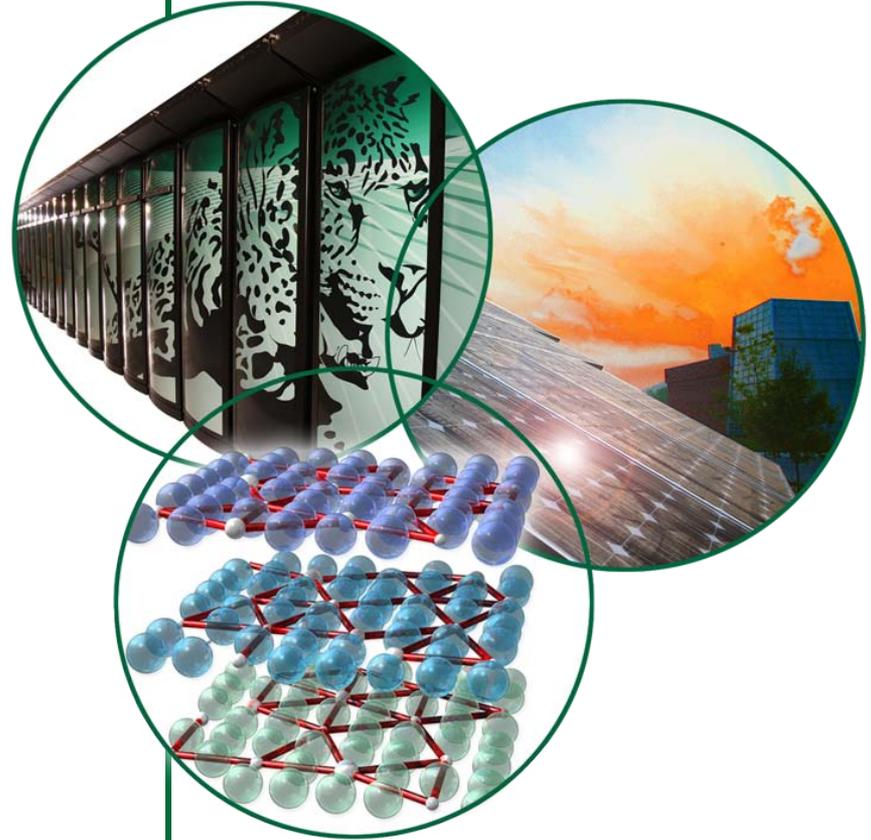


The HYSPEC Polarized Beam Spectrometer

Barry Winn, Mark Hagen,
Mark Lumsden, Melissa Graves-Brook
David Anderson, Xin Tony Tong

B2.5, rm G, 3:15-3:30 PM



HYSPEC History and People

Initial Proposal:



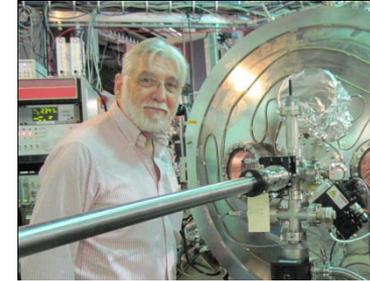
Principal Investigators & BNL Engineer:



Steve Shapiro



Igor Zaliznyak



Bill Leonhardt

IDT Executive also includes:



R. McQueeny



J. Rhyne



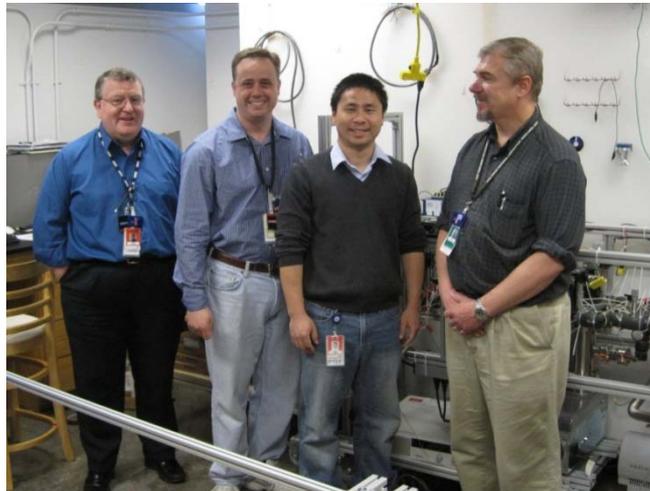
M. Kenzelmann

At ORNL:

Instrument construction complete

Commissioning with unpolarized neutrons mostly done

Polarized neutron commissioning beginning

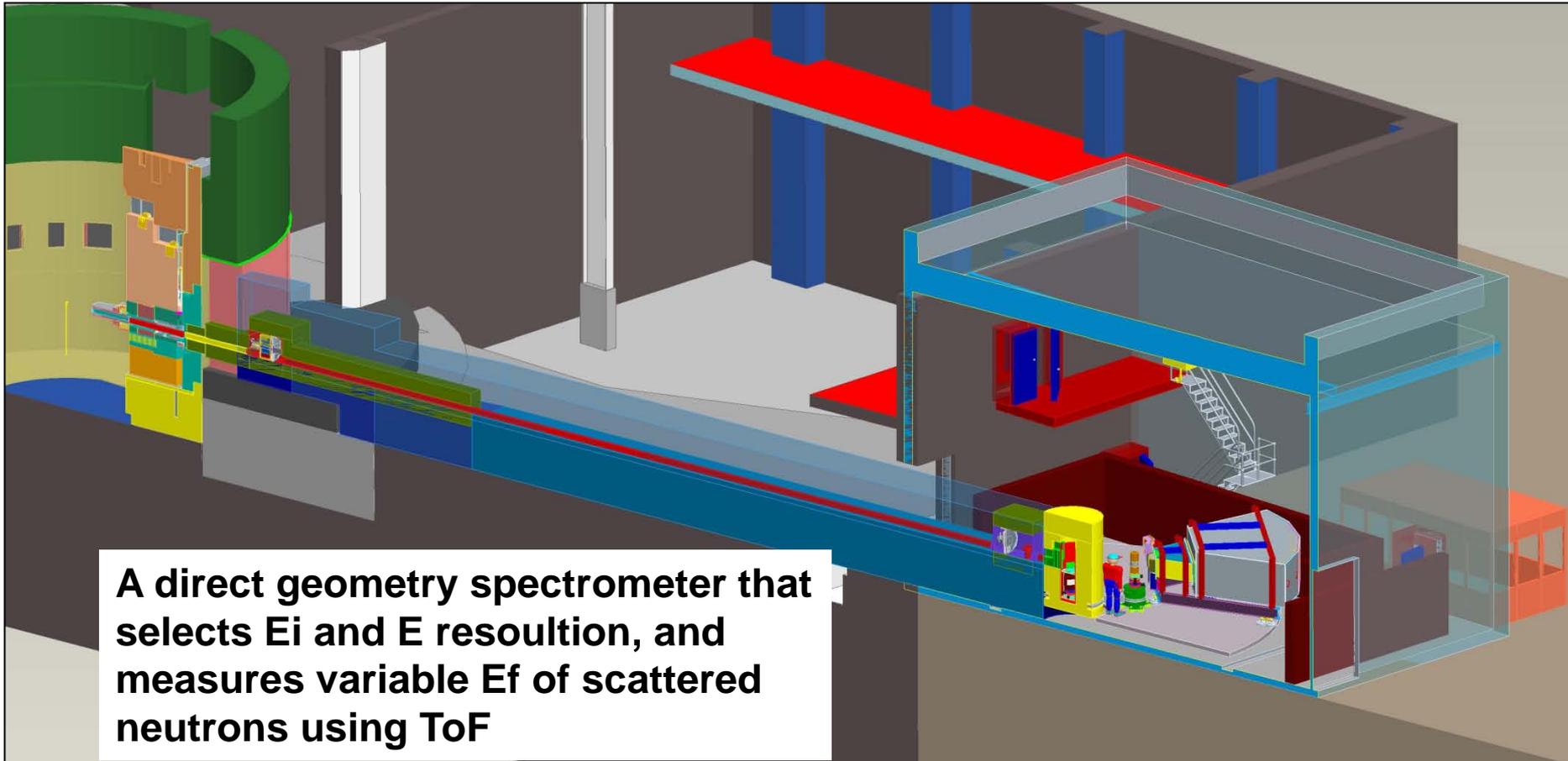


Mark Hagen Barry Winn Tony Tong David Anderson



Melissa Graves-Brook

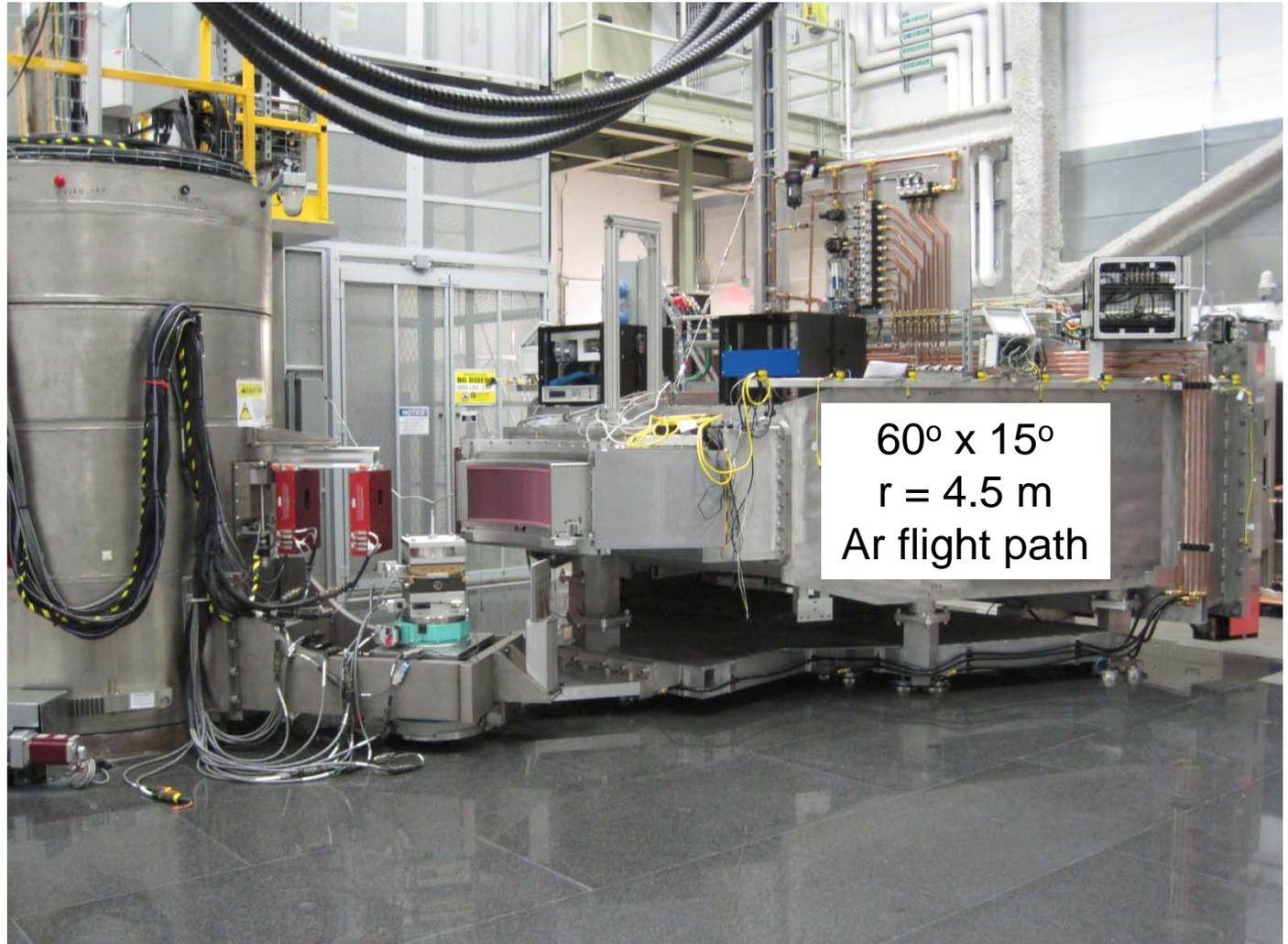
Hybrid Spectrometer: a cross between



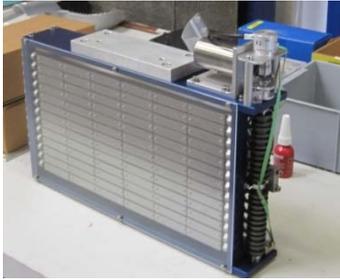
Hybrid Spectrometer: a cross between

...and a
triple-axis
spectrometer's
vertical
focusing array

and a variable
direction final
flight path



The focusing element focuses neutrons from a vertical trumpet guide system

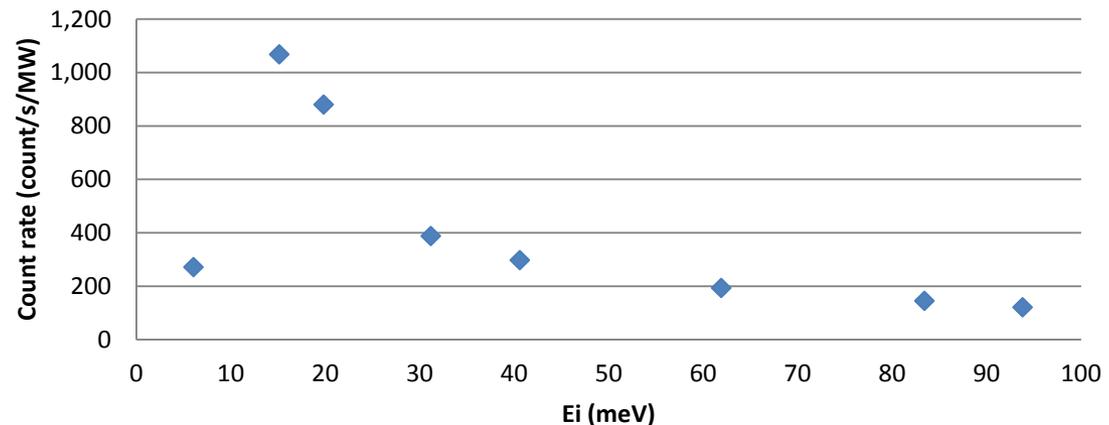


Pyrolytic
Graphite

$3.8 \text{ meV} < E_i < 95 \text{ meV}$

- 15 cm high guide, PG focusing array focused at sample with $\sim 2 \text{ cm}$ high spot size
- Gold foil measurement at sample position, 1.8 m between focus element and sample, $E_i = 15 \text{ meV}$, Fermi Chopper frequency 180 Hz : $4.2 \text{E}5 \text{ c/s/MW/cm}^2$
- Vanadium incoherent isotropic scatter to detector array at 70°

Vanadium 6.4 mm dia rod



And we have the option to polarize the incident beam with a Heusler crystal array



Heusler
(polarizing)



Energy(meV)	Flipping Ratio of Heusler and guide fields pre-sample
50	23.01
14.59	25.44
7.5	28.41

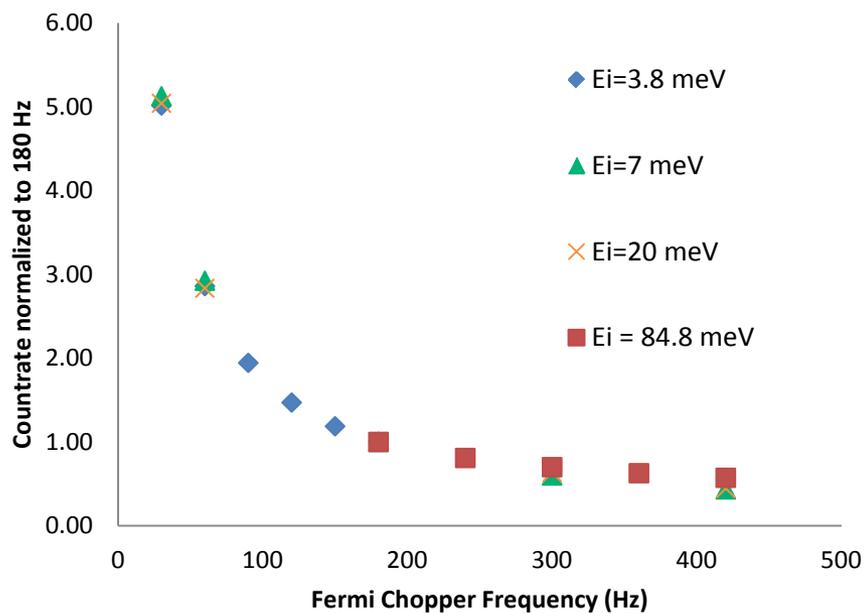
Flux / Resolution tradeoff using Fermi Chopper Frequency

- V rod 6.4 mm diameter

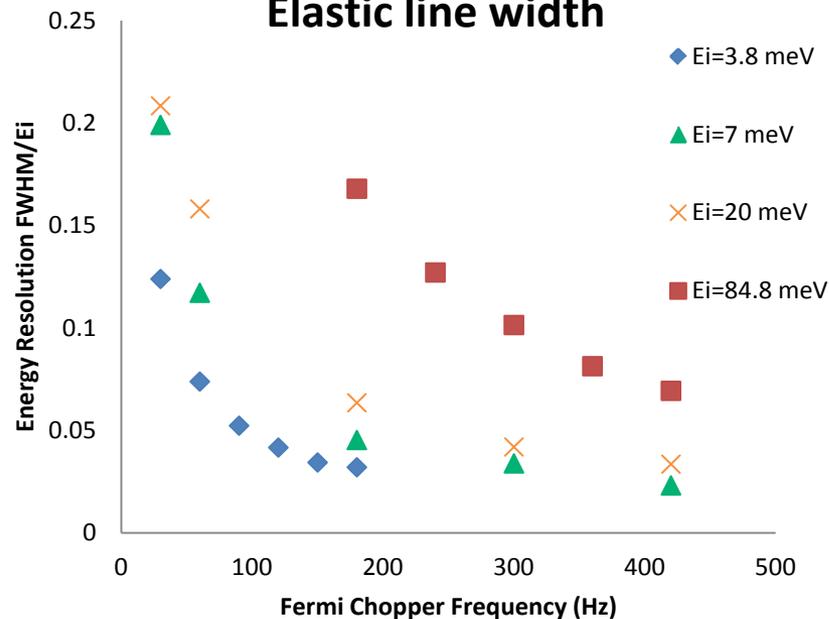


Straight-blade
Fermi chopper,
30-420 Hz

Flux tradeoff with Fermi Frequency

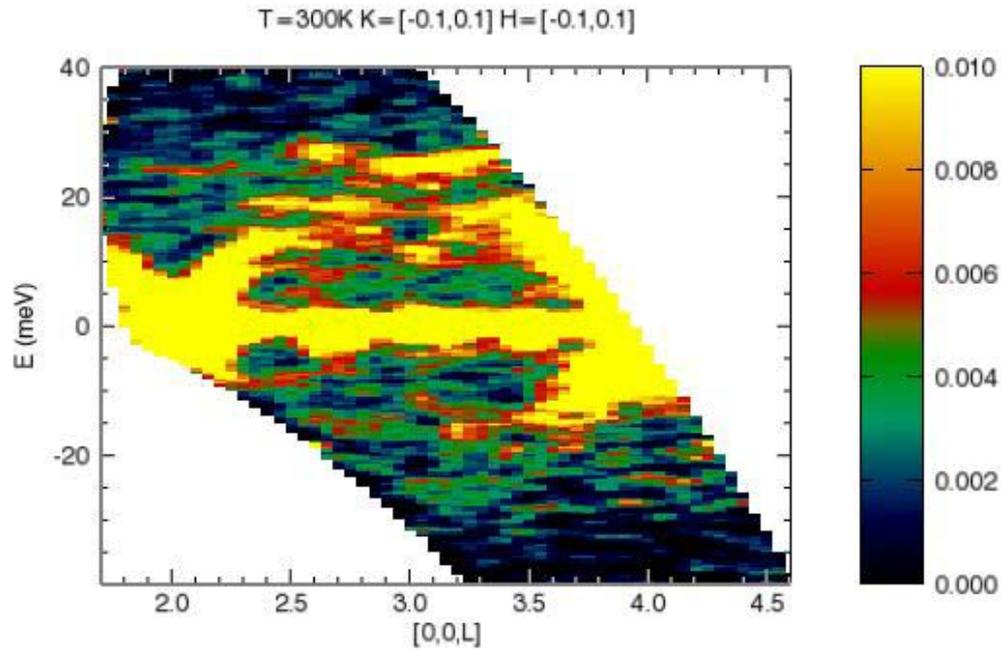


Elastic line width



Useful to study phonon excitations on single crystals

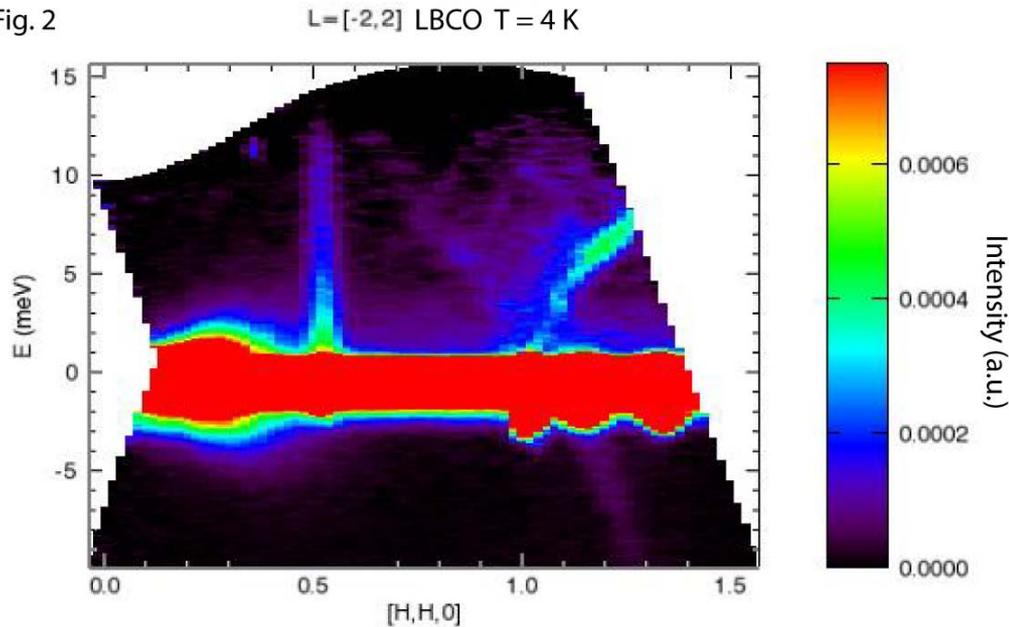
FeSb₂, E_i=51.58 meV, Fermi chopper 420 Hz, High Detector Vessel angle, Multiple sample θ , 30 min/angle, Mantid to NxSPE, Dave Mslice: T=3, 100, 300 K



I. Zaliznyak (BNL), A. Savici, A. Christianson, B. Winn, M. Hagen, R. Hu and C. Petrovic (in preparation)

Or magnetic excitations in single crystals or powders

Fig. 2



Very dispersive magnetic excitations in the ground state of the quantum magnet $\text{La}(2-x)\text{Ba}(x)\text{CuO}_4$ with $x=0.025$ can be seen emanating out of $\sim 1/2, 1/2 L$. These particular data, taken with HYSPEC at $T=4$ K, integrate over much of the direction normal to L , that is normal to the two dimensional copper-oxide planes in this layered magnet. These spin excitations are gapless and are known to extend to very high energies (~ 200 meV). Acoustic phonons can also be seen emanating out of the nuclear zone centers near $11L$.

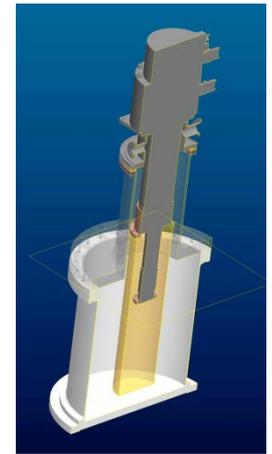
K. Fritsch, B. Gaulin (McMaster U), in preparation

Getting ready for your samples

Dedicated
Cryostat



Dedicated closed cycle refrigerator
compatible with ^3He polarization
analysis



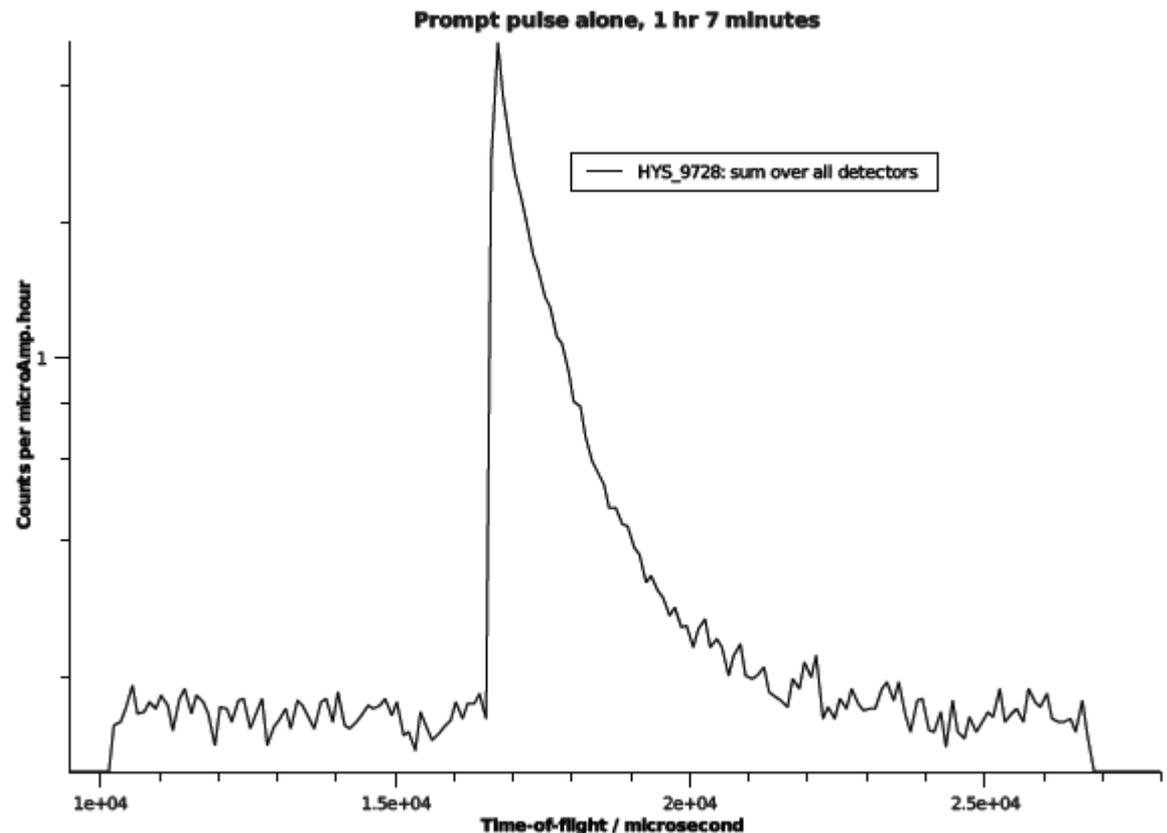
Larger OVC's and
new heat shields
for both CCR's

Spare CCR



Minimizing background...

- 70% already removed by shielding BL 10 near monolith
- One frame shown (1/60 sec), with HYSPEC shutters closed
- Leading edge coincides with subsequent spallation events
- Tail is epi-cadmium (>500 meV)
- Ei not yet useful at 4 meV, 9 meV and 27-38 meV
- **STILL HUNTING!**



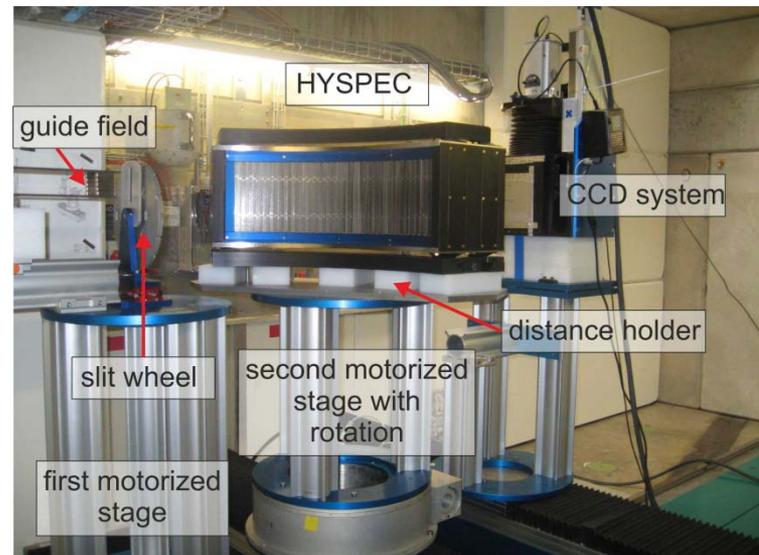
And preparing to commission for polarization analysis

Option 1: ^3He polarization analyzer and Filling Station



Status: See T Tong's talk, Wednesday at 11:00 AM, B4.2, and D. Brown's poster Tuesday at BP2.8

Option 2: Polarizing supermirror array from PSI



Summary

- Unpolarized commissioning mostly complete
- Polarized commissioning has begun
 - Through spring 2013
- Limited availability in user program in spring 2013
 - Unpolarized neutrons only
- Expanding Instrument Team at ORNL

It takes a village

- Engineering & Design
 - J. Terrell, R. Huerto
- Installation
 - R. Connatser, S. Proffitt
 - D. Engle, W. Dawkins, C. Fletcher, S. Vasques, J. Brackett
 - HAZELWOOD
- Electrical & Controls
 - J. Moss, R. Saethre
 - A. Groff, R. Morgan
 - Research Mechanics
- Interlocks & Safety
 - P. Wright, J. Proulx
 - G. Rowland, P. Abston
- Vacuum
 - J. Price, C. Stone, R. Morton
- Choppers
 - W. McHargue, J. Garrett
- DAS
 - A. Parizzi, T. Thompson, G. Greene, M. Ruiz-Rodrigues
 - M. Yao, J. Kohl, M. Sundaram, P. Zivanovic
- Data Reduction & Analysis
 - S. Campbell, A. Savici