12 Mechanical Workshop

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The modern equipment of the institute's mechanical workshop allows to fulfill almost every wish from the researchers. The numerically controlled tools are also used to produce parts for other institutes of the university. The metal and technical material store, maintained by the workshop, is used by more than 30 institutes [10]. We also give advise in technical problems, like the choice of the appropriate materials, etc. For outside companies we do construction and modification work. We also design and build prototypes and limited-lot productions. The resulting income is available for new tooling and the education and advanced training of the apprentices and the staff members.

Figure 12.1: Installation of the new milling machine.

In December 2006 we installed a milling machine with 5 axes. Three of them are simultaneously computer controlled whereas the other two are positioned at fixed values. The powerful tool changer with 16 pockets allows the automatic production of complex workpieces. The design offers a perfect solution for manufacturing almost anything from single parts to small series. The compact design with a walled enclosure and the modern ergonomics emphasize the universality of the machine which replaces a 22 years old machine.

Besides educating two apprentices the workshop staff organizes and teaches also two basic courses for the bachelor students in physics. In the first part the students learn how to use all kinds of measuring tools and how to read and produce technical drawings. They also accomplish simple work on drilling and milling machines as well as on the lathe. The course finishes with an introduction in the technique of hard soldering. In the second part more demanding machining techniques are trained. Different materials are handled and an introduction into various welding processes is given. In autumn 2006 and spring 2007 four courses of 35 hours each were arranged.

Below we list some of our main projects and activities during 2006.

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

LHCb inner tracking detector
(Group Straumann, see Sec. 6)

The main part of the workshop workload was related to this project. The complete detector housings including the adjustable suspension were produced. In the middle of 2006 we produced all the custom-built electronic crates with the integrated water cooling. The complete system with the rails and the detector housings including the cooling circuits was then assembled in the institute's assembly hall. Cooling tests under realistic conditions were performed successfully. By the end of 2006 the complete system was moved to CERN and installed in the LHCb experimental hall.

Figure 12.2: Crate-cooling elements.

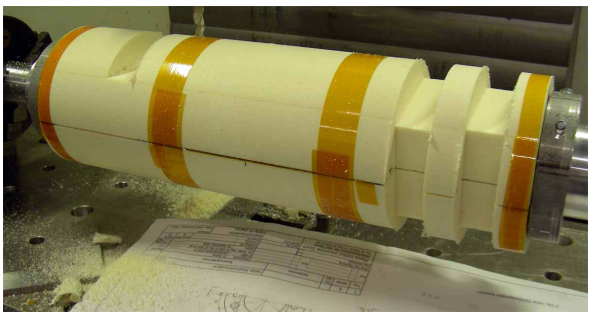

Figure 12.3: Thermal beam-pipe shielding.

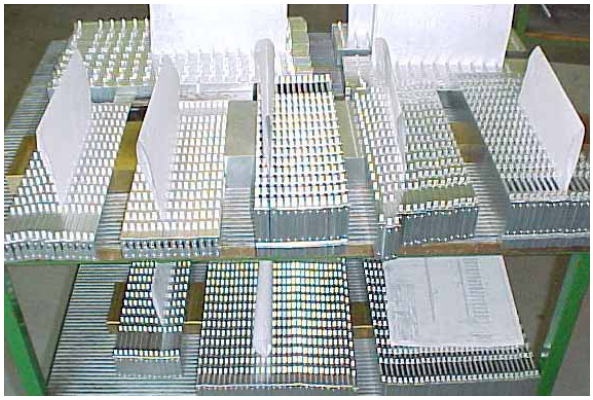

Figure 12.4: Parts of the electronic crates.

Figure 12.5: Inner tracking detector for LHCb with partially-installed silicon sensors.

CMS pixel detector
(Group Amsler, see Sec. 7)

In close collaboration with industry the laser welding process was optimized. The quality of this manufacturing process is crucial to guarantee the tightness of the detector cooling system. Missing tooling for the third detector layer was produced. At the beginning of 2007 the production of the first supply tube started. The modern milling machine installed last year was used to produce cooling fluid distributors with a complex shape made out of stainless steel.

Figure 12.6: Test segment.

Figure 12.7: Mounting tool for the third detector layer.

DIRAC II
(Group Amsler, see Sec. 4)

For the DIRAC II experiment at the CERN-PS we built the housings for the Čerenkov detector.

Figure 12.8: Čerenkov-detector housings.

Surface Physics
(Group Osterwalder, see Sec. 10)

The frame for the μ-metal shielding for the COPHEE experiment installed at the swiss light source (SLS) in Villigen was designed and manufactured. A series of probe- and vacuum-deposition-holders were produced. Some apparatus were upgraded, in addition we performed maintenance and repair work.

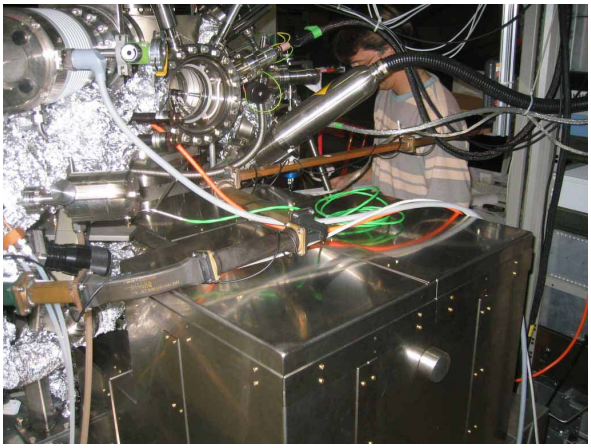

Figure 12.9: Picture of the COPHEE experiment showing the newly installed μ-metal shielding for the Mott detectors.

Figure 12.10: Probe holders made out of Molybdenum.

Physics of Biological Systems
(Group Fink, see Sec. 11)

Different mechanical infrastructure was manufactured and some test setups were built. We produced also a high temperature oven made out of ceramic material.

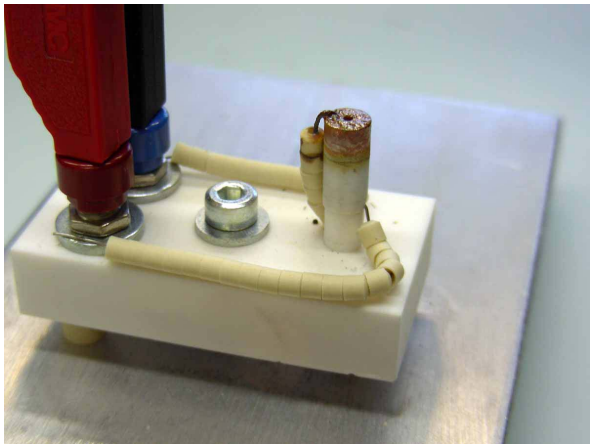

Figure 12.11: The new oven in operation.

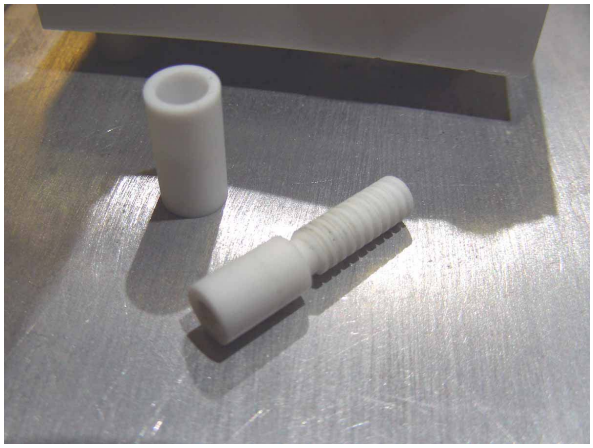

Figure 12.12: Coil bobin and outer shell.

Projects of other institutes and outside companies

We completed various projects of other institutes of the university as well as outside companies. For the zoological institute we carried out a major welding task for a touring exposition.

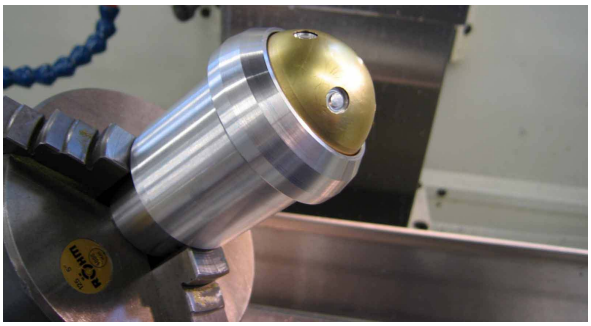

Figure 12.13: Special light source.

Figure 12.14: Replacement wheel housing for a racing car.

Figure 12.15: Feeding trays for the animal hospital.

Continuing education of the workshop staff

On the sixth of February we visited Deckel Maho Gildenmeister in Pfronten (Germany). An overview was given of the latest milling machines and state-of-the-art milling techniques. We also attended seminars and training courses for the CAM software used in the workshop, new welding procedures and machining techniques.

Figure 12.16: Here we are watching a huge milling machine.

Education of the apprentices

Besides the mandatory courses the apprentices attend they also completed advanced education in computer controlled machine (CNC) programming, pneumatics and electronics. The apprentices also carried out by themselves a project for the animal hospital of the university. The intermediate and final examinations will take place in May 2007.

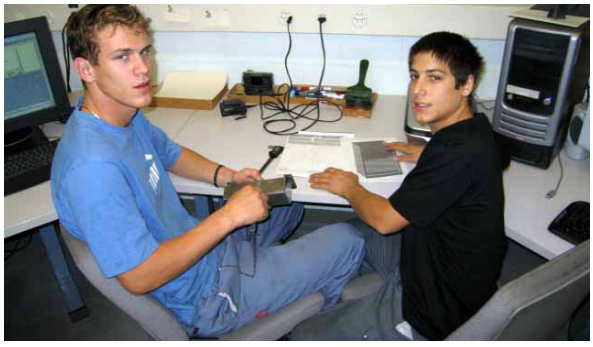

Figure 12.17: The apprentices discussing their project.