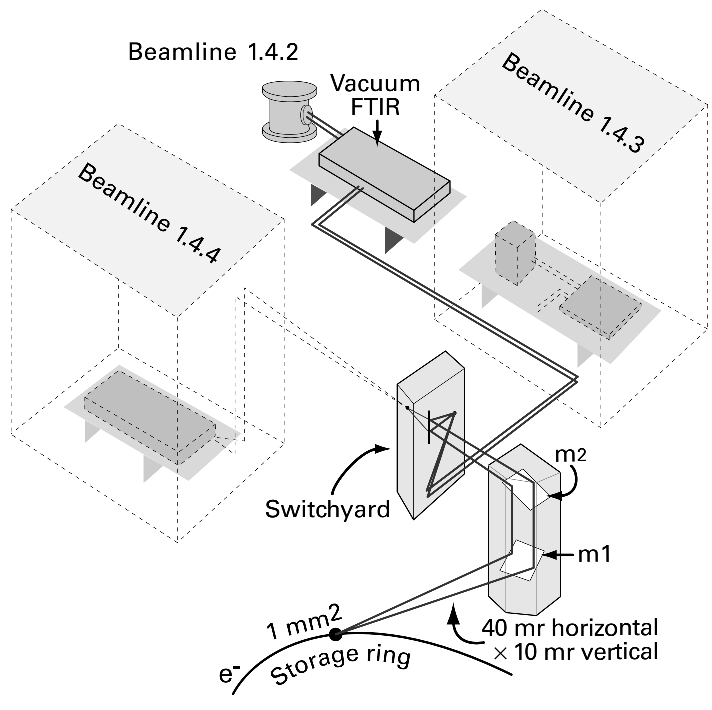
Visible and Infrared Fourier Transform Spectroscopy (FTIR) • Beamline 1.4.2

Berkeley Lab • University of California

Beamline Specifications

Photon Energy Range (cm^{-1})	Spectral Resolution (cm^{-1})	Spot Size (mm)	Availability
15–25,000 (0.002–3 eV)	0.125	1 (varies with coupling optics)	NOW



Schematic layout *of Beamline 1.4.2.*

Beamline 1.4 serves three distinct experimental stations designated as Beamlines 1.4.2, 1.4.3, and 1.4.4. Beamline 1.4.2 provides state-of-the-art Fourier transform infrared (FTIR) spectroscopy in the visible to far IR regions from 25,000 to 15 cm^{-1}. All-reflecting optics focus the bend-magnet radiation into a switchyard. The switchyard houses optics that collimate the radiation and distribute it to the three experimental stations.

The synchrotron beam serves as an external source for a Bruker IFS66v/S vacuum FTIR bench with rapid-scan and step-scan capabilities. The beam, after being modulated by the moving mirror in the Michaelson interferometer in the IFS66v/S, can be directed into an ultrahigh-vacuum (UHV) surface-science chamber. Any of several detectors placed on the opposite side of the surface-science chamber to measure the reflected signal may be operated remotely from the IFS66v/S. The IFS66v/S also has a standard internal sample area that may accommodate any standard FTIR sample accessory, including a LHe cryostat (2–475 K), attenuated total-internal-reflection cells (ATR), near-normal-incidence reflectivity adapters, solid pellets (KBr,

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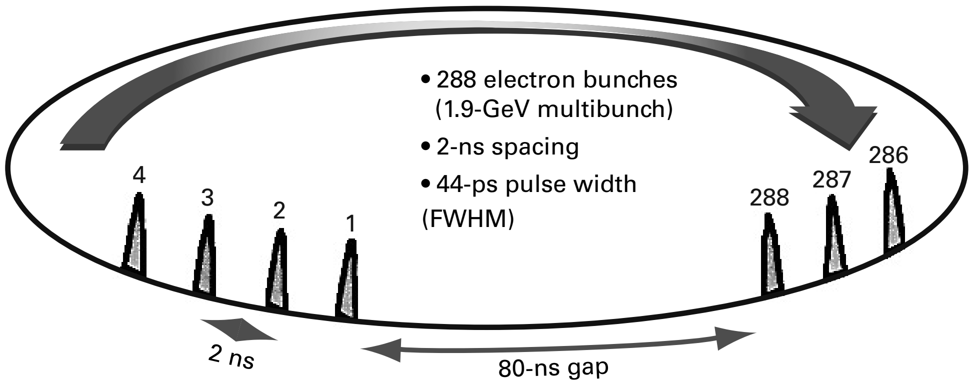
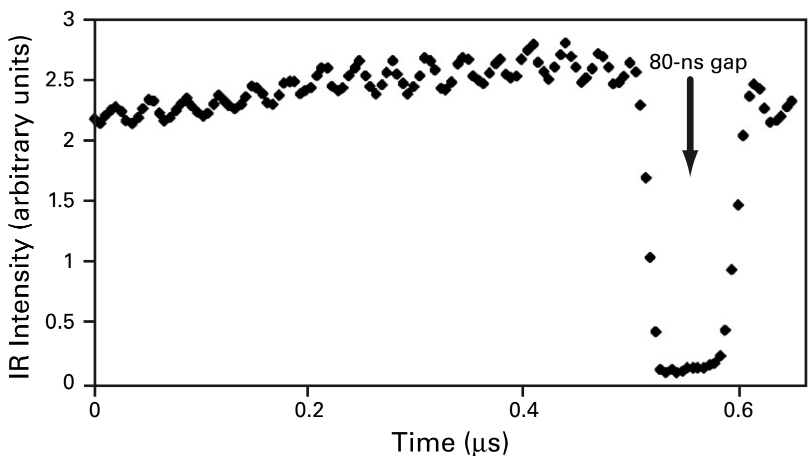
polyethylene), and many other custom configurations.

The step-scan and fast-electronic capabilities of the IFS66v/S allow for time-resolved FTIR spectroscopy at time steps as short as 5 ns. In multi-bunch operation of the storage ring, pulses of light of approximately 44-ps duration illuminate the sample every 2 ns. Faster electronics than currently available but expected to be forthcoming should allow subnanosecond timing. A chopper is available for experiments at time scales longer than 10 ms.

Typical applications include pump-probe measurements (semiconductors, metastable states), environmental science (adsorbates, bacteria, soil chemistry, remediation), biological materials (bioremediation, identification of biomolecules, tissue analysis), thin films and crystals (novel electronic materials and molecules), high-pressure systems (materials in diamond anvil cells), and measurements in high magnetic fields (reflectivity from high-T_c materials). Visit infrared.als.lbl.gov for more information. ■





Time-resolved IR spectroscopy *on Beamline 1.4.2. The step-scan and fast-electronic capabilities of the IFS66v/S allow for time-resolved FTIR spectroscopy at time steps as short as 5 ns. In the multibunch mode, the ALS produces pulses at intervals of 2 ns, except for a single long gap of 80 ns. This time-resolved plot of infrared intensity shows the 80-ns gap, but the time resolution of the current electronics does not fully separate the 2-ns spacing between pulses. Data courtesy of Mike Martin and Wayne McKinney (ALS).*

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

For Beamline Information

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