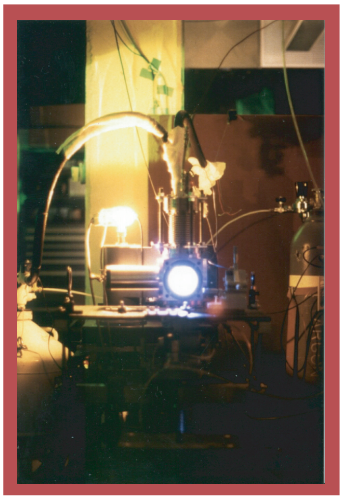
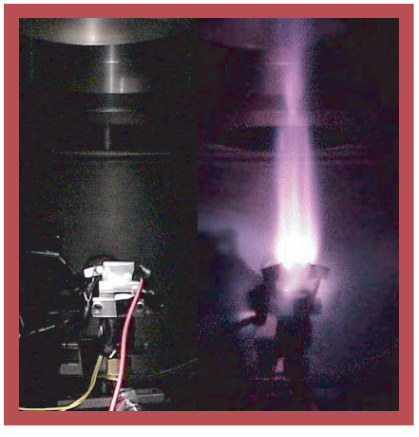
Intense Laser Matter Interactions



The **interaction of extremely intense laser pulses** with solids, liquids and gases has many technological applications and is rich in physics. Our experiments involve elements of atomic physics, nonlinear optics, plasma physics, condensed matter physics and quantum electronics. There are two conditions generated in our laser-matter interaction experiments that make many of the applications possible, and motivate much of the physics interest. The first is that **intense lasers** can locally heat up matter to about 100 times the temperature of the sun. This means that such heated material is a **strong x-ray source**. The second is that high laser intensities, the **optical properties** of materials behave in altogether new ways. For example, at laser intensities greater than about 1017 W/cm2 (routinely generated in our lab), one must consider relativistic corrections to the index of refraction! Such effects make possible exotic **laser-driven particle acceleration schemes**, which have the aim of shrinking existing multi-kilometer long particle accelerators to the size of a table top.



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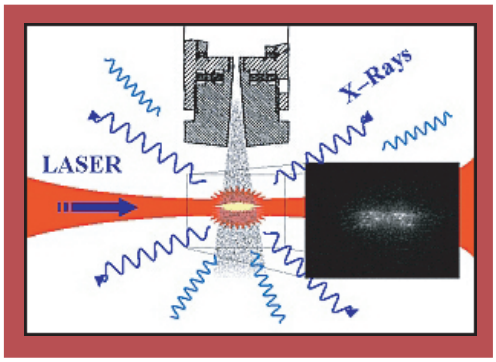

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