PREFACE

The annual report of the *Beschleunigerlaboratorium der Ludwig-Maximilians-Universität München und der Technischen Universität München* for the year 1998 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:

- Experiments using accelerator mass spectrometry (AMS) were focussed on problems in astrophysics – with the first detection of supernova produced ^{60}Fe on earth –, in dosimetry – with the determination of the fluence of fast and thermal neutrons from the Hiroshima bomb – and in geophysics.
- For the development of new electronic and ultrahard materials numerous ERD analyses were performed using energetic heavy ion beams.
- An ion cooling or heating effect in single crystalline Si was observed for the first time within the studies of irradiation effects in solids.
- The essential components of the new micro probe were assembled and tested. The final installation at the beam line has started.
- Relativistic laser plasmas and especially the "'super channel"', appearing at Terawatt laser energies, were characterized by means of nuclear physics techniques. In collaboration with the laser plasma group at the MPQ, energy spectra of fusion neutrons, of the intense electron beam emerging the channel and of the corresponding Bremsstrahlung were investigated.

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

A second direction of experimental activities at the *Tandem accelerator* focuses on high-resolution nuclear spectroscopy. The precise transfer data to ^{196}Au and ^{195}Pt with high energy resolution of ~ 4 keV provide for the first time evidence for the validity of supersymmetry in nuclear systems.

The nuclear structure of Actinide nuclei in the superdeformed second and hyperdeformed third minimum of the potential surface was investigated with unprecedented energy resolution and sensivity using the method of transmission resonance spectroscopy.

The *Tandem accelerator* itself and connected components as ion sources, beam transport and the computer systems worked reliably. The new data acquisition system was implemented and operated successfully and will now be introduced also for all other experiments.

Experimental developments in the field of ion sources resulted in ion beams of highest brilliance, negative nuclear polarized Deuteron ion beams with intensities of more than 5 μA, and extremely low background beams for AMS.

The research program in the field of nuclear physics, particle physics, and particle-astro physics was dominated by new projects:

- Studies of the properties of nuclei at the drip lines with the fragment separator (FRS) at GSI/Darmstadt and the NSCL at Michigan State University.
- Development of a new accelerator for radioactive ion beams at CERN (REX-ISOLDE) and construction 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.
- Development of new methods for the production of ultracold neutrons for the FRM-II.
- Studies of the properties of hadrons in hot and dense hadronic matter using the FRS and the HADES experiment at GSI.
- Planning and preparing experiments for the spectroscopy of solar neutrinos in the Gran Sasso Laboratory in Italy.
- Investigations of the spin structure of the nucleon at the HERMES experiment (HERA, DESY), employing the spin-polarized Deuteron storage-target.

The theoretical physics associated with the Beschleunigerlabor supports the experiments in the field of nuclear and hadron physics. In particular, help and guidelines for running and future experiments are given on the topics of exotic nuclei, the properties of hadrons in nuclear matter and the study of hadron structure using high energy lepton beams at DESY and CERN.
The education of young physicists from the two universities in Munich is regarded to be the main obligation of the Beschleunigerlaboratorium. During the year 1998 in total 8 diploma theses and 10 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 colleagues about our work, and we want to thank them.

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