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# QUASICLASSICAL AND QUANTUM DYNAMICS OF SYSTEMS OF ANGULAR MOMENTA

JAN JERZY SŁAWIANOWSKI, VASYL KOVALCHUK, AGNIESZKA MARTENS, BARBARA GOŁUBOWSKA and EWA E. ROŻKO

*Institute of Fundamental Technological Research, Polish Academy of Sciences*
$5^{\mathrm{B}}$ *Pawińskiego Street, 02-106 Warsaw, Poland*

**Abstract.** Here we use the mathematical structure of group algebras and $H^+$-algebras for describing certain problems concerning the quantum dynamics of systems of angular momenta, including also the spin systems. The underlying groups are $\mathrm{SU}(2)$ and its quotient $\mathrm{SO}(3,\mathbb{R})$. The proposed scheme is considered in two different contexts.

Firstly, the purely group-algebraic framework is applied to the system of angular momenta of arbitrary origin, e.g., orbital and spin angular momenta of electrons and nucleons, systems of quantized angular momenta of rotating extended objects like molecules and etc.

Secondly, the other promising area of applications is Schrödinger quantum mechanics of rigid body with its often rather unexpected and very interesting features. Even within this Schrödinger framework the algebras of operators related to group algebras are a very useful tool.

Finally, we investigate also some problems of composed systems and the quasiclassical limit obtained as the asymptotics of "large" quantum numbers, i.e., "quickly oscillating" wave functions on groups. They are related in an interesting way to the geometry of the coadjoint orbits of the Lie group $\mathrm{SU}(2)$.

The presentation is based on the general ideas of applying group-algebraic methods and extesive use of the Lie group structure. The papers ends with consideration of the special case of the group SU(2) and its quotient SO(3,R), which is the main subject in this paper, i.e., angular momentum problems. Formally, the scheme could be applied to the isospin systems.

However, it is rather hard to imagine realistic quasiclassical isospin problems.