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B0 -> K*e+e- angular analysis at LHCb: an indirect search for New Physics

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The conflicts between cosmological observations (dark matter, matter/anti-matter asymmetry …) and the predictions of the Standard Model (SM) calls for New Physics (NP) beyond the SM, i.e. new interactions or new particles. Collider experiments such as the LHC at CERN is a privileged place for NP searches. Indeed, by smashing together two protons at nearly the speed of light, one can try to pop up a massive NP particle. But these direct searches are limited by the energy of the proton beam (E=mc2). Instead of directly creating the particle, one can try to pop up a virtual NP particle. Indeed, when a b quark transforms to an s quark, the process involves the exchange of a virtual (very short lived) particle, whose energy (mass) is allowed to exceed by far the energy (mass) of the initial b quark thanks to quantum mechanics (roughly speaking, due to Heisenberg's uncertainty principle). Thus, indirect searches can access much higher energies than direct searches for NP.

At LHCb, a large amount of B mesons (containing a b quark) are created. Some of them decay to a K*meson (containing an s quark) and two electrons. This type of b to s quark transition is very suppressed in the SM and thus any NP appearing in the process should be dominant. In particular, the presence of NP could modify the angular distribution of the final states particles detected in the LHCb detector, motivating the measurement of B0 -> K*e+e- angular distributions.*

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