Present Status of Theories on Superfluid Helium-three in Aerogel

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Superfluid 3He in aerogel has been originally studied as a prototype of an impurity-induced pair-breaking of unconventional (non *s*-wave) fermionic superfluidity and superconductivity. However, a central issue in recent years on this system is rather an aspect peculiar to liquid 3He with isotropic Fermi surface and hence, with high degeneracies among different pairing states, i.e., to understand what the A-like phase with equal-spin pairing, the counterpart of the bulk A-phase, is. Broadly speaking, there is now a controversy between two candidates, i.e., the ABM (axial) pairing state with *no* genuine ODLRO but with superfluid LRO [1,2] or a more complicated quasi-isotropic pairing with LRO [3]. A brief review on this issue is given in my talk including our preliminary research plan.

[1] K.Aoyama and R.Ikeda, Phys. Rev. B **72** (2005) 012515 and ibid. **73** (2006) 060504 (R).
[2] G.E. Volovik, JETP Lett. 81 (2005) 647 ; V.P.Mineev and M.E.Zhitomirsky, JETP Lett. 81 (2005) 296 (2005); J.A. Sauls, presented in LT24 (2005).
[3] I.A. Fomin, presented in LT24 (2005) (cond-mat/0509524).