Ohmic and step noise from a single trapping center hybridized with a Fermi sea[†][1] ROGERIO DE SOUSA, K. BIRGITTA WHALEY, Department of Chemistry and Pitzer Center for Theoretical Chemistry, University of California, Berkeley, CA 94720-1460, USA, FRANK K. WILHELM, JAN VON DELFT, Department Physik, CeNS, and ASC, Ludwig-Maximilians-Universität, Theresienstrasse 37, D-80333 München, Germany — We show that single electron tunneling devices such as the Cooper-pair box or double quantum dot can be sensitive to the zero-point fluctuation of a single trapping center hybridized with a Fermi sea. If the trap energy level is close to the Fermi sea and has line-width $\gamma > k_B T$, its noise spectrum has an Ohmic Johnson-Nyquist form, whereas for $\gamma < k_B T$ the noise has a Lorentzian form expected from the semiclassical limit. Trap levels above the Fermi level are shown to lead to steps in the noise spectrum that can be used to probe their energetics, allowing the identification of individual trapping centers coupled to the device.

[†]R. de Sousa, K.B. Whaley, F.K. Wilhelm, and J. von Delft, Phys. Rev. Lett. in press; cond-mat/0504149.

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