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Accession number:13004257
Title:Terahertz generation in an electrically biased optical fiber: a theoretical investigation
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Source title:International Journal of Optics
Abbreviated source title:Int. J. Opt. (USA)
Publication date:2012
Pages:486849 (6 pp.)
Language:English
ISSN:1687-9384
Document type:Journal article (JA)
Publisher:Hindawi Publishing Corporation
Country of publication:USA
Material Identity Number:GK09-2011-002
Abstract:We propose and theoretically investigate a novel approach for generating terahertz (THz) radiation in a standard single-mode fiber. The optical fiber is mediated by an electrostatic field, which induces an effective second-order nonlinear susceptibility via the Kerr effect. The THz generation is based on difference frequency generation (DFG). A dispersive fiber Bragg grating (FBG) is utilized to phase match the two interacting optical carriers. A ring resonator is utilized to boost the optical intensities in the biased optical fiber. A mathematical model is developed which is supported by a numerical analysis and simulations. It is shown that a wide spectrum of a tunable THz radiation can be generated, providing a proper design of the FBG and the optical carriers.
Number of references:24
Inspec controlled terms:Bragg gratings - microwave photonics - nonlinear optical susceptibility - numerical analysis - optical design techniques - optical fibre dispersion - optical fibre theory - optical frequency conversion - optical Kerr effect - optical phase matching - optical resonators - optical tuning - terahertz wave generation
Uncontrolled terms:electrically biased optical fiber - terahertz radiation generation - electrostatic field - second-order nonlinear susceptibility - Kerr effect - difference frequency generation - DFG - dispersive fiber Bragg grating - FBG - phase match - optical carriers - ring resonator - optical intensities - mathematical model - numerical analysis - tunable THz radiation
Inspec classification codes:A4281W Other fibre optical devices and techniques - A4265J Beam trapping, self focusing, thermal blooming, and related effects - A4265K Optical harmonic generation, frequency conversion, parametric oscillation and amplification - A4281D Optical propagation, dispersion and attenuation in fibres - A4280F Gratings, echelles - A4215E Optical system design - B4125 Fibre optics - B1350P Microwave photonics - B4340K Optical harmonic generation, frequency conversion, parametric oscillation and amplification - B4340J Optical self-focusing and related effects
Treatment:Theoretical or Mathematical (THR)
Discipline:Physics (A); Electrical/Electronic engineering (B)
DOI:10.1155/2012/486849
Database:Inspec

IPC Code:G02B5/18; G02F1/35; G02F2/00