Global Product Compliance Laboratory
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TESTING
NVLAP LAB CODE: 100275-0

Spectrum Allocation Server- Domain Proxy/Citizens Band Radio Service Device Conformity Assessment Test Report

Test Standards
CBRSA-TS-9001 V1.0.0, March 20, 2018
WINNF-TS-0122 Version V1.0.0, December 19, 2017

Client
Nokia Mobility

Product Evaluated
Nokia AirScale Micro Remote Radio Head (AirScale Micro CBRS)
(comprised of the AirScale System Module (BBU) and the AirScale AZQC Remote Radio Head (RRH)
FCC ID: 2AD8UAZQCRH1

GPCL Project Number:
2018-0097

Report Number:
TR-2018-0097-CBRS -SAS

Date Issued:
11/25/2018

Table of Contents

Revisions

Date	Revision	Section	Change
10/29/2018	0		Initial Release
10/31/2018	1		Remove reference KDB 552295 D01
11/25/2018	2		Remove Draft Watermark, Paragraph 1.1

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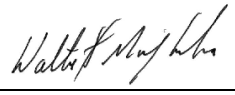
Prepared By: Walter S. Majkowski NCE

Signed:  10/31/2018

Compliance Engineer

Approved By: Raymond J. Johnson

Signed:  10/31/2018

Technical Manager

1. System Information and Requirements

Company Name	**Nokia Solutions and Networks, OY,** 2000 Lucent Lane, Naperville, IL 60563
FCC ID: / Grant Date	**FCC ID: 2AD8UAZQCRH1**
Product Name	**Nokia AirScale Micro Remote Radio Head (AirScale Micro CBRS) (comprised of the AirScale System Module (BBU) and the AirScale AZQC Remote Radio Head (RRH)**
Model Name	**AZQCRH1**
Part No	474156A
GPCL Project Number / PRI#	2018-0097
Serial Numbers	AirScale BBU: ABIA L1163812128, ASIA AH173415023 AZQC CBSD1: 1M181532494 AZQC CDSD2: 1M181624804
Test Standard(s)	• CBRSA-TS-9001 V1.0.0, March 20, 2018 • WINNF-TS-0122 Version V1.0.0, December 19, 2017 • KDB 940660 D01 Part 96 CBRS Equipment v01
Reference(s)	• 47 CFR FCC Part 2 and Part 96 • ANSI C63.26 (2015) • ANSI C63.4 (2014)
Measurement Procedure(s):	FCC-WINN-SAS and FCC-IC-0B
Frequency Band	CBRS (Tx: 3550-3700 MHz), E-UTRAN Band 48
Technology	LTE-TDD: 10M0F9W and 20M0F9W
Test Frequency Range	3550 – 3700 MHz
Operation Mode(s)	4x5W MIMO
Submission Type	Initial Filing for Part 96
FCC Part 15 Subpart B	Compliance with Class B
Test Date	September 21 – October 26, 2018
Test Laboratory	Nokia Global Product Compliance Laboratory 600-700 Mountain Avenue, Rm 5B-108 Murray Hill, New Jersey 07974-0636 USA **NVLAP** Lab Code: 100275-0 **FCC Registration Number: 395774**

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Product Engineer(s): Ronald Remy

Test Engineer (s): W. Steve Majkowski, Raymond J. Johnson

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1.1 Introduction

This Spectrum Access Server (SAS) Conformity Assessment Report applies to the Nokia AirScale Micro Remote Radio Head (AirScale Micro CBRS) with Long Term Evolution (LTE) Technology, hereinafter referred to as the Equipment Under Test (EUT) or the Domain Proxy/Citizens Broadband Radio Service Device (DP/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 48, with TDD-LTE technologies. It is a Nokia designed product and is designed with TDD_LTE technology with capability for 10 and 20 MHz carrier bandwidths.
Conformance of the interactions between the SAS and the Domain Proxy/Citizens Broadband Radio Service Device (DP/CBSD), including the specific test requirements, have been defined in FCC KDB documents and WInnForum Standards™.

This report documents the digital interface conformance and operational interaction between the SAS and the CBSD to the WInnForum Standards™.

The RF output of this CBSD has a maximum power is 5W (37.0dBm) per transmit port with 4x MIMO operation for up to four carriers. Total power for four ports is 20W (43.0 dBm).

1.2 Purpose and Scope

The purpose of this document is to provide results of testing of the digital interface conformance and operational interaction between the Spectrum Allocation Server Test Harness (SAS) and the combination of the Domain Proxy with CBSD multiple devices.

This test data is required for qualifying the Nokia AirScale Base Station DP/CBSD to 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 Nokia AirScale Base Station is a distributed eNodeB cell that consists of a Baseband platform and LTE (Long Term Evolution) RF transceiver modules (AZQC) in various combinations. Each RF transceiver module supports 4 Tx/Rx branches.

The EUT supports LTE-TDD operation with 10 and 20 MHz carrier bandwidths and has a maximum RF power output capability of 5W at each of its 4 MIMO transmit port outputs. The **AZQC RRH** transceiver module, the subject of this application, is always connected with an AirScale Baseband Unit.

1.4 Test Rationale

The testing performed is based on the Mandatory test cases for FCC certification as specified in WINNF-TS-0122 Version V1.0.0, December 19, 2017 for the configuration of the DP/CBSD. In addition, optional and conditional test cases supported by the product were identified by the manufacturer for test and results are included herein. RF performance for the AZQC CBSD device is reported in a separate test report.

For the UUT RF Transmit Power Measurement, four measurements were made encompassing minimum per port power of P1 (17 dBm) to maximum per port power Pmax (37 dBm).

The operation of the CBSD product with the SAS Test harness is evaluated herein.

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 Specifications & 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 36.141 V14.1.0 (2016-09) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing (Release 14).

1.5.2 Test Specifications

- CBRS Alliance Certification Test Plan, CBRSA-TS-9001 V1.0.0, 20 March 2018
- 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
- Code of Federal Regulations 47, Federal Communications Commission 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

1.5.3 Procedures

1. 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

2. GPCL Procedure FCC-IC-OB, Power measurement, Occupied Bandwidth, & Modulation Test Procedure

3. 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.

1.5.4 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, (*e.g.*, ANSI C63.4, C63.26, CISPR 11, 14, 22, *etc.*, using ESHS 30, AR-6 Semi-Anechoic Chamber	Conducted Emissions	10 – 10,000	±3.5 dB

Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band, Conducted Spurious Emissions	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	1.78 dB
RF Power with Power Meter	10 Hz to 20 MHz	50 MHz to 18 GHz	0.5 dB

1.6 Product Equipage

1.6.1 System Interconnect Block Diagram

The EUT was fully populated and configured as in a normal installation for the intended operation. The high level test configuration specified in WINNF-TS-0122-V1.0.0 for the DP/CBSD device was used to demonstrate the eNodeB distributed base station combination of the AirScale BBU/ AZQC CBSD devices.

1.7 Executive Summary

RESULTS:

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

WINNF-TS-0122	Section 6.1	CBSD Registration Process	Result
WINNF-TS-0122	Section 6.2	CBSD Spectrum Inquiry Process	PASS
WINNF-TS-0122	Section 6.3	CBSD Spectrum Grant Process	PASS
WINNF-TS-0122	Section 6.4	CBSD Heart Beat Process	PASS
WINNF-TS-0122	Section 6.5	CBSD Measurement Report	PASS
WINNF-TS-0122	Section 6.6	CBSD Relinquishment Process	PASS
WINNF-TS-0122	Section 6.7	CBSD Deregistration Process	PASS
WINNF-TS-0122	Section 6.8	CBSD Security Validation	PASS
WINNF-TS-0122	Section 7.1	CBSD RF Power Measurement	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

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Multi-Step registration	**Pass**	WINNF.FT.D.REG.2_2018-10-11T12.55.23Z.log	N/A

2.1.2 WINNF.FT.D.REG.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Single-Step registration for Cat A CBSD	**NT**	N/A	Not supported by this device.

2.1.3 WINNF.FT.D.REG.6

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Single-Step registration for CBSD with CPI signed data	**NT**	N/A	Not supported by this device.

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	**Pass**	WINNF.FT.C.REG.7_2018-10-12T16.19.29Z.log	Sent within 2 seconds.

2.1.5 WINNF.FT.D.REG.9

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Missing Required parameters (responseCode 102)	**Pass**	WINNF.FT.D.REG.9_2018-10-11T13.19.20Z.log	Ri = 102 for both CBSD1 and CBSD2

2.1.6 WINNF.FT.D.REG.11

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Pending registration (responseCode 200)	**Pass**	WINNF.FT.D.REG.11_2018-10-11T13.22.34Z.log	Ri = 200 for both CBSD1 and CBSD2

2.1.7 WINNF.FT.D.REG.13

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Invalid parameter (responseCode 103)	**Pass**	WINNF.FT.D.REG.13_2018-10-11T13.27.12Z.log	Ri = 0 for CBSD1, Ri = 103 for CBSD2

2.1.8 WINNF.FT.D.REG.15

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Blacklisted CBSD (responseCode 101)	**Pass**	WINNF.FT.D.REG.15_2018-10-11T13.33.03Z.log	Ri = 0 for CBSD1, Ri = 103 for CBSD2

2.1.9 WINNF.FT.D.REG.17

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Unsupported SAS protocol version (responseCode 1001)	**Pass**	WINNF.FT.D.REG.17_2018-10-11T13.36.54Z.log	Ri = 100 for both CBSD1 and CBSD2

2.1.10 WINNF.FT.D.REG.19

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Group Error (responseCode 201)	**Pass**	WINNF.FT.D.REG.19_2018-10-11T13.42.15Z.log	Ri = 0 for CBSD1, Ri = 201 for CBSD2

2.1.11 WINNF.FT.C.REG.20

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Group Error (responseCode 201)	**NT**	N/A	

2.2 CBSD Spectrum Inquiry Process

2.2.1 Successful spectrum Inquiry response from SAS

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Successful spectrum Inquiry response from SAS – Domain Proxy (6.2.4.1.2)	**Pass**	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)	**Pass**	WINNF.FT.C.GRA.1_2018-10-24T11.51.32Z.log	Ri = 400 for CBSD1

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_2018-10-24T11.35.21Z.log	Ri=401 for CBSD1

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
Domain Proxy Heartbeat Success Case (first Heartbeat Response)	**Pass**	WINNF.FT.D.HBT.2_2018-10-12T15.06.07Z.log	CBSD1 grantId=974192920, responseCode=0; CBSD2 grantId=411740634, responseCode=0

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_2018-09-21T14.39.21Z.log	

2.4.3 WINNF.FT.C.HBT.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Heartbeat responseCode=500 (TERMINATED_GRANT)	**Pass**	WINNF.FT.C.HBT.5_2018-09-21T15.18.34Z.log	Response A

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 First Heartbeat Response	**Pass**	WINNF.FT.C.HBT.6_2018-09-27T17.42.31Z.log	Response A

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)	**Pass**	WINNF.FT.C.HBT.7_2018-09-21T15.48.36Z.log	

2.4.6 WINNF.FT.D.HBT.8

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat	**Pass**	WINNF.FT.D.HBT.8_2018-10-17T18.56.13Z.log	

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_2018-09-24T12.23.56Z.log	

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_2018-09-21T16.28.41Z.log	

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	**Pass**	WINNF.FT.C.HBT.11_2018-10-24T13.02.16Z.log	

2.5 CBSD Measurement Report

2.5.1 WINNF.FT.D.MES.2

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Registration Response contains measReportConfig	**Pass**	WINNF.FT.D.MES.2_2018-10-26T13.05.53Z.log	Separate messages to each CBSD device.

2.5.2 WINNF.FT.C.MES.3

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Grant Response contains measReportConfig	**NT**		Supported in future Software release.

2.5.3 WINNF.FT.D.MES.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Heartbeat Response contains measReportConfig	**NT**		Supported in future Software release.

2.6 CBSD Relinquishment Process

2.6.1 WINNF.FT.D.RLQ.2

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Successful Relinquishment	**Pass**	WINNF.FT.D.RLQ.2_2018-10-11T18.22.27Z.log	CBSD1 grantId=757511524, responseCode=0; CBSD2 grantId= 739164639, responseCode=0

2.6.2 WINNF.FT.D.RLQ.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Unsuccessful Relinquishment, responseCode=102	**Pass**	WINNF.FT.D.RLQ.4_2018-10-11T19.44.42Z.log	CBSD1 grantId 211545216, responsecode=102; CBSD2 grantId 964292585, responsecode=102

2.6.3 WINNF.FT.D.RLQ.6

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Unsuccessful Relinquishment, responseCode=103	**Pass**	WINNF.FT.D.RLQ.6_2018-10-12T11.10.16Z.log	CBSD1 grantId 786899692, responsecode=103; CBSD2 grantId 248354042, responsecode=102

2.7 CBSD Deregistration Process

2.7.1 WINNF.FT.D.DRG.2

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Successful Deregistration	Pass	WINNF.FT.D.DRG.2_2018-10-22T16.36.53Z.log	Both CBSD's provided cbsid (SN) and responsecode=0

2.7.2 WINNF.FT.D.DRG.4

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Deregistration responseCode=102	Pass	WINNF.FT.D.DRG.4_2018-10-26T16.35.29Z.log	CBSD1 responsecode=102; CBSD2 responsecode=102

2.7.3 WINNF.FT.C.DRG.5

Test Case Title	Result P/F / (NT)	Log File Name	Comment
Domain Proxy Deregistration responseCode=103	Pass	WINNF.FT.C.DRG.5_2018-10-26T18.03.36Z.log	CBSD1 responsecode=103

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.REG.1_2018-10-18T16.49.11Z.log SCS1 Test Case Capture 10_18.pcapng	

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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.REG.1_2018-10-18T17.10.03Z.log SCS2 Test Case Capture 10_18.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	Pass	WINNF.FT.C.REG.1_2018-10-18T18.17.30Z.log SCS3 Test Case Capture 10_18.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	Pass	WINNF.FT.C.REG.1_2018-10-18T19.08.11Z.log SCS4 Test Case Capture 10_18.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	**Pass**	WINNF.FT.C.REG.1_2018-10-24T12.14.15Z.log SCS5 Test Case Capture 10_24.pcapng	

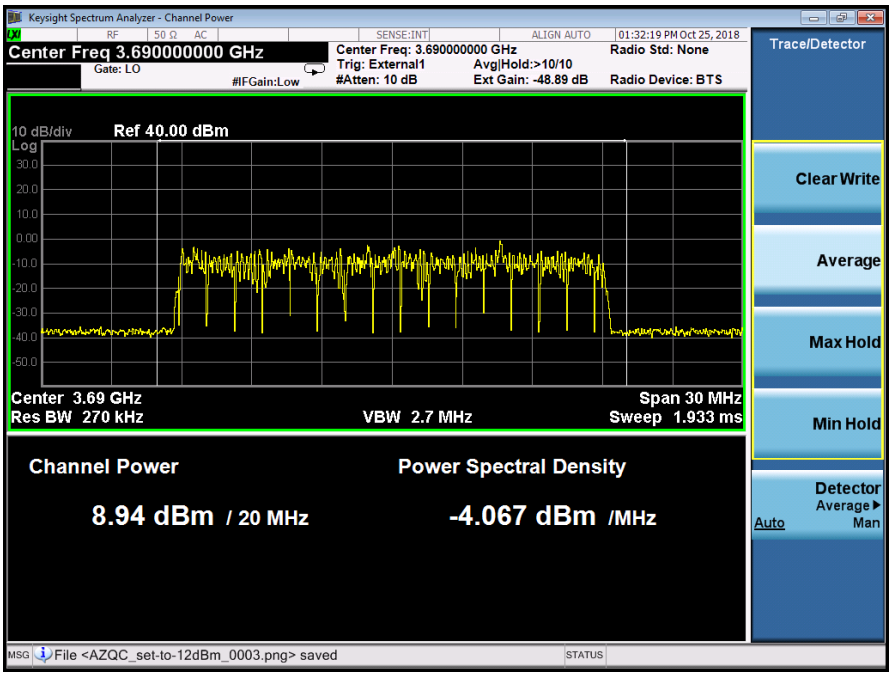
2.9 SAS-CBSD/DP Interface Performance Test Specifications

Not Tested

2.10 CBSD RF Power Measurement

2.10.1 WINNF.PT.C.HBT – P1 (17 dBm)

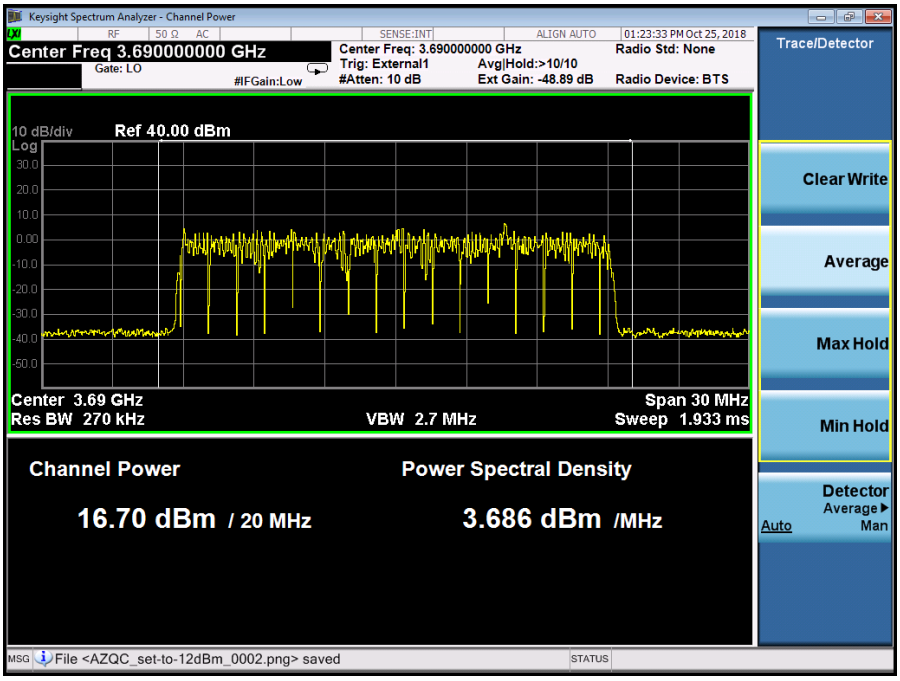
Test Case Title	Result P/F / (NT)	Log File Name	Comment or Plot Data Reference
UUT RF Transmit Power Measurement	**Pass**	PowerMeasTest_2018-10-25T17.29.09Z.log Start Frequency: 3680 MHz Bandwidth: 20 MHz MaxEIRP: 17 dBm/MHz (17 dBm/MHz= 27 dBm/10 MHz)	TX1 = 8.94 dBm/20 MHz 8.94 dBm/20MHz x 4 ports = 17.94 dBm/10MHz 17.94 dBm/10MHz + 6.99 dBi Gain = 24.93 dBm/10MHz EIRP ≤ 27 dBm/10MHz Limit -4.067 dBm/MHz +10Log(4) + 6.99 dBi Gain = 8.94 8.94 dBm/MHz PSD ≤ 17 dBm/MHz PSD Limit **PASS**



P1 Measurement

2.10.2 WINNF.PT.C.HBT – P2 (25 dBm)

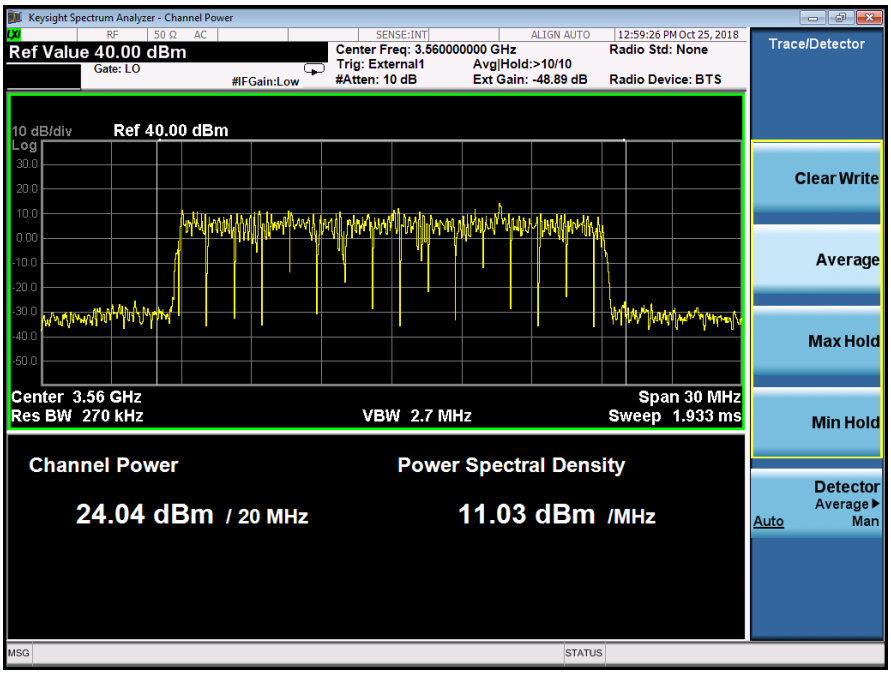
Test Case Title	Result P/F / (NT)	Log File Name	Comment or Plot Data Reference
UUT RF Transmit Power Measurement	**Pass**	PowerMeasTest_2018-10-25T17.19.57Z.log Start Frequency: 3680 MHz Bandwidth: 20 MHz MaxEIRP: 25 dBm/MHz (25 dBm/MHz= 35 dBm/10 MHz)	TX1 = 16.70 dBm/20 MHz 16.70 dBm/20MHz x 4 Ports = 25.70 dBm/10MHz 25.70 dBm/10MHz + 6.99 dBi Gain = 32.69 dBm/10MHz EIRP ≤ 35 dBm/10MHz Limit 3.86 dBm/MHz +10Log(4) + 6.99 dBi Gain = 16.87 16.87 dBm/MHz PSD ≤ 25 dBm/MHz PSD Limit **PASS**



P2 Measurement

2.10.3 WINNF.PT.C.HBT – P3 (32 dBm)

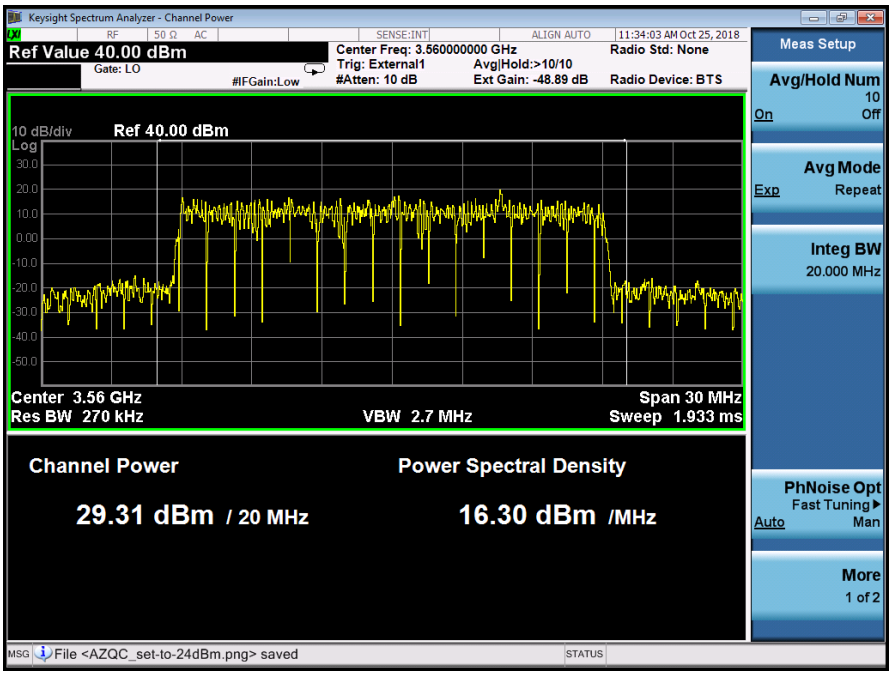
Test Case Title	Result P/F / (NT)	Log File Name	Comment or Plot Data Reference
UUT RF Transmit Power Measurement	**Pass**	PowerMeasTest_2018-10-25T16.53.44Z.log Start Frequency: 3550 MHz Bandwidth: 20 MHz MaxEIRP: 32 dBm/MHz (32 dBm/MHz= 42 dBm/10 MHz)	TX1 = 24.04 dBm/20 MHz 24.04 dBm/20MHz x 4 Ports = 33.04 dBm/10MHz 33.04 dBm/10MHz + 6.99 dBi Gain = 40.04 dBm/10MHz EIRP ≤ 42 dBm/10 MHz Limit 11.03 dBm/MHz +10Log(4) + 6.99 dBi Gain = 24.04 24.04 dBm/MHz PSD ≤ 32 dBm/MHz Limit **PASS**



P3 Measurement

2.10.4 WINNF.PT.C.HBT – Pmax (37 dBm)

Test Case Title	Result P/F / (NT)	Log File Name	Comment or Plot Data Reference
UUT RF Transmit Power Measurement	Pass	PowerMeasTest_2018-10-25T14.49.42Z.log Start Frequency: 3550 MHz Bandwidth: 20 MHz MaxEIRP= 37 dBm/MHz (37 dBm/MHz= 47dBm/10 MHz)	TX1 = 29.31 dBm/20 MHz 29.31 dBm/20 MHz x 4 Ports = 38.31 dBm/10MHz 38.31 dBm/10MHz + 6.99 dBi Gain = 45.30 dBm/10 MHz EIRP ≤ 47 dBm/10MHz Limit 16.30 dBm/MHz +10Log(4) + 6.99 dBi Gain = 29.31 29.31 dBm/MHz PSD ≤ 37 dBm/MHz Limit **PASS**



Pmax 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 Calibration Type Status**

3.1.1 Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1055	Agilent Technologies	Spectrum Analyzer	PSA 3Hz - 26.5GHz	E4440A	MY46185576	2018-04-09	2020-04-09
P339	Control Company	Electronic Stopwatch		1051	181179959	2018-05-12	2020-05-12
P328	Extech	Data Logger	Barometric Pressure/ Humidity/ Temperature Data logger	SD700	Q769151	2018-06-30	2020-06-30
E1217	Keysight Technologies	EMI Receiver	MXE EMI Receiver 26.5GHz	N9038A	MY54130087	2016-12-28	2018-12-28
GPCL-LAP-231	Lenova	ThinkPad	GPCL-LAP-231			N/A	N/A
FWQA-LMTS	Nokia	Trigger Buffer	Timing Trigger buffer	FWQA-LMTS U81B051.00	EC163610199	N/A	N/A

3.1.2 Laboratory Environmental Conditions

Date	Temperature (°C)	Humidity (%)	Barometric Pressure (mB)
9/21/18	23.4	58.9	1005.8
9/24/18	23.1	53.5	1012.3
9/27/18	23.4	53.8	1000.8
10/11/19	23.3	66.9	985.4
10/12/18	23.0	55.0	984.1
10/17/18	22.0	38.5	993.5
10/18/18	23.3	39.8	998.6
10/19/18	19.9	33.0	1004.8
10/22/18	20.3	34.0	1003.0
10/24/18	21.0	34.1	998.9
10/25/18	21.1	29.7	998.9
10/26/18	22.1	28.1	1009.1

4. NVLAP Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

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 17025:2005. 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).

2018-09-05 through 2019-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program