



**Federal Communications Commission
Office of Engineering and Technology
Laboratory Division**

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**GUIDANCE REGARDING DEVICES OPERATING
IN THE 3650–3700 MHz BAND UNDER PART 90Z**

I. INTRODUCTION

This document provides guidance for approval of devices operating in the 3650–3700 MHz under Part 90Z of the FCC rules.¹ The guidance addresses: (1) several questions and information to help determine the contention-based protocol capability (CBP) of a device and (2) requirements for certain subscriber stations operating at power levels in excess of those permitted for mobile stations.²

These questions are intended to be used as a guide by the applicant to describe how their system meets the requirements for the contention-based protocol, or for providing the necessary information to be granted under the mobile station waiver order, or both. The list is not intended to be exhaustive and may be modified in the future. There may be follow-up questions based on the responses provided by the applicant for authorization. All other technical requirements shall be demonstrated utilizing the procedures specified in ANSI C63.26, as applicable.³

Applicants seeking certification for systems as complying with either restricted or unrestricted contention-based protocol (3650–3675 MHz) can seek equipment authorization from a Telecommunications Certification Body (TCB) using the Pre-Approval Guidance (PAG) procedure, as described in Section VI.⁴

Applicants seeking certification for devices that operate in the Citizen Broadband Radio Service (CBRS) band (3550–3700 MHz) must follow the guidance provided in KDB Publication 940660 D01.⁵

¹ In this document “Part 90Z” refers to Part 90 Subpart Z.

² Mobile stations as defined in § 90.1333 operate only if they can positively receive and decode an enabling signal transmitted by a base station. In a recent waiver order (see DA 10-676) the Commission approved Alvarion BreezeMAX Si-CPE mobile stations to operate above the limits of § 90.1321 of 1 W/25 MHz EIRP and 40 mW in any 1 MHz slice of spectrum under prescribed circumstances. In the Order, the Commission also permitted similarly situated devices to be approved under similar conditions.

³ ANSI C63.26, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services, Institute for Electrical and Electronic Engineers (IEEE).

⁴ § 2.964; see KDB Publication 388624 D01 and D02 for the PAG procedures and PAG list.

⁵ The Commission has adopted new rules for commercial operations in the 3550–3650 MHz band and also established transition rules for operation in the 3650–3700 MHz band. See FCC 15-47 in GN Docket No. 12-354 (adopted April 17, 2015). See Section VII for more information.

II. RESTRICTED CERTIFICATION UNDER PART 90Z (3650–3675 MHz BAND)

To ensure that a device complies with the requirements of restricted contention-based protocol, the following information should be provided in the application.

- a) Restricted Protocol Description
 - 1) Although the restricted protocol does not have the extended requirement to recognize all other systems, it is still mandatory to incorporate a contention-based protocol that provides satisfactory sharing of spectrum with similar systems.
 - 2) Address the key requirements for operation using restricted contention-based protocol opportunities for other transmitters to operate. Please note that this requires recognizing like systems (similar to yours) that permit operation on a co-channel.
 - 3) Provide any additional manuals and operational descriptions to allow the reviewer to understand the product and its operation.
- b) Describe the method to permit occupancy.
- c) Describe the action taken if two or more transmitters simultaneously access the same channel by the master and the client devices.
- d) Describe opportunities for other similar systems to operate; address whether and how a different system operator using the same technology can operate in the same band.

III. UNRESTRICTED CERTIFICATION UNDER PART 90Z (3650–3700 MHz BAND)

To ensure that a device complies with the requirements of unrestricted contention-based protocol, the following information should be provided in the application.

a) Unrestricted Protocol Description

Address the key requirements for operation using unrestricted contention-based protocol. Please note that this requires recognizing other systems (both similar to yours and different from yours) that operate on a co-channel. Indicate the strategy for sharing the spectrum in terms of: (1) Does the system use spectrum sensing to determine if the other devices are transmitting and then find ways to share the bandwidth, or (2) Does the system have some other strategy?

b) Threshold detection to determine occupancy

- 1) Describe how your system determines if another system is using the spectrum. At what detection level – relative to 0 dBi receive antenna gain (busy channel threshold) – does the device determine if another system is operating on the spectrum?
- 2) How long does the system observe to determine if the channel is busy – at the initial time and in between communications?
- 3) What is the bandwidth being monitored versus bandwidth occupied for all modes of operation?
- 4) How much variability is provided to the system operator to adjust the busy-channel detection threshold?
- 5) What is the operating system threshold (receive threshold) compared to the monitoring threshold (busy-channel threshold)?

- 6) What additional checks does the system perform to determine if the spectrum is being used before initiating a transmission?
 - 7) Do both the master and the client perform the threshold detection? If only the master performs the detection, how does it determine if the client may interfere with the other system (hidden-node detection mechanism)?
- c) Action taken when occupancy is determined
- 1) What action does your system take when it determines occupancy? Does it vacate the channel, or does it have some back-off and retry strategy? What is the impact of traffic on the spectrum sensing or avoidance performance?
 - 2) If you use other means, please describe how the device determines the existence of other systems, and what steps it takes to either share the channel or avoid its use.
 - 3) Describe any mechanism that would limit a transmission from a remote station if only the master detects occupancy (hidden-node avoidance mechanism).
- d) Opportunities for other transmitters to operate
- 1) When describing occupancy profile, clarify any differences between the start-up acquisition mode of spectrum usage, and the operational modes.
 - 2) In operational mode, how long does the system transmit before stopping and giving others a reasonable time to transmit before continuing?
 - 3) Does the system (master or client or both) listen prior to every transmission? If not, explain.
 - 4) Describe how the operational spectrum usage (on-air time) is dependent on system load conditions (no load, typical and overload). For example, if a station does not have any information to transmit, describe any regular or recurring transmission that may take place.
 - 5) Describe if there are any limitations imposed by the contention protocol on what applications are used (e.g., limitations on Quality of Service).
 - 6) Describe how applications or configuration of services can affect spectrum usage. To describe your occupancy sharing capability, you can assume that two systems on a co-channel are the same (your systems being described). How would they share the spectrum?

IV. MOBILE STATIONS CERTIFIED UNDER THE DA 10-676 LIMITED WAIVER

Mobile equipment (operating under Section 90.1333 that only transmits if it can positively receive and decode an enabling signal transmitted by a base station) is permitted to be certified, marketed, and operated under the DA 10-676 limited waiver subject to the following conditions.

- a) Similarly situated applications for certification of 3650 MHz equipment.
- b) The conditions of certification, including marketing and operation conditions, apply to all equipment granted under the submitted FCC ID, and not just to a limited set of models or installation configurations that may be applicable. Applications under this waiver shall address the following items.
 - 1) Applicant shall demonstrate equipment is similar to the equipment in the waiver, and shall provide a request for a waiver, which shall include a justification why this meets the intent in a fixed mode under this waiver. This request shall also include an operational overview that describes the equipment's physical properties, intended installation arrangements, optional mounting arrangements, antennas, power outputs, modulation characteristics and channel

bandwidths, and references to the specific detailed installation instructions and end user guidelines that ensure that licensees locate the equipment in a manner that will maintain its fixed location, and appropriate RF exposure compliance separation distances.

- 2) The grant comments shall state: “This equipment can only be installed and operated by a licensee and must be registered in the ULS database as a fixed station under the rules of Section 90.1331 and enabled by a valid base station registered in the ULS database to the same licensee.”
- 3) The installation manual shall state: “This equipment is subject to the registration rules of Section 90.1331 for restrictions on the operation of base and fixed stations. It can be sold and marketed only to licensees and cannot be sold to the general public. The license holder is responsible, prior to operation, to register the device in the ULS database and operate the equipment only at the registered fixed location and not at any other location.”
- 4) The installation and end-user manual shall include RF exposure compliance information, sufficiently detailed installation instructions, antenna locations and guidelines to ensure that licensees locate the equipment and antenna to maintain appropriate RF exposure compliance separation distances at all times: “The antenna used for this transmitter must be kept at a separation distance of at least *as applicable* cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.”

V. ALL STATIONS OPERATING IN FIXED MODE AT HIGHER POWER

Any station (includes one or more of the following attributes: non-mobile, mobile, base, fixed, subscriber, remote, CPE, or stations that positively receive and decode an enabling signal) operating above the limits of 1 W/25 MHz EIRP or a peak EIRP density above 40 mW in any 1 MHz slice of spectrum, as defined in Section 90.1321(c) (power and antenna limits), is subject to the registration rules of Section 90.1331 for restrictions on the operation of base and fixed stations

VI. PROCEDURES FOR PRE-APPROVAL GUIDANCE

An initial PAG inquiry, providing the information described in Section II and in the applicable Sections III, IV, or V, must be submitted to the FCC for review. Once the protocol approach is approved, a TCB may file for final approval when the remainder of the application has been reviewed for compliance. The TCB is responsible for ensuring a complete review of the application for compliance with all the relevant requirements.

Special note must be made about the power limits specified in the rules for these devices. These devices are subject to transmitted power⁶ and power density limits. Also, mobile devices may have to meet special restrictions based on the mode of operation. The grant must also list the note code RS,⁷ to denote “restricted contention-based protocol.”

⁶ Grant comments: “Output is EIRP.”

⁷ RS Note Code: This device incorporates a restricted contention-based protocol. It is not capable of avoiding co-frequency interference with devices using all other types of contention-based protocols. Operation is restricted to the 3650–3675 MHz band.

VII. TRANSITION TO PART 96 CBRS

The Commission has adopted new rules for CBRS which permits operation in the 3550–3700 MHz band under Part 96.⁸ At the same time, rules were established for grandfathered devices operating in the 3650–3700 MHz band under Part 90Z. Section 90.1338 defines grandfathered operations and transition to CBRS. Devices approved under Part 90Z rules can receive protection from harmful interference from CBRS operations until April 17, 2020, or the end of their license term, whichever is later.⁹

A device can be certified for both Part 90Z and Part 96, as long as it meets all requirements for both parts.¹⁰ Grantees of existing certifications under Part 90Z may file a new original application, to re-certify the device and add operation under Part 96 under the same FCC ID, if there are no hardware changes and the device complies with all the requirements for a CBSD or End User Device.

CHANGE NOTICE

1/13/2010: 552295 D01 CBT Guidance for 3650 3700 Band v01 has been changed to 552295 D01 CBT Guidance for 3650 3700 Band v01r01 to correct an error. Section 3 -Procedures for Permit-but-Ask approvals – the first sentence was correct from unrestricted to the restricted based protocol.

12/15/2010: 552295 D01 CBT Guidance for 3650 3700 Band v01r01 has been changed to 552295 D01 CBT Guidance for 3650 3700 Band v02. Section 3 for Mobile equipment operating under limited waiver in DA 10-676 has been added and all stations as described in section 4. 2/09/2010 552295 D01 CBT Guidance for 3650 3700 Band v02 has been changed to 552295 D01 CBT Guidance for 3650 3700 Band v02r01. From **12/15/2010 to 02/09/2011** Version v02 was incorrectly documented as v01r01. This document (v02) only corrected the version /revision number. There is no text change in this v02 document from the document published on 12/15/2010 (incorrectly documented as v01r01).

10/13/2011: 552295 D01 CBT Guidance for 3650 3700 Band v02 has been changed to 552295 D01 CBP Guidance for 3650 3700 Band v02r01. The only change to this document was in the document identifier. CBT was changed to CBP for consistency with the subject Contention Based Protocol.

04/08/2013: 552295 D01 CBT Guidance for 3650 3700 Band v02r01 has been changed to 552295 D01 CBP Guidance for 3650 3700 Band v02r02. Removed the requirement to submit applications to the Commission for devices with unrestricted protocol.

01/29/2018: 552295 D01 CBP Guidance for 3650 3700 Band v02r02 has been changed to 552295 D01 CBP Guidance for 3650 3700 Band v03. Added information on grandfathered operation, per Section 90.1338 and Part 96.

⁸ 47 CFR Part 96.

⁹ 47 CFR § 90.1338.

¹⁰ See KDB Publication 940660 D01.