Lectures:

Monday, 17.6.: Recapitulation, Superfluidity
Thursday, 20.6.: Superconductivity, London equations

Exercises:
All solutions must be handed in by **Tue. 25.6.** noon in box on 5th floor of Building 46 or electronically to laschwar@rptu.de

16.) Superconducting block

Consider a superconducting block that is bounded by two parallel sides at $y=\pm d$ where d is much smaller than the size in the other directions. A field is applied parallel to the sides in z-direction with strength B_0. Show that according to the London and Maxwell equations, the field inside the superconductor is given by

$$B(y) = B_0 \frac{\cosh(y/\lambda)}{\cosh(d/\lambda)}$$

where λ is the penetration depth. Further show that the current is given by

$$\vec{j}(y) = \hat{x} B_0 \frac{c}{4\pi\lambda} \frac{\sinh(y/\lambda)}{\cosh(d/\lambda)}$$

Calculate the average magnetization in the entire block $\overline{M} = (\overline{B} - B_0)/4\pi$. How can the result be used to determine the penetration depth experimentally?