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Searches for light new-physics particles with BaBar data

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We report on the latest searches for low mass states predicted in several New Physics models performed with the data collected by the BaBar detector at the PEP-II e+e- collider. In particular we search for a new muonic dark force mediated by a gauge boson (Z') coupling only to the second and third lepton families. The existence of the Z' boson is probed in e+e- -> mu+mu- Z', Z'-> mu+ mu- events. No significant signal is observed. Limits on dark-sector coupling constants are derived, improving the current constraints to the allowed parameter space. We also present a test of the existence of light scalar (A0) or vector (A') particles decaying into an invisible final state and produced in two-body processes Upsilon -> gamma A0, A0 -> invisible, and e+e- -> gamma A', A'-> invisible. Such particles appear in extensions of the Standard Model, such as the Next-to-Minimal Supersymmetric Standard Model, where a light CP-odd Higgs boson A0 naturally couples strongly to b-quarks. Vector states A'are predicted by "dark sector" models, where A'is a new U(1) gauge boson that interactions among dark matter particles and can kinetically mix with the Standard Model photon. The analysis, based on the BaBar dataset with a single-photon trigger collected in 2007-2008, sets significant constraints on the coupling of these states to electrons and b quarks.

Summary

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