

^{53}Mn – a long-lived activation product in a fusion environment

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G. Korschinek^b, J. Lachner^b, M. Poutivtsev^b, G. Rugel^b, K. Seidel^c, and H. Vonach^a

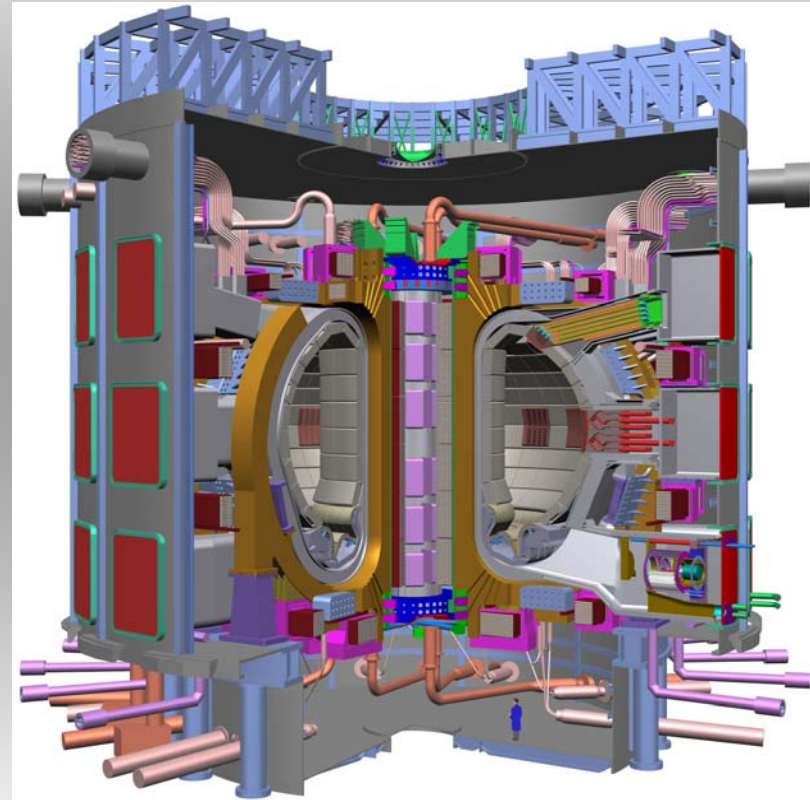
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^cInst. f. Kern- und Teilchenphysik, TU Dresden und Forschungszentrum Dresden-Rossendorf

Motivation

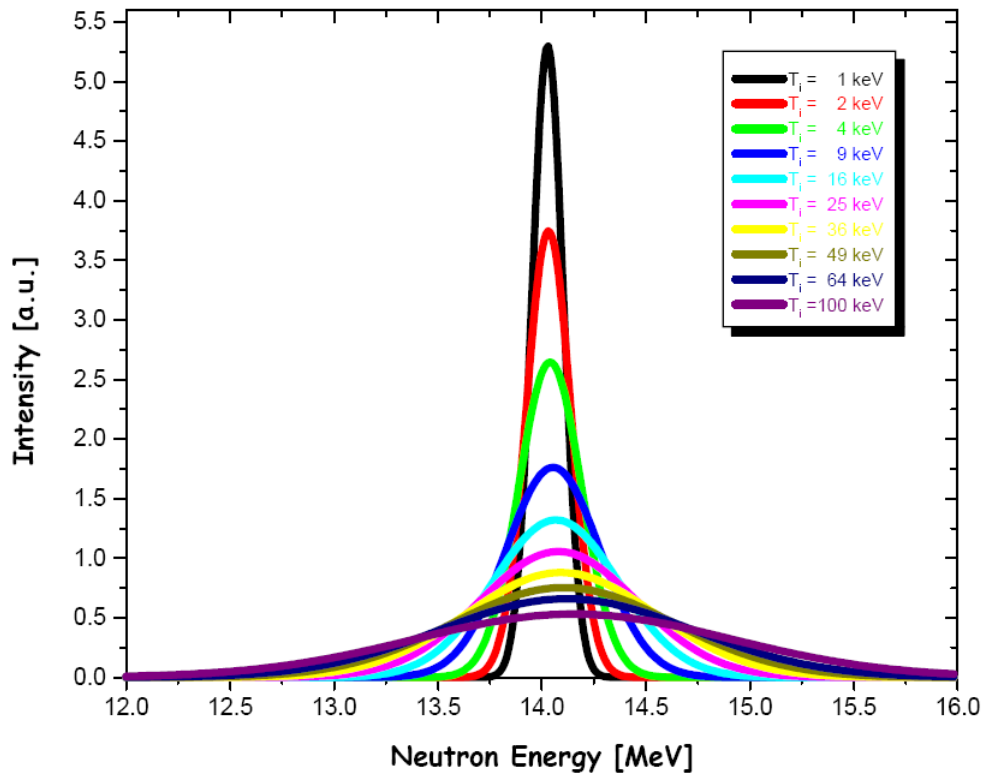
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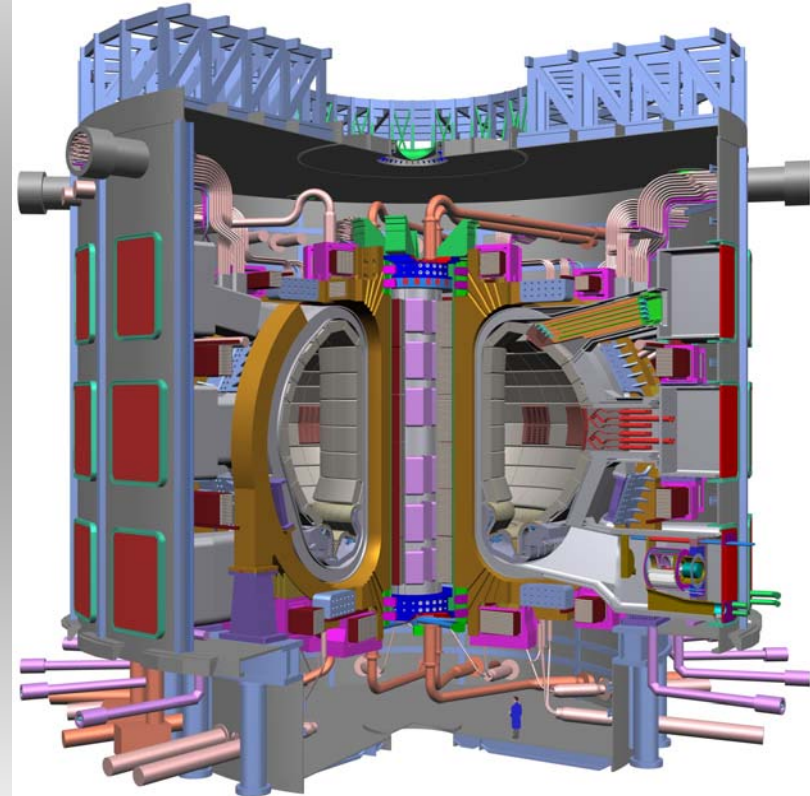
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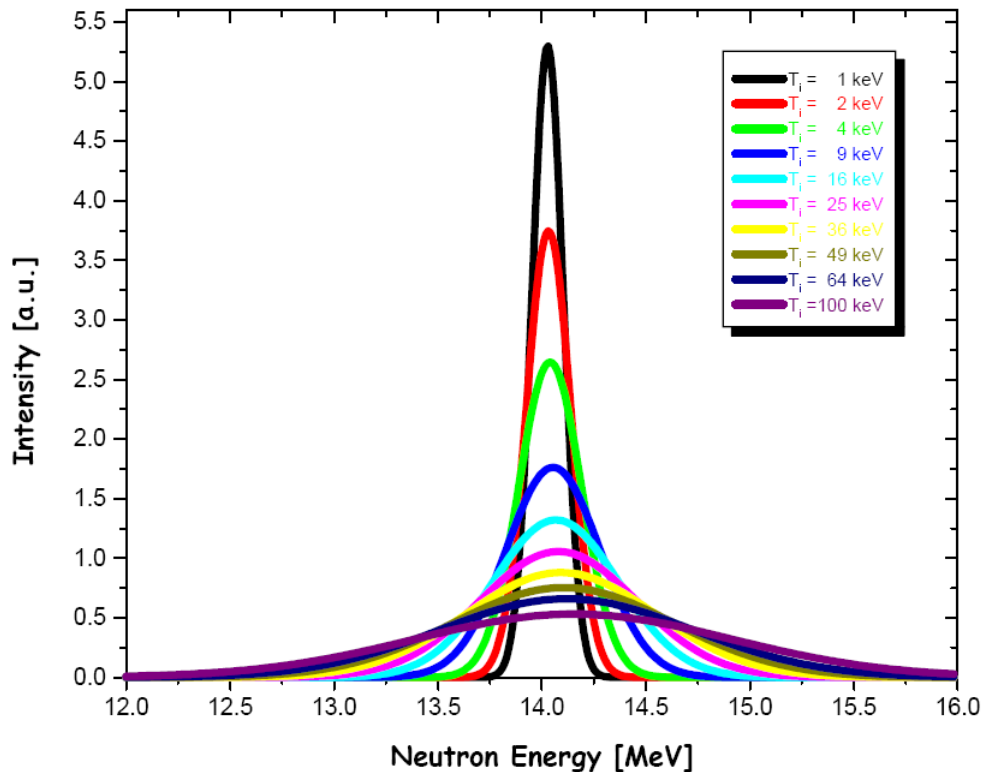
A. Wallner, 2000



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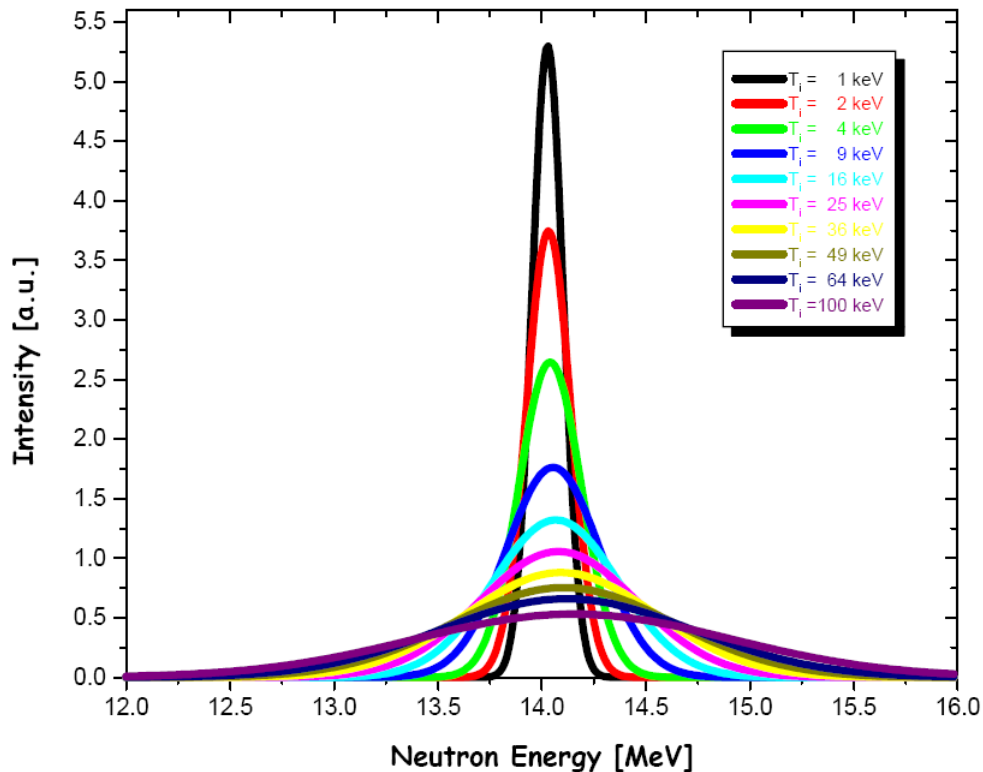


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Isotope	Half-life (y)	Reaction
^{14}C	5730	$^{14}\text{N}(n,p)$
^{26}Al	$7.2 \cdot 10^5$	$^{27}\text{Al}(n,2n)$
^{53}Mn	$3.7 \cdot 10^6$	$^{54}\text{Fe}(n,2n)$
		$^{54}\text{Fe}(n,np+d)$
^{55}Fe	2.73	$^{56}\text{Fe}(n,2n)$
^{63}Ni	100	$^{63}\text{Cu}(n,p)$
		$^{64}\text{Ni}(n,2n)$
^{59}Ni	$7.6 \cdot 10^4$	$^{60}\text{Ni}(n,2n)$
^{93}Zr	$1.5 \cdot 10^6$	$^{94}\text{Zr}(n,2n)$
		$^{93}\text{Nb}(n,p)$
^{91}Nb	680	$^{92}\text{Nb}(n,2n)$
^{92}Nb	$3.2 \cdot 10^7$	$^{93}\text{Nb}(n,2n)$
^{93m}Nb	16.1	$^{94}\text{Mo}(n,x)$
^{94}Nb	$2.0 \cdot 10^4$	$^{94}\text{Mo}(n,p)$
^{93}Mo	3500	$^{94}\text{Mo}(n,2n)$

Motivation

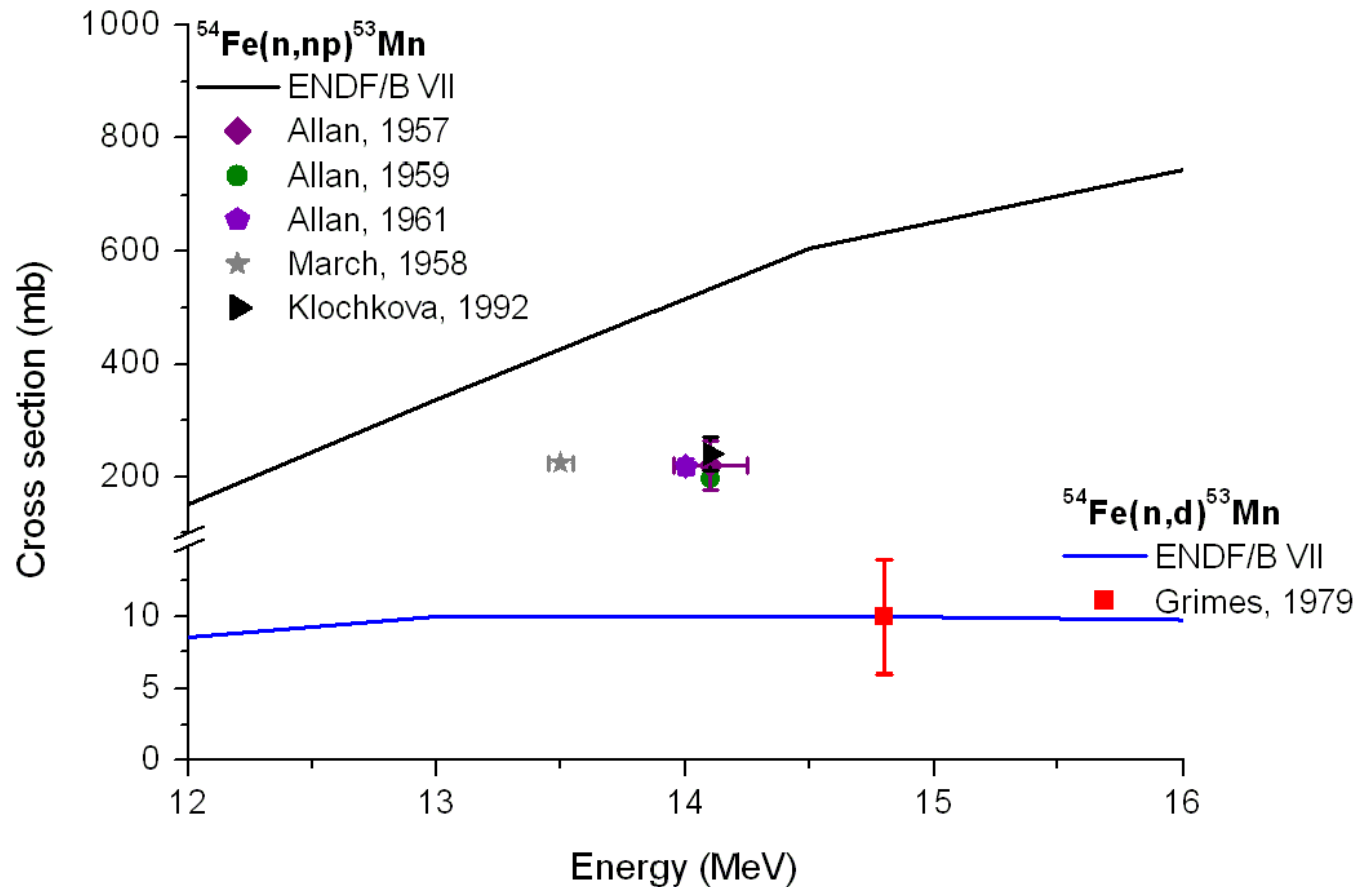
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Available data for $^{54}\text{Fe}(n,np+d)^{53}\text{Mn}$ cross-sections



<http://www-nds.iaea.org/>

Cross-section determination



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AMS

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AMS

mass measurement

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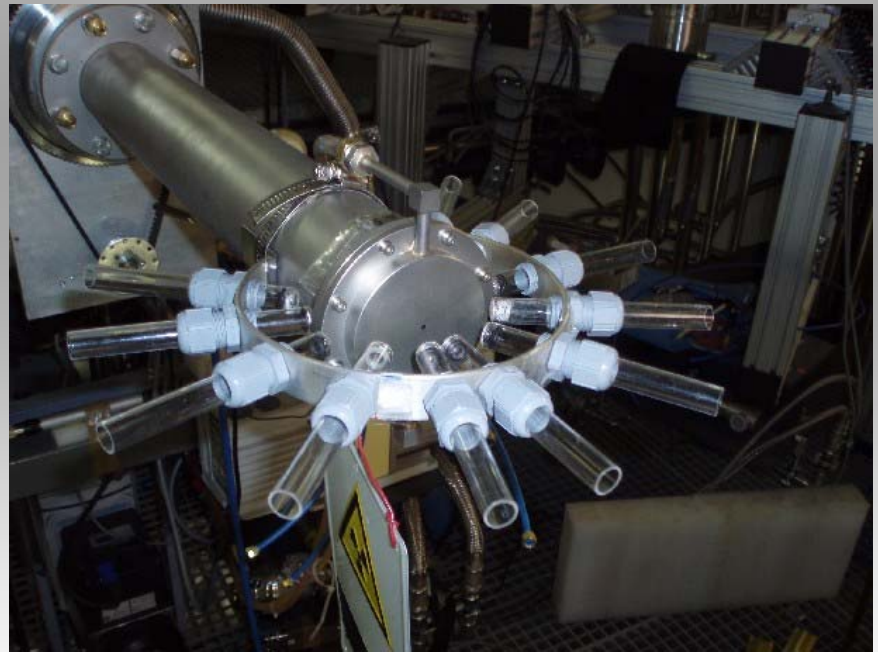
AMS ← mass measurement ← monitor reactions

Neutron Irradiations



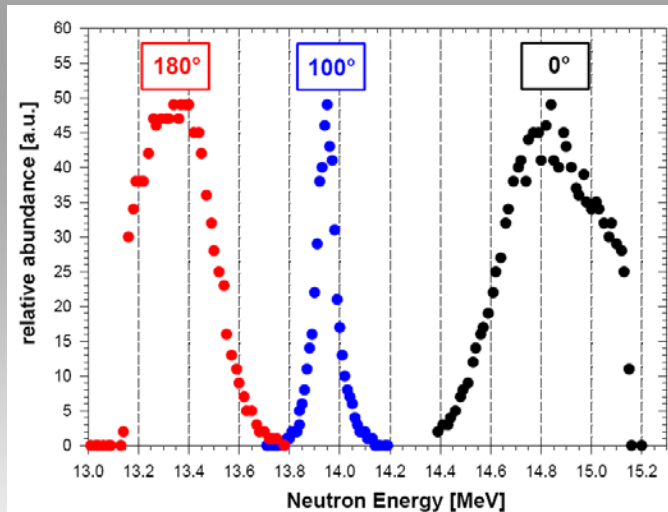
Neutron Irradiations

- Neutron generator at Forschungszentrum Dresden: $t(d,n)^4\text{He}$
- 11 positions with ^{13}C , ^{14}N , ^{54}Fe , $^{\text{nat}}\text{Fe}$ samples
- 4 positions for $^{54}\text{Fe}(n,np+d) ^{53}\text{Mn}$

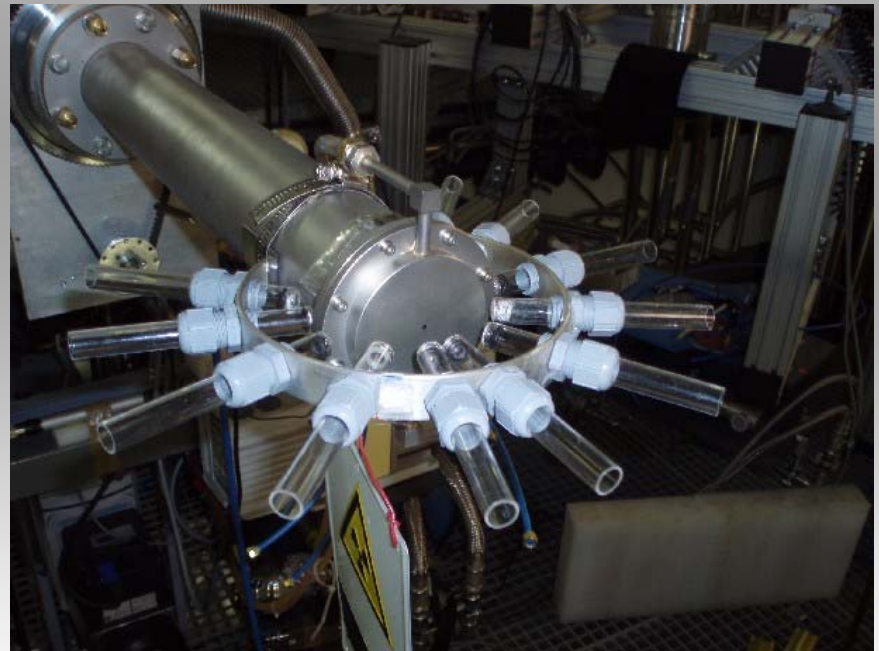


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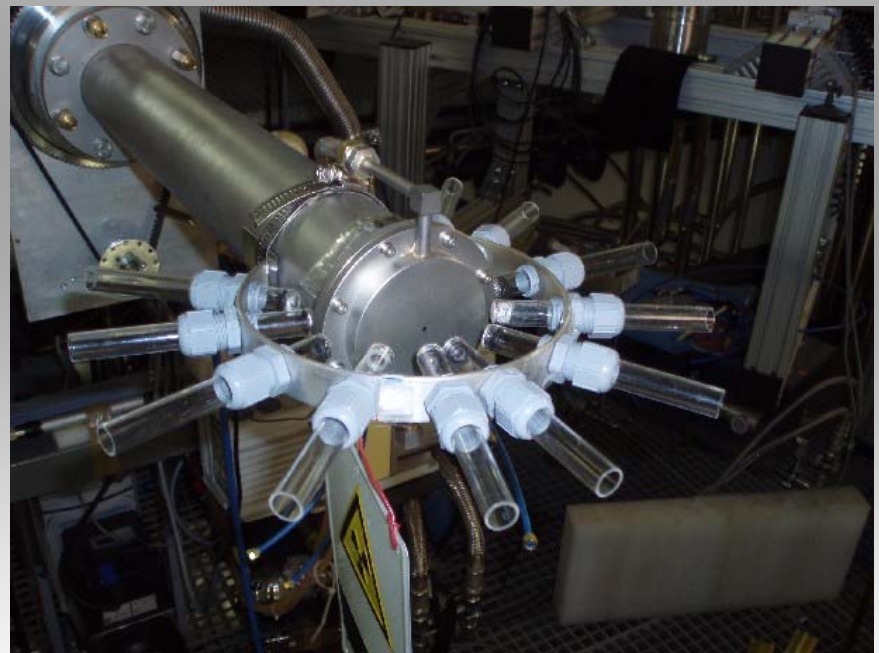
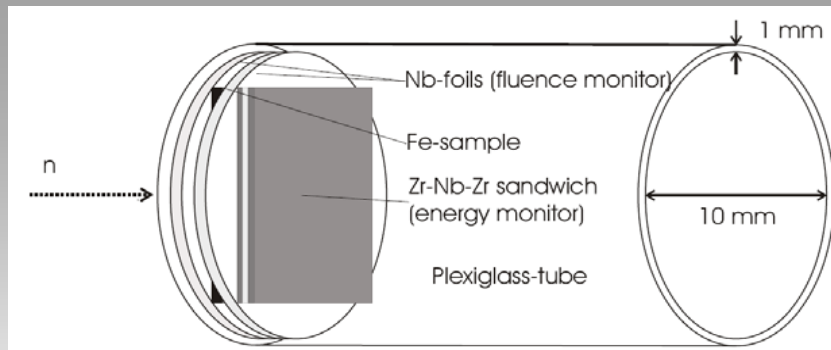
A. Wallner, 2000



Claudia Lederer

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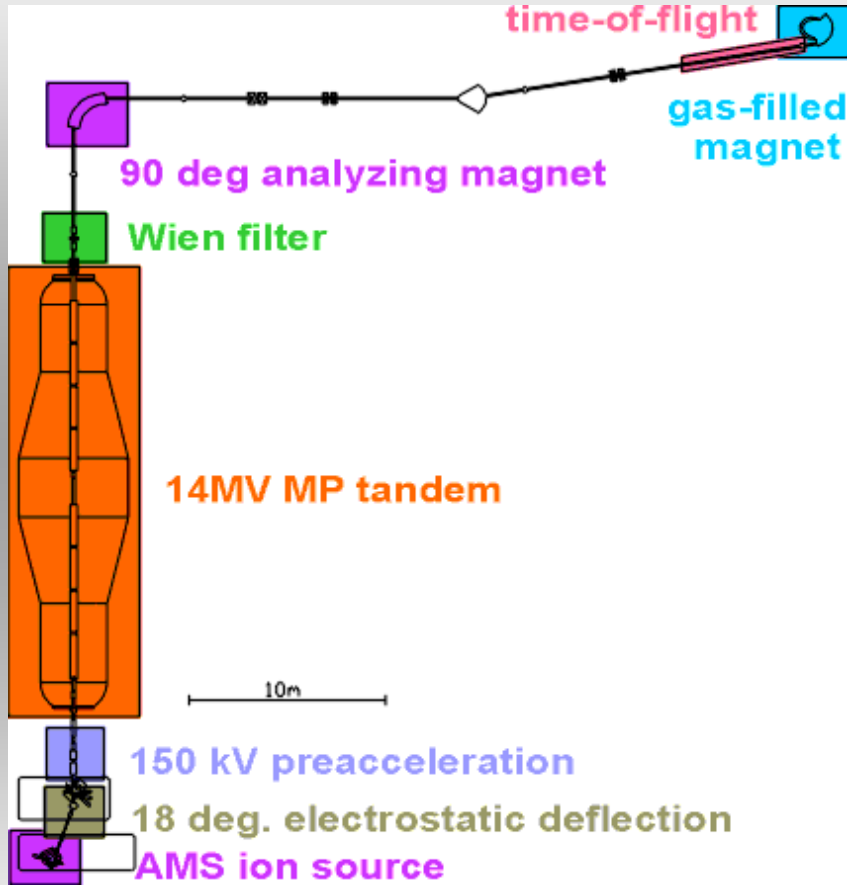
$^{53}\text{Mn}/^{55}\text{Mn}$ measurements with AMS

(AMS....Accelerator Mass Spectrometry)



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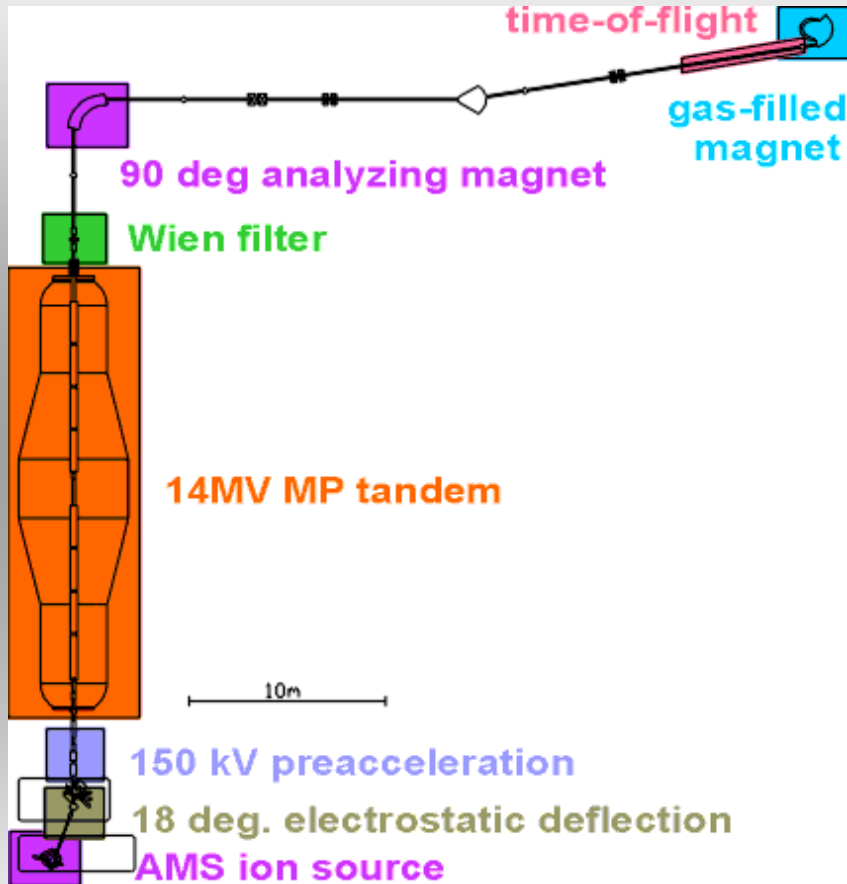
(AMS....Accelerator Mass Spectrometry)



Munich 14 MV tandem accelerator

$^{53}\text{Mn}/^{55}\text{Mn}$ measurements with AMS

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^{53}Mn - stable isobar ^{53}Cr

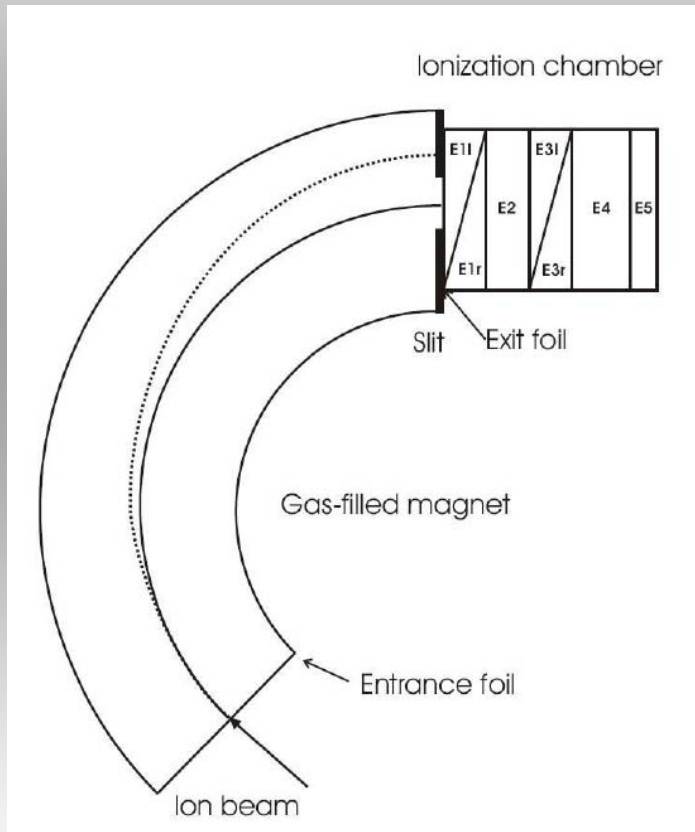
Munich 14 MV tandem accelerator

Isobar suppression: GAMS

- GAMS.... Gas-filled Analyzing Magnet System

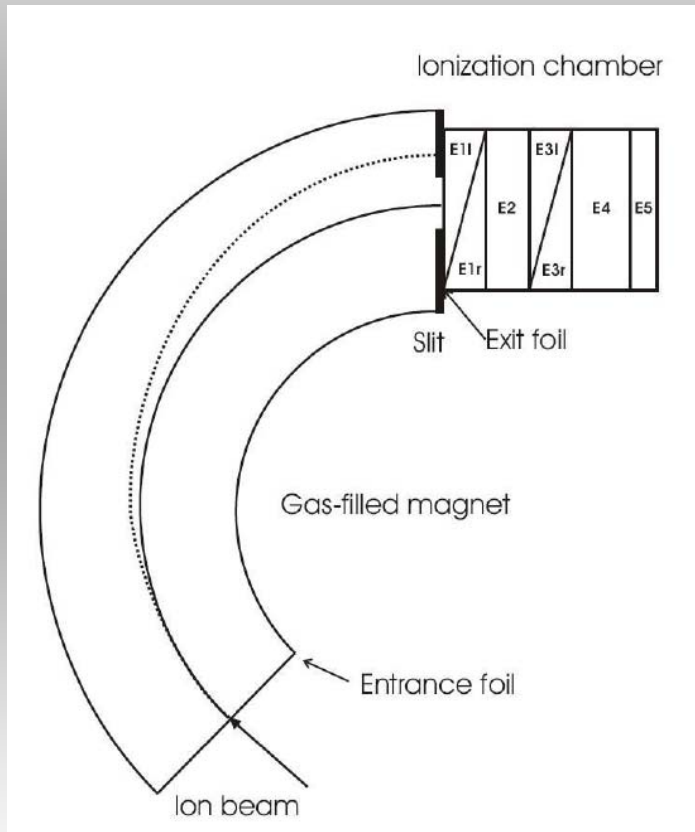
Isobar suppression: GAMS

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- Principle:



Isobar suppression: GAMS

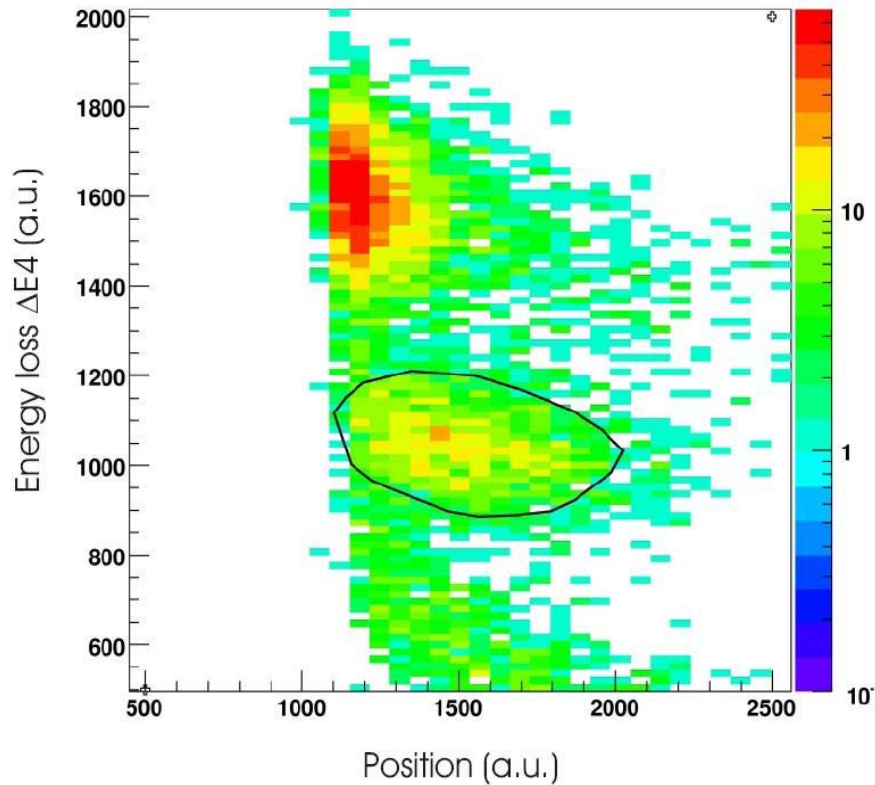
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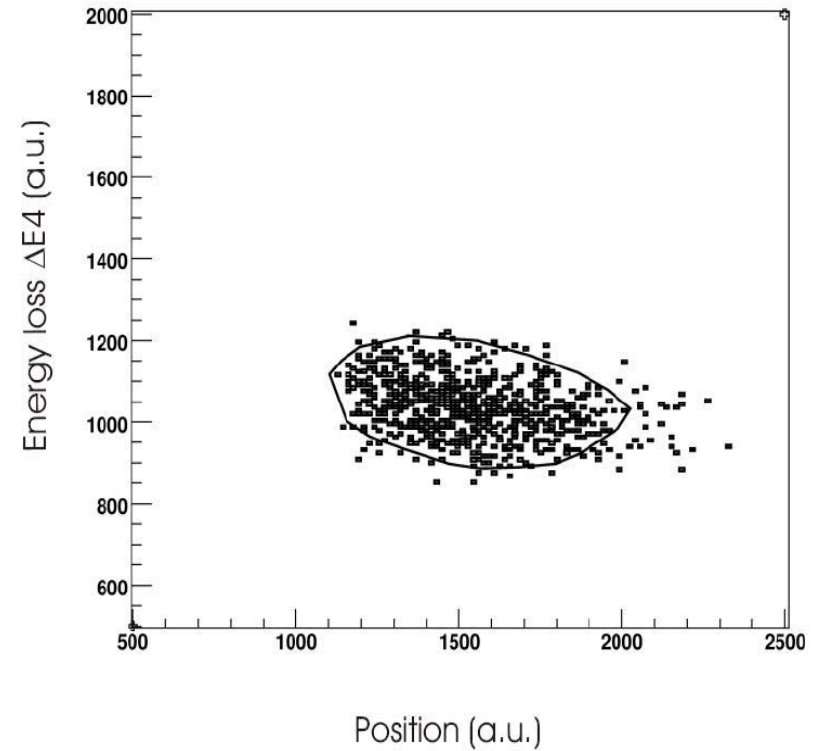
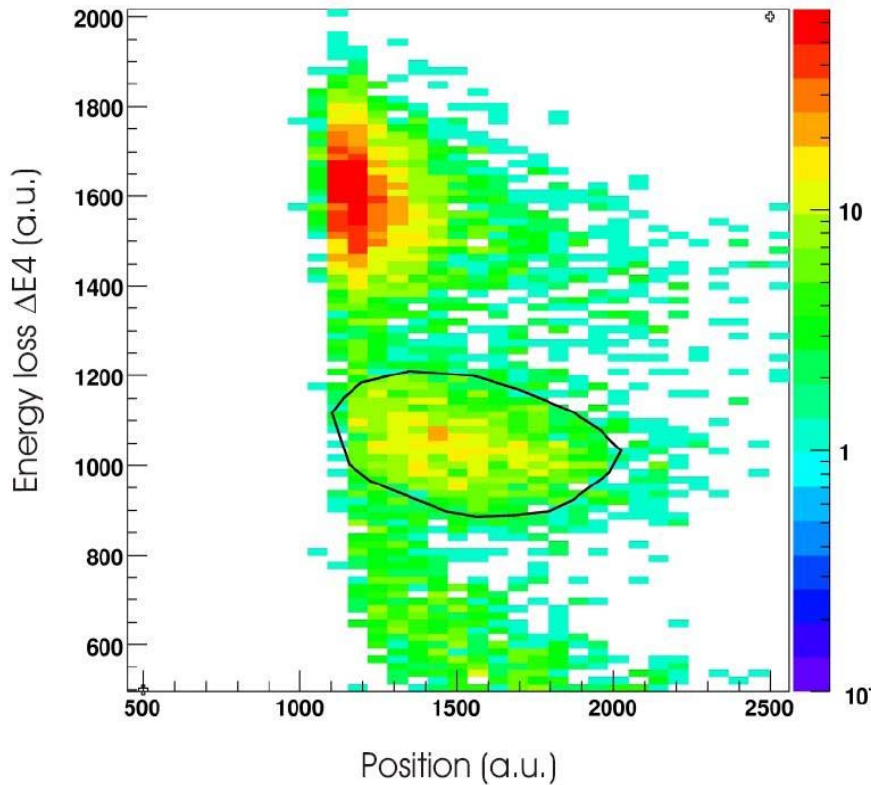
Cr-suppression:

- Magnet: 10^3
- Ionization chamber: 10^6

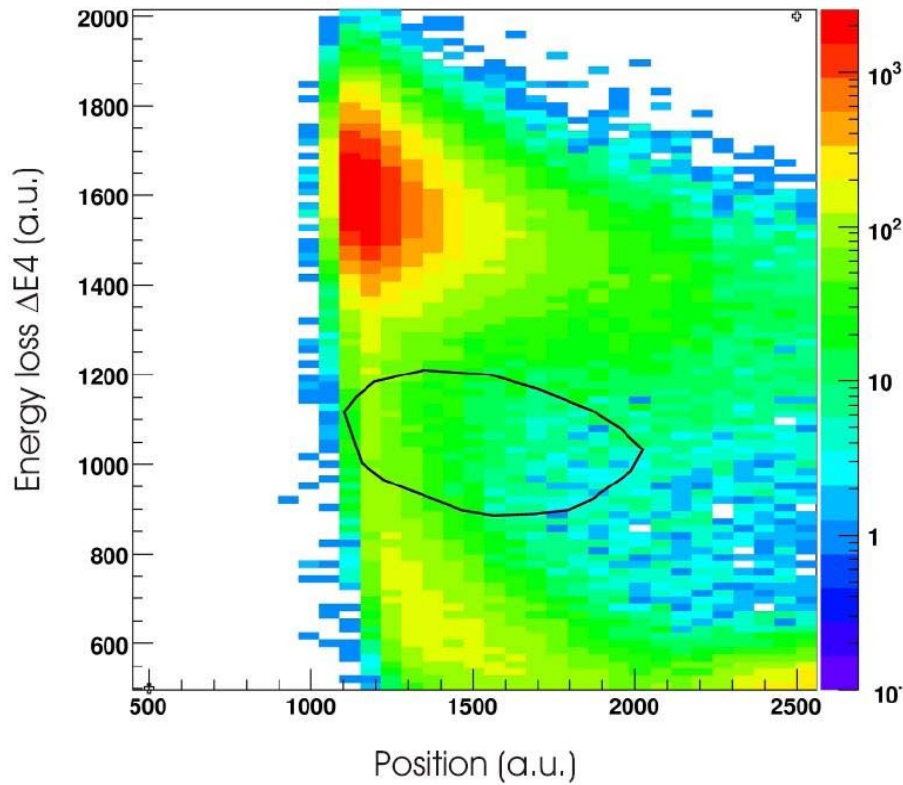
Reference Material



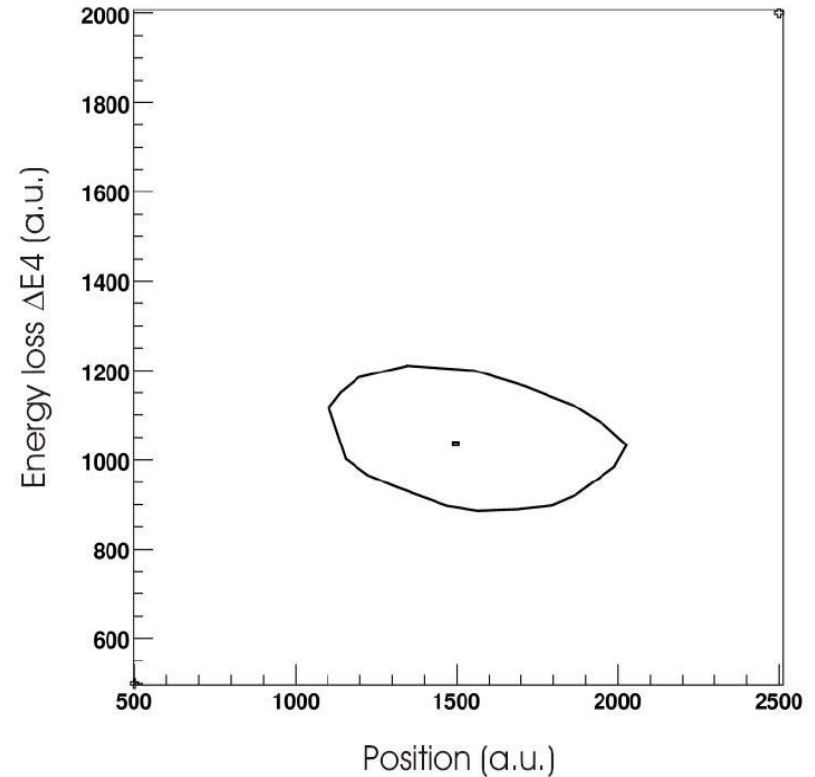
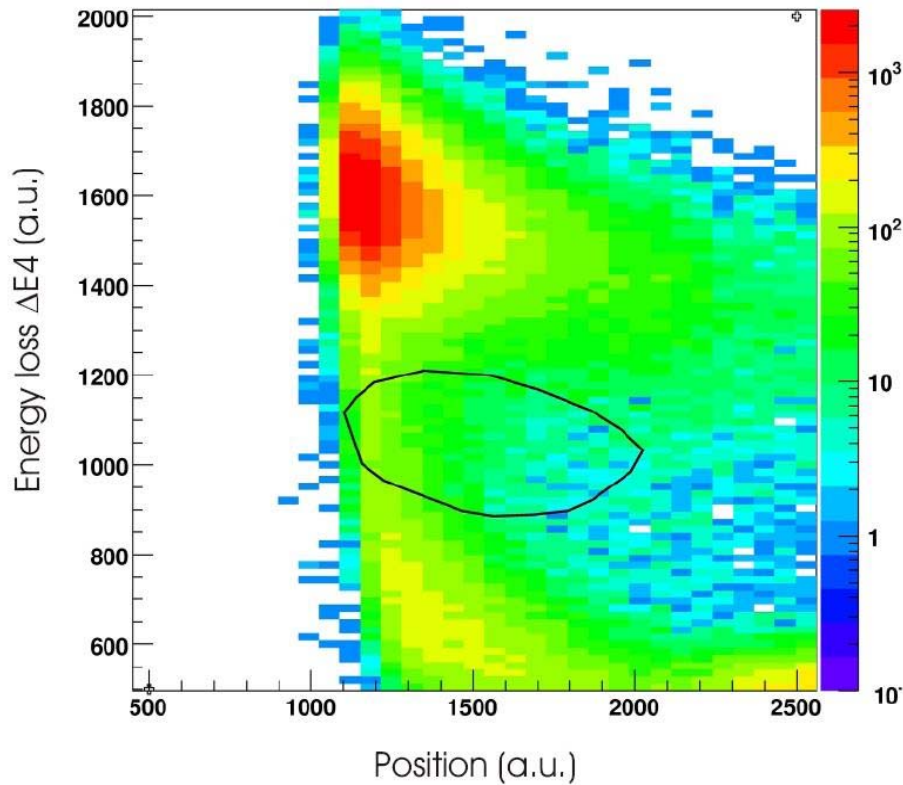
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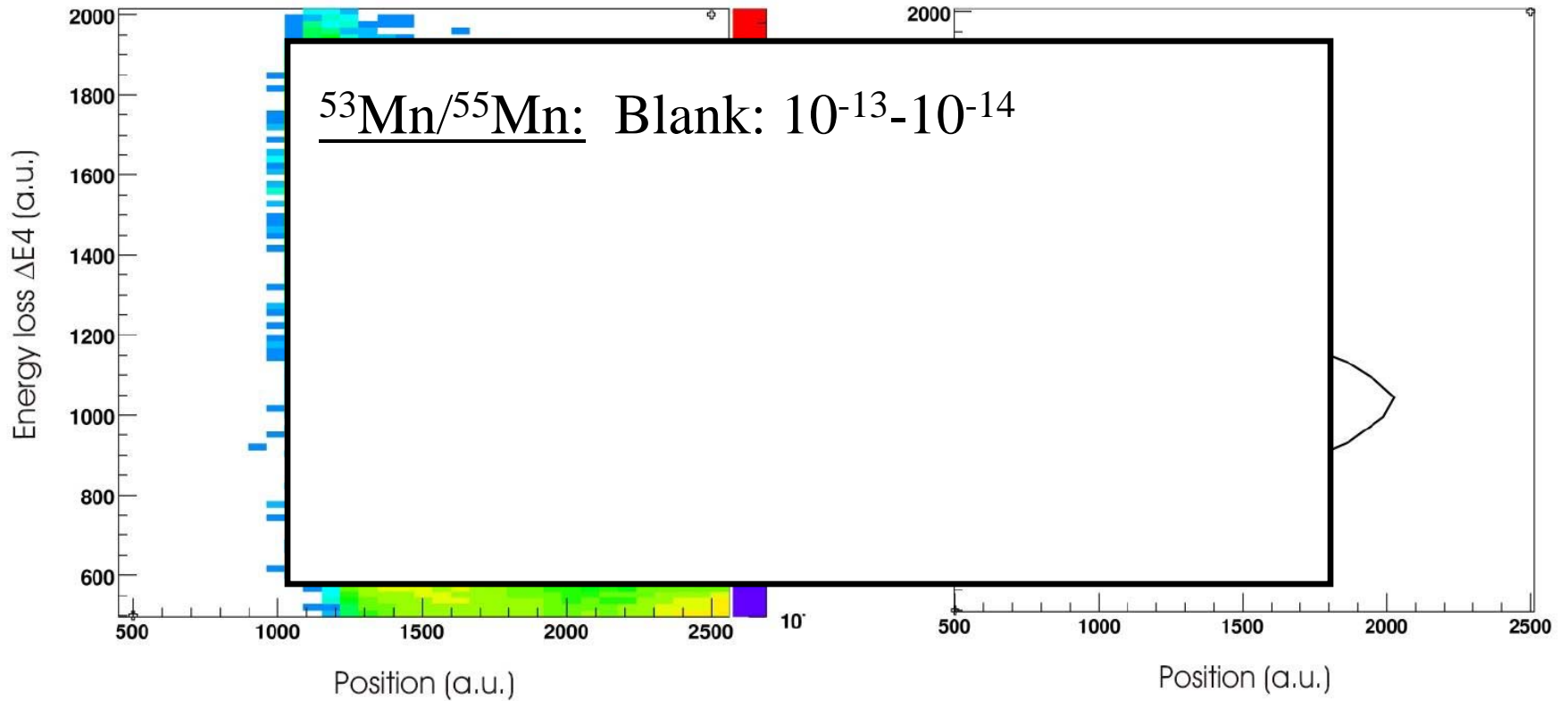
Cr-blank: ^{55}Mn with 1000 ppm ^{53}Cr



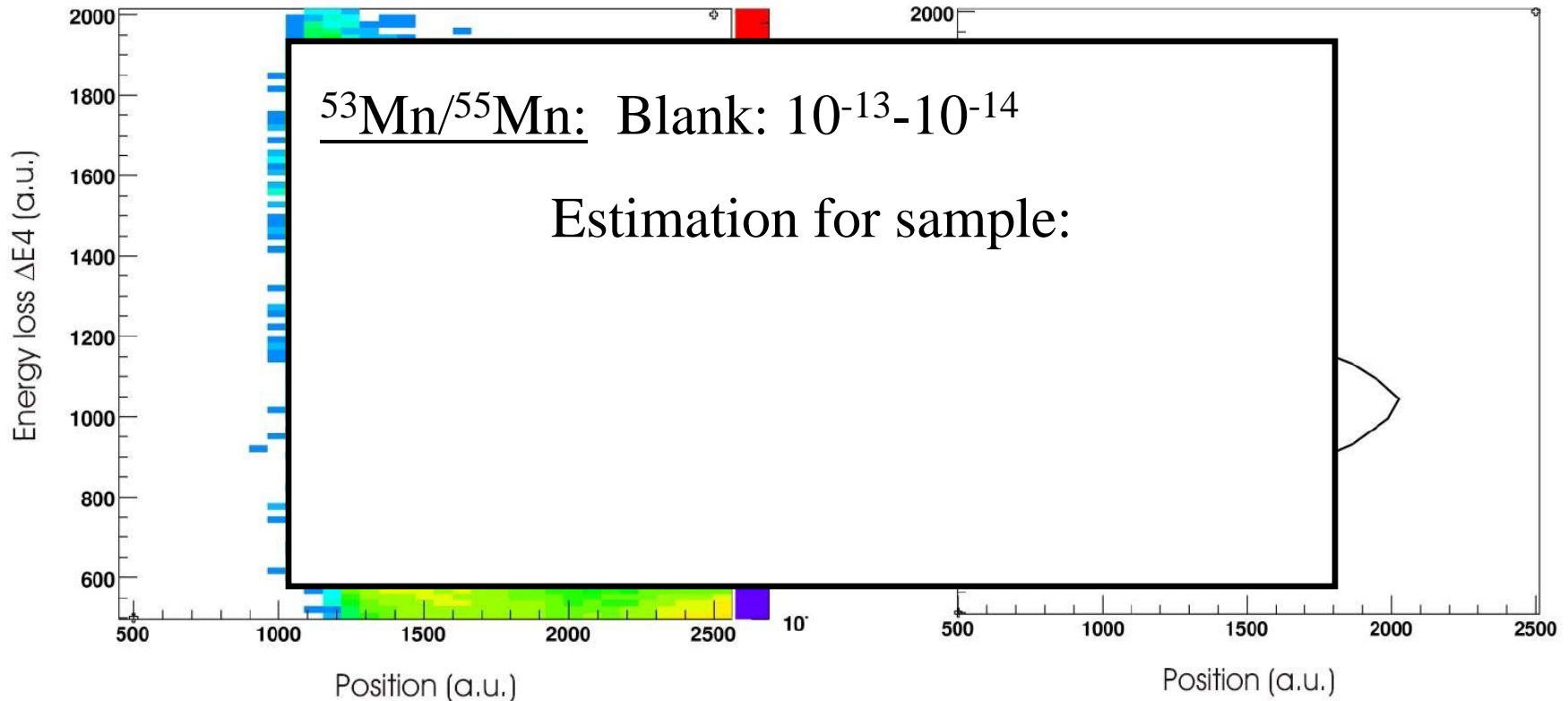
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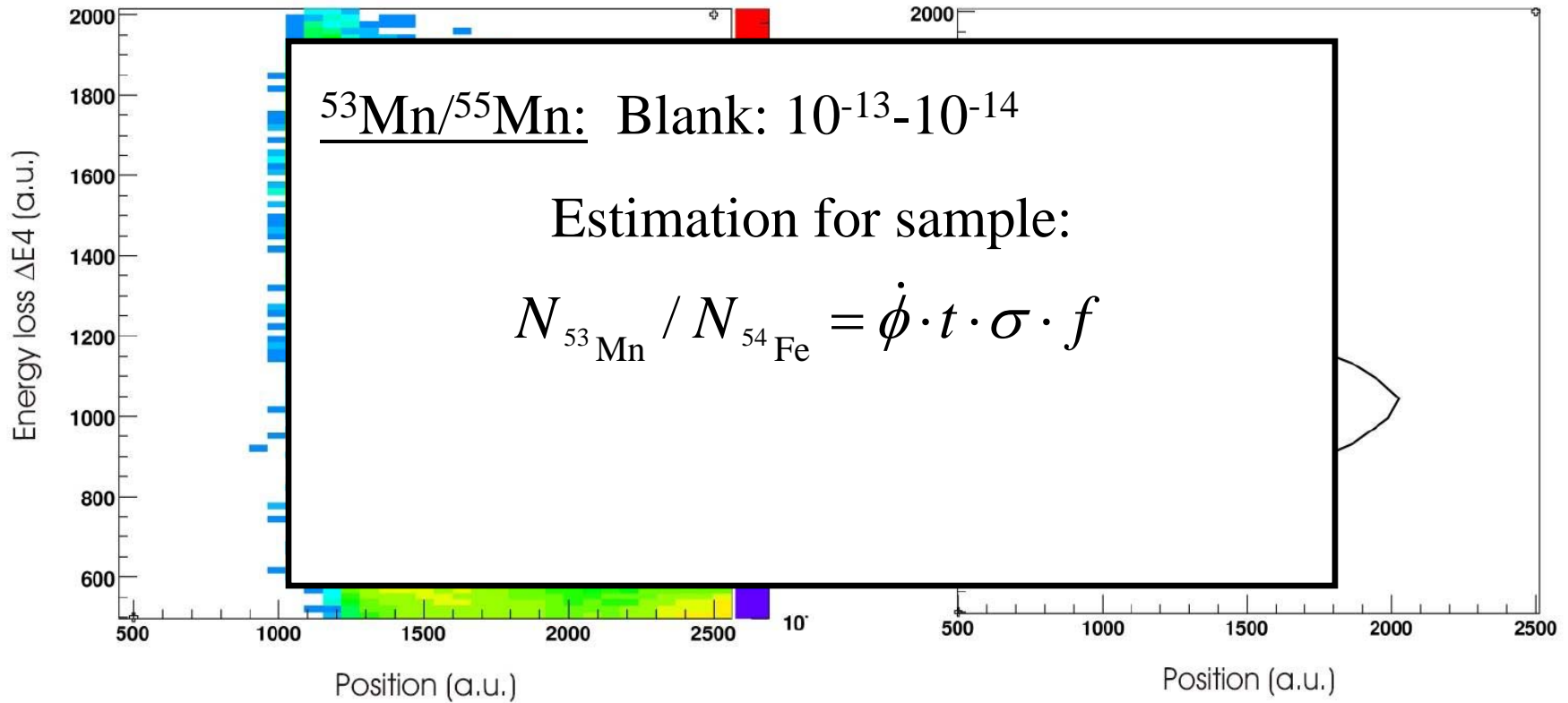
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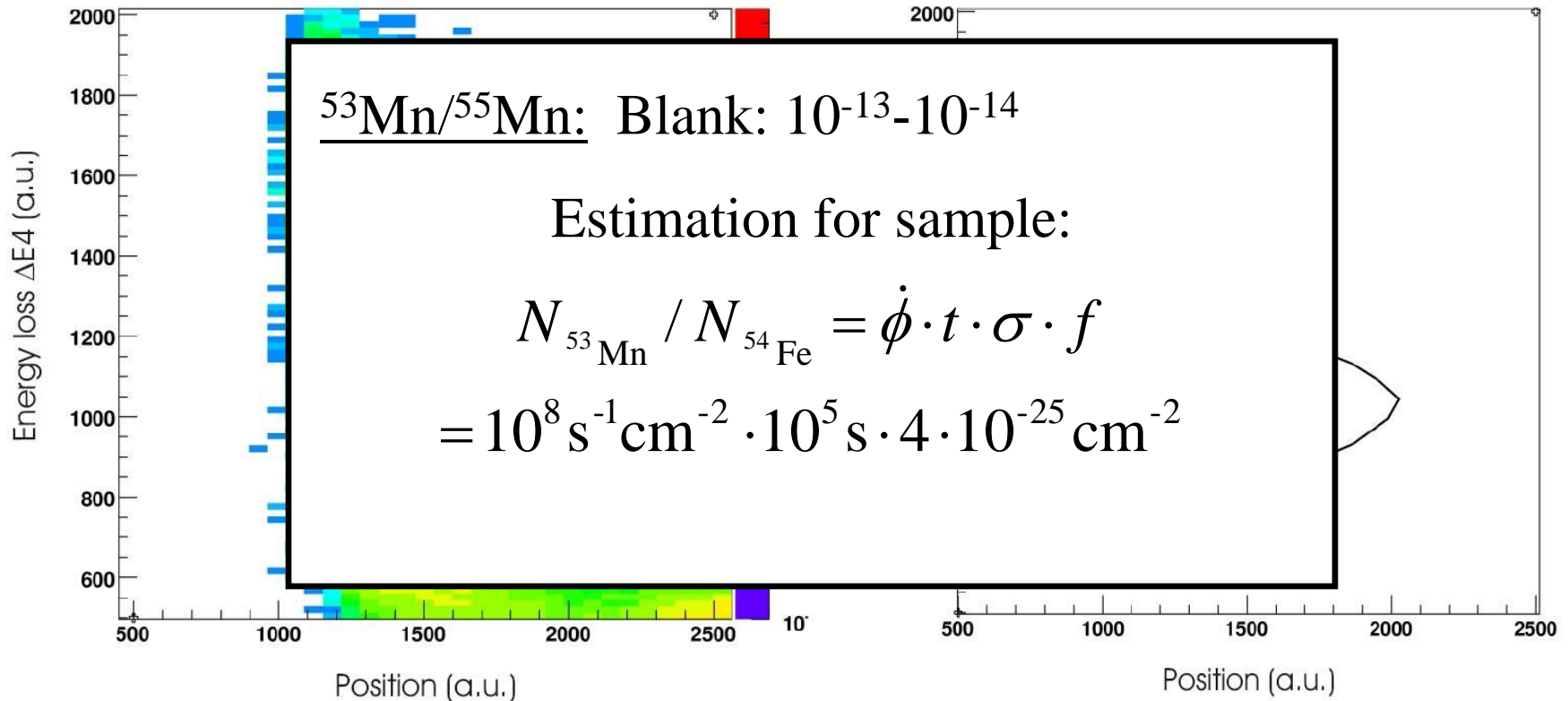
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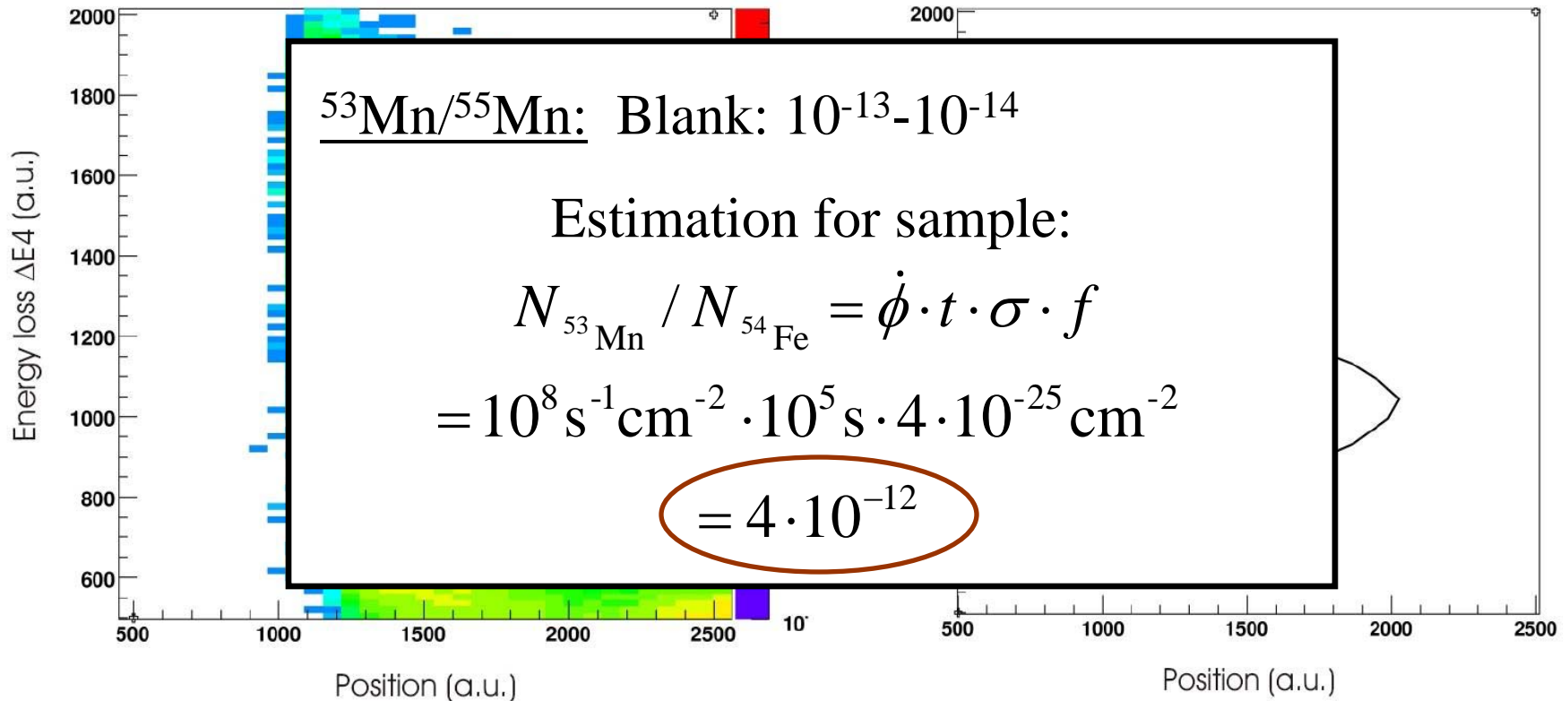
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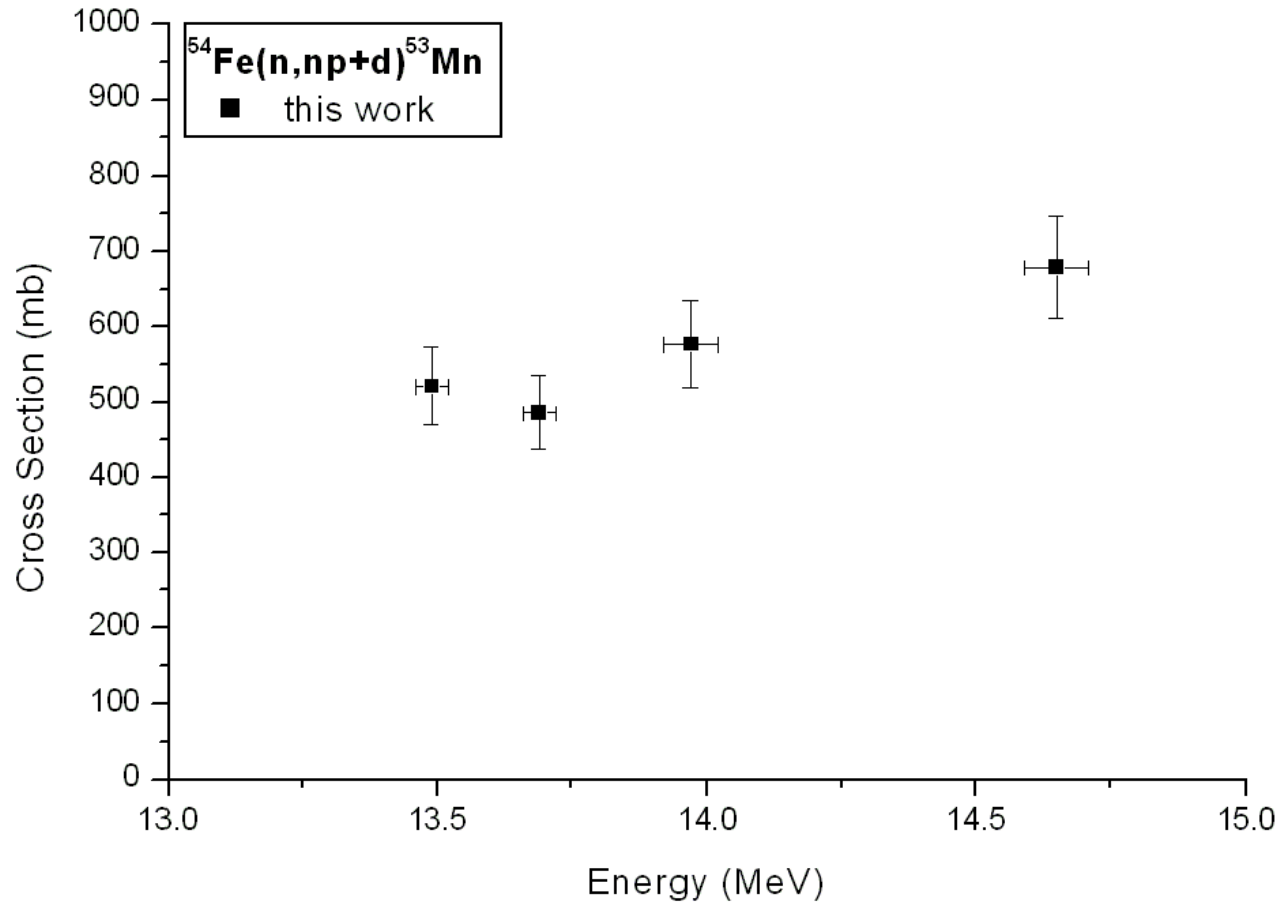
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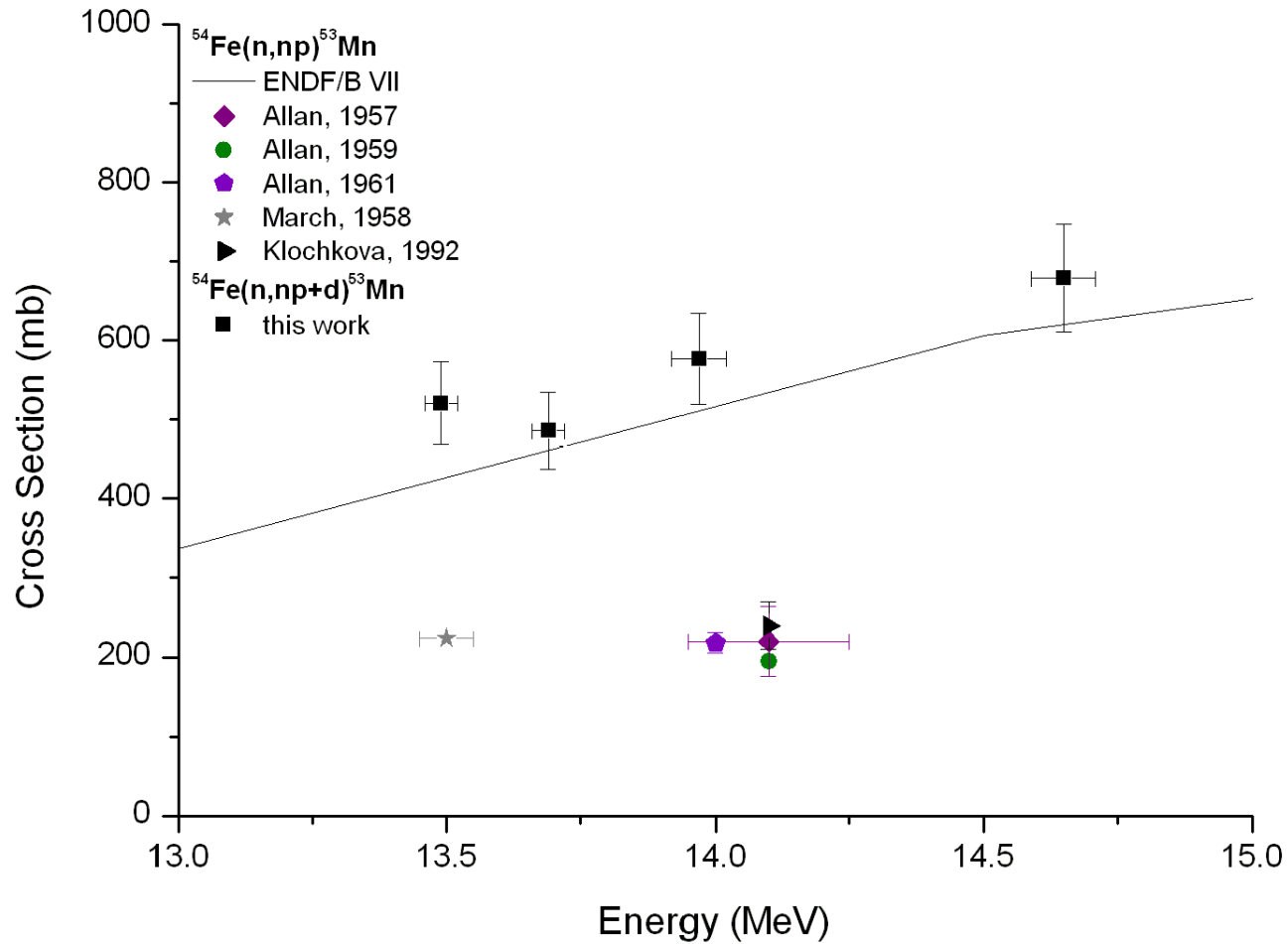
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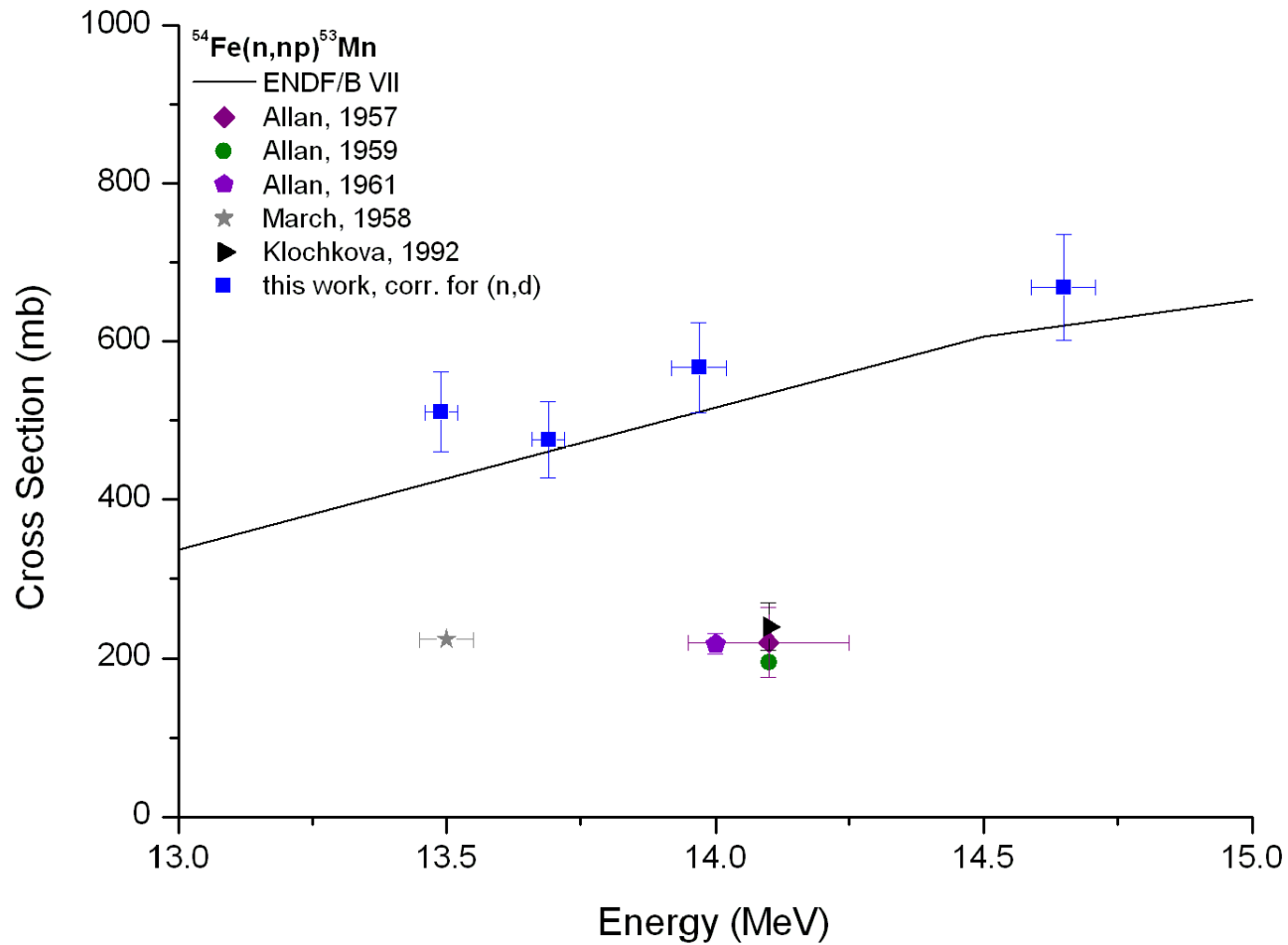
Results



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Thank you!