

FAB\$ and LABS

Northeastern University Expeditionary Cyber and Unmanned Aerial System Facility: One of the most advanced wireless evaluation centers in the world



Back in the 1990s, I completed an MBA night program at Northeastern University's suburban campus in Burlington, just north of Boston. On my recent visit to the campus, I was stunned to find a completely transformed facility that used to only house a few classrooms and small library. Now it is the state-of-the-art Northeastern University Innovation Campus at Burlington MA (ICBM) that hosts the Kostas Research Institute and Northeastern University Expeditionary Cyber and Unmanned Aerial System (ECUAS) Research and Development Facility along with labs and startup incubator facilities.

The ECUAS facility provides a suite of capabilities for science, engineering, technology development, test and evaluation on advanced systems across all readiness levels. It is a platform to spur innovation in cyber systems, electromagnetic systems, navigation and timing systems, autonomous systems and flight systems for ground and air autonomous vehicles. The facility consists of both indoor and outdoor test ranges for evaluating autonomous aerial and ground systems, antennas, cyber, radio, network, navigation and communications equipment.

This unique facility has one of the largest anechoic chambers on the East Coast that attaches through a tunnel to a large netted outdoor testing area with the goal of being flexible and configurable to support current and future R&D activities. The Indoor Wireless Test Range includes a 50 ft. x 50 ft. x 22 ft. Faraday Cage/Anechoic Chamber for operation of unmanned and autonomous systems as well as testing of wireless devices in a fully controlled RF environment. The chamber has state-of-the-art software-defined radios and 64 antenna array to transmit/receive arbitrary waveforms for jamming, interference, spoofing, communications and control; multi-axis antenna positioner with ± 0.5 degree accuracy for antenna testing/analysis; accommodation for testing up to 1300+ lbs large drones with integrated tether points; RF testing from 300 MHz to 18+ GHz;

24 cameras with 360 degree HD optical tracking system for precise indoor positioning in the 50,000 cu. ft. volume; and state-of-the-art RF measurement equipment.

The outdoor facility is a 150 ft. x 200 ft. x 60 ft. netted enclosure for unobstructed GPS enabled flight testing. Flight in the netted enclosure eliminates need for FAA approval and is large enough to support multiple simultaneous test events. It is outfitted with various UAS obstacles for setting up a wide range of flight tests and has a paved surface for testing air and ground systems, including UAS/UGS teaming exercises. It is equipped with enhanced kinematic GPS for extremely precise centimeter positioning, has steady state/gust wind test capability for small drones (< 150 g), an interconnected flight path between outdoor and indoor test ranges for seamless transition and 60 ft. observation deck in adjacent building for flight test viewing.

The facility can perform navigation testing (with jamming, spoofing, interference) using a Global Navigation Satellite System (GNSS) simulator; cyber security testing of wireless devices for vulnerability/exploitation analysis, EMP testing (RS105) for radiated susceptibility of small devices/systems, characterization of emissions of wireless devices to enable things such as UAS/UGS Detection/Tracking and networking for autonomy, swarms and massive MIMO.

The ICBM facility recently won the right to host DARPA's Colosseum testbed, which is the largest and most powerful channel emulator in the world. The Colosseum is supporting the Spectrum Collaboration Challenge to evaluate teams entering their AI-based wireless algorithms into the contest to see who has the best performance for autonomous systems. This ECUAS facility is one of the most advanced and unique wireless facilities in the world and will be enabling new RF and microwave innovation for years to come.

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