Characterizing magnetic field-coupled computing devices by the Extraordinary Hall Effect

Abstract:
A submicron sized extraordinary Hall-effect (EHE) sensor for read-out of field-coupled computing devices is presented. The applied sensing structure is suitable to electrically probe the output states of field-coupled magnetic logic gates. Furthermore it reveals details on the magnetic properties of submicron-scale single-domain dots. A `split-current' architecture is chosen, where Hall-sensing takes place in a single lateral direction, in order to keep field-coupling to adjacent nanomagnets undisturbed. By focused ion beam (FIB) irradiation, the magnetic properties of Co/Pt multilayers are tailored to define both the switching field and the geometry of nanomagnetic dots. From angular measurements we conclude, that the reversal mechanism of the FIB patterned magnetic dots remains to be domain-wall driven. The sensor is a main component needed for integration of nanomagnetic computing units embedded into microelectronic systems.

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