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Large Magnetic Field Gradients for Crystal Lattice Quantum Computing JONATHAN GOLDMAN, THADDEUS LADD, CHARLES SANTORI, SHINICHI KOSEKI, GLENN SOLOMON, BINGYANG ZHANG, YOSHINORI MATSUMOTO, FUMIKO YAMAGUCHI, YOSHIHISA YAMAMOTO, Edward L. Ginzton Laboratory, Stanford University — A quantum computer using nuclear spins in a crystal lattice requires a method for addressing individual quantum bits. This identification can be achieved with a spatially varying magnetic field. Spins at different lattice sites can have distinguishable Zeeman frequencies allowing initialization, logic operations, and measurements to be performed through radio frequency (rf) pulse techniques. Here, we present magnet designs that have gradients between 1 and 20 G/Angstrom, which are necessary to realize quantum computation with particular crystals.

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