

Experimental License Exhibit

Applicant seeks to modify experimental license WJ2XAK to expand its testing of services and equipment to the 37 GHz (37.0-38.6 GHz) and 39 GHz (38.6-40.0 GHz) spectrum bands. Applicant seeks to conduct such testing using the same fixed stations that were authorized for operation in the 28 GHz band in Waco, TX, Kalamazoo, MI, and South Bend, IN for the remainder of the license term.

Industry standards organization 3rd Generation Partnership Project (“3GPP”) is developing fifth generation (“5G”) network standards, which are expected for release beginning in 2018. The testing performed under this experimental license will provide information for optimizing system parameters being discussed in 5G standard activities and provide data on coverage, capacity, latency, and other key performance indices. Applicant will use this data to study potential designs for its 5G systems, contribute to 3GPP 5G standards development, and gain insight into customer perception and use patterns. Applicant will examine data collected during testing to determine the viability of the millimeter wave bands to support 5G wireless communication systems and to validate 5G system designs operating in a non-simulated business and residential environment in the 37/39 GHz bands. The propagation characteristics of the 37/39 GHz bands in urban morphologies will also be studied and mathematical models will be developed.

The testing will involve transmissions between fixed base stations and fixed user equipment (“UE”) operating within a 1 kilometer (“km”) radius (from the base station) in real-world metropolitan environments. The antennas will be mounted on the existing stations authorized in this license. The total radiated power at each transmission point will be less than the EIRP limits for the 37/39 GHz bands established for the Upper Microwave Flexible Use band in GN Docket No. 14-177, which are 75 dBm/100 MHz average.¹ The gain of any antenna deployed will not exceed 30 dBi. Furthermore, the center line of any antenna deployed will be pointed approximately to the horizon plus or minus 10 degrees, with a possible maximum of plus or minus 25 degrees when considering the beamforming capability of the advanced antenna systems. The azimuthal orientation of the main lobe of the antenna is to be determined based on UE location. The channel bandwidth will be in multiples of 100 MHz up to a maximum of 800 MHz, used in a Time Division Duplex (TDD) scheme for uplink and downlink transmission.

The air interface protocol will be vendor-specific prototypes based on long term evolution (“LTE”)-Advanced protocols as well as the required improvements and modifications for the 5G system. Transmissions will include common multi-media data as well as high speed internet access for on-demand video and on-line gaming.

5G systems utilize advanced antenna technologies with beamforming and multiple input multiple output (MIMO) techniques, as well as more efficient coding and modulation schemes. These technologies are expected to result in higher spectral efficiencies, reduce latency to 1-5 milliseconds, and enable gigabit per second (Gbps) mobile and fixed broadband services, significantly faster than today’s average 4G speeds using LTE.

¹ Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et, al., GN Docket No. 14-177, et al., Report and Order, 31 FCC Rcd 8014 (2016).