PREFACE

The annual report of the *Beschleunigerlaboratorium der Ludwig-Maximilians-Universität München und der Technischen Universität München* for the year 1996 provides information on experimental and theoretical studies performed by physicists from both universities in the field *Nuclear Physics and Related Topics*. The various contributions describe the activities pursued in Munich and projects performed at external research facilities with major contributions from Munich physicists. The newly appointed collegues at both universities in Munich have broadened the scientific spectrum of the research activities.

The tandem accelerator itself and related components such as ion sources, beam transport and data acquisition systems worked reliably and according to their specifications. The ion sources for polarized hydrogen beams, the designated injector for accelerator mass spectroscopy experiments with stable isotopes, and the replacement of the old 90° analyzing magnet by a magnet with superior ion optics, obtained from the Daresbury laboratory (UK), were improvements completed during 1996. A beam pipe pointing upwards by 90° was installed in the experimental hall I. It will be used for experiments studying the interaction of fast ion beams with biomolecules and solid state probes. A new magnet obtained from the GSI Darmstadt was installed in the experimental hall II. Equipped with the appropriate detectors this gas-filled analyzing system is very successfully being used for accelerator mass spectroscopy experiments with medium-heavy radionuclides.

Extensive tests were performed in the superconducting TRITRON post-accelerator to study the beam transport and beam dynamics inside the machine as well as in the injection path. Progress in the performance of many components could be achieved. It appears, however, that the full operation of the whole system cannot be guaranteed in reasonable time. The directorate (Forschungskollegium) of the laboratory has therefore decided to terminate the TRITRON project in 1997.

The scientific program at the accelerator laboratory aims at two major subjects: (1) Studies to understand nuclear structure and fission, the mechanism of heavy ion reactions, and the interaction of hadronic probes with nuclei. (2) A broad spectrum of applications of experimental nuclear techniques in adjacent fields of the natural sciences.

Basic research projects at external research facilities include: Progress in the realisation of an accelerator for radioactive beams REX-ISOLDE at CERN; studies and first activities to install an accelerator for fission products at the new research reactor FRM II in Munich; plans to build a background-free laboratory for detector developments in astro-physics projects; large efforts in the development of the di-lepton spectrometer HADES, to be built and used at the GSI Darmstadt; and tests of large-area detectors with high position resolution, which are part of the ATLAS detector for the pp storage-ring LHC at CERN.

We emphazise the successful operation of the polarized hydrogen target for measurements of the spin-structure of the nucleon in the HERMES experiment at HERA/DESY, studies of the antiprotonic helium system at LEAR/ CERN, mass measurements of radioactive nuclei at the storage ring ESR, and the observation of deeply bound pionic states in lead in an experiment at the fragment separator FRS of the GSI Darmstadt. All these experimental activities are accompanied by excellent theoretical work.

In the field of applications we mention the research in astrophysical problems, by the use of accelerator mass spectroscopy and with inverse beta-decay studies at the storage ring ESR. At the tandem laboratory accelerator mass spectroscopy was used to investigate transport phenomena in medical applications. Basic studies of the interaction of energetic ion beams with solid state and with gas targets were performed as well as "tailored" modifications of solid state materials by ion beams. Elastic recoil detection techniques were used to analyze various probes, and work for the development of an ion beam microprobe with a resolution in the sub-micrometer range has started. All these experiments in the field of applications were performed in close cooperation with external groups.

The education of physics students from both universities in Munich is regarded to be the main obligation of the Beschleunigerlaboratorium. A number of interesting diploma and PhD thesis works have been completed during the year 1996. The authors of these as well as the titles of their manuscripts are summarized at the end of this annual report. For the first time, laboratory training was offered for groups of third year physics students from the Technische Universität München. They were educated in in-beam experimental techniques with energetic particle beams. This program is considered to be a great success. More than 400 high-school students have been introduced into the research-life of the tandem laboratory in 35 guided tours.

As in all the previous years the budget to run the laboratory and the experiments 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.

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