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SUMMARY

PROPOSAL TO STUDY NEUTRINO-ELECTRON SCATTERING AT THE SPS ^{*)}

CERN-HAMBURG-Moscow-Naples-Rome Collaboration

(CHARM II)

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The aim of the experiment is a measurement of the cross-section ratio of neutrino-electron and antineutrino-electron scattering in the horn-focussed wide band beam. The electroweak mixing angle can be determined in the leptonic sector by making use of the direct relation between this ratio and $\sin^2\theta$.

A significant test of the electroweak theory at the loop level can be made by measuring $\sin^2\theta$ to an error of ± 0.005 , corresponding to an error of 0.7 GeV on the Born term of the Z^0 mass. This accuracy can be achieved by a measurement of the cross-section ratio of ± 0.05 .

The detector design is based on the principle of a fine-grain target-calorimeter followed by a muon spectrometer. The calorimeter consists of 552 units of 3.7 m² surface area, each composed of a low Z target plate of 1/3 X₀ (marble or glass) and of a plane of streamer tubes of the Mont Blanc experiment type with 1 cm wire spacing, read out by cathode strips of 2 cm spacing in the projection orthogonal to the wires, and digitally from the wires. The total mass of the calorimeter is 618 tons, the fiducial mass is 436 tons. The streamer tubes are used to measure the shower vertex position, the shower width (to discriminate against hadronic showers), and its direction and energy. A layer of 20 scintillators of 15 cm width and of 3 m length is inserted after every 6th unit to measure dE/dx of showers originating in a depth of one radiation length in front of it. This measurement is required to analyze the background and to monitor the flux of electron-neutrinos.

The muon spectrometer is composed of six toroidal iron magnets and seven packs of track detectors, each consisting of 8 planes of drift tubes and one streamer tube plane.

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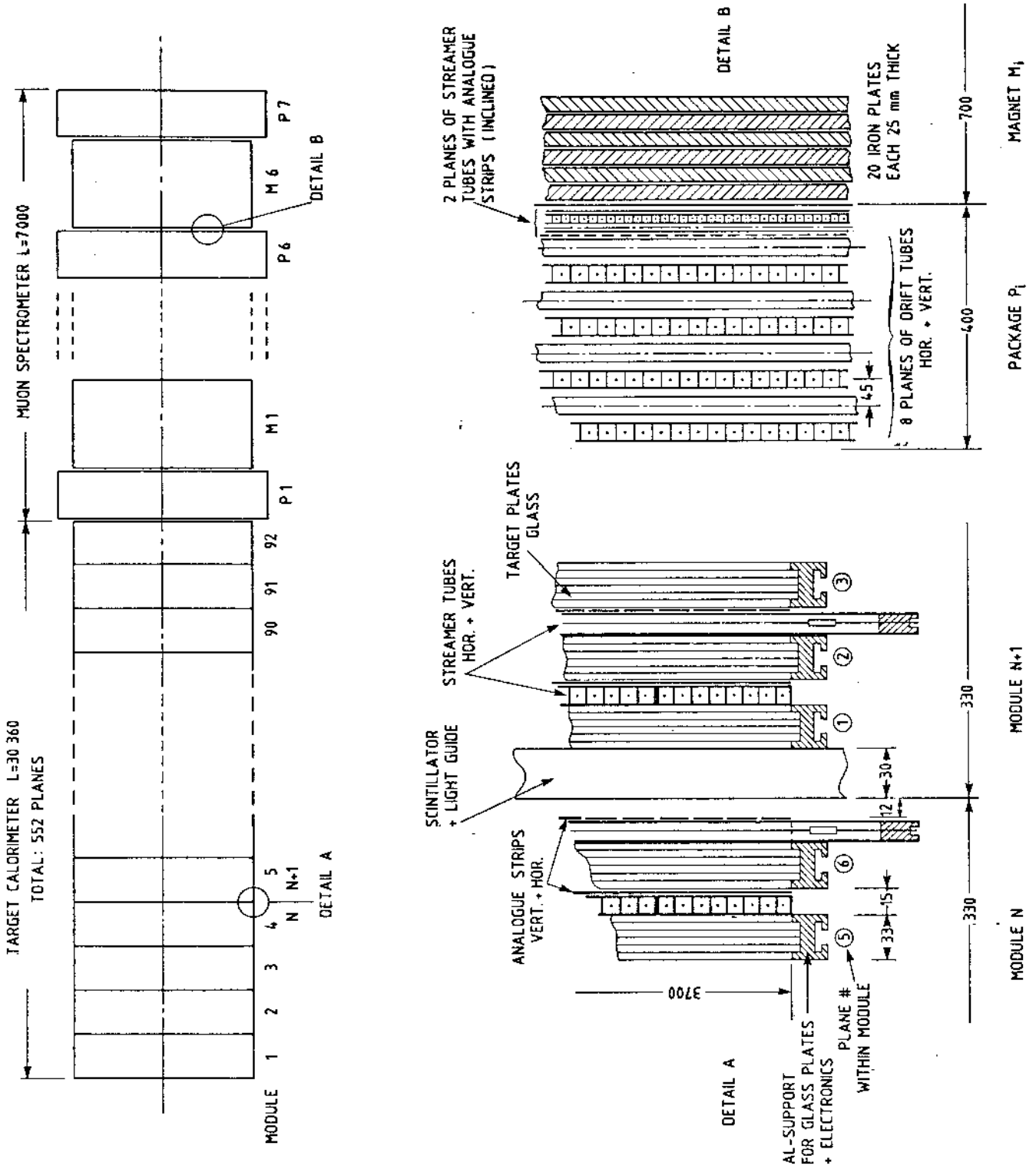


Fig. 1 Layout of the fine-grain calorimeter, composed of 552 units, and of the muon spectrometer, composed of 6 toroidal iron magnets. Details A and B show the modular structure of the fine-grain calorimeter and of the muon spectrometer, respectively.