

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 V1.0.0

Client:

Nokia Solutions and Networks

Product Evaluated:

AEQM AirScale MAA 64T64R 192AE B48 32W

Report Number:

TR2022-0078-FCC96-SAS

Date Issued:

7-29-2022

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 or any other agency of the U.S. Government.

# Table of Contents

<b>1. SYSTEM INFORMATION AND REQUIREMENTS .....</b>	<b>5</b>
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.....	8
1.4.1 Test Requirements.....	8
1.5 REFERENCE DOCUMENTS, TEST STANDARDS & PROCEDURES .....	9
1.5.1 Reference Documents .....	9
1.5.2 Test Standards .....	9
1.5.3 Test Procedures .....	9
1.5.4 Measurement Uncertainty.....	10
1.6 PRODUCT EQUIPAGE.....	10
1.6.1 System Interconnect Block Diagram .....	10
1.7 EXECUTIVE SUMMARY .....	11
<b>2. DETAILED RESULTS .....</b>	<b>11</b>
2.1 CBSD REGISTRATION PROCESS .....	11
2.1.1 WINNF.FT.C.REG.1 .....	11
2.1.2 WINNF.FT.C.REG.3 .....	11
2.1.3 WINNF.FT.C.REG.5 .....	12
2.1.4 WINNF.FT.C.REG.7 .....	12
2.1.5 WINNF.FT.C.REG.8 .....	12
2.1.6 WINNF.FT.C.REG.10 .....	12
2.1.7 WINNF.FT.C.REG.12 .....	12
2.1.8 WINNF.FT.C.REG.14 .....	12
2.1.9 WINNF.FT.C.REG.16 .....	12
2.1.10 WINNF.FT.C.REG.18 .....	12
2.1.11 WINNF.FT.C.REG.20 .....	12
2.2 CBSD SPECTRUM INQUIRY PROCESS.....	12
2.2.1 Successful response from SAS Test Harness .....	12
2.3 CBSD SPECTRUM GRANT PROCESS.....	13
2.3.1 WINNF.FT.D.GRA.1 .....	13
2.3.2 WINNF.FT.C.GRA.2 .....	13
2.4 CBSD HEART BEAT PROCESS .....	13
2.4.1 WINNF.FT.C.HBT.1 .....	13
2.4.2 WINNF.FT.C.HBT.3 .....	13
2.4.3 WINNF.FT.C.HBT.4 .....	13
2.4.4 WINNF.FT.C.HBT.5 .....	13
2.4.5 WINNF.FT.C.HBT.6 .....	13
2.4.6 WINNF.FT.C.HBT.7 .....	13
2.4.7 WINNF.FT.C.HBT.9 .....	14
2.4.8 WINNF.FT.C.HBT.10.....	14
2.4.9 WINNF.FT.C.HBT.11 .....	14

- 2.5 CBSD MEASUREMENT REPORT ..... 14
  - 2.5.1 WINNF.FT.C.MES.1 ..... 14
  - 2.5.2 WINNF.FT.C.MES.3 ..... 14
  - 2.5.3 WINNF.FT.C.MES.4 ..... 14
- 2.6 CBSD RELINQUISHMENT PROCESS..... 15
  - 2.6.1 WINNF.FT.C.RLQ.1 ..... 15
  - 2.6.2 WINNF.FT.C.RLQ.3 ..... 15
  - 2.6.3 WINNF.FT.C.RLQ.5 ..... 15
- 2.7 CBSD DEREGISTRATION PROCESS ..... 15
  - 2.7.1 WINNF.FT.C.DRG.1 ..... 15
  - 2.7.2 WINNF.FT.C.DRG.3 ..... 15
  - 2.7.3 WINNF.FT.C.DRG.5 ..... 15
- 2.8 CBSD SECURITY VALIDATION ..... 16
  - 2.8.1 WINNF.FT.C.SCS.1 ..... 16
  - 2.8.2 WINNF.FT.C.SCS.2 ..... 16
  - 2.8.3 WINNF.FT.C.SCS.3 ..... 16
  - 2.8.4 WINNF.FT.C.SCS.4 ..... 16
  - 2.8.5 WINNF.FT.C.SCS.5 ..... 16
  - 2.8.6 WINNF.PT.C.HBT – Pmax (30 dBm) ..... 17
  - 2.8.7 WINNF.PT.C.HBT – Pmax (32 dBm) ..... 18
  - 2.8.8 WINNF.PT.C.HBT – Pmax (37 dBm) ..... 19
- 3. LIST OF TEST EQUIPMENT..... 20
  - Laboratory Environmental Conditions..... 20
- 4. NVLAP ACCREDITATION ..... 21

**Revisions**

Date	Revision	Section	Change
	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 calibration or 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:

  
 \_\_\_\_\_ 7/29/2022  
 Walter S. Majkowski  
 Compliance Engineer  
 steve.majkowski@nokia-bell-labs.com

Signed:

  
 \_\_\_\_\_ 7/29/2022  
 Raymond Johnson  
 Technical Manager  
 NVLAP Signatory  
 ray.johnson@nokia-bell-labs.com

## 1. System Information and Requirements

<b>Equipment Under Test:</b>	AEQM AirScale MAA 64T64R 192AE B48 32W
<b>Serial Number:</b>	1M211503039
<b>GPCL Project Number:</b>	2022-0078
<b>FCC ID:</b>	FCC ID: VBNAEQM-02
<b>Company:</b>	Nokia Solutions and Networks, OY KARAKAARI 7, FI-02610 ESPOO FINLAND
<b>Hardware Version:</b>	092851A.101
<b>Software Version:</b>	STBS21B
<b>Frequency Range:</b>	3550 - 3700 MHz
<b>Applicant:</b>	Nokia Solutions and Networks 3201 Olympus Blvd Dallas, Texas 75019 Steve Mitchell
<b>Test Requirement(s):</b>	Title 47 CFR FCC Part 96 WINNF-TS-0122 V1.0.0
<b>Test Standard(s):</b>	Refer to Section 1.5.2
<b>Test Procedure(s):</b>	Refer to Section 1.5.3
<b>Test Type:</b>	Initial Certification
<b>Test Date(s):</b>	June 23 – August 4, 2021
<b>Test Performed By:</b>	Nokia Bell Labs Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636 Site Registration Number: US5302
<b>Product Engineer(s):</b>	Ronald Remy
<b>Test Engineer (s):</b>	W. Steve Majkowski, Raymond J Johnson
<b>Test Results:</b> 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.	

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 Murray-Hill, NJ.

## 1.1 Introduction

This Spectrum Access Server (SAS) Conformity Assessment Report applies to the **AEQM AirScale MAA 64T64R 192AE B48 32W** 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 EUT operates in the Citizens Broadband Radio Service (**CBRS**) domestic 3550-3700 MHz band (3.5 GHz Band), i.e., E-UTRAN band 49, with TDD technology. The AEQM supports 10MHz and 20 MHz single LTE carriers, plus 10+20 and 20+20 MHz multiple carriers and a maximum total output RF power capacity of 32W at its 64T/64R transmit ports. The AEQM also supports cross-polarized 32T/32R 4 streams per polarization and 64T/64R 8 streams per polarization MIMO operations.

This report documents the digital interface conformance and operational interaction between the SAS and the CBSD. 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 required for qualifying the EUT CBDS 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.

## 1.3 EUT Description

The **AEQM AirScale MAA 64T64R 192AE B48 32W** is a Remote Radio Head (RRH) that consists of a LTE (Long Term Evolution)/5G-NR RF transceiver with 64 ports and an integrated Adaptive Antenna System (AAS). The RRH specifications are as follows:

### 1.3.1 Specifications

<b>Specification</b>	3GPP/FCC LTE compliant, TDD
<b>Frequency range</b>	3550 - 3700 MHz
<b>Max. supported modulation</b>	QPSK, 16QAM, 64QAM and 256 QAM
<b>Number of TX/RX paths</b>	64T/64R and 32T/32R
<b>MIMO streams</b>	16 for 64T/64R and 8 for 32T/32R from both polarizations
<b>Occupied bandwidth OBW</b>	10/20/30/40 MHz
<b>Total average EIRP</b>	54.81 dBm
<b>Max. output power</b>	0.27 w per TRX and 8.6 W total
<b>Antenna configuration</b>	12, 8, 2 ( $\pm 45^\circ$ X-polarized)
<b>Max. Antenna gain</b>	24.5dBi for 32T/32R and 27.5 dBi for 64T/64R with 1 stream per polarization
<b>Horizontal beamwidth</b>	15° (boresight)
<b>Vertical beamwidth</b>	6° (boresight)
<b>Horizontal coverage angle</b>	$\pm 45^\circ$ (3 dB), $\pm 60^\circ$ (5 dB)
<b>Vertical steering angle</b>	$\pm 6^\circ$
<b>Dimensions</b>	750 mm (H) x 450 mm (W) x 240 mm (D)
<b>Volume</b>	81 l
<b>Weight</b>	42.2 kg (without mounting brackets)
<b>Supply voltage / Connector type</b>	DC -40.5 V ... -57 V / 2 pole connector
<b>Power Consumption</b>	716 W typical (75% DL duty cycle, 30% RF load) 752 W max (75% DL duty cycle, 100% RF load)

### 1.3.2 Photographs



## 1.4 Test Rationale

The SAS testing was focused on the Mandatory test cases identified in WINNF-TS-0122 V1.0.0 for certification to Part 96. The CBSD RF performance is reported in a separate test report. The operation of the CBSD product with the SAS evaluation is evaluated herein.

The product has several modes of operation that have effect on the conducted power. The antenna gain varies based on the Number of Streams, Cross Polarization (+/- 45 degrees), etc., and ranges from 15.46 dBi (2 polarities cross polarized) to a maximum of 27.5 dBi for the 64T64R mode with one stream per polarization. For the purposes of the CBSD RF Power Measurement, a single port was measured with the product configured for an antenna gain of 11 dBi so that maximum conducted power could be used to obtain the measured value to compare to the 47 dBm/MHz Part 96 limit.

### 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:

- 3GPP2 C.S0032-C, “Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Network”, V1.0, September 2010.
- 3GPP TS 36.104 (2010-02), “LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception”, Version 8.8.0 Release 8.

### 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 (Currently in Draft Version)
- KDB 971168 D01 (Current Version) - Measurement Guidance for Certification of Licensed Digital Transmitters
- Working Document 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 V1.0.0, 19 December 2017
- 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 fully populated and configured as in a normal installation and intended operation. Refer to the GPCL FCC Test Report TR2021-0067-FCC96 for details.

## 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	6/23 – 6/24	Pass	
6.2	CBSD Spectrum Inquiry Process	6/24	Pass	
6.3	CBSD Spectrum Grant Process	6/24	Pass	
6.4	CBSD Heart Beat Process	6/24-6/25, 7/8	Pass	
6.5	CBSD Measurement Report	NT	N/A	No Mandatory Test Cases
6.6	CBSD Relinquishment Process	7/20	Pass	
6.7	CBSD Deregistration Process	6/28	Pass	
6.8	CBSD Security Validation	7/20	Pass	
7.1	CBSD RF Power Measurement	7/30, 8/4	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.C.REG.1

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

#### 2.1.2 WINNF.FT.C.REG.3

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

**2.1.3 WINNF.FT.C.REG.5**

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

**2.1.4 WINNF.FT.C.REG.7**

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

**2.1.5 WINNF.FT.C.REG.8**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Missing Required parameters (responseCode 102)	Pass	WINNF.FT.C.REG.8_2021-06-23T16.51.03Z	Confirmed RC = 102

**2.1.6 WINNF.FT.C.REG.10**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Pending registration (responseCode 200)	Pass	WINNF.FT.C.REG.10_2021-06-23T17.30.43Z	Confirmed RC = 200

**2.1.7 WINNF.FT.C.REG.12**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Invalid parameter (responseCode 103)	Pass	WINNF.FT.C.REG.12_2021-06-23T17.41.32Z	Confirmed RC = 103

**2.1.8 WINNF.FT.C.REG.14**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Blacklisted CBSD (responseCode 101)	Pass	WINNF.FT.C.REG.14_2021-06-23T18.47.10Z	Confirmed RC = 101

**2.1.9 WINNF.FT.C.REG.16**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsupported SAS protocol version (responseCode 100)	Pass	WINNF.FT.C.REG.16_2021-06-24T14.20.09Z	Confirmed RC = 100

**2.1.10 WINNF.FT.C.REG.18**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Group Error (responseCode 201)	Pass	WINNF.FT.C.REG.18_2021-06-24T14.30.50Z	Confirmed RC = 201

**2.1.11 WINNF.FT.C.REG.20**

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	WINNF.FT.C.HBT.1_2021-06-24T15.05.41Z.log	Confirmed in HBT.1

## 2.3 CBSD Spectrum Grant Process

### 2.3.1 WINNF.FT.D.GRA.1

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Unsuccessful Grant responseCode=400 (INTERFERENCE)	Pass	WINNF.FT.C.GRA.1_2021-06-24T14.46.38Z	Confirmed RC = 400

### 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)	Pass	WINNF.FT.C.GRA.2_2021-06-24T14.55.35Z	Confirmed RC = 401

## 2.4 CBSD Heart Beat Process

### 2.4.1 WINNF.FT.C.HBT.1

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Success Case (first Heartbeat Response)	Pass	WINNF.FT.C.HBT.1_2021-06-24T15.05.41Z	Confirmed Transmit parameters, RC = 0, RF turned on

### 2.4.2 WINNF.FT.C.HBT.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=105 (DEREGISTER)	Pass	WINNF.FT.C.HBT.3_2021-06-25T12.48.10Z	RC = 105, RF turned off before T+60 sec

### 2.4.3 WINNF.FT.C.HBT.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=500 (TERMINATED_GRANT)	Pass	WINNF.FT.C.HBT.4_2021-06-25T13.18.28Z	RC = 500, RF turned off before T+60 sec

### 2.4.4 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	Pass	WINNF.FT.C.HBT.5_2021-07-08T15.52.19Z	RC = 501, No RF Output

### 2.4.5 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	Pass	WINNF.FT.C.HBT.6_2021-07-08T16.21.37Z	RC = 501, RF turned off before T+60 sec

### 2.4.6 WINNF.FT.C.HBT.7

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Pass	WINNF.FT.C.HBT.7_2021-06-25T17.25.13Z	RC = 502, RF turned off before T+60 sec

**2.4.7 WINNF.FT.C.HBT.9**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Response Absent (First Heartbeat)	Pass	WINNF.FT.C.HBT.9_2021-06-25T17.56.57Z	Confirmed message components, No RF Output

**2.4.8 WINNF.FT.C.HBT.10**

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat Response Absent (Subsequent Heartbeat)	Pass	WINNF.FT.C.HBT.10_2021-06-25T19.04.53Z	Confirmed message components, RF turned off before T+60 sec

**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		O – Not required for certification

**2.5 CBSD Measurement Report**

**2.5.1 WINNF.FT.C.MES.1**

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

**2.5.3 WINNF.FT.C.MES.4**

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

## 2.6 CBSD Relinquishment Process

### 2.6.1 WINNF.FT.C.RLQ.1

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful Relinquishment	Pass	WINNF.FT.C.RLQ.1_2021-07-30T19.16.48Z.log	Relinquishment Trigger stops all Messages and Tx RF stops before T+60

### 2.6.2 WINNF.FT.C.RLQ.3

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

### 2.6.3 WINNF.FT.C.RLQ.5

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

## 2.7 CBSD Deregistration Process

### 2.7.1 WINNF.FT.C.DRG.1

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful Deregistration	Pass	WINNF.FT.C.DRG.1_2021-06-28T18.43.36Z	Confirmed Deregistration request, RF turned off before T+60 sec

### 2.7.2 WINNF.FT.C.DRG.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Deregistration responseCode=102	NT		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			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	Pass	WINNF.FT.C.SCS1_w-REG.1 WINNF.FT.C.REG.1_2021-07-09T01.02.56Z - SCS1.log Wireshark SCS1 REG file capture.pcapng	Pass, No RF Output

### 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	Pass	WINNF.FT.C.SCS2_w-HBT.1_ WINNF.FT.C.HBT.1_2021-07-20T14.50.49Z - SCS2.log Wireshark- SCS2 Test Case capture 7-20 -P.pcapng	Pass, No RF Output

### 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	Pass	WINNF.FT.C.SCS3_w-HBT.1_ WINNF.FT.C.HBT.1_2021-07-20T17.49.52Z - SCS3.log Wireshark - _SCS3 Test Case capture 7-20 -P.pcapng	Pass, No RF Output

### 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	Pass	WINNF.FT.C.SCS4_w-HBT.1 WINNF.FT.C.HBT.1_2021-07-20T18.42.58Z - SCS4.log Wireshark SCS4 Test Case capture 7-20 -P.pcapng	Pass, No RF Output

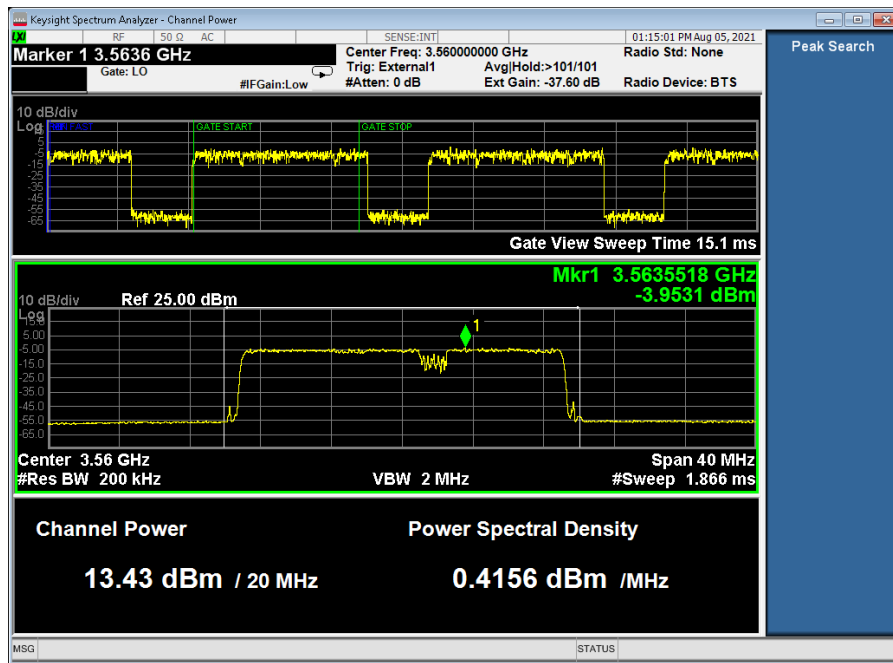
### 2.8.5 WINNF.FT.C.SCS.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
TLS failure when certificate at the SAS Test Harness is corrupted	Pass	WINNF.FT.C.SCS5_w-HBT.1_ WINNF.FT.C.HBT.1_2021-07-20T18.57.56Z - SCS5.log Wireshark SCS5 Test Case capture 7-20 -P.pcapng	Pass, No RF Output



### 2.8.6 WINNF.PT.C.HBT – Pmax (30 dBm)

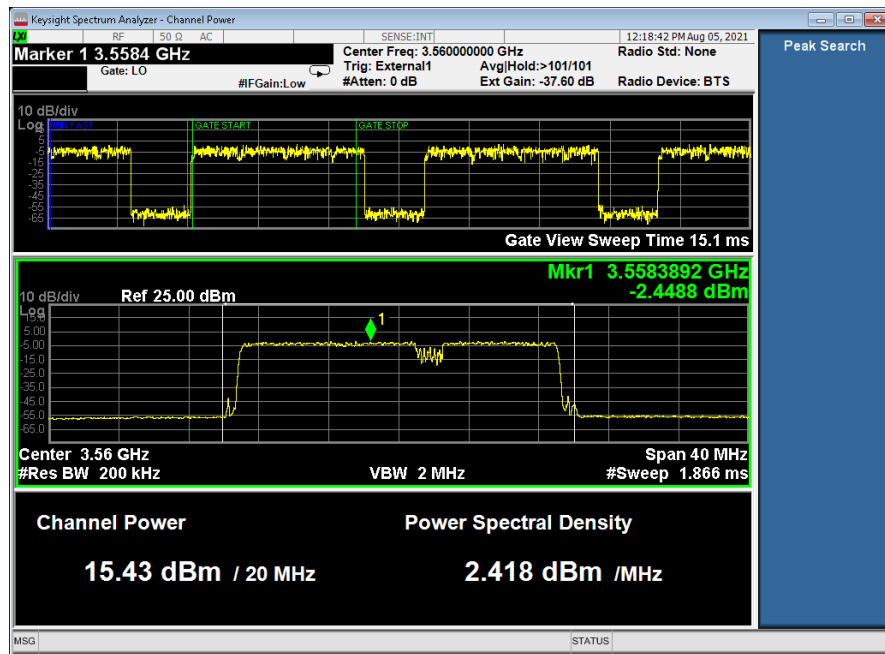
Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2021-08-04T16.41.37Z 3550 20 30.log Start Frequency: 3550 MHz Bandwidth: 20 MHz MaxEIRP: 30 dBm/MHz  (30 dBm/MHz= 43 dBm/20 MHz)	TX reading = 13.43 dBm/20 MHz <b>Conducted Power</b> = 13.43 dBm/20MHz x 64 Ports (10 log(64)) = 31.49 dBm/20MHz  <b>Total EIRP</b> = 31.49 dBm/20MHz + 11.0 dBi Gain = 42.49 dBm/20MHz EIRP ≤ 43 dBm/20 MHz Limit  <b>PSD</b> = 0.42 dBm/MHz + 10Log(64) + 11.0 dBi Gain = 29.48 dBm/MHz PSD ≤ 30 dBm/MHz Limit



Pmax 30 dBm Measurement

**2.8.7 WINNF.PT.C.HBT – Pmax (32 dBm)**

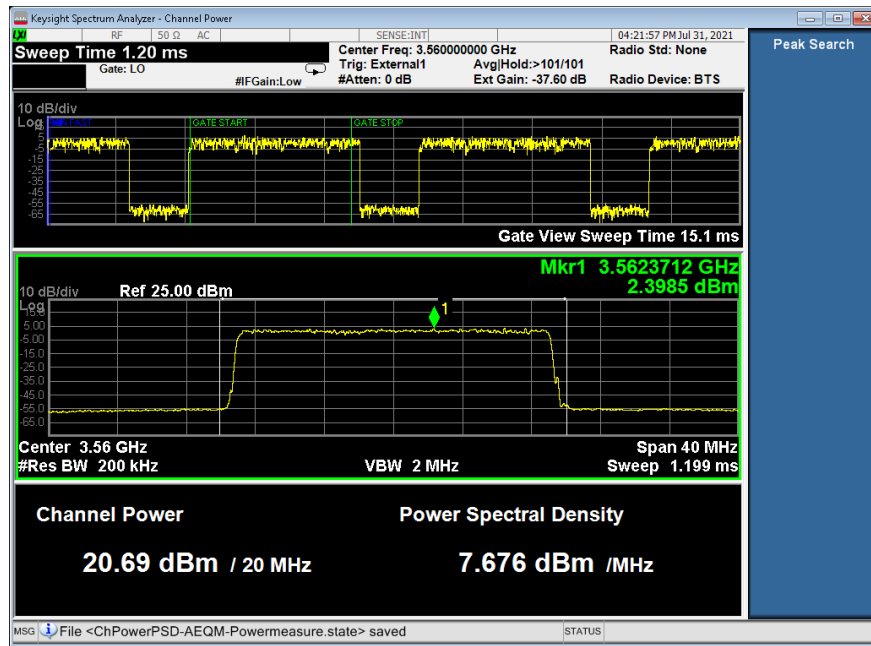
Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2021-08-04T15.29.54Z 3550 20 32.log Start Frequency: 3550 MHz Bandwidth: 20 MHz MaxEIRP: 32 dBm/MHz  (32 dBm/MHz= 45 dBm/20 MHz)	TX reading = 15.43 dBm/20 MHz <b>Conducted Power</b> = 15.43 dBm/20MHz x 64 Ports (10 log(64)) = 33.49 dBm/20MHz  <b>Total EIRP</b> = 33.49 dBm/20MHz + 11.0 dBi Gain = 44.49 dBm/20MHz EIRP ≤ 45 dBm/20 MHz Limit  <b>PSD</b> = 2.42 dBm/MHz + 10Log(64) + 11.0 dBi Gain = 31.48 dBm/MHz PSD ≤ 32 dBm/MHz Limit



**Pmax 32 dBm Measurement**

### 2.8.8 WINNF.PT.C.HBT – Pmax (37 dBm)

Test Case Title	Result P/F / (NT)	Log File Name	Comment
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2021-07-30T19.43.22Z 3550 2037.log Start Frequency: 3550 MHz Bandwidth: 20 MHz MaxEIRP: 37 dBm/MHz  (37 dBm/MHz= 50 dBm/20 MHz)	TX reading = 20.69 dBm/20 MHz <b>Conducted Power</b> = 20.69 dBm/20MHz x 64 Ports (10 log(64)) = 38.75 dBm/20MHz  <b>Total EIRP</b> = 38.75 dBm/20MHz + 11.0 dBi Gain = 49.75 dBm/20MHz EIRP ≤ 50 dBm/20 MHz Limit  <b>PSD</b> = 7.68 dBm/MHz +10Log(64) + 11.0 dBi Gain = 36.74 36.74 dBm/MHz PSD < 37 dBm/MHz Limit



Pmax 37 dBm Measurement

### 3. List of Test Equipment

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

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1152	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz Analyzer	N9020A	MY53420147	2021-02-19	2023-02-19
P345	Control Company	Electronic Stopwatch		1051	200462370	2020-08-04	2022-08-04
P328	Extech	Data Logger	Barometric Pressure/ Humidity/Temperature Datalogger	SD700	Q769151	2020-09-16	2022-09-16
E1561	Lenovo	Computer - Laptop	SAS Testing PC	T530	R-2392PK290GB	NA	NA

### Laboratory Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Barometric Pressure (mB)
6/23/21	23.5	44.5	1003.5
6/24/21	23.2	46.0	997.0
6/25/21	24.0	45.0	998.0
6/28/21	24.2	56.5	1004.3
7/1/21	23.8	54.1	994.3
7/7/21	24.1	57.4	996.5
7/20/21	24.0	56.1	994.9
7/30/21	24.0	51.2	991.9
8/4/21	23.7	52.1	1002.4

## 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

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & 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 Communique dated January 2009).*

---

2021-09-24 through 2022-09-30  
*Effective Dates*



  
*For the National Voluntary Laboratory Accreditation Program*