

## Nucleus–nucleus interactions in the inner crust of neutron stars

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The interaction between nuclei in the inner crust of neutron stars consists of two contributions, the so-called “direct” interaction and an “induced” one due to density changes in the neutron fluid. For large nuclear separations  $r$  the contributions from nuclear forces to each of these terms are shown to be nonzero. In the static limit they are equal in magnitude but have opposite signs and they cancel exactly. We analyze earlier results on effective interactions in the light of this finding. We consider the properties of long-wavelength collective modes and, in particular, calculate the degree of mixing between the lattice phonons and the phonons in the neutron superfluid. Using microscopic theory, we calculate the net non-Coulombic contribution to the nucleus–nucleus interaction and show that, for large  $r$ , the leading term is due to exchange of two phonons and varies as  $1/r^7$ : it is an analog of the Casimir–Polder interaction between neutral atoms.

## References

- [1] D. Kobyakov and C. J. Pethick, Phys. Rev. C **94**, 055806 (2014).

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