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# Application of the Trotter-Suzuki formalism to the transverse ferromagnetic Ising system on a graphene layer.

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## Abstract

The Monte Carlo simulation combined to the Trotter-Suzuki formalism has been employed to study a transverse ferromagnetic Ising system on a graphene layer. The effect of the transverse field  $\Omega$ , the longitudinal magnetic field  $h$  and the next-nearest neighbors couplings  $J_2$  on the magnetic properties, the blocking temperature  $T_B$ , the blocking transverse field  $\Omega_B$  and the hysteresis behaviors have been studied.

*Keywords:* Graphene; Transverse Ising model; Blocking temperature; Blocking transverse field; Hysteresis behavior.

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## 1. Introduction

The transverse Ising Model (TIM) has attracted considerable attention since its introduction by de Gennes [1]. Using several technics and approaches, the TIM is extensively employed theoretically to study nanostructured ferroelectric or ferromagnetic systems in order to explain theoretically the experimentally found behaviors. Recently, by using the Trotter-Suzuki formalism, the electric and the magnetic properties of a ferroelectric and ferrimagnetic superlattice in the framework of TIM have been studied [2]. The effects of the transverse field and the thickness of the superlattice on the critical behavior have been investigated. In another work, based on the

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