Magnetic Topological Critical Materials
NSTC-AFOSR

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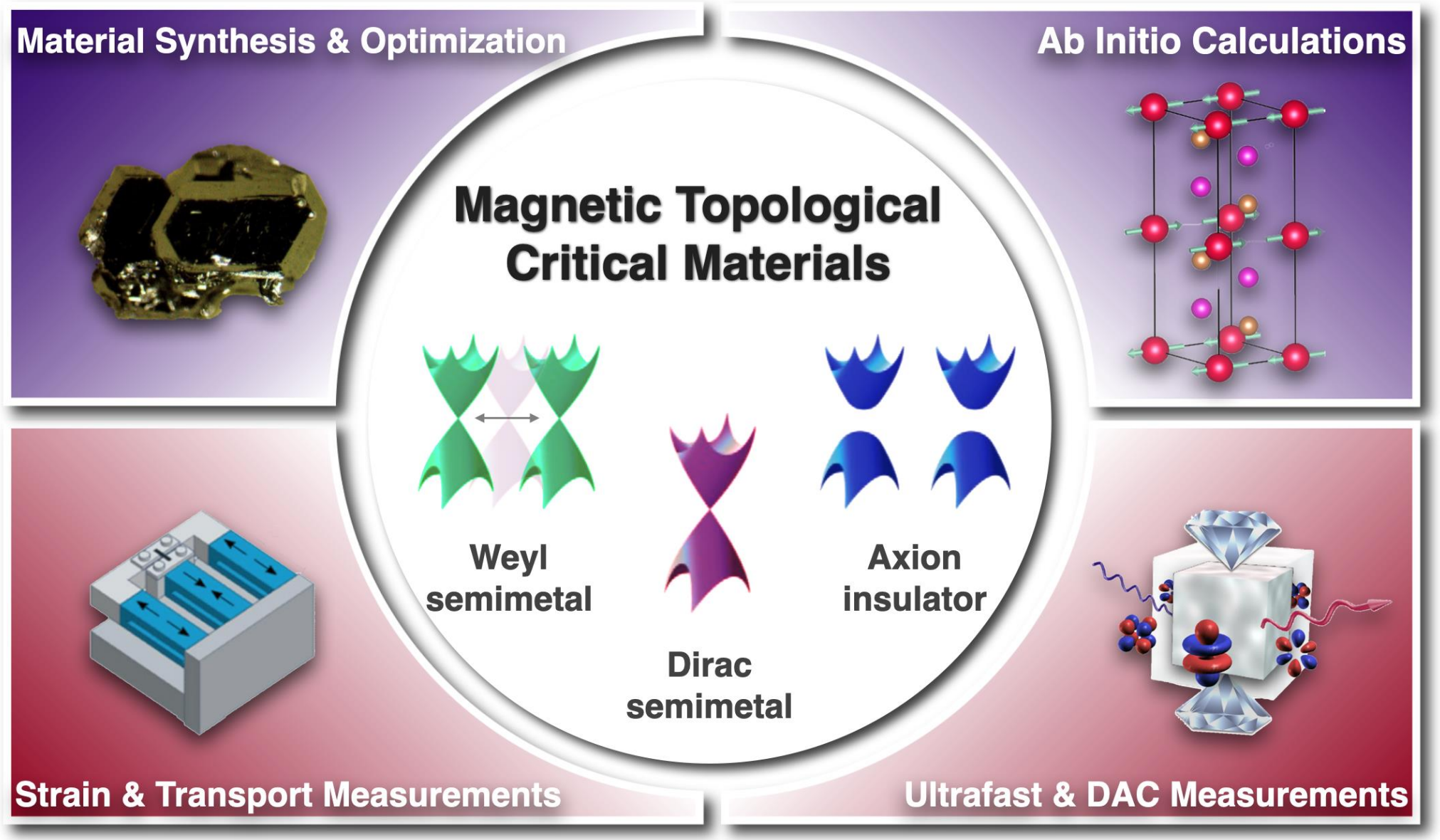
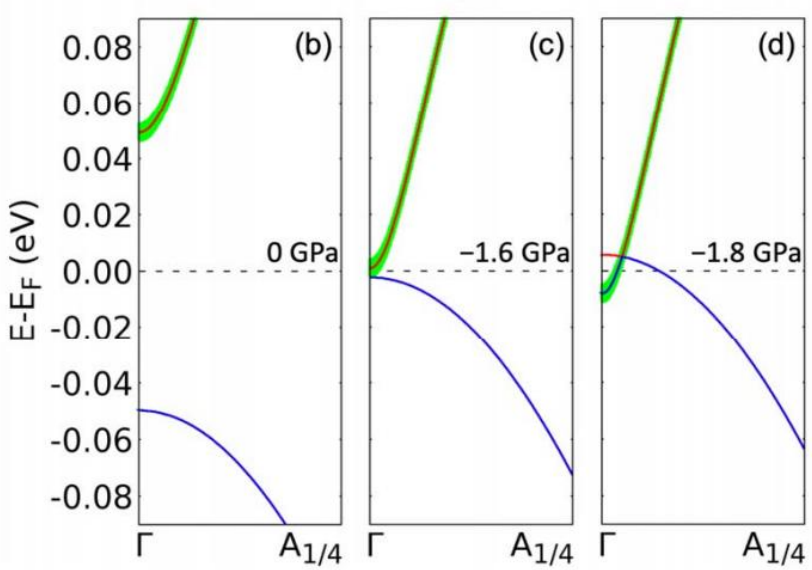
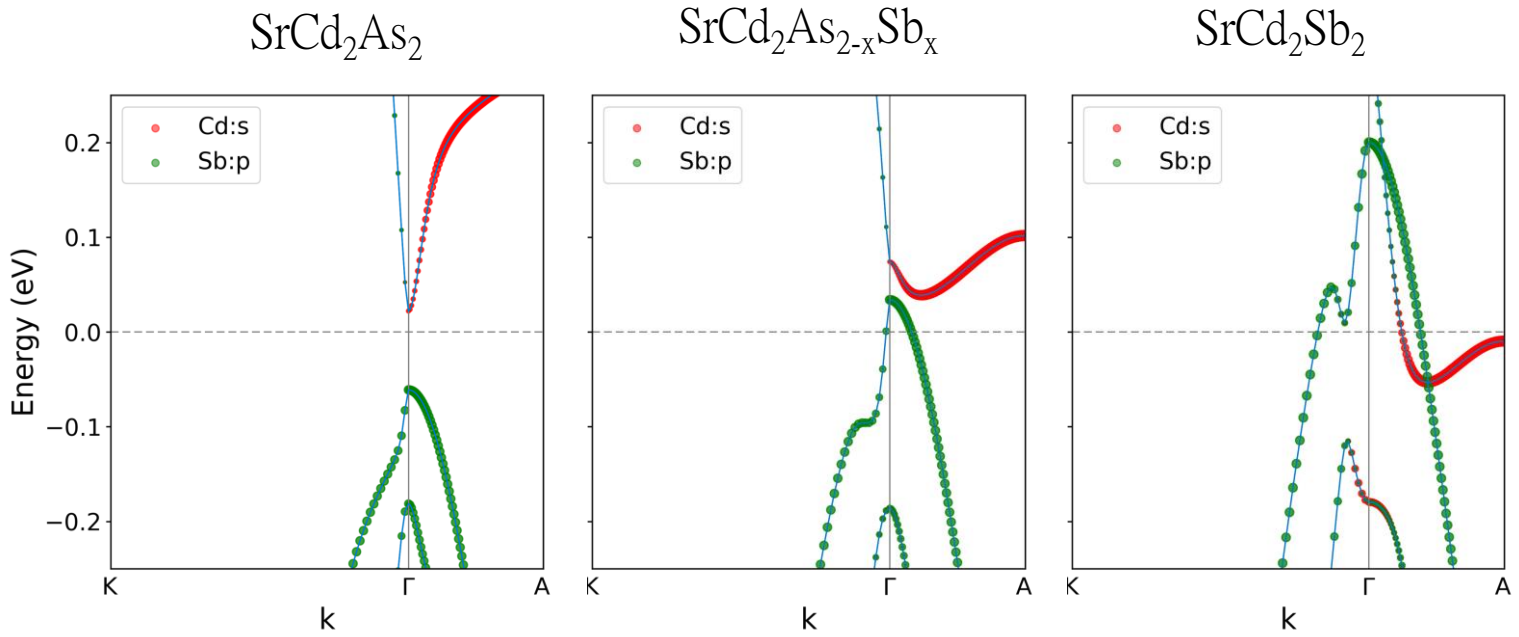


Main Proposal Themes

Band structure of $SrCd_2(As_{1-x}Sb_x)_2$





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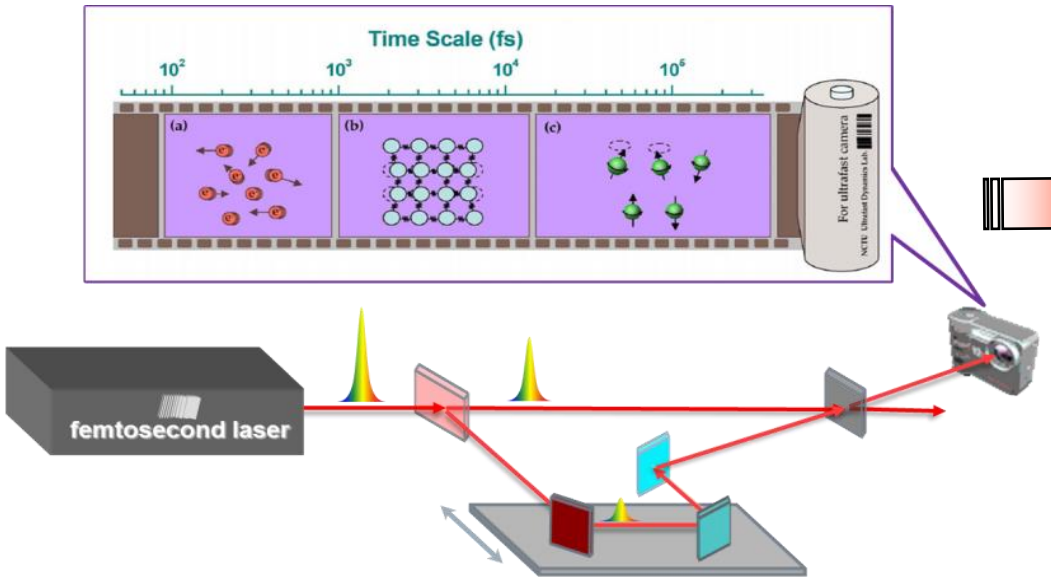
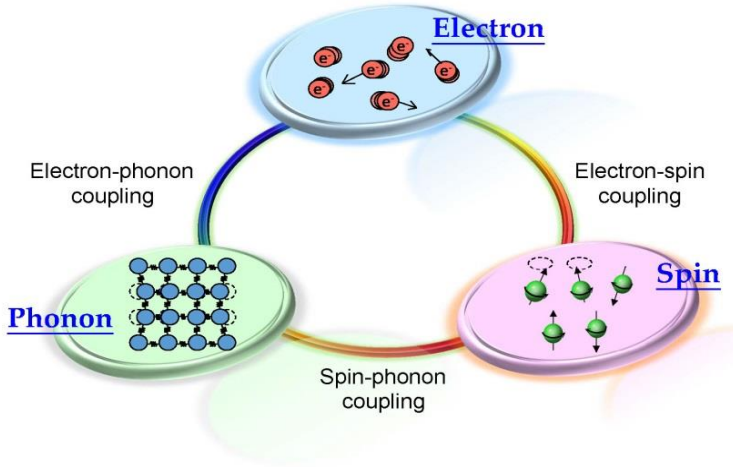
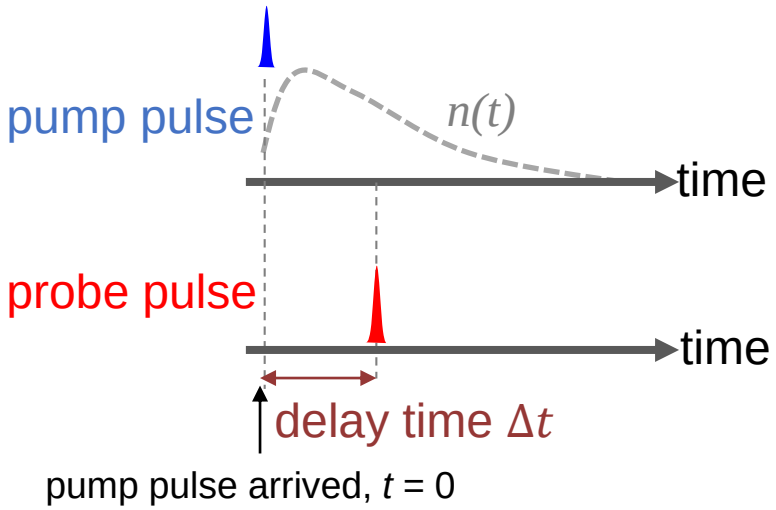
Optical Pump-Probe Spectroscopy

- **Probe the dynamics of electrons, phonons, and spins in time domain.**



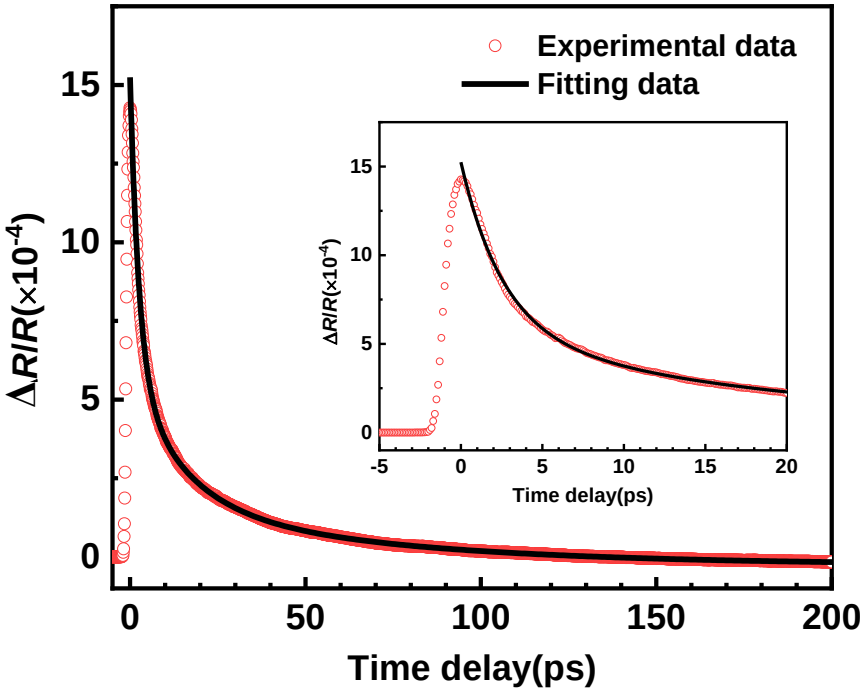


Ti-Sapphire laser
Pulse duration: 50 fs
Repetition rate: 5.2 MHz
Pump: 3.1 eV, 38 μJ/cm^2, P wave
Probe: 1.55 eV, 8 μJ/cm^2, S wave

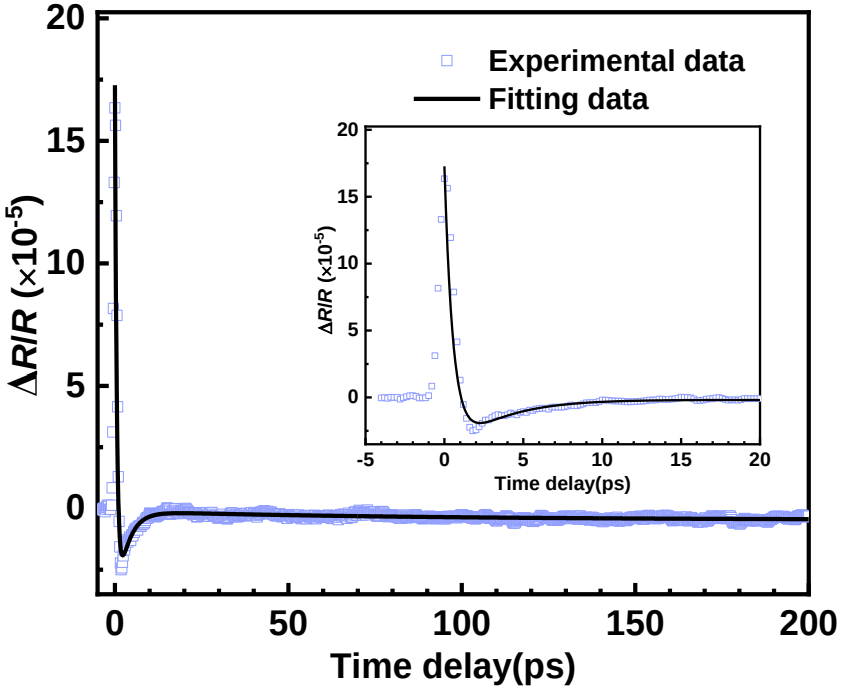


Comparison of $SrCd_2Sb_{2-x}As_x$ for x = 0 and 2.0

$SrCd_2Sb_2$



$SrCd_2As_2$



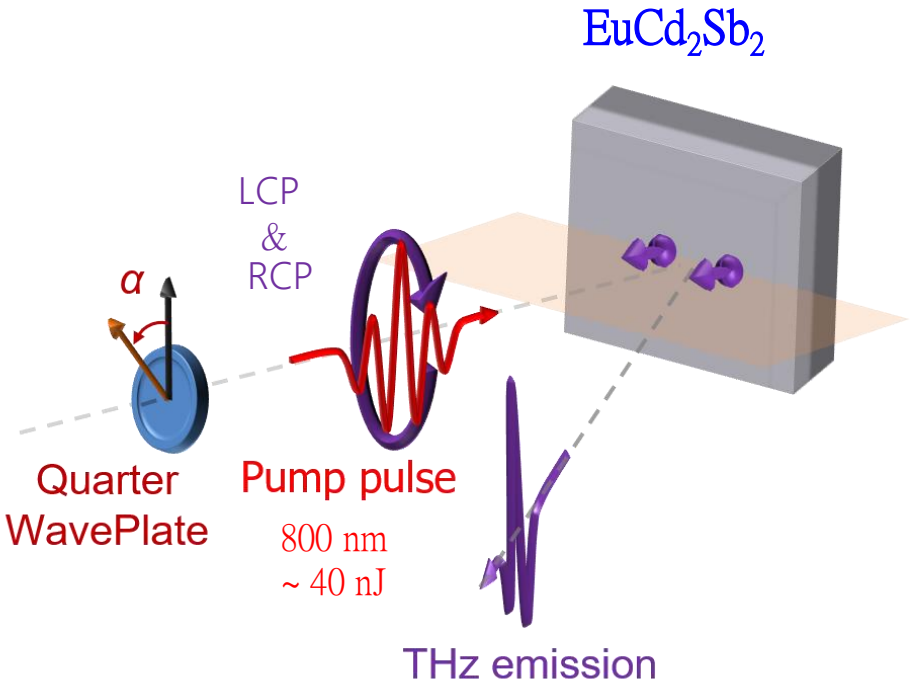
Parameter	$SrCd_2Sb_2$	$SrCd_2As_2$
y_0 ($\times 10^{-5}$)	-2.59±0.01	-0.47±0.01
A_1 ($\times 10^{-5}$)	-	21.88±1.44
τ_1 (ps)	-	0.56±0.10
A_2 ($\times 10^{-5}$)	93.24±0.24	-4.5±0.10
τ_2 (ps)	2.54±0.01	3.12±0.10
A_3 ($\times 10^{-5}$)	41.35±0.20	-
τ_3 (ps)	14.47±0.12	-
A_4 ($\times 10^{-5}$)	20.47±0.16	0.36±0.01
τ_4 (ps)	65.30±0.33	84.99±8.34

$$\frac{\Delta R}{R} = A_2 e^{-\frac{t}{\tau_2}} + A_3 e^{-\frac{t}{\tau_3}} + A_4 e^{-\frac{t}{\tau_4}} + y_0$$

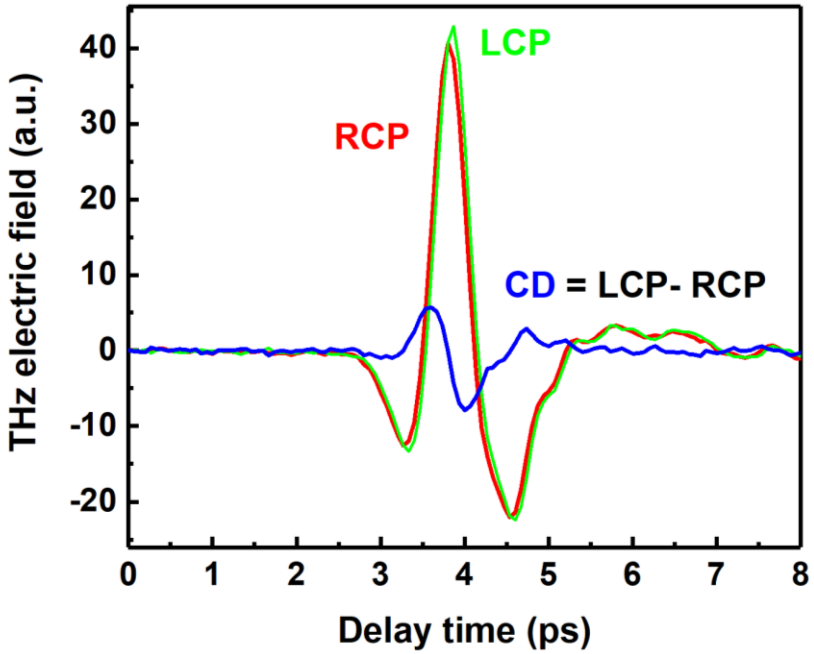
$$\frac{\Delta R}{R} = A_1 e^{-\frac{t}{\tau_1}} + A_2 e^{-\frac{t}{\tau_2}} + A_4 e^{-\frac{t}{\tau_4}} + y_0$$

THz emission spectroscopy

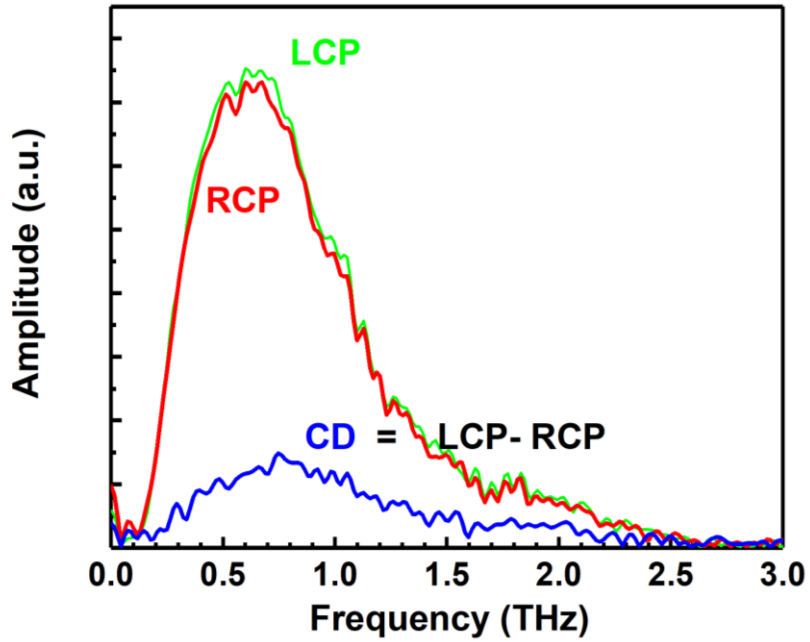
- At room temperature



THz waveforms



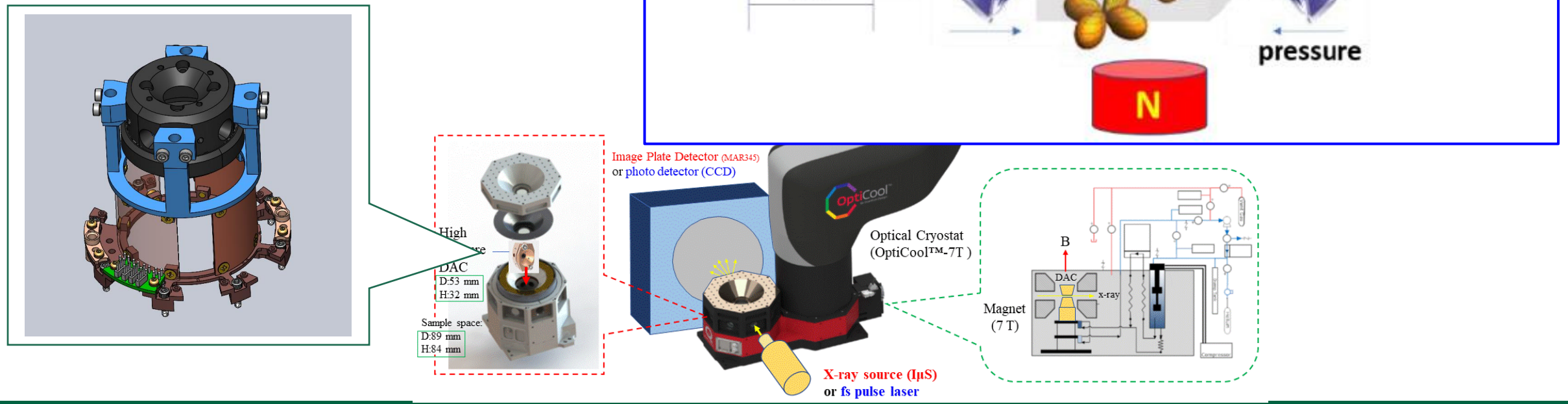
FFT Spectra



Ultrafast dynamics under extreme conditions (2nd year)

Temperature range: 1.7 K - 350 K
Magnetic field: ±7 T
Pressure: Up to 30 GPa

First data set: October, 2022



- Advertisement

Postdoctoral research fellow position: “Study the ultrafast dynamics of magnetic topological critical materials” at the National Yang Ming Chiao Tung University (NYCU) / TaiwanUSAF Program

JOB DESCRIPTION:

The Ultrafast Dynamics and Quantum Matter Physics group (Prof. Chih-Wei Luo and Prof. Jiunn-Yuan Lin) at NYCU, Taiwan, has an opening for a ***three-year postdoctoral position***. In this project, you will perform experiments to study the ultrafast dynamics of magnetic topological critical materials with pump-probe spectroscopy under low temperature, high magnetic field and high pressure. Topics of interest include electron dynamics of a Weyl semimetal. Ultimately, the goal is to connect spectroscopic transient absorption and reflection measurements with simultaneously tunable pressure, magnetic field, and temperature techniques, in order to alter the degrees of magnetic fluctuations, and study the corresponding electronic, spectroscopic, and transport phenomena due to exotic Weyl physics.

Thank You!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