Abstracts

Scanning near-field millimeter-wave microscopy using a metal slit as a scanning probe

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In this paper, a novel type of scanning near-field millimeter-wave microscopy using a metal slit-type probe is proposed. A tapered reduced-height rectangular waveguide forms the slit aperture, which has a width much smaller than one wavelength /spl lambda/ and length of the order of /spl lambda/. The slit probe can be operated in the TE/sub 10/ mode and, thus, results in high transmission efficiency, even when the width is exceedingly small. An image reconstruction algorithm based on computerized tomographic imaging is used to obtain two-dimensional near-field images. Experiments performed at 60 GHz (/spl lambda/=5 mm) show that image resolution equal to the slit width (/spl sim/80 /spl mu/m) is achieved. As an application of this scanning slit microscopy, visualization of transition phenomena of photoexcited free carriers in silicon have been successfully demonstrated, yielding useful information on the dynamics of free carriers in semiconductor materials.

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