15 Mechanical Workshop

B. Schmid, K. Bösiger, M. Schaffner (since 8/01), Y. Steiger (apprentice until 7/01),
P. Treier, B. Wachter, B. Zaugg (retired 11/01 - left us after 27 years),
R. Caro (apprentice, since 8/01) and A. Rochat (apprentice)

Last year the workshop was again fully occupied manufacturing numerous components for the different research projects presented in this report. A small part of the shop activity was also devoted to orders from outside consisting in special designs, modifications and small series. This work is charged and provides some income. More than 30 institutes made use of the metal/technical material supply stores maintained by us[3].

In April 2001 we helped install the new 5 layer cylindrical wire chamber (CIP) in H1. Pictures are shown in Fig.6.2. Below we show a selection of our contributions to the following three projects:

- CMS pixel detector (Sec.10) and LHCb inner tracking detector (Sec.8): different test setups and prototypes were manufactured.

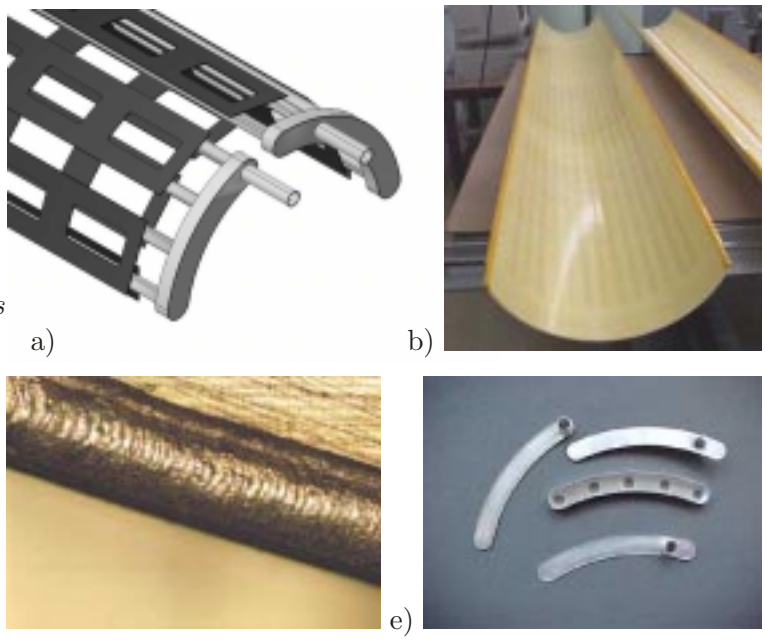
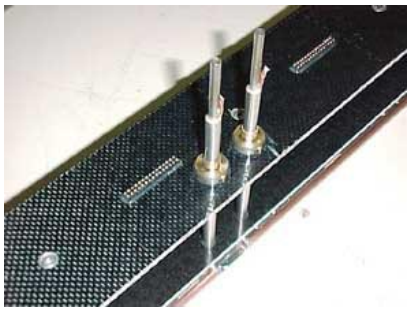


Figure 15.1: *Picures from the CMS pixel project:*
a) support structure
b) service tube prototype
c) test setup for the laser welding of the cooling tubes
d) a welding seam under the microscope
e) different pure aluminum parts which have to be laser welded

- Surface physics group: For the spin-resolved photoelectron spectrometer COPHEE (see Sec.12.8) an electrostatic beam transport system was manufactured, which guides the electrons from the energy analyzer to the two Mott detectors. The system consists of a set of aluminum electrodes, spherical deflection elements and cylindrical lens parts, separated by macor insulators for use in ultrahigh vacuum. A two-way switch with parallel deflection plates and a symmetric end-deflector allows the beam to be sent to either of the two Mott detectors. The vacuum envelope consists of several welded stainless steel chambers. A special stainless steel chamber encloses the switch and the large entrance optics of the Mott detectors. It was cut from a single 231 kg block of steel (final mass $\approx$ 50 kg).

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


a)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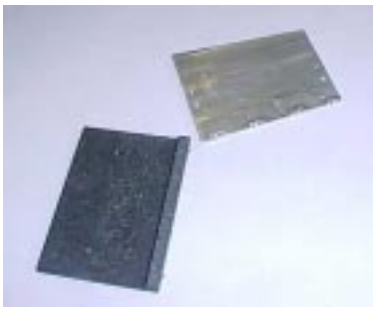
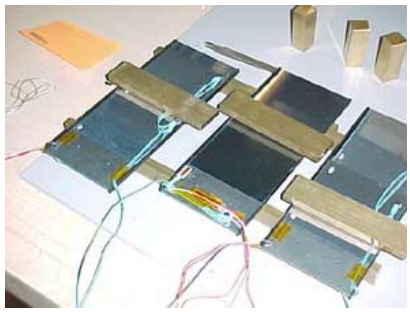

c)

Figure 15.2: *the LHCb inner tracker:*
a) polyurethane isolating detector box
b) box cover with electrical connectors and cooling tubes
c) cooling parts made of aluminum and foam-impregnated carbon fibre
d) silicon detectors with temperature sensors
e) complete test setup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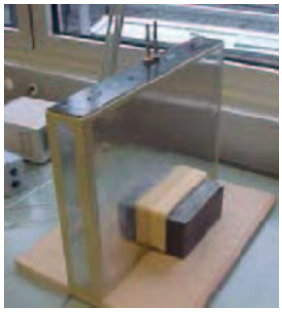
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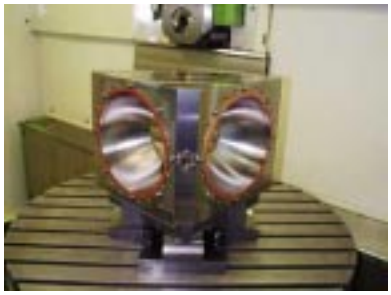
a)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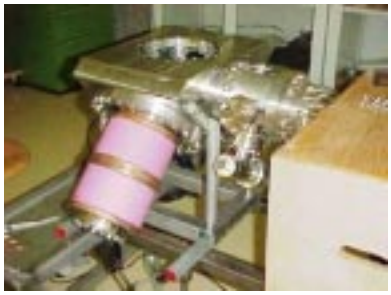

c)

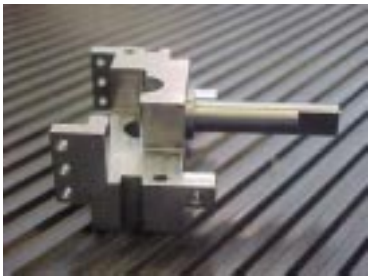
Figure 15.3: *the COPHEE project.*
a) forged steel block used for the beam chamber (weight 231 kg)
b) resulting chamber (weight 50 kg)
c) beam chamber during assembly
d) view inside the 90 ° deflection part of the beam transport system
e) aluminum electrodes for the beam transport system with 45 ° switch


d)


e)

- Artificial Intelligence Laboratory, Department of Computer Science (this work was done by the apprentices): The "Whirling Arm" will be used at the Artificial Intelligence Lab as an experimental tool for research on insect vision. It can be looked at as a "flight-simulator for insect eyes": An artificial insect eye (camera or specially constructed compound eye) is mounted on the Whirling Arm and is then subjected to fast and complex movements in space that can (to some degree) mimic the actual situation encountered by the head of a flying insect. One goal of these studies is to better understand how the specific features of insect eyes (e.g., its sensor morphology) relate to the visual input the animal encounters during its flight and how this can facilitate flight control. Since insects - like the housefly - can navigate very fast the Whirling Arm has to be able to produce very fast reactions too. Consequently it was designed for a minimum of inertia for each of its three rotational degrees of freedom while at the same time providing enough motor power for fast accelerations.

a)



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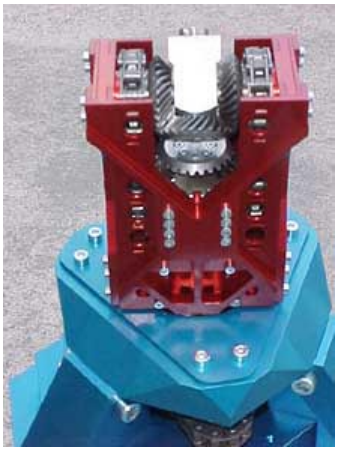

d)

e)

Figure 15.4: *the whirling arm project:*
a) reinforced side piece of the moving part milled out off aluminum
b) another single piece illustrating the complex processing
c) look inside the moving head showing the complicated transmission
d) detail of the assembled moving head
e) the completed "Whirling Arm" with support frame and motors