Laser Pulses – Amplification Made Easy

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The invention describes a procedure and an easy-to-use optical setup to amplify laser pulses with an optical compressor. The clever optical configuration enables an extraordinarily high laser peak power through an extremely resource-friendly and easy to use setup.

- Simple, space-efficient, optical compressor configuration
- Resource-friendly optical layout
- No materials-specific laser pulse peak density
- Long-lasting laser compression unit

Fiedls of applications

This invention shows its highlights in the field of application where amplifier laser systems with ultra-high laser peak power are required for e.g. structuring and maniplutaing surfaces at wish. Possible applications comprises among others drilling of holes, cutting corbon reinforced plastics fibers, structuring large area surfaces and welding of glas. High-intensity lasers are also used in scientific applications such as atmospheric studies, or the generation of high-harmonics will benefit from the present invention.

Background

The invention involves a method and purposeful implementation of amplification of laser pulses, which at the same time minimizes the risk of damage to the compressor. Thus, it helps to significantly extend the life of the optical laser pulse compressor.

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Service
Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Problem

Laser pulse amplification soon reaches a limit once you go beyond the materials damage threshold of the optical component being used. The invention comprises a method and a focused effort to amplify seed laser pulses, which simultaneously minimizes the risk of damaging the compressor unit. Thus, this invention helps to increase the lifetime cycle of this particular compressor unit.

Solution

This invention allows to separate certain laser pulse trains in a timely manner, but not in the space domain, to obtain so-called laser-sub-pulses. Therefore the optical amplification compartment needs only a single compressor unit which leads to a very efficient cost-benefit ratio in all aspects of this technology field. The time distribution of those laser-sub-pulses enables the system to be satisfied with a single passively driven laser combiner unit and laser pulse train combiner path. Therefore, there is no need for an active stabilization of the laser cavity length. For that purpose a special combiner scheme is used. The core of this invention can be described by a symmetrical optical path for the pulse divider and pulse combiner section, which acts accordingly depending on the flow direction of the laser-sub-pulses. In short, this invention allows laser pulse amplification at a low cost and small footprint for the first time.

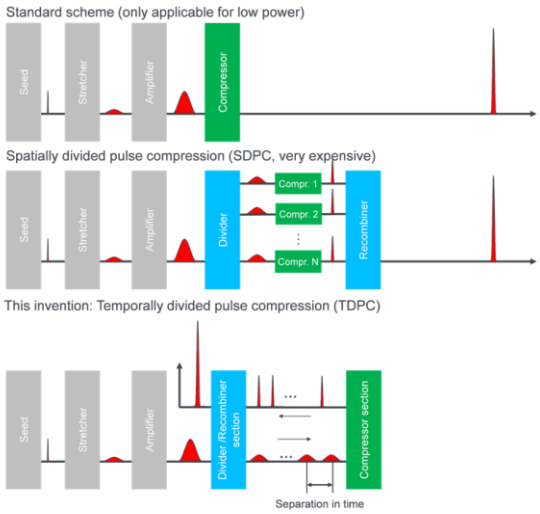

Abb 1: Schematics of optical components [F.Bienert, Institut für Strahlwerkzeuge, University of Stuttgart]

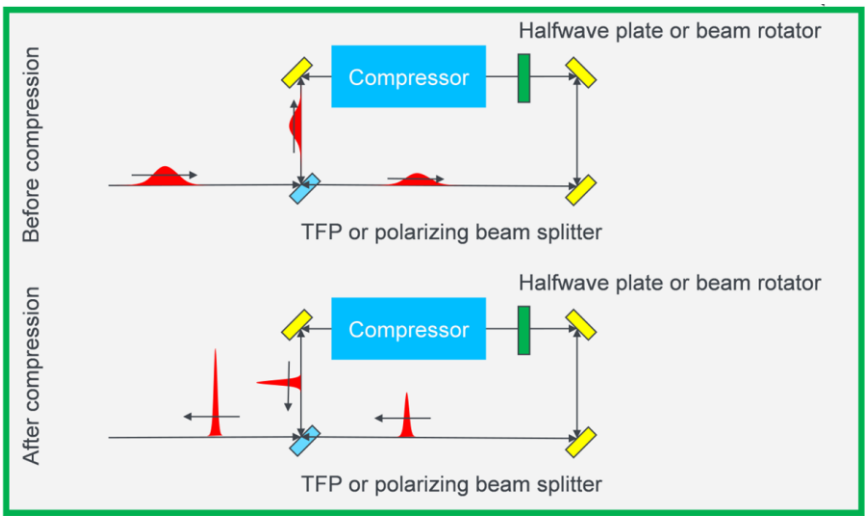

Abb 2: Functionality of the optical configuration [F. Bienert, Institut für Strahlwerkzeuge, Univerity of Stuttgart]