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Exact thermodynamics of electron hole pairing and ferroelectricity in attractive Hubbard nanoclusters. ARMEN KOCHARIAN, Department of Physics and Astronomy, California State University, GAYANATH FERNANDO, KALUM PALANDAGE, Department of Physics, University of Connecticut, JIM DAVENPORT, Computational Science Center, Brookhaven National — Using analytical diagonalization and symmetries in the small Hubbard clusters, we demonstrate exact mapping between $U > 0$ and $U < 0$ models in the ground state and at finite temperatures for general electron concentration and magnetic field. We establish equivalency between corresponding phase diagrams for one hole off half-filling at $U > 0$ and in the low spin region for half filled $U < 0$ models. The $U < 0$ model exhibits Fulde-Ferrell-Larkin-Ovchinnikov phase separation into spin-rich and spin-poor regions analogous to electron pairing for $0 < U < U_C$ [1,2], while at strong coupling regime it provides a mechanism of electron instability with spontaneous (saturated) ferroelectricity, similar to Nagaoka ferromagnetism at $U > U_F$ [1]. The calculated phase diagrams resemble a number of metal dielectric transitions, inhomogeneous paired phases, superconductivity, ferromagnetism and ferroelectricity found recently in transition metal and Nb nanoparticles [3], etc. [1] A.N.Kocharian et. al., Phys. Rev. B**74**, 024511 (2006); Phys. Lett. A**364**, 57 (2007). [2] G. W. Fernando, et. al., Phys. Rev. B**75**, 085109 (2007). [3] X. Xu et al., Phys. Rev. Lett. **93**, 086803 (2004).

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