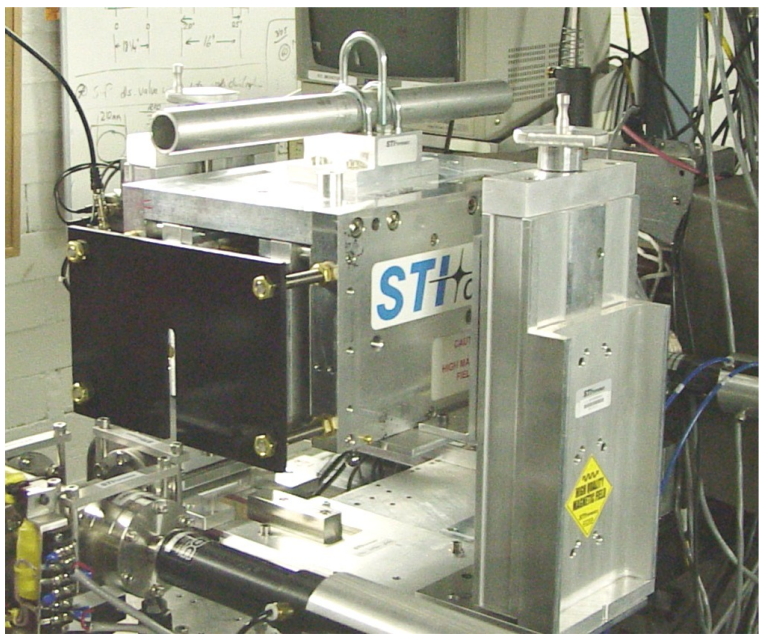
ADVANCED ACCELERATOR



STI has been active in advanced accelerator research and development (AARD) since 1985. Our research focuses on *laser acceleration*, in which intense laser fields are used to generate extremely high gradients for accelerating electrons. Laser acceleration offers the potential to create more compact and less expensive systems that can also reach much higher energies than conventional microwave-driven accelerators.

STI's Staged Electron Laser Acceleration (STELLA) experiment demonstrated:

- The highest energy gain at the time in an inverse Cerenkov accelerator
- Creation of few femtosecond-long electron bunches (microbunches) from a laser accelerator device
- The **first demonstration of staging (http://www.stioptronics.com//wp-content/uploads/2017/03/STELLA-I_PRL-.pdf)** between two laser-driven accelerator devices
- The **first demonstration of high trapping efficiency (http://www.stioptronics.com//wp-content/uploads/2017/03/STELLA-II_PRL-.pdf)** of laser-generated microbunches
- The **first demonstration of narrow energy spread (http://www.stioptronics.com//wp-content/uploads/2017/03/STELLA-II_PRST-1.pdf)** (monoenergetic) of the laser-accelerated microbunches

Many of these accomplishments are critical for developing laser linacs – practical laser-driven electron accelerators.

STI also designs and builds specialized hardware related to AARD, such as **gas-filled capillary discharges (http://www.stioptronics.com//projects/advanced-capillary-discharge/)**and supersonic nozzles, which can be used in plasma-based AARD experiments.

Selected papers on STI's AARD work can be found in **AARD Reprints (http://www.stioptronics.com//projects/advanced-accelerator/advanced-accelerator-rd-reprints/)**.

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