
MACDONALD LABORATORY

The James R. MacDonald Laboratory at Kansas State University operates a 7-MeV tandem accelerator, a 9-MeV superconducting linear accelerator (LINAC), and a cryogenic electron beam ion source (CRYEBIS) for the study of ion-atom collisions with highly charged ions. The tandem, with six dedicated beam lines, can operate as a stand-alone accelerator. The LINAC is operated as a booster accelerator to the tandem. The tandem-LINAC combination has four beam lines available. The CRYEBIS is a stand-alone facility for studying collisions with bare ions at low velocity.

The Laboratory has a variety of experimental apparatus for atomic physics research. These include recoil ion sources, Auger electron spectrometers, X-ray spectrometers, and a 45-inch-diameter scattering chamber. The Laboratory is available to researchers who require the unique facilities for atomic collision experiments.

COLLABORATIVE USE

Users are encouraged to seek a collaborator on the staff or they may submit a brief proposal to the laboratory director.

PULSE RADIOLYSIS FACILITY

The Pulse Radiolysis Facility (PRF) at the University of Notre Dame is based on a 5-ns electron pulse from an 8-MeV linear accelerator. It is fully instrumented for computerized acquisition of optical and conductivity information on radiation chemical intermediates having lifetimes of 10 ns and longer. An excimer laser/dye laser combination is accessible for double-pulse experiments involving photolysis of radiolytic transients. Energies of -400 mJ at 308 nm and -50 mJ at various near-UV and visible wavelengths are available.

For typical absorption studies, where one produces 10^{-5} M of intermediates, spectral and kinetic information can be obtained on species having extinction coefficients in excess of $100 \text{ M}^{-1} \text{ cm}^{-1}$. Conductometric methods in aqueous solution cover the pH range of 3 to 11. Data are recorded digitally and stored in magnetically readable form for rapid off-line examination of spectral and kinetic details.

COLLABORATIVE USE

Experiments may be arranged by proposal to the laboratory director or through collaborations with appropriate staff scientists.

TECHNICAL DATA

Electron source S-MeV linear accelerator

Operating mode Single pulse, with signal averaging

Data collection Workstation DOS/Intel 486)

Pulse width 5, 10, 20, 50 ns

Time resolution (RC) 2 ns

Pulse current Up to 1 A

Repetition frequency 0.2 S-I

Optical absorption measurements

Spectral region 210 to 750 nm

Sensitivity +0.00002 absorbance

Conductivity

pH range 3 to 11

Sensitivity +5 mhos/cm