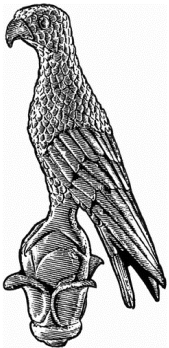


The $^{241}\text{Am}(n,f)$ reaction study at the n_TOF/CERN facility

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Barbagallo^{3,6}, M. Mastromarco^{3,8}, D. Macina³, E. Chiaveri^{3,8,9}, G. Sibbens⁶, A. Moens⁶, D. Vanleeuw⁶
and the n_TOF Collaboration¹⁰



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Introduction/Motivation:

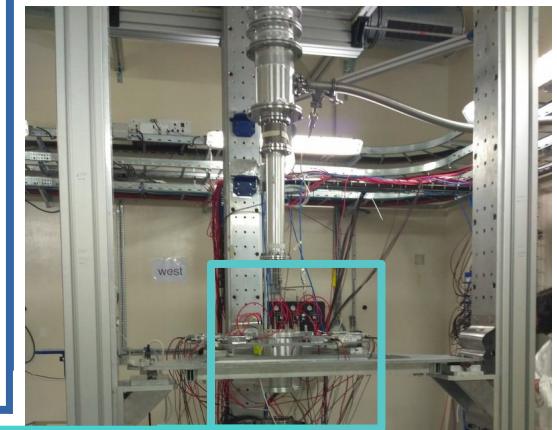
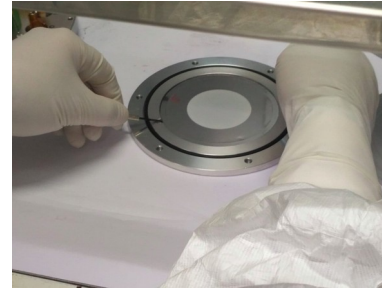
- ^{241}Am ($T_{1/2} = 433 \text{ y}$) is present in high-level nuclear waste
- Represents 1.8% of the actinide mass in spent PWR UOx fuel
- Additional production from the beta-decay of ^{241}Pu ($T_{1/2} = 14.3 \text{ y}$)
- Important for different waste transmutation and recycling scenarios
- $^{241}\text{Am}(n,f)$ reaction is included in the **Nuclear Energy Agency (NEA) Nuclear Data High Priority Request List (HPRL)**

Challenge of the measurement:

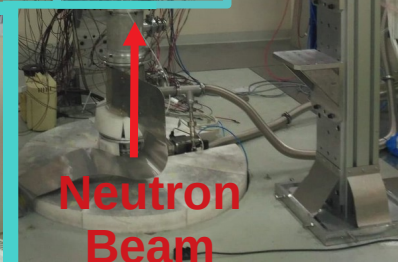
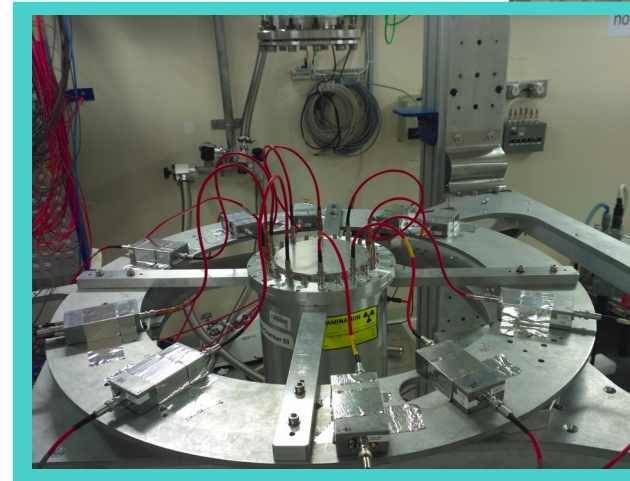
Specific activity of ^{241}Am : 127 MBq/mg → This strong alpha particle background limits the mass of the samples that can be used

Experimental Details:

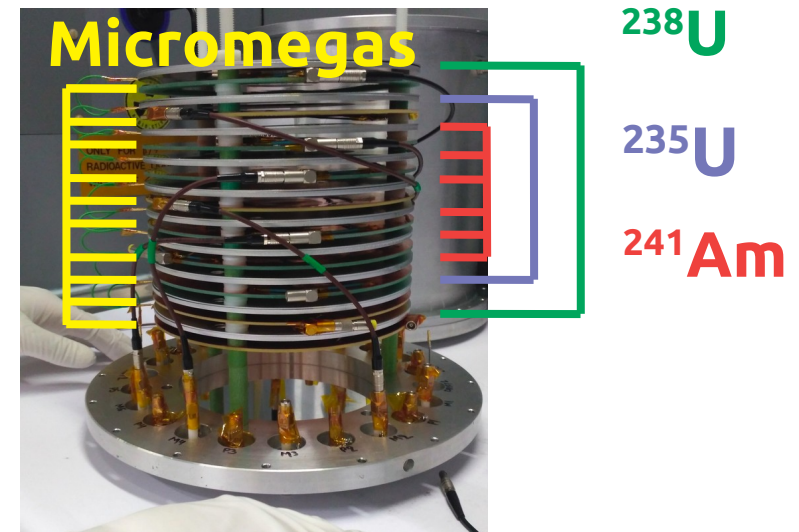
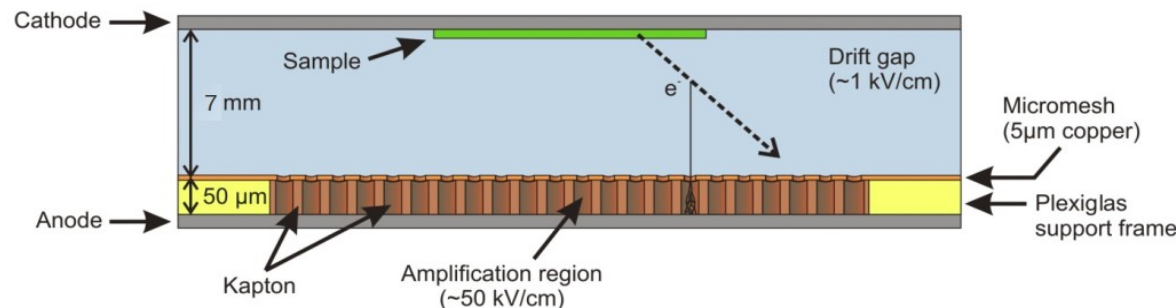
- **Samples** provided by JRC-Geel
6 samples of ^{241}Am (99.98% purity) with total mass of 0.78 mg ($\sim 4.6 \mu\text{g}/\text{cm}^2$ per sample) and **activity of $\sim 0.1 \text{ GBq}$**
Reference samples: **2 x ^{235}U** (total mass 0.56 mg) and **2 x ^{238}U** (total mass 4.28 mg)



- Measurement performed at the **vertical experimental area (EAR2)** of the **neutron time-of-flight facility (n_TOF)** at **CERN** so as to take advantage of the **high instantaneous neutron flux** and also be able to cover an **energy range of almost 10 orders of magnitude** starting from $\sim 10^{-3} \text{ eV}$

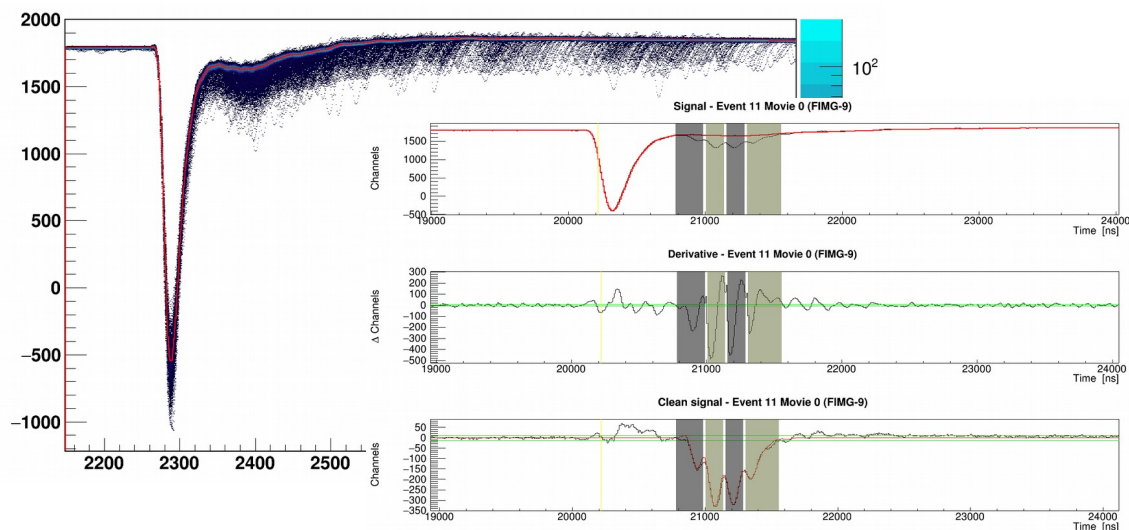


- **Detectors:** Array of Micromegas Detectors (Micro-Mesh Gaseous Structure)

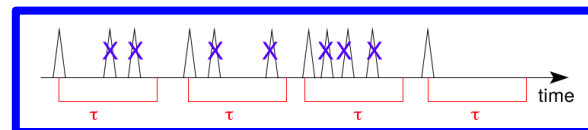


Analysis Progress: Correction factors

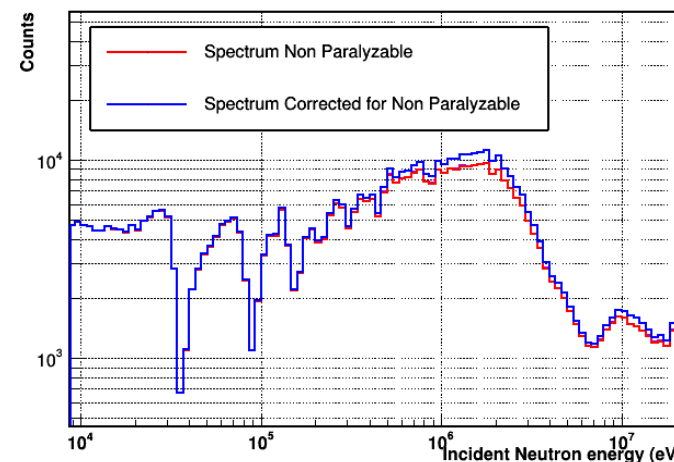
- Gamma-Flash Subtraction and Signal Reconstruction:



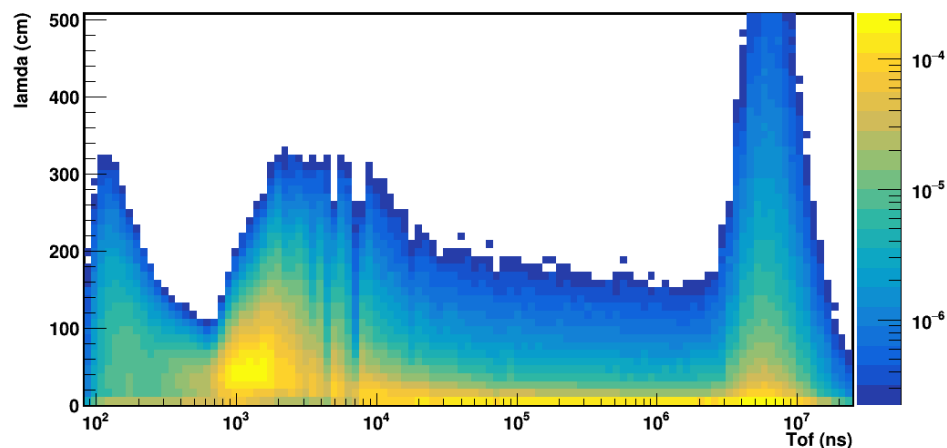
- Dead Time Correction :



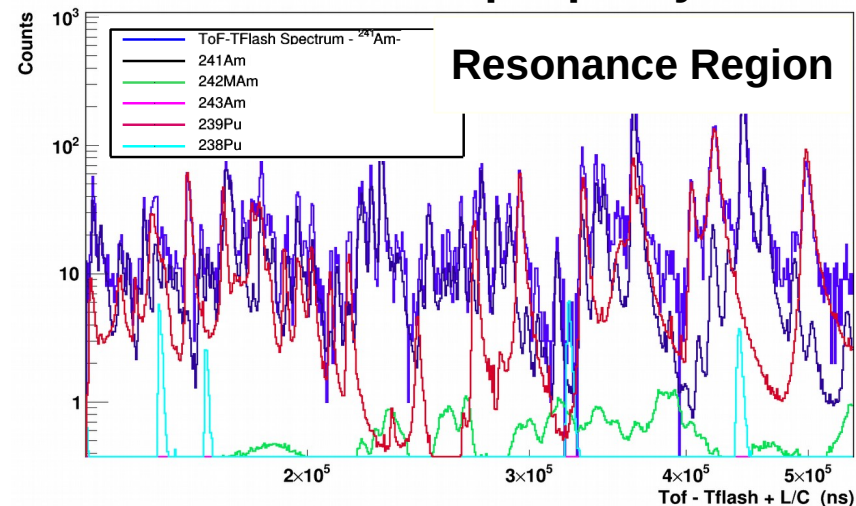
Counting Spectrum - ^{235}U -IRMM #9



- Resolution Function Correction :



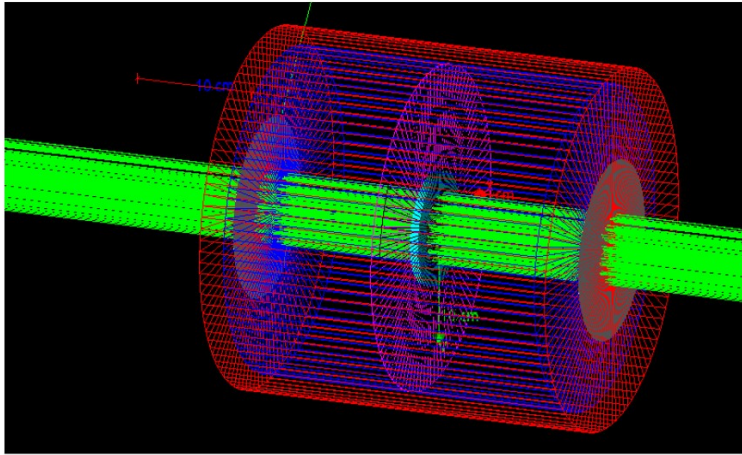
- $^{241}\text{Americium}$ sample purity check:



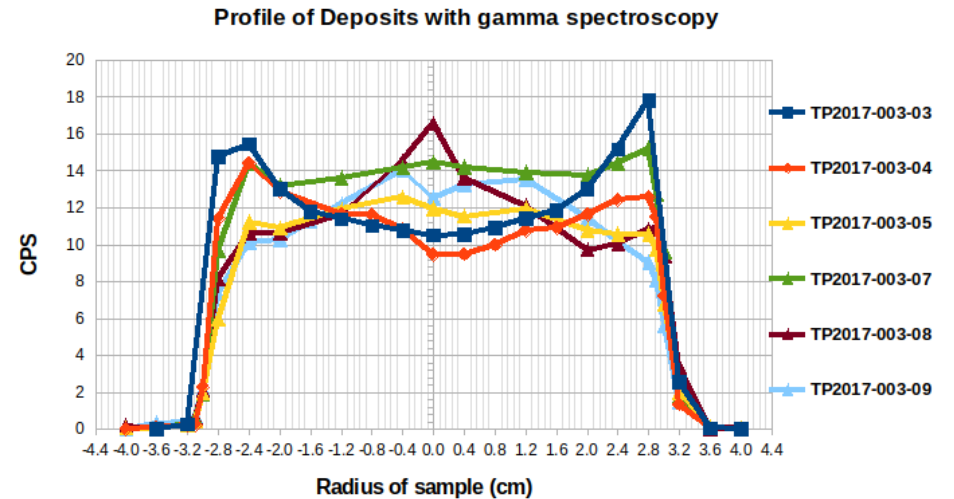
Unreported Contaminant ^{239}Pu ~ 0.5 %

Analysis Progress: Profile of ^{241}Am samples and Detector's Response

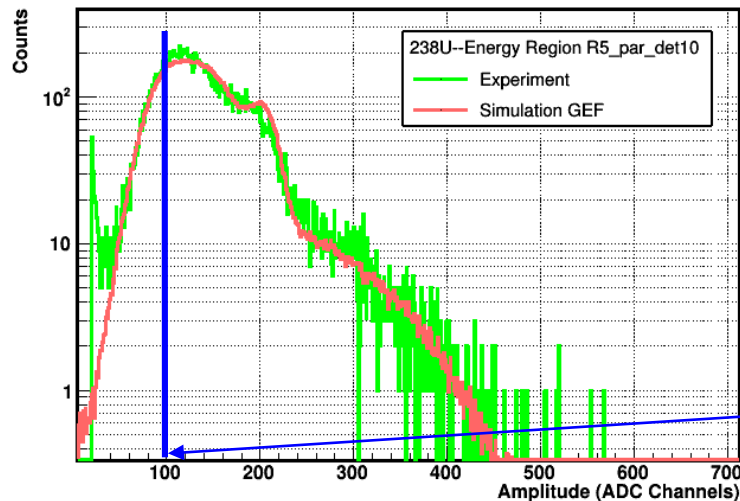
- Geant4 Simulations/GEF Calculations:



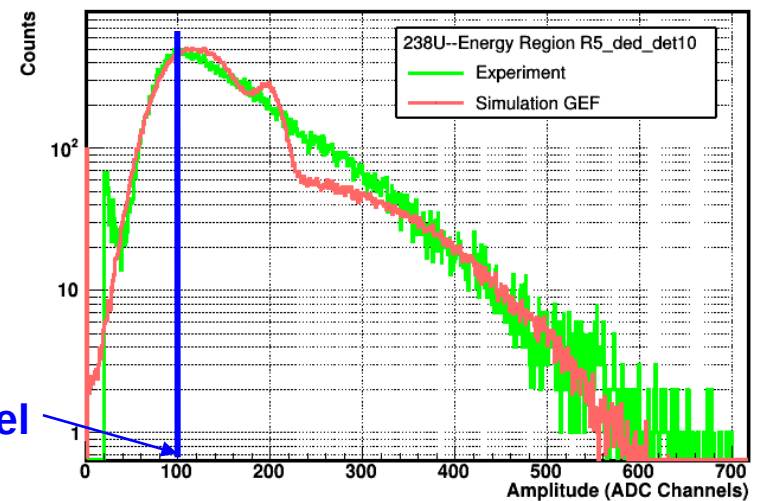
- Investigation of Am targets surface homogeneity:



- Amplitude Cut correction factor:



1 MHz Counting Rate

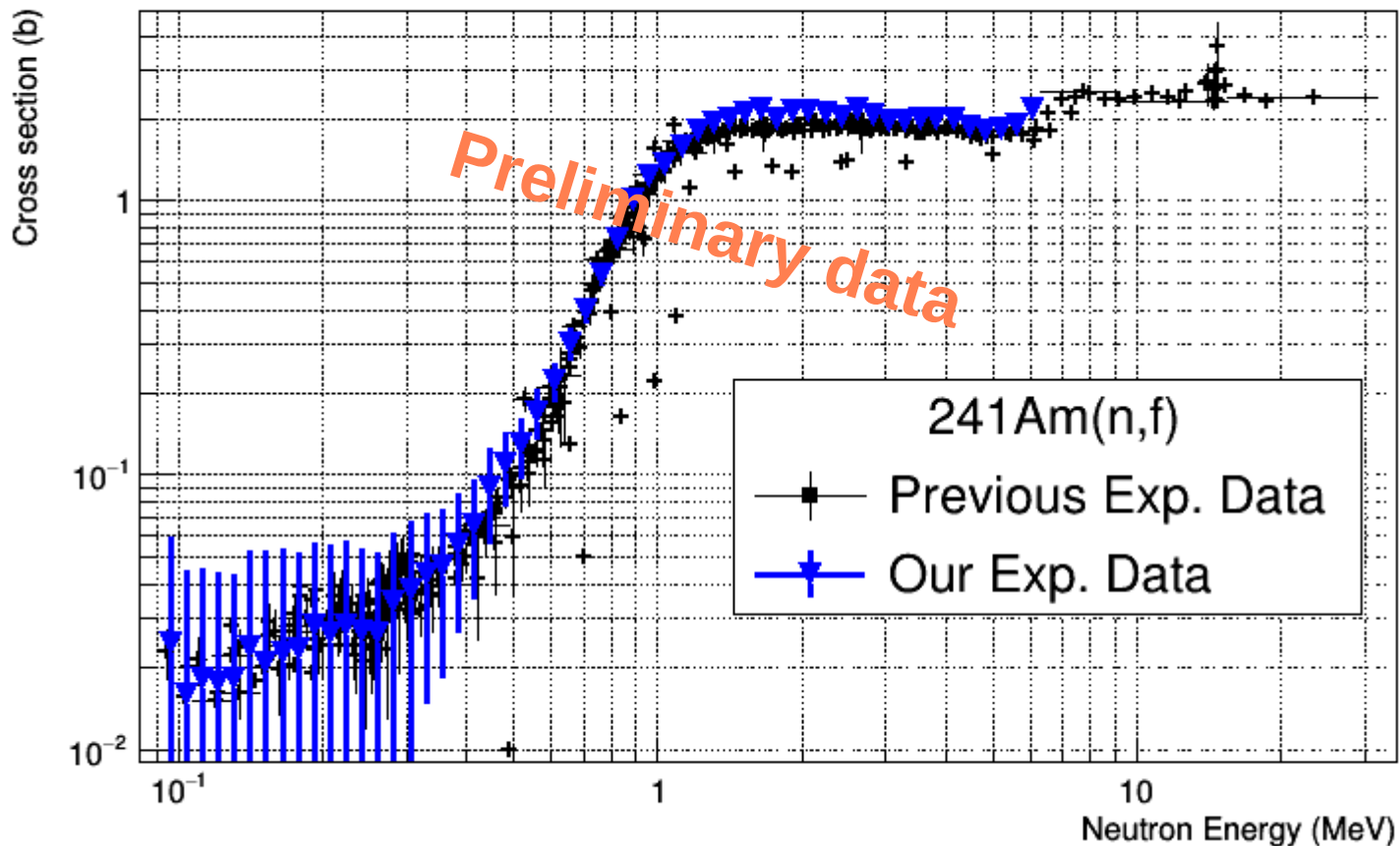


3 MHz Counting Rate

Cut channel

Results/Conclusions:

- Measurement of the $^{241}\text{Am}(n,f)$ reaction at the n_TOF Experimental Area 2 using micromegas detectors
- Preliminary data in a wide energy range from thermal up to the MeV with emphasis at the near threshold energies



Publications in Conference Proceedings for this work:

- Z. Eleme, N. Patronis et al., HNPS Advances in Nuclear Physics, 27, 189-194 (2019)
<http://dx.doi.org/10.12681/hnps.3008>
- Z. Eleme, N. Patronis et al., ND2019, EPJ Web of Conferences 239, 05014 (2020)
<https://doi.org/10.1051/epjconf/202023905014>



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