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On the regularization of the Kepler and Coulomb problems

We describe two known regularizations of the Kepler problem: The Moser and the Kustaanheimo–Stiefel regularizations. By considering the quantization of a canonical transformation relating both regularizations, we define a Bargmann-type transform and as a consequenece a set of coherent states for the Hilbert space of square integrable functions on the 3-sphere and the hydrogen atom problem with negative energy. We describe asymptotics for clusters of eigenvalues for suitable perturbations of the hydrogen atom problem. We will describe the geometry of the above-mentioned canonical transformation involving two moment maps of related Lie groups.