

Quantum Integrability of the Dynamics on a Group Manifold

V. Aldaya¹ M. Calixto² J. Guerrero³

F.F. Lopez-Ruiz¹

April 27, 2007

1. Instituto de Astrofísica de Andalucía, CSIC. Apartado Postal 3004. 18080 Granada (Spain).
2. Departamento de Matemática Aplicada y Estadística. Universidad Politécnica de Cartagena. Paseo Alfonso XIII 56. 30203 Cartagena (Spain).
3. Departamento de Matemática Aplicada. Universidad de Murcia. Facultad de Informática, Campus de Espinardo. 30100 Murcia (Spain).

We study the dynamics of a particle moving on the $SU(2)$ group manifold. And exact quantization of this system is accomplished by finding the unitary and irreducible representations of a finite-dimensional Lie subalgebra of the whole Poisson algebra in phase space. In fact, the basic position and momentum operators, as well as the Hamiltonian, are found in the enveloping algebra of the anti-de Sitter group $SO(3, 2)$. This algorithm mimics the one previously used in [1, 2]. This construction can be extended to more general semisimple Lie groups. This framework would allow us to achieve the quantization of the geodesic motion in a symmetric pseudo-Riemannian manifold.

References

- [1] V. Aldaya and J. Guerrero, *Journal of Physics*, **A38**(6939), 2005.
- [2] J. Guerrero and V. Aldaya, *Journal of Physics*, **A39**(L267), 2006.