Inclusive $V_{ub}$ at Belle II

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Introduction
Introduction

• Master at KIT working on a $b \rightarrow b$ii $R(D^{(*)})$ (hadrons, FEI)
  • Study of $B \rightarrow D^{**} (\rightarrow D^{(*)} \pi^0) \ell \nu_\ell$ background
  • Form factor reweighting
  • Template Fit including sys. uncertainties

• Started Phd in October
  • Goal: Measurement of $|V_{ub}|$ using incl. $B \rightarrow X_u \ell \nu_\ell$ decays and study of differential kinematic distributions
b2luigi
Tomorrow
Hybrid MC
Introduction

- Inclusive predictions include resonant contributions, but resonant structure in mass spectrum is lost
- Goal: simulate data sample which properly reflects both (inclusive and exclusive predictions have to be properly combined)
- Reweighting in bins of \( m_X, q^2 \) and \( E_\ell^* \)
- Hybrid Weights:
  - In each bin, subtract the partial rate from the resonances from the inclusive prediction (remainder only predicts non-resonant final states)
  - Add resonant structures using exclusive predictions
  - Hybrid Model prediction: Number of events in bin \( i \) given by

\[
H_i = R_i + w_i l_i
\]

\( H_i \) - total number of events, \( R_i \) - number of resonant events, \( l_i \) - number of events by inclusive prediction, \( w_i \) - weight assigned such that \( H_i = l_i \)
Charged

Mixed

Events in arb. units
q^2

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BACKUP
$m_X$, $q^2$ and $E^*_\ell$ bins

- Bins are theoretically motivated
- Inclusive predictions only reliable in bins with resonances integrated out

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