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Title:Super-resolution imaging via spatiotemporal frequency shifting and coherent detection
Authors:Alekseyev, Leonid (1); Narimanov, Evgenii (1); Khurgin, Jacob (2)
Author affiliation:(1) Department of Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47907, United States; (2) Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD 21218, United States
Corresponding author:Alekseyev, L.
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Abstract:Diffraction limit is manifested in the loss of high spatial frequency information that results from decay of evanescent waves. As a result, conventional far-field optics yields no information about an object's subwavelength features. Here we propose a novel approach to recovering evanescent waves in the far field, thereby enabling subwavelength-resolved imaging and spatial spectroscopy. Our approach relies on shifting the frequency and the wave vector of near-field components via scattering on acoustic phonons. This process effectively removes the spatial frequency cut-off for unambiguous far field detection. This technique can be adapted for digital holography, making it possible to perform phase-sensitive subwavelength imaging. We discuss the implementation of such a system in the mid-IR and THz bands, with possible extension to other spectral regions.
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