Photodissociation of neutron deficient nuclei

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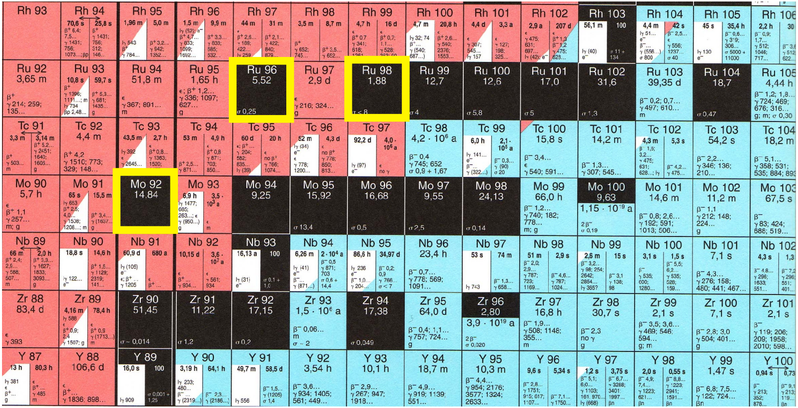
Reaction rates in the $A \approx 100$ region at $T_9 = 2.5$



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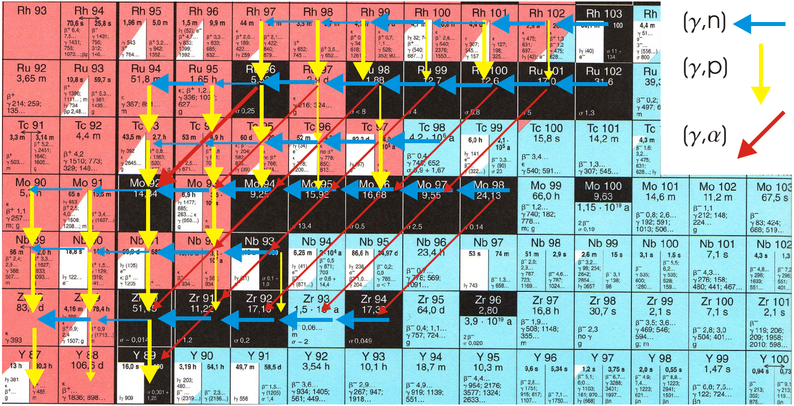
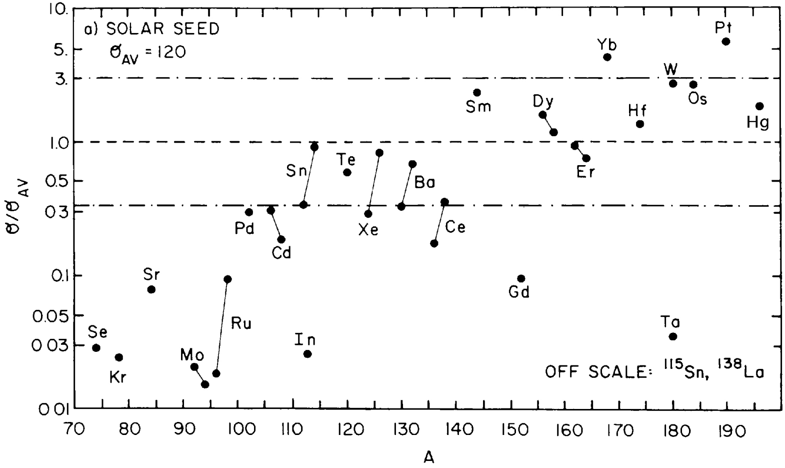
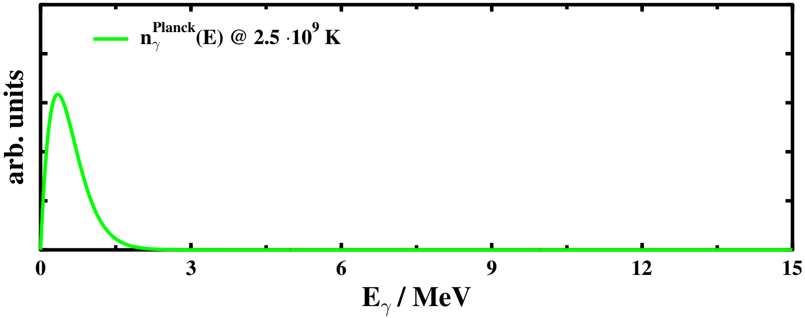


Overproduction factors



Gamow window for (γ,n) reactions

- Planck distribution: $n_\gamma^{\text{Planck}} \mathrm{d}E = \frac{1}{\pi^2(\hbar c)^3} \frac{E^2}{\exp(E/kT)-1} \mathrm{d}E$



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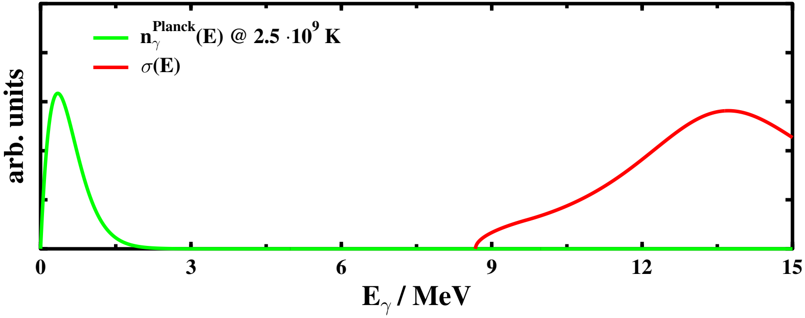

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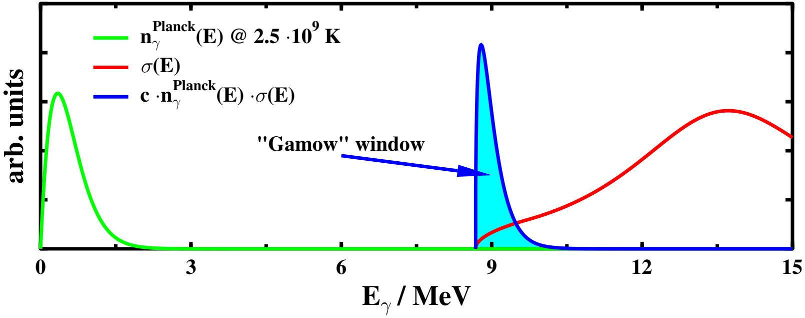
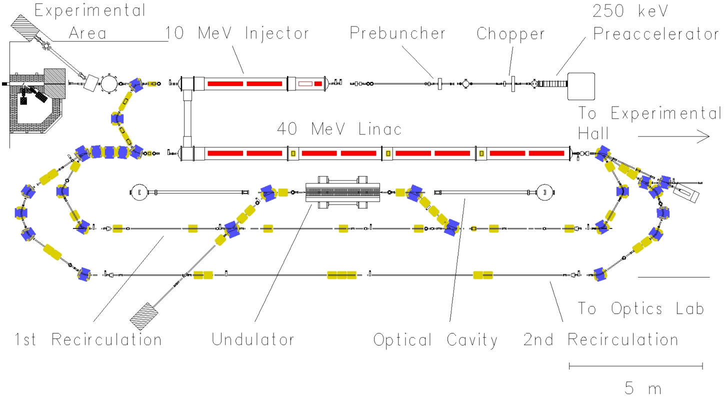
- Cross section $\sigma(E)$ with typical threshold behaviour
- Reaction rate: $\lambda(T) = \int c \cdot n_\gamma^{\text{Planck}} \cdot \sigma(E) \cdot \mathrm{d}E$



First step: Activation



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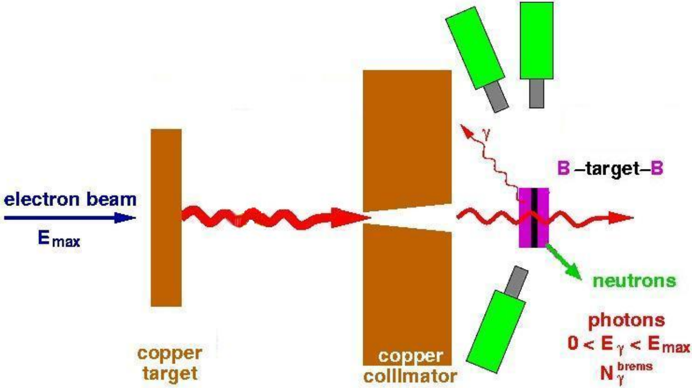

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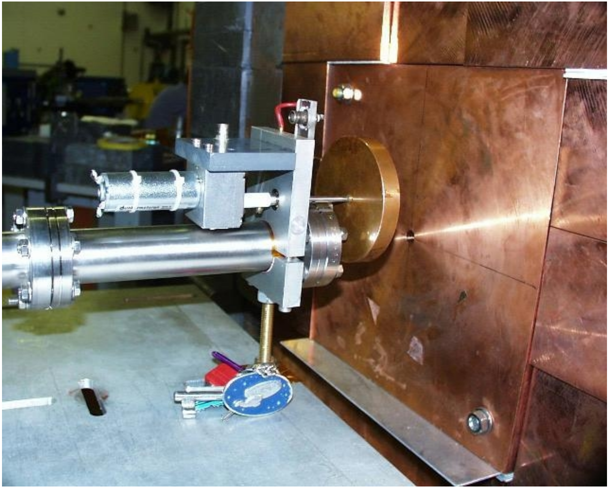
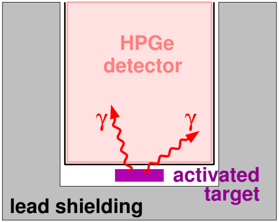
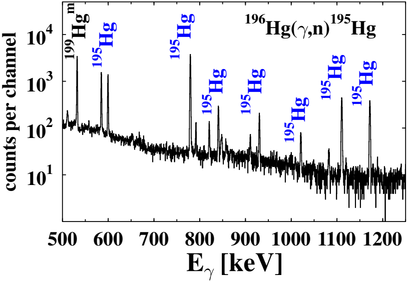


Second step: γ-spectroscopy

Setup



γ-spectrum



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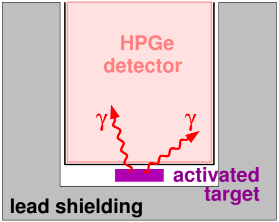

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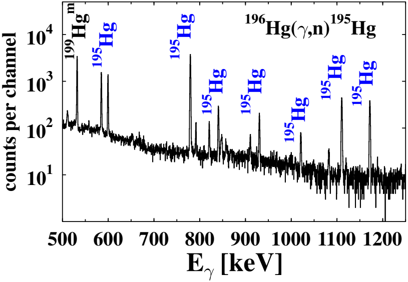


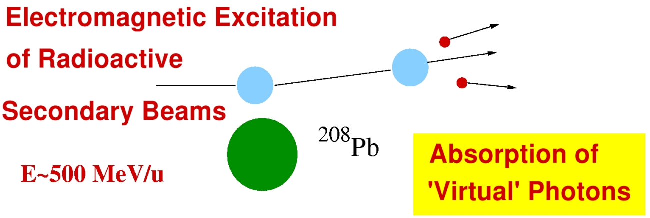
- Isotopic abundance of ^{196}Hg: 0.15%

Groundstate reaction rates at $T = 2.5 \cdot 10^9$ K

isotope	λ_{exp} [s^{-1}]			λ_{NONS} [s^{-1}]	λ_{MOST} [s^{-1}]
^{96}Zr	6.2	$\pm$	0.3	6.1	—
^{186}W	314	$\pm$	44	257	250
^{185}Re	19	$\pm$	9	12.8	—
^{187}Re	94	$\pm$	5	70.5	74.9
^{190}Pt	0.4	$\pm$	0.2	0.18	0.29
^{192}Pt	0.5	$\pm$	0.2	0.58	0.56
^{198}Pt	80	$\pm$	19	50	110
^{197}Au	6.2	$\pm$	0.8	4.8	5.6
^{196}Hg	0.42	$\pm$	0.07	0.32	0.58
^{198}Hg	2.0	$\pm$	0.3	1.4	2.1
^{204}Hg	57	$\pm$	9	73	170
^{204}Pb	1.9	$\pm$	0.3	1.5	3.0

Photodissociation in inverse kinematics

real photons $\longrightarrow$ virtuals photons



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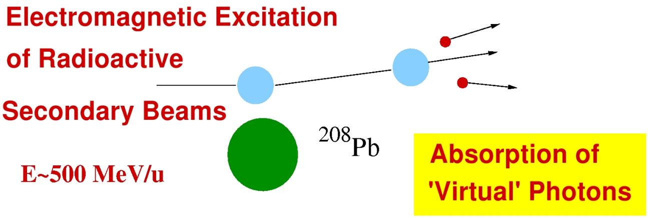
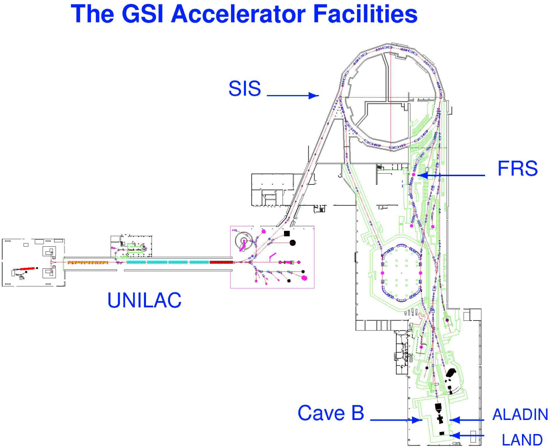


$$^{208}\text{Pb}(^{100,94,93,92}\text{Mo},^{99,93,92,91}\text{Mo}+\text{n})^{208}\text{Pb}$$

Coulomb dissociation at GSI/LAND



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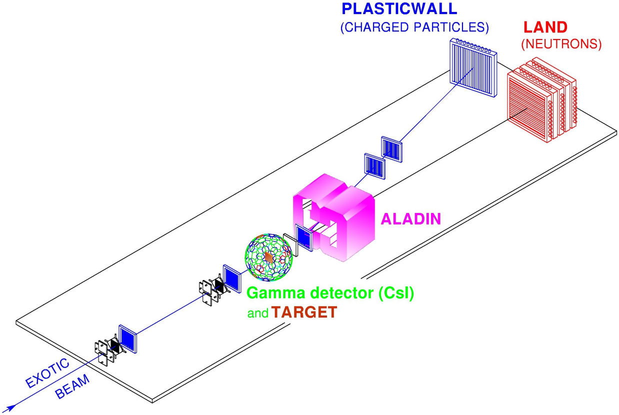

Summary & Outlook

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- Photoactivation of ^{92}Mo @ ELBE

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- Photoactivation of ^{100}Mo @ S–DALINAC

Collaboration for Experiment S295

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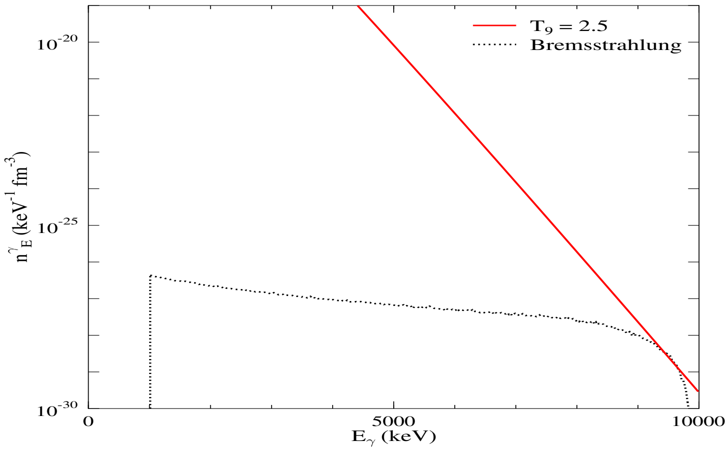
Direct determination of the reaction rate



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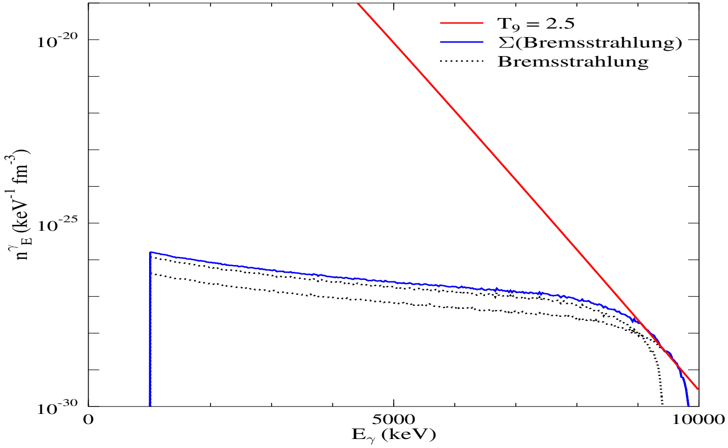

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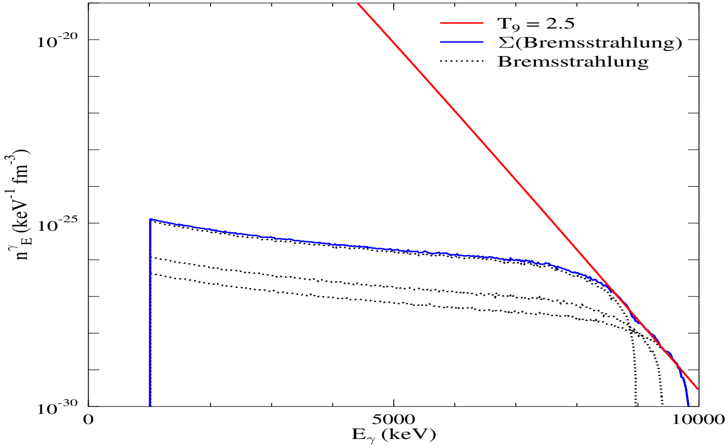

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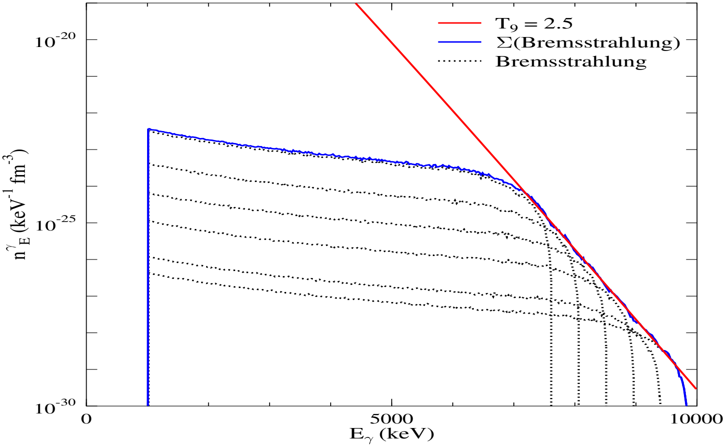

- Reaction rate: $\lambda(T) \propto \sum a_i(T) \cdot Y_i$