WINNF-TS-0122 TEST REPORT

FCC ID	:	Z8H89FT0061
Equipment	:	3 GHz cnRanger 210 RRH
Brand Name	:	Cambium Networks
Model Name	:	3 GHz cnRanger 210 RRH
Applicant	:	Cambium Networks Inc.
		3800 Golf Road, Suite 360 Rolling Meadows, IL 60008, USA
Manufacturer	:	Cambium Networks, Ltd.
		Ashburton, TQ13 7UP, UK
Standard	:	WINNF-TS-0122 Version V1.0.1

The product was received on Dec. 01, 2020, and testing was started from Mar. 23, 2021 and completed on Mar. 25, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in WINNF-TS-0122 Version V1.0.1 and shown compliance with the applicable technical standards.

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

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

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

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 1 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

Table of Contents

TEL : 886-3-656-9065   Page Number   : 2 of 49
FAX : 886-3-656-9085   Issued Date   : Apr. 15, 2021
Report Template No.: CB-A18_2 Ver1.1   Report Version   : 01

History of this test report

Report No.	Version	Description	Issued Date
FG0N3005AB	01	Initial issue of report	Apr. 15, 2021

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 3 of 49
Issued Date   : Apr. 15, 2021
Report Version : 01

Summary of Test Result

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

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 4 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

3.8	6.1.4.2.12	-	X	M	WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	Pass	-
-	6.1.4.3.1	X	X	C2	WINNF.FT.C.REG.20	Category A CBSD location Update	N/A	-
3.9	6.3.4.2.1	X	X	M	WINNF.FT.C.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	Pass	-
3.10	6.3.4.2.2	X	X	M	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	Pass	-
-	6.4.4.1.1	X	-	M	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	N/A	-
3.11	6.4.4.1.2	-	X	M	WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	Pass	-
3.12	6.4.4.2.1	X	X	M	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	Pass	-
-	6.4.4.2.2	X	-	M	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)	N/A	-
3.13	6.4.4.2.3	X	X	M	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	Pass	-
3.14	6.4.4.2.4	X	X	M	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	Pass	-
3.15	6.4.4.2.5	X	X	M	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Pass	-
3.16	6.4.4.2.6	-	X	M	WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	Pass	-
3.17	6.4.4.3.1	X	X	M	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	Pass	-
3.18	6.4.4.3.2	X	X	M	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	Pass	-
3.19	6.4.4.4.1	X	X	O	WINNF.FT.C.HBT.11	Successful Grant Renewal in Heartbeat Test Case	Pass	-
-	6.5.4.2.1	X	-	C4	WINNF.FT.C.MES.1	Registration Response contains measReportConfig	N/A	-
3.20	6.5.4.2.2	-	X	C4	WINNF.FT.D.MES.2	Domain Proxy Registration Response contains measReportConfig	Pass	-
-	6.5.4.2.3	X	X	C5	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	N/A	-
-	6.5.4.2.4	X	-	C5	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	N/A	-
-	6.5.4.2.5	-	X	C5	WINNF.FT.D.MES.5	Domain Proxy Heartbeat Response contains measReportConfig	N/A	-

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 5 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

-	6.6.4.1.1	X	-	M	WINNF.FT.C.RLQ.1	Successful Relinquishment	N/A	-
3.21	6.6.4.1.2	-	X	M	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	Pass	-
-	6.6.4.2.1	X	-	O	WINNF.FT.C.RLQ.3	Unsuccessful Relinquishment, responseCode=102	N/A	-
-	6.6.4.2.2	-	X	O	WINNF.FT.D.RLQ.4	Domain Proxy Unsuccessful Relinquishment, responseCode=102	N/A	-
-	6.6.4.3.1	X	-	O	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	N/A	-
-	6.6.4.3.2	-	X	O	WINNF.FT.D.RLQ.6	Domain Proxy Unsuccessful Relinquishment, responseCode=103	N/A	-
-	6.7.4.1.1	X	-	M	WINNF.FT.C.DRG.1	Successful Deregistration	N/A	-
3.22	6.7.4.1.2	-	X	M	WINNF.FT.D.DRG.2	Domain Proxy Successful Deregistration	Pass	-
-	6.7.4.2.1	X	-	O	WINNF.FT.C.DRG.3	Deregistration responseCode=102	N/A	-
-	6.7.4.2.2	-	X	O	WINNF.FT.D.DRG.4	Domain Proxy Deregistration responseCode=102	N/A	-
3.23	6.7.4.3.1	X	X	O	WINNF.FT.C.DRG.5	Deregistration responseCode=103	Pass	-
3.24	6.8.4.1.1	X	X	M	WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	Pass	-
3.25	6.8.4.2.1	X	X	M	WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	Pass	-
3.26	6.8.4.2.2	X	X	M	WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	Pass	-
3.27	6.8.4.2.3	X	X	M	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	Pass	-
3.28	6.8.4.2.4	X	X	M	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	Pass	-
3.29	7.1.4.1.1	X	X	M	WINNF.PT.C.HBT.1	UUT RF Transmit Power Measurement	Pass	-

Note1:
♦ M: Mandatory for certification
♦ O: Optional. Not required for certification.
♦ C: Conditional. Mandatory if CBSD supports relevant functionality.
Note2: The unit under test type is CBSD with Domain Proxy and Conditional Test Case Definitions are C1, C3 and C4.

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 6 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Wendy Pan

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 7 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

1   General Description

1.1   Product Feature of Equipment Under Test

Product Feature of Equipment Under Test	
EUT Type	CBSD
Power Type	From power supply
Category of EUT	☐ Category A
	☒ Category B
Professional Installation	☒ Yes
	☐ No
EUT in Test ID	☒ EUT with Domain Proxy
	☐ EUT without Domain Proxy
CBSD Hardware Version	220
CBSD Software Version	cnRanger_RRH_v2.1
CBSD Firmware Version	N/A
Domain Proxy Hardware Version	N/A
Domain Proxy Software Version	12.6
Domain Proxy Firmware Version	N/A

Note: The above information was declared by manufacturer.

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 8 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

1.2   Accessories

Accessories			
No.	**Equipment Name**	**Brand Name**	**Model Name**	**Rating**
1	AC, DC Power supply	XP	DNR120AS48-I	Input: 115 / 230VAC, 28 / 14A, 47-63Hz Output:48VDC, 120W
Other			
AC power cable*1, Non-shielded 1.45m			

1.3   Support Equipment

Support Equipment			
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	WLAN AP	Netgear	R7500	PY314300288
B	Switch	Panasonic	Switch-S9GPWR	N/A
C	Notebook (Domain Proxy)	ASUS	B500-P45VA-0391A3210M	N/A
D	Notebook (SAS)	ASUS	B500-P45VA-0391A3210M	N/A
E	BBU	Cambium	Sierra 800	N/A
F	UE	Cambium	3GHz cnRanger 201 SM	N/A
G	Notebook	DELL	E4300	N/A

1.4   Testing Location

Testing Location Information
Test Lab.：Sporton International Inc. Hsinchu Laboratory
Hsinchu   ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)   TEL: 886-3-656-9065   FAX: 886-3-656-9085
Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086D with Industry Canada.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
RF Conducted	TH01-CB	Jeff Wu	21.5~22.2 / 53~65	Mar. 23, 2021~Mar. 25, 2021

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 9 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

2   Measurement Environment

Measurement Environment Information	
Test Harness version	1.0.0.3
Operating System	Microsoft Windows 10
TLS version	1.2
Python	2.7.18

2.1   Conditional Test Case

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

Note: The above information was declared by manufacturer.

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 10 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

2.2　　Test Configuration

Test configuration without Domain Proxy	Test configuration with Domain Proxy

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number　　: 11 of 49

Issued Date　　: Apr. 15, 2021

Report Version　: 01
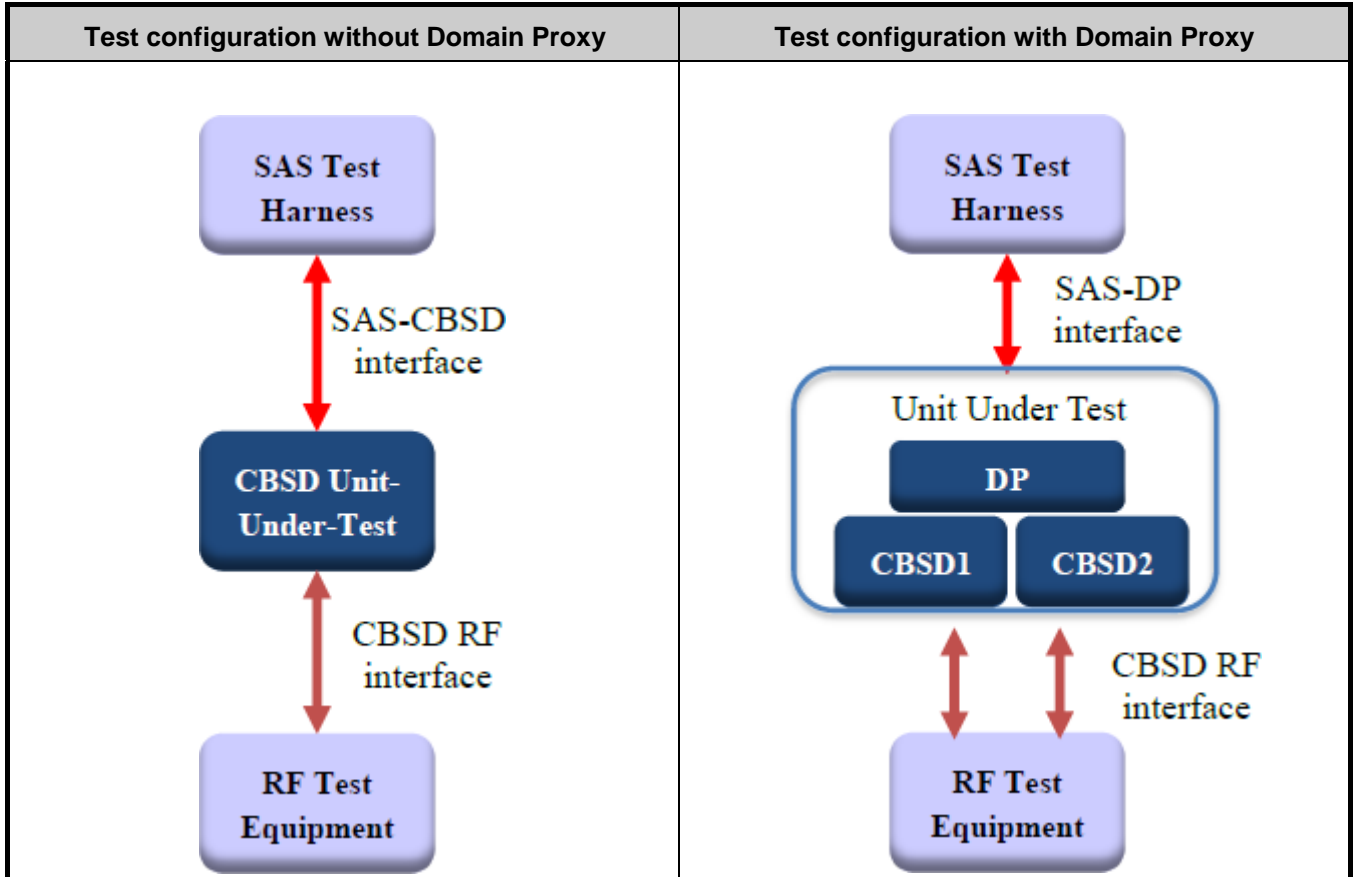
3   Protocol Test Results

3.1   WINNF.FT.D.REG.2 - Domain Proxy Multi-Step registration

#	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	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	--
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 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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 12 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

3.2   WINNF.FT.D.REG.6 - Domain Proxy Single-Step registration for CBSD with CPI signed data

#	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	--
3	• SAS Test Harness sends a CBSD Registration Response in the form of one 2-element Array or as 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 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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 13 of 49
Issued Date   : Apr. 15, 2021
Report Version : 01

3.3   WINNF.FT.D.REG.9 - Domain Proxy Missing Required parameters (responseCode 102)

#	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 (*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 not transmit RF	PASS	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 14 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

3.4   WINNF.FT.D.REG.11 - Domain Proxy Pending registration (responseCode 200)

#	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 (*responseCode*=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	--

3.5   WINNF.FT.D.REG.13 - Domain Proxy Invalid parameters (responseCode 103)

#	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 (*responseCode* 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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 16 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

3.6   WINNF.FT.D.REG.15 - Domain Proxy Blacklisted CBSD (responseCode 101)

#	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 (*responseCode* 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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 17 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

3.7   WINNF.FT.D.REG.17 - Domain Proxy Unsupported SAS protocol version (responseCode 100)

#	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 (*responseCode (Ri)=100 for each CBSD)* 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	--

3.8   WINNF.FT.D.REG.19 - Domain Proxy Group Error (responseCode 201)

#	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 (*responseCode* 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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 19 of 49

Issued Date   : Apr. 15, 2021

Report Version : 01

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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* = R	--	--
4	After completion of step 3, SAS Test Harness does not provide any positive response (*responseCode*=0) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 20 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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* = R	--	--
4	After completion of step 3, SAS Test Harness does not provide any positive response (*responseCode*=401) to further request messages from the UUT.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 21 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

3.11 WINNF.FT.D.HBT.2 - Domain Proxy Heartbeat Success Case (first Heartbeat Response)

#	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 a Spectrum Inquiry Request, go to step 3 • If message is a 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	--
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	--

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	--
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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 23 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 24 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: o valid *cbsdId* = C o valid *grantId* = G o grant is for frequency range F, power P o *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	--
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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 25 of 49
Issued Date   : Apr. 15, 2021
Report Version : 01

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

#	Test Execution Steps	Results	

1	Ensure the following conditions are met for test entry:
	• 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	--
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	--

TEL : 886-3-656-9065   Page Number   : 26 of 49
FAX : 886-3-656-9085   Issued Date   : Apr. 15, 2021
Report Template No.: CB-A18_2 Ver1.1   Report Version   : 01

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

#	Test Execution Steps	Results	

1	Ensure the following conditions are met for test entry:
	• 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	--
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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 27 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

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

#	Test Execution Steps	Results	

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	  o valid *cbsdId* =C
	  o valid *grantId* =G
	  o grant is for frequency range F, power P
	  o *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	--
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:
	  o *cbdsId* =C
	  o *grantId*=G
	Monitor the RF output of the UUT. Verify:
	• UUT shall stop transmission within (T+60) seconds of completion of step 3.
		PASS	--

3.16   WINNF.FT.D.HBT.8 - Domain Proxy Heartbeat responseCode=500 (TERMINATED_GRANT)

#	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: o valid *cbsdId* = Ci, i={1,2} o valid *grantId* = Gi, i={1,2} o grant is for frequency range Fi, power Pi o *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	--
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: o *transmitExpireTime* = current UTC time + 200 seconds o *responseCode* = 0 • For CBSD2: o *transmitExpireTime* = T = current UTC time o *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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 30 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

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

#	Test Execution Steps	Results	

1	Ensure the following conditions are met for test entry:
	 • UUT has registered successfully with SAS Test Harness
	 • UUT has a valid single grant as follows:
	     o valid *cbsdId* = C
	     o valid *grantId* = G
	     o grant is for frequency range F, power P
	     o *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	--
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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 31 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

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

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: ● 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 the latest specified *heartbeatInterval*, and is formatted correctly, including: ● *cbsdId* =C ● *grantId* =G ● *operationState* = "AUTHORIZED"	PASS	--
3	SAS Test Harness sends a Heartbeat Response message, with the following parameters: ● *cbsdId* =C ● *grantId* =G ● *transmitExpireTime* = current UTC time + 200 seconds ● *responseCode* = 0	--	--
4	After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT	--	--
5	Monitor the RF output of the UUT. Verify: ● UUT shall stop all transmission on RF interface within (*transmitExpireTime* + 60 seconds), using the transmitExpireTime sent in Step 3.	PASS	--

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

#	Test Execution Steps	Results	

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	   o valid *cbsdId* = C
	   o valid *grantId* = G
	   o 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:
	   o *grantExpireTime* = UTC time equal to time at start of test + 300 seconds = Tgrant_expire
	   o *transmitExpireTime* = UTC time equal to time at start of test + 200 seconds
	   o *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	--
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	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 33 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

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 subsquent Heartbeat 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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 34 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

3.20 WINNF.FT.D.MES.2 - Domain Proxy Registration Response contains measReportConfig

#	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: • *userId* is present and correct • *fccId* is present and correct • *cbsdSerialNumber* is present and correct • *measCapability* = "RECEIVED_POWER_WITHOUT_GRANT"	PASS	--
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: • *cbsdId* = Ci • *measReportConfig* = "RECEIVED_POWER_WITHOUT_GRANT" • *responseCode* = 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: • *cbsdId* = Ci • *measReport* is present, and is a properly formatted *rcvdPowerMeasReport*.	PASS	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 35 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

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: • *cbsdId* = Ci • *availableChannel* is an array of *availableChannel* objects • *responseCode* = 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: • *cbsdId* = Ci • *measReport* is present, and is a properly formatted *rcvdPowerMeasReport.*	PASS	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number : 36 of 49
Issued Date : Apr. 15, 2021
Report Version : 01

3.21   WINNF.FT.D.RLQ.2 - Domain Proxy Successful Relinquishment

| #	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 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: • *cbsdId* = Ci • *grantId* = Gi	PASS	--
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	--

3.22 WINNF.FT.D.DRG.2 - Domain Proxy Successful Deregistration

#	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 deregister each UUT 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 CBSD i: • *cbsdId* = Ci	PASS	--
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	--

3.23 WINNF.FT.C.DRG.5 - Deregistration responseCode=103

#	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: • No *cbsdId* • *responseCode* = 103	--	--
5	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=0) to further request messages from the UUT.	--	--
6	Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify: • 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	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number : 39 of 49

Issued Date : Apr. 15, 2021

Report Version : 01

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

#	Test Execution Steps	Results	
1	• UUT shall start CBSD-SAS communication with the security procedure • 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	--

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	--

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	--
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	--

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

#	Test Execution Steps	Results	
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS	--
2	• Make sure that UUT uses TLS v1.2 for security establishment. • 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	--
3	UUT may retry for the security procedure which shall fail	PASS	--
4	SAS Test-Harness shall not receive any Registration request or any application data.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 41 of 49
Issued Date   : Apr. 15, 2021
Report Version : 01

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

#	Test Execution Steps	Results	
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS	--
2	• Make sure that UUT uses TLS v1.2 for security establishment. • 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	--
3	UUT may retry for the security procedure which shall fail.	PASS	--
4	SAS Test-Harness shall not receive any Registration request or any application data.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 42 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

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

#	Test Execution Steps	Results	
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS	--
2	• Make sure that UUT uses TLS v1.2 for security establishment. • 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	--
3	UUT may retry for the security procedure which shall fail.	PASS	--
4	SAS Test-Harness shall not receive any Registration request or any application data.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

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

#	Test Execution Steps	Results	
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS	--
2	• Make sure that UUT uses TLS v1.2 for security establishment. • 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	--
3	UUT may retry for the security procedure which shall fail.	PASS	--
4	SAS Test-Harness shall not receive any Registration request or any application data.	--	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: • UUT shall not transmit RF	PASS	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 44 of 49
Issued Date   : Apr. 15, 2021
Report Version : 01

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

Items	Parameters
Maximum rated power (EIRP, dBm/MHz)	37dBm/MHz
Transmit dynamic range (EIRP, dBm/MHz)	1dB increments from 7 dBm/MHz to 37 dBm/MHz (31 steps)
Occupied bandwidth (OBW)	20MHz
maxEirp values	37dBm/MHz
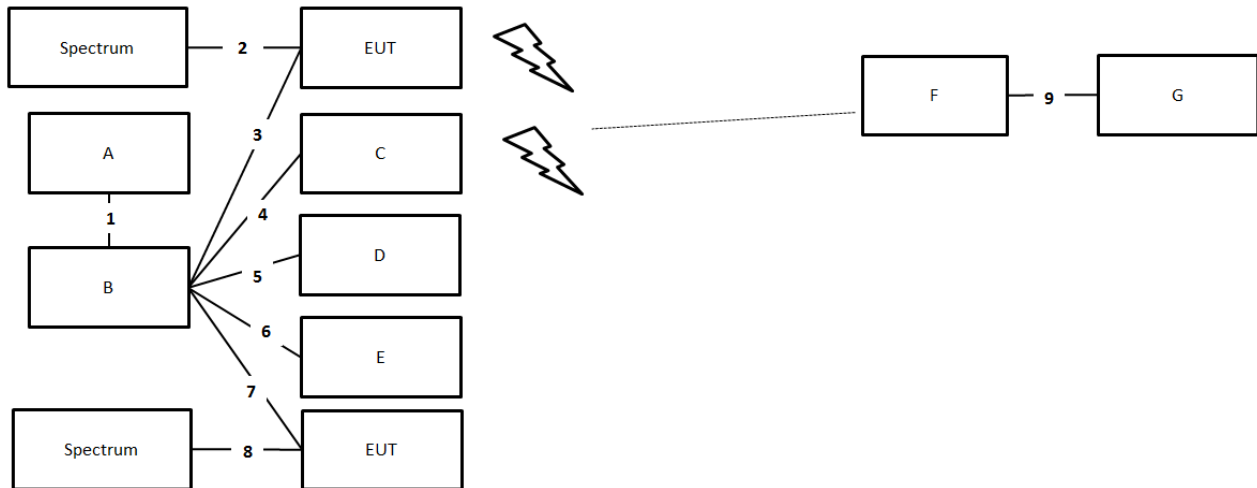
Item	Connection	Shielded	Length
1	RJ-45 cable	No	1.5m
2	RJ-45 cable	No	1.5m
3	RJ-45 cable	No	1.5m
4	RJ-45 cable	No	1.5m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	1.5m
7	RJ-45 cable	No	1.5m
8	RJ-45 cable	No	1.5m
9	RJ-45 cable	No	1.5m

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

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 45 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

Spectrum Analyzer Setting	Parameters
Center Frequency	3600MHz
Frequency Span	40MHz
RBW / VBW	1 MHz / 3MHz
Channel Power Meas Bandwidth	10MHz
Sweep Time	1ms

#	Test Execution Steps	Results	
1	Ensure the following conditions are met for test entry: • 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 = F_L, highFrequency = F_H, maxEirp = P_i}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case *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:
	  ○ *cbsdId* = C
	  ○ *grantId* = G
	  ○ *transmitExpireTime* = current UTC time + 200 seconds
	  ○ *responseCode* = 0
		--	--

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 46 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

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

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 | -- |

Frequency	Bandwidth	Antenna Gain	Conducted PSD		maxEirp	Grant maxEirp	Result
			Port 1	Port 2			
	(MHz)	(dBi)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	
3600MHz	20	17	15.63	16.39	36.04	37	PASS
3600MHz	20	17	0.697	1.443	21.10	22	PASS
3600MHz	20	17	-14.09	-14.26	5.84	7	PASS

TEL : 886-3-656-9065

FAX : 886-3-656-9085

Report Template No.: CB-A18_2 Ver1.1

Page Number   : 47 of 49

Issued Date   : Apr. 15, 2021

Report Version   : 01

4   Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Signal analyzer	Agilent	N9010A	MY52220519	10kHz~44GHz	Mar. 19, 2021	Mar. 18, 2022	Conducted (TH01-CB)
Signal analyzer	Keysight	N9020A	MY55400138	10 Hz up to 26.5 GHz	Jan. 13, 2021	Jan. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-30	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Feb. 23, 2021	Feb. 22, 2022	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Feb. 23, 2021	Feb. 22, 2022	Conducted (TH01-CB)

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

5   Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission	2.8 dB	Confidence levels of 95%

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A18_2 Ver1.1

Page Number   : 49 of 49
Issued Date   : Apr. 15, 2021
Report Version   : 01

RF measurement plot for WINNF.FT.D.HBT.2 CBSD 1 Test Case ID
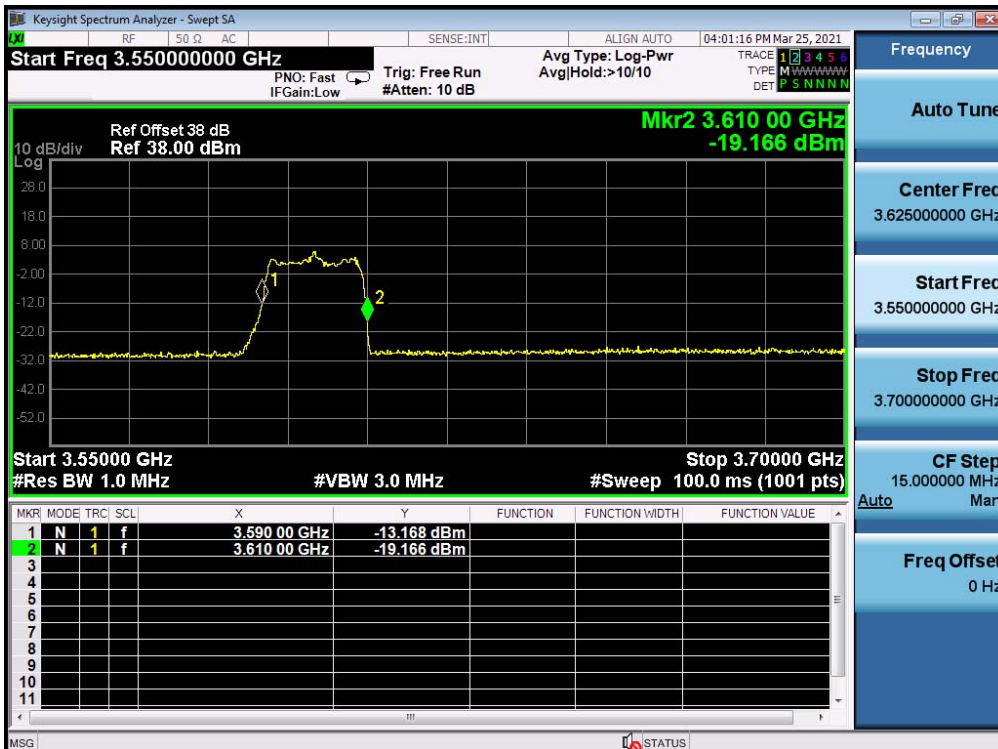
RF measurement plot for WINNF.FT.D.HBT.2 CBSD 2 Test Case ID
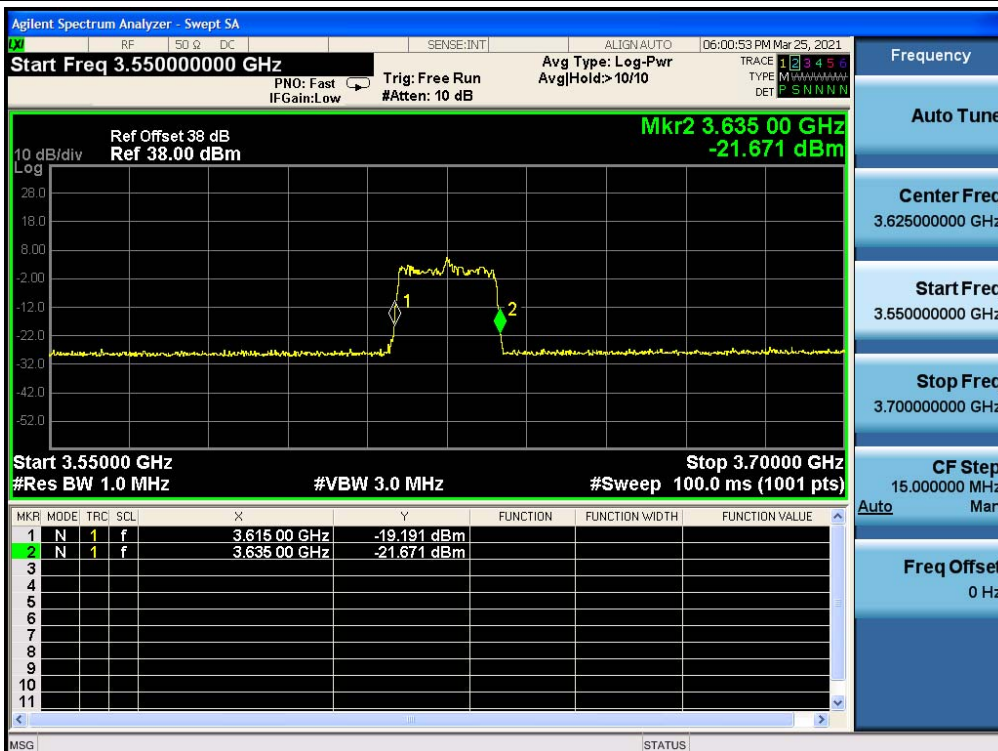
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 37 / Plot 1
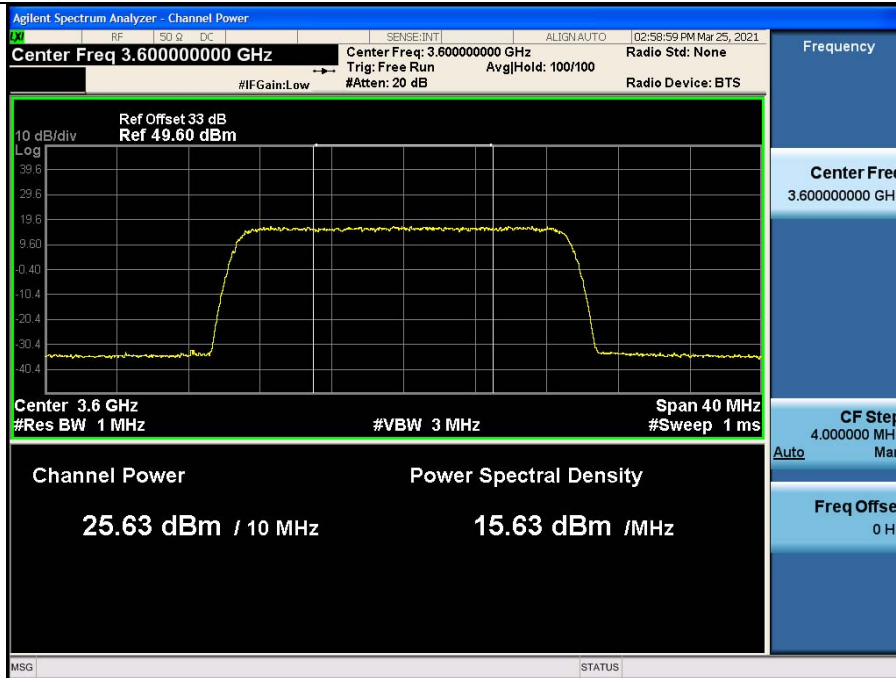
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 37 / Plot 2
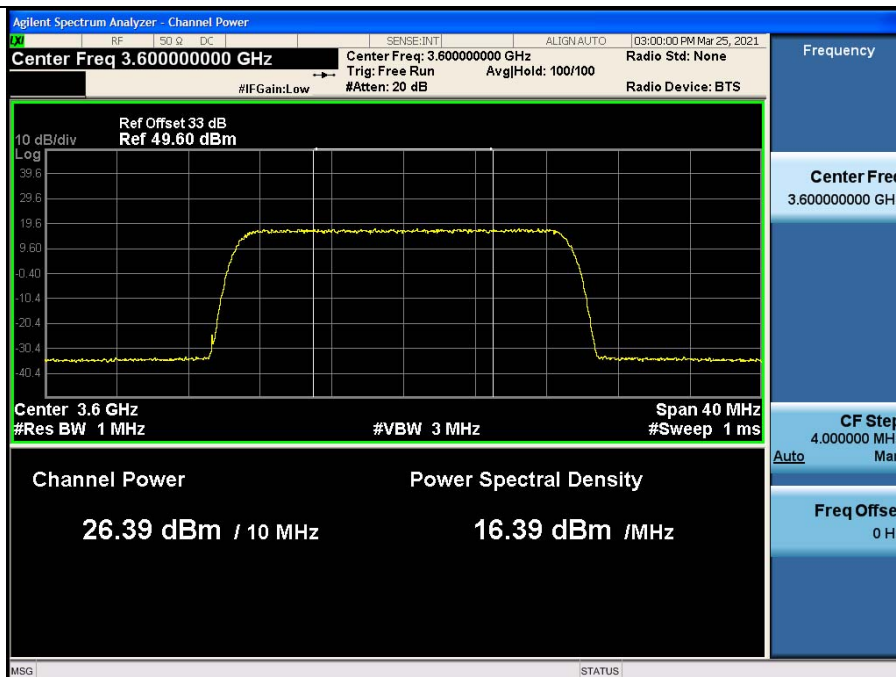
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 22 / Plot 1
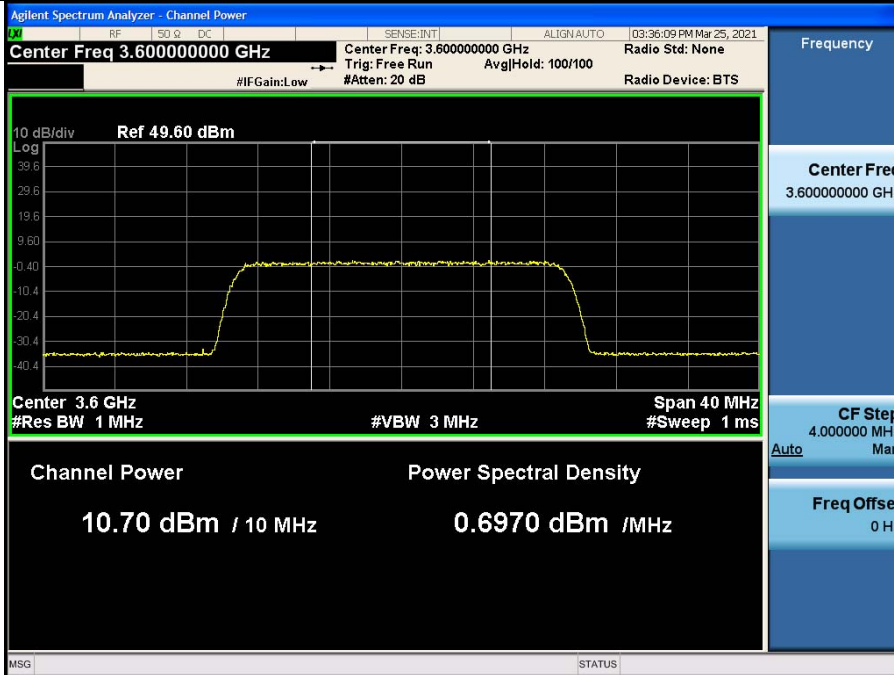
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 22 / Plot 2
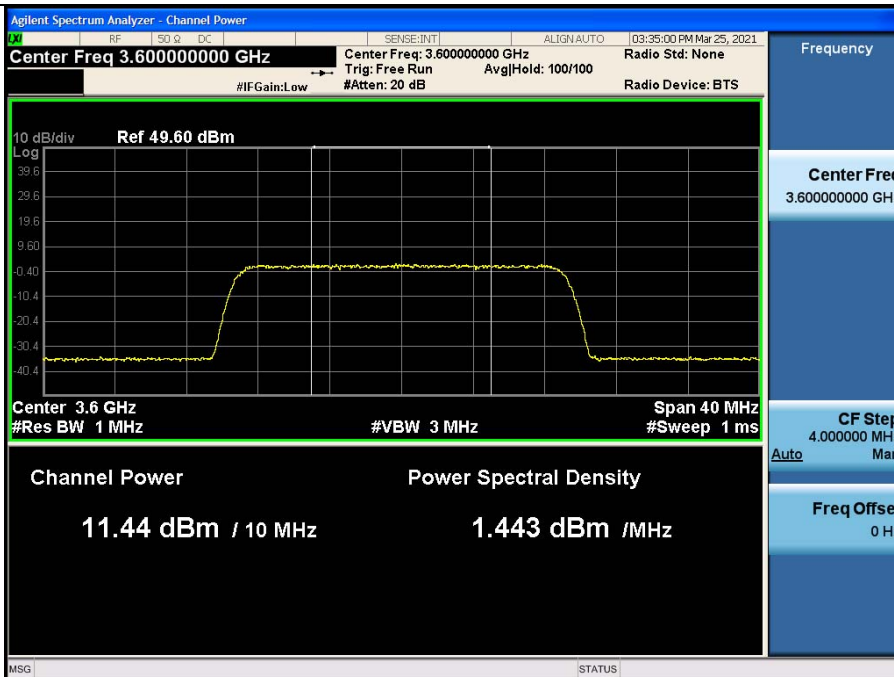
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 7 / Plot 1
RF measurement plot for WINNF.PT.C.HBT.1 Test Case ID_BW20M_Grant maxEirp 7 / Plot 2
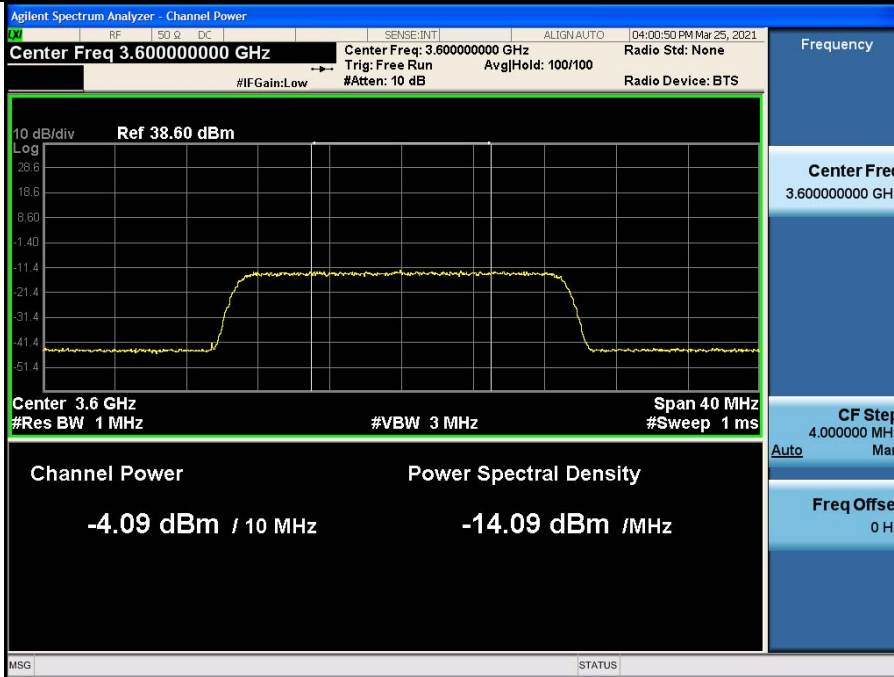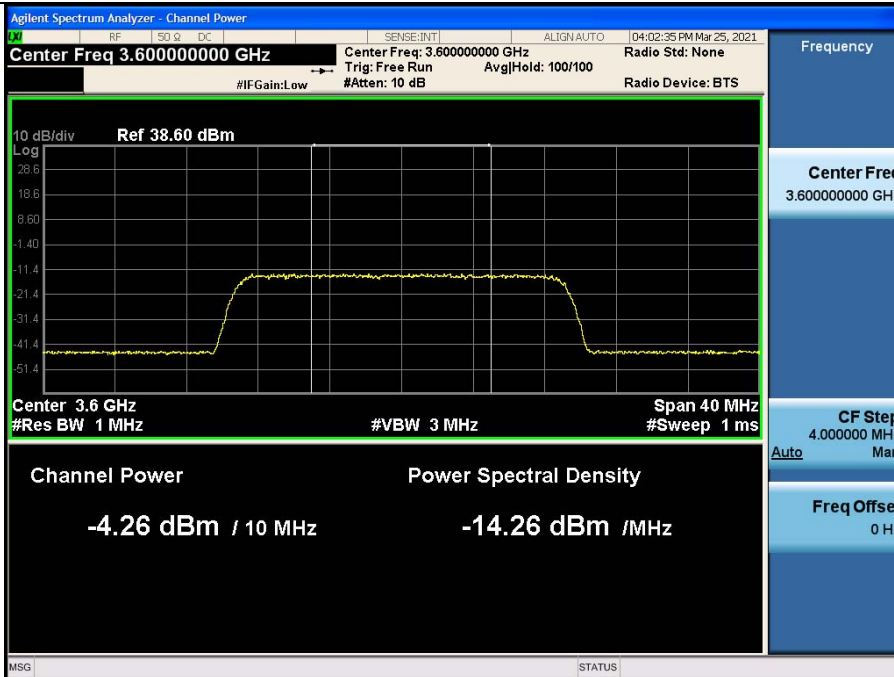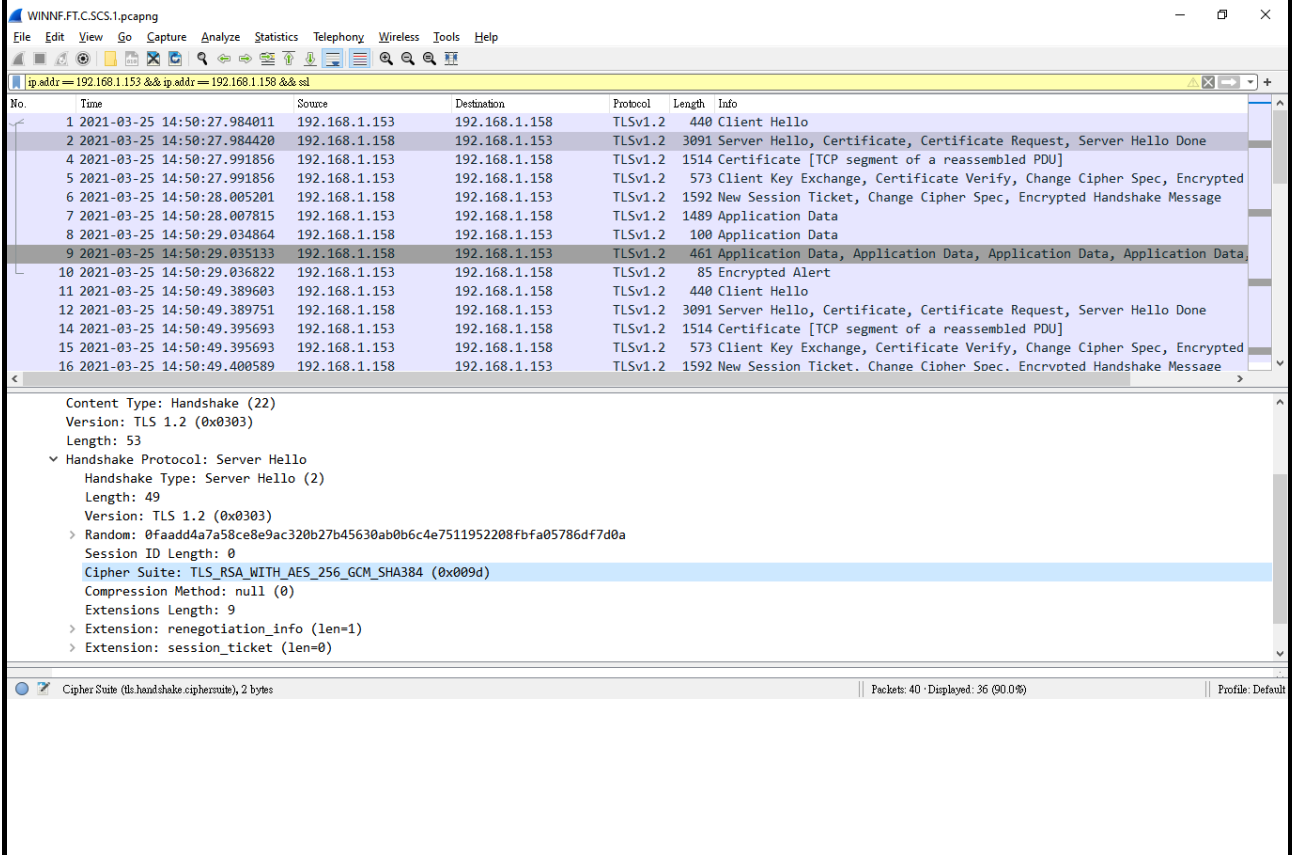
Wireshark Plots for WINNF.FT.C.SCS.1 Test Case ID

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

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

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

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

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

Activities   Wireshark ▾   Thu 15:47 ●

*any   ×

File   Edit   View   Go   Capture   Analyze   Statistics   Telephony   Wireless   Tools   Help

`ocsp`   Expression...   +
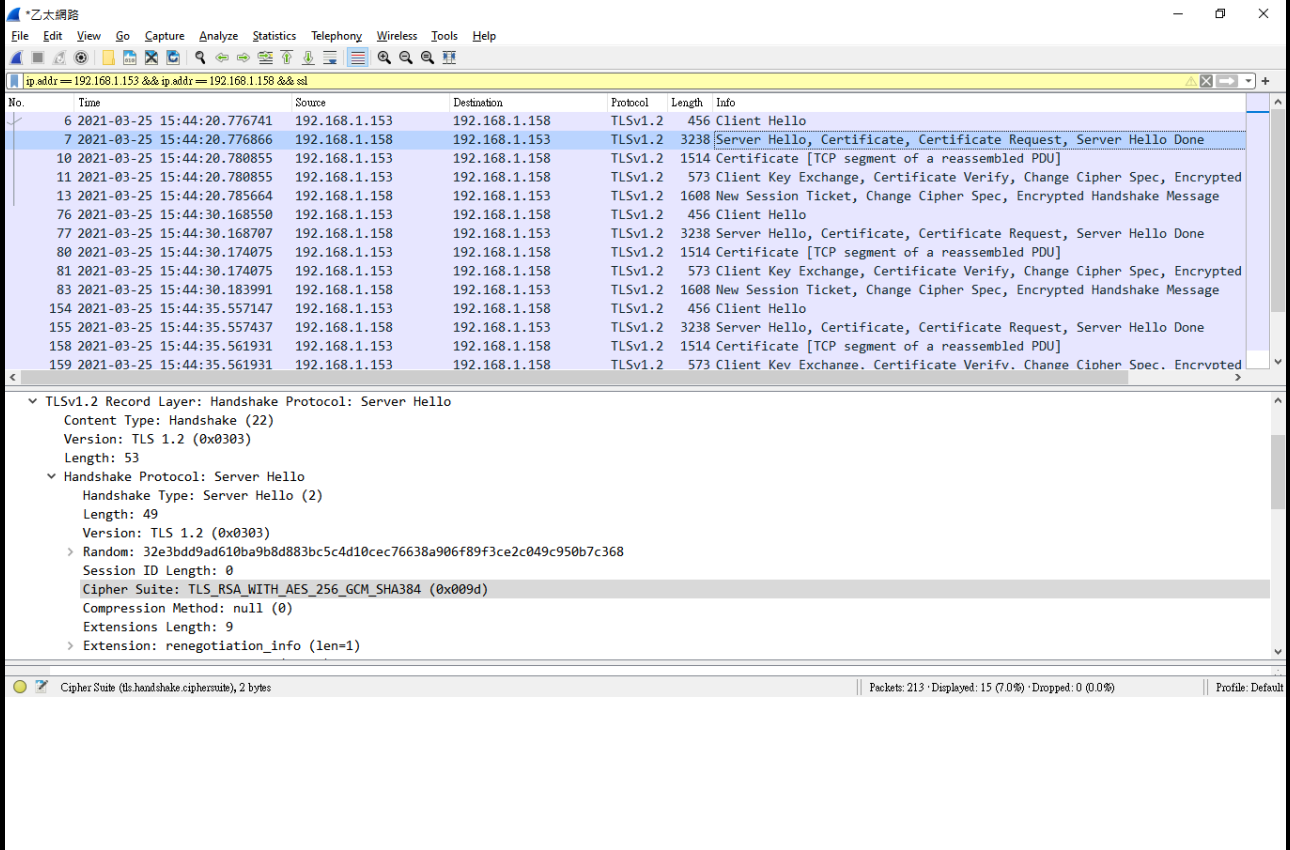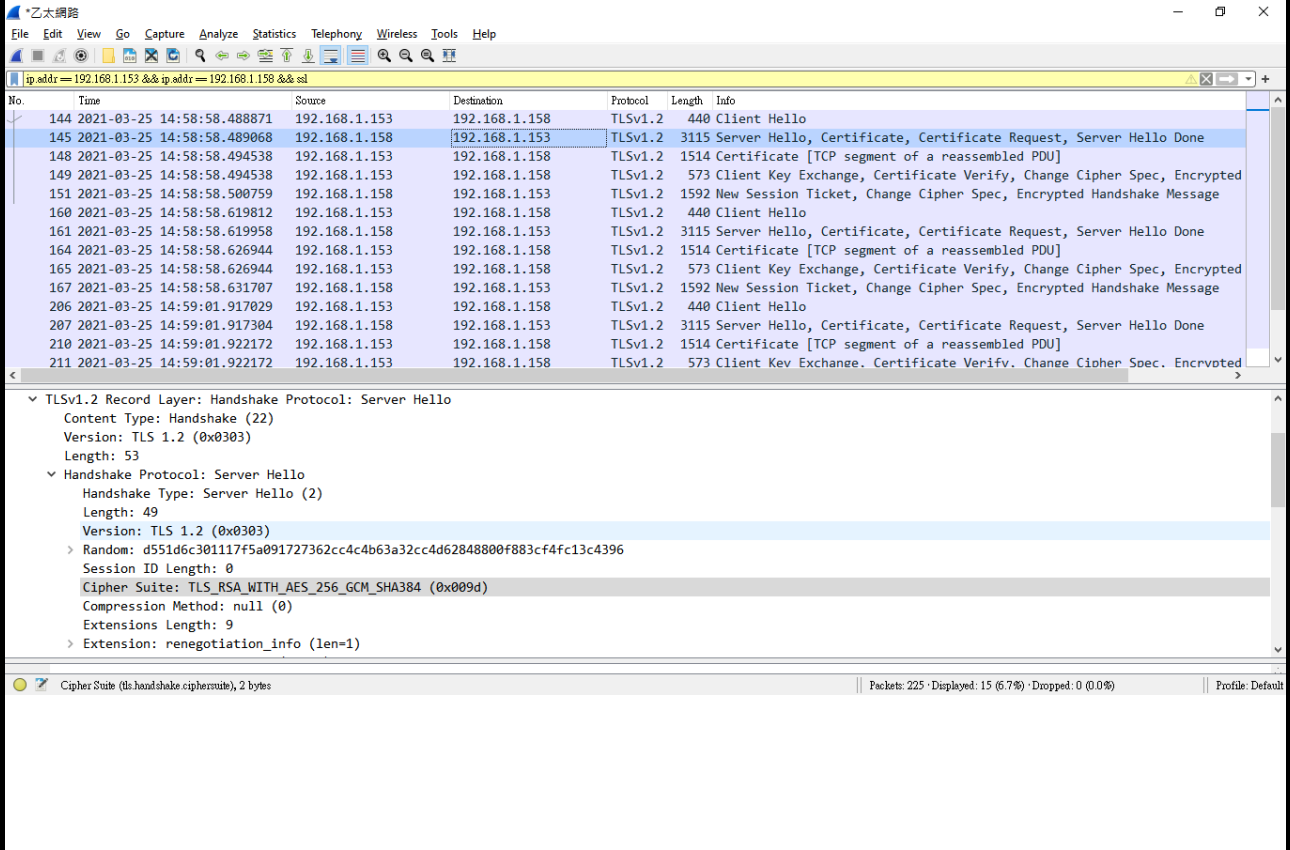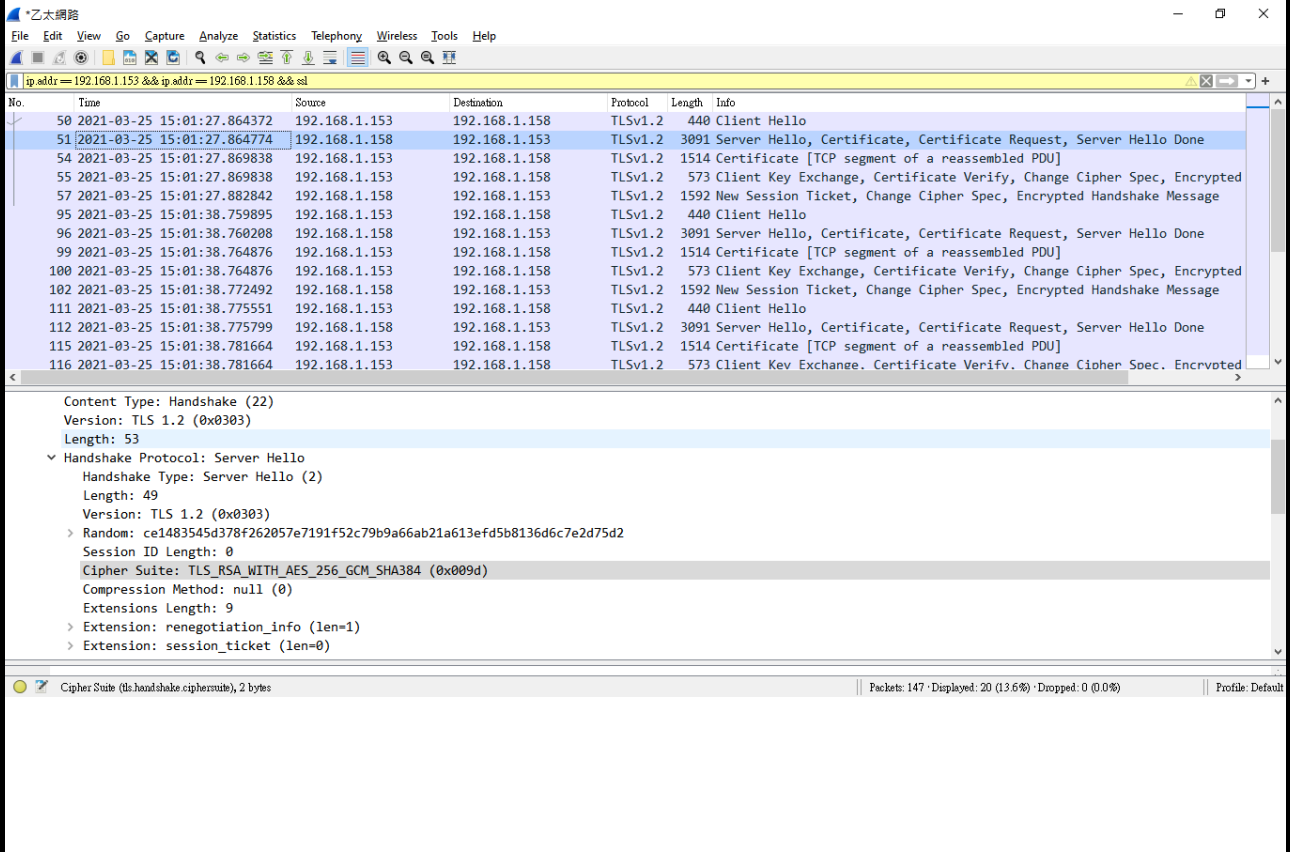
No.	Time	Source	Destination	Protocol	Length	Info
61	2021-03-25 15:44:52	192.168.1.153	192.168.1.162	OCSP	324	Request
63	2021-03-25 15:44:52	192.168.1.162	192.168.1.153	OCSP	3696	Response
91	2021-03-25 15:44:59	192.168.1.153	192.168.1.162	OCSP	324	Request
93	2021-03-25 15:44:59	192.168.1.162	192.168.1.153	OCSP	3696	Response
104	2021-03-25 15:45:00	192.168.1.153	192.168.1.162	OCSP	324	Request
106	2021-03-25 15:45:00	192.168.1.162	192.168.1.153	OCSP	3696	Response
141	2021-03-25 15:45:10	192.168.1.153	192.168.1.162	OCSP	324	Request
143	2021-03-25 15:45:10	192.168.1.162	192.168.1.153	OCSP	3696	Response
165	2021-03-25 15:45:15	192.168.1.153	192.168.1.162	OCSP	324	Request
167	2021-03-25 15:45:15	192.168.1.162	192.168.1.153	OCSP	3696	Response

▶ Transmission Control Protocol, Src Port: 40268, Dst Port: 80, Seq: 1, Ack: 1, Len: 256
▶ Hypertext Transfer Protocol
▼ Online Certificate Status Protocol
   ▼ tbsRequest
     ▼ requestList: 1 item
       ▼ Request
         ▼ reqCert
           ▶ hashAlgorithm (SHA-1)
           issuerNameHash: 82a88f8c0947d43b3dba73543c76051d46b3f0c1
           issuerKeyHash: 7cd5c94505f2ca38b67b6eb22743ea53ee705156
           serialNumber: 10917353450081643897
     ▶ requestExtensions: 1 item

● ✎   CertificateSerialNumber (ocsp.serialNumber), 9 bytes   Packets: 211 · Displayed: 10 (4.7%)   Profile: Default