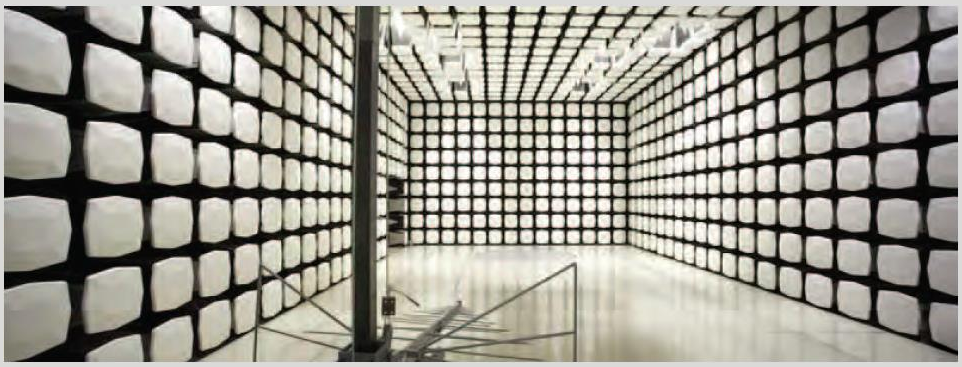
Radio Test Report
Application for a Class II Permissive Change of Equipment Authorization

FCC Part 24:2019 and RSS-133:2018
[1930MHz - 1995MHz]
FCC ID: VBNAAFB-01
IC ID: 661W-AAFB

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

Report # NOKI0005



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: January 31, 2020
Nokia Solutions and Networks
EUT: Airscale Base Transceiver Station Radio Module Model AAFB

Radio Equipment Testing

Standards

Specification	Method
FCC Part 24:2020	ANSI C63.26-2015, with FCC KDB 971168D01 v03r01 and FCC KDB 662911D01 v02r01
RSS-133:2018	RSS-Gen:2019

Results

Test Description	Applied	Results	Comments
Duty Cycle	No	N/A	Not requested.
Occupied Bandwidth	Yes	Pass	
Output Power	Yes	Pass	
Output Power – Worst Case Port	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:

Jeremiah Darden, Operations Manager

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

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

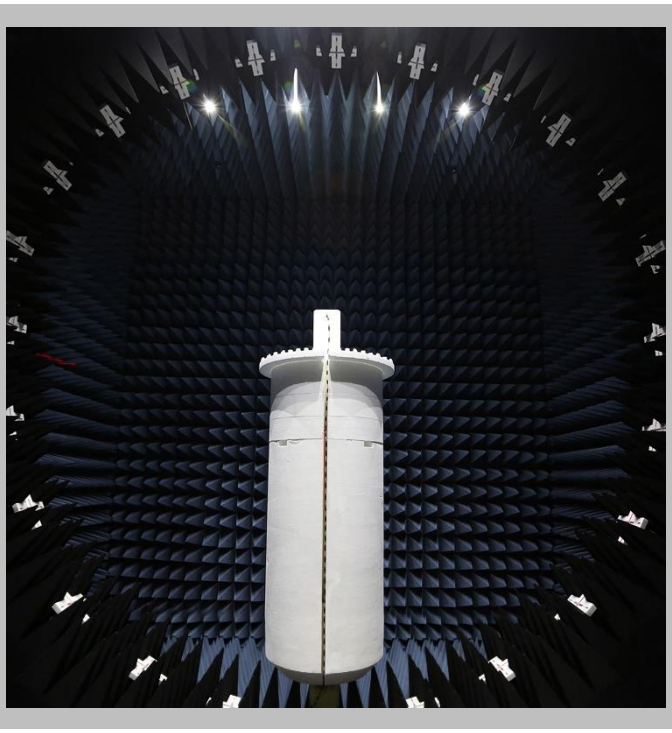
MIC – Recognized by MIC as a CAB for the acceptance of test data.

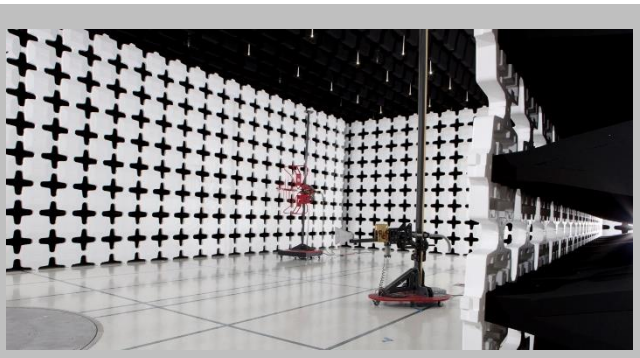
SCOPE

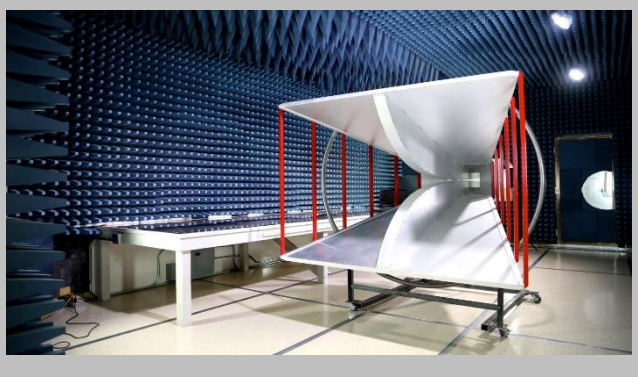
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

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







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

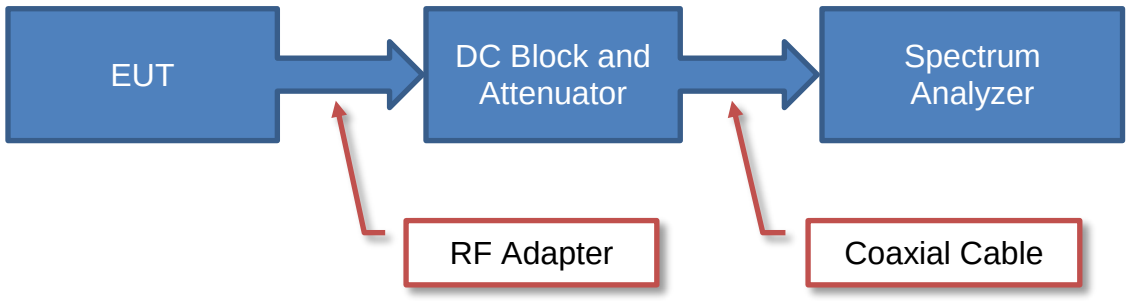
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

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

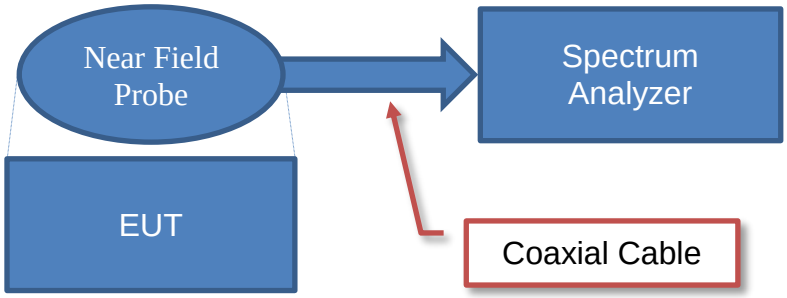
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field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

Test Setup Block Diagrams

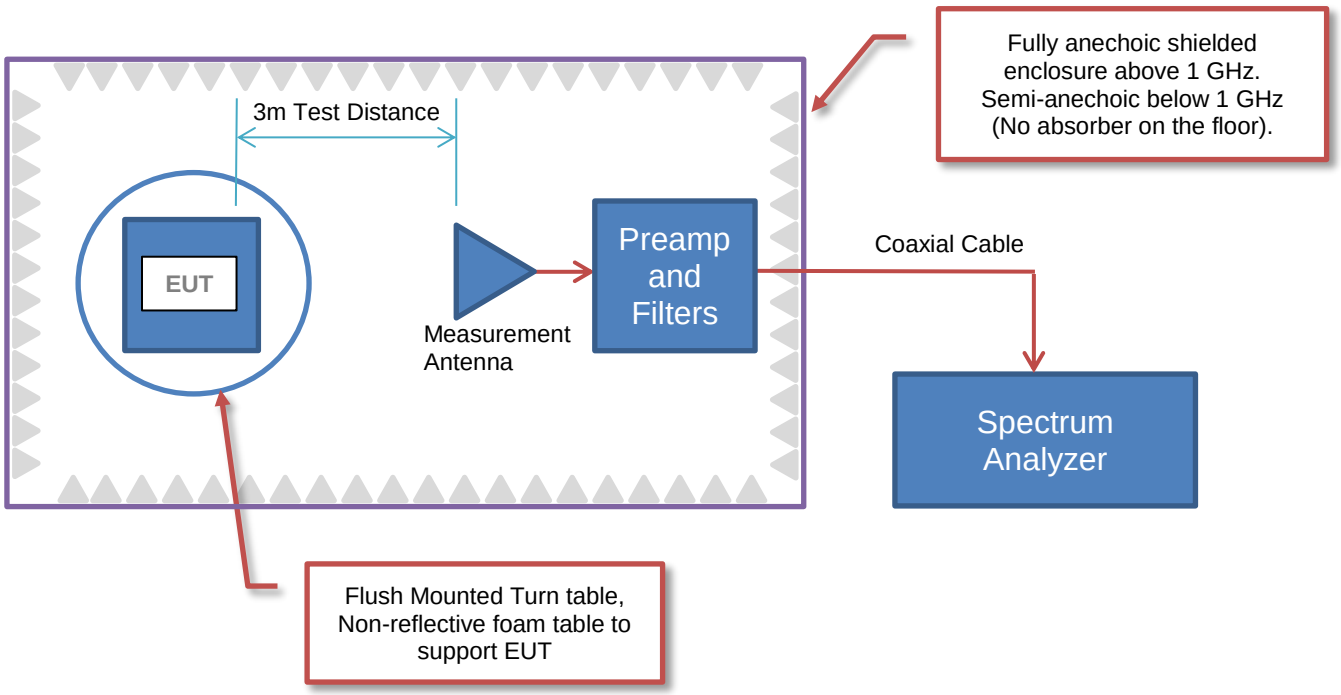
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nokia Solutions and Networks
Address:	6000 Connection Drive
City, State, Zip:	Irving, TX 75039
Test Requested By:	Steve Mitchell
EUT:	Airscale Base Transceiver Station Radio Module Model AAFB
First Date of Test:	January 30, 2020
Last Date of Test:	January 31, 2020
Receipt Date of Samples:	January 28, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

A class II permissive change on the original filing is being pursued to add Narrow Band IoT Guard Band (NB IoT GB) to the LTE carrier for the Airscale BTS Radio Module AAFB Federal Communication Commission and Industry Canada certifications. The original FCC and IC radio certification submittal was NTS Test Report Number PR083556 Revision 1 dated August 27, 2018. The original test effort included testing for LTE technologies. Please refer to the test report on the original certification (FCC ID: VBNAAFB-01) for details on all required testing. The scope of testing in this effort is for narrow band IoT guard band operations for 10, 15 and 20MHz LTE channel bandwidths.

All conducted RF testing performed for the original certification testing will be repeated using NB IoT GB for this class II permissive change per correspondence/guidance from Nemko TCB. The same test methodology used in the original certification testing will be used in this class II permissive change test effort. Tests performed under the class II change effort include RF power, CCDF, emission bandwidth (99% and 26 dB down), band edge spurious emissions, and conducted spurious emissions. The LTE modulation type for this testing was setup according to 3GPP TS 36.141 E-UTRA Test Models and is “E-TM 1.1 (QPSK modulation type) with N-TM (narrow band IoT)”. The base station and radio module software for this testing is an updated release that includes Narrow Band IoT Guard Band support.

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

The equipment under test (EUT) is a Nokia Solutions and Networks AirScale Base Transceiver Station (BTS) radio module, model AAFB. The AAFB has 16 transmit/receive antenna ports that supports 3GPP frequency band 25 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 radio module supports LTE-FDD, and narrow band IoT (internet of things) operations (in-band, guard band, standalone). The TX and RX instantaneous bandwidth cover the full operational (Band 25) bandwidth. The radio module supports 5, 10, 15, and 20MHz LTE bandwidths. The radio module supports four LTE downlink modulation types (QPSK, 16QAM, 64QAM and 256QAM) and NB-IoT.

The AAFB LTE channel numbers and frequencies are as follows:

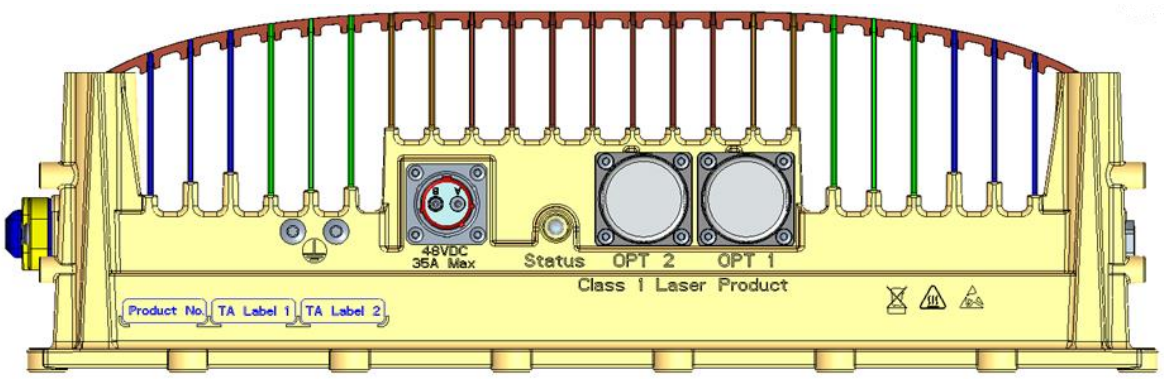
	Downlink EARFCN	Downlink Frequency (MHz)	LTE Channel Bandwidth			
			5 MHz	10 MHz	15 MHz	20 MHz
AAFB Band 25 (Antennas 1 through 16)	8040	1930.0	Band Edge	Band Edge	Band Edge	Band Edge
	……					
	8065	1932.5	Bottom Ch			
	……					
	8090	1935.0		Bottom Ch		
	……					
	8115	1937.5			Bottom Ch	
	……					
	8140	1940.0				Bottom Ch
	……					
	8365	1962.5	Middle Ch	Middle Ch	Middle Ch	Middle Ch
	……					
	8590	1985.0				Top Channel
	……					
	8615	1987.5			Top Channel	
	……					
	8640	1990.0		Top Channel		
	……					
	8665	1992.5	Top Channel			
	……					
	8690	1995.0	Band Edge	Band Edge	Band Edge	Band Edge

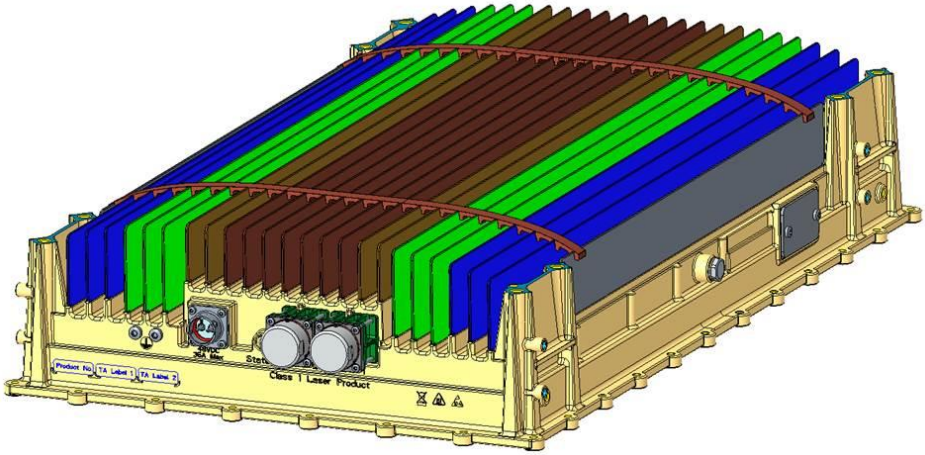
AAFB Downlink Band Edge LTE Band 25 Frequency Channels

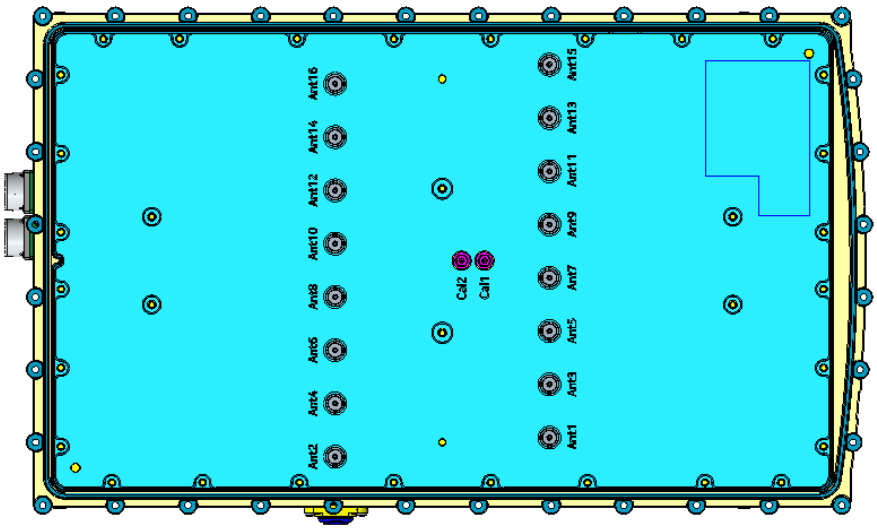
Note: AAFB narrow band IoT guard band operations for 10, 15 and 20MHz LTE channel bandwidths are supported.

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 Narrow Band IoT Guard Band to the LTE carrier for the Airscale BTS Radio Module AAFB Federal Communication Commission and Industry Canada certifications.

CONFIGURATIONS

Configuration NOKI0005- 1

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM 59.10.R28L
BTS Software Version	SBTS19B_ENB_0000_000904

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AAFB (Radio Module Model)	Nokia	090148A.101	YK190400217

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
30dB Attenuator (50W)	Narda	776B-30	None
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
AMIA (BTS system Module)	Nokia	473098A.101	RK16401509
ASIA (BTS system Module)	Nokia	473095A.203	AH173111443
ABIA (BTS system Module)	Nokia	473096A.102	L1164015939
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	Kr16180020006
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610206
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
Power Supply (Laptop)	HP	608428-002	F12941232064008

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF cable HS-SUCOFLEX_106	Y	2m	N	EUT [AAFB] RF port 1 (port under test)	Narda 30dB Attenuator (50W)
RF cable HS-SUCOFLEX_104	Y	1m	N	Narda 30dB Attenuator (50W)	Spectrum Analyzer
RF cable R&D Microwaves CBL-6ft-NMNM-402J-N 15 places	Y	~1.8m	N	EUT [AAFB] RF ports 2 thru 16	Antenna Loads (1 through 15)

CONFIGURATIONS

Configuration NOKI0005- 2

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM 59.10.R28L
BTS Software Version	SBTS19B_ENB_0000_000904

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AAFB (Radio Module Model)	Nokia	090148A.101	YK190400217

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
10dB Attenuator (100W)	API Weinschel	48-10-34-LIM	BJ1771
Low Pass Filter (100W)	Microwave Circuits, INC.	L13502G1	SN24254-01
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
AMIA (BTS system Module)	Nokia	473098A.101	RK16401509
ASIA (BTS system Module)	Nokia	473095A.203	AH173111443
ABIA (BTS system Module)	Nokia	473096A.102	L1164015939
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	Kr16180020006
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610206
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
Power Supply (Laptop)	HP	608428-002	F12941232064008

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF cable HS-SUCOFLEX_106	Y	2m	N	EUT [AAFB] RF port 1 (port under test)	10dB Attenuator (100W)
RF cable HS-SUCOFLEX_104	Y	1m	N	Low Pass Filter (100W)	Spectrum Analyzer
RF cable R&D Microwaves CBL-6ft-NMNM-402J-N 15 places	Y	~1.8m	N	EUT [AAFB] RF ports 2 thru 16	Antenna Loads (1 through 15)

CONFIGURATIONS

Configuration NOKI0005- 3

Software/Firmware Running during test	
Description	**Version**
Radio Module Software	FRM 59.10.R28L
BTS Software Version	SBTS19B_ENB_0000_000904

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AAFB (Radio Module Model)	Nokia	090148A.101	YK190400217

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
30dB Attenuator (50W)	Narda	776B-30	None
High Pass Filter (2W)	RLC Electronics	F-100-3000-5-R	0028
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
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Antenna Load 14	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
Antenna Load 15	R&D Microwaves LLC	TA-A40NFCB-BR	N/A
AMIA (BTS system Module)	Nokia	473098A.101	RK16401509
ASIA (BTS system Module)	Nokia	473095A.203	AH173111443
ABIA (BTS system Module)	Nokia	473096A.102	L1164015939
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	Kr16180020006
SFP+ 9.8G,300M,850NM	Nokia	473842.A101	MA17331610206
HP ProBook 6470b	HP	B2G14EC#ABA	CNU246B8XP
Power Supply (Laptop)	HP	608428-002	F12941232064008

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF cable HS-SUCOFLEX_106	Y	2m	N	EUT [AAFB] RF port 1 (port under test)	Narda 30dB Attenuator (50W)
RF cable HS-SUCOFLEX_104	Y	1m	N	High Pass Filter (2W)	Spectrum Analyzer
RF cable R&D Microwaves CBL-6ft-NMNM-402J-N 15 places	Y	~1.8m	N	EUT [AAFB] RF ports 2 thru 16	Antenna Loads (1 through 15)

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-01-30	Output Power – Worst Case Port	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2020-01-31	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	2020-01-31	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2020-01-31	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	2020-01-31	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2020-01-31	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH

XMit 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

OCCUPIED BANDWIDTH

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**AAFB**			**Work Order:**	**NOKI0005**
Serial Number:	**YK190400217**			**Date:**	**31-Jan-20**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**23.6 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**39.8% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Willie Love, Brandon Hobbs**	**Power:**	**54VDC**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 24E:2020	ANSI C63.26:2015
RSS-Gen:2019	

COMMENTS

All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature*

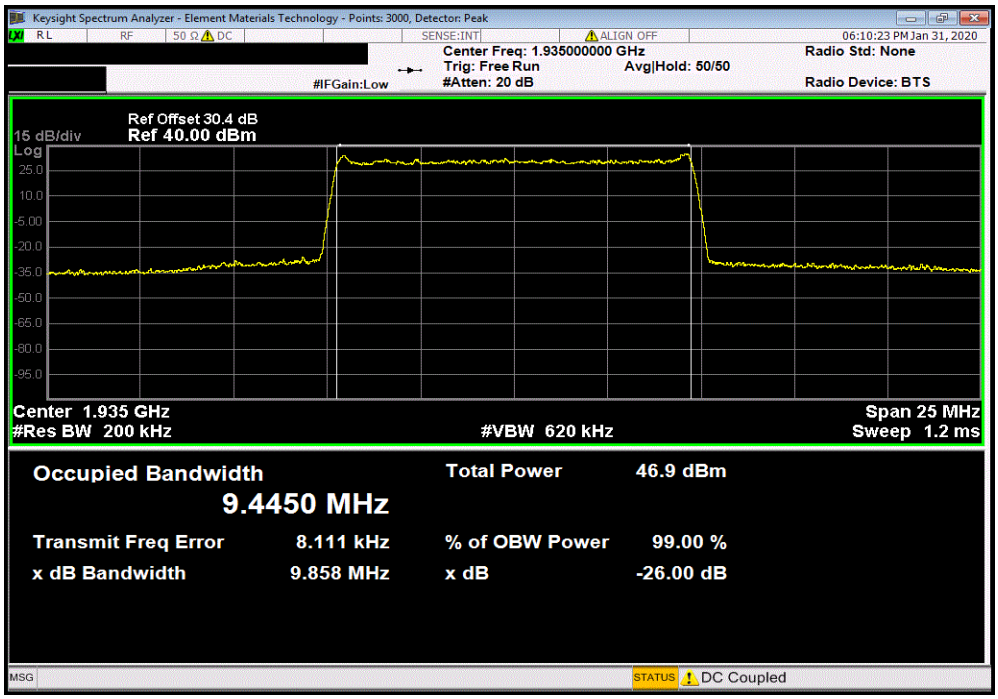
			Value 99% (MHz)	**Value -26dB (MHz)**	**Limit (>)**	**Result**
Band 25 (Single Carrier) Port 1						
	10 MHz					
		NB-IoT				
		Low Channel, 1935 MHz	9.45	9.86	Within Band	Pass
		Mid Channel, 1962.5 MHz	9.44	9.86	Within Band	Pass
		High Channel, 1990.0 MHz	9.44	9.86	Within Band	Pass
	15 MHz					
		NB-IoT				
		Low Channel, 1937.5 MHz	14.07	14.64	Within Band	Pass
		Mid Channel, 1962.5 MHz	14.10	14.67	Within Band	Pass
		High Channel, 1987.5 MHz	14.09	14.73	Within Band	Pass
	20 MHz					
		NB-IoT				
		Low Channel, 1940 MHz	18.58	19.41	Within Band	Pass
		Mid Channel, 1962.5 MHz	18.57	19.39	Within Band	Pass
		High Channel, 1985 MHz	18.58	19.41	Within Band	Pass

Band 25 Emission Designators:

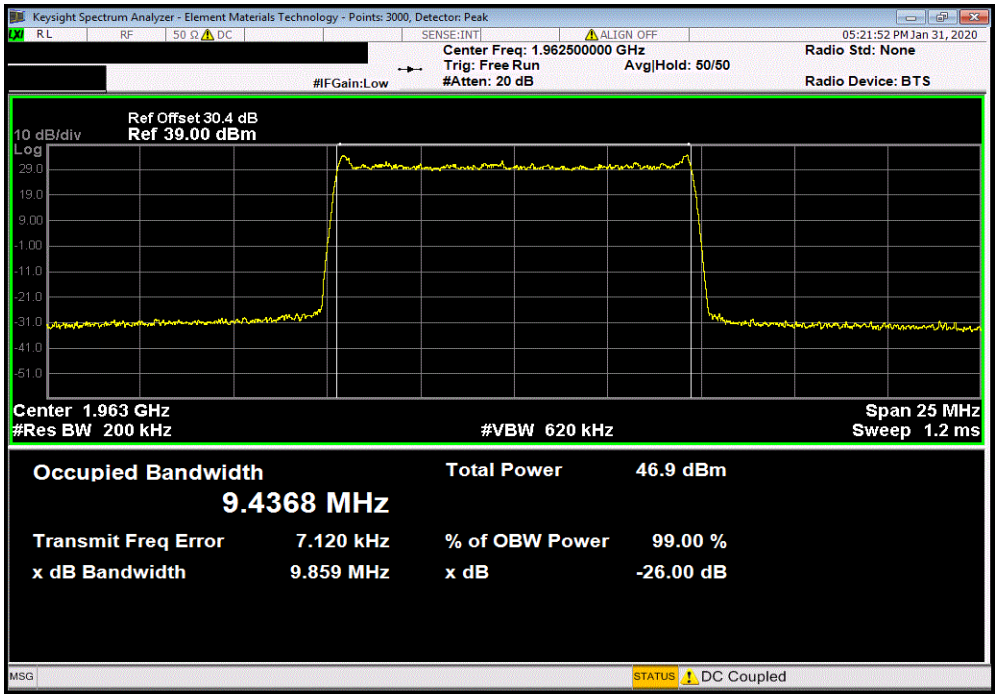
Band 25 (1930MHz to 1995MHz) Emission Designators						
LTE Narrow Band IoT Guard Band						
LTE Channel Bandwidth	Low Channel		Middle Channel		High Channel	
	FCC	IC	FCC	IC	FCC	IC
10M	9M86F9W	9M45F9W	9M86F9W	9M44F9W	9M86F9W	9M44F9W
15M	14M6F9W	14M1F9W	14M7F9W	14M1F9W	14M7F9W	14M1F9W
20M	19M4F9W	18M6F9W	19M4F9W	18M6F9W	19M4F9W	18M6F9W
Note: FCC based on 26dB emission bandwidth; IC based on 99% emission bandwidth.						

OCCUPIED BANDWIDTH

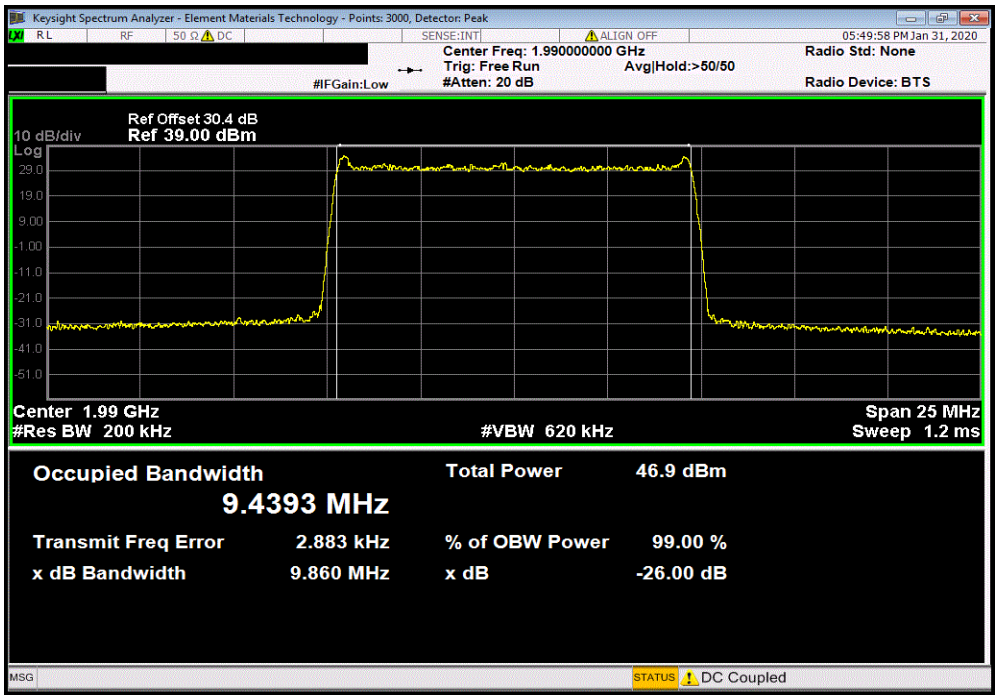
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			9.445	9.858	Within Band	Pass



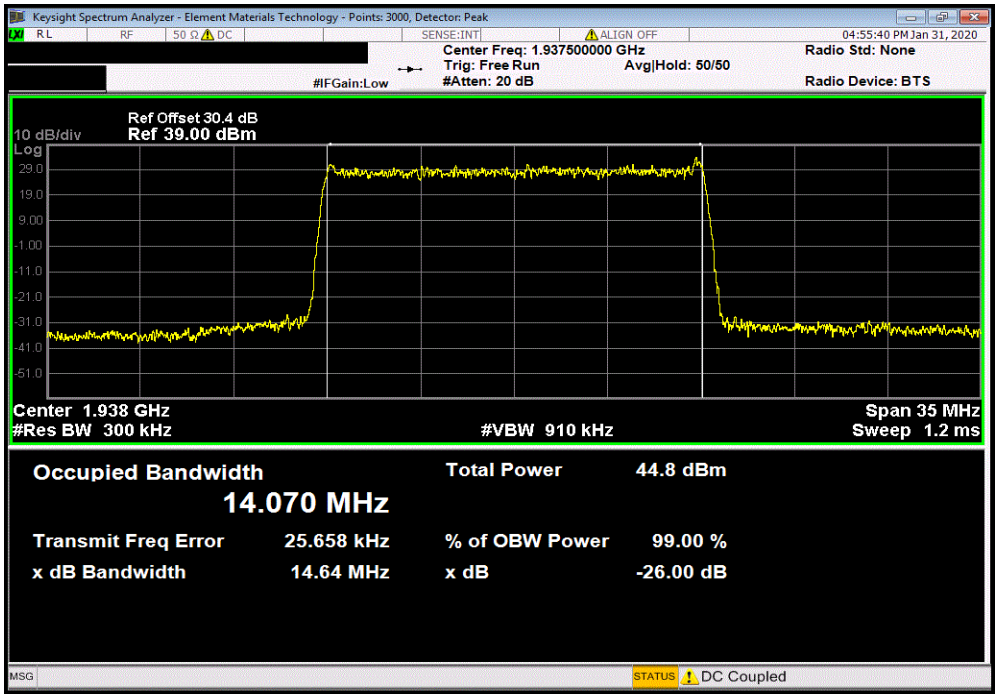
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			9.437	9.859	Within Band	Pass



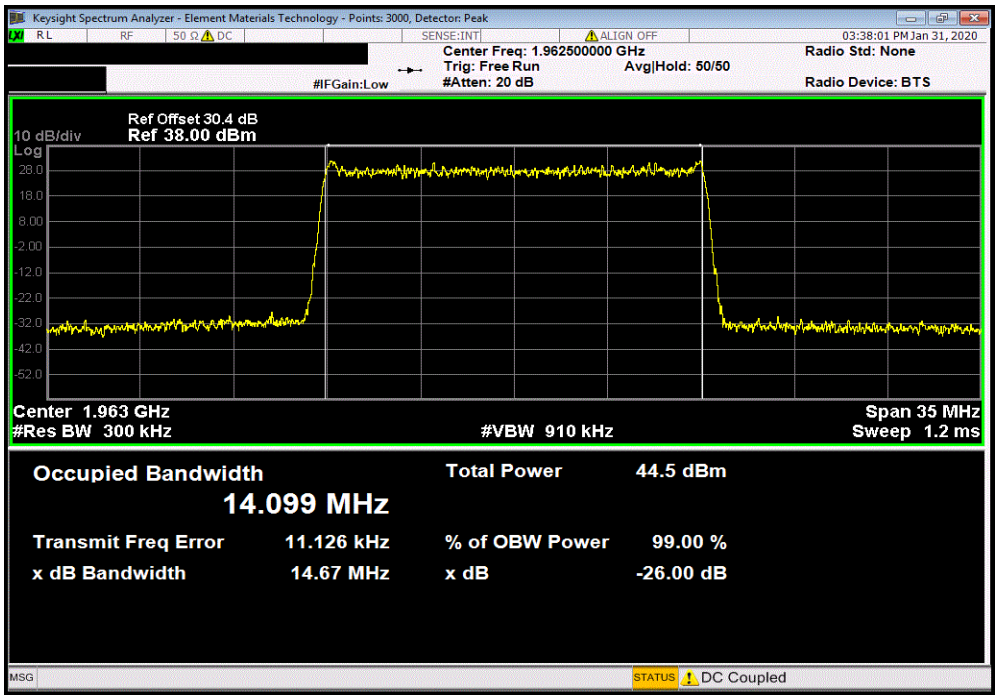
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990.0 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			9.439	9.86	Within Band	Pass



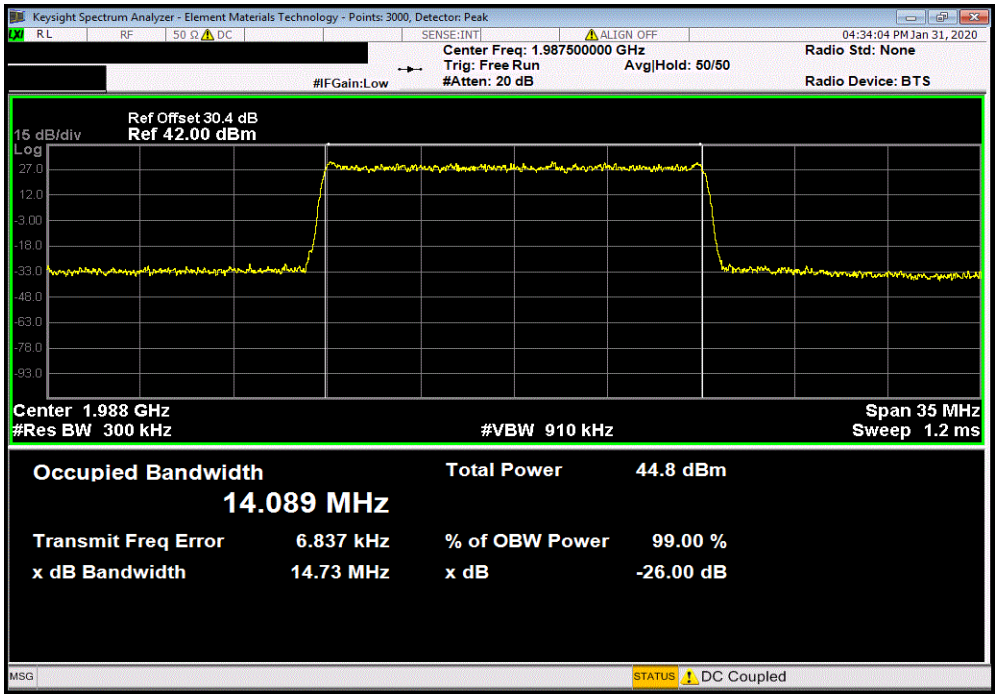
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Low Channel, 1937.5 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			14.07	14.641	Within Band	Pass



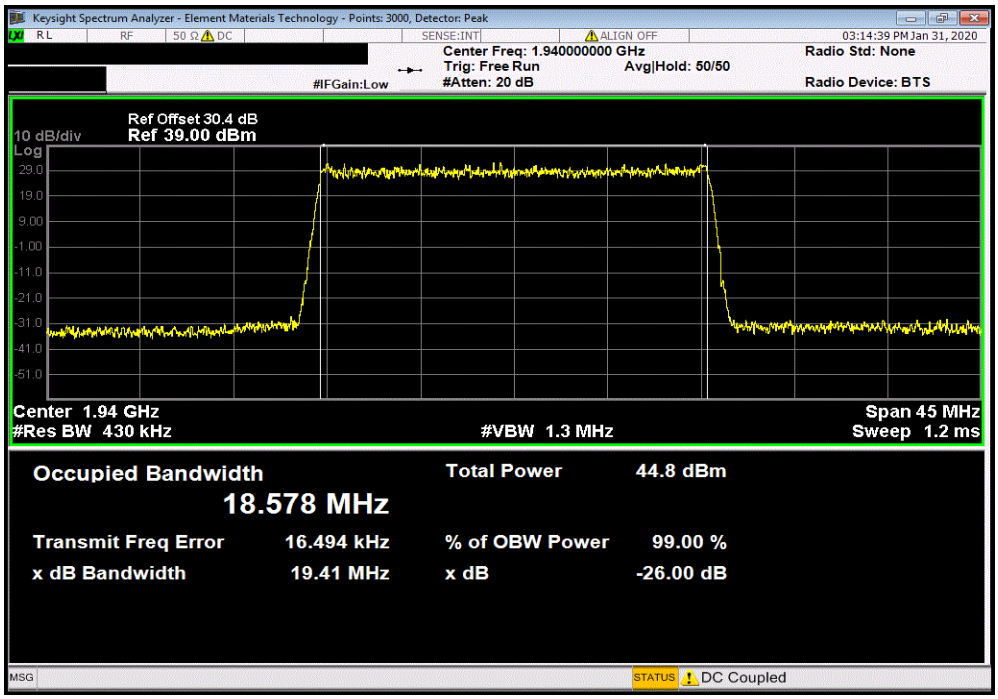
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			14.099	14.674	Within Band	Pass



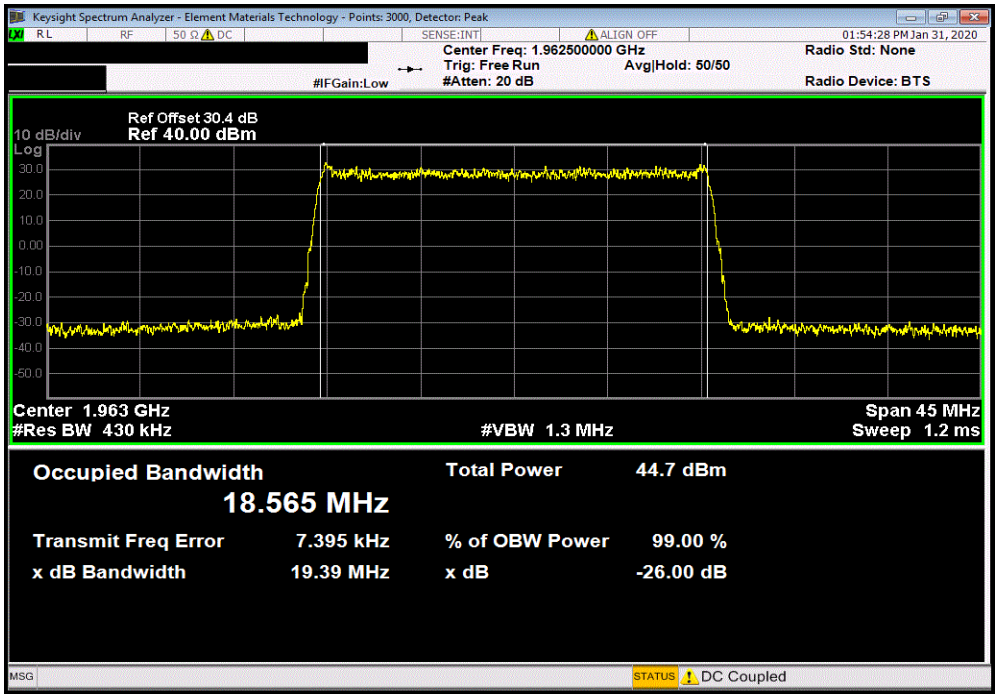
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1987.5 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			14.089	14.734	Within Band	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1940 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			18.578	19.41	Within Band	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			18.565	19.392	Within Band	Pass



OCCUPIED BANDWIDTH

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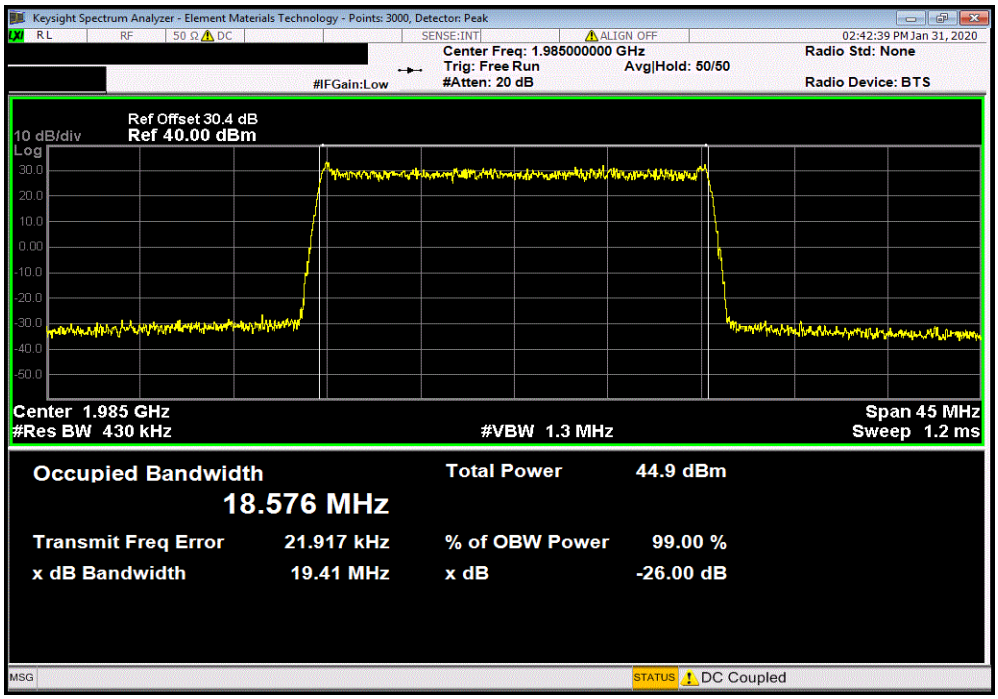
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1985 MHz						
			Value 99% (MHz)	Value -26dB (MHz)	Limit (>)	Result
			18.576	19.406	Within Band	Pass



OUTPUT POWER

XMit 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

The 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.

Per FCC part 24.232(a)(1), 24.232(a)(2) and RSS 133 6.4, the Equivalent Isotropically Radiated Power (EIRP) of the transceiver cannot exceed 1640 Watts/MHz.

OUTPUT POWER

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**AAFB**			**Work Order:**	**NOKI0005**
Serial Number:	**YK190400217**			**Date:**	**31-Jan-20**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**22 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**33.4% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Willie Love, Brandon Hobbs**	**Power:**	**54VDC**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 24E:2020	ANSI C63.26:2015
RSS-133:2018	RSS-Gen:2019

COMMENTS

All losses in the measurement path were accounted for. Per ANSI C63.26-2015 section 4.2.3 a correction factor was used to determine the Power/MHz value based on a measured dBm/OBW with a reduced RBW from the specification required reference bandwidth. CF= 10*Log(ref BW/measured Integration BW) The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel shown elsewhere in the report.

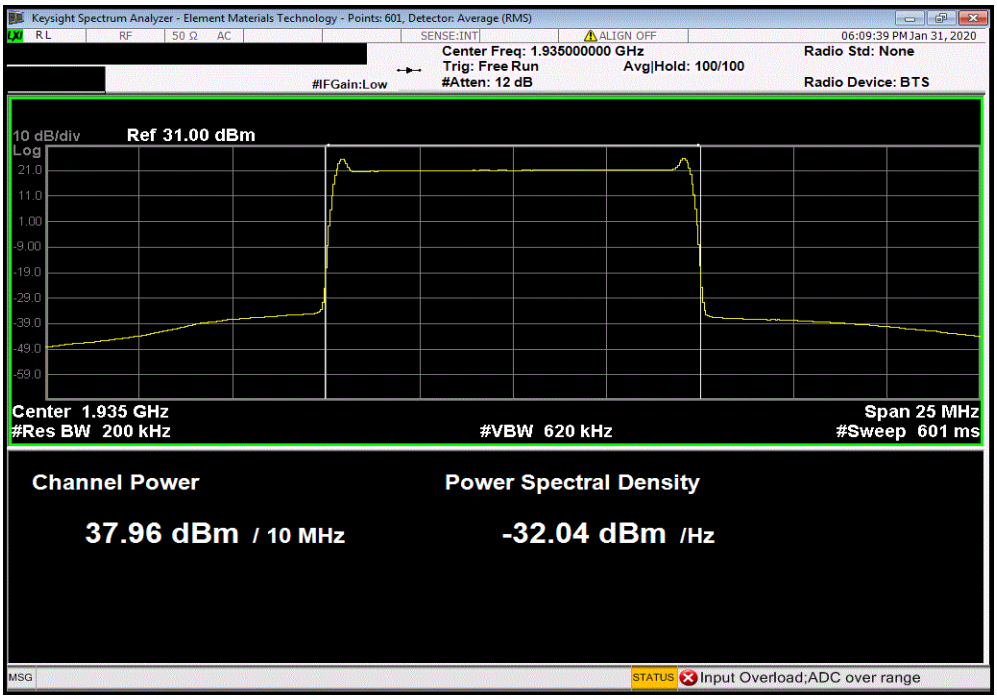
DEVIATIONS FROM TEST STANDARD

None

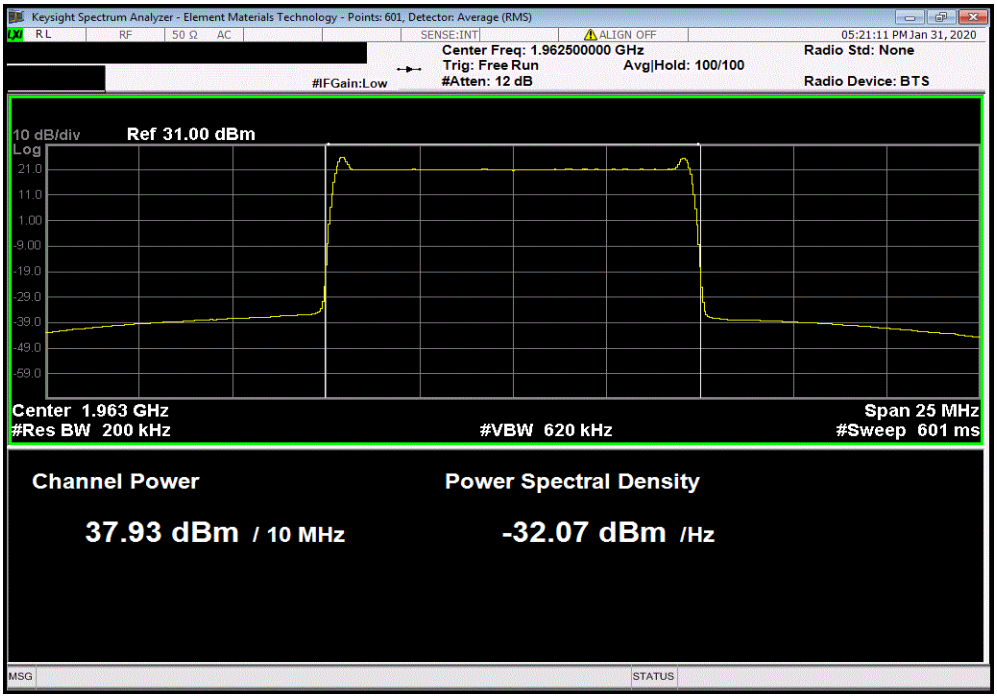
Configuration #	**1**	*Signature*

			Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Band 25 (Single Carrier) Port 1									
	10 MHz								
		NB-IoT							
		Low Channel, 1935 MHz	Not Provided	38.0	0.0	-10.0	28.0	62.2	Pass
		Mid Channel, 1962.5 MHz	Not Provided	37.9	0.0	-10.0	27.9	62.2	Pass
		High Channel, 1990.0 MHz	Not Provided	38.0	0.0	-10.0	28.0	62.2	Pass
	15 MHz								
		NB-IoT							
		Low Channel, 1937.5 MHz	Not Provided	38.2	0.0	-11.8	26.5	62.2	Pass
		Mid Channel, 1962.5 MHz	Not Provided	38.0	0.0	-11.8	26.2	62.2	Pass
		High Channel, 1987.5 MHz	Not Provided	38.2	0.0	-11.8	26.4	62.2	Pass
	20 MHz								
		NB-IoT							
		Low Channel, 1940 MHz	Not Provided	38.3	0.0	-13.0	25.2	62.2	Pass
		Mid Channel, 1962.5 MHz	Not Provided	38.0	0.0	-13.0	25.0	62.2	Pass
		High Channel, 1985 MHz	Not Provided	38.3	0.0	-13.0	25.3	62.2	Pass

Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	37.958	0	-10.0	28.0	62.2	Pass

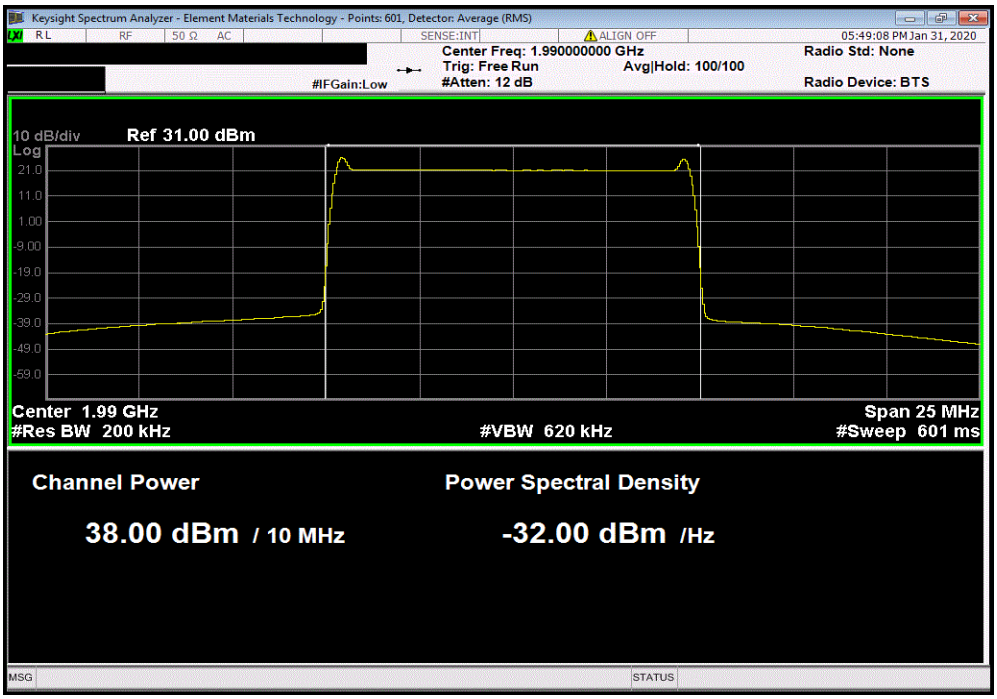


Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	37.934	0	-10.0	27.9	62.2	Pass

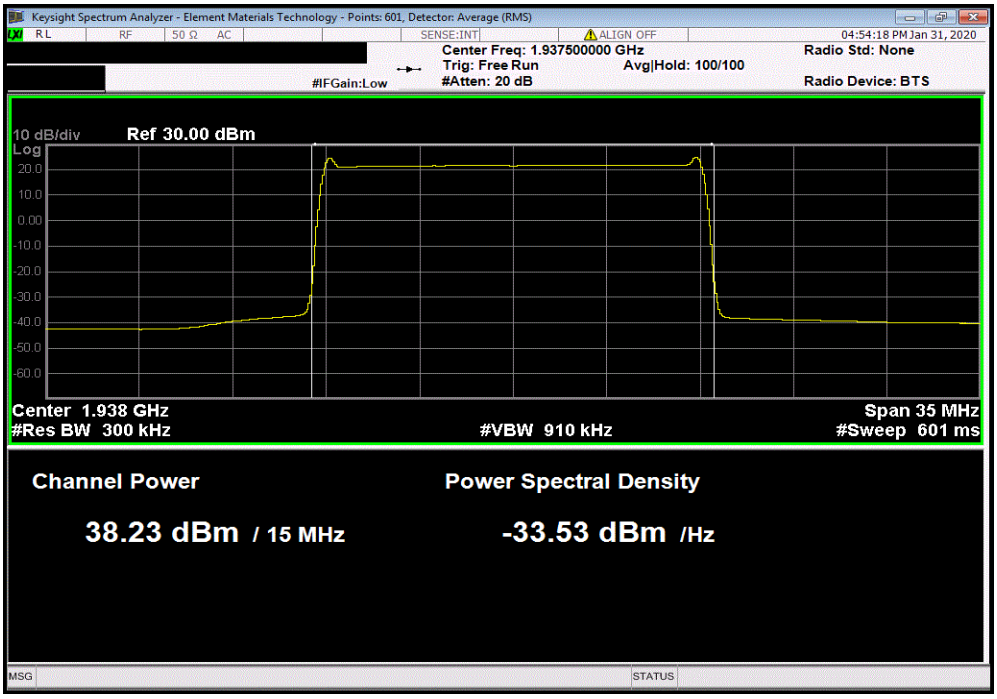


OUTPUT POWER

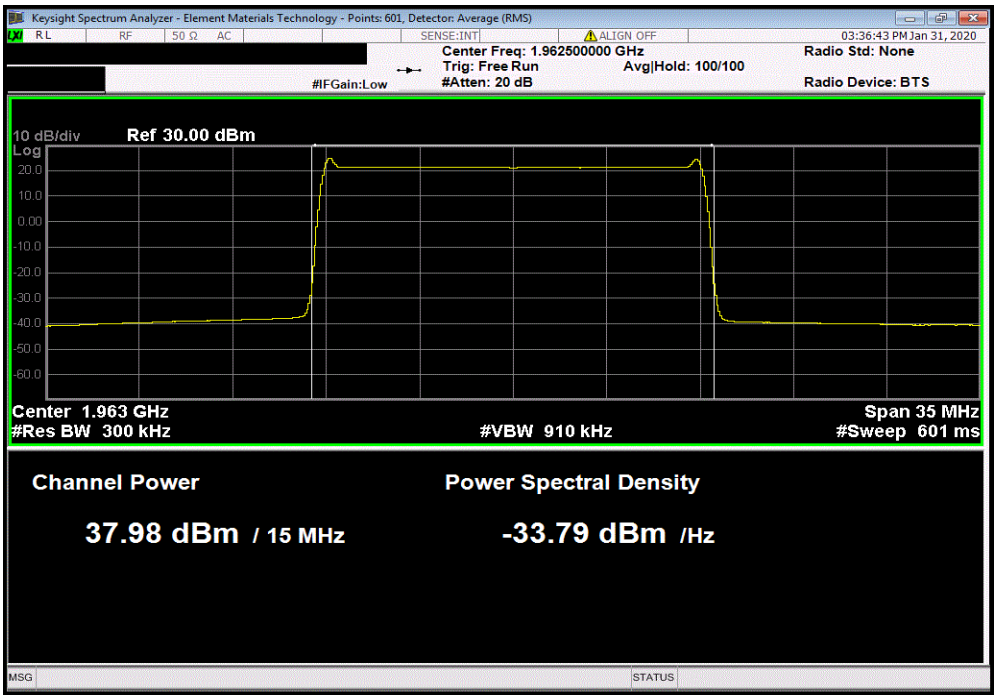
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990.0 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	37.995	0	-10.0	28.0	62.2	Pass



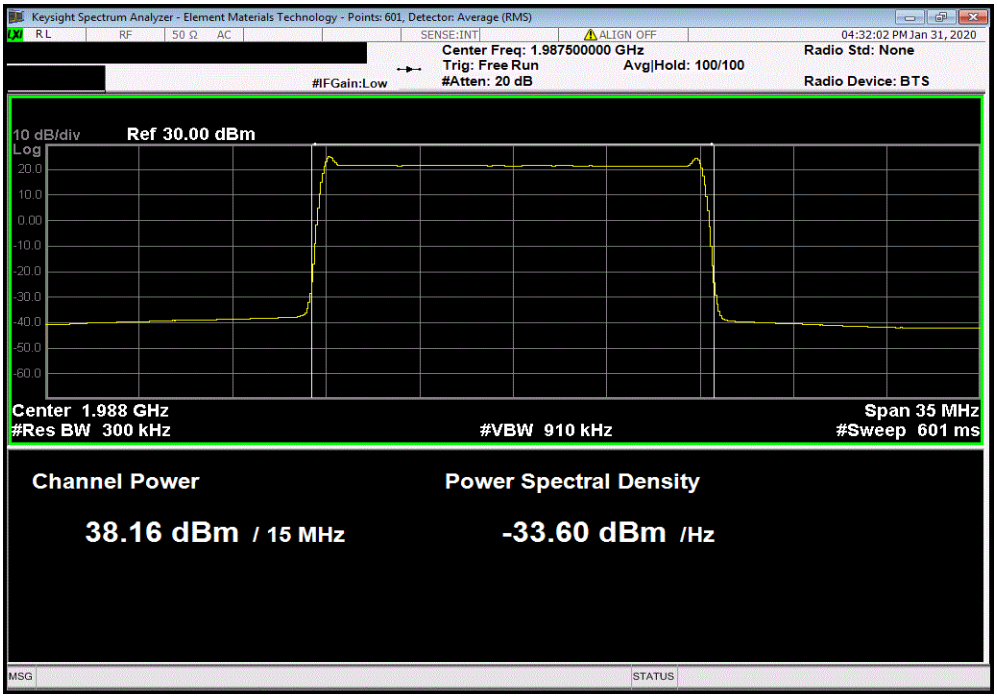
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Low Channel, 1937.5 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	38.228	0	-11.8	26.5	62.2	Pass



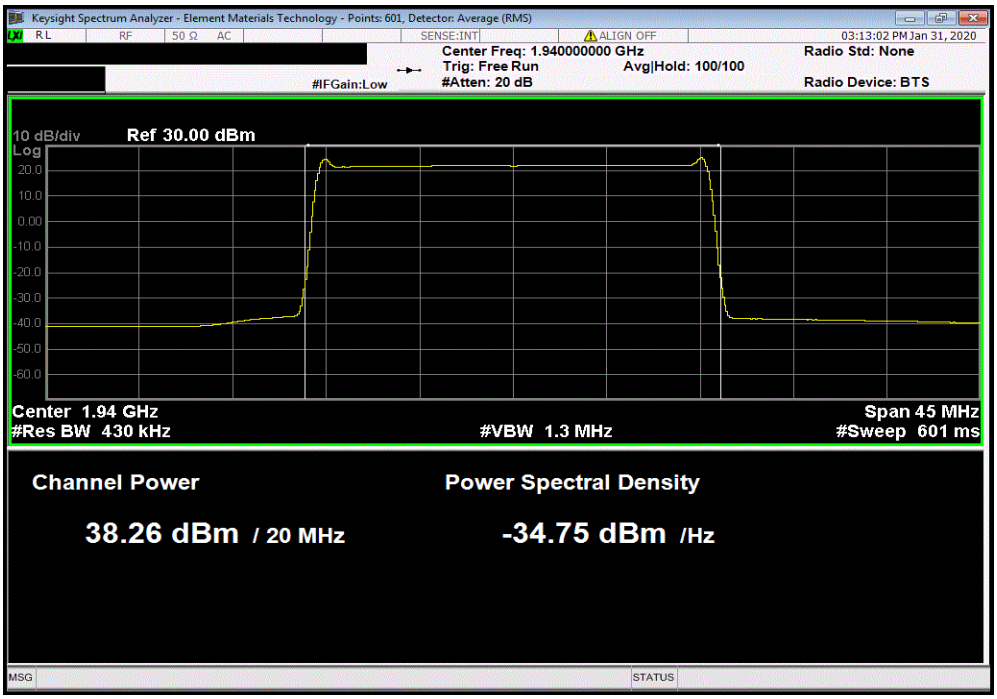
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	37.975	0	-11.8	26.2	62.2	Pass



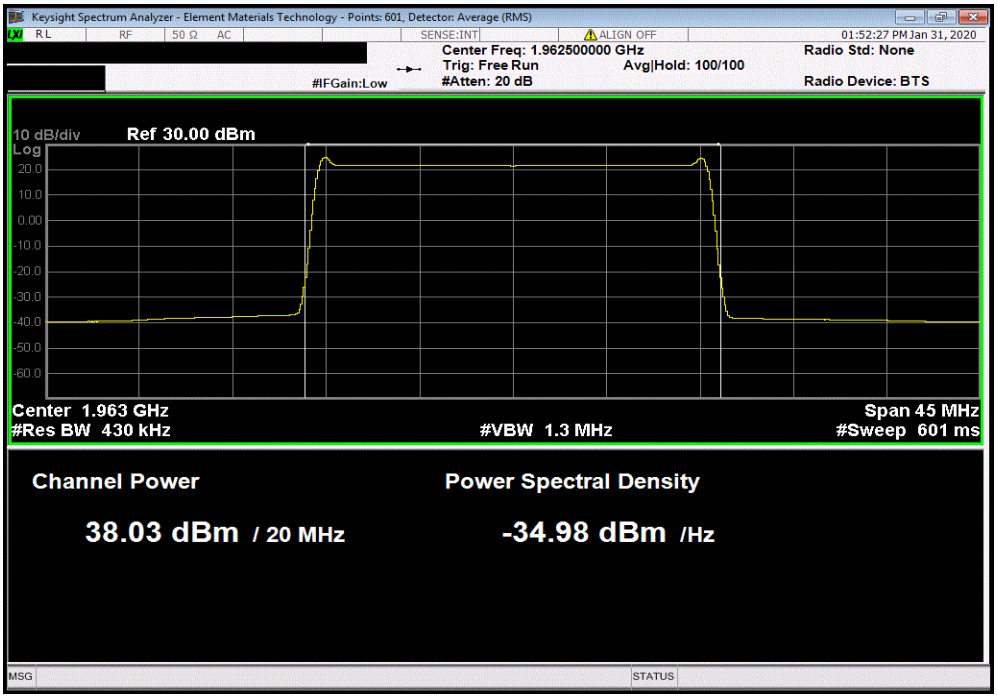
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1987.5 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	38.165	0	-11.8	26.4	62.2	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1940 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	38.255	0	-13.0	25.2	62.2	Pass

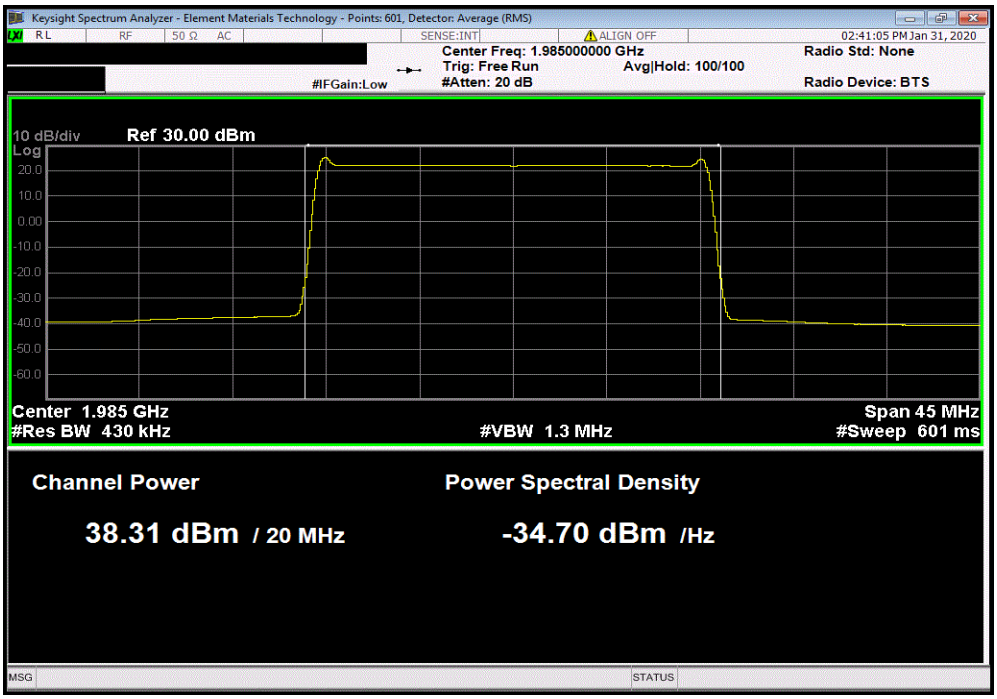


Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	38.027	0	-13.0	25.0	62.2	Pass



OUTPUT POWER

Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1985 MHz						
Antenna Gain (dBi)	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Correction Factor (dB)	Final w/o Ant Gain Value (dBm/MHz)	Limit EIRP (dBm/MHz)	Results
Not Provided	38.314	0	-13.0	25.3	62.2	Pass



OUTPUT POWER (WORST CASE PORT)

XMit 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

The 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.

Per FCC part 24.232(a)(1), 24.232(a)(2) and RSS 133 6.4, the Equivalent Isotropically Radiated Power (EIRP) of the transceiver cannot exceed 1640 Watts/MHz.

OUTPUT POWER (WORST CASE PORT)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**AAFB**			**Work Order:**	**NOKI0005**
Serial Number:	**YK190400217**			**Date:**	**30-Jan-20**
Customer:	**Nokia**			**Temperature:**	**22.7 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**28.1% RH**
Project:	**None**			**Barometric Pres.:**	**1041 mbar**
Tested by:	**Willie Love, Brandon Hobbs**	**Power:**	**54VDC**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 24E:2020	ANSI C63.26:2015
RSS-133:2018	RSS-133:2018

COMMENTS

All loses in the measurement path were accounted for. Worst case port was found to be port 1

DEVIATIONS FROM TEST STANDARD

None

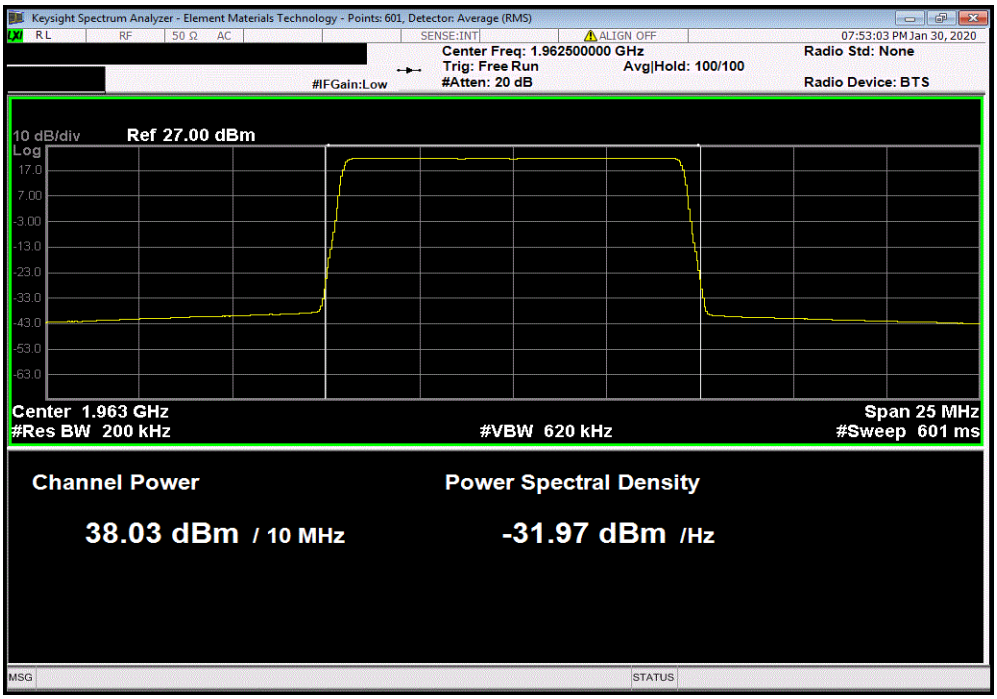
Configuration #	**1**	*Signature*

			Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
Band 25 (Single Carrier) Port 1								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	38.03	0	Not Provided	38.0	N/A	N/A
Band 25 (Single Carrier) Port 2								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.83	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 3								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.89	0	Not Provided	37.9	N/A	N/A
Band 25 (Single Carrier) Port 4								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.75	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 5								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.89	0	Not Provided	37.9	N/A	N/A
Band 25 (Single Carrier) Port 6								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.72	0	Not Provided	37.7	N/A	N/A
Band 25 (Single Carrier) Port 7								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.83	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 8								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.79	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 9								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.92	0	Not Provided	37.9	N/A	N/A
Band 25 (Single Carrier) Port 10								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.87	0	Not Provided	37.9	N/A	N/A
Band 25 (Single Carrier) Port 11								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.88	0	Not Provided	37.9	N/A	N/A
Band 25 (Single Carrier) Port 12								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.71	0	Not Provided	37.7	N/A	N/A
Band 25 (Single Carrier) Port 13								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.77	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 14								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.82	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 15								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.78	0	Not Provided	37.8	N/A	N/A
Band 25 (Single Carrier) Port 16								
	10 MHz							
		256QAM						
		Mid Channel, 1962.5 MHz	37.75	0	Not Provided	37.7	N/A	N/A

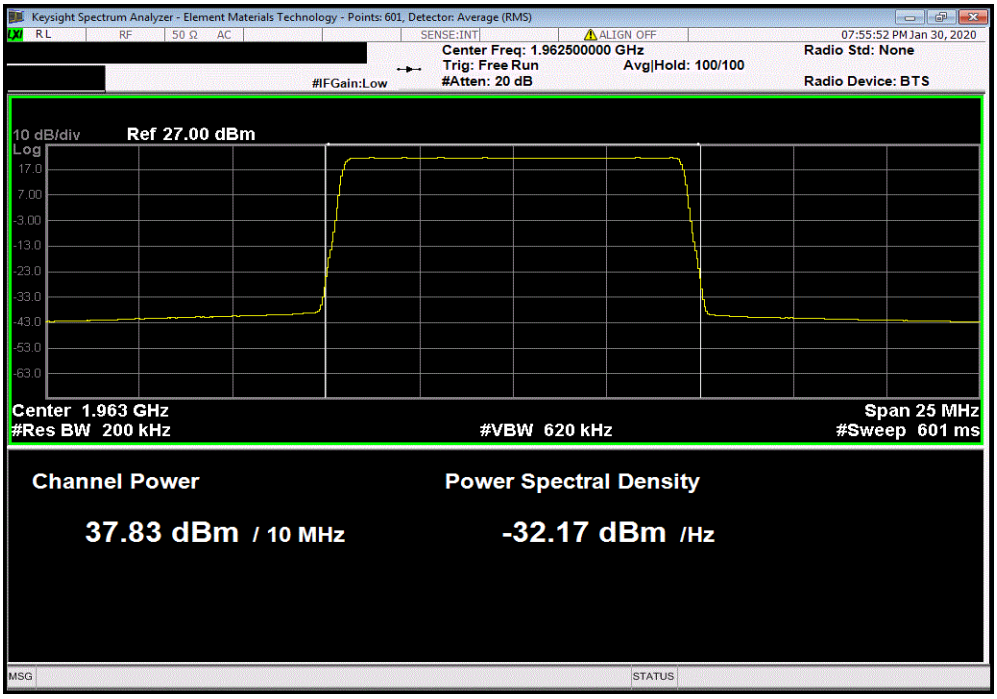
OUTPUT POWER (WORST CASE PORT)

TbtTx 2019.08.30.0 XMit 2019.09.05

Band 25 (Single Carrier) Port 1, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	38.034	0	Not Provided	38	N/A	N/A

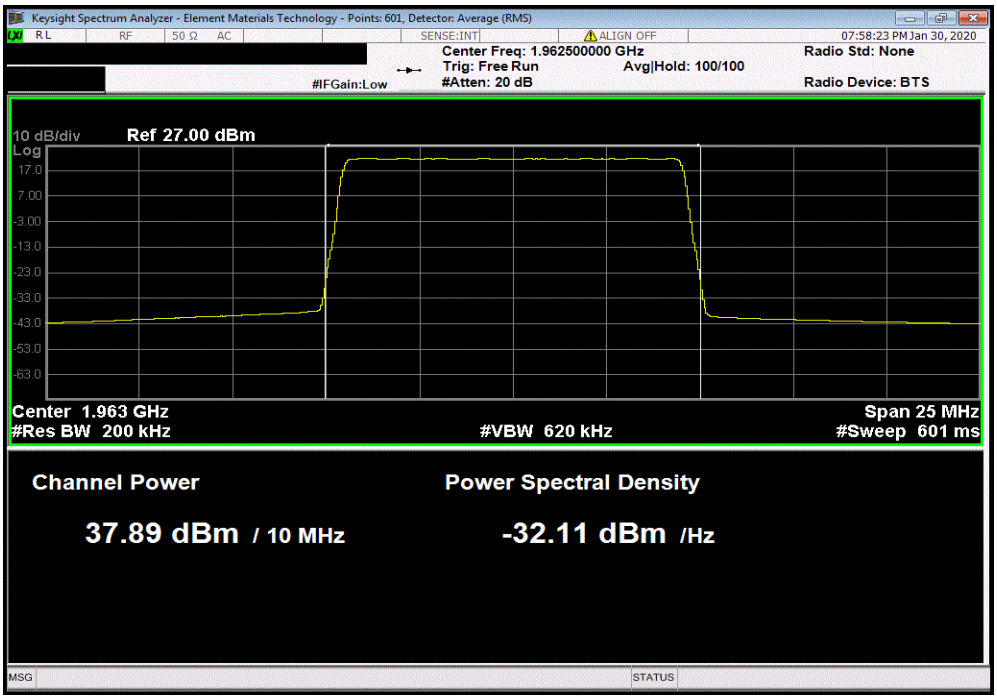


Band 25 (Single Carrier) Port 2, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.828	0	Not Provided	37.8	N/A	N/A

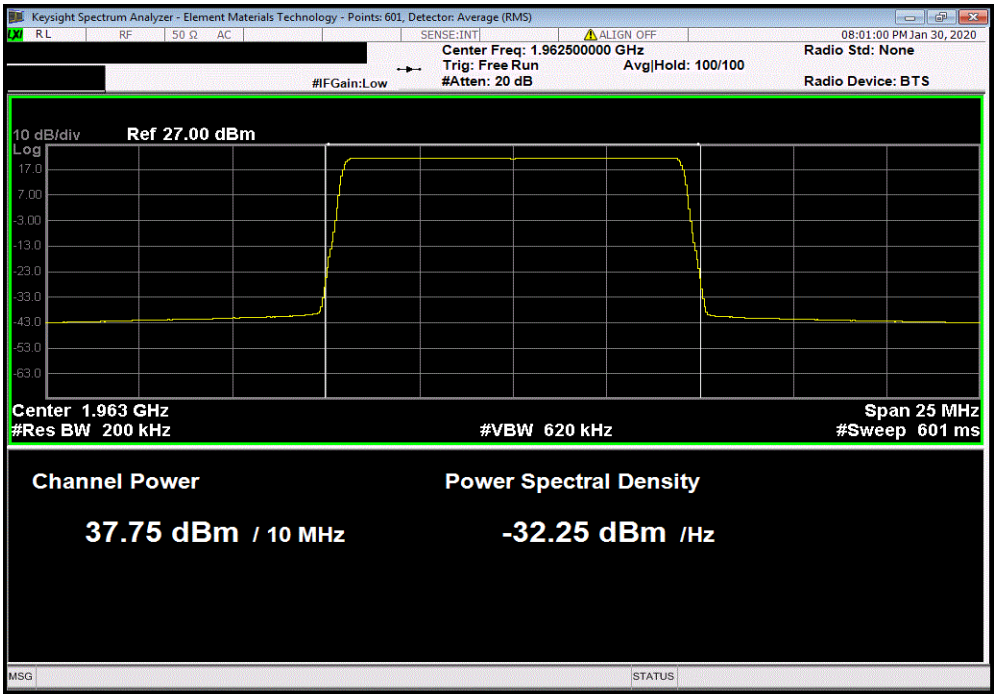


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 3, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.889	0	Not Provided	37.9	N/A	N/A

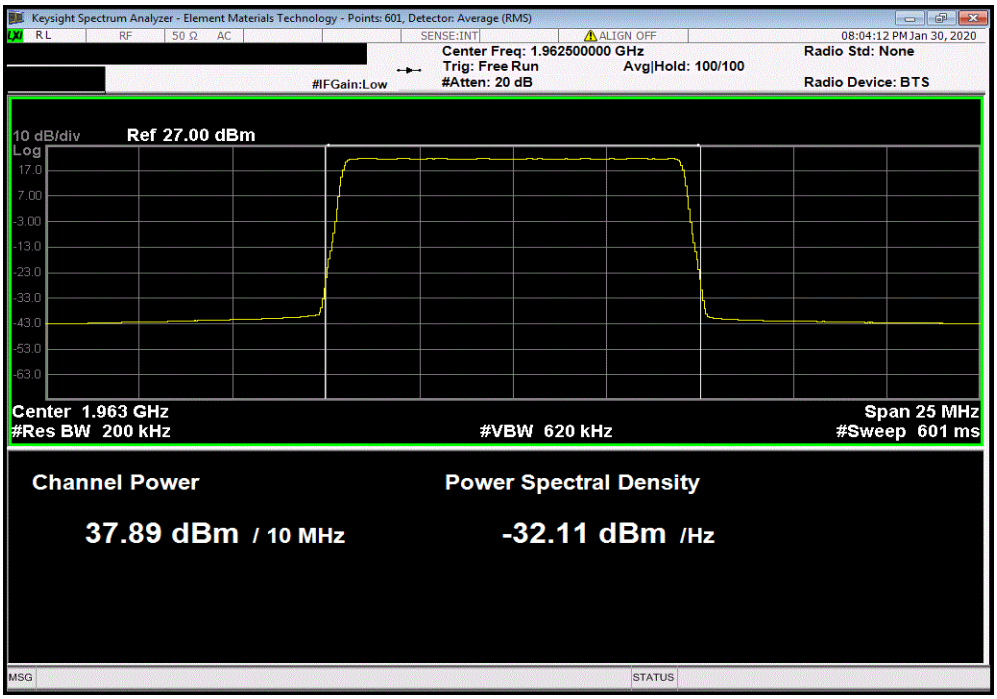


Band 25 (Single Carrier) Port 4, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.753	0	Not Provided	37.8	N/A	N/A

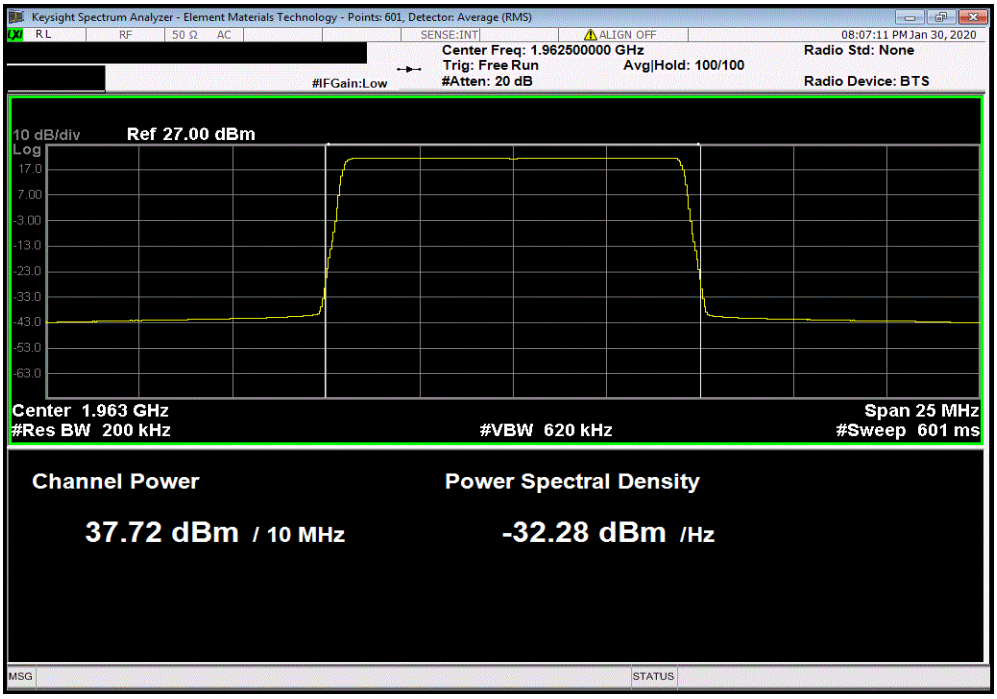


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 5, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.889	0	Not Provided	37.9	N/A	N/A

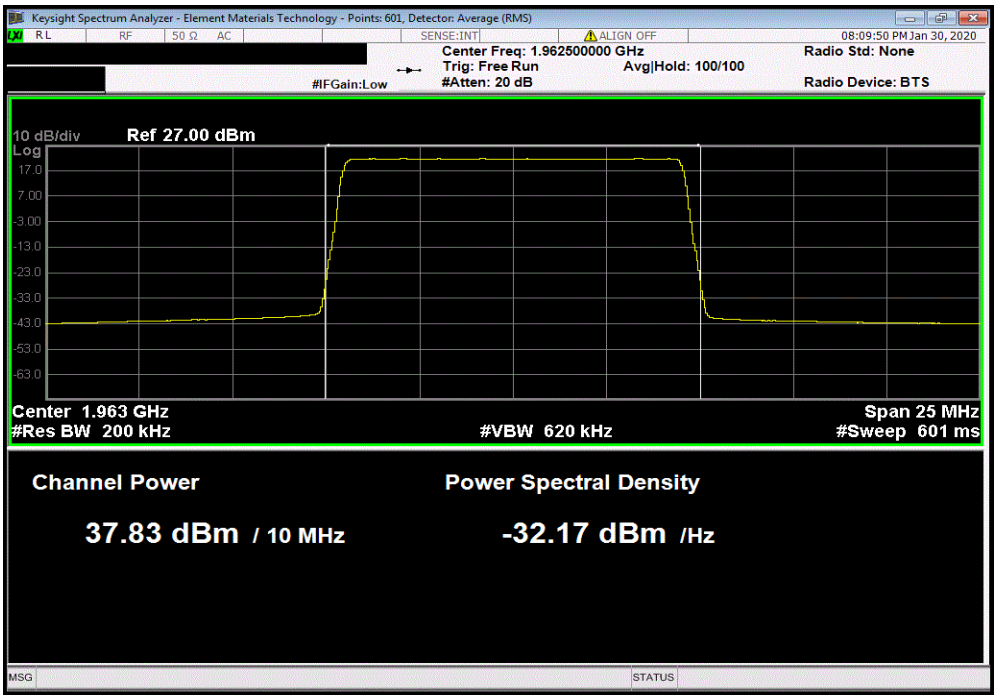


Band 25 (Single Carrier) Port 6, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.724	0	Not Provided	37.7	N/A	N/A

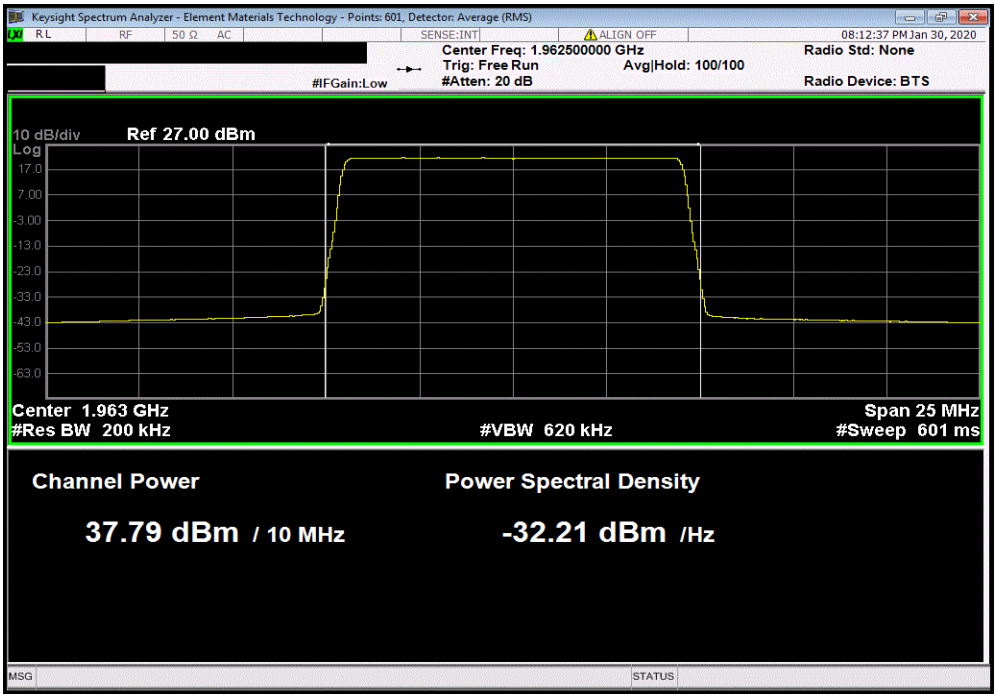


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 7, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.83	0	Not Provided	37.8	N/A	N/A

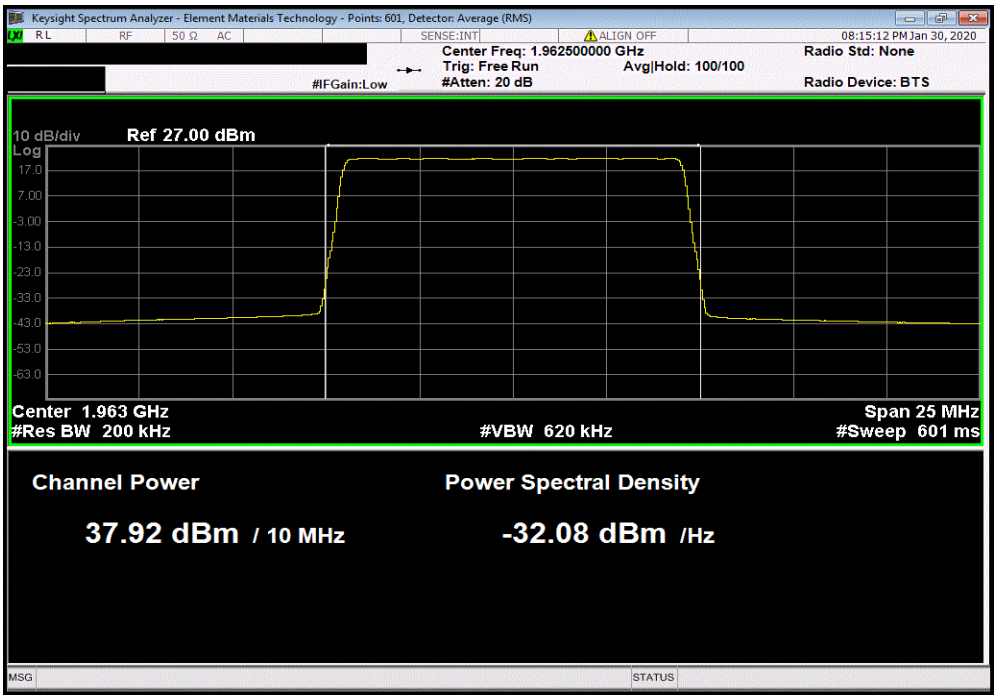


Band 25 (Single Carrier) Port 8, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.79	0	Not Provided	37.8	N/A	N/A

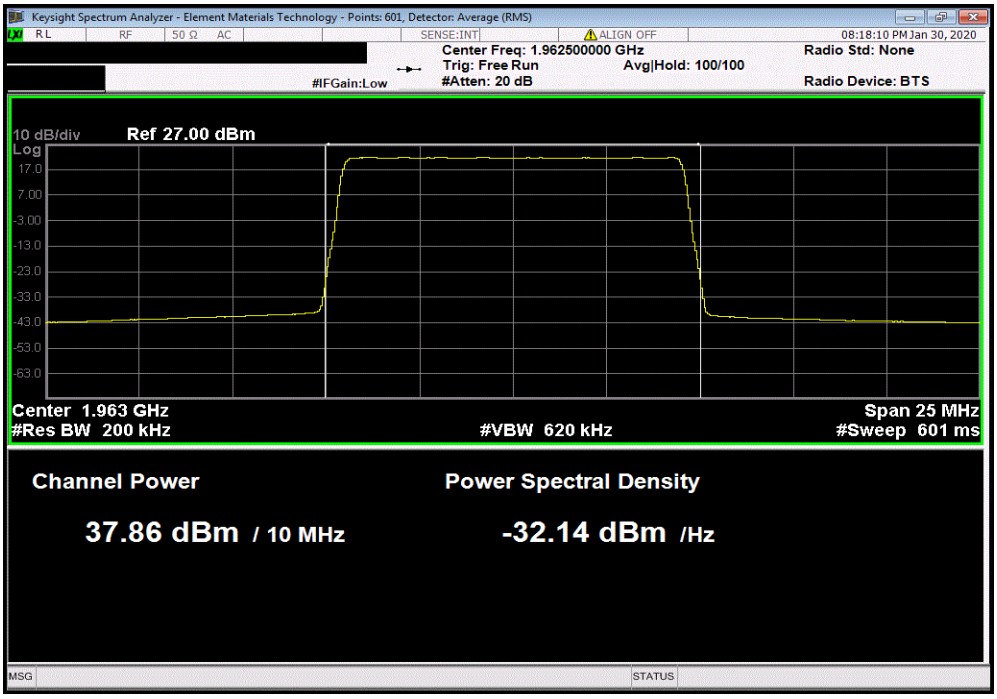


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 9, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.923	0	Not Provided	37.9	N/A	N/A

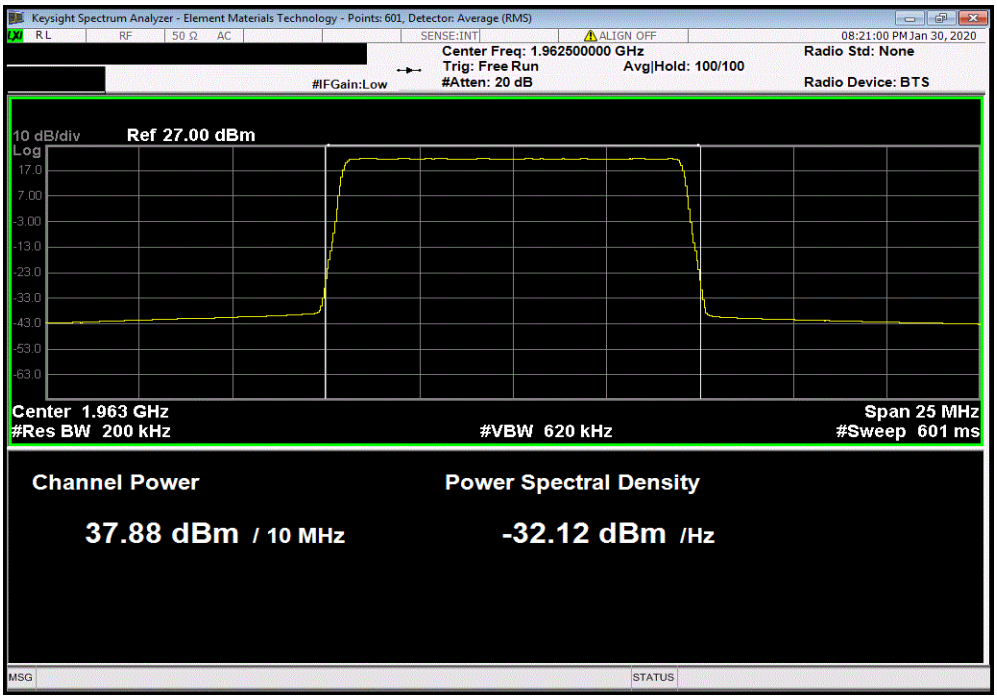


Band 25 (Single Carrier) Port 10, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.865	0	Not Provided	37.9	N/A	N/A

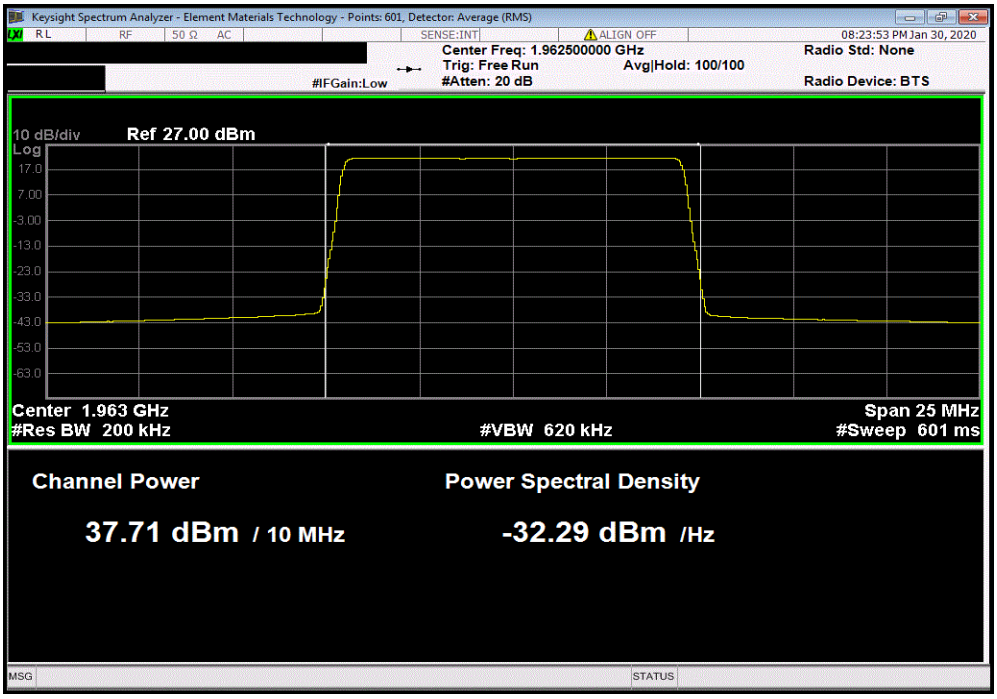


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 11, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.877	0	Not Provided	37.9	N/A	N/A

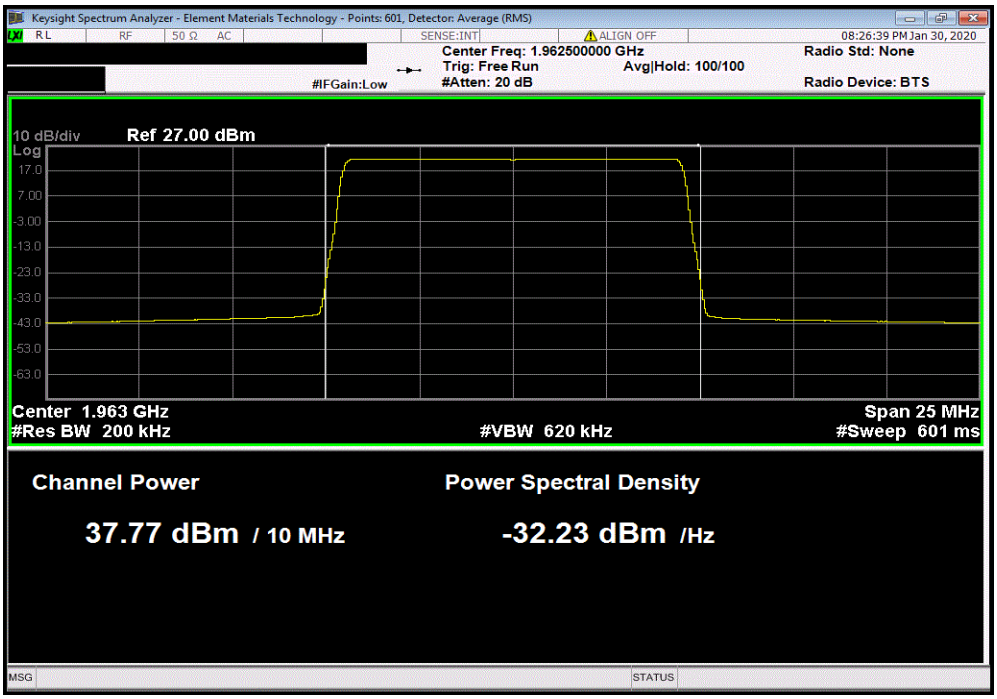


Band 25 (Single Carrier) Port 12, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.711	0	Not Provided	37.7	N/A	N/A

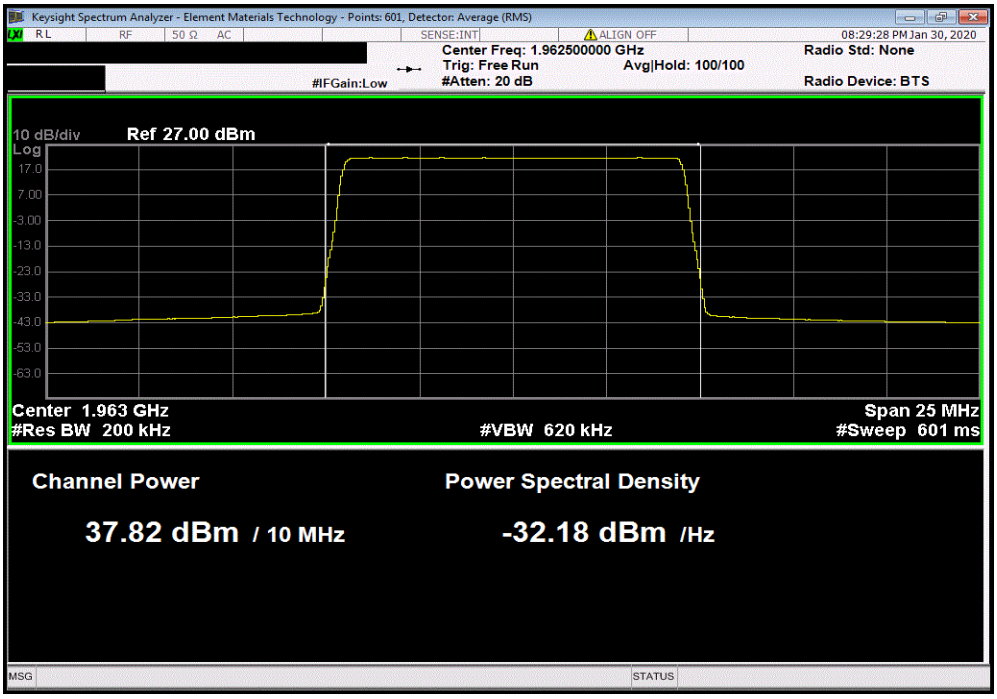


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 13, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.766	0	Not Provided	37.8	N/A	N/A

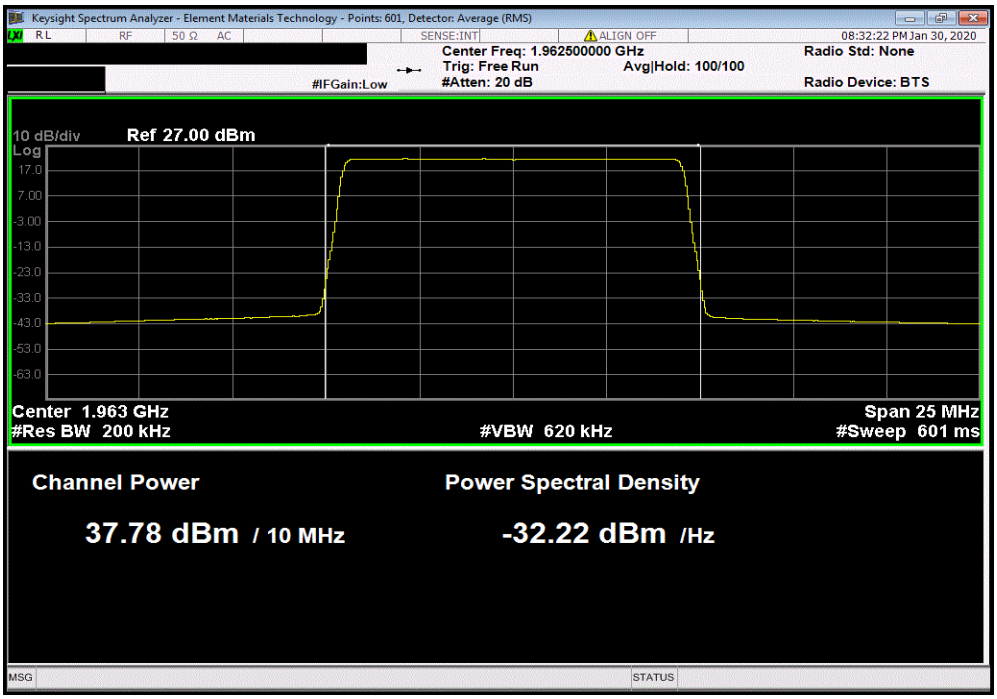


Band 25 (Single Carrier) Port 14, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.82	0	Not Provided	37.8	N/A	N/A

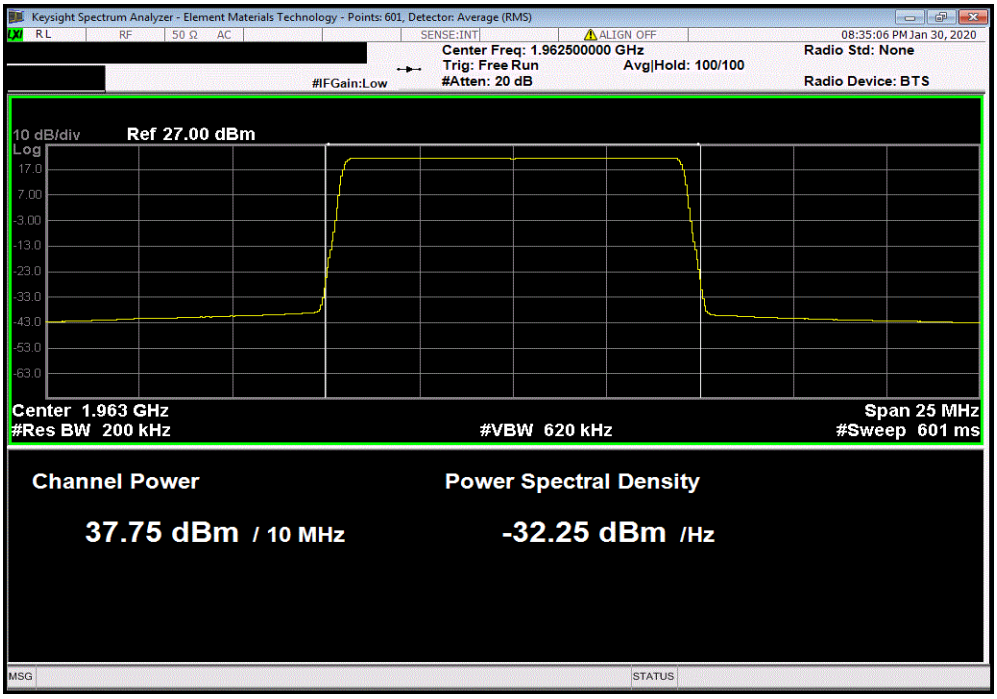


OUTPUT POWER (WORST CASE PORT)

Band 25 (Single Carrier) Port 15, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.775	0	Not Provided	37.8	N/A	N/A



Band 25 (Single Carrier) Port 16, 10 MHz, 256QAM, Mid Channel, 1962.5 MHz						
	Initial Power (dBm/OBW)	Duty Cycle Factor (dB)	Antenna Gain (dBi)	Final w/o Ant Gain Value (dBm/OBW)	Limit (dBm)	Results
	37.748	0	Not Provided	37.7	N/A	N/A



PEAK TO AVERAGE POWER (CCDF)

XMit 2019.09.05

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

TEST EQUIPMENT

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

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.
The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC part 24.232(d) and RSS 133 6.4, the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.

PEAK TO AVERAGE POWER (CCDF)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**AAFB**			**Work Order:**	**NOKI0005**
Serial Number:	**YK190400217**			**Date:**	**31-Jan-20**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**23.6 °C**
Attendees:	**Mitch Hill, John Rattanavong**			**Humidity:**	**39.6% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Willie Love, Brandon Hobbs**	**Power:**	**54VDC**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 24E:2020	ANSI C63.26:2015
RSS-133:2018	RSS-Gen:2019

COMMENTS

All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel found elsewhere in the report.

DEVIATIONS FROM TEST STANDARD

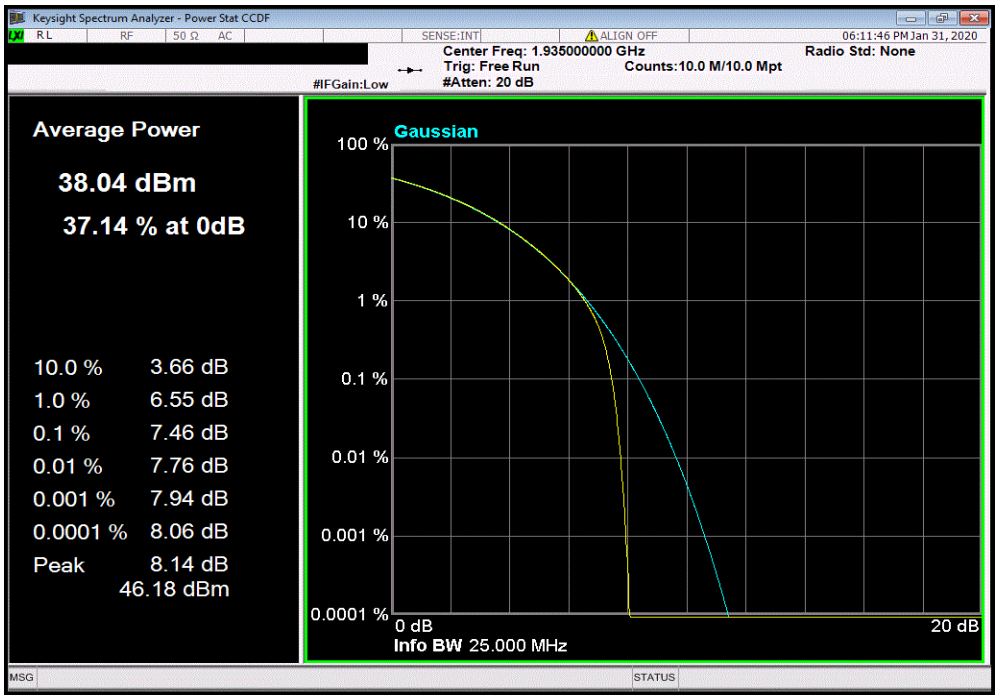
None

Configuration #	**1**	*Signature*

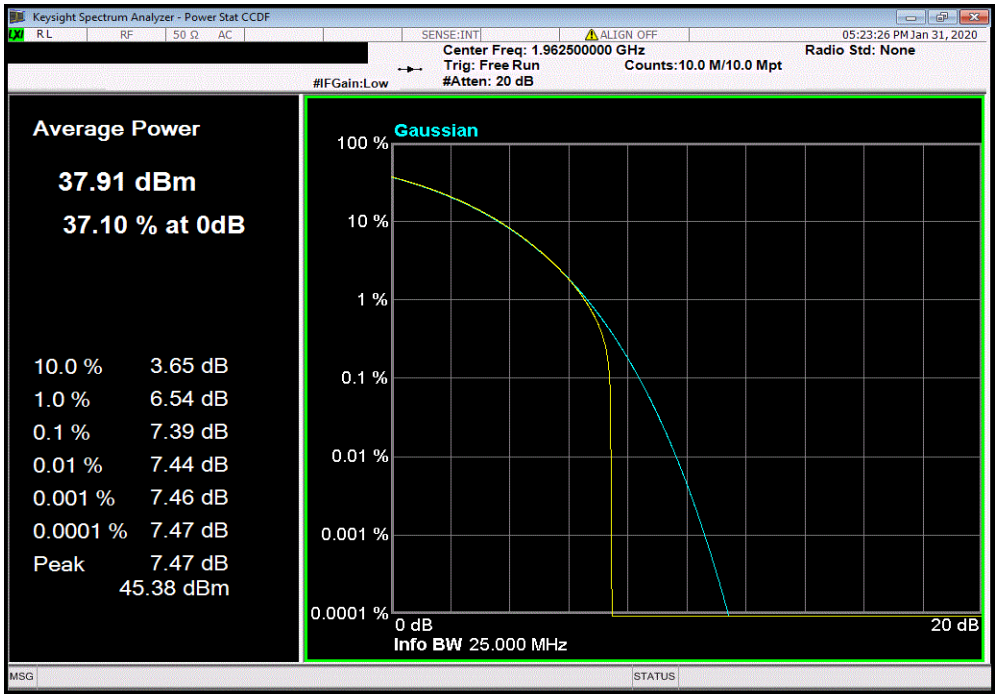
			PAPR Value (dB)	**PAPR Limit (dB)**	**Results**
Band 25 (Single Carrier) Port 1					
10 MHz					
	NB-IoT				
		Low Channel, 1935 MHz	7.46	13	Pass
		Mid Channel, 1962.5 MHz	7.39	13	Pass
		High Channel, 1990.0 MHz	7.39	13	Pass
15 MHz					
	NB-IoT				
		Low Channel, 1937.5 MHz	7.48	13	Pass
		Mid Channel, 1962.5 MHz	7.35	13	Pass
		High Channel, 1987.5 MHz	7.35	13	Pass
20 MHz					
	NB-IoT				
		Low Channel, 1940 MHz	7.47	13	Pass
		Mid Channel, 1962.5 MHz	7.22	13	Pass
		High Channel, 1985 MHz	7.25	13	Pass

PEAK TO AVERAGE POWER (CCDF)

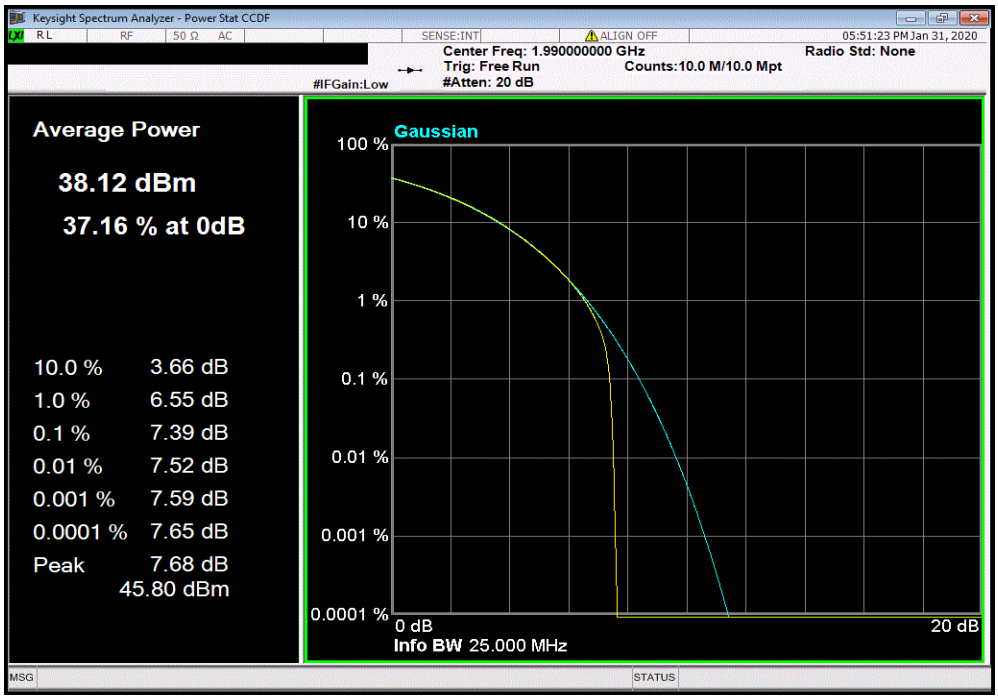
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.46	13	Pass



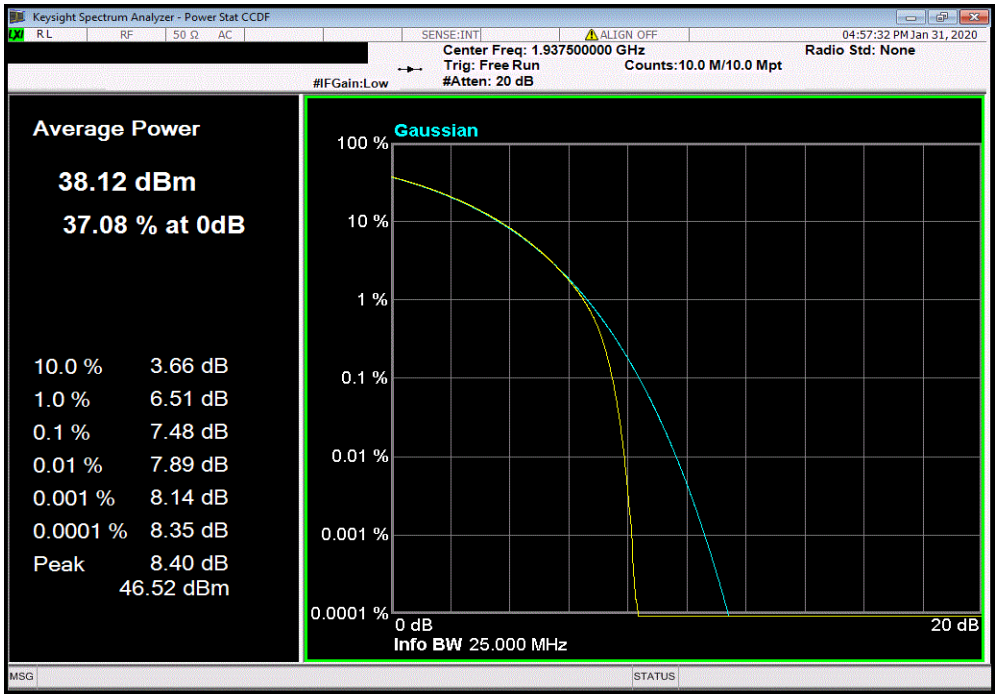
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.39	13	Pass



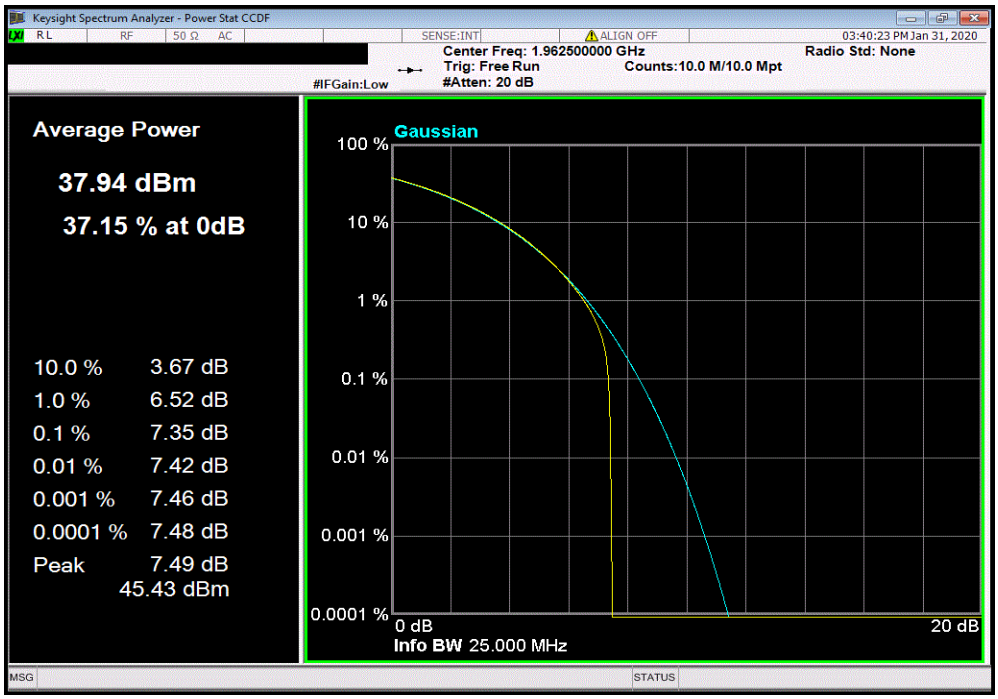
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990.0 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.39	13	Pass



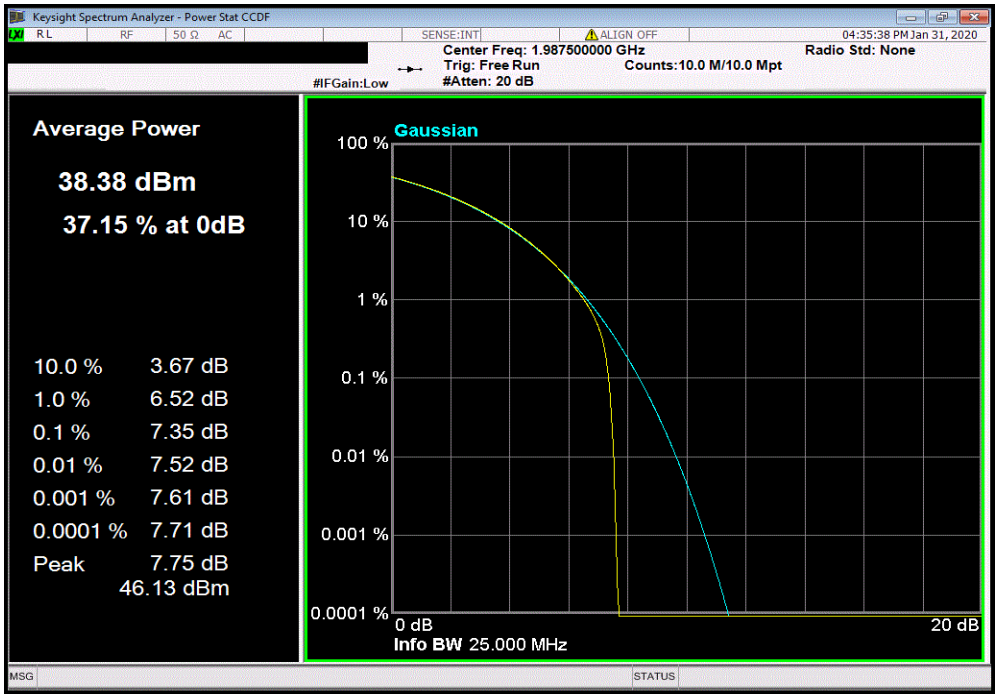
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Low Channel, 1937.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.48	13	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.35	13	Pass

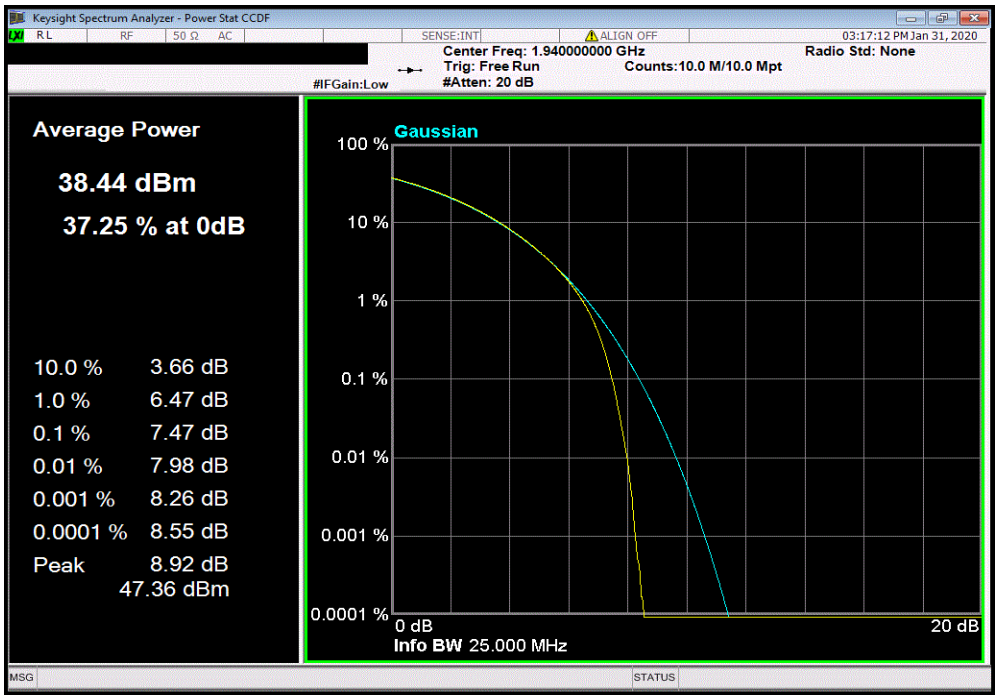


Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1987.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.35	13	Pass

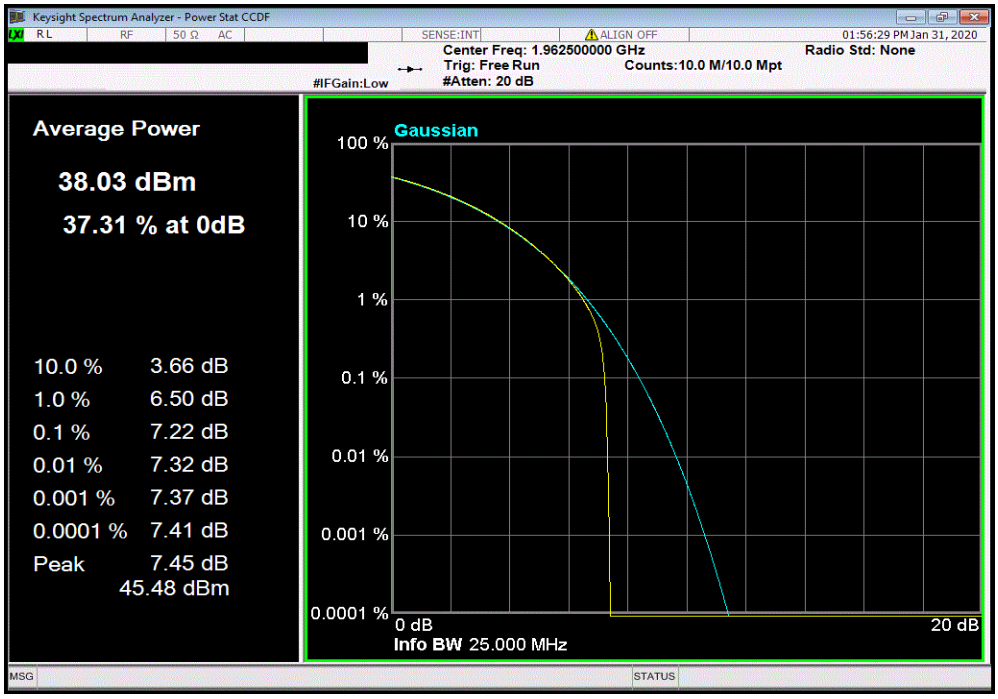


PEAK TO AVERAGE POWER (CCDF)

Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1940 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.47	13	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.22	13	Pass



PEAK TO AVERAGE POWER (CCDF)

Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1985 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				7.25	13	Pass