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Simultaneous imaging of strain waves and induced magnetization dynamics at the nanometer scale. FERRAN MACIA, ICMAB-CSIC Barcelona, MICHAEL FOERSTER, ALBA Synchrotron Light Source, NAHUEL STATUTO, Universitat de Barcelona, SIMONE FINIZIO, Swiss Light Source, PSI, ALBERTO HERNANDEZ-MINGUEZ, Paul Drude Institute Berlin, SERGI LENDINEZ, Universitat de Barcelona, PAULO V. SANTOS, Paul Drude Institute Berlin, JOSEP FONTCUBERTA, ICMAB-CSIC Barcelona, JOAN MANEL HERNANDEZ, Universitat de Barcelona, MATHIAS KLAUI, Johannes Gutenberg Universitat, LUCIA ABALLE, ALBA Synchrotron Light Source — The magnetoelastic effect or inverse magnetostriction—the change of magnetic properties by elastic deformation or strain—is often a key coupling mechanism in multiferroic heterostructures and nanocomposites. It has lately attracted considerable interest as a possible approach for controlling magnetization by electric fields (instead of current) in future devices with low power consumption. However, many experiments addressing the magnetoelastic effect are performed at slow speeds, often using materials and conditions which are impractical or too expensive for device integration. Here, we have studied the effect of the dynamic strain accompanying a surface acoustic wave on magnetic nanostructures. We have simultaneously imaged the temporal evolution of both strain waves and magnetization dynamics of nanostructures at the picosecond timescale. Our experimental technique, based on X-ray microscopy, is versatile and provides a pathway to the study of strain-induced effects at the nanoscale.

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