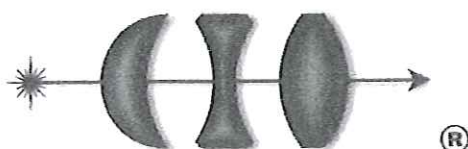


Handling supercontinuum in the femtosecond regime by spectra generation and by optimization with genetic algorithms



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Abstract

Supercontinuum generation has been the subject of extensive studies in optical fibers and its special spectral shapes are of many interest for a variety of applications. For input pulses in the femtosecond regime, the dynamics of supercontinuum generation can be broadly decomposed into two phases: an initial fission into an N soliton dominated by the Kerr effect and second order dispersion; and a subsequent redistribution of spectral energy where the Raman effect and higher dispersion orders also play a role. In this work, these two phases are exploited to numerically handle the spectral output in order to adequately apply the supercontinuum generation phenomenon to medical image techniques, specifically, optical coherence tomography. The First part is focused on the development of methods that use the properties of dispersive waves and the soliton self-frequency shift to obtain simultaneous spectral peaks tuned on specific frequencies, both of them sited on after the initial-fission scenario. Additionally, it is shown a method to obtain an ultra-flat spectrum based on self-phase modulation. The last effect is sited on before the initial-fission scenario. Based on these methods, the results of this thesis show that supercontinuum spectral output can be tailored to bell-shaped pulses to optical coherence tomography applications, ultra-flat to telecommunications or any proposed spectral forms (conditions permitting), resulting in a useful tool with great potential for many practical areas.

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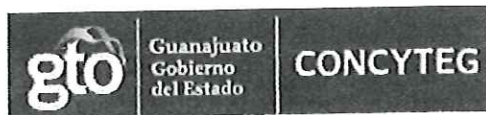
TO THE INSTITUTIONS THAT SUPPORTED MY STUDIES

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