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Remote Sensing of Sound Speed in the Ocean via Brillouin Scattering

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Innovative Brillouin LIDAR concepts to obtain range-resolved remote measurements of sound speed (and temperature) in the ocean are described. Objectives are an accuracy of 0.2 m/s (0.1degC) over a range of $\simeq$ 100 m in clear ocean with a range resolution of 1 m. Our approach provides high-resolution spectroscopic capabilities even in very severe acoustic/vibration environments. The detection is based on the use of edge filters to provide a high-resolution determination of the Brillouin frequency shifts. Edge filters could be molecular iodine absorption lines or excited-state Faraday anomalous dispersion optical filters. The transmitter is a commercial, injection seeded, frequency-doubled Nd:YAG laser that we have modified in two ways. First, we changed its operating temperature to obtain lasing at a frequency consistent with our choice of iodine absorption lines. Second, we implemented the Ramp and Fire technique we had developed so that the laser operates in a single longitudinal mode even when there are severe environmental disturbances. Test results will be presented that clearly demonstrate the efficacy of this new concept.