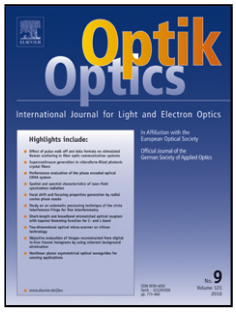

Title: Semi-analytical simulation for temperature of material irradiated by CW laser considering the effect of atmospheric thermal blooming

Author: Guibo Chen Juan Bi

PII: S0030-4026(16)31257-8
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2016.10.071
Reference: IJLEO 58339

To appear in:

Received date: 22-8-2016
Accepted date: 24-10-2016

Please cite this article as: Guibo Chen, Juan Bi, Semi-analytical simulation for temperature of material irradiated by CW laser considering the effect of atmospheric thermal blooming, Optik - International Journal for Light and Electron Optics http://dx.doi.org/10.1016/j.ijleo.2016.10.071

Semi-analytical simulation for temperature of material irradiated by CW laser considering the effect of atmospheric thermal blooming

Guibo Chen

Juan Bi*

custcb@126.com

School of Science, ChangChun University of Science and Technology,

ChangChun 130022, PR China

*Corresponding author

Abstract

In this paper, the temperature of material irradiated by continuous wave (CW) laser considering the effect of atmospheric thermal blooming is simulated and analyzed. By using the analytical solution of the atmosphere thermal blooming for axial symmetry, the heat conduction model of CW laser irradiating surface of material after the atmosphere thermal blooming is established. Separation of variables is used to solve the heat conduction equation and its semi-analytical solution is obtained. We studied the effect of laser propagation distance and the intensity of undistorted laser beam on the thermal blooming, and on the temperature distribution of the material. The results show that the greater the laser propagation distance in the atmosphere, the more obvious the effect of the thermal blooming, which leads to the greater distortion of the temperature distribution of the material.

Keywords: Thermal blooming; Laser irradiation; Temperature; Semi-analytical solution