

Test Report

As per

FCC Part 96 SAS requirements (CBRS Test Plan)

on the

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

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

Scott Drysdale.
Test Personnel



Steve McFarlane
Report Reviewer



Add value.
Inspire trust.

Testing produced
for

Nokia

See Appendix A for
full client & EUT
details.



Testing Laboratory
Certificate #2955.19

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Table of Contents

Table of Contents	2
Report Scope	3
Summary	4
Test Results Summary	5
Notes, Justifications, or Deviations	10
Applicable Standards, Specifications and Methods.....	11
Document Revision Status.....	12
Definitions and Acronyms	13
Testing Facility	14
Calibrations and Accreditations.....	14
Testing Environmental Conditions and Dates	15
Detailed Test Results Section	16
Registration	17
Grant	25
Heartbeat	27
Measurement.....	38
Relinquishment	40
Deregistration.....	41
Power Level	42
WINNF Security Test Case Analysis	45
WINNF.FT.C.SCS.1	45
WINNF.FT.C.SCS.2	49
WINNF.FT.C.SCS.3	53
WINNF.FT.C.SCS.4.....	54
WINNF.FT.C.SCS.5.....	55
Appendix A – EUT & Client Provided Details	59
MAIN EUT	60
Technical Description	61

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Report Scope

This report addresses the SAS protocol verification testing and test results of the **Nokia LTE 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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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'.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

					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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

					- 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 (TERMINATED_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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

					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 within 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 relinquishmentRequest message.	P

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

					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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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: 2AU8H-MG40. The certification of this module in that mode of operation is not part of this test report.

Logs are kept on file.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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 Conformance and Performance Test Technical Specification;
Version V1.0.2 CBSD/DP as Unit Under Test (UUT)
25 November 2020 Working Document
- ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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'.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Testing Facility

Testing for SAS protocol compliance on the EUT was carried out at TÜV SÜD 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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Testing Environmental Conditions and Dates

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

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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Detailed Test Results Section

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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
01-11-2022	19:42:32	469	0
01-11-2022	19:42:33	469	0
01-11-2022	19:42:34	471	0

End of test

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

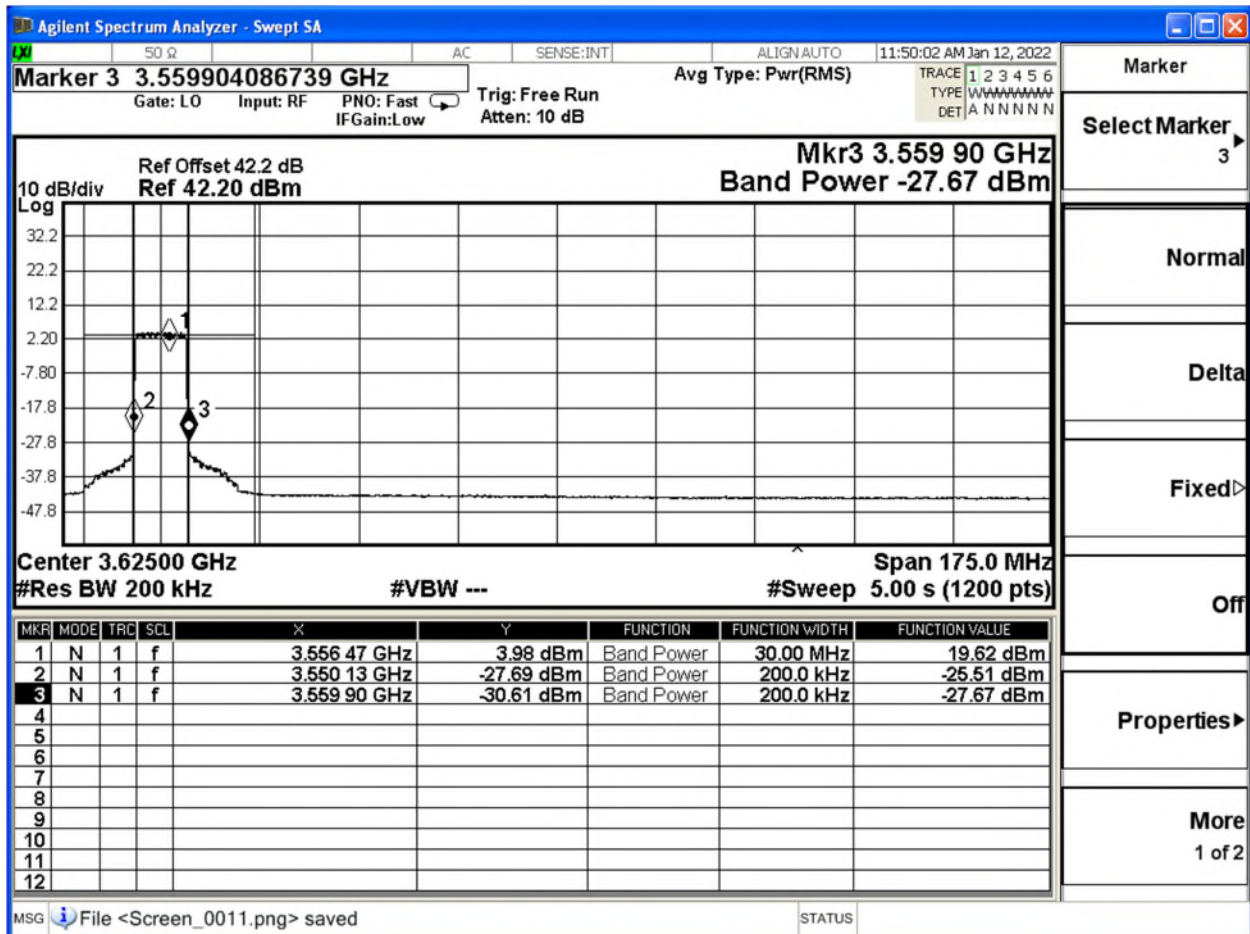
High Channel

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

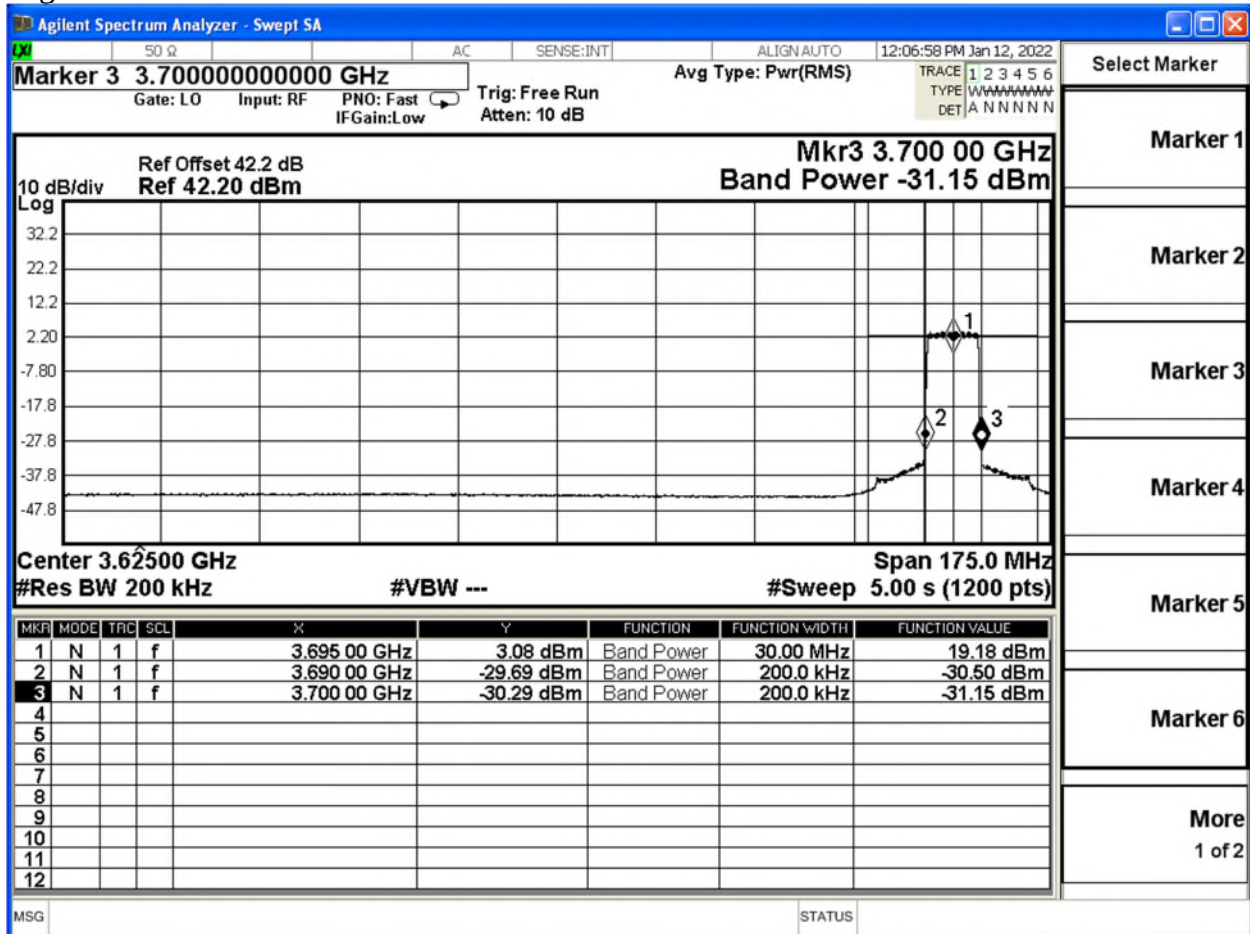
01-12-2022	16:25:33	469	0	Customer traffic has stopped
01-12-2022	16:25:34	469	0	
01-12-2022	16:25:35	471	0	
01-12-2022	16:25:36	469	387	Heartbeat response received. Customer traffic started
01-12-2022	16:25:37	469	469	
01-12-2022	16:25:38	469	469	
01-12-2022	16:25:39	469	471	

Low Channel



Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

High Channel



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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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 relinquishment request message.	P
-----------	---	----	------------------	---------------------------	---	---

WINNF.FT.C.RLQ.1 2022-01-12T19:53:13.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tls or icmp

No.	Time	Source	Destination	Protocol	Length	Info
284	2022-01-12 19:55:17.814830	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03ec, seq=
285	2022-01-12 19:55:17.832577	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03ec, seq=
289	2022-01-12 19:55:18.017538	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello Last Customer data
290	2022-01-12 19:55:18.039760	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello packet
291	2022-01-12 19:55:18.040009	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Se
297	2022-01-12 19:55:18.300638	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
298	2022-01-12 19:55:18.300654	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Sp
301	2022-01-12 19:55:18.318770	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Sp
303	2022-01-12 19:55:18.352546	192.168.168.19	192.168.168.100	TLSv1.2	197	[TLS segment of a reassembled PDU]
305	2022-01-12 19:55:18.412523	192.168.168.19	192.168.168.100	HTTP/JSON	185	POST /v1.2/relinquishment HTTP/1.1 ,
306	2022-01-12 19:55:18.444969	192.168.168.100	192.168.168.19	TLSv1.2	100	[TLS segment of a reassembled PDU]
307	2022-01-12 19:55:18.445202	192.168.168.100	192.168.168.19	TLSv1.2	115	[TLS segment of a reassembled PDU]
308	2022-01-12 19:55:18.446549	192.168.168.100	192.168.168.19	TLSv1.2	104	[TLS segment of a reassembled PDU]
309	2022-01-12 19:55:18.447345	192.168.168.100	192.168.168.19	TLSv1.2	187	[TLS segment of a reassembled PDU]
310	2022-01-12 19:55:18.448054	192.168.168.100	192.168.168.19	HTTP/JSON	243	HTTP/1.1 200 OK , JavaScript Object
315	2022-01-12 19:55:18.482517	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning. Description:

```

0000 7b 22 72 65 6c 69 6e 71 75 69 73 68 6d 65 6e 74 {"relinquishment
0010 52 65 71 75 65 73 74 22 3a 5b 20 7b 22 63 62 73 Request" :[ {"cbs
0020 64 49 64 22 3a 20 22 41 53 35 37 37 30 35 53 41 dId": "A S577055A
0030 52 48 4d 43 2d 32 4d 6f 63 6b 2d 53 41 53 4e 53 RHWIC-2Mo ck-SASNS
0040 32 31 33 38 36 30 31 39 30 22 2c 22 67 72 61 6e 21386019 0", "gran
0050 74 49 64 22 3a 20 22 33 36 35 34 32 34 36 31 31 tId": "3 65424611
0060 22 7d 20 5d 20 7d "}] }

```

Relinquishment request

Frame (185 bytes) Decrypted TLS (102 bytes) Reassembled SSL (216 bytes)

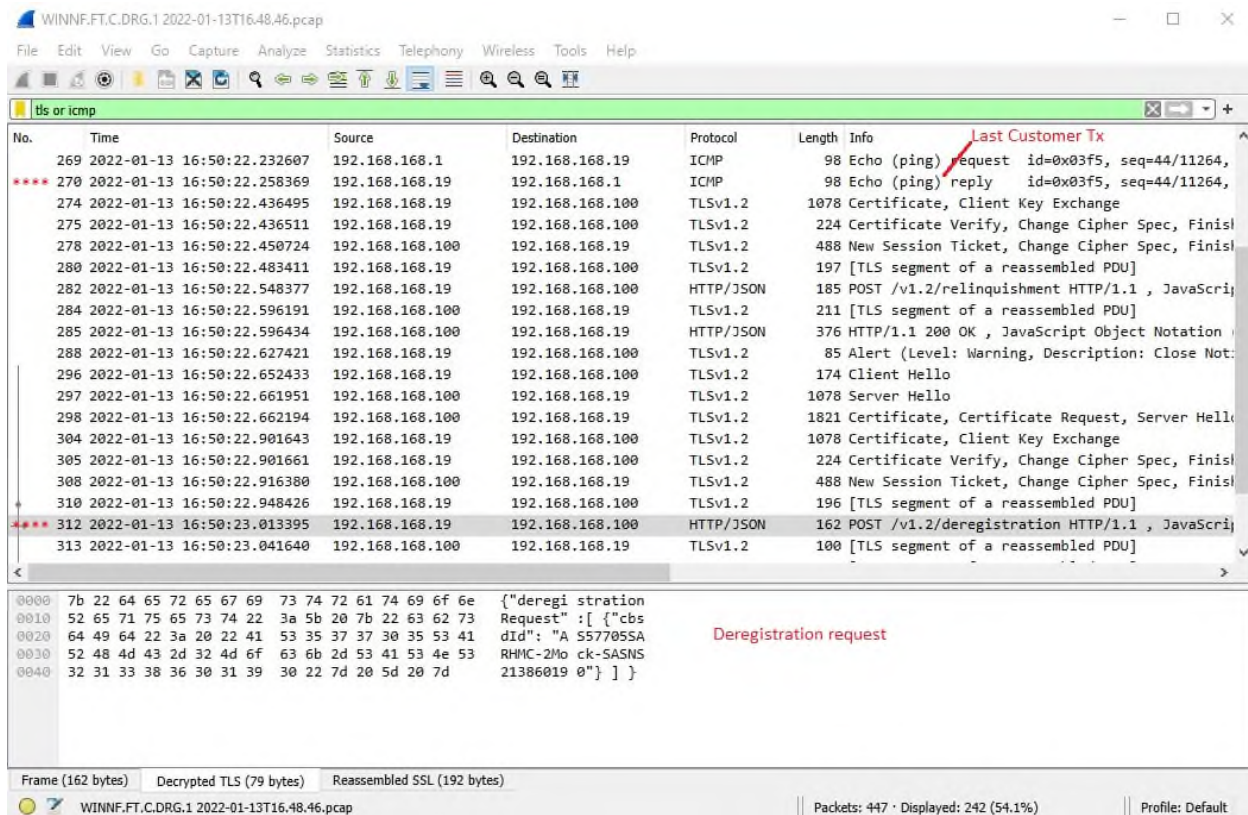
The payload of a single TLS segment (tls.segment.data), 102 bytes Packets: 478 · Displayed: 274 (57.3%) Profile: Default

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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
-----------	---	----	------------------	---------------------------	---	---



WINNF.FT.C.DRG.1 2022-01-13T16:48:46.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tls or icmp

No.	Time	Source	Destination	Protocol	Length	Info
269	2022-01-13 16:50:22.232607	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f5, seq=44/11264,
270	2022-01-13 16:50:22.258369	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03f5, seq=44/11264,
274	2022-01-13 16:50:22.436495	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
275	2022-01-13 16:50:22.436511	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finis
278	2022-01-13 16:50:22.450724	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finis
280	2022-01-13 16:50:22.483411	192.168.168.19	192.168.168.100	TLSv1.2	197	[TLS segment of a reassembled PDU]
282	2022-01-13 16:50:22.548377	192.168.168.19	192.168.168.100	HTTP/JSON	185	POST /v1.2/relinquishment HTTP/1.1 , JavaScrip
284	2022-01-13 16:50:22.596191	192.168.168.100	192.168.168.19	TLSv1.2	211	[TLS segment of a reassembled PDU]
285	2022-01-13 16:50:22.596434	192.168.168.100	192.168.168.19	HTTP/JSON	376	HTTP/1.1 200 OK , JavaScript Object Notation
288	2022-01-13 16:50:22.627421	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning, Description: Close Not
296	2022-01-13 16:50:22.652433	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
297	2022-01-13 16:50:22.661951	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
298	2022-01-13 16:50:22.662194	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello
304	2022-01-13 16:50:22.901643	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
305	2022-01-13 16:50:22.901661	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finis
308	2022-01-13 16:50:22.916380	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finis
310	2022-01-13 16:50:22.948426	192.168.168.19	192.168.168.100	TLSv1.2	196	[TLS segment of a reassembled PDU]
312	2022-01-13 16:50:23.013395	192.168.168.19	192.168.168.100	HTTP/JSON	162	POST /v1.2/deregistration HTTP/1.1 , JavaScrip
313	2022-01-13 16:50:23.041640	192.168.168.100	192.168.168.19	TLSv1.2	100	[TLS segment of a reassembled PDU]

Frame (162 bytes) Decrypted TLS (79 bytes) Reassembled SSL (192 bytes)

WINNF.FT.C.DRG.1 2022-01-13T16:48:46.pcap Packets: 447 · Displayed: 242 (54.1%) Profile: Default

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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.H BT	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
-----------	---	---	--------------------	--------------------------------------	--	---

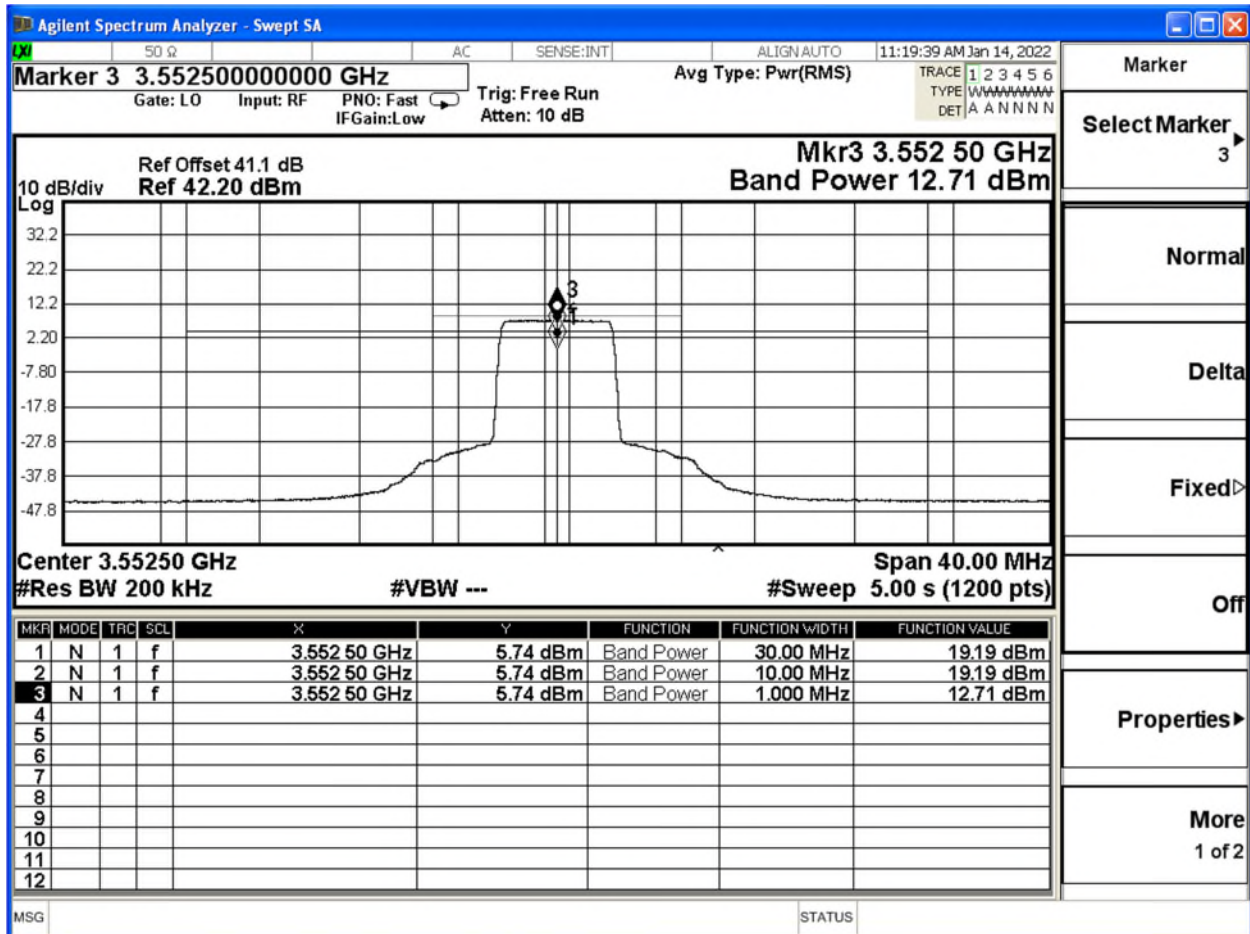
Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Test Table

Freq (Center)	Ca t	1MHz EIRP limit (target) dBm	10MHz EIRP limit (target) dBm	B W	1 MHz	10 MHz	Losses (dB)	dBm/MH z	dBm / 10 MHz	Antenn a 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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Worst case reading(s)

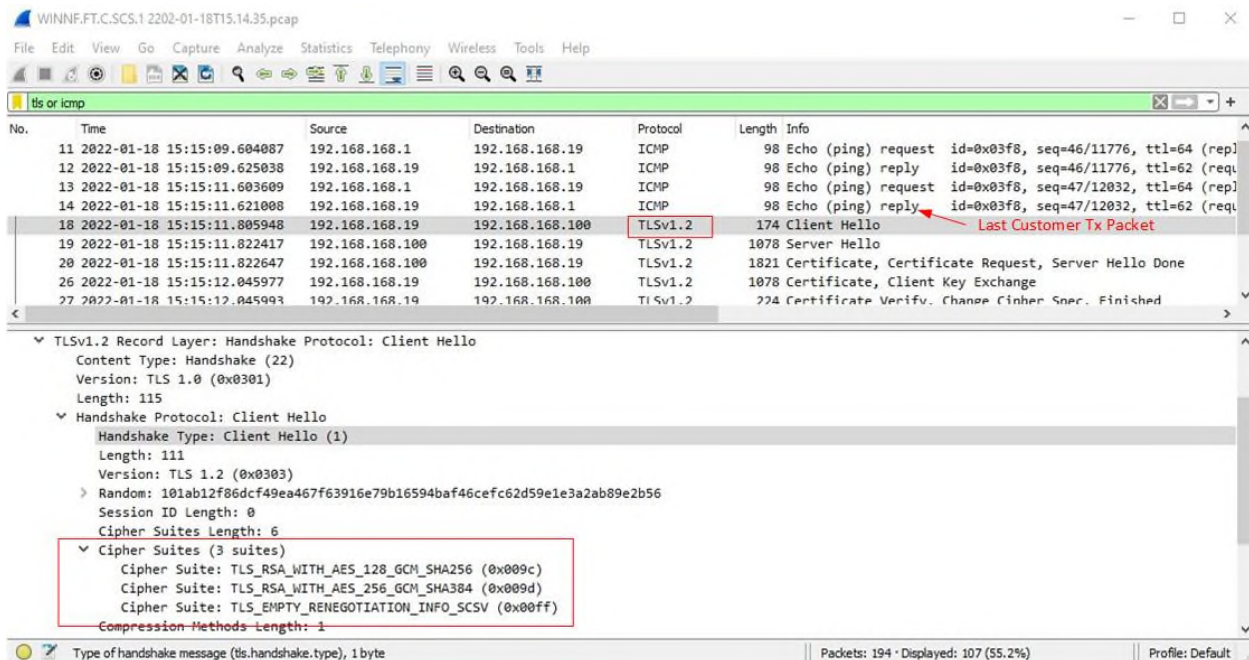


Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF Security Test Case Analysis

WINNF.FT.C.SCS.1

Packet Capture Sequence



WINNF.FT.C.SCS.1.2202-01-18T15.14.35.pcap

No.	Time	Source	Destination	Protocol	Length	Info
11	2022-01-18 15:15:09.604087	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f8, seq=46/11776, ttl=64 (rep)
12	2022-01-18 15:15:09.625038	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03f8, seq=46/11776, ttl=62 (req)
13	2022-01-18 15:15:11.603609	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f8, seq=47/12032, ttl=64 (rep)
14	2022-01-18 15:15:11.621008	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03f8, seq=47/12032, ttl=62 (req)
18	2022-01-18 15:15:11.805948	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
19	2022-01-18 15:15:11.822417	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
20	2022-01-18 15:15:11.822647	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
26	2022-01-18 15:15:12.045977	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
27	2022-01-18 15:15:12.045993	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished

▼ TLSv1.2 Record Layer: Handshake Protocol: Client Hello

- Content Type: Handshake (22)
- Version: TLS 1.0 (0x0301)
- Length: 115
- ▼ Handshake Protocol: Client Hello
 - Handshake Type: Client Hello (1)
 - Length: 111
 - Version: TLS 1.2 (0x0303)
 - Random: 101ab12f86dcf49ea467f63916e79b16594baf46cefc62d59e1e3a2ab89e2b56
 - Session ID Length: 0
 - Cipher Suites Length: 6
 - ▼ Cipher Suites (3 suites)
 - Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
 - Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
 - Cipher Suite: TLS_EMPTY_RENEGOTIATION_INFO_SCSV (0x00ff)
 - Compression Methods Length: 1

Type of handshake message (tls.handshake.type), 1 byte

Packets: 194 · Displayed: 107 (55.2%)

Profile: Default

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF.FT.C.SCS.1 2202-01-18T15:14:35.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tls or icmp

No.	Time	Source	Destination	Protocol	Length	Info
27	2022-01-18 15:15:12.045993	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
30	2022-01-18 15:15:12.063309	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
32	2022-01-18 15:15:12.090967	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning, Description: Close Notify)
38	2022-01-18 15:15:12.120917	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
39	2022-01-18 15:15:12.127514	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
40	2022-01-18 15:15:12.127779	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
46	2022-01-18 15:15:12.345972	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
47	2022-01-18 15:15:12.345988	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
50	2022-01-18 15:15:12.361647	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
52	2022-01-18 15:15:12.385983	192.168.168.19	192.168.168.100	TLSv1.2	195	[TLS segment of a reassembled PDU]
54	2022-01-18 15:15:12.455963	192.168.168.19	192.168.168.100	HTTP/JSON	261	POST /v1.2/registration HTTP/1.1, JavaScript Object Notat
56	2022-01-18 15:15:12.505441	192.168.168.100	192.168.168.19	TLSv1.2	211	[TLS segment of a reassembled PDU]
57	2022-01-18 15:15:12.505683	192.168.168.100	192.168.168.19	HTTP/JSON	352	HTTP/1.1 200 OK, JavaScript Object Notation (application/
60	2022-01-18 15:15:12.530971	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning, Description: Close Notify)
70	2022-01-18 15:15:12.565937	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
71	2022-01-18 15:15:12.571735	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello

0000 7b 22 72 65 67 69 73 74 72 61 74 69 6f 6e 52 65 {"regist rationRe
0010 73 70 6f 6e 73 65 22 3a 5b 7b 22 63 62 73 64 49 sponse": [{"cbsdI
0020 64 22 3a 22 41 53 35 37 37 30 35 53 41 52 48 4d d": "AS57 705SARHM
0030 43 2d 32 4d 6f 63 6b 2d 53 41 53 4e 53 32 31 33 C-2Mock- SASNS213
0040 38 36 30 31 39 30 22 2c 22 72 65 73 70 6f 6e 73 860190", "respons
0050 65 22 3a 7b 22 72 65 73 70 6f 6e 73 65 43 6f 64 e": {"res ponseCod
0060 65 22 3a 30 7d 7d 5d 7d 0a e":0}}]]

Frame (352 bytes) | Decrypted TLS (38 bytes) | Decrypted TLS (37 bytes) | Decrypted TLS (2 bytes) | Decrypted TLS (105 bytes) | Reassembled SSL (252 bytes)

WINNF.FT.C.SCS.1 2202-01-18T15:14:35.pcap | Packets: 194 - Displayed: 107 (55.2%) | Profile: Default

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF test requirements:

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

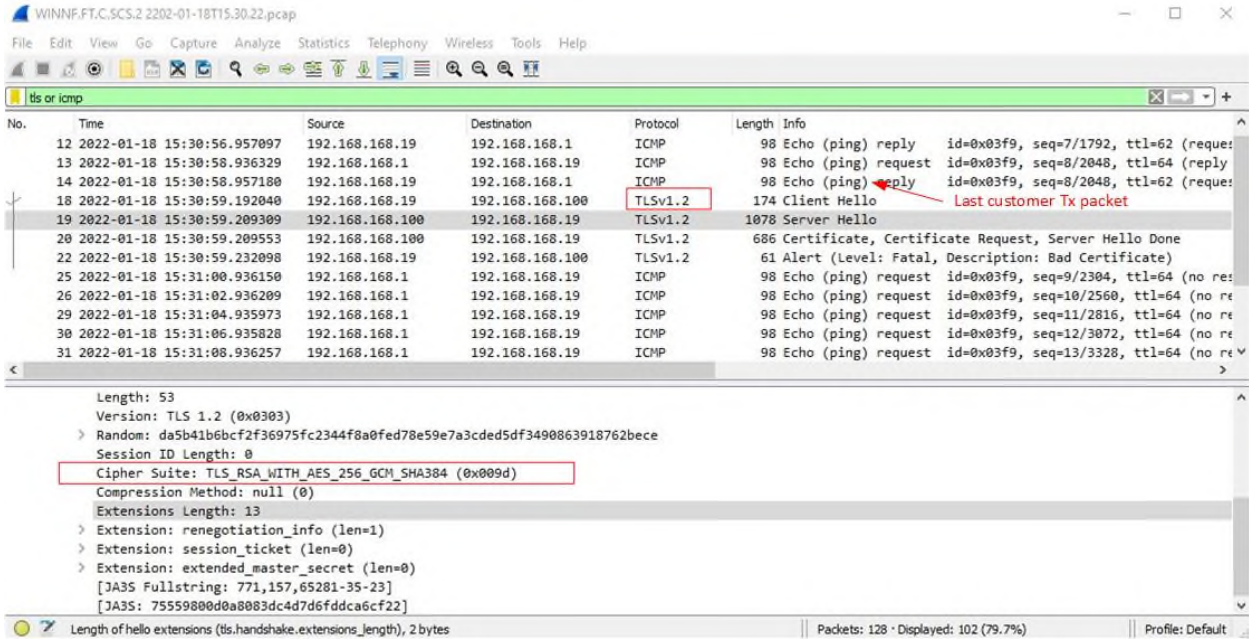
2	• Make sure that Mutual authentication happens between UUT and the SAS Test Harness. • Make sure that UUT uses TLS v1.2 • Make sure that cipher suites from one of the following is selected, • TLS_RSA_WITH_AES_128_GCM_SHA256 • TLS_RSA_WITH_AES_256_GCM_SHA384 • TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF.FT.C.SCS.2

Packet Capture Sequence



The image shows a Wireshark packet capture sequence for the file WINNF.FT.C.SCS.2.2202-01-18T15.30.22.pcap. The capture shows a series of ICMP Echo (ping) requests and replies between 192.168.168.1 and 192.168.168.100. A red box highlights the 'Client Hello' packet (174 bytes) in the TLSv1.2 section, which is the first packet of the TLS handshake. The packet details pane shows the TLSv1.2 structure, including the 'Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)' and 'Extensions Length: 13'. The status bar at the bottom indicates 'Packets: 128 · Displayed: 102 (79.7%)'.

No.	Time	Source	Destination	Protocol	Length	Info
12	2022-01-18 15:30:56.957097	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03f9, seq=7/1792, ttl=62 (request=12)
13	2022-01-18 15:30:58.936329	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=8/2048, ttl=64 (reply=13)
14	2022-01-18 15:30:58.957180	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03f9, seq=8/2048, ttl=62 (request=14)
18	2022-01-18 15:30:59.192040	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
19	2022-01-18 15:30:59.209309	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
20	2022-01-18 15:30:59.209553	192.168.168.100	192.168.168.19	TLSv1.2	686	Certificate, Certificate Request, Server Hello Done
22	2022-01-18 15:30:59.232098	192.168.168.19	192.168.168.100	TLSv1.2	61	Alert (Level: Fatal, Description: Bad Certificate)
25	2022-01-18 15:31:00.936150	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=9/2304, ttl=64 (no reply=25)
26	2022-01-18 15:31:02.936209	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=10/2560, ttl=64 (no reply=26)
29	2022-01-18 15:31:04.935973	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=11/2816, ttl=64 (no reply=29)
30	2022-01-18 15:31:06.935828	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=12/3072, ttl=64 (no reply=30)
31	2022-01-18 15:31:08.936257	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03f9, seq=13/3328, ttl=64 (no reply=31)

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

- From Client Hello can read: TLS version = TLS 1.2

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 3440: 195 bytes on wire (1560 bits), 195 bytes captured (1560 bits)
> Ethernet II, Src: fa:16:3e:17:b4:ec (fa:16:3e:17:b4:ec), Dst: fa:16:3e:41:fa:8b (fa:16:3e:41:fa:8b)
> Internet Protocol Version 4, Src: 10.10.0.61, Dst: 10.10.0.124
> Transmission Control Protocol, Src Port: 55972, Dst Port: 5000, Seq: 1, Ack: 1, Len: 129
✓ Transport Layer Security
  ✓ TLSv1.2 Record Layer: Handshake Protocol: Client Hello
    Content Type: Handshake (22)
    Version: TLS 1.2 (0x0303)
    Length: 124
    ✓ Handshake Protocol: Client Hello
      Handshake Type: Client Hello (1)
      Length: 120
      Version: TLS 1.2 (0x0303)
      > Random: 5d6e7837c5e3315b08e80a896946254509886b3c5b562820...
      Session ID Length: 0
      Cipher Suites Length: 6
      ✓ Cipher Suites (3 suites)
        Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
        Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (0xc02b)
        Cipher Suite: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (0xc02f)
      Compression Methods Length: 1
      > Compression Methods (1 method)
      Extensions Length: 73
      > Extension: supported_groups (len=22)
      > Extension: ec_point_formats (len=2)
      > Extension: signature_algorithms (len=28)
      > Extension: extended_master_secret (len=0)
      > Extension: renegotiation_info (len=1)

```

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

TLS_RSA_WITH_AES_128_GCM_SHA256
 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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 3442: 2862 bytes on wire (22896 bits), 2862 bytes captured (22896 bits)
> Ethernet II, Src: fa:16:3e:41:fa:8b (fa:16:3e:41:fa:8b), Dst: fa:16:3e:17:b4:ec (fa:16:3e:17:b4:ec)
> Internet Protocol Version 4, Src: 10.10.0.124, Dst: 10.10.0.61
> Transmission Control Protocol, Src Port: 5000, Dst Port: 55972, Seq: 1, Ack: 130, Len: 2796
✓ Transport Layer Security
  ✓ TLSv1.2 Record Layer: Handshake Protocol: Server Hello
    Content Type: Handshake (22)
    Version: TLS 1.2 (0x0303)
    Length: 81
    ✓ Handshake Protocol: Server Hello
      Handshake Type: Server Hello (2)
      Length: 77
      Version: TLS 1.2 (0x0303)
      > Random: 5d6e7842d84d8cbfc7078fe9e913fcf7eb0fe3354f54f192...
      Session ID Length: 32
      Session ID: e50dd1e43d8d5028f12ae61800ad52ffd4fe63dce8630ea5...
      Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
      Compression Method: null (0)
      Extensions Length: 5
      > Extension: renegotiation_info (len=1)

```

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

```

> Frame 3451: 142 bytes on wire (1136 bits), 142 bytes captured (1136 bits)
> Ethernet II, Src: fa:16:3e:17:b4:ec (fa:16:3e:17:b4:ec), Dst: fa:16:3e:41:fa:8b (fa:16:3e:41:fa:8b)
> Internet Protocol Version 4, Src: 10.10.0.61, Dst: 10.10.0.124
> Transmission Control Protocol, Src Port: 42352, Dst Port: 8100, Seq: 261, Ack: 1, Len: 76
> [2 Reassembled TCP Segments (336 bytes): #3450(260), #3451(76)]
> Hypertext Transfer Protocol
✓ Online Certificate Status Protocol
  ✓ tbsRequest
    ✓ requestList: 1 item
      ✓ Request
        ✓ reqCert
          ✓ hashAlgorithm (SHA-1)
            Algorithm Id: 1.3.14.3.2.26 (SHA-1)
            issuerNameHash: 5368d21d2529427538588c5ccba4c4e6f3b96641
            issuerKeyHash: 5b63d7bb6e95ca42c49450451b47e5cd6ee1fdb4
            serialNumber: 18248749012425898463

```

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 3455: 2498 bytes on wire (19984 bits), 2498 bytes captured (19984 bits)
> Ethernet II, Src: fa:16:3e:41:fa:8b (fa:16:3e:41:fa:8b), Dst: fa:16:3e:17:b4:ec (fa:16:3e:17:b4:ec)
> Internet Protocol Version 4, Src: 10.10.0.124, Dst: 10.10.0.61
> Transmission Control Protocol, Src Port: 8100, Dst Port: 42352, Seq: 1, Ack: 337, Len: 2432
> Hypertext Transfer Protocol
> Online Certificate Status Protocol
  responseStatus: successful (0)
  responseBytes
    responseType: Id: 1.3.6.1.5.5.7.40.1.1 (id-pkix-ocsp-basic)
    basicOCSPResponse
      tbsResponseData
        responderID: byName (1)
        producedAt: 2019-09-03 14:27:14 (UTC)
        responses: 1 item
          singleResponse
            certID
              hashAlgorithm (SHA-1)
                Algorithm Id: 1.3.14.3.2.26 (SHA-1)
                issuerNameHash: 5368d21d2529427538588c5ccba4c4e6f3b96641
                issuerKeyHash: 5b63d7bb6e95ca42c49450451b47e5cd6eefdb4
                serialNumber: 18248749012425898463
              certStatus: revoked (1)
                revoked
                  revocationTime: 2019-09-02 13:59:41 (UTC)
                  thisUpdate: 2019-09-03 14:27:14 (UTC)
            signatureAlgorithm (sha1WithRSAEncryption)
              Algorithm Id: 1.2.840.113549.1.1.5 (sha1WithRSAEncryption)
              padding: 0
              signature: 906f60430a1260eb9d7e21c1f2049842f94c7f6ee489ad67...
          certs: 1 item
            certificate (id-at-commonName=SAS.OCSP.EXAMPLE,id-at-organizationalUnitName=WiInnForum SAS OCSP Responder Certi,id-at-organizationName=Test Lab for FCC PART 96,id-at-countryName=US)
              signedCertificate
                algorithmIdentifier (sha256WithRSAEncryption)
                  padding: 0
                  encrypted: 88a547c487789b3ad084c353a8cc7d0ff2c507626c62494b...

```

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

```

> Frame 3461: 73 bytes on wire (584 bits), 73 bytes captured (584 bits)
> Ethernet II, Src: fa:16:3e:17:b4:ec (fa:16:3e:17:b4:ec), Dst: fa:16:3e:41:fa:8b (fa:16:3e:41:fa:8b)
> Internet Protocol Version 4, Src: 10.10.0.61, Dst: 10.10.0.124
> Transmission Control Protocol, Src Port: 55972, Dst Port: 5000, Seq: 130, Ack: 3147, Len: 7
> Transport Layer Security
  TLSv1.2 Record Layer: Alert (Level: Fatal, Description: Certificate Unknown)
    Content Type: Alert (21)
    Version: TLS 1.2 (0x0303)
    Length: 2
  Alert Message
    Level: Fatal (2)
    Description: Certificate Unknown (46)

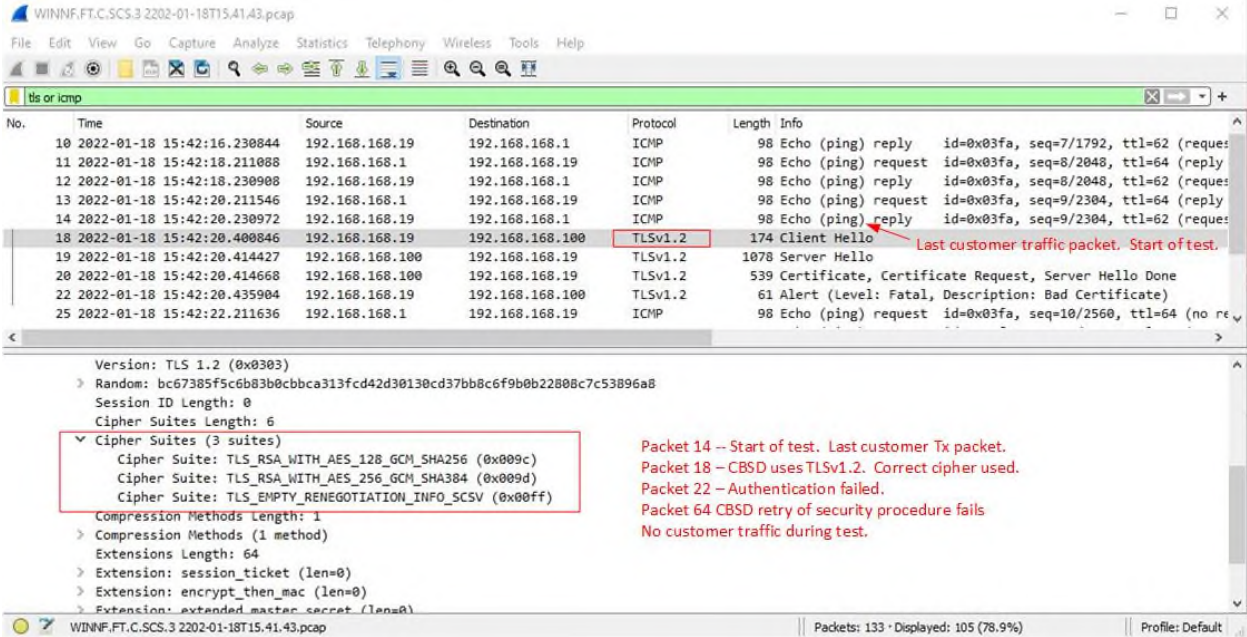
```

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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF.FT.C.SCS.3

Packet Capture Sequence



Version: TLS 1.2 (0x0303)
 Random: bc67385f5c6b83b0cbbca313fcd42d30130cd37bb8c6f9b0b22808c7c53896a8
 Session ID Length: 0
 Cipher Suites Length: 6
 Cipher Suites (3 suites)
 Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
 Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
 Cipher Suite: TLS_EMPTY_RENEGOTIATION_INFO_SCSV (0x00ff)
 Compression Methods Length: 1
 Compression Methods (1 method)
 Extensions Length: 64
 Extension: session_ticket (len=0)
 Extension: encrypt_then_mac (len=0)
 Extension: extended_master_secret (len=0)

Packet 14 – Start of test. Last customer Tx packet.
 Packet 18 – CBSD uses TLSv1.2. Correct cipher used.
 Packet 22 – Authentication failed.
 Packet 64 CBSD retry of security procedure fails
 No customer traffic during test.

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
---	--	------

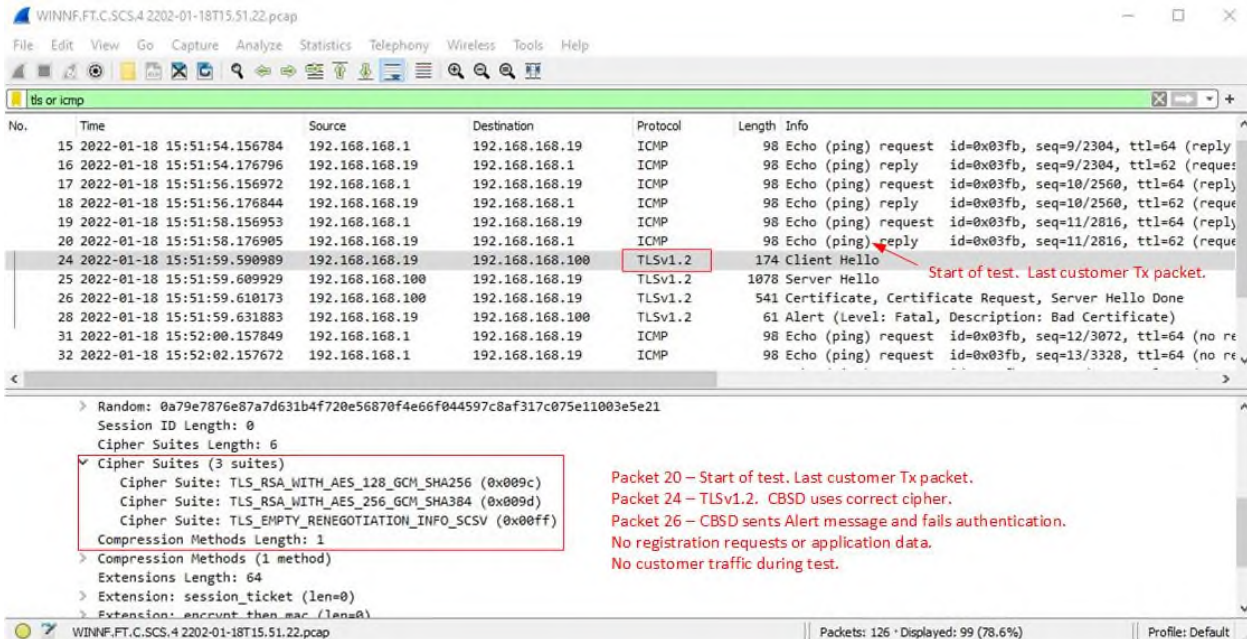
Analysis of WINNF Test Requirements

- From Client Hello can read: TLS version = TLS 1.2

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF.FT.C.SCS.4

Packet Capture Sequence



Random: 0a79e7876e87a7d631b4f720e56870f4e66f044597c8af317c075e11003e5e21
Session ID Length: 0
Cipher Suites Length: 6
Cipher Suites (3 suites)
Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
Cipher Suite: TLS_EMPTY_RENEGOTIATION_INFO_SCSV (0x00ff)
Compression Methods Length: 1
Compression Methods (1 method)
Extensions Length: 64
Extension: session_ticket (len=0)
Extension: encrpt_then_mac (len=0)

Packet 20 – Start of test. Last customer Tx packet.
Packet 24 – TLSv1.2. CBSD uses correct cipher.
Packet 26 – CBSD sends Alert message and fails authentication.
No registration requests or application data.
No customer traffic during test.

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

- From Client Hello can read: TLS version = TLS 1.2

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

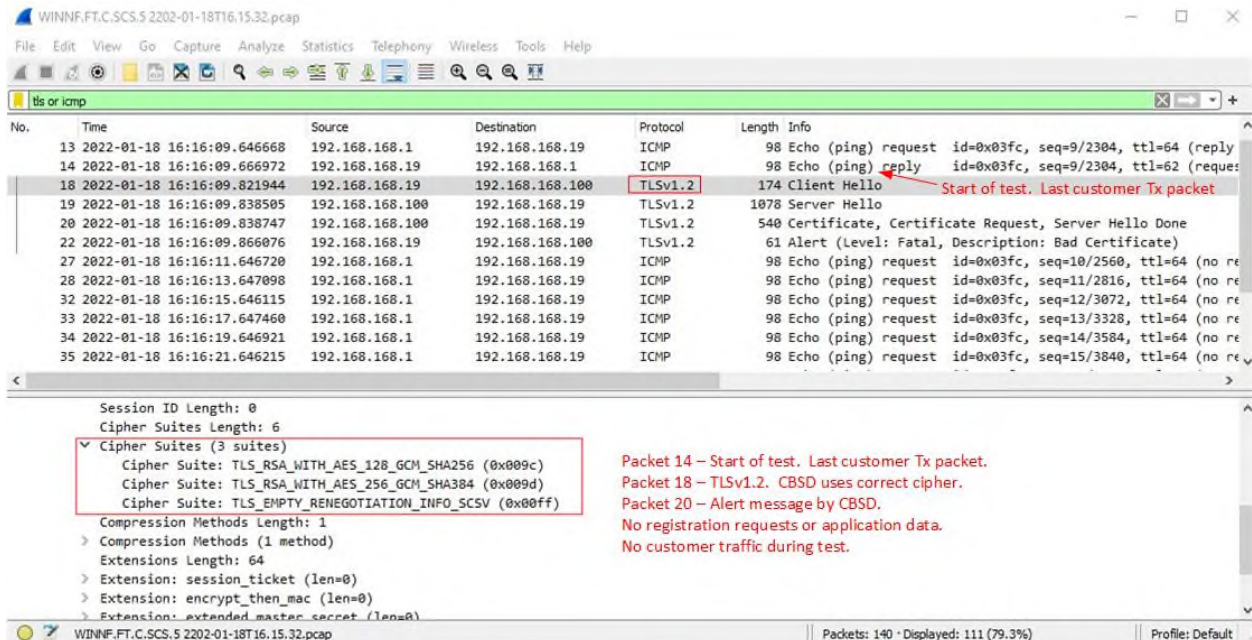
TLS_RSA_WITH_AES_128_GCM_SHA256
 TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
 TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

3. From Server Hello, cipher suite chosen:

TLS_RSA_WITH_AES_128_GCM_SHA256

WINNF.FT.C.SCS.5

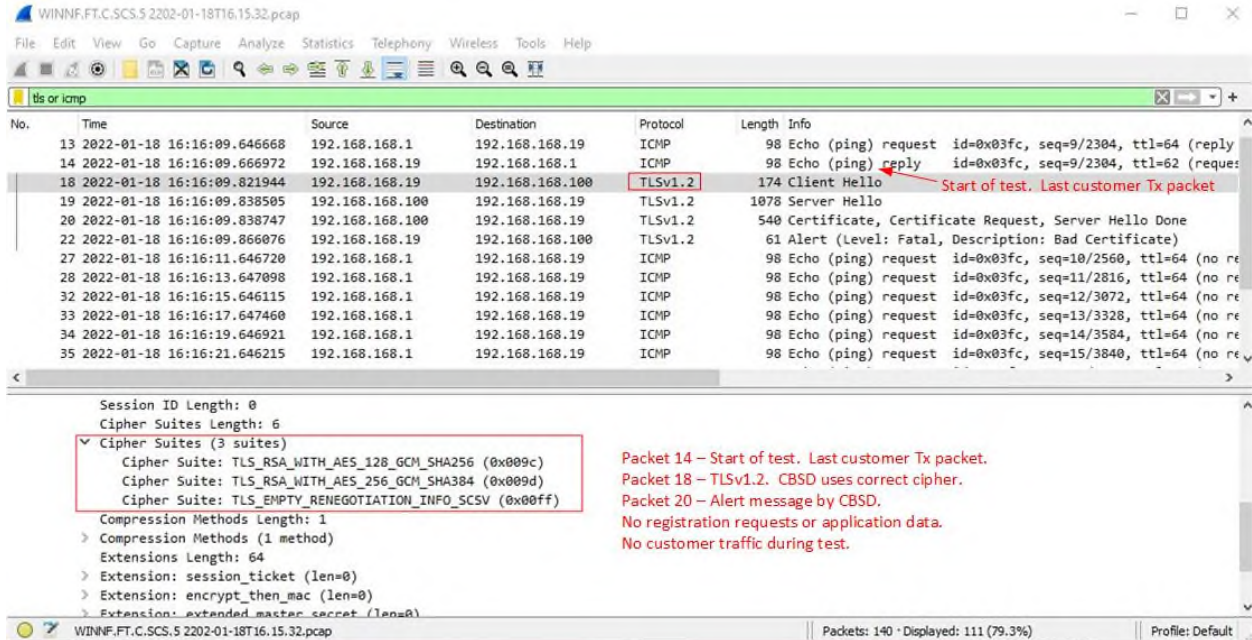
Packet Capture Sequence



Session ID Length: 0
 Cipher Suites Length: 6
 Cipher Suites (3 suites)
 Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
 Cipher Suite: TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
 Cipher Suite: TLS_EMPTY_RENEGOTIATION_INFO_SCSV (0x00ff)
 Compression Methods Length: 1
 Compression Methods (1 method)
 Extensions Length: 64
 Extension: session_ticket (len=0)
 Extension: encrypt_then_mac (len=0)
 Extension: extended_master_secret (len=0)

Packet 14 – Start of test. Last customer Tx packet.
 Packet 18 – TLSv1.2. CBSD uses correct cipher.
 Packet 20 – Alert message by CBSD.
 No registration requests or application data.
 No customer traffic during test.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	



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

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

TLS_RSA_WITH_AES_128_GCM_SHA256
 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):

o Confirmed

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

o Confirmed

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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	-

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Appendix A – EUT & Client Provided Details

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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-2
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.

Client	Nokia	
Product	Nokia 7705 SAR-Hmc NA Variant 2 (3HE12473AAA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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.