

Verizon 3.5 GHz Experiment Proposal

1. Introduction

Verizon Communications Inc. (Verizon or the Company) is a holding company that, acting through its subsidiaries, is one of the world's leading providers of communications, information and entertainment products and services to consumers, businesses and governmental agencies. With a presence around the world, we offer voice, data and video services and solutions on our wireless and wireline networks that are designed to meet customers' demand for mobility, reliable network connectivity, security and control. We have two reportable segments, Wireless and Wireline. Our wireless business, operating as Verizon Wireless, provides voice and data services and equipment sales across the United States (U.S.) using one of the most extensive and reliable wireless networks.

2. Experiment Description

Verizon is working with partner companies to develop equipment that will use LTE technologies, using Citizens Band Radio Service (CBRS) spectrum, also known as Band 48, using 3GPP terminology. As part of the technology validation, Verizon plans to conduct a series of field tests with category B Citizen Band Service Devices (CBSDs) at various locations.

The purpose of the proposed tests is:

- 1) Evaluation of the radio propagation characteristics of 3.5 GHz
- 2) Evaluation of TDD-LTE using 3.5 GHz
- 3) Evaluation of end-to-end CBRS architecture in a production network
- 4) Evaluation of inter-band carrier aggregation between 3.5 GHz and licensed (and/or unlicensed) bands. Licensed bands are restricted to VZ legacy licensed bands

Note: Verizon will limit all of the above tests in the CBRS band to 3650-3700 MHz.

Field tests will be conducted in a production network, in a highly controlled field environment, in order to assist in the development of commercial products. The testing will benefit the public interest by enabling the pre-commercial testing of new products outside of a lab environment but in a controlled and managed manner.

In addition to the product development testing described above, Verizon and partner companies intend to conduct separate and independent lab testing in a real-world environment at a Verizon facility or at a vendor's facility using specifications developed by the WINN Forum and CBRS Alliance.

This field trial will consist of an aggregate of up to **14** Category B CBSDs, for all the trial locations. The CBSDs will use the transmission parameters and operate inside the geographic regions defined below. Some of the tests will use solely base stations and user equipment operating in CBRS spectrum only. Some equipment however, includes 3GPP LTE base stations that operate on PCS (3GPP Band 2) and/or AWS (3GPP Band 4), and/or U-NII-1/3 (3GPP B46), operating under 47 CFR Part 24 or Part 27 or Part 15. Transmission on PCS and/or AWS spectrum will be constrained to VZ's legacy licensed spectrum.

Verizon and several mobile device partner companies are planning to conduct testing with an aggregate of no more than 20 mobile devices, from various vendors, to support the field trial testing. The mobile devices will operate within the RF coverage area of the small cell devices. Some of the tests with mobile stations will be using CBRS spectrum only. The majority of the tests, however, will include mobiles and base stations with LTE transmitters that operate in Carrier aggregation mode with CBRS band.

Mobile devices will only be used by test engineers, from either Verizon or mobile device partners. They are strictly limited to field trial testing between Verizon and partner companies

The equipment used in these trials will be compliant with FCC rules. As time progresses, pre-commercial devices will be introduced. Equipment from multiple equipment manufacturers will be used in the evaluation testing. Verizon has the ability to shut down all transmissions operated under the experimental license in the unlikely event any interference occurs.

3. Hours of operation and equipment shut down

The intent is to operate the evaluation devices, both small cells and mobile units, 24 hours per day, 7 days per week, during the test period. Equipment can be shut down speedily, if the need arises, by contacting one or more of the interference coordinators identified in the section "Interference Coordination"

4. Interference Coordination

Immediate requests to stop transmissions under this STA can be communicated to David Zuber, at Mobile 315-529-3846 or by email at david.zuber@verizonwireless.com, or Frederick Anthony Relyea at frederick.relyea@verizonwireless.com

5. Trial Duration

Approximately 6 months, from 3/15/2019 to 9/14/2019

6. Evaluation Equipment Transmitter Information

Small cells supporting CBRS band will be operating in compliance with FCC Part 96 rules. Both directional antennas (embedded and external) will be used with the small cell systems within the maximum EIRP and antenna gain constraints as specified in the Part 96 rules.

Some tests are limited to LTE mobile devices supporting TDD-LTE operation with an LTE uplink in Band 48 and receive in the same band. Other tests involve mobile devices supporting inter-band carrier aggregation

- Up to **14** category B CBSDs ($\text{EIRP} \leq 50 \text{ dBm}/20 \text{ MHz}$) using Band 48
- Multiple mobile terminals (up to 20 test mobiles), from multiple mobile device partners, each terminal operating in either standalone Band 48 only, or in Carrier Aggregation (CA) mode, using one or more licensed bands B2 and/or B4 and/or unlicensed band B46, or a combination of these, in CA aggregation with B48, using LTE(FDD/TDD), with a maximum transmitter power (EIRP) = 24 dBm

Verizon will conduct the above proposed tests at three different locations:

Test Locations – Three locations in Utica, NY will be used for outdoor 3.5 GHz testing between Category B CBSDs and mobile terminals. For outdoor radio installations, integrated antennas as well as external directional antennas will be used.

Location 1: Utica, NY, with coordinates Lat/Lon = 43-6-6.82 N/ 75-15-8.52 W uses radios with orientations in horizontal plane: 30°, 150°, 270° (nominal values) $\pm 20^\circ$ from nominal values

Location 2: Utica, NY, with coordinates Lat/Lon = 43-5-50.93 N/ 75-13-56.81 W uses radios with orientations in horizontal plane: 10°, 100°, 270°, 180° (nominal values) $\pm 20^\circ$ from nominal values

Location 3: Utica, NY, with coordinates Lat/Lon = 43-5-26.42 N/ 75-15-23.22 W uses radios with orientations in horizontal plane: 350°, 100°, 220° (nominal values) $\pm 20^\circ$ from nominal values