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Parametric excitation of magnetization by electric field YU-JIN CHEN, HAN KYU LEE, Univ of California - Irvine, ROMAN VERBA, Institute of Magnetism, Kyiv, Ukraine, JORDAN KATINE, HGST, VASIL TIBERKEVICH, ANDREI SLAVIN, Oakland University, IGOR BARSUKOV, ILYA KRIVOROTOV, Univ of California - Irvine — Manipulation of magnetization by electric field is of primary importance for development of low-power spintronic devices. We present the first experimental demonstration of parametric generation of magnetic oscillations by electric field. We realize the parametric generation in CoFeB/MgO/SAF nanoscale magnetic tunnel junctions (MTJs). The magnetization of the free layer is perpendicular to the sample plane while the magnetizations of the synthetic antiferromagnet (SAF) lie in the plane. We apply microwave voltage to the MTJ at $2f$, where f is the ferromagnetic resonance frequency of the free layer. In this configuration, the oscillations can only be driven parametrically via voltage-controlled magnetic anisotropy (VCMA) whereby electric field across the MgO barrier modulates the free layer anisotropy. The parametrically driven oscillations are detected via microwave voltage from the MTJ near f and show resonant character, observed only in a narrow range of drive frequencies near $2f$. The excitation also exhibits a well-pronounced threshold drive voltage of approximately 0.1 Volts. Our work demonstrates a low threshold for parametric excitation of magnetization by VCMA that holds promise for the development of energy-efficient nanoscale spin wave devices.

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