

CBSD-EUD Test Report

Report No.: RFBCUN-WTW-P23030714-2

FCC ID: H8N46116A

Test Model: NR xCell 46116A

Received Date: Mar. 31, 2023

Test Date: May 30, 2023 ~ Aug. 25, 2023

Issued Date: Sep. 05, 2023

Applicant: ASKEY COMPUTER CORP.

Address: 10F, NO. 119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY
23585, TAIWAN, R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

**FCC Registration/
Designation Number:** 788550 / TW0003



This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Modification Record	9
3 General Information	10
3.1 General Description of EUT	10
3.2 General Description of Applied Standards	11
4 Measurement	12
4.1 CBSD Measurement	12
4.2 CBSD Test Procedure	12
4.3 Test Environment	12
4.4 Test Environment	13
4.5 Test Equipment	13
4.6 Test Setup	13
4.7 Test Result	14
4.7.1 CBSD Registration Process	14
4.7.1.1 WINNF.FT.C.REG.3	14
4.7.1.2 WINNF.FT.C.REG.7	15
4.7.1.3 WINNF.FT.C.REG.8	16
4.7.1.4 WINNF.FT.C.REG.10	17
4.7.1.5 WINNF.FT.C.REG.12	18
4.7.1.6 WINNF.FT.C.REG.14	19
4.7.1.7 WINNF.FT.C.REG.16	20
4.7.1.8 WINNF.FT.C.REG.18	21
4.7.1.9 WINNF.FT.C.REG.20	22
4.7.2 CBSD Spectrum Grant Process	23
4.7.2.1 WINNF.FT.C.GRA.1	23
4.7.2.2 WINNF.FT.C.GRA.2	24
4.7.3 CBSD Heart Beat Process	25
4.7.3.1 WINNF.FT.C.HBT.1	25
4.7.3.2 WINNF.FT.C.HBT.3	27
4.7.3.3 WINNF.FT.C.HBT.4	28
4.7.3.4 WINNF.FT.C.HBT.5	29
4.7.3.5 WINNF.FT.C.HBT.6	30
4.7.3.6 WINNF.FT.C.HBT.7	31
4.7.3.7 WINNF.FT.C.HBT.9	32
4.7.3.8 WINNF.FT.C.HBT.10	33
4.7.4 CBSD Relinquishment Process	34
4.7.4.1 WINNF.FT.C.RLQ.1	34
4.7.5 CBSD Deregistration Process	35
4.7.5.1 WINNF.FT.C.DRG.1	35
4.7.6 CBSD Security Validation	36
4.7.6.1 WINNF.FT.C.SCS.1	36
4.7.6.2 WINNF.FT.C.SCS.2	37
4.7.6.3 WINNF.FT.C.SCS.3	38
4.7.6.4 WINNF.FT.C.SCS.4	39
4.7.6.5 WINNF.FT.C.SCS.5	40
4.7.7 CBSD RF Power Measurement	41
4.7.7.1 WINNF.PT.C.HBT.1	41
5 Pictures of Test Arrangements	44
6 WinnForum Logs	45

Appendix – Information of the Testing Laboratories 46

Release Control Record

Issue No.	Description	Date Issued
RFBCUN-WTW-P23030714-2	Original release	Sep. 05, 2023

1 Certificate of Conformity

Product: 5G small cell

Brand: ASKEY

Test Model: NR xCell 46116A

Sample Status: Engineering sample

Applicant: ASKEY COMPUTER CORP.

Test Date: May 30 ~ Aug. 25, 2023

Standards: WINNF-TS-0122 V1.0.2
ONGO-TS-9001 V1.3.0

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Pettie Chen , **Date:** Sep. 05, 2023
Pettie Chen / Senior Specialist

Approved by : Jeremy Lin , **Date:** Sep. 05, 2023
Jeremy Lin / Project Engineer

2 Summary of Test Results

WINNF-TS-0122			
Classes	Test Case Items	Pass Items	Pass Rate (%)
FT(CBSD, DP/CBSD)	26	26	100
PT(CBSD, DP/CBSD)	1	1	100
Total	27	27	100

Note:

1. Functional Test (FT): Test to validate the conformance of the Protocols and functionalities implemented in the CBS/D/DP UUT to the requirements developed by WInnForum and supporting FCC/DoD requirements.
2. Field/Performance Test (PT): Test to check the capability of the CBS/D/DP UUT to support various traffic models and actual operations in the field.

Supported Features in details:

WINNF-TS-0122 Test Case		
Definitions	Test Case ID	Supported
C1	NA	No
C2	WINNF.FT.C.REG.3 WINNF.FT.C.REG.20	Yes
C3	NA	No
C4	NA	No
C5	NA	No
C6	WINNF.FT.C.REG.7	Yes

WINNF-TS-0122 Test Case

Section	Test Case ID	Test Case Title	Test Result
6.1.4.1.1	WINNF.FT.C.REG.1	Multi-Step registration	NA
6.1.4.1.2	WINNF.FT.D.REG.2	Domain Proxy Multi-Step registration	NA
6.1.4.1.3	WINNF.FT.C.REG.3	Single-Step registration for Category A CBSD	Pass
6.1.4.1.4	WINNF.FT.D.REG.4	Domain Proxy Single-Step registration for Cat A CBSD	NA
6.1.4.1.5	WINNF.FT.C.REG.5	Single-Step registration for CBSD with CPI signed data	NA
6.1.4.1.6	WINNF.FT.D.REG.6	Domain Proxy Single-Step registration for CBSD with CPI signed data	NA
6.1.4.1.7	WINNF.FT.C.REG.7	Registration due to change of an installation parameter	Pass
6.1.4.2.1	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	Pass
6.1.4.2.2	WINNF.FT.D.REG.9	Domain Proxy Missing Required parameters (responseCode 102)	NA
6.1.4.2.3	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	Pass
6.1.4.2.4	WINNF.FT.D.REG.11	Domain Proxy Pending registration (responseCode 200)	NA
6.1.4.2.5	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	Pass
6.1.4.2.6	WINNF.FT.D.REG.13	Domain Proxy Invalid parameters (responseCode 103)	NA
6.1.4.2.7	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	Pass
6.1.4.2.8	WINNF.FT.D.REG.15	Domain Proxy Blacklisted CBSD (responseCode 101)	NA
6.1.4.2.9	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	Pass
6.1.4.2.10	WINNF.FT.D.REG.17	Domain Proxy Unsupported SAS protocol version (responseCode 100)	NA
6.1.4.2.11	WINNF.FT.C.REG.18	Group Error (responseCode 201)	Pass
6.1.4.2.12	WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	NA
6.1.4.3.1	WINNF.FT.C.REG.20	Category A CBSD location update	Pass

WINNF-TS-0122 Test Case			
Section	Test Case ID	Test Case Title	Test Result
6.3.4.2.1	WINNF.FT.D.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
6.4.4.1.2	WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	NA
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
6.4.4.2.6	WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TERMINATED_GRANT)	NA
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
6.4.4.4.1	WINNF.FT.C.HBT.11	Successful Grant Renewal in Heartbeat Test Case	NA
6.5.4.2.1	WINNF.FT.C.MES.1	Registration Response contains measReportConfig	NA
6.5.4.2.2	WINNF.FT.D.MES.2	Domain Proxy Registration Response contains measReportConfig	NA
6.5.4.2.3	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	NA
6.5.4.2.4	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	NA
6.5.4.2.5	WINNF.FT.D.MES.5	Domain Proxy Heartbeat Response contains measReportConfig	NA

WINNF-TS-0122 Test Case

Section	Test Case ID	Test Case Title	Test Result
6.6.4.1.1	WINNF.FT.C.RLQ.1	Successful Relinquishment	Pass
6.6.4.1.2	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	NA
6.6.4.2.1	WINNF.FT.C.RLQ.3	Unsuccessful Relinquishment, responseCode=102	NA
6.6.4.2.2	WINNF.FT.D.RLQ.4	Domain Proxy Unsuccessful Relinquishment, responseCode=102	NA
6.6.4.3.1	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	NA
6.6.4.3.2	WINNF.FT.D.RLQ.6	Domain Proxy Unsuccessful Relinquishment, responseCode=103	NA
6.7.4.1.1	WINNF.FT.C.DRG.1	Successful Deregistration	Pass
6.7.4.1.2	WINNF.FT.D.DRG.2	Domain Proxy Successful Deregistration	NA
6.7.4.2.1	WINNF.FT.C.DRG.3	Deregistration responseCode=102	NA
6.7.4.2.2	WINNF.FT.D.DRG.4	Domain Proxy Deregistration responseCode=102	NA
6.7.4.3.1	WINNF.FT.C.DRG.5	Deregistration responseCode=103	NA
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	UUT RF Transmit Power Measurement	Pass

Note: Section as per WINNF-TS-0122 If the product as tested complies with the specification, the UUT is deemed to comply with the standard and is deemed a "Pass" grade. If not "Fail" grade is issued. Where "NA" is stated this means the test case is not applicable.

2.1 Modification Record

Following the FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v02, when running the test cases in WINNF-TS-0122 for CPE-CBSD device type, for the last execution step appearing in WINNF-TS-0122:

1. The Pass/Fail criteria "UUT shall not transmit RF" is replaced by "CPE-CBSD UUT shall not transmit user traffic".
2. The Pass/Fail criteria "UUT shall stop transmission" is replaced by CPE-CBSD UUT shall stop transmitting user traffic"

3 General Information

3.1 General Description of EUT

Product	5G small cell
Brand	ASKEY
Test Model	NR xCell 46116A
Status of EUT	Engineering sample
Accessory Device	12Vdc or 48Vdc (Adapter)
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT contains following accessory devices and PoE.

AC Adapter 1	Brand	FLYPOWER
	Model	PS65B120Y5000S
	AC Input	100-240Vac~, 15A, 50/60Hz
	DC Output	12.0Vdc, 5.0A
AC Adapter 2	Brand	Sunny
	Model	SYS1649-6548-T2
	AC Input	100-240Vac~, 15A, 50/60Hz
	DC Output	48.0Vdc, 1.35A
Bracket	Brand	LUNG TENG
	Model	MOD-SCE2200-Wall_Ceiling_Ploe-Mount-Sub

Power cord	Brand	WELL SHIN
	Model	1961-0048
PoE (Support unit)	Brand	CERiO
	Model	FPOE-DXG

2. The antenna information is listed as below.

Antenna Type	Antenna Gain(dBi)			Connector Type
	Frequency (MHz)	Ant 1	Ant 2	
Dipole	3300	5.54	4.80	I-PEX
	3550	4.79	5.05	
	3700	4.71	5.79	
	3800	5.14	6.20	

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 General Description of Applied Standards

The UUT is a BTS-CBSD product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC 47 CFR Part 96

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 940660 D01 Part 96 CBRS Eqpt v03

All test items have been performed as a reference to the above KDB test guidance.

4 Measurement

4.1 CBSD Measurement

The CBSD shall validate and ensure that the Conformance and Performance Test results from compliance with SAS functional requirements.

4.2 CBSD Test Procedure

- a. Connect the UUT to SAS Test Harness system and RF Test instruments via the CBSD interface and RF components. The highest level is set to test configuration.
- b. UUT shall be UTC time synchronized
- c. The frequency band is granted and set as UUT supported Modulation and Channels, transmitted power of the UUT according to it granted parameters from the SAS Test Harness.
- d. Each test case results was recorded and validated by SAS Test Harness system and RF instruments test cases was recorded test results from SAS Test Harness system.

4.3 Test Environment

Test Harness Version	V1.0.0.3
Operating System	Microsoft Windows 10
TLS Version	1.2
Python	2.7.13

4.4 Test Environment

Test Condition

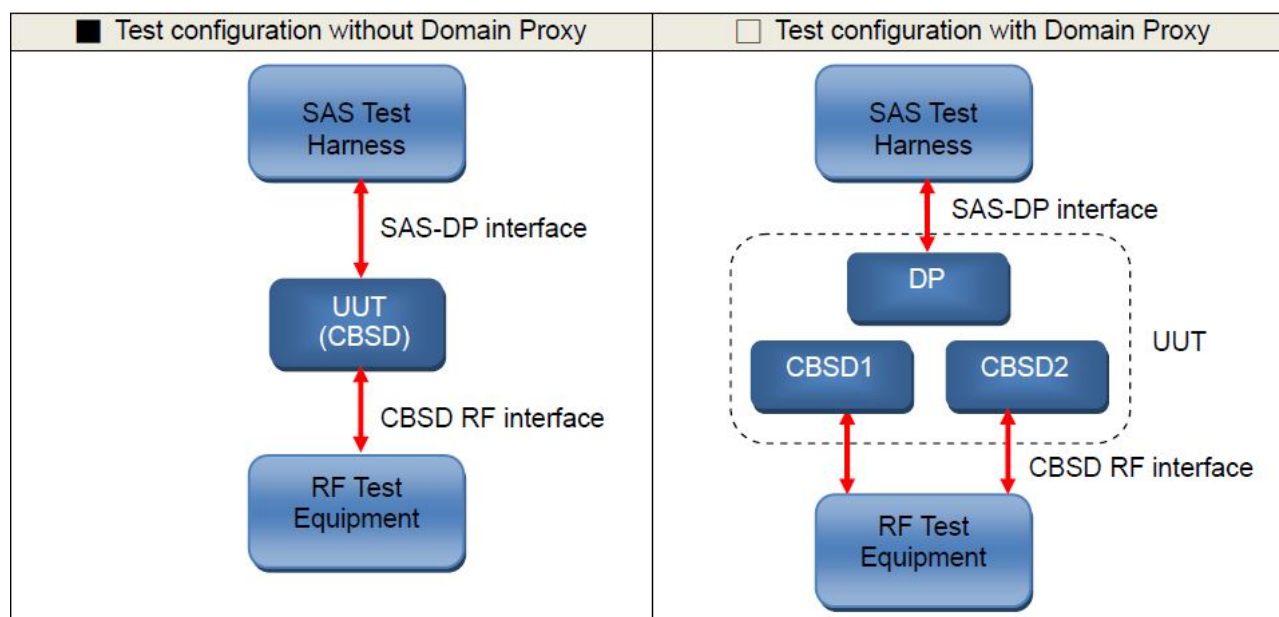
Test Item	Environmental Conditions	Input Power	Tested By
WINNF-TS-0122	25deg. C, 65%RH	120Vac, 60Hz	Matthew Yang

4.5 Test Equipment

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal Analyzer ROHDE & SCHWARZ	N9030A	MY54490561	Jul. 26, 2022	Jul. 25, 2023
			Jul. 25, 2023	Jul. 24, 2024
Temperature & Humidity Chamber TERCHY	TFA 452019	NA	Dec. 15, 2022	Dec. 14, 2023
Laptop Lenovo	P137G	P137G001	NA	NA

NOTE: 1. The test was performed in InfoSec Test Room.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6 Test Setup



4.7 Test Result

4.7.1 CBSD Registration Process

4.7.1.1 WINNF.FT.C.REG.3

■ Test Case ID : WINNF.FT.C.REG.3 □ NA

#	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 is in the Unregistered state	--	--
2	CBSD sends Registration request to SAS Test Harness: all required and REG-Conditional parameter included (userId, fcld, cbsdSerialNumber, cbsdCategory, airInterface, installationParam, measCapability) for a Category A CBSD. - The required userId, fcld and cbsdSerialNumber and REG-Conditional cbsdCategory, airInterface, installationParam, and measCapability registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. - Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.	☒ Pass	☐ Fail
3	- SAS Test Harness sends a CBSD Registration Response as follows: <i>cbsdId</i> = C <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 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

4.7.1.2 WINNF.FT.C.REG.7

☒ Test Case ID : WINNF.FT.C.REG.7
 ☐ NA

#	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	--	--
2	UUT has successfully registered with SAS Test Harness	--	--
3	Change an installation parameters at the UUT (time T) Tester needs to record the current time at which the parameter change is executed.	--	--
4	Monitor the SAS-CBSD interface. UUT sends a deregistrationRequest to the SAS Test Harness The deregistration request shall be sent within (T + 60 seconds) from step 3.	☒ Pass	☐ Fail

4.7.1.3 WINNF.FT.C.REG.8

☒ Test Case ID : WINNF.FT.C.REG.8
 ☐ NA

#	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 <i>cbsdId</i> <i>responseCode</i> = R = 102	--	--
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

4.7.1.4 WINNF.FT.C.REG.10

☒ Test Case ID : WINNF.FT.C.REG.10
 ☐ NA

#	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 <i>cbsdId</i> <i>responseCode</i> = R = 200	--	--
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

4.7.1.5 WINNF.FT.C.REG.12

☒ Test Case ID : WINNF.FT.C.REG.12
 ☐ NA

#	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 <i>cbsdId</i> <i>responseCode</i> = R = 103	--	--
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

4.7.1.6 WINNF.FT.C.REG.14

☒ Test Case ID : WINNF.FT.C.REG.14
 ☐ NA

#	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 <i>cbsdId</i> <i>responseCode</i> = R = 101	--	--
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

4.7.1.7 WINNF.FT.C.REG.16

☒ Test Case ID : WINNF.FT.C.REG.16
 ☐ NA

#	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 <i>cbsdId</i> <i>responseCode</i> = R = 100	--	--
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

4.7.1.8 WINNF.FT.C.REG.18

■ Test Case ID : WINNF.FT.C.REG.18 □ NA

#	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 <i>cbsdId</i> - <i>responseCode</i> = R = 201	--	--
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

4.7.1.9 WINNF.FT.C.REG.20

The test case ID is provided as a means to ensure that evidence is provided showing compliance to this requirement.

4.7.2 CBSD Spectrum Grant Process

4.7.2.1 WINNF.FT.C.GRA.1

☒ Test Case ID : WINNF.FT.C.GRA.1
 ☐ NA

#	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 valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including <i>cbsdId</i>=C <i>responseCode</i> = R = 400	--	--
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

4.7.2.2 WINNF.FT.C.GRA.2

☒ Test Case ID : WINNF.FT.C.GRA.2
 ☐ NA

#	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 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

4.7.3 CBSD Heart Beat Process

4.7.3.1 WINNF.FT.C.HBT.1

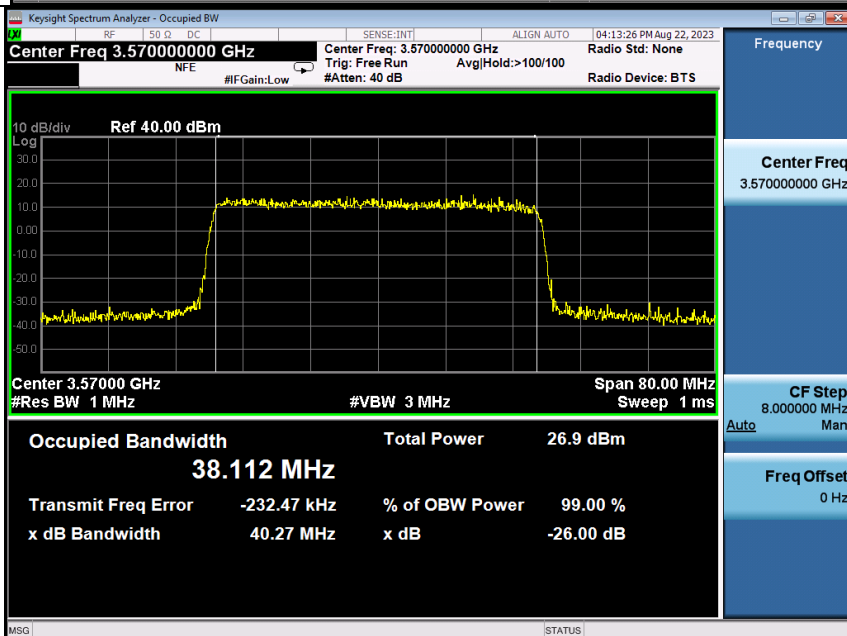
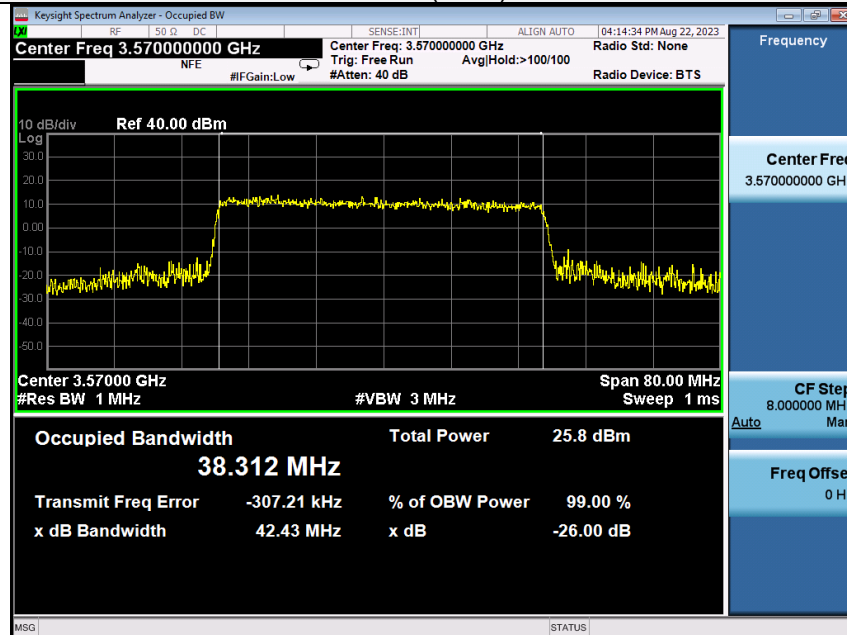
■ Test Case ID : WINNF.FT.C.HBT.1 □ NA

#	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 ● <i>availableChannel</i> is an array of availableChannel objects ● <i>responseCode</i> = 0	--	--
5	UUT sends Grant Request message. Validate: ● <i>cbsdId</i> = C ● <i>maxEIRP</i> is at or below the limit appropriate for CBSD category as defined by Part 96 ● <i>operationFrequencyRange</i> , 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

- UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F.

Channel	Freq. (MHz)	OCP 99 Band Width (MHz)	
		F = 40MHz	
		Chain (0)	Chain (1)
Middle	3570	38.312	38.112

Spectrum Plot
Chain (0 ~ 1)



4.7.3.2 WINNF.FT.C.HBT.3

■ Test Case ID : WINNF.FT.C.HBT.3 □ NA

#	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. 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"	--	--
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

4.7.3.3 WINNF.FT.C.HBT.4

■ Test Case ID : WINNF.FT.C.HBT.4 □ NA

#	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. 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> = "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

4.7.3.4 WINNF.FT.C.HBT.5

■ Test Case ID : WINNF.FT.C.HBT.5 □ NA

#	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 is 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

4.7.3.5 WINNF.FT.C.HBT.6

■ Test Case ID : WINNF.FT.C.HBT.6 □ NA

#	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. 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> = "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

4.7.3.6 WINNF.FT.C.HBT.7

■ Test Case ID : WINNF.FT.C.HBT.7 □ NA

#	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. 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> = "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

4.7.3.7 WINNF.FT.C.HBT.9

☒ Test Case ID : WINNF.FT.C.HBT.9
 ☐ NA

#	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

4.7.3.8 WINNF.FT.C.HBT.10

■ Test Case ID : WINNF.FT.C.HBT.10 □ NA

#	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 + 200 seconds ● <i>responseCode</i> = 0	--	--
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 all transmission on RF interface within (<i>transmitExpireTime</i> + 60 seconds), using the <i>transmitExpireTime</i> sent in Step 3.	■ Pass	□ Fail

4.7.4 CBSD Relinquishment Process

4.7.4.1 WINNF.FT.C.RLQ.1

■ Test Case ID : WINNF.FT.C.RLQ.1 □ NA

#	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 the 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 relinquishment and UUT sending the relinquishment request	■ Pass	□ Fail

4.7.5 CBSD Deregistration Process

4.7.5.1 WINNF.FT.C.DRG.1

■ Test Case ID : WINNF.FT.C.DRG.1 □ NA

#	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 sends 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.	■ Pass	□ Fail
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

4.7.6 CBSD Security Validation

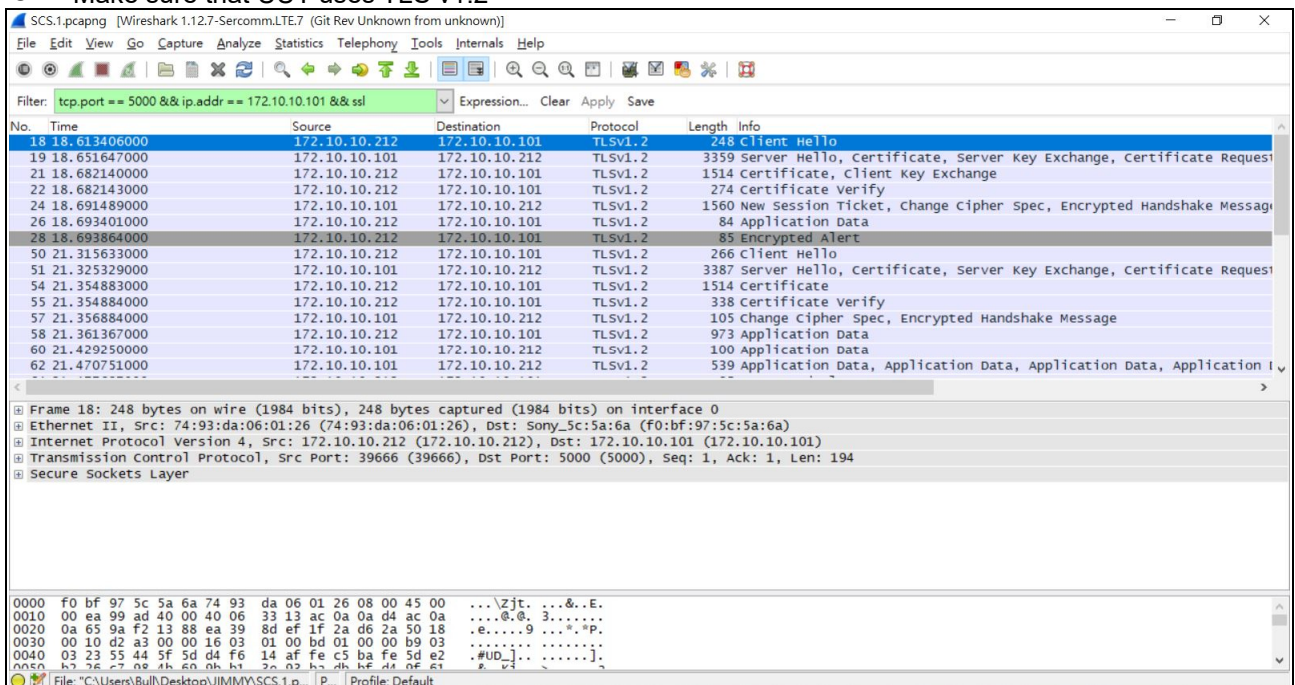
4.7.6.1 WINNF.FT.C.SCS.1

Test Case ID : WINNF.FT.C.SCS.1 ☐ NA

#	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>cbstdId</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 :

- Make sure that UUT uses TLS v1.2



The screenshot shows a Wireshark capture of a TLS v1.2 handshake. The filter is set to 'tcp.port == 5000 && ip.addr == 172.10.10.101 && ssl'. The capture shows the following packets:

- 18: 248 Client Hello
- 19: 3359 Server Hello, Certificate, Server Key Exchange, Certificate Request
- 21: 1514 Certificate, Client Key Exchange
- 22: 274 Certificate Verify
- 24: 1560 New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
- 26: 84 Application Data
- 28: 85 Encrypted Alert
- 50: 266 Client Hello
- 51: 3387 Server Hello, Certificate, Server Key Exchange, Certificate Request
- 54: 1514 Certificate
- 55: 338 Certificate Verify
- 57: 105 Change Cipher Spec, Encrypted Handshake Message
- 58: 973 Application Data
- 60: 100 Application Data
- 62: 539 Application Data, Application Data, Application Data, Application Data

The packet details for the first Client Hello (Frame 18) are shown below:

```

Frame 18: 248 bytes on wire (1984 bits), 248 bytes captured (1984 bits) on interface 0
Ethernet II, Src: 74:93:da:06:01:26 (74:93:da:06:01:26), Dst: Sony_5c:5a:6a (f0:bf:97:5c:5a:6a)
Internet Protocol Version 4, Src: 172.10.10.212 (172.10.10.212), Dst: 172.10.10.101 (172.10.10.101)
Transmission Control Protocol, Src Port: 39666 (39666), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 194
Secure Sockets Layer

```

The packet bytes are shown in hexadecimal and ASCII format at the bottom of the window.

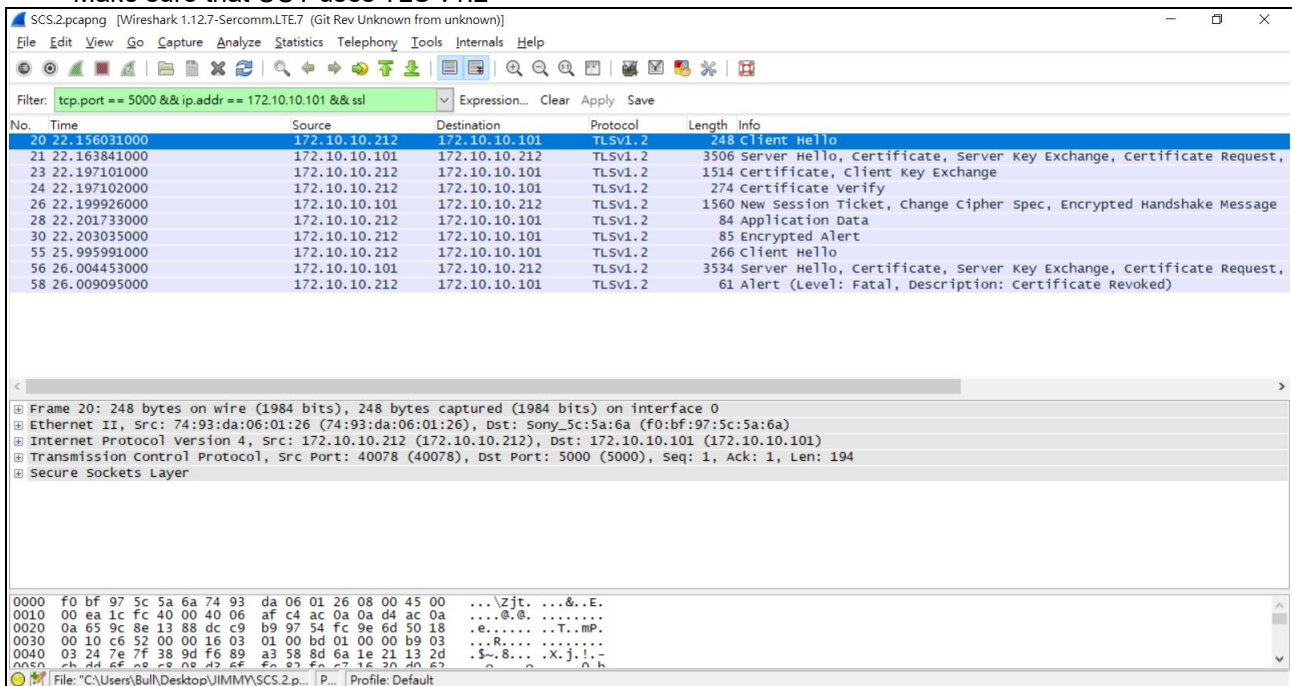
4.7.6.2 WINNF.FT.C.SCS.2

■ Test Case ID : WINNF.FT.C.SCS.2 ☐ NA

#	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 :

- Make sure that UUT uses TLS v1.2



SCS.2.pcapng [Wireshark 1.12.7-Sercomm.LTE.7 (Git Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: tcp.port == 5000 && ip.addr == 172.10.10.101 && ssl

No.	Time	Source	Destination	Protocol	Length	Info
20	22.156031000	172.10.10.212	172.10.10.101	TLSv1.2	248	Client Hello
21	22.163841000	172.10.10.101	172.10.10.212	TLSv1.2	3506	Server Hello, Certificate, Server Key Exchange, Certificate Request,
23	22.197101000	172.10.10.212	172.10.10.101	TLSv1.2	1514	Certificate, Client Key Exchange
24	22.197102000	172.10.10.212	172.10.10.101	TLSv1.2	274	Certificate Verify
26	22.199926000	172.10.10.101	172.10.10.212	TLSv1.2	1560	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
28	22.201733000	172.10.10.212	172.10.10.101	TLSv1.2	84	Application Data
30	22.203035000	172.10.10.212	172.10.10.101	TLSv1.2	85	Encrypted Alert
55	25.995991000	172.10.10.212	172.10.10.101	TLSv1.2	266	Client Hello
56	26.004453000	172.10.10.101	172.10.10.212	TLSv1.2	3534	Server Hello, Certificate, Server Key Exchange, Certificate Request,
58	26.009095000	172.10.10.212	172.10.10.101	TLSv1.2	61	Alert (Level: Fatal, Description: Certificate Revoked)

Frame 20: 248 bytes on wire (1984 bits), 248 bytes captured (1984 bits) on interface 0

Ethernet II, Src: 74:93:da:06:01:26 (74:93:da:06:01:26), Dst: Sony_5c:5a:6a (f0:bf:97:5c:5a:6a)

Internet Protocol Version 4, Src: 172.10.10.212 (172.10.10.212), Dst: 172.10.10.101 (172.10.10.101)

Transmission Control Protocol, Src Port: 40078 (40078), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 194

Secure Sockets Layer

0000 f0 bf 97 5c 5a 6a 74 93 da 06 01 26 08 00 45 00 ...Zjt. ...&.E.

0010 00 ea 1c fc 40 00 40 06 af c4 ac 0a 0a d4 ac 0a@.

0020 0a 65 9c 8e 13 88 dc c9 b9 97 54 fc 9e 6d 50 18 ..e.....T..mp.

0030 00 10 c6 52 00 00 16 03 01 00 bd 01 00 00 b9 03 ...R.....

0040 03 24 7e 7f 38 9d f6 89 a3 58 8d 6a 1e 21 13 2d ..\$.8...X.j!..

0050 0b dd 6f c8 c8 08 d2 6f fc 87 fc c7 16 20 d0 67 ..b...f...f...f...

File: "C:\Users\Bull\Desktop\JIMMY\SCS.2.p..." Profile: Default

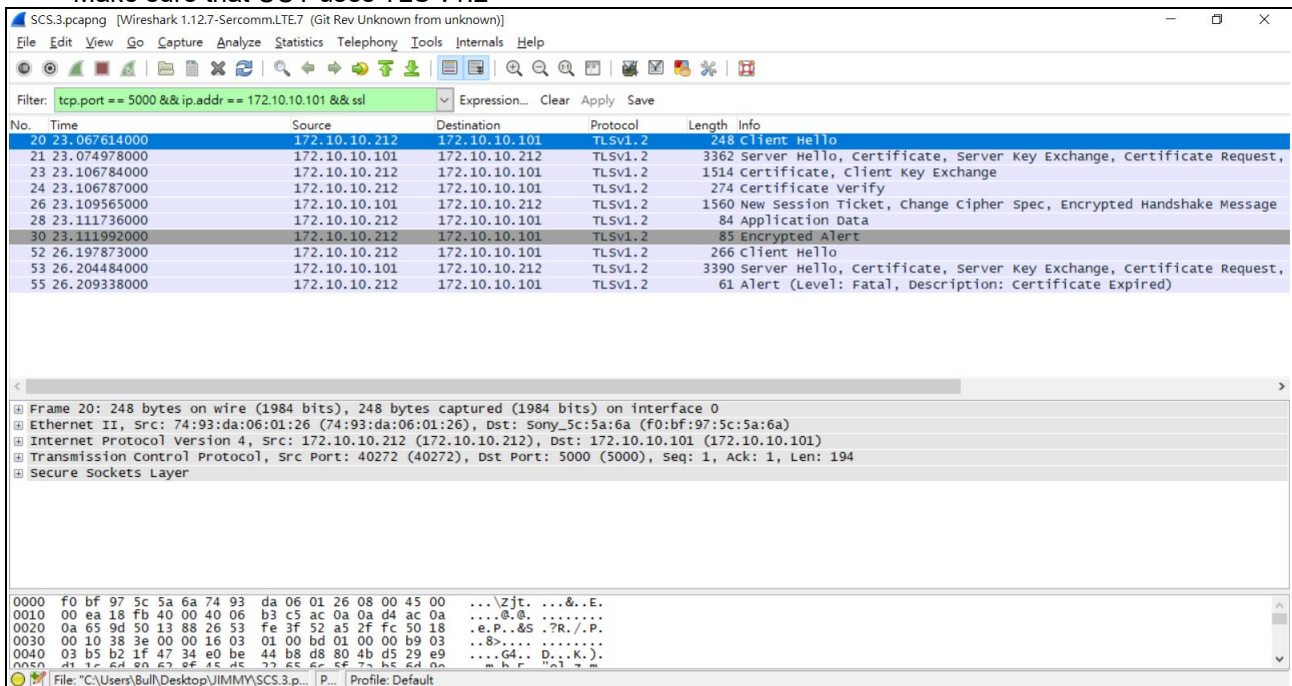
4.7.6.3 WINNF.FT.C.SCS.3

■ Test Case ID : WINNF.FT.C.SCS.3 ☐ NA

#	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 :

- Make sure that UUT uses TLS v1.2



SCS.3.pcapng [Wireshark 1.12.7-Sercomm.LTE.7 (Git Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: tcp.port == 5000 && ip.addr == 172.10.10.101 && ssl

No.	Time	Source	Destination	Protocol	Length	Info
20	23.067614000	172.10.10.212	172.10.10.101	TLSv1.2	248	Client Hello
21	23.074978000	172.10.10.101	172.10.10.212	TLSv1.2	3362	Server Hello, Certificate, Server Key Exchange, Certificate Request,
23	23.106784000	172.10.10.212	172.10.10.101	TLSv1.2	1514	Certificate, Client Key Exchange
24	23.106787000	172.10.10.212	172.10.10.101	TLSv1.2	274	Certificate Verify
26	23.109565000	172.10.10.101	172.10.10.212	TLSv1.2	1560	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
28	23.111736000	172.10.10.212	172.10.10.101	TLSv1.2	84	Application Data
30	23.111992000	172.10.10.212	172.10.10.101	TLSv1.2	85	Encrypted Alert
52	26.197873000	172.10.10.212	172.10.10.101	TLSv1.2	266	Client Hello
53	26.204484000	172.10.10.101	172.10.10.212	TLSv1.2	3390	Server Hello, Certificate, Server Key Exchange, Certificate Request,
55	26.209338000	172.10.10.212	172.10.10.101	TLSv1.2	61	Alert (Level: Fatal, Description: Certificate Expired)

Frame 20: 248 bytes on wire (1984 bits), 248 bytes captured (1984 bits) on interface 0

Ethernet II, Src: 74:93:da:06:01:26 (74:93:da:06:01:26), Dst: Sony_5c:5a:6a (f0:bf:97:5c:5a:6a)

Internet Protocol Version 4, Src: 172.10.10.212 (172.10.10.212), Dst: 172.10.10.101 (172.10.10.101)

Transmission Control Protocol, Src Port: 40272 (40272), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 194

Secure Sockets Layer

0000 f0 bf 97 5c 5a 6a 74 93 da 06 01 26 08 00 45 00 ...Zjt. ...&.E.

0010 00 ea 18 fb 40 00 40 06 b3 c5 ac 0a 0a d4 ac 0a@.@.

0020 0a 65 9d 50 13 88 26 53 fe 3f 52 a5 2f fc 50 18 .e.P..&S .?R./P.

0030 00 10 38 3e 00 00 16 03 01 00 bd 01 00 00 b9 03 ...8>....

0040 03 b5 b2 1f 47 34 e0 be 44 b8 d8 80 4b d5 29 e9 ...G4. D..K.).

0050 41 1c 6d 80 62 ef 45 d5 22 65 6c 5f 73 b5 6d 0a m b f "al z m

File: "C:\Users\Bull\Desktop\JIMMY\SCS.3.p..." Profile: Default

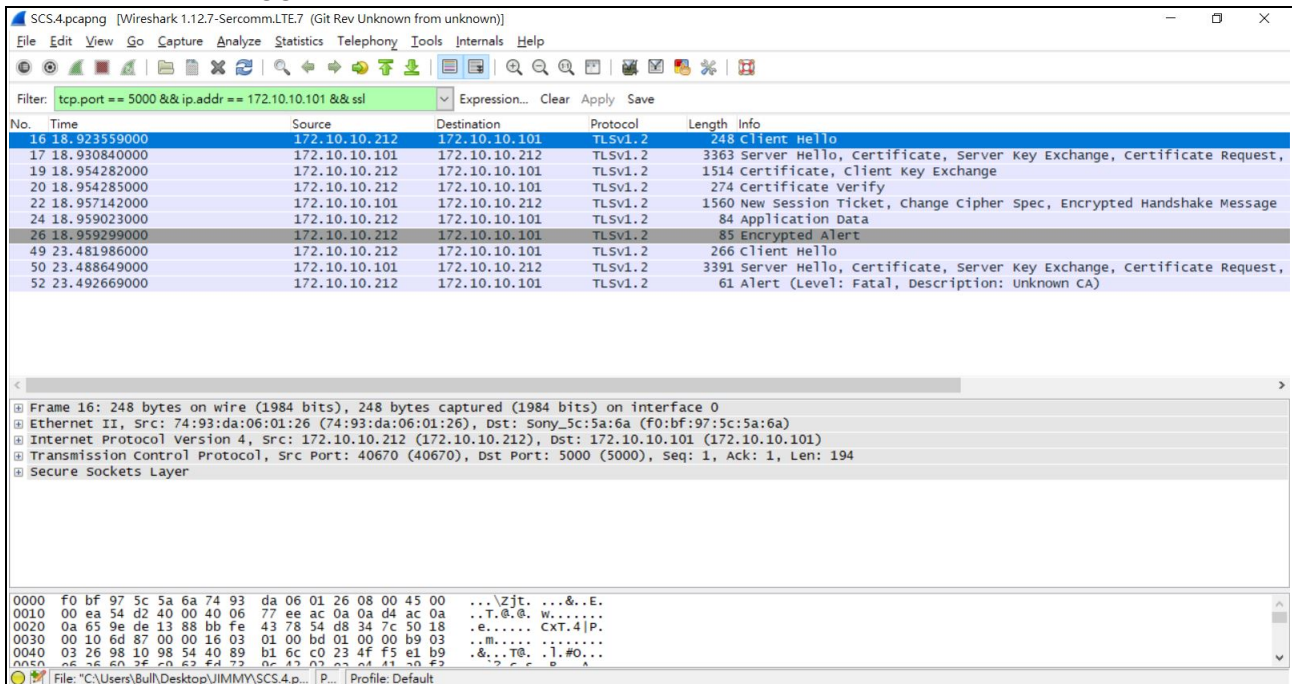
4.7.6.4 WINNF.FT.C.SCS.4

Test Case ID : WINNF.FT.C.SCS.4 ☐ NA

#	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 :

- Make sure that UUT uses TLS v1.2



SCS.4.pcapng [Wireshark 1.12.7-Sercomm.LTE.7 (Git Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: tcp.port == 5000 && ip.addr == 172.10.10.101 && ssl Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
16	18.923559000	172.10.10.212	172.10.10.101	TLSv1.2	248	Client Hello
17	18.930840000	172.10.10.101	172.10.10.212	TLSv1.2	3363	Server Hello, Certificate, Server Key Exchange, Certificate Request,
19	18.954282000	172.10.10.212	172.10.10.101	TLSv1.2	1514	certificate, Client Key Exchange
20	18.954285000	172.10.10.212	172.10.10.101	TLSv1.2	274	certificate verify
22	18.957142000	172.10.10.101	172.10.10.212	TLSv1.2	1560	New Session Ticket, change Cipher Spec, Encrypted Handshake Message
24	18.959023000	172.10.10.212	172.10.10.101	TLSv1.2	84	Application Data
26	18.959299000	172.10.10.212	172.10.10.101	TLSv1.2	85	Encrypted Alert
49	23.481986000	172.10.10.212	172.10.10.101	TLSv1.2	266	Client Hello
50	23.488649000	172.10.10.101	172.10.10.212	TLSv1.2	3391	Server Hello, Certificate, Server Key Exchange, Certificate Request,
52	23.492669000	172.10.10.212	172.10.10.101	TLSv1.2	61	Alert (Level: Fatal, Description: unknown CA)

< Frame 16: 248 bytes on wire (1984 bits), 248 bytes captured (1984 bits) on interface 0

Ethernet II, Src: 74:93:da:06:01:26 (74:93:da:06:01:26), Dst: Sony_5c:5a:6a (f0:bf:97:5c:5a:6a)

Internet Protocol Version 4, Src: 172.10.10.212 (172.10.10.212), Dst: 172.10.10.101 (172.10.10.101)

Transmission Control Protocol, Src Port: 40670 (40670), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 194

Secure Sockets Layer

0000 f0 bf 97 5c 5a 6a 74 93 da 06 01 26 08 00 45 00 ...Zjt. ...&.E.
0010 00 ea 54 d2 40 00 40 06 77 ee ac 0a 0a d4 ac 0a ..T.@.W.....
0020 0a 65 9e de 13 88 bb fe 43 78 54 d8 34 7c 50 18 .e.....EXT.4|p.
0030 00 10 6d 87 00 00 16 03 01 00 bd 01 00 00 b9 03 ..m.....
0040 03 26 98 10 98 54 40 89 b1 6c c0 23 4f f5 e1 b9 .&...T@.l.#0...
0050 05 26 60 2f c0 e2 f4 72 0c 12 02 02 04 a1 20 f2 ..2 6 0 A

File: "C:\Users\Bull\Desktop\JIMMYSCS.4.p..." Profile: Default

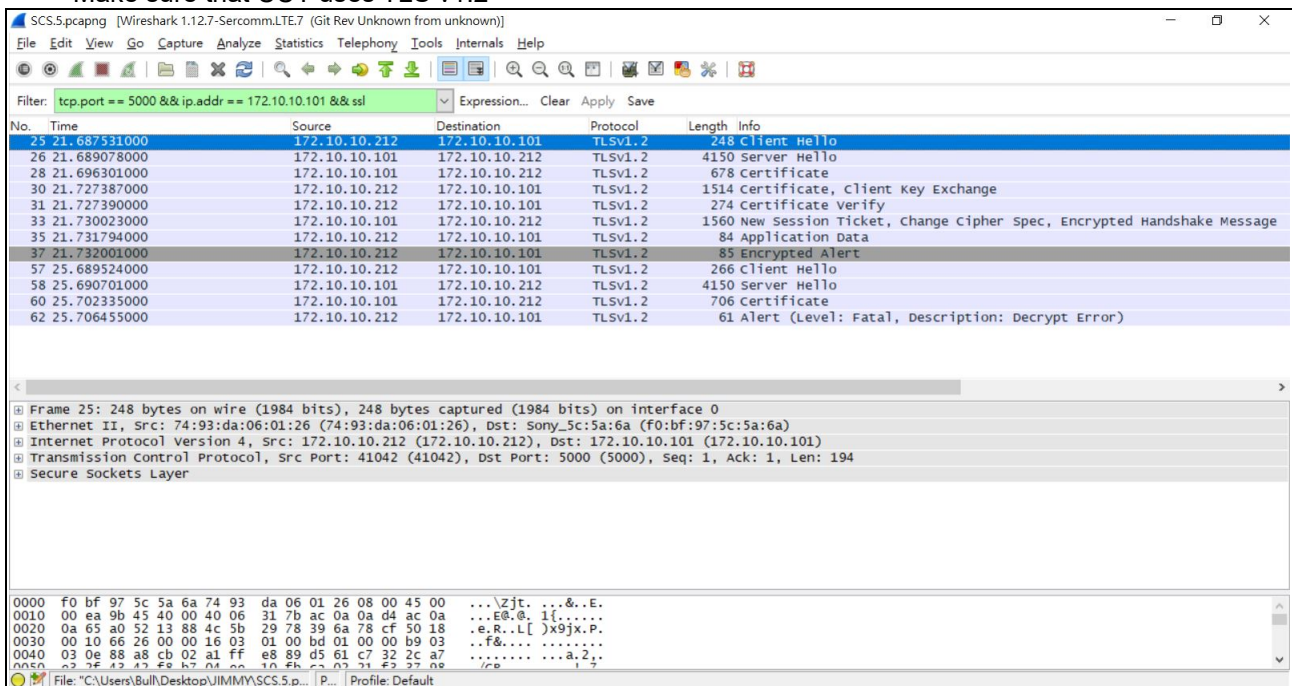
4.7.6.5 WINNF.FT.C.SCS.5

■ Test Case ID : WINNF.FT.C.SCS.5 ☐ NA

#	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 :

- Make sure that UUT uses TLS v1.2



The image shows a Wireshark capture of a TLS v1.2 handshake between two devices. The filter is set to 'tcp.port == 5000 && ip.addr == 172.10.10.101 && ssl'. The capture shows the following frames:

- 25: Client Hello (248 bytes)
- 26: Server Hello (4150 bytes)
- 28: Certificate (678 bytes)
- 30: Certificate, Client Key Exchange (1514 bytes)
- 31: Certificate Verify (274 bytes)
- 33: New Session Ticket, change Cipher Spec, Encrypted Handshake Message (1560 bytes)
- 35: Application Data (84 bytes)
- 37: Encrypted Alert (85 bytes)
- 57: Client Hello (266 bytes)
- 58: Server Hello (4150 bytes)
- 60: Certificate (706 bytes)
- 62: Alert (Level: Fatal, Description: Decrypt Error) (61 bytes)

The packet details for frame 25 (Client Hello) are expanded, showing the Ethernet II, Internet Protocol Version 4, Transmission Control Protocol, and Secure Sockets Layer headers.

4.7.7 CBSD RF Power Measurement

4.7.7.1 WINNF.PT.C.HBT.1

■ Test Case ID : WINNF.PT.C.HBT.1 □ NA

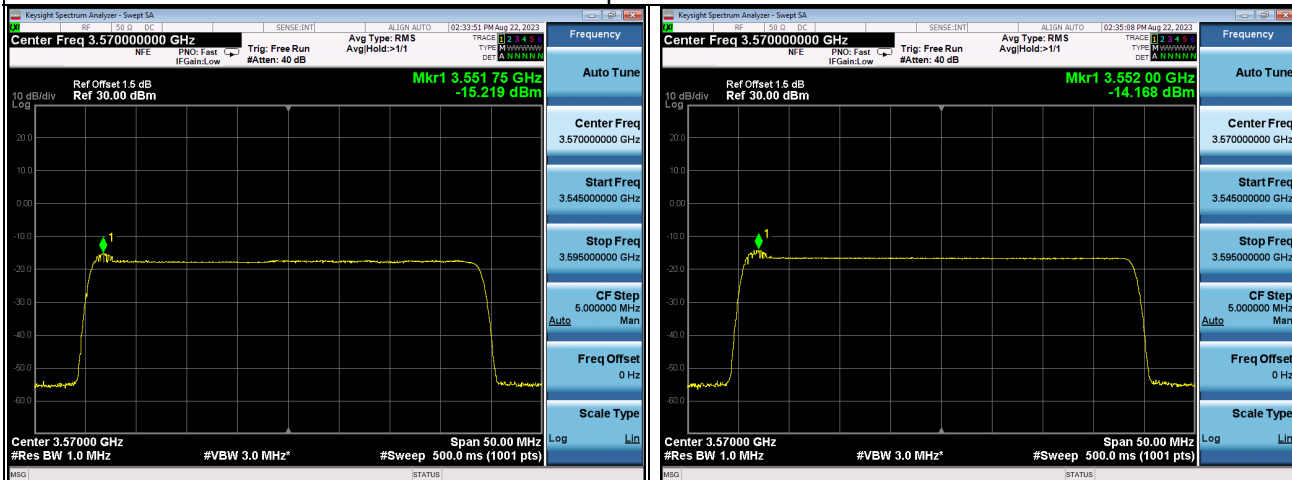
#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness ● UUT has registered with the SAS, with CBSD ID = C ● UUT has a single valid grant G with parameters {lowFrequency = FL, 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 fulfill 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 measurement plot for Test Case :

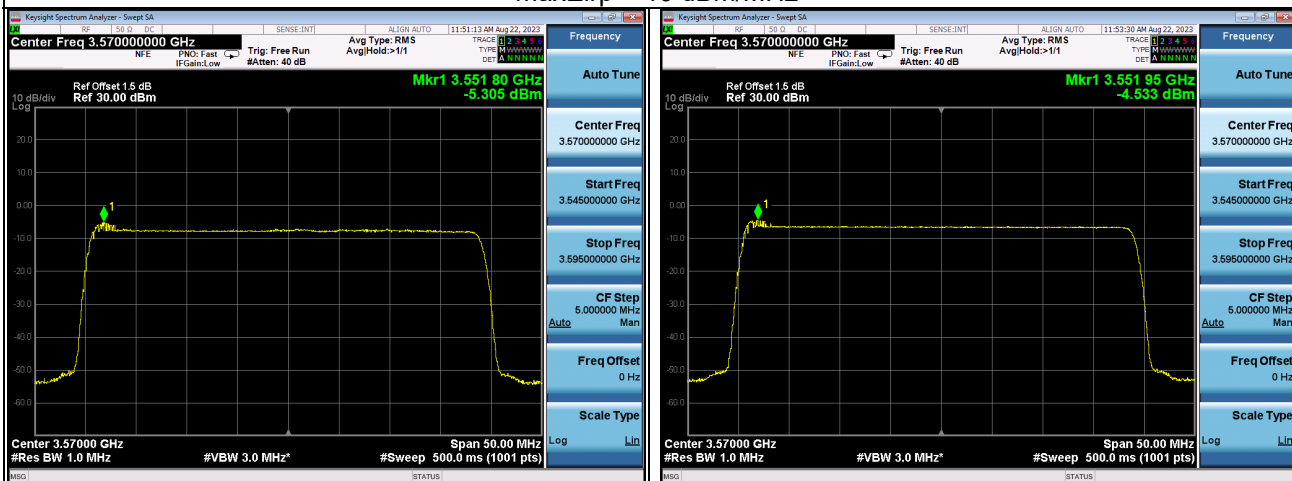
- Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method.

Channel	Freq. (MHz)	20MHz			Limit	Pass / Fail
		Conducted Power Density (dBm/MHz)		Gain(dBi) 5.79		
		Chain 0	Chain 1	Power Density	maxEirp(dBm)=Pi	
Middle	3570	-15.219	-14.168	-11.651	0.0	Pass
Middle	3570	-5.305	-4.533	-1.892	10.0	Pass
Middle	3570	4.240	4.645	7.458	20.0	Pass

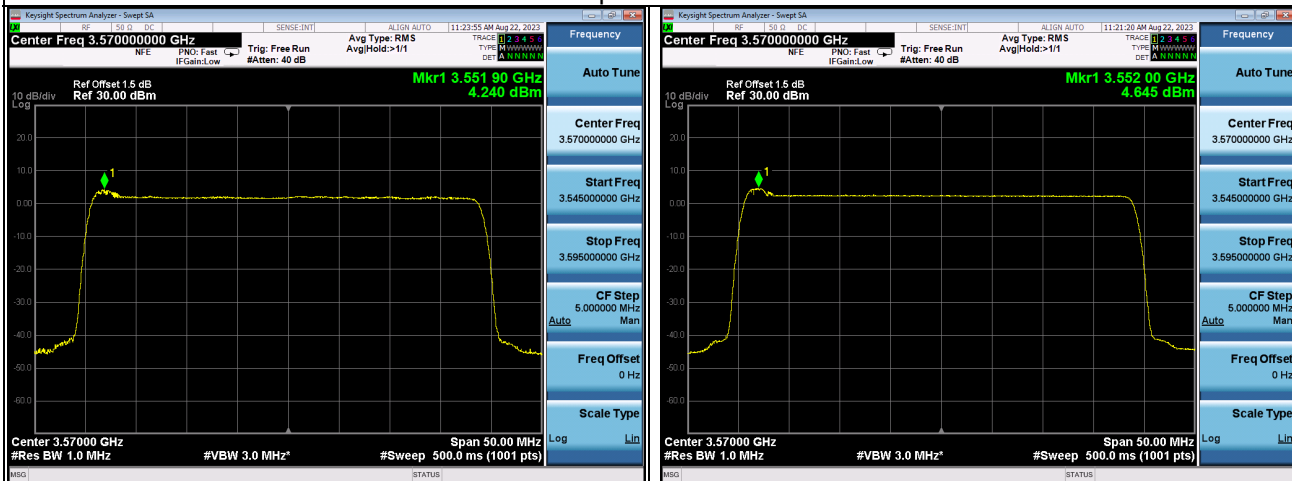
maxEirp = 0 dBm/MHz



maxEirp = 10 dBm/MHz



maxEirp = 20 dBm/MHz



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

6 WinnForum Logs

Please refer to the attached file (Test Logs).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

The address and road map of all our labs can be found in our web site also.

--- END ---