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Seminar der Institute für Quantenoptik und Quantenphysik

Prof. Dr. Sándor Varró

Wigner Research Centre for Physics,
Hungarian Academy of Sciences, Budapest
ELI-ALPS, ELI-HU Nonprofit Ltd., Szeged, Hungary

Regular phase coherent states represented by s-waves

Donnerstag, den 27. April 2017
10:00 Uhr
O28/ H21

Abstract:

Recently we have introduced a new regular phase operator, regular phase coherent states, and the associated "R-functions" and quantum phase probability distributions, for describing optical fields. The regular phase coherent states – which we have found as eigenstates of a new 'exponential phase operator' – has turned out to be the natural basis for treating phase-related quantities [1].

In the present talk we analyse new possible physical interpretations of this abstract formalism, by going beyond its original target, and giving closed-form analytic expressions for the regular coherent states in special 'coordinate' representations. First we discuss the coherent superpositions of zero-angular-momentum radial wave functions, i.e. s-waves, of a D-dimensional isotropic oscillator, in which case the 'coordinates' are considered as (monochromatic electric field strength) quadratures. Some applications of these coherent waves in the theory of black-body radiation will be outlined. In our second example, we show that the Hankel transform of such s-waves may also be used as wave-packet profiles for describing the free propagation and expansion of material many-boson systems in real space, where now D is three times the number of particles. In each case the regular phase coherent states correspond to exponential radial localization of the coordinates.

Reference [1] Varro S, Regular phase operator and SU(1,1) coherent states of the harmonic oscillator. *Physica Scripta* 90 (2015) 074053. E-print: arXiv: 1412.3218v2.