



Test Lab
 Cert 2764.01

Test report No:
 NIE: 03934RCB.001

Test report

Test and Certification for Citizens Broadband Radio Service (CBRS): WINNF-TS-0122

Identification of item tested	AirVelocity 1901
Trademark	Airspan Networks Inc.
Model and /or type reference	AirVelocity 1901, 3.55-3.7GHz (n48) CBSD
Other identification of the product	FCC ID: PIDAV1901
Features	CBSD, Domain Proxy, 5G-TDD n48
Final HW Version:	00
Final SW Version:	SR19.50
Manufacturer	AIRSPAN NETWORK INC 777 YAMATO ROAD SUIT 310 BOCA RATON, FLORIDA – 33431 UNITED STATES OF AMERICA
Test method requested, standard	WINNF-TS-0122 v1.0.2
Approved by (name / position & signature)	Gonzalo Casado Lab Manager
Date of issue	2022-December-03
Report template No	FDT08_23

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Abbreviations

Abbreviation	Meaning
CBRS	Citizens Broadband Radio Services
CBSD	Citizens Broadband Radio Service Device
DP	Domain Proxy
DUT	Device Under Test
SAS	Spectrum Access System
UUT	Unit Under Test
CPI	Certified Professional Installer
N/A	Not Applicable

Usage of samples

Samples undergoing test have been selected by the client

Sample M/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
3934.01	CBSD	AV191-N48-DP4C1S	F08869013152	2022-11-26
N/A	DOMAIN PROXY	-	N/A	2022-11-26

Sample M/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
3934.02	CBSD	AV191-N48-DP4C1S	F08869013108	2022-11-26
N/A	DOMAIN PROXY	-	N/A	2022-11-26

1. Sample M/01 and M/02 has undergone the test(s) specified in subclause “Test method requested”.

Supported Features

Condition	Feature Description	Supported
C1	Mandatory for UUT which supports multi-step registration message.	Y
C2	Mandatory for UUT which supports single-step registration with no CPI-signed data in the registration message. By definition, this is a subset of Category A devices which determine all registration information, including location, without CPI intervention.	N
C3	Mandatory for UUT which supports single-step registration containing CPI-signed data in the registration message.	Y

C4	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type.	Y
C5	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.	N
C6	Mandatory for UUT which supports parameter change being made at the UUT and prior to sending a deregistration.	N
DP	CBSD with Domain Proxy	Y
CPE	CBSD is CPE-CBSD device	N

Identification of the client

AIRSPAN NETWORK INC
777 YAMATO ROAD SUIT 310
BOCA RATON, FLORIDA – 33431, USA

Testing period and place

Test Location	DEKRA Certification Inc 405 Glenn Drive, Suite 12, Sterling, Virginia, USA, 20164
Date (start)	2022-November-29
Date (finish)	2022-November-30

Document history

Report number	Date	Description
3934RCB.001	2022-December-03	First release

Remarks and comments

Testing performed by Avinash Koduri

According to manufacturer's declaration, the system under test has two model names due to marketing purposes based on the target sale country. The model names are: AirVelocity 1901, 3.55-3.7GHz (n48), POE, DC.

Client provided Final HW Version, Final SW Version: SR19.50, FCC ID, Identification of Item tested, Model and/or type reference, Feature

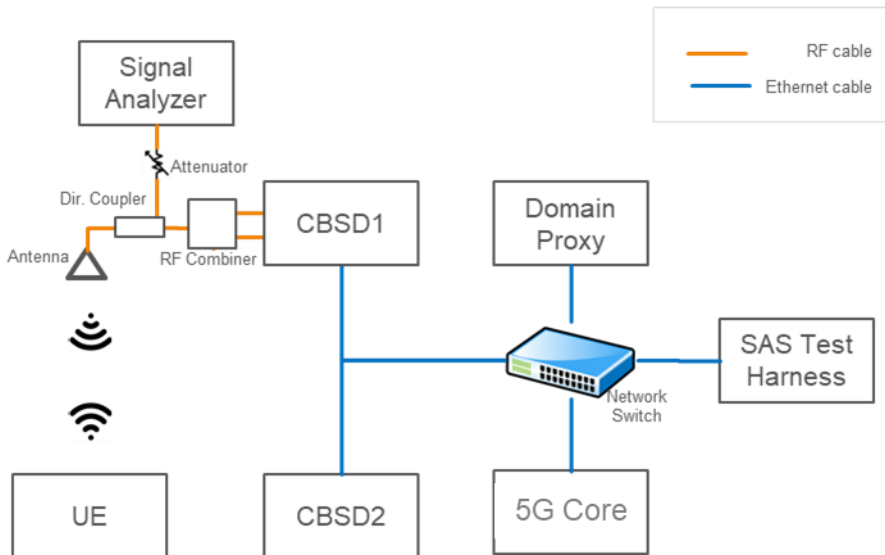
List of equipment used during the test

Description	Model	Test Equipment		
		Control Number	SW Version	Serial Number
Signal Analyzer	MXAN9020A	0382	A 14.16	MY50110425

Test SAS Harness	N/A	CTC-5233-K	V1.0.3	R9-L2D1Y
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Test Setup Diagram

Domain Proxy Configuration



Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Test Results Summary

Test Cases Verdicts	Number of Test Cases
Pass :	32
Total Number of Test Cases	32

Appendix A: Test results

Test Case Name	Description	Verdict	Date
WINNF.FT.D.REG.2	Domain Proxy Multi-Step registration	PASS	11/29/2022
WINNF.FT.D.REG.6	Domain Proxy Single-Step registration for CBSD with CPI signed data	PASS	11/29/2022
WINNF.FT.D.REG.9	Domain Proxy Missing Required parameters (responseCode 102)	PASS	11/29/2022
WINNF.FT.D.REG.11	Domain Proxy Pending registration (responseCode 200)	PASS	11/29/2022
WINNF.FT.D.REG.13	Domain Proxy Invalid parameters (responseCode 103)	PASS	11/29/2022
WINNF.FT.D.REG.15	Domain Proxy Blacklisted CBSD (responseCode 101)	PASS	11/29/2022
WINNF.FT.D.REG.17	Domain Proxy Unsupported SAS protocol version responseCode 100)	PASS	11/29/2022
WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	PASS	11/29/2022
WINNF.FT.C.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	PASS	11/29/2022
WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT CONFLICT)	PASS	11/29/2022
WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	PASS	11/29/2022
WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	PASS	11/29/2022
WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	PASS	11/29/2022
WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	PASS	11/29/2022
WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC OP PARAM)	PASS	11/29/2022
WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	PASS	11/29/2022
WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	PASS	11/29/2022
WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	PASS	11/29/2022
WINNF.FT.C.HBT.11	Successful Grant Renewal in Heartbeat Test Case	PASS	11/29/2022
WINNF.FT.D.MES.2	Domain Proxy Registration Response contains measReportConfig	PASS	11/29/2022

Test Case Name	Description	Verdict	Date
WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	PASS	11/29/2022
WINNF.FT.D.RLQ.4	Domain Proxy Unsuccessful Relinquishment, responseCode=102	PASS	11/29/2022
WINNF.FT.D.RLQ.6	Domain Proxy Unsuccessful Relinquishment, responseCode=103	PASS	11/29/2022
WINNF.FT.D.DRG.2	Domain Proxy Successful Deregistration	PASS	11/29/2022
WINNF.FT.D.DRG.4	Domain Proxy Deregistration responseCode=102	PASS	11/29/2022
WINNF.FT.C.DRG.5	Domain Proxy Deregistration responseCode=103	PASS	11/29/2022
WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	PASS	11/30/2022
WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	PASS	11/30/2022
WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	PASS	11/30/2022
WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	PASS	11/30/2022
WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	PASS	11/30/2022
WINNF.PT.C.HBT.1	UUT RF Transmit Power Measurement	PASS	11/30/2022

UUT RF Transmit Power Measurement

The value of Reference Level Offset for this test was taken of the attenuators and cable loss in the setup, plus adding 9dB which complies with 9dBi antenna configured for the UUT. MaxEIRP supported by the by UUT is 20dBm/MHz.

Frequency [MHz]	Bandwidth [MHz]	Granted maxEIRP [dBm/MHz]	Tx Conducted PSD [dBm/MHz]	Antenna Gain [dBi]	maxEIRP [dBm/MHz]
3570-3590	20	20	9.91	9	18.91
		18	7.59	9	16.59
		15	5.06	9	14.06
		12	2.03	9	11.03
		10	0.27	9	9.27

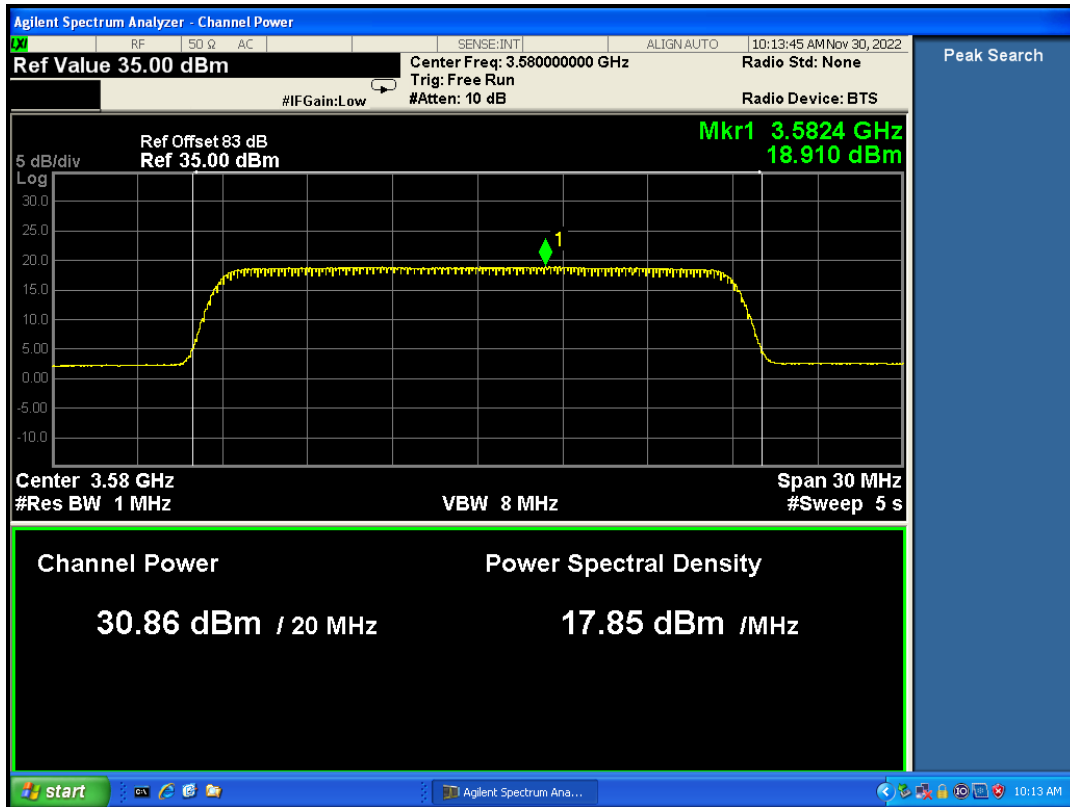


Figure 1: PSD Measurement Granted Max EIRP of 20dBm/MHz

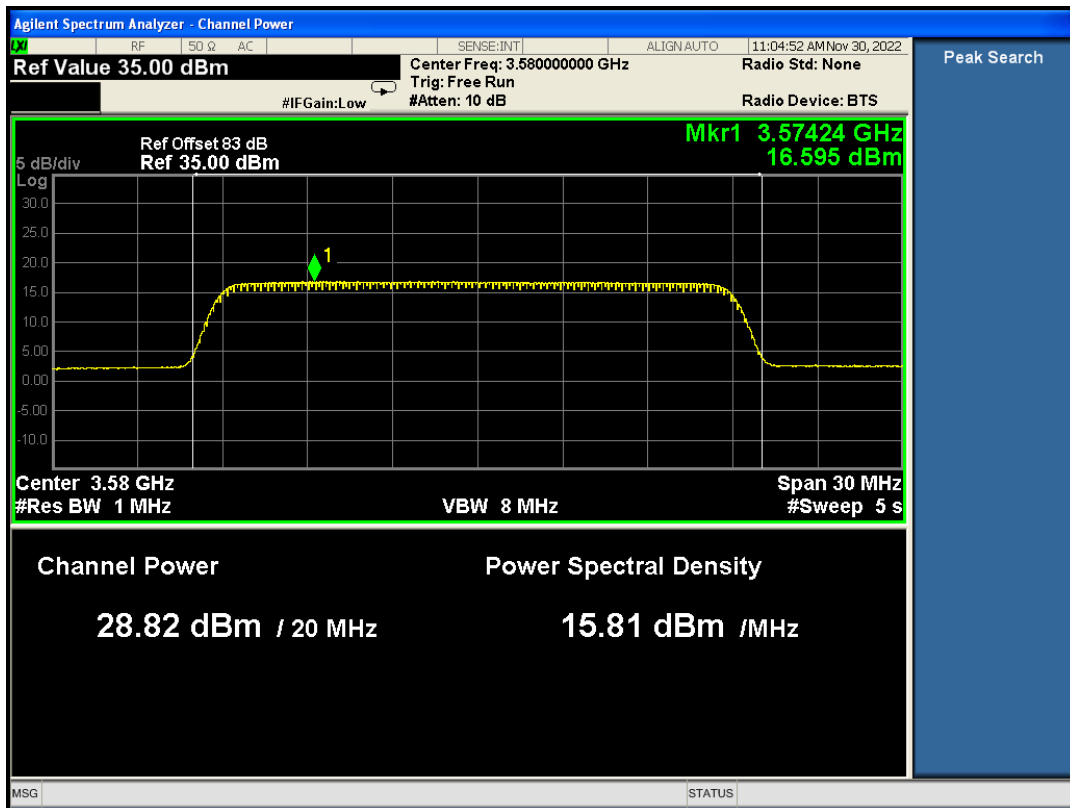


Figure 2: PSD Measurement Granted Max EIRP of 18dBm/MHz

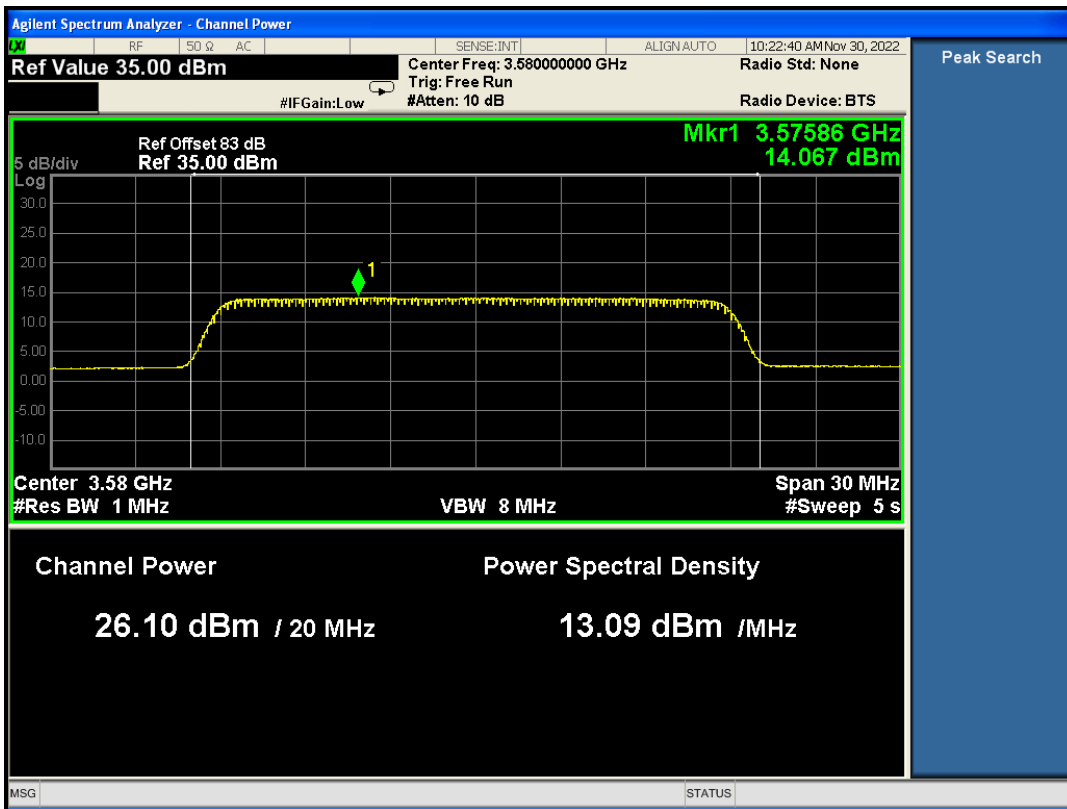


Figure 3: PSD Measurement Granted Max EIRP of 15dBm/MHz

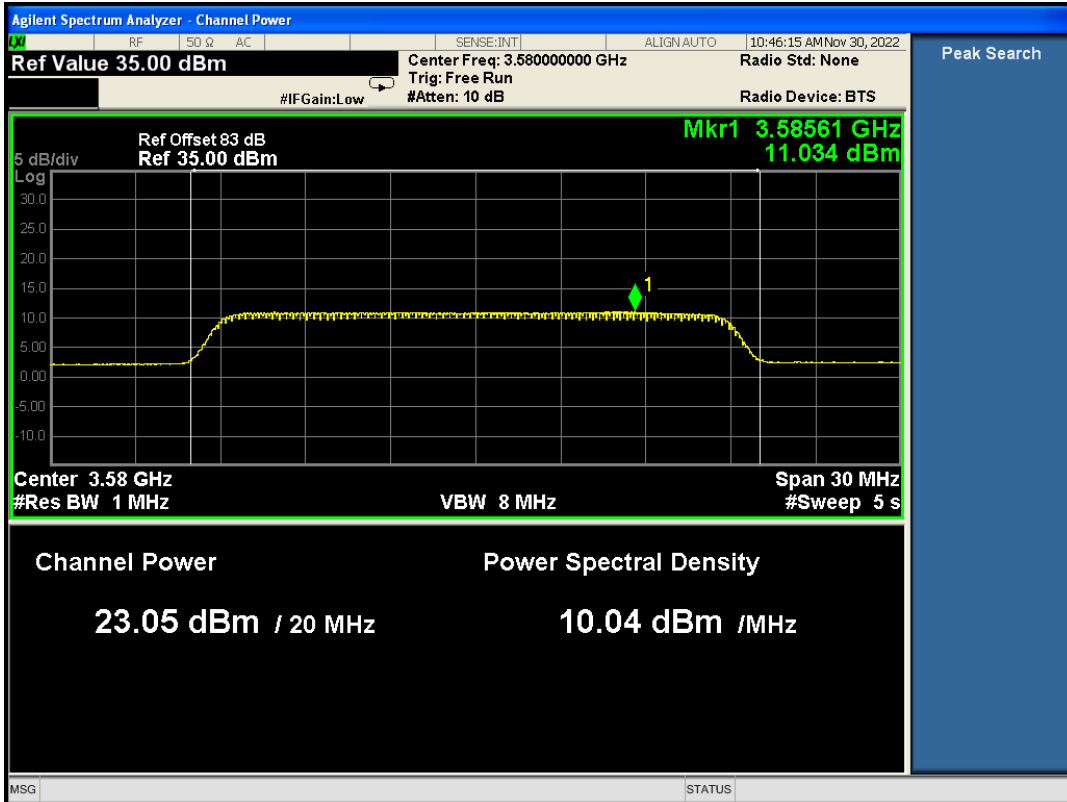


Figure 4: PSD Measurement Granted Max EIRP of 12dBm/MHz

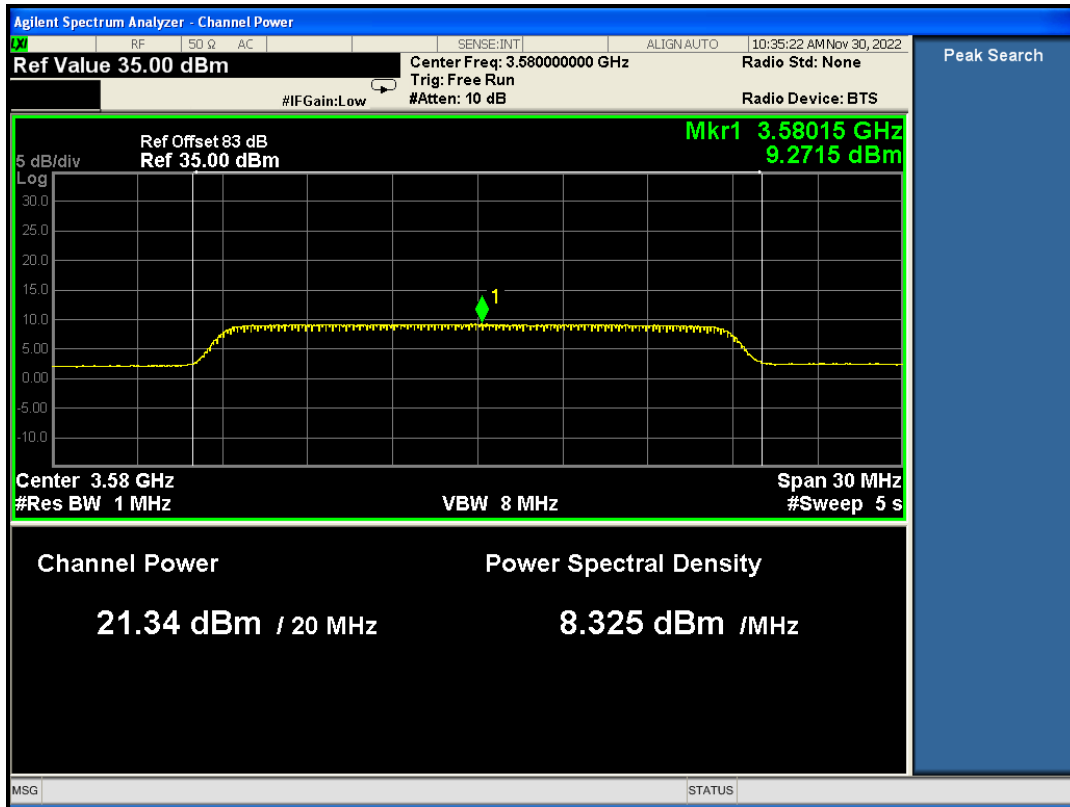
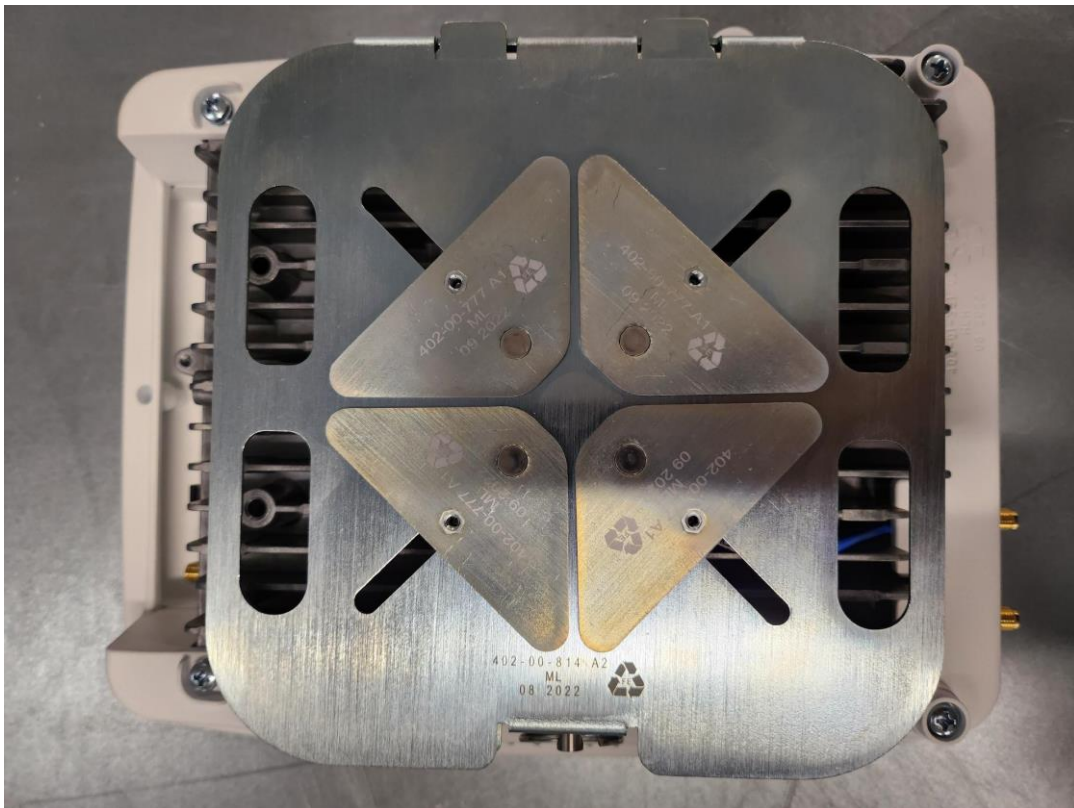


Figure 5: PSD Measurement Granted Max EIRP of 10dBm/MHz

Appendix B: DUT Photographs



Appendix C: Test Cases Details

1) [WINNF.FT.D.REG.2] Domain Proxy Multi-Step registration

This test is mandatory for the Domain proxy that is controlling CBSDs which support multi-step registration. This test validates that each of the required parameters appear within the registration request message. This test case applies to Domain Proxy supervising two CBSDs. The following are the test execution steps:

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state
2	DP with two CBSD sends correct Registration request information, as specified in [n.5], in the form of one 2-element Array or as individual messages to the SAS Test Harness: <ul style="list-style-type: none"> • The required <i>userId</i>, <i>fccId</i> and <i>cbsdSerialNumber</i> registration parameters shall be sent for each CBSD and conform to proper format and acceptable ranges. • Any REG-conditional or optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges. Note: It is outside the scope of this document to test the Registration information that is supplied via another means.
3	<ul style="list-style-type: none"> • SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or individual messages as follows: <ul style="list-style-type: none"> – <i>cbsdId</i> = Ci – <i>measReportConfig</i> shall not be included – <i>responseCode</i> = 0 for each CBSD
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

2) [WINNF.FT.D.REG.6] Domain Proxy Single-Step registration for CBSD with CPI signed data

This test is mandatory for DP with CBSDs which report all Required and REG-Conditional parameters in the Registration request to the SAS using CPI signed data. This test validates that each of the required and REG-Conditional parameters appear within the registration request message. This test case applies to Domain Proxy supervising two CBSDs.

All Category B devices, and Category A devices not able to determine its own location require installation by a CPI. This test is for devices where the CPI enters data into the CBSD and this information along with the CPI signature are sent in the request message. Excluded from this test are devices which require the CPI to enter the information into a SAS interface. These devices would follow the multiple step registration test [WINNF.FT.D.REG.2].

The following are the test execution steps:

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state • All of the required and REG-Conditional parameters shall be configured and CPI signature provided
2	The DP with two CBSDs sends Registration requests in the form of one 2-element Array or as individual messages to the SAS Test Harness: <ul style="list-style-type: none"> • The required <i>userId</i>, <i>fccId</i> and <i>cbsdSerialNumber</i> and REG- Conditional <i>cbsdCategory</i>, <i>airInterface</i>, <i>measCapability</i> and <i>cpiSignatureData</i> registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. • Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.
3	<ul style="list-style-type: none"> • SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – <i>cbsdId</i> = Ci – <i>measReportConfig</i> for each CBSD shall not be included. – <i>responseCode</i> = 0 for each CBSD
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

If a waiver for the measurement capability has been obtained from the FCC for the CBSD, the WINNF.FT.D.REG.6_waiver test case shall be executed which is the same as above, but where *measCapability* is not required in the request message.

3) [WINNF.FT.D.REG.9] Domain Proxy Missing Required parameters (*responseCode* 102)

This test case applies to Domain Proxy supervising two CBSDs. The following are the test execution steps where the Registration response contains *responseCode* (Ri) = 102 for each CBSD:

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state

2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

4) [WINNF.FT.D.REG.11] Domain Proxy Pending registration (responseCode 200)

The same steps provided for WINNF.FT.D.REG.9 shall be executed for this test, with the exception that the Registration response contains *responseCode* (Ri) = 200 for each CBSD.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

5) [WINNF.FT.D.REG.13] Domain Proxy Invalid parameters (responseCode 103)

The same steps provided for WINNF.FT.D.REG.9 shall be executed for this test, with the exception that the Registration response contains *responseCode* R1 = 0 for CBSD1 and R2 = 103 for CBSD2.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state

2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

6) [WINNF.FT.D.REG.15] Domain Proxy Blacklisted CBSD (responseCode 101)

The same steps provided for WINNF.FT.D.REG.9 shall be executed for this test, with the exception that the Registration response contains *responseCode* R1 = 0 for CBSD1 and R2 = 101 for CBSD2.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

7) [WINNF.FT.D.REG.17] Domain Proxy Unsupported SAS protocol version (responseCode 100)

The same steps provided for WINNF.FT.D.REG.9 shall be executed for this test, with the exception that the Registration response contains *responseCode* (Ri) = 100 for each CBSD.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state

2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

8) [WINNF.FT.D.REG.19] Domain Proxy Group Error (responseCode 201)

The registrationRequest groupingParam is an optional field and will be validated by the SAS Test Harness if provided in the Registration Request message. This test will validate that the CBSD will remain Unregistered after receiving responseCode 201.

The same steps provided for WINNF.FT.D.REG.9 shall be executed for this test, with the exception that the Registration response contains *responseCode* R1 = 0 for CBSD1 and R2 = 201 for CBSD2.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> – SAS response does not include a <i>cbstdId</i>. – <i>responseCode</i> = Ri for CBSD1 and CBSD2
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

9) [WINNF.FT.C.GRA.1] Unsuccessful Grant responseCode=400 (INTERFERENCE)

The following steps describe the test execution where the Grant response contains responseCode (R) = 400.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness, with <i>cbstdId</i> = C
2	UUT sends valid Grant Request.

3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none"> • <i>cbstdId=C</i> • <i>responseCode = R</i>
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

10) WINNF.FT.C.GRA.2] Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)

The same steps provided for WINNF.FT.C.GRA.1 shall be executed for this test, with the exception that the Grant response contains *responseCode (R) = 401*.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness, with <i>cbstdId = C</i>
2	UUT sends valid Grant Request.
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none"> • <i>cbstdId=C</i> • <i>responseCode = R</i>
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

11) [WINNF.FT.D.HBT.2] Domain Proxy Heartbeat Success Case (first Heartbeat Response)

This test case incorporates validation of successful Spectrum Inquiry messaging (if present) and successful Grant messaging into the Heartbeat Success case.

This test case applies to Domain Proxy supervising two CBSDs. The following are the test execution steps.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • DP has two CBSD registered successfully with SAS Test Harness, with <i>cbstdId = Ci, i={1,2}</i>
2	DP sends a message: <ul style="list-style-type: none"> • If message is a Spectrum Inquiry Request, go to step 3 • If message is a Grant Request, go to step 5

3	<p>DP sends a Spectrum Inquiry Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Spectrum Inquiry Request message is formatted correctly for each CBSD, including for CBSD_i, $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • List of frequencyRange objects sent by DP are within the CBRS frequency range
4	<p>If a separate Spectrum Inquiry Request message was sent for each CBSD, the SAS Test Harness shall respond to each Spectrum Inquiry Request message with a separate Spectrum Inquiry Response message.</p> <p>If a single Spectrum Inquiry Request message was sent containing a 2- object array (one per CBSD), the SAS Test Harness shall respond with a single Spectrum Inquiry Response message containing a 2-object array.</p> <p>Verify parameters for each CBSD within the Spectrum Inquiry Response message are as follows, for CBSD_i, $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • availableChannel is an array of availableChannel objects • <i>responseCode</i> = 0
5	<p>DP sends a Grant Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Grant Request message is formatted correctly for each CBSD, including for CBSD_i, $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96 • operationFrequencyRange, F_i, sent by UUT is a valid range within the CBRS band
6	<p>If a separate Grant Request message was sent for each CBSD, the SAS Test Harness shall respond to each Grant Request message with a separate Grant Response message.</p>
	<p>If a single Grant Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Grant Response message containing a 2-object array.</p> <p>Verify parameters for each CBSD within the Grant Response message are as follows, for CBSD_i, $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • <i>grantId</i> = G_i = a valid grant ID • <i>grantExpireTime</i> = UTC time greater than duration of the test • <i>responseCode</i> = 0

7	<p>Ensure DP sends first Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Heartbeat Request message is formatted correctly for each CBSD, including, for CBSDi i={1,2}:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci, i={1,2} • <i>grantId</i> = Gi, i={1,2} • <i>operationState</i> = “GRANTED”
8	<p>If a separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message.</p> <p>If a single Heartbeat Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Heartbeat Response message containing a 2-object array.</p> <p>Verify parameters for each CBSD within the Heartbeat Response message are as follows, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi • <i>transmitExpireTime</i> = current UTC time + 200 seconds • <i>responseCode</i> = 0
9	<p>For further Heartbeat Request messages sent from DP after completion of step 8, validate message is sent within latest specified heartbeatInterval for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi • <i>operationState</i> = “AUTHORIZED” <p>and SAS Test Harness responds with a Heartbeat Response message including the following parameters, for CBSDi</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi • <i>transmitExpireTime</i> = current UTC time + 200 seconds • <i>responseCode</i> = 0
10	<p>Monitor the RF output of the UUT from start of test until UUT transmission commences. Monitor the RF output of the UUT from start of test until RF transmission commences. Verify:</p> <ul style="list-style-type: none"> • UUT does not transmit at any time prior to completion of the first heartbeat response • UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range Fi.

12) [WINNF.FT.C.HBT.3] Heartbeat responseCode=105 (DEREGISTER)

The following are the test execution steps.

#	Test Execution Steps
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1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface
2	<p>UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "AUTHORIZED"
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>transmitExpireTime</i> = T = Current UTC time ● <i>responseCode</i> = 105 (DEREGISTER)
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>
5	<p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3

13) [WINNF.FT.C.HBT.5] Heartbeat *responseCode*=501 (SUSPENDED_GRANT) in First Heartbeat Response

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)

2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = “GRANTED”
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = current UTC time • <i>responseCode</i> = 501 (SUSPENDED_GRANT)
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>
5	<p>Monitor the SAS-CBSD interface. Verify either A OR B occurs:</p> <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = “GRANTED” <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbdsId</i> = C • <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> • UUT does not transmit at any time

14) [WINNF.FT.C.HBT.6] Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface

2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED"
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = current UTC time • <i>responseCode</i> = 501 (SUSPENDED_GRANT)
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>
5	<p>Monitor the SAS-CBSD interface. Verify either A OR B occurs:</p> <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED" <p>B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbdsId</i> = C • <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <p>UUT shall stop transmission within (<i>T</i> + 60 seconds) of completion of step 3</p>

15) [WINNF.FT.C.HBT.7] Heartbeat responseCode=502 (UNSYNC_OP_PARAM)

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface

2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> • cbsdId = C • grantId = G • operationState = “AUTHORIZED”
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> • cbsdId = C • grantId = G • transmitExpireTime = T = Current UTC Time • responseCode = 502 (UNSYNC_OP_PARAM)
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>
5	<p>Monitor the SAS-CBSD interface. Verify:</p> <ul style="list-style-type: none"> • UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: <ul style="list-style-type: none"> ○ cbsdId = C ○ grantId = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> • UUT shall stop transmission within (T+60) seconds of completion of step 3.

16) [WINNF.FT.D.HBT.8] Domain Proxy Heartbeat responseCode=500 (TERMINATED_GRANT)

This test case applies to Domain Proxy supervising two CBSDs. The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has two CBSD registered successfully with SAS Test Harness • Each CBSD {1,2} has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = Ci, i={1,2} ○ valid grantId = Gi, i={1,2} ○ grant is for frequency range Fi, power Pi ○ grantExpireTime = UTC time greater than duration of the test • Both CBSD are in AUTHORIZED state and transmitting within their granted bandwidth on RF interface
2	<p>DP sends a Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of size 2. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly for each CBSD, including, for CBSDi i={1,2}:</p> <ul style="list-style-type: none"> • cbsdId = Ci, i = {1,2} • grantId = Gi, i = {1,2} • operationState = “AUTHORIZED”

3	<p>If separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message. message should be as follows, for CBSDi:</p> <ul style="list-style-type: none"> • cbsdId = Ci • grantId = Gi • For CBSD1: <ul style="list-style-type: none"> ○ transmitExpireTime = current UTC time + 200 seconds ○ responseCode = 0 • For CBSD2: transmitExpireTime = T = current UTC time
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> <p>If CBSD sends further Heartbeat Request messages for CBSD1, SAS Test Harness shall respond with a Heartbeat Response message with parameters:</p> <ul style="list-style-type: none"> • cbsdId = C1 • grantId = G1 • transmitExpireTime = current UTC time + 200 seconds • responseCode = 0 • Heartbeat Request message is within heartbeatInterval of previous Heartbeat Request message
5	<p>Monitor the RF output of CBSD2. Verify:</p> <ul style="list-style-type: none"> • CBSD2 shall stop transmission within bandwidth F2 within (T + 60 seconds) of completion of step 3

17) [WINNF.FT.C.HBT.9] Heartbeat Response Absent (First Heartbeat)

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test • UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)
2	<p>UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> • cbsdId = C • grantId = G • operationState = "GRANTED"
3	<p>After completion of Step 2, SAS Test Harness does not respond to any further messages from UUT to simulate loss of network connection</p>
4	<p>Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify:</p> <ul style="list-style-type: none"> • At any time during the test, UUT shall not transmit on RF interface

18) [WINNF.FT.C.HBT.10] Heartbeat Response Absent (Subsequent Heartbeat) The following are the test execution steps.

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED"
3	SAS Test Harness sends a Heartbeat Response message, with the following parameters: <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0
4	After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT
5	Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none"> ● UUT shall stop all transmission on RF interface within (transmitExpireTime + 60 seconds), using the transmitExpireTime sent in Step 3.

19) [WINNF.FT.C.HBT.11] Successful Grant Renewal in Heartbeat Test Case

The following are the test execution steps.

1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface. ● Grant has the following parameters at the start of the test: <ul style="list-style-type: none"> ○ grantExpireTime =UTC time equal to time at start of test + 300 seconds = Tgrant_expire ○ transmitExpireTime = UTC time equal to time at start of test + 200 seconds ○ heartbeatInterval = 60 seconds
2	<p>UUT sends a Heartbeat Request message. If Heartbeat Request message contains grantRenew = TRUE, go to Step 6, else go to Step 3.</p>
3	<p>Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”
4	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = current UTC + 200 seconds ● grantExpireTime = same as Step 1 ● responseCode = 0
5	<p>Go to Step 2</p>
6	<p>Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState=“AUTHORIZED” ● grantRenew=TRUE ●
7	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>grantExpireTime</i> = UTC time set far in the future ● <i>transmitExpireTime</i> = current UTC time + 200 seconds ● <i>responseCode</i> = 0

8	Continue to respond to any subsequent Heartbeat Request from CBSD with Heartbeat Response with the following parameters: <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = same as Step 7 • <i>responseCode</i> = 0
9	Monitor RF transmission of UUT from start of test until Tgrant_expire + 60 seconds and ensure UUT continues to transmit throughout the time period.

20) [WINNF.FT.D.MES.2] Domain Proxy Registration Response contains *measReportConfig*

This test case is mandatory for Domain Proxy supervising CBSD which support RECEIVED_POWER_WITHOUT_GRANT.

The following steps describes the test execution steps:

#	Test Execution Steps
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness
2	DP sends a Registration Request message for each of two CBSD. This may occur in a separate Request message per CBSD, or together in a single Request message with array of 2. Verify Registration Request message contains all required parameters properly formatted for CBSDi, i={1,2}, and specifically: <ul style="list-style-type: none"> • <i>userId</i> is present and correct • <i>fccId</i> is present and correct • <i>cbsdSerialNumber</i> is present and correct • <i>measCapability</i> = “RECEIVED_POWER_WITHOUT_GRANT”
3	If a separate Registration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Registration Request message with a separate Registration Response message. If a single Registration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Registration Response message containing a 2-object array. Parameters for each CBSD within the Registration Response message should be as follows, for CBSDi: <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>measReportConfig</i>= “RECEIVED_POWER_WITHOUT_GRANT” • <i>responseCode</i> = 0
4	UUT sends a message: <ul style="list-style-type: none"> • If message is type Spectrum Inquiry Request, go to step 5, or • If message is type Grant Request, go to step 7

5	<p>UUT sends message type Spectrum Inquiry Request. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Spectrum Inquiry Request message contains all required parameters properly formatted for CBSDi, i= {1,2}, and specifically:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.
6	<p>If a separate Spectrum Inquiry Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Spectrum Inquiry Request message with a separate Spectrum Inquiry Response message.</p> <p>If a single Spectrum Inquiry Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Spectrum Inquiry Response message containing a 2-object array.</p> <p>Parameters for each CBSD within the Spectrum Inquiry Response message should be as follows:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>availableChannel</i> is an array of <i>availableChannel</i> objects <p><i>responseCode</i> = 0</p>
7	<p>UUT sends message type Grant Request message. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify the Grant Request message contains all required parameters properly formatted for CBSDi, i= {1,2}, and specifically:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.

21) [WINNF.FT.D.RLQ.2] Domain Proxy Successful Relinquishment

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, i={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, i={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger to relinquish each UUT Grant from the SAS Test Harness</p>
2	<p>Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi

3	<p>If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response shall be as follows: cbsdId = Ci grantId = Gi responseCode = 0</p>
4	<p>After completion of step 3, SAS Test Harness will not provide any additional positive response (responseCode=0) to further request messages from the UUT.</p>
5	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: UUT shall stop RF transmission at any time between triggering the relinquishments and UUT sending the relinquishment requests for each CBSD.</p>

22) [WINNF.FT.D.RLQ.4] Domain Proxy Unsuccessful Relinquishment, responseCode=102

This test case applies to Domain Proxy supervising two CBSDs. The following are the test execution steps where the Relinquishment response contains *responseCode* (Ri) = 102 for each CBSD.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, i={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, i={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger on UUT to Relinquish Grant from the SAS Test Harness</p>
2	<p>DP with two CBSDs sends Relinquishment Request with two objects to the SAS Test Harness. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi

3	<p>If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response Message shall be as follows:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • No <i>grantId</i> • <i>responseCode</i> = Ri
4	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.</p>
5	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <p style="padding-left: 40px;">A. UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</p>

23) [WINNF.FT.D.RLQ.6] Domain Proxy Unsuccessful Relinquishment, responseCode=103

The same steps provided for WINNF.FT.D.RLQ.4 shall be executed for this test, with the exception that the Relinquishment response contains responseCode (Ri) = 103 and responseData = “grantId” for each CBSD.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, i={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, i={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger on UUT to Relinquish Grant from the SAS Test Harness</p>
2	<p>DP with two CBSDs sends Relinquishment Request with two objects to the SAS Test Harness. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • <i>grantId</i> = Gi

3	<p>If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response Message shall be as follows:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci • No <i>grantId</i> • <i>responseCode</i> = Ri
4	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.</p>
5	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <p>A. UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</p>

24) [WINNF.FT.D.DRG.2] Domain Proxy Successful Deregistration

The following are the test execution steps.

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • Each UUT has successfully registered with SAS Test Harness • Each UUT is in the authorized state • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, <i>i</i>={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, <i>i</i>={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger to deregister each UUT from the SAS Test Harness</p>
2	<p>UUT may send a Relinquishment request and receives Relinquishment response with <i>responseCode</i>=0</p>
3	<p>Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci

4	<p>If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response shall be as follows:</p> <ul style="list-style-type: none"> • cbsdId = Ci • responseCode = 0
5	<p>After completion of step 4, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.</p>
6	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory UUT sending a Deregistration Request message

25) [WINNF.FT.D.DRG.4] Domain Proxy Deregistration responseCode=102

The following are the test execution steps where the Deregistration response contains *responseCode* (Ri) = 102 for each CBSD..

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, i={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, i={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger to deregister each UUT from the SAS Test Harness</p>
2	<p>UUT may send a Relinquishment request and receives Relinquishment response with <i>responseCode</i>=0 for each CBSD</p>
3	<p>Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci

4	<p>If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response Message shall be as follows:</p> <ul style="list-style-type: none"> • No <i>cbsdId</i> in either response • <i>responseCode</i> = Ri
5	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.</p>
6	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory UUT sending a Deregistration Request message

26) [WINNF.FT.C.DRG.5] Deregistration *responseCode*=103

The same steps provided for WINNF.FT.C.DRG.3 shall be executed for this test, with the exception that the Deregistration response contains *responseCode* (R) = 103 and *responseData* = "cbsdId".

#	Test Execution Steps
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • DP has successfully completed SAS Discovery and Authentication with SAS Test Harness • DP has successfully registered 2 CBSD with SAS Test Harness, each with <i>cbsdId</i>=Ci, i={1,2} • DP has received a valid grant with <i>grantId</i> = Gi, i={1,2} for each CBSD • Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. <p>Invoke trigger to deregister each UUT from the SAS Test Harness</p>
2	<p>UUT may send a Relinquishment request and receives Relinquishment response with <i>responseCode</i>=0 for each CBSD</p>
3	<p>Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = Ci

4	<p>If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message.</p> <p>If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response Message shall be as follows:</p> <ul style="list-style-type: none"> • No cbsdId in either response • <i>responseCode</i> = Ri
5	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.</p>
6	<p>Monitor the RF output of each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory UUT sending a Deregistration Request message

27) [WINNF.FT.C.SCS.1] Successful TLS connection between UUT and SAS Test Harness

The following are the test execution steps.

#	Test Execution Steps
1	<ul style="list-style-type: none"> • UUT shall start CBSD-SAS communication with the security procedure • The UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate. • Configure the SAS Test Harness to accept the security procedure and establish the connection
2	<ul style="list-style-type: none"> • Make sure that Mutual authentication happens between UUT and the SAS Test Harness. • Make sure that UUT uses TLS v1.2 • Make sure that cipher suites from one of the following is selected, <ul style="list-style-type: none"> • TLS_RSA_WITH_AES_128_GCM_SHA256 • TLS_RSA_WITH_AES_256_GCM_SHA384 • TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 • TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 • TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
3	<p>A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability.</p> <ul style="list-style-type: none"> • UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with <i>responseCode</i> = 0 and <i>cbsdId</i>.
4	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT shall not transmit RF

28) [WINNF.FT.C.SCS.2] TLS failure due to revoked certificate

Test case pre-requisite:

The certificate at the SAS Test Harness shall be marked as revoked The following are the test execution steps.

#	Test Execution Steps
1	<ul style="list-style-type: none"> • UUT shall start CBSD-SAS communication with the security procedures
2	<ul style="list-style-type: none"> • Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.
3	UUT may retry for the security procedure which shall fail
4	SAS Test-Harness shall not receive any Registration request or any application data.
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

29) [WINNF.FT.C.SCS.3] TLS failure due to expired server certificate

Test case pre-requisite:

Configure the SAS Test Harness such that server certificate is valid but expired.

The following are the test execution steps.

#	Test Execution Steps
1	<ul style="list-style-type: none"> • UUT shall start CBSD-SAS communication with the security procedures
2	<ul style="list-style-type: none"> • Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.
3	UUT may retry for the security procedure which shall fail.
4	SAS Test-Harness shall not receive any Registration request or any application data.
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> • UUT shall not transmit RF

30) [WINNF.FT.C.SCS.4] TLS failure when SAS Test Harness certificate is issued by an unknown CA

Test case pre-requisite:

Equip the SAS Test Harness with certificate signed by an unknown CA to the CBSD. The following are the test execution steps:

#	Test Execution Steps
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1	<ul style="list-style-type: none"> • UUT shall start CBSD-SAS communication with the security procedures
2	<ul style="list-style-type: none"> • Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.
3	UUT may retry for the security procedure which shall fail.
4	SAS Test-Harness shall not receive any Registration request or any application data.
5	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT shall not transmit RF

31) [WINNF.FT.C.SCS.5] TLS failure when certificate at the SAS Test Harness is corrupted

Test case pre-requisite:

- The end-entity certificate at the SAS Test Harness shall be corrupted The following steps describe the test execution.

#	Test Execution Steps
1	<ul style="list-style-type: none"> • UUT shall start CBSD-SAS communication withthe security procedures
2	<ul style="list-style-type: none"> • Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.
3	UUT may retry for the security procedure which shall fail.
4	SAS Test-Harness shall not receive any Registration request or any application data.
5	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> • UUT shall not transmit RF

32) UUT RF Transmit Power Measurement Performance Test Case

- 1) This test case places the UUT in REGISTERED state, with a grant in AUTHORIZED state, with grant parameters: {lowFrequency, highFrequency, maxEirp}. The maxEirp value is varied by performing multiple iterations of the test case.
- 2) To perform this test case, the vendor of the UUT must declare the following parameters:
 1. Maximum rated power (EIRP, dBm/MHz) for the UUT

2. Transmit dynamic range of the UUT (in EIRP, dBm/MHz). The transmit dynamic range is the difference between the largest and smallest transmit power levels over which the device may operate, under SAS approved grant.

3. Occupied bandwidth (OBW) of the transmitted signal for the UUT for the test case.

4. maxEirp values for the test case. A total of N maxEirp values shall be chosen: maxEirp = {P1, P2, ... PN} across the transmit dynamic range of the UUT.

This may also require declaration of antenna gain and any feeder loss of the product, if conducted power measurements are to be used for measurement.

To demonstrate compliance, the following parameters shall be chosen:

- lowFrequency, highFrequency of the grant. These values should correspond to the bandwidth of operation for the test, appropriate to the OBW of signal under test. Where a UUT is capable of multiple bandwidth operation modes, a single bandwidth operation mode shall be chosen for this test.

The test case below shall be performed for each of the maxEirp values: {P1, P2, ... PN}, determining a pass or fail for each. The UUT must comply with the grant maxEirp parameter for each test. Choice of maxEirp values {P1, P2, ... PN} should be made with knowledge of any limitations on UUT power control steps.

The UUT should be configured during the test to apply the maxEirp values to the entire occupied bandwidth and is implicitly expected to not exceed the dBm/MHz grant requirement.