

SAS-CBSD Test Report

Report No.: RFBEIH-WTW-P24110561-2

FCC ID: 2ASK5AIOID5GSC03

Test Model: Nokia AIOSC Indoor 5G n48

Received Date: Dec. 31, 2024

Test Date: Aug. 18, 2025 ~ Jan. 16, 2026

Issued Date: Jan. 20, 2026

Applicant: Nokia

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration/
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBEIH-WTW-P24110561-2	Original release	Jan. 20, 2026

1 Certificate of Conformity

Product: Nokia AIOSC Indoor 5G

Brand: Nokia

Test Model: Nokia AIOSC Indoor 5G n48

Sample Status: Engineering sample

Applicant: Nokia

Test Date: Aug. 18, 2025 ~ Jan. 16, 2026

Standards: WINNF-TS-0122 V1.0.2
ONGO-TS-9001 V1.3.0

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by :

Gina Liu

, Date:

Jan. 20, 2026

Gina Liu / Specialist

Approved by :

Jeremy Lin

, Date:

Jan. 20, 2026

Jeremy Lin / Project Engineer

2 Summary of Test Results

WINNF-TS-0122			
Classes	Test Case Items	Pass Items	Pass Rate (%)
FT(CBSD, DP/CBSD)	25	25	100
PT(CBSD, DP/CBSD)	1	1	100
Total	26	26	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 WINNF and supporting FCC/DoD requirements.
2. Field/Performance Test (PT): Test to check the capability of the CBSD/DP UUT to support various traffic models and actual operations in the field.

Supported Features in details:

WINNF-TS-0122 Test Case		
Definitions	Test Case ID	Supported
C1	WINNF.FT.D.REG.2	Yes
C2	NA	No
C3	NA	No
C4	WINNF.FT.D.MES.2	Yes
C5	NA	No
C6	NA	No

WINNF-TS-0122 Test Case

Section	Test Case ID	Test Case Title	Test Result
6.1.4.1.1	WINNF.FT.C.REG.1	Multi-Step registration	NA
6.1.4.1.2	WINNF.FT.D.REG.2	Domain Proxy Multi-Step registration	Pass
6.1.4.1.3	WINNF.FT.C.REG.3	Single-Step registration for Category A CBSD	NA
6.1.4.1.4	WINNF.FT.D.REG.4	Domain Proxy Single-Step registration for Cat A CBSD	NA
6.1.4.1.5	WINNF.FT.C.REG.5	Single-Step registration for CBSD with CPI signed data	NA
6.1.4.1.6	WINNF.FT.D.REG.6	Domain Proxy Single-Step registration for CBSD with CPI signed data	NA
6.1.4.1.7	WINNF.FT.C.REG.7	Registration due to change of an installation parameter	NA
6.1.4.2.1	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	NA
6.1.4.2.2	WINNF.FT.D.REG.9	Domain Proxy Missing Required parameters (responseCode 102)	Pass
6.1.4.2.3	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	NA
6.1.4.2.4	WINNF.FT.D.REG.11	Domain Proxy Pending registration (responseCode 200)	Pass
6.1.4.2.5	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	NA
6.1.4.2.6	WINNF.FT.D.REG.13	Domain Proxy Invalid parameters (responseCode 103)	Pass
6.1.4.2.7	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	NA
6.1.4.2.8	WINNF.FT.D.REG.15	Domain Proxy Blacklisted CBSD (responseCode 101)	Pass
6.1.4.2.9	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	NA
6.1.4.2.10	WINNF.FT.D.REG.17	Domain Proxy Unsupported SAS protocol version responseCode 100)	Pass
6.1.4.2.11	WINNF.FT.C.REG.18	Group Error (responseCode 201)	NA
6.1.4.2.12	WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	Pass
6.1.4.3.1	WINNF.FT.C.REG.20	Category A CBSD location update	NA

WINNF-TS-0122 Test Case			
Section	Test Case ID	Test Case Title	Test Result
6.3.4.2.1	WINNF.FT.D.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	Pass
6.3.4.2.2	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	Pass
6.4.4.1.1	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	NA
6.4.4.1.2	WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	Pass
6.4.4.2.1	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	Pass
6.4.4.2.2	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)	NA
6.4.4.2.3	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	Pass
6.4.4.2.4	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	Pass
6.4.4.2.5	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Pass
6.4.4.2.6	WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TERMINATED_GRANT)	Pass
6.4.4.3.1	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	Pass
6.4.4.3.2	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	Pass
6.4.4.4.1	WINNF.FT.C.HBT.11	Successful Grant Renewal in Heartbeat Test Case	NA
6.5.4.2.1	WINNF.FT.C.MES.1	Registration Response contains measReportConfig	NA
6.5.4.2.2	WINNF.FT.D.MES.2	Domain Proxy Registration Response contains measReportConfig	Pass
6.5.4.2.3	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	NA
6.5.4.2.4	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	NA
6.5.4.2.5	WINNF.FT.D.MES.5	Domain Proxy Heartbeat Response contains measReportConfig	NA

WINNF-TS-0122 Test Case

Section	Test Case ID	Test Case Title	Test Result
6.6.4.1.1	WINNF.FT.C.RLQ.1	Successful Relinquishment	NA
6.6.4.1.2	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	Pass
6.6.4.2.1	WINNF.FT.C.RLQ.3	Unsuccessful Relinquishment, responseCode=102	NA
6.6.4.2.2	WINNF.FT.D.RLQ.4	Domain Proxy Unsuccessful Relinquishment, responseCode=102	NA
6.6.4.3.1	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	NA
6.6.4.3.2	WINNF.FT.D.RLQ.6	Domain Proxy Unsuccessful Relinquishment, responseCode=103	NA
6.7.4.1.1	WINNF.FT.C.DRG.1	Successful Deregistration	NA
6.7.4.1.2	WINNF.FT.D.DRG.2	Domain Proxy Successful Deregistration	Pass
6.7.4.2.1	WINNF.FT.C.DRG.3	Deregistration responseCode=102	NA
6.7.4.2.2	WINNF.FT.D.DRG.4	Domain Proxy Deregistration responseCode=102	NA
6.7.4.3.1	WINNF.FT.C.DRG.5	Deregistration responseCode=103	NA
6.8.4.1.1	WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	Pass
6.8.4.2.1	WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	Pass
6.8.4.2.2	WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	Pass
6.8.4.2.3	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	Pass
6.8.4.2.4	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	Pass
7.1.4.1.1	WINNF.PT.C.HBT	UUT RF Transmit Power Measurement	Pass

Note: Section as per WINNF-TS-0122 If the product as tested complies with the specification, the UUT is deemed to comply with the standard and is deemed a "Pass" grade. If not "Fail" grade is issued. Where "NA" is stated this means the test case is not applicable.

2.1 Measurement Uncertainty

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

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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nokia AIO SC Indoor 5G
Brand	Nokia
Test Model	Nokia AIO SC Indoor 5G n48
Hardware Version	C00
Firmware Version	IndoorV1
Status of EUT	Engineering sample
Accessory Device	Adapter
Data Cable Supplied	NA

Note:

1. The EUT consumes power from the following adapter.

Item	Brand	Model	Specification
AC Adapter 1	Mass Power Electronics Inc.	NBS100A120600M2	AC Input : 100-240Vac, 50/60Hz, 1.6A DC Output : 12.0V, 6.0A, 72.0W DC Output Cable : 2pin, 1.5m non shielded without core
AC Adapter 2	Mass Power Electronics Inc.	NBS100A120600M3	AC Input : 100-240Vac, 50/60Hz, 1.6A DC Output : 12.0V, 6.0A, 72.0W DC Output Cable : 3pin, 1.5m non shielded without core

* After pre-tested all the adapters and found adapter 1 was the worst. Therefore, only adapter 1 was for the final test and presented in the test report.

2. The product is an indoor Small Cell, with built-in antenna as the primary usage scenario.

Test Condition:

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

3.2 General Description of Applied Standards

The UUT is a BTS-CBSD/DP product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC 47 CFR Part 96

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

References Test Guidance:

KDB 940660 D01 Part 96 CBRS Eqpt v03

All test items have been performed as a reference to the above KDB test guidance.

4 Measurement

4.1 CBSD Measurement

The CBSD shall validate and ensure that the Conformance and Performance Test results from compliance with SAS functional requirements.

4.2 CBSD Test Procedure

- a. Connect the UUT to SAS Test Harness system and RF Test instruments via the CBSD interface and RF components. The highest level is set to test configuration.
- b. UUT shall be UTC time synchronized
- c. The frequency band is granted and set as UUT supported Modulation and Channels, transmitted power of the UUT according to it granted parameters from the SAS Test Harness.
- d. Each test case results was recorded and validated by SAS Test Harness system and RF instruments test cases was recorded test results from SAS Test Harness system.

4.3 Test Environment

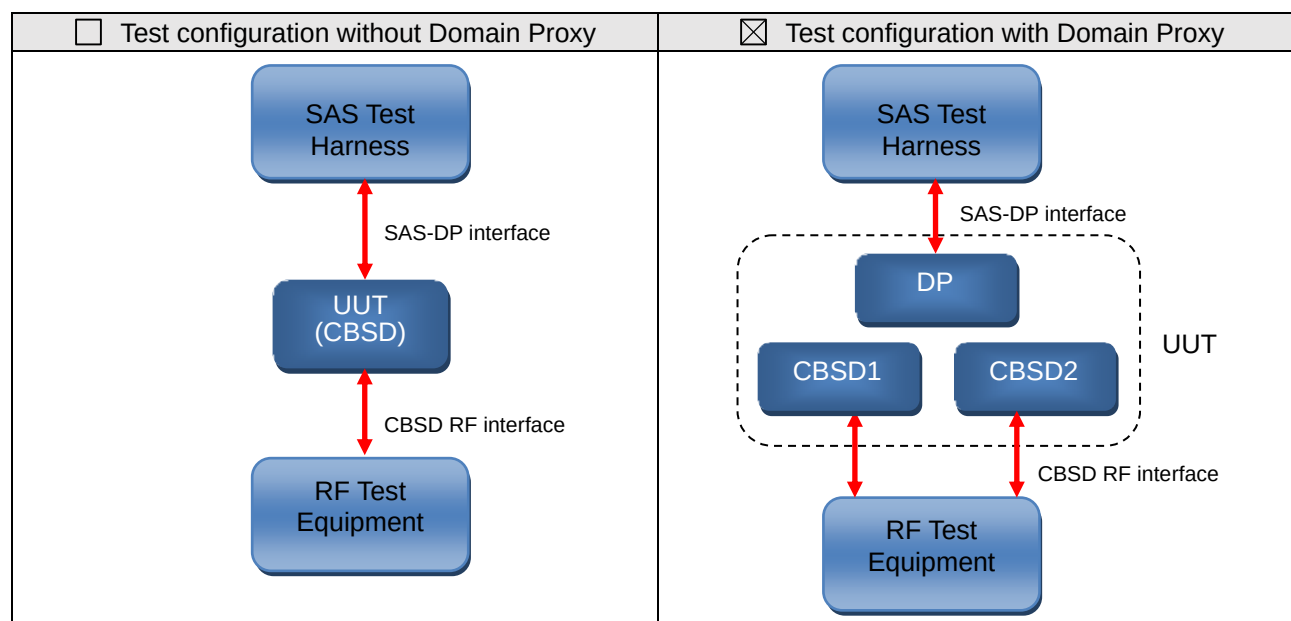
Test Harness Version	V1.0.0.3
Operating System	Microsoft Windows 10
TLS Version	1.2
Python	2.7.13

4.4 Test Equipment

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
KEYSIGHT Signal Analyzer	MXE N9038A	E2-010530	May. 29, 2024	May 28, 2026
Temperature & Humidity Chamber TERCHY	TFA 452019	E2-010883	Dec. 13, 2024	Dec. 12, 2025
			Dec. 12, 2025	Dec. 11, 2026
Laptop Lenovo	P137G	P137G001	NA	NA

Note: 1. The test was performed in HY-OVEN Test Room.
2. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.5 Test Setup



4.6 Test Results

4.6.1 Successful registration

4.6.1.1 WINNF.FT.D.REG.2

■ Test Case ID : WINNF.FT.D.REG.2 □ NA

#	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 <i>userId</i>, <i>fcId</i> and <i>cbsdSerialNumber</i> registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. - Any REG-conditional or optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges. 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 as follows: <i>cbsdId</i> = Ci <i>measReportConfig</i> shall not be included <i>responseCode</i> = 0 for each CBSD	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i>=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: UUT shall not transmit RF	☒ Pass	☐ Fail

4.6.1.2 WINNF.FT.D.REG.9

■ Test Case ID : WINNF.FT.D.REG.9 ☐ NA

#	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 = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.	--	--
5	Monitor the RF output of each 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

4.6.1.3 WINNF.FT.D.REG.11

■ Test Case ID : WINNF.FT.D.REG.11 □ NA

#	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 <i>cbsdId</i>. - <i>responseCode</i> = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =200) to further request messages from the UUT.	--	--
5	Monitor the RF output of each 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

4.6.1.4 WINNF.FT.D.REG.13

☒ Test Case ID : WINNF.FT.D.REG.13
 ☐ NA

#	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 <i>cbstdId</i>. - <i>responseCode</i> = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> R1 = 0 for CBSD1 and R2 = 103 for CBSD2) 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 not transmit RF	☒ Pass	☐ Fail

4.6.1.5 WINNF.FT.D.REG.15

■ Test Case ID : WINNF.FT.D.REG.15 □ NA

#	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 <i>cbsdId</i>. - <i>responseCode</i> = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> R1 = 0 for CBSD1 and R2 = 101 for CBSD2) 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 not transmit RF	☒ Pass	☐ Fail

4.6.1.6 WINNF.FT.D.REG.17

■ Test Case ID : WINNF.FT.D.REG.17 □ NA

#	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 <i>cbsdId</i>. - <i>responseCode</i> = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> (Ri) = 100 for each CBS) 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 not transmit RF	☒ Pass	☐ Fail

4.6.1.7 WINNF.FT.D.REG.19

☒ Test Case ID : WINNF.FT.D.REG.19
 ☐ NA

#	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 <i>cbsdId</i>. - <i>responseCode</i> = Ri for CBSD1 and CBSD2	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> R1 = 0 for CBSD1 and R2 = 201 for CBSD2.) 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 not transmit RF	☒ Pass	☐ Fail

4.6.2 CBSD Spectrum Grant Process

4.6.2.1 WINNF.FT.C.GRA.1

☒ Test Case ID : WINNF.FT.C.GRA.1
 ☐ NA

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

4.6.2.2 WINNF.FT.C.GRA.2

■ Test Case ID : WINNF.FT.C.GRA.2 □ NA

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i> = C	--	--
2	UUT sends valid Grant Request.	--	--
3	SAS Test Harness sends a Grant Response message, including ● <i>cbsdId</i> =C ● <i>responseCode</i> = R = 401	--	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =401) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: ● UUT shall not transmit RF	■ Pass	□ Fail

4.6.3 CBSD Heart Beat Process

4.6.3.1 WINNF.FT.D.HBT.2

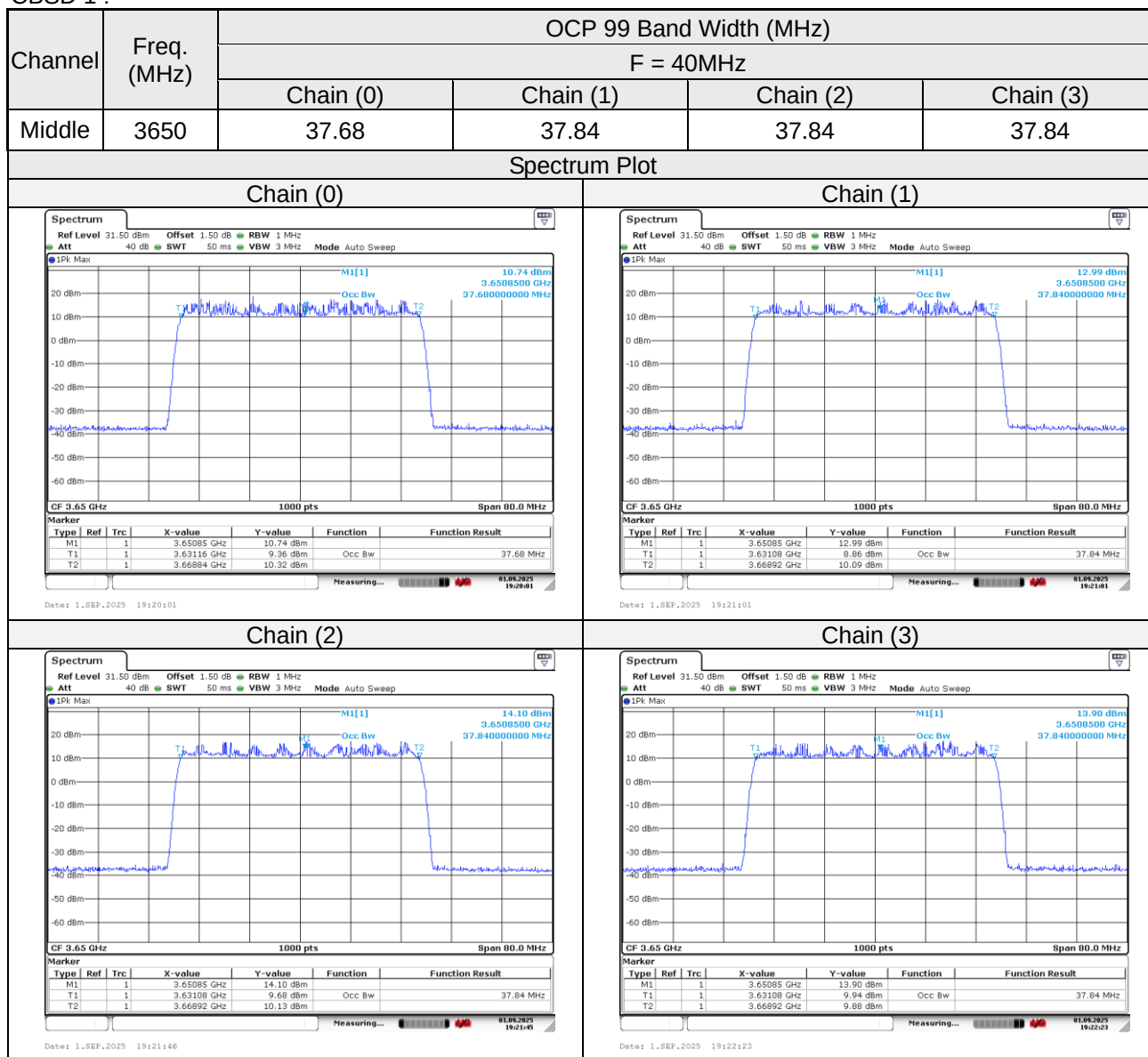
■ Test Case ID : WINNF.FT.C.HBT.2 □ NA

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: DP has two CBSD has registered successfully with SAS Test Harness, with <i>cbsdId</i> = 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 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}: <i>cbsdId</i> = 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}: <i>cbsdId</i> = Ci <i>availableChannel</i> is an array of availableChannel objects <i>responseCode</i> = 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}: <i>cbsdId</i> = Ci <i>maxEIRP</i> is at or below the limit appropriate for CBSD category as defined by Part 96 <i>operationFrequencyRange</i>, F, sent by UUT is a valid range within the CBRS band	■ Pass	□ Fail

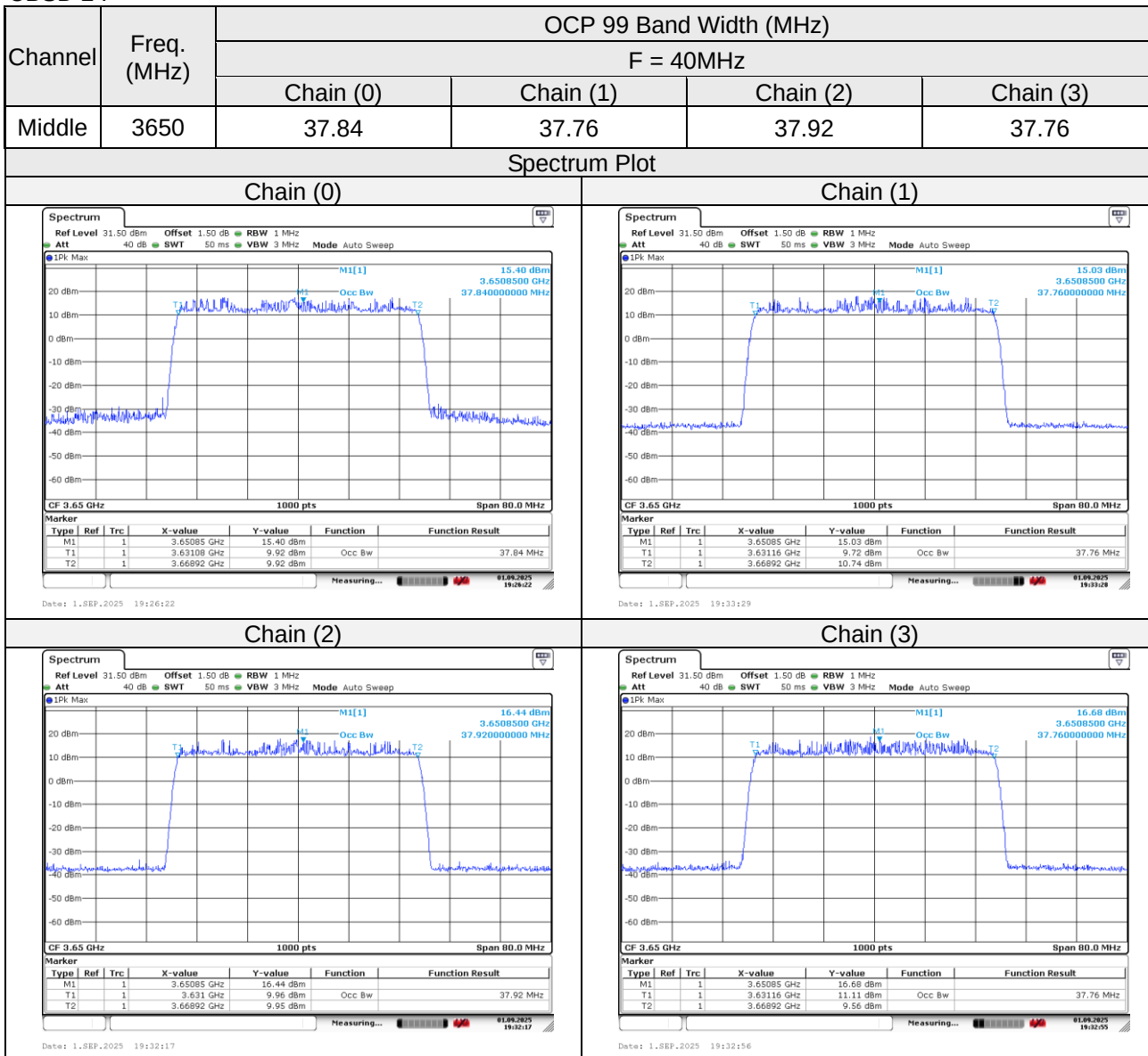
6	If a separate Grant Request message was sent for each CBSD, the SAS Test Harness shall respond to each Grant Request message with a separate Grant Response message. If a single Grant Request message was sent containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Grant Response message containing a 2-object array. Verify parameters for each CBSD within the Grant Response message are as follows, for CBSD_i, i={1,2}: ● <i>cbsdId</i> = C_i ● <i>grantId</i> = G_i = a valid grant ID ● <i>grantExpireTime</i> = UTC time greater than duration of the test ● <i>responseCode</i> = 0	--	--
---	---	----	----

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

CBSD 1 :



CBSD 2 :



4.6.3.2 WINNF.FT.C.HBT.3

☒ Test Case ID : WINNF.FT.C.HBT.3
 ☐ NA

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

4.6.3.3 WINNF.FT.C.HBT.5

■ Test Case ID : WINNF.FT.C.HBT.5 □ NA

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

4.6.3.4 WINNF.FT.C.HBT.6

■ Test Case ID : WINNF.FT.C.HBT.6 □ NA

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

4.6.3.5 WINNF.FT.C.HBT.7

■ Test Case ID : WINNF.FT.C.HBT.7 □ NA

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

4.6.3.6 WINNF.FT.D.HBT.8

■ Test Case ID : WINNF.FT.D.HBT.8 □ NA

#	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: <i>valid cbsdId</i> = Ci, i={1,2} <i>valid grantId</i> = Gi, i={1,2} - grant is for frequency range Fi, power Pi <i>grantExpireTime</i> = 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 <i>heartbeatInterval</i>, and is formatted correctly for each CBSD, including, for CBSDi i={1,2}: <i>cbsdId</i> = Ci, i = {1,2} <i>grantId</i> = Gi, i = {1,2} <i>operationState</i> = "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: <i>cbsdId</i> = Ci <i>grantId</i> = Gi - For CBSD1: <i>transmitExpireTime</i> = current UTC time + 200 seconds <i>responseCode</i> = 0 - For CBSD2: <i>transmitExpireTime</i> = T = current UTC time <i>responseCode</i> = 500 (TERMINATED GRANT)	--	--

4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT. If CBSD sends further Heartbeat Request messages for CBSD1, SAS Test Harness shall respond with a Heartbeat Response message with parameters: ● <i>cbsdId</i> = C1 ● <i>grantId</i> = G1 ● <i>transmitExpireTime</i> = current UTC time + 200 seconds ● <i>responseCode</i> = 0 ● Heartbeat Request message is within <i>heartbeatInterval</i> 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

4.6.3.7 WINNF.FT.C.HBT.9

■ Test Case ID : WINNF.FT.C.HBT.9 □ NA

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● UUT has registered successfully with SAS Test Harness ● UUT has a valid single grant as follows: ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test ● UUT is in GRANTED, but not AUTHORIZED state(i.e. has not performed its first Heartbeat Request)	--	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: ● <i>cbsdId</i> = C ● <i>grantId</i> = G ● <i>operationState</i> = "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

4.6.3.8 WINNF.FT.C.HBT.10

■ Test Case ID : WINNF.FT.C.HBT.10 □ NA

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

4.6.4 CBSD MEASUREMENT REPORT

4.6.4.1 WINNF.FT.D.MES.2

■ Test Case ID : WINNF.FT.D.MES.2 □ NA

#	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	--	--
2	DP sends a Registration Request message for each of two CBSD. This may occur in a separate Request message per CBSD, or together in a single Request message with array of 2. Verify Registration Request message contains all required parameters properly formatted for CBSDi, i={1,2}, and specifically: <i>userId</i> is present and correct <i>fcclId</i> is present and correct <i>cbsdSerialNumber</i> is present and correct <i>measCapability</i> = "RECEIVED_POWER_WITHOUT_GRANT"	■ Pass	□ Fail
3	If a separate Registration Request message was sent for each CBSD by the DP, the SAS Test Harness shall respond to each Registration Request message with a separate Registration Response message. If a single Registration Request message was sent by the DP containing a 2-object array (one per CBSD), the SAS Test Harness shall respond with a single Registration Response message containing a 2-object array. Parameters for each CBSD within the Registration Response message should be as follows, for CBSDi: <i>cbsdId</i> = Ci <i>measReportConfig</i> = "RECEIVED_POWER_WITHOUT_GRANT" <i>responseCode</i> = 0	--	--
4	UUT sends a message: - If message is type Spectrum Inquiry Request, go to step 5, or - If message is type Grant Request, go to step 7	--	--
5	UUT sends message type Spectrum Inquiry Request. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify Spectrum Inquiry Request message contains all required parameters properly formatted for CBSDi, i= {1,2}, and specifically: <i>cbsdId</i> = Ci <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.	■ Pass	□ Fail
6	If a separate Spectrum Inquiry Request message was sent for each CBSD by the DP, 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 by the DP 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. Parameters for each CBSD within the Spectrum Inquiry Response message should be as follows: <i>cbsdId</i> = Ci <i>availableChannel</i> is an array of <i>availableChannel</i> objects <i>responseCode</i> = 0	--	--
7	UUT sends message type Grant Request message. This may occur in a separate message per CBSD, or together in a single message with array of 2. Verify the Grant Request message contains all required parameters properly formatted for CBSDi, i= {1,2}, and specifically: <i>cbsdId</i> = Ci <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.	■ Pass	□ Fail

4.6.5 CBSD Relinquishment Process

4.6.5.1 WINNF.FT.D.RLQ.2

■ Test Case ID : WINNF.FT.D.RLQ.2 □ NA

#	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 <i>cbsdId</i>=Ci, i={1,2} ● DP has received a valid grant with <i>grantId</i> = 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 each 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: ● <i>cbsdId</i> = Ci ● <i>grantId</i> = 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: ● <i>cbsdId</i> = Ci ● <i>grantId</i> = Gi ● <i>responseCode</i> = 0	--	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode</i>=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

4.6.6 CBSD Deregistration Process

4.6.6.1 WINNF.FT.D.DRG.2

■ Test Case ID : WINNF.FT.D.DRG.2 □ NA

#	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 <i>cbsdId</i>=Ci, i={1,2} - DP has received a valid grant with <i>grantId</i> = 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 deregister each UUT from the SAS Test Harness	--	--
2	UUT sends a Relinquishment request and receives Relinquishment response with <i>responseCode</i> =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: <i>cbsdId</i> = 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: <i>cbsdId</i> = Ci <i>responseCode</i> = 0	--	--
5	After completion of step 4, SAS Test Harness will not provide any positive response (<i>responseCode</i> =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

4.6.7 CBSD Security Validation

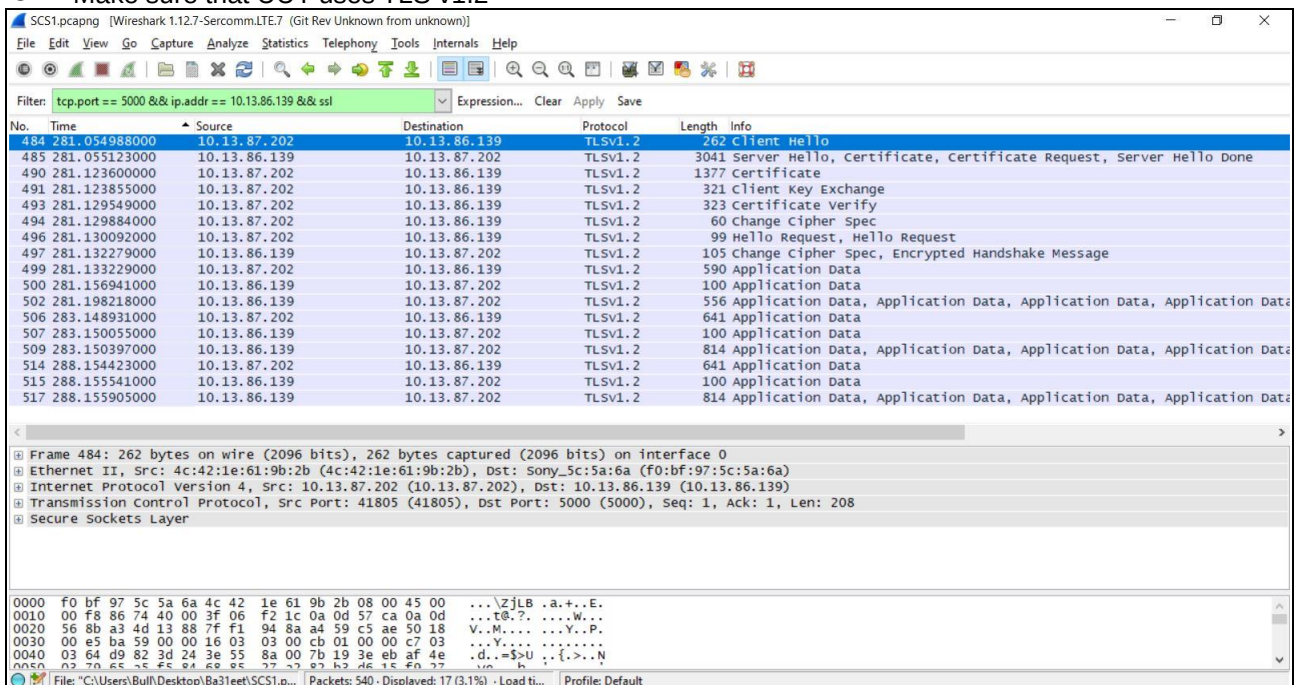
4.6.7.1 WINNF.FT.C.SCS.1

Test Case ID : WINNF.FT.C.SCS.1 ☐ NA

#	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 <i>responseCode</i> = 0 and <i>cbsdId</i>.	☒ 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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



The screenshot shows a Wireshark capture of a TLS v1.2 handshake and subsequent application data exchange. The filter is set to `tcp.port == 5000 && ip.addr == 10.13.86.139 && ssl`. The capture shows the following key frames:

- Frame 484:** 262 Client Hello
- Frame 485:** 3041 Server Hello, Certificate, Certificate Request, Server Hello Done
- Frame 490:** 1377 Certificate
- Frame 491:** 321 Client Key Exchange
- Frame 493:** 323 Certificate Verify
- Frame 494:** 60 Change Cipher Spec
- Frame 496:** 99 Hello Request, Hello Request
- Frame 497:** 105 Change Cipher Spec, Encrypted Handshake Message
- Frame 499:** 590 Application Data
- Frame 500:** 100 Application Data
- Frame 502:** 556 Application Data, Application Data, Application Data, Application Data
- Frame 506:** 641 Application Data
- Frame 507:** 100 Application Data
- Frame 509:** 814 Application Data, Application Data, Application Data, Application Data
- Frame 514:** 641 Application Data
- Frame 515:** 100 Application Data
- Frame 517:** 814 Application Data, Application Data, Application Data, Application Data

The packet details for Frame 484 (Client Hello) show the following structure:

- Frame 484: 262 bytes on wire (2096 bits), 262 bytes captured (2096 bits) on interface 0
- Ethernet II, Src: 4c:42:1e:61:9b:2b (4c:42:1e:61:9b:2b), Dst: Sony_5c:5a:6a (f0:bf:97:5c:5a:6a)
- Internet Protocol Version 4, Src: 10.13.87.202 (10.13.87.202), Dst: 10.13.86.139 (10.13.86.139)
- Transmission Control Protocol, Src Port: 41805 (41805), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 208
- Secure Sockets Layer

The packet bytes show the raw TLS handshake data, including the Client Hello structure.

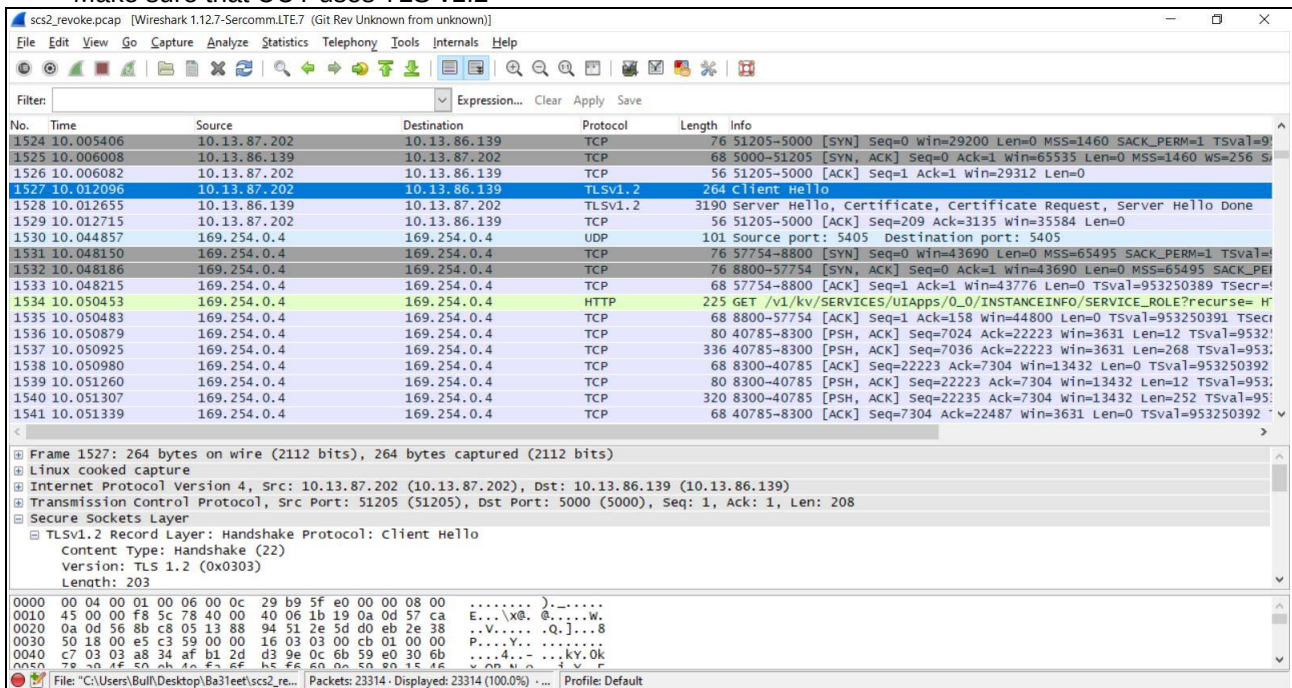
4.6.7.2 WINNF.FT.C.SCS.2

Test Case ID : WINNF.FT.C.SCS.2 ☐ NA

#	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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



The image shows a Wireshark capture of a network session. The packet list on the left shows a series of TCP and TLSv1.2 packets. The selected packet (1527) is a TLSv1.2 Client Hello. The packet details pane on the right shows the structure of the Client Hello, including the Content Type (Handshake), Version (TLS 1.2), and Length (203). The packet bytes pane at the bottom shows the raw data of the Client Hello.

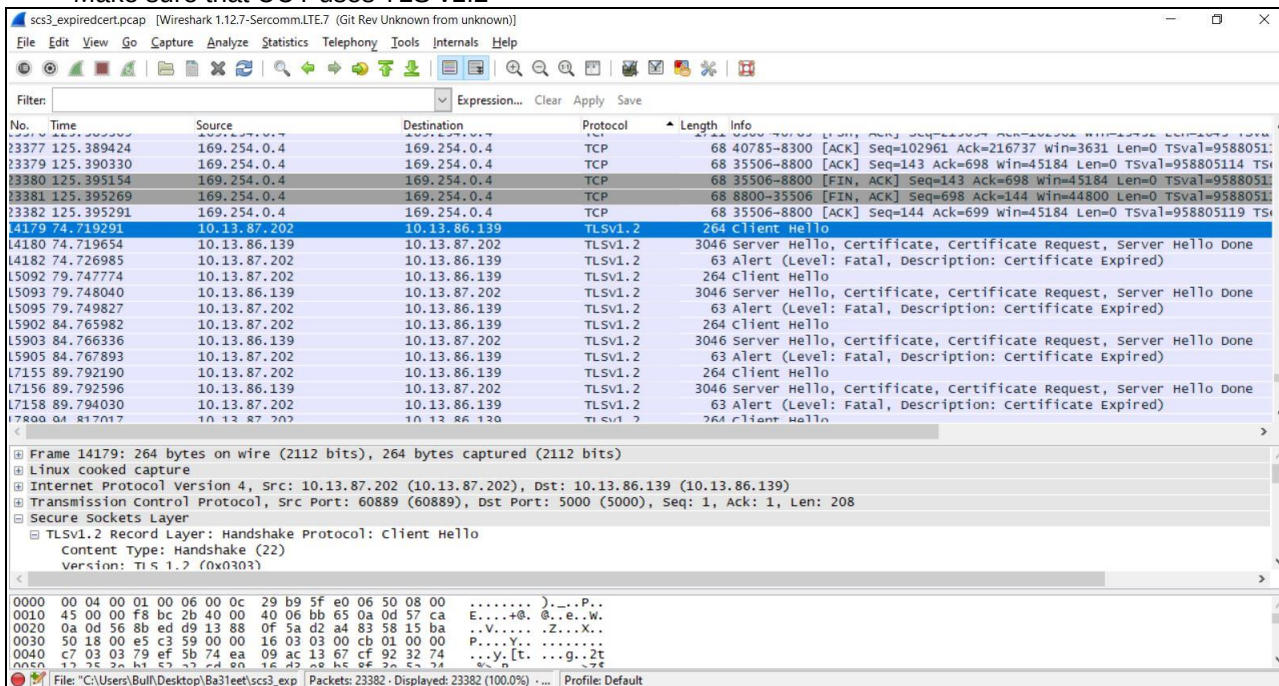
4.6.7.3 WINNF.FT.C.SCS.3

Test Case ID : WINNF.FT.C.SCS.3 ☐ NA

#	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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



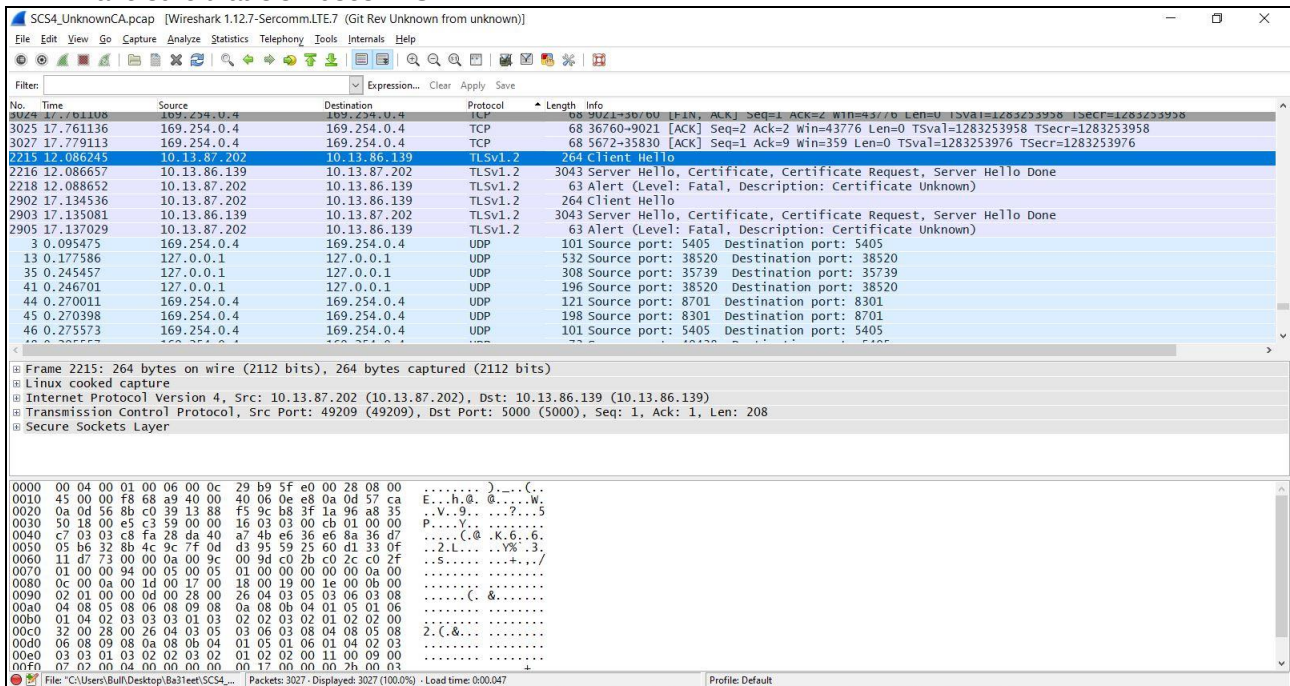
4.6.7.4 WINNF.FT.C.SCS.4

Test Case ID : WINNF.FT.C.SCS.4 ☐ NA

#	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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



SCS4_UnknownCA.pcap [Wireshark 1.12.7-Sercomm.LTE.7 (Git Rev Unknown from unknown)]

Filter: Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
3025	17.761136	169.254.0.4	169.254.0.4	TCP	68	36760-9021 [ACK] Seq=2 Ack=2 Win=43776 Len=0 TSval=1283253958 TSecr=1283253958
3027	17.779113	169.254.0.4	169.254.0.4	TCP	68	5672-35830 [ACK] Seq=1 Ack=9 Win=359 Len=0 TSval=1283253976 TSecr=1283253976
2215	12.086245	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
2216	12.086657	10.13.86.139	10.13.87.202	TLSv1.2	3043	Server Hello, Certificate, Certificate Request, Server Hello Done
2218	12.088652	10.13.87.202	10.13.86.139	TLSv1.2	63	Alert (Level: Fatal, Description: Certificate Unknown)
2902	17.134536	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
2903	17.135081	10.13.86.139	10.13.87.202	TLSv1.2	3043	Server Hello, Certificate, Certificate Request, Server Hello Done
2905	17.137029	10.13.87.202	10.13.86.139	TLSv1.2	63	Alert (Level: Fatal, Description: Certificate Unknown)
3	0.0095475	169.254.0.4	169.254.0.4	UDP	101	Source port: 5405 Destination port: 5405
13	0.177586	127.0.0.1	127.0.0.1	UDP	532	Source port: 38520 Destination port: 38520
35	0.245457	127.0.0.1	127.0.0.1	UDP	308	Source port: 35739 Destination port: 35739
41	0.246701	127.0.0.1	127.0.0.1	UDP	196	Source port: 38520 Destination port: 38520
44	0.270011	169.254.0.4	169.254.0.4	UDP	121	Source port: 8701 Destination port: 8301
45	0.270398	169.254.0.4	169.254.0.4	UDP	198	Source port: 8301 Destination port: 8701
46	0.275573	169.254.0.4	169.254.0.4	UDP	101	Source port: 5405 Destination port: 5405

Frame 2215: 264 bytes on wire (2112 bits), 264 bytes captured (2112 bits) on interface 0

Ethernet II, Src: Intel(R) Ethernet Controller (P0-P7) (82:55:08:00:20:00), Dst: Intel(R) Ethernet Controller (P0-P7) (82:55:08:00:20:00)

Internet Protocol Version 4, Src: 10.13.87.202 (10.13.87.202), Dst: 10.13.86.139 (10.13.86.139)

Transmission Control Protocol, Src Port: 49209 (49209), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 208

Secure Sockets Layer

0000 00 04 00 01 00 06 00 0c 29 b9 5f e0 00 28 08 00)... (..

0010 45 00 00 f8 68 a9 40 00 40 06 0e e8 0a 0d 57 ca E...h.0: @...W.

0020 0a 0d 56 8b c0 39 13 88 f5 9c b8 3f 1a 96 a8 35 ..V..9...?...5

0030 50 18 00 e5 c3 59 00 00 16 03 03 00 cb 01 00 00 P...Y...

0040 c7 03 03 c8 fa 28 da 40 a7 4b e6 36 e6 8a 36 d7(.@..K.6..6.

0050 05 b6 32 8b 4c 9c 7f 0d d3 95 59 25 60 d1 33 0f ..2.L...Y%.3.

0060 11 d7 73 00 00 0a 00 9c 00 9d c0 2b c0 2c c0 2f ..S.....+.../

0070 01 00 00 94 00 05 00 05 01 00 00 00 00 00 0a 00

0080 0c 00 0a 00 1d 00 17 00 18 00 19 00 1e 00 0b 00

0090 02 01 00 00 0d 00 28 00 26 04 03 05 03 06 03 08

00a0 04 08 05 08 06 08 09 08 0a 08 0b 04 01 05 01 06

00b0 01 04 02 03 03 03 01 03 02 02 03 02 01 02 02 00

00c0 32 00 28 00 26 04 03 05 03 06 03 08 04 08 05 08 2.(.&...

00d0 06 08 09 08 0a 08 0b 04 01 05 01 06 01 04 02 03

00e0 03 03 01 03 02 02 03 02 01 02 02 00 11 00 09 00

00f0 07 02 00 04 00 00 00 00 00 17 00 00 00 7b 00 03 +.....

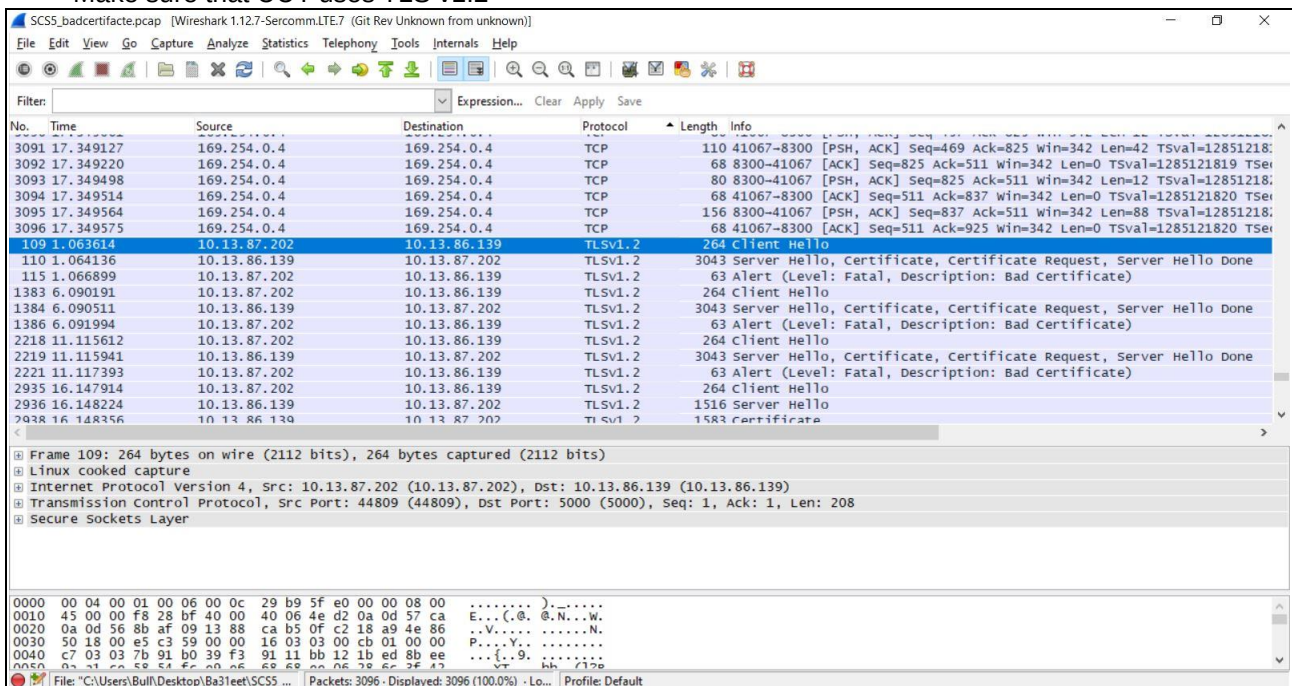
4.6.7.5 WINNF.FT.C.SCS.5

Test Case ID : WINNF.FT.C.SCS.5 ☐ NA

#	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

Wireshark Capture Example for Test Case :

- Make sure that UUT uses TLS v1.2



SCS5_badcertificate.pcap [Wireshark 1.12.7-Sercomm.LTE.7 (Git Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
3091	17.349127	169.254.0.4	169.254.0.4	TCP	110	41067→8300 [PSH, ACK] Seq=469 Ack=825 Win=342 Len=42 TSval=12851218
3092	17.349220	169.254.0.4	169.254.0.4	TCP	68	8300→41067 [ACK] Seq=825 Ack=511 Win=342 Len=0 TSval=1285121819 TSe
3093	17.349498	169.254.0.4	169.254.0.4	TCP	80	8300→41067 [PSH, ACK] Seq=825 Ack=511 Win=342 Len=12 TSval=12851218
3094	17.349514	169.254.0.4	169.254.0.4	TCP	68	41067→8300 [ACK] Seq=511 Ack=837 Win=342 Len=0 TSval=1285121820 TSe
3095	17.349564	169.254.0.4	169.254.0.4	TCP	156	8300→41067 [PSH, ACK] Seq=837 Ack=511 Win=342 Len=88 TSval=12851218
3096	17.349575	169.254.0.4	169.254.0.4	TCP	68	41067→8300 [ACK] Seq=511 Ack=925 Win=342 Len=0 TSval=1285121820 TSe
109	1.063614	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
110	1.064136	10.13.86.139	10.13.87.202	TLSv1.2	3043	Server Hello, Certificate, Certificate Request, Server Hello Done
115	1.066899	10.13.87.202	10.13.86.139	TLSv1.2	63	Alert (Level: Fatal, Description: Bad certificate)
1383	6.090191	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
1384	6.090511	10.13.86.139	10.13.87.202	TLSv1.2	3043	Server Hello, Certificate, Certificate Request, Server Hello Done
1386	6.091994	10.13.87.202	10.13.86.139	TLSv1.2	63	Alert (Level: Fatal, Description: Bad certificate)
2218	11.115612	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
2219	11.115941	10.13.86.139	10.13.87.202	TLSv1.2	3043	Server Hello, Certificate, Certificate Request, Server Hello Done
2221	11.117393	10.13.87.202	10.13.86.139	TLSv1.2	63	Alert (Level: Fatal, Description: Bad certificate)
2935	16.147914	10.13.87.202	10.13.86.139	TLSv1.2	264	Client Hello
2936	16.148224	10.13.86.139	10.13.87.202	TLSv1.2	1516	Server Hello
2938	16.148356	10.13.86.139	10.13.87.202	TLSv1.2	1583	Certificate

Frame 109: 264 bytes on wire (2112 bits), 264 bytes captured (2112 bits) on interface 0

Ethernet II, Src: Intel (08:00:00:00:00:00), Dst: Intel (08:00:00:00:00:00)

Internet Protocol Version 4, Src: 10.13.87.202, Dst: 10.13.86.139 (10.13.86.139)

Transmission Control Protocol, Src Port: 44809 (44809), Dst Port: 5000 (5000), Seq: 1, Ack: 1, Len: 208

Secure Sockets Layer

0000 00 04 00 01 00 06 00 0c 29 b9 5f e0 00 00 08 00).

0010 45 00 00 f8 28 bf 40 00 40 06 4e d2 0a 0d 57 ca E...(. @. @.N...W.

0020 0a 0d 56 8b af 09 13 88 ca b5 0f c2 18 a9 4e 86 .V.....N.

0030 50 18 00 e5 c3 59 00 00 16 03 03 00 cb 01 00 00 P...Y.....

0040 c7 03 03 7b 91 b0 39 f3 91 11 bb 12 1b ed 8b ee ...{..9.....

0050 02 21 20 58 54 f0 00 00 68 68 00 06 78 6c 3f 12 ..Tkh.....

File: C:\Users\Bull\Desktop\Ba3Teet\SCS5... Packets: 3096 - Displayed: 3096 (100.0%) - Lo... Profile: Default

4.6.8 CBSD RF Power Measurement

4.6.8.1 WINNF.PT.C.HBT.1

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

#	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 <i>Note: in order for the UUT to request a grant with the parameters {lowFrequency, highFrequency, maxEirp}, the SAS Test Harness may need to provide appropriate guidance in the availableChannel object of the spectrumInquiry response message, and the operationParam object of the grant response message. Alternately, the UUT vendor may provide the ability to set those parameters on the UUT so that the UUT will request a grant with those parameters</i>	--	--
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: ○ 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. <i>Note: it may be required for the vendor to provide a method or configuration to bring the UUT to a mode which is required by the measurement methodology. Any such mode is vendor-specific and depends upon UUT behavior and the measurement methodology.</i>	■ Pass	□ Fail

RF measurement plot for Test Case :

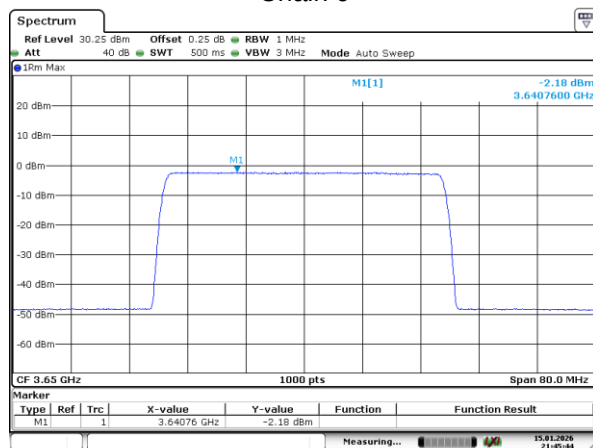
- Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfill the requirements of the power measurement method.

For Internal

Channel	Freq. (MHz)	40MHz						Limit	Pass / Fail
		Conducted Power Density (dBm/MHz)				Gain(dBi)	5.52		
		Chain 0	Chain 1	Chain 2	Chain 3	Total	EIRP (dBm/MHz)	maxEirp(dBm)=Pi	
Middle	3650	-2.18	-2.02	-1.78	-1.95	4.04	9.56	10.0	Pass
Middle	3650	3.08	3.45	3.29	3.17	9.27	14.79	15.0	Pass
Middle	3650	7.86	8.21	8.60	8.40	14.30	19.82	20.0	Pass

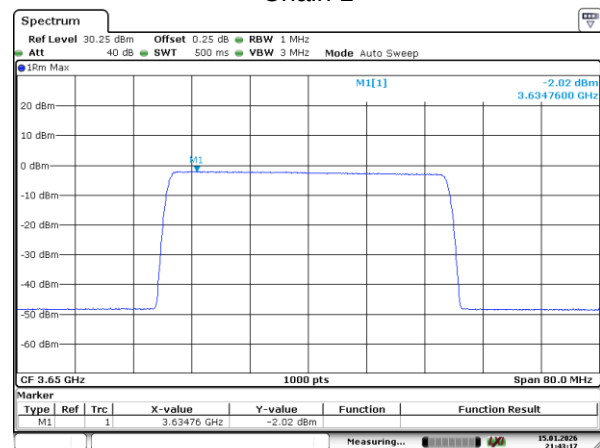
maxEirp = 10 dBm/MHz

Chain 0



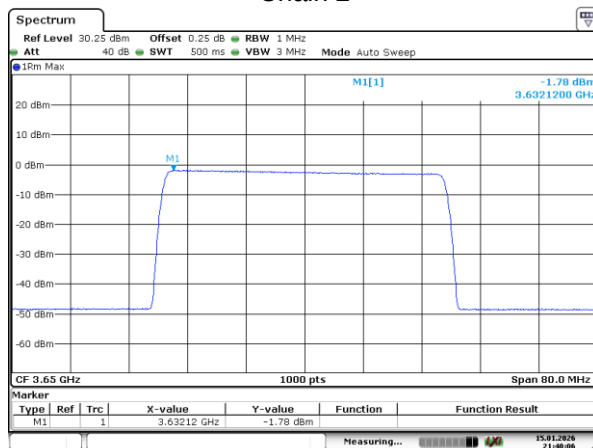
Date: 15.JAN.2026 21:45:45

Chain 1



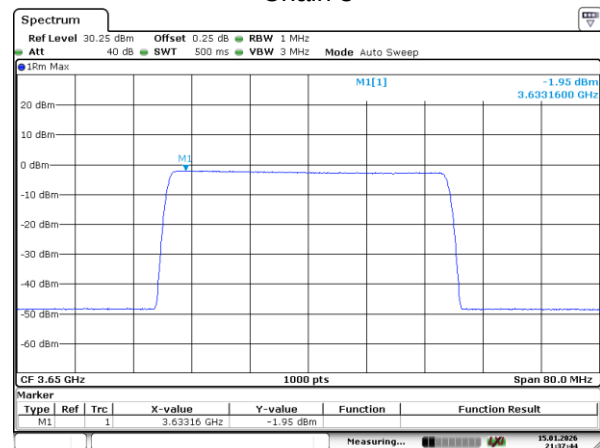
Date: 15.JAN.2026 21:43:17

Chain 2



Date: 15.JAN.2026 21:40:07

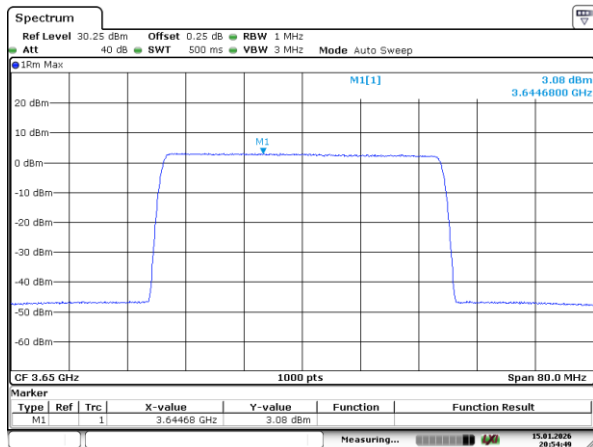
Chain 3



Date: 15.JAN.2026 21:37:45

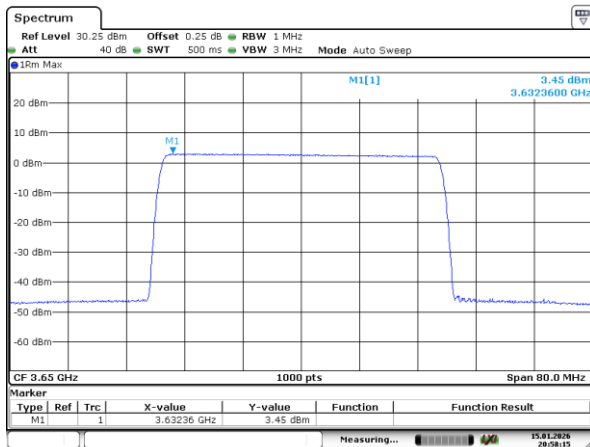
maxEirp = 15 dBm/MHz

Chain 0



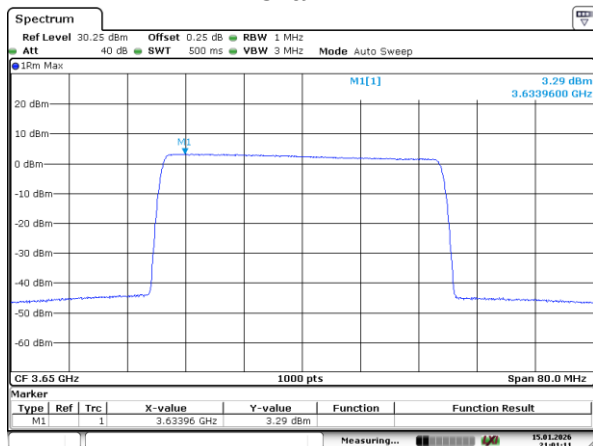
Date: 15.JAN.2026 20:54:49

Chain 1



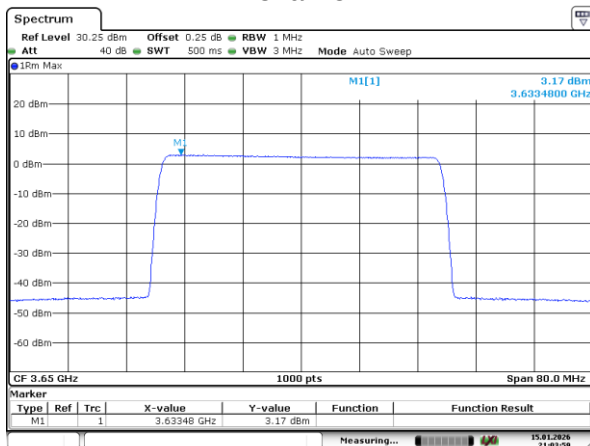
Date: 15.JAN.2026 20:58:15

Chain 2



Date: 15.JAN.2026 21:01:11

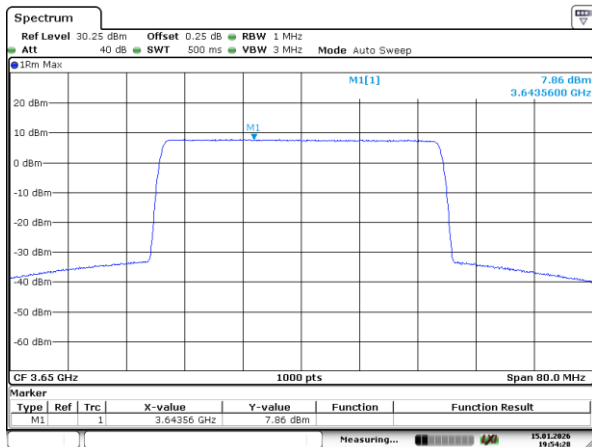
Chain 3



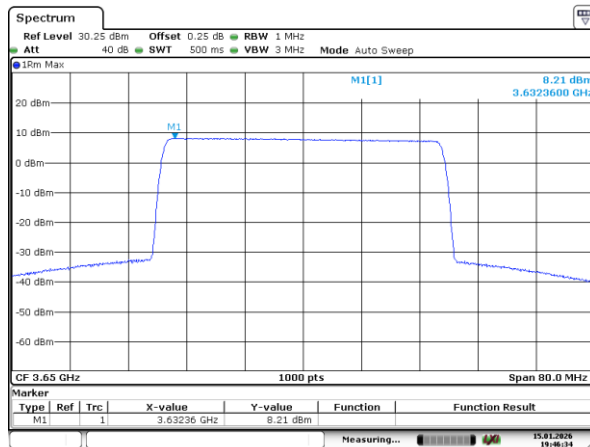
Date: 15.JAN.2026 21:03:59

maxEirp = 20 dBm/MHz

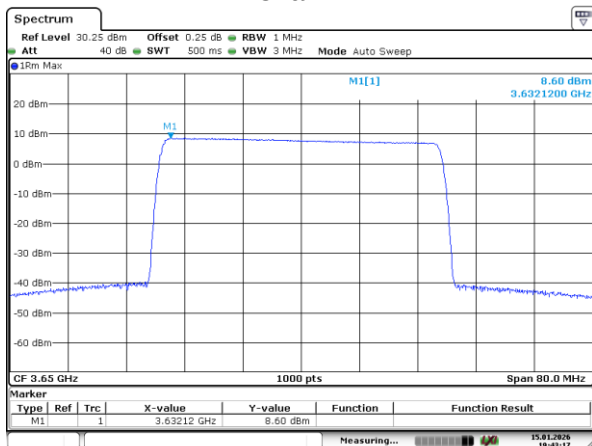
Chain 0



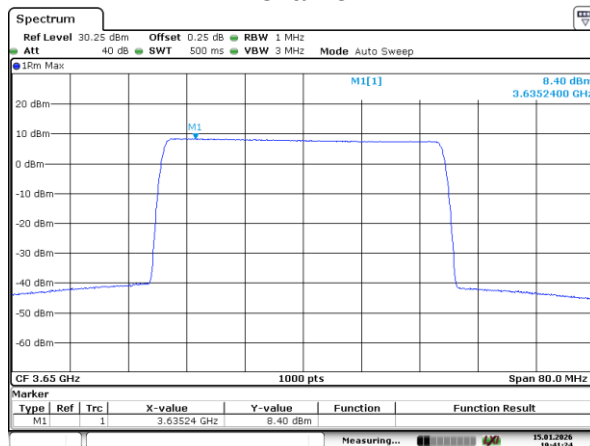
Chain 1



Chain 2



Chain 3

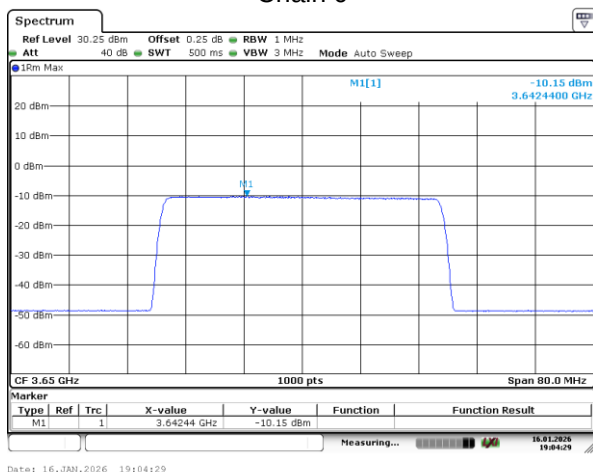


For External

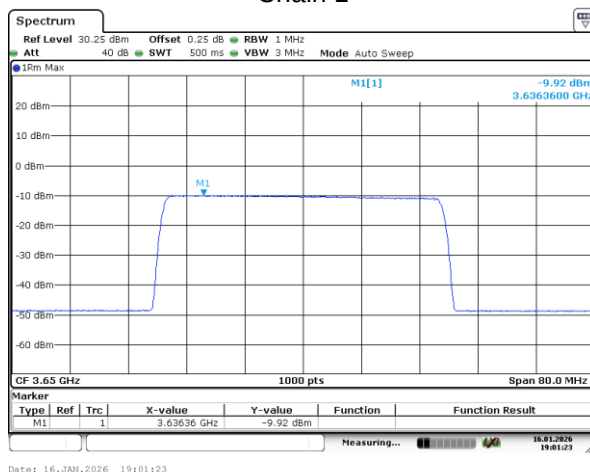
Channel	Freq. (MHz)	40MHz						Limit	Pass / Fail
		Conducted Power Density (dBm/MHz)				Gain(dBi)	13.72		
		Chain 0	Chain 1	Chain 2	Chain 3	Total	EIRP (dBm/MHz)	maxEirp(dBm)=Pi	
Middle	3650	-10.15	-9.92	-9.73	-10.02	-3.93	9.79	10.0	Pass
Middle	3650	-5.05	-5.29	-5.17	-5.05	0.88	14.60	15.0	Pass
Middle	3650	0.15	0.08	0.20	0.08	6.15	19.87	20.0	Pass

maxEirp = 10 dBm/MHz

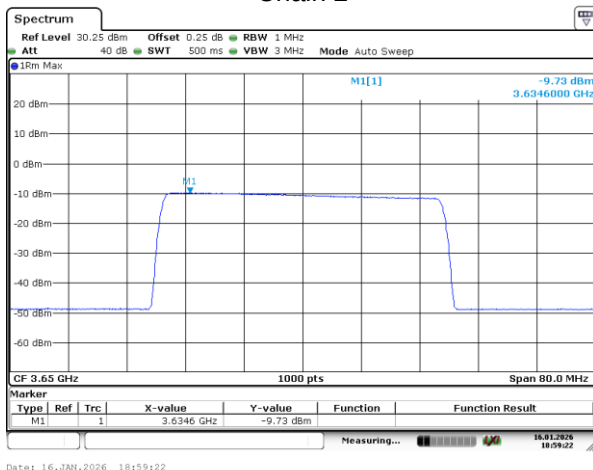
Chain 0



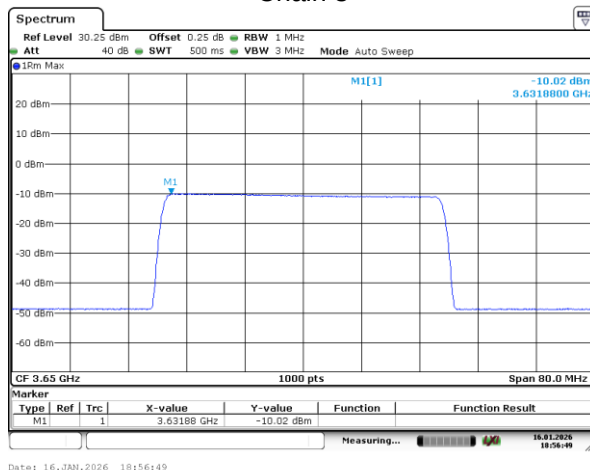
Chain 1



Chain 2

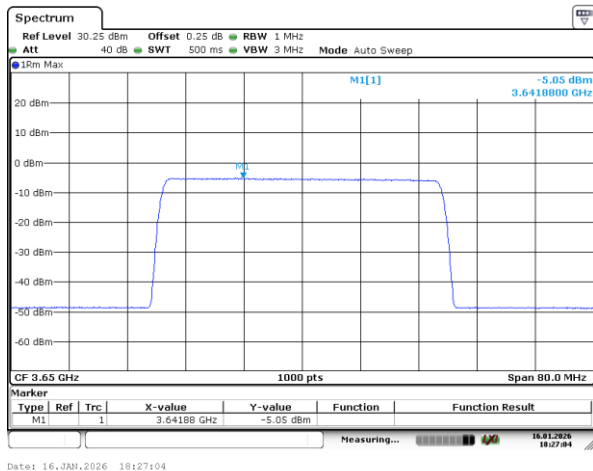


Chain 3

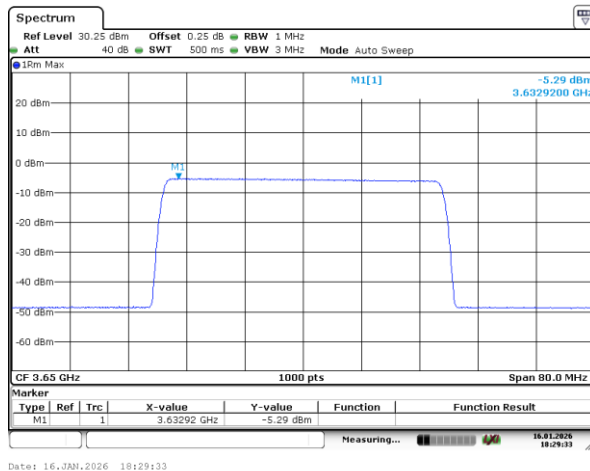


maxEirp = 15 dBm/MHz

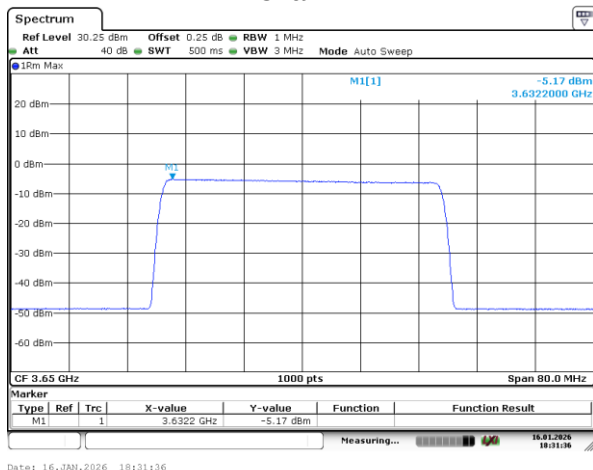
Chain 0



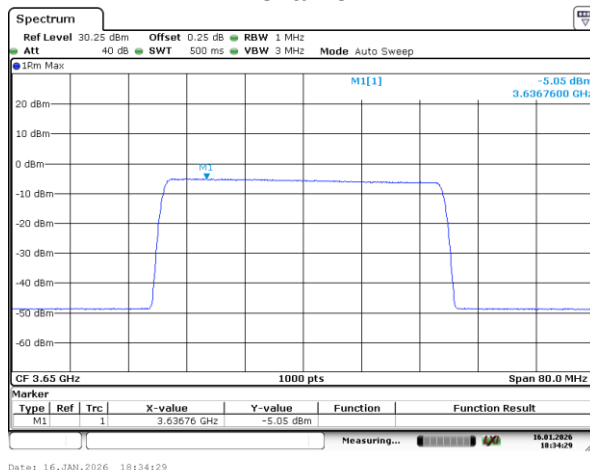
Chain 1



Chain 2

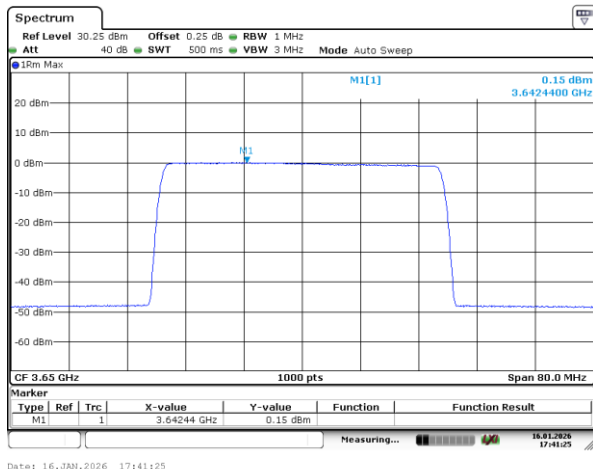


Chain 3

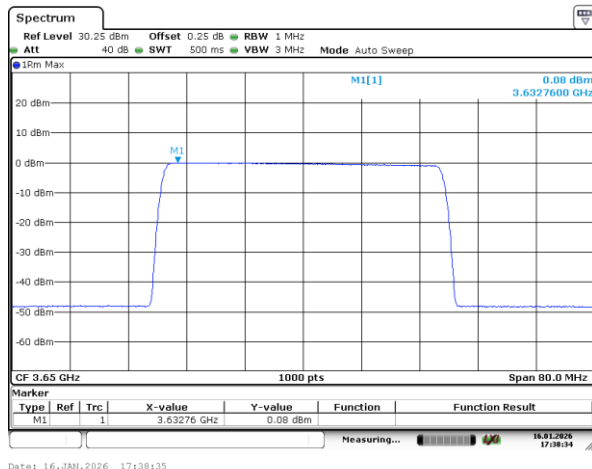


maxEirp = 20 dBm/MHz

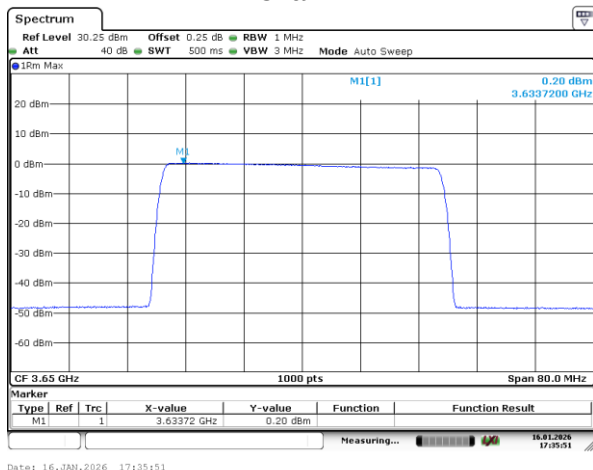
Chain 0



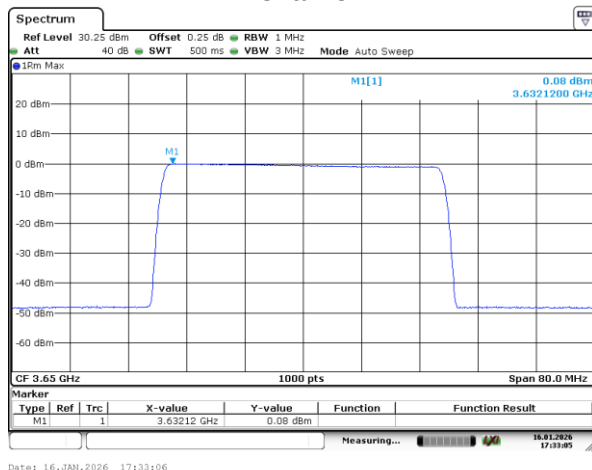
Chain 1



Chain 2



Chain 3



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

6 WinnForum Logs

Please refer to the attached file (Test Logs).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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

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