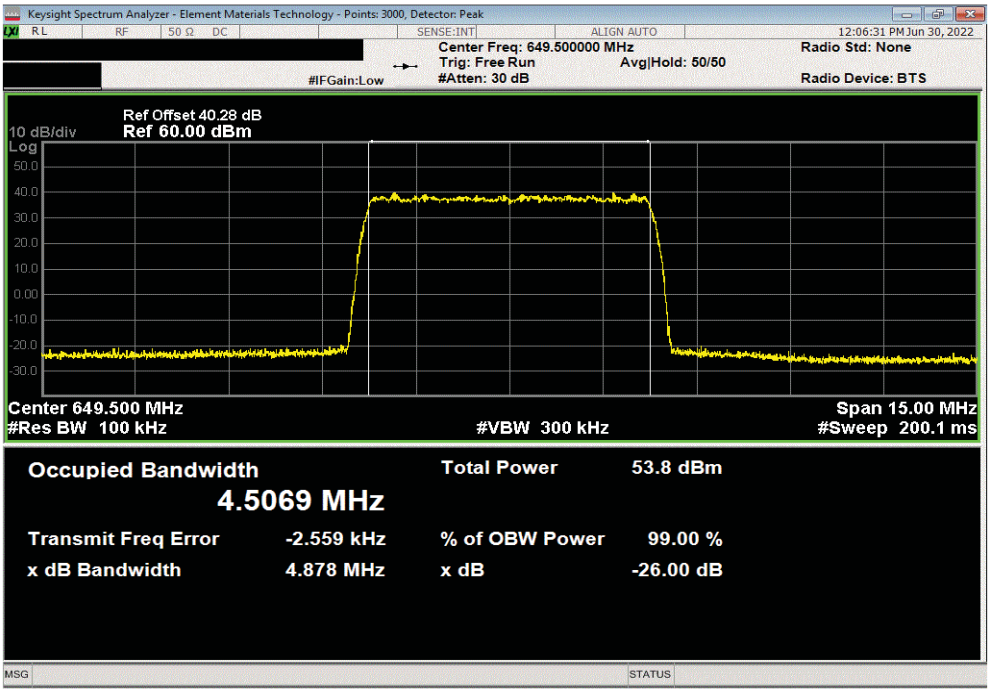
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 619.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.511 MHz	4.877 MHz	Within Band	Pass



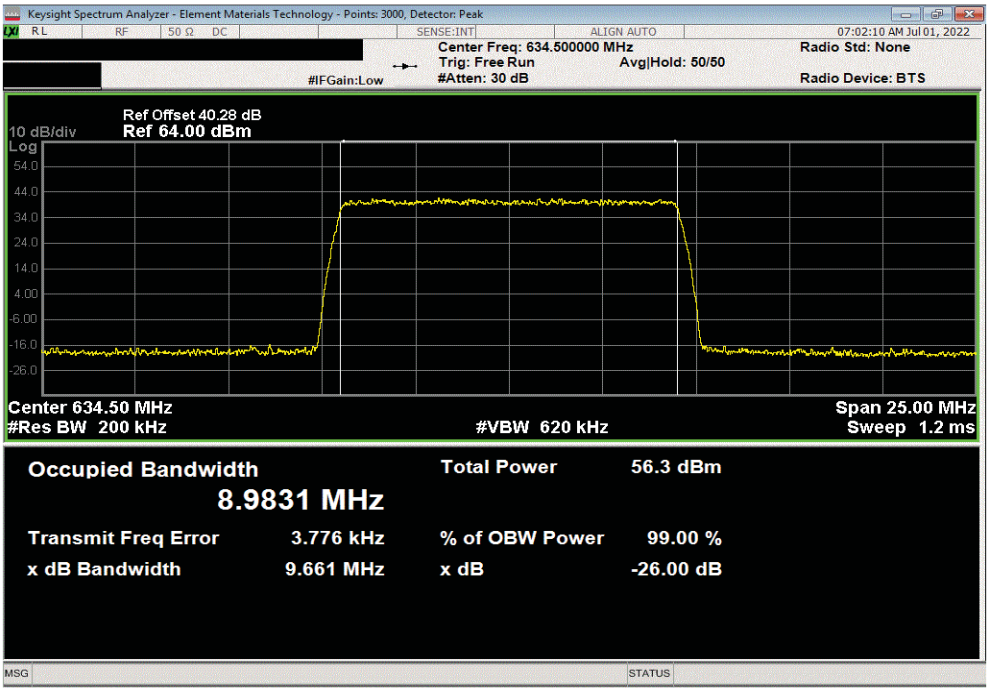
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.51 MHz	4.87 MHz	Within Band	Pass



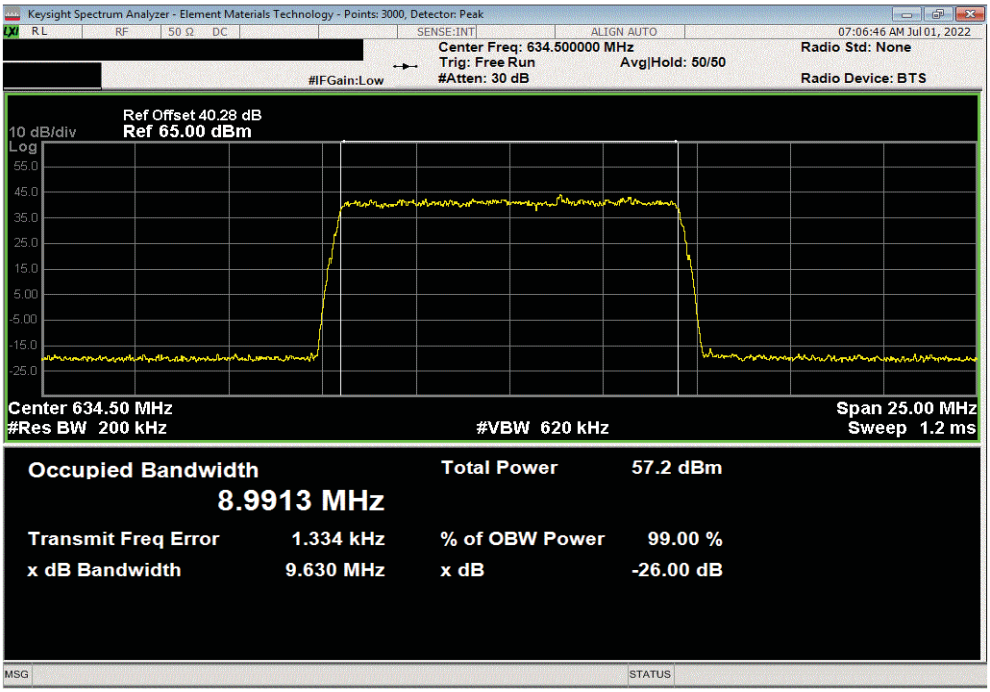
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 649.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.507 MHz	4.878 MHz	Within Band	Pass



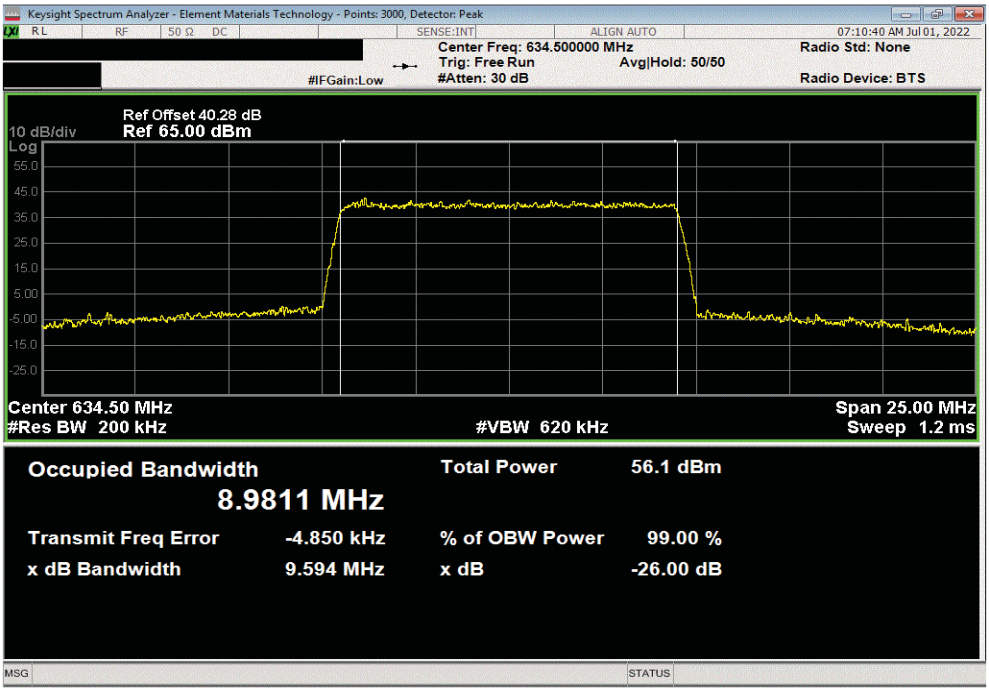
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.983 MHz	9.661 MHz	Within Band	Pass



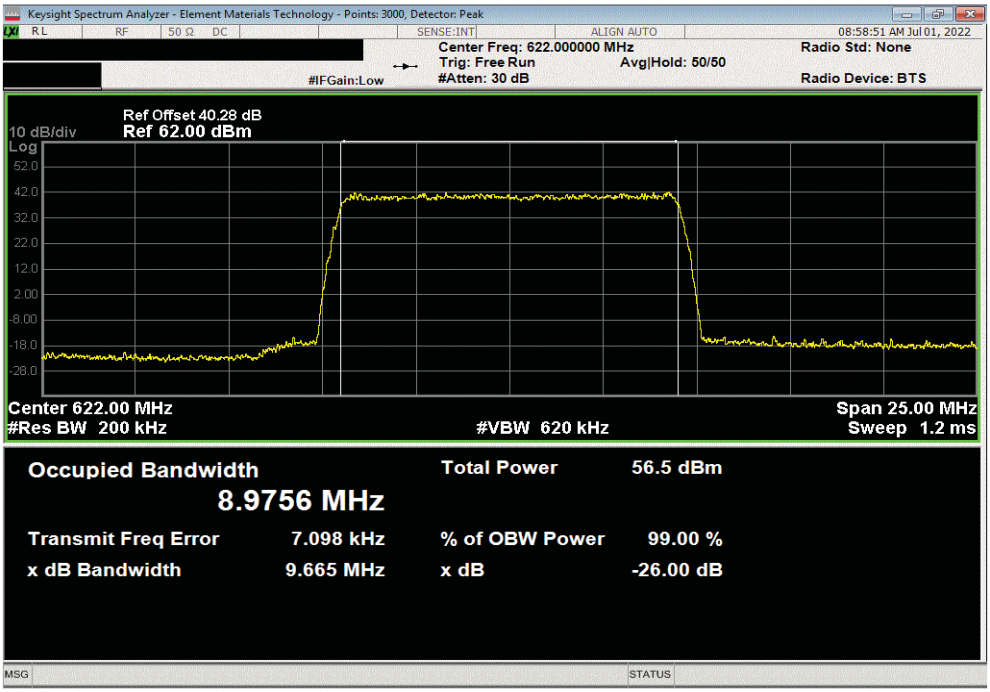
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.991 MHz	9.63 MHz	Within Band	Pass



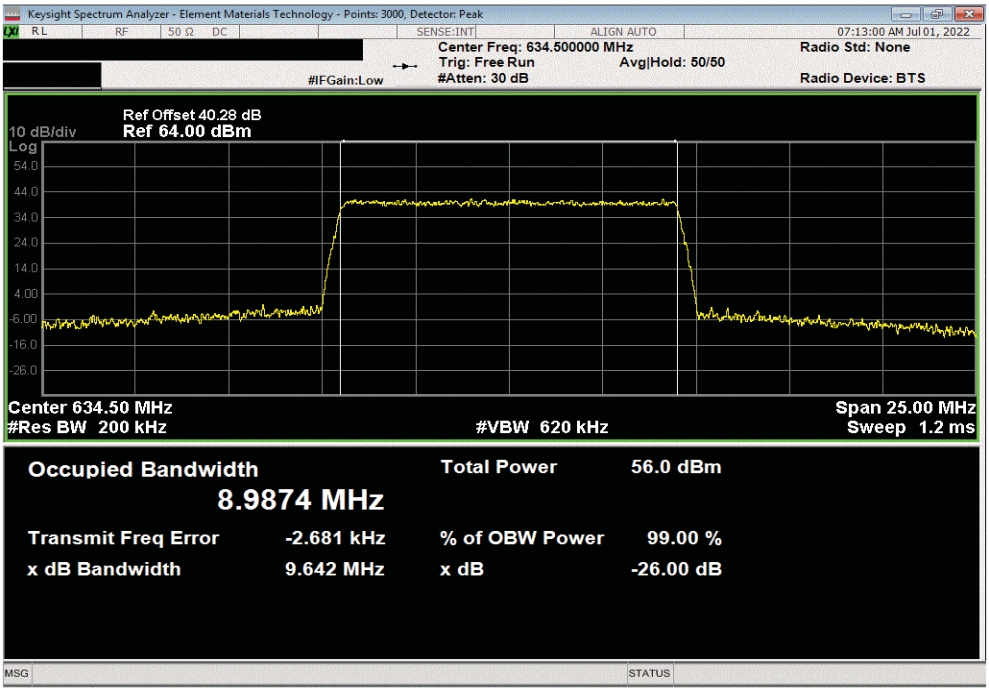
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.981 MHz	9.594 MHz	Within Band	Pass



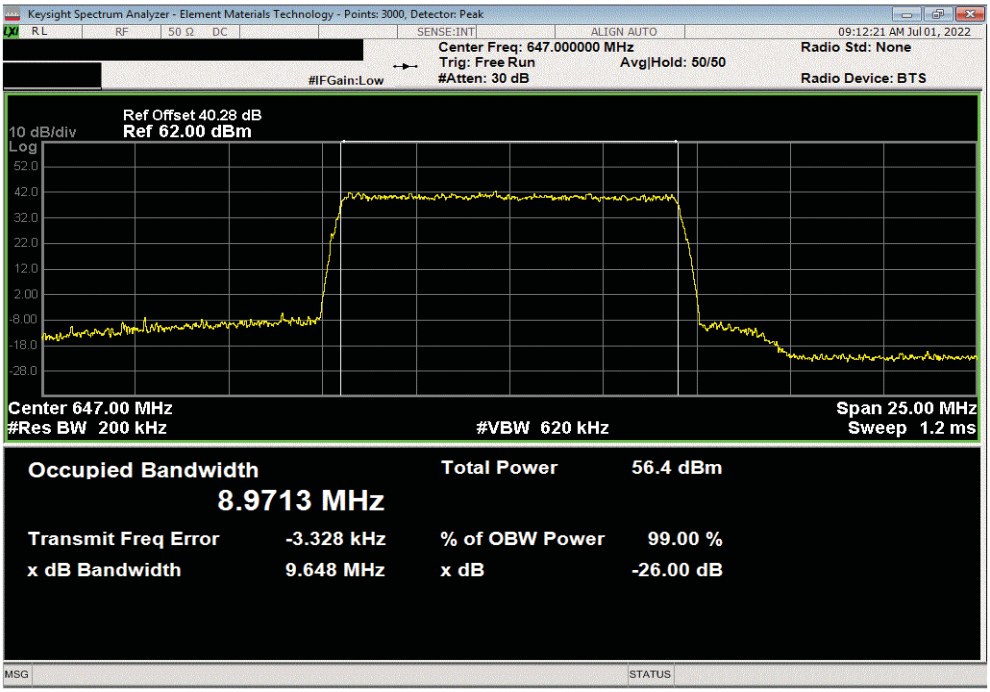
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 622 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.976 MHz	9.665 MHz	Within Band	Pass



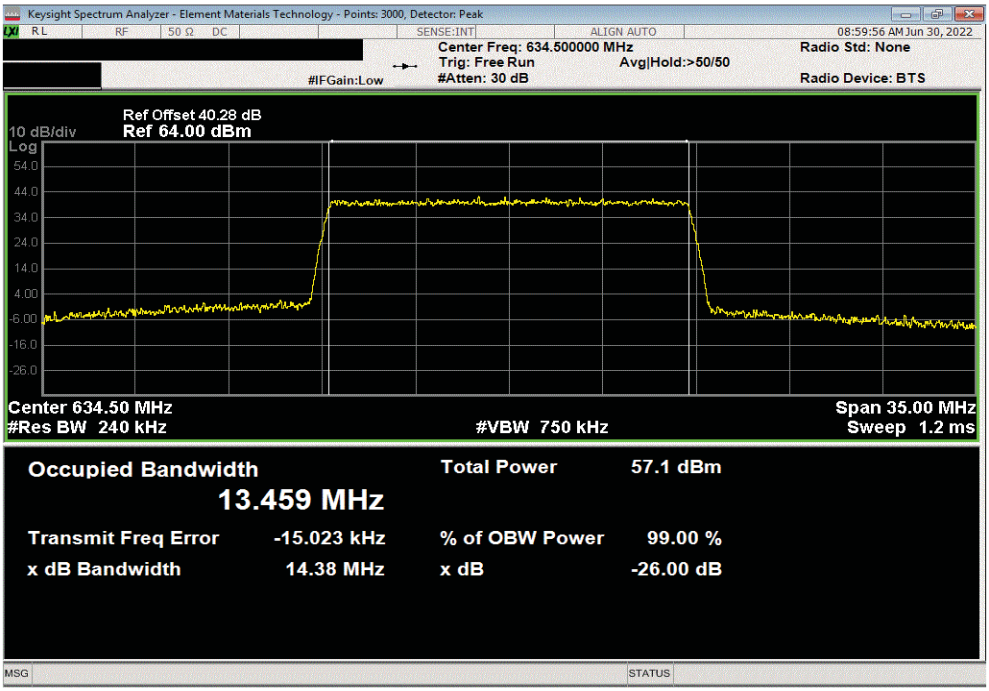
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.987 MHz	9.642 MHz	Within Band	Pass



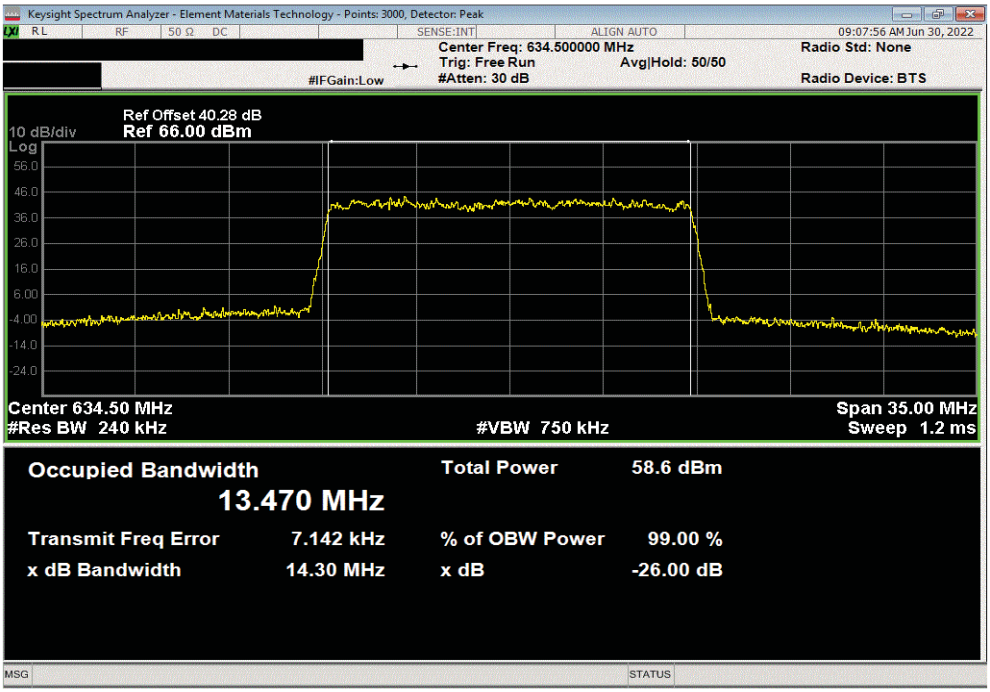
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 647 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.971 MHz	9.648 MHz	Within Band	Pass



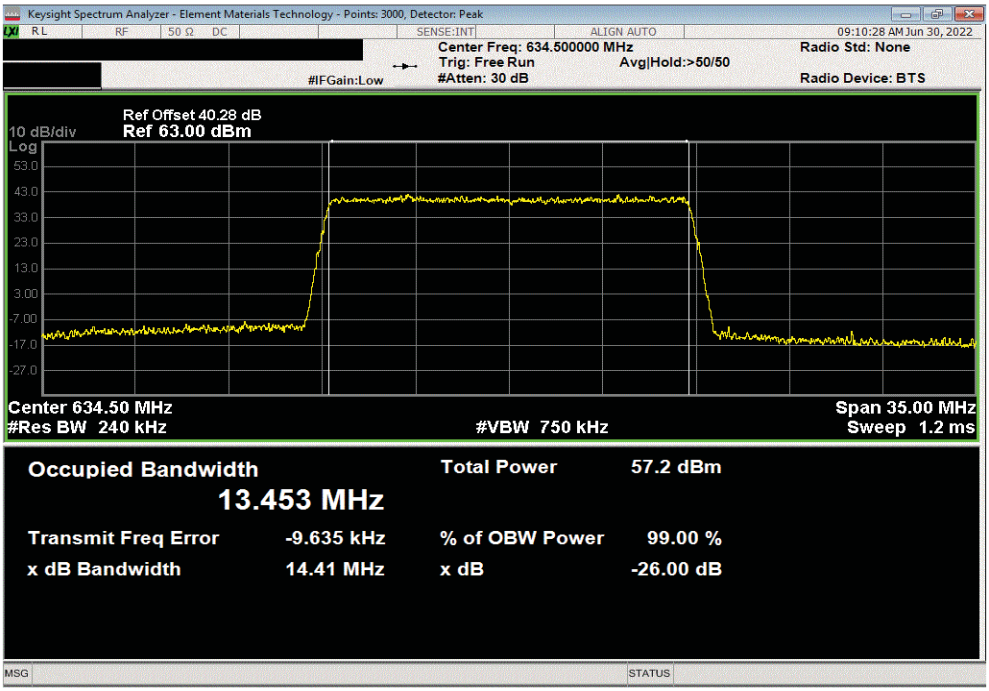
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.459 MHz	14.378 MHz	Within Band	Pass



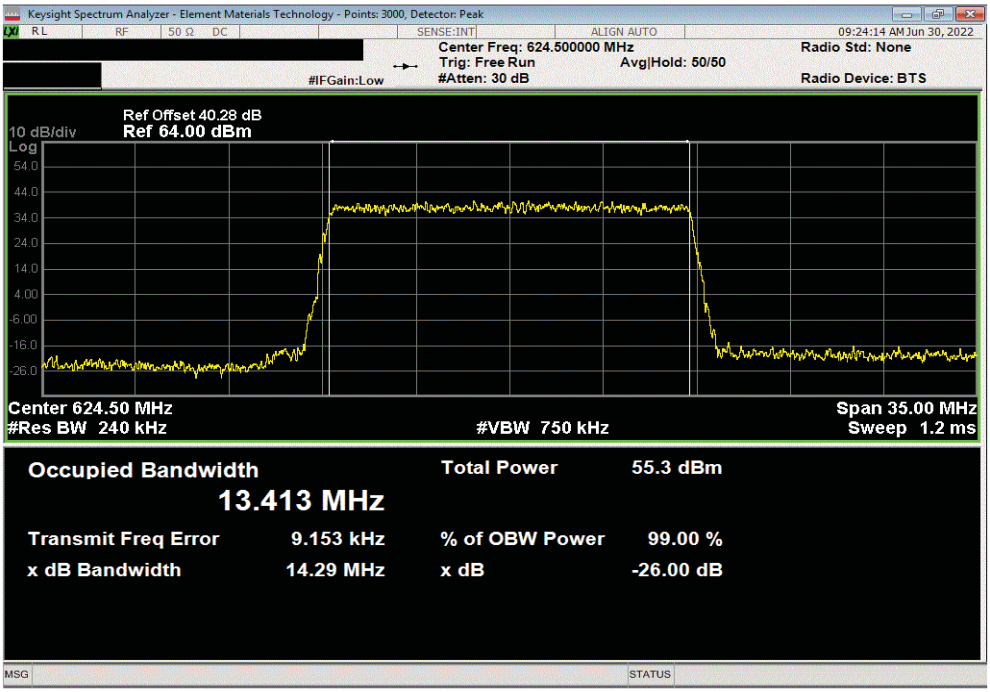
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.47 MHz	14.301 MHz	Within Band	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.453 MHz	14.405 MHz	Within Band	Pass

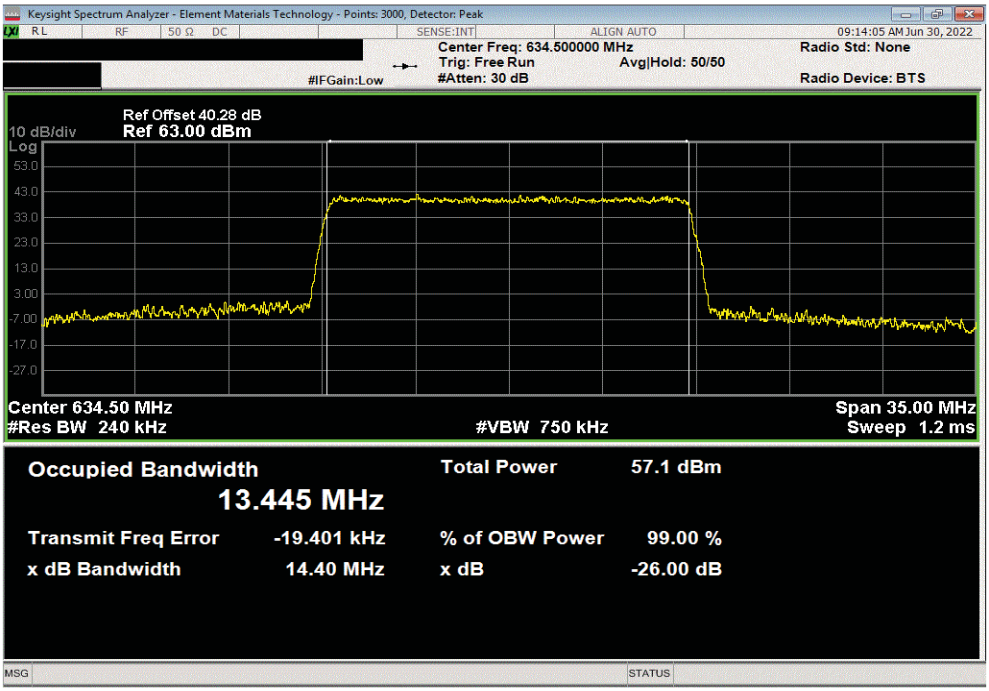


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 624.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.413 MHz	14.286 MHz	Within Band	Pass

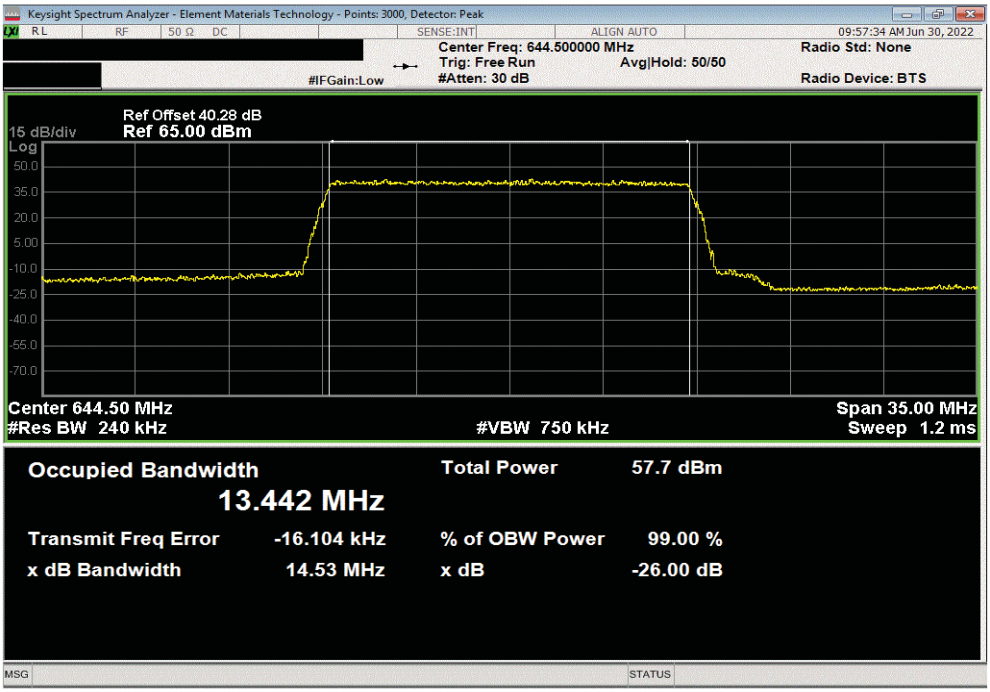


OCCUPIED BANDWIDTH - Band 71 LTE

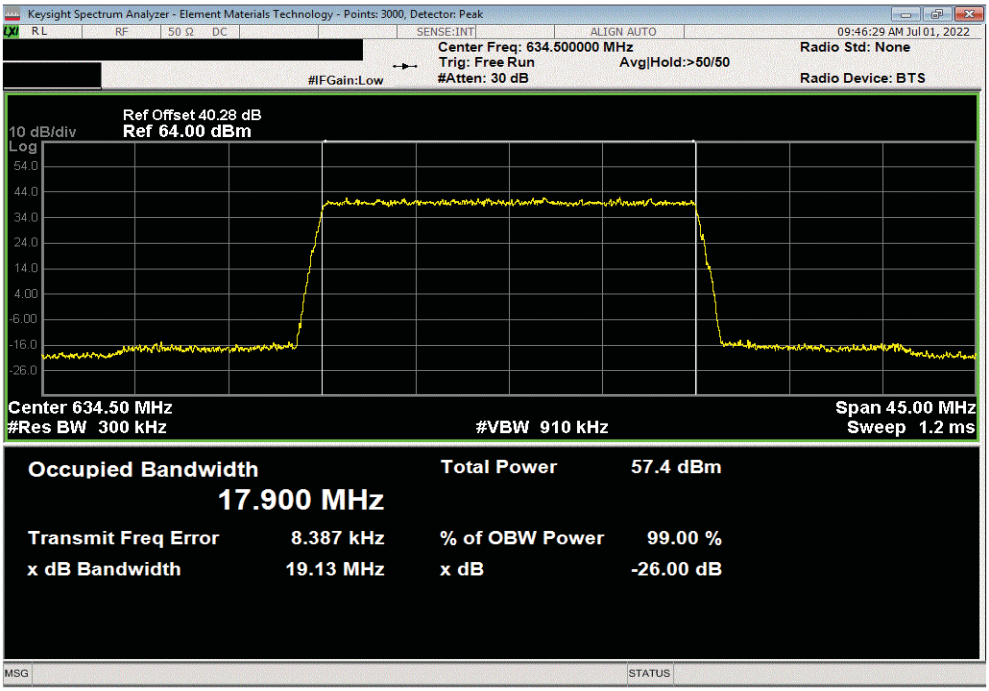
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.445 MHz	14.401 MHz	Within Band	Pass



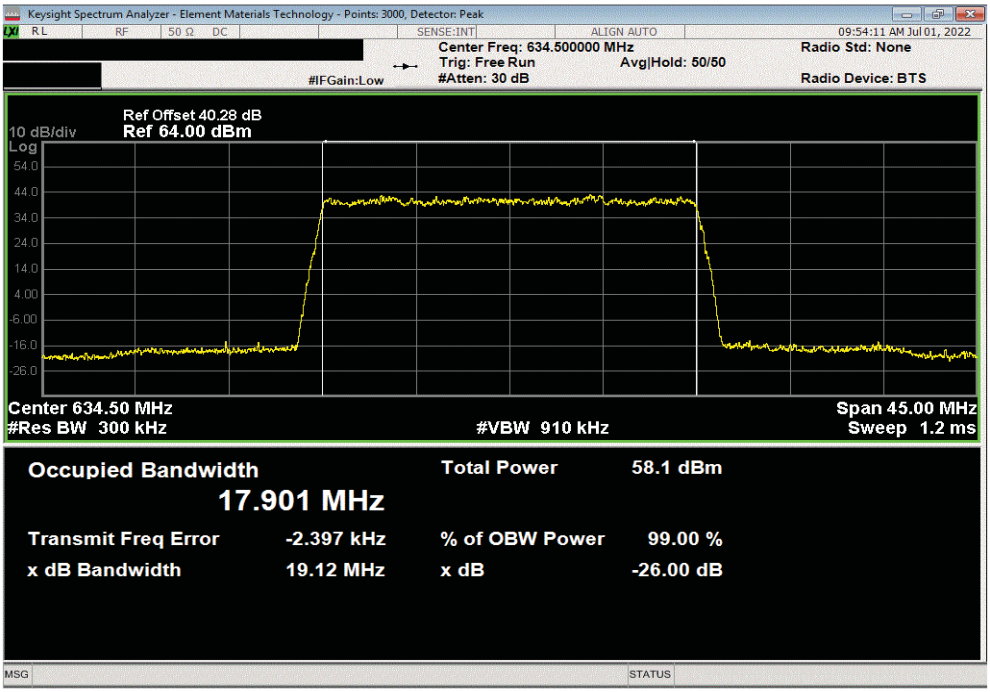
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 644.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.442 MHz	14.528 MHz	Within Band	Pass



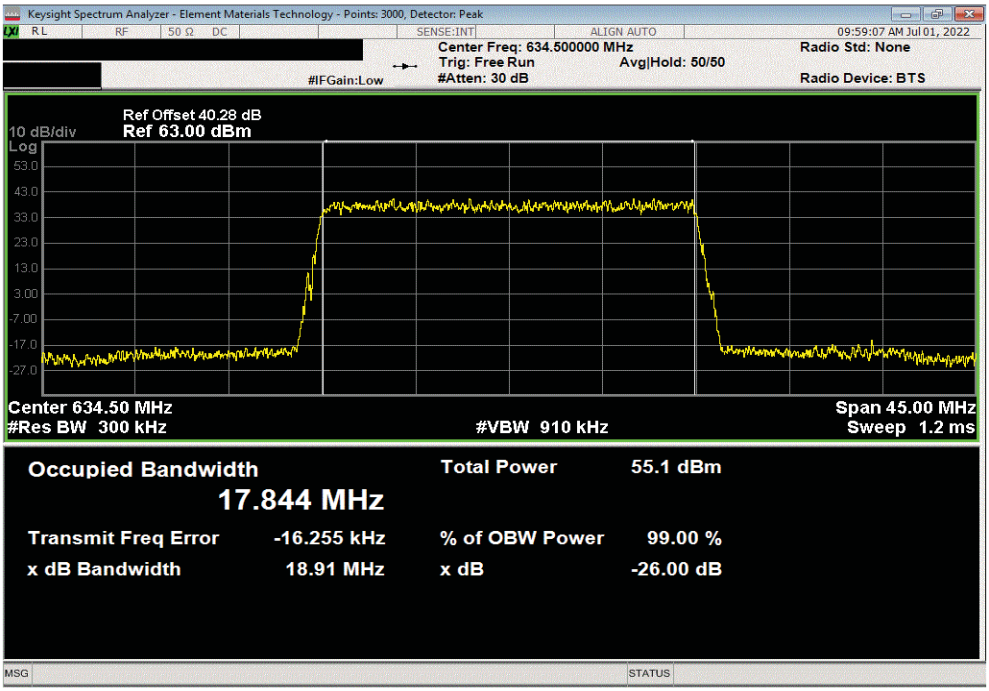
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.9 MHz	19.126 MHz	Within Band	Pass



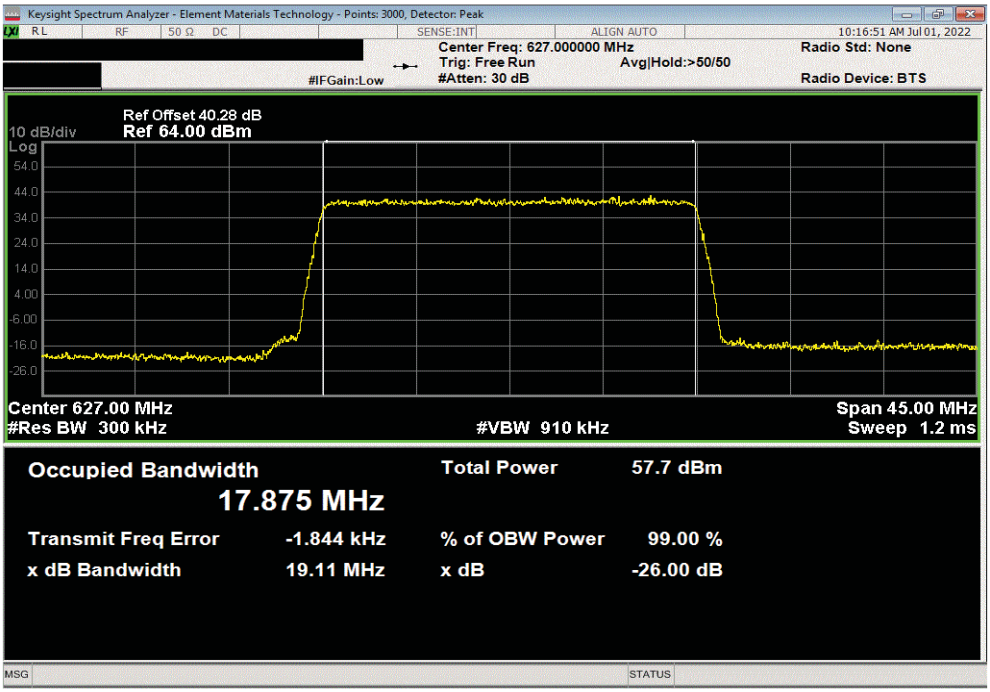
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.901 MHz	19.119 MHz	Within Band	Pass



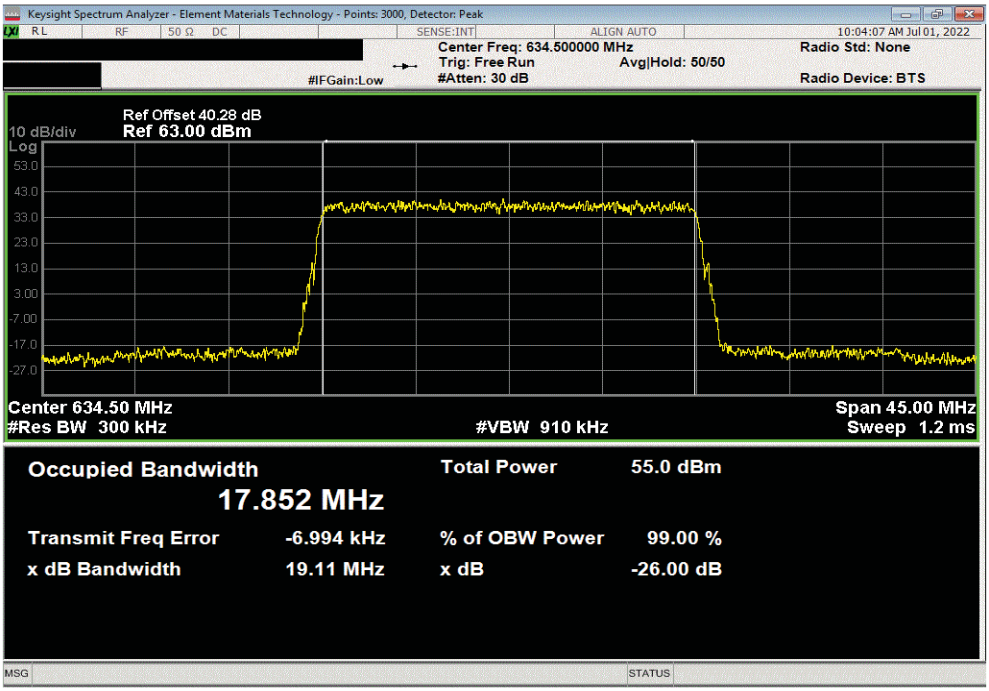
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.844 MHz	18.907 MHz	Within Band	Pass



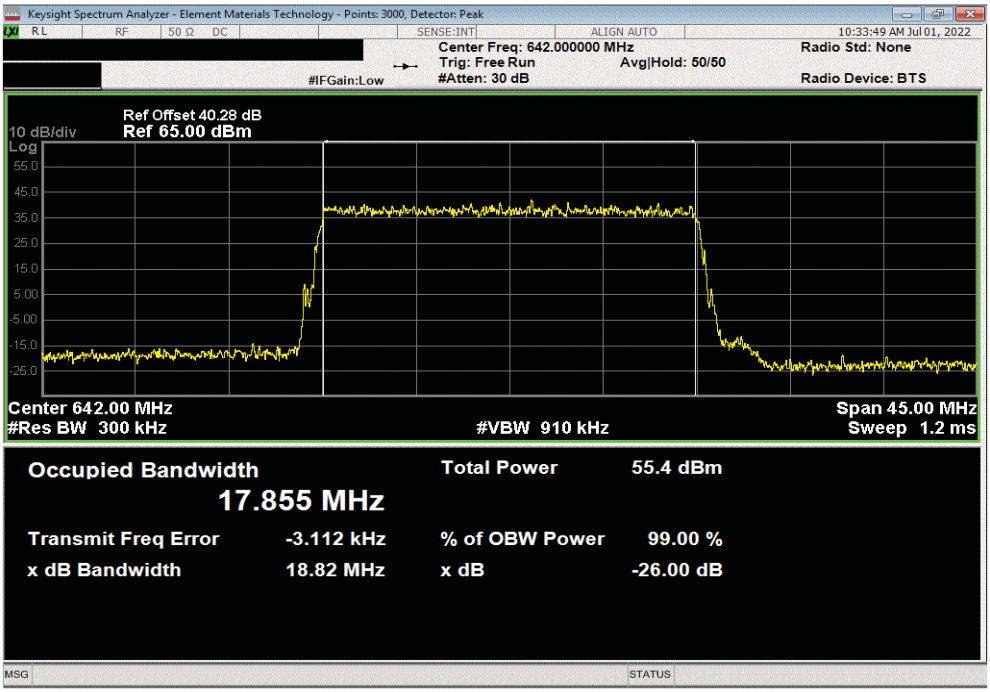
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Low Ch. 627 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.875 MHz	19.113 MHz	Within Band	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.852 MHz	19.107 MHz	Within Band	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, High Ch. 642 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			17.855 MHz	18.822 MHz	Within Band	Pass



OCCUPIED BANDWIDTH - Band 85 LTE

element

XMit 2022.02.07.0

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
Block - DC	Fairview Microwave	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 27.53 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band 85 LTE Carriers (728MHz to 746MHz)									
Ch BW	Radio Channel	LTE: QPSK		LTE: 16QAM		LTE: 64QAM		LTE: 256QAM	
		FCC	ISED	FCC	ISED	FCC	ISED	FCC	ISED
5MHz	Low							4M78F9W	4M50F9W
	Mid	4M77F9W	4M49F9W	4M75F9W	4M48F9W	4M81F9W	4M48F9W	4M81F9W	4M50F9W
	High							4M81F9W	4M51F9W
10MHz	Low							9M55F9W	9M00F9W
	Mid	9M63F9W	8M98F9W	9M56F9W	9M02F9W	9M68F9W	9M00F9W	9M61F9W	8M99F9W
	High							9M57F9W	9M01F9W
15MHz	Low							14M3F9W	13M4F9W
	Mid	14M1F9W	13M4F9W	14M1F9W	13M4F9W	14M4F9W	13M4F9W	14M2F9W	13M4F9W
	High							14M3F9W	13M5F9W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.									

OCCUPIED BANDWIDTH - Band 85 LTE

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	11-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	20.8 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	55.3% RH
Project:	None			Barometric Pres.:	1014 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

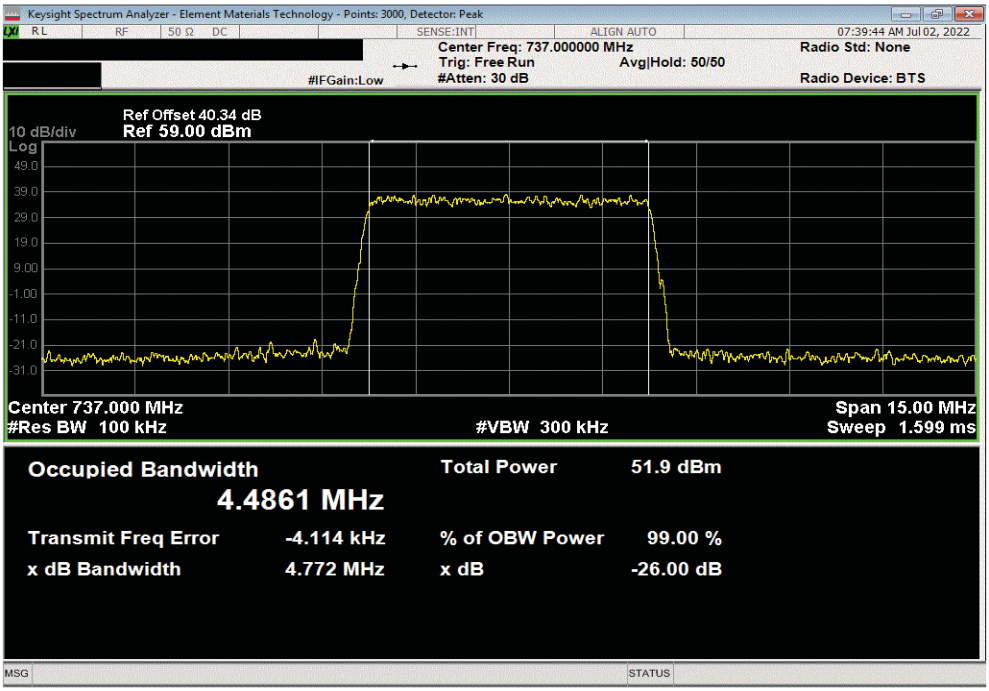
None

Configuration #	2	Signature

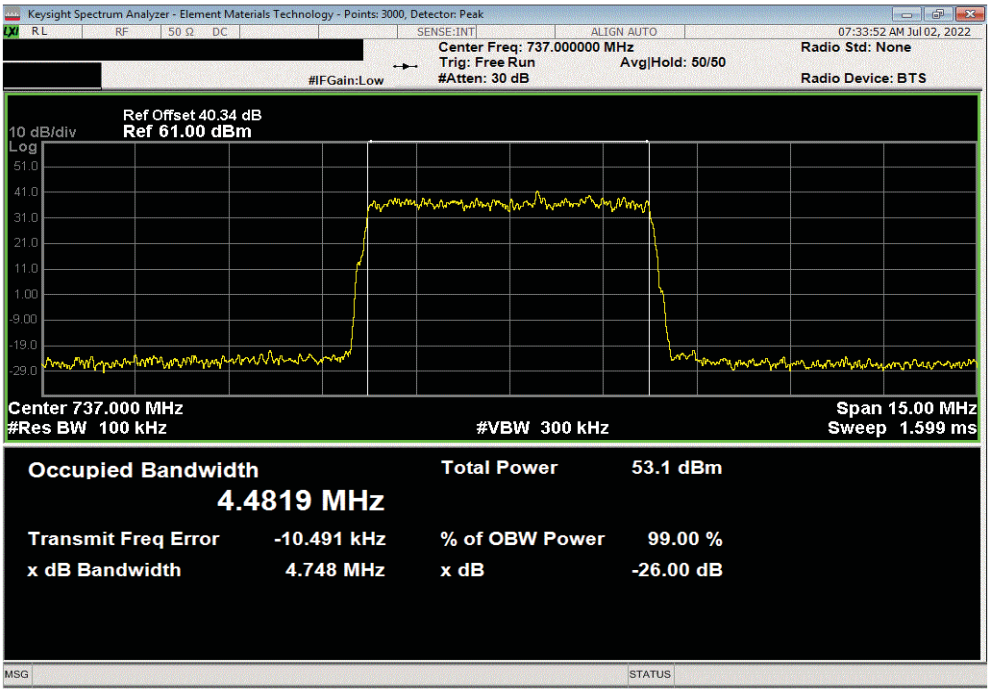
	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 2, LTE, Band 85, 728 MHz - 746 MHz				
5 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 737 MHz	4.486 MHz	4.772 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 737 MHz	4.482 MHz	4.748 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 737 MHz	4.482 MHz	4.811 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 730.5 MHz	4.499 MHz	4.776 MHz	Within Band	Pass
Mid Ch. 737 MHz	4.497 MHz	4.808 MHz	Within Band	Pass
High Ch. 743.5 MHz	4.513 MHz	4.809 MHz	Within Band	Pass
10 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 737 MHz	8.978 MHz	9.637 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 737 MHz	9.018 MHz	9.561 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 737 MHz	9.003 MHz	9.676 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 733 MHz	8.997 MHz	9.55 MHz	Within Band	Pass
Mid Ch. 737 MHz	8.991 MHz	9.612 MHz	Within Band	Pass
High Ch. 741 MHz	9.006 MHz	9.565 MHz	Within Band	Pass
15 MHz Bandwidth				
QPSK Modulation				
Mid Ch. 737 MHz	13.42 MHz	14.136 MHz	Within Band	Pass
16-QAM Modulation				
Mid Ch. 737 MHz	13.434 MHz	14.086 MHz	Within Band	Pass
64-QAM Modulation				
Mid Ch. 737 MHz	13.43 MHz	14.37 MHz	Within Band	Pass
256-QAM Modulation				
Low Ch. 735.5 MHz	13.409 MHz	14.257 MHz	Within Band	Pass
Mid Ch. 737 MHz	13.414 MHz	14.224 MHz	Within Band	Pass
High Ch. 738.5 MHz	13.464 MHz	14.316 MHz	Within Band	Pass

OCCUPIED BANDWIDTH - Band 85 LTE

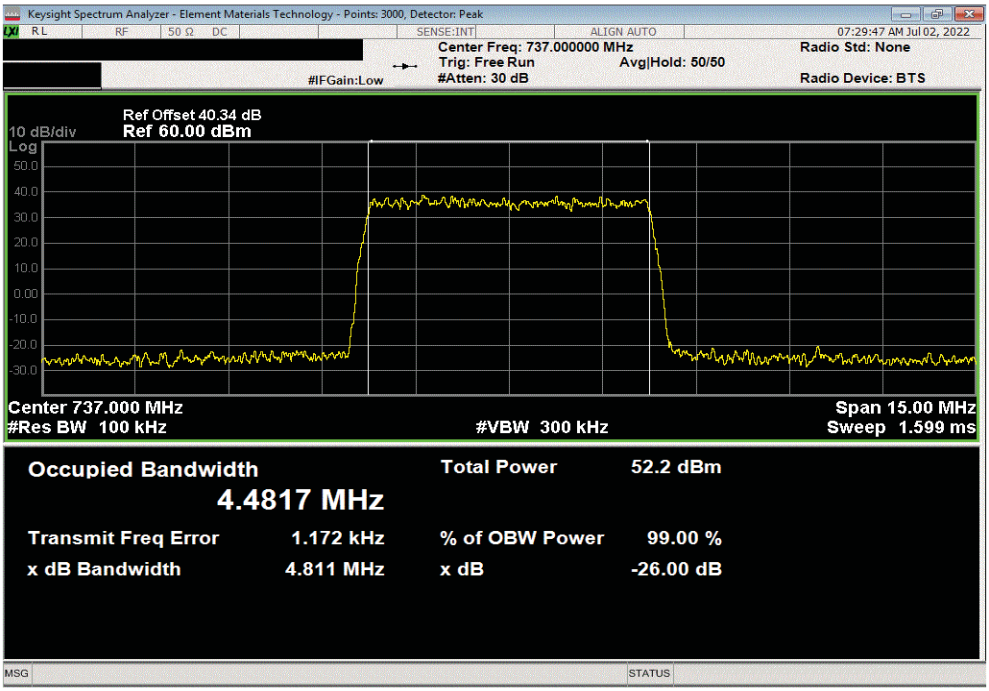
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.486 MHz	4.772 MHz	Within Band	Pass



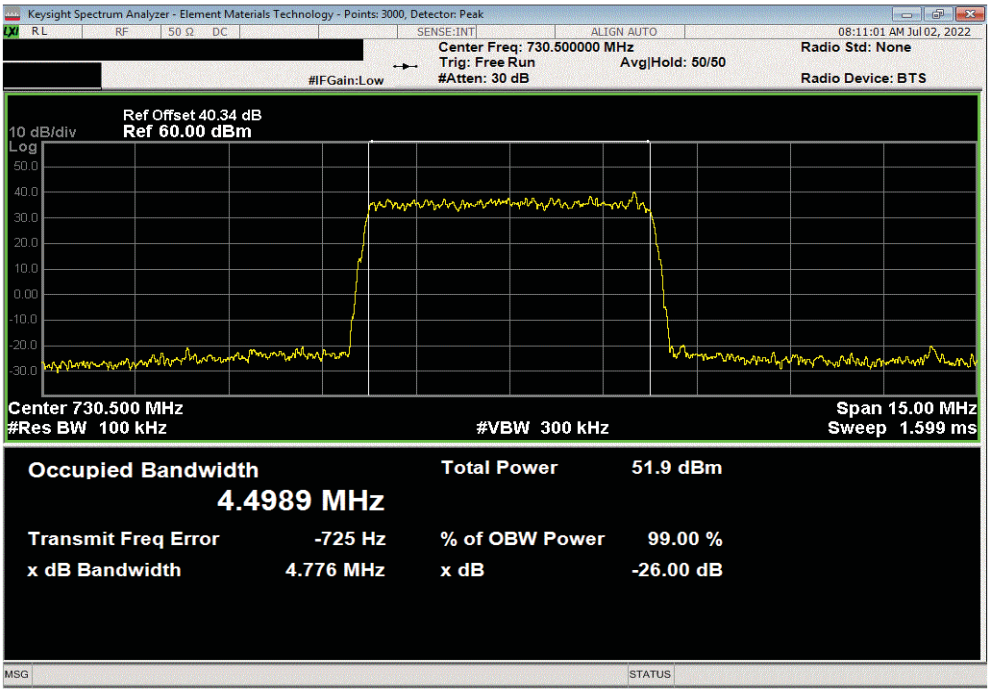
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.482 MHz	4.748 MHz	Within Band	Pass



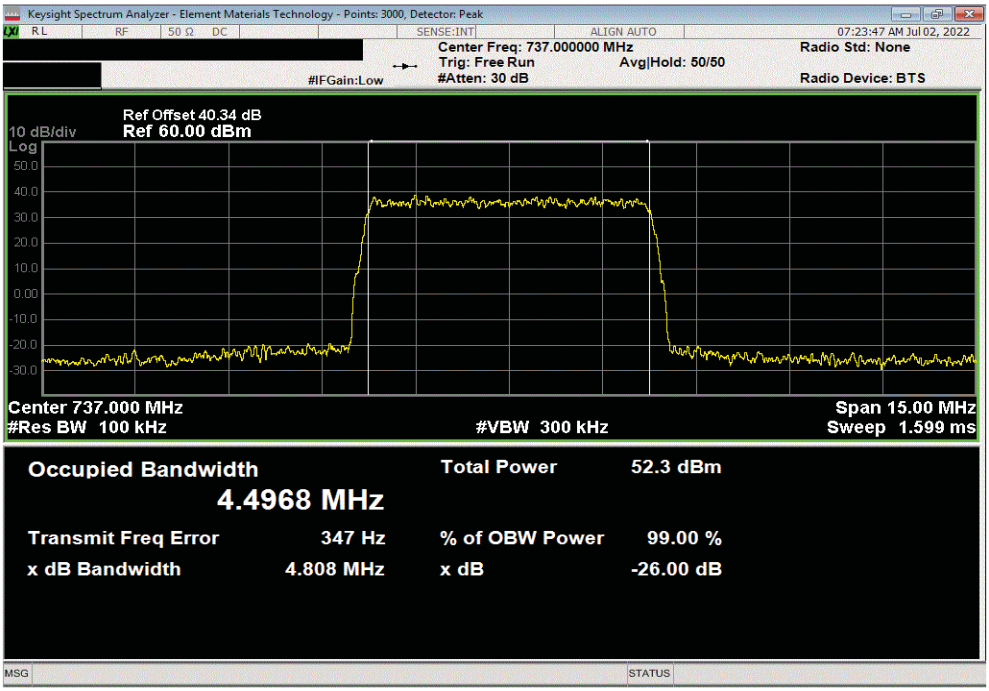
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.482 MHz	4.811 MHz	Within Band	Pass



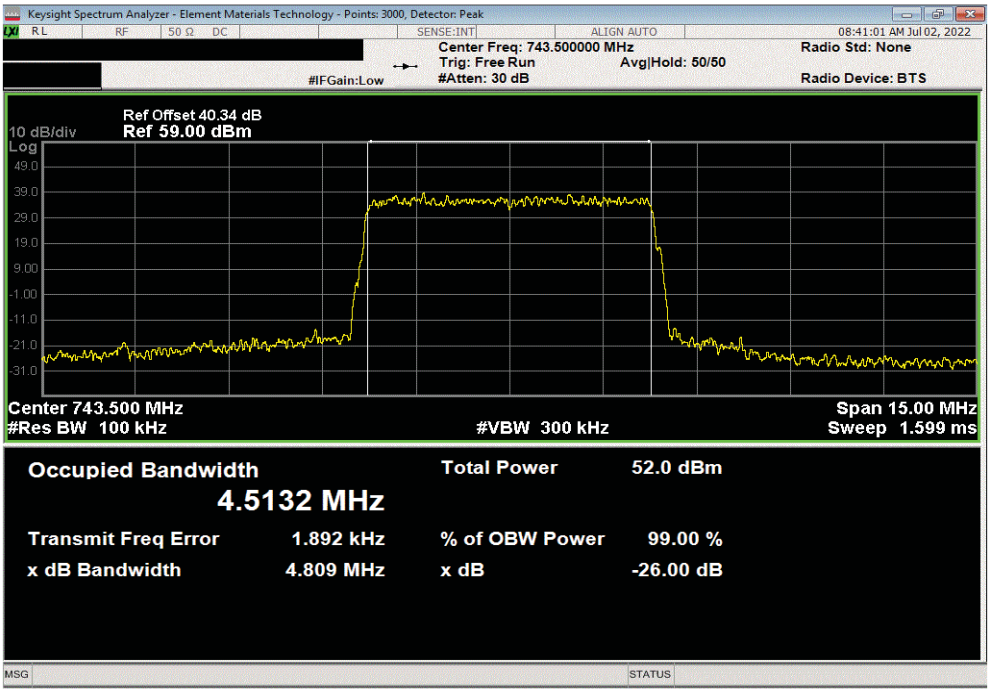
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 730.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.499 MHz	4.776 MHz	Within Band	Pass



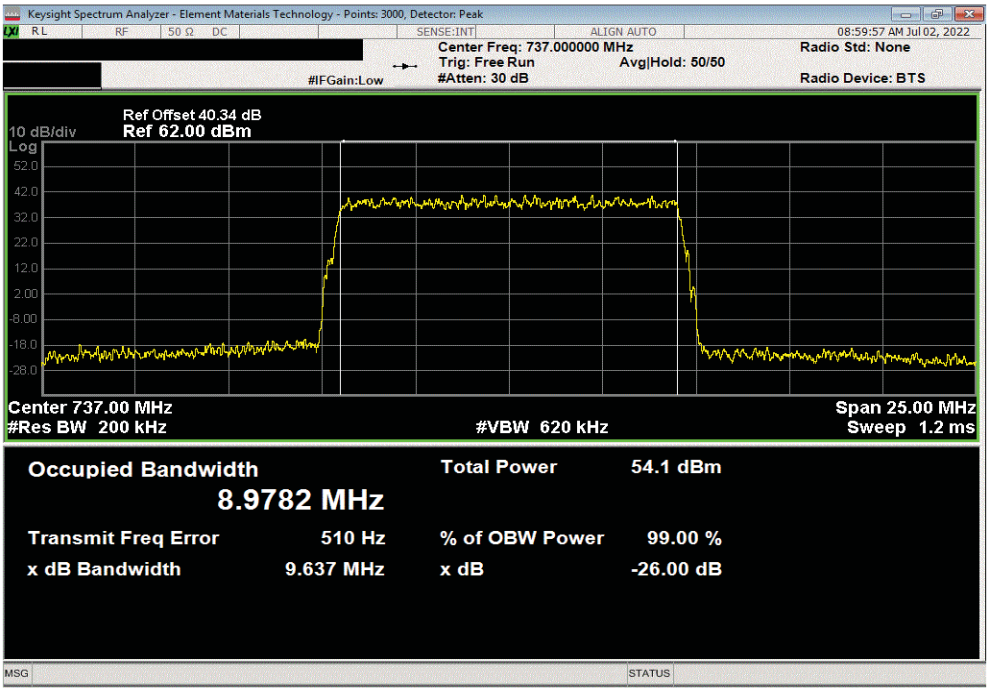
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.497 MHz	4.808 MHz	Within Band	Pass



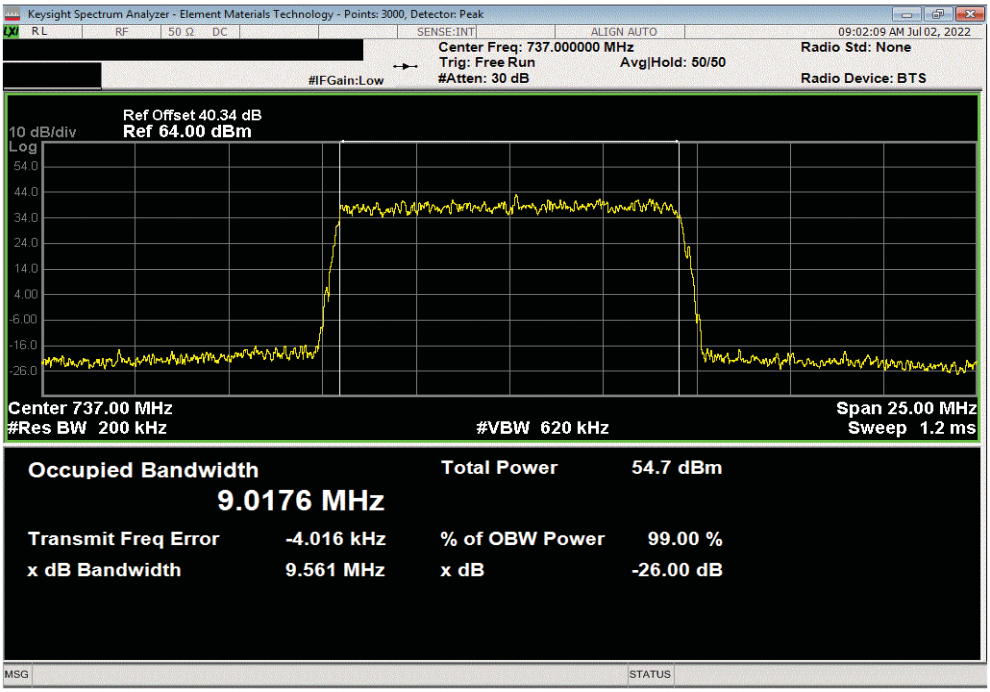
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 743.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.513 MHz	4.809 MHz	Within Band	Pass



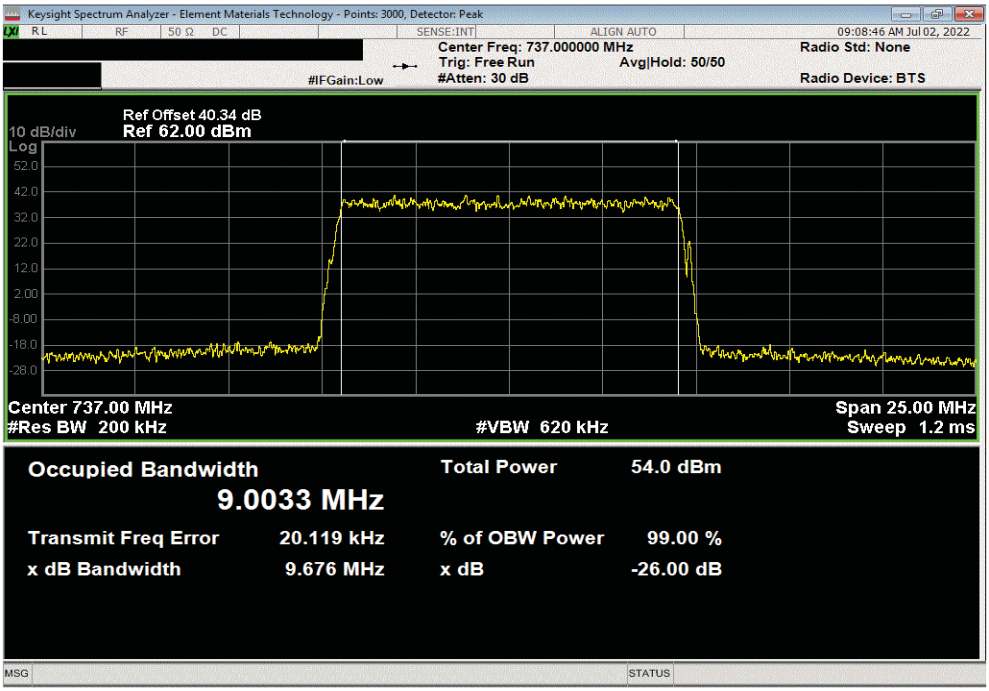
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.978 MHz	9.637 MHz	Within Band	Pass



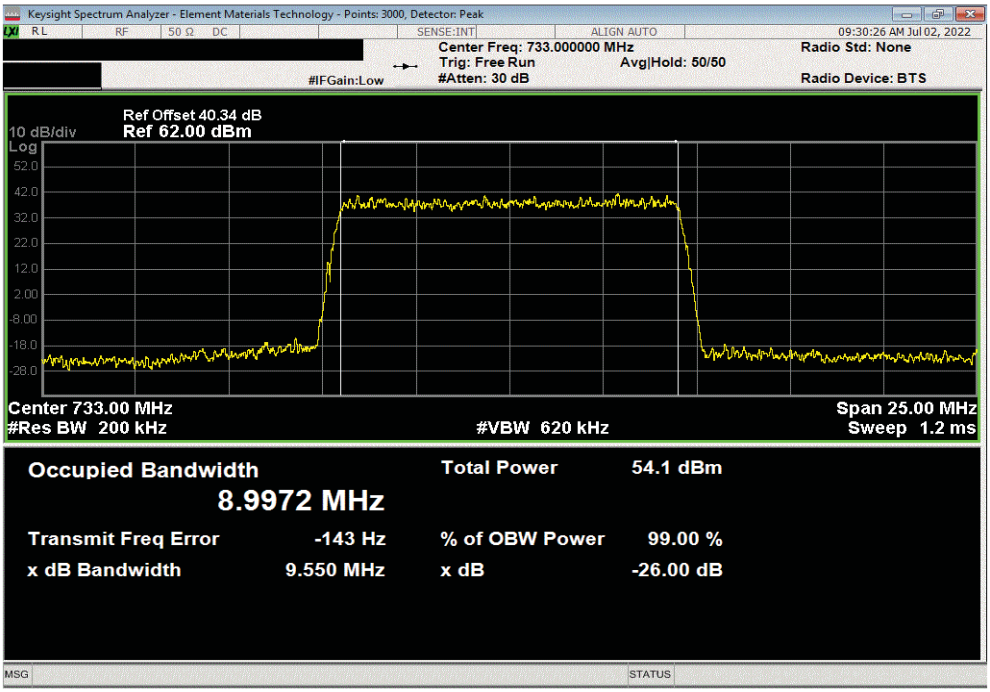
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.018 MHz	9.561 MHz	Within Band	Pass



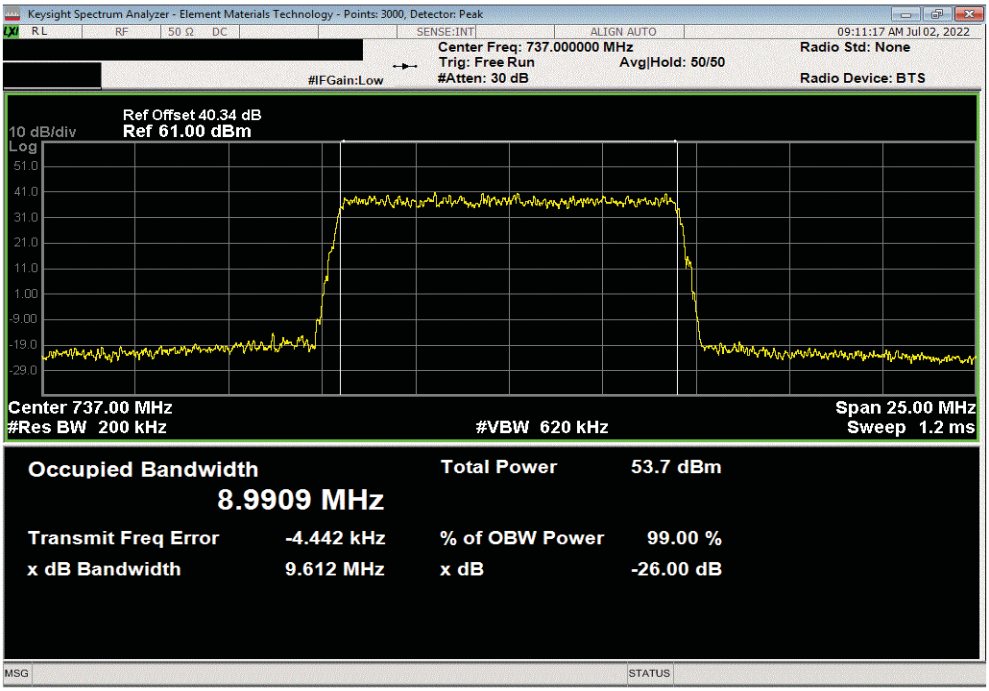
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.003 MHz	9.676 MHz	Within Band	Pass



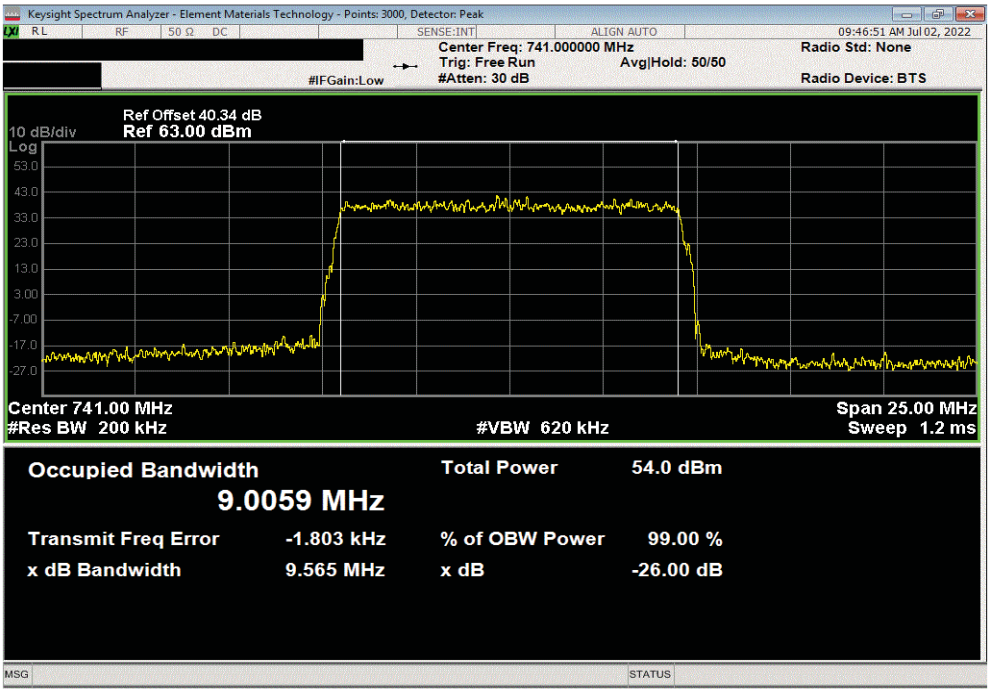
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 733 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.997 MHz	9.55 MHz	Within Band	Pass



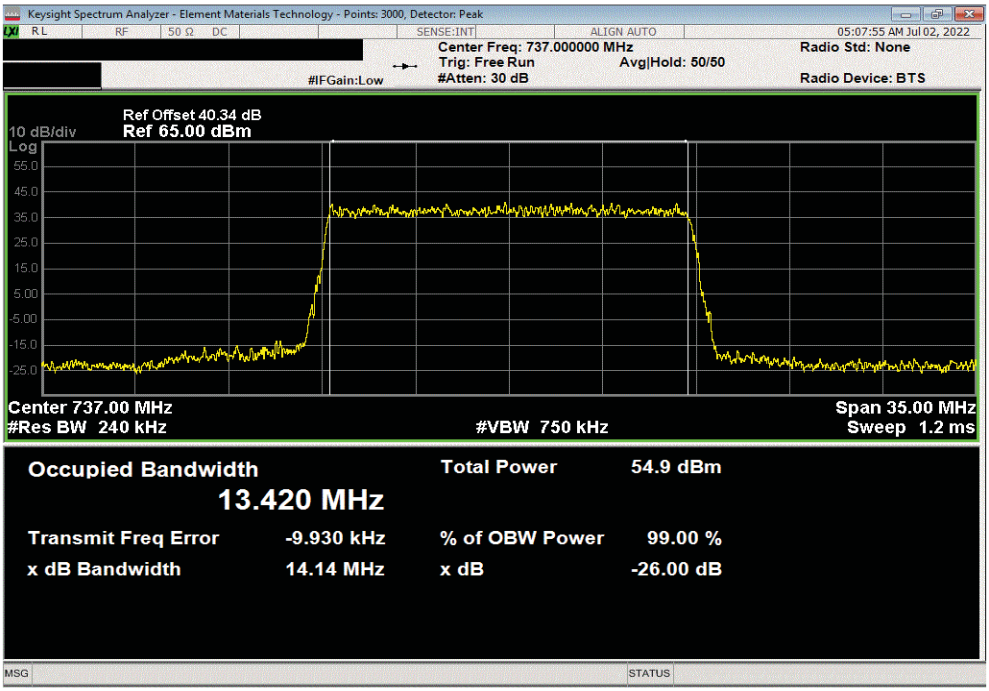
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			8.991 MHz	9.612 MHz	Within Band	Pass



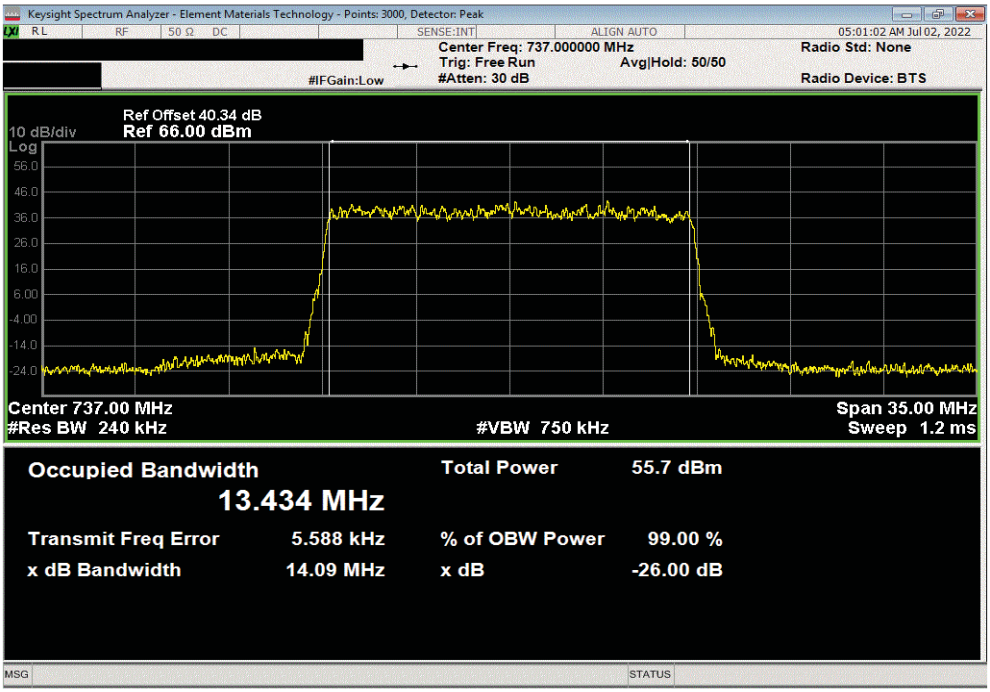
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 741 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.006 MHz	9.565 MHz	Within Band	Pass



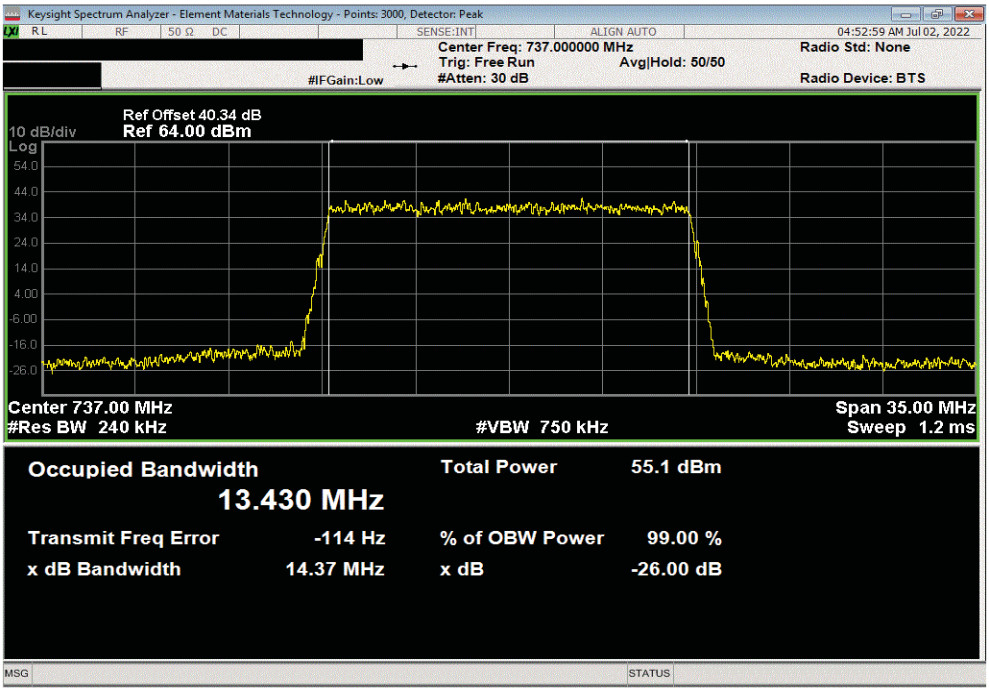
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.42 MHz	14.136 MHz	Within Band	Pass



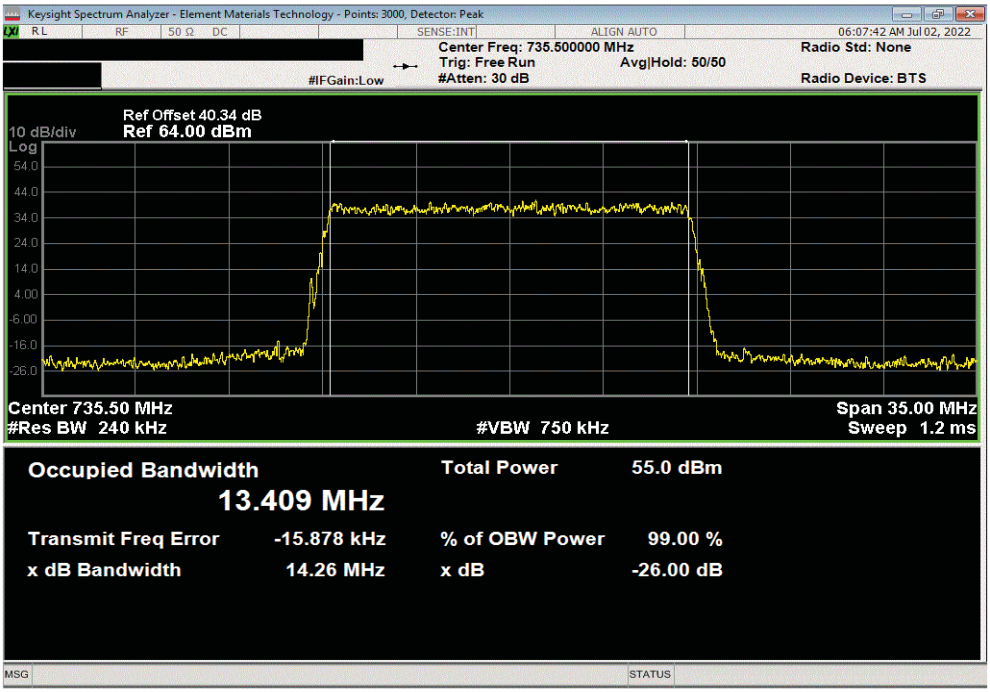
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.434 MHz	14.086 MHz	Within Band	Pass



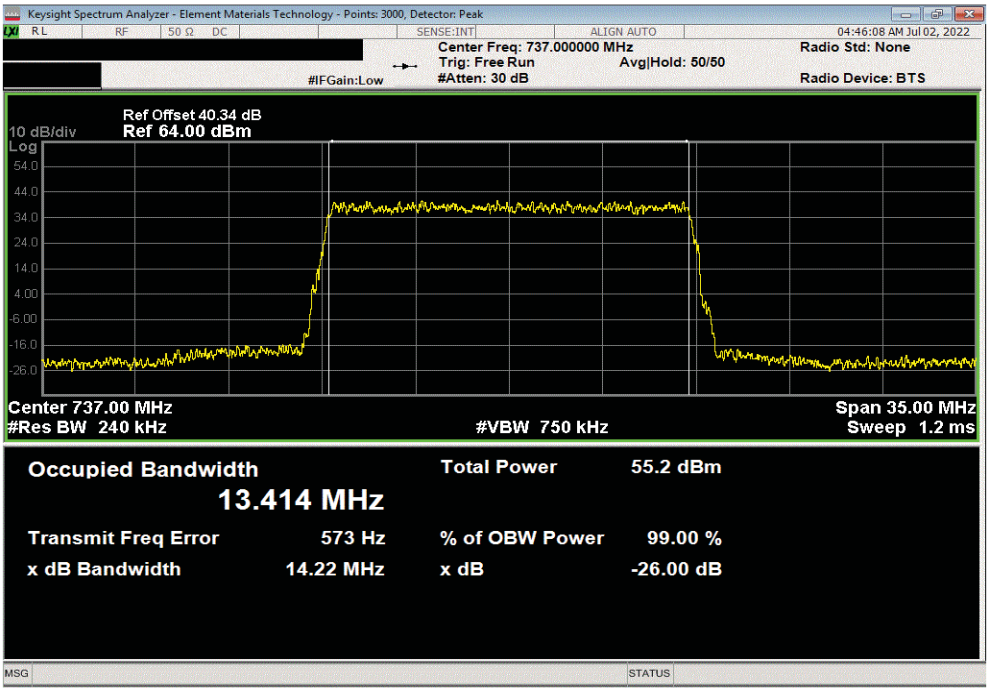
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.43 MHz	14.37 MHz	Within Band	Pass



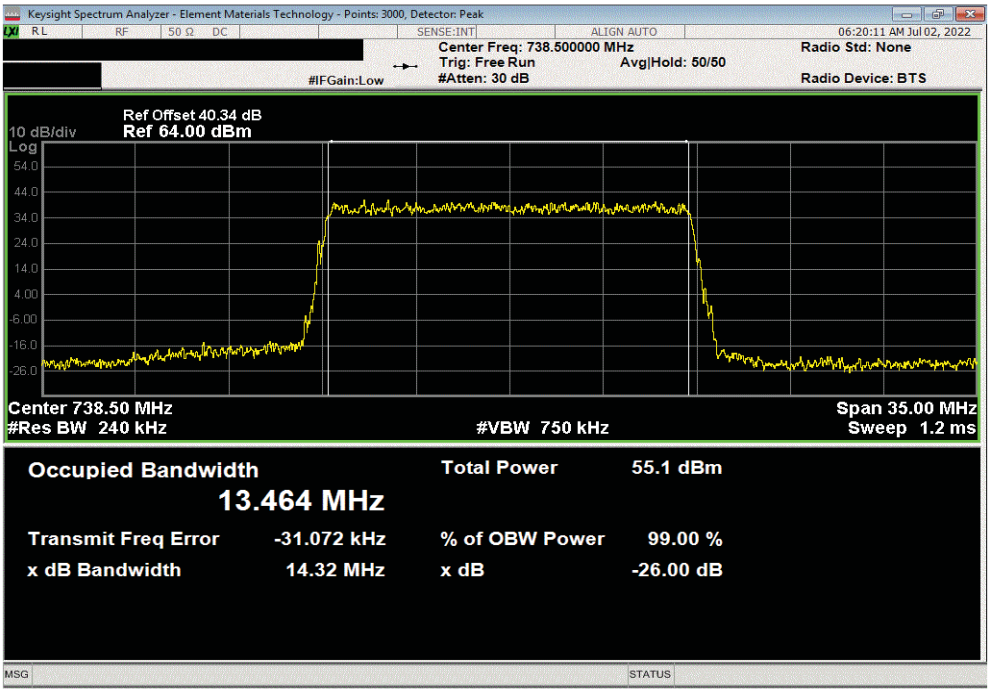
Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 735.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.409 MHz	14.257 MHz	Within Band	Pass



Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.414 MHz	14.224 MHz	Within Band	Pass



Port 2, LTE, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 738.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			13.464 MHz	14.316 MHz	Within Band	Pass



OCCUPIED BANDWIDTH - Band 71 NB IoT GB

XMit 2022.02.07.0

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
Block - DC	Fairview Microwave	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOB) as the original certification test. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 27.53 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band 71 (617MHz to 652MHz) Narrow-Band IoT Guard Band			
Ch BW	Radio Channel	4G-LTE: E-TM1.1 with N-TM	
		FCC	ISED
10MHz	Low	9M94F9W	9M51F9W
	Mid	9M94F9W	9M52F9W
	High	9M93F9W	9M52F9W
15MHz	Low	14M6F9W	14M1F9W
	Mid	14M7F9W	14M1F9W
	High	14M7F9W	14M1F9W
20MHz	Low	19M5F9W	18M5F9W
	Mid	19M5F9W	18M6F9W
	High	19M5F9W	18M5F9W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.			

OCCUPIED BANDWIDTH - Band 71 NB IoT GB

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	11-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	21.1 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	55.4% RH
Project:	None			Barometric Pres.:	1014 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

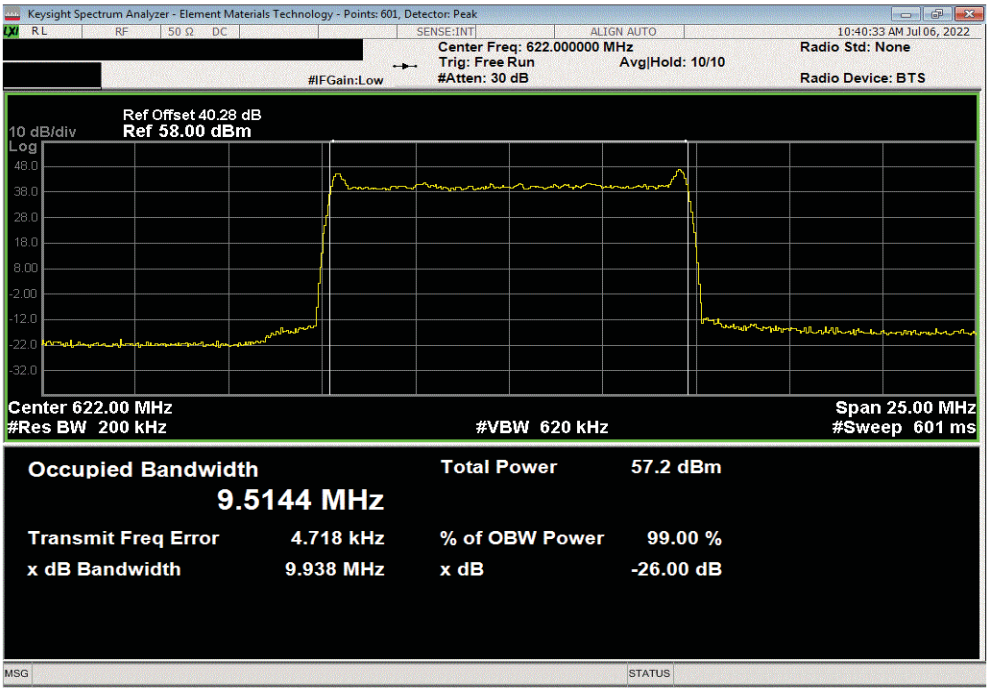
None

Configuration #	2	Signature

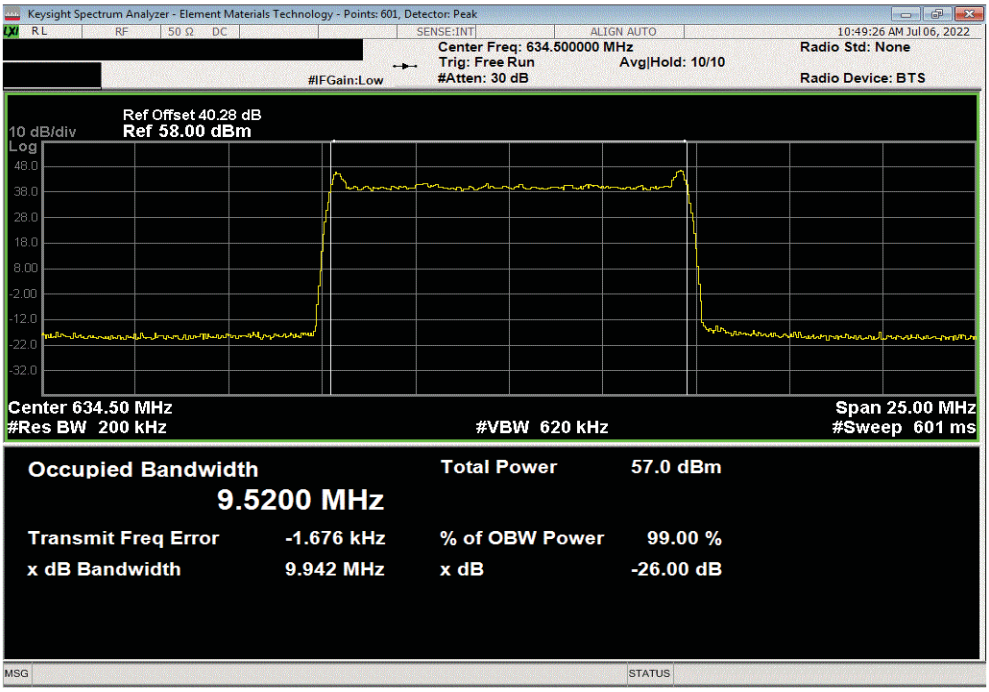
		Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 2, LTE, Band 71, 617 MHz - 652 MHz					
10 MHz Bandwidth					
NB IoT GB					
	Low Ch. 622 MHz	9.514 MHz	9.938 MHz	Within Band	Pass
	Mid Ch. 634.5 MHz	9.52 MHz	9.942 MHz	Within Band	Pass
	High Ch. 647 MHz	9.518 MHz	9.934 MHz	Within Band	Pass
15 MHz Bandwidth					
NB IoT GB					
	Low Ch. 624.5 MHz	14.093 MHz	14.649 MHz	Within Band	Pass
	Mid Ch. 634.5 MHz	14.089 MHz	14.681 MHz	Within Band	Pass
	High Ch. 644.5 MHz	14.082 MHz	14.689 MHz	Within Band	Pass
20 MHz Bandwidth					
NB IoT GB					
	Low Ch. 627 MHz	18.531 MHz	19.471 MHz	Within Band	Pass
	Mid Ch. 634.5 MHz	18.55 MHz	19.478 MHz	Within Band	Pass
	High Ch. 642 MHz	18.529 MHz	19.457 MHz	Within Band	Pass

OCCUPIED BANDWIDTH - Band 71 NB IoT GB

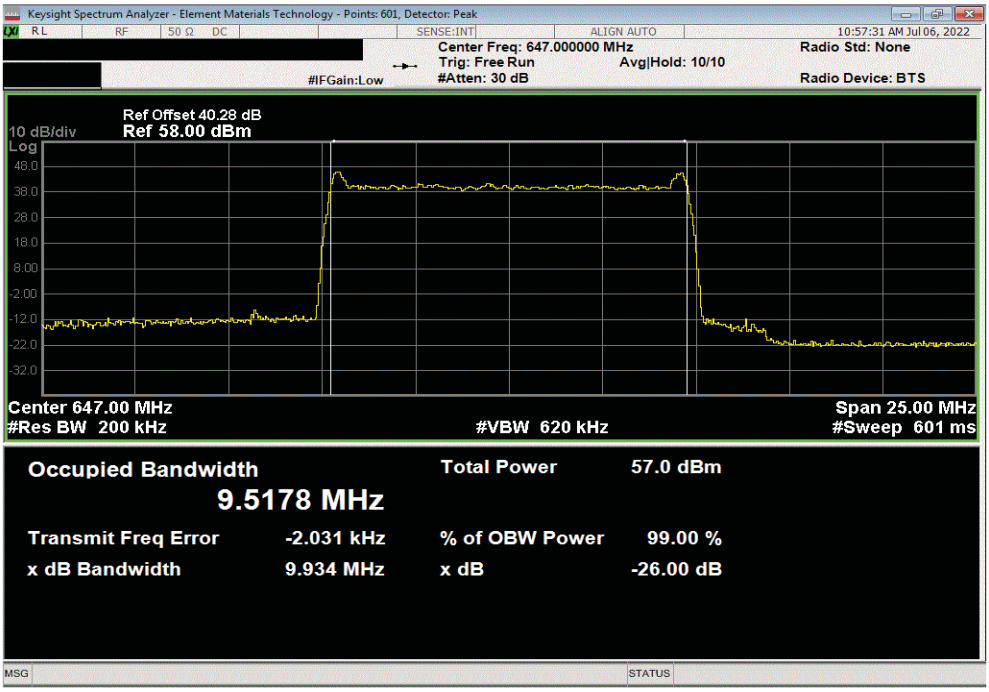
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 10 MHz Bandwidth, NB IoT GB Modulation, Low Ch. 622 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.514 MHz	9.938 MHz	Within Band	Pass



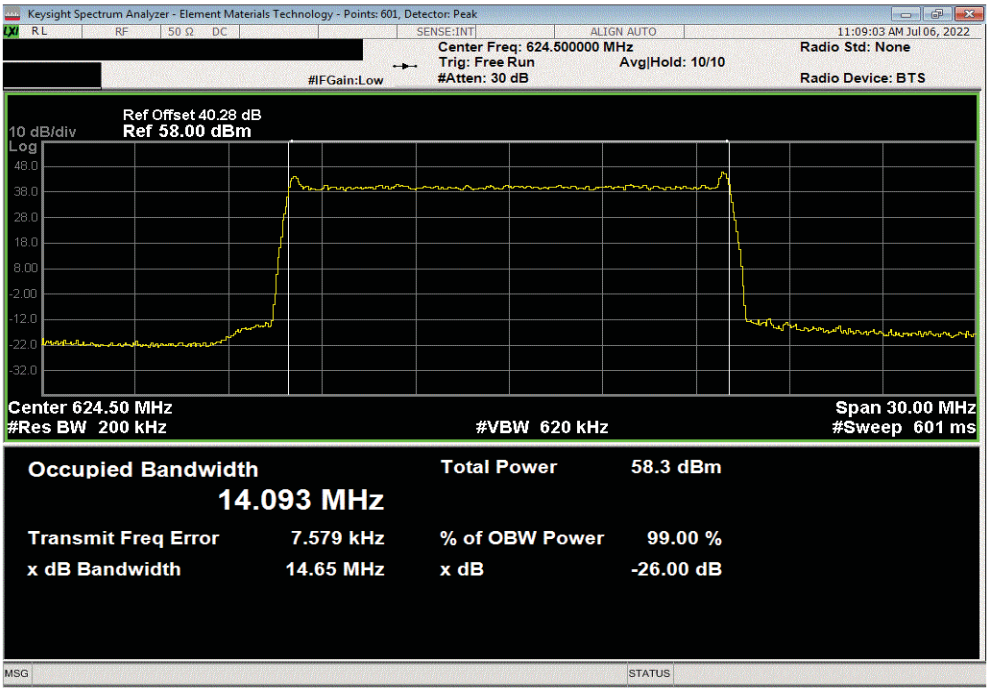
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 10 MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.52 MHz	9.942 MHz	Within Band	Pass



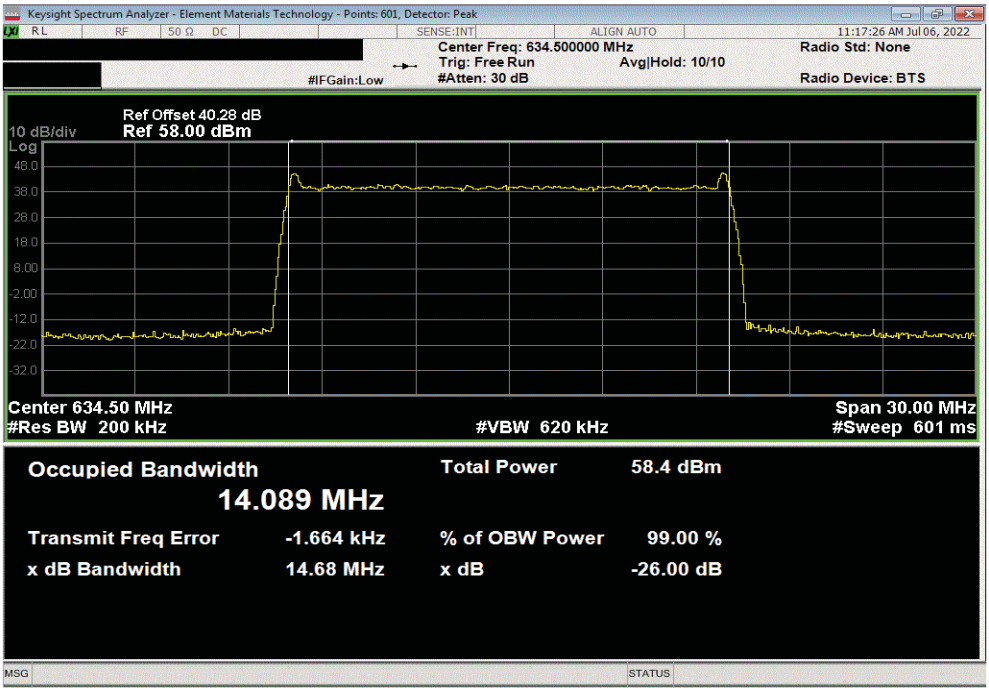
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 10 MHz Bandwidth, NB IoT GB Modulation, High Ch. 647 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.518 MHz	9.934 MHz	Within Band	Pass



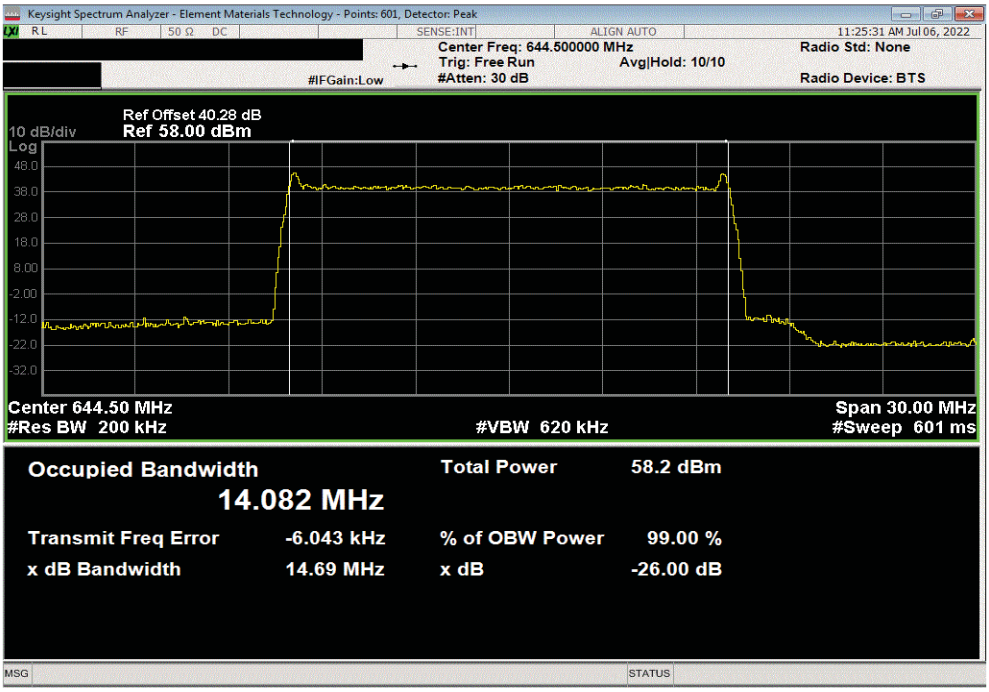
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 15 MHz Bandwidth, NB IoT GB Modulation, Low Ch. 624.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.093 MHz	14.649 MHz	Within Band	Pass



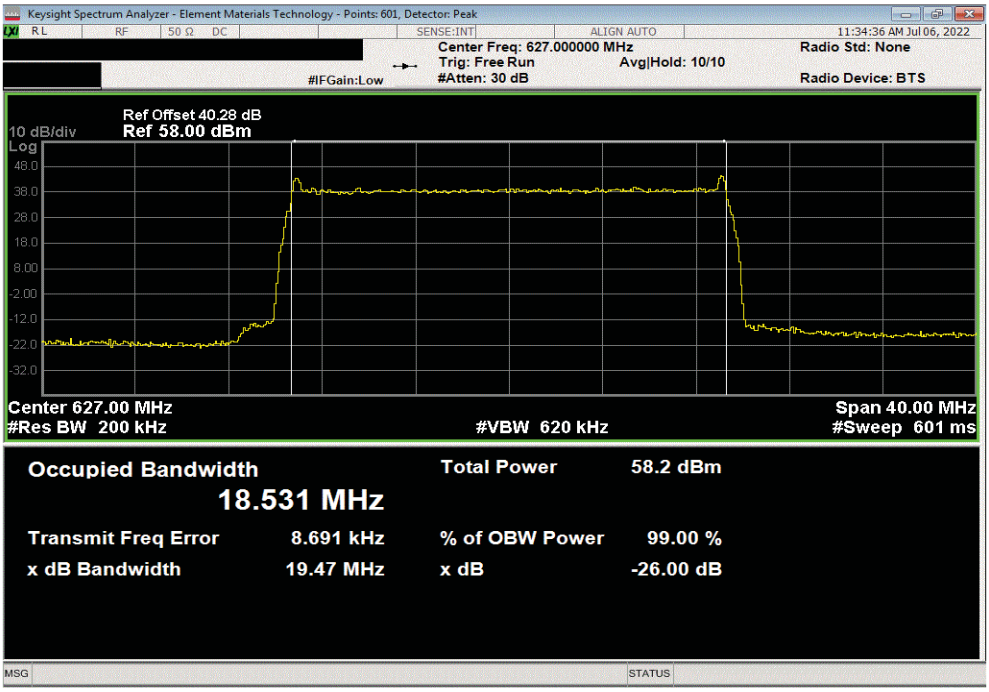
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 15 MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.089 MHz	14.681 MHz	Within Band	Pass



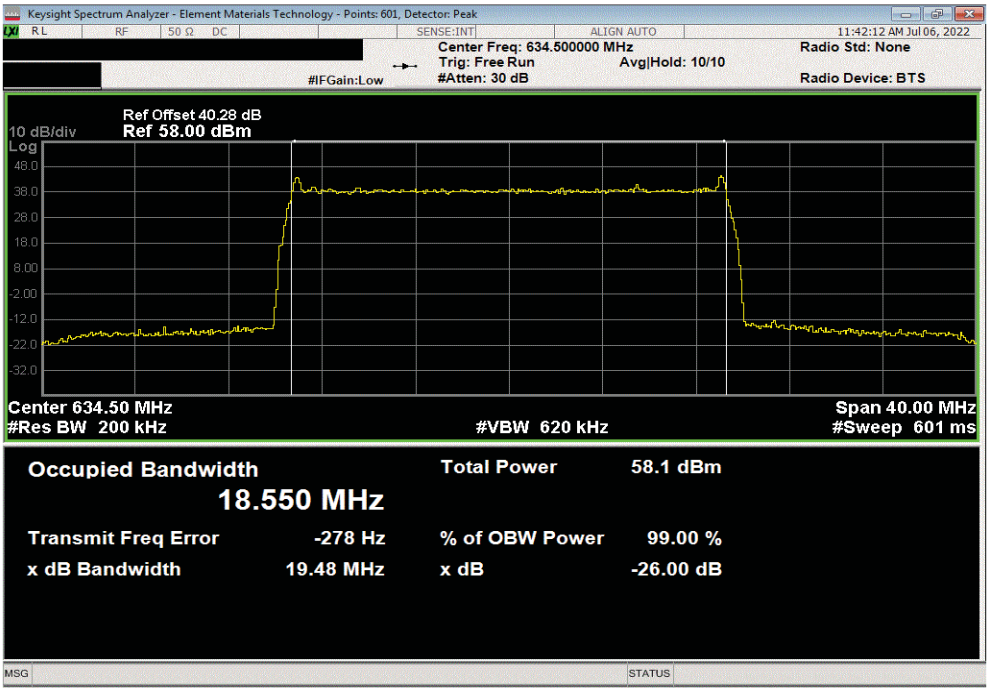
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 15 MHz Bandwidth, NB IoT GB Modulation, High Ch. 644.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.082 MHz	14.689 MHz	Within Band	Pass



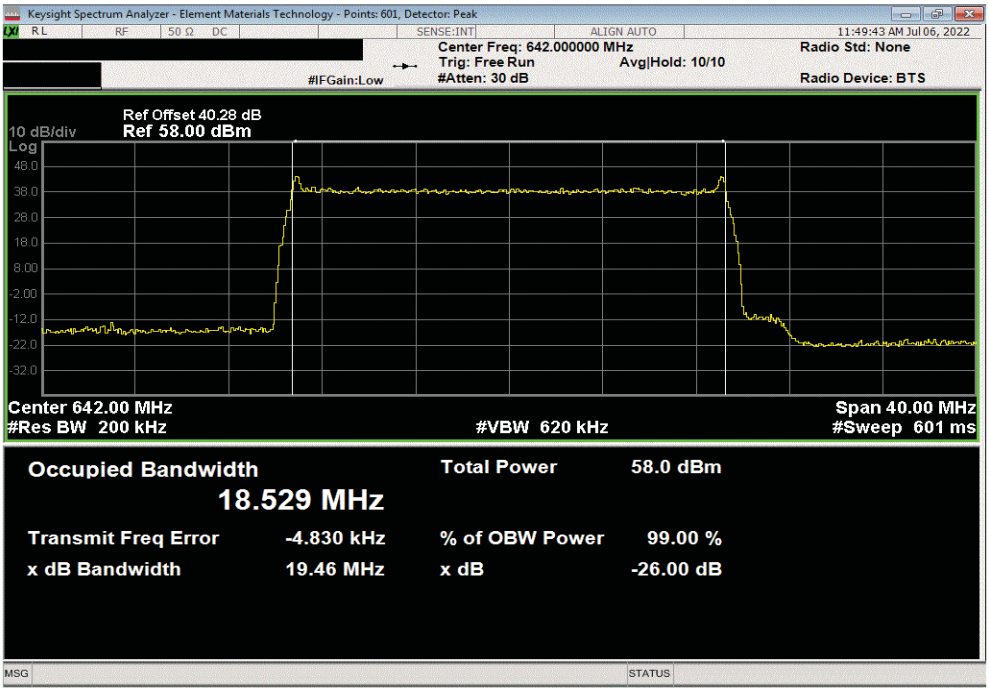
Port 2, LTE, Band n71, 617 MHz - 652 MHz, 20 MHz Bandwidth, NB IoT GB Modulation, Low Ch. 627 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.531 MHz	19.471 MHz	Within Band	Pass



Port 2, LTE, Band n71, 617 MHz - 652 MHz, 20 MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.55 MHz	19.478 MHz	Within Band	Pass



Port 2, LTE, Band n71, 617 MHz - 652 MHz, 20 MHz Bandwidth, NB IoT GB Modulation, High Ch. 642 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.529 MHz	19.457 MHz	Within Band	Pass



OCCUPIED BANDWIDTH - Band 85 NB IoT GB

XMit 2022.02.07.0

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
Block - DC	Fairview Microwave	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 27.53 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band 85 (728MHz to 746MHz) Narrow-Band IoT Guard Band			
Ch BW	Radio Channel	4G-LTE: E-TM1.1 with N-TM	
		FCC	ISED
10MHz	Low	9M87F9W	9M45F9W
	Mid	9M91F9W	9M52F9W
	High	9M94F9W	9M52F9W
15MHz	Low	14M7F9W	14M1F9W
	Mid	14M8F9W	14M1F9W
	High	14M8F9W	14M1F9W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.			

OCCUPIED BANDWIDTH - Band 85 NB IoT GB

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	13-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	20.9 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	54.2% RH
Project:	None			Barometric Pres.:	1018 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. The carriers were enabled at maximum power.

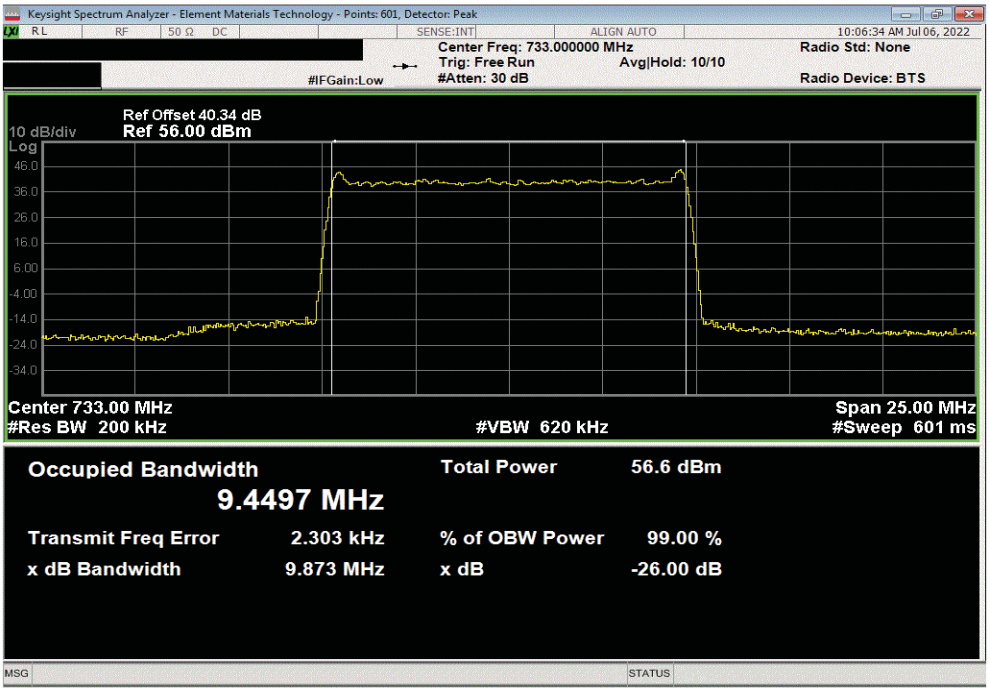
DEVIATIONS FROM TEST STANDARD

None

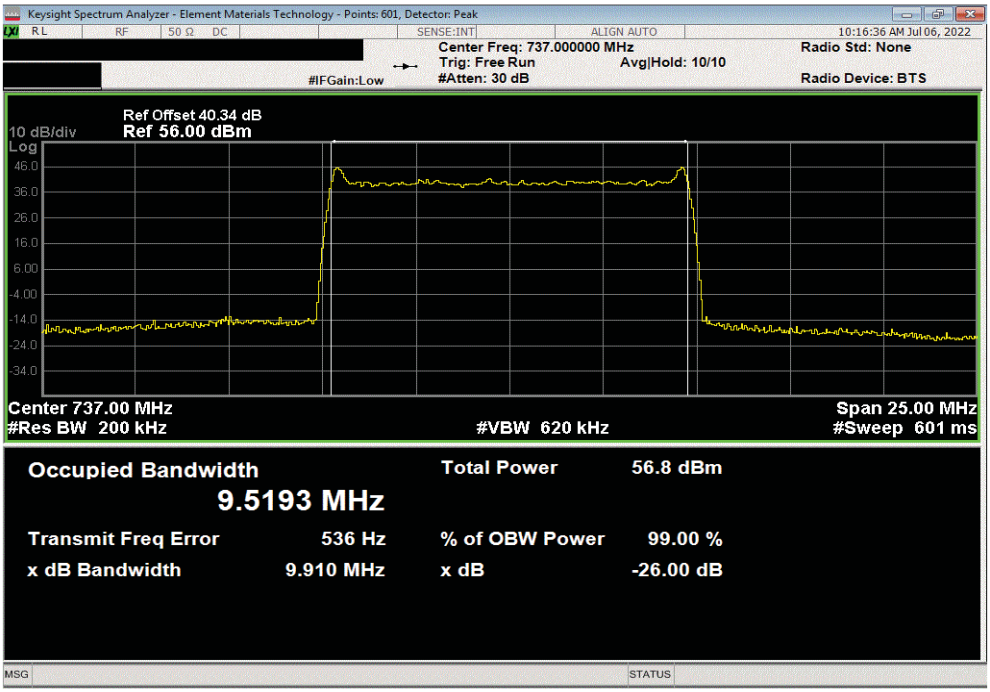
Configuration #	2	Signature

		Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 2, LTE, Band 85, 728 MHz - 746 MHz					
10MHz Bandwidth					
NB IoT GB					
	Low Ch. 733 MHz	9.45 MHz	9.873 MHz	Within Band	Pass
	Mid Ch. 737 MHz	9.519 MHz	9.91 MHz	Within Band	Pass
	High Ch. 741 MHz	9.516 MHz	9.944 MHz	Within Band	Pass
Port 2, LTE, Band 85, 728 MHz - 746 MHz					
15MHz Bandwidth					
NB IoT GB					
	Low Ch. 735.5 MHz	14.126 MHz	14.735 MHz	Within Band	Pass
	Mid Ch. 737 MHz	14.129 MHz	14.763 MHz	Within Band	Pass
	High Ch. 738.5 MHz	14.127 MHz	14.757 MHz	Within Band	Pass

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB Modulation, Low Ch. 733 MHz						
			Value (%)	Value (dB)	Limit	Result
			9.45 MHz	9.873 MHz	Within Band	Pass

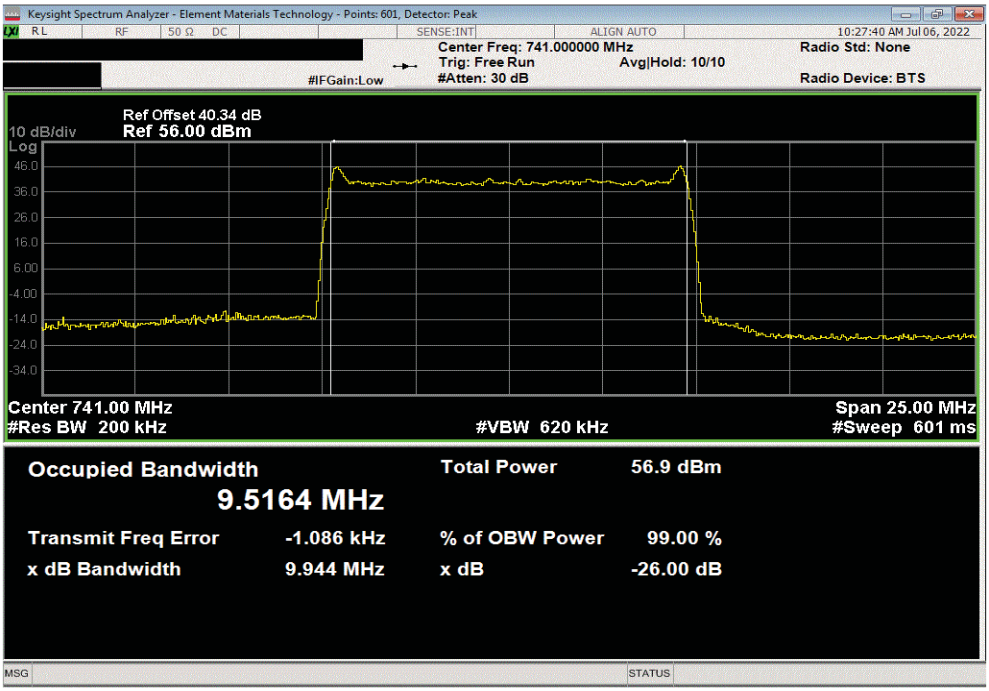


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 737 MHz						
			Value (%)	Value (dB)	Limit	Result
			9.519 MHz	9.91 MHz	Within Band	Pass



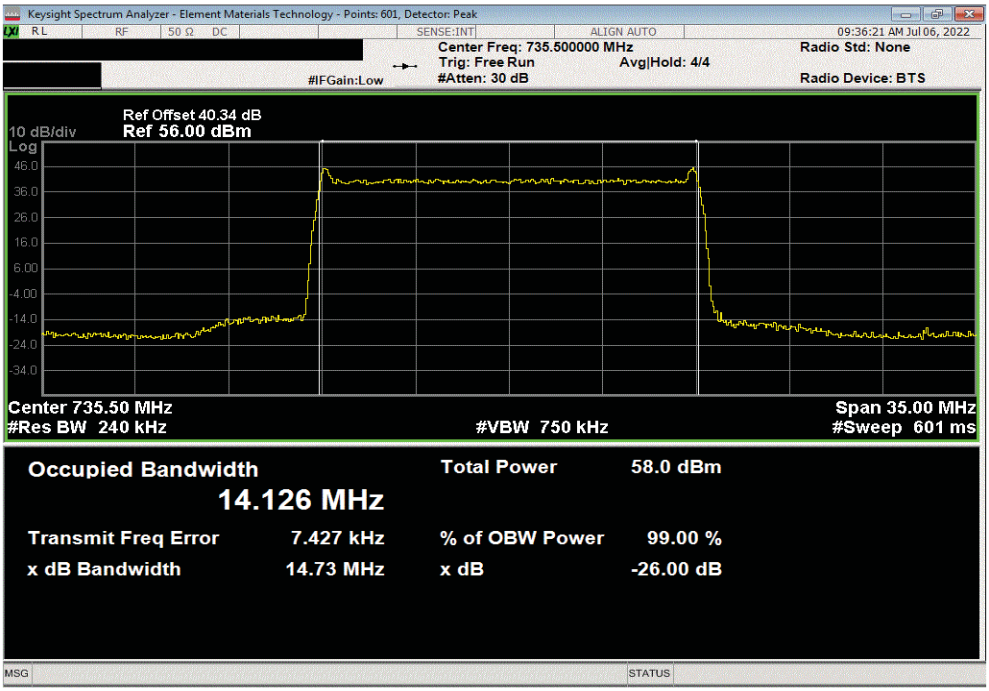
OCCUPIED BANDWIDTH - Band 85 NB IoT GB

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB Modulation, High Ch. 741 MHz						
			Value (%)	Value (dB)	Limit	Result
			9.516 MHz	9.944 MHz	Within Band	Pass

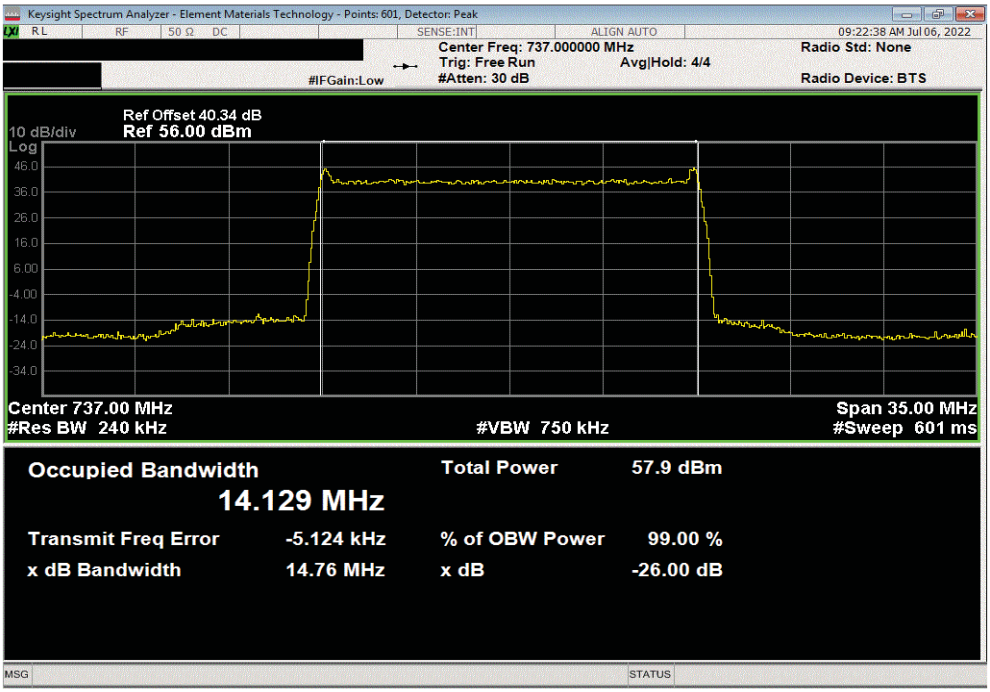


OCCUPIED BANDWIDTH - Band 85 NB IoT GB

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB Modulation, Low Ch. 735.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.126 MHz	14.735 MHz	Within Band	Pass

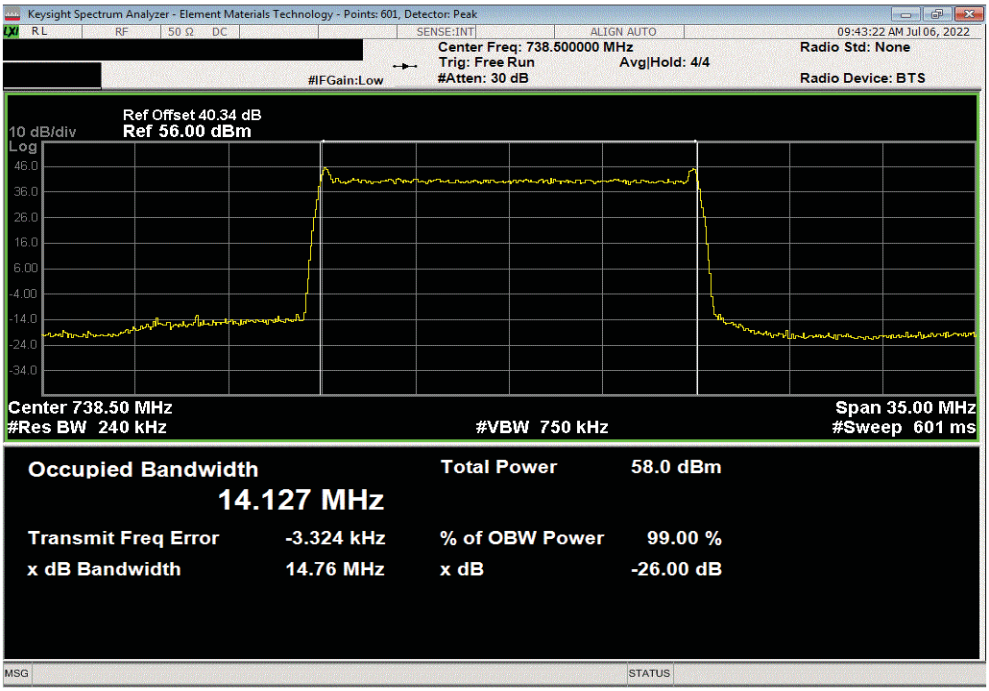


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 737 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.129 MHz	14.763 MHz	Within Band	Pass



OCCUPIED BANDWIDTH - Band 85 NB IoT GB

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB Modulation, Mid Ch. 738.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.127 MHz	14.757 MHz	Within Band	Pass



OCCUPIED BANDWIDTH - Band 71 NB IoT SA

XMit 2022.02.07.0

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
Block - DC	Fairview Microwave	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOB) as the original certification test. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 27.53 defines the 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band 71 (617MHz to 652MHz) Narrow-Band IoT Stand Alone			
Ch BW	Radio Channel	4G-LTE: N-TM	
		FCC	ISED
200kHz	Low	295KG7D	204KG7D
	Mid	293KG7D	205KG7D
	High	303KG7D	210KG7D
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.			

OCCUPIED BANDWIDTH - Band 71 NB IoT SA

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	11-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	21.1 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	54% RH
Project:	None			Barometric Pres.:	1013 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. The carriers were enabled at a maximum power.

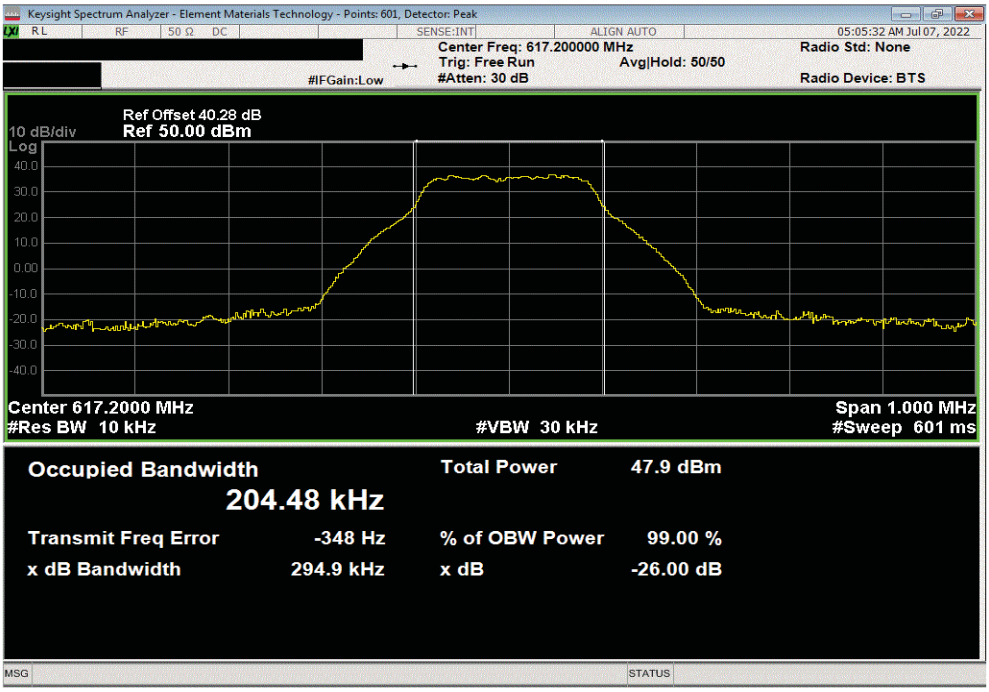
DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	Signature

	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 2, LTE, Band 71, 617 MHz - 652 MHz				
200 kHz Bandwidth				
Standalone NB-IoT				
Low Ch. 617.2 MHz	204.48 kHz	294.914 kHz	Outside Band	Pass
Mid Ch. 634.5 MHz	204.953 kHz	293.47 kHz	Outside Band	Pass
High Ch. 651.8 MHz	210.407 kHz	302.775 kHz	Outside Band	Pass

Port 2, LTE, Band 71, 617 MHz - 652 MHz, 200 kHz Bandwidth, Standalone NB-IoT Modulation, Low Ch. 617.2 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			204.48 kHz	294.914 kHz	Outside Band	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 200 kHz Bandwidth, Standalone NB-IoT Modulation, Mid Ch. 634.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			204.953 kHz	293.47 kHz	Outside Band	Pass