ELEMENT WASHINGTON DC LLC
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TEST REPORT
CBSD-SAS Interoperability

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
2/7/2023 – 2/9/2023
Test Site/Location:
Element Lab. Columbia, MD, USA
Test Report Serial No.:
1M2302100007-01.A3L

FCC ID:	**A3LSOG2201**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SOG2201-G30
EUT Type:	Smallcell
Frequency Range:	3550 – 3700 MHz
FCC Classification:	Citizens Band Category A and B Devices (CBD)
FCC Rule Part(s):	Part 96
Test Procedure(s):	KDB 940660 D01 v03, WINNF-TS-0122-V1.0.2, ONGO-TS-9001 V.1.0.0

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in the test procedures listed above. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

Authorized Test Lab

ACCREDITED
CERT #2041.01

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element is a CBRS Alliance (OnGo) Approved Test Lab
- Element is a WInnForum Approved Test Lab
- Element is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for CBRS Alliance Certification Test Plan and WInnForum Conformance and Performance Test Technical Standard.
- Element is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd., Smallcell FCC ID: A3LSOG2201.** The test data contained in this report pertains only to CBSD-SAS interoperability. The EUT is a Category B CBSD.

Test Device Serial Number(s): 12-Samsung_Networks
Test Device Hardware Version: PCS01
Test Device Software Version: 23A

2.2 Device Capabilities

This device contains the following capabilities:

NR n48

This device supports the following conditional features:

	Conditional Test Case Definitions	Supported
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 CPI-signed 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	☐

Table 2-1. Conditional Features

2.3 Test Configuration

The EUT was connected to the SAS Test Harness developed by WINNF WG4-CBSD. The SAS Test Harness (V1.0.0.2) provided by CBRS Alliance was used. The SAS Test Harness is synchronized to UTC time.

2.4 Modifications

No modifications were made to EUT during testing.

3.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9020A	MXA Signal Analyzer	3/4/2022	Annual	3/4/2023	US46470561
Dell	Latitude 5580	Test Harness Laptop	N/A	N/A	N/A	N/A

Table 3-1 Annual Test Equipment Calibration Schedule

4.0 ENVIRONMENTAL CONDITIONS

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

5.0 EVALUATION PROCEDURE

The measurement procedure described in KDB940660 D01 V03 and WINNF-TS-0122V1.0.2 were used in the measurement of the EUT**.**

Deviation from measurement procedure…….....None

6.0 TEST SUMMARY

6.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSOG2201

Table 6-1. Summary of Test Results

FCC Part Section(s)	KDB940660 D01 Section 3.3 a)	Test Case Description	WInnForum Test Case	Test Result
96.39 (c)	1	Confirm that the device will only transmit after it receives authorization from a SAS	WINNF.FT.C.REG.1 WINNF.FT.C.REG.8 WINNF.FT.C.REG.10 WINNF.FT.C.REG.12 WINNF.FT.C.REG.14 WINNF.FT.C.REG.16 WINNF.FT.C.REG.18 WINNF.FT.C.GRA.1 WINNF.FT.C.GRA.2 WINNF.FT.C.HBT.5	Pass
96.39 (c)	2	Check the device registration and authorization with the SAS – determine if the device behaves appropriately for successful and unsuccessful registrations. The device should not be transmitting without authorization from the SAS.	WINNF.FT.C.REG.1 WINNF.FT.C.REG.8 WINNF.FT.C.REG.10 WINNF.FT.C.REG.12 WINNF.FT.C.REG.14 WINNF.FT.C.REG.16 WINNF.FT.C.REG.18	Pass
96.39(c)(1)	3	Confirm that the device changes its operating power and/or channel in response to a command from the SAS.	WINNF.FT.C.HBT.1	Pass
96.39	4	Confirm that the device correctly configures based on the different license classes	N/A	Pass
96.39(c)(1)	5	Confirm that the device transmits at a power level less than or equal to the maximum power level approved by the SAS.	WINNF.PT.C.HBT.1	Pass
96.39(b)(c)	6	Confirm that the device transmits with a bandwidth less than or equal to the SAS specified bandwidth.	WINNF.FT.C.HBT.1	Pass
96.39(c)(2)	7	Confirm that the device transmits on the SAS specified frequency.	WINNF.FT.C.HBT.1	Pass
96.39(c)(2)	8	Confirm that the device stops transmission in response to a command from the SAS, within a period as required by Part 96.	WINNF.FT.C.HBT.3 WINNF.FT.C.HBT.4 WINNF.FT.C.HBT.6 WINNF.FT.D.HBT.7 WINNF.FT.C.HBT.10 WINNF.FT.C.RLQ.1 WINNF.FT.C.DRG.1	Pass

Table 6-2. Summary of Test Results (continued)

96.39 (c)	9	Confirm that the device sends measurements data in response to the command from the SAS.	WINNF.FT.C.MES.1	Pass
96.39(a)	10	For devices with geo-location, confirm that it notifies the SAS of a new location when it is beyond the required distance parameter (±50 m) within the required time frame.	N/A	N/A
96.39 (c)	11	Confirm that the device is capable of reporting the signal level (measurement data) and frequency to SAS.	WINNF.FT.C.MES.1	Pass
	12	For a device that operates as a Category A CBSD and then desires to operate as a Category B CBSD (or vice versa), confirm that it re-registers with the SAS for the updated authorization status.	N/A	Pass
96 E	13	When CBSDs communicate through a management system, confirm compliance with all requirements.	N/A	Pass
96.39	14	When communication between the CBSD and SAS is lost: i) Describe how the CBSD would react if the communications between the device and the SAS is lost. Confirm that the CBSD stops transmission once it loses the link to the SAS. ii) Describe the process for re-establishment of the communications and confirm that the CBSD acts accordingly. iii) Confirm power-on restart process for registration (re-registration) occurs as expected. iv) Confirm the process for de-registration occurs as expected.	WINNF.FT.C.HBT.9 WINNF.FT.C.HBT.10	Pass
96.39(f)	KDB940660 D01 Section 4	SAS and Device Security Requirements	WINNF.FT.C.SCS.1 WINNF.FT.C.SCS.2 WINNF.FT.C.SCS.3 WINNF.FT.C.SCS.4 WINNF.FT.C.SCS.5	Pass

Notes:

- Test cases denoted as “N/A” in the table above are not applicable to the EUT and are either Optional or Conditional per Section 6 of WINNF-TS-0122.
- Please see Appendices for test data.

7.0 CONCLUSION

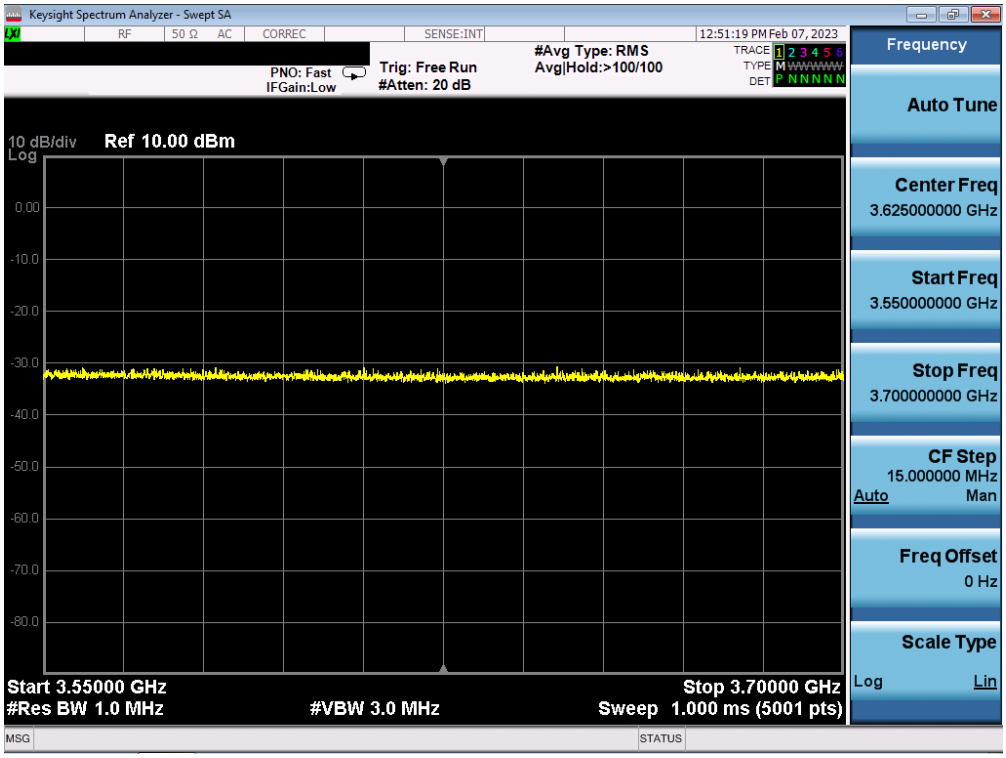
The data collected relate only to the item(s) tested and show that the **Samsung Electronics Co., Ltd., Cat B NR Router FCC ID: A3LSOG2201** has been tested to show compliance with Part 96 and WINNF-TS-0122.

APPENDIX A – TEST RESULT AND DATA

A1 [WINNF.FT.C.REG.1] Multi-Step registration

	Test Execution Steps	PASS	FAIL
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 CBSD sends correct Registration request information, as specified in [n.5], to the SAS Test Harness:	--	--
2	• 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.	☒	☐
3	• SAS Test Harness sends a CBSD Registration Response as follows: - cbsdId = Ci - 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	☒	☐

Test Plots:

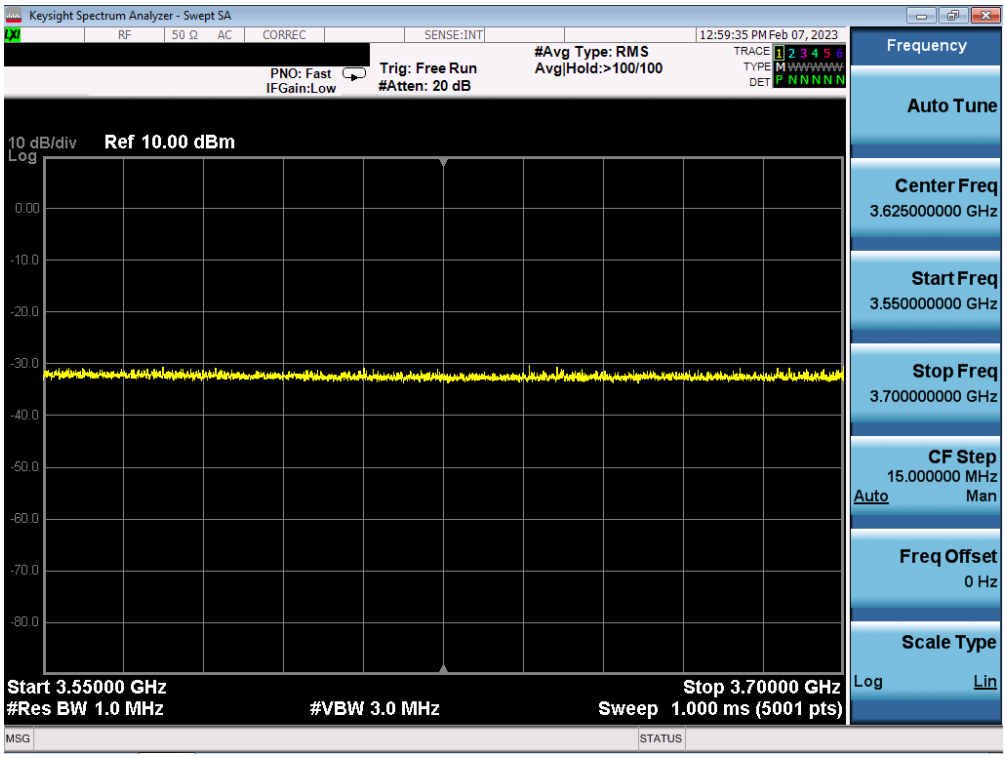


Plot 1. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.1) - NR

A2 [WINNF.FT.C.REG.8] Missing Required parameters (responseCode 102)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

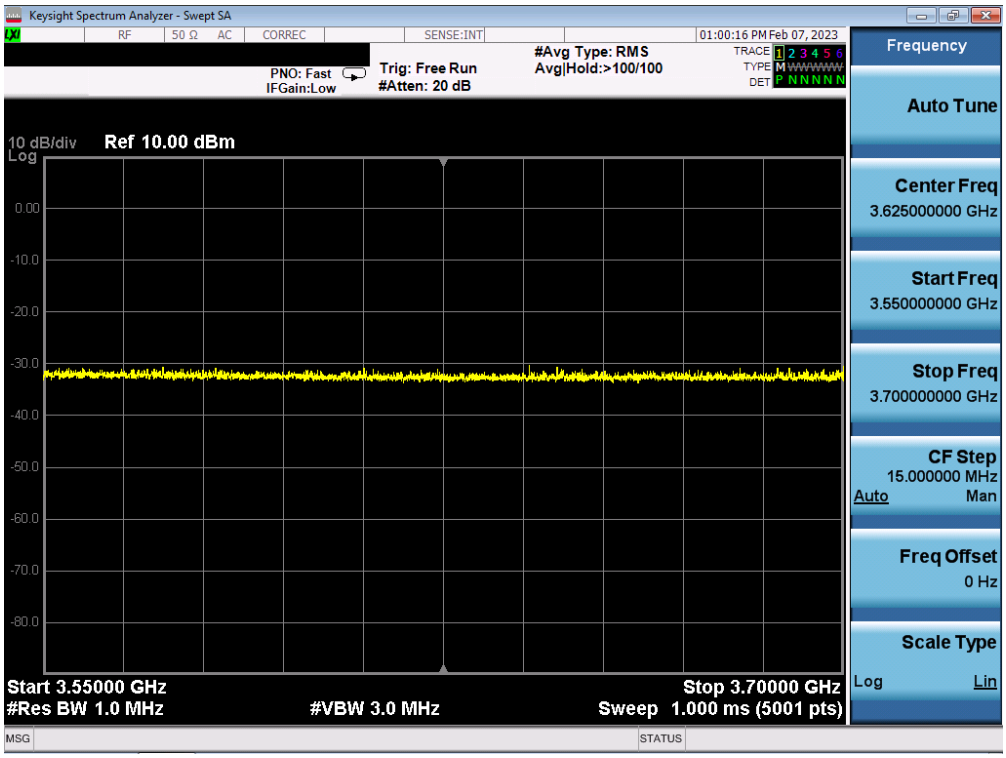


Plot 2. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.8) – NR

A3 [WINNF.FT.C.REG.10] Pending registration (responseCode 200)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

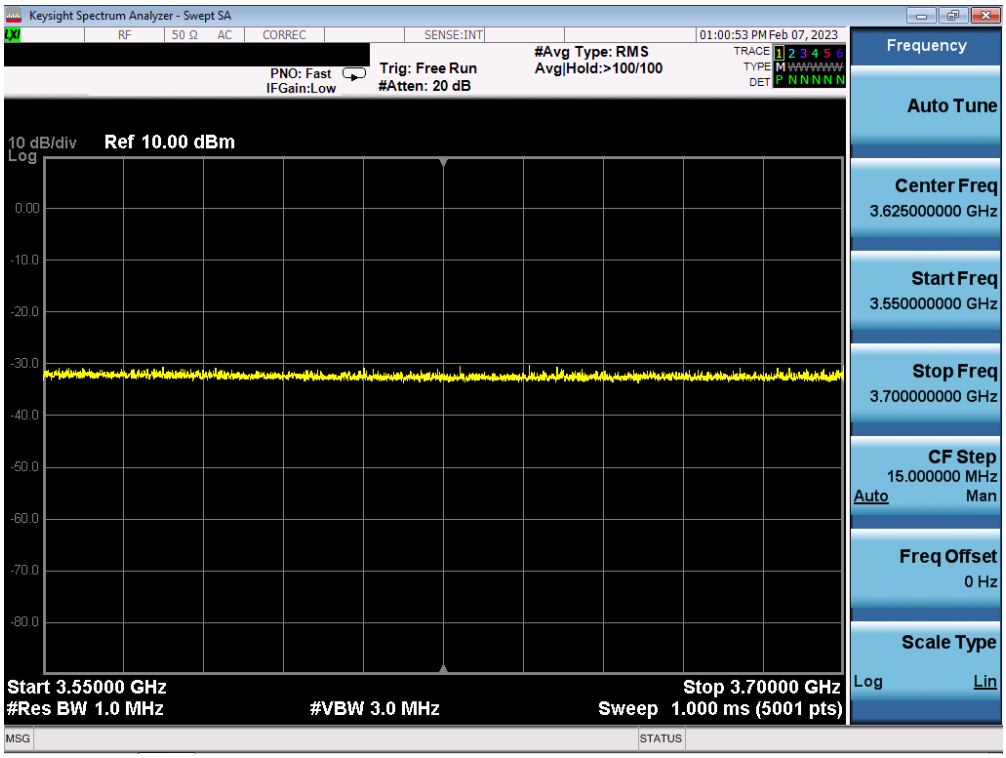


Plot 3. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.10) – NR

A4 [WINNF.FT.C.REG.12] Invalid parameter (responseCode 103)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

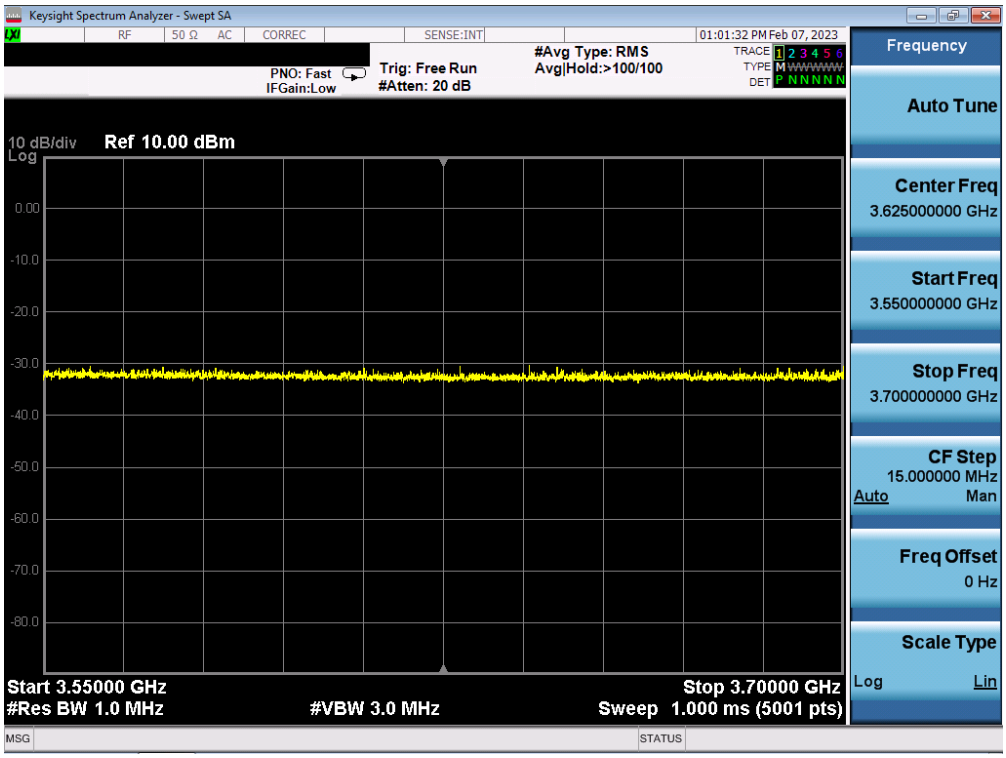


Plot 4. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.12) – NR

A5 [WINNF.FT.C.REG.14] Blacklisted CBSD (responseCode 101)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

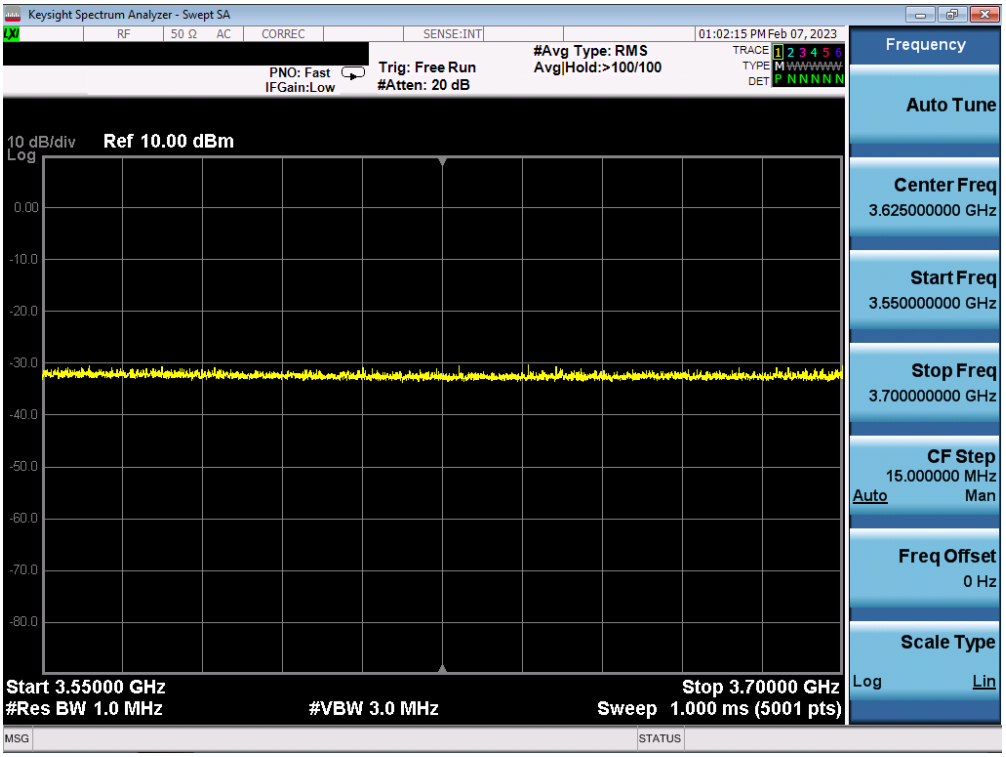


Plot 5. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.14) – NR

A6 [WINNF.FT.C.REG.16] Unsupported SAS protocol version (responseCode 100)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

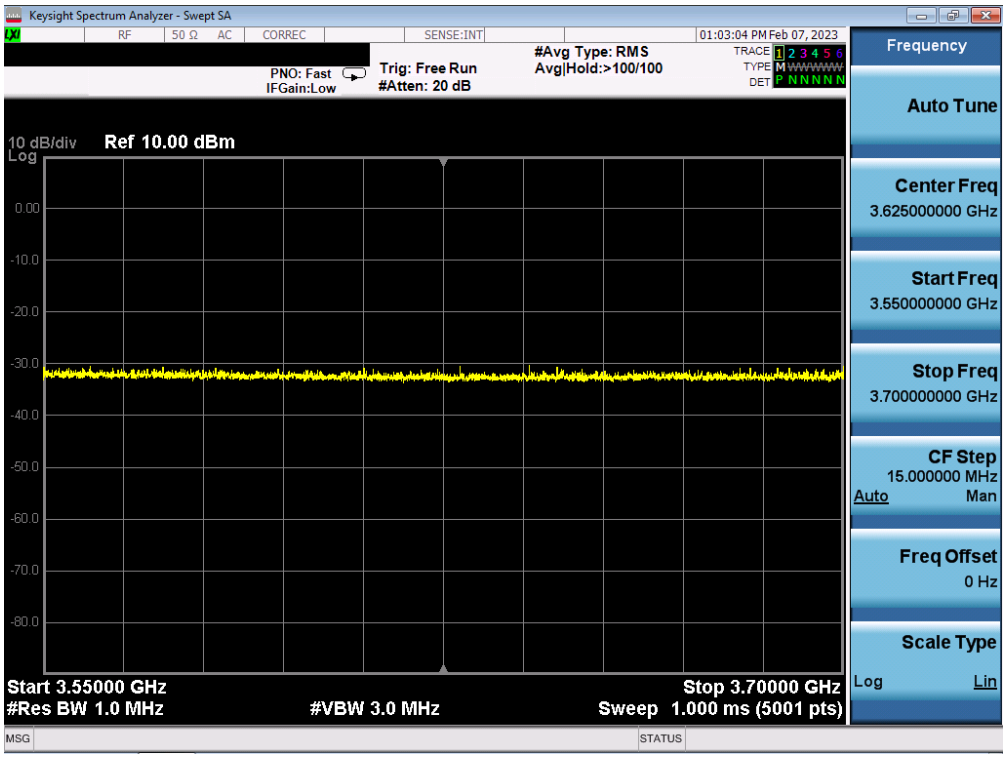


Plot 6. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.16) – NR

A7 [WINNF.FT.C.REG.18] Group Error (responseCode 201)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

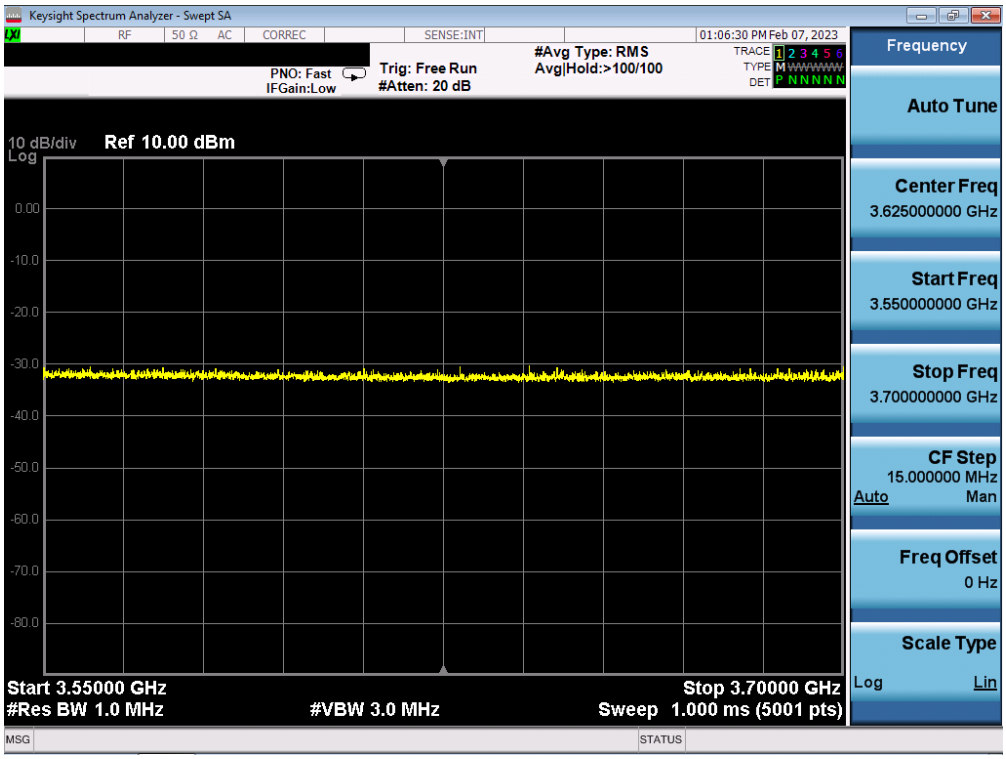


Plot 7. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.REG.18) – NR

A8 [WINNF.FT.C.GRA.1] Unsuccessful Grant responseCode=400 (INTERFERENCE)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:

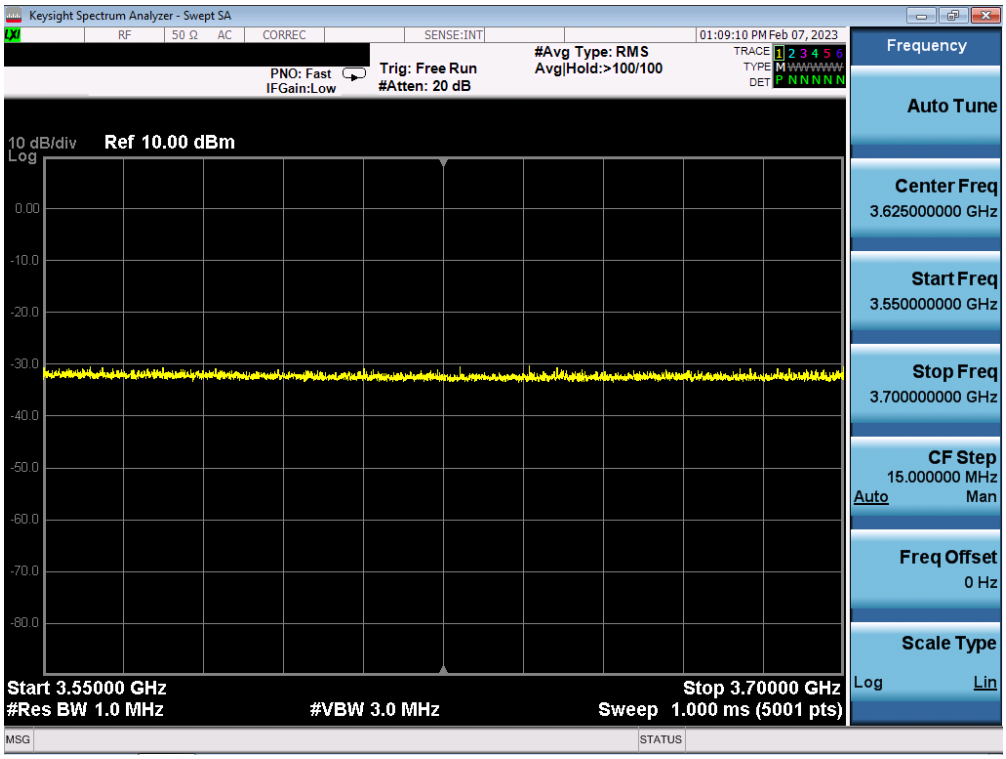


Plot 8. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.GRA.1) – NR

A9 [WINNF.FT.C.GRA.2] Unsuccessful Grant responseCode=401 (GRANT_CONFLICT)

	Test Execution Steps	PASS	FAIL
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	☒	☐

Test Plots:



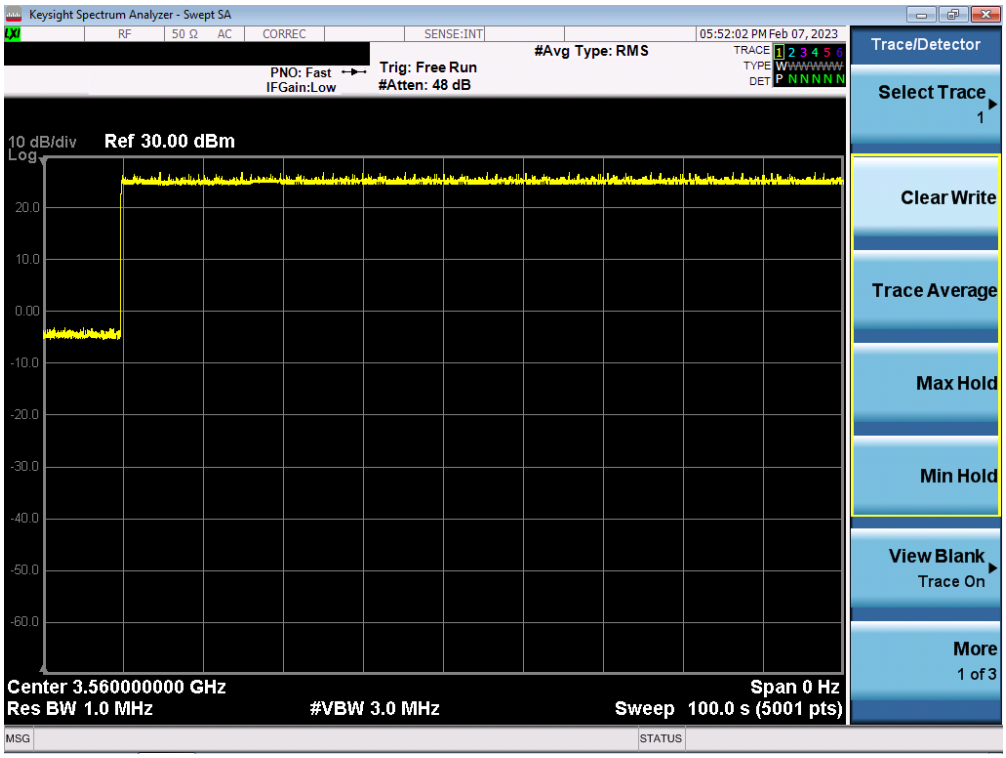
Plot 9. Conducted Measurement – No RF transmission in entire band for 60s of elapsed time (WINNF.FT.C.GRA.2) – NR

A10 [WINNF.FT.C.HBT.1] Heartbeat Success Case (first Heartbeat Response)

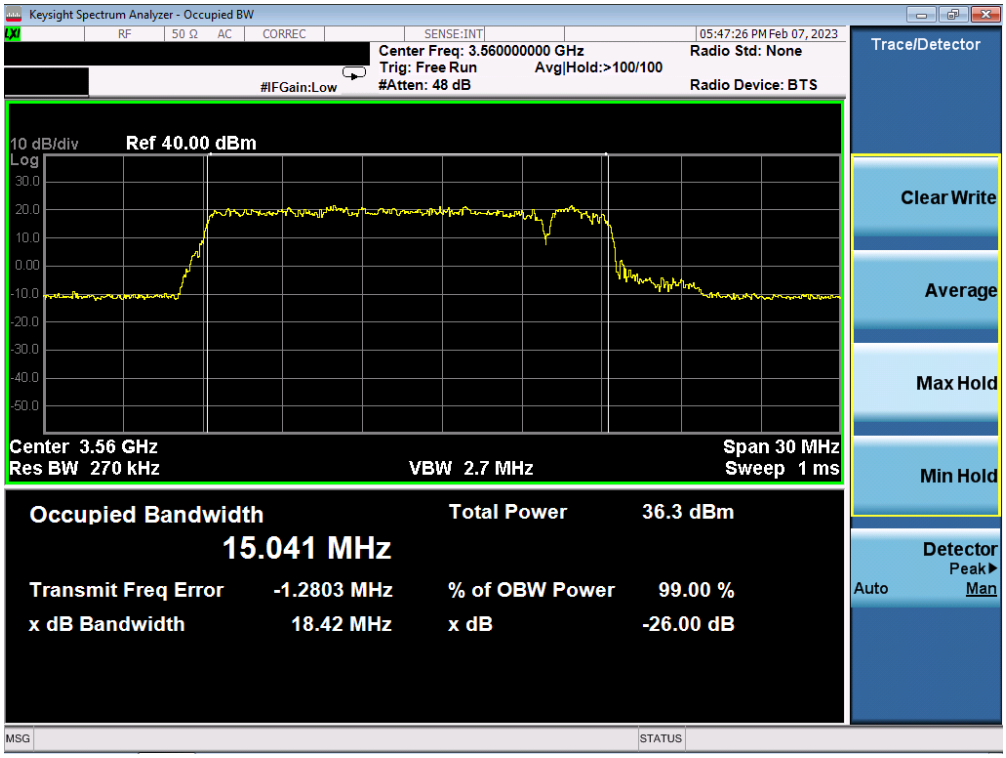
	Test Execution Steps	PASS	FAIL
1	Ensure the following conditions are met for test entry: • UUT has registered successfully with SAS Test Harness, with cbsdId = C	--	--
2	UUT sends a message: • If message is type Spectrum Inquiry Request, go to step 3, or • If message is type Grant Request, go to step 5	--	--
3	UUT sends Spectrum Inquiry Request. Validate: • cbsdId = C • List of frequencyRange objects sent by UUT are within the CBRS frequency range	☒	☐
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	☒	☐
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”	☒	☐
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	☒	☐

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	☒	☐

Test Plots:



Plot 10.Conducted Measurement - RF transmission after SAS heartbeat response (WINNF.FT.C.HBT.1) – NR

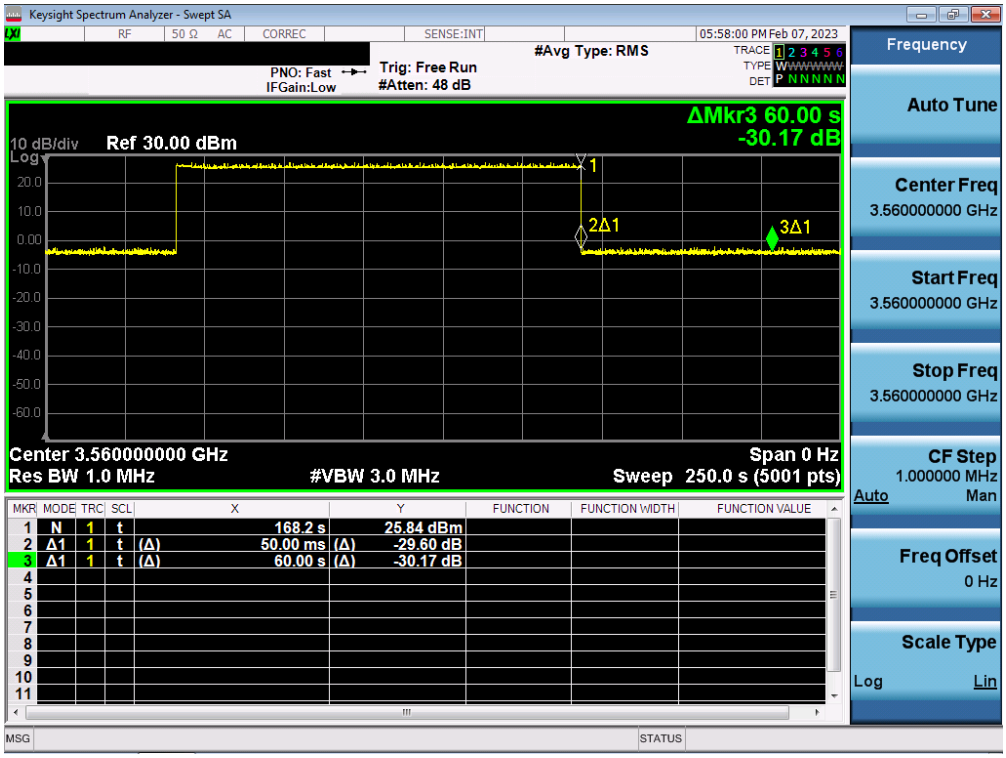


Plot 11.Conducted Measurement Occupied Bandwidth for 20MHz (WINNF.FT.C.HBT.1) – NR

A11 [WINNF.FT.C.HBT.3] Heartbeat responseCode=105 (DEREGISTER)

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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”	☒	☐
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	☒	☐

Test Plots:

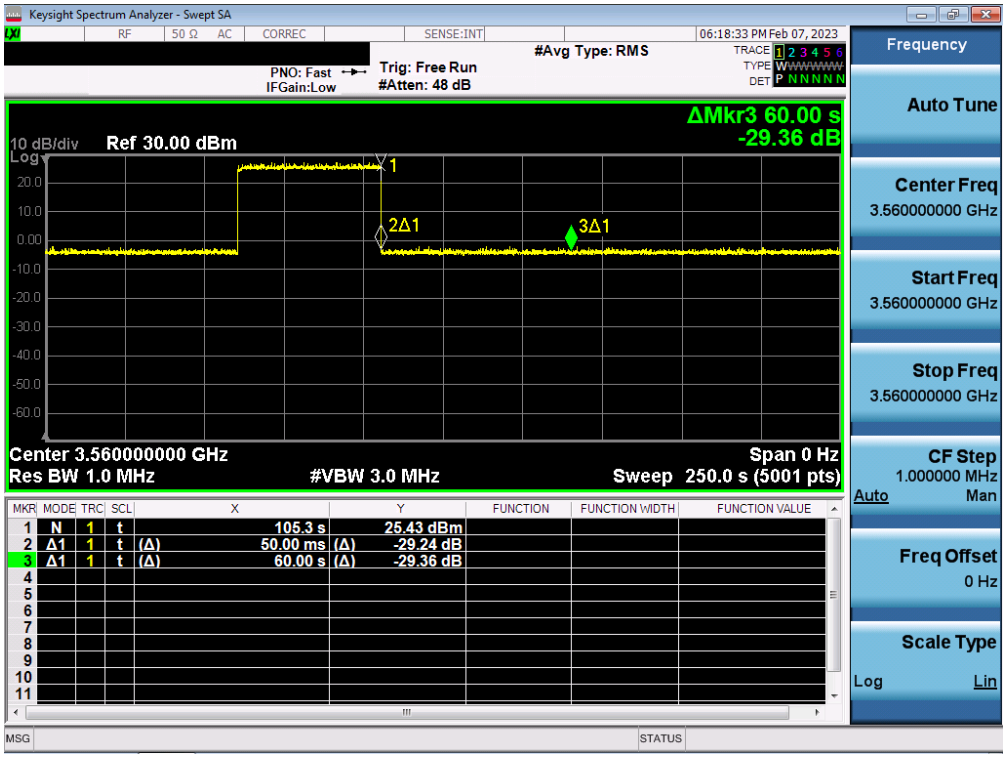


Plot 12. Conducted Measurement - RF transmission stops within 60s of SAS message indicated by Marker 1 (WINNF.FT.C.HBT.3) – NR

A12 [WINNF.FT.C.HBT.4] Heartbeat responseCode=500 (TERMINATED_GRANT)

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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”	☒	☐
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	☒	☐

Test Plots:

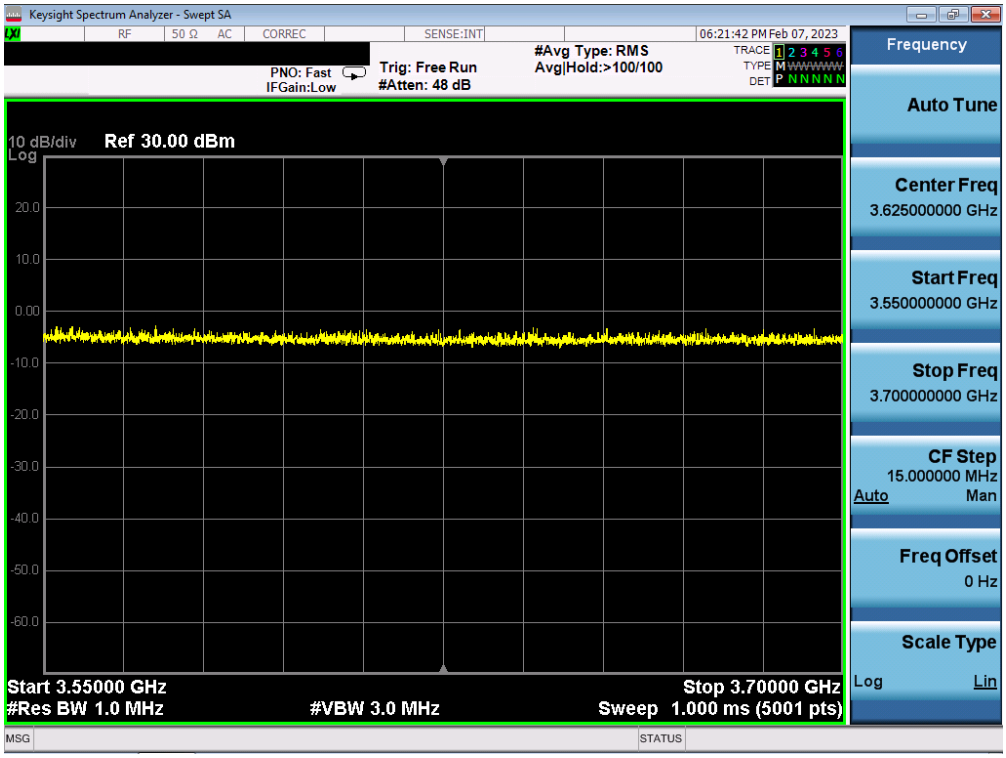


Plot 13.Conducted Measurement - RF transmission stops within 60s of SAS message indicated by Marker 1 (X) (WINNF.FT.C.HBT.4) – NR

A13 [WINNF.FT.C.HBT.5] Heartbeat responseCode=501 (SUSPENDED_GRANT) in First Heartbeat Response

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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 = “GRANTED”	☒	☐
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	☒	☐

Test Plots:

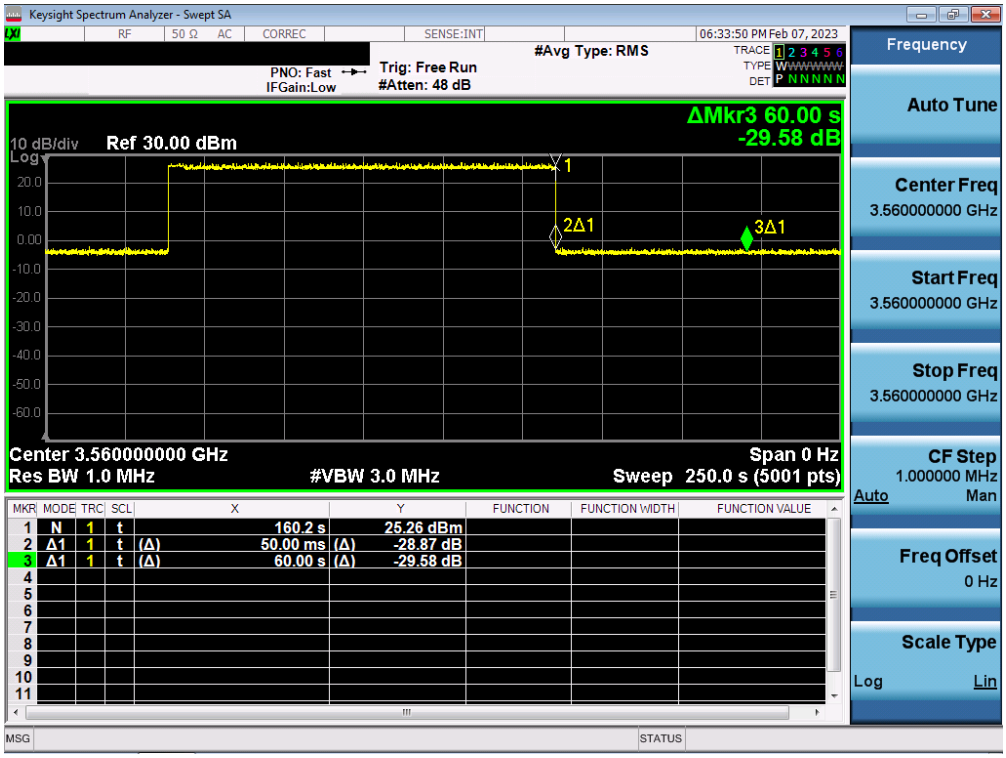


Plot 14. Conducted Measurement – No RF transmission in entire band (WINNF.FT.C.HBT.5) – NR

A14 [WINNF.FT.C.HBT.6] Heartbeat responseCode=501 (SUSPENDED_GRANT) in Subsequent Heartbeat Response

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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”	☒	☐
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 shall stop transmission within (T + 60 seconds) of completion of step 3	☒	☐

Test Plots:

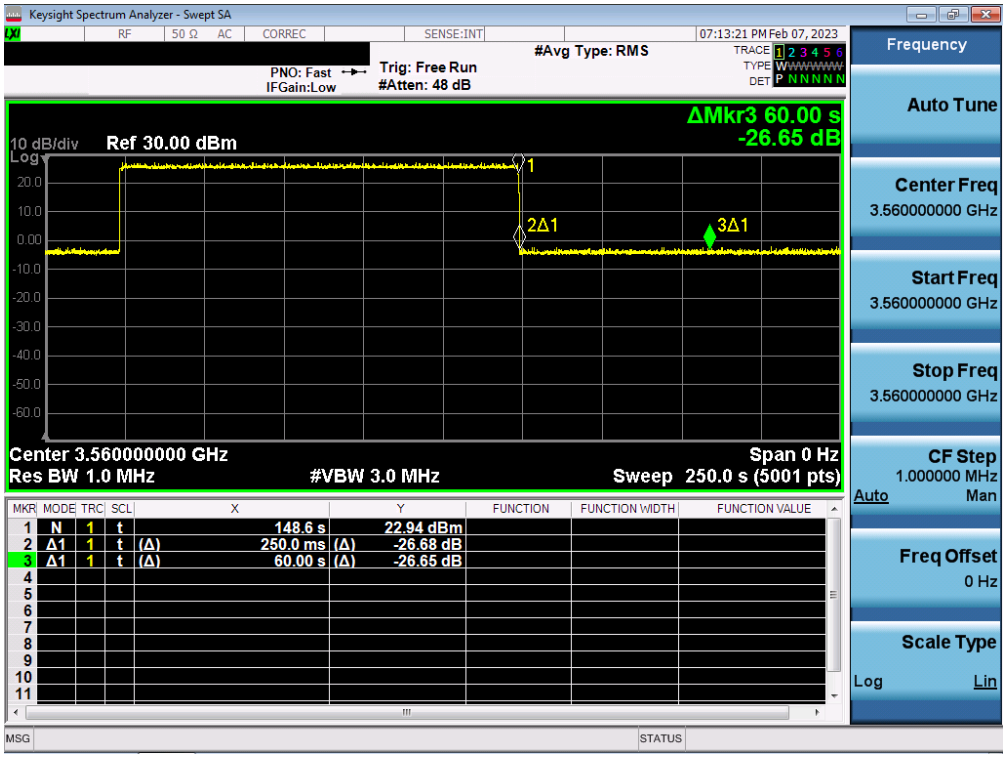


Plot 15.Conducted Measurement - RF transmission stops within 60s of SAS message indicated by Marker 1 (X) (WINNF.FT.C.HBT.6) – NR

A15 [WINNF.FT.C.HBT.7] Heartbeat responseCode=502 (UNSYNC_OP_PARAM)

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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”	☒	☐
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: o cbdsId = C o grantId = G Monitor the RF output of the UUT. Verify: • UUT shall stop transmission within (T+60) seconds of completion of step 3.	☒	☐

Test Plots:

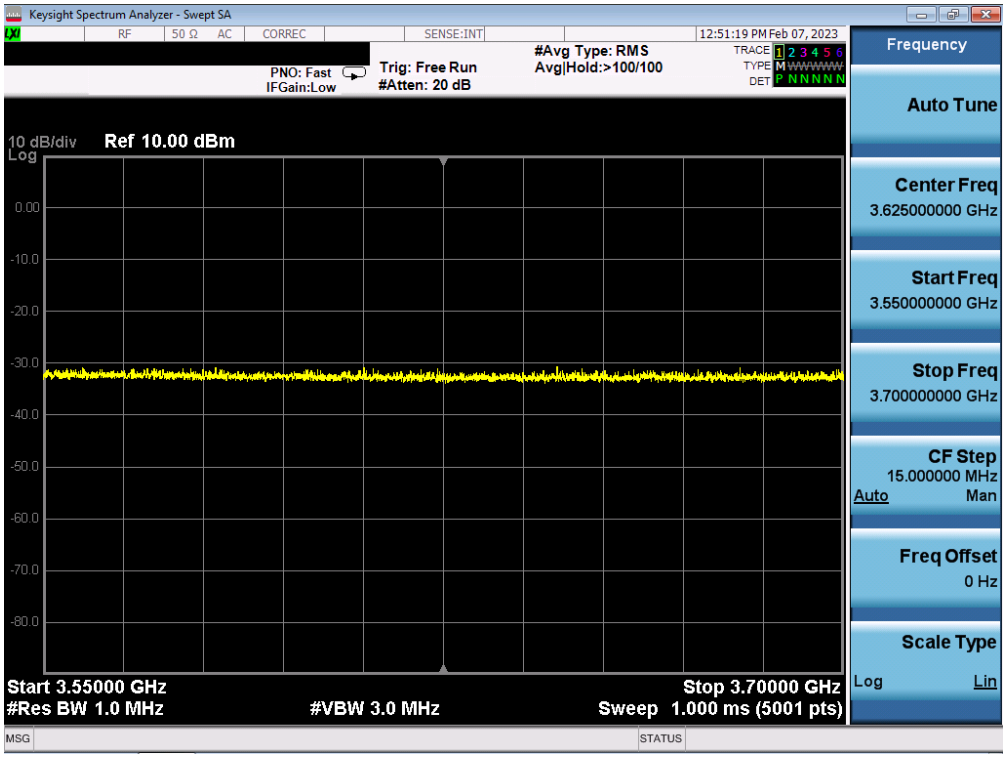


Plot 16. Conducted Measurement - RF transmission stops within 60s of SAS message indicated by Marker 1 (X) (WINNF.FT.C.HBT.7) – NR

A16 [WINNF.FT.C.HBT.9] Heartbeat Response Absent (First Heartbeat)

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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 • 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	☒	☐

Test Plots:



Plot 17. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.HBT.9) – NR

A17 [WINNF.FT.C.HBT.10] Heartbeat Response Absent (Subsequent Heartbeat)

	Test Execution Steps	PASS	FAIL
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: o valid cbsdId = C o valid grantId = G o grant is for frequency range F, power P o 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”	☒	☐
3	SAS Test Harness sends a Heartbeat Response message, including 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.	☒	☐

Test Plots:

Plot 18. Conducted Measurement - RF transmission stops within transmitExpireTime + 60s. The last SAS heartbeat message is indicated by Marker 1 (X) (WINNF.FT.C.HBT.10) – NR

A18 [WINNF.FT.C.MES.1] Registration Response contains measReportConfig

	Test Execution Steps	PASS	FAIL
1	Ensure the following conditions are met for test entry: • UUT has successfully completed SAS Discovery and Authentication with SAS Test Harness	--	--
2	UUT sends a Registration Request message. Validate the Registration Request message is formatted correctly, including: • userId is present and correct • fccId is present and correct • cbsdSerialNumber is present and correct • measCapability = “RECEIVED_POWER_WITHOUT_GRANT”	☒	☐
3	SAS Test Harness sends a Registration Response message, with the following parameters: • cbsdId = C = valid cbsdId for this UUT • measReportConfig= “RECEIVED_POWER_WITHOUT_GRANT” • responseCode = 0	--	--
4	UUT sends a message: • If message is type Spectrum Inquiry Request, go to step 5, or • If message is type Grant Request, go to step 7	--	--
5	UUT sends message type Spectrum Inquiry Request. Verify message contains all required parameters properly formatted, and specifically: • cbsdId = C • measReport is present, and is a properly formatted rcvdPowerMeasReport.	☒	☐
6	SAS Test Harness sends a Spectrum Inquiry Response, with the following parameters: • cbsdId = C • availableChannel is an array of availableChannel objects • responseCode = 0	--	--
7	UUT sends message type Grant Request message. Verify message contains all required parameters properly formatted, and specifically: • cbsdId = C • measReport is present, and is a properly formatted rcvdPowerMeasReport.	☒	☐

```
"rcvdPowerMeasReports": [
    {
        "measBandwidth": 10000000,
        "measFrequency": 3550000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3560000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3570000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3580000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3590000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3600000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3610000000,
        "measRcvdPower": -100
    },
    {
        "measBandwidth": 10000000,
        "measFrequency": 3620000000,
        "measRcvdPower": -100
    },
```


Plot 19. Measurement Report in Registration Response (WINNF.FT.C.MES.1)

```
{
    "measBandwidth": 10000000,
    "measFrequency": 3630000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3640000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3650000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3660000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3670000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3680000000,
    "measRcvdPower": -100
},
{
    "measBandwidth": 10000000,
    "measFrequency": 3690000000,
    "measRcvdPower": -100
```


Plot 20. Measurement Report in Registration Response Cont. (WINNF.FT.C.MES.1)

A19 [WINNF.FT.C.RLQ.1] Successful Relinquishment

	Test Execution Steps	PASS	FAIL
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 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	☒	☐

Test Plots:

Plot 21.Conducted Measurement - RF transmission stops (WINNF.FT.C.RLQ.1) – NR

A20 [WINNF.FT.C.DRG.1] Successful Deregistration

	Test Execution Steps	PASS	FAIL
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	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	☒	☐

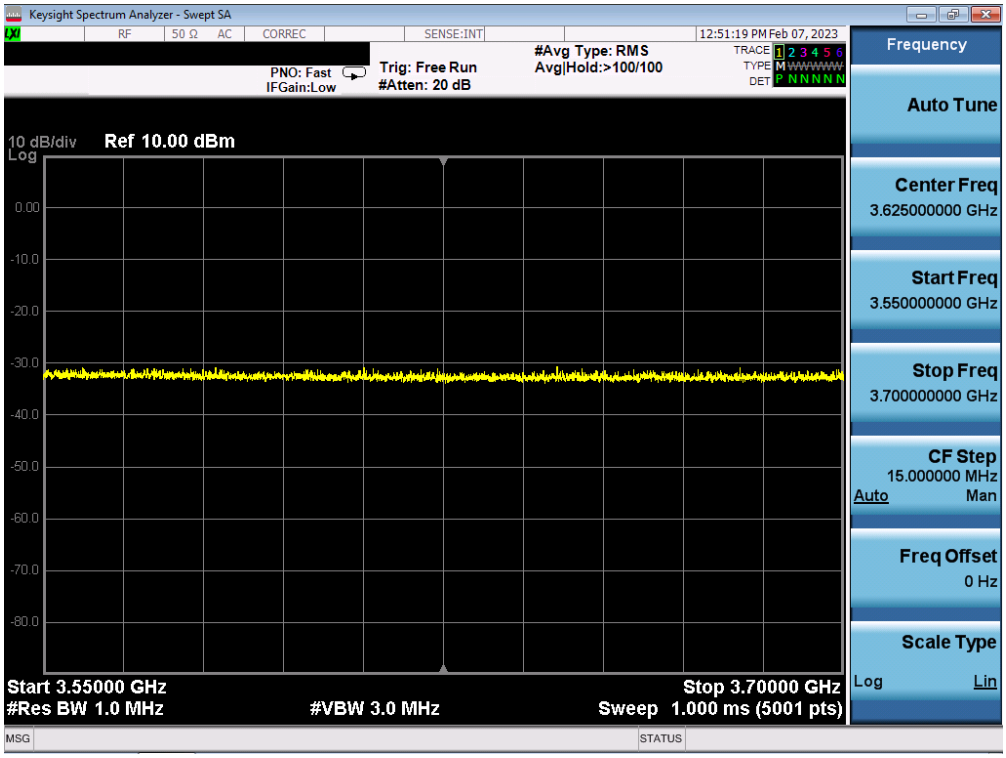
Test Plots:

Plot 22.Conducted Measurement - RF transmission stops within 60s. The SAS message is indicated by Marker 1 (X) (WINNF.FT.C.DRG.1) – NR

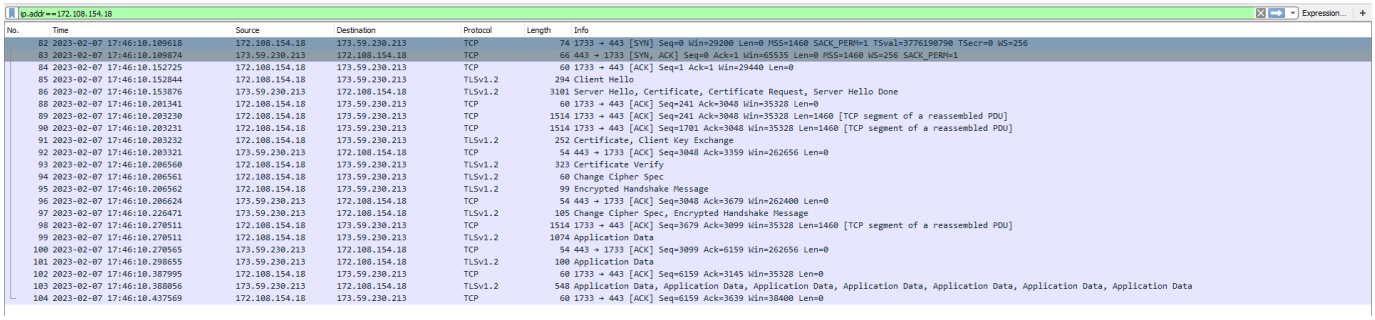
A21 [WINNF.FT.C.SCS.1] Successful TLS connection between UUT and SAS Test Harness

	Test Execution Steps	PASS	FAIL
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	☒	☐
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_SHA256 • TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 • TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	☒	☐
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.	☒	☐
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	☒	☐

Test Plots:



Plot 23. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.SCS.1) – NR

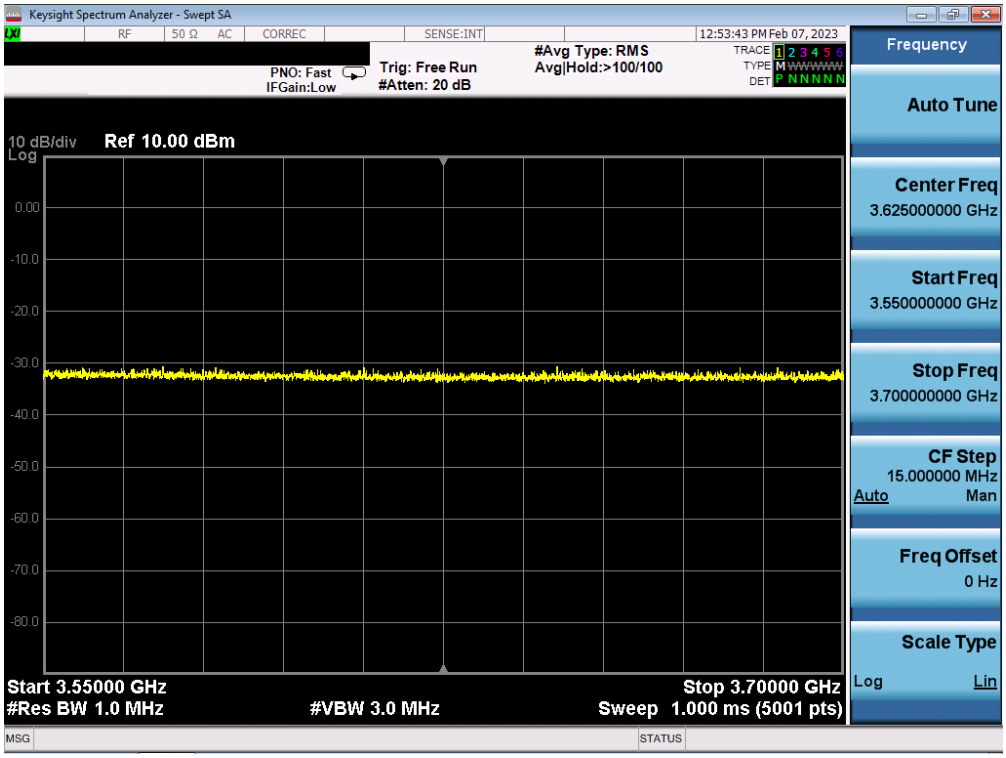


Plot 24. WireShark Screenshot – Successful Handshake (WINNF.FT.C.SCS.1) – NR

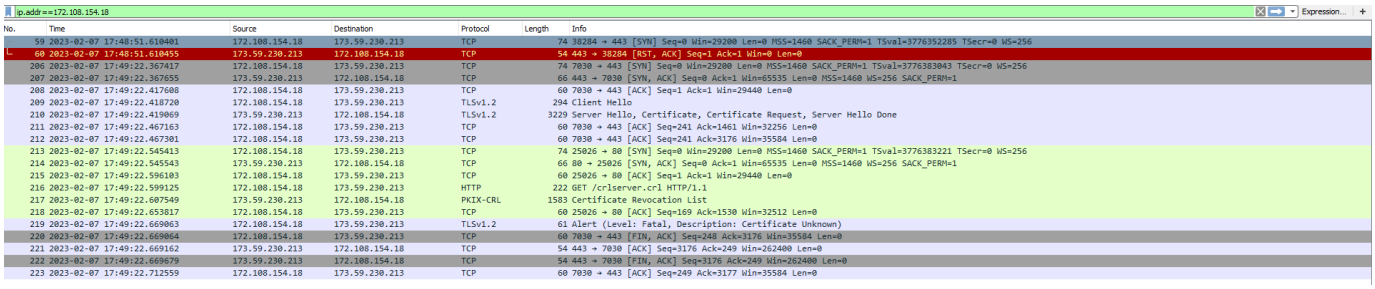
A22 [WINNF.FT.C.SCS.2] TLS failure due to revoked certificate

	Test Execution Steps	PASS	FAIL
1	• UUT shall start CBSD-SAS communication with the security procedure	☒	☐
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	☒	☐
3	UUT may retry for the security procedure which shall fail	☒	☐
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	☒	☐

Test Plots:



Plot 25. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.SCS.2) – NR



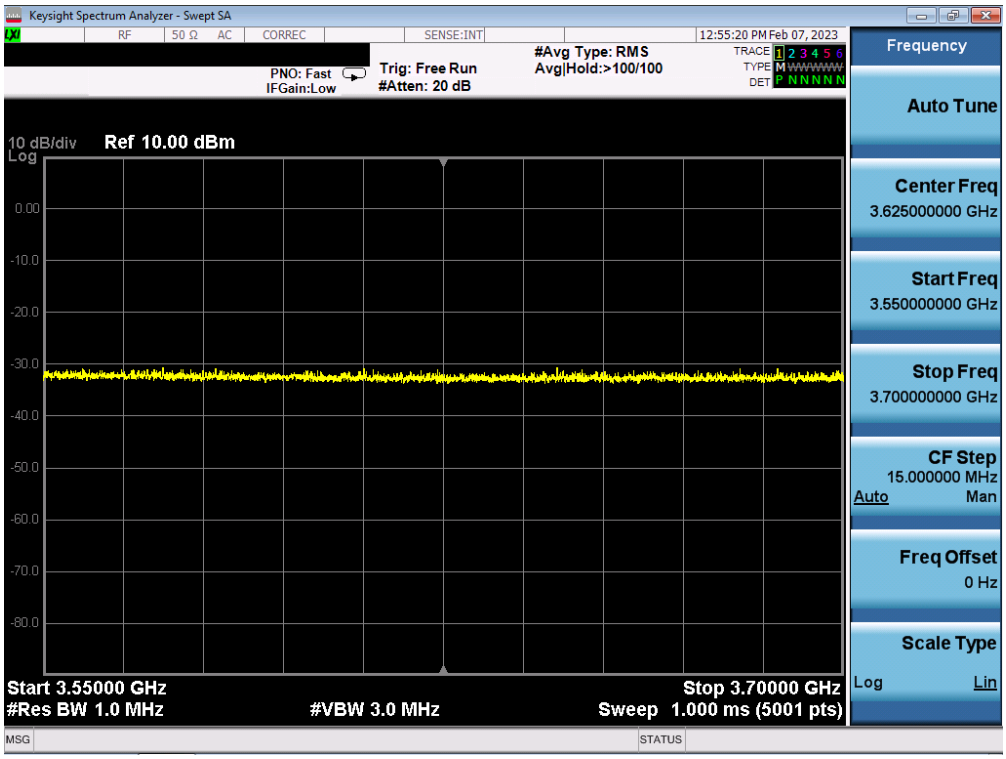
No.	Time	Source	Destination	Protocol	Length	Info
59	2023-02-07 17:48:51.610401	172.108.154.18	173.59.230.213	TCP	74	38284 → 443 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=3776352285 TSecr=0 WS=256
60	2023-02-07 17:48:51.610455	173.59.230.213	172.108.154.18	TCP	54	443 → 38284 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
206	2023-02-07 17:49:22.367417	172.108.154.18	173.59.230.213	TCP	74	7030 → 443 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=3776383043 TSecr=0 WS=256
207	2023-02-07 17:49:22.367655	173.59.230.213	172.108.154.18	TCP	66	443 → 7030 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM=1
208	2023-02-07 17:49:22.417608	172.108.154.18	173.59.230.213	TCP	60	7030 → 443 [ACK] Seq=1 Ack=1 Win=29440 Len=0
209	2023-02-07 17:49:22.418720	172.108.154.18	173.59.230.213	TLSv1.2	294	Client Hello
210	2023-02-07 17:49:22.419069	173.59.230.213	172.108.154.18	TLSv1.2	3229	Server Hello, Certificate, Certificate Request, Server Hello Done
211	2023-02-07 17:49:22.467163	172.108.154.18	173.59.230.213	TCP	60	7030 → 443 [ACK] Seq=241 Ack=1461 Win=32256 Len=0
212	2023-02-07 17:49:22.467301	172.108.154.18	173.59.230.213	TCP	60	7030 → 443 [ACK] Seq=241 Ack=3176 Win=35584 Len=0
213	2023-02-07 17:49:22.545413	172.108.154.18	173.59.230.213	TCP	74	25026 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=3776383221 TSecr=0 WS=256
214	2023-02-07 17:49:22.545543	173.59.230.213	172.108.154.18	TCP	66	80 → 25026 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM=1
215	2023-02-07 17:49:22.596103	172.108.154.18	173.59.230.213	TCP	60	25026 → 80 [ACK] Seq=1 Ack=1 Win=29440 Len=0
216	2023-02-07 17:49:22.599125	172.108.154.18	173.59.230.213	HTTP	222	GET /crlserver.crl HTTP/1.1
217	2023-02-07 17:49:22.607549	173.59.230.213	172.108.154.18	PKIX-CRL	1583	Certificate Revocation List
218	2023-02-07 17:49:22.653817	172.108.154.18	173.59.230.213	TCP	60	25026 → 80 [ACK] Seq=169 Ack=1530 Win=32512 Len=0
219	2023-02-07 17:49:22.669063	172.108.154.18	173.59.230.213	TLSv1.2	61	Alert (Level: Fatal, Description: Certificate Unknown)
220	2023-02-07 17:49:22.669064	172.108.154.18	173.59.230.213	TCP	60	7030 → 443 [FIN, ACK] Seq=248 Ack=3176 Win=35584 Len=0
221	2023-02-07 17:49:22.669162	173.59.230.213	172.108.154.18	TCP	54	443 → 7030 [ACK] Seq=3176 Ack=249 Win=262400 Len=0
222	2023-02-07 17:49:22.669679	173.59.230.213	172.108.154.18	TCP	54	443 → 7030 [FIN, ACK] Seq=3176 Ack=249 Win=262400 Len=0
223	2023-02-07 17:49:22.712559	172.108.154.18	173.59.230.213	TCP	60	7030 → 443 [ACK] Seq=249 Ack=3177 Win=35584 Len=0

Plot 26.WireShark Screenshot - Failed Handshake (WINNF.FT.C.SCS.2) – NR

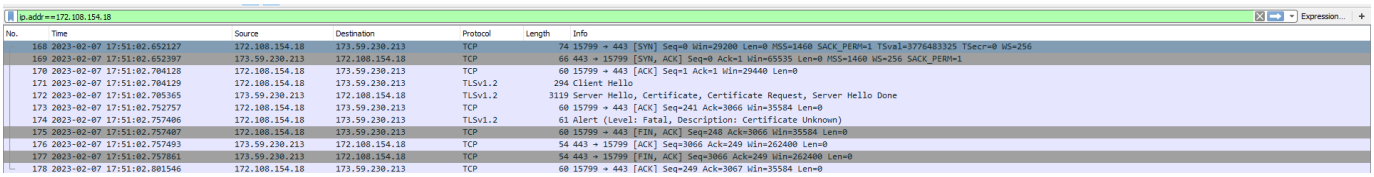
A23 [WINNF.FT.C.SCS.3] TLS failure due to expired server certificate

	Test Execution Steps	PASS	FAIL
1	• UUT shall start CBSD-SAS communication with the security procedure	☒	☐
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.	☒	☐
3	UUT may retry for the security procedure which shall fail	☒	☐
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	☒	☐

Test Plots:



Plot 27. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.SCS.3) – NR

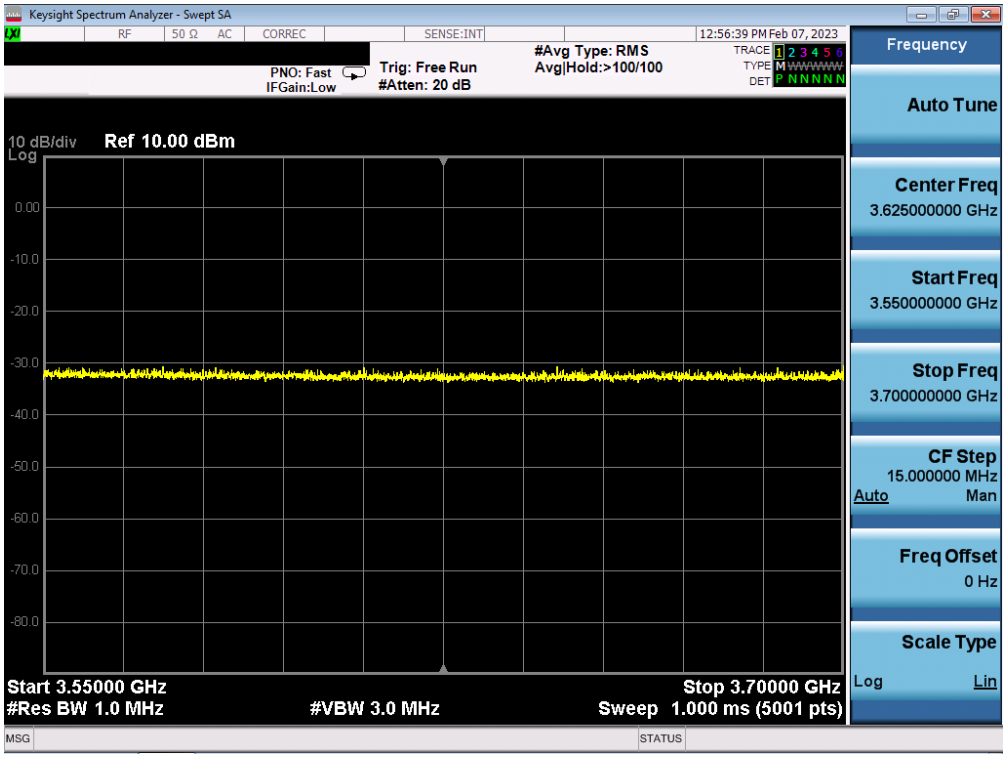


Plot 28. WireShark Screenshot - Failed Handshake (WINNF.FT.C.SCS.3) – NR

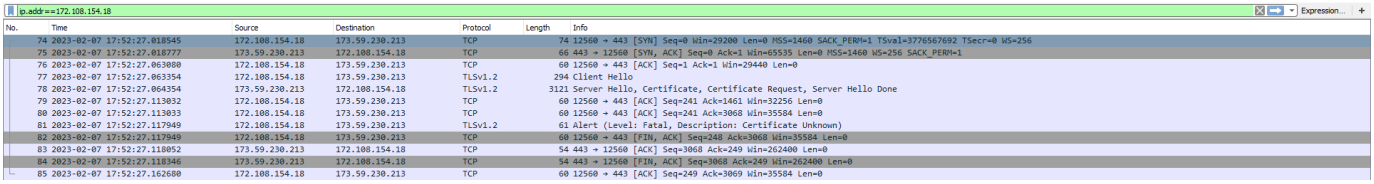
A24 [WINNF.FT.C.SCS.4] TLS failure when SAS Test Harness certificate is issued by an unknown CA

	Test Execution Steps	PASS	FAIL
1	• UUT shall start CBSD-SAS communication with the security procedure	☒	☐
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.	☒	☐
3	UUT may retry for the security procedure which shall fail	☒	☐
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	☒	☐

Test Plots:



Plot 29. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.SCS.4) – NR



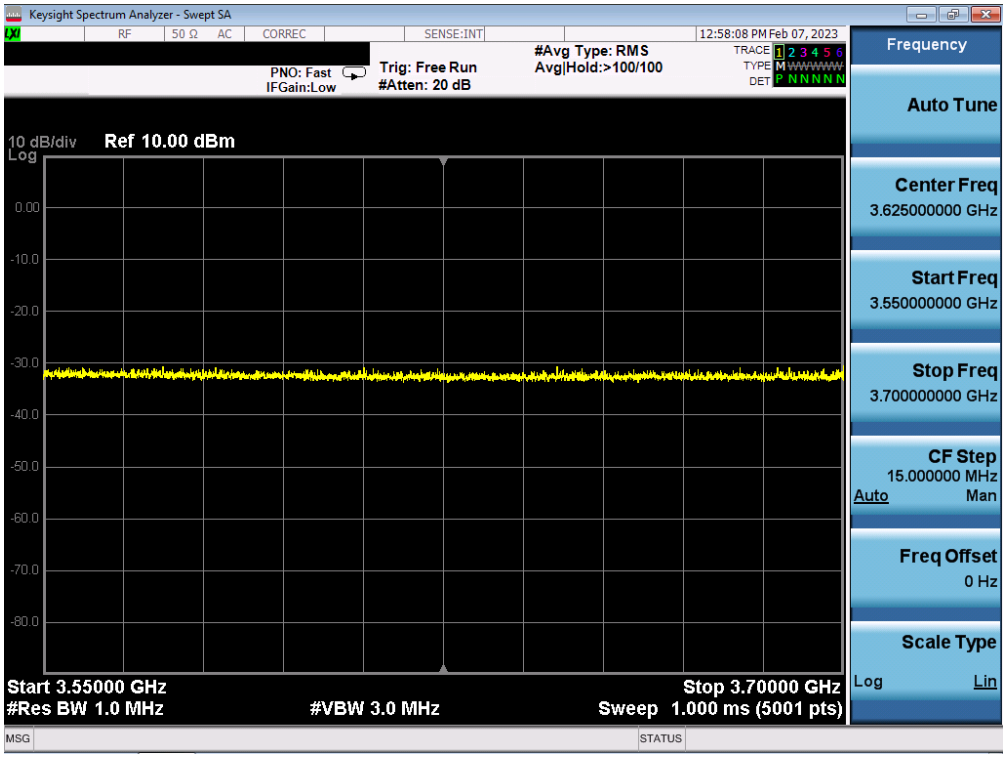
No.	Time	Source	Destination	Protocol	Length	Info
74	2023-02-07 17:52:27.018545	172.108.154.18	173.59.230.213	TCP	74	12560 → 443 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=3776567692 TSecr=0 WS=256
75	2023-02-07 17:52:27.018777	173.59.230.213	172.108.154.18	TCP	66	443 → 12560 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM=1
76	2023-02-07 17:52:27.063080	172.108.154.18	173.59.230.213	TCP	60	12560 → 443 [ACK] Seq=1 Ack=1 Win=29440 Len=0
77	2023-02-07 17:52:27.063354	172.108.154.18	173.59.230.213	TLSv1.2	294	Client Hello
78	2023-02-07 17:52:27.064354	173.59.230.213	172.108.154.18	TLSv1.2	3121	Server Hello, Certificate, Certificate Request, Server Hello Done
79	2023-02-07 17:52:27.113032	172.108.154.18	173.59.230.213	TCP	60	12560 → 443 [ACK] Seq=241 Ack=1461 Win=32256 Len=0
80	2023-02-07 17:52:27.113033	172.108.154.18	173.59.230.213	TCP	60	12560 → 443 [ACK] Seq=241 Ack=3068 Win=35584 Len=0
81	2023-02-07 17:52:27.117949	172.108.154.18	173.59.230.213	TLSv1.2	61	Alert (Level: Fatal, Description: Certificate Unknown)
82	2023-02-07 17:52:27.117949	172.108.154.18	173.59.230.213	TCP	60	12560 → 443 [FIN, ACK] Seq=248 Ack=3068 Win=35584 Len=0
83	2023-02-07 17:52:27.118052	173.59.230.213	172.108.154.18	TCP	54	443 → 12560 [ACK] Seq=3068 Ack=249 Win=262400 Len=0
84	2023-02-07 17:52:27.118346	173.59.230.213	172.108.154.18	TCP	54	443 → 12560 [FIN, ACK] Seq=3068 Ack=249 Win=262400 Len=0
85	2023-02-07 17:52:27.162680	172.108.154.18	173.59.230.213	TCP	60	12560 → 443 [ACK] Seq=249 Ack=3069 Win=35584 Len=0

Plot 30.WireShark Screenshot – Failed Handshake (WINNF.FT.C.SCS.4) – NR

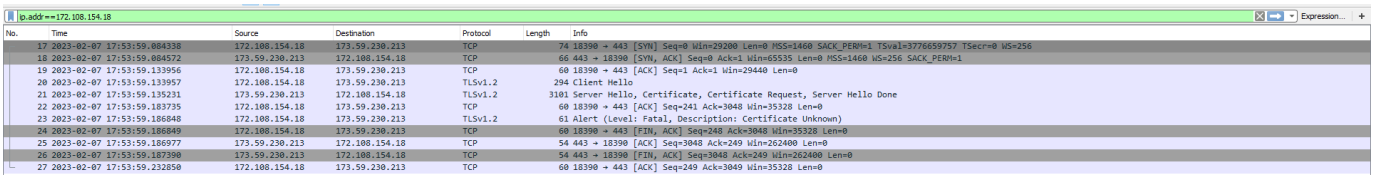
A25 [WINNF.FT.C.SCS.5] TLS failure when certificate at the SAS Test Harness is corrupted

	Test Execution Steps	PASS	FAIL
1	• UUT shall start CBSD-SAS communication with the security procedure	☒	☐
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.	☒	☐
3	UUT may retry for the security procedure which shall fail	☒	☐
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	☒	☐

Test Plots:



Plot 31. Conducted Measurement – No RF transmission in entire band at anytime (WINNF.FT.C.SCS.5) – NR



Plot 32. WireShark Screenshot - Failed Handshake (WINNF.FT.C.SCS.5) – NR

A26 [WINNF.PT.C.HBT.1] UUT RF Transmit Power Measurement

	Test Execution Steps	PASS	FAIL
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 = FL, highFrequency = FH, maxEirp = Pi}, 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: o cbsdId = C o grantId = G • SAS Test Harness responds with Heartbeat Response, including: o cbsdId = C o grantId = G o transmitExpireTime = current UTC time + 200 seconds o responseCode = 0	--	--
3	Tester performs power measurement on RF interface(s) of UUT, and verifies it complies with the maxEirp setting, Pi. The RF measurement method is out of scope of this document, but may include additional configuration of the UUT, as required, to fulfil the requirements of the power measurement method. *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.*	☒	☐

RF Power Measurements:

Testing is performed per KDB 971168 D01 and across the transmit dynamic range of 29dBm/MHz to 17dBm/MHz for 20MHz Bandwidth. Per the manufacturer, when all 8 antennas are operating, the maximum antenna gain is 8dBi. 8dbi is used for maximum directional gain per KDB 662911 because the device operates in 4 sectors, each with a pair of cross-polarized antennas. The PSD of each transmitter was measured and summed in linear terms and then the directional antenna gain was added to yield the max EIRP.

Granted EIRP [dBm/MHz]	Tx1 Conducted PSD [dBm/MHz]	Tx2 Conducted PSD [dBm/MHz]	Tx3 Conducted PSD [dBm/MHz]	Tx4 Conducted PSD [dBm/MHz]	Tx5 Conducted PSD [dBm/MHz]	Tx6 Conducted PSD [dBm/MHz]	Tx7 Conducted PSD [dBm/MHz]	Tx8 Conducted PSD [dBm/MHz]	Summed PSD [dBm/MHz]	Max Directional Ant Gain [dBi]	EIRP [dBm/MHz]	Margin [dB]
29.00	11.40	11.32	11.98	11.14	11.79	11.26	11.51	11.72	20.55	8.00	28.55	-0.45
23.00	5.73	5.39	5.63	5.14	5.40	5.48	5.63	5.38	14.51	8.00	22.51	-0.49
17.00	-0.52	-0.64	-0.70	-0.49	-0.49	-0.32	-0.58	-0.58	8.49	8.00	16.49	-0.51

Table 7-1 RF Output Power Measurements (WINNF.PT.C.HBT.1 – NR)

Example Summed PSD calculation:

Tx1 + Tx2 + Tx3 + Tx4 + Tx5 + Tx6 + Tx7 + Tx8 = Total Conducted PSD

11.40 dBm + 11.32 dBm + 11.98 dBm + 11.14 dBm + 11.79 dBm + 11.26 dBm + 11.51 dBm + 11.72 dBm =

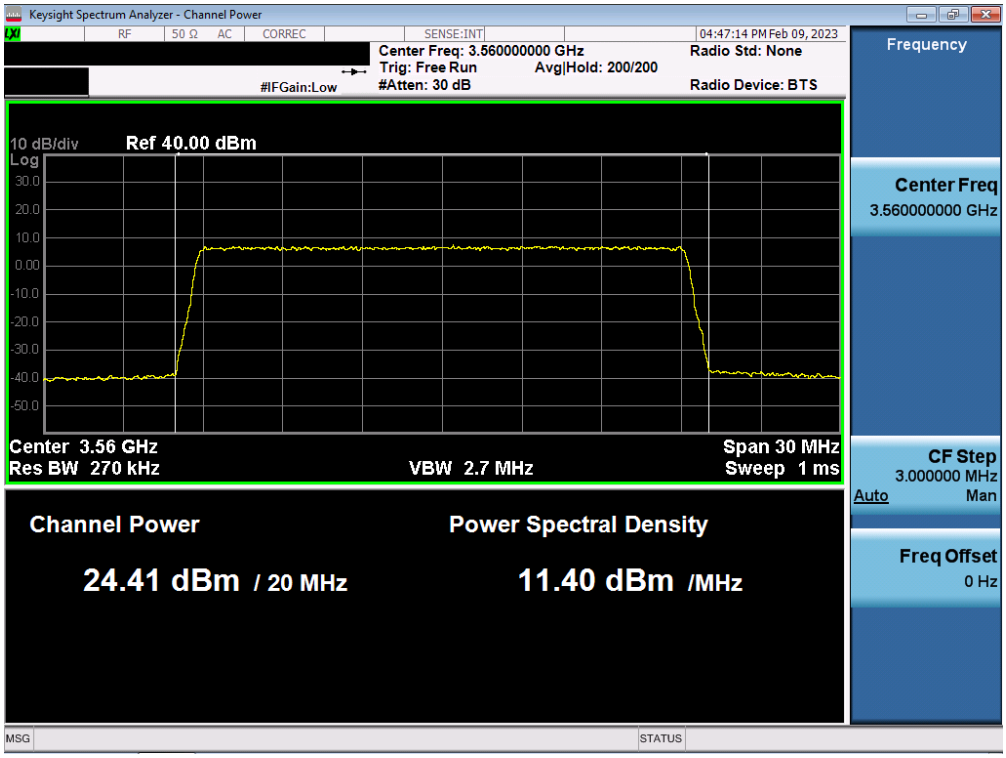
13.804 mW + 13.552 mW + 15.776 mW + 13.002 mW + 15.101 mW + 13.336 mW + 14.158 mW + 14.859 mW = 113.618 mW = 20.55 dBm

Example EIRP calculation

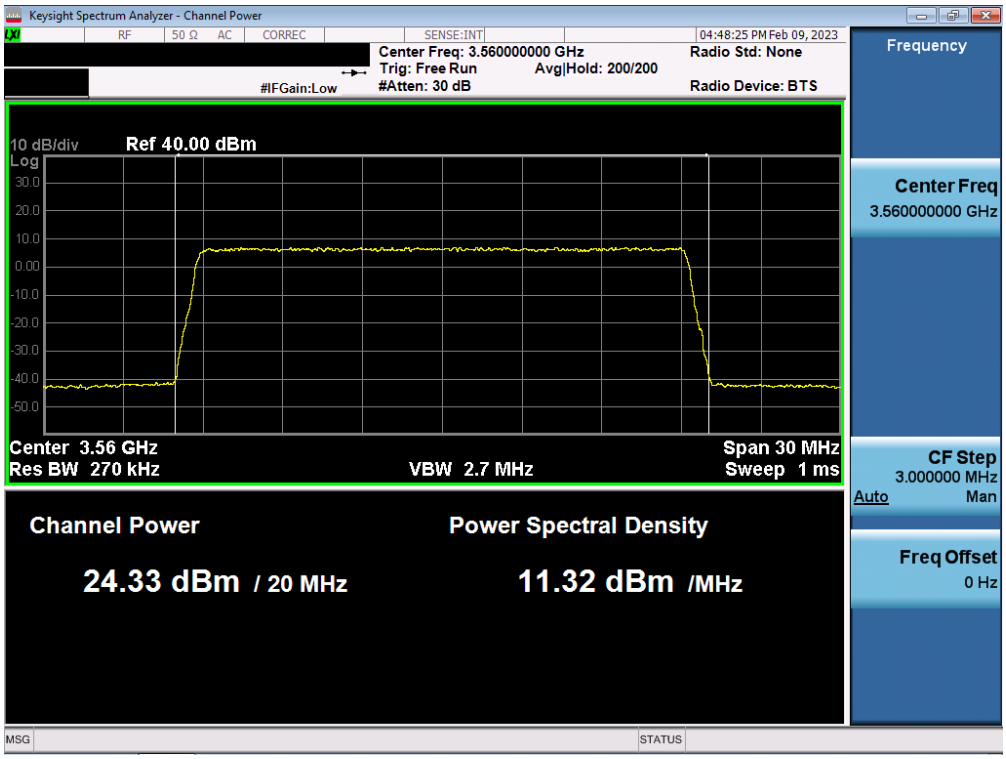
Total Conducted PSD + Directional Antenna Gain = EIRP/MHz

20.55 dBm/MHz + 8.00 dBi = 28.55 dBm/MHz

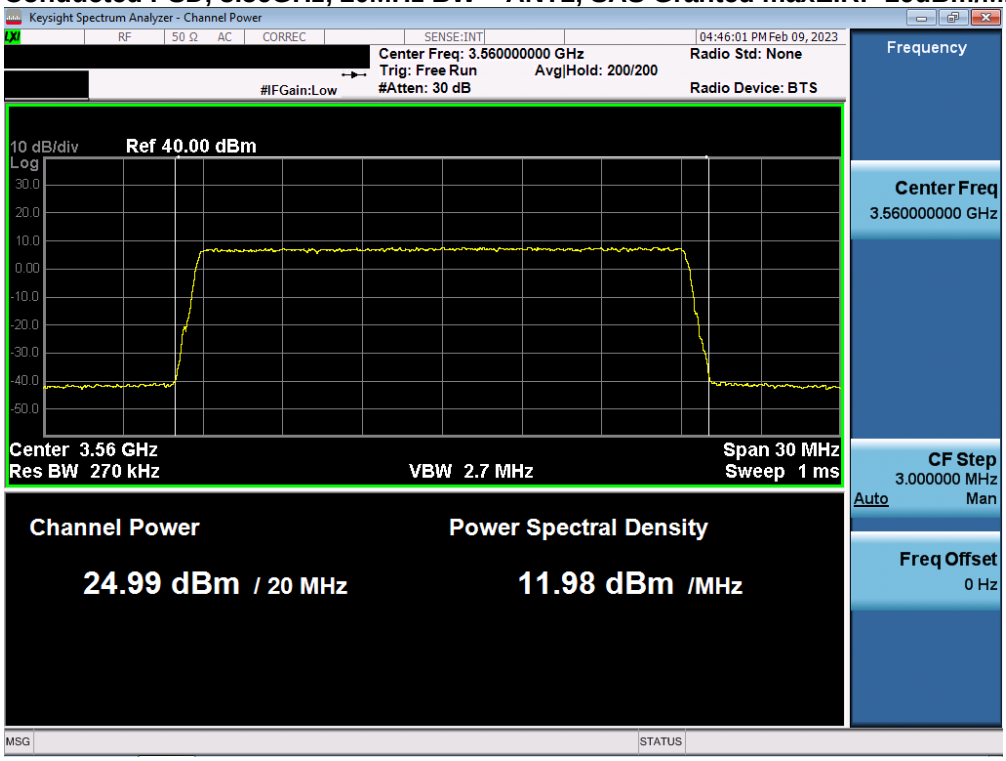
Test Plots:



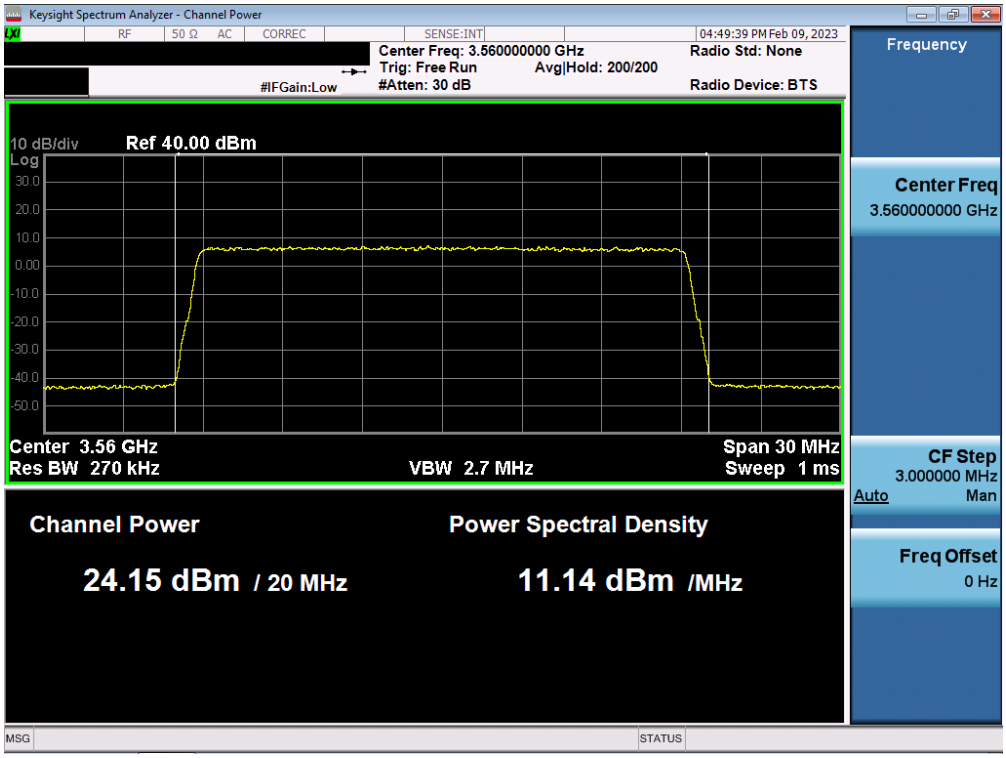
Plot 33. Conducted PSD, 3.56GHz, 20MHz BW – ANT1, SAS Granted maxEIRP 29dBm/MHz (NR)



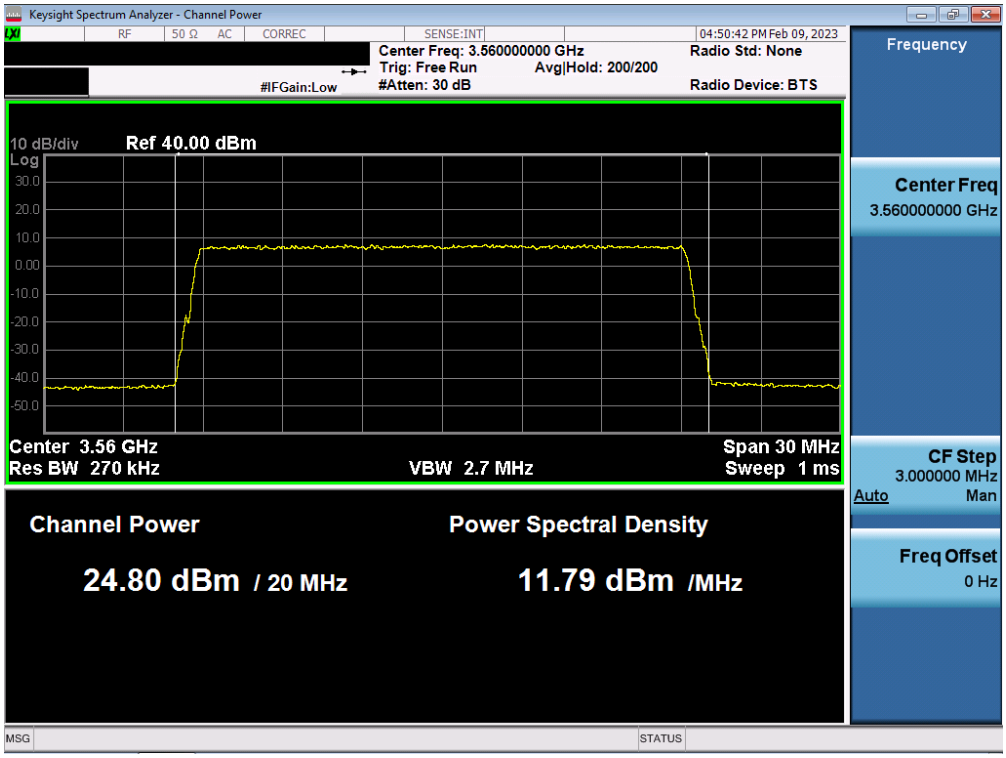
Plot 34. Conducted PSD, 3.56GHz, 20MHz BW – ANT2, SAS Granted maxEIRP 29dBm/MHz (NR)



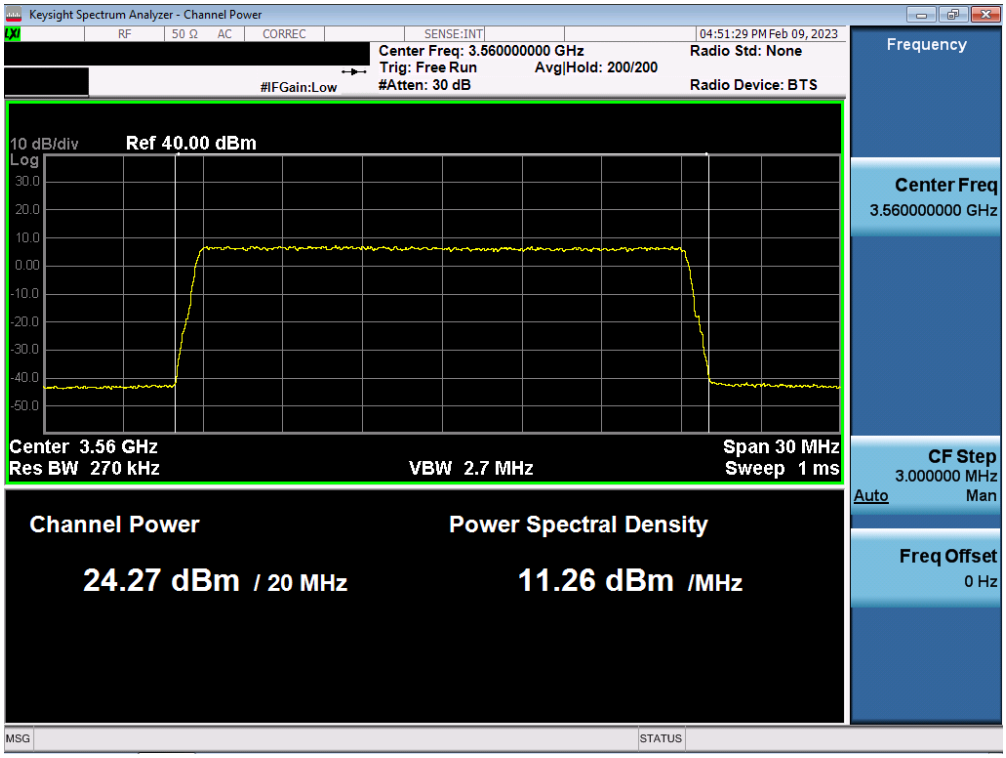
Plot 35. Conducted PSD, 3.56GHz, 20MHz BW – ANT3, SAS Granted maxEIRP 29dBm/MHz (NR)



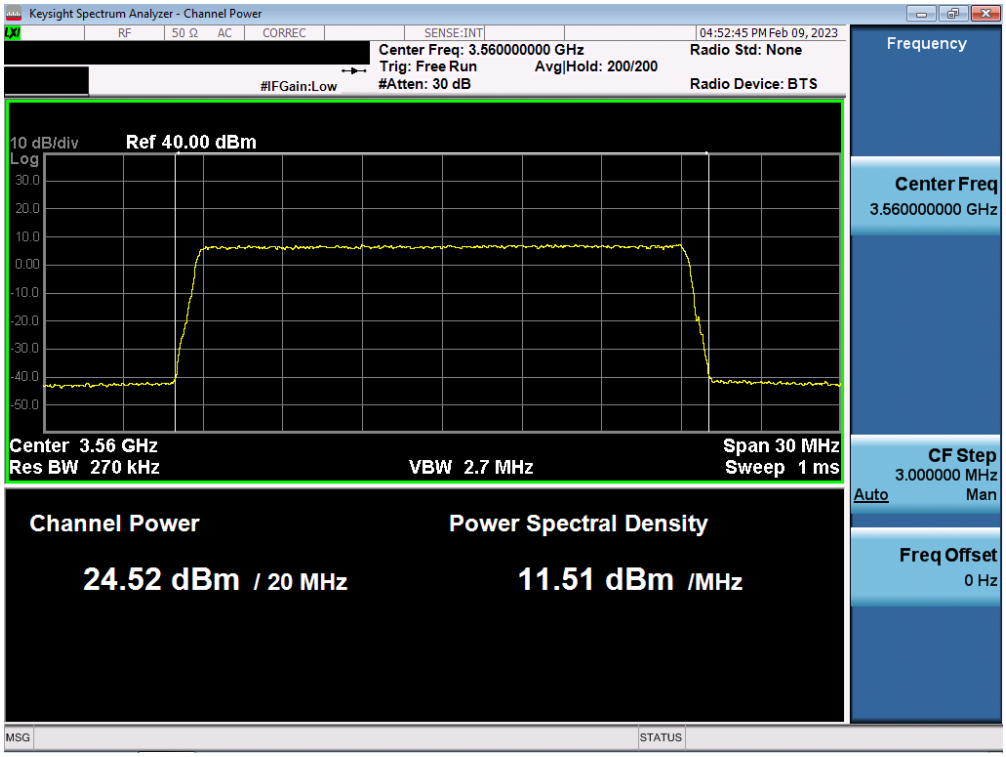
Plot 36. Conducted PSD, 3.56GHz, 20MHz BW – ANT4, SAS Granted maxEIRP 29dBm/MHz (NR)



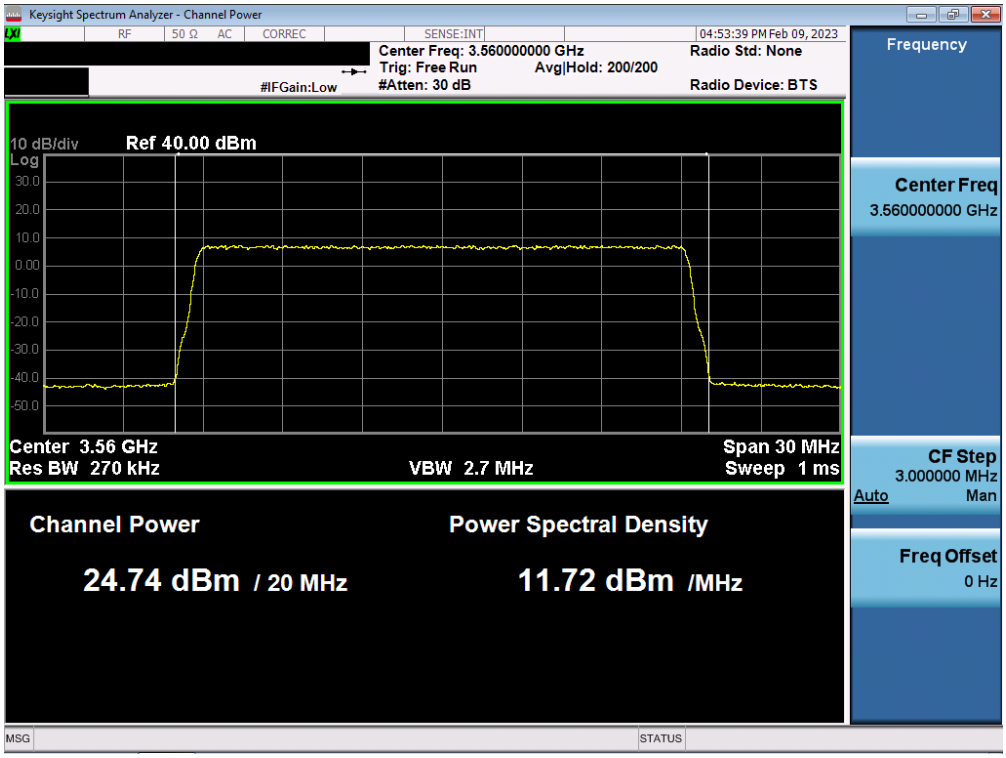
Plot 37. Conducted PSD, 3.56GHz, 20MHz BW – ANT5, SAS Granted maxEIRP 29dBm/MHz (NR)



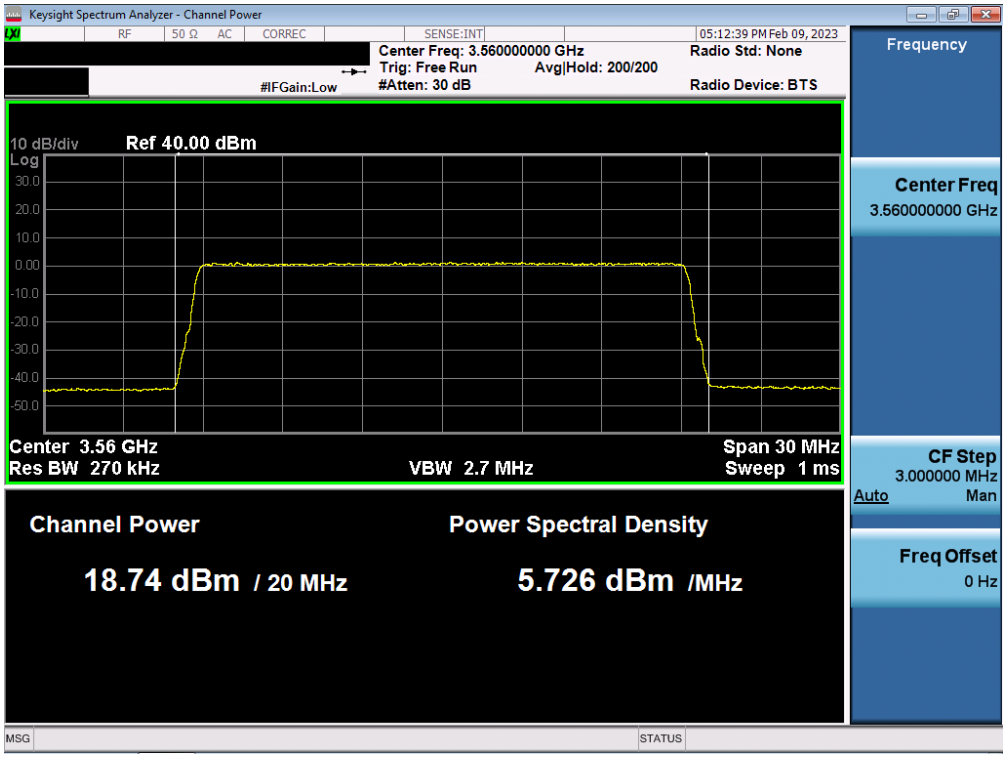
Plot 38. Conducted PSD, 3.56GHz, 20MHz BW – ANT6, SAS Granted maxEIRP 29dBm/MHz (NR)



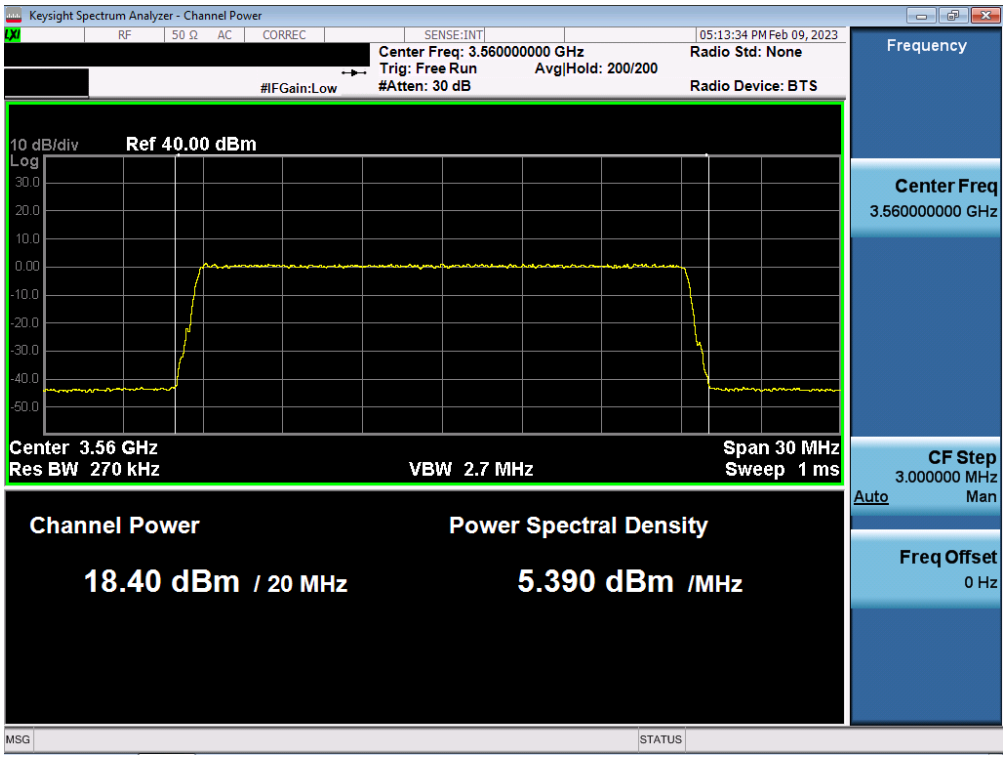
Plot 39. Conducted PSD, 3.56GHz, 20MHz BW – ANT7, SAS Granted maxEIRP 29dBm/MHz (NR)



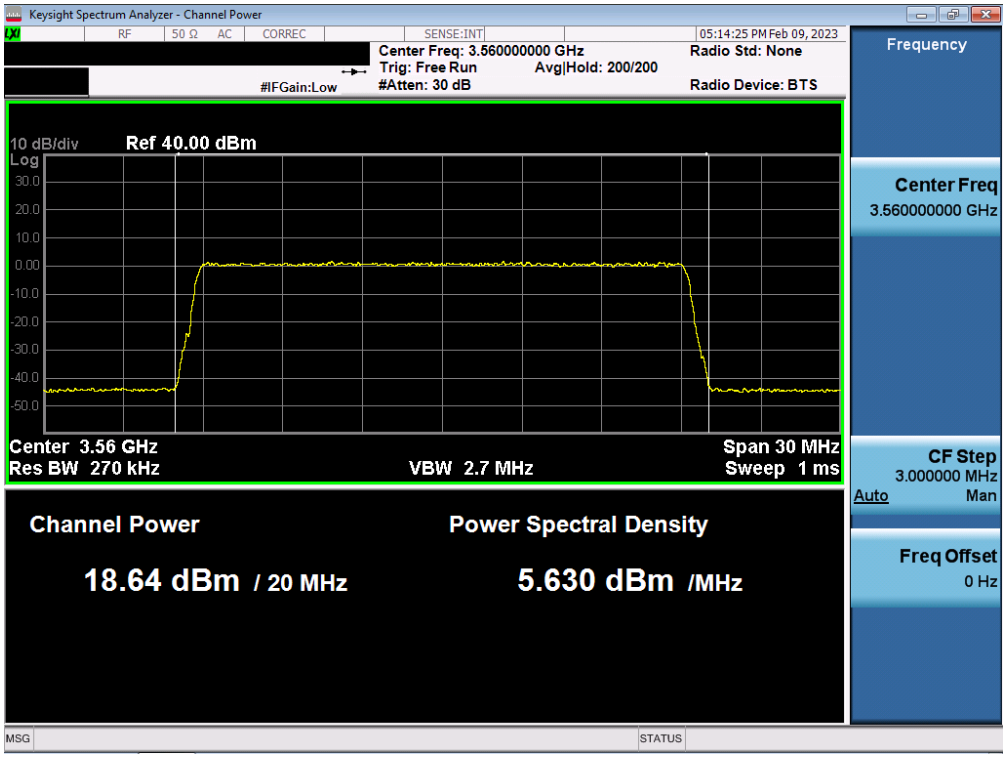
Plot 40. Conducted PSD, 3.56GHz, 20MHz BW – ANT8, SAS Granted maxEIRP 29dBm/MHz (NR)



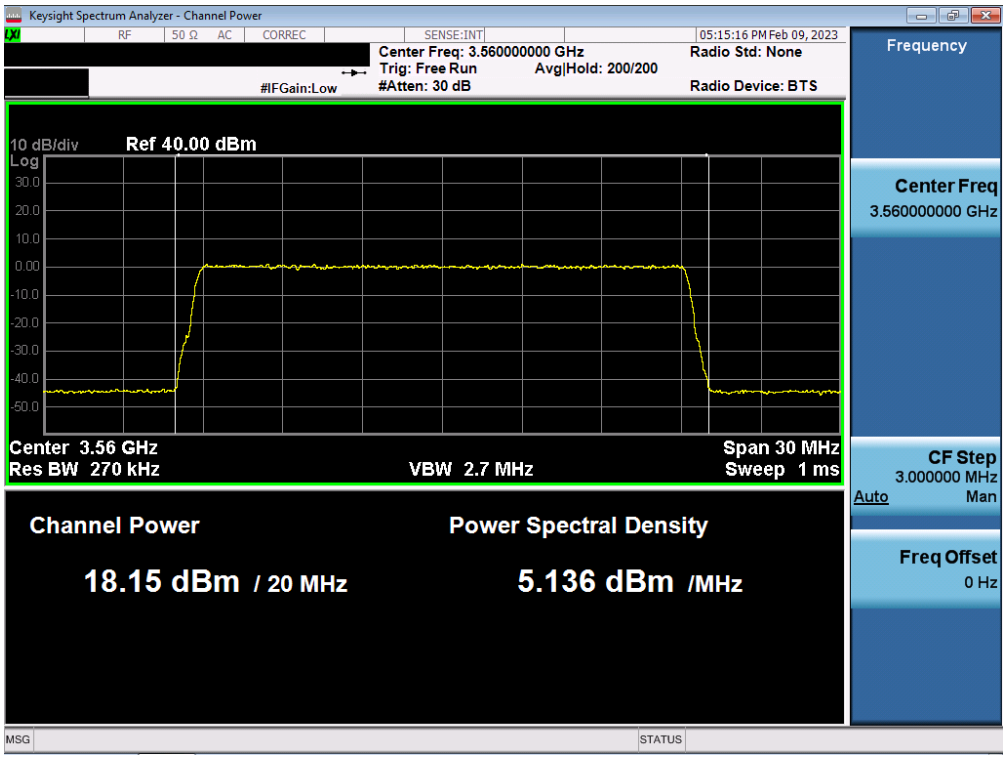
Plot 41. Conducted PSD, 3.56GHz, 20MHz BW – ANT1, SAS Granted maxEIRP 23dBm/MHz (NR)



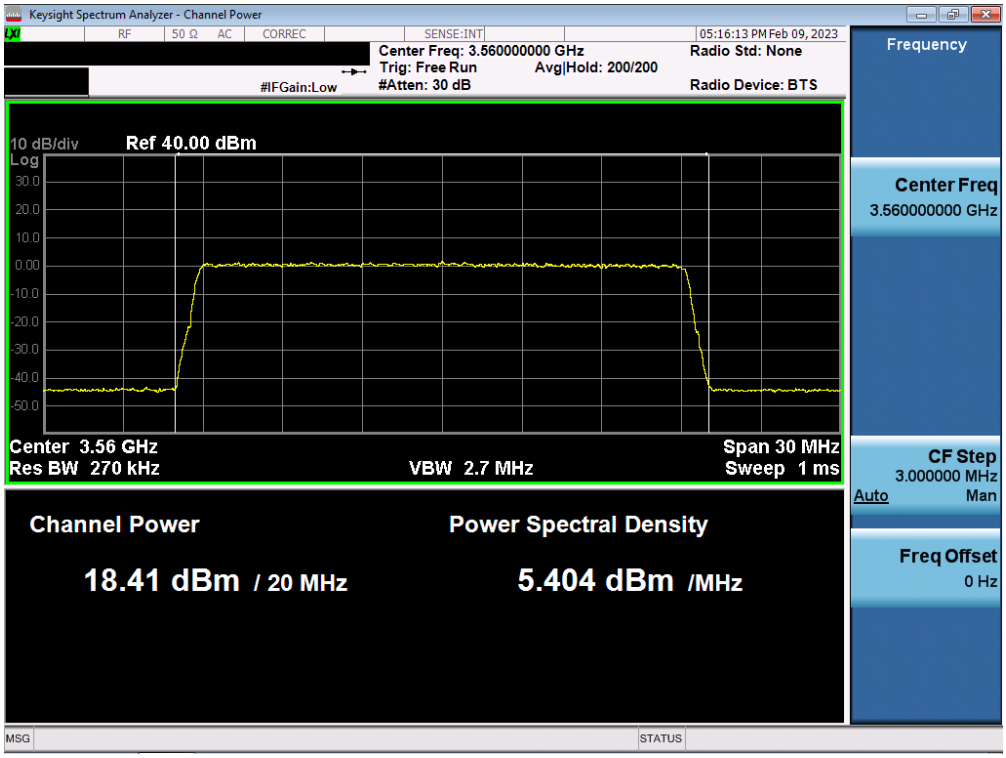
Plot 42. Conducted PSD, 3.56GHz, 20MHz BW – ANT2, SAS Granted maxEIRP 23dBm /MHz (NR)



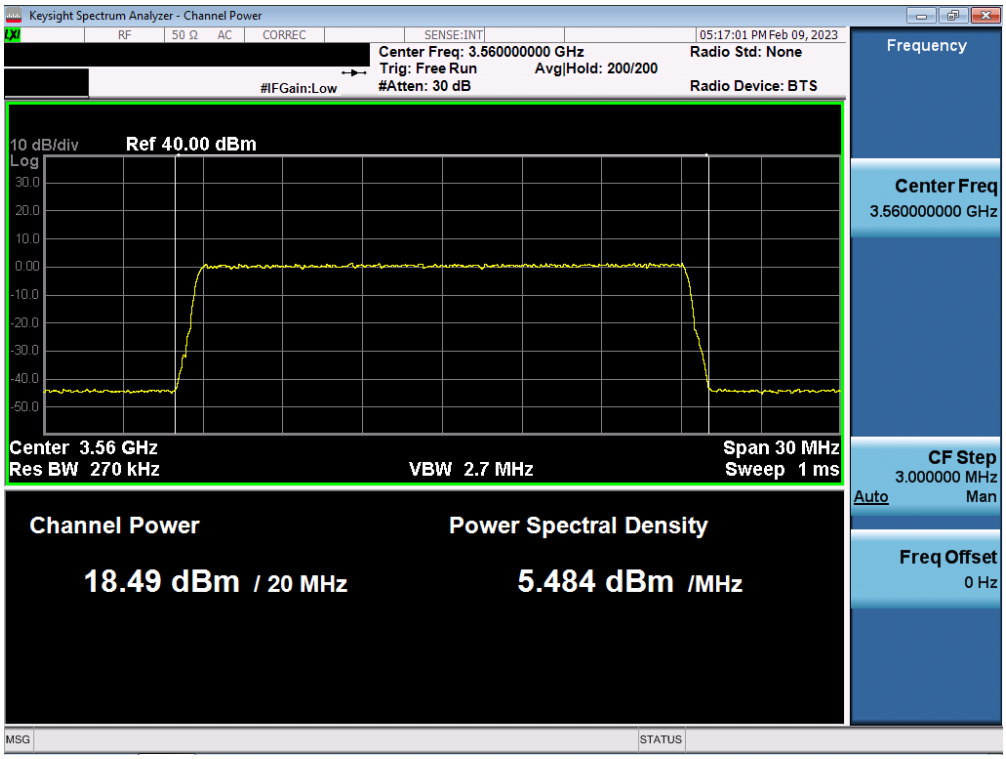
Plot 43. Conducted PSD, 3.56GHz, 20MHz BW – ANT3, SAS Granted maxEIRP 23dBm /MHz (NR)



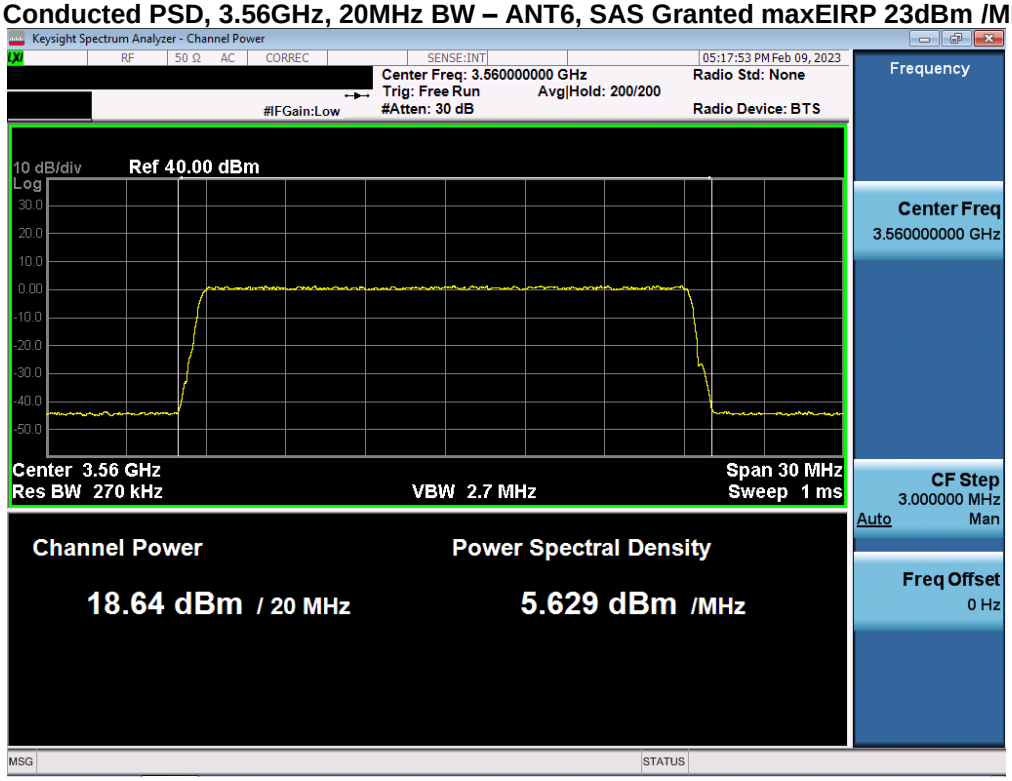
Plot 44. Conducted PSD, 3.56GHz, 20MHz BW – ANT4, SAS Granted maxEIRP 23dBm /MHz (NR)



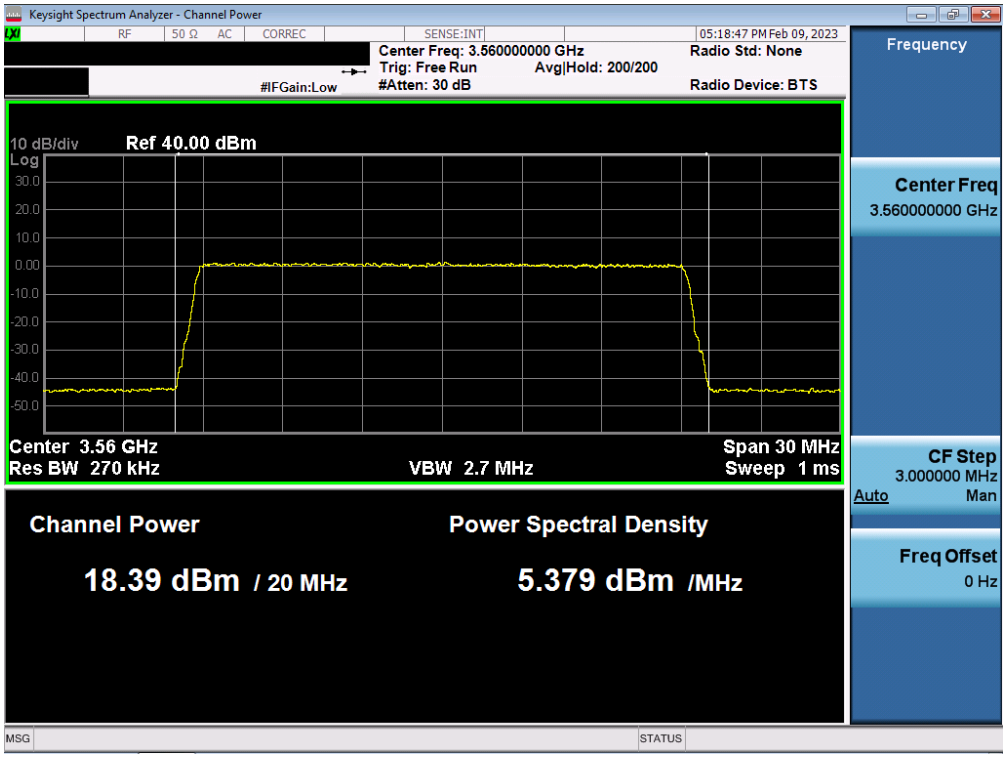
Plot 45. Conducted PSD, 3.56GHz, 20MHz BW – ANT5, SAS Granted maxEIRP 23dBm /MHz (NR)



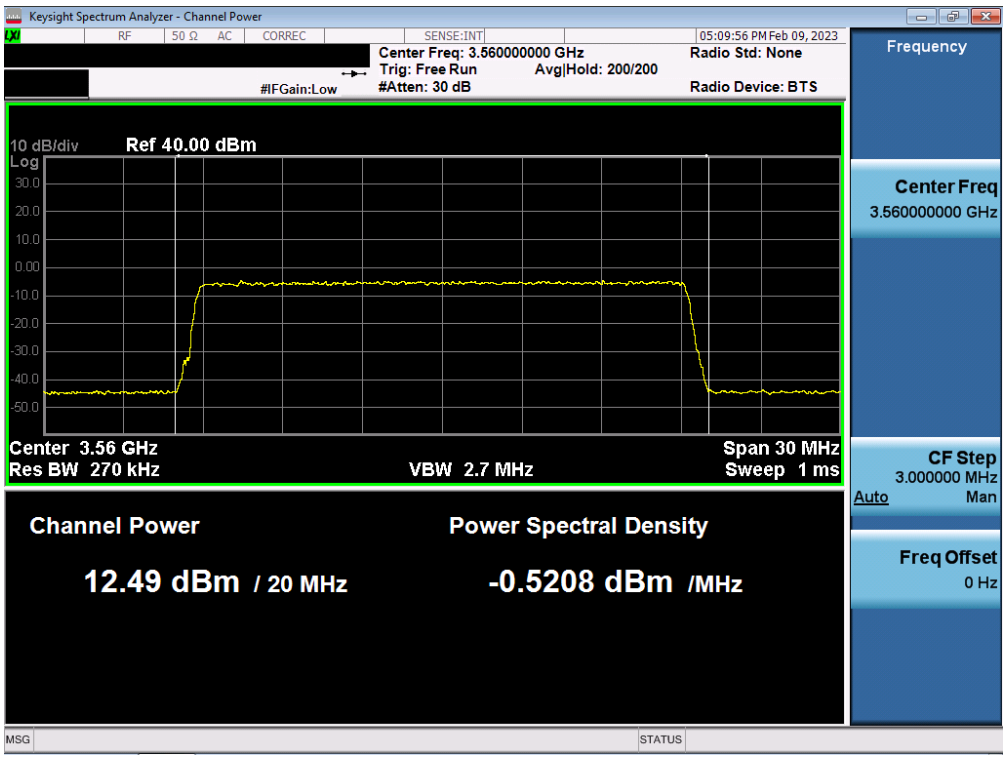
Plot 46. Conducted PSD, 3.56GHz, 20MHz BW – ANT6, SAS Granted maxEIRP 23dBm /MHz (NR)



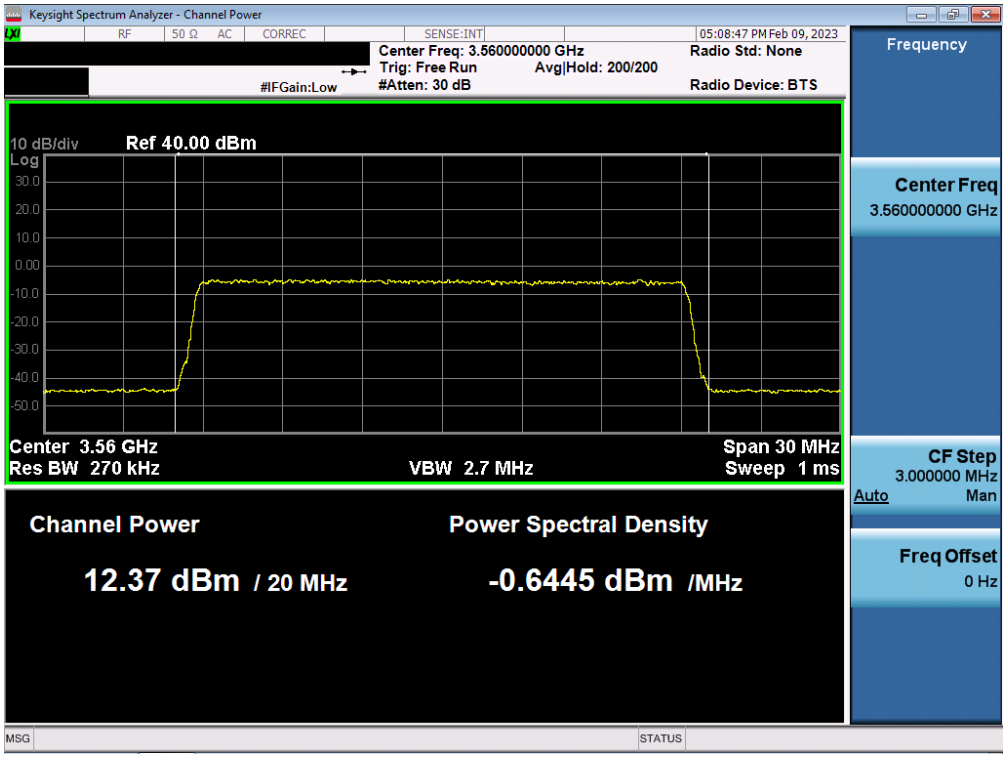
Plot 47. Conducted PSD, 3.56GHz, 20MHz BW – ANT7, SAS Granted maxEIRP 23dBm /MHz (NR)



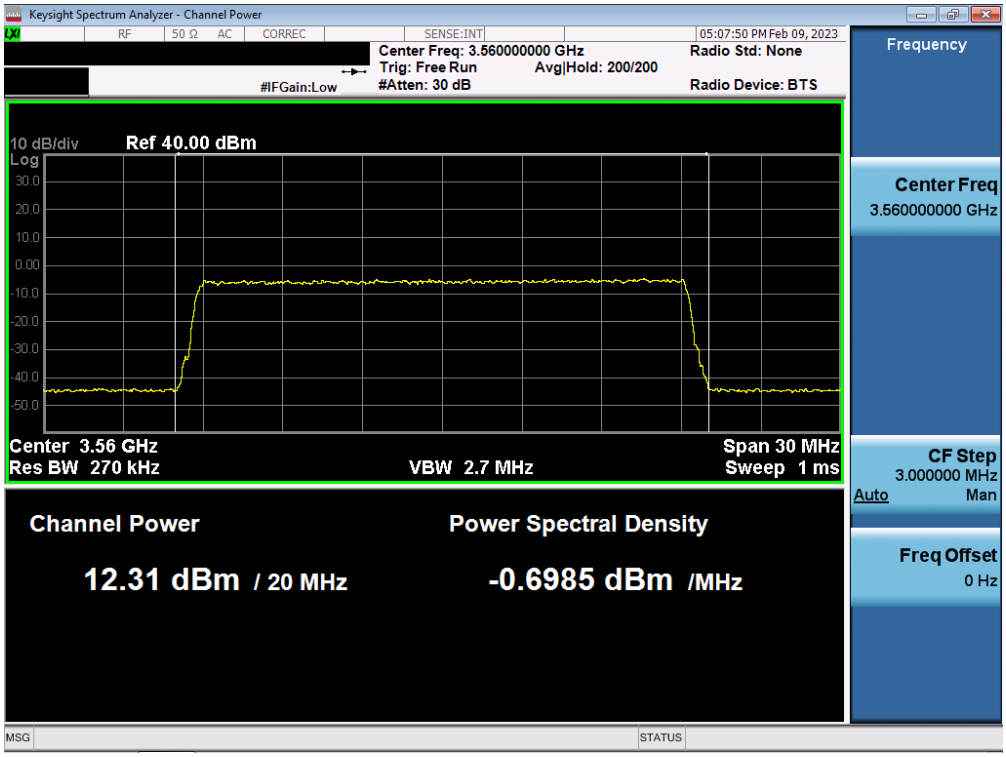
Plot 48. Conducted PSD, 3.56GHz, 20MHz BW – ANT8, SAS Granted maxEIRP 23dBm /MHz (NR)



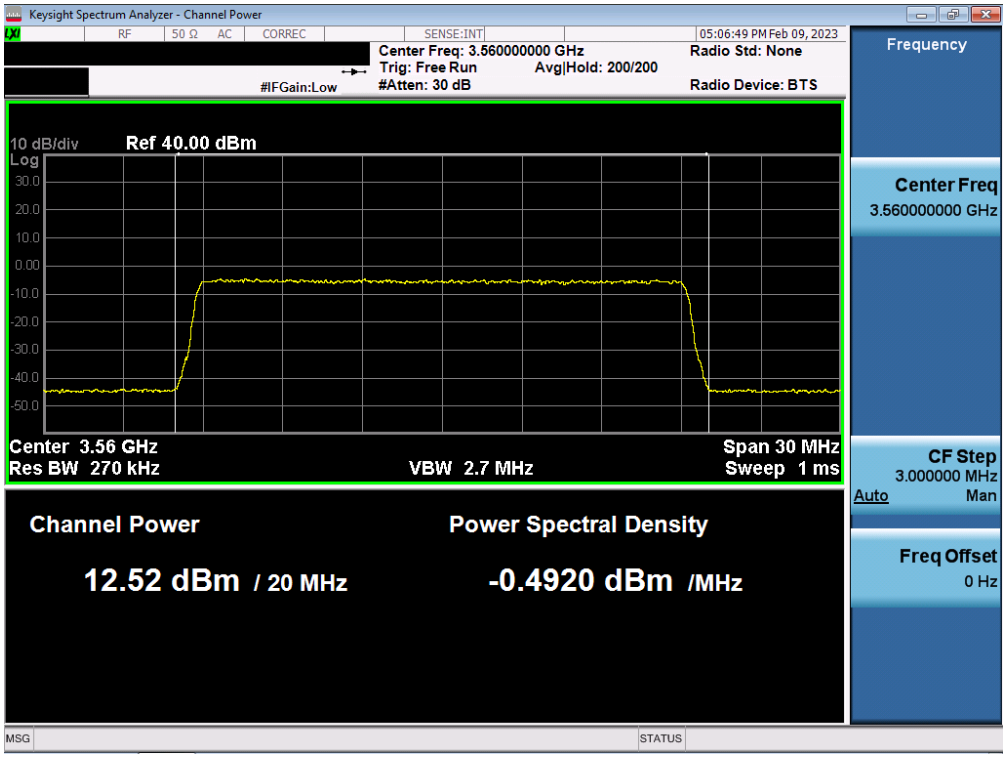
Plot 49. Conducted PSD, 3.56GHz, 20MHz BW – ANT1, SAS Granted maxEIRP 17dBm/MHz (NR)



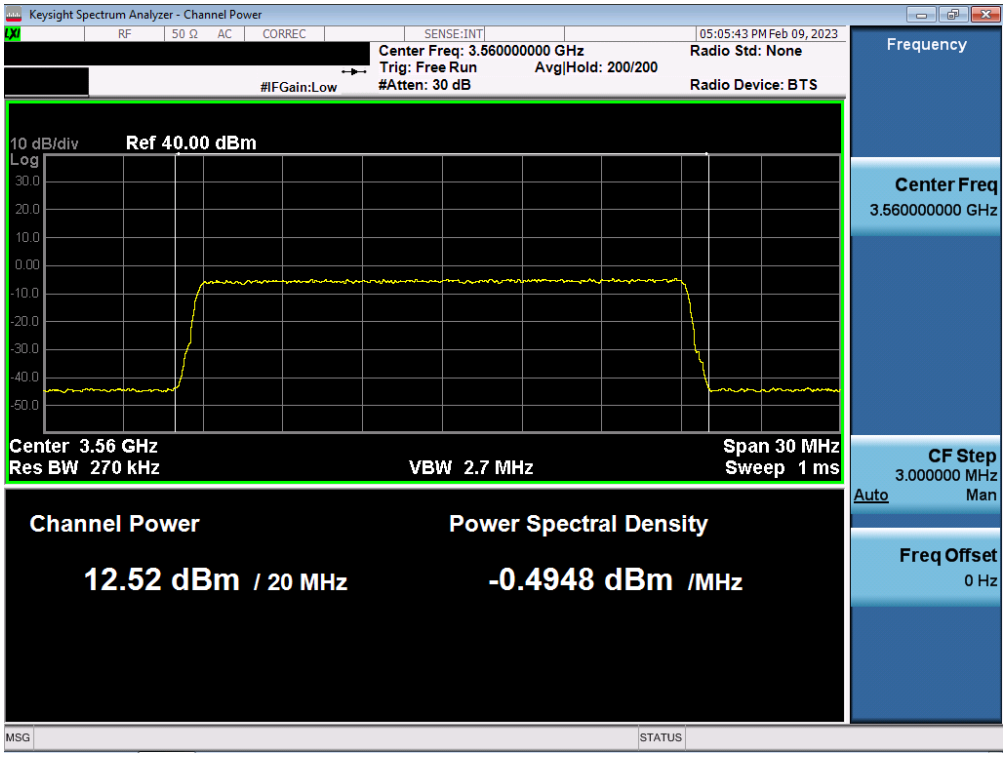
Plot 50. Conducted PSD, 3.56GHz, 20MHz BW – ANT2, SAS Granted maxEIRP 17dBm /MHz (NR)



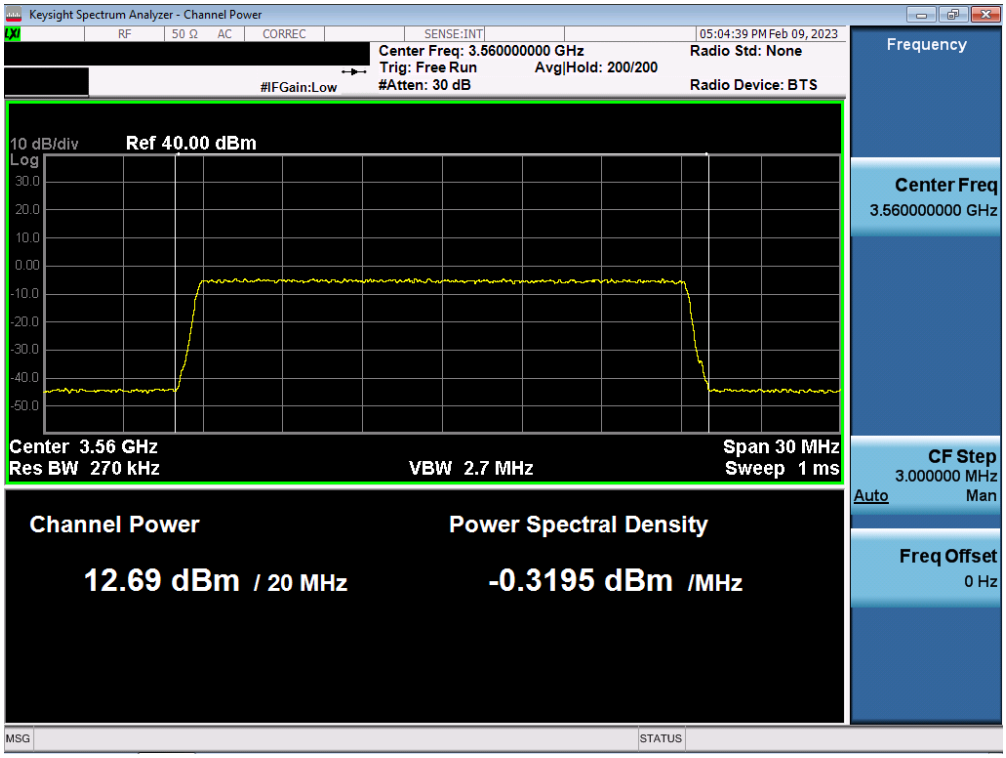
Plot 51. Conducted PSD, 3.56GHz, 20MHz BW – ANT3, SAS Granted maxEIRP 17dBm /MHz (NR)



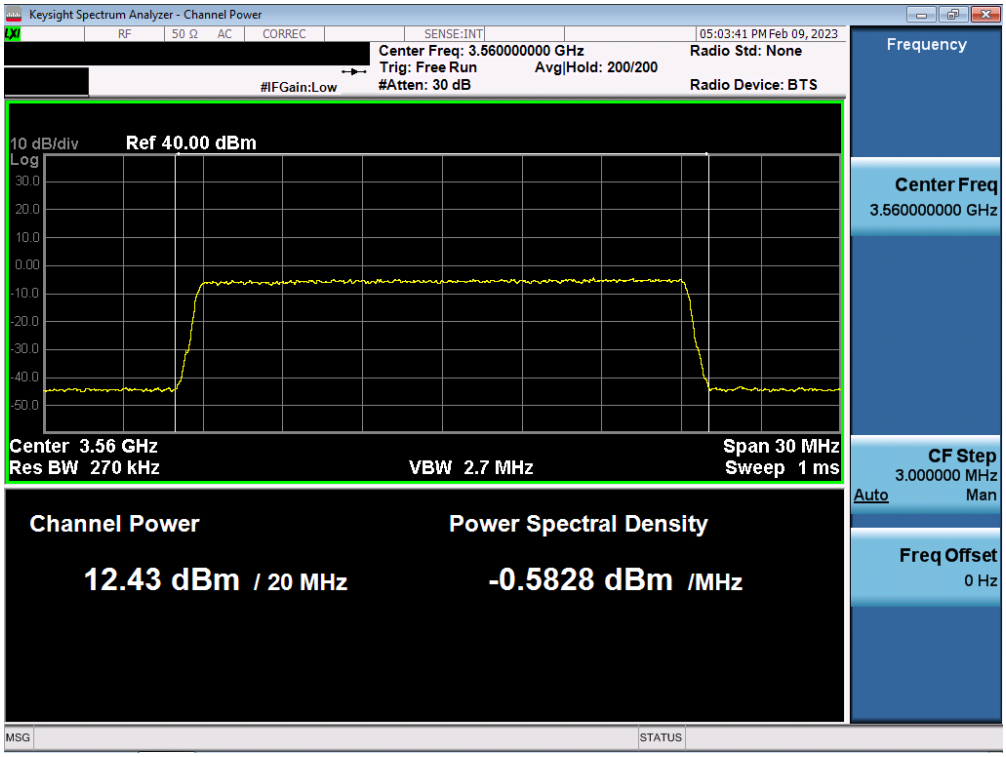
Plot 52. Conducted PSD, 3.56GHz, 20MHz BW – ANT4, SAS Granted maxEIRP 17dBm /MHz (NR)



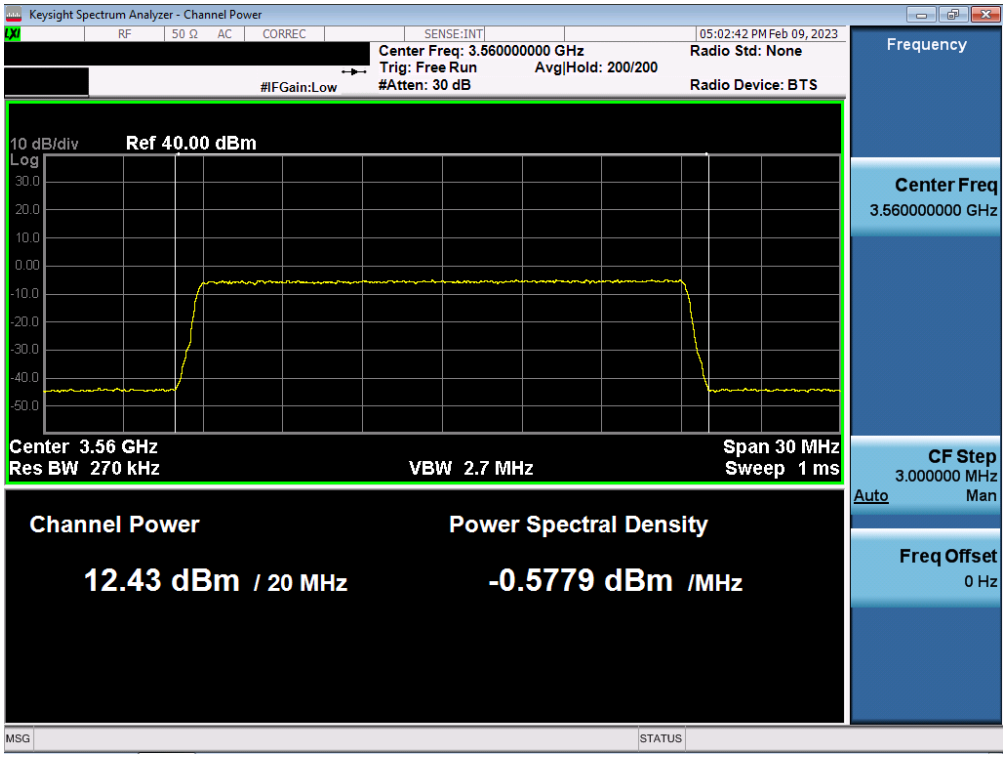
Plot 53. Conducted PSD, 3.56GHz, 20MHz BW – ANT5, SAS Granted maxEIRP 17dBm /MHz (NR)



Plot 54. Conducted PSD, 3.56GHz, 20MHz BW – ANT6, SAS Granted maxEIRP 17dBm /MHz (NR)



Plot 55. Conducted PSD, 3.56GHz, 20MHz BW – ANT7, SAS Granted maxEIRP 17dBm /MHz (NR)



Plot 56. Conducted PSD, 3.56GHz, 20MHz BW – ANT8, SAS Granted maxEIRP 17dBm /MHz (NR)

APPENDIX B – TEST LOGS

Logs are available upon request

PowerMeasTest_2023-02-09T20.53.29Z	2/9/2023 4:51 PM	Text Document
PowerMeasTest_2023-02-09T21.56.49Z	2/9/2023 5:06 PM	Text Document
PowerMeasTest_2023-02-09T22.07.06Z	2/13/2023 4:06 PM	Text Document
SCS.1	2/7/2023 12:47 PM	Wireshark capture...
SCS.2	2/7/2023 12:50 PM	Wireshark capture...
SCS.3	2/7/2023 12:51 PM	Wireshark capture...
SCS.4	2/7/2023 12:52 PM	Wireshark capture...
SCS.5	2/7/2023 12:54 PM	Wireshark capture...
WINNF.FT.C.DRG.1_2023-02-08T19.36.27Z	2/8/2023 2:39 PM	Text Document
WINNF.FT.C.GRA.1_2023-02-07T17.59.40Z	2/7/2023 1:02 PM	Text Document
WINNF.FT.C.GRA.2_2023-02-07T18.04.51Z	2/7/2023 1:05 PM	Text Document
WINNF.FT.C.HBT.1_2023-02-07T18.06.48Z	2/7/2023 1:17 PM	Text Document
WINNF.FT.C.HBT.3_2023-02-07T22.49.30Z	2/7/2023 5:53 PM	Text Document
WINNF.FT.C.HBT.4_2023-02-07T23.07.37Z	2/7/2023 6:12 PM	Text Document
WINNF.FT.C.HBT.5_2023-02-07T23.16.02Z	2/7/2023 6:17 PM	Text Document
WINNF.FT.C.HBT.6_2023-02-07T23.25.06Z	2/7/2023 6:30 PM	Text Document
WINNF.FT.C.HBT.7_2023-02-08T00.04.41Z	2/7/2023 7:07 PM	Text Document
WINNF.FT.C.HBT.9_2023-02-07T22.25.58Z	2/7/2023 5:30 PM	Text Document
WINNF.FT.C.HBT.10_2023-02-08T19.04.53Z	2/8/2023 2:11 PM	Text Document
WINNF.FT.C.MES.1_2023-02-07T22.24.37Z	2/7/2023 5:25 PM	Text Document
WINNF.FT.C.REG.1_2023-02-07T17.45.43Z	2/7/2023 12:46 PM	Text Document
WINNF.FT.C.REG.8_2023-02-07T17.55.09Z	2/7/2023 12:55 PM	Text Document
WINNF.FT.C.REG.10_2023-02-07T17.56.12Z	2/7/2023 12:56 PM	Text Document
WINNF.FT.C.REG.12_2023-02-07T17.56.54Z	2/7/2023 12:57 PM	Text Document
WINNF.FT.C.REG.14_2023-02-07T17.57.31Z	2/7/2023 12:57 PM	Text Document
WINNF.FT.C.REG.16_2023-02-07T17.58.11Z	2/7/2023 12:58 PM	Text Document
WINNF.FT.C.REG.18_2023-02-07T17.58.53Z	2/7/2023 12:59 PM	Text Document
WINNF.FT.C.RLQ.1_2023-02-08T19.30.36Z	2/8/2023 2:33 PM	Text Document