Eur. Phys. J. D **57**, 1 (2010)
DOI: 10.1140/epjd/e2009-00308-1

THE EUROPEAN PHYSICAL JOURNAL D

Comment

Comment on

"Exact solution of N-dimensional radial Schrödinger equation for the fourth-order inverse-power potential"

G.R. Khan, Eur. Phys. J. D 53, 123–125 (2009)

F. Calogero[1,2,a]

[1] Dipartimento di Fisica, Università di Roma "La Sapienza", 00185 Roma, Italy
[2] Istituto Nazionale di Fisica Nucleare, Sezione di Roma, Italy

Received 3 August 2009
Published online 15 December 2009 –

Abstract. The claim made in [Eur. Phys. J. D **53**, 123 (2009)] is invalid.

Purpose and scope of the present paper is to set the record straight concerning the exact solvability of a well-known quantum mechanical problem. In the paper entitled "Exact solution of N-dimensional radial Schrödinger equation for the fourth-order inverse-power potential" [Eur. Phys. J. D **53**, 123-125 (2009)] it is claimed that "an exact series solution to the radial Schrödinger equation in N-dimensional Hilbert space for the fourth-order inverse-power potential" is obtained. Actually the claim refers to the potential $V(r) = ar^{-1} + br^{-2} + cr^{-3} + dr^{-4}$ (see (2); here and hereafter the equation numbers identify equations of the paper under consideration), where r is the radial coordinate in N-dimensional space. The (standard) technique of solution employed consists in the introduction of an appropriate *ansatz* (see (4)) for the eigenfunction of the radial stationary Schrödinger equation (see (3)), consisting (up to a prefactor) of a power series in the radial coordinate r (see (6)). A recursion relation is then obtained for the coefficients a_n of this series, where the index n identifies the terms of the series corresponding to the power r^n. This recursion relation is then solved explicitly, but to do so the assumption is made that the coupling constants $a,\ b,\ c,\ d$ characterizing the potential, as well as the energy eigenvalue, depend themselves appropriately on the index n (see (8) and (9)). Unfortunately this assumption is inconsistent with the treatment, hence the results obtained are invalid. This fact is also evident from the formula for the energy eigenvalues (see (9)), yielding a discrete set of values, while of course the problem under consideration certainly also features a continuous spectrum, indeed *only* a continuous spectrum if the 4 coupling constants $a,\ b,\ c,\ d$ are all positive.

[a] e-mail: francesco.calogero@roma1.infn.it