Status of ABLA

- "Standard" version (e.g. incorporated in LAHET):

  -n, p, α evaporation

  -$\Gamma_f(t) \rightarrow$ step function

- New version (still in the testing phase):

  -improvements in particle widths and barriers for charged-particles emission

  -n, H, He, IMF emission

  -$\Gamma_f(t) \rightarrow$ new analytical approach of B. Jurado

Particle emission widths

Weisskopf-Ewing formalism

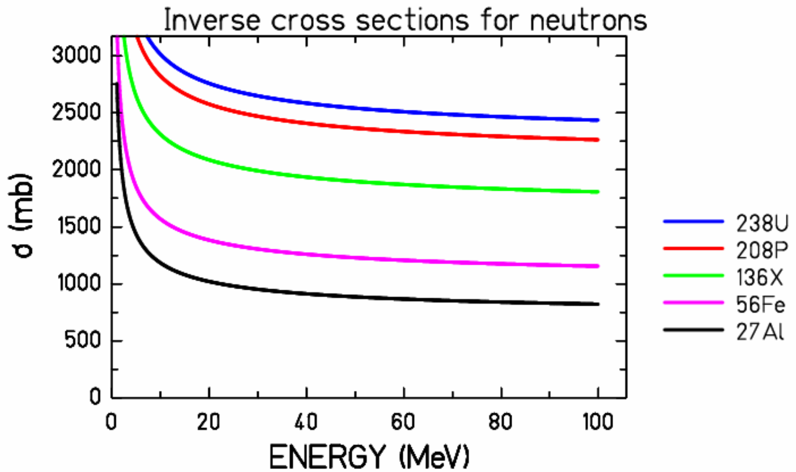
$$\Gamma_\nu(E_i) = \frac{2 \cdot s_\nu + 1}{2 \cdot \pi \cdot \rho(E_i)} \cdot \frac{2 \cdot m_\nu}{\pi \cdot \hbar^2} \cdot \int_0^{E_i - S_\nu} \sigma_c(\varepsilon_\nu) \cdot \rho(E_f) \cdot (\varepsilon_\nu - B_\nu) \mathrm{d}E_f$$

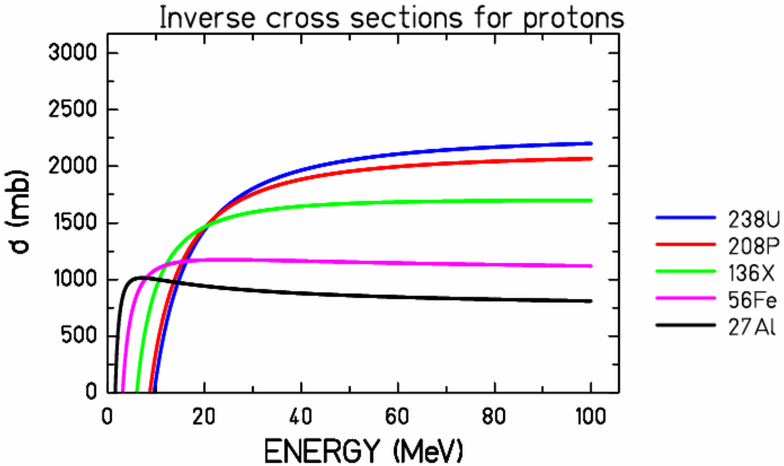
- Barriers →
  - ➢based on the Bass model for the fusion of two spherical nuclei
- Inverse cross section →
  - ➢existence of the Coulomb barrier (especially at low energy),
  - ➢energy-dependent cross section
  - ➢tunnelling through the barrier (especially for light particles)

Inverse cross section

$$\sigma_c(\varepsilon_\nu) = \pi \cdot (R_{geom} + R_\lambda)^2 \cdot \left(1 - \frac{\varepsilon_\nu}{B_\nu}\right)$$

$$R_{geom} = 1.16 \cdot \left(A_1^{1/3} + A_2^{1/3}\right), \quad \text{and} \quad R_\lambda = \sqrt{\frac{\hbar^2}{2 \cdot \mu \cdot E_{cm}}}$$

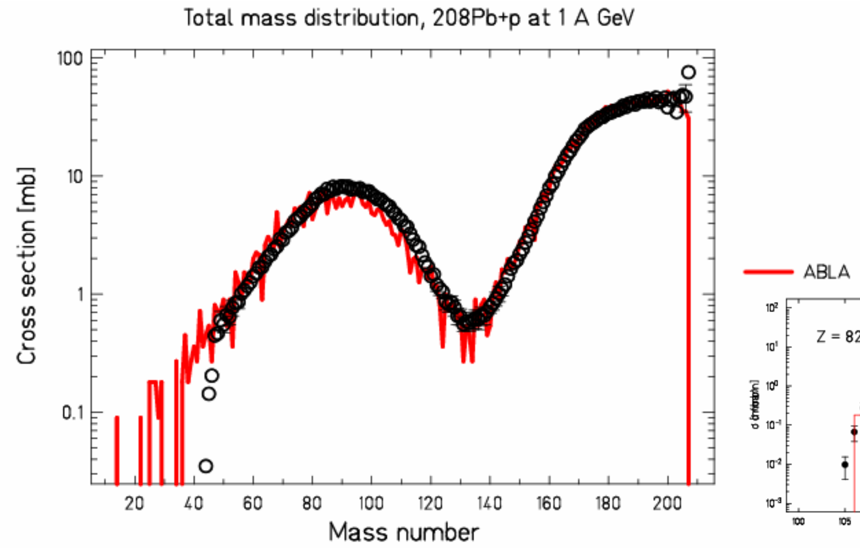




- Tunnelling - by fitting the numerical results of a complete calculation with the Avishei formula for the transmission coefficients:

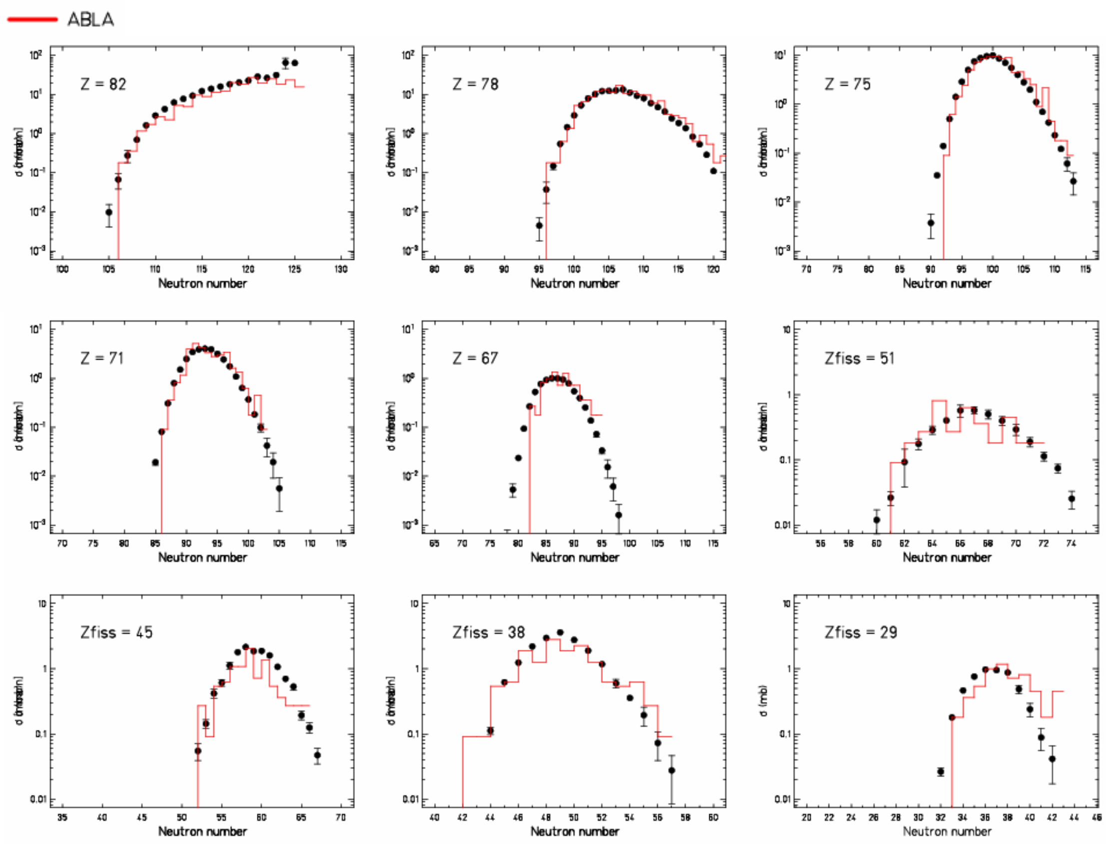
$$\frac{\Gamma}{\Gamma_{class}} = 10^{\left(4 \cdot 10^{-4} \cdot exp\left(-4.3 \cdot log_{10}(x)\right)\right)} \qquad x = \left(\frac{T}{(\hbar\omega)^2} \frac{1}{\mu^{1/4}}\right)$$

Some results for ^{208}Pb + p at 1 *A* GeV



- New Γ_ν

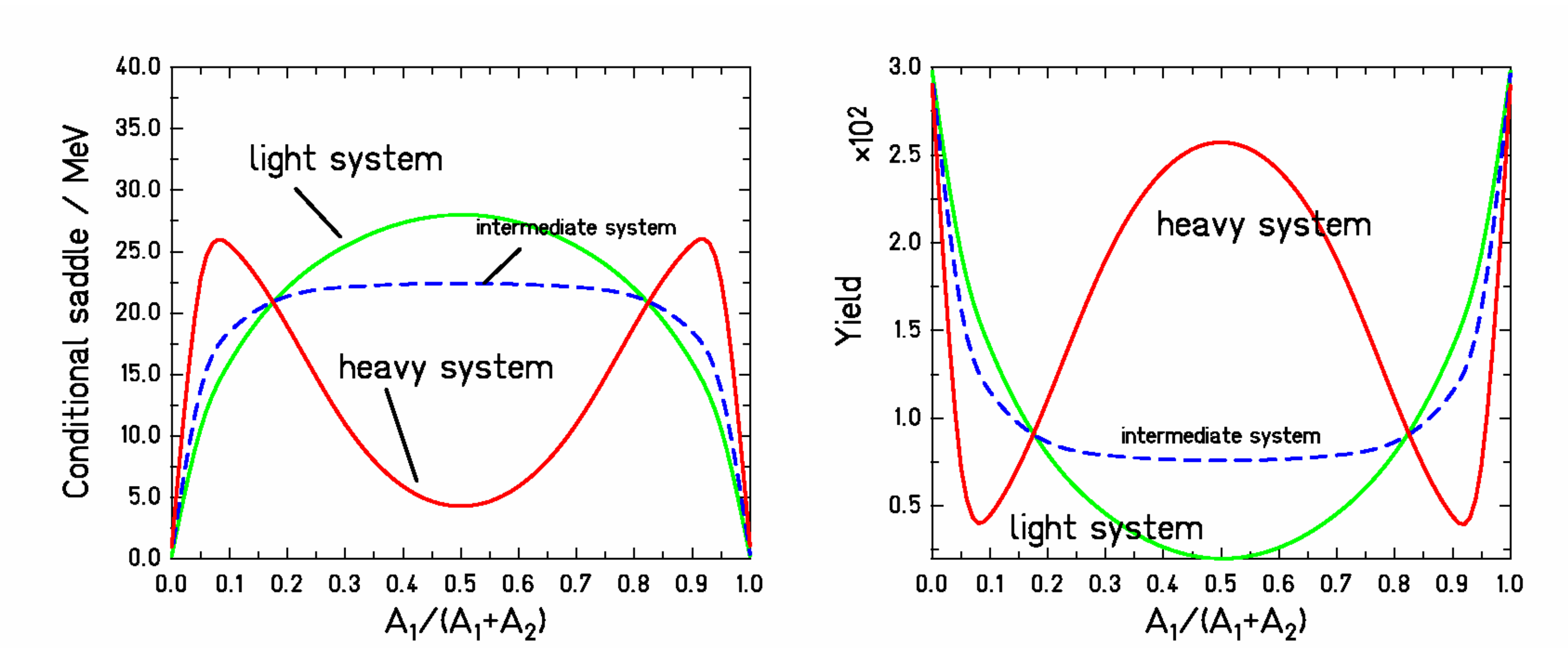
- Emission of n, H, He
(IMF not included)



IMF emission

-Moretto, Nucl.Phys. A247, p211:

Particle evaporation and fission → two limits of one, same, process



IMF emission

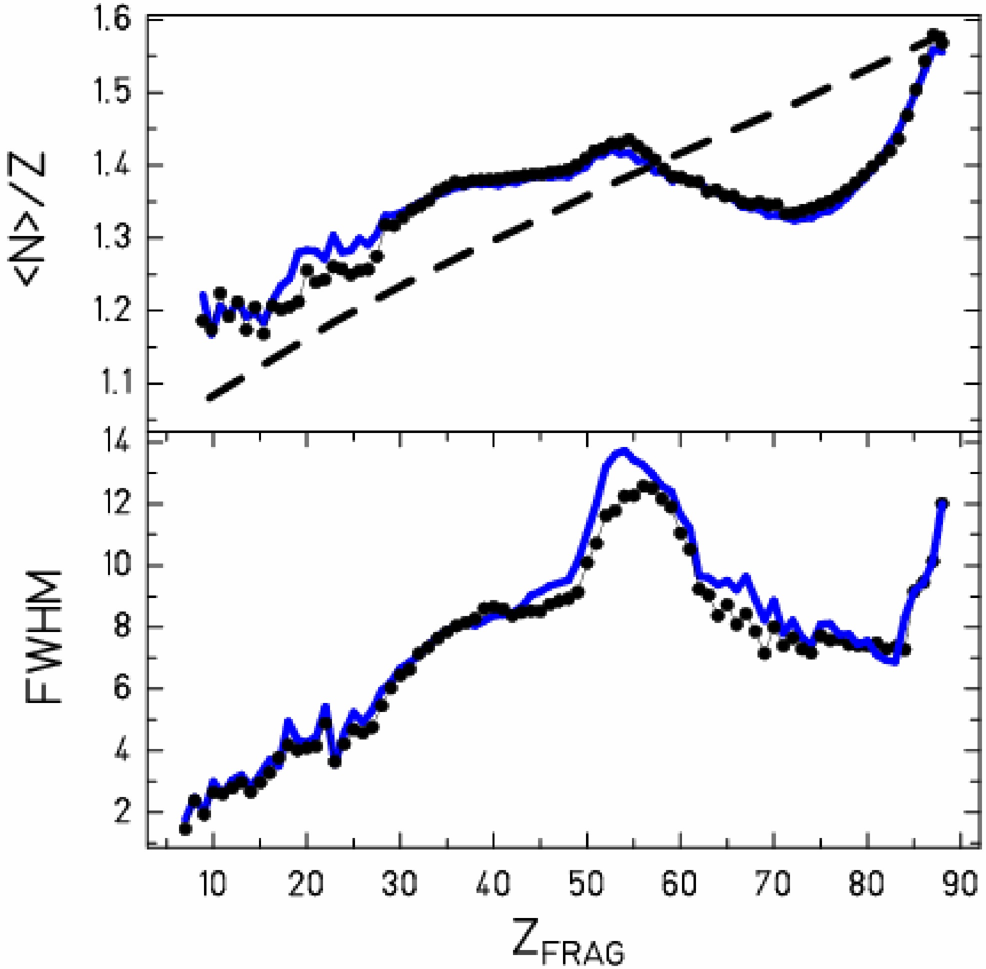
- Evaporation-like approach
- Integration over the available states in the IMF and the partner
- No tunneling, no preformation included

$$\Gamma \approx \int_0^{E_{imf}^{max}} \int_0^{E_{partner}^{max}} \sigma_{inv} \frac{\rho_{imf}(E_{imf}) \cdot \rho_{partner}(E_{partner})}{\rho_C(E)} (\varepsilon - B) dE_{imf} \; dE_{partner}$$

$$E = E_{imf} + E_{partner} + Q + \varepsilon - B$$

IMF emission

- some results for ^{238}U + p at 1 *A* GeV -



- Experimental data

- ABRABLA

M.V. Ricciardi et al, PRC accepted