

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCEGENERAL PURPOSES COMMITTEEProposed Heavy Liquid Bubble ChamberNote by the Secretary

1. The members will remember that a design study for a heavy liquid bubble chamber (which may also be used as a propane chamber) is under way in Professor Massey's department at University College London. The design study was supported by a DSIR research grant from 1st October 1958 to 1st August 1959, when approval was given for the study to be intensified, and its support was taken over by the Institute.

The Board took the view, at their meeting on 20th April 1959 (Minute 3.3) that the construction of this chamber, if required, was more appropriate for the Institute to sponsor than the DSIR, and decided that the proposal for construction of the chamber should be submitted in due course to the Institute, through the Physics Committee.

2. Professor Massey therefore submitted a detailed proposal to the Physics Committee. A brief account of the proposal is appended. The Physics Committee appointed three assessors to consider the proposal and also obtained the comments of Professor S. Glaser, a leading American scientist in the field. After consideration of the proposal itself, the assessors' report and Professor Glaser's comments, the Physics Committee recommended to the Institute that they should support Professor Massey's proposal at an estimated cost of £300,000, which the Committee thought a more realistic figure than the £270,000 shown in the para 5 of the appendix. The broad breakdown of the £300,000 is as follows:

Capital cost	£250,000
Staff	£ 35,000
Consumable Stores	£ 10,000
Travel & subsistence	<u>£ 5,000</u>

As indicated in the appendix, the project would also involve additional capital expenditure at the Rutherford Laboratory estimated approximately at £50,000.

Further, it should be remembered that expenditure of £27,000 on the design study, has already been approved in addition to about £5,000 provided by the DSIR. These sums are not included in the £300,000 mentioned above.

3. Provision has been made for this project in the 1960/61 estimates, approved by the Committee at their last meeting. It is forecast there that the greater part of the expenditure would fall in 1961/62.
4. For a project of this size, a project Committee, reporting to the GPC, is clearly needed. The exact form of the committee depends on a decision whether the purchasing should be done by University College or by the Institute through the AEA contracts branch. This matter is under discussion with Professor Massey.

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Brief Details of the proposal to construct a bubble chamber for use with propane or heavy liquids

1. Description

The proposed bubble chamber will be 150 cms long and have a cross section 50 cms wide by 40 cms high, very similar in size to the hydrogen bubble chamber but a higher magnetic field of up to 18,000 gauss can be provided as compared to 11,000 in the hydrogen chamber. A whole variety of liquid fillings may be used ranging from relatively light liquids such as propane to heavy liquids such as the freon CF_3Br the chief difference from the hydrogen chamber being the presence of heavy nuclei.

2. Uses

The uses of the chamber particularly when filled with heavy liquid are complementary to those of the hydrogen chamber. Although as a propane chamber many useful experiments are possible some of which cannot be performed with the hydrogen chamber, it is mainly on its use as a heavy liquid chamber that this proposal is made. In this role it has a high detection efficiency for neutral mesons and for decay particles produced in interactions in the chamber. Provision of the strong magnetic field will greatly assist in the calculating the kinematics of an interaction and in addition useful range measurements of low energy tracks will be possible.

3. Design and Construction

The design of heavy liquid chambers is now well established and those at present in use give high quality tracks and operate with good reliability. The design study on this proposal has been carried to the stage where all the major engineering difficulties have been surmounted and drawings illustrating methods of construction have been prepared.

It is proposed that the design and experimental work would be carried out at University College, London by a team of 16 physicists, engineers and technicians some of whom are already employed on the design study. They would be engaged on three year contracts. The team, under the general supervision of Professor H. S. W. Massey, would be led by Mr. H. S. Tomlinson.

The construction would be carried out at the Rutherford Laboratory by members of the same team, in cooperation with Rutherford Laboratory staff.

4. Cost Estimate

In summary, the cost estimate made by University College for the construction of the bubble chamber is as follows:-

Capital cost	£227,500	— Includes 10,000 for contingencies
Staff	£ 35,000	
Consumable stores	£ 3,000	
Travel and subsistence	£ 5,250	
	£ 270,000	

5. Additional cost at the Rutherford Laboratory

In addition to the cost of the chamber itself there would be additional capital cost at the Rutherford Laboratory on power supplies and other services to the chamber, and on accommodation for it including the cost of meeting safety requirements. It is proposed to provide cabling, switchgear etc to take the power supply from the DC generators which are already being provided to serve the hydrogen chamber. The two chambers could therefore not be used at full power simultaneously, but this is considered acceptable.

The total cost of the additional capital equipment at the Rutherford Laboratory is estimated to be £50,000.