

Stern-Gerlach experiment 5.1.11-01/11



Set-up of experiment P251111 with PC interface

What you can learn about ...

- Magnetic moment
- Bohr magneton
- Directional quantization
- g-factor
- Electron spin
- Atomic beam
- Maxwellian velocity distribution
- Two-wire field

Principle:

A beam of potassium atoms generated in a hot furnace travels along a specific path in a magnetic two-wire field. Because of the magnetic moment of the potassium atoms, the nonhomogeneity of the field applies a force at right angles to the direction of their motion. The potassium atoms are thereby deflected from their path.

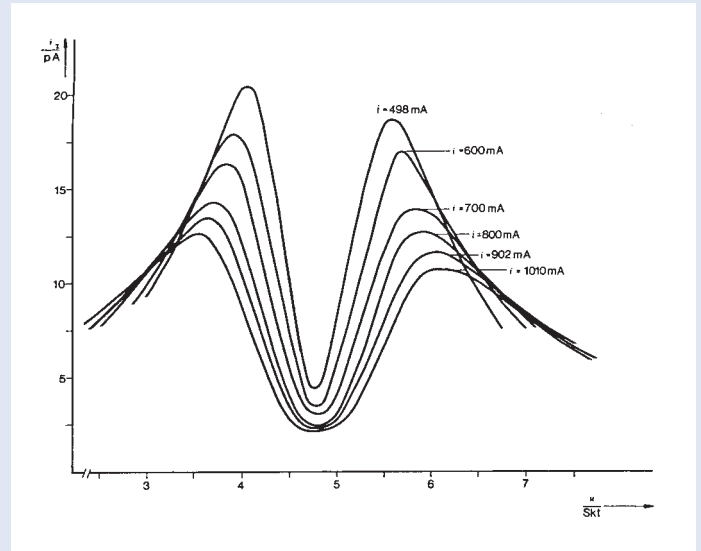
By measuring the density of the beam of particles in a plane of detection lying behind the magnetic

What you need:

Experiment P251111 with PC interface  
 Experiment P2511101 classical

|  |          |   |   |
|--|----------|---|---|
| Stern-Gerlach apparatus                                  | 09054.88 | 1 | 1 |
| Matching transformer                                     | 09054.04 | 1 | 1 |
| Potassium ampoules, set of 6                             | 09054.05 | 1 | 1 |
| High vacuum pump assembly, compact                       | 09059.99 | 1 | 1 |
| Electromagnet without pole shoes                         | 06480.01 | 1 | 1 |
| Pole piece, plane  | 06480.02 | 2 | 2 |
| Commutator switch  | 06034.03 | 1 | 1 |
| Voltmeter 0.3...300 V-, 10...300 V-                      | 07035.00 | 2 | 1 |
| Ammeter, 1 mA...3 A DC/AC                                | 07036.00 | 2 | 2 |
| Meter 10/30 mV, 200°C                                    | 07019.00 | 1 | 1 |
| Storage tray, 413 x 240 x 100 mm                         | 47325.02 | 1 | 1 |
| Crystallizing dishes, BORO 3.3., 2300 ml                 | 46246.00 | 1 | 1 |
| Isopropyl alcohol, 1000 ml                               | 30092.70 | 1 | 1 |
| Direct current measuring amplifier                       | 13620.93 | 1 | 1 |
| Variable transformer with rectifier 15 V~/12 V-, 5 A     | 13530.93 | 1 | 1 |
| Power supply 0-12 V DC/ 6 V, 12 V AC                     | 13505.93 | 2 | 2 |
| Two tier platform support                                | 02076.03 | 1 | 1 |
| Rubber tubing/vacuum, d = 6 mm                           | 39286.00 | 3 | 3 |
| Connecting cable, 4 mm plug, 32 A, yellow, l = 25 cm     | 07360.02 | 2 | 2 |
| Connecting cable, 4 mm plug, 32 A, blue, l = 25 cm       | 07360.04 | 2 | 2 |
| Connecting cable, 4 mm plug, 32 A, red, l = 50 cm        | 07361.01 | 3 | 2 |
| Connecting cable, 4 mm plug, 32 A, blue, l = 50 cm       | 07361.04 | 2 | 1 |
| Connect. cable, 4 mm plug, 32 A, green-yellow, l = 50 cm | 07361.15 | 1 | 1 |
| Connecting cable, 4 mm plug, 32 A, red, l = 75 cm        | 07362.01 | 1 | 1 |
| Connecting cable, 4 mm plug, 32 A, yellow, l = 75 cm     | 07362.02 | 3 | 3 |
| Steel cylinders, nitrogen, 10 l                          | 41763.00 | 1 | 1 |
| Pressure-reducing valves, nitrogen                       | 33483.00 | 1 | 1 |
| Gas-cylinder Trolley for 10 l                            | 41790.10 | 1 | 1 |
| Step motor Stern-Gerlach apparatus                       | 09054.06 | 1 | 1 |
| Step motor unit  | 08087.99 | 1 | 1 |
| Data cable USB, plug type A/B, l = 1.8 m                 | 14608.00 | 1 | 1 |
| Software for stepping motor                              | 14451.61 | 1 | 1 |
| Adapter, BNC-socket/4 mm plug pair                       | 07542.27 | 1 | 1 |
| Screened cable, BNC, l = 1500 mm                         | 07542.12 | 1 | 1 |
| PC, Windows® 95 or higher                                |          |   |   |

Complete Equipment Set, Manual on CD-ROM included  
 Stern-Gerlach experiment P25111 01/11



Ionization current as a function of position (u) of detector with large excitation currents in the magnetic analyser.

field, it is possible to draw conclusions as to the magnitude and direction of the magnetic moment of the potassium atoms.

mentally determined special distribution of the particle beam density.

Tasks:

1. Recording the distribution of the particle beam density in the detection plane in the absence of the effective magnetic field.
2. Fitting a curve consisting of a straight line, a parabola, and another straight line, to the experimentally determined special distribution of the particle beam density.
3. Determining the dependence of the particle beam density in the detection plane with different values of the non-homogeneity of the effective magnetic field.
4. Investigating the positions of the maxima of the particle beam density as a function of the non-homogeneity of the magnetic field.