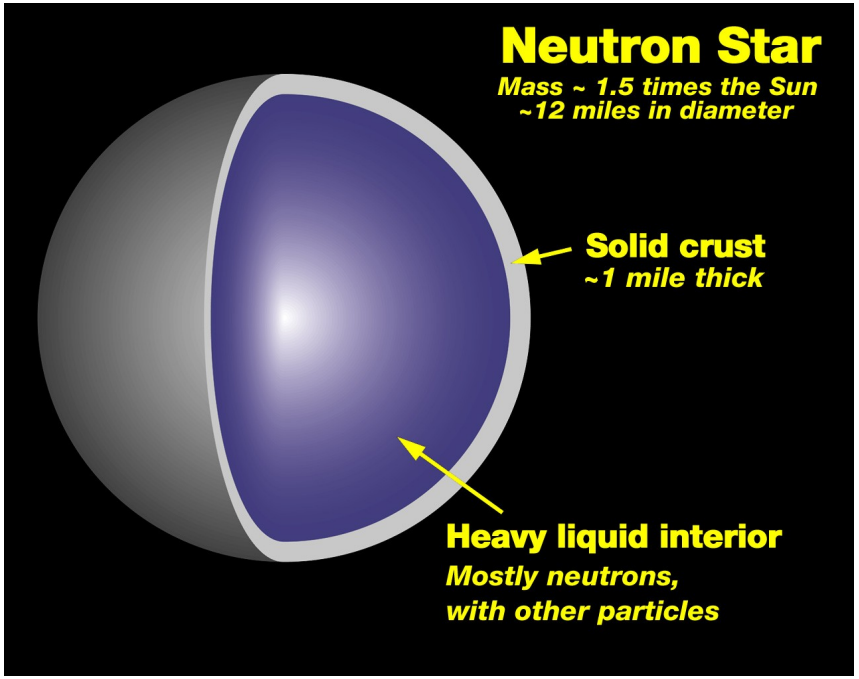
# *Polarized Compton Scattering for Precision Measurements of the Isovector Giant Quadrupole Resonance in Nuclei*

Constraining the density dependence of the symmetry energy in the nuclear matter Equation of State...the structure of neutron stars

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***For the Compton@HIγS Collaboration***

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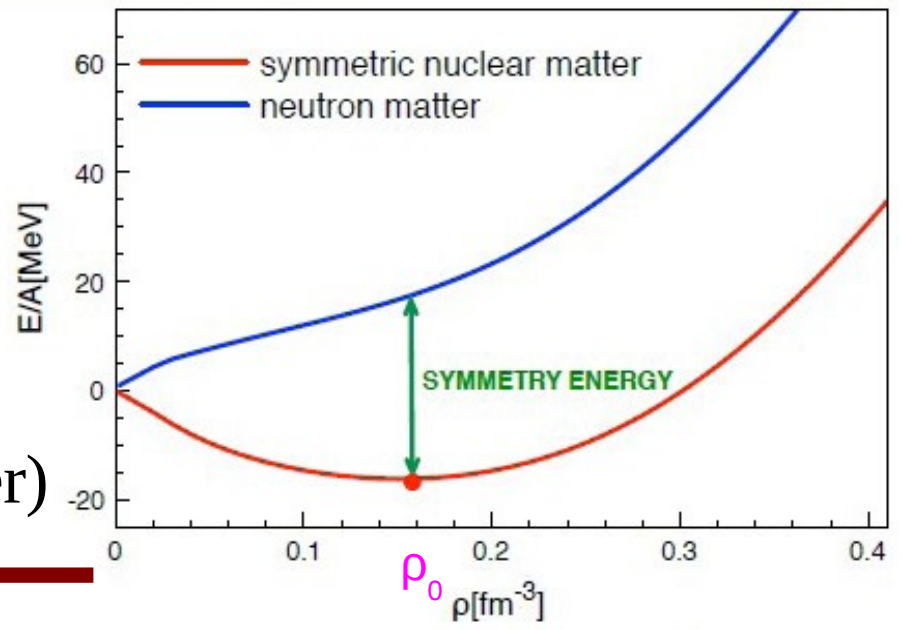
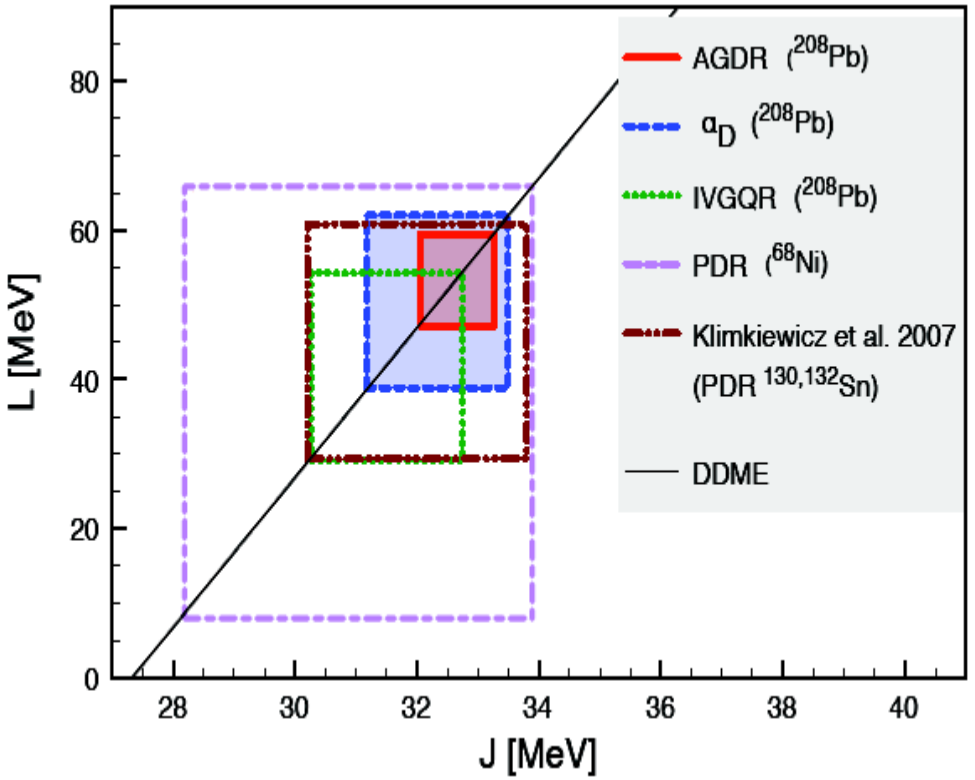
Theory Support: Nils Paar et al, University of Zagreb

$$E_{sym}(\rho) = J - L(\rho_0 - \rho)/(3\rho_0) + \ldots$$

J – symmetry energy at saturation density
L – slope of the symmetry energy
(related to the pressure of neutron matter)




- Symmetry energy at saturation density (J) vs. slope of the symmetry energy (L)
- Calculations of various modes are based on the same set of energy density functionals
  → relativistic random-phase approximation + density-dependent meson-nucleon couplings
- Constrained by ground state properties

**E1-E2 interference term**

$$\frac{\sigma_{\parallel}(\theta)}{\sigma_{\perp}(\theta)} = \cos^2\theta + 2\frac{|C_{E2}|}{|C_{E1}|}\cos(\phi_{E2}-\phi_{E1})[\cos^3\theta - \cos\theta]$$

- $\sigma_{\parallel}/\sigma_{\perp}$: $\varphi_{\parallel} = 0°, 180°$; $\varphi_{\perp} = 90°, 270°$
- Pure E1
- IVGQR + GDR + Thomson
- E1-E2 phase difference
- Sign change between forward/backward ($\theta = 55°, 125°$)