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Erratum: Dynamics of filament formation in a Kerr medium [Phys Rev. A 71, 063811 (2005)]

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Erratum: Dynamics of filament formation in a Kerr medium [Phys Rev. A 71, 063811 (2005)]

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We have found an error in this paper. In our calculation of the intensity threshold for breakdown in CS_2 we erroneously used the ionization energy of molecular CS_2 (10.08 eV). The correct value should be 3.3 eV [1], the band gap energy of liquid CS_2. Using the band gap energy, nonlinear absorption will be a three-photon process, and the calculated breakdown threshold becomes 8.5×10^{11} W/cm^2 (as opposed to the value of 2×10^{13} W/cm^2 reported previously). Multiphoton absorption and plasma defocusing could then become significant for the intensity of the filaments, $I_{fil}=(5.9\pm2.4)\times10^{11}$ W/cm^2, that was measured experimentally.

In order to test our conclusion that a model including a fifth order nonlinearity is the best fit to the experimental data, we have numerically simulated the pulse propagation in CS_2 both with and without fifth order nonlinearity (n_4) and plasma effects. The numerical model is the same in this paper with the addition of plasma effects (negative index change and multiphoton absorption). The parameters for the plasma effects were calculated according to the method described in Ref. [2]. The numerical results show that for the case of only plasma effects (with $n_4=0$) a filament forms with an intensity of 3×10^{12} W/cm^2, well above the experimental value. For both cases including n_4 (with and without plasma effects) the intensity peaks at about 10^{12} W/cm^2, and the inclusion of plasma effects results in a loss of 15% after 4 mm of propagation. It should be noted that while the losses due to multiphoton absorption can be significant, they are not essential for filament formation. In addition, the simulation with only plasma effects resulted in very high plasma density ($>10^{19}$ cm^{-3}) which was not observed experimentally [3].

In conclusion, our numerical results show that the effect of plasma alone cannot reproduce the experimental results, while including a fifth order nonlinearity (with or without plasma) generates good agreement with the experiments. The main conclusion of the numerical section of the original paper then remains unchanged in that the fifth order nonlinearity provides good agreement with the experiment while plasma effects alone do not.

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