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**Theory of magnetoelectric switching in spiral magnets**[1] ANDREA SCARAMUCCI, Zernike Institute for Advanced Materials, University of Groningen, THOMAS KAPLAN, Department of Physics and Astronomy and Institute for Quantum Sciences, Michigan State University, MAXIM MOSTOVOY, Zernike Institute for Advanced Materials, University of Groningen — We study magnetoelectric switching phenomena in multiferroic materials where electric polarization is induced by a spiral spin ordering. Recent experiments showed that electric polarization of $ZnCr_2Se_4$ and $Eu_{0.55}Y_{0.45}MnO_3$ can be manipulated by an applied magnetic field and that the efficiency of the magnetoelectric switching, i.e. the polarization reversal induced by reversing the direction of magnetic field, strongly depends on the strength of the field and the path along which it changes its direction. We present the results of analytical and numerical studies of deformations of the spiral states produced by the combined effect of an applied magnetic field and magnetocrystalline anisotropy and provide a simple picture explaining the rich variety of the observed behaviors. We also study clamping between ferromagnetic and ferroelectric domain walls that controls magnetoelectric switching in the conical spiral magnet $CoCr_2O_4$.

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