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Search for light Higgs bosons in radiative Upsilon(1S) decays at BABAR

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We search for a light CP-odd Higgs boson (A0) that arises in non-minimal supersymmetric extensions of the Standard Model and naturally couples strongly to bottom quarks. The search is conducted using radiative di-muon and di-tau decays of the Upsilon(1S) meson. We use BABAR's large data sets of (92.8 +- 0.8) million Upsilon(2S) and (116.8 +- 1.0) million Upsilon(3S) decays to identify Upsilon(1S) production via the decay Upsilon(2S,3S) −> pi+pi- Upsilon(1S). This yields a high-purity sample with a Higgs-search sensitivity similar to that of radiative Upsilon(2S) and Upsilon(3S) decays. We set stringent limits on the product of branching ratios Br(Upsilon(1S) −> gamma A0) x B(A0 −> l+l-) where l = mu or tau, as well as on the effective coupling of the b-quark to the A0. Depending on the parameters of the model, the Higgs may decay predominantly into hadrons. We also present results of a search for a CP-odd Higgs boson produced in radiative Upsilon(2S) or Upsilon(3S) decays and decaying into hadrons. Our results severely restrict the available parameter space for models predicting light Higgs states.

Primary authors: BABAR COLLABORATION, (A. Soffer) (SLAC); Prof. KOLOMENSKY, Yury (UC Berkeley & LBNL (US))

Presenter: Prof. KOLOMENSKY, Yury (UC Berkeley & LBNL (US))

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