

TGM Pinnacle Network Solutions LLC
Statement in Support of Experimental License

TGM Pinnacle Network Solutions LLC (“Pinnacle”) provides this statement pursuant to Section 5.63(c)(1) of the Commission’s Rules in support of its application for an experimental license to conduct a market trial, as defined in Sections 5.5 and 5.602, using spectrum in the 3550-3650 MHz band transmitting from five designated locations in Archer, Clay, and Wichita Counties in North Texas. Pinnacle requests a license term equal to the shorter of (a) two (2) years from grant of this application, or (b) Pinnacle’s grant of authority from a Spectrum Access System (“SAS”) and Environmental Sensing Capability (“ESC”) to operate the authorized equipment and facilities on a General Authorized Access (“GAA”) basis.

Overview

Pinnacle is a fixed wireless broadband provider that holds a nationwide non-exclusive 3650-3700 MHz service license (Call Sign WQMN656). Pinnacle uses this license and unlicensed spectrum to provide last-mile fixed broadband service to customers throughout a 7800 square mile area of North Texas. Pinnacle currently provides broadband service to approximately 3250 customers in rural areas of Texas.

Pinnacle intends to experiment using equipment with software-defined radios that can be tuned to operate in the 3550-3650 MHz band and ultimately configured to operate with the SAS and ESC that are under development. Based on its preliminary research, Pinnacle believes that the 3550-3700 MHz band offers the best combination of throughput, propagation, cost and equipment to deliver high-quality broadband service to its subscribers and others in the target markets that lack access to competitive broadband services.

In this trial, Pinnacle plans to test equipment manufactured by Cambium. This will enable Pinnacle to gain a better understanding of the benefits, challenges and costs associated with near-term deployment in the 3650-3700 MHz band as well as for the Citizens Broadband Radio Service (“CBRS”) and to compare performance and capabilities with Pinnacle’s existing equipment and the other spectrum bands it uses. Understanding the balance between cost and performance will significantly inform Pinnacle’s business decisions, for the benefit of its own financial modeling and consumers who will be offered a better service. Pinnacle also plans to experiment with various speed and pricing plans to assess consumer acceptance of the service. If the trial is technologically successful and beneficial to consumers, Pinnacle expects that it will have more information that will help it realize significant cost savings and improved performance.

The trial also will provide Pinnacle with information to help make its future equipment, expansion and network investment plans. Assuming the trial is successful, Pinnacle expects to utilize a combination of Priority Access Licenses (“PAL”) and GAA “license by rule” spectrum across the entire 150 megahertz of 3550-3700 MHz spectrum. However, to date, there is no Part 96 certified equipment that incorporates the functionality needed to comply with new Part 96

requirements, partially due to the fact that there is no certified SAS and ESC, and the technical specifications for the SAS and ESC are still under development.

Pinnacle believes that the *CBRS Order*,¹ along with the ongoing development of the SAS and ESC, represents a positive change in spectrum management policy, and will eventually result in extremely efficient and widespread use of this 150 megahertz of spectrum for both small cell technologies for mobile wireless broadband and higher power technologies for fixed wireless broadband in rural and underserved locations.

In order to determine the financial and technical viability of the CBRS band and assess consumer acceptance at various speeds and price points, Pinnacle seeks an experimental license to use spectrum in the 3550-3650 MHz band, transmitting from the sites identified in this application. As the experiment develops, Pinnacle may submit additional applications to modify and expand its areas of operation to include new locations. These areas include significant rural areas where consumers lack choice in broadband access. Pinnacle plans to deploy Cambium equipment on an experimental basis to determine equipment and technology performance from two different manufacturers and the market potential resulting from an additional 100 megahertz of low-band spectrum. In sum, this experiment will inform Pinnacle's business, investment, technology and deployment decisions as it plans to expand and upgrade its fixed broadband network.

Description of Program

Because the Commission has not yet certified equipment for use with the SAS or the ESC in the CBRS band, Pinnacle plans to use Cambium equipment certified by the FCC for use in the 3650-3700 MHz band that is re-tuned to the 3550-3650 MHz band. Power limits and out-of-band emission limits will conform to the Part 96 rules for Category B CBSDs that the Commission adopted in the *CBRS Order* and the Order on Reconsideration and Second Report and Order.²

Pinnacle will conduct the experiment in its existing licensed and leased areas of operation. Pinnacle has access to and is transmitting on other frequencies from existing towers and operation in this area with personnel on site to monitor construction and operation, to ensure that there will be no harmful interference to Incumbent Access users, and to remedy harmful interference in the unlikely event it occurs. Commission records also show that there are no Fixed Satellite earth stations in the 3600-3650 MHz band operating near the test area.³ Likewise,

¹ See *Amendment of the Commission's Rules with Regard to the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959 (2015) ("*CBRS Order*").

² See *Amendment of the Commission's Rules with Regard to the 3550-3650 MHz Band*, Order on Reconsideration and Second Report and Order, 31 FCC Rcd 5011 (2016) .

³ See *Amendment of the Commission's Rules with Regard to the 3550-3650 MHz Band*, Notice of Proposed Rulemaking and Order, 27 FCC Rcd 15594 (2012), at Appendix A.

there appear to be no ground-based radar in or near the planned trial area that would require ESC or coordination with incumbents, and the area where the trial will be conducted lies outside of the coastal exclusion zone.⁴

Under the market trial aspect of the experiment, Pinnacle plans to test different equipment, broadband speeds and price points to determine the utility and value of the CBRS as it relates to consumer take rates and network performance. Consistent with the market trial requirements of Section 5.602(d), Pinnacle will own the access point and customer premise equipment, and will not transfer ownership to trial participants. Pinnacle seeks authority to deploy across the entire network and serve up to 3750 end users, which it believes is the minimum quantity necessary to conduct the two-year trial proposed in this application due to the need to measure performance and the integration of the equipment with the SAS and ESC.

Objectives of Experimental Program

During the trial, and prior to the certification of a SAS and ESC, Pinnacle will comply with the power levels in Section 96.41 as they apply to End User Devices and Category B CBSDs. Pinnacle has also carefully designed its experimental system to minimize signal that could extend across the boundary of the coastal exclusion zone or to areas where harmful interference to earth stations would be expected to occur. At the conclusion of the requested experimental license term, Pinnacle will either transition to Part 96 GAA if equipment is certified and authorized under GAA rules or, if not, cease operation in 3550-3650 MHz. Pinnacle hopes that the equipment and SAS/ESC development can be accelerated through the information generated by the market trial.

In addition to the technical objectives, Pinnacle will test to determine the value and utility of PALs, which necessitates charging for the service at varying price points and performance levels. The trial will also provide Pinnacle with information that may be useful in bidding on PALs.

The experiment will examine the impact of the following rules on potential future commercial deployments.

Section 96.15 - Validate ability to comply through dynamic frequency changes across a geographically clustered collection of CBSDs, planned and executed within 300 seconds of a simulated command to vacate an occupied channel.

Section 96.17 – Validate propagation model’s ability to predict co-channel interference, blocking, and OOB to comply with protections of existing Incumbent Access users. This will also be useful to assess protection of PAL users by GAA users.

⁴ See Letter dated from Paige R. Atkins, NTIA, to Julius P. Knapp, FCC, GN Docket No. 12-354 (dated March 24, 2015), at Enclosures 1 and 2.

Section 96.21 - Validate propagation model's ability to predict co-channel interference, blocking, and OOB to comply with protections of grandfathered FSS earth stations and any Grandfathered Wireless Broadband Protection Zones.

Section 96.25 – Validate propagation model's ability to predict compliance with PAL Protection Areas.

Section 96.41 – Determine the appropriate power levels for CBSD and End User Devices to both comply with this section and achieve desired coverage and performance. The aggregate RMS power level RSS and PAPR requires measurement validations in a real world environment where CBSD and End User Device density is consistent with intended long term use of the band. Propagation models must be tuned and validated to accurately predict compliance. Power level control of the equipment must be tuned so that the CBSD and End User Device transmit at the lowest power levels possible to meet performance objectives, while complying with the prescribed limits.

Section 96.53 – Develop methods to detect interference at the CBSD and End User Device from other GAA and PAL users so it can be reported to the SAS and ESC.

Notice to Consumers

As required by Section 5.602(e), all end users will be advised at the commencement of the trial that service is being provided on a trial basis, that any non-approved devices are for testing only and that all equipment must be returned at the end of the trial period. Pinnacle further acknowledges that it will retrieve the end user devices from the users at the end of the trial. In particular, all end users will be notified that the service they will be receiving is being provided in part or in whole under experimental authority, and that as a condition of the experimental license, Pinnacle may be required at any time, without prior notice, to cease operations in the 3550-3650 MHz band. In addition, Pinnacle acknowledges and will notify users that all customer premise equipment authorized under the experimental license remains the property of Pinnacle, and must be collected or rendered inoperable at the conclusion of the trial. At the end of the trial, Pinnacle will either: (1) shut off the service immediately, stop billing users for the service and post a public notice at www.pinnaclenetworksolutions.com, and collect or render all customer premise equipment inoperable, or (2) change the frequency and operating parameters of some or all of the customer premise equipment that is part of the trial to parameters authorized under Part 90, Subpart Z of the FCC rules (which may materially impact network capacity, performance, and quality of service), post a public notice to www.pinnaclenetworksolutions.com, and allow users to opt out of the modified service offering with no further obligation to pay for the service.

Contribution to the Radio Art

In accordance with Section 5.63(c)(1), Pinnacle expects that the market trial will contribute greatly to the radio art. The CBRS is a new service in which commercial and Federal users will share a spectrum band, with use governed by an SAS and ESC. It has been

characterized as a test-bed for innovation and as a paradigm shift in spectrum management. In connection with its market trial, Pinnacle expects to learn a significant amount of information about equipment capabilities and limitations, interference protection and mitigation, customer acceptance at various speeds and price points, and integration of its service and equipment with the SAS and ESC. Because Pinnacle will make test data available to the equipment manufacturers, the manufacturers also will gain important information that will improve equipment performance and development. To the extent permitted by SAS and ESC administrators and equipment providers, Pinnacle will share the results of its market trial with the Commission.

Deployment Parameters

The experimental trial proposes operation from the five sites, which are identified on the application. As part of the test, Pinnacle proposes that all 100 MHz will be available to each antenna so that Pinnacle can test reuse and scalability. Throughout the test Pinnacle will use various 20 megahertz channels with the signal oriented at specific azimuths. The chart below provides information requested in the Directional Antenna section of the form.

Antenna 1	
Coordinates	33-48-46N / 98-33-57W
Width of beam in degrees at the half power point	65° ± 2
Orientation in horizontal plane (degrees from True North)	0°, 90°, 180° and 270°
Orientation in vertical plane (degrees from horizontal)	- 2°

Antenna 2	
Coordinates	33-44-26N / 98-19-40W
Width of beam in degrees at the half power point	65° ± 2
Orientation in horizontal plane (degrees from True North)	0°, 90°, 180° and 270°
Orientation in vertical plane (degrees from horizontal)	- 2°

Antenna 3	
Coordinates	33-57-59N / 98-41-38
Width of beam in degrees at the half power point	65 ° ± 2
Orientation in horizontal plane (degrees from True North)	0°, 90°, 180° and 270°
Orientation in vertical plane (degrees from horizontal)	- 2°

Antenna 4	
Coordinates	33-53-46N / 98-32-04W
Width of beam in degrees at the half power point	$65^{\circ} \pm 2$
Orientation in horizontal plane (degrees from True North)	0°, 90°, 180° and 270°
Orientation in vertical plane (degrees from horizontal)	- 2°

Antenna 5	
Coordinates	33-51-59N / 98-32-05W
Width of beam in degrees at the half power point	$65^{\circ} \pm 2$
Orientation in horizontal plane (degrees from True North)	0°, 90°, 180° and 270°
Orientation in vertical plane (degrees from horizontal)	- 2°