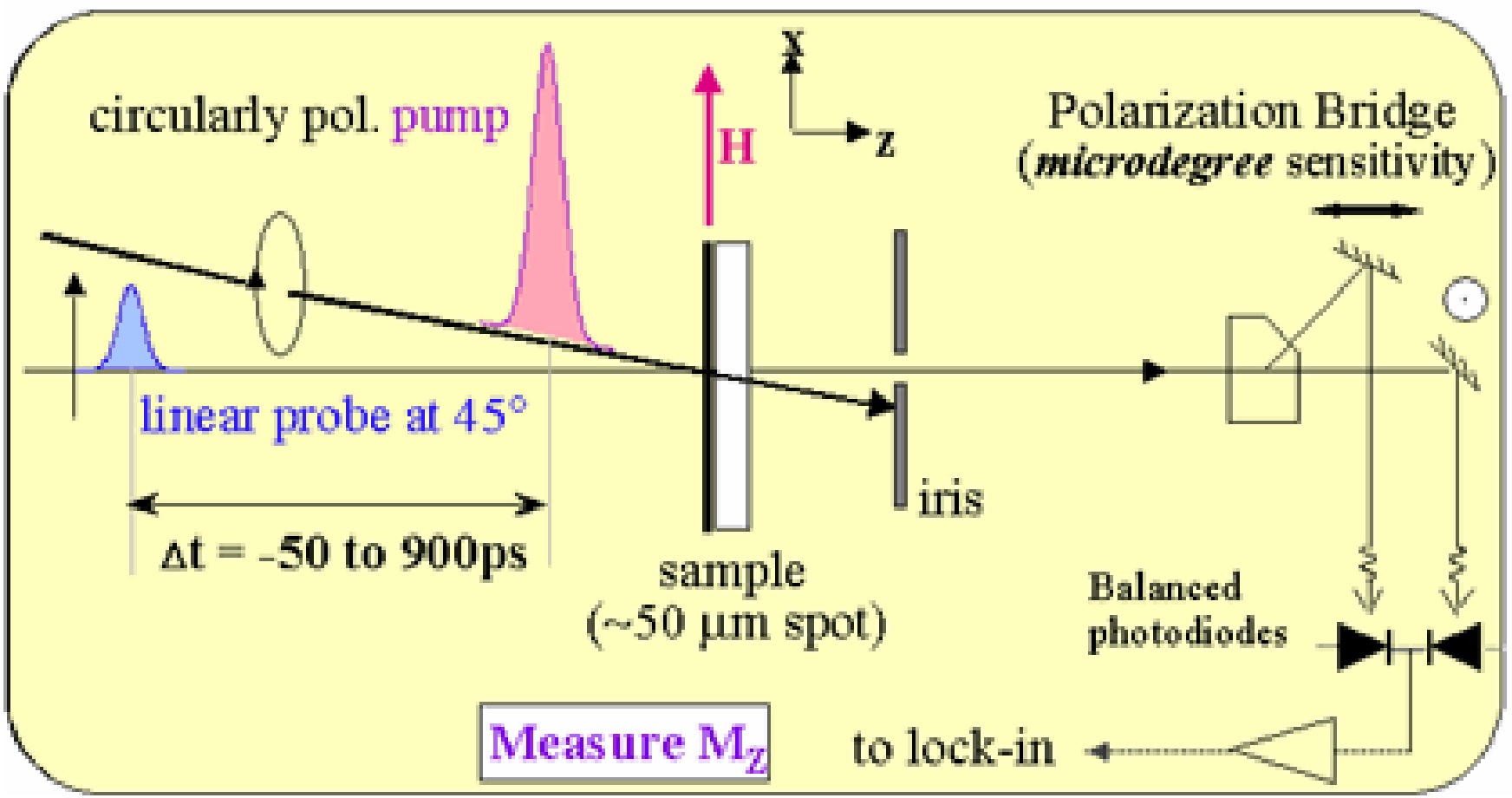
Cathode R&D

- Faraday Rotation experiment plans

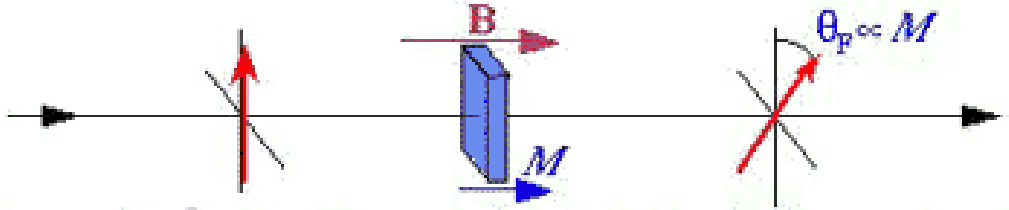
Faraday Rotation

- Polarization measurements without the NEA effects
- Study of the structures
- Independent measurements of left – right asymmetry
- Very high resolution polarization measurement



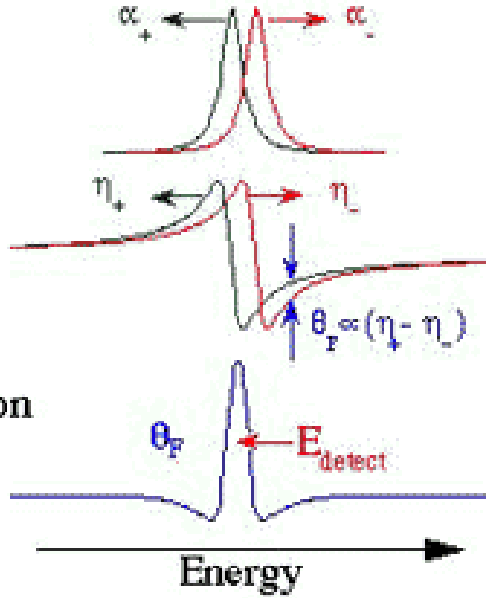
Basic principle

- **Faraday Effect** : Rotation of polarization upon transmission through magneto-birefringent media.



- **Rotation angle θ_F** directly proportional to the **difference** in index of refraction for RCP and LCP light, $(\eta_+ - \eta_-) \propto M$.

- **Near quantum-well resonance:**
  - Zeeman-split absorption peaks
  - Associated indicies of refraction
  - Resultant resonant Faraday rotation



$$\theta_F(\omega) = \frac{\omega L_{eff}}{2c}(\eta_+ - \eta_-)$$

$$\theta_1/\theta_2 \propto P_1/P_2$$

What can we measure?

- Measure spin coherence evolution with time
- Relative values of polarization of different samples
- Right-left hand polarization asymmetry
- With different probe wavelengths we can measure depolarization effects as a function of energy

Working out the numbers

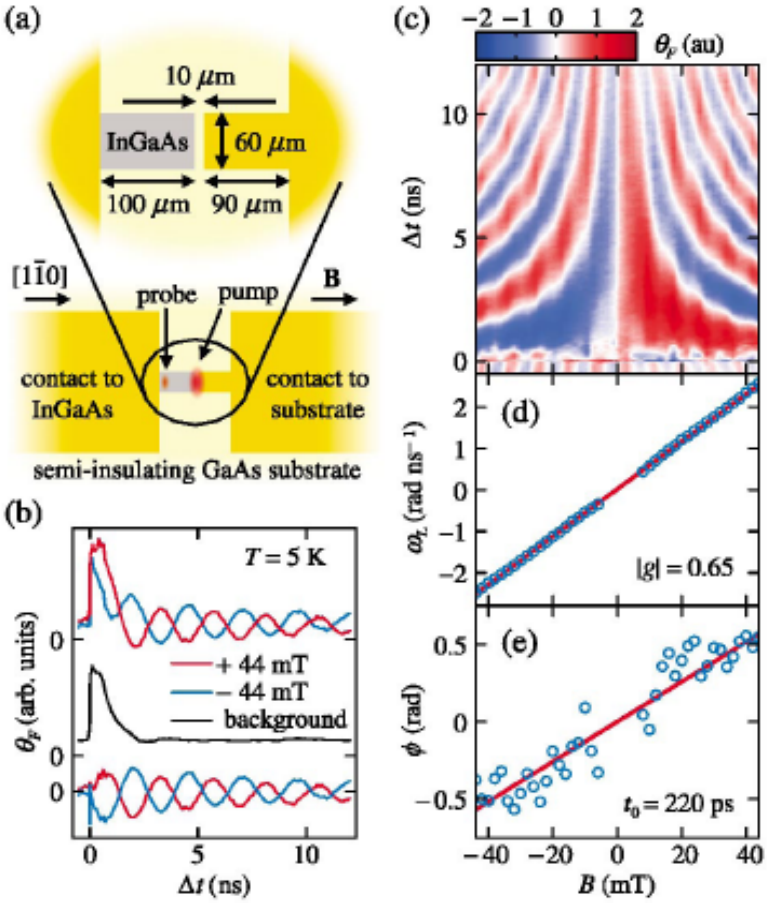


FIG. 4 (color). (a) Device schematic. (b) Time evolution of voltage-induced θ_F. Top curves (red, $B = +44$ mT, blue, $B = -44$ mT) show the raw data. Black curve is the background signal. Bottom curves show the data after background subtraction. (c) θ_F (background subtracted) as a function of Δt and B. (d) and (e) show ω_L and ϕ, respectively, obtained from fits to data in (c).

- Spot size : ~100μm
- Pump power : ~20μW
- Probe power: ~5μW
- Expected theta

$$\theta = 2\pi A d \rho_{el} I_{pr} \sigma_x \sigma_y$$

ρ_{el}~8μm^{-3}

Plans

Equipment

- Readout system already available
- TiSapphire modelocked laser ordered by U. of Wisconsin
- Where we put the Ti sapphire laser
- Which pump laser we use
- Other..

1.Saxet new sample arriving today (thin GaAs layer with thick W lines on top)

2.Collaboration with U.of New Mexico for samples growth