Chemical selectivity of the IGISOL/JYFLTRAP system

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“Nuorison parasta tässä harrastetaan”

Seinäteksti Jyväskylän yliopiston vanhassa juhlasalissa (1882)

Fission ion guide technique

Based on survival of primary ions from nuclear reaction in helium buffer gas

Fast extraction of ions is required to prevent neutralisation

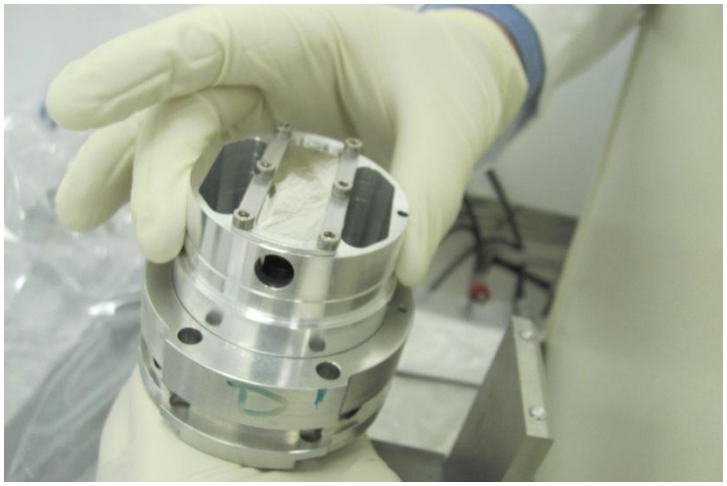
Charge state concentration: (0), +1, (+2)

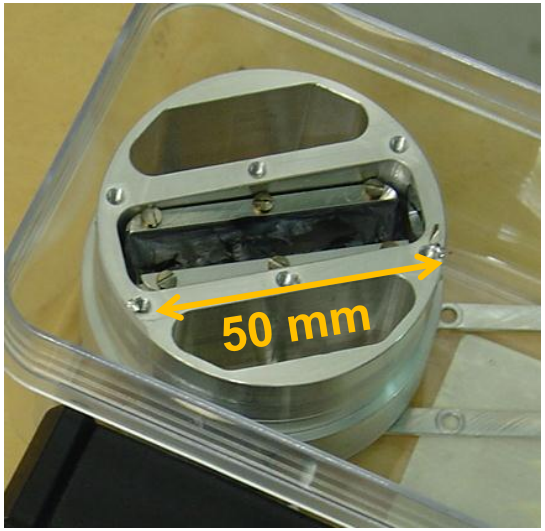
Produces ions of any element

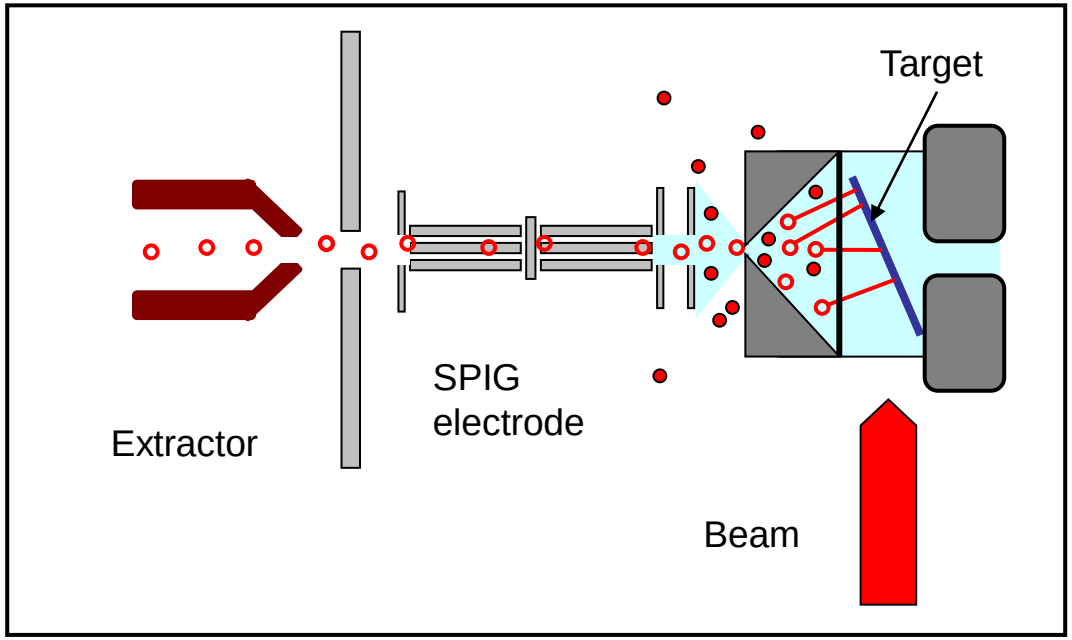
All elements can be studied

All ions come directly from fission

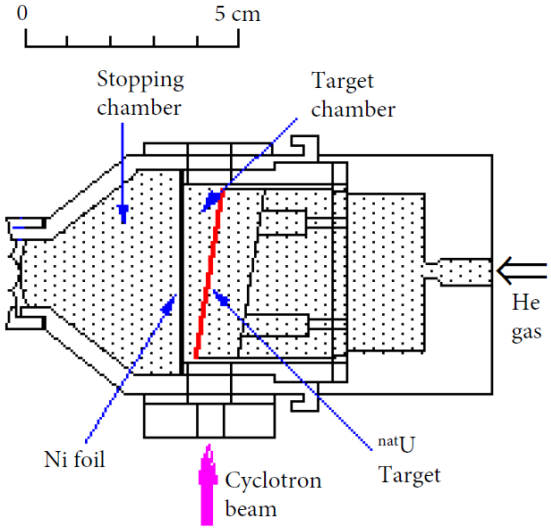
Ion rate in the formed beam corresponds to the independent fission yield

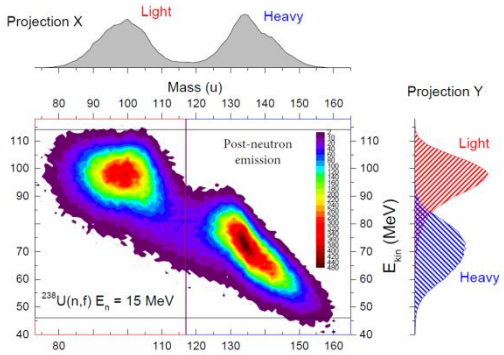






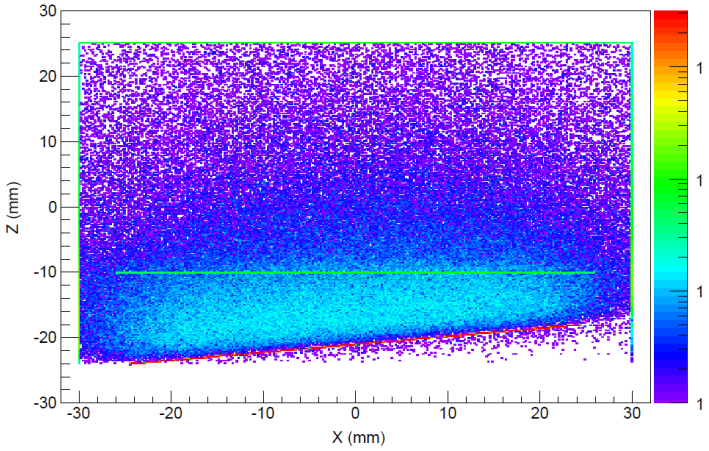
Mass dependency of the stopped ions

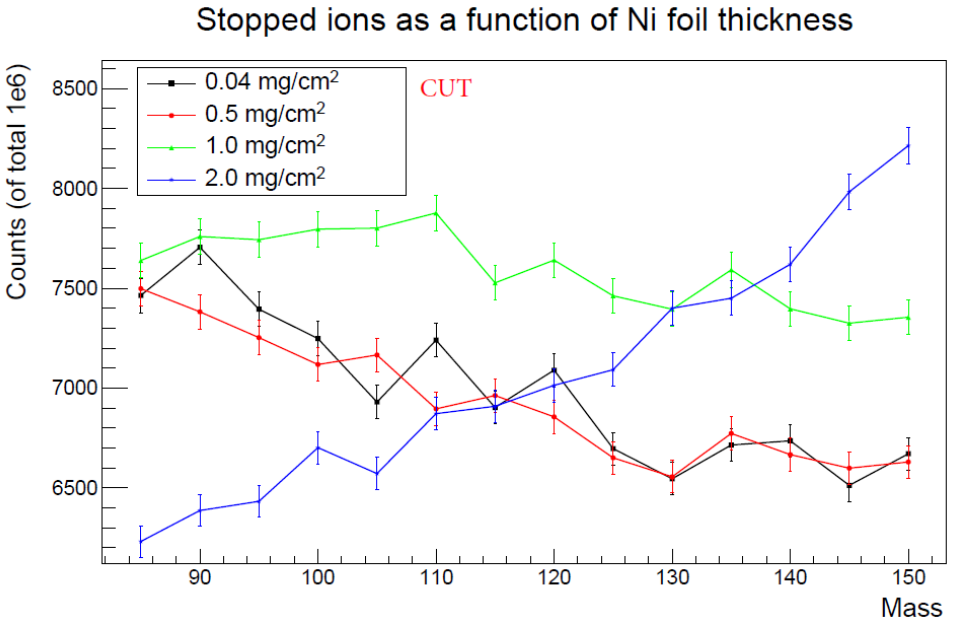




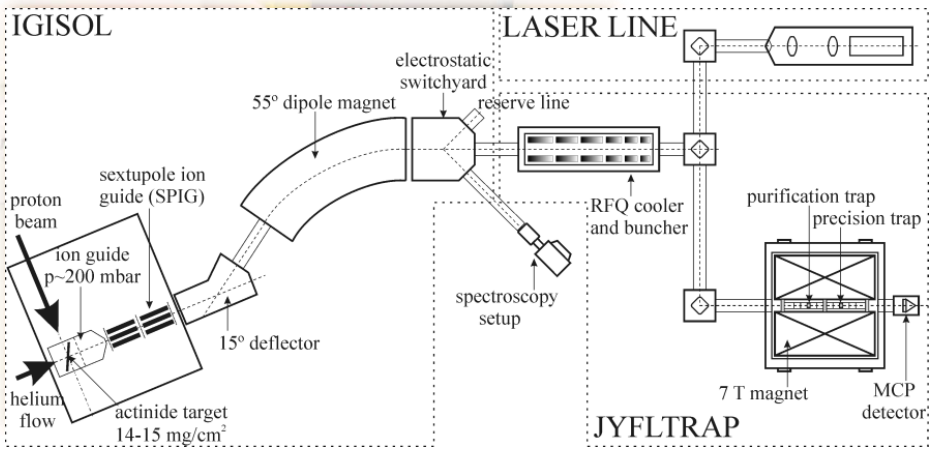
Simulations made by Uppsala Universitet collaboration

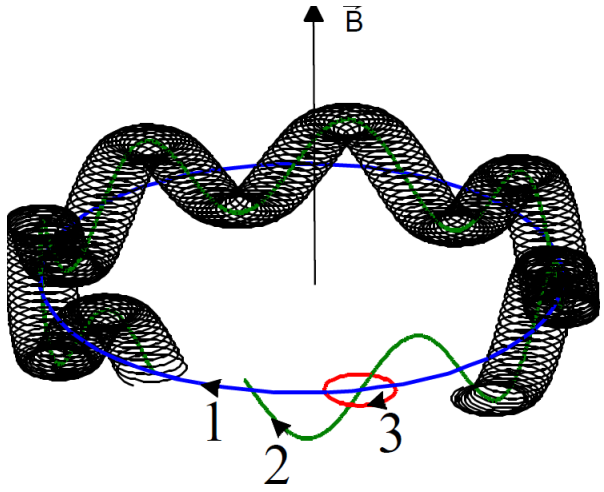
http://arxiv.org/abs/1409.0714

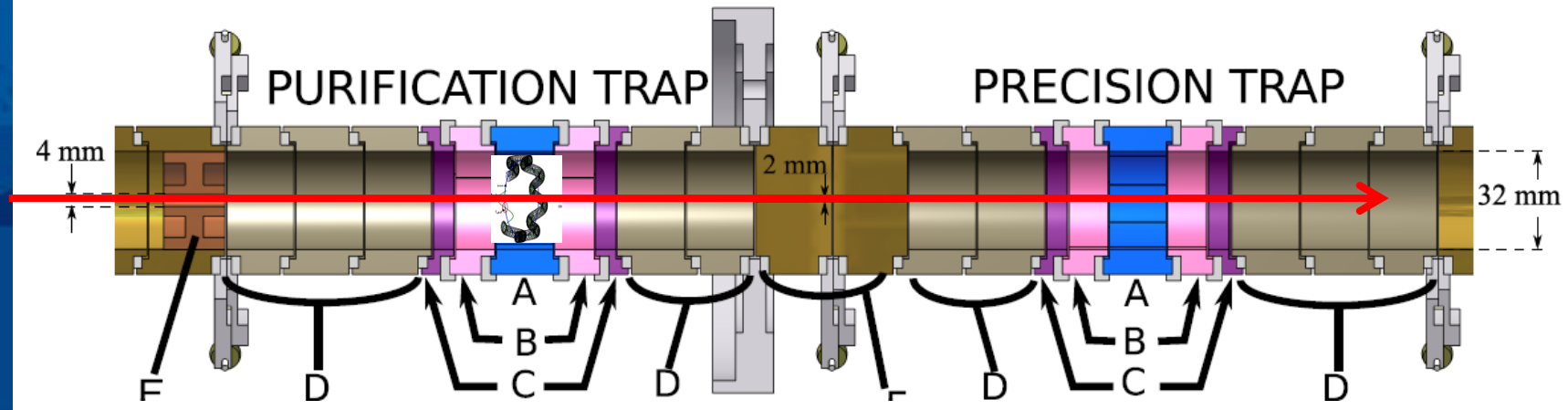




Counting ions with JYFLTRAP







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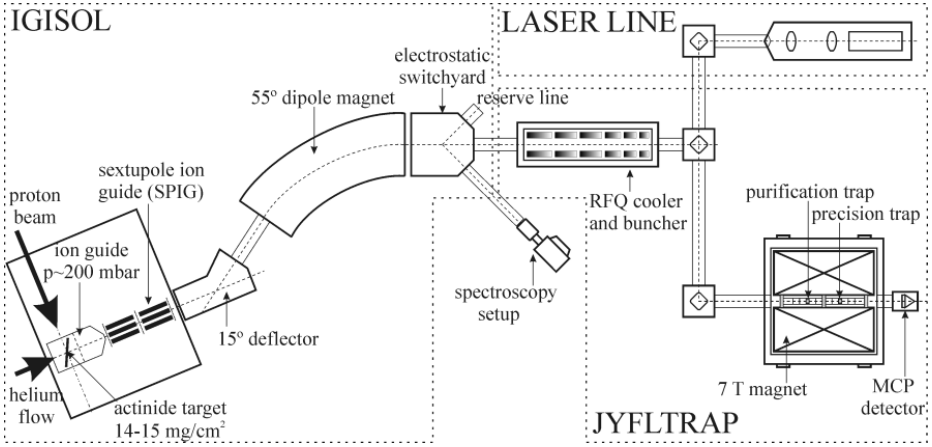
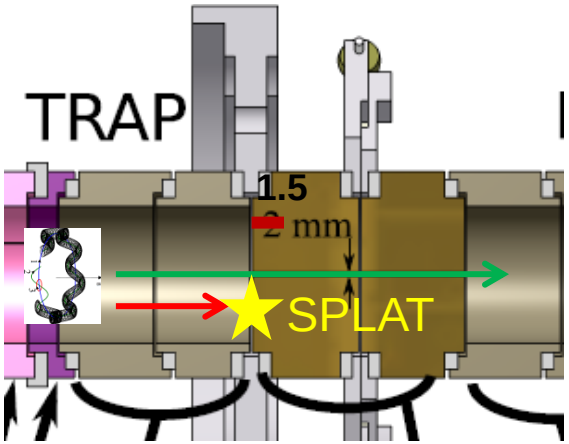
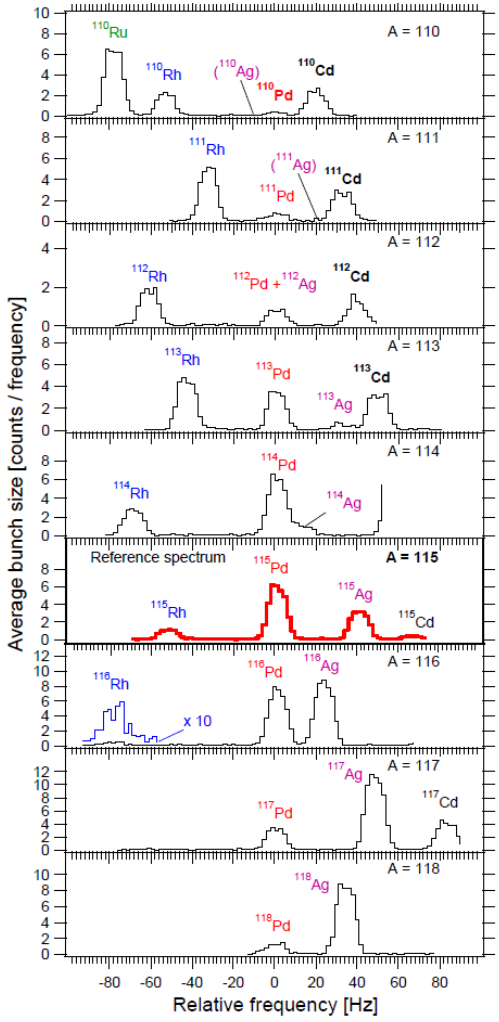
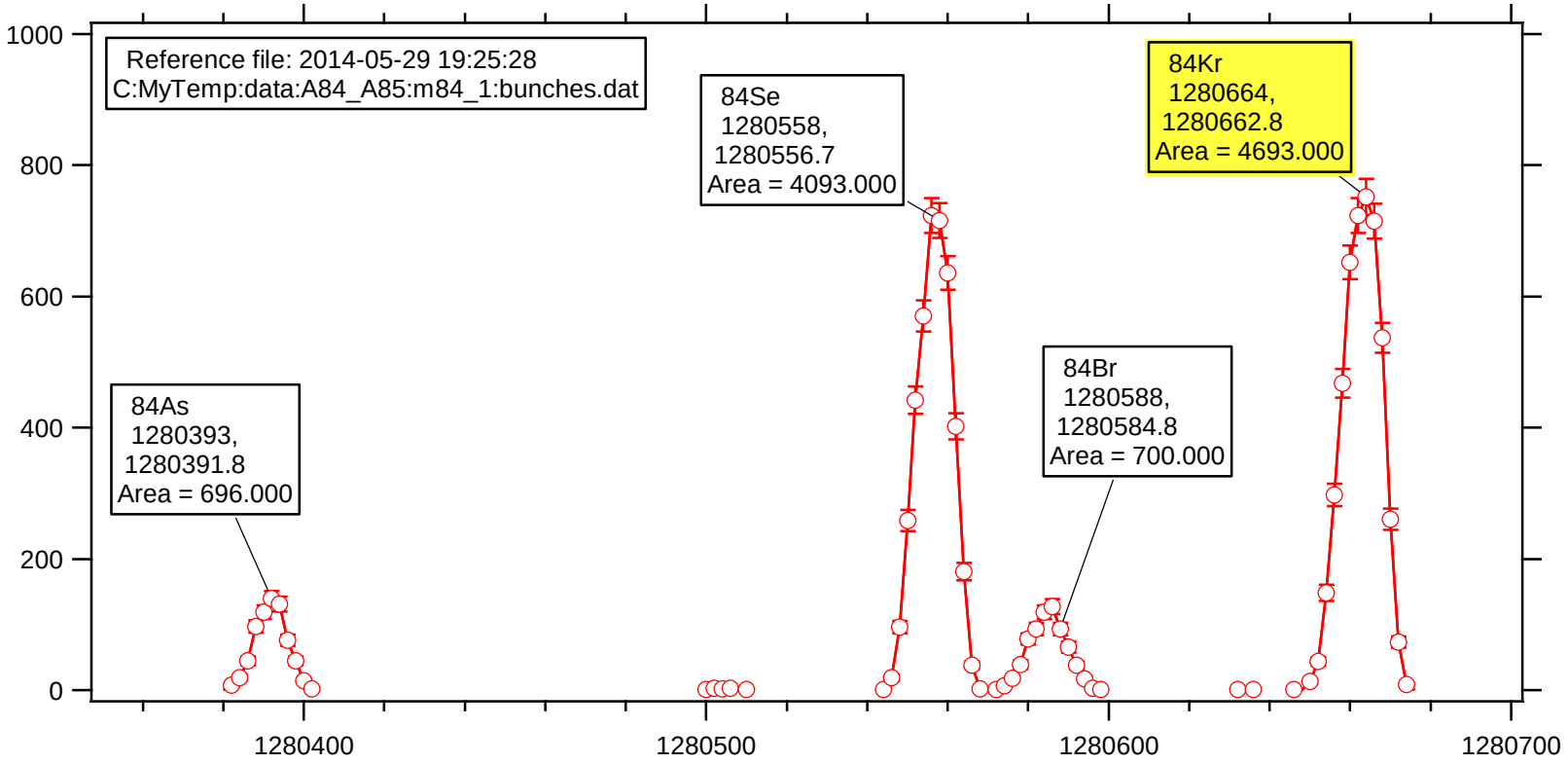


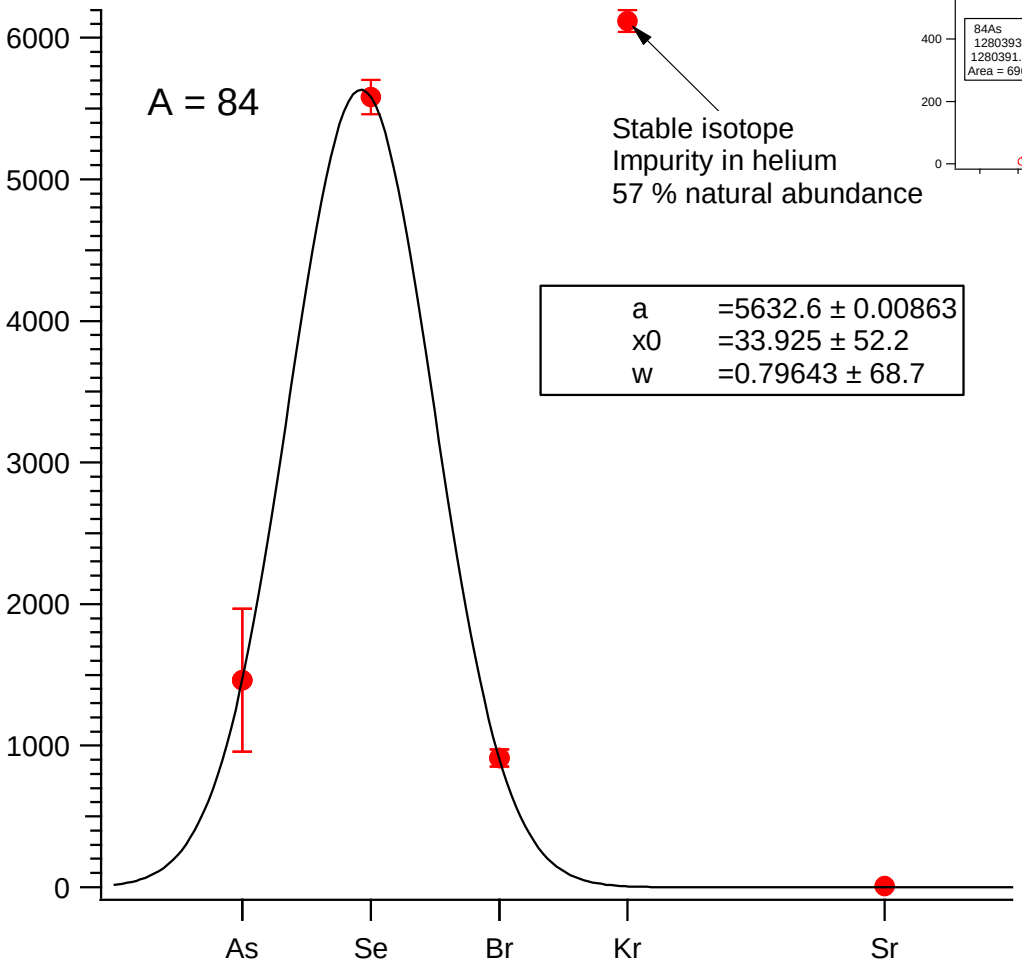




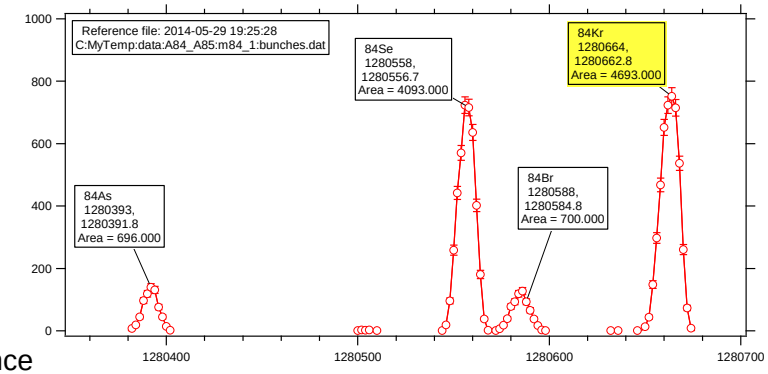
Charge distributions



Charge distributions

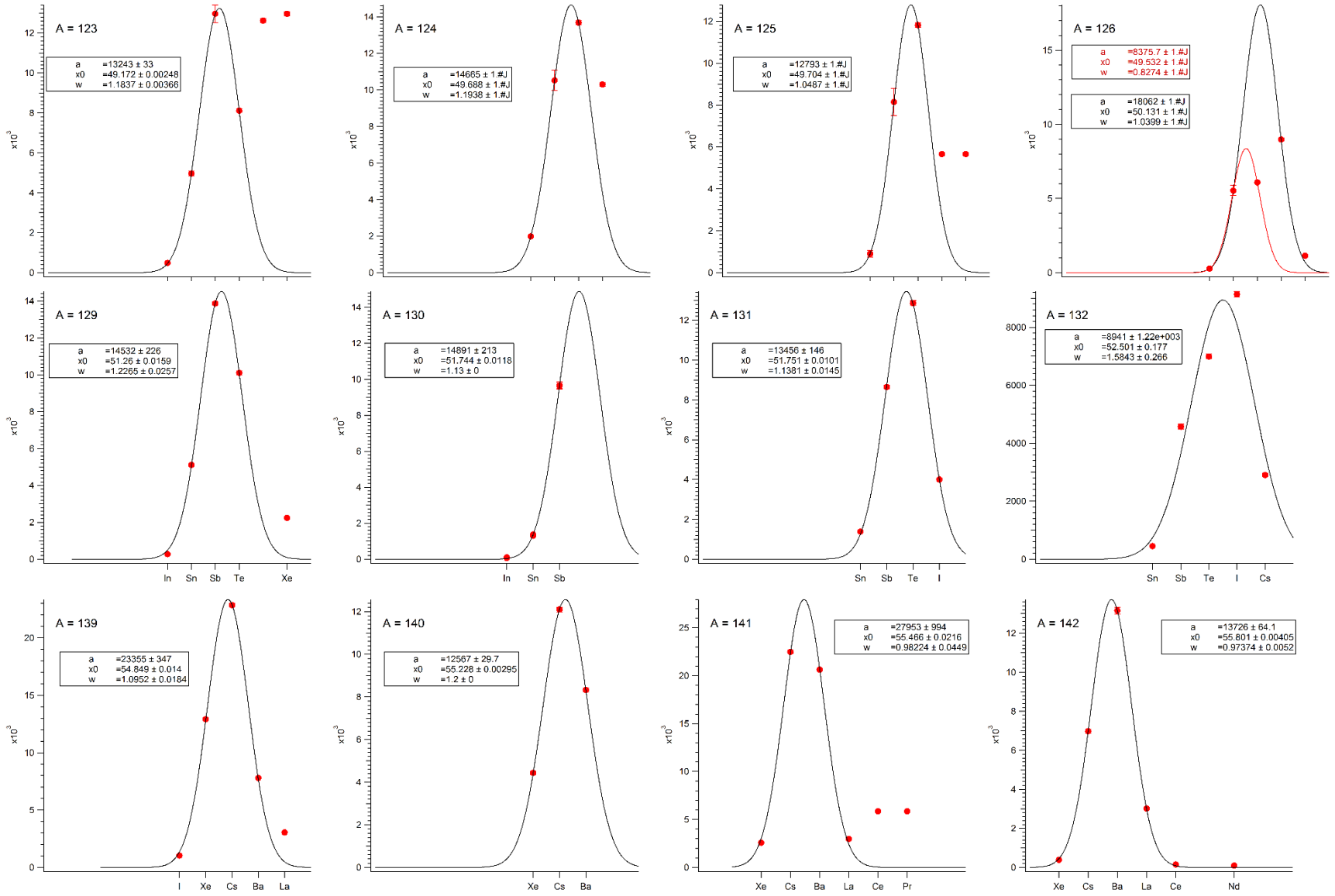


Stable isotope
Impurity in helium
57 % natural abundance

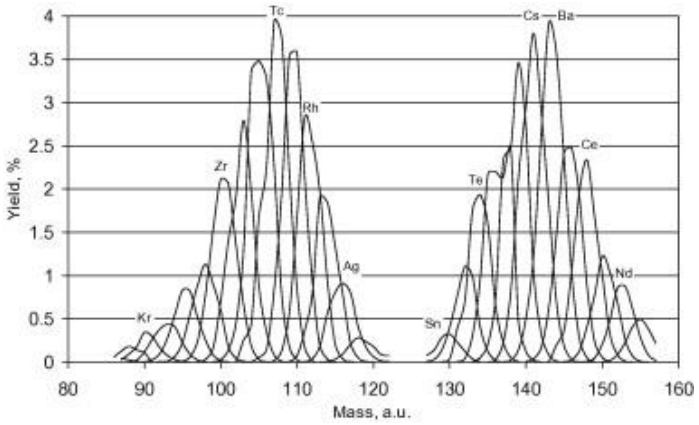


a	=5632.6 ± 0.00863
x0	=33.925 ± 52.2
w	=0.79643 ± 68.7

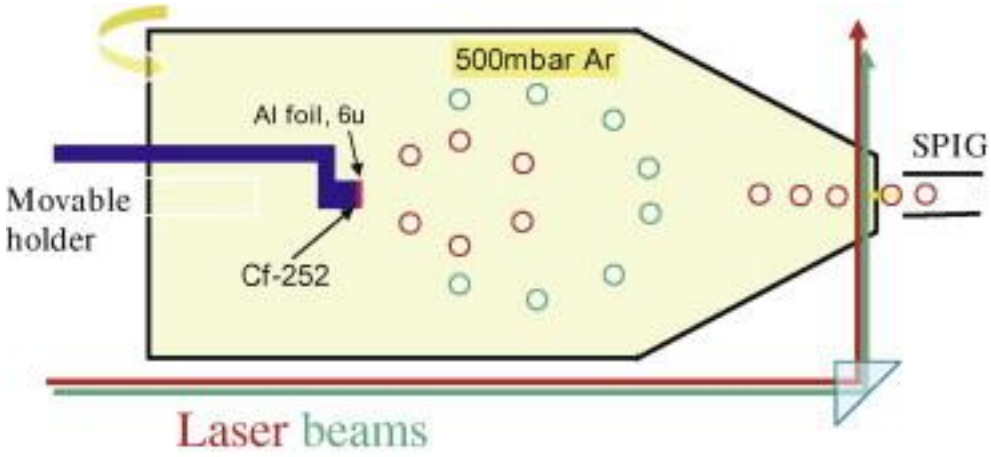
Charge distributions

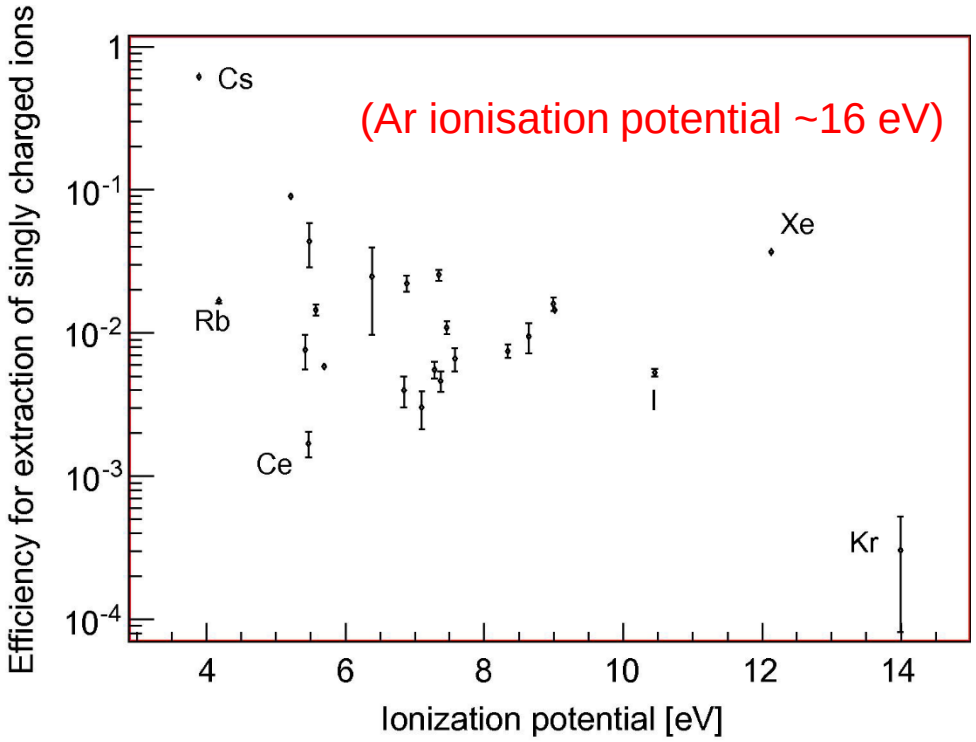


Efficiency from a known yield distribution



Yield distribution from ^{252}Cf source

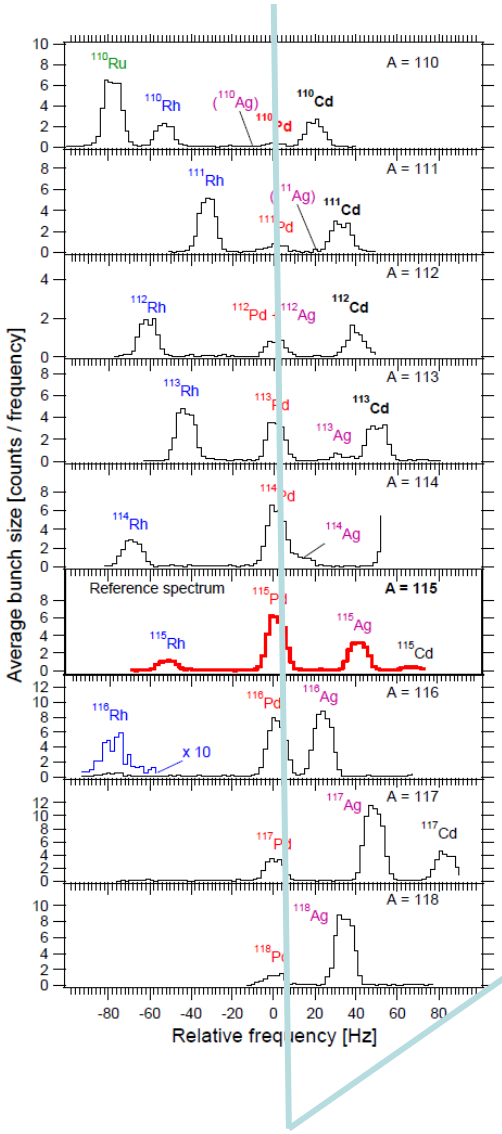


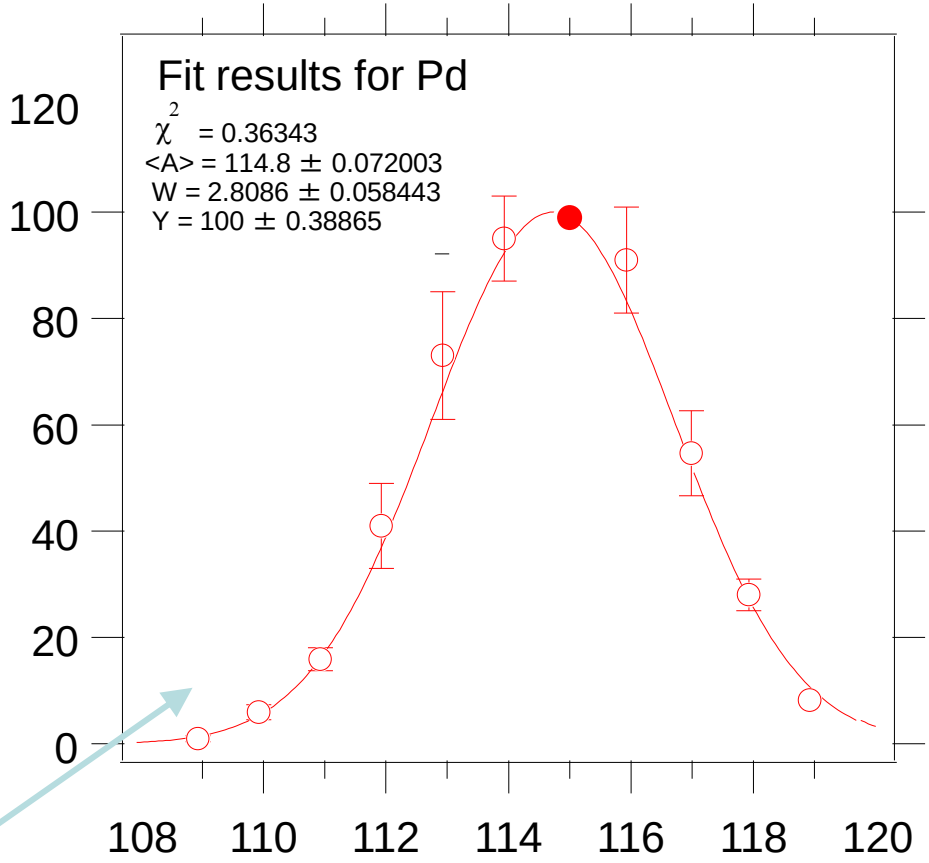


Yu. Kudryavtsev, et al

NIMB 266, 4368–4372 (2008)
http://dx.doi.org/10.1016/j.nimb.2008.05.037

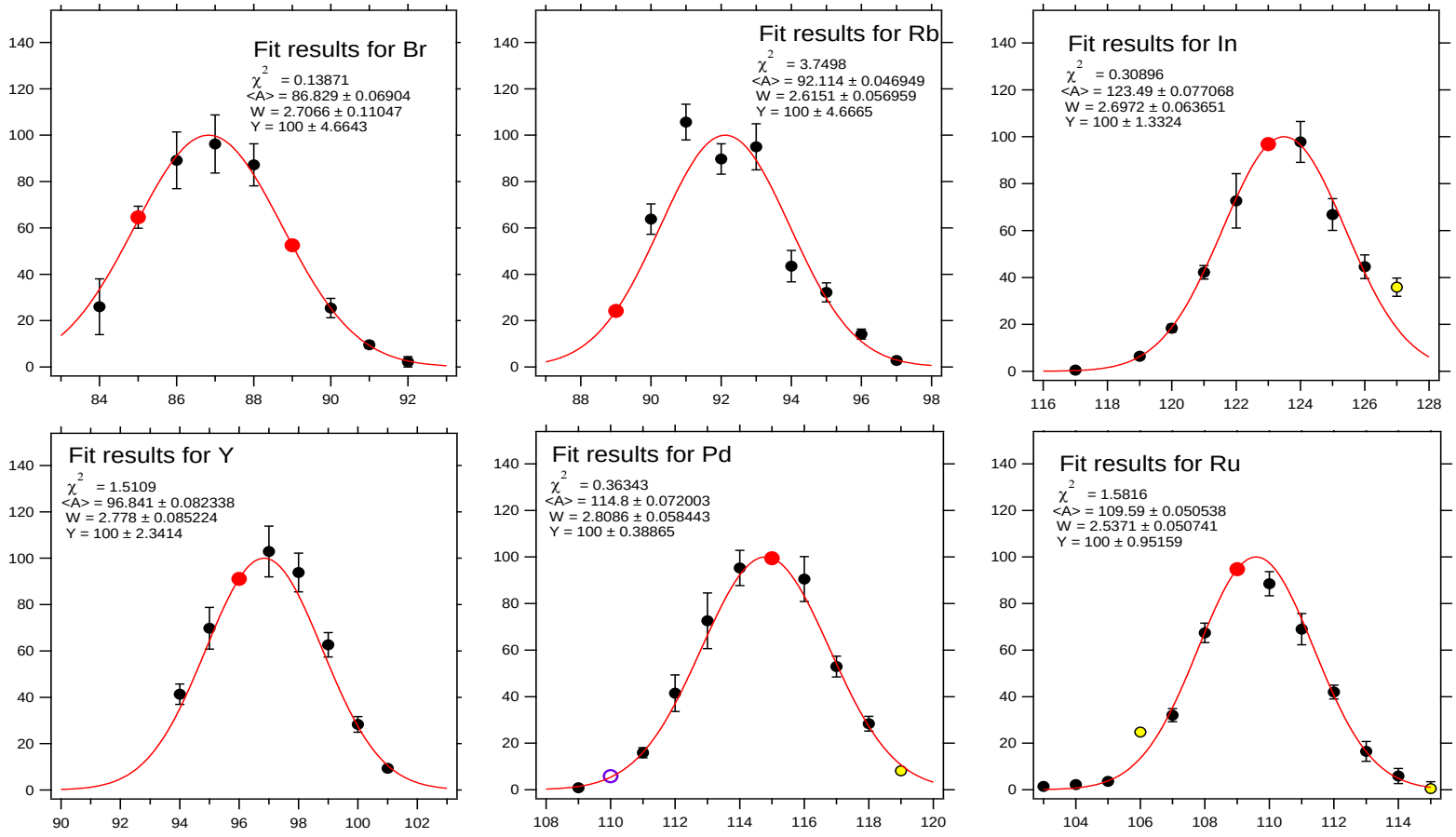
Way around the chemical dependencies



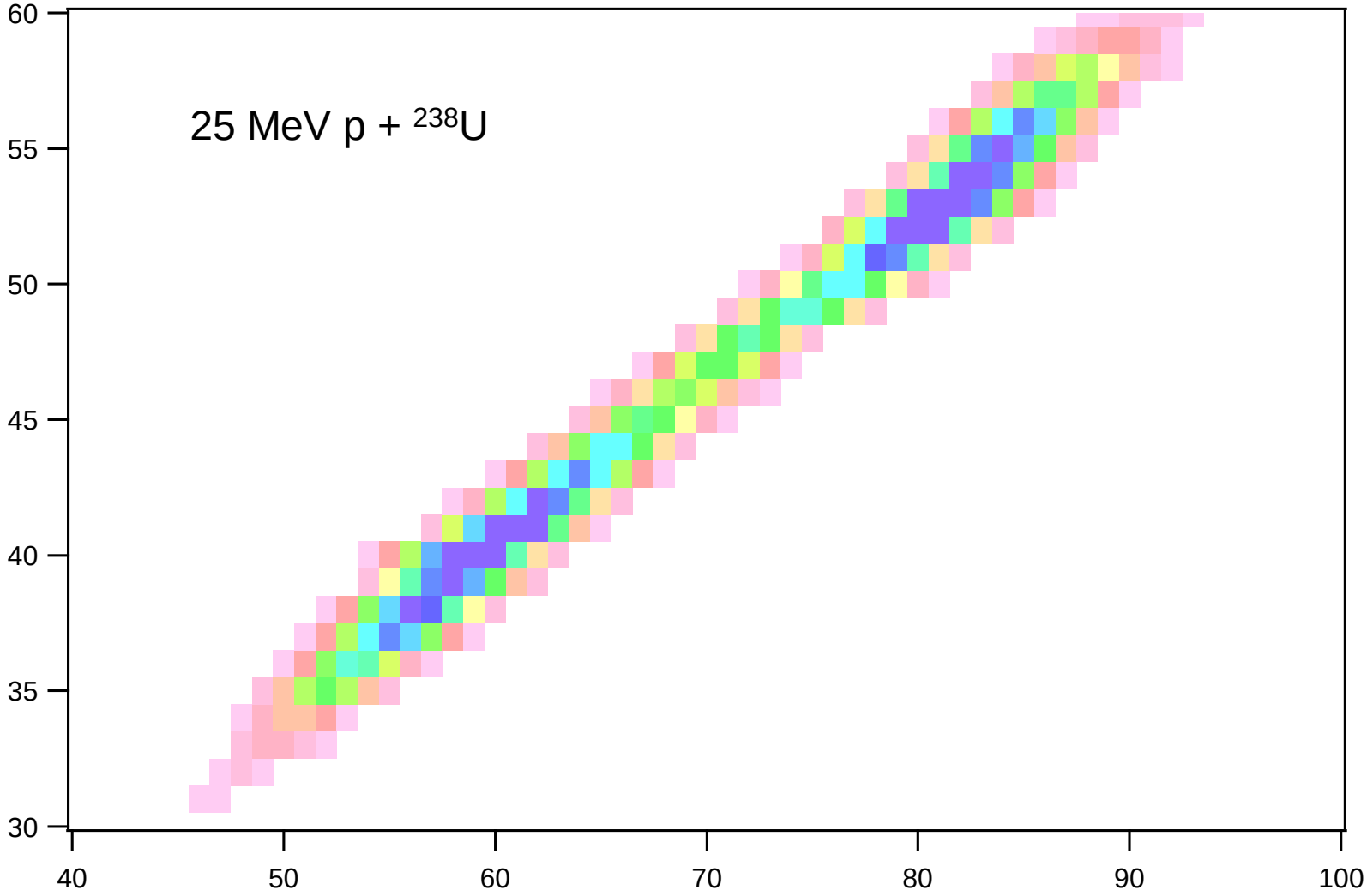


Element-dependent (chemical) effects in transmission same for all isotopes of the same element

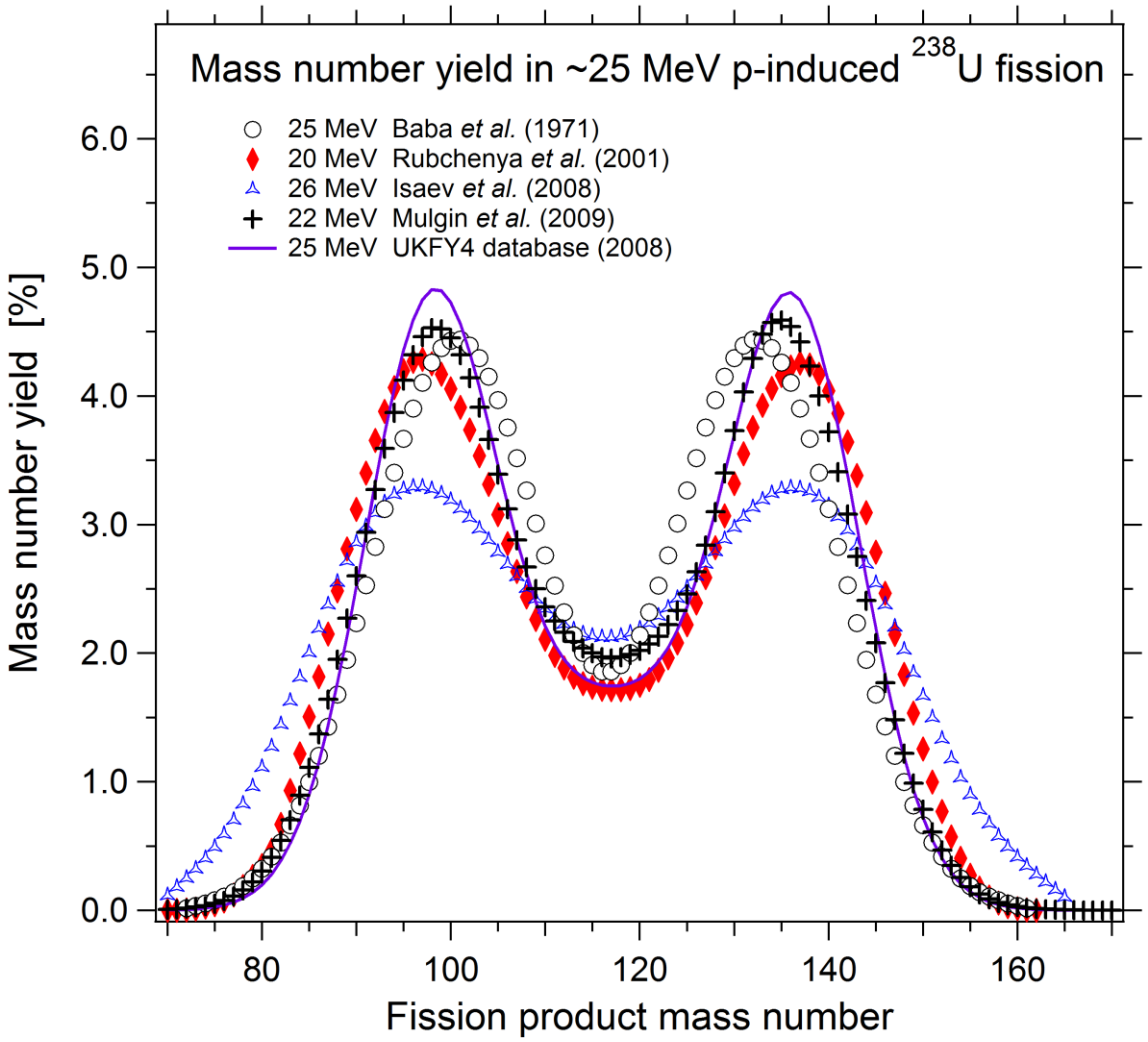
From isotopic yields …



…to absolute yields?



Mass yields



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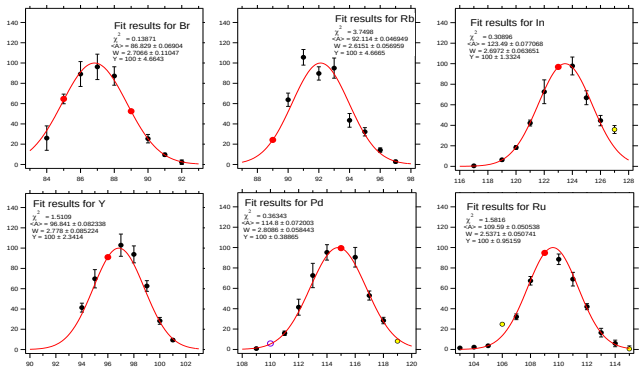
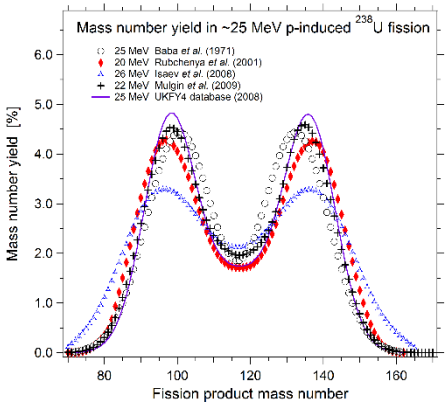
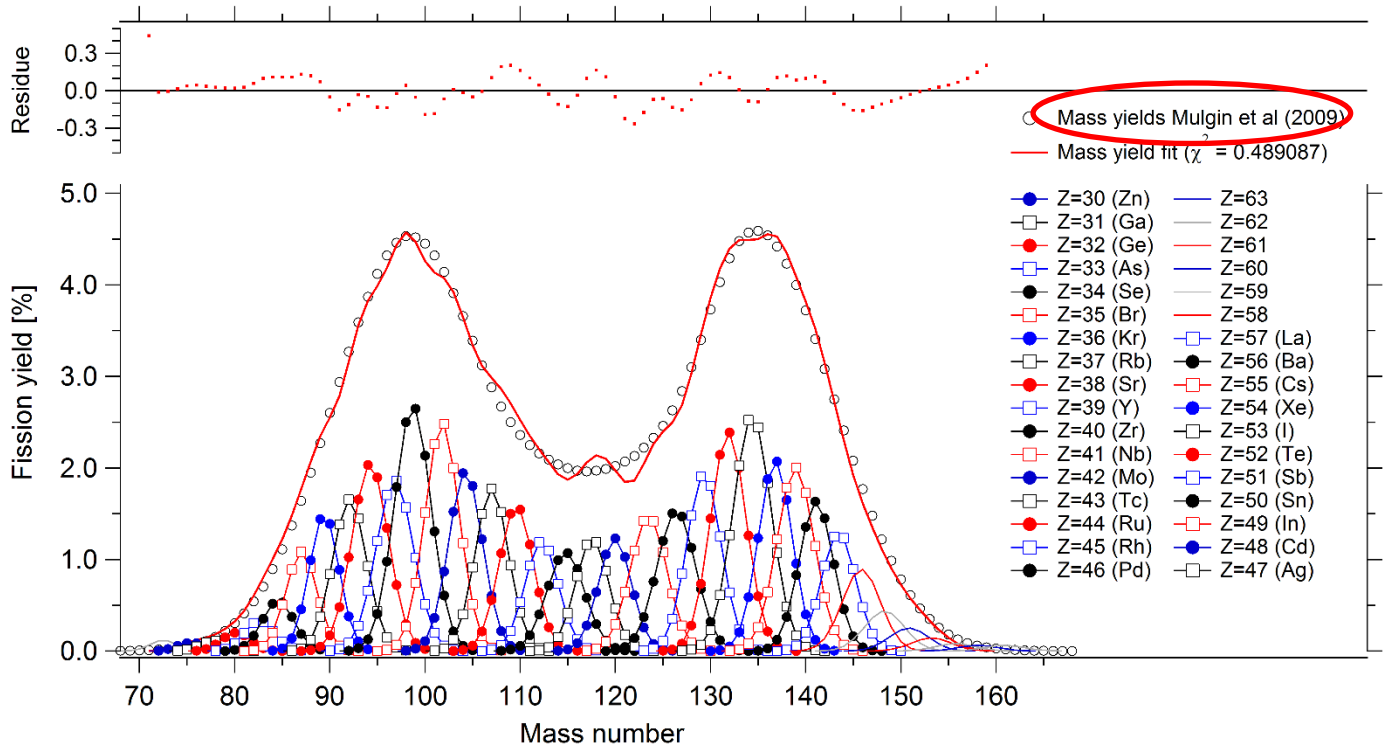
http://dx.doi.org/10.1140/epja/i2016-16104-4

Independent absolute yields







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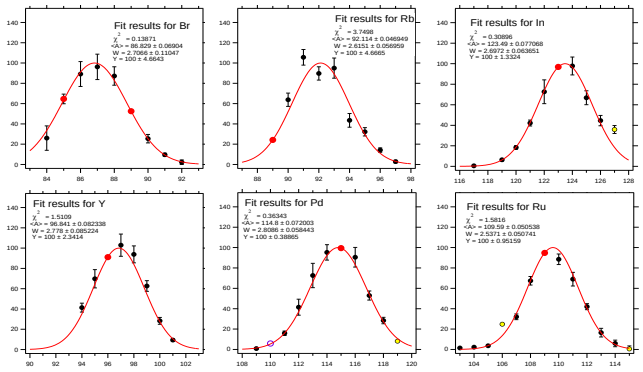
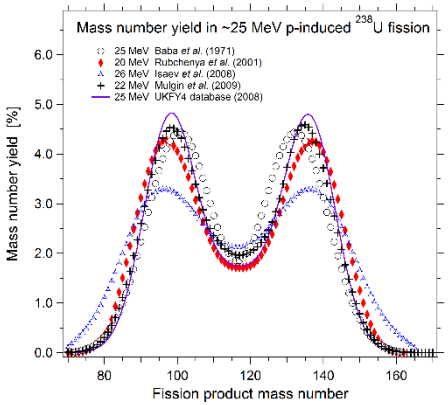
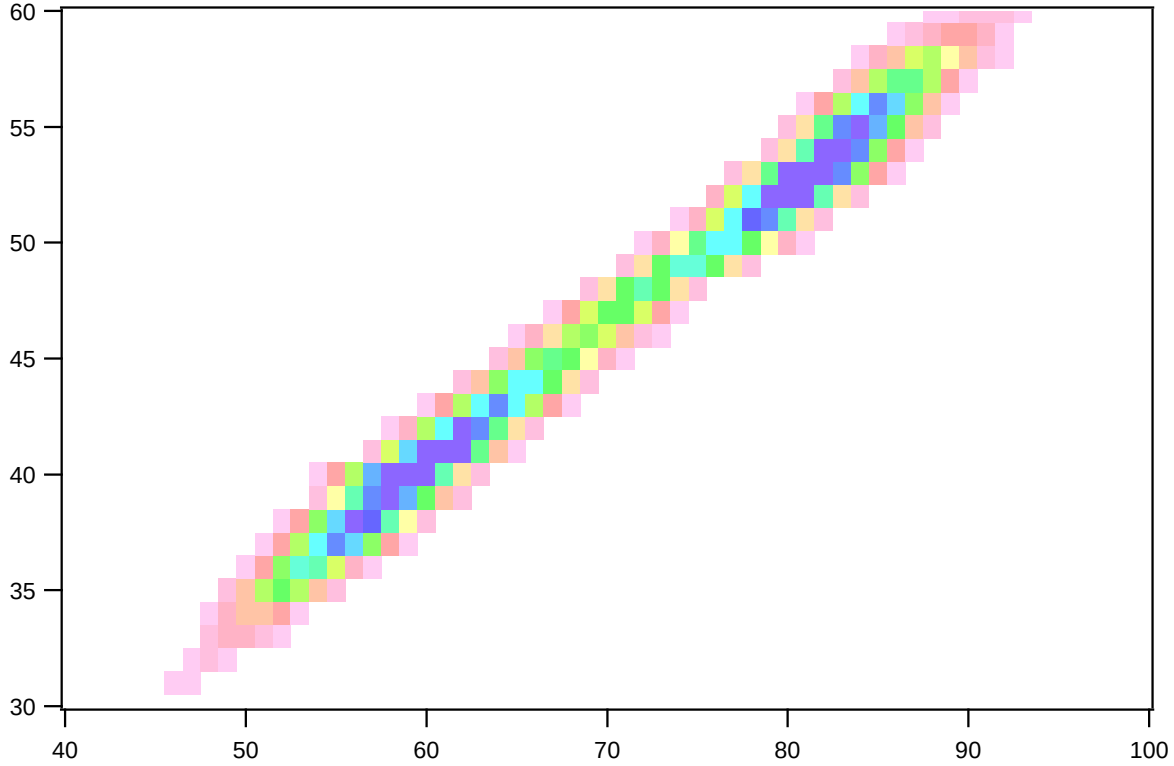
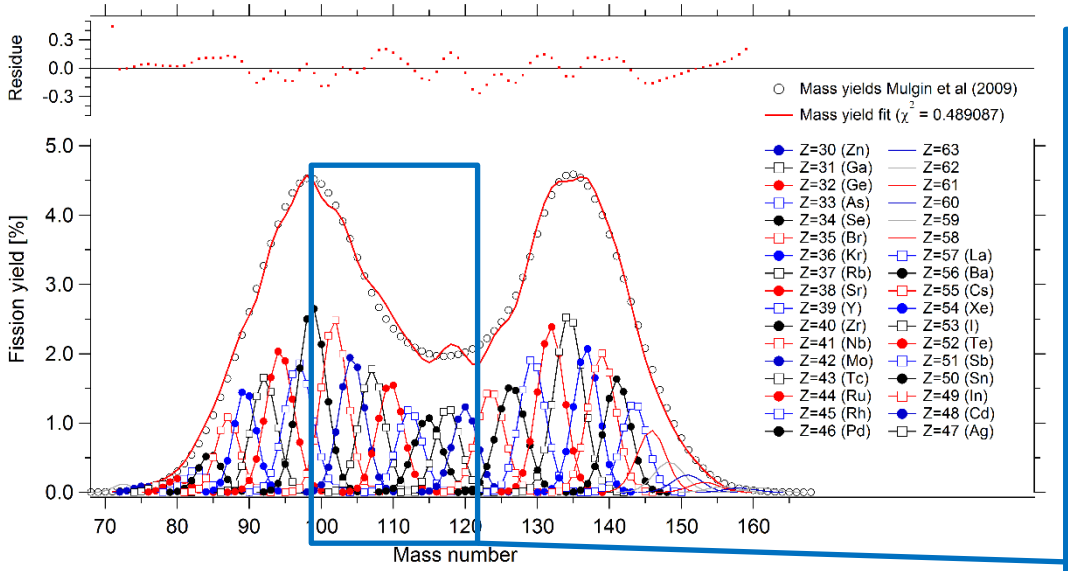
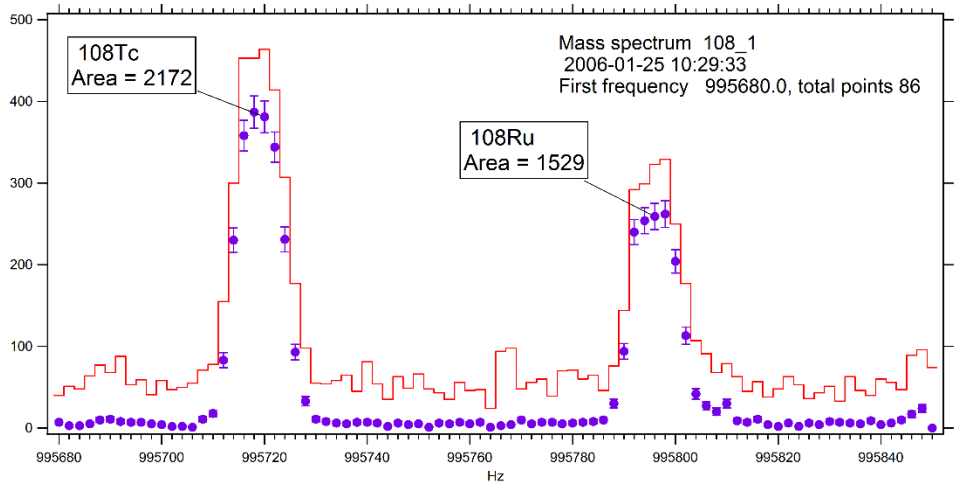


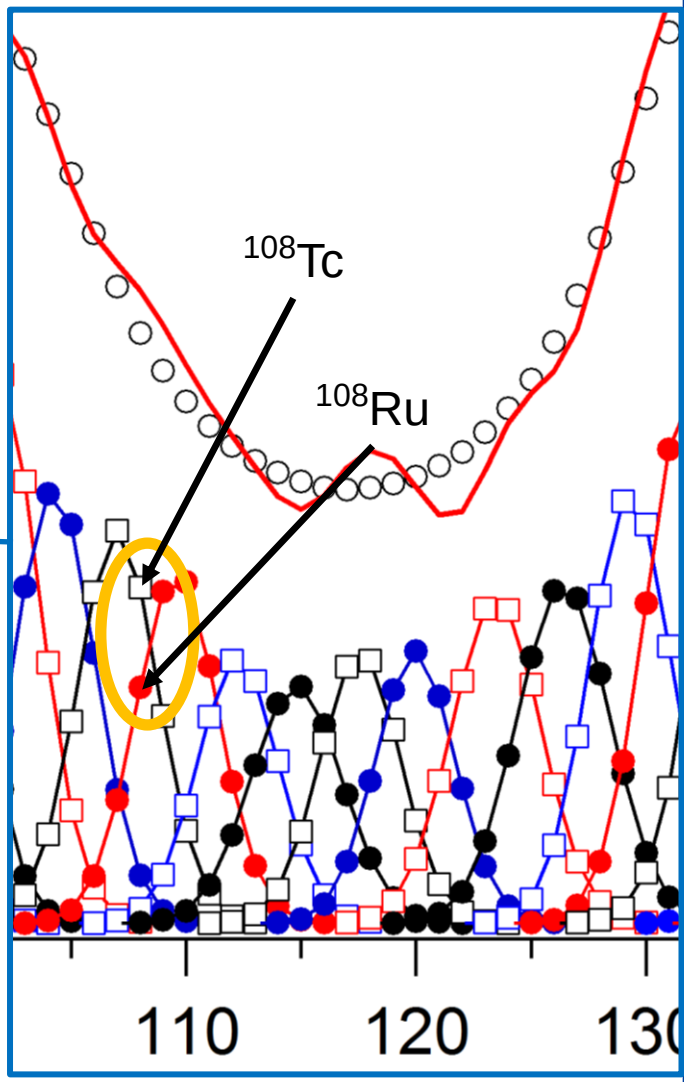




”Absolute” and experimental yield ratios







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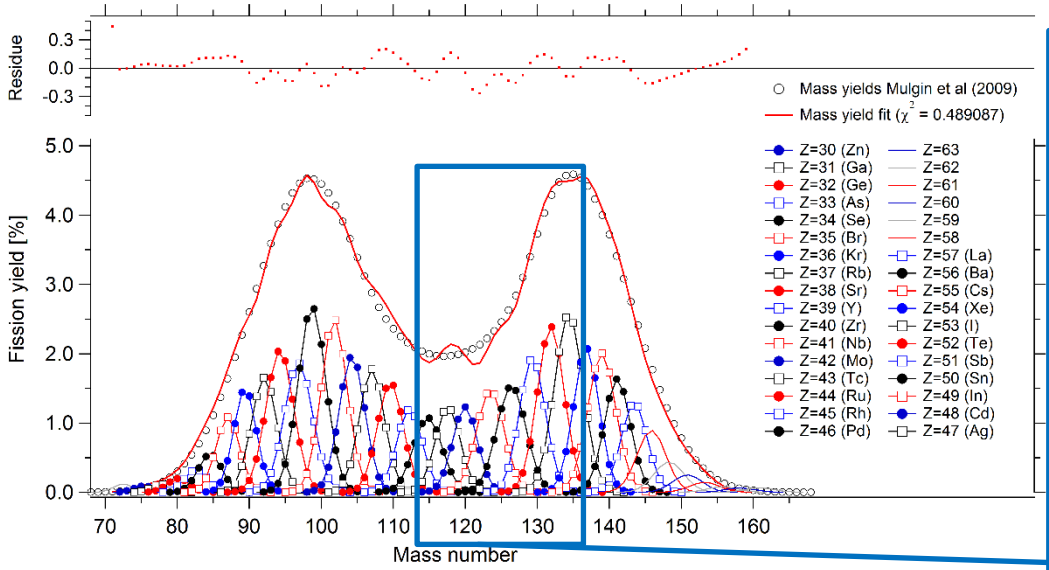
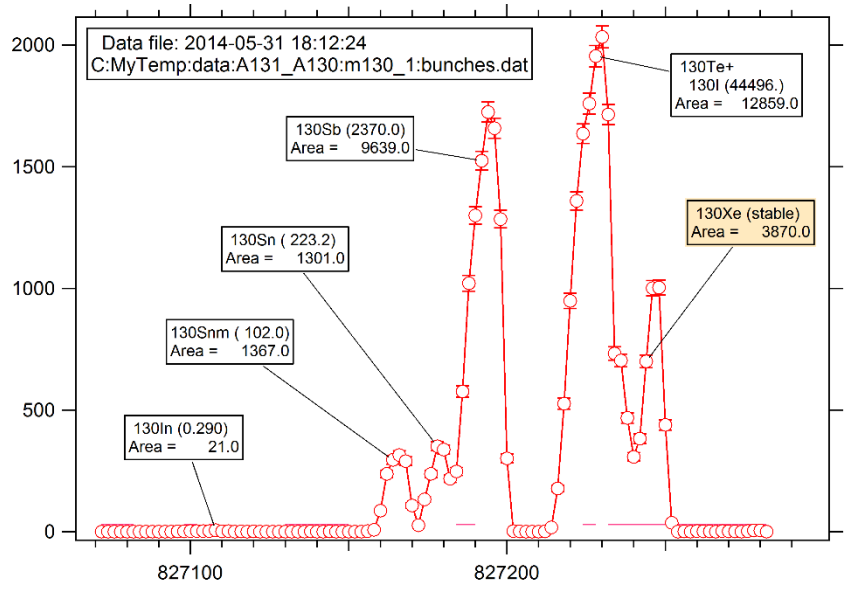
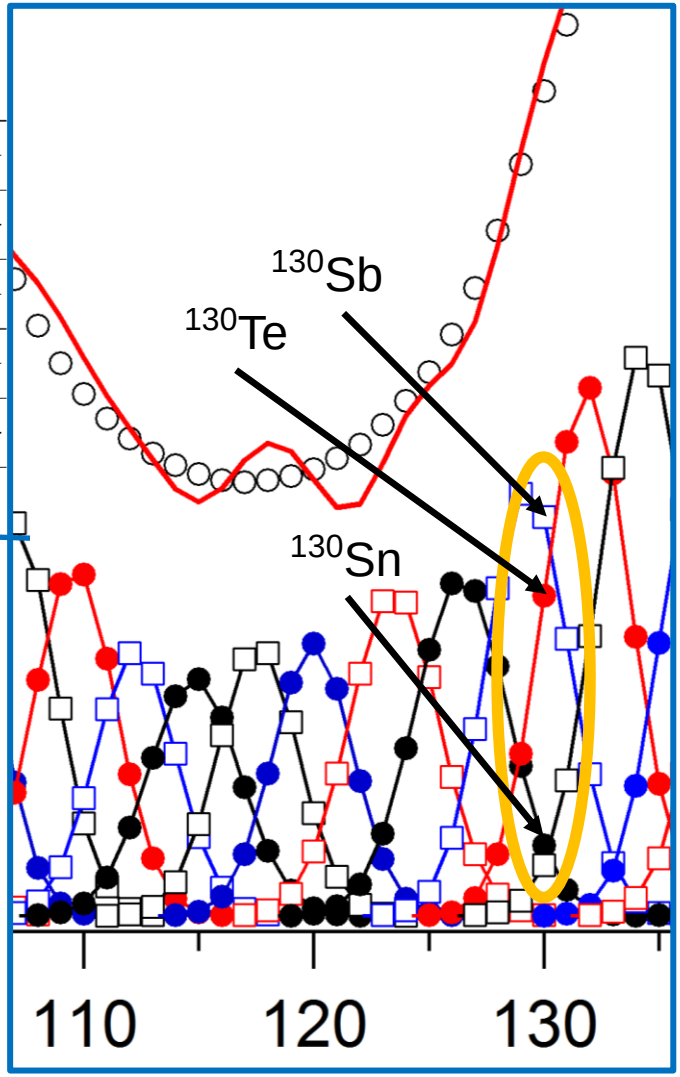
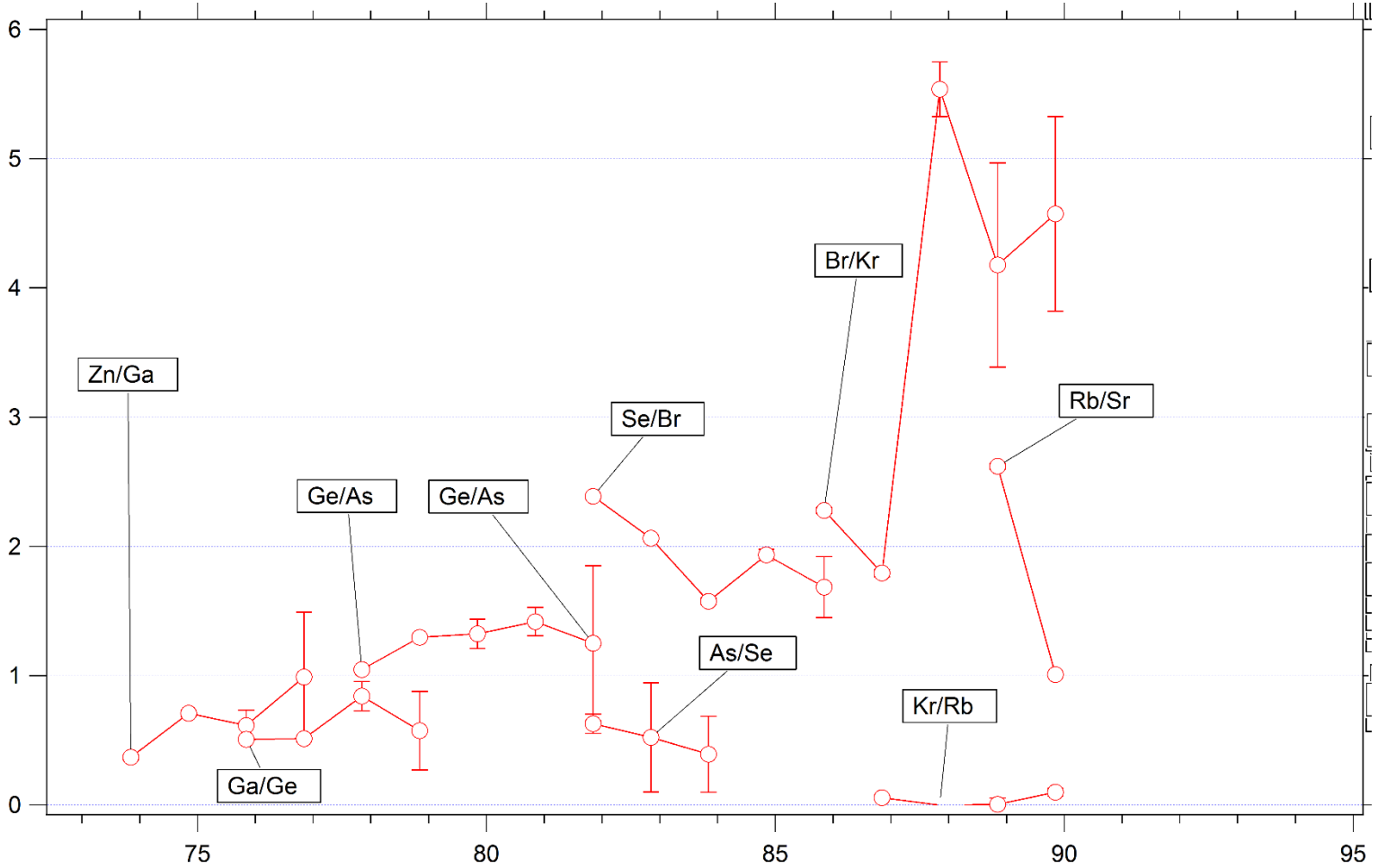






Efficiency ratios between elements



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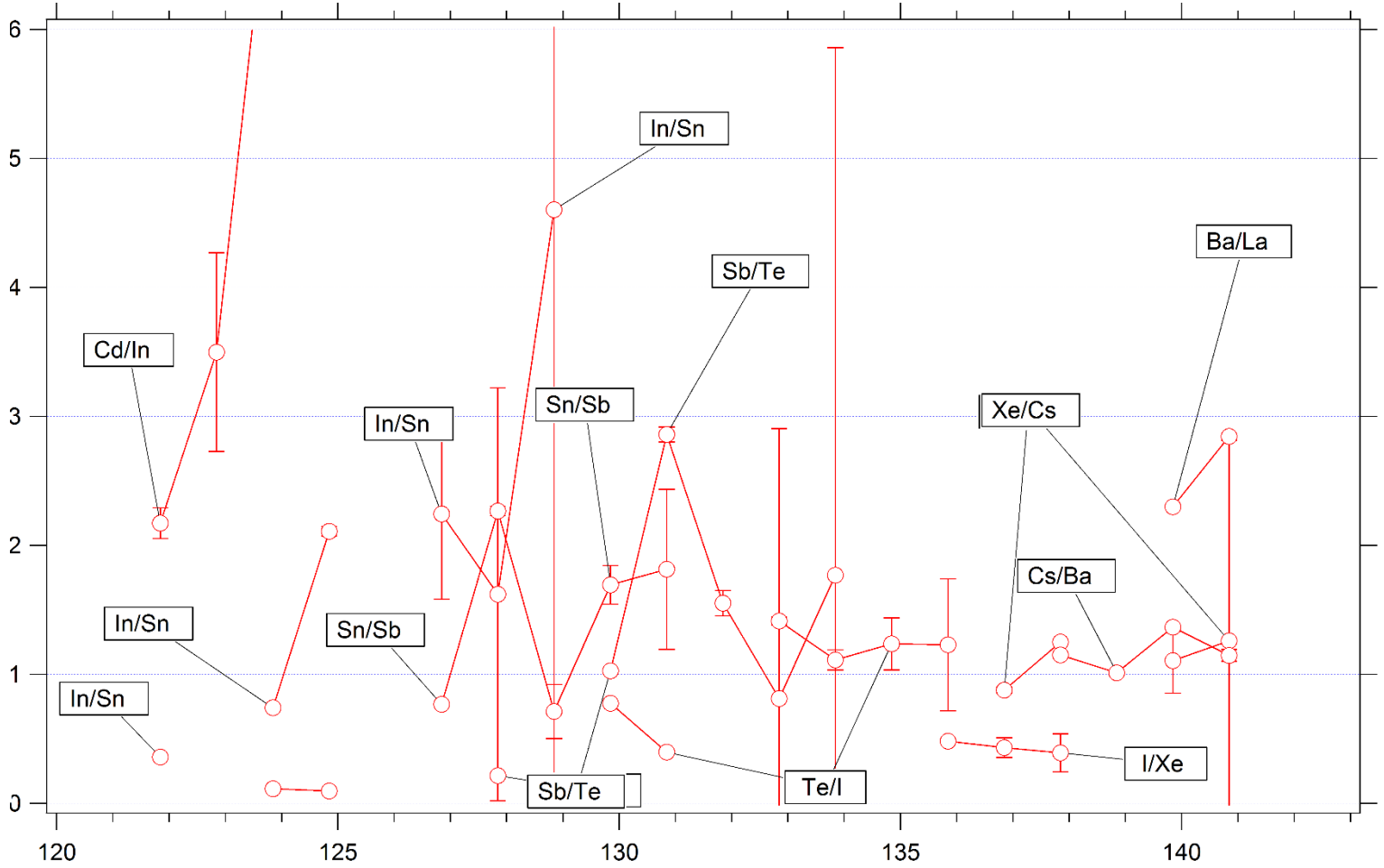
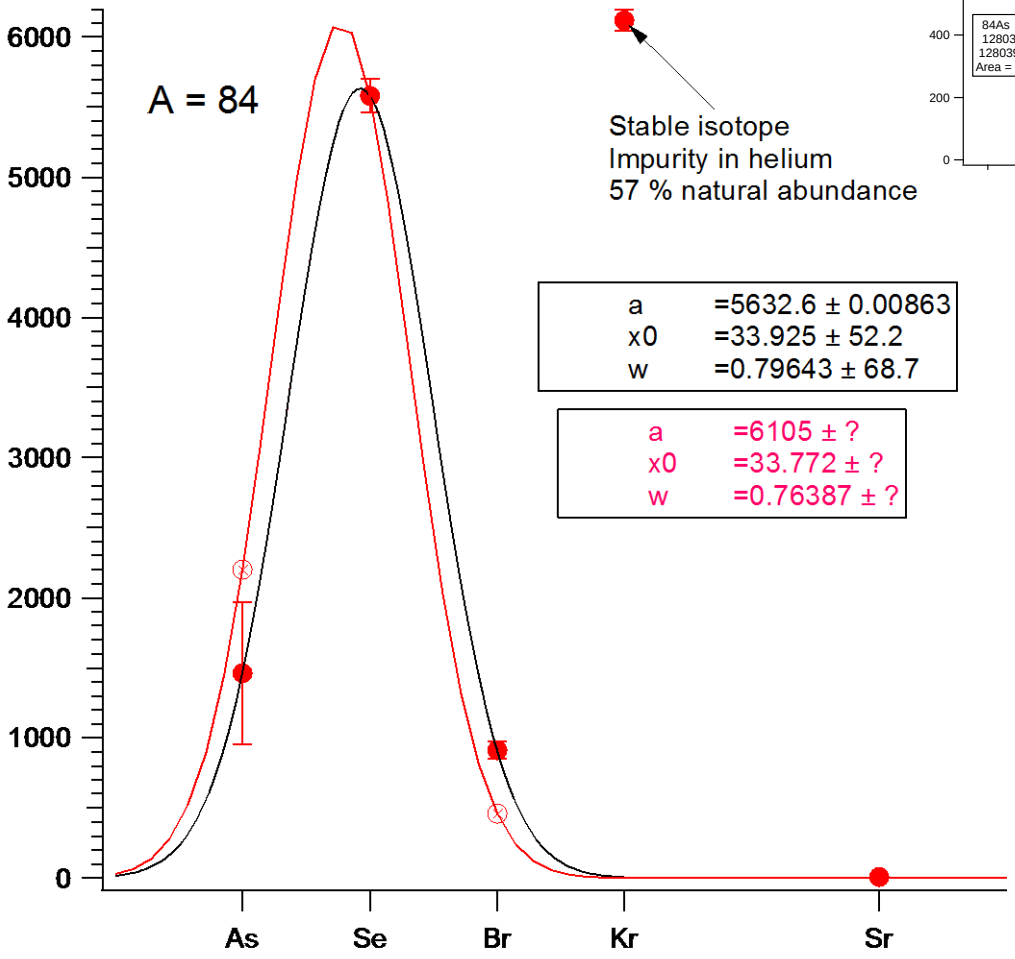


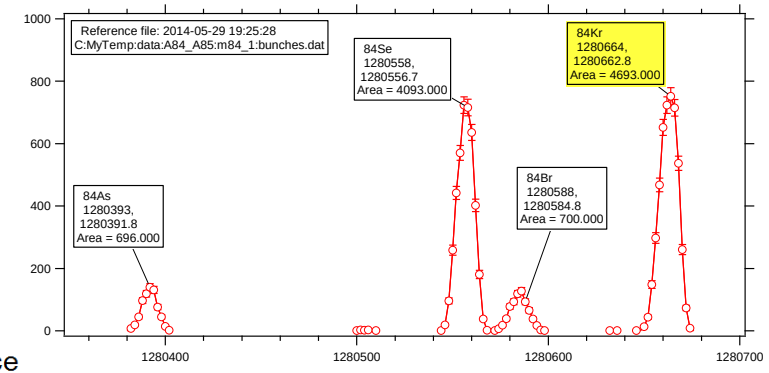
Charge distribution modification



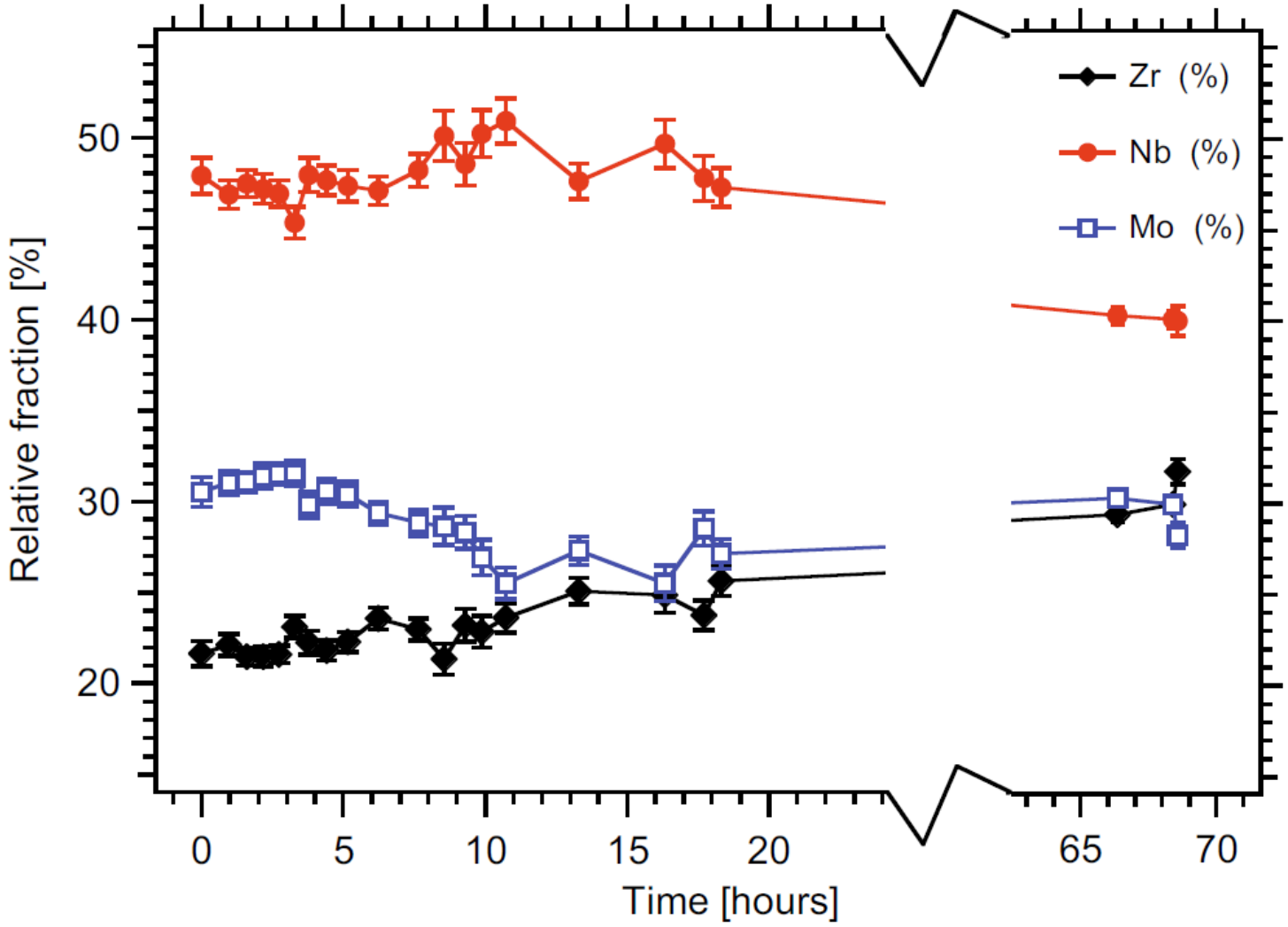
Stable isotope
Impurity in helium
57 % natural abundance

a	=5632.6 ± 0.00863
x0	=33.925 ± 52.2
w	=0.79643 ± 68.7

a	=6105 ± ?
x0	=33.772 ± ?
w	=0.76387 ± ?



Relative efficiency fluctuation



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IGISOL group and relevant collaboration:

JYFL-IGISOL: H. Penttilä, A. Jokinen, I.D.Moore, J. Äystö, V.A. Rubchenya, S. Rinta-Antila, V.S. Kolhinen, T. Eronen, A. Kankainen, A. Voss, D. Gorelov, J. Hakala, V. Simutkin, V. Sonnenschein, I. Pohjalainen, J. Koponen, J. Reinikainen

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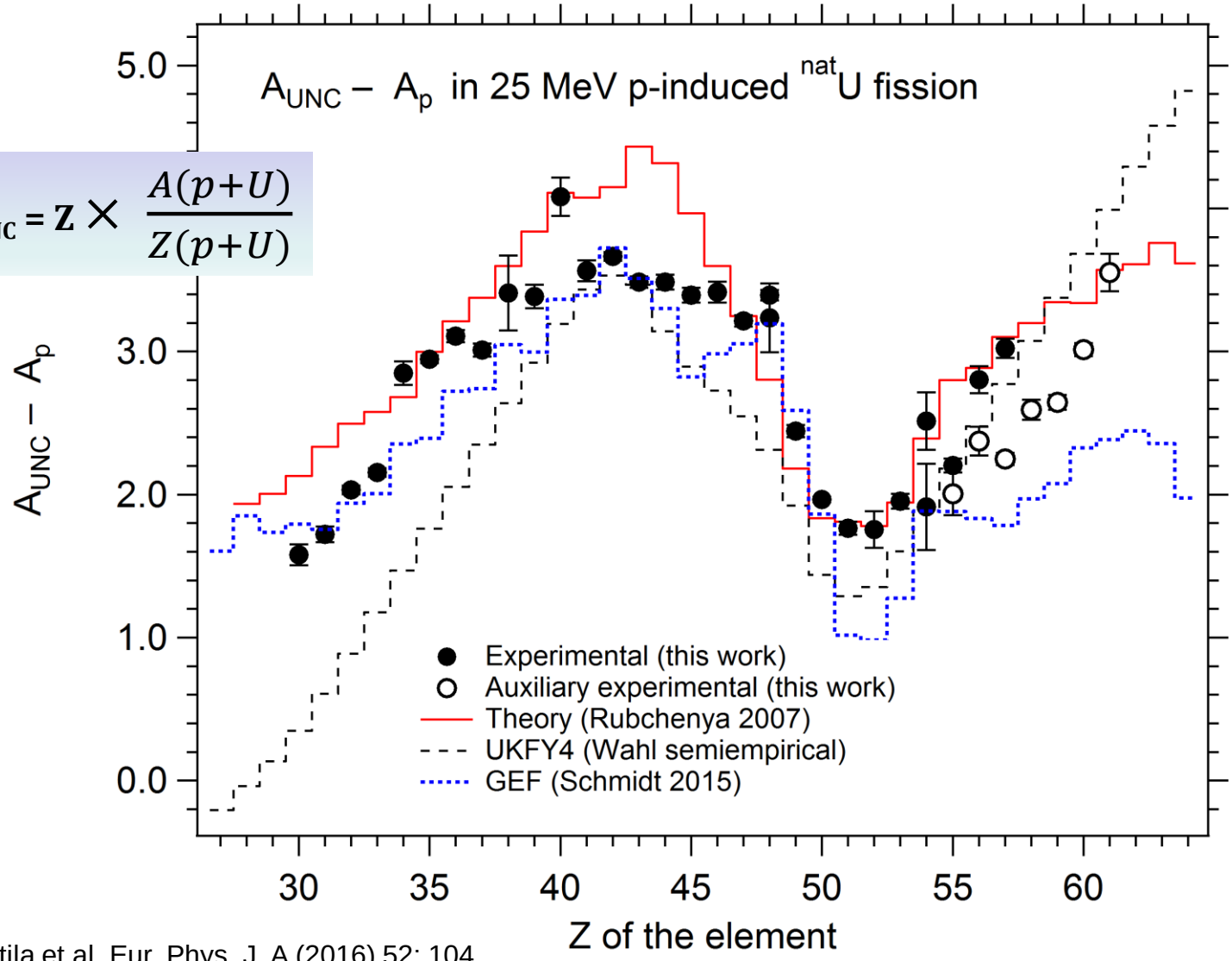
25 MeV p + ^{nat}U fission : centroids

$$A_{UNC} = Z \times \frac{A(p+U)}{Z(p+U)}$$



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Independent absolute yields