

**Federal Communications Commission  
Office of Engineering and Technology  
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**Draft Laboratory Division Publications Report**

**Title:** Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized Under Part 96 of the Rules

**Short Title:** Part 96 - CBSD

**Reason:** New rule part

**Publication:** 940660 D01 Part 96 CBSD v01

**Keyword/Subject:** CBSD, Part 96, Part 90 Subpart Z, SAS

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**Question:** What procedures should be used to evaluate CBSDs for compliance under Part 96?

**Answer:** Attachment 940660 D01 Part 96 CBSD v01 provides guidance on applicable approval procedures, technical requirements, and CBSDs interaction with Spectrum Access System (SAS) evaluation.

**Attachment List:**

[940660 D01 Part 96 CBSD v01](#)

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**CERTIFICATION AND TEST PROCEDURES FOR CITIZENS BROADBAND RADIO  
SERVICE DEVICES AUTHORIZED UNDER PART 96 OF THE RULES**

**I. INTRODUCTION**

**1. Background**

The Commission recently created rules that permit the use of the 3550-3700 MHz band under the Citizens Broadband Radio Service (CBRS).<sup>1</sup> Devices operating in this band are called Citizens Broadband Radio Service Devices (CBSDs), and the rules governing their operation are codified in Title 47 of the Code of Federal Regulations (CFR) at Part 96. Existing Part 90 Subpart Z rules were also modified to implement a transition period that allows licensees to continue operations until the deadline at which they must comply with Part 96 rules.

**2. Objective**

This guidance recommends CBSD measurement and validation procedures that will demonstrate compliance to the applicable rules in Part 96.<sup>2</sup>

In addition to demonstrating compliance with the technical rules, CBSDs are required to demonstrate the capability to access at least one Spectrum Access System (SAS), which authorizes and manages CBRS spectrum use.

To demonstrate compliance with the rules, the requirements and procedures are divided into four parts:

**Section II** addresses equipment authorization requirements and procedures.

**Section III** specifies CBSD verification tests and recommended measurement procedures for demonstrating compliance to the specific radio frequency (RF) requirements and limits. It also specifies verification tests and recommended procedures for demonstrating compliance with the rules governing the connection and interaction between the CBSD and one or more SASs.

**Section IV** addresses all security requirements.

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<sup>1</sup> See *Report And Order And Second Further Notice Of Proposed Rulemaking* in GN Docket No. 12-354, 30 FCC Rcd 3959 (2015; FCC 15-47) and *Order on Reconsideration And Second Report And Order*, 31 FCC Rcd 5011 (2016; FCC 16-55).

<sup>2</sup> CBSDs are currently on the Pre-Approval Guidance (PAG) list. A sample must be submitted to the FCC for pre-approval testing prior to approval by a TCB. See KDB Publication 388624 D01 and D02.

## II. EQUIPMENT AUTHORIZATION

Per Section 96.49, CBSDs require certification. Applications for certification of CBSDs must be filed using the designated equipment codes: **CBD** (for all devices except for end-user devices), and **CBE** (for end-user devices).<sup>3</sup> Applications for certification must include all supporting documents demonstrating compliance with the rules, including two-way transmission and operation in the entire 3550-3700 MHz band.<sup>4</sup> For more details, see the FAQs at the end of this document.

## III. MEASUREMENT PROCEDURES

### 1. Test Mode Requirements

To perform many of the certification compliance tests described in this document, a test mode accessible by test personnel (but not end-use customers) must be incorporated into a CBSD submitted for evaluation. Radio management software must also include software used for CBSD-to-SAS communication, whether directly or through a domain proxy.<sup>5, 6</sup> The software may be the same package as will be available to end users; however administrative privileges must be available. The test mode and radio management software must at a minimum provide:

- a) The ability to compel the device-under-test (DUT) to operate on a channel selectable by test personnel.
- b) The ability to vary the output power from the minimum to the maximum realizable levels and set it to a desired level.
- c) As needed, the ability to continuously transmit a modulated signal (i.e., with no time bursting or signal gating applied).
- d) The ability to enter all required SAS registration information.
- e) The ability to view all information provided to the radio by the SAS.

### 2. Technical Requirements

The following list identifies the key requirements for compliance with Part 96 rules. In cases where test procedures or test cases have not been specified, the application for certification must include a detailed description of how the device complies with the requirements.

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<sup>3</sup> Classification of the device must be consistent with specific requirements found in §§ 96.39, 96.41, 96.43, and 96.45. Where necessary, grant comments must be used; for example: “For outdoor operation, antenna should not exceed 6 meters HAAT”; “This device is limited to outdoor operations.”

<sup>4</sup> Note that existing Part 90 Subpart Z devices may continue to operate under their current certification until the end of the transition period, which is defined by the wireless license, and are exempted from the two-way operation and band-wide operability during the transition period. Grantees of existing certifications under Part 90 Subpart Z may file a new original application to re-certify the device and add the applicable equipment code, under the same FCC ID, if they demonstrate compliance with all the requirements for the category of CBSD.

<sup>5</sup> If a CBSD is managed through a domain proxy or a management server for connection to a SAS, the applicant must include the information in the operational description of the equipment application.

<sup>6</sup> Devices may use the SAS emulator developed by Wireless Innovation Forum (“WInnForum”) to demonstrate compliance. Devices that do not use the SAS emulator must identify a specific SAS and demonstrate compliance using the indicated SAS.

a) §96.39 General requirements

1. Geo-location

Must determine its location to an accuracy of  $\pm 50$  meters horizontal and  $\pm 30$  meters of elevation. For non-professional installed devices it must report any location changes within 60 seconds.

2. Operability (Two-way communication)

Devices should be able to transmit and receive any communication on any channel assigned by the SAS and respond accordingly.

3. Registration with SAS

The CBSD must provide the required information to the SAS and obtain a successful registration.

The management software must be able to collect the data listed below. Confirm that the DUT will not operate unless a successful registration and authorization is received from SAS.

All CBSDs:

- i. Geographic location
- ii. Antenna height AGL (m)
- iii. CBSD class (Cat. A or B)
- iv. Requested authorization status (PAL or GAA)
- v. FCC ID
- vi. Call sign (PALs only)
- vii. User contact info
- viii. Air interference technology
- ix. Serial #
- x. Sensing capability (if supported)

For Category B Devices:

- i. Antenna gain
- ii. Beam-width
- iii. Azimuth
- iv. Down tilt angle

For Category A devices

- i. Indoor or outdoor operation

#### 4. Signal level reporting

A CBSD must report to a SAS received signal strength in its occupied and adjacent frequencies, received packet error rates, and other common standard metrics of interference for itself and its associated end user devices as directed by SAS.

#### 5. Frequency reporting

If directed by the SAS, a CBSD that receives a range of available frequencies or channels from an SAS must promptly report to the SAS which of the available channels or frequencies it will utilize.

### b) Section 96.41 General radio requirements

#### 1. Power limits and power management

All CBSDs must meet both, the maximum EIRP limit and maximum PSD limit. CBSDs must operate across 150 MHz, thus measurements shall be performed and reported for low, mid, and high channels.

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a
Category A CBSD	30	20
Category B CBSD <sup>1</sup>	47	37

##### i. Maximum EIRP

The procedure outlined in Section 5.2 of ANSI C63.26-2015 is acceptable for performing power measurements. Measurements can be made using either a peak or average (RMS) detector, as long as the appropriate procedure is followed.

##### ii. Maximum PSD

The rules require “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. To perform this measurement, the DUT must configured to transmit continuously at full power. The procedure outlined in Section 5.2 of ANSI C63.26-2015 is acceptable.

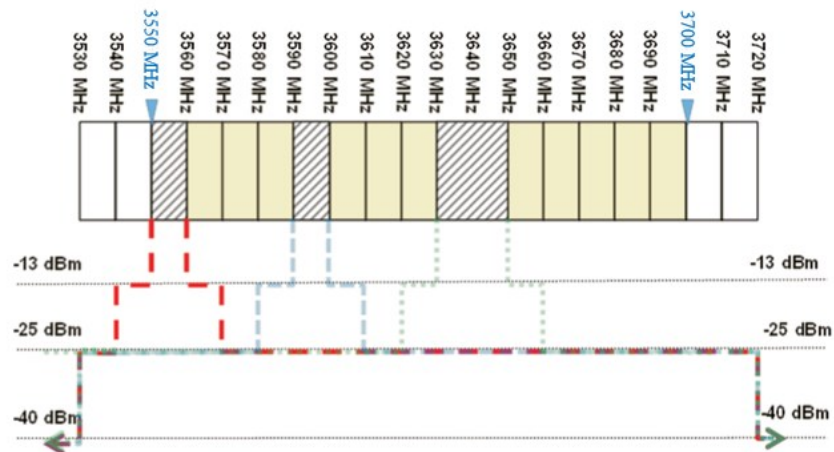
iii. Peak-to-Average Power Ratio (PAPR)

In addition to the power limits in § 96.41, CBSDs need to meet a PAPR limit. For this measurement, the procedure found in Section 5.2.6 of ANSI C63.26-2015 is acceptable.

2. Emissions outside the fundamental

The limits for emission outside the fundamental are stated below.

- within 0-10 MHz above and below the **assigned channel**  $\leq -13$  dBm/MHz
- greater than 10 MHz above and below the **assigned channel**  $\leq -25$  dBm/MHz
- any emission below 3530 MHz and above 3720 MHz  $\leq -40$  dBm/MHz



Measurements must be performed for low, mid, and high channels. It is acceptable to apply the procedures in Section 5.7 of ANSI C63.26-2015 using the following settings, per § 96.41(e)(3).

Note that unwanted emissions for CBSDs are relative to the authorized channel, as assigned by the SAS.

- Resolution bandwidth<sup>7</sup>:
  - a) 1% of fundamental for measurements within 1 MHz immediately outside authorized channel; and
  - b) 1 MHz for beyond 1 MHz outside the authorized channel.

<sup>7</sup> A narrower RBW is permitted in all cases to improve measurement accuracy, provided the measured power is integrated over the full reference bandwidth.

### 3. Test Cases

The following is a list of test cases that should be used, as appropriate for the device type, to demonstrate compliance with the requirements of the rule parts; the device also will need to demonstrate compliance with all the other general requirements in Part 2.

- a) Can the device transmit on its own without prior authorization from an SAS?
- b) 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.
- c) Will the device change its operating power and/or channel in response to a command from an SAS?
  - 1. Will the device correctly configure based on the different license classes?
  - 2. Will the device change power levels on commands from the device?
  - 3. Will the device stop transmission on command?
  - 4. Will the device send measurements in response to the command from the SAS?
- d) For devices with geo-location, will it notify the SAS of a new location that is beyond the required distance parameter ( $\pm 50$  m) within the required time frame?
- e) Is the device capable of signal level and frequency reporting to SAS?
- f) For a device that operates as a Category A and then as a Category B (or vice versa), will it notify the SAS of the change and report the necessary information?
- g) How compliance with all requirements is met when CBSDs communicate through a management system.
- h) Processes used when communication between CBSD and SAS is lost.
  - 1. How would CBSD react if the communications between the device and the SAS is lost? CBSD should stop transmitting once it loses the link to the SAS.
  - 2. Process for re-establishment of the communications.
  - 3. Review power-on restart process for registration (re-registration) process.
  - 4. Process for de-registration.

### IV. SAS and Device Security Requirements

The device operating procedures if communicating directly to a SAS, or to a domain proxy if that manages multiple devices, must include documentation with detailed explanations for the following for each SAS the device is expected to work with:

- a) What communication protocol is used between the SAS and the CBSD?
- b) How are communications initiated?
- c) How does the CBSD validate messages from the SAS?
- d) How does the device handle failure to communicate or authenticate the SAS?
- e) How does the SAS validate messages from a CBSD?
- f) What encryption method is used?
- g) How does the SAS ensure secure registration of protected devices?

## FREQUENTLY ASKED QUESTIONS (FAQs)

**Question 1:** What are the effective dates for the CBSD rules adopted by the Commission on April 17, 2015, in GN Docket No. 12-354 (FCC 15-47)?

**Answer 1:** Part 96 rules became effective on July 23, 2015, and modified rules on August 25, 2016.<sup>8</sup>

**Question 2:** When is the FCC going to start certifying Part 96 devices?

**Answer 2:** For devices that comply with all requirements, including the SAS interface requirements, pre-TCB KDB inquiries<sup>9</sup> and/or TCB PAG KDB inquiries<sup>10</sup> can be submitted at this time.

**Question 3:** What are the transition dates for already-certified devices under Part 90 Subpart Z?

**Answer 3:** Transition dates for device importation, marketing, and operation are not defined in the rules. A transition period is defined for Grandfathered Wireless Broadband Licensees (“90Z licensees”) and are dependent on each individual license term. We expect all 90Z licensees to comply with the Part 96 rules once their transitions are complete. At that point, use of legacy equipment that does not operate across the entire 150 MHz band could hinder a former Part 90 licensee’s flexibility with respect to other GAA operations in the band.

**Question 4:** What are the options for existing Part 90 Subpart Z devices?

**Answer 4:** Part 90 Subpart Z devices that are used by Grandfathered Wireless Broadband Licensees and are **not** capable of operating across the entire 3550-3700 MHz band, may continue to operate beyond the license term as long as they meet all Part 96 requirements, with the exception of the band-wide operability.

A new Part 96 certification for these devices must be filed no later than April 17, 2020 (see Question 4). The new certification can be added to the existing FCC ID (as a composite Form-731 application) and must bear the following grant note:

**Note Code ##:** This device is exempted from the band-wide operability Part 96 requirement and is limited to operate in the 3650-3700 MHz band. The device may be marketed, manufactured, installed or imported after April 17, 2020.

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<sup>8</sup> Rules were modified to change the limits of non-rural Category B CBSDs, remove maximum conducted power limits for all CBSDs, and to allow RMS-detection or peak-detection when performing emission power measurements.

<sup>9</sup> KDB Publication 388624 D01 v11r01, II. MANUFACTURER / TEST LABORATORY TESTING GUIDANCE PRIOR TO SUBMISSION TO TCB.

<sup>10</sup> KDB Publication 388624 D01 v11r01, III. TCB PRE-APPROVAL GUIDANCE.



Existing Part 90, Subpart Z devices that are capable of meeting all Part 96 requirements, including band-wide operability, must add the Part 96 certification to the existing FCC ID (as a composite Form-731 application) and must bear the following grant note:

**Note Code ##:** This device meets all Part 96 requirements and can be marketed, manufactured, installed or imported after April 17, 2020.

**Question 5:** For non-composite grants, how do you file for a new equipment class?

**Answer 5:** For Part 90 Subpart Z and Part 96 grants that are not already composite applications, the grantee should contact the TCB that issued the original grant of certification and request the TCB to modify the original grant to be a composite grant. The TCB may need to contact the FCC for assistance with this request. After the original grant has been modified to be a composite grant, any TCB may complete a new composite original grant application under the original FCC ID, and then issue the new composite-application grant under the new CBSD equipment class.

**Question 6:** How do you apply the EIRP limit of § 96.41 when there are bandwidths other than 10 MHz, or when there is channel aggregation?

**Answer 6:** The limit for smaller bandwidths is still per 10 MHz, and neither measurement results or limits should be adjusted to the lesser BW. In the case of channel aggregation or bandwidths larger than 10 MHz, the limit is per channel (i.e., 10 MHz).