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

FCC ID: VBNAAFB-01
IC ID: 661W-AAFB

Nokia Solutions and Networks
Airscale Base Transceiver Station Radio Module
Model: AAFB

Report: NOKI0031, Issue Date: August 12, 2021

ACCREDITED
CERT #3310.03

CERTIFICATE OF TEST

Last Date of Test: July 31, 2021
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Radio Module Model AAFB

Radio Equipment Testing

Standards

Specification	Method
Code of Federal Regulations (CFR) Title 47 Part 2 (Radio Standards Specification) RSS-Gen Issue 5: 2019 CFR Title 47 Part 24 Subpart E – Broadband PCS RSS-133 Issue 6 - January 18, 2018 – 2GHz Personal Communications Services	ANSI C63.26-2015 with FCC KDB 971168 D01 v03r01 FCC KDB 662911D01 v02r01 FCC KDB 662911D02 v01

Results

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

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

United States

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

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

Canada

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

European Union

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

United Kingdom

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

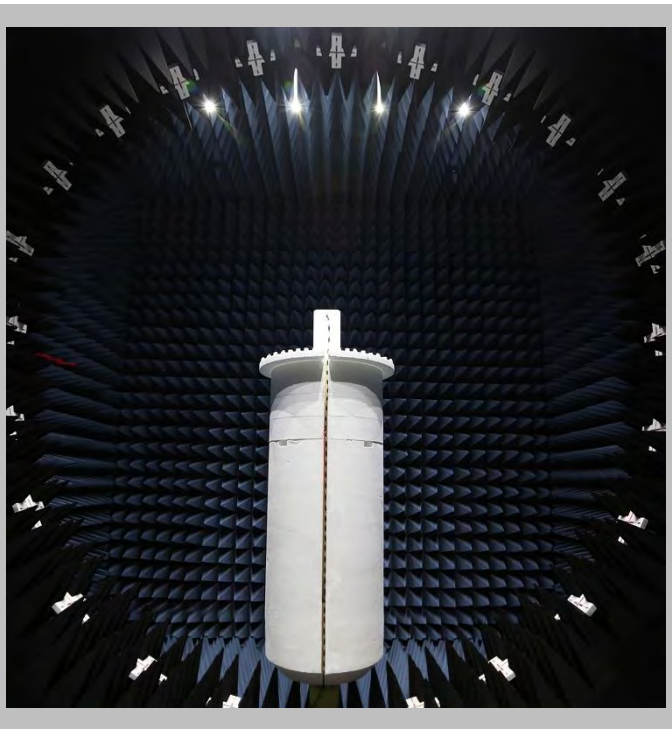
SCOPE

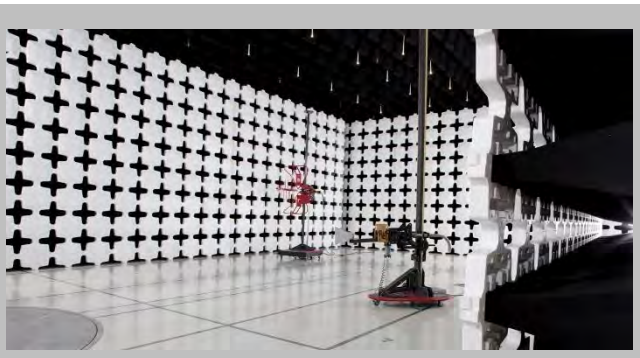
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

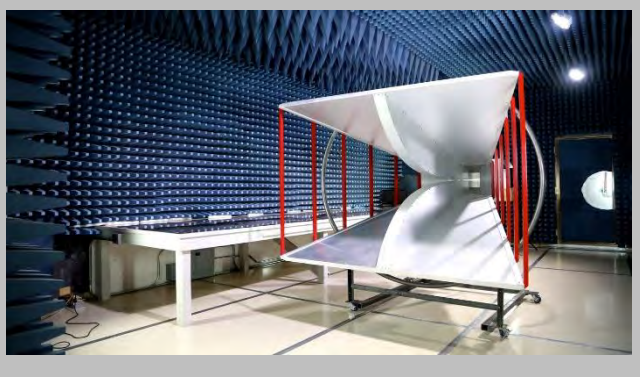
FACILITIES

element
2020.12.15

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







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

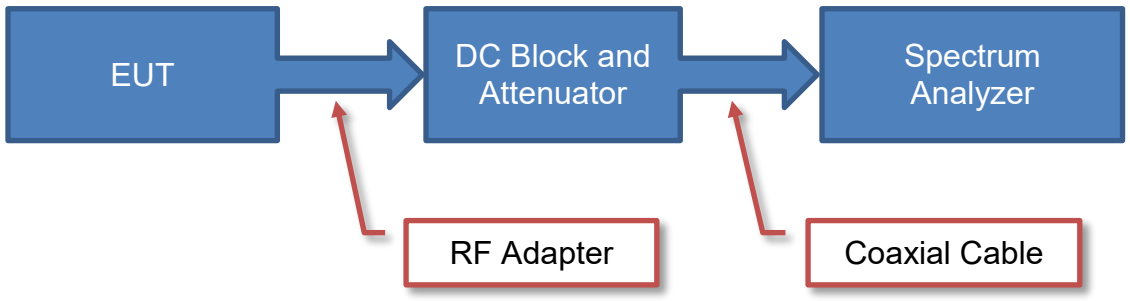
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific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

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

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

TEST SETUP BLOCK DIAGRAMS

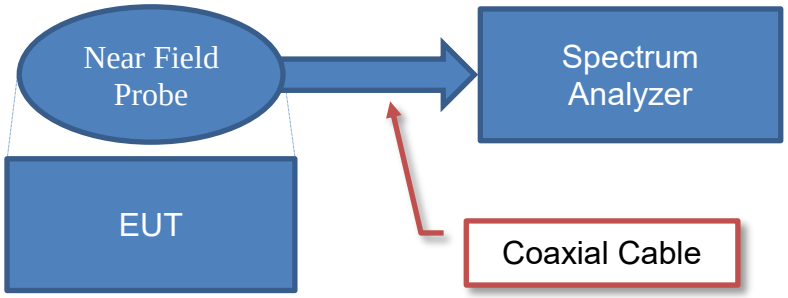
Antenna Port Conducted Measurements



Sample Calculation

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

Near Field Test Fixture Measurements

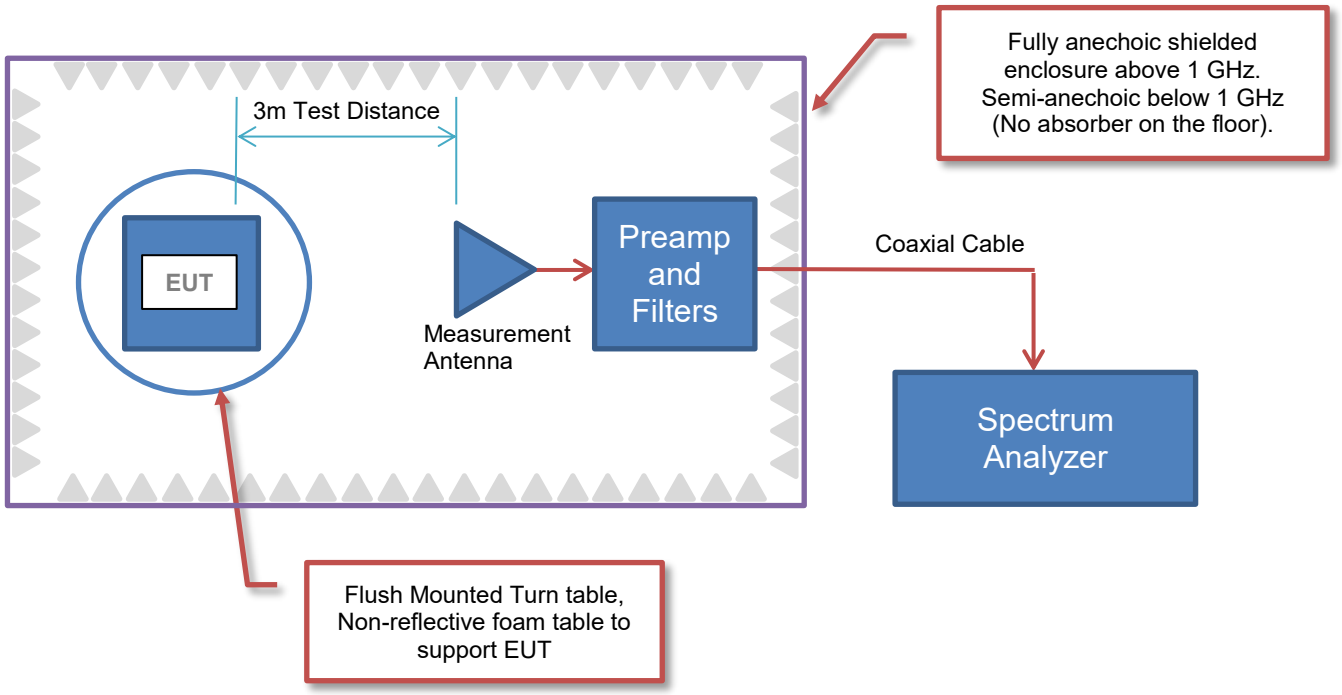


Sample Calculation

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

Company Name:	Nokia Solutions and Networks
Address:	3201 Olympus Blvd
City, State, Zip:	Dallas, TX 75019
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Radio Module Model AAFB
First Date of Test:	July 22, 2021
Last Date of Test:	July 31, 2021
Receipt Date of Samples:	July 22, 2021
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 Base Transceiver Station Radio Module Model AAFB FCC and ISED radio certifications. The original certification effort included testing for LTE technologies. Please refer to the test report on the original certification (FCC ID: VBNAAFB-01/IC ID: 661W-AAFB) 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, PSD, CCDF, 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 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 testing was performed on the same hardware version (AAFB) as the original certification test. 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 were not repeated under this effort per TCB guidance. The radiated emission and frequency stability/accuracy results from the original certification had enough margin to preclude requiring additional testing. The same frequency stability/accuracy radio design is the same for all radio technologies/modulation types.

The equipment under test (EUT) is a Nokia Solutions and Networks Airscale Base Transceiver Station Radio Module Model AAFB. The AAFB radio module is a multi-standard multi-carrier radio module designed to support 4G LTE-FDD and 5G NR-FDD operations. **The scope of testing in this effort is for 5G NR Single Carrier operations.**

The AAFB radio module is a subassembly of the massive MIMO adaptive antenna (MMAA) assembly. The MMAA integrates radio module variants with the 8 column antenna into one assembly. The MMAA assembly/antenna is not directly used/part of this radio approval test effort (i.e.: The AAFB radio module is tested under this effort. The antenna assembly is not part of the test under this

effort). The MMAA AAFIA assembly also contains the AAIB radio module whose certification/testing are documented elsewhere. The MMAA AAFIA Dual 16T16R 100W +100W (8 column antenna) contains the AAIB and AAFB radio modules.

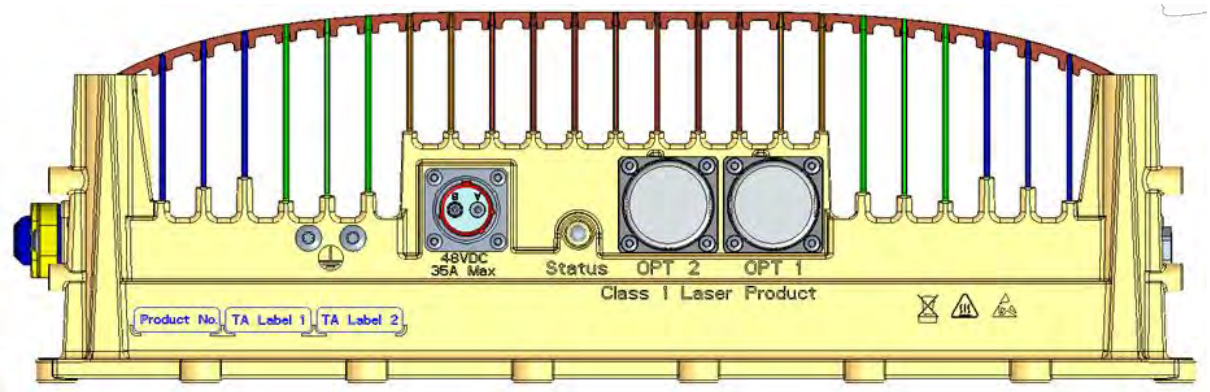
The AAFB RRH has 16 transmit/receive antenna ports (16TX/16RX) that supports 3GPP frequency band n25 operations (BTS RX: 1850 to 1915 MHz/BTS TX: 1930 to 1995 MHz). The maximum RF output power of the radio module antenna port is 6.25 watts. The total RF output power for the AAFB radio module is 100 watts (16 x 6.25 watts). The TX and RX instantaneous bandwidth cover the full AAFB operational bandwidth (Band n25). The AAFB supports 5, 10, 15 and 20MHz 5G NR bandwidths. The AAFB supports four 5G NR downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM).

The radio module has external interfaces including DC power (DC In), ground, transmit/receive (ANT), and optical (OPT). The massive MIMO adaptive antenna assembly (configured with AAFB and AAIB radios) may be pole or wall mounted.
The AAFB PCS Band 5G NR channel bandwidths are 5, 10, 15 and 20MHz. The downlink channel numbers and frequencies are provided below.

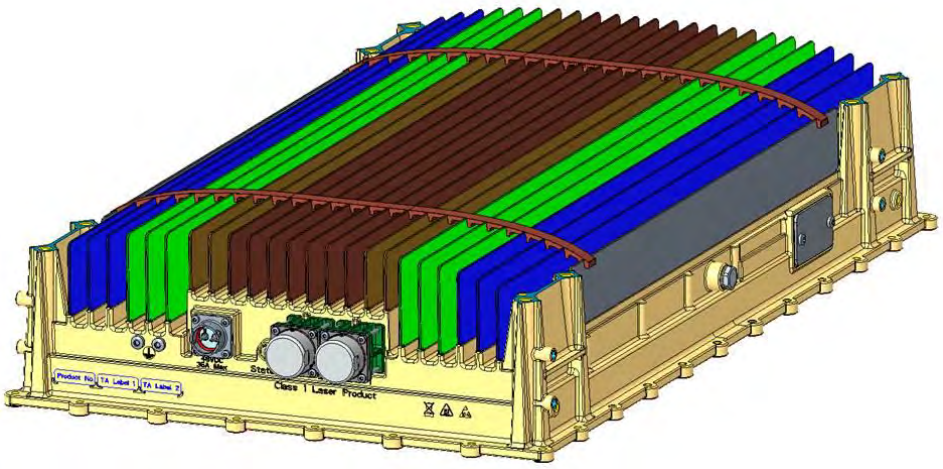
	Downlink 5G NR NR-ARFCN	Downlink Frequency (MHz)	5G NR Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AAFB Band n25 (Ant 1 through 16)	386000	1930.0	Band Edge	Band Edge	Band Edge	Band Edge
	386500	1932.5	Bottom Ch			
	387000	1935.0		Bottom Ch		
	387500	1937.5			Bottom Ch	
	388000	1940.0				Bottom 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			
	399000	1995.0	Band Edge	Band Edge	Band Edge	Band Edge

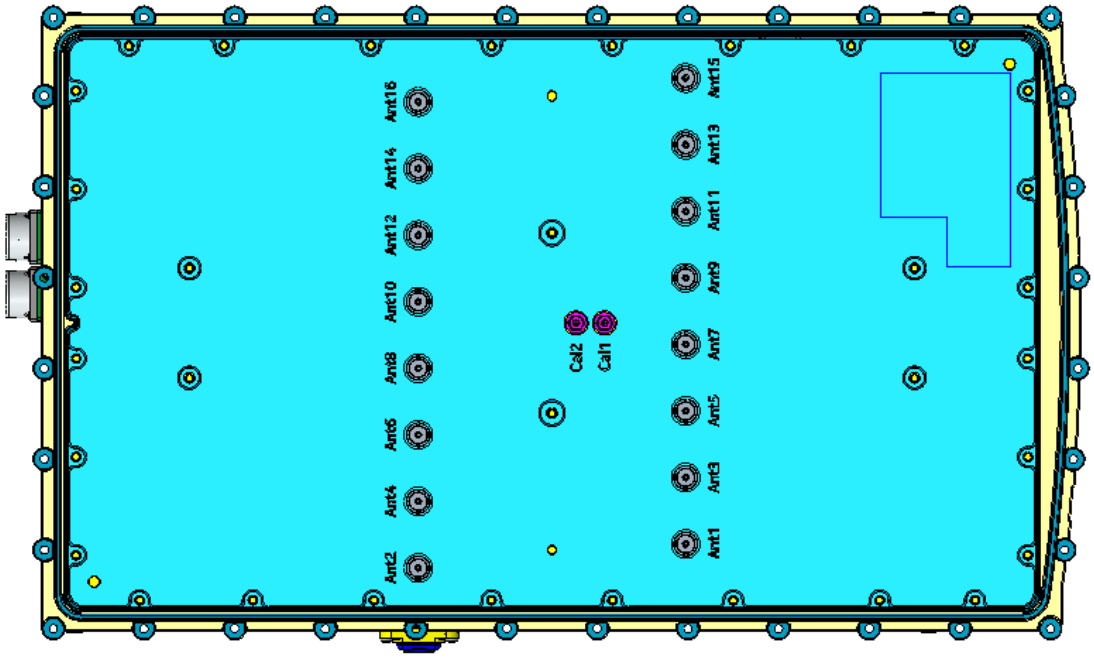
AAFB Downlink Band Edge 5G NR Band n25 Frequency Channels

AAFB Connector Layout:



PRODUCT DESCRIPTION





PRODUCT DESCRIPTION

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	16	4.3-10 Blind Mate/Quick Disconnect	RF signal for Transmitter/Receiver (50 Ohm)
Unit	1	LED	Unit Status LED
OPT	2	SFP+ cage	Optical Interface
Fan	1	Microfit	Power for fan on the side of radio module.

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 Radio Module AAFB Federal Communication Commission and Industry Canada certifications.

CONFIGURATIONS

Configuration NOKI0031- 1

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version	SBTS00_ENB_9900_210629_000001
5G RF_SW	SRM51.06.R04

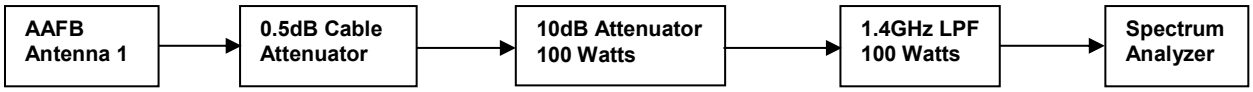
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.101	L1184301617
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AAFB (Radio Module Model)	Nokia Solutions and Networks	090148A.103	BL2032H23PI
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	VF20230058S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF20230008Y
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	18-0204-11
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-14
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-10
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-20
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-04
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-05
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-17
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-29
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-30
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-08
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-27
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-24
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-01
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-15
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-28
Antenna Load 1	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 2	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 3	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 4	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 5	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 6	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 7	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 8	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 9	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 10	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 11	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 12	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 13	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 14	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 15	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
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

CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	10 meters	N	ABIL	AAFB
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 [AAFB] Ant ports 2-16	Antenna Load

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106 0.5dB cable attenuator	Y	2 meters	N	EUT [AAFB] Ant port #1	Attenuator 100W/10dB
Attenuator 100W/10dB	N	N/A	N	RF cable HS-SUCOFLEX_106	Low Pass filter 1.4G/100W
Low Pass Filter 1.4G/100W	N	N/A	N	Attenuator 100W/10dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	Low Pass Filter 1.4G/100W	Analyzer

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0031- 2

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version	SBTS00_ENB_9900_210629_000001
5G RF_SW	SRM51.06.R04

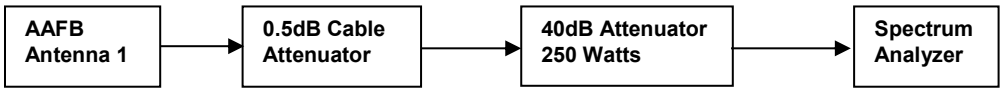
Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.101	L1184301617
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AAFB (Radio Module Model)	Nokia Solutions and Networks	090148A.103	BL2032H23PI
Attenuator 250W/40dB	API Weinschel	58-40-43-LIM	TC909
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20230058S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF20230008Y
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	18-0204-11
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-14
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-10
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-20
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-04
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-05
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-17
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-29
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-30
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-08
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-27
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-24
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-01
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-15
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-28
Antenna Load 1	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 2	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 3	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 4	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 5	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 6	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 7	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 8	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 9	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 10	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 11	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 12	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 13	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 14	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 15	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
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

CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
Fiber Optic Cable	N	10 meters	N	ABIL	AAFB
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 [AAFB] Ant ports 2-16	Antenna Load

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

RF Test Setup Diagram:



CONFIGURATIONS

Configuration NOKI0031- 3

Software/Firmware Running during test	
Description	**Version**
5G BTS Software Version	SBTS00_ENB_9900_210629_000001
5G RF_SW	SRM51.06.R04

Equipment being tested (include Peripherals)			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AMIA (BTS System Module)	Nokia Solutions and Networks	473098A.203	J8181470035
ASIK (5G BTS System Module)	Nokia Solutions and Networks	474021A.101	L1184301617
ABIL (5G BTS Baseband Module)	Nokia Solutions and Networks	474020A.102	L1183605740
AAFB (Radio Module Model)	Nokia Solutions and Networks	090148A.103	BL2032H23PI
High Pass Filter 2.5GHz/2W	Microwave Circuits	F-100-3000-5-R	0028
Attenuator 50W/30dB	Narda	776B-30	N/A
AOMC SFP28+ 9.8G,70M,850NM (Radio)	Nokia	474900A.101	VF20230058S
AOMC SFP28+ 9.8G,70M,850NM (BS)	Nokia	474900A.101	VF20230008Y
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	18-0204-11
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-14
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-10
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-20
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-04
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-05
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-17
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-29
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-30
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-08
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-27
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-24
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-01
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-15
2 Meter RF cable	RD Microwave Systems	CBL-6FT-NMNM-402J-N	18-0204-28
Antenna Load 1	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 2	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 3	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 4	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 5	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 6	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 7	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 8	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 9	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 10	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 11	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 12	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 13	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 14	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 15	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Fiber Optic cable 10m	Amphenol Fiber Optic	E201648	995109C-180512
GPS Receiver Cable	Nokia	995426C	CA2029
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CONFIGURATIONS

Cables (Peripheral)					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1 (5G)**	**Connection 2**
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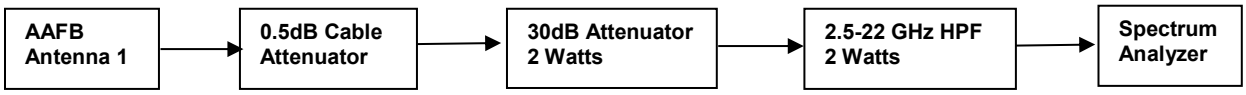
GPS Receiver Cable	Y	100 meters	N	ASIK	FYGB GPS receiver
Cat-5e Cable	Y	7 meters	N	ASIK	WebEM- PC
RD Microwave Systems – RF CABLE	Y	2 meters	N	EUT [AAFB] Ant ports 2-16	Antenna Load

Cables					
Description	**Shield (Y/N)**	**Length (m)**	**Ferrite (Y/N)**	**Connection 1**	**Connection 2**
HS-SUCOFLEX_106	Y	2 meters	N	EUT [AAFB] Ant port #1	Attenuator 50W/30dB
Attenuator 50W/30dB	N	NA	N	RF cable HS-SUCOFLEX_106	High Pass Filter 2.5GHz/2W
High Pass Filter 2.5GHz/2W	N	NA	N	Attenuator 50W/30dB	RF cable HS-SUCOFLEX_104
HS-SUCOFLEX_104	Y	1 meter	N	High Pass Filter 2.5GHz/2W	Analyzer

RF Test Setup Diagram:



MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-07-22	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-07-23	Peak to Average Power (PAPR)CCDF	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2021-07-26	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.
4	2021-07-26	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2021-07-31	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.
6	2021-07-31	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

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

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

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AAFB) as the original certification test. The AAFB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The occupied bandwidth was measured with the EUT configured in the modes called out in the data sheets.
FCC 24.238(b) defines he 26dB emission bandwidth requirement.
RSS GEN Section 6.7 defines the 99% emission bandwidth requirement.

FCC and ISED Emission Designators for Band n25 (1930MHz to 1995MHz)									
Ch BW	Radio Channel	5G-NR: QPSK		5G-NR: 16QAM		5G-NR: 64QAM		5G-NR: 256QAM	
		FCC	ISED	FCC	ISED	FCC	ISED	FCC	ISED
5MHz	Low							4M84G7W	4M47G7W
	Mid	4M86G7W	4M48G7W	4M85G7W	4M51G7W	4M87G7W	4M50G7W	4M86G7W	4M48G7W
	High							4M84G7W	4M49G7W
10MHz	Low							9M88G7W	9M28G7W
	Mid	9M89G7W	9M31G7W	9M85G7W	9M26G7W	9M87G7W	9M31G7W	9M88G7W	9M28G7W
	High							9M88G7W	9M27G7W
15MHz	Low							15M0G7W	14M1G7W
	Mid	15M0G7W	14M2G7W	15M0G7W	14M2G7W	14M9G7W	14M1G7W	14M9G7W	14M1G7W
	High							14M9G7W	14M1G7W
20MHz	Low							19M9G7W	18M9G7W
	Mid	19M9G7W	19M0G7W	19M9G7W	19M0G7W	20M0G7W	18M9G7W	19M9G7W	18M9G7W
	High							20M0G7W	18M9G7W
Note: FCC emission designators are based on 26dB emission bandwidth. ISED emission designators are based on 99% emission bandwidth.									

OCCUPIED BANDWIDTH

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	**AAFB (FCC/ISED C2PC)**			**Work Order:**	**NOKI0031**
Serial Number:	**BL2032H23PI**			**Date:**	**26-Jul-21**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**21.5 °C**
Attendees:	**David Le, Mitchell Hill**			**Humidity:**	**55.5% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**54 VDC**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 24E:2021	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	RSS-133 Issue 6:2013+A1:2018

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks.Band n25 carriers are enabled at maximum power (6.25 watts/carrier).

DEVIATIONS FROM TEST STANDARD

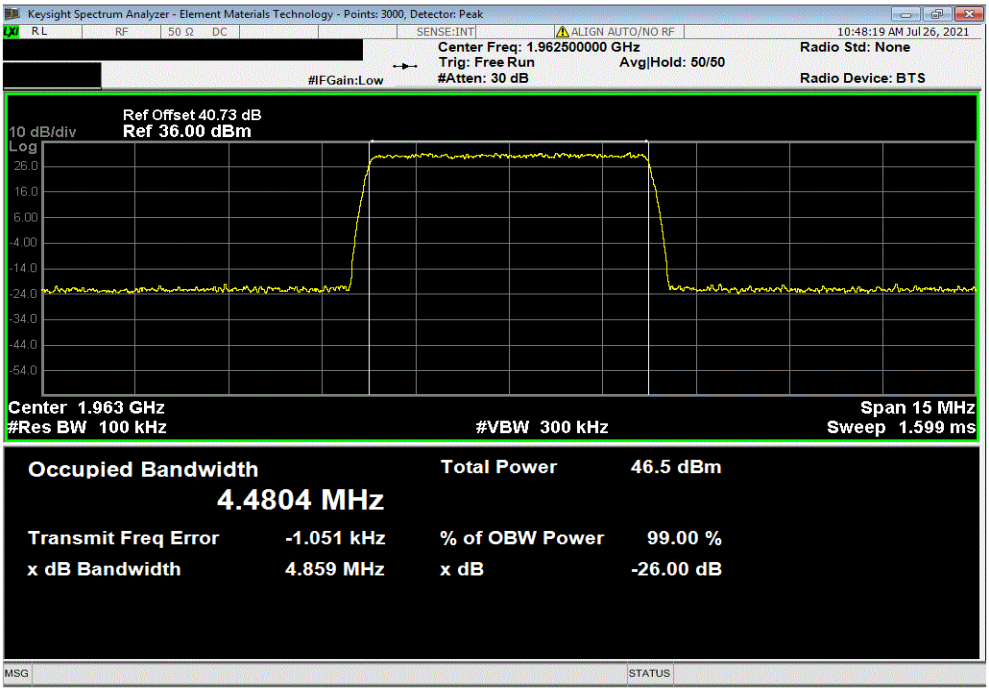
None

Configuration #	**2**	*Signature*

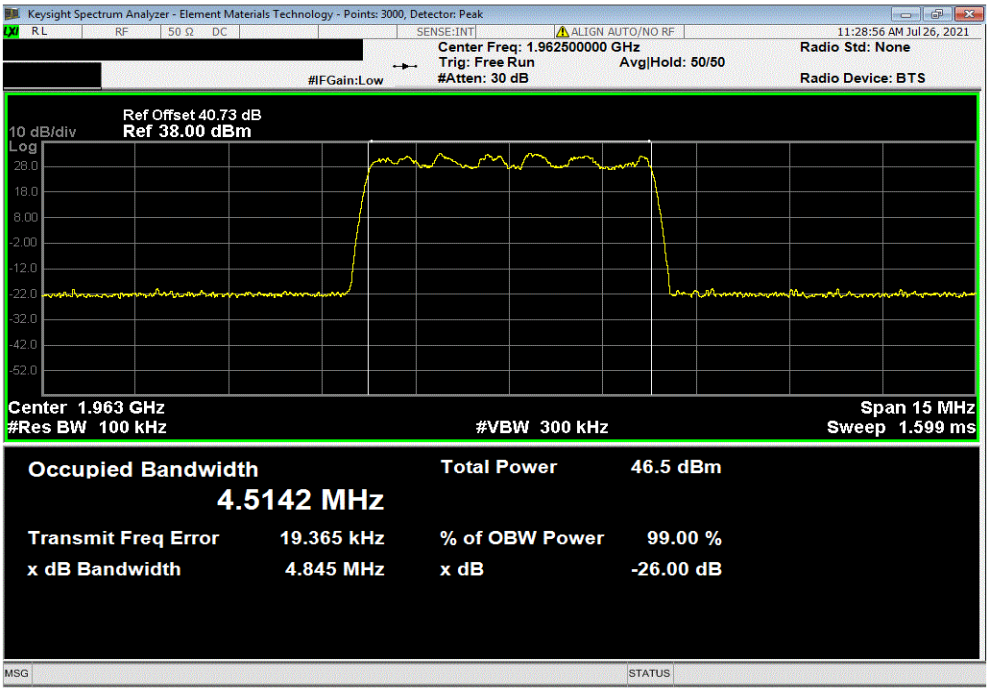
	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Band n25, 1930 MHz - 1995 MHz, 5G				
Port 1				
5 MHz Bandwdith				
QPSK Modulation				
Mid Channel, 1962.5 MHz	4.48	4.86	Within Band	Pass
16-QAM Modulation				
Mid Channel, 1962.5 MHz	4.51	4.85	Within Band	Pass
64-QAM Modulation				
Mid Channel, 1962.5 MHz	4.50	4.87	Within Band	Pass
256-QAM Modulation				
Low Channel, 1932.5 MHz	4.47	4.84	Within Band	Pass
Mid Channel, 1962.5 MHz	4.48	4.86	Within Band	Pass
High Channel, 1992.5 MHz	4.49	4.84	Within Band	Pass
10 MHz Bandwdith				
QPSK Modulation				
Mid Channel, 1962.5 MHz	9.31	9.89	Within Band	Pass
16-QAM Modulation				
Mid Channel, 1962.5 MHz	9.26	9.85	Within Band	Pass
64-QAM Modulation				
Mid Channel, 1962.5 MHz	9.31	9.87	Within Band	Pass
256-QAM Modulation				
Low Channel, 1935.0 MHz	9.28	9.88	Within Band	Pass
Mid Channel, 1962.5 MHz	9.28	9.88	Within Band	Pass
High Channel, 1990 MHz	9.27	9.88	Within Band	Pass
15 MHz Bandwdith				
QPSK Modulation				
Mid Channel, 1962.5 MHz	14.2	15.0	Within Band	Pass
16-QAM Modulation				
Mid Channel, 1962.5 MHz	14.2	15.0	Within Band	Pass
64-QAM Modulation				
Mid Channel, 1962.5 MHz	14.1	14.9	Within Band	Pass
256-QAM Modulation				
Low Channel, 1937.5 MHz	14.1	15.0	Within Band	Pass
Mid Channel, 1962.5 MHz	14.1	14.9	Within Band	Pass
High Channel, 1987.5 MHz	14.1	14.9	Within Band	Pass
20 MHz Bandwdith				
QPSK Modulation				
Mid Channel, 1962.5 MHz	19.0	19.9	Within Band	Pass
16-QAM Modulation				
Mid Channel, 1962.5 MHz	19.0	19.9	Within Band	Pass
64-QAM Modulation				
Mid Channel, 1962.5 MHz	18.9	20.0	Within Band	Pass
256-QAM Modulation				
Low Channel, 1940 MHz	18.9	19.9	Within Band	Pass
Mid Channel, 1962.5 MHz	18.9	19.9	Within Band	Pass
High Channel, 1985 MHz	18.9	20.0	Within Band	Pass

OCCUPIED BANDWIDTH

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, QPSK Modulation , Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.48	4.859	Within Band	Pass

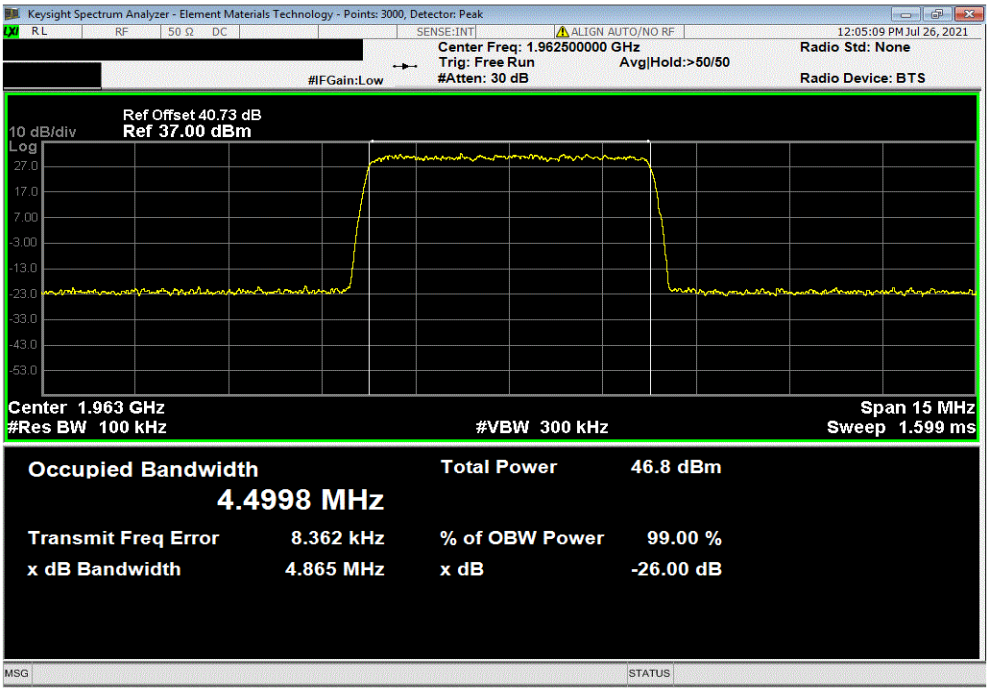


Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.514	4.845	Within Band	Pass

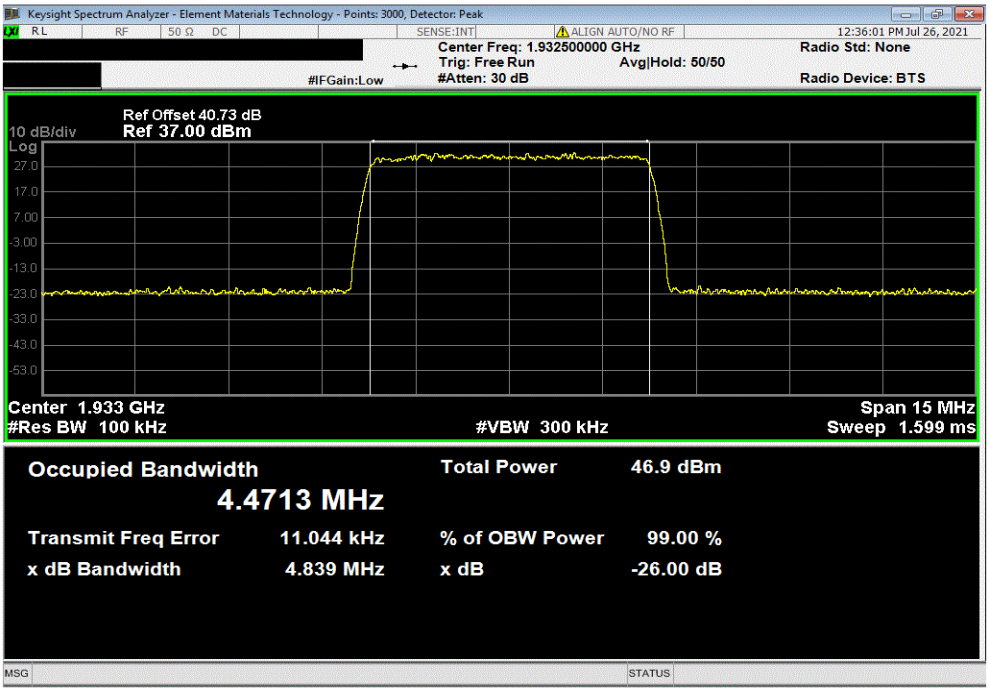


OCCUPIED BANDWIDTH

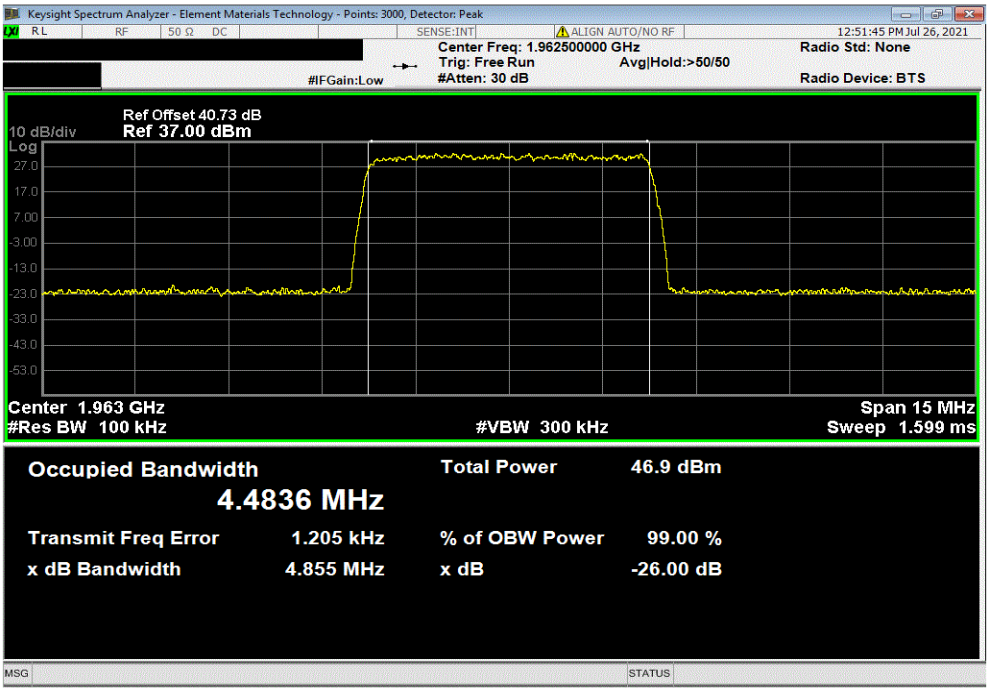
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.5	4.865	Within Band	Pass



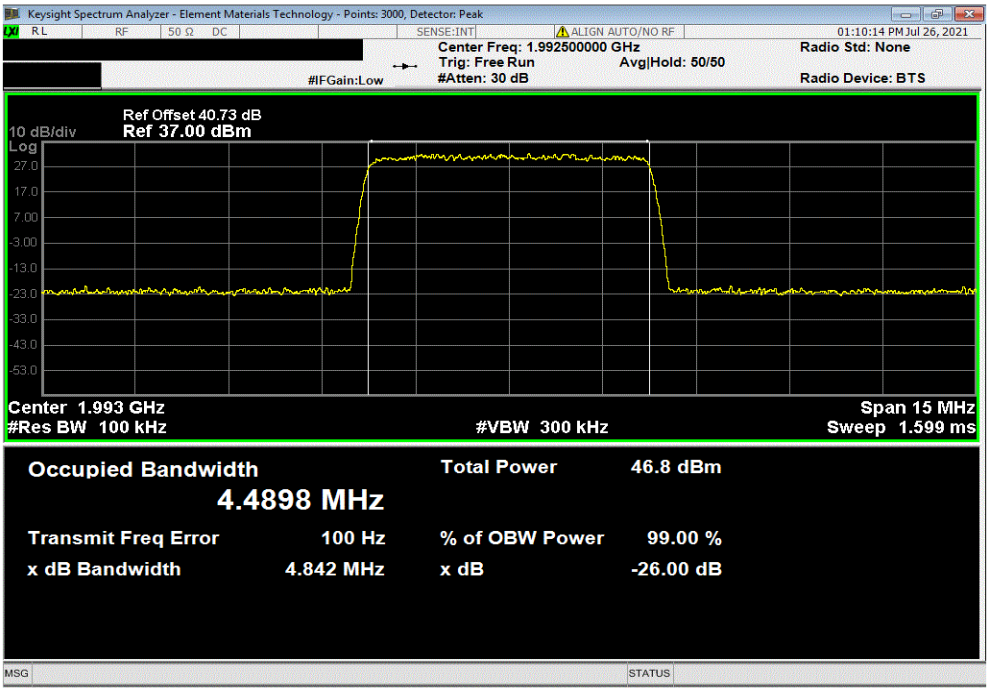
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1932.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.471	4.839	Within Band	Pass



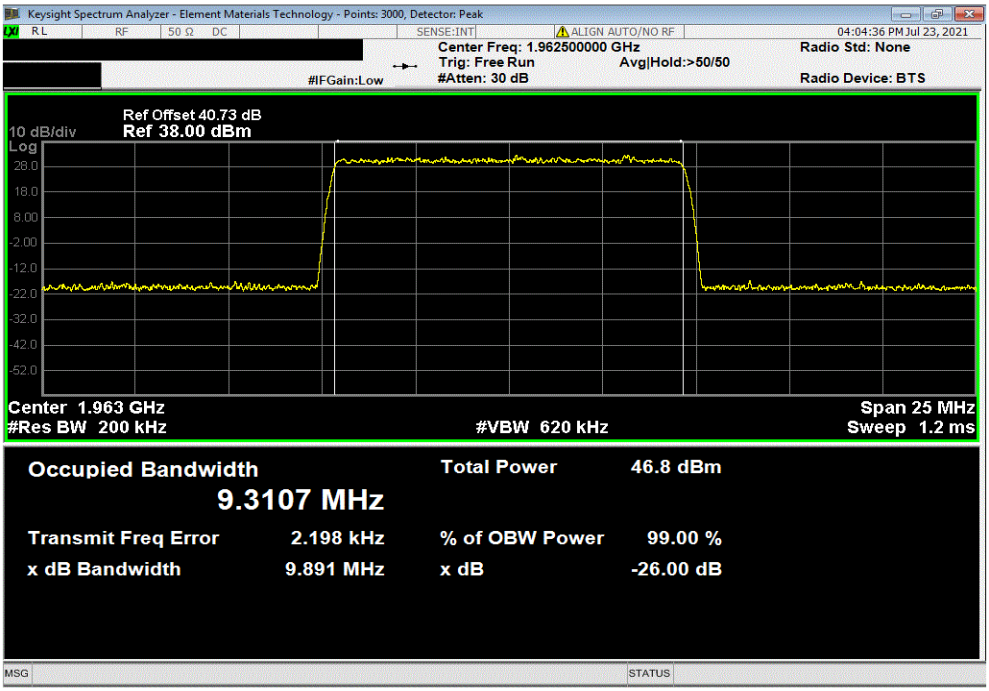
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.484	4.855	Within Band	Pass



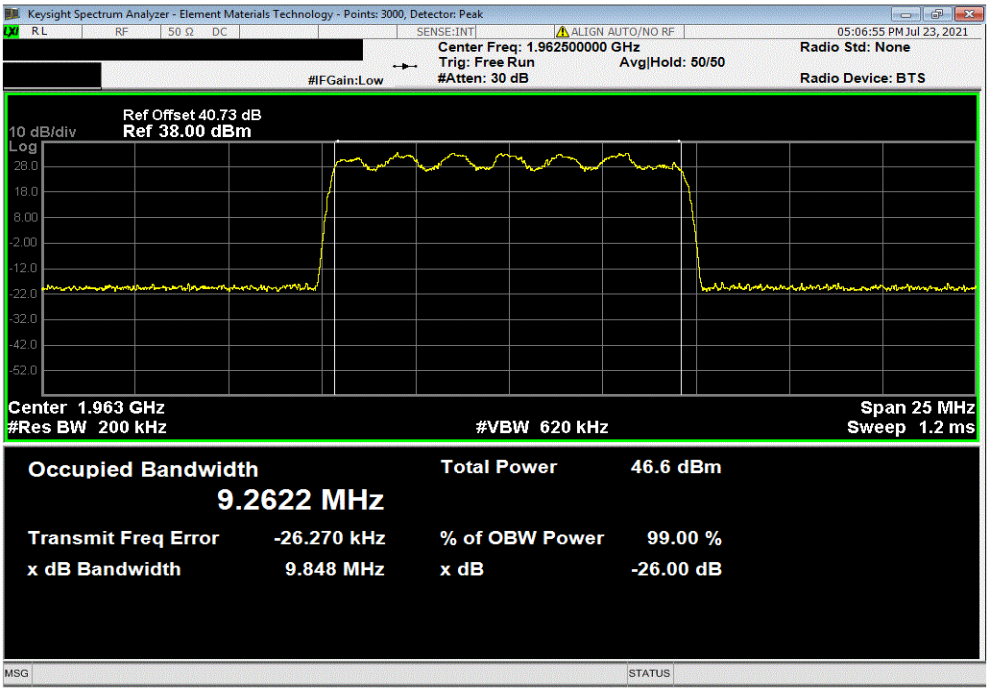
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, High Channel, 1992.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			4.49	4.842	Within Band	Pass



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, QPSK Modulation , Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.311	9.891	Within Band	Pass

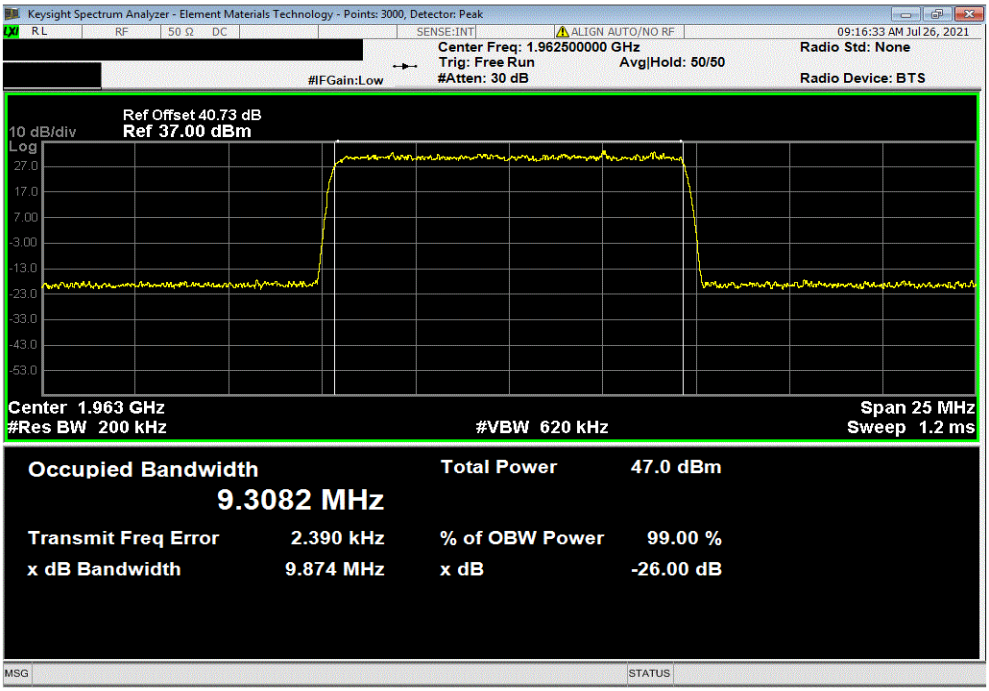


Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.262	9.848	Within Band	Pass

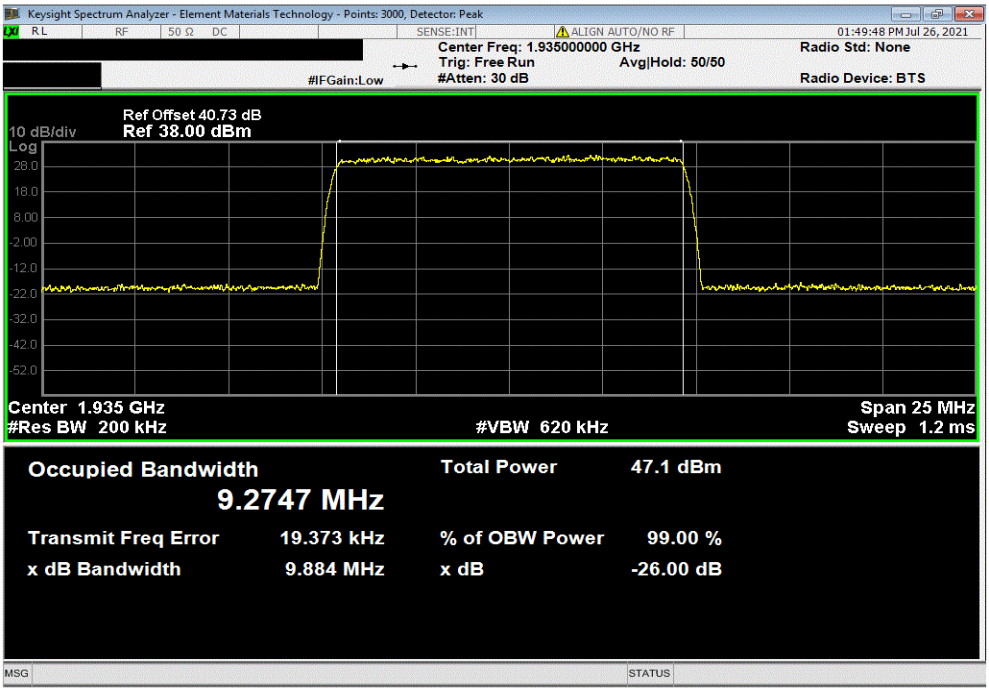


OCCUPIED BANDWIDTH

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.308	9.874	Within Band	Pass

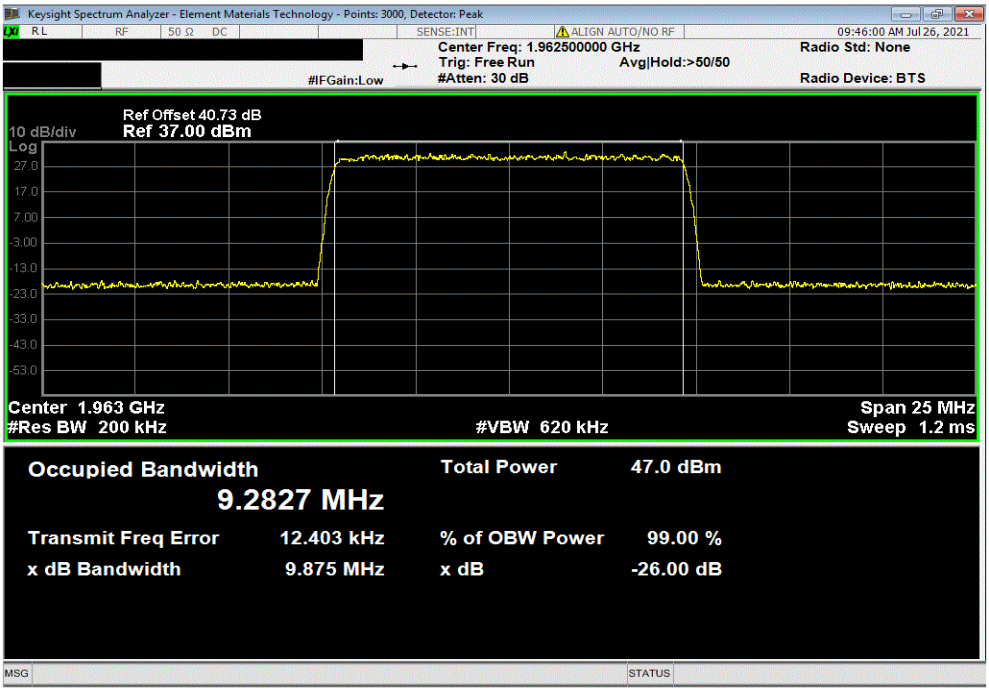


Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1935.0 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.275	9.884	Within Band	Pass

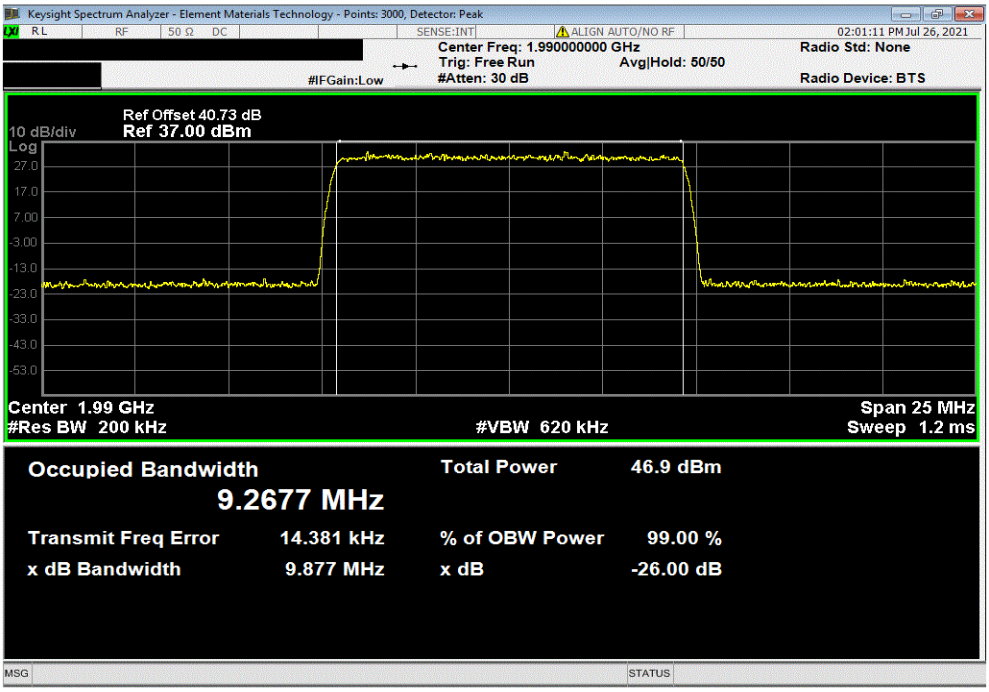


OCCUPIED BANDWIDTH

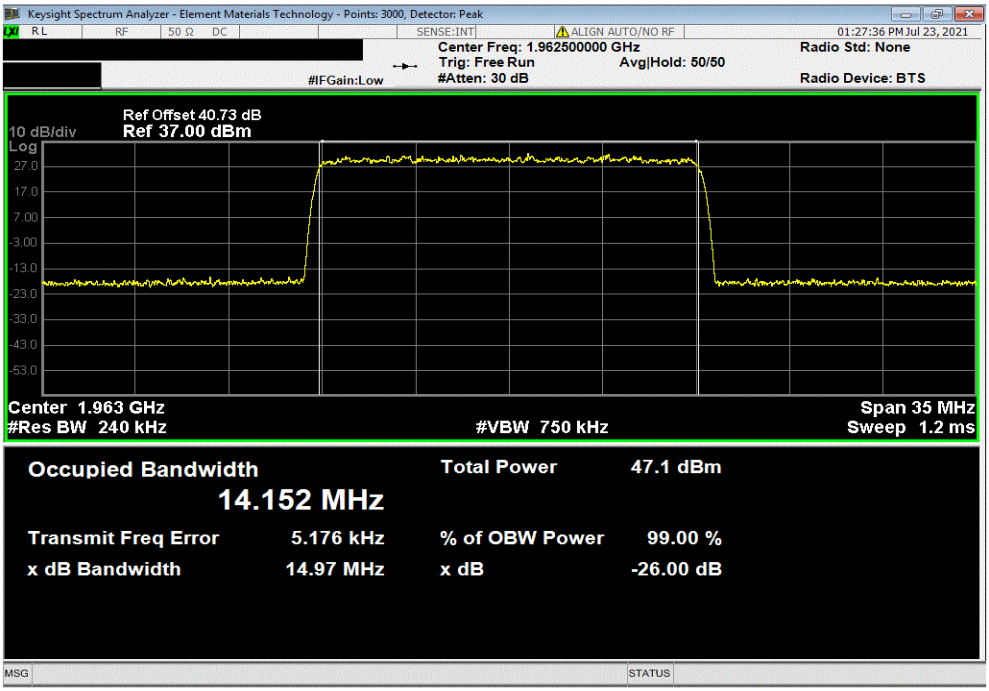
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.283	9.875	Within Band	Pass



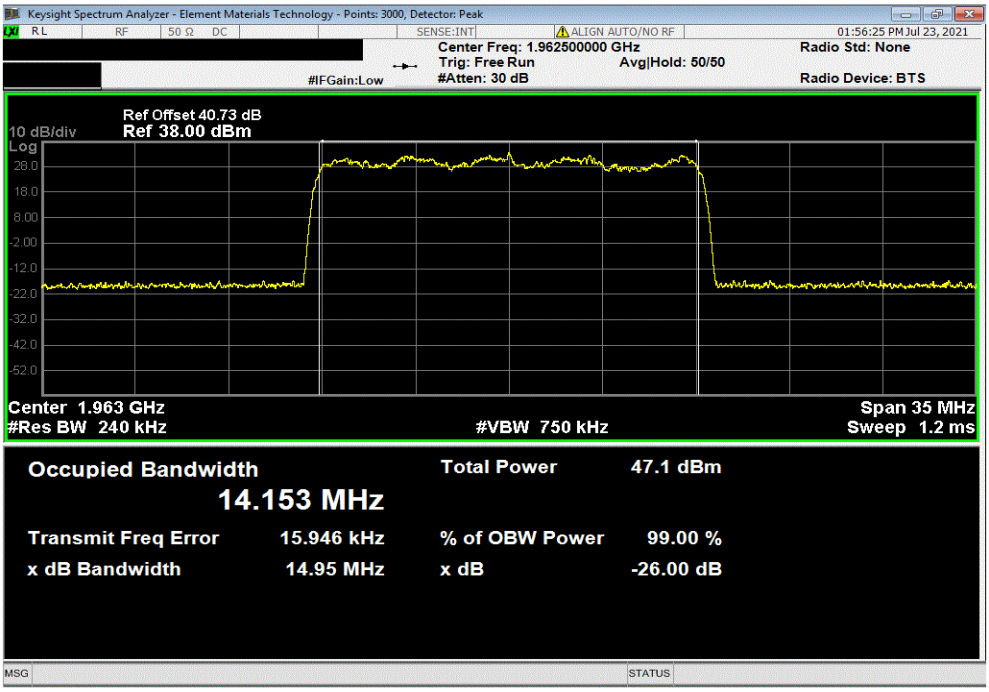
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, High Channel, 1990 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			9.268	9.877	Within Band	Pass



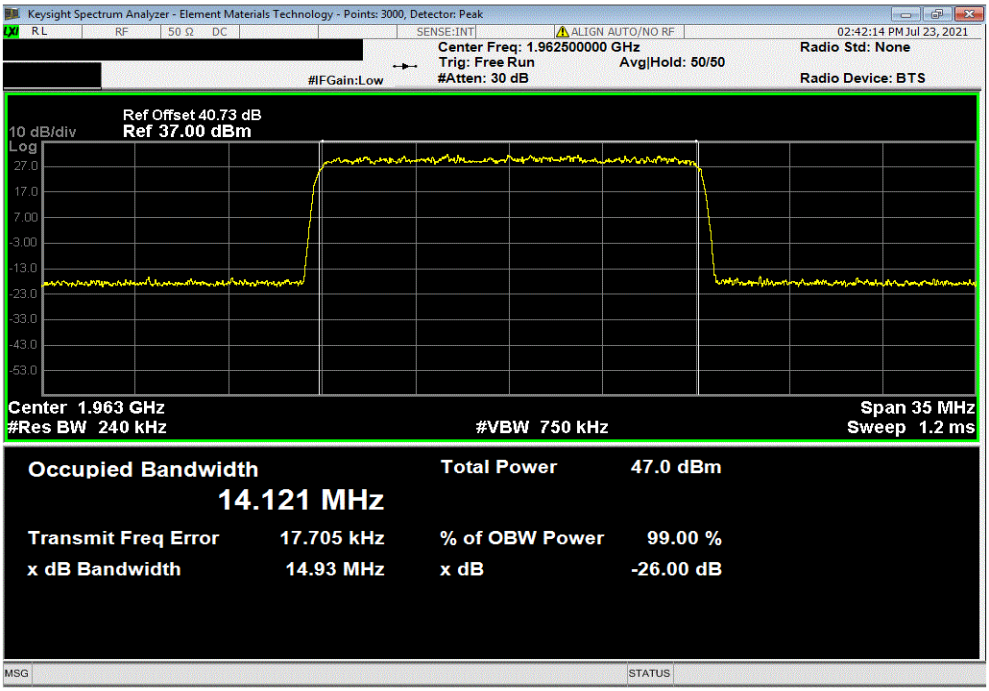
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, QPSK Modulation , Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.152	14.967	Within Band	Pass



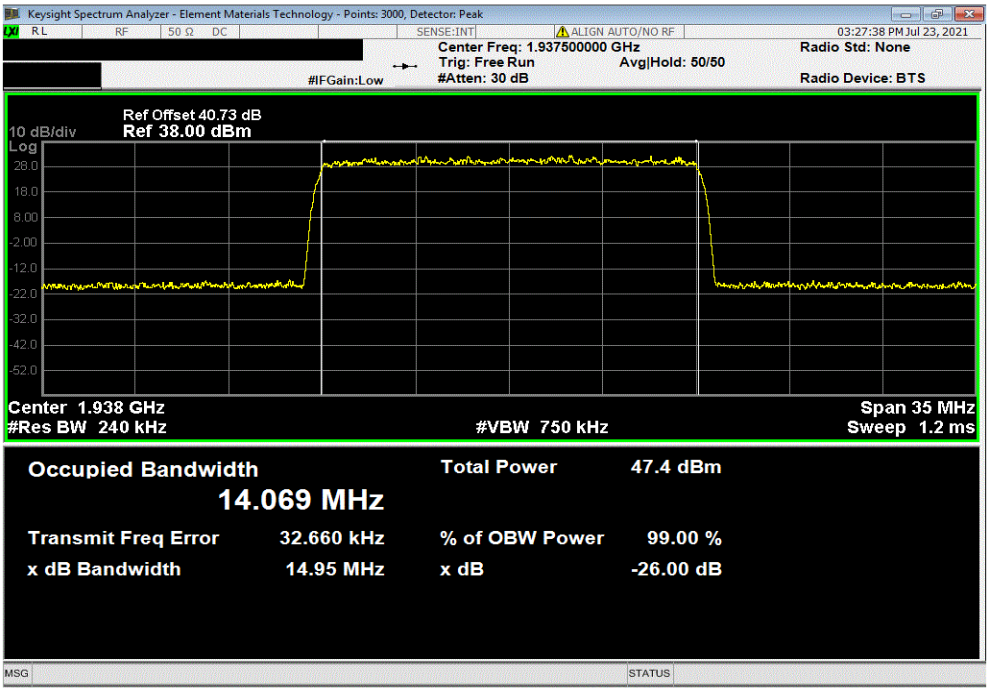
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.153	14.951	Within Band	Pass



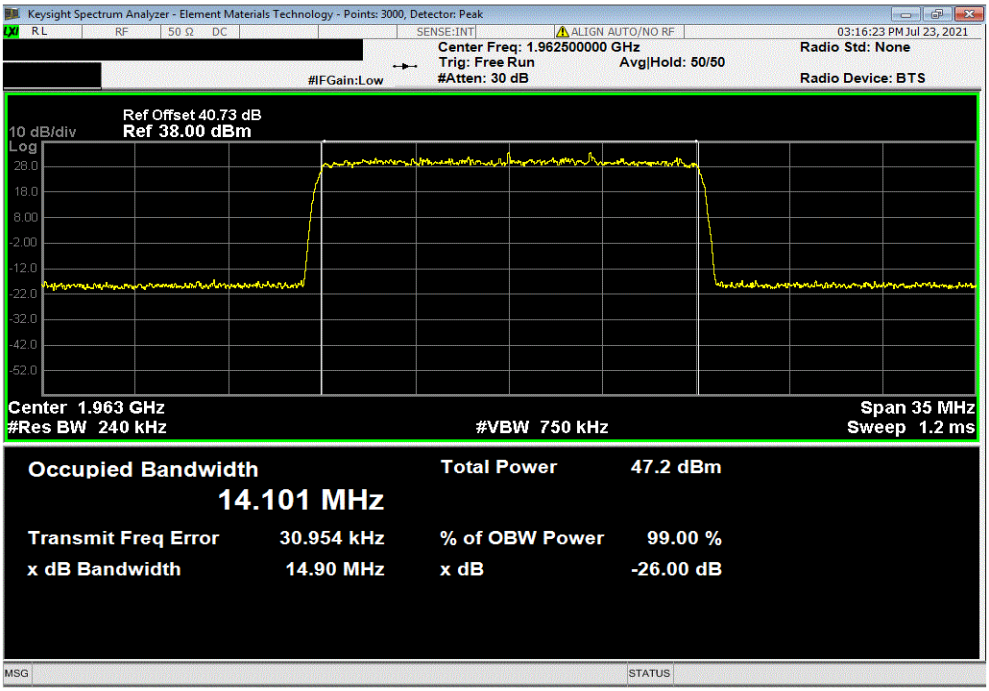
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.121	14.931	Within Band	Pass



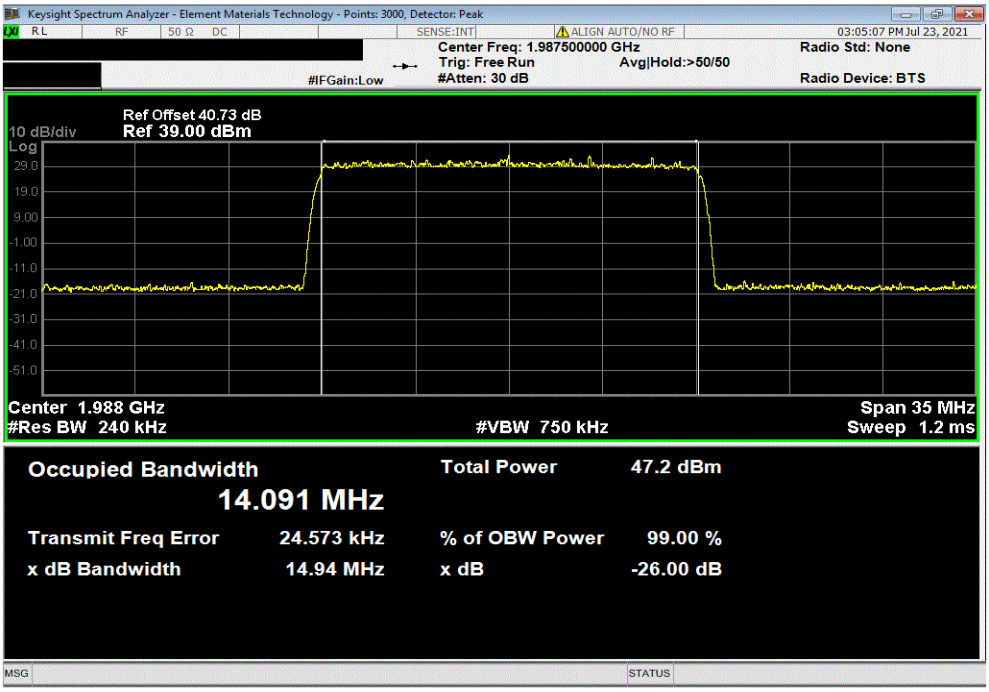
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1937.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.069	14.952	Within Band	Pass



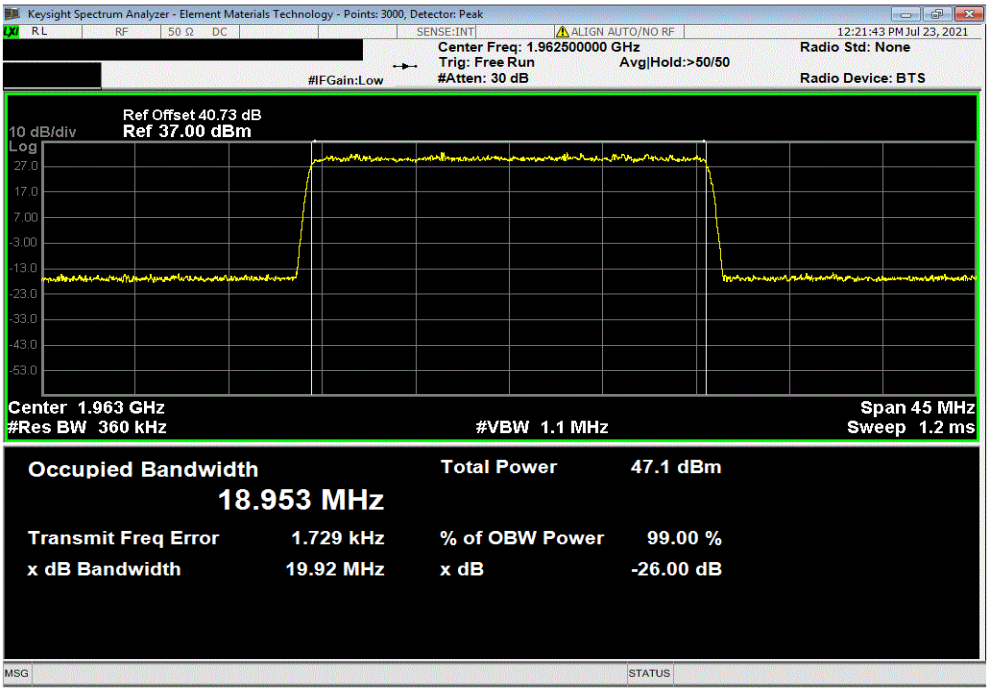
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.101	14.902	Within Band	Pass



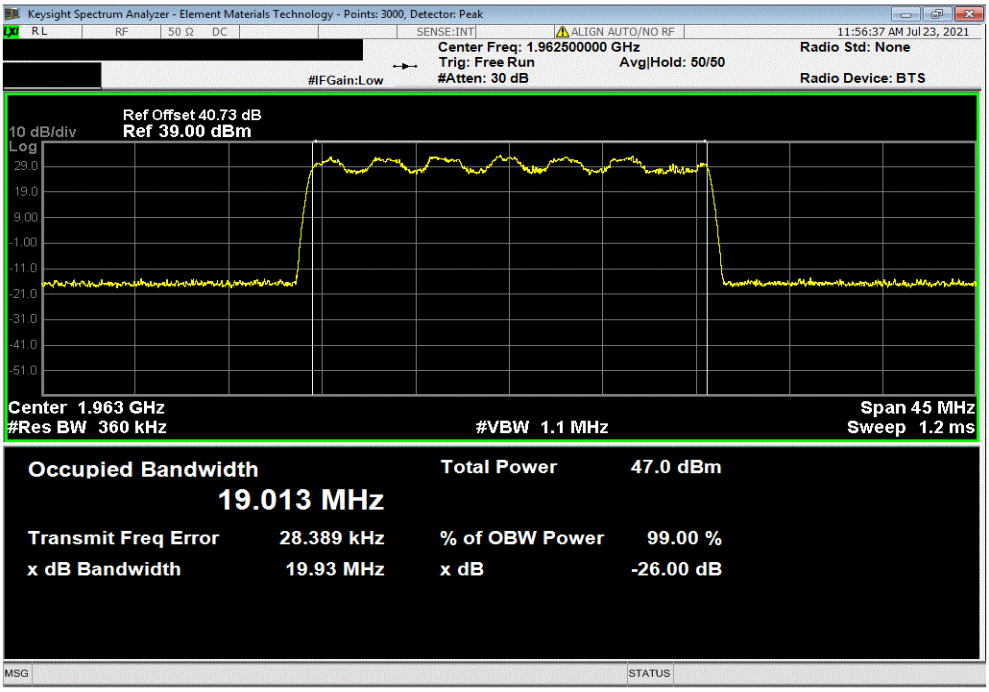
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, High Channel, 1987.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			14.091	14.935	Within Band	Pass



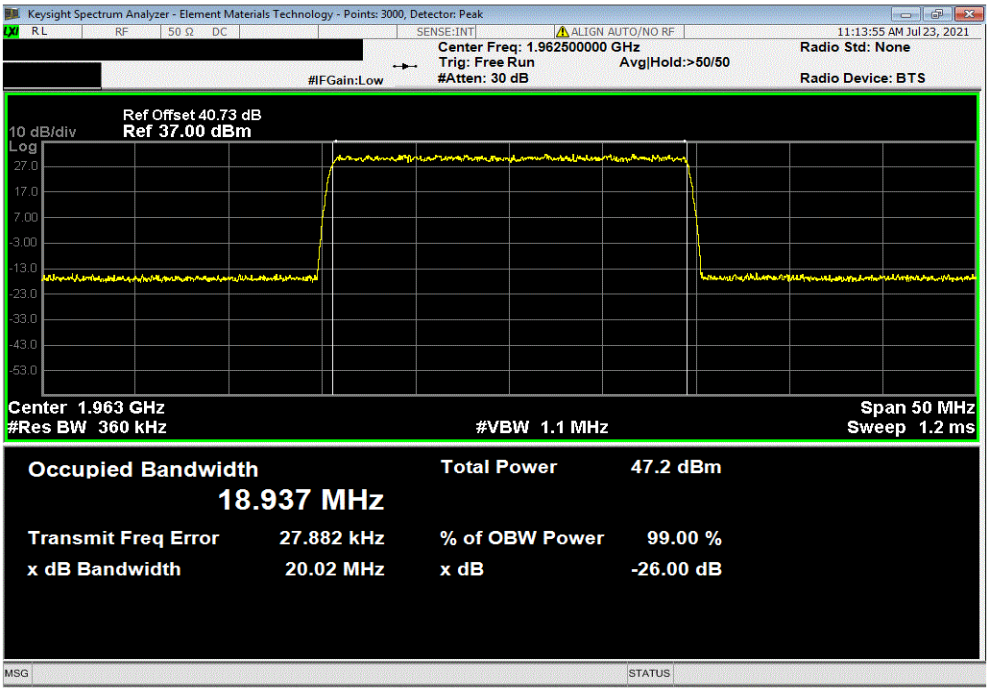
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, QPSK Modulation , Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.953	19.919	Within Band	Pass



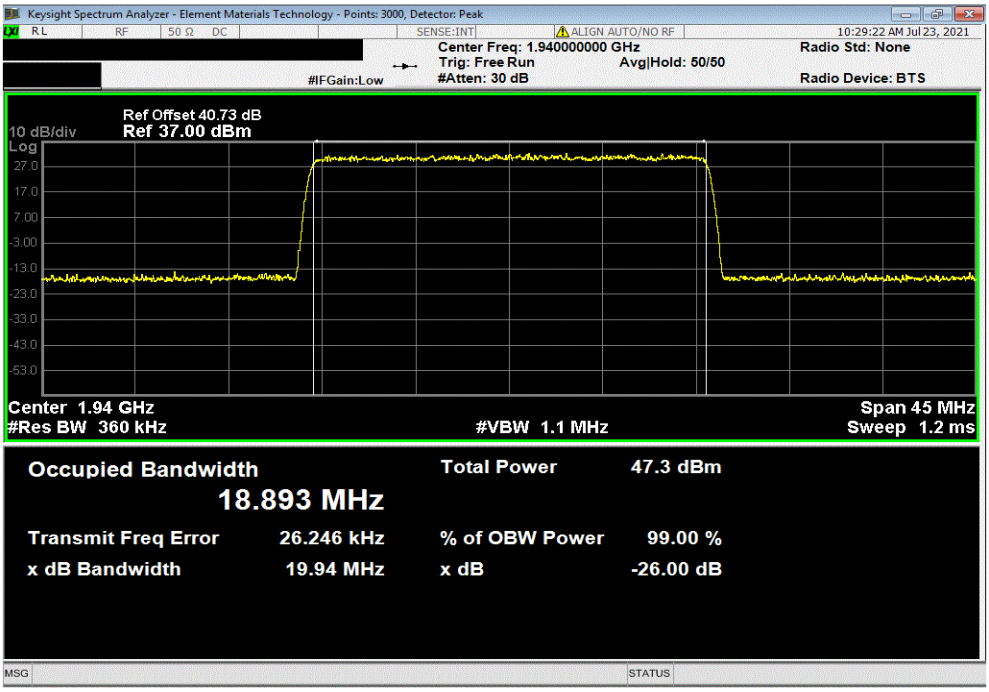
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			19.013	19.934	Within Band	Pass



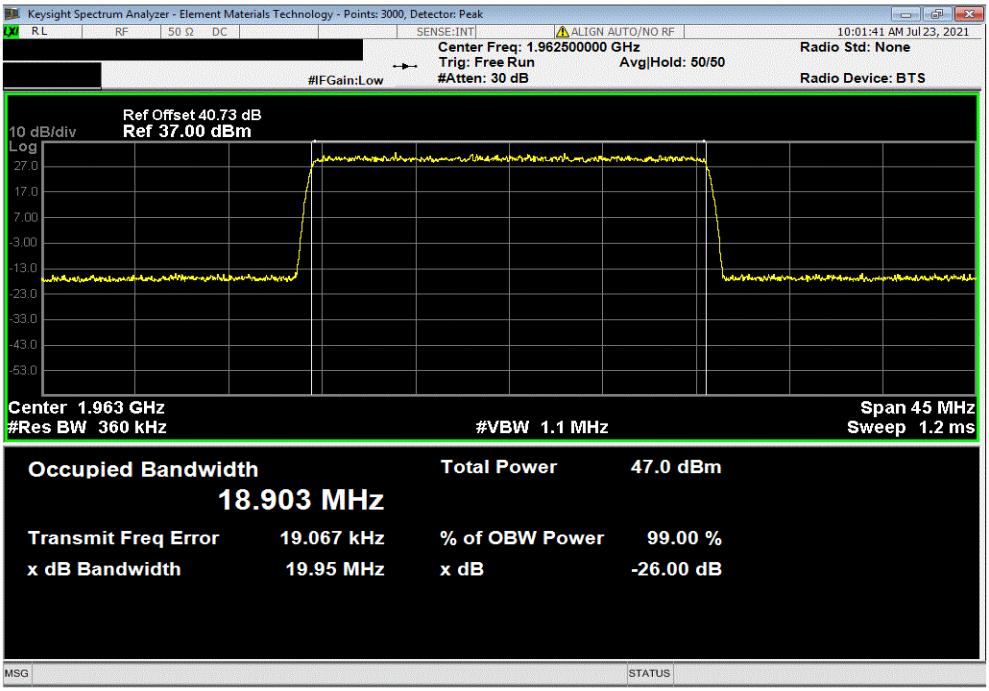
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.937	20.02	Within Band	Pass



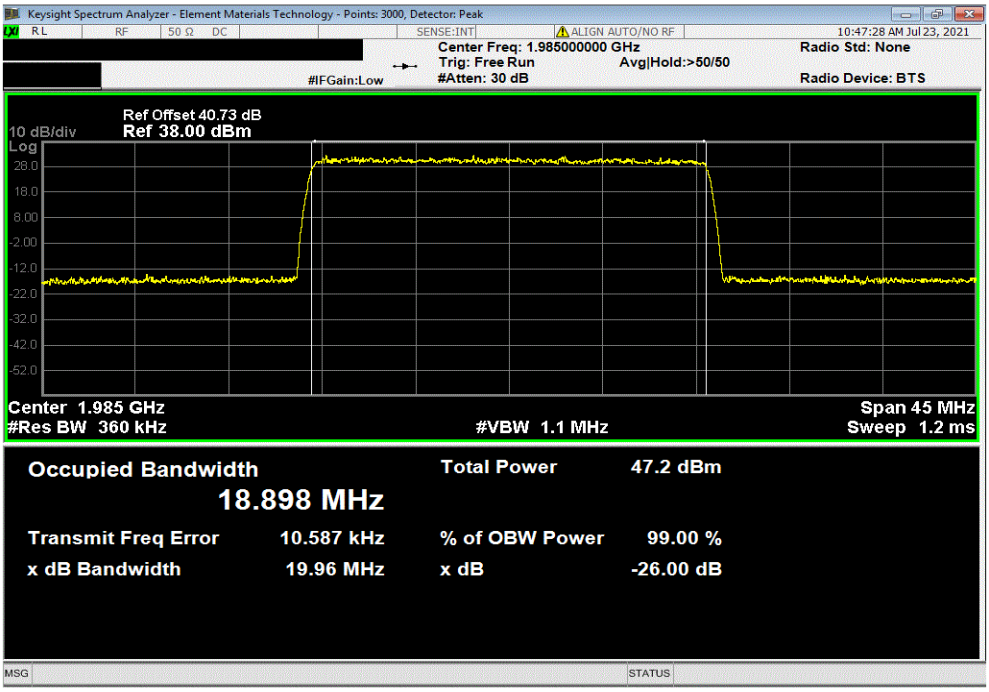
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1940 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.893	19.943	Within Band	Pass



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.903	19.947	Within Band	Pass



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, High Channel, 1985 MHz						
			Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
			18.898	19.959	Within Band	Pass



OUTPUT POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AAFB) as the original certification test. The AAFB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The total average transmit power of all antenna ports was determined per ANSI C63.26-2105 paragraph 6.4.3.1.

OUTPUT POWER

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	AAFB (FCC/ISED C2PC)			Work Order:	NOKI0031
Serial Number:	BL2032H23PI			Date:	26-Jul-21
Customer:	Nokia Solutions and Networks			Temperature:	21.5 °C
Attendees:	David Le, Mitchell Hill			Humidity:	55.5% RH
Project:	None			Barometric Pres.:	1017 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 24E:2021	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	RSS-133 Issue 6:2013+A1:2018

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks.). Band n25 carriers are enabled at maximum power (6.25 watts/carrier). The following is the output power measurements at the radio output ports. The output power was measured for a single carrier over the carrier channel bandwidth on port 1. The total output power for multiport (2x2 MIMO, 4x4 MIMO, 8x8 MIMO & 16x16 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for two port operation is single port power + 3dB [i.e. 10log(2)]. The total output power for four port operation is single port power + 6dB [i.e. 10log(4)]. The total output power for eight port operation is single port power + 9dB [i.e. 10log(8)]. The total output power for sixteen port operation is single port power + 12dB [i.e. 10log(16)].

DEVIATIONS FROM TEST STANDARD

None

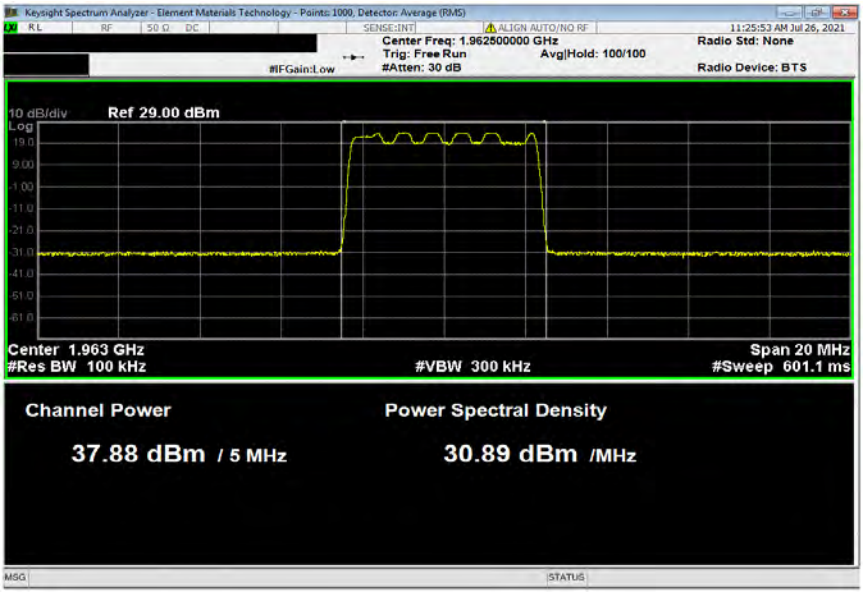
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
Band n25, 1930 MHz - 1995 MHz, 5G							
Port 1							
5 MHz Bandwdith							
QPSK Modulation							
Mid Channel, 1962.5 MHz	38.097	0	38.1	41.1	44.1	47.1	50.1
16-QAM Modulation							
Mid Channel, 1962.5 MHz	37.878	0	37.9	40.9	43.9	46.9	49.9
64-QAM Modulation							
Mid Channel, 1962.5 MHz	38.011	0	38.0	41.0	44.0	47.0	50.0
256-QAM Modulation							
Low Channel, 1932.5 MHz	38.158	0	38.2	41.2	44.2	47.2	50.2
Mid Channel, 1962.5 MHz	37.949	0	37.9	40.9	43.9	46.9	49.9
High Channel, 1992.5 MHz	37.927	0	37.9	40.9	43.9	46.9	49.9
10 MHz Bandwdith							
256-QAM Modulation							
Low Channel, 1935 MHz	38.245	0	38.2	41.2	44.2	47.2	50.2
Mid Channel, 1962.5 MHz	37.978	0	38.0	41.0	44.0	47.0	50.0
High Channel, 1990 MHz	38.015	0	38.0	41.0	44.0	47.0	50.0
15 MHz Bandwdith							
256-QAM Modulation							
Low Channel, 1937.5 MHz	38.107	0	38.1	41.1	44.1	47.1	50.1
Mid Channel, 1962.5 MHz	37.791	0	37.8	40.8	43.8	46.8	49.8
High Channel, 1987.5 MHz	37.867	0	37.9	40.9	43.9	46.9	49.9
20 MHz Bandwdith							
256-QAM Modulation							
Low Channel, 1940 MHz	38.281	0	38.3	41.3	44.3	47.3	50.3
Mid Channel, 1962.5 MHz	37.939	0	37.9	40.9	43.9	46.9	49.9
High Channel, 1985 MHz	38.07	0	38.1	41.1	44.1	47.1	50.1

OUTPUT POWER

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, QPSK Modulation , Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.097	0	38.10	41.10	44.10	47.10	50.10

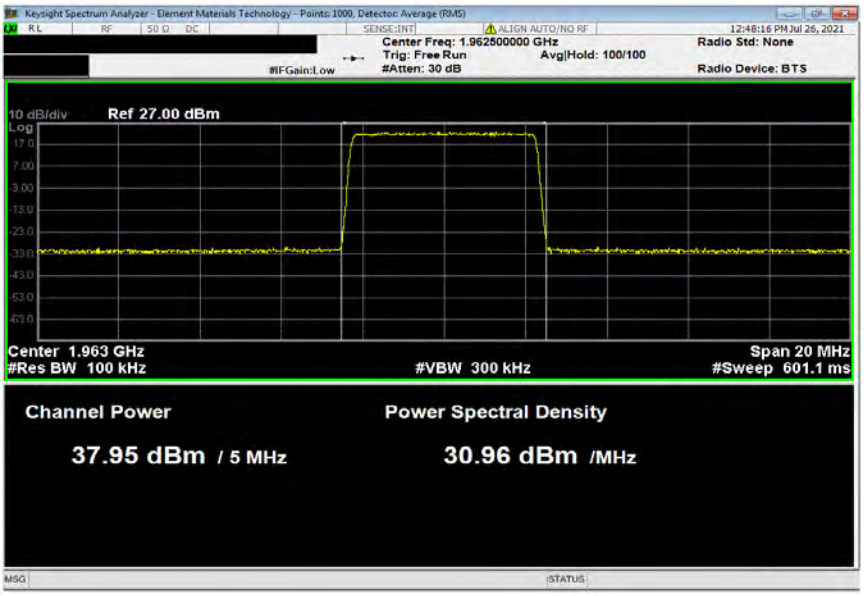
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.878	0	37.88	40.88	43.88	46.88	49.88



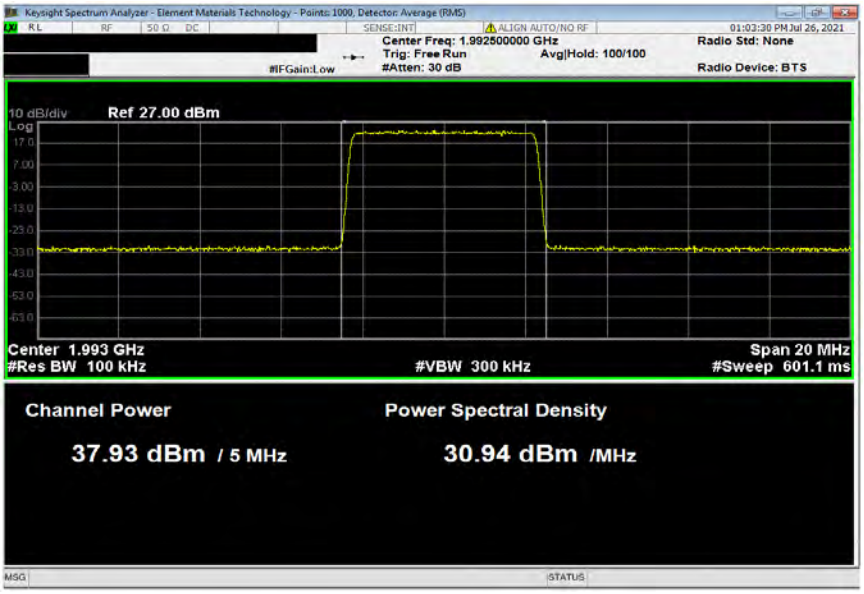
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.011	0	38.01	41.01	44.01	47.01	50.01

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1932.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.158	0	38.16	41.16	44.16	47.16	50.16

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.949	0	37.95	40.95	43.95	46.95	49.95

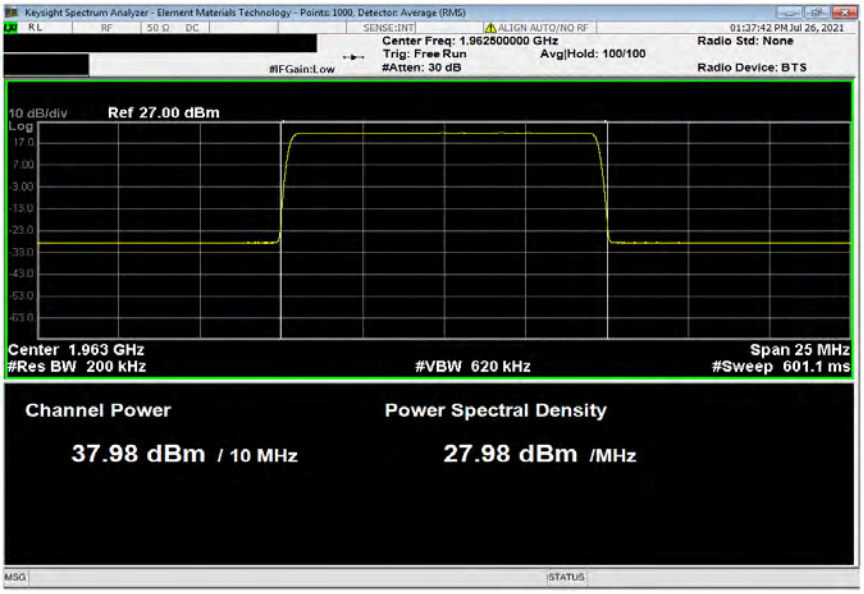


Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 5 MHz Bandwdith, 256-QAM Modulation, High Channel, 1992.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.927	0	37.93	40.93	43.93	46.93	49.93

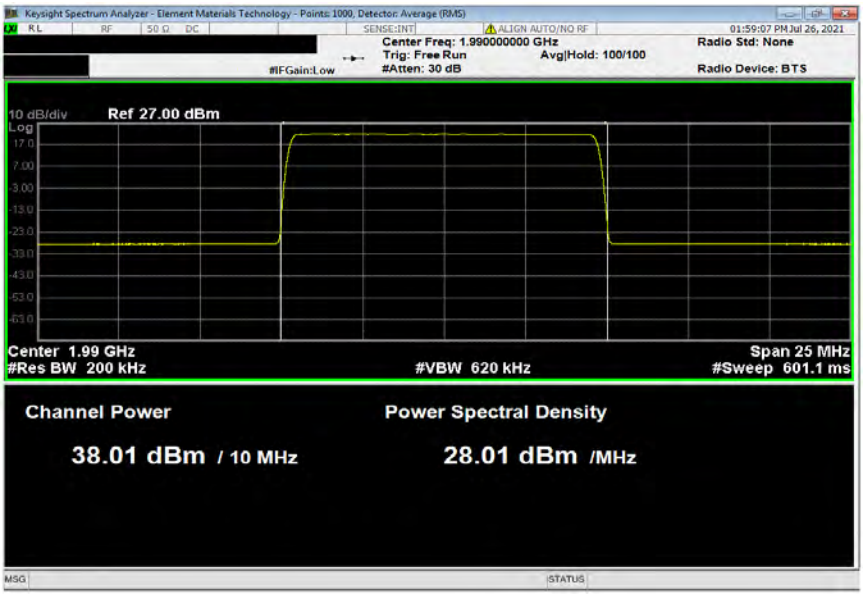


Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1935 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.245	0	38.25	41.25	44.25	47.25	50.25

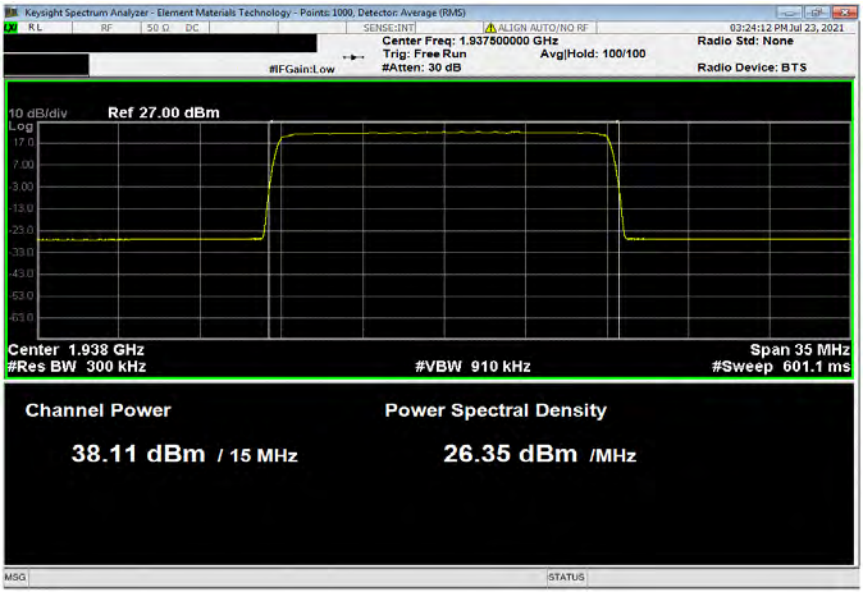
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.978	0	37.98	40.98	43.98	46.98	49.98



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 10 MHz Bandwdith, 256-QAM Modulation, High Channel, 1990 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.015	0	38.02	41.02	44.02	47.02	50.02



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1937.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.107	0	38.11	41.11	44.11	47.11	50.11



Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.791	0	37.79	40.79	43.79	46.79	49.79

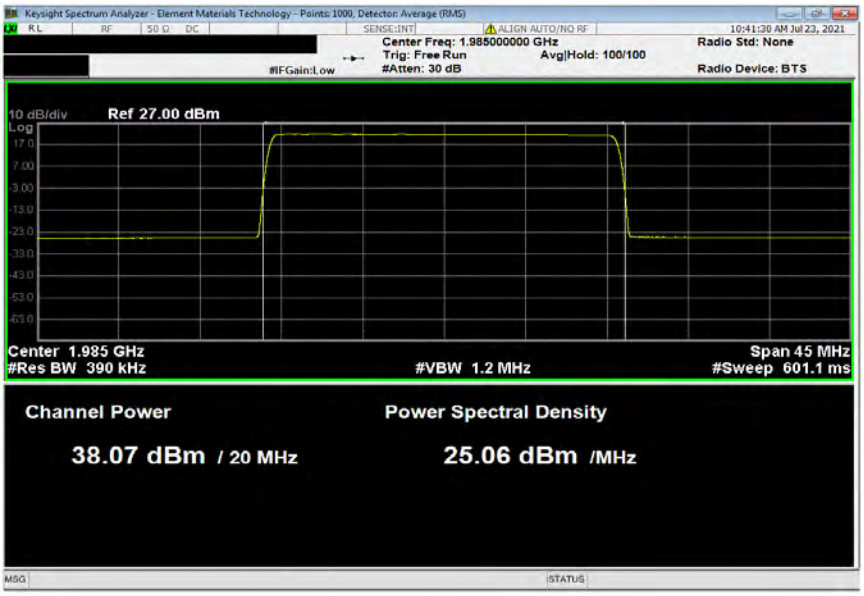
Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 15 MHz Bandwdith, 256-QAM Modulation, High Channel, 1987.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.867	0	37.87	40.87	43.87	46.87	49.87

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, Low Channel, 1940 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.281	0	38.28	41.28	44.28	47.28	50.28

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
37.939	0	37.94	40.94	43.94	46.94	49.94

OUTPUT POWER

Band n25, 1930 MHz - 1995 MHz, 5G, Port 1, 20 MHz Bandwdith, 256-QAM Modulation, High Channel, 1985 MHz						
Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	Eight Port (8x8 MIMO) dBm/Carrier BW	Sixteen Port (16x16 MIMO) dBm/Carrier BW
38.07	0	38.07	41.07	44.07	47.07	50.07



OUTPUT POWER - ALL PORTS

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed on all sixteen ports at NR5 middle channel to demonstrate that the AAFB antenna ports are essentially electrically identical. AAFB antenna port 1 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.

OUTPUT POWER - ALL PORTS

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	AAFB (FCC/ISED C2PC)			Work Order:	NOKI0031
Serial Number:	BL2032H23PI			Date:	22-Jul-21
Customer:	Nokia Solutions and Networks			Temperature:	20.9 °C
Attendees:	David Le, Mitchell Hill			Humidity:	56.1% RH
Project:	None			Barometric Pres.:	1023 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 24E:2021	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	RSS-133 Issue 6:2013+A1:2018

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks.Band n25 NR5 carriers are enabled at maximum power (6.25 watts/carrier).

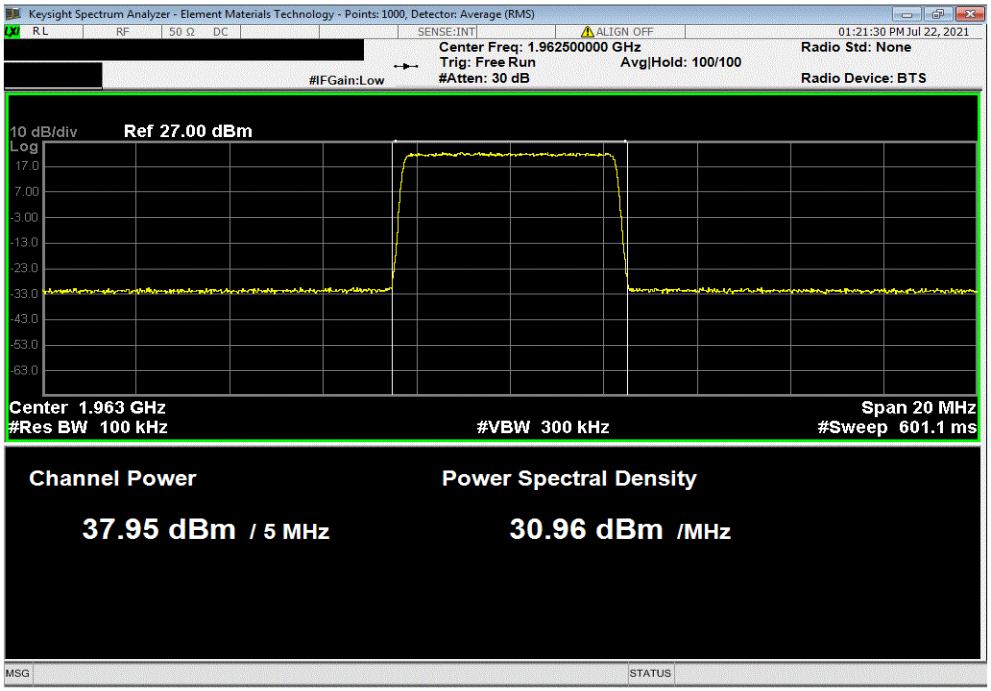
DEVIATIONS FROM TEST STANDARD

None

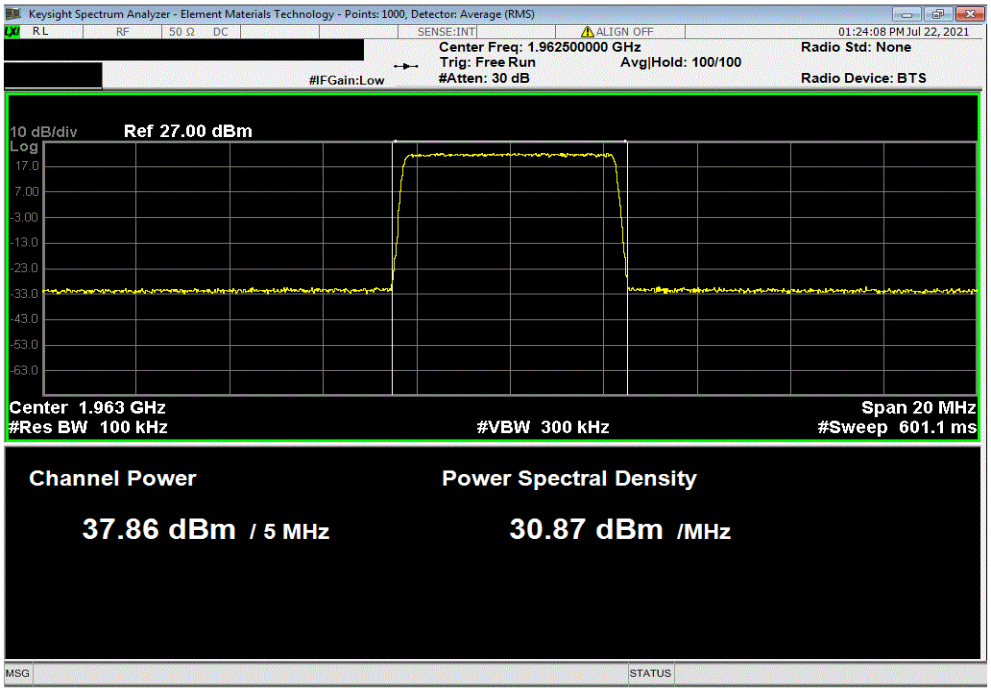
Configuration #	2	Signature

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Limit	Results
Band n25, 1930 MHz - 1995 MHz, 5G					
5 MHz Bandwidth					
256-QAM Modulation					
Mid Channel, 1962.5 MHz					
Port 1	37.948	0	37.9	Inside Tolerance	N/A
Port 2	37.863	0	37.9	Inside Tolerance	N/A
Port 3	37.874	0	37.9	Inside Tolerance	N/A
Port 4	37.992	0	38.0	Inside Tolerance	N/A
Port 5	37.770	0	37.8	Inside Tolerance	N/A
Port 6	37.860	0	37.9	Inside Tolerance	N/A
Port 7	37.837	0	37.8	Inside Tolerance	N/A
Port 8	37.959	0	38.0	Inside Tolerance	N/A
Port 9	37.672	0	37.7	Inside Tolerance	N/A
Port 10	37.897	0	37.9	Inside Tolerance	N/A
Port 11	37.654	0	37.7	Inside Tolerance	N/A
Port 12	37.902	0	37.9	Inside Tolerance	N/A
Port 13	37.593	0	37.6	Inside Tolerance	N/A
Port 14	37.871	0	37.9	Inside Tolerance	N/A
Port 15	37.731	0	37.7	Inside Tolerance	N/A
Port 16	37.968	0	38.0	Inside Tolerance	N/A

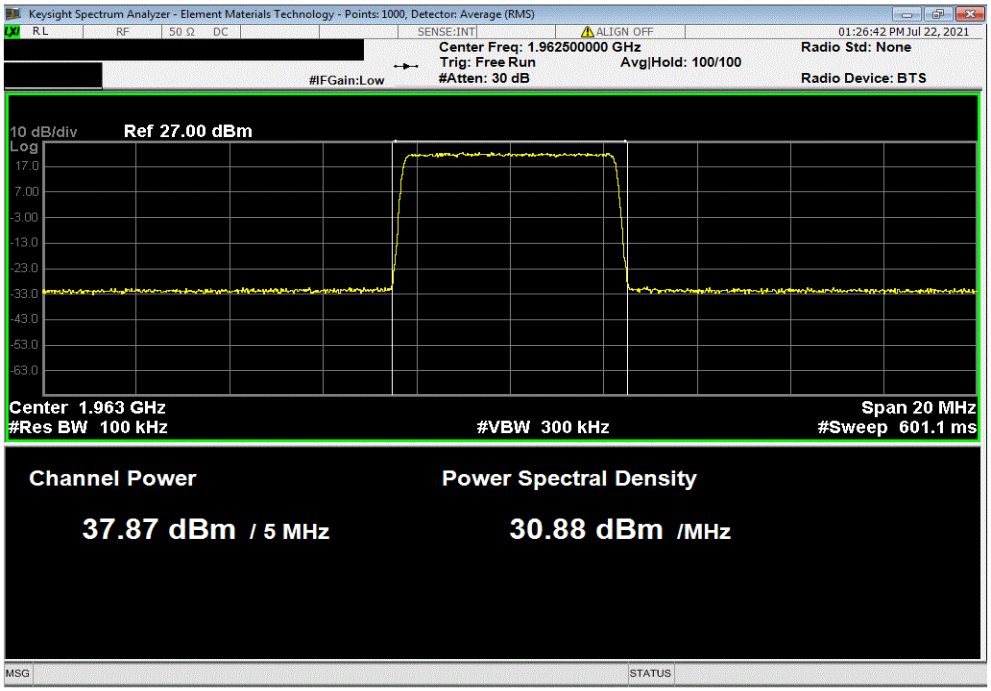
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 1						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.948	0		37.9	Inside Tolerance	N/A



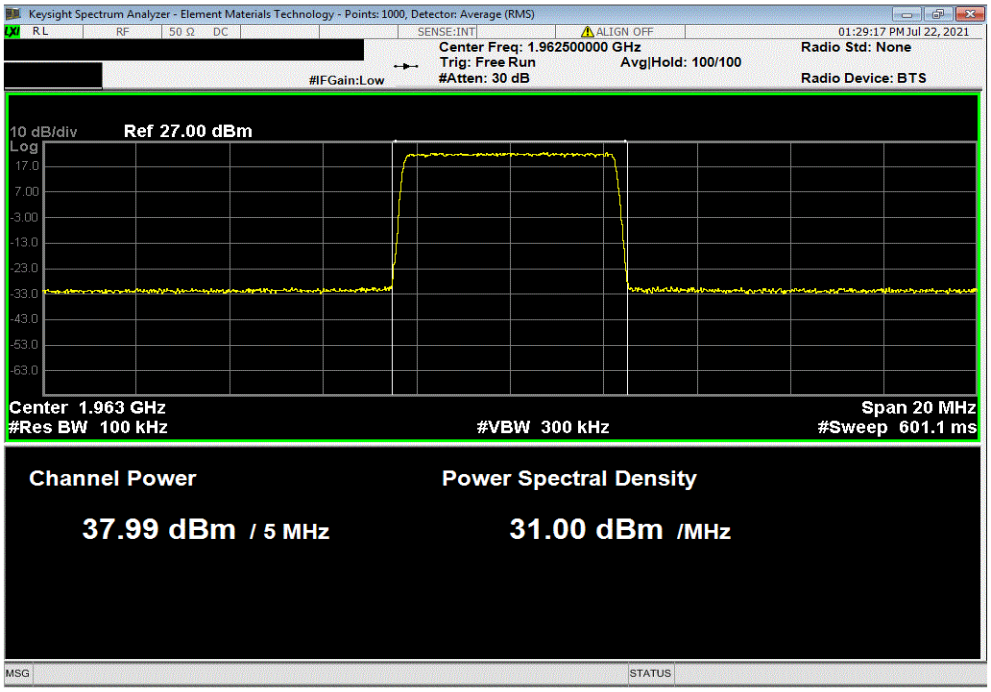
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 2						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.863	0		37.9	Inside Tolerance	N/A



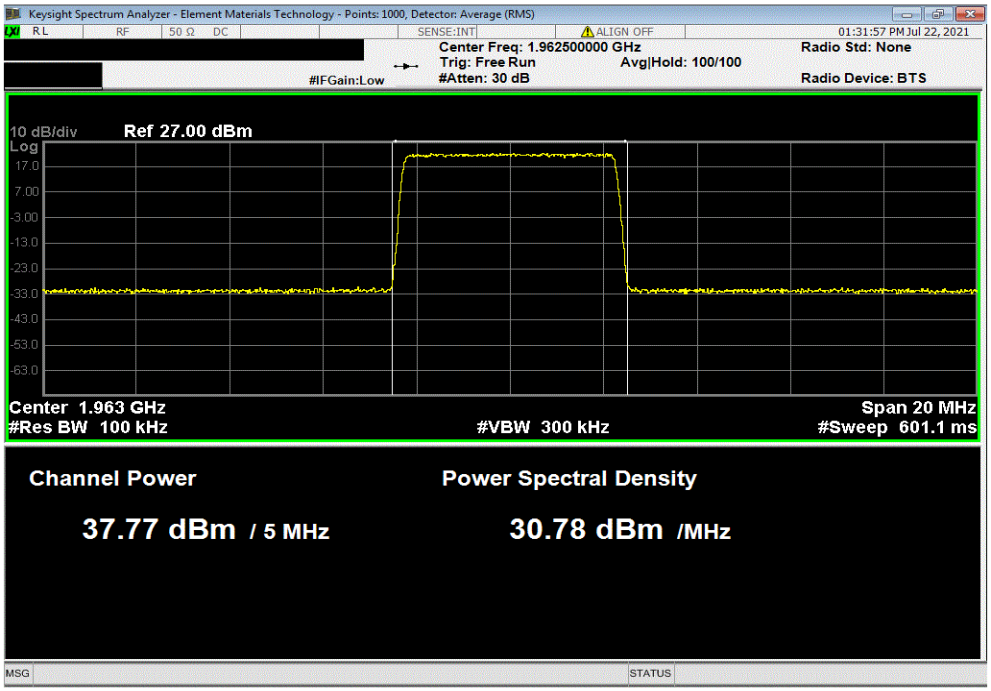
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 3						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.874	0		37.9	Inside Tolerance	N/A



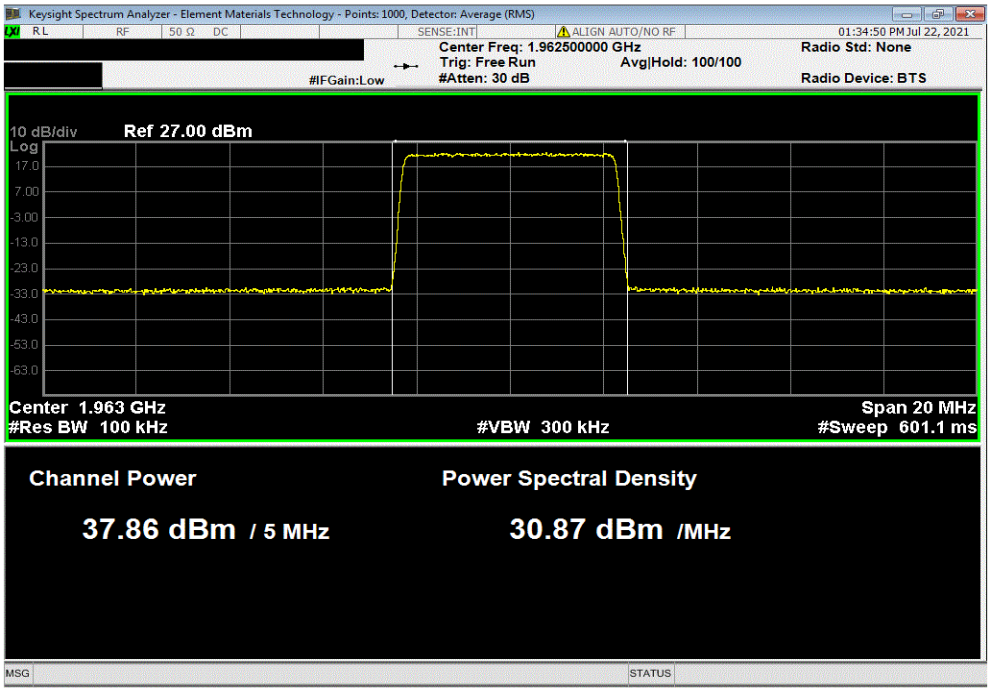
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 4						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.992	0		38	Inside Tolerance	N/A



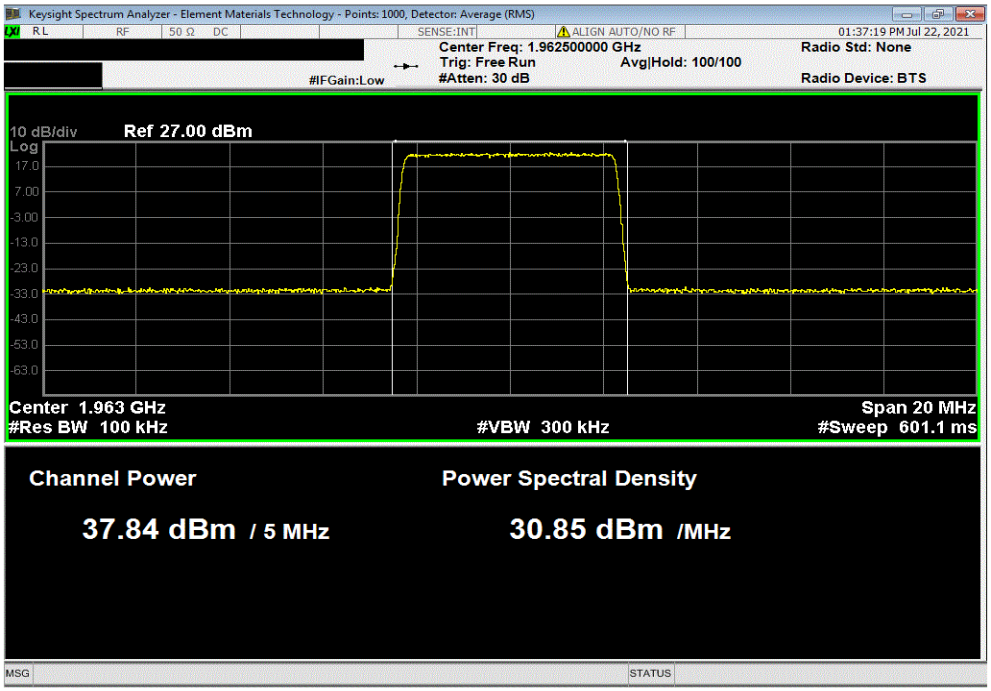
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 5						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.77	0		37.8	Inside Tolerance	N/A



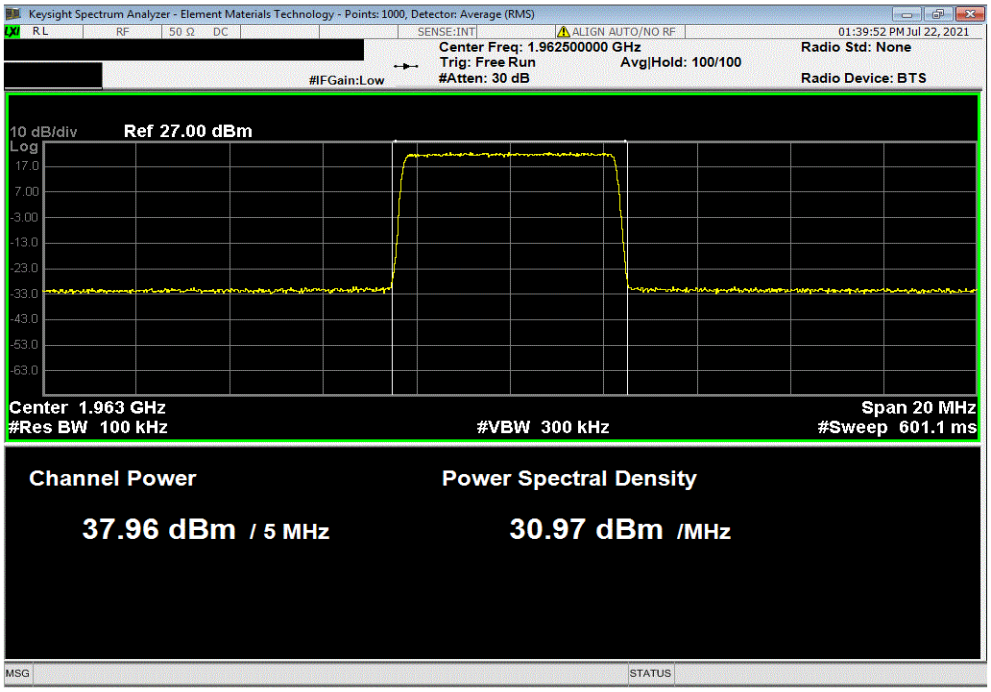
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 6						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.86	0		37.9	Inside Tolerance	N/A



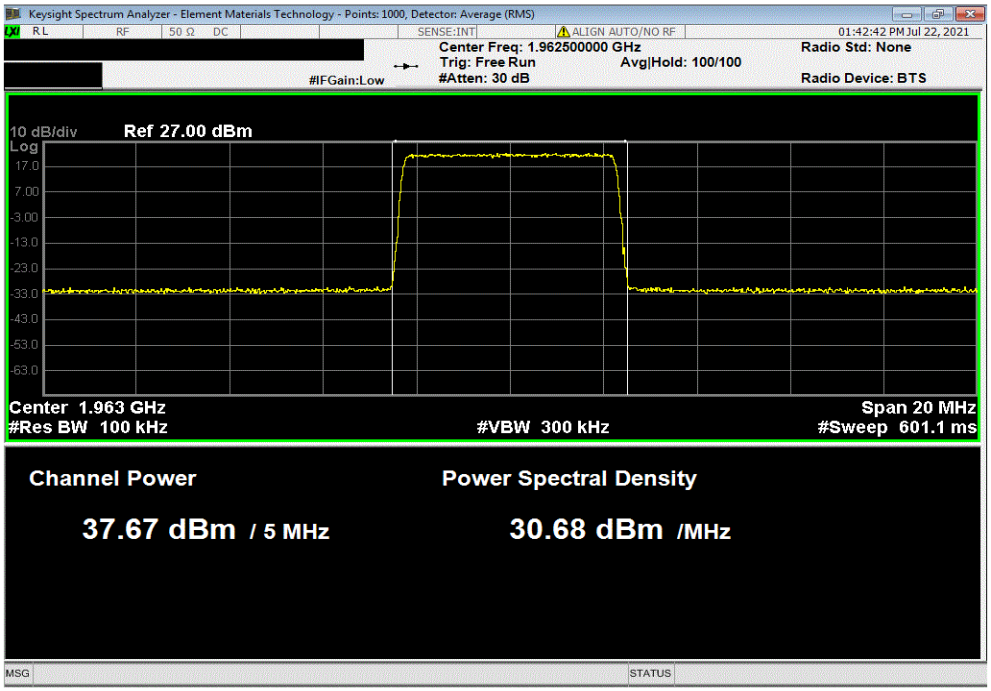
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 7						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.837	0		37.8	Inside Tolerance	N/A



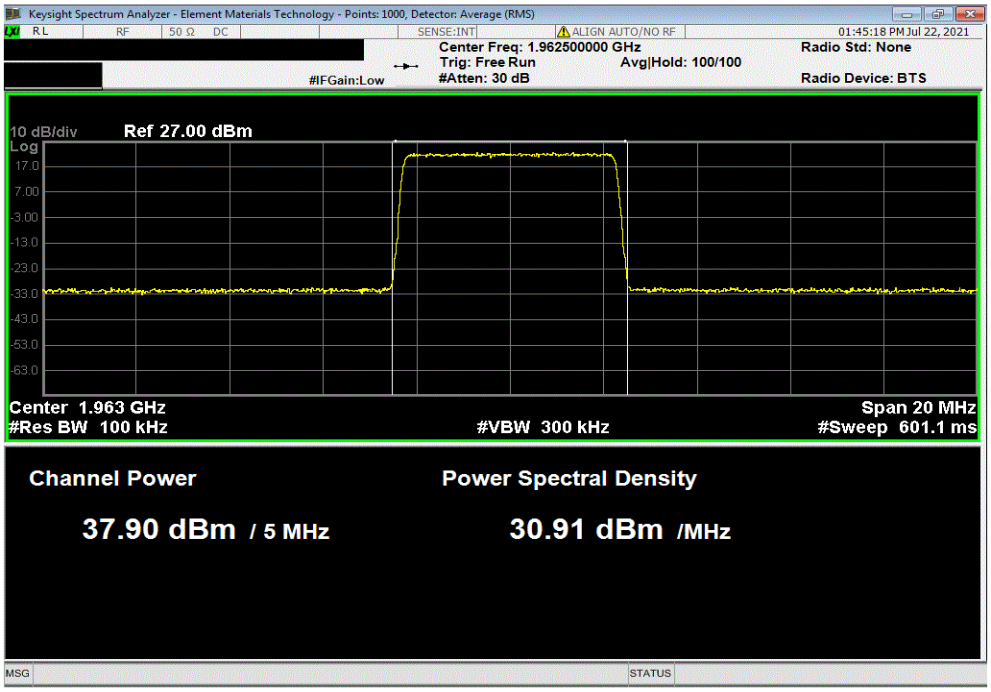
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 8						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.959	0		38	Inside Tolerance	N/A



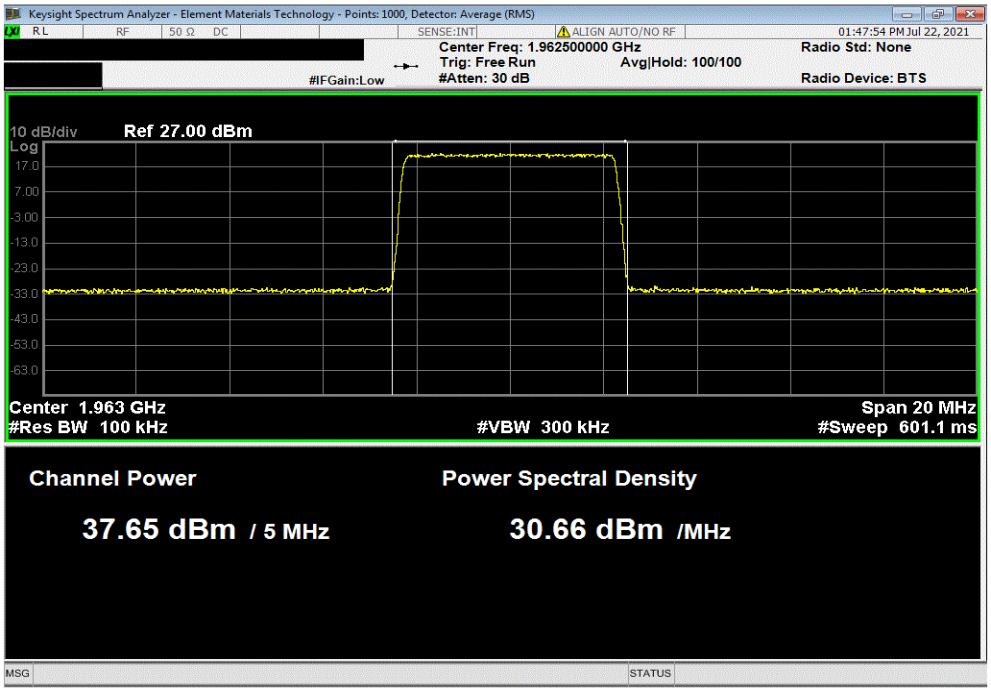
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 9						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.672	0		37.7	Inside Tolerance	N/A



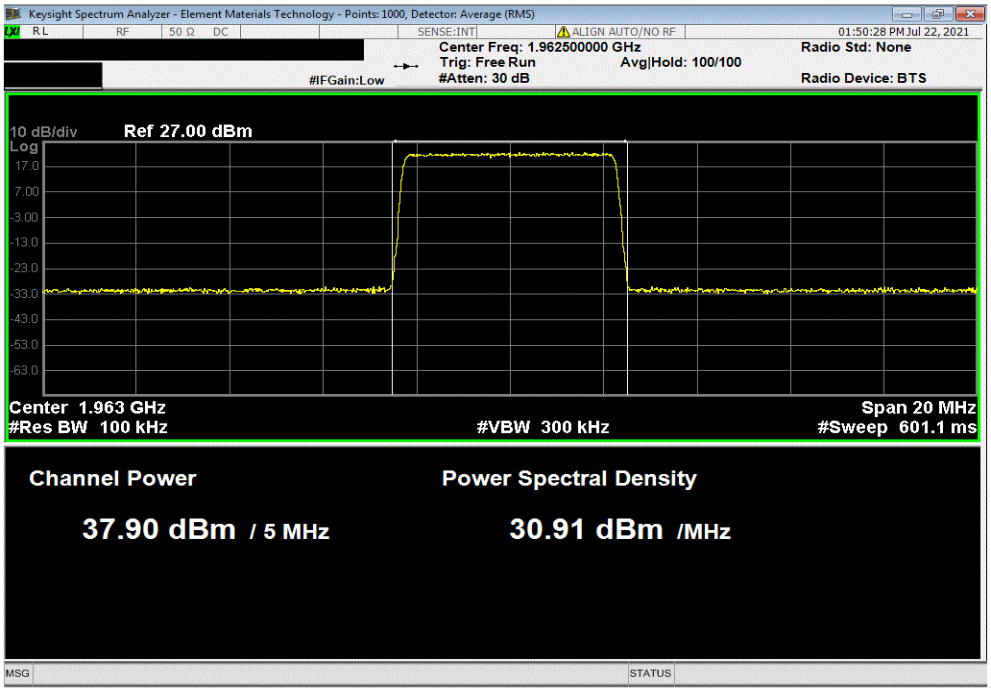
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 10						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.897	0		37.9	Inside Tolerance	N/A



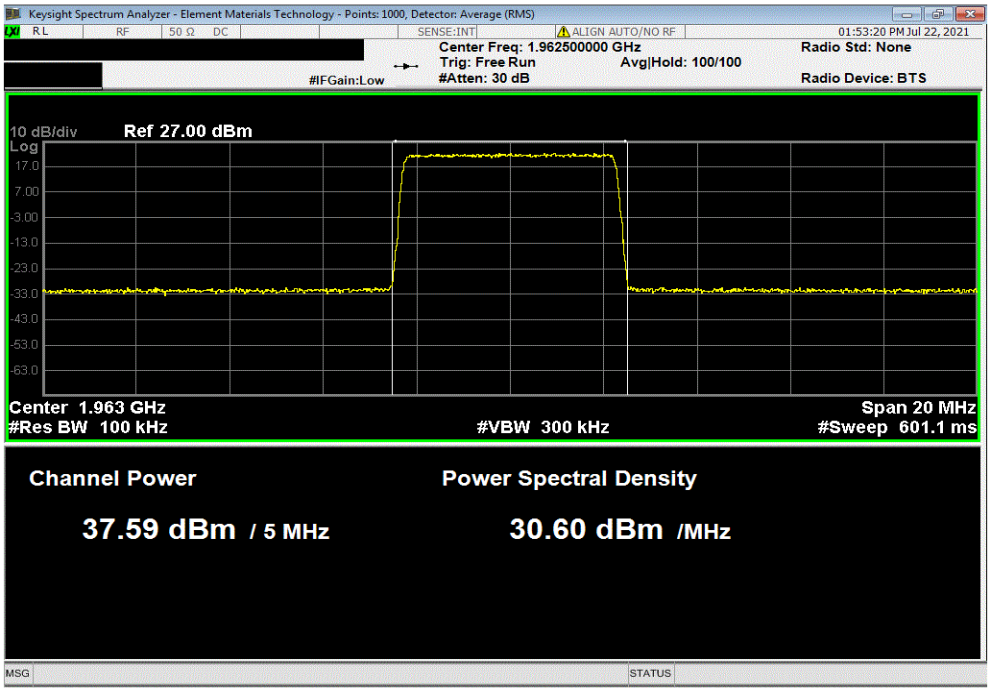
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 11						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.654	0		37.7	Inside Tolerance	N/A



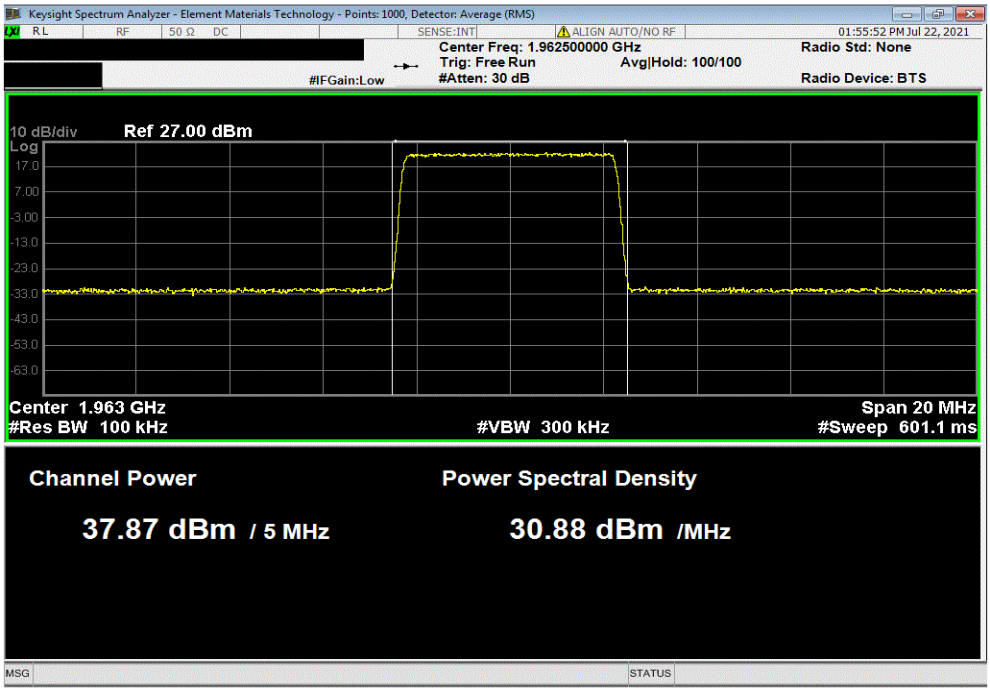
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 12						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.902	0		37.9	Inside Tolerance	N/A



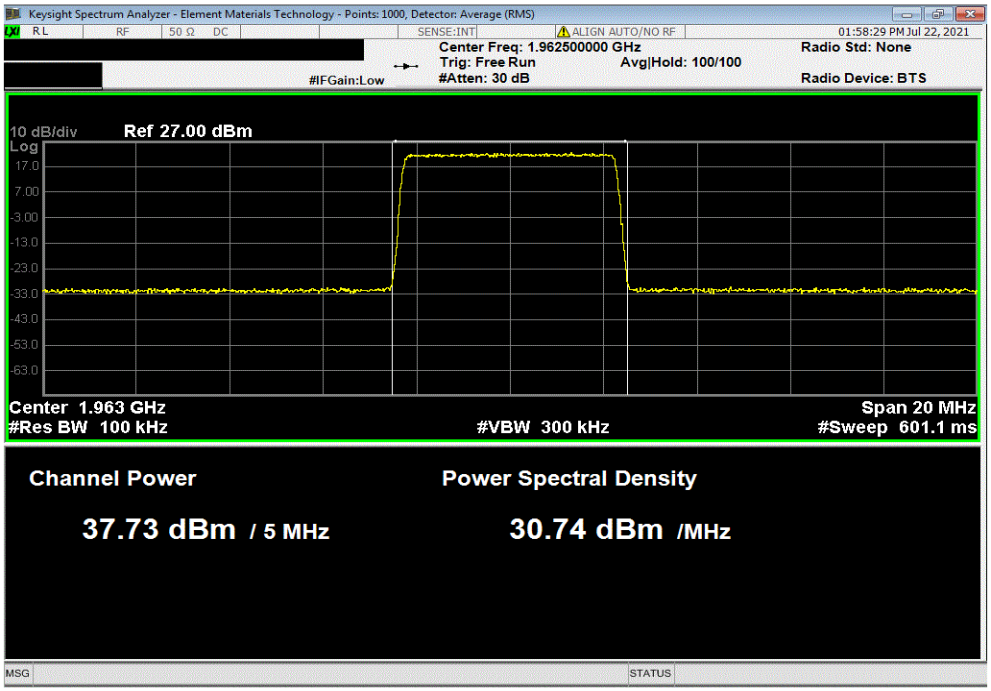
Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 13						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.593	0		37.6	Inside Tolerance	N/A



Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 14						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.871	0		37.9	Inside Tolerance	N/A



Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 15						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.731	0		37.7	Inside Tolerance	N/A



Band n25, 1930 MHz - 1995 MHz, 5G, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz, Port 16						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Single Port dBm/Carrier BW	Limit	Results
	37.968	0		38	Inside Tolerance	N/A