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Automated Microwave Frequency Control in Dynamic Nuclear Polarization Experiments ETHAN SCOTT, IAN JOHNSON, DUSTIN KELLER, University of Virginia, SOLID POLARIZED TARGET GROUP TEAM — To achieve highest polarization levels in dynamic nuclear polarization (DNP) experiments, target materials must be subjected to microwave irradiation at a particular frequency determined by the difference in the nuclear Larmor and electron paramagnetic resonance (EPR) frequencies. However, this resonant frequency is variable; it drifts as a result of radiation damage. Manually adjusting the frequency to accommodate for this fluctuation can be difficult, and improper adjustments negatively impact the polarization. In response to this problem, a controller has been developed which automates the process of seeking and maintaining optimal frequency. The creation of such a controller has necessitated research into the correlation between microwave frequency and corresponding polarization growth or decay rates in DNP experiments. Knowledge gained from the research of this unique relationship has additionally lead to the development of a Monte-Carlo simulation which accurately models polarization as a function of frequency and a number of other parameters. The simulation and controller continue to be refined, however, recent DNP experimentation has confirmed the controller's effectiveness.

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