



TEST REPORT

Application No.: SZCR2106021337AT
Applicant: Baicells Technologies Co., Ltd.
Address of Applicant: 9-10F, 1stBldg., No.81BeiqingRoad, Haidian District, Beijing, China
Equipment Under Test (EUT):
EUT Name: LTE Outdoor CPE
Model No.: EG8013L-M11
Trade Mark: Baicells
FCC ID: 2AG32EG8013LM11
Standard(s) : CBRSA-TS-9001-V1.0.0
WINNF-19-IN-00033 V1.0
WINNF-TS-0122-V1.0
FCC 47 CFR Part 96
KDB 940660 D01
KDB 940660 D02
Date of Receipt: 2021-06-28
Date of Test: 2021-06-28 to 2021-06-29
Date of Issue: 2021-06-30

| | |
|---------------------|--------------|
| Test Result: | Pass* |
|---------------------|--------------|



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

Keny Xu

Keny Xu
EMC Laboratory Manager



| Revision Record | | | | |
|-----------------|---------|------------|----------|----------|
| Version | Chapter | Date | Modifier | Remark |
| 01 | | 2021-06-30 | | Original |
| | | | | |
| | | | | |

| | | | |
|--------------------------|--|---|--|
| Authorized for issue by: | | | |
| | |  | |
| | | <hr/> Jacky Li /Project Engineer | |
| | |  | |
| | | <hr/> Eric Fu /Reviewer | |

2 Test Summary

| Item | Standard | Test Case ID | Result |
|---|----------------------|-------------------|--------|
| Multi-Step registration | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.1 | Pass |
| Single-Step registration for CBSD with CPI signed data | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.5 | Pass |
| Missing Required parameters (responseCode 102) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.8 | Pass |
| Pending registration (responseCode 200) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.10 | Pass |
| Invalid parameter (responseCode 103) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.12 | Pass |
| Blacklisted CBSD (responseCode 101) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.14 | Pass |
| Unsupported SAS protocol version (responseCode 100) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.16 | Pass |
| Group Error (responseCode 201) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.REG.18 | Pass |
| Unsuccessful Grant responseCode=400 (INTERFERENCE) | WINNF-TS-0122-V1.0.0 | WINNF.FT.D.GRA.1 | Pass |
| Unsuccessful Grant responseCode=401 (GRANT_CONFLICT) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.GRA.2 | Pass |
| Heartbeat Success Case (first Heartbeat Response) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.HBT.1 | Pass |
| Heartbeat responseCode=105 (DEREGISTER) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.HBT.3 | Pass |
| Heartbeat responseCode=500 (TERMINATED_GRANT) | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.HBT.4 | 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 |
| 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 |
| Successful Relinquishment | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.RLQ.1 | Pass |



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| Item | Standard | Test Case ID | Result |
|--|----------------------|------------------|--------|
| Successful Deregistration | WINNF-TS-0122-V1.0.0 | WINNF.FT.C.DRG.1 | Pass |
| 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 | Pass |
| SAS Version: 1.0.0.3 | | | |

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

Test standards:

CBRSA-TS-9001-V1.0.0

CBRS Alliance Certification Test Plan

WINNF-TS-0122-V1.0.0

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

WINNF-19-IN-00033 V1.0

CBRS CPE-CBSD as UUT Test Guidelines

KDB 940660 D01 Part 96 CBRS Eqpt v03

KDB 940660 D02 CPE-CBSD Handshake Procedures v02



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4 General Information

4.1 Details of E.U.T.

| | |
|------------------------------|--|
| Power supply: | Adapter Model NO.: G0720-240-050 Input: 100-240V~50/60Hz, 0.75A Output: 24.0V, 0.5A, 12.0W |
| Sample Type: | Fixed device |
| CBSD Class: | B (Outdoor CPE) |
| Transmitter Frequency Band: | LTE Band 48 |
| Transmitter Frequency Range: | 3550~3700MHz |
| Hardware Version: | A |
| 11Software Version: | BaiCE_BG_1.6.17 |
| Test sample: | 1203000094204NQ0291 (S/N) |
| Antenna Gain: | 14dBi |

4.2 Description of CBSD/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. | Y |
| 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) | 25 | 25 | 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.

| Duration and Duty Cycle | | |
|-------------------------|-----------|-------------|
| Period | Limit | Test Result |
| 10-second | 1-second | Pass |
| 300-second | 10-second | Pass |
| 3600-second | 20-second | Pass |

Note: Limited in duration and duty cycle to the minimum time necessary to get a grant from the SAS.
This time should not exceed 1 second within any 10-second period, 10seconds within any 300-second period, or 20 seconds within any 3600-second period.

4.4 Modification Record

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"



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4.5 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 | $\pm 3\%$ |

4.6 Description of Support Units

| Description | Manufacturer | Model No. | Serial No. |
|--------------|-------------------------|---|---------------------|
| EPC | Lanner Electronics Inc. | LICA-1513A | LR202002004052 |
| Router | TP-LINK | TL-R860+ | 1175379002425 |
| Base station | Baicells | mBS1105 (FCC ID: 2AG32MBS110596N) | 120200007219BSP0001 |

4.7 Test Location

All tests were performed at:

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No tests were sub-contracted.



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5 Equipment List

| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal Date | Cal Due Date |
|------------------------------------|--|-------------------|--------------------|------------|--------------|
| Laptop (With SAS Test harness) | Lenovo | Pro-13API 2019 | REF. No.SEA1800 | / | / |
| Spectrum Analyzer | Keysight | N9020A | SEM004-19 | 2021-5-31 | 2022-5-30 |
| Shield Room | SAEMC | MSR433 | SEM001-11 | 2021-03-13 | 2024-03-12 |
| Coaxial Cable | SGS | N/A | SEM031-01 | 2020-07-11 | 2021-07-10 |
| Attenuator | Weinschel Associates | WA41 | SEM021-09 | N/A | N/A |
| Splitter | MACOM | 2090-6214-00 | N/A | N/A | N/A |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory | ZJ1-2B | SEM002-03 | 2020-09-27 | 2021-09-26 |



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6 Test Method and Environment

6.1 CBSD/DP Conformance and Performance

Test Requirement: CBRS CBSD Test Specification WINNF-TS-0122-V1.0.0
 Test Method: CBRS CBSD Test Specification WINNF-TS-0122-V1.0.0
 WINNF-IN-0156_WinnForum_SAS_Test_Harness_CBSD_UUT_Tutorial_v1_0_0_1

6.2 CPE-CBSD Handshake Procedures

Test Requirement: KDB 940660 D02 CPE-CBSD Handshake Procedures v02
 Test Method: WINNF-19-IN-00033 V1.0
 KDB 940660 D02 CPE-CBSD Handshake Procedures v02

6.3 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 Test Harness.
- 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.

6.4 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.

6.5 Duration and Duty Cycle Test Procedure

- CPE-CBSD as UUT does not receive any RF signal from its "Compatible BTS-CBSD" (FCC ID: 2AG32MBS110596N), so CPE-CBSD as UUT does not transmit. UUT shall be UTC time synchronized.
- 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.
- 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}.
- 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.
- Answer the questions on the WinnForum SAS Harness #1 console so the WinnForum SAS Harness #1 is ready for the next test.



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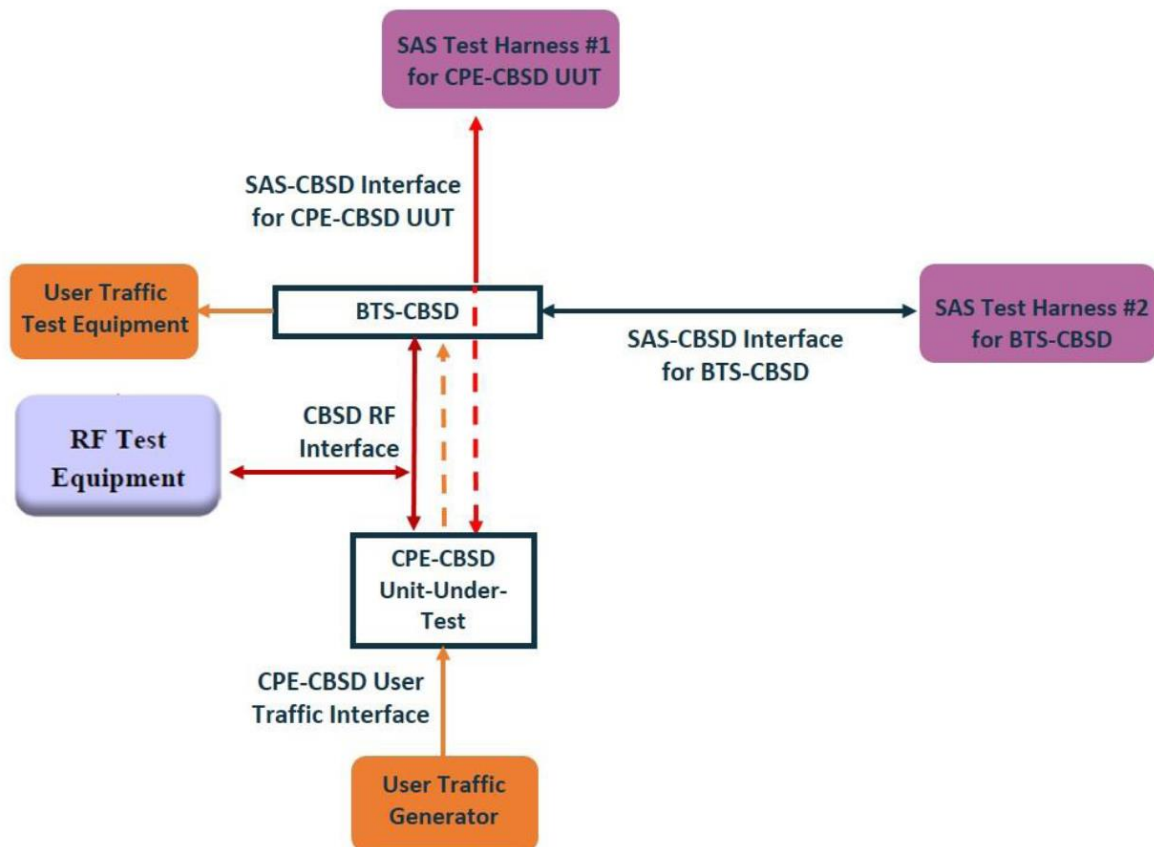
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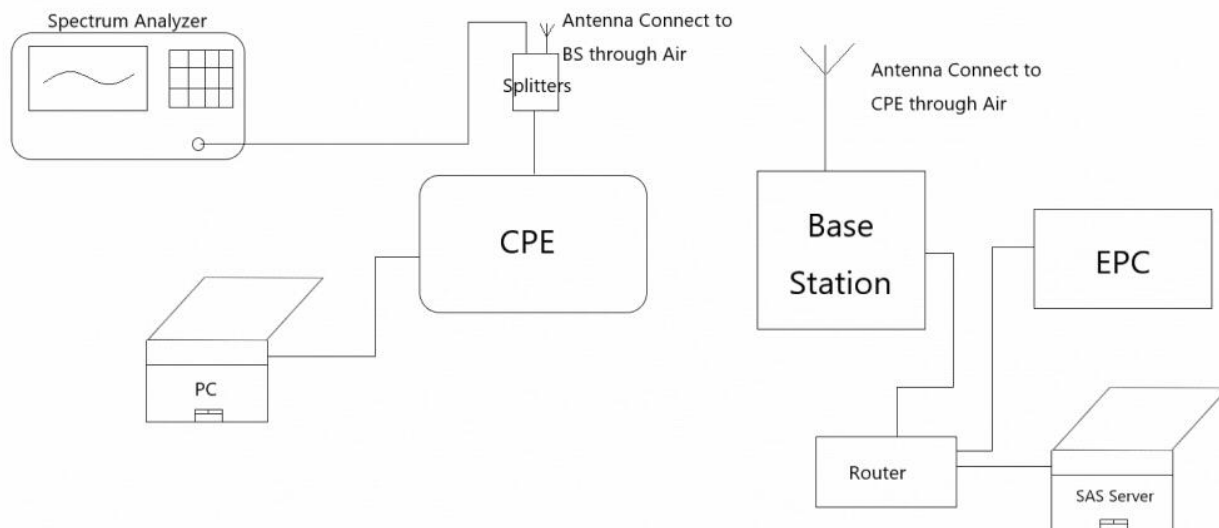
6.6 Test Environment

| | |
|---------------------------|----------------------|
| 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 |

6.7 Test Setup



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



Test setup diagram for WINNF.PT.C.HBT Test case

7 Test Data

7.1 CBSD Registration Process

7.1.1 WINNF.FT.C.REG.1

| # | 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 correct Registration request information, as specified in [n.5], to the SAS Test Harness: <ul style="list-style-type: none"> The required userId, fcId and cbsdSerialNumber registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. Any REG-conditional or optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges. <p>Note: It is outside the scope of this document to test the Registration information that is supplied via another means.</p> | <div>■</div> Pass | <div>□</div> Fail |
| 3 | SAS Test Harness sends a CBSD Registration Response as follows: <ul style="list-style-type: none"> cbsdId = C measReportConfig shall not be included responseCode = 0 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT. | -- | -- |
| 5 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none"> UUT shall not transmit RF | <div>■</div> Pass | <div>□</div> Fail |

7.1.2 WINNF.FT.C.REG.5

| # | Test Execution Steps | Results | |
|---|---|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness UUT is in the Unregistered state All of the required and REG-Conditional parameters shall be configured and CPI signature provided | -- | -- |
| 2 | <p>CBSD sends Registration request to the SAS Test Harness:</p> <ul style="list-style-type: none"> The required userId, fcId and cbsdSerialNumber and REG-Conditional cbsdCategory, airInterface, measCapability and cpiSignatureData 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 | <p>SAS Test Harness sends a CBSD Registration Response as follows:</p> <ul style="list-style-type: none"> cbsdId = C measReportConfig shall not be included. responseCode = 0 | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.</p> | -- | -- |
| 5 | <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 |

7.1.3 WINNF.FT.C.REG.8

| # | 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 cbsdId responseCode = 102 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT. | -- | -- |
| 5 | Monitor the RF output of 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 |

7.1.4 WINNF.FT.C.REG.10

| # | 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 cbsdId responseCode = 200 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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 |

7.1.5 WINNF.FT.C.REG.12

| # | 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 cbsdId responseCode = 103 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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 |

7.1.6 WINNF.FT.C.REG.14

| # | 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 cbsdId responseCode = 101 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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 |

7.1.7 WINNF.FT.C.REG.16

| # | 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 cbsdId responseCode = 100 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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 |

7.1.8 WINNF.FT.C.REG.18

| # | 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 cbsdId responseCode = 201 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=201) 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 |

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. | ■ Pass | □ Fail |
| 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 | ■ Pass | □ Fail |

7.2.2 WINNF.FT.C.GRA.2

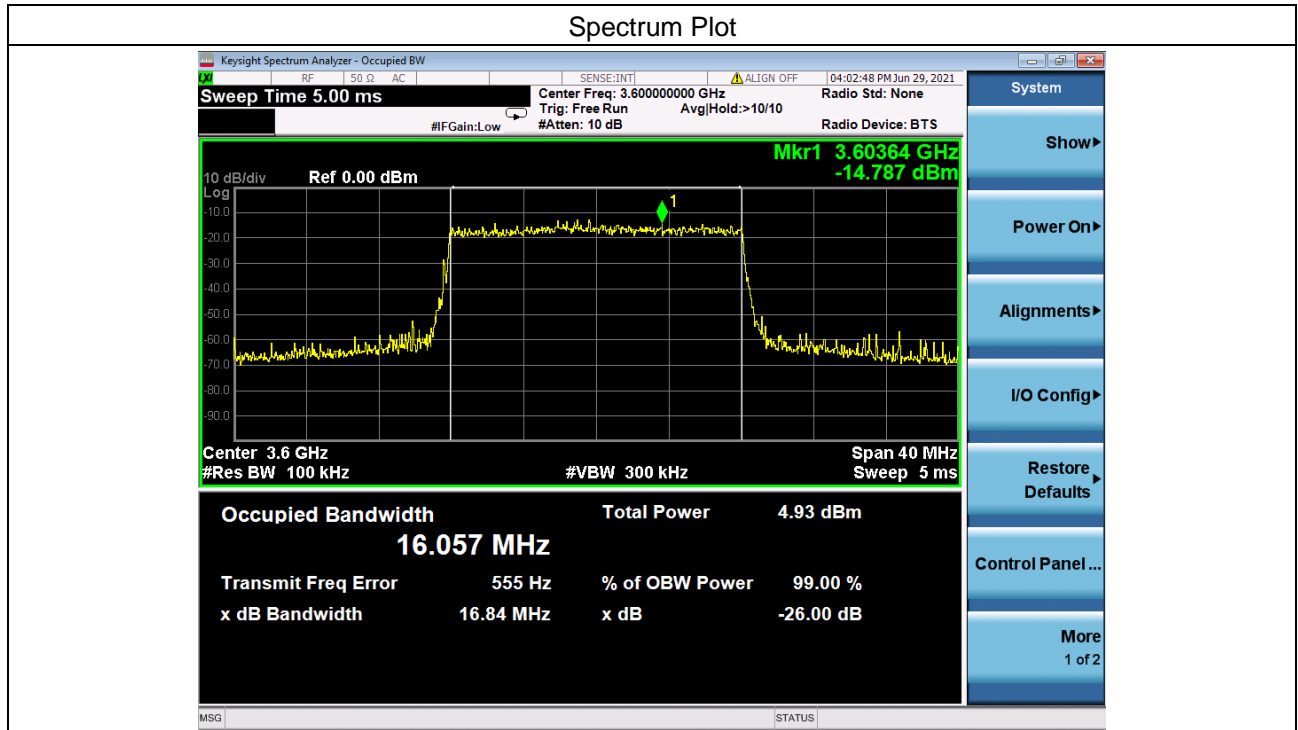
| # | Test Execution Steps | Results | |
|---|--|---------|--------|
| 1 | Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness, with cbsdId = C | -- | -- |
| 2 | UUT sends valid Grant Request. | ■ Pass | □ Fail |
| 3 | SAS Test Harness sends a Grant Response message, including - cbsdId=C - responseCode = 401 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness will not provide any positive response (responseCode=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: ● UUT shall not transmit RF | ■ Pass | □ Fail |

7.3 CBSD HeartBeat Process

7.3.1 WINNF.FT.C.HBT.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 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: ● cbsdId = 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: ● cbsdId = C ● availableChannel is an array of availableChannel objects ● responseCode = 0 | -- | -- |
| 5 | UUT sends Grant Request message. Validate: ● cbsdId = C ● maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96 ● operationFrequencyRange, F, sent by UUT is a valid range within the CBRS band | ■ Pass | □ Fail |
| 6 | SAS Test Harness sends a Grant Response message, including the parameters: ● cbsdId = C ● grantId = G = a valid grant ID ● grantExpireTime = UTC time greater than duration of the test ● responseCode = 0 | -- | -- |
| 7 | UUT sends a first Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = "GRANTED" | ■ Pass | □ Fail |
| 8 | SAS Test Harness sends a Heartbeat Response message, with the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0 | -- | -- |
| 9 | For further Heartbeat Request messages sent from UUT after completion of step 8, validate message is sent within latest specified heartbeatInterval, and: ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED" and SAS Test Harness responds with a Heartbeat Response message including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0 | ■ Pass | □ Fail |

| | | | |
|----|--|--|-------------------------------|
| 10 | <p>Monitor the RF output of the UUT from start of test until UUT transmission commences. Verify:</p> <ul style="list-style-type: none"> UUT does not transmit at any time prior to completion of the first heartbeat response UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
|----|--|--|-------------------------------|



7.3.2 WINNF.FT.C.HBT.3

| # | Test Execution Steps | Results | |
|---|---|--|--|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message.</p> <p>Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED" | -- | -- |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = T = Current UTC time ● responseCode = 105 (DEREGISTER) | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3 | <div> <div></div> <div>Pass</div> </div> | <div> <div></div> <div>Fail</div> </div> |

7.3.3 WINNF.FT.C.HBT.4

| # | Test Execution Steps | Results | |
|---|---|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED" | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● responseCode = 500 (TERMINATED_GRANT) | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3 | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

7.3.4 WINNF.FT.C.HBT.5

| # | Test Execution Steps | Results | |
|---|--|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request) | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "GRANTED" | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● ? responseCode = 501 (SUSPENDED_GRANT) | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the SAS-CBSD interface. Verify either A OR B occurs:</p> <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT does not transmit at any time | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

7.3.5 WINNF.FT.C.HBT.6

| # | Test Execution Steps | Results | |
|---|--|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED" | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● responseCode = 501 (SUSPENDED_GRANT) | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the SAS-CBSD interface. Verify either A OR B occurs:</p> <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop transmission within (T+60) seconds of completion of step 3 | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

7.3.6 WINNF.FT.C.HBT.7

| # | Test Execution Steps | Results | |
|---|---|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> UUT has registered successfully with SAS Test Harness UUT has a valid single grant as follows: <ul style="list-style-type: none"> valid cbsdId = C valid grantId = G grant is for frequency range F, power P grantExpireTime = UTC time greater than duration of the test UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message.</p> <p>Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> cbsdId = C grantId = G operationState = "AUTHORIZED" | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> cbsdId = C grantId = G transmitExpireTime = T = current UTC time responseCode = 502 (UNSYNC_OP_PARAM) | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the SAS-CBSD interface. Verify:</p> <ul style="list-style-type: none"> UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: <ul style="list-style-type: none"> cbsdId = C grantId = 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 |

7.3.7 WINNF.FT.C.HBT.9

| # | Test Execution Steps | Results | |
|---|---|-------------------|-------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in GRANTED, but not AUTHORIZED state(i.e. has not performed its first Heartbeat Request) | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "GRANTED" | <div>■</div> Pass | <div>□</div> Fail |
| 3 | <p>After completion of step 2, SAS Test Harness does not respond to any further</p> <ul style="list-style-type: none"> ● messages from UUT to simulate loss of network connection | -- | -- |
| 4 | <p>Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify: At any time during the test, UUT shall not transmit on RF interface</p> | <div>■</div> Pass | <div>□</div> Fail |

7.3.8 WINNF.FT.C.HBT.10

| # | Test Execution Steps | Results | |
|---|---|-------------------|-------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ○ grantExpireTime = UTC time greater than duration of the test ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | <p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● operationState = "AUTHORIZED" | <div>■</div> Pass | <div>□</div> Fail |
| 3 | <p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time + 200 seconds ● responseCode = 0 | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p> | -- | -- |
| 5 | <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> ● UUT shall stop all transmission on RF interface within (transmitExpireTime + 60 seconds), using the transmitExpireTime sent in Step 3. | <div>■</div> Pass | <div>□</div> Fail |

7.4 CBSD Relinquishment Process

7.4.1 WINNF.FT.C.RLQ.1

| # | Test Execution Steps | Results | |
|---|--|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT has successfully registered with SAS Test Harness, with cbsdId=C ● UUT has received a valid grant with grantId = G ● UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to relinquish UUT Grant from the SAS Test Harness</p> | -- | -- |
| 2 | <p>UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none"> ● cbsdId = C ● grantId = G | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3 | <p>SAS Test Harness shall approve the request with a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none"> - cbsdId = C - grantId = G ● responseCode = 0 | -- | -- |
| 4 | <p>After completion of step 3, SAS Test Harness will not provide any additional positive</p> <ul style="list-style-type: none"> ● response (responseCode=0) to further request messages from the UUT | -- | -- |
| 5 | <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 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 |

7.5 CBSD Deregistration Process

7.5.1 WINNF.FT.C.DRG.1

| # | Test Execution Steps | Results | |
|---|--|--|-------------------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT has successfully registered with SAS Test Harness, with cbsdId=C ● UUT has received a valid grant with grantId = G ● UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to deregister UUT from the SAS Test Harness</p> | -- | -- |
| 2 | <p>UUT sends a Relinquishment request and receives Relinquishment response with</p> <ul style="list-style-type: none"> ● responseCode=0 | -- | -- |
| 3 | <ul style="list-style-type: none"> ● UUT sends Deregistration Request to SAS Test Harness with cbsdId = C. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4 | <p>SAS Test Harness shall approve the request with a Deregistration Response message with parameters:</p> <ul style="list-style-type: none"> ● cbsdId = C ● responseCode = 0 | -- | -- |
| 5 | <p>After completion of step 3, SAS Test Harness will not provide any additional positive</p> <ul style="list-style-type: none"> ● response (responseCode=0) to further request messages from the UUT. | -- | -- |
| 6 | <p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none"> ● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: <p>A. UUT sending a Registration Request message, as this is not mandatory</p> <p>B. UUT sending a Deregistration Request message</p> | <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"> 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 responseCode = 0 and cbsdId. | <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 |

7.6.2 WINNF.FT.C.SCS.2

| # | 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 | <ul style="list-style-type: none"> UUT may retry for the security procedure which shall fail. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4 | <ul style="list-style-type: none"> SAS Test-Harness shall not receive any Registration request or any application data. | -- | -- |
| 5 | <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 |



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7.6.3 WINNF.FT.C.SCS.3

| # | 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 | <ul style="list-style-type: none"> UUT may retry for the security procedure which shall fail. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4 | <ul style="list-style-type: none"> 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 |

7.6.4 WINNF.FT.C.SCS.4

| # | 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 | <ul style="list-style-type: none"> UUT may retry for the security procedure which shall fail. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4 | <ul style="list-style-type: none"> 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 |

7.6.5 WINNF.FT.C.SCS.5

| # | 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 | <ul style="list-style-type: none"> UUT may retry for the security procedure which shall fail. | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4 | <ul style="list-style-type: none"> 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 |

7.7 CBSD RF Power Measurement

7.7.1 WINNF.PT.C.HBT

| # | Test Execution Steps | Results | |
|---|---|-------------------|-------------------|
| 1 | <p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness UUT has registered with the SAS, with CBSD ID = C UUT has a single valid grant G with parameters {lowFrequency = FL, highFrequency = FH, maxEirp = Pi}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case 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 | -- | -- |
| 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> <ul style="list-style-type: none"> 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. | <div>■</div> Pass | <div>□</div> Fail |

RF measurement plot for Test Case :

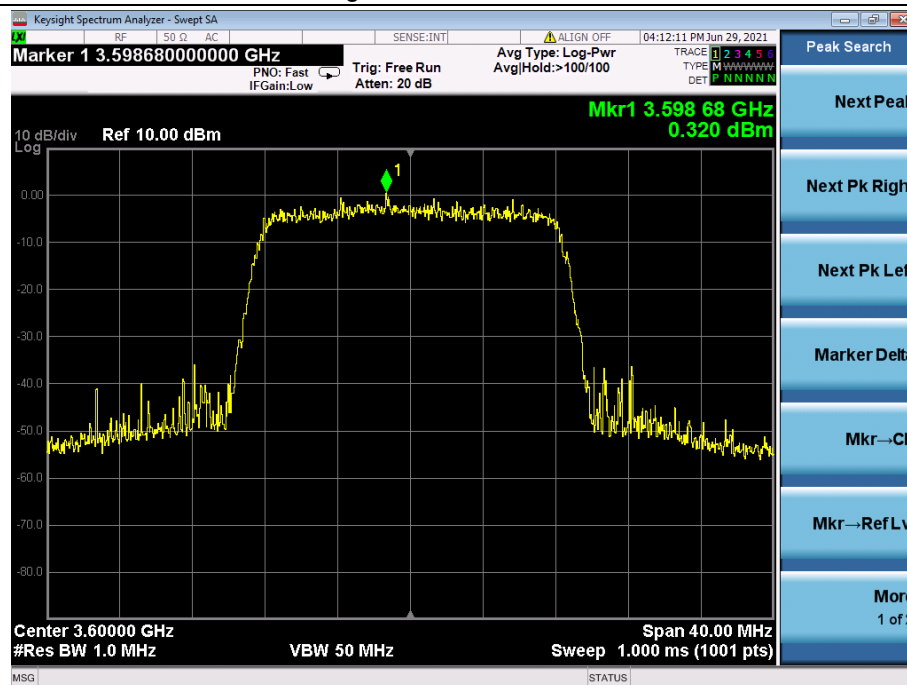
- Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method.

| Frequency (MHz) | Channel Bandwidth (MHz) | Granted maxEIRP (dBm/MHz) | Conducted PSD (dBm/MHz) | | Antenna Gain (dBi) | Directional Gain (dB) | Cable Loss (dB) | maxEIRP (dBm/MHz) |
|-----------------|-------------------------|---------------------------|-------------------------|--------|--------------------|-----------------------|-----------------|-------------------|
| | | | Ant. 0 | Ant. 1 | | | | |
| 3600 | 20 | 23 | 0.320 | / | 14 | 3.01 | 5 | 22.330 |
| 3600 | 20 | 15 | -8.235 | / | 14 | 3.01 | 5 | 13.775 |

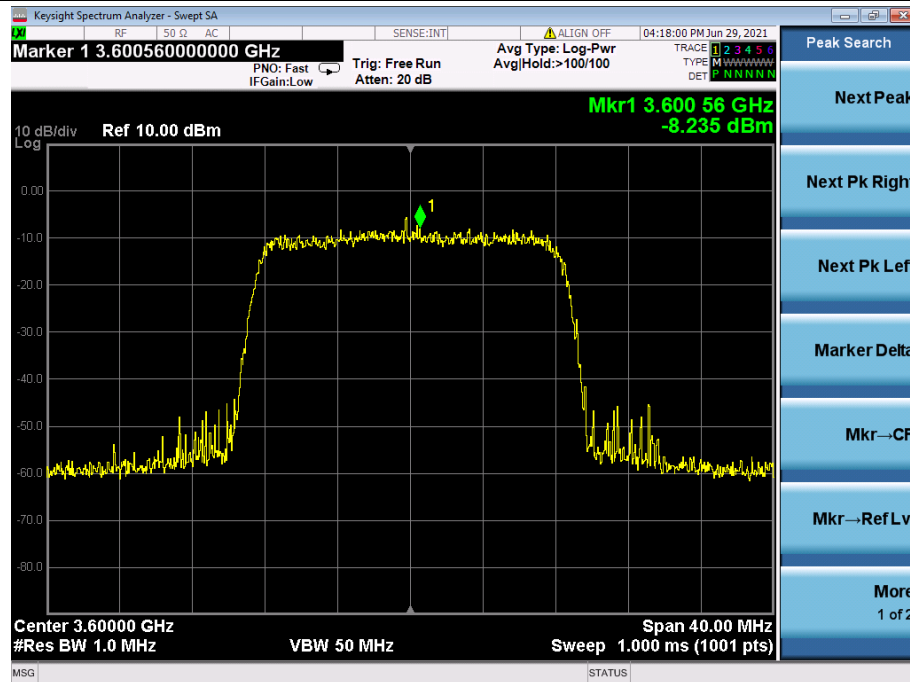
Note:

- maxEIRP= Conducted PSD+ Antenna Gain+ Directional Gain+ Cable loss
- Directional Gain=10log(n), n=2 for this product

Target Power:23 dBm/MHz



Target Power: 15 dBm/MHz



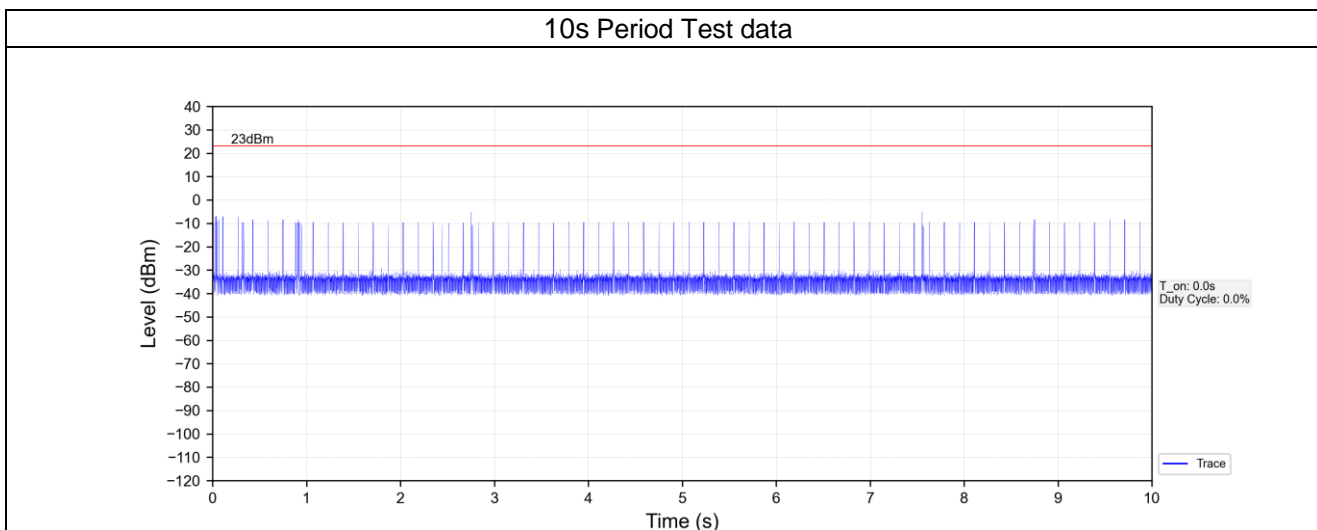


7.8 Duration and Duty Cycle

| Duration and Duty Cycle | | | |
|-------------------------|------------------|-----------|-------------|
| Period | Minimum Time (s) | Limit (s) | Pass / Fail |
| 10-second | 0.004 | 1-second | Pass |
| 300-second | 0.061 | 10-second | Pass |
| 3600-second | 0.088 | 20-second | Pass |

Note:

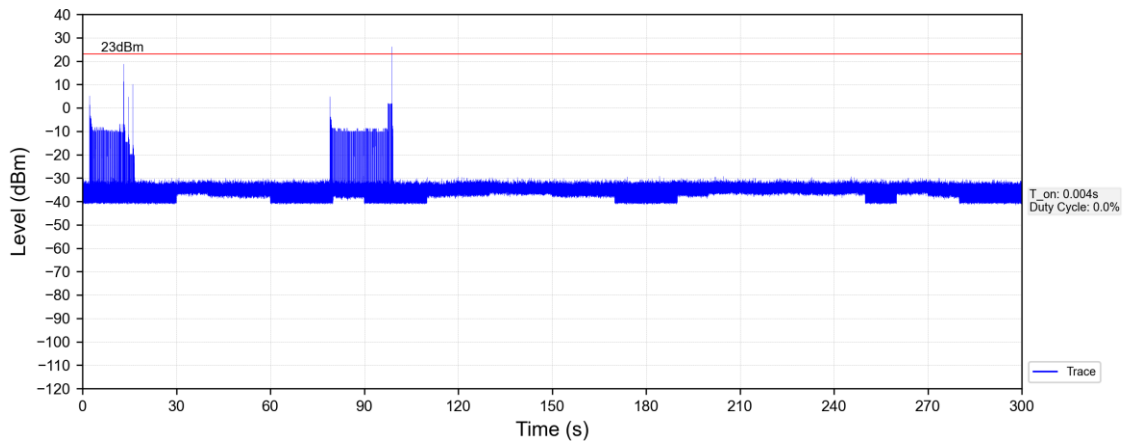
1. Limited in duration and duty cycle to the minimum time necessary to get a grant from the SAS. This time should not exceed 1 second within any 10-second period, 10seconds within any 300-second period, or 20 seconds within any 3600-second period.
2. Pass = Minimum Time < Limit



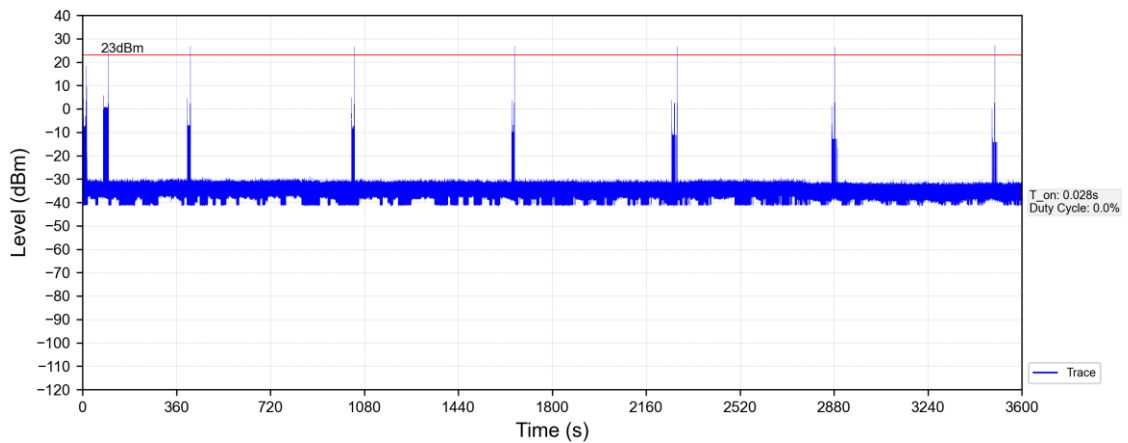
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300s Period Test data

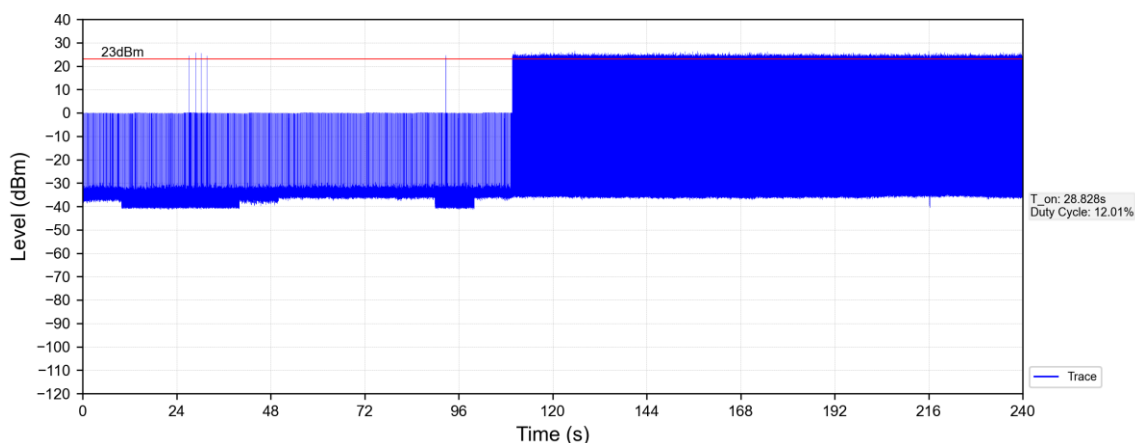


3600s Period Test data



7.9 Verify that the device will register with a SAS when operating below 23 dBm

Verified in test case WINNF.PT.C.HBT.1, the CPE-CBSD as UUT default EIRP is under 23 dBm and can register success with SAS. After granted, the CPE-CBSD UUT will adjust the EIRP by maxEirp.



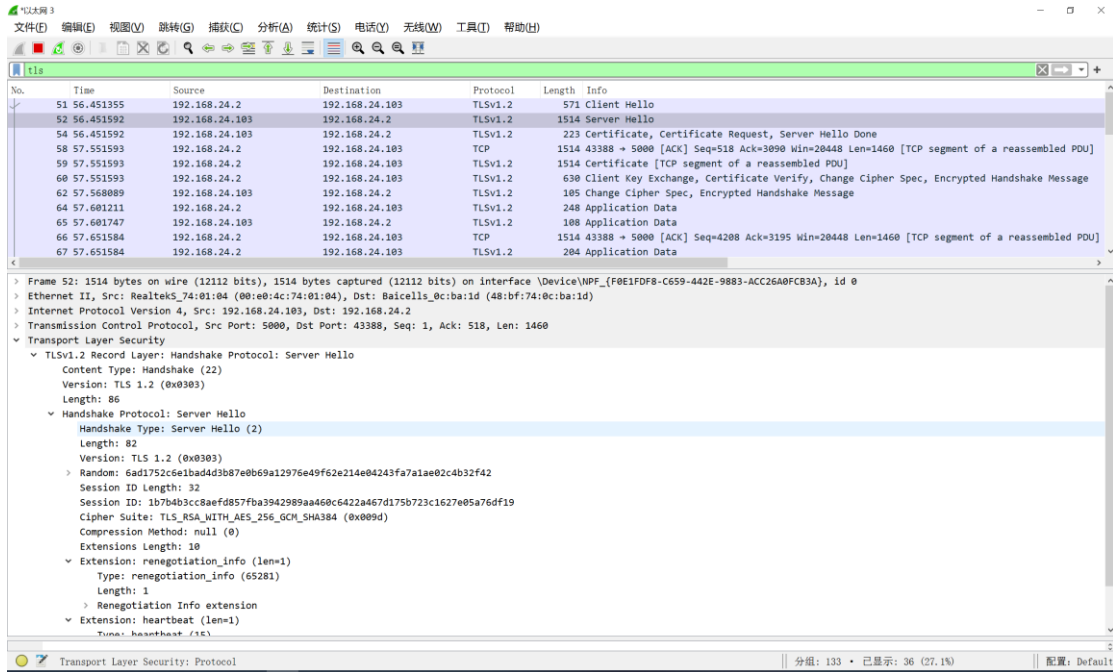
Note:

1. Red color line in above plot represents the 23 dBm.
2. When Granted the product will transmit at power level above 23dBm.
3. Only when the product sends packets the product will work at max EIRP.

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

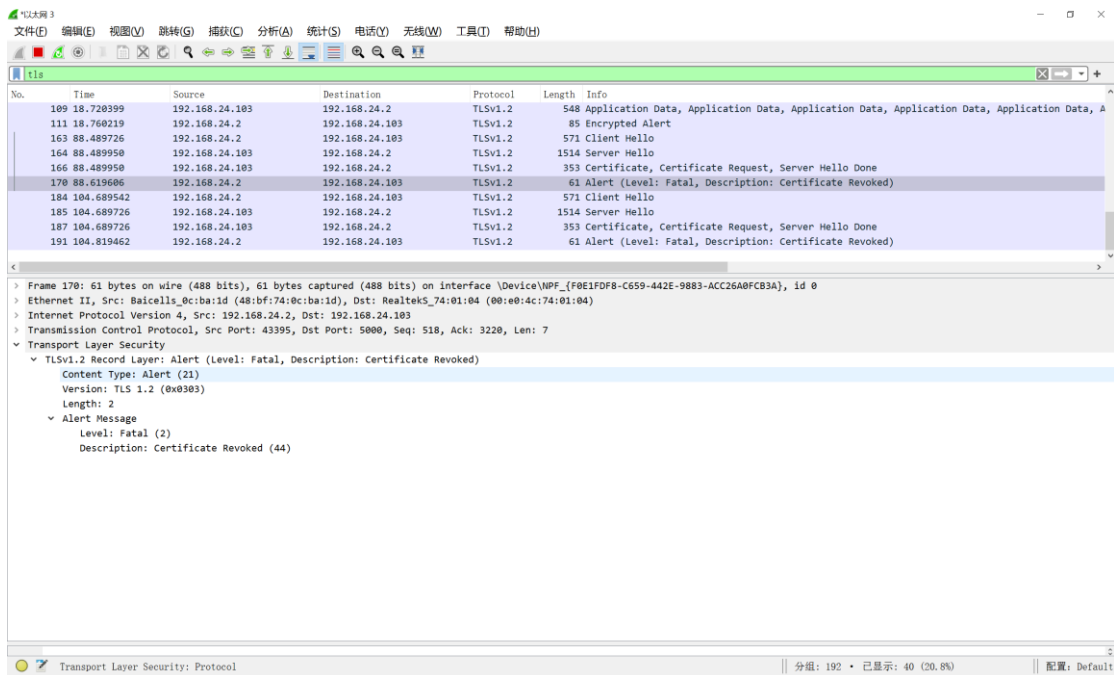
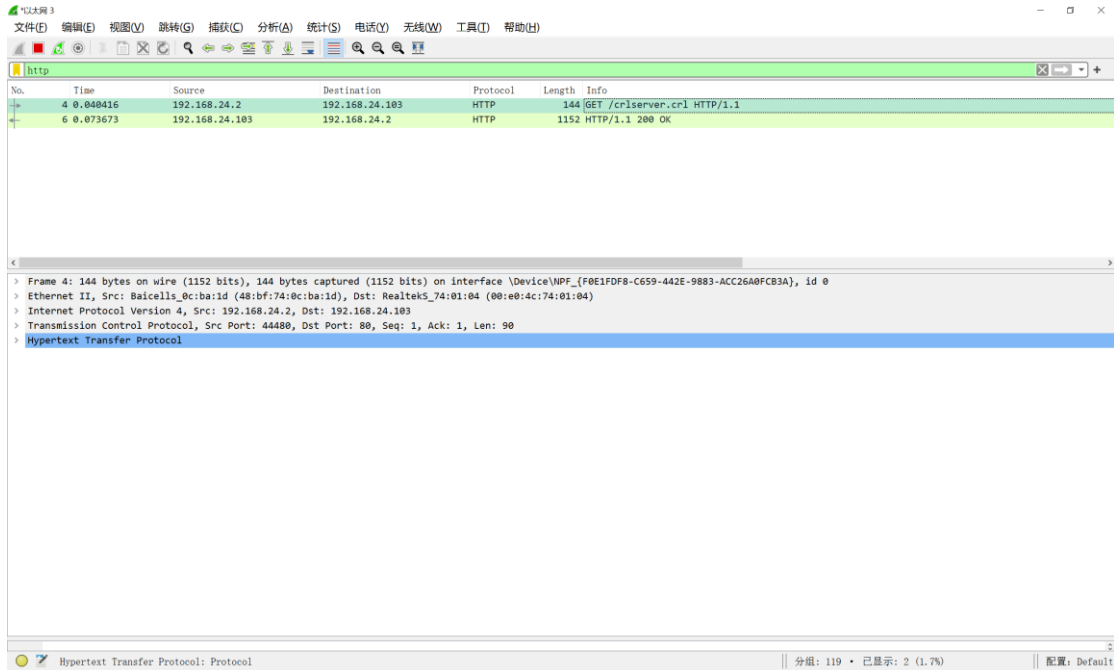


| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|-----------|----------------|----------------|----------|--------|--|
| 51 | 56.451355 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 571 | Client Hello |
| 52 | 56.451592 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 1514 | Server Hello |
| 54 | 56.451592 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 223 | Certificate, Certificate Request, Server Hello Done |
| 58 | 57.551593 | 192.168.24.2 | 192.168.24.103 | TCP | 1514 | 43388 → 5000 [ACK] Seq=518 Ack=3090 Win=20448 Len=1460 [TCP segment of a reassembled PDU] |
| 59 | 57.551593 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 1514 | Certificate [TCP segment of a reassembled PDU] |
| 60 | 57.551593 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 630 | Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted Handshake Message |
| 62 | 57.568089 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 105 | Change Cipher Spec, Encrypted Handshake Message |
| 64 | 57.601211 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 248 | Application Data |
| 65 | 57.601747 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 108 | Application Data |
| 66 | 57.651584 | 192.168.24.2 | 192.168.24.103 | TCP | 1514 | 43388 → 5000 [ACK] Seq=4208 Ack=3195 Win=20448 Len=1460 [TCP segment of a reassembled PDU] |
| 67 | 57.651584 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 204 | Application Data |

Frame 52: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{F0E1FDF8-C659-442E-9883-ACC26A0FCB3A}, id 0
 Ethernet II, Src: Realtek5_74:01:04 (00:e0:4c:74:01:04), Dst: BaiCells_0c:ba:1d (48:bf:74:0c:ba:1d)
 Internet Protocol Version 4, Src: 192.168.24.103, Dst: 192.168.24.2
 Transmission Control Protocol, Src Port: 5000, Dst Port: 43388, Seq: 1, Ack: 518, Len: 1460
 Transport Layer Security
 TLSv1.2 Record Layer: Handshake Protocol: Server Hello
 Content Type: Handshake (22)
 Version: TLS 1.2 (0x0303)
 Length: 86
 Handshake Protocol: Server Hello
 Handshake Type: Server Hello (2)
 Length: 82
 Version: TLS 1.2 (0x0303)
 Random: 6ad1752c6e1bad4d3b87e0b69a12976e49f62e214e04243fa7a1ae02c4b32f42
 Session ID Length: 32
 Session ID: 1b7b4b3cc8aef0857fba3942989aa460c6422a467d175b723c1627e05a76df19
 Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
 Compression Method: null (0)
 Extensions Length: 10
 Extension: renegotiation_info (len=1)
 Type: renegotiation_info (65281)
 Length: 1
 Renegotiation Info extension
 Extension: heartbeat (len=1)
 Type: heartbeat (15)



8.2 WINNF.FT.C.SCS.2



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8.3 WINNF.FT.C.SCS.3

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15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

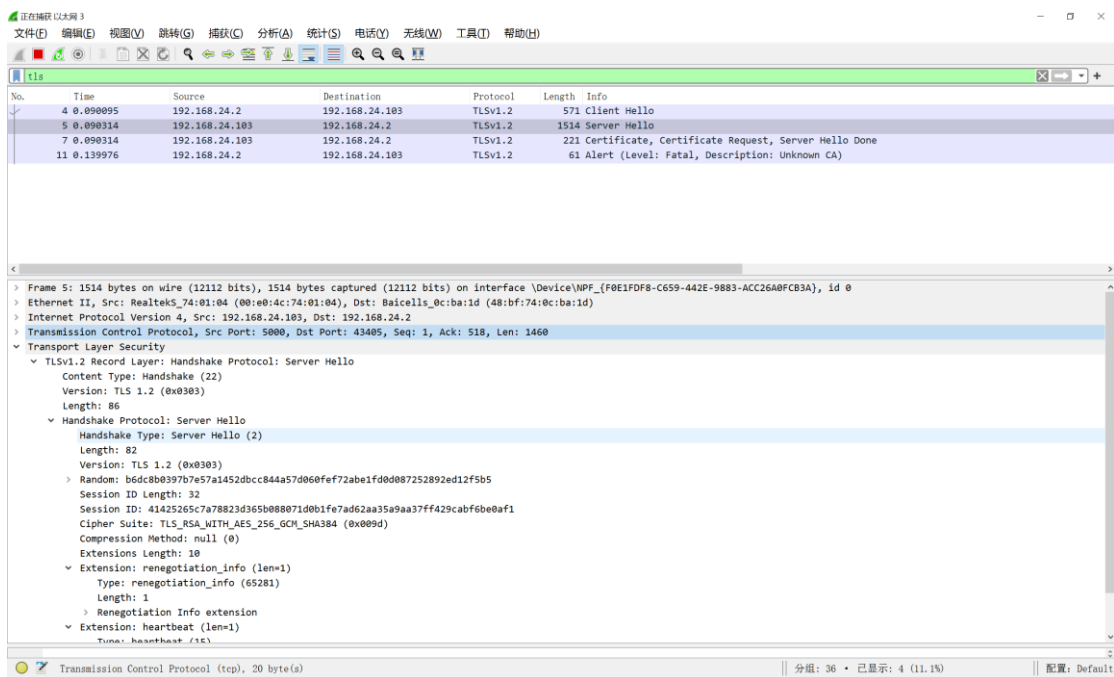
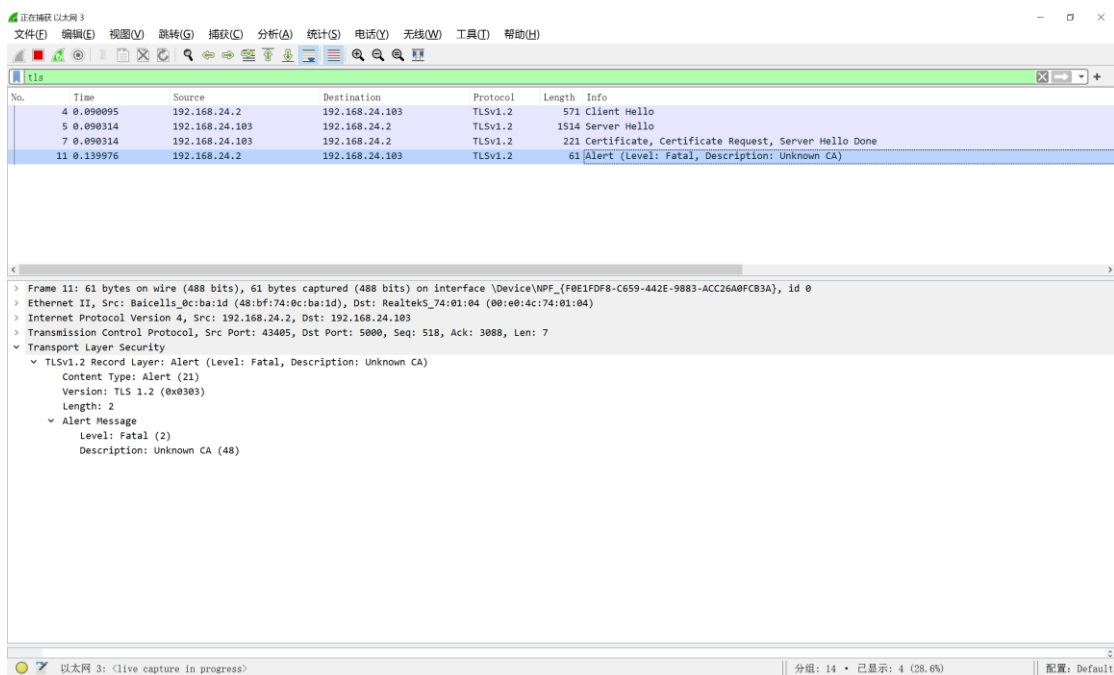
| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 14 | 3.130001 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 571 | Client Hello |
| 15 | 3.130352 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 1514 | Server Hello |
| 17 | 3.130352 | 192.168.24.103 | 192.168.24.2 | TLSv1.2 | 217 | Certificate, Certificate Request, Server Hello Done |
| 22 | 3.131987 | 192.168.24.2 | 192.168.24.103 | TLSv1.2 | 61 | Alert (Level: Fatal, Description: Certificate Expired) |

< Frame 15: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{F8E1FDF8-C659-442E-98B3-ACC26A0FCB3A}, id 0
> Ethernet II, Src: Realtek5_74:01:04 (00:0e:04:74:01:04), Dst: Balcells_0c:ba:1d (48:bf:74:0c:ba:1d)
> Internet Protocol Version 4, Src: 192.168.24.103, Dst: 192.168.24.2
> Transmission Control Protocol, Src Port: 5000, Dst Port: 43404, Seq: 1, Ack: 518, Len: 1460
v Transport Layer Security
v TLSv1.2 Record Layer: Handshake Protocol: Server Hello
Content Type: Handshake (22)
Version: TLS 1.2 (0x0303)
Length: 86
v Handshake Protocol: Server Hello
Handshake Type: Server Hello (2)
Length: 82
Version: TLS 1.2 (0x0303)
Random: 23e31cd6bc7a71e9d4f9e51d9e8199f5e54a71572792f15949cebcf73dab2066
Session ID length: 32
Session ID: fbf91c1e274d699f8a82d15fbae0fd8e26ff9644981e830031109474a8ef467
Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
Compression Method: null (0)
Extensions Length: 10
v Extension: renegotiation_info (len=1)
Type: renegotiation_info (65281)
Length: 1
v Renegotiation Info extension
v Extension: heartbeat (len=1)
Type: heartbeat (1)

以太网 3: (live capture in progress) 分组: 33 • 已显示: 4 (12.1%) 配置: Default



8.4 WINNF.FT.C.SCS.4



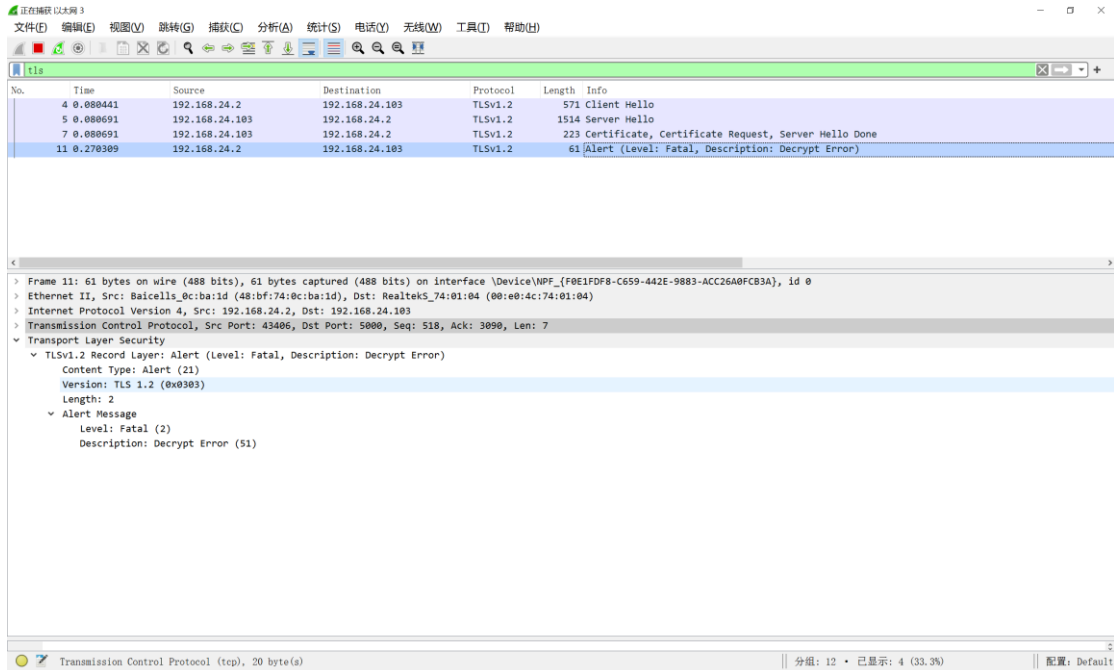
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8.5 WINNF.FT.C.SCS.5



9 Photographs

9.1 EUT Constructional Details (EUT Photos)

Please Refer to external and internal photos for details.

- End of the Report -



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Shenzhen Branch (Shenzhen) Laboratory

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