INFRARED BEAMLINE for MAGNETOSPECTROSCOPY, ELLIPSOMETRY and TIME-RESOLVED OPTICAL SPECTROSCOPIES (METRO)

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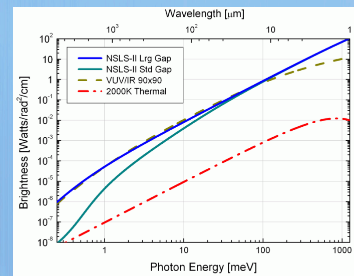
BROOKHAVEN NATIONAL LABORATORY

NATIONAL SYNCHROTRON LIGHT SOURCE II planned by Photon Sciences Directorate

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 cm^{-1} to >30,000 cm^{-1} (0.5 meV to 4 eV)
- Diffraction-limited spatial resolution, time resolution to 10s of picoseconds.



High magnetic field & low-temp. spectroscopy

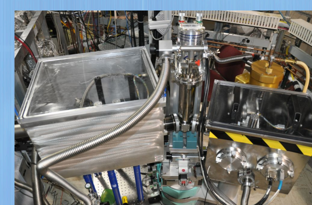
- Fields to 10T (16T feasible)
- Temperatures down to 1.6K
- Optical access for synchrotron radiation and laser.
- Polarization control.

THz microprobe of small crystals and structures

- Spotsize of 2λ (diff. limited)
- Temperatures down to 5K.

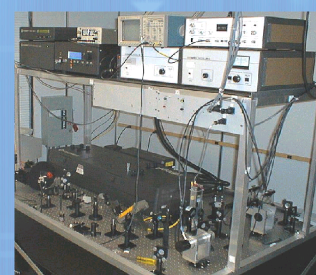
Spectroscopic ellipsometry

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



Time-resolved, photo-induced spectroscopies

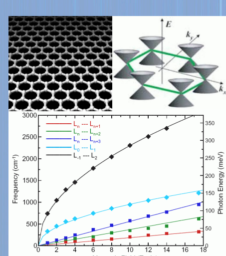
- Synchronized optical excitation with Ti:S laser.
- Probe with complete spectral coverage.
- Time resolution to ~10ps.



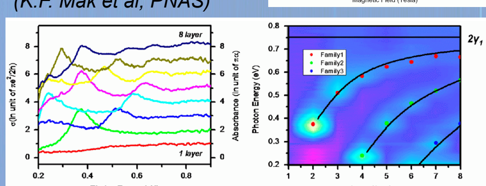
APPLICATIONS

Electronic properties of novel materials such as graphene.

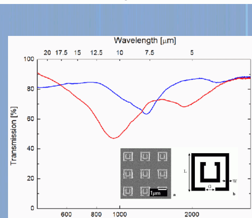
(H.L. Liu et al, NJP)



(K.F. Mak et al, PNAS)

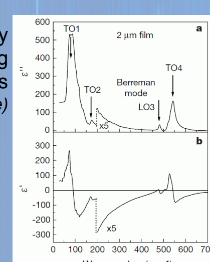


Plasmonic structures and metamaterials for negative refractive index. *(J. Hwang et al).*



Spectroscopic studies of complex oxides and emergent materials.

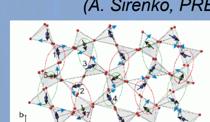
Ellipsometric study of mode softening in $SrTiO_3$ films *(A. Sirenko, Nature)*

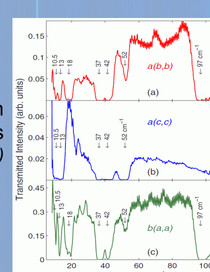


Conductivity through M-I transition in vanadium oxide single microcrystals *(M. Qazilbash & D. Basov)*

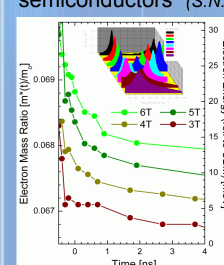
295K 343K 360K

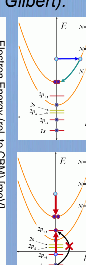
Multiferroic phonon and magnon modes *(A. Sirenko, PRB)*





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)*