

# Test Report

As per

## FCC Part 96 SAS requirements (CBRS Test Plan)

on the

**Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA)**

**Base Station**

FCC ID: AS57705SARHMC-1

Issued by:

**TÜV SÜD Canada Inc.**

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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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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## Report Scope

This report addresses the EMC verification testing and test results of the **Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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.


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## Summary

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

Equipment Under Test (EUT)	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>
EUT passed all tests performed	Yes
Tests conducted by	Scott Drysdale


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

Client	Nokia	
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## 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. <ul style="list-style-type: none"> <li>Record time at which transmission stops. Time must be within 60 seconds of the installationParam change taking effect.</li> </ul>	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

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					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.	
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.	
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.	
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: <ul style="list-style-type: none"> <li>Transmission does not start until time of first heartbeat response or after.</li> <li>After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)</li> </ul>	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:	


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					<ul style="list-style-type: none"> <li>Transmission does not start until time of first heartbeat response or after.</li> <li>After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)</li> </ul>	
6.4.4.2.1	X	X	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	Monitor RF transmission. Ensure that: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of the heartbeatResponse which contains responseCode = 105</li> </ul>	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: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=501</li> </ul>	P
6.4.4.2.5	X	X	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	Monitor RF transmission. Ensure: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=502</li> </ul>	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: <ul style="list-style-type: none"> <li>CBSD1: will continue to transmit to end of test (this is not a pass/fail criteria, but check)</li> </ul>	N/A

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					<ul style="list-style-type: none"> <li>CBSD2: must stop transmission within 60 seconds of being sent heartbeatResponse with responseCode = 500</li> </ul>	
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: <ul style="list-style-type: none"> <li>CBSD must stop transmission within transmitExpireTime+60 seconds, where transmitExpireTime is from last successful heartbeatResponse message</li> </ul>	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: <ul style="list-style-type: none"> <li>CBSD stops transmission at any time prior to sending the relinquishmentRequest message.</li> </ul>	P
6.6.4.1.2	--	X	WINNF.FT.D.RLQ.2	Domain Proxy Successful Relinquishment	Monitor RF transmission. Ensure: <ul style="list-style-type: none"> <li>CBSD stops transmission at any time prior to sending the relinquishmentRequest message.</li> </ul>	N/A
6.7.4.1.1	X	--	WINNF.FT.C.DRG.1	Successful Deregistration	Monitor RF transmission. Ensure: <ul style="list-style-type: none"> <li>CBSD stops transmission at any time prior to sending the relinquishmentRequest message.</li> </ul>	P



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					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.

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### ***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-V1.0.0, 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, where due to the simulation of the network a cached version of the revocation list was utilized.

Logs are kept on file.

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## 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 V1.0.0 CBSD/DP as Unit Under Test (UUT)  
19 December 2017 Working Document

ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories

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## Document Revision Status

000 – 1<sup>st</sup> issue. January 31, 2021

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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'.


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## Testing Facility

Testing for EMC on the EUT was carried out at customer location as described in Appendix A.

### ***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.

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### ***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)
Dec 8 - 20 <sup>th</sup> , 2022	All	SD	20-23	40-55	96.106

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## Detailed Test Results Section



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


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
12-08-2021	16:42:34	469	467	
12-08-2021	16:42:39	469	471	
12-08-2021	16:42:44	470	470	
12-08-2021	16:42:49	470	476	
12-08-2021	16:42:54	470	476	
12-08-2021	16:42:59	470	0	Customer traffic has stopped
12-08-2021	16:43:04	470	0	
12-08-2021	16:43:09	470	0	
12-08-2021	16:43:14	470	0	
12-08-2021	16:43:19	470	0	
12-08-2021	16:43:24	470	0	
12-08-2021	16:43:29	470	0	
12-08-2021	16:43:34	470	0	
12-08-2021	16:43:39	470	0	
12-08-2021	16:43:44	469	0	
12-08-2021	16:43:49	469	0	
12-08-2021	16:43:54	470	0	End of Test

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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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	16:54:20	469	471	
12-08-2021	16:54:25	471	467	
12-08-2021	16:54:30	469	467	
12-08-2021	16:54:35	469	0	Customer traffic has stopped
12-08-2021	16:54:40	469	0	
12-08-2021	16:54:45	471	0	
12-08-2021	16:54:50	469	0	
12-08-2021	16:54:55	469	0	
12-08-2021	16:55:00	469	0	
12-08-2021	16:55:05	470	0	
12-08-2021	16:55:10	469	0	
12-08-2021	16:55:15	471	0	
12-08-2021	16:55:20	470	0	
12-08-2021	16:55:25	470	0	
12-08-2021	16:55:30	468	0	End of Test

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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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	16:58:46	471	471	
12-08-2021	16:58:51	471	469	
12-08-2021	16:58:56	471	471	
12-08-2021	16:59:01	469	469	
12-08-2021	16:59:06	470	471	
12-08-2021	16:59:11	469	0	Customer traffic has stopped
12-08-2021	16:59:16	470	0	
12-08-2021	16:59:21	469	0	
12-08-2021	16:59:26	469	0	
12-08-2021	16:59:31	470	0	
12-08-2021	16:59:36	471	0	
12-08-2021	16:59:41	469	0	
12-08-2021	16:59:46	470	0	
12-08-2021	16:59:51	470	0	
12-08-2021	16:59:56	472	0	
12-08-2021	17:00:01	469	0	
12-08-2021	17:00:06	469	0	End of Test

Client	Nokia	
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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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	17:04:41	470	470	
12-08-2021	17:04:46	470	471	
12-08-2021	17:04:51	468	468	
12-08-2021	17:04:56	470	470	
12-08-2021	17:05:01	470	0	Customer traffic has stopped
12-08-2021	17:05:06	470	0	
12-08-2021	17:05:11	469	0	
12-08-2021	17:05:16	471	0	
12-08-2021	17:05:21	471	0	
12-08-2021	17:05:26	468	0	
12-08-2021	17:05:31	470	0	
12-08-2021	17:05:36	471	0	
12-08-2021	17:05:41	471	0	
12-08-2021	17:05:46	471	0	
12-08-2021	17:05:51	469	0	
12-08-2021	17:05:56	471	0	
12-08-2021	17:06:01	471	0	End of Test

Client	Nokia	
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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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	17:08:06	469	472	
12-08-2021	17:08:11	469	471	
12-08-2021	17:08:16	469	471	
12-08-2021	17:08:21	469	472	
12-08-2021	17:08:26	469	467	
12-08-2021	17:08:31	471	365	
12-08-2021	17:08:36	469	0	Customer traffic has stopped
12-08-2021	17:08:41	469	0	
12-08-2021	17:08:46	469	0	
12-08-2021	17:08:51	471	0	
12-08-2021	17:08:56	469	0	
12-08-2021	17:09:01	469	0	
12-08-2021	17:09:06	469	0	
12-08-2021	17:09:11	468	0	
12-08-2021	17:09:16	471	0	
12-08-2021	17:09:21	471	0	
12-08-2021	17:09:26	469	0	
12-08-2021	17:09:31	471	0	End of Test

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	17:12:17	470	472	
12-08-2021	17:12:22	469	471	
12-08-2021	17:12:27	469	471	
12-08-2021	17:12:32	469	471	
12-08-2021	17:12:37	469	471	
12-08-2021	17:12:42	470	0	Customer traffic has stopped
12-08-2021	17:12:47	470	0	
12-08-2021	17:12:52	471	0	
12-08-2021	17:12:57	470	0	
12-08-2021	17:13:02	470	0	
12-08-2021	17:13:07	471	0	
12-08-2021	17:13:12	470	0	
12-08-2021	17:13:17	469	0	
12-08-2021	17:13:22	471	0	
12-08-2021	17:13:27	469	0	
12-08-2021	17:13:32	469	0	
12-08-2021	17:13:37	469	0	
12-08-2021	17:13:42	470	0	End of Test

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	17:16:27	470	473	
12-08-2021	17:16:32	469	468	
12-08-2021	17:16:37	470	472	
12-08-2021	17:16:42	471	469	
12-08-2021	17:16:47	469	473	
12-08-2021	17:16:52	470	0	Customer traffic has stopped
12-08-2021	17:16:57	470	0	
12-08-2021	17:17:02	469	0	
12-08-2021	17:17:07	470	0	
12-08-2021	17:17:12	470	0	
12-08-2021	17:17:17	470	0	
12-08-2021	17:17:22	469	0	
12-08-2021	17:17:27	469	0	
12-08-2021	17:17:32	470	0	
12-08-2021	17:17:37	470	0	
12-08-2021	17:17:42	470	0	
12-08-2021	17:17:47	470	0	End of Test


Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

***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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	18:52:10	471	471	
12-08-2021	18:52:15	469	469	
12-08-2021	18:52:20	469	467	
12-08-2021	18:52:25	472	468	
12-08-2021	18:52:30	470	0	Customer traffic has stopped
12-08-2021	18:52:35	469	0	
12-08-2021	18:52:40	469	0	
12-08-2021	18:52:45	471	0	
12-08-2021	18:52:50	469	0	
12-08-2021	18:52:55	469	0	
12-08-2021	18:53:00	471	0	
12-08-2021	18:53:05	471	0	
12-08-2021	18:53:10	470	0	
12-08-2021	18:53:15	469	0	
12-08-2021	18:53:20	469	0	
12-08-2021	18:53:25	469	0	
12-08-2021	18:53:30	469	0	End of Test



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-08-2021	18:57:11	469	467	
12-08-2021	18:57:16	469	473	
12-08-2021	18:57:21	470	411	
12-08-2021	18:57:26	471	0	Customer traffic has stopped
12-08-2021	18:57:31	469	0	
12-08-2021	18:57:36	471	0	
12-08-2021	18:57:41	471	0	
12-08-2021	18:57:46	469	0	
12-08-2021	18:57:51	468	0	
12-08-2021	18:57:56	469	0	
12-08-2021	18:58:01	471	0	
12-08-2021	18:58:06	469	0	
12-08-2021	18:58:11	469	0	
12-08-2021	18:58:16	471	0	
12-08-2021	18:58:21	471	0	
12-08-2021	18:58:26	469	0	End of Test


Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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: <ul style="list-style-type: none"> <li>• Transmission does not start until time of first heartbeat response or after.</li> <li>• After transmission starts, measure that transmission is within the granted channel (frequencyLow, frequencyHigh)</li> </ul>	P
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	19:22:04	378	360	
12-09-2021	19:22:05	469	470	
12-09-2021	19:22:06	472	469	
12-09-2021	19:22:07	469	467	
12-09-2021	19:22:08	469	467	
12-09-2021	19:22:09	472	470	
12-09-2021	19:22:10	470	468	
12-09-2021	19:22:11	470	132	
12-09-2021	19:22:12	470	0	Customer traffic has stopped
12-09-2021	19:22:13	469	0	
12-09-2021	19:22:14	470	0	
12-09-2021	19:22:15	470	340	Heartbeat response received. Customer traffic started
12-09-2021	19:22:16	470	340	
12-09-2021	19:22:17	470	468	
12-09-2021	19:22:18	470	467	
12-09-2021	19:22:19	470	468	
12-09-2021	19:22:20	470	470	
12-09-2021	19:22:21	471	469	
12-09-2021	19:22:22	470	470	
12-09-2021	19:22:23	470	470	
12-09-2021	19:22:24	472	468	
12-09-2021	19:22:25	470	468	
12-09-2021	19:22:26	472	476	
12-09-2021	19:22:27	470	467	
12-09-2021	19:22:28	470	470	

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	


12-09-2021	19:22:29	470	470
12-09-2021	19:22:30	470	469
12-09-2021	19:22:31	470	470
12-09-2021	19:22:32	472	476
12-09-2021	19:22:33	470	470
12-09-2021	19:22:34	470	470
12-09-2021	19:22:35	471	471
12-09-2021	19:22:36	470	470
12-09-2021	19:22:37	470	470
12-09-2021	19:22:38	470	470
12-09-2021	19:22:39	470	480
12-09-2021	19:22:40	470	468
12-09-2021	19:22:41	471	471
12-09-2021	19:22:42	470	470
12-09-2021	19:22:43	470	472
12-09-2021	19:22:44	470	469
12-09-2021	19:22:45	470	480
12-09-2021	19:22:46	470	470
12-09-2021	19:22:47	470	472
12-09-2021	19:22:48	470	472
12-09-2021	19:22:49	470	472
12-09-2021	19:22:50	469	471
12-09-2021	19:22:51	470	472
12-09-2021	19:22:52	470	480
12-09-2021	19:22:53	470	470
12-09-2021	19:22:54	470	470
12-09-2021	19:22:55	470	470
12-09-2021	19:22:56	469	471
12-09-2021	19:22:57	472	472
12-09-2021	19:22:58	470	470
12-09-2021	19:22:59	470	470
12-09-2021	19:23:00	470	470
12-09-2021	19:23:01	472	470
12-09-2021	19:23:02	470	470
12-09-2021	19:23:03	470	470
12-09-2021	19:23:04	470	464
12-09-2021	19:23:05	470	474
12-09-2021	19:23:06	470	470
12-09-2021	19:23:07	472	470
12-09-2021	19:23:08	469	470

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	


12-09-2021	19:23:09	470	470
12-09-2021	19:23:10	470	470
12-09-2021	19:23:11	470	466
12-09-2021	19:23:12	470	474
12-09-2021	19:23:13	470	472
12-09-2021	19:23:14	469	468
12-09-2021	19:23:15	470	468
12-09-2021	19:23:16	470	470
12-09-2021	19:23:17	470	470
12-09-2021	19:23:18	469	468
12-09-2021	19:23:19	469	468
12-09-2021	19:23:20	470	467
12-09-2021	19:23:21	470	467
12-09-2021	19:23:22	469	468
12-09-2021	19:23:23	470	469
12-09-2021	19:23:24	472	468
12-09-2021	19:23:25	470	470
12-09-2021	19:23:26	469	470
12-09-2021	19:23:27	469	468
12-09-2021	19:23:28	470	468
12-09-2021	19:23:29	469	468
12-09-2021	19:23:30	472	476
12-09-2021	19:23:31	470	468
12-09-2021	19:23:32	470	470
12-09-2021	19:23:33	470	470
12-09-2021	19:23:34	470	470
12-09-2021	19:23:35	470	470
12-09-2021	19:23:36	470	476
12-09-2021	19:23:37	472	468
12-09-2021	19:23:38	470	470
12-09-2021	19:23:39	470	470
12-09-2021	19:23:40	472	470
12-09-2021	19:23:41	470	470
12-09-2021	19:23:42	469	479
12-09-2021	19:23:43	470	467
12-09-2021	19:23:44	470	467
12-09-2021	19:23:45	470	468
12-09-2021	19:23:46	470	472
12-09-2021	19:23:47	470	471
12-09-2021	19:23:48	470	472

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	


12-09-2021	19:23:49	470	478
12-09-2021	19:23:50	472	474
12-09-2021	19:23:51	470	472
12-09-2021	19:23:52	470	472
12-09-2021	19:23:53	471	471
12-09-2021	19:23:54	471	469
12-09-2021	19:23:55	469	469
12-09-2021	19:23:56	469	471
12-09-2021	19:23:57	469	471
12-09-2021	19:23:58	471	469
12-09-2021	19:23:59	469	467
12-09-2021	19:24:00	469	467
12-09-2021	19:24:01	471	467
12-09-2021	19:24:02	470	472
12-09-2021	19:24:03	470	476
12-09-2021	19:24:04	470	472
12-09-2021	19:24:05	470	472
12-09-2021	19:24:06	470	470
12-09-2021	19:24:07	470	468
12-09-2021	19:24:08	470	470
12-09-2021	19:24:09	469	473
12-09-2021	19:24:10	470	471
12-09-2021	19:24:11	471	473
12-09-2021	19:24:12	470	465
12-09-2021	19:24:13	470	474
12-09-2021	19:24:14	470	464
12-09-2021	19:24:15	470	474
12-09-2021	19:24:16	471	469
12-09-2021	19:24:17	469	467
12-09-2021	19:24:18	470	469
12-09-2021	19:24:19	471	469
12-09-2021	19:24:20	469	463
12-09-2021	19:24:21	469	477
12-09-2021	19:24:22	471	471
12-09-2021	19:24:23	469	471
12-09-2021	19:24:24	469	479
12-09-2021	19:24:25	471	467
12-09-2021	19:24:26	469	467
12-09-2021	19:24:27	469	469
12-09-2021	19:24:28	469	469

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

12-09-2021	19:24:29	471	467
12-09-2021	19:24:30	469	467
12-09-2021	19:24:31	470	468
12-09-2021	19:24:32	471	467
12-09-2021	19:24:33	469	467
12-09-2021	19:24:34	469	467
12-09-2021	19:24:35	471	477
12-09-2021	19:24:36	469	469
12-09-2021	19:24:37	469	467
12-09-2021	19:24:38	469	467
12-09-2021	19:24:39	471	467
12-09-2021	19:24:40	469	475
12-09-2021	19:24:41	469	467
12-09-2021	19:24:42	469	469
12-09-2021	19:24:43	469	469
12-09-2021	19:24:44	469	469
12-09-2021	19:24:45	471	469
12-09-2021	19:24:46	469	469
12-09-2021	19:24:47	469	477
12-09-2021	19:24:48	471	467
12-09-2021	19:24:49	469	467
12-09-2021	19:24:50	469	467
12-09-2021	19:24:51	469	467
12-09-2021	19:24:52	471	469
12-09-2021	19:24:53	470	469
12-09-2021	19:24:54	470	480
12-09-2021	19:24:55	471	467
12-09-2021	19:24:56	469	471
12-09-2021	19:24:57	469	469
12-09-2021	19:24:58	469	469
12-09-2021	19:24:59	471	471
12-09-2021	19:25:00	469	479
12-09-2021	19:25:01	469	471
12-09-2021	19:25:02	471	471
12-09-2021	19:25:03	471	469
12-09-2021	19:25:04	469	471
12-09-2021	19:25:05	471	469
12-09-2021	19:25:06	469	473
12-09-2021	19:25:07	469	469
12-09-2021	19:25:08	471	469


Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

12-09-2021	19:25:09	469	469
12-09-2021	19:25:10	469	471
12-09-2021	19:25:11	469	471
12-09-2021	19:25:12	471	471
12-09-2021	19:25:13	469	471
12-09-2021	19:25:14	469	471
12-09-2021	19:25:15	471	471
12-09-2021	19:25:16	469	469
12-09-2021	19:25:17	471	469
12-09-2021	19:25:18	469	469
12-09-2021	19:25:19	471	461
12-09-2021	19:25:20	469	469
12-09-2021	19:25:21	469	471
12-09-2021	19:25:22	471	469
12-09-2021	19:25:23	471	469
12-09-2021	19:25:24	469	469
12-09-2021	19:25:25	471	469
12-09-2021	19:25:26	470	472
12-09-2021	19:25:27	469	469
12-09-2021	19:25:28	471	471
12-09-2021	19:25:29	469	467
12-09-2021	19:25:30	469	469
12-09-2021	19:25:31	471	469
12-09-2021	19:25:32	469	467
12-09-2021	19:25:33	469	467
12-09-2021	19:25:34	469	467
12-09-2021	19:25:35	471	469
12-09-2021	19:25:36	470	468
12-09-2021	19:25:37	471	467
12-09-2021	19:25:38	469	467
12-09-2021	19:25:39	469	469
12-09-2021	19:25:40	471	467
12-09-2021	19:25:41	469	467
12-09-2021	19:25:42	469	467
12-09-2021	19:25:43	471	468
12-09-2021	19:25:44	469	467
12-09-2021	19:25:45	469	475
12-09-2021	19:25:46	469	470
12-09-2021	19:25:47	470	478
12-09-2021	19:25:48	471	470


Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

12-09-2021	19:25:49	469	471
12-09-2021	19:25:50	469	467
12-09-2021	19:25:51	471	479
12-09-2021	19:25:52	469	469
12-09-2021	19:25:53	469	467
12-09-2021	19:25:54	471	469
12-09-2021	19:25:55	471	469
12-09-2021	19:25:56	469	469
12-09-2021	19:25:57	471	475
12-09-2021	19:25:58	469	475
12-09-2021	19:25:59	469	470
12-09-2021	19:26:00	471	471
12-09-2021	19:26:01	469	469
12-09-2021	19:26:02	469	469
12-09-2021	19:26:03	471	469
12-09-2021	19:26:04	469	479
12-09-2021	19:26:05	469	471
12-09-2021	19:26:06	469	471
12-09-2021	19:26:07	469	471
12-09-2021	19:26:08	469	471
12-09-2021	19:26:09	471	471
12-09-2021	19:26:10	469	479
12-09-2021	19:26:11	471	479
12-09-2021	19:26:12	469	469
12-09-2021	19:26:13	469	471
12-09-2021	19:26:14	471	471
12-09-2021	19:26:15	471	471
12-09-2021	19:26:16	469	471
12-09-2021	19:26:17	471	478
12-09-2021	19:26:18	469	469
12-09-2021	19:26:19	469	470
12-09-2021	19:26:20	471	469
12-09-2021	19:26:21	469	469
12-09-2021	19:26:22	468	468
12-09-2021	19:26:23	471	471
12-09-2021	19:26:24	469	469
12-09-2021	19:26:25	469	471
12-09-2021	19:26:26	471	471
12-09-2021	19:26:27	471	468
12-09-2021	19:26:28	469	469




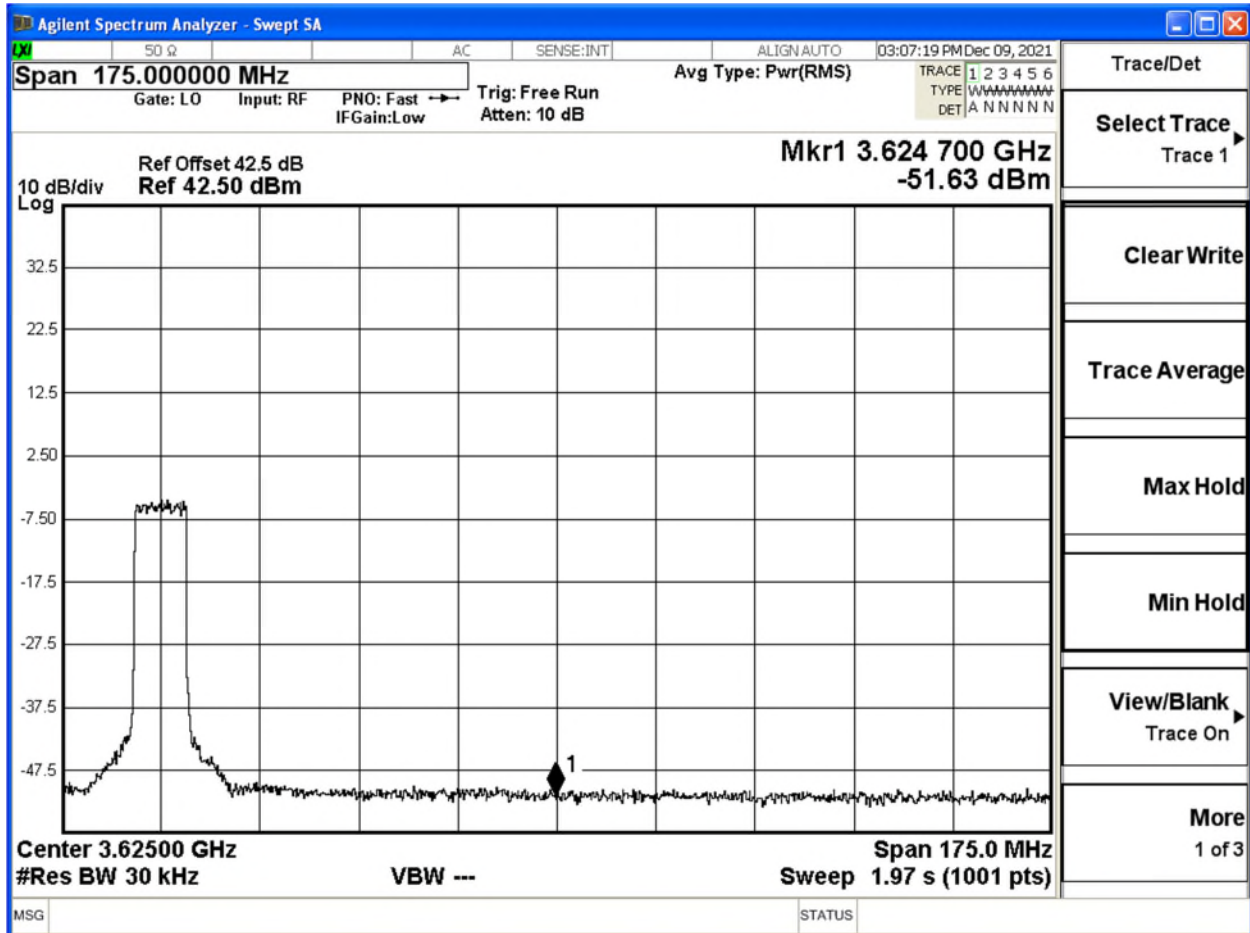
Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

12-09-2021	19:26:29	471	469
12-09-2021	19:26:30	469	469
12-09-2021	19:26:31	469	469
12-09-2021	19:26:32	471	469
12-09-2021	19:26:33	469	467
12-09-2021	19:26:34	471	469
12-09-2021	19:26:35	471	469
12-09-2021	19:26:36	469	469
12-09-2021	19:26:37	471	467
12-09-2021	19:26:38	469	467
12-09-2021	19:26:39	469	467
12-09-2021	19:26:40	471	467
12-09-2021	19:26:41	469	467
12-09-2021	19:26:42	469	467
12-09-2021	19:26:43	471	469
12-09-2021	19:26:44	469	469
12-09-2021	19:26:45	469	467
12-09-2021	19:26:46	471	467
12-09-2021	19:26:47	469	467
12-09-2021	19:26:48	469	467
12-09-2021	19:26:49	471	459
12-09-2021	19:26:50	469	469
12-09-2021	19:26:51	469	461
12-09-2021	19:26:52	471	469
12-09-2021	19:26:53	470	461
12-09-2021	19:26:54	469	469
12-09-2021	19:26:55	469	469
12-09-2021	19:26:56	469	470
12-09-2021	19:26:57	469	467
12-09-2021	19:26:58	469	469
12-09-2021	19:26:59	470	469
12-09-2021	19:27:00	469	469
12-09-2021	19:27:01	469	475
12-09-2021	19:27:02	469	475
12-09-2021	19:27:03	471	469
12-09-2021	19:27:04	469	469
12-09-2021	19:27:05	469	471
12-09-2021	19:27:06	471	469
12-09-2021	19:27:07	469	469
12-09-2021	19:27:08	469	479


Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

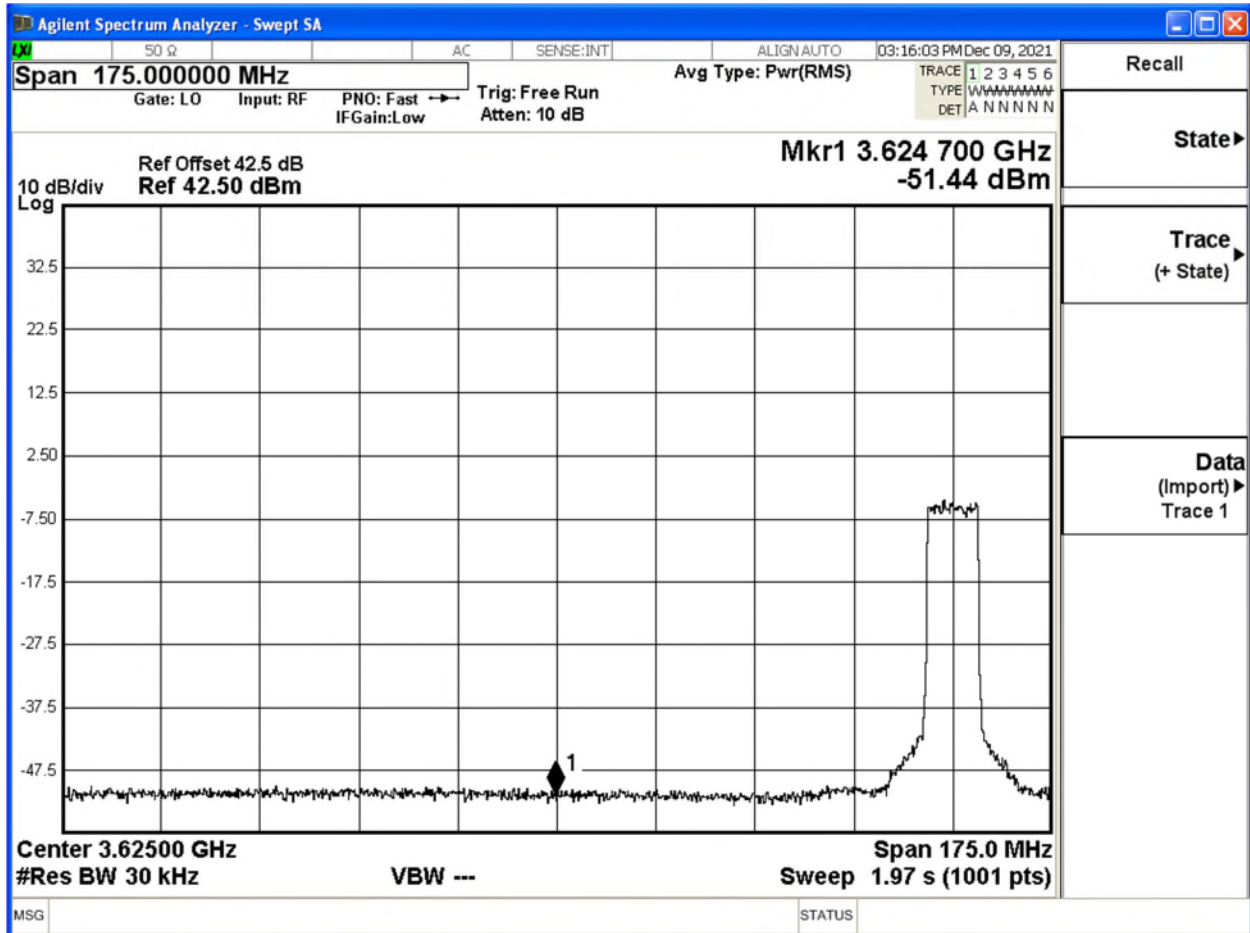
12-09-2021	19:27:09	471	471
12-09-2021	19:27:11	469	471
12-09-2021	19:27:12	469	471
12-09-2021	19:27:13	471	471
12-09-2021	19:27:14	469	471
12-09-2021	19:27:15	469	471
12-09-2021	19:27:16	469	471
12-09-2021	19:27:17	469	469
12-09-2021	19:27:18	471	471
12-09-2021	19:27:19	471	471
12-09-2021	19:27:20	469	471
12-09-2021	19:27:21	471	471
12-09-2021	19:27:22	469	471
12-09-2021	19:27:23	469	469
12-09-2021	19:27:24	471	469
12-09-2021	19:27:25	469	469
12-09-2021	19:27:26	469	469
12-09-2021	19:27:27	471	471
12-09-2021	19:27:28	469	471
12-09-2021	19:27:29	469	470
12-09-2021	19:27:30	471	471

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	




Low Channel

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of the heartbeatResponse which contains responseCode = 105</li> </ul>	P
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	20:44:04	470	460	
12-09-2021	20:44:05	470	468	
12-09-2021	20:44:06	470	468	
12-09-2021	20:44:07	469	468	
12-09-2021	20:44:08	471	467	
12-09-2021	20:44:09	469	468	
12-09-2021	20:44:10	470	470	
12-09-2021	20:44:11	470	466	
12-09-2021	20:44:12	469	460	
12-09-2021	20:44:13	470	0	Customer traffic has stopped
12-09-2021	20:44:14	471	0	
12-09-2021	20:44:15	469	0	Heartbeat response sent by SAS Harness
12-09-2021	20:44:16	469	56	
12-09-2021	20:44:17	472	472	
12-09-2021	20:47:14	471	469	
12-09-2021	20:47:15	469	469	
12-09-2021	20:47:16	469	469	
12-09-2021	20:47:17	469	479	SAS Harness sent Code 105
12-09-2021	20:47:18	470	468	
12-09-2021	20:47:19	469	0	Customer traffic has stopped

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	13:59:55	469	475	
12-09-2021	13:59:56	471	467	
12-09-2021	13:59:57	469	467	
12-09-2021	13:59:58	469	467	
12-09-2021	13:59:59	471	467	
12-09-2021	14:00:00	469	428	
12-09-2021	14:00:01	469	0	Customer traffic has stopped
12-09-2021	14:00:02	472	0	
12-09-2021	14:00:03	471	0	
12-09-2021	14:00:04	469	96	Heartbeat response sent from SAS Harness
12-09-2021	14:00:05	471	471	
12-09-2021	14:00:06	469	469	
12-09-2021	14:00:07	469	467	
12-09-2021	14:00:08	471	475	
12-09-2021	14:00:09	469	471	
12-09-2021	14:00:10	469	471	
12-09-2021	14:05:00	470	472	
12-09-2021	14:05:01	470	470	
12-09-2021	14:05:02	471	471	
12-09-2021	14:05:03	470	470	
12-09-2021	14:05:04	470	470	
12-09-2021	14:05:05	471	380	Code 500 received from SAS Harness
12-09-2021	14:05:06	469	0	Customer traffic has stopped
12-09-2021	14:05:07	469	0	
12-09-2021	14:05:08	470	0	
12-09-2021	14:05:09	471	0	

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	14:38:02	469	471	
12-09-2021	14:38:03	471	467	
12-09-2021	14:38:04	469	467	
12-09-2021	14:38:05	469	471	
12-09-2021	14:38:06	471	469	
12-09-2021	14:38:07	469	469	
12-09-2021	14:38:08	469	196	
12-09-2021	14:38:09	471	0	Customer traffic has stopped
12-09-2021	14:38:10	469	0	
12-09-2021	14:38:11	469	0	
12-09-2021	14:38:12	471	0	
12-09-2021	14:38:13	469	0	
12-09-2021	14:38:14	471	0	
12-09-2021	14:38:15	471	0	
12-09-2021	14:38:16	471	0	
12-09-2021	14:38:17	471	0	
12-09-2021	14:38:18	469	0	
12-09-2021	14:38:19	469	0	
12-09-2021	14:38:20	471	0	
12-09-2021	14:38:21	469	0	
12-09-2021	14:38:22	469	0	
12-09-2021	14:38:23	471	0	
12-09-2021	14:38:24	469	0	
12-09-2021	14:38:25	469	0	
12-09-2021	14:38:26	471	0	
12-09-2021	14:38:27	469	0	
12-09-2021	14:38:28	469	0	
12-09-2021	14:38:29	471	0	
12-09-2021	14:38:30	469	0	
12-09-2021	14:38:31	469	0	
12-09-2021	14:38:32	471	0	
12-09-2021	14:38:33	469	0	
12-09-2021	14:38:34	469	0	

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

12-09-2021	14:38:35	471	0	
12-09-2021	14:38:36	471	0	
12-09-2021	14:38:37	469	0	
12-09-2021	14:38:38	471	0	
12-09-2021	14:38:39	469	0	
12-09-2021	14:38:40	471	0	
12-09-2021	14:38:41	469	0	
12-09-2021	14:38:42	469	0	
12-09-2021	14:38:43	471	0	End of Test





Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=501</li> </ul>	P
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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	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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: <ul style="list-style-type: none"> <li>CBSD stops transmission within 60 seconds of heartbeatResponse which contains responseCode=502</li> </ul>	P
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	16:32:40	470	470	
12-09-2021	16:32:41	469	469	
12-09-2021	16:32:42	470	208	
12-09-2021	16:32:43	470	0	Customer traffic has stopped
12-09-2021	16:32:44	470	0	
12-09-2021	16:32:45	469	0	CBSD received heartbeat response
12-09-2021	16:32:46	469	467	
12-09-2021	16:32:47	469	469	
12-09-2021	16:32:48	469	469	
12-09-2021	16:35:44	469	468	
12-09-2021	16:35:45	469	467	
12-09-2021	16:35:46	471	467	
12-09-2021	16:35:47	471	467	CBSD received relinquish response
12-09-2021	16:35:48	469	0	Customer traffic has stopped
12-09-2021	16:35:49	469	0	
12-09-2021	16:35:50	471	0	
12-09-2021	16:35:51	469	0	
12-09-2021	16:35:52	470	0	
12-09-2021	16:35:53	471	0	
12-09-2021	16:35:54	469	0	


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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	18:05:26	470	467	
12-09-2021	18:05:27	471	469	
12-09-2021	18:05:28	469	467	
12-09-2021	18:05:29	469	467	
12-09-2021	18:05:30	469	0	Customer traffic has stopped
12-09-2021	18:05:31	470	0	
12-09-2021	18:05:32	469	0	
12-09-2021	18:05:33	469	0	
12-09-2021	18:09:03	471	0	
12-09-2021	18:09:04	469	0	
12-09-2021	18:09:05	471	0	
12-09-2021	18:09:06	471	0	end of test
12-09-2021	18:09:07	469	0	
12-09-2021	18:09:08	471	0	
12-09-2021	18:09:09	28	0	


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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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: <ul style="list-style-type: none"> <li>CBSD must stop transmission with in transmitExpireTime+60 seconds, where transmitExpireTime is from last successful heartbeatResponse message</li> </ul>	P
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Date	Time	Customer traffic Generated	Customer Traffic Transmitted	Comments
12-09-2021	16:56:31	469	469	
12-09-2021	16:56:32	471	469	
12-09-2021	16:56:33	469	469	
12-09-2021	16:56:34	469	0	Customer traffic has stopped
12-09-2021	16:56:35	471	0	
12-09-2021	16:56:37	469	0	
12-09-2021	16:56:38	469	469	CBSD receives heartbeat response
12-09-2021	16:56:39	469	469	
12-09-2021	16:56:40	469	471	
12-09-2021	16:56:41	471	467	
12-09-2021	17:00:49	469	469	
12-09-2021	17:00:50	471	469	
12-09-2021	17:00:51	469	469	
12-09-2021	17:00:52	470	0	Customer traffic has stopped
12-09-2021	17:00:53	471	0	
12-09-2021	17:00:54	469	0	
12-09-2021	17:00:55	469	0	
12-09-2021	17:00:56	471	0	

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

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


6.5.4.2.3	X	X	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	No RF monitoring	P
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Pass. “measreportconfig” in logs. All other requirements verified.

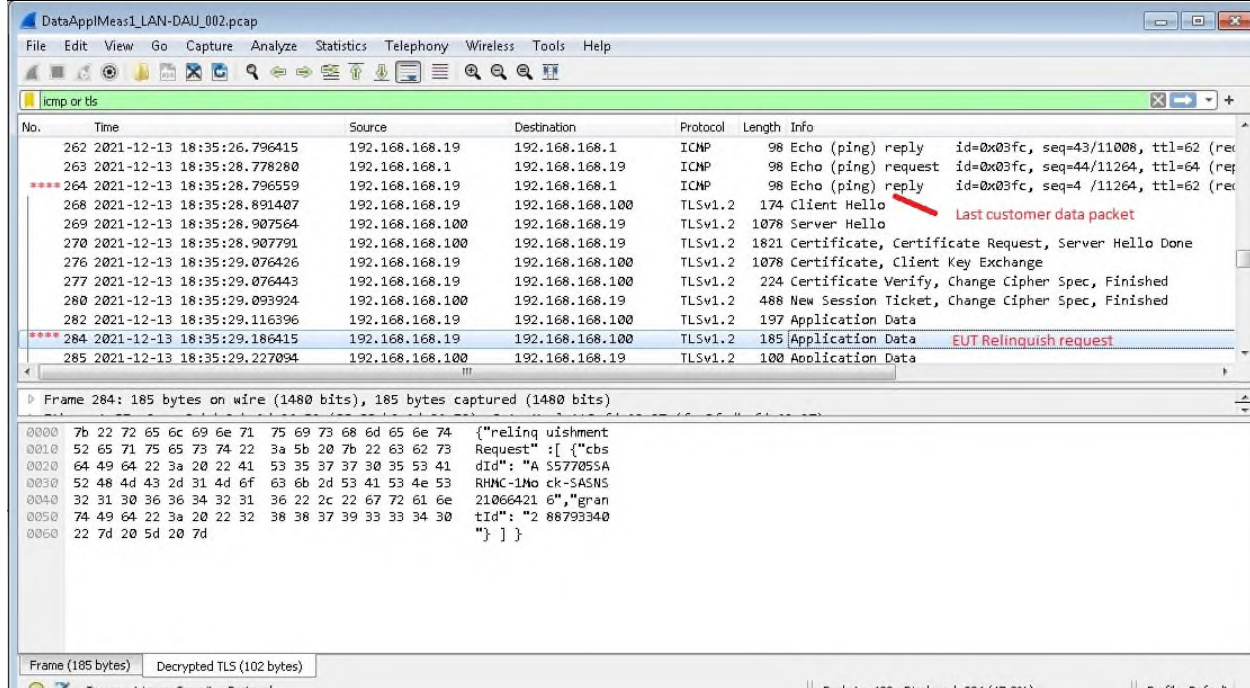
Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

6.5.4.2.4	X	--	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	No RF monitoring	P
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Pass. “measreportconfig” in logs. All other requirements verified.

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

6.6.4.1.1	X	--	WINNF.FT.C.RLQ.1	Successful Relinquishment	Monitor RF transmission. Ensure: <ul style="list-style-type: none"> <li>CBSD stops transmission at any time prior to sending the relinquishmentRequest message.</li> </ul>	P
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DataApplMeas1\_LAN-DAU\_002.pcap

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icmp or tls

No.	Time	Source	Destination	Protocol	Length	Info
262	2021-12-13 18:35:26.796415	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03fc, seq=43/11008, ttl=62 (re
263	2021-12-13 18:35:28.778280	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x03fc, seq=44/11264, ttl=64 (re
264	2021-12-13 18:35:28.796559	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x03fc, seq=4 /11264, ttl=62 (re
268	2021-12-13 18:35:28.891407	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
269	2021-12-13 18:35:28.907564	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
270	2021-12-13 18:35:28.907791	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
276	2021-12-13 18:35:29.076426	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
277	2021-12-13 18:35:29.076443	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
280	2021-12-13 18:35:29.093924	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
282	2021-12-13 18:35:29.116396	192.168.168.19	192.168.168.100	TLSv1.2	197	Application Data
284	2021-12-13 18:35:29.186415	192.168.168.19	192.168.168.100	TLSv1.2	185	Application Data EUT Relinquish request
285	2021-12-13 18:35:29.227034	192.168.168.100	192.168.168.19	TLSv1.2	100	Application Data

Frame 284: 185 bytes on wire (1480 bits), 185 bytes captured (1480 bits)


```

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 5577055A
0030 52 48 4d 43 2d 31 4d 6f 63 6b 2d 53 41 53 4e 53 RHMC-1No ck-SASNS
0040 32 31 30 36 36 34 32 31 36 22 2c 22 67 72 61 6e 21066421 6","gran
0050 74 49 64 22 3a 20 22 32 38 38 37 39 33 33 34 30 tId": "2 88793340
0060 22 7d 20 5d 20 7d "}] }

```

Frame (185 bytes) Decrypted TLS (102 bytes)



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

DataAppMeas1\_LAN-DAU\_014.pcap

No.	Time	Source	Destination	Protocol	Length	Info
38172	2021-12-22 17:36:51.586975	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
38179	2021-12-22 17:36:51.599696	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
38180	2021-12-22 17:36:51.599940	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
38237	2021-12-22 17:36:51.714254	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x041a, seq=42/10752, ttl=64 (reply in 38246)
38246	2021-12-22 17:36:51.731933	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x041a, seq=42/10752, ttl=62 (request in 38237)
38272	2021-12-22 17:36:51.776975	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, client Key Exchange
38273	2021-12-22 17:36:51.780001	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
38284	2021-12-22 17:36:51.797956	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
38298	2021-12-22 17:36:51.821956	192.168.168.19	192.168.168.100	TLSv1.2	197	Application Data
38334	2021-12-22 17:36:51.891957	192.168.168.19	192.168.168.100	TLSv1.2	185	Application Data
38358	2021-12-22 17:36:51.940303	192.168.168.100	192.168.168.19	TLSv1.2	211	Application Data, Application Data, Application Data
38359	2021-12-22 17:36:51.940321	192.168.168.100	192.168.168.19	TLSv1.2	121	Application Data
38360	2021-12-22 17:36:51.940547	192.168.168.100	192.168.168.19	TLSv1.2	120	Application Data
38361	2021-12-22 17:36:51.940560	192.168.168.100	192.168.168.19	TLSv1.2	250	Application Data, Application Data
38380	2021-12-22 17:36:51.971973	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning, Description: Close Notify)
38398	2021-12-22 17:36:51.996969	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
38401	2021-12-22 17:36:52.001439	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
38402	2021-12-22 17:36:52.001692	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
38494	2021-12-22 17:36:52.181986	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, client Key Exchange
38495	2021-12-22 17:36:52.185008	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
38506	2021-12-22 17:36:52.199638	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
38520	2021-12-22 17:36:52.226028	192.168.168.19	192.168.168.100	TLSv1.2	196	Application Data

Frame (185 bytes)    Decrypted TLS (102 bytes)

DataAppMeas1\_LAN-DAU\_014.pcap    Packets: 38984 · Displayed: 232 (0.6%)    Profile: Default


DataAppMeas1\_LAN-DAU\_004.pcap

No.	Time	Source	Destination	Protocol	Length	Info
257	2021-12-13 20:29:17.168526	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x0402, seq=37/9472, ttl=64 (reply in 258)
258	2021-12-13 20:29:17.187871	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x0402, seq=37/9472, ttl=62 (request in 257)
259	2021-12-13 20:29:18.042963	192.168.168.19	192.168.168.100	TCP	74	50066 → 5000 [SYN] Seq=0 Win=8192 Len=0 MSS=1024 WS=1 TSval=4159543129 TSecr=
260	2021-12-13 20:29:18.043489	192.168.168.100	192.168.168.19	TCP	62	5000 → 50066 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460 WS=256
261	2021-12-13 20:29:18.067812	192.168.168.19	192.168.168.100	TCP	54	50066 → 5000 [ACK] Seq=1 Ack=1 Win=8192 Len=0
262	2021-12-13 20:29:18.067830	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
263	2021-12-13 20:29:18.102015	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
264	2021-12-13 20:29:18.102281	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
265	2021-12-13 20:29:18.127805	192.168.168.19	192.168.168.100	TCP	54	50066 → 5000 [ACK] Seq=121 Ack=2049 Win=8192 Len=0
266	2021-12-13 20:29:18.132787	192.168.168.19	192.168.168.100	TCP	54	50066 → 5000 [ACK] Seq=121 Ack=2792 Win=8120 Len=0
267	2021-12-13 20:29:18.252883	192.168.168.19	192.168.168.100	TCP	1078	50066 → 5000 [ACK] Seq=121 Ack=2792 Win=8192 Len=1024 [TCP segment of a reas
268	2021-12-13 20:29:18.252903	192.168.168.19	192.168.168.100	TCP	1078	50066 → 5000 [ACK] Seq=1145 Ack=2792 Win=8192 Len=1024 [TCP segment of a reas
269	2021-12-13 20:29:18.253557	192.168.168.100	192.168.168.19	TCP	60	5000 → 50066 [ACK] Seq=2792 Ack=2169 Win=131072 Len=0
270	2021-12-13 20:29:18.277849	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
271	2021-12-13 20:29:18.277867	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
272	2021-12-13 20:29:18.278588	192.168.168.100	192.168.168.19	TCP	60	5000 → 50066 [ACK] Seq=2792 Ack=3363 Win=131072 Len=0
273	2021-12-13 20:29:18.295999	192.168.168.100	192.168.168.19	TCP	1078	5000 → 50066 [ACK] Seq=2792 Ack=3363 Win=131072 Len=1024 [TCP segment of a re
274	2021-12-13 20:29:18.296223	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
275	2021-12-13 20:29:18.317829	192.168.168.19	192.168.168.100	TCP	54	50066 → 5000 [ACK] Seq=3363 Ack=4250 Win=6739 Len=0
276	2021-12-13 20:29:18.317851	192.168.168.19	192.168.168.100	TLSv1.2	197	[TLS segment of a reassembled PDU]
277	2021-12-13 20:29:18.367757	192.168.168.100	192.168.168.19	TCP	60	5000 → 50066 [ACK] Seq=4250 Ack=3506 Win=130816 Len=0
278	2021-12-13 20:29:18.392820	192.168.168.100	192.168.168.19	HTTP/JSON	185	POST /v1.2/relinquishment HTTP/1.1 , JavaScript Object Notation (application/
279	2021-12-13 20:29:18.416534	192.168.168.100	192.168.168.19	TLSv1.2	211	[TLS segment of a reassembled PDU]
280	2021-12-13 20:29:18.416777	192.168.168.100	192.168.168.19	TLSv1.2	121	[TLS segment of a reassembled PDU]
281	2021-12-13 20:29:18.417498	192.168.168.100	192.168.168.19	TLSv1.2	120	[TLS segment of a reassembled PDU]
282	2021-12-13 20:29:18.418172	192.168.168.100	192.168.168.19	HTTP/JSON	250	HTTP/1.1 200 OK , JavaScript Object Notation (application/json)

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

DataAppMeas1\_LAN-DAU\_004.pcap    Packets: 476 · Displayed: 476 (100.0%)    Profile: Default

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

6.7.4.1.1	X	--	WINNF.FT.C.DRG.1	Successful Deregistration	Monitor RF transmission. Ensure: <ul style="list-style-type: none"> <li>• CBSD stops transmission at any time prior to sending the relinquishmentRequest message or deregistration Request message (whichever is sent first)</li> </ul>	P
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DataAppMeas1\_LAN-DAU\_006.pcap

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icmp or tls

No.	Time	Source	Destination	Protocol	Length	Info
276	2021-12-13 21:04:17.556634	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x0404, seq=42/10752, ttl=62 (re
280	2021-12-13 21:04:17.911597	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
281	2021-12-13 21:04:17.933857	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
282	2021-12-13 21:04:17.934103	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
288	2021-12-13 21:04:18.101783	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
289	2021-12-13 21:04:18.101805	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
292	2021-12-13 21:04:18.120140	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
294	2021-12-13 21:04:18.141569	192.168.168.19	192.168.168.100	TLSv1.2	197	Application Data
296	2021-12-13 21:04:18.201629	192.168.168.19	192.168.168.100	TLSv1.2	185	Application Data
298	2021-12-13 21:04:18.248170	192.168.168.100	192.168.168.19	TLSv1.2	211	Application Data, Application Data, Application Data
299	2021-12-13 21:04:18.248417	192.168.168.100	192.168.168.19	TLSv1.2	376	Application Data, Application Data, Application Data, Ap
313	2021-12-13 21:04:18.311565	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
315	2021-12-13 21:04:18.318655	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
316	2021-12-13 21:04:18.318902	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
322	2021-12-13 21:04:18.491620	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
323	2021-12-13 21:04:18.491639	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
326	2021-12-13 21:04:18.506190	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
328	2021-12-13 21:04:18.531598	192.168.168.19	192.168.168.100	TLSv1.2	196	Application Data
330	2021-12-13 21:04:18.591612	192.168.168.19	192.168.168.100	TLSv1.2	162	Application Data <b>EUT deregistration request</b>
332	2021-12-13 21:04:18.637026	192.168.168.100	192.168.168.19	TLSv1.2	161	Application Data, Application Data
333	2021-12-13 21:04:18.637252	192.168.168.100	192.168.168.19	TLSv1.2	171	Application Data, Application Data
334	2021-12-13 21:04:18.638534	192.168.168.100	192.168.168.19	TLSv1.2	120	Application Data

Frame 330: 162 bytes on wire (1296 bits), 162 bytes captured (1296 bits)

Ethernet II, Src: RohdeSch\_id:24:58 (00:90:b8:1d:24:58), Dst: HewlettP\_fd:42:87 (fc:3f:db:fd:42:87)

Internet Protocol Version 4, Src: 192.168.168.19 (192.168.168.19), Dst: 192.168.168.100 (192.168.168.100)

```


0000 7b 22 64 65 72 65 67 69 73 74 72 61 74 69 6f 6e {"deregistration
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 S57705SA
0030 52 48 4d 43 2d 31 4d 6f 63 6b 2d 53 41 53 4e 53 RHMC-1No ck-SASNS
0040 32 31 30 36 36 34 32 31 36 22 7d 20 5d 20 7d 21066421 6"} ] }

```

Frame (162 bytes)    Decrypted TLS (79 bytes)

DataAppMeas1\_LAN-DAU\_006.pcap    Packets: 463    Displayed: 233 (49.2%)    Profile: Default



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

DataAppMeas1\_LAN-DAU\_007.pcap

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icmp or tls

No.	Time	Source	Destination	Protocol	Length	Info
282	2021-12-14 01:51:39.764168	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x0405, seq=42/10752, ttl=62 (re
286	2021-12-14 01:51:39.929004	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello <i>Last customer data packet</i>
287	2021-12-14 01:51:39.933270	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
288	2021-12-14 01:51:39.933541	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
294	2021-12-14 01:51:40.119066	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
295	2021-12-14 01:51:40.123999	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
298	2021-12-14 01:51:40.130969	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
300	2021-12-14 01:51:40.154036	192.168.168.19	192.168.168.100	TLSv1.2	197	Application Data
302	2021-12-14 01:51:40.224038	192.168.168.19	192.168.168.100	TLSv1.2	185	Application Data
303	2021-12-14 01:51:40.264090	192.168.168.100	192.168.168.19	TLSv1.2	533	Application Data, Application Data, Application Data, Ap
312	2021-12-14 01:51:40.319047	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
313	2021-12-14 01:51:40.326644	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
314	2021-12-14 01:51:40.326890	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
320	2021-12-14 01:51:40.494102	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
321	2021-12-14 01:51:40.494120	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
324	2021-12-14 01:51:40.501313	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
326	2021-12-14 01:51:40.524060	192.168.168.19	192.168.168.100	TLSv1.2	196	Application Data
328	2021-12-14 01:51:40.589041	192.168.168.19	192.168.168.100	TLSv1.2	162	Application Data
329	2021-12-14 01:51:40.615864	192.168.168.100	192.168.168.19	TLSv1.2	466	Application Data, Application Data, Application Data, Ap
342	2021-12-14 01:51:40.674044	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
343	2021-12-14 01:51:40.681826	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
344	2021-12-14 01:51:40.682072	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done

Frame 329: 466 bytes on wire (3728 bits), 466 bytes captured (3728 bits)

Ethernet II, Src: HewlettP\_fd:42:87 (fc:3f:db:fd:42:87), Dst: RohdeSch\_id:24:58 (00:90:b8:1d:24:58)

Internet Protocol Version 4, Src: 192.168.168.100 (192.168.168.100), Dst: 192.168.168.19 (192.168.168.19)


```

0000 7b 22 64 65 72 65 67 69 73 74 72 61 74 69 6f 6e {"deregi stration
0010 52 65 73 70 6f 6e 73 65 22 3a 5b 7b 22 72 65 73 Response ":[{"res
0020 70 6f 6e 73 65 22 3a 7b 22 72 65 73 70 6f 6e 73 ponse":[{"respon
0030 65 43 6f 64 65 22 3a 31 30 32 7d 7d 5d 7d 0a ecode":1 02}}]}

```

bytes) Decrypted TLS (17 bytes) Decrypted TLS (32 bytes) Decrypted TLS (20 bytes) Decrypted TLS (38 bytes) Decrypted TLS (37 bytes) Decrypted TLS (2 bytes) Decrypted TLS (63 bytes)

DataAppMeas1\_LAN-DAU\_007.pcap Packets: 494 · Displayed: 224 (45.3%) Profile: Default

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


No.	Time	Source	Destination	Protocol	Length	Info
269	2021-12-14 02:51:38.048203	192.168.168.1	192.168.168.19	ICMP	98	Echo (ping) request id=0x040f, seq=40/10240, ttl=64 (reply in 270)
270	2021-12-14 02:51:38.064843	192.168.168.19	192.168.168.1	ICMP	98	Echo (ping) reply id=0x040f, seq=40/10240, ttl=62 (request in 269)
274	2021-12-14 02:51:38.324822	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
275	2021-12-14 02:51:38.335400	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
276	2021-12-14 02:51:38.335647	192.168.168.100	192.168.168.19	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
282	2021-12-14 02:51:38.504888	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
283	2021-12-14 02:51:38.504905	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
286	2021-12-14 02:51:38.515835	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
288	2021-12-14 02:51:38.539775	192.168.168.19	192.168.168.100	TLSv1.2	197	[TLS segment of a reassembled PDU]
290	2021-12-14 02:51:38.604791	192.168.168.19	192.168.168.100	HTTP/JSON	185	POST /v1.2/relinquishment HTTP/1.1 , JavaScript Object Notation (application/json)
291	2021-12-14 02:51:38.638684	192.168.168.100	192.168.168.19	TLSv1.2	161	[TLS segment of a reassembled PDU]
292	2021-12-14 02:51:38.638928	192.168.168.100	192.168.168.19	TLSv1.2	104	[TLS segment of a reassembled PDU]
293	2021-12-14 02:51:38.639798	192.168.168.100	192.168.168.19	TLSv1.2	121	[TLS segment of a reassembled PDU]
294	2021-12-14 02:51:38.640412	192.168.168.100	192.168.168.19	HTTP/JSON	309	HTTP/1.1 200 OK , JavaScript Object Notation (application/json)
298	2021-12-14 02:51:38.664804	192.168.168.19	192.168.168.100	TLSv1.2	85	Alert (Level: Warning, Description: Close Notify)
308	2021-12-14 02:51:38.709793	192.168.168.19	192.168.168.100	TLSv1.2	174	Client Hello
309	2021-12-14 02:51:38.714240	192.168.168.100	192.168.168.19	TLSv1.2	1078	Server Hello
310	2021-12-14 02:51:38.714479	192.168.168.19	192.168.168.100	TLSv1.2	1821	Certificate, Certificate Request, Server Hello Done
316	2021-12-14 02:51:38.894050	192.168.168.19	192.168.168.100	TLSv1.2	1078	Certificate, Client Key Exchange
317	2021-12-14 02:51:38.894072	192.168.168.19	192.168.168.100	TLSv1.2	224	Certificate Verify, Change Cipher Spec, Finished
320	2021-12-14 02:51:38.900768	192.168.168.100	192.168.168.19	TLSv1.2	488	New Session Ticket, Change Cipher Spec, Finished
322	2021-12-14 02:51:38.924819	192.168.168.19	192.168.168.100	TLSv1.2	196	[TLS segment of a reassembled PDU]
324	2021-12-14 02:51:38.994801	192.168.168.19	192.168.168.100	HTTP/JSON	162	POST /v1.2/deregistration HTTP/1.1 , JavaScript Object Notation (application/json)
325	2021-12-14 02:51:39.024809	192.168.168.100	192.168.168.19	TLSv1.2	210	[TLS segment of a reassembled PDU]
326	2021-12-14 02:51:39.025952	192.168.168.100	192.168.168.19	TLSv1.2	218	[TLS segment of a reassembled PDU]
327	2021-12-14 02:51:39.027097	192.168.168.100	192.168.168.19	HTTP/JSON	172	HTTP/1.1 200 OK , JavaScript Object Notation (application/json)

0000	7b 22 64 65 72 65 67 69 73 74 72 61 74 69 6f 6e	{ "deregistration
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 31 4d 6f 63 6b 2d 53 41 53 4e 53	RHMC-1Pb ck-SASNS
0040	32 31 30 36 36 34 32 31 36 22 7d 20 5d 20 7d	21066421 6"} ] }


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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


***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	<p>Power Spectral Density test case.</p> <p>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>	P
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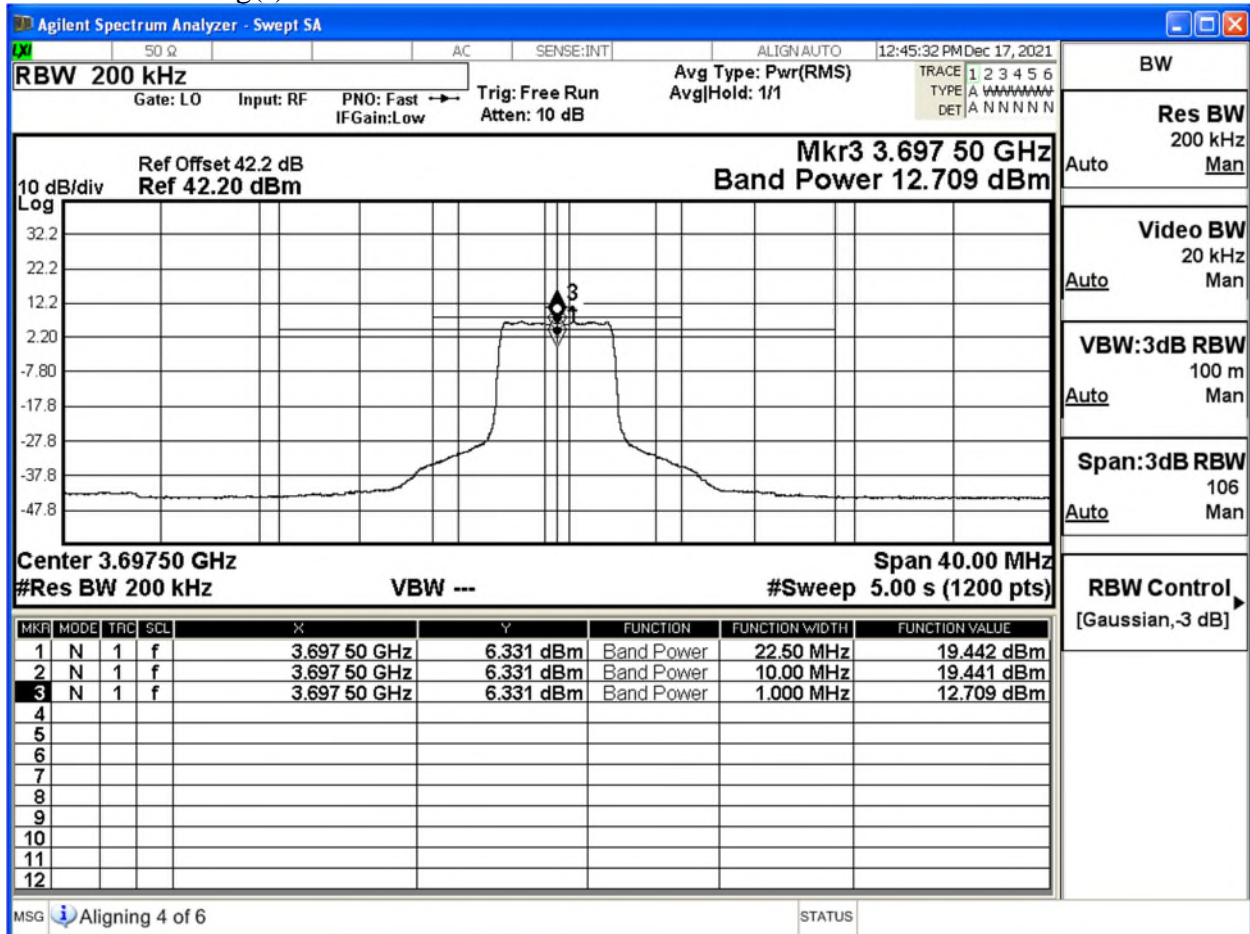
Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

## 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	12.5	19.3	42.2	19.7	26.5	7.2	0.3
3552.5	B	37	47	5	12.5	19.3	42.2	36.7	43.5	24.2	0.3
3555	A	20	30	10	9.5	19	42.2	16.7	26.2	7.2	3.3
3555	B	37	47	10	9.5	19	42.2	33.7	43.2	24.2	3.3
3557.5	A	20	30	15	7	16.6	42.2	14.2	23.8	7.2	5.8
3557.5	B	37	47	15	7	16.6	42.2	31.2	40.8	24.2	5.8
3560	A	20	30	20	7.2	16.5	42.2	14.4	23.7	7.2	5.6
3560	B	37	47	20	7.2	16.5	42.2	31.4	40.7	24.2	5.6
3625	A	20	30	5	12.6	19.5	42.2	19.8	26.7	7.2	0.2
3625	B	37	47	5	12.6	19.5	42.2	36.8	43.7	24.2	0.2
3625	A	20	30	10	9.7	19.7	42.2	16.9	26.9	7.2	3.1
3625	B	37	47	10	9.7	19.7	42.2	33.9	43.9	24.2	3.1
3625	A	20	30	15	7.9	17.7	42.2	15.1	24.9	7.2	4.9
3625	B	37	47	15	7.9	17.7	42.2	32.1	41.9	24.2	4.9
3625	A	20	30	20	6.7	16.2	42.2	13.9	23.4	7.2	6.1
3625	B	37	47	20	6.7	16.2	42.2	30.9	40.4	24.2	6.1
3697.5	A	20	30	5	12.7	19.4	42.2	19.9	26.6	7.2	0.1
3697.5	B	37	47	5	12.7	19.4	42.2	36.9	43.6	24.2	0.1
3695	A	20	30	10	9.4	18.7	42.2	16.6	25.9	7.2	3.4
3695	B	37	47	10	9.4	18.7	42.2	33.6	42.9	24.2	3.4
3692.5	A	20	30	15	7.5	16.9	42.2	14.7	24.1	7.2	5.3
3692.5	B	37	47	15	7.5	16.9	42.2	31.7	41.1	24.2	5.3
3690	A	20	30	20	6.2	15.4	42.2	13.4	22.6	7.2	6.6
3690	B	37	47	20	6.2	15.4	42.2	30.4	39.6	24.2	6.6

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

Worst case reading(s)





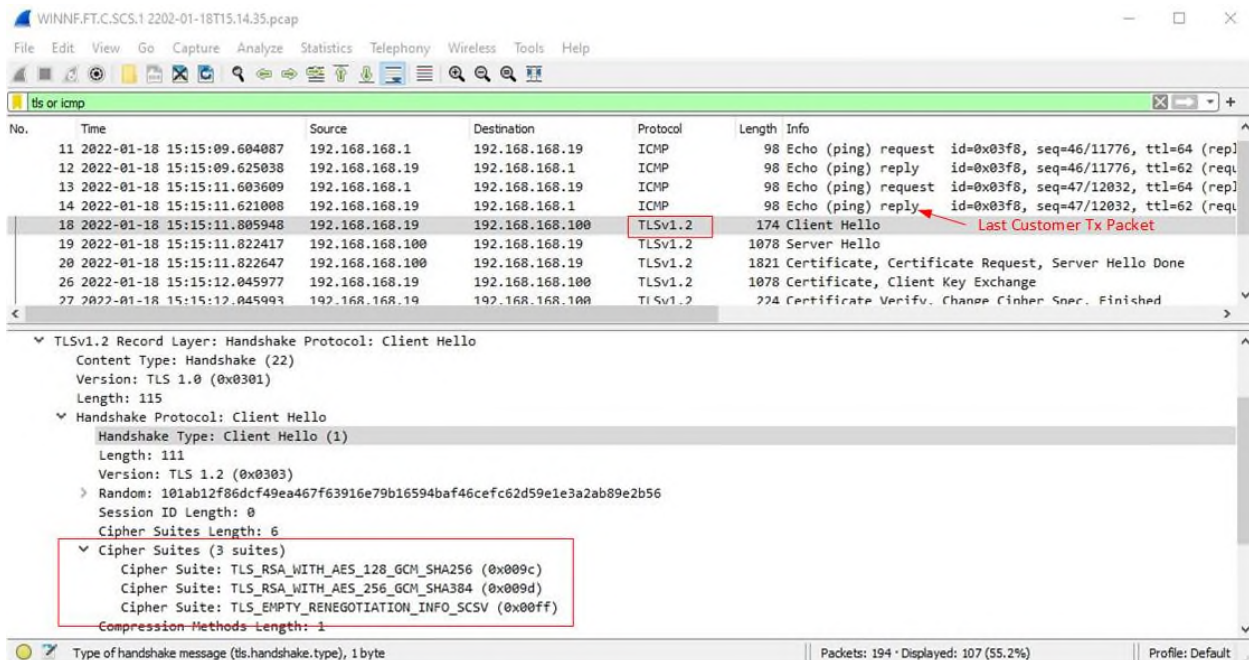
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## DOT CBRS Radio: WINNF / Security Test Case Analysis

### WINNF Security Test Case Analysis

#### WINNF.FT.C.SCS.1

#### Packet Capture Sequence



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

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tls or icmp

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 <span style="color: red;">Last Customer Tx Packet</span>
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 Verifv. 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: 101ab12f86dcf49ea46f63916e79b16594baf46cefc62d59e1e3a2ab89e2b56

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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

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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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

WINNF test requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.0 CBRS CBSD Test Specification:

2	<ul style="list-style-type: none"> <li>• Make sure that Mutual authentication happens between UUT and the SAS Test Harness.</li> <li>• Make sure that UUT uses TLS v1.2</li> <li>• Make sure that cipher suites from one of the following is selected, <ul style="list-style-type: none"> <li>• TLS_RSA_WITH_AES_128_GCM_SHA256</li> <li>• TLS_RSA_WITH_AES_256_GCM_SHA384</li> <li>• TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256</li> <li>• TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384</li> <li>• TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256</li> </ul> </li> </ul>	PASS
---	--	------

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## Analysis of WINNF Test Requirements

### 1. From Client Hello: TLS version = TLS 1.2

```

> Frame 658: 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: 55482, 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: 5d6e73aaa319bed5672f75f9f4ac9b12db5d59130b44f1cc...
    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. Cipher suite list from Client Hello 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. Cipher suite chosen (from Server Hello):

TLS\_RSA\_WITH\_AES\_128\_GCM\_SHA256

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


```

> Frame 660: 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: 55482, 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: 5d6e73b5267853f94c269c3818f0a575ac5d562d15e544eb...
      Session ID Length: 32
      Session ID: 22698059d7a584ee0cd7b1905af413c1fa4241c12a49862c...
      Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
      Compression Method: null (0)
      Extensions Length: 5
      > Extension: renegotiation_info (len=1)

```

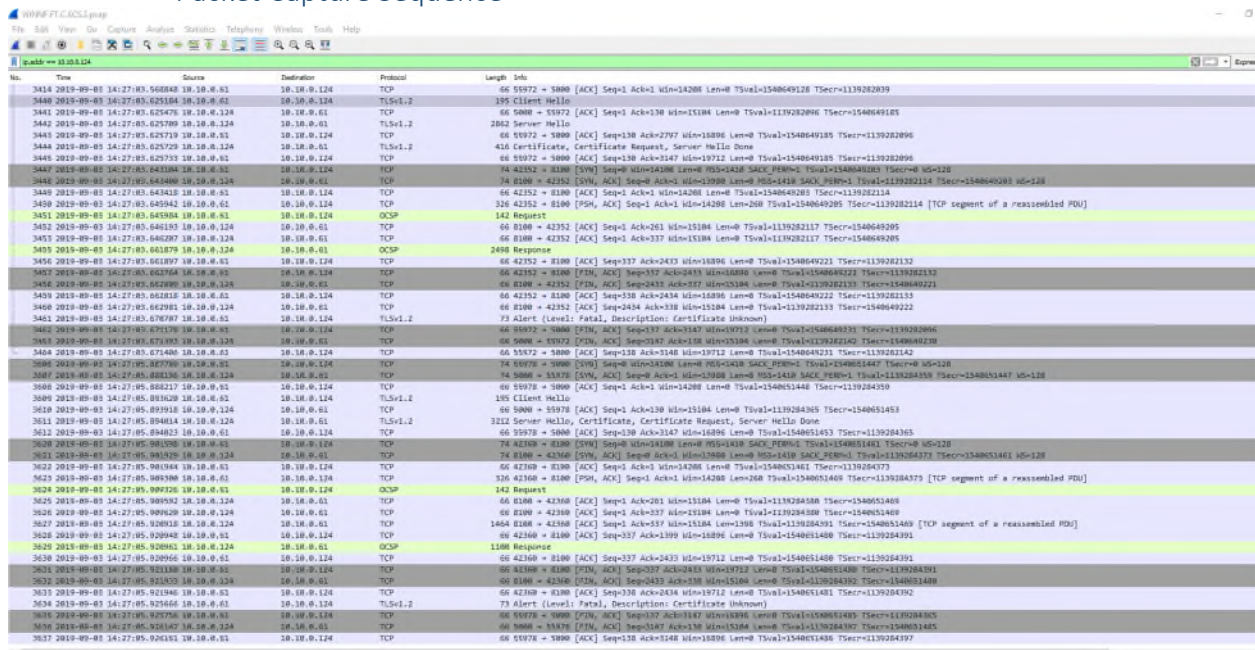
4. The Registration request message arrived at the Test Harness, so authentication was completed.



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## WINNF.FT.C.SCS.2

### Packet Capture Sequence



The screenshot shows a Wireshark packet capture of a TLS handshake. The 'Packet Details' pane on the right highlights the 'TLSv1.2' protocol. The 'Packet Bytes' pane shows the raw data of the selected packet. The 'Packet List' pane shows a list of captured packets, with the selected packet highlighted in blue.


### WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.0 CBRS CBSB Test Specification:

2	<ul style="list-style-type: none"> <li>Make sure that UUT uses TLS v1.2 for security establishment.</li> <li>Make sure UUT selects the correct cipher suite.</li> <li>UUT shall use CRL or OCSP to verify the validity of the server certificate.</li> <li>Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.</li> </ul>	PASS
---	--	------

### Analysis of WINNF Test Requirements

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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)

```

- 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

- From Server Hello, cipher suite chosen:  
 TLS\_RSA\_WITH\_AES\_128\_GCM\_SHA256

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) 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)

```

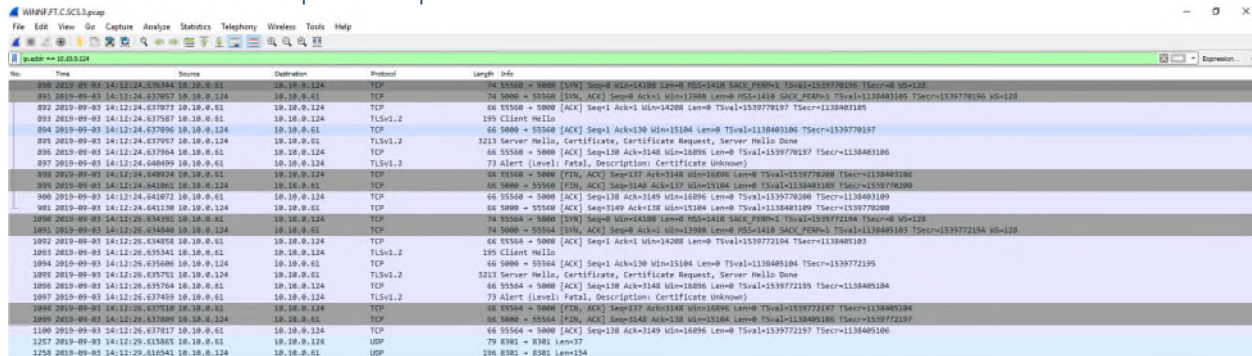
##### 6. Registration request message is not received at Test Harness (authentication fails)



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## WINNF.FT.C.SCS.3

### Packet Capture Sequence



No.	Time	Source	Destination	Protocol	Length	Info
890	2019-09-03 14:12:24.635344	10.10.0.1	10.10.0.124	TCP	74	55508 → 50000 [FIN] Seq=8 Wm=14208 Len=0 MSG=0000 SACK_PERM=1 TSval=1539770197 TSecr=0 Wm=128
891	2019-09-03 14:12:24.637057	10.10.0.124	10.10.0.1	TCP	74	50000 → 55508 [RST, ACK] Seq=8 Sck=0 Wm=13808 Len=0 MSG=1418 SACK_PERM=0 TSval=1138405185 TSecr=1539770196 Wm=128
892	2019-09-03 14:12:24.637857	10.10.0.1	10.10.0.124	TCP	66	55508 → 50000 [ACK] Seq=1 Ack=1 Wm=14208 Len=0 TSval=1539770197 TSecr=1138405185
893	2019-09-03 14:12:24.637857	10.10.0.1	10.10.0.124	TLSv1.2	195	Client Hello
894	2019-09-03 14:12:24.637896	10.10.0.124	10.10.0.1	TCP	66	50000 → 55508 [ACK] Seq=1 Ack=130 Wm=15184 Len=0 TSval=1138405186 TSecr=1539770197
895	2019-09-03 14:12:24.637907	10.10.0.124	10.10.0.1	TLSv1.2	3213	Server Hello, Certificate, Certificate Request, Server Hello Done
896	2019-09-03 14:12:24.637964	10.10.0.1	10.10.0.124	TCP	66	55508 → 50000 [ACK] Seq=130 Ack=3148 Wm=18096 Len=0 TSval=1539770197 TSecr=1138405186
897	2019-09-03 14:12:24.640499	10.10.0.1	10.10.0.124	TLSv1.2	73	Alert (Level: Fatal, Description: Certificate Unknown)
898	2019-09-03 14:12:24.640924	10.10.0.124	10.10.0.1	TCP	66	55508 → 50000 [FIN, ACK] Seq=137 Ack=3148 Wm=18096 Len=0 TSval=1539770200 TSecr=1138405186
899	2019-09-03 14:12:24.641061	10.10.0.1	10.10.0.124	TCP	66	50000 → 55508 [FIN, ACK] Seq=138 Ack=157 Wm=15184 Len=0 TSval=1138405189 TSecr=1539770200
900	2019-09-03 14:12:24.641071	10.10.0.1	10.10.0.124	TCP	66	55508 → 50000 [ACK] Seq=138 Ack=3148 Wm=18096 Len=0 TSval=1539770200 TSecr=1138405189
901	2019-09-03 14:12:24.641130	10.10.0.124	10.10.0.1	TCP	66	50000 → 55508 [ACK] Seq=139 Ack=158 Wm=15184 Len=0 TSval=1138405189 TSecr=1539770200
1000	2019-09-03 14:12:24.654400	10.10.0.124	10.10.0.1	TCP	66	55508 → 50000 [FIN] Seq=139 Ack=158 Wm=15184 Len=0 TSval=1138405193 TSecr=1539772194 Wm=128
1095	2019-09-03 14:12:24.673458	10.10.0.124	10.10.0.1	TCP	74	50000 → 55508 [FIN, ACK] Seq=8 Ack=1 Wm=13808 Len=0 MSG=1418 SACK_PERM=0 TSval=1138405185 TSecr=1539772194 Wm=128
1092	2019-09-03 14:12:24.674054	10.10.0.1	10.10.0.124	TCP	66	55508 → 50000 [ACK] Seq=1 Ack=1 Wm=14208 Len=0 TSval=1539772194 TSecr=1138405183
1093	2019-09-03 14:12:24.674054	10.10.0.1	10.10.0.124	TLSv1.2	195	Client Hello
1094	2019-09-03 14:12:24.675000	10.10.0.124	10.10.0.1	TCP	66	50000 → 55508 [ACK] Seq=1 Ack=130 Wm=15184 Len=0 TSval=1138405184 TSecr=1539772195
1095	2019-09-03 14:12:24.675761	10.10.0.124	10.10.0.1	TLSv1.2	3213	Server Hello, Certificate, Certificate Request, Server Hello Done
1096	2019-09-03 14:12:24.675761	10.10.0.124	10.10.0.1	TCP	66	55508 → 50000 [ACK] Seq=138 Ack=3148 Wm=18096 Len=0 TSval=1539772195 TSecr=1138405184
1097	2019-09-03 14:12:24.675769	10.10.0.1	10.10.0.124	TLSv1.2	73	Alert (Level: Fatal, Description: Certificate Unknown)
1098	2019-09-03 14:12:24.677910	10.10.0.124	10.10.0.1	TCP	66	55508 → 50000 [FIN, ACK] Seq=137 Ack=3148 Wm=18096 Len=0 TSval=1539772197 TSecr=1138405184
1099	2019-09-03 14:12:24.677908	10.10.0.124	10.10.0.1	TCP	66	50000 → 55508 [FIN, ACK] Seq=138 Ack=158 Wm=15184 Len=0 TSval=1138405186 TSecr=1539772197
1100	2019-09-03 14:12:24.677917	10.10.0.1	10.10.0.124	TCP	66	55508 → 50000 [ACK] Seq=138 Ack=3148 Wm=18096 Len=0 TSval=1539772197 TSecr=1138405186
1257	2019-09-03 14:12:29.615801	10.10.0.1	10.10.0.124	UDP	79	8381 → 8381 Len=37
1258	2019-09-03 14:12:29.615941	10.10.0.124	10.10.0.1	UDP	196	8381 → 8381 Len=154


### WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.0 CBRS CBSD Test Specification:

2	<ul style="list-style-type: none"> <li>Make sure that UUT uses TLS v1.2 for security establishment.</li> <li>Make sure UUT selects the correct cipher suite.</li> <li>UUT shall use CRL or OCSP to verify the validity of the server certificate.</li> <li>Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.</li> </ul>	PASS
---	--	------

### Analysis of WINNF Test Requirements

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```


> Frame 893: 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: 55560, 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: 5d6e74c8e3b9907c8bf1d8d3b2e41de44ff3d4d88a2df236...
      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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 895: 3213 bytes on wire (25704 bits), 3213 bytes captured (25704 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: 55560, Seq: 1, Ack: 130, Len: 3147
▼ 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: 5d6e74d363b38c017e0456ec16e593567a70151d81f72696...
      Session ID Length: 32
      Session ID: 9736c983db797e9cedf3a8d3ff5cde8d50f9f0d983a75c99...
      Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
      Compression Method: null (0)
      Extensions Length: 5
      > Extension: renegotiation_info (len=1)
    > TLSv1.2 Record Layer: Handshake Protocol: Certificate
    > TLSv1.2 Record Layer: Handshake Protocol: Multiple Handshake Messages

```


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

```

> Frame 897: 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: 55560, Dst Port: 5000, Seq: 130, Ack: 3148, 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)

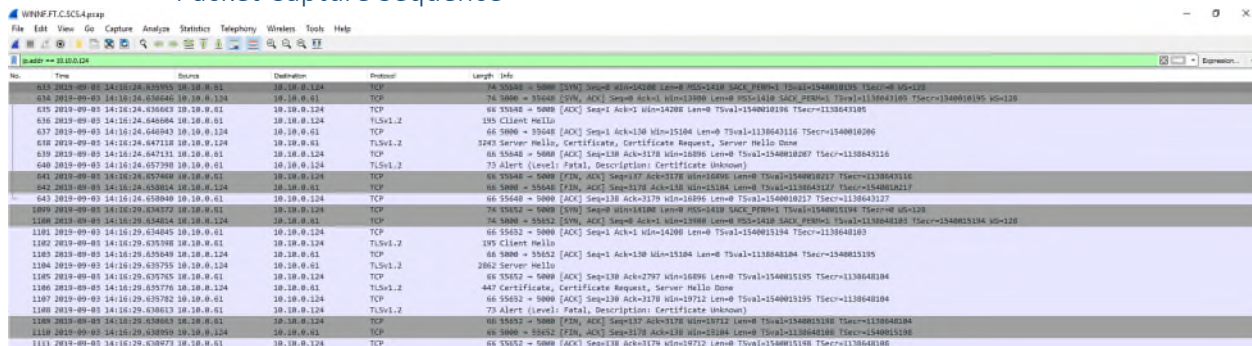
```

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## WINNF.FT.C.SCS.4

### Packet Capture Sequence



No.	Time	Source	Destination	Protocol	Length	Info
613	2019-09-03 14:16:24.635955	10.10.0.1	10.10.0.124	TCP	74	55648 → 5000 [FIN] Seq=8 Win=14208 Len=0 MSS=65535 SACK_PERM=1 TSval=1340010135 TSecr=0 Win=0
614	2019-09-03 14:16:24.636046	10.10.0.124	10.10.0.1	TCP	74	5000 → 55648 [RST] Seq=888888888 Win=0 Len=0 MSS=65535 SACK_PERM=1 TSval=1340010135 TSecr=1340010135 Win=0
615	2019-09-03 14:16:24.636663	10.10.0.1	10.10.0.124	TCP	66	55648 → 5000 [ACK] Seq=1 Ack=3 Win=14208 Len=0 TSval=1340010135 TSecr=133643127
616	2019-09-03 14:16:24.640684	10.10.0.1	10.10.0.124	TLSv1.2	195	Client Hello
617	2019-09-03 14:16:24.640943	10.10.0.124	10.10.0.1	TCP	66	5000 → 55648 [ACK] Seq=1 Ack=138 Win=15184 Len=0 TSval=133643116 TSecr=1340010206
618	2019-09-03 14:16:24.647218	10.10.0.1	10.10.0.124	TLSv1.2	3263	Server Hello, Certificate, Certificate Request, Server Hello Done
619	2019-09-03 14:16:24.647131	10.10.0.1	10.10.0.124	TCP	66	55648 → 5000 [ACK] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010207 TSecr=133643116
640	2019-09-03 14:16:24.657790	10.10.0.1	10.10.0.124	TLSv1.2	75	Alert (level: Fatal, Description: Certificate Unknown)
642	2019-09-03 14:16:24.657940	10.10.0.1	10.10.0.124	TCP	66	55648 → 5000 [RST] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010217 TSecr=133643116
643	2019-09-03 14:16:24.658014	10.10.0.1	10.10.0.124	TCP	66	5000 → 55648 [FIN, ACK] Seq=1178 Ack=138 Win=15184 Len=0 TSval=133643127 TSecr=1340010217
643	2019-09-03 14:16:24.658040	10.10.0.1	10.10.0.124	TCP	66	55648 → 5000 [ACK] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010217 TSecr=133643127
1009	2019-09-03 14:16:29.638772	10.10.0.1	10.10.0.124	TCP	74	55632 → 5000 [RST] Seq=888888888 Win=0 Len=0 MSS=65535 SACK_PERM=1 TSval=1340010104 TSecr=0 Win=0
1100	2019-09-03 14:16:29.634214	10.10.0.124	10.10.0.1	TCP	74	5000 → 55632 [RST] Seq=888888888 Win=0 Len=0 MSS=65535 SACK_PERM=1 TSval=133643123 TSecr=1340010104 Win=0
1101	2019-09-03 14:16:29.634045	10.10.0.1	10.10.0.124	TCP	66	55632 → 5000 [ACK] Seq=1 Ack=1 Win=14208 Len=0 TSval=1340010104 TSecr=133643103
1102	2019-09-03 14:16:29.635308	10.10.0.1	10.10.0.124	TLSv1.2	195	Client Hello
1103	2019-09-03 14:16:29.635040	10.10.0.124	10.10.0.1	TCP	66	5000 → 55632 [ACK] Seq=1 Ack=138 Win=15184 Len=0 TSval=133643104 TSecr=1340010103
1104	2019-09-03 14:16:29.635755	10.10.0.124	10.10.0.1	TLSv1.2	2862	Server Hello
1105	2019-09-03 14:16:29.635765	10.10.0.1	10.10.0.124	TCP	66	55632 → 5000 [ACK] Seq=138 Ack=2797 Win=16896 Len=0 TSval=1340010105 TSecr=133643104
1106	2019-09-03 14:16:29.635776	10.10.0.124	10.10.0.1	TLSv1.2	447	Certificate, Certificate Request, Server Hello Done
1107	2019-09-03 14:16:29.635782	10.10.0.1	10.10.0.124	TCP	66	55632 → 5000 [ACK] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010105 TSecr=133643104
1108	2019-09-03 14:16:29.638813	10.10.0.1	10.10.0.124	TLSv1.2	75	Alert (level: Fatal, Description: Certificate Unknown)
1109	2019-09-03 14:16:29.638905	10.10.0.124	10.10.0.1	TCP	66	55632 → 5000 [RST] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010106 TSecr=133643104
1110	2019-09-03 14:16:29.638959	10.10.0.124	10.10.0.1	TCP	66	5000 → 55632 [FIN, ACK] Seq=1178 Ack=138 Win=15184 Len=0 TSval=133643106 TSecr=1340010106
1111	2019-09-03 14:16:29.638973	10.10.0.1	10.10.0.124	TCP	66	55632 → 5000 [ACK] Seq=138 Ack=1178 Win=18896 Len=0 TSval=1340010106 TSecr=133643106

### WINNF Test Requirements:


WINNF test requirements from WINNF-TS-0122-V1.0.0 CBRS CBSD Test Specification:

2	<ul style="list-style-type: none"> <li>Make sure that UUT uses TLS v1.2 for security establishment.</li> <li>Make sure UUT selects the correct cipher suite.</li> <li>UUT shall use CRL or OCSP to verify the validity of the server certificate</li> <li>Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.</li> </ul>	PASS

### Analysis of WINNF Test Requirements

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



Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```


> Frame 636: 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: 55648, 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: 5d6e75b8e4794caba494c3d4e26398551122b1995d332a19...
      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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 638: 3243 bytes on wire (25944 bits), 3243 bytes captured (25944 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: 55648, Seq: 1, Ack: 130, Len: 3177
✓ 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: 5d6e75c348790b56a8a2b2e56c0448af8a18c8b5f0ca8790...
      Session ID Length: 32
      Session ID: 51f334de8b50d6a093491444515eaa5feb9995af54e66e30...
      Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
      Compression Method: null (0)
      Extensions Length: 5
      > Extension: renegotiation_info (len=1)
    > TLSv1.2 Record Layer: Handshake Protocol: Certificate
    > TLSv1.2 Record Layer: Handshake Protocol: Multiple Handshake Messages

```


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

```

> Frame 640: 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: 55648, Dst Port: 5000, Seq: 130, Ack: 3178, 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)

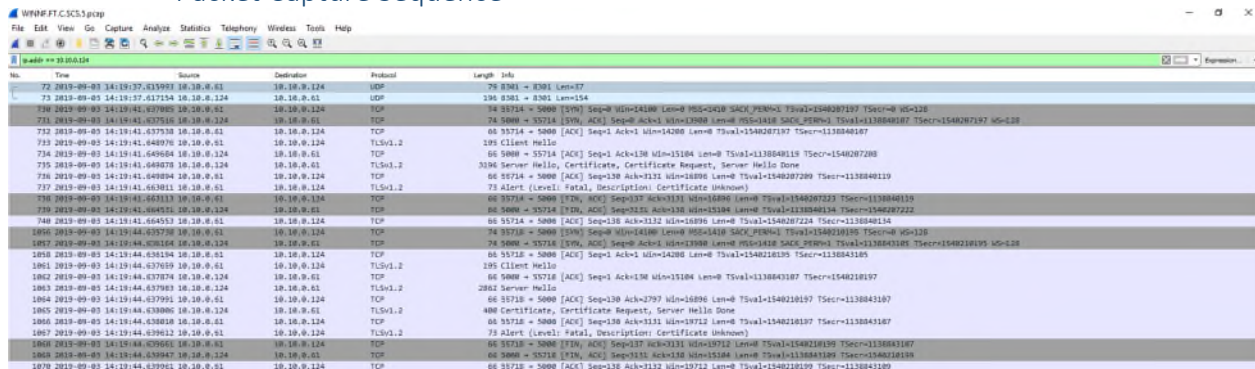
```

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## WINNF.FT.C.SCS.5

### Packet Capture Sequence



No.	Time	Source	Destination	Protocol	Length	Info
72	2019-09-03 14:19:37.615993	10.10.0.1	10.10.0.124	UDP	78	8301 → 8301 Len=57
73	2019-09-03 14:19:37.617154	10.10.0.124	10.10.0.1	UDP	190	8301 → 8301 Len=154
74	2019-09-03 14:19:37.617965	10.10.0.124	10.10.0.1	TCP	74	83716 → 5000 [RST] Seq=0 Win=14180 Len=0 RST=0 SACK_PERM=1 TSval=1540207219 TSecr=0 WS=128
75	2019-09-03 14:19:41.637510	10.10.0.124	10.10.0.1	TCP	74	5000 → 53716 [SYN, ACK] Seq=0 Ack=1 Win=32768 Len=0 MSS=1418 SACK_PERM=1 TSval=1138840187 TSecr=1540207219 WS=128
76	2019-09-03 14:19:41.637510	10.10.0.1	10.10.0.124	TCP	60	53716 → 5000 [ACK] Seq=1 Ack=1 Win=14200 Len=0 TSval=1540207197 TSecr=1138840187
77	2019-09-03 14:19:41.640970	10.10.0.1	10.10.0.124	TLSv1.2	195	Client Hello
78	2019-09-03 14:19:41.640970	10.10.0.124	10.10.0.1	TCP	66	5000 → 53716 [ACK] Seq=1 Ack=138 Win=35104 Len=0 TSval=1138840119 TSecr=1540207208
79	2019-09-03 14:19:41.640970	10.10.0.124	10.10.0.1	TLSv1.2	3196	Server Hello, Certificate, Certificate Request, Server Hello Done
80	2019-09-03 14:19:41.640970	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [ACK] Seq=138 Ack=131 Win=16896 Len=0 TSval=1540207209 TSecr=1138840119
81	2019-09-03 14:19:41.640970	10.10.0.124	10.10.0.1	TLSv1.2	73	Alert (Level: Fatal, Description: Certificate unknown)
82	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [RST, ACK] Seq=137 Ack=131 Win=16896 Len=0 TSval=1540207213 TSecr=1138840119
83	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	5000 → 53716 [RST, ACK] Seq=138 Ack=131 Win=16896 Len=0 TSval=1540207213 TSecr=1540207213
84	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [ACK] Seq=138 Ack=131 Win=16896 Len=0 TSval=1540207213 TSecr=1138840119
85	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	74	53716 → 5000 [RST, ACK] Seq=0 Win=14180 Len=0 RST=0 SACK_PERM=1 TSval=1540207213 TSecr=0 WS=128
86	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	74	5000 → 53716 [SYN, ACK] Seq=0 Ack=1 Win=32768 Len=0 MSS=1418 SACK_PERM=1 TSval=1138840187 TSecr=1540207213 WS=128
87	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	60	53716 → 5000 [ACK] Seq=1 Ack=1 Win=14200 Len=0 TSval=1540207213 TSecr=1138840187
88	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TLSv1.2	195	Client Hello
89	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	5000 → 53716 [ACK] Seq=1 Ack=138 Win=35104 Len=0 TSval=1138840187 TSecr=1540207213
90	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TLSv1.2	2862	Server Hello
91	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [ACK] Seq=138 Ack=137 Win=16896 Len=0 TSval=1540207213 TSecr=1138840187
92	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TLSv1.2	408	Certificate, Certificate Request, Server Hello Done
93	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [ACK] Seq=138 Ack=131 Win=16896 Len=0 TSval=1540207213 TSecr=1138840187
94	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TLSv1.2	73	Alert (Level: Fatal, Description: Certificate unknown)
95	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	53716 → 5000 [RST, ACK] Seq=137 Ack=131 Win=16896 Len=0 TSval=1540207213 TSecr=1138840187
96	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	66	5000 → 53716 [SYN, ACK] Seq=0 Ack=1 Win=32768 Len=0 MSS=1418 SACK_PERM=1 TSval=1138840187 TSecr=1540207213 WS=128
97	2019-09-03 14:19:41.643113	10.10.0.124	10.10.0.1	TCP	60	53716 → 5000 [ACK] Seq=1 Ack=1 Win=14200 Len=0 TSval=1540207213 TSecr=1138840187


### WINNF Test Requirements:

WINNF test requirements from WINNF-TS-0122-V1.0.0 CBRS CBSD Test Specification:

2	<ul style="list-style-type: none"> <li>Make sure that UUT uses TLS v1.2 for security establishment.</li> <li>Make sure UUT selects the correct cipher suite.</li> <li>UUT shall use CRL or OCSP to verify the validity of the server certificate.</li> <li>Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.</li> </ul>	PASS
---	--	------

### Analysis of WINNF Test Requirements

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

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 733: 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: 55714, 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: 5d6e767d62c21254967019646a3fc8da4d00c8eca5e78cc9...
      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 LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

```

> Frame 735: 3196 bytes on wire (25568 bits), 3196 bytes captured (25568 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: 55714, Seq: 1, Ack: 130, Len: 3130
✓ 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: 5d6e768814d017b54b1c55f0176bf996f1b41c32231ba2fd...
      Session ID Length: 32
      Session ID: fb8025d3eec7ffc9f97f61f574942c6276f822812fac30f4...
      Cipher Suite: TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
      Compression Method: null (0)
      Extensions Length: 5
      > Extension: renegotiation_info (len=1)
    > TLSv1.2 Record Layer: Handshake Protocol: Certificate
    > TLSv1.2 Record Layer: Handshake Protocol: Multiple Handshake Messages

```


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

```

> Frame 737: 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: 55714, Dst Port: 5000, Seq: 130, Ack: 3131, 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)


```

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


Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## Test Equipment

Instrument	Manufacturer	Type No.	Serial No	Calibration Period (months)	Calibration Due
Power Supply	Xantrex	XKW 60-50	E00109863	O/P Mon	-
Signal Analyzer	Agilent	MXA	SSG013930	12 months	2020-01-15
Attenuator	Pasternack	PE7004-10	N/S	O/P Mon	-
Switching Control Unit	Hewlett Packard	11713A	3748A060876	O/P Mon	-
RF Switch Unit	Burnsco	RARFSW 4x1	001	O/P Mon	-
Power Supply	Leader	730-3D	9801135	O/P Mon	-

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## Appendix A – EUT & Client Provided Details

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

#### General EUT Description

Manufacturer	Ericsson
Address	Torshamnsgatan 23 Kista SE-16480 Stockholm Sweden
Product Name	Radio 6488 B48
Product Number	3HE12472AA (with un-secuity software and RDNB board for testing purpose). 3HE12472AA1 (with secuity software and RDNB board for testing purpose). KRD 901 160/1 (with un-secuity software and antenna). KRD 901 160/11 (with secuity software and antenna).
Serial Number(s)	D829153166
Software Version	CXP 901 3268/15_R79GC
Hardware Version	R1A
Test Specification/Issue/Date	FCC CFR 47 Part 96: 2018


Note: For the testing performed in Dec 2019, the following EUT details were additionally recorded:

Node HW:

AAS-1 fru\_2048 AIR6488B48 1 OFF ON OFF N/A KRD901160/2 R1A  
D829153166 20190628 4 (OK) 62.0 0.08

ENM/DC Version:


ENM 19.12 (ISO Version: 1.79.131) AOM 901 151 R1CX/2

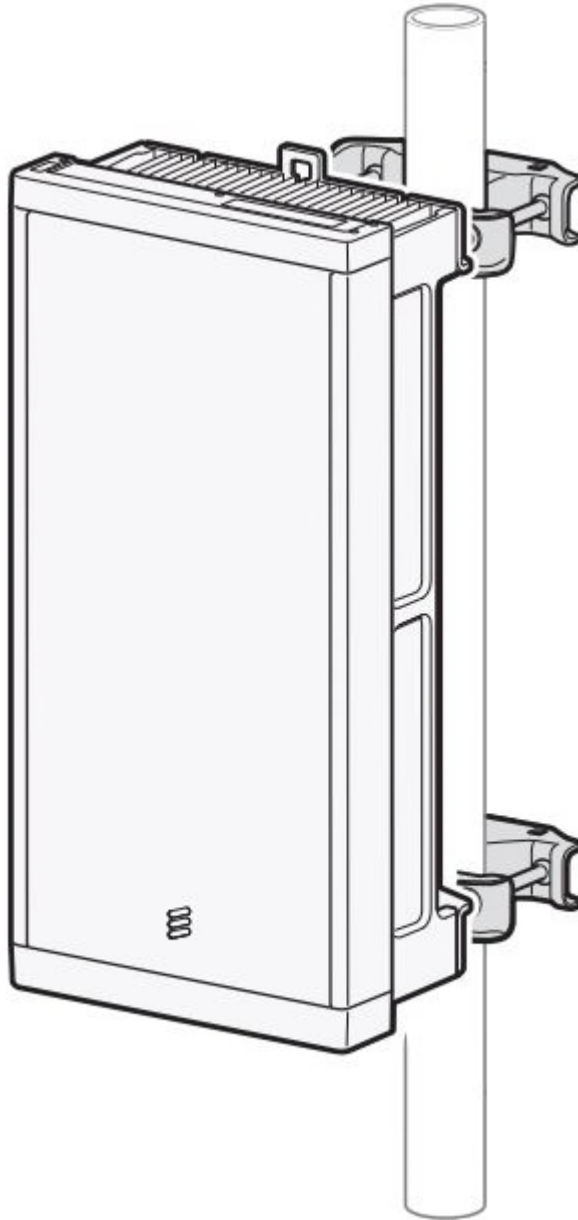
Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

### Technical Description

The Equipment Under Test (EUT) Radio 6488 B48 KRD 901 160 is an NokiaAB Radio Unit working in the public mobile service (3550-3700 MHz) band which provides communication connections to 3550-3700 MHz network. The Radio 6488 B48 KRD 901 160 operates from a - 48V DC or a 120V AC 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.

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	




#### EUT Configuration


Please see Appendix B for close up pictures of the unit as configured during testing

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

Domain Proxy Software Version: = 1.36.1 (ENM version ENM 19.14)

Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


## Appendix B – EUT, Peripherals, and Test Setup Photos

Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


Test setup

<Photos kept on file>



Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

## Appendix C – Additional Test Information


Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

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

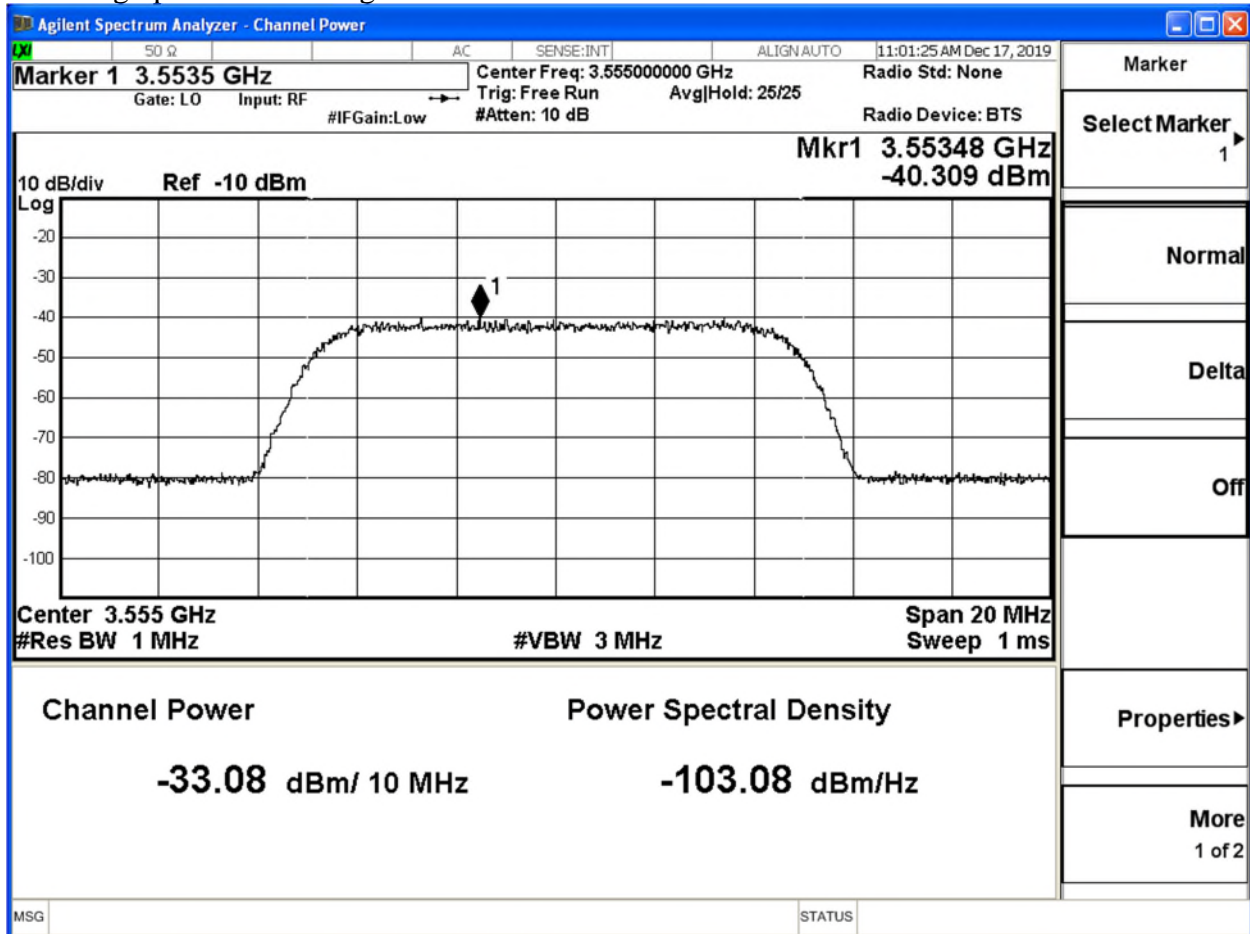
7.1.4.1.1	X	X	WINNF.PT.C.H BT	UUT RF Transmit Power Measurement	Power Spectral Density test case.  Assume we use 1 carrier bandwidth (say, 5 or 10 MHz), one frequency (say middle channel in band) for test. Measure at max transmit power, and reduce in steps of 3 dB to minimum declared transmit power.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

		Raw	Raw	Extern al	Conduct ed				EIRP 1MHz	EIRP 10 MHz	marg in
Freq	1MHz EIRP limit (target) dBm	10 MHz	1MHz	Losses (dB)	dBm/M Hz	antenna gain dBi	po rts	port gain (dB)	dBm/M Hz	dBm	dB
3555- High	37	-33.08	-40.31	41.93	1.62	17.00	64	18.06	36.68	43.91	0.32
3630- high	37	-33.01	-41.85	42.26	0.41	17.00	64	18.06	35.47	44.31	1.53
3695- high	37	-32.74	-40.82	42.33	1.51	17.00	64	18.06	36.57	44.65	0.43
3555- High	37	-27.94	-35.54	41.93	6.39	11.00	64	18.06	35.45	43.05	1.55
3630- high	37	-27.11	-34.76	42.26	7.50	11.00	64	18.06	36.56	44.21	0.44
3695- high	37	-27.48	-35.93	42.33	6.40	11.00	64	18.06	35.46	43.91	1.54

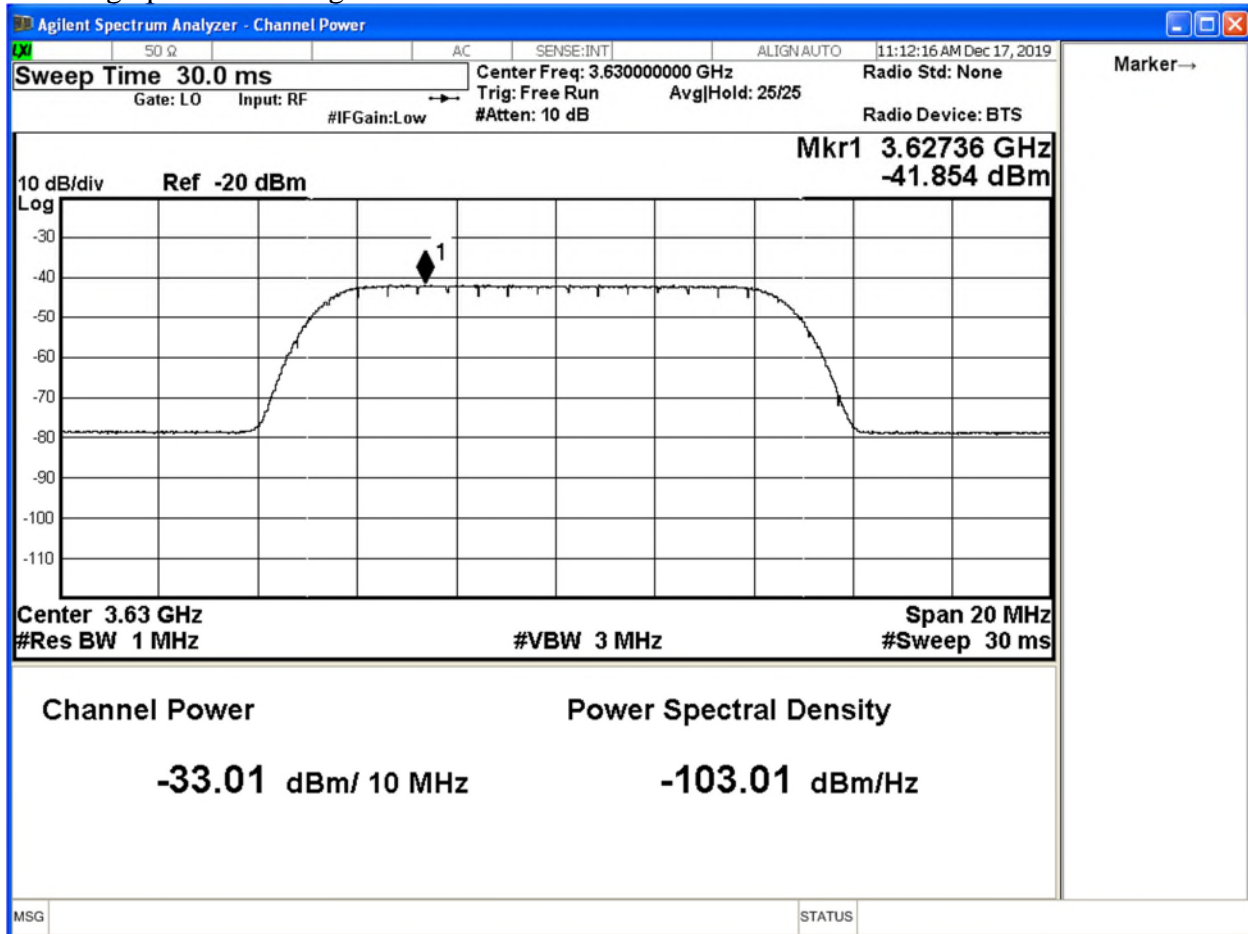
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


3555-High power – 17 dBi gain



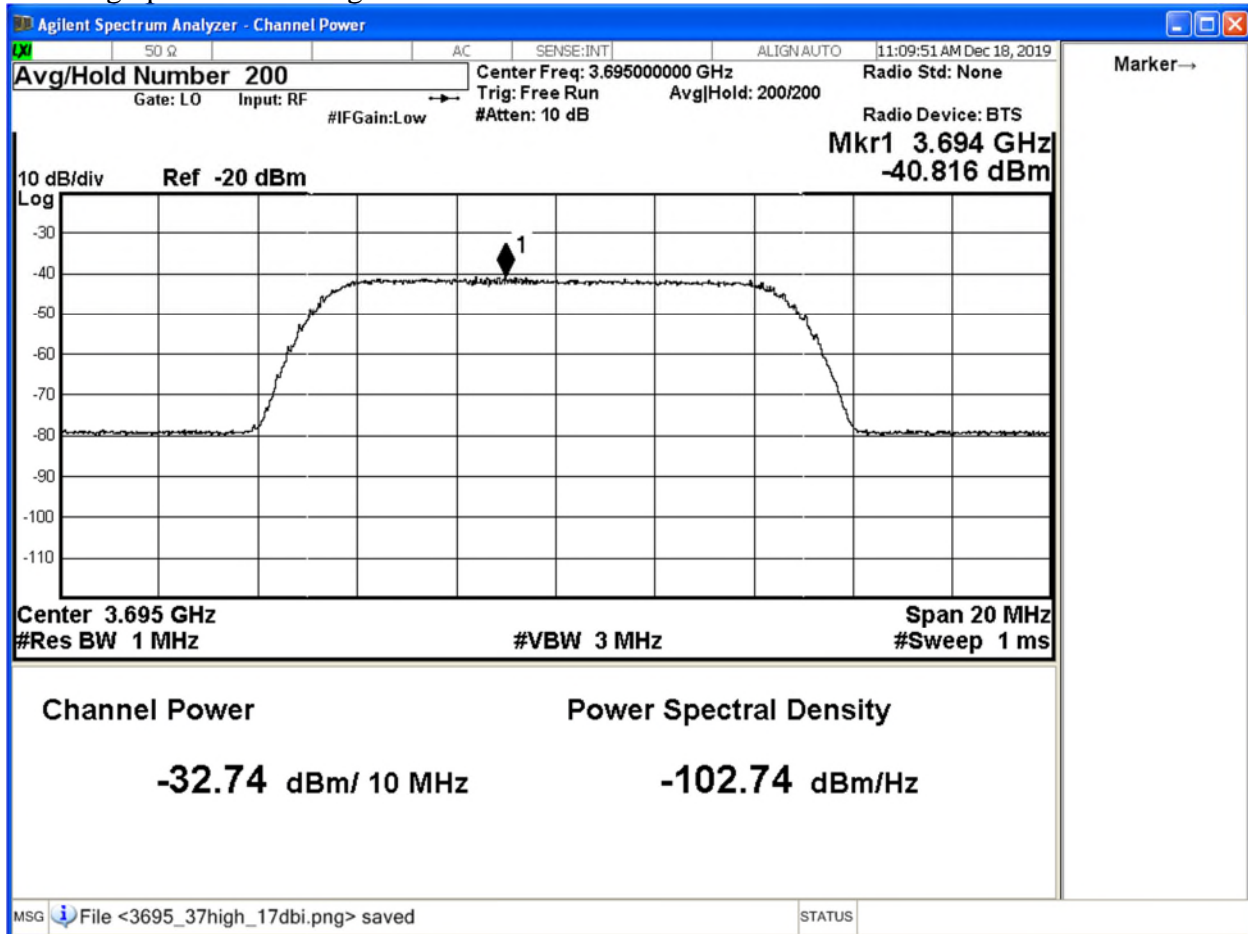
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


3630-high power 17 dBi gain



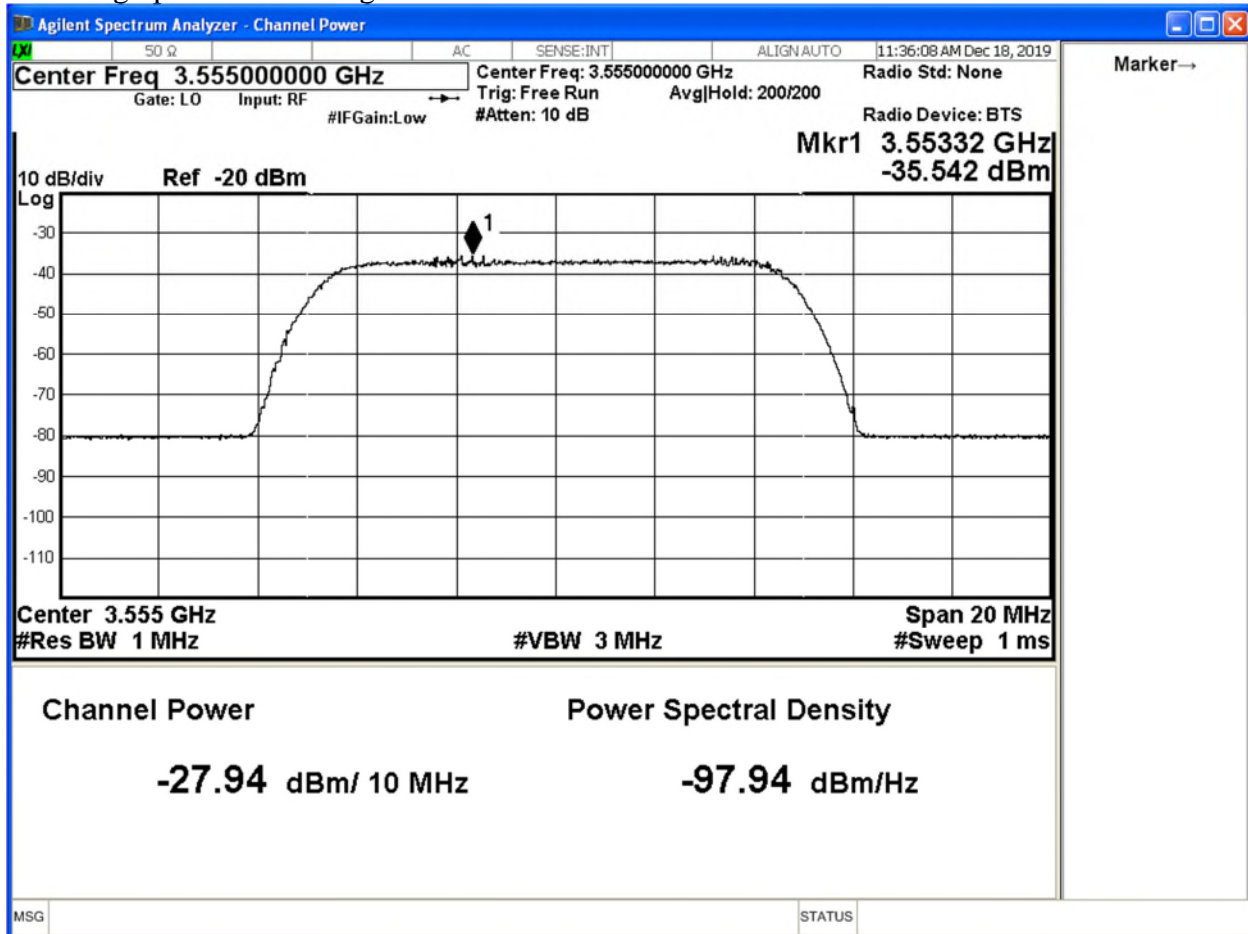
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


3695-high power – 17 dbi gain



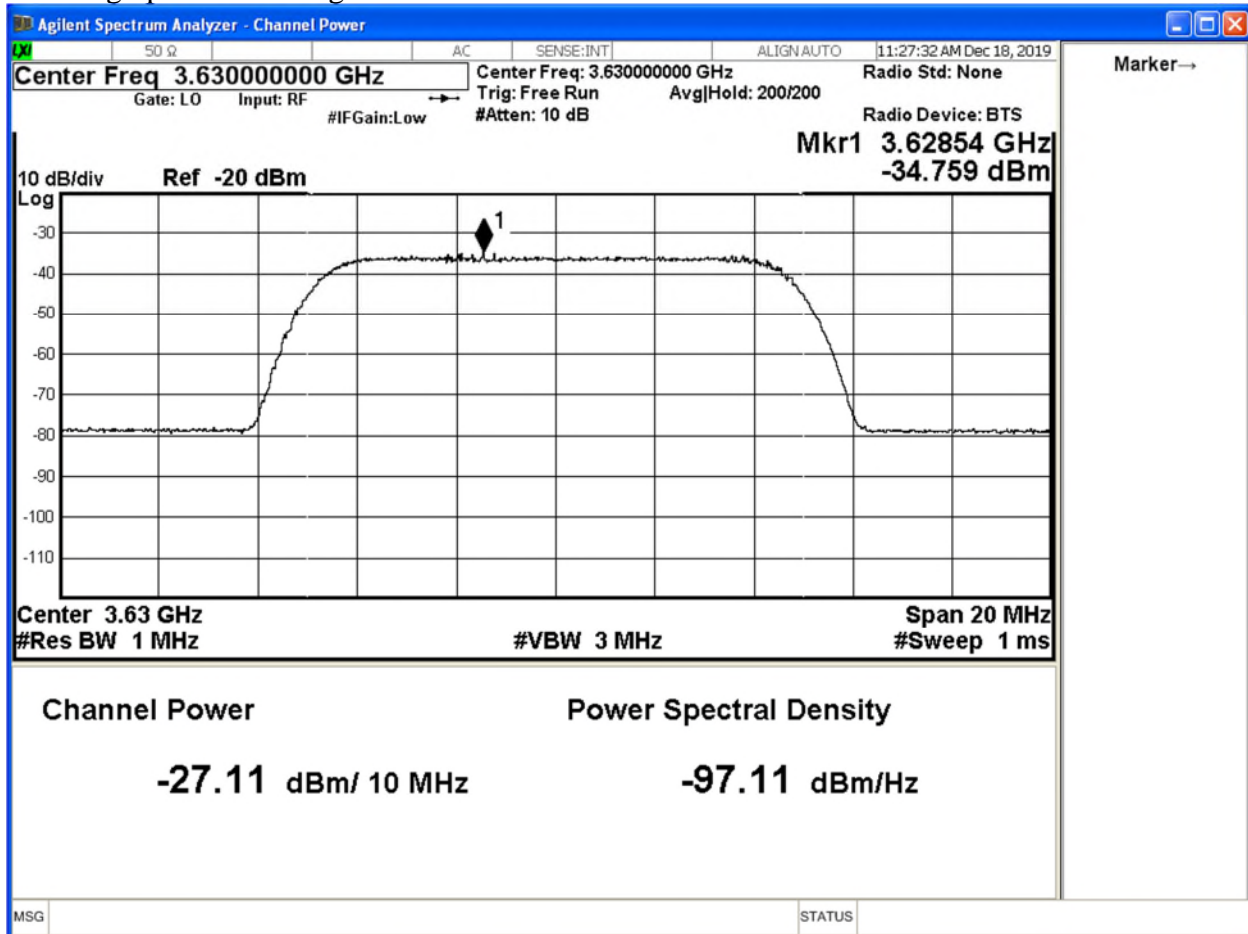
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	


3555-High power – 11 dBi gain



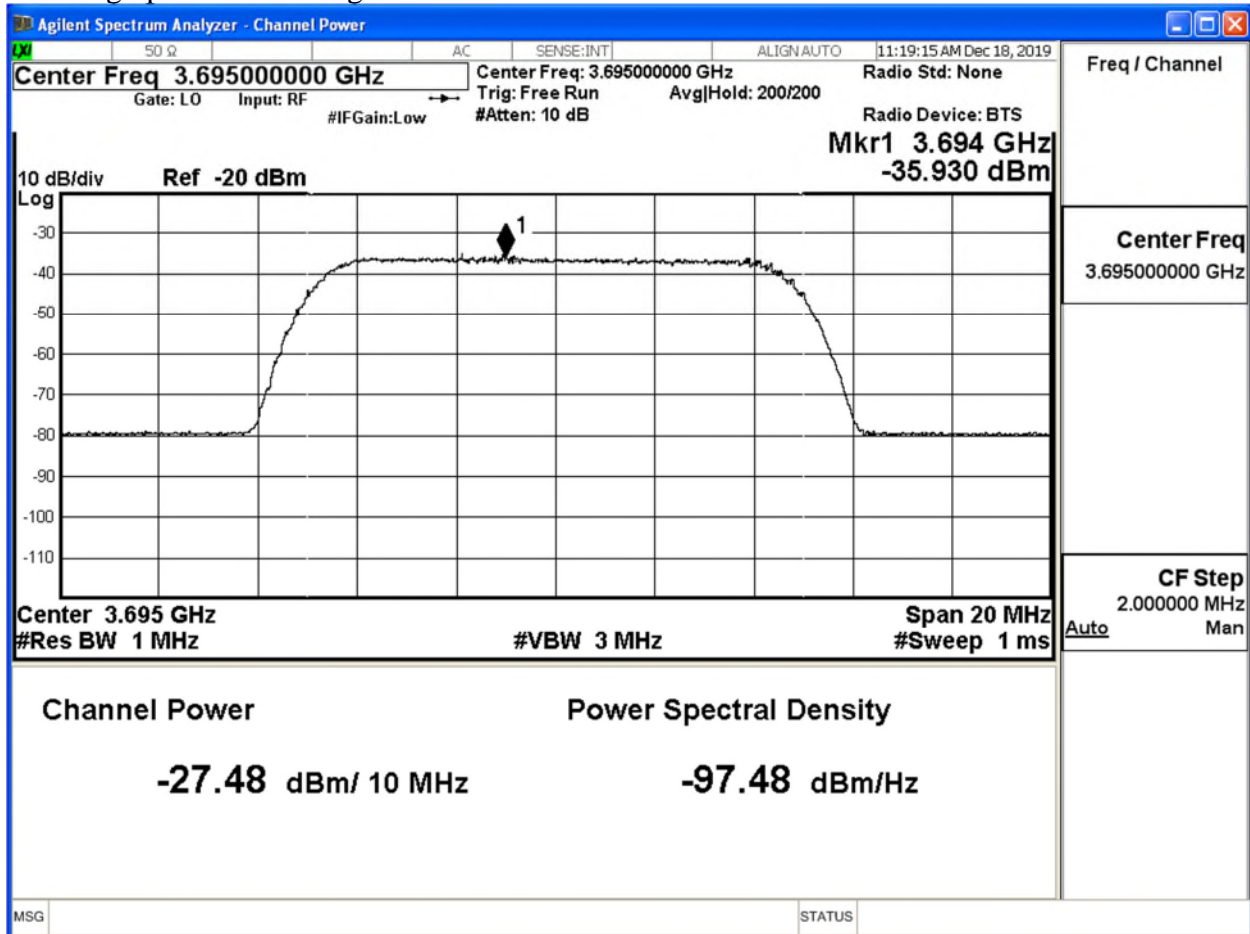
Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

3630-high power 11 dBi gain




Client	Nokia	
Product	Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station	
Standard(s)	FCC Part 96 SAS requirements (CBRS Test Plan)	

3695-high power – 11 dbi gain





Client	<b>Nokia</b>	
Product	<b>Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12472AA) Base Station</b>	
Standard(s)	<b>FCC Part 96 SAS requirements (CBRS Test Plan)</b>	

Test equipment used for Dec 2019 testing

Instrument	Manufacturer	Type No.	Serial No	Calibration Period (months)	Calibration Due
THG	Fluke	77 IV	34770264	12	18-Apr-2020
DVM	VWR	61161-378	170120564	24	17-Feb-2021
Power Supply	Xantrex	XKW 60-50	E00109863	O/P Mon	-
Spectrum Analyser	Keysight	N9020A	MY49100827	24	27-Dec-2021
Attenuator	Pasternack	PE7004-10	N/S	O/P Mon	-
Switching Control Unit	Hewlett Packard	11713A	3748A060876	O/P Mon	-
RF Switch Unit	Burnsco	RARFSW 4x1	001	O/P Mon	-
Power Supply	Leader	730-3D	9801135	O/P Mon	-