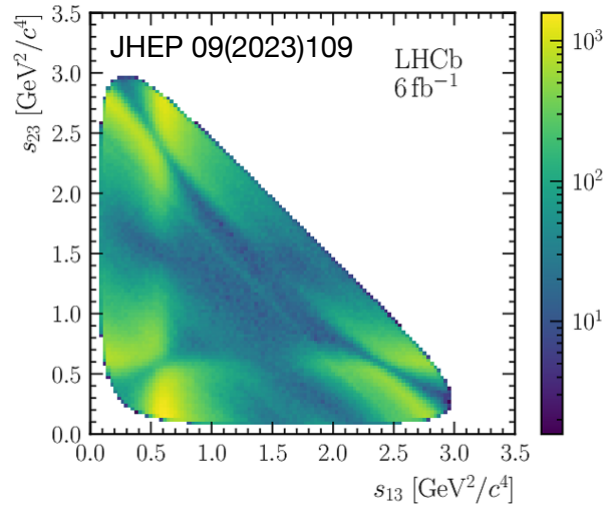
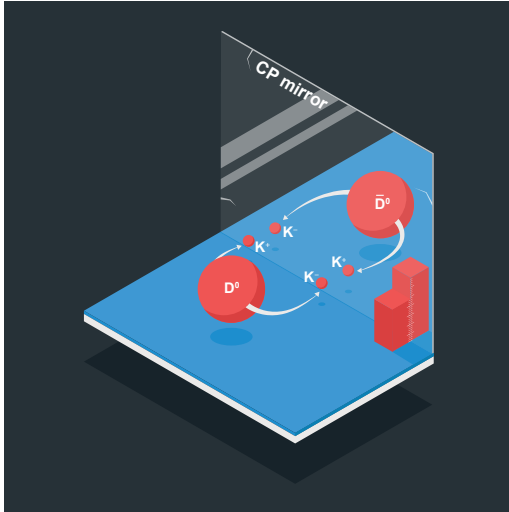


# Bachelor/Master thesis projects: Flavour Physics at LHCb

Precision measurements to unravel antimatter's secrets  
Group Prof. Dr. Marco Gersabeck



The LHCb experiment is the dedicated flavour physics experiment at the Large Hadron Collider (LHC). The experiment has just undergone a first major upgrade that introduced for the first time a full detector readout at the collision frequency of 40 MHz and real-time processing of the data. At this time, we are finalising analyses of data taken with the original LHCb experiment until 2018 and we are validating the data acquired more recently to publish first analyses with the upgraded experiment. The dataset taken in 2024 alone promises to equal the full amount of data acquired by the original experiment (see plot below).

There is a wide range of analysis-related projects available. Our core activity are studies of CP violation and there predominantly of  $D^0$  mesons (top-left graphic). Some of the measurements we conduct study the variation with decay time, which explore a phenomenon whereby  $D^0$  mesons can periodically change into anti- $D^0$  mesons and back. Many of our measurements concern final states with three or more particles. In this case, detailed understanding of the distribution within the allowed kinematic phase space such as in a Dalitz plot (top right) is the method of choice.

Other analysis areas include semi-leptonic decays, which are final states involving hadrons, a charged lepton and a neutrino. Here, we study all hadrons from  $D^0$  to  $B_c$  mesons. Projects range from specific studies of individual analysis aspects or techniques to entire publishable analyses.

The projects will be carried out with the support of the group's analysis and operations team and may include work together with international collaborators.

## Interested?

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