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Giant spin pumping effect in microwave-driven ferromagnet-topological insulator systems FARZAD MAHFOUZI, BRANISLAV K. NIKOLIC, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716, SON-HSIEN CHEN , CHING-RAY CHANG, Department of Physics, National Taiwan University, Taipei 10617, Taiwan — The spin pumping from microwave-driven precessing magnetization has recently emerged (together with spin transfer torque as its inverse effect) as one of the key phenomena of the second generation metal spintronics involving coherent spin states. The well understood pumping by ferromagnet-normal metal (FN) interfaces can also be exploited for spin batteries that generate pure spin current. However, typical output of FN systems is rather small due to spin accumulation driving the backflow of spins. Here we demonstrate that surprisingly large current can be pumped if the precessing ferromagnetic layer is surrounded by a topological insulator (based on graphene or HgTe), where vastly different dependence on the precession cone angle than in the FN-based devices is obtained. Thus, experimental realization of this proposal would make possible efficient conversion of microwave power into pure spin current, as well as understanding of how chiral spin-filtered edge state within finite-size topological insulators can be exploited in realistic inhomogeneous nanodevices.

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