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Bound states and decays in Relativistic Quantum Mechanics.

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Abstract content
   (Max 300 words)
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The numerical aspects of the solution of a bound state problem in relativistic quantum mechanics are considered and the completely covariant formulation of the problem is first presented. The systems with a general central potential are quantized and the wave equation for the eigenstates given by 16-components spinor, is deduced in a spherical basis. Because of the symmetries the spectral problem reduces to the solution of a singular boundary value problem of the fourth order. It is shown how Padé approximants can help or directly substitute the integration of the system. It is also shown how to deal with the addition of a perturbation term representing the spin-spin interaction.
The calculation of the hyperfine levels and decays of hydrogenic atoms, the determination of the meson masses and the widths of radiative decays of bottomonium states are finally described showing the excellent agreement with experimental data. (Refs: J. Phys. A 38 (2005) 1345–1370; J. Phys. A 39 (2006) 15207–15223; Phys. Rev. D 87, 034021 (2013); J. Phys. B 48 (2015) 085002 (9pp); arXiv:1604.08043 (2016)).

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