

CBSD Test Report

Report No.: RF191115C09-1

FCC ID: H8NSFE3160S

Test Model: SFE3160S

Received Date: Nov. 15, 2019

Test Date: Dec. 17, 2019 ~ Mar. 04, 2020

Issued Date: Sep. 09, 2019

Applicant: ASKEY COMPUTER CORP.

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



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Release Control Record

Issue No.	Description	Date Issued
RF191115C09-1	Original release	Sep. 09, 2019

1 Certificate of Conformity

Product: CBRS Femtocell

Brand: Askey

Test Model: SFE3160S

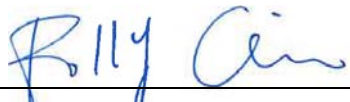
Sample Status: Engineering sample


Applicant: ASKEY COMPUTER CORP.

Test Date: Dec. 17, 2019 ~ Mar. 04, 2020

Standards: WINNF-TS-0122 V1.0.0
CBRSA-TS-9001 V1.1.0

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 :  , **Date:** Sep. 09, 2019
Polly Chien / Specialist

Approved by :  , **Date:** Sep. 09, 2019
Look Huang / Supervisor

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 CBSD/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 CBSD/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 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the UUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions above 1 GHz	1GHz ~ 18GHz	1 dB

2.2 Modification Record

Following the FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, 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	CBRS Femtocell
Brand	Askey
Test Model	SFE3160S
Hardware Version	1.0
Firmware Version	7.8.0.00352
Status of EUT	Engineering sample
Accessory Device	Adapter
Data Cable Supplied	2.97m non-shielded RJ45 cable without core

Note:

1. The EUT consumes power from the following adapter and POE.

Adapter	
Brand	SHENZHEN FRECOM ELECTRONICS CO., LTD
Model	F24W5-120200SPAU
Input	100-240Vac, 50/60Hz, 0.6A
Output	12Vdc, 2A
Power Line	1.5m DC power cable without core attached on adapter

POE (Support unit only)	
Brand	EUSSO
Model	UPE5600-IHGM
Input Power	100-240Vac, 50-60Hz
Output Power	48-52Vdc, 30Watt Maximum

Test Condition:

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

3.2 General Description of Applied Standards and References

The UUT is a CPE-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

WINNF-19-IN-00033 V1.0

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

References Test Guidance:

KDB 940660 D01 Part 96 CBRS Eqpt v02

KDB 940660 D02 CPE-CBSD Handshake Procedures v01

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 Duration and Duty Cycle Measurement

The CPE-CBSD shall validate and ensure that limited in duration and duty cycle to the minimum time necessary to get a grant from the SAS.

4.4 Duration and Duty Cycle Test Procedure

- a. CPE-CBSD as UUT does not receive any RF signal from its "Compatible BTS-CBSD" (FCC ID: P27P208), so CPE-CBSD as UUT does not transmit. UUT shall be UTC time synchronized.
- b. Use the WinnForum SAS Harness #1 for CPE-CBSD as UUT and run test case WINNF.FT.C.GRA.1 for CPE-CBSD as UUT.
- c. CPE-CBSD as UUT starts to receive the RF signal from its "Compatible BTS-CBSD", so CPE-CBSD can start communicating with the WinnForum SAS Harness #1. Make note of the time when RF Test equipment logs the first transmission from CPE-CBSD which is above 23dBm/10MHz – this is the start time of the {X time out of Y time}.
- d. When the test case WINNF.FT.C.GRA.1 finishes and the questions appear on the WinnForum SAS Harness #1 console, do NOT answer the questions. Wait until Y time has passed from step #3. During this Y time, the RF test equipment is logging the amount of time CPE-CBSD as UUT transmitted EIRP above 23dBm/10MHz. The amount of time logged for transmitting EIRP above 23dBm/10MHz is the X time.
- e. Answer the questions on the WinnForum SAS Harness #1 console so the WinnForum SAS Harness #1 is ready for the next test.

4.5 Test Environment

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

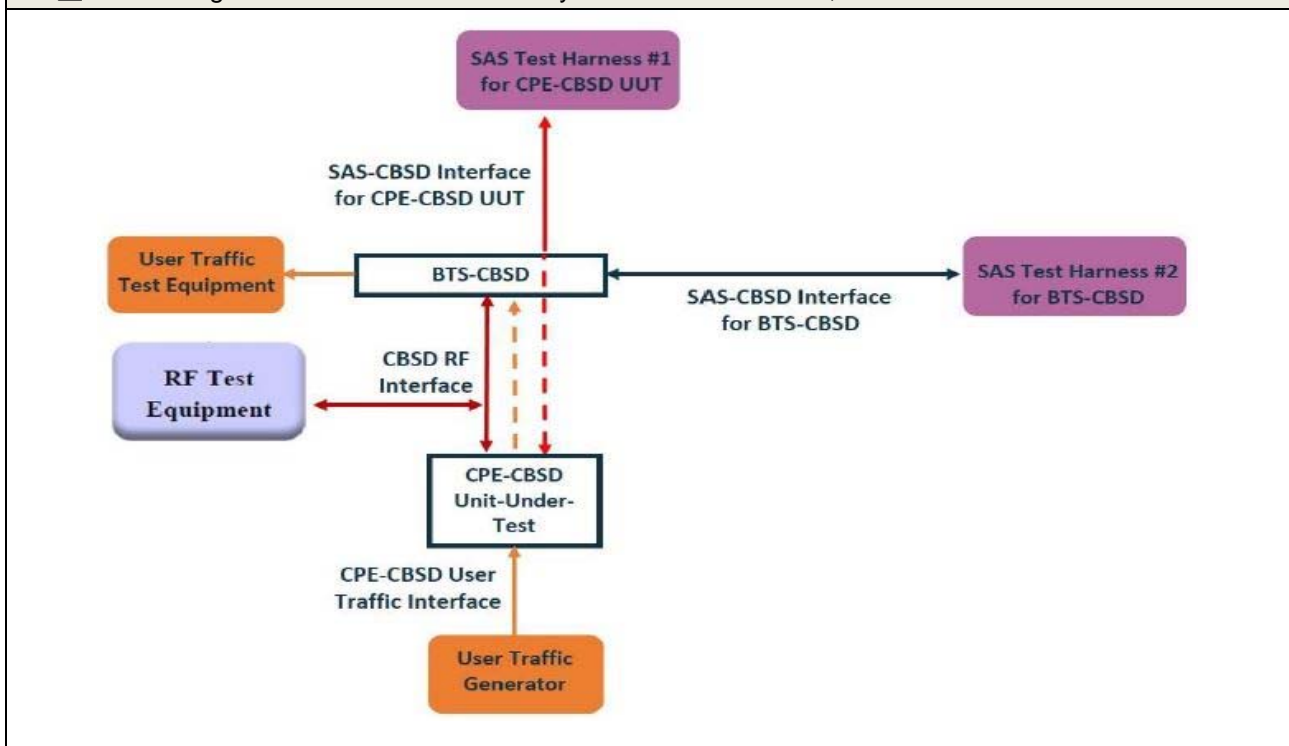
4.6 Test Equipment

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
ROHDE & SCHWARZ Signal Analyzer	FSV	E2-010642	May. 28, 2019	May. 27, 2020
Temperature & Humidity Chamber TERCHY	MHU-225AU	920842	May 31, 2019	May 30, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 25, 2019	Nov. 24, 2020
Laptop Lenovo	L470	PF-11H9B8	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.

4.7 Test Setup

■ Test configuration without Domain Proxy - CPE-CBSD as UUT, BTS-CBSD direct communication



4.8 Test Results

4.8.1 CBSD Registration Process

4.8.1.1 WINNF.FT.C.REG.1

Test Case ID : WINNF.FT.C.REG.1 NA

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with 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, fcId, cbsdSerialNumber, cbsdCategory, airInterface, installationParam, measCapability) for a Category A CBSD. <ul style="list-style-type: none"> ● The required userId, fcId 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. 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	<ul style="list-style-type: none"> ● SAS Test Harness sends a CBSD Registration Response as follows: <ul style="list-style-type: none"> - <i>cbsdId</i> = 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: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.2 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: <ul style="list-style-type: none"> ● 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.	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.3 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbstdId</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 the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.4 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbsdId</i> - <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =200) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.5 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbstdId</i> - <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =103) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.6 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbstdId</i> - <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =101) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.7 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbstdId</i> - <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =100) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.8 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state 	--	--
2	CBSD sends a Registration request to SAS Test Harness.	--	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none"> - SAS response does not include <i>cbstdId</i> - <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=201</i>) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.1.9 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.

4.8.2 CBSD Spectrum Grant Process

4.8.2.1 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i> = C 	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none"> ● <i>cbsdId</i>=C ● <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.2.2 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i> = C 	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none"> ● <i>cbsdId</i>=C ● <i>responseCode</i> = R 	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =401) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall not transmit RF 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.3 CBSD Heart Beat Process

4.8.3.1 WINNF.FT.C.HBT.1

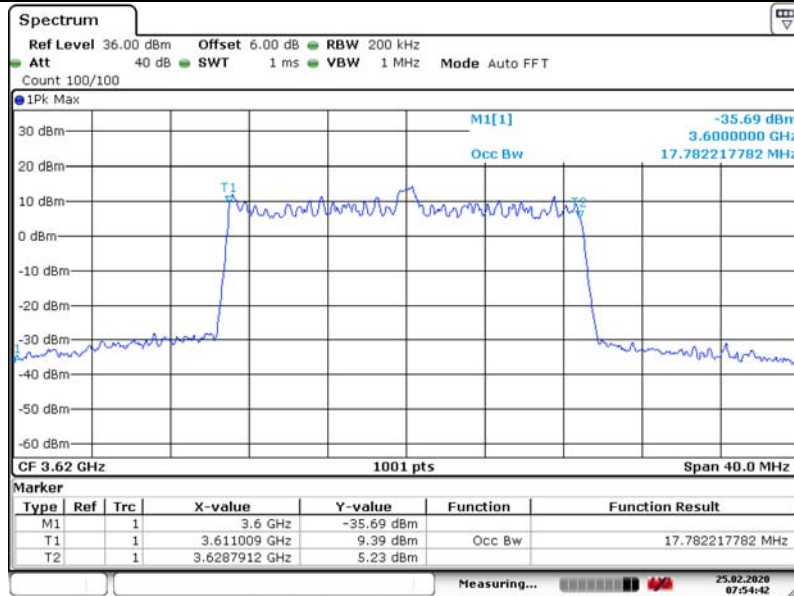
■ Test Case ID : WINNF.FT.C.HBT.1 □ NA

#	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

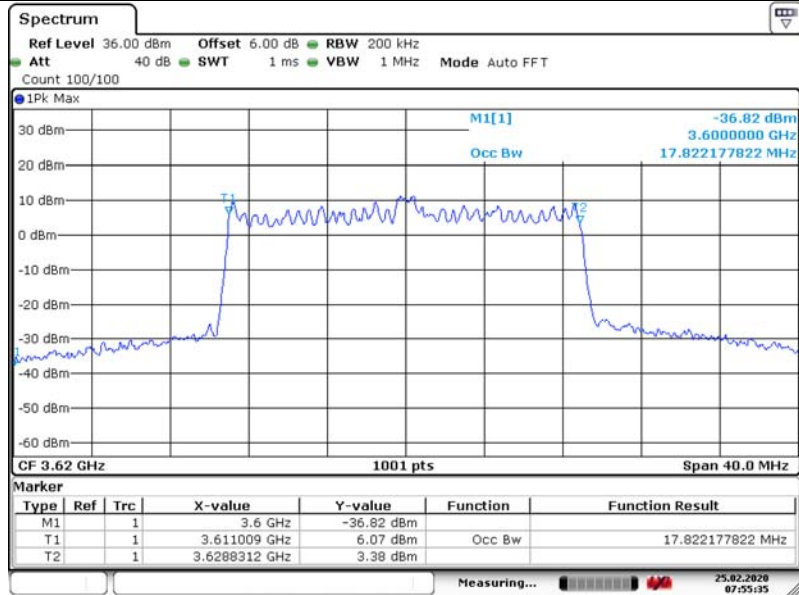
- UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F.

Channel	Freq. (MHz)	OCP 99 Band Width (MHz)	
		F = 20MHz	
		Chain (0)	Chain (1)
Middle	3620	17.782	17.822

Spectrum Plot
Chain (0 ~ 1)



Date: 25.FEB.2020 07:54:42



Date: 25.FEB.2020 07:55:35

4.8.3.2 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--	--
2	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: <ul style="list-style-type: none"> ● <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: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>transmitExpireTime</i> = T = Current UTC time ● <i>responseCode</i> = 105 (DEREGISTER) 	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
5	Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none"> ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.3.3 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none"> ● <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: <ul style="list-style-type: none"> ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.3.4 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request) 	--	--
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "GRANTED" 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>transmitExpireTime</i> = T = current UTC time ? <i>responseCode</i> = 501 (SUSPENDED_GRANT) 	--	--
4	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: <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT does not transmit at any time 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.3.5 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>transmitExpireTime</i> = T = current UTC time ● <i>responseCode</i> = 501 (SUSPENDED_GRANT) 	--	--
4	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: <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop transmission within (T+60) seconds of completion of step 3 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.3.6 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>transmitExpireTime</i> = T = current UTC time ● <i>responseCode</i> = 502 (UNSYNC_OP_PARAM) 	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
5	Monitor the SAS-CBSD interface. Verify: <ul style="list-style-type: none"> ● UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: <ul style="list-style-type: none"> ○ <i>cbsdId</i> = C ○ <i>grantId</i> = G Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none"> ● UUT shall stop transmission within (T+60) seconds of completion of step 3 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

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

4.8.3.8 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: <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--	--
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified <i>heartbeatInterval</i> , and is formatted correctly, including: <ul style="list-style-type: none"> ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "AUTHORIZED" 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none"> ● <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: <ul style="list-style-type: none"> ● UUT shall stop all transmission on RF interface within (<i>transmitExpireTime</i> + 60 seconds), using the <i>transmitExpireTime</i> sent in Step 3. 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.4 CBSD Measurement Report

4.8.4.1 WINNF.FT.C.MES.1

Test Case ID : WINNF.FT.C.MES.1 NA

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i> ● UUT has received a valid grant with <i>grantId = G</i> ● 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: <ul style="list-style-type: none"> ● <i>cbsdId = C</i> ● <i>grantId = G</i> 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	SAS Test Harness shall approve the request with a Relinquishment Response message with parameters: <ul style="list-style-type: none"> - <i>cbsdId = C</i> - <i>grantId = G</i> - <i>responseCode = 0</i> 	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode=0</i>) to further request messages from the UUT	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> ● UUT shall stop RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.5 CBSD Deregistration Process

4.8.5.1 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: <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i> ● UUT has received a valid grant with <i>grantId = G</i> ● 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=0</i>	--	--
3	UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId = C</i> .	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
4	SAS Test Harness shall approve the request with a Deregistration Response message with parameters: <ul style="list-style-type: none"> ● <i>cbsdId = C</i> ● <i>responseCode = 0</i> 	--	--
5	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode=0</i>) 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: <ul style="list-style-type: none"> ● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: <ul style="list-style-type: none"> A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message 	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

4.8.6 CBSD Security Validation

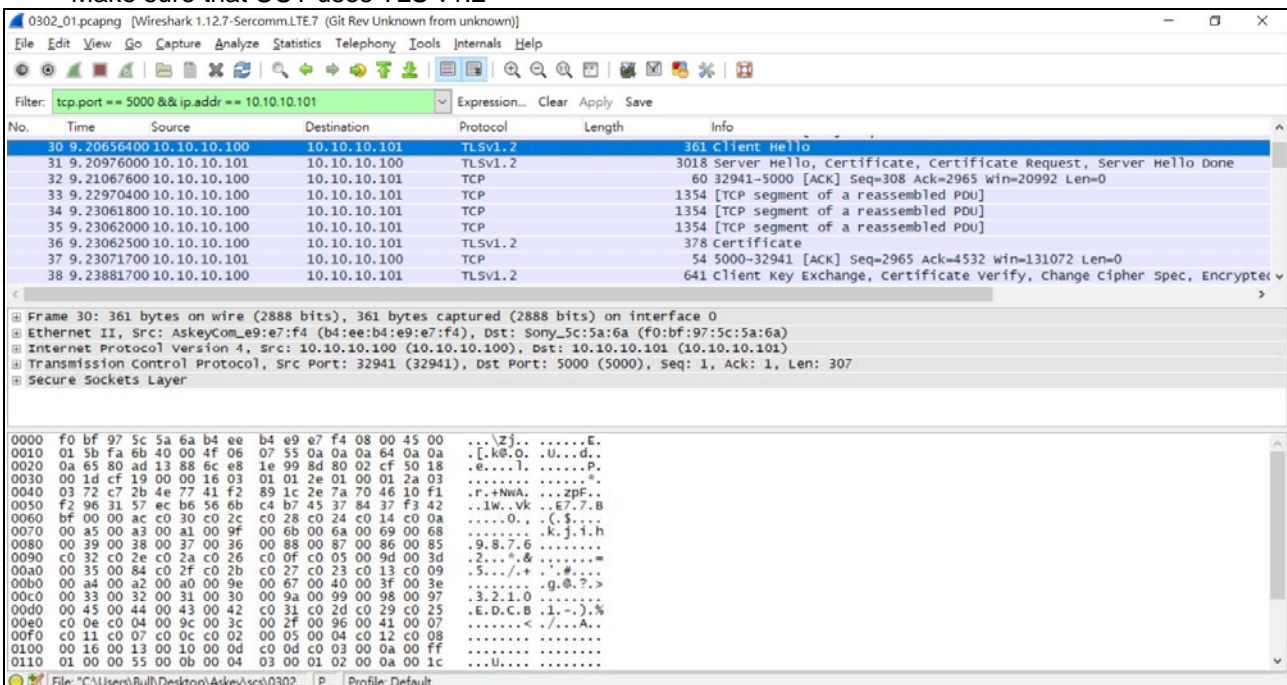
4.8.6.1 WINNF.FT.C.SCS.1

Test Case ID : WINNF.FT.C.SCS.1 NA

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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



The screenshot shows a Wireshark capture of a TLS handshake. The filter is set to 'tcp.port == 5000 && ip.addr == 10.10.10.101'. The capture shows the following frames:

- 30: 9.20656400 10.10.10.100 to 10.10.10.101, TLSv1.2, 361 Client Hello
- 31: 9.20976000 10.10.10.101 to 10.10.10.100, TLSv1.2, 3018 Server Hello, Certificate, Certificate Request, Server Hello Done
- 32: 9.21067600 10.10.10.100 to 10.10.10.101, TCP, 60 32941-5000 [ACK] Seq=308 Ack=2965 Win=20992 Len=0
- 33: 9.22970400 10.10.10.100 to 10.10.10.101, TCP, 1354 [TCP segment of a reassembled PDU]
- 34: 9.23061800 10.10.10.100 to 10.10.10.101, TCP, 1354 [TCP segment of a reassembled PDU]
- 35: 9.23062000 10.10.10.100 to 10.10.10.101, TCP, 1354 [TCP segment of a reassembled PDU]
- 36: 9.23062500 10.10.10.100 to 10.10.10.101, TLSv1.2, 378 Certificate
- 37: 9.23071700 10.10.10.101 to 10.10.10.100, TCP, 54 5000-32941 [ACK] Seq=2965 Ack=4532 Win=131072 Len=0
- 38: 9.23881700 10.10.10.101 to 10.10.10.101, TLSv1.2, 641 Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted

The packet details for frame 30 (Client Hello) are expanded, showing the Ethernet II, Internet Protocol Version 4, Transmission Control Protocol, and Secure Sockets Layer headers.

```

0000 f0 bf 97 5c 5a 6a b4 ee b4 e9 e7 f4 08 00 45 00  ...Zj...E.
0010 01 5b fa 6b 40 00 4f 06 07 55 0a 0a 0a 64 0a 0a  .[.k@.O..U..d.
0020 0a 65 80 ad 13 88 6c e8 1e 99 8d 80 02 cf 50 18  .e...T. ....P.
0030 00 1d cf 19 00 00 16 03 01 01 2e 01 00 01 2a 03  .....%.....
0040 03 72 c7 2b 4e 77 41 f2 89 1c 2e 7a 70 46 10 f1  .P.+NwA...zpf..
0050 f2 96 31 57 ec b6 56 6b c4 b7 45 37 84 37 f3 42  ...1W..vk...E?..B
0060 bf 00 00 ac c0 30 c0 2c c0 28 c0 24 c0 14 c0 0a  ....O..(.$.
0070 00 a5 00 a3 00 a1 00 9f 00 6b 00 6a 00 69 00 68  .......k.j.i.h
0080 00 39 00 38 00 37 00 36 00 88 00 87 00 86 00 85  ...9.8.7.6.....
0090 c0 32 c0 2e c0 2a c0 26 c0 0f c0 05 00 9d 00 3d  .2...%&.....+
00a0 00 35 00 84 c0 2f c0 2b c0 27 c0 23 c0 13 c0 09  .5.../+. .#.
00b0 00 a4 00 a2 00 a0 00 9e 00 67 00 40 00 3f 00 3e  ....g.?.>
00c0 00 33 00 32 00 31 00 30 00 9a 00 99 00 98 00 97  .3.2.1.0.....
00d0 00 45 00 44 00 43 00 42 c0 31 c0 2d c0 29 c0 25  .E.D.C.B.(.-.)%
00e0 c0 0e c0 04 00 9c 00 3c c0 2f 00 96 00 41 00 07  .....<./...A..
00f0 c0 11 c0 07 c0 0c c0 02 00 05 00 04 c0 12 c0 08  .....<./...A..
0100 00 16 00 13 00 10 00 0d c0 0d c0 03 00 0a 00 ff  .....
0110 01 00 00 55 00 0b 00 04 03 00 01 02 00 0a 00 1c  ...U.....
  
```

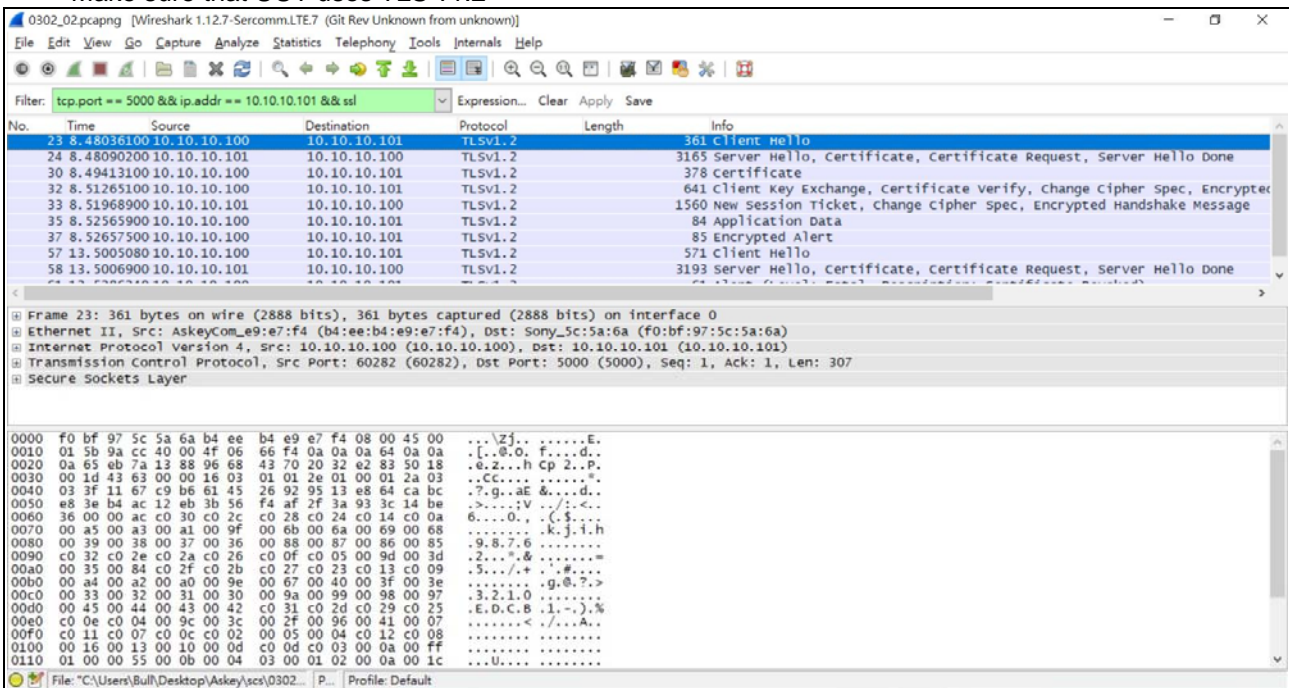
4.8.6.2 WINNF.FT.C.SCS.2

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

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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



The screenshot shows a Wireshark capture of a TLSv1.2 handshake. The filter is set to 'tcp.port == 5000 && ip.addr == 10.10.10.101 && ssl'. The packet list shows the following frames:

- 23: 8.48036100 10.10.10.100 to 10.10.10.101, TLSv1.2, 361 bytes, Client Hello
- 24: 8.48090200 10.10.10.101 to 10.10.10.100, TLSv1.2, 3165 bytes, Server Hello, Certificate, Certificate Request, Server Hello Done
- 30: 8.49413100 10.10.10.100 to 10.10.10.101, TLSv1.2, 378 bytes, certificate
- 32: 8.51265100 10.10.10.100 to 10.10.10.101, TLSv1.2, 641 bytes, client key Exchange, certificate verify, change cipher spec, encrypted
- 33: 8.51968900 10.10.10.101 to 10.10.10.100, TLSv1.2, 1560 bytes, New session ticket, change cipher spec, Encrypted Handshake Message
- 35: 8.52565900 10.10.10.100 to 10.10.10.101, TLSv1.2, 84 bytes, Application Data
- 37: 8.52657500 10.10.10.100 to 10.10.10.101, TLSv1.2, 85 bytes, Encrypted Alert
- 57: 13.50050800 10.10.10.100 to 10.10.10.101, TLSv1.2, 571 bytes, client Hello
- 58: 13.50069000 10.10.10.101 to 10.10.10.100, TLSv1.2, 3193 bytes, server Hello, certificate, certificate request, server Hello done

The packet details pane for frame 23 shows:

- Frame 23: 361 bytes on wire (2888 bits), 361 bytes captured (2888 bits) on interface 0
- Ethernet II, Src: AskeyCom_e9:e7:f4 (b4:ee:b4:e9:e7:f4), Dst: Sony_Sc:5a:6a (f0:bf:97:5c:5a:6a)
- Internet Protocol Version 4, Src: 10.10.10.100 (10.10.10.100), Dst: 10.10.10.101 (10.10.10.101)
- Transmission Control Protocol, Src Port: 60282 (60282), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 307
- Secure Sockets Layer

The raw data pane shows the hex and ASCII representation of the captured bytes.

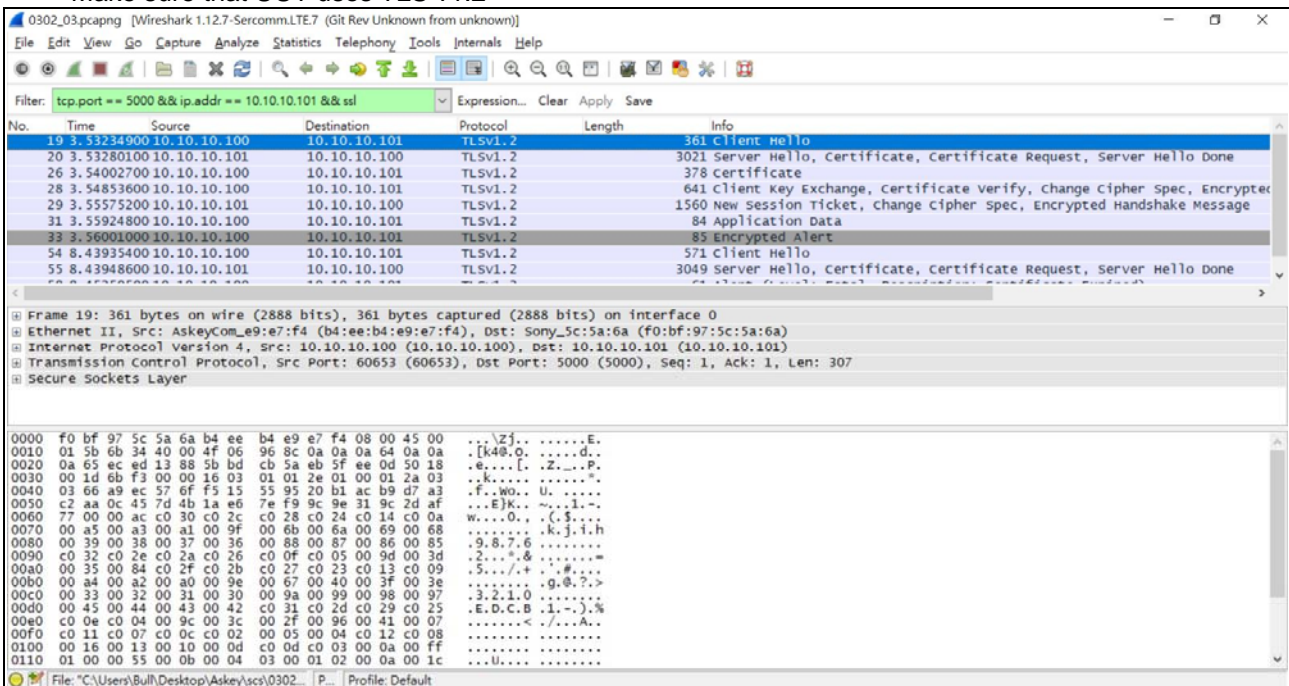
4.8.6.3 WINNF.FT.C.SCS.3

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

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

Wireshark Capture Example for Test Case :

- 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 == 10.10.10.101 && ssl'. The capture shows the following frames:

- Frame 19: 361 bytes on wire (2888 bits), 361 bytes captured (2888 bits) on interface 0
- Ethernet II, Src: AskeyCom_e9:e7:f4 (b4:ee:b4:e9:e7:f4), Dst: Sony_Sc:5a:6a (f0:bf:97:5c:5a:6a)
- Internet Protocol Version 4, Src: 10.10.10.100 (10.10.10.100), Dst: 10.10.10.101 (10.10.10.101)
- Transmission Control Protocol, Src Port: 60653 (60653), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 307
- Secure Sockets Layer
 - 361 Client Hello
 - 3021 Server Hello, Certificate, Certificate Request, Server Hello Done
 - 378 certificate
 - 641 client key Exchange, certificate verify, Change Cipher Spec, Encrypted
 - 1560 New Session Ticket, Change cipher spec, Encrypted Handshake Message
 - 84 Application Data
 - 85 Encrypted Alert
 - 571 client Hello
 - 3049 server Hello, certificate, certificate request, Server Hello done

The packet bytes pane shows the raw data for the Client Hello frame, including fields like Magic Number, Version, Session ID Length, Cipher Suites, Compression Methods, Extensions, and Random Bytes.

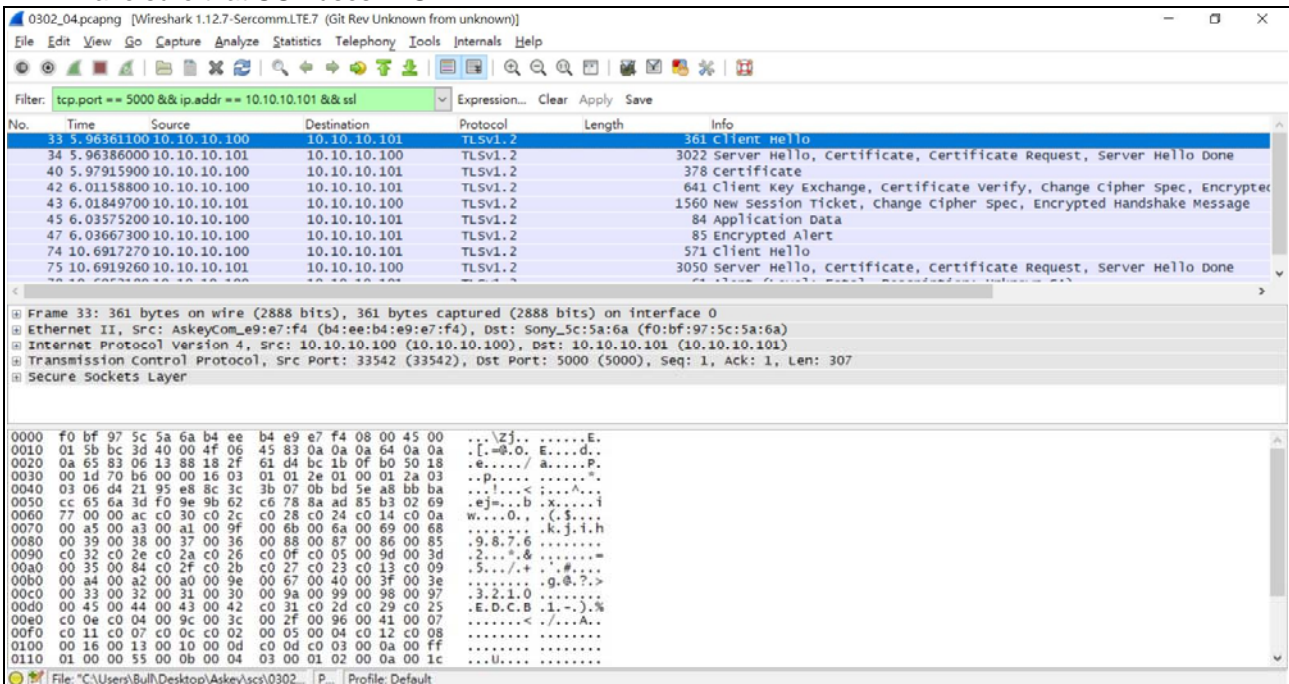
4.8.6.4 WINNF.FT.C.SCS.4

Test Case ID : WINNF.FT.C.SCS.4 NA

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

Wireshark Capture Example for Test Case :

- 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 == 10.10.10.101 && ssl'. The capture shows the following frames:

- 33: 361 bytes Client Hello
- 34: 3022 bytes Server Hello, Certificate, Certificate Request, Server Hello Done
- 40: 378 bytes Certificate
- 42: 641 bytes Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted Handshake Message
- 43: 1560 bytes New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
- 45: 84 bytes Application Data
- 47: 85 bytes Encrypted Alert
- 74: 571 bytes Client Hello
- 75: 3050 bytes Server Hello, Certificate, Certificate Request, Server Hello Done

The packet details for frame 33 (Client Hello) are expanded, showing the Secure Sockets Layer section with the following hex dump and ASCII representation:

```

0000 f0 bf 97 5c 5a 6a b4 ee b4 e9 e7 f4 08 00 45 00 ... \Zj. ....E.
0010 01 5b bc 3d 40 00 4f 06 45 83 0a 0a 0a 64 0a 0a .[.=0. E...d.
0020 0a 65 83 06 13 88 18 2f 61 d4 bc 1b 0f b0 50 18 .e.... / a....P.
0030 00 1d 70 b6 00 00 16 03 01 01 2e 01 00 01 2a 03 ..p....".
0040 03 06 d4 21 95 e8 8c 3c 3b 07 0b bd 5e a8 bb ba ..!...< ;.A...
0050 cc 65 6a 3d f0 9e 9b 62 c6 78 8a ad 85 b3 02 69 .ej...b .x....i
0060 77 00 00 ac c0 30 c0 2c c0 28 c0 24 c0 14 c0 0a w....0. .($....
0070 00 a5 00 a3 00 a1 00 9f 00 6b 00 6a 00 69 00 68 ..... .k.j.i.h
0080 00 39 00 38 00 37 00 36 00 88 00 87 00 86 00 85 .9.8.7.6 .....
0090 c0 32 c0 2e c0 2a c0 26 c0 0f c0 05 00 9d 00 3d .2...& .....=
00a0 00 35 00 84 c0 2f c0 2b c0 27 c0 23 c0 13 c0 09 .5.../+ .#....
00b0 00 a4 00 a2 00 a0 00 9e 00 67 00 40 00 3f 00 3e ..... .g.0.?.>
00c0 00 33 00 32 00 31 00 30 00 9a 00 99 00 98 00 97 .3.2.1.0 .....
00d0 00 45 00 44 00 43 00 42 c0 31 c0 2d c0 29 c0 25 .E.D.C.B .1.-.)%.
00e0 c0 0e c0 04 00 9c 00 3c 00 2f 00 96 00 41 00 07 .....< ./...A..
00f0 c0 11 c0 07 c0 0c c0 02 00 05 00 04 c0 12 c0 08 .....
0100 00 16 00 13 00 10 00 0d c0 0d c0 03 00 0a 00 ff .....
0110 01 00 00 55 00 0b 00 04 03 00 01 02 00 0a 00 ..U.....
  
```

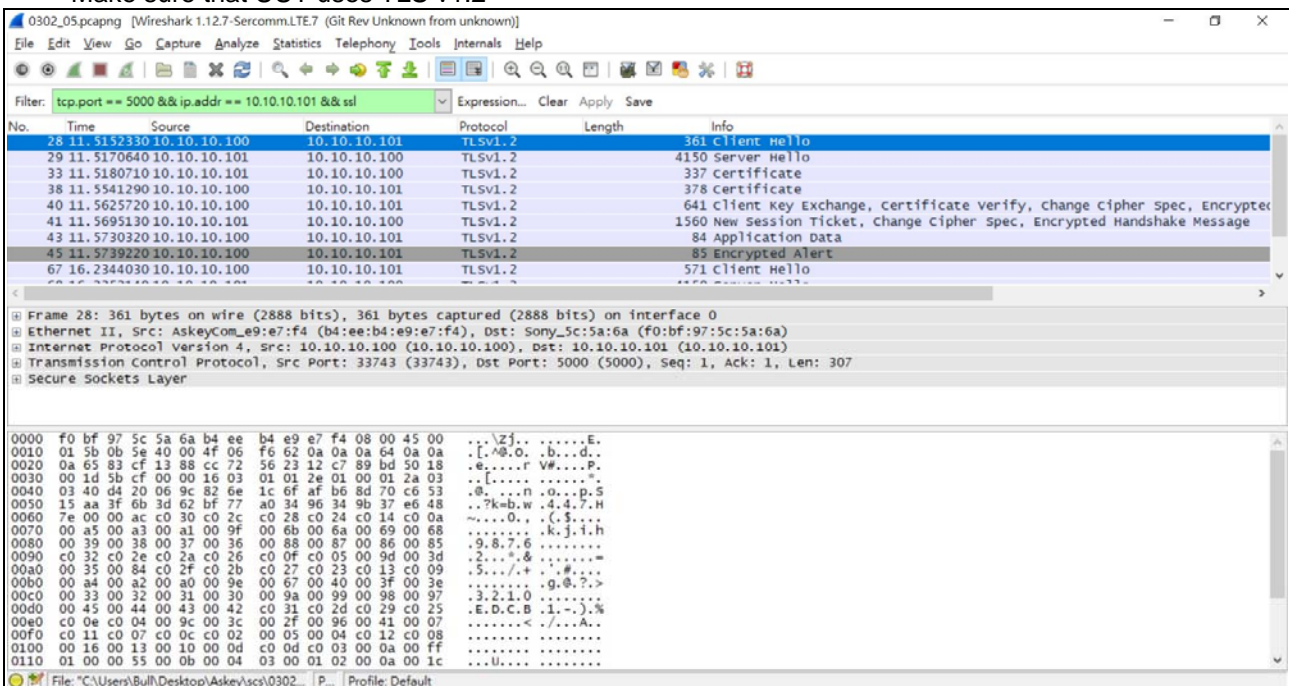
4.8.6.5 WINNF.FT.C.SCS.5

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

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

Wireshark Capture Example for Test Case :

- 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 == 10.10.10.101 && ssl'. The capture shows the following frames:

- 28: Client Hello (361 bytes)
- 29: Server Hello (4150 bytes)
- 33: Certificate (337 bytes)
- 38: Certificate (378 bytes)
- 40: Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted Handshake Message (641 bytes)
- 41: New Session Ticket, Change Cipher Spec, Encrypted Handshake Message (1560 bytes)
- 43: Application Data (84 bytes)
- 45: Encrypted Alert (85 bytes)
- 67: Client Hello (571 bytes)

The packet details for Frame 28 (Client Hello) are expanded, showing the Secure Sockets Layer section with the following hex dump:

```

0000 f0 bf 97 5c 5a 6a b4 ee b4 e9 e7 f4 08 00 45 00 ... \Zj. ....E.
0010 01 5b 0b 5e 40 00 4f 06 f6 62 0a 0a 0a 64 0a 0a .[.O. .b...d.
0020 0a 65 83 cf 13 88 cc 72 56 23 12 c7 89 bd 50 18 .e.....r V#...P.
0030 00 1d 5b cf 00 00 16 03 01 01 2e 01 00 01 2a 03 ..[.....".
0040 03 40 d4 20 06 9c 82 6e 1c 6f af b6 8d 70 c6 53 .@.....n o...p.S
0050 15 aa 3f 6b 3d 62 bf 77 a0 34 96 34 9b 37 e6 48 ..?k=b.w .4.4.7.H
0060 7e 00 00 ac c0 30 c0 2c c0 28 c0 24 c0 14 c0 0a .....0. .($....
0070 00 a5 00 a3 00 a1 00 9f 00 6b 00 6a 00 69 00 68 ..... .k.j.i.h
0080 00 39 00 38 00 37 00 36 00 88 00 87 00 86 00 85 .9.8.7.6 .....
0090 c0 32 c0 2e c0 2a c0 26 c0 0f c0 05 00 9d 00 3d .2.../& .....=
00a0 00 35 00 84 c0 2f c0 2b c0 27 c0 23 c0 13 c0 09 .5.../+ .#.....
00b0 00 a4 00 a2 00 a0 00 9e 00 67 00 40 00 3f 00 3e ..2... .g.#.?>
00c0 00 33 00 32 00 31 00 30 00 9a 00 99 00 98 00 97 .3.2.1.0 .....
00d0 00 45 00 44 00 43 00 42 c0 31 c0 2d c0 29 c0 25 .E.D.C.B .1.-.)%.
00e0 c0 0e c0 04 00 9c 00 3c 00 2f 00 96 00 41 00 07 .....< ./...A..
00f0 c0 11 c0 07 c0 0c c0 02 00 05 00 04 c0 12 c0 08 .....
0100 00 16 00 13 00 10 00 0d c0 0d c0 03 00 0a 00 ff .....
0110 01 00 00 55 00 0b 00 04 03 00 01 02 00 0a 00 1c .....U.....
  
```

4.8.7 CBSD RF Power Measurement

4.8.7.1 WINNF.PT.C.HBT.1

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

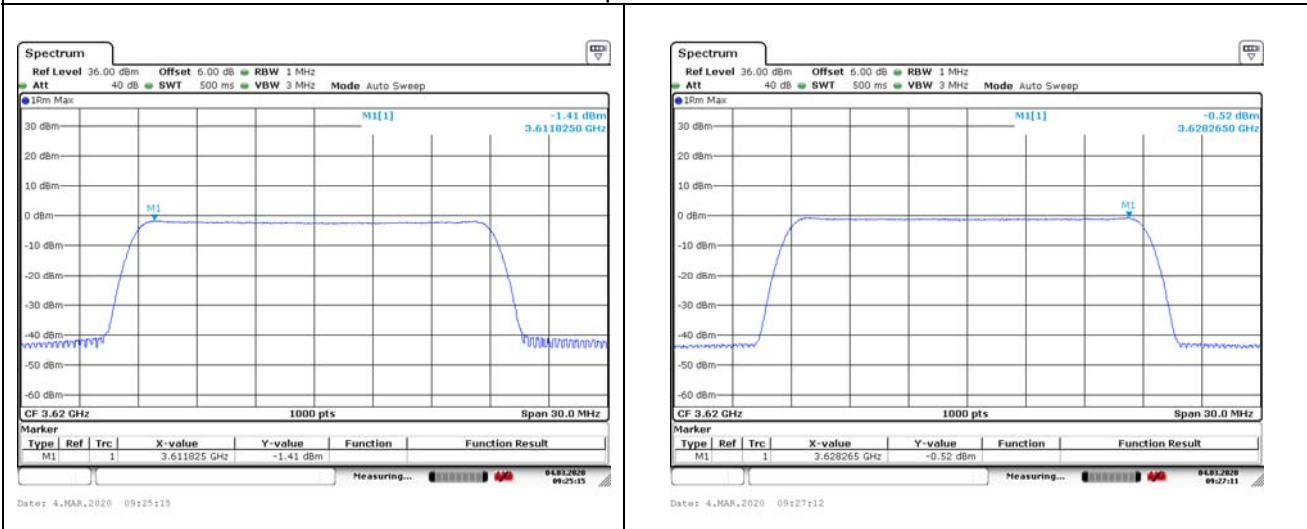
#	Test Execution Steps	Results	
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness ● UUT has registered with the SAS, with CBSID = C ● UUT has a single valid grant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

RF 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)		
		Chain 0	Chain 1	5	Power Density	
Middle	3620	-1.41	-0.52	2.07	5.0	Pass
Middle	3620	6.41	6.81	9.62	12.0	Pass
Middle	3620	14.82	14.49	17.67	19.0	Pass

maxEirp = 5 dBm/MHz



maxEirp = 12 dBm/MHz



maxEirp = 19 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.

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

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