

High efficiency CO₂ lasers for inertial confinement fusion *

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For inertial confinement fusion induced by lasers, short pulse CO₂ lasers represent the most efficient developed systems available today. Since 1969, Los Alamos Scientific Laboratory has built one-, two-, and eight-beam laser systems and is presently assembling the 72-beam ANTARES system. Many problems in laser physics, optical science and technology, energy extraction, pulsed power technology, and parasitic oscillations have been resolved. The design and present performance of the eight-beam HELIOS system (5 — 10 kJ, 1800 torr of helium rich gas, ~ 0.5 — 1 ns pulse) and the anticipated performance of ANTARES (30 — 100 kJ, 1800 torr of helium free gas, 0.5 — 1 ns pulses) will be described. Plans for much larger systems possessing efficiencies about an order of magnitude greater than the present 1 — 2% will be discussed, and will include an assessment of the role of optical multiplexing in these very efficient systems.

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用于惯性约束聚变的高效率 CO₂ 激光器

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对于激光引发的惯性约束聚变，短脉冲 CO₂ 激光器是现今最有效的系统。从 1969 年开始，洛斯·阿拉莫斯科学实验室就在建立 1 路、2 路和 8 路激光系统。目前正在安装 72 路的 ANTARES 系统。很多方面的问题，如激光物理、光学科学和技术、抽取能量、脉冲功率技术以及寄生振荡等都已解决。本文将描述 8 路 HELIOS 装置(5~10 千焦耳, 0.5~1 毫微秒脉宽, 充 1800 托的富于氦的气体)的设计和目前工作情况及 ANTARES (30~100 千焦耳, 1800 托无氦气体, 0.5~1 毫微秒脉宽) 装置的预期性能。本文将讨论效率约比目前的 1~2% 高一个数量级的大得多的系统的计划, 其中包括评价光束的多通道传输在这些相当有效的系统中的作用。