

Global Product Compliance Laboratory
600-700 Mountain Avenue
Room 5B-108
Murray Hill, New Jersey 07974-0636 USA



TESTING
NVLAP LAB CODE: 100275-0

Title 47 Code of Federal Regulations Test Report

Regulation:

Title 47 CFR FCC Part 96
Spectrum Allocation Server Test
WINNF-TS-0122 V1.0.2

Client:

Nokia Solutions and Networks, OY

Product Evaluated:

AWPQY/Z – CBRS SAS with DP (BBU)

Report Number:

TR2022-0151-FCC96

Date Issued:

1/27/2023

This report shall not be reproduced, in whole or in part without the approval of Nokia Global Product Compliance Laboratory. This report must not be used by the recipient to claim product endorsement by NVLAP, NIST, or any agency of the U.S. government.

Table of Contents

1. SYSTEM INFORMATION AND REQUIREMENTS	5
1.1 INTRODUCTION	6
1.2 PURPOSE AND SCOPE	6
1.3 EUT DESCRIPTION	6
1.3.1 Specifications	7
1.3.2 Photographs	7
1.4 TEST RATIONALE	9
1.4.1 Test Requirements	10
1.5 REFERENCE DOCUMENTS, TEST STANDARDS & PROCEDURES	10
1.5.1 Reference Documents	10
1.5.2 Test Standards	10
1.5.3 Test Procedures	11
1.5.4 Measurement Uncertainty	11
1.6 PRODUCT EQUIPAGE	11
1.6.1 System Interconnect Block Diagram	11
1.7 EXECUTIVE SUMMARY	12
2. DETAILED RESULTS	12
2.1 CBSD REGISTRATION PROCESS	12
2.1.1 WINNF.FT.D.REG.2 (C1)	12
2.1.2 WINNF.FT.D.REG.4 (C2)	12
2.1.3 WINNF.FT.D.REG.6 (C3)	13
2.1.4 WINNF.FT.C.REG.7 (C6)	13
2.1.5 WINNF.FT.D.REG.9 (M)	13
2.1.6 WINNF.FT.D.REG.11 (M)	13
2.1.7 WINNF.FT.D.REG.13 (M)	13
2.1.8 WINNF.FT.D.REG.15 (M)	13
2.1.9 WINNF.FT.D.REG.17 (M)	13
2.1.10 WINNF.FT.D.REG.19 (M)	13
2.1.11 WINNF.FT.C.REG.20 (C2)	13
2.2 CBSD SPECTRUM INQUIRY PROCESS	13
2.2.1 Successful response from SAS Test Harness	13
2.3 CBSD SPECTRUM GRANT PROCESS	14
2.3.1 WINNF.FT.C.GRA.1	14
2.3.2 WINNF.FT.C.GRA.2	14
2.4 CBSD HEART BEAT PROCESS	14
2.4.1 WINNF.FT.D.HBT.2	14
2.4.2 WINNF.FT.C.HBT.3	14
2.4.3 WINNF.FT.C.HBT.5	14
2.4.4 WINNF.FT.C.HBT.6	14
2.4.5 WINNF.FT.C.HBT.7	14
2.4.6 WINNF.FT.D.HBT.8	14
2.4.7 WINNF.FT.C.HBT.9	15
2.4.8 WINNF.FT.C.HBT.10	15

2.4.9	WINNF.FT.C.HBT.11.....	15
2.5	CBSD MEASUREMENT REPORT	15
2.5.1	WINNF.FT.D.MES.2.....	15
2.5.2	WINNF.FT.C.MES.3.....	15
2.5.3	WINNF.FT.D.MES.5.....	15
2.6	CBSD RELINQUISHMENT PROCESS.....	16
2.6.1	WINNF.FT.D.RLQ.2.....	16
2.6.2	WINNF.FT.D.RLQ.4.....	16
2.6.3	WINNF.FT.D.RLQ.6.....	16
2.7	CBSD DEREGISTRATION PROCESS	16
2.7.1	WINNF.FT.C.DRG.2.....	16
2.7.2	WINNF.FT.D.DRG.4	16
2.7.3	WINNF.FT.C.DRG.5.....	16
2.8	CBSD SECURITY VALIDATION	17
2.8.1	WINNF.FT.C.SCS.1.....	17
2.8.2	WINNF.FT.C.SCS.2.....	17
2.8.3	WINNF.FT.C.SCS.3.....	17
2.8.4	WINNF.FT.C.SCS.4.....	17
2.8.5	WINNF.FT.C.SCS.5.....	17
2.8.6	WINNF.PT.C.HBT – Pmax (20 dBm, AG=6.0 dBi)	18
2.8.7	WINNF.PT.C.HBT – Pmax (17 dBm, AG=6.0 dBi)	19
2.8.8	WINNF.PT.C.HBT – Pmax (17 dBm, AG=4.0 dBi)	20
3.	TEST EQUIPMENT	21
3.1.1	Test Equipment	21
3.1.2	Laboratory Environmental Conditions.....	21
4.	NVLAP ACCREDITATION	22

Revisions

Date	Revision	Section	Change
1/27/2023	0		Initial Release

Nokia Global Product Compliance Laboratories is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP®) for specific services, listed on the Scope of Accreditation, for: Electromagnetic Compatibility and Telecommunications. This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009). NVLAP LAB CODE: 100275-0.

Nokia Global Product Compliance Laboratory represents to the client that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

Prepared By:

Approved By:

Signed:



1/27/2023

Steve Gordon
Radio Engineer
Steve.gordon@nokia-bell-labs.com

Signed:



1/27/2023

Raymond Johnson
Technical Manager
NVLAP Signatory
ray.johnson@nokia-bell-labs.com

1. System Information and Requirements

Equipment Under Test:	AWPQY/Z – CBRS SAS with DP (BBU), Model 476101A.X21
Serial Number:	AirScale BBU: ABIO – 475266A.M04, SN: L1215008346; ASIB 473764A.M02 SN: L1201707731 AWPQZ: EB2234R0609; EB2234R0614
GPCL Project Number:	2022-0151
FCC ID:	FCC ID: 2AD8UAWPQYAWPQZ01
Company:	Nokia Solutions and Networks, OY KARAKAARI 7, FI-02610 ESPOO FINLAND
AWPQY/BBU DP Software Version:	SBTS23R2
Frequency Range:	3550 - 3700 MHz
Applicant:	Nokia Solutions and Networks, OY 2000 Lucent Lane Naperville, IL 60563, USA Lee Klinkenborg
Test Requirement(s):	Title 47 CFR FCC Part 96 CBRSA-TS-9001-V1.0.0 WINNF-TS-0122 V1.0.2
Test Standard(s):	Refer to Section 1.5.2
Test Procedure(s):	Refer to Section 1.5.3
Test Type:	CBRS Alliance OnGo certification/FCC Winnforum Testing
Test Date(s):	January 5 thru 27, 2023
Test Performed By:	Nokia Bell Labs Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636
Product Engineer(s):	Ronald Remy
Test Engineer (s):	Raymond Johnson, Jaideep Yadav, Steve Gordon
Test Results: The EUT, <i>as tested</i> met the above listed Test Requirements. The decision rule employed is binary (Pass/Fail) based on the measured values without accounting for Measurement Uncertainty or any Guard Band. The measured values obtained during testing were compared to a value given in the referenced regulation or normative standard. Report copies and other information not contained in this report are held by either the product engineer or in an identified file at the Global Product Compliance Laboratory in New Providence, NJ.	

1.1 Introduction

This Spectrum Access Server (SAS) Conformity Assessment Report applies to the **AirScale Indoor pico RRH 4T4R n48 AWPQY/Z** with Long Term Evolution (LTE) and 5G New Radio (5G-NR) Technology, hereinafter referred to as the Equipment Under Test (EUT) or the Citizens Broadband Radio Service Device (CBSD).

The Nokia AWPQY/Z is a 4 port radio head that transmits 0.25 Watts per port over the B48/n48 spectrum (3550 – 3700 MHz). This product supports LTE 10MHz, 20 MHz single carriers, and 10+10 MHz dual carrier. It also supports 5G-NR 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz single carriers and 20+100 MHz & 50+100 MHz dual carrier. The product utilizes QPSK, 16QAM, 64QAM and 256QAM modulation formats.

This report documents the digital interface conformance and operational interaction between the SAS and the CBSD (AWPQZ with DP). The specific test requirements have been defined in FCC KDB documents and WinnForum Standards™.

1.2 Purpose and Scope

The purpose of this document is to documents the digital interface conformance and operational interaction between the SAS and the CBSD.

This test data is required for qualifying the EUT CBSD in compliance with FCC Part 96 requirements for certification under FCC Part 2, measured in accordance with the procedures set out in Section 2.1033 (c) (14) of the Rules. The AWPQY/Z is being under FCC ID: 2AD8UAWPQYAWPQZ01. This testing is necessary due to the software changes to the product for 5G operation with the Nokia Centralized Domain Proxy (NCDP).

The software version for the LTE and 5G operation is SBTS23R2.

The testing that is reported herein represents the mandatory CBSD – SAS test cases identified in the Winnforum specification for FCC Certification and for OnGo Alliance Certification.

1.3 EUT Description

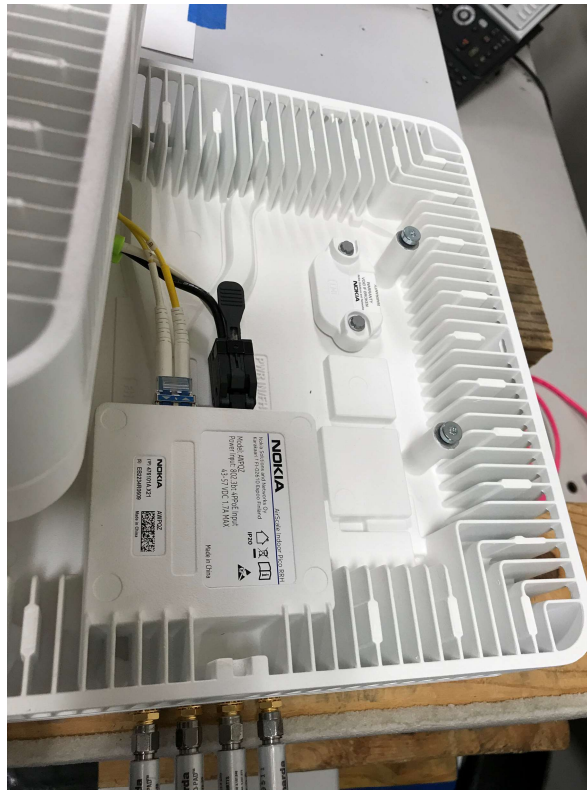
The **AirScale Indoor pico RRH 4T4R n48 AWPQY/Z** is a RRH that consists of a LTE (Long Term Evolution)/5G-NR RF TDD transceiver with 4 transmit/receive ports.

The RRH specifications are as follows:

1.3.1 Specifications

Specification	3GPP/FCC 5G-NR and LTE compliant, TDD
Frequency range	3550 - 3700 MHz
Max. supported modulation	QPSK, 16QAM, 64QAM and 256 QAM
Number of TX/RX paths	4T/4R and 2T/2R
Bandwidth	IBW: up to 150MHz; OBW: 150MHz
Capacity	4G BW: 10, 20MHz, 10+10 MHz 5G BW: 20, 30, 40, 50, 60, 70, 80 , 90, 100, 20+100, and 50+100 MHz
Max. output power	0.25W per Tx port 1 W total for 4 ports
Antenna configuration	Configuration: 4 Tx/ 4 Rx AWPQY: Integrated omni AWPQZ: External antenna (SMA female)
Max. Antenna gain	6.0dBi per port for 4T4R or 2T2R MIMO

1.3.2 Photographs



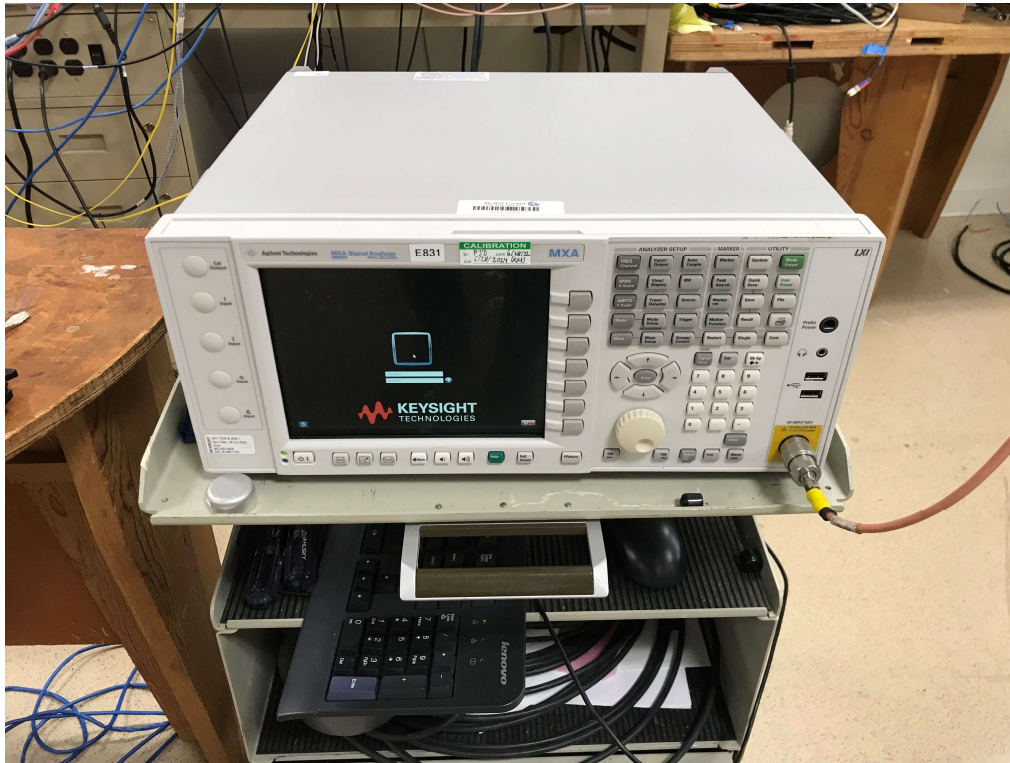
AWPQZ (SN: EB2234R0609)



AWPQZ (SN: EB2234R0614)



AWPQY/Z



MXA Signal Analyzer

1.4 Test Rationale

The SAS testing was focused on the mandatory test cases necessary for FCC certification using the Winforum Specification, and for OnGo Alliance Certification.

The product has two modes of operation that have effect on the conducted power. For the purposes of the CBSD RF Power Measurement, a single port was measured with the product configured for 4 port transmit and with an antenna gain of 6.0 dBi so that maximum conducted power could be used to obtain the measured value to compare to the 30 dBm/10MHz Part 96 limit for Category A CBSD.

1.4.1 Test Requirements

The test requirements are described in CFR47 Part 2 and WInnForum Standards™. Each required measurement is listed below:

WINNF-TS-0122	Paragraph 6.1	CBSD Registration Process
WINNF-TS-0122	Paragraph 6.2	CBSD Spectrum Inquiry Process
WINNF-TS-0122	Paragraph 6.3	CBSD Spectrum Grant Process
WINNF-TS-0122	Paragraph 6.4	CBSD Heart Beat Process
WINNF-TS-0122	Paragraph 6.5	CBSD Measurement Report
WINNF-TS-0122	Paragraph 6.6	CBSD Relinquishment Process
WINNF-TS-0122	Paragraph 6.7	CBSD Deregistration Process
WINNF-TS-0122	Paragraph 6.8	CBSD Security Validation
WINNF-TS-0122	Paragraph 7	SAS-CBSD/DP Interface Performance Test Specifications
WINNF-TS-0122	Paragraph 7.1	CBSD RF Power Measurement

1.5 Reference Documents, Test Standards & Procedures

A list of the applicable documents is provided herein.

1.5.1 Reference Documents

A list of the applicable documents is provided herein:

- 3GPP TS 36.104 (2019-12), “Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception”, Version 16.4.0 Release 16.
- 3GPP TS 38.141-2 (2019-12), “NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing.” Version 15.4.0 Release 15

1.5.2 Test Standards

- Code of Federal Regulations 47, Federal Communications Commission Part 96.
- 47 CFR FCC Part 96 Subpart E – Citizens Broadband Radio Services
- KDB 940660 D01 (Current Version) – Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized under Part 96 of The Rules, DR01
- KDB 971168 D01 (Current Version) - Measurement Guidance for Certification of Licensed Digital Transmitters
- CBRS-TS-9001-V1.0.0, CBRS Alliance Certification Test Plan

- WINNF-TS-0122, Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT), Version V1.0.2, 25 November 2020
- ANSI C63.26 (2015) entitled: “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services”, American National Standards Institute, Institute of Electrical and Electronic Engineers, Inc., New York, NY 10017-2394, USA.

1.5.3 Test Procedures

- GPCL Procedure FCC-IC-OB, Power measurement, Occupied Bandwidth, & Modulation Test Procedure
- GPCL Procedure FCC-WINN-SAS, Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT) Test Procedure

1.5.4 Measurement Uncertainty

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Table below. These are the worst-case values.

Worst-Case Estimated Measurement Uncertainties

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, (<i>e.g.</i> , ANSI C63.4, C63.26, CISPR 11, 14, 22, <i>etc.</i> , using ESHS 30, AR-6 Semi-Anechoic Chamber	Conducted Emissions	10 – 10,000	±3.5 dB

1.6 Product Equipage

1.6.1 System Interconnect Block Diagram

The EUT was configured as in a normal installation and intended operation.

1.7 Executive Summary

RESULTS:

1. **COMPLIES** - Passed all applicable tests.
2. **N/A** – Not Applicable.
3. **NT** – Not Tested.

WINNF-TS-0122 Section	Description	Date Tested	Result	Comment
6.1	CBSD Registration Process	1/6, 1/2/2023	Pass	
6.2	CBSD Spectrum Inquiry Process	1/18/2023	Pass	
6.3	CBSD Spectrum Grant Process	1/12, 1/18/2023	Pass	
6.4	CBSD Heart Beat Process	1/20/2023	Pass	
6.5	CBSD Measurement Report	NT	N/A	No Mandatory Test Cases
6.6	CBSD Relinquishment Process	1/24/2023	Pass	
6.7	CBSD Deregistration Process	1/24/2023	Pass	
6.8	CBSD Security Validation	1/26/2023	Pass	
7.1	CBSD RF Power Measurement	1/25, 1/26/2023	Pass	

2. Detailed Results

The results of the individual test cases are detailed in below. Documentation of specific data items follow.

2.1 CBSD Registration Process

2.1.1 WINNF.FT.D.REG.2 (C1)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Multi-Step registration	NT	N/A	C1

2.1.2 WINNF.FT.D.REG.4 (C2)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Single-Step registration for Category A CBSD	NT	N/A	C2 – Not required for certification

2.1.3 WINNF.FT.D.REG.6 (C3)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Single-Step registration for CBSD with CPI signed data	NT	N/A	C3 – Not required for certification

2.1.4 WINNF.FT.C.REG.7 (C6)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Registration due to change of an installation parameter	NT	N/A	C6 – Not required for certification

2.1.5 WINNF.FT.D.REG.9 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Missing Required parameters (responseCode 102)	P	winnf.ft.d.reg.9 2023-01-06T00.56.13Z	

2.1.6 WINNF.FT.D.REG.11 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Pending registration (responseCode 200)	P	winnf.ft.d.reg.11 2023-01-06T01.02.21Z	

2.1.7 WINNF.FT.D.REG.13 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Invalid parameter (responseCode 103)	P	winnf.ft.d.reg.13 2023-01-12T17.04.02Z	

2.1.8 WINNF.FT.D.REG.15 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Blacklisted CBSD (responseCode 101)	P	winnf.ft.d.reg.15 2023-01-12T17.47.28Z	

2.1.9 WINNF.FT.D.REG.17 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsupported SAS protocol version (responseCode 100)	P	winnf.ft.d.reg.17 2023-01-06T01.41.32Z	

2.1.10 WINNF.FT.D.REG.19 (M)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Group Error (responseCode 201)	P	winnf.ft.d.reg.19 2023-01-12T18.16.39Z	

2.1.11 WINNF.FT.C.REG.20 (C2)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Category A CBSD location update	NT	N/A	C2 – Not required for certification

2.2 CBSD Spectrum Inquiry Process**2.2.1 Successful response from SAS Test Harness**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful response from SAS Test Harness (6.2.4.1)	P	Refer to WINNF.FT.D.HBT.2	

2.3 CBSD Spectrum Grant Process**2.3.1 WINNF.FT.C.GRA.1**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsuccessful Grant responseCode=400 (INTERFERENCE)	P	winnf.ft.c.gra.1_2023-01-12T18.52.09Z	

2.3.2 WINNF.FT.C.GRA.2

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	P	winnf.ft.c.gra.2_2023-01-18T15.00.51Z	

2.4 CBSD Heart Beat Process**2.4.1 WINNF.FT.D.HBT.2**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Success Case (first Heartbeat Response)	P	winnf.ft.d.hbt.2_2023-01-18T19.57.25Z	

2.4.2 WINNF.FT.C.HBT.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=105 (DEREGISTER)	P	winnf.ft.c.hbt.3_2023-01-20T15.23.40Z	

2.4.3 WINNF.FT.C.HBT.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	P	winnf.ft.c.hbt.5_2023-01-20T15.40.36Z	

2.4.4 WINNF.FT.C.HBT.6

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	P	winnf.ft.c.hbt.6_2023-01-20T16.19.23Z	

2.4.5 WINNF.FT.C.HBT.7

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	P	winnf.ft.c.hbt.7_2023-01-20T17.01.05Z	

2.4.6 WINNF.FT.D.HBT.8

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	P	winnf.ft.d.hbt.8_2023-01-23T16.44.11Z	

2.4.7 WINNF.FT.C.HBT.9

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Response Absent (First Heartbeat)	P	winnf.ft.c.hbt.9_2023-01-20T17.41.13Z	

2.4.8 WINNF.FT.C.HBT.10

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Response Absent (Subsequent Heartbeat)	P	winnf.ft.c.hbt.10_2023-01-20T19.36.42Z	

2.4.9 WINNF.FT.C.HBT.11

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful Grant Renewal in Heartbeat Test Case	NT	N/A	O – Not required for certification

2.5 CBSD Measurement Report**2.5.1 WINNF.FT.D.MES.2**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Registration Response contains measReportConfig	NT	N/A	O – Not required for certification

2.5.2 WINNF.FT.C.MES.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Grant Response contains measReportConfig	NT	N/A	O – Not required for certification

2.5.3 WINNF.FT.D.MES.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Response contains measReportConfig	NT	N/A	O – Not required for certification

2.6 CBSD Relinquishment Process**2.6.1 WINNF.FT.D.RLQ.2**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful Relinquishment	P	winnf.ft.d.rlq.2_2023-01-24T16.18.58Z	

2.6.2 WINNF.FT.D.RLQ.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsuccessful Relinquishment, responseCode=102	NT	N/A	O – Not required for certification

2.6.3 WINNF.FT.D.RLQ.6

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsuccessful Relinquishment, responseCode=103	NT	N/A	O – Not required for certification

2.7 CBSD Deregistration Process**2.7.1 WINNF.FT.C.DRG.2**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful Deregistration	NT	winnf.ft.d.drg.2_2023-01-24T15.56.47Z	

2.7.2 WINNF.FT.D.DRG.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Deregistration responseCode=102	NT	N/A	O – Not required for certification

2.7.3 WINNF.FT.C.DRG.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Deregistration responseCode=103	NT	N/A	O – Not required for certification

2.8 CBSD Security Validation

2.8.1 WINNF.FT.C.SCS.1

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful TLS connection between UUT and SAS Test Harness	P	winnf.ft.c.reg.1_2023-01-26T19.19.52Z SCS1 AWQPY SCS1 Wireshark.pcapng	

2.8.2 WINNF.FT.C.SCS.2

Test Case Title	Result P/F / (NT)	Log File Name	Comment
TLS failure due to revoked certificate	P	winnf.ft.c.reg.1_2023-01-26T19.32.45Z SCS2 AWQPY SCS2 crl Wireshark.pcapng	

2.8.3 WINNF.FT.C.SCS.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
TLS failure due to expired server certificate	P	winnf.ft.c.reg.1_2023-01-26T19.43.57Z SCS3 AWQPY SCS3 exp Wireshark..pcapng	

2.8.4 WINNF.FT.C.SCS.4

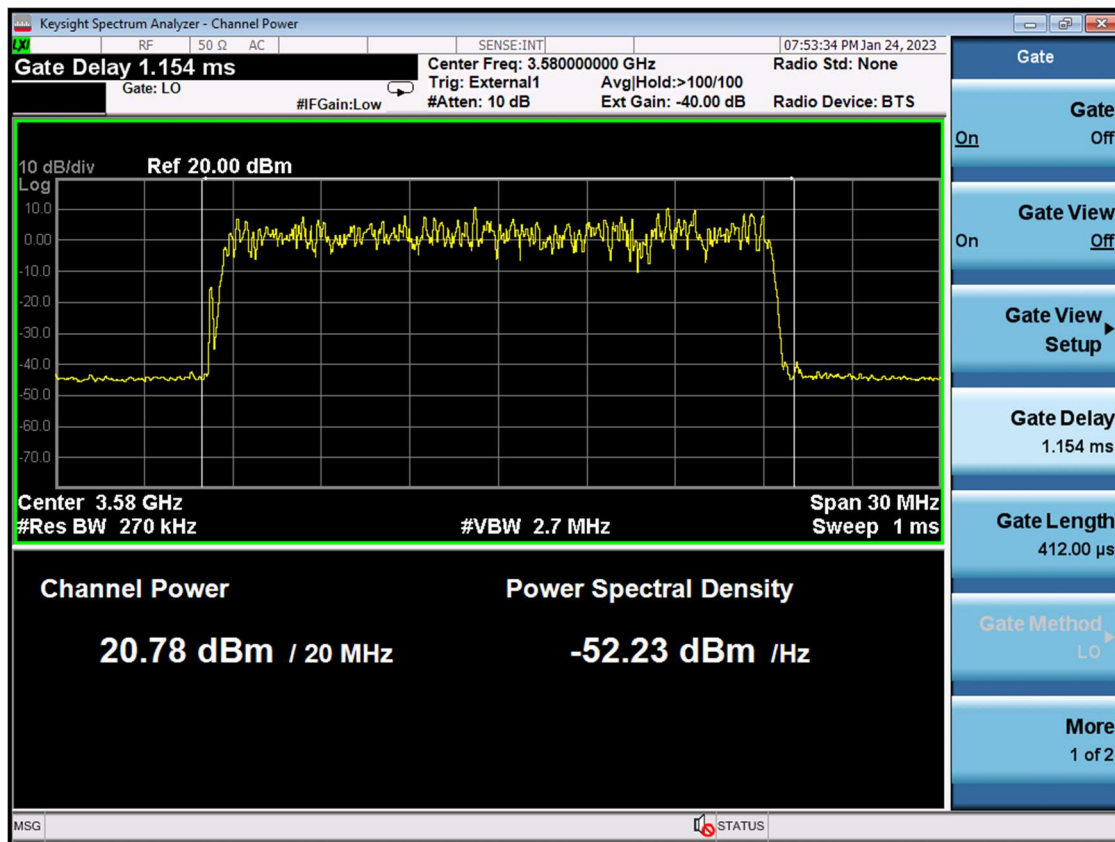
Test Case Title	Result P/F / (NT)	Log File Name	Comment
TLS failure when SAS Test Harness certificate is issue by unknown CA	P	winnf.ft.c.reg.1_2023-01-26T19.53.23Z SCS4 AWQPY SCS4 unknown Wireshark.pcapng	

2.8.5 WINNF.FT.C.SCS.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
TLS failure when certificate at the SAS Test Harness is corrupted	P	winnf.ft.c.reg.1_2023-01-26T20.09.58Z SCS5 AWQPY SCS5 corrupted Wireshark.pcapng	

2.8.6 WINNF.PT.C.HBT – Pmax (20 dBm, AG=6.0 dBi)

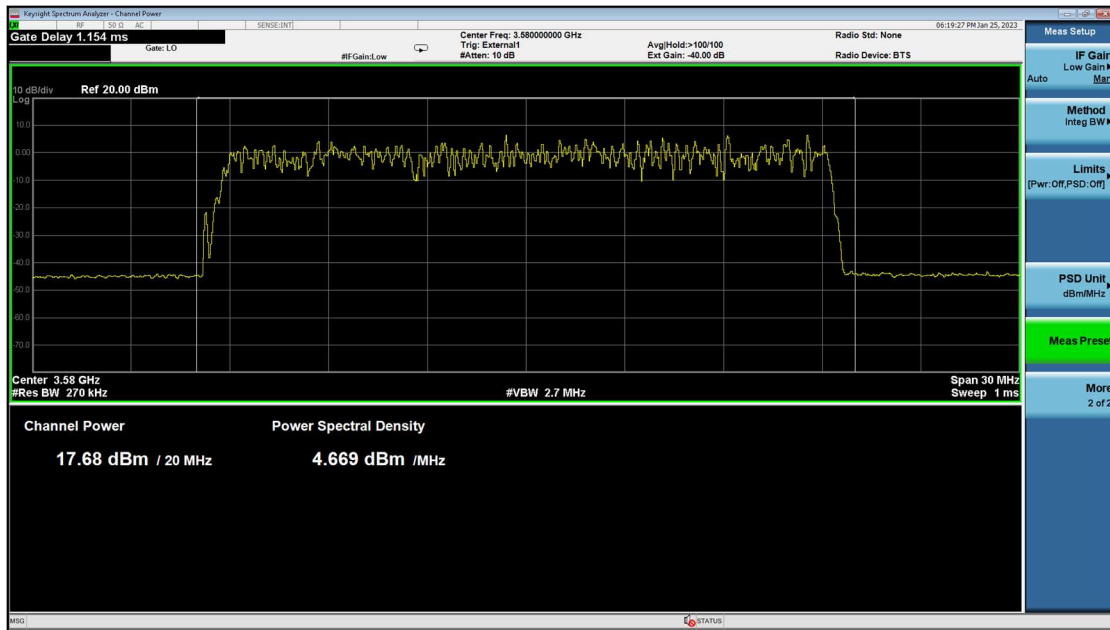
Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2023-01-24T19.39.27Z.log Start Frequency: 3570 MHz Bandwidth: 20 MHz MaxEIRP: 20 dBm/MHz Requested 20 dBm/MHz = 33 dBm/20 MHz = 30 dBm/10MHz Measured 20.78 dBm/20 MHz + 6dBi Gain + 6dB (4 Ports) = 32.78 dBm/20 MHz	TX reading = 20.78 dBm/20 MHz Conducted Power = 20.78 dBm/20MHz/port +10 log(4) (4 Ports) = 26.78 dBm/20MHz Total EIRP 26.78 dBm/20MHz + 6.0 dBi Gain = 32.78 dBm/20MHz EIRP 32.78 dBm/20MHz ≤ 33 dBm/20 MHz Limit - PASS PSD = -52.23 dBm/Hz + 60 dB Hz (convert to MHz) + 6dBi gain + 6.02dB(ports) = 19.79 dBm/MHz ≤ 20 dBm/MHz - PASS Limit-EIRP is 30 dBm/10 MHz = 33 dBm/20 MHz, Limit PSD= 20 dBm/MHz PASS



Pmax 30 dBm Measurement

2.8.7 WINNF.PT.C.HBT – Pmax (17 dBm, AG=6.0 dBi)

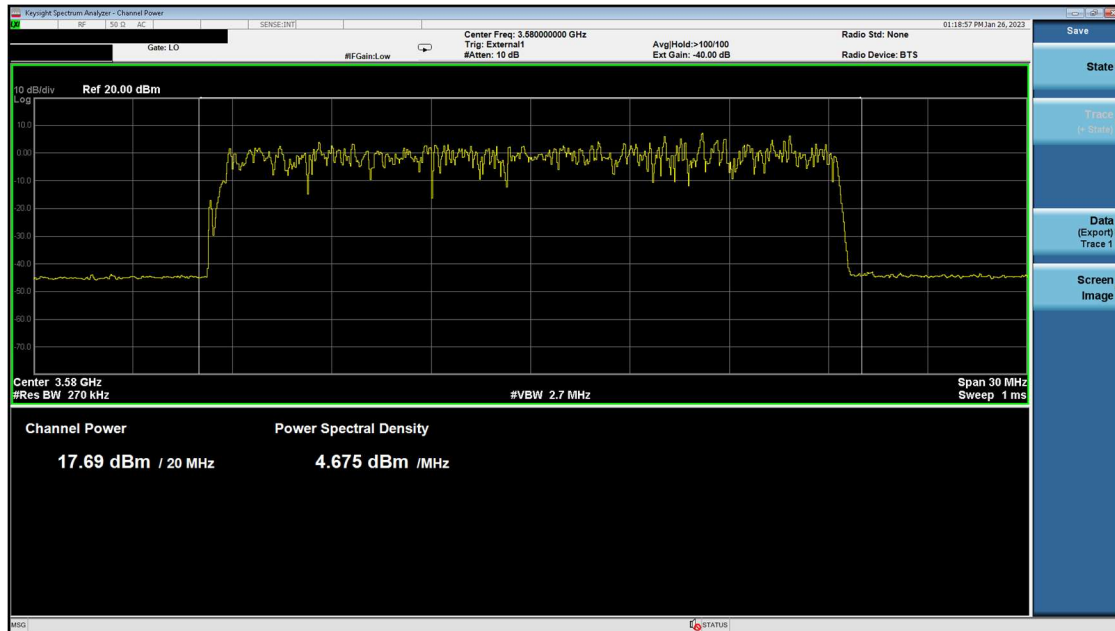
Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2023-01-25T17.58.14Z.log Start Frequency: 3570 MHz Bandwidth: 20 MHz MaxEIRP: 17 dBm/MHz (17 dBm/MHz= 30 dBm/20 MHz)	TX reading = 17.68 dBm/20 MHz Conducted Power = 17.68 dBm/20MHz/port +10 log(4) (4 Ports) = 23.70 dBm/20MHz Total EIRP 23.70 dBm/20MHz + 6.0 dBi Gain = 29.70 dBm/20MHz EIRP 29.70 dBm/20MHz ≤ 33 dBm/20 MHz Limit - PASS PSD 4.669 dBm/MHz +6dBi gain + 6.02dB (ports) = 16.69 dBm/MHz ≤ 20 dBm/MHz - Pass Limit-EIRP is 30 dBm/10 MHz = 33 dBm/20 MHz, Limit PSD = 20 dBm/MHz PASS



Pmax 17 dBm Measurement

2.8.8 WINNF.PT.C.HBT – Pmax (17 dBm, AG=4.0 dBi)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2023-01-26T03.05.39Z.log Start Frequency: 3570 MHz Bandwidth: 20 MHz MaxEIRP: 17 dBm/MHz (17 dBm/MHz = 30 dBm/20 MHz)	TX reading = 17.69 dBm/20 MHz Conducted Power = 17.69 dBm/20MHz/port +10 log(4) (4 Ports) = 23.69 dBm/20MHz Total EIRP 23.69 dBm/20MHz + 4.0 dBi Gain = 27.69 dBm/20MHz EIRP 27.69 dBm/20MHz ≤ 33 dBm/20 MHz Limit - Pass PSD 4.675 dBm/MHz + 4 dBi gain + 6.02dB(ports) = 14.70 dBm/MHz ≤ 20 dBm/ MHz Limit - Pass Limit-EIRP is 30 dBm/10 MHz = 33 dBm/20 MHz, Limit PSD= 30 dBm/MHz PASS



Pmax 17 dBm Measurement

3. Test Equipment

The Equipment used for performance of the tests results are listed below.

3.1.1 Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E831	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz	N9020A	MY48011791	2022-06-28	2024-06-28
E1139	Extech	Data Logger	BaroPre/Humidity/Temp/Datalogger	SD700	Q679360	2022-07-27	2024-07-27
E1259	KeySight Technologies	Network Analyzer	43.5 GHz	N5234A	MY55441410	2021-06-02	2023-06-02
P348	Traceable	Electronic Stopwatch		1051 94460-28	210516688	2021-06-18	2023-06-18

3.1.2 Laboratory Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Barometric Pressure (mB)
1/5/23	21.8	42.8	995
1/12/23	21.9	29.6	999
1/18/23	22.9	25.0	989
1/19/23	26.0	23.8	992
1/20/23	25.9	23.8	987
1/23/23	25.9	23.4	984
1/24/23	23.3	23.7	1000
1/25/23	24.1	23.9	998
1/26/23	25.0	23.9	987

4. NVLAP Accreditation

United States Department of Commerce National Institute of Standards and Technology	
	
Certificate of Accreditation to ISO/IEC 17025:2017	
NVLAP LAB CODE: 100275-0	
Nokia, Global Product Compliance Lab Murray Hill, NJ	
<i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i>	
Electromagnetic Compatibility & Telecommunications	
<i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).</i>	
2022-09-28 through 2023-09-30 <i>Effective Dates</i>	 <i>For the National Voluntary Laboratory Accreditation Program</i>