Test Report

As per

FCC Part 96 SAS requirements (CBRS Test Plan)

Add value.
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on the

Nokia 7705 SAR-Hmc NA
Variant 2 (3HE12473AAA) Base Station
FCC ID: AS57705SARHMC-2B

Issued by:
TÜV SÜD Canada Inc.
1280 Teron Rd,
Ottawa, ON K2K 2C1
Canada

Testing produced for

Nokia

See Appendix A for full client & EUT details.

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Test Personnel

Steve McFarlane
Report Reviewer

Testing Laboratory
Certificate #2955.19

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Report Scope

This report addresses the SAS protocol verification testing and test results of the **Nokia 7705 SAR-Hmc NA(3HE12473AAA) Base Station (3550-3700 MHz)** herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

FCC Part 96 SAS requirements (CBRS Test Plan)

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc, unless otherwise stated.

Summary

The results contained in this report relate only to the item(s) tested.

Equipment Under Test (EUT)	**Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station**
EUT passed all tests performed	Yes
Tests conducted by	Scott Drysdale

For testing dates, see 'Testing Environmental Conditions and Dates'.

Test Results Summary

Section as per Working Document WINNF-TS-0122

Section	CBSD	DP	Test Case ID	Test Case Title	RF Measurement Requirement	Pass / Fail
6.1.4.1.1	X	--	WINNF.FT.C.REG.1	Multi-Step registration	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.1.2	--	X	WINNF.FT.D.REG.2	Domain Proxy Multi-Step registration	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.1.3	X	--	WINNF.FT.C.REG.3	Single-Step registration for Category A CBSD	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.1.4	--	X	WINNF.FT.D.REG.4	Domain Proxy Single-Step registration for Cat A CBSD (Note: Mandatory for without CPI, if EUT will always have signed CPI – asked for email waiver)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.1.5	X	--	WINNF.FT.C.REG.5	Single-Step registration for CBSD with CPI signed data	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.1.6	--	X	WINNF.FT.D.REG.6	Domain Proxy Single-Step registration for CBSD with CPI signed data	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.1.7	X	X	WINNF.FT.C.REG.7	Registration due to change of an installation parameter	Test waits until transmission starts, then trigger an installationParam change. • Record time at which transmission stops. Time must be within 60 seconds of the installationParam change taking effect.	N/A
6.1.4.2.1	X	--	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.2	--	X	WINNF.FT.D.REG.9	Domain Proxy Missing Required parameters (responseCode 102)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.2.3	X	--	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.4	--	X	WINNF.FT.D.REG.11	Domain Proxy Pending registration (responseCode 200)	Monitor for 60 seconds after REG message	N/A

					sent. No transmission during test.	
6.1.4.2.5	X	--	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.6	--	X	WINNF.FT.D.REG.13	Domain Proxy Invalid parameters (responseCode 103)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.2.7	X	--	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.8	--	X	WINNF.FT.D.REG.15	Domain Proxy Blacklisted CBSD (responseCode 101)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.2.9	X	--	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.10	--	X	WINNF.FT.D.REG.17	Domain Proxy Unsupported SAS protocol version responseCode 100)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.2.11	X	--	WINNF.FT.C.REG.18	Group Error (responseCode 201)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.1.4.2.12	--	X	WINNF.FT.D.REG.19	Domain Proxy Group Error (responseCode 201)	Monitor for 60 seconds after REG message sent. No transmission during test.	N/A
6.1.4.3.1	X	X	WINNF.FT.C.REG.20	Category A CBSD location update		P
6.3.4.2.1	X	X	WINNF.FT.C.GRA.1 (TYPO FIXED D TO C)	Unsuccessful Grant responseCode=400 (INTERFERENCE)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.3.4.2.2	X	X	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	Monitor for 60 seconds after REG message sent. No transmission during test.	P
6.4.4.1.1	X	--	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	Monitor RF from start of test. Ensure that: • Transmission does not start until time of first heartbeat response or after. • After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)	P
6.4.4.1.2	--	X	WINNF.FT.D.HBT.2	Domain Proxy Heartbeat Success Case (first Heartbeat Response)	Monitor RF from start of test. Ensure that:	N/A

					• Transmission does not start until time of first heartbeat response or after. • After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)	
6.4.4.2.1	X	X	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	Monitor RF transmission. Ensure that: • CBSD stops transmission within 60 seconds of the heartbeatResponse which contains responseCode = 105	P
6.4.4.2.2	X	--	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)		P
6.4.4.2.3	X	X	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	Monitor RF transmission from start of test. Ensure there is no transmission during the test	P
6.4.4.2.4	X	X	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	Monitor RF transmission. Ensure: • CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=501	P
6.4.4.2.5	X	X	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Monitor RF transmission. Ensure: • CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=502	P
6.4.4.2.6	--	X	WINNF.FT.D.HBT.8	Domain Proxy Heartbeat responseCode=500 (TEMINATED_GRANT)	Monitor RF transmission. CBSDs will have different behavior: • CBSD1: will continue to transmit to end of test (this is not a pass/fail criteria, but check)	N/A

					• CBSD2: must stop transmission within 60 seconds of being sent heartbeatResponse with responseCode = 500	
6.4.4.3.1	X	X	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	Monitor RF from start of test to 60 seconds after last heartbeatResponse message was sent. CBSD should not transmit at any time during test	P
6.4.4.3.2	X	X	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	Monitor RF transmission. Verify: • CBSD must stop transmission with in transmitExpireTime+60 seconds, where transmitExpireTime is from last successful heartbeatResponse message	P
6.5.4.2.1	X	--	WINNF.FT.C.MES.1	Registration Response contains measReportConfig	No RF monitoring	P
6.5.4.2.2	--	X	WINNF.FT.D.MES.2	Domain Proxy Registration Response contains measReportConfig	No RF monitoring	N/A
6.5.4.2.3	X	X	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	No RF monitoring	P
6.5.4.2.4	X	--	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	No RF monitoring	P
6.5.4.2.5	--	X	WINNF.FT.D.MES.5	Domain Proxy Heartbeat Response contains measReportConfig	No RF monitoring	N/A
6.6.4.1.1	X	--	WINNF.FT.C.RLQ.1	Successful Relinquishment	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRequest message.	P
6.6.4.1.2	--	X	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRequest message.	N/A
6.7.4.1.1	X	--	WINNF.FT.C.DRG.1	Successful Deregistration	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRe	P

					quest message or deregistration Request message (whichever is sent first)	
6.7.4.1.2	--	X	WINNF.FT.D.DRG.2	Domain Proxy Successful Deregistration	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRequest message or deregistrationRequest message (whichever is sent first)	N/A
6.8.4.1.1	X	X	WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	No RF transmission during test Check the tcpdump for the TLS information	P
6.8.4.2.1	X	X	WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	No RF transmission during test Check the tcpdump for the TLS information	P
6.8.4.2.2	X	X	WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	No RF transmission during test Check the tcpdump for the TLS information	P
6.8.4.2.3	X	X	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	No RF transmission during test Check the tcpdump for the TLS information	P
6.8.4.2.4	X	X	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	No RF transmission during test Check the tcpdump for the TLS information	P
7.1.4.1.1	X	X	WINNF.PT.C.HBT	UUT RF Transmit Power Measurement	Power Spectral Density test case. Assume we use 1 carrier bandwidth (say, 5 or 10 MHz), one frequency (say middle channel in band) for test. Measure at max transmit power, and reduce in steps of 3 dB to minimum declared transmit power.	P

If the product as tested complies with the specification, the EUT is deemed to comply with the standard and is deemed a 'PASS' or ‘P’ grade. If not 'FAIL' grade is issued. Where ‘N/A’ is stated this means the test case is not applicable, and see Notes, Justifications or Deviations Section for details.

Notes, Justifications, or Deviations

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

A later revision of the standard may have been substituted in place of the previous dated referenced revision. The year of the specification used is listed under applicable standards. Using the later revision accomplishes the goal of ensuring compliance to the intent of the previous specification, while allowing the laboratory to incorporate the extensions and clarifications made available by a later revision.

Test results were obtained using the model, the client attests the test results are representative or worst case of all models as listed in appendix A

For the N/A test cases, the following justifications apply:

a. EUT is a CBSD without a Domain Proxy
b. EUT supports the following Conditional functionality from WINNF-TS-0122-V1.0.2, Table 6-2:
    i. C1 – Multi-step registration (WINNF.FT.C.REG.1)
c. Optional test cases were not performed

Additional testing for power spectral density (PSD) requirements were evaluated as the original EUT firmware was changed to allow for higher conducted power with different antenna gains. All other parameters were deemed to not be affected as there was no other changes.

Note that security case 2 was performed as per customer request. There were no DNS, OCSP or web servers available in the test set-up to allow lookup and download of the CRL file. The CRL file was manually installed on the CBSD for the purposes of these tests.

When the device is not operating in CBSD mode as a category A or category B device, it is operating under modular operation of FCC ID: N7NMC74B. The certification of this module in that mode of operation is not part of this test report.

Logs are kept on file.

Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CFR47 FCC Part 96	Code of Federal Regulations – Citizens Broadband Radio Service
WINNF-TS-0122 Version V1.0.2 25 November 2020	Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT) Working Document
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories

Document Revision Status

000 – Draft issue. January 31, 2022
001 – 1st issue, Aug 10, 2023. Note due to anomalies, the draft test report for this was not issued to client.
002 – 2nd issue, Aug 14, 2023. Minor revisions and typographical errors as per client request. Kept on file.
003 – 3rd issue, Aug 15, 2023. Minor revisions and typographical errors as per client request. Kept on file.
004 – 4th issue, Aug 21, 2023. Removed erroneous description on page 3 as per client request kept on file.
005 – 5th issue, Nov 5, 2023. Changed the FCC ID as per client request.

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

AM – Amplitude Modulation

Class A device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public and the instructions for use accompanying the product shall contain the following text:

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Class B device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environments.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

Enclosure Port – Physical boundary of equipment through which electromagnetic fields may radiate or impinge.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

LISN – Line Impedance Stabilization Network

NCR – No Calibration Required

NSA – Normalized Site Attenuation

RF – Radio Frequency

EMC Test Plan – An EMC test plan established prior to testing. See 'Appendix A – EUT & Client Provided Details'.

Testing Facility

Testing for SAS protocol compliance on the EUT was carried out at TUV SUD Ottawa.

Calibrations and Accreditations

TÜV SÜD Canada Inc is accredited to ISO/IEC 17025 by A2LA with Testing Certificate #2955.19. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing

Date	Test	Initials	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Jan 11 – 17th , 2022	All (Except security)	SD	20-23	40-55	96.106
Jan 18, 2022	Security test cases	SD	20-23	40-55	96.106

Detailed Test Results Section

Registration

Section	DP	Test Case ID	Test Case Title	Pass / Fail
6.1.4.1.1		WINNF.FT.C.REG.1	Multi-Step registration	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	19:27:31	469	471	
01-11-2022	19:27:32	470	472	
01-11-2022	19:27:33	469	473	
01-11-2022	19:27:34	470	472	
01-11-2022	19:27:35	472	0	Customer traffic has stopped
01-11-2022	19:27:36	470	0	
01-11-2022	19:27:37	470	0	
01-11-2027	19:28:33	469	0	
01-11-2028	19:28:34	471	0	
01-11-2029	19:28:35	471	0	End of test

6.1.4.2.1	X	--	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	19:37:49	469	467	
01-11-2022	19:37:50	469	467	
01-11-2022	19:37:51	470	468	
01-11-2022	19:37:52	471	467	
01-11-2022	19:37:53	469	0	Customer traffic has stopped
01-11-2022	19:37:54	470	0	
01-11-2022	19:37:55	471	0	
01-11-2022	19:38:51	470	0	
01-11-2022	19:38:52	469	0	
01-11-2022	19:38:53	469	0	End of test
01-11-2022	19:38:54	469	0	

6.1.4.2.3	X	--	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	19:41:27	469	467	
01-11-2022	19:41:28	469	467	
01-11-2022	19:41:29	469	467	
01-11-2022	19:41:30	469	467	
01-11-2022	19:41:31	469	0	Customer traffic has stopped
01-11-2022	19:41:32	469	0	
01-11-2022	19:41:34	469	0	
01-11-2022	19:41:35	469	0	
01-11-2022	19:41:36	471	0	
01-11-2022	19:41:37	469	0	
01-11-2022	19:41:38	469	0	
01-11-2022	19:41:39	471	0	
01-11-2022	19:41:40	469	0	
01-11-2022	19:41:41	469	0	
01-11-2022	19:41:42	471	0	
01-11-2022	19:41:43	469	0	
01-11-2022	19:41:44	469	0	
01-11-2022	19:41:45	471	0	
01-11-2022	19:41:46	469	0	
01-11-2022	19:41:47	469	0	
01-11-2022	19:41:48	471	0	
01-11-2022	19:41:49	469	0	
01-11-2022	19:41:50	469	0	
01-11-2022	19:41:51	469	0	
01-11-2022	19:41:52	469	0	
01-11-2022	19:41:53	469	0	
01-11-2022	19:41:54	469	0	
01-11-2022	19:41:55	469	0	
01-11-2022	19:41:56	471	0	
01-11-2022	19:41:57	469	0	
01-11-2022	19:41:58	469	0	
01-11-2022	19:41:59	470	0	
01-11-2022	19:42:00	469	0	
01-11-2022	19:42:01	469	0	

01-11-2022	19:42:02	471	0	
01-11-2022	19:42:03	469	0	
01-11-2022	19:42:04	469	0	
01-11-2022	19:42:05	471	0	
01-11-2022	19:42:06	469	0	
01-11-2022	19:42:07	469	0	
01-11-2022	19:42:08	471	0	
01-11-2022	19:42:09	469	0	
01-11-2022	19:42:10	469	0	
01-11-2022	19:42:11	471	0	
01-11-2022	19:42:12	469	0	
01-11-2022	19:42:13	469	0	
01-11-2022	19:42:14	471	0	
01-11-2022	19:42:15	469	0	
01-11-2022	19:42:16	471	0	
01-11-2022	19:42:17	469	0	
01-11-2022	19:42:18	469	0	
01-11-2022	19:42:19	471	0	
01-11-2022	19:42:20	469	0	
01-11-2022	19:42:21	469	0	
01-11-2022	19:42:22	471	0	
01-11-2022	19:42:23	469	0	
01-11-2022	19:42:24	469	0	
01-11-2022	19:42:25	471	0	
01-11-2022	19:42:26	469	0	
01-11-2022	19:42:27	469	0	
01-11-2022	19:42:28	471	0	
01-11-2022	19:42:29	469	0	
01-11-2022	19:42:30	469	0	
01-11-2022	19:42:31	471	0	End of test
01-11-2022	19:42:32	469	0	
01-11-2022	19:42:33	469	0	
01-11-2022	19:42:34	471	0	

6.1.4.2.5	X	--	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	20:04:08	470	470	
01-11-2022	20:04:09	470	466	
01-11-2022	20:04:10	470	472	
01-11-2022	20:04:11	469	475	
01-11-2022	20:04:12	470	470	
01-11-2022	20:04:13	469	471	
01-11-2022	20:04:14	469	471	
01-11-2022	20:04:15	471	471	
01-11-2022	20:04:16	469	471	
01-11-2022	20:04:17	468	474	
01-11-2022	20:04:18	471	324	
01-11-2022	20:04:19	469	0	Customer traffic has stopped
01-11-2022	20:04:20	469	0	
01-11-2022	20:04:21	471	0	
01-11-2022	20:05:18	469	0	
01-11-2022	20:05:19	469	0	
01-11-2022	20:05:20	469	0	End of test
01-11-2022	20:05:21	471	0	

6.1.4.2.7	X	--	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	20:07:14	470	472	
01-11-2022	20:07:15	469	466	
01-11-2022	20:07:16	469	467	
01-11-2022	20:07:17	471	471	
01-11-2022	20:07:18	469	469	
01-11-2022	20:07:19	469	0	Customer traffic has stopped
01-11-2022	20:07:20	469	0	
01-11-2022	20:07:21	471	0	
01-11-2022	20:08:17	469	0	
01-11-2022	20:08:18	469	0	
01-11-2022	20:08:19	471	0	End of test
01-11-2022	20:08:20	471	0	
01-11-2022	20:08:21	470	0	

6.1.4.2.9	X	--	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	20:15:59	471	470	
01-11-2022	20:16:00	469	471	
01-11-2022	20:16:01	469	475	
01-11-2022	20:16:02	471	471	
01-11-2022	20:16:03	469	80	
01-11-2022	20:16:04	471	0	Customer traffic has stopped
01-11-2022	20:16:05	469	0	
01-11-2022	20:16:06	469	0	
01-11-2022	20:17:02	470	0	
01-11-2022	20:17:03	471	0	
01-11-2022	20:17:04	470	0	
01-11-2022	20:17:05	469	0	End of test
01-11-2022	20:17:06	469	0	
01-11-2022	20:17:07	469	0	

6.1.4.2.11	X	--	WINNF.FT.C.REG.18	Group Error (responseCode 201)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	20:19:11	471	467	
01-11-2022	20:19:12	469	471	
01-11-2022	20:19:13	469	467	
01-11-2022	20:19:14	471	467	
01-11-2022	20:19:15	469	0	Customer traffic has stopped
01-11-2022	20:19:16	469	0	
01-11-2022	20:19:17	471	0	
01-11-2022	20:20:13	471	0	
01-11-2022	20:20:14	469	0	
01-11-2022	20:20:15	470	0	End of test
01-11-2022	20:20:16	471	0	

Grant

Check the device registration and authorization with the SAS,
Confirm that the device changes its operating power and/or channel in response to a command from the SAS and Confirm that the device correctly configures based on the different license classes.

6.3.4.2.1	WINNF.FT.C.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-11-2022	20:24:28	471	467	
01-11-2022	20:24:29	469	469	
01-11-2022	20:24:30	470	468	
01-11-2022	20:24:31	469	471	
01-11-2022	20:24:32	471	323	
01-11-2022	20:24:33	469	0	Customer traffic has stopped
01-11-2022	20:24:34	470	0	
01-11-2022	20:24:35	471	0	
01-11-2022	20:24:36	470	0	
01-11-2022	20:25:32	469	0	
01-11-2022	20:25:33	469	0	
01-11-2022	20:25:34	471	0	
01-11-2022	20:25:35	469	0	End of test
01-11-2022	20:25:36	469	0	
01-11-2022	20:25:37	471	0	

6.3.4.2.2	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	Monitor for 60 seconds after REG message sent. No transmission during test.	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	14:05:28	469	471	
01-12-2022	14:05:29	469	467	
01-12-2022	14:05:30	471	467	
01-12-2022	14:05:31	471	467	
01-12-2022	14:05:32	470	0	Customer traffic has stopped
01-12-2022	14:05:33	470	0	
01-12-2022	14:05:34	471	0	
01-12-2022	14:06:32	469	0	
01-12-2022	14:06:33	472	0	
01-12-2022	14:06:34	470	0	End of test
01-12-2022	14:06:35	470	0	

Heartbeat

6.4.4.1.1	X	--	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	Monitor RF from start of test. Ensure that: • Transmission does not start until time of first heartbeat response or after. • After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)	P

Low Channel

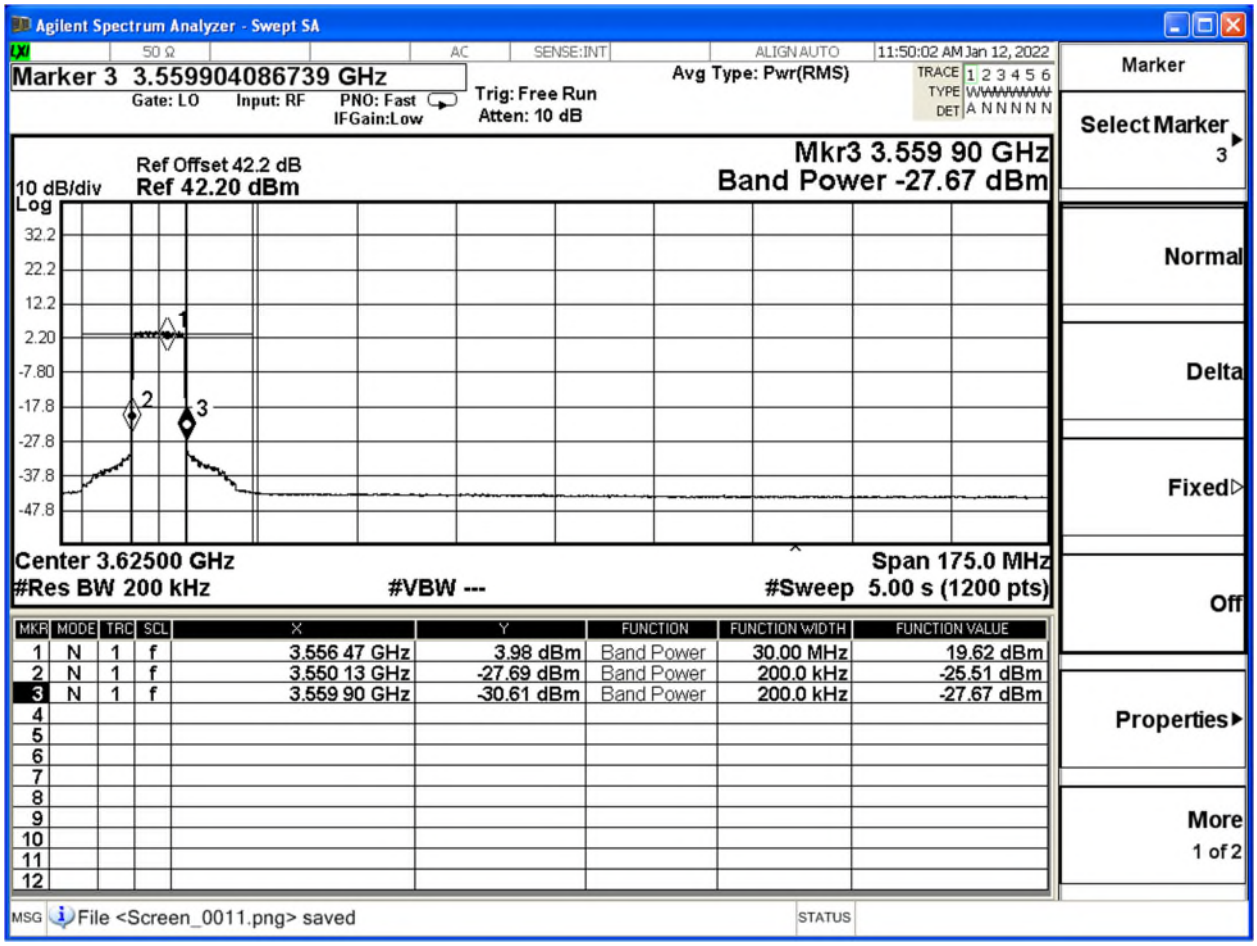
Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	16:37:04	470	470	
01-12-2022	16:37:05	471	469	
01-12-2022	16:37:06	469	467	
01-12-2022	16:37:07	469	449	
01-12-2022	16:37:08	471	0	Customer traffic has stopped
01-12-2022	16:37:09	469	0	
01-12-2022	16:37:10	471	220	Heartbeat response received. Customer traffic started
01-12-2022	16:37:11	469	469	
01-12-2022	16:37:12	471	469	
01-12-2022	16:37:13	469	469	
01-12-2022	16:37:14	469	469	

High Channel

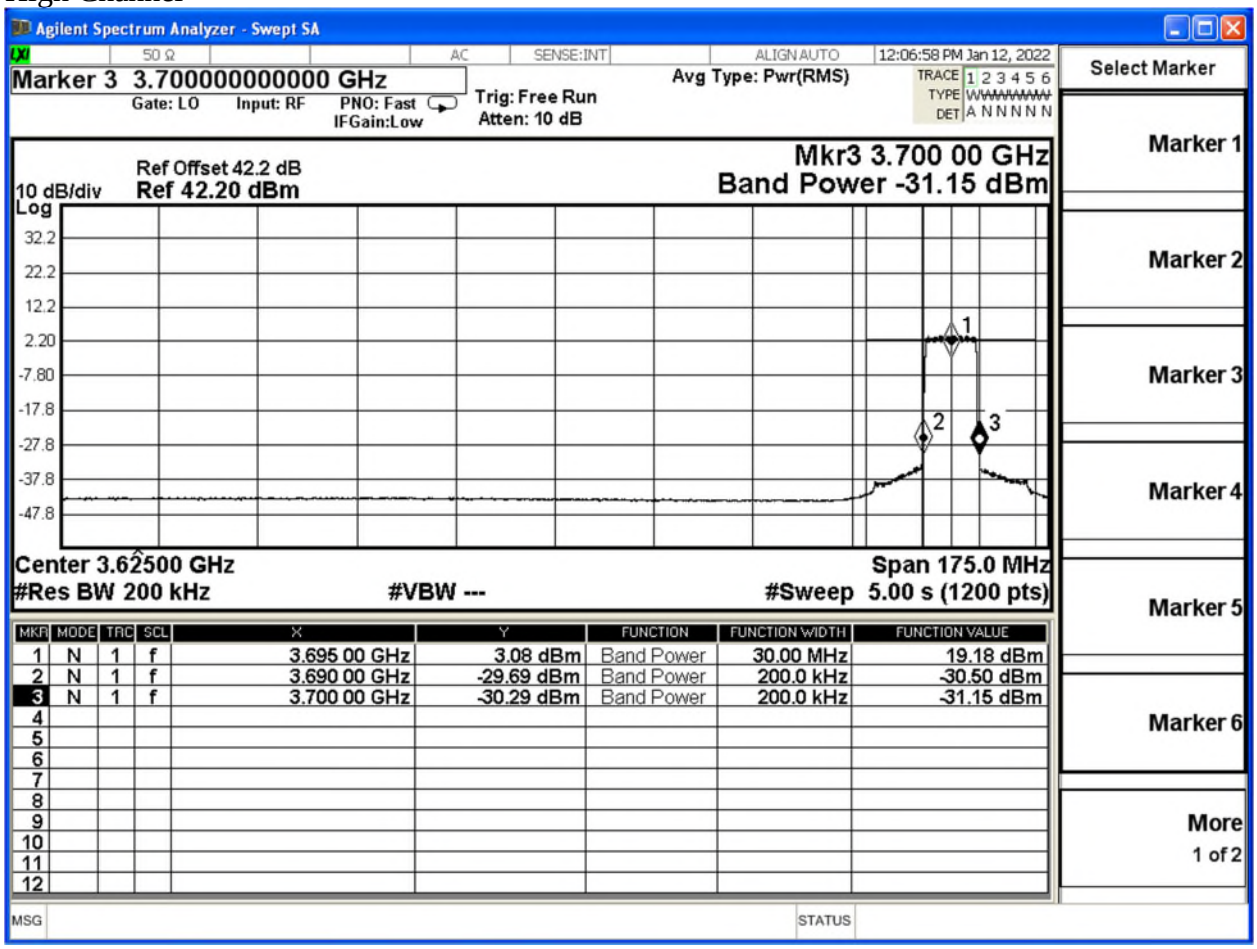
Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	16:25:29	471	469	
01-12-2022	16:25:30	469	471	
01-12-2022	16:25:31	469	471	
01-12-2022	16:25:32	471	220	

01-12-2022	16:25:33	469	0	Customer traffic has stopped
01-12-2022	16:25:34	469	0	
01-12-2022	16:25:35	471	0	
01-12-2022	16:25:36	469	387	Heartbeat response received. Customer traffic started
01-12-2022	16:25:37	469	469	
01-12-2022	16:25:38	469	469	
01-12-2022	16:25:39	469	471	

Low Channel



High Channel



Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.4.4.2.1	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	Monitor RF transmission. Ensure that: • CBSD stops transmission within 60 seconds of the heartbeatResponse which contains responseCode = 105	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	18:21:04	469	471	
01-12-2022	18:21:05	471	469	
01-12-2022	18:21:06	469	469	
01-12-2022	18:21:07	469	278	
01-12-2022	18:21:08	471	0	Customer traffic has stopped
01-12-2022	18:21:09	469	0	
01-12-2022	18:21:10	469	0	
01-12-2022	18:21:11	470	306	Heartbeat response received. Customer traffic started
01-12-2022	18:21:12	469	469	
01-12-2022	18:21:13	469	467	
01-12-2022	18:21:14	471	467	
01-12-2022	18:24:08	471	469	
01-12-2022	18:24:09	469	469	
01-12-2022	18:24:10	469	473	
01-12-2022	18:24:11	471	467	
01-12-2022	18:24:12	469	469	Received heartbeat response code "105"
01-12-2022	18:24:13	469	475	
01-12-2022	18:24:14	471	281	
01-12-2022	18:24:15	469	0	Customer traffic stopped
01-12-2022	18:24:16	469	0	
01-12-2022	18:24:17	471	0	
01-12-2022	18:24:18	470	0	

Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.4.4.2.2	X	--	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)		P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	18:28:03	469	471	
01-12-2022	18:28:04	471	471	
01-12-2022	18:28:05	471	471	
01-12-2022	18:28:06	469	52	
01-12-2022	18:28:07	471	0	Customer traffic has stopped
01-12-2022	18:28:08	469	0	
01-12-2022	18:28:09	470	0	
01-12-2022	18:28:10	471	0	Heartbeat response received.
01-12-2022	18:28:11	471	299	Customer traffic started
01-12-2022	18:28:12	469	469	
01-12-2022	18:28:13	471	471	
01-12-2022	18:33:10	469	471	
01-12-2022	18:33:11	471	469	
01-12-2022	18:33:12	470	472	Heartbeat response code 500 received.
01-12-2022	18:33:13	469	0	Customer traffic has stopped
01-12-2022	18:33:14	471	0	
01-12-2022	18:33:15	471	0	
01-12-2022	18:33:16	472	0	
01-12-2022	18:33:17	470	0	

6.4.4.2.3	X	X	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	Monitor RF transmission from start of test. Ensure there is no transmission during the test	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	18:35:57	471	475	
01-12-2022	18:35:58	469	469	
01-12-2022	18:35:59	469	134	
01-12-2022	18:36:00	471	0	Customer traffic has stopped
01-12-2022	18:36:01	469	0	
01-12-2022	18:36:02	469	0	
01-12-2022	18:36:03	471	0	
01-12-2022	18:36:04	469	0	Heartbeat request sent with "Granted" state.
01-12-2022	18:36:05	470	0	
01-12-2022	18:36:06	472	0	
01-12-2022	18:36:32	469	0	
01-12-2022	18:36:33	471	0	
01-12-2022	18:36:34	469	0	Response received with code "501". Heartbeat request sent with "Granted" state. End of test.
01-12-2022	18:36:35	469	0	
01-12-2022	18:36:36	471	0	
01-12-2022	18:36:37	469	0	

6.4.4.2.4	X	X	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	Monitor RF transmission. Ensure: • CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=501	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	18:50:31	470	470	
01-12-2022	18:50:32	469	469	
01-12-2022	18:50:33	471	473	
01-12-2022	18:50:34	469	469	
01-12-2022	18:50:35	469	0	Customer traffic has stopped
01-12-2022	18:50:36	469	0	
01-12-2022	18:50:37	469	0	
01-12-2022	18:50:38	469	0	
01-12-2022	18:50:39	471	0	Heartbeat request sent with "Authorized" state
01-12-2022	18:50:40	469	419	Customer traffic started
01-12-2022	18:50:41	469	469	
01-12-2022	18:50:42	471	469	
01-12-2022	18:53:38	469	459	
01-12-2022	18:53:39	472	468	
01-12-2022	18:53:40	469	477	Heartbeat response with code "501" received
01-12-2022	18:53:41	469	0	Customer traffic has stopped
01-12-2022	18:53:42	471	0	
01-12-2022	18:54:09	469	0	
01-12-2022	18:54:10	471	0	
01-12-2022	18:54:11	469	0	Heartbeat request message sent with "granted" state. End of test
01-12-2022	18:54:13	470	0	

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	15:07:10	470	468	
12-09-2021	15:07:11	471	467	
12-09-2021	15:07:12	469	459	
12-09-2021	15:07:13	469	0	Customer traffic has stopped
12-09-2021	15:07:14	471	0	
12-09-2021	15:07:15	469	0	
12-09-2021	15:07:16	469	471	CBSD received heartbeat response
12-09-2021	15:07:17	472	468	
12-09-2021	15:07:18	469	467	
12-09-2021	15:07:19	469	471	
12-09-2021	15:10:14	469	471	
12-09-2021	15:10:15	469	471	
12-09-2021	15:10:16	469	471	
12-09-2021	15:10:17	471	0	CBSD received code 501
12-09-2021	15:10:18	469	0	
12-09-2021	15:10:19	469	0	
12-09-2021	15:10:43	469	0	
12-09-2021	15:10:44	471	0	
12-09-2021	15:10:45	471	0	CBSD Sent Heartbeat request
12-09-2021	15:10:46	469	0	
12-09-2021	15:10:47	471	0	
12-09-2021	15:10:48	469	0	
12-09-2021	15:10:49	469	0	

Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.4.4.2.5	X	X	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Monitor RF transmission. Ensure: • CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=502	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	18:58:21	471	469	
01-12-2022	18:58:22	469	471	
01-12-2022	18:58:23	469	248	
01-12-2022	18:58:24	471	0	Customer traffic has stopped
01-12-2022	18:58:25	469	0	
01-12-2022	18:58:26	469	0	
01-12-2022	18:58:27	471	389	Customer traffic started
01-12-2022	18:58:28	469	469	
01-12-2022	18:58:29	469	469	
01-12-2022	18:58:30	471	465	
01-12-2022	19:01:27	469	469	
01-12-2022	19:01:28	469	470	
01-12-2022	19:01:29	469	469	Heartbeat response received with code "502". Relinquishment request sent.
01-12-2022	19:01:30	469	0	
01-12-2022	19:01:31	469	0	
01-12-2022	19:01:32	471	0	

Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.4.4.3.1	X	X	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	Monitor RF from start of test to 60 seconds after last heartbeatResponse message was sent. CBSD should not transmit at any time during test	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	19:04:35	471	471	
01-12-2022	19:04:36	471	471	
01-12-2022	19:04:37	471	469	
01-12-2022	19:04:38	469	0	Customer traffic has stopped
01-12-2022	19:04:39	469	0	
01-12-2022	19:04:40	471	0	
01-12-2022	19:04:41	469	0	Heartbeat request sent with "Granted" state
01-12-2022	19:04:42	469	0	
01-12-2022	19:04:43	471	0	
01-12-2022	19:08:22	469	0	
01-12-2022	19:08:23	469	0	
01-12-2022	19:08:24	471	0	end of test

Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.4.4.3.2	X	X	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	Monitor RF transmission. Verify: • CBSD must stop transmission with in transmitExpireTime+60 seconds, where transmitExpireTime is from last successful heartbeatResponse message	P

Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
01-12-2022	19:11:41	471	475	
01-12-2022	19:11:42	469	469	
01-12-2022	19:11:43	469	469	
01-12-2022	19:11:44	471	471	
01-12-2022	19:11:45	469	0	Customer traffic has stopped
01-12-2022	19:11:46	469	0	
01-12-2022	19:11:47	471	0	
01-12-2022	19:11:48	469	0	
01-12-2022	19:11:49	471	0	
01-12-2022	19:11:50	469	431	Heartbeat response received. Customer traffic starts
01-12-2022	19:11:51	469	431	
01-12-2022	19:11:52	469	469	
01-12-2022	19:16:08	470	472	
01-12-2022	19:16:09	469	283	
01-12-2022	19:16:10	471	0	Customer traffic has stopped
01-12-2022	19:16:11	471	0	
01-12-2022	19:16:12	470	0	

Test Harness logs and timing on data was verified, the EUT passed the requirement.

Measurement

6.5.4.2.3	X	X	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	No RF monitoring	P

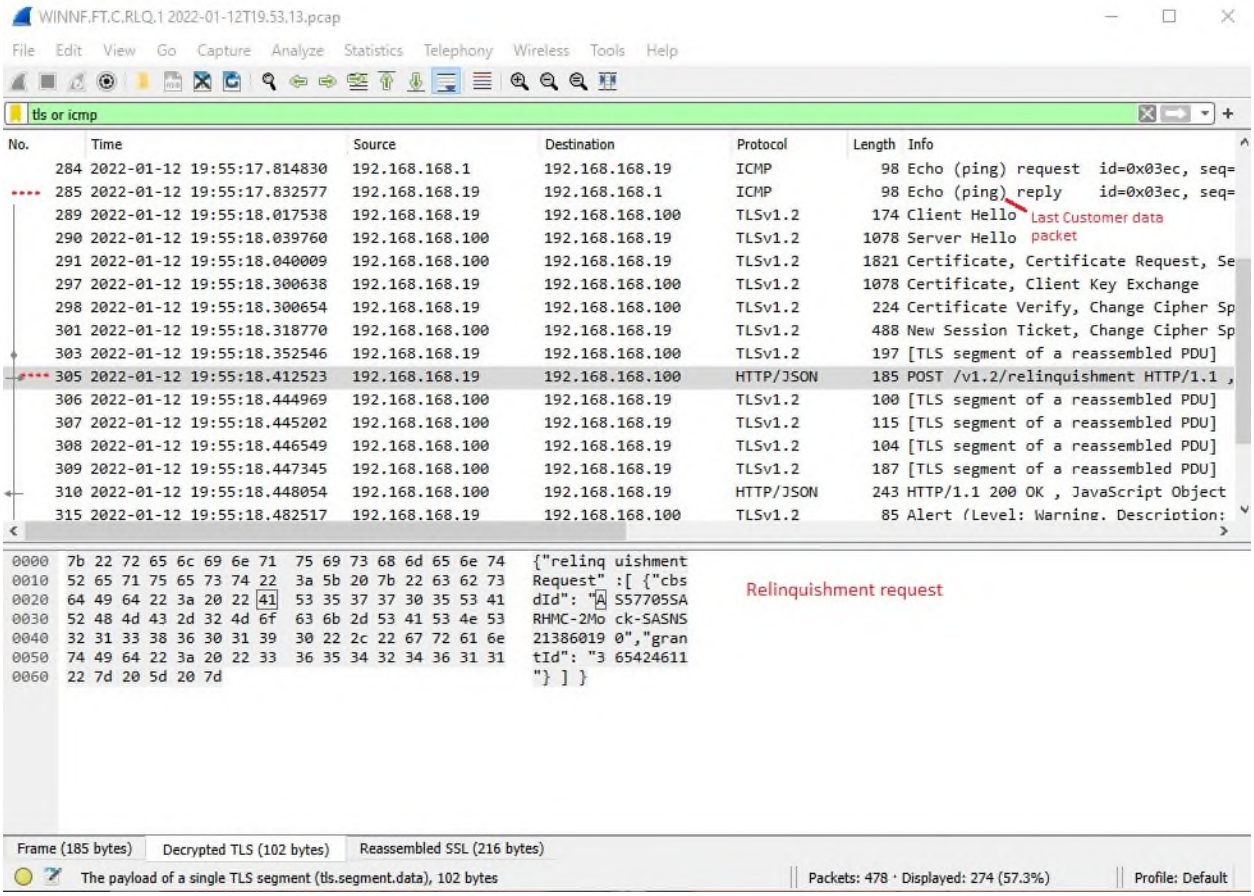
Pass. “measreportconfig” in logs. All other requirements verified.

6.5.4.2.4	X	--	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	No RF monitoring	P

Pass. “measreportconfig” in logs. All other requirements verified.

Relinquishment

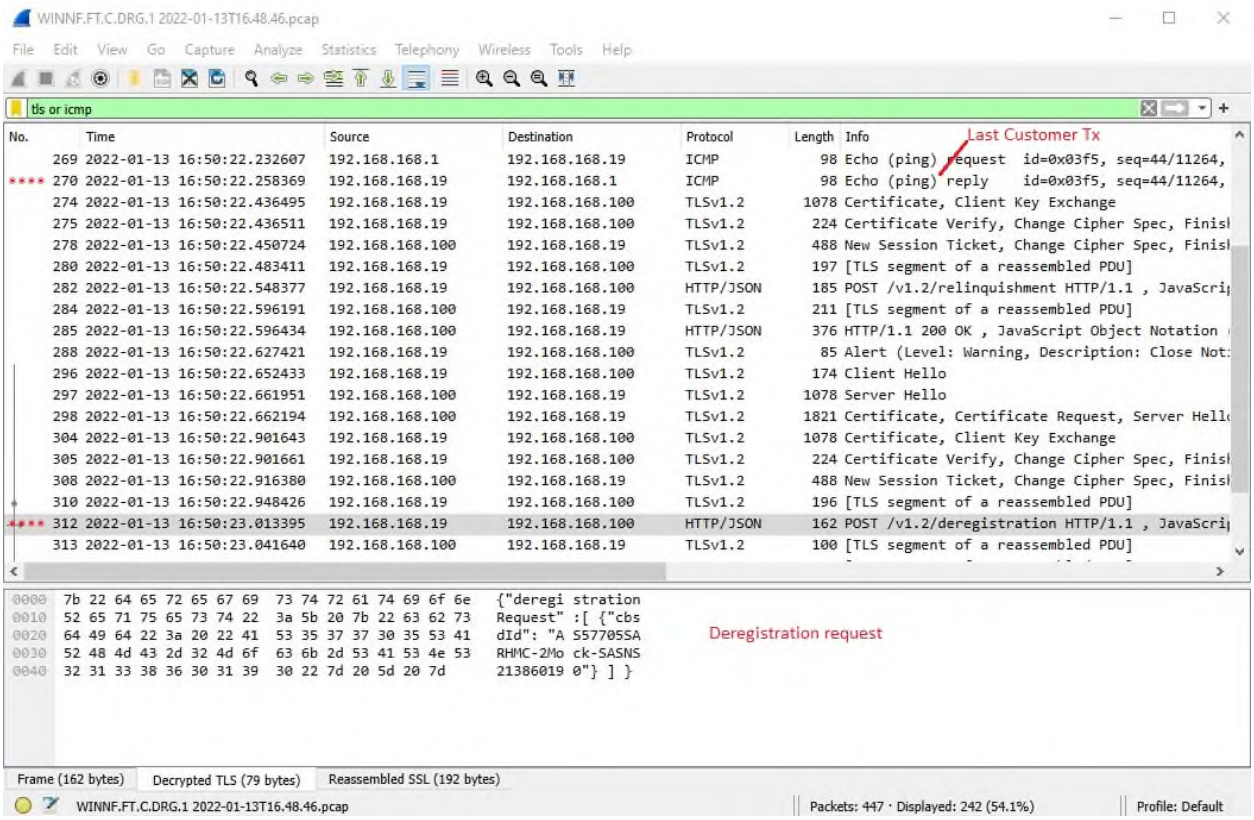
6.6.4.1.1	X	--	WINNF.FT.C.RLQ.1	Successful Relinquishment	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRequest message.	P



Deregistration

Test Harness logs and timing on data was verified, the EUT passed the requirement.

6.7.4.1.1	X	--	WINNF.FT.C.DRG.1	Successful Deregistration	Monitor RF transmission. Ensure: • CBSD stops transmission at any time prior to sending the relinquishmentRequest message or deregistration Request message (whichever is sent first)	P



Test Harness logs and timing on data was verified, the EUT passed the requirement.

Shutdown time taken from logs, and shutdown confirmed by external monitoring.

Power Level

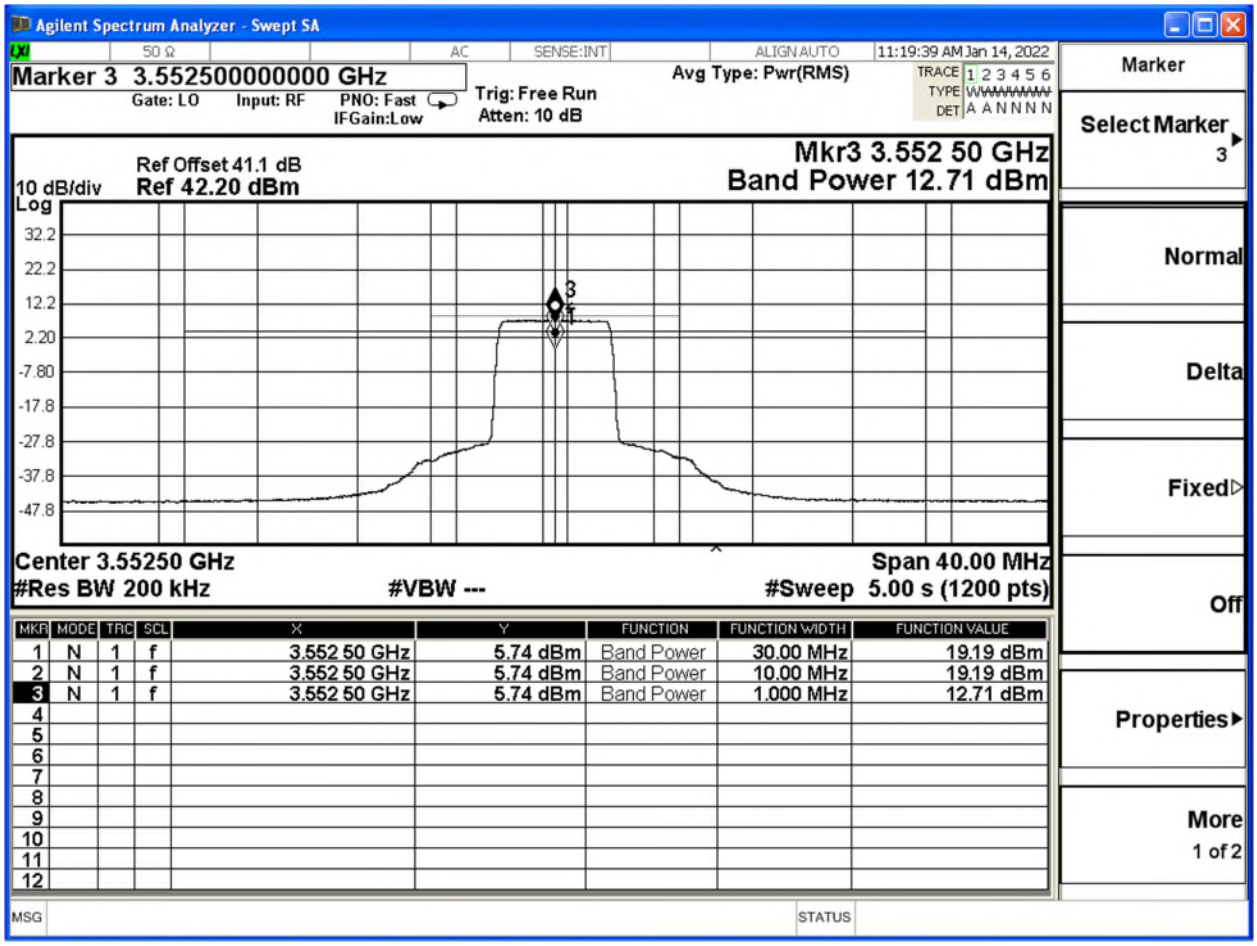
- Confirm that the device transmits at a power level less than or equal to the maximum power level approved by the SAS.

7.1.4.1.1	X	X	WINNF.PT.C.HBT	UUT RF Transmit Power Measurement	Power Spectral Density test case. Assume we use 1 carrier bandwidth (say, 5 or 10 MHz), one frequency (say middle channel in band) for test. Measure at max transmit power, and reduce in steps of 3 dB to minimum declared transmit power.	P

Test Table

Freq (Center)	Cat	1MHz EIRP limit (target) dBm	10MHz EIRP limit (target) dBm	BW	1 MHz	10 MHz	Losses (dB)	dBm/MHz	dBm / 10 MHz	Antenna gain (dBi)	Margin dB
3552.5	A	20	30	5	12.71	19.19	41.1	19.91	26.39	7.2	0.09
3552.5	B	37	47	5	12.71	19.19	41.1	36.91	43.39	24.2	0.09
3555	A	20	30	10	11.7	21.15	41.1	18.9	28.35	7.2	1.1
3555	B	37	47	10	11.7	21.15	41.1	35.9	45.35	24.2	1.1
3557.5	A	20	30	15	7.93	18.03	41.1	15.13	25.23	7.2	4.77
3557.5	B	37	47	15	7.93	18.03	41.1	32.13	42.23	24.2	4.77
3560	A	20	30	20	6.81	16.87	41.1	14.01	24.07	7.2	5.93
3560	B	37	47	20	6.81	16.87	41.1	31.01	41.07	24.2	5.93
3625	A	20	30	5	11.71	18.2	41.1	18.91	25.4	7.2	1.09
3625	B	37	47	5	11.71	18.2	41.1	35.91	42.4	24.2	1.09
3625	A	20	30	10	10.85	20.32	41.1	18.05	27.52	7.2	1.95
3625	B	37	47	10	10.85	20.32	41.1	35.05	44.52	24.2	1.95
3625	A	20	30	15	7.05	17.1	41.1	14.25	24.3	7.2	5.7
3625	B	37	47	15	7.05	17.1	41.1	31.25	41.3	24.2	5.7
3625	A	20	30	20	5.88	15.94	41.1	13.08	23.14	7.2	6.86
3625	B	37	47	20	5.88	15.94	41.1	30.08	40.14	24.2	6.86
3697.5	A	20	30	5	11.81	18.28	41.1	19.01	25.48	7.2	0.99
3697.5	B	37	47	5	11.81	18.28	41.1	36.01	42.48	24.2	0.99
3695	A	20	30	10	10.98	20.42	41.1	18.18	27.62	7.2	1.82
3695	B	37	47	10	10.98	20.42	41.1	35.18	44.62	24.2	1.82
3692.5	A	20	30	15	7.29	17.71	41.1	14.49	24.91	7.2	5.09
3692.5	B	37	47	15	7.29	17.71	41.1	31.49	41.91	24.2	5.09
3690	A	20	30	20	6.16	16.21	41.1	13.36	23.41	7.2	6.59
3690	B	37	47	20	6.16	16.21	41.1	30.36	40.41	24.2	6.59

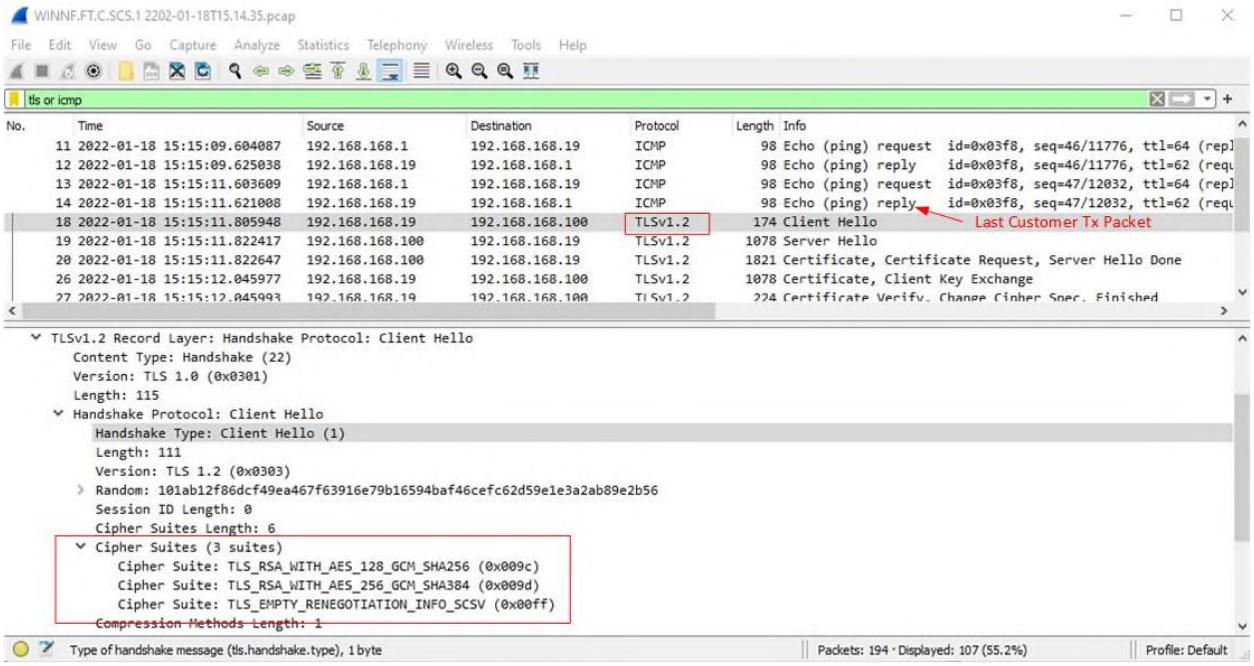
Worst case reading(s)

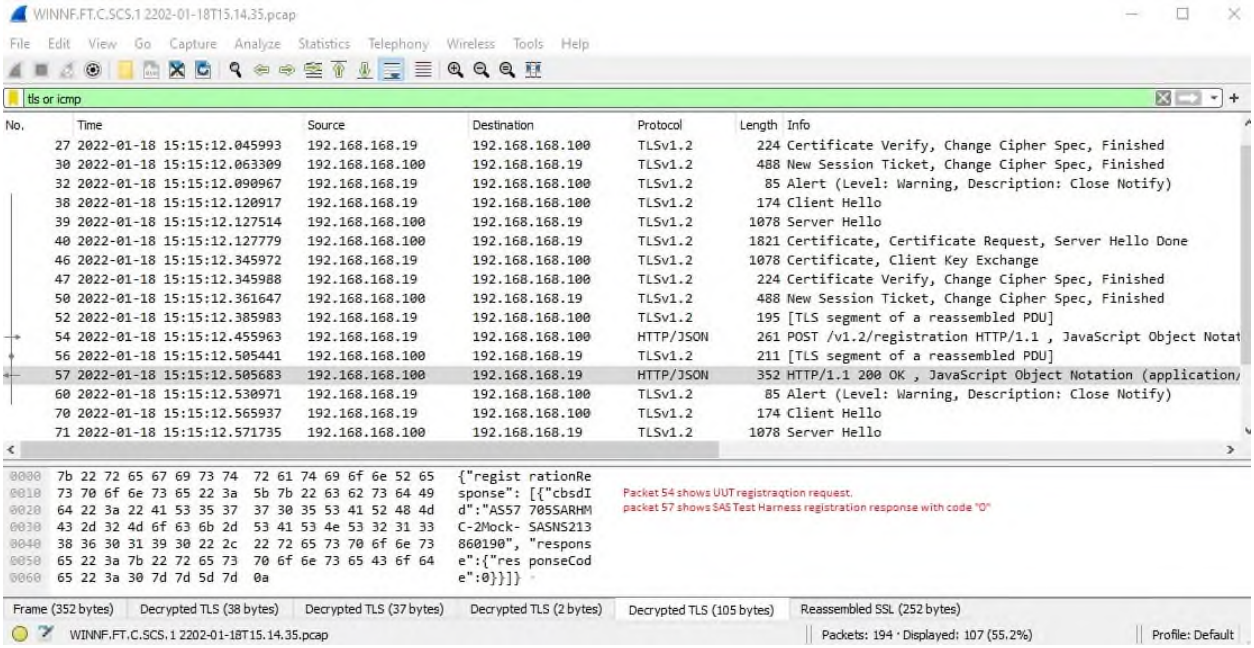


WINNF Security Test Case Analysis

WINNF.FT.C.SCS.1

Packet Capture Sequence





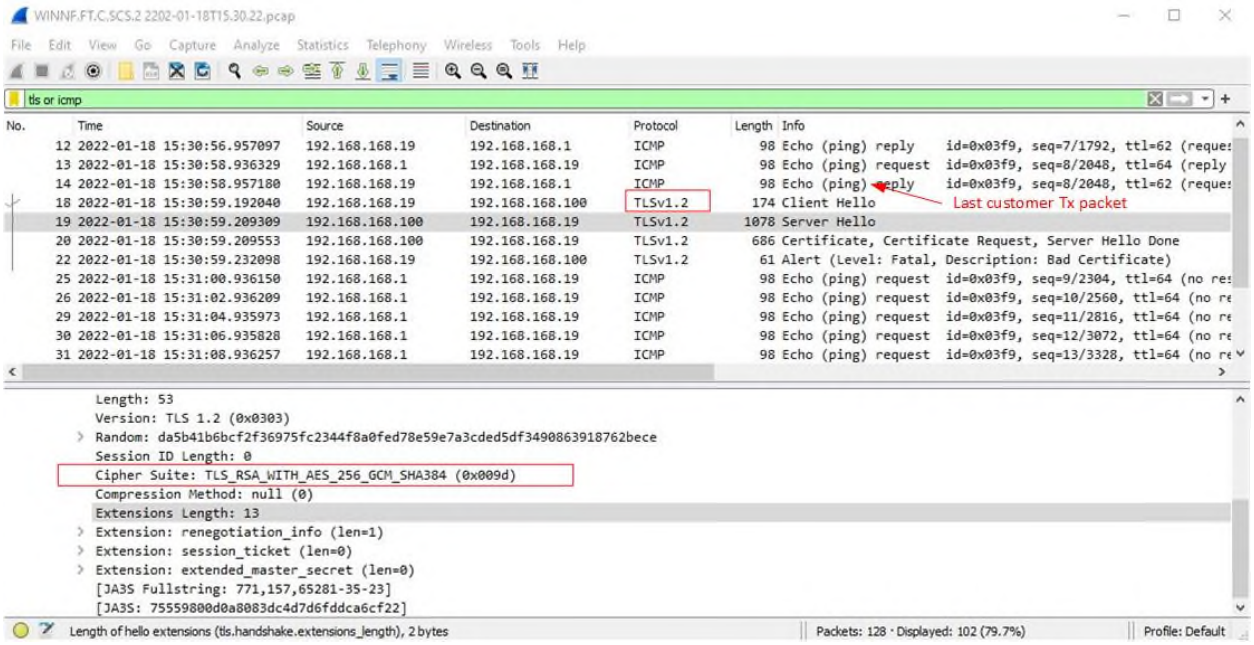
WINNF test requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.2 CBRS CBSD Test Specification:

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

WINNF.FT.C.SCS.2

Packet Capture Sequence



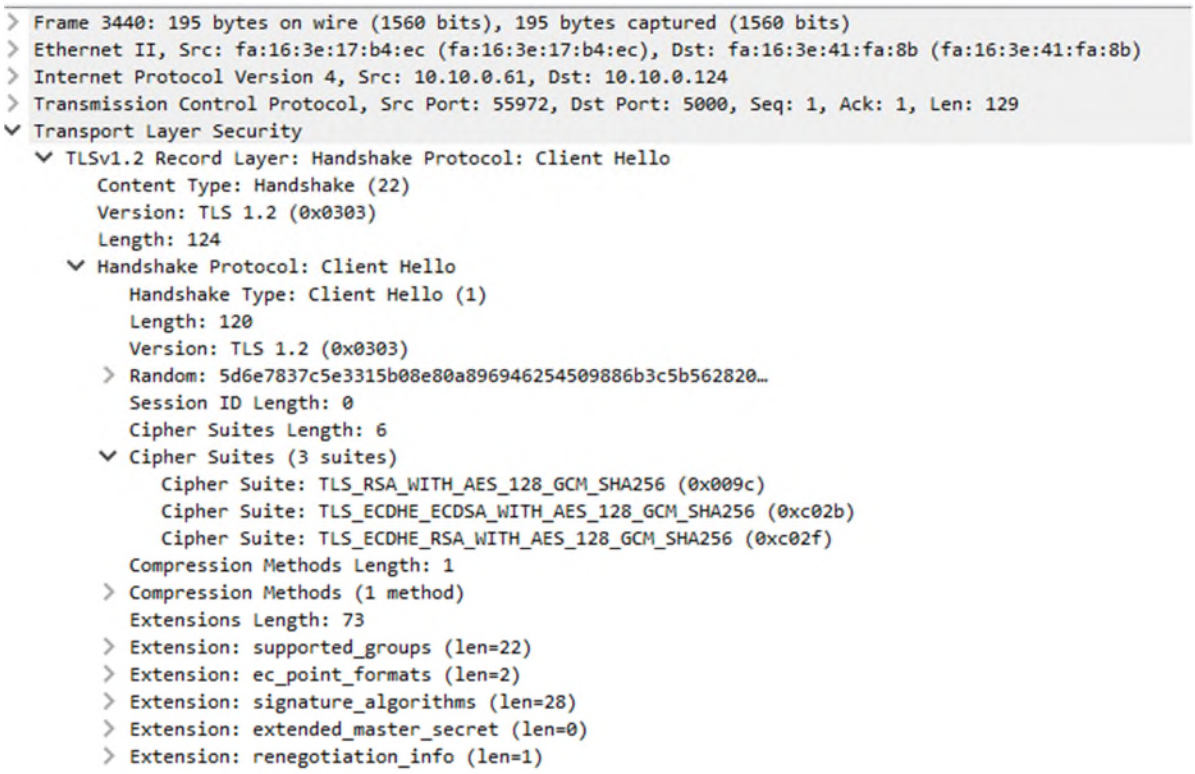
WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.2 CBRS CBSD Test Specification:

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

Analysis of WINNF Test Requirements

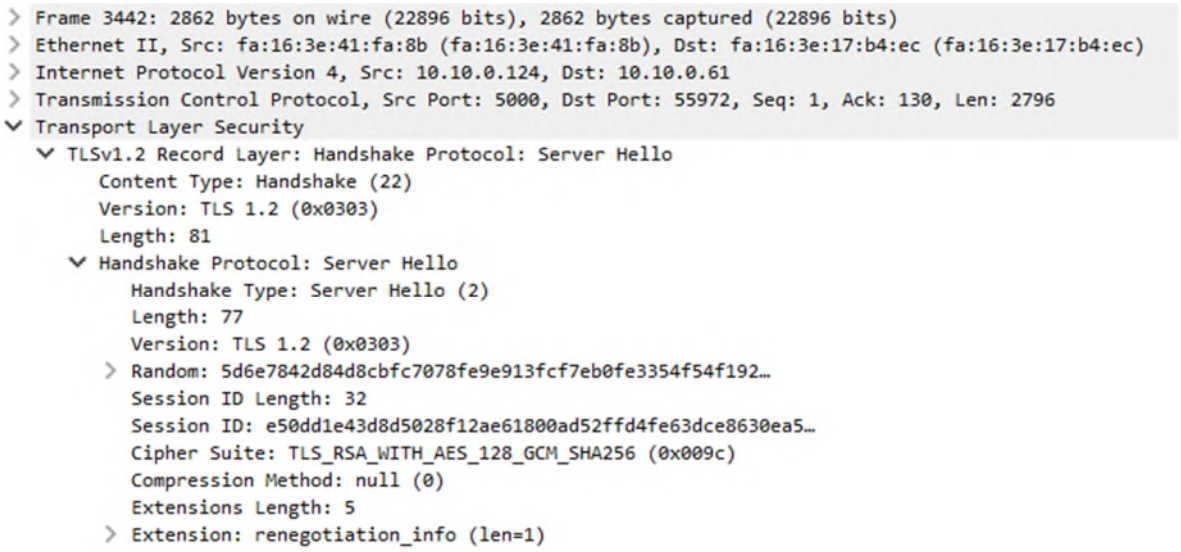
1. From Client Hello can read: TLS version = TLS 1.2



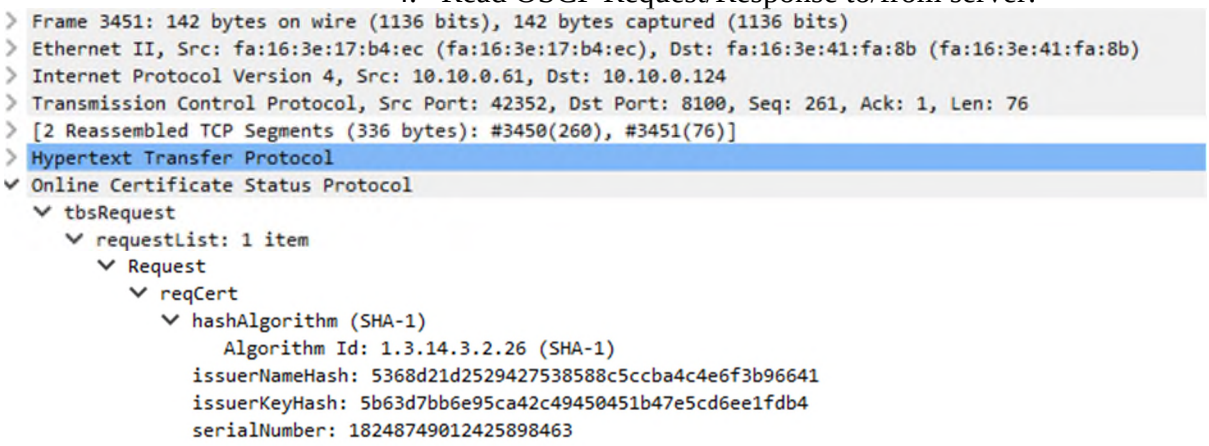
2. From Client Hello, cipher suite list is from WINNF approved list:

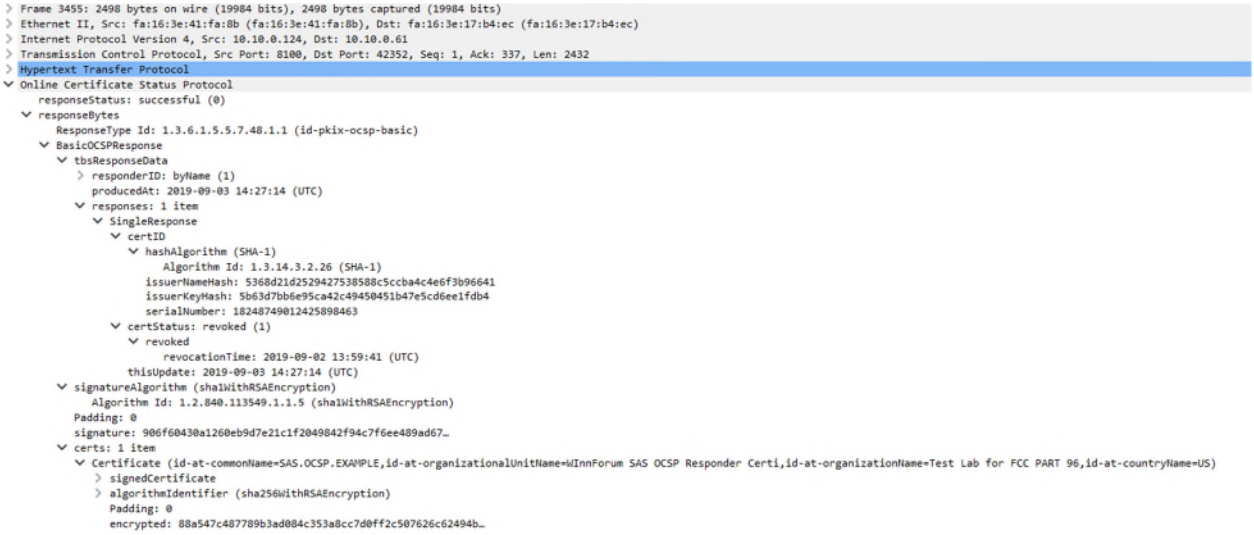
   TLS_RSA_WITH_AES_128_GCM_SHA25
   TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
   TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

3. From Server Hello, cipher suite chosen:
   TLS_RSA_WITH_AES_128_GCM_SHA256

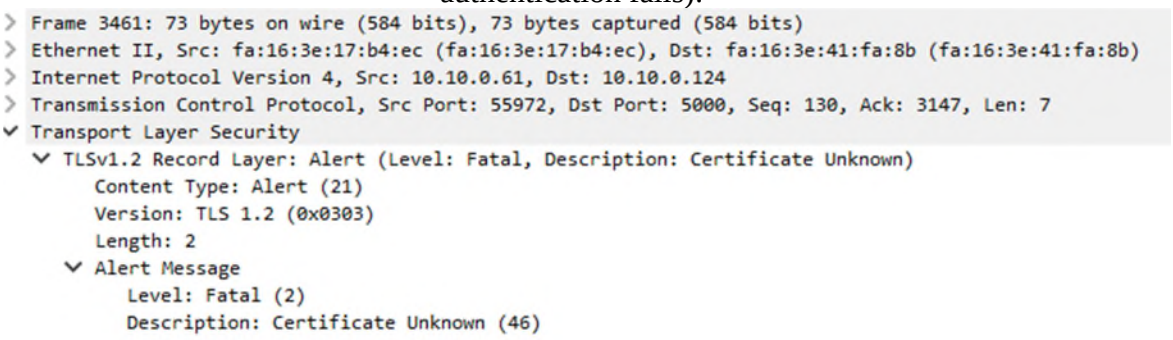


4. Read OSCP Request/Response to/from server:





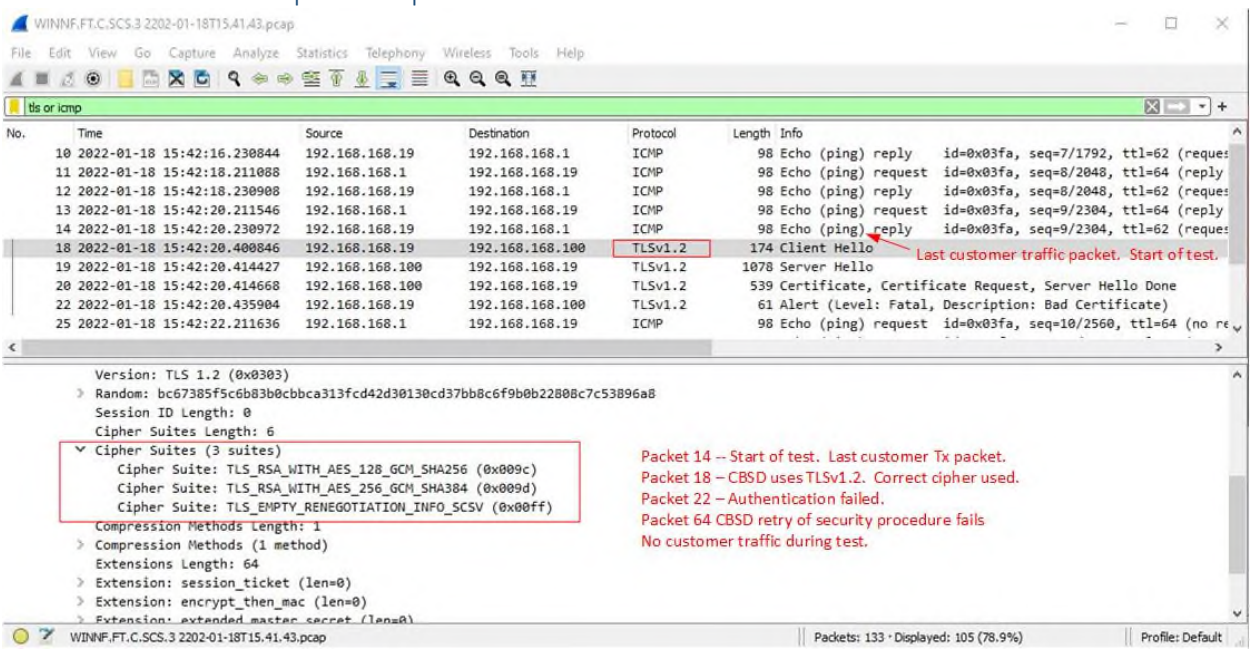
5. Authentication exchange ends with TLS Alert message (i.e. authentication fails):



6. Registration request message is not received at Test Harness (authentication fails)

WINNF.FT.C.SCS.3

Packet Capture Sequence



WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.2 CBRS CBSD Test Specification:

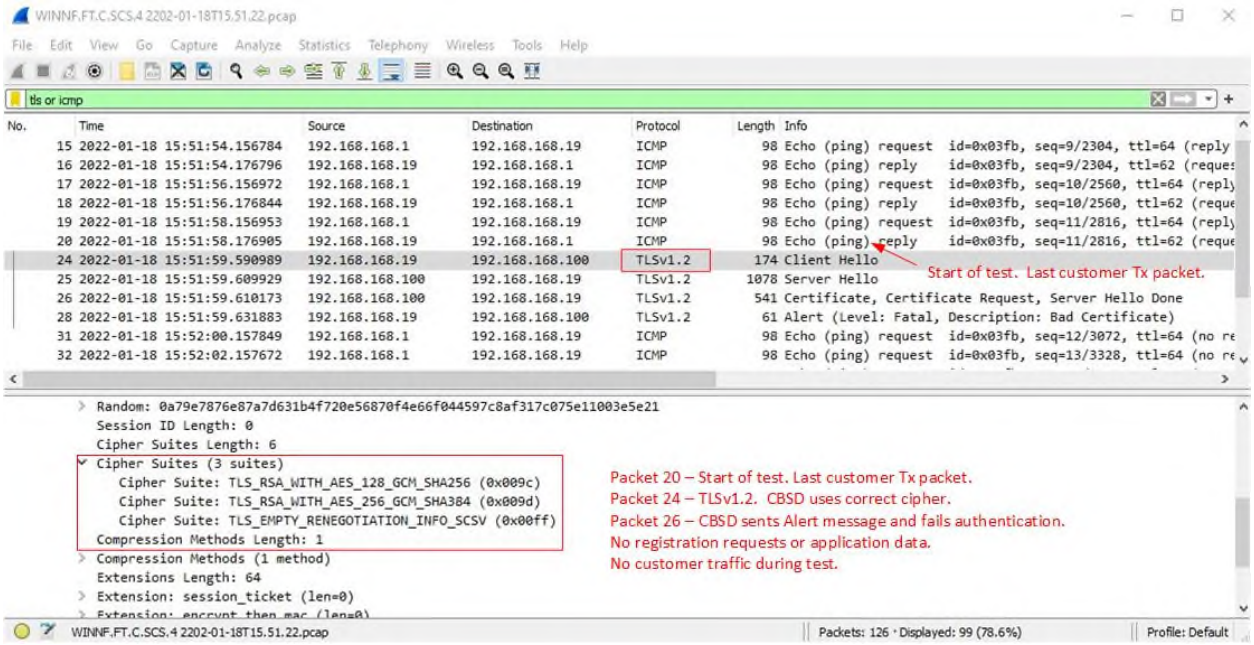
2	• Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS

Analysis of WINNF Test Requirements

1. From Client Hello can read: TLS version = TLS 1.2

WINNF.FT.C.SCS.4

Packet Capture Sequence



WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.2 CBRS CBSD Test Specification:

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

Analysis of WINNF Test Requirements

1. From Client Hello can read: TLS version = TLS 1.2

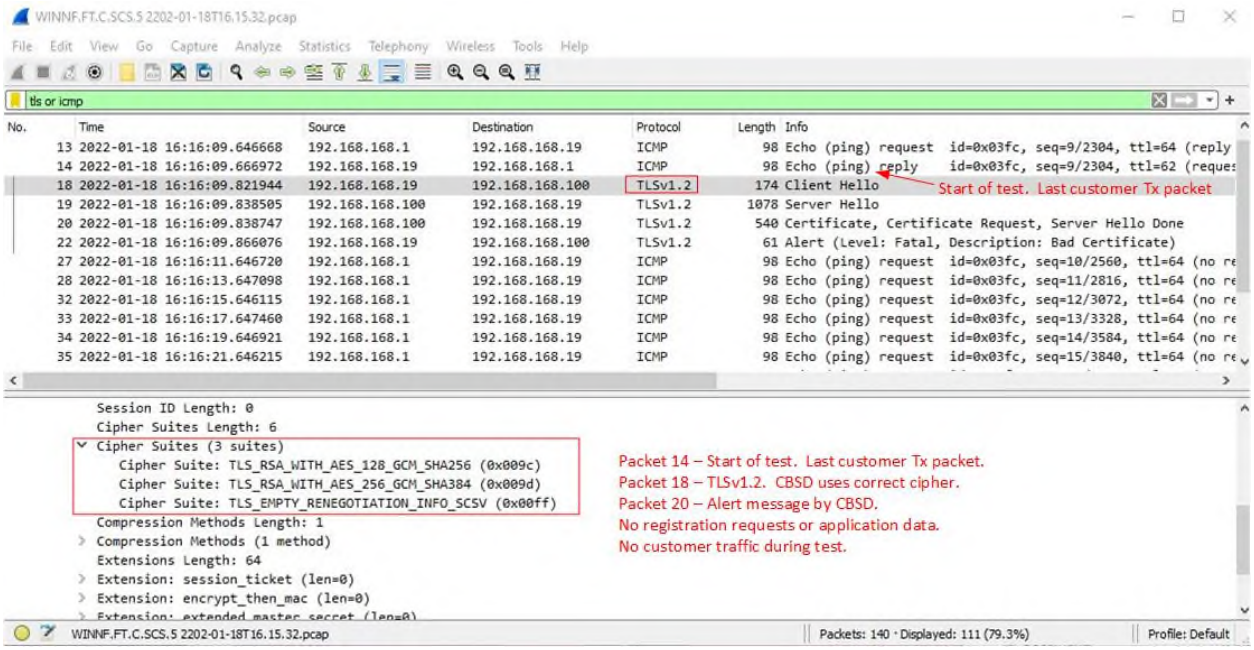
2. From Client Hello, cipher suite list is from WINNF approved list:

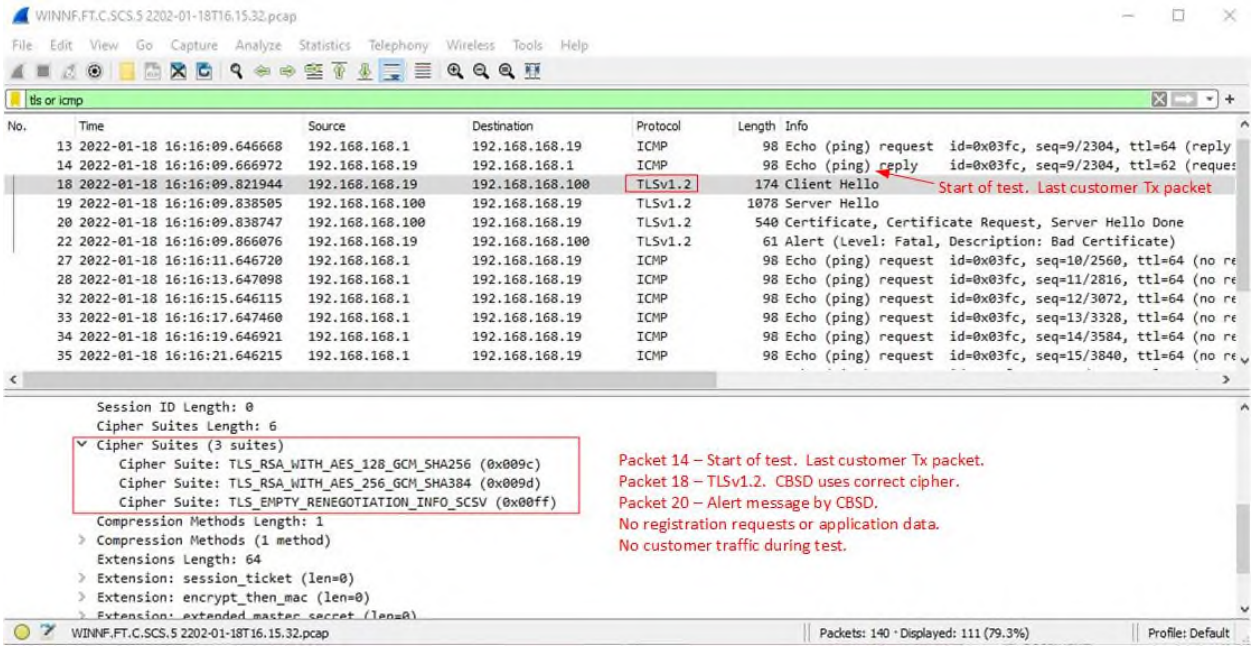
   TLS_RSA_WITH_AES_128_GCM_SHA25
   TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
   TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

3. From Server Hello, cipher suite chosen:
   TLS_RSA_WITH_AES_128_GCM_SHA256

WINNF.FT.C.SCS.5

Packet Capture Sequence





WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.2

CBRS CBSD Test Specification:

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

Analysis of WINNF Test Requirements

1. From Client Hello can read: TLS version = TLS 1.2

2. From Client Hello, cipher suite list is from WINNF approved list:

   TLS_RSA_WITH_AES_128_GCM_SHA25
   TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
   TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

3. From Server Hello, cipher suite chosen:
   TLS_RSA_WITH_AES_128_GCM_SHA256

4. Authentication exchange ends with TLS Alert message (i.e. authentication fails):

   - Confirmed

5. Registration request message is not received at Test Harness (authentication fails)

   - Confirmed

Test Equipment

Instrument	Manufacturer	Type No.	Serial No	Calibration Due
Power Supply	Xantrex	XKW 60-50	E00109863	-
Signal Analyzer	Agilent	MXA	SSG013930	2024-04-26
Attenuator	Pasternack	PE7004-10	N/S	-
Switching Control Unit	Hewlett Packard	11713A	3748A060876	-
RF Switch Unit	Burnsco	RARFSW 4x1	001	-
Power Supply	Leader	730-3D	9801135	-

Appendix A – EUT & Client Provided Details

General EUT Description

Table 1 – Declaration

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio equipment
MANUFACTURER	Nokia
TYPE	Remote Radio Base Station
PRODUCT NUMBER	3HE12473AAA
SERIAL NUMBER	NS213860190
HARDWARE VERSION	V.1.2
SOFTWARE VERSION	TIMOS-B-21-10.B1-7
TRANSMITTER OPERATING RANGE	B48 3550 – 3700 MHz (TDD)
RECEIVER OPERATING RANGE	B48 3550 – 3700 MHz (TDD)
COUNTRY OF ORIGIN	China
INTERMEDIATE FREQUENCIES	DL: 110 – 150MHz, UL: 40 – 80MHz
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	LTE 5M00 W7D 10M0 W7D 15M0 W7D 20M0 W7D
MODULATION TYPES: (i.e. GMSK, QPSK)	LTE: QPSK, 16QAM
Antenna Gain	Cat A: 7.1 Cat B: 24.1
HIGHEST INTERNALLY GENERATED FREQUENCY	3.7 GHz
OUTPUT POWER (W or dBm)	18dBm
FCC ID	AS57705SARHMC-2B
INDUSTRY CANADA ID	NA
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The Nokia 7705 SAR-Hm series includes feature-rich IP/MPLS service routers in a ruggedized and compact platform. With these routers, operators are able to support IP VPN, VPLS, and VPWS services over wireless networks, enabling an end-to-end, seamless, IP/MPLS service offering between wireless and wired devices. This enables critical infrastructure operators to fully realize the promise of smart grids, smart cities, and public safety mobile broadband to enhance safety, efficiency and responsiveness. The 7705 SAR-Hm series can be used in fixed or mobile locations for a variety of applications, such as supervisory control and data acquisition (SCADA), security monitoring, workforce voice and data connectivity in offices or vehicles, mass transit, fleet management, and vehicle remote control and monitoring.

Technical Description

The Equipment Under Test (EUT) **Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station** is an Nokia Radio Unit working in the public mobile service (3550-3700 MHz) band which provides communication connections to 3550-3700 MHz network. The EUT operates from a 12/24/-48V DC power supply.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.

EUT Configuration

- Cables and earthing when applicable were connected as per manufacturer's specification.