

Status and development of a high-power laser facility at IPEN

R. E. Samad¹, A. Bonatto², N. D. Vieira Jr.¹

¹Center for Lasers and Applications, Nuclear Energy Research Institute, IPEN-CNEN, São Paulo, Brazil.

²Federal University of Health Sciences of Porto Alegre, Porto Alegre, Brazil

Corresponding author: resamad@gmail.com

IPEN's Center for Lasers and Applications utilized laser pulses produced by a hybrid Ti:Sapphire/Cr:LiSAF CPA system. The CPA frontend is a Quantronix Odin laser that generates 50 fs, 1 mJ pulses at 1 kHz. The system has been modified to allow the extraction of the amplified, uncompressed pulses, which are then sent to an in-house, custom-designed Cr:LiSAF multipass amplifier [1,2] and compressor, generating up to 0.5 TW pulses at 5 Hz. This system is shown in Fig. 1, and is being upgraded replacing the Cr:LiSAF by a multipass Ti:sapphire amplifier, aiming to obtain near-TW pulses at 10 Hz.

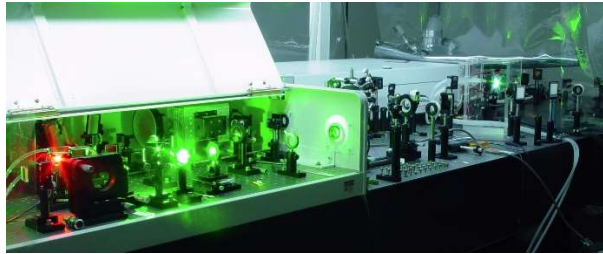


Figure 1: Hybrid Ti:Sapphire/Cr:LiSAF CPA system, 0.5 TW @ 10 Hz.

As a first target, the upgraded system will aim to investigate the production of medical radioisotopes by photonuclear reactions triggered by Bremsstrahlung gamma photons from electrons; IPEN is developing a laser wakefield accelerator (LWFA) – potentially the first one in Brazil –, to initially operate in the self-modulated regime (SM-LWFA). With this goal, multiple subjects related to the SM-LWFA are being addressed ranging from theoretical works and PIC simulations [3] to the in-house development of de Laval nozzles [4], and plasma diagnostics [5]. Currently, IPEN intends to establish a high-intensity, multi-user laser facility that will be equipped with a 15 TW, 35 fs pulse laser system at 10 Hz. The system will be modular, featuring a main oscillator, a temporal stretcher, a regenerative and 2 multipass amplification stages, and a pulse compressor, capable of being upgraded to 30 TW. The system, the experimental setup and the diagnostics are designed to be versatile, prepared for supporting particle accelerations processes and even extreme conditions, a platform for multi-users experiments.

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