Contribution ID: **195** Contribution code: **P-TUE-12** Type: **Poster**

LE-muSR Study of the Meissner state. New Results on an Old Problem.

Tuesday, 30 August 2022 18:40 (20 minutes)

The Meissner state (MS) is the state with the most pronounced superconducting properties. Therefore, knowledge and understanding properties of the MS is a necessary condition to understand and predict properties of all other states of all superconductors. The standard interpretation of the MS is based on the theory of F. and H. London, with minor modifications adopted in the Ginzburg-Landau and Bardeen-Cooper-Schrieffer theories. Londons'theory rests on three postulates: (i) the magnetic permeability μ and dielectric permittivity ε are equal to unity; (ii) the induction B and, consequently, the intensity $H(= B/\mu)$ of the magnetic field is zero; and (iii) the penetration depth λ is independent of the applied field H_0. Quite long-ago, using thermodynamic considerations, H. London showed that λ must depend on H_0. The first application of Pippard's microwave resonator technique was to verify this statement. Pippard found a weak increase of λ vs H_0 nonmonotonically changing with temperature, and concluded that λ can be viewed as independent of H_0. This result was (and still is) regarded as a confirmation of the London theory (F. London, 1950). However, the standard diagram of the Abrikosov vortices suggests that λ strongly decreases with the field. Soon after Pippard's experiment, Shoenberg noted that Londons'theory conflicts with the law of energy conservation. Besides, Londons'postulate $\mu = \varepsilon = 1$ implies that the electromagnetic properties of superconductors are identical to those of vacuum. To sort out with these and other fundamental issues in the MS interpretation, we launched the LE-μSR project aimed at measuring the field dependence of the induction profile near the surface of high-quality type-I and type-II superconductors in the MS. The entire profile (from $B = H_0$ to zero) was measured for the first time. The results obtained to date and the challenges we are encountering in this investigation will be reported.

Primary authors: Prof. KOZHEVNIKOV, Vladimir; Dr VALENTE-FELICIANO, Anne-Marie (Thomas Jefferson National Accelerator Facility); Dr PROKSCHA, Thomas (PSI); Prof. VAN HAESENDONCK, Chris (KU Leuven)

Presenter: Prof. KOZHEVNIKOV, Vladimir

Session Classification: Posters

Track Classification: Superconductivity