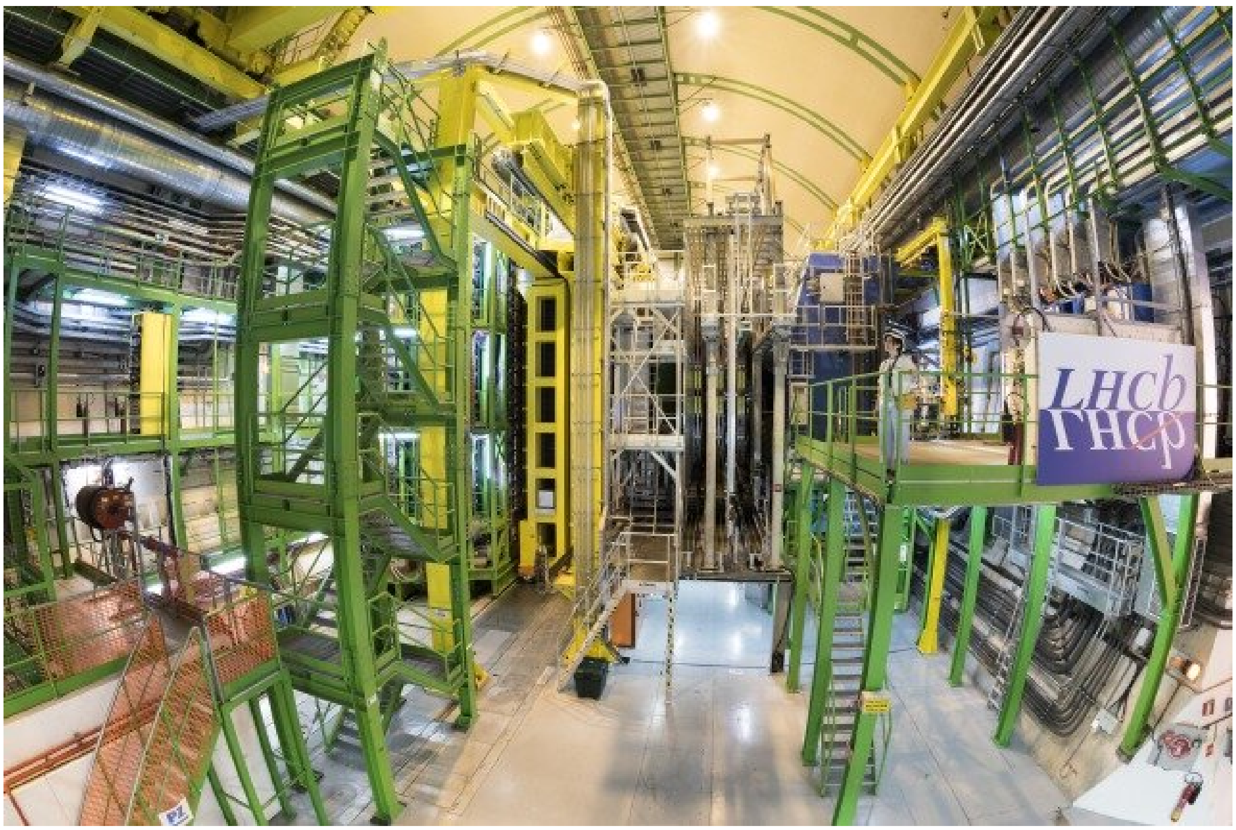
# New LHCb analysis still sees previous intriguing results

March 10 2020, by Ana Lopes




The LHCb experiment at CERN. Credit: CERN

At a seminar today at CERN, the LHCb collaboration presented a new analysis of data from a specific transformation, or "decay," that a particle called B0 meson can undergo. The analysis is based on twice as many B0 decays as previous LHCb analyses, which had disclosed some tension with the Standard Model of particle physics. The tension is still present in the new analysis, but more data are needed to identify its nature.

The decay in question is the decay of a B0 meson, which is made up of a bottom quark and a down quark, into a K* meson (containing a strange quark and down quark) and a pair of muons. It is a rare process: The Standard Model predicts only one such decay for every million B0 decays. In many theories that extend the Standard Model, new unknown particles can also contribute to the decay, resulting in a change of the rate at which the decay should occur. In addition, the distribution of the angles of the B0 decay products with respect to the parent B0—that is, of the muons and the kaon and pion from the K* decay—can also be affected by the presence of new particles.

In previous studies of this decay, the LHCb team analyzed data from the first run of the Large Hadron Collider and found a deviation from Standard Model predictions in one parameter calculated from the angular distributions, technically known as P5." In the new study, the LHCb team has added LHC data from the machine's second run to their analysis and still sees a deviation from Standard Model calculations in P5' as well as other parameters. However, the old and new results have a statistical significance of about three standard deviations, whereas five standard deviations are the gold standard in particle physics. It is therefore too soon to tell whether the deviation is statistically significant and, if so, whether it is caused by a new particle or an unknown experimental or theoretical effect.

"This is a very exciting time to be doing what we call flavor physics," said Mat Charles, LHCb's Physics Coordinator. "Here and in other related analyses, we keep seeing moderate tensions with the Standard Model. We still don't know how this mystery will turn out—nothing has yet reached the level of solid proof—but we're very much looking forward to the next round of results using the full LHCb data, which will roughly double the number of events again."

Read more in the LHCb CERN presentation, in the LHCb paper and also in the CERN update.

Provided by CERN

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