

Acoustic Research and Development in the FLC MAR

The study, advancement and use of sound and ultrasound technologies are of fundamental importance to many of the projects and missions of the FLC MAR laboratories. Whether imaging and monitoring the inside of the human body, sensing for undersea objects or monitoring industrial machinery, sound and ultrasound are primary phenomena and tools for researchers across many of the labs. Below are some examples:

National Energy Technology Laboratory, Department of Energy

<http://www.netl.doe.gov/>

NETL onsite R&D helps industrial and academic partners solve problems that would otherwise become barriers to commercializing power systems, fuels, environmental and waste management technologies. Laboratories are located in Morgantown, WV and Pittsburgh, PA.

Tech transfer methods include:

- Cooperative Research and Development Agreements (CRADAs)
- Patents and Licenses
- Publications and software tools

Available Patents

- 6,959,589 Ultrasound Analysis of Slurries
- 5,337,289 Phased-Array Ultrasonic Surface Contour Mapping System and Method for Solids Hoppers

Past and Present Acoustic Projects

- Develop finite element acoustic modeling methods for industrial gas turbines.
- Descriptive Acoustics: Characterization of the major sound sources associated with energy development (e.g. compressors, drilling rigs, road noise)
- Ammonia Removal from Fly Ash Using An Acoustically Enhanced Fluidized Bed.
- Develop sensors employing electromagnetic and acoustic technology (EMAT) for the detection of low-level stress corrosion cracking (SCC) anomalies in natural gas pipelines

Naval Surface Warfare Center, Dahlgren Division

<http://www.nswc.navy.mil/>

The Navy at Dahlgren conducts basic research in all systems-related areas and pursues scientific thrusts that draw upon many disciplines, including biotechnology, chemistry, mathematics, laser and computer technology, chemical, mechanical, electrical and systems engineering, physics and computer science.

Business opportunities exist in the following areas

- Acoustic Area Protection System
- Long-range acoustic detection of surface targets

National Institute of Standards and Technology

<http://www.nist.gov/>

NIST, a non-regulatory federal agency, was founded in 1901 to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in

ways that enhances economic security and improves our quality of life. Laboratories are for use under collaborative/non-collaborative proprietary research and non-proprietary research. The Main laboratory is located in Gaithersburg, MD.

Past and Present Acoustic Projects

- Lensless line-focus broadband transducer, helps acoustic microscopes perform ultrasonic examinations
- Acoustic techniques to determine the thermophysical properties of semiconductor process gases.
- Synchronization of multiple nanoscale oscillators
- Detection of acoustic emissions.

Additional NIST acoustic projects can be found by searching “current + acoustic” in the search box on the NIST homepage.

US Naval Research Laboratory

<http://www.nrl.navy.mil/>

NRL is the corporate research laboratory for the Navy and Marine Corps and conducts a broad program of scientific research, technology and advanced development. The Chesapeake Bay Detachment occupies a 168-acre site near Chesapeake Beach, Maryland, and provides facilities and support services for research in acoustics radar, electronic warfare, optical devices, materials, communications, and fire research. The Acoustics Division research concentrates on:

- Acoustic signal processing
- Physical acoustics
- Acoustic systems
- Acoustic simulation, measurement and tactics

Tech transfer: Since 1989, the NRL has entered into more than 260 cooperative research and development agreements with companies, universities, nonprofit organizations and other government organizations. NRL supports an active licensing program and has over 1,000 patents available for licensing in fields as diverse as advanced materials, chemistry, biotechnology, optics, ocean and atmospheric sciences, electronics, radar, and satellite technology.

National Oceanic & Atmospheric Administration (Silver Springs, MD)

www.noaa.gov

The NOAA funds a wide range of acoustical research projects in several general areas.

- Acoustic Monitoring Program
- Great Lakes Environmental Research
- Earth System Research
- Radio Acoustics
- Remote Sensing
- Mooring
- Rainfall Measurement
- Sound, Bioacoustics
- Geophysical Research

The primary responsibility of the Fisheries Acoustics Research Group is to use state-of-the-art acoustic technologies to provide unbiased fisheries-independent abundance estimates of commercially important fish and squid stocks in the Northwest Atlantic (www.nefsc.noaa.gov/femad/ecosurvey/acoustics/). The goal is to effectively implement fisheries acoustics as a cost-efficient approach for improving the precision and accuracy of abundance estimates of these stocks. Radio acoustics is being evaluated by the Demonstration Division as a new atmospheric observing technologies developed by the Office of Atmospheric Research (OAR) laboratories and other organizations and determines their value in the operational domain. Activities range from the demonstration of scientific and engineering innovations to the management of new systems and technologies. Progress includes the addition of Radio Acoustic Sounding Systems (RASS) for temperature profiling in the lower troposphere. The Remote Sensing Division (www.aoml.noaa.gov/rsd/) uses electromagnetic and acoustic-based remote sensors for research on climate and oceans, tropical meteorology, and coastal stewardship/coastal ecosystem health. In the geophysical area NOAA scientist are engaged in the development and deployment of infrasonic instruments for detection and monitoring of low-frequency sound generated by several important anthropogenic and geophysical processes (www.esrl.noaa.gov/psd/programs/infrasound/). Bioacoustics, mooring, and Great Lake environmental research are other areas where the use of acoustic is being researched.

US Army Research Laboratory (Adelphi, MD and Aberdeen, MD)

www.arl.army.mil

The ARL Acoustic Sensing Program is designed to develop acoustic sensor arrays and sensor networks to detect, classify, localize, and track continuous and impulsive sources. It intends to demonstrate "real" value of acoustic sensors as robust stand-alone and complementary sensors.

Naval Surface Warfare Center-Carderock Div (Carderock, MD)

www.nswccd.navy.mil/

Acoustic Trials Detachment USNS Hayes, converted from an oceanographic research vessel to an ultra-quiet noise measurement vessel, began operation in 1991 as the fleet's submarine acoustical measurement platform on the East Coast. Utilizing advanced measurement systems developed under the Acoustic Measurement Facilities Improvement Program (AMFIP), USNS Hayes provides the platform and system capability of measuring radiated noise signatures of the Navy's quietest submarines.

It conducts deep-water measurements at a variety of locations off the Florida coast and the Bahamas. Special measurement arrays, a high capacity data acquisition and processing system (MAX), and a towed array measurement system (ATAMS) provide enhanced measurement capability of various noise deficiencies including sources that may be transient in nature.

Machinery Acoustic Silencing Laboratory This laboratory consists of three large anechoic/quiet rooms with isolated floors containing facilities for the measurement and characterization of low-level airborne, fluid-borne, and structure-borne generated noise of full-scale shipboard machinery. The large scale machinery anechoic chamber has a 3900 square foot test area and a 50 foot high ceiling; floor loading is 700 pounds per square foot. The total test area of three rooms exceeds 14,000 square feet. Programs to develop quiet machinery technology and prototype hardware for all classes of submarine and surface ships are supported by this laboratory. Research and development is conducted for quiet pumps, fans, ventilation and fluid

systems, valves, mounts, electric motors and generators, and other machinery components and systems.

Naval 2003 virtual acoustical training system-

<http://www.globalsecurity.org/military/library/news/2003/02/mil-030210-navsea02.htm>

National Institutes of Health

www.nih.gov

Sound and ultrasound are primary phenomena of interest to essentially all of the 27 institutes that comprise the National Institutes of Health. Medical acoustics are major tools for imaging the internal body and in diagnosis, from head to toe. The National Institute of Biomedical Imaging is the leader in developing new medical acoustics technologies, while the other institutes are leaders in using the technologies for studying cancer, heart, brain and etc. For example, the Institute of Child Health and Human Development leads in the advancement and use of ultrasound for fetal monitoring.

One of the institutes, the National Institute of Deafness, focuses its primary attention on sound and uses advanced acoustics technologies in its studies.