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Variations to the z-Expansion of the Form Factor Describing the Decay of B Mesons

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We studied the decay rate of the particle decay $B^0 \rightarrow D^- \ell^+ \nu_\ell$ using data collected from the Belle Collaboration. In order to analyze this decay rate, we used three parameterizations of the form factor which describes this process, the CLN (Caprini, Lellouch, and Neubert) parameterization, the BGL (Boyd, Grinstein, and Lebed) parameterization, and the BCL (Bourrely, Caprini, and Lellouch) parameterization. This form factor is a function of the hadronic recoil variable w and each parameterization contains unique free parameters which are the interest of this project. One of the goals of this project was to fit these different parameterizations of the form factor to the Belle data in the lattice regime, considering the data points where $w < \sim 1.3$, so that we can predict what the larger w region should look like. We hope to in the future be able to use Monte Carlo simulations to extract values of the form factors, however these simulations are only able to reliably extract these values inside of the lattice regime. By fitting only the low w values, we are able to get an idea of what the larger w region should look like and how many data points are needed in the fit to accurately predict the larger w region.

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