



TECHNISCHE
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*Total photoabsorption measurements
at NEPTUN*

Heiko Scheit

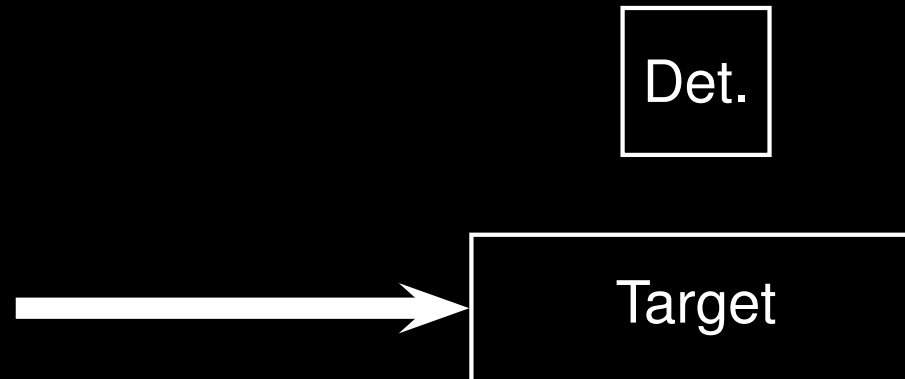


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July 06, 2018

Nuclear Absorption |

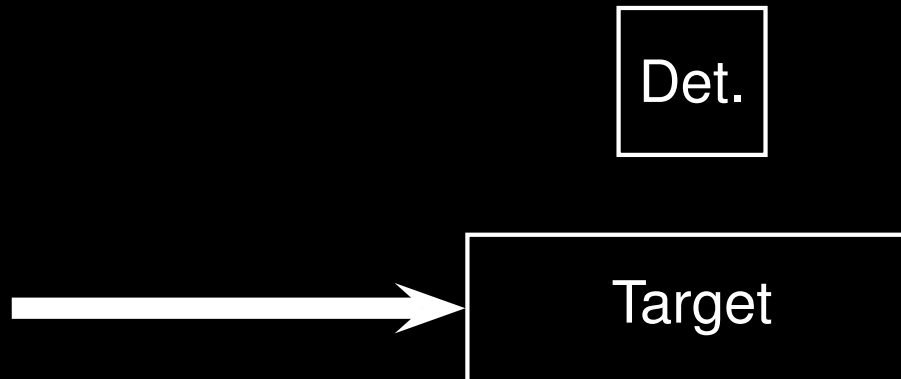
Gamma cascades
Nuclear Absorption
Previous work
Improvements
Status and plan



$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma}$$

Nuclear Absorption |

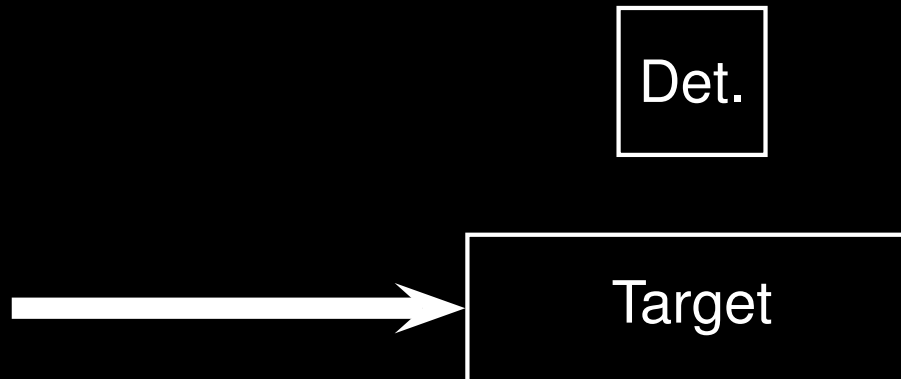
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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'}$$

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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n}$$

Nuclear Absorption |

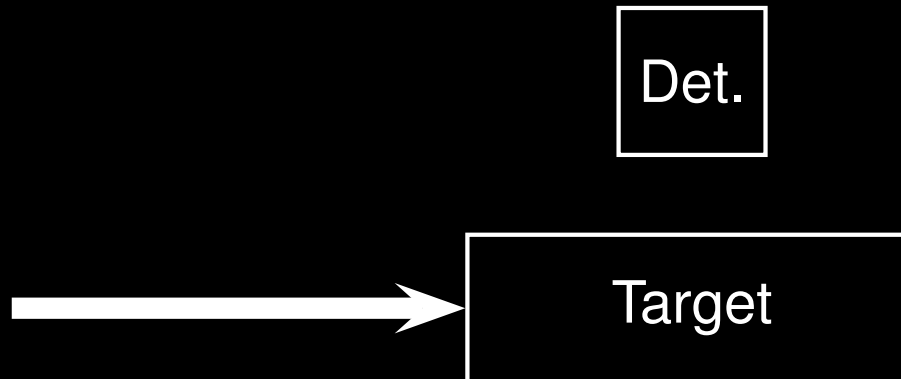
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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n} + \sigma_{\gamma,2n} + \sigma_{\gamma,xn}$$

Nuclear Absorption |

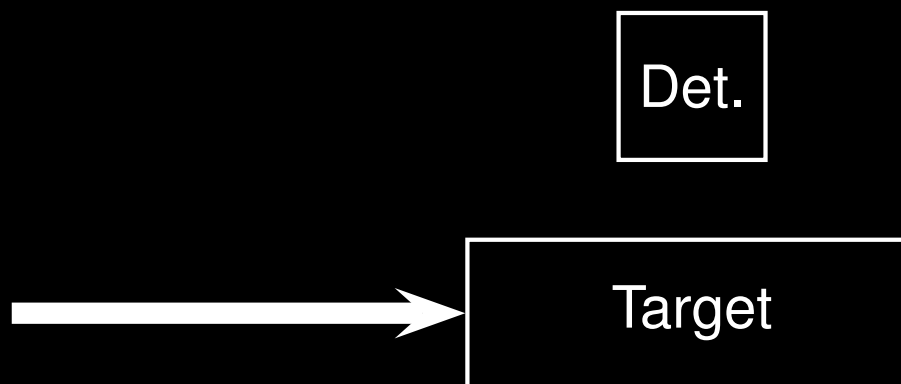
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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n} + \sigma_{\gamma,2n} + \sigma_{\gamma,xn} + \sigma_{\gamma,p}$$

Nuclear Absorption |

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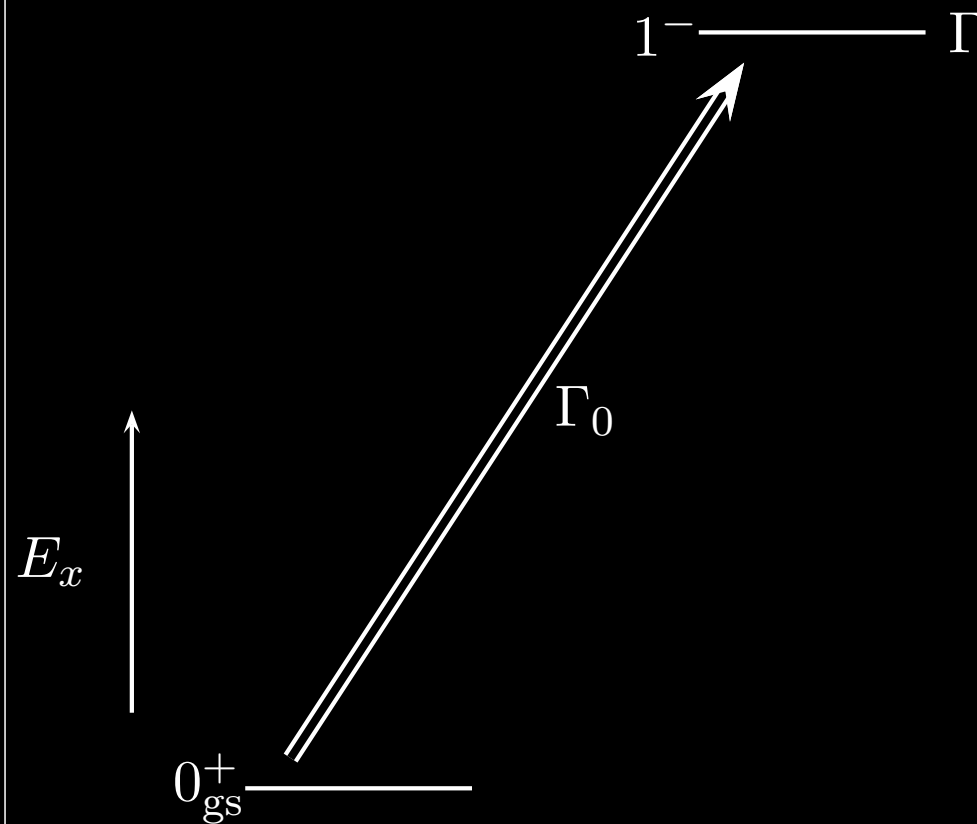


$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n} + \sigma_{\gamma,2n} + \sigma_{\gamma,xn} + \sigma_{\gamma,p} + \sigma_{\gamma,\alpha} + \sigma_{\dots} + \dots$$

Gamma cascades



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Nuclear Absorption

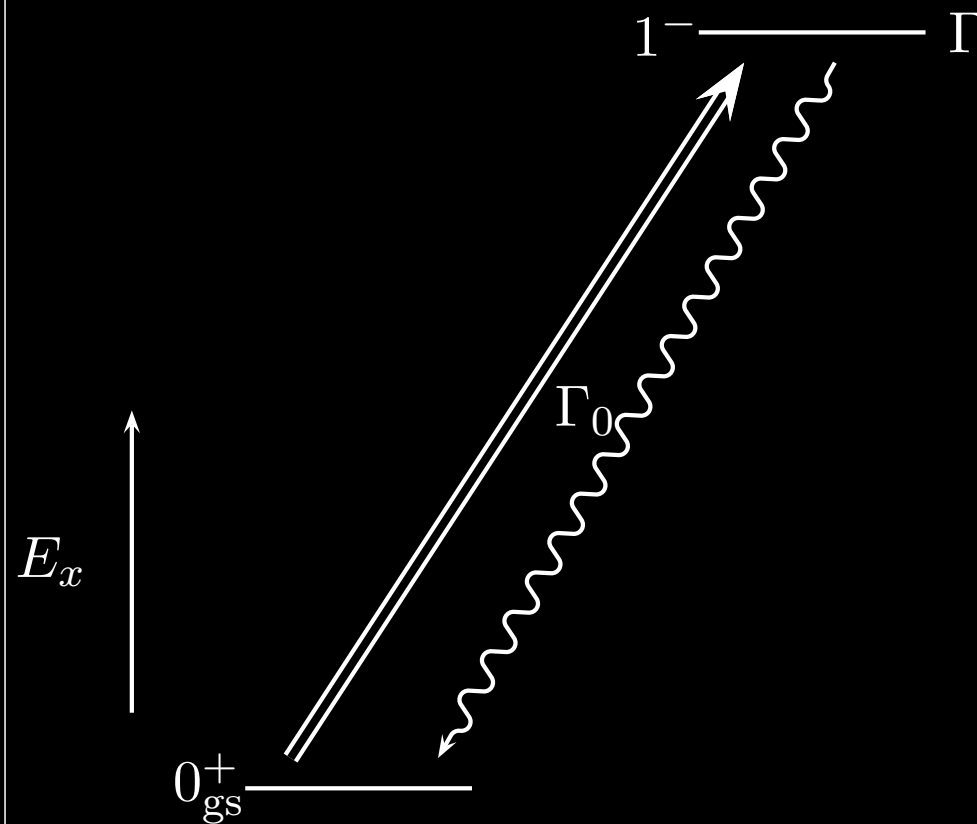
Gamma cascades |

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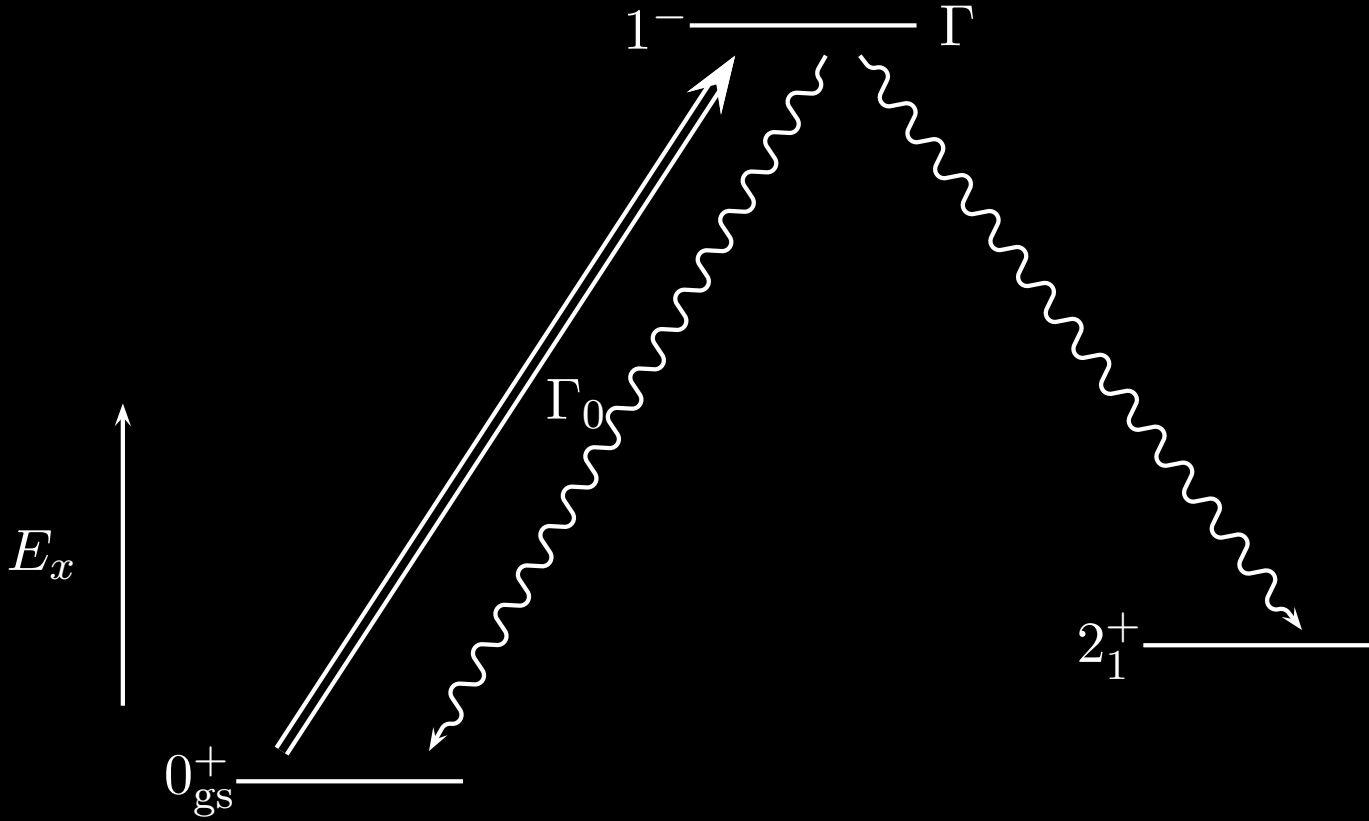
Status and plan



Gamma cascades



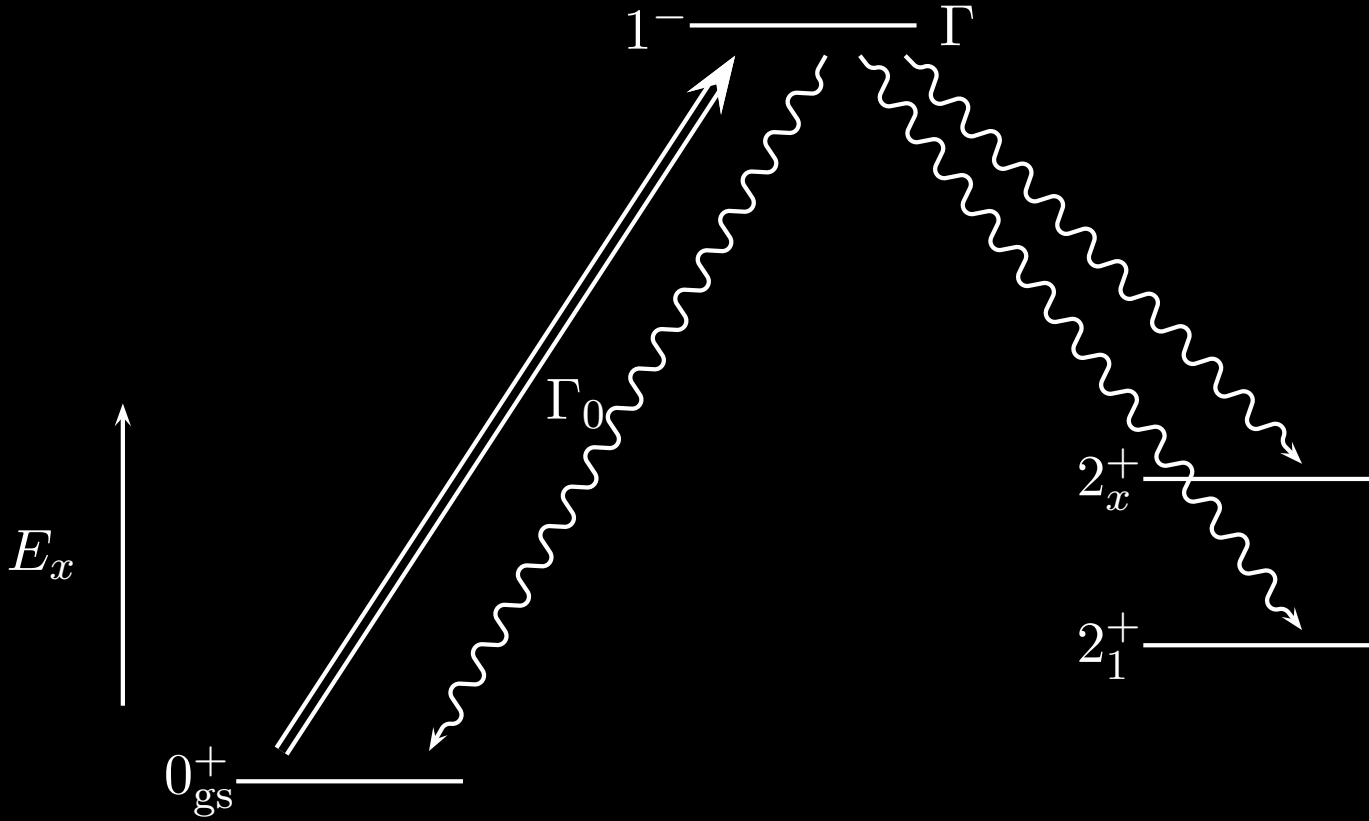
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Gamma cascades



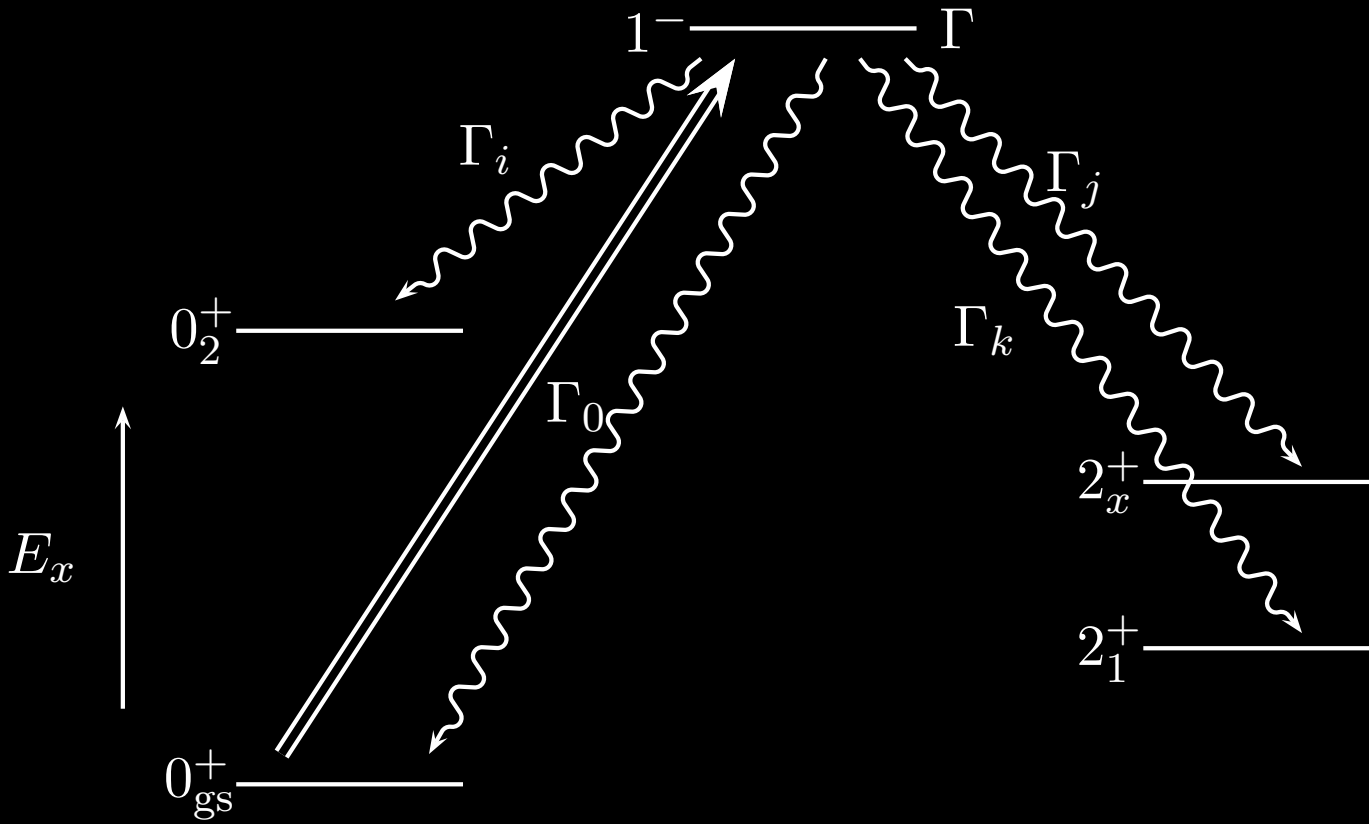
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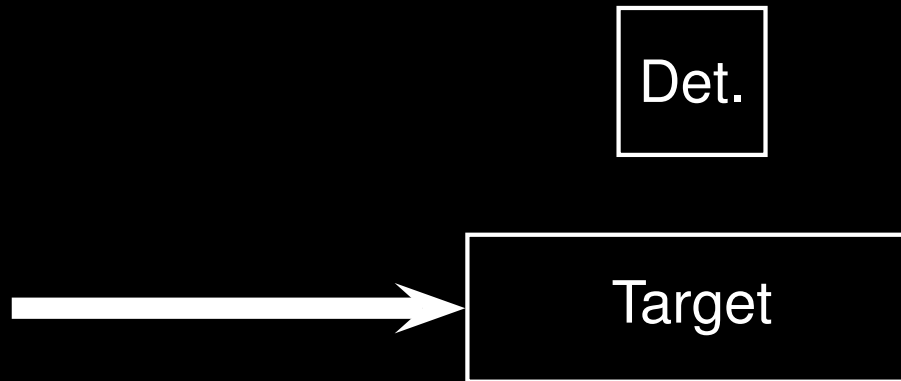
Gamma cascades



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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n} + \sigma_{\gamma,2n} + \sigma + \sigma_{\gamma,p} + \sigma_{\gamma,\alpha} + \sigma \dots + \dots$$

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$$N = N_0 e^{-n\sigma_{tot}}$$

Nuclear Absorption



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$$\sigma_{\gamma,T} = \sigma_{\gamma,\gamma} + \sigma_{\gamma,\gamma'} + \sigma_{\gamma,n} + \sigma_{\gamma,2n} + \sigma + \sigma_{\gamma,p} + \sigma_{\gamma,\alpha} + \sigma \dots + \dots$$



$$N = N_0 e^{-n\sigma_{tot}}$$

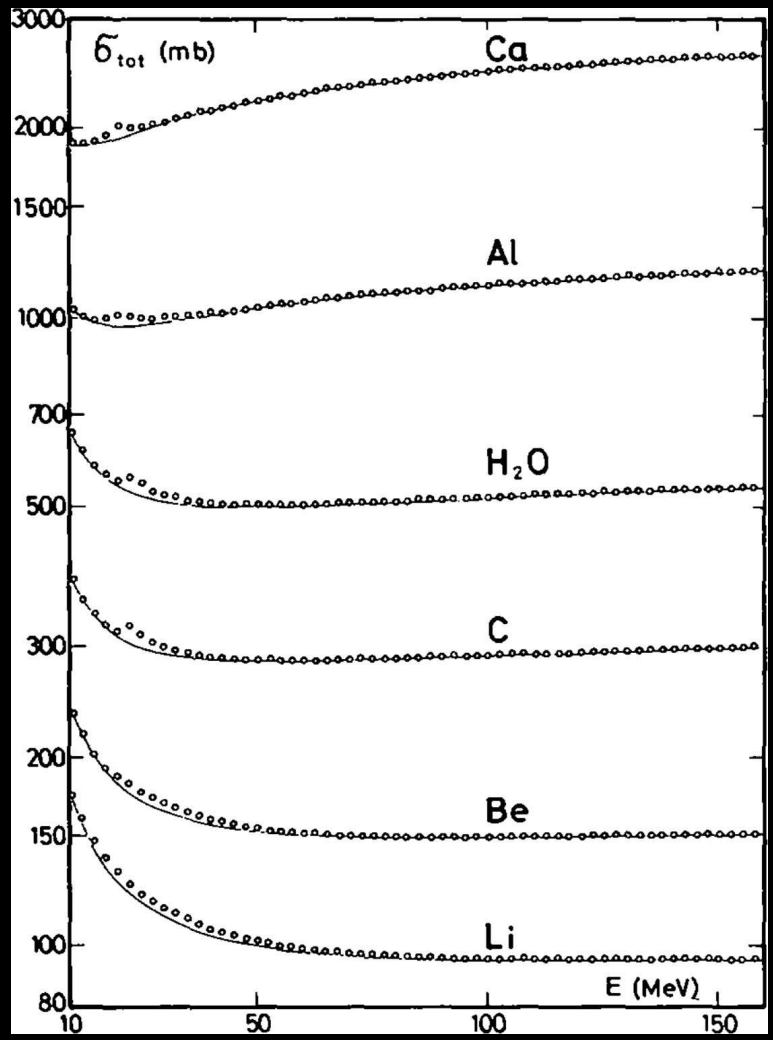
$$\sigma_{tot} = \sigma_{atomic} + \sigma_{\gamma,T}$$

$\sigma_{atomic} \sim$ several barn

Previous work

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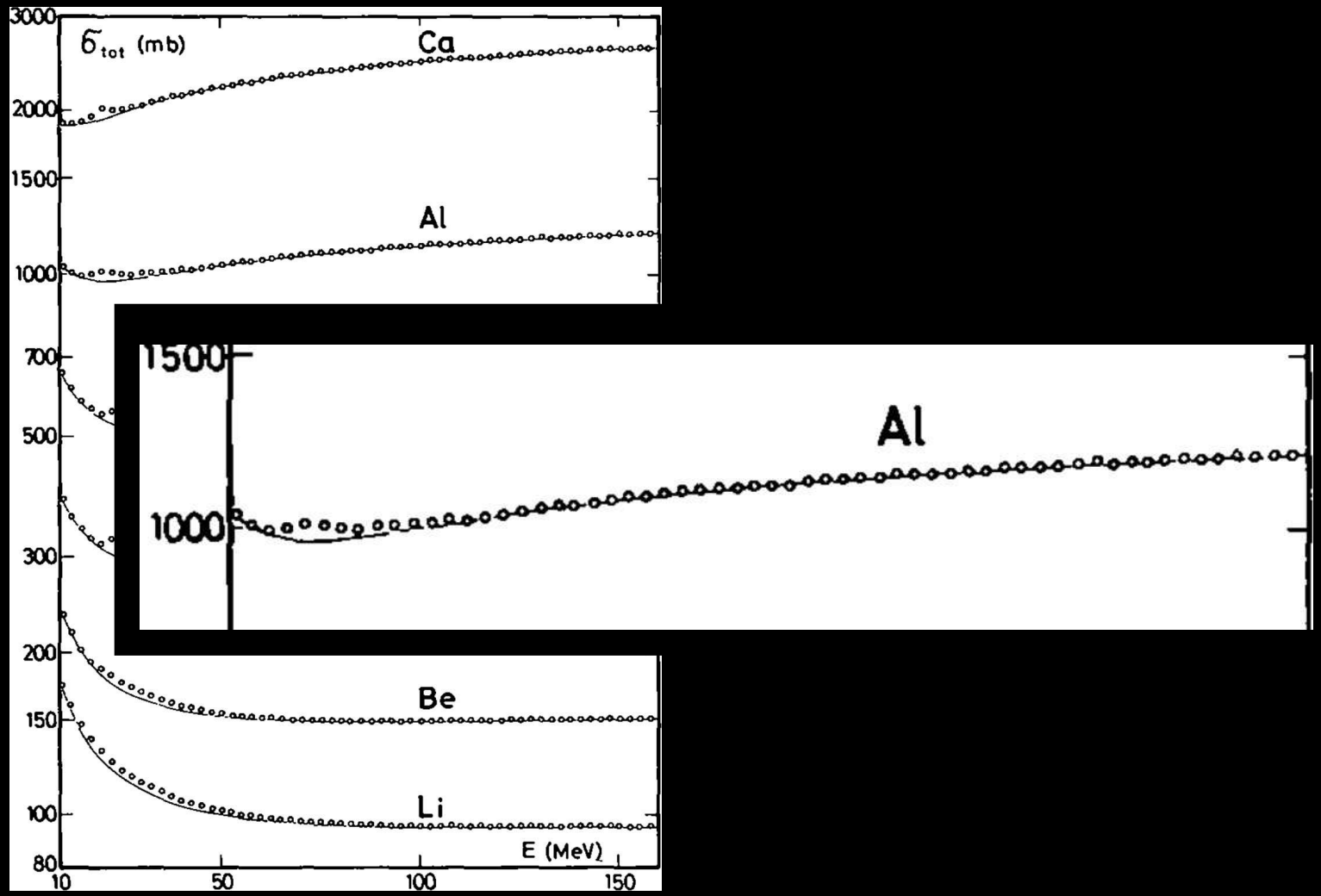
J. Ahrens et al., NPA 251, 479 (1975)



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Nuclear Absorption

Gamma cascades

Nuclear Absorption

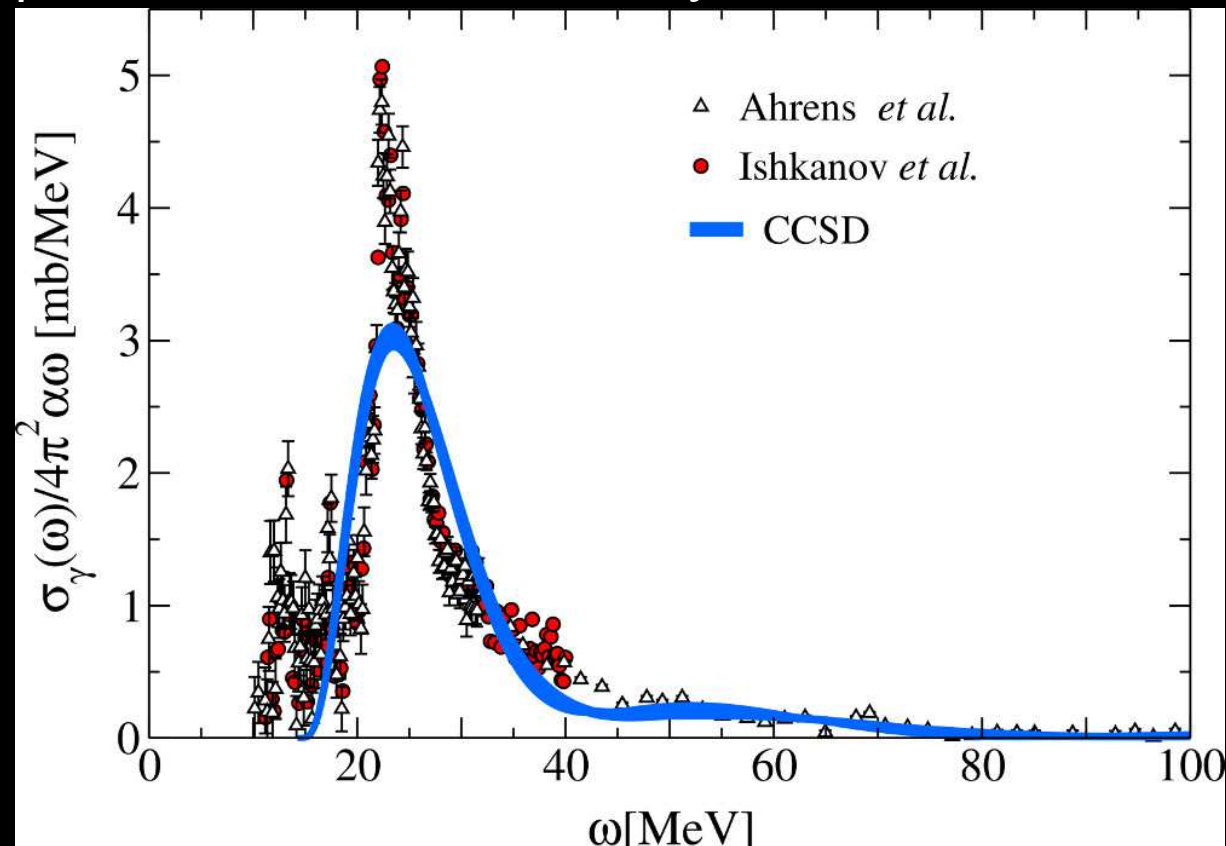
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- Experimental:
 - Tagged photons (NEPTUN)
 - fast high-resolution detector (CeBr)
 - fast **target changer**
 - in future: vacuum chamber
- Atomic absorption
 - calculate (currently OK up to $Z \sim 20$)
no improvements recently
 - long-term: dedicated measurement
 - start collaboration to improve calculations
(maybe interest from other communities)
 - Note: atomic absorption is smooth

- commission setup in October NEPTUN run
- production run with Al, maybe O in November



S. Bacca *et al.*, PRL 111, 122502 (2013)



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The END



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- NRF with Bremsstrahlung (e.g. DHIPS)
 - no information on incoming γ -energy



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- NRF with laser Compton backscattering
 - low resolution of incoming γ -energy
 - polarization



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- NRF with tagged photons
 - good resolution of incoming γ -energy, low intensity
 - efficient γ detector array



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- (p,p') (missing mass)
 - **insensitive** to S_n and Γ_0/Γ
 - multipole decomposition required



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- NRF with tagged photons
 - good resolution of incoming γ -energy, low intensity
 - efficient γ detector array
- (p,p') (missing mass)
 - **insensitive** to S_n and Γ_0/Γ
 - multipole decomposition required
- relativistic Coulomb excitation (invariant mass)
 - can be used with RNBs
- (α, α') (+ γ decay)
 - isoscalar probe