STSM scientific report

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During my visit I had a close collaboration with Prof. Voskresensky.
The project was a natural continuation of our previous collaboration. Before the beginning of the visit we, together with K. Maslov, have finalized the paper [1] where a new equation of state with inclusion of hyperons was proposed, which satisfies well the constraints known from the particle production in heavy-ion collisions and analyses of the astrophysical data including the maximum mass. So, during the visit we started a preparation for inclusion of the contribution of hyperons [2] to the bulk viscosity of the neutron star matter as an update of our work [3] within this novel equation of state. During the visit we finalized the paper [4] where we studied excitations in a normal Fermi liquid with a local scalar interaction and the possibility to avoid the Pomeranchuk instability by letting the unstable modes to form a Bose condensate. The condensation may occur in a homogeneous or inhomogeneous state relying on the momentum dependence of the scalar Landau parameter. In the moving system, such as rotating neutron star, this scalar condensate may influence to bulk and shear viscosities, cf. [3].
The main time of the visit was devoted to the analysis of the dynamics of the relaxation of the order parameter in superfluid nuclear matter with a singlet pairing. The kinetic equations [4] for the gap relaxation in a clean homogeneous superconductor under the action of an external density perturbation were rederived in the framework of the real-time Schwinger-Keldysh technique [5]. At the abrupt change of the density the gap will relax to a new equilibrium value in a non-exponential manner, as $\cos[2\Delta t+\phi]/t^{1/2}$, which corresponds to a Schmid excitation mode in superconductors. The contribution of such mode to the bulk viscosity was calculated within the "soft-mode" approach by Mandelstam and Leontovich [7] used also in ref. [3]. The results will be presented in a forthcoming publication.

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[6] A. Schmidt, Phys. Kondens. Mater. 8 (1968) 129 (1968).
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