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Decay of the tetraquark with double beauty

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A detailed study is presented of the flavor-exotic isoscalar
$T_{bb}^- \equiv bb\bar{u}\bar{d}$ tetraquark. with spin and parity $J^P = 1^+$.
In realistic quark models, with a careful treatment of the 4-body problem, the T_{bb}^- is approximately 150 MeV below the strong decay threshold $B^- \bar{B}^{*0}$ and 105 MeV below the electromagnetic decay threshold $B^- \bar{B}^0 \gamma$.

The lifetime of T_{bb} is estimated, as well as the dominant decay modes where the tetraquark might be looked for in future experiments. Its total decay width is
$\Gamma \simeq 79. \times 10^{-15}$ GeV and therefore
its lifetime $\tau \simeq 8.3$ ps. The promising final states are $B^{*-}\, D^{*+}\, l^-\, \bar{\nu}_l$
and $\bar{B}^{*0}\, D^{*0}\, l^-\, \bar{\nu}_l$ among the semileptonic decays, and, among the non-leptonic ones,
$B^{*-}\, D^{*+}\, D_s^{*-}$, $\bar{B}^{*0}\, D^{*0}\, D_s^{*-}$
$B^{*-}\, D^{*+}\, \rho^-$.

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