

## DESCRIPTION OF RESEARCH PROJECT

Pursuant to Sections 5.3(j) and Section 5.61 of the Federal Communications Commission’s rules, 47 C.F.R. §§ 5.3(j) and 5.61, CCO Fiberlink, LLC (“Charter”), a limited liability company and subsidiary of Charter Communications, Inc., seeks Special Temporary Authority (“STA”) for 180 days, beginning September 30, 2017, to test and evaluate coverage, capacity, and propagation characteristics in the 3550-3700 MHz band. The proposed operations will advance Charter’s understanding of technology and network potential in the 3550-3700 MHz band and will advance the potential deployment of fixed wireless services.

### Location of Testing

Charter will conduct outdoor fixed testing within a radius of 8 km from the specified fixed locations in each of Bakersfield, California; Coldwater, Michigan; and Charlotte, North Carolina.

### Description of Testing

Charter will deploy the experimental fixed antennas on existing structures, and will test the radio link between each base station antenna and another end user antenna sequentially on a portable mast placed at fixed locations within the test area.

Charter will evaluate propagation characteristics, conduct connectivity and throughput testing in the vicinity of each device, and assess individual performance of each vendor’s equipment.

### Radio Equipment Description

For the testing, Charter will use 17 different models of fixed equipment. The technical information below provides the greatest bandwidth and power levels that will be used for each piece of prototype equipment.

| Equipment   | Category <sup>1</sup> | Fixed or mobile | Tx Power (mW) | EIRP (dBm) | ERP (watts) | Mean or Peak Power | Frequency Tolerance +/- (%) | Emission Designator | Signal Modulation Format(s) |
|-------------|-----------------------|-----------------|---------------|------------|-------------|--------------------|-----------------------------|---------------------|-----------------------------|
| Prototype 1 | B                     | Fixed           | 8000          | 56.0       | 242.7       | Peak               | 0.0005                      | 80M0W9W             | Digital, 256 QAM            |
| Prototype 2 | B                     | Fixed           | 37767         | 54.8       | 184.1       | Peak               | 0.0005                      | 60M0W9W             | Digital, 256 QAM            |
| Prototype 3 | B                     | Fixed           | 251           | 40.0       | 6.1         | Peak               | 0.0005                      | 10M0W8W             | OTFS <sup>2</sup>           |
| Prototype 4 | B                     | Fixed           | 1000          | 43.0       | 12.2        | Mean               | 0.000001                    | 20M0D7D             | 256 QAM, 64 QAM, 16 QAM     |
| Prototype 5 | B                     | Fixed           | 1000          | 43.0       | 12.2        | Mean               | 0.000001                    | 20M0D7D             | 256 QAM, 64 QAM, 16 QAM     |

<sup>1</sup> Category A and B radios are defined in Sections 96.3 and 96.41 of the FCC’s rules. *See* 47 C.F.R. §§ 96.3 and 96.41.

<sup>2</sup> “Orthogonal Time Frequency and Space” is a proprietary vendor signal modulation format.

|              |   |       |      |      |      |      |          |         |                            |
|--------------|---|-------|------|------|------|------|----------|---------|----------------------------|
| Prototype 6  | B | Fixed | 1000 | 43.0 | 12.2 | Mean | 0.000001 | 20M0D7D | 256 QAM, 64 QAM, 16 QAM    |
| Prototype 7  | B | Fixed | 1000 | 37.0 | 3.1  | Mean | 0.000005 | 20M0W7W | 64 QAM, 16 QAM, QPSK, BPSK |
| Prototype 8  | B | Fixed | 2000 | 47.0 | 30.6 | Mean | 0.000005 | 20M0W9W | 256QAM, 64QAM, 16QAM, QPSK |
| Prototype 9  | B | Fixed | 2000 | 47.0 | 30.6 | Mean | 0.000005 | 20M0W9W | 256QAM, 64QAM, 16QAM, QPSK |
| Prototype 10 | B | Fixed | 2000 | 50.0 | 61.0 | Mean | 0.000005 | 20M0F9W | 256QAM, 64QAM, 16QAM, QPSK |
| Prototype 11 | B | Fixed | 251  | 33.0 | 1.2  | Mean | 0.000001 | 20M0W7W | 64QAM, 16QAM, QPSK         |
| Prototype 12 | B | Fixed | 199  | 35.0 | 1.9  | Peak | 0.000001 | 20M0W7W | 64QAM, 16QAM, QPSK         |
| Prototype 13 | A | Fixed | 199  | 25.5 | 0.2  | Peak | 0.000001 | 20M0W7W | 64QAM, 16QAM, QPSK         |
| Prototype 14 | B | Fixed | 316  | 47   | 30.6 | Mean | 0.000001 | 20M0W7D | 64QAM, 16QAM               |
| Prototype 15 | B | Fixed | 200  | 38   | 3.9  | Mean | 0.000001 | 20M0W7D | 64QAM, 16QAM               |
| Prototype 16 | B | Fixed | 200  | 33   | 1.2  | Mean | 0.000005 | 80M0W9W | 256QAM, 64QAM              |
| Prototype 17 | B | Fixed | 200  | 23   | 0.12 | Mean | 0.000005 | 40M0W9W | 64 QAM                     |

### Protection Against Interference

Charter has taken a number of steps to protect against interference. In particular, the three base station locations were chosen specifically to avoid risk of physical interference. All base station sites are located on existing towers, and the equipment will not extend above those structures. Individual “end user device” test locations were also selected specifically to avoid physical interference, which will be further lessened due to the limited duration of the test, as well as the continuous presence of test engineers at each location under test.

Charter understands it must accept interference from any federal and non-federal incumbent users of the 3550-3700 MHz band and that all Charter operations will be on a secondary basis. With regard to existing users, Charter confirmed there are no Fixed Satellite Service (“FSS”) earth stations operating in the 3600-3650 MHz band in the areas in which Charter seeks to conduct testing. Charter is aware the requested Bakersfield location is within the coordination zone of four 3650-3700 MHz FSS stations in the Los Angeles area, and will coordinate directly, but expects the process to be greatly simplified by the presence of the San Gabriel mountain range between the test location and the FSS stations. The other two sites are not within a FSS coordination zone.

Charter has also identified all grandfathered 3650-3700 MHz “NN” Wireless Broadband Licensees with registered locations within 30 km of the requested testing areas, and will coordinate directly to avoid impacting their existing operations.

Finally, as transmit levels of the proposed radios comply with approved CBRS band operations, and will be operated sequentially, Charter expects limited RF propagation distances as well as limited and localized aggregative contribution to the RF noise floor.

## **Restrictions on Operation**

Charter does not seek authority to perform a market study under the requested license and will retain control over the equipment in the testing at all times.

## **Contact Information**

Point of contact for FCC licensing issues:

Colleen King  
Vice President, Regulatory Affairs  
(202) 621-1921  
colleen.king@charter.com

Point of contact for questions about testing operations:

Greg McLaughlin  
Sr. Director of Wireless Operations, R&D  
(720) 482-4290  
greg.mclaughlin@charter.com

The following individual will be available 24/7 during all testing and has authority and ability to immediately cease all operations:

PJ Dhillon  
Principal Engineer  
(631) 374-0748  
parmjit.dhillon@charter.com