

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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HCT-OT-2508-SS001

DATE OF ISSUE

August 19, 2025

Applicant

SAMJI Electronics Co., Ltd.
63-27, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, KOREA

**Product Name
Model Number**

CBRS 5G n48 4T4R 4W Outdoor ORAN RU
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

☒ Permanent Testing Lab ☐ 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).

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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

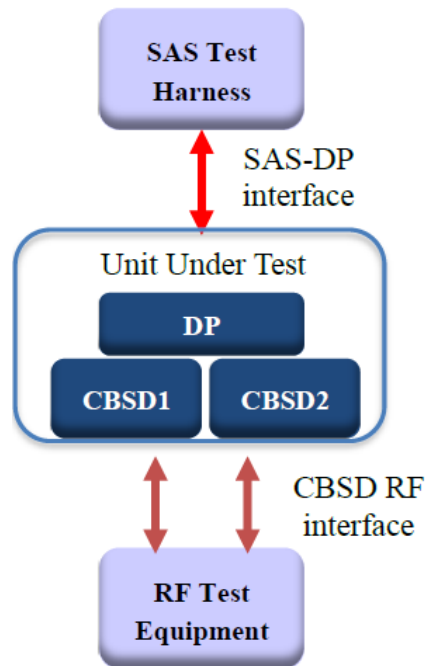
3.1 Test Equipment

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 (DEREGISTER)	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 (TERMINATED_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 Deregistration	PASS
6.7.4.2.2	WINNF.FT.D.DRG.4	Domain Proxy Deregistration responseCode=102	PASS
6.7.4.3.1	WINNF.FT.C.DRG.5	Deregistration 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 issued 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	<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 is in the Unregistered state 	--	--
2	<p>CBSD sends correct Registration request information, as specified in[n.5], to the SAS Test Harness:</p> <ul style="list-style-type: none"> • The required <i>userId</i>, <i>fcid</i> and <i>cbsdSerialNumber</i> 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</i> = <i>Ci</i> - <i>measReportConfig</i> shall not be included - <i>responseCode</i> = 0 	--	--
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	<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> <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 cbsdId. - 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 cbsdId. - 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	<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 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	<p>SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows:</p> <ul style="list-style-type: none"> - SAS response does not include a cbsdId. - 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	<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> <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 cbsdId. - 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 cbsdId. - 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</i>=C • <i>responseCode</i>=R 	--	--
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 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</i>=C • <i>responseCode</i>(R) = 401 	--	--
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 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 3 If 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 objects responseCode = 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 96 operationFrequencyRange, 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 CBSD_i, $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <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.</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 CBSD_i $i=\{1,2\}$:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i, $i=\{1,2\}$ • <i>grantId</i> = G_i, $i=\{1,2\}$ • <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 CBSD_i:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • <i>grantId</i> = G_i • <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 CBSD_i:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • <i>grantId</i> = G_i • <i>operationState</i> = "AUTHORIZED" <p>and SAS Test Harness responds with a Heartbeat Response message including the following parameters, for CBSD_i</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C_i • <i>grantId</i> = G_i • <i>transmitExpireTime</i> = current UTC time + 200 seconds • <i>responseCode</i> = 0 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

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

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

#	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 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	<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" 	<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>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = Current UTC time • <i>responseCode</i> = 105 (DEREGISTER) 	--	--
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 (T + 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 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. Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none"> • cbsdId = C • grantId = G • operationState = "GRANTED" 	<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"> • cbsdId = C • grantId = G • transmitExpireTime = T = Current UTC time • responseCode = 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"> • cbsdId = C • grantId = G • operationState = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <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 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>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" 	<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>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>cbsdId</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>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" 	<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>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = Current UTC Time • <i>responseCode</i> = 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"> ◦ <i>cbsdId</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 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" 	<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. 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. Parameters for each CBSD within the Heartbeat Response 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 For CBSD2: <ul style="list-style-type: none"> transmitExpireTime = T = current UTC time responseCode = 500 (TERMINATED_GRANT) 	--	--
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. 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 	<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>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. Ensure 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> = "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	<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 	<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 <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 relinquish each UUT Grant from the SAS Test Harness</p>	--	--
2	<p>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.</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"> <i>cbsdId</i>= Ci <i>grantId</i>= Gi 	<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"> <i>cbsdId</i>= Ci <i>grantId</i>= Gi <i>responseCode</i> = 0 	--	--
4	<p>After completion of step 3, SAS Test Harness will not provide any additional 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> <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 <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 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. 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:</p> <ul style="list-style-type: none"> <i>cbsdId</i>= Ci No <i>grantId</i> <i>responseCode</i> = Ri 	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode</i> =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 <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 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. 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:</p> <ul style="list-style-type: none"> <i>cbsdId</i>= Ci No <i>grantId</i> <i>responseCode</i> = Ri 	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode</i> =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

5.5 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 <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 on UUT to Relinquish Grant from the SAS Test Harness</p>	--	--
2	UUT may send a Relinquishment request and receives Relinquishment response with <i>responseCode</i> =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 CBSDi:</p> <ul style="list-style-type: none"> <i>cbsdId</i>=Ci 	--	--
4	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <ul style="list-style-type: none"> No <i>cbsdId</i> <i>responseCode</i> = 102 	--	--
5	After completion of step 3, SAS Test Harness will not provide any additional 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 3 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 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 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 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 CBSDi:</p> <ul style="list-style-type: none"> cbsdId = 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.</p> <p>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 responseCode = Ri 	--	--
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: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory B. UUT 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	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <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: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory B. 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 procedureThe 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 v1.2Make sure that cipher suites from one of the following is selected,<ul style="list-style-type: none">TLS_RSA_WITH_AES_128_GCM_SHA256TLS_RSA_WITH_AES_256_GCM_SHA384TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384TLS_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:

WINNF.FT.C.SCS.1.pcap

파열(F) 편집(E) 보기(V) 이동(G) 캡처(C) 분석(A) 통계(S) 전화(Y) 무선(W) 도구(T) 도움말(H)

172.21.130.15 → 172.21.130.50

207 2025-08-13 11:36:16.150838 172.21.130.15 172.21.130.50 TLSv1.2 347 Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)

208 2025-08-13 11:36:16.162440 172.21.130.15 172.21.130.50 TLSv1.2 1464 Server Hello

210 2025-08-13 11:36:16.162440 172.21.130.15 172.21.130.50 TLSv1.2 738 Certificate, Server Key Exchange, Certificate Request, Server Hello Done

214 2025-08-13 11:36:16.166785 172.21.130.15 172.21.130.50 TLSv1.2 61 Alert (Level: Fatal, Description: Bad Certificate)

467 2025-08-13 11:39:38.307854 172.21.130.15 172.21.130.50 TLSv1.2 347 Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)

468 2025-08-13 11:39:38.316463 172.21.130.15 172.21.130.50 TLSv1.2 1464 Server Hello

470 2025-08-13 11:39:38.316463 172.21.130.15 172.21.130.50 TLSv1.2 738 Certificate, Server Key Exchange, Certificate Request, Server Hello Done

474 2025-08-13 11:39:38.321460 172.21.130.15 172.21.130.50 TLSv1.2 61 Alert (Level: Fatal, Description: Bad Certificate)

570 2025-08-13 11:40:52.648035 172.21.130.15 172.21.130.50 TLSv1.2 347 Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)

571 2025-08-13 11:40:52.656601 172.21.130.15 172.21.130.50 TLSv1.2 1464 Server Hello

573 2025-08-13 11:40:52.656601 172.21.130.15 172.21.130.50 TLSv1.2 738 Certificate, Server Key Exchange, Certificate Request, Server Hello Done

577 2025-08-13 11:40:52.661262 172.21.130.15 172.21.130.50 TLSv1.2 61 Alert (Level: Fatal, Description: Bad Certificate)

802 2025-08-13 11:43:52.665137 172.21.130.15 172.21.130.50 TLSv1.2 347 Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)

803 2025-08-13 11:43:52.676530 172.21.130.15 172.21.130.50 TLSv1.2 1464 Server Hello

805 2025-08-13 11:43:52.676530 172.21.130.15 172.21.130.50 TLSv1.2 738 Certificate, Server Key Exchange, Certificate Request, Server Hello Done

809 2025-08-13 11:43:52.680647 172.21.130.15 172.21.130.50 TLSv1.2 61 Alert (Level: Fatal, Description: Bad Certificate)

Internet Protocol Version 4, Src: 172.21.130.15, Dst: 172.21.130.50

Transmission Control Protocol, Src Port: 5000, Dst Port: 7096, Seq: 1, Ack: 294, Len: 1410

Transport Layer Security

TLSh1.2 Record Layer: Handshake Protocol: Server Hello

Content Type: Handshake (22)

Version: TLS 1.2 (0x0303)

Length: 89

Handshake Protocol: Server Hello

Handshake Type: Server Hello (2)

Length: 85

Version: TLS 1.2 (0x0303)

Random: 9cf80ff5ec7ab7f11c73151794133be1458c5235095245e826a8adc73177bbaf

Session ID Length: 32

Session ID: 470ed155e9644fe54f682d0c9e936051774952c18330f588e776b2723166f1b

Cipher Suite: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (0xc02f)

Compression Method: null (0)

Extensions Length: 13

Extension: renegotiation_info (len=1)

Extension: ec_point_formats (len=4)

[JA3S Fullstring: 771,49199,65281-11]

[JA3S: 303951d4c50efb2e991652225a6ff02b1]

TLS segment data (1316 bytes)

Cipher Suite (tls.handshake.ciphersuite), 2바이트

패킷: 15255-개 표시됨: 1297(8.5%)

프로파일: Default

오류: 3:17

2025-08-14

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:

The Wireshark capture shows a TLSv1.2 session between 172.21.130.50 (Source) and 172.21.130.15 (Destination). The session includes a Client Hello (350 bytes), Server Hello (1464 bytes), Certificate (1464 bytes), Key Exchange (445 bytes), and an Encrypted Alert (85 bytes). The alert message is 'Alert (Warning: Certificate Revoked)'.

Frame 243: 350 bytes on wire (2800 bits), 350 bytes captured (2800 bits) on interface 0

Ethernet II, Src: SuperMicroCo_df:51:2c (3c:ec:ef:df:51:2c), Dst: SamsungElect_id: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: 52374, Dst Port: 5000, Seq: 1, Ack: 1, Len: 296

Transport Layer Security

Alert (Warning: Certificate Revoked)

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:

Wireshark Capture Example for Test Case:

The capture shows a TLS session between a client (172.21.130.15) and a server (172.21.130.50). The session starts with a Client Hello (347 bytes) and a Server Hello (1464 bytes). The server then sends a Certificate (591 bytes), a Server Key Exchange (347 bytes), and a Certificate Request (591 bytes). The client responds with a Client Hello (347 bytes), a Client Key Exchange (1464 bytes), and a Certificate Request (591 bytes). The server then sends a 61 Alert (Level: Fatal, Description: Bad Certificate) to the client. The client responds with a 61 Alert (Level: Fatal, Description: Bad Certificate).

Packet List:

No.	Time	Source	Destination	Protocol	Length	Info
105	2025-08-13 13:55:24.278505	172.21.130.50	172.21.130.15	TLSv1.2	347	Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)
106	2025-08-13 13:55:24.279268	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
108	2025-08-13 13:55:24.279268	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
112	2025-08-13 13:55:24.283491	172.21.130.50	172.21.130.15	TLSv1.2	61	Alert (Level: Fatal, Description: Bad Certificate)
121	2025-08-13 13:55:25.358129	172.21.130.50	172.21.130.15	TLSv1.2	347	Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)
122	2025-08-13 13:55:25.374229	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
124	2025-08-13 13:55:25.374229	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
128	2025-08-13 13:55:25.377563	172.21.130.50	172.21.130.15	TLSv1.2	61	Alert (Level: Fatal, Description: Bad Certificate)
137	2025-08-13 13:55:26.449761	172.21.130.50	172.21.130.15	TLSv1.2	347	Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)
138	2025-08-13 13:55:26.465545	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
140	2025-08-13 13:55:26.465545	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
144	2025-08-13 13:55:26.468879	172.21.130.50	172.21.130.15	TLSv1.2	61	Alert (Level: Fatal, Description: Bad Certificate)
154	2025-08-13 13:55:27.541368	172.21.130.50	172.21.130.15	TLSv1.2	347	Client Hello (SHA-mocksas.testharness.cbsd.winnf.github.com)
155	2025-08-13 13:55:27.552694	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
157	2025-08-13 13:55:27.552694	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
161	2025-08-13 13:55:27.555890	172.21.130.50	172.21.130.15	TLSv1.2	61	Alert (Level: Fatal, Description: Bad Certificate)

Packet Details:

Frame 112: 61 bytes on wire (488 bits), 61 bytes captured (488 bits) on interface 0

Ethernet II, Src: SuperMicroCo_df:51:2c (3c:ec:ef:df:51:2c), Dst: SamsungElect_id: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: 36479, Dst Port: 5000, Seq: 294, Ack: 3358, Len: 7

Transport Layer Security

Alert (Level: Fatal, Description: Bad Certificate)

Alert (Level: Fatal, Description: Bad Certificate)

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:

Wireshark capture example showing a TLS failure. The packet list shows a 61 Alert (Level: Fatal, Description: Bad Certificate) from 172.21.130.15 to 172.21.130.50. The packet details show the Transport Layer Security protocol with a fatal alert.

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 CBS-D-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 screenshot shows a Wireshark capture of a TLS session. The packet list on the left shows a sequence of TLS messages: Client Hello, Server Hello, Certificate, Server Key Exchange, Certificate Request, Server Hello Done, and Alert. The Alert message (packet 104) is highlighted, showing a '61 Alert (Level: Fatal, Description: Bad Certificate)'. The packet details pane on the right shows the 'Transport Layer Security' protocol with a 'Bad Certificate' error.

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"> ◦ cbsdId= C ◦ grantId= G • SAS Test Harness responds with Heartbeat Response, including: <ul style="list-style-type: none"> ◦ cbsdId= C ◦ grantId= G ◦ transmitExpireTime= current UTC time + 200 seconds ◦ responseCode= 0 	--	--
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

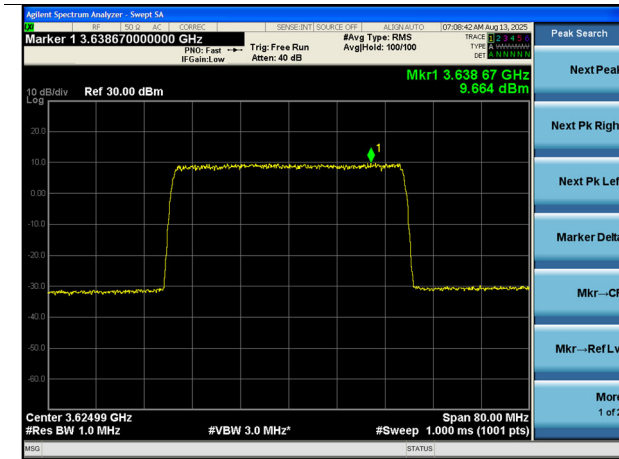
Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method

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

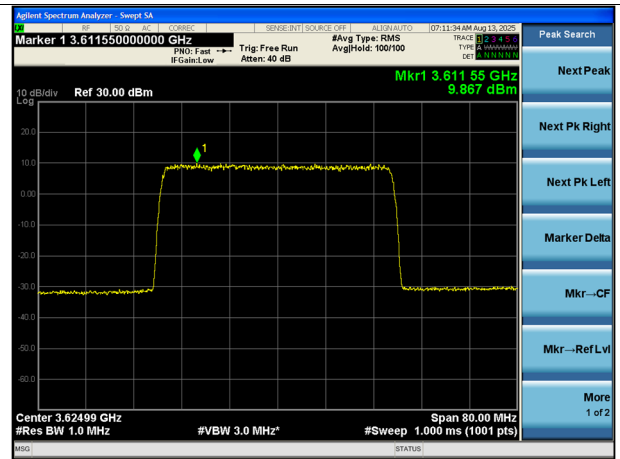
Plots of RF Power Measurements

Granted max EIRP = 36 dBm/MHz

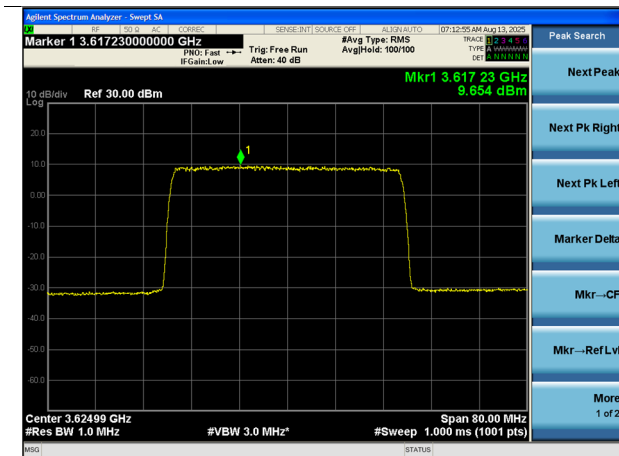
Tx 1



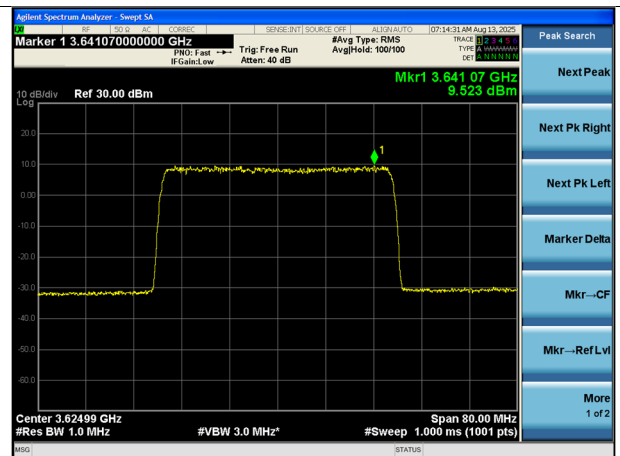
Tx 2



Tx 3

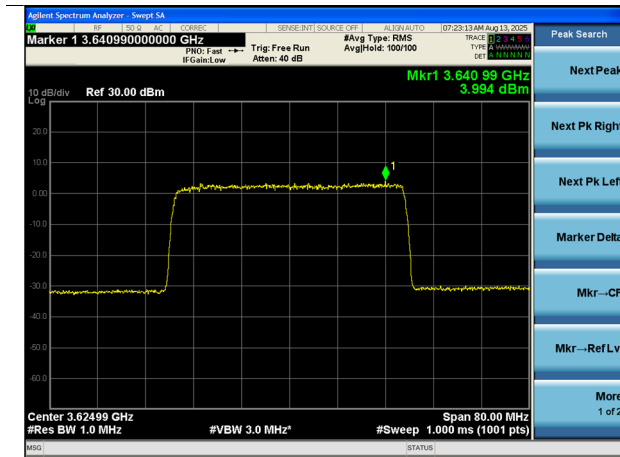


Tx 4

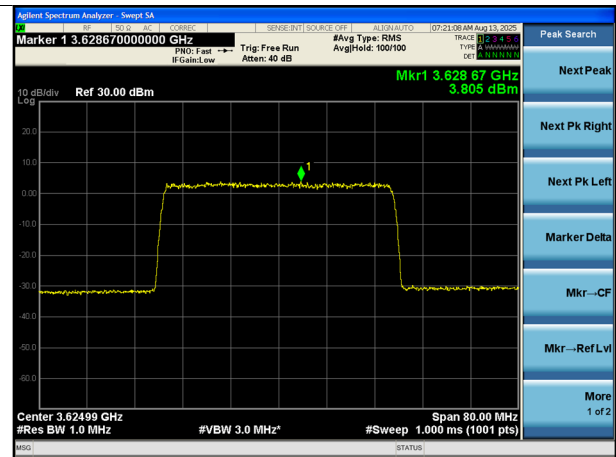


Granted max EIRP = 30 dBm/MHz

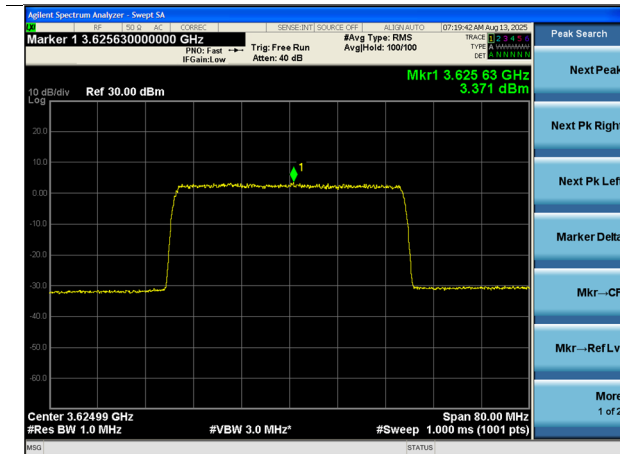
Tx 1



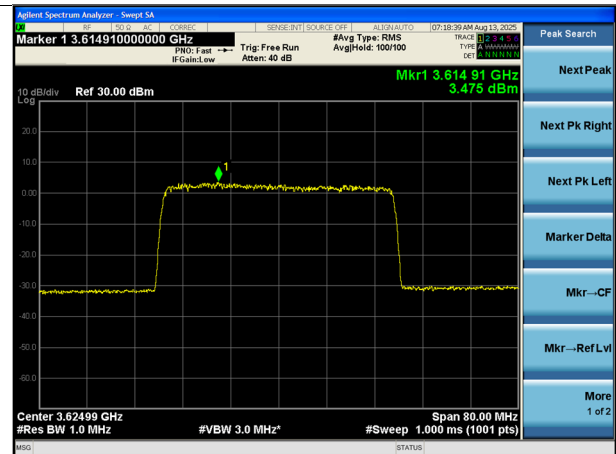
Tx 2



Tx 3

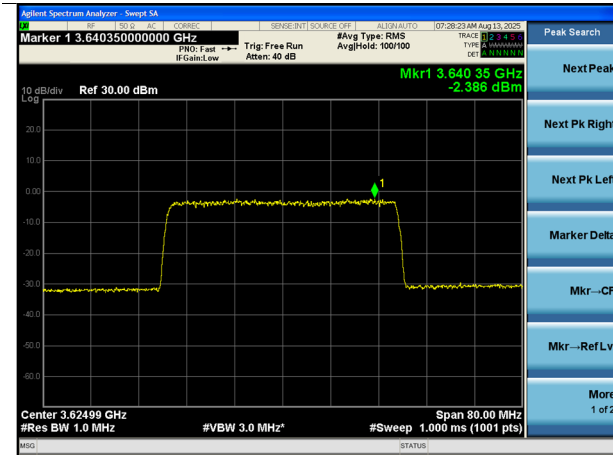


Tx 4

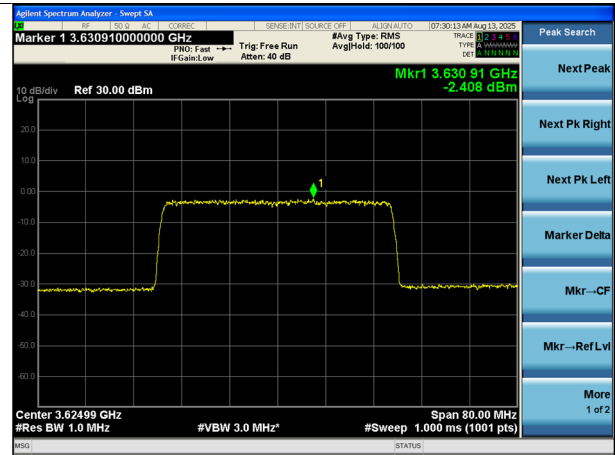


Granted max EIRP = 24 dBm/MHz

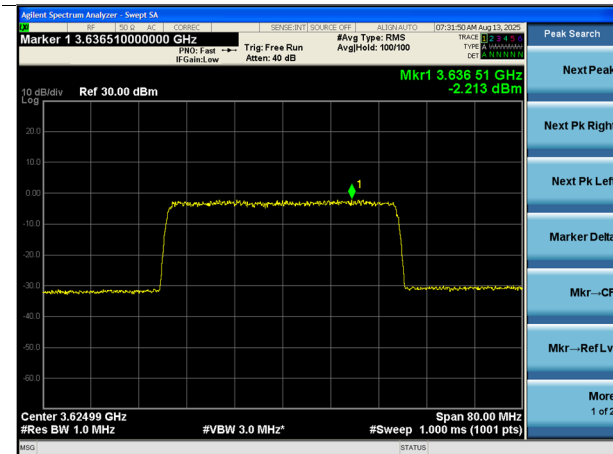
Tx 1



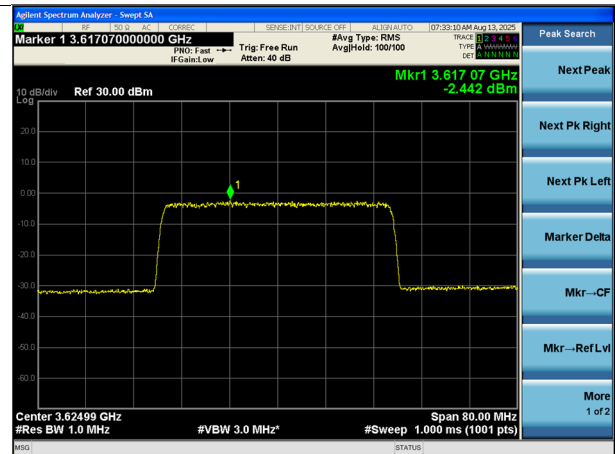
Tx 2



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.