16 Mechanical Workshop

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The modern infrastructure of our mechanical workshop helps us solve demanding problems both for the in-house projects presented in this report and for some projects from other institutes of our university. Over 30 institutes again made use of the metal and other technical material supply stores maintained by the shop[4]. A small fraction of our activities was devoted to special designs, modifications and small series for outside companies. This work is charged and provides some income.

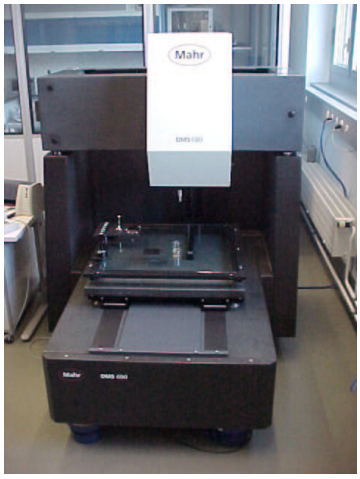


Figure 16.1: *The new coordinate measuring system in the air-conditioned clean room of the institute.*

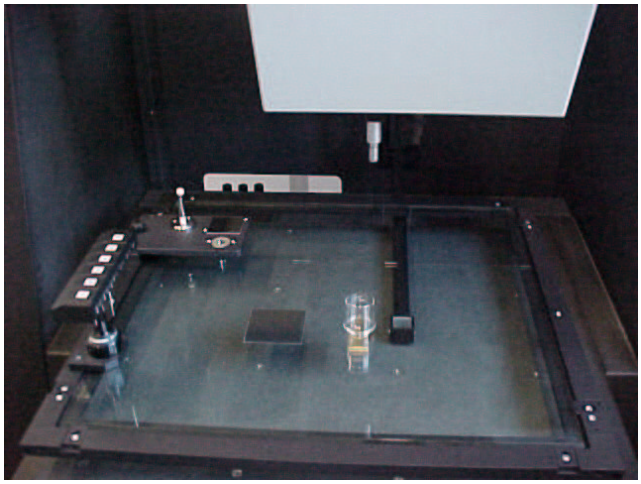


Figure 16.2: *Detailed view of the glass surveying table with two measuring samples.*

Last year the workshop equipment was supplemented by a MAHR OMS 600 coordinate measuring system from which many projects may benefit enormously. The instrument allows precise ($1.5\,\mu$m) mechanical and optical (with a video and a laser system) surveying of mechanical parts with dimensions up to $650 \times 600 \times 300$ mm^3.

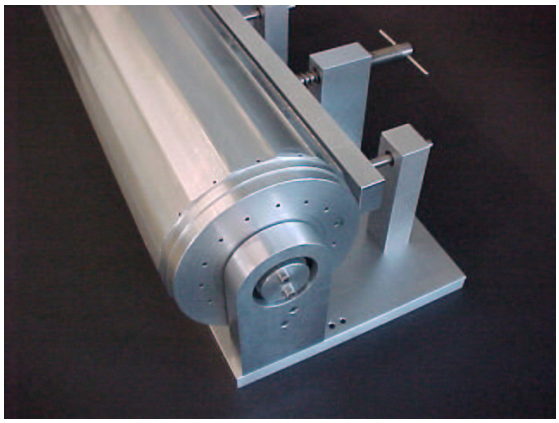
A selection of our projects is listed below:

- *CMS pixel detector (Group Amsler, see Section 11)*
  For the production of the support structure for the CMS pixel detector all the necessary tools were produced. Additional laser welding tests were performed in close collaboration with an outside company. Some modifications and better tools for the welding process led to nice results. A full support structure segment is now being prepared for cooling and stability tests.

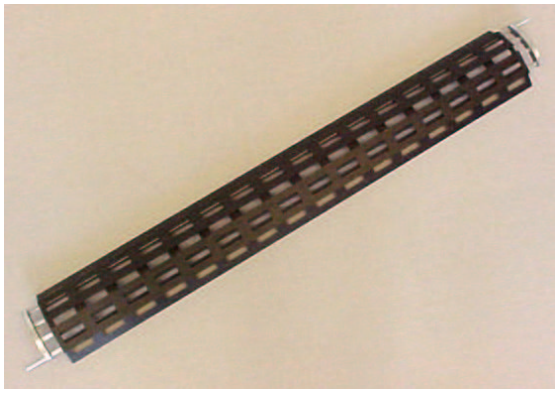
- *LHCb inner tracking detector (Group Straumann, see Section 9)*
  Cooling balconies made of different materials were manufactured to study the specific characteristics. In addition test stands and other small parts were produced.

- *Surface Physics (Group Osterwalder, see Section 13)*
  For this group the priorities were repair and maintenance work.

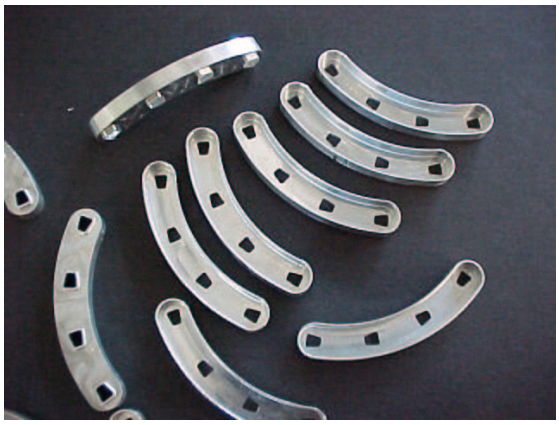
[4]For a catalogue see http://www.physik.unizh.ch/groups/ werkstatt/dienstleistung.html



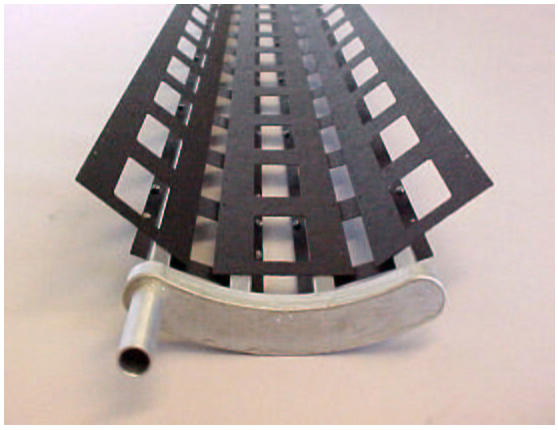
Tool used to produce the support structure for the middle layer of the CMS pixel detector.



Completed segment of the pixel detector support structure.

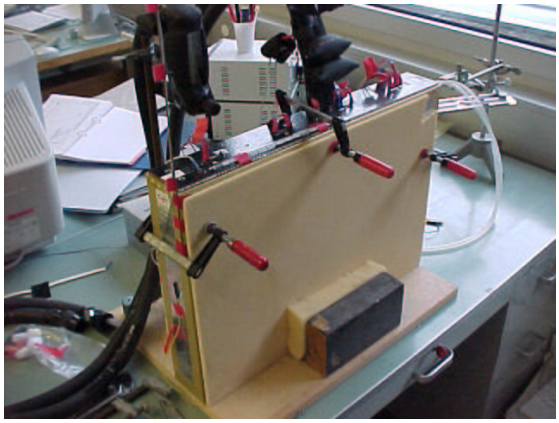


Open aluminum cooling containers after the difficult machining.

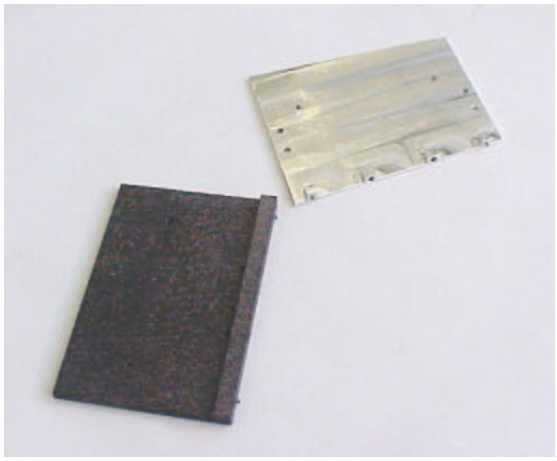


End view of the support and cooling structure. The aluminum parts are connected by laser welding.

Figure 16.3: *Pictures from the CMS pixel project.*



Isolating detector box made out of polyurethane during the cooling test.

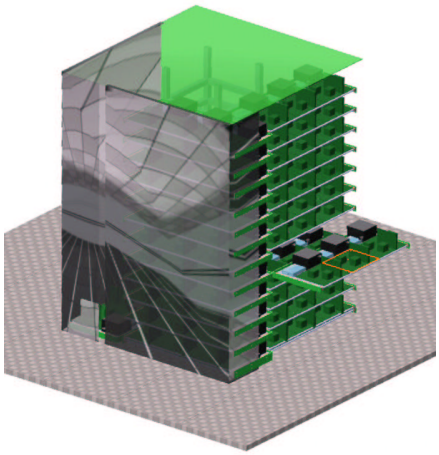


Two cooling balcony prototypes made out of aluminum and carbon fiber composite.

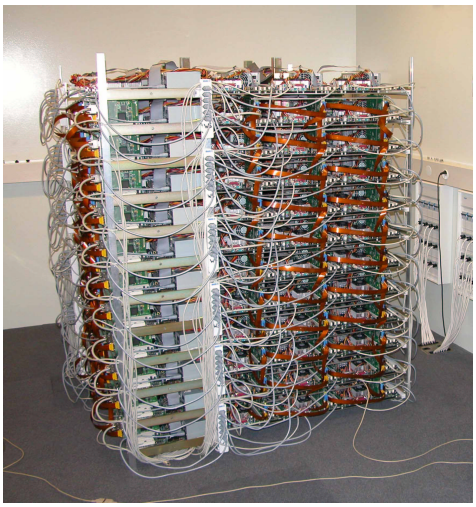
Figure 16.4: *Pictures from parts of the LHCb inner tracker.*

- *Physics of Biological Systems (Group Fink, see Section 14)*
  Different structures for the experiments and test stands were manufactured.

- *Rack for the CPU cluster of the institute for theoretical physics*
  A rack was designed and built which carries the 144 dual processor motherboards with all the necessary power supplies and hard disks. The quadratic tower which contains the full equipment has a side length of 1.70 m and a height of 1.85 m.



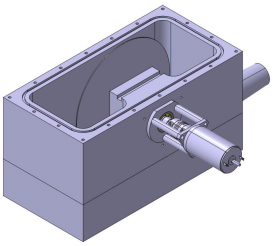
Isometric view of the rack for the computer cluster.



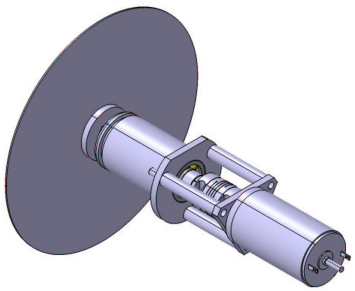
The rack after the installation of all nodes. The rack will be covered to guarantee proper cooling.

Figure 16.5: *Pictures of the computer rack.*

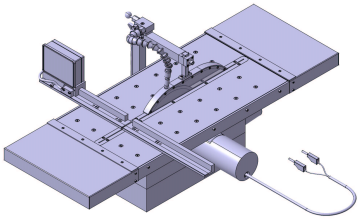
- *Apprentice exam work*
  The candidates produce workpieces that will be used eventually, such as a circular saw with diamond blade to be used in the workshop afterwards. For the instructors this means more preparation work although it allows more flexibility as well. During the early stages of the projects the apprentices participate in discussions and preparations. They now do the exam work in the home workshop which has the advantage that the work is done in their familiar environment with well known equipment. The time for the production of the parts varies between 24 and 120 hours. The exam is completed with an oral presentation followed by a discussion with the examinator.



Housing for the circular saw with sawing table removed.



Motor and drive for the diamond saw.



View of the completed circular saw.

Figure 16.6: *Pictures from the apprentice examination work.*