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Study of hadron production through pair annihilation in the noncommutative standard model

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Abstract

Different scattering processes have been yet studied in the noncommutative standard model (SM) and different limits on the noncommutative scale have been determined. In the present work we, for the first time, study the hadron production process through pair annihilation, in the noncommutative standard model. In the experimental studies of hadron production through pair annihilation a wide range of collision energy spectrum (\sqrt{s}) has been considered. In our study, we restrict ourselves to the ranges $\sqrt{s} \ll M_z$ so having available experimental data from Belle Collaboration for B-meson production in the process $e^-e^+ \rightarrow B\bar{B}$ we shall determine a lower limit $\Lambda_{NC} > 0.37 TeV$ for the noncommutative scale. In fact, by studying the effect of noncommutativity on the differential cross section at the parton level ($e^-e^+ \rightarrow q\bar{q}$) as well as the fragmentation function of meson and comparing the theoretical results and experimental data the lower limit will be determined. Having analytical results for the pair annihilation cross section in the noncommutative SM it would be possible to specify the production cross section of each meson or baryon for various values of noncommutative scale.

Keywords: noncommutative standard model, pair annihilation, hadron, noncommutative parameter, fragmentation function, collision energy spectrum

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