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Self-Consistent Superfluid Band Calculations for Neutron Star Inner Crust

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Neutron star is a remnant of supernova, and viewed as the resource of plenty of physical properties, associated with subnuclear, nuclear and quark matter.

At the bottom layer of subnuclear area(so-called "crust"), neutrons are dripped from excessively neutron-rich nuclei, and moreover nuclei form various non-uniform crystalline structures which are totally called "pasta" phases.
It becomes clear that properties of pasta nuclei are intimately related with dripped neutrons and their conduction. In particular "entrainment" effect may interrupt the interpretation of pulsar's "glitch" phenomenon and bring about a big controversy, that's why a naively microscopic calculation is strongly desired.

Under such a situation, we formalized the time-dependent Hartree-Fock-Bogoliubov (TDHFB) calculations combined with Band theory, and performed them for 1 dimensional crystalline (slab) phases, imposing Beta equilibrium condition. At the same time, we extended those calculations into finite-temperature and magnetic field systems, investigating the diverse properties of subnuclear matter.

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