Low-Electric-Field Tuned Impurity Conduction in Antiferromagnetic Manganites\textsuperscript{1} CORNELIU CHIORESCU, JOSHUA COHN, University of Miami, JOHN NEUMEIER, Montana State University — Transport measurements for temperatures in the range $4.2 \, \text{K} \leq T \leq 300 \, \text{K}$ are reported for the semiconducting, antiferromagnetic manganites SrMnO$_3$ and CaMnO$_3$. At low $T$ where impurity conduction predominates, the electrical conductivity and Hall coefficient are found to be strongly electric-field dependent. For SrMnO$_3$, the mobile carrier density is continuously tunable over a range of more than three orders of magnitude in electric fields $F \leq 50 \, \text{V/cm}$. The conductivity and carrier density scale with field $\propto \exp(\sqrt{F})$, indicating Poole-Frenkel field-assisted ionization of bound carriers. The binding energy for SrMnO$_3$ ($\delta \sim 3.5 \, \text{meV}$) implies that electrons are ionized to more mobile states within the energy gap, rather than to the conduction band. This small energy scale correlates with the low-temperature onset of a small ferromagnetic moment in this compound, suggesting that bound electrons form ferromagnetic polarons. Strong electron correlation effects are suggested by the electric-field dependent Hall mobility.

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