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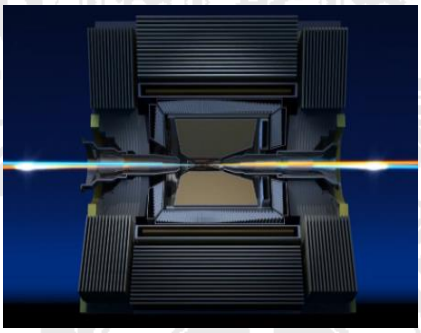


Searching for New Phenomena with Heavy Quarks and Neutrinos: An Adventure in Five Acts

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Something is at odds with our understanding of the universe: although highly anticipated by our field, no new particles apart from the Higgs boson and exotic hadrons materialized at the Large Hadron Collider (LHC). We have, however, good reasons to believe that our understanding of fundamental particles and their interactions is incomplete: E.g. matter is dominating the universe, astrophysical observations require the existence of dark matter, neutrinos oscillate and thus possess mass, and the strong force seems to be invariant under charge-parity transformations. The list goes on.

In this presentation, I will touch on how we are trying to reveal cracks in the Standard Model of particle physics using decay properties of heavy quarks at the Belle II experiment, and by studying neutrinos and searching for feebly interacting particles at the FASER Experiment. Belle II is a next-generation B-factory experiment located in Tsukuba in Japan, just an hour north of Tokyo. It aims to record an unprecedented number of decays of heavy beauty quarks in the clean laboratory of electron-positron annihilations by the 2030s. The experiment just entered its first long-shutdown to upgrade the pixel detector, but collected sufficient collision data for competitive measurements at the precision frontier. FASER is a small detector, located about 480 m downstream of the ATLAS experiment at CERN. It just started recording its first data sample and aims to shed light on the long-lifetime frontier and explore properties of neutrinos produced in LHC collisions. Both Belle II and FASER will give us new insights and I firmly believe our largest discoveries are still ahead of us. Let’s go on a journey together to find out why.

Images: Me, simulated cut through the Belle II detector in Japan, Image of FASER during the assembly showing the TI12 cavern and the LHC tunnel in Geneva.