
Confidential and Proprietary

**TEST RESULTS: Google SAS - CBSD Interoperability Testing
v5.8**

NOTE - All Fields in BLUE are to be filled in by vendor. Do not change text in BLACK.

Name of Vendor: **AmpliTech Group**

Date of Test Submittal: **2/15/2025**

This test report summarizes the results of Interoperability Tests (IOT) to validate the CBSD-SAS interface compatibility between VVDN Technologies Private Limited and a specific instance of Google SAS designed to execute this test plan for AmpliTech Group. The relevant document describing the test requirements is located here:

Google SAS and CBSD Integration Test Plan

The results of these test are 'Confidential Information' under the terms of the Google SAS Integration Testing Agreement between VVDN Technologies Private Limited and Google for customers (AmpliTech Group). Therefore, in addition to the other obligations contained in that agreement, you will not disclose or make public this report or the results hereof outside of the scope of that agreement.

CBSD Model Number: **VLRU-Gen3-3537-AE-AI**

CBSD Serial Number(s): **2.40435E+12**

Device Category (A or B): **A**

User ID(s): **vvdn-cbrs-dp**

CBSD FCC ID(s): **2BNMP-AMPU-LPRU**

Project ID: [vvdn-cbrs-dp](#)

Organisation ID: [2.23953E+11](#)

Results Overview:	
<u>Tests performed (9 required, 12 optional)</u>	
Note: Tests 1 through 7 are required. The count of '9 required' includes tests 3b and 5b.	
Passed	9
Passed with Conditions	0
Failed	0
Not Performed	12

Submitted for VVDN Technologies Private Limited by: [Name sumit.gandhi@vvdntech.com](#)

Verified for Google by: [Name sas-support@google.com](#)

NOTE: We will be verifying your logs against the "Expected CBSD result" section for each test, so please ensure that provided logs contain entries that directly correspond to that section

Time zone used for device logs (including UTC offset): UTC+00:00

Test case 1: CBSD registration, spectrum inquiry, grant & heartbeat (normal operation)

Test Description:

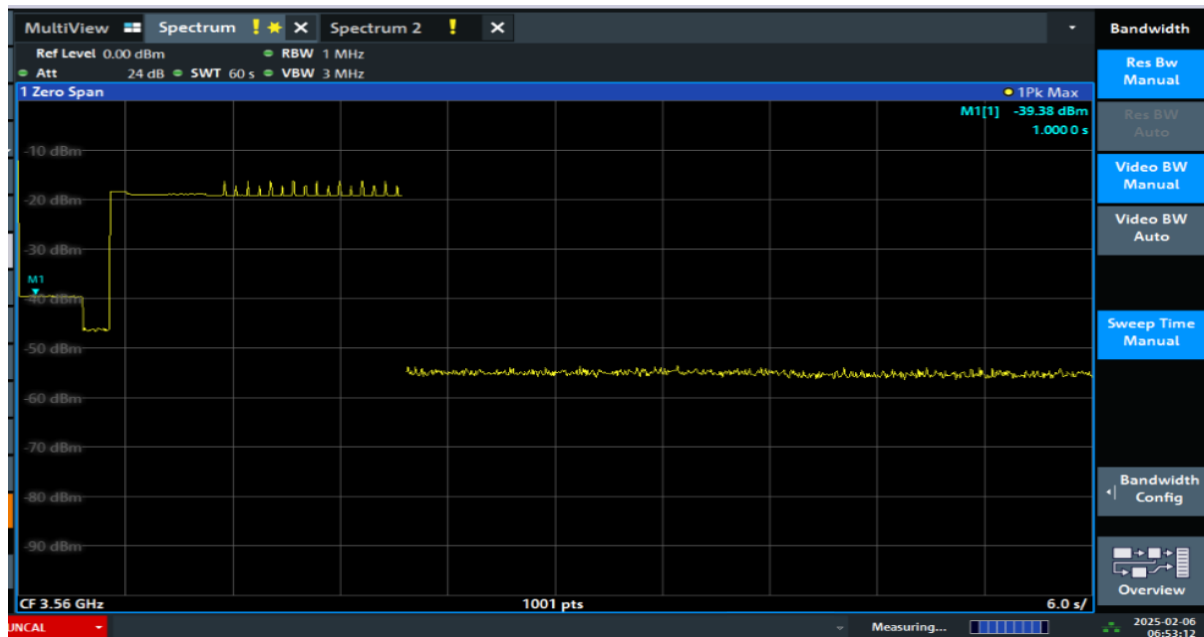
This test case verifies

- The CBSD registration procedure, grant procedure and first successful heartbeat to turn on the radio.
- [Optional] If the CBSD sends a spectrum inquiry request, it uses the available channels in the spectrum inquiry response for the following grant request.

Test Result: **Passed**

Does the device support single-step or multi-step registration?	Single Step Registration
Does the device use SI response to select channels for grant request? (or SI response is ignored)	Yes, based on SI response grant request will be initiated
How does the device choose which channel(s) and power(s) to request?	First continuous range will be chosen for Grant request based on the preferred bandwidth suggested by CBSD
How does the device decide how long it should wait between heartbeat requests?	In the grant response, heartbeatInterval time will be received from the SAS server
What are the device's minimum and preferred bandwidth and power requirements?	Minimum bandwidth: 10Mhz Minimum Power: 20 dBm/10 MHz
How many simultaneous grants is the device expected to hold in normal operation?	Single grant

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	<pre> 2025-02-06 06:52:03 INFO Sent defaultdict(<class 'list'>, {'registrationRequest': [{'userId': 'vvdn-cbrs-dp', 'fccId': '2BNMP-AMPU- LPRU', 'cbsdSerialNumber': 'VVDN-LPRU_RU_INDOOR_LPRU_VVDN- LPRU_RU_INDOOR_LPRU_2404348600008', 'callSign': 'callSign123', 'cbsdCategory': 'A', 'airInterface': {'radioTechnology': 'NR', 'supportedSpec': 'FFS'}, 'installationParam': {'latitude': 27.959260621112705, 'longitude': -82.4478757144776, 'height': 8, 'heightType': 'AGL', 'horizontalAccuracy': 0, 'verticalAccuracy': 0, 'indoorDeployment': True, 'antennaAzimuth': 359, 'antennaDowntilt': 2, 'antennaGain': 7, 'eirpCapability': 24, 'antennaBeamwidth': 65, 'antennaModel': 'test'}}]]) to SAS and got the following response: b'{\n "registrationResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "response": {\n "responseCode": 0\n }\n }\n]\n }' 2025-02-06 06:52:13 INFO Sent defaultdict(<class 'list'>, {'spectrumInquiryRequest': [{'cbsdId': '2BNMP-AMPU- LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'inquiredSpectrum': [{'lowFrequency': 3550000000, 'highFrequency': 3700000000}]]}) to SAS and got the following response: b'{\n "spectrumInquiryResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "availableChannel": [\n {\n "frequencyRange": {\n "lowFrequency": 3690000000,\n "highFrequency": 3700000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3680000000,\n "highFrequency": 3690000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3670000000,\n "highFrequency": 3680000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3660000000,\n "highFrequency": 3670000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3650000000,\n "highFrequency": 3660000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3640000000,\n "highFrequency": 3650000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3630000000,\n "highFrequency": 3640000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3620000000,\n "highFrequency": 3630000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3610000000,\n "highFrequency": 3620000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n }\n]\n }\n]\n }' </pre>
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Notes (optional):

Test case 2: Grant relinquishment and deregistration (normal operation)

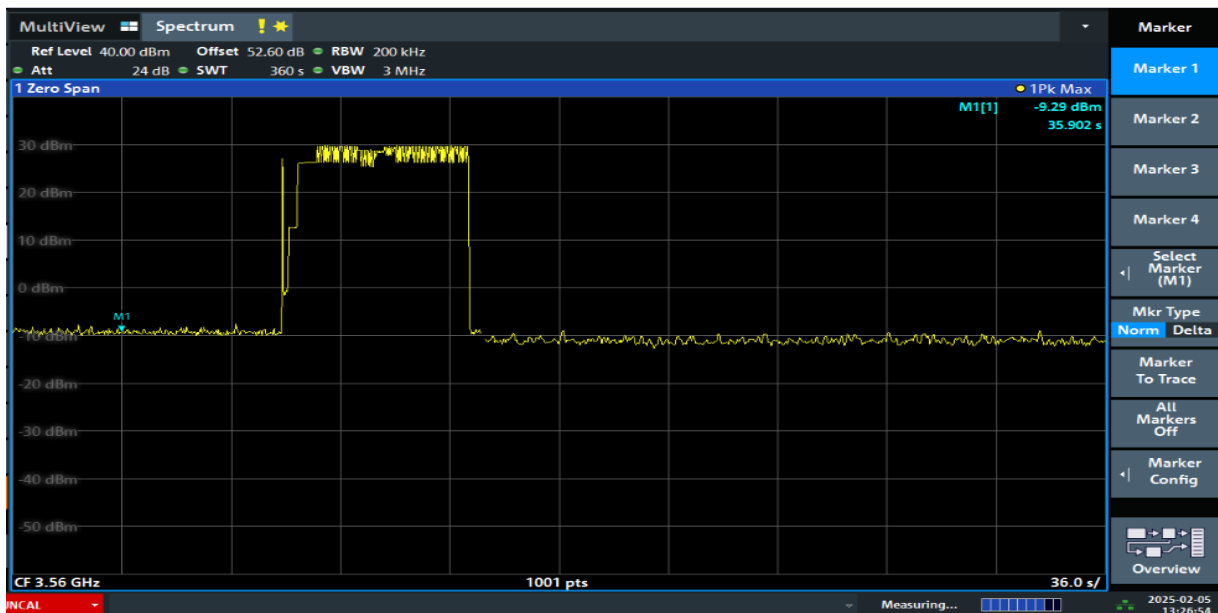
Test Description:

This test case verifies that a CBSD can deregister from the SAS.

Test Result: **Passed**

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the	2025-02-05 13:26:50 INFO Sent defaultdict(<class 'list'>, {'relinquishmentRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'grantId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/6966710478449175758'}]}) to SAS and got the following response: b'\n"relinquishmentResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "grantId":
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	cell may not display the entire log.	"2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/6966710478449175758",\n "response": {\n "responseCode": 0\n }\n }\n }\n }\n '\n 2025-02-05 14:56:22 INFO Sent defaultdict(<class 'list'>, {'deregistrationRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f'}]}) to SAS and got the following response: b'\n "deregistrationResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "response": {\n "responseCode": 0\n }\n }\n }\n }\n '\n
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Notes (optional):

Test case 3a: Grant suspension: IAP Pending

Test Description:

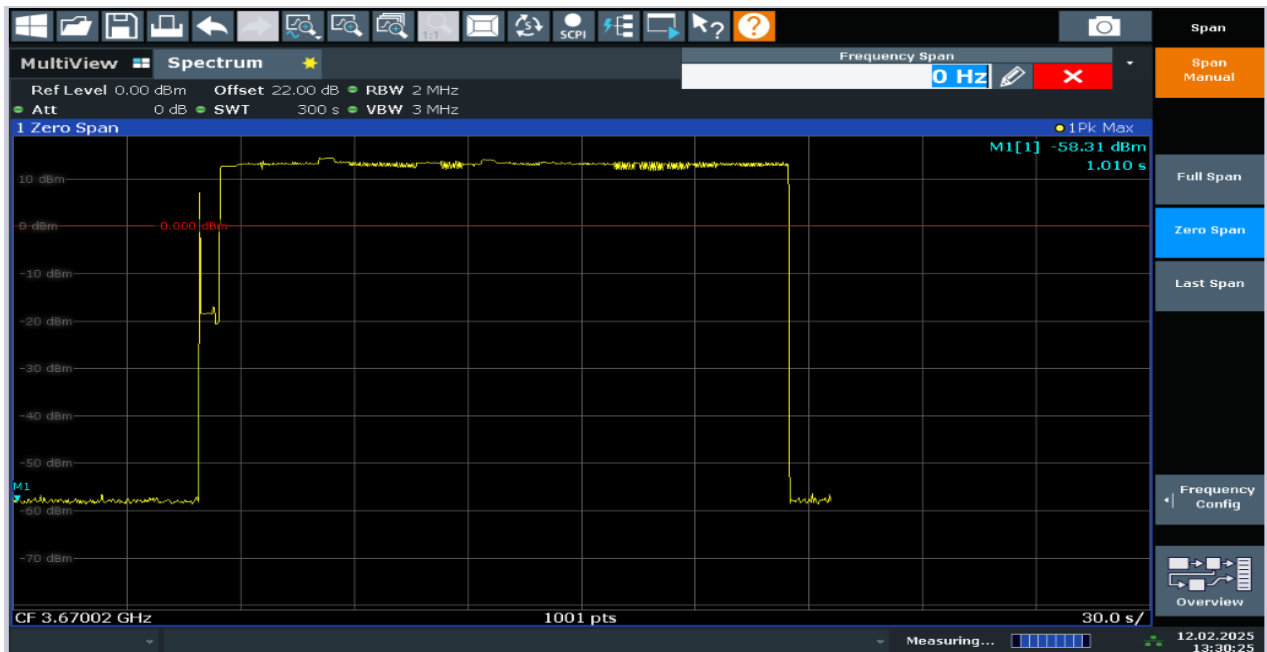
This test case verifies that

- The CBSD radio turns off when the SAS suspends the CBSD's grant.
- The CBSD reports the correct operation state in subsequent heartbeat requests.

Test Result: Passed

How long after a grant is suspended will the CBSD take action (beyond heartbeating)?	Within 60 seconds
What is that action? Examples include any/all of: heartbeat on the suspended grant, relinquish the suspended grant, spectrum inquiry, request a new grant.	heartbeat on the suspended grant
If the device requests a new grant, how are the operating parameters chosen?	If SAS suggest new opeartionParams during grant suspension, The existing grant is relinquished and new grant is raised with SAS suggested operationParams
Assuming unrealistically-instantaneous SAS responses, would users of the radio experience any downtime, and if so how much?	Less than 60 seconds

Devic e Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	2025-02-12 13:27:21 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/12045006793830426474', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae",\n "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/12045006793830426474",\n "transmitExpireTime": "2025-02-12T19:27:21Z",\n "response": {\n "responseCode": 0\n }\n }\n]\n]\n' 2025-02-12 13:29:51 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/12286835505379496926', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae",\n "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/12286835505379496926",\n "transmitExpireTime": "2025-02-12T13:28:22Z",\n "response": {\n "responseCode": 501,\n "responseMessage": "SUSPENDED_GRANT: IAP Pending",\n "responseData": [\n "IAP Pending"\n]\n }\n }\n]\n]\n'
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Notes (optional):

Test case 3b: Grant suspension: DPA move list activated

Test Description:

This test case verifies that

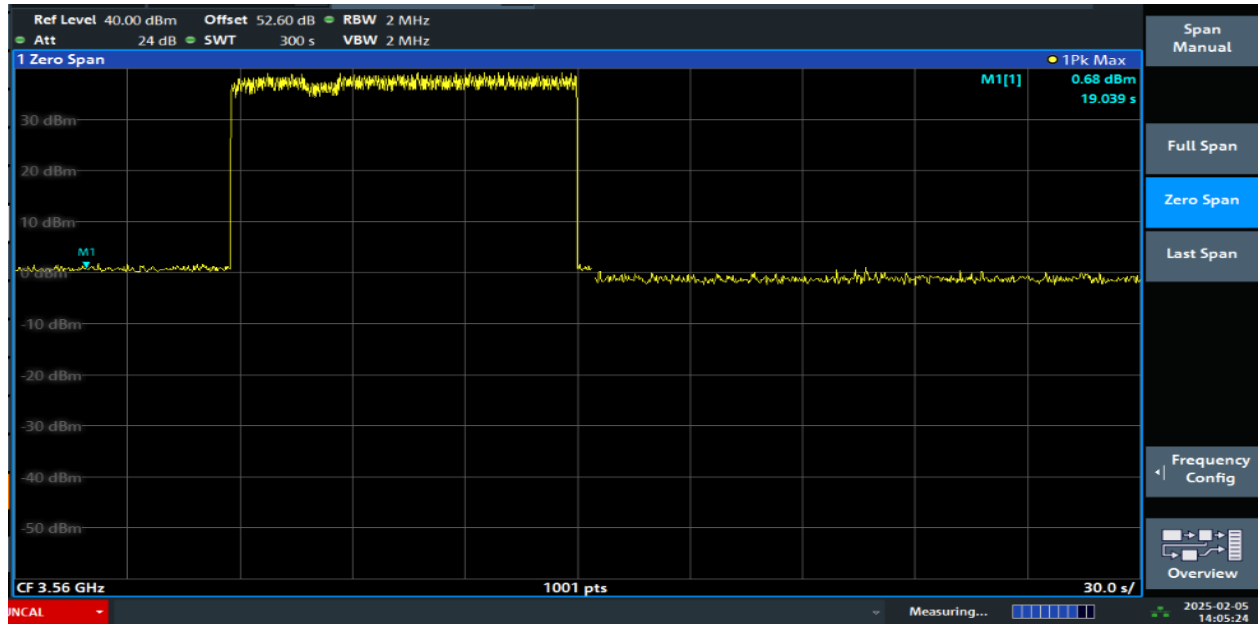
- The CBSD radio turns off when the SAS suspends the CBSD's grant.
- The CBSD reports the correct operation state in subsequent heartbeat requests.

Test Result: **Passed**

How long after a grant is suspended will the CBSD take action (beyond heartbeating)?	Within 60 seconds
What is that action? Examples include any/all of: heartbeat on the suspended grant, relinquish the suspended grant, spectrum inquiry, request a new grant.	Stop the radio RF transmission and heartbeat on the suspended grant
If the device requests a new grant, how are the operating parameters chosen?	OperationParams are chosen from the SAS heartbeat response. Will relinquish the existing grant and raise a new grant with SAS suggested operationParams
Assuming unrealistically-instantaneous SAS responses, would users of the radio experience any downtime, and if so how	Less than 60 seconds

much?

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	2025-02-05 14:03:42 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'grantId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/17939898414114140252', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'{\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "grantId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/17939898414114140252",\n "transmitExpireTime": "2025-02-05T14:07:41Z",\n "response": {\n "responseCode": 0\n }\n }\n]\n }'\n 2025-02-05 14:05:22 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'grantId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/17939898414114140252', 'operationState': 'AUTHORIZED'}]}) to SAS and got the following response: b'{\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "grantId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/17939898414114140252",\n "transmitExpireTime": "2025-02-05T14:05:22Z",\n "response": {\n "responseCode": 501,\n "responseMessage": "SUSPENDED_GRANT: The grant is suspended because it is in the move list of a DPA that has been activated",\n "responseData": [\n "The grant is suspended because it is in the move list of a DPA that has been activated"\n]\n }\n }\n]\n }'\n
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Notes (optional):

Test case 4: Grant reauthorization

Test Description:

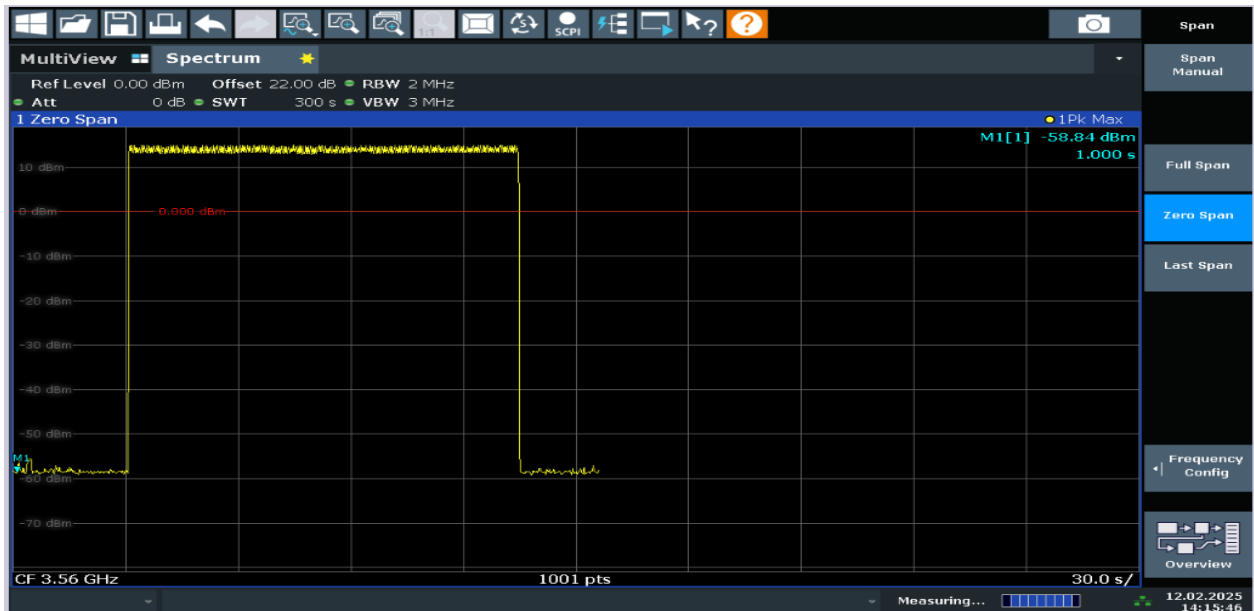
This test case verifies that the CBSD can resume transmission when the suspension zone is deactivated. Note that the CBSD behavior verified in this test is similar to the case when the CBSD's grant is suspended due to DPA protection and the grant is reauthorized after the DPA is deactivated.

Test Result: **Passed**

When reauthorized, will the CBSD relinquish the grants (if any) that it obtained due to the original grant's suspension?	If new operationParams is obtained during suspension period, Then old grants are relinquished. CBSD will only keep new grant.
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Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire	2025-02-12 14:13:31 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/5328973702884859310', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'{"heartbeatResponse": [{"cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae", "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/5328973702884859310", "transmitExpireTime": "2025-02-12T14:17:31Z", "response":
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	log.	<pre>{ "responseCode": 0 }</pre> 2025-02-12 14:15:21 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/5328973702884859310', 'operationState': 'AUTHORIZED'}]}) to SAS and got the following response: b'{ "heartbeatResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/5328973702884859310", "transmitExpireTime": "2025-02-12T14:15:21Z", "response": { "responseCode": 501, "responseMessage": "SUSPENDED_GRANT: The grant is suspended because it is in the move list of a DPA that has been activated", "responseData": ["The grant is suspended because it is in the move list of a DPA that has been activated"] } }] } 2025-02-12 14:16:12 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/5328973702884859310', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'{ "heartbeatResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/5328973702884859310", "transmitExpireTime": "2025-02-12T14:15:21Z", "response": { "responseCode": 501, "responseMessage": "SUSPENDED_GRANT: The grant is suspended because it is in the move list of a DPA that has been activated", "responseData": ["The grant is suspended because it is in the move list of a DPA that has been activated"] } }] } 2025-02-12 14:28:01 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/8445317861662344853', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'{ "heartbeatResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/8445317861662344853", "transmitExpireTime": "2025-02-12T14:32:01Z", "response": { "responseCode": 0 } }] }
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Notes (optional):

Test case 5a: Termination of an authorized grant with suggested operational parameters

Test Description:

This test case verifies that the CBSD

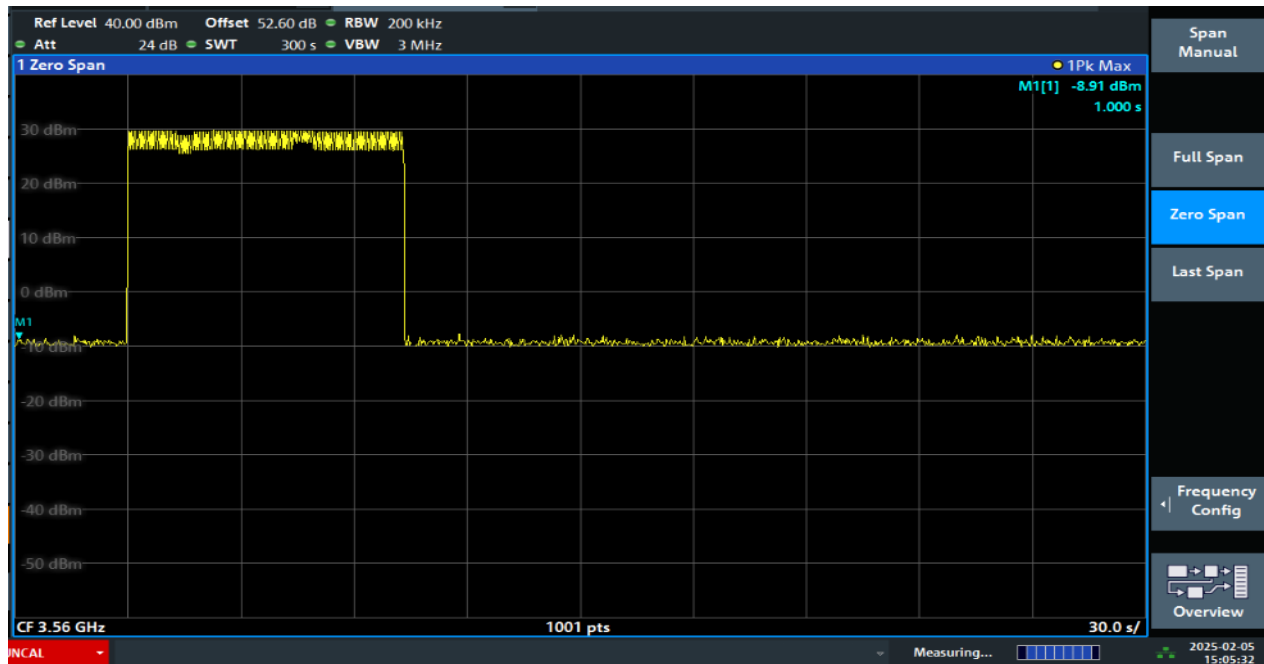
- Stops its heartbeat and stop the transmission associated with the grant that was terminated by SAS.
- Requests a new grant by using the operational parameters recommended by SAS in the heartbeat response.

Test Result: **Passed**

What is the CBSD's behavior after the grant is terminated?

CBSD relinquish existing grant and stop RF trasnmission.
 Raise new grant request with SAS suggested operation parameters.

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	2025-02-05 15:05:21 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'grantId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/9447120769735632423', 'operationState': 'AUTHORIZED'}]}) to SAS and got the following response: b'\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n "grantId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f/9447120769735632423",\n "transmitExpireTime": "2025-02-05T15:05:21Z",\n "operationParam": {\n "maxEirp": 11,\n "operationFrequencyRange": {\n "lowFrequency": 3620000000,\n "highFrequency": 3640000000\n }\n },\n "response": {\n "responseCode": 500,\n "responseMessage": "TERMINATED_GRANT"\n }\n }\n]\n]\n'\n
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Notes (optional):

Test case 5b: Termination of an authorized grant from a channel mask in the SAS Portal

Test Description:

This test case verifies that the CBSD

- Can stop heartbeating and cease transmission associated with a grant which has been terminated by the SAS.
- Requests a new grant for one of the available channels from the SI response without user intervention.

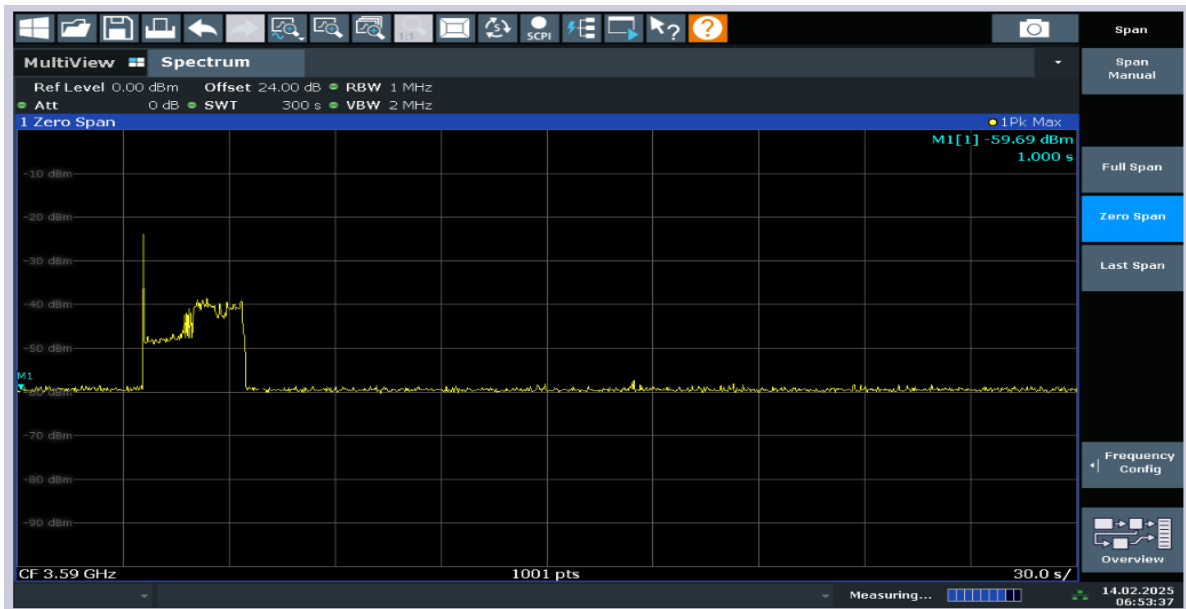
Test Result: **Passed**

What is the CBSD's behavior after the grant is terminated?	CBSD relinquish the grant and stop RF transmission
What is the CBSD's behavior after receiving ranked SI response?	CBSD will raise a new grant based on the SI Response

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	<pre> DP logs=====2025-02-15 04:33:38 DEBUG Starting new HTTPS connection (1): test.sas.goog:443 2025-02-15 04:33:40 DEBUG https://test.sas.goog:443 "POST /v1.2/heartbeat HTTP/1.1" 200 232 2025-02-15 04:33:40 INFO REQUEST TYPE=====heartbeatRequest : <class 'str'> 2025-02-15 04:33:40 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae', 'grantId': '2BNMP- AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/161116296565369 18155', 'operationState': 'AUTHORIZED'}]}) to SAS and got the following response: b'\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae",\n "grantId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/161116296565369 18155",\n "transmitExpireTime": "2025-02-15T04:33:40Z",\n "response": {\n "responseCode": 500,\n "responseMessage": "TERMINATED_GRANT"\n }\n }\n]\n' 2025-02-15 04:33:40 INFO About to process responses sas_response=<Response [200]> 2025-02-15 04:33:40 DEBUG [heartbeatResponse] Processing requests: [<DBRequest(id='6986', type_id='4', cbsd_id='482' created_date='2025-02-15 04:33:29.629638+00:00' updated_date='2025- 02-15 04:33:29.629638+00:00' payload='{<dict obj= {'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae', 'grantId': '2BNMP- AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbed22e0798f52ae/161116296565369 18155', 'operationState': 'AUTHORIZED'}>}] using response </pre>
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		<pre>{'heartbeatResponse': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP- AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/161116296565369 18155', 'transmitExpireTime': '2025-02-15T04:33:40Z', 'response': {'responseCode': 500, 'responseMessage': 'TERMINATED_GRANT'}}]}</pre> 2025-02-15 04:34:00 DEBUG https://test.sas.goog:443 "POST /v1.2/spectrumInquiry HTTP/1.1" 200 286 2025-02-15 04:34:00 INFO REQUEST TYPE=====spectrumInquiryRequest : <class 'str'> 2025-02-15 04:34:00 INFO Sent defaultdict(<class 'list'>, { 'spectrumInquiryRequest': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'inquiredSpectrum': [{'highFrequency': 3640000000, 'lowFrequency': 3620000000}]}]) to SAS and got the following response: b'\n "spectrumInquiryResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae",\n "availableChannel": [\n {\n "frequencyRange": {\n "lowFrequency": 3630000000,\n "highFrequency": 3640000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n },\n {\n "frequencyRange": {\n "lowFrequency": 3620000000,\n "highFrequency": 3630000000\n },\n "channelType": "GAA",\n "ruleApplied": "FCC_PART_96",\n "maxEirp": 14\n }\n],\n "response": {\n "responseCode": 0\n }\n]\n]\n}' 2025-02-15 04:34:00 INFO About to process responses sas_response=<Response [200]> 2025-02-15 04:34:00 DEBUG [spectrumInquiryResponse] Processing requests: [<DBRequest(id='6988', type_id='2', cbsd_id='482' created_date='2025-02-15 04:33:55.049166+00:00' updated_date='2025- 02-15 04:33:55.049166+00:00' payload='{ 'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'inquiredSpectrum': [{'highFrequency': 3640000000, 'lowFrequency': 3620000000}]}')>] using response {'spectrumInquiryResponse': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'availableChannel': [{'frequencyRange': {'lowFrequency': 3630000000, 'highFrequency': 3640000000}, 'channelType': 'GAA', 'ruleApplied': 'FCC_PART_96', 'maxEirp': 14}, {'frequencyRange': {'lowFrequency': 3620000000, 'highFrequency': 3630000000}, 'channelType': 'GAA', 'ruleApplied': 'FCC_PART_96', 'maxEirp': 14}], 'response': { 'responseCode': 0}]}} 2025-02-15 04:34:12 DEBUG https://test.sas.goog:443 "POST /v1.2/grant HTTP/1.1" 200 230 2025-02-15 04:34:12 INFO REQUEST TYPE=====grantRequest : <class 'str'> 2025-02-15 04:34:12 INFO Sent defaultdict(<class 'list'>,
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		<pre>{'grantRequest': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'operationParam': {'maxEirp': 14, 'operationFrequencyRange': {'lowFrequency': 3620000000, 'highFrequency': 3640000000}}]}) to SAS and got the following response: b{'\n "grantResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae",\n "grantId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/712158282922720 8335",\n "grantExpireTime": "2026-02-15T04:34:10Z",\n "heartbeatInterval": 60,\n "channelType": "GAA",\n "response": {\n "responseCode": 0\n } \n } \n] \n } \n } 2025-02-15 04:34:12 INFO About to process responses sas_response=<Response [200]> 2025-02-15 04:34:12 DEBUG [grantResponse] Processing requests: [<DBRequest(id='6989', type_id='3', cbsd_id='482' created_date='2025- 02-15 04:34:00.733799+00:00' updated_date='2025-02-15 04:34:00.733799+00:00' payload='{cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'operationParam': {'maxEirp': 14, 'operationFrequencyRange': {'lowFrequency': 3620000000, 'highFrequency': 3640000000}}}>] using response {'grantResponse': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP- AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/712158282922720 8335', 'grantExpireTime': '2026-02-15T04:34:10Z', 'heartbeatInterval': 60, 'channelType': 'GAA', 'response': {'responseCode': 0}}]} 2025-02-15 04:34:19 DEBUG https://test.sas.goog:443 "POST /v1.2/heartbeat HTTP/1.1" 200 202 2025-02-15 04:34:19 INFO REQUEST TYPE=====heartbeatRequest : <class 'str'> 2025-02-15 04:34:19 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP- AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/712158282922720 8335', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b{'\n "heartbeatResponse": [\n {\n "cbsdId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae",\n "grantId": "2BNMP-AMPU- LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/712158282922720 8335",\n "transmitExpireTime": "2025-02-15T04:38:19Z",\n "response": {\n "responseCode": 0\n } \n } \n] \n } \n }</pre>
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Notes (optional):

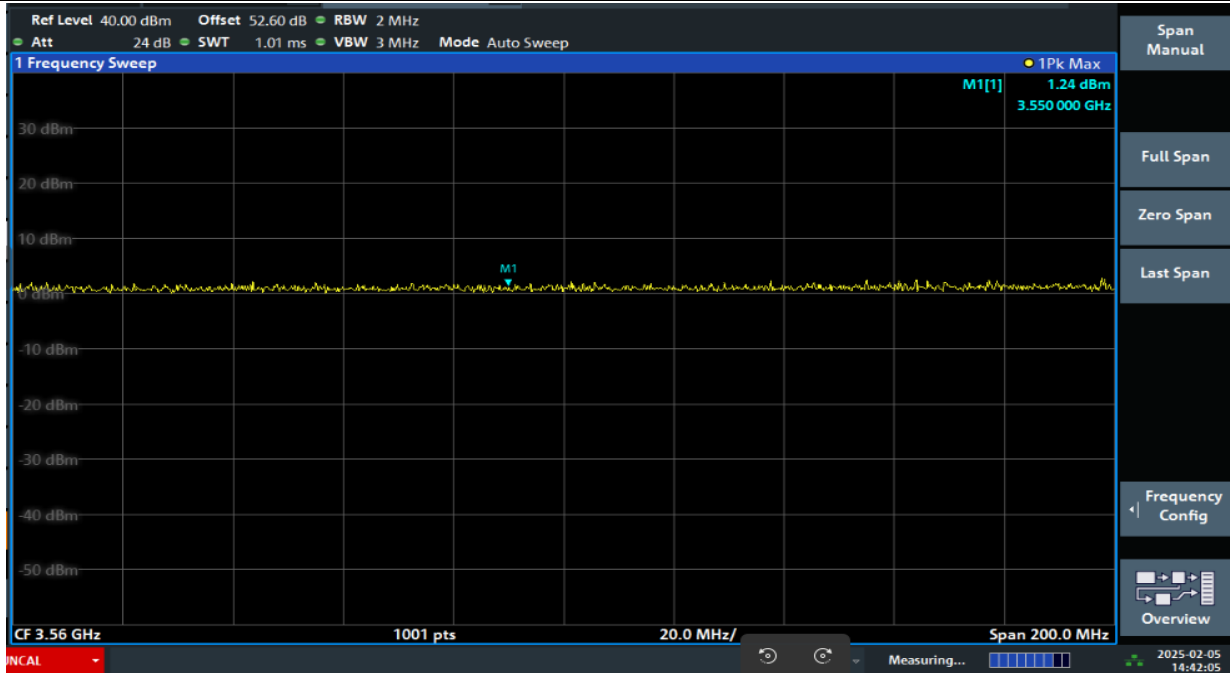
Test case 6: Grant request failure

Test Description:

This test case verifies that the CBSD does not start the heartbeat process or transmission if a grant request does not succeed.

Test Result: **Passed**

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	2025-02-05 14:42:23 INFO Sent defaultdict(<class 'list'>, {'grantRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f', 'operationParam': {'maxEirp': 14, 'operationFrequencyRange': {'lowFrequency': 3650000000, 'highFrequency': 3670000000}}]}]) to SAS and got the following response: b{'\n "grantResponse": [\n\n "cbsdId": "2BNMP-AMPU-LPRU/b9ef323c08639ea5a1036fa05c63db376dcc510f",\n\n "response": {\n "responseCode": 400,\n\n "responseMessage": "Inside GWPZ"\n } }\n]\n }\n'
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Notes (optional):

Test case 7: CBSD deregistration and re-registration

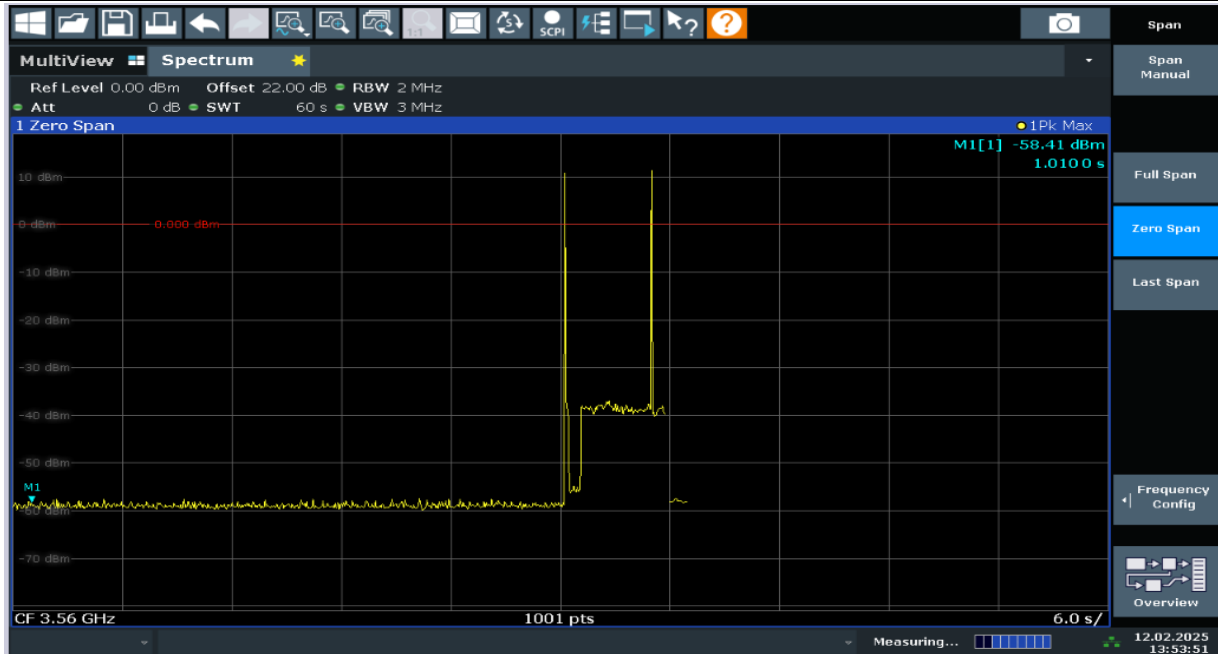
Test Description:

This test case verifies that the CBSD de-registers itself and re-registers when it is moved from one location to another location more than 50 meters away.

Test Result: Passed

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	2025-02-12 13:51:37 INFO Sent defaultdict(<class 'list'>, {'registrationRequest': [{'userId': 'a-cbrs-dp', 'fcid': '2BNMP-AMPU-LPRU', 'cbsdSerialNumber': 'VVDN-LPRU_RU_INDOOR_LPRU_2404348600008', 'callSign': 'callSign123', 'cbsdCategory': 'A', 'airInterface': {'radioTechnology': 'NR', 'supportedSpec': 'FFS'}, 'installationParam': {'latitude': 27.959260621112705, 'longitude': -82.4478757144776, 'height': 8, 'heightType': 'AGL', 'horizontalAccuracy': 0, 'verticalAccuracy': 0, 'indoorDeployment': True, 'antennaAzimuth': 359, 'antennaDowntilt': 2, 'antennaGain': 7, 'eirpCapability': 24, 'antennaBeamwidth': 65, 'antennaModel': 'test'}}]} to SAS and got the following response: b{'\n "registrationResponse": [\n {\n "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae",\n "response":
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		<pre>{ "responseCode": 0 }</pre> 2025-02-12 13:52:01 INFO Sent defaultdict(<class 'list'>, {'heartbeatRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae', 'grantId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/766734014775390006', 'operationState': 'GRANTED'}]}) to SAS and got the following response: b'{ "heartbeatResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "grantId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae/766734014775390006", "transmitExpireTime": "2025-02-12T13:56:01Z", "response": { "responseCode": 0 } }] }' 2025-02-12 13:55:22 INFO Sent defaultdict(<class 'list'>, {'deregistrationRequest': [{'cbsdId': '2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae'}]}) to SAS and got the following response: b'{ "deregistrationResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "response": { "responseCode": 0 } }] }' 2025-02-12 13:55:42 INFO Sent defaultdict(<class 'list'>, {'registrationRequest': [{'userId': 'vvdn-cbrs-dp', 'fccId': '2BNMP-AMPU-LPRU', 'cbsdSerialNumber': 'VVDN-LPRU_RU_INDOOR_LPRU_2404348600008', 'callSign': 'callSign123', 'cbsdCategory': 'A', 'airInterface': {'radioTechnology': 'NR', 'supportedSpec': 'FFS'}, 'installationParam': {'latitude': 27.959711808104814, 'longitude': -82.4478757144776, 'height': 8, 'heightType': 'AGL', 'horizontalAccuracy': 0, 'verticalAccuracy': 0, 'indoorDeployment': True, 'antennaAzimuth': 359, 'antennaDowntilt': 2, 'antennaGain': 7, 'eirpCapability': 24, 'antennaBeamwidth': 65, 'antennaModel': 'test'}]}) to SAS and got the following response: b'{ "registrationResponse": [{ "cbsdId": "2BNMP-AMPU-LPRU/59fcc39081e4d9cd3b8f0e82bbbed22e0798f52ae", "response": { "responseCode": 0 } }] }'
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Notes (optional):

Test case 8: (Optional) Grant expiration and renewal

Test Description:

This test case verifies the CBSD behavior when a grant is about to expire.

Test Result: **Not Performed**

Did the CBSD request grant renewal?	
If yes, how long before grant expiration did it request renewal?	
Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.

Notes (optional):

Test case 9: (Optional) CBSD handling of invalid/missing values

Test Description:

This test case shows examples of invalid requests. The CBSD need not follow the instructions step by step, but the tester should verify that once the CBSD receives a response code indicating there is an error in the request, it does not retry the same (invalid) request.

Test Result: **Not Performed**

What did the CBSD do once the SAS notified it of the invalid request? Examples include any/all of: re-send the same request, notify the user via the device's interface, notify the user out of band.

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test case 10: (Optional) CBSD measurement reporting for RECEIVED_POWER_WITHOUT_GRANT

Test Description:

This test verifies that CBSDs which support the “RECEIVED_POWER_WITHOUT_GRANT” measurement capability send measurement reports as prescribed in WINNF-17-SSC-0002.

Test Result: **Not Performed**

Did the CBSD perform spectrum inquiry before requesting the grant?

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test case 11: (Optional) CBSD measurement reporting for RECEIVED_POWER_WITH_GRANT

Test Description:

This test verifies that CBSDs which support the “RECEIVED_POWER_WITH_GRANT” measurement capability send measurement reports as prescribed in WINNF-17-SSC-0002.

Test Result: **Not Performed**

How long (in seconds) did it take for the CBSD to provide the first measurement report?

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test case 12: (Optional) Batch requests

Test Description:

This test case verifies that a domain proxy (DP) is capable of sending batch requests and receiving batch responses for multiple CBSDs.

In particular, this test case verifies:

The batch spectrum inquiry for multiple CBSDs.

The batch grant procedure for multiple CBSDs.

The first batch heartbeat to turn the radios on for multiple CBSDs.

Test Result: **Not Performed**

What is the largest batch request size supported by the DP?

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Test case 13: (Optional) Oversized batch requests

Test Description:

This test case verifies that a domain proxy is capable of handling a situation where the size of a batch request exceeds the maximum batch size that is processed by the SAS.

Test Result: **Not Performed**

What is the max batch size supported by DP?	
Does the DP support SAS grant response error code 106 (NOT_PROCESSED)	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test case 14: (Optional) Passive DAS registration & grant procedure

Test Description:

This test case verifies:

- The registration and grant procedure for Passive DAS radio equipment.
- (Optional) The spectrum inquiry process for Passive DAS radio equipment.

Test Result: **Not Performed**

Does the solution support Multi-step registration?	
Does each TP register with the SAS as a CBSD?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Case 15: (Optional) Sorted spectrum inquiry response

Test Description:

This test case verifies that the CBSD can select the highest quality channels from a sorted spectrum inquiry response.

Test Result: **Not Performed**

What are some of the selection criteria/conditions for CBSD/DP to request grants?	
Does the CBSD/DP chose/select channels for grant requests based on channel ranking provided in SI response? (i.e., most preferred/recommended channel first)	
Does the DP/CBSD chose recommended maxeirp value in the SI response when requesting grants?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Case 16: (Optional) Support for "Same Freq." value

Test Description:

This test case verifies that the CBSD/DP supports & sends Same Freq. identifier to Google SAS for those CBSDs that desire to obtain the same frequency. (i.e., supports WInnF. spec. for Single Freq. Group value)

Test Result: **Not Performed**

Does the CBSD/DP provide an option to configure this value (on-device or via NMS?)?	
Does the CBSD/DP send this value via Registration & heartbeat?	
Can this value be changed for multiple CBSDs via NMS? Or is it one device at a time?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Case 17: (Optional) Support for "Freq. reuse" value

Test Description:

This test case verifies that the CBSD/DP supports & send Freq. reuse to Google SAS for those CBSDs that desire to manage interference on their own. (i.e., supports WInnF. spec. for Spectrum Reuse Group value)

Test Result: **Not Performed**

Does the CBSD/DP provide an option to configure this value?	
Does the CBSD/DP send this value via Registration & heartbeat?	
Can this value be changed for multiple CBSDs via NMS? Or is it one device at a time?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Case 18: (Optional) Preference for multiple 10MHz grant requests v/s a single grant request for desired spectrum

Test Description:

This test case verifies that the DP/CBSD prefers & requests multiple 10MHz wide grants whenever possible, instead of a single grant of more than 10 Mhz when multiple channels are desired for operation.

Test Result: **Not Performed**

Does the CBS/D/DP support 10MHz grants?	
Does the solution support Carrier Aggregation?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Case 19: (Optional) Support for grants on non-contiguous channels

Test Description:

This test case verifies that the DP/CBSD supports & requests grants for multiple non-contiguous/non-consecutive 10MHz channels for the same CBS/D.

Test Result: **Not Performed**

Does the solution support Carrier Aggregation?	
Does the solution support Carrier Aggregation on non-contiguous channels?	
Does the solution support & request multiple grants?	

Device Logs:	Copy logs for this test (with timestamps) into the cell to the right. Note that the cell may not display the entire log.	
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Notes (optional):

Test Status:

Passed	The device under test has met all the requirements defined in the test case description.
Passed with Conditions	The device under test has met all the requirements defined in the test case description; however, clarification is deemed necessary.
Failed	The device under test has not met the criteria specified in the test case description.
Not Performed	The test case was not performed for some reason.

Test Environment:

