

TEST REPORT

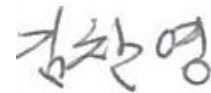
CBSD-SAS Interoperability Test for of SJ-ORU4402-N48US
Certification

APPLICANT
SAMJI Electronics Co., Ltd.

REPORT NO.
HCT-OT-2412-SS002

DATE OF ISSUE
December 13, 2024

Tested by
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TEST REPORT

REPORT NO.

HCT-OT-2412-SS002

DATE OF ISSUE

December 13, 2024

Applicant

SAMJI Electronics Co., Ltd.
63-25, 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

December 05, 2024 ~ December 09, 2024

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

Manufacturer

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	December 13, 2024	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	SJSP24100005
Hardware version	1.0
Software version	1.0
Firmware version	1.0
FCC ID	2BK6Y-GC457198
CBSD Category	Category B
Unit Under Test Type	BTS-CBSD
Transmitter Frequency Band	NR n48

2.2 Supported Features

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

3. Measurement Setup

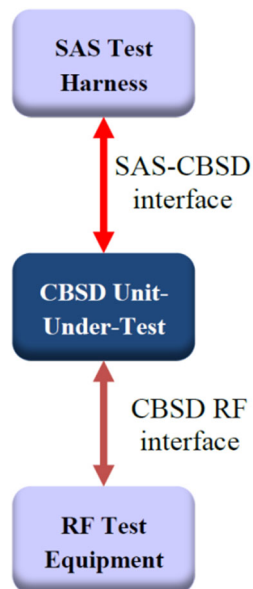
3.1 Test Equipment

No.	Instrument	Model	Manufacturer	Serial No.	Due to Calibration
1	Signal Analyzer	N9020A	Agilent	MY51240852	2025-01-25
2	SAS Test Harness Laptop	NT551XDA	SAMSUNG	KPXH99YR9003T4D	N/A
3	Hub switch	CSS610-8G-2S+IN	Mikrotik	HD808CH9128-243	N/A
4	UE	WD-H850P	WOORINET	0010192	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
6.1.4.1.1	WINNF.FT.C.REG.1	Multi-Step registration	PASS
6.1.4.2.1	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	PASS
6.1.4.2.3	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	PASS
6.1.4.2.5	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	PASS
6.1.4.2.7	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	PASS
6.1.4.2.9	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	PASS
6.1.4.2.11	WINNF.FT.C.REG.18	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
6.4.4.1.1	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	PASS
6.4.4.2.1	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	PASS
6.4.4.2.2	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)	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
6.4.4.3.1	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
6.6.4.1.1	WINNF.FT.C.RLQ.1	Successful Relinquishment	PASS
6.6.4.2.1	WINNF.FT.C.RLQ.3	Unsuccessful Relinquishment, responseCode=102	PASS
6.6.4.3.1	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	PASS
6.7.4.1.1	WINNF.FT.C.DRG.1	Successful Deregistration	PASS
6.7.4.2.1	WINNF.FT.C.DRG.3	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 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.1] Multi-Step registration

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: - 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: - 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. Note: It is outside the scope of this document to test the Registration information that is supplied via another means.	☒ PASS	☐ FAIL
3	- SAS Test Harness sends a CBSD Registration Response as follows: <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	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.2 [WINNF.FT.D.REG.8] Missing Required parameters (responseCode 102)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 102	--	--
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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.3 [WINNF.FT.D.REG.10] Pending registration (responseCode 200)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.4 [WINNF.FT.D.REG.12] Invalid parameter (responseCode 103)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 103	--	--
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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.5 [WINNF.FT.D.REG.14] Blacklisted CBSD (responseCode 101)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 101	--	--
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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.6 [WINNF.FT.D.REG.16] Unsupported SAS protocol version (responseCode 100)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 100	--	--
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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.1.7 [WINNF.FT.D.REG.18] Group Error (responseCode 201)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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: - SAS response does not include a cbsdId. - responseCode (R) = 201	--	--
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: • UUT shall not transmit RF	☒ PASS	☐ 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: • 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 • <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: • UUT shall not transmit RF	☒ PASS	☐ 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: • 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 • <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: • UUT shall not transmit RF	☒ PASS	☐ FAIL

5.3 CBSD Heart Beat Process

5.3.1 [WINNF.FT.D.HBT.1] Heartbeat Success Case (first Heartbeat Response)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i>= C	--	--
2	UUT sends a message: - If message is type Spectrum Inquiry Request, go to step 3, or - If message is type Grant Request, go to step 5	--	--
3	UUT sends Spectrum Inquiry Request. Validate: <i>cbsdId</i>= C - List of frequencyRange objects sent by UUT are within the CBRS frequency range	☒ PASS	☐ FAIL
4	SAS Test Harness sends a Spectrum Inquiry Response message, including the following parameters: <i>cbsdId</i>= C - availableChannel is an array of availableChannel objects - responseCode = 0	--	--
5	UUT sends Grant Request message. Validate: <i>cbsdId</i>= C - maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96 - operationFrequencyRange, F, sent by UUT is a valid range within the CBRS band	☒ PASS	☐ FAIL

6	SAS Test Harness sends a Grant Response message, including the parameters: • <i>cbsdId</i>= C • <i>grantId</i>= G = a valid grant ID • <i>grantExpireTime</i> = UTC time greater than duration of the test • <i>responseCode</i>= 0	--	--
7	UUT sends a first Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: • <i>cbsdId</i>= C • <i>grantId</i>= G • <i>operationState</i>= "GRANTED"	☒ PASS	☐ FAIL
8	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • <i>cbsdId</i>= C • <i>grantId</i>= G • <i>transmitExpireTime</i>= current UTC time + 200 seconds • <i>responseCode</i>= 0	--	--
9	For further Heartbeat Request messages sent from UUT after completion of step 8, validate message is sent within latest specified heartbeatInterval, and: • <i>cbsdId</i>= C • <i>grantId</i>= G • <i>operationState</i>= "AUTHORIZED" and SAS Test Harness responds with a Heartbeat Response message including the following parameters: • <i>cbsdId</i>= C • <i>grantId</i>= G • <i>transmitExpireTime</i>= current UTC time + 200 seconds • <i>responseCode</i>= 0	☒ PASS	☐ FAIL
10	Monitor the RF output of the UUT from start of test until UUT transmission commences. Verify: • 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 F.	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ valid cbsdId = C ◦ valid grantId = G ◦ grant is for frequency range F, power P ◦ grantExpireTime = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • <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	Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T + 60 seconds) of completion of step 3	☒ PASS	☐ FAIL

5.3.3 [WINNF.FT.C.HBT.4] Heartbeat responseCode=500 (TERMINATED_GRANT)

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ valid cbsdId = C ◦ valid grantId = G ◦ grant is for frequency range F, power P ◦ grantExpireTime = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = Current UTC time • <i>responseCode</i> = 500 (TERMINATED_GRANT)	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
5	Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T + 60 seconds) of completion of step 3	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message isS formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • <i>cbsdId</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	Monitor the SAS-CBSD interface. Verify either A OR B occurs: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED" B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters: • <i>cbsdId</i> = C • <i>grantId</i> = G Monitor the RF output of the UUT. Verify: • UUT does not transmit at any time	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • <i>cbsdId</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	Monitor the SAS-CBSD interface. Verify either A OR B occurs: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED" B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters: • <i>cbsdId</i> = C • <i>grantId</i> = G Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T + 60 seconds) of completion of step 3	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • <i>cbsdId</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	Monitor the SAS-CBSD interface. Verify: • UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: ◦ <i>cbsdId</i> = C ◦ <i>grantId</i> = G Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T+60) seconds of completion of step 3.	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ 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	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED"	☒ PASS	☐ 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: • At any time during the test, UUT shall not transmit on RF interface	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ◦ 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including: • <i>cbsdId</i>= C • <i>grantId</i>= G • <i>operationState</i>= "AUTHORIZED"	☒ PASS	☐ FAIL
3	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • <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	Monitor the RF output of the UUT. Verify: • UUT shall stop all transmission on RF interface within (<i>transmitExpireTime</i>+ 60 seconds), using the transmitExpireTime sent in Step 3.	☒ PASS	☐ FAIL

5.4 CBSD Relinquishment Process

5.4.1 [WINNF.FT.D.RLQ.1] Successful Relinquishment

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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.. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically: • <i>cbsdId</i>= C • <i>grantId</i>= G	☒ PASS	☐ FAIL
3	SAS Test Harness shall approve the request with a Relinquishment Response message with parameters: - <i>cbsdId</i>= C - <i>grantId</i>= G - <i>responseCode</i>= 0	--	--
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	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall stop RF transmission at any time between triggering the relinquishments and UUT sending the relinquishment requests for each CBSD.	☒ PASS	☐ FAIL

5.4.2 [WINNF.FT.D.RLQ.3] Unsuccessful Relinquishment, responseCode=102

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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. Invoke trigger to Relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically: • <i>cbsdId</i>= C • <i>grantId</i>= G	--	--
3	SAS Test Harness shall send a Relinquishment Response message with parameters: • <i>cbsdId</i>= C • No <i>grantId</i> • <i>responseCode</i>= R	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	☒ PASS	☐ FAIL

5.4.3 [WINNF.FT.D.RLQ.5] Unsuccessful Relinquishment, responseCode=103

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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. Invoke trigger to Relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically: • <i>cbsdId</i>= C • <i>grantId</i>= G	--	--
3	SAS Test Harness shall send a Relinquishment Response message with parameters: • <i>responseCode</i> (R) = 103 • <i>responseData</i>= "grantId"	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	☒ PASS	☐ FAIL

5.5 CBSD Deregistration Process

5.5.1 [WINNF.FT.D.DRG.1] Successful Deregistration

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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. Invoke trigger to deregister each UUT from the SAS Test Harness	--	--
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	SAS Test Harness shall approve the request with a Deregistration Response message with parameters: • <i>cbsdId</i>= C • <i>responseCode</i>= 0	--	--
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	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	☒ PASS	☐ FAIL

5.5.2 [WINNF.FT.D.DRG.3] Deregistration responseCode=102

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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. Invoke trigger to deregister UUT from the SAS Test Harness	--	--
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: • No <i>cbsdId</i> • <i>responseCode</i>= 102	--	--
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	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	☒ PASS	☐ FAIL

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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. Invoke trigger to deregister UUT from the SAS Test Harness	--	--
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: • <i>responseCode</i> (R) = 103 • <i>reponseData</i> = "cbsdId"	--	--
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	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	☒ PASS	☐ 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	- 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	☒ PASS	☐ FAIL
2	- 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, - TLS_RSA_WITH_AES_128_GCM_SHA256 - TLS_RSA_WITH_AES_256_GCM_SHA384 - TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 - TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 - TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	☒ PASS	☐ FAIL
3	A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability. 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>cbsd/d</i>.	☒ PASS	☐ FAIL
4	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: UUT shall not transmit RF	☒ PASS	☐ FAIL

Wireshark Capture Example for Test Case:

WINNF.FT.C.SCS.1.pcapng

파일(F) 편집(E) 보기(V) 이동(M) 캡처(C) 분석(A) 통계(S) 전환(T) 무선(W) 도구(T) 도움말(H)

현재 필터: ts

No.	Time	Source	Destination	Protocol	Length	Info
144	2024-12-05 15:13:33.481129	172.21.130.50	172.21.130.15	TLSv1.2	430	Client Hello
145	2024-12-05 15:13:33.496146	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
147	2024-12-05 15:13:33.496146	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
150	2024-12-05 15:13:33.500250	172.21.130.50	172.21.130.15	TLSv1.2	1169	Certificate
151	2024-12-05 15:13:33.501184	172.21.130.50	172.21.130.15	TLSv1.2	129	Client Key Exchange
152	2024-12-05 15:13:33.501184	172.21.130.50	172.21.130.15	TLSv1.2	323	Certificate Verify
153	2024-12-05 15:13:33.501184	172.21.130.50	172.21.130.15	TLSv1.2	60	Change Cipher Spec
154	2024-12-05 15:13:33.501184	172.21.130.50	172.21.130.15	TLSv1.2	99	Encrypted Handshake Message
156	2024-12-05 15:13:33.504571	172.21.130.15	172.21.130.50	TLSv1.2	105	Change Cipher Spec, Encrypted Handshake Message
157	2024-12-05 15:13:33.506938	172.21.130.50	172.21.130.15	TLSv1.2	702	Application Data
158	2024-12-05 15:13:33.541747	172.21.130.15	172.21.130.50	TLSv1.2	100	Application Data
160	2024-12-05 15:13:33.587963	172.21.130.15	172.21.130.50	TLSv1.2	545	Application Data, Application Data, Application Data, Application Data, Application Data, A
162	2024-12-05 15:13:33.589003	172.21.130.50	172.21.130.15	TLSv1.2	85	Encrypted Alert
170	2024-12-05 15:13:33.625580	172.21.130.15	172.21.130.50	TLSv1.2	430	Client Hello
171	2024-12-05 15:13:33.641346	172.21.130.15	172.21.130.50	TLSv1.2	1464	Server Hello
173	2024-12-05 15:13:33.641346	172.21.130.15	172.21.130.50	TLSv1.2	591	Certificate, Server Key Exchange, Certificate Request, Server Hello Done
176	2024-12-05 15:13:33.645145	172.21.130.50	172.21.130.15	TLSv1.2	1169	Certificate
177	2024-12-05 15:13:33.645145	172.21.130.50	172.21.130.15	TLSv1.2	129	Client Key Exchange
178	2024-12-05 15:13:33.645145	172.21.130.50	172.21.130.15	TLSv1.2	323	Certificate Verify
179	2024-12-05 15:13:33.645145	172.21.130.50	172.21.130.15	TLSv1.2	60	Change Cipher Spec
180	2024-12-05 15:13:33.645145	172.21.130.50	172.21.130.15	TLSv1.2	99	Encrypted Handshake Message

Length: 89

Handshake Protocol: Server Hello

Handshake Type: Server Hello (2)

Length: 85

Version: TLS 1.2 (0x0303)

Random: 96b6e2a1e623e1af2246df6b814819155023edb821c34052808fb9d149299

Session ID Length: 32

Session ID: a030f38708ad92cde626fe2933f102218dd8b6bc4d4a8992f4c89ddcac69

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: 383951d4c50efb2e991652225a6f02b1]

TLS segment data (1316 bytes)

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

패킷 수: 322 · 표시됨: 26(8.1%) · 누락됨: 0(0.0%)

프로토콜: Default

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

#	Test Execution Steps	Results	
1	UUT shall start CBSD-SAS communication with the security procedures	☒ PASS	☐ FAIL
2	- 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.	☒ PASS	☐ FAIL
3	UUT may retry for the security procedure which shall fail	☒ PASS	☐ 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: UUT shall not transmit RF	☒ PASS	☐ FAIL

Wireshark Capture Example for Test Case:

The Wireshark capture shows a network session between 172.21.130.50 and 172.21.130.15. The session starts with a TCP connection (Seq=16579, Ack=5000) and a TLS handshake. The server sends a Certificate Request (Seq=1411, Ack=518). The client responds with a Certificate Request (Seq=518, Ack=1411). The server then sends a fatal alert (Seq=518, Ack=3505) with the description 'Certificate Revoked'. This indicates that the server's certificate has been revoked, leading to a TLS failure.

Packet 187: 61 bytes on wire (488 bits), 61 bytes captured (488 bits) on interface \Device\NPF{B87DE53D-0660-47F1-8000-000000000000} (0.0.0.0) on interface 0.0.0.0

Ethernet II, Src: SuperMicroCo_deid:d9:da (3c:ec:ef:de:d9:da), 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: 16579, Dst Port: 5000, Seq: 518, Ack: 3505, Len: 7

Transport Layer Security

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

#	Test Execution Steps	Results	
1	UUT shall start CBSD-SAS communication with the security procedures	☒ PASS	☐ FAIL
2	- 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.	☒ PASS	☐ FAIL
3	UUT may retry for the security procedure which shall fail.	☒ PASS	☐ 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: UUT shall not transmit RF	☒ PASS	☐ FAIL

Wireshark Capture Example for Test Case:

The screenshot shows a Wireshark network capture of a TLS session. The packet list on the left shows various ARP, DHCP, and TCP packets. Packet 186, at time 10:27:42.924024, is a TCP segment (Seq=5000, Win=0, Len=0) with a description: "Alert (Level: Fatal, Description: Certificate Expired)". The packet details pane on the right shows the structure of this alert: "Alert (Level: Fatal, Description: Certificate Expired)" with a length of 7 bytes. The packet bytes pane on the right shows the raw hex and ASCII data of the alert.

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	UUT shall start CBSD-SAS communication with the security procedures	☒ PASS	☐ FAIL
2	- 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.	☒ PASS	☐ FAIL
3	UUT may retry for the security procedure which shall fail.	☒ PASS	☐ 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: UUT shall not transmit RF	☒ PASS	☐ FAIL

Wireshark Capture Example for Test Case:

The Wireshark capture shows a network interface 'usbmon0' capturing traffic. The packet list includes several ARP requests from 'SuperMicroCo_de:d9:da' to 'Broadcast'. Following these, a TLS handshake is visible. Packet 76, at time 10:29:56.981967, is a TLS alert with level 'Fatal' and description 'Certificate Unknown'. The packet details pane for this alert shows the following structure:

```

Frame 75: 61 bytes on wire (488 bits), 61 bytes captured (488 bits) on Interface \Device\NPF...
Ethernet II, Src: SuperMicroCo_de:d9:da (3c:ec:ef:de:d9:da), 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: 26528, Dst Port: 5000, Seq: 518, Ack: 3358, Len: 7
Transport Layer Security
  Alert (Level: Fatal, Description: Certificate Unknown)
    0000 8c b0 e9 1d a9 77 3c ec ef de d9 da 08 00 45 00 .....uc.....E-
    0010 00 2f 28 b3 40 00 3f 06 b6 a9 ac 15 82 32 ac 15 ../( @ ? ..2..
    0020 82 0f 67 a0 13 88 55 2f 09 75 16 6f 44 22 50 18 ..g..U/..u oD'P-
    0030 00 Be d6 67 00 00 15 03 03 00 02 02 2e          ..g.....
  
```

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

#	Test Execution Steps	Results	
1	UUT shall start CBSD-SAS communication with the security procedures	☒ PASS	☐ FAIL
2	- 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.	☒ PASS	☐ FAIL
3	UUT may retry for the security procedure which shall fail.	☒ PASS	☐ 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: UUT shall not transmit RF	☒ PASS	☐ FAIL

Wireshark Capture Example for Test Case:

The screenshot displays a Wireshark capture of network traffic. The packet list on the left shows various protocols including DHCP, ARP, and TLSv1.2. Packet 117 is highlighted in red, indicating a fatal error. The packet details pane for packet 117 shows the alert structure with fields for level, description, and length. The packet bytes pane at the bottom shows the raw data of the alert.

5.7 CBSD RF Power Measurement

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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 <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>	--	--
2	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: • UUT sends Heartbeat Request, including: ◦ cbsdId= C ◦ grantId= G • SAS Test Harness responds with Heartbeat Response, including: ◦ cbsdId= C ◦ grantId= G ◦ transmitExpireTime= current UTC time + 200 seconds ◦ responseCode= 0	--	--
3	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. <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>	☒ PASS	☐ FAIL

● RF Power Measurements

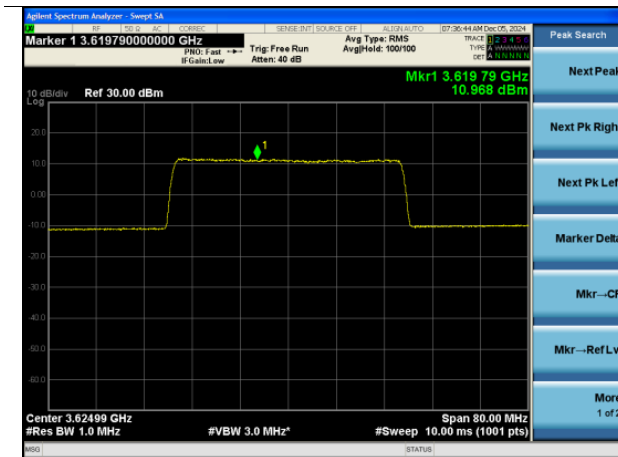
Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method

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	37	10.968	11.656	11.287	11.242	17.32	1.60	14.00	35.93
3624.99	40	31	5.642	5.696	5.837	5.502	11.69	1.60	14.00	30.30
3624.99	40	25	0.255	0.332	0.297	0.247	6.30	1.60	14.00	24.91

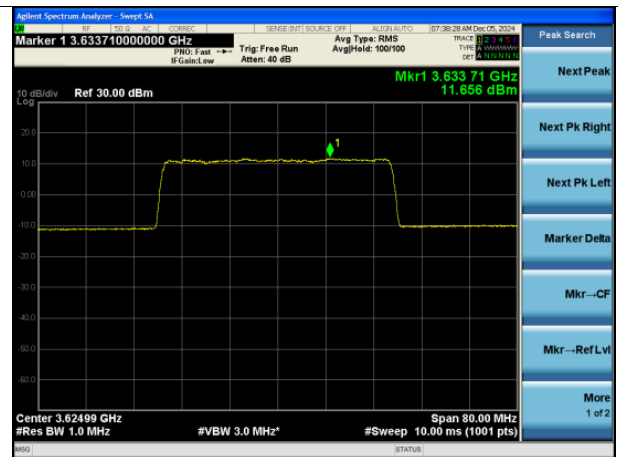
- Plots of RF Power Measurements

Granted max EIRP = 37 dBm/MHz

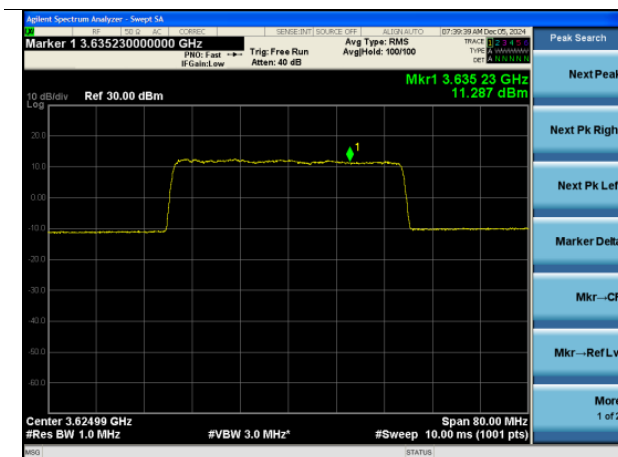
Tx 1



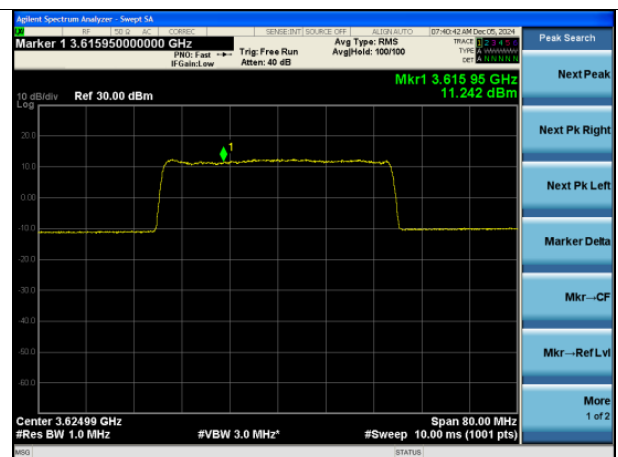
Tx 2



Tx 3

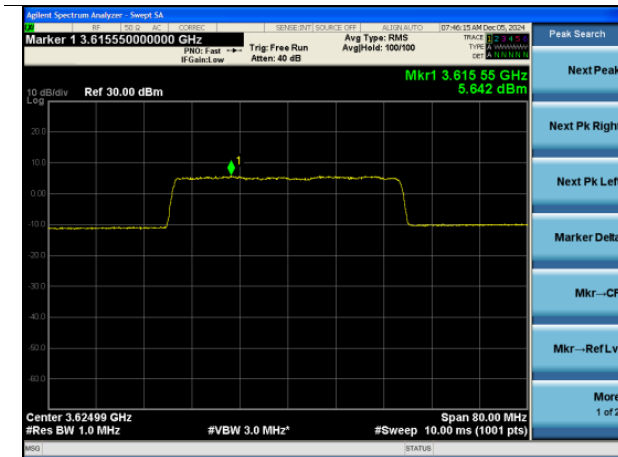


Tx 4

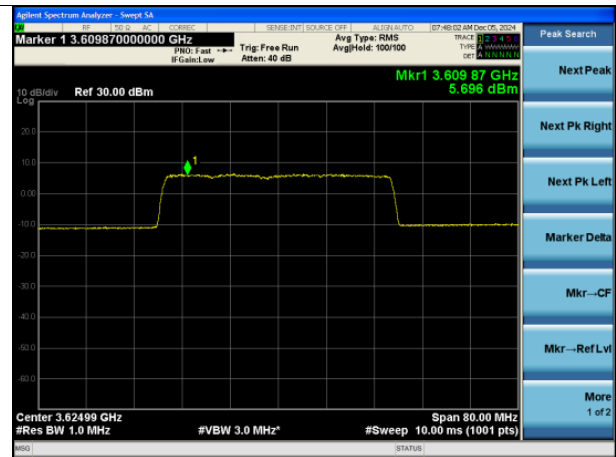


Granted max EIRP = 31 dBm/MHz

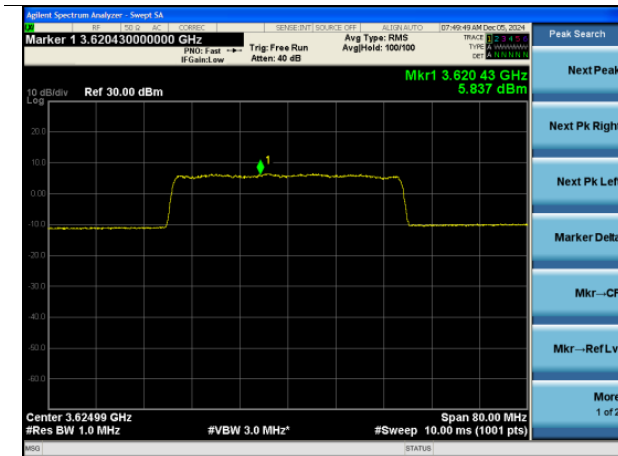
Tx 1



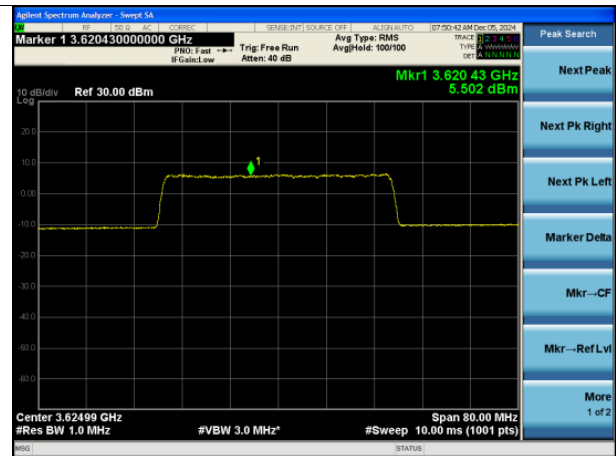
Tx 2



Tx 3

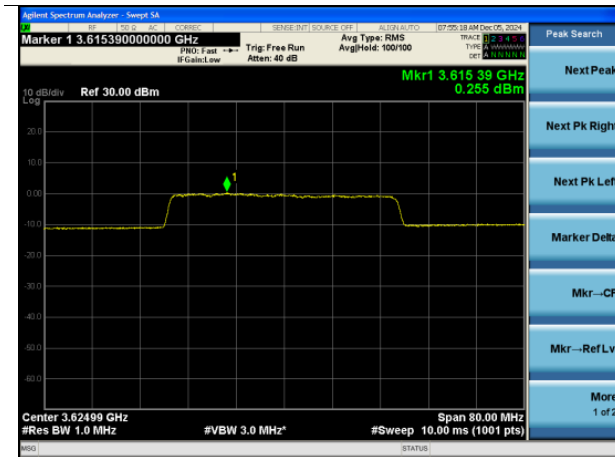


Tx 4

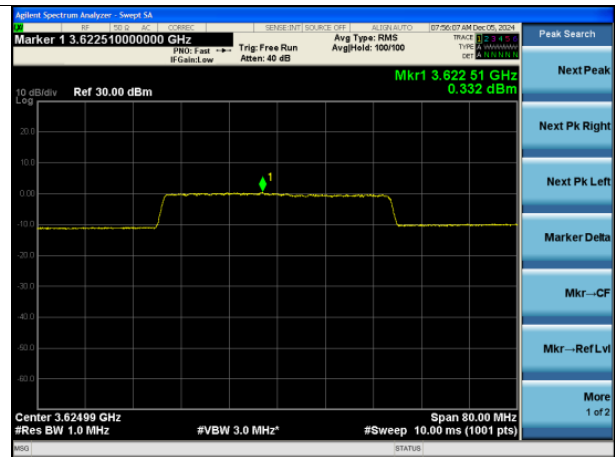


Granted max EIRP = 25 dBm/MHz

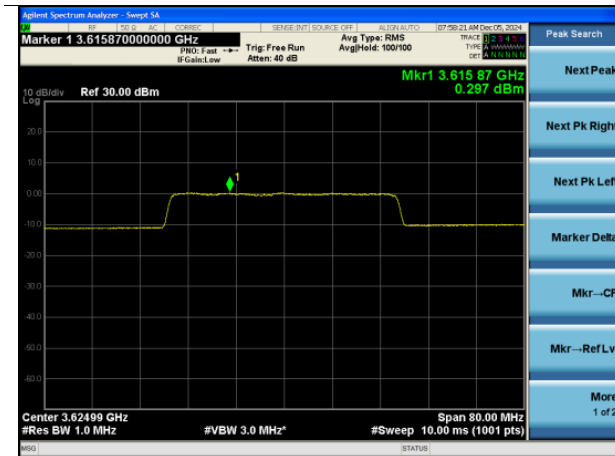
Tx 1



Tx 2



Tx 3



Tx 4



6. TEST LOGS

Please refer to the attached file named 'Test Logs'

7. TEST SETUP PHOTOGRAPHS



- End -