SPES -Thin target calculations: isotope production and power deposition

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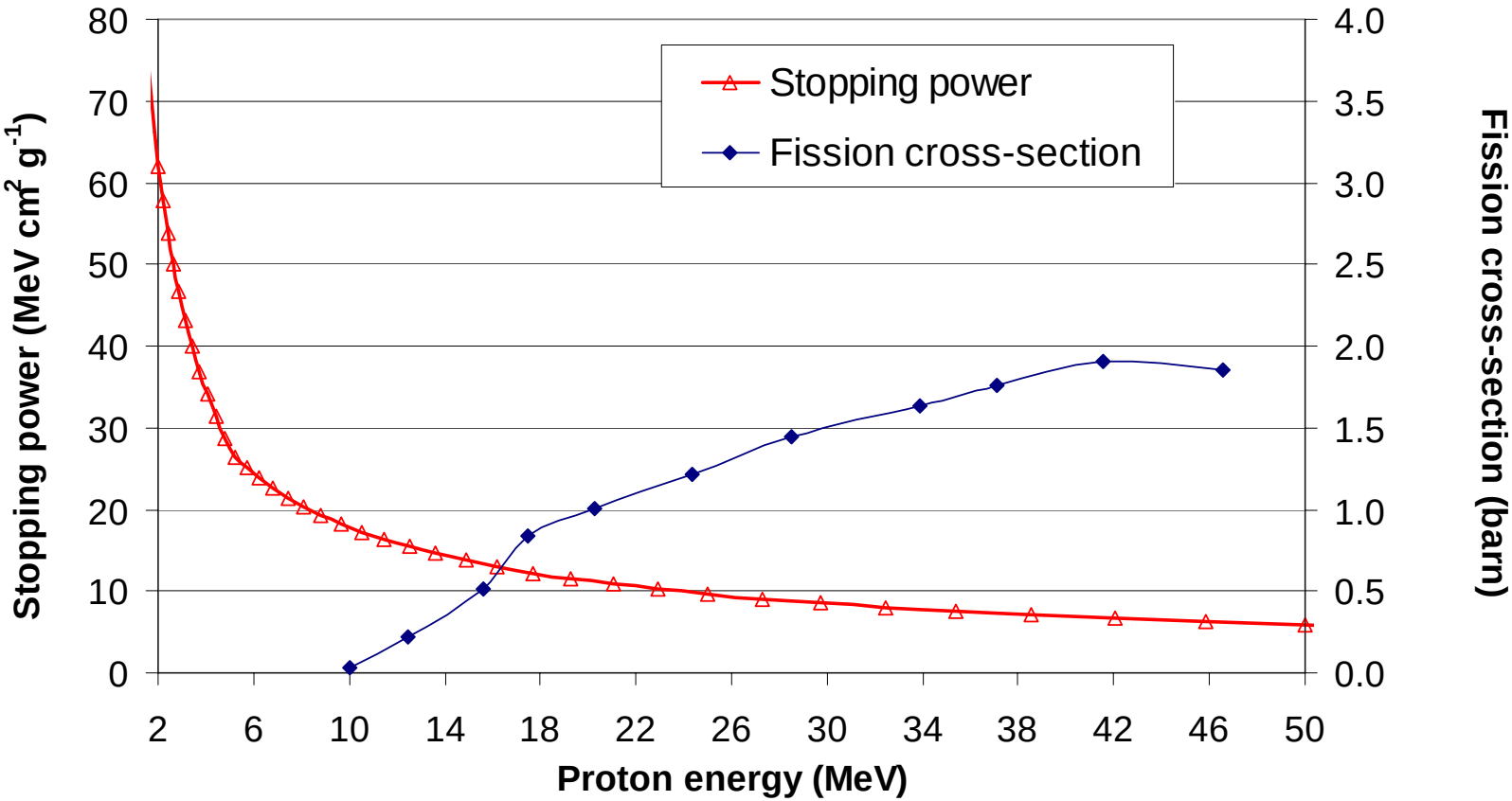
Content:

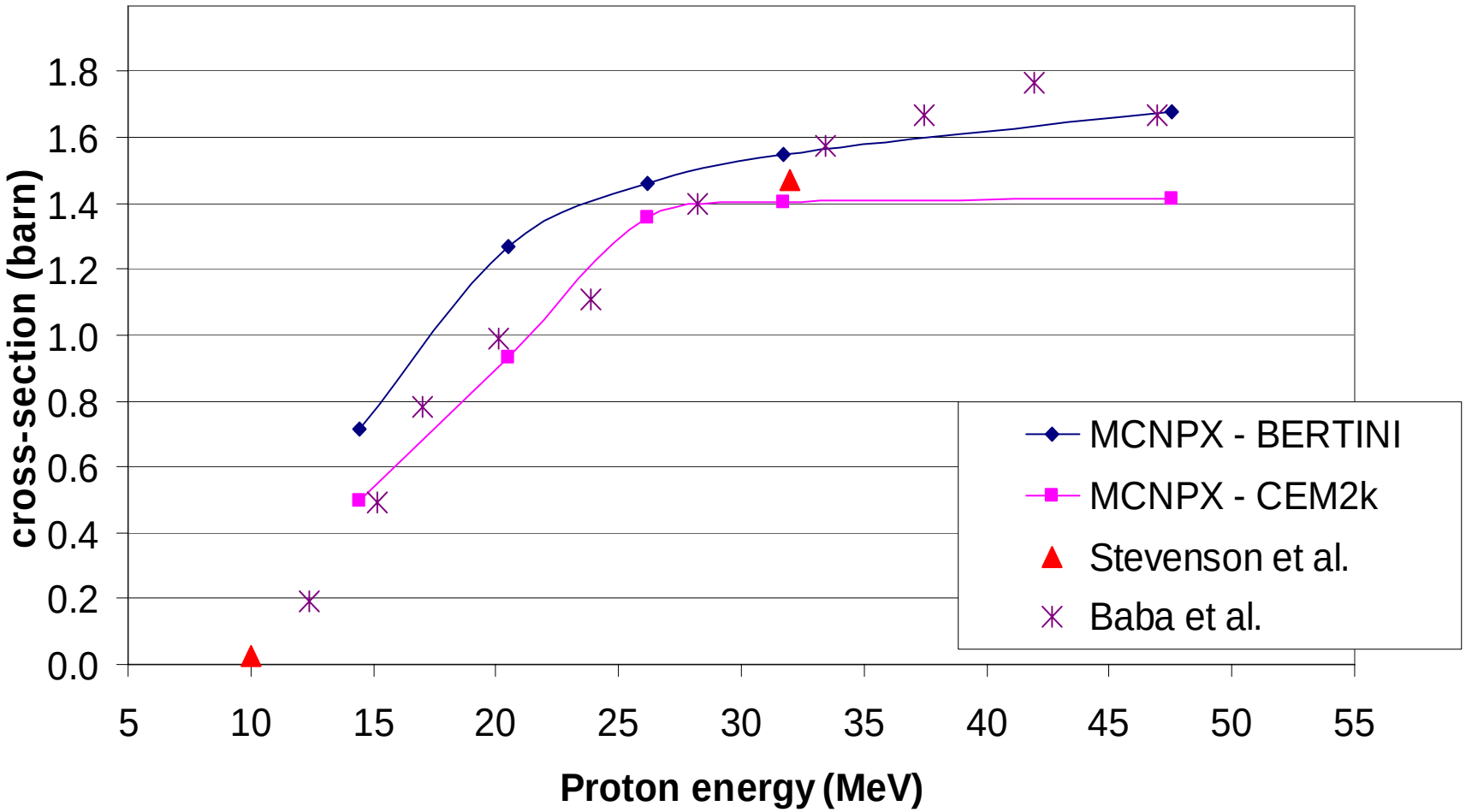
- Description of the target configuration
- Some evaluations for accuracy of the MCNPX code
- Simulations (by MCNPX) for:
  1. power deposition
  2. fission rates
  3. fragmentation distribution
  4. activation (FISPACT code)

Stopping power & Fission cross-section for protons on UCx



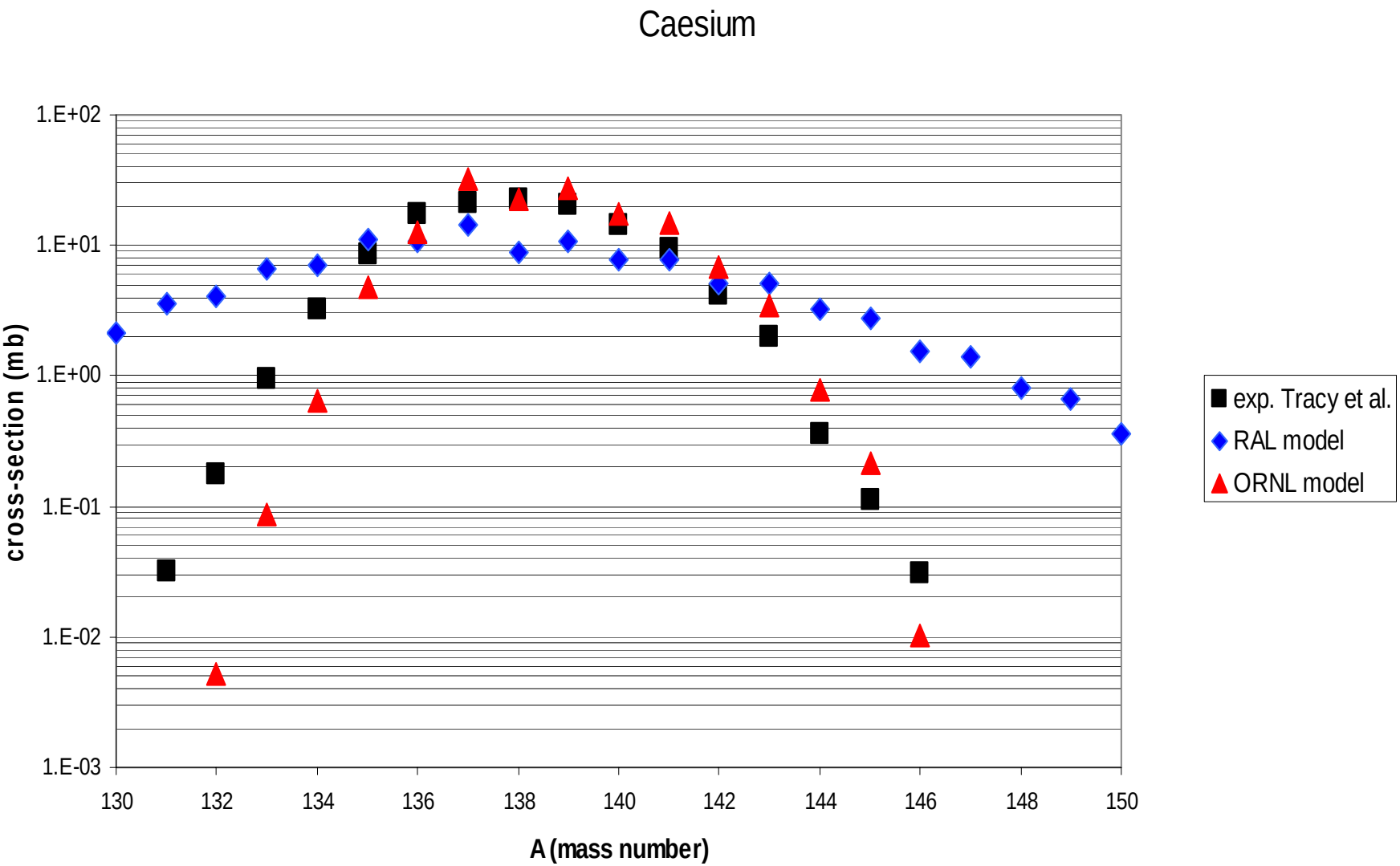
For lower power deposition in uranium keeping high fission rates:
High energy p+ in the UCx and low energy p+ towards a dump.

Comparison MCNPX vs. experim. for ^{238}U proton fiss.



Discrepancies for the fission cross-section lie in the range 10%-30%

Comparison MCNPX vs. experim. for 40 MeV



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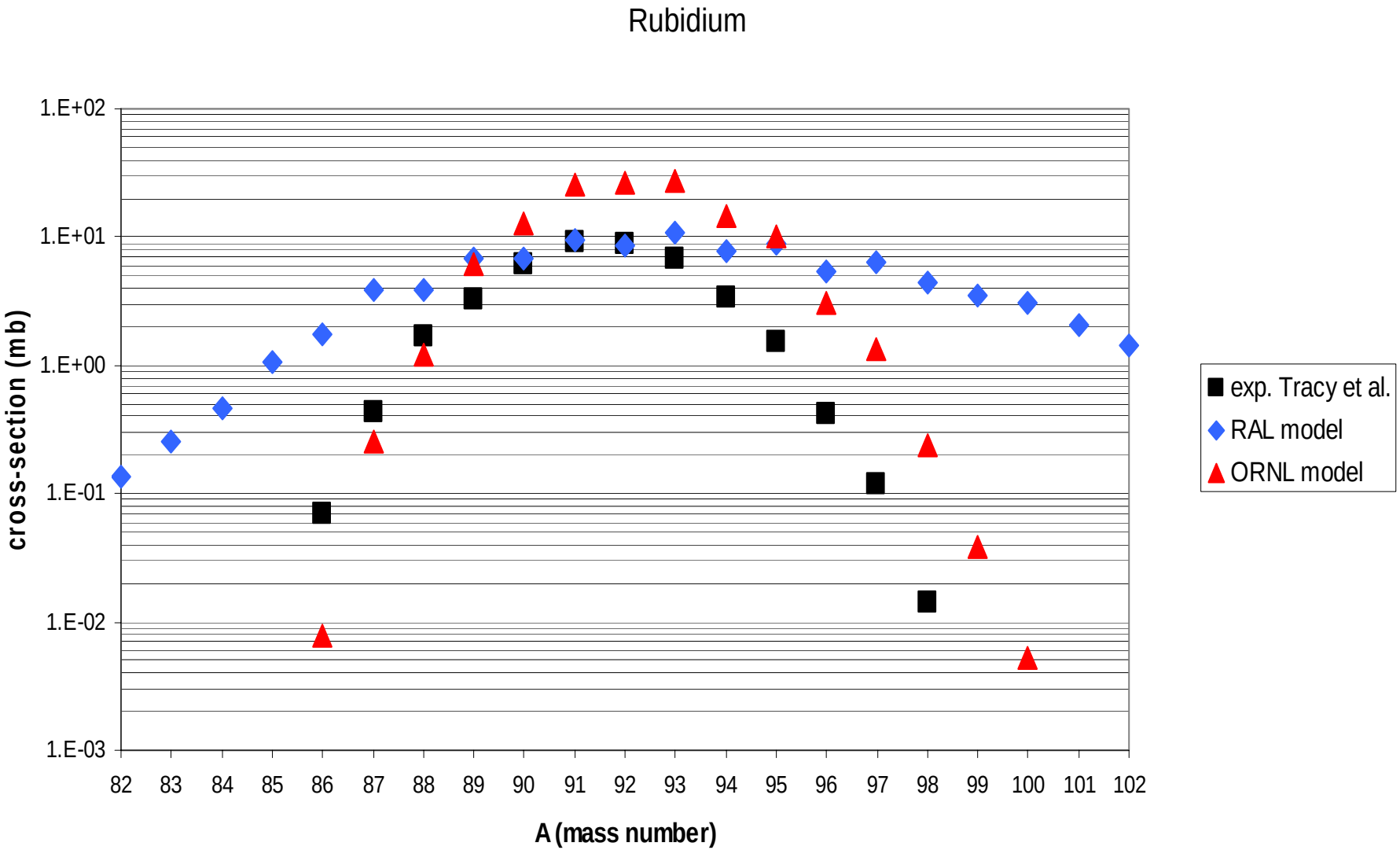
Comparison MCNPX vs. experim. for 40 MeV



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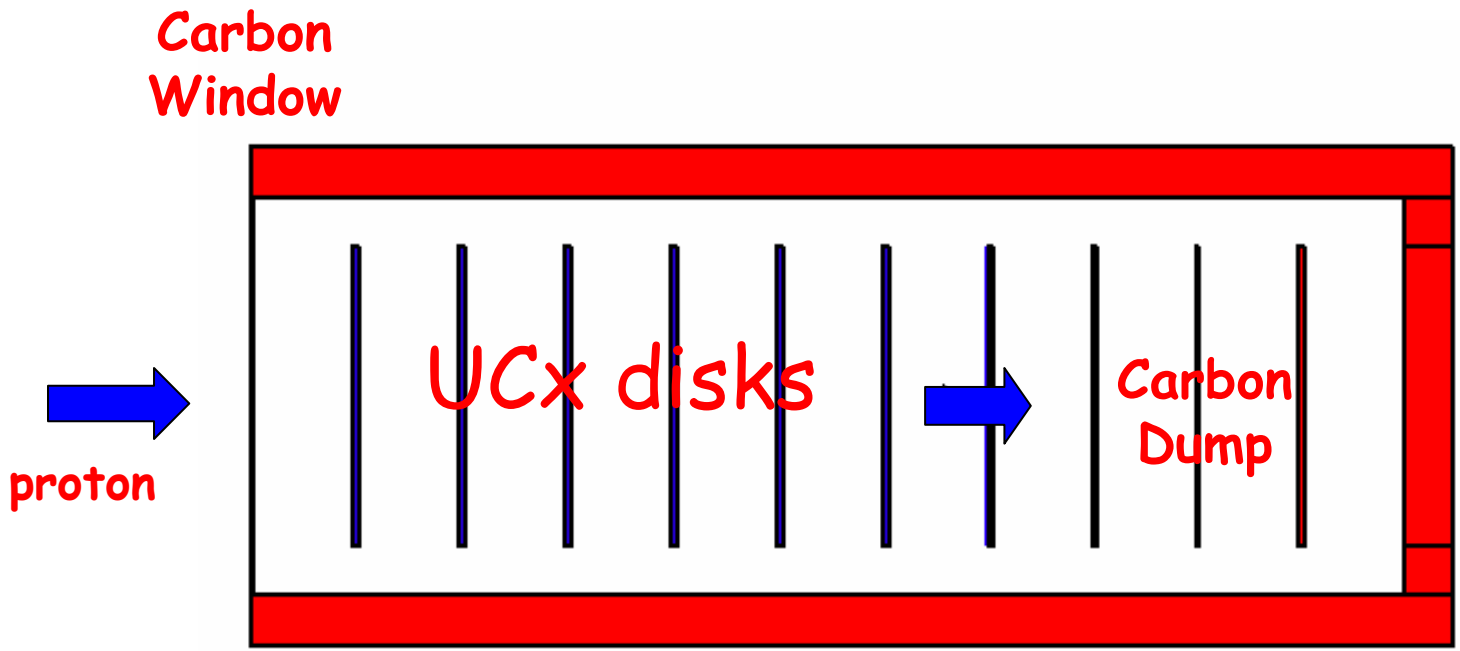
1-step thin target configuration



~580 Watt / UC_x disk

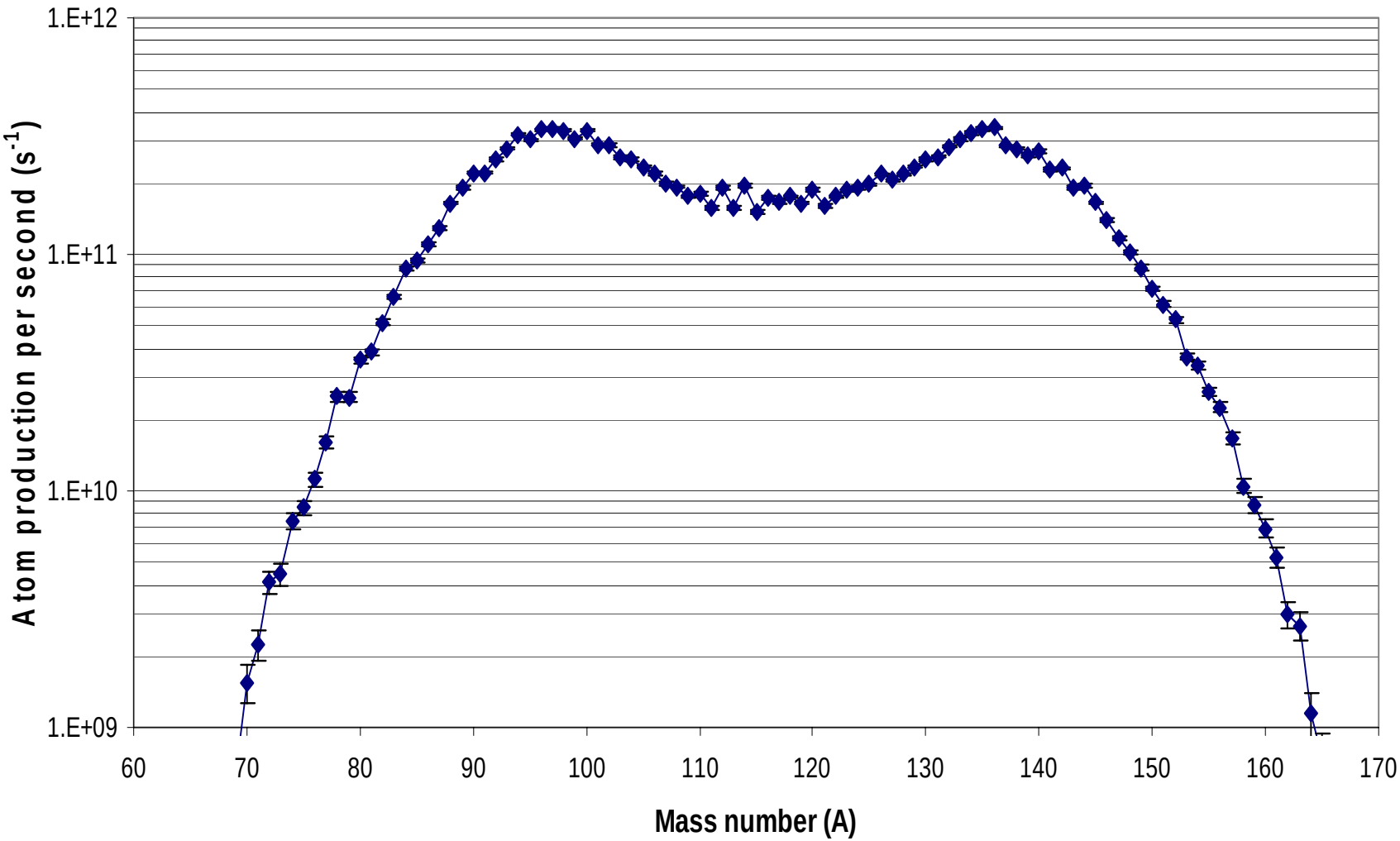
$7.6 \cdot 10^{12}$ fissions/s $\Rightarrow$ $1.5 \cdot 10^{13}$ atoms/s

Beam proton energy	40 MeV
Beam current	0.2 mA
Beam profile	Uniform circle with r=3 cm
Window	Carbon, 1.75 g/cm^3, 400 μm
Target material	UC_x (U:C=1:4) , 2.5 g/cm^3
Target disks	7 disks, r=3 cm, thickness=1.2-1.4 mm
Dump material	Carbon, 1.75 g/cm^3
Dump disks	3 disks, r=3 cm, thickness=0.8-1 mm
External box	Carbon, 1.75 g/cm^3

Data to be confirmed: radius? densities?

Mass distribution (in-target)

MCNPX-ORNL (Oak-Ridge National Laboratory) model



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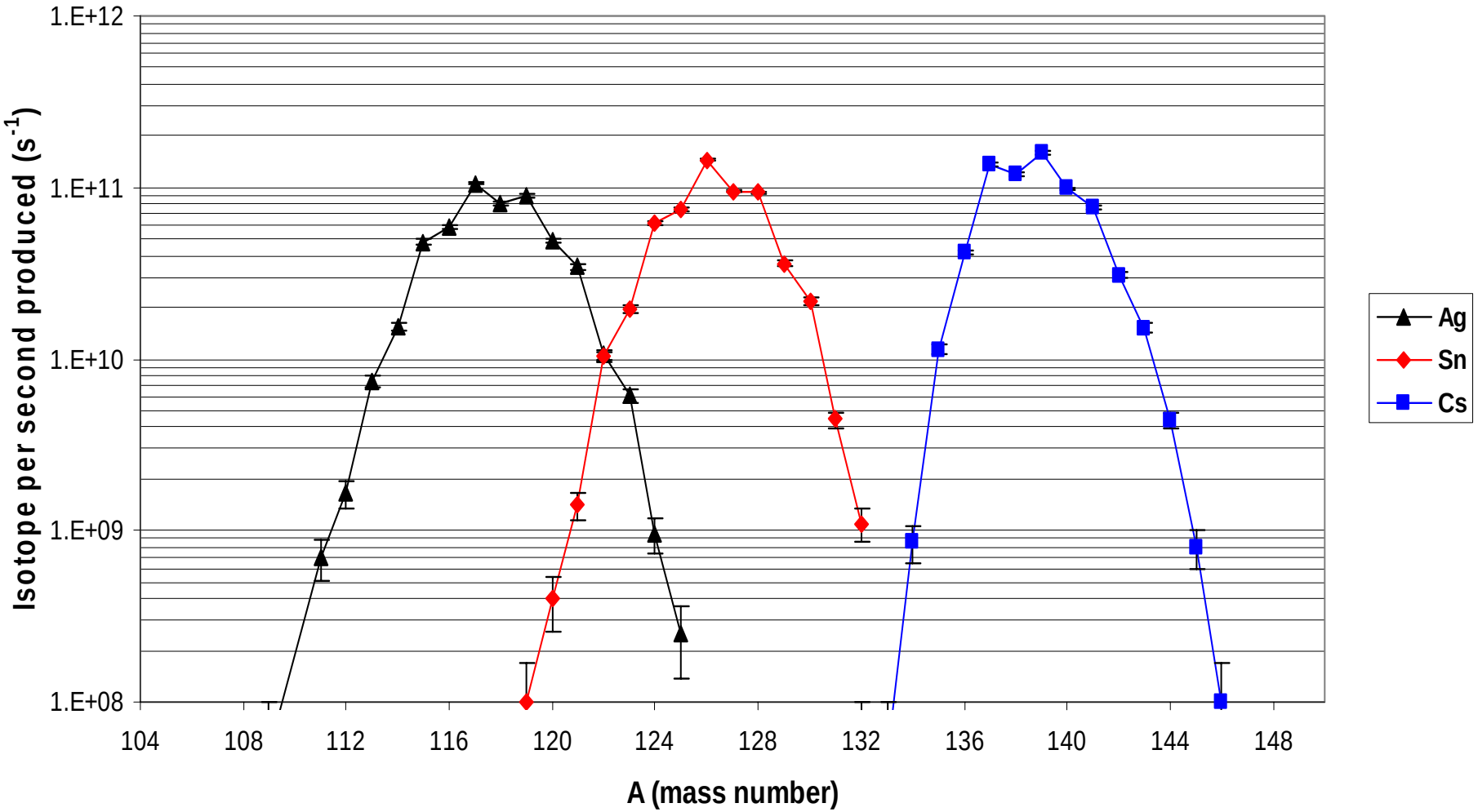

^{132}Sn produced: ~10^9 s^{-1}

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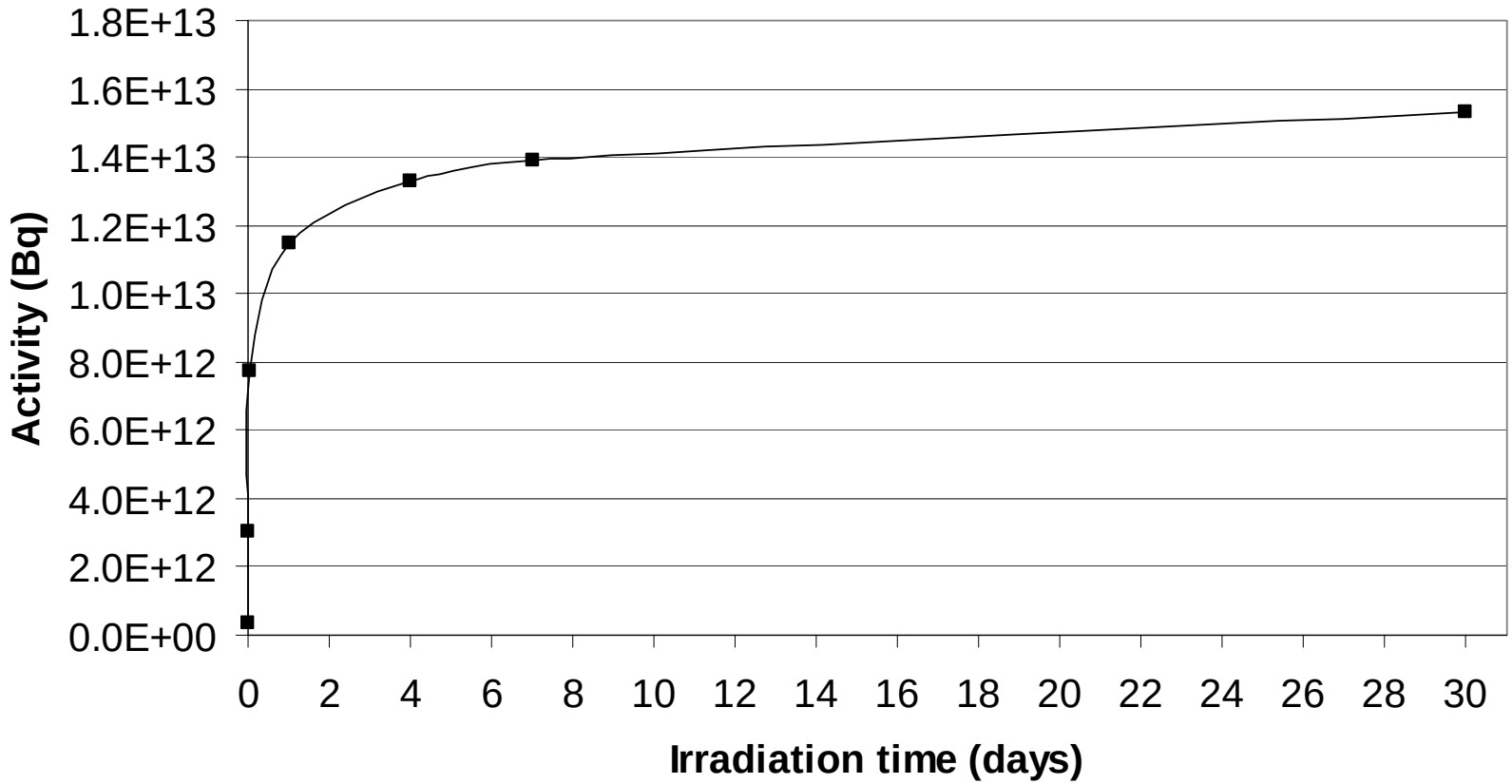
Induced target ACTIVITY during a full irradiation time of 1 month

(warning: 30% of the atoms/sec not included in the code. No tritium)

after 1 hour: ~$8 \cdot 10^{12}$ Bq (= $2 \cdot 10^{14}$ Bq/kg)

after 1 month: ~$1 \cdot 10^{13}$ Bq. (= $4 \cdot 10^{14}$ Bq/kg), ~10^{16} H^3 atoms, ~$2 \cdot 10^{-4}$ gr.of Pu



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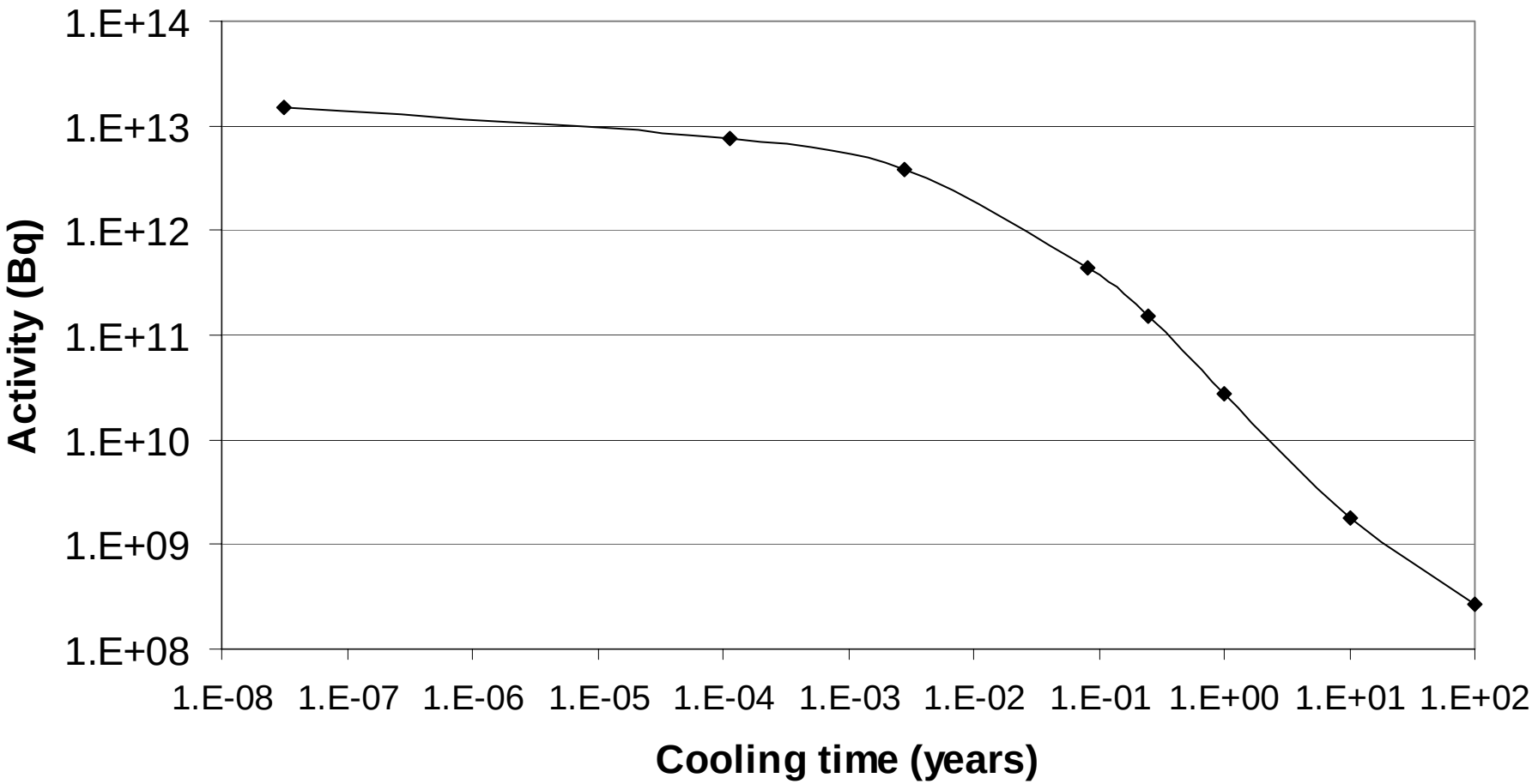
ACTIVITY of the UCx discs during cooling (after irradiation of 1 month)



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