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An Exactly Solvable Model with a Tunable Mott Gap without Broken Symmetry DANIEL HANSEN, B. SRIRAM SHASTRY, UCSC Physics — The 1d Hubbard model at half filling provides the only known example of a Mott Hubbard insulating state, with a Mott charge gap without any concomittant broken symmetry. Such a state has inspired much current work in correlated matter in low dimensions. We present a model, where the Mott gap can be manipulated and infact made to vanish with some parameter. Using the higher conserved currents found by Shastry in 1986 for the 1-d Hubbard model, we construct a new model *which does show a tunable Mott gap.* The model is given by the hamiltonian

$$H = H_{Hubbard}(U) + \lambda\, I_3(U),$$

where $H_{Hubbard}$ is the Hubbard hamiltonian and I_3 is its third conserved current. The new model has exactly the same space time symmetries as the Hubbard model, but possesses *two parameters*, U, λ. The phase diagram in $\lambda - U$ is explored using numerical methods and the Bethe Ansatz. It displays several interesting features including a "superconducting" type state. A significant role is played by a band transition at $U = 0$ (similar to the Lifshitz transition), wherein the two fermi points of the Hubbard model break up into 6 Fermi points. We also find a variety of second order transitions.

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