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An Overview of Piezoelectric MEMS: Designing devices from 40 Hz to 10 GHz

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Piezoelectric microelectromechanical systems (MEMS) are ubiquitous in our present-day technology, ranging from sensor and actuator technologies to electromechanical filters in cell phones. Frequency range across these technologies range from 40 Hz to 10s of GHz, offering design challenges to overcome. In this seminar, an overview of design challenges and solutions in three frequency ranges are addressed: acoustic range (10s Hz to 10s of kHz), ultrasonic range (100s of kHz to 10s of MHz), and radio frequency range (100s of MHz to 10s Ghz). The integration of the designed MEMS device into a CMOS system is then presented. The presence of piezoelectric MEMS in the advent of internet of things is discussed in detail through the DARPA NZero project through the design of a near zero power wakeup system consuming less than 10 nW of power, less than the leakage power of a battery. Finally, an overview of work performed elsewhere at Sandia will be briefly discussed.

Biography:

Adam Edstrand obtained his bachelor's and master's degrees in aerospace engineering from the University of Florida where he began research in experimental fluid mechanics and aeroacoustics. He went on to obtain his Ph.D. at Florida State University at the Florida Center for Advanced Aero-Propulsion where he was funded as an National Science Foundation PIRE scholar. This opportunity allowed him to perform collaborative research on pressure sensitive paint at Tohoku University and on hydrodynamic stability theory at École Polytechnique in Paris and Imperial College in London. After a remote post-doctoral position at FCAAP performing hydrodynamic stability analyses on complex flows, Adam accepted a post-doctoral appointee position at Sandia National Laboratories, broadening his expertise from hydrodynamic stability and fluid mechanics to MEMS modeling, fabrication, and integration of MEMS into larger systems.

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