

# REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-24-04

## Microtubule Dynamics for Real-time Sensitive Cell State Estimation

**PROJECT DESCRIPTION:** Our current research aims to determine how radio frequency (RF) EM fields interact with intracellular structures such as the microtubule cytoskeleton. Specifically, we intend to assess changes in the dynamics and behavior of the microtubule and its associated proteins in response to various physical stressors, including RF fields (frequencies in MHz to GHz range). These measurements of intracellular dynamics would provide critical insights into the current state of a cell following the physical insult, since the cytoskeleton – the scaffolding and engine of the cell – integrates information from a multitude of signaling pathways, translating information into action. The measurements will involve fluorescent labeled tips, to measure growth dynamics of microtubules, and fluorescent labeling of the microtubule network itself. The number of growing filaments, the straightness of growth, and the speed of growth all contain information about the state of the cell. The analysis of the labeled microtubule network will build on a recent work where we have shown that the lateral fluctuations of microtubules can be measured even in dense cellular environments. The student intern will develop an experimental protocol that integrates both measurements along with analysis to provide rapid in situ insights into cell states. The student intern will have the opportunity to gain skills in cell biology and biophysics, and in fluorescent microscopy and image processing.

**ACADEMIC LEVEL:** Doctoral; Masters; Undergraduate

**DISCIPLINE NEEDED:**

- Physics
- Biophysics
- Biomedical Engineering

**RESEARCH LOCATION:** Virtual/Hybrid - JBSA-Fort Sam Houston, San Antonio, Texas

**RESEARCH MENTOR:** Ibtissam Echchgadda, Ph.D.  
Biology, University of Texas Health Science Center, 2003



Dr. Ibtissam Echchgadda is a Senior Research Biological Scientist in the Radio Frequency Bioeffects Branch at the Air Force Research Laboratory (AFRL), 711 Human Performance Wing, Joint Base San Antonio-Fort Sam Houston, TX. She serves as a principal investigator on several projects that focus on understanding the biophysical and biochemical mechanisms that govern radio frequency electromagnetic fields interaction with biological systems, including coupling to intracellular molecules and potential impact on the natural cellular processes. Dr. Echchgadda has over 20 years of experience in different basic science and applied research. Before joining AFRL, she worked as a defense contractor for General Dynamics and before that, she served as a Research Faculty at the University of Texas Health Science Center San Antonio. Dr. Echchgadda received multiple honorable awards and her work has been published in peer-reviewed journals and has been presented at several national and international conferences.

*Photo courtesy of the U.S. Air Force Research Laboratory.*