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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 $B^- \rightarrow \tau^- \bar{\nu}_\tau$ RECOILING
AGAINST $B^+ \rightarrow \bar{D}^{*0} \ell^+ \nu_\ell$

by

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Abstract

This thesis describes a search for the decay $B^- \rightarrow \tau^- \bar{\nu}_\tau$ 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 ($B^+ \rightarrow \bar{D}^{*0} \ell^+ \nu_\ell$) is selected, and in the recoil a search for $B^- \rightarrow \tau^- \bar{\nu}_\tau$ signal is performed in the following τ decay modes: $\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau$, $\tau^- \rightarrow \mu^- \bar{\nu}_\mu \nu_\tau$, $\tau^- \rightarrow \pi^- \nu_\tau$, $\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$, and $\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau$. We find no evidence of signal, and we set a preliminary upper limit on the branching fraction of $\mathcal{B}(B^- \rightarrow \tau^- \bar{\nu}_\tau) < 2.8 \times 10^{-4}$ at the 90% confidence level (CL). This result is then combined with a statistically independent *BABAR* search for $B^- \rightarrow \tau^- \bar{\nu}_\tau$ to give a combined preliminary limit of $\mathcal{B}(B^- \rightarrow \tau^- \bar{\nu}_\tau) < 2.6 \times 10^{-4}$ at 90% CL.

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