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“Spin inverter” as building block of All Spin Logic devices¹

ANGIK SARKAR, SRIKANT SRINIVASAN, SUPRIYO DATTA, School of Electrical and Computer Engineering, Purdue University, W. Lafayette, IN, USA — All-spin logic (ASL) represents a new approach to information processing where the roles of charges and capacitors in charge based transistors are played by spins and magnets, without the need for repeated spin-charge conversion. In our past work, we have presented numerical simulations based on a coupled spin transport and Landau Lifshitz Gilbert model showing that ring oscillators and logic circuits with intrinsic directionality [IEEE Trans. Magn. 47,10, 4026, 2011; Proc. IEDM, 2011)] can be implemented by manipulation of spins in magnetic nanostructures. The aim of this talk is (1) to identify a basic ASL unit that can be interconnected to build up spin circuits analogous to the way transistors are interconnected to build conventional circuits and (2) to present a compact model for this basic unit that can be used to design and analyze large scale spin circuits. We will show that this basic ASL unit is a one-magnet “spin inverter” with gain that can be cascaded to accomplish a spin circuit implementation of almost any logic functionality

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