

Anisotropic Spin Cluster as a Qubit

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(Received: 2006-8-2; Revised:)

Abstract: We study an anisotropic spin cluster of 3 spin $S=1/2$ particles with antiferromagnetic exchange interaction with non-uniform coupling constants. A time-dependent magnetic field is applied to control the time evolution of the cluster. It is well known that for an odd number of sites a spin cluster qubit can be defined in terms of the ground state doublet. The universal one-qubit logic gate can be constructed from the time evolution operator of the non-autonomous many-body system, and the six basic one-qubit gates can be realized by adjusting the applied time-dependent magnetic field.

PACS: 03.67.Lx, 75.10.Pq

Key words: algebraic dynamics, anisotropic spin cluster, universal one-qubit logic gate

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