LHCb finds new hints of possible deviations from the Standard Model

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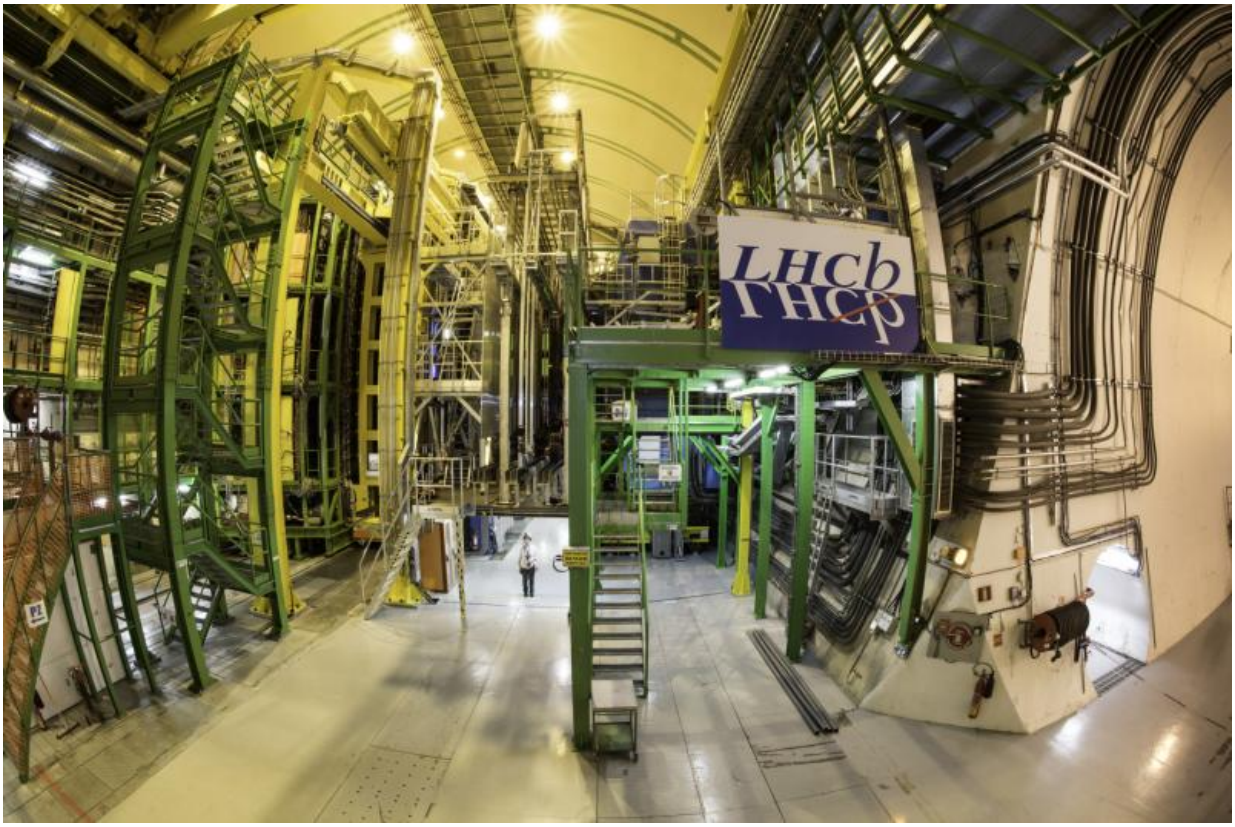

Credit: CERN

The LHCb experiment finds intriguing anomalies in the way some particles decay. If confirmed, these would be a sign of new physics phenomena not predicted by the Standard Model of particle physics. The

observed signal is still of limited statistical significance, but strengthens similar indications from earlier studies. Forthcoming data and follow-up analyses will establish whether these hints are indeed cracks in the Standard Model or a statistical fluctuation.

Today, in a seminar at CERN, the LHCb collaboration presented new long-awaited results on a particular decay of B^0 mesons produced in collisions at the Large Hadron Collider. The Standard Model of particle physics predicts the probability of the many possible decay modes of B^0 mesons, and possible discrepancies with the data would signal new physics.

In this study, the LHCb collaboration looked at the decays of B^0 mesons to an excited kaon and a pair of electrons or muons. The muon is 200 times heavier than the electron, but in the Standard Model its interactions are otherwise identical to those of the electron, a property known as lepton universality. Lepton universality predicts that, up to a small and calculable effect due to the mass difference, electron and muons should be produced with the same probability in this specific B^0 decay. LHCb finds instead that the decays involving muons occur less often.

While potentially exciting, the discrepancy with the Standard Model occurs at the level of 2.2 to 2.5 sigma, which is not yet sufficient to draw a firm conclusion. However, the result is intriguing because a recent measurement by LHCb involving a related decay exhibited similar behaviour.

While of great interest, these hints are not enough to come to a conclusive statement. Although of a different nature, there have been many previous measurements supporting the symmetry between electrons and muons. More data and more observations of similar decays are needed in order to clarify whether these hints are just a statistical

fluctuation or the first signs for new particles that would extend and complete the Standard Model of particles physics. The measurements discussed were obtained using the entire data sample of the first period of exploitation of the Large Hadron Collider (Run 1). If the new measurements indeed point to physics beyond the Standard Model, the larger data sample collected in Run 2 will be sufficient to confirm these effects.

More information: LHCb statement: lhcb-public.web.cern.ch/lhcb-p…/Welcome.html#RKstar

Provided by CERN