WINNF-TS-0122 Test Report

APPLICANT	Gemtek Technology Co., Ltd.
EQUIPMENT	WLTGG-122 LTE Cat 12 B48 HE Outdoor CPE
BRAND NAME	Gemtek
MODEL NAME	WLTGG-122-HGA_48
FCC ID	MXF-WLTGG12248H
REFERENCE	WINNF-TS-0122 Version V1.0.1
TEST DATE(S)	Sep. 11, 2019 ~ Oct. 08, 2019

We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

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

Reviewed by: **Approved by:**

William Chen / Deputy Manager **Jones Tsai / Manager**

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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Appendix A Setup Plot

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG990239	01	Initial issue of report	Sep. 23, 2019
FG990239	02	Update verification result at Appendix C	Oct. 08, 2019

1. Administration Data

1.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	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

Company Name	Gemtek Technology Co., Ltd.
Address	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	CPE-CBSD
FCC ID	MXF-WLTGG12248H
Professional Installation	☒ Yes ☐ No
UUT Category	☐ Category A ☒ Category B
Unit Under Test in Test ID	☐ UUT with Domain Proxy ☒ UUT without Domain Proxy
Air Interface Supported	LTE Band 48
Air Interface Tested	LTE Band 48
EUT HW Version	MB: V01; RF: V00
EUT SW Version	01.02.01.025
Device Power Class	LTE Band 48: Power Class 3
Condition of registering with SAS	☒ Always ☐ When UUT needs to operate at signal levels higher than the 23 dBm

Brand name	Model name	Producrt name	Description
Gemtek	WLTGG-122-HGA_48	WLTGG-122 LTE Cat 12 B48 HE Outdoor CPE	with 16dBi antenna
	WLTGG-122_48		with 13dBi antenna
BLiNQ	FWC-122HG-35	WLTGG-122-HGA	with 16dBi antenna
	FWC-122-35	WLTGG-122	with 13dBi antenna

Remark:

1. All models are electrically identical except antenna, different model names are for applied antenna and marketing purpose.
2. The above models, model WLTGG-122_48 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
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

Section	Test Case ID	Test Case Title	Test Result
6.8.4.2.3	WINNF.FT.C.SCS.4	TLS failure when SAS Test Harness certificate is issue by unknown CA	Pass
6.8.4.2.4	WINNF.FT.C.SCS.5	TLS failure when certificate at the SAS Test Harness is corrupted	Pass
7.1.4.1.1	WINNF.PT.C.HBT	UUT RF Transmit Power Measurement	Pass

2.3 Time test for getting Grant Summary

Trail	Time limit	Monitoring time	Measured result	Verdict
1	1 second	10 seconds	0.08 second	Pass
2	10 seconds	300 seconds	0.2 second	Pass
3	20 seconds	3600 seconds	18.8 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

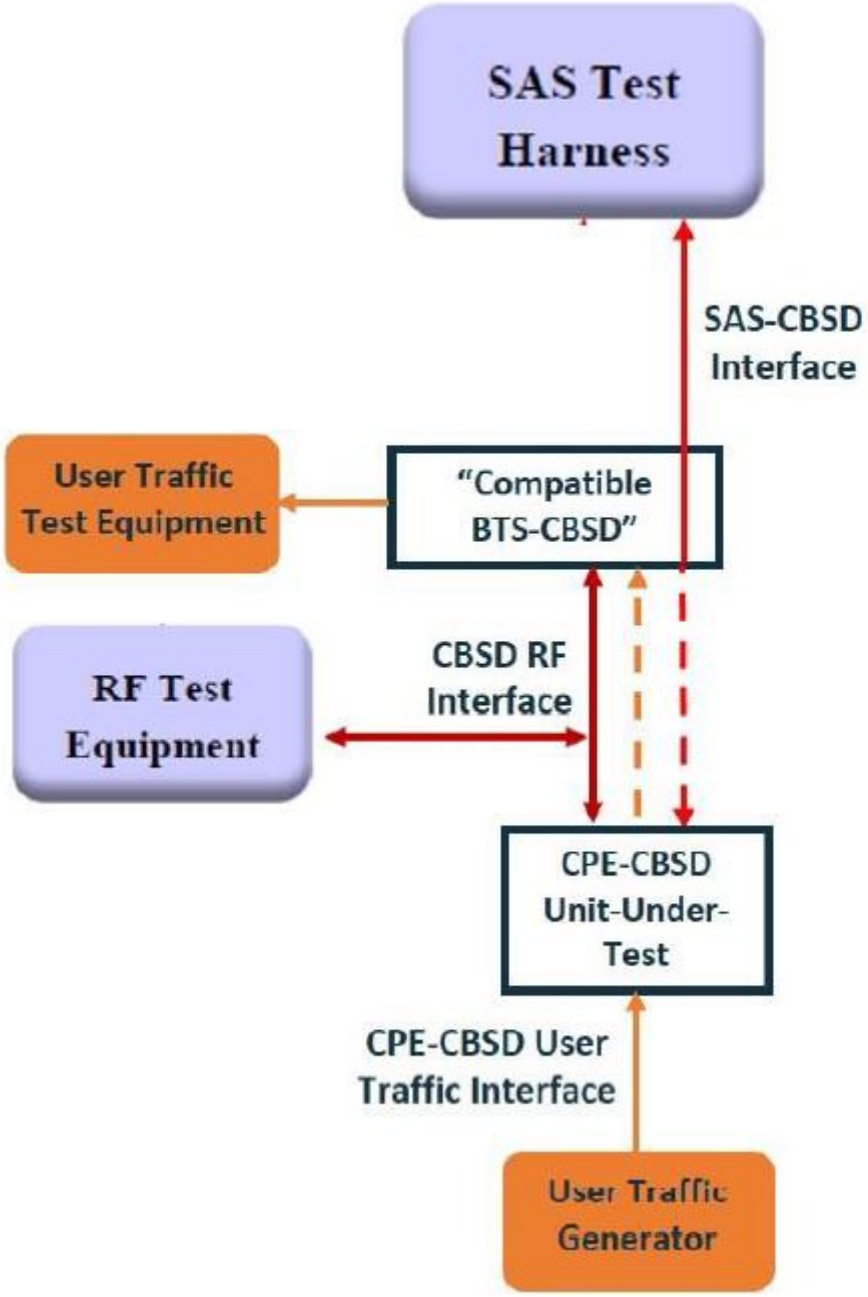
Name	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Spectrum Analyzer	KeySight	N9010A	MY5712084	2018-11-15	2019-11-14

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		
☒	**C1**	Mandatory for UUT which supports multi-step registration message
☐	**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.
☒	**C3**	Mandatory for UUT which supports single-step registration containing CPIsigned data in the registration message.
☐	**C4**	Mandatory for UUT which supports RECEIVED_POWER_WITHOUT_GRANT measurement report type
☐	**C5**	Mandatory for UUT which supports RECEIVED_POWER_WITH_GRANT measurement report type.
☒	**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



3.2 Standards

[n.1]. FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, 19 April 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 CPE-CBSD device type. Following the [n.1], when running the test cases in [n.2] for CPE-CBSD device type, verify that

1. CPE-CBSD can begin transmitting its RF only after receiving radio signal from its compatible BTS-CBSD.
2. For all CPE-CBSD RF transmissions, the CPE-CBSD 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	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends correct Registration request information, as specified in [n.5], to the SAS Test Harness: • The required userId, fccId and cbsdSerialNumber registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges. • 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. Note: It is outside the scope of this document to test the Registration information that is supplied via another means.	PASS
3	• SAS Test Harness sends a CBSD Registration Response as follows: – *cbsdId* = C – *measReportConfig* shall not be included – *responseCode* = 0	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state • All of the required and REG-Conditional parameters shall be configured and CPI signature provided	--
2	CBSD sends Registration request to the SAS Test Harness: • The required userId, fccId and cbsdSerialNumber and REG-Conditional cbsdCategory, airInterface, measCapability and cpiSignatureData registration parameters shall be sent from the CBSD and conform to proper format and acceptable ranges.	PASS
	• 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.	
3	• SAS Test Harness sends a CBSD Registration Response as follows: – *cbsdId* = C – *measReportConfig* shall not be included. – *responseCode* = 0	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness	--
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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT is in the Unregistered state	--
2	CBSD sends a Registration request to SAS Test Harness.	--
3	SAS Test Harness rejects the request by sending a CBSD Registration Response as follows: – SAS response does not include *cbsdId* – *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has registered successfully with SAS Test Harness, with *cbsdId* = C	--
2	UUT sends valid Grant Request.	--
3	SAS Test Harness sends a Grant Response message, including • *cbsdId*=C • *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has registered successfully with SAS Test Harness, with *cbsdId* = C	--
2	UUT sends valid Grant Request.	--
3	SAS Test Harness sends a Grant Response message, including • *cbsdId*=C • *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT shall not transmit RF	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: • UUT has registered successfully with SAS Test Harness, with *cbsdId* = C	--
2	UUT sends a message: • If message is type Spectrum Inquiry Request, go to step 3, or • If message is type Grant Request, go to step 5	--
3	UUT sends Spectrum Inquiry Request. Validate: • *cbsdId* = C • List of frequencyRange objects sent by UUT are within the CBRS frequency range	PASS
4	SAS Test Harness sends a Spectrum Inquiry Response message, including the following parameters: • *cbsdId* = C • availableChannel is an array of availableChannel objects • *responseCode* = 0	--
5	UUT sends Grant Request message. Validate: • *cbsdId* = C • maxEIRP is at or below the limit appropriate for CBSD category as defined by Part 96 • operationFrequencyRange, F, sent by UUT is a valid range within the CBRS band	PASS
6	SAS Test Harness sends a Grant Response message, including the parameters: • *cbsdId* = C • *grantId* = G = a valid grant ID • grantExpireTime = UTC time greater than duration of the test • *responseCode* = 0	--
7	UUT sends a first Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “GRANTED”	PASS

#	Test Execution Steps	Results
8	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = current UTC time + 200 seconds • *responseCode* = 0	--
9	For further Heartbeat Request messages sent from UUT after completion of step 8, validate message is sent within latest specified heartbeatInterval, and: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED” and SAS Test Harness responds with a Heartbeat Response message including the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = current UTC time + 200 seconds • *responseCode* = 0	PASS
10	Monitor the RF output of the UUT from start of test until UUT transmission commences. Verify: • UUT does not transmit at any time prior to completion of the first heartbeat response • UUT transmits after step 8 is complete, and its transmission is limited to within the bandwidth range F.	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ○ valid *cbsdId* = C ○ valid *grantId* = G ○ grant is for frequency range F, power P ○ *grantExpireTime* = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within Heartbeat Interval specified in the latest Heartbeat Response, and formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = "AUTHORIZED"	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • *cbsdId* = C • *grantId* = G	--
	• *transmitExpireTime = T = Current UTC time* • *responseCode* = 105 (DEREGISTER)	
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T + 60 seconds) of completion of step 3	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ○ valid *cbsdId* = C ○ valid *grantId* = G ○ grant is for frequency range F, power P ○ *grantExpireTime* = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED”	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = T = current UTC time • *responseCode* = 500 (TERMINATED_GRANT)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T + 60 seconds) of completion of step 3	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ○ valid *cbsdId* = C ○ valid *grantId* = G ○ grant is for frequency range F, power P ○ *grantExpireTime* = UTC time greater than duration of the test • UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)	--
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = "GRANTED"	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = T = current UTC time • *responseCode* = 501 (SUSPENDED_GRANT)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the SAS-CBSD interface. Verify either A OR B occurs: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: • *cbsdId* = C • *grantId* = G • *operationState* = "GRANTED" B. UUT sends a Relinquishment request message. Ensure message is correctly formatted with parameters: • *cbdsId* = C • *grantId* = G Monitor the RF output of the UUT. Verify: • UUT does not transmit at any time	PASS

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

#	Test Execution Steps	**Results**

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	  ○ valid *cbsdId* = C
	  ○ valid *grantId* = G
	  ○ grant is for frequency range F, power P
	  ○ *grantExpireTime* = UTC time greater than duration of the test
	• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface
		--

2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified heartbeatInterval, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED”	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = T = current UTC time • *responseCode* = 501 (SUSPENDED_GRANT)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--

#	Test Execution Steps	**Results**
5	Monitor the SAS-CBSD interface. Verify either A OR B occurs: A. UUT sends a Heartbeat Request message. Ensure message is sent within latest specified heartbeatInterval, and is correctly formatted with parameters: • *cbsdId* = C • *grantId* = G • *operationState* = “GRANTED” B. UUT sends a Relinquishment Request message. Ensure message is correctly formatted with parameters: • *cbdsId* = C • *grantId* = G Monitor the RF output of the UUT. Verify:	PASS
	• UUT shall stop transmission within (*T* + 60 seconds) of completion of step 3	

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness • UUT has a valid single grant as follows: ○ valid *cbsdId* = C ○ valid *grantId* = G ○ grant is for frequency range F, power P ○ *grantExpireTime* = UTC time greater than duration of the test • UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface	--
2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message is sent within latest specified *heartbeatInterval*,and is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED”	PASS
3	SAS Test Harness sends a Heartbeat Response message, including the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = T = Current UTC Time • *responseCode* = 502 (UNSYNC_OP_PARAM)	--
4	After completion of step 3, SAS Test Harness shall not allow any further grants to the UUT.	--
5	Monitor the SAS-CBSD interface. Verify: • UUT sends a Grant Relinquishment Request message. Verify message is correctly formatted with parameters: ○ *cbdsId* = C ○ *grantId* = G Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T+60) seconds of completion of step 3.	PASS

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

#	Test Execution Steps	Results

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	  ○ valid *cbsdId* = C
	  ○ valid *grantId* = G
	  ○ grant is for frequency range F, power P
	  ○ *grantExpireTime* = UTC time greater than duration of the test
	• UUT is in GRANTED, but not AUTHORIZED state (i.e. has not performed its first Heartbeat Request)
		--

2	UUT sends a Heartbeat Request message. Ensure Heartbeat Request message is sent within latest specified *heartbeatInterval*, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G	PASS
	• *operationState* = “GRANTED”	
3	After completion of Step 2, SAS Test Harness does not respond to any further messages from UUT to simulate loss of network connection	--
4	Monitor the RF output of the UUT from start of test to 60 seconds after step 3. Verify: • At any time during the test, UUT shall not transmit on RF interface	PASS

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

#	Test Execution Steps	Results

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	  ○ valid *cbsdId* = C
	  ○ valid *grantId* = G
	  ○ grant is for frequency range F, power P
	  ○ *grantExpireTime* = UTC time greater than duration of the test
	• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface
		--

2	UUT sends a Heartbeat Request message. Verify Heartbeat Request message issent within the latest specified *heartbeatInterval*, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED”	PASS
3	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = current UTC time + 200 seconds • *responseCode* = 0	--
4	After completion of Step 3, SAS Test Harness does not respond to any further messages from UUT	--
5	Monitor the RF output of the UUT. Verify: • UUT shall stop all transmission on RF interface within (*transmitExpireTime* + 60 seconds), using the transmitExpireTime sent in Step 3.	PASS

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

#	Test Execution Steps	Results

1	Ensure the following conditions are met for test entry:
	• UUT has registered successfully with SAS Test Harness
	• UUT has a valid single grant as follows:
	  ○ valid *cbsdId* = C
	  ○ valid *grantId* = G
	  ○ grant is for frequency range F, power P
	• UUT is in AUTHORIZED state and is transmitting within the grant bandwidth F on RF interface.
	• Grant has the following parameters at the start of the test:
	  ○ *grantExpireTime* =UTC time equal to time at start of test + 300 seconds = Tgrant_expire
	  ○ *transmitExpireTime* = UTC time equal to time at start of test + 200 seconds
	  ○ *heartbeatInterval* = 60 seconds
		--

2	UUT sends a Heartbeat Request message. If Heartbeat Request message contains grantRenew = TRUE, go to Step 6, else go to Step 3.	--
3	Verify Heartbeat Request message is sent within the latest specified *heartbeatInterval*, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G • *operationState* = “AUTHORIZED”	PASS
4	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = current UTC + 200 seconds • *grantExpireTime* = same as Step 1 • *responseCode* = 0	--
5	Go to Step 2	--

#	Test Execution Steps	Results
6	Verify Heartbeat Request message is sent within the latest specified heartbeatInterval, and is formatted correctly, including: • *cbsdId* = C • *grantId* = G	PASS
	• *operationState* = “AUTHORIZED” • *grantRenew* = TRUE	
7	SAS Test Harness sends a Heartbeat Response message, with the following parameters: • *cbsdId* = C • *grantId* = G • *grantExpireTime* = UTC time set far in the future • *transmitExpireTime* = current UTC time + 200 seconds • *responseCode* = 0	--
8	Continue to respond to any subsquentHeartbeat Request from CBSD with Heartbeat Response with the following parameters: • *cbsdId* = C • *grantId* = G • *transmitExpireTime* = same as Step 7 • *responseCode* = 0	--
9	Monitor RF transmission of UUT from start of test until Tgrant_expire + 60 seconds and ensure UUT continues to transmit throughout the time period.	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. 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: • *cbsdId* = C • *grantId* = G	PASS
3	SAS Test Harness shall approve the request with a Relinquishment Response message with parameters: – *cbsdId* = C – *grantId* = G – *responseCode* = 0	--
4	After completion of step 3, SAS Test Harness will not provide any additional positive response (*responseCode*=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: • UUT shall stop RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.	--
	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: • *cbsdId* = C • *grantId* = G	--
3	SAS Test Harness shall send a Relinquishment Response message with parameters: • *cbsdId* = C • No *grantId* • *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS

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

#	**Test Execution Steps**	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant.	--
	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: • *cbsdId* = C • *grantId* = G	--
3	SAS Test Harness shall send a Relinquishment Response message with parameters: • *cbsdId* = C • No *grantId* • *responseCode* = R	--
4	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=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: • UUT stopped RF transmission at any time between triggering the relinquishment and UUT sending the relinquishment request	PASS

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

#	**Test Execution Steps**	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. Invoke trigger to deregister UUT from the SAS Test Harness	--
2	UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0	--
3	UUT sends Deregistration Request to SAS Test Harness with *cbsdId* = C.	PASS
4	SAS Test Harness shall approve the request with a Deregistration Response message with parameters: • *cbsdId* = C • *responseCode* = 0	--
5	After completion of step 3, SAS Test Harness will not provide any additional positive response (*responseCode*=0) to further request messages from the UUT.	--
6	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. Invoke trigger to deregister UUT from the SAS Test Harness	--
2	UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0	--
3	UUT sends Deregistration Request to SAS Test Harness with *cbsdId* = C	--
4	The SAS Test Harness sends the Deregistration Response Message to UUT with: • No *cbsdId* • *responseCode* = 102	--
5	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=0) to further request messages from the UUT.	--
6	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: A. UUT sending a Registration Request message, as this is not mandatory B. UUT sending a Deregistration Request message	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness • UUT has successfully registered with SAS Test Harness, with *cbsdId*=C • UUT has received a valid grant with *grantId* = G • UUT is in Grant State AUTHORIZED and is actively transmitting within the bounds of its grant. Invoke trigger to deregister UUT from the SAS Test Harness	--
2	UUT sends a Relinquishment request and receives Relinquishment response with *responseCode*=0	--
3	UUT sends Deregistration Request to SAS Test Harness with *cbsdId* = C	--
4	The SAS Test Harness sends the Deregistration Response Message to UUT with: • No *cbsdId* • *responseCode* = 103	--
5	After completion of step 3, SAS Test Harness will not provide any positive response (*responseCode*=0) to further request messages from the UUT.	--
6	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: • UUT stopped RF transmission at any time between triggering the deregistration and either A OR B occurs: C. UUT sending a Registration Request message, as this is not mandatory D. UUT sending a Deregistration Request message	PASS

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

#	Test Execution Steps	Results
1	• UUT shall start CBSD-SAS communication with the security procedure • The UUT shall establish a TLS handshake with the SAS Test Harness using configured certificate. • Configure the SAS Test Harness to accept the security procedure and establish the connection	PASS

2	• Make sure that Mutual authentication happens between UUT and the SAS Test Harness.
	• Make sure that UUT uses TLS v1.2
	• Make sure that cipher suites from one of the following is selected,
	  • TLS_RSA_WITH_AES_128_GCM_SHA256
	  • TLS_RSA_WITH_AES_256_GCM_SHA384
	  • TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA2 56
	  • TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA3 84
	  • TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
		PASS

3	A successful registration is accomplished using one of the test cases described in section 6.1.4.1, depending on CBSD capability. • UUT sends a registration request to the SAS Test Harness and the SAS Test Harness sends a Registration Response with *responseCode* = 0 and *cbsdId*.	PASS
4	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: • UUT shall not transmit RF	PASS

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

#	Test Execution Steps	Results
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	• Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
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: • UUT shall not transmit RF	PASS

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

#	Test Execution Steps	Results
1	• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	• Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
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: • UUT shall not transmit RF	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	• UUT shall start CBSD-SAS communication with the security procedures	PASS
2	• Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
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: • UUT shall not transmit RF	PASS

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

#	Test Execution Steps	**Results**
1	• UUT shall start CBSD-SAS communication withthe security procedures	PASS
2	• Make sure that UUT uses TLS v1.2 for security establishment. • Make sure UUT selects the correct cipher suite. • UUT shall use CRL or OCSP to verify the validity of the server certificate. • Make sure that Mutual authentication does not happen between UUT and the SAS Test Harness.	PASS
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: • UUT shall not transmit RF	PASS

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

#	Test Execution Steps	Results
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with the SAS Test Harness • UUT has registered with the SAS, with CBSD ID = C • UUT has a single valid grant G with parameters {lowFrequency = F_L, highFrequency = F_H, maxEirp = P_i}, with grant in AUTHORIZED state, and grantExpireTime set to a value far past the duration of this test case *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.*	--

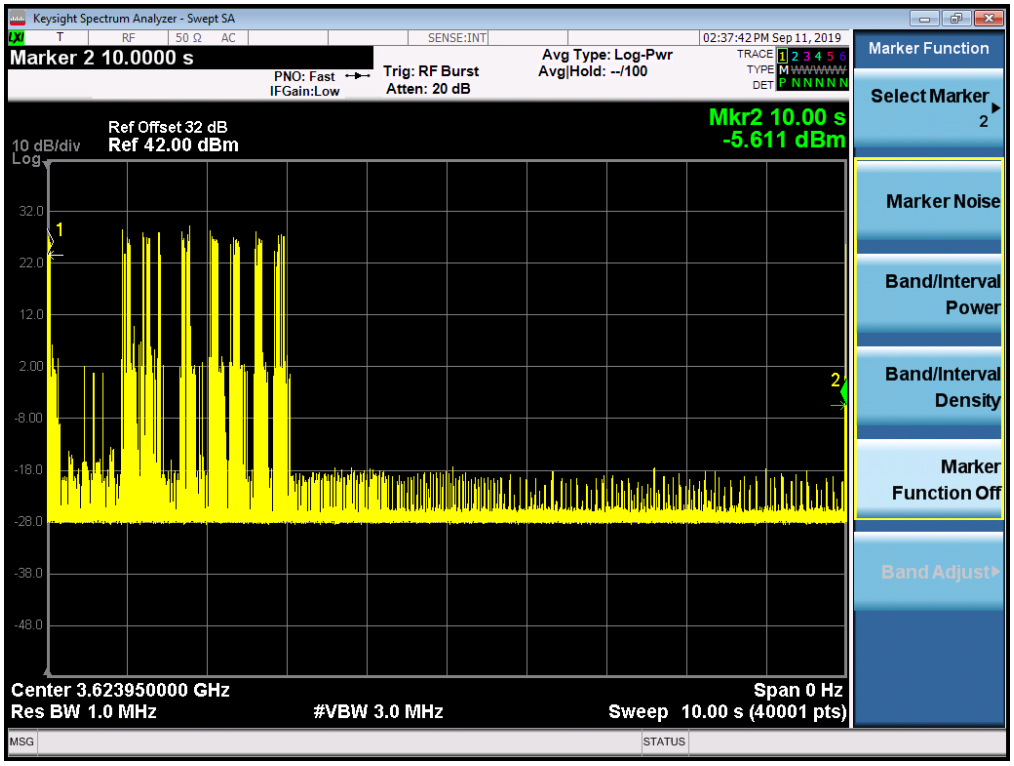
2	UUT and SAS Test Harness perform a series of Heartbeat Request/Response cycles, which continues until the other test steps are complete. Messaging for each cycle is as follows:
	• UUT sends Heartbeat Request, including:
	  ○ *cbsdId* = C
	  ○ *grantId* = G
	• SAS Test Harness responds with Heartbeat Response, including:
	  ○ *cbsdId* = C
	  ○ *grantId* = G
	  ○ *transmitExpireTime* = current UTC time + 200 seconds
	  ○ *responseCode* = 0
		--

#	Test Execution Steps	Results
3	Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, P_i. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfil the requirements of the power measurement method. *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.*	PASS

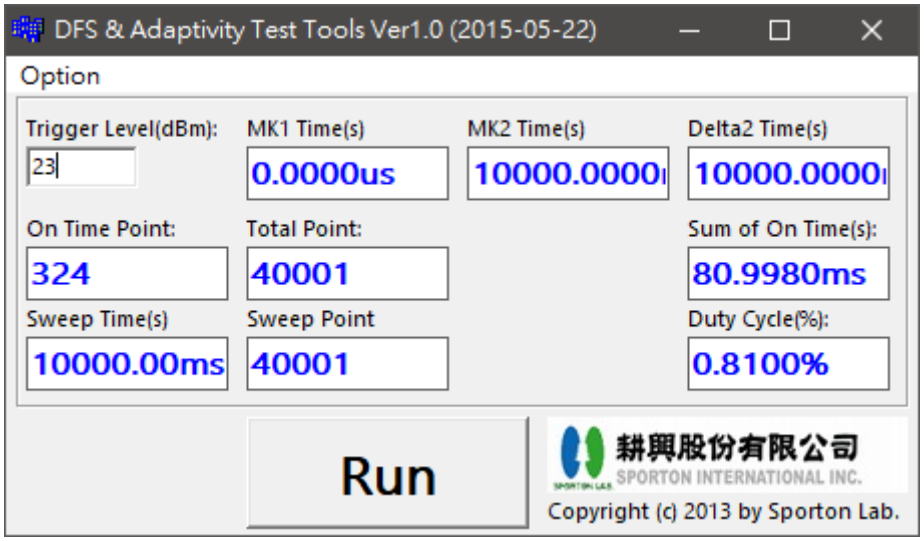
5. Result of Time test for getting Grant

5.1 1 second within any 10-second period

Spectrum Analyzer



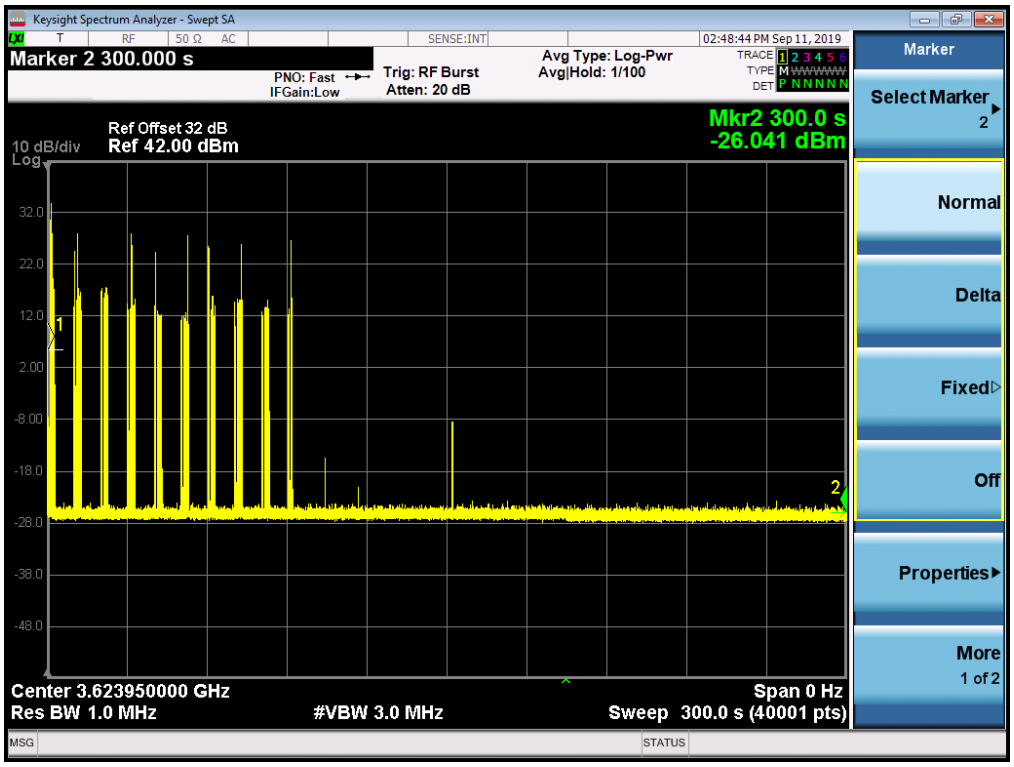
Calculated Result



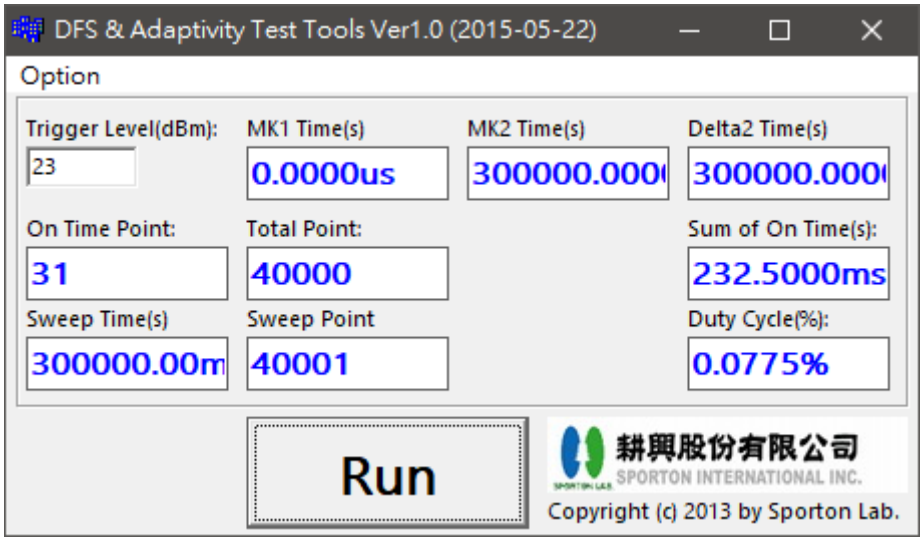
The sum of On Time (aggregated time from marker 1 to 2): 0.08s < 1s = Pass

5.2 10 seconds within any 300-second period

Spectrum Analyzer



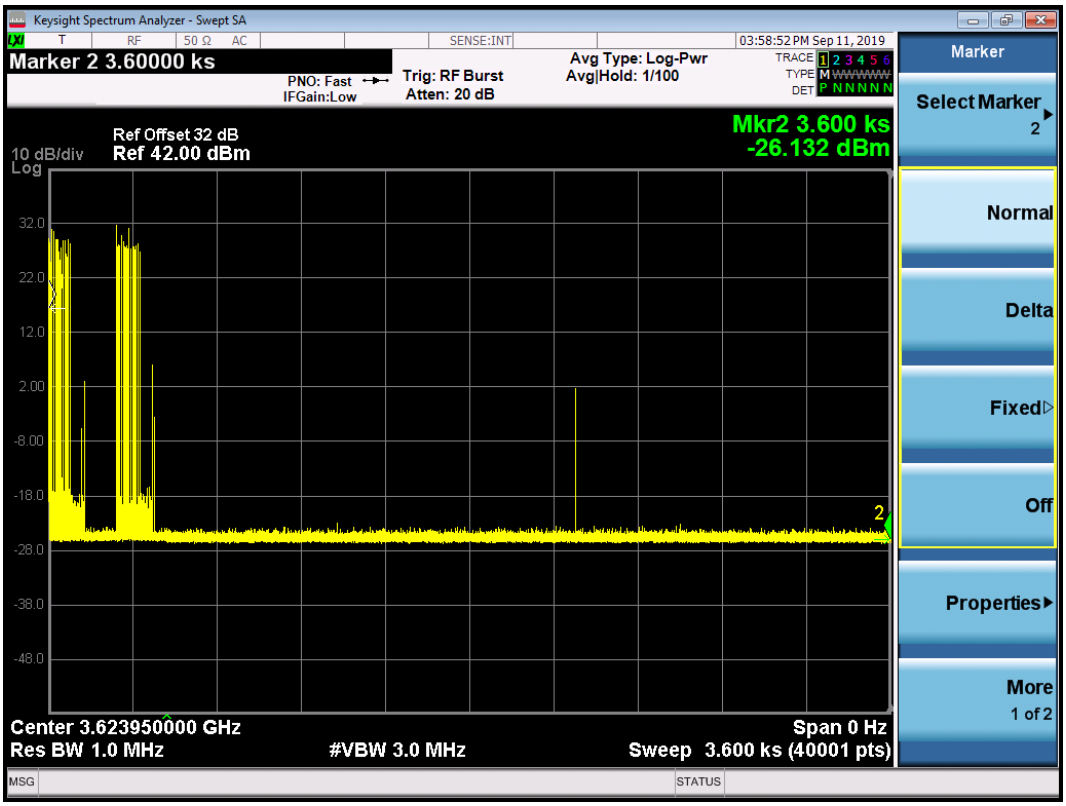
Calculated Result



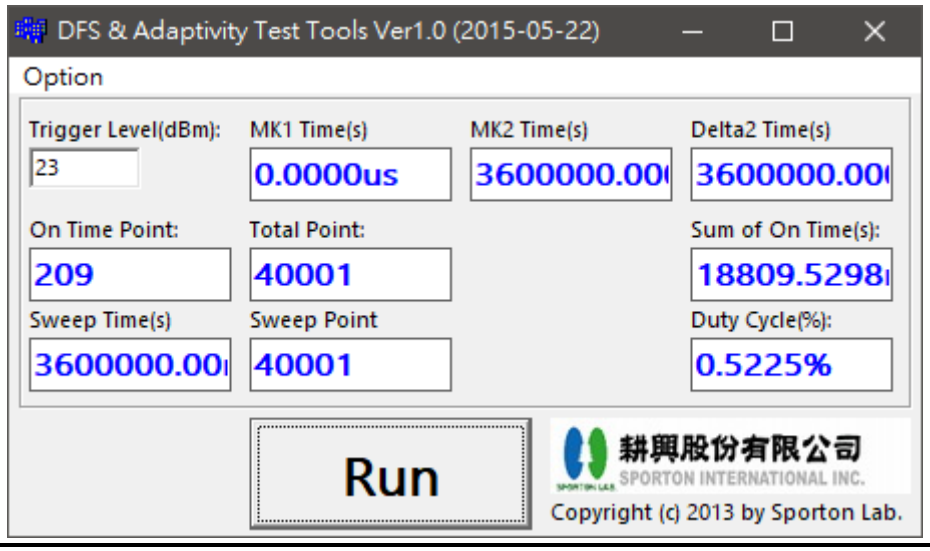
The sum of On Time (aggregated time from marker 1 to 2): 0.2s < 10s = Pass

5.3 20 seconds within any 3600-second period

Spectrum Analyzer



Calculated Result



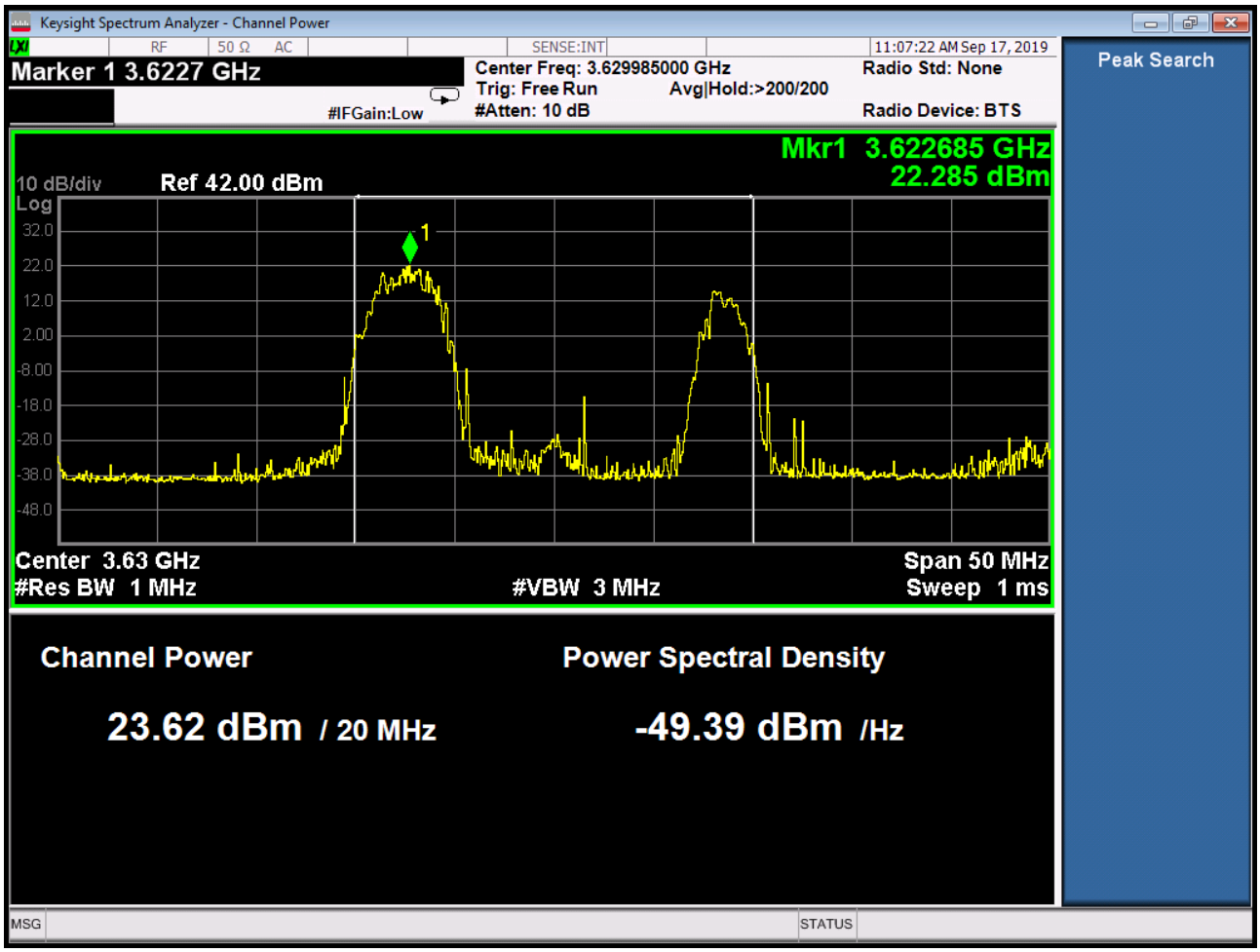
The sum of On Time (aggregated time from marker 1 to 2): 18.8s < 20s = Pass

Appendix B RF measurement plots

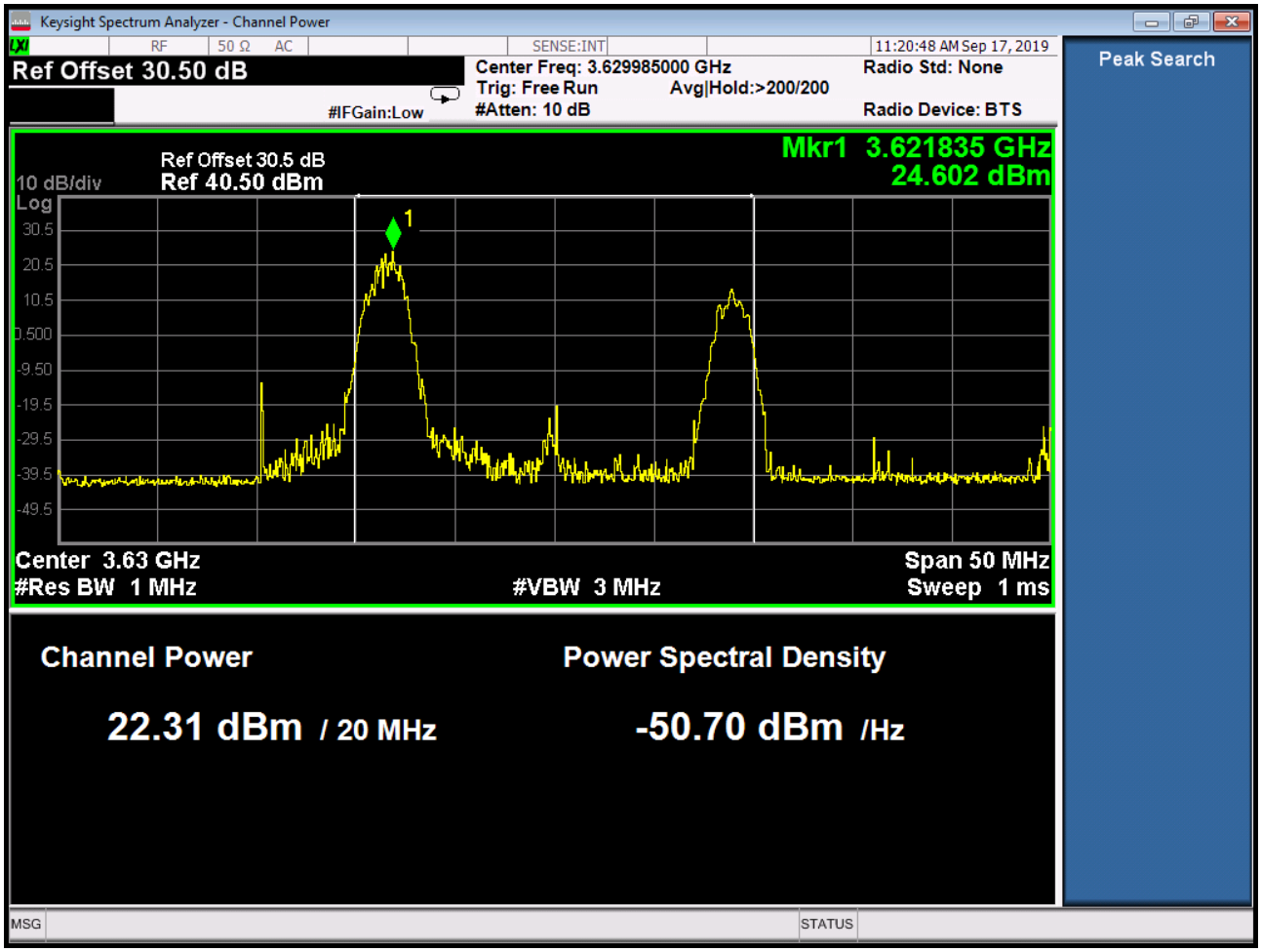
Report Clause 4.32 [WINNF.PT.C.HBT] UUT RF Transmit Power Measurement

SAS authorizes MaxEirp (dBm/MHz)	UUT EIRP PSD (dBm/MHz)
23	22.285 dBm
25	24.602 dBm
27	26.097 dBm
29	28.324 dBm
31	30.424 dBm
33	31.161 dBm
35	32.192 dBm
37	32.201 dBm

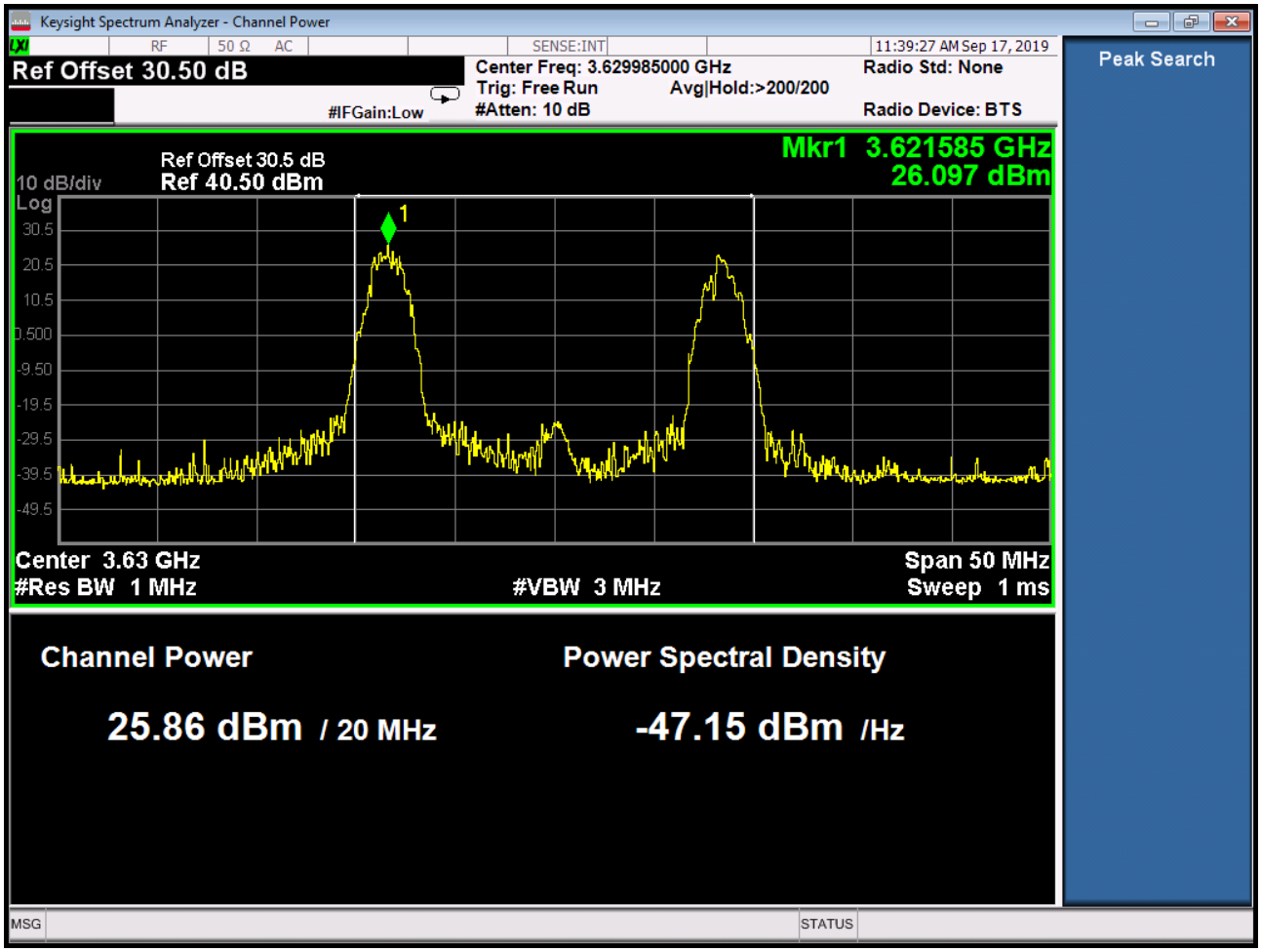
MaxEirp 23



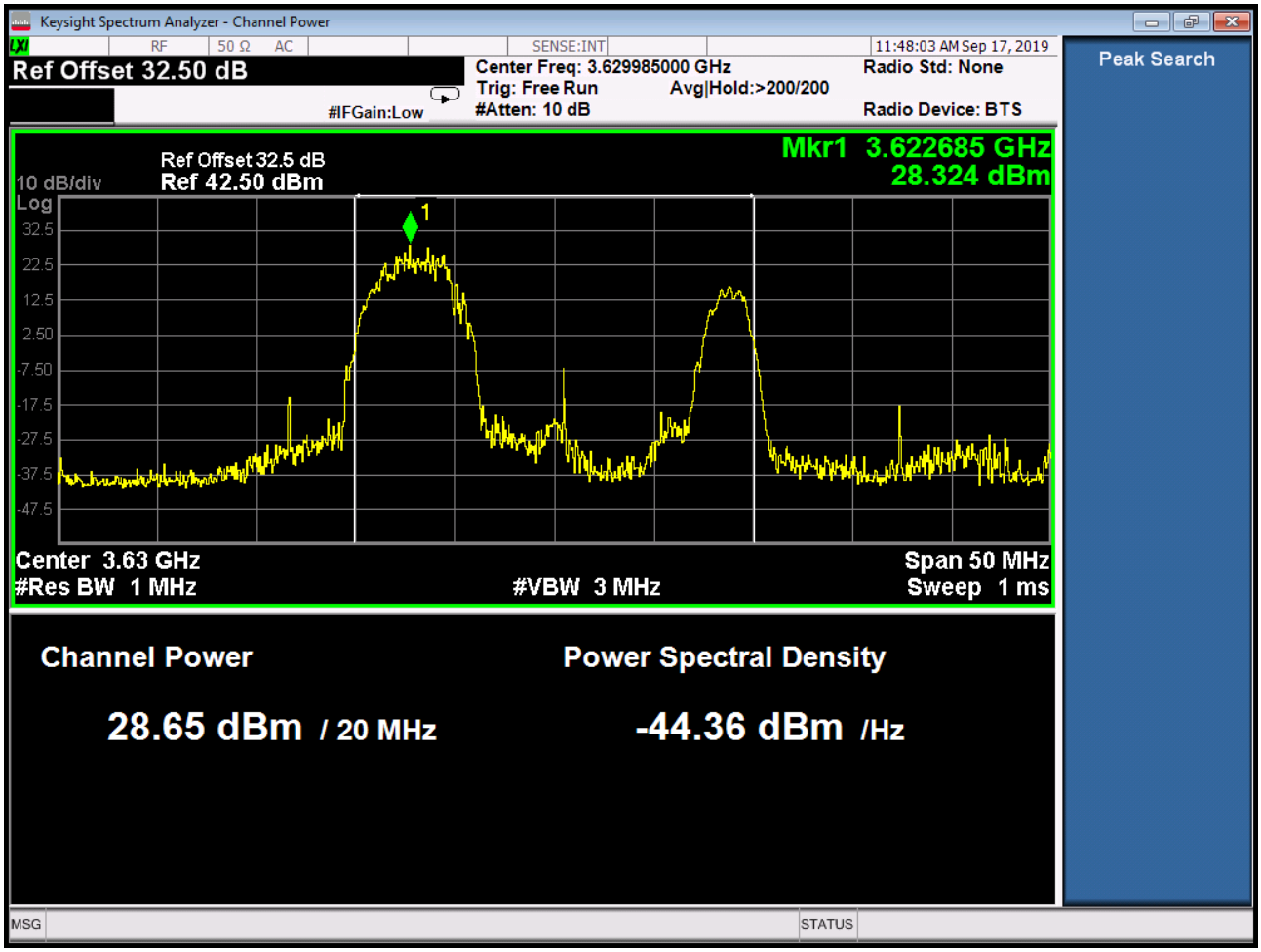
MaxEirp 25


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
11:20:48 AM Sep 17, 2019
Ref Offset 30.50 dB
#IFGain:Low
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 30.5 dB
10 dB/div
Ref 40.50 dBm
Log
Mkr1 3.621835 GHz
24.602 dBm
30.5
20.5
10.5
0.500
-9.50
-19.5
-29.5
-39.5
-49.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
22.31 dBm / 20 MHz
Power Spectral Density
-50.70 dBm /Hz
MSG
STATUS

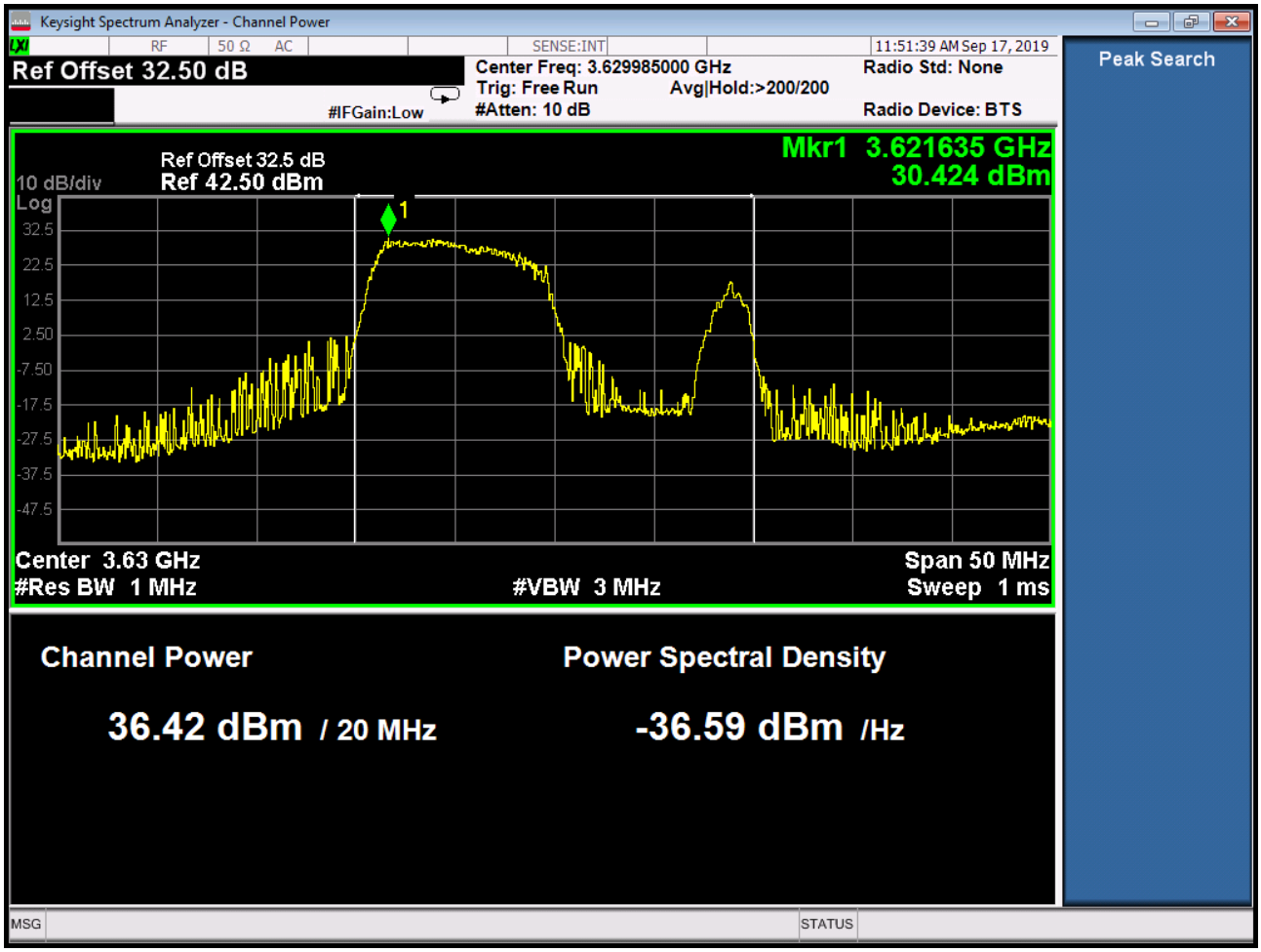
MaxEirp 27


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
11:39:27 AM Sep 17, 2019
Ref Offset 30.50 dB
#IFGain:Low
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 30.5 dB
10 dB/div
Ref 40.50 dBm
Log
Mkr1 3.621585 GHz
26.097 dBm
30.5
20.5
10.5
0.500
-9.50
-19.5
-29.5
-39.5
-49.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
25.86 dBm / 20 MHz
Power Spectral Density
-47.15 dBm /Hz
MSG
STATUS

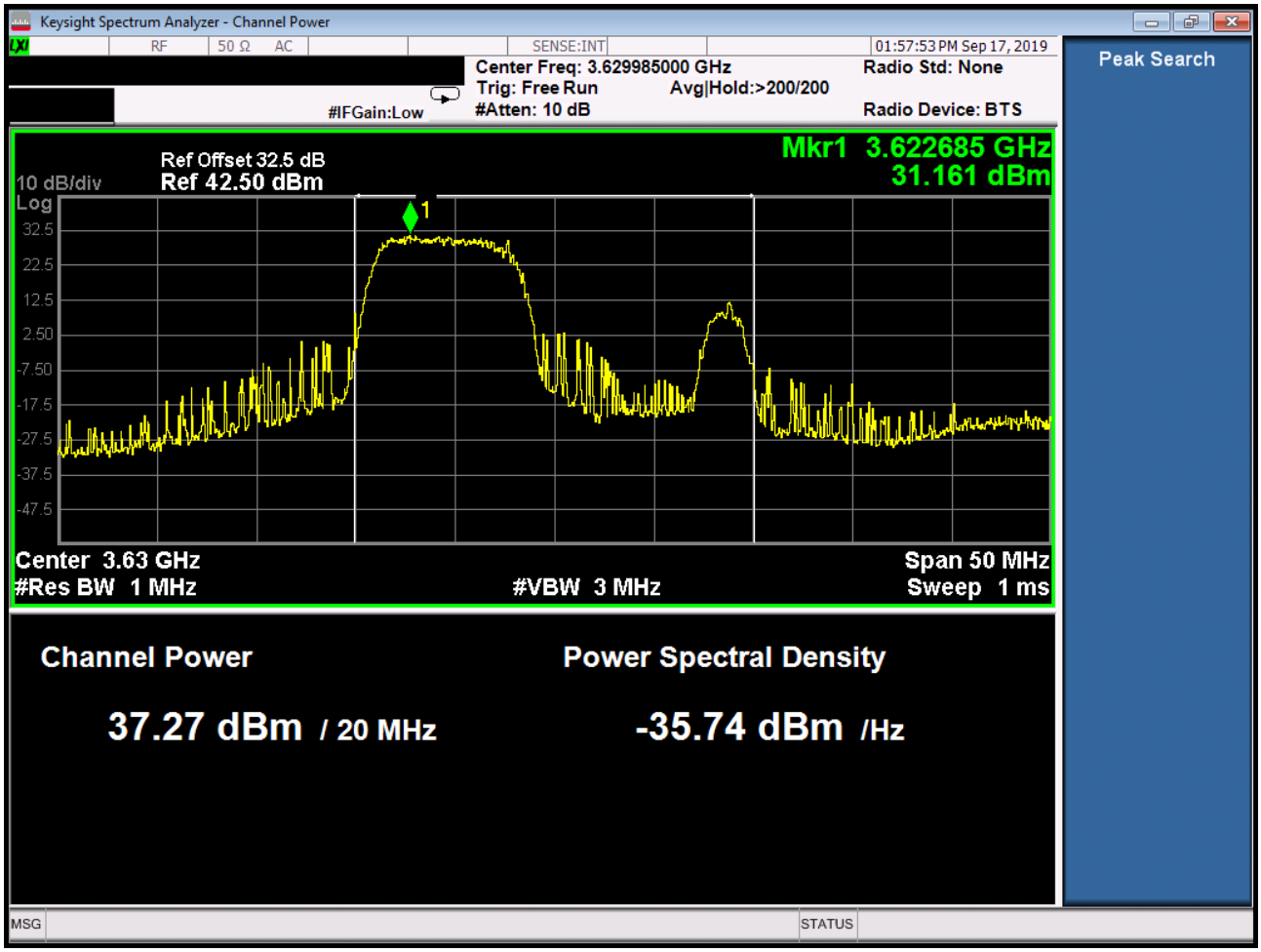
MaxEirp 29


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
11:48:03 AM Sep 17, 2019
Ref Offset 32.50 dB
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 32.5 dB
10 dB/div
Ref 42.50 dBm
Log
Mkr1 3.622685 GHz
28.324 dBm
32.5
22.5
12.5
2.50
-7.50
-17.5
-27.5
-37.5
-47.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
28.65 dBm / 20 MHz
Power Spectral Density
-44.36 dBm /Hz
MSG
STATUS

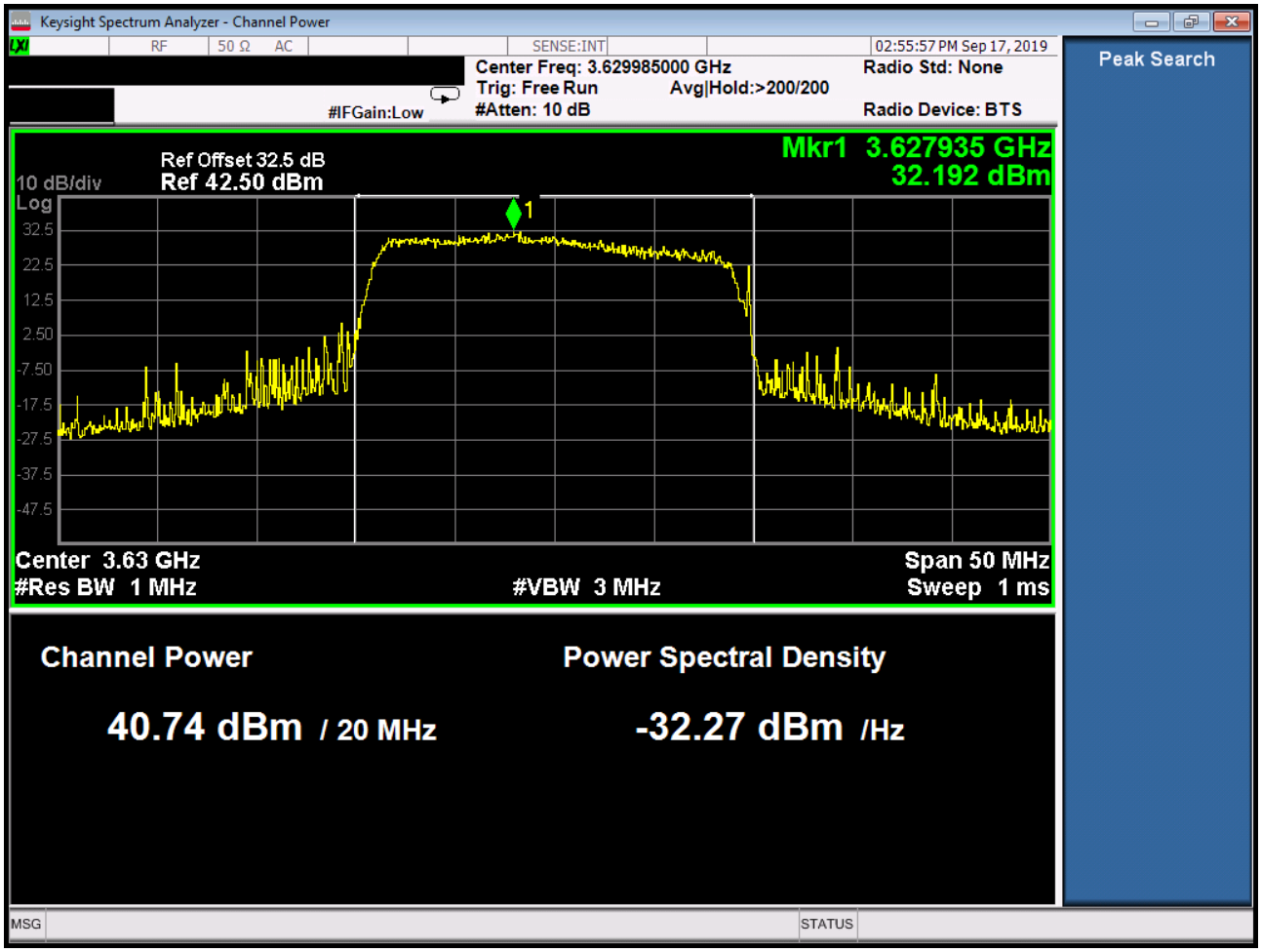
MaxEirp 31


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
11:51:39 AM Sep 17, 2019
Ref Offset 32.50 dB
#IFGain:Low
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 32.5 dB
10 dB/div
Ref 42.50 dBm
Log
Mkr1 3.621635 GHz
30.424 dBm
32.5
22.5
12.5
2.50
-7.50
-17.5
-27.5
-37.5
-47.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
36.42 dBm / 20 MHz
Power Spectral Density
-36.59 dBm /Hz
MSG
STATUS

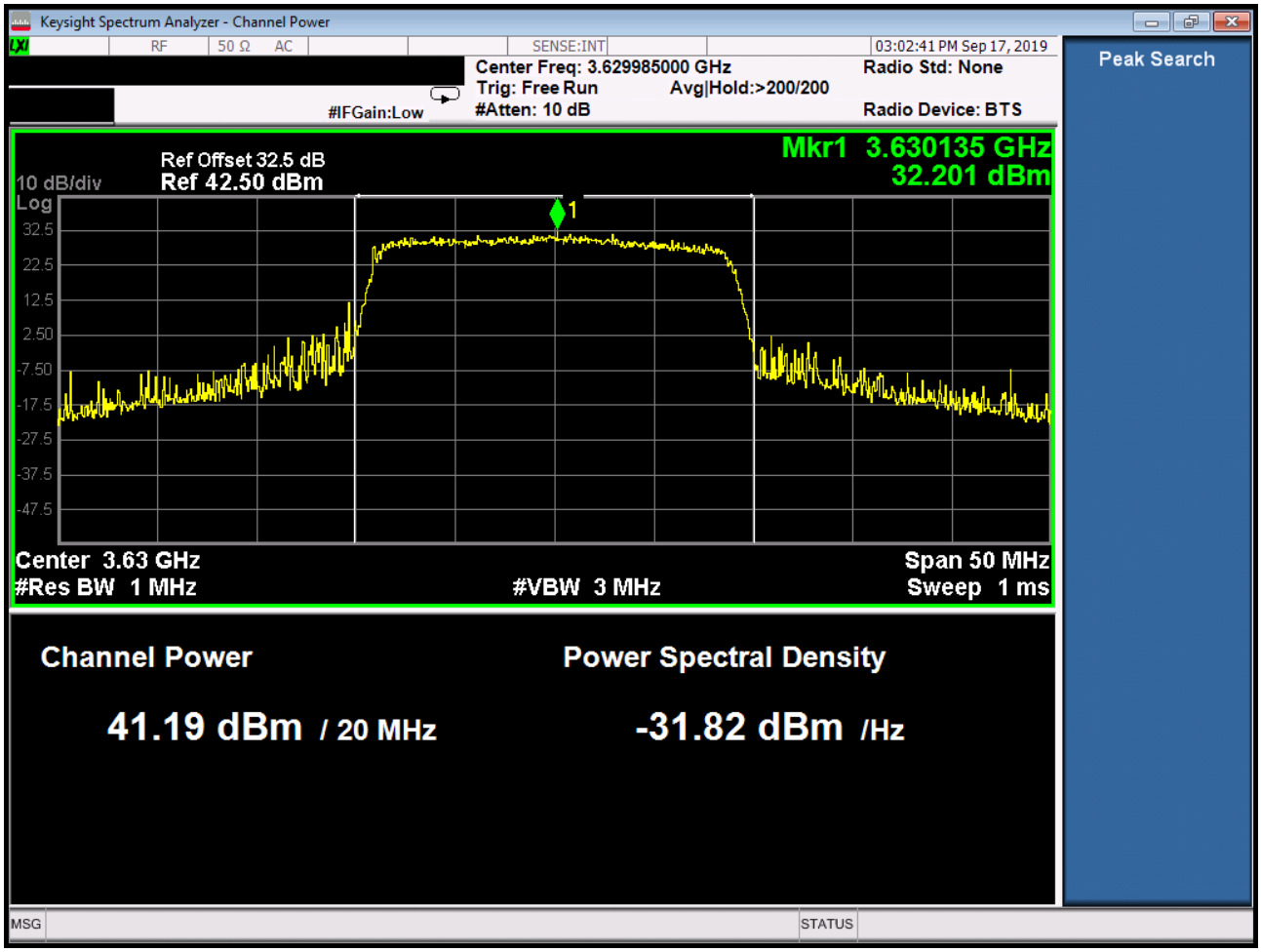
MaxEirp 33


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
01:57:53 PM Sep 17, 2019
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 32.5 dB
10 dB/div
Ref 42.50 dBm
Log
Mkr1 3.622685 GHz
31.161 dBm
32.5
22.5
12.5
2.50
-7.50
-17.5
-27.5
-37.5
-47.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
37.27 dBm / 20 MHz
Power Spectral Density
-35.74 dBm /Hz
MSG
STATUS

MaxEirp 35


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
02:55:57 PM Sep 17, 2019
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 32.5 dB
10 dB/div
Ref 42.50 dBm
Log
Mkr1 3.627935 GHz
32.192 dBm
32.5
22.5
12.5
2.50
-7.50
-17.5
-27.5
-37.5
-47.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
40.74 dBm / 20 MHz
Power Spectral Density
-32.27 dBm /Hz
MSG
STATUS

MaxEirp 37


Keysight Spectrum Analyzer - Channel Power
RF
50 Ω AC
SENSE:INT
03:02:41 PM Sep 17, 2019
Center Freq: 3.629985000 GHz
Trig: Free Run
Avg|Hold:>200/200
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Peak Search
Ref Offset 32.5 dB
10 dB/div
Ref 42.50 dBm
Log
Mkr1 3.630135 GHz
32.201 dBm
32.5
22.5
12.5
2.50
-7.50
-17.5
-27.5
-37.5
-47.5
Center 3.63 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 50 MHz
Sweep 1 ms
Channel Power
41.19 dBm / 20 MHz
Power Spectral Density
-31.82 dBm /Hz
MSG
STATUS

Appendix C Condition of registering with SAS

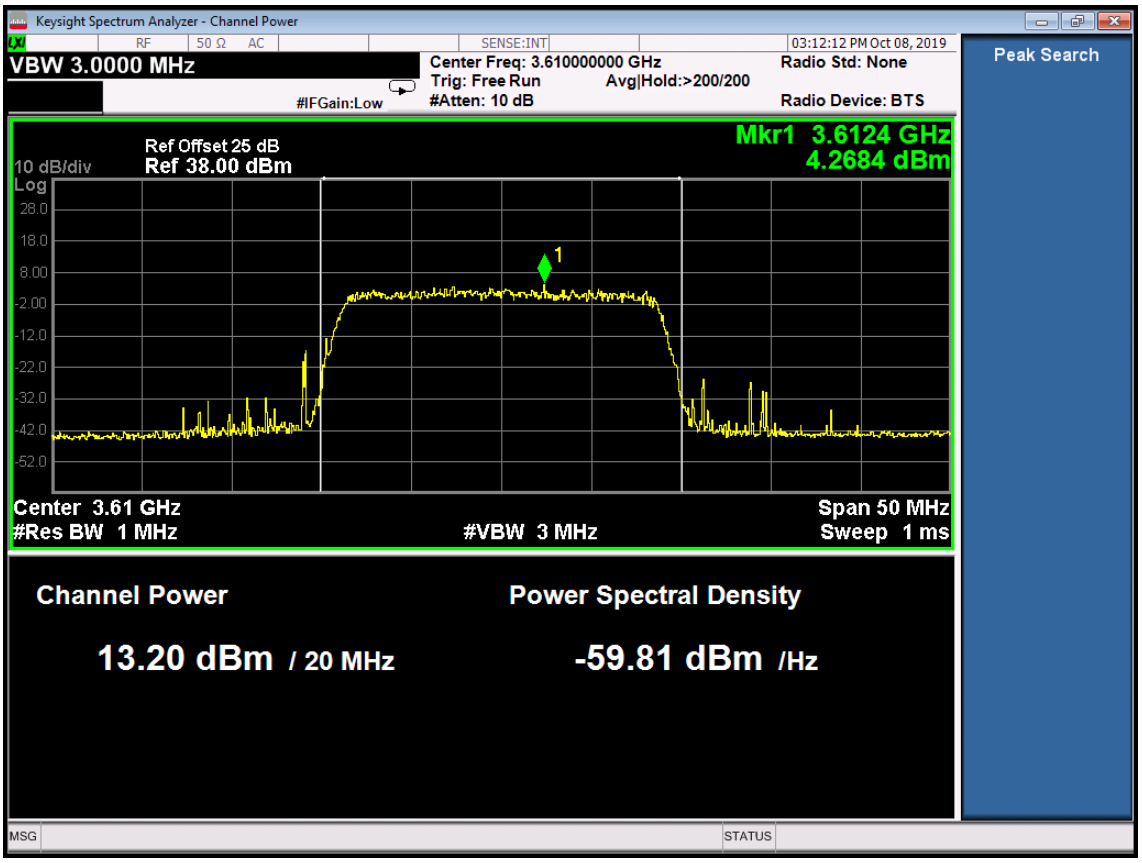
Introduction:

To prove that UUT will always register with SAS even the output power is below 23 dBm EIRP.

Test procedure:

1. Adjust path loss between UUT and BTS-CBSD to ensure the UUT power be below 23 dBm EIRP.
2. Run “WINNF.PT.C.HBT” test case to check if UUT will register with SAS.
3. After UUT will register the SAS, check the UUT power level is below 23 dBm EIRP via spectrum plot.

SAS authorizes MaxEirp (dBm/MHz)	Measured UUT EIRP (dBm)
21	13.20



Note : The Ref Offset 25 dB includes the antenna gain 13dBi and cable path loss 12 dB.

2019-10-08T07:09:10.210Z - INFO - WINNF TEST HARNESS RELEASE: 1.0.0.3 - 2018-November-13
2019-10-08T07:09:10.211Z - INFO - Selected spectrum frequency is {'lowFrequency': 3600000000L, 'highFrequency': 3620000000L}
2019-10-08T07:09:10.213Z - INFO - Granted Spectrum Max Eirp = 21dBm/MHz
2019-10-08T07:09:10.214Z - INFO - the selected test from the user : PowerMeasTest is starting now
2019-10-08T07:09:20.263Z - INFO - registration request from CBRS : {
"registrationRequest": [
{
"airInterface": {
"radioTechnology": "E_UTRA",
"supportedSpec": "FFS"
},
"callSign": "callSign123",
"cbsdCategory": "B",
"cbsdSerialNumber": "D823956047",
"cpiSignatureData": {
"digitalSignature":
"AQIxdnskq-PmADBzrp0CzdsGotnFMIZAgVJpQtC7AYJTWzwUxw_CrNqTigO-yj-EFq2KEfxoNL0-wMzEIaCt3_NPlHIEvfP8rhaJ8GWDEuOickt5n4ufUSWAW97WKHD9zDNbeQN4rAUSx4mTMAV0M02O6-fu6WsOxHdy7sYAF2qt68IvMJ-kC51rmg1tNNWE64Qr8BSrus6vf-n9O4fE_jCwEYSJPYrXiFu5bk1kgoC3IneCo6itkVtdZpmmI16w4TjVKbTI6Oa73EF5NQNiNadGk2Lc1RGLSK33i3bFfftvAKT-RZsn-5YNaoFXANIL4YpLFtUHqKlOXV9GU8R3qQ",
"encodedCpiSignedData":
"eyJmY2NJZCI6IkdlbXRlayIsImNic2RTZXJpYWxOdW1iZXIiOiJEODIzOTU2MDQ3IiwiaW5zdGFsbGF0aW9uUGFyYW0iOnsibGF0aXR1ZGUiOjM4LCJsb25naXR1ZGUiOjgwLCJoZWlnaHQiOjgsImhlaWdodFR5cGUiOiJBR0wiLCJob3Jpem9udGFsQWNjdXJhY3kiOjEsInZlcnRpY2FsQWNjdXJhY3kiOjEsImluZG9vckRlcGxveW1lbnQiOmZhbHNlLCJlaXJwQ2FwYWJpbGl0eSI6MzksImFudGVubmFBemltdXRoIjo0NSwiYW50ZW5uYURvd250aWx0IjoxMCwiYW50ZW5uYUdhaW4iOjEzLCJhbnRlbm5hQmVhbXdpZHRoIjozMSwiYW50ZW5uYU1vZGVsIjoiSW50ZXJuYWwifSwicHJvZmVzc2lvbmFsSW5zdGFsbGVyRGF0YSI6eyJjcGlJZCI6IjEyMzQ1IiwiY3BpTmFtZSI6IkhlbnJ5IiwiaW5zdGFsbENlcnRpZmljYXRpb25UaW1lIjoiMjAxOS0wOC0wMlQwMzowNzozNloifX0",
"protectedHeader": "eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9"
},
"fccId": "Gemtek",
"groupingParam": [
{
"groupId": "V9S8Na",

```
                "groupType": "INTERFERENCE_COORDINATION"
            }
        ],
        "measCapability": [
            "RECEIVED_POWER_WITHOUT_GRANT"
        ],
        "userId": "V9S8Na"
    }
  ]
}
2019-10-08T07:09:20.319Z - INFO - engine sent successfully, the response to CBRS    : {
  "registrationResponse": [
    {
        "cbsdId": "GemtekMock-SASD823956047",
        "response": {
            "responseCode": 0
        }
    }
  ]
}
2019-10-08T07:09:20.559Z - INFO - spectrumInquiry request from CBRS    : {
  "spectrumInquiryRequest": [
    {
        "cbsdId": "GemtekMock-SASD823956047",
        "inquiredSpectrum": [
            {
                "highFrequency": 3620000000.0,
                "lowFrequency": 3600000000.0
            }
        ]
    }
  ]
}
2019-10-08T07:09:20.578Z - INFO - The requested spectrum is in the range, SpectrumInquiry response code is 0
2019-10-08T07:09:20.581Z - INFO - engine sent successfully, the response to CBRS    : {
  "spectrumInquiryResponse": [
```

```
        {
            "availableChannel": [
                {
                    "channelType": "GAA",
                    "frequencyRange": {
                        "highFrequency": 3620000000.0,
                        "lowFrequency": 3600000000.0
                    },
                    "maxEirp": 21,
                    "ruleApplied": "FCC_PART_96"
                }
            ],
            "cbsdId": "GemtekMock-SASD823956047",
            "response": {
                "responseCode": 0
            }
        }
    ]
}
2019-10-08T07:09:20.819Z - INFO - grant request from CBRS    : {
    "grantRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "operationParam": {
                "maxEirp": 21,
                "operationFrequencyRange": {
                    "highFrequency": 3620000000.0,
                    "lowFrequency": 3600000000.0
                }
            }
        }
    ]
}
2019-10-08T07:09:20.834Z - INFO - engine sent successfully, the response to CBRS    : {
    "grantResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
```

```
                "channelType": "GAA",
                "grantExpireTime": "2019-10-15T07:09:20Z",
                "grantId": "115809179",
                "heartbeatInterval": 60,
                "response": {
                    "responseCode": 0
                }
            }
        ]
}
2019-10-08T07:09:21.069Z - INFO - heartbeat request from CBRS   : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "GRANTED"
        }
    ]
}
2019-10-08T07:09:21.085Z - INFO - engine sent successfully, the response to CBRS   : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:12:41Z"
        }
    ]
}
2019-10-08T07:09:37.404Z - INFO - heartbeat request from CBRS   : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "AUTHORIZED"
```

```
        }
    ]
}
2019-10-08T07:09:37.421Z - INFO - engine sent successfully, the response to CBRS   : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:12:57Z"
        }
    ]
}
2019-10-08T07:09:53.407Z - INFO - heartbeat request from CBRS   : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "AUTHORIZED"
        }
    ]
}
2019-10-08T07:09:53.421Z - INFO - engine sent successfully, the response to CBRS   : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:13:13Z"
        }
    ]
}
2019-10-08T07:10:09.395Z - INFO - heartbeat request from CBRS   : {
```

```
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "AUTHORIZED"
        }
    ]
}
2019-10-08T07:10:09.414Z - INFO - engine sent successfully, the response to CBRS   : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:13:29Z"
        }
    ]
}
2019-10-08T07:10:25.387Z - INFO - heartbeat request from CBRS   : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "AUTHORIZED"
        }
    ]
}
2019-10-08T07:10:25.404Z - INFO - engine sent successfully, the response to CBRS   : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
```

```
                "transmitExpireTime": "2019-10-08T07:13:45Z"
            }
        ]
}
2019-10-08T07:10:41.374Z - INFO - heartbeat request from CBRS    : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "operationState": "AUTHORIZED"
        }
    ]
}
2019-10-08T07:10:41.390Z - INFO - engine sent successfully, the response to CBRS    : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "115809179",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:14:01Z"
        }
    ]
}
2019-10-08T07:10:54.375Z - INFO - deregistration request from CBRS    : {
    "deregistrationRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047"
        }
    ]
}
2019-10-08T07:10:54.382Z - INFO - engine sent successfully, the response to CBRS    : {
    "deregistrationResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "response": {
```

```
                "responseCode": 0
            }
        }
    ]
}
2019-10-08T07:10:56.918Z - INFO - registration request from CBRS    : {
    "registrationRequest": [
        {
            "airInterface": {
                "radioTechnology": "E_UTRA",
                "supportedSpec": "FFS"
            },
            "callSign": "callSign123",
            "cbsdCategory": "B",
            "cbsdSerialNumber": "D823956047",
            "cpiSignatureData": {
                "digitalSignature":
"AQIxdnskq-PmADBzrp0CzdsGotnFMIZAgVJpQtC7AYJTWzwUxw_CrNqTigO-yj-EFq2KEfxoNL0-wMzEIaCt
3_NPlHIEvfP8rhaJ8GWDEuOickt5n4ufUSWAW97WKHD9zDNbeQN4rAUSx4mTMAV0M02O6-fu6WsOxHdy
7sYAF2qt68IvMJ-kC51rmg1tNNWE64Qr8BSrus6vf-n9O4fE_jCwEYSJPYrXiFu5bk1kgoC3IneCo6itkVtdZpm
mI16w4TjVKbTI6Oa73EF5NQNiNadGk2Lc1RGLSK33i3bFfftvAKT-RZsn-5YNaoFXANIL4YpLFtUHqKlOXV9
GU8R3qQ",
                "encodedCpiSignedData":
"eyJmY2NJZCI6IkdlbXRlayIsImNic2RTZXJpYWxOdW1iZXIiOiJEODIzOTU2MDQ3IiwiaW5zdGFsbGF0aW9u
UGFyYW0iOnsibGF0aXR1ZGUiOjM4LCJsb25naXR1ZGUiOjgwLCJoZWlnaHQiOjgsImhlaWdodFR5cGUiOiJ
BR0wiLCJob3Jpem9udGFsQWNjdXJhY3kiOjEsInZlcnRpY2FsQWNjdXJhY3kiOjEsImluZG9vckRlcGxveW1lb
nQiOmZhbHNlLCJlaXJwQ2FwYWJpbGl0eSI6MzksImFudGVubmFBemltdXRoIjo0NSwiYW50ZW5uYURvd2
50aWx0IjoxMCwiYW50ZW5uYUdhaW4iOjEzLCJhbnRlbm5hQmVhbXdpZHRoIjozMSwiYW50ZW5uYU1vZG
VsIjoiSW50ZXJuYWwifSwicHJvZmVzc2lvbmFsSW5zdGFsbGVyRGF0YSI6eyJjcGlJZCI6IjEyMzQ1IiwiY3Bp
TmFtZSI6IkhlbnJ5IiwiaW5zdGFsbENlcnRpZmljYXRpb25UaW1lIjoiMjAxOS0wOC0wMlQwMzowNzozNloifX0
",
                "protectedHeader": "eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9"
            },
            "fccId": "Gemtek",
            "groupingParam": [
                {
                    "groupId": "V9S8Na",
```

```
                "groupType": "INTERFERENCE_COORDINATION"
            }
        ],
        "measCapability": [
            "RECEIVED_POWER_WITHOUT_GRANT"
        ],
        "userId": "V9S8Na"
    }
  ]
}
2019-10-08T07:10:56.984Z - INFO - engine sent successfully, the response to CBRS    : {
  "registrationResponse": [
    {
        "cbsdId": "GemtekMock-SASD823956047",
        "response": {
            "responseCode": 0
        }
    }
  ]
}
2019-10-08T07:10:57.223Z - INFO - spectrumInquiry request from CBRS    : {
  "spectrumInquiryRequest": [
    {
        "cbsdId": "GemtekMock-SASD823956047",
        "inquiredSpectrum": [
            {
                "highFrequency": 3620000000.0,
                "lowFrequency": 3600000000.0
            }
        ]
    }
  ]
}
2019-10-08T07:10:57.232Z - INFO - The requested spectrum is in the range, SpectrumInquiry response code is 0
2019-10-08T07:10:57.233Z - INFO - engine sent successfully, the response to CBRS    : {
  "spectrumInquiryResponse": [
```

```
        {
            "availableChannel": [
                {
                    "channelType": "GAA",
                    "frequencyRange": {
                        "highFrequency": 3620000000.0,
                        "lowFrequency": 3600000000.0
                    },
                    "maxEirp": 21,
                    "ruleApplied": "FCC_PART_96"
                }
            ],
            "cbsdId": "GemtekMock-SASD823956047",
            "response": {
                "responseCode": 0
            }
        }
    ]
}
2019-10-08T07:10:57.474Z - INFO - grant request from CBRS    : {
    "grantRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "operationParam": {
                "maxEirp": 21,
                "operationFrequencyRange": {
                    "highFrequency": 3620000000.0,
                    "lowFrequency": 3600000000.0
                }
            }
        }
    ]
}
2019-10-08T07:10:57.487Z - INFO - engine sent successfully, the response to CBRS    : {
    "grantResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
```

```
                "channelType": "GAA",
                "grantExpireTime": "2019-10-15T07:10:57Z",
                "grantId": "897824970",
                "heartbeatInterval": 60,
                "response": {
                    "responseCode": 0
                }
            }
        ]
}
2019-10-08T07:10:57.723Z - INFO - heartbeat request from CBRS    : {
    "heartbeatRequest": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "897824970",
            "operationState": "GRANTED"
        }
    ]
}
2019-10-08T07:10:57.740Z - INFO - engine sent successfully, the response to CBRS    : {
    "heartbeatResponse": [
        {
            "cbsdId": "GemtekMock-SASD823956047",
            "grantId": "897824970",
            "response": {
                "responseCode": 0
            },
            "transmitExpireTime": "2019-10-08T07:14:17Z"
        }
    ]
}
```


———THE END———