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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCEGOVERNING BOARDProgress at the Rutherford Laboratory

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1. Proton Linear Accelerator

The high standard of serviceability of the P.L.A. has been maintained during the last three months, in spite of a fracture in a water connection which flooded the vacuum vessel of Tank I. The machine was out of action for only three days after this fault, and its overall reliability for the period was about 80 per cent.

The overall design of a new Tank I, with quadrupole focusing, has been completed. A new ioniser has been installed in the polarised ion source, and has given an improved beam (6×10^7 protons per second, 36 per cent polarised, at 50 MeV).

Physicists from Oxford, Birmingham, Belfast, King's and Queen Mary Colleges, London, A.E.R.E. and the Rutherford Laboratory have used the machine during the last three months. The following experiments have been completed during this time:

- (i) Determination of the rotation parameter A in proton-proton scattering at 50 MeV.

This has been the most complicated experiment yet performed on the P.L.A., and has been very successful.

- (ii) Neutron energy spectra from (p-n) reactions at 0° , from 13 elements ranging from carbon to uranium, at 30 and 50 MeV proton energy.
- (iii) Polarisation angular distribution from ^{59}Co and ^{120}Sn .
- (iv) Calibration of the polarisation of the proton beam.
- (v) Differential cross section of proton-helium elastic scattering at 50 MeV.

2. Nimrod

The last vacuum vessels (the headers) have been delivered, and all work at Marston Excelsior Ltd. has been completed. The header vessels are now satisfactory.

The beam transport and inflector components, linking the injector with the magnet ring, have been completed and installed. A beam of 15 MeV protons has been steered through this equipment and into Nimrod, and through 3 of the 8 magnet sectors. The reason for not attempting a complete orbit was simply that the remaining octants had not been coupled and pumped out.

Two weeks were lost when a glass window imploded on Octant 1. Components in this and a neighbouring octant were damaged, and some dismantling was necessary to install replacements. The safety devices, protecting the inner vacuum vessel against excessive pressure difference, operated correctly. The lost time is expected to be recovered, and completion is still scheduled for September.

3. Auxiliary apparatus for Nimrod

The plunging mechanisms and extraction magnets, for the external proton beams, have been tested and are being installed in the accelerator. 40 quadrupole magnets and 12 bending magnets have been delivered, and 26 and 13 more, respectively, are on order. The first of 12 pairs of electrodes for particle separators have arrived and are being installed in the first tank. 2000 ft. of vacuum pipe for beam lines have been delivered, and the associated pumps and vacuum boxes are on order. 28 DC power supplies of 50 KW and 10 for 100 KW, for beam magnets, have been delivered.

The Orion computer has been delivered and is being installed.

Negotiations have been opened with German groups, with a view to borrowing the Desy 80 cm liquid hydrogen bubble chamber for use on Nimrod next year. This would be a most useful stop-gap, pending the return from Geneva of our 1.5 metre chamber.

4. High energy physics

June 1st was taken as the closing date for proposals of experiments for the first scheduling period of Nimrod. Altogether there are proposals from 8 independent groups, and there is also a tentative proposal from a U.S. group who may wish to bring a bubble chamber with a superconducting magnet.

Much work has been put into the layout of beams, and the compatibility or otherwise of the proposed experiments has been studied in detail.

A small "experimental proposals committee" will be called together shortly to select the first group of experiments to be run.

5. Budget

A serious financial situation has arisen, which jeopardises future progress. This is outlined in a separate note.