

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Exchange coupling of spins on superconducting qubit substrates from first-principles¹ NICOLE ADELSTEIN, Lawrence Livermore National Laboratory, DONGHWA LEE, Oak Ridge National Laboratory, JONATHAN DUBOIS, VINCENZO LORDI, Lawrence Livermore National Laboratory — Magnetic flux noise in superconducting qubits remains a hurdle to the realization of a scalable quantum computer. Current performance as measured by the lifetime of quantum states in these systems is, however, largely limited by an as yet unidentified source of low frequency flux noise. Recent experimental and theoretical results suggest that spin-clustering of paramagnetic defects can explain the measured low frequency noise spectrum. Modeling of spin-ordering requires knowledge of the couplings between spin defects. We present here exchange coupling between spin defects on the surface of common substrate materials calculated using first-principles density functional theory.

¹This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344.

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Date submitted: 14 Nov 2014

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