Progress in inertial fusion research at the Los Alamos Scientific Laboratory

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Inertial fusion is being pursued at the Los Alamos Scientific Laboratory for the dual goals of military applications and commercial power. For both of these goals, it is necessary to develop fusion fuel targets which can be driven to high gains. At Los Alamos, a series of carbon dioxide gas lasers is being constructed for laser fusion experiments. Helios, the world's most powerful gas laser system, is being used for integrated target experiments with energy on target in excess of 5 kilojoules. Antares, with a design output of 100 kilojoules, is being fabricated and assembled in a recently completed laboratory complex. The design and operation of these efficient, short pulse gas laser systems will be described.

Experiments on Helios, designed to compress fuel to high densities, have achieved peak fuel density of about 4 gm/cm^3. Experimental diagnostics included X-ray pinhole photographs, neutron yield determination, time interval between the arrival of the laser pulse and the emission of the neutrons, and fuel temperature determined from the spread in the neutron arrival times. Further experiments are underway to achieve higher density and to improve and extend diagnostic capabilities.

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洛斯·阿拉莫斯科学实验室惯性聚变研究的进展

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洛斯·阿拉莫斯科学实验室正在从事的惯性聚变有军事应用和商用发电两个目的。为这两种目的，都必须发展高增益的聚变燃料靶。在洛斯·阿拉莫斯，为了激光聚变实验的目的，一系列 CO_2 气体激光器正在安装筹建。Helios——世界上功率最高的气体激光系统——正用于综合打靶实验，其辐射在靶面的能量超过 5 千焦耳。Antares——其设计输出为 10 万焦耳——正在制造和在新近完成的综合实验室内装配。本文将描述这些高效率短脉冲气体激光系统的设计和操作。

使用将燃料压缩到高密度的 Helios 装置进行的实验，已取得约 4 克/厘米^3 的峰值燃料密度。实验诊断包括X光针孔照相、中子产额测定、激光脉冲的到达同中子发射之间的时延以及由中子到达时间的分布来决定燃料温度。为达到更高密度，改善和扩大诊断能力，实验正在进一步进行。