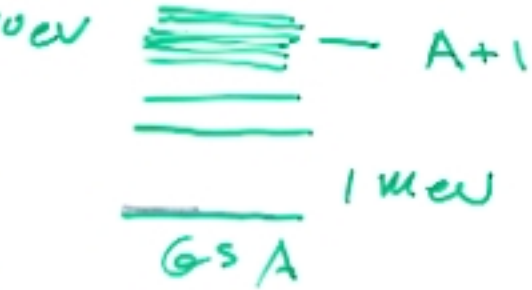
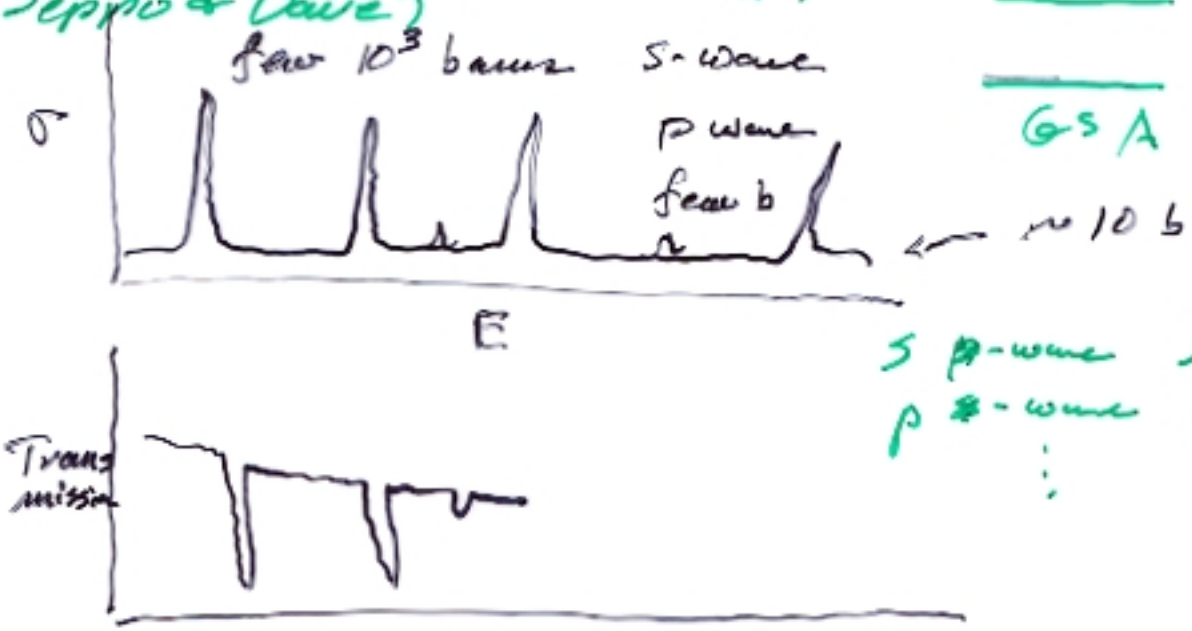
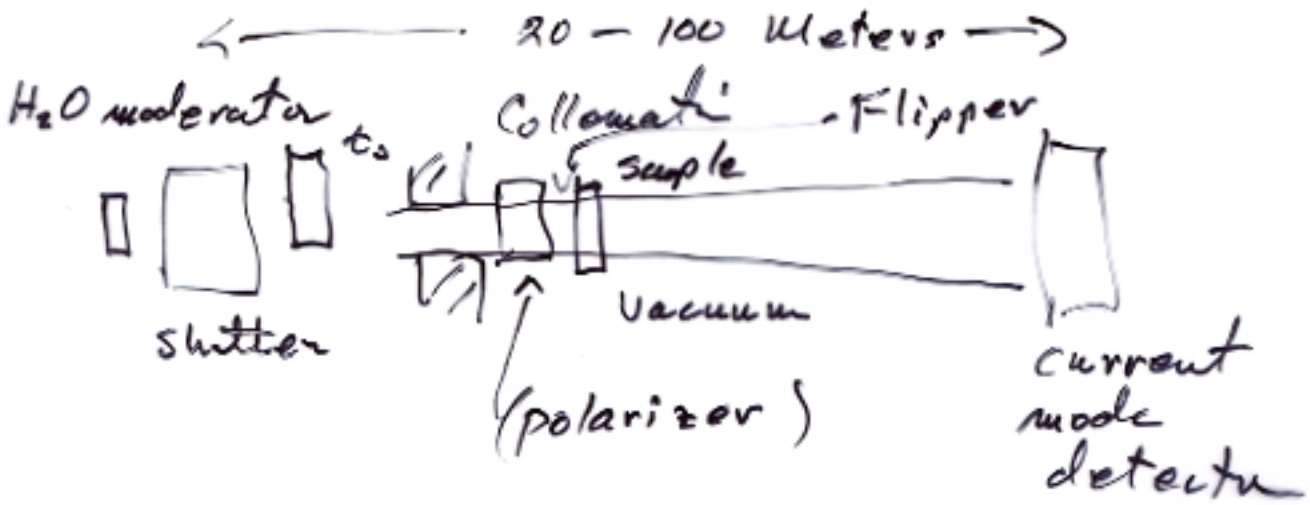
Compound Nucleus
Resonances + epithermal n's
(Seppo + Dave)





s p-wave $l=0$ $\pi+$
p p-wave $l=1$ $\pi-$
⋮

need pulsed beam (or chopped beam) to see resonances.



Resolution

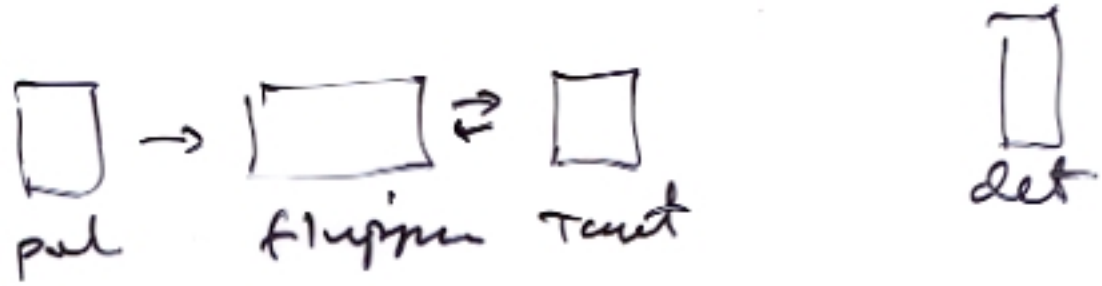
Beam Pulse ~300 μs
Moderation time $\frac{1\ \mu s}{\sqrt{E(eV)}}$

Detector Resolution
Resonance Width ~.1 eV
Doppler Width ~ Intrensic

$\frac{200\ \mu s}{E^{3/2}\ eV}$

PV in compound nucleus states

$\sigma \cdot k$



Triple
PV observed in $\gtrsim 100$ p wave resonances

~~Also~~ Also Spin Rotation

$$A_p = 2 \sum_s \frac{\langle s | V_{pv} | p \rangle}{\Delta E_{sp}} \frac{\gamma_s}{\gamma_p} \sqrt{\frac{\Gamma_s}{\Gamma_p}} = \frac{\Delta\sigma}{2\sigma}$$

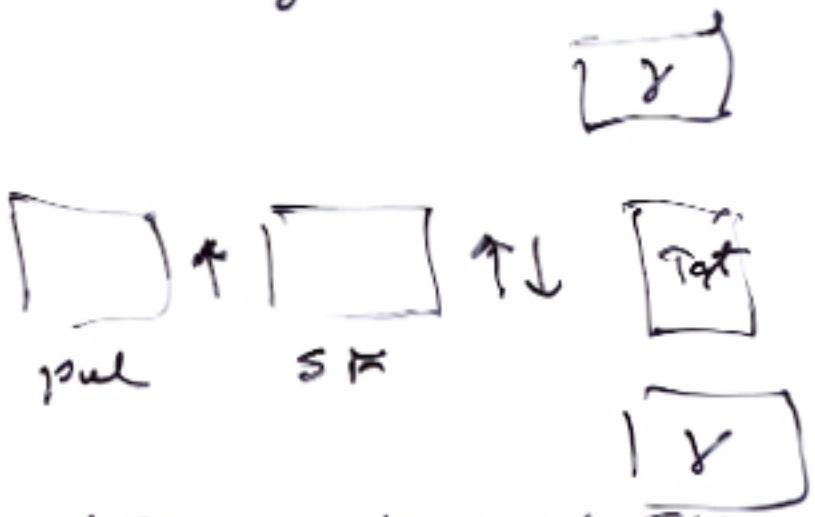
A is a R.V.

Expect $|\langle s | V_{pv} | p \rangle|^2$ RMS
as $\Gamma_w = \frac{2\pi |\langle s | V_{pv} | p \rangle|^2}{D} \sim 10^{-7}$ eV

But 10/10 resonances in ^{232}Th
have $\frac{\Delta\sigma}{2\sigma} > 0$ why?

Door Way States.

Check $\sigma \cdot k_\gamma$



$$\Delta\sigma \sim \langle p | V_{pv} | s \rangle \, \gamma_s^m \, \gamma_p^n$$

compare $\Delta\sigma_\gamma \langle p | V_{pv} | s \rangle \cdot \gamma_s^\gamma \gamma_p^n$

is $\Delta\sigma_\gamma$ random?

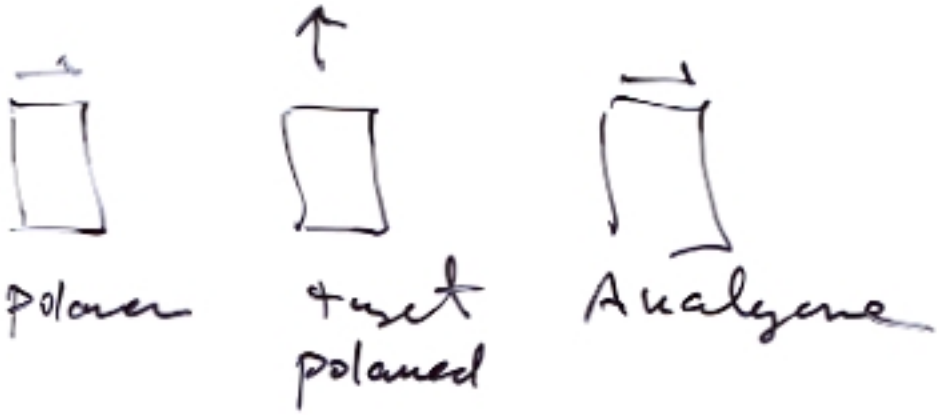
3 fold correlation

$\sigma \cdot J \times k$ s-p mixing

polarized beam polarized target

.734 eV (p-wave) ^{139}La Hm 10% PV in $\sigma \cdot k$ channel

Strong S-wave mixes with weak P-wave



searches for parity odd to odd ~ 10^{-5} - 10^{-6} of weak interaction

Harder than l s fold

$\not{T}$ violation $P = +$

5 fold correlation

$\sigma \cdot J \times k \, (J \cdot k)$ 5-D Mixing

Polarized Beam - Aligned Target
165 H_e
Exists @ TUNL
0 → 100 keV

Flipper
Exists @ LANL

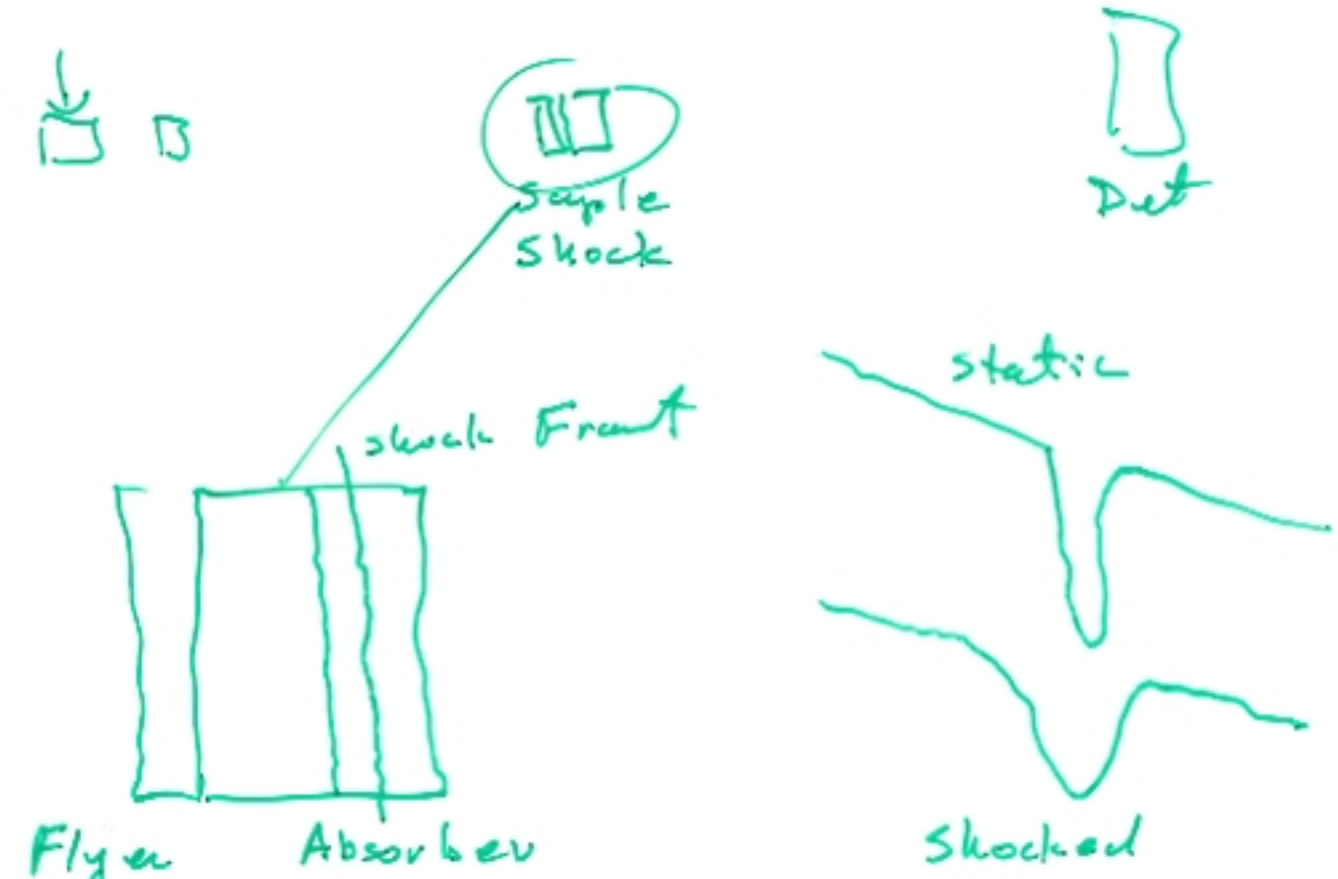
Dynamically
Polarized $\vec{P}$ (NH_3)
Exists at LANL ~1M 80 cm²

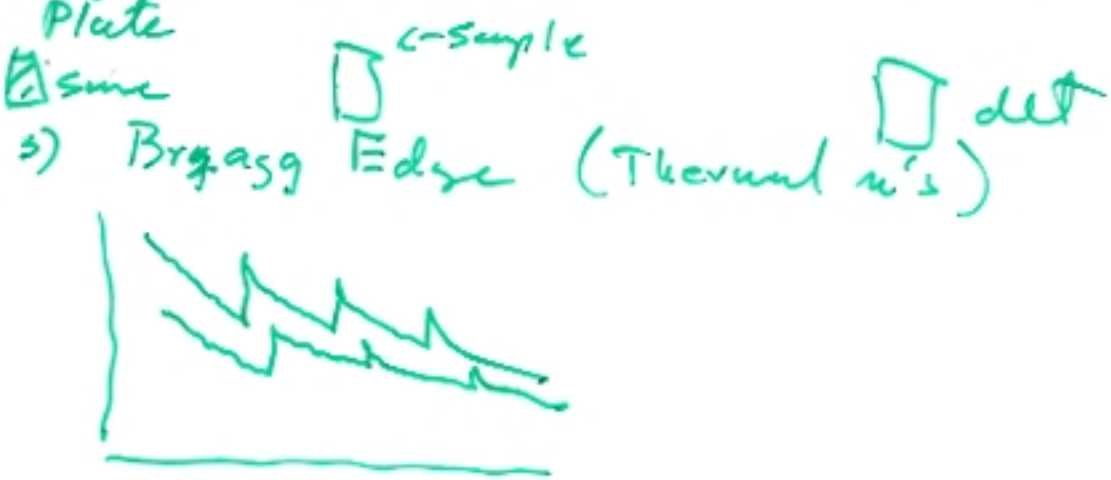
Improve ∝ strength of T-P+
by 10^2 at SMS

Applied Physics

1) Temperature Measurement by Doppler Broadening

2) Dynamic temperature Measurements





3) Bragg Edge (Thermal n's)

Quasi Static Change $Fe\text{-}C_{I} \rightarrow Fe\text{-}C_{II}$

3) Radiography ^{238}U-Hb