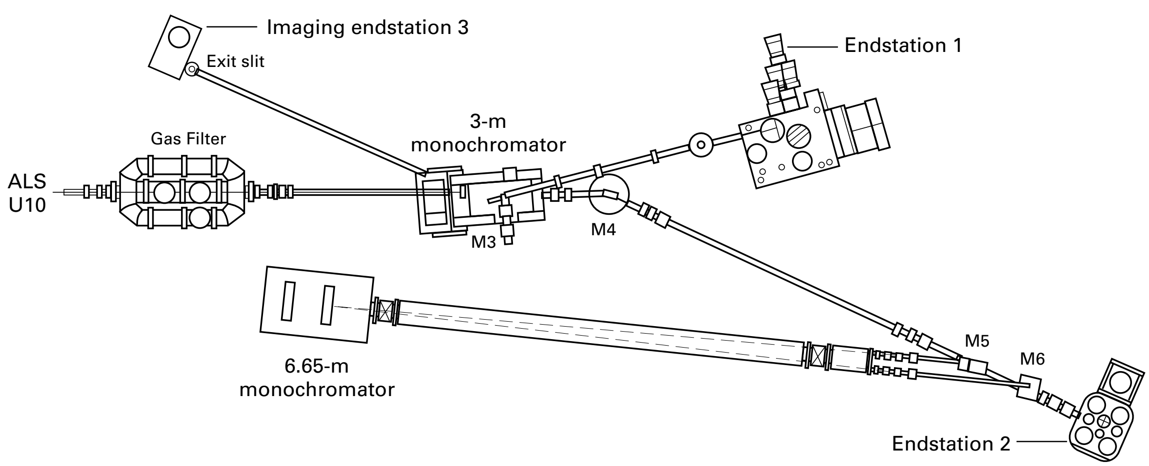
Chemical Dynamics Using Synchrotron Radiation • Beamline 9.0.2

Berkeley Lab • University of California

Beamline Specifications

ENDSTATION	1	2	3
Monochromator	White Beam	3-m Eagle	6.65-m Eagle
Resolution ($E/\Delta E$)	40	50–1200	3000–120,000
Image size (mm)	0.05×0.17	0.3×1.0	0.36×0.24
Flux	10^{16}	10^{14}	10^{11}
At resolution	40	1000	3000
Photon energy range	5.0 – 30 eV at 1.5 GeV with gas filter 7.8 – 30 eV at 1.9 GeV with gas filter		



Schematic layout *of Beamline 9.0.2.*

Beamline 9.0.2 is an undulator beamline designed to deliver photons ranging in energy from 5 to 30 eV (with no gas filter at 1.5-GeV operation), an important range for investigating chemical phenomena of interest in combustion, atmospheric chemistry, and the detection and characterization of transient species such as free radicals, metal oxide clusters, and other unstable species. The undulator light passes through a gas filter that suppresses the higher harmonics by more than four orders of magnitude, thereby delivering very pure light at the fundamental. The light delivered to the three endstations differs in flux and resolution.

Endstation 1 has a unique and permanently placed apparatus that combines two rotatable molecular beam sources with soft vacuum ultraviolet (VUV) ionization. Both bimolecular reactions and photodissociation reactions can be investigated. The use of the undispersed VUV “white beam” from the undulator provides sensitivity, selectivity, and universality in product detection, thereby opening new doors to the study of elementary reaction dynamics.

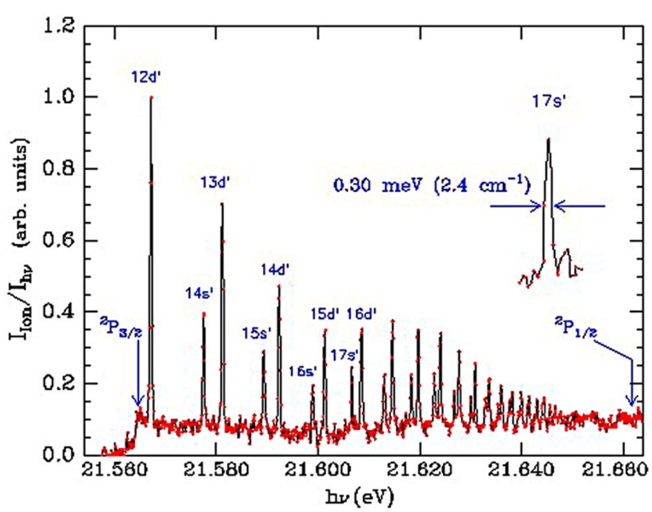
Endstation 2 has a permanently placed universal apparatus that is designed to perform high-resolution photoionization, photoelectron, photoelectron photoion coincidence (PEPICO), and pulsed-field

7/03

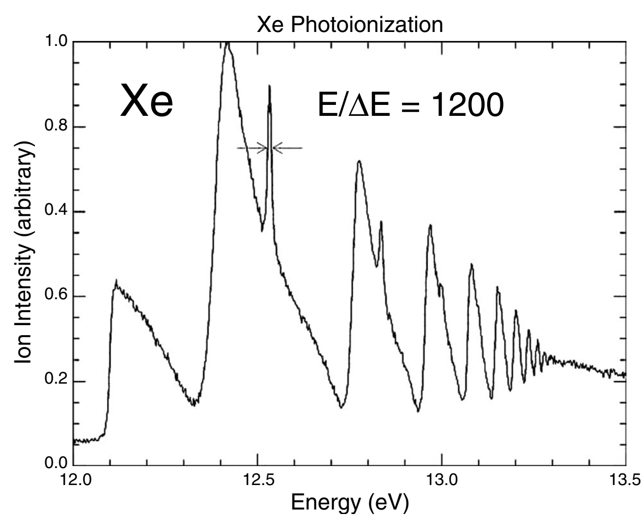
ionization studies on cold molecules produced by the molecular beam source. In addition, ion/molecule reactions can be investigated by transporting state-selected ions via octupole ion guides to collision cells. The 6.65-m Eagle monochromator delivers easily tunable light from 5 to 30 eV with a flux and resolution comparable to that of VUV lasers. However, this light is continuous and also covers the range below 8 eV, a region not attainable by tunable VUV lasers.

Endstation 3 is located at a port that delivers high-flux photons with a modest resolution. The versatile experimental chamber is in the form of an 18-in. cube plus a molecular-beam source on which a variety of flanged detection devices can be installed. In addition, this chamber can be moved to allow more specialized chambers to be installed. The endstation is designed for imaging studies of electrons and ions as well as coincidence experiments. This machine enables new approaches to many systems of interest, including photochemistry, radical studies, superexcited states, flame diagnostics, liquid-helium droplet studies, and characterization of new molecules.

Visit *www.chemicaldynamics.lbl.gov* for more information. ■



__A photoionization scan__ of Ne with the 6.65-m monochromator on Endstation 2 showing a resolution of 72,000. This resolution has now been improved to 120,000 with the use of a 4800-line/mm grating. Data courtesy of P.A. Heimann (ALS) et al. [Proc. SPIE 2856, 90 (1996)].



__The photoionization yield__ for Xe obtained with the 3-m monochromator at Endstation 3. Data courtesy of D. Peterka (LBNL).

To obtain a proposal form, go to www-als.lbl.gov/als/quickguide/independinvest.html.

For Beamline Information

Musa Ahmed
Berkeley Lab, MS 10R0110
Berkeley, CA 94720
Tel: (510) 486-6355
Fax: (510) 486-5664
Email: mahmed@lbl.gov

Darcy Peterka
Berkeley Lab, MS 10R0110
Berkeley, CA 94720
Tel: (510) 495-2207
Fax: (510) 486-5664
Email: dspeterka@lbl.gov

Spokesperson

Stephen Leone
Berkeley Lab, MS 2R0300
Berkeley, CA 94720
Tel: (510) 486-4754
Fax: (510) 495-2690
Email: srleone@lbl.gov

Berkeley Lab
7/03