

# The Production of $^{53}\text{Mn}$ in a Fusion-Environment

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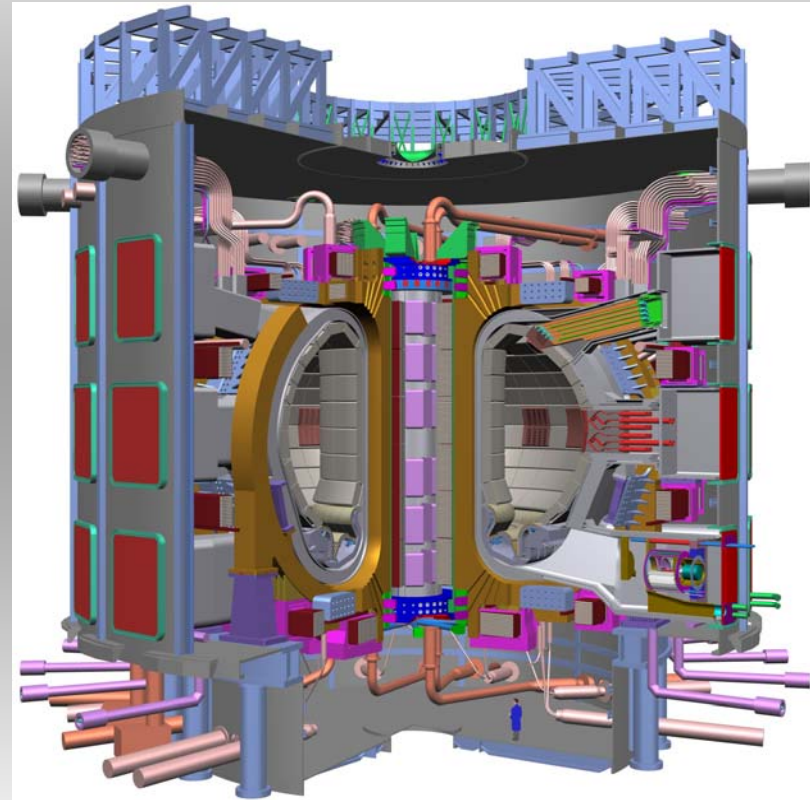
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<sup>c</sup>Inst. f. Kern- und Teilchenphysik, TU Dresden und Forschungszentrum Dresden-Rossendorf

# Motivation

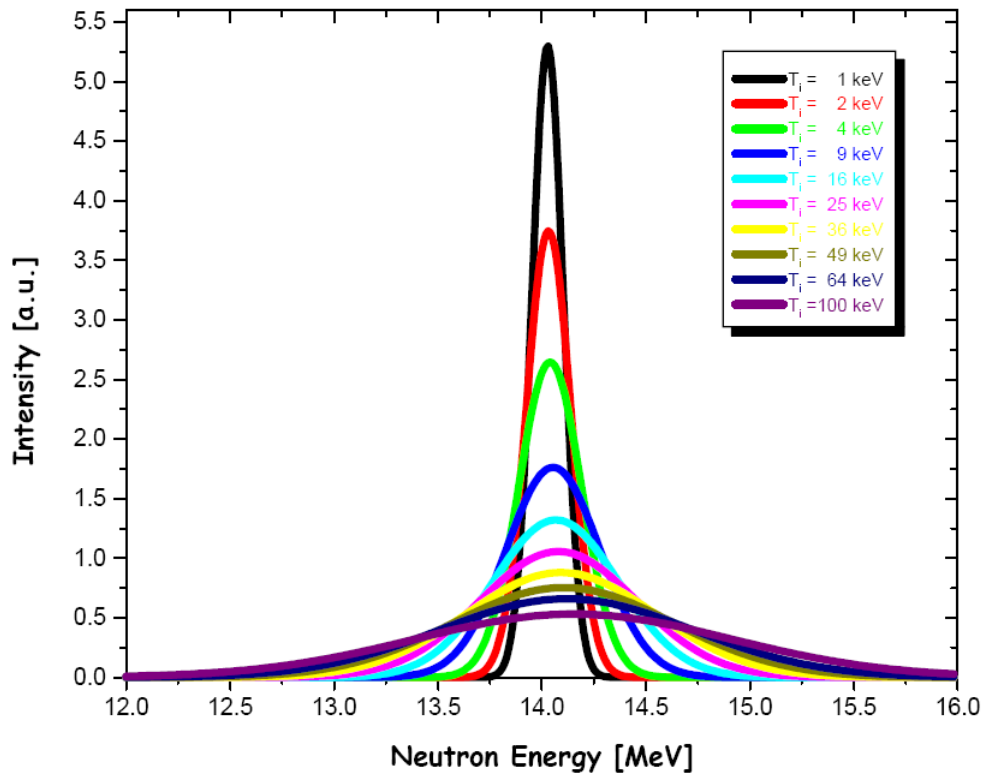
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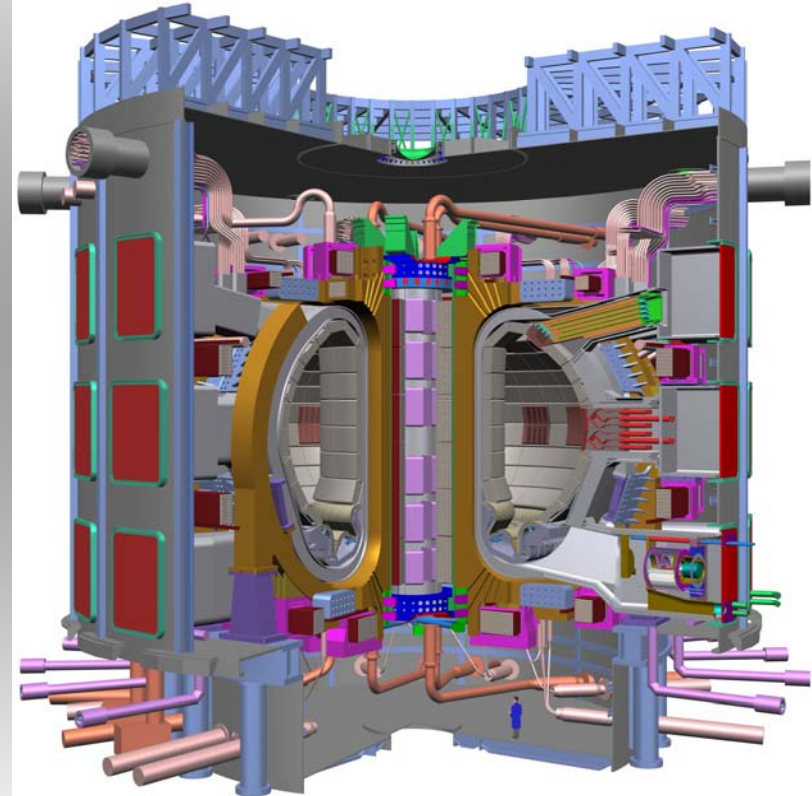
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Reaction:



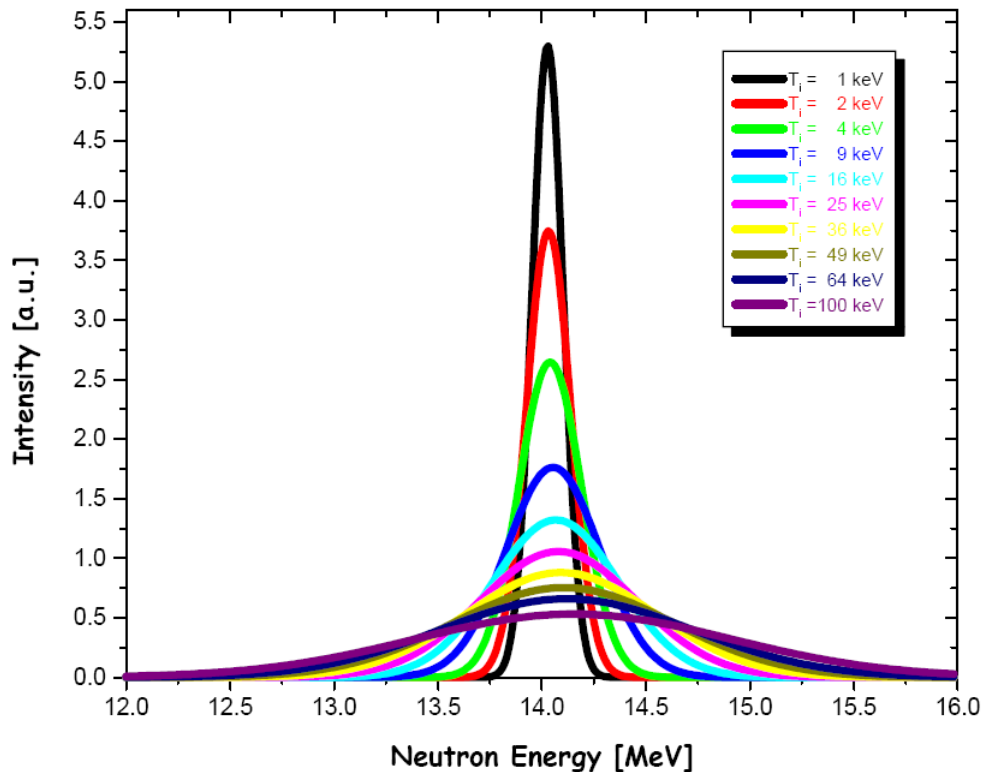
A. Wallner, 2000



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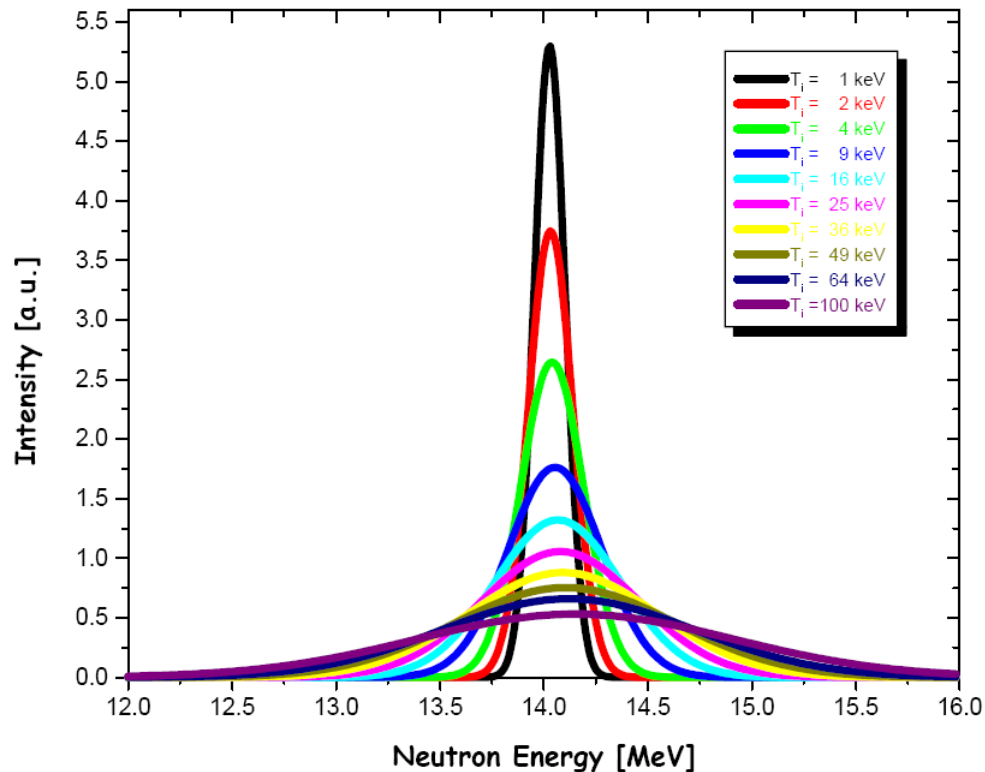


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Isotope	Half-life (y)	Reaction
$^{14}\text{C}$	5730	$^{14}\text{N}(n,p)$
$^{26}\text{Al}$	$7.2 \cdot 10^5$	$^{27}\text{Al}(n,2n)$
$^{53}\text{Mn}$	$3.7 \cdot 10^6$	$^{54}\text{Fe}(n,2n)$
		$^{54}\text{Fe}(n,np+d)$
$^{55}\text{Fe}$	2.73	$^{56}\text{Fe}(n,2n)$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

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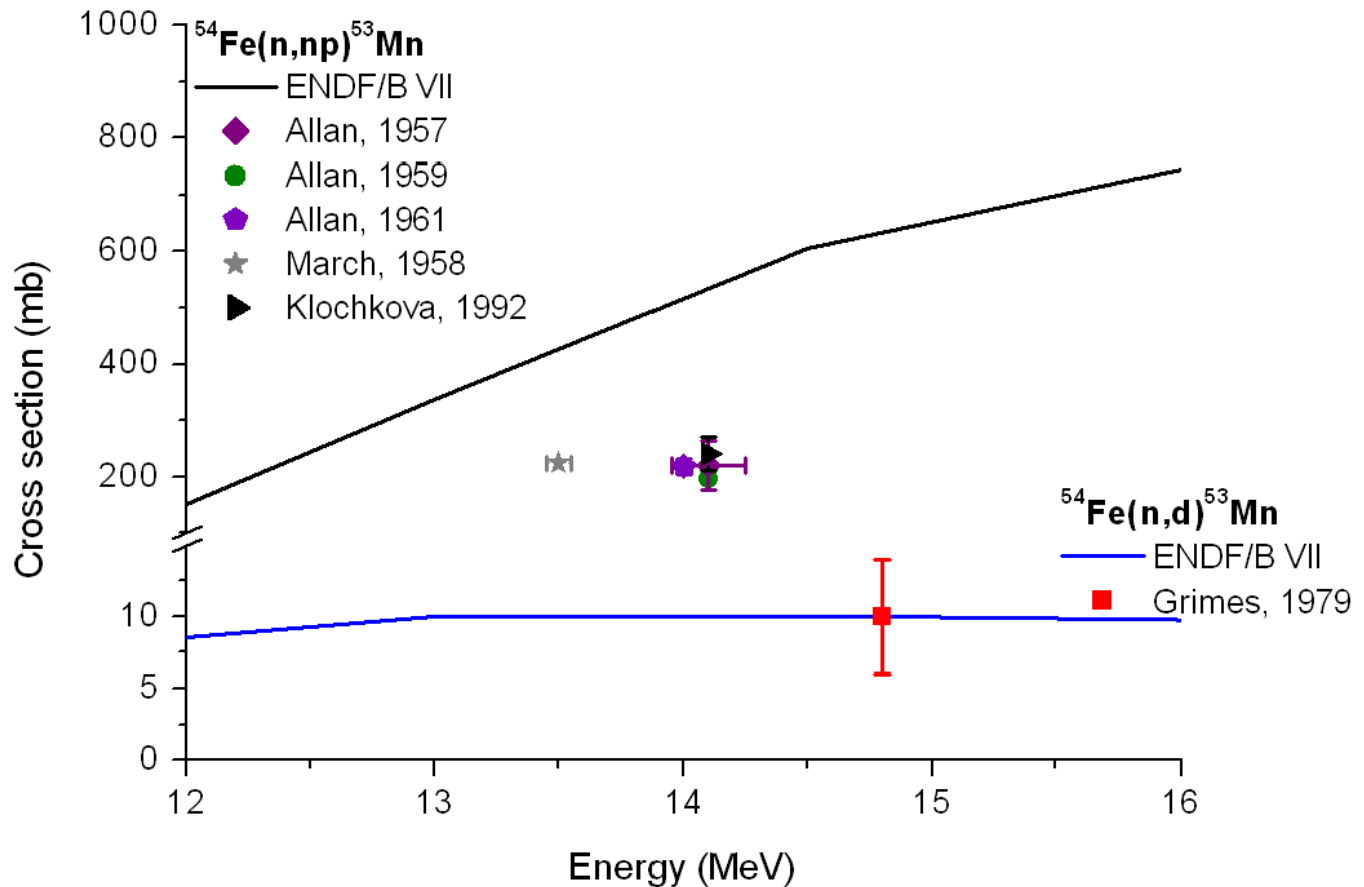
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# Available data for $^{54}\text{Fe}(n,np+d)^{53}\text{Mn}$ cross-sections



<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

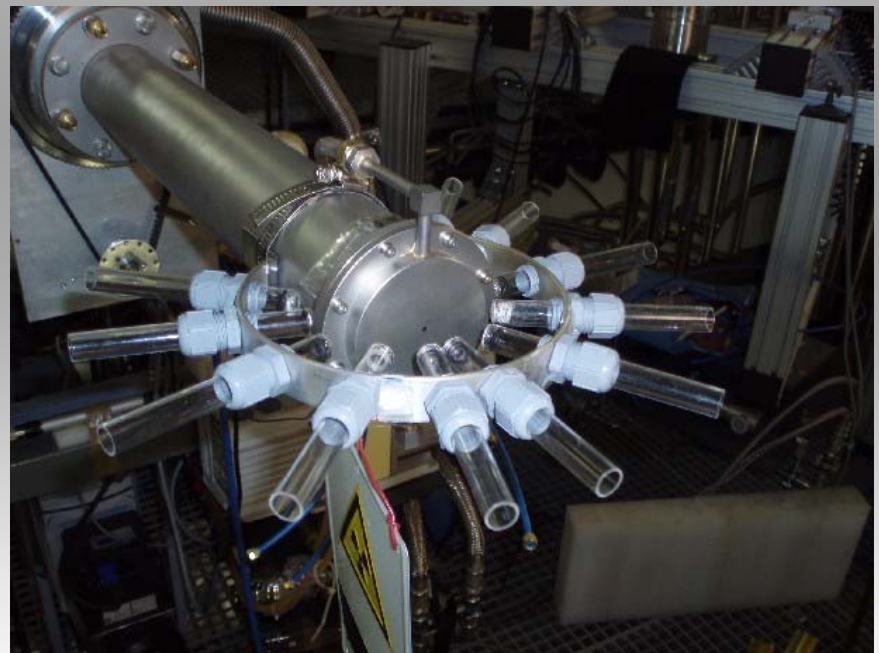


# Neutron Irradiations



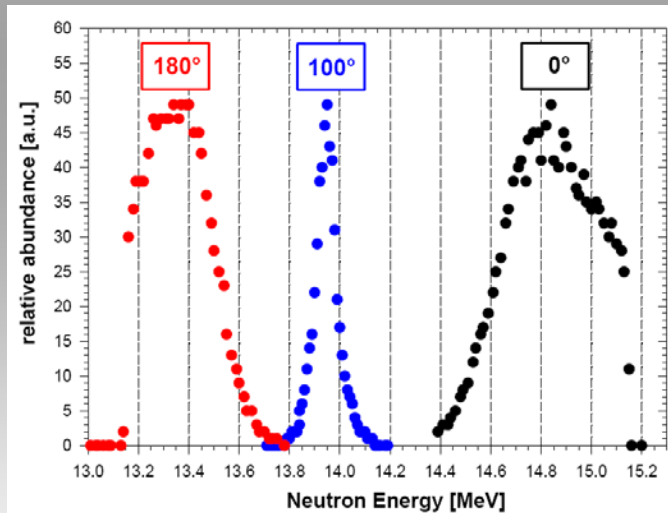
# Neutron Irradiations

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

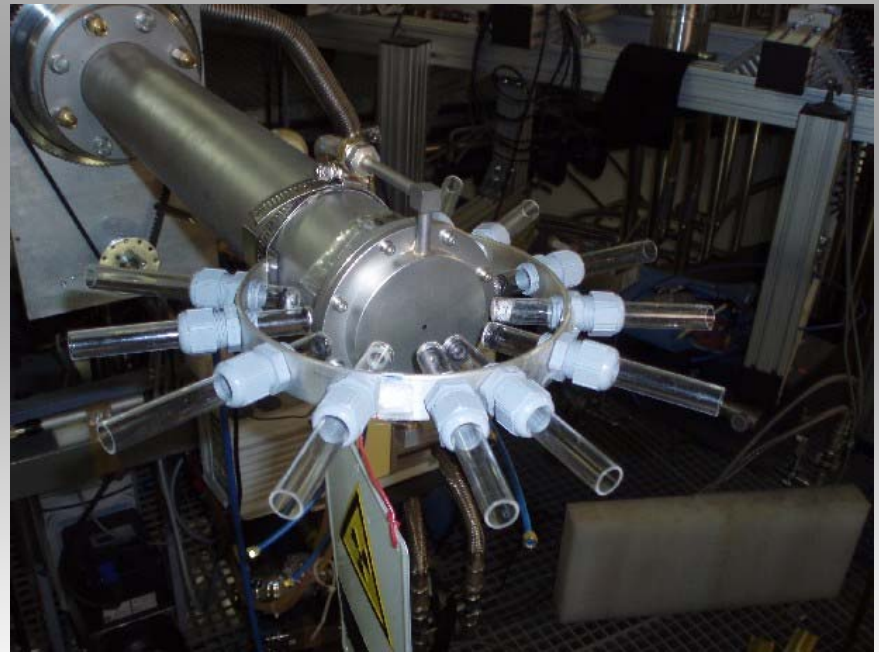


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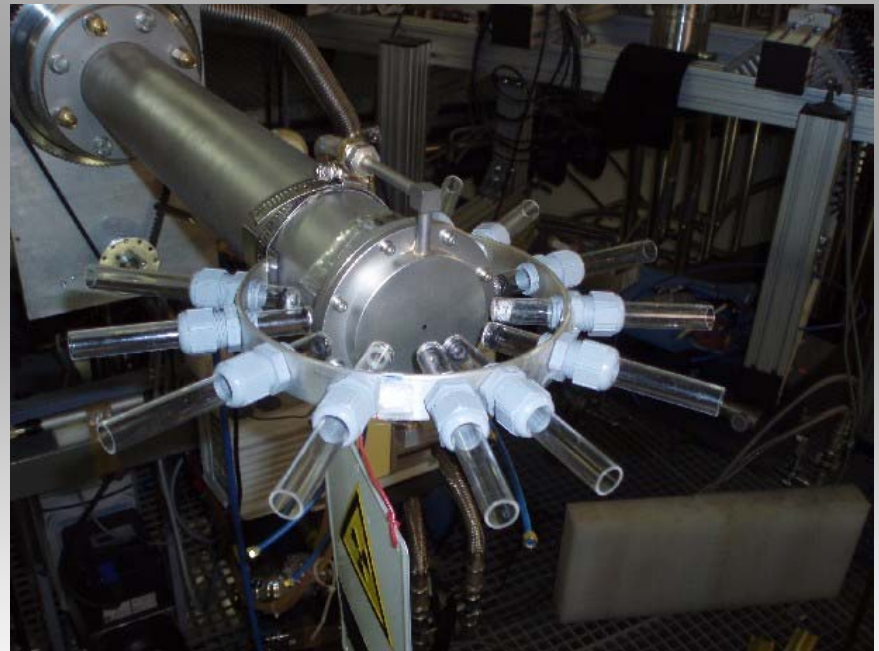
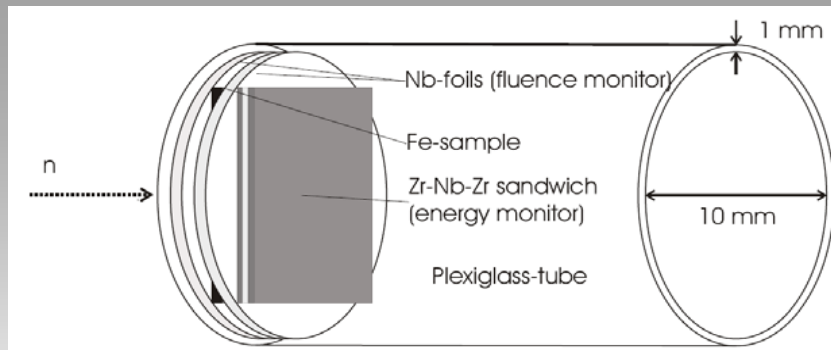


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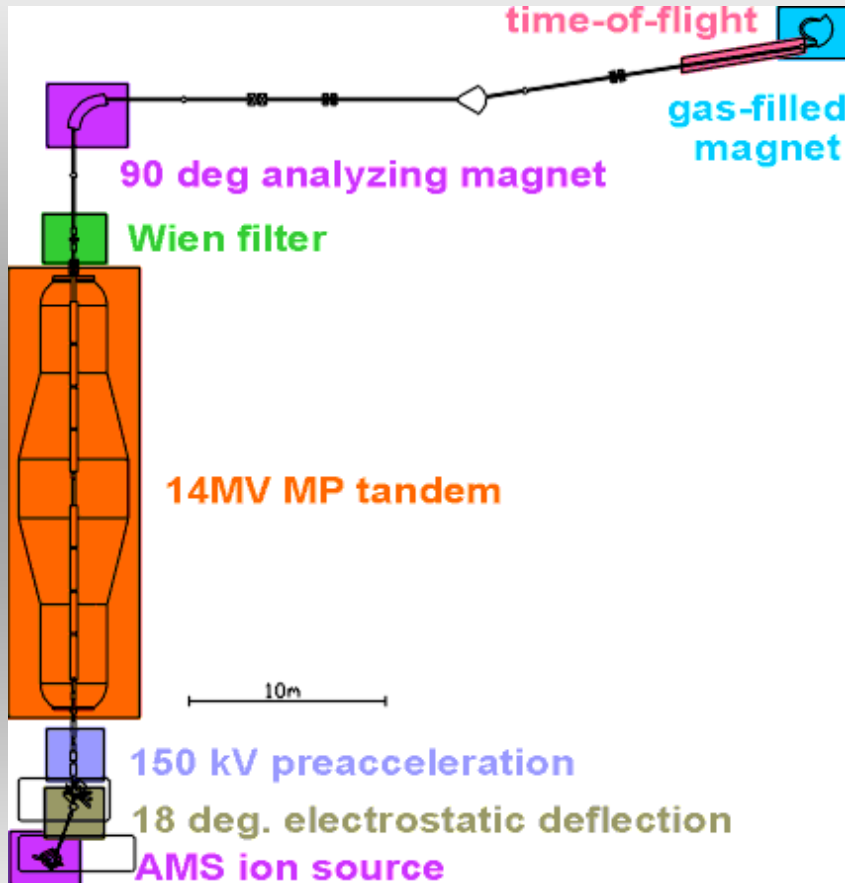
# $^{53}\text{Mn}/^{55}\text{Mn}$ measurements with AMS

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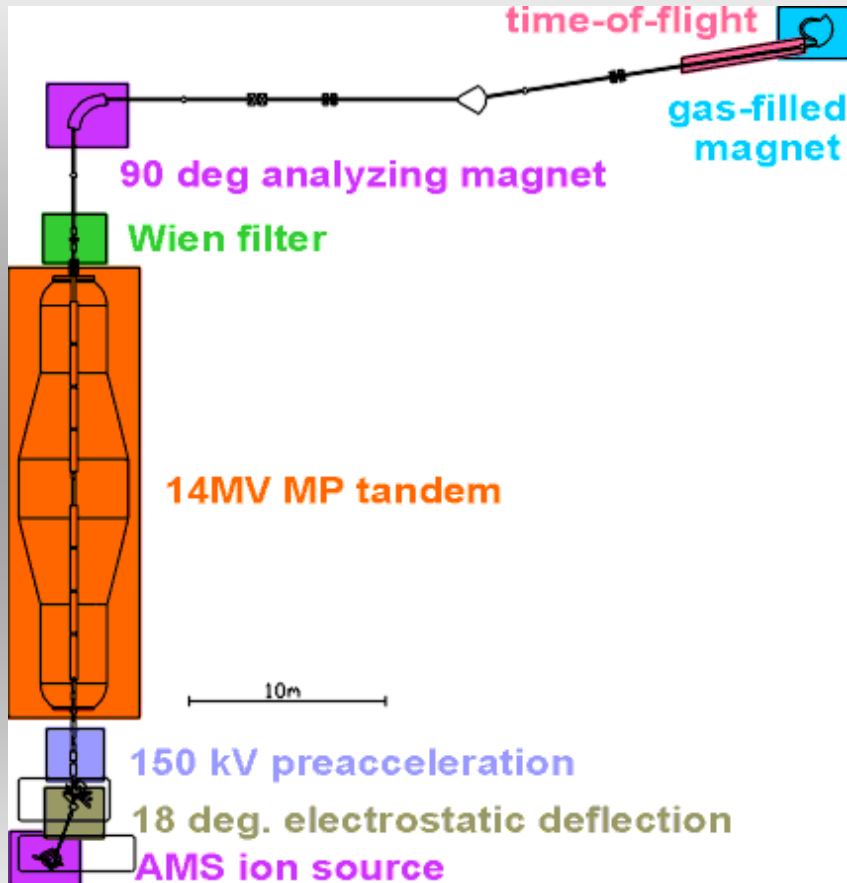


Munich 14 MV tandem accelerator



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(AMS....Accelerator Mass Spectrometry)



$^{53}\text{Mn}$  - stable isobar  $^{53}\text{Cr}$

Munich 14 MV tandem accelerator

# Isobar suppression: GAMS

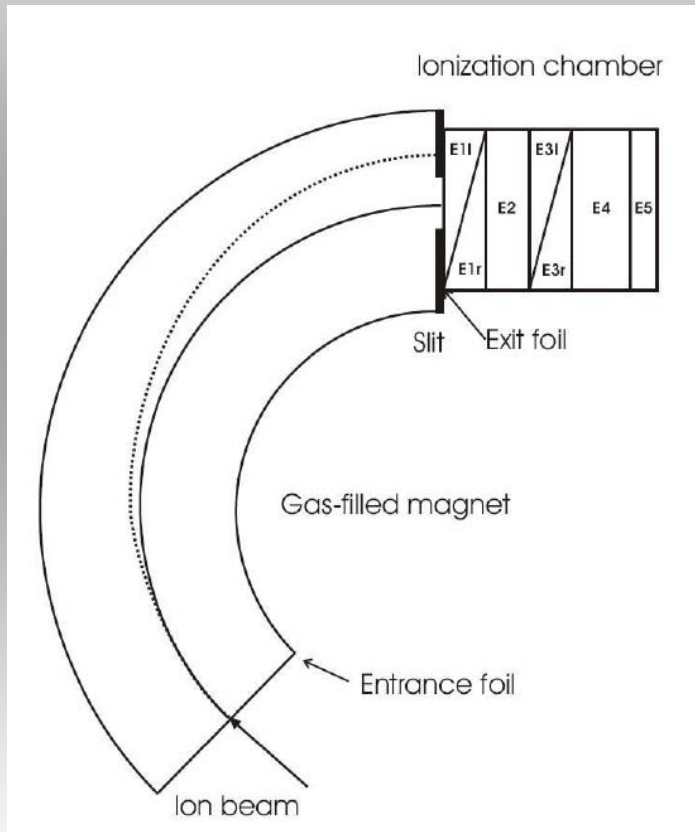
- GAMS.... Gas-filled Analyzing Magnet System





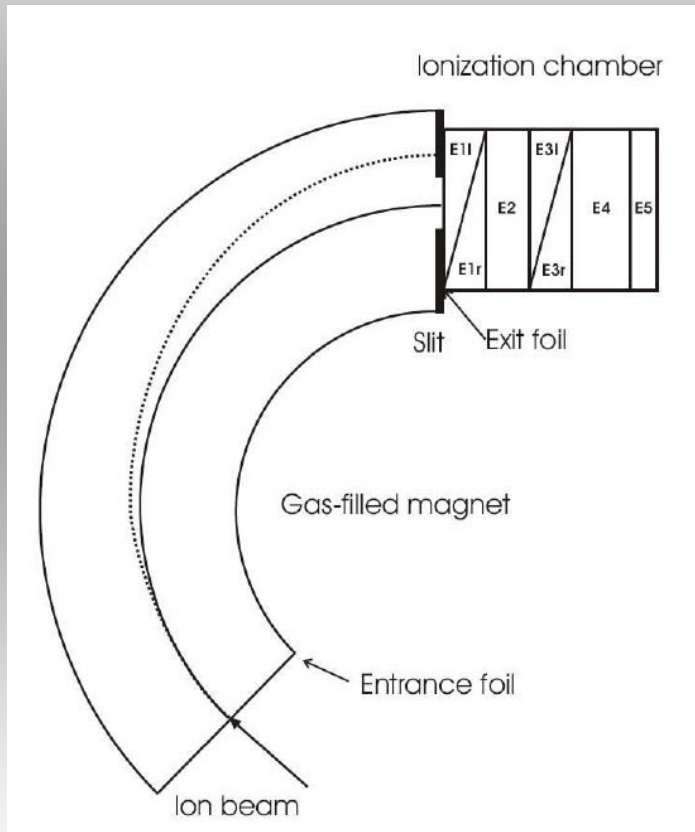
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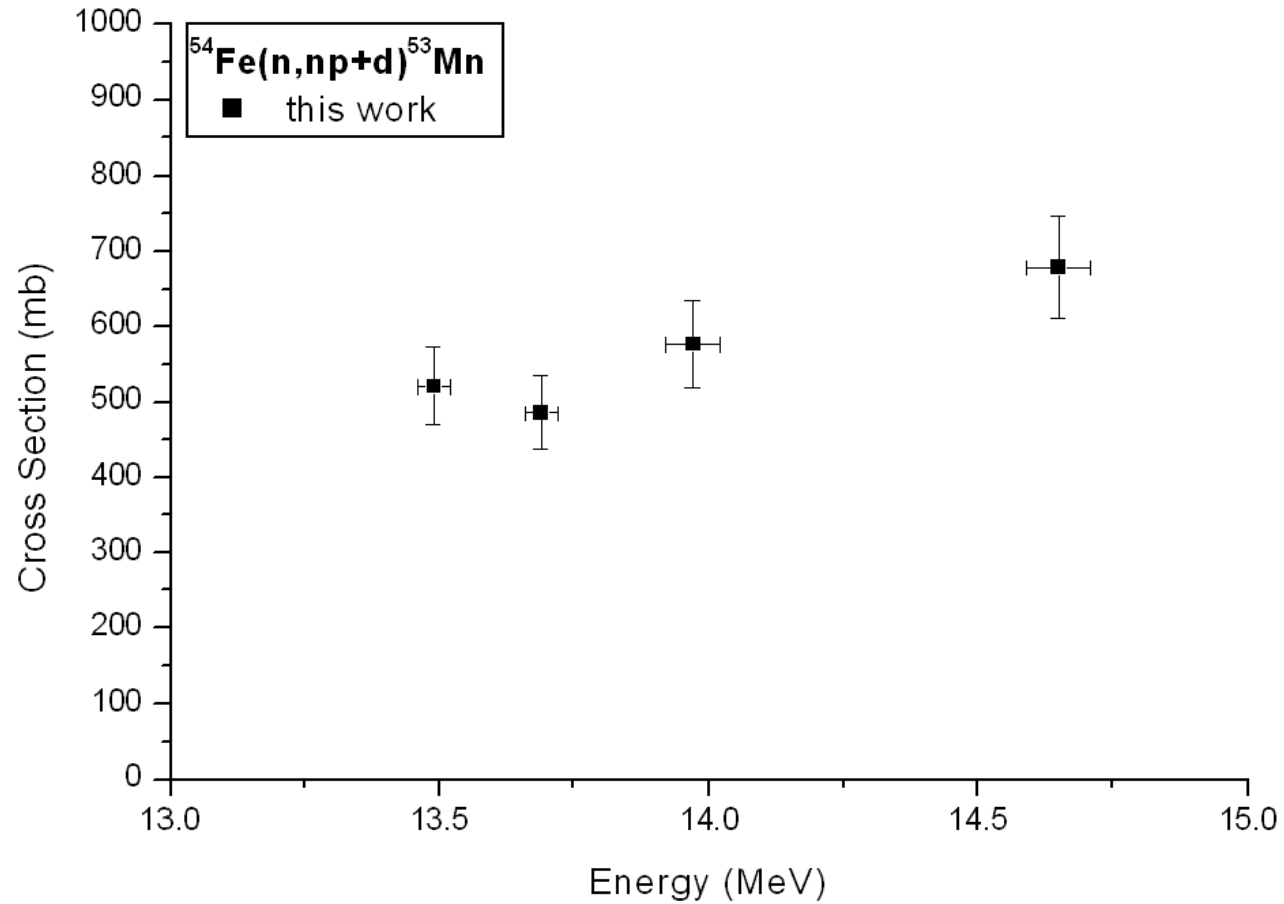


Cr-suppression:

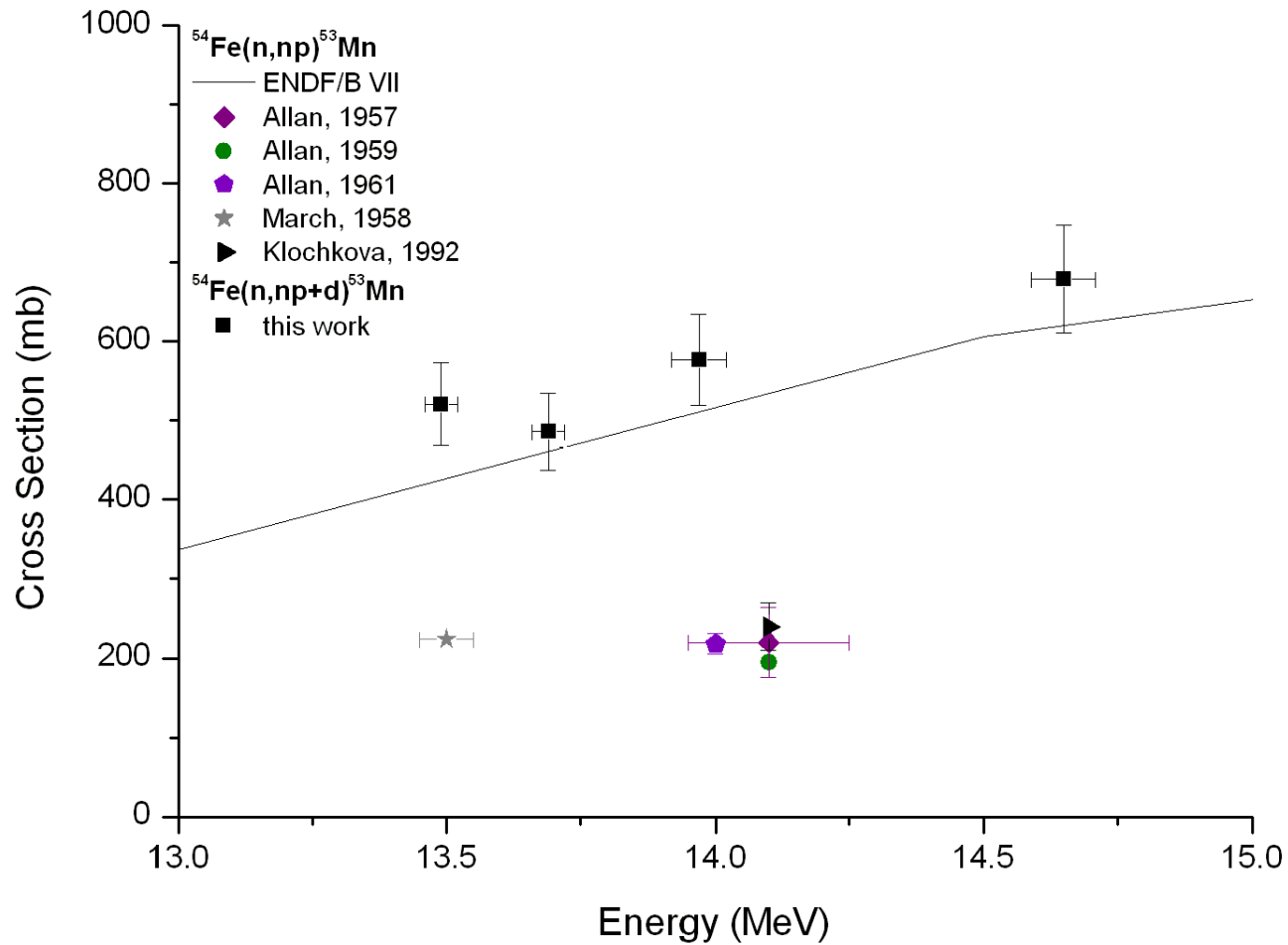
- Magnet:  $10^3$
- Ionization chamber:  $10^6$

[fwd](#)

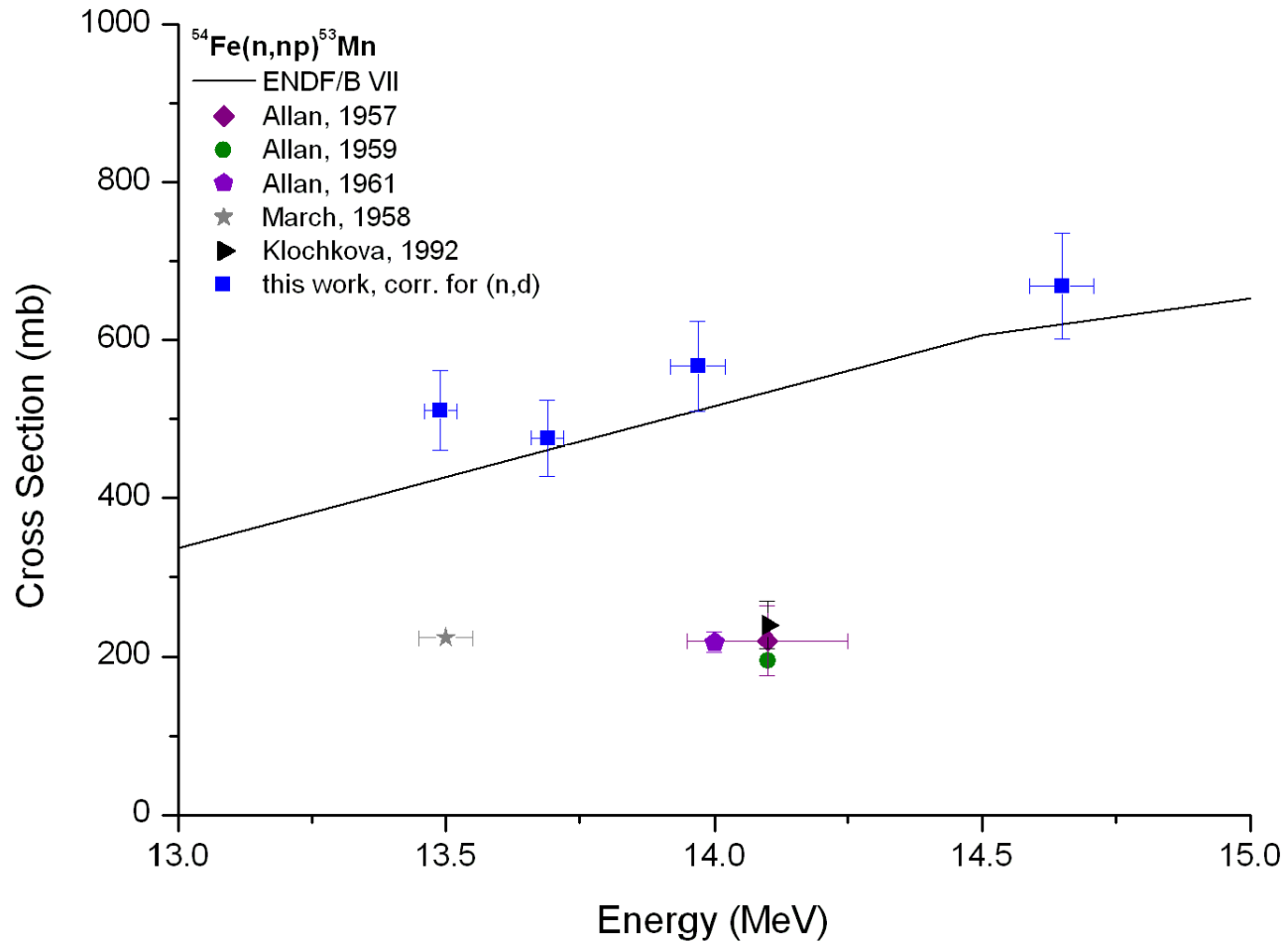
# Results



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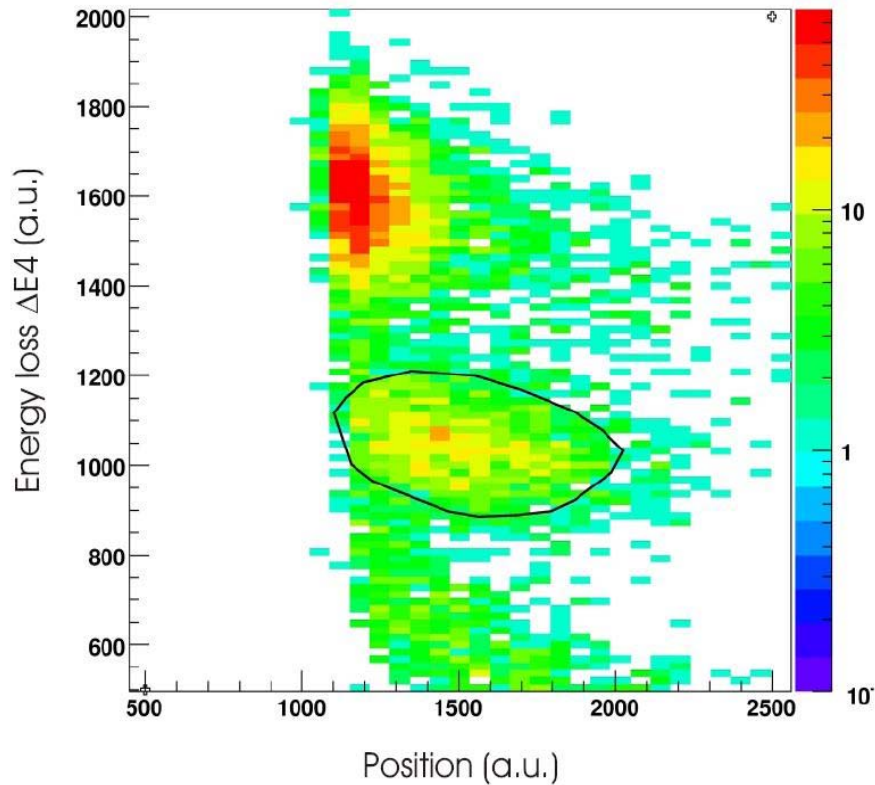


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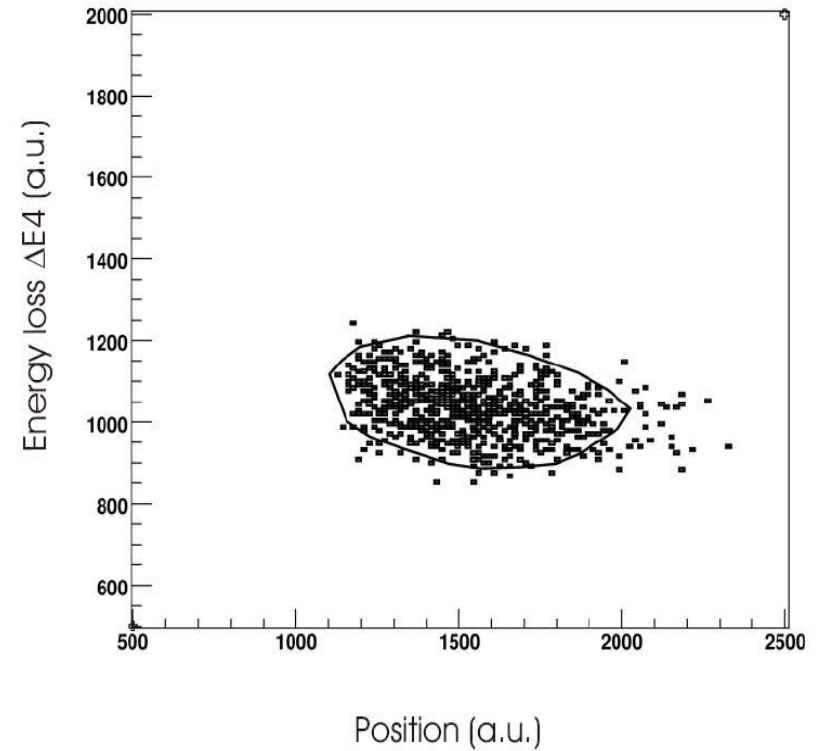
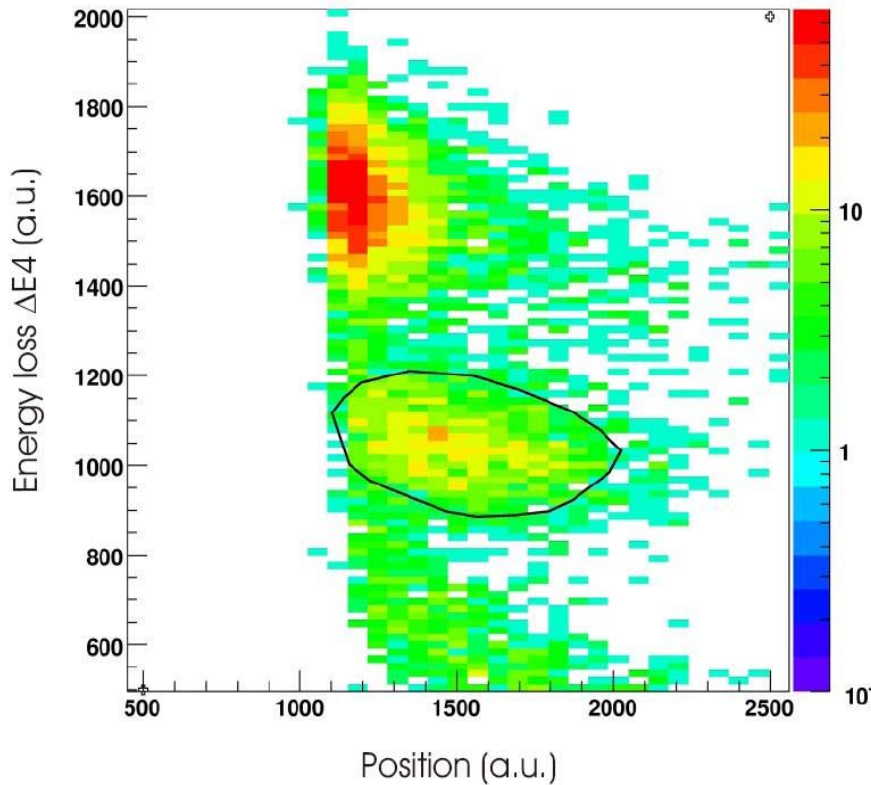


Thank you!

# Reference Material

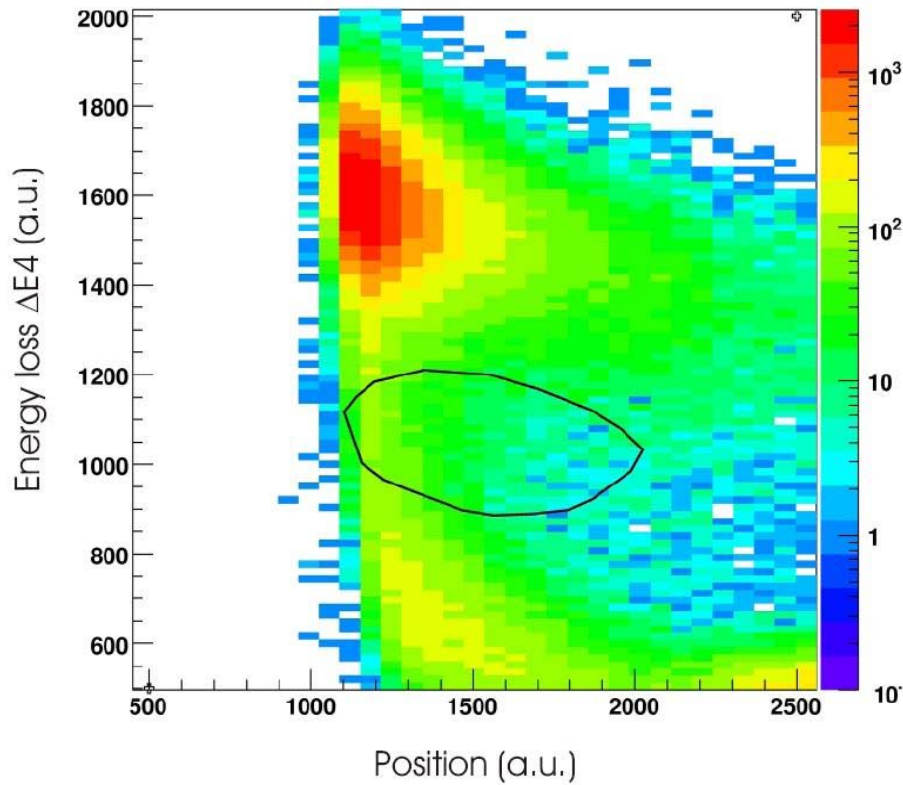


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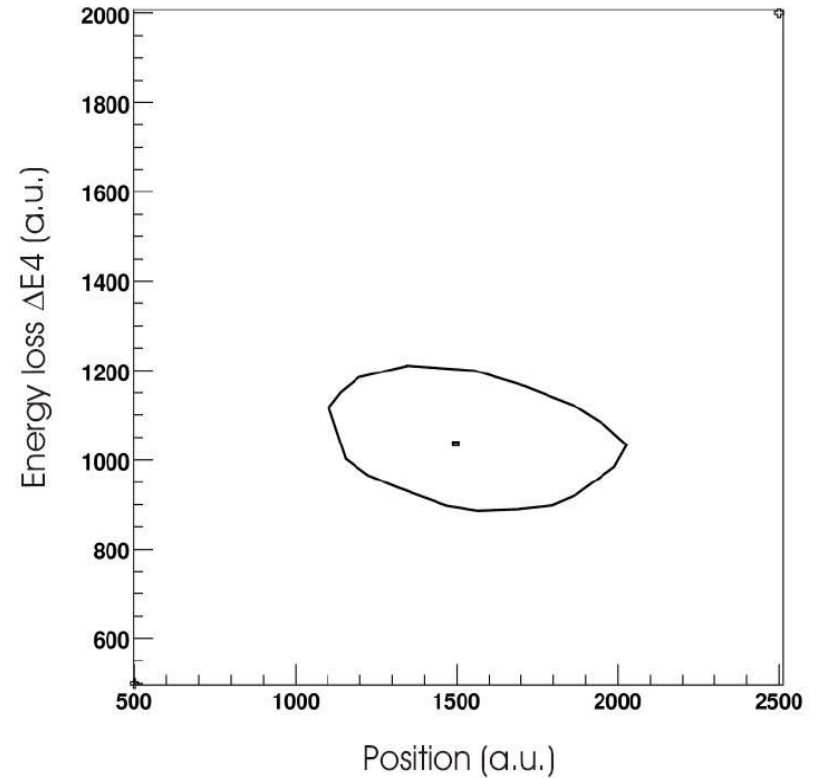
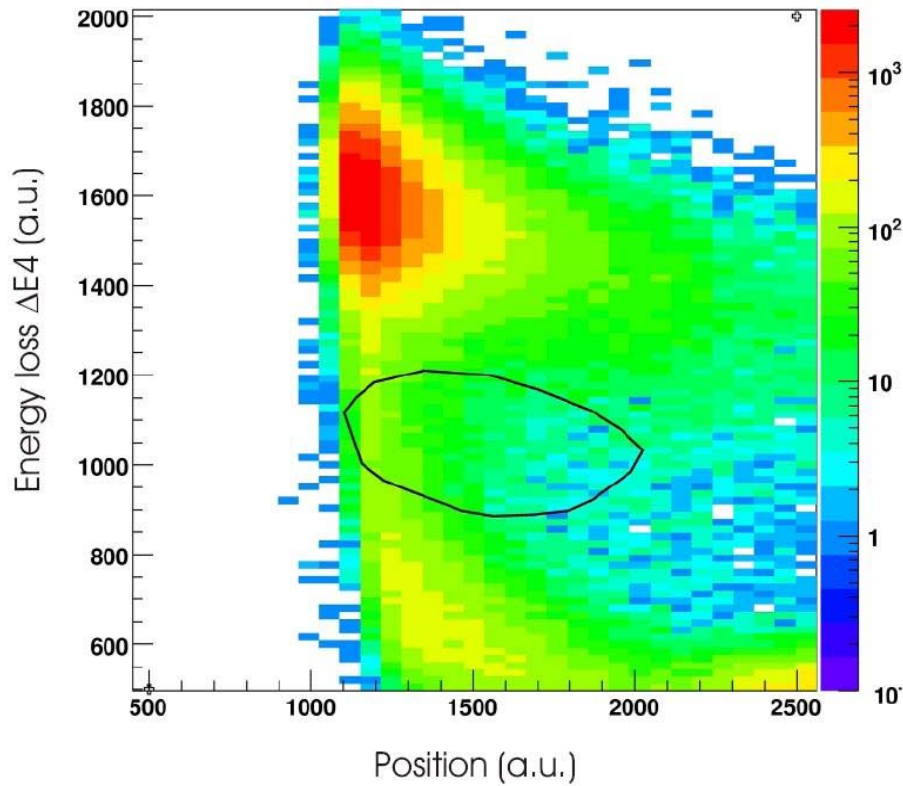




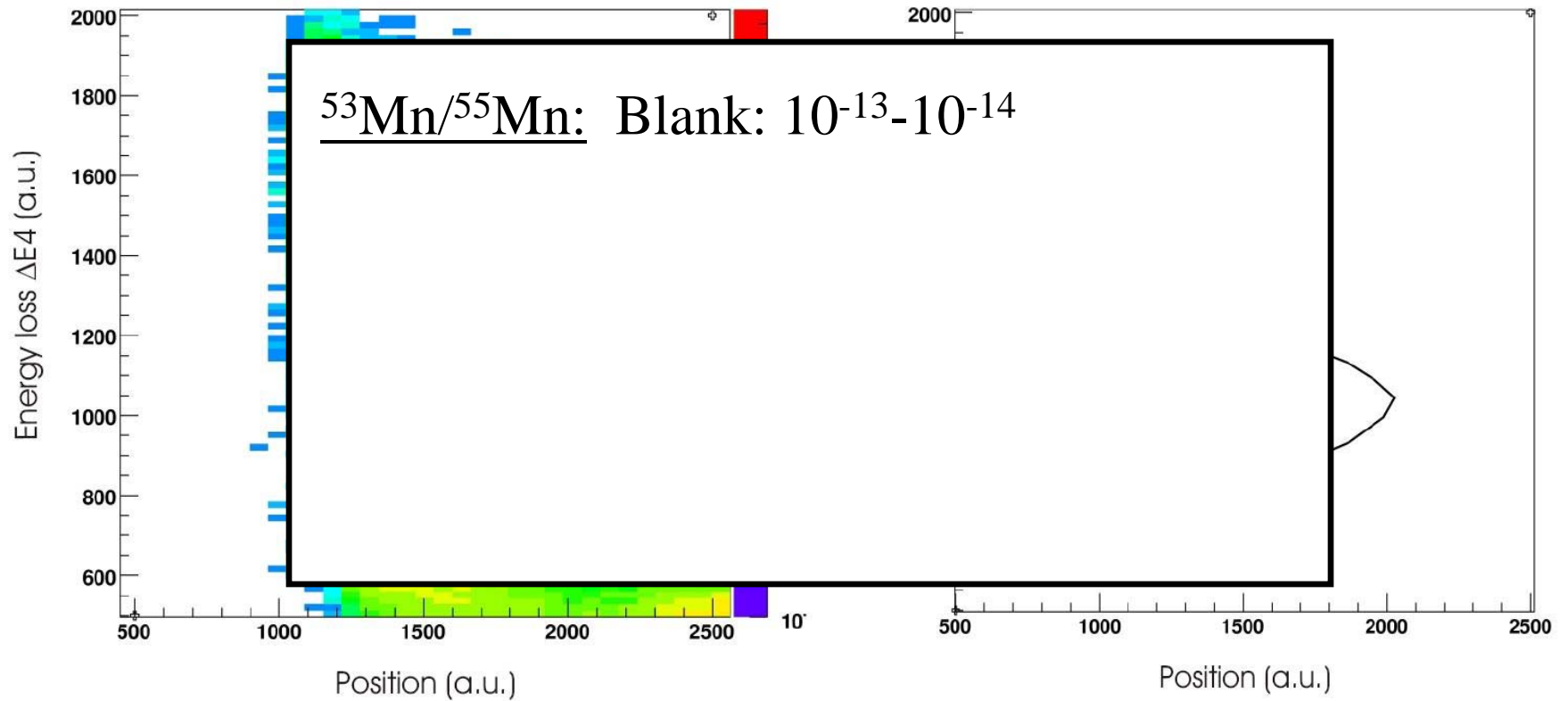
# Cr-blank: $^{55}\text{Mn}$ with 1000 ppm $^{53}\text{Cr}$



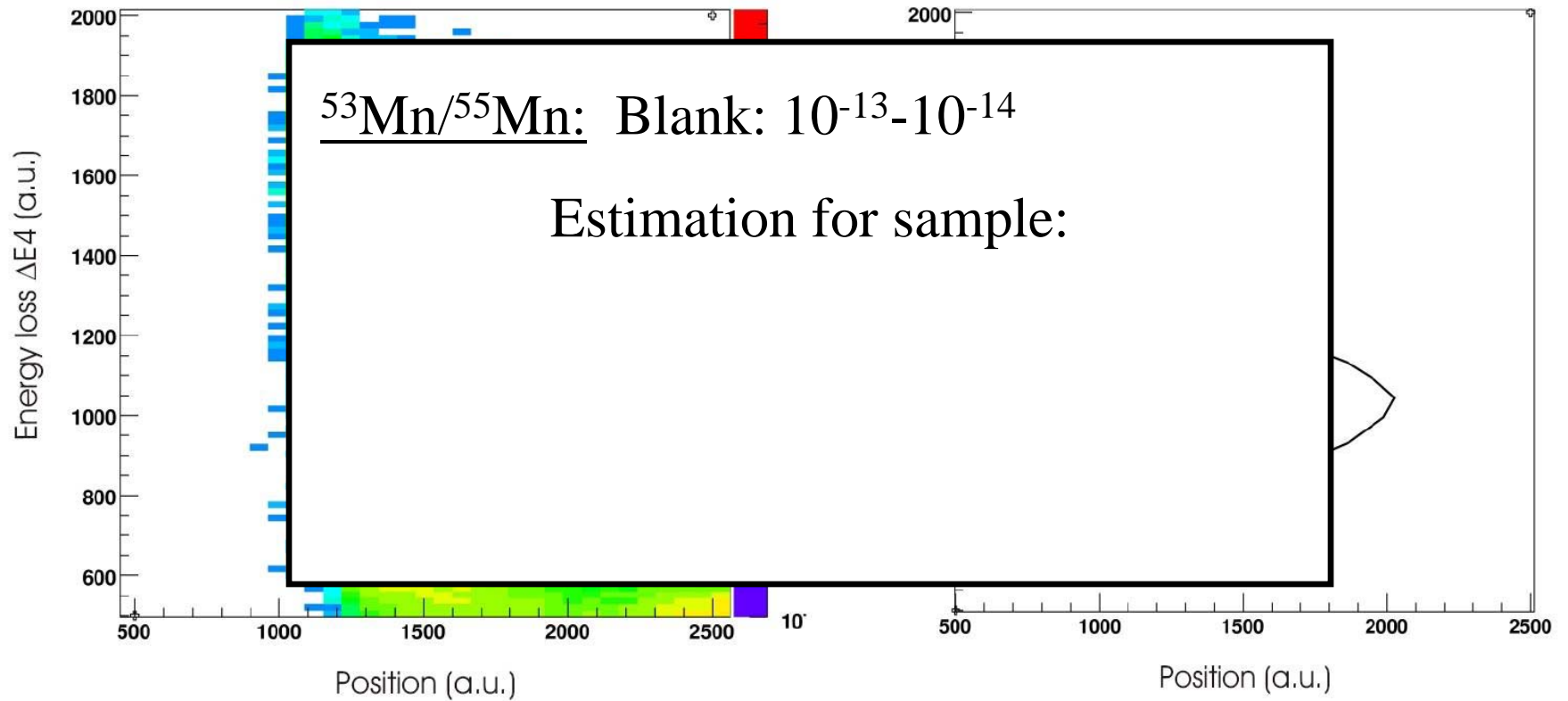
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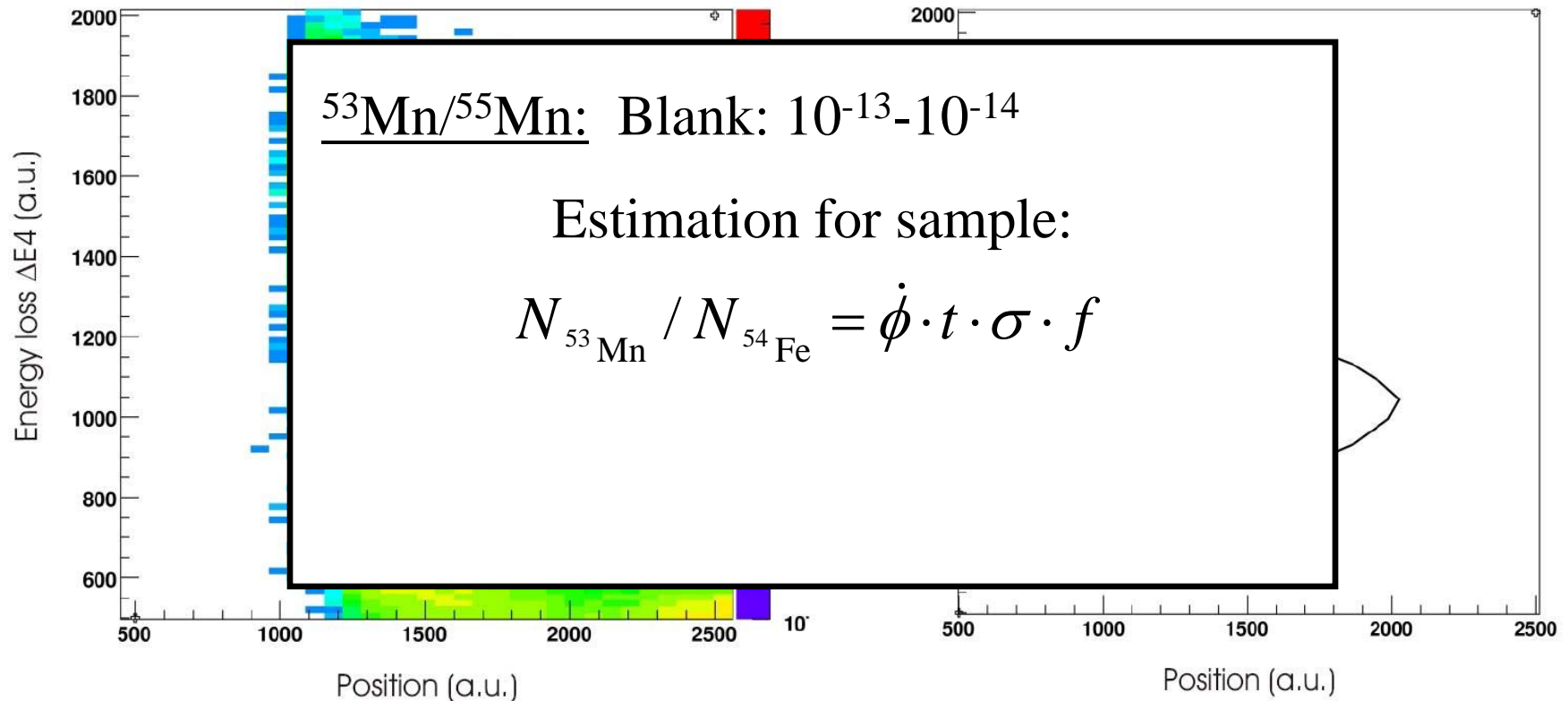
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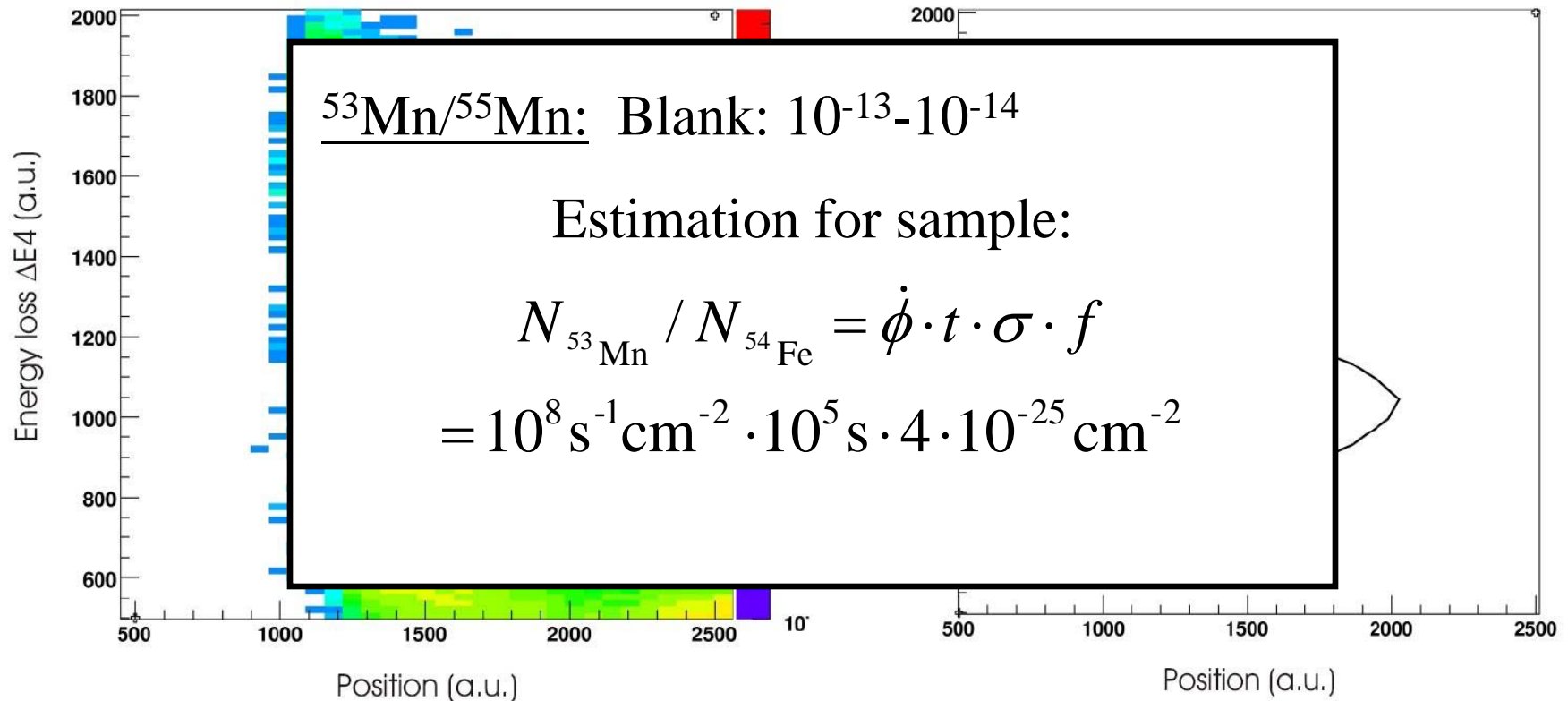
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