



WINNF-TS-0122 Test Report

FCC ID : 2A0385G2101-48
Equipment : Apex Enterprise Femto cell (E-Femto) (B4/B13/B66 Plus N48/N77)
Brand Name : APEX Femto for Enterprise (eFemto)
Model Name : 5G2101-48
Applicant : Casa Systems Inc.
100 Old River Road, Andover, MA, USA
Manufacturer : Casa Systems Inc.
100 Old River Road, Andover, MA, USA
Standard : WINNF-TS-0122 Version V1.0.2

The product was received on Oct. 25, 2022 and testing was performed from Oct. 25, 2022 to Nov. 29, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in WINNF-TS-0122 Version V1.0.2 and has been in compliance with the applicable technical standards.

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

Approved by: Jones Tsai

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issue Date
FG2O2460	01	Initial issue of report	Dec. 09, 2022

Declaration of Conformity:

The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Thomas Chen
Report Producer: Michelle Chen



1 Administration Data

1.1 Testing Laboratory

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
	TH05-HY
Test Engineer	Thomas Chen
Temperature	21 ~ 24 °C
Relative Humidity	48 ~ 53 %

FCC designation No.: TW3786

2 General Information

2.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Apex Enterprise Femto cell (E-Femto) (B4/B13/B66 Plus N48/N77)
Brand Name	APEX Femto for Enterprise (eFemto)
Model Name	5G2101-48
FCC ID	2AO385G2101-48
Professional Installation	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Unit Under Test Type	<input checked="" type="checkbox"/> BTS-CBSD product (Base Station) <input type="checkbox"/> CPE-CBSD product (Customer Premises Equipment)
Unit Under Test Category	<input checked="" type="checkbox"/> Category A <input type="checkbox"/> Category B
Domain Proxy support	<input type="checkbox"/> CBSD with Domain Proxy <input checked="" type="checkbox"/> CBSD without Domain Proxy
UUT Antenna Gain	7.5 dBi
UUT HW Version	V02
UUT FW Version	FR4.5
UUT SW Version	R1.0
UUT Serial Number	D823956047

**2.2 Protocol Test Summary**

Section	Test Case ID	Test Case Title	Test Result
6.1.4.1.3	WINNF.FT.C.REG.3	Single-Step registration for Category A CBSD	PASS
6.1.4.2.1	WINNF.FT.C.REG.8	Missing Required parameters (responseCode 102)	PASS
6.1.4.2.3	WINNF.FT.C.REG.10	Pending registration (responseCode 200)	PASS
6.1.4.2.5	WINNF.FT.C.REG.12	Invalid parameter (responseCode 103)	PASS
6.1.4.2.7	WINNF.FT.C.REG.14	Blacklisted CBSD (responseCode 101)	PASS
6.1.4.2.9	WINNF.FT.C.REG.16	Unsupported SAS protocol version (responseCode 100)	PASS
6.1.4.2.11	WINNF.FT.C.REG.18	Group Error (responseCode 201)	PASS
6.1.4.3.1	WINNF.FT.C.REG.20	Category A CBSD location update	PASS
6.3.4.2.1	WINNF.FT.C.GRA.1	Unsuccessful Grant responseCode=400 (INTERFERENCE)	PASS
6.3.4.2.2	WINNF.FT.C.GRA.2	Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)	PASS
6.4.4.1.1	WINNF.FT.C.HBT.1	Heartbeat Success Case (first Heartbeat Response)	PASS
6.4.4.2.1	WINNF.FT.C.HBT.3	Heartbeat responseCode=105 (DEREGISTER)	PASS
6.4.4.2.2	WINNF.FT.C.HBT.4	Heartbeat responseCode=500 (TERMINATED_GRANT)	PASS
6.4.4.2.3	WINNF.FT.C.HBT.5	Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response	PASS
6.4.4.2.4	WINNF.FT.C.HBT.6	Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response	PASS
6.4.4.2.5	WINNF.FT.C.HBT.7	Heartbeat responseCode=502 (UNSYNC_OP_PARAM)	PASS
6.4.4.3.1	WINNF.FT.C.HBT.9	Heartbeat Response Absent (First Heartbeat)	PASS
6.4.4.3.2	WINNF.FT.C.HBT.10	Heartbeat Response Absent (Subsequent Heartbeat)	PASS
6.4.4.4.1	WINNF.FT.C.HBT.11	Successful Grant Renewal in Heartbeat Test Case	PASS
6.6.4.1.1	WINNF.FT.C.RLQ.1	Successful Relinquishment	PASS
6.6.4.2.1	WINNF.FT.C.RLQ.3	Unsuccessful Relinquishment, responseCode=102	PASS
6.6.4.3.1	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	PASS
6.7.4.1.1	WINNF.FT.C.DRG.1	Successful Deregistration	PASS
6.7.4.2.1	WINNF.FT.C.DRG.3	Deregistration responseCode=102	PASS
6.7.4.3.1	WINNF.FT.C.DRG.5	Deregistration responseCode=103	PASS



Section	Test Case ID	Test Case Title	Test Result
6.8.4.1.1	WINNF.FT.C.SCS.1	Successful TLS connection between UUT and SAS Test Harness	PASS
6.8.4.2.1	WINNF.FT.C.SCS.2	TLS failure due to revoked certificate	PASS
6.8.4.2.2	WINNF.FT.C.SCS.3	TLS failure due to expired server certificate	PASS
6.8.4.2.3	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	PASS
6.8.4.2.4	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	PASS
7.1.4.1.1	WINNF.PT.C.HBT	UUT RF Transmit Power Measurement	PASS

2.3 Test Equipment List

Name	Brand Name	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	Jan, 20. 2022	Jan, 19. 2023

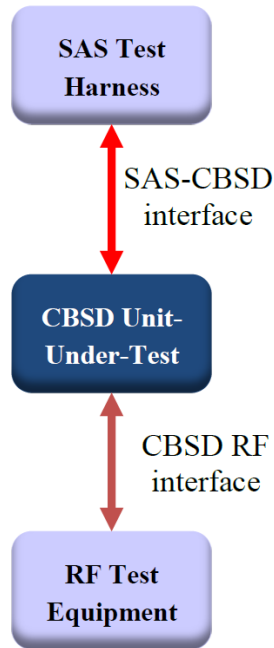


3 Measurement Environment

Measurement Environment Information	
SAS Test Harness version	1.0.0.3
Operating System	Windows 10
TLS version	V 1.2
Python version	V 2.7

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

3.1 Test configuration with Domain Proxy



3.2 Standards

[n.1]. WINNF-TS-0122 Version 1.0.2, “Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)”, 25 November 2020

[n.2]. WINNF-TS-0016 Version 1.2.6, “SAS to CBSD Technical Specification”, 25 November 2020



4 Protocol Test Results

4.1 [WINNF.FT.C.REG.3] Single-Step registration for Category A CBSD

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends Registration request to SAS Test Harness: all required and REG-Conditional parameter included (userId, fcId, cbsdSerialNumber, cbsdCategory, airInterface, installationParam, measCapability) for a Category A CBSD. <ul style="list-style-type: none">• The required userId, fcId and cbsdSerialNumber and REG-Conditional cbsdCategory, airInterface, installationParam, and measCapability registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges.• Any optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.	PASS
3	<ul style="list-style-type: none">• SAS Test Harness sends a CBSD Registration Response as follows:<ul style="list-style-type: none">– <i>cbsdId</i> = C– <i>measReportConfig</i> shall not be included.– <i>responseCode</i> = 0	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.2 [WINNF.FT.C.REG.8] Missing Required parameters (responseCode 102)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>csdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =0) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.3 [WINNF.FT.C.REG.10] Pending registration (responseCode 200)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>csdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =200) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.4 [WINNF.FT.C.REG.12] Invalid parameter (responseCode 103)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>cbsdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =103) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.5 [WINNF.FT.C.REG.14] Blacklisted CBSD (responseCode 101)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>cbsdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =101) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.6 [WINNF.FT.C.REG.16] Unsupported SAS protocol version (responseCode 100)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>cbsdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =100) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.7 [WINNF.FT.C.REG.18] Group Error (responseCode 201)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: <ul style="list-style-type: none">– SAS response does not include <i>cbsdId</i>– <i>responseCode</i> = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode</i> =201) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.8 [WINNF.FT.C.REG.20] Category A CBSD location update

This section is specific to Category A CBSDs that do not require professional installation. The requirement is for the Category A (non-professionally installed) to report to the SAS any location change exceeding a distance of 50m horizontally or 3m vertically within a 60 second window. It is left to the CBSD vendor and certification lab to generate the required evidence showing the UUT meets the requirement.

#	Test Execution Steps	Results
1	The UUT will report to the SAS any location change exceeding a distance of 50m horizontally or 3m vertically within a 60 second window, as declared by manufacturer.	PASS

CBSD Vender Declaration:

The unit has integrated GPS receiver and GPS antenna to get precise horizontal location within 50m range and has built-in high precise barometric sensor to measure the real time environmental air pressure to calculate the altitude within 3m range with the calibration of real-time sea-level air pressure from national wide air pressure stations. Both horizontal and altitude positions information update rates is 10s. If the location changes exceeding 50 meters horizontal and ± 3 meters elevation from its last reported location, the unit will report to SAS of location change within 50s.

The unit complies with FCC 47 CFR part96.39(a)(3) A non-professionally installed CBSD must check its location and report to the SAS any location changes exceeding 50 meters horizontal and ± 3 meters elevation from its last reported location within 60 seconds of such location change.



4.9 [WINNF.FT.C.GRA.1] Unsuccessful Grant responseCode=400 (INTERFERENCE)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness, with <i>cbsdId = C</i>	--
2	UUT sends valid Grant Request.	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none">• <i>cbsdId=C</i>• <i>responseCode = R</i>	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.10 [WINNF.FT.C.GRA.2] Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness, with <i>cbsdId = C</i>	--
2	UUT sends valid Grant Request.	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none">• <i>cbsdId=C</i>• <i>responseCode = R</i>	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=401</i>) to further request messages from the UUT.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.11 [WINNF.FT.C.HBT.1] Heartbeat Success Case (first Heartbeat Response)

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i> = C	--
2	UUT sends a message: <ul style="list-style-type: none">If message is type Spectrum Inquiry Request, go to step 3, orIf message is type Grant Request, go to step 5	--
3	UUT sends Spectrum Inquiry Request. Validate: <ul style="list-style-type: none"><i>cbsdId</i> = CList of frequencyRange objects sent by UUT are within the CBRS frequency range	PASS
4	SAS Test Harness sends a Spectrum Inquiry Response message, including the following parameters: <ul style="list-style-type: none"><i>cbsdId</i> = C<i>availableChannel</i> is an array of availableChannel objects<i>responseCode</i> = 0	--
5	UUT sends Grant Request message. Validate: <ul style="list-style-type: none"><i>cbsdId</i> = C<i>maxEIRP</i> is at or below the limit appropriate for CBSD category as defined by Part 96<i>operationFrequencyRange</i>, F, sent by UUT is a valid range within the CBRS band	PASS
6	SAS Test Harness sends a Grant Response message, including the parameters: <ul style="list-style-type: none"><i>cbsdId</i> = C<i>grantId</i> = G = a valid grant ID<i>grantExpireTime</i> = UTC time greater than duration of the test<i>responseCode</i> = 0	--



7	UUT sends a first Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "GRANTED"	PASS
8	SAS Test Harness sends a Heartbeat Response message, with the following parameters: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = current UTC time + 200 seconds• <i>responseCode</i> = 0	--
9	For further Heartbeat Request messages sent from UUT after completion of step 8, validate message is sent within latest specified heartbeatInterval, and: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED" and SAS Test Harness responds with a Heartbeat Response message including the following parameters: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = current UTC time + 200 seconds• <i>responseCode</i> = 0	PASS
10	Monitor the RF output of the UUT from start of test until UUT transmission commences. Verify: <ul style="list-style-type: none">• UUT does not transmit at any time prior to completion of the first heartbeat response• UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F.	PASS

**4.12[WINNF.FT.C.HBT.3] Heartbeat responseCode=105 (DEREGISTER)**

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdlid</i> = C○ valid <i>grantld</i> = G○ grant is for frequency range F, power P○ <i>grantExpireTime</i> = UTC time greater than duration of the test• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including: <ul style="list-style-type: none">• <i>cbsdlid</i> = C• <i>grantld</i> = G• <i>operationState</i> = "AUTHORIZED"	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none">• <i>cbsdlid</i> = C• <i>grantld</i> = G• <i>transmitExpireTime</i> = T = Current UTC time• <i>responseCode</i> = 105 (DEREGISTER)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none">• UUT shall stop transmission within (T + 60 seconds) of completion of <i>step 3</i>	PASS

**4.13[WINNF.FT.C.HBT.4] Heartbeat responseCode=500
(TERMINATED_GRANT)**

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdlId</i> = C○ valid <i>grantId</i> = G○ grant is for frequency range F, power P○ <i>grantExpireTime</i> = UTC time greater than duration of the test• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified <i>heartbeatInterval</i> , and is formatted correctly, including: <ul style="list-style-type: none">• <i>cbsdlId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: <ul style="list-style-type: none">• <i>cbsdlId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = T = current UTC time• <i>responseCode</i> = 500 (TERMINATED_GRANT)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none">• UUT shall stop transmission within (T + 60 seconds) of completion of step 3	PASS



4.14 [WINNF.FT.C.HBT.5] Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test • UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request) 	--
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED" 	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = T = current UTC time • <i>responseCode</i> = 501 (SUSPENDED_GRANT) 	--
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>	--
5	<p>Monitor the SAS-CBSD interface. Verify either A OR B occurs:</p> <p>A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "GRANTED" <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> • <i>cbdsId</i> = C • <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> • UUT does not transmit at any time 	PASS



4.15 [WINNF.FT.C.HBT.6] Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdId</i> = C○ valid <i>grantId</i> = G○ grant is for frequency range F, power P○ <i>grantExpireTime</i> = UTC time greater than duration of the test• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = T = current UTC time• <i>responseCode</i> = 501 (SUSPENDED_GRANT)	--



#	Test Execution Steps	Results
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the SAS-CBSD interface. Verify either A OR B occurs: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "GRANTED" B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters: <ul style="list-style-type: none">• <i>cbdsId</i> = C• <i>grantId</i> = G Monitor the RF output of the UUT. Verify: <ul style="list-style-type: none">• UUT shall stop transmission within (<i>T</i> + 60 seconds) of completion of step 3	PASS



4.16 [WINNF.FT.C.HBT.7] Heartbeat responseCode=502 (UNSYNC_OP_PARAM)

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdId</i> = C○ valid <i>grantId</i> = G○ grant is for frequency range F, power P○ <i>grantExpireTime</i> = UTC time greater than duration of the test• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified <i>heartbeatInterval</i>, and is formatted correctly, including:</p> <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = T = Current UTC Time• <i>responseCode</i> = 502 (UNSYNC_OP_PARAM)	--
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>	--
5	<p>Monitor the SAS-CBSD interface. Verify:</p> <ul style="list-style-type: none">• UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters:<ul style="list-style-type: none">○ <i>cbsdId</i> = C○ <i>grantId</i> = G <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none">• UUT shall stop transmission within (T+60) seconds of completion of step 3.	PASS

**4.17 [WINNF.FT.C.HBT.9] Heartbeat Response Absent (First Heartbeat)**

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdlId</i> = C○ valid <i>grantId</i> = G○ grant is for frequency range F, power P○ <i>grantExpireTime</i> = UTC time greater than duration of the test• UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified <i>heartbeatInterval</i> , and is formatted correctly, including: <ul style="list-style-type: none">• <i>cbsdlId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "GRANTED"	PASS
3	After completion of Step 2, SAS Test Harness does not respond to any further messages from UUT to simulate loss of network connection	--
4	Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify: <ul style="list-style-type: none">• At any time during the test, UUT shall not transmit on RF interface	PASS

4.18 [WINNF.FT.C.HBT.10] Heartbeat Response Absent (Subsequent Heartbeat)

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: <ul style="list-style-type: none"> ○ valid <i>cbsdId</i> = C ○ valid <i>grantId</i> = G ○ grant is for frequency range F, power P ○ <i>grantExpireTime</i> = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface 	--
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within the latest specified <i>heartbeatInterval</i>, and is formatted correctly, including:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>operationState</i> = "AUTHORIZED" 	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none"> • <i>cbsdId</i> = C • <i>grantId</i> = G • <i>transmitExpireTime</i> = current UTC time + 200 seconds • <i>responseCode</i> = 0 	--
4	<p>After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT</p>	--
5	<p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> • UUT shall stop all transmission on RF interface within (<i>transmitExpireTime</i> + 60 seconds), using the <i>transmitExpireTime</i> sent in Step 3. 	PASS

**4.19[WINNF.FT.C.HBT.11] Successful Grant Renewal in Heartbeat Test Case**

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has registered successfully with SAS Test Harness• UUT has a valid single grant as follows:<ul style="list-style-type: none">○ valid <i>cbsdlid</i> = C○ valid <i>grantld</i> = G○ grant is for frequency range F, power P• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface.• Grant has the following parameters at the start of the test:<ul style="list-style-type: none">○ <i>grantExpireTime</i> = UTC time equal to time at start of test + 300 seconds = Tgrant_expire○ <i>transmitExpireTime</i> = UTC time equal to time at start of test + 200 seconds○ <i>heartbeatInterval</i> = 60 seconds	--
2	<p>UUT sends a Heartbeat Request message.</p> <p>If Heartbeat Request message contains grantRenew = TRUE, go to Step 6, else go to Step 3.</p>	--
3	<p>Verify Heartbeat Request message is sent within the latest specified <i>heartbeatInterval</i>, and is formatted correctly, including:</p> <ul style="list-style-type: none">• <i>cbsdlid</i> = C• <i>grantld</i> = G• <i>operationState</i> = "AUTHORIZED"	PASS
4	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none">• <i>cbsdlid</i> = C• <i>grantld</i> = G• <i>transmitExpireTime</i> = current UTC + 200 seconds• <i>grantExpireTime</i> = same as Step 1• <i>responseCode</i> = 0	--



#	Test Execution Steps	Results
5	Go to Step 2	--
6	Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>operationState</i> = "AUTHORIZED"• <i>grantRenew</i> = TRUE	PASS
7	SAS Test Harness sends a Heartbeat Response message, with the following parameters: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>grantExpireTime</i> = UTC time set far in the future• <i>transmitExpireTime</i> = current UTC time + 200 seconds• <i>responseCode</i> = 0	--
8	Continue to respond to any subsequentHeartbeat Request from CBSD with Heartbeat Response with the following parameters: <ul style="list-style-type: none">• <i>cbsdId</i> = C• <i>grantId</i> = G• <i>transmitExpireTime</i> = same as Step 7• <i>responseCode</i> = 0	--
9	Monitor RF transmission of UUT from start of test until Tgrant_expire + 60 seconds and ensure UUT continues to transmit throughout the time period.	PASS



4.20[WINNF.FT.C.RLQ.1] Successful Relinquishment

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to relinquish UUT Grant from the SAS Test Harness</p>	--
2	<p>UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• <i>grantId = G</i>	PASS
3	<p>SAS Test Harness shall approve the request with a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none">– <i>cbsdId = C</i>– <i>grantId = G</i>– <i>responseCode = 0</i>	--
4	<p>After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode=0</i>) to further request messages from the UUT.</p>	--
5	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT shall stop RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS



4.21 [WINNF.FT.C.RLQ.3] Unsuccessful Relinquishment, responseCode=102

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to Relinquish UUT Grant from the SAS Test Harness</p>	--
2	<p>UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• <i>grantId = G</i>	--
3	<p>SAS Test Harness shall send a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• No <i>grantId</i>• <i>responseCode = R</i>	--
4	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.</p>	--
5	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS



4.22 [WINNF.FT.C.RLQ.5] Unsuccessful Relinquishment, responseCode=103

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to Relinquish UUT Grant from the SAS Test Harness</p>	--
2	<p>UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• <i>grantId = G</i>	--
3	<p>SAS Test Harness shall send a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• No <i>grantId</i>• <i>responseCode = R</i>	--
4	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=103</i>) to further request messages from the UUT.</p>	--
5	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS



4.23 [WINNF.FT.C.DRG.1] Successful Deregistration

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to deregister UUT from the SAS Test Harness</p>	--
2	UUT sends a Relinquishment request and receives Relinquishment response with <i>responseCode=0</i>	--
3	UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId = C</i> .	PASS
4	<p>SAS Test Harness shall approve the request with a Deregistration Response message with parameters:</p> <ul style="list-style-type: none">• <i>cbsdId = C</i>• <i>responseCode = 0</i>	--
5	After completion of step 3, SAS Test Harness will not provide any additional positive response (<i>responseCode=0</i>) to further request messages from the UUT.	--
6	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	PASS



4.24 [WINNF.FT.C.DRG.3] Deregistration responseCode=102

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to deregister UUT from the SAS Test Harness</p>	--
2	<p>UUT sends a Relinquishment request and receives Relinquishment response with <i>responseCode=0</i></p>	--
3	<p>UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId = C</i></p>	--
4	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <ul style="list-style-type: none">• No <i>cbsdId</i>• <i>responseCode = 102</i>	--
5	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.</p>	--
6	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	PASS



4.25 [WINNF.FT.C.DRG.5] Deregistration responseCode=103

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none">• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i>• UUT has received a valid grant with <i>grantId = G</i>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. <p>Invoke trigger to deregister UUT from the SAS Test Harness</p>	--
2	<p>UUT sends a Relinquishment request and receives Relinquishment response with <i>responseCode=0</i></p>	--
3	<p>UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId = C</i></p>	--
4	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <ul style="list-style-type: none">• No <i>cbsdId</i>• <i>responseCode = 103</i>	--
5	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<i>responseCode=0</i>) to further request messages from the UUT.</p>	--
6	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 4 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	PASS



4.26[WINNF.FT.C.SCS.1] Successful TLS connection between UUT and SAS Test Harness

#	Test Execution Steps	Results
1	<ul style="list-style-type: none">UUT shall start CBSD-SAS communication with the security procedureThe UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate.Configure the SAS Test Harness to accept the security procedure and establish the connection	PASS
2	<ul style="list-style-type: none">Make sure that Mutual authentication happens between UUT and the SAS Test Harness.Make sure that UUT uses TLS v1.2Make sure that cipher suites from one of the following is selected,<ul style="list-style-type: none">TLS_RSA_WITH_AES_128_GCM_SHA256TLS_RSA_WITH_AES_256_GCM_SHA384TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	PASS
3	<p>A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability.</p> <ul style="list-style-type: none">UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with <i>responseCode = 0</i> and <i>cbsdId</i>.	PASS
4	<p>Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify:</p> <ul style="list-style-type: none">UUT shall not transmit RF	PASS



4.27[WINNF.FT.C.SCS.2] TLS failure due to revoked certificate

#	Test Execution Steps	Results
1	<ul style="list-style-type: none">• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	<ul style="list-style-type: none">• Make sure that UUT uses TLS v1.2 for security establishment.• Make sure UUT selects the correct cipher suite.• UUT shall use CRL or OCSP to verify the validity of the server certificate.• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
3	UUT may retry for the security procedure which shall fail	PASS
4	SAS Test-Harness shall not receive any Registration request or any application data.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.28[WINNF.FT.C.SCS.3] TLS failure due to expired server certificate

#	Test Execution Steps	Results
1	<ul style="list-style-type: none">UUT shall start CBSD-SAS communication with the security procedures	PASS
2	<ul style="list-style-type: none">Make sure that UUT uses TLS v1.2 for security establishment.Make sure UUT selects the correct cipher suite.UUT shall use CRL or OCSP to verify the validity of the server certificate.Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
3	UUT may retry for the security procedure which shall fail.	PASS
4	SAS Test-Harness shall not receive any Registration request or any application data.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">UUT shall not transmit RF	PASS



4.29[WINNF.FT.C.SCS.4] TLS failure when SAS Test Harness certificate is issued by an unknown CA

#	Test Execution Steps	Results
1	<ul style="list-style-type: none">• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	<ul style="list-style-type: none">• Make sure that UUT uses TLS v1.2 for security establishment.• Make sure UUT selects the correct cipher suite.• UUT shall use CRL or OCSP to verify the validity of the server certificate• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
3	UUT may retry for the security procedure which shall fail.	PASS
4	SAS Test-Harness shall not receive any Registration request or any application data.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.30[WINNF.FT.C.SCS.5] TLS failure when certificate at the SAS Test Harness is corrupted

#	Test Execution Steps	Results
1	<ul style="list-style-type: none">• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	<ul style="list-style-type: none">• Make sure that UUT uses TLS v1.2 for security establishment.• Make sure UUT selects the correct cipher suite.• UUT shall use CRL or OCSP to verify the validity of the server certificate.• Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
3	UUT may retry for the security procedure which shall fail.	PASS
4	SAS Test-Harness shall not receive any Registration request or any application data.	--
5	Monitor the RF output of the UUT from start of test until 60 seconds after Step 3 is complete. This is the end of the test. Verify: <ul style="list-style-type: none">• UUT shall not transmit RF	PASS



4.31 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> • UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness • UUT has registered with the SAS, with CBSID ID = C • UUT has a single valid grant G with parameters {lowFrequency = FL, highFrequency = FH, maxEirp = Pi}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case <p><i>Note: in order for the UUT to request a grant with the parameters {lowFrequency, highFrequency, maxEirp}, the SAS Test Harness may need to provide appropriate guidance in the availableChannel object of the spectrumInquiry response message, and the operationParam object of the grant response message. Alternately, the UUT vendor may provide the ability to set those parameters on the UUT so that the UUT will request a grant with those parameters.</i></p>	--
2	<p>UUT and SAS Test Harness perform a series of Heartbeat Request/Response cycles, which continues until the other test steps are complete. Messaging for each cycle is as follows:</p> <ul style="list-style-type: none"> • UUT sends Heartbeat Request, including: <ul style="list-style-type: none"> ○ cbsdId = C ○ grantId = G • SAS Test Harness responds with Heartbeat Response, including: <ul style="list-style-type: none"> ○ cbsdId = C ○ grantId = G ○ transmitExpireTime = current UTC time + 200 seconds ○ responseCode = 0 	--



#	Test Execution Steps	Results
3	<p>Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, P_i. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfil the requirements of the power measurement method.</p> <p><i>Note: it may be required for the vendor to provide a method or configuration to bring the UUT to a mode which is required by the measurement methodology. Any such mode is vendor-specific and depends upon UUT behavior and the measurement methodology.</i></p>	PASS

Note: For test 4.31, please find the Appendix B for RF measurement plots.

Appendix B. RF measurement plots

Appendix B.1 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

Report Clause 4.31 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

Center Frequency [MHz]	Bandwidth [MHz]	Granted MaxEIRP [dBm/MHz]	Conducted PSD [dBm/MHz]		Antenna Gain [dBi]	UUT total MaxEIRP [dBm/MHz]
			TX 0	TX 1		
3600	20	20	9.28	9.56	7.5	19.93
		15	4.18	4.63		14.92
		10	-0.63	-0.53		9.93
		5	-5.68	-5.93		4.71
		0	-14.16	-13.85		-3.49
	40	20	8.15	8.26		18.72
		15	4.24	4.34		14.80
		10	-0.69	-1.09		9.62
		5	-6.03	-5.76		4.62
		0	-10.51	-10.91		-0.20

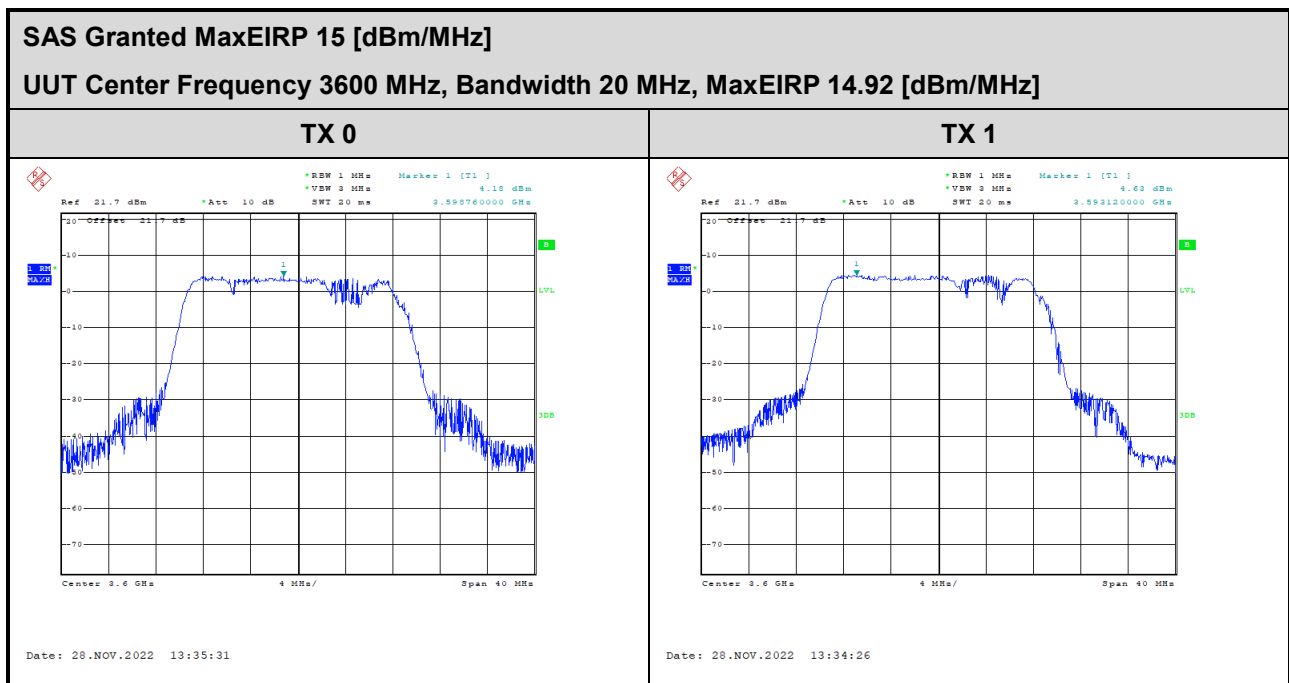
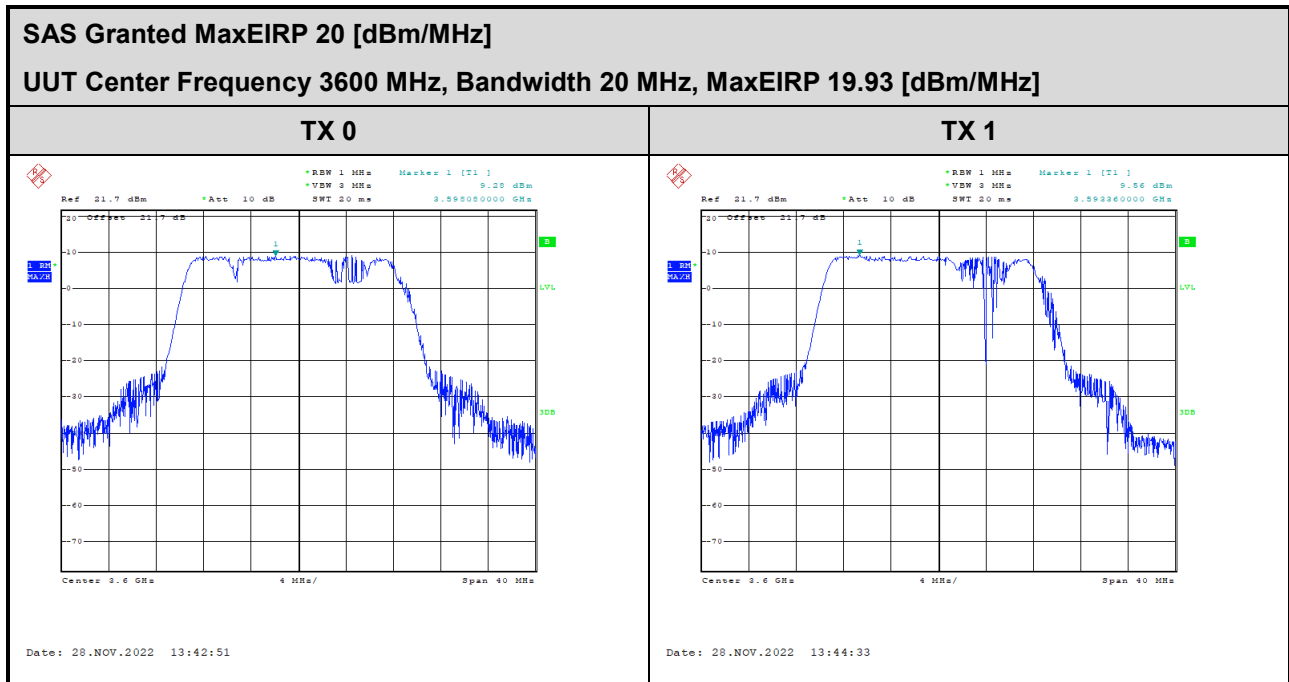
Note: The total path loss is offset with 21.74 dB.

Appendix B.1.1 Test Procedure

[WINNF.PT.C.HBT] UUT RF Transmit Power Measurement defined in clause 4.31 of this test report.



Appendix B.1.2 Test Result

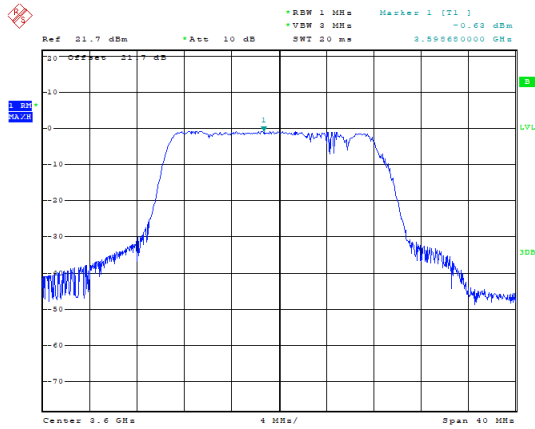




SAS Granted MaxEIRP 10 [dBm/MHz]

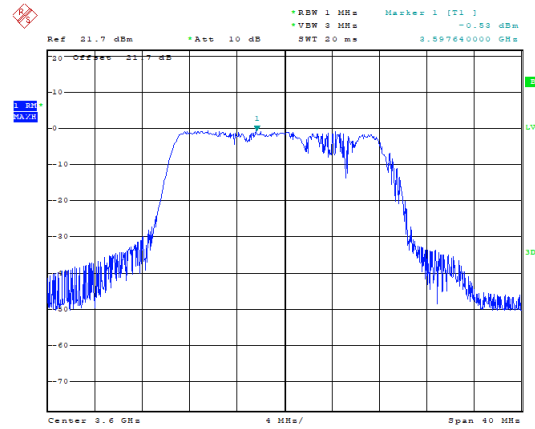
UUT Center Frequency 3600 MHz, Bandwidth 20 MHz, MaxEIRP 9.93 [dBm/MHz]

TX 0



Date: 28.NOV.2022 13:24:52

TX 1

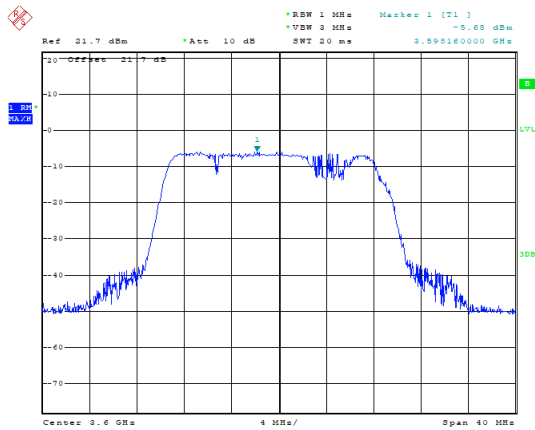


Date: 28.NOV.2022 13:26:41

SAS Granted MaxEIRP 5 [dBm/MHz]

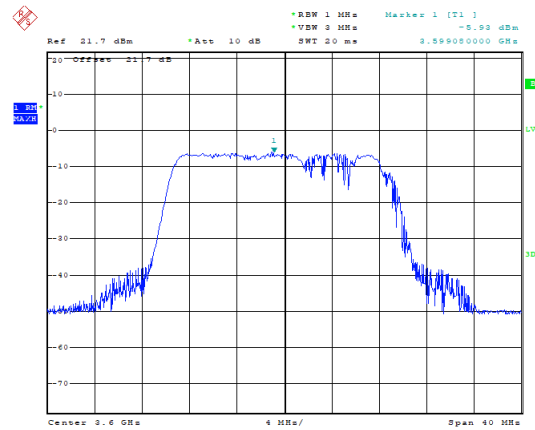
UUT Center Frequency 3600 MHz, Bandwidth 20 MHz, MaxEIRP 4.71 [dBm/MHz]

TX 0



Date: 28.NOV.2022 13:51:10

TX 1



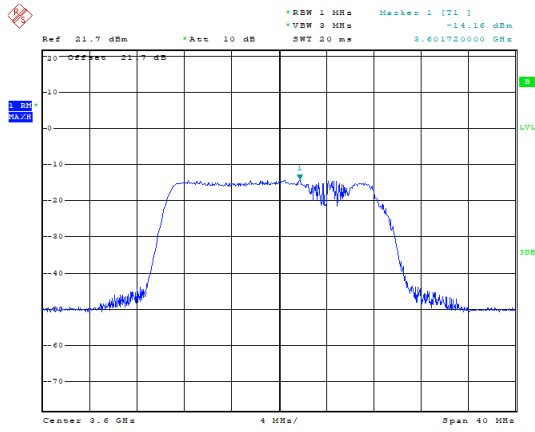
Date: 28.NOV.2022 13:49:03



SAS Granted MaxEIRP 0 [dBm/MHz]

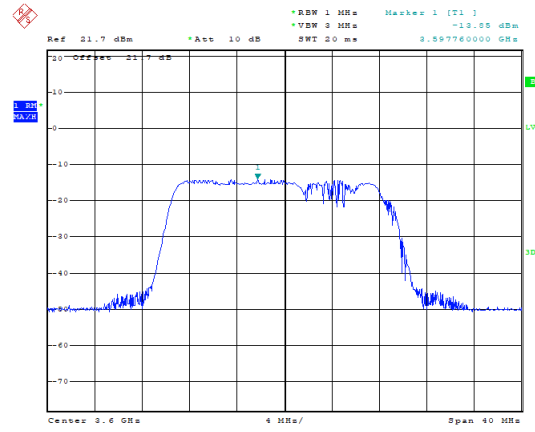
UUT Center Frequency 3600 MHz, Bandwidth 20 MHz, MaxEIRP -3.49 [dBm/MHz]

TX 0



Date: 29.NOV.2022 13:42:15

TX 1

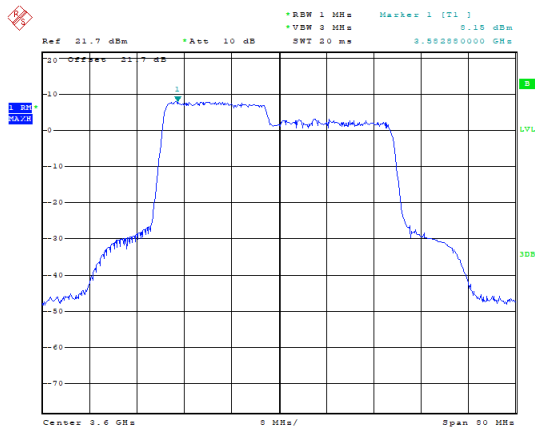


Date: 29.NOV.2022 13:39:58

SAS Granted MaxEIRP 20 [dBm/MHz]

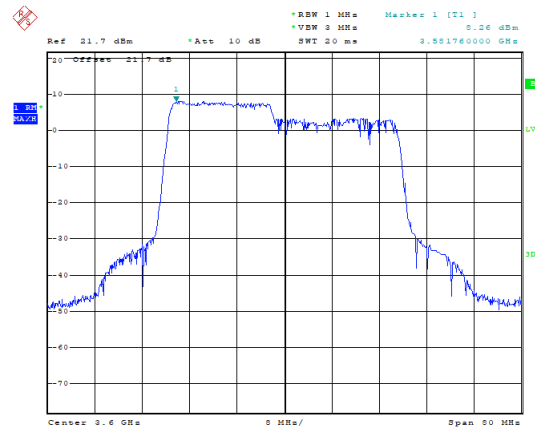
UUT Center Frequency 3600 MHz, Bandwidth 40 MHz, MaxEIRP 18.72 [dBm/MHz]

TX 0



Date: 28.NOV.2022 14:42:43

TX 1



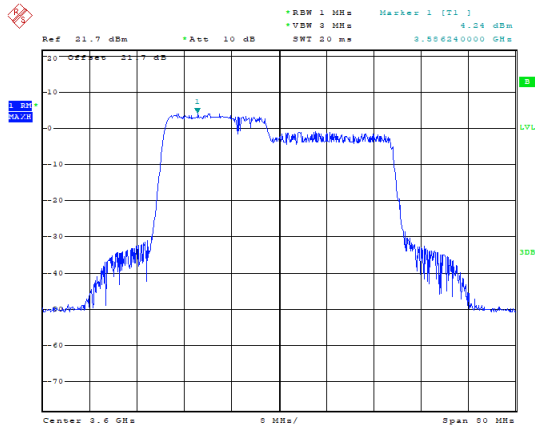
Date: 28.NOV.2022 14:34:24



SAS Granted MaxEIRP 15 [dBm/MHz]

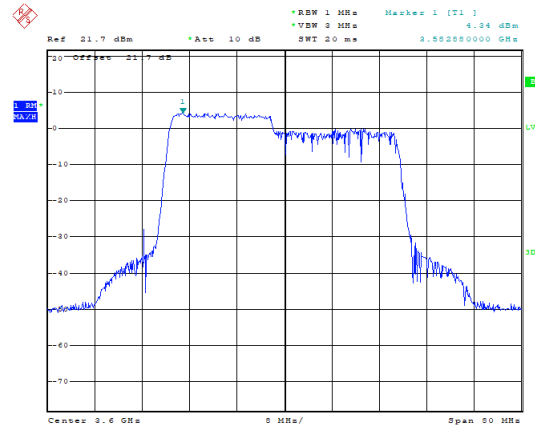
UUT Center Frequency 3600 MHz, Bandwidth 40 MHz, MaxEIRP 14.8 [dBm/MHz]

TX 0



Date: 28.NOV.2022 15:01:42

TX 1

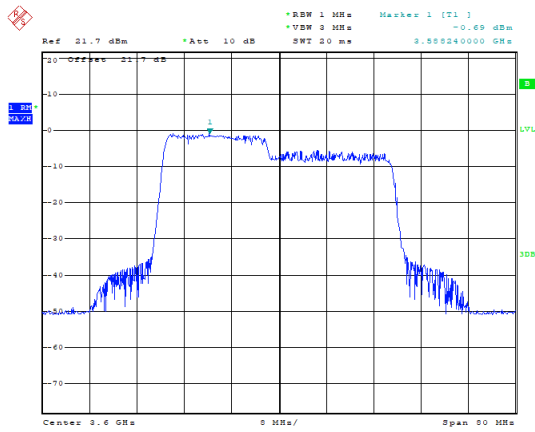


Date: 28.NOV.2022 14:57:43

SAS Granted MaxEIRP 10 [dBm/MHz]

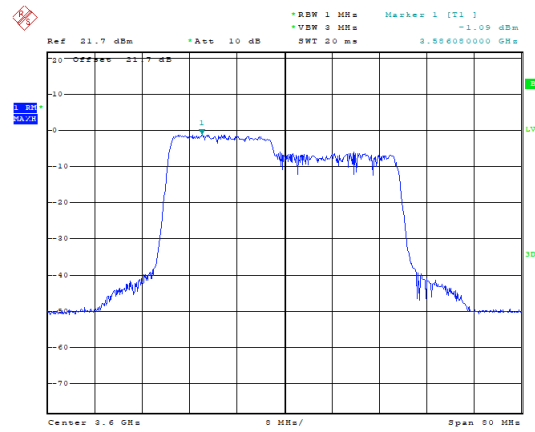
UUT Center Frequency 3600 MHz, Bandwidth 40 MHz, MaxEIRP 9.62 [dBm/MHz]

TX 0



Date: 28.NOV.2022 15:07:01

TX 1



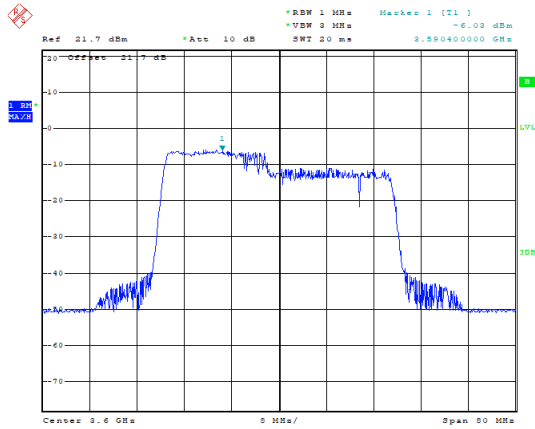
Date: 28.NOV.2022 15:11:24



SAS Granted MaxEIRP 5 [dBm/MHz]

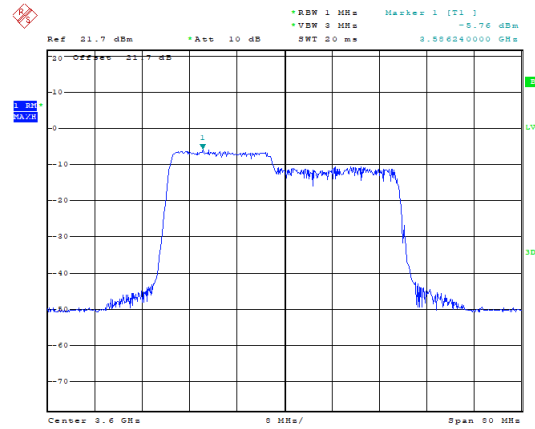
UUT Center Frequency 3600 MHz, Bandwidth 40 MHz, MaxEIRP 4.62 [dBm/MHz]

TX 0



Date: 28.NOV.2022 15:25:29

TX 1

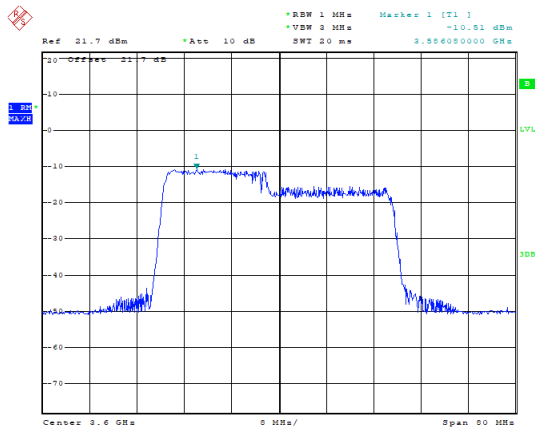


Date: 28.NOV.2022 15:24:07

SAS Granted MaxEIRP 0 [dBm/MHz]

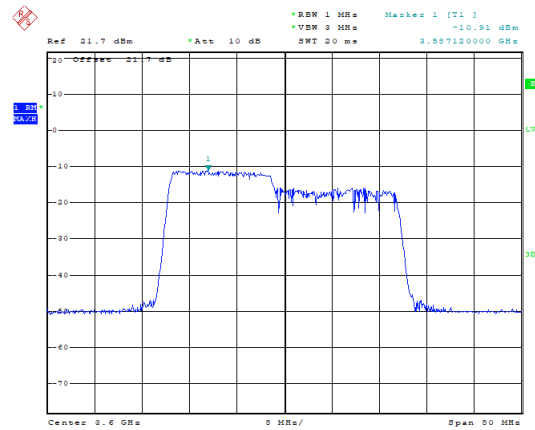
UUT Center Frequency 3600 MHz, Bandwidth 40 MHz, MaxEIRP -0.2 [dBm/MHz]

TX 0



Date: 29.NOV.2022 13:24:45

TX 1



Date: 29.NOV.2022 13:28:13

—THE END—