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Phonon mechanism for superconductivity in YPtBi[1] JONATHAN RUHMAN, LUCILE SAVARY, JORN W. F. VENDERBOS, LIANG FU, PATRICK A. LEE, Massachusetts Inst of Tech-MIT — YPtBi is a semi metal with low charge-carrier density, $n = 2 \times 10^{18}\,\mathrm{cm}^{-3}$, influenced by strong spin-orbit coupling. Despite, the low density, this material becomes superconducting with a transition temperature of $T_c = 0.8$ K. According to recent ab-initio calculations, phonons can not be responsible for the superconducting instability, due to the low density of states at the Femri level. Notwithstanding, we obtain a sufficiently large transition temperature by considering the coupling to longitudinal-optical phonon modes through Coulomb forces. Here the long range nature of the Coulomb interaction makes it effective at low density, where the density of states is small, as apposed to local phonon couplings. We derive the appropriate Elaishberg theory for a semi-metal with a quadratic band touching point. We also discuss the possibility of triplet pairing generated by these polar phonons.

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