PREFACE

The annual report of the *Beschleunigerlaboratorium der Ludwig-Maximilians-Universität München und der Technischen Universität München* for the year 1997 provides information on experimental and theoretical studies performed by physicists from both universities in the field of *Nuclear Physics and Related Topics*. The contributions describe experiments performed at the *tandem accelerator in München* and investigations pursued at external research centers in which physicists from Munich played a major role.

The applied investigations represent a major field of experiments at the *tandem accelerator* and cover a broad range of topics from related fields of science:

- Accelerator Mass Spectrometry (AMS) mainly focusses on astrophysical problems, measurement of the dose of fast neutrons in Hiroshima, and investigations of super-asymmetric fission of uranium.
- A large number of samples from different fields of solid state physics has been investigated via ion beam analytics using high resolution ERD with less than 1 nm depth resolution.
- For high-temperature superconductors – when structuring on the nano-scale with high energy heavy ion beams – a fundamental surface effect was detected for the first time.
- A new ion beam micro probe has been setup. New micro slits were tested successfully with ion beams.
- For the investigation of particle-radiation biology a new unique experiment with a vertical ion beam has been installed. First results look promising.

These experiments are typically performed in close interdisciplinary cooperation with external groups.

A second center of experimental activities at the *tandem accelerator* focusses on high-resolution nuclear spectroscopy. For example, the low lying states of the odd-odd nucleus ^{196}Au were nicely resolved and quantum numbers could be assigned using spin-polarized beams. After putting the new laboratory for radioactive targets into operation exciting perspectives opened up: with unprecedented energy resolution and sensitivity the nuclear structure of actinide nuclei in the second superdeformed minimum was investigated.

The *tandem accelerator* itself and connected components as ion sources, beam transport and the computer systems worked reliably. Experimental developments in the field of ion sources resulted in ion beams of highest brilliance, nuclear polarized hydrogen beams of large intensities, and extremely low background beams for AMS. A new data acquisition system was designed and implemented.

The superconducting post accelerator TRITRON was tested successfully in 1997, with all the newly developed components working. Sulfur ions were accelerated several times, and the beam dynamics and beam losses were studied for several revolutions of the beam. The end energy of the system is limited by the quality and stability of the injected beam. Thus it was demonstrated that this new accelerator principle works and is theoretically understood. The TRITRON project as a prototype study has therefore come to an end, but opens promising prespectives for future accelerators.

The scientific program in this annual report is dominated by new projects in the field of nuclear physics, particle physics, and particle-astro physics:

- Studies of the properties of nuclei at the drip lines with the fragment separator (FRS) at GSI/Darmstadt and the NSCL of Michigan State University.
- Deployment of a new accelerator for radioactive ion beams at CERN (REX-ISOLDE) and development of a fission fragment accelerator at the new high-flux reactor FRM II in Garching.
- Detector developments, in particular for the experiments at CERN: ATLAS at LHC, COMPASS, and MiniBall.
- Investigations of the spin structure of the nucleon at the HERMES experiment (HERA, DESY), employing the spin-polarized hydrogen storage-target.
- Studies of the properties of hadrons in hot and dense hadronic matter using the HADES experiment at GSI.
- Planning and preparing experiments for the spectroscopy of solar neutrinos in the Gran Sasso Laboratory in Italy.

The education of young physicists from the two universities in Munich is regarded to be the main obligation of the Beschleunigerlaboratorium. During the year 1997 in total 23 diploma theses and 15 PhD theses have been completed. The authors of these and the titles of their manuscripts are summarized at the end of this annual report.

As in all the previous years the budget to run the experiments and the laboratory was provided by the state of Bavaria. Single projects were supported by grants provided by the DFG, the BMBF, the DAAD and the Alexander-von-Humboldt-Stiftung. With this annual report we want to inform all our sponsors and our friends and collegues about our work, and we want to thank them.

Dietrich Habs

Hans Joachim Körner

Prof. Dr. Dietrich Habs

Prof. Dr. Hans-Joachim Körner