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Searching For Dark Matter Portals Using B Meson Decays to Four Leptons¹

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Dark matter appears to make up most of the matter in the universe, but its composition is still not understood. However, “portals” between normal matter and dark matter have been proposed and they can be searched for using existing experiments. The purpose of my research is to use data collected by the BaBar Experiment using electron-positron collisions from the PEP-II Collider to search for a rare connection between the standard model of particle physics and one of the many predicted dark matter models. This connection involves the decay from “normal” matter particles (B-mesons) into two intermediate “dark” particles, that then subsequent decay to lepton pairs, leading to the unique signature of a four-lepton final state. My research focused on selecting such decays and on understanding how well these decays can be understood using Monte Carlo simulation. If we observe these decays, it might help us understand the connection between normal and dark matter.

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