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NONADIABATIC HANNAY'S ANGLE OF SPIN ONE HALF IN GRASSMANNIAN VERSION AND INVARIANT ANGLE COHERENT STATES

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Abstract. We propose to determinate the nonadiabatic Hannay's angle of spin one half in a varying external magnetic field, by using an averaged version of the variational principal. we also show how the evolution and this nonadiabatic Hannay's angle is associated with the evolution of Grassmannian invariant-angle coherent states.

1. Introduction

After the discovery of the adiabatic geometrical phase by Berry [4], there has been a substantial interest in works in this research fields. Indeed Aharonov and Anandan [1] have generalized adiabatic **Berry's phase** to nonadiabatic case in cyclic evolution. Cyclicity means that, after some time, the state returns to itself up to a phase. A way to get this cyclic states is to consider the eigenvectors of a Hermitian periodic invariant [15], which play the same basic role as the Hamiltonian eigenvectors in the adiabatic case. For this reason, invariant theory takes an important place in works on nonadiabatic phases [7, 9, 10, 17].

The classical analogue of Berry's phase is the so-called **Hannay's angle**. Hannay [13] has shown that when the adiabatic excursion takes place on a closed path in the space of parameters, an extra shift analogue to the Berry's phase is realized in the angle variables, which is called adiabatic Hannay's angle. It can be viewed as a semi classical limit of Berry's phase [4]. A geometrical angle can be defined also on a constant-action surface for cyclic evolution [6] in a classical nonadiabatic integrable Hamiltonian system; this angle is the classical counterpart of the geometrical phase [1], so it is called the nonadiabatic Hannay's angle.