An Overview of the WHOI Micro-Modem Capabilities

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The WHOI Micro-Modem is a compact, low-power underwater acoustic communication and navigation subsystem. It provides for low-rate frequency-shift keying (FSK) for low-throughput applications and higher rate phase shift keying (PSK) signaling at data rates of 300 to 5000 bps for more demanding applications. It supports a variety of navigation systems for underwater vehicles, including REMUS-compatible long-baseline (LBL), standard narrowband LBL and synchronous transmissions for one-way travel time measurements.

The modem uses a single receiver channel for the low-rate FSK, and can use one to four channels for PSK reception. Carrier frequencies from 3 to 30 kHz are supported with appropriate transducers, and the signaling bandwidth (symbol rate) can be varied from 1 to 5 kHz. The PSK receiver implements a multi-channel decision-feedback equalizer (DFE) with integrated phase-locked loop and error-correction based on original work by Stojanovic.

Recent projects have focused on Navy applications for shallow-water mine-hunting applications using unmanned underwater vehicles. One test that was done this past summer involved multiple vehicles using the synchronous navigation capability to enhance underwater positioning plus both low and high-rate communications. High-rate communications was used to send snippets of side-scan sonar images of mine-like objects to the surface while the vehicles were performing the survey.