8
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Title:Full-wavelength dipole antenna on a hybrid GaAs membrane and Si lens for a terahertz photomixer
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Abstract:A full-wavelength dipole antenna on a GaAs membrane, covered with a silicon lens to improve the output power of a terahertz (THz) photomixer, is proposed. A fullwavelength dipole antenna supported by a GaAs membrane structure has been proven to achieve both high input resistance and high radiation efficiency for improved overall efficiency. However, the antenna has insufficient directivity. An extended hemispherical lens was introduced in front of the antenna in a non-contact configuration and coupled to the antenna radiation to achieve high directivity by beam collimation. This approach greatly enhances the antenna directivity while avoiding an inherent obstacle of the input resistance reduction caused by the high permittivity lens substrate. The resulting antenna after optimization had a 3818-Ω input resistance and a 71.2% radiation efficiency, corresponding to approximately 57% total efficiency at the 1.07-THz resonance frequency. The total efficiency of this structure is approximately 6.8 times that of a full-wavelength dipole antenna with the same hemisphere lens size while exhibiting slightly lower directivity. © Springer Science+Business Media, LLC 2012.
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