Power amplifier for Ti:Sapphire multi 100 TW and PW lasers

F. Canova, G. Riboulet, L. Vigroux, P-M Paul
Amplitude Technologies, 2-4 rue du Bois Chaland - CE 2926, 91029 EVRY – France

fcanova@amplitude-technologies.com

ABSTRACT:

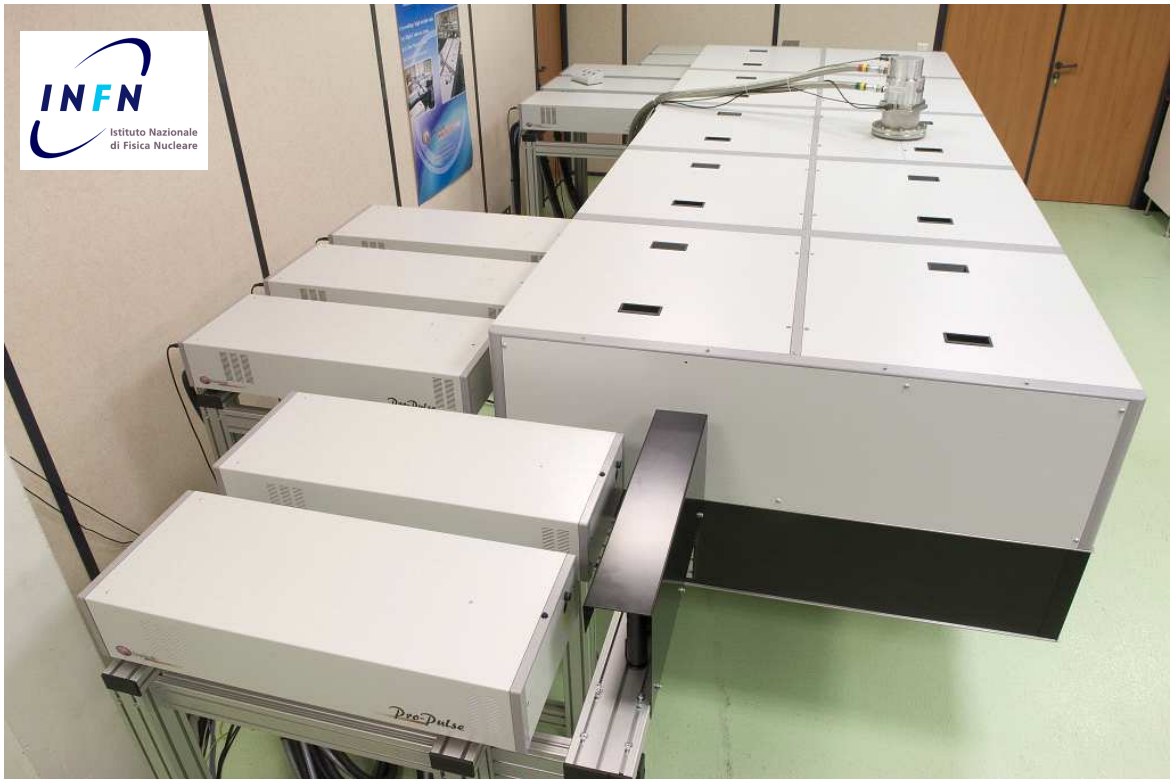
The applications of multi 100 Terawatts or Petawatts lasers require high repetition rate lasers. Ti:Sapphire technologies offer solutions for Petawatt range lasers with repetition rate of a few Hertz. For this laser class, big technological and technical challenges appear in the high power amplifier and its pumps

We develop multi-passes amplifier and pump laser adapted to multi joules laser systems.

The mixing of high energy pump laser beams in a single Ti:sapphire amplifier offer solution to improve the beam quality , the beam stability and the pulse contrast. Stabilities better than 1% RMS, have been obtained at the output of 4 joules amplifier, both in high repetition rate mode and in single shot operation. Short pump pulses (4 to 8 ns) associated with a precise timing of pump energy deposition into the crystal prevent transverse lasing on large amplifier crystal cryogenically cooled.

We report results obtained with a 10Hz, 220TW 22fs laser. The laser has been designed to obtain a very good reliability and to be operated by a single operator. A supervision/command integrated system allows a complete control of laser pulses shot to shot.

We will comment some important issues for getting ultra short pulse duration, very high contrast ratios and excellent beam quality at the same time. Results already obtained underline R&D efforts to be considered in order to achieve ultra intense peak power as PW level at high repetition rate.



FLAME 200TW-class final power amplifier (LNF Frascati, Italy)