MEETING ON THE ANALYSIS OF PHOTOGRAPHS OF

HEAVY LIQUID BUBBLE CHAMBERS

INTRODUCTION

The computers and their programmes are today a part of the equipment of the experimental physicists working in the field of high energies, particularly with bubble chambers. The constant efforts on the development of the methods of analysis of bubble chamber photographs are of the same nature as the efforts made to perfect other aspects of the experimental apparatus: better instruments open the way to better experiments.

The geometry programmes for the analysis of photographs of heavy liquid chambers, which are the subject of the present day of discussion, have been developed over several years. They have been used for many experiments which have been successfully completed. Yet, the problem cannot be considered as solved, instead the field is very dynamic. Physicists have learned by experience where lay the limitations to their present methods, where the programmes of computation give results of insufficient reliability, where improvements are needed to increase the accuracy.

The programmes available today are perhaps more satisfactory for the hydrogen bubble chambers than for the heavy liquid chambers, which present difficulties of their own. These are connected with the higher density and the shorter radiation length, giving rise to a higher rate of energy loss, to more single and multiple scatterings,
to sudden losses of energy by radiation. Yet the fundamental physical processes are the same for both types of chambers and it may well be that some of the advances made in solving the problems which appear today as sore points for the heavy liquids will be of later use also for hydrogen. Other problems are connected with the methods of measurement, which are also very similar for all types of bubble chambers.

The bubble chamber experiments are constantly increasing in statistical accuracy: the detailed investigation of high energy phenomena requires increasing numbers of events. The systematic errors which may be introduced by the methods of analysis must be correspondingly kept in check, approximations which are now satisfactory may become progressively too coarse, several proposed improvements which appear superfluous today may become essential tomorrow. These remarks apply not only to the determination of the quantities measured - such as angles, ranges, radii of curvature - but also to the evaluation of the errors of measurements. A precise evaluation of these experimental errors is crucial for the correct interpretation of the results of the fitting procedure used in the kinematics programmes.

These problems will become even more important in the near future, when the more automatic methods of measurement, such as the HPD, will enable the physicists to increase by an order of magnitude the number of events analysed in their experiments.

The present day of discussion between experts of many laboratories working in this field gives them an excellent opportunity to compare methods and to exchange ideas. A prompt publication of the papers and of the discussions will give access to this useful material to those who were unable to attend the meeting. The
papers and discussions are thus less expected to present achievements and results than, instead, to provide a basis for further thought, development and progress.

It is a pleasure to acknowledge the work of Dr. Nikolic, ably assisted by Mrs. Cooper, who organised the meeting, and of the scientific secretaries who collected the papers and wrote down the discussions for prompt publication.

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