



element

Radio Test Report
Application for a Class II Permissive Change of Equipment Authorization
FCC Part 24 and IC RSS-133
[1930MHz – 1995MHz]

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

FCC ID: VBNAHFIA-01
IC ID: 661W-AHFIA

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

Report # NOKI0008



NVLAP LAB CODE: 201049-0



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CERTIFICATE OF TEST



Last Date of Test: February 20, 2020

Nokia Solutions and Networks

EUT: Airscale Base Transceiver Station Remote Radio Head Model AHFIA

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 6: 2019 CFR Title 47 Part 24 Subpart E – Broadband PCS RSS-133 Issue 6 - January 18, 2018 – 2GHz Personal Communications Services CFR Title 47 Part 27 Subpart C RSS-139 Issue 3 - July 16, 2015 – Advanced Wireless Services (AWS)	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01

Results

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

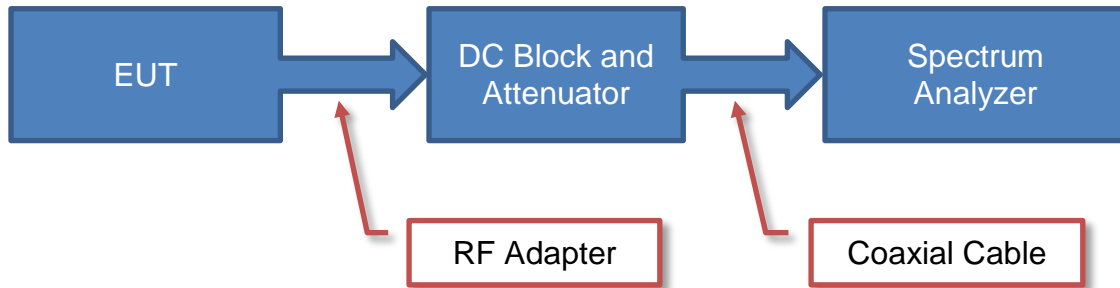


California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, 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

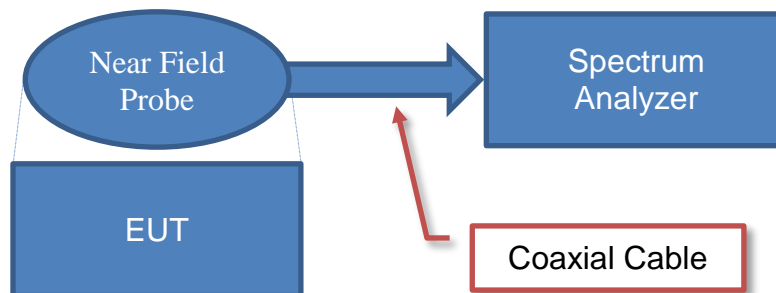


Test Setup Block Diagrams

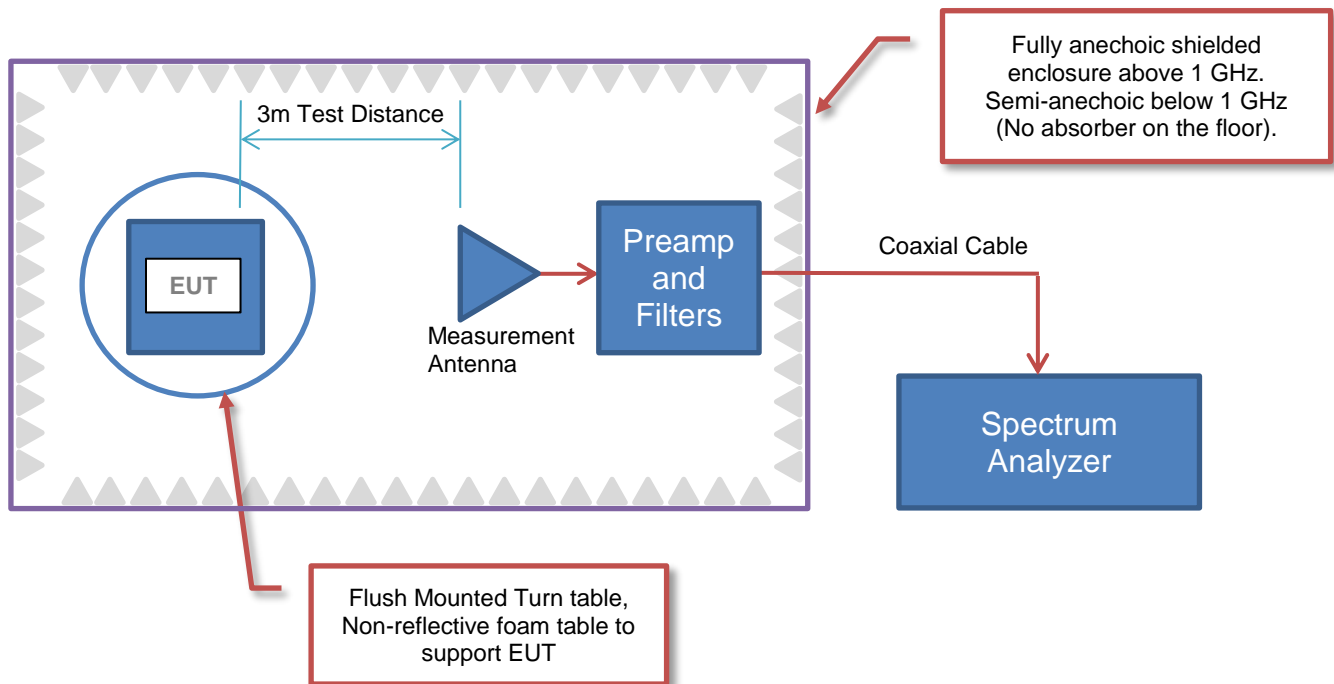
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

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

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

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

PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	6000 Connection Drive
City, State, Zip:	Irving, TX 75039
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHFIA
First Date of Test:	February 13, 2020
Last Date of Test:	February 20, 2020
Receipt Date of Samples:	February 12, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

A class II permissive change on the original filing is being pursued to add 5G NR (new radio) carriers to the Airscale BTS RRH model AHFIA FCC and ISED radio certifications. The original FCC certification submittal (FCC ID: VBNAHFIA-01) and the original ISED certification submittal (IC ID: 661W-AHFIA) was NTS Test Report Number PR072254 Revision 1 dated March 18, 2018. The original test effort includes testing for LTE technologies. Please refer to the test report on the original certification for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using 5G NR carriers for this class II permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing was used in this class II permissive change test effort. 5G NR carrier bandwidths of 5MHz, 10MHz, 15MHz and 20MHz with QPSK, 16QAM, 64QAM and 256QAM modulation types were verified under this effort. Tests performed under the class II change effort include RF power, peak to average power ratio, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions. The 5G NR carriers/modulation types for this testing are based upon 3GPP TS 38.141-1 Test Models and are NR-FR1-TM 1.1 (QPSK modulation type), NR-FR1-TM 3.2 (16QAM modulation type), NR-FR1-TM 3.1 (64QAM modulation type), and NR-FR1-TM 3.1a (256QAM modulation type).

The testing was performed on the same hardware (AHFIA) as the original certification test. The same AHFIA RF port (Antenna 4) determined in the original certification testing to be the highest power port was used for all testing in this effort. The base station and remote radio head software for this testing is an updated release that includes 5G NR carrier support.

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

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

PRODUCT DESCRIPTION



The AHFIA RRH has four transmit/four receive antenna ports (4TX/4RX for Band 25 and 4TX/4RX for Band 66a). Each antenna port supports 3GPP frequency band 25 (BTS Rx: 1850 to 1915 MHz/BTS TX: 1930 to 1995 MHz) and 3GPP frequency band 66a (BTS Rx: 1710 to 1780 MHz/BTS TX: 2110 to 2180 MHz). The maximum RF output power of the RRH is 160 Watts (40 watts per carrier, 40 watts per antenna port). The RRH can be operated as a 4x4 MIMO, 2x2 MIMO or as non-MIMO. The TX and RX instantaneous bandwidth cover the full operational RRH bandwidth. The RRH supports 5G NR channel bandwidths of 5MHz, 10MHz, 15MHz and 20MHz for 3GPP frequency bands n2 and n66a operations. The RRH supports four 5G NR downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM).

The RRH has external interfaces including DC power (DC In), ground, transmit/receive (ANT), external alarm (EAC), optical CPRI (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted. The RRH may be configured with optional cooling fan. The 5G NR channel bandwidths are 5, 10, 15 and 20MHz. The channel spacing is 100 kHz between channel numbers. The AHFIA 5G NR downlink channel numbers and frequencies for Band n25 (PCS Band) are as follows:

	Downlink NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AHFIA Band n25 (Ant 1, 2, 3, 4)	386000	1930.0	Band Edge	Band Edge	Band Edge	Band Edge
	386500	1932.5	Bottom Ch			
	387000	1935.0		Bottom Ch		
	387500	1937.5			Bottom Ch	
	388000	1940.0				Bottom Ch
	392500	1962.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	397000	1985.0				Top Channel
	397500	1987.5			Top Channel	
398000	1990.0		Top Channel			
398500	1992.5	Top Channel				

PRODUCT DESCRIPTION



	399000	1995.0	Band Edge	Band Edge	Band Edge	Band Edge
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AHFIA Downlink Band Edge 5G NR Band n25 Frequency Channels

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

	Downlink NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AHFIA Band n66a (Ant 1, 2, 3, 4)	422000	2110.0	Band Edge	Band Edge	Band Edge	Band Edge
	422500	2112.5	Bottom Ch			
	423000	2115.0		Bottom Ch		
	423500	2117.5			Bottom Ch	
	424000	2120.0				Bottom Ch
	429000	2145.0	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	434000	2170.0				Top Channel
	434500	2172.5			Top Channel	
	435000	2175.0		Top Channel		
435500	2177.5	Top Channel				
436000	2180.0	Band Edge	Band Edge	Band Edge	Band Edge	

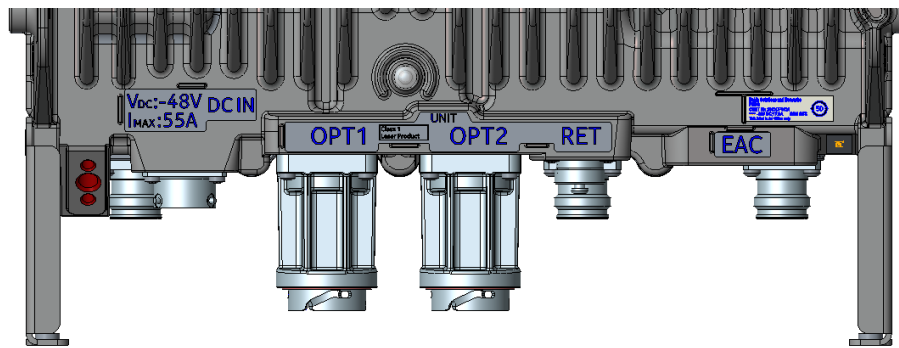
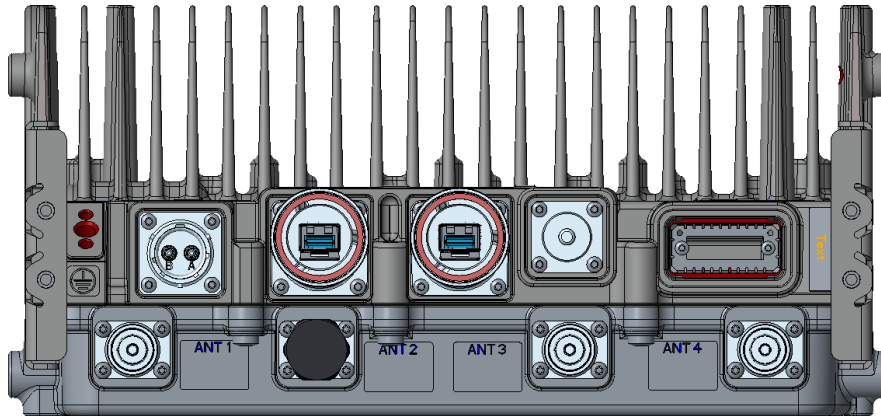
AHFIA Downlink Band Edge 5G NR Band n66a Frequency Channels

Testing Objective:

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

PRODUCT DESCRIPTION

AHFIA Connector Layout:



EUT 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
Fan	1	Molex Microfit	Power for RRH Fan. Located on the side of RRH.

CONFIGURATIONS



Configuration NOKI0008- 1

Software/Firmware Running during test	
Description	Version
Radio module Software	FRM 50.01.R20
BTS Software Version	5G20A_GNB_0000_000840_000232

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Airscale BTS Remote Radio Head Model AHFIA	Nokia Solutions and Networks	473967A.101	K9174623559

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIK (BTS system Module)	Nokia Solutions and Networks	474021A.102	AH173111443
ABIL (BTS system Module)	Nokia Solutions and Networks	474020A.102	L1183605740
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ1165
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
HP ProBook 5470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Low Pass Filter 1.5GHz/100W	Microwave Circuits Inc.	L13502G1	SN2454-01
Fiber Optic cable 0300 mm	Amphenol	E201648	11C
CATe data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
WebEM- PC	Lenovo	20HES2141X	None
CAT-5e cable	CSA	LL73189	E151955

CONFIGURATIONS



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHFIA [RRH] RF Port 4	Attenuator 150W/20dB
Amphenol Fiber Optic cable	No	7.0 m	No	ASIK	AHFIA
CAT5e data cable	Yes	25 m	No	ASIK	FYGB GPS receiver
RF cable Port 1	Yes	2.0 m	No	AHFIA [RRH] RF Port 1	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHFIA [RRH] RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHFIA [RRH] RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Low Pass filter 1.5 GHz	Analyzer
CAT-5e cable	Yes	7.0 m	No	ASIK	WebEM - PC
AC Power Cable	Yes	7.0 m	No	AC Mains	FPAC (DC-pwr supply)

CONFIGURATIONS



Configuration NOKI0008- 2

Software/Firmware Running during test	
Description	Version
Radio module Software	FRM 50.01.R20
BTS Software Version	5G20A_GNB_0000_000840_000232

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Airscale BTS Remote Radio Head Model AHFIA	Nokia Solutions and Networks	473967A.101	K9174623559

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIK (BTS system Module)	Nokia Solutions and Networks	474021A.102	AH173111443
ABIL (BTS system Module)	Nokia Solutions and Networks	474020A.102	L1183605740
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ1165
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
HP ProBook 5470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Fiber Optic cable 0300 mm	Amphenol	E201648	11C
CATe data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
WebEM- PC	Lenovo	20HES2141X	None
CAT-5e cable	CSA	LL73189	E151955

CONFIGURATIONS



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHFIA [RRH] RF Port 4	Attenuator 150W/20dB
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	Attenuator 150W/20dB	Analyzer
Amphenol Fiber Optic cable	No	7.0 m	No	ASIK	AHFIA
CAT5e data cable	Yes	25 m	No	ASIK	FYGB GPS receiver
RF cable Port 1	Yes	2.0 m	No	AHFIA [RRH] RF Port 1	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHFIA [RRH] RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHFIA [RRH] RF Port 2	250W 50 ohm Load
CAT-5e cable	Yes	7.0 m	No	ASIK	WebEM - PC
AC Power Cable	Yes	7.0 m	No	AC Mains	FPAC (DC-pwr supply)

CONFIGURATIONS



Configuration NOKI0008- 3

Software/Firmware Running during test	
Description	Version
Radio module Software	FRM 50.01.R20
BTS Software Version	5G20A_GNB_0000_000840_000232

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Airscale BTS Remote Radio Head Model AHFIA	Nokia Solutions and Networks	473967A.101	K9174623559

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIK (BTS system Module)	Nokia Solutions and Networks	474021A.102	AH173111443
ABIL (BTS system Module)	Nokia Solutions and Networks	474020A.102	L1183605740
Attenuator 150W/20dB	AeroflexWeinschel	66-20-33	BZ2075
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
HP ProBook 5470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Fiber Optic cable 0300 mm	Amphenol	E201648	11C
CATe data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
WebEM- PC	Lenovo	20HES2141X	None
CAT-5e cable	CSA	LL73189	E151955
High Pass Filter 2.5GHz	RLC Electronics	F-100-3000-5-R	0028

CONFIGURATIONS



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHFIA [RRH] RF Port 4	Attenuator 150W/20dB
Amphenol Fiber Optic cable	No	7.0 m	No	ASIK	AHFIA
CAT5e data cable	Yes	25 m	No	ASIK	FYGB GPS receiver
RF cable Port 1	Yes	2.0 m	No	AHFIA [RRH] RF Port 1	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHFIA [RRH] RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHFIA [RRH] RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	1.0 m	No	High Pass Filter 2.5 GHz	Analyzer
CAT-5e cable	Yes	7.0 m	No	ASIK	WebEM - PC
AC Power Cable	Yes	7.0 m	No	AC Mains	FPAC (DC-pwr supply)

CONFIGURATIONS



Configuration NOKI0008- 4

Software/Firmware Running during test	
Description	Version
Radio module Software	FRM 50.01.R20
BTS Software Version	5G20A_GNB_0000_000840_000232

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Airscale BTS Remote Radio Head Model AHFIA	Nokia Solutions and Networks	473967A.101	K9174623559

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS system Module)	Nokia Solutions and Networks	473098A.101	RK182307104
ASIK (BTS system Module)	Nokia Solutions and Networks	474021A.102	AH173111443
ABIL (BTS system Module)	Nokia Solutions and Networks	474020A.102	L1183605740
Attenuator 50W/30dB	Narda	7768-30	1
SFP+ 9.8G,300M,850NM	NOKIA	473842.A101	KR160900020030
SFP+9.8G,300M,850NM	NOKIA	473842.A101	MA17331610207
HP ProBook 5470b	HP	B2G14EC#ABA	CNU246B8XP
HP-DC System power supply	HP	6032A	3440A-10308
FPAC (DC-pwr supply)	Nokia	472438A.101	G7111007146
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00005TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00006TMC
2 Meter RF cable	Times Microwave Systems	SPP250NM43MR2.0M	463559-00002TMC
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC867
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TV066
250W -50ohm -Terminating Load	API Weinschel inc	1433-3-LIM	TC870
Attenuator 100W/3dB	AeroflexWeinschel	47-3-33	CG5493
Fiber Optic cable 0300 mm	Amphenol	E201648	11C
CATe data cable	LEONI L	64867m	146180
FYGB GPS receiver	Nokia	472748A	71231431
WebEM- PC	Lenovo	20HES2141X	None
CAT-5e cable	CSA	LL73189	E151955
High Pass Filter 2.5GHz	RLC Electronics	F-100-3000-5-R	0028

CONFIGURATIONS



Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Amphenol Fiber Optic cable	No	7.0 m	No	ASIK	AHFIA
CAT5e data cable	Yes	25 m	No	ASIK	FYGB GPS receiver
RF cable Port 1	Yes	2.0 m	No	AHFIA [RRH] RF Port 1	250W 50 ohm Load
RF cable Port 3	Yes	2.0 m	No	AHFIA [RRH] RF Port 3	250W 50 ohm Load
RF cable Port 2	Yes	2.0 m	No	AHFIA [RRH] RF Port 2	250W 50 ohm Load
RF cable HS-SUCFLEX_104	Yes	2.0 m	No	Analyzer	High Pass Filter 2.5GHz
CAT-5e cable	Yes	7.0 m	No	ASIK	WebEM - PC
RF cable HS-SUCFLEX_106	Yes	2.0 m	No	AHFIA [RRH] RF Port 4	Attenuator 100W/3dB
AC Power Cable	Yes	7.0 m	No	AC Mains	FPAC (DC-pwr supply)

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-02-13	Occupied Bandwidth Band 25	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	2020-02-13	Output Power Band 66a	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	2020-02-13	Peak to Average Power (CCDF) Band 25	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	2020-02-14	Occupied Bandwidth Band 66a	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	2020-02-14	Output Power Band 66a	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	2020-02-14	Peak to Average Power (CCDF) Band 66a	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2020-02-18	Band Edge Compliance Band 25	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2020-02-18	Band Edge Compliance Band 25	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2020-02-18	Power Spectral Band 25	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
10	2020-02-18	Power Spectral Density Band 66a	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	2020-02-20	Spurious Conducted Emissions Band 25	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
12	2020-02-20	Spurious Conducted Emissions Band 66a	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH BAND 25



XMI 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

The 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 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 $\geq 3x$ the RBW
- Peak Detector 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 24.238(b) defines the 26dB emission bandwidth requirement.
 RSS GEN Section 6.7 defines the 99% emission bandwidth requirement

Band n25 Emission Designators:


Band n25 (1930MHz to 1995MHz) Emission Designators								
Channel Bandwidth	5G-NR: QPSK		5G-NR: 16QAM		5G-NR: 64QAM		5G-NR: 256QAM	
	FCC	IC	FCC	IC	FCC	IC	FCC	IC
5M	4M85G7W	4M49G7W	4M80G7W	4M49G7W	4M83G7W	4M48G7W	4M84G7W	4M49G7W
10M	9M87G7W	9M32G7W	9M83G7W	9M27G7W	9M88G7W	9M32G7W	9M90G7W	9M32G7W
15M	14M8G7W	14M1G7W	14M8G7W	14M2G7W	14M8G7W	14M2G7W	14M8G7W	14M1G7W
20M	19M9G7W	18M9G7W	19M8G7W	19M0G7W	19M9G7W	19M0G7W	19M9G7W	18M9G7W

Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.

OCCUPIED BANDWIDTH BAND 25



TotTx 2019.08.30.0 XM8 2019.09.05

EUT:	AHFIA	Work Order:	NOKI0008
Serial Number:	K9174623559	Date:	13-Feb-20
Customer:	Nokia of America Corporation	Temperature:	23.6 °C
Attendees:	Mitch Hill, John Rattanavong	Humidity:	36.1% RH
Project:	None	Barometric Pres.:	1011 mbar
Tested by:	Brandon Hobbs	Power:	54VDC
		Job Site:	TX09
TEST SPECIFICATIONS		Test Method	
FCC 24E:2020		ANSI C63.26:2015	
RSS-Gen:2019		RSS-Gen:2019	
COMMENTS			
All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. The worst case port was found in the original client provided test report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value 99% (MHz)	Value 26dB (MHz) Limit Result

Band 25 (Single Carrier) Port 4

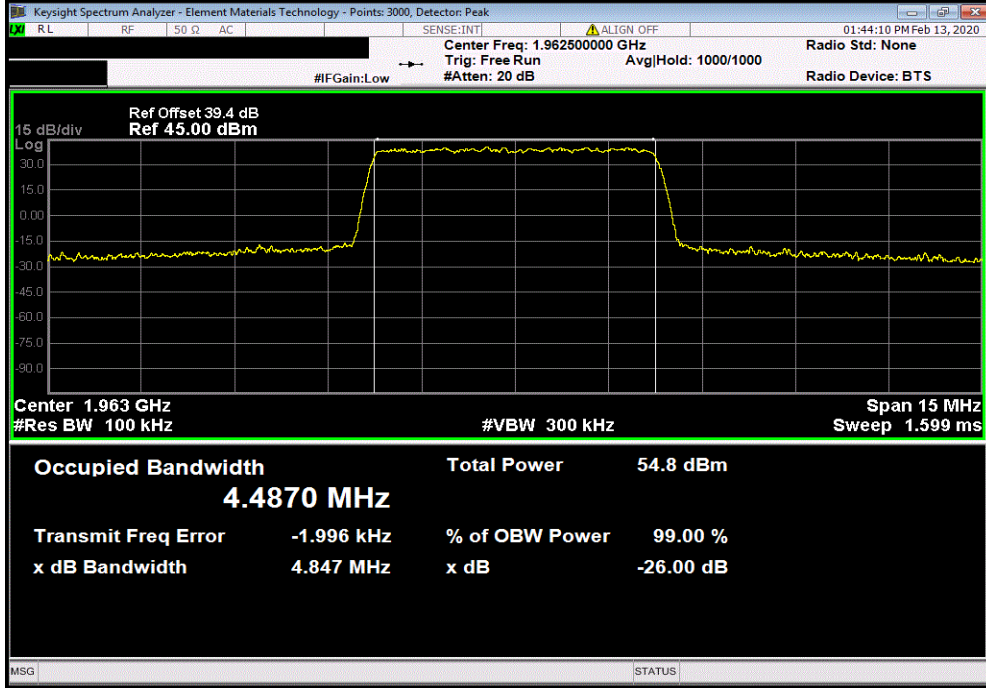
Modulation	Bandwidth	Channel	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
QPSK						
5 MHz		Mid Channel, 1962.5 MHz	4.49	4.85	Within Band	Pass
10 MHz		Mid Channel, 1962.5 MHz	9.32	9.87	Within Band	Pass
15 MHz		Mid Channel, 1962.5 MHz	14.19	14.84	Within Band	Pass
20 MHz		Mid Channel, 1962.5 MHz	18.92	19.93	Within Band	Pass
16-QAM						
5 MHz		Mid Channel, 1962.5 MHz	4.49	4.80	Within Band	Pass
10 MHz		Mid Channel, 1962.5 MHz	9.27	9.83	Within Band	Pass
15 MHz		Mid Channel, 1962.5 MHz	14.13	14.79	Within Band	Pass
20 MHz		Mid Channel, 1962.5 MHz	18.99	19.82	Within Band	Pass
64-QAM						
5 MHz		Mid Channel, 1962.5 MHz	4.48	4.83	Within Band	Pass
10 MHz		Mid Channel, 1962.5 MHz	9.32	9.88	Within Band	Pass
15 MHz		Mid Channel, 1962.5 MHz	14.18	14.83	Within Band	Pass
20 MHz		Mid Channel, 1962.5 MHz	18.96	19.92	Within Band	Pass
256-QAM						
5 MHz		Mid Channel, 1962.5 MHz	4.49	4.84	Within Band	Pass
10 MHz		Mid Channel, 1962.5 MHz	9.32	9.90	Within Band	Pass
15 MHz		Mid Channel, 1962.5 MHz	14.12	14.84	Within Band	Pass
20 MHz		Mid Channel, 1962.5 MHz	18.94	19.91	Within Band	Pass

OCCUPIED BANDWIDTH BAND 25

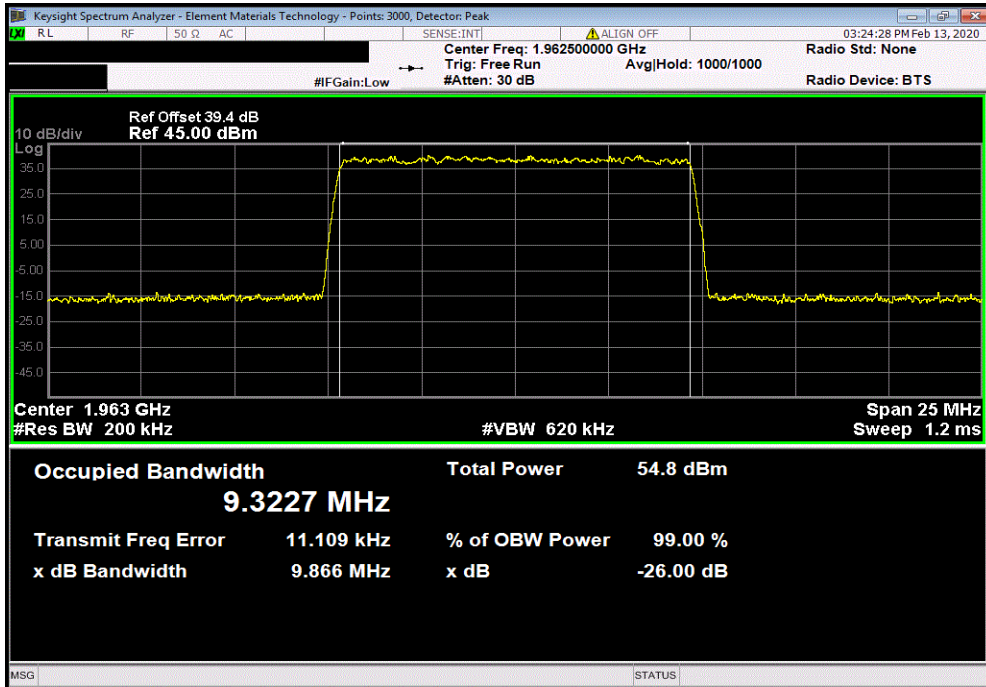


TxFx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, QPSK, 5 MHz, Mid Channel, 1962.5 MHz							
			Value	Value			
			99% (MHz)	26dB (MHz)	Limit		Result
			4.487	4.847	Within Band		Pass



Band 25 (Single Carrier) Port 4, QPSK, 10 MHz, Mid Channel, 1962.5 MHz							
			Value	Value			
			99% (MHz)	26dB (MHz)	Limit		Result
			9.323	9.866	Within Band		Pass

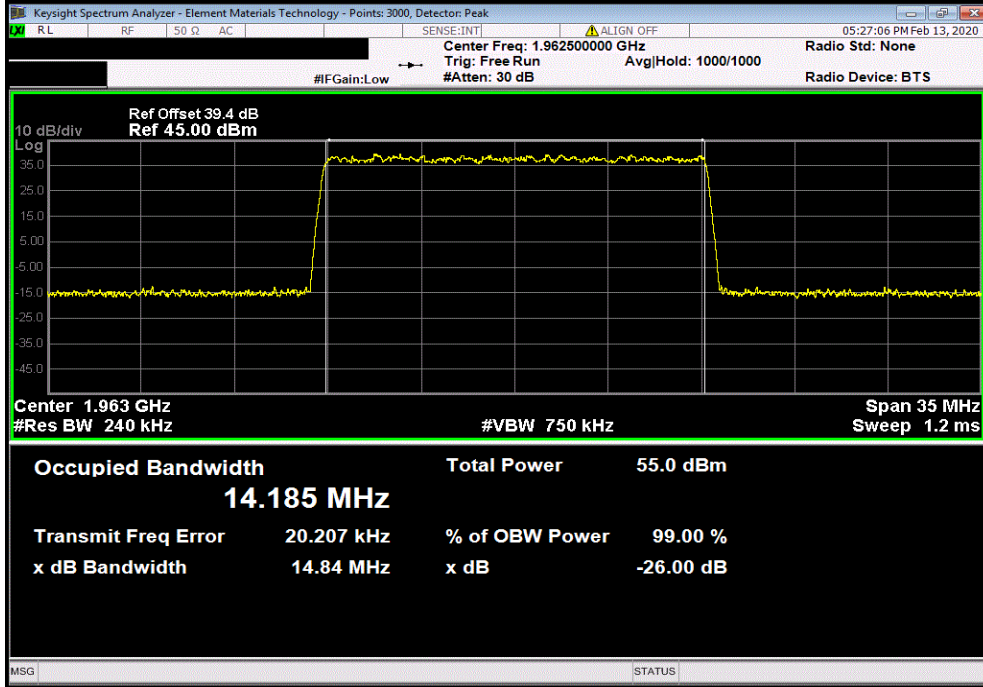


OCCUPIED BANDWIDTH BAND 25

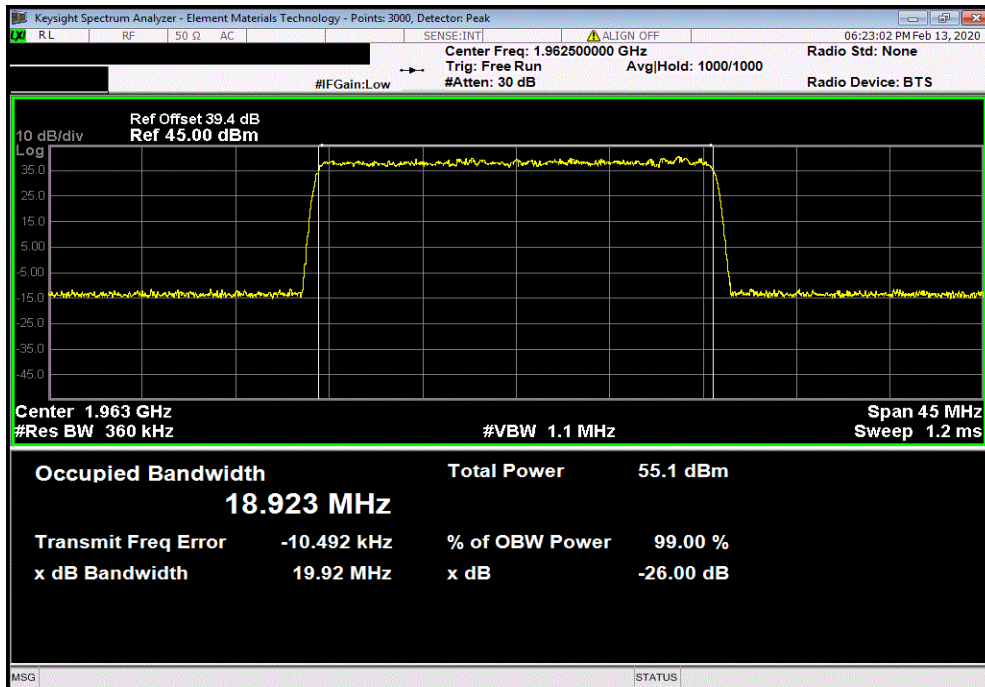


TxtTx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, QPSK, 15 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.185	14.835	Within Band	Pass		



Band 25 (Single Carrier) Port 4, QPSK, 20 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.923	19.925	Within Band	Pass		

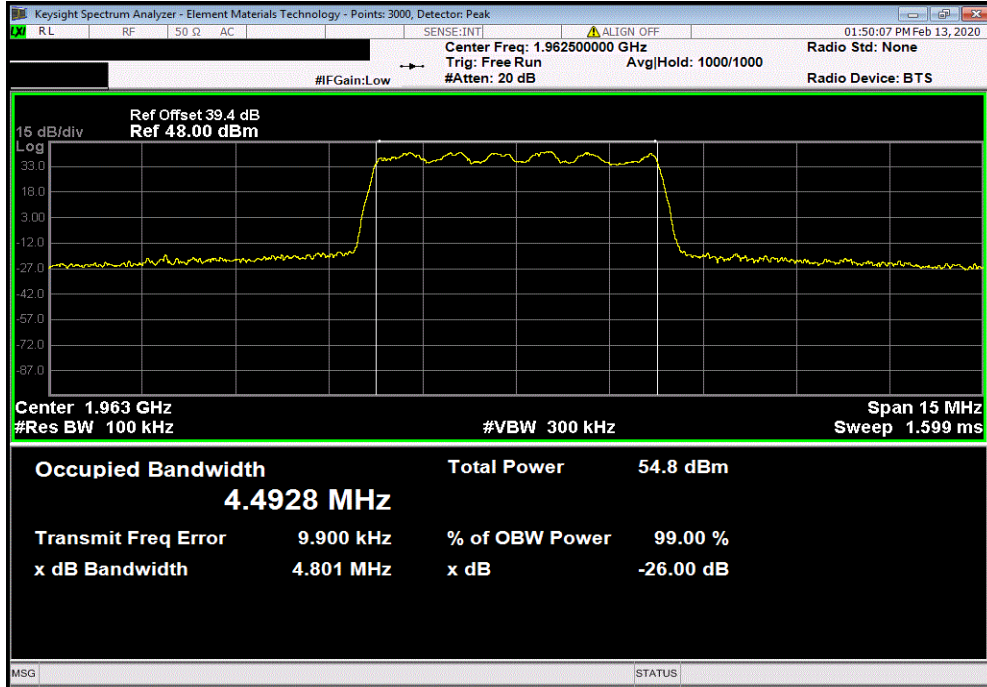


OCCUPIED BANDWIDTH BAND 25

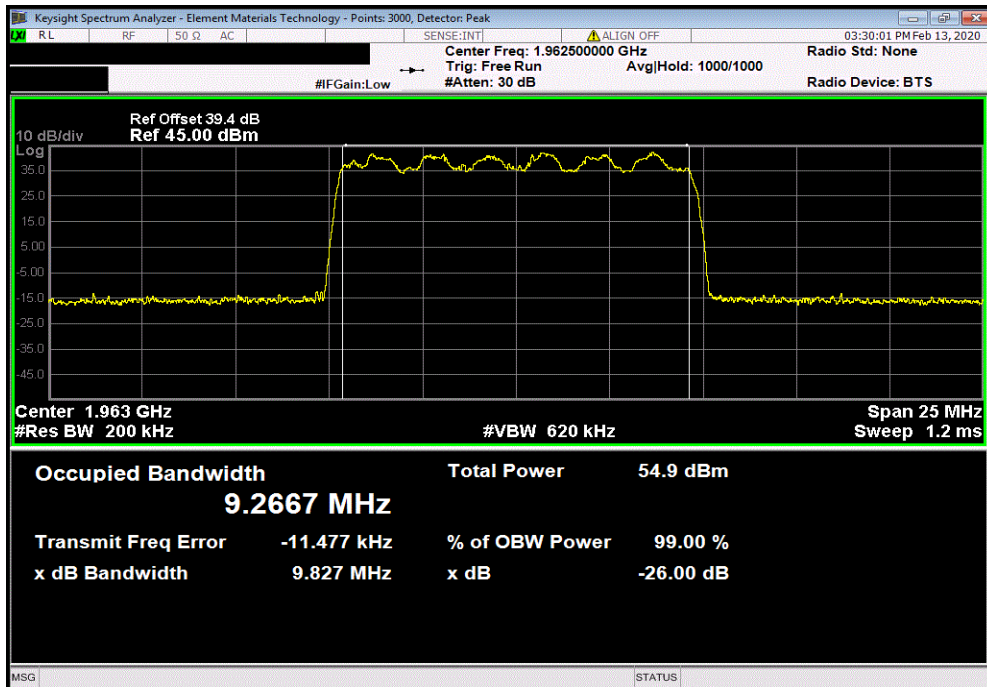


TxFx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, 16-QAM, 5 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.493	4.801	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 16-QAM, 10 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.267	9.827	Within Band	Pass		

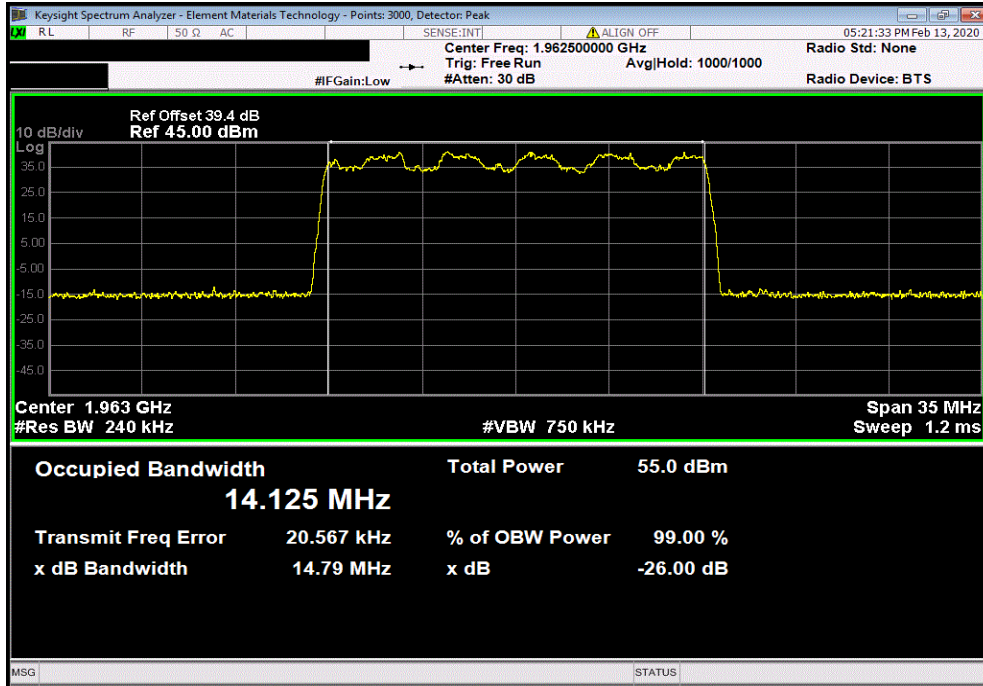


OCCUPIED BANDWIDTH BAND 25

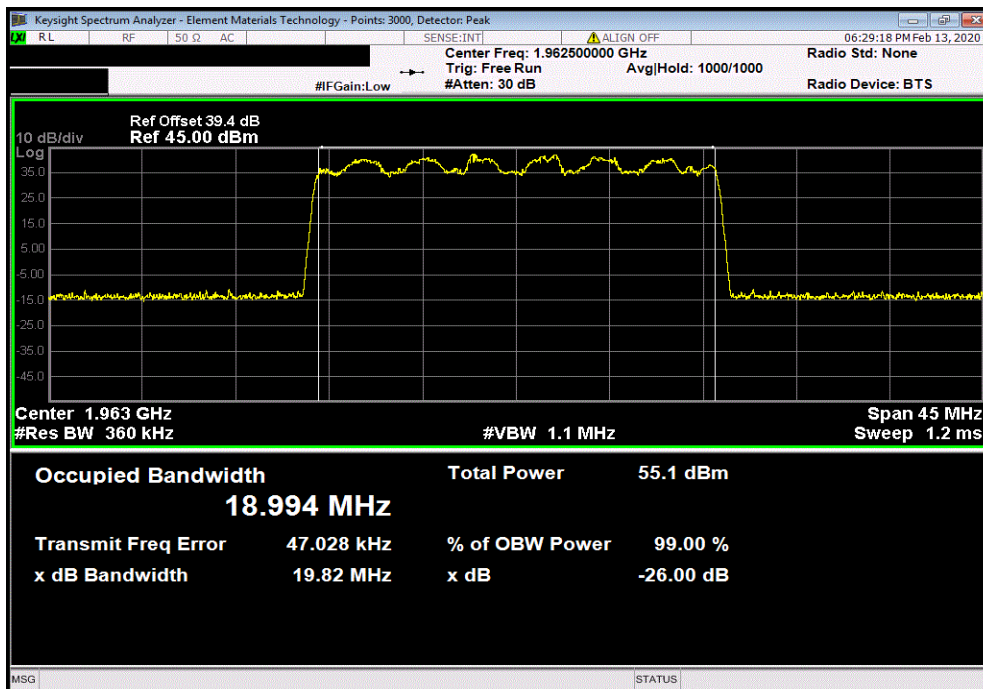


TxFx 2019.08.30.0 XMM 2019.09.05

Band 25 (Single Carrier) Port 4, 16-QAM, 15 MHz, Mid Channel, 1962.5 MHz							
		Value	Value				
		99% (MHz)	26dB (MHz)	Limit	Result		
		14.125	14.785	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 16-QAM, 20 MHz, Mid Channel, 1962.5 MHz							
		Value	Value				
		99% (MHz)	26dB (MHz)	Limit	Result		
		18.994	19.82	Within Band	Pass		

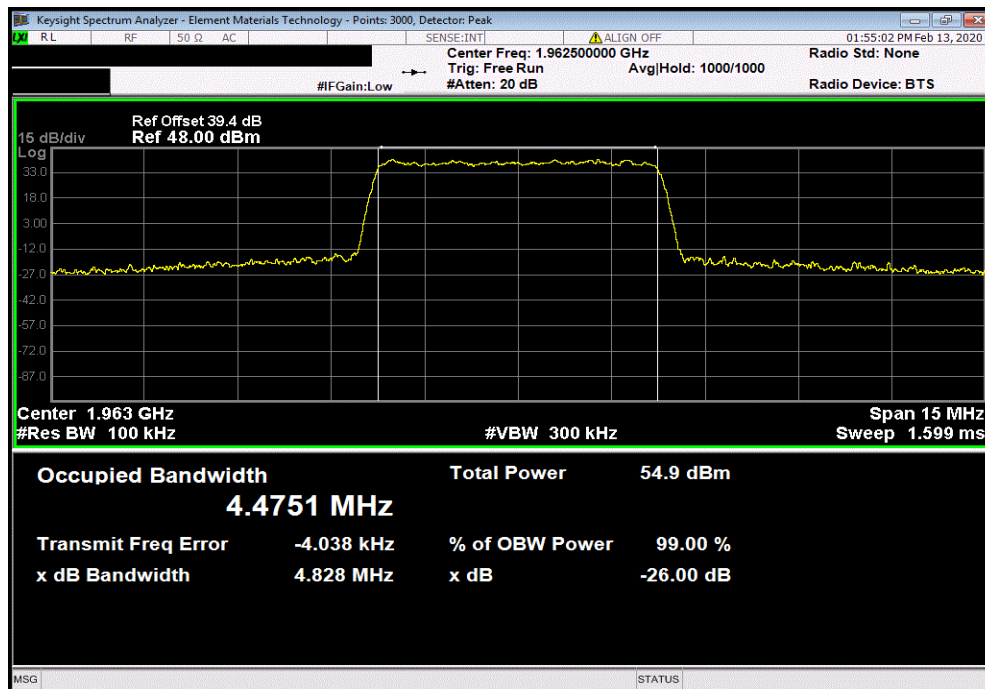


OCCUPIED BANDWIDTH BAND 25

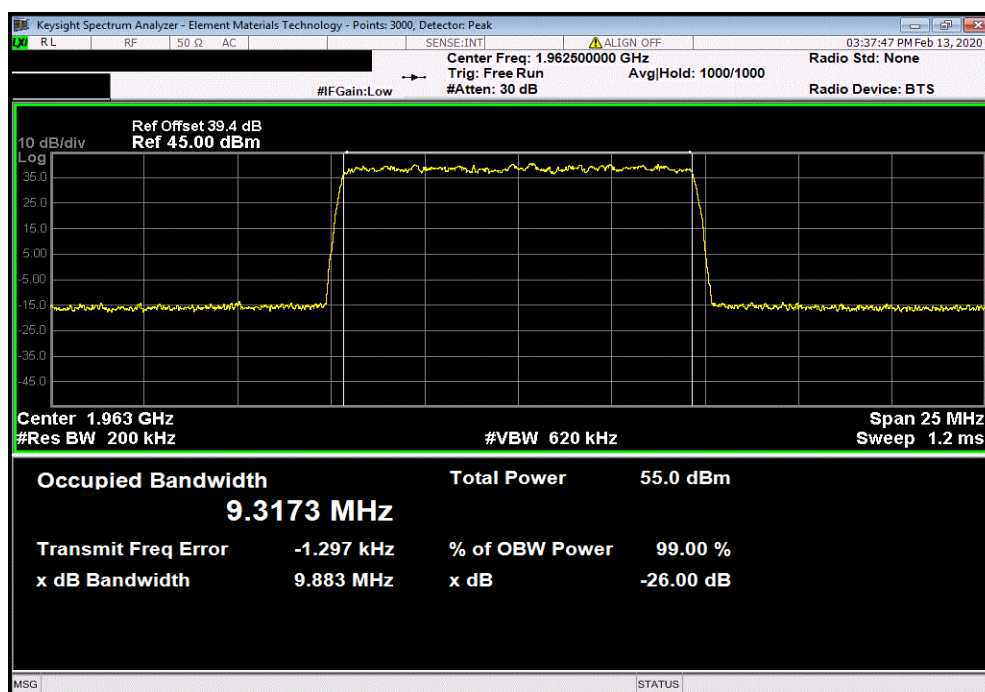


TxFx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, 64-QAM, 5 MHz, Mid Channel, 1962.5 MHz							
		Value	Value				
		99% (MHz)	26dB (MHz)	Limit	Result		
		4.475	4.828	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 64-QAM, 10 MHz, Mid Channel, 1962.5 MHz							
		Value	Value				
		99% (MHz)	26dB (MHz)	Limit	Result		
		9.317	9.883	Within Band	Pass		

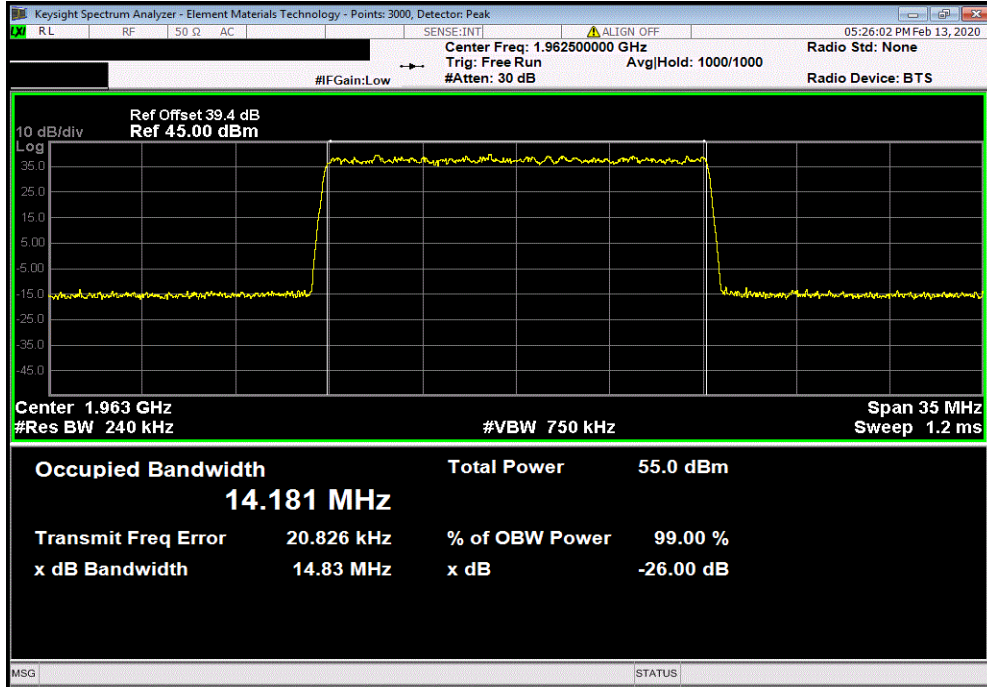


OCCUPIED BANDWIDTH BAND 25

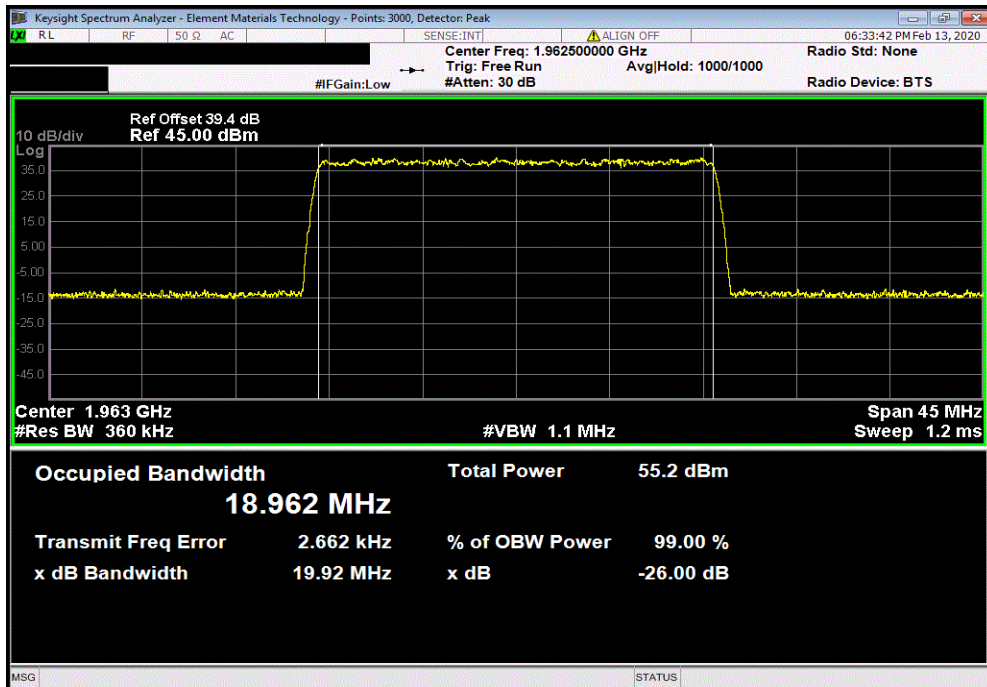


TxFx 2019.08.30.0 XMHz 2019.09.05

Band 25 (Single Carrier) Port 4, 64-QAM, 15 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.181	14.826	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 64-QAM, 20 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.962	19.924	Within Band	Pass		

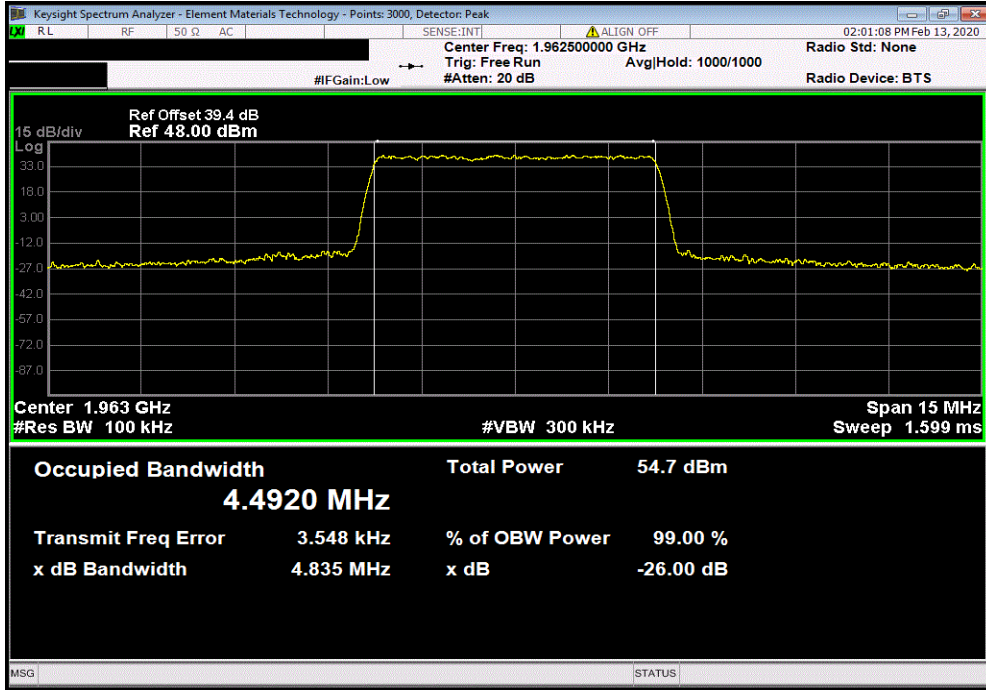


OCCUPIED BANDWIDTH BAND 25

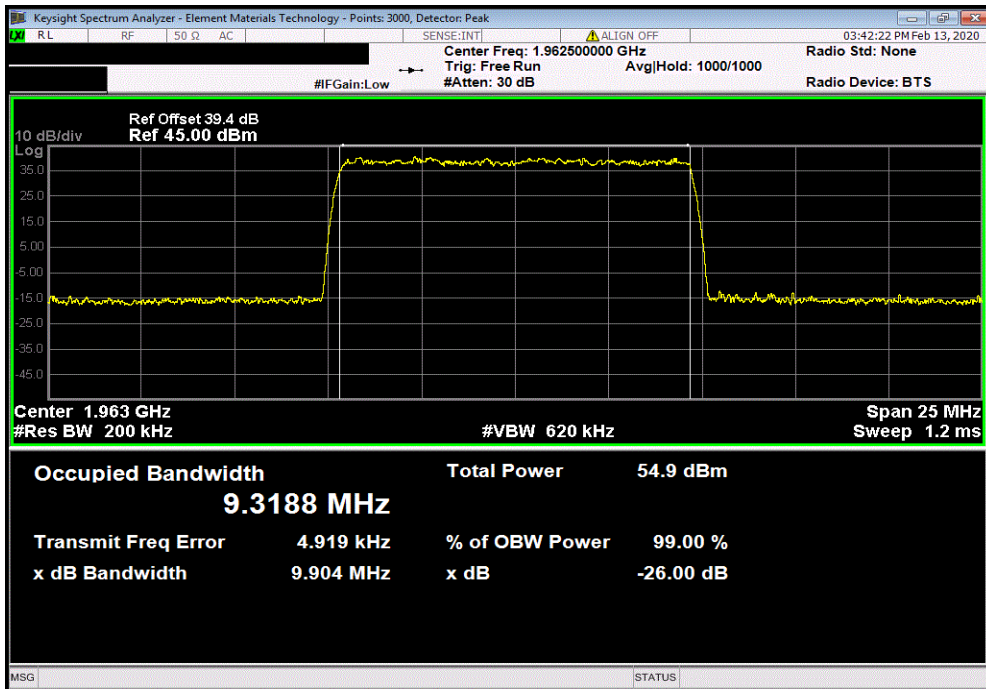


TxFx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, 256-QAM, 5 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.492	4.835	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 256-QAM, 10 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.319	9.904	Within Band	Pass		

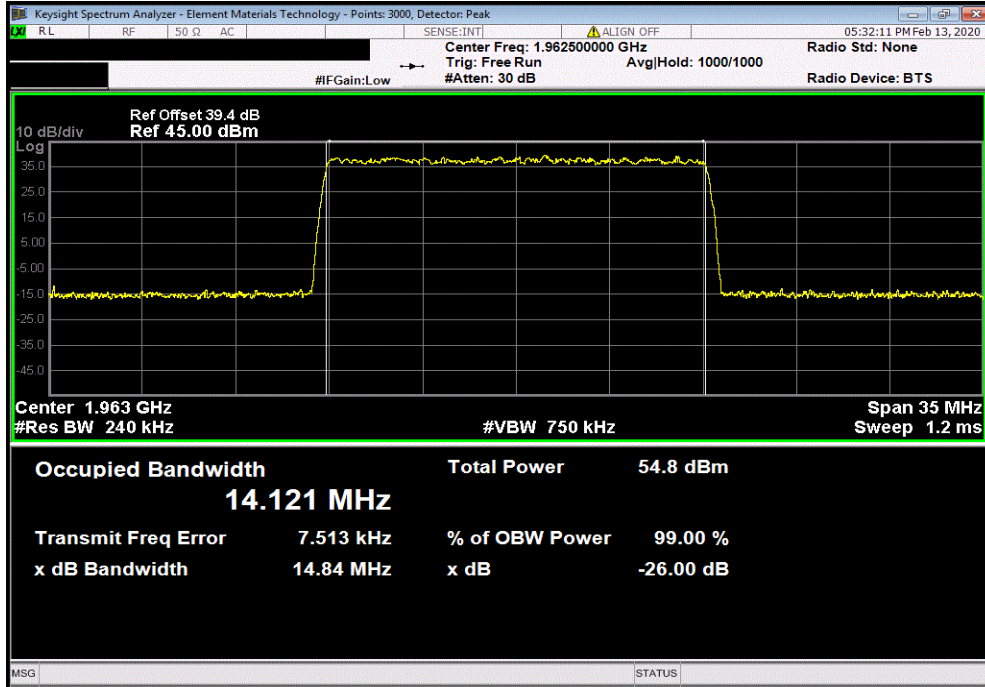


OCCUPIED BANDWIDTH BAND 25

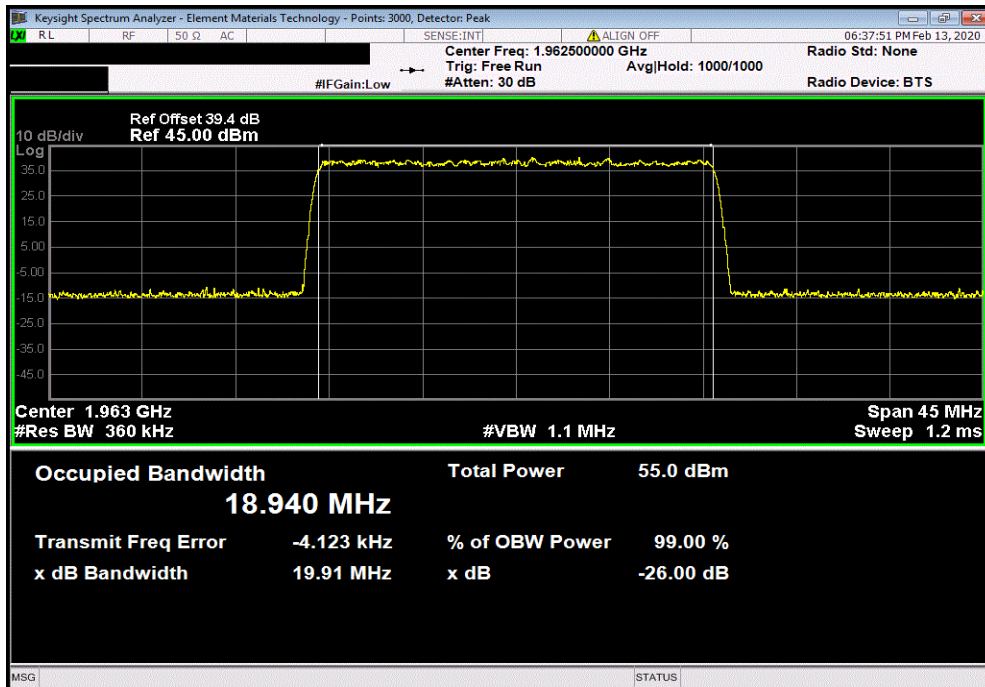


TxFx 2019.08.30.0 XMH 2019.09.05

Band 25 (Single Carrier) Port 4, 256-QAM, 15 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.121	14.844	Within Band	Pass		



Band 25 (Single Carrier) Port 4, 256-QAM, 20 MHz, Mid Channel, 1962.5 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.94	19.912	Within Band	Pass		



OCCUPIED BANDWIDTH BAND 66a



XMit 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

The 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 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 $\geq 3x$ the RBW
- Peak Detector 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 requires an emission bandwidth measurement. FCC 27.53(h)(3) defines the emission bandwidth to be used as 26 dB down. RSS GEN Section 6.7 defines the 99% emission bandwidth requirement

Band n66a Emission Designators:


Band n66a (2110MHz to 2180MHz) Emission Designators								
Channel Bandwidth	5G-NR: QPSK		5G-NR: 16QAM		5G-NR: 64QAM		5G-NR: 256QAM	
	FCC	IC	FCC	IC	FCC	IC	FCC	IC
5M	4M84G7W	4M49G7W	4M80G7W	4M50G7W	4M84G7W	4M48G7W	4M83G7W	4M49G7W
10M	9M86G7W	9M32G7W	9M85G7W	9M25G7W	9M87G7W	9M31G7W	9M89G7W	9M31G7W
15M	14M8G7W	14M1G7W	14M8G7W	14M1G7W	14M9G7W	14M2G7W	14M8G7W	14M1G7W
20M	19M9G7W	18M9G7W	19M8G7W	19M0G7W	19M9G7W	19M0G7W	19M9G7W	18M9G7W

Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.

OCCUPIED BANDWIDTH BAND 66a



TelTx 2019.08.30.0 XMt 2019.09.05

EUT: AHFIA		Work Order: NOKI0008	
Serial Number: K9174623559		Date: 14-Feb-20	
Customer: Nokia of America Corporation		Temperature: 22.9 °C	
Attendees: Mitch Hill, John Rattanavong		Humidity: 27.8% RH	
Project: None		Barometric Pres.: 1034 mbar	
Tested by: Brandon Hobbs	Power: 54VDC	Job Site: TX09	
TEST SPECIFICATIONS			
FCC 27:2020		Test Method	
RSS-Gen:2019		ANSI C63.26:2015	
COMMENTS		RSS-Gen:2019	
All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. The worst case port was found in the original client provided test report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	

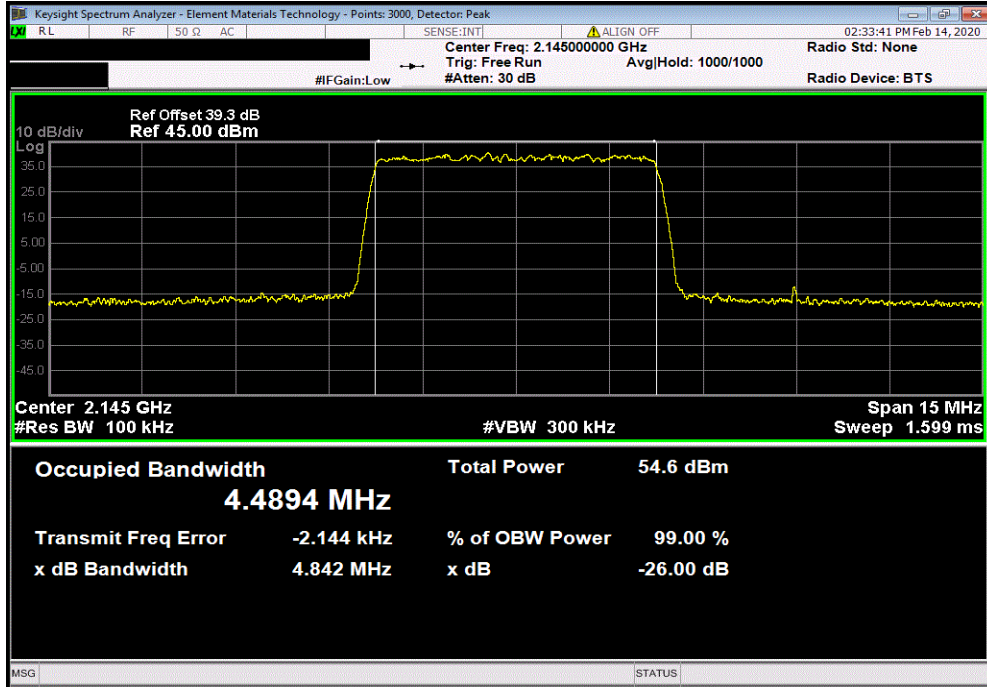
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Band 66a (Single Carrier) Port 4						
QPSK						
5 MHz	Mid Channel, 2145 MHz		4.49	4.84	Within Band	Pass
10 MHz	Mid Channel, 2145 MHz		9.32	9.86	Within Band	Pass
15 MHz	Mid Channel, 2145 MHz		14.09	14.83	Within Band	Pass
20 MHz	Mid Channel, 2145 MHz		18.91	19.91	Within Band	Pass
16-QAM						
5 MHz	Mid Channel, 2145 MHz		4.50	4.80	Within Band	Pass
10 MHz	Mid Channel, 2145 MHz		9.25	9.85	Within Band	Pass
15 MHz	Mid Channel, 2145 MHz		14.13	14.78	Within Band	Pass
20 MHz	Mid Channel, 2145 MHz		18.97	19.83	Within Band	Pass
64-QAM						
5 MHz	Mid Channel, 2145 MHz		4.48	4.84	Within Band	Pass
10 MHz	Mid Channel, 2145 MHz		9.31	9.87	Within Band	Pass
15 MHz	Mid Channel, 2145 MHz		14.18	14.85	Within Band	Pass
20 MHz	Mid Channel, 2145 MHz		18.95	19.94	Within Band	Pass
256-QAM						
5 MHz	Mid Channel, 2145 MHz		4.49	4.83	Within Band	Pass
10 MHz	Mid Channel, 2145 MHz		9.31	9.89	Within Band	Pass
15 MHz	Mid Channel, 2145 MHz		14.12	14.81	Within Band	Pass
20 MHz	Mid Channel, 2145 MHz		18.94	19.89	Within Band	Pass

OCCUPIED BANDWIDTH BAND 66a

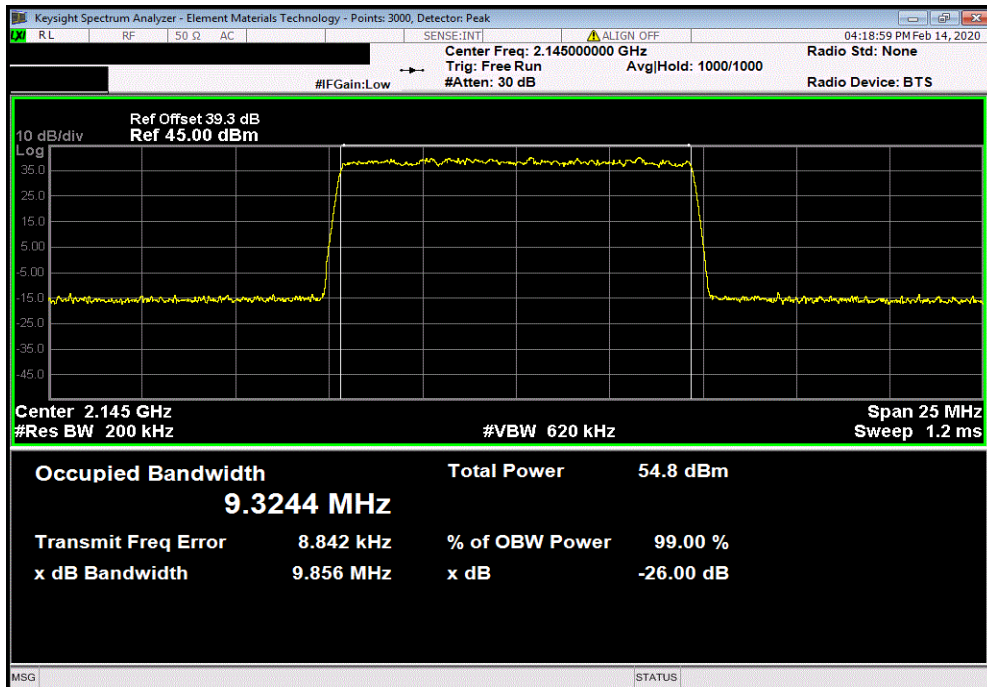


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, QPSK, 5 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.489	4.842	Within Band	Pass		



Band 66a (Single Carrier) Port 4, QPSK, 10 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.324	9.856	Within Band	Pass		

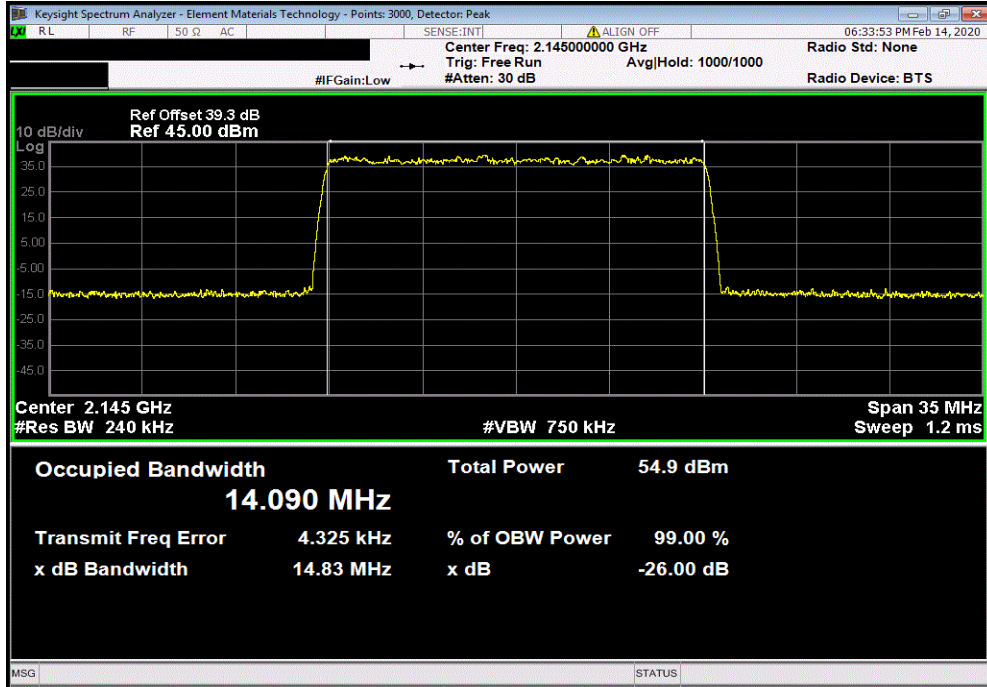


OCCUPIED BANDWIDTH BAND 66a



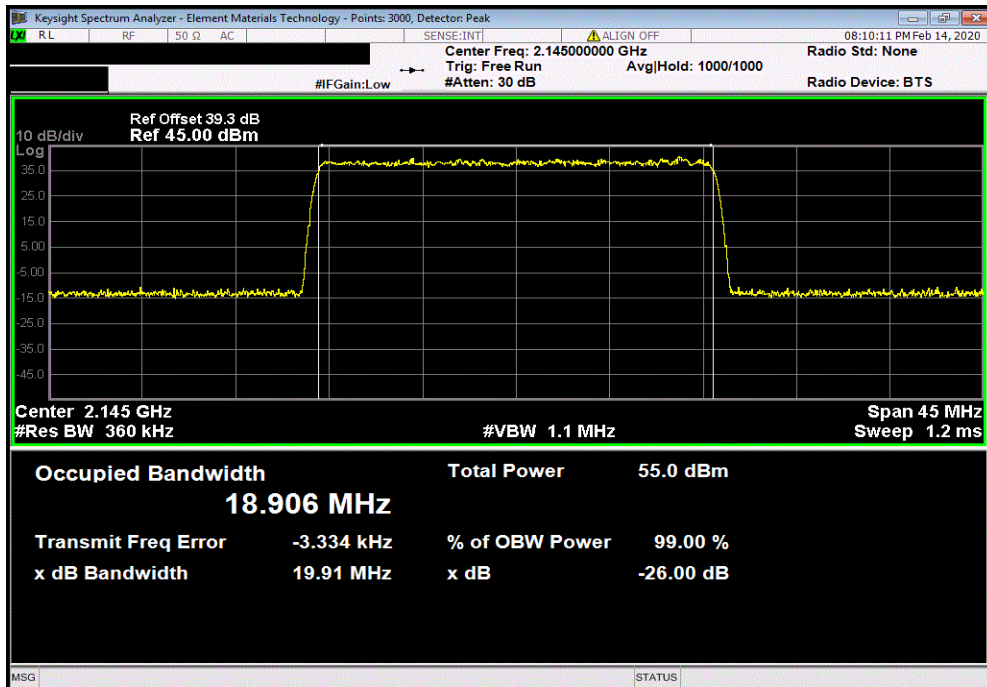
TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, QPSK, 15 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.09	14.831	Within Band	Pass		



Band 66a (Single Carrier) Port 4, QPSK, 20 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.906	19.907	Within Band	Pass		

Within Band

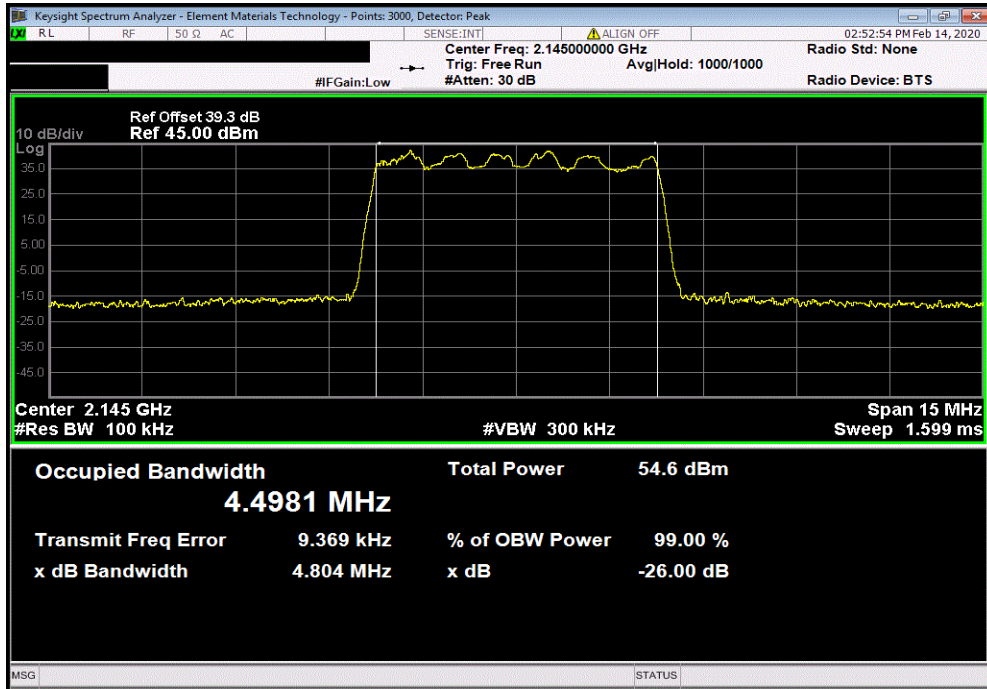


OCCUPIED BANDWIDTH BAND 66a

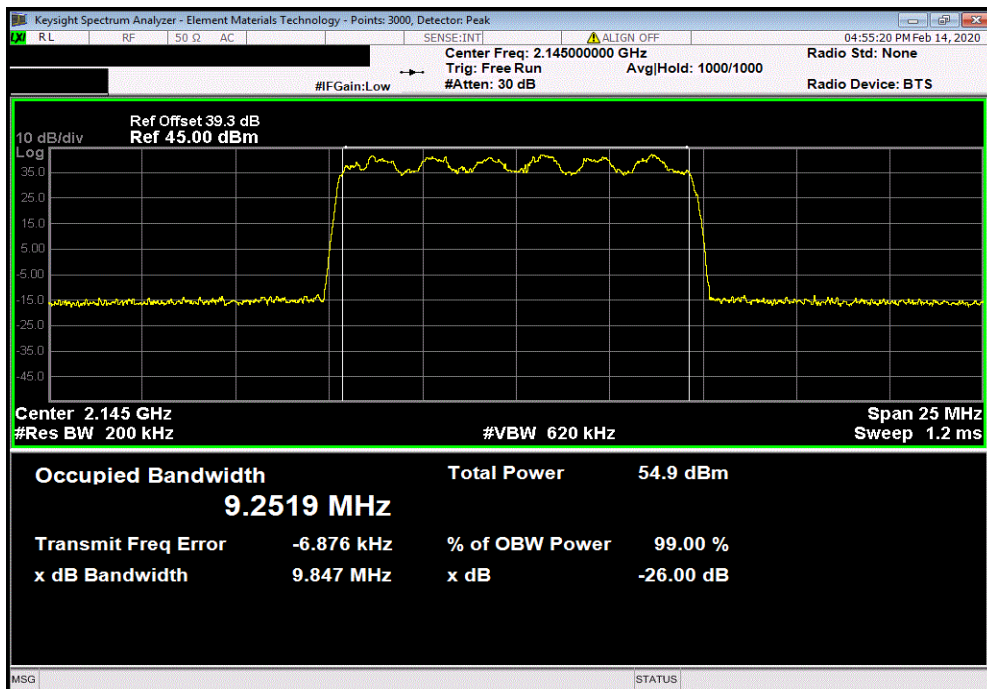


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 16-QAM, 5 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.498	4.804	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 16-QAM, 10 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.252	9.847	Within Band	Pass		

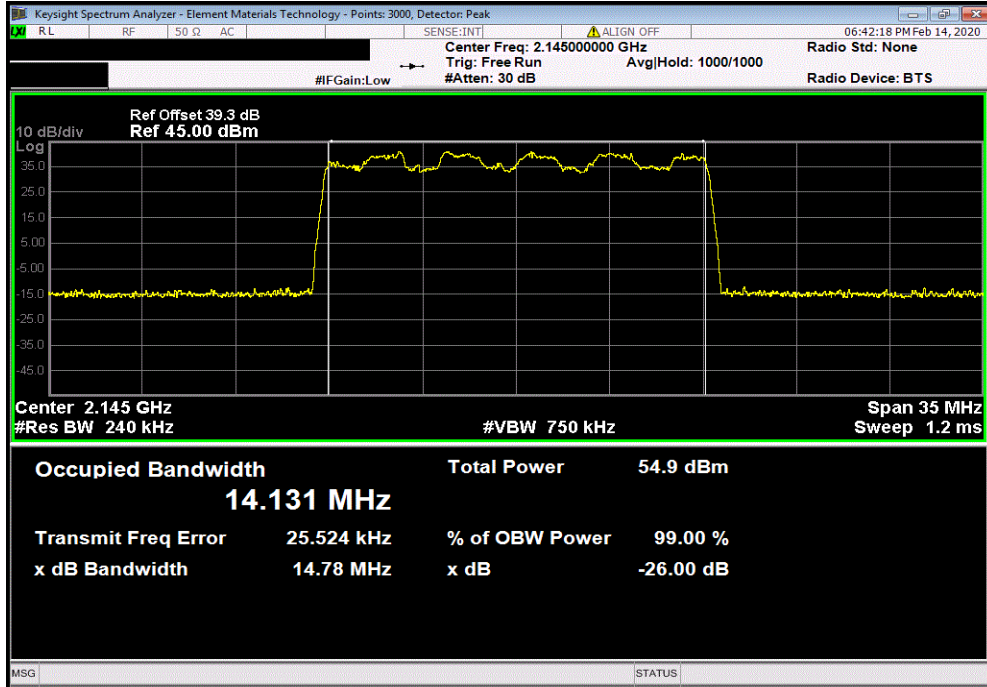


OCCUPIED BANDWIDTH BAND 66a

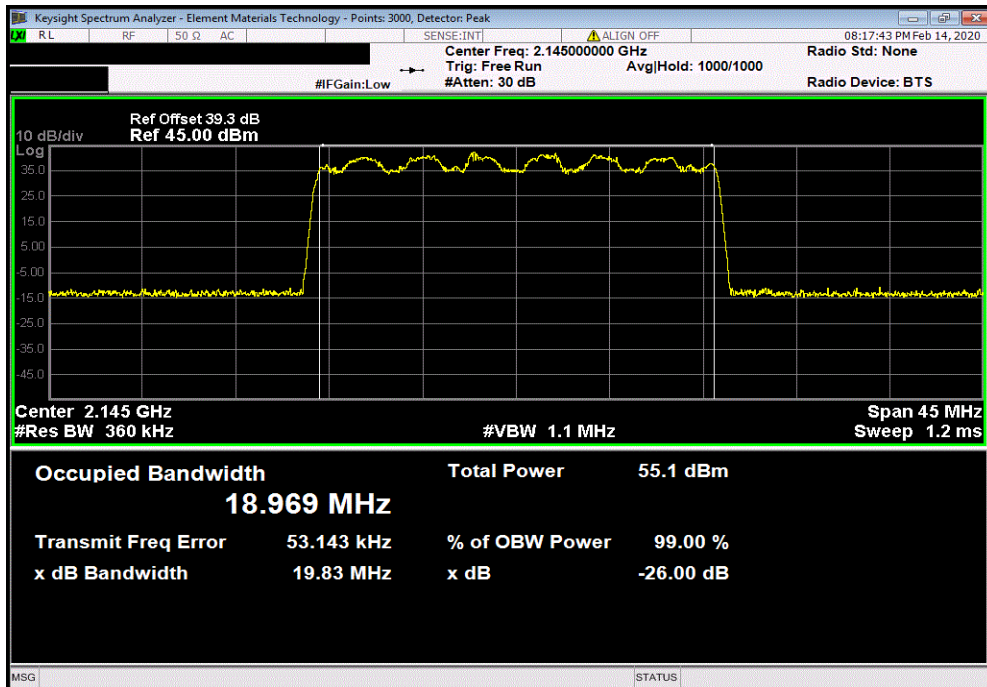


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 16-QAM, 15 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.131	14.777	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 16-QAM, 20 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.969	19.831	Within Band	Pass		

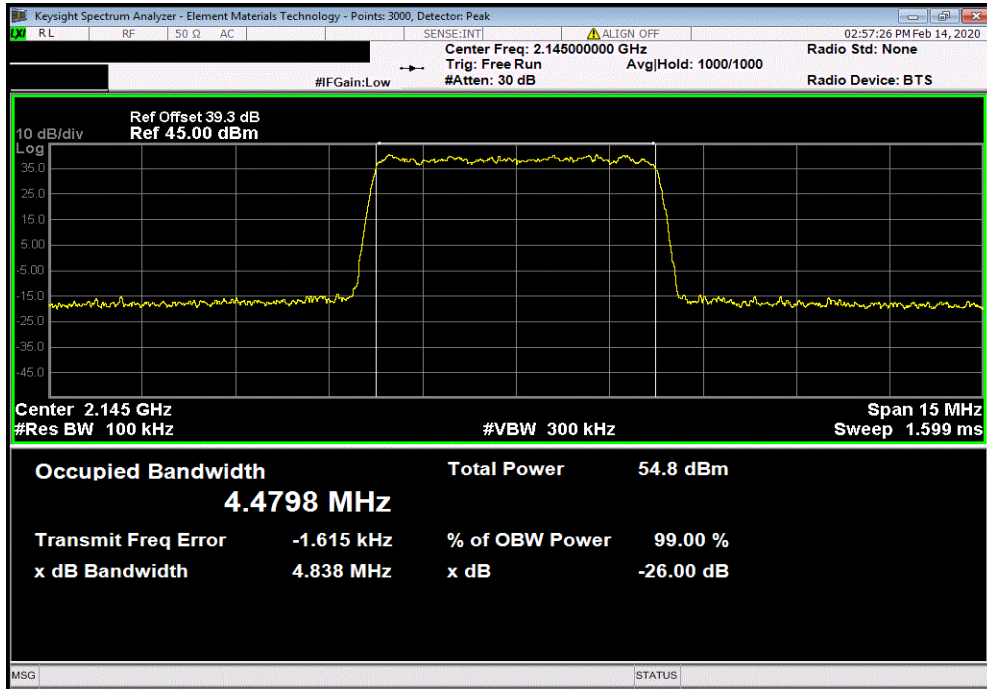


OCCUPIED BANDWIDTH BAND 66a

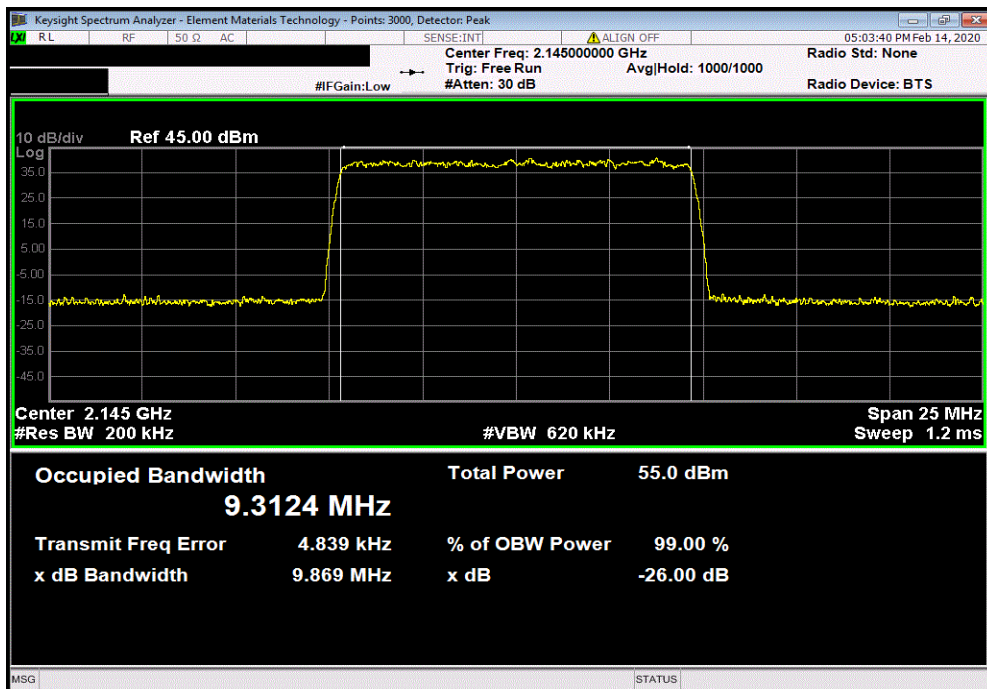


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 64-QAM, 5 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.48	4.838	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 64-QAM, 10 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.312	9.869	Within Band	Pass		

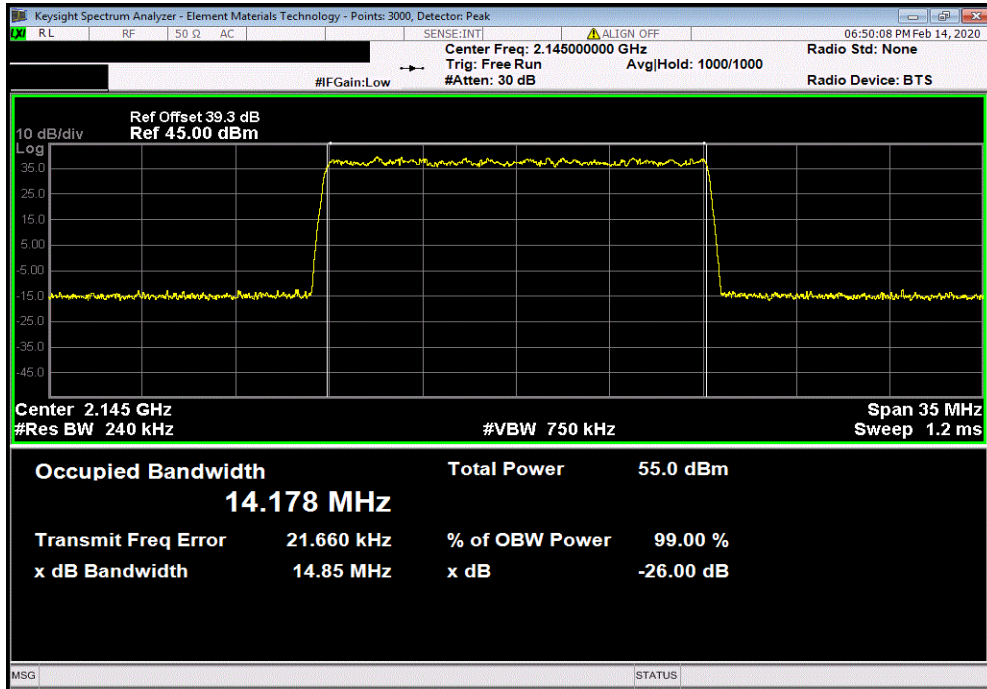


OCCUPIED BANDWIDTH BAND 66a

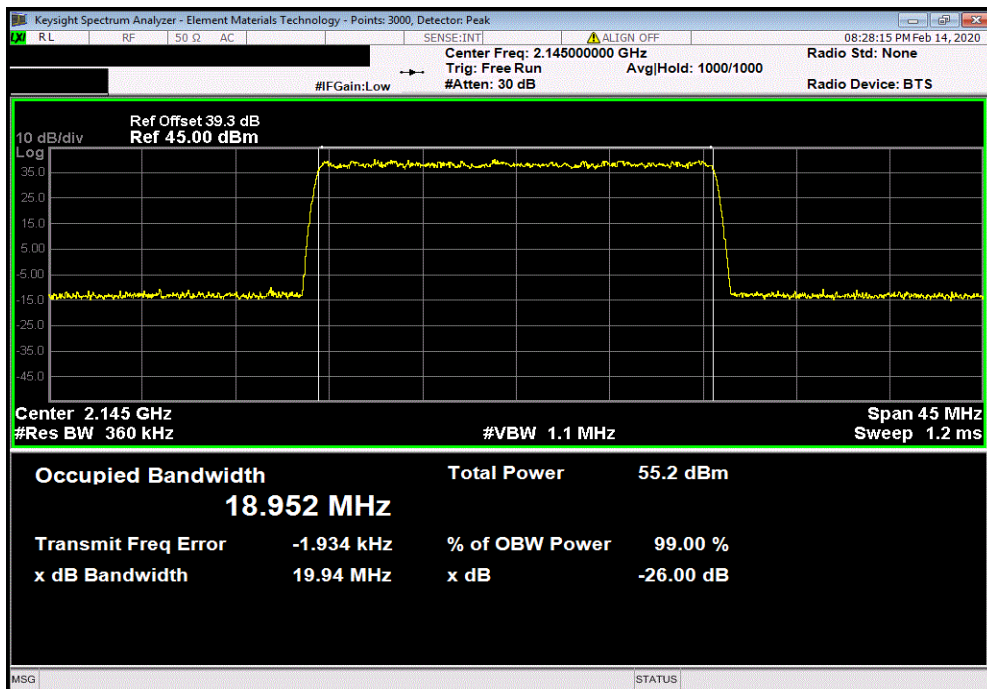


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 64-QAM, 15 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.178	14.846	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 64-QAM, 20 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.952	19.944	Within Band	Pass		

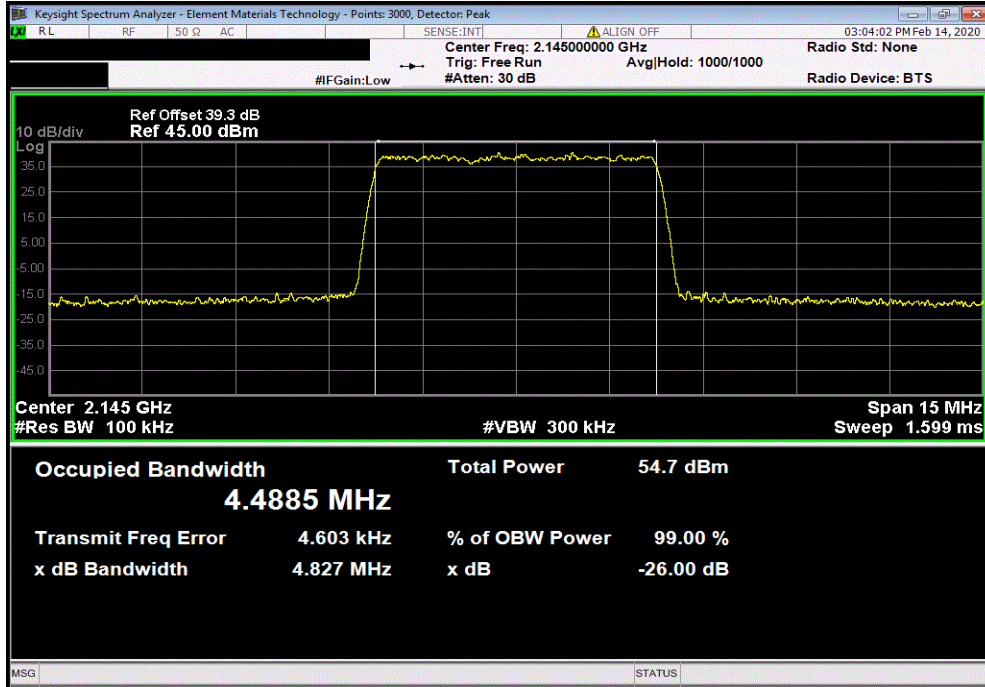


OCCUPIED BANDWIDTH BAND 66a

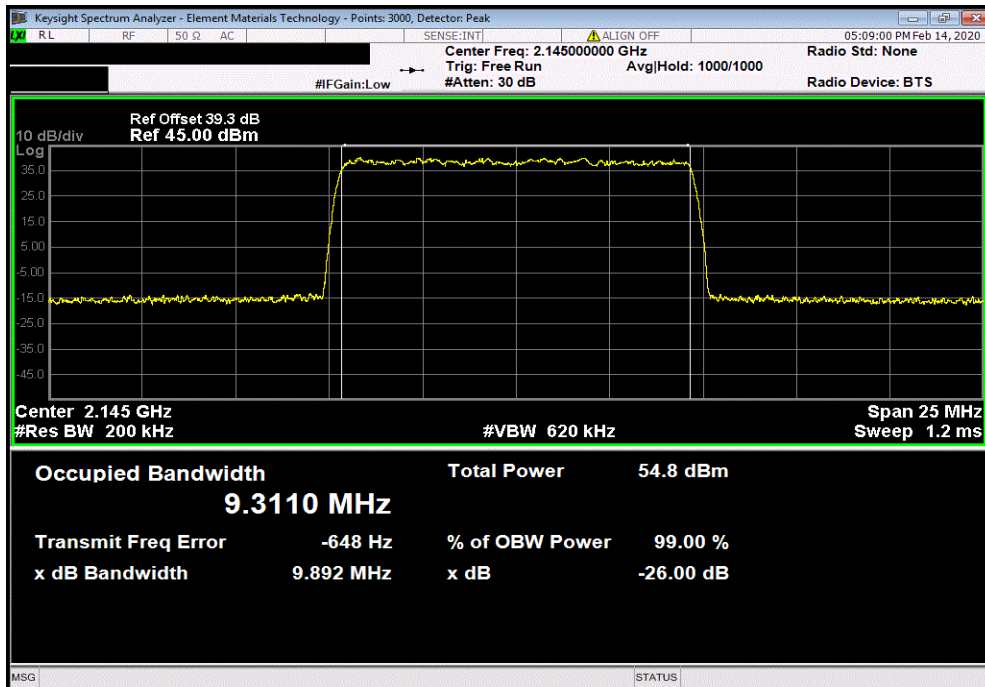


TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 256-QAM, 5 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	4.489	4.827	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 256-QAM, 10 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	9.311	9.892	Within Band	Pass		

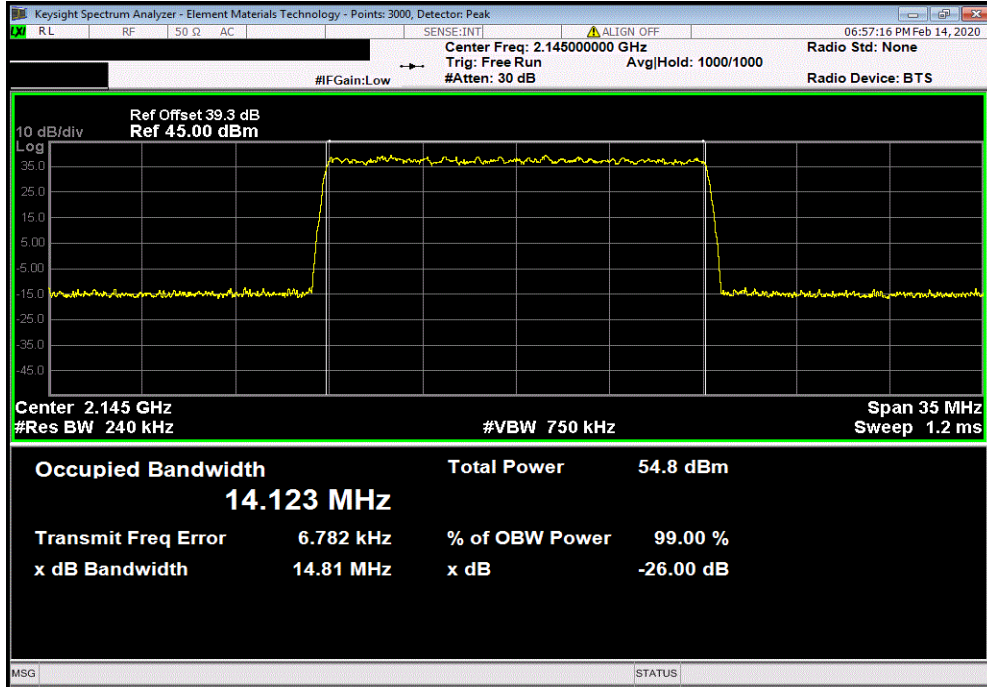


OCCUPIED BANDWIDTH BAND 66a



TbTx 2019.08.30.0 XMI 2019.09.05

Band 66a (Single Carrier) Port 4, 256-QAM, 15 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	14.123	14.812	Within Band	Pass		



Band 66a (Single Carrier) Port 4, 256-QAM, 20 MHz, Mid Channel, 2145 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	18.938	19.893	Within Band	Pass		

