

D** at Belle II

Dr. Markus Prim

Universität Bonn

Anomalies in b-hadron decays observed over the past decade have drawn significant attention, as they challenge the Standard Model of particle physics and hint at possible new physics. Two notable examples in charged-current interactions are the long-standing discrepancy between the inclusive and exclusive determinations of the CKM matrix element V_{cb} , and the observed excess in the ratio $R(D^*)$, which probes lepton flavor universality.

In this talk, we will explore one of the main sources of systematic uncertainty in these measurements: semileptonic decays involving excited charmed mesons in the final state. After reviewing the current status of semileptonic B anomalies and the tensions in existing measurements of B to D** l nu decays, we will turn to recent spectroscopic studies of the excited charmed mesons. These provide growing evidence that the lightest orbitally excited charmed mesons, particularly the $D_0^*(2300)$, may exhibit a structure more complex than predicted by the quark model. We will conclude with a discussion on how developments in spectroscopy and semileptonic decay measurements can be integrated to improve our understanding of these processes and to reduce theoretical and experimental uncertainties.

""