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STUDY OF CHIRPED PULSE COMPRESSION IN OPTICAL FIBER FOR ALL FIBER CPA SYSTEM

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ABSTRACT

Fiber lasers are highly regarded in present laser technological fields due to their high efficiency, beam quality and easy thermal management. Although, performance of fiber laser system is challenged by different nonlinear effects at high power. In case of ultra-short high power pulse fiber laser, nonlinearity plays significant role in pulse propagation through optical fiber as a result of presence of the high peak power of short pulses. Chirped pulse amplification (CPA) system can be incorporated in the design of such fiber laser as a way of increasing the pulse energy while mitigating the nonlinear effects. CPA system stretches the chirped pulses coming from fiber laser to reduce its peak power and then linearly amplified it. Amplified pulse experienced a pulse compressor made by bulk diffraction grating employed for recompression of the pulse. This bulk diffraction grating arrangement can be supplanted by specially design fiber arrangements to design all fiber CPA system using the nature of chirped pulse propagation in negative dispersion (anomalous) regime. In this paper, ultra-short chirped pulse propagation and compression in anomalous regime under the influence of Kerr nonlinearity, initial chirp and dispersion is studied using the nonlinear Schrödinger equation for optical fibers for all fiber CPA system.

KEYWORDS: Anomalous Dispersion, Chirped Pulse Amplification, Kerr Effect, Nonlinear Schrödinger Equation, Self Phase Modulation