

Coherent States for Arbitrary Lie Group

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Abstract. The concept of coherent states originally closely related to the nilpotent group of Weyl is generalized to arbitrary Lie group. For the simplest Lie groups the system of coherent states is constructed and its features are investigated.

1. Introduction

In a number of fields of quantum theory, and especially in quantum optics and radiophysics, it is convenient to use the system of so called coherent states [1–3].

These states are in close connection with the nilpotent group first considered by Weyl [4].

A question arises: are there exist analogous systems of states for other Lie groups?

The recent paper [5] generalizes the concept of coherent states to some Lie groups. However, the method proposed in this paper cannot be applied to all Lie groups and, in particular, it is inapplicable to compact groups. Besides, with this approach the set of coherent states is noninvariant relative to the action of the group representation operators.

The present paper proposes another method to extend the concept of coherent state¹. This method can be applied to any Lie group and is consistent with the action of the group on the set of coherent states (see Section 2). Sections 3–5 of the paper deal with construction of the system of coherent states and with the investigation of its features for the simplest Lie groups.

¹ Note in this connection that although some states of such type were considered previously, the properties of the system of states as a whole do not appear to have been investigated (except for the Weyl group).