

Electron-Spin Resonance: ToDo list

!!! Warm up all devices for at least 15 min !!!

1. Check if the coils are arranged in Helmholtz system

- a) geometry of the system
- b) electric connection

2. Measure $B(I)$

- a) prove that it has linear dependence
- b) check if there is hysteresis in the system
- c) check the pre-factor from the Biot-Savart law
- d) repeat measurement 3 times
- e) error calculation:
 - (i) Hall-magnetometer
 - (ii) multimeter
 - (iii) ruler (“ R ” in Biot-Savart law is distance between the two coils)

3. Check the homogeneity of the magnetic field

- a) chose the appropriate coordinate system
- b) set field to 2 mT at the center of the system
- c) measure B as a function of coordinates
- d) calculate the volume of the homogeneous region
- e) compare the volume of the homogeneous region to the volume of the sample
- f) error calculation:
 - (i) ruler
 - (ii) Hall-magnetometer

4. Measure $I_{\text{res}}(f)$ for one high frequency coil with and without Hall-sensor

- a) check if the presence of the Hall-sensor changes the value for I_{res}
- b) single measurement for each frequency is required
- c) error calculation is NOT required (explain why)

5. Measure $B_{\text{res}}(f)$ and $I_{\text{res}}(f)$ for three high frequency coils

- a) at least 3 measurements of I_{res} and B_{res} for each frequency
- b) use I_{res} to calculate $B_{\text{res,calc}}$ according to the Biot-Savart law
- c) compare $B_{\text{res}}(f)$ and $B_{\text{res,calc}}(f)$
- d) use $B_{\text{res}}(f)$ and $B_{\text{res,calc}}(f)$ to calculate g -factor
 - (i) using linear fit to the data (not only fitting error should be accounted!)
 - (ii) for each pair of values B and f
- e) error calculation:
 - (i) Hall-magnetometer
 - (ii) multimeter
 - (iii) ruler (“ R ” in Biot-Savart law is distance between the two coils)
 - (iv) high frequency generator