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Preparation of Laser-Polarized Xenon at High Xe Densities and High Resonant Laser Powers Provided by Volume Holographic Grating-Narrowed LDAs BOYD GOODSON, NICHOLAS WHITING, PANAYIOTIS NIKOLAOU, NEIL ESCHMANN, Department of Chemistry and Biochemistry, Southern Illinois University Carbondale, MICHAEL BARLOW, Sir Peter Mansfield Magnetic Resonance Centre, University of Nottingham, UK — The xenon nuclear spin polarization (P_{Xe}) achieved via alkali metal spin-exchange optical pumping (SE OP) is normally expected to be limited at high xenon cell densities because of decreased rubidium electron spin polarization (P_{Rb}) resulting from increased Rb/Xe collisions. Surprisingly high P_{Xe} values (e.g., ∼55%, ∼32%, ∼23%, and ∼11% at 50, 300, 500, and 2000 torr Xe) were obtained with batch-mode OP and a ∼29 W VHG-narrowed laser by exploiting a sensitive and unexpected interdependence between the optimal cell temperature and the Xe partial pressure. The OP dynamics can be further investigated as a function of wavelength offset and optical power using frequency-narrowed lasers (with on-chip Bragg gratings or TEC-controlled VHGs) able to tune over the entire range of the Rb D_1 absorption profile independently of laser flux. These effects are studied using *in situ* time-dependent nuclear polarimetry and optical P_{Rb} measurements based on magnetic field-dependent transmission of the polarizing laser beam.

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