
Small Accelerators for Education

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AccApp09



Educational Goals

- Train students in accelerator science and technology
 - Consider small self-contained experiments
 - Teach research oriented students techniques for larger accelerator labs
 - Educate young people using 'hands on' instruction
- Explore applications
 - Train non-specialists in the use of accelerator techniques

Accelerator ?

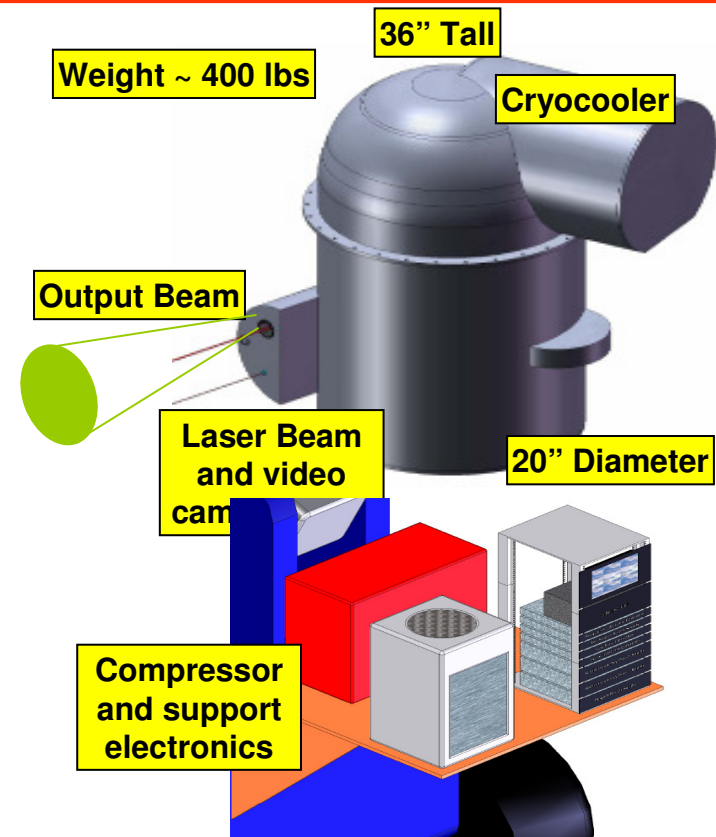


Small Accelerators

- DD and DT generators
- electrostatic machines
- Small cyclotrons
- RF driven linear accelerators
- “Free machines”
 - Price (0) is not cost ($\gg 0$)
 - Be prepared to spend time and money
 - Keep in mind educational goals

Compact Accelerator Development

- Simple view of the Nanotron is shown to right
 - About 36" tall and 20" in diameter
 - About 400 lbs
 - The superconducting magnet is without cryogen and cooled with a cryopump
 - The output beam port is designed with an alignment laser and a video camera
 - This design incorporates gas supplies for either a deuteron or proton beam
 - Some light shielding will be required to protect from unwanted emissions in some applications
 - Can accelerate protons (10 MeV) or deuterons (5 MeV)
- The support equipment is shown below on right
 - Compressor for the cryocooler is the first box in the picture.
 - The support electronics and power supplies are in the inner rack
 - All support equipment can be remotely located with an umbilical to the cyclotron head



***Extremely low power consumption:
total power consumption is ~ 3 kW***