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New Bubble Chamber Design Studies

Meeting held on November 12th, 1965

Present: Mr. W. Walkinshaw
Mr. M. Snowden
Dr. D. B. Thomas
Dr. R. W. Newport
Dr. P. R. Williams

The basis for such design studies was taken to be the proposal of Dr. E. Pickup and Dr. C. M. Fisher for a high field (~ 80 kg), high precision hydrogen bubble chamber of about 1,700 litres volume (Ref. NUAC /P/7/65). It was agreed that the subjects to be considered should be the following:

1. A superconducting magnet

It was assumed that the final design would be produced on the basis of the proposed work on smaller coils being undertaken in the Rutherford Laboratory but that interest should be taken in any work on superconductivity in neighbouring laboratories, e.g. CERN and Culham particularly if such work is connected with bubble chambers.

2. Optical systems

It is important that optical systems be analysed to ensure that the required measuring accuracy and resolution are obtained.

Dr. Williams has already begun this work and reported that adequate resolution was unlikely to be obtained for a chamber 1 metre deep with cameras close to the liquid but that better than 500 μ (Rayleigh Criterion) could be resolved with cameras placed 4 metres away (using light of wavelength, $\lambda = 5500 \text{ \AA}$). Such an object distance would, however, restrict the stereo angle to 14° .

Dr. Newport has begun a study of the resolution requirements for bubble density (i.e. ionisation) measurements, in conjunction with Dr. Williams' work.

Dr. Thomas is investigating the effect of turbulence and small scale temperature variations on the bubble images.

3. Expansion systems

Multiple expansions were considered to be an essential feature of any new bubble chamber. Such a requirement should not influence the capacity of the refrigeration system which would be governed by the cooldown requirements of the magnet and chamber components and the filling time of the chamber. The most important effect would be the additional heat input to the liquid with the subsequent increase in turbulence.

4. Cryogenics

Dr. Newport has begun an investigation to choose the most suitable type of refrigeration system.

It was agreed that attention should be devoted to fundamental problems relevant to the physics rather than to technical problems, though obviously these must receive some consideration. On this basis a programme of work will be produced.

The work will be recorded in the form of notes, (similar to the Berkeley & Brookhaven Engineering Notes) the titles and reference numbers of which will be circulated with the minutes.

The meetings will take place approximately monthly and specialists in certain fields e.g. optics, superconductivity, and nuclear physics will be invited when required.

The next meeting will be on Friday, December ^{6th} ~~3rd~~ at ^{2.15} ~~09.00~~ hours.

~~R. W.~~

R. W. Newport

Building R.50
Bubble Chamber Group,
Applied Physics Division.

18th November, 1965

Distribution: Those present
Dr. T. G. Pickavance
Mr. L. B. Mullett
Dr. G. H. Stafford
Dr. L. C. W. Hobbs
Mr. J. D. Lawson
Dr. P. F. Smith
Dr. C. M. Fisher
Dr. E. Pickup