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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

GOVERNING BOARD

Progress at the Rutherford Laboratory

Note by T. G. Pickavance

1. Proton Linear Accelerator

The machine was shut down on 18th August to carry out several major installation jobs and to overhaul certain parts of the plant. It was put into operation again, on schedule, on 14th October.

During the shut-down a clearing magnet used in neutron time of flight work was re-sited to provide 20 flight paths in the angular range $0-90^\circ$, in place of a single path in the forward direction. A large single-gap spectrometer magnet was installed. All the remaining ignitrons in the modulators were replaced by deuterium thyratrons, and the modulator circuits were improved. A larger refrigerator was installed on the polarized ion source, and a set of three orthogonal Helmholtz coils were fitted to the ionizer to provide more flexible control of the spin direction.

2. Nimrod

Members have received a note summarising the events of last August when the first operation at full energy was achieved. The commissioning went very well indeed, and the reproducibility of machine performance from pulse to pulse was remarkably good.

The power transformer which failed immediately after the first high energy runs had to be sent back to the contractor's works in Scotland to be rebuilt. It will not be in service again before December, but the interval is not wasted time. Nimrod was operated without pole-face correction and with injection conditions which were far from optimum. It can be run at reduced ratings without the damaged transformer: 7 GeV can be obtained at 10 pulses per minute, and 6 GeV at 20 pulses per minute. The maximum rate of rise of magnetic field in these conditions is 10 kilogauss per second, which is believed to be close to the optimum value at the injection energy. The rate of rise can be reduced at injection energy, but during the initial runs Nimrod would not accept injected protons at a value below 20 kilogauss per second (which is the maximum value with the whole power supply in operation).

Accordingly, work has been done to improve the magnetic field distribution and the injection conditions. The pole-face windings and their power supplies have been commissioned and adjusted for the injection and early acceleration parts of the operating cycle. Injection has been achieved at 10 kilogauss per second, and there are now 125 orbits at injection. There were 57 during the initial runs. The survival of the injected protons and the intensity of the circulating beam are also much better than before. We are therefore confident that 10^{11} protons per pulse will be accelerated to full energy in the next high energy runs. This is the target figure for 1963, and is the intensity required by the first series of high energy physics experiments.

3. Nimrod apparatus

The Orion computer has been completed and handed over to the Laboratory for routine use. It has suffered from teething troubles.

Although the German research groups are anxious to collaborate with us in using their 80 cm bubble chamber on Nimrod, the time-scale of the Desy accelerator may prevent this before the autumn of 1964. This would probably be too late to make the exercise worth while, as the 1.5 metre British chamber may return shortly afterwards. Negotiations are continuing; other bubble chambers may be available.

The British chamber has been completed and has been put into operation at CERN.

4. High energy physics

Experiments are planned to begin with routine operation of Nimrod in January 1964, and seven proposals from counter groups have been considered by the Laboratory "experimental proposals selection panel". The object was to select experiments for the first six months of operation. Four experiments were allocated "main user time", and a fifth was given time on the assumption (later confirmed) that it could share alternate machine pulses with one of the other four. Another of the four requires revision because results have now come in from elsewhere. The remaining four experiments are:

A.E.R.E. Queen Mary College	p-p diffraction scattering in the Coulomb interference region
Rutherford Laboratory	π^- -p differential cross-section and polarization between 800 and 1000 MeV
University College Westfield College	π^+ -p differential elastic cross- sections near 2 GeV
Birmingham University Bristol University A.E.R.E.	elastic charge exchange scattering of neutrons

The members of the committee on this occasion were Professors P. T. Matthews and J. Hamilton, Dr. G. H. Stafford, with myself as Chairman. Professor J. M. Cassels, who could not attend the meeting, was consulted. For the second period the members from outside the Laboratory will be Professors R. H. Dalitz and A. Salam.

In this method of selection, all detailed technical questions (e.g. feasibility and compatibility with the machine) are settled, and full discussions of the proposals are held, before the panel is called together. The panel members have a detailed write-up of each proposal and discuss it with the experimentalists responsible. They place the proposals in order of priority, but do not schedule the machine; this is a job for the Laboratory staff, joined by the leaders of the groups whose proposals have been put on the programme.

The beam lines for the first experiments are now being installed. It may be possible to build subsidiary beams for use parasitically by those teams who have not been allocated time in the first period.

5. General

Dr. J. M. Valentine has been appointed Secretary of the Rutherford Laboratory. A "Directors' Committee", with Professor Merrison and myself alternating as Chairman (for a year at a time), has been formed to ensure co-ordination of Institute matters as distinct from internal Laboratory matters.

Professor R. H. Dalitz, now at Oxford University, has been appointed a consultant at the Rutherford Laboratory. He has full use of the Laboratory's facilities and spends a substantial part of his time with us.

We have accepted a 10-months visit from a Polish physicist, to work on the P.L.A., and are hoping to arrange exchanges of staff with the U.S.S.R. Four physicists from North America are working in the Laboratory at present.

6. Budget

The financial affairs of the Laboratory are discussed in detail in other papers. The research and development budgets were restored, at the reduced level mentioned to the Board at their last meeting, immediately sanction was received for a supplementary grant. The fact that Nimrod was commissioned at the height of the crisis is sufficient evidence that the worst effects of the budgetary troubles were avoided. The economy measures which I introduced are still in force, except that I have permitted a limited amount of recruiting to replace wastage.