16 Electronics Workshop

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During the reporting period the electronic workshop contributed to many projects of our institute, such as:

- With the delivery and successful installation mid 2008 of the components designed and manufactured for the CMS pixel detector at CERN our activities for this project were terminated. Meanwhile the complete system is integrated into the CMS detector and measurements with cosmic rays show that the detector system performs very well.
- The involvement in the installation and commissioning of the trigger tracker system of the LHCb experiment proceeds. Some laser diodes of the readout system had to be replaced and the cooling system of the electronics was upgraded.

Figure 16.1: Part of the readout electronics of the LHCb trigger tracker.

- The secondary particles generated in the atmosphere by high-energy gamma rays produce Cherenkov radiation which can be detected by optical telescopes. The Cherenkov Telescope Array (CTA) Project aims at building the next generation ground-based gamma-ray telescope. Two arrays of optical telescopes are planned. A southern hemisphere array, covering the energy range from some 10 GeV to about 100 TeV will allow for a detailed investigation of galactic sources including the central part of our Galaxy and for the observation of extragalactic objects. A northern hemisphere array, sensitive in the low energy region from some 10 GeV to $\sim$1 TeV is dedicated mainly to extragalactic objects. The required mirror diameter of about 20 m can only be realized by segmentation. The individual mirror facets span an area of 2.5 m^2.

Mechanical instabilities in the support structure of the telescope require a continuous alignment of the facets with respect to a reference position. This is done with two precise actuators installed on every segment. The electronic workshop developed and built the control electronics for a prototype system. The devices allow a range of operation of 35 mm with a precision of $\sim$35 μm. To minimize cabling a wireless communication is planned with the central control processor. To test the actuators under realistic conditions with constant exposure to the environment we are presently building a remote controlled test setup with a dummy mirror facet. It will be installed in spring 2009 on the roof of the institute's building. Whereas the actuators are permanently moving we record the actual positions and weather condi-

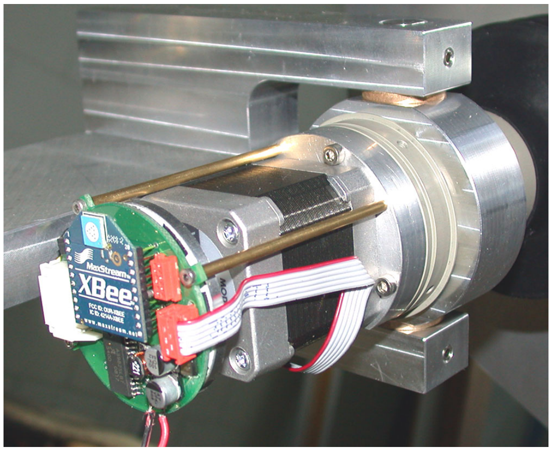

Figure 16.2: Prototype actuator for the CTA experiment with the control electronics and the wireless communication unit. Two of these are used to align one single mirror facet.

tions. The data will be analyzed and used to find correlations and possible impacts.

- For a new spin polarimeter of the Surface Physics group we constructed fast programmable discriminators and a high-speed interface. The discriminators had to be small since they have to fit in the detector head near the GAPD sensor.

- For the XENON experiment a dedicated bipolar power supply and special ultra-clean PMT bases made out of a Teflon substrate were built.

- We are also coordinating the development and construction of a new demonstration experiment with a running train supported by cooled high temperature superconductors floating in a magnetic field. Among others we built different adaptor boxes with the necessary dedicated cables and a simple motor control unit for a new student experiment which measures the gravitational constant.

- In collaboration with L. Pauli and M. Weber (J. Seiler retired in June 2008), who are responsible for the preparation of the demonstration experiments, we renewed and improved again some experiments. As an example Fig. 16.3 shows the renewed control unit and the actual user interface of the microwave scattering demonstration experiment.

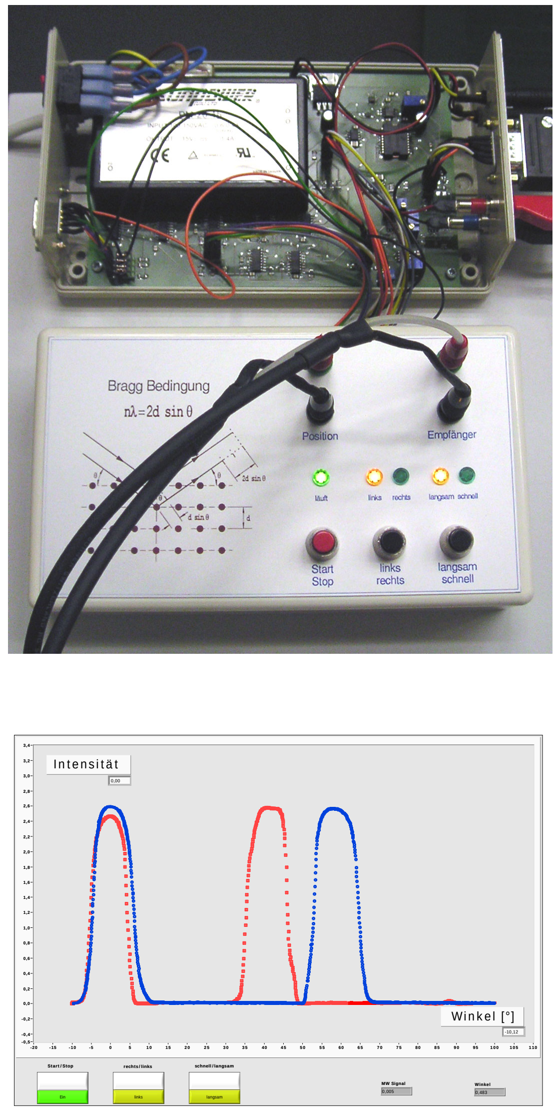

Figure 16.3: The renewed control unit and the computer user interface of the Bragg demonstration scattering experiment. The curves show two measurements with different orientation of the crystal model axis.

The electronics workshop supported all research groups in maintaining and repairing the existing devices and equipment. Thanks to a supplementary credit we could purchase some new tooling which helps in assembling cables. The Automatic Cutting Machine cuts wire, cable, round material such as tubing, flat ribbon and Glass Fiber Optic cable. This unit can process wires up to 21 mm^2, cuts round material up to 15 mm in diameter and cuts flat material up to 100 mm wide. Programming and operation is performed with a user-friendly control panel. The Stripping Machine is an electric wire and cable stripping machine for a wide range of single conductor wires, either stranded or solid up to 4.7 mm in diameter for partial strips, respectively 3.2 mm in diameter for full strips. It strips lengths up to 25 mm and handles wires from 0.03 to 5.26 mm^2. The machine is highly portable, compact and fast and powerful. Stripping of most insulation types with one set of blades is no problem with this robust machine. The stripping length and stripping diameter are easily adjustable, allowing quick changeover between different types of wires. In addition, the unit is also capable of partial and full insulation strips.

In April 2008 on the occasion of the 175th anniversary of the University of Zürich the workshop staff arranged and installed an exhibition stand. We provided different electronic construction sets and the necessary tooling for the assembly of the devices. Interested visitors were invited to assemble their own part with our help and instruction. Guests, primarily children with their parents, were building electronic devices with an amazing enthusiasm all day until the last resistor was soldered to the final remaining printed circuit board.