ACOUSTICS2008/2862
Evidence for vortex transport by surface acoustic waves in a high-Tc superconductor

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The interaction of surface acoustic waves (SAW) with the magnetic vortex system in YBa2Cu3O7 is investigated. A 100nm YBCO film is deposited on a piezoelectric substrate and structured for electrical 4-point measurements. Interdigital transducers are fabricated on the same substrate. When applying an external magnetic field perpendicular to the film surface a SAW-induced dc-voltage perpendicular to the acoustic sound-path is observed. This is interpreted as consequence of directed dragging of vortices by the SAW induced dynamic pinning structure [1]. The piezoacoustic wave acts as a conveyor for mobile flux quanta. Additional ac-dc-conversion as result of the nonlinear current-voltage characteristics close to the superconducting transition temperature can be resolved and separated. In order to observe the sound-induced vortex motion directly, the flux distribution is analyzed magnetooptically. Magnetooptic imaging allows for time resolved analysis of flux distribution. Quantitative analysis of changes in the magnetization distribution when acoustic driving fields are applied is carried out. The influence of piezoacoustic waves on the pinning properties and sound-induced depinning is discussed.
[1] F. Jachmann and C. Hucho, Sol. State Comm., 142 (4) (2007), 212