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Searches for effects Beyond the Standard Model in semileptonic decays of B mesons at LHCb

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Search for Charge-Parity violation (CPV) in $B \rightarrow D^* \ell \nu$ transitions. In the Standard model (SM) there is no CP-asymmetry in this type of decays, however two New Physics (NP) possible ways to obtain CPV are investigated in this thesis. One possibility is given by the triple product asymmetries in four-body decays of B mesons, while the other possibility is the interference of two (or more) decay amplitudes with overlapping D^{**} resonances. A Monte-Carlo (MC) study of $B \rightarrow D^* \mu \nu$ was conducted to investigate the sensitivity to CPV in different NP scenarios. For this purpose, HAMMER (tool that reweights MC SM distributions to NP scenarios) was used. The analysis includes studies of stripping lines, trigger lines, offline selection, data-simulation comparison of quantities of interest and studies of systematic uncertainties. A kinematic reconstruction of the events with missing neutrinos using the full refit of the decay tree was implemented. This gives a 10-20% improvement in angular resolution with respect to techniques previously used for semileptonic decays.

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