

TEST REPORT

CBSD-SAS Interoperability Test for of SJ-ORU4402-N48US
Certification

APPLICANT

SAMJI Electronics Co., Ltd.

REPORT NO.

HCT-OT-2508-SS001

DATE OF ISSUE

August 19, 2025

Tested by
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TEST REPORT

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Applicant	SAMJI Electronics Co., Ltd. 63-27, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, KOREA
Product Name	CBRS 5G n48 4T4R 4W Outdoor ORAN RU
Model Number	SJ-ORU4402-N48US
Date of Test	Aug. 13, 2025
Test Standard Used	FCC 47 CFR Part 96 ONGO-TS-9001-V1.3.0 WINNF-TS-0122 V1.2.0
Test Results	Refer to the attachment
Frequency range	3 550 MHz ~ 3 700 MHz
Manufacture	SAMJI Electronics Co., Ltd.
Location of Test	<input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 19, 2025	Initial Release

Notice

Content

The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.

The test results have only been applied with the test methods required by the standard(s).

The laboratory is not accredited for the test results marked *.

Information provided by the applicant is marked **.

Test results provided by external providers are marked ***.

When confirmation of authenticity of this test report is required, please contact www.hct.co.kr

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

1. Applicant Information	5
2. Equipment Under Test (EUT)	5
2.1 Identification of the EUT.....	5
2.2 Supported Features	5
3. Measurement Setup	6
3.1 Test Equipment	6
3.2 Test Environment.....	6
3.3 Test Configuration.....	6
4. Test Summary	7
5. Test Results	8
5.1 CBSD Registration Process.....	8
5.2 CBSD Spectrum Grant Process	15
5.3 CBSD Heart Beat Process.....	17
5.4 CBSD Relinquishment Process	27
5.5 CBSD Deregistration Process	30
5.6 CBSD Security Validation.....	33
5.7 CBSD RF Power Measurement.....	38
6. TEST LOGS.....	43
7. TEST SETUP PHOTOGRAPHS	44

1. Applicant Information

The EUT has been tested by request of

Company	SAMJI Electronics Co., Ltd.
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2. Equipment Under Test (EUT)

2.1 Identification of the EUT

Model	SJ-ORU4402-N48US
Serial Number	CBSD 1: SJSP241000004 CBSD 2: SJSP241000012
CBSD Hardware version	1.0
CBSD Software version	1.0
DP Hardware version	1.0
DP Software version	1.0
Firmware version	1.0
FCC ID	2BK6Y-GC457198
CBSD Category	Category B
Unit Under Test Type	CBSD with DP
Transmitter Frequency Band	NR n48

2.2 Supported Features

	Conditional Test Case	Supported
C1	Mandatory for UUT which supports multi-step registration message	<input checked="" type="checkbox"/>
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.	<input type="checkbox"/>
C3	Mandatory for UUT which supports single-step registration containing CPI-signed data in the registration message	<input type="checkbox"/>
C4	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type.	<input type="checkbox"/>
C5	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.	<input type="checkbox"/>
C6	Mandatory for UUT which supports parameter change being made at the UUT and prior to sending a deregistration.	<input type="checkbox"/>

3. Measurement Setup

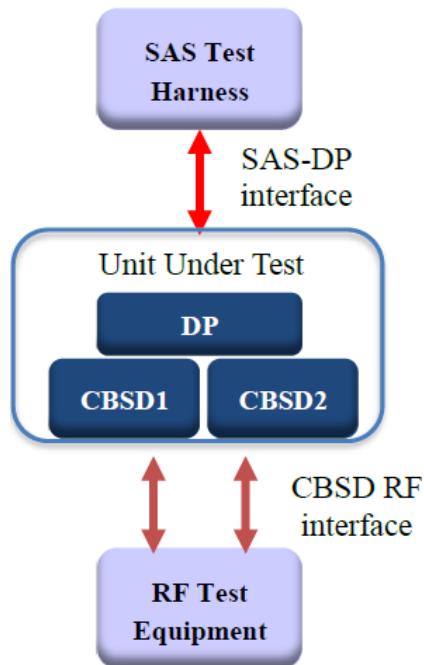
3.1 Test Equipment

No.	Instrument	Model	Manufacturer	Serial No.	Due to Calibration
1	Signal Analyzer	N9030A	Agilent	US51350313	2026-03-13
2	SAS Test Harness Laptop	NT551XDA	SAMSUNG	KPXH99YR9003T4D	N/A
3	Hub switch	NEXT-510POE-TP	EZ-NET	202203250121	N/A
4	UE	WD-H812P	WOORINET	010118	N/A
5	UE	WD-H812P	WOORINET	010130	N/A

3.2 Test Environment

SAS Test Harness version	V1.0.3
Operating System	Windows 10
TLS Version	V1.2
Python version	V2.7

3.3 Test Configuration



4. Test Summary

Section	Test Case ID	Test Case Title	Test Result
6.1.4.1.2	WINNF.FT.D.REG.2	Domain Proxy Multi-Step registration	PASS
6.1.4.2.2	WINNF.FT.D.REG.9	Domain Proxy Missing Required parameters (responseCode 102)	PASS
6.1.4.2.4	WINNF.FT.D.REG.11	Domain Proxy Pending registration (responseCode 200)	PASS
6.1.4.2.6	WINNF.FT.D.REG.13	Domain Proxy Invalid parameters (responseCode 103)	PASS
6.1.4.2.8	WINNF.FT.D.REG.15	Domain Proxy Blacklisted CBSD (responseCode 101)	PASS
6.1.4.2.10	WINNF.FT.D.REG.17	Domain Proxy Unsupported SAS protocol version responseCode 100)	PASS
6.1.4.2.12	WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	PASS
6.3.4.2.1	WINNF.FT.C.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	PASS
6.3.4.2.2	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	PASS
6.4.4.1.2	WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	PASS
6.4.4.2.1	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DREGISTER)	PASS
6.4.4.2.3	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	PASS
6.4.4.2.4	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	PASS
6.4.4.2.5	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	PASS
6.4.4.2.6	WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	PASS
6.4.4.3.1	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	PASS
6.4.4.3.2	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	PASS
6.6.4.1.2	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	PASS
6.6.4.2.2	WINNF.FT.D.RLQ.4	Domain Proxy Unsuccessful Relinquishment, responseCode=102	PASS
6.6.4.3.2	WINNF.FT.D.RLQ.6	Domain Proxy Unsuccessful Relinquishment, responseCode=103	PASS
6.7.4.1.2	WINNF.FT.D.DRG.2	Domain Proxy Successful Dereistration	PASS
6.7.4.2.2	WINNF.FT.D.DRG.4	Domain Proxy Dereistration responseCode=102	PASS
6.7.4.3.1	WINNF.FT.C.DRG.5	Dereistration responseCode=103	PASS
6.8.4.1.1	WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	PASS
6.8.4.2.1	WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	PASS
6.8.4.2.2	WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	PASS
6.8.4.2.3	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	PASS
6.8.4.2.4	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	PASS
7.1.4.1.1	WINNF.PT.C.HBT.1	UUT RF Transmit Power Measurement	PASS

5. Test Results

5.1 CBSD Registration Process

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

#	Test Execution Steps	Results	
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	CBSD sends correct Registration request information, as specified in[n.5], to the SAS Test Harness: <ul style="list-style-type: none">• The required userId, fcclId and cbsdSerialNumber registration parameters shall be sent from the 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. <p>Note: It is outside the scope of this document to test the Registration information that is supplied via another means.</p>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	<ul style="list-style-type: none">• SAS Test Harness sends a CBSD Registration Response as follows:<ul style="list-style-type: none">- <i>cbsdId = Ci</i>- <i>measReportConfig shall not be included</i>- <i>responseCode = 0</i>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId- responseCode = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">- SAS response does not include a cbsId.- responseCode (Ri) = 200	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId.- responseCode R1 = 0 for CBSD1 and R2 = 103 for CBSD2.	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsdId.- responseCode R1 = 0 for CBSD1 and R2 = 101 for CBSD2.	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId.- responseCode (Ri) = 100 for CBSD1 and CBSD2.	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId.- responseCode R1 = 0 for CBSD1 and R2 = 201 for CBSD2.	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.2 CBSD Spectrum Grant Process

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

#	Test Execution Steps	Results	
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 cbsdId = C	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none">• <i>cbsdId=C</i>• <i>responseCode =R</i>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) 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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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>cbsdId</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>cbsdId</i>=C• <i>responseCode</i> (R) = 401	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) 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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.3 CBSD Heart Beat Process

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

#	Test Execution Steps	Results	
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 $cbsdId = Ci, i\{1,2\}$	--	--
2	UUT sends a message: <ul style="list-style-type: none">If message is a Spectrum Inquiry Request, go to step 3If message is a Grant Request, go to step 5	--	--
3	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. Verify Spectrum Inquiry Request message is formatted correctly for each CBSD, including for $CBSDi, i\{1,2\}$: <ul style="list-style-type: none">$cbsdId = C$List of frequencyRange objects sent by DP are within the CBRS frequency range	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
4	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. 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. Verify parameters for each CBSD within the Spectrum Inquiry Response message are as follows, for $CBSDi, i\{1,2\}$: <ul style="list-style-type: none">$cbsdId = C$availableChannel is an array of availableChannel objectsresponseCode = 0	--	--
5	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. Verify Grant Request message is formatted correctly for each CBSD, including for $CBSDi, i\{1,2\}$: <ul style="list-style-type: none">$cbsdId = C$maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96operationFrequencyRange, Fi, sent by UUT is a valid range within the CBRS band	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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 CBS<i>D</i>_i, i={1,2}:</p> <ul style="list-style-type: none">• <i>cbsdId</i>=C• <i>grantId</i>= Gi = 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.</p> <p>This may occur in a separate message per CBSD, or together in a single message with array of 2.</p> <p>Verify Heartbeat Request message is formatted correctly for each CBSD, including, for CBS<i>D</i>_i i={1,2}:</p> <ul style="list-style-type: none">• <i>cbsdId</i>=C_i, i={1,2}• <i>grantId</i>= Gi, i={1,2}• <i>operationState</i> = "GRANTED"	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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 CBS<i>D</i>_i:</p> <ul style="list-style-type: none">• <i>cbsdId</i>=C_i• <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 CBS<i>D</i>_i:</p> <ul style="list-style-type: none">• <i>cbsdId</i>=C_i• <i>grantId</i>= Gi• <i>operationState</i>= "AUTHORIZED" <p>and SAS Test Harness responds with a Heartbeat Response message including the following parameters, for CBS<i>D</i>_i</p> <ul style="list-style-type: none">• <i>cbsdId</i>=C_i• <i>grantId</i>= Gi• <i>transmitExpireTime</i>= current UTC time + 200 seconds• <i>responseCode</i>=0	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

10	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: <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.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
----	--	--	-------------------------------

5.3.2 [WINNF.FT.C.HBT.3] Heartbeat responseCode=105 (DREGISTER)

#	Test Execution Steps	Results	
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>cbsId</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>cbsId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none">• <i>cbsId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = <i>T</i> = Current UTC time• <i>responseCode</i> = 105 (DREGISTER)	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
5	<p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none">• UUT shall stop transmission within (<i>T</i> + 60 seconds) of completion of step 3	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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>cbsId</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.</p> <p>Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none">• <i>cbsId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "GRANTED"	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none">• <i>cbsId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = T = Current UTC time• <i>responseCode</i> = 501 (SUSPENDED_GRANT)	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
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 <i>heartbeatInterval</i>, and is correctly formatted with parameters:</p> <ul style="list-style-type: none">• <i>cbsId</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>cbsId</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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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>cbsId</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>cbsId</i> = C <i>grantId</i> = G <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> <i>cbsId</i> = C <i>grantId</i> = G <i>transmitExpireTime</i> = T = current UTC time <i>responseCode</i> = 501 (SUSPENDED_GRANT) 	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
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>cbsId</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 shall stop transmission within (T + 60 seconds) of completion of step 3 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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>cbsId</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>cbsId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none">• <i>cbsId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = T = Current UTC Time• <i>responseCode</i> = 502 (UNSYNC_OP_PARAM)	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
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">◦ <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 shall stop transmission within (T+60) seconds of completion of step 3.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 <i>cbsdId</i> = <i>C_i</i>, <i>i</i>={1,2} valid <i>grantId</i> = <i>G_i</i>, <i>i</i>={1,2} grant is for frequency range <i>F_i</i>, power <i>P_i</i> <i>grantExpireTime</i> = 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.</p> <p>Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly for each CBSD, including, for CBSD_i <i>i</i>={1,2}:</p> <ul style="list-style-type: none"> <i>cbsdId</i> = <i>C_i</i>, <i>i</i> = {1,2} <i>grantId</i> = <i>G_i</i>, <i>i</i> = {1,2} <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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.</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>Parameters for each CBSD within the Heartbeat Response message should be as follows, for CBSD_i:</p> <ul style="list-style-type: none"> <i>cbsdId</i> = <i>C_i</i> <i>grantId</i> = <i>G_i</i> For CBSD1: <ul style="list-style-type: none"> <i>transmitExpireTime</i> = current UTC time + 200 seconds For CBSD2: <ul style="list-style-type: none"> <i>transmitExpireTime</i> = <i>T</i> = current UTC time <i>responseCode</i> = 500 (TERMINATED_GRANT) 	--	--
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"> <i>cbsdId</i> = <i>C₁</i> <i>grantId</i> = <i>G₁</i> <i>transmitExpireTime</i> = current UTC time + 200 seconds <i>responseCode</i> = 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 <i>F₂</i> within (<i>T</i> + 60 seconds) of completion of step 3 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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>cbsId</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. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none">• <i>cbsId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "GRANTED"	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	After completion of Step 2, SAS Test Harness does not respond to any further messages from UUT to simulate loss of network connection	--	--
4	Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify: <ul style="list-style-type: none">• At any time during the test, UUT shall not transmit on RF interface	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.3.8 [WINNF.FT.C.HBT.10] Heartbeat Response Absent (Subsequent Heartbeat)

#	Test Execution Steps	Results	
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.</p> <p>Verify Heartbeat Request message is sent within the 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”	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	<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>transmitExpireTime</i>= current UTC time + 200 seconds• <i>responseCode</i>=0	--	--
4	After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT	--	--
5	<p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none">• UUT shall stop all transmission on RF interface within (<i>transmitExpireTime</i>+ 60 seconds), using the <i>transmitExpireTime</i> sent in Step 3.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.4 CBSD Relinquishment Process

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

#	Test Execution Steps	Results	
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 $cbsId=C_i$, $i=\{1,2\}$• DP has received a valid grant with $grantId = G_i$, $i=\{1,2\}$ for each CBSD• Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants <p>Invoke trigger to 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.</p> <p>Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for $CBSdi$:</p> <ul style="list-style-type: none">• $cbsId = C_i$• $grantId = G_i$	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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.</p> <p>Parameters for each CBSD within the Relinquishment Response shall be as follows:</p> <ul style="list-style-type: none">• $cbsId = C_i$• $grantId = G_i$• $responseCode = 0$	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response ($responseCode=0$) 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 stop RF transmission at any time between triggering the relinquishments and UUT sending the relinquishment requests for each CBSD.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId=C_i, i={1,2} • DP has received a valid grant with grantId = G_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 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.</p> <p>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 CBS<i>d</i>:</p> <ul style="list-style-type: none"> • <i>cbsdId</i>=C_i • <i>grantId</i>=G_i 	--	--
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.</p> <p>Parameters for each CBSD within the Relinquishment Response shall be as follows:</p> <ul style="list-style-type: none"> • <i>cbsdId</i>=C_i • <i>No grantId</i> • <i>responseCode</i> = R_i 	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (responseCode=0) to further request messages from the UUT.	--	--
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>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 $cbsdId= Ci$, $i=\{1,2\}$• DP has received a valid grant with $grantId = Gi$, $i=\{1,2\}$ 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.</p> <p>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 CBS<i>Di</i>:</p> <ul style="list-style-type: none">• $cbsdId= Ci$• $grantId= Gi$	--	--
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.</p> <p>Parameters for each CBSD within the Relinquishment Response shall be as follows:</p> <ul style="list-style-type: none">• $cbsdId= Ci$• <i>No grantId</i>• $responseCode = Ri$	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response ($responseCode=0$) 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: A. UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.5 CBSD Deregistration Process

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

#	Test Execution Steps	Results	
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 $cbsdId=Ci$, $i=\{1,2\}$• DP has received a valid grant with $grantId = Gi$, $i=\{1,2\}$ 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	UUT may send a Relinquishment request and receives Relinquishment response with $responseCode=0$ for each CBSD	--	--
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 CBS<i>Di</i>:</p> <ul style="list-style-type: none">• $cbsdId= Ci$	--	--
4	The SAS Test Harness sends the Deregistration Response Message to UUT with: <ul style="list-style-type: none">• No $cbsdId$• $responseCode = 102$	--	--
5	After completion of step 3, SAS Test Harness will not provide any additional positive response ($responseCode=0$) to further request messages from the UUT.	--	--
6	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 stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

#	Test Execution Steps	Results	
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 cbsId=C_i, i={1,2}• DP has received a valid grant with grantId = G_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	UUT may send a Relinquishment request and receives Relinquishment response with responseCode=0 for each CBSD	--	--
3	<p>Verify DP sends a Deregistration Request message for each CBSD.</p> <p>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 CBS<i>D</i>i:</p> <ul style="list-style-type: none">• cbsId = C_i	--	--
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.</p> <p>Parameters for each CBSD within the Deregistration Response Message shall be as follows:</p> <ul style="list-style-type: none">• No cbsId in either response• responseCode = R_i	--	--
5	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
6	<p>Monitor the RF output of the 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:<ol style="list-style-type: none">UUT sending a Registration Request message, as this is not mandatoryUUT sending a Deregistration Request message	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.5.3 [WINNF.FT.C.DRG.5] Deregistration responseCode=103

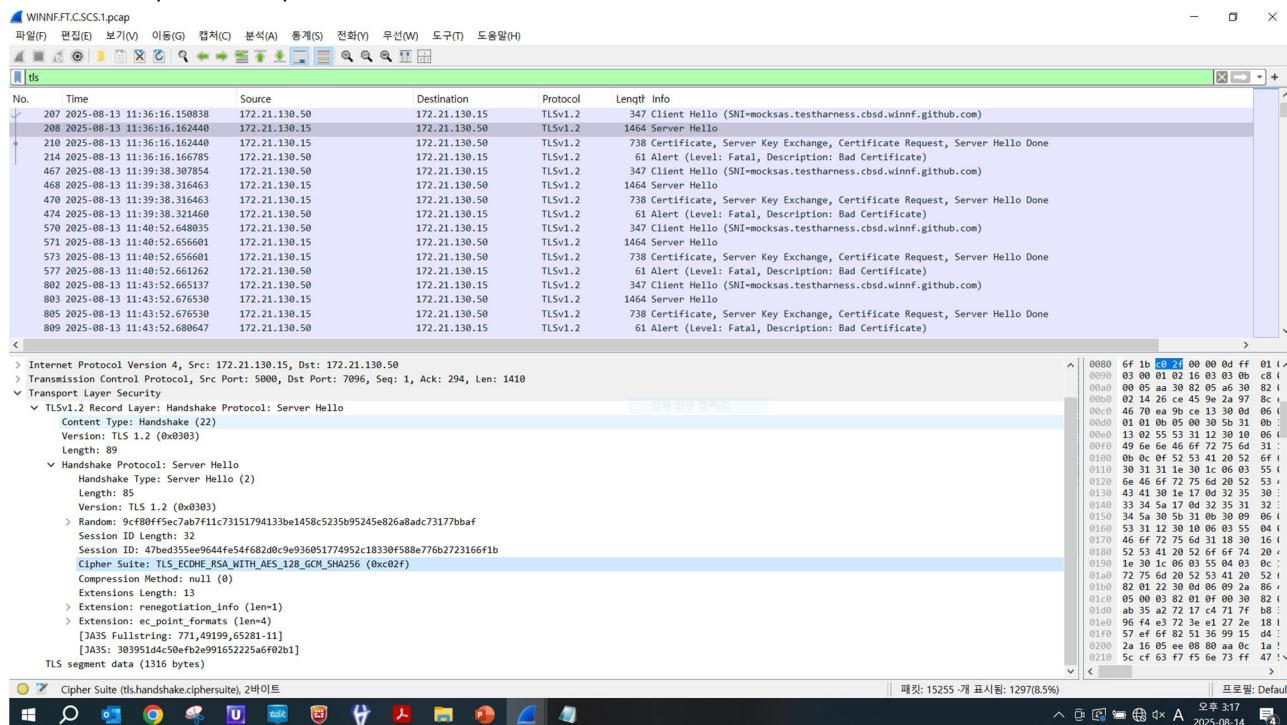
#	Test Execution Steps	Results	
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId</i>=C• UUT has received a valid grant with <i>grantId</i>=G• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to deregister UUT from the SAS Test Harness</p>	--	--
2	UUT may send a Relinquishment request and receives Relinquishment response with <i>responseCode</i> =0	--	--
3	UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId</i> =C	--	--
4	The SAS Test Harness sends the Deregistration Response Message to UUT with: <ul style="list-style-type: none">• <i>responseData</i>=cbsdId• <i>responseCode</i>=103	--	--
5	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.	--	--
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:<ol style="list-style-type: none">A. UUT sending a Registration Request message, as this is not mandatoryB. UUT sending a Deregistration Request message	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

5.6 CBSD Security Validation

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

#	Test Execution Steps	Results	
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 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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_SHA2 56 TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA3 84 TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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>cbstdId</i>. 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

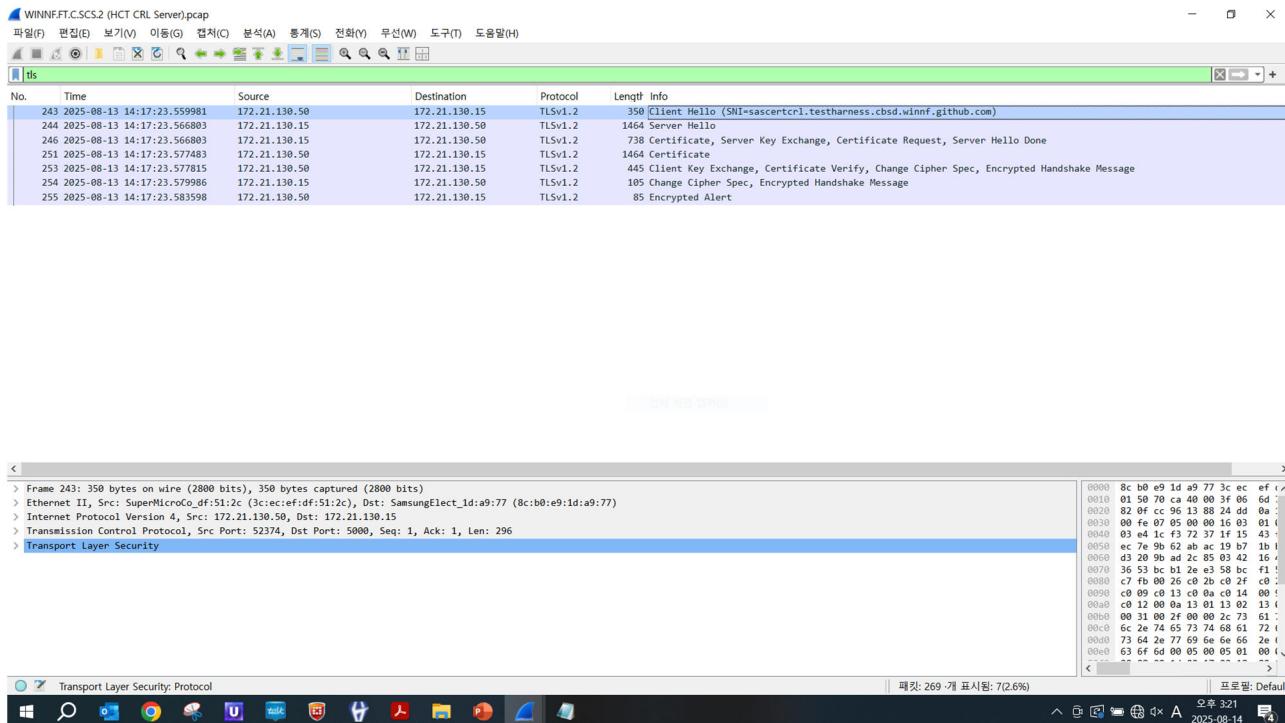
Wireshark Capture Example for Test Case:



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

#	Test Execution Steps	Results	
1	<ul style="list-style-type: none"> UUT shall start CBSD-SAS communication with the security procedures 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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. 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	UUT may retry for the security procedure which shall fail	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> 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 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

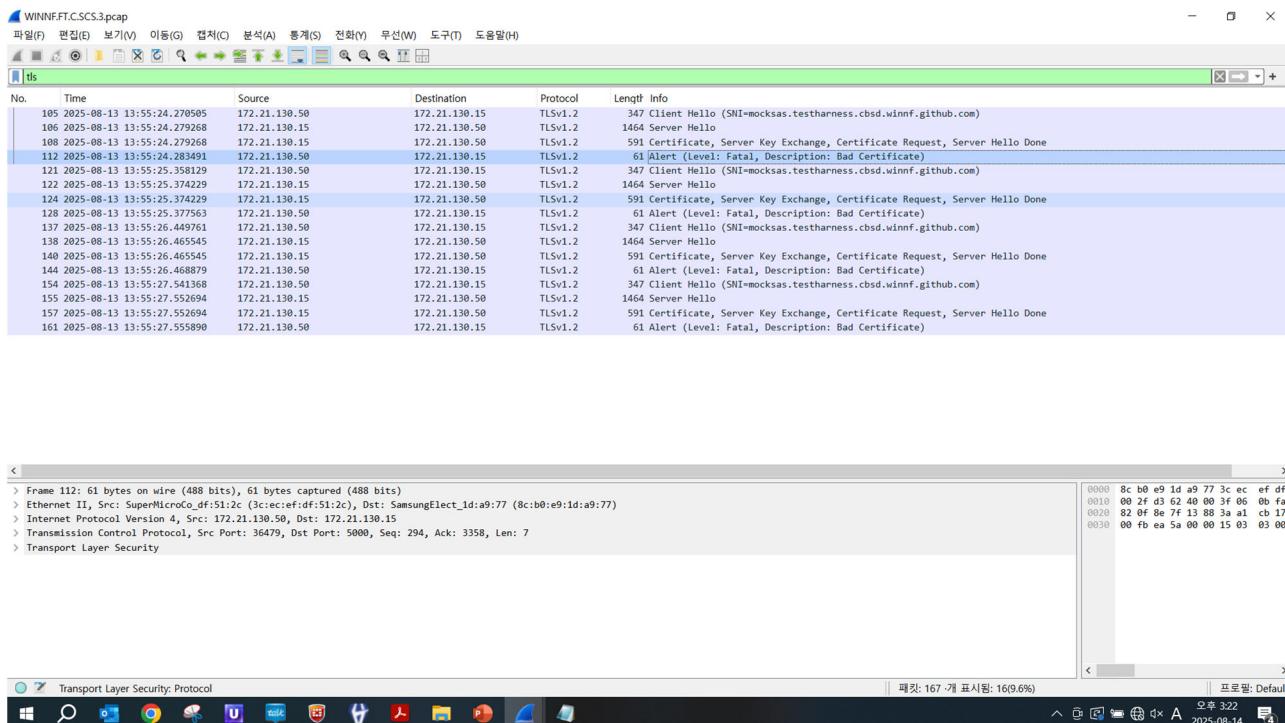
Wireshark Capture Example for Test Case:



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

#	Test Execution Steps	Results	
1	<ul style="list-style-type: none"> UUT shall start CBSD-SAS communication with the security procedures 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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. 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	UUT may retry for the security procedure which shall fail.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> 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 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

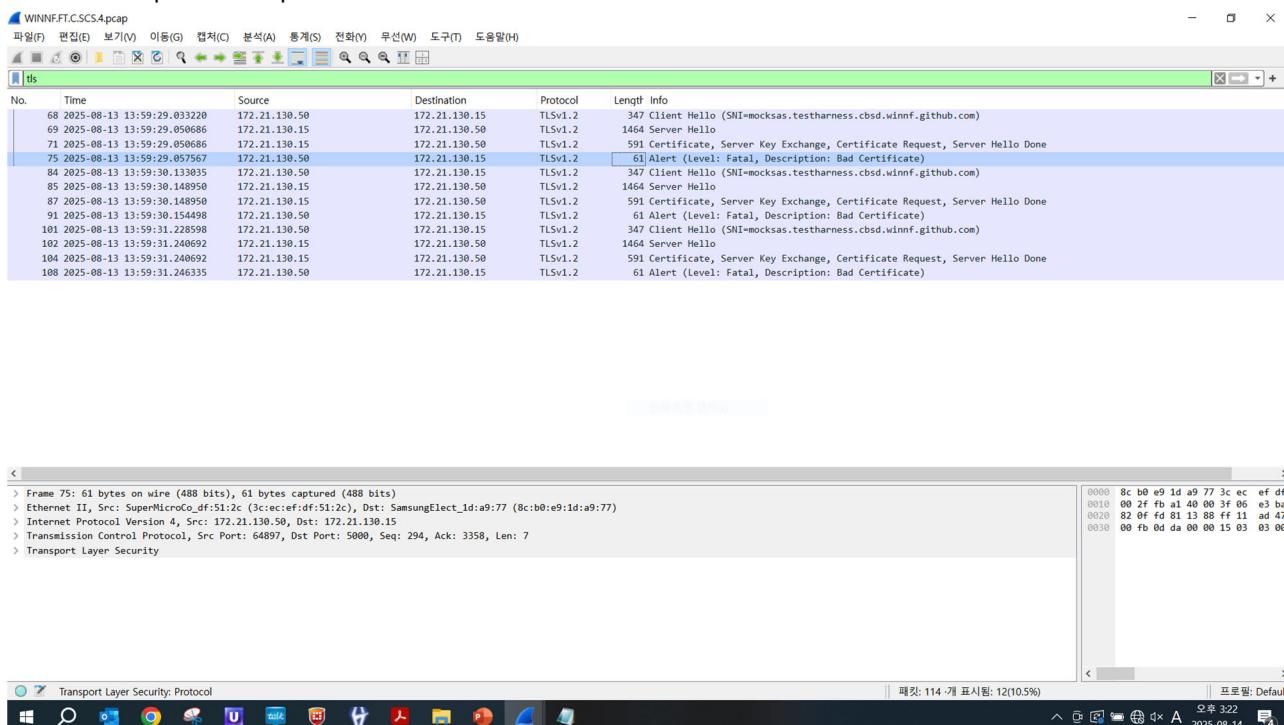
Wireshark Capture Example for Test Case:



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

#	Test Execution Steps	Results	
1	<ul style="list-style-type: none"> UUT shall start CBSD-SAS communication with the security procedures 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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. 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	UUT may retry for the security procedure which shall fail.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> 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 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

Wireshark Capture Example for Test Case:



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

#	Test Execution Steps	Results	
1	<ul style="list-style-type: none">UUT shall start CBSD-SAS communication with the security procedures	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
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.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
3	UUT may retry for the security procedure which shall fail.	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> 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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

Wireshark Capture Example for Test Case:

The Wireshark capture shows a sequence of TLS frames between two hosts. The traffic is as follows:

- Frame 97: Client Hello (SNI=mocksas.testharness.cbsd.winnf.github.com)
- Frame 98: Server Hello
- Frame 100: Certificate, Server Key Exchange, Certificate Request, Server Hello Done
- Frame 104: Alert (Level: Fatal, Description: Bad Certificate)
- Frame 113: Client Hello (SNI=mocksas.testharness.cbsd.winnf.github.com)
- Frame 114: Server Hello
- Frame 116: Certificate, Server Key Exchange, Certificate Request, Server Hello Done
- Frame 120: Alert (Level: Fatal, Description: Bad Certificate)
- Frame 130: Client Hello (SNI=mocksas.testharness.cbsd.winnf.github.com)
- Frame 131: Server Hello
- Frame 133: Certificate, Server Key Exchange, Certificate Request, Server Hello Done
- Frame 137: Alert (Level: Fatal, Description: Bad Certificate)
- Frame 146: Client Hello (SNI=mocksas.testharness.cbsd.winnf.github.com)
- Frame 147: Server Hello
- Frame 149: Certificate, Server Key Exchange, Certificate Request, Server Hello Done
- Frame 153: Alert (Level: Fatal, Description: Bad Certificate)
- Frame 162: Client Hello (SNI=mocksas.testharness.cbsd.winnf.github.com)
- Frame 163: Server Hello
- Frame 165: Certificate, Server Key Exchange, Certificate Request, Server Hello Done
- Frame 169: Alert (Level: Fatal, Description: Bad Certificate)

Frame 104 details:
Frame 104: 61 bytes on wire (488 bits), 61 bytes captured (488 bits)
> Ethernet II, Src: SuperMicro_Oc_Df:51:2c (3:ce:cdf:51:2c), Dst: SamsungElect_1d:a9:77 (8c:b0:e9:1d:a9:77)
> Internet Protocol Version 4, Src: 172.21.130.50, Dst: 172.21.130.15
> Transmission Control Protocol, Src Port: 8989, Dst Port: 5000, Seq: 294, Ack: 3358, Len: 7
> Transport Layer Security

Frame 104 bytes:
0000: 8c b0 e9 1d a9 77 3c ec ef df
0010: 00 2f 18 d3 40 00 3f 06 c6 89
0020: 02 0f 23 1d 13 88 d2 3b ba ee
0030: 00 fb 1a c3 00 00 15 03 03 00

Transport Layer Security: Protocol

5.7 CBSD RF Power Measurement

5.7.1 [WINNF.PT.C.HBT.1] UUT RF Transmit Power Measurement

#	Test Execution Steps	Results	
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness• UUT has registered with the SAS, with CBSD ID = C• UUT has a single valid grant G with parameters {lowFrequency = FL, highFrequency = FH, maxEirp = Pi}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case <p><i>Note: in order for the UUT to request a grant with the parameters {lowFrequency, highFrequency, maxEirp}, the SAS Test Harness may need to provide appropriate guidance in the availableChannel object of the spectrumInquiry response message, and the operationParam object of the grant response message. Alternately, the UUT vendor may provide the ability to set those parameters on the UUT so that the UUT will request a grant with those parameters.</i></p>	--	--
2	<p>UUT and SAS Test Harness perform a series of Heartbeat Request/Response cycles, which continues until the other test steps are complete. Messaging for each cycle is as follows:</p> <ul style="list-style-type: none">• UUT sends Heartbeat Request, including:<ul style="list-style-type: none">◦ <i>cbsdId=C</i>◦ <i>grantId=G</i>• SAS Test Harness responds with Heartbeat Response, including:<ul style="list-style-type: none">◦ <i>cbsdId=C</i>◦ <i>grantId=G</i>◦ <i>transmitExpireTime= current UTC time + 200 seconds</i>◦ <i>responseCode=0</i>	--	--
3	<p>Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfil the requirements of the power measurement method.</p> <p><i>Note: it may be required for the vendor to provide a method or configuration to bring the UUT to a mode which is required by the measurement methodology. Any such mode is vendor-specific and depends upon UUT behavior and the measurement methodology.</i></p>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

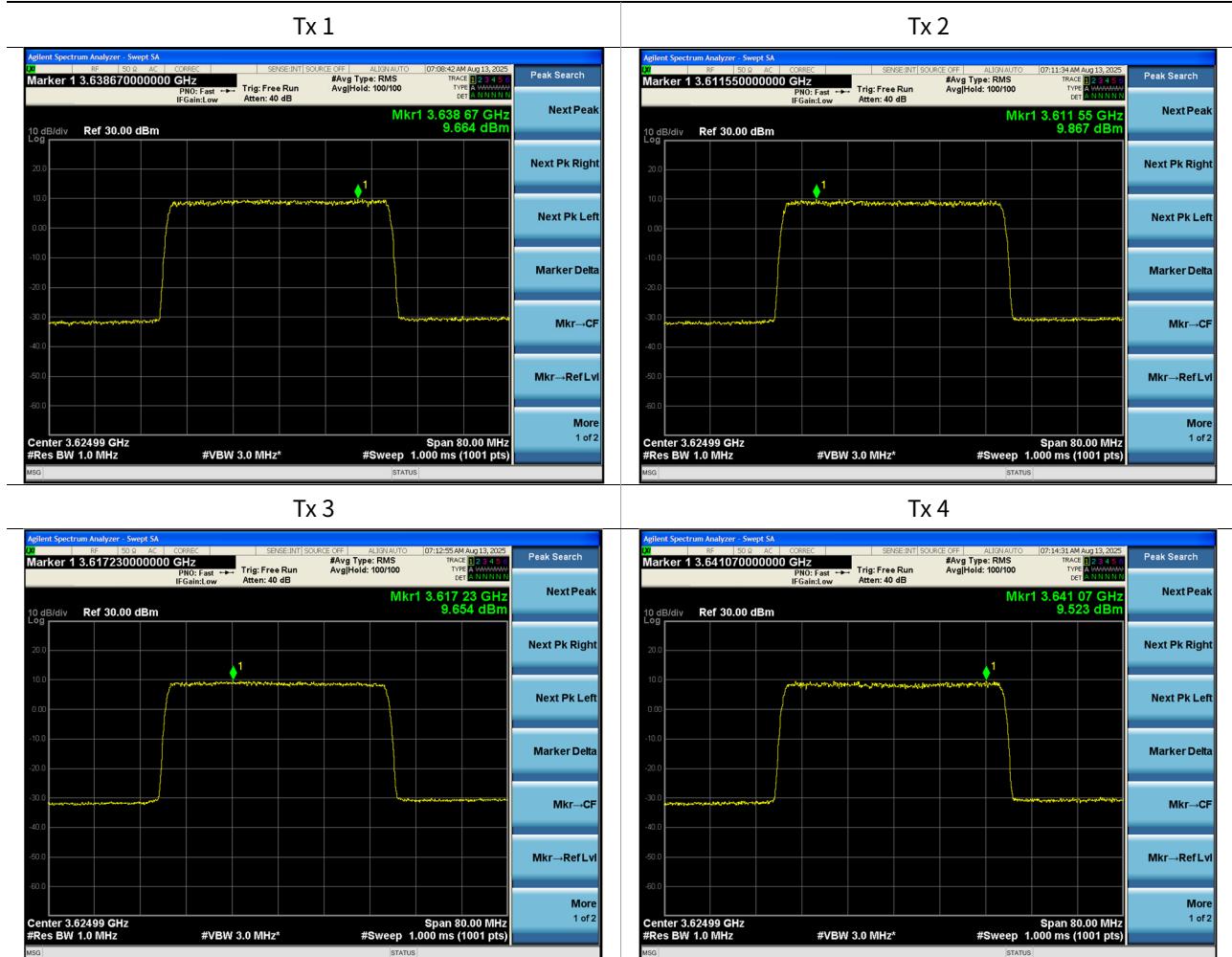
- RF Power Measurements

Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method

Frequency [MHz]	Bandwidth [MHz]	Granted maxEIRP [dBm/MHz]	Conducted Power Density					Duty Cycle Factor (dB)	Antenna Gain [dBi]	maxEIRP [dBm/MHz]
			Tx1 Conducted PSD [dBm/MHz]	Tx2 Conducted PSD [dBm/MHz]	Tx3 Conducted PSD [dBm/MHz]	Tx4 Conducted PSD [dBm/MHz]	Total Conducted PSD [dBm/MHz]			
3624.99	40	36	9.664	9.867	9.654	9.523	15.70	3.05	14.00	35.76
3624.99	40	30	3.994	3.805	3.371	3.475	9.69	3.05	14.00	29.75
3624.99	40	24	-2.386	-2.408	-2.213	-2.442	3.66	3.05	14.00	23.72

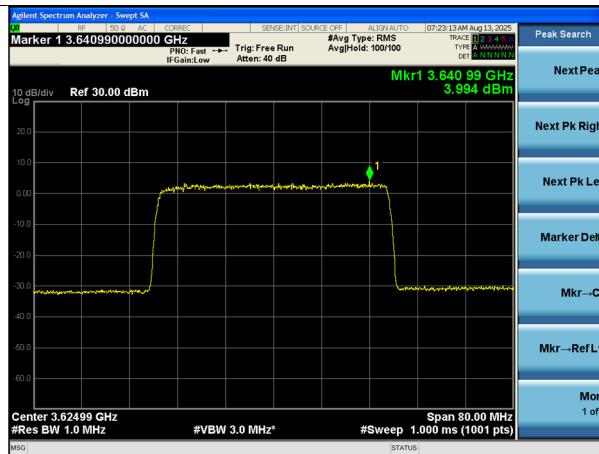
● Plots of RF Power Measurements

Granted max EIRP = 36 dBm/MHz

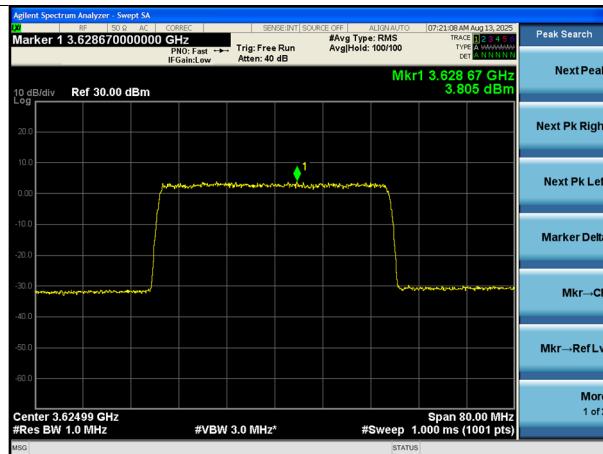


Granted max EIRP = 30 dBm/MHz

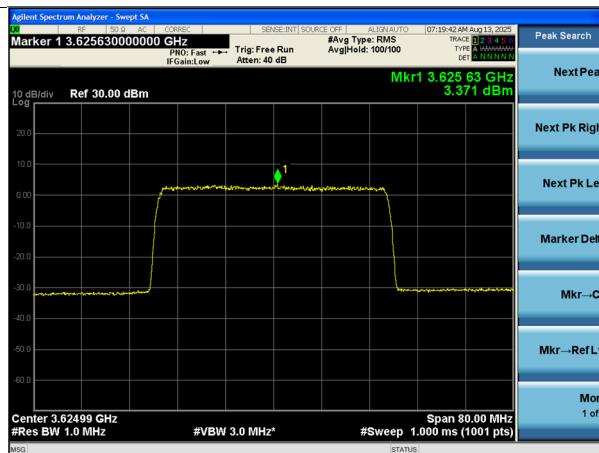
Tx 1



Tx 2



Tx 3

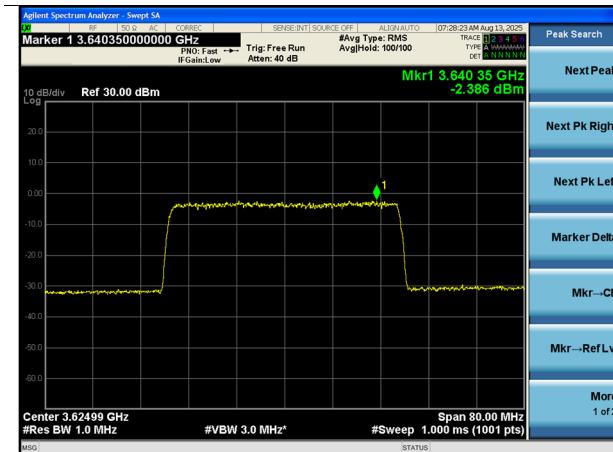


Tx 4

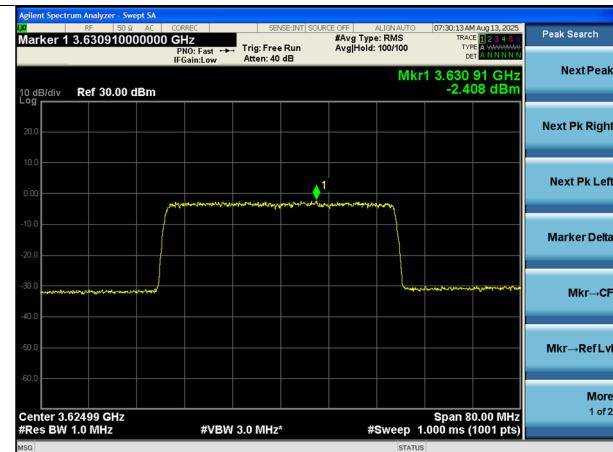


Granted max EIRP = 24 dBm/MHz

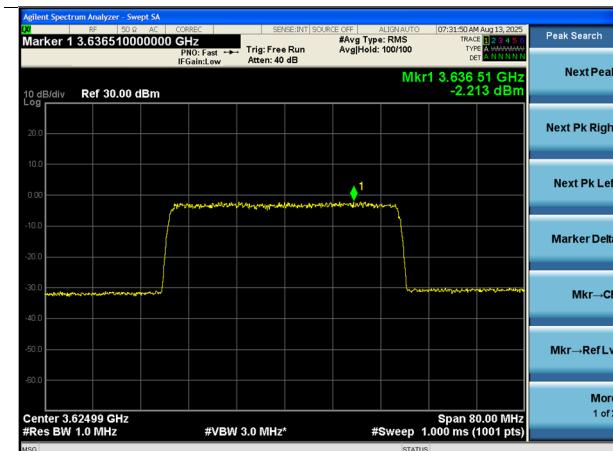
Tx 1



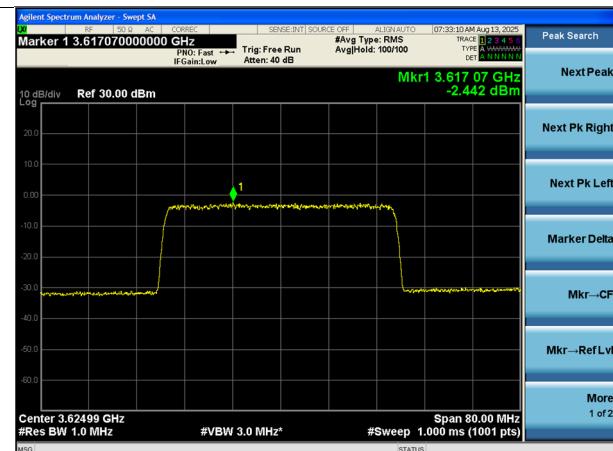
Tx 2



Tx 3



Tx 4



6. TEST LOGS

■ Please refer to the attached file named 'Test Logs'

7. TEST SETUP PHOTOGRAPHS

- Photographs is described in Appendix A. Please refer to Appendix A.