

Abstract Submitted  
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**Controlling relaxation of nuclear spin qubit ensembles for a more sensitive search for axion-like dark matter** JANOS ADAM, DENIZ AYBAS, ALEXANDR GRAMOLIN, EMMY BLUMENTHAL, ALEXANDER O. SUSHKOV, Boston University, DEREK F. JACKSON KIMBALL, California State University - East Bay, DMITRY BUDKER, Helmholtz Institut and Johannes Gutenberg-Universitt, Mainz, Germany; University of California, Berkeley — Cosmic Axion Spin Precession Experiment (CASPER) is a laboratory scale experiment searching for ultralight axion-like dark matter, using nuclear magnetic resonance [D. Budker, P. W. Graham, M. Ledbetter, S. Rajendran, A. O. Sushkov, Phys. Rev. X, 4,021030 (2014)]. I will describe our work on the next phase of the experiment, with the goal of searching in the kHz – MHz frequency band, using SQUID sensors. I will also describe our study of transient light-induced paramagnetic centers in ferroelectric PMN-PT  $((\text{PbMg}_{1/3}\text{Nb}_{2/3}\text{O}_3)_{2/3} - (\text{PbTiO}_3)_{1/3})$  crystals. We use these paramagnetic centers to control the polarization and relaxation of the nuclear spin qubit ensemble, allowing us to improve sensitivity to axion-like dark matter.

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