

Qualcomm 5 GHz Experiment Proposal

1 Introduction

Qualcomm Incorporated (NASDAQ: QCOM) is a world leader in 3G, 4G and next-generation wireless technologies. Qualcomm Incorporated includes Qualcomm's licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm's engineering, research and development functions, and substantially all of its products and services businesses, including its semiconductor business, QCT. For more than 30 years, Qualcomm ideas and inventions have driven the evolution of digital communications, linking people everywhere more closely to information, entertainment, and each other. For more information, visit Qualcomm's [website](#), [OnQ blog](#), [Twitter](#) and [Facebook](#) pages.

2 Experiment Description

This experimental license purpose is to extend authorized testing granted under STA file 0460-EX-ST-2016 granted May 3, 2016. There are no changes to the technical parameters or test goals defined below in the original STA filing.

Qualcomm is working with partner companies to develop equipment that will use multiple technologies, including 802.11 and LTE, in unlicensed 5 GHz frequency bands. This request for Special Temporary Authority ("STA") seeks authority to conduct very small scale product development testing of this equipment at four trial sites.

The purpose of the proposed testing is to evaluate the technical performance of pre-commercial LTE-U equipment, operating in downlink-only mode in the UNII-1 and UNII-3 portions of the 5 GHz band, in a highly controlled field environment in order to assist in the ultimate 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.

Since LTE-U was conceived, Qualcomm, T-Mobile and their partner companies have engaged in extensive technical collaboration with, and outreach to, the Wi-Fi community. Indeed, Qualcomm is part of that community. These efforts are ongoing, and Qualcomm will continue to work with the Wi-Fi community to ensure successful coexistence in the UNII-1 and UNII-3 portions of the 5 GHz band.

In addition to the product development testing described above, Qualcomm, T-Mobile, and their partner companies intend to conduct separate and independent LTE-U/Wi-Fi coexistence testing in a real-world environment at a T-Mobile facility using a coexistence test plan being developed by the Wi-Fi Alliance. This test plan is a product of extensive technical collaboration between the Wi-Fi Alliance, T-Mobile, Qualcomm, and their partner companies and would be modified as appropriate based on the specific environment to be used for the testing. The Wi-Fi Alliance would be invited to observe these tests. This Wi-Fi Alliance test plan will initially be used for joint coexistence testing to take place within a Wi-Fi Alliance certified lab.

This trial will consist of up to 10 small cells and access points that will use the transmission parameters and operate inside the geographic regions defined in Section 4 below. Some equipment also includes a 3GPP LTE base station that operates on 3GPP Band 4, also known as

the US AWS band operated under 47 CFR Part 27. Transmission on AWS spectrum will occur only with authorization from the respective spectrum licensee.

Mobile units will also operate within the RF coverage area of the small cell devices. The mobile units are receive-only in the 5 GHz spectrum but also include an LTE transmitter that operates on 3GPP Band 4.

Up to 20 mobile stations will be used at each location for a total possible number of 80 LTE-U capable mobile devices.

Although the devices are prototypes that have not completed formal equipment authorization, the equipment used in this testing is compliant with 47 CFR Part 15 Subpart E and Part 27 Subpart E technical requirements. Equipment from multiple equipment manufacturers will be used in the evaluation testing. Qualcomm has the ability to shut down all transmissions operated under this STA in the unlikely event any interference occurs.

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.

3 Interference Coordination

Immediate requests to stop transmissions under this STA should be emailed to 5GHz.trial.shutdown@qti.qualcomm.com. Alternatively, a shutdown request can be communicated to John Forrester at 858-845-7428 or jforrest@qti.qualcomm.com.

4 Evaluation Equipment Transmitter Information

802.11 access points and small cells supporting either LTE or 802.11 will be operating with the transmitter parameters defined in Table 1. Both directional and omnidirectional antennas will be used with the small cell systems within the maximum EIRP and antenna gain constraints defined in Table 1. The LTE small cell will simultaneously transmit a single 20 MHz signal in a 5 GHz band and an LTE in the AWS band.

Mobile devices will operate near the small cell sites with the transmitter parameters defined in Table 1. LTE mobile devices support AWS FDD operation with an LTE uplink in the AWS band but are receive only for LTE in the 5 GHz band. Mobile devices also support 802.11 modes in the requested 5 GHz band.

Table 2 defines the deployment areas where small cell and access points will be located during the evaluation testing. Up to 6 fixed stations will be installed indoors within each region defined in Table 2.

Table 1 Transmitter Information

| Device Type | Transmit Frequency Band (MHz) | Conducted TX Power (dBm) | Maximum Antenna Gain (dBi) | EIRP (dBm) | EIRP (W) | ERP (dBm) | ERP (W) | Maximum Transmission Bandwidth (MHz) | Emissions Designator | Technology |
|-----------------------------|-------------------------------|--------------------------|----------------------------|------------|----------|-----------|---------|--------------------------------------|----------------------|-----------------|
| Small cell and Access Point | 5150-5250 | 30 | 6 | 36 | 4.0 | 33.83 | 2.4 | 20 20/40 | 40M0F7D | LTE-U 802.11 |
| Small cell and Access Point | 5725-5850 | 30 | 6 | 36 | 4.0 | 33.83 | 2.4 | 20 20/40 | 40M0F7D | LTE-U 802.11 |
| Mobile | 5150-5250 5725-5850 | 24 | 3 | 27 | 0.5 | 24.83 | 0.3 | 20/40 | 40M0F7D | 802.11 |
| Small cell | 2110-2155 | 30 | 6 | 36 | 4.0 | 3.8 | 2.4 | 20 | 20M0F7D | LTE |
| Mobile | 1710-1755 | 24 | 3 | 27 | 0.5 | 24.83 | 0.3 | 20 | 20M0F7D | LTE |



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Table 2 Small Cell and Mobile Device Deployment Regions and Operational Radius

| Location # | Address | County | Operational Center Point | | Fixed Site Location Radius | |
|------------|--|-------------|--------------------------|---------------|----------------------------|-----|
| | | | Lat | Long | Miles | km |
| 1 | 3625 132nd Ave SE Bellevue WA 98006 | King County | 47 34 41 N | 122 10 3 W | 1 | 1.6 |
| 2 | 4100 Guardian St. Suite 101 Simi Valley, CA 93063 | Ventura | 34 15 51 N | 118 42 54 W | 1 | 1.6 |
| 3 | 3040 Simmons St. Suite 106 North Las Vegas, NV. 89032 | Clark | 36 12 51 N | 115 10 44 W | 1 | 1.6 |
| 4 | 2250 Lakeside Blvd. Richardson, TX 75082 | Dallas | 32 58 43.43 N | 96 42 35.91 W | 1 | 1.6 |