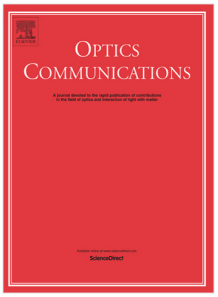
Accepted Manuscript



Extended depth of field in continuous-wave terahertz computed tomography based on Bessel beam

Dayong Wang, Bin Li, Lu Rong, Zhihao Xu, Yanlin Zhao, Jie Zhao, Yunxin Wang, Changchao Zhai

PII: S0030-4018(18)30812-5
DOI: https://doi.org/10.1016/j.optcom.2018.09.031
Reference: OPTICS 23470

To appear in: *Optics Communications*

Received date : 30 June 2018
Revised date : 5 September 2018
Accepted date : 14 September 2018

Please cite this article as: D. Wang, et al., Extended depth of field in continuous-wave terahertz computed tomography based on Bessel beam, *Optics Communications* (2018), https://doi.org/10.1016/j.optcom.2018.09.031

Extended Depth of Field in Continuous-wave Terahertz Computed Tomography Based on Bessel Beam

Dayong Wang,[1, 2] Bin Li,[1] Lu Rong,[1, 2*] Zhihao Xu,[1] Yanlin Zhao,[1]
Jie Zhao[1, 2], Yunxin Wang[1, 2], Changchao Zhai[1]

[1]College of Applied Sciences, Beijing University of Technology, No. 100 Pingleyuan Rd., Beijing, 100124, China

[2]Beijing Engineering Research Center of Precision Measurement Technology and Instruments, Beijing University of Technology, No. 100 Pingleyuan Rd., Beijing, 100124, China

* Corresponding author: ronglu@bjut.edu.cn

Abstract

Terahertz (THz) radiation is able to penetrate many different types of nonpolar and nonmetallic materials. THz imaging can be combined with computed tomography (CT) to form THz CT, which is an effective method to visualize the sample's internal structure. Here, we report the continuous-wave (CW) THz CT imaging results using Bessel beam generated by use of axicon. In this method, the sample cross section is scanned in all translation and rotation directions. Due to the non-diffracting property of the Bessel beam, two-dimensional (2-D) cross-sectional images of the internal structure of the plastic pipe at different distances from axicon can be full reconstructed by using filtered back projection algorithm. Compared with conventional Gaussian beam, Bessel beam can extend the depth of field in CW THz CT system. Using this system, we obtained 2-D cross-sectional image of the internal structure of the clogged plastic pipe and the obstruction was accurately detected by comparing 2-D cross-sectional images at different sections. Our experimental data demonstrated a feasible application of the CW THz CT system with Bessel beam in non-destructive testing.

Keywords: terahertz imaging; computed tomography; depth of field; Bessel beam; axicon;