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Visualization of GHz Acoustic Wave in LiNbO3 by Microwave Impedance Microscopy LU ZHENG, Department of Physics , Univ of Texas at Austin, HUI DONG, Department of Electrical Computer Engineering, Univ of Texas at Austin, XIAOYU WU, YEN-LIN HUANG, Department of Physics , Univ of Texas at Austin, WEIDA WU, Department of Physics and Astronomy, Rutgers University, ZHENG WANG, Department of Electrical Computer Engineering, Univ of Texas at Austin, KEJI LAI, Department of Physics , Univ of Texas at Austin — Acoustic wave devices based on piezoelectric materials play a key role in the modern information technology and the research field of phononic metamaterials. High-resolution real-space mapping of the phononic modes is therefore of fundamental importance for the understanding of scattering, diffraction, and localization of the acoustic waves. To date, however, it has been challenging to directly image the GHz-range acoustic properties in piezoelectrics. Using a microwave impedance microscope (MIM), we demonstrate the ability to visualize the interference pattern of GHz acoustic waves in periodically poled lithium niobate (PPLN) samples, where the domain walls serve as good reflectors of the elastic deformation. The constructive and destructive interference regions exhibit different loss in the microwave images, which can be simulated by finite-element analysis of the PPLN samples. Our results pave the way to locally probe various phenomena of sound waves in phononic materials by nanoscale electromagnetic imaging.

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