Collective properties of unconventional superconductors

P.N. Brusov, P.P.Brusov[1], C. Lee[2], A. Matsubara[3]

Department of HTSC Theory, Physical Research Institute, Rostov-on-Don, 344090, Russia
[1]Department of Physics and Applied Physics, Strathclyde University, Glasgow, G4 0NG , UK
[2] Department of Physics,Hannam University, Dacdukgu, Tacjon, Korea
[3]Department of Physics, Kyoto University, Kyoto, 14853, Japan

Study of collective excitations in the USC had carried an exotic character up to recent times due to a couple of reasons. While there was some evidence of a nontrivial type of pairing in some superconductors (HFSC (heavy-fermion SC), HTSC (high-temperature SC) etc.) there was no superconductor in which unconventional pairing had been established exactly. Secondly, an evidence of existence of the collective excitations in superconductors didn't seem to appear.

The situation has changed drastically within the last few years directing study of the collective excitations in the USC into the real plane. In light of recent experiments this topic appears to become a very important one. First of all, a few years ago an amplitude mode (with frequency of order 2Δ) was observed in films of ordinary superconductors. Secondly, the type of pairing is now well-established for a number of superconductors (*s*-pairing in ordinary superconductors and electron-type HTSC; *p*-pairing in Sr_{2} RuO_{4} (HTSC), UPt_{3} (HFSC) and *d*-pairing in hole-type HTSC, organic superconductors, some HFSC (UPd_{2} Al_{3}, $CePd_{2}$ Si_{2}, $CeIn_{3}$, $CeNi_{2}$ Ge_{2} etc.).

2D and 3D models of *p*- and *d*- wave superconductors (SC) (and their mixtures) have been constructed with use of the path integration technique (PIT). We calculated the collective excitations in different USC. Results obtained could be used for an interpretation of sound and microwave absorption data as well as for an identification of the actual type of pairing and the order parameter in USC.

References.

1. P.N.Brusov "The mechanisms of HTSC", RSU publishing,v.1,2,1389 p.,1999 (in English)
2. P.N. Brusov, P. P.Brusov " Collective properties of superconductors with nontrivial pairing", Sov. Phys. JETP, 119, N.5 (2001).

1. Correlated Electrons and High Temperature Superconductors,oral presentation,
pnb1983@yahoo.com; 3 borko st.,fl.152,Rostov-on-Don,344092, Russia