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Title:Design and threshold analysis for a novel intracavity THz-wave parametric oscillator

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Abstract:A novel surface -emitted intracavity THz-wave parametric oscillator (TPO) was designed to improve the down-conversion efficiency. An intersecting cavity geometry was employed that allowed the nonlinear medium to be placed within the cavity of the pump laser. The surface-emitted scheme was employed to extract the THz-wave from MgO:LiNbO₃ crystal. The expression of the effective parametric gain length under the condition of noncollinear phase matching condition was derived. The pump beam with larger radius and the crystal with longer length could increase the effective parametric gain length efficiently. Based on the expression of the effective parametric gain length the expression of TPO oscillation threshold was deduced and was theoretically analyzed under different conditions. Larger beam radius of pump wave, lower frequency of THz-wave, shorter cavity physical length, higher reflectivity of the Stokes output coupler and longer crystal length can effectively reduce the oscillation threshold. Such an analysis is useful for the experiments of TPO.

Number of references:25

Main heading:Parametric oscillators

Controlled terms:Band structure - Conversion efficiency - Phase matching - Pumping (laser)

Uncontrolled terms:Beam radius - Cavity geometry - Crystal length - Downconversion - Intracavities - Lower frequencies - MgO:LiNbO₃ - Non-collinear phase-matching - Nonlinear medium - Novel surfaces - Oscillation threshold - Output couplers - Parametric gain - Physical length - Pump beams - Pump laser - Pump waves - Threshold analysis

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