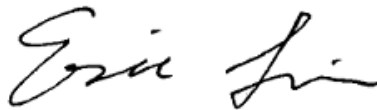


# TEST REPORT

**Application No.:** KSCR2203000358AT (SZCR2202000416AT)  
**FCC ID:** 2AG32PBS3101S  
**Applicant:** Baicells Technologies Co., Ltd.  
**Address of Applicant:** 9-10F, 1stBldg., No.81BeiqingRoad, Haidian District, Beijing, China  
**Manufacturer:** Baicells Technologies Co., Ltd.  
**Address of Manufacturer:** 9-10F, 1stBldg., No.81BeiqingRoad, Haidian District, Beijing, China  
**Equipment Under Test (EUT):**  
**EUT Name:** LTE Base Station  
**Model No.:** pBS3101SH  
**Trade Mark:** Baicells  
**Standard(s):** FCC 47 CFR Part 96  
 CBRSA-TS-9001-V1.2.1  
 WINNF-TS-0122-V1.0.2  
 KDB 940660 D01 V03  
**Date of Receipt:** 2022-02-18  
**Date of Test:** 2022-02-21 to 2022-03-16  
**Date of Issue:** 2022-03-17

<b>Test Result:</b>	<b>Pass*</b>
---------------------	--------------

\* In the configuration tested, the EUT complied with the standards specified above.



Eric Lin  
Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record			
Version	Description	Date	Remark
00	Original	2022-03-17	/

<b>Authorized for issue by:</b>			
		<i>Damon Zhou</i>	
		<b>Damon Zhou / Project Engineer</b>	
		<i>Eric Lin</i>	
		<b>Eric Lin / Reviewer</b>	



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## 2 Test Summary

Item	Standard	Test Case ID	Result
Domain Proxy Multi-Step registration	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.2	Pass
Domain Proxy Missing Required parameters (responseCode 102)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.9	Pass
Domain Proxy Pending registration (responseCode 200)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.11	Pass
Domain Proxy Invalid parameters (responseCode 103)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.13	Pass
Domain Proxy Blacklisted CBSD (responseCode 101)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.15	Pass
Domain Proxy Unsupported SAS protocol version responseCode 100)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.17	Pass
Domain Proxy Group Error (responseCode 201)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.REG.19	Pass
Unsuccessful Grant responseCode=400 (INTERFERENCE)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.GRA.1	Pass
Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.GRA.2	Pass
Domain Proxy Heartbeat Success Case (first Heartbeat Response)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.HBT.2	Pass
Heartbeat responseCode=105 (DEREGISTER)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.3	Pass
Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.5	Pass
Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.6	Pass
Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.7	Pass
Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	WINNF-TS-0122-V1.0.0	WINNF.FT.D.HBT.8	Pass
Heartbeat Response Absent (First Heartbeat)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.9	Pass
Heartbeat Response Absent (Subsequent Heartbeat)	WINNF-TS-0122-V1.0.0	WINNF.FT.C.HBT.10	Pass
Domain Proxy Successful Relinquishment	WINNF-TS-0122-V1.0.0	WINNF.FT.D.RLQ.2	Pass
Domain Proxy Successful Deregistration	WINNF-TS-0122-V1.0.0	WINNF.FT.D.DRG.2	Pass



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Item	Standard	Test Case ID	Result
Successful TLS connection between UUT and SAS Test Harness	WINNF-TS-0122-V1.0.0	WINNF.FT.C.SCS.1	Pass
TLS failure due to revoked certificate	WINNF-TS-0122-V1.0.0	WINNF.FT.C.SCS.2	Pass
TLS failure due to expired server certificate	WINNF-TS-0122-V1.0.0	WINNF.FT.C.SCS.3	Pass
TLS failure when SAS Test Harness certificate is issue by unknown CA	WINNF-TS-0122-V1.0.0	WINNF.FT.C.SCS.4	Pass
TLS failure when certificate at the SAS Test Harness is corrupted	WINNF-TS-0122-V1.0.0	WINNF.FT.C.SCS.5	Pass
UUT RF Transmit Power Measurement	WINNF-TS-0122-V1.0.0	WINNF.PT.C.HBT.1	Pass
SAS Version: 1.0.0.3			

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

**Test standards:**

**CBRSA-TS-9001-V1.2.1**

CBRS Alliance Certification Test Plan

**WINNF-TS-0122-V1.0.2**

Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)

**KDB 940660 D01 Part 96 CBRS Eqpt v03**



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## 4 General Information

### 4.1 Details of E.U.T.

Power supply:	Adapter Model NO.: G0566-480-100 Input: 100-240V~50/60Hz, 1.5A Output: 48.0V, 1.0A
Sample Type:	Fixed device
CBSD Class:	B
Transmitter Frequency Band:	LTE Band 48
Transmitter Frequency Range:	3550~3700MHz
Hardware Version:	A01
Software Version:	BaiBS_QRTB_2.8.11
Test sample:	SN1: 120200039521AGB0700 SN2: 12020003952147B0011
Antenna Gain:	13 dBi
MIMO Type:	2*2 MIMO
Note: This is a BTS-CBSD communication with Domain Proxy. The Domain Proxy is a cloud Domain Proxy which information show as below: Hardware Version of Domain Proxy: A01 Software Version of Domain Proxy: DP 1.7	

### 4.2 Description of CBS/D/DP Support Features

Condition	Feature Description	Supported
C1	Mandatory for UUT which supports multi-step registration message.	Y
C2	Mandatory for UUT which supports single-step registration with no CPI-signed data in the registration message. By definition, this is a subset of Category A devices which determine all registration information, including location, without CPI intervention.	N
C3	Mandatory for UUT which supports single-step registration containing CPI-signed data in the registration message.	N
C4	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type.	N
C5	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.	N
C6	Mandatory for UUT which supports parameter change being made at the UUT and prior to sending a deregistration.	N

Y: Supported

N: Not supported



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### 4.3 Summary of Test Results

WINNF-TS-0122			
Classes	Test Case Items	Pass Items	Pass Rate (%)
FT (CBSD, DP/CBSD)	24	24	100
PT (CBSD, DP/CBSD)	1	1	100
Total	25	25	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.

### 4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	RF conducted power	$\pm 0.75\text{dB}$
3	Temperature test	$\pm 1^\circ\text{C}$
4	Humidity test	$\pm 3\%$
5	Supply voltages	$\pm 1.5\%$
6	Time	$\pm 3\%$

### 4.5 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
CPE	SMAWAVE	USB Dongle	/
Gateway	FreedomFi	FFG-HL-4-64	HL-2143-00004105

### 4.6 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

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Fax: +86 512 5737 0818

No tests were sub-contracted.



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## 5 Equipment List

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Laptop	Lenovo	Y510P	HFL000026	N/A	N/A
Spectrum Analyzer	KEYSIGHT	N9020A	KUS2001M001-2	2021/7/13	2022/7/12
Shield Room	研创	N/A	KS301115-2	N/A	N/A
Coaxial Cable	Thermax	N/A	14	2021/10/16	2022/10/15
Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R.	N.C.R.
Humidity / Temperature Indicator	Anymetre	TH603	CZ700001(4/7)	2021/10/14	2022/10/13



## 6 Test Method and Environment

### 6.1 CBSD/DP Conformance and Performance

Test Requirement: CBRS CBSD Test Specification WINNF-TS-0122-V1.0.2  
Test Method: CBRS CBSD Test Specification WINNF-TS-0122-V1.0.2  
WINNF-IN-0156\_WinnForum\_SAS\_Test\_Harness\_CBSD\_UUT\_Tutorial\_v1\_0\_0\_1

### 6.2 CBSD Test Procedure

- 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.
- UUT shall be UTC time synchronized
- 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 TestHarness.
- Each test case results were recorded and validated by SAS Test Harness system and RF instruments test cases was recorded test results from SAS Test Harness system.

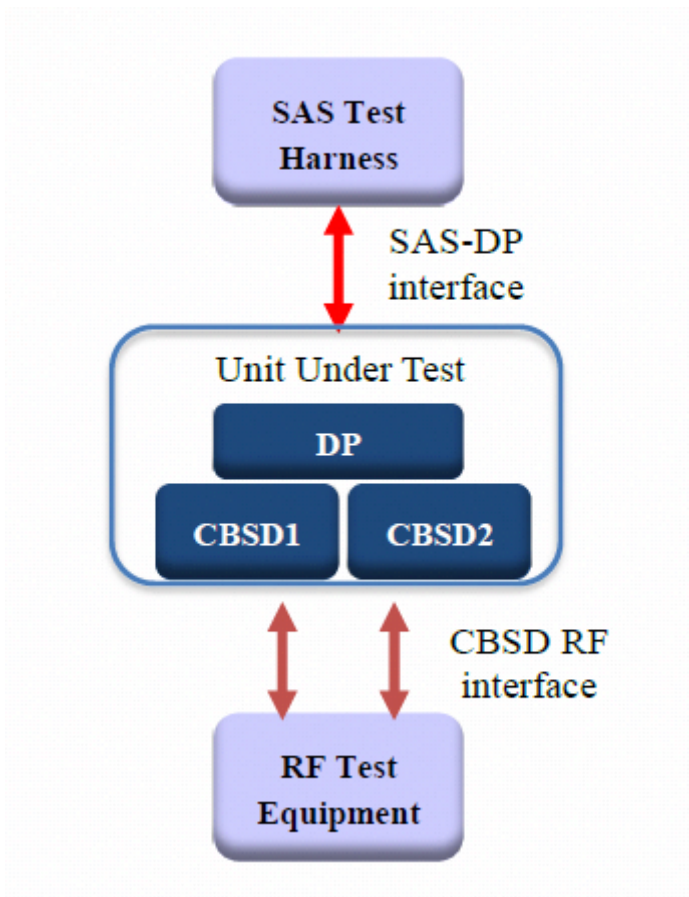


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### 6.3 Test Environment

Test Harness Version: V1.0.0.3  
 Operating System: Microsoft Windows 10  
 TLS Version: 1.2  
 Python Version: 2.7.13  
 Environmental Conditions: 25deg. C, 65%RH  
 Input Power: 120Vac, 60Hz

### 6.4 Test Setup



DP/CBSD as UUT, BTS-CBSD communication with Domain Proxy



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## 7 Test Data

### 7.1 CBSD Registration Process

#### 7.1.1 WINNF.FT.D.REG.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	DP with two CBSD sends correct Registration request information, as specified in [n.5], in the form of one 2-element Array or as individual messages to the SAS Test Harness: <ul style="list-style-type: none"> <li>● The required userId, fcId and cbsdSerialNumber registration parameters shall be sent for each CBSD and conform to proper format and acceptable ranges.</li> <li>● Any REG-conditional or optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.</li> </ul> Note: It is outside the scope of this document to test the Registration information that is supplied via another means.	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	<ul style="list-style-type: none"> <li>● SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or individual messages as follows:               <ul style="list-style-type: none"> <li>- cbsdId = Ci</li> <li>- measReportConfig shall not be included</li> <li>- responseCode = 0 for each CBSD</li> </ul> </li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.1.2 WINNF.FT.D.REG.9**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 102 for CBSD1 and CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

**7.1.3 WINNF.FT.D.REG.11**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 200 for CBSD1 and CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.1.4 WINNF.FT.D.REG.13**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 0 for CBSD1</li> <li>- responseCode = 103 for CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

**7.1.5 WINNF.FT.D.REG.15**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 0 for CBSD1</li> <li>- responseCode = 101 for CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.1.6 WINNF.FT.D.REG.17**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 100 for CBSD1 and CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

**7.1.7 WINNF.FT.D.REG.19**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● UUT is in the Unregistered state</li> </ul>	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: <ul style="list-style-type: none"> <li>- SAS response does not include a cbsdId.</li> <li>- responseCode = 0 for CBSD1</li> <li>- responseCode = 201 for CBSD2</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall not transmit RF</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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## 7.2 CBSD Spectrum Grant Process

### 7.2.1 WINNF.FT.C.GRA.1

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness, with cbsdId = C	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including - cbsdId=C - responseCode = 400	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: ● UUT shall not transmit RF	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

### 7.2.2 WINNF.FT.C.GRA.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness, with cbsdId = C	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including - cbsdId=C - responseCode = 400	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: ● UUT shall not transmit RF	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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### 7.3 CBSD HeartBeat Process

#### 7.3.1 WINNF.FT.D.HBT.2

#	Test Execution Steps	Results	
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> <li>● DP has two CBSD registered successfully with SAS Test Harness, with cbsdId = Ci, i={1,2}</li> </ul>	--	--
2	<p>DP sends a message:</p> <ul style="list-style-type: none"> <li>● If message is type Spectrum Inquiry Request, go to step 3, or</li> <li>● If message is type Grant Request, go to step 5</li> </ul>	--	--
3	<p>DP sends a Spectrum Inquiry Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Spectrum Inquiry Request message is formatted correctly for each CBSD, including for CBSDi, i={1,2}:</p> <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● List of frequencyRange objects sent by DP are within the CBRS frequency range</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
4	<p>If a separate Spectrum Inquiry Request message was sent for each CBSD, the SAS Test Harness shall respond to each Spectrum Inquiry Request message with a separate Spectrum Inquiry Response message. If a single Spectrum Inquiry Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Spectrum Inquiry Response message containing a 2-object array. Verify parameters for each CBSD within the Spectrum Inquiry Response message are as follows, for CBSDi, i={1,2}:</p> <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● availableChannel is an array of availableChannel objects</li> <li>● responseCode = 0</li> </ul>	--	--
5	<p>DP sends a Grant Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Grant Request message is formatted correctly for each CBSD, including for CBSDi, i={1,2}:</p> <ul style="list-style-type: none"> <li>● cbsdId = C</li> <li>● maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96</li> <li>● operationFrequencyRange, Fi, sent by UUT is a valid range within the CBRS band</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
6	<p>If a separate Grant Request message was sent for each CBSD, the SAS Test Harness shall respond to each Grant Request message with a separate Grant Response message.  If a single Grant Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Grant Response message containing a 2-object array.  Verify parameters for each CBSD within the Grant Response message are as follows, for CBSDi, i={1,2}:</p> <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi = a valid grant ID</li> </ul>	--	--



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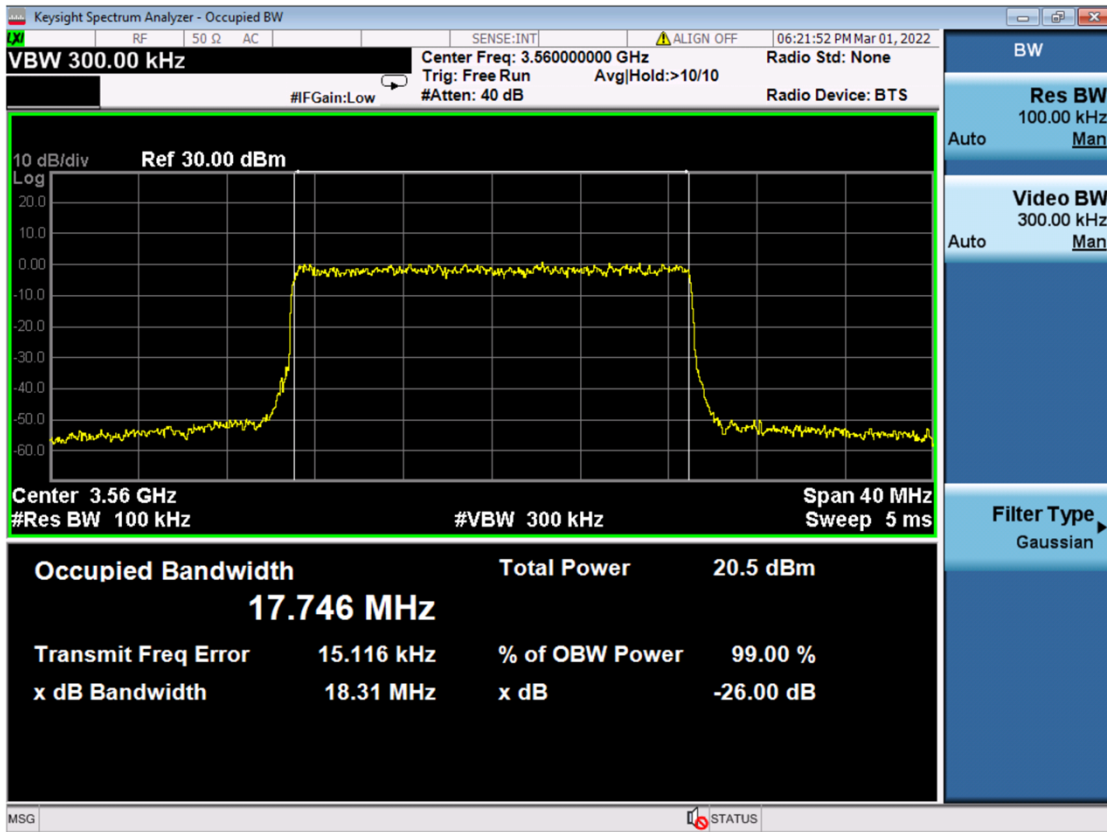
	<ul style="list-style-type: none"> <li>● grantExpireTime = UTC time greater than duration of the test</li> <li>● responseCode = 0</li> </ul>		
7	Ensure DP sends first Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Heartbeat Request message is formatted correctly for each CBSD, including, for CBSDi i={1,2}: <ul style="list-style-type: none"> <li>● cbsdId = Ci, i={1,2}</li> <li>● grantId = Gi, i={1,2}</li> <li>● operationState = "GRANTED"</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
8	If a separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message. If a single Heartbeat Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Heartbeat Response message containing a 2-object array. Verify parameters for each CBSD within the Heartbeat Response message are as follows, for CBSDi: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> <li>● transmitExpireTime = current UTC time + 200 seconds</li> <li>● responseCode = 0</li> </ul>	--	--
9	For further Heartbeat Request messages sent from DP after completion of step 8, validate message is sent within latest specified heartbeatInterval for CBSDi: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> <li>● operationState = "AUTHORIZED"</li> </ul> and SAS Test Harness responds with a Heartbeat Response message including the following parameters, for CBSDi <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> <li>● transmitExpireTime = current UTC time + 200 seconds</li> <li>● responseCode = 0</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
10	Monitor the RF output of the UUT from start of test until UUT transmission commences. Monitor the RF output of the UUT from start of test until RF transmission commences. Verify: <ul style="list-style-type: none"> <li>● UUT does not transmit at any time prior to completion of the first heartbeat response</li> <li>● UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range Fi.</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.3.2 WINNF.FT.C.HBT.3**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has registered successfully with SAS Test Harness</li> <li>● UUT has a valid single grant as follows:                             <ul style="list-style-type: none"> <li>○ valid cbsdId = C</li> <li>○ valid grantId = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ grantExpireTime = UTC time greater than duration of the test</li> </ul> </li> <li>● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--	--
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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● operationState = "AUTHORIZED"</li> </ul>	<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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● transmitExpireTime = T = Current UTC time</li> <li>● responseCode = 105 (DEREGISTER)</li> </ul>	--	--
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"> <li>● UUT shall stop transmission within (T + 60 seconds) of completion of step 3</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.3.3 WINNF.FT.C.HBT.5**

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



**7.3.4 WINNF.FT.C.HBT.6**

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





**7.3.5 WINNF.FT.C.HBT.7**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has registered successfully with SAS Test Harness</li> <li>● UUT has a valid single grant as follows:                             <ul style="list-style-type: none"> <li>○ valid cbsdId = C</li> <li>○ valid grantId = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ grantExpireTime = UTC time greater than duration of the test</li> </ul> </li> <li>● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--	--
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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● operationState = "AUTHORIZED"</li> </ul>	<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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● transmitExpireTime = T = current UTC time</li> <li>● responseCode = 502 (UNSYNC_OP_PARAM)</li> </ul>	--	--
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"> <li>● UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters:                             <ul style="list-style-type: none"> <li>○ cbsdId = C</li> <li>○ grantId = G</li> </ul> </li> </ul> Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none"> <li>● UUT shall stop transmission within (T+60) seconds of completion of step 3</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail





**7.3.6 WINNF.FT.D.HBT.8**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● DP has two CBSD registered successfully with SAS Test Harness</li> <li>● Each CBSD {1,2} has a valid single grant as follows                             <ul style="list-style-type: none"> <li>○ valid cbsdId = Ci, i={1,2}</li> <li>○ valid grantId = Gi, i={1,2}</li> <li>○ grant is for frequency range Fi, power Pi</li> <li>○ grantExpireTime = UTC time greater than duration of the test</li> </ul> </li> <li>● Both CBSD are in AUTHORIZED state and transmitting within their granted bandwidth on RF interface</li> </ul>	--	--
2	DP sends a Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of size 2. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly for each CBSD, including, for CBSDi i={1,2}: <ul style="list-style-type: none"> <li>● cbsdId = Ci, i = {1,2}</li> <li>● grantId = Gi, i = {1,2}</li> <li>● operationState = "AUTHORIZED"</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	If separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message. If a single Heartbeat Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Heartbeat Response message containing a 2-object array. Parameters for each CBSD within the Heartbeat Response message should be as follows, for CBSDi: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> <li>● For CBSD1:                             <ul style="list-style-type: none"> <li>○ transmitExpireTime = current UTC time + 200 seconds</li> <li>○ responseCode = 0</li> </ul> </li> <li>● For CBSD2:                             <ul style="list-style-type: none"> <li>○ transmitExpireTime = T = current UTC time</li> <li>○ responseCode = 500 (TERMINATED GRANT)</li> </ul> </li> </ul>	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. If CBSD sends further Heartbeat Request messages for CBSD1, SAS Test Harness shall respond with a Heartbeat Response message with parameters: <ul style="list-style-type: none"> <li>● cbsdId = C1</li> <li>● grantId = G1</li> <li>● transmitExpireTime = current UTC time + 200 seconds</li> <li>● responseCode = 0</li> <li>● Heartbeat Request message is within heartbeatInterval of previous Heartbeat Request message</li> </ul>	--	--
5	Monitor the RF output of CBSD2. Verify: <ul style="list-style-type: none"> <li>● CBSD2 shall stop transmission within bandwidth F2 within (T + 60 seconds) of completion of step 3</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.3.7 WINNF.FT.C.HBT.9**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has registered successfully with SAS Test Harness</li> <li>● UUT has a valid single grant as follows:                             <ul style="list-style-type: none"> <li>○ valid cbsdId = C</li> <li>○ valid grantId = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ grantExpireTime = UTC time greater than duration of the test</li> </ul> </li> <li>● UUT is in GRANTED, but not AUTHORIZED state(i.e. has not performed its first Heartbeat Request)</li> </ul>	--	--
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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● operationState = "GRANTED"</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	After completion of step 2, SAS Test Harness does not respond to any further <ul style="list-style-type: none"> <li>● messages from UUT to simulate loss of network connection</li> </ul>	--	--
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"> <li>● At any time during the test, UUT shall not transmit on RF interface</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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**7.3.8 WINNF.FT.C.HBT.10**

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● UUT has registered successfully with SAS Test Harness</li> <li>● UUT has a valid single grant as follows:                             <ul style="list-style-type: none"> <li>○ valid cbsdId = C</li> <li>○ valid grantId = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ grantExpireTime = UTC time greater than duration of the test</li> </ul> </li> <li>● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--	--
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● operationState = "AUTHORIZED"</li> </ul>	<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"> <li>● cbsdId = C</li> <li>● grantId = G</li> <li>● transmitExpireTime = T = current UTC time + 200 seconds</li> <li>● responseCode = 0</li> </ul>	--	--
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"> <li>● UUT shall stop all transmission on RF interface within (transmitExpireTime + 60 seconds), using the transmitExpireTime sent in Step 3.</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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## 7.4 CBSD Relinquishment Process

### 7.4.1 WINNF.FT.D.RLQ.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2}</li> <li>● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD</li> <li>● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants.</li> </ul> Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
3	If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response shall be as follows: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● grantId = Gi</li> <li>● responseCode = 0</li> </ul>	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT shall stop RF transmission at any time between triggering the relinquishments and UUT sending the relinquishment requests for each CBSD.</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail



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## 7.5 CBSD Deregistration Process

### 7.5.1 WINNF.FT.D.DRG.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>● Each UUT has successfully registered with SAS Test Harness</li> <li>● Each UUT is in the authorized state</li> <li>● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2}</li> <li>● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD</li> <li>● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants.</li> </ul> Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT sends a Relinquishment request and receives Relinquishment response with responseCode=0	--	--
3	Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> </ul>	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
4	If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response shall be as follows: <ul style="list-style-type: none"> <li>● cbsdId = Ci</li> <li>● responseCode = 0</li> </ul>	--	--
5	After completion of step 4, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
6	Monitor the RF output of each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> <li>● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs:</li> </ul> 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





## 7.6 CBSD Security Validation

### 7.6.1 WINNF.FT.C.SCS.1

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

### 7.6.2 WINNF.FT.C.SCS.2

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



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**7.6.3 WINNF.FT.C.SCS.3**

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

**7.6.4 WINNF.FT.C.SCS.4**

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



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**7.6.5 WINNF.FT.C.SCS.5**

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



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## 7.7 CBSD RF Power Measurement

### 7.7.1 WINNF.PT.C.HBT.1

#	Test Execution Steps	Results	
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> <li>UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness</li> <li>UUT has registered with the SAS, with CBSID = C</li> <li>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</li> </ul> <p>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</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"> <li>UUT sends Heartbeat Request, including: <ul style="list-style-type: none"> <li>cbsId = C</li> <li>grantId = G</li> </ul> </li> <li>SAS Test Harness responds with Heartbeat Response, including: <ul style="list-style-type: none"> <li>cbsId = C</li> <li>grantId = G</li> <li>transmitExpireTime = current UTC time + 200 seconds</li> <li>responseCode = 0</li> </ul> </li> </ul>	--	--
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>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.</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.

Freq. (MHz)	Conducted PSD (dBm/MHz)	Antenna Gain (dBi)	Array Gain (dB)	Loss (dB)	EIRP PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
3560	8.818	13.0	3.01	2	26.828	37	Pass
3560	-0.530	13.0	3.01	2	17.480	18	Pass

Note:

- Array Gain=10log(n), n is the antenna number, for this CBSD the n=2
- EIRP PSD= Conducted PSD+ Antenna Gain+ Array Gain+ Loss



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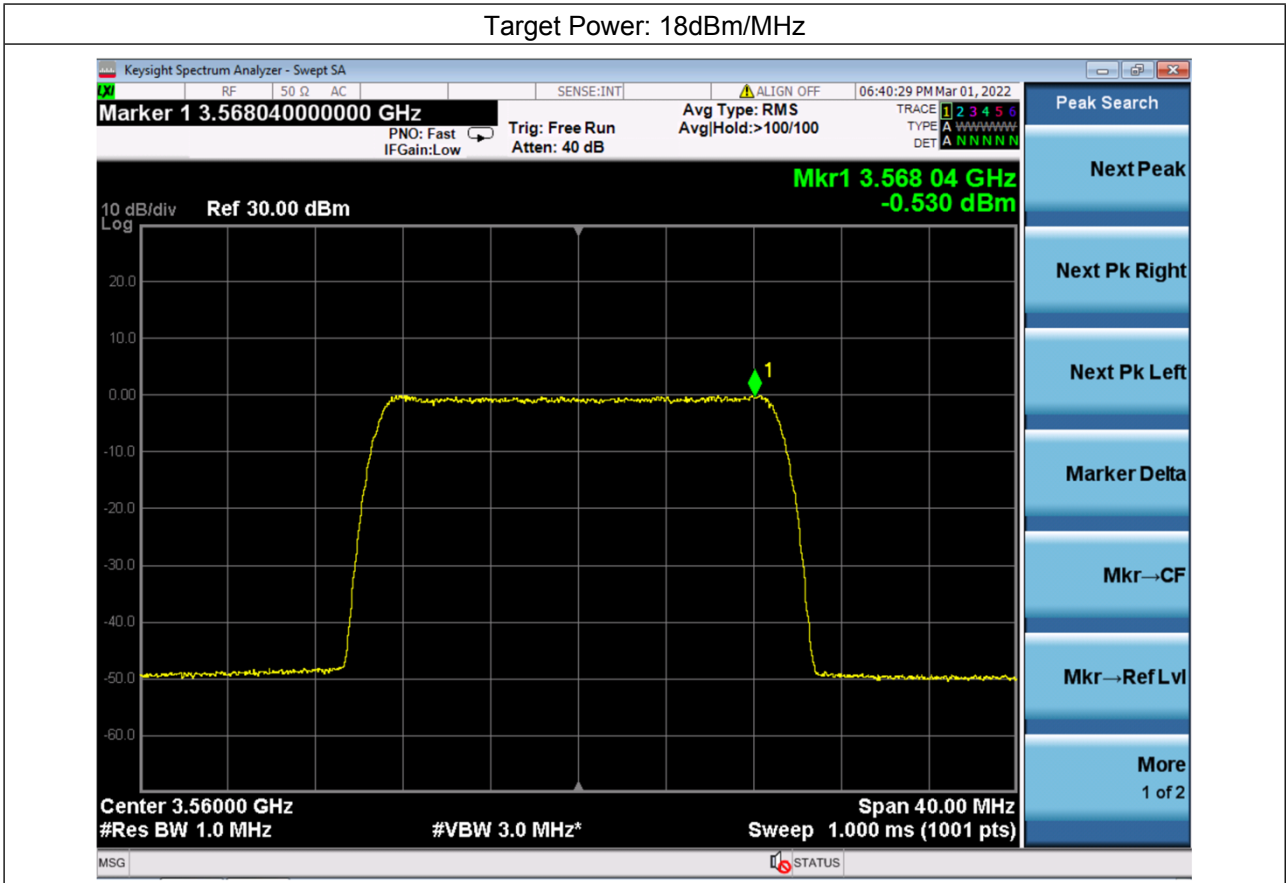
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Target Power: 18dBm/MHz



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## 8 Test Data Log

Test data log refer to log files (Log files appendix) except for securitytest cases which shows below.

### 8.1 WINNF.FT.C.SCS.1

The screenshot shows a network traffic capture in Wireshark. The main pane displays a list of packets, with packet 6 selected. The packet list table is as follows:

No.	Time	Source	Destination	Protocol	Length	Info
4	0.007927	10.10.101.241	10.10.101.185	TLSv1.2	583	Client Hello
6	0.009662	10.10.101.185	10.10.101.241	TLSv1.2	4162	Server Hello
8	0.009804	10.10.101.185	10.10.101.241	TLSv1.2	747	Certificate, Certificate Request, Server Hello Done
10	0.009798	10.10.101.241	10.10.101.185	TLSv1.2	4747	Certificate
11	0.009981	10.10.101.241	10.10.101.185	TLSv1.2	653	Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted
13	0.101680	10.10.101.185	10.10.101.241	TLSv1.2	117	Change Cipher Spec, Encrypted Handshake Message

The packet details pane for packet 6 shows the following structure:

- Frame 6: 4162 bytes on wire (33296 bits), 4162 bytes captured (33296 bits)
- Ethernet II, Src: 8e:8b:6c:36:62:27 (8e:8b:6c:36:62:27), Dst: e6:ee:1e:dd:0f:20 (e6:ee:1e:dd:0f:20)
- Internet Protocol Version 4, Src: 10.10.101.185, Dst: 10.10.101.241
- Transmission Control Protocol, Src Port: 9000, Dst Port: 53528, Seq: 1, Ack: 518, Len: 4096
- Transport Layer Security
  - TLSv1.2 Record Layer: Handshake Protocol: Server Hello
    - Content Type: Handshake (22)
    - Version: TLS 1.2 (0x0303)
    - Length: 85
    - Handshake Protocol: Server Hello
      - Handshake Type: Server Hello (2)
      - Length: 81
      - Version: TLS 1.2 (0x0303)
      - Random: 54dce017c6d6adf10a294f816e58ffb4fab9a32353febe35d1ce64805accbde5
      - Session ID Length: 32
      - Session ID: 23c78f4fbaddee2454e80d955b7f3435c1f2cf2d9f3efcd233bc126876808179
      - Cipher Suite: TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384 (0x009d)
      - Compression Method: null (0)
      - Extensions Length: 9
        - Extension: renegotiation\_info (len=1)
        - Extension: extended\_master\_secret (len=0)
      - [JA3S Fullstring: 771,157,65281-23]

The packet bytes pane shows the raw data for the selected packet, including the cipher suite field: `Cipher Suite (tls.handshake.cipheruite), 2 byte(s)`.



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## 8.2 WINNF.FT.C.SCS.2

2022-03-16 10:19:34 M5%3A24-0000.pcap

文件(F) 编辑(E) 视图(V) 跳转(G) 捕获(C) 分析(A) 统计(S) 电话(Y) 无线(W) 工具(T) 帮助(H)

No.	Time	Source	Destination	Protocol	Length	Info
4	0.000673	10.10.100.104	10.10.101.198	HTTP	118	GET /sas_ca.cr1 HTTP/1.0
7	0.001221	10.10.101.198	10.10.100.104	PKIX-C...	927	Certificate Revocation List
15	10.093205	10.10.100.104	10.10.101.198	HTTP	118	GET /sas_ca.cr1 HTTP/1.0
18	10.093717	10.10.101.198	10.10.100.104	PKIX-C...	927	Certificate Revocation List
26	20.097051	10.10.100.104	10.10.101.198	HTTP	118	GET /sas_ca.cr1 HTTP/1.0

Frame 4: 118 bytes on wire (944 bits), 118 bytes captured (944 bits)

Ethernet II, Src: 22:b6:54:10:a4:4e (22:b6:54:10:a4:4e), Dst: 2e:e5:60:f0:cd:33 (2e:e5:60:f0:cd:33)

Internet Protocol Version 4, Src: 10.10.100.104, Dst: 10.10.101.198

Transmission Control Protocol, Src Port: 45404, Dst Port: 9007, Seq: 1, Ack: 1, Len: 52

Hypertext Transfer Protocol

GET /sas\_ca.cr1 HTTP/1.0\r\n

Host: fake-cr1-service\r\n

\r\n

[Full request URI: http://fake-cr1-service/sas\_ca.cr1]

[HTTP request 1/1]

[Response in frame: 7]

0000 2e e5 60 f0 cd 33 22 b6 54 10 a4 4e 08 00 45 00 . . . 3" : T · N · · E ·  
0010 00 68 32 ab 40 00 fd 06 6c a2 0a 0a 64 68 0a 0a h2 @ · · · 1 · · · dh · ·

2022-03-16 10:19:34 M5%3A13-0000.pcap

文件(F) 编辑(E) 视图(V) 跳转(G) 捕获(C) 分析(A) 统计(S) 电话(Y) 无线(W) 工具(T) 帮助(H)

No.	Time	Source	Destination	Protocol	Length	Info
4	0.000994	10.10.100.104	10.10.101.87	TLSv1.2	349	Client Hello
6	0.001308	10.10.101.87	10.10.100.104	TLSv1.2	4162	Server Hello
8	0.001957	10.10.101.87	10.10.100.104	TLSv1.2	735	Certificate, Certificate Request, Server Hello Done
10	0.006150	10.10.100.104	10.10.101.87	TLSv1.2	73	Alert (Level: Fatal, Description: Certificate Revoked)
17	10.000829	10.10.100.104	10.10.101.87	TLSv1.2	349	Client Hello

Frame 6: 4162 bytes on wire (33296 bits), 4162 bytes captured (33296 bits)

Ethernet II, Src: 5a:da:e3:a0:64:56 (5a:da:e3:a0:64:56), Dst: 3a:d0:9c:52:fd:70 (3a:d0:9c:52:fd:70)

Internet Protocol Version 4, Src: 10.10.101.87, Dst: 10.10.100.104

Transmission Control Protocol, Src Port: 9000, Dst Port: 55172, Seq: 1, Ack: 284, Len: 4096

Transport Layer Security

TLSv1.2 Record Layer: Handshake Protocol: Server Hello

Content Type: Handshake (22)

Version: TLS 1.2 (0x0303)

Length: 57

Handshake Protocol: Server Hello

Handshake Type: Server Hello (2)

Length: 53

Version: TLS 1.2 (0x0303)

Random: bf28ccc71ac76dc85cf476285002a0aff242a4a8a041fb56c77f8761f5bf39ae

Session ID Length: 0

Cipher Suite: TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384 (0x009d)

Compression Method: null (0)

Extensions Length: 13

Extension: renegotiation\_info (len=1)

Extension: session\_ticket (len=0)

Extension: extended\_master\_secret (len=0)

[JA3S Fullstring: 771,157,65281-35-23]

[JA3S: 75559800da08083dc4d7d6fddca6cf22]

0000 3a d0 9c 52 fd 70 5a da e3 a0 64 56 08 00 45 00 . . . pZ . . dV · · E ·  
0010 10 34 6b 17 40 00 ff 06 22 d9 0a 0a 65 57 0a 0a · 4k @ · · · · · · · · ew · ·



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### 8.3 WINNF.FT.C.SCS.3

The screenshot shows a Wireshark capture of a TLS handshake. The packet list pane shows several frames, with frame 6 (4162 bytes) selected. The packet details pane shows the following structure:

- Frame 6: 4162 bytes on wire (33296 bits), 4162 bytes captured (33296 bits)
- Ethernet II, Src: 66:48:e0:c4:62:4e (66:48:e0:c4:62:4e), Dst: 46:82:01:3a:57:2a (46:82:01:3a:57:2a)
- Internet Protocol Version 4, Src: 10.10.101.87, Dst: 10.10.100.227
- Transmission Control Protocol, Src Port: 9000, Dst Port: 49288, Seq: 1, Ack: 518, Len: 4096
- Transport Layer Security
  - TLSv1.2 Record Layer: Handshake Protocol: Server Hello
    - Content Type: Handshake (22)
    - Version: TLS 1.2 (0x0303)
    - Length: 85
    - Handshake Protocol: Server Hello
      - Handshake Type: Server Hello (2)
      - Length: 81
      - Version: TLS 1.2 (0x0303)
      - Random: 9f1e9f753a49a9d99bbe6b1d97533df3f71005efcd5886268159f48a2445c2a7
      - Session ID Length: 32
      - Session ID: 443448f6134d72104bb2ad9b223fb28eb916fb0da11242791b7d2eaa0702638
      - Cipher Suite: TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384 (0x009d)
      - Compression Method: null (0)
      - Extensions Length: 9
        - Extension: renegotiation\_info (len=1)
        - Extension: extended\_master\_secret (len=0)
      - [JA3S Fullstring: 771,157,65281-23]

The packet bytes pane shows the raw data for the selected packet, with the cipher suite field highlighted in blue.



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### 8.4 WINNF.FT.C.SCS.4

2022-03-01T09:34:53.119-0000.pcap

No.	Time	Source	Destination	Protocol	Length	Info
4	0.004028	10.10.101.247	10.10.100.88	TLSv1.2	583	Client Hello
6	0.004171	10.10.100.88	10.10.101.247	TLSv1.2	1667	Server Hello, Certificate, Certificate Request, Server Hello Done
8	0.004958	10.10.101.247	10.10.100.88	TLSv1.2	73	Alert (Level: Fatal, Description: Unknown CA)
13	10.009153	10.10.101.247	10.10.100.88	TLSv1.2	583	Client Hello
15	10.009295	10.10.100.88	10.10.101.247	TLSv1.2	1667	Server Hello, Certificate, Certificate Request, Server Hello Done
17	10.010419	10.10.101.247	10.10.100.88	TLSv1.2	73	Alert (Level: Fatal, Description: Unknown CA)

Frame 6: 1667 bytes on wire (13336 bits), 1667 bytes captured (13336 bits)

- Ethernet II, Src: f2:5b:68:68:5d:57 (f2:5b:68:68:5d:57), Dst: 46:8b:c4:bc:f7:40 (46:8b:c4:bc:f7:40)
- Internet Protocol Version 4, Src: 10.10.100.88, Dst: 10.10.101.247
- Transmission Control Protocol, Src Port: 9000, Dst Port: 40712, Seq: 1, Ack: 518, Len: 1601
- Transport Layer Security
  - TLSv1.2 Record Layer: Handshake Protocol: Server Hello
    - Content Type: Handshake (22)
    - Version: TLS 1.2 (0x0303)
    - Length: 85
    - Handshake Protocol: Server Hello
      - Handshake Type: Server Hello (2)
      - Length: 81
      - Version: TLS 1.2 (0x0303)
      - Random: 06ea44751df4afaf4dc2a0167ad809f9c6ebf958ae4636c305839896863ba40
      - Session ID Length: 32
      - Session ID: 016f3b181e81362216cd8bf04dbf6ce166758667f035711b8ca4971d7a2fd251
      - Cipher Suite: TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384 (0x009d)
      - Compression Method: null (0)
      - Extensions Length: 9
      - Extension: renegotiation\_info (len=1)
      - Extension: extended\_master\_secret (len=0)
      - [JA3S Fullstring: 771,157,65281-23]

0080 86 f7 60 35 71 1b 8c a4 97 1d 7a 2f d2 51 00 9d :g:5q... ..z/Q..

0090 00 00 09 ff 01 00 01 00 00 17 00 00 16 03 03 05 .....

Cipher Suite (tls.handshake.ciphersuite), 2 byte(s) | 分组: 27 · 已显示: 9 (33.3%) | 配置:

2022-03-01T09:34:53.119-0000.pcap

No.	Time	Source	Destination	Protocol	Length	Info
4	0.004028	10.10.101.247	10.10.100.88	TLSv1.2	583	Client Hello
6	0.004171	10.10.100.88	10.10.101.247	TLSv1.2	1667	Server Hello, Certificate, Certificate Request, Server Hello Done
8	0.004958	10.10.101.247	10.10.100.88	TLSv1.2	73	Alert (Level: Fatal, Description: Unknown CA)
13	10.009153	10.10.101.247	10.10.100.88	TLSv1.2	583	Client Hello
15	10.009295	10.10.100.88	10.10.101.247	TLSv1.2	1667	Server Hello, Certificate, Certificate Request, Server Hello Done
17	10.010419	10.10.101.247	10.10.100.88	TLSv1.2	73	Alert (Level: Fatal, Description: Unknown CA)

Frame 8: 73 bytes on wire (584 bits), 73 bytes captured (584 bits)

- Ethernet II, Src: 46:8b:c4:bc:f7:40 (46:8b:c4:bc:f7:40), Dst: f2:5b:68:68:5d:57 (f2:5b:68:68:5d:57)
- Internet Protocol Version 4, Src: 10.10.101.247, Dst: 10.10.100.88
- Transmission Control Protocol, Src Port: 40712, Dst Port: 9000, Seq: 518, Ack: 1602, Len: 7
- Transport Layer Security
  - TLSv1.2 Record Layer: Alert (Level: Fatal, Description: Unknown CA)
    - Content Type: Alert (21)
    - Version: TLS 1.2 (0x0303)
    - Length: 2
    - Alert Message
      - Level: Fatal (2)
      - Description: Unknown CA (48)

0000 f2 5b 68 68 5d 57 46 8b c4 bc f7 40 08 00 45 00 :[hh]WF...@.E.

0010 00 3b dd ba 40 00 fd 06 c1 9e 0a 0a 65 f7 0a 0a :;.@.....e...

2022-03-01T09:34:53.119-0000.pcap | 分组: 27 · 已显示: 9 (33.3%) | 配置:



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### 8.5 WINNF.FT.C.SCS.5

The image shows a Wireshark capture of a TLS handshake. The packet list pane shows several frames, with frame 6 selected. The packet details pane shows the following structure:

- Frame 6: 4162 bytes on wire (33296 bits), 4162 bytes captured (33296 bits)
- Ethernet II, Src: 66:78:02:2c:59:9c (66:78:02:2c:59:9c), Dst: 02:a7:95:cf:ba:d6 (02:a7:95:cf:ba:d6)
- Internet Protocol Version 4, Src: 10.10.100.104, Dst: 10.10.101.242
- Transmission Control Protocol, Src Port: 9000, Dst Port: 41958, Seq: 1, Ack: 518, Len: 4096
- Transport Layer Security
  - TLSv1.2 Record Layer: Handshake Protocol: Server Hello
    - Content Type: Handshake (22)
    - Version: TLS 1.2 (0x0303)
    - Length: 85
    - Handshake Protocol: Server Hello
      - Handshake Type: Server Hello (2)
      - Length: 81
      - Version: TLS 1.2 (0x0303)
      - Random: 0b24cc6e31ff12f2a5e2a7de89030f5a89b95e149957f39adf2582e0c1e88416
      - Session ID Length: 32
      - Session ID: a01507953aa949ff609272582450a5d415f40f3b1d60d491b2c42431c8fa4a9c
      - Cipher Suite: TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384 (0x009d)
      - Compression Method: null (0)
      - Extensions Length: 9
        - Extension: renegotiation\_info (len=1)
        - Extension: extended\_master\_secret (len=0)
      - [JA3S Fullstring: 771,157,65281-23]

The packet bytes pane shows the raw data for the Cipher Suite field: 00 00 09 ff 01 00 01 00 00 17 00 00 16 03 03 12



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## 9 Photographs

### 9.1 EUT Constructional Details (EUT Photos)

Please Refer to Integral and internal photos for details.

- End of the Report -



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