

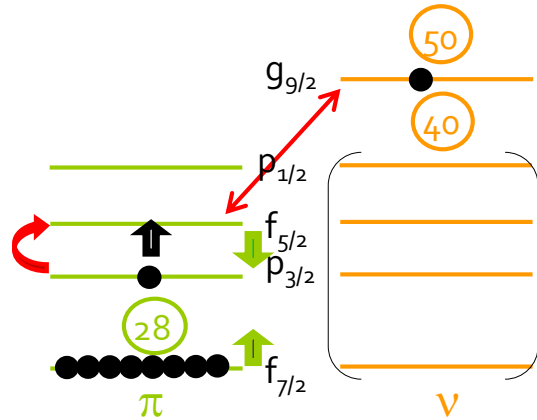


Isomer spectroscopy studies near $N=50$

Cristina Petrone
IFIN-HH

Important role of the $vg_{9/2}$ for $40 < N < 50$ in Cu isotopic chain

Monopole migration

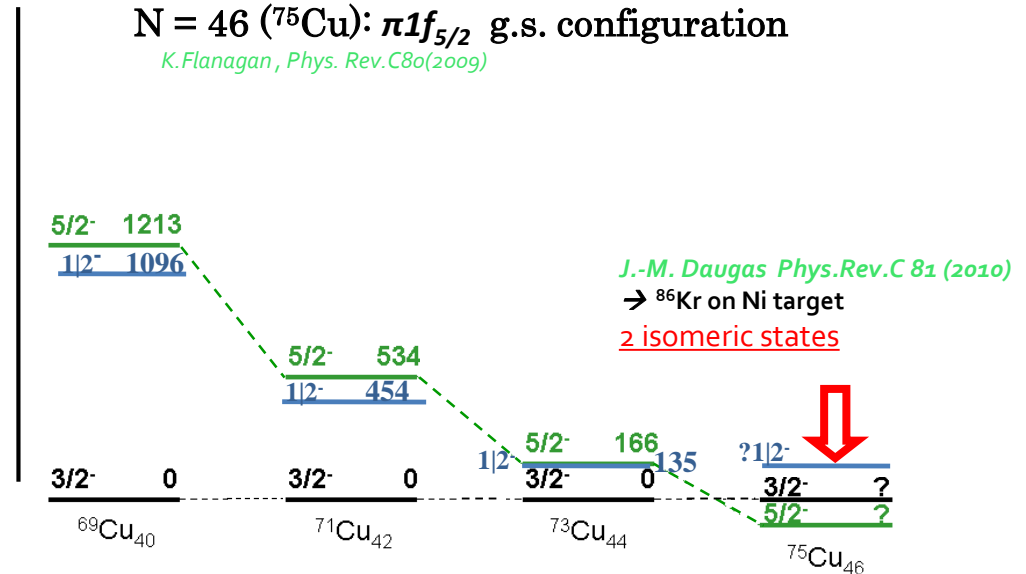
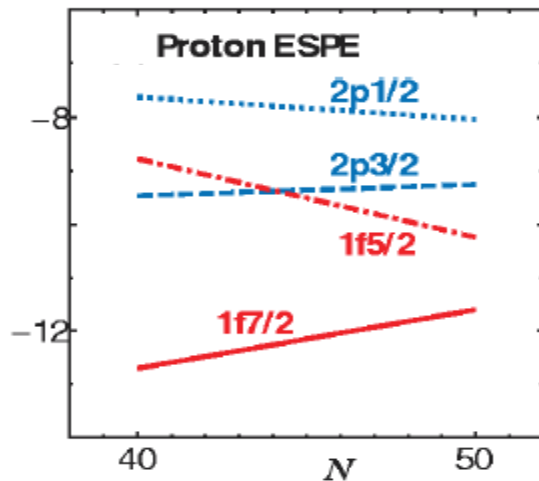


- Neutron-rich Cu isotopes ($Z=29$):
1 π outside $Z=28$ shell structure coupled to the changing Ni core structure

^{75}Cu

$N = 46$ (^{75}Cu): $\pi 1f_{5/2}$ g.s. configuration

K. Flanagan, Phys. Rev. C80(2009)

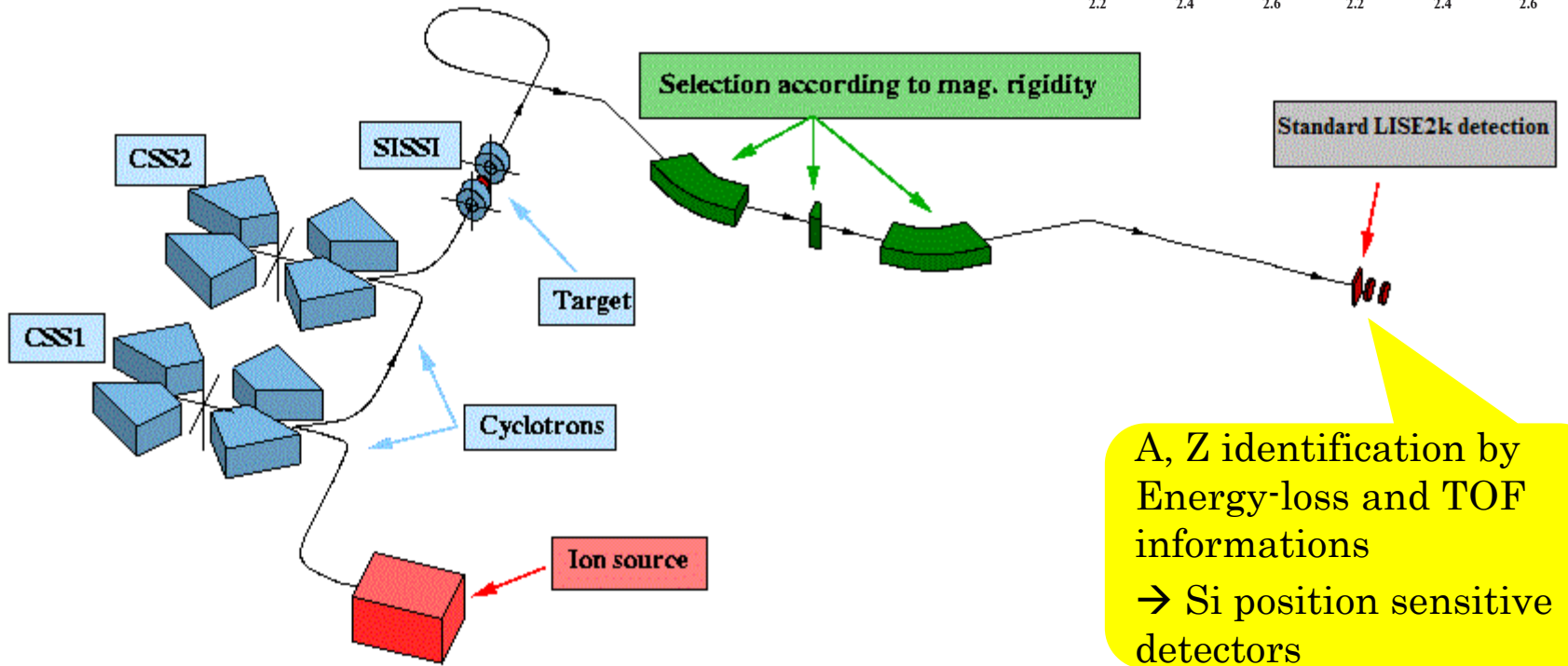
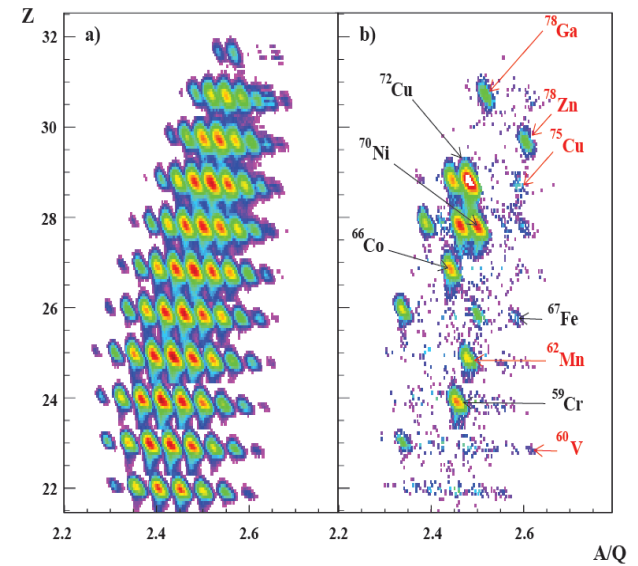


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published C. Petrone et al., Phys. Rev. C. 94, 024319 (2016)

Fragmentation of ^{86}Kr @ 60 MeV/u on Be target (500um)

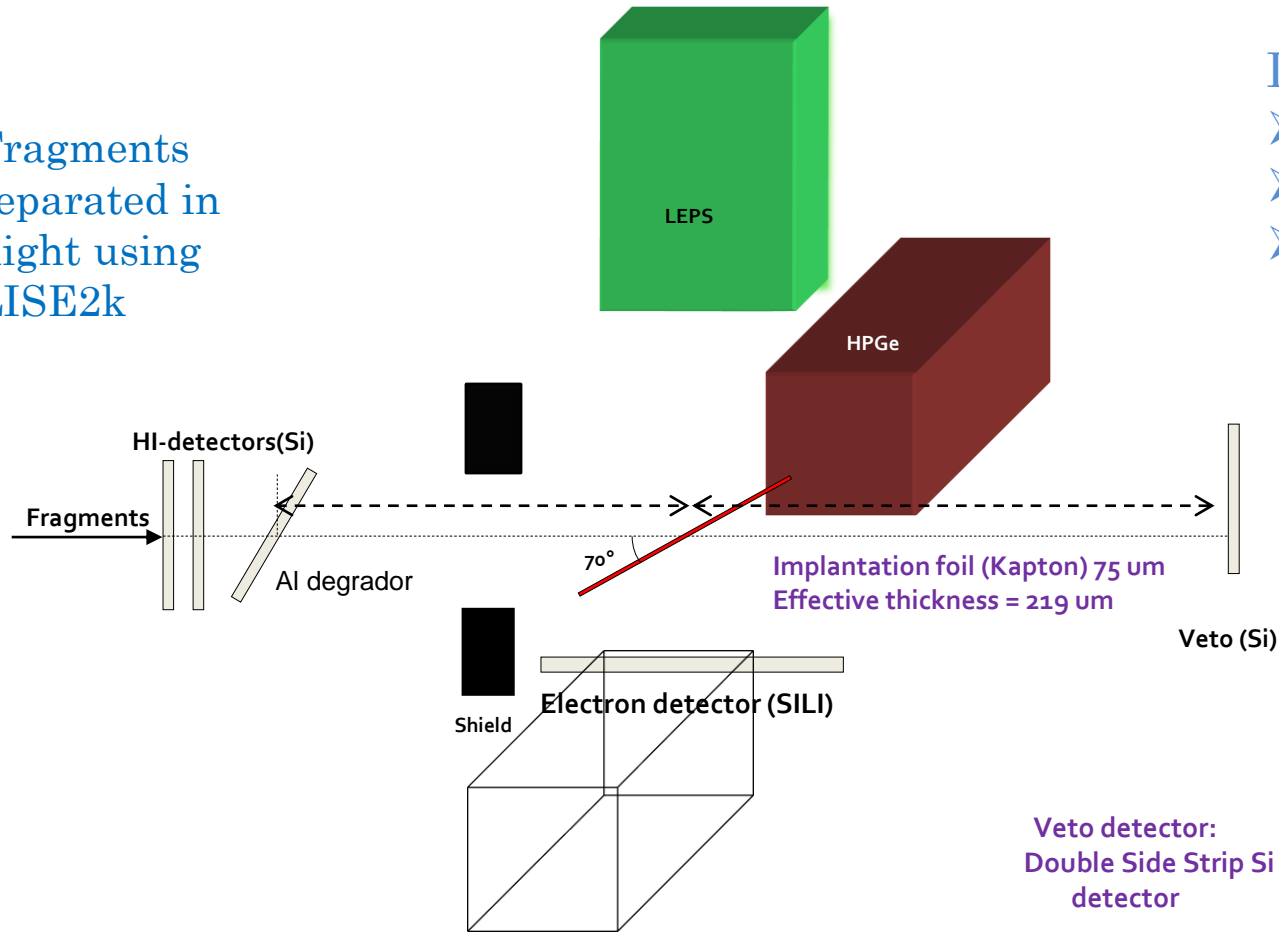
- Beam intensity: 4 mAe
- Lise 2k Spectrometer: high angular acceptance and short flight-path



Detection set-up

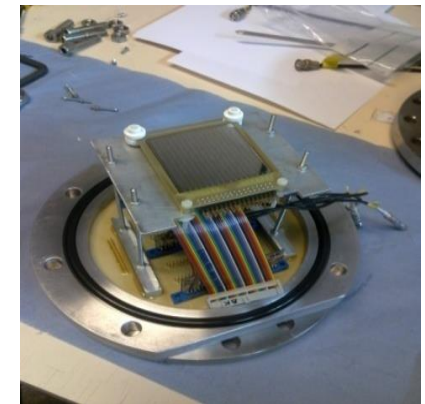
Upgraded version of previous experimental set-up used with success in the study of ^{34}Si , ^{44}S and $^{72,74}\text{Kr}$ – **IN2P3 collaboration**

Fragments separated in flight using LISE2k



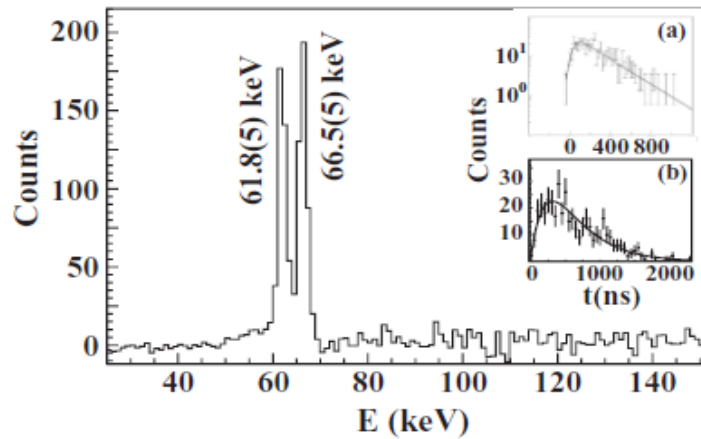
Detection ensemble :

- 2 HPGE
- 1 LEPS
- 2 Si(Li)



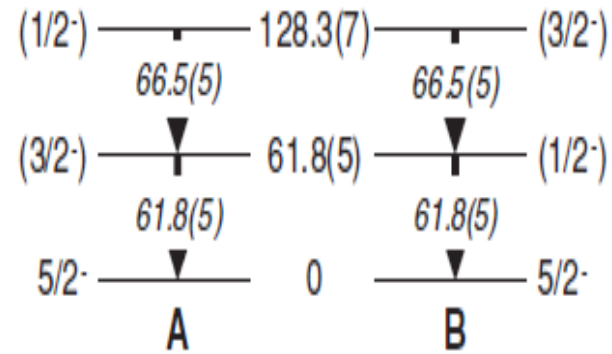
Veto detector:
Double Side Strip Si
detector

^{75}Cu previous information

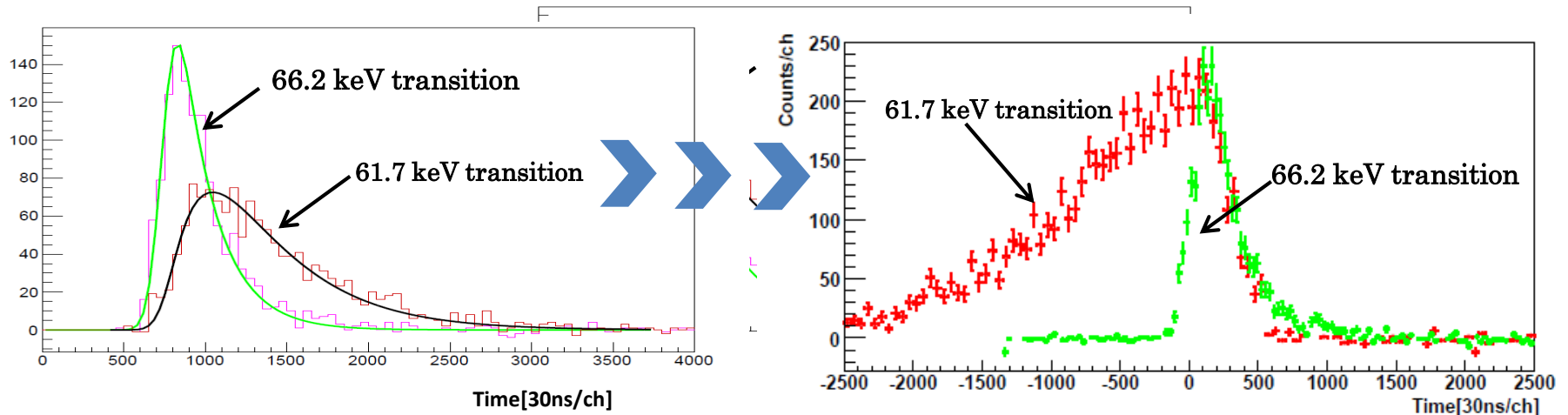


J.M.Daugas et al., Phys.Rev.C 81(2010)

Proposed isomer decay schemes



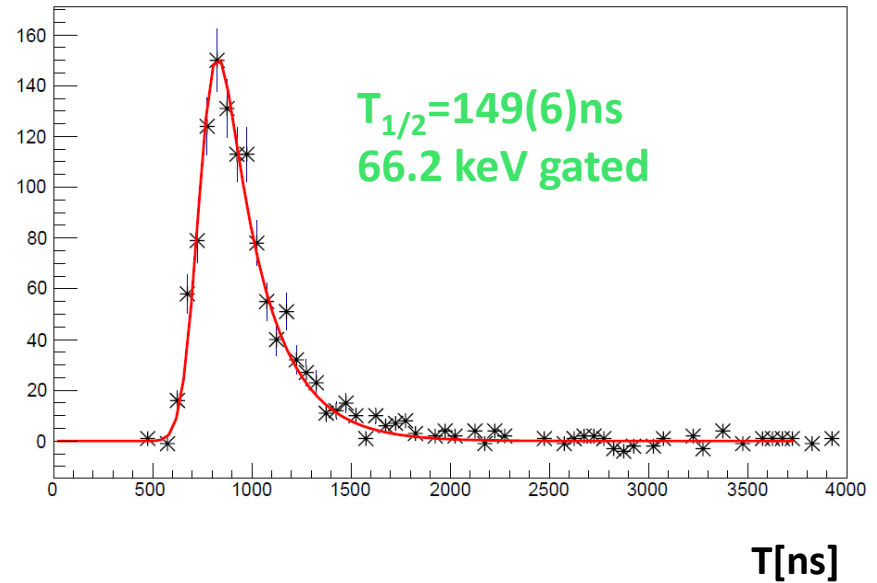
Decay patterns – present study



Lifetime Measurements

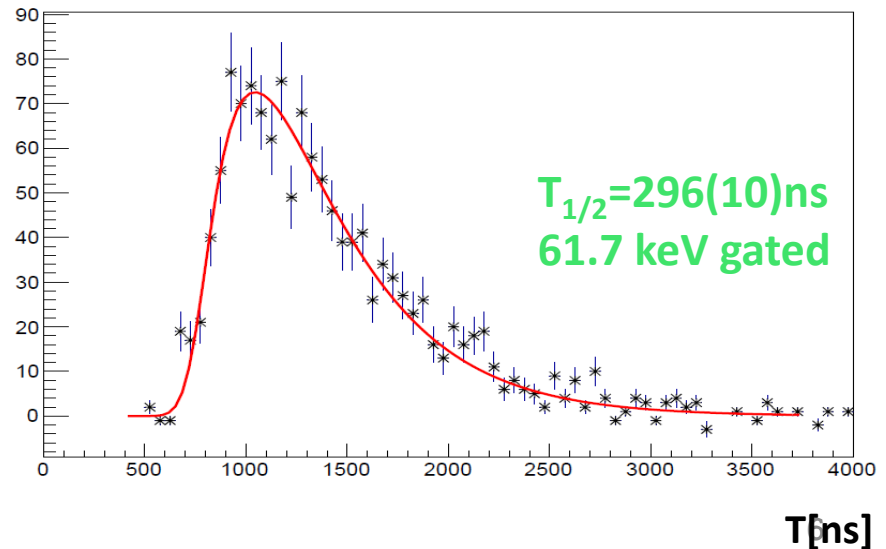
- 66.2 keV level

$$f(x) = ke^{\frac{x_0-x}{\tau}} \left[1 + \operatorname{erf} \left[\left(\frac{x-x_0}{\sigma\sqrt{2}} \right) - \left(\frac{\sigma}{\tau\sqrt{2}} \right) \right] \right]$$



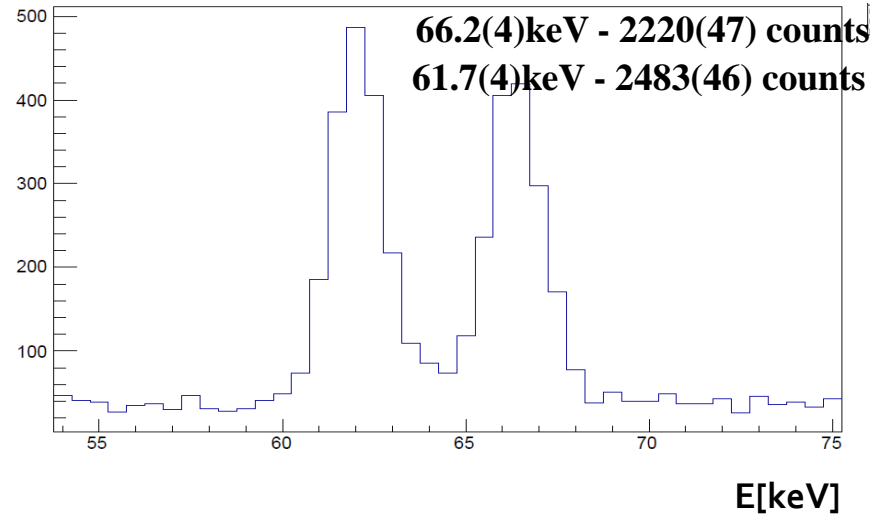
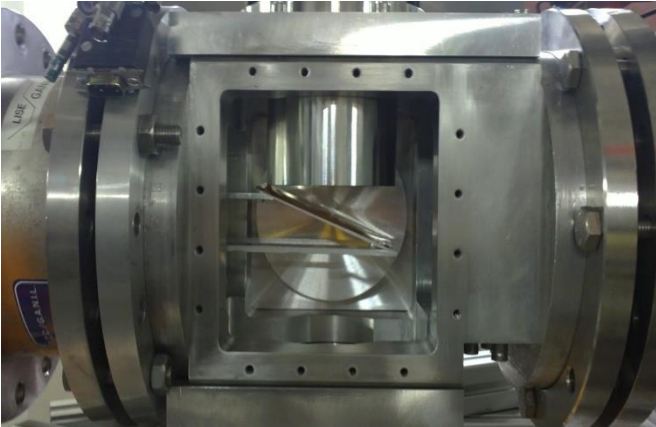
- 61.7 keV level

$$N_2(t) = \frac{\lambda_1 N_{01}}{\lambda_2 - \lambda_1} (e^{-\lambda_1 t} - e^{-\lambda_2 t}) + N_{02} e^{-\lambda_2 t}$$



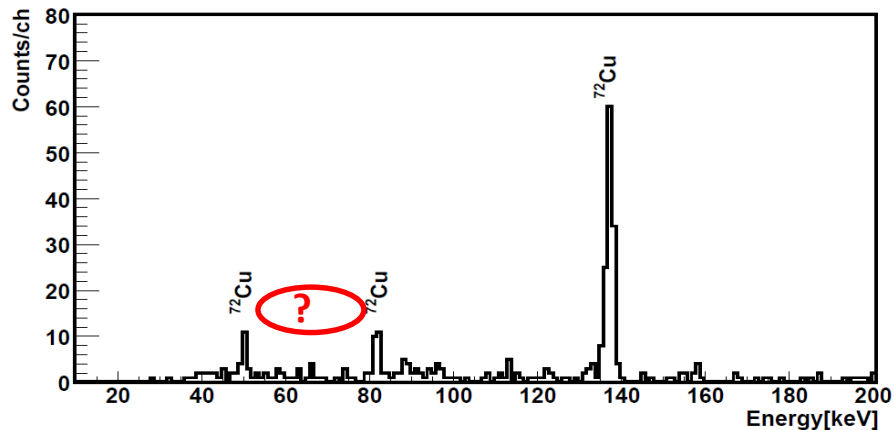
^{75}Cu gamma spectrum

Compact reaction chamber \rightarrow high efficiency detection
Total efficiency : 15.5%

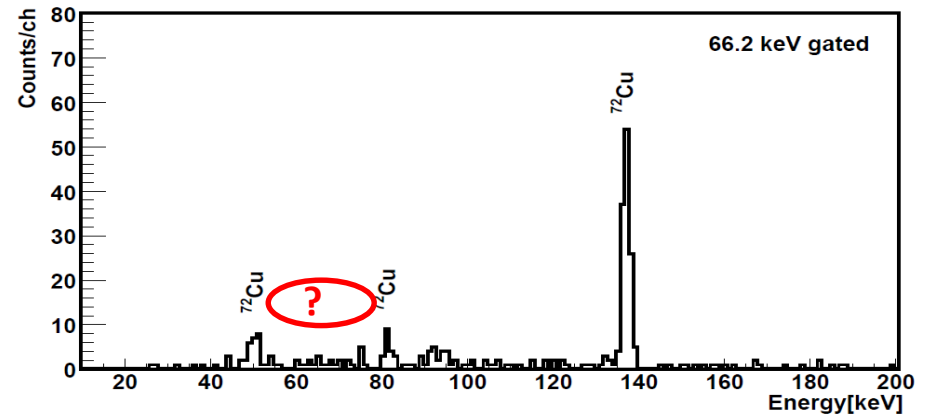


$\gamma\gamma$ coincidence results

Coincidence spectra 61.7 keV gated

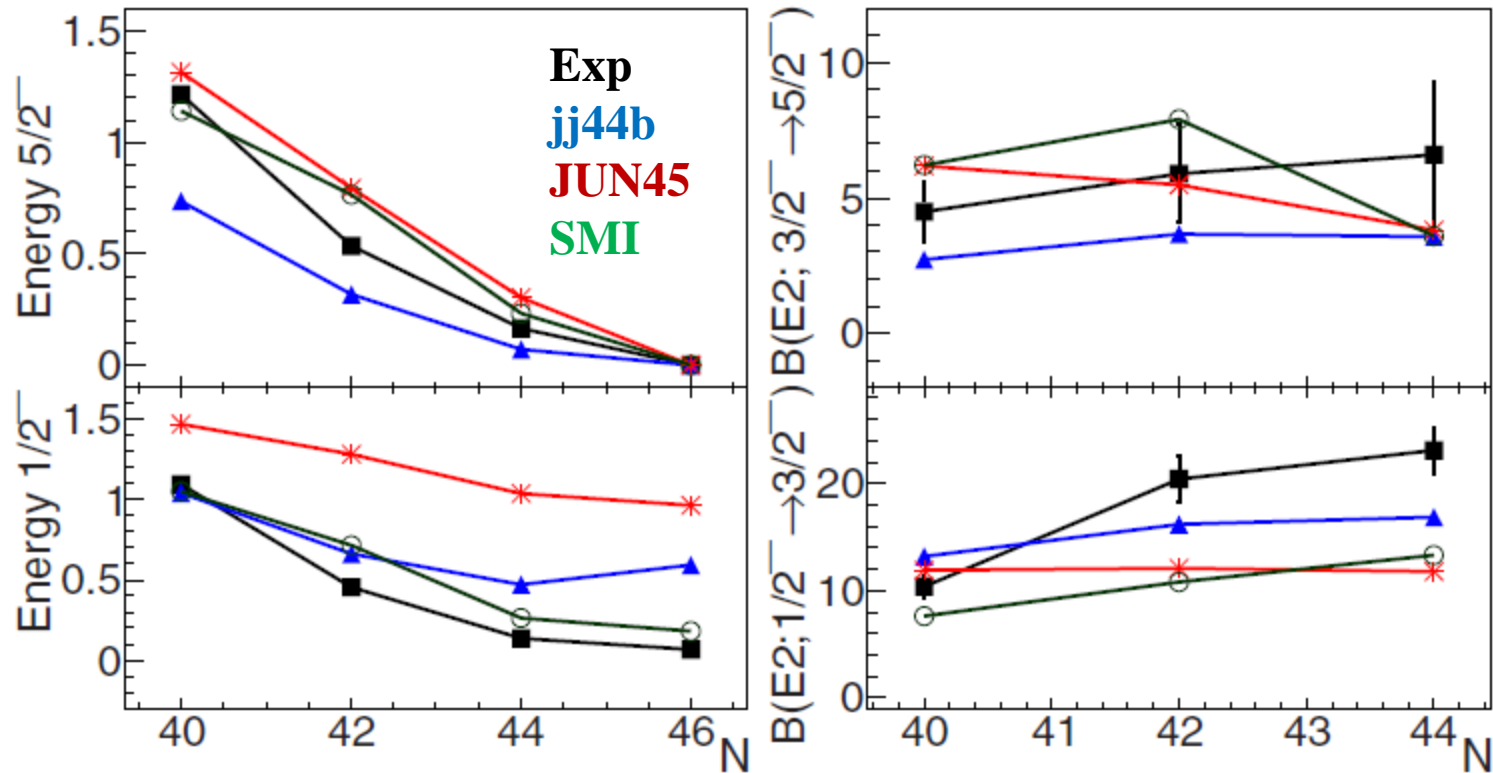


Coincidence spectra 66.2 keV gated



The 61.7 keV and 66.2 keV transitions are not in coincidence!

^{75}Cu : theoretical predictions with SMI, jj44b and JUN45 interactions



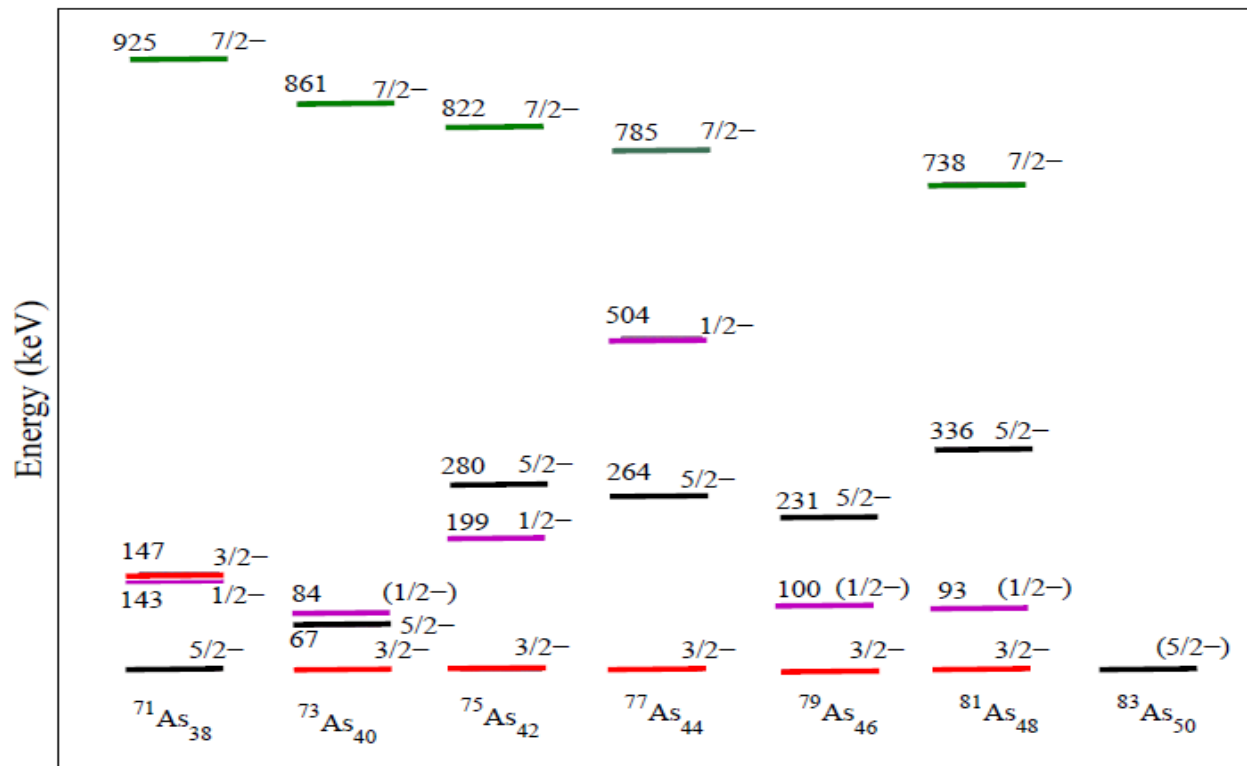
B. Brown and A. Lisetskiy, unpublished
 K. Sieja and F. Nowacki, Pys.Rev.C 81, 061303(2010)
 M. Honma et al., Phy. Rev. C 80, 064323 (2009)

**A-130 Experiment @9MV
Tandem in Bucharest:
Decay properties of ^{79}As excited
states populated in $^{76}\text{Ge}(\alpha, p)$**

November2016

Nuclear structure of As isotopes

- 5 π outside Z=28 core
- Low-energy states: $[\pi p_{3/2} \pi f_{5/2}]^5 \implies I^\pi = 1/2^-$ to $I^\pi = 13/2^-$



- Positive parity states: excitation of one proton into the $\pi g_{9/2}$

Experimental set-up

^4He beam at the energy of 16 MeV

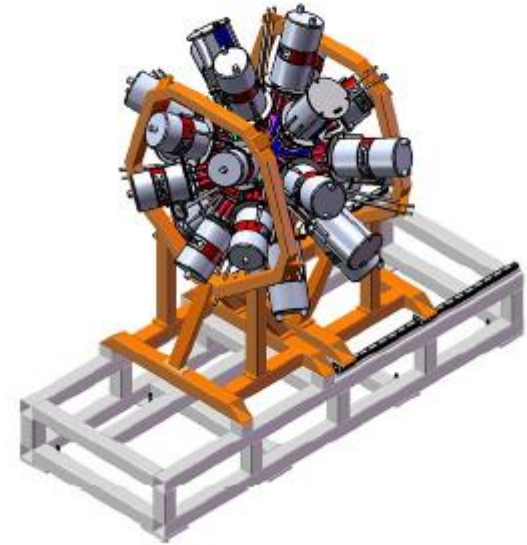
Average intensity 1.5 μA

^{76}Ge target, 0.52mg/cm²

Estimated cross section $\sim 3\text{mb}$

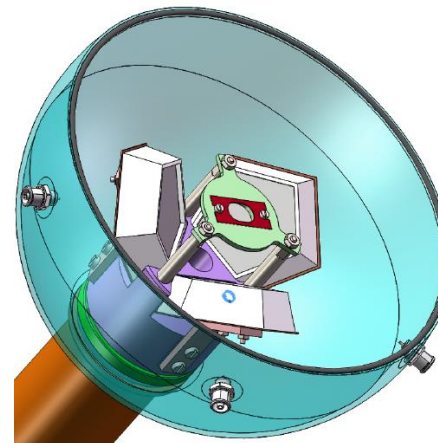
RoSphere array:

- ❖ 14 HPGe detectors
- ❖ 11 LaBr₃(Ce) scintillators

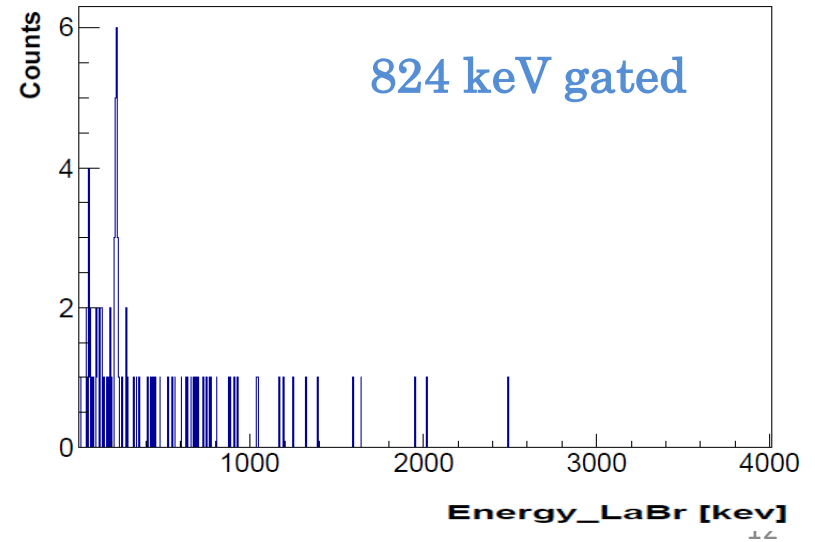
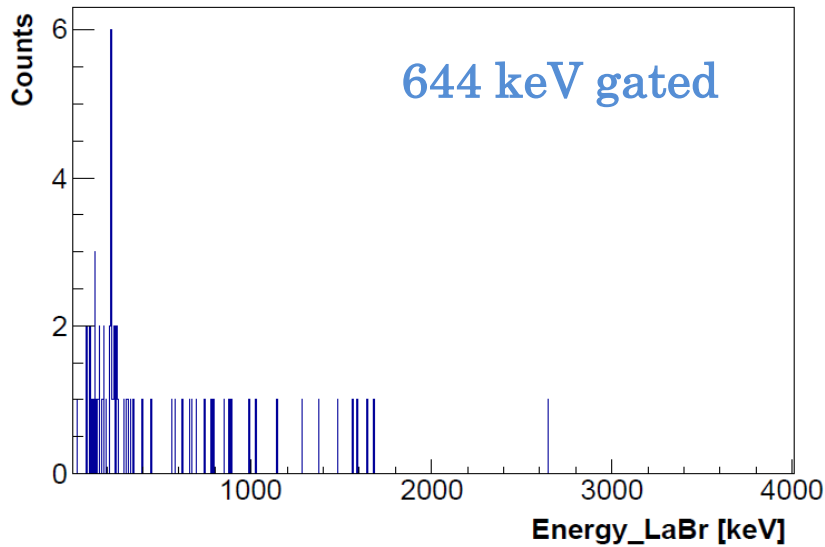
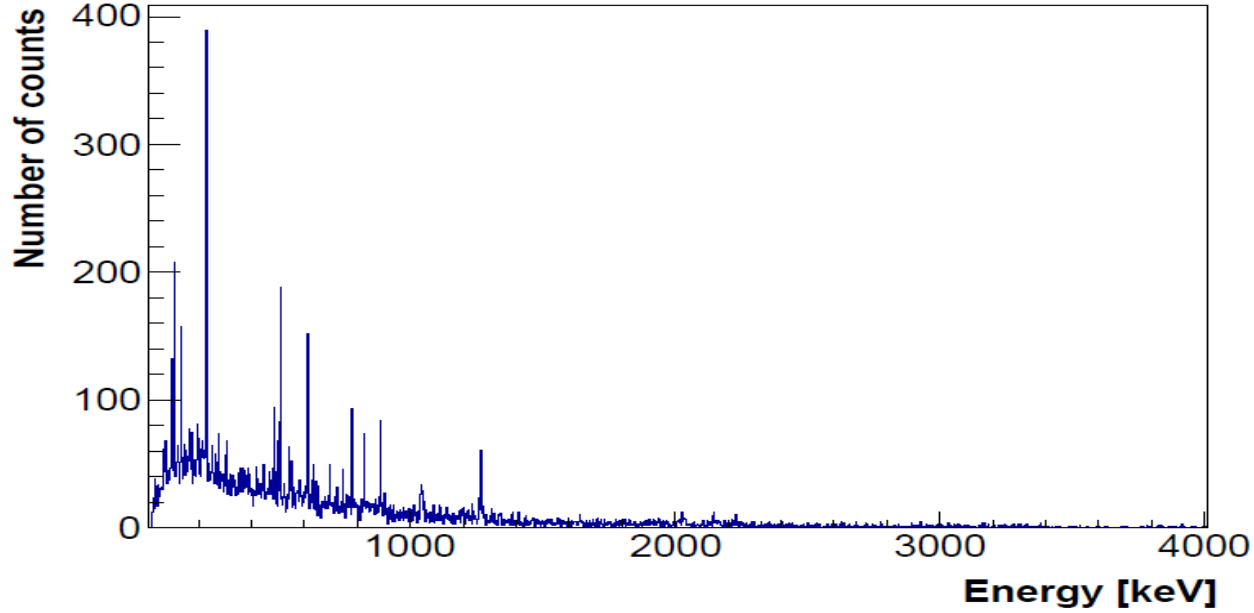


Charged particle detectors:

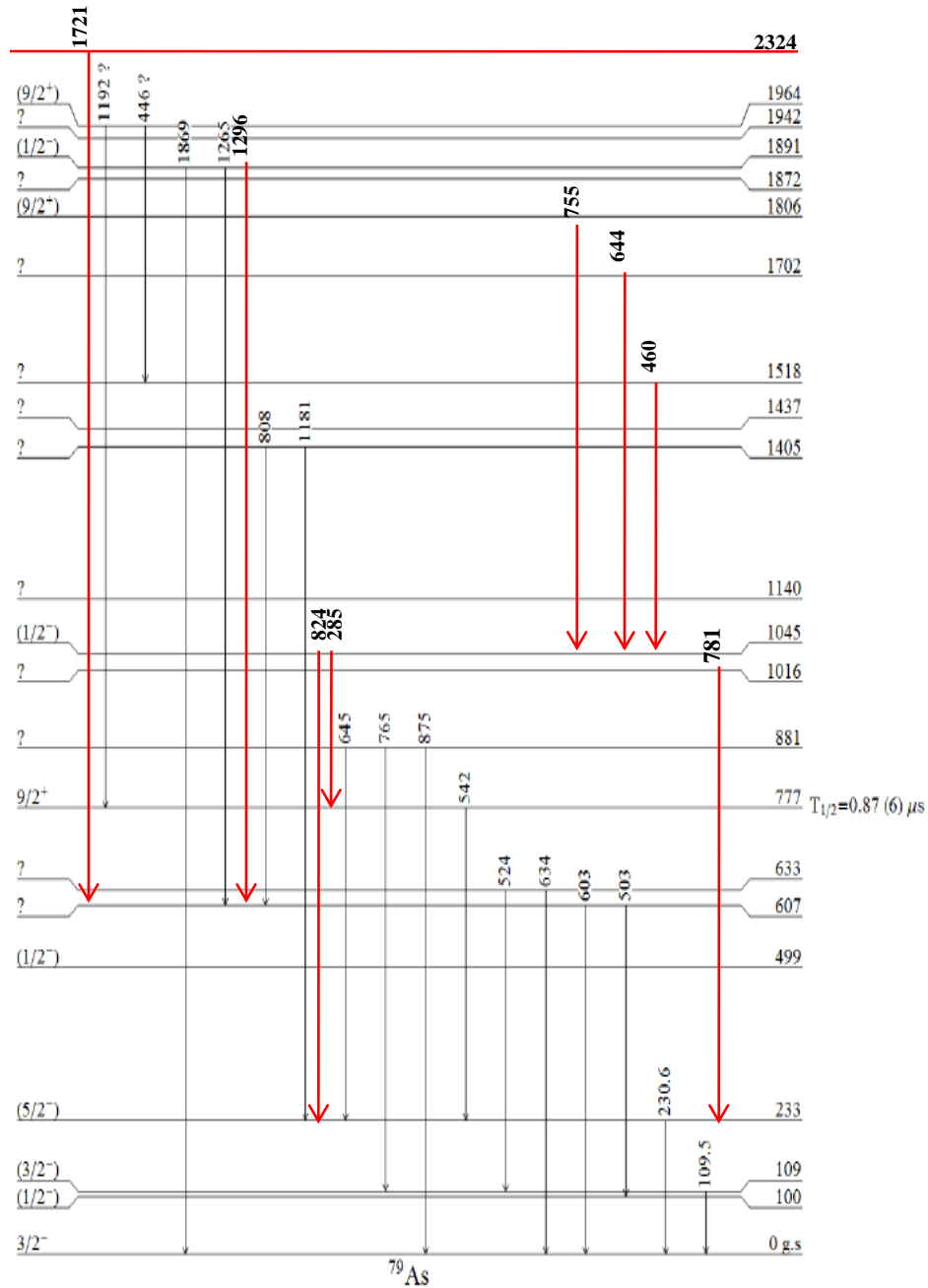
- ❖ 3 Silicon pentagonal detectors
- ❖ Active area $\sim 10.2\text{ cm}^2$
- ❖ 12% efficiency for proton detection



γ spectrum conditioned by proton detection



^{79}As level scheme



Preliminary!

Acknowledgments

J. M. Daugas¹, M. Stanoiu², C. Mihai², N. Marginean², G. Simpson³, C. Borcea², R. Borcea², D. Bucurescu², L. Caceres⁴, S. Calinescu², C. Costache², R. Chevrier¹, N. Florea², L. Gaudefroy¹, G. Georgiev⁵, G. Gey³, D.G. Ghita², A. Ionescu², R. Marginean², R. Mihai², A. Mitu², A. Negret², C.R. Nita², A. Olacel², A. Oprea², C. Plaisir¹, F. Rotaru², O. Sorlin⁴, C. Sotty², L. Stan², A. Serban², J. C. Thomas⁴, S. Toma², A. Turturica², S. Ujeniu²

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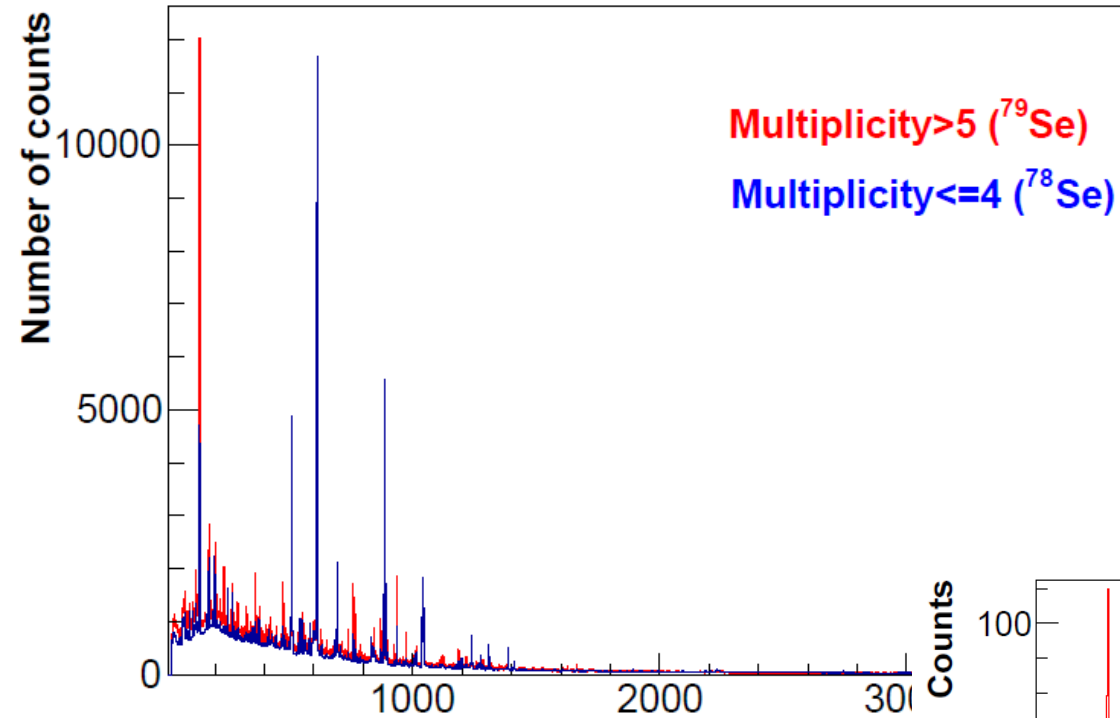
³ ILL, 38042 Grenoble Cedex, France

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Thank you!

Multiplicity condition



$Q(^{79}\text{Se}) = -2.94 \text{ MeV}$
 $Q(^{78}\text{Se}) = -9.9 \text{ MeV}$
 $Q(^{79}\text{As}) = -4.4 \text{ MeV}$

