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New physics from rare beauty

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The Standard Model of particle physics has established itself through an impressive series of successes at explaining a large variety of experimental observations and for its mathematical beauty.

Despite of this, it is still regarded as an effective Quantum Field Theory, affected by several theoretical and phenomenological problems which lead particle physicists to postulate the existence of New Physics beyond the Standard Model, accompanied by the existence of new, yet unobserved, particles.

New heavy particles could be observed directly or indirectly through their contributions to quantum loops. Indirect contributions can change significantly the predicted SM branching ratio in Flavor Changing Neutral Currents process, where the SM contributions are suppressed.

For those reasons and due to its precise theoretical prediction and simple signature, the branching ratio of B_s meson decaying into two muons is considered the "smoking gun" of New Physics. In this book a method to measure this branching ratio at the LHCb experiment is described. LHCb is one of the four experiments along the Large Hadron Collider at the European Center of Nuclear Research (CERN) in Geneva, which became operative in November 2009.

The observation of a discrepancy between the prediction of the Standard Model could be a clear sign of New Physics, and it is of paramount importance for the future development not only of the idea of supersymmetry, but of any other grand unification theory of the fundamental interactions.

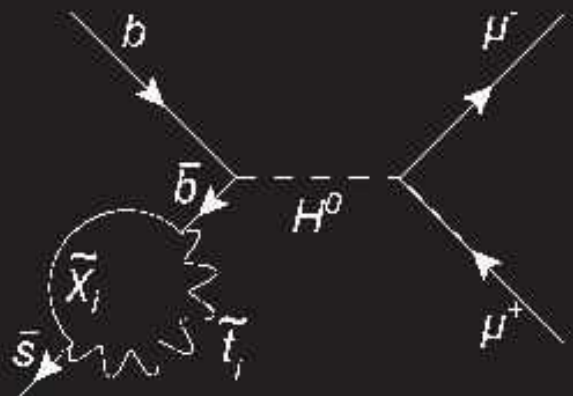


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