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(G*) (POS-38) Two Color Nonlinear Fiber Amplification

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Nonlinear laser fiber amplification is a powerful technique known for generating high-energy, ultrashort pulses efficiently and compactly, finding applications in various fields. In this study, our objective is to develop and optimize a two-color nonlinear amplification system, which will serve as a crucial component for future multi-frequency Raman generation (MRG) experiments. The traditional two-color chirped pulse amplification (CPA) method has limitations such as gain narrowing and compressibility. To overcome these drawbacks, we focus on the construction of a two-color laser system using nonlinear amplification techniques. Initially, a single-color broad spectrum is generated using a gain-managed nonlinear amplifier (GMNA). By selectively removing the central portion of the spectrum through the implementation of notch filters, a two-color configuration is created. This modified spectrum is then employed as a seed for a nonlinear amplifier, where self-phase modulation (SPM) is utilized to broaden the spectral content of each color while maintaining high-quality pulses. The resulting pulses can be easily compressed through a simple grating compressor. The optimization process involves carefully selecting parameters such as fiber length, pump power and direction, and the size and placement of the center notch colors to control the extent of spectral broadening. Simulations based on the gain-rate equation will be conducted to study the performance of the system, which will be subsequently validated through experimental verification. By developing this two-color nonlinear amplification system, we aim to overcome the limitations of traditional two-color CPA methods and provide a suitable platform for future MRG experiments.

Keyword-1

Laser Amplification

Keyword-2

Ultrafast

Keyword-3

Nonlinear Optics

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