TECHNIQUES AND CAPABILITIES

- The METRO infrared beamline will provide advanced infrared spectroscopic capabilities for condensed matter physics and materials science.
- High-brightness, ultra low-noise and pulsed infrared synchrotron radiation source from NSLS-II Large Gap bending magnet.
- Continuous spectral coverage from $<5 \text{ cm}^{-1}$ to $>30,000 \text{ cm}^{-1}$ (0.5 meV to 4 eV)
- Diffraction-limited spatial resolution, time resolution to 10s of picoseconds.

High magnetic field & low-temp. spectroscopy

- Fields to 10T (16T feasible)
- Temperatures down to 1.6K
- Optical access for synchrotron radiation and laser.
- Polarization control.

THz microprobe of small crystals and structures

- Spotsize of $2\lambda$ (diff. limited)
- Temperatures down to 5K.

Spectroscopic ellipsometry

- Unique capability into THz w/cryogenic sample space.
- Full Müller-matrix system: => anisotropic & magnetic materials.

Time-resolved, photo-induced spectroscopies

- Synchronized optical excitation with Ti:S laser.
- Probe with complete spectral coverage.
- Time resolution to $\approx 10$ps.

APPLICATIONS

Electronic properties of novel materials such as graphene.

(H.L. Liu et al, NJP)

(K.F. Mak et al, PNAS)

Plasmonic structures and metamaterials for negative refractive index: (J. Hwang et al).

Spectroscopic studies of complex oxides and emergent materials.

Ellipsometric study of mode softening in SrTiO$_3$ films (A. Sirenko, Nature)

Conductivity through M-I transition in vanadium oxide single microcrystals (M. Qazilbash & D. Basov)

Multiferroic phonon and magnon modes (A. Sirenko, PRB)

Materials for harvesting light energy: photoelectron relaxation dynamics in III-V semiconductors (S.N. Gilbert).

Light source & accelerator physics: coherent THz produced by electron bunch instability (G.L. Carr)