

Abstract Submitted  
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**Adsorbed Oxygen Molecules as a Source of Flux Noise in SQUIDS**<sup>1</sup> HUI WANG, ZHE WANG, Department of Physics, Fudan University, Shanghai 200433, China, JUN HU, CHUNTAI SHI, CLARE C. YU, RUQIAN WU, Department of Physics and Astronomy, University of California, Irvine, CA 92697-4575, USA, DEPARTMENT OF PHYSICS, FUDAN UNIVERSITY, SHANGHAI 200433, CHINA COLLABORATION, DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF CALIFORNIA, IRVINE, CA 92697-4575, USA COLLABORATION — A major obstacle for using superconducting quantum interference devices (SQUIDs) as qubits is the flux noise generated by fluctuating magnetic spins on the surface of SQUIDs. Using density functional theory (DFT) calculations, we investigated O<sub>2</sub> adsorbates and various vacancies on an  $\alpha$ -alumina surface as spin candidates. Their spectroscopic features are directly compared to experimental data using the x-ray magnetic circular dichroism. The calculated magnetic anisotropy energy for the spin of O<sub>2</sub> to rotate within a plane perpendicular to the axis of the O-O bond is only about 12 mK (or  $\sim 1 \mu\text{eV}$ ) so we believe that O<sub>2</sub> molecules are the main source of flux noise in Al SQUIDs.

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