

## Negative Magneto-Resistance Beyond Weak Localization in Three-Dimensional Billiards: Effect of Arnold Diffusion

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**Abstract:** We investigate a semiclassical conductance for ballistic open three-dimensional (3-d) billiards. For partially or completely broken-ergodic 3-d billiards such as  $S_0(2)$  symmetric billiards, the dependence of the conductance on the Fermi wavenumber is dramatically changed by the lead orientation. Application of a symmetry-breaking weak magnetic field brings about mixed phase-space structures of 3-d billiards which ensures a novel Arnold diffusion that cannot be seen in 2-d billiards. In contrast to the 2-d case, the anomalous increment of the conductance should inevitably include a contribution arising from Arnold diffusion as well as a weak localization correction. Discussions are devoted to the physical condition for observing this phenomenon.

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