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Accession number:20123915464468
Title:Theory of monochromatic terahertz generation via Cherenkov phase-matched difference frequency generation in LiNbO3 crystal
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Source title:Journal of the Optical Society of America B: Optical Physics
Abbreviated source title:J Opt Soc Am B
Volume:29
Issue:9
Issue date:September 1, 2012
Publication year:2012
Pages:2425-2430
Language:English
ISSN:07403224
CODEN:JOBPDE
Document type:Journal article (JA)
Publisher:Optical Society of America, 2010 Massachusetts Avenue NW, Washington, DC 20036-1023, United States
Abstract:A theory of Cherenkov phase-matched monochromatic terahertz (THz)-wave generation via difference frequency generation in a nonlinear crystal is developed. An experimental situation (LiNbO3 pumped by dual-wavelength near-infrared nanosecond pulses) is considered. This theory accounts for the finite size of pump beam and allows us to explore the generation of transverse THz wave vector. The output characteristic of this THz source is analyzed based on the analytical expression, including radiation pattern, conversion efficiency, and tuning range. Calculated tuning curves are presented, which reasonably agree with previous experimental results. The influence of divergence of the focused pump beam on total radiated energy is studied in detail. Optimal pump beam size that maximizing generated THz energy is obtained. © 2012 Optical Society of America.
Number of references:27
Main heading:Optical frequency conversion
Controlled terms:Conversion efficiency - Optical pumping - Phase matching - Terahertz waves
Uncontrolled terms:Analytical expressions - Cherenkov - Difference-frequency generation - Dual-wavelength - Finite size - LiNbO3 crystals - Nanosecond pulse - Near Infrared - Nonlinear crystals - Output characteristics - Pump beams - Radiated energies - Terahertz - Terahertz generation - THz sources - THz waves - Tuning curve - Tuning ranges - Wave generation
Classification code:525.5 Energy Conversion Issues - 711 Electromagnetic Waves - 713 Electronic Circuits - 741.1 Light/Optics - 741.1.1 Nonlinear Optics
DOI:10.1364/JOSAB.29.002425