

D. G. H. Clifford
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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

GOVERNING BOARD

Progress at the Rutherford Laboratory

Note by T. G. Pickavance

Proton Linear Accelerator

The improvement in reliability of the machine has been maintained, 63% and 82% of scheduled running time having been obtained during March and April respectively. A feasible solution has been found for the difficult problem of introducing alternating-gradient focusing into the first tank, and detailed design has been started. The object is to increase the beam current by about a factor 10, and the main value of the scheme will be in experiments with polarised beams. The supply and reliability of radiofrequency power sources are now adequate to maintain the full machine schedule at 50 MeV.

A N.I.R.N.S. group has determined the polarisation in proton-proton scattering at 50 MeV and at a scattering angle of 45° (centre of mass). The result is 0.032 ± 0.002 ; the errors are one third of the previous best result. Oxford University have completed their work on radiative capture of protons in N^{15} and are preparing a paper. A second N.I.R.N.S. group working with visitors from Queen's University, Belfast, have completed experiments on the (p-2p) reaction in carbon.

Nimrod

The injector has operated reliably at 15 MeV for long periods, with currents of 4 milliamperes (without a prebuncher). This output is sufficient to flood Nimrod with particles. The machine has been opened, to permit replacement of a faulty capacitor, and has gone into operation again without a recurrence of the trouble from the multipactor effect but the lampblack coating on the drift tubes had to be renewed.

The primary frequency generator of the radiofrequency system is being installed in the Nimrod control room, and the engineered version of the drive chain is under test at the contractor's works.

All the magnet pole pieces have now been delivered, and the final payment to the contractor is being negotiated. Fourteen of the sixteen pole face correction windings have been delivered. Two outer vacuum vessels have been installed in the magnet; final polepiece installation is complete in one, and has begun in the other. Temporary polepiece installation (i.e. without vacuum vessels) has been completed in the remaining six octants of the magnet. Magnetic field survey has begun after delays caused by excessive ripple on the magnet voltage. The magnet has withstood pulsing at high power for 110 hours, and at lower power for 200 hours, with no undesirable effects except for loosening of some of the coil clamping bolts.

The alternator at the Rutherford Laboratory has performed satisfactorily in commissioning tests of the magnet and power supply, and both sets of Brown Boveri rectifiers have now been successfully commissioned.

Remarkably few faults have occurred so far. The other alternator, which is being rebuilt at the contractor's works, suffered a setback when the steel for the new poles proved to be of unacceptable quality. The steel was returned to the Steel Company of Wales, who gave it a further heat treatment; it is now satisfactory, and pole-building has been started. The Nimrod construction and commissioning programme has been recast to permit acceptance of this alternator in August 1962; the completion date has not been changed.

Three of the eight outer-vacuum vessels have been delivered. One of the two vessels installed in the machine was damaged during installation of the pole pieces, but was satisfactorily repaired in situ. The fourth outer vessel is due for delivery in the latter half of May, and the fifth is ready for dimensional checking and drilling at the factory. The prototype inner vessel has been found to have a leak rate of less than 1 lusec, which is acceptable; the first production inner vessel has been delivered and is being vacuum tested. Two more inner vessels are being prepared for delivery. A contract for the vacuum vessels has been signed with Marston Excelsior Ltd. after protracted discussion. It is on the basis of costs plus a percentage fee, but the fee is variable to give a penalty for costs higher than an agreed sum, and an incentive for costs lower than this. An expenditure check has just been made which shows that costs are within the amount estimated for this stage of the work.

Components have been ordered for a simplified closure system for the vacuum vessels, to be used in place of four of the complicated header vessels in octants where extracted particle beams are not required; this has been made possible by recent improvements in the quality of some of the polyethylene sheet available from industry, and enables substantial savings of time and money to be made.

Auxiliary apparatus

45 quadrupole magnets and 12 bending magnets for the beam programme are now on order, for delivery in March 1963. We have also ordered 10 particle separator boxes, each 10 feet long, and enough rectifier sets of 50 KW and 100 KW rating to power one half of the initial beam system.

General

The physics laboratory in the P.L.A. extension building has been completed, and the new stores in the R.1 link building have been opened. With building operations in several areas nearing completion, a great effort is being made to tidy up the site and lay out grass and flower beds.

Since February the site has been fenced with lockable gates, and gatekeepers have been provided at open gates.

All the finance and accounts functions which it is intended to take over from A.E.R.E. have now been taken over, the last being the payment of salaries and wages which has been done by the Rutherford Laboratory pay office since 1st April.