PARTICLE DETECTORS AND THEIR LIMITATIONS

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Introduction

The scaling up of experiments from a few hundred GeV to energies one or two orders of magnitude higher leads to problems very dependent on the type of accelerators foreseen, colliding beams or fixed targets, and on the type of experiments envisaged.

Some of the questions which can be raised in the field of particle detectors are the following:

- Limits in detection accuracy. Can we locate the particles with enough precision to make momentum measurements by magnetic deflection feasible over reasonable lengths?

- Limits in particle separation. Can we separate particles often bunched into narrow cones?

- Particle identification. With rising γ's can we utilize the old arsenal or are new methods available?

- Calorimetry. Can we still measure the total energy of particles with enough accuracy to single out accurately different processes?

- Data handling. The considerable extension of the scale of the experiments, both in space and in complexity, may force us to new conceptions in the data treatment. Can we already elaborate possible new approaches from the latest available components of the electronics industry?

In addressing ourselves to these questions our working group composed of W. Willis, W. Lippach, B. Knaff, L. Lederman, J. Sandweiss, P. Lehmann.

K. Lanius, and G. Charpak, decided that while it is impossible with our limit of focus to exhaust these questions, a few reports on the state of the art and the foreseen developments on some selected topics may be useful to a formulation of ideas exchanged in these fields.

The following reports will be made:

- Limitations in spatial resolutions and rates in some particle detectors, by G. Charpak.

- Particle identification and energy measurements at growing energies. by W. Willis.

- High accuracy vertex detectors for the measurement of short-lived states, by K. Lanius.