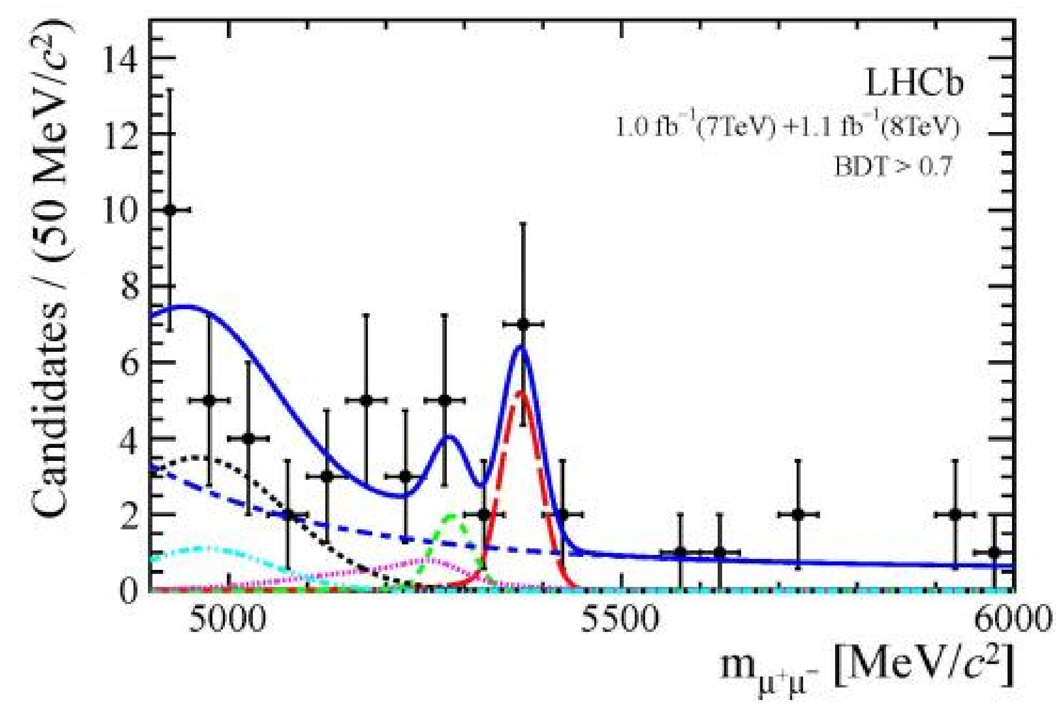
Confining supersymmetry: LHCb presents evidence of rare B decay

November 13 2012, by Antonella Del Rosso

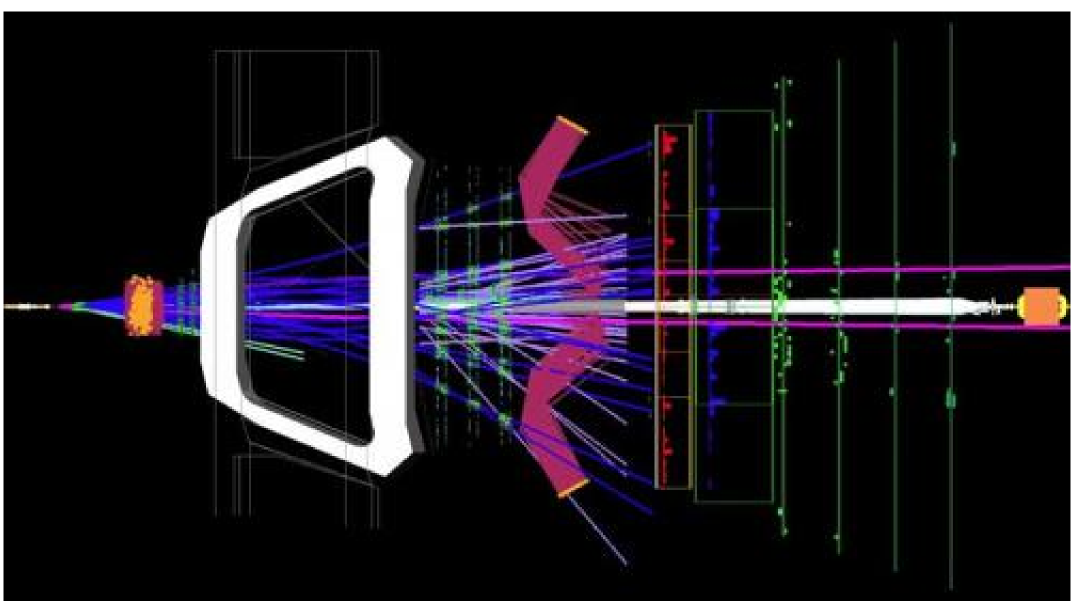


The graph showing evidence of the Bs0 → μ+ μ- decay. The result was presented Monday 12 November at the HCP Conference in Kyoto. Credit: LHCb Collaboration

Today, at the Hadron Collider Physics Symposium in Kyoto, the LHCb collaboration has presented the evidence of a very rare B decay, the rarest ever seen. The result further shrinks the region in which scientists can still look for supersymmetry.

Particle decays tell us about the inner properties and functioning of Nature's physics processes. By studying them and their occurrence, physicists infer the rules that control them. Often, it turns out that some rare decays, which are very difficult to observe, are those in which Nature could reveal the presence of new physics. This is the case of some decays of the B_s^0 particle (a particle made of a bottom anti-quark bound to a strange quark), and in particular $B_s^0 \rightarrow \mu^+ \mu^-$ whose rate can be predicted very precisely in the Standard Model. Deviations from the expected values could be the signal of the existence of new particles, for example those from supersymmetry.

After analysing part of the data accumulated in 2012, together with that from 2011, the LHCb collaboration has presented for the first time 3.5 σ evidence made up of a handful of $B_s^0 \rightarrow \mu^+ \mu^-$ decays. "Theorists have calculated that, in the Standard Model, this decay should occur about 3 times in every billion (10^9) total decays of the particle," explains Pierluigi Campana, LHCb Spokesperson. "This first measurement gives a value of $(3.2^{+1.5}_{-1.2}) \times 10^{-9}$, which is in very good agreement with the prediction."



A beam of protons enters the LHCb detector on the left, creating a B0s particle, which decays into two muons (purple tracks crossing the whole detector). Credit: LHCb/CERN

This result provides more severe constraints on the impact of new physics in this decay, at least the areas more widely explored so far by theorists. "This channel is a very precise marker of new physics effects. Supersymmetry is not ruled out by our measurement but it is strongly confined," says Pierluigi Campana. "This measurement is a sort of checkup of the Standard Model and today it appears healthier than it was yesterday."

The baton now passes on to the large community of physicists and theorists in particular. "The result needs to be fully integrated in the theoretical models," says Pierluigi Campana. "We now plan to continue analysing data to improve the accuracy of this measurement and others which could show effects of new physics (such as studies of CP violation in B_s^0 decays). We believe that new data from the LHC and more sophisticated analyses will eventually allow us to find a chink in the Standard Model's armour."

The collaboration hopes to have additional results from its 2012 dataset in time for the winter physics conferences.

More information: lhcb-public.web.cern.ch/lhcb-public/

Provided by CERN

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