Microscopic Model of 1/f Noise in Josephson Junctions MAGDALENA CONSTANTIN, CLARE YU, Department of Physics and Astronomy, University of California, Irvine, California 92697, JOHN MARTINIS, Physics Department, University of California, Santa Barbara, Santa Barbara, California 93106

— We present a simple microscopic model to show how fluctuating two-level systems in the Josephson junction tunnel barrier can modify the potential energy of the barrier and produce critical current noise spectra as well as charge noise. We find 1/f critical current and charge noise at low frequencies. Our values are in good quantitative agreement with recent experimental measurements of noise in Al/AlO$_x$/Al Josephson junctions. We also investigate the sensitivity of the critical current noise on the nonuniformity of the tunnel barrier.

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