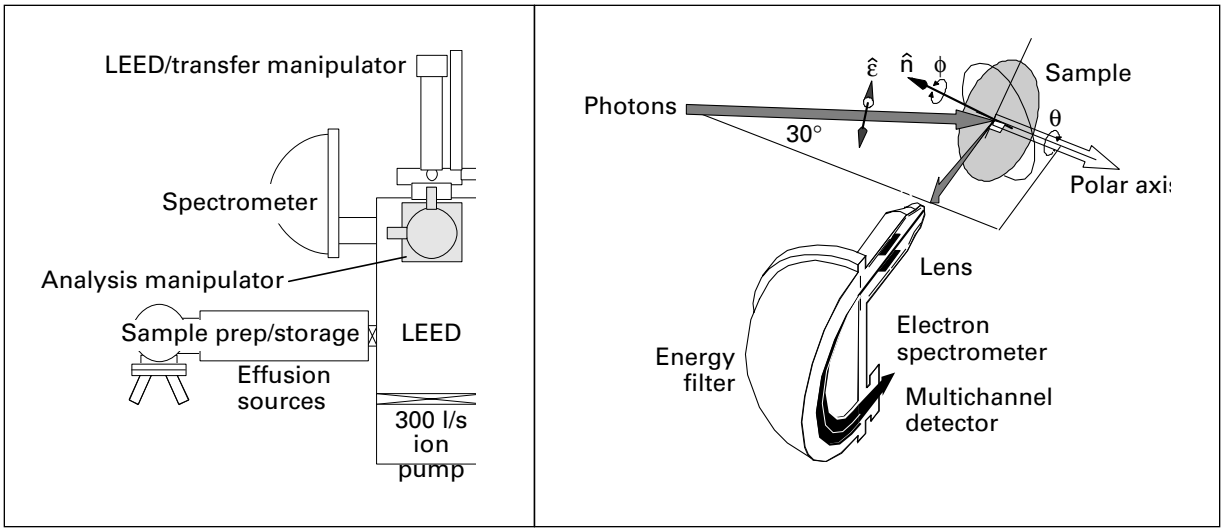
High-Resolution, Small-Spot Photoelectron Spectroscopy (UltraESCA) • Beamline 7.0.1

Berkeley Lab • University of California

Endstation Specifications

Energy Photon Range (eV)	Photon Flux (photons/s/0.01%BW)	Spectral Resolution (E/ΔE)	Spot Size (μm)	Availability
60 – 1200	~10^{12} (dependent upon resolution & energy)	≤8000	50 (diameter at sample position)	NOW



Schematic of experimental station *(left) and analysis geometry (right).*

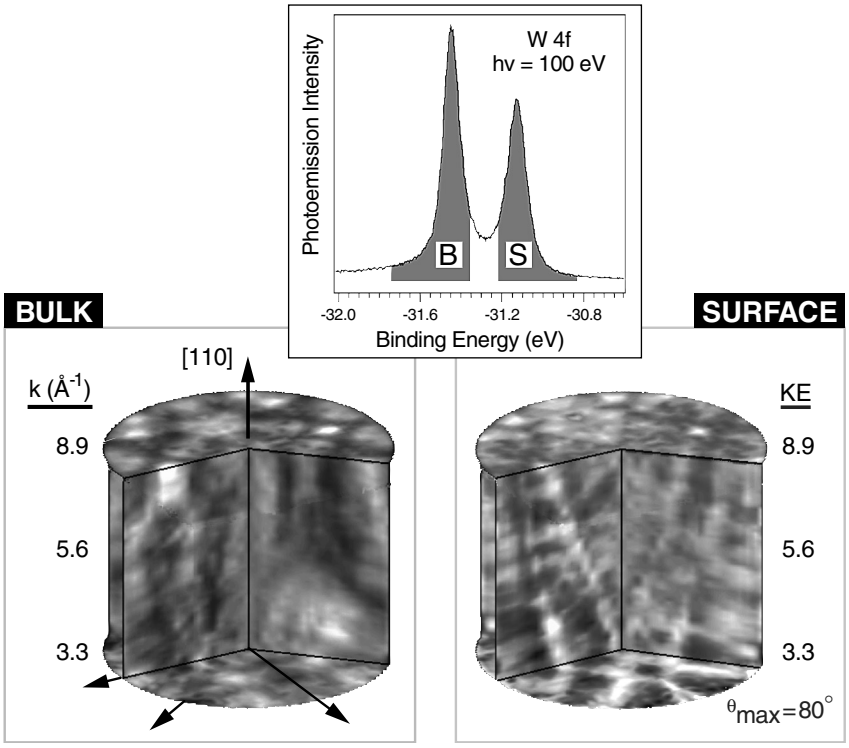
Beamline 7.0.1 serves several experimental stations stations collectively comprising "The Spectromicroscopy Facility." The UltraESCA station is based on a photoemission spectrometer with both high energy and angular resolution. Separate data sheets describe scanning transmission x-ray (STXM) and scanning photoemission (SPEM) microscopes that share beamtime with the UltraESCA station by means of deflection mirrors.

Operating at base pressures as low as 0.8×10^{-10} Torr, the station is equipped with a 137-mm Perkin-Elmer Omni IV electron-energy analyzer. The analyzer has variable angular acceptance ranging from ~7° to better than ± 0.5°. The corresponding spatial resolution varies from better than 100 μm up to 4 mm by means of a system of interchangeable apertures and applied lens voltages.

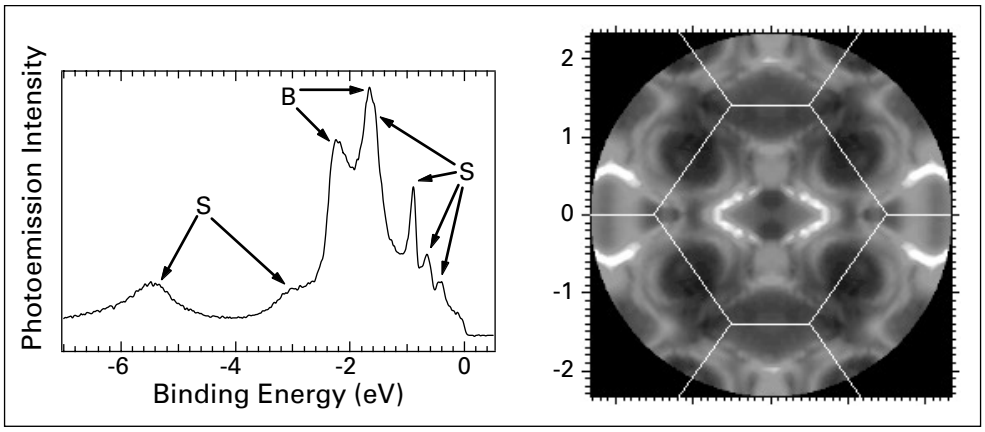
Sample preparation in the main chamber includes a magnetic pulser coil, sputter gun, leak valves, gas-backfill manifold, and an e-beam or resistive-heating sample holder. Sample characterization tools include LEED and ESCA using a Mg/Al dual-anode x-ray source. A connected sample storage and preparation chamber, also in ultrahigh vacuum, is provided. This chamber has a sputter gun, three-axis e-beam heating manipulator, numerous ports for user-supplied effusion sources, and storage for up to ten samples. Samples, mounted on

pucks, are introduced into the vacuum environment though a two-stage load lock (the second stage is the storage/prep vessel).

Typical experiments performed in the station are x-ray photoelectron diffraction (in angular- or energy-scan mode), valence-band mapping studies, linear and circular dichroism in photoemission, resonant photoemission at various edges, and coarse spectromicroanalysis of inhomogeneous samples. ■



X-ray photoelectron diffraction. *The inset shows W 4f photoemission with windowing regions used to acquire the volume diffraction data sets for bulk (left) and surface (right) photoemission. Data courtesy of J.D. Denlinger (University of Michigan), E. Rotenberg (ALS), S.D. Kevan (University of Oregon), and B.P. Tonner (University of Wisconsin-Milwaukee).*



Fermi surface crossings. *Left—Typical valence-band photoemission spectrum of a clean W(110) surface. Various surface and bulk transitions are highlighted. Right—Angular distribution of photoelectrons at the Fermi edge acquired for a 200-meV window for one monolayer of hydrogen on this surface. Data courtesy of E. Rotenberg (ALS) and S.D. Kevan (University of Oregon).*

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

For Endstation Information

Eli Rotenberg
Advanced Light Source
Berkeley Lab, MS 6R2100
Berkeley, CA 94720
Tel: (510) 486-5975
Fax: (510) 486-7696
Email: erotenberg@lbl.gov

7/03