TEST REPORT

Application No.:	KSCR2402000282AT
FCC ID:	WBKRU424048
Applicant:	BTI Wireless
Address of Applicant:	11205 Knott Avenue -Suite A, Cypress, CA 90630, United States
Manufacturer:	BTI Wireless
Address of Manufacturer:	11205 Knott Avenue -Suite A, Cypress, CA 90630, United States
Equipment Under Test (EUT):	
EUT Name:	5G Pico Remote Radio Unit
Model No.:	RU4240
Trade Mark:	
Standard(s) :	CBRSA-TS-9001-V1.2.1 WINNF-TS-0122-V1.0.2 FCC 47 CFR Part 96 KDB 940660 D01 V03
Date of Receipt:	2024-02-26
Date of Test:	2024-03-20 to 2024-05-09
Date of Issue:	2024-05-10
Test Result:	**Pass***

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

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Member of the SGS Group (SGS SA)

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2024-05-10	/

Authorized for issue by:				
Tested By		**Cloud Peng /Project Engineer**		
Approved By		**Terry Hou /Reviewer**		

2 Test Summary

Item	Standard	Test Case ID	Result
Domain Proxy Multi-Step registration	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.2	Pass
Domain Proxy Single-Step registration for Cat A CBSD	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.4	Pass
Domain Proxy Single-Step registration for CBSD with CPI signed data	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.6	Pass
Registration due to change of an installation parameter	WINNF-TS-0122-V1.0.2	WINNF.FT.C.REG.7	Pass
Domain Proxy Missing Required parameters (responseCode 102)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.9	Pass
Domain Proxy Pending registration (responseCode 200)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.11	Pass
Domain Proxy Invalid parameters (responseCode 103)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.13	Pass
Domain Proxy Blacklisted CBSD (responseCode 101)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.15	Pass
Domain Proxy Unsupported SAS protocol version responseCode 100)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.17	Pass
Domain Proxy Group Error (responseCode 201)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.REG.19	Pass
Category A CBSD location update	WINNF-TS-0122-V1.0.2	WINNF.FT.C.REG.20	Pass
Unsuccessful Grant responseCode=400 (INTERFERENCE)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.GRA.1	Pass
Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.GRA.2	Pass
Domain Proxy Heartbeat Success Case (first Heartbeat Response)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.HBT.2	Pass
Heartbeat responseCode=105 (DEREGISTER)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.3	Pass
Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.5	Pass
Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.6	Pass
Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.7	Pass
Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	WINNF-TS-0122-V1.0.2	WINNF.FT.D.HBT.8	Pass
Heartbeat Response Absent (First Heartbeat)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.9	Pass
Heartbeat Response Absent (Subsequent Heartbeat)	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.10	Pass

Item	Standard	Test Case ID	Result
Successful Grant Renewal in Heartbeat Test Case	WINNF-TS-0122-V1.0.2	WINNF.FT.C.HBT.11	Pass
Domain Proxy Successful Relinquishment	WINNF-TS-0122-V1.0.2	WINNF.FT.D.RLQ.2	Pass
Domain Proxy Unsuccessful Relinquishment, responseCode=102	WINNF-TS-0122-V1.0.2	WINNF.FT.D.RLQ.4	Pass
Domain Proxy Unsuccessful Relinquishment, responseCode=103	WINNF-TS-0122-V1.0.2	WINNF.FT.D.RLQ.6	Pass
Domain Proxy Successful Deregistration	WINNF-TS-0122-V1.0.2	WINNF.FT.D.DRG.2	Pass
Domain Proxy Deregistration responseCode=102	WINNF-TS-0122-V1.0.2	WINNF.FT.D.DRG.4	Pass
Deregistration responseCode=103	WINNF-TS-0122-V1.0.2	WINNF.FT.C.DRG.5	Pass
Successful TLS connection between UUT and SAS Test Harness	WINNF-TS-0122-V1.0.2	WINNF.FT.C.SCS.1	Pass
TLS failure due to revoked certificate	WINNF-TS-0122-V1.0.2	WINNF.FT.C.SCS.2	Pass
TLS failure due to expired server certificate	WINNF-TS-0122-V1.0.2	WINNF.FT.C.SCS.3	Pass
TLS failure when SAS Test Harness certificate is issue by unknown CA	WINNF-TS-0122-V1.0.2	WINNF.FT.C.SCS.4	Pass
TLS failure when certificate at the SAS Test Harness is corrupted	WINNF-TS-0122-V1.0.2	WINNF.FT.C.SCS.5	Pass
UUT RF Transmit Power Measurement	WINNF-TS-0122-V1.0.2	WINNF.PT.C.HBT.1	Pass
SAS Version: 1.0.0.3			

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

Test standards:

CBRSA-TS-9001-V1.2.1

CBRS Alliance Certification Test Plan

WINNF-TS-0122-V1.0.2

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

KDB 940660 D01 Part 96 CBRS Eqpt v03

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4 General Information

4.1 Details of E.U.T.

Product Information:	This base station consists ofC EU and RU
Power supply:	48V DC, ±20%
Sample Type:	Fixed device
CBSD Class:	A
Transmitter Frequency Band:	5GNR N48,N77,N78
Transmitter Frequency Range:	3550~3700MHz
Hardware Version:	RUZ4V2
Software Version:	0.05.64
Test sample:	SN1 23505261 SN2 23505266
Antenna Gain:	2dBi
MIMO supported	4*4 UL
Antenna Type:	Integral Antenna
Note: This is a BTS-CBSD communication with Domain Proxy. Domain Proxy information show as below: Name of Domain Proxy: RAK CloudNMS Software Version of Domain Proxy: V1.8.0	

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.	Y
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.	Y

Y: Supported

N: Not supported

4.3 Summary of Test Results

WINNF-TS-0122			
Classes	Test Case Items	Pass Items	Pass Rate (%)
FT (CBSD, DP/CBSD)	33	33	100
PT (CBSD, DP/CBSD)	1	1	100
Total	34	34	100

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

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10^{-8}
2	RF conducted power	± 0.75dB
3	Temperature test	± 1°C
4	Humidity test	± 3%
5	Supply voltages	± 1.5%
6	Time	± 3%

4.5 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
CPE	SUNWAVE	CPX80I	/
Router	TP-LINK	TL-R860+	1175379002425

4.6 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

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

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

3. Sample source: sent by customer.

4.1 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

5 Equipment List

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Laptop	Lenovo	Y510P	HFL000026	N/A	N/A
Spectrum Analyzer	KEYSIGHT	N9020A	KUS2001M001-2	2023/8/24	2024/8/23
Shield Room	YanChuang	N/A	KS301115-2	N/A	N/A
Coaxial Cable	Thermax	N/A	13	2023/9/15	2024/9/14
Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R.	N.C.R.
Humidity / Temperature Indicator	Renke	RS-WS-N01-6J	1032844	2024/3/21	2025/3/20

6 Test Method and Environment

6.1 CBSD/DP Conformance and Performance

Test Requirement:	CBRS CBSD Test Specification WINNF-TS-0122-V1.0.2
Test Method:	CBRS CBSD Test Specification WINNF-TS-0122-V1.0.2 WINNF-IN-0156_WInnForum_SAS_Test_Harness_CBSD_UUT_Tutorial_v1_0_0_1

6.2 CBSD Test Procedure

a. Connect the UUT to SAS Test Harness system and RF Test instruments via the DP interface and RF components. The highest level is set to test configuration.

b. UUT shall be UTC time synchronized

c. The frequency band is granted and set as UUT supported Modulation and Channels, transmitted power of the UUT according to it granted parameters from the SAS Test Harness.

d. Each test case results were recorded and validated by SAS Test Harness system and RF instruments test cases was recorded test results from SAS Test Harness system.

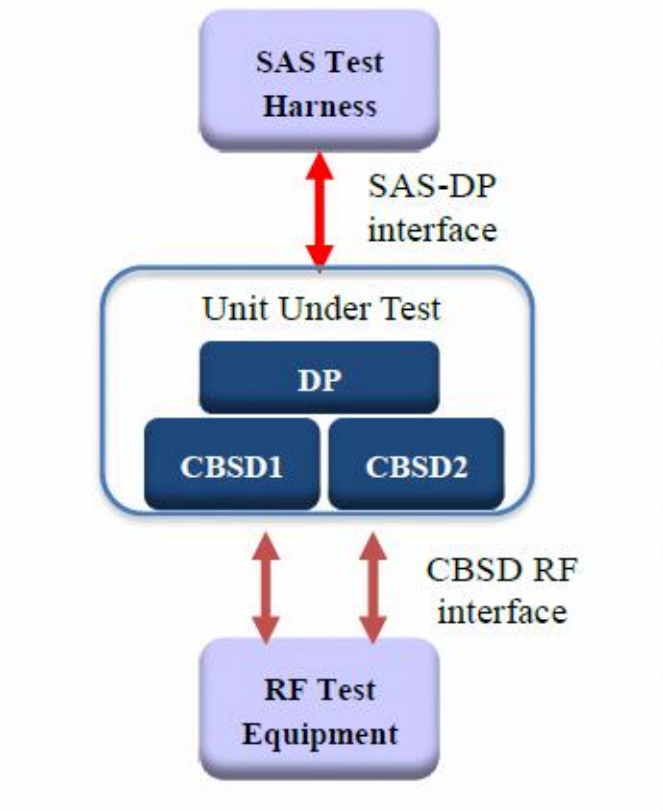
6.3 Test Environment

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

6.4 Test Setup

1) DP is deployed on the network management, and the registration of DP to SAS is to register with SAS according to the granularity of CBSD ID;

2) The DP and the network element communicate messages according to the cell granularity, and each CBSDID corresponds to a cell of an RRU which belongs to a base station.



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

7 Test Data

7.1 CBSD Registration Process

7.1.1 WINNF.FT.D.REG.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness ● UUT is in the Unregistered state	--	--
2	DP with two CBSD sends correct Registration request information, as specified in [n.5], in the form of one 2-element Array or as individual messages to the SAS Test Harness: ● The required userId, fccId and cbsdSerialNumber registration parameters shall be sent for each 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. Note: It is outside the scope of this document to test the Registration information that is supplied via another means.	■ Pass	□ Fail
3	● SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or individual messages as follows: - cbsdId = Ci - measReportConfig shall not be included - responseCode = 0 for each CBSD	--	--
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

7.1.2 WINNF.FT.D.REG.4

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends Registration requests in the form of one 2-element Array or as individual messages to SAS Test Harness. ● The required userId, fccId and cbsdSerialNumber and REG-Conditional cbsdCategory, airInterface, installationParam, and measCapability registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. ● Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.	■ Pass	□ Fail
3	● SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or individual messages as follows: - cbsdId = Ci - measReportConfig for each CBSD shall not be included - responseCode = 0 for each CBSD	--	--
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

7.1.3 WINNF.FT.D.REG.6

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state ● All of the required and REG-Conditional parameters shall be configured and CPI signature provided	--	--
2	The DP with two CBSDs sends Registration requests in the form of one 2-element Array or as individual messages to the SAS Test Harness: ● 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. ● Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.	■ Pass	□ Fail
3	● SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or individual messages as follows: - cbsdId = Ci - measReportConfig for each CBSD shall not be included - responseCode = 0 for each CBSD	--	--
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

7.1.4 WINNF.FT.C.REG.7

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

7.1.5 WINNF.FT.D.REG.9

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 102 for CBSD1 and CBSD2	--	--
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

7.1.6 WINNF.FT.D.REG.11

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 200 for CBSD1 and CBSD2	--	--
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

7.1.7 WINNF.FT.D.REG.13

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 0 for CBSD1 - responseCode = 103 for CBSD2	--	--
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

7.1.8 WINNF.FT.D.REG.15

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 0 for CBSD1 - responseCode = 101 for CBSD2	--	--
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

7.1.9 WINNF.FT.D.REG.17

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 100 for CBSD1 and CBSD2	--	--
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

7.1.10 WINNF.FT.D.REG.19

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT is in the Unregistered state	--	--
2	The DP with two CBSDs sends a Registration request in the form of one 2-element Array or as individual messages to SAS Test Harness.	--	--
3	SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as individual messages as follows: - SAS response does not include a cbsdId. - responseCode = 0 for CBSD1 - responseCode = 201 for CBSD2	--	--
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 CBSD Spectrum Grant Process

7.2.1 WINNF.FT.C.GRA.1

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

7.2.2 WINNF.FT.C.GRA.2

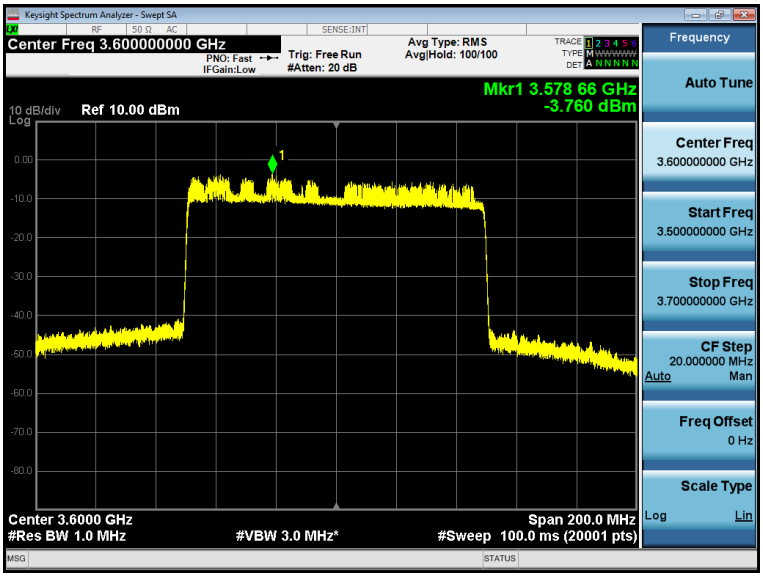
#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness, with cbsdId = C	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including - cbsdId=C - responseCode = 400	--	--
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

7.3 CBSD HeartBeat Process

7.3.1 WINNF.FT.D.HBT.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has two CBSD registered successfully with SAS Test Harness, with cbsdId = Ci, i={1,2}	--	--
2	DP 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	DP sends a Spectrum Inquiry Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Spectrum Inquiry Request message is formatted correctly for each CBSD, including for CBSDi, i={1,2}: ● cbsdId = Ci ● List of frequencyRange objects sent by DP are within the CBRS frequency range	■ Pass	□ Fail
4	If a separate Spectrum Inquiry Request message was sent for each CBSD, the SAS Test Harness shall respond to each Spectrum Inquiry Request message with a separate Spectrum Inquiry Response message. If a single Spectrum Inquiry Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Spectrum Inquiry Response message containing a 2-object array. Verify parameters for each CBSD within the Spectrum Inquiry Response message are as follows, for CBSDi, i={1,2}: ● cbsdId = Ci ● availableChannel is an array of availableChannel objects ● responseCode = 0	--	--
5	DP sends a Grant Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Grant Request message is formatted correctly for each CBSD, including for CBSDi, i={1,2}: ● cbsdId = C ● maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96 ● operationFrequencyRange, Fi, sent by UUT is a valid range within the CBRS band	■ Pass	□ Fail
6	If a separate Grant Request message was sent for each CBSD, the SAS Test Harness shall respond to each Grant Request message with a separate Grant Response message. If a single Grant Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Grant Response message containing a 2-object array. Verify parameters for each CBSD within the Grant Response message are as follows, for CBSDi, i={1,2}: ● cbsdId = Ci ● grantId = Gi = a valid grant ID ● grantExpireTime = UTC time greater than duration of the test ● responseCode = 0	--	--

7	Ensure DP sends first Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Heartbeat Request message is formatted correctly for each CBSD, including, for CBSDi i={1,2}: ● cbsdId = Ci, i={1,2} ● grantId = Gi, i={1,2} ● operationState = “GRANTED”	■ Pass	□ Fail
8	If a separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message. If a single Heartbeat Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Heartbeat Response message containing a 2-object array. Verify parameters for each CBSD within the Heartbeat Response message are as follows, for CBSDi: ● cbsdId = Ci ● grantId = Gi ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0	--	--
9	For further Heartbeat Request messages sent from DP after completion of step 8, validate message is sent within latest specified heartbeatInterval for CBSDi: ● cbsdId = Ci ● grantId = Gi ● operationState = “AUTHORIZED” and SAS Test Harness responds with a Heartbeat Response message including the following parameters, for CBSDi ● cbsdId = Ci ● grantId = Gi ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0	■ Pass	□ Fail
10	Monitor the RF output of the UUT from start of test until UUT transmission commences. Monitor the RF output of the UUT from start of test until RF transmission commences. Verify: ● 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 Fi.	■ Pass	□ Fail


Keysight Spectrum Analyzer - Swept SA
Center Freq 3.600000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
Avg|Hold: 100/100
Mkr1 3.578 66 GHz
-3.760 dBm
10 dB/div
Log
Ref 10.00 dBm
Center 3.6000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 200.0 MHz
#Sweep 100.0 ms (20001 pts)
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Center Freq
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Stop Freq
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7.3.2 WINNF.FT.C.HBT.3

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ 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	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”	■ Pass	□ Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = T = Current UTC time ● 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: ● UUT shall stop transmission within (T + 60 seconds) of completion of step 3	■ Pass	□ Fail

7.3.3 WINNF.FT.C.HBT.5

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “GRANTED”	■ Pass	□ Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● 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: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: ● cbsdId = C ● grantId = G ● operationState = “GRANTED” B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters: ● cbdsId = C ● grantId = G Monitor the RF output of the UUT. Verify: ● UUT does not transmit at any time	■ Pass	□ Fail

7.3.4 WINNF.FT.C.HBT.6

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid 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	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”	■ Pass	□ Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● 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: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: ● cbsdId = C ● grantId = G ● operationState = “GRANTED” B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters: ● cbdsId = C ● grantId = G Monitor the RF output of the UUT. Verify: ● UUT shall stop transmission within (T+60) seconds of completion of step 3	■ Pass	□ Fail

7.3.5 WINNF.FT.C.HBT.7

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid 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	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”	■ Pass	□ Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time ● 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: ● UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: ○ cbsdId = C ○ grantId = G Monitor the RF output of the UUT. Verify: ● UUT shall stop transmission within (T+60) seconds of completion of step 3	■ Pass	□ Fail

7.3.6 WINNF.FT.D.HBT.8

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has two CBSD registered successfully with SAS Test Harness ● Each CBSD {1,2} has a valid single grant as follows ○ valid cbsdId = Ci, i={1,2} ○ valid grantId = Gi, i={1,2} ○ grant is for frequency range Fi, power Pi ○ grantExpireTime = UTC time greater than duration of the test ● Both CBSD are in AUTHORIZED state and transmitting within their granted bandwidth on RF interface	--	--
2	DP sends a Heartbeat Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of size 2. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly for each CBSD, including, for CBSDi i={1,2}: ● cbsdId = Ci, i = {1,2} ● grantId = Gi, i = {1,2} ● operationState = “AUTHORIZED”	■ Pass	□ Fail
3	If separate Heartbeat Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Heartbeat Request message with a separate Heartbeat Response message. If a single Heartbeat Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Heartbeat Response message containing a 2-object array. Parameters for each CBSD within the Heartbeat Response message should be as follows, for CBSDi: ● cbsdId = Ci ● grantId = Gi ● For CBSD1: ○ transmitExpireTime = current UTC time + 200 seconds ○ responseCode = 0 ● For CBSD2: ○ transmitExpireTime = T = current UTC time ○ responseCode = 500 (TERMINATED_GRANT)	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. If CBSD sends further Heartbeat Request messages for CBSD1, SAS Test Harness shall respond with a Heartbeat Response message with parameters: ● cbsdId = C1 ● grantId = G1 ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0 ● Heartbeat Request message is within heartbeatInterval of previous Heartbeat Request message	--	--

5	Monitor the RF output of CBSD2. Verify: ● CBSD2 shall stop transmission within bandwidth F2 within (T + 60 seconds) of completion of step 3	■ Pass	□ Fail

7.3.7 WINNF.FT.C.HBT.9

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid 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	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “GRANTED”	■ Pass	□ Fail
3	After completion of step 2, SAS Test Harness does not respond to any further ● messages from UUT to simulate loss of network connection	--	--
4	Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify: ● At any time during the test, UUT shall not transmit on RF interface	■ Pass	□ Fail

7.3.8 WINNF.FT.C.HBT.10

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid 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	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”	■ Pass	□ Fail
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = T = current UTC time + 200 seconds ● responseCode = 0	--	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--	--
5	Monitor the RF output of the UUT. Verify: ● UUT shall stop all transmission on RF interface within (transmitExpireTime + 60 seconds), using the transmitExpireTime sent in Step 3.	■ Pass	□ Fail

7.3.9 WINNF.FT.C.HBT.11

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid cbsdId = C ○ valid grantId = G ○ grant is for frequency range F, power P ● UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface. ● Grant has the following parameters at the start of the test: ○ grantExpireTime =UTC time equal to time at start of test + 300 seconds = Tgrant_expire ○ *transmitExpireTime* = UTC time equal to time at start of test + 200 seconds ○ *heartbeatInterval* = 60 seconds	--	--
2	UUT sends a Heartbeat Request message. 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: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED”	■ Pass	☐ Fail
4	SAS Test Harness sends a Heartbeat Response message, with the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = current UTC + 200 seconds ● grantExpireTime = same as Step 1 ● responseCode = 0	--	--
5	Go to Step 2	--	--
6	Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including: ● cbsdId = C ● grantId = G ● operationState = “AUTHORIZED” ● grantRenew = TRUE	■ Pass	☐ Fail
7	SAS Test Harness sends a Heartbeat Response message, with the following parameters: ● cbsdId = C ● grantId = G ● grantExpireTime = UTC time set far in the future ● transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0	--	--
8	Continue to respond to any subsquentHeartbeat Request from CBSD with Heartbeat Response with the following parameters: ● cbsdId = C ● grantId = G ● transmitExpireTime = same as Step 7 ● 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	☐ Fail

7.4 CBSD Relinquishment Process

7.4.1 WINNF.FT.D.RLQ.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness ● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2} ● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD ● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: ● cbsdId = Ci ● grantId = Gi	■ Pass	□ Fail
3	If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response shall be as follows: ● cbsdId = Ci ● grantId = Gi ● 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 each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: ● UUT shall stop RF transmission at any time between triggering the relinquishments and UUT sending the relinquishment requests for each CBSD.	■ Pass	□ Fail

7.4.2 WINNF.FT.D.RLQ.4

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness ● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2} ● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD ● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	DP with two CBSDs sends Relinquishment Request with two objects to the SAS Test Harness. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: ● cbsdId = Ci ● grantId = Gi	■ Pass	□ Fail
3	If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response shall be as follows: ● cbsdId = Ci ● grantId = Gi ● responseCode = Ri	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: A. UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	■ Pass	□ Fail

7.4.3 WINNF.FT.D.RLQ.6

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness ● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2} ● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD ● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	DP with two CBSDs sends Relinquishment Request with two objects to the SAS Test Harness. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify DP sends a Relinquishment Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Relinquishment Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: ● cbsdId = Ci ● grantId = Gi	■ Pass	□ Fail
3	If a separate Relinquishment Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Relinquishment Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Relinquishment Response shall be as follows: ● cbsdId = Ci ● grantId = Gi ● responseCode = 103	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (responseCode=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: A. UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	■ Pass	□ Fail

7.5 CBSD Deregistration Process

7.5.1 WINNF.FT.D.DRG.2

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness ● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2} ● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD ● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT may send a Relinquishment request and receives Relinquishment response with responseCode=0 for each CBSD	--	--
3	Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: ● cbsdId = Ci	■ Pass	□ Fail
4	If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response shall be as follows: ● No cbsdId in either response ● responseCode = Ri	--	--
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 each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify: ● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	■ Pass	□ Fail

7.5.2 WINNF.FT.D.DRG.4

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● Each UUT has successfully registered with SAS Test Harness ● Each UUT is in the authorized state ● DP has successfully completed SAS Discovery and Authentication with SAS Test Harness ● DP has successfully registered 2 CBSD with SAS Test Harness, each with cbsdId=Ci, i={1,2} ● DP has received a valid grant with grantId = Gi, i={1,2} for each CBSD ● Both CBSD are in Grant State AUTHORIZED and actively transmitting within the bounds of their grants. Invoke trigger to relinquish UUT Grant from the SAS Test Harness	--	--
2	UUT sends a Relinquishment request and receives Relinquishment response with responseCode=0	--	--
3	Verify DP sends a Deregistration Request message for each CBSD. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Deregistration Request message contains all required parameters properly formatted for each CBSD, specifically, for CBSDi: ● cbsdId = Ci	■ Pass	□ Fail
4	If a separate Deregistration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each request message with a separate response message. If a single Deregistration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Response message containing a 2-object array. Parameters for each CBSD within the Deregistration Response shall be as follows: ● cbsdId = Ci ● responseCode = 0	--	--
5	After completion of step 4, SAS Test Harness will not provide any positive response (responseCode=0) to further request messages from the UUT.	--	--
6	Monitor the RF output of each UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify: ● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	■ Pass	□ Fail

7.5.3 WINNF.FT.C.DRG.5

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness ● UUT has successfully registered with SAS Test Harness, with 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. 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: ● cbsdId=C ● responseCode = 103	--	--
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: ● UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	■ Pass	□ Fail

7.6 CBSD Security Validation

7.6.1 WINNF.FT.C.SCS.1

#	Test Execution Steps	Results	
1	● UUT shall start CBSD-SAS communication with the security procedure ● The UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate. ● Configure the SAS Test Harness to accept the security procedure and establish the connection	■ Pass	□ Fail

2	● Make sure that Mutual authentication happens between UUT and the SAS Test Harness.
	● Make sure that UUT uses TLS v1.2
	● Make sure that cipher suites from one of the following is selected,
	  ● TLS_RSA_WITH_AES_128_GCM_SHA256
	  ● TLS_RSA_WITH_AES_256_GCM_SHA384
	  ● TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
	  ● TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
	  ● TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
		■ Pass	□ Fail

3	A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability. ● UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with responseCode = 0 and cbsdId.	■ Pass	□ Fail
4	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: ● UUT shall not transmit RF	■ Pass	□ Fail

7.6.2 WINNF.FT.C.SCS.2

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

7.6.3 WINNF.FT.C.SCS.3

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

7.6.4 WINNF.FT.C.SCS.4

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

7.6.5 WINNF.FT.C.SCS.5

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

7.7 CBSD RF Power Measurement

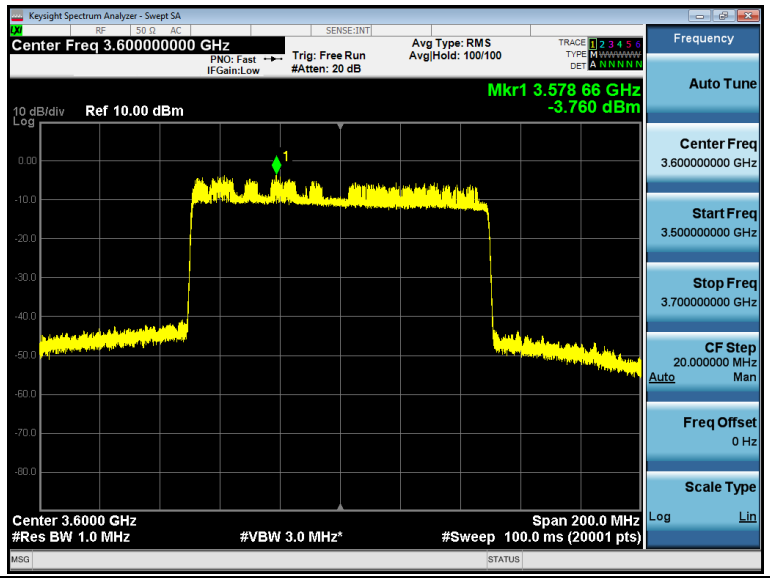
7.7.1 WINNF.PT.C.HBT.1

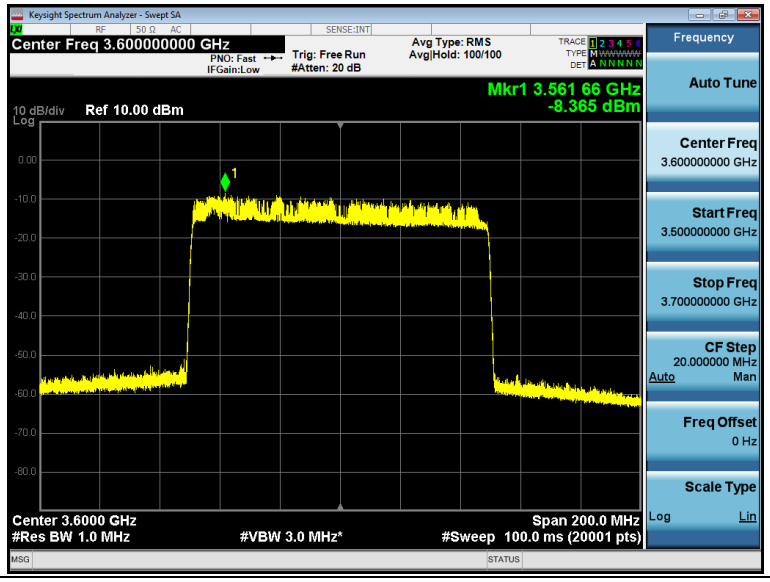
#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness ● UUT has registered with the SAS, with CBSD ID = C ● UUT has a single valid grant G with parameters {lowFrequency = FL, highFrequency = FH, maxEirp = Pi}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case ● 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: ● UUT sends Heartbeat Request, including: ○ cbsdId = C ○ grantId = G ● SAS Test Harness responds with Heartbeat Response, including: o cbsdId = C ○ grantId = G ○ transmitExpireTime = current UTC time + 200 seconds ● responseCode = 0	--	--
3	Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method. ● 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	□ Fail

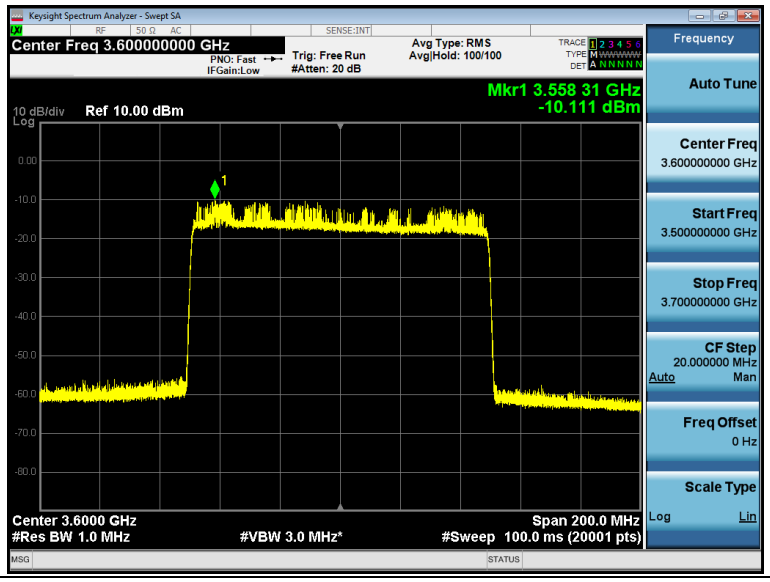
RF measurement plot for Test Case:

- 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.

5G NR							
Freq. (MHz)	Conducted PSD (dBm/MHz)	Path Loss (dB)	Antenna Gain (dBi)	Array Gain (dB)	EIRP PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
3600	-3.760	6	2	6.02	10.260	20	Pass
3600	-8.365	6	2	6.02	5.655	15	Pass
3600	-10.111	6	2	6.02	3.909	10	Pass
Note: 1. Array Gain=10log(n), n is the antenna number, for this test the n=4 2. EIRP PSD= Conducted PSD+ Path Loss+ Antenna Gain+ Array Gain							

5GNR Target Power: 20dBm/MHz


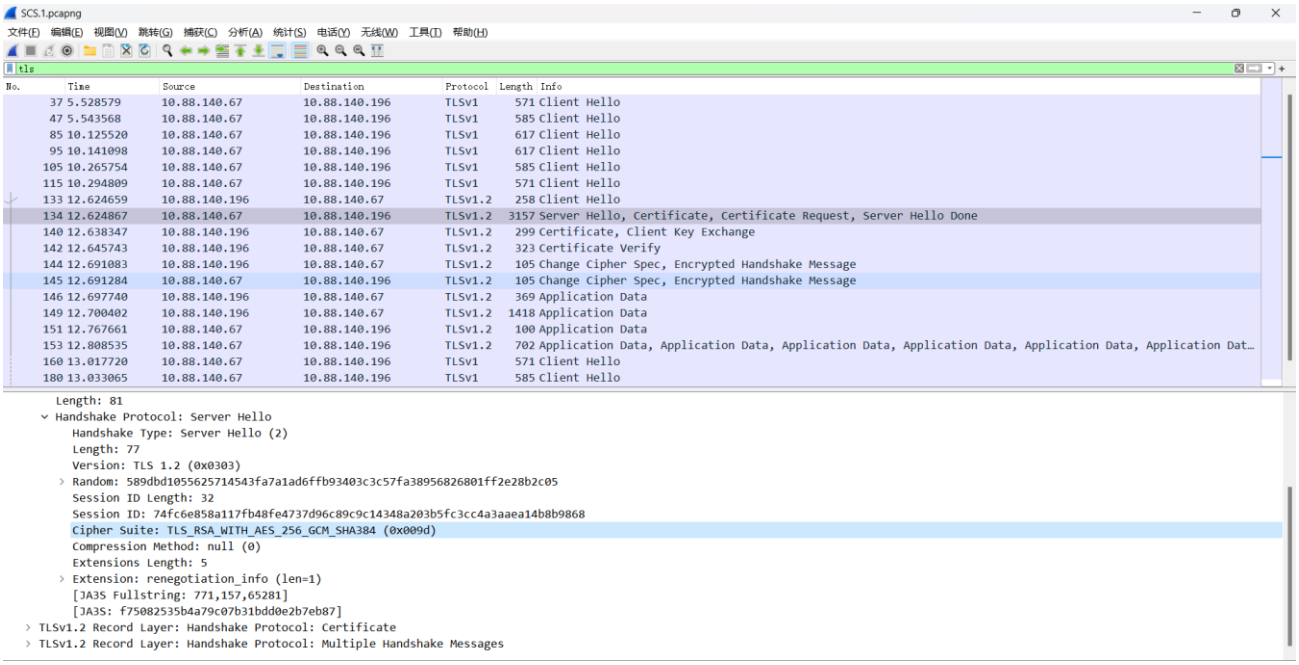
5GNR Target Power: 15dBm/MHz


5GNR Target Power: 10dBm/MHz


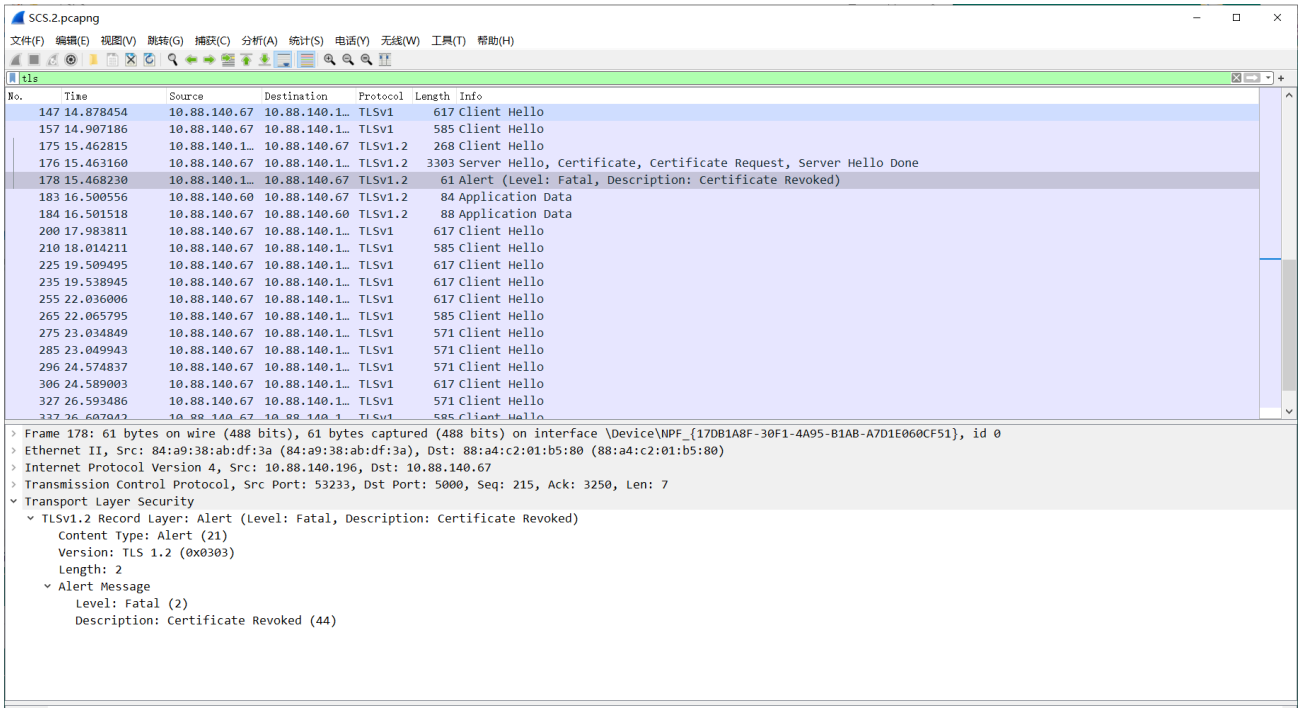
8 Test Data Log

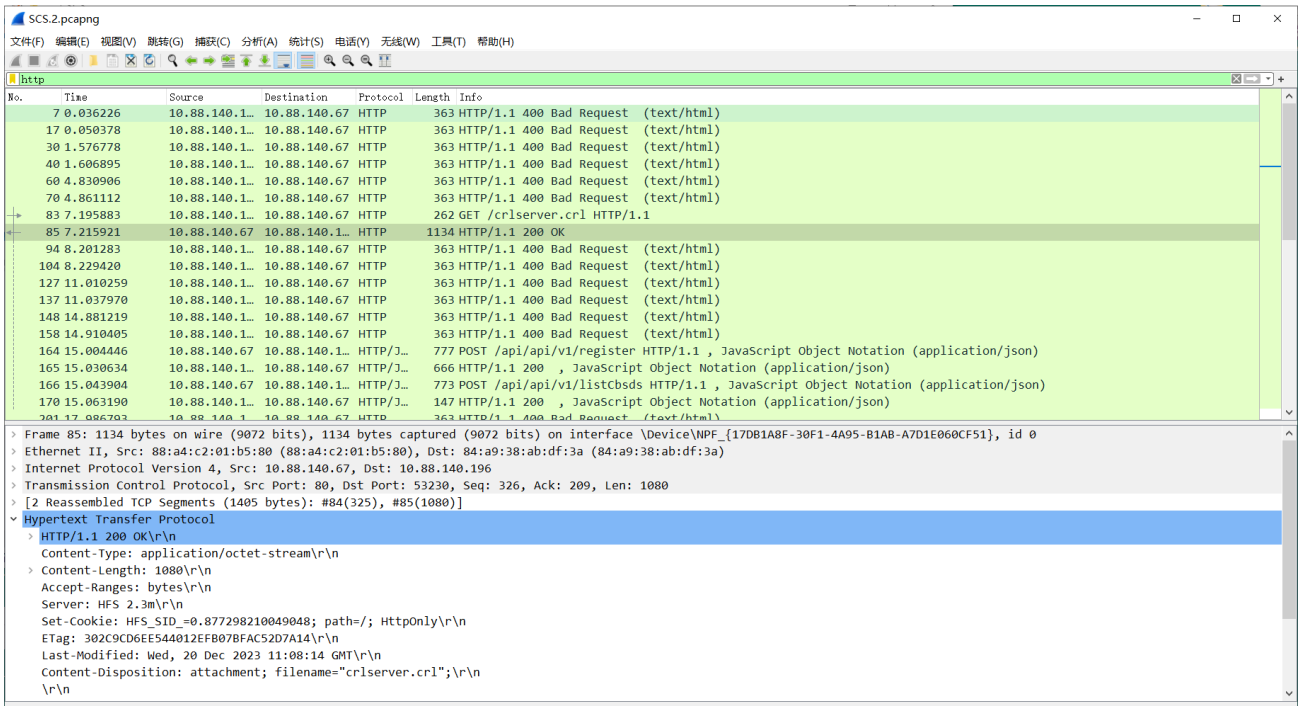
Test data log refer to log files (Log files appendix) except for securitytest cases which shows below.

8.1 WINNF.FT.C.SCS.1

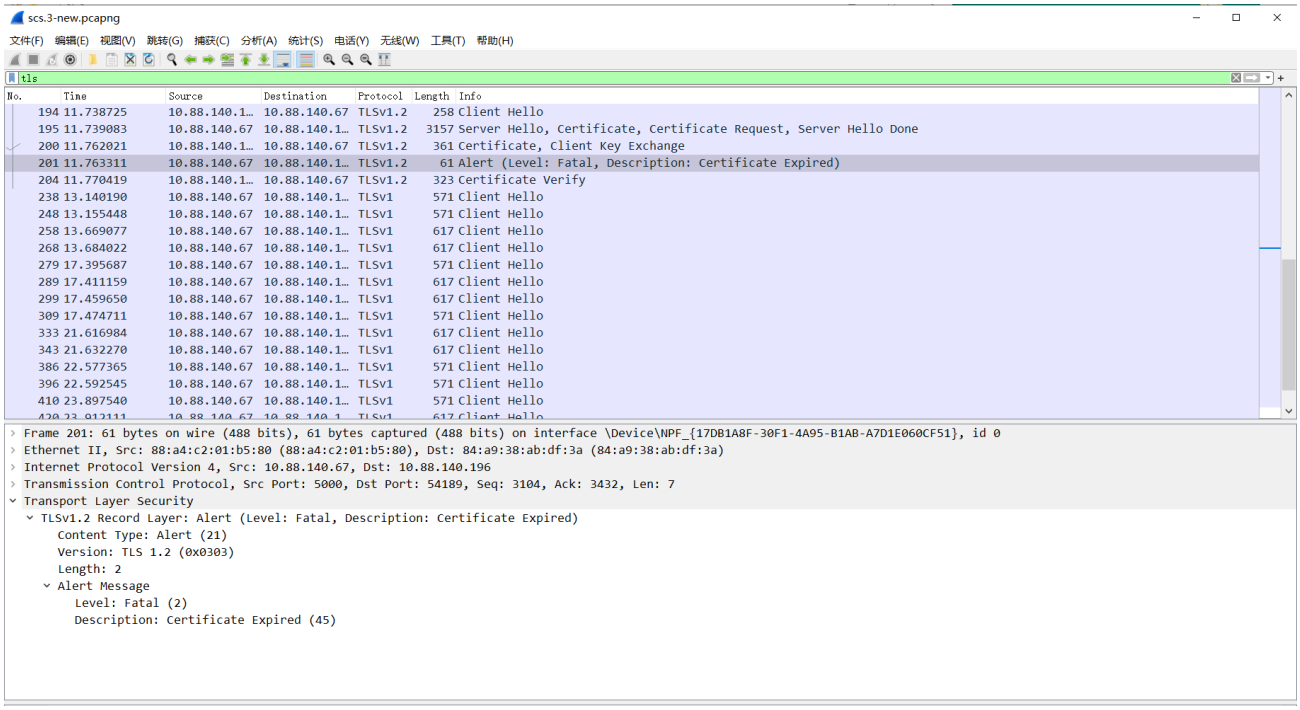


8.2 WINNF.FT.C.SCS.2

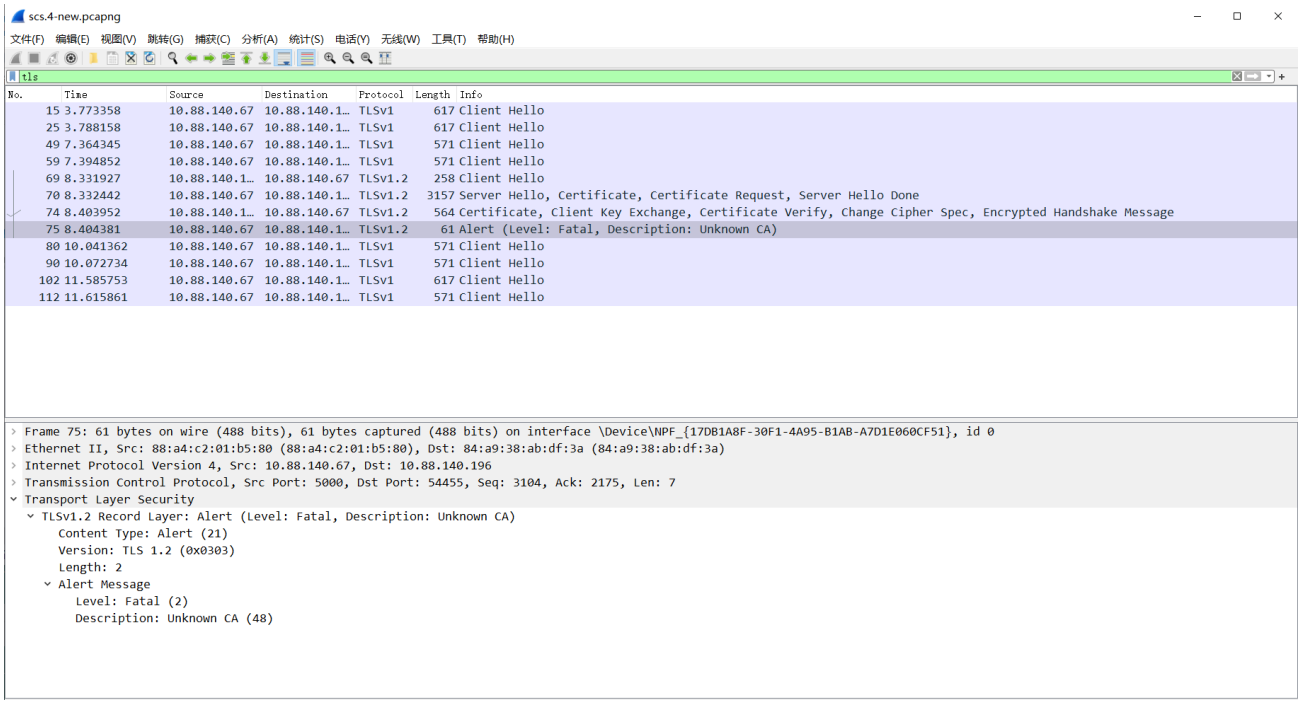




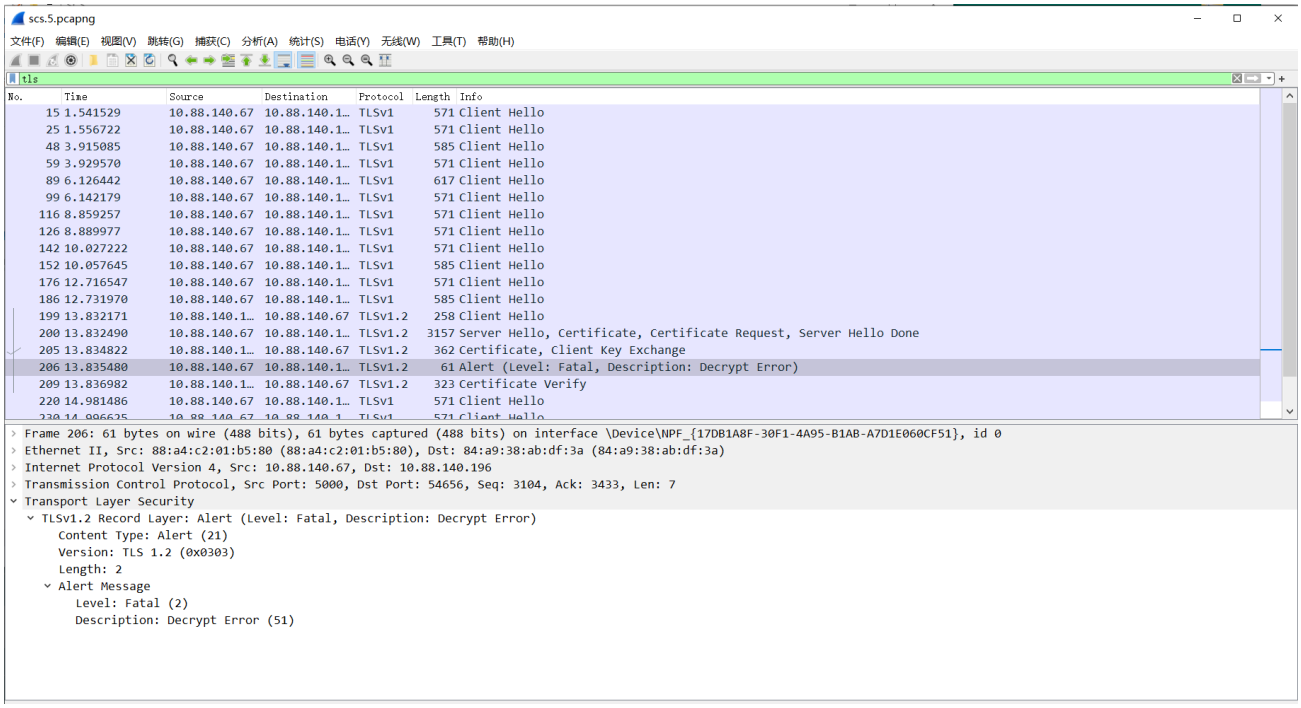
8.3 WINNF.FT.C.SCS.3



8.4 WINNF.FT.C.SCS.4



8.5 WINNF.FT.C.SCS.5



9 Photographs

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -