

A prototype broadband acoustic underwater data communication system for high data rates

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Abstract

The need for wireless underwater communication systems exists due to the constraints that tethered wired communication systems place on underwater equipment, and the extensive time and effort required to retrieve information from remote underwater installations. With current available commercial underwater acoustic modem systems only offering low data rates for use mainly in control signals and sensor telemetry data transfer from deep depths and over large distances, there exists a need for a wireless system capable of handling large, high-speed data transfers over shorter distances. Being able to transmit data at a high transmission rate in turn requires higher frequencies and a broader system bandwidth. With the development of advanced wideband ultrasonic transducer technology within the Council for Scientific and Industrial Research (CSIR), the application of such transducers for broadband underwater acoustic data communication for high data rates and reliable transmission has been researched and investigated over the past few years. A prototype broadband acoustic underwater data communication (BAUDC) system has been developed, with the intended end goal of being able to perform large data transfers, such as sonar images, from an unmanned underwater vehicle (UUV) to a surface ship, surface buoy or submarine at a sufficiently high data rate to allow the data to be received in near real-time. The prototype BAUDC system is currently still under development, but it has so far produced excellent results. During testing of the system in the CSIR's sonar testing tank, a set of transducers having a bandwidth of around 280 kHz achieved data rates over 200 kbps with a bit-error-ratio (BER) of 0, meaning no bit-errors occurred. The prototype system has also been tested in a real shallow water environment inside a harbor, with a communication distance of 200m successfully achieved.