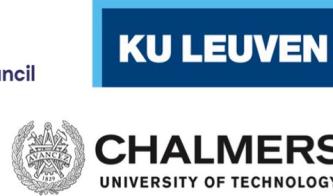


Onset of deformation in neutron-rich Kr isotopes at ISS, ISOLDE, CERN

HIE-ISOLDE Physics Workshop
25th May 2023

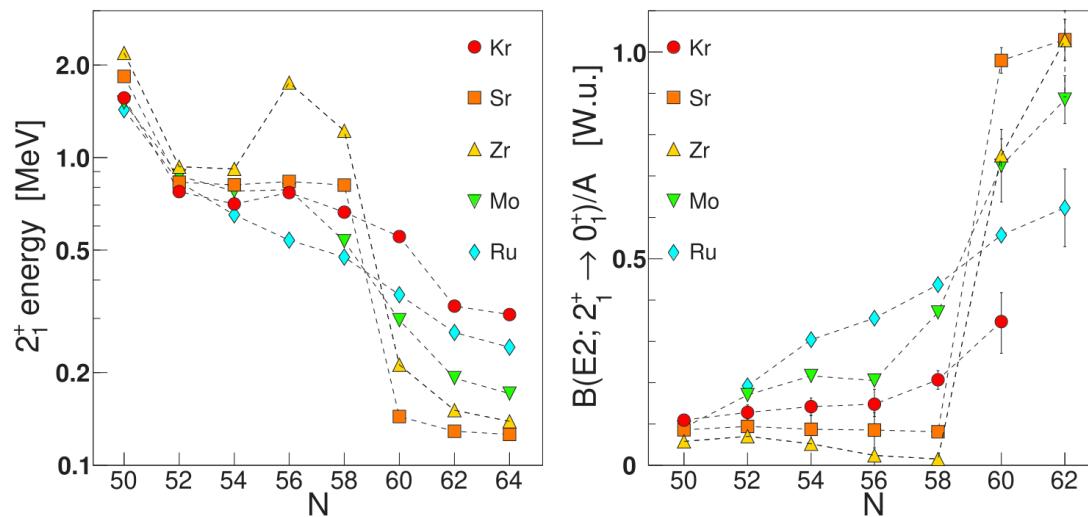
Annie Dolan
University of Liverpool



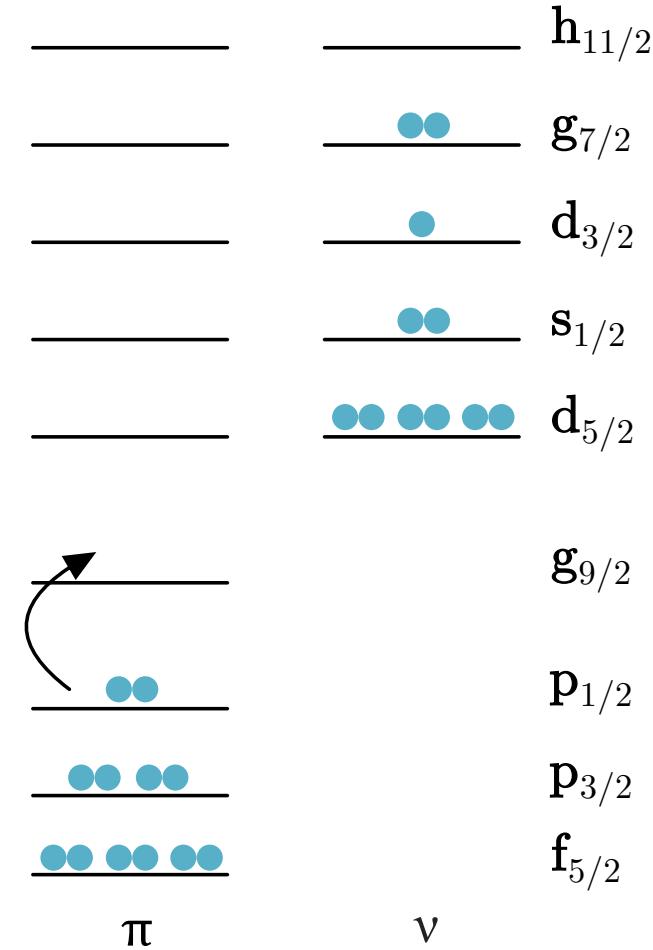
Onset of deformation in neutron rich Kr isotopes

$N = 60$

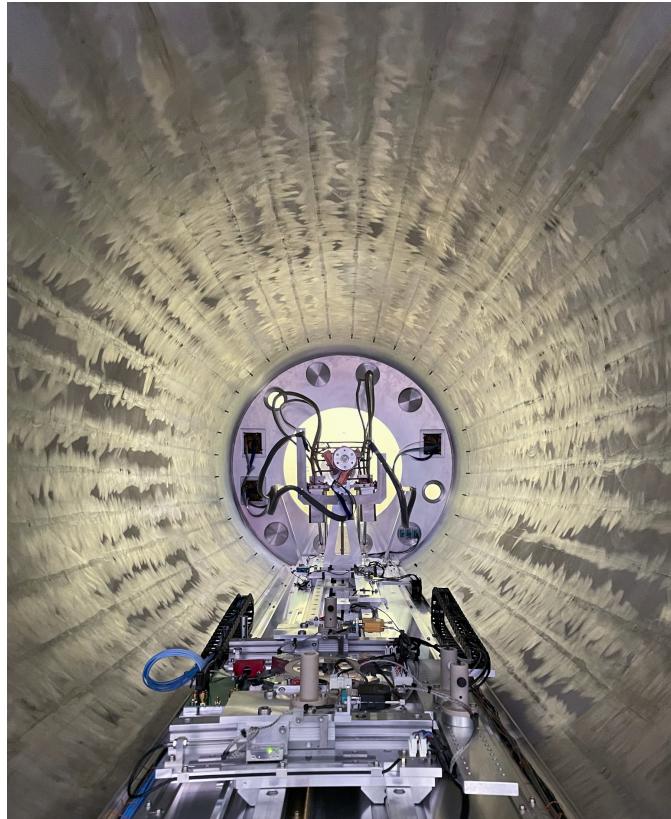
- Zr, Sr – dramatic shape change
- Kr – smooth shape change
- Shell evolution



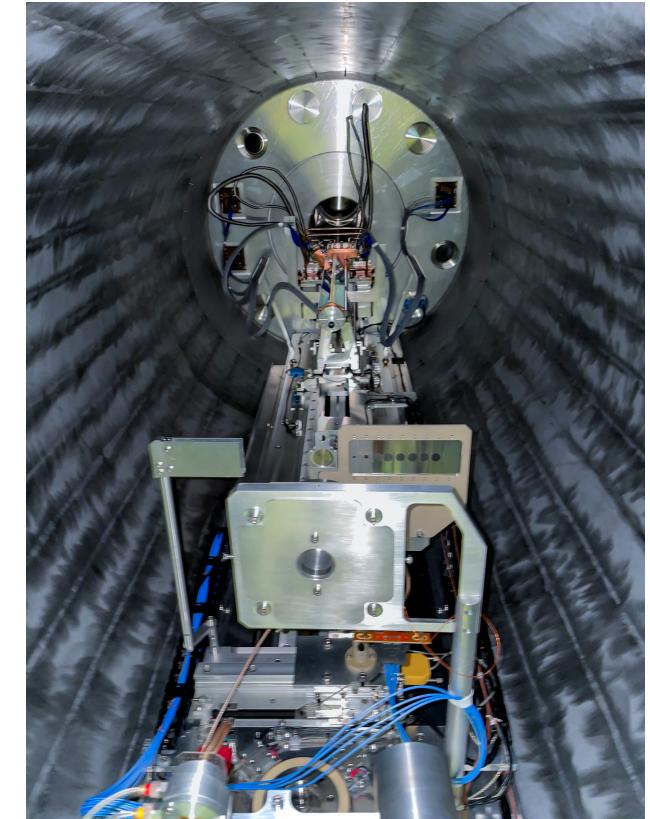
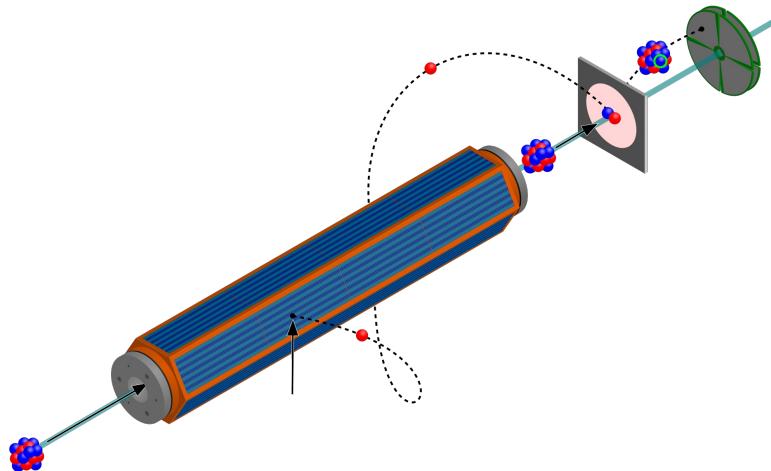
P. E. Garrett, M. Zielinska, and E. Clement, Prog. Part. Nucl. Phys. **163**, 103931 (2021).



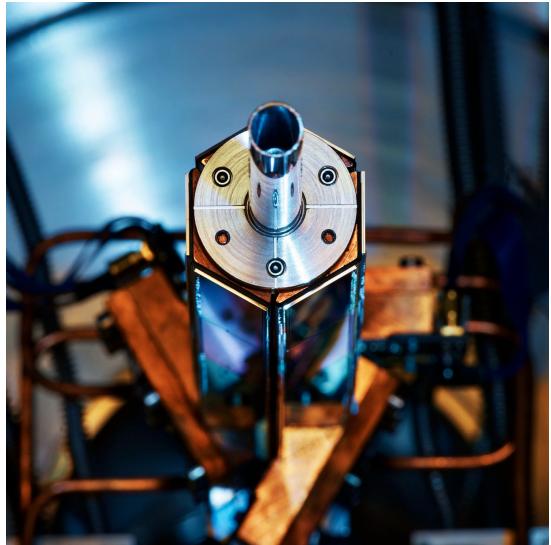
Inside ISS



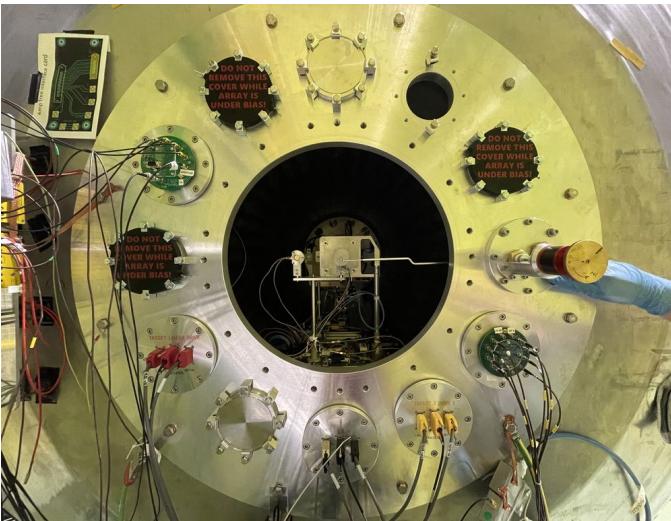
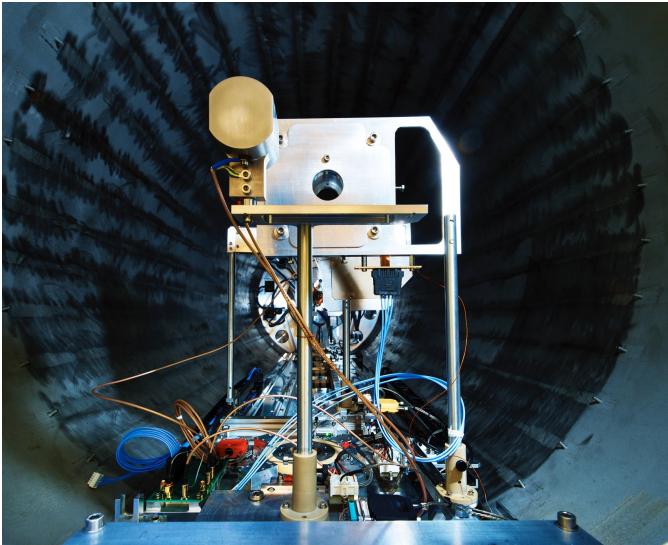
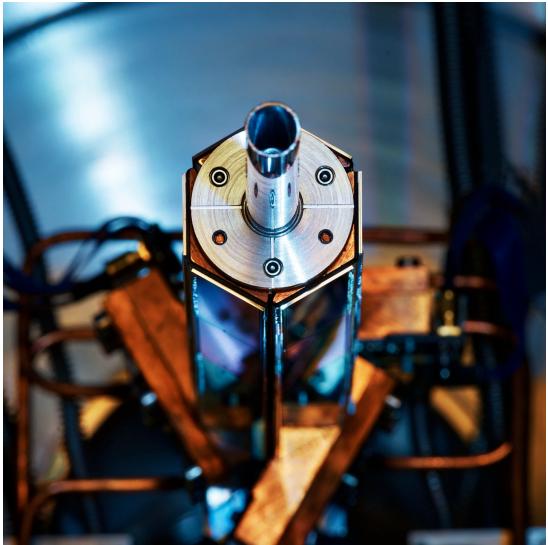
- Silicon array
- Target ladder - CD_2 targets
- Luminosity detector
- Recoil detector (Si or gas)



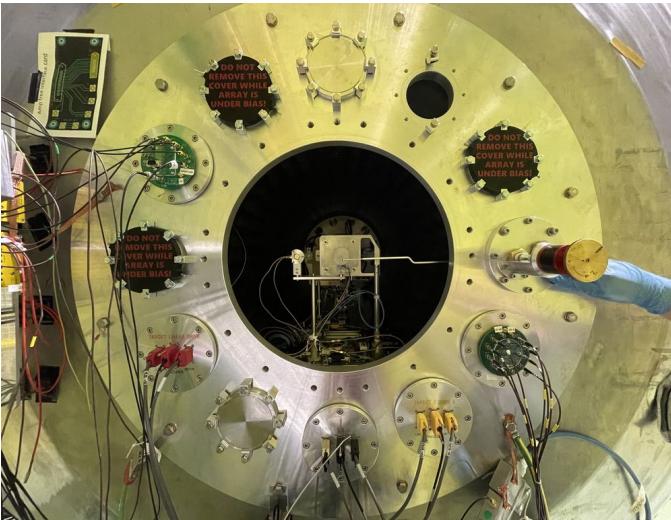
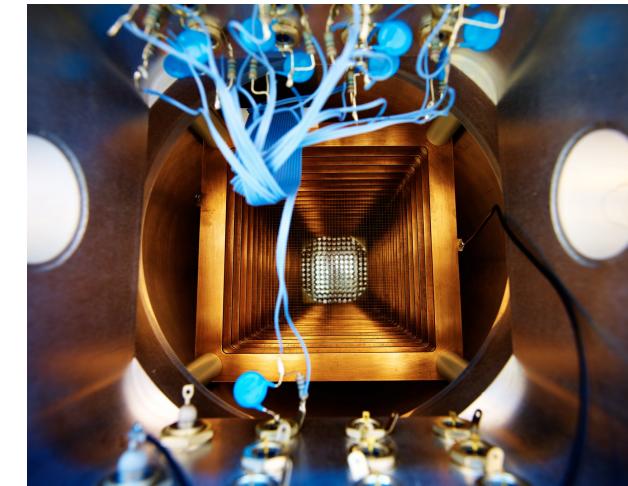
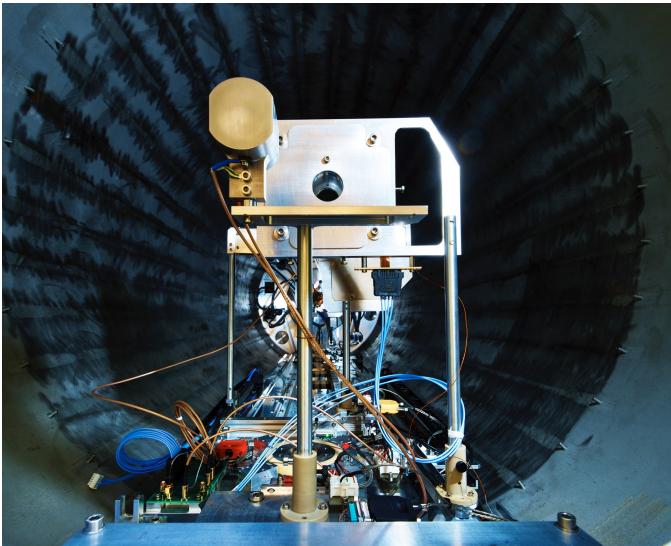
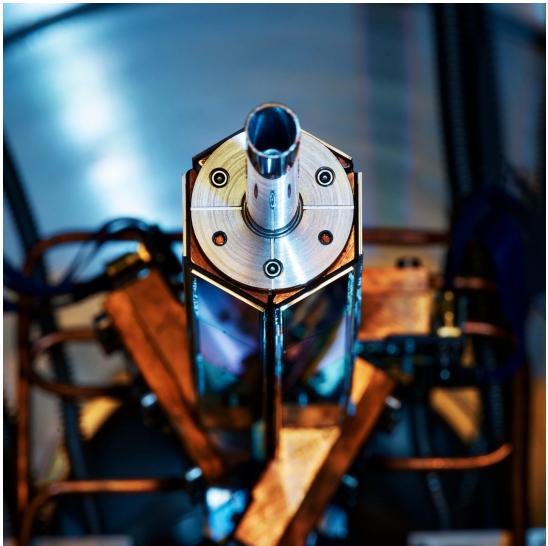
Inside ISS



Inside ISS

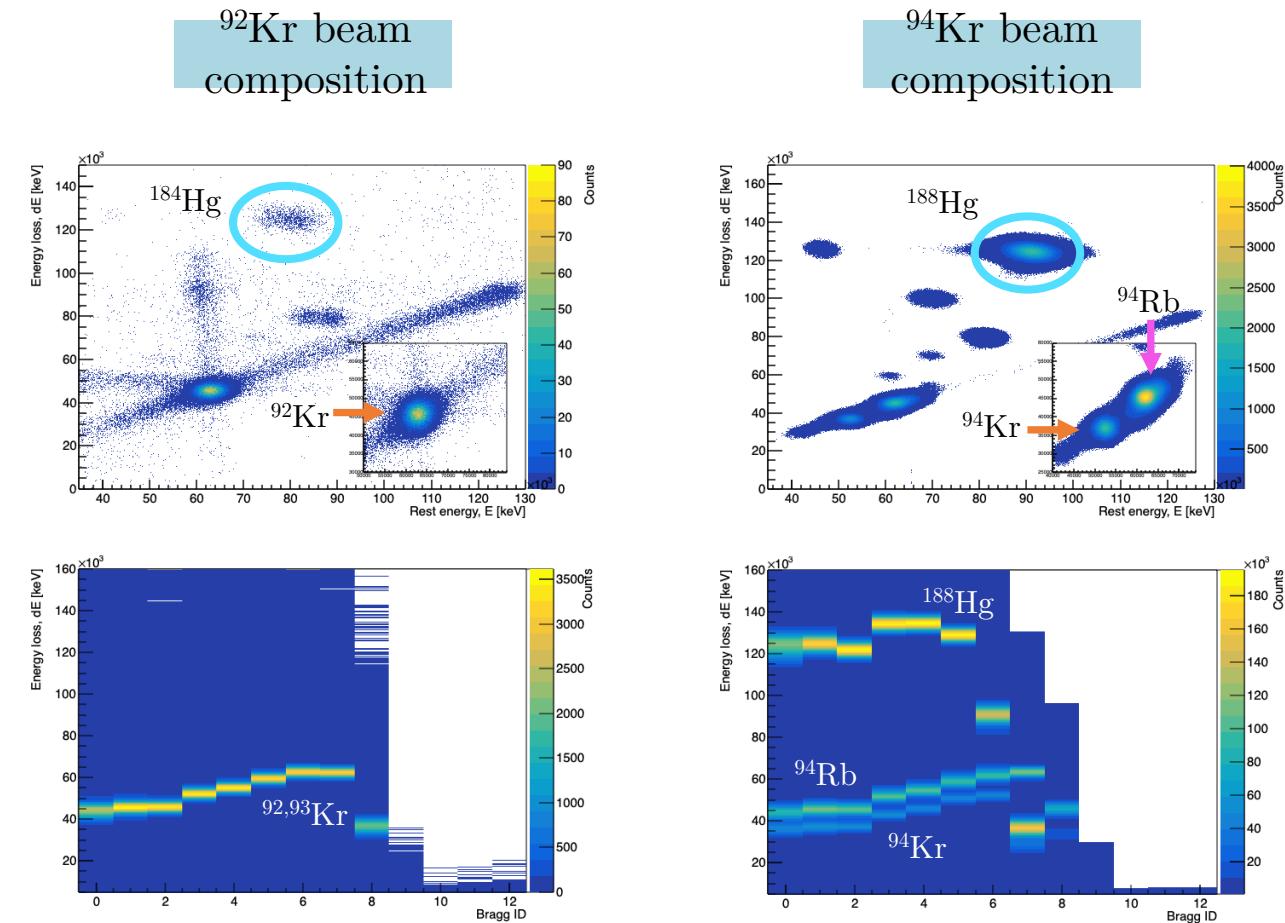


Inside ISS



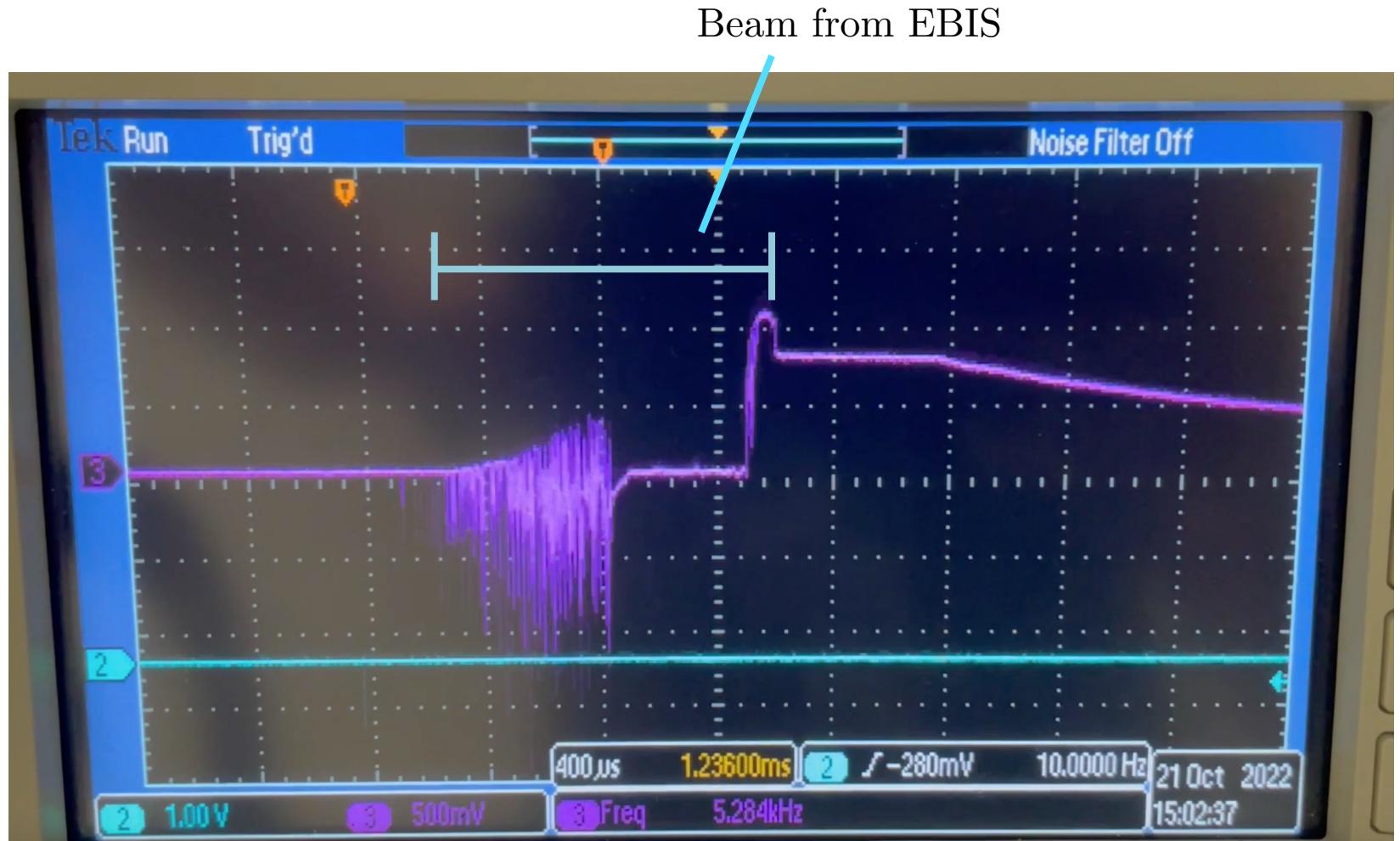
The $^{92,94}(d,p)\text{Kr}$ experiment

- October 2022
- Ion source efficiency lower than expected
- Unable to observe the $^{94}\text{Kr}(d,p)^{95}\text{Kr}$ reaction
- Half lives
 - $^{92}\text{Kr} - 1.84 \text{ s}$
 - $^{94}\text{Kr} - 212 \text{ ms}$
 - $^{96}\text{Kr} - 80 \text{ ms}$



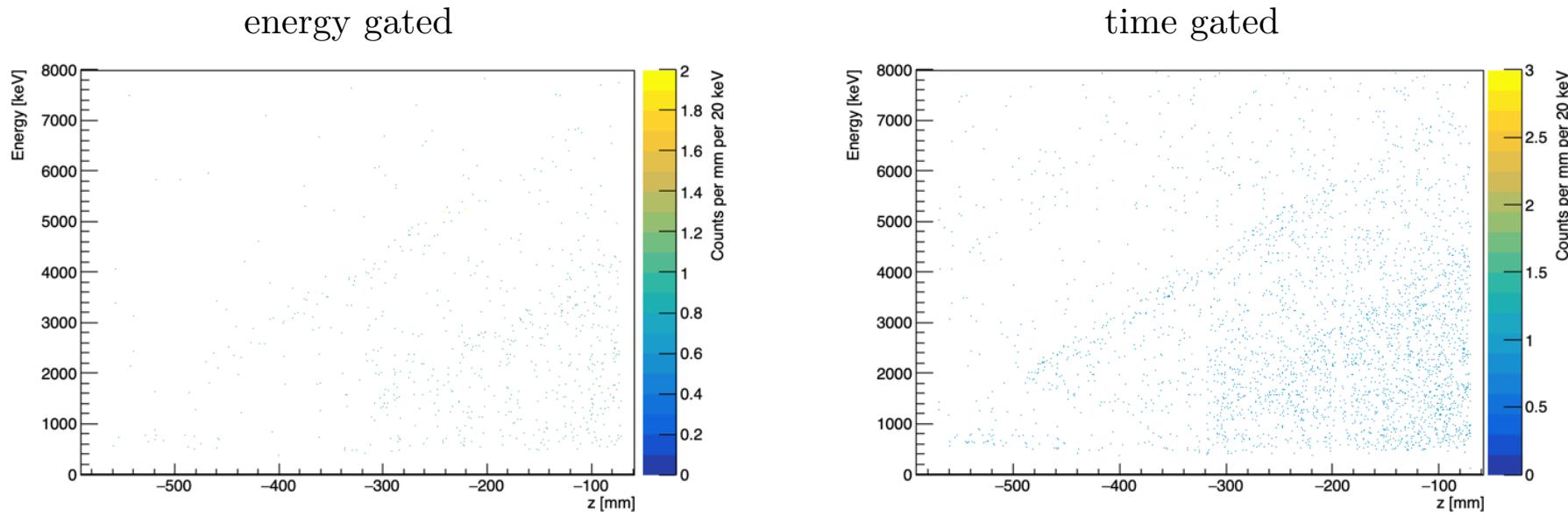
Recoil issues :(

- First ISS run with gas-ionisation recoil detector
- Saturated pre-amp output
- Pile up

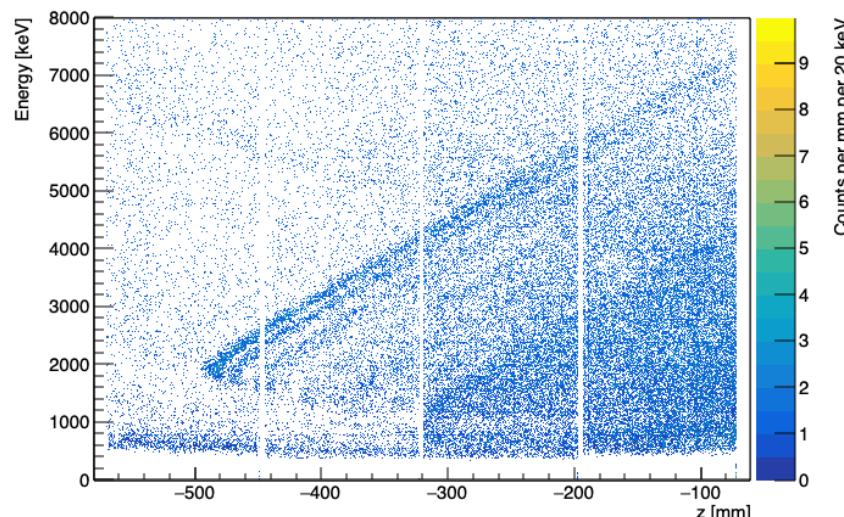


Recoils :(

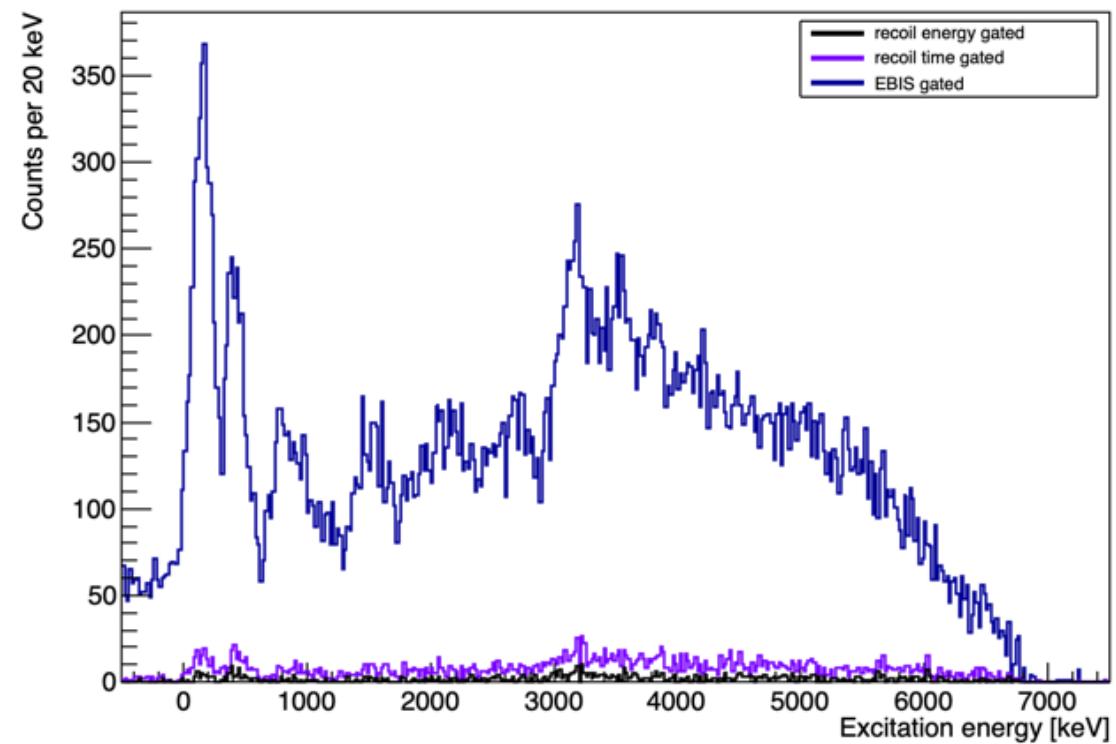
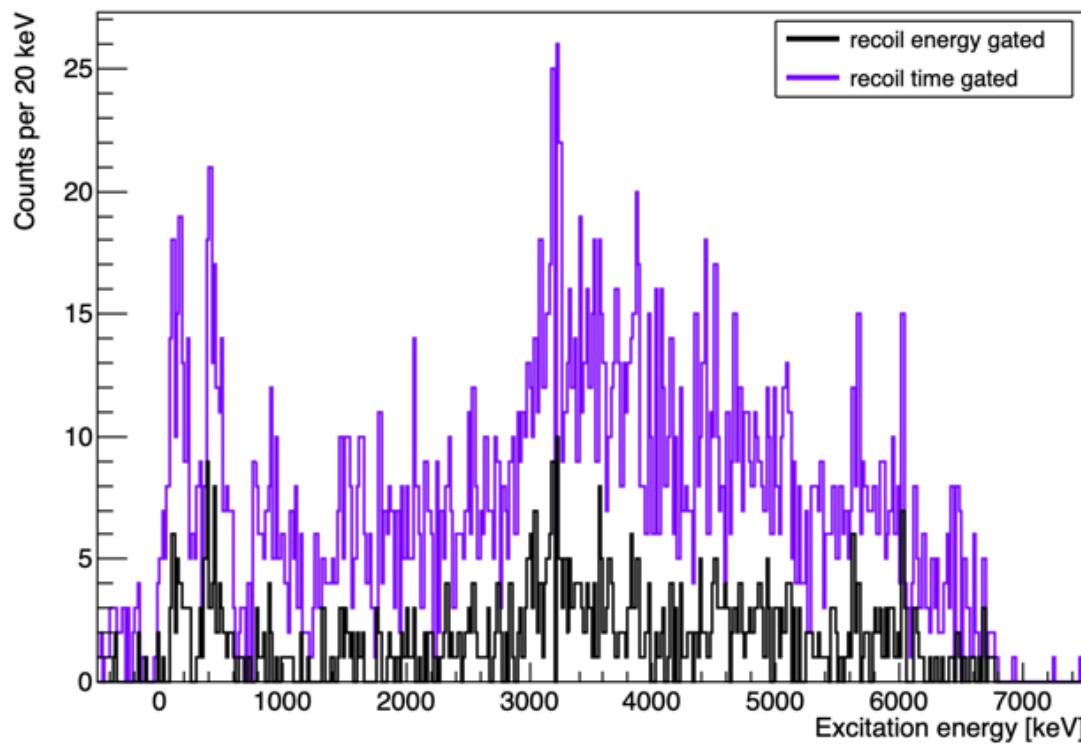
Recoil-gated



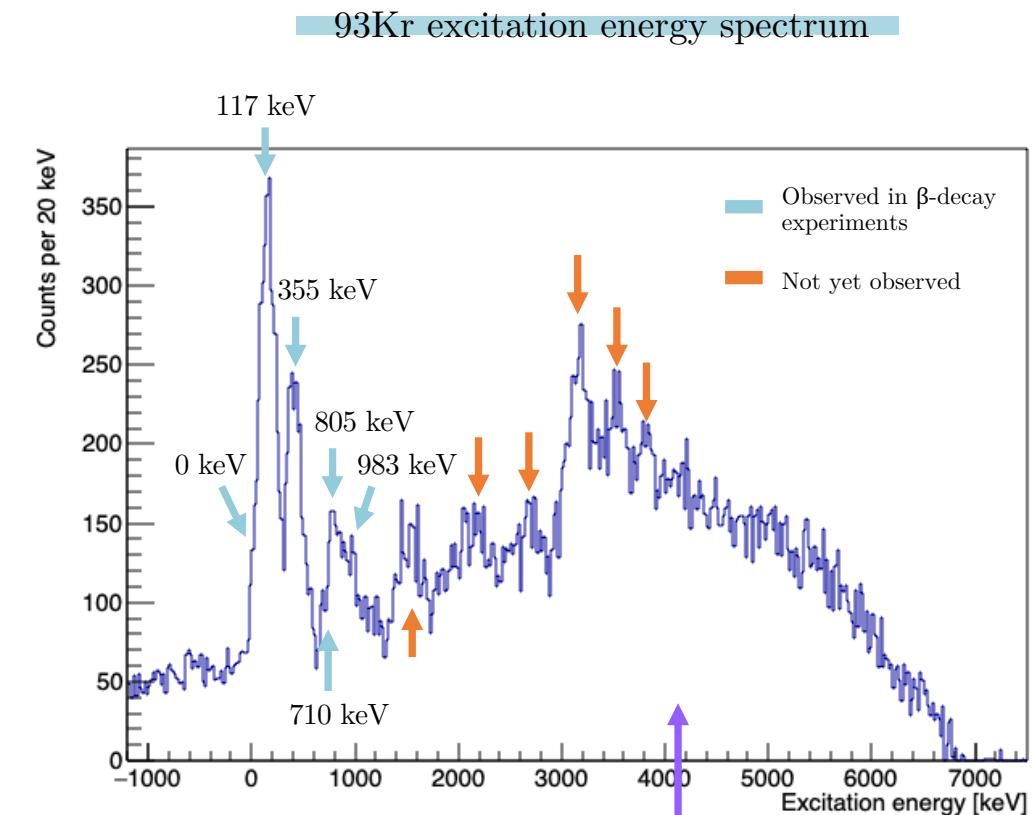
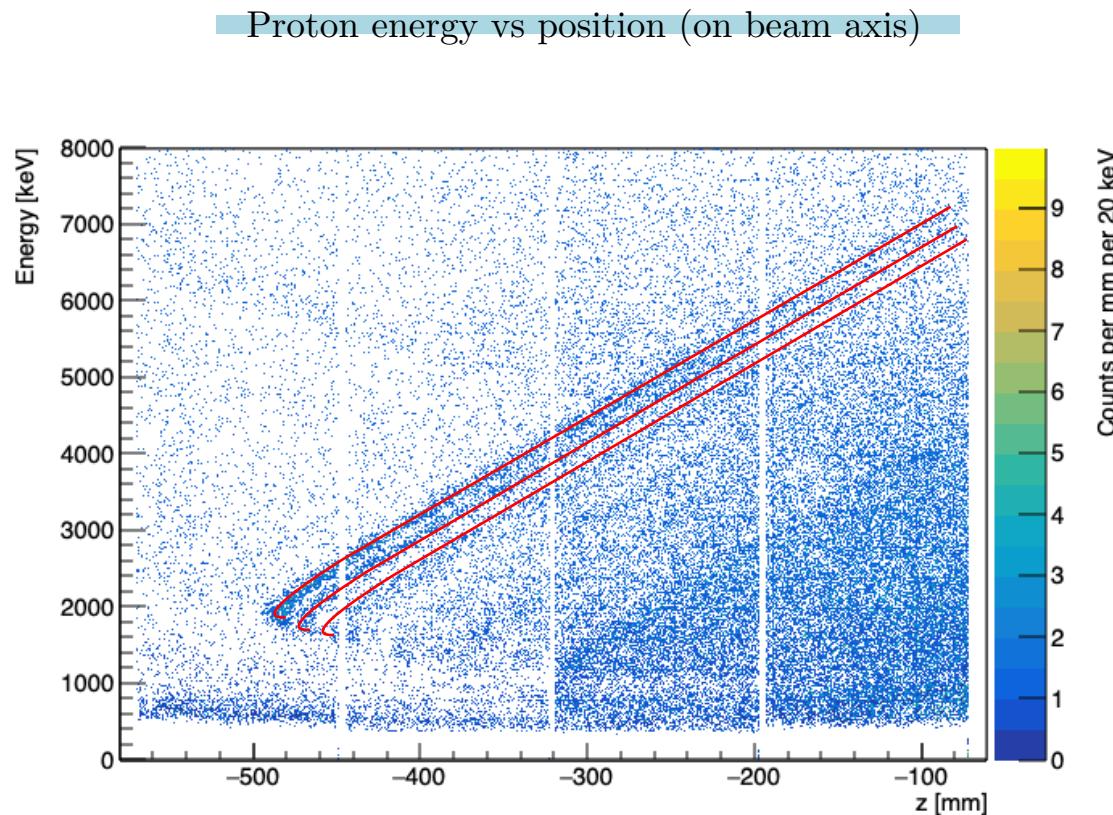
EBIS-gated



Recoils

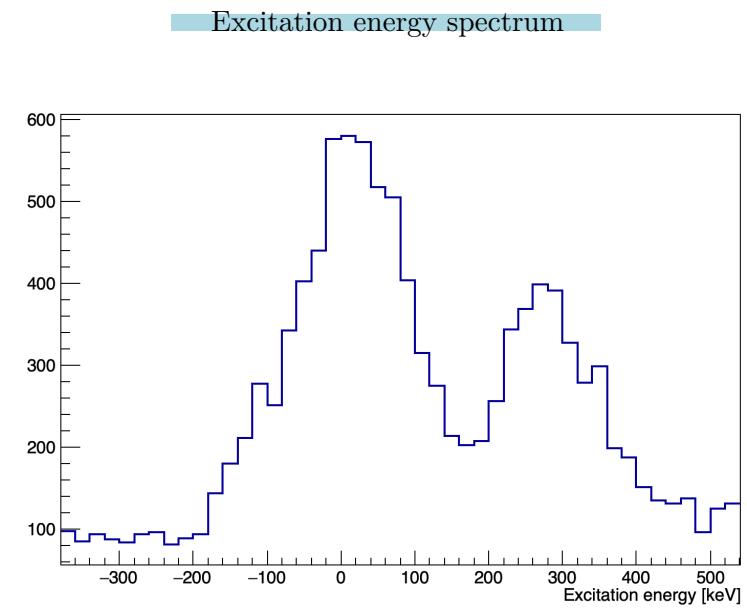
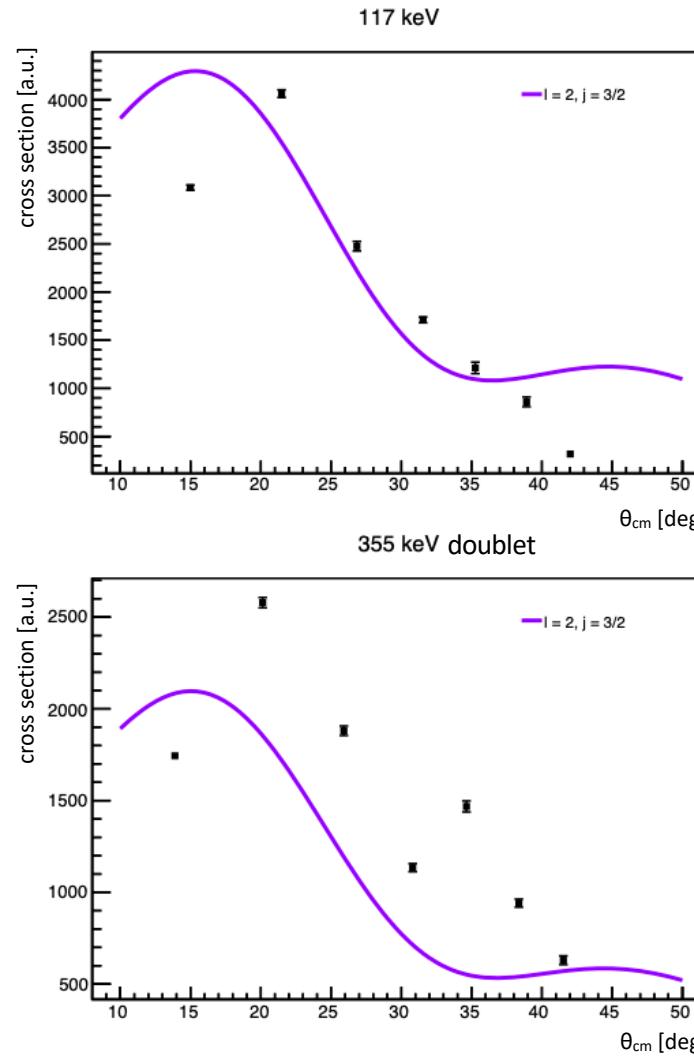
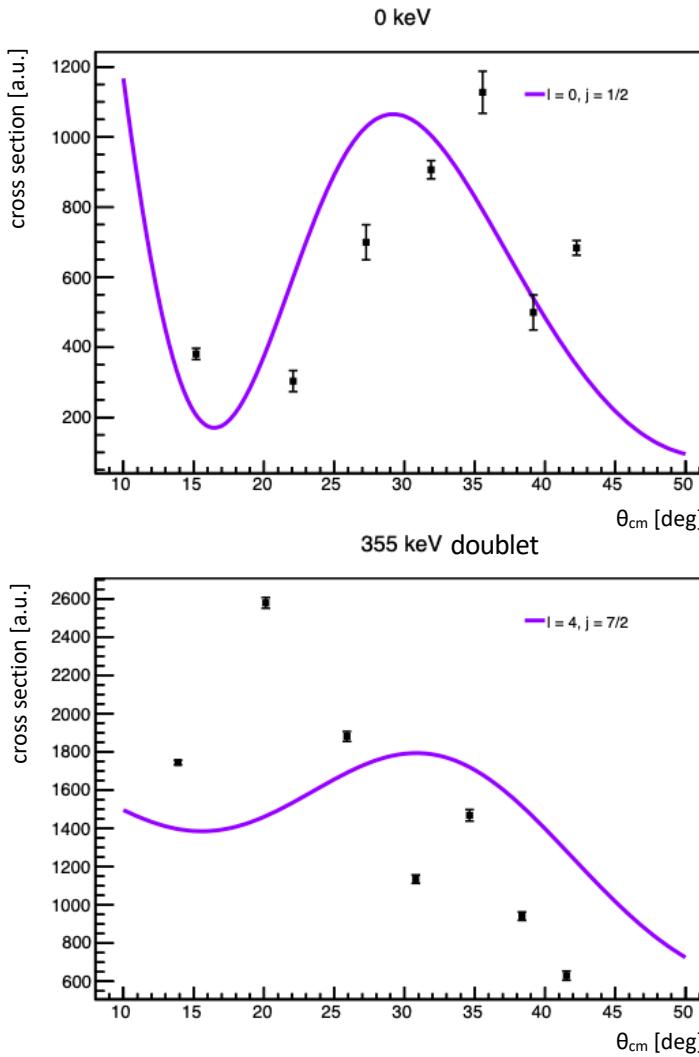


Early analysis

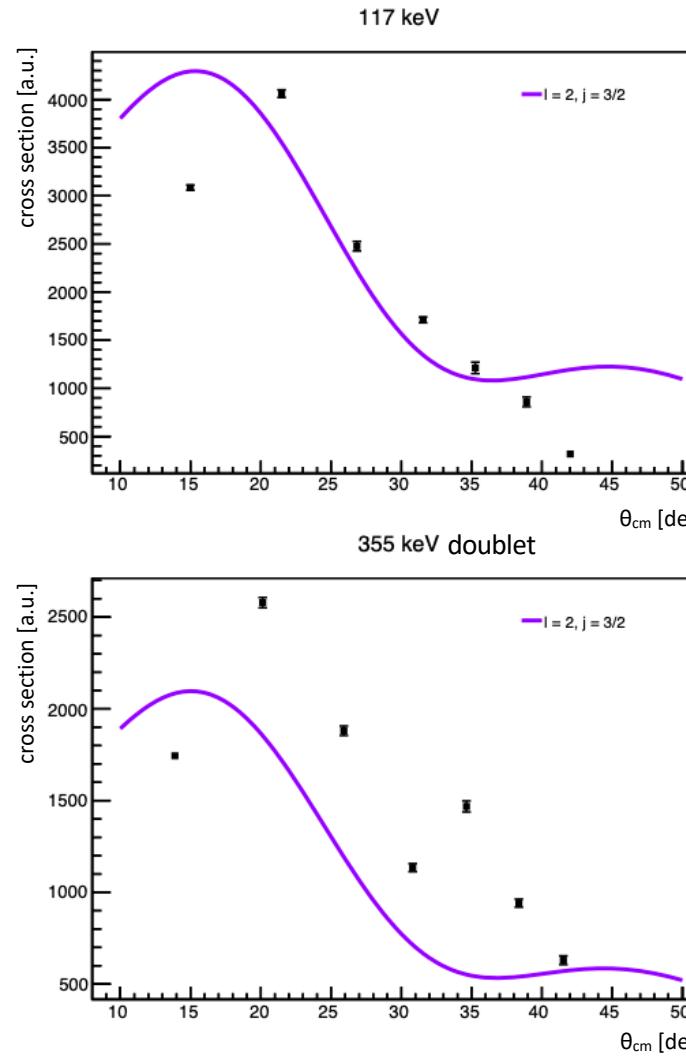
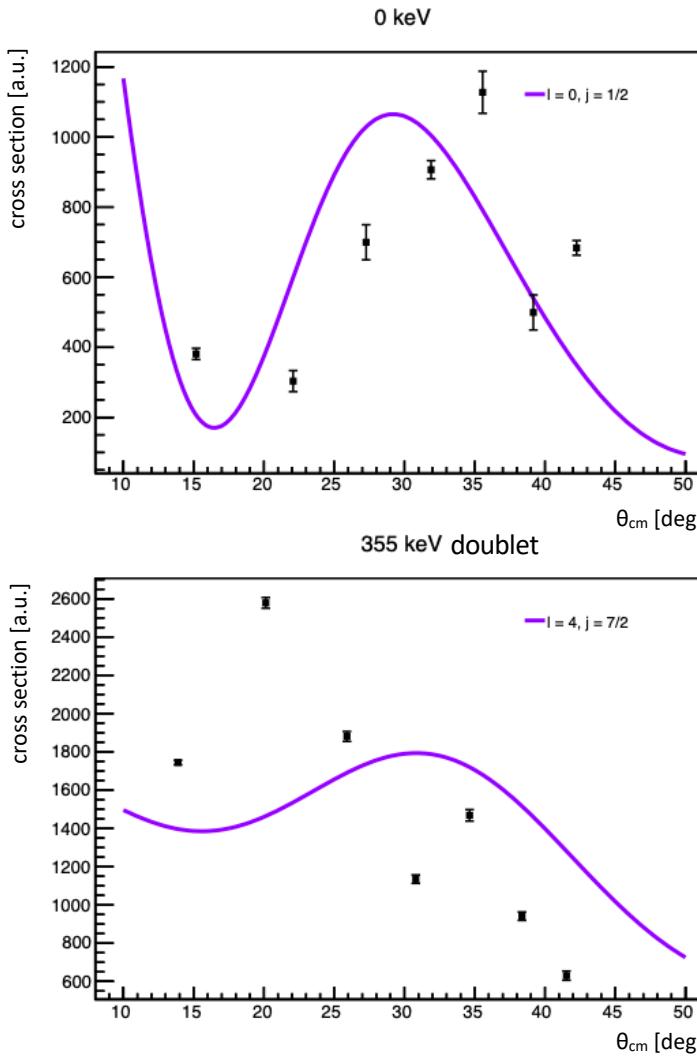


Fusion-evaporation
background

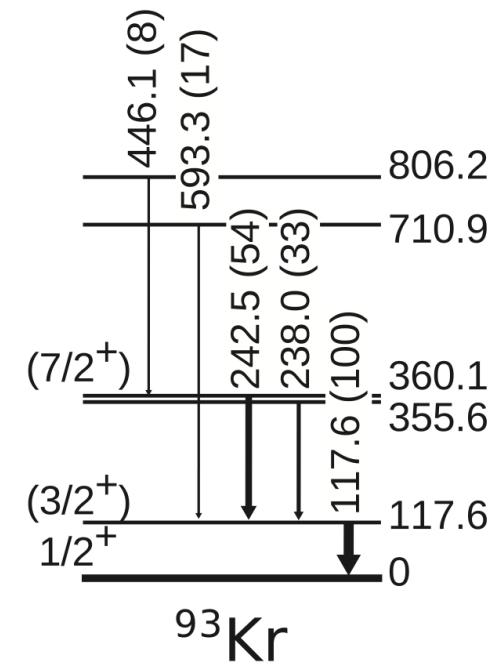
Preliminary angular distributions



Preliminary angular distributions

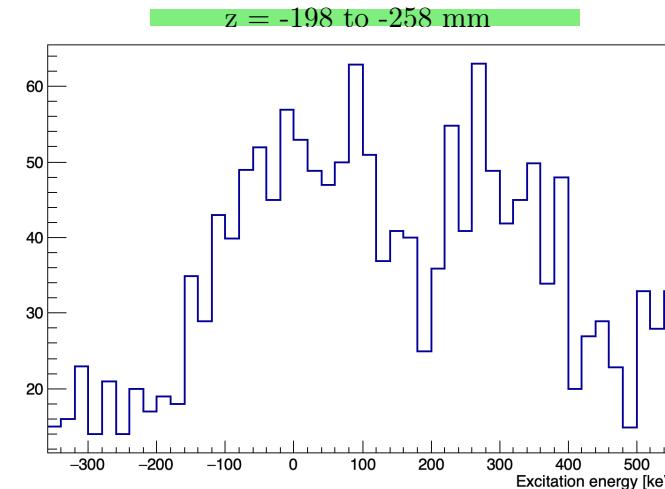
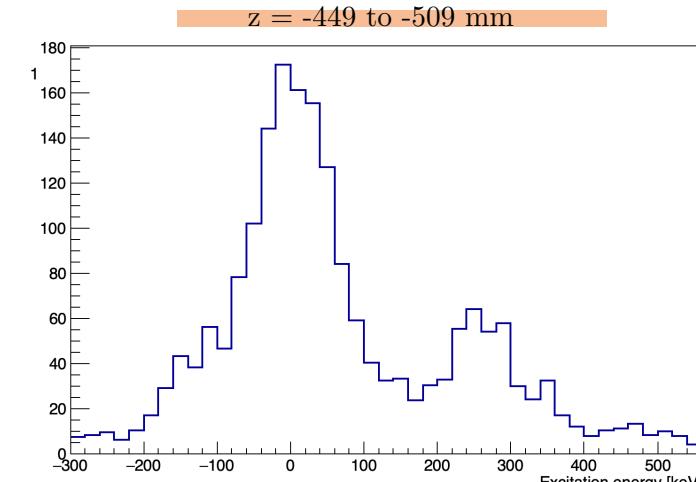
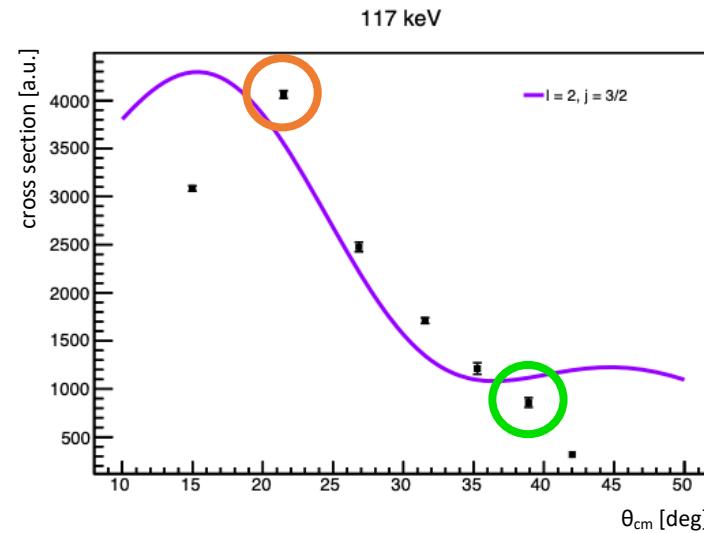
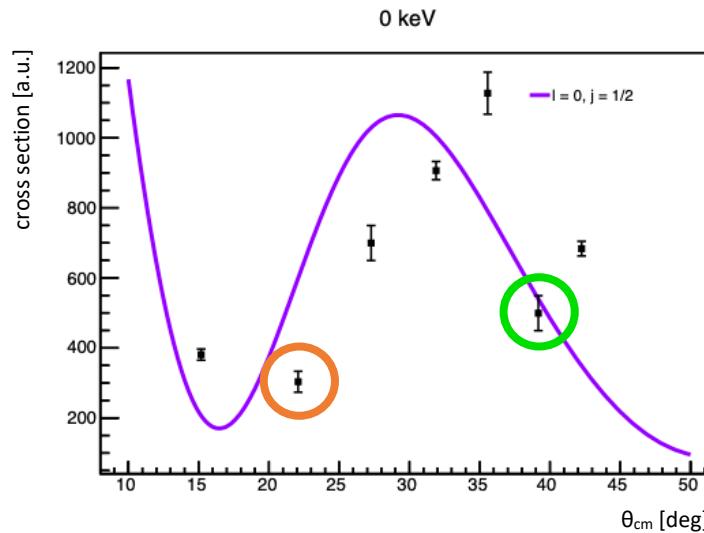


Level scheme from β -decay

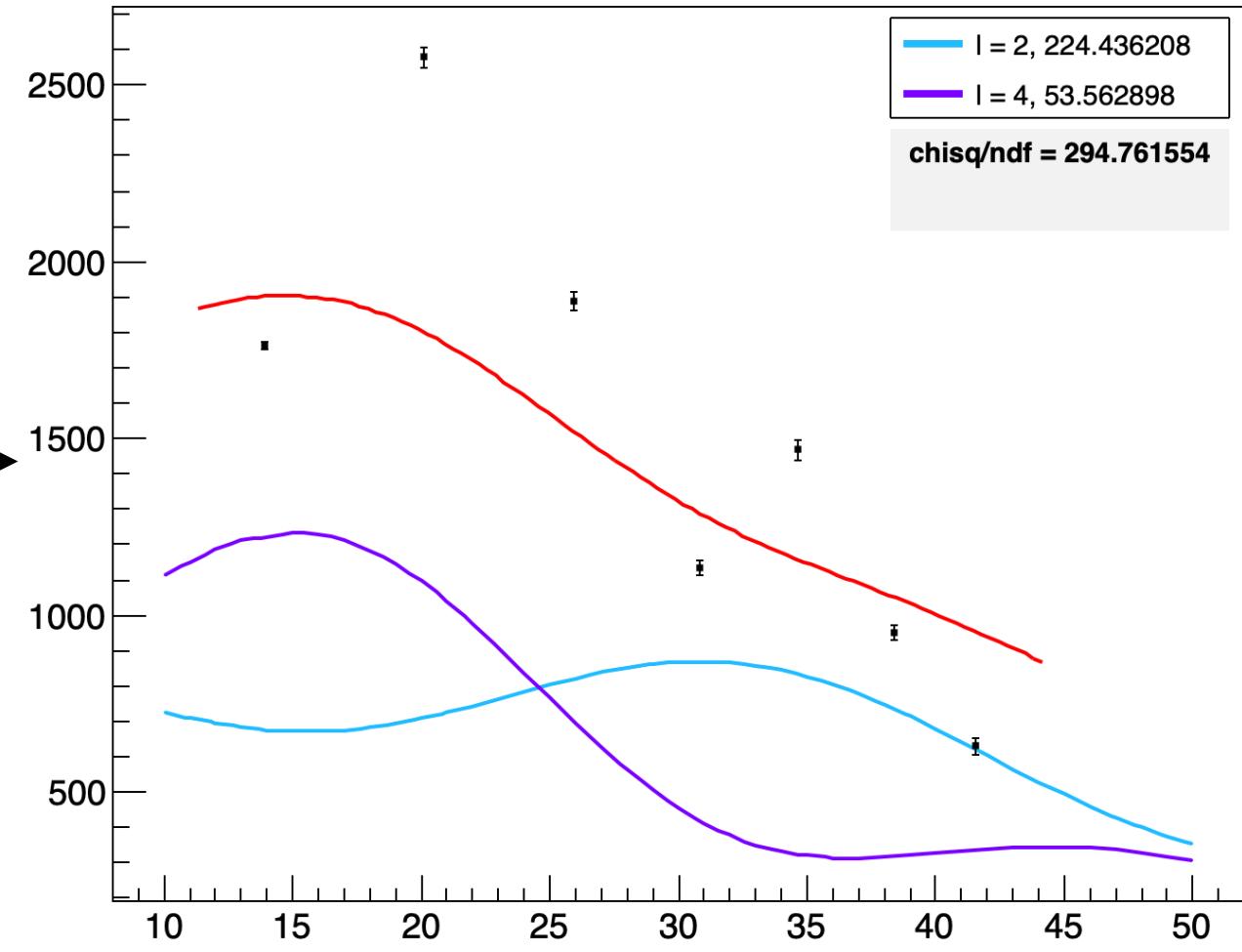
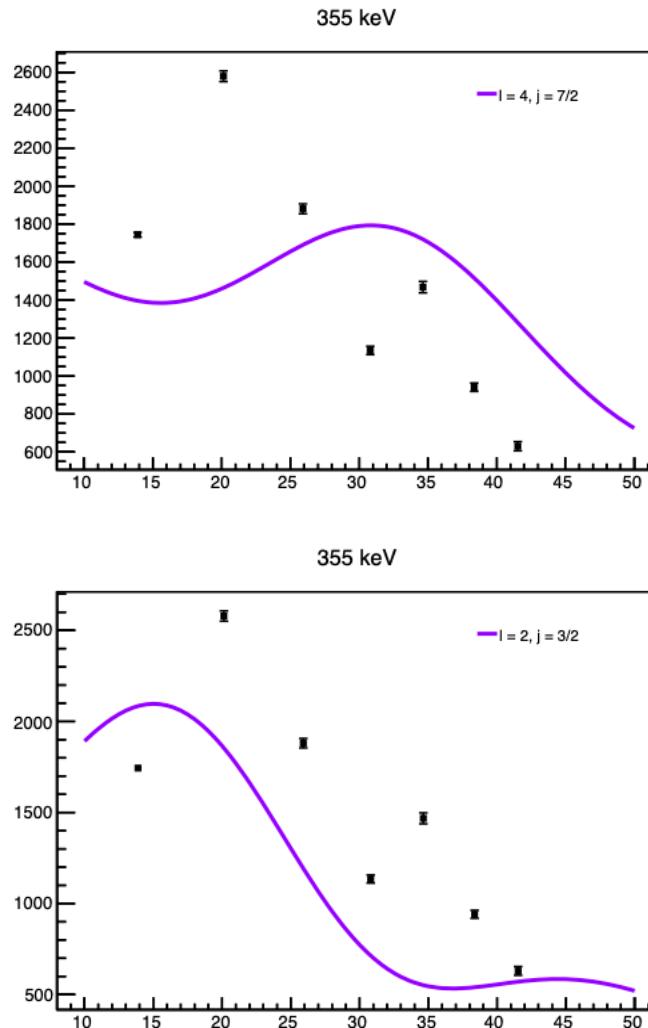


K. Miernik et al., Phys. Rev. C **88**, 014309 (2013).

Preliminary angular distributions



Preliminary angular distributions



Future Work

- Single particle energy differences and spectroscopic factors of the low-lying states in ^{93}Kr
- Energy difference between the $2\nu\text{s}_{1/2}$ and $0\nu\text{g}_{7/2}$ orbitals below $N = 60$
- Compare to modern shell model calculations
- Improve understanding of deformation around $A = 100$

Thank you

- Acknowledgments
 - STFC
 - ISS collaboration
 - ISOLDE technical group

