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Acoustic Spectroscopy in a Toroidal Bose-Einstein Condensate G. EDWARD MARTI, RYAN OLF, GABE DUNN, DAN STAMPER-KURN, UC Berkeley, Dept. of Physics — Sound waves in a Bose-Einstein condensate are longlived excitations that probe the atomic density distribution. Measuring the frequencies, damping rates, and mode structures reveal perturbations of the atomic density and the underlying distortion of the trap. We excite azimuthal standing sound waves in a Bose-Einstein condensate that fills an all-optical toroidal trap. Frequency spectroscopy measures the speed of sound in the toroidal channel and corrugations of the potential. We demonstrate a proof-of-concept sonic rotation sensor that is fairly insensitive to errors in the optical potential and density effects.

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