

# ASHIHARA LAB.

## Ultrafast and Nano Optical Science



Department of Fundamental Engineering

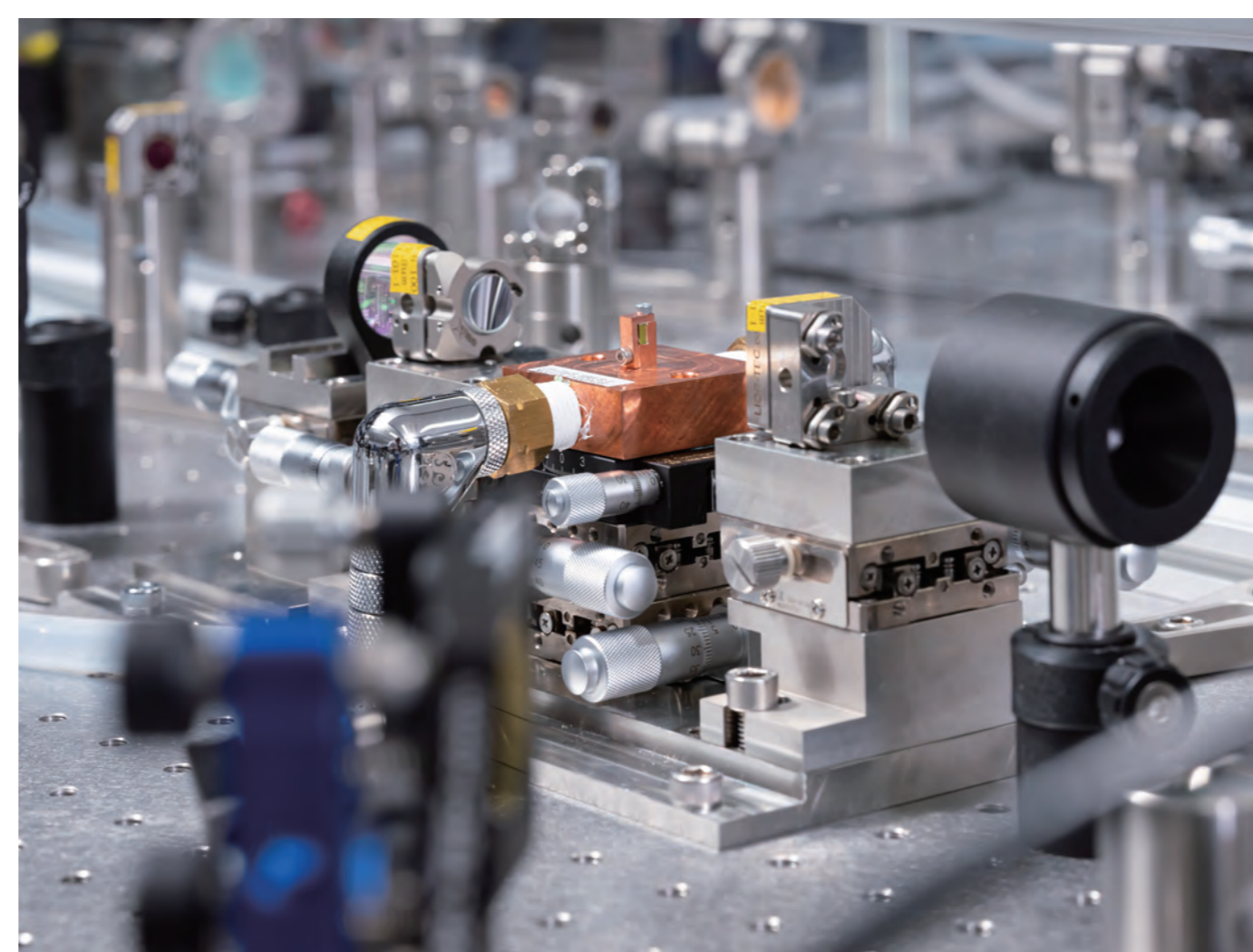
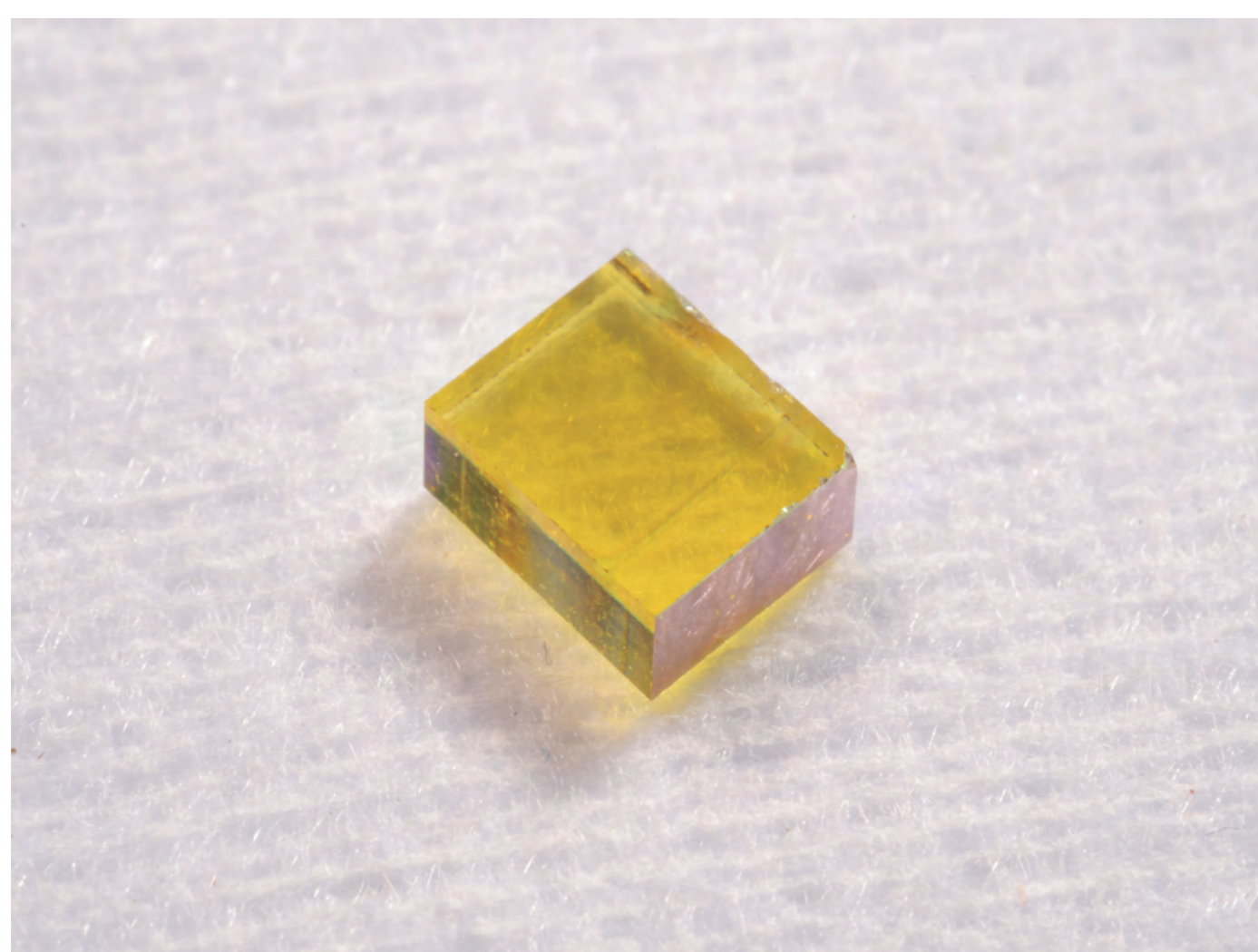
Ultrafast Optics

Department of Applied Physics, Graduate School of Engineering

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

We conduct optical science research to create new value through light. Focusing on the potential of infrared light, we develop state-of-the-art solid-state lasers that generate intense flashes of infrared light. Using this refined infrared light, we aim to establish new methods for identifying and manipulating the microscopic structures of materials. Our research has potential applications in quantum control of chemical reactions and phase transitions, ultrasensitive molecular detection, chemical imaging, and ultrafast optoelectronics.

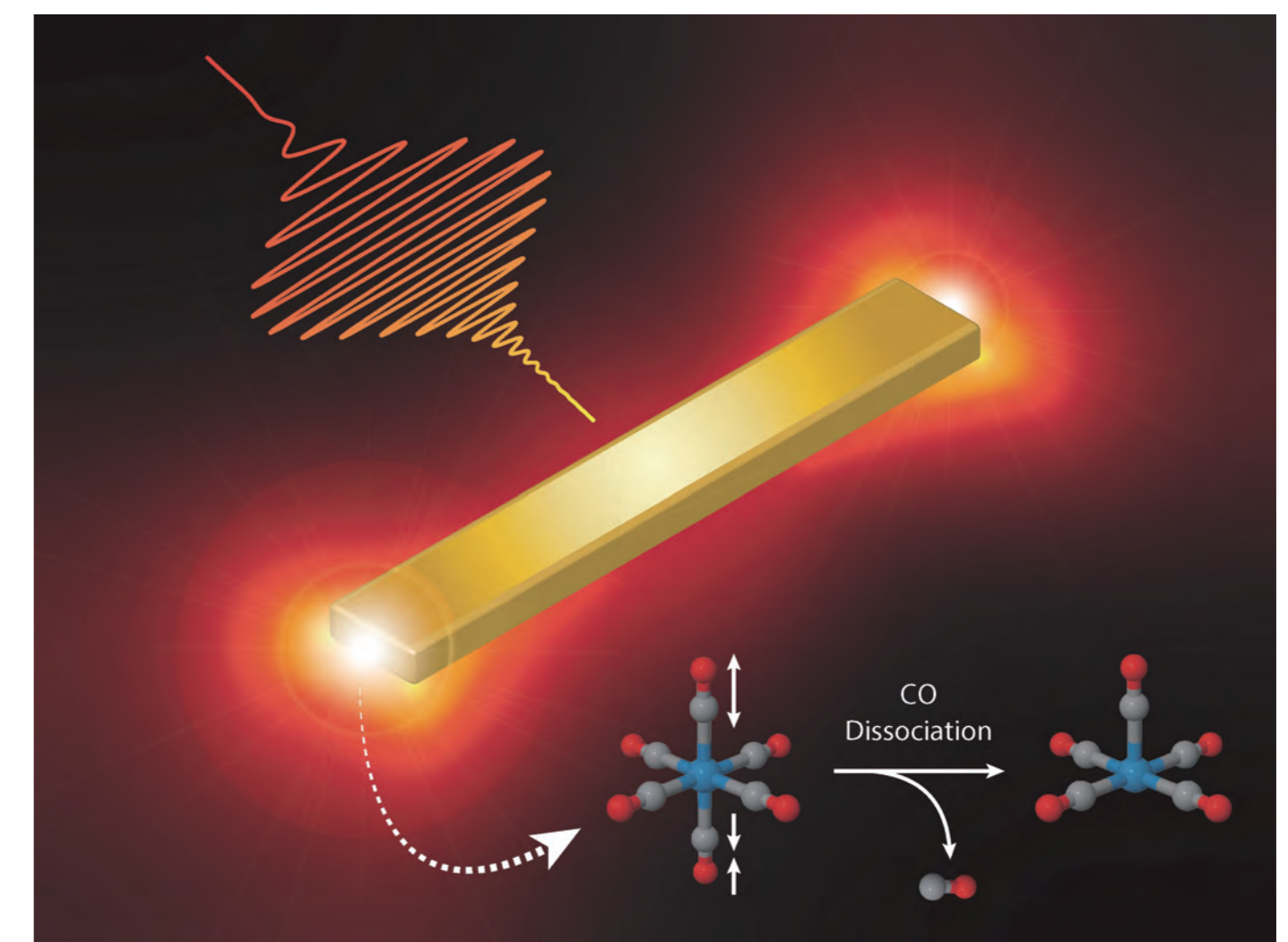
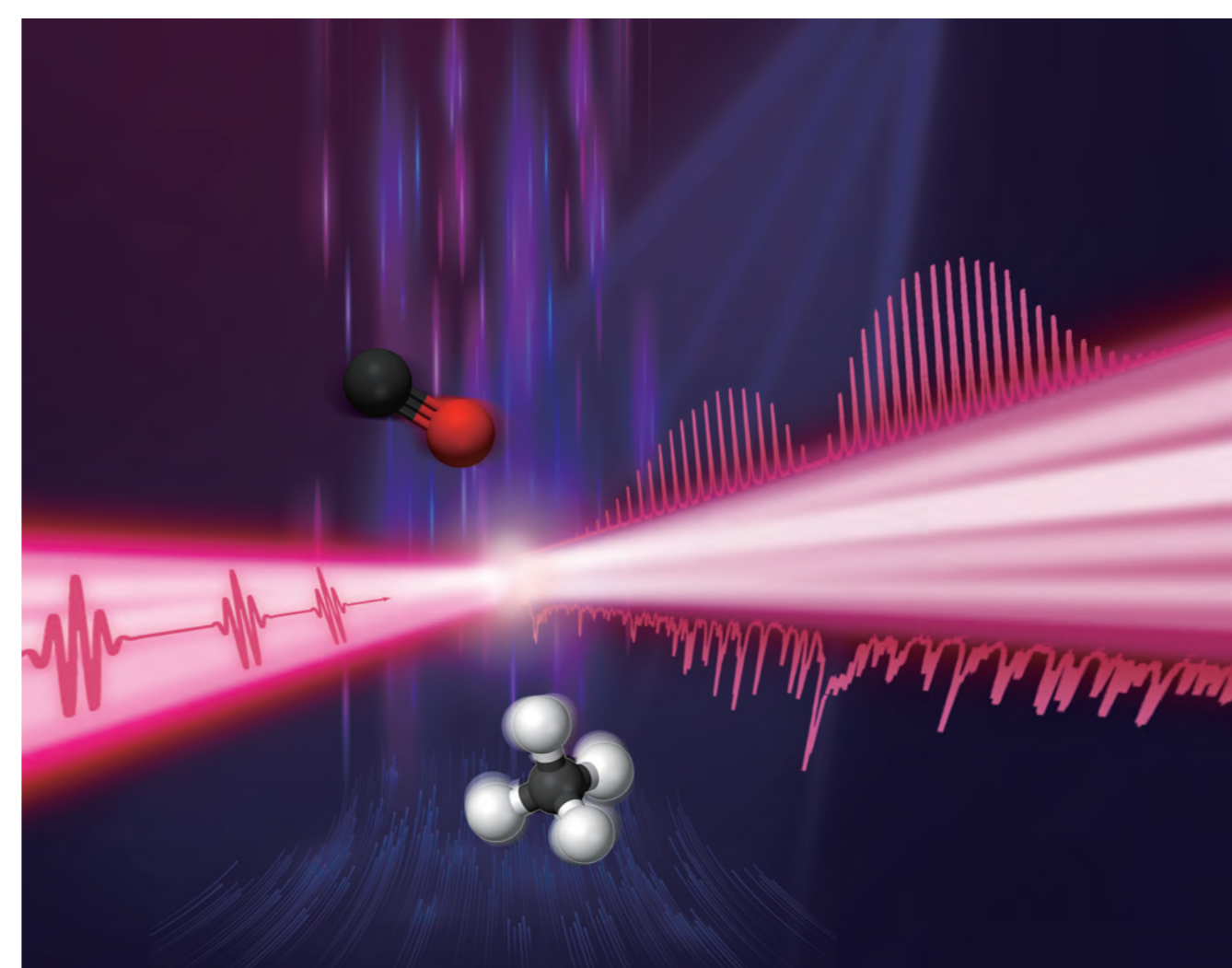
### Infrared Ultrafast Lasers



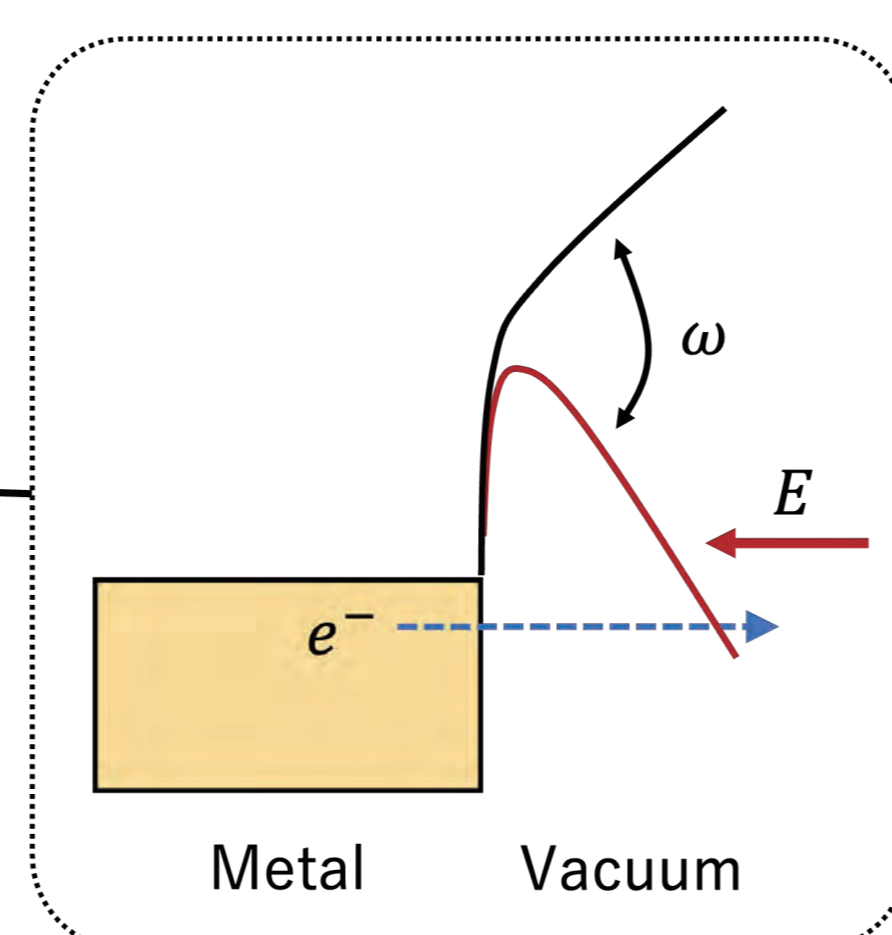
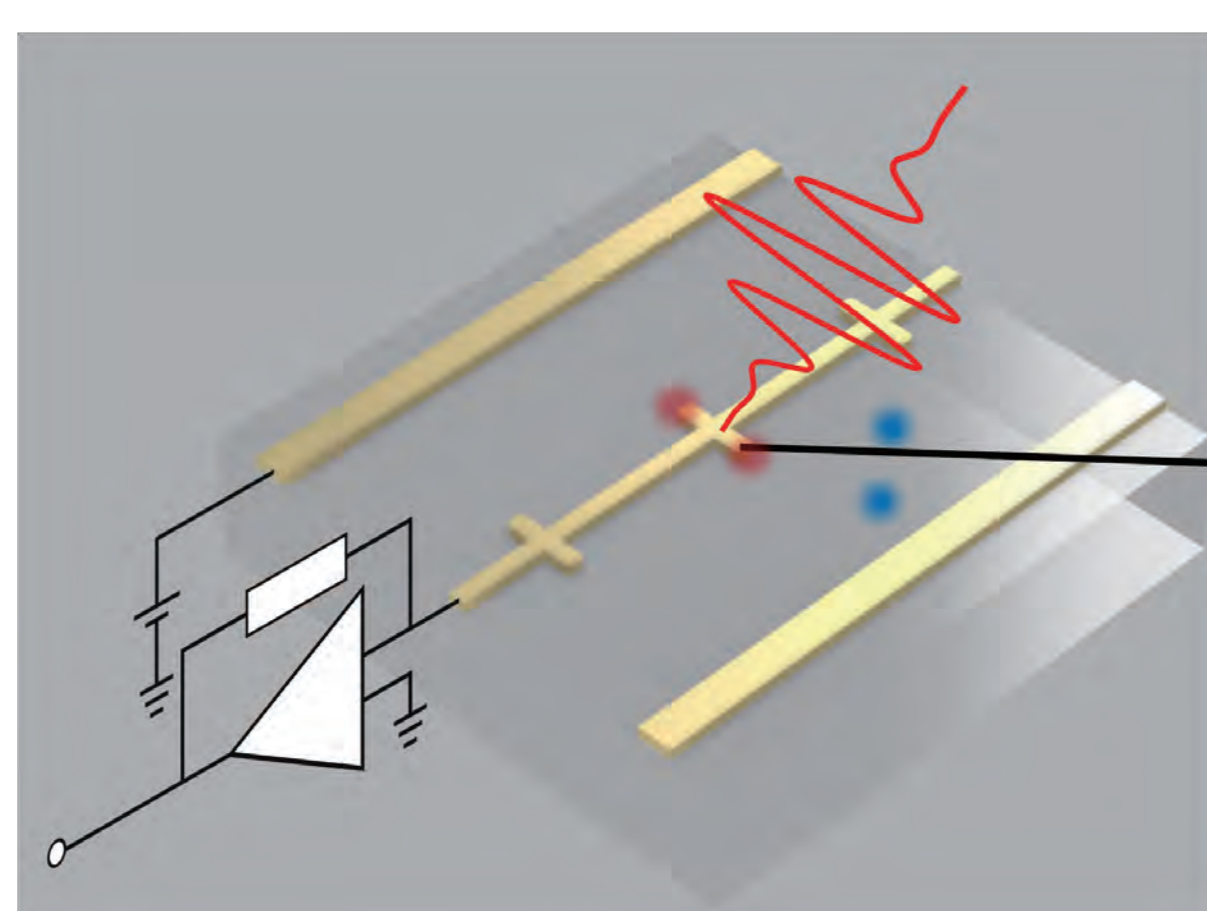
We are developing infrared pulsed lasers with a pulse duration of 100 fs. These lasers feature a broad spectrum in the infrared range while maintaining excellent directionality and focusability, making them highly promising for advancing vibrational spectroscopy and other fields.

### Spectroscopy & Reaction Control

Infrared light can directly excite molecular vibrations, offering great potential for probing molecular structures and controlling reactions. We are developing novel molecular measurement and reaction control methods by leveraging state-of-the-art optical technologies including infrared ultrashort pulsed lasers.



### Optical-Field-Driven Electronics



High-intensity optical fields enable control of electron wave packets on the attosecond timescale. We are developing a detector that can follow optical frequencies beyond 100 THz by utilizing plasmonic field enhancement in metallic nanostructures and attosecond-scale electron control.