

**Exhibit to
Experimental License Renewal Application
0490-EX-CR-2017**

Florida Atlantic University (“FAU”), respectfully requests a **four year further renewal** of its experimental authorization WF2XQI (0542-EX-PL-2010) as last renewed by 0504-EX-RR-2015 until November 1, 2017.

Applicant Background: Florida Atlantic University, offers both graduate and undergraduate degrees through its College of Engineering and Computer Science. Within that College, the Department of Computer and Electrical Engineering and Computer Science (“CEECS”) offers courses in a combined field dealing with all aspects of computing and electronics. Engineers in this field are responsible for developing a wide array of items including: sensors, microchips, robotics, circuit boards, personal computers, mobile phone applications, software and database systems. CEECS faculty have very active research interests in software engineering, networking and communications, multimedia, VLSI design, computer architecture, distributed systems, database systems, and internet engineering. In the last two years, approximately 2 million dollars have been generated in sponsored research from the National Science Foundation (NSF), NASA, NIH, DOD, and many companies including Motorola, LexisNexis, RealNetworks, Pratt & Whitney, and IBM.

Research Background: In 2010 Tecore Networks, donated certain cellular equipment for CEECS’ new Tecore Networks Laboratory (“Tecore Lab”), which would facilitate research on cellular technologies and their interaction with Ad Hoc networks. FAU thereafter applied for the experimental authorization WF2XQI, which was granted on October 21, 2011 and renewed for an additional two years on October 30, 2013, and an additional two year term on December 28, 2015. At the time FAU received its experimental authorization to use the Tecore equipment, the department was being relocated to a new “Green” building on the FAU campus. Unfortunately issues related to the green design of the building, as well as structural, environmental and safety concerns regarding the placement of the Tecore Lab’s needed transmit antennas on the building’s roof led to a long delay in the installation of Tecore Antenna. Thus, while during the past four years the Lab has been able to initiate and pursue studies which are completely self contained within the building, it has been unable until November 2017, to initiate the course of research for which experimental license WF2XQI was obtained.

Specifically, Five professors and their graduate students have been using the Tecore Lab. More than 50 graduate students have been using the Tecore Lab for their research dissertations/theses. FAU has now awarded advanced degrees to some 20 graduate students that have done such advanced research in the Tecore Lab facility. Over 100 technical papers have been published by the students who worked in the Tecore Lab with their advisors. The Tecore Lab is expected to continue to grow in its activities providing a productive research environment for faculty and students.

Need for a License Extension:

The University believed it had solved its antenna issue in 2015, but new concerns and objections surfaced against the proposed installation method, since it was going to penetrate the roof. This delayed resolution until 2017. To resolve this obstacle, CEECS with the help of Tecore

Networks had to propose a non-invasive method to install the antennas, which was finally approved by the University Building Codes Administration. On October 26, 2017 the needed antennas were finally installed.

In April 2017 CEECS received an internal FAU grant of \$27,676 to support aerial vehicles (UAVs/Drones) research and education efforts. This is in addition to the continued efforts related to the four-year NSF MRI grant of \$471,897 (including FAU cost share), received in 2012 to develop a realistic vehicular networking testbed to support multi-technology vehicular networking systems experimentation and verification. The study titled *Development of Instrumentation to Support Multi-Technology Vehicular Networking Systems Research* will now include both ground vehicles as well as aerial vehicles (UAVs/Drones). Vehicular networks are an important emerging application of embedded wireless systems. With 250 million registered vehicles in the U.S. alone in 2006, the market for vehicular networking technology is large and has captured the attention of automotive manufacturers, academic researchers, and governmental agencies. Future vehicles will communicate with other vehicles on an ad-hoc basis and with infrastructure access points using the recently ratified IEEE 802.11p, IEEE 1609.3 and IEEE 1609.4 (WAVE) standards. They will also have the ability to access the wide-area network using cellular systems such as UMTS, WiMAX, or LTE. Research efforts in vehicular networking protocols and systems require hardware platforms that support all vehicular communication paths for development and verification. Our objective in this project is to continue the development and field testing of a small and fully contained device that is light enough to fit on aerial vehicles (Drones) as well. The device combines ad-hoc networking capabilities of IEEE 802.11p and WAVE with centralized cellular communications. This will enable the integration of the aerial vehicles (Drones) with the ground vehicular network. The cellular communication will be supported by Tecore Network's equipment, which requires an external antenna. Hence, the FCC experimental authorization WF2XQI needs to be renewed.

FAU respectfully requests an extension term of Four Years, as its current course of study based on the ground and aerial vehicular networking testbed will need such amount of time to be completed. Professors and their graduate students will be working on this project, which is essential for the continued development of vehicular networking systems. The results obtained from this project will be disseminated in educational and technical conferences and journals.

As stated in its original request for the Authorization and its initial renewal, all operation of the equipment in a manner that would have the potential to cause harmful interference to other licensees of the frequencies requested herein in the proposed area of operation will be coordinated in advance to avoid any such harmful interference. Further, FAU will immediately suspend the operation of any equipment if such operation causes harmful interference despite prior coordination efforts until such time as a satisfactory interference mitigating solution can be implemented.

Questions regarding the technical aspect of the research may be directed to: Dr. Imad Mahgoub, Professor, Department of Computer & Electrical Engineering and Computer Science, Florida Atlantic University. (mahgoubi@fau.edu) (561) 297-3458).