Testing Laboratory 3787

# WINNF-TS-0122 TEST REPORT

| | | |
|---|---|---|
| FCC ID | : | NKR-R2210-048L |
| Equipment | : | Indoor O-RAN Radio Unit |
| Brand Name | : | WNC |
| Model Name | : | R2210-048L |
| Applicant | : | Wistron NeWeb Corporation<br>20 Park Avenue II, Hsinchu Science Park, Hsinchu, 308 Taiwan |
| Manufacturer | : | Wistron NeWeb Corporation<br>20 Park Avenue II, Hsinchu Science Park, Hsinchu, 308 Taiwan |
| Standard | : | WINNF-TS-0122 Version V1.0.2 |

**The product was received on Aug. 14, 2024, and testing was started from Aug. 14, 2024 and completed on Aug. 22, 2024. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in WINNF-TS-0122 Version V1.0.2 and shown compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Rex Liao**

***Sporton International Inc. Hsinchu Laboratory***
*No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)*

# Table of Contents

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FG460628-01AA | 01 | Initial issue of report | Sep. 16, 2024 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | CBSD | DP | Required for Cert. | Test Case ID | Test Case Title | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|---|---|---|---|
| - | 6.1.4.1.1 | X | - | C1 | WINNF.FT.C.REG.1 | Multi-Step registration | N/A | - |
| - | 6.1.4.1.2 | - | X | C1 | WINNF.FT.D.REG.2 | Domain Proxy Multi-Step registration | N/A | - |
| - | 6.1.4.1.3 | X | - | C2 | WINNF.FT.C.REG.3 | Single-Step registration for Category A CBSD | N/A | - |
| | 6.1.4.1.4 | - | X | C2 | WINNF.FT.D.REG.4 | Domain Proxy Single-Step registration for Cat A CBSD | N/A | - |
| 3.1 | 6.1.4.1.5 | X | - | C3 | WINNF.FT.C.REG.5 | Single-Step registration for CBSD with CPI signed data | PASS | - |
| - | 6.1.4.1.6 | - | X | C3 | WINNF.FT.D.REG.6 | Domain Proxy Single-Step registration for CBSD with CPI signed data | N/A | - |
| 3.2 | 6.1.4.1.7 | X | X | C6 | WINNF.FT.C.REG.7 | Registration due to change of an installation parameter | PASS | - |
| 3.3 | 6.1.4.2.1 | X | - | M | WINNF.FT.C.REG.8 | Missing Required parameters (responseCode 102) | PASS | - |
| - | 6.1.4.2.2 | - | X | M | WINNF.FT.D.REG.9 | Domain Proxy Missing Required parameters (responseCode 102) | N/A | - |
| 3.4 | 6.1.4.2.3 | X | - | M | WINNF.FT.C.REG.10 | Pending registration (responseCode 200) | PASS | - |
| - | 6.1.4.2.4 | - | X | M | WINNF.FT.D.REG.11 | Domain Proxy Pending registration (responseCode 200) | N/A | - |
| 3.5 | 6.1.4.2.5 | X | - | M | WINNF.FT.C.REG.12 | Invalid parameter (responseCode 103) | PASS | - |
| - | 6.1.4.2.6 | - | X | M | WINNF.FT.D.REG.13 | Domain Proxy Invalid parameters (responseCode 103) | N/A | - |
| 3.6 | 6.1.4.2.7 | X | - | M | WINNF.FT.C.REG.14 | Blacklisted CBSD (responseCode 101) | PASS | - |
| - | 6.1.4.2.8 | - | X | M | WINNF.FT.D.REG.15 | Domain Proxy Blacklisted CBSD (responseCode 101) | N/A | - |
| 3.7 | 6.1.4.2.9 | X | - | M | WINNF.FT.C.REG.16 | Unsupported SAS protocol version (responseCode 100) | PASS | - |
| - | 6.1.4.2.10 | - | X | M | WINNF.FT.D.REG.17 | Domain Proxy Unsupported SAS protocol version responseCode 100) | N/A | - |
| 3.8 | 6.1.4.2.11 | X | - | M | WINNF.FT.C.REG.18 | Group Error (responseCode 201) | PASS | - |
| - | 6.1.4.2.12 | - | X | M | WINNF.FT.D.REG.19 | Domain Proxy Group Error (responseCode 201) | N/A | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| - | 6.1.4.3.1 | X | X | C2 | WINNF.FT.C.REG.20 | Category A CBSD location Update | N/A | - |
| 3.9 | 6.3.4.2.1 | X | X | M | WINNF.FT.C.GRA.1 | Unsuccessful Grant responseCode=400 (INTERFERENCE) | PASS | - |
| 3.10 | 6.3.4.2.2 | X | X | M | WINNF.FT.C.GRA.2 | Unsuccessful Grant responseCode=401 (GRANT_CONFLICT) | PASS | - |
| 3.11 | 6.4.4.1.1 | X | - | M | WINNF.FT.C.HBT.1 | Heartbeat Success Case (first Heartbeat Response) | PASS | - |
| - | 6.4.4.1.2 | - | X | M | WINNF.FT.D.HBT.2 | Domain Proxy Heartbeat Success Case (first Heartbeat Response) | N/A | - |
| 3.12 | 6.4.4.2.1 | X | X | M | WINNF.FT.C.HBT.3 | Heartbeat responseCode=105 (DEREGISTER) | PASS | - |
| 3.13 | 6.4.4.2.2 | X | - | M | WINNF.FT.C.HBT.4 | Heartbeat responseCode=500 (TERMINATED_GRANT) | PASS | - |
| 3.14 | 6.4.4.2.3 | X | X | M | WINNF.FT.C.HBT.5 | Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response | PASS | - |
| 3.15 | 6.4.4.2.4 | X | X | M | WINNF.FT.C.HBT.6 | Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response | PASS | - |
| 3.16 | 6.4.4.2.5 | X | X | M | WINNF.FT.C.HBT.7 | Heartbeat responseCode=502 (UNSYNC_OP_PARAM) | PASS | - |
| - | 6.4.4.2.6 | - | X | M | WINNF.FT.D.HBT.8 | Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT) | N/A | - |
| 3.17 | 6.4.4.3.1 | X | X | M | WINNF.FT.C.HBT.9 | Heartbeat Response Absent (First Heartbeat) | PASS | - |
| 3.18 | 6.4.4.3.2 | X | X | M | WINNF.FT.C.HBT.10 | Heartbeat Response Absent (Subsequent Heartbeat) | PASS | - |
| 3.19 | 6.4.4.4.1 | X | X | O | WINNF.FT.C.HBT.11 | SuccessfulGrantRenewalin HeartbeatTestCase | PASS | - |
| 3.20 | 6.5.4.2.1 | X | - | C4 | WINNF.FT.C.MES.1 | Registration Response contains measReportConfig | PASS | - |
| - | 6.5.4.2.2 | - | X | C4 | WINNF.FT.D.MES.2 | Domain Proxy Registration Response contains measReportConfig | N/A | - |
| 3.21 | 6.5.4.2.3 | X | X | C5 | WINNF.FT.C.MES.3 | Grant Response contains measReportConfig | PASS | - |
| 3.22 | 6.5.4.2.4 | X | - | C5 | WINNF.FT.C.MES.4 | Heartbeat Response contains measReportConfig | PASS | - |
| - | 6.5.4.2.5 | - | X | C5 | WINNF.FT.D.MES.5 | Domain Proxy Heartbeat Response contains measReportConfig | N/A | - |
| 3.23 | 6.6.4.1.1 | X | - | M | WINNF.FT.C.RLQ.1 | Successful Relinquishment | PASS | - |
| - | 6.6.4.1.2 | - | X | M | WINNF.FT.D.RLQ.2 | Domain Proxy Successful Relinquishment | N/A | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3.24 | 6.6.4.2.1 | X | - | O | WINNF.FT.C.RLQ.3 | Unsuccessful Relinquishment, responseCode=102 | PASS | - |
| - | 6.6.4.2.2 | - | X | O | WINNF.FT.D.RLQ.4 | Domain Proxy Unsuccessful Relinquishment, responseCode=102 | N/A | - |
| 3.25 | 6.6.4.3.1 | X | - | O | WINNF.FT.C.RLQ.5 | Unsuccessful Relinquishment, responseCode=103 | PASS | - |
| - | 6.6.4.3.2 | - | X | O | WINNF.FT.D.RLQ.6 | Domain Proxy Unsuccessful Relinquishment, responseCode=103 | N/A | - |
| 3.26 | 6.7.4.1.1 | X | - | M | WINNF.FT.C.DRG.1 | Successful Deregistration | PASS | - |
| - | 6.7.4.1.2 | - | X | M | WINNF.FT.D.DRG.2 | Domain Proxy Successful Deregistration | N/A | - |
| 3.27 | 6.7.4.2.1 | X | - | O | WINNF.FT.C.DRG.3 | Deregistration responseCode=102 | PASS | - |
| - | 6.7.4.2.2 | - | X | O | WINNF.FT.D.DRG.4 | Domain Proxy Deregistration responseCode=102 | N/A | - |
| 3.28 | 6.7.4.3.1 | X | X | O | WINNF.FT.C.DRG.5 | Deregistration responseCode=103 | PASS | - |
| 3.29 | 6.8.4.1.1 | X | X | M | WINNF.FT.C.SCS.1 | Successful TLS connection between UUT and SAS Test Harness | PASS | - |
| 3.30 | 6.8.4.2.1 | X | X | M | WINNF.FT.C.SCS.2 | TLS failure due to revoked certificate | PASS | - |
| 3.31 | 6.8.4.2.2 | X | X | M | WINNF.FT.C.SCS.3 | TLS failure due to expired server certificate | PASS | - |
| 3.32 | 6.8.4.2.3 | X | X | M | WINNF.FT.C.SCS.4 | TLSfailurewhenSASTestHarness certificateisissue by unknown CA | PASS | - |
| 3.33 | 6.8.4.2.4 | X | X | M | WINNF.FT.C.SCS.5 | TLS failure when certificate at the SAS Test Harness is corrupted | PASS | - |
| 3.34 | 7.1.4.1.1 | X | X | M | WINNF.PT.C.HBT.1 | UUT RF Transmit Power Measurement | PASS | - |

Note1:
♦ M: Mandatory for certification
♦ O: Optional. Not required for certification.
♦ C: Conditional. Mandatory if CBSD supports relevant functionality.
Note2:
The unit under test type is CBSD without Domain Proxy and Conditional Test Case Definitions are C3, C4, C5 and C6.

| Conformity Assessment Condition: |
| --- |
| 1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.<br>2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty". |
| **Disclaimer:** |
| The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity. |

**Reviewed by: Sam Chen**

**Report Producer: Cathy Chiu**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature of Equipment Under Test | |
|---|---|
| EUT Type | CBSD |
| Power Type | From power adapter or PoE |
| Category of EUT | ☒ Category A<br>☐ Category B |
| Professional Installation | ☒ Yes<br>☐ No |
| EUT in Test ID | ☐ EUT with Domain Proxy<br>☒ EUT without Domain Proxy |
| CBSD Firmware Version | 1.0 |
| CBSD Software Version | N/A |
| CBSD Hardware Version | 1.0 |

Note: The above information was declared by manufacturer.

## 1.2 Accessories

| Accessories | | | | |
|---|---|---|---|---|
| **Equipment Name** | **Brand Name** | **Model Name** | **Rating** | **Remark** |
| Adapter | FSP | FSP075-DHAN3 | INPUT: 100-240V~, 1.2A, 50/60Hz<br>OUTPUT: 12.0V, 6.25A, 75.0W | DC cable, non-shielded, 1.65m |
| **Others** | | | | |
| Power cable*1, non-shielded, 1.8m | | | | |

## 1.3 Support Equipment

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | Notebook | acer | TravelMate P2 14 | N/A |
| B | Notebook | acer | TravelMate P2 14 | N/A |
| C | UE | MOXA | CCG-1510-US-T | N/A |
| D | Notebook | acer | TravelMate P2 14 | N/A |

## 1.4 Testing Location

| Testing Location Information |
|---|
| Test Lab.：Sporton International Inc. Hsinchu Laboratory<br>Hsinchu (TAF: 3787) ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)<br>TEL: 886-3-656-9065 FAX: 886-3-656-9085<br>Test site Designation No. TW3787 with FCC.<br>Conformity Assessment Body Identifier (CABID) TW3787 with ISED. |

| Test Condition | Test Site No. | Test Engineer | Test Environment (°C / %) | Test Date |
|---|---|---|---|---|
| RF Conducted | TH03-CB | Caster Chang | 23.2~23.7 / 56~61 | Aug. 14, 2024~ Aug. 22, 2024 |

# 2 Measurement Environment

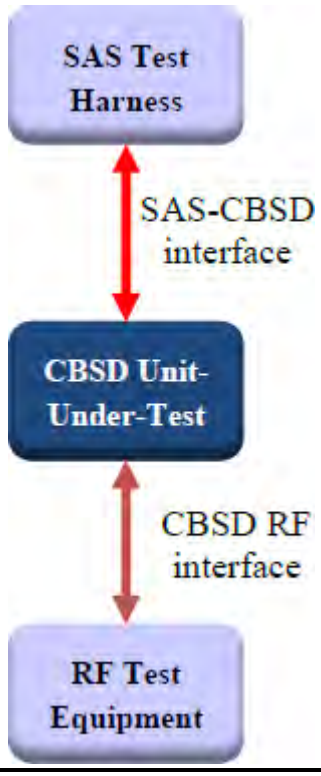
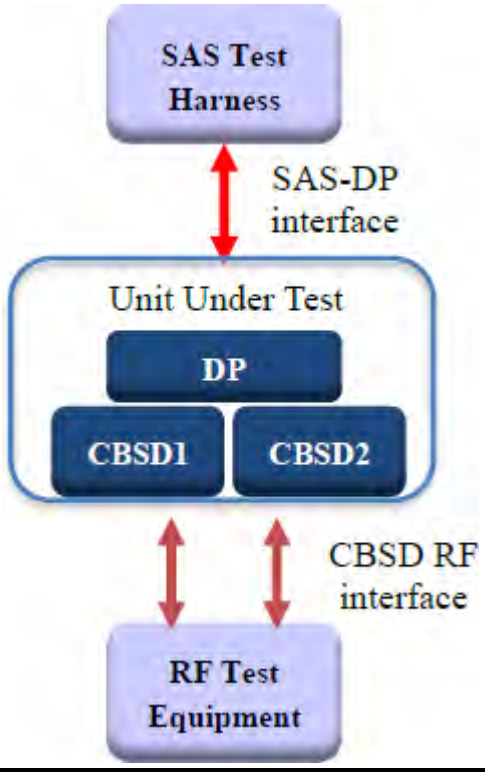
| Measurement Environment Information | |
|---|---|
| Test Harness version | 1.0.0.3 |
| Operating System | win10 |
| TLS version | 1.2 |
| Python | 2.7.13 |

## 2.1 Conditional Test Case

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

Note: The above information was declared by manufacturer.

## 2.2 Test Configuration

| Test configuration without Domain Proxy | Test configuration with Domain Proxy |
|---|---|
|  |  |

# 3 Protocol Test Results

## 3.1 WINNF.FT.C.REG.5 - Single-Step registration for CBSD with CPI signed data

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT is in the Unregistered state<br>• All of the required and REG-Conditional parameters shall be configured and CPI signature provided | -- | -- |
| 2 | CBSD sends Registration request to the SAS Test Harness:<br>• The required userId, fccId 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.<br>• Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges. | PASS | -- |
| 3 | • SAS Test Harness sends a CBSD Registration Response as follows:<br>– *cbsdId* = C<br>– *measReportConfig* shall not be included.<br>– *responseCode* = 0 | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.2 WINNF.FT.C.REG.7 - Registration due to change of an installation parameter

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness | -- | -- |
| 2 | UUT has successfully registered with SAS Test Harness | -- | -- |
| 3 | Change an installation parameters at the UUT (time T)<br>Tester needs to record the current time at which the parameter change is executed. | -- | -- |
| 4 | Monitor the SAS-CBSD interface.<br>UUT sends a deregistrationRequest to the SAS Test Harness The deregistration request shall be sent within (T + 60 seconds) from step 3. | PASS | -- |

## 3.3 WINNF.FT.C.REG.8 - Missing Required parameters (responseCode 102)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.4 WINNF.FT.C.REG.10 - Pending registration (responseCode 200)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.5 WINNF.FT.C.REG.12 - Invalid parameter (responseCode 103)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.6 WINNF.FT.C.REG.14 - Blacklisted CBSD (responseCode 101)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.7 WINNF.FT.C.REG.16 - Unsupported SAS protocol version (responseCode 100)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.8 WINNF.FT.C.REG.18 - Group Error (responseCode 201)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• 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:<br>– SAS response does not include *cbsdId*<br>– *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.9 WINNF.FT.C.GRA.1 - Unsuccessful Grant responseCode=400 (INTERFERENCE)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• 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<br>• *cbsdId*=C<br>• *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.10 WINNF.FT.C.GRA.2 - Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• 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<br>• *cbsdId*=C<br>• *responseCode* = R | -- | -- |
| 4 | After completion of step 3, SAS Test Harness does 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.11 WINNF.FT.C.HBT.1 - Heartbeat Success Case (first Heartbeat Response)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness, with *cbsdId* = C | -- | -- |
| 2 | UUT sends a message:<br>• If message is type Spectrum Inquiry Request, go to step 3, or<br>• If message is type Grant Request, go to step 5 | -- | -- |
| 3 | UUT sends Spectrum Inquiry Request. Validate:<br>• *cbsdId* = C<br>• List of frequencyRange objects sent by UUT are within the CBRS frequency range | PASS | -- |
| 4 | SAS Test Harness sends a Spectrum Inquiry Response message, including the following parameters:<br>• *cbsdId* = C<br>• availableChannel is an array of availableChannel objects<br>• *responseCode* = 0 | -- | -- |
| 5 | UUT sends Grant Request message. Validate:<br>• *cbsdId* = C<br>• maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96<br>• operationFrequencyRange, F, sent by UUT is a valid range within the CBRS band | PASS | -- |
| 6 | SAS Test Harness sends a Grant Response message, including the parameters:<br>• *cbsdId* = C<br>• *grantId* = G = a valid grant ID<br>• grantExpireTime = UTC time greater than duration of the test<br>• *responseCode* = 0 | -- | -- |
| 7 | UUT sends a first Heartbeat Request message. Verify HeartbeatRequest message is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED" | PASS | -- |
| 8 | SAS Test Harness sends a Heartbeat Response message, with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = current UTC time + 200 seconds<br>• *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:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED"<br>and SAS Test Harness responds with a Heartbeat Response message including the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = current UTC time + 200 seconds<br>• *responseCode* = 0 | PASS | -- |
| 10 | Monitor the RF output of the UUT from start of test until UUT transmission commences. Verify:<br>• UUT does not transmit at any time prior to completion of the first heartbeat response<br>• UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F. | PASS | -- |

## 3.12 WINNF.FT.C.HBT.3 - Heartbeat responseCode=105 (DEREGISTER)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | UUT sends a Heartbeat Request message.<br>Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, including the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = *T* = *Current UTC time*<br>• *responseCode* = 105 (DEREGISTER) | -- | -- |
| 4 | After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. | -- | -- |
| 5 | Monitor the RF output of the UUT. Verify:<br>• UUT shall stop transmission within (T + 60 seconds) of completion of step 3 | PASS | -- |

## 3.13 WINNF.FT.C.HBT.4 - Heartbeat responseCode=500 (TERMINATED_GRANT)

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

## 3.14 WINNF.FT.C.HBT.5 - Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request) | -- | -- |
| 2 | UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, including the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = T = current UTC time<br>• *responseCode* = 501 (SUSPENDED_GRANT) | -- | -- |
| 4 | After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. | -- | -- |
| 5 | Monitor the SAS-CBSD interface. Verify either A OR B occurs:<br>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED"<br>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:<br>• *cbdsId* = C<br>• *grantId* = G<br>Monitor the RF output of the UUT. Verify:<br>• UUT does not transmit at any time | PASS | -- |

## 3.15 WINNF.FT.C.HBT.6 - Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | UUT sends a Heartbeat Request message.<br>Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, including the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = T = current UTC time<br>• *responseCode* = 501 (SUSPENDED_GRANT) | -- | -- |
| 4 | After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. | -- | -- |
| 5 | Monitor the SAS-CBSD interface. Verify either A OR B occurs:<br>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED"<br>B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters:<br>• *cbdsId* = C<br>• *grantId* = G<br>Monitor the RF output of the UUT. Verify:<br>• UUT shall stop transmission within (*T* + 60 seconds) of completion of step 3 | PASS | -- |

## 3.16 WINNF.FT.C.HBT.7 - Heartbeat responseCode=502 (UNSYNC_OP_PARAM)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | UUT sends a Heartbeat Request message.<br>Verify Heartbeat Request message is sent within latest specified *heartbeatInterval*, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, including the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = T = Current UTC Time<br>• *responseCode* = 502 (UNSYNC_OP_PARAM) | -- | -- |
| 4 | After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. | -- | -- |
| 5 | Monitor the SAS-CBSD interface. Verify:<br>• UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters:<br>o *cbdsId* = C<br>o *grantId* = G<br>Monitor the RF output of the UUT. Verify:<br>• UUT shall stop transmission within (T+60) seconds of completion of step 3. | PASS | -- |

## 3.17 WINNF.FT.C.HBT.9 - Heartbeat Response Absent (First Heartbeat)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request) | -- | -- |
| 2 | UUT sends a Heartbeat Request message.<br>Ensure Heartbeat Request message is sent within latest specified *heartbeatInterval*, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED" | PASS | -- |
| 3 | After completion of Step 2, SAS Test Harness does not respond to any further messages from UUT to simulate loss of network connection | -- | -- |
| 4 | Monitor the RF output of the UUT from start of test to 60 seconds after step 3.<br>Verify:<br>• At any time during the test, UUT shall not transmit on RF interface | PASS | -- |

## 3.18 WINNF.FT.C.HBT.10 - Heartbeat Response Absent (Subsequent Heartbeat)

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>o *grantExpireTime* = UTC time greater than duration of the test<br>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface | -- | -- |
| 2 | UUT sends a Heartbeat Request message. Verify HeartbeatRequest message is sent within the latest specified *heartbeatInterval*, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = current UTC time + 200 seconds<br>• *responseCode* = 0 | -- | -- |
| 4 | After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT | -- | -- |
| 5 | Monitor the RF output of the UUT. Verify:<br>• UUT shall stop all transmission on RF interface within (*transmitExpireTime* + 60 seconds), using the transmitExpireTime sent in Step 3. | PASS | -- |

## 3.19 WINNF.FT.C.HBT.11 - Successful Grant Renewal in Heartbeat Test Case

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has registered successfully with SAS Test Harness<br>• UUT has a valid single grant as follows:<br>o valid *cbsdId* = C<br>o valid *grantId* = G<br>o grant is for frequency range F, power P<br>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface.<br>• Grant has the following parameters at the start of the test:<br>o *grantExpireTime* = UTC time equal to time at start of test + 300 seconds = Tgrant_expire<br>o *transmitExpireTime* = UTC time equal to time at start of test + 200 seconds<br>o *heartbeatInterval* = 60 seconds | -- | -- |
| 2 | UUT sends a Heartbeat Request message.<br>If Heartbeat Request message contains grantRenew = TRUE, go to Step 6, else go to Step 3. | -- | -- |
| 3 | Verify Heartbeat Request message is sent within the latest specified *heartbeatInterval*, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 4 | SAS Test Harness sends a Heartbeat Response message, with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = current UTC + 200 seconds<br>• *grantExpireTime* = same as Step 1<br>• *responseCode* = 0 | -- | -- |
| 5 | Go to Step 2 | -- | -- |
| 6 | Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED"<br>• *grantRenew* = TRUE | PASS | -- |

| | | | |
|---|---|---|---|
| 7 | SAS Test Harness sends a Heartbeat Response message, with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *grantExpireTime* = UTC time set far in the future<br>• *transmitExpireTime* = current UTC time + 200 seconds<br>• *responseCode* = 0 | -- | -- |
| 8 | Continue to respond to any subsquent Heartbeat Request from CBSD with Heartbeat Response with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = same as Step 7<br>• *responseCode* = 0 | -- | -- |
| 9 | Monitor RF transmission of UUT from start of test until Tgrant_expire + 60 seconds and ensure UUT continues to transmit throughout the time period. | PASS | -- |

## 3.20 WINNF.FT.C.MES.1 - Registration Response contains measReportConfig

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness | -- | -- |
| 2 | UUT sends a Registration Request message.<br>Validate the Registration Request message is formatted correctly, including:<br>• *userId* is present and correct<br>• *fccId* is present and correct<br>• *cbsdSerialNumber* is present and correct<br>• *measCapability* = "RECEIVED_POWER_WITHOUT_GRANT" | PASS | -- |
| 3 | SAS Test Harness sends a Registration Response message, with the following parameters:<br>• *cbsdId* = C = valid cbsdId for this UUT<br>• *measReportConfig*= "RECEIVED_POWER_WITHOUT_GRANT"<br>• *responseCode* = 0 | -- | -- |
| 4 | UUT sends a message:<br>• If message is type Spectrum Inquiry Request, go to step 5, or<br>• If message is type Grant Request, go to step 7 | -- | -- |
| 5 | UUT sends message type Spectrum Inquiry Request. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *measReport* is present, and is a properly formatted *rcvdPowerMeasReport.* | PASS | -- |
| 6 | SAS Test Harness sends a Spectrum Inquiry Response, with the following parameters:<br>• *cbsdId* = C<br>• *availableChannel* is an array of *availableChannel* objects<br>• *responseCode* = 0 | -- | -- |
| 7 | UUT sends message type Grant Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *measReport* is present, and is a properly formatted *rcvdPowerMeasReport.* | PASS | -- |

## 3.21 WINNF.FT.C.MES.3 - Grant Response contains measReportConfig

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C and *measCapability* = "RECEIVED_POWER_WITH_GRANT" | -- | -- |
| 2 | UUT sends a Grant Request message.<br>Verify Grant Request message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *operationParam* is present and format is valid | PASS | -- |
| 3 | SAS Test Harness sends a Grant Response message, with the following parameters:<br>• *cbsdId* = C<br>• *grantId* = G = valid grant ID<br>• *grantExpireTime* = UTC time in the future<br>• *heartbeatInterval* = 60 seconds<br>• *measReportConfig*="RECEIVED_POWER_WITH_GRANT"<br>• *operationParam* is set to valid operating parameters<br>• *channelType* = "GAA"<br>• *responseCode* = 0 | -- | -- |
| 4 | UUT sends a Heartbeat Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "GRANTED" | PASS | -- |
| 5 | If Heartbeat Request message (step 4) contains *measReport* object, then:<br>• verify *measReport* is properly formatted as object *rcvdPowerMeasReport*<br>• end test, with PASS result<br>else, if Heartbeat Request message (step 4) does not contain measReport object, then:<br>If number of Heartbeat Requests sent by UUT after Step 3 is = 5, then stop test with result of FAIL | PASS | -- |
| 6 | SAS Test Harness sends a Heartbeat Response message, containing all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *transmitExpireTime* = current UTC time + 200 seconds<br>• *responseCode*=0<br>Go to Step 4, above | -- | -- |

## 3.22 WINNF.FT.C.MES.4 - Heartbeat Response contains measReportConfig

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C and *measCapability* = "RECEIVED_POWER_WITH_GRANT"<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>• Grant has *heartbeatInterval* = 60 seconds | -- | -- |
| 2 | UUT sends a Heartbeat Request message. Verify Heartbeat Request message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *operationState* = "AUTHORIZED" | PASS | -- |
| 3 | SAS Test Harness sends a Heartbeat Response message, containing all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *measReportConfig*="RECEIVED_POWER_WITH_GRANT"<br>• *responseCode* = 0 | -- | -- |
| 4 | UUT sends a Heartbeat Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• operationState = "AUTHORIZED" | PASS | -- |
| 5 | If Heartbeat Request message (step 4) contains *measReport* object, then:<br>• verify *measReport* is properly formatted as object *rcvdPowerMeasReport*<br>• end test, with PASS result<br>else, if Heartbeat Request message (step 4) does not contain measReport object, then:<br>• If number of Heartbeat Requests sent by UUT after Step 3 is= 5, then stop test with result of FAIL | PASS | -- |
| 6 | SAS Test Harness sends a Heartbeat Response message, containing all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G<br>• *responseCode*=0<br>Go to Step 4, above | -- | -- |

## 3.23 WINNF.FT.C.RLQ.1 - Successful Relinquishment

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to relinquish UUT Grant from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G | PASS | -- |
| 3 | SAS Test Harness shall approve the request with a Relinquishment Response message with parameters:<br>– *cbsdId* = C<br>– *grantId* = G<br>– *responseCode* = 0 | -- | -- |
| 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 the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:<br>• UUT shall stop RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request | PASS | -- |

## 3.24 WINNF.FT.C.RLQ.3 - Unsuccessful Relinquishment, responseCode=102

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to Relinquish UUT Grant from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G | -- | -- |
| 3 | SAS Test Harness shall send a Relinquishment Response message with parameters:<br>• *cbsdId* = C<br>• No *grantId*<br>• *responseCode* = R | -- | -- |
| 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:<br>• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request | PASS | -- |

## 3.25 WINNF.FT.C.RLQ.5 - Unsuccessful Relinquishment, responseCode=103

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to Relinquish UUT Grant from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:<br>• *cbsdId* = C<br>• *grantId* = G | -- | -- |
| 3 | SAS Test Harness shall send a Relinquishment Response message with parameters:<br>• *cbsdId* = C<br>• No *grantId*<br>• *responseCode* = R | -- | -- |
| 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:<br>• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request | PASS | -- |

## 3.26 WINNF.FT.C.DRG.1 - Successful Deregistration

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to deregister UUT from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0 | -- | -- |
| 3 | UUT sends Deregistration Request to SAS Test Harness with *cbsdId*= C. | PASS | -- |
| 4 | SAS Test Harness shall approve the request with a Deregistration Response message with parameters:<br>• *cbsdId* = C<br>• *responseCode* = 0 | -- | -- |
| 5 | After completion of step 3, SAS Test Harness will not provide any additional positive response (*responseCode*=0) to further request messages from the UUT. | -- | -- |
| 6 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:<br>• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs:<br>A. UUT sending a Registration Request message, as this is not mandatory<br>B. UUT sending a Deregistration Request message | PASS | -- |

## 3.27 WINNF.FT.C.DRG.3 - Deregistration responseCode=102

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to deregister UUT from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0 | -- | -- |
| 3 | UUT sends Deregistration Request to SAS Test Harness with *cbsdId*= C | -- | -- |
| 4 | The SAS Test Harness sends the Deregistration Response Message to UUT with:<br>• No *cbsdId*<br>• *responseCode* = 102 | -- | -- |
| 5 | After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=0) to further request messages from the UUT. | -- | -- |
| 6 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:<br>• UUT stopped RF transmission at anytime between triggering the deregistration and either A OR B occurs:<br>A. UUT sending a Registration Request message, as this is not mandatory<br>B. UUT sending a Deregistration Request message | PASS | -- |

## 3.28 WINNF.FT.C.DRG.5 - Deregistration responseCode=103

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness<br>• UUT has successfully registered with SAS Test Harness, with *cbsdId*=C<br>• UUT has received a valid grant with *grantId* = G<br>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.<br>Invoke trigger to deregister UUT from the SAS Test Harness | -- | -- |
| 2 | UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0 | -- | -- |
| 3 | UUT sends Deregistration Request to SAS Test Harness with *cbsdId*= C | -- | -- |
| 4 | The SAS Test Harness sends the Deregistration Response Message to UUT with:<br>• No *cbsdId*<br>• *responseCode* = 103 | -- | -- |
| 5 | After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=0) to further request messages from the UUT. | -- | -- |
| 6 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:<br>• UUT stopped RF transmission at anytime between triggering the deregistration and either A OR B occurs:<br>A. UUT sending a Registration Request message, as this is not mandatory<br>B. UUT sending a Deregistration Request message | PASS | -- |

## 3.29 WINNF.FT.C.SCS.1 - Successful TLS connection between UUT and SAS Test Harness

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | • UUT shall start CBSD-SAS communication with the security procedure<br>• The UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate.<br>• Configure the SAS Test Harness to accept the security procedure and establish the connection | PASS | -- |
| 2 | • Make sure that Mutual authentication happens between UUT and the SAS Test Harness.<br>• Make sure that UUT uses TLS v1.2<br>• Make sure that cipher suites from one of the following is selected,<br>  • TLS_RSA_WITH_AES_128_GCM_SHA256<br>  • TLS_RSA_WITH_AES_256_GCM_SHA384<br>  • TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256<br>  • TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384<br>  • TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 | PASS | -- |
| 3 | A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability.<br>• UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with *responseCode* = 0 and *cbsdId*. | PASS | -- |
| 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:<br>• UUT shall not transmit RF | PASS | -- |

## 3.30 WINNF.FT.C.SCS.2 - TLS failure due to revoked certificate

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | • UUT shall start CBSD-SAS communication with the security procedures | PASS | -- |
| 2 | • Make sure that UUT uses TLS v1.2 for security establishment.<br>• Make sure UUT selects the correct cipher suite.<br>• UUT shall use CRL or OCSP to verify the validity of the server certificate.<br>• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness. | PASS | -- |
| 3 | UUT may retry for the security procedure which shall fail | PASS | -- |
| 4 | SAS Test-Harness shall not receive any Registration request or any application data. | -- | -- |
| 5 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:<br>• UUT shall not transmit RF | PASS | -- |

## 3.31 WINNF.FT.C.SCS.3 - TLS failure due to expired server certificate

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | • UUT shall start CBSD-SAS communication with the security procedures | PASS | -- |
| 2 | • Make sure that UUT uses TLS v1.2 for security establishment.<br>• Make sure UUT selects the correct cipher suite.<br>• UUT shall use CRL or OCSP to verify the validity of the server certificate.<br>• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness. | PASS | -- |
| 3 | UUT may retry for the security procedure which shall fail. | PASS | -- |
| 4 | SAS Test-Harness shall not receive any Registration request or any application data. | -- | -- |
| 5 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:<br>• UUT shall not transmit RF | PASS | -- |

## 3.32 WINNF.FT.C.SCS.4 - TLS failure when SAS Test Harness certificate is issued by an unknown CA

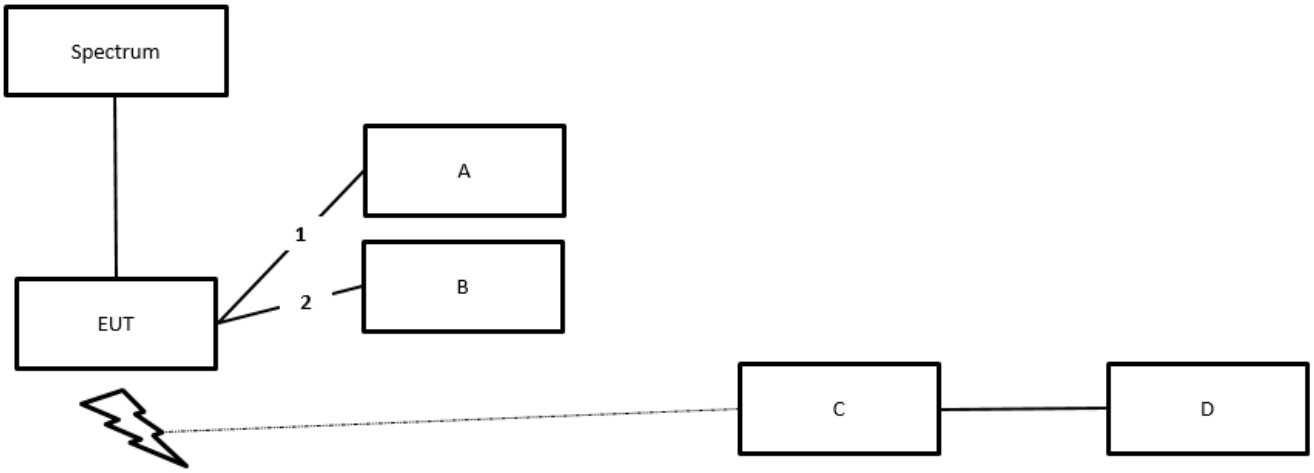
| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | • UUT shall start CBSD-SAS communication with the security procedures | PASS | -- |
| 2 | • Make sure that UUT uses TLS v1.2 for security establishment.<br>• Make sure UUT selects the correct cipher suite.<br>• UUT shall use CRL or OCSP to verify the validity of the server certificate<br>• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness. | PASS | -- |
| 3 | UUT may retry for the security procedure which shall fail. | PASS | -- |
| 4 | SAS Test-Harness shall not receive any Registration request or any application data. | -- | -- |
| 5 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:<br>• UUT shall not transmit RF | PASS | -- |

## 3.33 WINNF.FT.C.SCS.5 - TLS failure when certificate at the SAS Test Harness is corrupted

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | • UUT shall start CBSD-SAS communication with the security procedures | PASS | -- |
| 2 | • Make sure that UUT uses TLS v1.2 for security establishment.<br>• Make sure UUT selects the correct cipher suite.<br>• UUT shall use CRL or OCSP to verify the validity of the server certificate.<br>• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness. | PASS | -- |
| 3 | UUT may retry for the security procedure which shall fail. | PASS | -- |
| 4 | SAS Test-Harness shall not receive any Registration request or any application data. | -- | -- |
| 5 | Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:<br>• UUT shall not transmit RF | PASS | -- |

## 3.34 WINNF.PT.C.HBT.1 - UUT RF Transmit Power Measurement

| Items | Parameters |
|---|---|
| **Maximum rated power (EIRP, dBm/MHz)** | 20dBm/MHz |
| **Transmit dynamic range (EIRP, dBm/MHz)** | 20, 18, 16, 14, 12, 10dBm/MHz |
| **Occupied bandwidth (OBW)** | 20MHz |
| **maxEirp values** | 20dBm/MHz |




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | RJ-45 cable | No | 1.5m |
| 2 | RJ-45 cable | No | 1.5m |

Note: To ensure EUT transmits with full power across the Bandwidth during the on duration of duty cycle, EUT is running maximum traffic during the test.

| Spectrum Analyzer Setting | Parameters |
|---|---|
| **Center Frequency** | 3600MHz |
| **Frequency Span** | 30MHz |
| **RBW / VBW** | 1 MHz / 3MHz |
| **Channel Power Meas Bandwidth** | 10MHz |
| **Sweep Time** | 1ms |

| # | Test Execution Steps | Results | |
|---|---|---|---|
| 1 | Ensure the following conditions are met for test entry:<br>• UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness<br>• UUT has registered with the SAS, with CBSD ID = C<br>• UUT has a single valid grant G with parameters {lowFrequency = $F_L$, highFrequency = $F_H$, maxEirp = $P_i$}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case<br><br>*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 | 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:<br>• UUT sends Heartbeat Request, including:<br>o *cbsdId* = C<br>o *grantId* = G<br>• SAS Test Harness responds with Heartbeat Response, including:<br>o *cbsdId* = C<br>o *grantId* = G<br>o *transmitExpireTime* = current UTC time + 200 seconds<br>o *responseCode* = 0 | -- | -- |

| | | | |
|---|---|---|---|
| 3 | Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, $P_i$. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfil the requirements of the power measurement method.<br><br>*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.* | PASS | -- |

| Freq. (MHz) | Bandwidth (MHz) | Ant. Gain (dBi) | Conducted PSD (dBm/MHz) | | | | maxEirp (dBm/MHz) | Grant maxEirp (dBm/MHz) | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | Port 1 | Port 2 | Port 3 | Port4 | | | |
| 3600 | 20 | 6.36 | -3.32 | -3.06 | -3.02 | -2.95 | 9.29 | 20 | PASS |
| 3600 | 20 | 6.36 | -8.50 | -8.07 | -8.41 | -8.85 | 3.93 | 14 | PASS |
| 3600 | 20 | 6.36 | -11.47 | -11.49 | -11.75 | -12.89 | 0.52 | 10 | PASS |

# 4 Test Equipment and Calibration Data

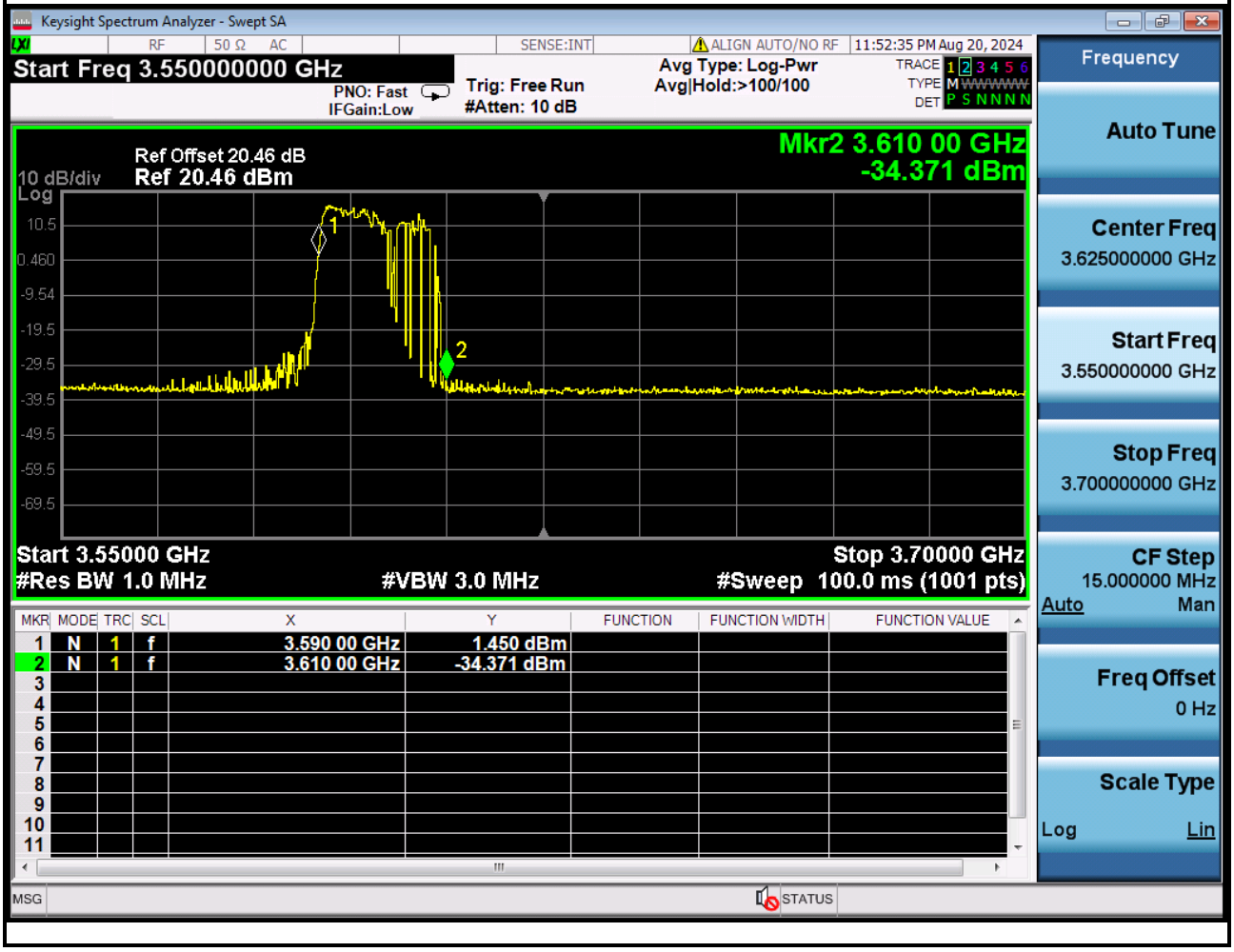
| Instrument | Brand | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| Spectrum analyzer | R&S | FSV40 | 101028 | 9kHz~40GHz | Dec. 22, 2023 | Dec. 21, 2024 | Conducted (TH03-CB) |
| RF Cable | Woken | RG402 | High Cable-11 | 30MHz –18 GHz | Oct. 02, 2023 | Oct. 01, 2024 | Conducted (TH03-CB) |
| RF Cable | Woken | RG402 | High Cable-12 | 30MHz –18 GHz | Oct. 02, 2023 | Oct. 01, 2024 | Conducted (TH03-CB) |
| RF Cable | Woken | RG402 | High Cable-13 | 30MHz –18 GHz | Oct. 02, 2023 | Oct. 01, 2024 | Conducted (TH03-CB) |
| RF Cable-high | Woken | RG402 | High Cable-14 | 1 GHz –18 GHz | Oct. 02, 2023 | Oct. 01, 2024 | Conducted (TH03-CB) |
| RF Cable-high | Woken | RG402 | High Cable-15 | 1 GHz –18 GHz | Oct. 02, 2023 | Oct. 01, 2024 | Conducted (TH03-CB) |
| RF Power Divider | Woken | 2 Way | TH03-DV01 | 1 ~ 6GHz | Oct. 03, 2023 | Oct. 02, 2024 | Conducted (TH03-CB) |
| RF Power Divider | Woken | 4 Way | TH03-DV02 | 1 ~ 6GHz | Oct. 03, 2023 | Oct. 02, 2024 | Conducted (TH03-CB) |

Note: Calibration Interval of instruments listed above is one year.

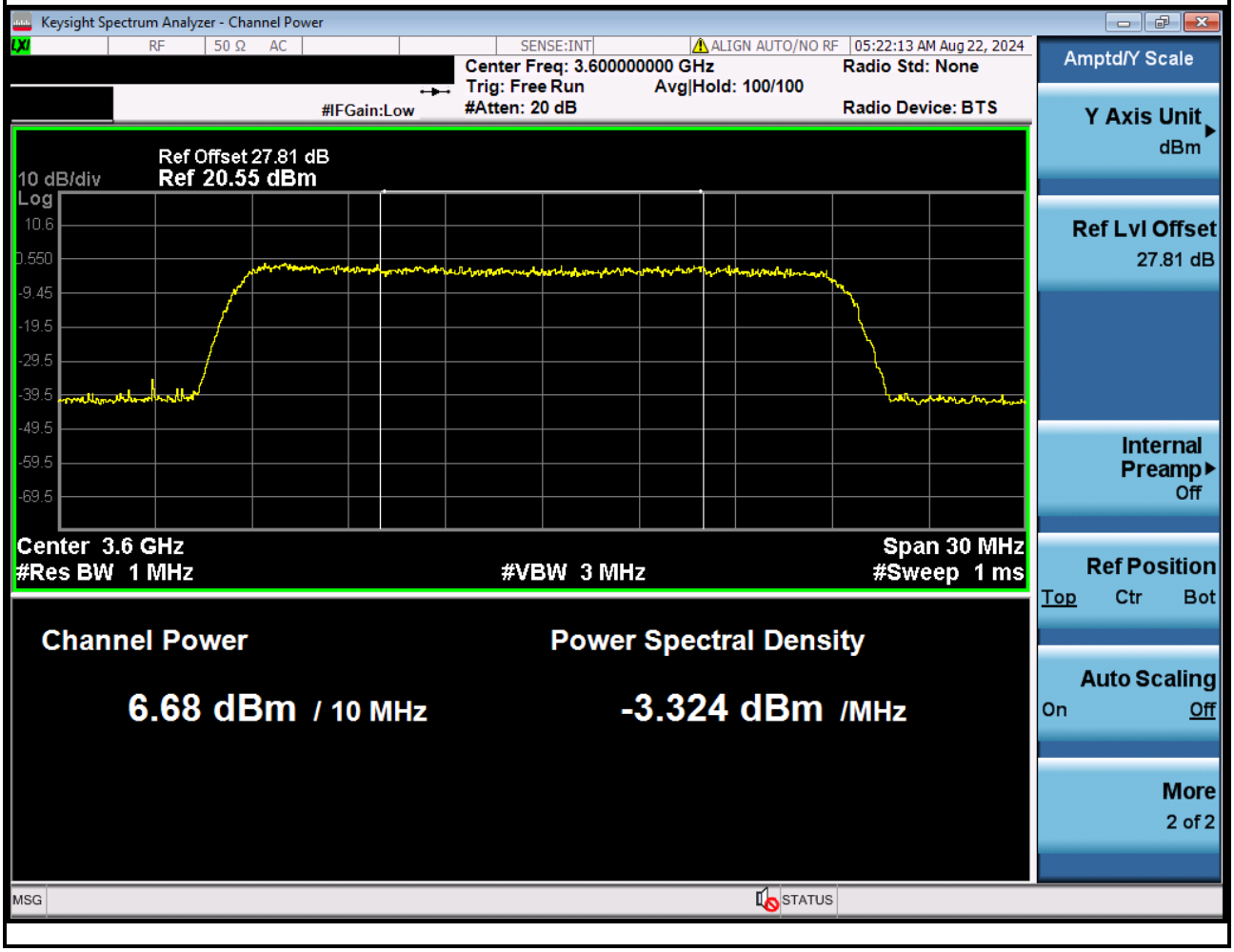
# 5 Measurement Uncertainty

| Test Items | Uncertainty | Remark |
|---|---|---|
| Conducted Emission | 3.1 dB | Confidence levels of 95% |

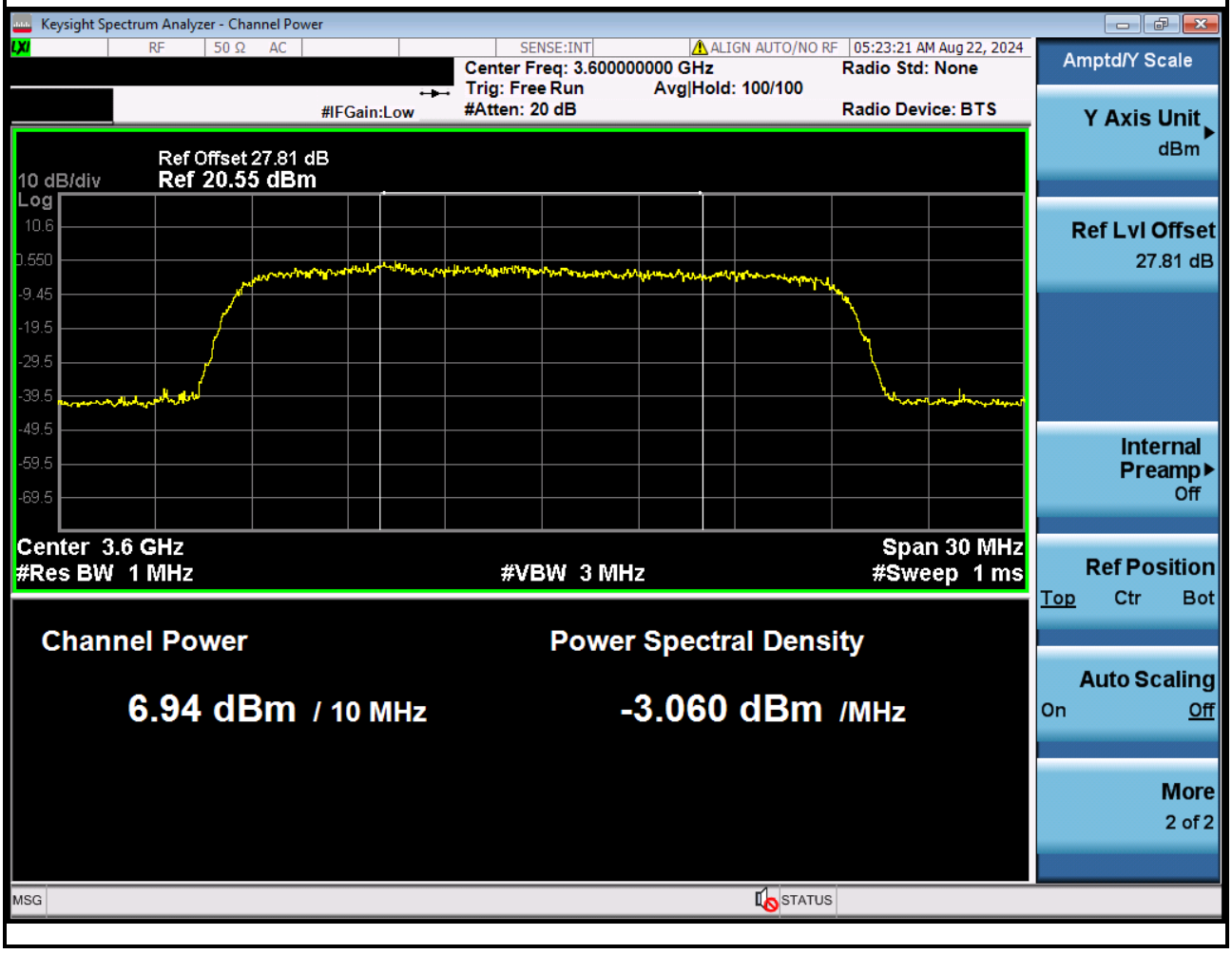
**RF measurement plot for WINNF.FT.C.HBT.1 Test Case ID**



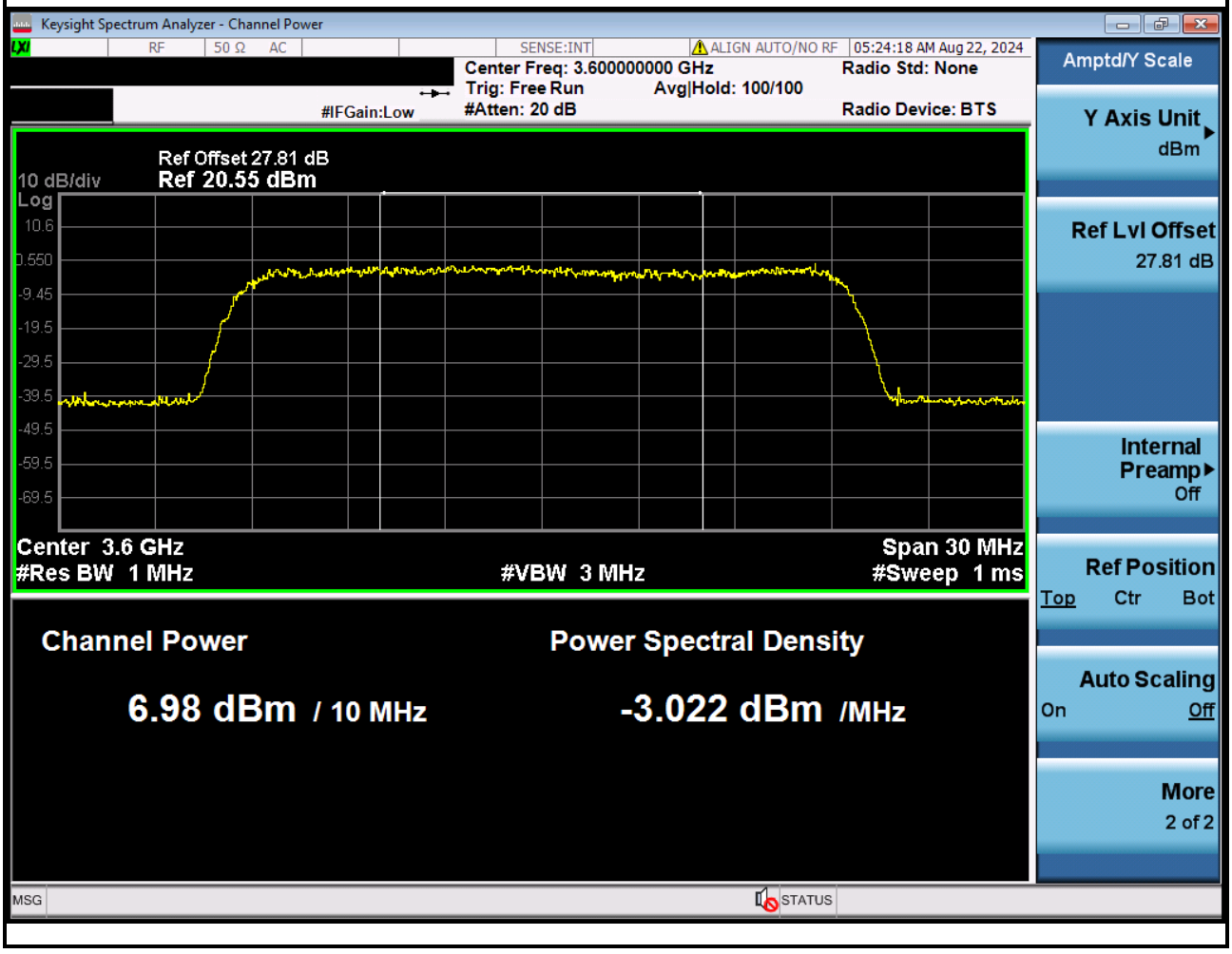
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 20_Port 1**



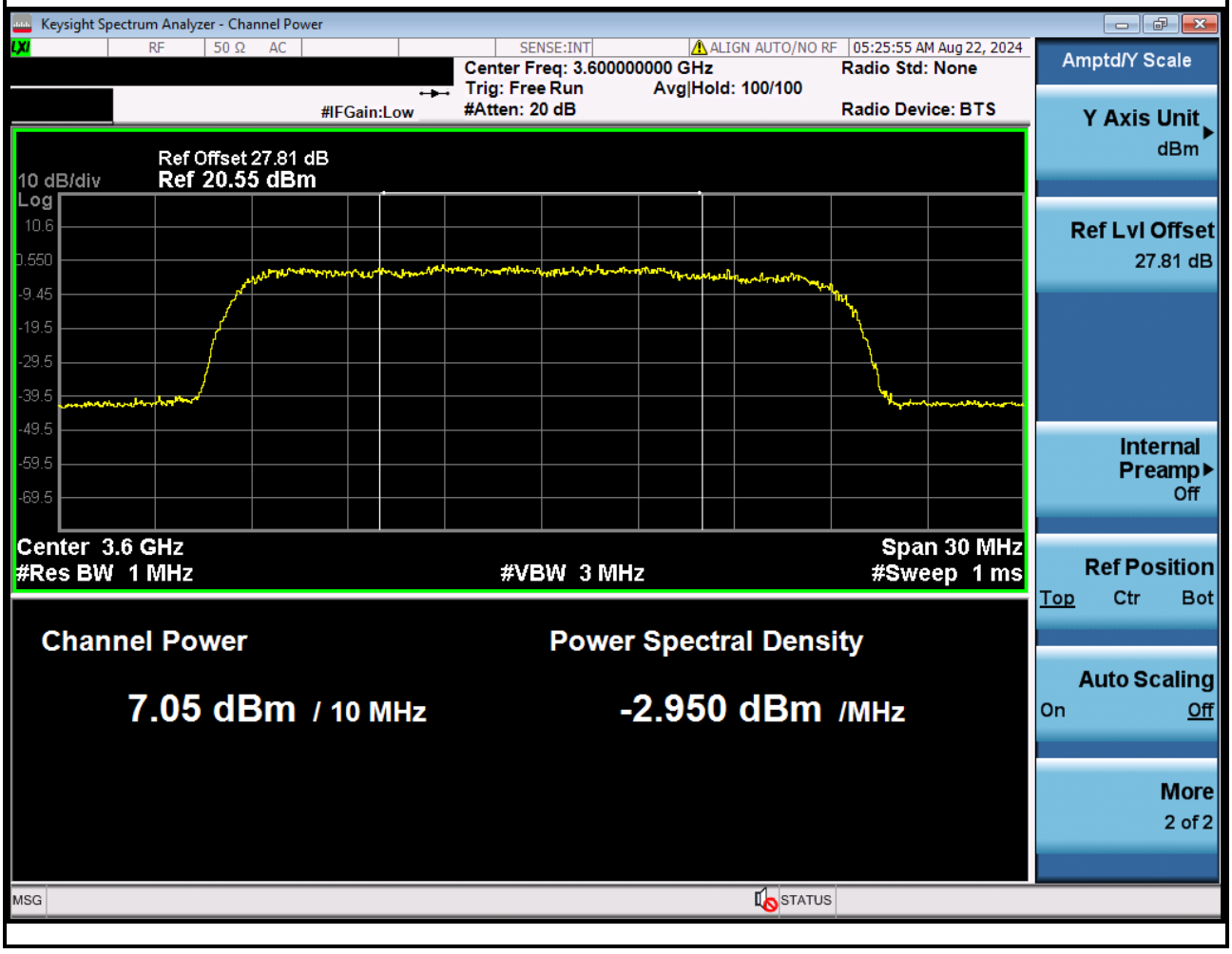
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 20_Port 2**



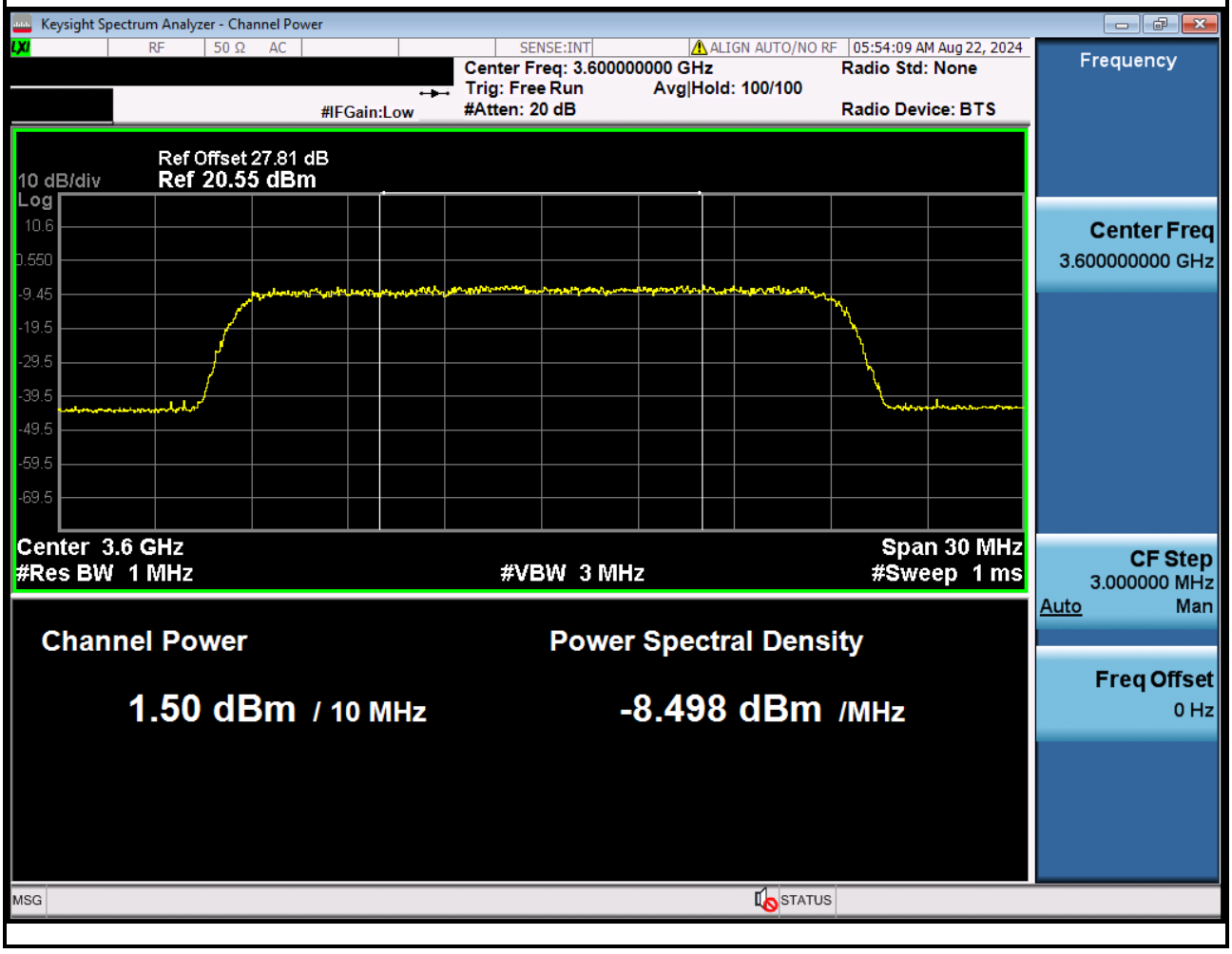
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 20_Port 3**



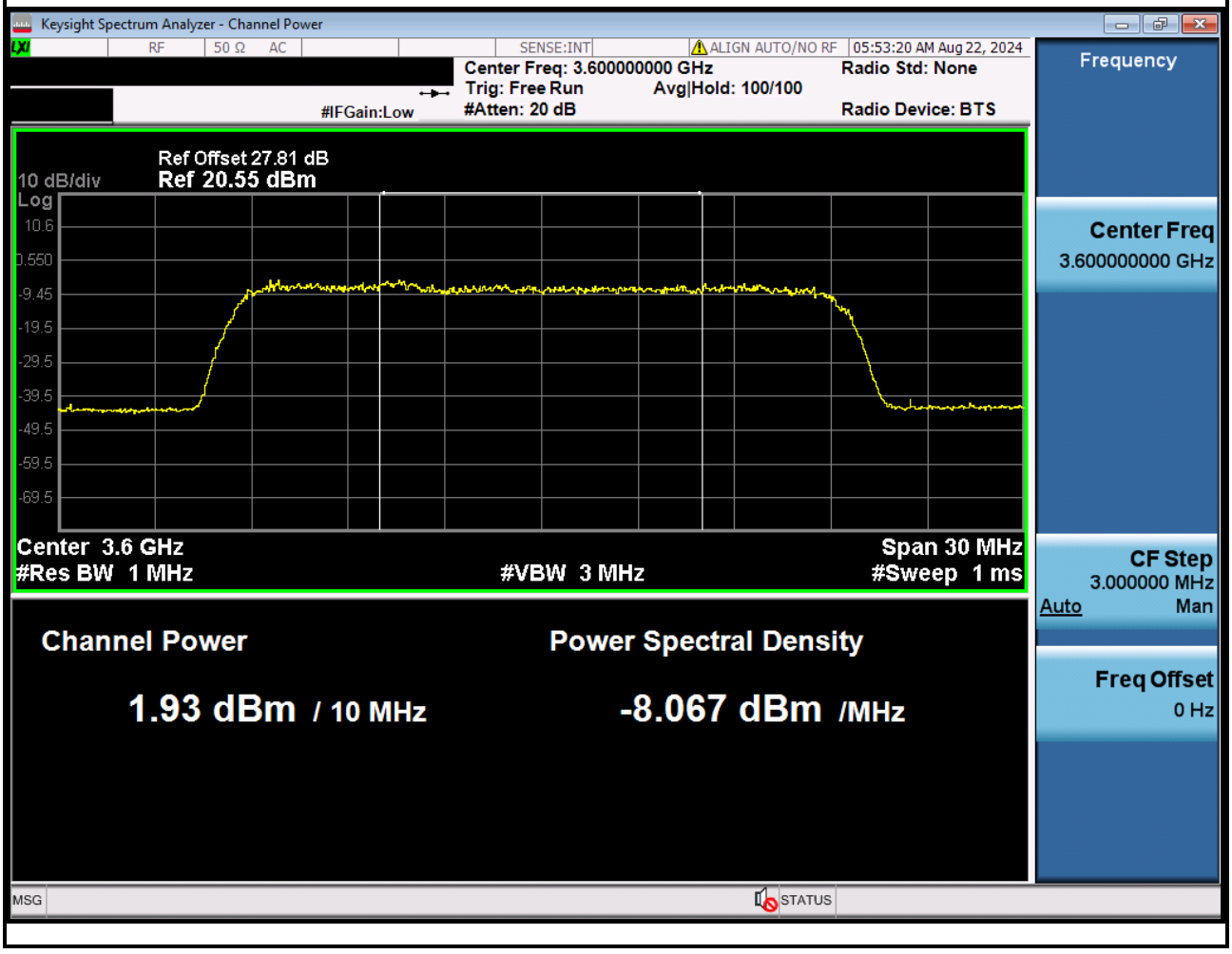
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 20_Port 4**



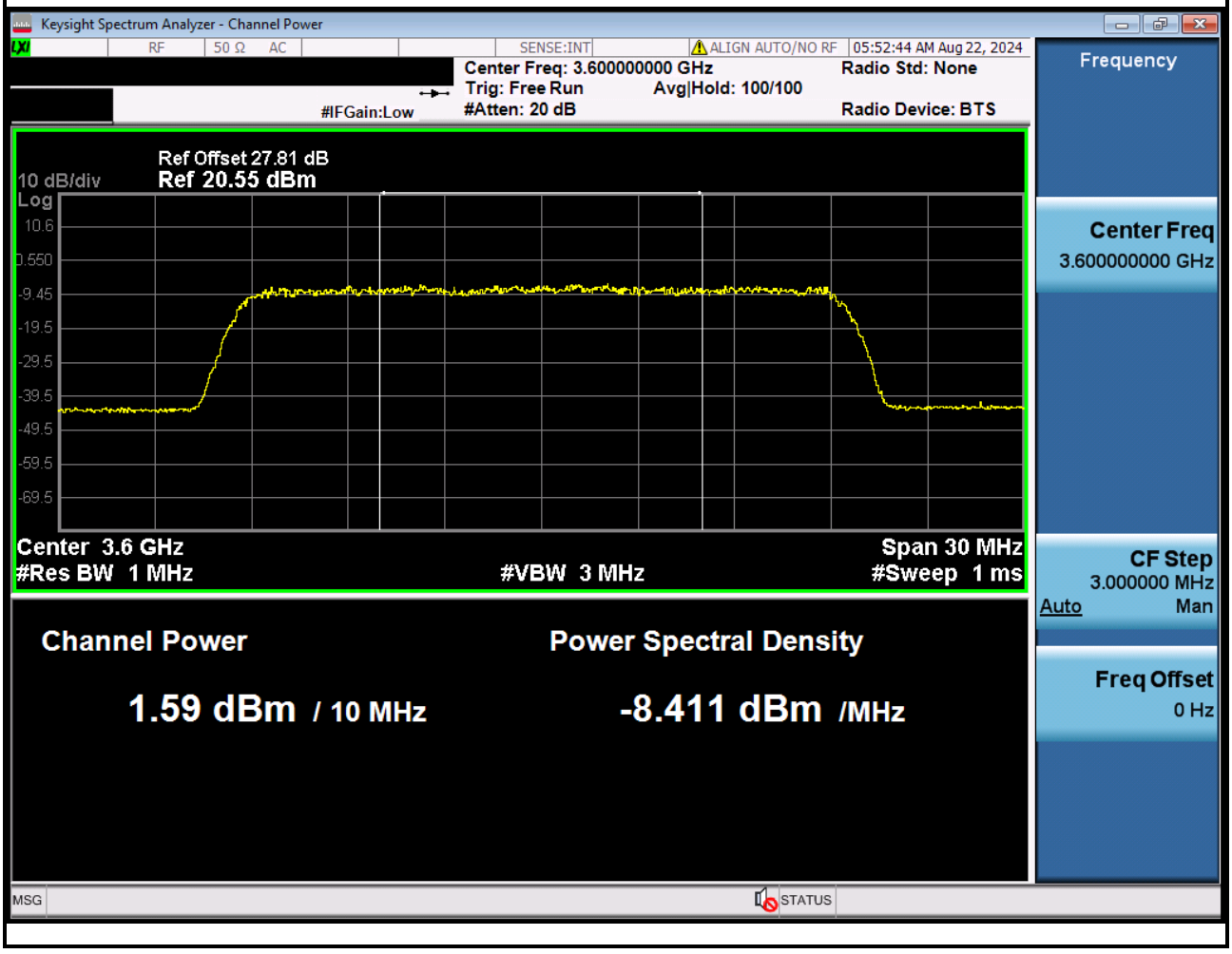
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 14_Port 1**



**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 14_Port 2**

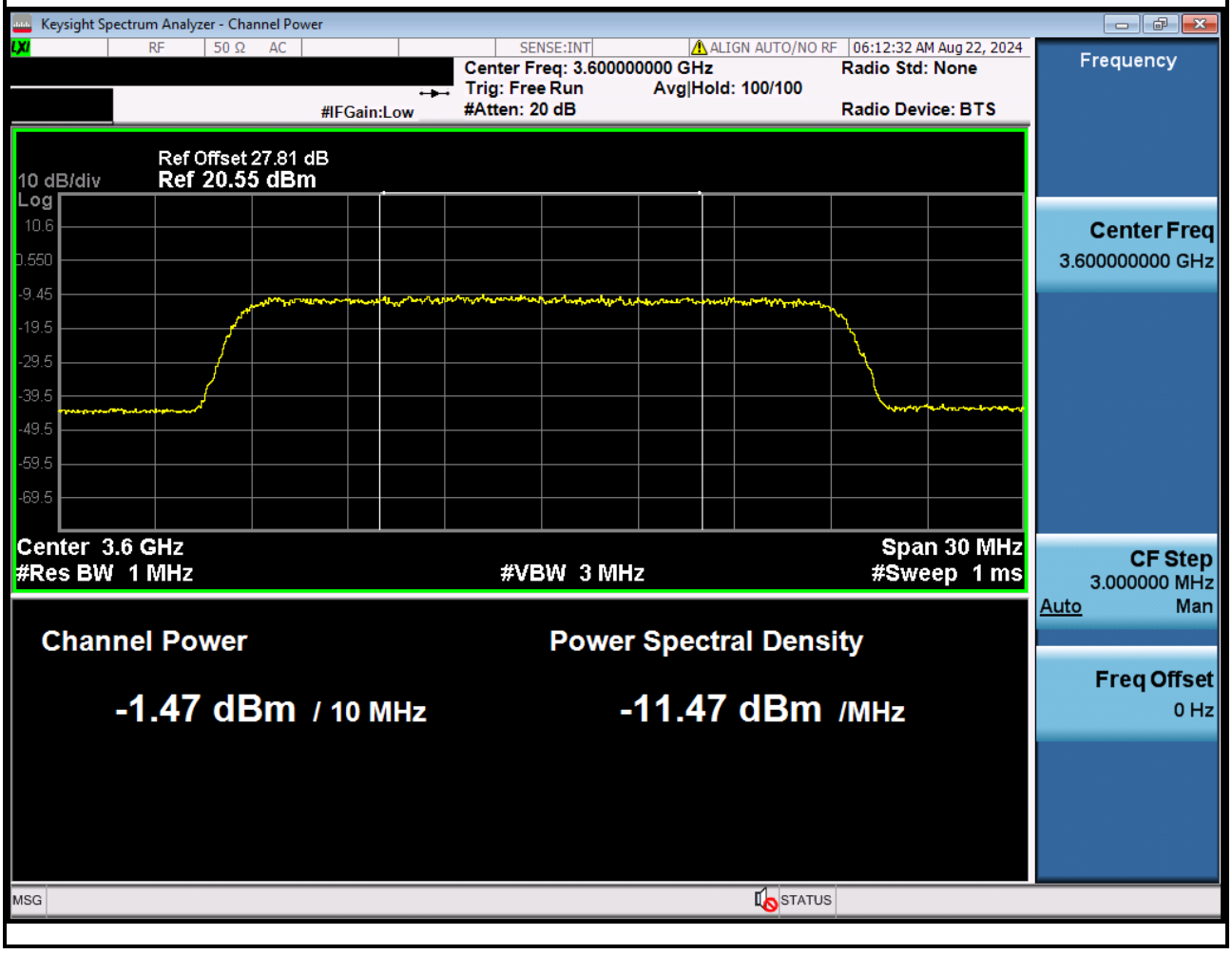


**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 14_Port 3**

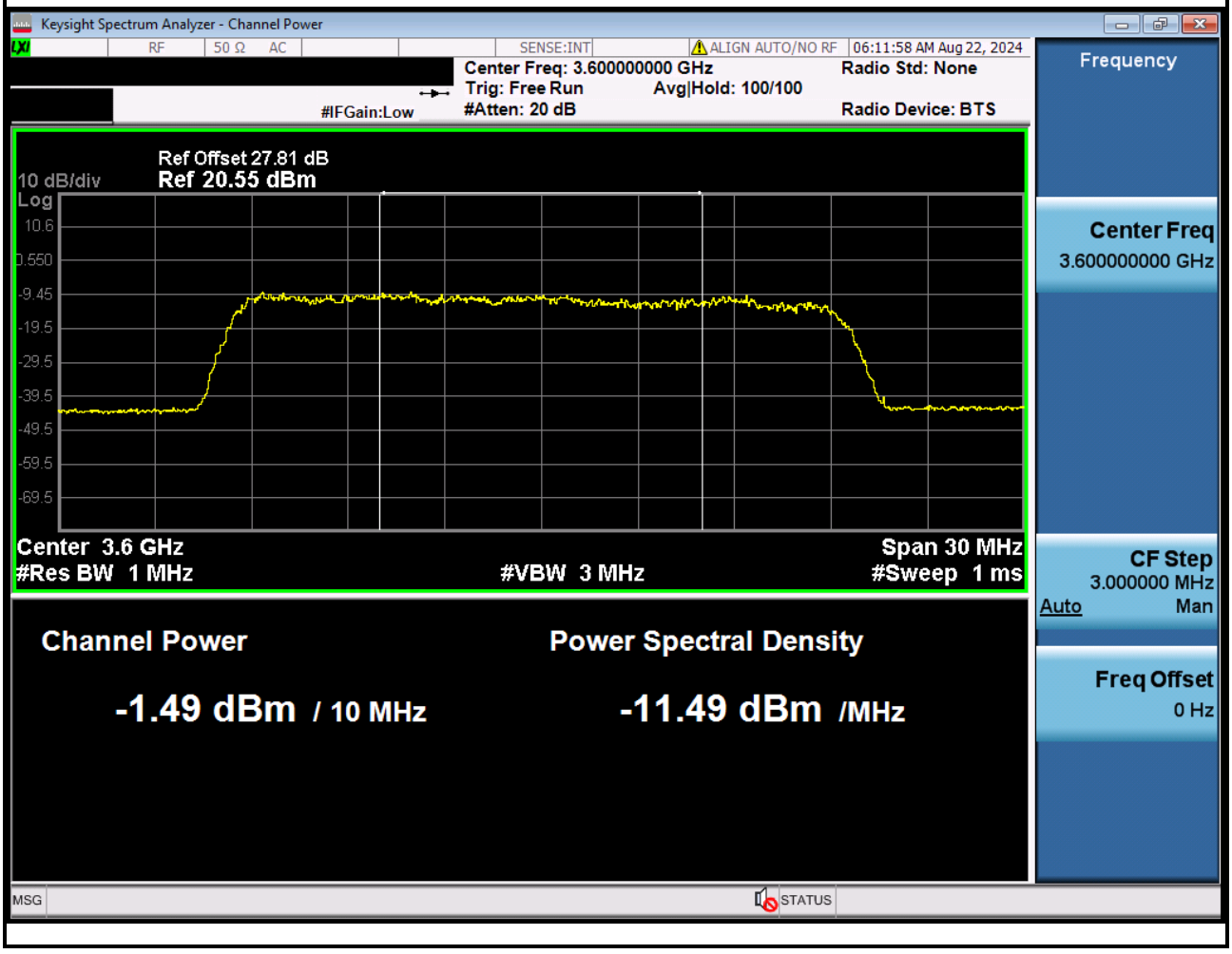


**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 14_Port 4**

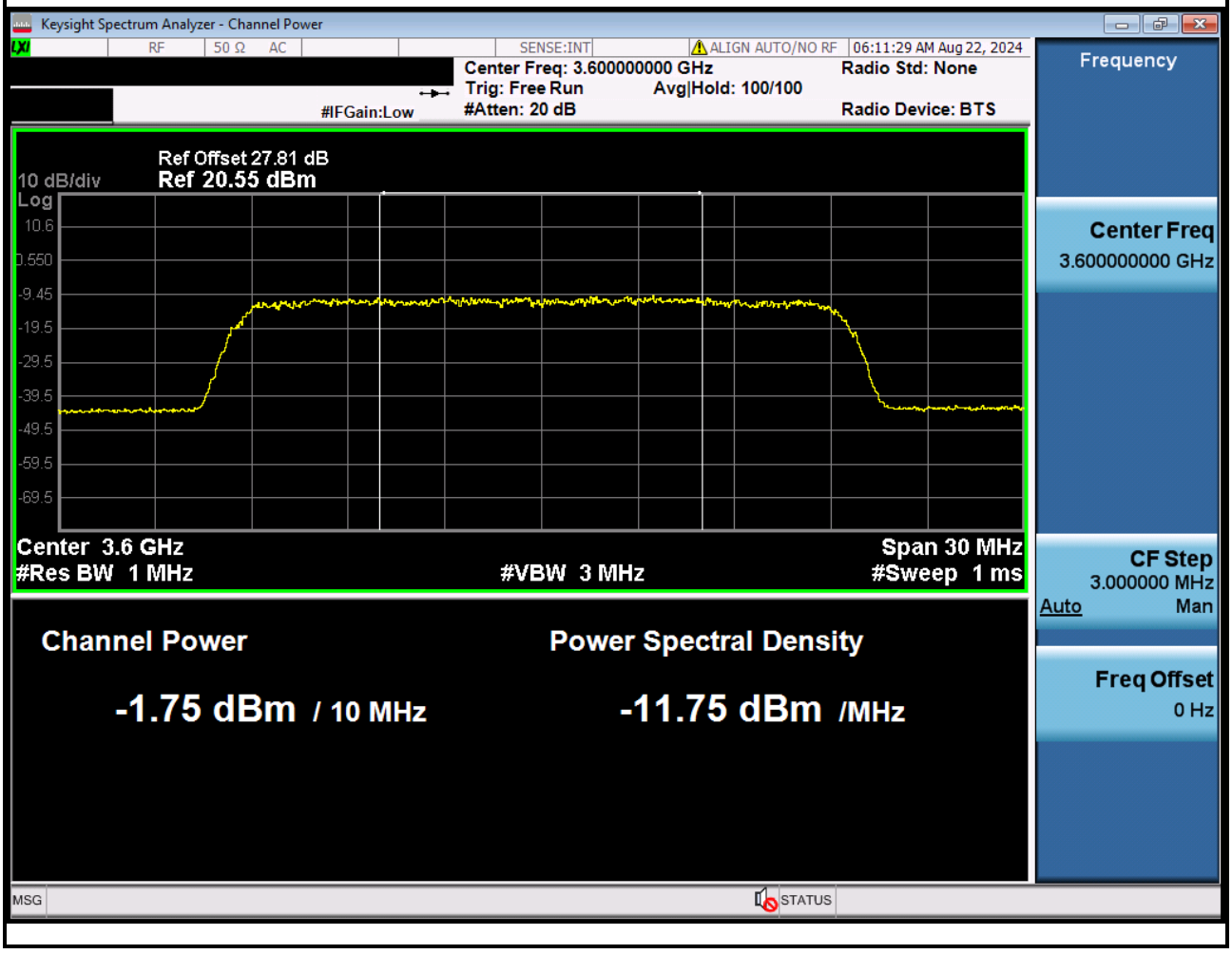
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 10_Port 1**



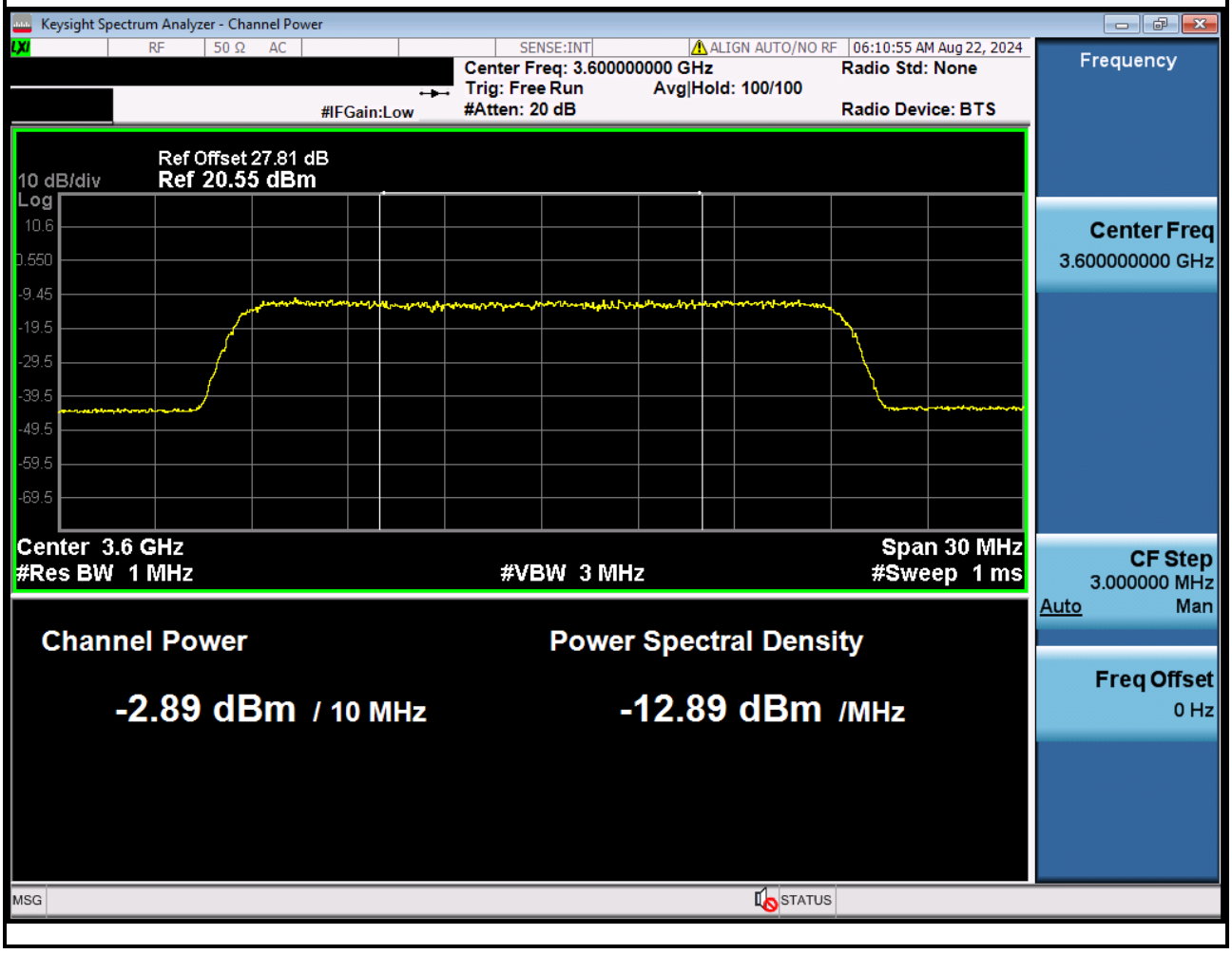
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 10_Port 2**



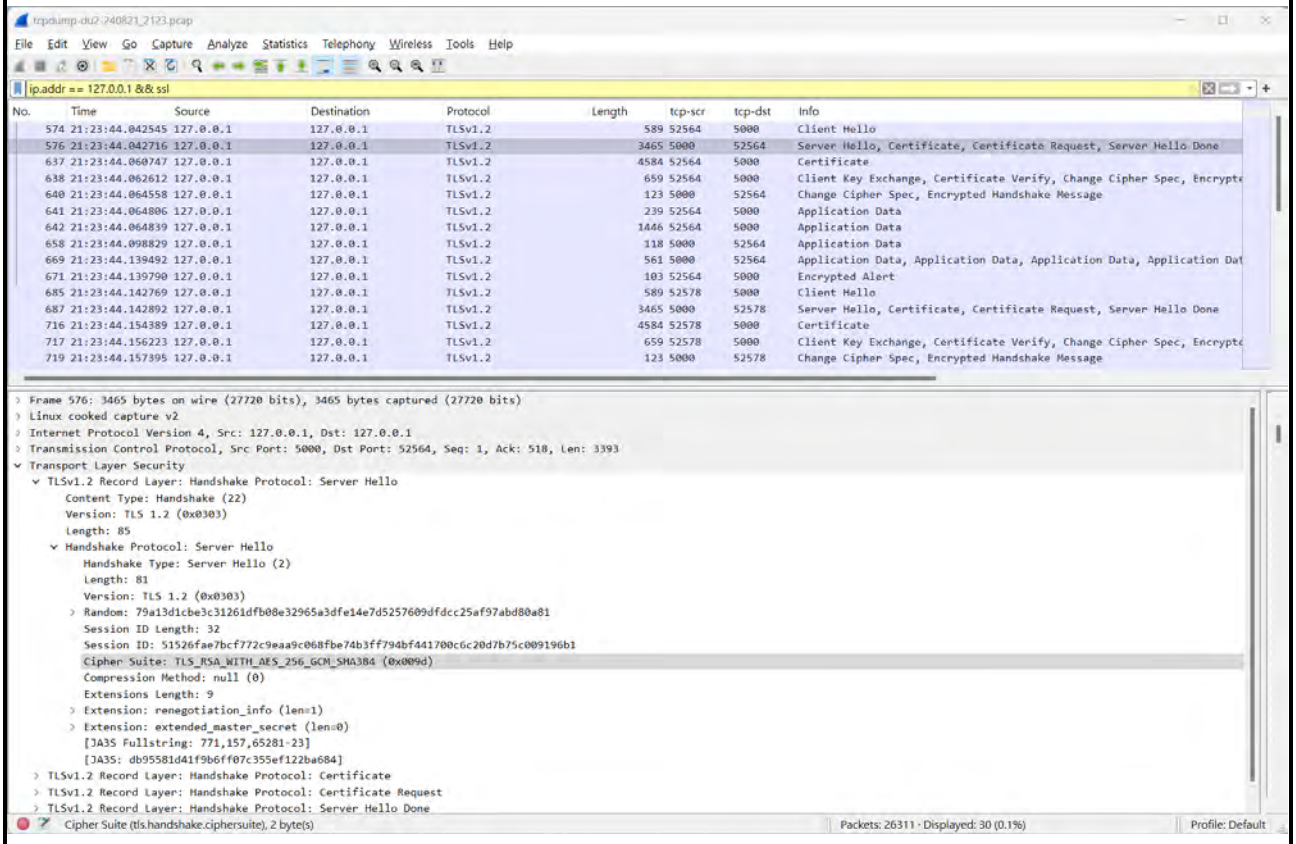
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 10_Port 3**



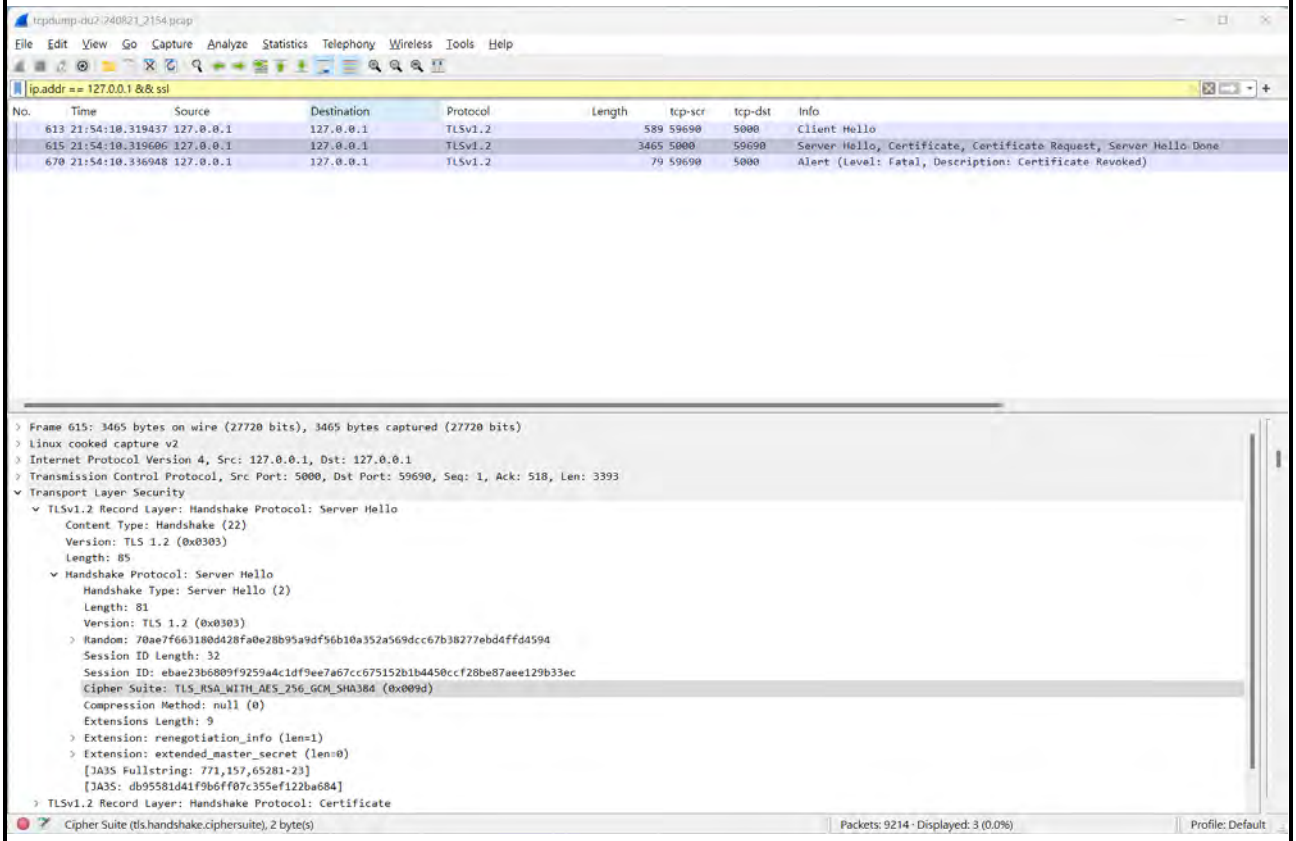
**RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 10_Port 4**



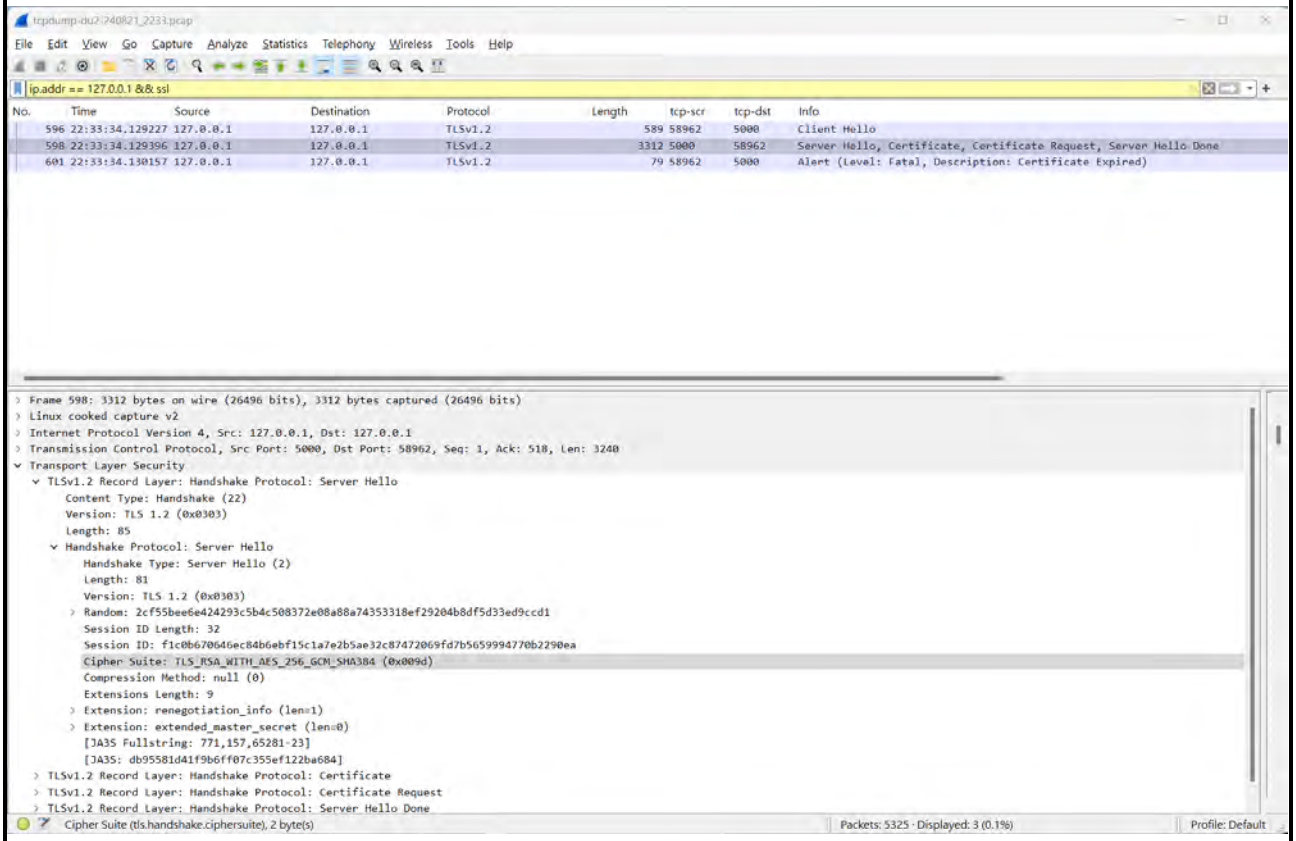
**Wireshark Plots for WINNF.FT.C.SCS.1 Test Case ID**



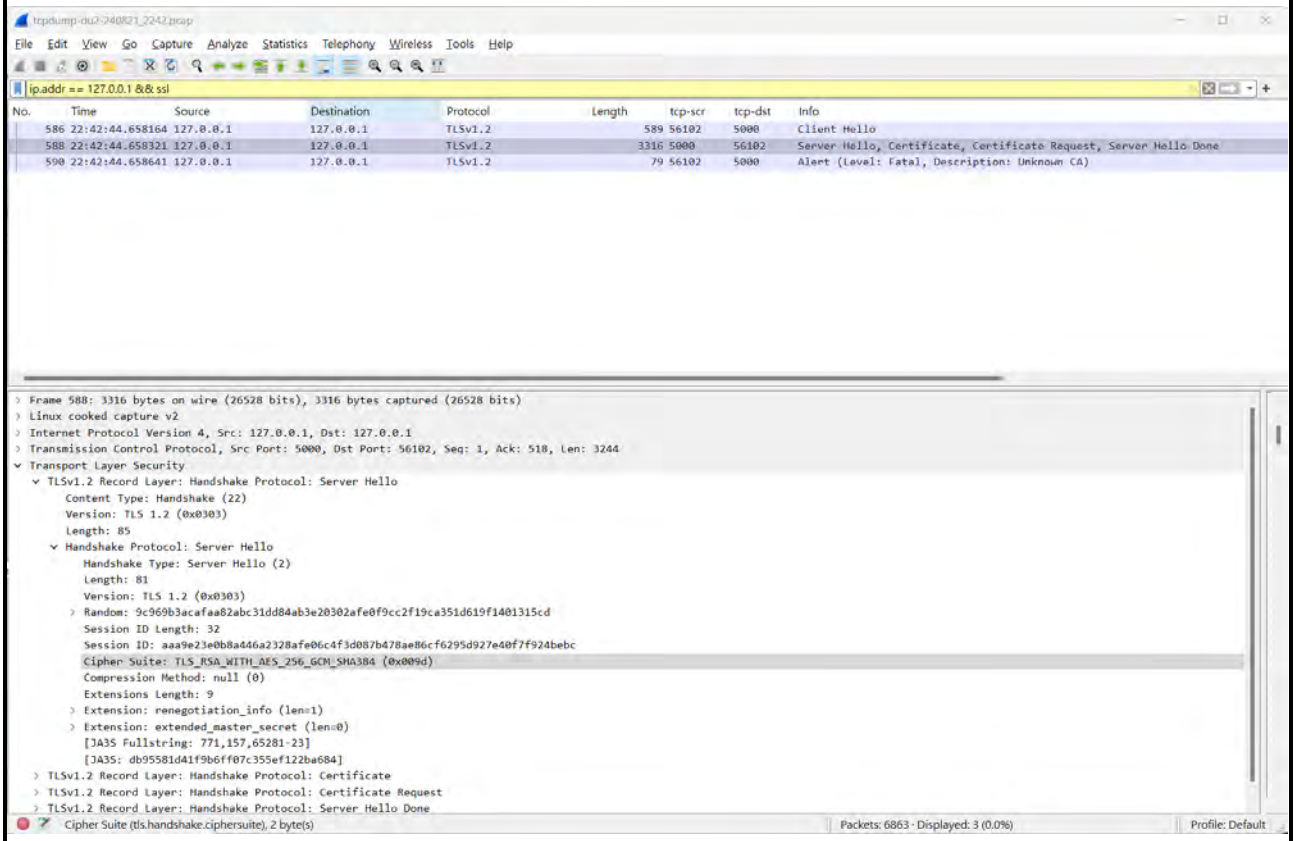
**Wireshark Plots for WINNF.FT.C.SCS.2 Test Case ID**



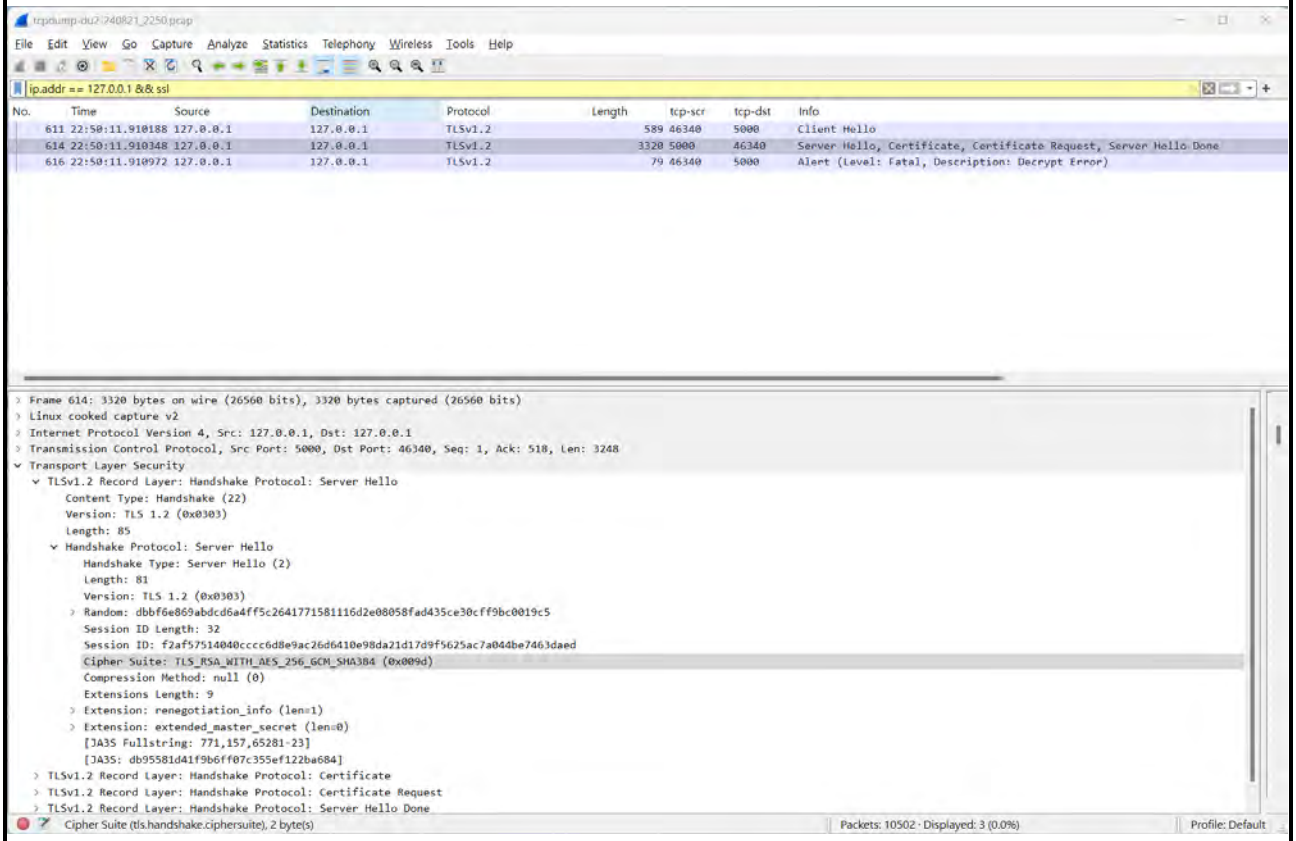
**Wireshark Plots for WINNF.FT.C.SCS.3 Test Case ID**



**Wireshark Plots for WINNF.FT.C.SCS.4 Test Case ID**



## Wireshark Plots for WINNF.FT.C.SCS.5 Test Case ID



## CRL Verify Plots for WINNF.FT.C.SCS.2 Test Case ID