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A three-dimensional superconformal quantum mechanics with $sl(2|1)$ dynamical symmetry

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I discuss a three-dimensional superconformal quantum mechanics (and its associated de Alfaro–Fubini–Furlan deformed oscillator) possessing an $sl(2|1)$ dynamical symmetry. At a coupling parameter $\beta \neq 0$ the Hamiltonian contains a $1/r^2$ potential and a spin-orbit (hence, a first-order differential operator) interacting term. At $\beta = 0$ four copies of undeformed three-dimensional oscillators are recovered. The Hamiltonian gets diagonalized in each sector of total j and orbital l angular momentum (the spin of the system is $\frac{1}{2}$). The Hilbert space of the deformed oscillator is given by a direct sum of $sl(2|1)$ lowest weight representations. The spectrum of the model and its degeneracy is computed for all values of β. is computed. The dimensional reduction of the model to $d = 2$ produces two copies (for β and $-\beta$, respectively) of the two-dimensional $sl(2|1)$ deformed oscillator. The dimensional reduction to $d = 1$ produces the one-dimensional $D(2, 1; \alpha)$ deformed oscillator, with α determined by β.

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