

# **Sonar Identification and Authentication using Embedded Digital Watermarks - Phase II**

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## **Project Summary**

The concept of embedding a digital watermark in the properly selected spectral components of an LFM sonar chirp has been verified in phase 1 of this work. A watermark is a low power, secure digital signature that is embedded in a sonar waveform prior to transmission for the purpose of identification and authentication. It was subsequently discovered that there exists a mutual coupling between sonar detection and watermark detection. In this work we propose to develop and exploit this coupling to enhance detection of sonar echoes. To an external observer without access to the spreading code, the watermark appears as additive noise. However, the authorized receiver can despread the watermark to improve the probability of detection of the sonar compared to standard matched filter detector. The reason is that the despread watermark adds additional energy at decision time, thus improve the detection rate above conventional matched filter detector. This capability can be achieved by performing the detection by a proposed joint processor.