DESCRIPTION OF RESEARCH PROJECT

Pursuant to Sections 5.3(j) and 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 January 2, 2018, 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 and mobile wireless services.

Location of Testing

Charter will conduct outdoor and indoor fixed and mobile testing within 8 miles (12.87 km) of the provided fixed location of 35° 13' 25" N, 80° 50' 21" W in Charlotte, North Carolina.

Description of Testing

Charter will deploy experimental fixed and mobile equipment in various configurations. The majority of devices will be attached to Charter's existing aerial cable strand, similar to how numerous cable operators, including Charter, have deployed outdoor WiFi access points to date. In addition, Charter will test some devices attached to existing buildings and poles, and some devices indoors. Specifically, Charter will use the following deployment approaches:

1. Strand mount deployment (Category A or B Radios)[1]
2. Building/pole mount deployment (Category A or B Radios)
3. Indoors (Category A Radios)

Other equipment will be used by Charter to receive signals from the mounted devices and transmit back to those devices ("End User Equipment"). Charter will evaluate propagation characteristics; conduct connectivity and throughput testing in the vicinity of each device; and assess inter-cell interference, mobility characteristics, Spectrum Access System ("SAS") compatibility and individual performance of each vendor.

Radio Equipment Description

For the testing, Charter will use 9 different models of fixed equipment and 6 different models of mobile End User Equipment. The technical information below provides the greatest bandwidth and power levels that will be used for each piece of prototype equipment.

While Charter intends to install approximately 200 fixed transmitters and employ up to 10 mobile transmitters during the testing, less than 20% of the total devices will be operational at any given time, with the remainder in a non-transmitting state.

[1] 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.

Fixed Equipment (9 models):

Equipment	Category	Tx Power (mW)	EIRP (dBm)	ERP (Watts)	Mean or Peak	Emission Designator	Frequency Tolerance	Modulation
Prototype 1	A	250	33	2	Mean	20M0W7W	0.00001%	64QAM/16QAM/ QPSK/BPSK
Prototype 2	B	250	50	100	Mean	20M0W7W	0.00001%	64QAM/16QAM/ QPSK/BPSK
Prototype 3	B	200	50	100	Peak	20M0W7W	0.00001%	64QAM/16QAM/ QPSK/BPSK
Prototype 4	A	250	30	1	Peak	10M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
		500	33	2		20M0W9W		
Prototype 5	A	1000	39	4	Peak	80M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
Prototype 6	B	1000	30	1	Peak	10M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
		2000	33	2		20M0W9W		
		4000	36	4		40M0W9W		
		8000	39	8		80M0W9W		
Prototype 7	B	500	50	100	Mean	20M0W7W	0.000005%	64QAM/16QAM/ QPSK
Prototype 8	B	2000	50	100	Mean	20M0W7W	0.0005%	64QAM/16QAM/ QPSK/BPSK
Prototype 9	B	3000	36	50	Mean	60M0W9W	0.00000005%	256QAM/64QAM/ 16QAM/QPSK

End User Equipment (6 models):

Equipment	Category	Tx Power (mW)	EIRP (dBm)	ERP (Watts)	Mean or Peak	Emission Designator	Frequency Tolerance	Modulation
Prototype 10	EUD	200	23	0.2	Peak	40M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
Prototype 11	EUD	200	23	0.2	Peak	40M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
Prototype 12	EUD	200	23	0.2	Peak	40M0W9W	0.0005%	64QAM/16QAM/ QPSK/BPSK
Prototype 13	EUD	200	23	0.2	Mean	20M0W7D	0.00001%	64 QAM/16QAM/ QPSK
Prototype 14	EUD	200	23	0.2	Peak	40M0W9D	0.00001%	64QAM/16QAM/ QPSK/BPSK
Prototype 15	EUD	200	23	0.2	Peak	20M0W7W	0.0001%	64QAM/16QAM/ QPSK/BPSK

All testing will be conducted within Charter's existing service areas, and employ power and backhaul from Charter's existing cable distribution plant. The fixed devices will be mounted on Charter's existing strand, as well as select street furniture and/or building facades.

Based on the height of these facilities, the devices may be more than 6 meters above ground level. However, there is no risk of physical interference because all devices will be mounted on existing facilities, and will not extend above those facilities.

Protection Against Interference

Charter requests use of the 3550-3700 MHz band. Charter understands that it must accept interference from any federal and non-federal incumbent users of this band and that all Charter operations will be on a secondary basis.

Charter is conducting this testing in cooperation with Federated Wireless ("Federated"), and will employ Federated's developmental SAS. The Charlotte test area is not located within the coastal exclusion zone. However, the following methods will be used to prevent harmful interference:

- Primary: Via the design process of a fully functional SAS, with the SAS commanding the test CBRS devices to non-interfering channels.
- Secondary: Federated will manually command the SAS to command CBRS test devices to shift to non-interfering channels.
- Tertiary: Charter has established a point of contact, identified below, available 24/7 during all testing with "kill switch" authority should any interference occur to primary licensed services. Should interference occur, Charter will take immediate steps to resolve the interference, including, as appropriate, channel shifting or discontinuing operations.

Charter has 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 will coordinate all testing with other grandfathered Wireless Broadband Licensees with registered locations in the requested testing areas, and intends to employ Federated's developmental SAS to coordinate channel assignments. Where the SAS is not capable of doing so, Charter will manually coordinate operations.

Finally, given the low EIRP transmit levels of the proposed radios, coupled with their low installed elevation, 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:

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Point of contact for questions about testing operations:

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

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