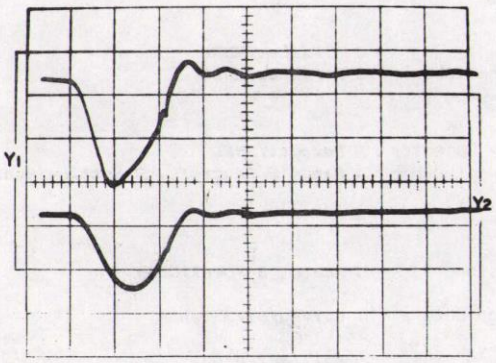
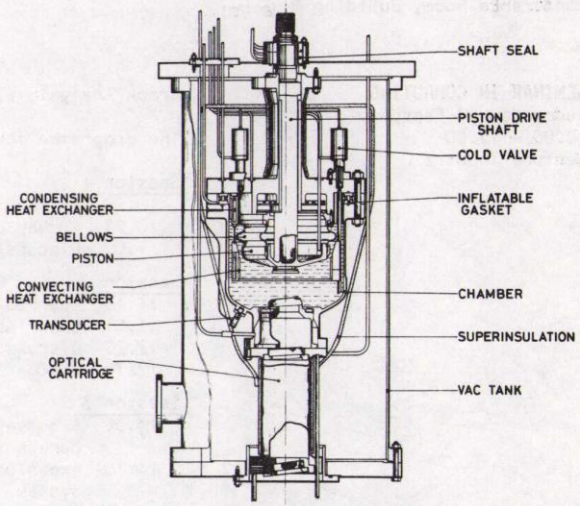
Rutherford Laboratory

12-19 February 1973

bulletin 6

FAST CYCLING BUBBLE CHAMBERS





SECTION THROUGH CHAMBER

One of the main drawbacks of a conventional bubble chamber is that it is a relatively slow cycling device and is therefore unable to take data on a beam line at a rate which is compatible with beam handling techniques. A group in the Applied Physics Division has therefore been working for the last two years on a new fast cycling bubble chamber test rig, whose object is to determine experimentally how fast a bubble chamber can operate. The optical system is not designed for nuclear physics data taking but can be used to determine the rate of growth and decay of individual bubbles during the expansion/recompression cycle. It can also be used to determine how fast the chamber can be operated before a bubble initiated on one expansion cycle reappears on the next expansion as a spurious signal; this is what eventually limits the speed of operation.

The test rig was commissioned in October 1972 with liquid nitrogen. Over 24,000 expansions were executed with pressure swings appropriate to liquid hydrogen conditions. The chamber was not sensitive but it was a valid cryogenic test of the components.

The first run with hydrogen commenced on 22 January 1973. The chamber was successfully cooled down and filled with liquid hydrogen at 25°K. About 15,000 expansions were performed at frequencies up to 8 times per second. Sensitive conditions were achieved but it did not prove possible to record pictures of electron tracks from the gamma source before the run was terminated by a compressor fault.

The diagrams show a sectional view through the apparatus and a polaroid picture of the pressure and stroke against time curves. The time scale was 10ms/cm and the scales for pressure (upper trace) was 20 PSI/cm and for stroke (lower trace) 1.5 mm/cm.

A notable step forward has been made in testing the bellows seal between the piston and chamber at liquid hydrogen temperatures. Both the piston and bellows are made of fibre glass reinforced epoxy resin and this is the first time that such an assembly has been pressure cycled with liquid hydrogen. Further runs are planned with liquid hydrogen to carry out detailed measurements of bubble sizes.

Readers who are particularly interested in the problems associated with not only the design of rapid cycling bubble chambers but also in the analysis of information obtained from the operation of such chambers may be interested in the forthcoming "Seminar in Computing", details of which are given in the 'Internal Events' section on page 2 of this issue.

NEW INJECTOR FOR NIMROD -CLOSURE OF ROAD 2

The excavation contractor is due on site on Monday 12 February. To minimise the risks involved to the users of roads in the area, it will be necessary to close road 2 to both vehicular and pedestrian traffic from the time excavating actually starts until further notice.

Staff and visitors requiring access to the 15 MeV injector entrance, Hall 2 and the north side of Hall 3 will have to use the longer route via road 8, road 3, and the hardstanding round the south, west and north sides of Hall 3. Everyone will have to exercise care in the use of road 8 between road 11 and the top of road 2 (particularly at the junction of road 8 and road 1) because of the almost continuous use of road 8 by the excavation Contractor's vehicles. The north-west gate to the Rutherford Laboratory site is being opened for use by this contractor only.

Those unfamiliar with road numbers, see map inside front cover of current telephone directory.

SUPERANNUATION

Anyone who is still undecided how best to 'exercise his options' under the new UKAEA Non-Industrial Family Benefits Scheme should collect a copy of R M Jenkin's guide entitled 'Options without Ulcers' from his local Admin Office; Personnel Group, Room 65, Building R20; Atlas Laboratory - Admin, Room 42.

Note: the guide will not interest FSSU or SRC Scheme members.

INTERNAL EVENTS

NIMROD LECTURE SERIES
Monday 12 February
11.30
Lecture Theatre

Barrelet Zeros and Resonance Ambiguities in $K^- p \to \Lambda \pi^0$

Dr A J Van Horn/RHEL

HEP DISCUSSION GROUP
Wednesday 14 February
11.00
Conference Room, Building R1

Feynman Graph Methods and Critical Phenomena

D Wallace/University of Southampton

SEMINAR IN COMPUTING
Wednesday 14 February
10.00 - 17.00
Lecture Theatre

Track Analysis with Rapid Cycling Bubble Chambers

The programme for the day, following coffee at 10.00, is outlined below:-

Session 1

10.20	Introduction	*C M Fisher/RHEL*
10.25	Survey of Physics Applications	*C M Fisher/RHEL*
11.00	Discussion	

Session 2

11.15	The Rapid Cycling Vertex Detector	*R Newport/RHEL*
11.55	Experience with Rapid Cycling HYBUC	*A Manz, S Reucroft, R Settles/Munich*
12.20	Discussion	
12.30	LUNCH	

Session 3

13.30	A Survey of some Television Camera Tubes	*G Amato, B Powel/CERN*
14.10	Experience with the Omega Camera System	*J Garvey/Birmingham*
14.40	Software Considerations for the Rapid Cycling Chamber	*D Hall/Berkeley*
15.00	COFFEE	

Session 4

15.15	Brush	*A Rudigar, R Schilling Max-Plank-Institut für Physik und Astrophysik*
15.50	A Pattern Recognition Processor	*J Solomon/University of Illinois*
16.15	Point and Track-Finding Processors for Multiwire Chambers	*C Verkerk/CERN*
16.30	A Polynomial Evaluator	*P Wilde/RHEL*
17.00	CLOSE	

SPECIAL NIMROD LECTURE
Friday 16 February
11.30
Lecture Theatre

Proton - Proton Total Cross-Sections at ISR

Professor G Bellettini/Pisa and CERN

NIMROD LECTURE SERIES
Monday 19 February
11.30
Lecture Theatre

Neutrino Interactions in Hydrogen and Deuterium

Dr M Derrick/ANL and UCL

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EVENTS AT AERE

THEORETICAL PHYSICS SEMINAR
Tuesday 13 February
14.00
Conference Room, Building 8.9

General Theory of Electronic Properties of Molecules

Professor R McWeeny/University of Sheffield

NUCLEAR PHYSICS COLLOQUIUM
Thursday 15 February
15.30
Conference Room, Hangar 8

The Proposed Nuclear Strcuture Laboratory at Daresbury

Dr R G P Voss/Daresbury Laboratory

EXTERNAL EVENTS

NUCLEAR STRUCTURE AND NUCLEAR ASTROPHYSICS
Monday 12 February
14.30
Nuclear Physics Lab., Oxford

Carbon and Oxygen Burning at Stellar Energies

Dr G D Symons/AERE

THEORETICAL PHYSICS SEMINAR
Monday 12 February
16.15
Queen Mary College

Quantum Dynamics of the Massless String

Dr J Goldstone/Cambridge

PHYSICS & GEOPHYSICS COLLOQUIUM
Monday 12 February
17.00
University of Bristol

The Discovery of the π Meson

Professor P H Fowler/University of Bristol

THEORETICAL PHYSICS SEMINAR
Wednesday 14 February
14.30
University of Manchester

Systematic Description of Convarient Wave-Equations

Professor L O'Raifeartaigh/Dublin Institute of Advanced Studies

OXFORD SOCIETY FOR SOCIAL RESPONSIBILITY IN SCIENCE
Wednesday 14 February
20.15
Room C113, Psychology Bldg.,
Oxford

Community Science

David Wield/BSSRS

ELEMENTARY PARTICLE PHYSICS SEMINAR
Thursday 15 February
14.15
Nuclear Physics Lab., Oxford

Positivity Conditions on Density Matrices
Dr T L Trueman/on leave from BNL

Comparison of $\pi N \rightarrow \omega \Delta$ Data with the Quark Model
Dr L Lyons

APPLIED MATHEMATICS SEMINAR
Thursday 15 February
14.30
Royal Holloway College

Group Theoretical Models of Molecules

Professor G G Hall/University of Nottingham

IERE DISTRICT MEETING
Thursday 15 February
19.30
University of Reading

Digital Communications in the Mobile Environment (Problems associated with the transmission of data for the mobile radio service and how many are overcome).

B D Parker/Dollman Electronics Ltd

ELEMENTARY PARTICLE THEORY SEMINAR
Friday 16 February
14.15
Nuclear Physics Lab., Oxford

Quantum Dynamics of a Relativistic String

Dr J Goldstone/Cambridge

COLLOQUIUM
Friday 16 February
16.15
Clarendon Laboratory Oxford

Gas Lasers - A Review of Progress in the Field

Dr C B Webb

RUTHERFORD LABORATORY BULLETIN *Published by the Scientific Administration Group*

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Deadline for Insertions	GENERAL & SOCIAL NEWS	INTERNAL & EXTERNAL EVENTS
	Tuesday 1600	Wednesday 1200

NIMROD SHUTDOWN, FEBRUARY TO APRIL 1973. - PART 1 The major shut-down, originally scheduled to start in December 1972, was put back to mid-February, to allow phasing-in of some of the construction work on the new 70 MeV injector. A large programme of installation, modification and maintenance has been scheduled on Nimrod and its experimental areas. Amongst other items the following are particularly worthy of mention, and for this first report are confined to Nimrod itself.

1. **2nd Harmonic RF Accelerating System:** This new addition is designed to increase the circulating beam intensity of Nimrod. It consists of a 50 kW radio-frequency amplifier driven by the existing primary frequency generator but running at 2.8-16 MHz(mega hertz) compared with the 1.4-8 MHz of the present RF system. The amplifier will feed a tuned ferrite-loaded drift-tube of accelerating structure to be located in Straight Section 6. This new system is complementary to the old RF accelerator, ie both systems will operate in tandem to "biff" protons to full energy.

2. **Vacuum Vessel Closure Plates, Octants 2 and 8:** It has been decided to renew these 46 feet long polythene closure plates as they have shown signs of increasing radiation damage of the past year.

3. **Beam Extraction Systems Power Supply:** A solid-state voltage regulator will be fitted to the 900 kW high current DC power supply which feeds the extraction systems kicker magnets. (These magnets kick the proton beam from the synchrotron to the beam lines). This new system will permit simultaneous powering of these magnets to maximum current of 8000 amps each, from the same power supply, and in consequence allow both the X3 proton beam and the new P8I proton beam to operate at the same time.

4. **Digital Position Control System, Straight 2 Plunging Mechanism:** This will replace an existing analogue system. It will permit control to be exercised from the main control room by either digi-switches or computer instruction. The system uses an optical grating to provide the positional information.

The programme of installation modification and maintenance will continue until about 14 April. During the following four weeks commissioning of the 2nd Harmonic RF System and the new extracted beams will commence.

In Part 2, which it is hoped to publish next week, a description of changes to extracted and secondary beams will be given.

FILM BADGE NOTICE It is Period 2 Colour Strip - GREEN for βγ films and neutron packs. Please check that you are wearing the correct dosimeters and that all old ones are returned.

OVERSEAS VISITS Dr J M Valentine, to CERN and ILL, Grenoble, 11 - 14 February for discussions.
Dr L C W Hobbis, to Grenoble, 11 - 15 February for discussions on the provision of new apparatus.
Dr J B Forsyth, to Grenoble, 12 - 16 February for discussions.
Mr H Wroe, to Darmstadt, West Germany, 14 - 17 February, to attend S2/68 Executive Committee Meeting.

HIGH PULSE RATE A new record monthly total of 1,198,734 magnet pulses was set up by the Nimrod Magnet Power Supply plant during January 1973.

VISITORS Twelve members of the Faringdon Church Youth Club will visit the Laboratory on Friday 16 February.

A party of thirty University of Oxford undergraduates will visit the Laboratory on Saturday 17 February.

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SOCIAL NEWS

CHRISTIAN FELLOWSHIP D Ness-Wilson of R36 will be leading the final meeting in the series "The Five Steps to Heaven". If you are not sure where Heaven is or how to get there why not come along? The meeting commences at 12.30 in the R12 Conference Room, on Friday 16 February.

HORTICULTURAL SOCIETY AGM The postponed Annual General Meeting will now take place at 12.30 on Monday 19 February, in the TV room at the Social Club. Due to lack of time it is impossible to notify members individually.

RECORD SOCIETY Tuesday, 13 February, 12.40 in the Lecture Theatre.

"The Essential Erroll Garner"

A selection of tracks from a 3 volume collection by this famous pianist, including well known American swing and jazz numbers such as "It might as well be spring", "Misty", "On the street where you live", etc.