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Prediction of Dephasing Rates of Si/SiO$_2$ Singlet-Triplet Qubits due to Charge and Spin Defects NEIL M. ZIMMERMAN, NIST, DIMITRIE CULCER, UNSW — Previous theoretical studies of dephasing rates due to time-dependent fluctuations of defects in Si have mostly used "model" defects, without reference to the body of knowledge concerning such defects. In this talk, we will present theoretical predictions of the dephasing rates of singlet-triplet qubits in quantum dots at the Si/SiO$_2$ interface, using properties of the known classes of defects in this material system; these defects have been studied intensively for many years in the microelectronics industry, and thus there is a fair amount of knowledge known about them. We set up a theoretical framework aimed at enabling experiment to efficiently identify the most deleterious defects, and complement it with the knowledge of defects. We relate the dephasing rates Γ_ϕ due to various classes of defects to experimentally measurable parameters such as charge dipole moment, spin dipole moment and fluctuator switching times. Perhaps surprisingly, we find that for spin qubits charge fluctuators are more efficient in causing dephasing than spin fluctuators.

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