

as the booster; the main synchrotron taking the beam to the final energy; followed by a stretcher that fits into the same tunnel as the main ring of circumference 960 m (any resemblance to existing presently empty tunnels is not unintentional). Bradamante pointed out that earlier criticisms are no longer valid. The price seems under control, the total investment for a 'green pasture' version amounting to about 870 million Deutschmarks. A version using existing facilities would be some-

what cheaper because some expenditure on buildings and general infrastructure would be saved.

In his concluding remarks, F. Scheck of Mainz, chairman of the EHF Study Group, pointed out that the physics case for EHF was well demonstrated, that there was a strong and competent European physics community pushing for it, and that there were good reasons for building it in Europe. He also described three site options: a 'green pasture' version in Italy; at CERN using the now defunct ISR

tunnel (this would require complementary funding beyond the normal CERN budget); and at the Swiss SIN Laboratory. Finally he pointed out that it was really one large community of future users, not three, who were pushing for a 'kaon factory'. Whoever would be first to obtain approval, the others would beat a path to his door.

National decisions on the project will be taken this year.

By Florian Scheck

ZEUS and HERA

The HERA electron-proton collider now being built at the German DESY Laboratory in Hamburg will be a unique physics tool. Colliding 820 GeV protons with 30 GeV electrons in a 6.3 km tunnel will probe the structure of matter down to distances of 10^{-18} — a hundred times finer than CERN's proton-antiproton Collider.

Electron probes have a tradition of opening up new physics frontiers — the Franck and Hertz investigations which revealed details of atomic structure; Hofstadter's studies at Stanford which saw the structure of the nucleus; and the experiments at the Stanford linac in the late sixties which showed that the nucleon too had a structure. Will HERA be able to find a deeper layer in the structure of matter?

In addition, the machine will be able to explore particle interactions under new conditions, and will supply physics insights comple-



A ZEUS group meeting, with spokesman Günter Wolf one step in front of the pack.

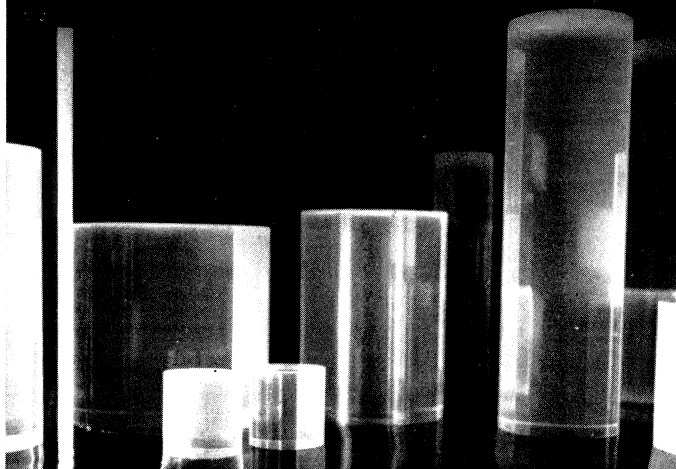
(Photo DESY)

mentary to those from CERN's LEP electron-positron Collider.

Construction of detectors for HERA is a new challenge. As well as having to measure particles and

jets of particles with precision at up to very high energies, the large momentum imbalance between the colliding protons and electrons means that most of the emerging

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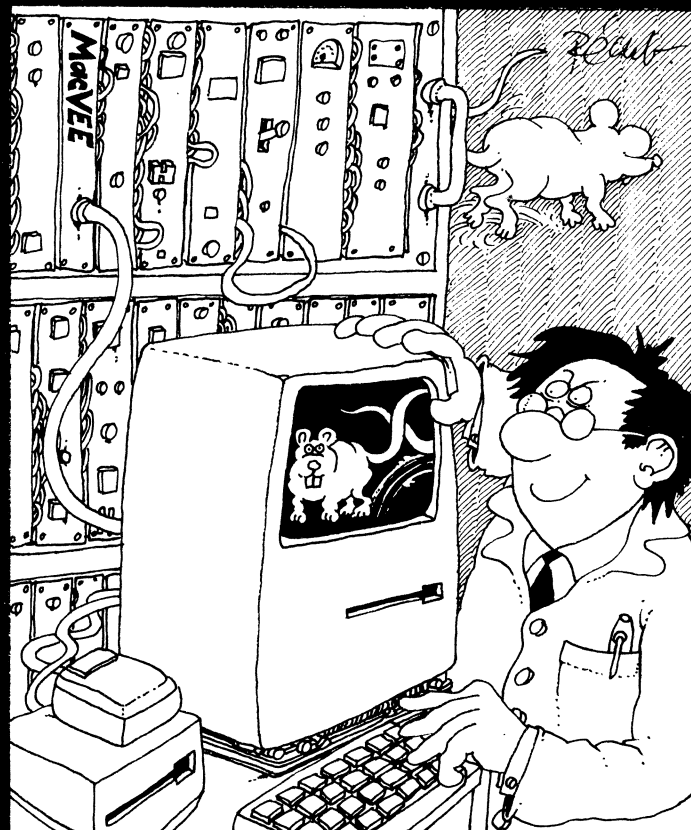
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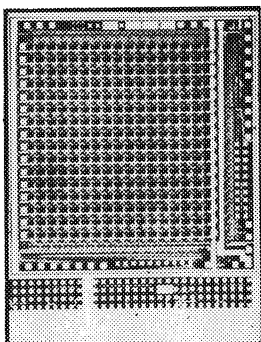
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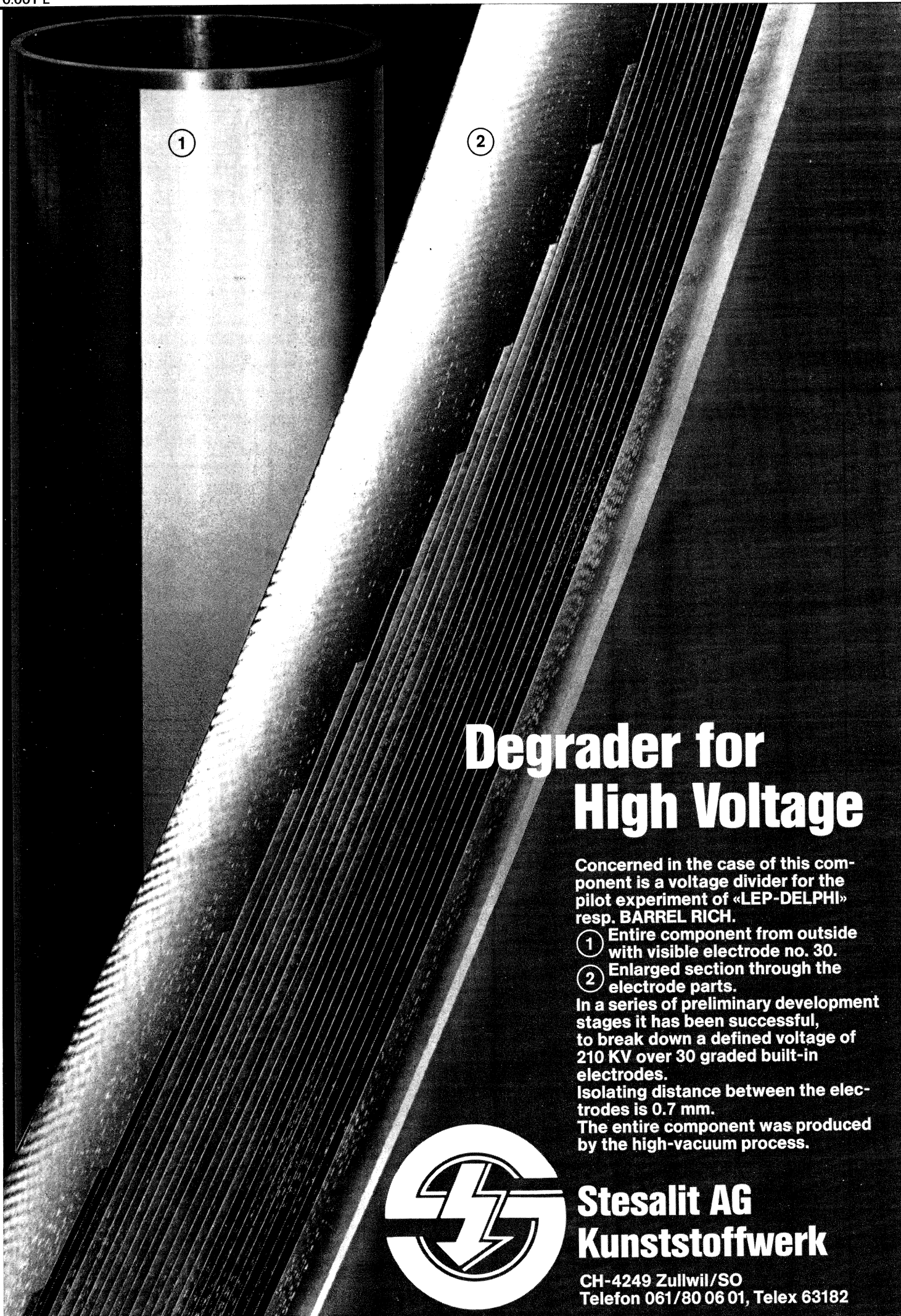
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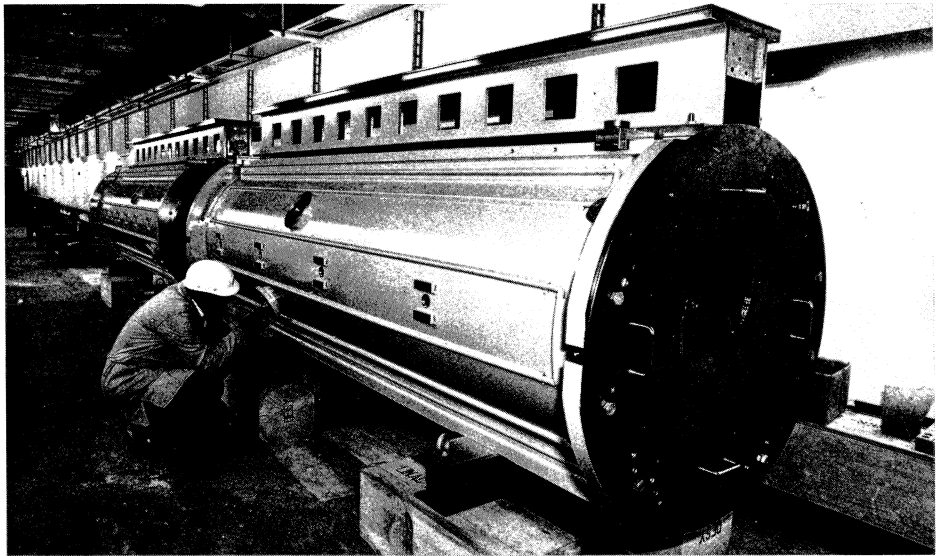
The entire component was produced by the high-vacuum process.



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Construction work for the HERA electron-proton Collider at the German DESY Laboratory in Hamburg continues to progress according to schedule. For example installation work has started on the linac which will supply DESY's first protons (so far DESY has been using electrons). Here are seen the first linac tanks to arrive.



HERA progress

Work is also well underway for the huge refrigeration plant for the 6.3 km ring of superconducting magnets to handle the high energy protons.

(Photos DESY)

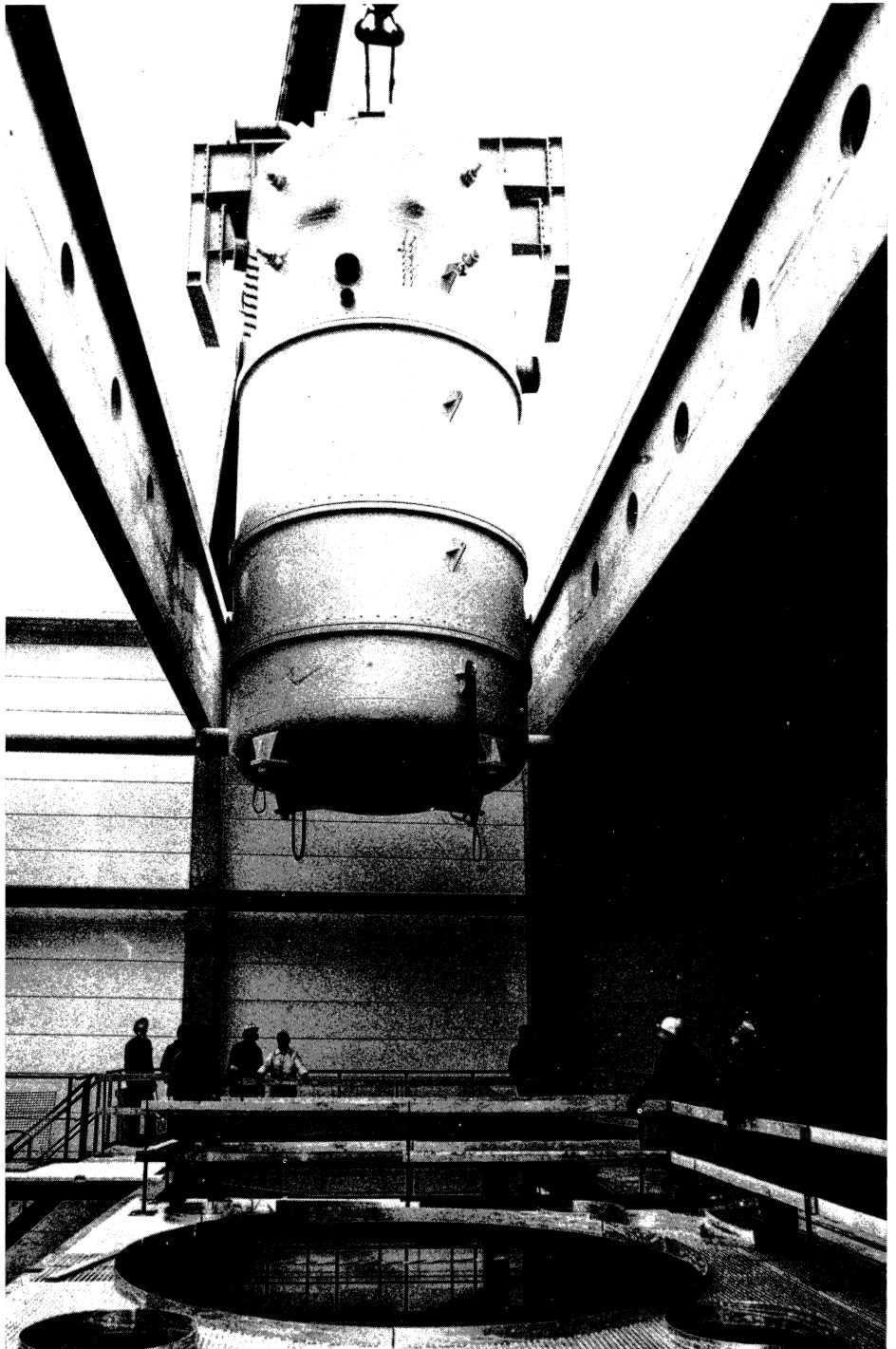
particles will sweep out in a narrow cone around the protons.

Two detectors have been proposed — H1 and ZEUS. The remainder of this article describes the proposed ZEUS setup: H1 will be covered in a forthcoming issue.

ZEUS is a collaboration of some 300 physicists from 41 research institutes in 9 countries. The most important design consideration has been the accurate identification and measurement of produced leptons (electroweakly interacting particles) and 'jets' of hadrons (strongly interacting particles) in a 'hermetic' calorimeter which intercepts all the released energy.

Two superconducting solenoids are foreseen. A thin solenoid of inner radius 86 cm and length 280 cm mounted between the central tracking detector and the outer calorimeter will provide a field of 1.8 T. In addition, a second compensating solenoid will be inserted in the rear endcap of the central iron yoke to provide the necessary corrections for the colliding beams.

After experience with the TASSO detector at DESY's PETRA electron-positron collider, the ZEUS



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team places great emphasis on a central vertex detector (VXD in the figure) immediately surrounding the beam pipe to pick up the fragments emerging directly from the collisions. This will detect the highly unstable particles which decay before encountering the rest of the detector. However the final design of this vertex detector has yet to be decided.

Outside the vertex detector will be the central cylindrical tracking detector (CDT, radius 85 cm, length 245 cm) consisting of a jet-type drift chamber. Track position and energy loss information will be measured in nine 'superlayers'

each containing eight layers of sense wires. Four superlayers will be fitted with stereo view wires. A resolution of 100 microns is expected. Close to the beam, tracking will be aided by planar drift chambers.

Electron identification will use energy loss information from the tracking detector together with the signals from the electromagnetic calorimeter. In the forward (proton) direction, transition radiation detectors (TRD) will 'reject' the hadron signal.

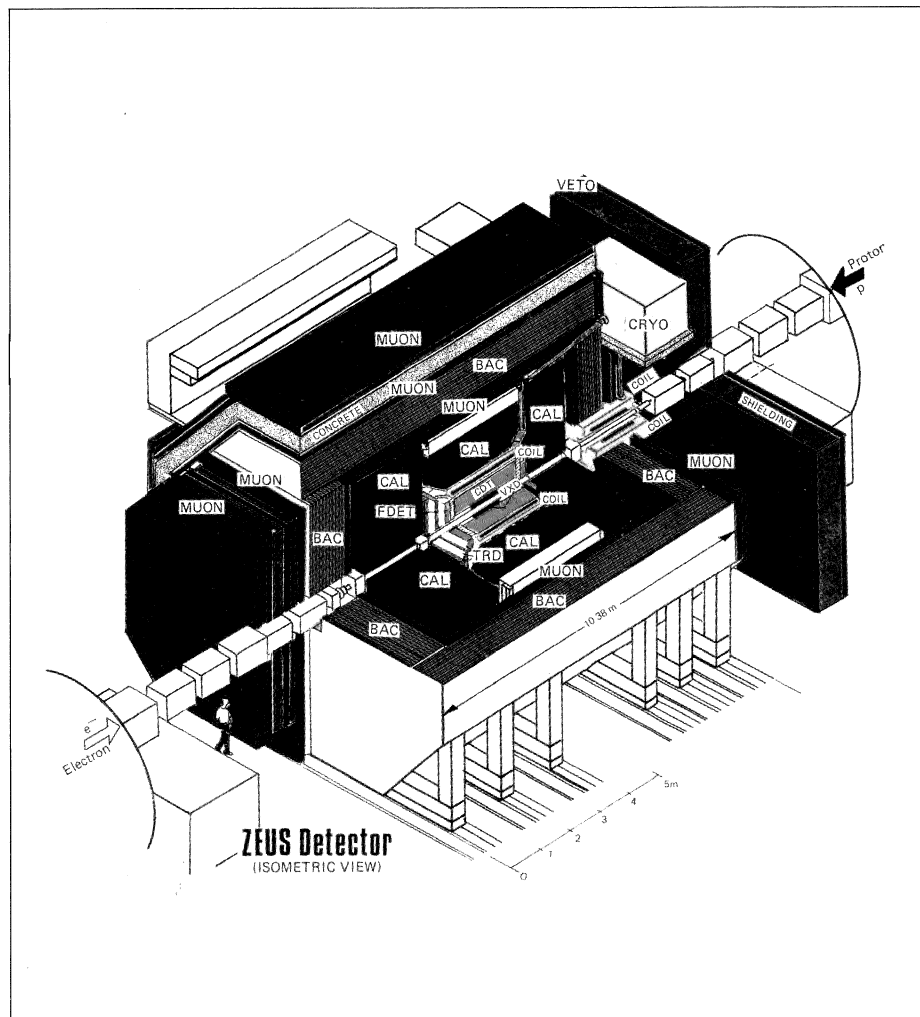
Electromagnetic and hadronic energy deposition will be measured in a calorimeter (CAL) surrounding

the central coil, using uranium plates as absorber and scintillator as the active material to achieve the best possible energy resolution for hadrons and jets. The calorimeter will be divided into forward, central barrel and rear portions. A further 'backing' calorimeter (BAC) consisting of an iron box and streamer chambers will surround the detector to catch late-developing showers. Muon detectors will make up ZEUS' outer envelope.

The detector will be structurally divided into the inner components, supported by the bottom of the magnet yoke, and two sideways-retracting 'clam-shells' carrying most of the backing calorimeter and the muon detectors.

The timetable for ZEUS construction and assembly is governed by the delivery date of the solenoid, probably in 1988. ZEUS should be complete by the summer of 1990.

In Greek mythology, Zeus' union with Hera was divine. It remains to be seen whether this will be repeated in the ring being built underneath Hamburg.

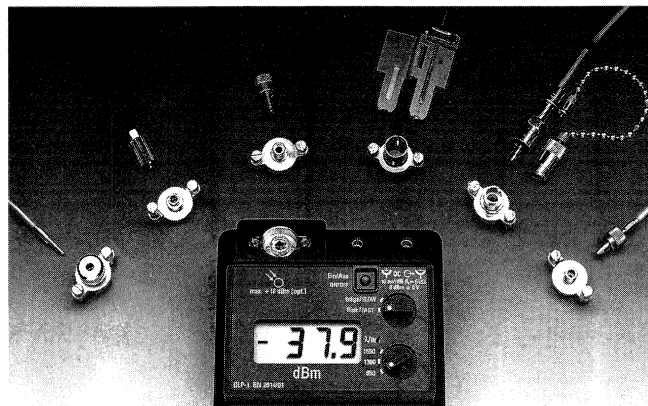
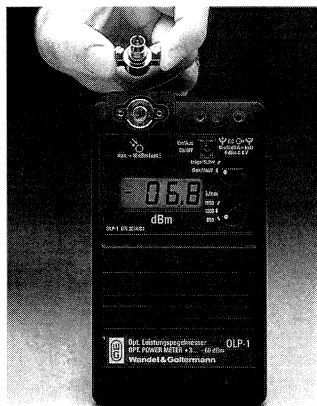


Proposed layout of the ZEUS detector for the HERA electron-proton collider at the German DESY Laboratory in Hamburg. With 820 GeV protons coming in from the right hitting 30 GeV electrons travelling in the opposite direction, most of the emerging particles will be caught in a cone around the proton direction. The configuration is described in the text.

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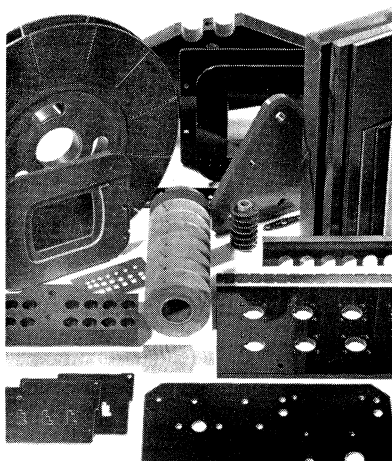
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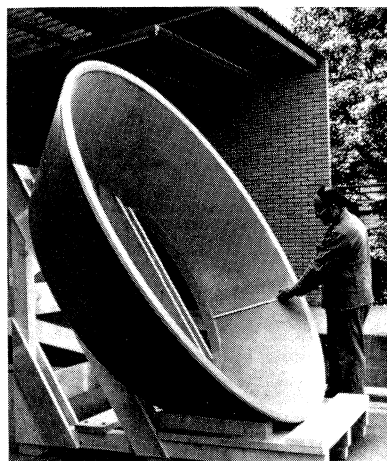


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