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A Search for the Rare Leptonic B- to tau- anti-neutrino Recoiling against B+ to Decays to anti-D*0 l+ Lepton-neutrino.

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A Search for the Rare Leptonic B Decay $B^- \to \tau^- \overline{\nu}_\tau$ Recoiling Against $B^+ \to \overline{D}^{*0} \ell^+ \nu_\ell$

by

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Abstract

This thesis describes a search for the decay $B^- \to \tau^-\overline{\nu}_\tau$ in 231.8×10^6 $\Upsilon(4S)$ decays recorded with the *BABAR* detector at the SLAC PEP-II B-Factory. A sample of events with one reconstructed exclusive semi-leptonic B decay ($B^+ \to \overline{D}^{*0}\ell^+\nu_\ell$) is selected, and in the recoil a search for $B^- \to \tau^-\overline{\nu}_\tau$ signal is performed in the following τ decay modes: $\tau^- \to e^-\overline{\nu}_e\nu_\tau$, $\tau^- \to \mu^-\overline{\nu}_\mu\nu_\tau$, $\tau^- \to \pi^-\nu_\tau$, $\tau^- \to \pi^-\pi^0\nu_\tau$, and $\tau^- \to \pi^-\pi^+\pi^-\nu_\tau$. We find no evidence of signal, and we set a preliminary upper limit on the branching fraction of $\mathcal{B}(B^- \to \tau^-\overline{\nu}_\tau) < 2.8 \times 10^{-4}$ at the 90% confidence level (CL). This result is then combined with a statistically independent *BABAR* search for $B^- \to \tau^-\overline{\nu}_\tau$ to give a combined preliminary limit of $\mathcal{B}(B^- \to \tau^-\overline{\nu}_\tau) < 2.6 \times 10^{-4}$ at 90% CL.

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Contents

List of Figures

List of Tables