

# WINNF-TS-0122 Test Report

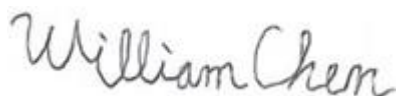
APPLICANT	Gemtek Technology Co., Ltd.
EQUIPMENT	LTE Cat6 TD-LTE CPE
BRAND NAME	Gemtek
MODEL NAME	WLTMS-110-HGA
FCC ID	MXF-WLTMS11048H
REFERENCE	WINNF-TS-0122 Version V1.0.1

The product was received on Nov. 22, 2019 and testing was started from Dec. 09, 2019 and completed on Dec. 24, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in WINNF-TS-0122 Version V1.0.1 and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Reviewed by:



William Chen / Deputy Manager

Approved by:



Jones Tsai / Manager

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

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### Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG9N2215	01	Initial issue of report	Jan. 03, 2020

## 1. Administration Data

### 1.1 Testing Laboratory

<b>Test Site</b>	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

### 1.2 Applicant

<b>Company Name</b>	Gemtek Technology Co., Ltd.
<b>Address</b>	No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352.

## 2. General Information

### 2.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE Cat6 TD-LTE CPE
Brand Name	Gemtek
Model Name	WLTMS-110-HGA
FCC ID	MXF-WLTMS11048H
Professional Installation	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
UUT Category	<input type="checkbox"/> Category A <input checked="" type="checkbox"/> Category B
Unit Under Test in Test ID	<input type="checkbox"/> UUT with Domain Proxy <input checked="" type="checkbox"/> UUT without Domain Proxy
UUT HW Version	MB: V00; RF: V01
UUT SW Version	01.01.02.154

Brand name	Model name	Product name	Description
Gemtek	WLTMS-110-HGA	LTE Cat6 TD-LTE CPE	19.44 dBi antenna
	WLTMS-110		15.43dBi antenna
BLiNQ	FWC-110HG-35	WLTMS-110-HGA-B42-B43-48	19.44 dBi antenna
	FWC-110-35	WLTMS-110-B42-B43-48	15.43dBi antenna
<b>Remark:</b> 1. All models are electrically identical except antenna, different model names are for applied antenna and marketing purpose. 2. The above models, model WLTMS-110-HGA was selected as a representative one for the final test and only its data was recorded in this report.			

## 2.2 Protocol Test Summary

Section	Test Case ID	Test Case Title	Test Result
6.1.4.1.1	WINNF.FT.C.REG.1	Multi-Step registration	PASS
6.1.4.1.5	WINNF.FT.C.REG.5	Single-Step registration for CBSD with CPI signed data	PASS
6.1.4.1.7	WINNF.FT.C.REG.7	Registration due to change of an installation parameter	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
6.3.4.2.1	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

Section	Test Case ID	Test Case Title	Test Result
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
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

### 2.3 Time test for getting Grant Summary

Trail	Time limit	Monitoring time	Measured result	Verdict
1	1 second	10 seconds	0.26 second	Pass
2	10 seconds	300 seconds	5.68 second	Pass
3	20 seconds	3600 seconds	10.08 second	Pass

### 2.4 Support Equipment

Name	Manufacturer	Type/Model	Serial Number	FCC ID
Q710	Ruckus	P01-Q710-US02	991929000175	P01-Q710-US02



## 2.5 Test Equipment List

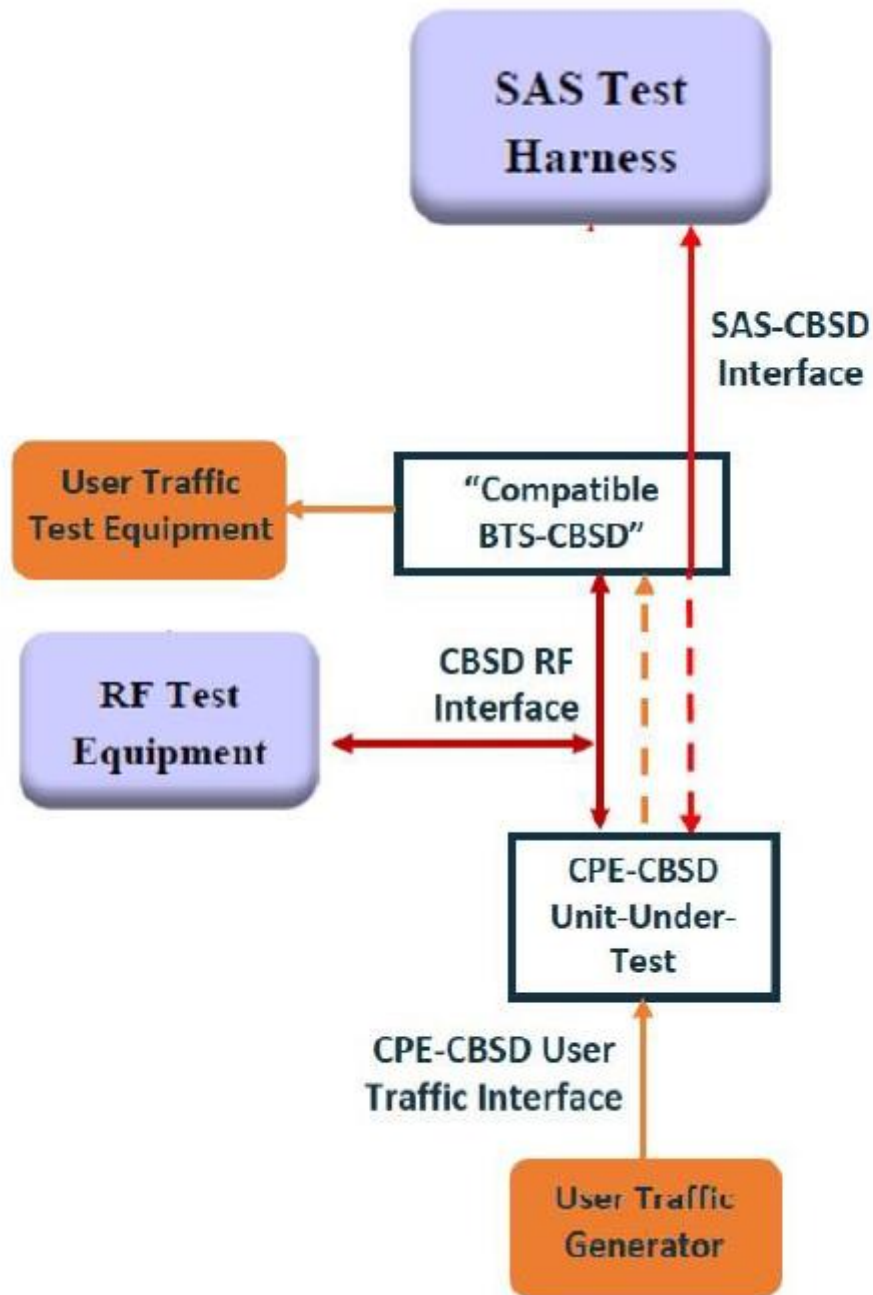
Name	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Spectrum Analyzer	KeySight	N9010A	MY5712084	2019-11-20	2020-11-19
Spectrum Analyzer	Rohde & Schwarz	ESCI7	100724	2019-10-24	2020-10-23

## 3. Measurement Environment

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

Conditional Test Case		
<input checked="" type="checkbox"/>	<b>C1</b>	Mandatory for UUT which supports multi-step registration message
<input type="checkbox"/>	<b>C2</b>	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.
<input checked="" type="checkbox"/>	<b>C3</b>	Mandatory for UUT which supports single-step registration containing CPIsigned data in the registration message.
<input type="checkbox"/>	<b>C4</b>	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type
<input type="checkbox"/>	<b>C5</b>	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.
<input checked="" type="checkbox"/>	<b>C6</b>	Mandatory for UUT which supports parameter change being made at the UUT and prior to sending a deregistration.

### 3.1 Test configuration without Domain Proxy



### 3.2 Standards

[n.1]. FCC KDB 940660 D02 CBSD-CPE Handshake Procedures v02, 22 October 2019

[n.2]. WINNF-TS-0122 Version 1.0.1, "Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)", 28 September 2018

### 3.3 Protocol test procedure

The test cases for SAS<->CBSD protocol in [n.2] apply for CBSD-CPE device type. Following the [n.1], when running the test cases in [n.2] for CBSD-CPE device type, verify that

1. CBSD-CPE can begin transmitting its RF only after receiving radio signal from its compatible BTS-CBSD.
2. For all CBSD-CPE RF transmissions, the CBSD-CPE UUT radio frequency range and bandwidth are less or equal to the frequency range and bandwidth of its compatible BTS-CBSD.
3. Judging the last execution step appearing in [n.2] with "User data traffics" instead of "RF transmission."

### 3.4 Time test for getting Grant Procedure

Use the WinnForum SAS Harness run test case WINNF.FT.C.GRA.1. Without answering the last question in WINNF.FT.C.GRA.1 will keep UUT's grant request being rejected, then measure the time.

## 4. Protocol Test Results

### 4.1 [WINNF.FT.C.REG.1] Multi-Step registration

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> <li>• UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
2	<p>CBSD sends correct Registration request information, as specified in [n.5], to the SAS Test Harness:</p> <ul style="list-style-type: none"> <li>• The required <code>userId</code>, <code>fcid</code> and <code>cbsdSerialNumber</code> registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges.</li> <li>• Any REG-conditional or optional registration parameters that may be included in the message shall be verified that they conform to proper format and are within acceptable ranges.</li> </ul> <p>Note: It is outside the scope of this document to test the Registration information that is supplied via another means.</p>	PASS
3	<ul style="list-style-type: none"> <li>• SAS Test Harness sends a CBSD Registration Response as follows: <ul style="list-style-type: none"> <li>– <code>cbsdId</code> = C</li> <li>– <code>measReportConfig</code> shall not be included</li> <li>– <code>responseCode</code> = 0</li> </ul> </li> </ul>	--
4	<p>After completion of step 3, SAS Test Harness will not provide any positive response (<code>responseCode=0</code>) 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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

#### 4.2 [WINNF.FT.C.REG.5] Single-Step registration for CBSD with CPI signed data

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> <li>• All of the required and REG-Conditional parameters shall be configured and CPI signature provided</li> </ul>	--
2	CBSD sends Registration request to the SAS Test Harness: <ul style="list-style-type: none"> <li>• The required <i>userId</i>, <i>fcid</i> and <i>cbsdSerialNumber</i> and REG-Conditional <i>cbsdCategory</i>, <i>airInterface</i>, <i>measCapability</i> and <i>cpiSignatureData</i> registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges.</li> </ul>	PASS
	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	
3	<ul style="list-style-type: none"> <li>• SAS Test Harness sends a CBSD Registration Response as follows:               <ul style="list-style-type: none"> <li>– <i>cbsdId</i> = C</li> <li>– <i>measReportConfig</i> shall not be included.</li> <li>– <i>responseCode</i> = 0</li> </ul> </li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

#### 4.3 [WINNF.FT.C.REG.7] Registration due to change of an installation parameter

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: <ul style="list-style-type: none"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> </ul>	--
2	UUT has successfully registered with SAS Test Harness	--
3	Change an installation parameters at the UUT (time T) Tester needs to record the current time at which the parameter change is executed.	--
4	Monitor the SAS-CBSD interface. UUT sends a deregistrationRequest to the SAS Test Harness The deregistration request shall be sent within (T + 60 seconds) from step 3.	PASS

#### 4.4 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbstdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

#### 4.5 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbstdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

#### 4.6 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbstdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

**4.7 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbstdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

**4.8 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbstdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS



**4.9 [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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT is in the Unregistered state</li> </ul>	--
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"> <li>– SAS response does not include <i>cbsdId</i></li> <li>– <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

**4.10 [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"> <li>• UUT has registered successfully with SAS Test Harness, with <i>cbsdId</i> = C</li> </ul>	--
2	UUT sends valid Grant Request.	--
3	SAS Test Harness sends a Grant Response message, including <ul style="list-style-type: none"> <li>• <i>cbsdId</i>=C</li> <li>• <i>responseCode</i> = R</li> </ul>	--
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"> <li>• UUT shall not transmit RF</li> </ul>	PASS

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

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

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

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

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

**4.14[WINNF.FT.C.HBT.4] Heartbeat responseCode=500 (TERMINATED\_GRANT)**

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

#### 4.15[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"> <li>• UUT has registered successfully with SAS Test Harness</li> <li>• UUT has a valid single grant as follows: <ul style="list-style-type: none"> <li>○ valid <i>cbsdId</i> = C</li> <li>○ valid <i>grantId</i> = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ <i>grantExpireTime</i> = UTC time greater than duration of the test</li> </ul> </li> <li>• UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)</li> </ul>	--
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "GRANTED"</li> </ul>	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>transmitExpireTime</i> = T = current UTC time</li> <li>• <i>responseCode</i> = 501 (SUSPENDED_GRANT)</li> </ul>	--
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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "GRANTED"</li> </ul> <p>B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> </ul> <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> <li>• UUT does not transmit at any time</li> </ul>	PASS

#### 4.16[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"> <li>• UUT has registered successfully with SAS Test Harness</li> <li>• UUT has a valid single grant as follows: <ul style="list-style-type: none"> <li>○ valid <i>cbsdId</i> = C</li> <li>○ valid <i>grantId</i> = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ <i>grantExpireTime</i> = UTC time greater than duration of the test</li> </ul> </li> <li>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--
2	<p>UUT sends a Heartbeat Request message.</p> <p>Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "AUTHORIZED"</li> </ul>	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>transmitExpireTime</i> = T = current UTC time</li> <li>• <i>responseCode</i> = 501 (SUSPENDED_GRANT)</li> </ul>	--
4	<p>After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.</p>	--



#	Test Execution Steps	Results
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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "GRANTED"</li> </ul> <p>B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> </ul> <p>Monitor the RF output of the UUT. Verify:</p>	PASS
	<ul style="list-style-type: none"> <li>• UUT shall stop transmission within (<i>T</i> + 60 seconds) of completion of step 3</li> </ul>	

**4.17[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"> <li>• UUT has registered successfully with SAS Test Harness</li> <li>• UUT has a valid single grant as follows: <ul style="list-style-type: none"> <li>○ valid <i>cbsId</i> = C</li> <li>○ valid <i>grantId</i> = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ <i>grantExpireTime</i> = UTC time greater than duration of the test</li> </ul> </li> <li>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--
2	<p>UUT sends a Heartbeat Request message.</p> <p>Verify Heartbeat Request message is sent within latest specified <i>heartbeatInterval</i>, and is formatted correctly, including:</p> <ul style="list-style-type: none"> <li>• <i>cbsId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "AUTHORIZED"</li> </ul>	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, including the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>transmitExpireTime</i> = T = Current UTC Time</li> <li>• <i>responseCode</i> = 502 (UNSYNC_OP_PARAM)</li> </ul>	--
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"> <li>• UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: <ul style="list-style-type: none"> <li>○ <i>cbsId</i> = C</li> <li>○ <i>grantId</i> = G</li> </ul> </li> </ul> <p>Monitor the RF output of the UUT. Verify:</p> <ul style="list-style-type: none"> <li>• UUT shall stop transmission within (T+60) seconds of completion of step 3.</li> </ul>	PASS

#### 4.18 [WINNF.FT.C.HBT.9] Heartbeat Response Absent (First Heartbeat)

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

**4.19[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"> <li>• UUT has registered successfully with SAS Test Harness</li> <li>• UUT has a valid single grant as follows: <ul style="list-style-type: none"> <li>○ valid <i>cbsdId</i> = C</li> <li>○ valid <i>grantId</i> = G</li> <li>○ grant is for frequency range F, power P</li> <li>○ <i>grantExpireTime</i> = UTC time greater than duration of the test</li> </ul> </li> <li>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface</li> </ul>	--
2	<p>UUT sends a Heartbeat Request message.</p> <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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "AUTHORIZED"</li> </ul>	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>transmitExpireTime</i> = current UTC time + 200 seconds</li> <li>• <i>responseCode</i> = 0</li> </ul>	--
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"> <li>• UUT shall stop all transmission on RF interface within (<i>transmitExpireTime</i> + 60 seconds), using the <i>transmitExpireTime</i> sent in Step 3.</li> </ul>	PASS

**4.20[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"> <li>• UUT has registered successfully with SAS Test Harness</li> <li>• UUT has a valid single grant as follows: <ul style="list-style-type: none"> <li>○ valid <i>cbsdId</i> = C</li> <li>○ valid <i>grantId</i> = G</li> <li>○ grant is for frequency range F, power P</li> </ul> </li> <li>• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface.</li> <li>• Grant has the following parameters at the start of the test: <ul style="list-style-type: none"> <li>○ <i>grantExpireTime</i> = UTC time equal to time at start of test + 300 seconds = Tgrant_expire</li> <li>○ <i>transmitExpireTime</i> = UTC time equal to time at start of test + 200 seconds</li> <li>○ <i>heartbeatInterval</i> = 60 seconds</li> </ul> </li> </ul>	--
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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>operationState</i> = "AUTHORIZED"</li> </ul>	PASS
4	<p>SAS Test Harness sends a Heartbeat Response message, with the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>transmitExpireTime</i> = current UTC + 200 seconds</li> <li>• <i>grantExpireTime</i> = same as Step 1</li> <li>• <i>responseCode</i> = 0</li> </ul>	--
5	Go to Step 2	--

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

**4.21[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i></li> <li>• UUT has received a valid grant with <i>grantId = G</i></li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul> <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"> <li>• <i>cbsdId = C</i></li> <li>• <i>grantId = G</i></li> </ul>	PASS
3	<p>SAS Test Harness shall approve the request with a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none"> <li>– <i>cbsdId = C</i></li> <li>– <i>grantId = G</i></li> <li>– <i>responseCode = 0</i></li> </ul>	--
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"> <li>• UUT shall stop RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</li> </ul>	PASS

**4.22[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId</i>=C</li> <li>• UUT has received a valid grant with <i>grantId</i> = G</li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul>	--
	Invoke trigger to Relinquish UUT Grant from the SAS Test Harness	
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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> </ul>	--
3	<p>SAS Test Harness shall send a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• No <i>grantId</i></li> <li>• <i>responseCode</i> = R</li> </ul>	--
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	<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"> <li>• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</li> </ul>	PASS



**4.23[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId</i>=C</li> <li>• UUT has received a valid grant with <i>grantId</i> = G</li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul>	--
	Invoke trigger to Relinquish UUT Grant from the SAS Test Harness	
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"> <li>• <i>cbsdId</i> = C</li> <li>• <i>grantId</i> = G</li> </ul>	--
3	<p>SAS Test Harness shall send a Relinquishment Response message with parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• No <i>grantId</i></li> <li>• <i>responseCode</i> = R</li> </ul>	--
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	<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"> <li>• UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</li> </ul>	PASS

**4.24[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId=C</i></li> <li>• UUT has received a valid grant with <i>grantId = G</i></li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul> <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"> <li>• <i>cbsdId = C</i></li> <li>• <i>responseCode = 0</i></li> </ul>	--
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"> <li>• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs:</li> </ul> <p>A. UUT sending a Registration Request message, as this is not mandatory</p> <p>B. UUT sending a Deregistration Request message</p>	PASS

#### 4.25[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId</i>=C</li> <li>• UUT has received a valid grant with <i>grantId</i> = G</li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul> <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</i> =0	--
3	UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId</i> = C	--
4	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <ul style="list-style-type: none"> <li>• No <i>cbsdId</i></li> <li>• <i>responseCode</i> = 102</li> </ul>	--
5	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.	--
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"> <li>• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs:</li> </ul> <p>A. UUT sending a Registration Request message, as this is not mandatory</p> <p>B. UUT sending a Deregistration Request message</p>	PASS

#### 4.26[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"> <li>• UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness</li> <li>• UUT has successfully registered with SAS Test Harness, with <i>cbsdId</i>=C</li> <li>• UUT has received a valid grant with <i>grantId</i> = G</li> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> </ul> <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</i> =0	--
3	UUT sends Deregistration Request to SAS Test Harness with <i>cbsdId</i> = C	--
4	<p>The SAS Test Harness sends the Deregistration Response Message to UUT with:</p> <ul style="list-style-type: none"> <li>• No <i>cbsdId</i></li> <li>• <i>responseCode</i> = 103</li> </ul>	--
5	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.	--
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"> <li>• UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs:</li> <li>C. UUT sending a Registration Request message, as this is not mandatory</li> <li>D. UUT sending a Deregistration Request message</li> </ul>	PASS

#### 4.27[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"> <li>UUT shall start CBSD-SAS communication with the security procedure</li> <li>The UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate.</li> <li>Configure the SAS Test Harness to accept the security procedure and establish the connection</li> </ul>	PASS
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
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"> <li>UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with <i>responseCode</i> = 0 and <i>cbsdId</i>.</li> </ul>	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"> <li>UUT shall not transmit RF</li> </ul>	PASS

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

#	Test Execution Steps	Results
1	<ul style="list-style-type: none"> <li>UUT shall start CBSD-SAS communication with the security procedures</li> </ul>	PASS
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
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	<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"> <li>UUT shall not transmit RF</li> </ul>	PASS

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

#	Test Execution Steps	Results
1	<ul style="list-style-type: none"> <li>UUT shall start CBSD-SAS communication with the security procedures</li> </ul>	PASS
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
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"> <li>UUT shall not transmit RF</li> </ul>	PASS

**4.30[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"> <li>UUT shall start CBSD-SAS communication with the security procedures</li> </ul>	PASS
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
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"> <li>UUT shall not transmit RF</li> </ul>	PASS

#### 4.31 [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"> <li>UUT shall start CBSD-SAS communication with the security procedures</li> </ul>	PASS
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
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	<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"> <li>UUT shall not transmit RF</li> </ul>	PASS



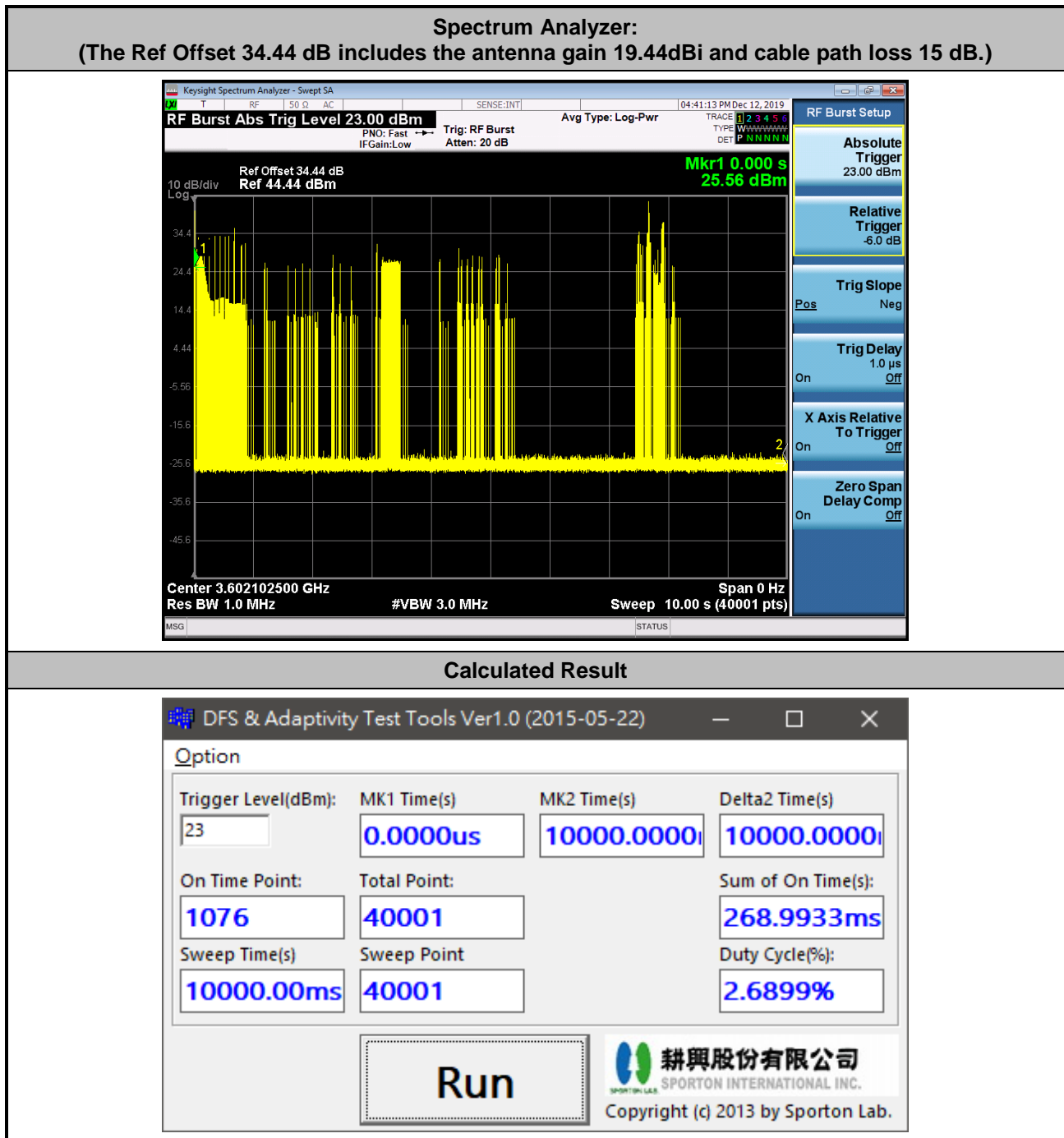
#### 4.32[WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

#	Test Execution Steps	Results
1	<p>Ensure the following conditions are met for test entry:</p> <ul style="list-style-type: none"> <li>• UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness</li> <li>• UUT has registered with the SAS, with CBSD ID = C</li> <li>• 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</li> </ul> <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"> <li>• UUT sends Heartbeat Request, including: <ul style="list-style-type: none"> <li>○ cbsdId = C</li> <li>○ grantId = G</li> </ul> </li> <li>• SAS Test Harness responds with Heartbeat Response, including: <ul style="list-style-type: none"> <li>○ cbsdId = C</li> <li>○ grantId = G</li> <li>○ transmitExpireTime = current UTC time + 200 seconds</li> <li>○ responseCode = 0</li> </ul> </li> </ul>	--

#	Test Execution Steps	Results
3	<p>Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, <math>P_i</math>. 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

## 5. Result of Time test for getting Grant

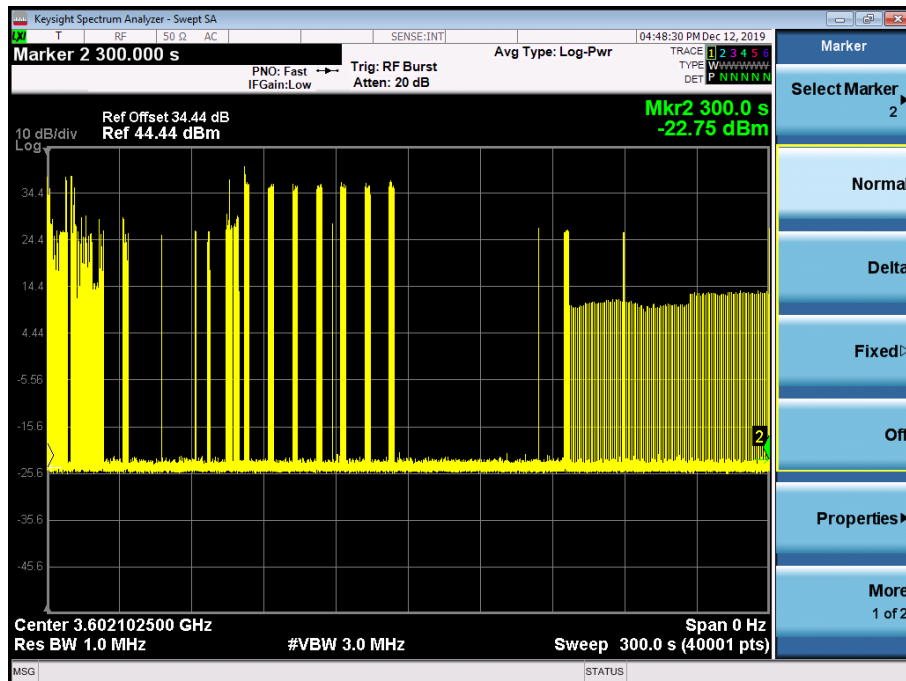
### 5.1 1 second within any 10-second period



The sum of On Time (aggregated time from marker 1 to 2): 0.26s < 1s = Pass

## 5.2 10 seconds within any 300-second period

**Spectrum Analyzer:**  
(The Ref Offset 34.44 dB includes the antenna gain 19.44dBi and cable path loss 15 dB.)



### Calculated Result



The screenshot shows the DFS & Adaptivity Test Tools Ver1.0 (2015-05-22) interface. It displays various parameters and calculated results:

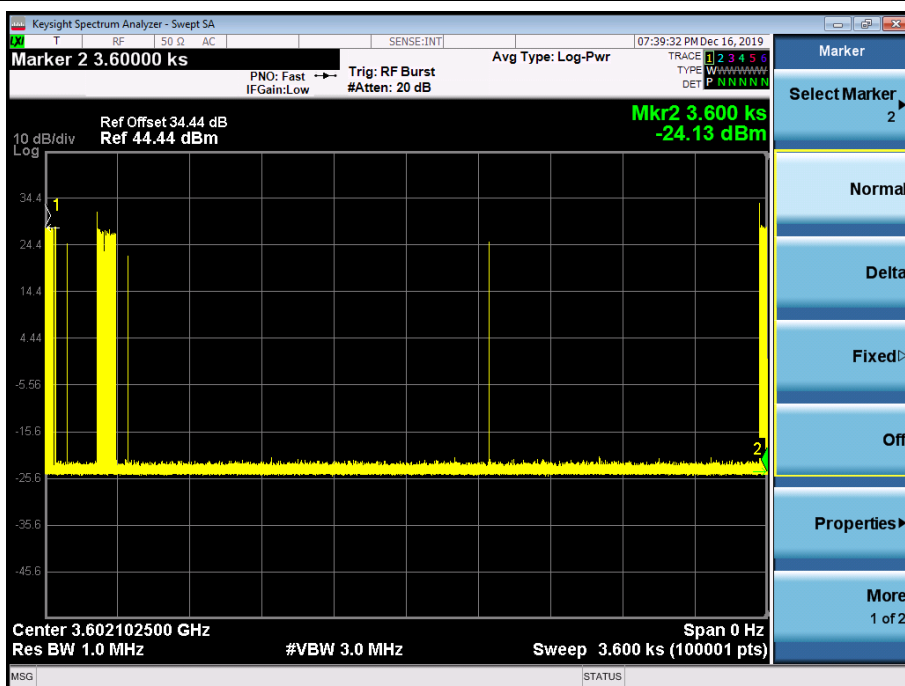
Option	Trigger Level(dBm):	MK1 Time(s)	MK2 Time(s)	Delta2 Time(s)
	23	0.0000us	300000.0000	300000.0000
On Time Point:	758	Total Point:	40000	Sum of On Time(s):
				5685.0000m
Sweep Time(s)	300000.00m	Sweep Point	40001	Duty Cycle(%):
				1.8950%

Below the table is a large "Run" button. At the bottom right, there is a logo for 耕興股份有限公司 (Sporton International Inc.) and the text "Copyright (c) 2013 by Sporton Lab."

**The sum of On Time (aggregated time from marker 1 to 2): 5.68s < 10s = Pass**

### 5.3 20 seconds within any 3600-second period

**Spectrum Analyzer:**  
(The Ref Offset 34.44 dB includes the antenna gain 19.44dBi and cable path loss 15 dB.)



#### Calculated Result

DFS & Adaptivity Test Tools Ver1.0 (2015-05-22)

Option

Trigger Level(dBm): 23	MK1 Time(s): 0.0000us	MK2 Time(s): 3600000.000	Delta2 Time(s): 3600000.000
On Time Point: 280	Total Point: 100000	Sum of On Time(s): 10080.0000	
Sweep Time(s): 3600000.000	Sweep Point: 100001	Duty Cycle(%): 0.2800%	

**Run**


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The sum of On Time (aggregated time from marker 1 to 2): 10.08s < 20s = Pass

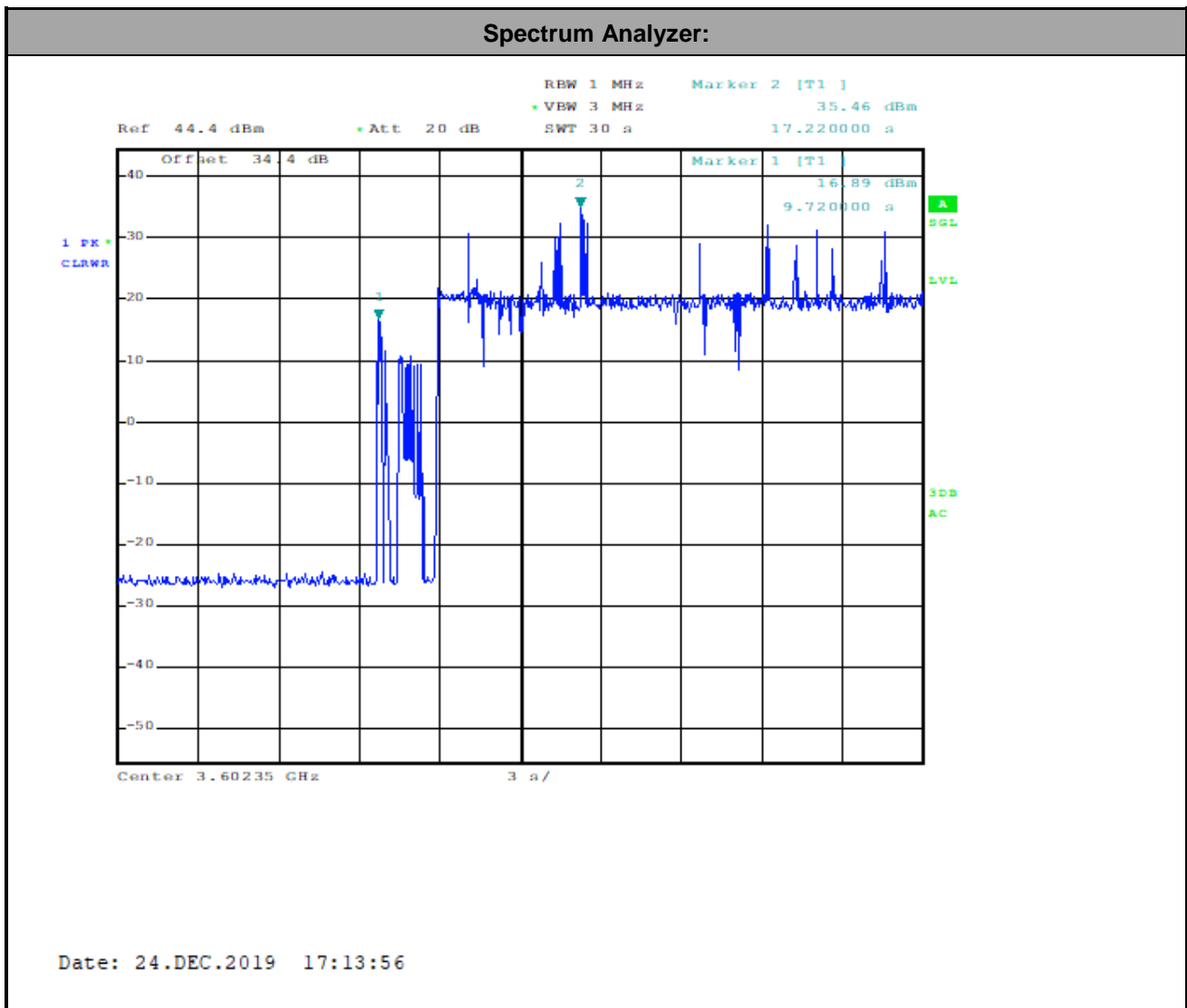
## 6. UUT register with the SAS irrespective of power levels

### 6.1 Test Procedure

1. Ensure the UUT power be below 23 dBm EIRP.
2. Make SAS test harness to grant UUT power level above 23 dBm EIRP
3. Enable UUT, then check UUT power will follow the power limit that SAS test harness authorized.

### 6.2 Result

The UUT will register with the SAS irrespective of power levels at which the device is set to operate – even below 23 dBm.



Note : The Ref Offset 34.44 dB includes the antenna gain 19.44 dBi and cable path loss 15 dB.

Marker 1 : Signal power before UUT is authorized by the SAS,

Marker 2 : Signal power after UUT is authorized by the SAS.

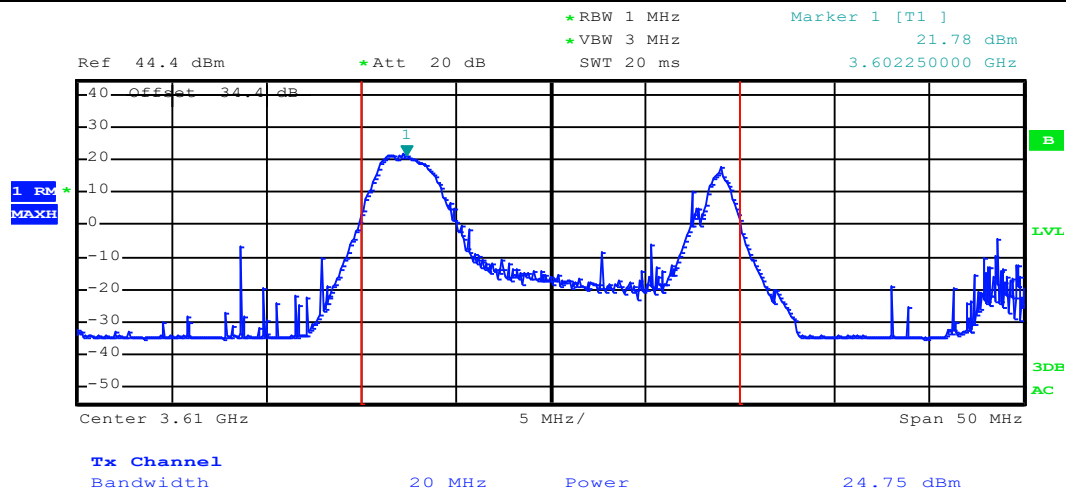
## Appendix B RF measurement plots

Report Clause 4.32 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

SAS authorizes MaxEirp (dBm/MHz)	UUT EIRP PSD (dBm/MHz)
23	21.78 dBm
25	23.89 dBm
27	25.68 dBm
29	27.86 dBm
31	29.55 dBm
33	31.31 dBm
35	32.24 dBm
37	32.92 dBm

Note : The Ref Offset 34.44 dB includes the antenna gain 19.44 dBi and cable path loss 15 dB.

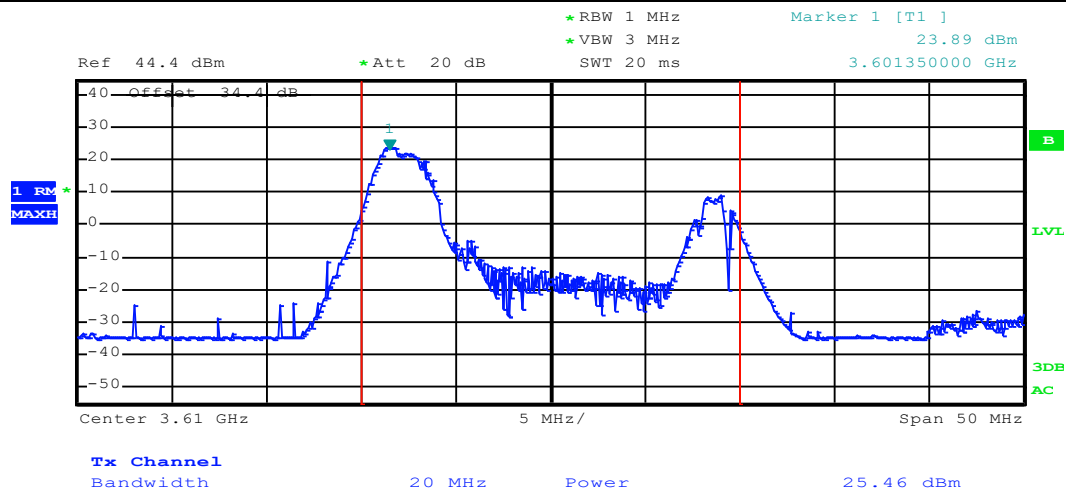
## MaxEirp 23



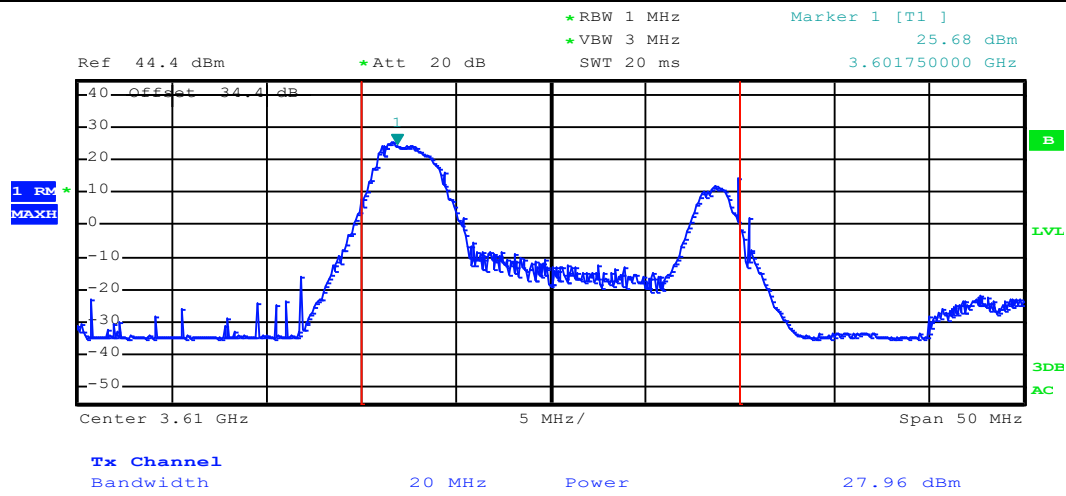
Date: 24.DEC.2019 10:30:39



MaxEirp 25



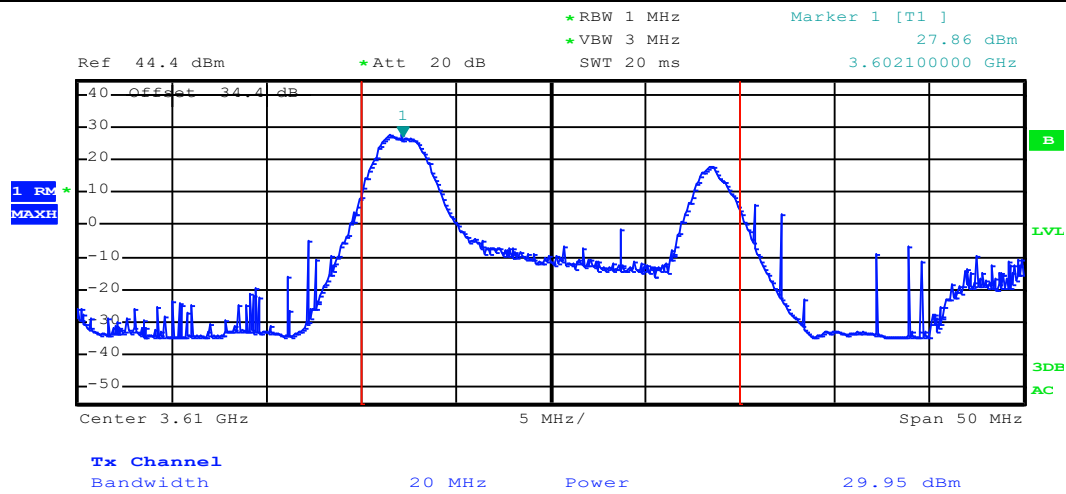
Date: 24.DEC.2019 10:39:35

**MaxEirp 27**


Date: 24.DEC.2019 10:44:37

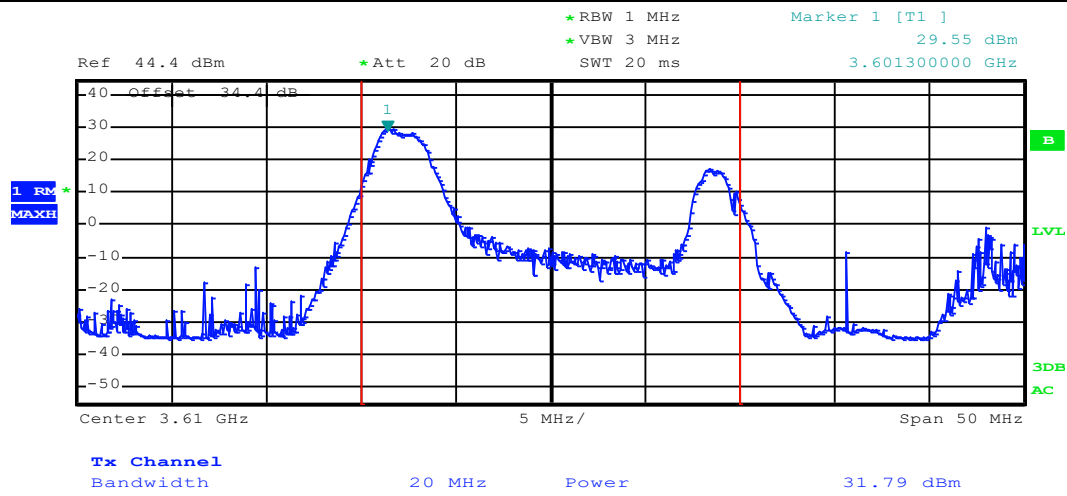


MaxEirp 29



Date: 24.DEC.2019 10:52:11

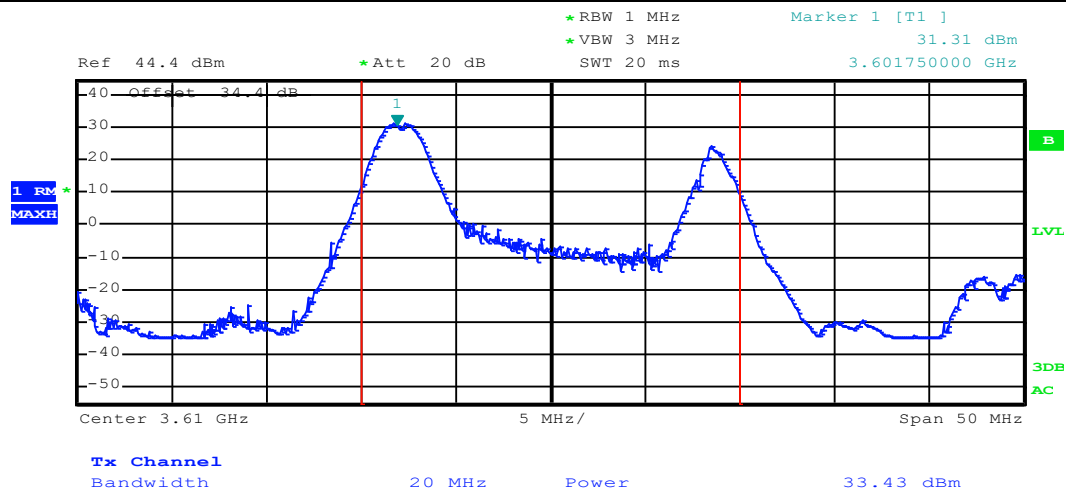
## MaxEirp 31



Date: 24.DEC.2019 10:55:29



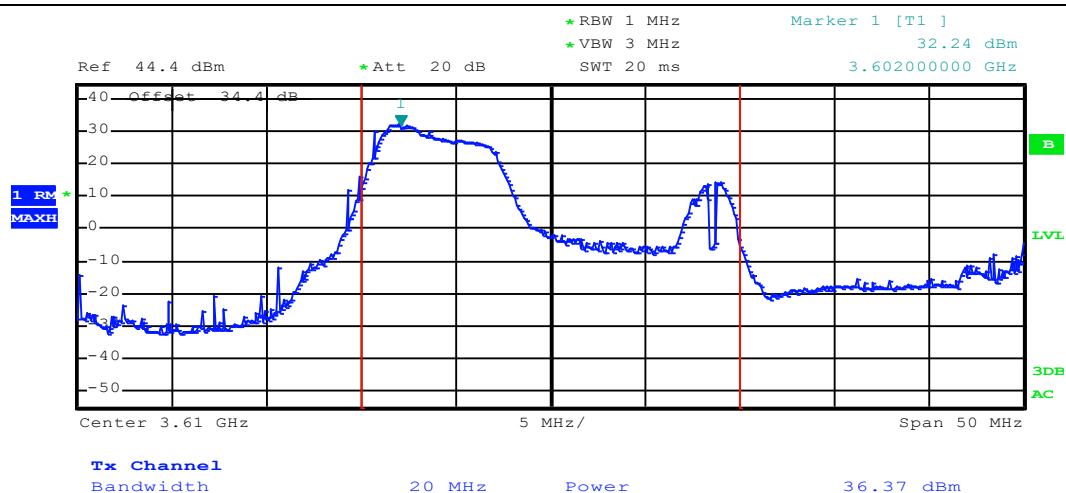
MaxEirp 33



Date: 24.DEC.2019 12:55:20

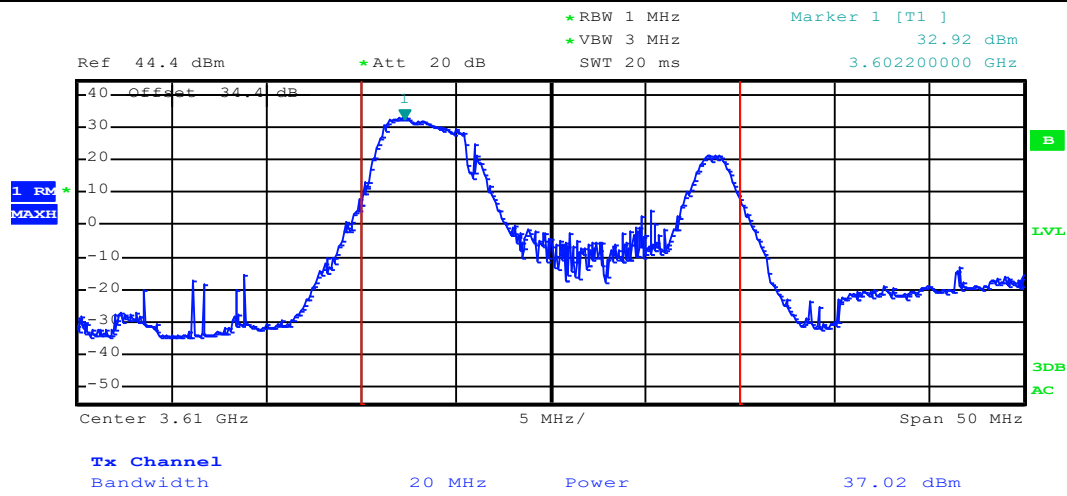


MaxEirp 35



Date: 24.DEC.2019 13:29:37

## MaxEirp 37



Date: 24.DEC.2019 13:34:53