Schrödinger equation of the hydrogen atom in strong magnetic fields

József M. Benkő

Konkoly Observatory of the Hungarian Academy of Sciences,
P O Box 67, H–1525 Budapest, Hungary, benko@buda.konkoly.hu

The eigenvalues belonging to the bound states of the hydrogen atom in extremely strong magnetic fields H were computed by the help of a specific eigenfunction expansion. In contrast to some wide-spread treatments, we applied a numerical method allowing us to find eigenvalues without numerical evaluation of the eigenfunctions.

From the mathematical point of view, the problem consists in the efficient computation of the point spectrum of a two-dimensional non-separable differential operator with a parameter H. Besides, the specific choice of the basis and the numerical method deliver some questions for the "pure" mathematics, e. g., properties of the parametric Hilbert spaces and the parameter-dependent behaviour of the spectrum.