

Matter Distribution and spin-orbit force

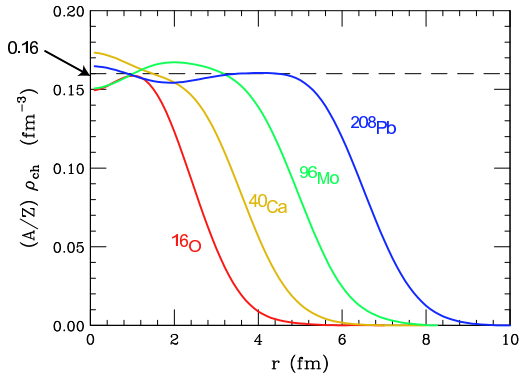
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Madrid, December, 1st, 2017

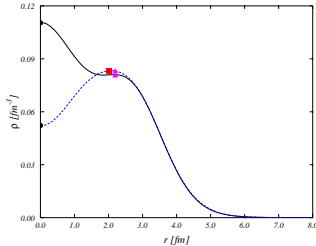
- Marta Anguiano, Universidad de Granada,
- Viviana De Donno, Università del Salento,
- Antonio M. Lallena, Universida de Granada

Shape of the density distributions ruled by the interplay between attractive nucleon-nucleon interaction and Pauli exclusion principle.



HF + BCS + QRPA

Gogny interactions: D1S, D1M, D1ST2a, D1MTd



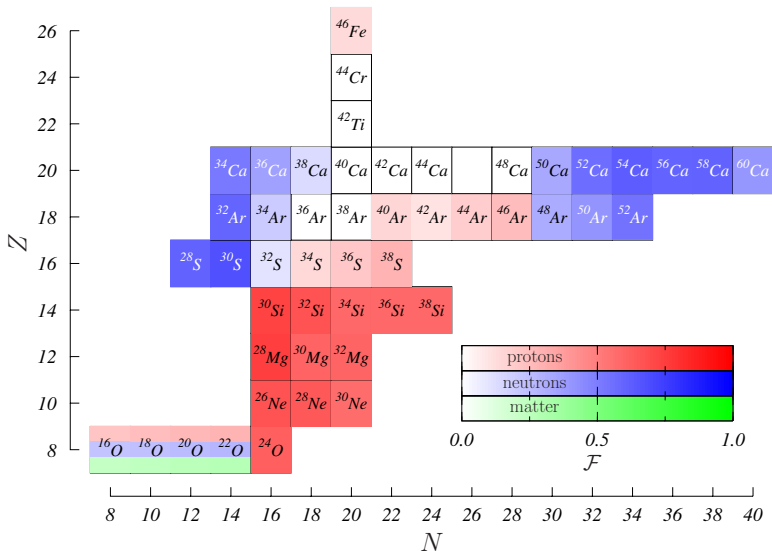
Depletion fraction

$$\mathcal{F}_\alpha = \frac{\rho_\alpha^{\max} - \rho_\alpha(0)}{\rho_\alpha^{\max}}$$

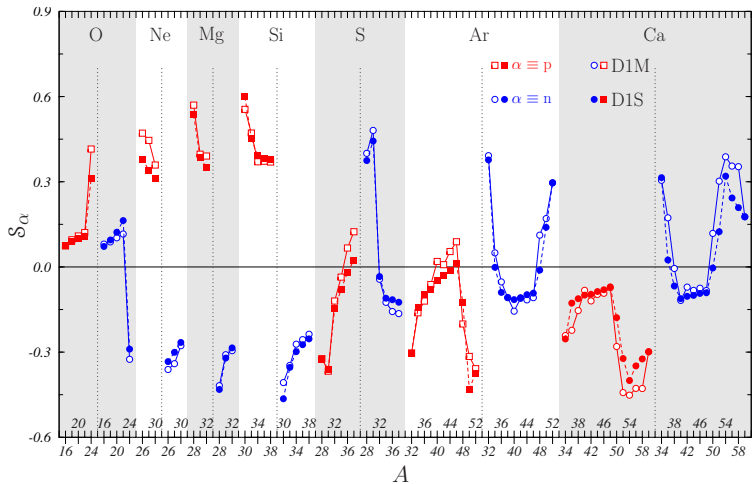
Flatness index

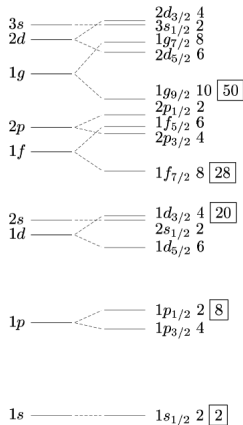
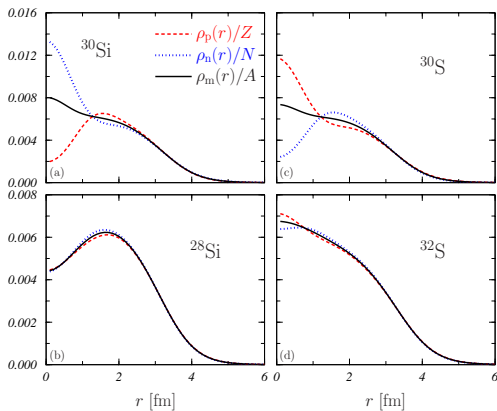
$$\mathcal{S}_\alpha = \frac{\rho_\alpha(r_{\text{mean}}/2) - \rho_\alpha(0)}{\rho_\alpha(r_{\text{mean}}/2) + \rho_\alpha(0)}$$

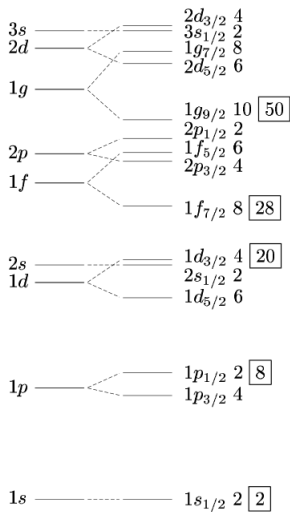
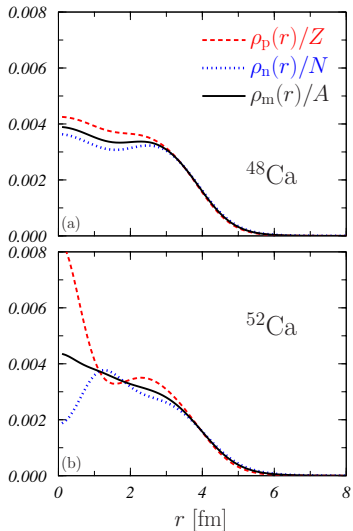
Depletion fraction

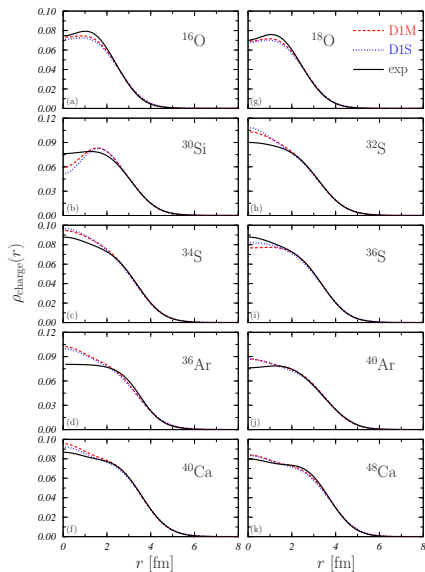


Flatness index



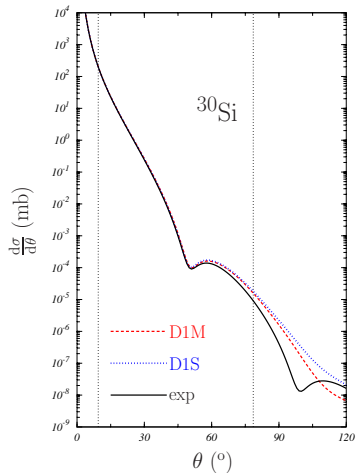




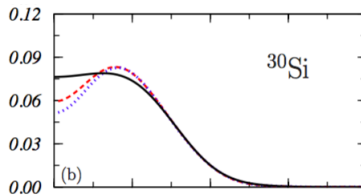


C. W. De Jager, C. De Vries, At. Data Nucl. Data Tables, 36 (1987) 495.

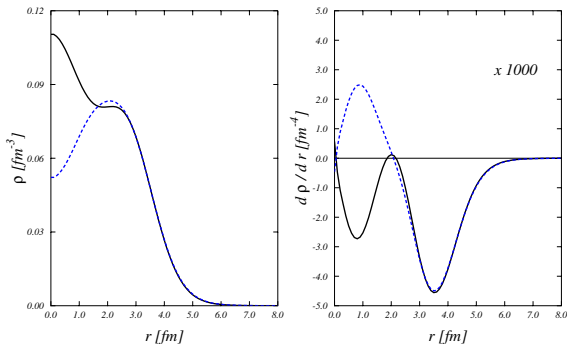
Elastic electron scattering cross section

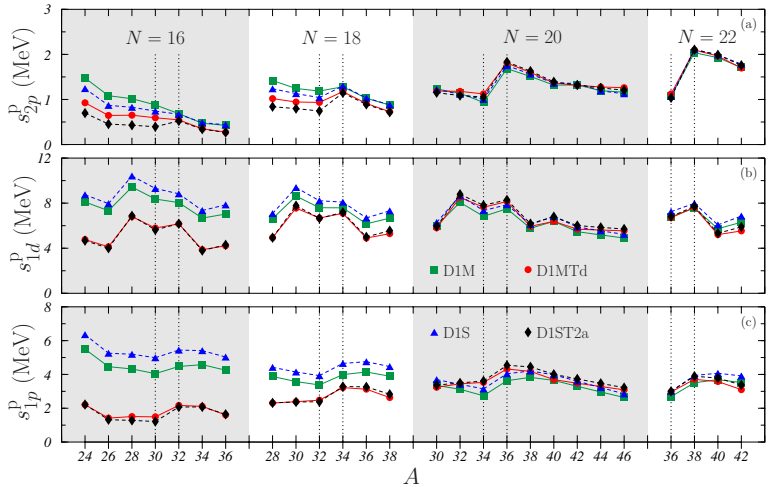


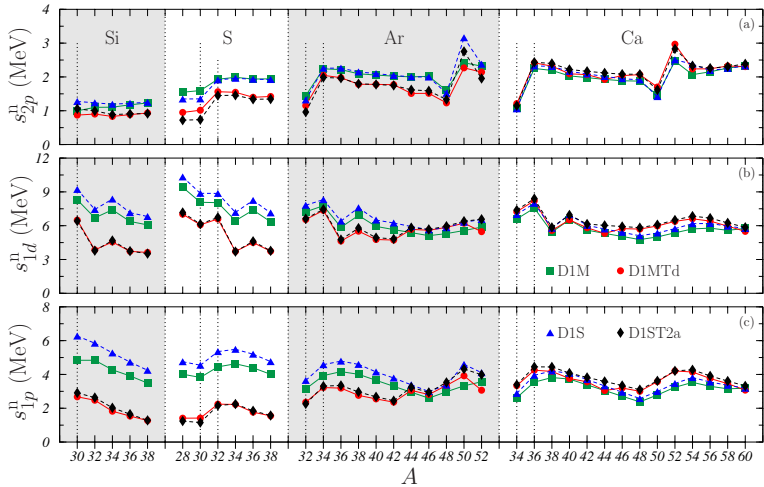
$\epsilon = 300 \text{ MeV}$



$$E_{\text{s.o.}} = \frac{1}{2} W_0 \int d^3r (\nabla \rho_m \cdot \mathbf{J}_m + \nabla \rho_n \cdot \mathbf{J}_n + \nabla \rho_p \cdot \mathbf{J}_p)$$







Excitation energies in MeV

J^π	nucleus	D1M	exp	nucleus	D1M
2^+	^{34}Si	3.991	3.327	^{34}Ca	3.545
	^{36}S	1.814	3.299	^{36}Ca	2.510
3^+	^{34}Si	4.743		^{34}Ca	4.678
	^{36}S	7.683	5.462	^{36}Ca	8.142
4^+	^{34}Si	6.766		^{34}Ca	6.733
	^{36}S	7.149	6.514	^{36}Ca	7.547
1^+	^{34}Si	8.121		^{34}Ca	8.147
	^{36}S	8.473	4.523	^{36}Ca	9.007

SB structure $\rightarrow$ reduction of s.o. energy splitting $\rightarrow$ lowering of the 4^+ energy.

The presence of a 4^+ state in ^{34}Si between 6.0 and 6.2 MeV would indicate a SB structure.

Thank you