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Design Challenges for the Detection of Dynamic Nuclear Polarization with Semiconductor Spin Diode Arrays[1] T. E. ALKHIDIR, A. ABDURAHMAN, I. A. H. FARHAT, D. L. GATER, Khalifa University, Abu Dhabi, UAE, C. ALPHA, Cornell University, CNF, Ithaca, NY, USA, A. F. ISAKOVIC, Khalifa University, Abu Dhabi, UAE — The success of the processes of electrical and optical injection of electron spins across the interface between semiconductor and other materials in the past 15 years, has also opened the door to exploitation of the measurement from NMR family of techniques on a semiconductor chip. Specifically, dynamic nuclear polarization and related phenomena are detectable in spin diodes under certain experimental conditions. Initial results that demonstrated the presence of DNP effects have relied on the NMR-like detection of Ga and As isotopes naturally present in Ga and As wafers. This Report is driven by the need to develop applications that would extend such detection to atoms and molecules that are external to the natural GaAs surface, but in touch with it, in its immediate vicinity. We therefore report on the design, nanofabrication and initial tests of a semiconductor spin "DNP diode" arrays, where we aim to detect the DNP-like effects between the operating GaAs spin diodes and externally applied molecules. In addition to the recommendations on the selection of molecules which are detectable through such process, we elaborate on the design of the spin diodes that may enhance the DNP signal.

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