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CBRS CPE-CBSD as UUT Test Guidelines

Version V1.0

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CBRS CPE-CBSD as UUT Test Guidelines

1 Introduction

This document provides guidelines for a proposed method of testing CBRS CPE-CBSD as UUT in test labs for FCC Part 96 certification following the publication of FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01.

WinnForum SAS Test Harness is developed for test and certification purposes of CBSD/DP UUT. The WinnForum SAS Test Harness is available for download from the GitHub repository <https://github.com/Wireless-Innovation-Forum/Citizens-Broadband-Radio-Service-Device>

Note: It is recommended to check the GitHub repository as the Test Harness code may have periodic updates to address reported items.

2 Scope

This document provides test guidelines for CBRS CPE-CBSD as UUT following [n.1] and [n.5].

3 References

3.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [n.1] FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, 19 April 2019
- [n.2] WINNF-TS-0122 Version 1.0.1, “Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)”, 28 September 2018
- [n.3] WINNF-IN-0156 Version V1.0.0.1, “WinnForum SAS Test Harness CBSD UUT Tutorial”, 2 March 2018
- [n.4] WINNF-TS-0112 Version V1.X, “Requirements for Commercial Operation in the U.S. 3550-3700 MHz Citizens Broadband Radio Service Band”
- [n.5] FCC KDB 940660 D01 Part 96 CBRS Eqpt v02, 19 April 2019

4 Proposed Test Lab Setup for CPE-CBSD as UUT

4.1 General Test Lab Setup for CPE-CBSD as UUT

CPE-CBSD can have direct communication with SAS, or via a Domain Proxy.

The proposed test lab setup for CPE-CBSD as UUT includes the following elements:

1. “compatible BTS-CBSD”
2. WinnForum SAS Test Harness as described in [n.3]

3. Radio test equipment required for RF measurements of CPE-CBSD as UUT (the Radio test equipment is out of the scope of this document)
4. Traffic test equipment (including traffic generator) required for testing of user traffic passing from CPE-CBSD as UUT to its “compatible BTS-CBSD” (the user traffic test equipment including traffic generator is out of scope of this document)

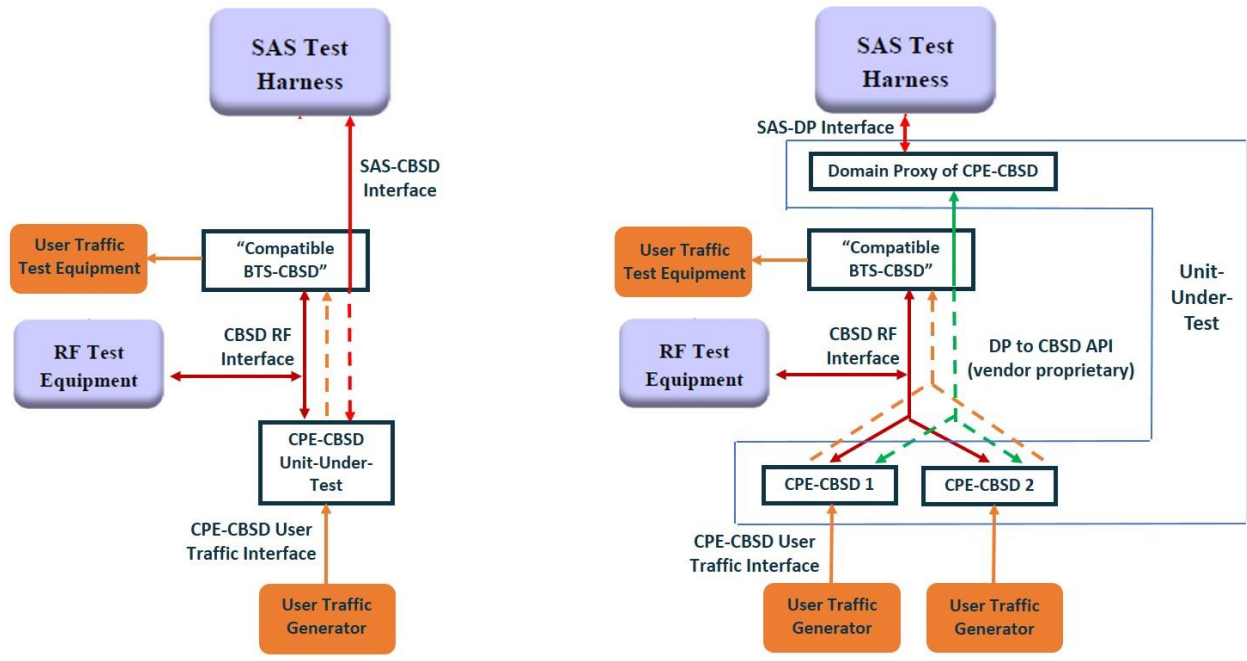


Figure 1: Proposed Lab Test Setup for CPE-CBSD as UUT

Further clarification for figure 1: dashed lines represent communication via the RF Air Interface between CPE-CBSD and its “compatible BTS-CBSD”. This communication via the RF Air Interface is passing:

- User Traffic from CPE-CBSD (Orange color in figure 1)
- SAS-CBSD protocol interface to/from SAS Test Harness (Red color in figure 1)
- DP to CBSD vendor proprietary API (Green color in figure 1)

4.2 Proposal for “compatible BTS-CBSD”

The “compatible BTS-CBSD” is proposed to be an “authorized CBSD” which fulfills the following:

1. A BTS-CBSD or {BTS-CBSD + Domain Proxy} that has already obtained from the FCC a formal FCC-ID compliant to FCC Part 96
2. Is operating in the test lab with its own SAS Test Harness separate from the SAS Test Harness for the CPE-CBSD as UUT. The test lab is actually running 2 separate independent instances/machines of the SAS Test Harness.

The following figures provide further clarifications for the lab setup for CPE-CBSD as UUT with its “compatible BTS-CBSD”. The figures show two separate instances/machines of the SAS

Test Harness: SAS Harness #1 is for the CPE-CBSD UUT, SAS Harness #2 is for the “compatible BTS-CBSD”. SAS Test Harness #1 is running the test cases described in [n.2]. SAS Test Harness #2 is running test case WINNF.PT.C.HBT.1.

The following table details the possible test setup configurations for communication with the SAS Test Harness:

Figure	UUT with SAS Test Harness #1	“Compatible BTS-CBSD” with SAS Test Harness #2
#2	CPE-CBSD as UUT direct communication	BTS-CBSD direct communication
#3	CPE-CBSD as UUT direct communication	{BTS-CBSD + Domain Proxy}
#4	{CPE-CBSD + Domain Proxy} as UUT	BTS-CBSD direct communication
#5	{CPE-CBSD + Domain Proxy} as UUT	{BTS-CBSD + Domain Proxy}

The Test Lab needs to setup only one option from the above 4 proposed options. This is based on the CPE-CBSD vendor and the Test Lab choice for “compatible BTS-CBSD”.

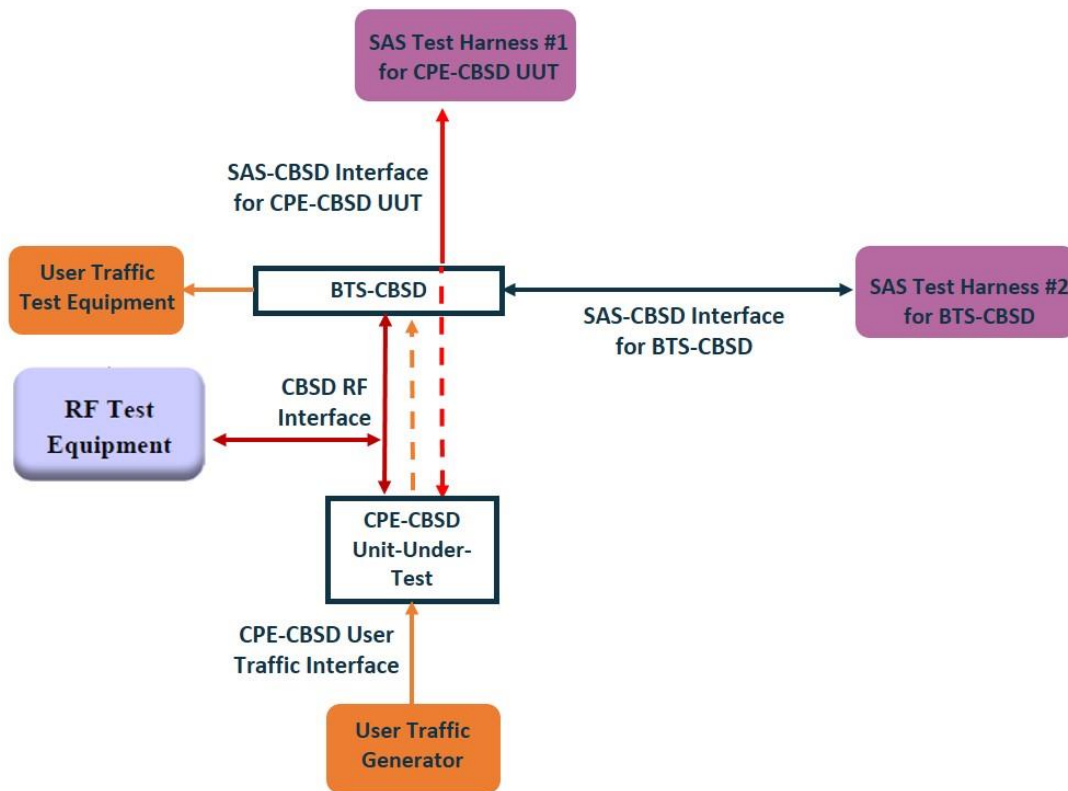


Figure 2: CPE-CBSD as UUT, BTS-CBSD direct communication

CBSD UUT Security Test Cases Tutorial

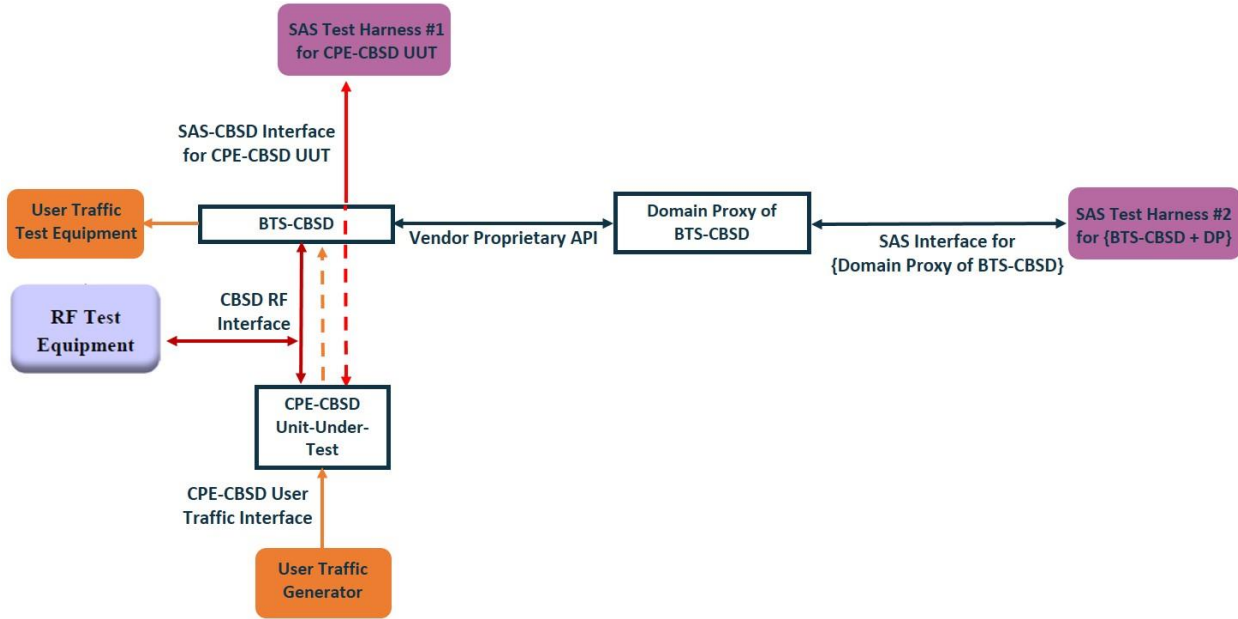


Figure 3: CPE-CBSD as UUT, {BTS-CBSD + Domain Proxy}

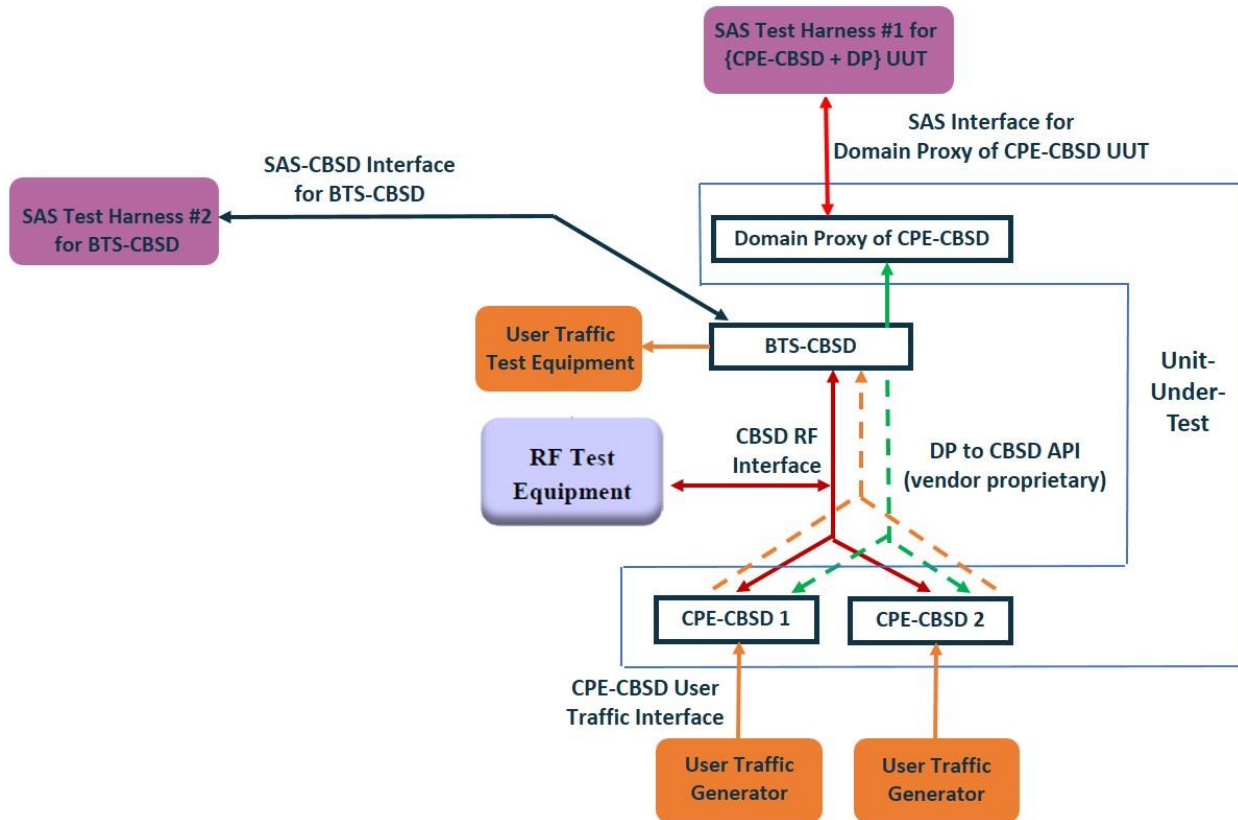


Figure 4: {CPE-CBSD + Domain Proxy} as UUT, BTS-CBSD direct communication

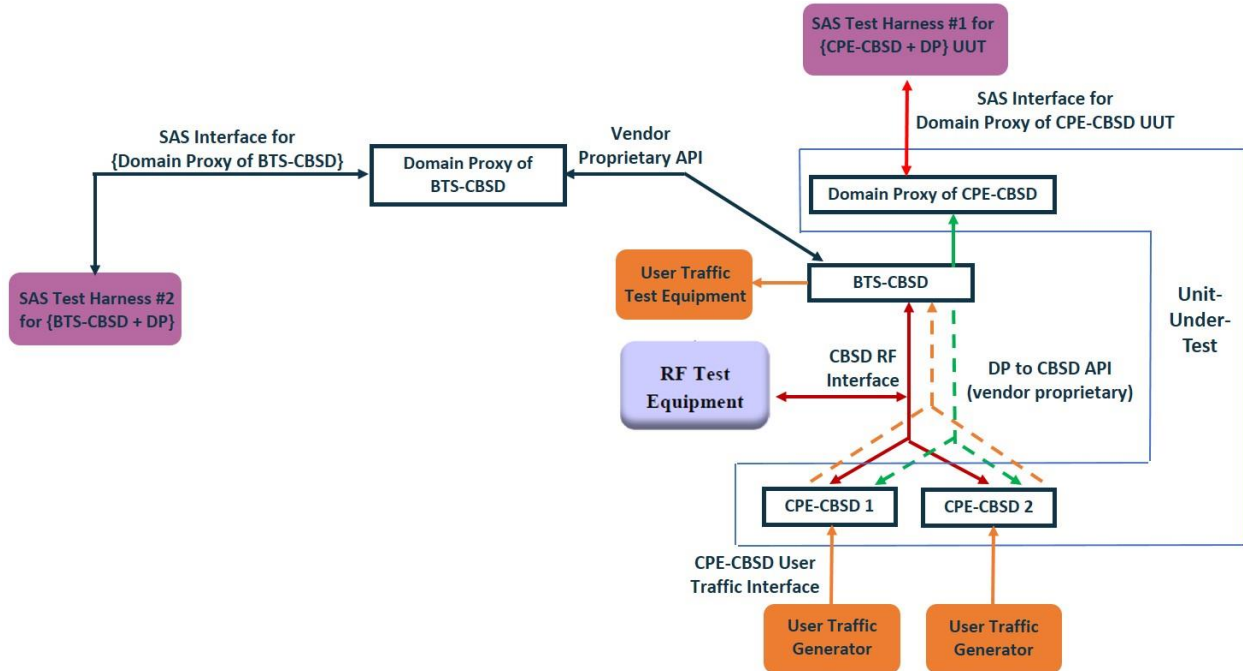


Figure 5: {CPE-CBSD + Domain Proxy} as UUT, {BTS-CBSD + Domain Proxy}

5 Executing WinnForum SAS<->CBSD Protocol Test Cases for CPE-CBSD

The test cases for SAS<->CBSD protocol in [n.2] apply also for CPE-CBSD device type. The WinnForum Github SAS Harness applies as is also for CPE-CBSD.

Following the FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, when running the test cases in [n.2] for CPE-CBSD device type, the Test Lab for all test cases needs to verify that:

- CPE-CBSD UUT can begin transmitting its RF only after receiving radio signal from its compatible BTS-CBSD
- For all CPE-CBSD RF transmissions, the CPE-CBSD UUT radio frequency range and bandwidth are less or equal to the frequency range and bandwidth of its compatible BTS-CBSD

Following the FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, when running the test cases in [n.2] for CPE-CBSD device type, for the last execution step appearing in [n.2]:

- The PASS/FAIL criteria “UUT shall not transmit RF” is replaced by “CPE-CBSD UUT shall not transmit user traffic”
- The PASS/FAIL criteria “UUT shall stop transmission” is replaced by CPE-CBSD UUT shall stop transmitting user traffic”

The test methodology described in this section allows the test lab to use the existing WinnForum Github SAS Harness as is also for CPE-CBSD as UUT. In the WinnForum Github SAS Harness

the wording of the “yes/no questions” and the correct answer for PASS/FAIL remains the same. It is for the Test Lab personnel to enter the correct answer for CPE-CBSD as UUT based on “user traffic transmission” of the CPE-CBSD. The figures of proposed test setup in the previous section show “user traffic generator, user traffic test equipment” for this purpose.

6 Proposed Test Method for CPE-CBSD as UUT Transmitting {X Time Out of Y Time} During the Handshake Process

Following the FCC KDB 940660 D02 CPE-CBSD Handshake Procedures v01, the CPE-CBSD is “limited in duration and duty cycle to the minimum time necessary to get a grant from the SAS; this time should not exceed 1 second within any 10-second period, 10seconds within any 300-second period, or 20 seconds within any 3600-second period”.

This is an {X Time Out of Y Time} test. The Test Lab needs to create the proper RF environment and RF conditions for this test.

The following steps are a proposed test method:

Step #1: CPE-CBSD as UUT does not receive any RF signal from its “Compatible BTS-CBSD”, so CPE-CBSD as UUT does not transmit.

Step #2: Use the WinnForum SAS Harness #1 for CPE-CBSD as UUT and run test case WINNF.FT.C.GRA.1 for CPE-CBSD as UUT.

Step #3: CPE-CBSD as UUT starts to receive the RF signal from its “Compatible BTS-CBSD”, so CPE-CBSD can start communicating with the WinnForum SAS Harness #1. Make note of the time when RF Test equipment logs the first transmission from CPE-CBSD which is above 23dBm/10MHz – this is the start time of the {X time out of Y time}.

Step #4: When the test case WINNF.FT.C.GRA.1 finishes and the questions appear on the WinnForum SAS Harness #1 console, do NOT answer the questions. Wait until Y time has passed from step #3. During this Y time, the RF test equipment is logging the amount of time CPE-CBSD as UUT transmitted EIRP above 23dBm/10MHz. The amount of time logged for transmitting EIRP above 23dBm/10MHz is the X time.

Step #5: Answer the questions on the WinnForum SAS Harness #1 console so the WinnForum SAS Harness #1 is ready for the next test.

Explanation for the procedure above: the {X time out of Y time} is the allowed transmission time of the CPE-CBSD as UUT prior reaching to AUTHORIZED state. According to [n.3] the WinnForum SAS Harness is built so when the test reaches the “questions phase” it will continue giving specific answers to Request Messages from UUT. Running WINNF.FT.C.GRA.1 will result that CPE-CBSD as UUT will get “stuck” in Grant Response with responseCode = 400 (INTERFERENCE) for the entire Y duration time (never reaching AUTHORIZED or even GRANTED state) which allows to measure the {X out of Y time} transmission of the CPE-CBSD as UUT.