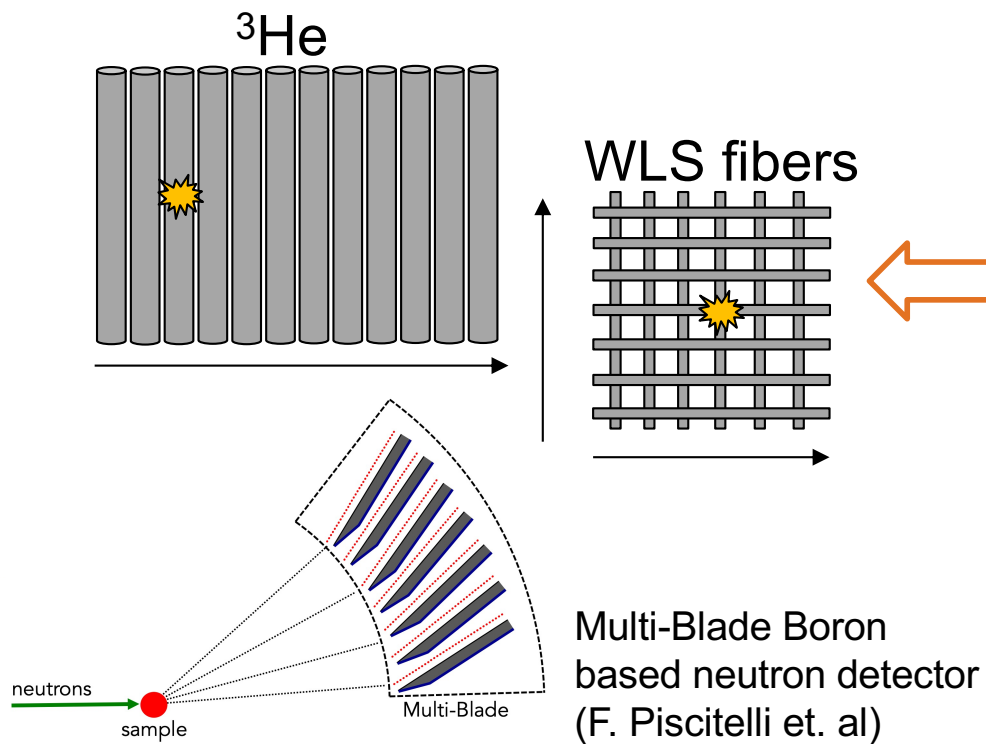
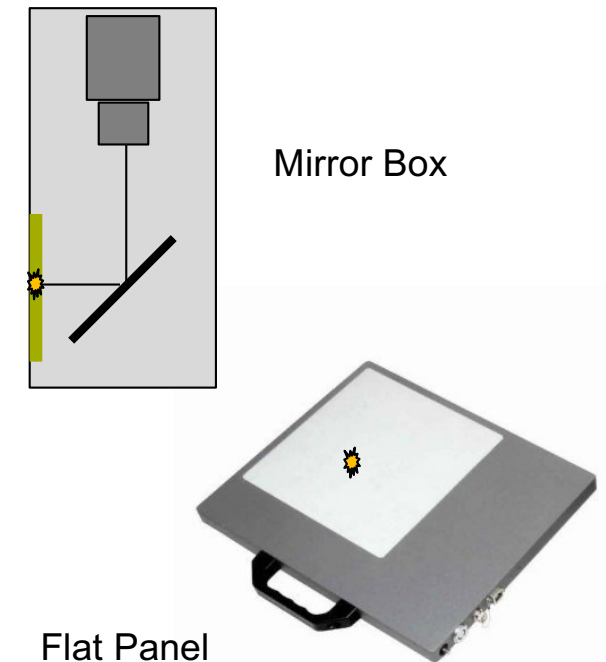


Neutron Detection 2.0 update

Counting type Detectors

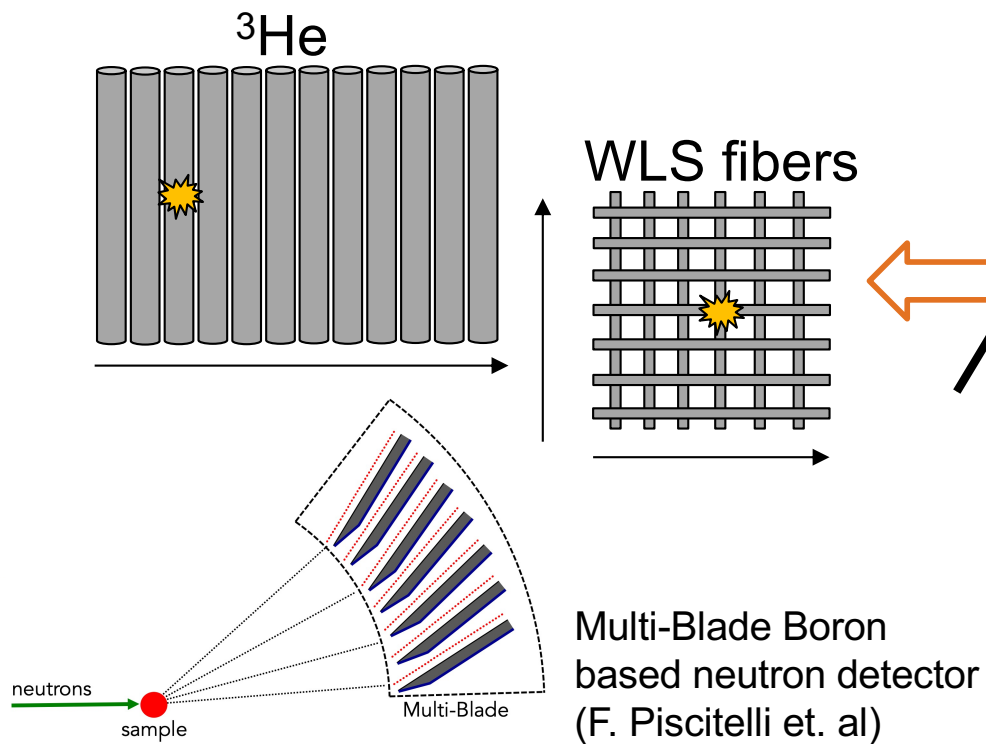


Camera type Detectors

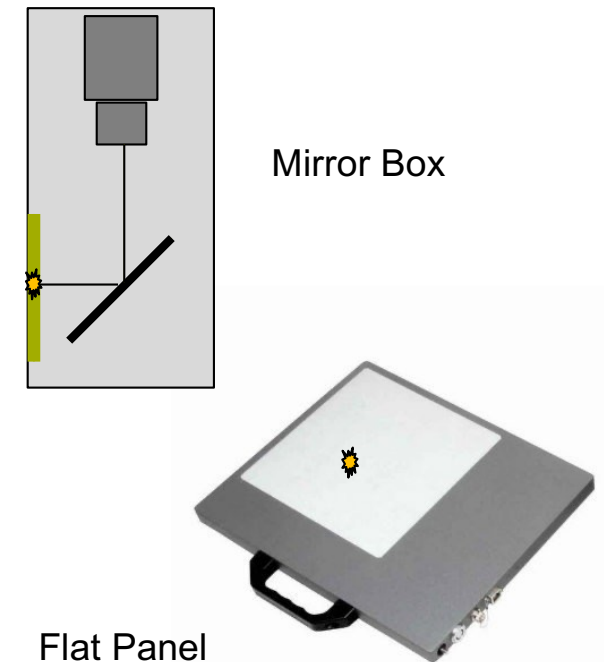


Neutron Detection 2.0 update

Counting type Detectors

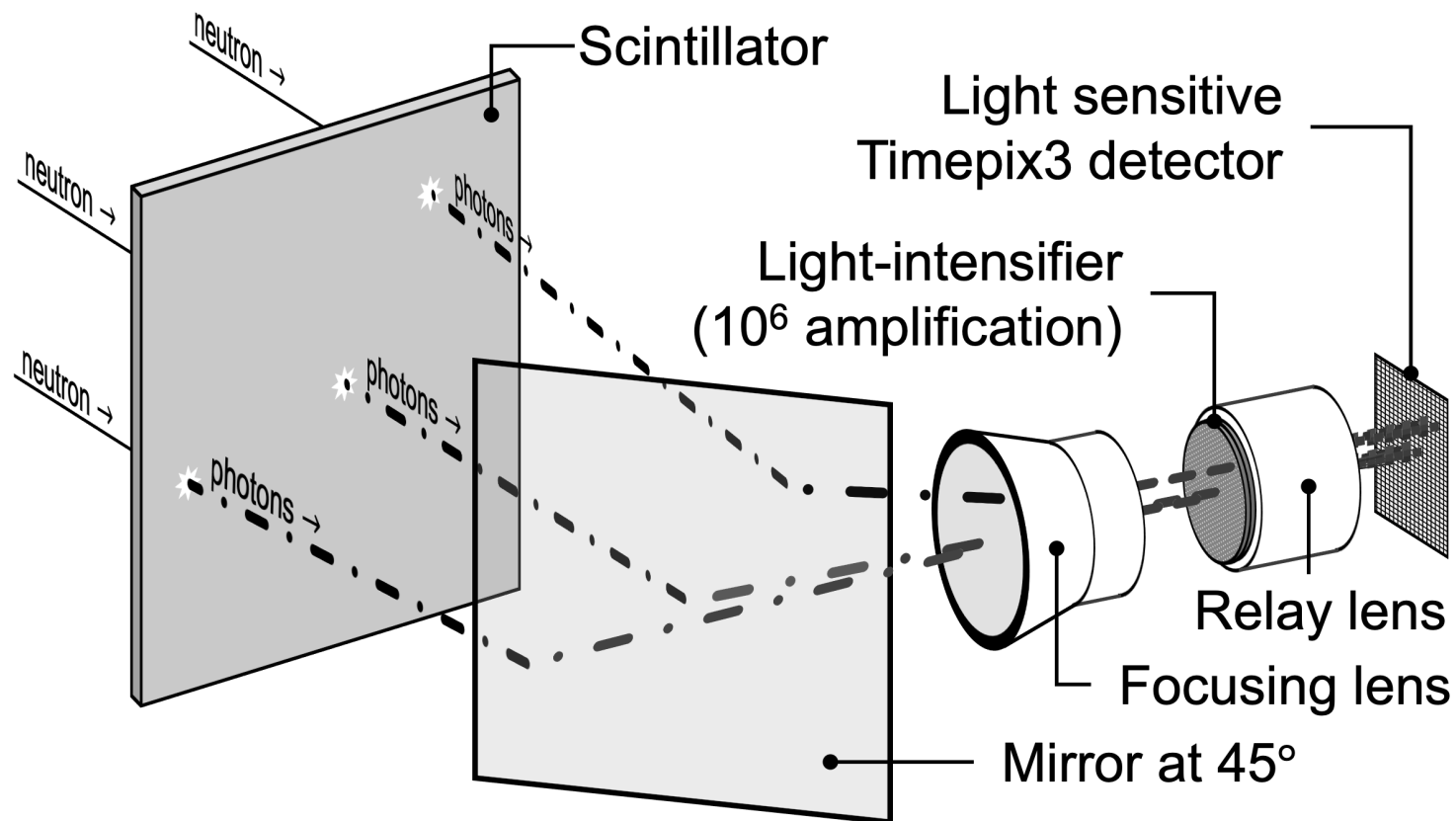


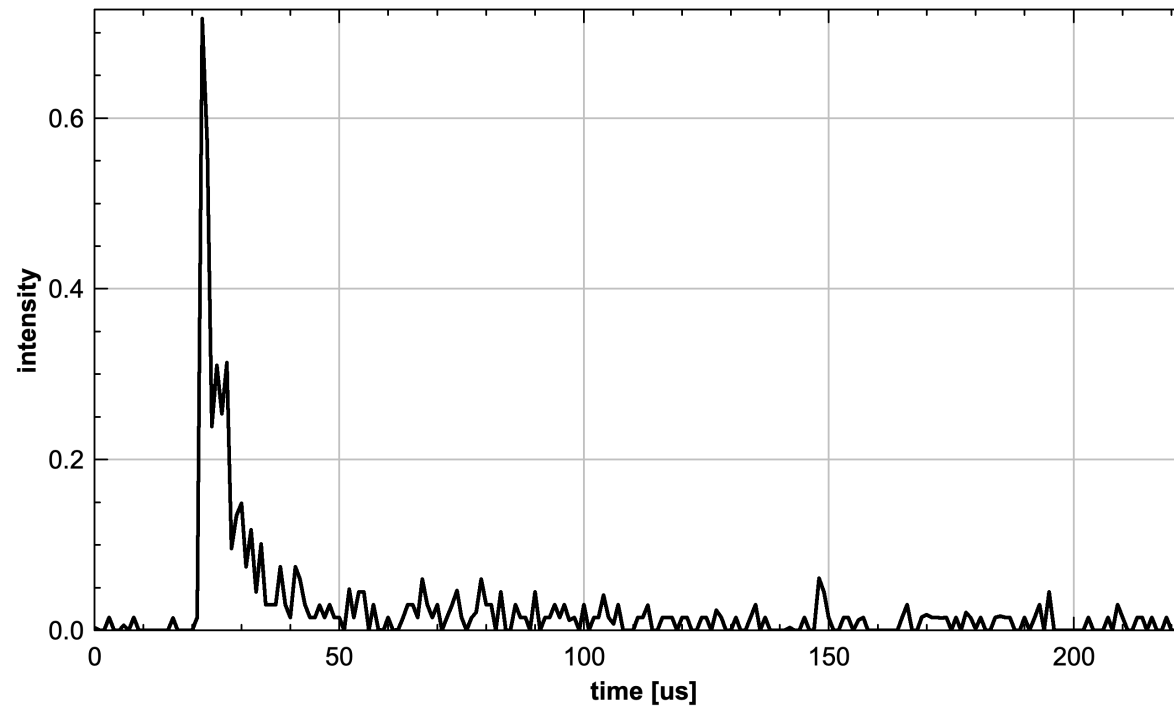
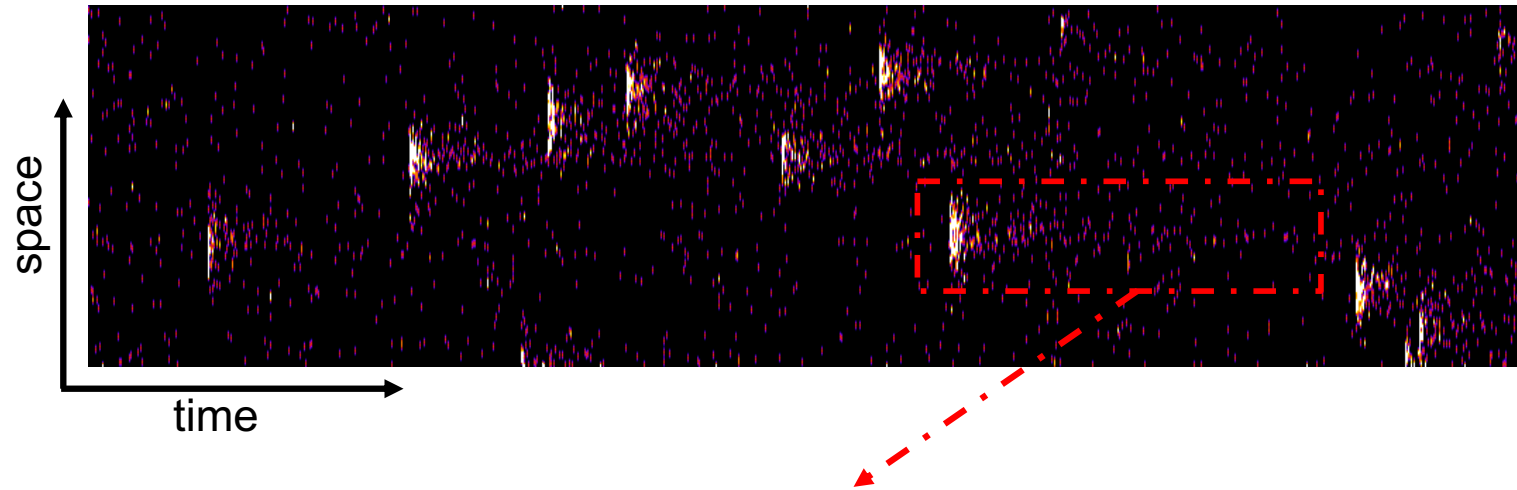
Camera type Detectors

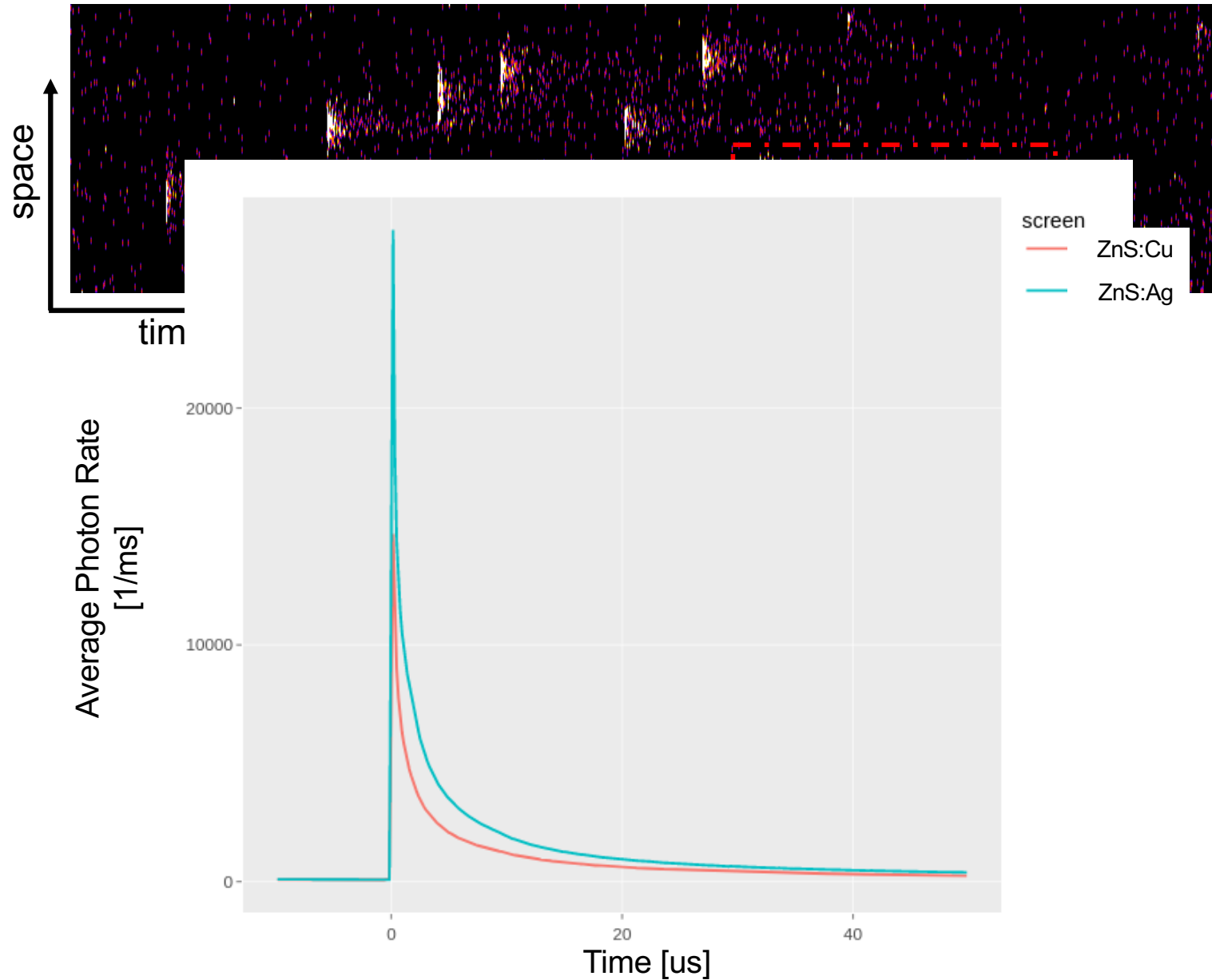


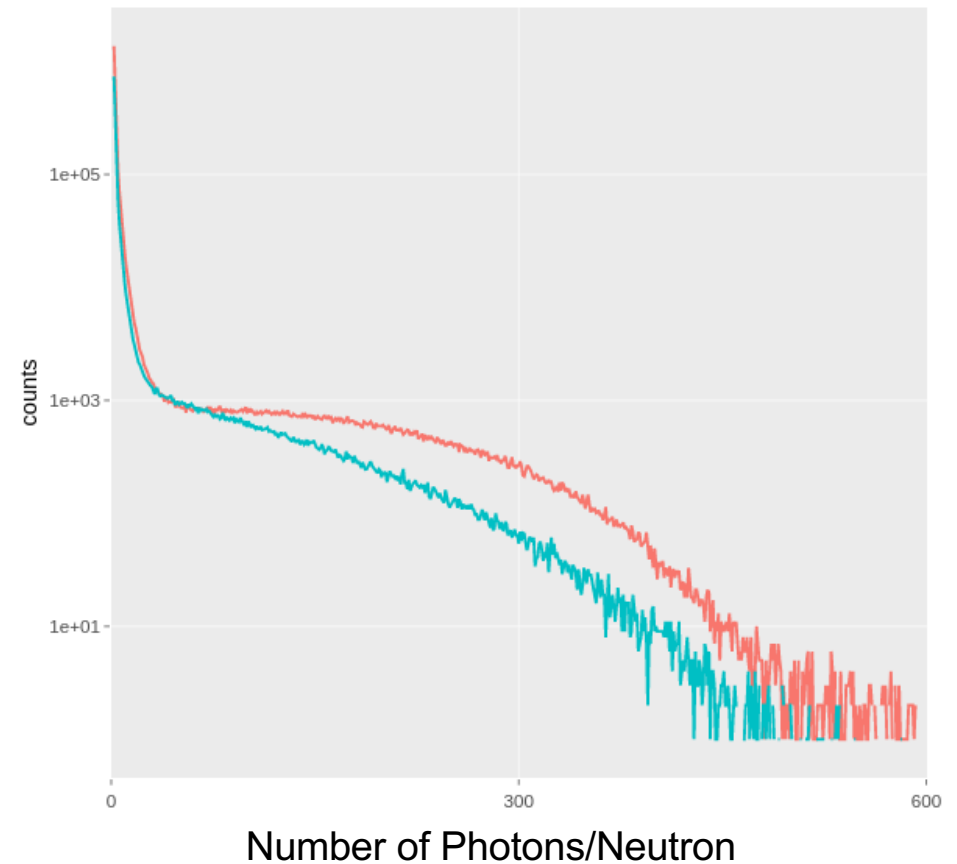
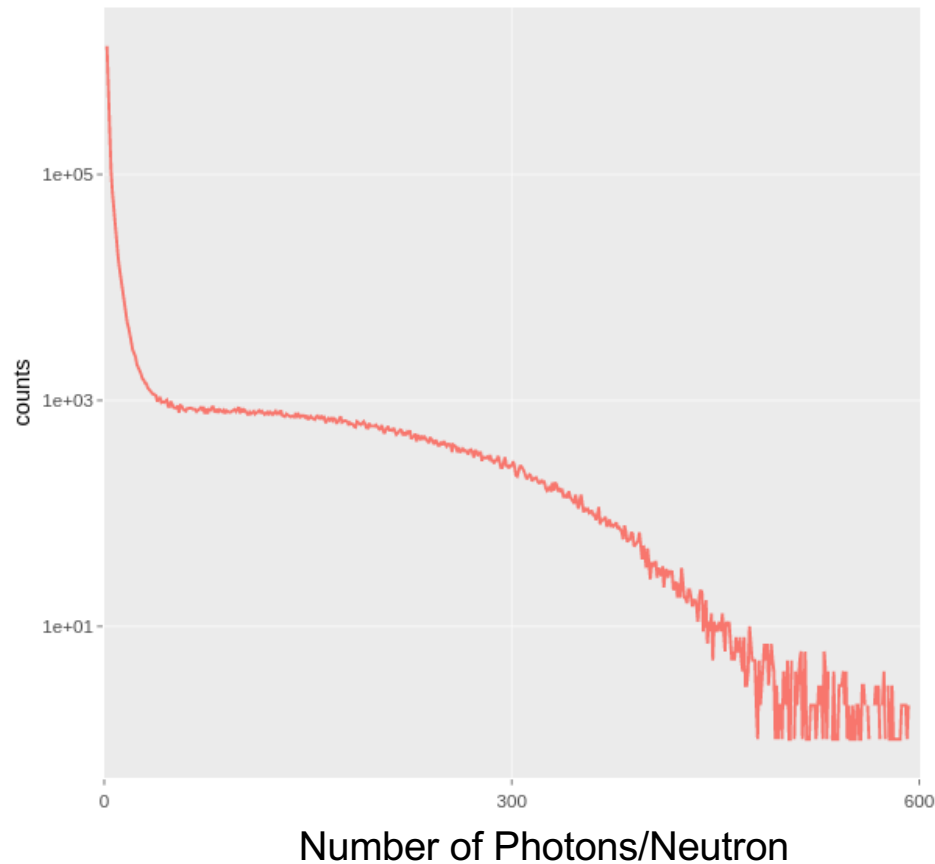
Detector Setup

(similar to conventional neutron radiography)



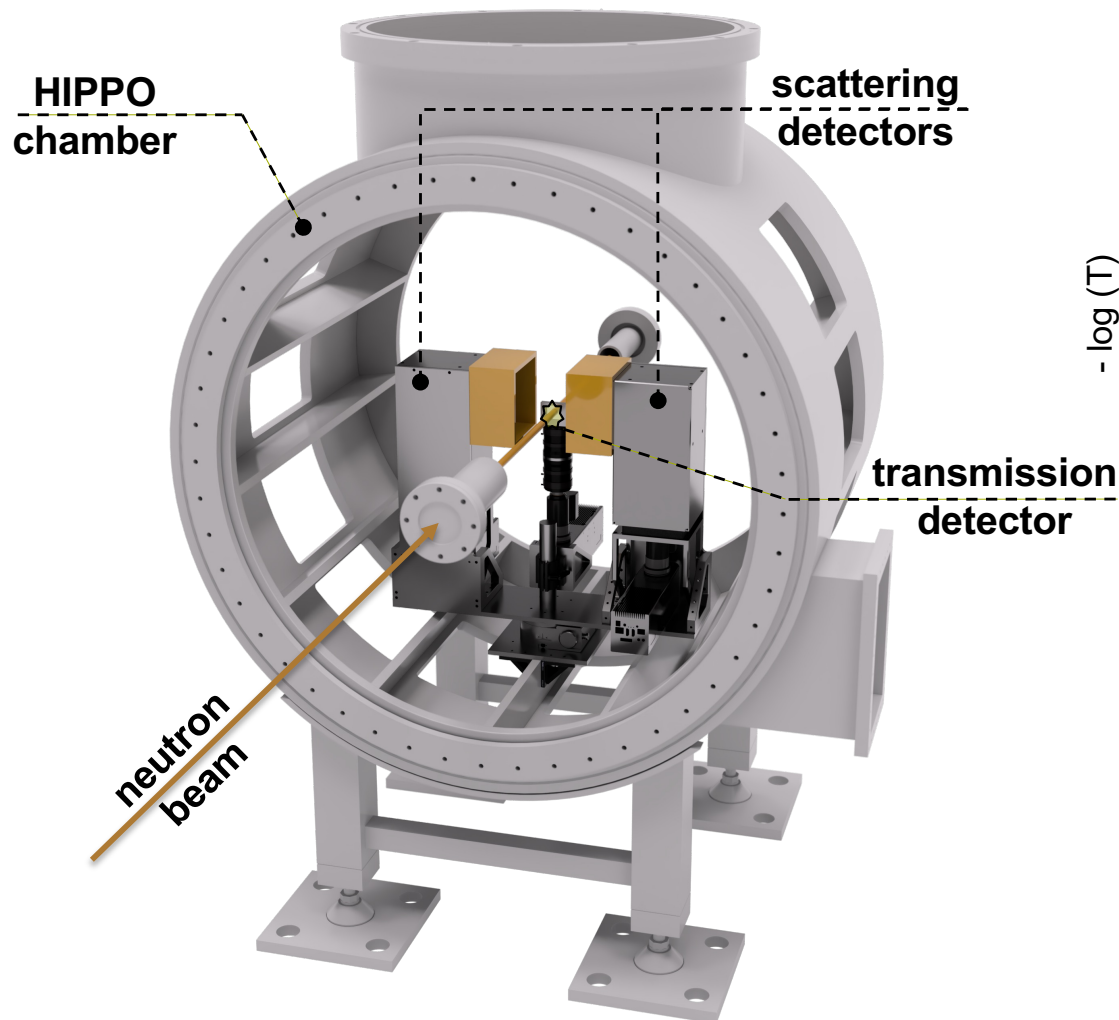




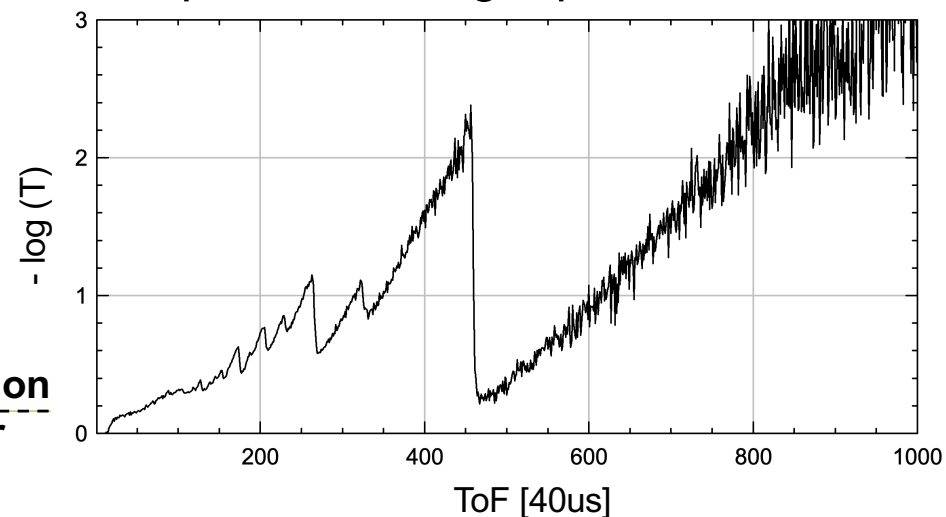


Red: N11 (LiF:ZnS:Ag, 270 μm , 5:1 Phosphor to Binder)
Cyan: N16 (LiF:ZnS:Ag, 220 μm , 3:4 Phosphor to Binder)

Energy Resolved Imaging in the meV range

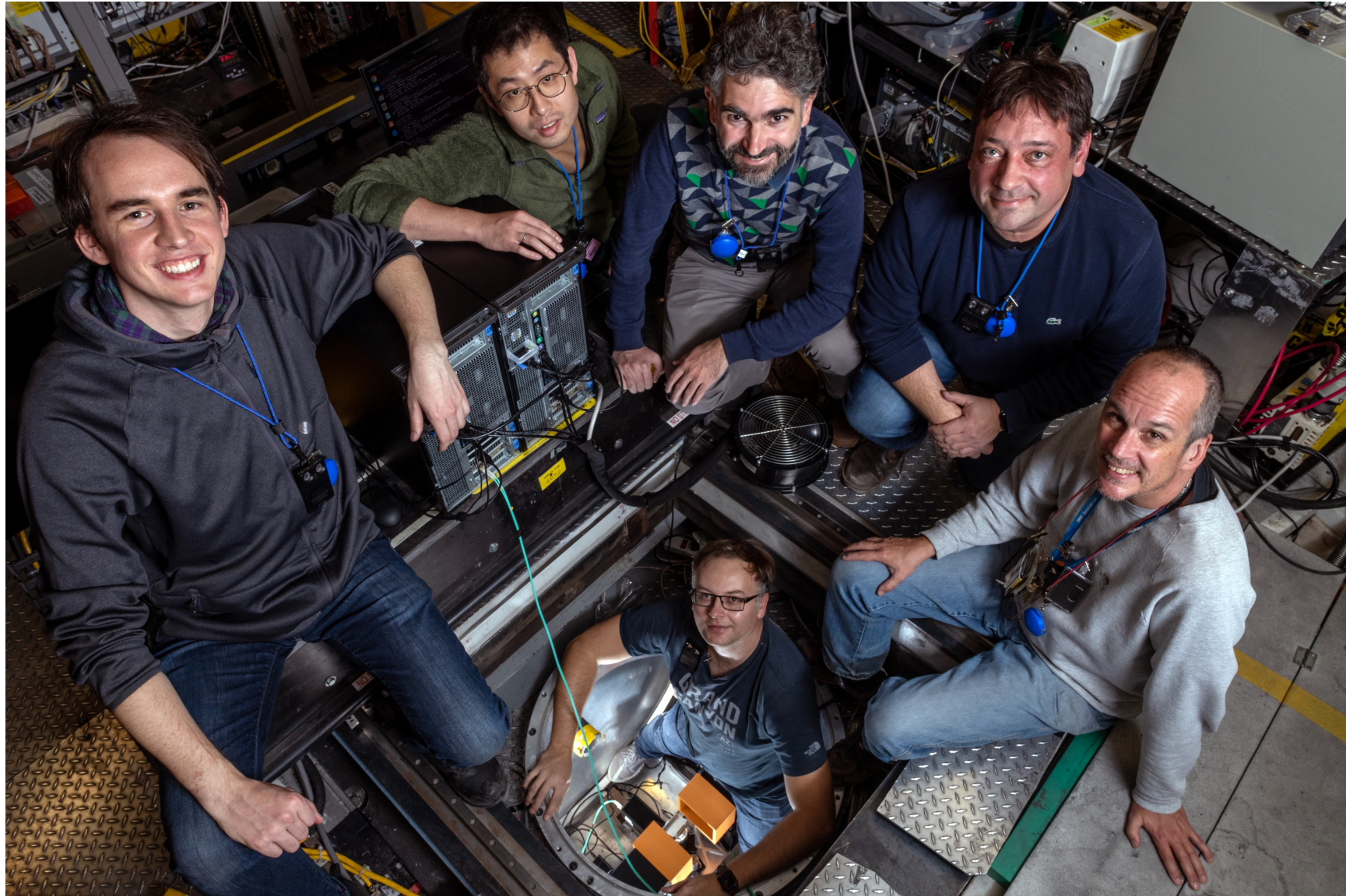


Fe powder for flight path calibration

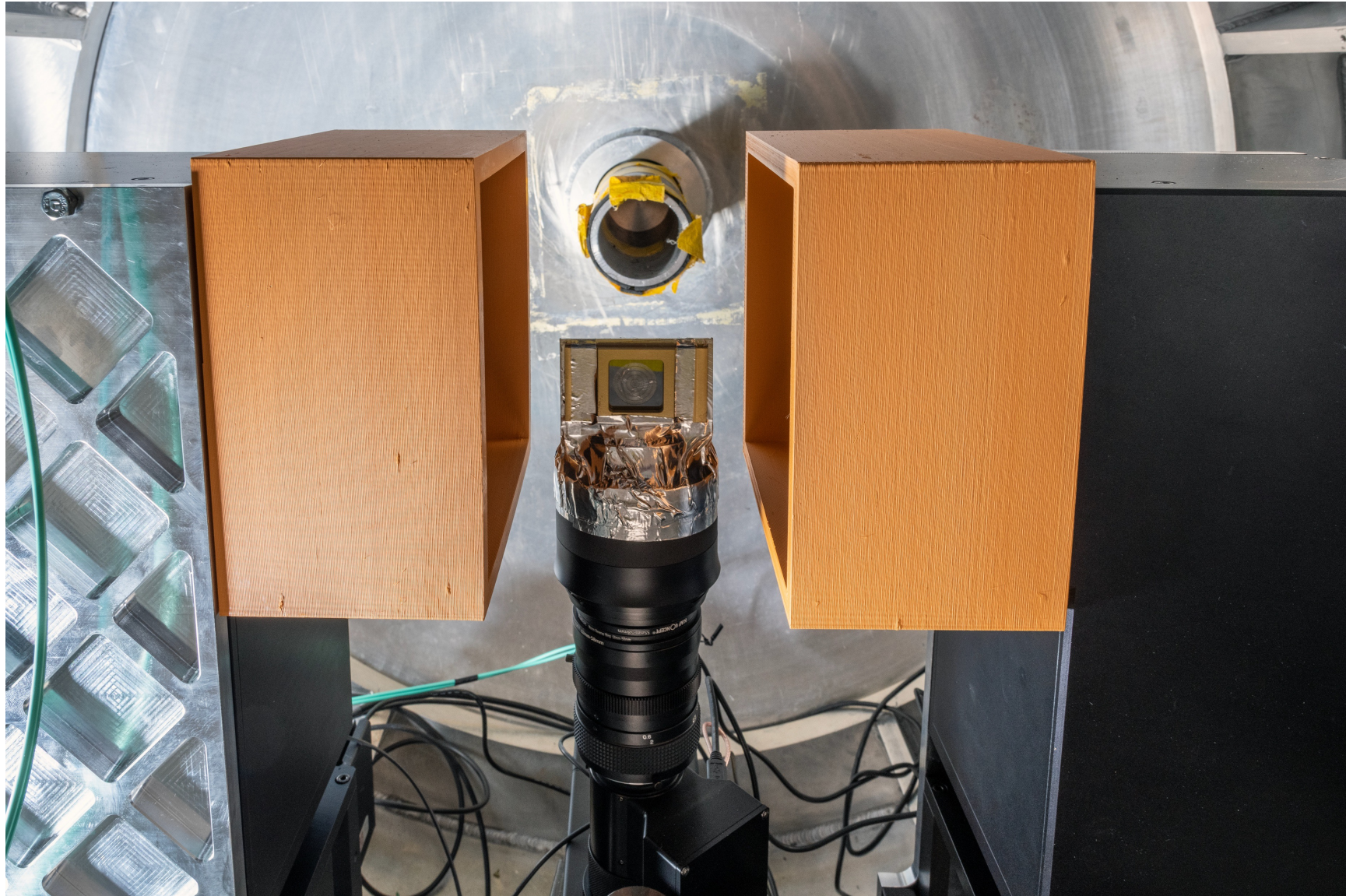


Simultaneous measurements of
transmission and diffraction

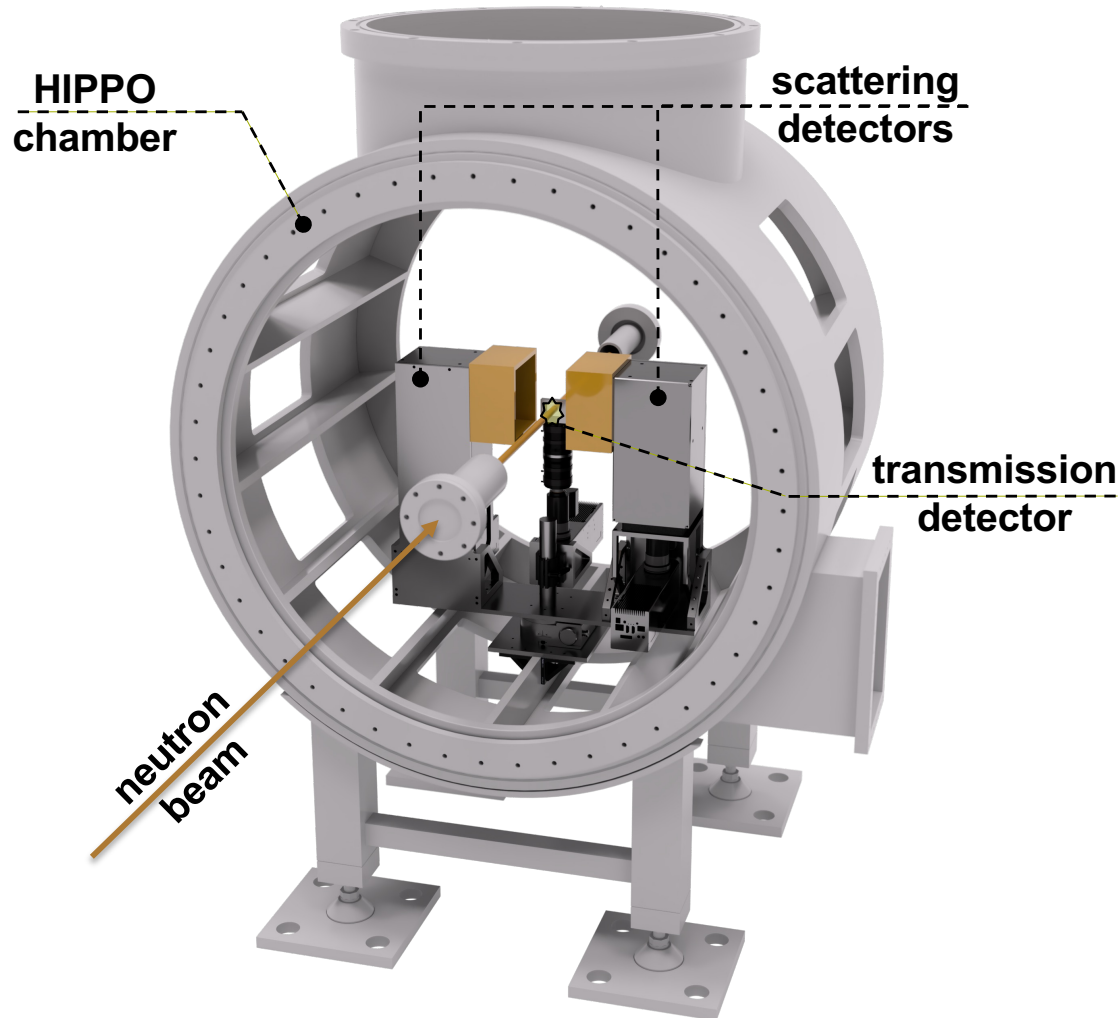
Energy Resolved Imaging in the meV range



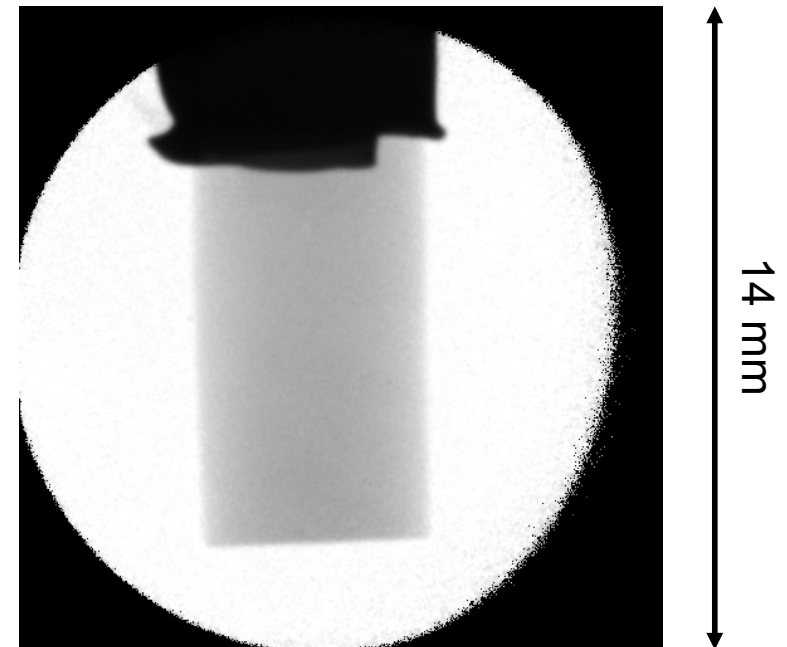
Energy Resolved Imaging in the meV range



Energy Resolved Imaging in the meV range

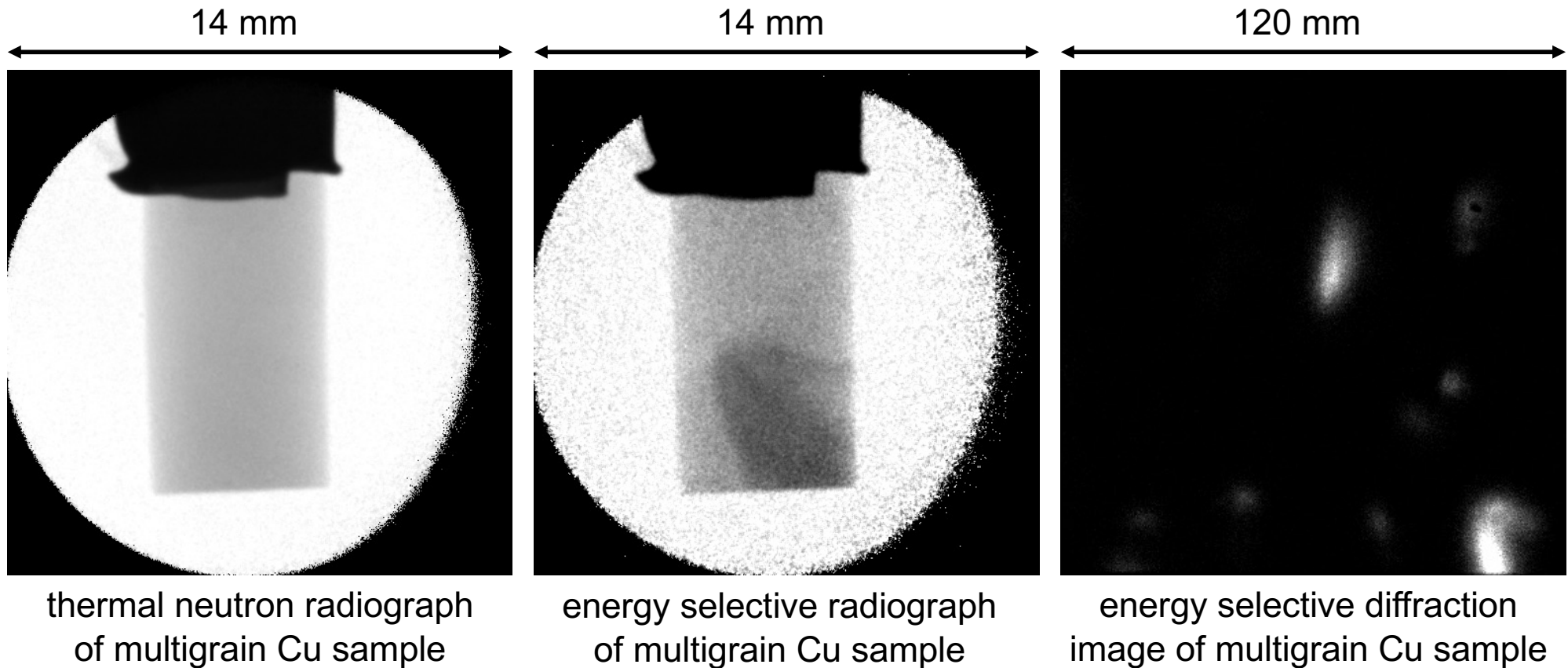


transmission detector

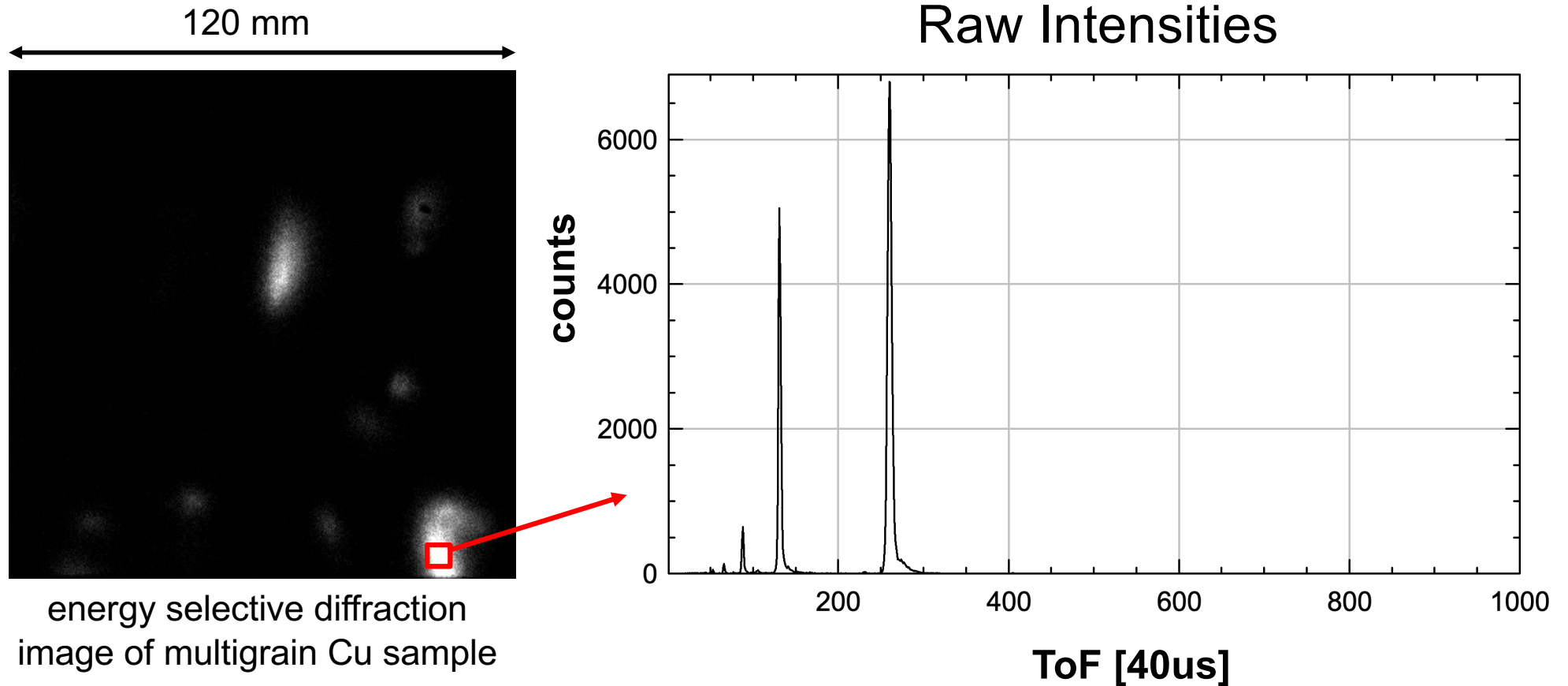


thermal neutron radiograph
of multigrain Cu sample

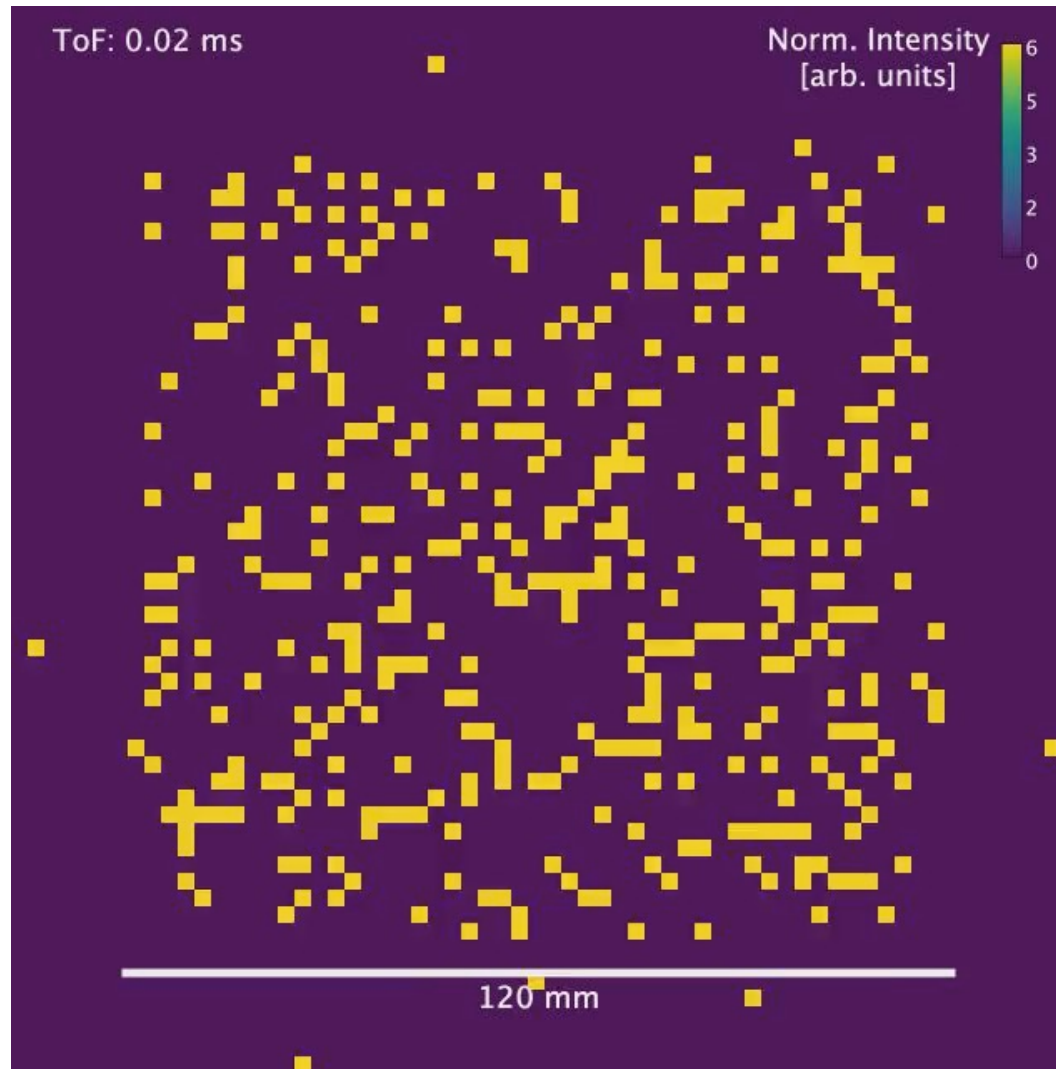
Energy Resolved Imaging in the meV range

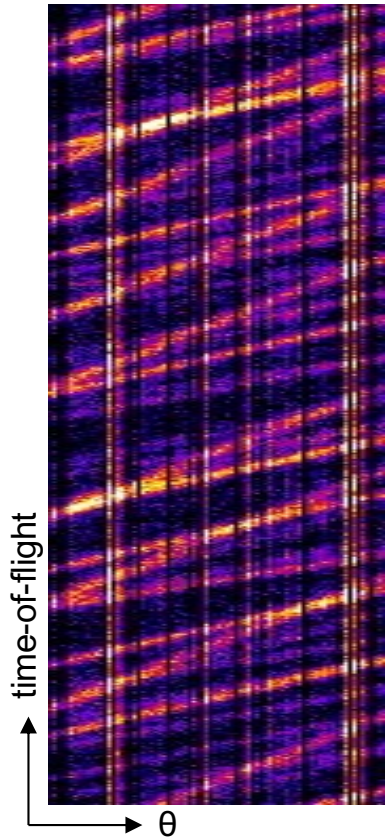


Energy Resolved Imaging in the meV range



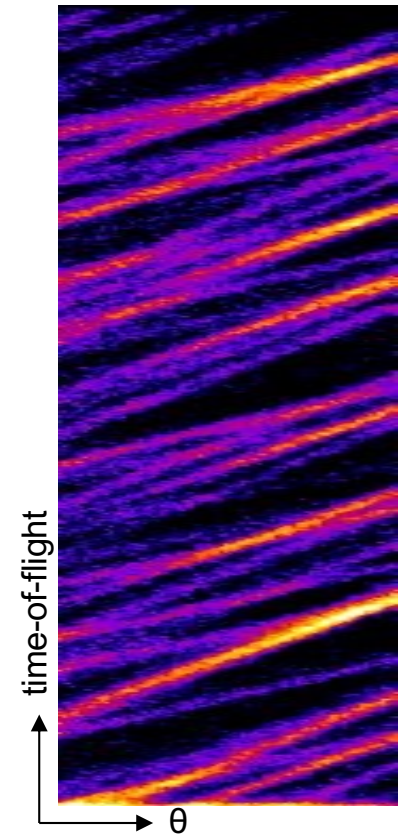
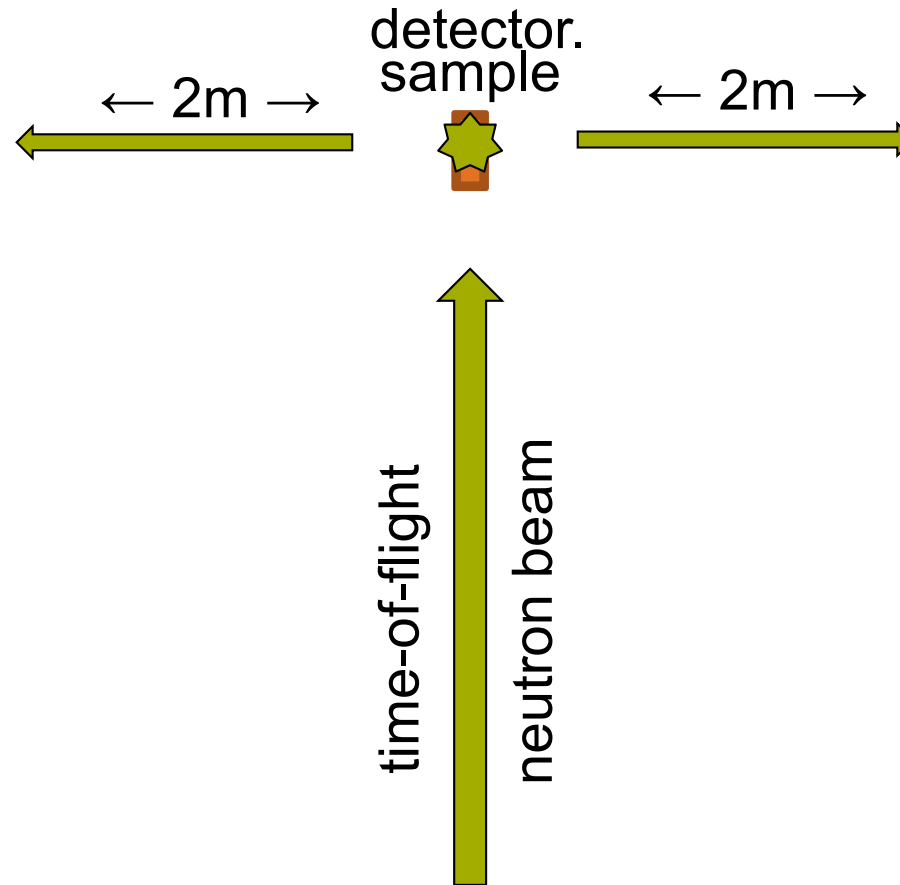
dU diffraction profiles





^3He wire chamber detector
(20x20cm²)

Direct comparison measurements were performed at the PSI POLDI beamline. First result indicates similar performance of new detector concept to that of ^3He wire chamber



Timepix3 based detector
(19x19cm²)

Relative comparison to 1" ^3He tube at 4Å (preliminary results at HFIR at CG1D)

Measurements using a 500um ZnS: ^6LiF

- **84% absorption**
- roughly **60% efficiency forward illuminated**
 - > detection of 0.71 of the absorbed neutrons
- roughly **75% efficiency backward illuminated**
 - > detection of 0.89 of the absorbed neutrons
- for 120x120mm² FoV global count rate limit $\sim 10^6$ n/sec
- for 5x5mm² count rate limit $\sim 10^5$ n/sec

Little variation of detected neutrons for large enough spatial and temporal search parameters. Discrimination ratios TBD. However, significant gamma discrimination already observed but not quantified. Different scintillators, such as ^6LiI , offer promising performance increase. Choice of scintillator will be based on application.

→ **More measurements performed at ISIS with data to fill the gaps**

Data on:

- Stability
- Efficiency
- Count rate
- Gamma/Neutron discrimination

Detectors at various facilities:

- FRM, PSI, ESS, LANL, ISIS, INL, LLNL

Steadily improving software

- EMPIR (Event Mode Particle Imaging Routines)
- Gitlab repo (starting with documentation)

NOTES to new proposal

- Stronger focus on X-rays and potential for medical (include partners)
- Stronger company presence (business case)

Thank you for listening!
Questions?

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Online Seminar:

<https://www.youtube.com/watch?v=VI3pRoOf8sA&t=1915s>

Recent publication:

<https://www.nature.com/articles/s41598-021-00822-5>