A Superconducting Solenoid for Conversion-Electron Spectroscopy in the Actinides

H. Hübel [a], W. Pohler [a], E. Mergel [a], D. Rossbach [a], B. Schulze [a], D. Habs, J. Simovic, and P. G. Thirolf

[a] Institut für Strahlen- und Kernphysik, Universität Bonn

The Bonn–Berlin superconducting solenoid electron spectrometer [1] will be installed at a beam line of the tandem accelerator. The beam line and beam port have been prepared and several improvements of the spectrometer have been made. Fig. 1 shows a floor plan of the experimental hall II of the Munich Tandem with the planned installation of the solenoid at the $+10^o$ beam line. At both ends of the solenoid Si(Li)-detectors with their dewars are included. A schematic drawing of the spectrometer is shown in Fig. 2. The cylindrical vacuum chamber in which the electrons spiral along the magnetic field lines to the detectors has an inner diameter of 85 mm and a length of 650 mm. Detectors may be inserted from both sides. If two Si electron detectors are used, e^-–e^- coincidences can be measured with large solid angle. The short side is well suited to mount a Ge detector close to the target for e^-–γ coincidence measurements. The space for the target and the detectors is separated from the cryo–vacuum, allowing for free access to mount baffle systems and electrostatic barriers for the suppression of low–energy δ–electrons. A new barrier has been constructed which may be operated up to a potential of 40 kV. A segmented Si detector has been acquired which allows the measurement of e^-–e^- coincidences on one side of the spectrometer alone. It has 24 segments arranged in six concentric rings which are separated into four sections. This detector has a thickness of 0.5 mm. Several conventional Si(Li) detectors of various thicknesses are also available. New compact preamlifiers and shapers have been developed for the segmented detector. The superconducting magnets (NbTi multicore filaments) consist of outer and inner coil pairs. Each pair can be powered separately resulting in a variety of field profiles. With a maximal current of 60 A in both coil sets a magnetic field of 2 T is obtained with good homogenity over a range of 500 mm [1]. In all previous experiments the field was applied perpendicular to the beam direction. Preparations for a collinear geometry where the beam is brought in on the axis of the solenoid have been made. The aim of the experiments, which will start in 1997, is the investigation of excited states in the superdeformed energy minimum of Actinide nuclei and their back–decay into the normal minimum. Conversion–electron spectroscopy is well suited for these studies because the conversion coefficients are large due to the high Z. In addition, E0 transitions are expected which can only be found by conversion–electron spectroscopy. The combination of the efficient electron spectrometer with segmented Si and Ge detectors allows to improve and extend previous measurements in this field considerably.

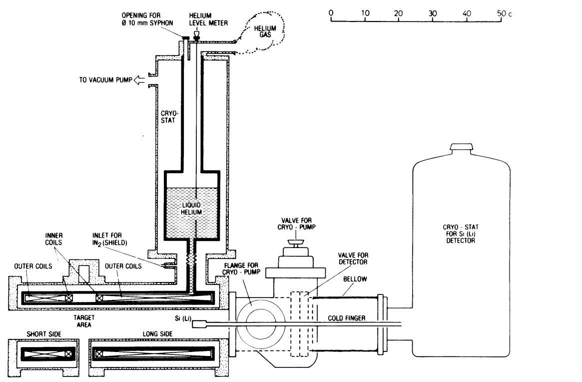

Fig. 1: The superconducting solenoid with ^{1}He reservoir and one Si(Li) electron detector.

References

[1] M. Guttormsen *et al.*, Nucl. Instr. Meth. **227** (1984) 489

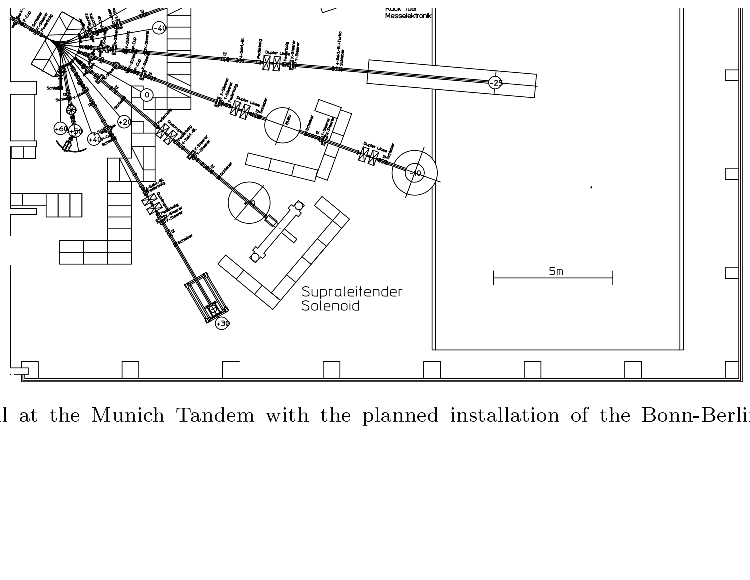

Fig. 2: The experimental hall at the Munich Tandem with the planned installation of the Bonn-Berlin superconducting solenoid at the $+10°$-beamline.