

M2 Univers et Particules

Equipe LHCb

Evidence for \mathbf{T} Violation in Λ_b Semi-Leptonic Decays

- Time Reversal, \mathbf{T} , is one of the fundamental discrete symmetries whose physical design presents obvious difficulties. Its experimental test is usually apprehended in an *indirect* way by invoking both the \mathbf{CPT} theorem and the violation of \mathbf{CP} symmetry. However there exist physical processes which could show *directly* a non-conservation of \mathbf{T} symmetry; among them the polarization of baryonic resonances coming from the weak decays of heavy hyperons, like the process $\Lambda_b \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu$, which has been thoroughly studied by the LHCb team.

- Serious indications of \mathbf{T} non-conservation have been obtained recently in the above decay channel with the LHCb data of the Run I (years 2011 and 2012). Our aim is to confirm these preliminary results by both analyzing the Run II data (2015-2017) and performing sophisticated simulation codes (Monte-Carlo ones) which could well reproduce the true decaying mechanism.

The purpose of this training is to conceive *kinematics calculations including some models of form-factors* describing the Λ_b semi-leptonic decays in order to test \mathbf{T} symmetry at the simulation level.

Furthermore, this work would create the opportunity of a *PhD thesis* concerning the experimental test of \mathbf{T} by analyzing the Run II data taken by the LHCb detector.

- Supervision of the M2 training will be made by Z.J.Ajaltouni (Professor, UCA).