

ASHIHARA LAB.

[Ultrafast&Nano Optical Science]

Department of Fundamental Engineering

Ultrafast Optics

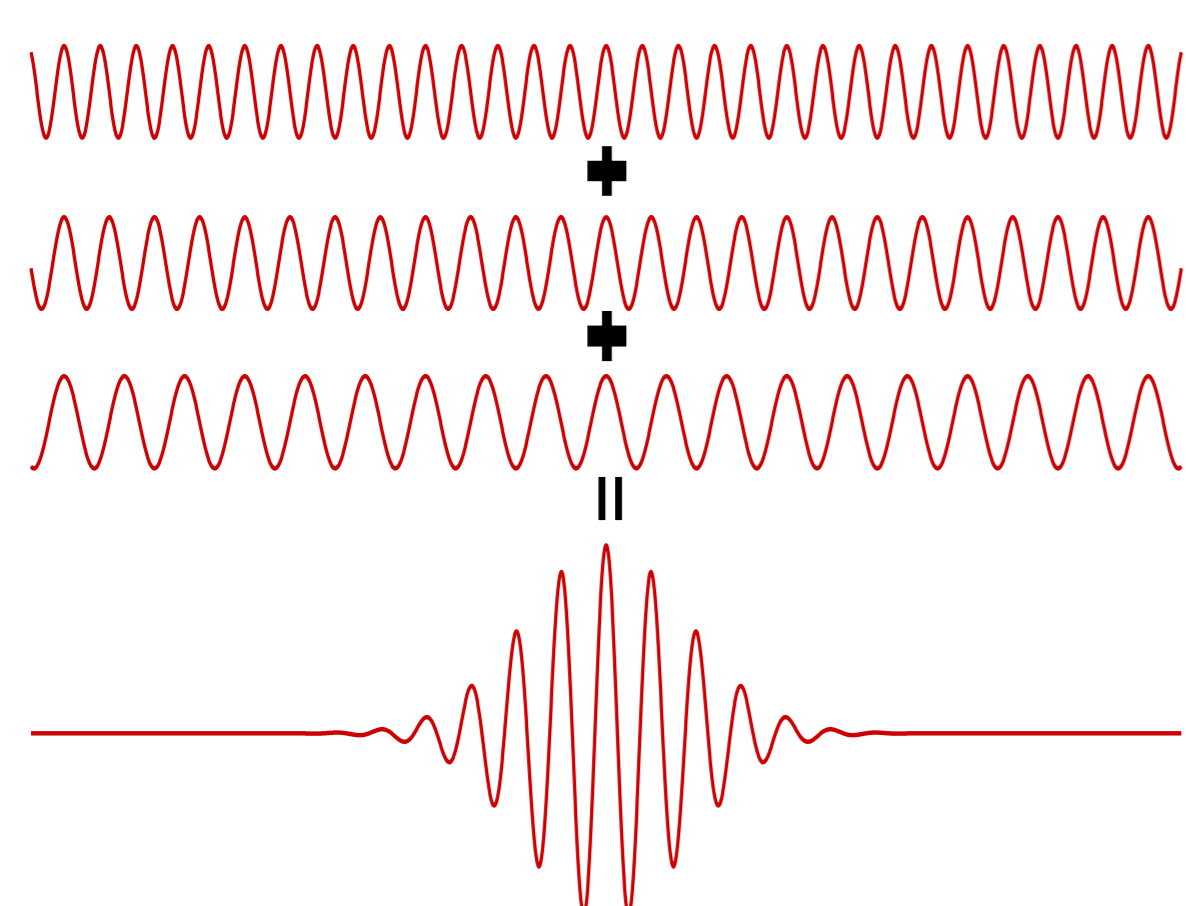
Department of Applied Physics

<http://www.ashihara.iis.u-tokyo.ac.jp>

Spectroscopy and Quantum Control with Designed Light

Ultrafast lasers emit short optical pulses, composed of a number of different frequency components. We study novel light-matter interactions and develop advanced spectroscopy and quantum control schemes using designed laser fields. Future prospects include the applications into ultra-sensitive molecular analysis, nano-spectroscopic imaging, reaction control, and ultrafast opto-electronics.

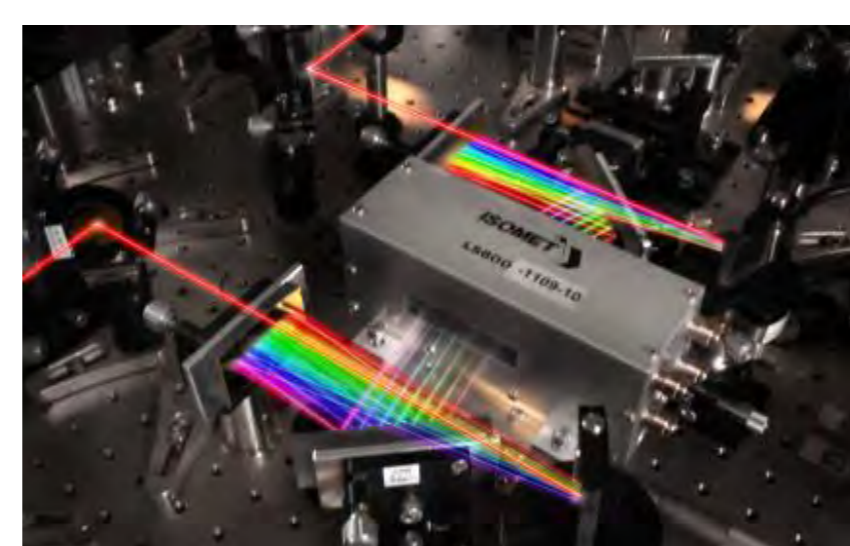
◆ Ultrashort Optical Pulses



Superposition of multiple frequencies

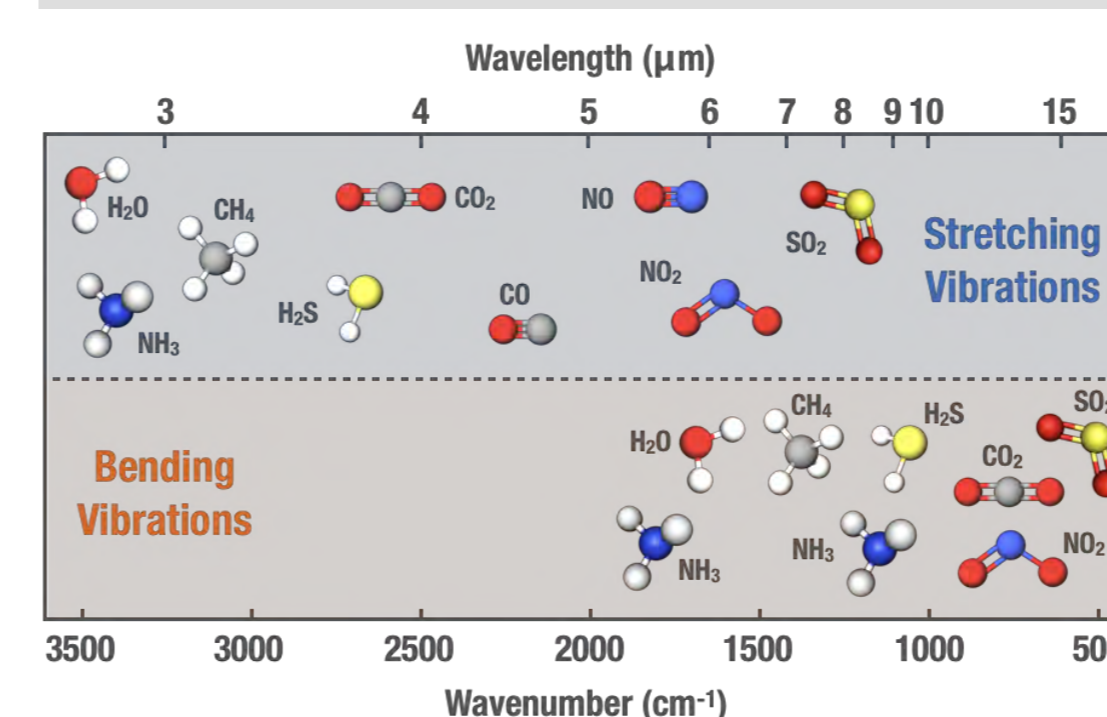


Mode-locked laser

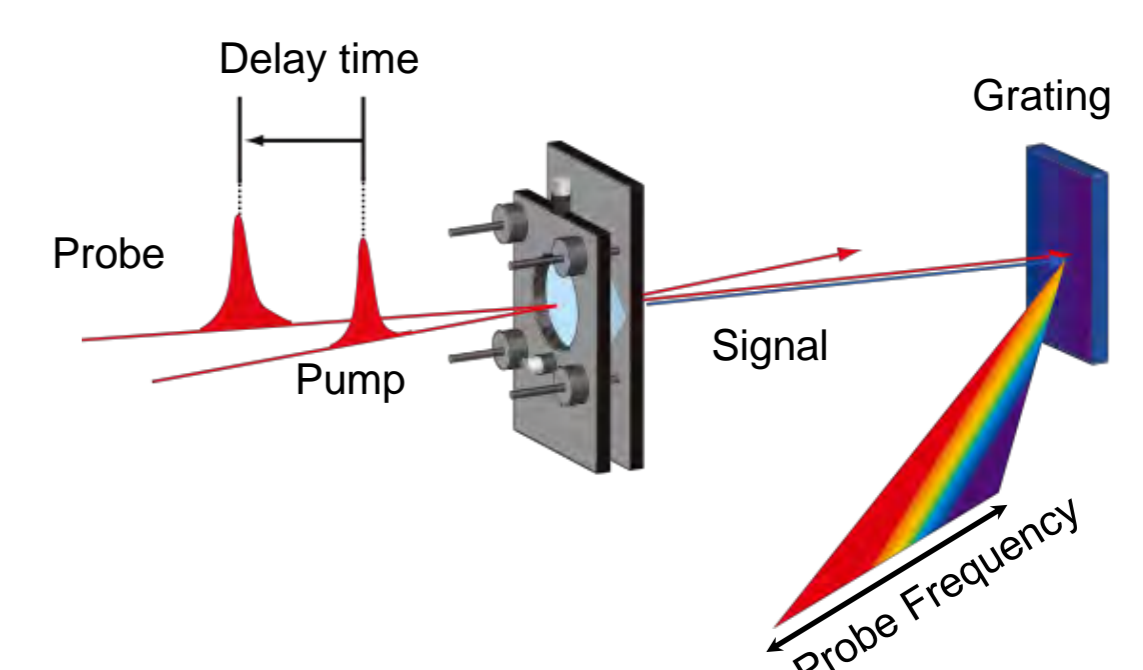


Optical Synthesizer

◆ Infrared Range



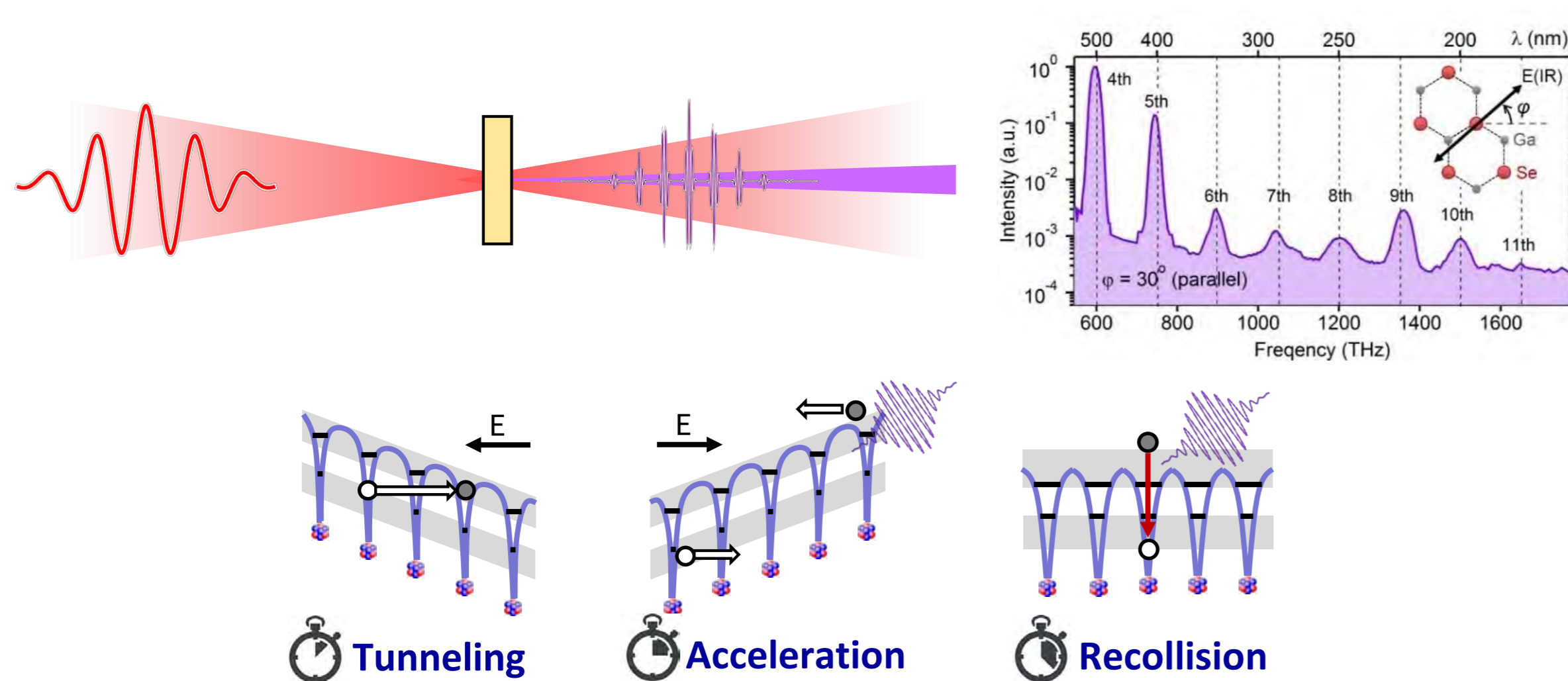
Vibrational resonances



Time-resolved spectroscopy

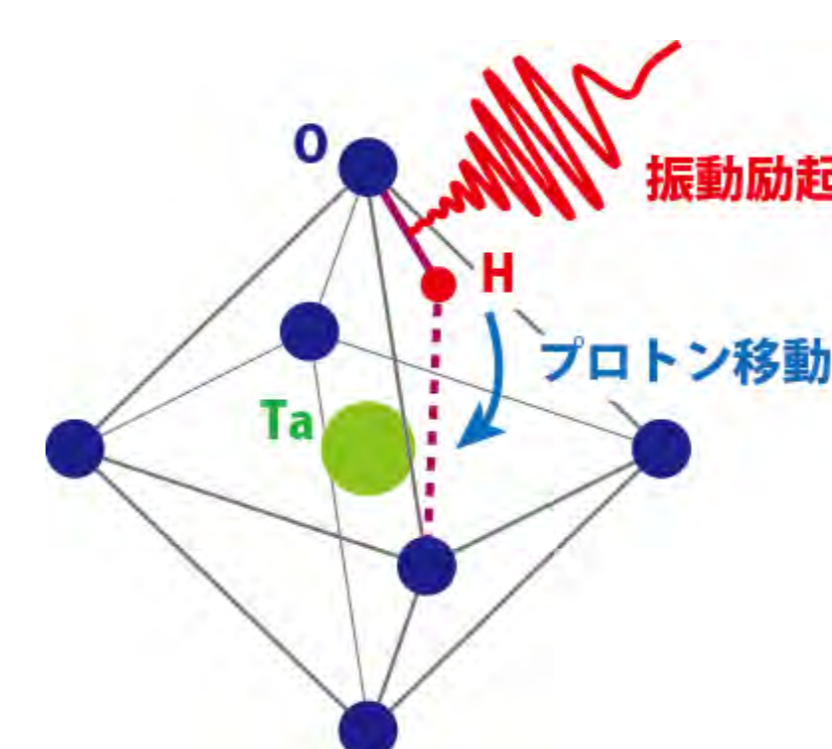
Resonances of molecular vibrations exist in the infrared range (wavelength of 2-20 micron). Ultrashort pulses in the infrared detect molecular structure and dynamics, and furthermore, can drive vibrational motions and the resulting chemical reactions.

♠ Strong-Field Nonlinear Optics

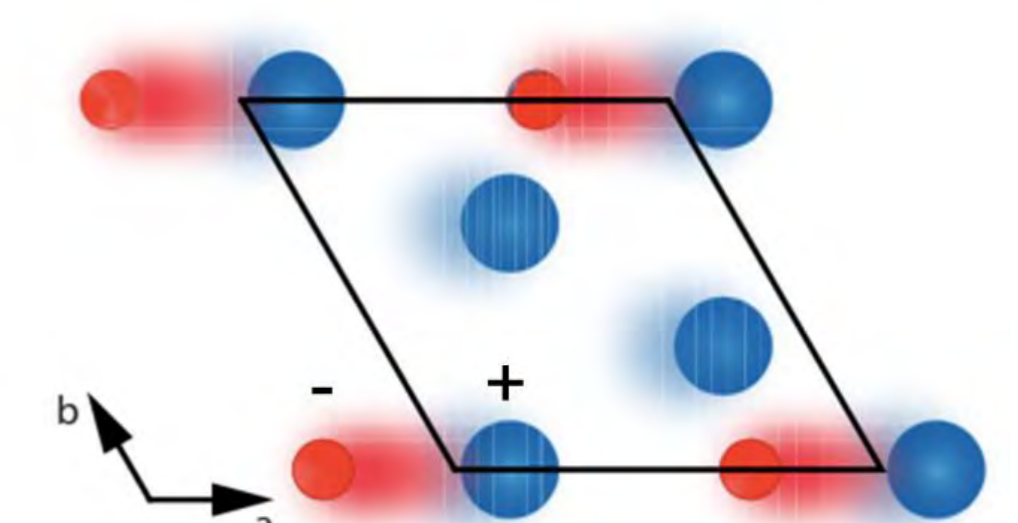


High harmonic generation in solids toward VUV/EUV attosecond source

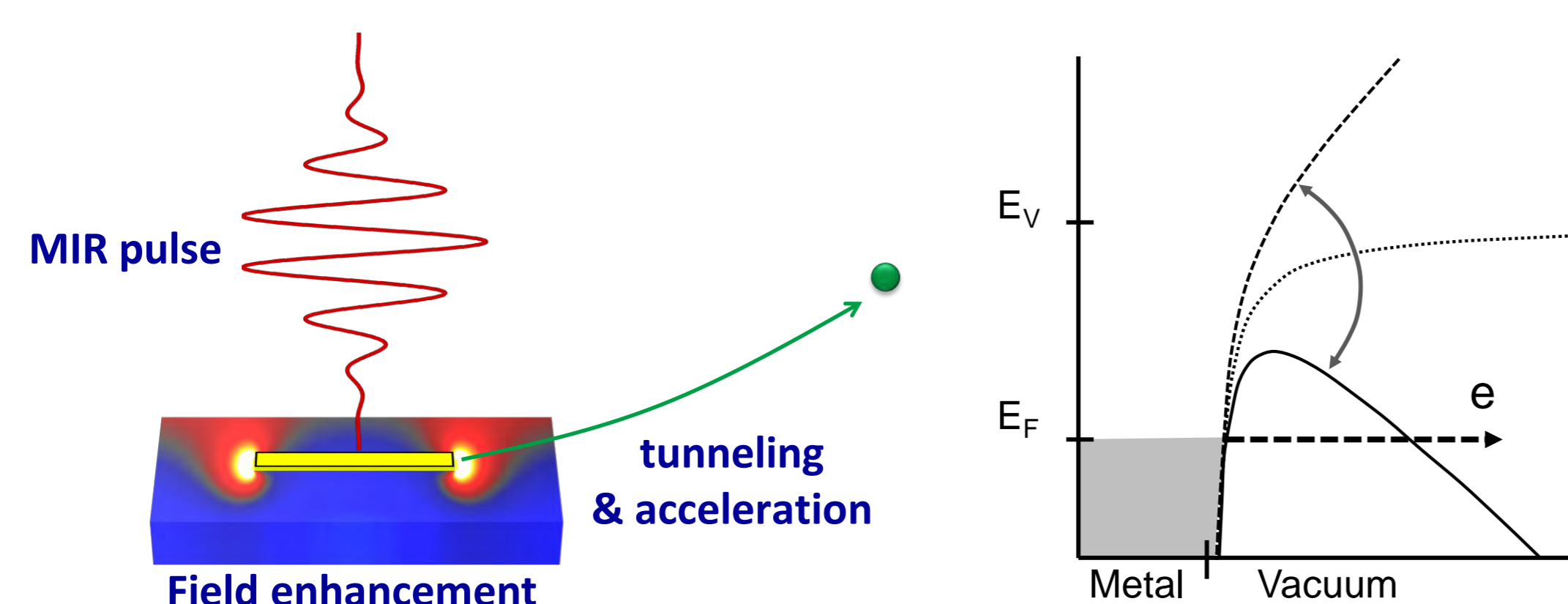
♠ Spectroscopy and Reaction Control



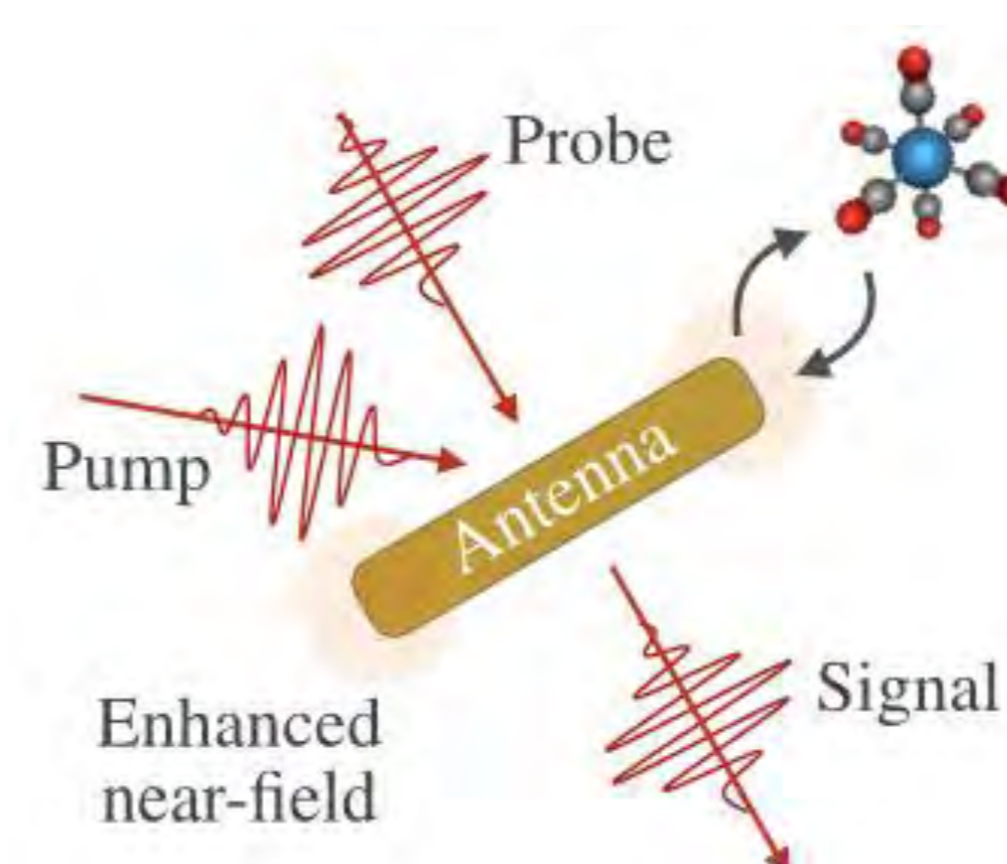
Protons in Oxides



Phonon Polaritons



Field-driven electron tunneling toward PHz electronics



Plasmon-mediated ultrasensitive spectroscopy and reaction control.

