Contribution submission to the conference Erlangen 2026

Flavour Changing Neutral Current decays of the top quark via a Higgs boson with the ATLAS experiment — Diptaparna Biswas, Carolina Costa, Markus Cristinziani, Carmen Diez Pardos, Ivor Fleck, Gabriel Gomes, Jan Joachim Hahn, Nikolaos Kamaras, Vadim Kostyukhin, Nils Benedikt Krengel, Austin Olson, •Inês Pinto, Sebastian Rentschler, Elisabeth Schopf, Katharina Voss, Wolfgang Walkowiak, and Adam Warnerbring — Experimentelle Teilchenphysik, Center for Particle Physics Siegen, Universität Siegen

Flavour Changing Neutral Current (FCNC) are processes in which a quark changes flavour through a neutral boson, e.g. the Higgs boson, and without changing its initial electric charge. These occurrences are forbidden at the lowest order, and highly suppressed in higher orders, by the Glashow–Iliopoulos–Maiani mechanism.

We aim to search for FCNC decays of a top quark to a Higgs boson, and either a charm or an up quark, with data collected by the ATLAS detector during Run 2 and the ongoing Run 3 of the LHC. These decay modes have extremely low probability, with expected branching ratios of about 10^{-15} for $t \to Hc$ and 10^{-17} for $t \to Hu$, far beyond the sensitivity of current detectors. As such, observing these decays at a significant rate would be a clear indication of New Physics. The search is performed in the highest branching ratio decay mode of the Higgs boson, $H \to b\bar{b}$, taking advantage of the latest machine learning developments in jet flavour tagging in the ATLAS experiment.

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Email: pinto@hep.physik.uni-siegen.de