



## IRIDE photo-production workshop



# Thermal neutron counting with radiative capture

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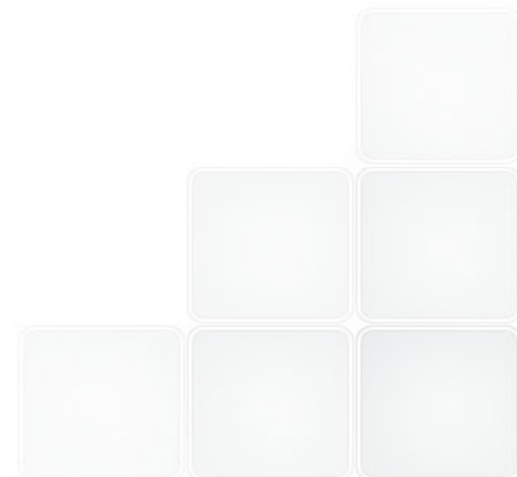
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## An open problem



Thermal neutron detectors:

**The  $^3\text{He}$  replacement**





PNNL-18388

Prepared for the U.S. Department of Energy  
under Contract DE-AC05-76RL01830

# The $^3\text{He}$ Supply Problem

RT Kouzes

April 2009

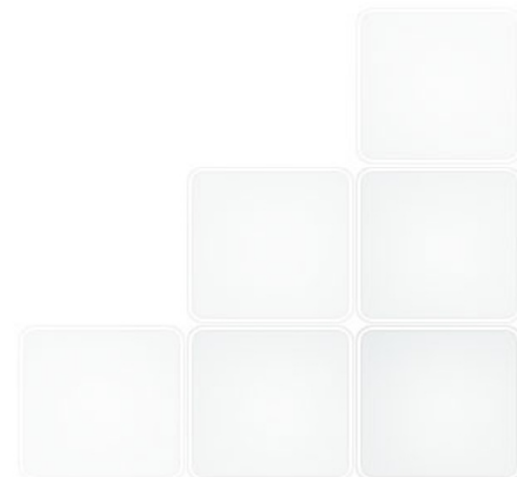


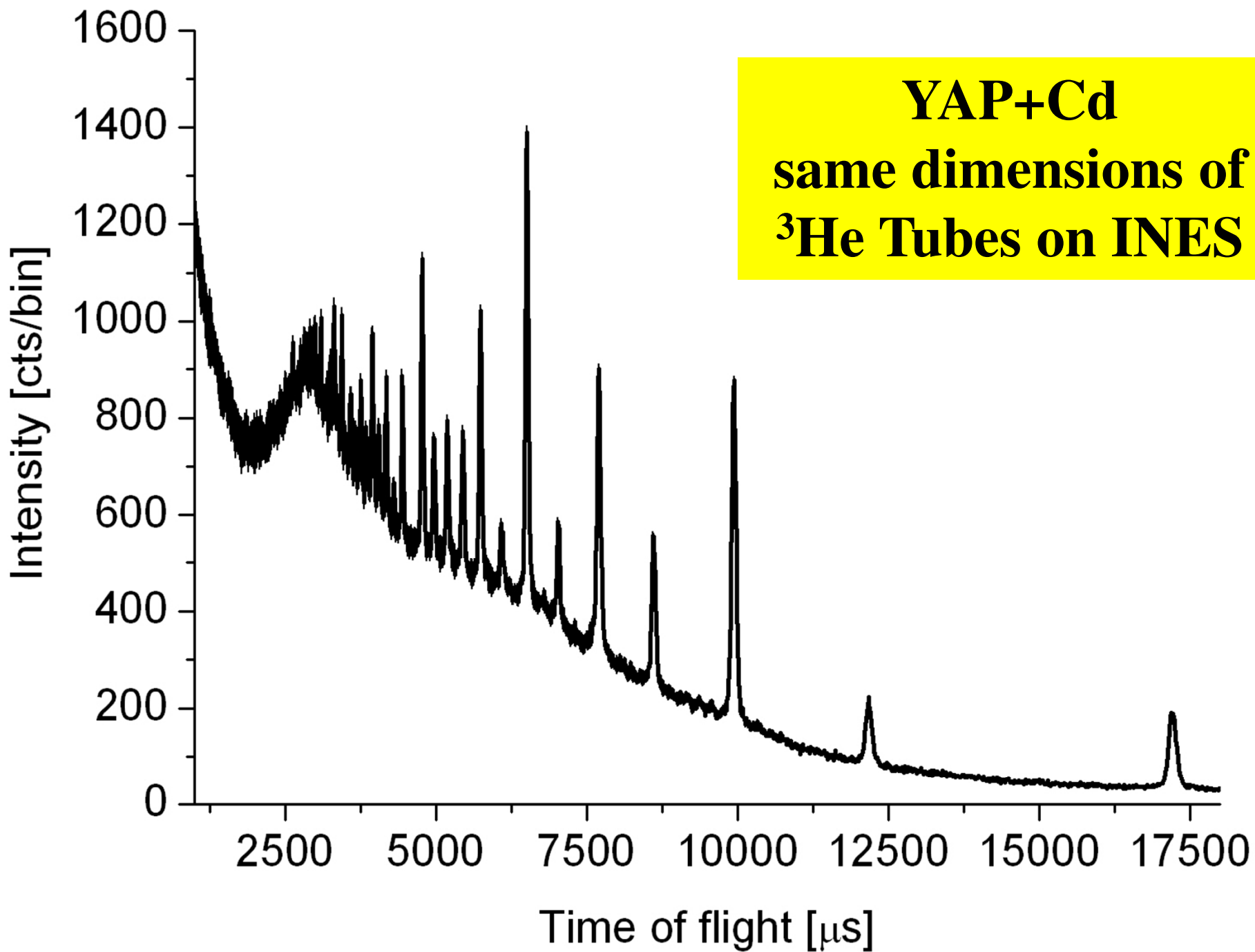
## The $^3\text{He}$ Supply Problem Updated June 20, 2009

### Abstract

One of the main uses for  $^3\text{He}$  is in gas proportional counters for neutron detection. Radiation portal monitors deployed for homeland security and non-proliferation use such detectors. Other uses of  $^3\text{He}$  are for research detectors, commercial instruments, well logging detectors, dilution refrigerators, for targets or cooling in nuclear research, and for basic research in condensed matter physics. The US supply of  $^3\text{He}$  comes almost entirely from the decay of tritium used in nuclear weapons in the US and Russia. A few other countries contribute a small amount to the world's  $^3\text{He}$  supply. Due to the large increase in use of  $^3\text{He}$  for homeland security, the supply has dwindled, and can no longer meet the demand. This white paper reviews the problems of supply, utilization, and alternatives.

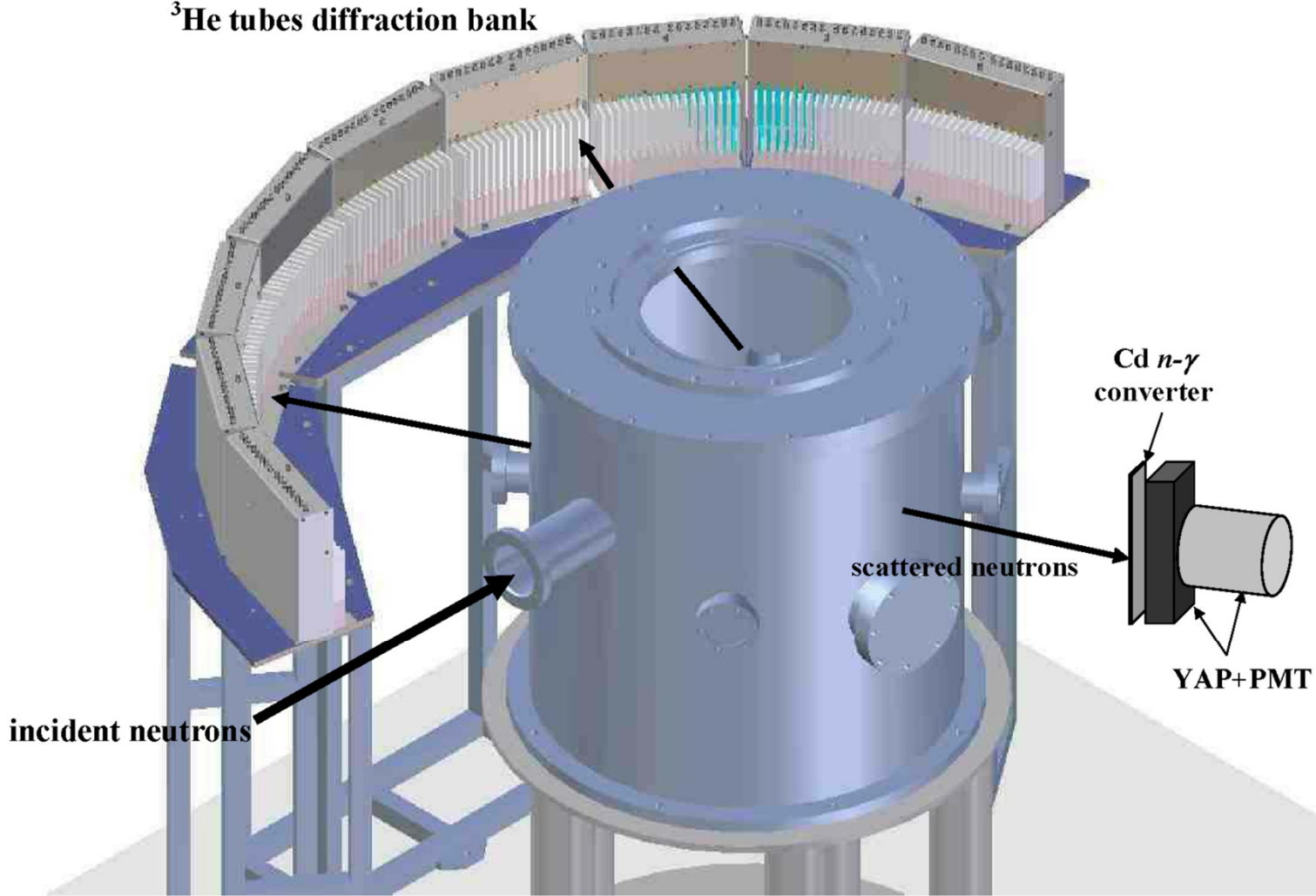
# Possible alternative detection techniques Beyond $^{10}\text{B}$ -based neutron detectors



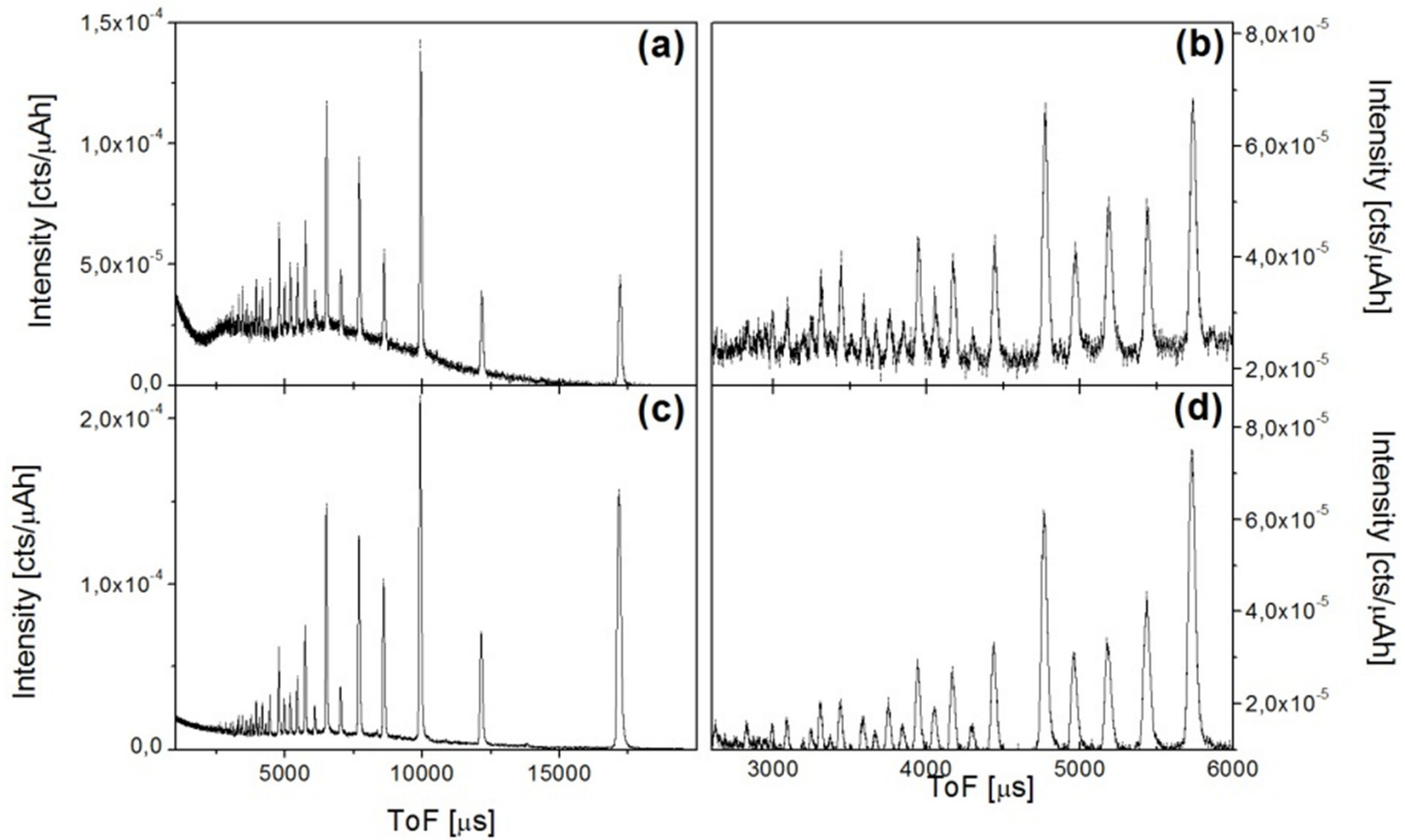


# First tests @ ISIS

## INES diffractometer



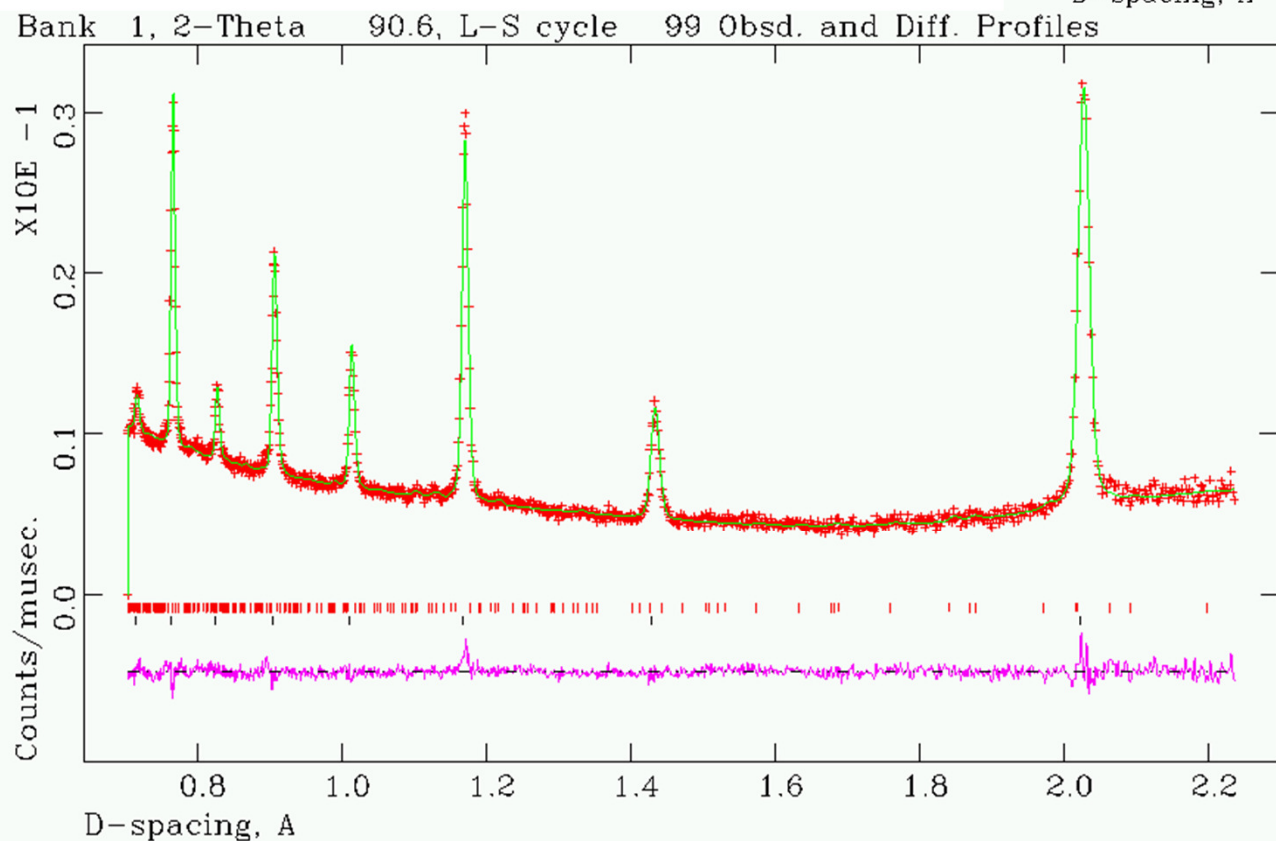
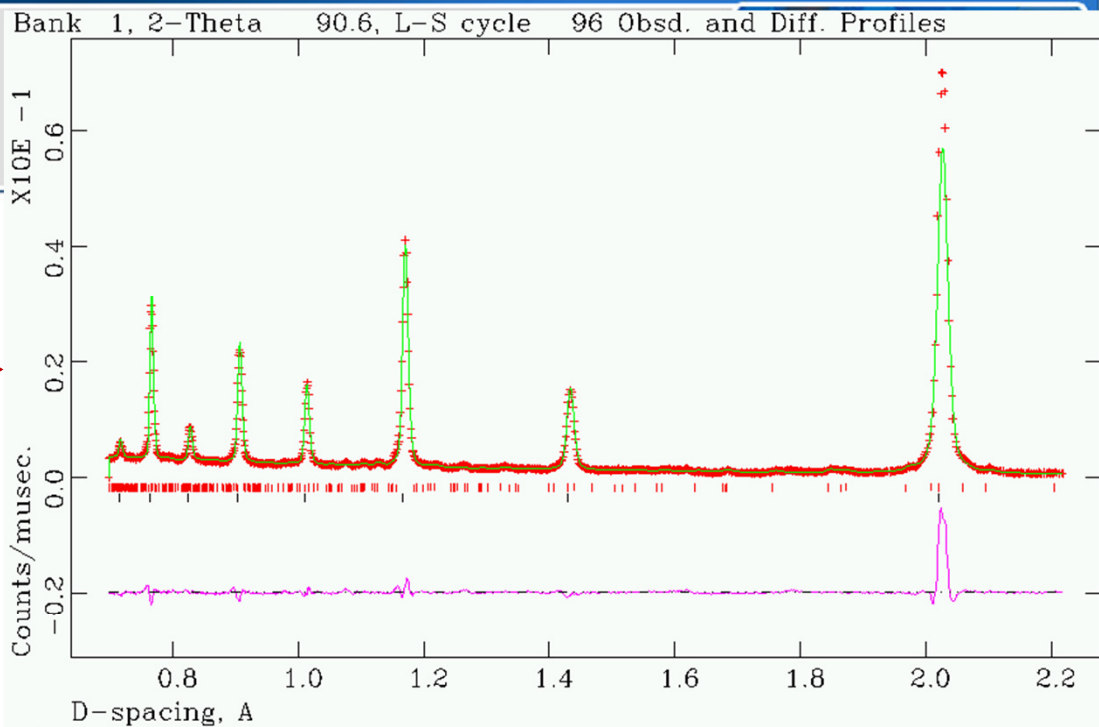
# $^3\text{He}$ vs YAP-Cd



Rietveld analysis on diffraction patterns from a metallic sample

3He tubes

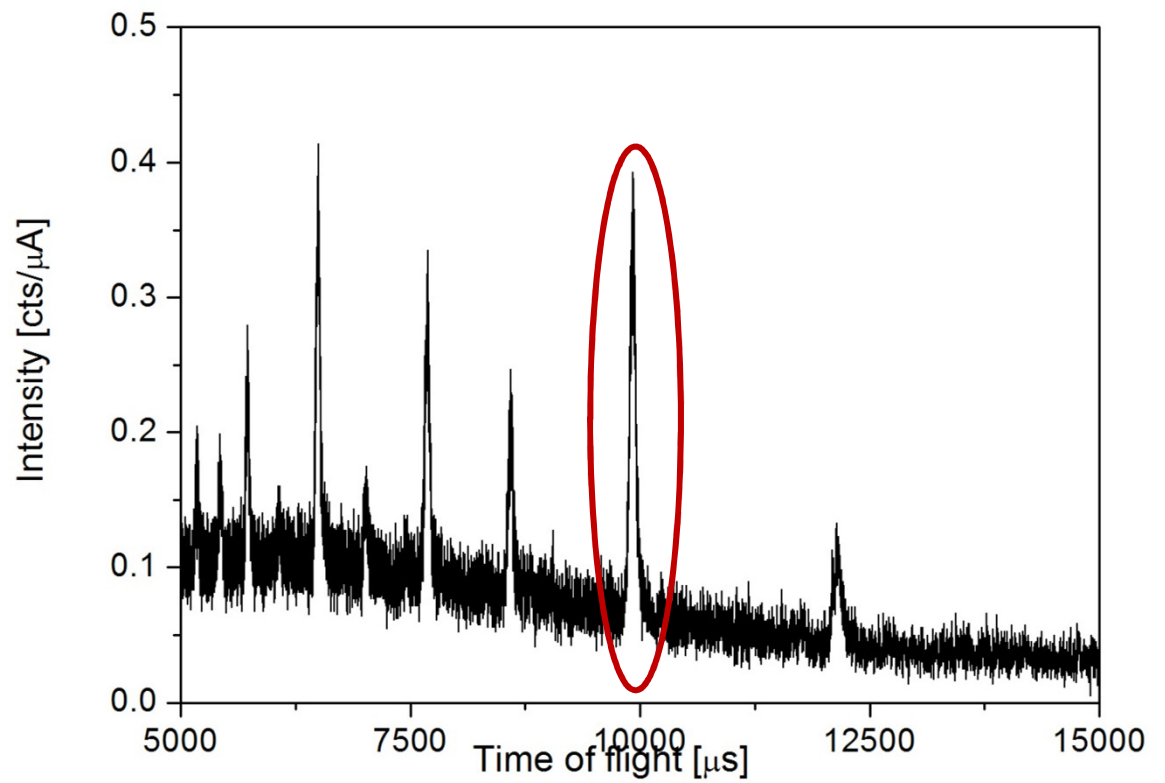
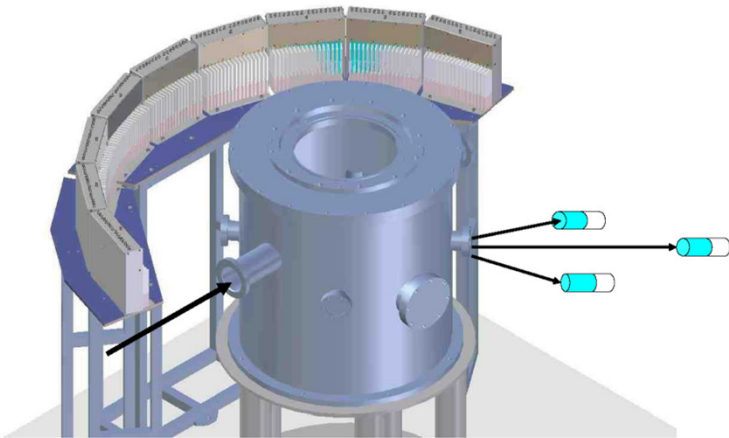
YAP-Cd





# detectors cross talk

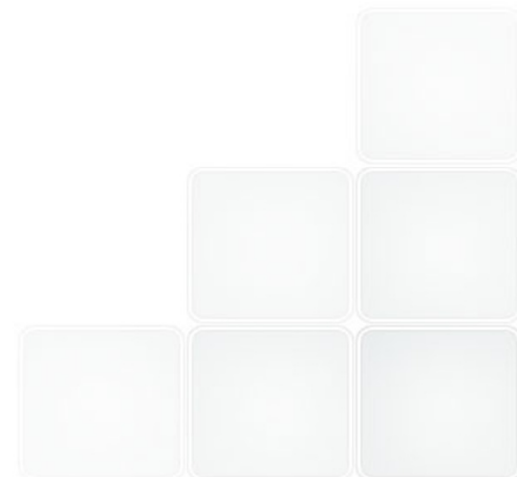
## Tests on beam at INES diffractometer



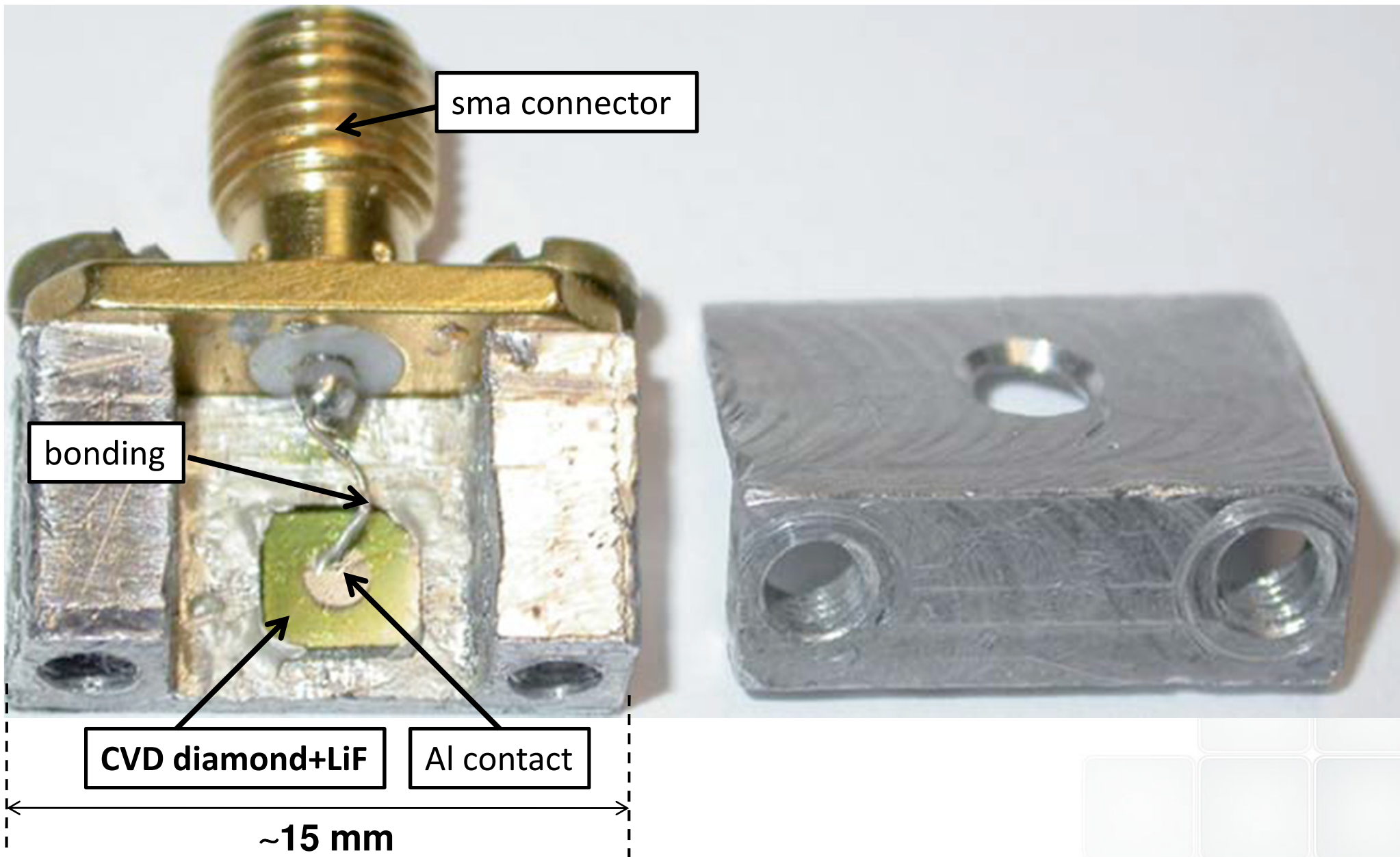
A further activity



## A different approach to beam monitoring



# D-LiF beam monitors



# Tests on the INES beam (ISIS)

