



# element

**Radio Test Report  
Application for Grant of Equipment Authorization**

**FCC Part 27  
(3700MHz – 3980MHz)**

**FCC ID: VBNAZQW-01**

**Nokia Solutions and Networks  
Airscale Base Transceiver Station Report Radio Head  
Model: AZQW**

**Report: NOKI0028.1, Issue Date: July 22, 2021**



NVLAP LAB CODE: 201049-0

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# CERTIFICATE OF TEST

Last Date of Test: June 25, 2021

Nokia Solutions and Networks

EUT: Airscale Base Transceiver Station Remote Radio Head Model AZQW

## Radio Equipment Testing

### Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 CFR Title 47 Part 27:2021	ANSI C63.26:2015

### Results

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

### Deviations From Test Standards

None

### 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
00	None		

# ACCREDITATIONS AND AUTHORIZATIONS



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## 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

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## 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.

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## European Union

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

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## United Kingdom

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

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## Australia/New Zealand

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

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## Korea

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

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## Japan

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

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## 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.

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## Singapore

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

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## Israel

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

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## Hong Kong

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

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## Vietnam

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

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## SCOPE

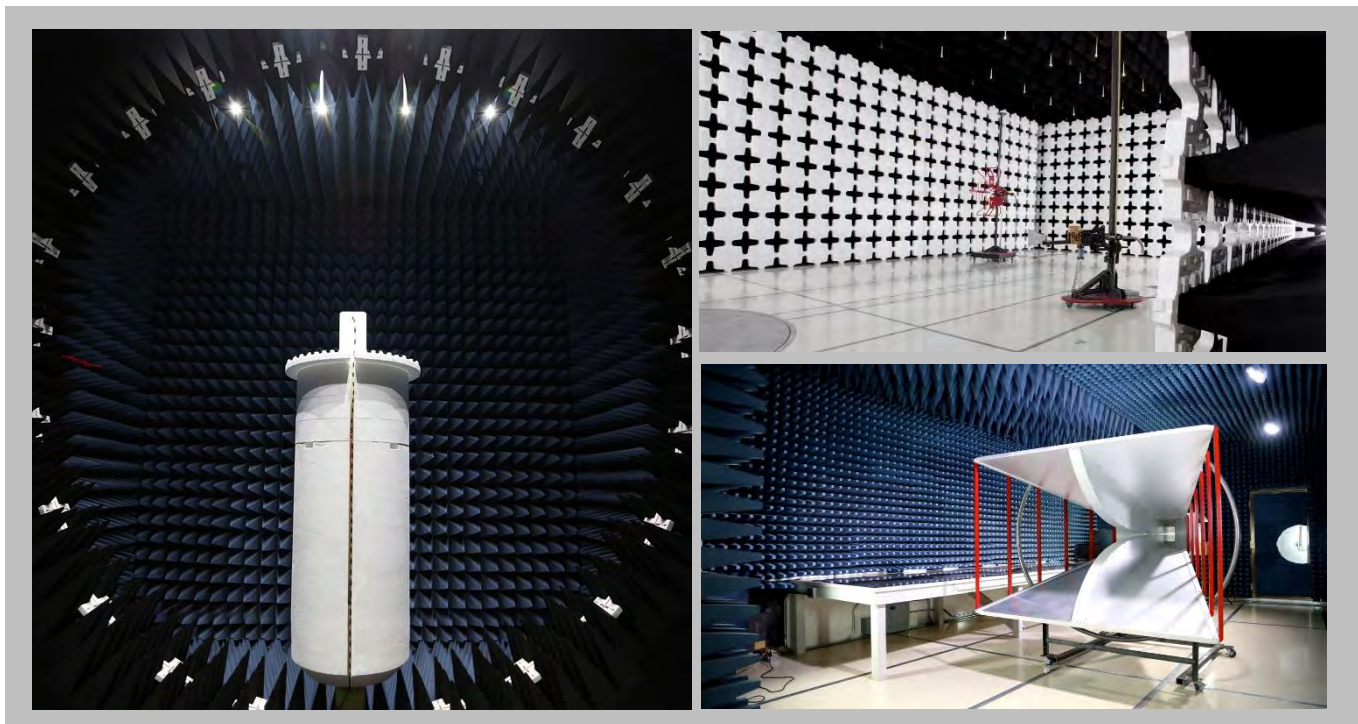
For details on the Scopes of our Accreditations, please visit:

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

# FACILITIES



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



# MEASUREMENT UNCERTAINTY



## Measurement Uncertainty

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

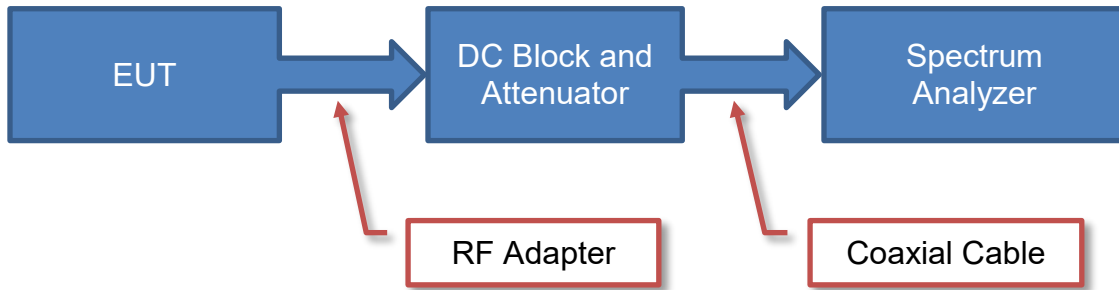
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific 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.

<b>Test</b>	<b>+ MU</b>	<b>- MU</b>
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)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

# TEST SETUP BLOCK DIAGRAMS

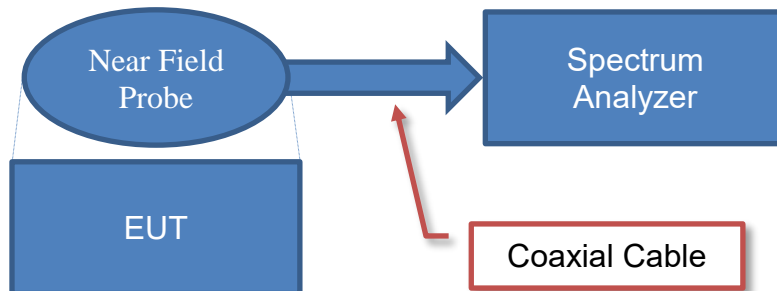
## Antenna Port Conducted Measurements



### Sample Calculation

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

## Near Field Test Fixture Measurements

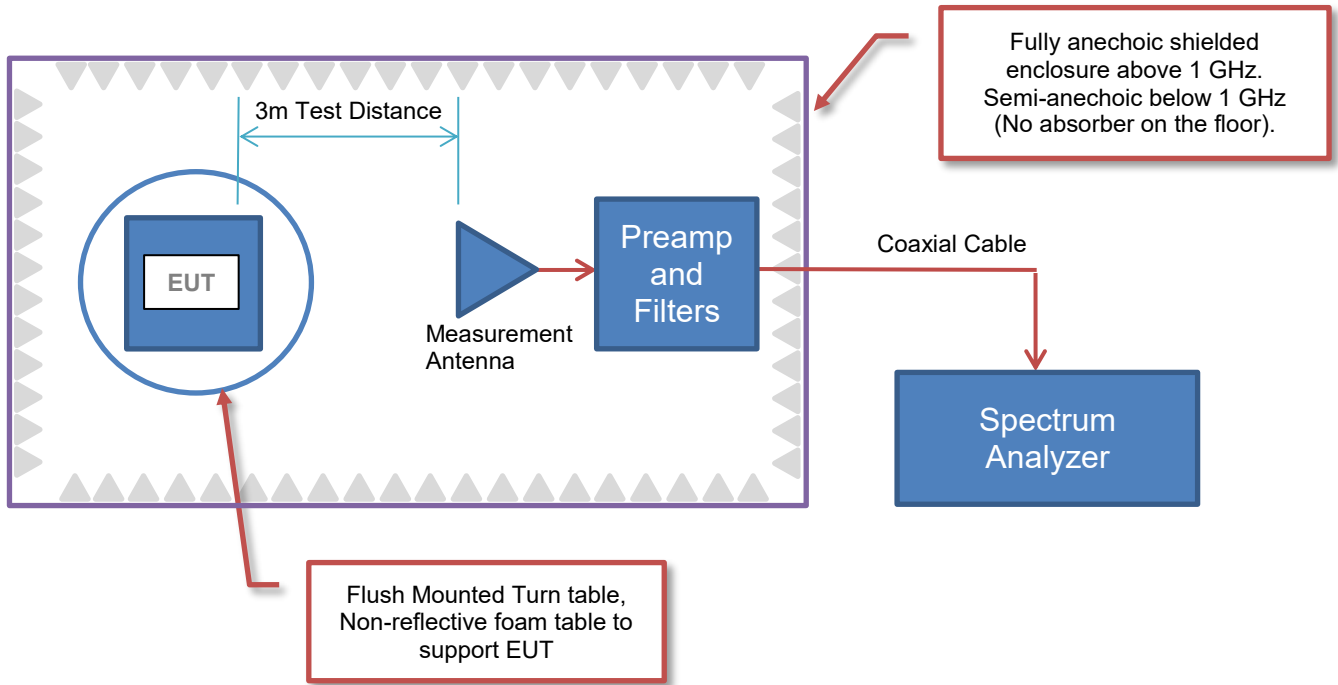


### Sample Calculation

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

# TEST SETUP BLOCK DIAGRAMS

## Spurious Radiated Emissions





# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	Nokia Solutions and Networks
<b>Address:</b>	3201 Olympus Blvd
<b>City, State, Zip:</b>	Dallas, TX 75039
<b>Test Requested By:</b>	Steve Mitchell
<b>EUT:</b>	Airscale Base Transceiver Station Remote Radio Head Model AZQW
<b>First Date of Test:</b>	June 11, 2021
<b>Last Date of Test:</b>	June 25, 2021
<b>Receipt Date of Samples:</b>	June 10, 2021
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage
<b>Purchase Authorization:</b>	Verified

## Information Provided by the Party Requesting the Test

### Functional Description of the EUT:

The equipment under test (EUT) is a Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model AZQW. The AZQW remote radio head is a multi-standard multi-carrier remote radio head designed to support 5G NR TDD. The scope of testing in this effort is FCC radio certification of the AZQW for 5G NR TDD Single Carrier operations. Multicarrier operations will be covered under a separate effort.

The AZQW RRH has 8 transmit/receive antenna ports that supports 3GPP frequency band n77 operations (BTS RX: 3700 to 3980 MHz/BTS TX: 3700 to 3980 MHz). The AZQW MIMO operating modes include 8T8R, 2x 4T4R and 4x 2T2R. The maximum RF output power of each antenna port is 40 watts. The total RF output power for the AZQW remote radio head is 320 watts (8 x 40 watts). The remote radio head software supports 20, 40, 60, 80 and 100MHz 5G NR TDD bandwidths. The maximum RF output power for single carrier operations are provided below.

Single Carrier Maximum RF Output Power per Port for each Radio Access Technology Channel Bandwidth				
NR20	NR40	NR60	NR80	NR100
15.0 Watts or 41.8 dBm	30.0 Watts or 44.8 dBm	40.0 Watts or 46.0 dBm	40.0 Watts or 46.0 dBm	40.0 Watts or 46.0 dBm

The AZQW software supports four downlink modulation types (QPSK, 16QAM, 64QAM, and 256QAM). The instantaneous bandwidth is 140MHz for non-contiguous carriers (frequency gap cannot exceed 80MHz) and 140MHz for contiguous carriers per antenna port. The software supports a maximum of two carriers per antenna port. The maximum total carrier bandwidth (sum of all carrier occupied bandwidths) for the 8T8R mode is 140MHz. Single carrier operations will be certified/verified under this effort. Multicarrier operations will be covered under a separate effort.

The remote radio head has external interfaces including DC power (DC In), ground, RF transmit/receive (ANT), beamforming calibration (BF Cal), optical (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted. The remote radio head may be configured with an optional cooling fan.

Tests to be performed include RF channel power, CCDF -peak to average power ratio, power spectral density (power/1MHz), emission bandwidth (99% and 26 dB down), band edge spurious emissions (+ 1MHz), spurious emissions (conducted and radiated), and frequency stability (over required voltage/temperature ranges). The 5G

# PRODUCT DESCRIPTION



NR modulation types for this testing are setup according to 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).

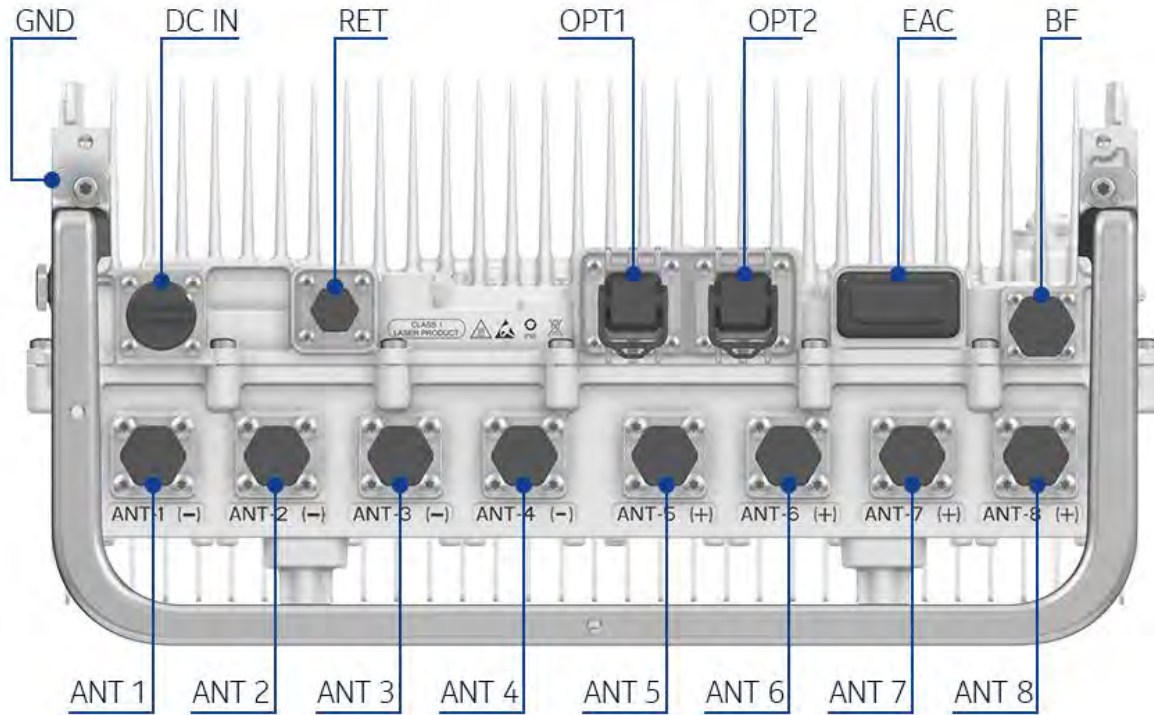
The 3GPP frequency Band n77 (3700-3980 MHz) band edge NR-ARFCNs for AZQW 5G NR channel bandwidths (20, 40, 60, 80 and 100 MHz) are provided below. The NR-ARFCN is defined as New Radio - Absolute Radio Frequency Channel Number.

	5G NR NR-ARFCN	Frequency (MHz)	5G NR Channel Bandwidth				
			20 MHz	40 MHz	60 MHz	80 MHz	100 MHz
AZQW Band n77 (Antennas 1 through 8)	Band Edge	3700.00	Lower Band Edge				
	.....						
	647334	3710.01	Bot Ch				
	.....						
	648000	3720.00		Bot Ch			
	.....						
	648668	3730.02			Bot Ch		
	.....						
	649334	3740.01				Bot Ch	
	.....						
	650000	3750.00					Bot Ch
	.....						
	656000	3840.00	Middle Channel				
	.....						
	662000	3930.00					Top Ch
	.....						
	662666	3939.99				Top Ch	
	.....						
	663332	3949.98			Top Ch		
	.....						
	664000	3960.00		Top Ch			
	.....						
	664666	3969.99	Top Ch				
	.....						
Band Edge	3980.00	Upper Band Edge					

AZQW Downlink Band Edge 5G NR Band n77 Frequency Channels

# PRODUCT DESCRIPTION

AZQW Connector Layout:



EUT External Interfaces

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Screw Terminal	2-pole Power Input Terminal
GND	1	Screw lug (2xM5)	Ground
ANT	8	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
BF	1	4.3-10	Beamforming Calibration
EAC	1	MDR26	External Alarm Interface
OPT	2	SFP28	Optical CPRI Interface
RET	1	8-pin circular connector	AISG 2.0 to external devices
Fan	1	Nokia	Power for RRH Fan. Located on the side of RRH.

## Testing Objective:

Demonstration of Aircscale BTS RRH model AZQW (5G NR operations over the 3700MHz to 3980MHz frequency band) radio compliance for FCC certification.

# CONFIGURATIONS



## Configuration 1 RF Conducted Emissions

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
AZQW (Radio Module Model)	Nokia Solutions and Networks	475742A.X21	YK211100168
Low Pass Filter 1.4GHz/100W	Microwave Circuits, Inc.	L13502G1	SN2454-01
Attenuator 100W/10dB	Weinschel Corp	48-10-43-LIM	BJ1771
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF2020001BQ
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	KEYSIGHT	N8757A	US21D4053S
FPAC (DC-PWR Supply-BS)	Nokia	472438A.101	G711007170
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-09
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-63
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-13
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-19
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-26
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-02
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-23
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
Fiber Optic Cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
Cat-5e Cable	CSA	E151955	LL79189
2 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297374
1 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-72
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-48

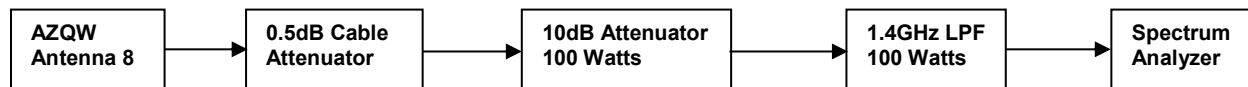
# CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (5G)	Connection 2
Fiber Optic Cable (2)	No	10 meters	No	ABIL	AZQW
GPS Receiver Cable	Yes	100 meters	Yes	ASIK	FYGB GPS Receiver
Cat-5e Cable	Yes	7 meters	No	ASIK	WebEM- PC
RD Microwave Systems – RF CABLE	Yes	2 meters	No	EUT [AZQW] Ant ports 1-7	150W -50ohm - Load
Reference Cables (Frame Clock & Trigger)	Yes	1 meter	No	ASIK	Analyzer

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_106 0.5dB Cable Attenuator	Yes	2 meters	No	EUT [AZQW] Ant port #8	Attenuator 100W/10dB
Attenuator 100W/10dB	No	N/A	No	RF Cable HS-SUCOFLEX_106	Low Pass Filter 1.4G/100W
Low Pass Filter 1.4G/100W	No	N/A	No	Attenuator 100W/10dB	RF Cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Yes	1 meter	No	Low Pass Filter 1.4G/100W	Analyzer

## RF Test Setup Diagram:



# CONFIGURATIONS



## Configuration 2 RF Conducted Emissions

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
AZQW (Radio Module Model)	Nokia Solutions and Networks	475742A.X21	YK211100168

# CONFIGURATIONS



Attenuator 250W/40dB	API Weinschel	58-40-43-LIM	TC909
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF2020001BQ
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	KEYSIGHT	N8757A	US21D4053S
FPAC (DC-PWR Supply-BS)	Nokia	472438A.101	G711007170
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-09
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-63
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-13
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-19
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-26
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-02
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-23
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
Fiber Optic Cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
Cat-5e Cable	CSA	E151955	LL79189
2 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297374
1 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-72
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-48

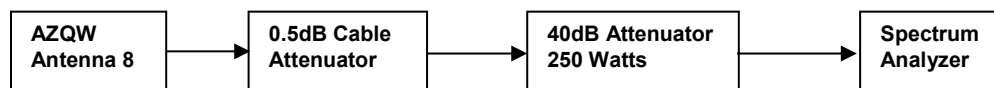
Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (5G)	Connection 2
Fiber Optic Cable (2)	No	10 meters	No	ABIL	AZQW
GPS Receiver Cable	Yes	100 meters	No	ASIK	FYGB GPS Receiver
Cat-5e Cable	Yes	7 meters	No	ASIK	WebEM- PC
RD Microwave Systems – RF CABLE	Yes	2 meters	No	EUT [AZQW] Ant ports 1-7	150W -50ohm - Load
Reference Cables (Frame Clock & Trigger)	Yes	1 meter	No	ASIK	Analyzer

# CONFIGURATIONS



Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_106	Yes	2 meters	No	EUT [AZQW] Ant port #8	Attenuator 250W/40dB
Attenuator 250W/40dB	No	NA	No	RF Cable HS-SUCOFLEX_106	RF Cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Yes	1 meter	No	Attenuator 250W/40dB	Analyzer

## RF Test Setup Diagram:





# CONFIGURATIONS



## Configuration 3 RF Conducted Emissions

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
AZQW (Radio Module Model)	Nokia Solutions and Networks	475742A.X21	YK211100168

# CONFIGURATIONS



High Pass Filter 5.5GHz/100W	Microwave Circuits	H6G013G1	2454-01
Attenuator 150W/20dB	Aeroflex Weinschel	66-20-33	BZ2075
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF2020001BQ
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	KEYSIGHT	N8757A	US21D4053S
FPAC (DC-PWR Supply-BS)	Nokia	472438A.101	G711007170
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-09
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-63
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-13
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-19
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-26
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-02
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-23
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
Fiber Optic Cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
Cat-5e Cable	CSA	E151955	LL79189
2 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297374
1 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-72
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-48

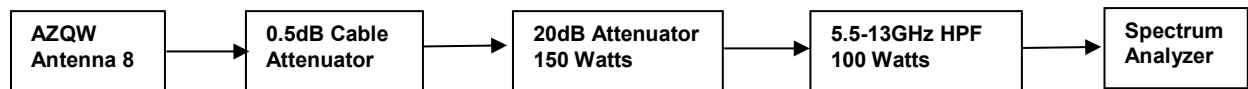
Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (5G)	Connection 2
Fiber Optic Cable (2)	N	10 meters	N	ABIL	AZQW
GPS Receiver Cable	Y	100 meters	N	ASIK	FYGB GPS Receiver
Cat-5e Cable	Y	7 meters	N	ASIK	WebEM- PC
RD Microwave Systems – RF CABLE	Y	2 meters	N	EUT [AZQW] Ant ports 1-7	150W -50ohm - Load
Reference Cables (Frame Clock & Trigger)	Y	1 meter	N	ASIK	Analyzer

# CONFIGURATIONS



Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_106	Yes	2 meters	No	EUT [AZQW] Ant port #8	Attenuator 150W/20dB
Attenuator 150W/20dB	No	NA	No	RF Cable HS-SUCOFLEX_106	High Pass Filter 5.5GHz/100W
High Pass Filter 5.5GHz/100W	No	NA	No	Attenuator 150W/20dB	RF Cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Yes	1 meter	No	High Pass Filter 5.5GHz/100W	Analyzer

## RF Test Setup Diagram:



# CONFIGURATIONS



## Configuration 4 RF Conducted Emissions

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
AZQW (Radio Module Model)	Nokia Solutions and Networks	475742A.X21	YK211100168

# CONFIGURATIONS



Attenuator 50W/10dB	RF-Lambda	RFS50G26S10FF	20031702
High Pass Filter 8-40GHz/15W	RF-Lambda	RHPF23G08G40	17102700014
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF2020001BQ
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	Keysight	N8757A	US21D4053S
FPAC (DC-PWR Supply-BS)	Nokia	472438A.101	G711007170
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-09
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-63
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-13
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-19
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-26
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-02
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-23
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
Fiber Optic Cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
Cat-5e Cable	CSA	E151955	LL79189
2 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297374
1 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-72
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-48

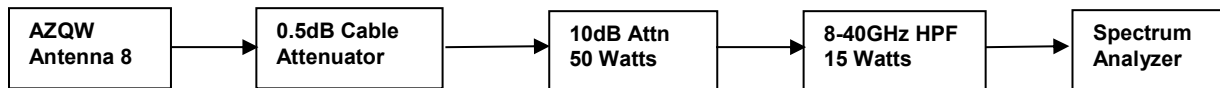
Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (5G)	Connection 2
Fiber Optic Cable (2)	No	10 meters	No	ABIL	AZQW
GPS Receiver Cable	Yes	100 meters	No	ASIK	FYGB GPS Receiver
Cat-5e Cable	Yes	7 meters	No	ASIK	WebEM- PC
RD Microwave Systems – RF CABLE	Yes	2 meters	No	EUT [AZQW] Ant ports 1-7	150W -50ohm - Load
Reference Cables (Frame Clock & Trigger)	Yes	1 meter	No	ASIK	Analyzer

# CONFIGURATIONS



Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_104	Yes	2 meters	No	EUT [AZQW] Ant port #8	Attenuator 50W/10dB
Attenuator 50W/10dB	No	NA	No	RF Cable HS-SUCOFLEX_104	High Pass Filter 8-40GHz
High Pass Filter 8-40GHz/15W	No	NA	No	Attenuator 50W/10dB	RF-Lambda-AC20040003
RF-Lambda-AC20040003	Yes	1 meter	No	High Pass Filter 8-40GHz/15W	Analyzer

## RF Test Setup Diagram:



# CONFIGURATIONS



## Configuration 5 Radiated Emissions

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Radio Head	Nokia Solutions and Networks	AZQW / 475742A.x21	YK211100168

Peripherals in the test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (Multi-Mode - BS)	Nokia	474900A.101	VF2020001BQ
AOSD SFP28+ 9.8G,10KM,1310NM (Single-Mode - Radio)	Nokia	474902A.101	VF1922001EI
AOSC SFP28+ 9.8G,2KM,1310NM (Single-Mode - BS)	Nokia	474902A.101	VF19220012F

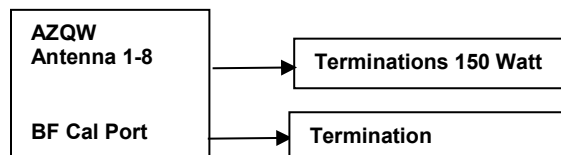
Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
Electric Fan (AC PWR)	Electric	L908	None
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	Keysight	N8757A	US21D4053S
GPS Cable 100m	FTSH	995426C	CA2029
Cat-5e Cable	CSA	E151955	LL79189

# CONFIGURATIONS



Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
TMS Load 1	Yes	2m	No	EUT [AZQW] Ant port #1	Antenna Load 1
TMS Load 2	Yes	2m	No	EUT [AZQW] Ant port #2	Antenna Load 2
TMS Load 3	Yes	2m	No	EUT [AZQW] Ant port #3	Antenna Load 3
TMS Load 4	Yes	2m	No	EUT [AZQW] Ant port #4	Antenna Load 4
TMS Load 5	Yes	2m	No	EUT [AZQW] Ant port #5	Antenna Load 5
TMS Load 6	Yes	2m	No	EUT [AZQW] Ant port #6	Antenna Load 6
TMS Load 7	Yes	2m	No	EUT [AZQW] Ant port #7	Antenna Load 7
TMS Load 8	Yes	2m	No	EUT [AZQW] Ant port #8	Antenna Load 8
TMS Load 9	Yes	2m	No	EUT [AZQW] BF Cal Port	Load 9
AC Power (PS Base Station)	No	2m	No	AC mains	Power Supply (Base Station)
AC Power (Laptop)	No	1.65m	No	AC Mains	Power Supply (Laptop)
DC Power Leads	No	7.5m	Yes	DC Power Supply (Keysight)	Remote Radio Head Module
AC Power (Keysight)	No	4m	No	AC mains	DC Power Supply (Radiated)
Optical Fiber (SM)	No	30m	No	Airscale Base Station (ABIL)	Remote Radio Head Module
Optical Fiber (MM)	No	30m	No	Airscale Base Station (ABIL)	Remote Radio Head Module
RET	No	2.4m	No	Remote Radio Head Module	Unterminated
EAC	No	5.4m	No	Remote Radio Head Module	Unterminated
Grounding	No	2.3m	No	Remote Radio Head Module	Turntable Ground
Amphenol Fiber Optic Cable	No	m	No	ASIK	AZQW
Cat-5e Data Cable	Yes	m	No	ASIK	WebEM- PC

## RF Test Setup Diagram:





# CONFIGURATIONS



## Configuration 6 Frequency Stability

Software/Firmware Running during test	
Description	Version
5G BTS Software Version	5G21A_GNB_0011_000800_001175
5G RF_SW	URM61.03.R33T

Equipment being tested (include Peripherals)			
Description	Manufacturer	Model/Part Number	Serial Number
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.102	J8173107703
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.102	EA194259377
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183300437
AZQW (Radio Module Model)	Nokia Solutions and Networks	475742A.X21	YK211100168

# CONFIGURATIONS



Attenuator 250W/40dB	API Weinschel	58-40-43-LIM	TC909
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20180015S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF2020001BQ
ThinkPad T490 (WebEM- PC)	Lenovo	20N3S88012	PF26RVZ0
DC System Power Supply (Radio)	KEYSIGHT	N8757A	US21D4053S
FPAC (DC-PWR Supply-BS)	Nokia	472438A.101	G711007170
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-09
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-63
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-13
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-19
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-26
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-02
2 Meter RF Cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-23
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SK764
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ465
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR300
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR301
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	PZ075
150W -50ohm -Terminating Load	API Weinschel inc	1435-3-LIM	SR299
150W -50ohm -Terminating Load	API Weinschel inc	1435-3	LY351
Fiber Optic Cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
Thermal Chamber	Cincinnati Sub-zero Product Inc	ZPH-8-2-SCT/AC	ZP1424214
Digital Multimeter	Fluke	77IV	27210148
Thermometer	Omega Engineering Inc	HH31	1130101855
Cat-5e Cable	CSA	E151955	LL79189
2 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_106	SN297374
1 Meter RF Cable	Huber + Suhner, Inc.	HS-SUCOFLEX_104	SN551432/4
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-72
Reference Cable (Frame Clock & Trigger)	Pomona	2249	C-48

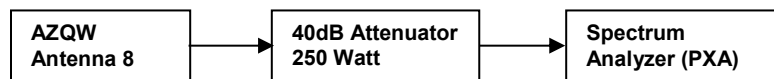
# CONFIGURATIONS



Cables (Peripheral)					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1 (5G)	Connection 2
Fiber Optic Cable (2)	No	10 meters	No	ABIL	AZQW
GPS Receiver Cable	Yes	100 meters	No	ASIK	FYGB GPS Receiver
Cat-5e Cable	Yes	7 meters	No	ASIK	WebEM- PC
HS-SUCOFLEX_104 1 Meter RF Cable	Yes	2 meter	No	Attenuator 250W/40dB	Analyzer(PXA)
HS-SUCOFLEX_106 2 Meter RF Cable	Yes	2 meter	No	EUT [AZQW] Ant port #8	Analyzer(PXA)
CBL-6FT-NMNM-402J-N 2 Meter RF Cable	Yes	2 meter	No	EUT [AZQW] Ant port #1-7	150W -50ohm - Terminating Load
Reference Cables (Frame Clock & Trigger)	Yes	1 meter	No	ASIK	Analyzer (PXA)
Grounding	No	2.3m	No	Remote Radio Head Module	Interior Temp Chamber wall

Cables					
Description	Shield (Y/N)	Length (m)	Ferrite (Y/N)	Connection 1	Connection 2
HS-SUCOFLEX_106	Yes	2 meters	No	EUT [AZQW] Ant port #8	Attenuator 250W/40dB
Attenuator 250W/40dB	No	NA	No	RF Cable HS- SUCOFLEX_106	RF Cable HS- SUCOFLEX_104
HS-SUCOFLEX_104	Yes	1 meter	No	Attenuator 250W/40dB	Analyzer (PXA)

RF Test Setup Diagram:



# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-06-11	Average 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.
2	2021-06-14	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.
3	2021-06-17	Peak to Average 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.
4	2021-06-17	Power Spectral Density	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	2021-06-18	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.
6	2021-06-18	Average 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.
7	2021-06-18	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.
8	2021-06-22	Frequency Stability	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	2021-06-25	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



XMH 2020.12.30.0

# OCCUPIED BANDWIDTH

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	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11

## 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 setting were as follows:

- RBW is 1% - 5% of the occupied bandwidth
- VBW is  $\geq 3x$  the RBW
- Peak Detector was used
- Trace max was used

The occupied bandwidth was measured with the EUT configured in the modes called out in the datasheets. FCC 27.53(l)(1) defines the 26dB emission bandwidth requirement.

The RF conducted emission testing was performed on one port. The AZQW antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power - All Ports" report section) and antenna port 8 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.

Band n77 (3700MHz to 3980MHz) Emission Designators derived from the measurement results are in the following table.

FCC Emission Designators for Band n77 (3700MHz to 3980MHz)					
Chan BW	Radio Channel	5G-NR: QPSK	5G-NR: 16QAM	5G-NR: 64QAM	5G-NR: 256QAM
20MHz	Low				19M7G7W
	Mid	19M9G7W	19M8G7W	19M8G7W	19M8G7W
	High				19M8G7W
40MHz	Low				40M4G7W
	Mid	40M3G7W	40M2G7W	40M4G7W	40M3G7W
	High				40M1G7W
60MHz	Low				61M0G7W
	Mid	61M1G7W	60M8G7W	60M9G7W	60M8G7W
	High				60M7G7W
80MHz	Low				82M4G7W
	Mid	82M3G7W	82M3G7W	82M4G7W	82M4G7W
	High				82M3G7W
100MHz	Low				103MG7W
	Mid	102MG7W	103MG7W	103MG7W	103MG7W
	High				102MG7W

Note: FCC emission designators are based on 26dB emission bandwidth.

# OCCUPIED BANDWIDTH



Tel: 2021.03.19.1 XMI: 2020.12.30.0

EUT: <b>Airscale Base Transceiver Station Remote Radio Head Model AZQW</b>		Work Order: <b>NOKI0028</b>
Serial Number: <b>YK211100168</b>		Date: <b>18-Jun-21</b>
Customer: <b>Nokia Solutions and Networks</b>		Temperature: <b>21 °C</b>
Attendees: <b>John Rattanavong, David Le</b>		Humidity: <b>51.9% RH</b>
Project: <b>None</b>		Barometric Pres.: <b>1019 mbar</b>
Tested by: <b>Brandon Hobbs</b>	Power: <b>54VDC</b>	Job Site: <b>TX05</b>
TEST SPECIFICATIONS		
FCC 27:2021		Test Method: <b>ANSI C63.26:2015</b>
COMMENTS		
All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. External 1 gating was set using a trig delay = 86.2us and a gate length = 3.714ms. The carrier power was set to maximum for all testing.		
DEVIATIONS FROM TEST STANDARD		
None		
Configuration #	2	Signature

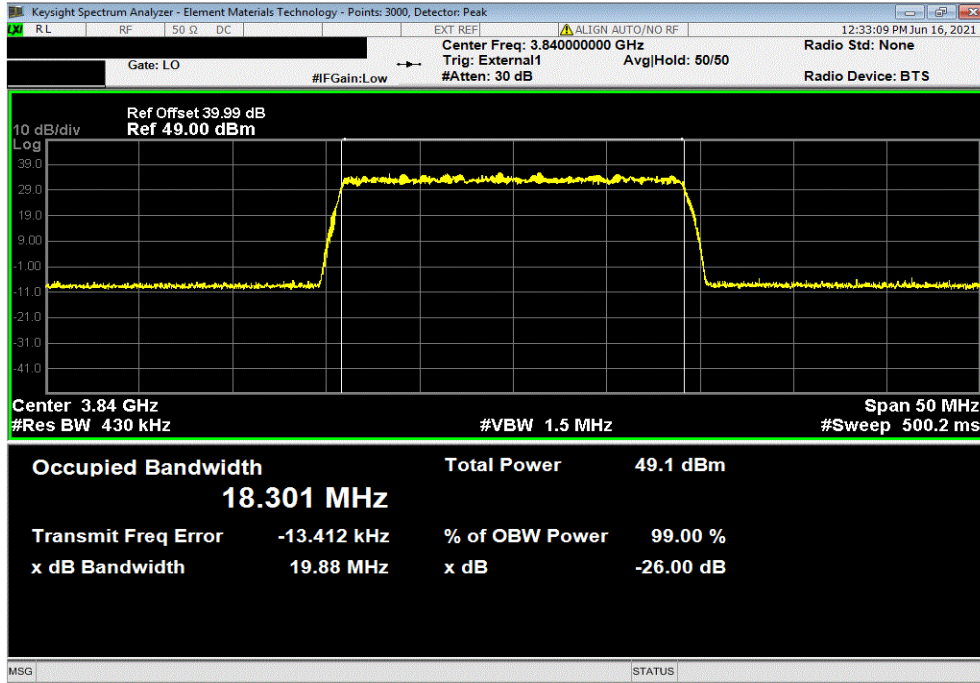
		Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Band n77, 3700 MHz - 3980 MHz, 5G NR					
Port 8					
20 MHz BW					
	QPSK Modulation				
	Mid Ch. 3840 MHz	18.3	19.9	Within Band	Pass
	16-QAM Modulation				
	Mid Ch. 3840 MHz	18.4	19.8	Within Band	Pass
	64-QAM Modulation				
	Mid Ch. 3840 MHz	18.3	19.8	Within Band	Pass
	256-QAM Modulation				
	Low Ch. 3710.01 MHz	18.2	19.7	Within Band	Pass
	Mid Ch. 3840 MHz	18.3	19.8	Within Band	Pass
	High Ch. 3969.99 MHz	18.3	19.8	Within Band	Pass
40 MHz BW					
	QPSK Modulation				
	Mid Ch. 3840 MHz	37.9	40.3	Within Band	Pass
	16-QAM Modulation				
	Mid Ch. 3840 MHz	38.1	40.2	Within Band	Pass
	64-QAM Modulation				
	Mid Ch. 3840 MHz	37.9	40.4	Within Band	Pass
	256-QAM Modulation				
	Low Ch. 3720 MHz	37.9	40.4	Within Band	Pass
	Mid Ch. 3840 MHz	37.9	40.3	Within Band	Pass
	High Ch. 3960 MHz	37.9	40.1	Within Band	Pass
60 MHz BW					
	QPSK Modulation				
	Mid Ch. 3840 MHz	57.9	61.1	Within Band	Pass
	16-QAM Modulation				
	Mid Ch. 3840 MHz	58.1	60.8	Within Band	Pass
	64-QAM Modulation				
	Mid Ch. 3840 MHz	57.9	60.9	Within Band	Pass
	256-QAM Modulation				
	Low Ch. 3730.02 MHz	57.8	61.0	Within Band	Pass
	Mid Ch. 3840 MHz	57.9	60.8	Within Band	Pass
	High Ch. 3949.98 MHz	57.9	60.7	Within Band	Pass
80 MHz BW					
	QPSK Modulation				
	Mid Ch. 3840 MHz	77.8	82.3	Within Band	Pass
	16-QAM Modulation				
	Mid Ch. 3840 MHz	78.1	82.3	Within Band	Pass
	64-QAM Modulation				
	Mid Ch. 3840 MHz	77.8	82.4	Within Band	Pass
	256-QAM Modulation				
	Low Ch. 3740.01 MHz	77.4	82.4	Within Band	Pass
	Mid Ch. 3840 MHz	77.5	82.4	Within Band	Pass
	High Ch. 3939.99 MHz	77.5	82.3	Within Band	Pass
100 MHz BW					
	QPSK Modulation				
	Mid Ch. 3840 MHz	97.6	102	Within Band	Pass
	16-QAM Modulation				
	Mid Ch. 3840 MHz	97.6	102	Within Band	Pass
	64-QAM Modulation				
	Mid Ch. 3840 MHz	97.7	103	Within Band	Pass
	256-QAM Modulation				
	Low Ch. 3750 MHz	97.4	103	Within Band	Pass
	Mid Ch. 3840 MHz	97.5	103	Within Band	Pass
	High Ch. 3930 MHz	97.5	102	Within Band	Pass

# OCCUPIED BANDWIDTH

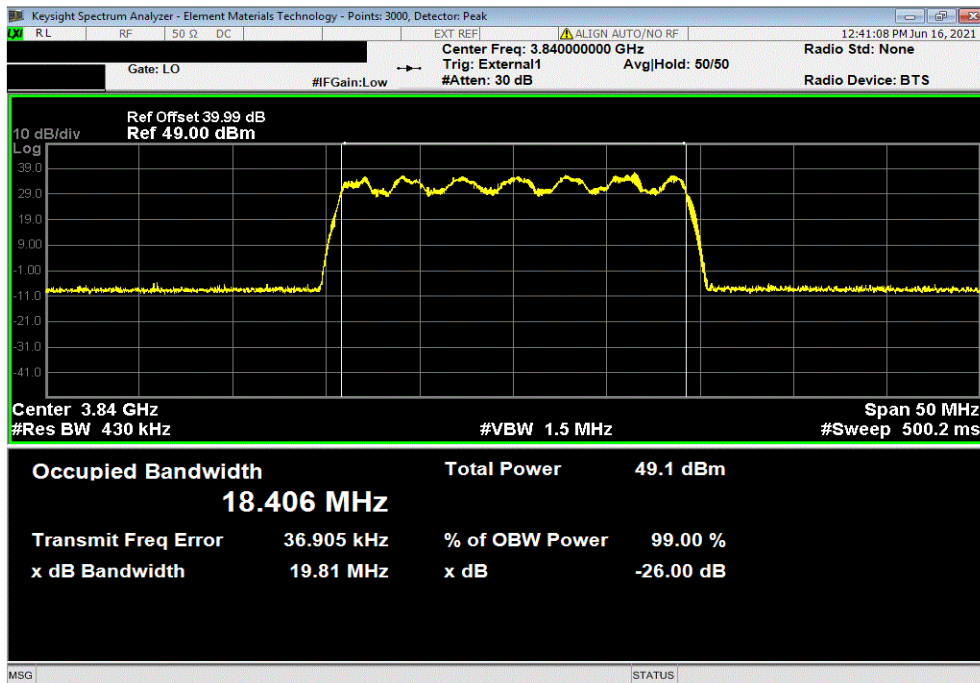


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, QPSK Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		18.301	19.881	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, 16-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		18.406	19.807	Within Band	Pass		

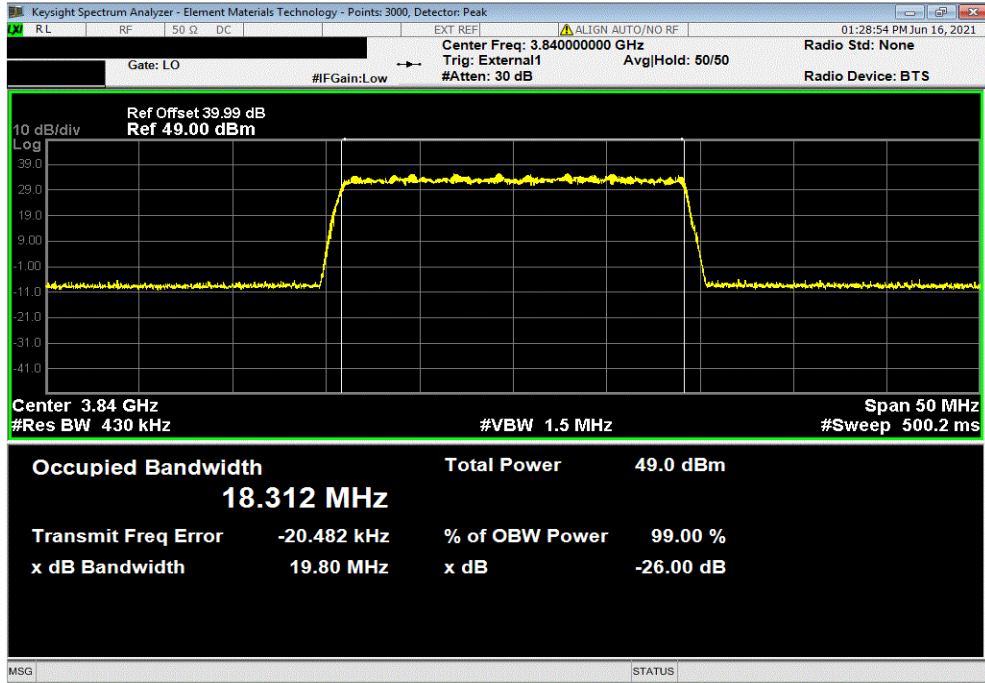


# OCCUPIED BANDWIDTH

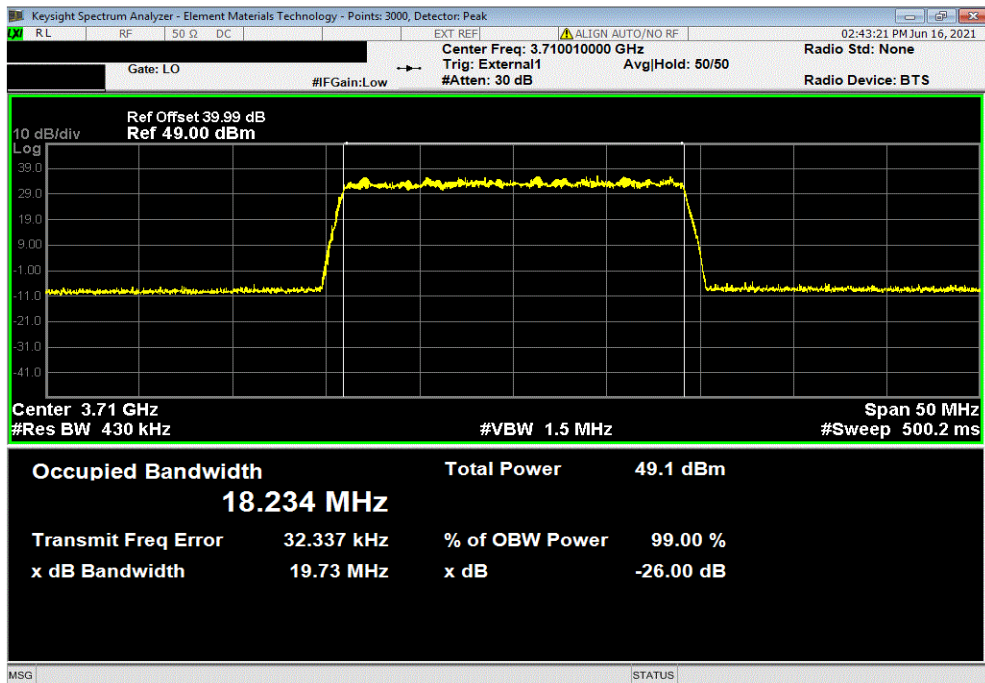


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, 64-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		18.312	19.805	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, 256-QAM Modulation, Low Ch.3710.01 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		18.234	19.728	Within Band	Pass		



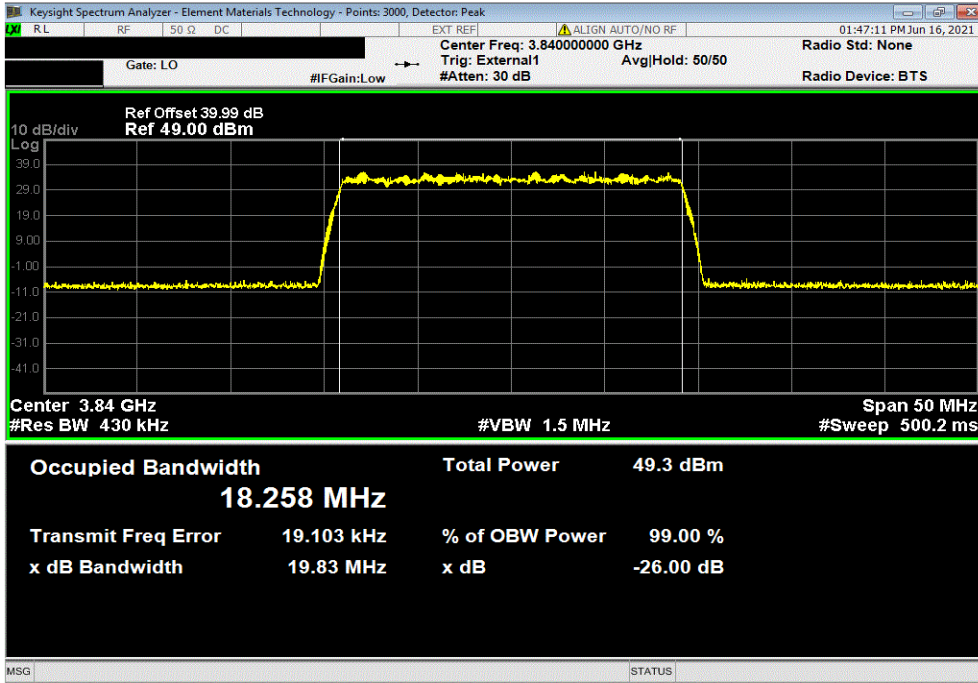


# OCCUPIED BANDWIDTH

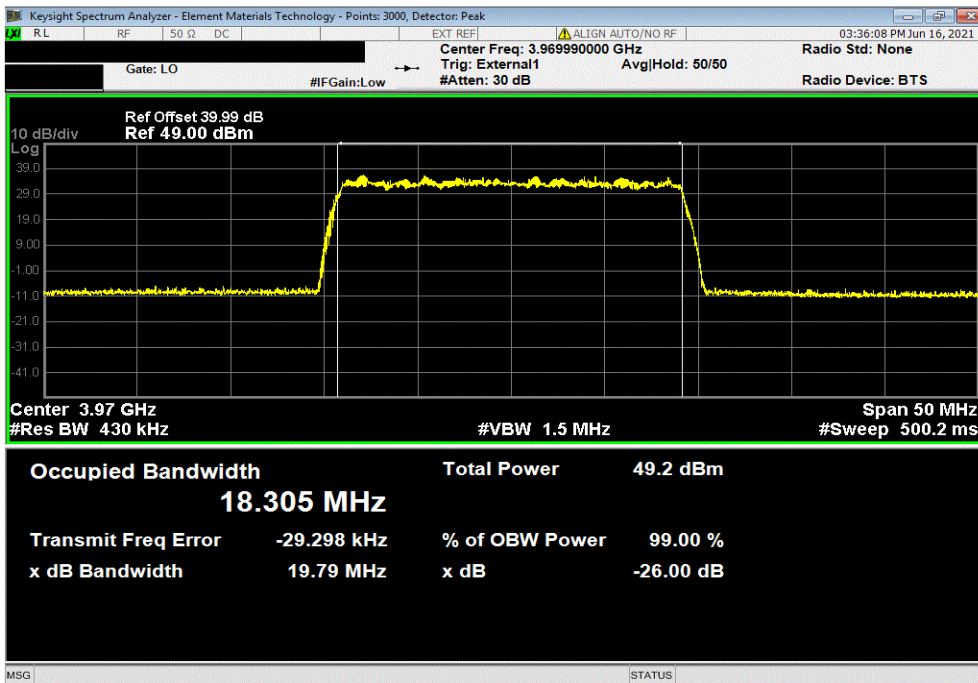


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, 256-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		18.258	19.827			Within Band	Pass



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 20 MHz BW, 256-QAM Modulation, High Ch. 3969.99 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		18.305	19.795			Within Band	Pass

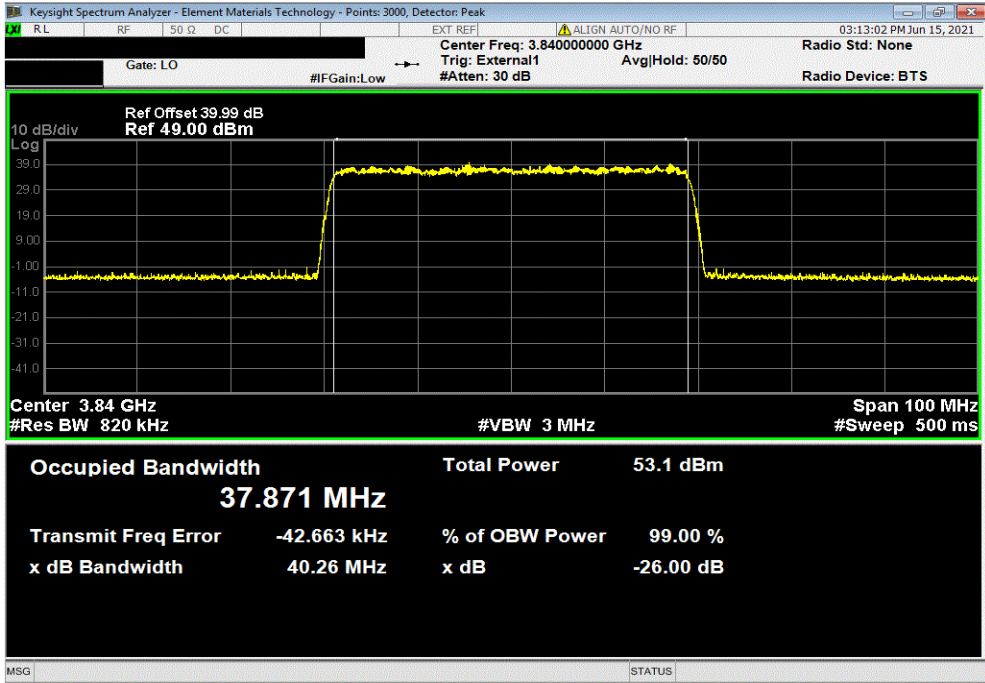


# OCCUPIED BANDWIDTH

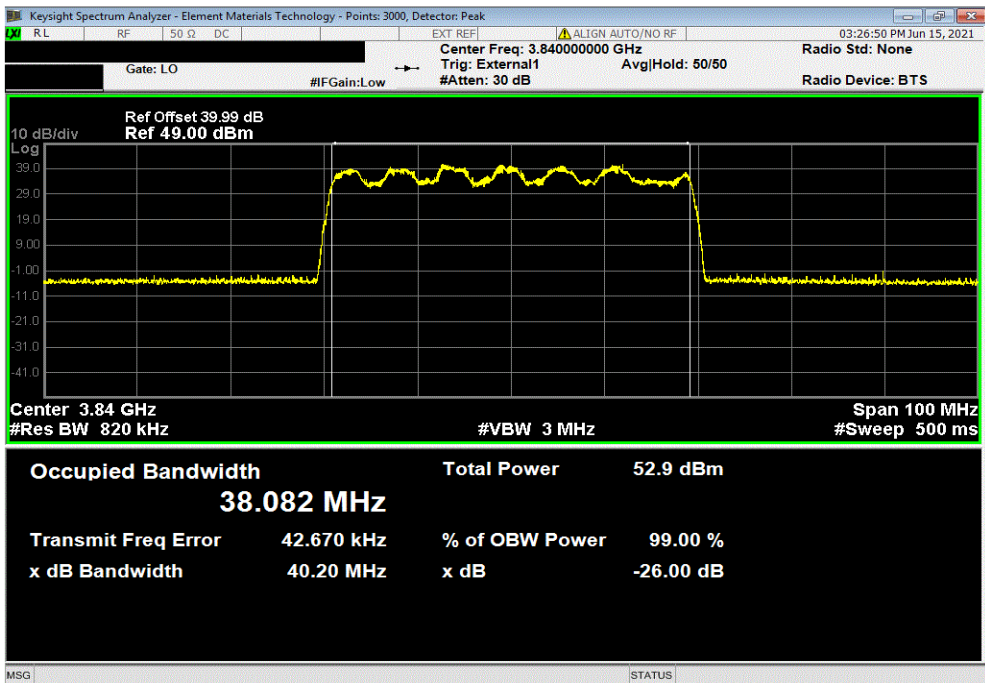


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, QPSK Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		37.871	40.257	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, 16-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		38.082	40.202	Within Band	Pass		

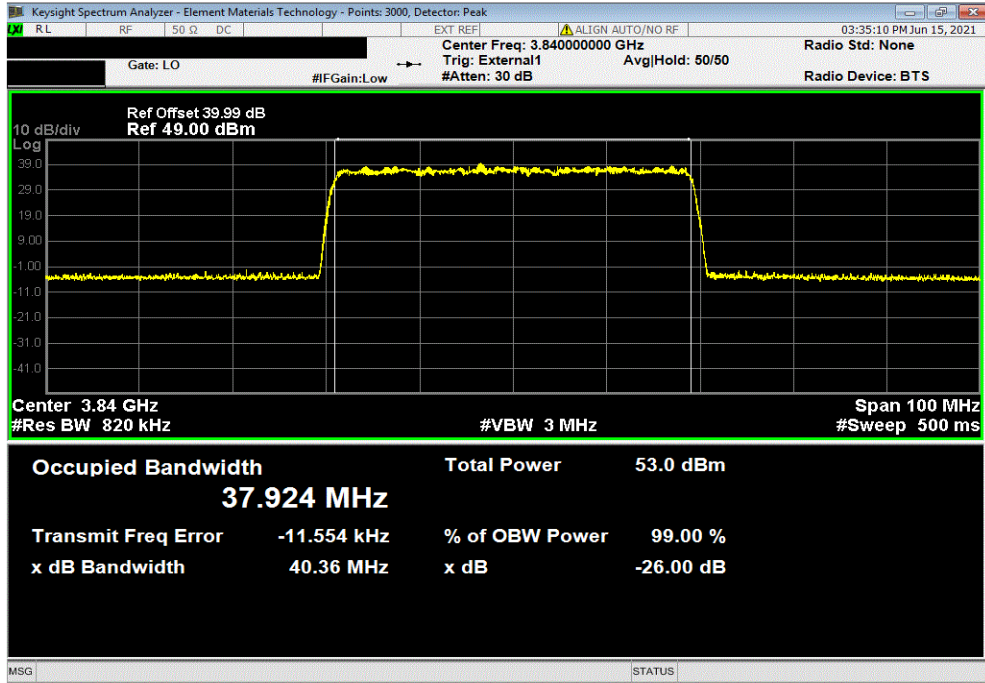


# OCCUPIED BANDWIDTH

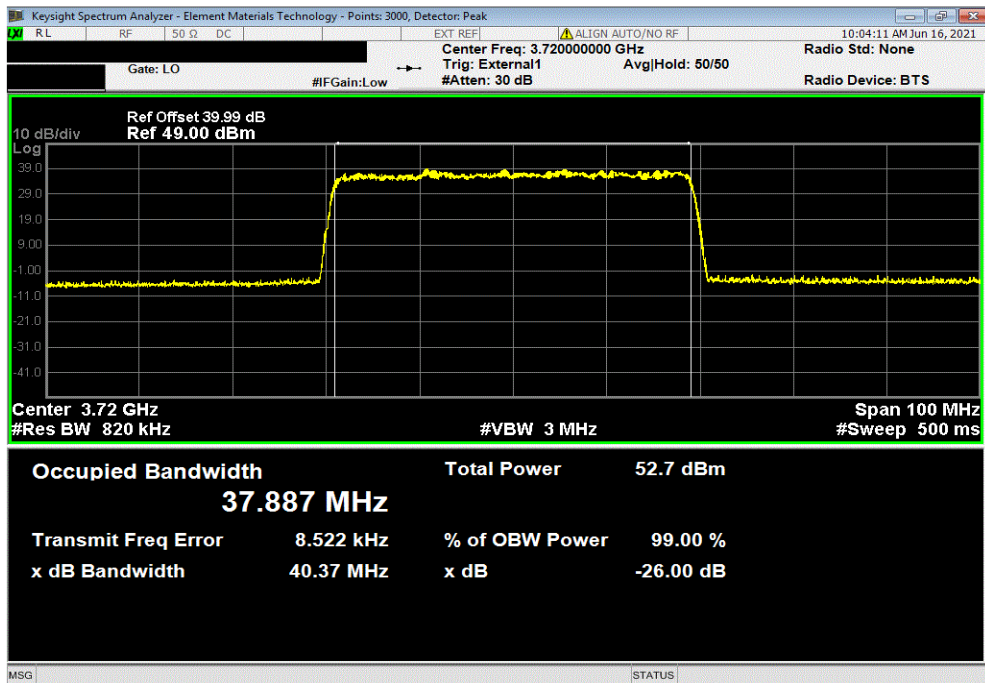


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, 64-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		37.924	40.355	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, 256-QAM Modulation, Low Ch. 3720 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		37.887	40.366	Within Band	Pass		

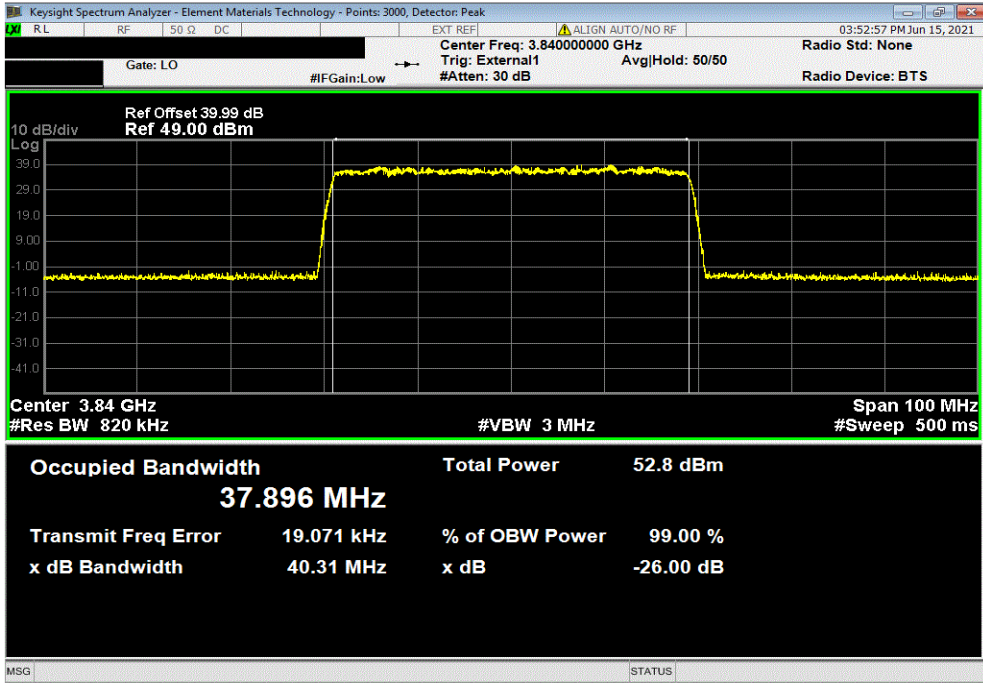


# OCCUPIED BANDWIDTH

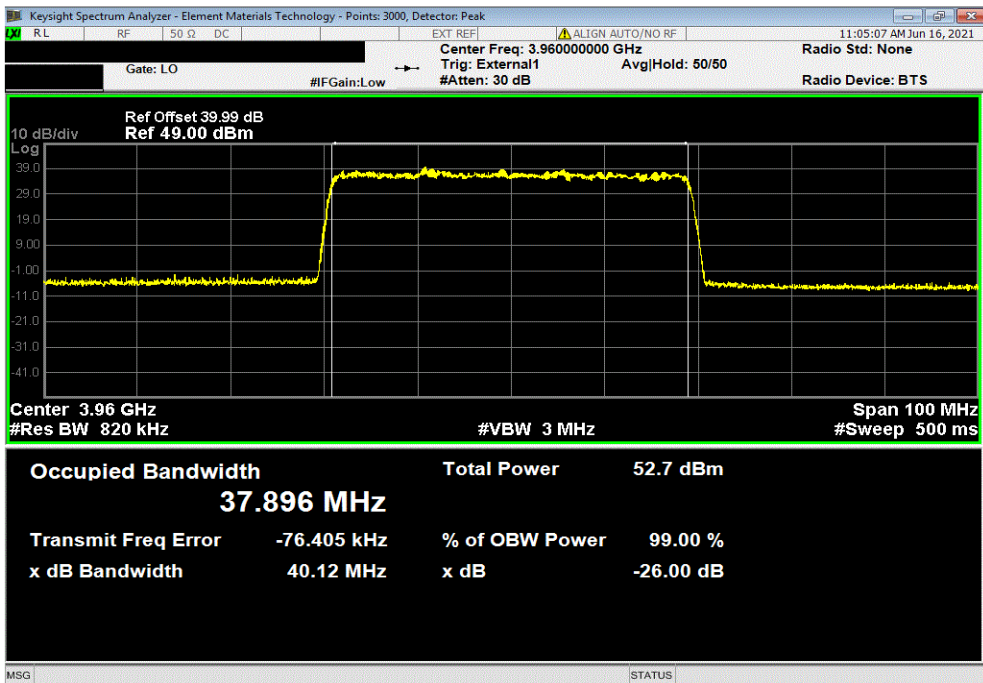


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, 256-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		37.896	40.306			Within Band	Pass



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 40 MHz BW, 256-QAM Modulation, High Ch. 3960 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		37.896	40.12			Within Band	Pass

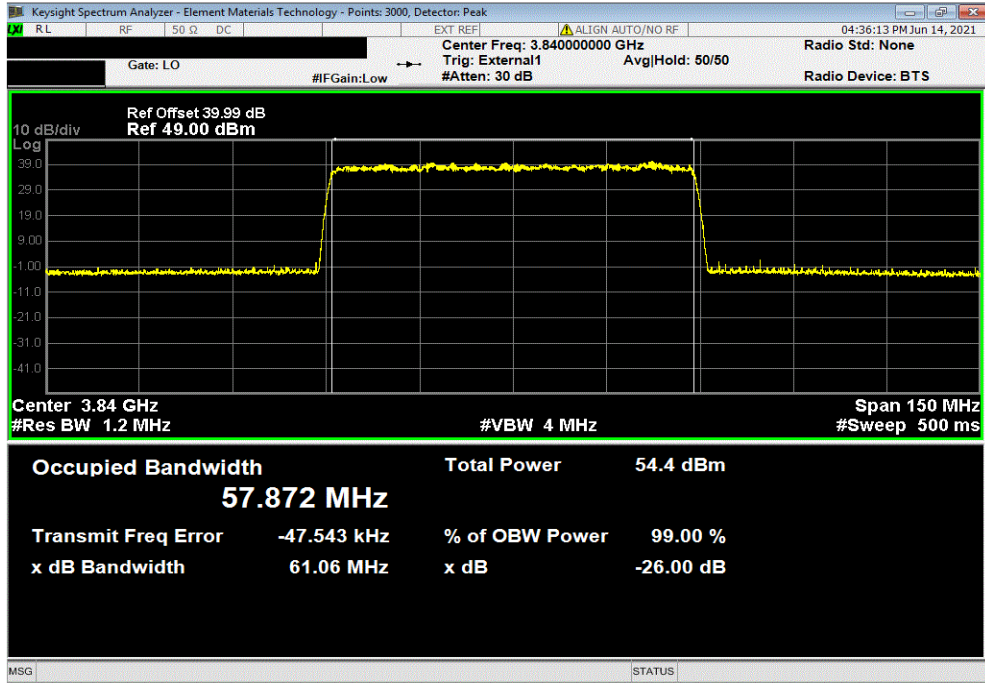


# OCCUPIED BANDWIDTH

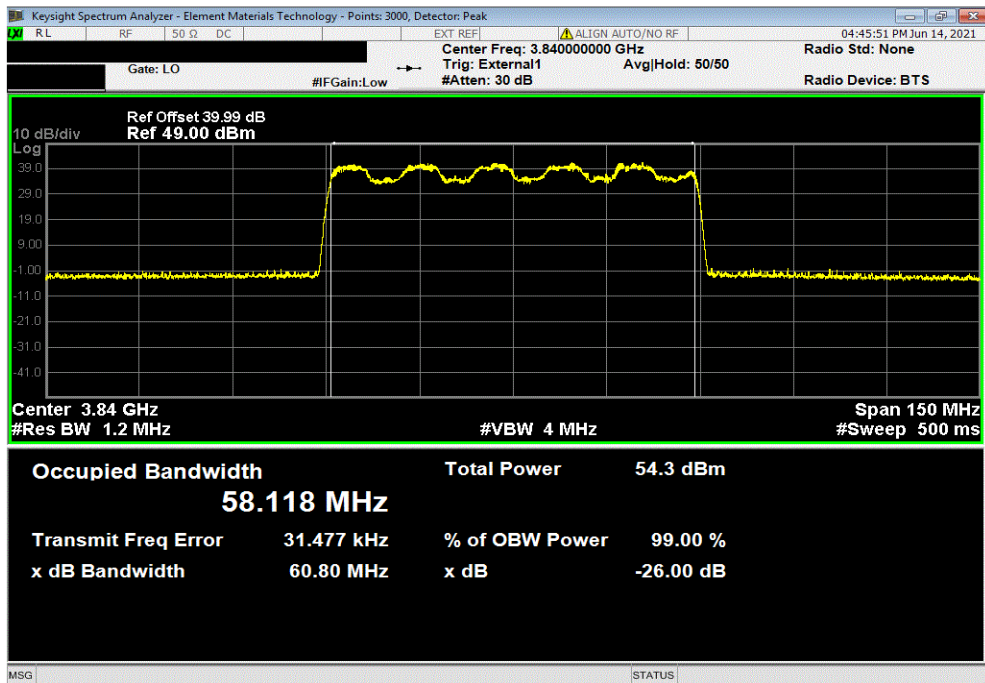


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, QPSK Modulation, Mid Ch. 3840 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			57.872	61.062	Within Band	Pass	



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, 16-QAM Modulation, Mid Ch. 3840 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			58.118	60.805	Within Band	Pass	

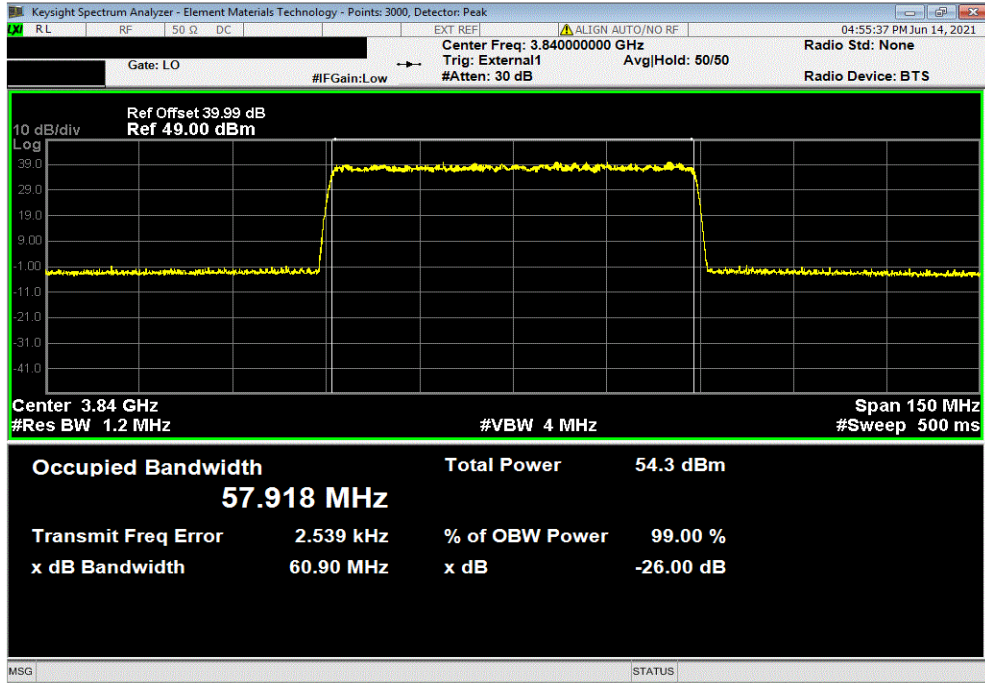


# OCCUPIED BANDWIDTH

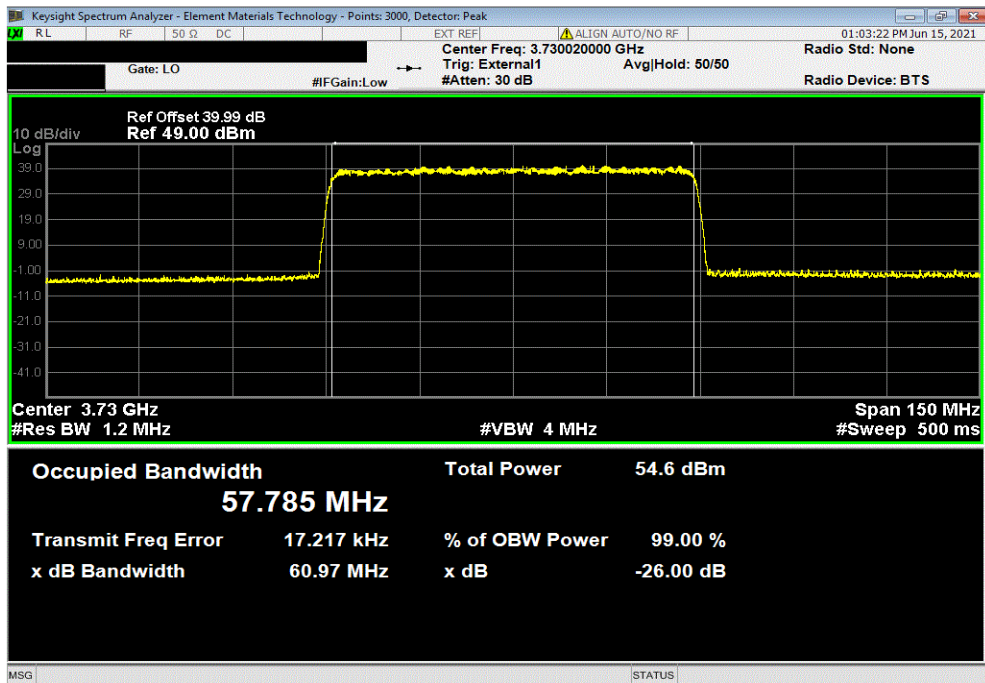


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, 64-QAM Modulation, Mid Ch. 3840 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			57.918	60.897	Within Band	Pass	



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, 256-QAM Modulation, Low Ch. 3730.02 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			57.785	60.969	Within Band	Pass	

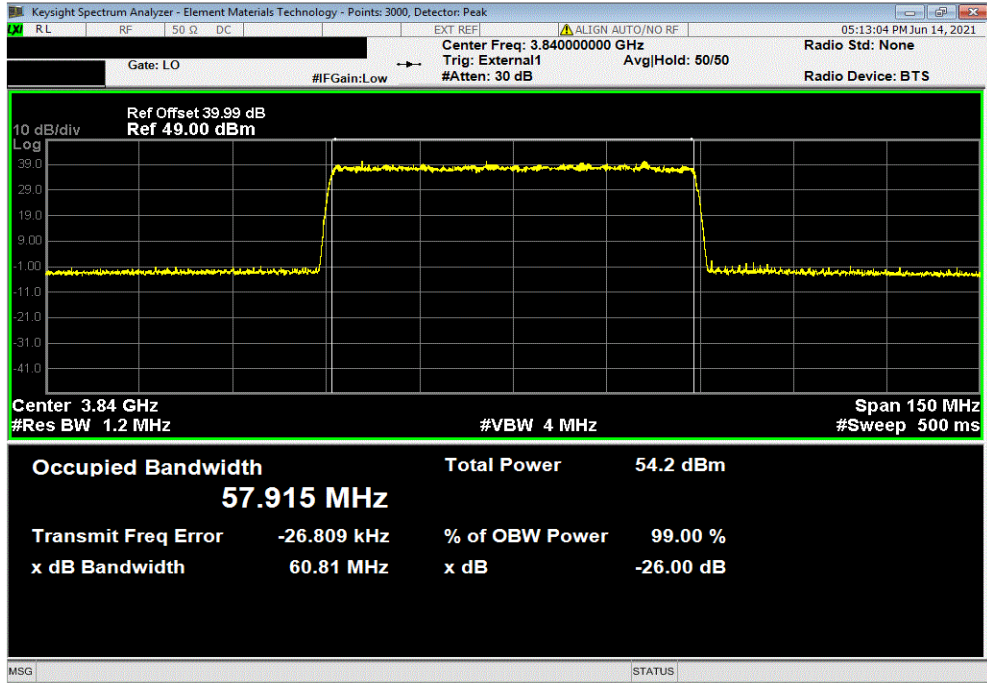


# OCCUPIED BANDWIDTH

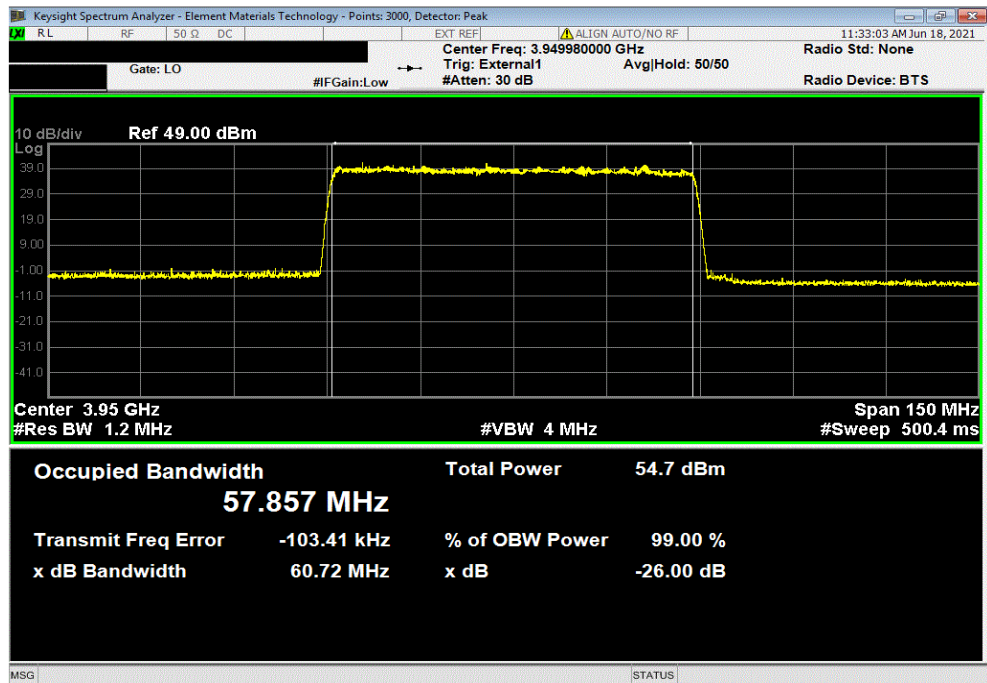


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, 256-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		57.915	60.813			Within Band	Pass



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 60 MHz BW, 256-QAM Modulation, High Ch. 3949.98 MHz							
		Value	Value			Limit	Result
		99% (MHz)	26dB (MHz)				
		57.86	60.72			Within Band	Pass

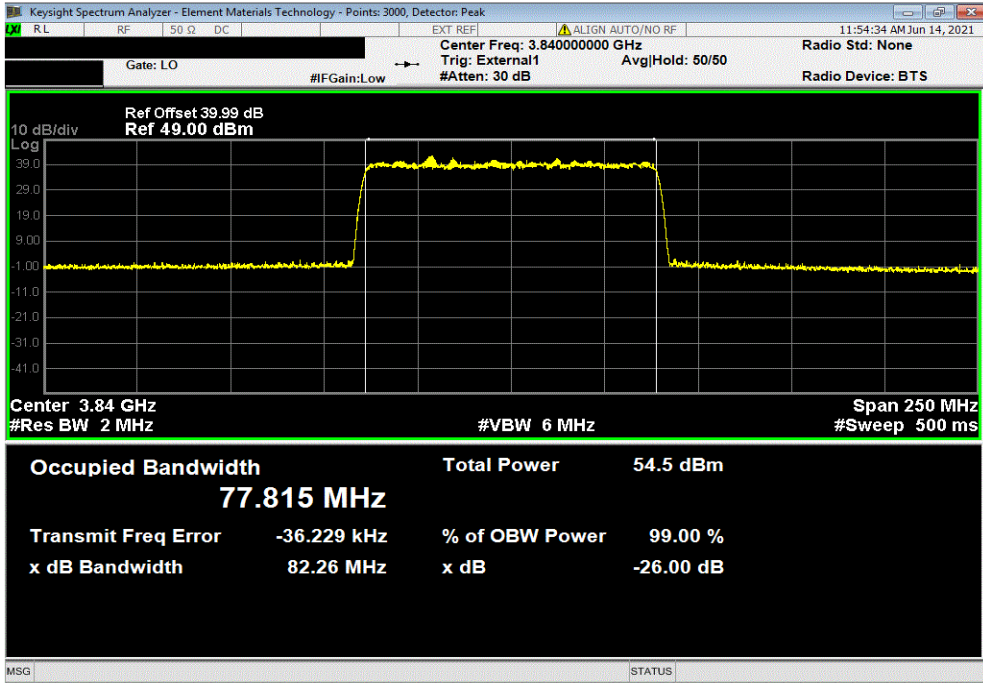


# OCCUPIED BANDWIDTH

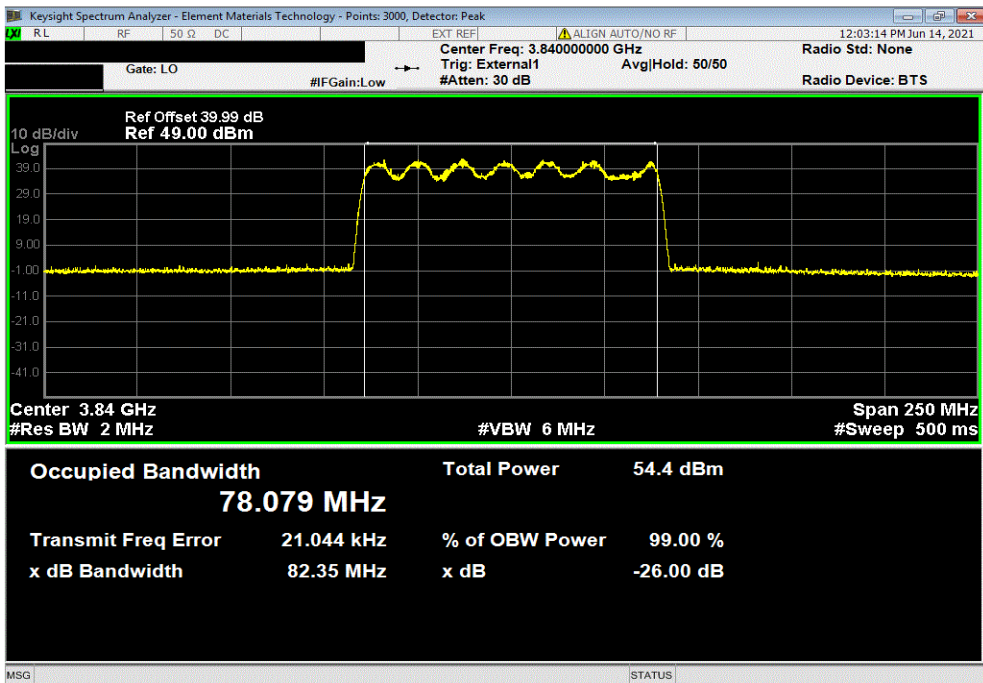


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, QPSK Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		77.815	82.255	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, 16-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		78.079	82.348	Within Band	Pass		



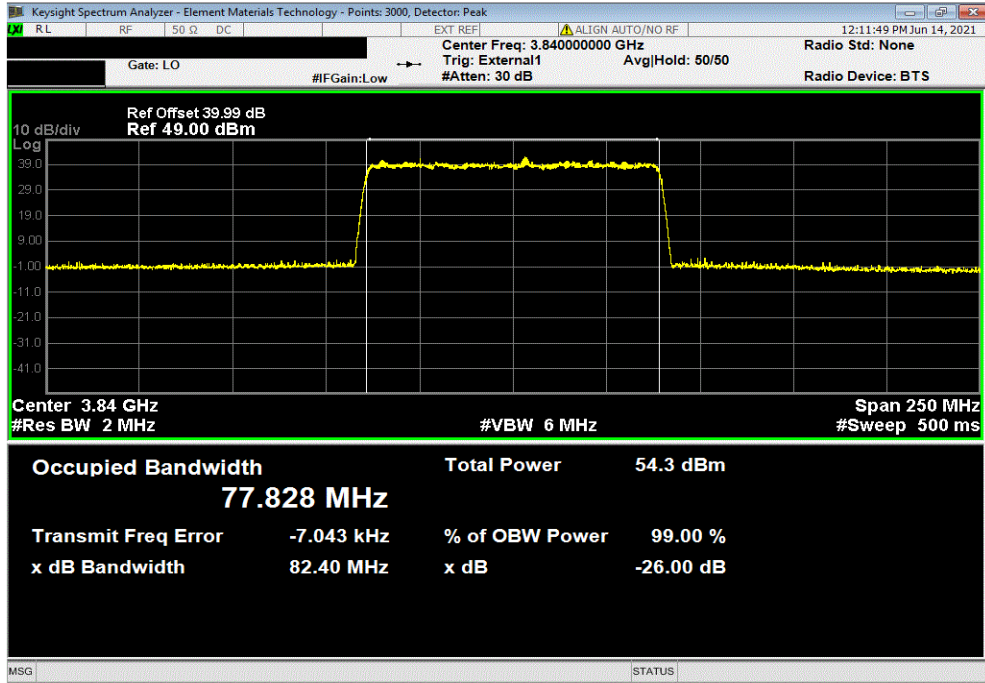


# OCCUPIED BANDWIDTH

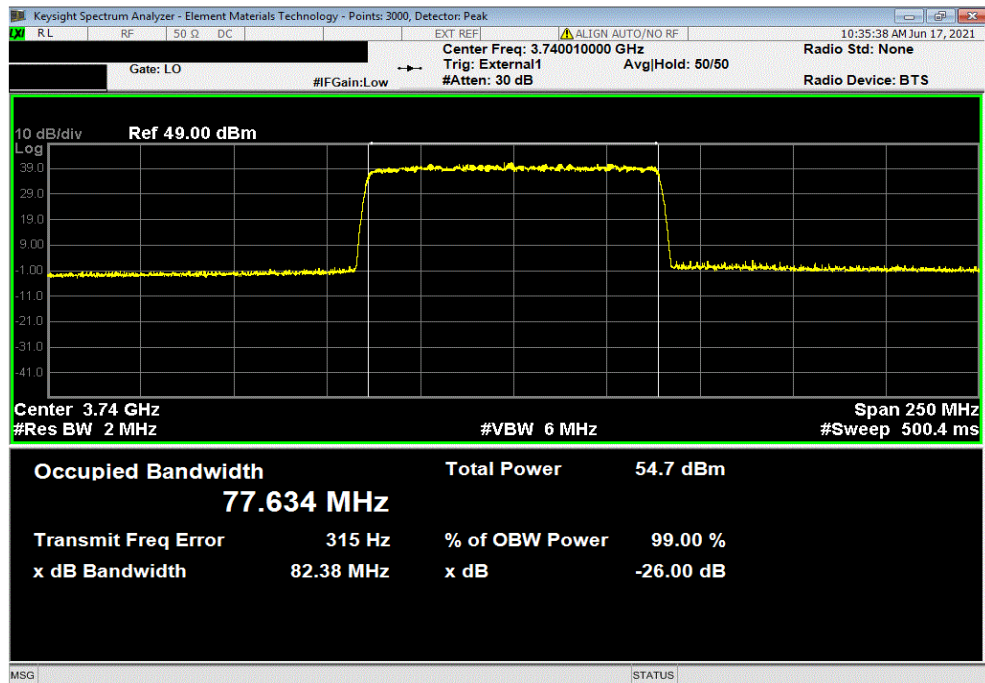


TotTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, 64-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		77.828	82.398	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, 256-QAM Modulation, Low Ch. 3740.01 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		77.373	82.38	Within Band	Pass		

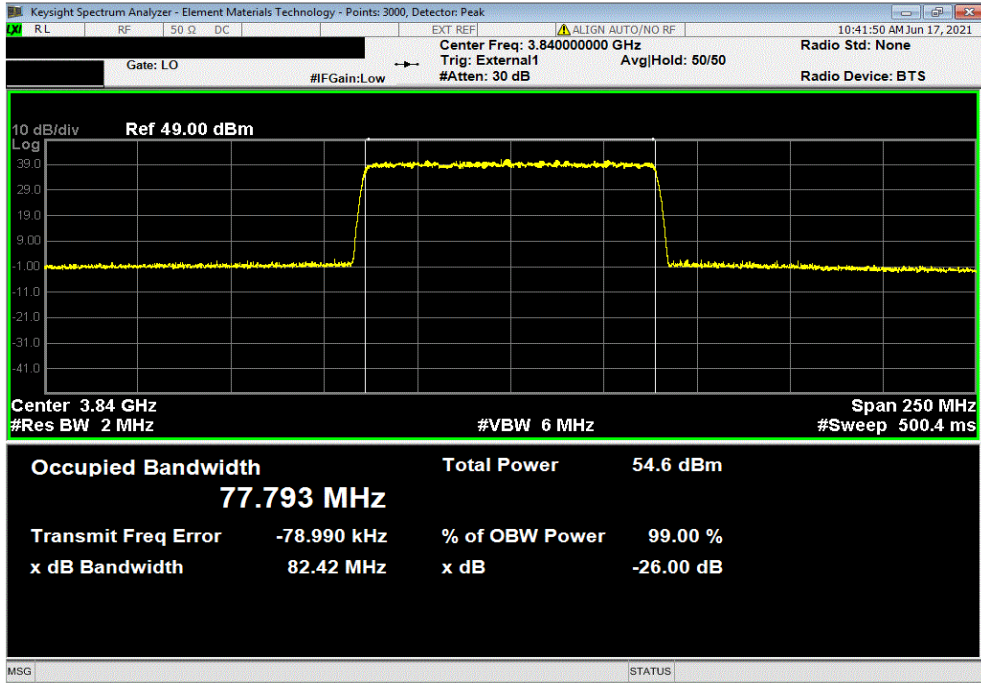


# OCCUPIED BANDWIDTH

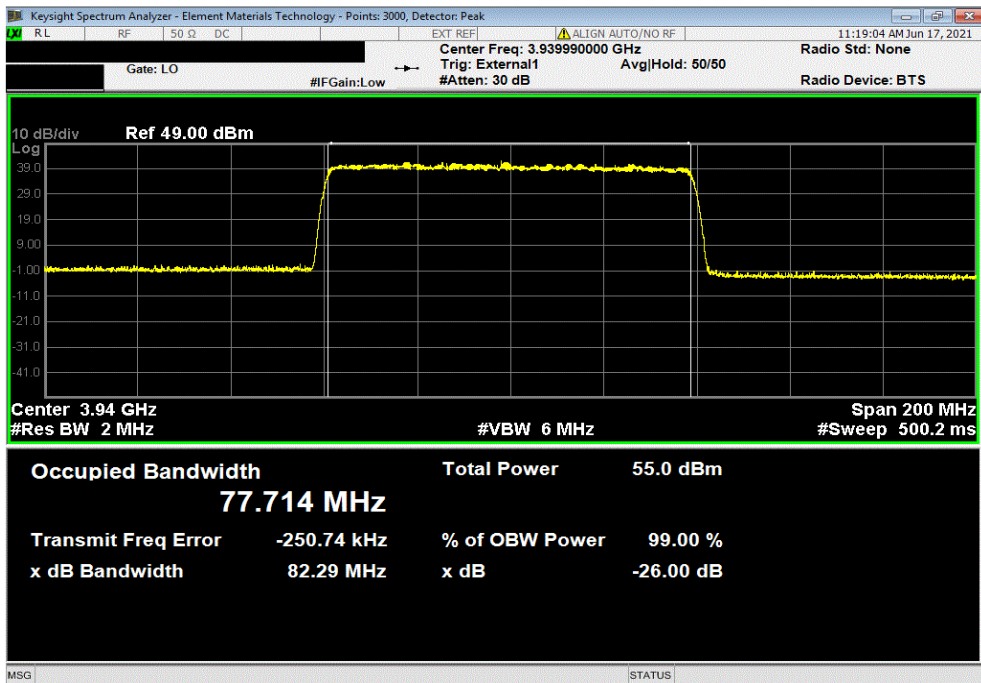


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, 256-QAM Modulation, Mid Ch. 3840 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	77.519	82.42	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 80 MHz BW, 256-QAM Modulation, High Ch. 3939.99 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	77.45	82.29	Within Band	Pass		

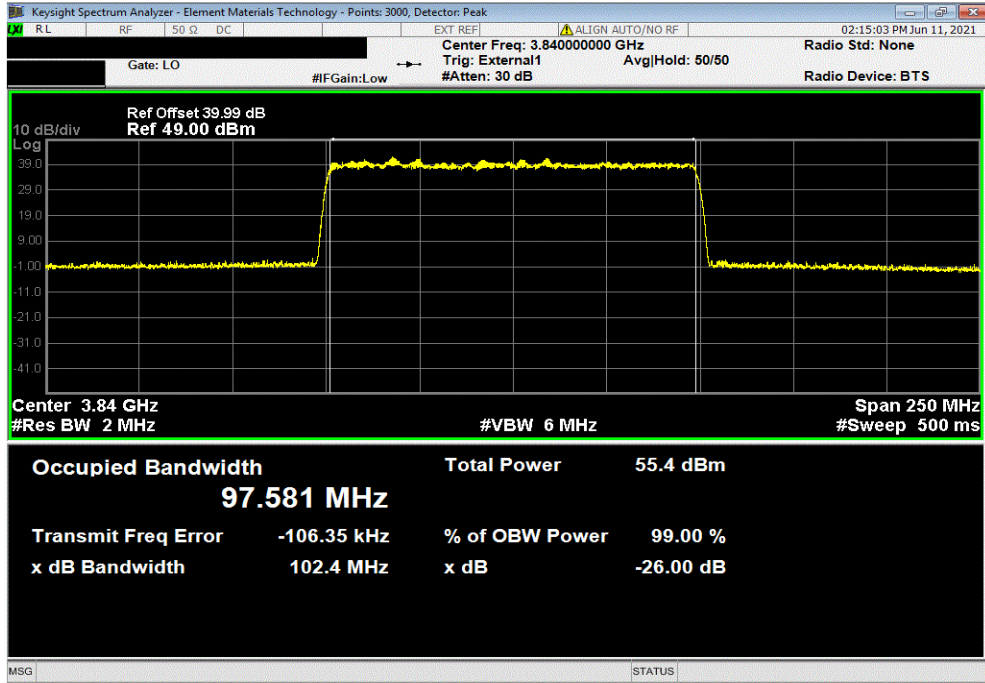


# OCCUPIED BANDWIDTH

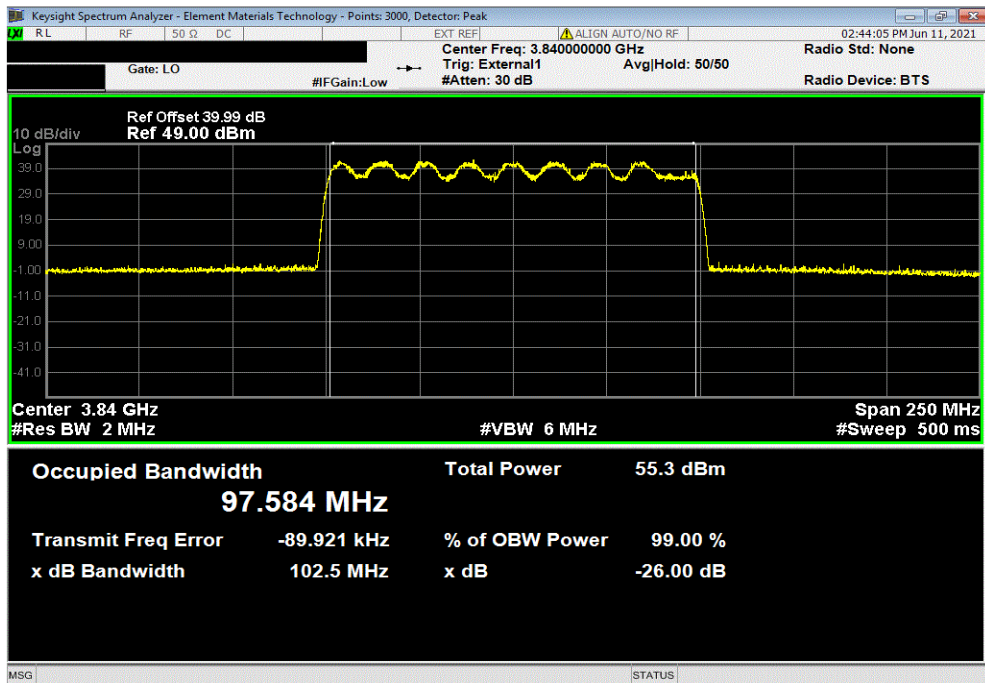


TotTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, QPSK Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		97.581	102.397	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, 16-QAM Modulation, Mid Ch. 3840 MHz							
		Value	Value	Limit	Result		
		99% (MHz)	26dB (MHz)				
		97.584	102.455	Within Band	Pass		

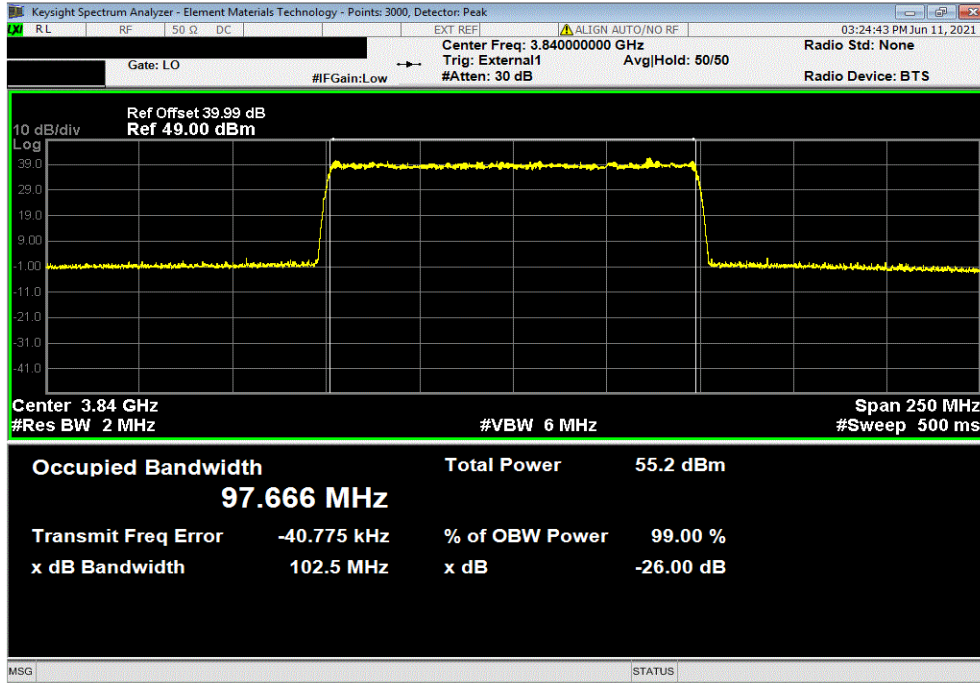


# OCCUPIED BANDWIDTH

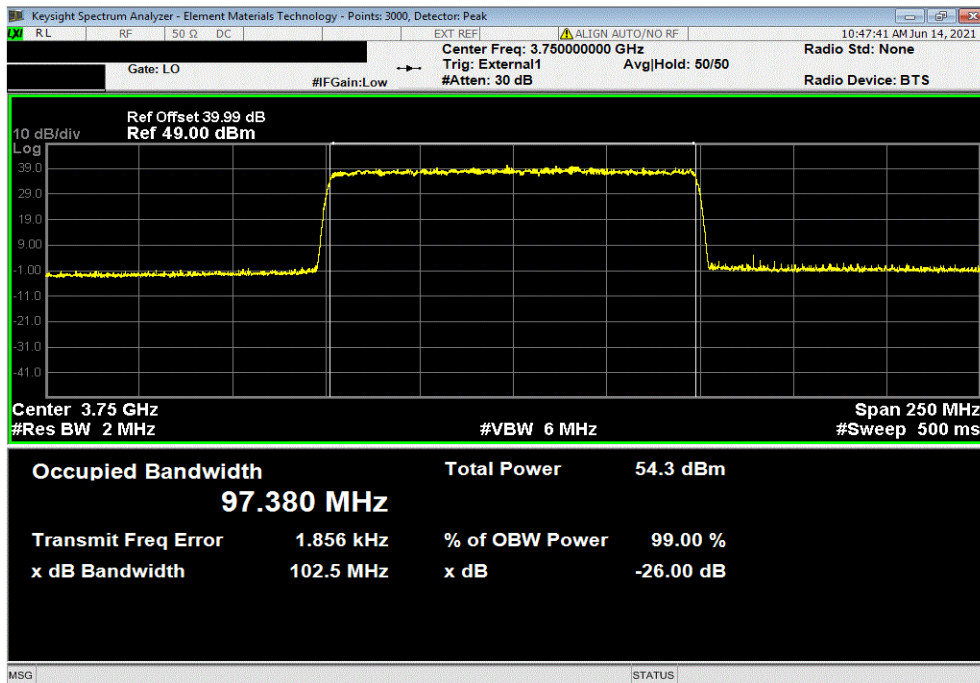


TotTx 2021.03.19.1 XMit 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, 64-QAM Modulation, Mid Ch. 3840 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	97.666	102.535	Within Band	Pass		



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, 256-QAM Modulation, Low Ch. 3750 MHz						
	Value	Value	Limit	Result		
	99% (MHz)	26dB (MHz)				
	97.38	102.521	Within Band	Pass		

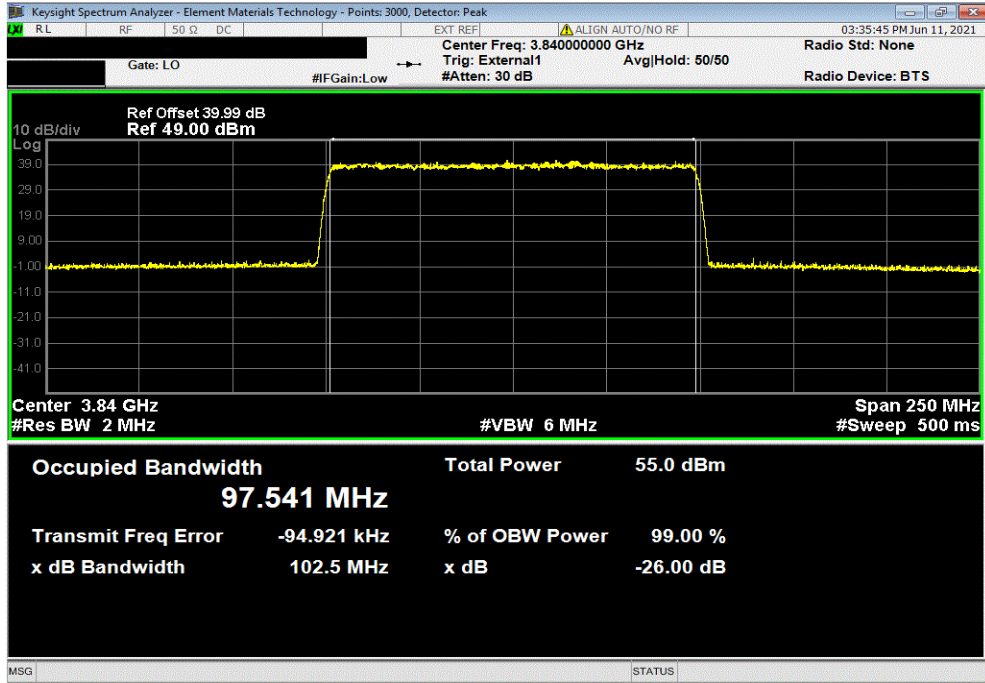


# OCCUPIED BANDWIDTH

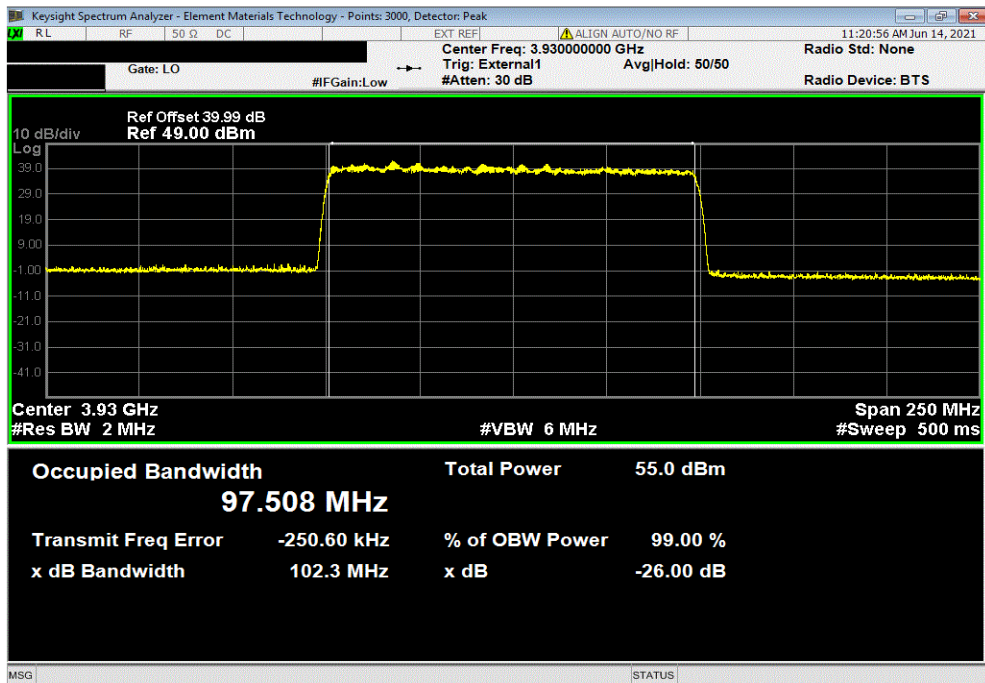


TbTx 2021.03.19.1 XMI 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, 256-QAM Modulation, Mid Ch. 3840 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			97.541	102.535	Within Band	Pass	



Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, 100 MHz BW, 256-QAM Modulation, High Ch. 3930 MHz							
			Value	Value	Limit	Result	
			99% (MHz)	26dB (MHz)			
			97.508	102.338	Within Band	Pass	





XMIT 2020.12.30.0

# FREQUENCY STABILITY

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
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBH	NCR	NCR
Spectrum Analyzer	Keysight	N9030B	R291	2020-06-13	2021-07-13
Meter - Multimeter	Fluke	77-IV	MLT	2020-10-15	2023-10-15
Thermometer	Omega Engineering, Inc.	HH311	DUI	2021-02-02	2024-02-02

## TEST DESCRIPTION

The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Measurements were made on the single transmit frequency as called out on the data sheets. Testing was done while the EUT was continuously operating.

The primary supply voltage was varied from 85 % to 115% of the nominal voltage while at ambient temperature. Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range of -30 ° to +50° C and at 10°C intervals.

FCC Part 27.54 defines the frequency deviation limit as follows: "The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation."

While there are no specific limits defined, results with a frequency error of less than 1000 Hz will show the carrier to be operating within the band. The frequency stability/accuracy radio design is the same for all radio technologies and modulation types. The radio was configured for 5G NR100 to show compliance.

# FREQUENCY STABILITY



XMIT 2020.12.30.0

EUT: <b>Airscale Base Transceiver Station Remote Radio Head Model AZQW</b>		Work Order: <b>NOKI0028</b>		
Serial Number: <b>YK211100168</b>		Date: <b>22-Jun-21</b>		
Customer: <b>Nokia Solutions and Networks</b>		Temperature: <b>23 °C</b>		
Attendees: <b>Mitchell Hill , David Le</b>		Humidity: <b>49.6% RH</b>		
Project: <b>None</b>		Barometric Pres.: <b>1017 mbar</b>		
Tested by: <b>Brandon Hobbs</b>	Power: <b>54VDC</b>	Job Site: <b>TX05</b>		
TEST SPECIFICATIONS				
FCC 27:2021		Test Method: <b>ANSI C63.26:2015</b>		
COMMENTS				
All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. External 1 gating was set using a trig delay = 86.2us and a gate length = 3.714ms. The EUT temperature was stabilized at each temperature step (for a minimum of 30 minutes) prior to measurements.				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	6	Signature		
		Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8				
NR100 Demodulated, Carrier Tone				
48 VDC Nominal Voltage Conditions				
-30°C Temperature Conditions				
	Mid Channel 3840 MHz	0.881	1000	Pass
-20°C Temperature Conditions				
	Mid Channel 3840 MHz	0.564	1000	Pass
-10°C Temperature Conditions				
	Mid Channel 3840 MHz	0.564	1000	Pass
0°C Temperature Conditions				
	Mid Channel 3840 MHz	0.582	1000	Pass
10°C Temperature Conditions				
	Mid Channel 3840 MHz	0.924	1000	Pass
20°C Temperature Conditions				
	Mid Channel 3840 MHz	0.373	1000	Pass
30°C Temperature Conditions				
	Mid Channel 3840 MHz	0.451	1000	Pass
40°C Temperature Conditions				
	Mid Channel 3840 MHz	0.525	1000	Pass
50°C Temperature Conditions				
	Mid Channel 3840 MHz	1.520	1000	Pass
40.8 VDC Extreme Low Voltage Conditions				
20°C Temperature Conditions				
	Mid Channel 3840 MHz	0.135	1000	Pass
55.2 VDC Extreme High Voltage Conditions				
20°C Temperature Conditions				
	Mid Channel 3840 MHz	0.212	1000	Pass

# FREQUENCY STABILITY



XMt 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, -30°C Temperature Conditions, Mid Channel 3840 M			
	Absolute Value Frequency $\Delta$ (Hz)	Limit $\Delta$ (Hz)	Result
	0.881	1000	Pass

5G NR 1  
Modulation Analysis

KEYSIGHT Input RF: Coupling: DC, Align: Auto  
Input Z: 50  $\Omega$ , Corrections: Off, Freq Ref: External  
Atten: 18 dB, Preamp: Off, #PNO: Best Wide  
Trig: External 1, Trig Delay: 86.2  $\mu$ s, IF Gain: Low  
Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CO0 Error Summary

Channel Power	37.30 dBm
Channel Power (Active)	38.59 dBm
EVM	2.55 %
EVM Peak	12.68 %
Frequency Error	-880.6 mHz
Symbol Clock Error	0.003 ppm
IQ Offset	-34.99 dB
Time Offset	-393 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.79 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Jun 21, 2021 12:24:32 PM

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, -20°C Temperature Conditions, Mid Channel 3840 M			
	Absolute Value Frequency $\Delta$ (Hz)	Limit $\Delta$ (Hz)	Result
	0.564	1000	Pass

5G NR 1  
Modulation Analysis

KEYSIGHT Input RF: Coupling: DC, Align: Auto  
Input Z: 50  $\Omega$ , Corrections: Off, Freq Ref: External  
Atten: 18 dB, Preamp: Off, #PNO: Best Wide  
Trig: External 1, Trig Delay: 86.2  $\mu$ s, IF Gain: Low  
Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CO0 Error Summary

Channel Power	38.05 dBm
Channel Power (Active)	39.34 dBm
EVM	2.62 %
EVM Peak	13.71 %
Frequency Error	-563.7 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.19 dB
Time Offset	-390 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.84 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Jun 21, 2021 2:28:26 PM



# FREQUENCY STABILITY



XMt 2020.12.30.0

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, -10°C Temperature Conditions, Mid Channel 3840 MHz			
	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	0.564	1000	Pass

5G NR 1 Modulation Analysis

KEYSIGHT Input RF: Coupling: DC, Align: Auto Input Z: 50 Ω, Corrections: Off, Freq Ref: External Atten: 18 dB, Preamp: Off #PNO: Best Wide Trng: External 1, Trng Delay: 86.2 μs, IF Gain: Low Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CC0 Error Summary

Channel Power	38.05 dBm
Channel Power (Active)	39.34 dBm
EVM	2.62 %
EVM Peak	13.71 %
Frequency Error	-563.7 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.19 dB
Time Offset	-390 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.84 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Jun 21, 2021 2:28:26 PM

Band n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 0°C Temperature Conditions, Mid Channel 3840 MHz			
	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	0.582	1000	Pass

5G NR 1 Modulation Analysis

KEYSIGHT Input RF: Coupling: DC, Align: Auto Input Z: 50 Ω, Corrections: Off, Freq Ref: External Atten: 18 dB, Preamp: Off #PNO: Best Wide Trng: External 1, Trng Delay: 86.2 μs, IF Gain: Low Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CC0 Error Summary

Channel Power	38.46 dBm
Channel Power (Active)	39.75 dBm
EVM	2.55 %
EVM Peak	12.15 %
Frequency Error	-582.0 mHz
Symbol Clock Error	0.001 ppm
IQ Offset	-35.24 dB
Time Offset	-396 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.80 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Jun 21, 2021 3:02:57 PM

# FREQUENCY STABILITY



XMU 2020.12.30.0

and n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 10°C Temperature Conditions, Mid Channel 3840 MHz

	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	0.924	1000	Pass

5G NR 1 Modulation Analysis

**KEYSIGHT** Input RF: Coupling: DC, Align: Auto | Input Z: 50 Ω, Corrections: Off, Freq Ref: External | Atten: 18 dB, Preamp: Off, #PNO: Best Wide | Trig: External 1, Trig Delay: 86.2 μs, IF Gain: Low | Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CC0 Error Summary

Channel Power	38.57 dBm
Channel Power (Active)	39.86 dBm
EVM	2.58 %
EVM Peak	13.25 %
Frequency Error	-924.3 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.24 dB
Time Offset	-389 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.82 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Jun 21, 2021 4:04:10 PM

and n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 20°C Temperature Conditions, Mid Channel 3840 MHz

	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	0.373	1000	Pass

5G NR 1 Modulation Analysis

**KEYSIGHT** Input RF: Coupling: DC, Align: Auto | Input Z: 50 Ω, Corrections: Off, Freq Ref: External | Atten: 18 dB, Preamp: Off, #PNO: Best Wide | Trig: External 1, Trig Delay: 86.2 μs, IF Gain: Low | Carrier Ref Freq: 3.840000000 GHz, AvgJHold: 10/10, CC Info: Downlink, 1 CC, SISO

4 CC0 Error Summary

Channel Power	38.64 dBm
Channel Power (Active)	39.93 dBm
EVM	2.60 %
EVM Peak	12.14 %
Frequency Error	-373.4 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.17 dB
Time Offset	-393 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.84 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

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# FREQUENCY STABILITY



XMI 2020.12.30.0

and n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 30°C Temperature Conditions, Mid Channel 3840 MHz

	Absolute Value Frequency $\Delta$ (Hz)	Limit $\Delta$ (Hz)	Result
	0.451	1000	Pass

**5G NR 1**  
Modulation Analysis

KEYSIGHT Input RF Input Z: 50  $\Omega$  Atten: 18 dB Trng: External 1 Carrier Ref Freq: 3.840000000 GHz  
Coupling: DC Corrections: Off Preamp: Off Trng Delay: 85.2  $\mu$ s AvgHld: 10/10  
Align: Auto Freq Ref: External #PNO: Best Wide IF Gain: Low CC Info: Downlink, 1 CC, SISO

4 COO Error Summary

- Channel Power: 38.89 dBm
- Channel Power (Active): 40.18 dBm
- EVM: 2.65 %
- EVM Peak: 12.17 %
- Frequency Error: 451.2 mHz
- Symbol Clock Error: 0.003 ppm
- IQ Offset: -35.14 dB
- Time Offset: -390 ns
- Sync Correlation: 99.9 %
- Sync Source: PDSCH DMRS
- Magnitude Error: 1.88 %
- Phase Error: 0.02 rad
- Gain Imbalance: ---
- Quad Error: ---
- Timing Skew: ---

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and n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 40°C Temperature Conditions, Mid Channel 3840 MHz

	Absolute Value Frequency $\Delta$ (Hz)	Limit $\Delta$ (Hz)	Result
	0.525	1000	Pass

**5G NR 1**  
Modulation Analysis

KEYSIGHT Input RF Input Z: 50  $\Omega$  Atten: 18 dB Trng: External 1 Carrier Ref Freq: 3.840000000 GHz  
Coupling: DC Corrections: Off Preamp: Off Trng Delay: 86.2  $\mu$ s AvgHld: 10/10  
Align: Auto Freq Ref: External #PNO: Best Wide IF Gain: Low CC Info: Downlink, 1 CC, SISO

4 COO Error Summary

- Channel Power: 39.09 dBm
- Channel Power (Active): 40.39 dBm
- EVM: 2.67 %
- EVM Peak: 13.90 %
- Frequency Error: -524.8 mHz
- Symbol Clock Error: 0.003 ppm
- IQ Offset: -35.11 dB
- Time Offset: -392 ns
- Sync Correlation: 99.9 %
- Sync Source: PDSCH DMRS
- Magnitude Error: 1.89 %
- Phase Error: 0.02 rad
- Gain Imbalance: ---
- Quad Error: ---
- Timing Skew: ---

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# FREQUENCY STABILITY



XMt 2020.12.30.0

and n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 48 VDC Nominal Voltage Conditions, 50°C Temperature Conditions, Mid Channel 3840 M			
	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	1.520	1000	Pass

5G NR 1 Modulation Analysis

KEYSIGHT Input RF: Input Z: 50 Ω Atten: 18 dB Trng: External 1 Carrier Ref Freq: 3.840000000 GHz  
 Coupling: DC Corrections: Off Preamp: Off Trng Delay: 86.2 μs AvgJHold: 10/10  
 Align: Auto Freq Ref: External #PNO: Best Wide IF Gain: Low CC Info: Downlink, 1 CC, SISO

4 CO0 Error Summary

Channel Power	39.17 dBm
Channel Power (Active)	40.46 dBm
EVM	2.59 %
EVM Peak	12.10 %
Frequency Error	-1.52 Hz
Symbol Clock Error	0.003 ppm
IQ Offset	-35.09 dB
Time Offset	-393 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.84 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

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n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 40.8 VDC Extreme Low Voltage Conditions, 20°C Temperature Conditions, Mid Channel 3840 M			
	Absolute Value Frequency Δ (Hz)	Limit Δ (Hz)	Result
	0.135	1000	Pass

5G NR 1 Modulation Analysis

KEYSIGHT Input RF: Input Z: 50 Ω Atten: 18 dB Trng: External 1 Carrier Ref Freq: 3.840000000 GHz  
 Coupling: DC Corrections: Off Preamp: Off Trng Delay: 86.2 μs AvgJHold: 10/10  
 Align: Auto Freq Ref: External #PNO: Best Wide IF Gain: Low CC Info: Downlink, 1 CC, SISO

4 CO0 Error Summary

Channel Power	38.63 dBm
Channel Power (Active)	39.92 dBm
EVM	2.59 %
EVM Peak	12.87 %
Frequency Error	-135.1 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.16 dB
Time Offset	-393 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.83 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

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# FREQUENCY STABILITY



XMI 2020.12.30.0

n77, 3700 MHz - 3980 MHz, 5G NR, Port 8, NR100 Demodulated, Carrier Tone, 55.2 VDC Extreme High Voltage Conditions, 20°C Temperature Conditions, Mid Channel 3840

	Absolute Value	Limit	Result
	Frequency $\Delta$ (Hz)	$\Delta$ (Hz)	
	0.212	1000	Pass

5G NR 1  
Modulation Analysis

**KEYSIGHT** Input: RF Coupling: DC Align: Auto Input Z: 50  $\Omega$  Corrections: Off Freq Ref: External Atten: 18 dB Preamp: Off #PNO: Best Wide Trng: External 1 Trig Delay: 86.2  $\mu$ s IF Gain: Low Carrier Ref Freq: 3.840000000 GHz AvgJHold: 10/10 CC Info: Downlink, 1 CC, SISO

4 CC0 Error Summary

Channel Power	38.63 dBm
Channel Power (Active)	39.92 dBm
EVM	2.67 %
EVM Peak	13.66 %
Frequency Error	-212.2 mHz
Symbol Clock Error	0.002 ppm
IQ Offset	-35.17 dB
Time Offset	-393 ns
Sync Correlation	99.9 %
Sync Source	PDSCH DMRS
Magnitude Error	1.89 %
Phase Error	0.02 rad
Gain Imbalance	---
Quad Error	---
Timing Skew	---

Windows taskbar: Jun 22, 2021 2:16:49 PM