Report of the Doctoral Thesis of Mgr. Ahmed Elmetwally Youssef
 "**Critical state response in hard type II superconductors (comparison of transverse and longitudinal geometries)**"

Doctoral thesis of Ahmed Youssef is devoted to developing and using a contactless method for determining critical current density in type II superconductors and to the comparison of obtained results with predictions of the Bean critical state model.

In the first part Ahmed Youssef summarizes number of known facts about type II superconductors with the main attention devoted to the Bean critical state model which is important for understanding and interpretation of the obtained experimental data. In this part author exhibited ability to grasp extensive literature devoted to this field.
Questions to this part of the work:
- page 12, fig. 7b: How to understand nonzero B for $B<B_{c1}$? Is it close to the surface?
- page 16: The coreless feature leads to ultra high speed motion – how it is explained?
- page 31: Which diffusion equation should be used?
- page 35, points 4,6: The notion "screening current density with a vertical slope at the flux front" should be explained
- page 37: The sentence: "... hence screening currents arise from the discontinuity of radial magnetic induction at $z = \pm d/2$." (almost exactly cited from Clem Sanches ref. [86]) together with continuation: "These currents flow on the surface of the specimen even without field penetration." deserves more detailed explanation.

The more important second part describes experimental method which was used and number of obtained experimental results. Close attention is devoted to meeting the model assumptions, fitting the acquired experimental data and comparison with the model calculation. Obtained results are illustrated by a number of figures and summarized in tables.
 Question to this part of the work:
- page 76: Comparison of temperature dependences of flux penetration depth measured by Hirschfeld and Goldenfeld (ref.[121]) and real part of fundamental susceptibility measured by author. Why it is not compatible?

General impression of this work is positive and I am convinced that Ahmed Youssef demonstrated his ability of independent scientific work. For solving the achievable goal author used appropriate methods.
I recommend this work to be accepted as a doctoral thesis.

Prague 6. 10. 2011   RNDr. Jan Koláček, CSc
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