



# WINNF-TS-0122 Test Report

Applicant	Ruckus Wireless Inc.
Equipment	LTE Access Point
Brand Name	RUCKUS
Model Number	Q950-US02
Marketing Name	Q950
FCC ID	S9GQ950US02
Reference	WINNF-TS-0122 Version V1.0.1

The product was received on Oct. 29, 2020 and testing was started from Oct. 29, 2020 and completed on Nov. 18, 2020. We, SPORTON INTERNATIONAL (USA) INC., 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 test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (USA) INC., the test report shall not be reproduced except in full.



Approved by: Neil Kao

**Sporton International (USA) Inc.**  
1175 Montague Expressway, Milpitas, CA 95035



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**Appendix A. Setup Plot**

**Appendix B. RF measurement plots**





## 1. Administration Data

### 1.1 Testing Laboratory

<b>Test Site</b>	Sporton International (USA) Inc.
<b>Test Site Location</b>	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300
<b>Test Engineer</b>	Janssen Wongso
<b>Temperature</b>	18 ~ 22 °C
<b>Relative Humidity</b>	45 ~ 53 %

### 1.2 Applicant

<b>Company Name</b>	Ruckus Wireless Inc.
<b>Address</b>	350 W. Java Dr., Sunnyvale CA 94089

## 2. General Information

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

Product Feature & Specification	
EUT Type	LTE Access Point
Brand Name	RUCKUS
Model Name	Q950-US02
Marketing Name	Q950
FCC ID	S9GQ950US02
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 Serial Number	972035000065
UUT HW Version	1.0
UUT SW Version	4.1.0.22
UUT Antenna Gain	13 dBi
Device Power Class	LTE Band 48: Power Class 3

**Remark:** The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

## 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
6.5.4.2.1	WINNF.FT.C.MES.1	Registration Response contains measReportConfig	PASS
6.5.4.2.3	WINNF.FT.C.MES.3	Grant Response contains measReportConfig	PASS
6.5.4.2.4	WINNF.FT.C.MES.4	Heartbeat Response contains measReportConfig	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
6.6.4.3.1	WINNF.FT.C.RLQ.5	Unsuccessful Relinquishment, responseCode=103	PASS

### 2.3 Test Equipment List

Name	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Spectrum Analyzer	Keysight	N9010A	MY57420221	2020-09-11	2021-09-10

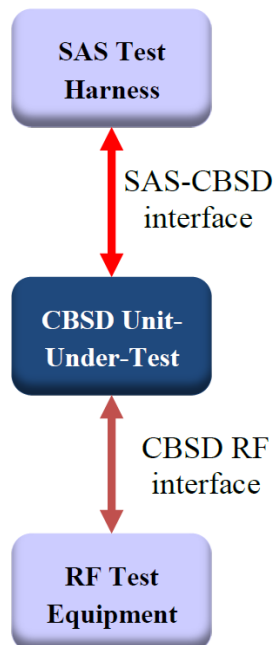


### 3. Measurement Environment

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
Yes	C1	Mandatory for UUT which supports multi-step registration message
No	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.
Yes	C3	Mandatory for UUT which supports single-step registration containing CPIsigned data in the registration message.
Yes	C4	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type
Yes	C5	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.
Yes	C6	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



Note:

The UUT supports single RF carrier and multiple RF carriers (i.e contiguous and non-contiguous carriers).

For single carrier and contiguous carriers, all follow and comply with SAS test harness. For non-contiguous carriers which use multiple grant requests, however, one of two GrantRequests is disabled and used to complete and meet all test cases of SAS test harness, due to the fact that the WinnForum SAS (v1.0.0.3) supports single GrantRequest only at time being of product test.

### 3.2 Standards

[n.1]. WINNF-TS-0122 Version 1.0.1, “Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)”, 28 September 2018

[n.2]. WINNF-TS-0016 Version 1.2.5, “SAS to CBSD Technical Specification”, 18 May 2020

## 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 = C</code></li> <li>– <code>measReportConfig</code> shall not be included</li> <li>– <code>responseCode = 0</code></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>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> =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>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> =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>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> =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>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> =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>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> =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=201</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"> <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 = C</i></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=C</i></li><li>• <i>responseCode = R</i></li></ul>	--
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"><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 = C</i></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=C</i></li><li>• <i>responseCode = R</i></li></ul>	--
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"><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 = C</i></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 = C</i></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 = C</i></li> <li>availableChannel is an array of availableChannel objects</li> <li><i>responseCode = 0</i></li> </ul>	--
5	UUT sends Grant Request message. Validate: <ul style="list-style-type: none"> <li><i>cbsdId = C</i></li> <li>maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96</li> <li>operationFrequencyRange, 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 = C</i></li> <li><i>grantId = G = a valid grant ID</i></li> <li>grantExpireTime = UTC time greater than duration of the test</li> <li><i>responseCode = 0</i></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 = C</i></li> <li><i>grantId = G</i></li> <li><i>operationState = "GRANTED"</i></li> </ul>	PASS

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. 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. 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>cbdsId</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. 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>	--

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>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. 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>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> = 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>cbdsId</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.  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> <li>• <i>operationState</i> = "GRANTED"</li> </ul>	PASS
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.  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	--
6	<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> </ul>	PASS



	<ul style="list-style-type: none"> <li>• <i>grantId</i> = G</li> </ul>	
	<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.MES.1] Registration Response contains measReportConfig**

#	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 sends a Registration Request message. Validate the Registration Request message is formatted correctly, including: <ul style="list-style-type: none"> <li>• <i>userId</i> is present and correct</li> <li>• <i>fcId</i> is present and correct</li> <li>• <i>cbsdSerialNumber</i> is present and correct</li> <li>• <i>measCapability</i> = "RECEIVED_POWER_WITHOUT_GRANT"</li> </ul>	PASS
3	SAS Test Harness sends a Registration Response message, with the following parameters: <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C = valid cbsdId for this UUT</li> <li>• <i>measReportConfig</i>= "RECEIVED_POWER_WITHOUT_GRANT"</li> <li>• <i>responseCode</i> = 0</li> </ul>	--
4	UUT sends a message: <ul style="list-style-type: none"> <li>• If message is type Spectrum Inquiry Request, go to step 5, or</li> <li>• If message is type Grant Request, go to step 7</li> </ul>	--
5	UUT sends message type Spectrum Inquiry Request. Verify message contains all required parameters properly formatted, and specifically: <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.</li> </ul>	PASS
6	SAS Test Harness sends a Spectrum Inquiry Response, with the following parameters: <ul style="list-style-type: none"> <li>• <i>cbsdId</i> = C</li> <li>• <i>availableChannel</i> is an array of <i>availableChannel</i> objects</li> <li>• <i>responseCode</i> = 0</li> </ul>	--



7	UUT sends message type Grant Request message. Verify message contains all required parameters properly formatted, and specifically: <ul style="list-style-type: none"><li>• <i>cbsdId</i> = C</li><li>• <i>measReport</i> is present, and is a properly formatted <i>rcvdPowerMeasReport</i>.</li></ul>	PASS
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4.22[WINNF.FT.C.MES.3] Grant Response contains measReportConfig

#	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> and <i>measCapability = "RECEIVED_POWER_WITH_GRANT"</i></li> </ul>	--
2	<p>UUT sends a Grant Request message. Verify Grant Request message contains all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId = C</i></li> <li>• <i>operationParam</i> is present and format is valid</li> </ul>	PASS
3	<p>SAS Test Harness sends a Grant Response message, with the following parameters:</p> <ul style="list-style-type: none"> <li>• <i>cbsdId = C</i></li> <li>• <i>grantId = G = valid grant ID</i></li> <li>• <i>grantExpireTime = UTC time in the future</i></li> <li>• <i>heartbeatInterval = 60 seconds</i></li> </ul>	--
	<ul style="list-style-type: none"> <li>• <i>measReportConfig= "RECEIVED_POWER_WITH_GRANT"</i></li> <li>• <i>operationParam</i> is set to valid operating parameters</li> <li>• <i>channelType = "GAA"</i></li> <li>• <i>responseCode = 0</i></li> </ul>	
4	<p>UUT sends a Heartbeat 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> <li>• <i>operationState = "GRANTED"</i></li> </ul>	PASS
5	<p>If Heartbeat Request message (step 4) contains <i>measReport</i> object, then:</p> <ul style="list-style-type: none"> <li>• verify <i>measReport</i> is properly formatted as object <i>rcvdPowerMeasReport</i></li> <li>• end test, with PASS result</li> </ul> <p>else, if Heartbeat Request message (step 4) does not contain <i>measReport</i> object, then:</p>	PASS



	If number of Heartbeat Requests sent by UUT after Step 3 is = 5, then stop test with result of FAIL	
6	SAS Test Harness sends a Heartbeat Response message, containing all required parameters properly formatted, and specifically: <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> Go to Step 4, above	--

4.23[WINNF.FT.C.MES.4] Heartbeat Response contains measReportConfig

#	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> and <i>measCapability = "RECEIVED_POWER_WITH_GRANT"</i></li> <li>• UUT has received a valid grant with <i>grantId = G</i></li> </ul>	--
	<ul style="list-style-type: none"> <li>• UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.</li> <li>• Grant has <i>heartbeatInterval = 60</i> seconds</li> </ul>	
2	<p>UUT sends a Heartbeat Request message. Verify Heartbeat Request 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> <li>• <i>operationState = "AUTHORIZED"</i></li> </ul>	PASS
3	<p>SAS Test Harness sends a Heartbeat Response message, containing 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> <li>• <i>measReportConfig= "RECEIVED_POWER_WITH_GRANT"</i></li> <li>• <i>responseCode = 0</i></li> </ul>	--
4	<p>UUT sends a Heartbeat 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> <li>• <i>operationState = "AUTHORIZED"</i></li> </ul>	PASS

5	<p>If Heartbeat Request message (step 4) contains <i>measReport</i> object, then:</p> <ul style="list-style-type: none"> <li>• verify <i>measReport</i> is properly formatted as object <i>rcvdPowerMeasReport</i></li> <li>• end test, with PASS result</li> </ul> <p>else, if Heartbeat Request message (step 4) does not contain <i>measReport</i> object, then:</p> <ul style="list-style-type: none"> <li>• If number of Heartbeat Requests sent by UUT after Step 3 is = 5, then stop test with result of FAIL</li> </ul>	PASS
6	<p>SAS Test Harness sends a Heartbeat Response message, containing all required parameters properly formatted, and specifically:</p> <ul style="list-style-type: none"> <li>• <i>cbsdlid</i> = C</li> <li>• <i>grantId</i> = G</li> <li>• <i>responseCode</i> = 0</li> </ul> <p>Go to Step 4, above</p>	--

4.24[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



4.25[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=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>	--
	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 = C</i></li> <li>• <i>grantId = G</i></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 = C</i></li> <li>• No <i>grantId</i></li> <li>• <i>responseCode = R</i></li> </ul>	--
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	<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

4.26[WINNF.FT.C.RLQ.5] Unsuccessful Relinquishment, 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 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>	--
	Invoke trigger to Relinquish UUT Grant from the SAS Test Harness	
2	UUT sends a Relinquishment Request message. Verify message contains all required parameters properly formatted, and specifically: <ul style="list-style-type: none"> <li>• <i>cbsdId = C</i></li> <li>• <i>grantId = G</i></li> </ul>	--
3	SAS Test Harness shall send a Relinquishment Response message with parameters: <ul style="list-style-type: none"> <li>• <i>cbsdId = C</i></li> <li>• No <i>grantId</i></li> <li>• <i>responseCode = R</i></li> </ul>	--
4	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.	--
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 stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request</li> </ul>	PASS

4.27[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: <ul style="list-style-type: none"> <li>A. UUT sending a Registration Request message, as this is not mandatory</li> <li>B. UUT sending a Deregistration Request message</li> </ul> </li> </ul>	PASS

4.28[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=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>	--
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 = 102</i></li> </ul>	--
5	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.	--
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: <ul style="list-style-type: none"> <li>A. UUT sending a Registration Request message, as this is not mandatory</li> <li>B. UUT sending a Deregistration Request message</li> </ul> </li> </ul>	PASS

4.29[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=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>	--
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 = 103</i></li> </ul>	--
5	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.	--
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: <ul style="list-style-type: none"> <li>A. UUT sending a Registration Request message, as this is not mandatory</li> <li>B. UUT sending a Deregistration Request message</li> </ul> </li> </ul>	PASS

**4.30[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 = 0</i> and <i>cbstdId</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

**4.31 [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	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

**4.32[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



**4.33[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

**4.34[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	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

4.35[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 CBSID 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>	--



3	<p>Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. 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
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## Appendix B. RF measurement plots

Report Clause 4.35 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

1 Carrier:

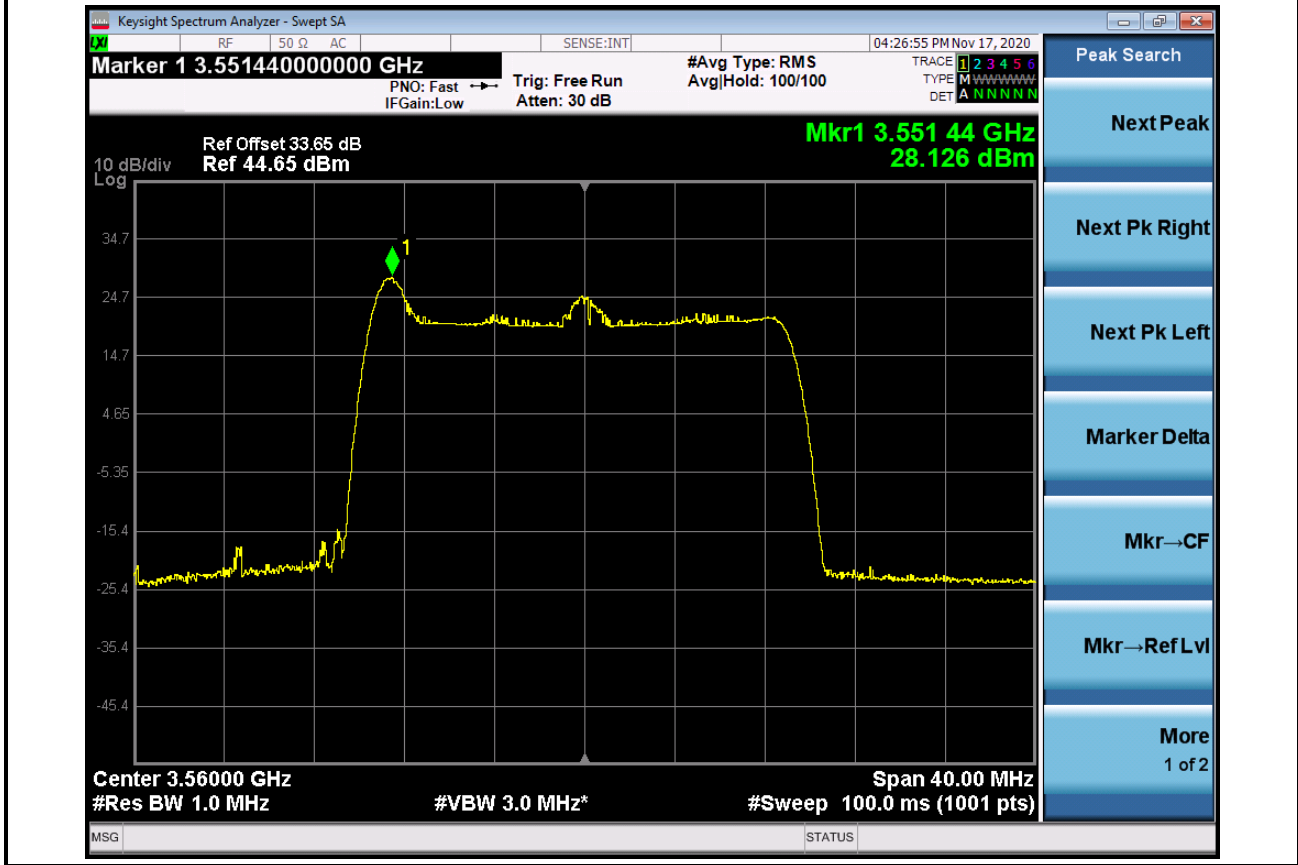
Center Frequency [MHz]	Bandwidth [MHz]	Granted maxEIRP [dBm/MHz]	Conducted PSD [dBm/MHz]	Antenna Gain [dBi]	UUT MaxEIRP [dBm/MHz]
3560	20	31	15.126	13	28.126 dBm
3580		32	16.470		29.470 dBm
3600		33	19.615		32.615 dBm
3620		34	20.751		33.751 dBm
3640		35	21.742		34.742 dBm
3660		36	22.204		35.204 dBm
3690		37	22.381		35.381 dBm

**Note :** The Spectrum Analyzer Ref Offset 33.65 dB includes the antenna gain 13 dBi and cable path loss 20.65 dB.



SAS Granted MaxEIRP 31 [dBm/MHz]

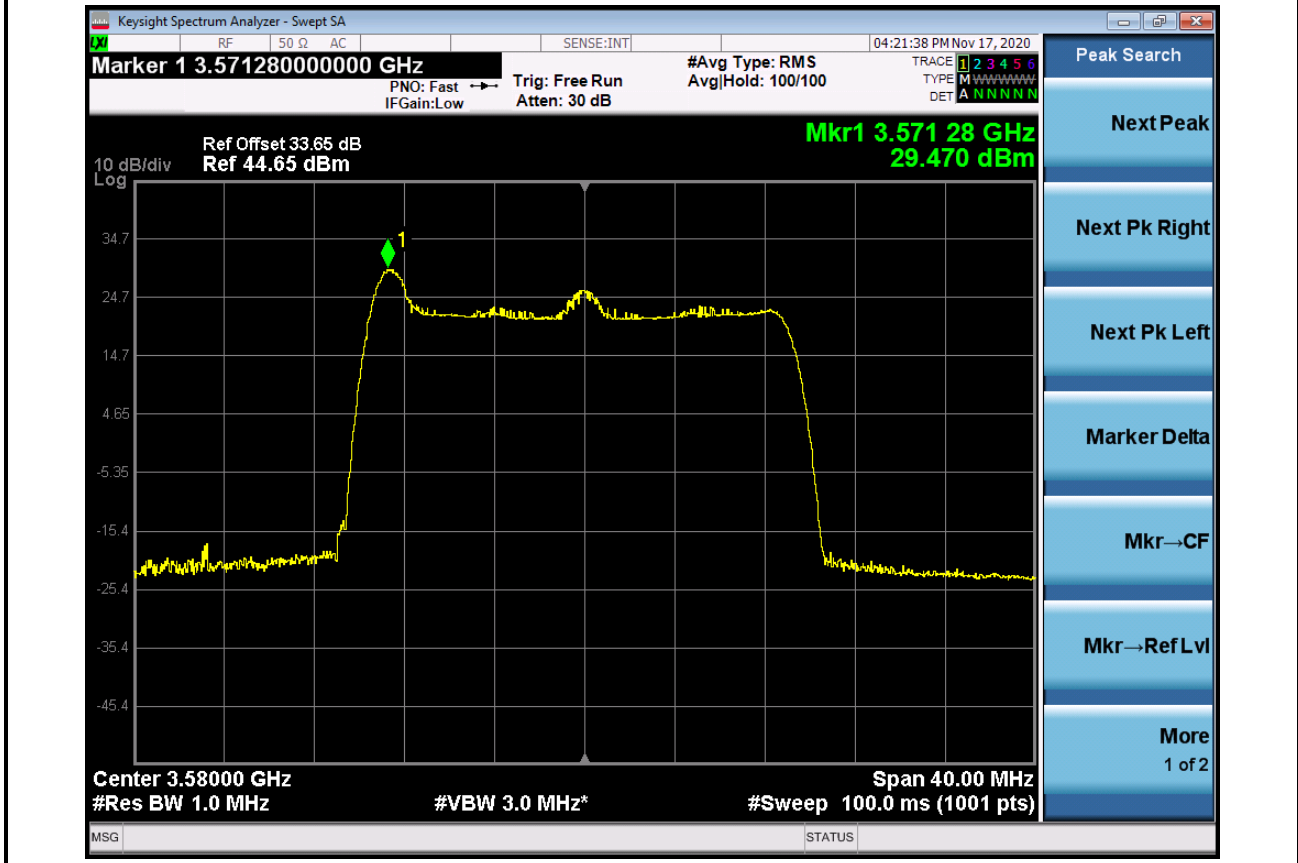
1 Carrier: UUT MaxEIRP 28.126 [dBm/MHz]





SAS Granted MaxEIRP 32 [dBm/MHz]

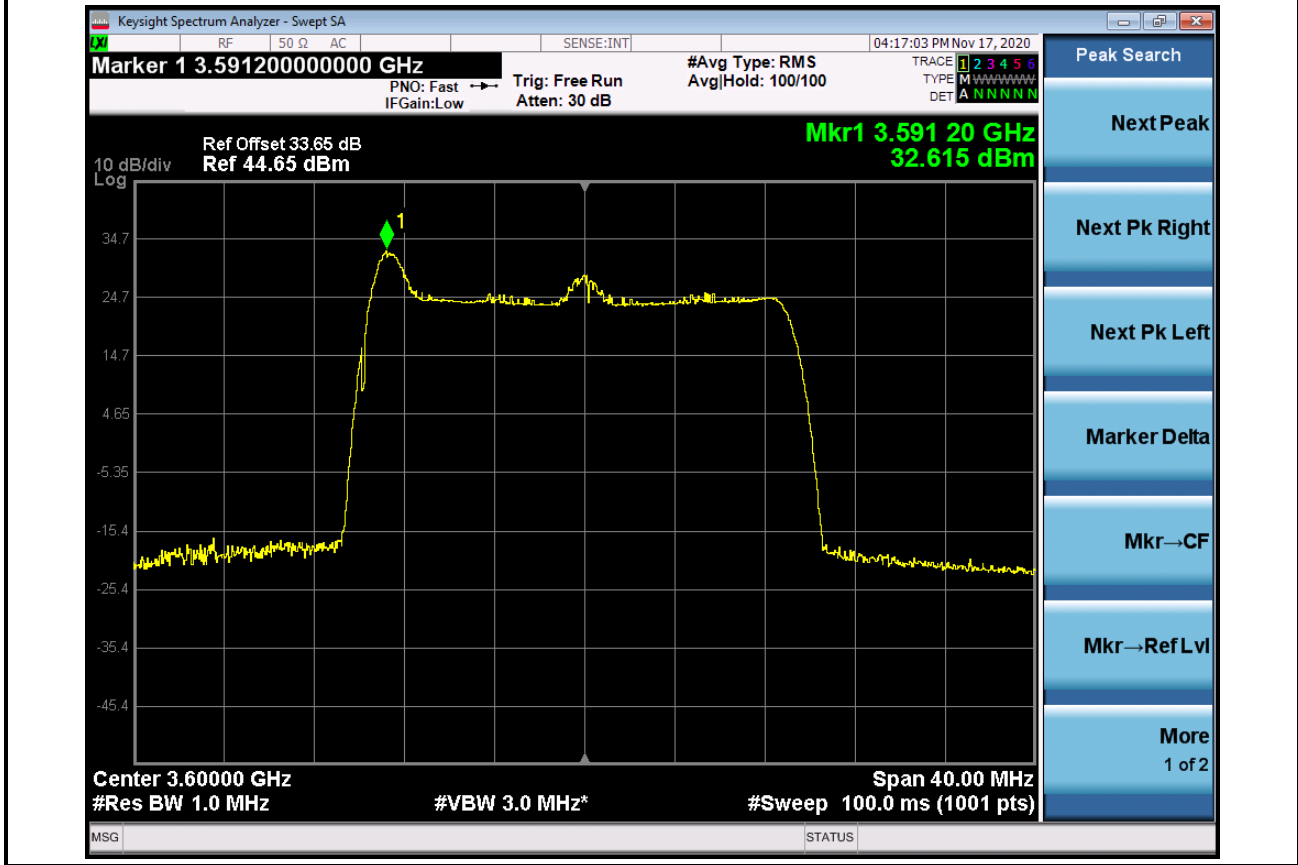
1 Carrier: UUT MaxEIRP 29.470 [dBm/MHz]





SAS Granted MaxEIRP 33 [dBm/MHz]

1 Carrier: UUT MaxEIRP 32.615 [dBm/MHz]



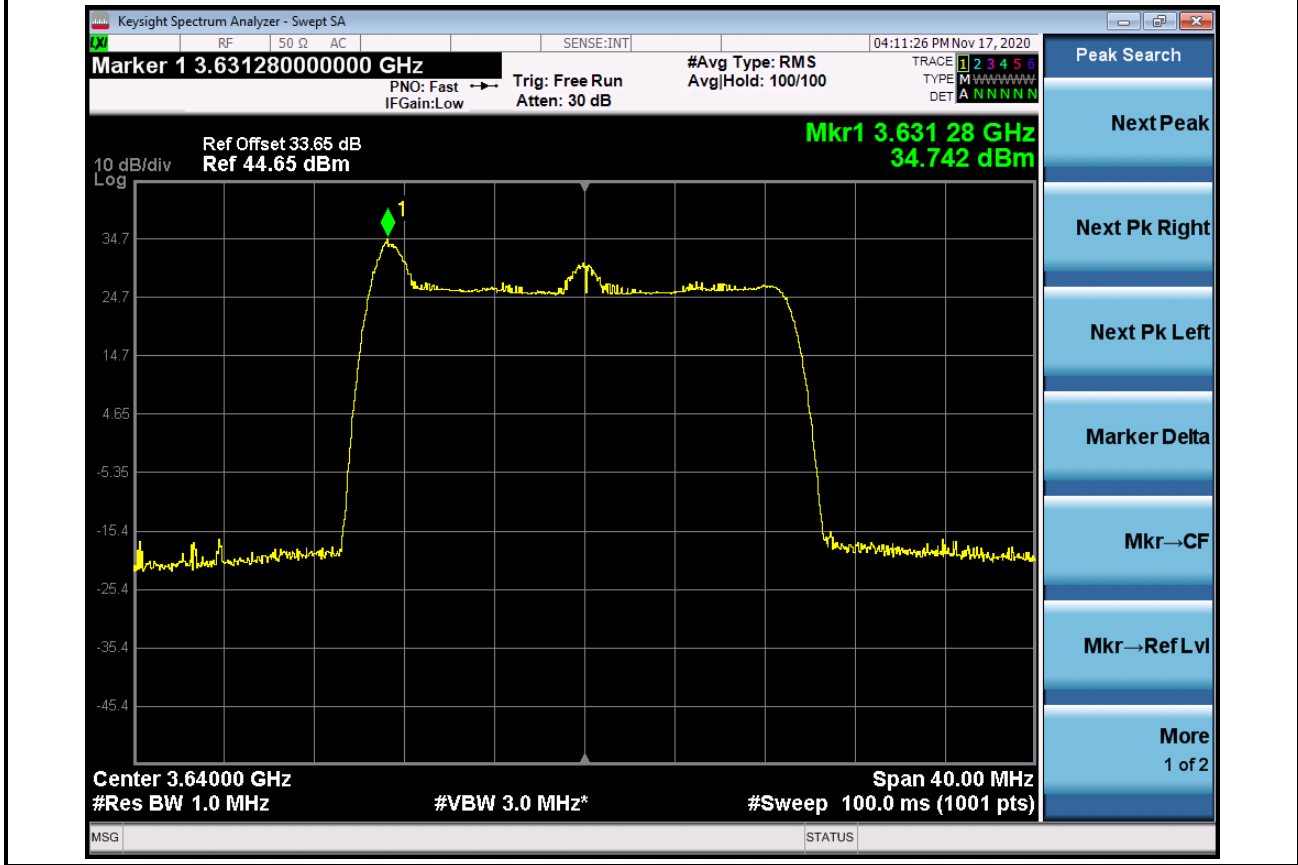






SAS Granted MaxEIRP 35 [dBm/MHz]

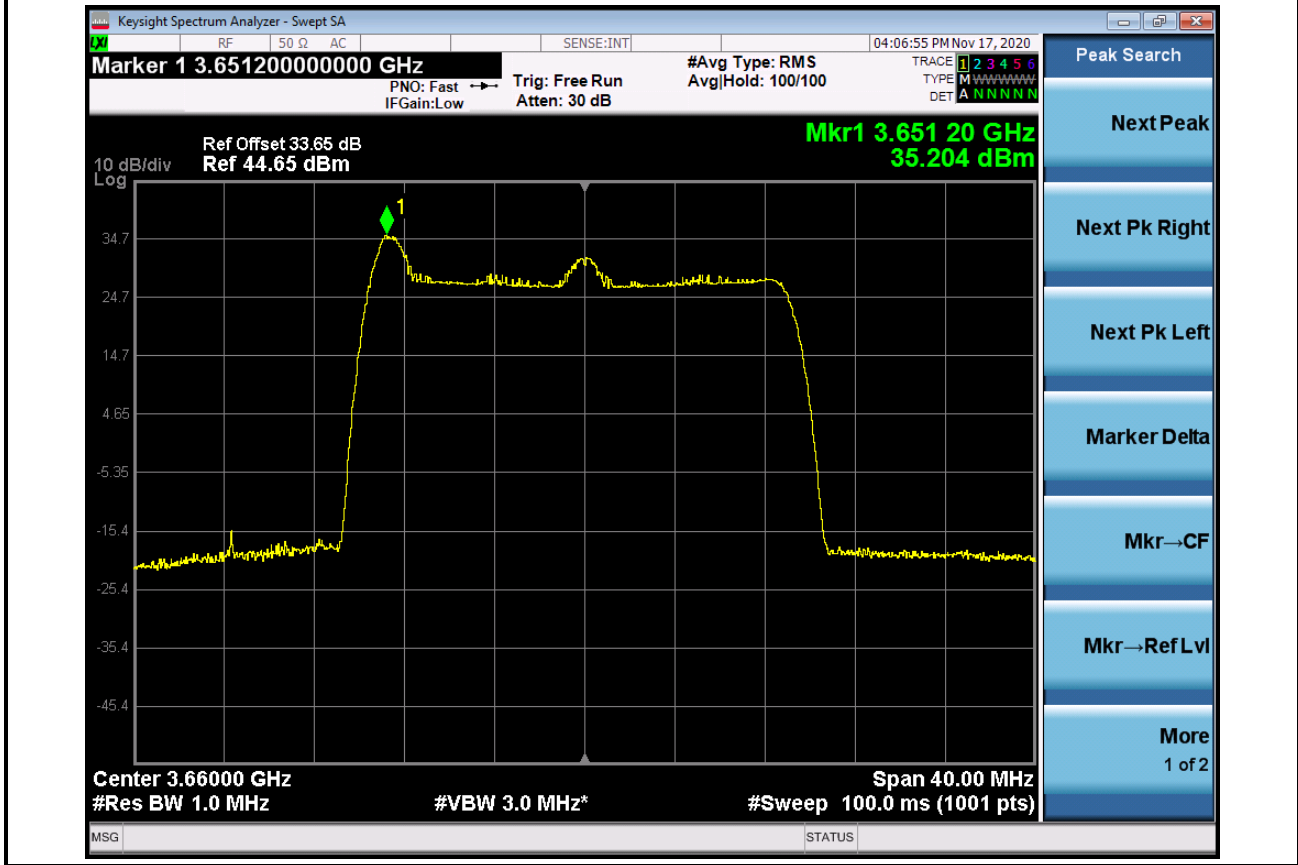
1 Carrier: UUT MaxEIRP 34.742 [dBm/MHz]





SAS Granted MaxEIRP 36 [dBm/MHz]

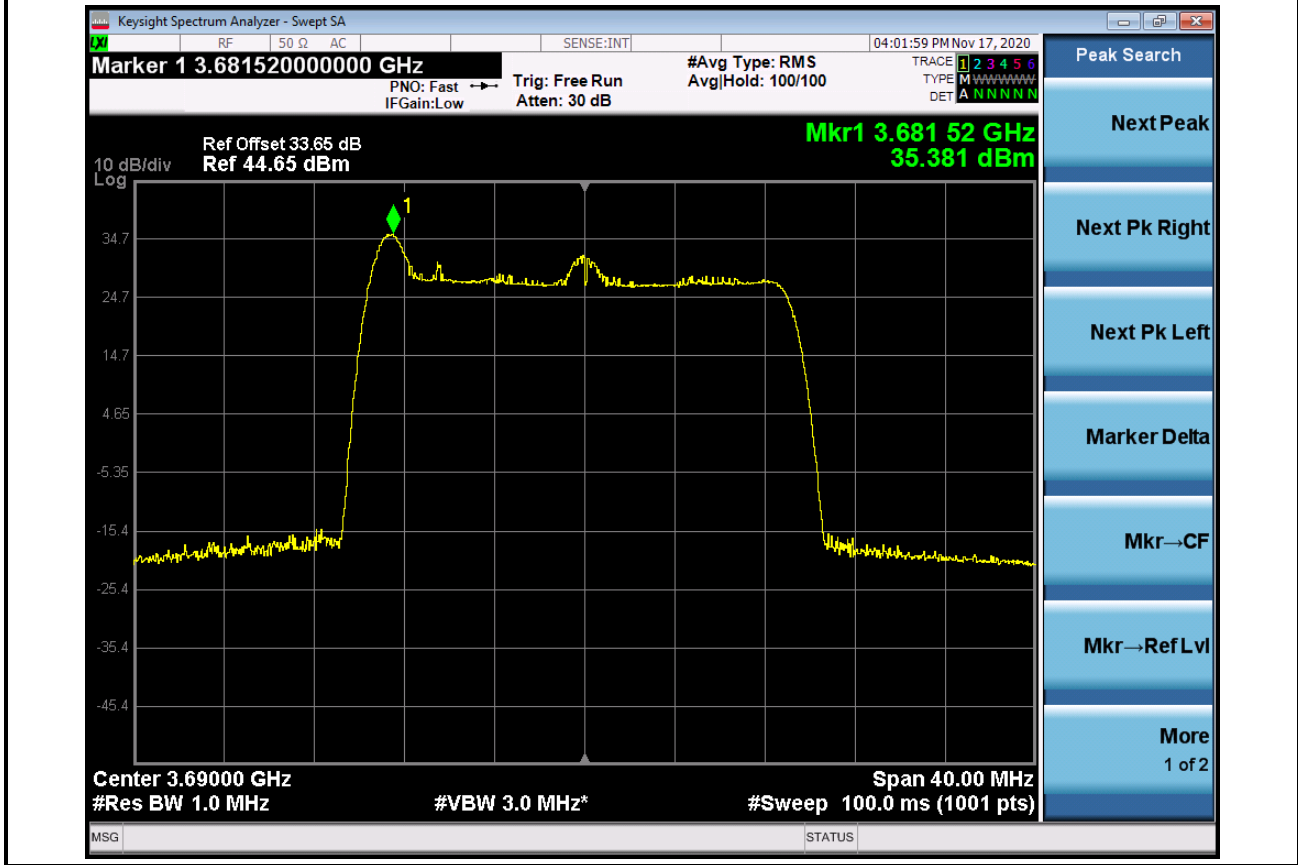
1 Carrier: UUT MaxEIRP 35.204 [dBm/MHz]





SAS Granted MaxEIRP 37 [dBm/MHz]

1 Carrier: UUT MaxEIRP 35.381 [dBm/MHz]

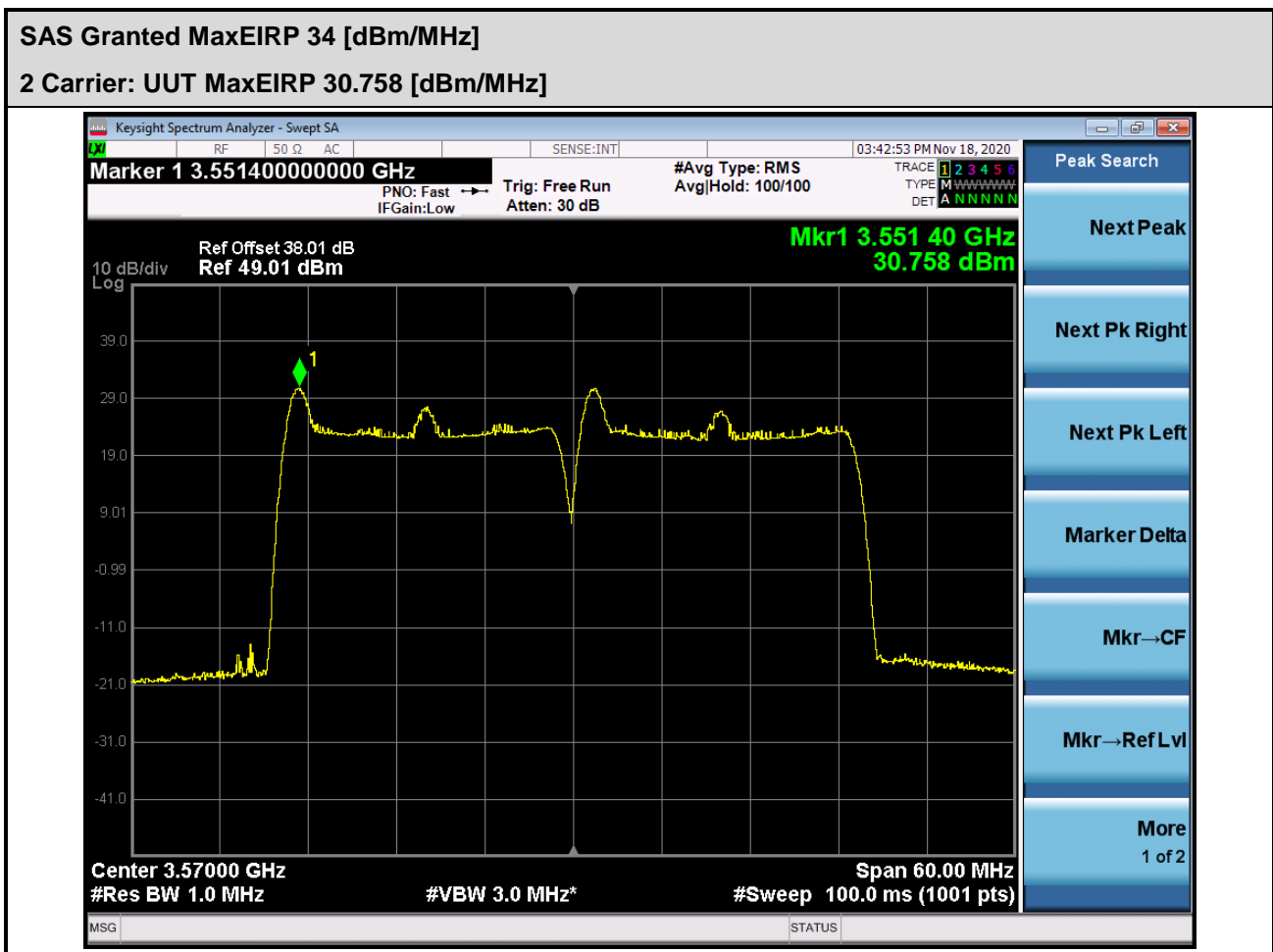




2 Carrier:

Center Frequency [MHz]	Bandwidth [MHz]	Granted maxEIRP [dBm/MHz]	Conducted PSD [dBm/MHz]	Antenna Gain [dBi]	UUT MaxEIRP [dBm/MHz]
3570	40	34	17.758	13	30.758 dBm
3610		35	20.979		33.979 dBm
3650		36	21.585		34.585 dBm
3680		37	22.242		35.242 dBm

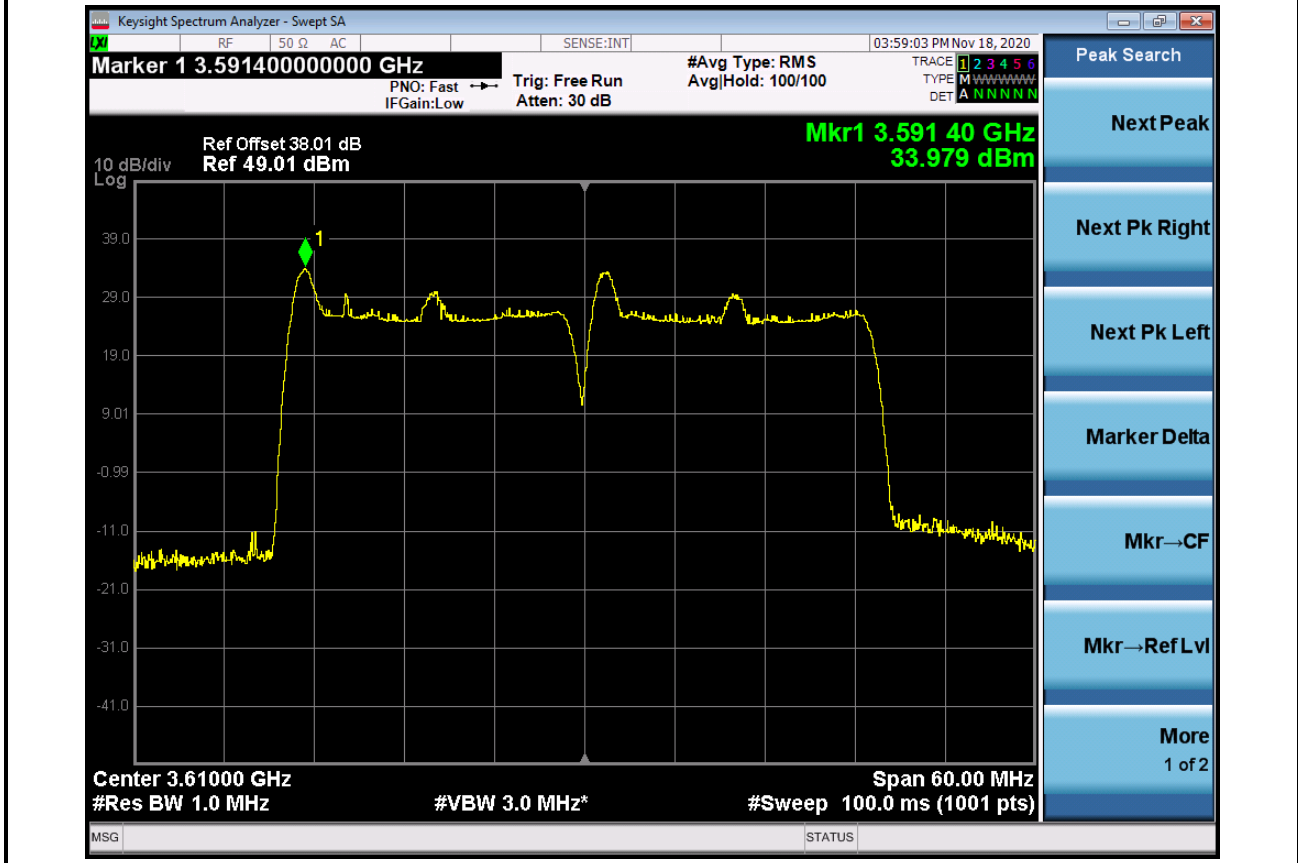
**Note :** The Spectrum Analyzer Ref Offset 38.01 dB includes the antenna gain 13 dBi and cable path loss 25.01 dB.





SAS Granted MaxEIRP 35 [dBm/MHz]

2 Carrier: UUT MaxEIRP 33.979 [dBm/MHz]





SAS Granted MaxEIRP 36 [dBm/MHz]

2 Carrier: UUT MaxEIRP 34.585 [dBm/MHz]





SAS Granted MaxEIRP 37 [dBm/MHz]

2 Carrier: UUT MaxEIRP 35.242 [dBm/MHz]



—THE END—