

Council Paper

IN CONFIDENCE

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SRC 63-74

(P/AL/25)

SCIENCE RESEARCH COUNCIL

HIGH POWERED LASER FACILITY

Memorandum by the Chairman of the Science Board and the Director,
Rutherford Laboratory

1. Introduction

At its meeting on 30 May 1974 the Science Board considered a report (SB 30/74) from its Physics Committee which made a case for the establishment of a central facility of high-powered lasers for the use of University groups. The report appears as Appendix I of this paper. The Board expressed its strong support of the proposal and agreed that it would wish to submit to Council a bid for funds for the establishment of such a facility. The Board also instructed the Office to seek the collaboration of the Rutherford Laboratory in looking more closely into the resources that would be needed to carry out such a project, taking into account the possibility of collaboration with AERE.

2. The Scientific Programme

The detailed scientific programme has been set out in SB 30/74. High-power neodymium-glass and CO₂ lasers are proposed to meet the scientific objectives which are envisaged. At least ten SRC supported university groups are currently working with lasers, and these would become active participants in the realisation and use of the new facility.

Independently of the proposals to the Science Board, a study group in the Atomic Energy Authority Research Group has proposed a high-powered laser facility for compression studies; this proposal is currently being considered by AEA management. The two proposals have much in common, both in the basic installations and in their scientific justifications although, naturally, there are differences in emphasis.

The complementary nature of the two proposals suggests that the provision of a high-powered laser facility as an AEA-SRC collaborative programme should be considered seriously.

3. Costs

Detailed costings for the facility have not yet been prepared. Both the Science Board and the AEA proposals include estimates based on the major capital costs of lasers and building and the likely operating costs including staff costs. Although different equipment is specified in the two proposals, as at present formulated, the figures quoted give some indication of the scale of the project. Rather more than half the cost over the first two years of the project would be for the provision of lasers, some of which are commercially available.

The AEA proposal contains an estimate of £5.6 million for a three-year programme. For a roughly comparable five-year programme with more energetic lasers the Science Board paper gives an estimate of £6.2 million.

4. Possible Security Implications

The AEA have drawn attention to classified topics associated with the high-powered laser facility. Alongside the classified studies, a large region of new physics of a fundamental nature would become accessible with the provision of the facility. Much of this work would not be classified and university scientists should be able to participate freely in this research. However, the classified nature of some of the theoretical and experimental investigations that are likely to be undertaken suggests that the high-powered laser facility would have to be situated in an establishment where security could be ensured.

Thus, in embarking on a programme centred on a high-powered laser facility, the Council may not be able to avoid becoming involved in some work of a classified nature, in which case university groups using a joint facility will find themselves constrained by the provisions of the Official Secrets Acts. In this event, collaboration with the AEA would be an essential feature of the programme.

5. A Possible Scheme for Council Involvement

One method of working would be for a joint AEA-SRC team to construct and operate a facility on the HARWELL/CHILTON site. If necessary, the security arrangements already operative on the Harwell site of the AEA could be extended to include the facility and the AEA could be responsible for all security aspects of work at the facility. The construction and operation of the facility would be controlled by a joint AEA-SRC steering Committee which would be responsible for its subsequent scientific programme. Construction and operating costs would

be shared. This scheme of Council participation is based on the assumptions of comparable utilisation and roughly equal partnership with the AEA. If close examination of the likely programmes indicates a significant imbalance in the interests then the scheme could be adjusted accordingly.

The Science Board is however anxious that whatever arrangements are made should properly reflect the needs of academic research workers who have been funded from the SRC and the initiative which they have taken in developing this new field.

The activities of university users could be supported by a Laser Research Unit set up at the Rutherford Laboratory. The mode of operation of the Unit could be similar to that of the Council's Neutron Beam Research Unit.

6. Recommendations

In order to appraise the resources required to operate the proposed facility, and to prepare the ground for UK establishment, it would be necessary to spend up to £20000 at the Rutherford Laboratory on a preliminary study, in consultation with appropriate university scientists and the AEA. The possibilities for collaboration with the AEA and the security implications would be examined closely. An important aspect would be the assessment of the relative interests of the AEA and SRC in using the facility, since this would influence the arrangements for collaboration and the costs to the SRC.

We would propose to report back not later than December 1974, and to make recommendations then on how Council might proceed with the project.

7. The Council are INVITED

- i) to approve in principle the provision of high powered laser facilities on the scale indicated in Appendix I, subject to the availability of funds and provided that appropriate arrangements can be made with AEA;
- ii) to approve the proposals for expenditure on the preliminary study set out in section 6 above.

80. HIGH POWERED LASER FACILITY (SRC 63-74)

80.1 The Chairman said that the proposal was brought to Council at this time because the project was important and of such a nature that expenditure could be entered into during the present financial year. Indeed, provision had been made in the reallocations for 1974/75 (SRC 62-74) for expenditure of up to £750K. It would be useful at this stage to have Council's approval, in principle, to allow progress to be made quickly.

80.2 Professor Mason said that work on lasers in universities had now reached a stage which justified concentration of facilities in a national laboratory. This had stimulated an approach to the Physics Committee and the Science Board had endorsed the proposal. In parallel, the Atomic Energy Authority had been considering the establishment of a high-powered laser facility for compression studies. While the two proposals had much in common, there were, naturally, differences in emphasis. However, the complementary nature of the two proposals suggested that an SRC-AEA collaborative programme should be considered. The total costs given in paragraph 3 of the paper were provisional but the proposed feasibility study by Rutherford Laboratory staff would enable a better estimate to be put to Council.

80.3 Dr Marshall informed the Council that matters of national security were involved and that the necessary restrictions would not be necessarily confined to the AEA programme or staff. These, however, were expected to affect only a small part of the overall effort and should not deter the universities and SRC from embarking on a joint venture of considerable promise. The universities had a major contribution to make to this project which was exciting scientifically and of immense potential value to the nation.

80.4 The Authority was planning for an expenditure of about £1M per annum but future AEA expenditure would obviously depend on the progress achieved on laser fusion and the opportunities that further research might reveal.

80.5 The following were the main points made in discussion:

- (i) A proposal for a high powered laser facility would have to come before Council whether or not any AEA interest had been declared. As far as SRC was concerned, the justification of the project lay in the good science that it promised and this was quite independent of any success in laser fusion. A simple method of meeting the requirements of both parties might be for SRC to construct the facility and to run it, allowing the AEA to buy time on the facility to carry out classified or unclassified work.
- (ii) In reply to a question, Dr Marshall said that AEA would not wish to do any classified work at the Culham Laboratory. However, he would be content for the HPLF to be sited at the Rutherford Laboratory, as long as the point he had made about security was met.

- (iii) Professor Sir Hermann Bondi said that the Ministry of Defence would wish to be kept closely informed of progress on the programme if the HPLF were set up, but would not wish to take the lead in carrying out the research.
- (iv) The Rutherford Laboratory would be responsible for submitting a reasonable, costed programme, after assessing the best rate of development of the project in relation to the contributions expected from university groups and other workers. This would involve detailed discussions with universities, AEA and other appropriate bodies. A preliminary report would be submitted to the Science Board and it was intended to submit the final report to Council in December. It was hoped that an outline report would be available for Council in September.
- (v) The provisional allocation of £750K for the project was in line with the earlier discussions (Minutes 76.2 and 77.3(ii)) that the Council should, wherever possible, place themselves in the position of being able to spend money at short notice, provided proper scientific assessment had been carried out and financial propriety observed.
- (vi) Several Council members expressed concern about the adequacy of the scientific case as presented in Appendix I and at the lack of clear indications of respective organisational responsibilities and of arrangements for the management of the proposed facility. They asked that these points should be covered when a definitive proposal was submitted to Council after the preliminary study.

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80.6 The Council:

- (a) approved the expenditure of up to £20K on the preliminary study as detailed in section 6 of paper SRC 63-74;
- (b) approved in principle the provision of high powered laser facilities on the scale indicated in Appendix I to SRC 63-74, subject to the availability of funds, appropriate arrangements being made with the AEA and the outcome of the preliminary study initiated under (1) above.

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