17 Mechanical Workshop

K. Bösiger, B. Lussi, R. Maier, M. Schaffner, S. Scherr, D. Dürst (apprentice), T. Naterop (apprentice)

Many interesting and demanding projects were realized for the research groups at the institute in the reporting period. In addition the mechanical workshop again supported other departments of the University and outside companies. The service provided by the central metal and technical material store maintained by the mechanical workshop could be further extended. [6] The large demand for the store services was demonstrated by a highly succesfull information meeting that we organized in November 2010 (Fig. 17.1) and by the over thirty institutes that used the supply of raw material, semi-finished products and components.

Fig. 17.1 – Visitors of the information meeting for the central store customers.

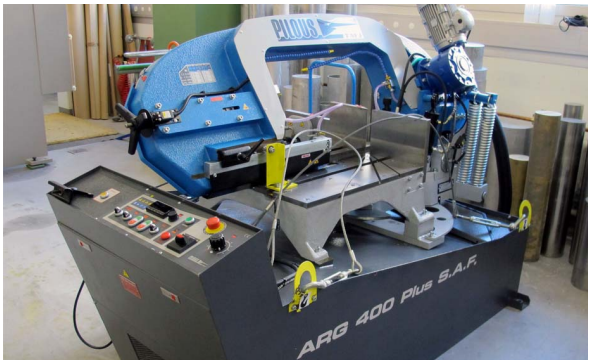

Fig. 17.2 – The new band saw in the material store.

The income from production of components for outside firms was again used to supplement and extend the central store. Also new tooling and the continuing education of the workshop staff and the apprentices could be financed this way. Various investments and acquisitions were made. In the material store we replaced a metal cutting bow saw with a powerful band saw (Fig. 17.2). The new semi-automatic machine allows to precisely cut raw materials with diameters up to 400 mm. The whole cutting process is automated which substantially increases the productivity, especially for solid materials. The integrated saw band speed control improves the cut quality and the saw band life time.

With the network license for the SolidWorks 3D design software, owned by the workshop and made available for the institute staff, the quality and the reliability of the technical drawings prepared by the research groups improved noticeably.

In August 2010 we started with the procurement of a new CNC-lathe. It is planned, that the new computer controlled machine, which replaces a 20 years old tool, will be installed in autumn 2011.

During two months we conducted the basic mechanical workshop courses for bachelor students. There were twelve courses with a work load of 35 hours each. In October 2010 and January 2011 we provided again one-week introductory mechanical workshop courses for the research staff of our institute and other institutes of the University.

Besides maintenance and repair work and support of various Bachelor- and Master-thesis projects we like to mention the following activities:

- **LHCb silicon tracking detector (Sec. 10)**
  Spare parts were manufactured for the LHCb silicon tracking detector. For this purpose we also produced new work holding devices and other auxiliary components.

[6] For a catalog see http://www.physik.unizh.ch/groups/werkstatt/dienstleistung.html

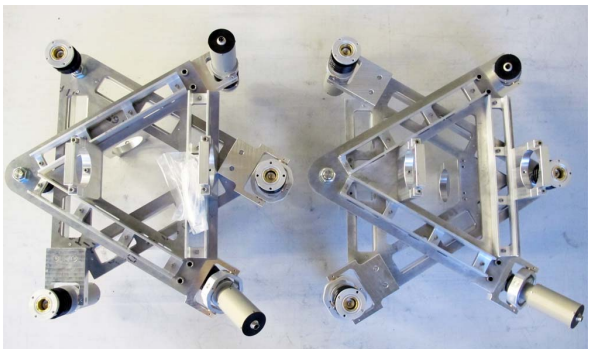

Fig. 17.3 – Complete mirror support structures for the CTA prototype telescope.

Fig. 17.4 – Molybdenum parts.

- **CTA Cherenkov Telescope Array (Sec. 6)**
  Test setups were assembled and a mirror support structure for the CTA prototype telescope was built (Fig. 17.3).

- **Surface Physics (Sec. 14)**
  We produced components for the upgrade of the Synergia project. On our five-axes milling machine very complex vacuum flanges were machined. Series of various molybdenum and stainless steel parts were fabricated (Fig. 17.4).

- **GERDA (Secs. 3)**
  A new calibration system for the GERDA experiment was designed in collaboration with the research group and the electronics workshop (Fig. 17.5). Three systems were manufactured.

- **Physics of Biological Systems (Sec. 15)**
  The custom-built vapour deposition device with six coating stations had to be modified. The water cooling system was improved. We manufactured ceramic mounts with contacts to hold silicon wafers and performed maintenance and repair work (Fig. 17.6).

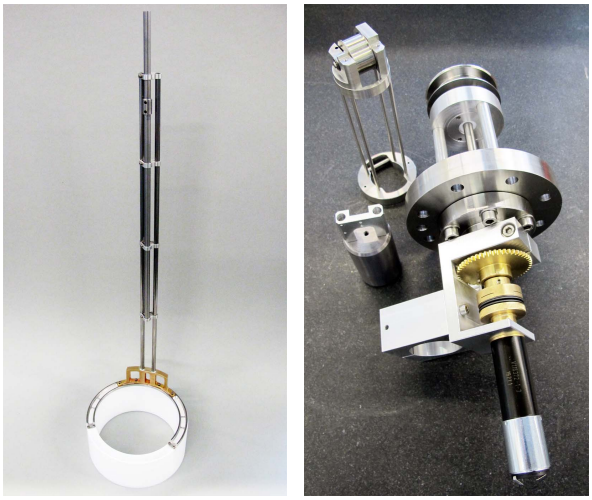

Fig. 17.5 – Left: teflon cooling component for the XENON experiment. Right: parts for one complete calibration system for the GERDA experiment.

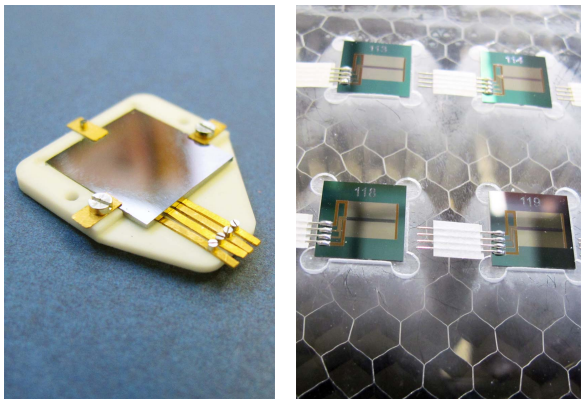

Fig. 17.6 – Left: custom-built silicon wafer holder. Right: labeling of printed circuit boards on the laser engraving system.

- **Solid State Physics (Sec. 12)**
  The high temperature superconductor demonstration experiment with a model magnetic levitation train built in previous years attracted broad interest. The frequent operation resulted in lot of maintenance work. We also built motor driven probe manipulators, evaporation masks and high pressure containers made of high-tensile materials (Fig. 17.7).

- **Fusion Neutron source**
  In summer 2010 the neutron generator vessel was finally filled with paraffin in the assembly hall of the workshop. The system was then installed and brought into operation in the custom-built shielding compartment in the basement (Fig. 17.8).

- **Demonstration and laboratory experiments**
  Several instruments and devices used in the demonstration experiments for the physics courses were improved and refurbished. We produced the mechanical components for a new demonstration experiment (a Wilson chamber, see Fig. 17.9) which will also be shown at expositions.

- **Continuing education of the workshop staff**
  The main focus was again on welding seminars and software courses. Higher level tutorials for the CAM software packages "hyperMill" and "Mastercam" used in the mechanical workshop were attended.

- **Education of the apprentices**
  In April 2010 and January 2011 we organized again trial apprenticeship for candidates interested in getting a grade as poly-technician. Besides the mandatory Swissmechanic courses the apprentices attended again advanced courses in computer controlled machine (CNC) programming, pneumatics and electronics. Also introductary seminars on graphical and office software were attended. By the end of February 2011 preparations for the intermediate and final apprenticeship examinations started.

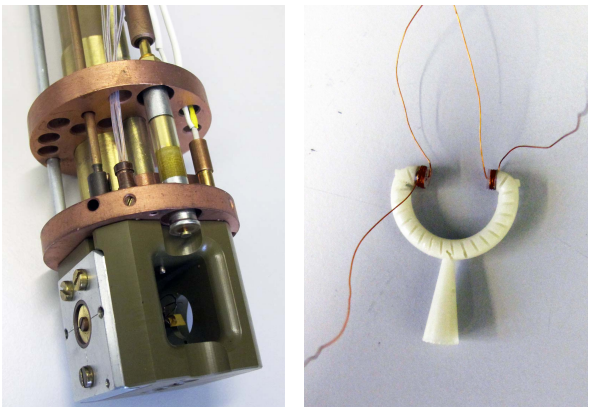

Fig. 17.7 – Left: probe manipulator. Right: special molded coil carrier.

Fig. 17.8 – Neutron generator installed in the shielding compartment. The fusion neutron source is mounted in the vessel to the right.

Fig. 17.9 – Housing of the Wilson chamber during machining on the mill.

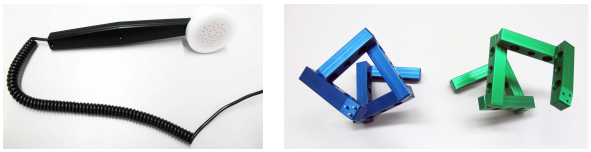

Fig. 17.10 – Left: headphone for the museum of zoology. Right: Two construction sets visualizing right- and left-turning DNA structures.

Fig. 17.11 – Sealed greenhouse with integrated control adaptors to study CO_2 metabolism.

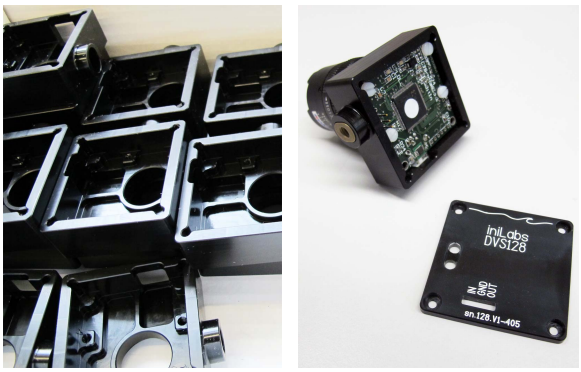

Fig. 17.12 – Left: plastic camera housings. Right: complete opened camera.

Activities for other departments and outside companies:

- For the museum of zoology we designed and produced head phones (Fig. 17.10 left).
- We manufactured construction sets which are presently used to demonstrate DNA molecules in the exhibition "Astrophysics and Biology" (Fig. 17.10 right).
- For a research group at the department of geography we designed and built two hermetically sealed greenhouse boxes with integrated control adaptors to study the CO_2 metabolism (Fig. 17.11).
- Micro drives with sensor holders used at universities in New York and custom designed camera packages made out of plastic (POM) were manufactured for the institute of neuroinformatics (Fig. 17.12).
- For the institute of medical virology special filter cartridges were fabricated.
- A series of custom-built portable cases with embedded x-y linear stages supporting a movable probe carrier were designed and assembled for the institute of pathology (Fig. 17.13). Up to 96 DNA probes can be filled computer controlled into the probe holder.
- For outside companies we built prototypes and produced limited-lot series. We also manufactured special LED-lamp housings for a company which is selling illuminating systems.

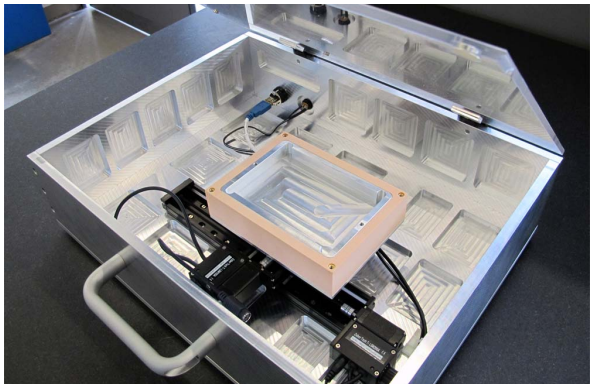

Fig. 17.13 – Custom-built portable case with x-y linear stages supporting a movable probe carrier.