Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

The Hall Number, Optical Sum Rule and Carrier Density for the $t-t'-J$ Model[1] SRIRAM SHASTRY, UCSC, Santa Cruz, CA, JAN HAERTER, UCSC — Mott Hubbard systems, epitomizing strong correlations and a sensitivity to half filling, display striking departures from band theory for many measurables. E.g. consider two quantities; the Hall constant R_H and the optical conductivity sum rule $\omega_P^2/8$. These are often inverted to give the carrier densities $n_H \equiv 1/q_e c R_H$ and $n_{Op} = \frac{m}{4\pi q_e^2}\omega_P^2$. There is considerable difficulty in reconciling these with x, the "chemical" estimate of density in many High T_c systems[1]. We have argued previously[2] that the Hall constant is a manybody object, that need not scale simply with x. In this work, we compute the variables n_H and n_{Op} for a $t-t'-J$ model by using exact diagonalization of small clusters and different dopings x. We compute the Kubo formulas exactly for small clusters, and also the high frequency Hall constant for even larger systems, and obtain a strong dependence of these variables on the ratio t'/t. We also comment on the departure from Luttinger's theorem for the Fermi surface for these clusters, defining the same from the tower of excited states for a given wave vector for an added particle or hole. [1] W. Padilla *et.al.*, Phys. Rev. **B 72**, 060511(2005). [2] B. S. Shastry, B. I. Shraiman and R. R. P. Singh, Phys. Rev. Lett.**70**, 2004(1993).

[1]NSF DMR-0408247

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Date submitted: 18 Nov 2006 Electronic form version 1.4