Rutherford Laboratory

5-12 March 1973

bulletin 9

BUBBLE CHAMBERS GO ONE (X10) BETTER

A Report on the C & A Division Seminar on Track Analysis for the Rapid Cycling Bubble Chambers, held on Wednesday 14 February.

Introduction: Conventional bubble chambers take pictures (stereo triads i e 3 views) at about one per second and are completely unselective, i e the chamber is photographed each cycle irrespective of any interesting interaction. Typical experiments take 1 - 2 years to analyse and yield 20 - 50 events per microbarn (μb) of cross-sections, i e a total of about 1 million interactions of any kind occur in an experiment.

The bubble chamber however, has the considerable advantages that all details of the interactions and most associated decay vertices are detected with excellent precision and resolution. This is because the chamber filled with hydrogen is both the target and the detector. As the bubbles formed by particles are only ~0.2 mm and size is independent of the direction or position of the track, the bubble chamber has the important property of being an isotropic detector.

The rapid cycling chamber maintains the basic advantages of the technique yet allows significantly higher rates and selective triggering on specific reaction channels. This is achieved by allowing secondary particles to leave the chamber through a large solid angle and reach external counters and/or spark chambers. These external devices can either be used to trigger the photographic flash on the chamber or to give more precise angle or momentum measurements.

Data Processing: On Wednesday, 14 February (a good date for a tie up between computers, counters and bubblers), a special Computing and Automation Division Seminar was organized to discuss the problems of dealing with the potentially higher data rates. The discussions were based upon a suggestion by C M Fisher and R A Lawes of RHEL and B W Powell of CERN, to use a direct view Vidicon (TV camera) read-out system.

A 30 cm diameter chamber cycling at 60 - 100 c p s would yield about 1 event/μb/hour, (i e one full days operation will yield the same number of interactions as a whole experiment in a conventional chamber) and present interesting problems in both measurement and data handling. The advantages of using a Vidicon coupled with some form of real-time hardware processor capable of very fast data reduction would be considerable.

For large cross-sections the quantity of film taken by conventional camera systems becomes prohibitive (1 - 2 million triads/experiment). For larger trigger cross-sections it would be difficult to construct film cameras capable of matching the chamber rate. The additional possibility of constructing internal topology triggers is also exciting. For example a vidicon scan of the chamber with rough track finding during the bubble growth period (1 - 2 ms) could act as a trigger for more precise measuring Vidicons, or for film cameras. Alternatively, the measurement Vidicons could be exposed and pattern recognition performed to establish the position of the vertex and the topology before an event was accepted. This makes use of the 1.5 seconds between machine pulses for additional computation.

The problems of such data reduction/pattern recognition processors is actively under discussion in the C & A Division particularly for the existing HPD measuring machines. The technique developed would be directly applicable to the above problems.

Status Report: The seminar attempted to discuss the main areas of chamber characteristics, Vidicons and hardware data processors within a single day.

Reports on Rapid Cycling Chamber Projects were given by R Newport/RHEL and R Settles/Munich. These two chambers present quite different pictures and hence different data reduction problems. The RHEL design has a vertical optical and magnetic field axis whilst the Munich HYBUC chamber has a horizontal axis along the beam.

G Amato and B W Powell/CERN, presented a survey of advanced Vidicons and discussed in some detail the problems of accuracy, resolution and sensitivity of likely cameras. Good evidence for the advantages of dark field illumination was also given. J Garvey/Birmingham enthusiastically presented the recent excellent results obtained with the Omega cameras at CERN (designed at RHEL).

A Rudiger/Munich described the BRUSH system designed for the HPD measuring machine adapted for use with the rapid cycling proposal. J Solomon/University of Illinois described a processor based upon a system of hardware developed for detecting particle tracks in multiwire chambers and P Wilde/RHEL gave a brief indication of a fast polynomial evaluator, developed at RHEL, and now under test at CERN.

The general consensus of opinion both during the seminar and in the vigorous discussions that took place for most of the next day was that the hardware processors should be perfectly feasible. Whilst recognising that a number of problems still exist with Vidicons for bubble chambers, it was felt that such an alternative to film was desirable for both high cross-section processes and as a trigger mechanism.

Informal proceedings are in preparation and anyone who wishes to receive a copy should give their name to Miss A Foster, Ext 532. Anyone wishing to pursue technical problems should contact C M Fisher or R A Lawes.

OBITUARY NOTICE

We deeply regret to announce the death of Miss A J Curran on Tuesday, 27 February after a long illness. She was aged 26. Anne Curran, an Assistant Scientific Officer on Computer operations in the C & A Division joined the Laboratory in 1970. She will be sadly missed by her many friends and colleagues. We extend our deepest sympathy to her mother.

ANY OFFERS?

Two French secretaries from the Institut Max von Laue - Paul Langevin, wish to spend a month with an English family as paying guests in order to improve their English. One wishes to come in July and the other in July or August. Please contact Mrs J Wells Ext 469 for further details.

INTERNAL EVENTS

NIMROD LECTURE SERIES
Monday 5 March
11.30
Lecture Theatre

Experimental Study of Deep Inelastic Neutrino Reactions

Dr K Schultze/Aachen

HEP DISCUSSION GROUP
Tuesday 6 March
11.00
Conference Room, Building R1

Brakes and Dips in Elastic Scattering

Dr F Henyey/University of Michigan

HEP DISCUSSION GROUP
Wednesday 7 March
11.00
Conference Room, Building R1

Dual Models in Inclusive Reactions

Dr C I Tan/Brown University

SEMINAR IN COMPUTING
Friday 9 March
11.00
Conference Room, Building R12

Some More Programs of the RHEL Film Analysis Group

J Barlow and B Franek

The RHEL Film Analysis Group has developed some programs which are of interest to other users. Some of them have been discussed previously; at this meeting the Automatic Job Submission Program will be described. This greatly simplifies job submission where multiple runs are required of the same program but with different tape/disk requirements.

The Group Program Library system will be discussed, this is a framework for developing, storing, documenting and maintaining commonly used programs intended for general use.

NIMROD LECTURE SERIES
Monday 12 March
11.30
Lecture Theatre

Title not known at time of going to press.

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EVENTS AT AERE

THEORETICAL PHYSICS SEMINAR
Tuesday 6 March
14.00
Conference Room, Building 8.9

Seeing in the Dark

Dr T P McLean/RRE, Malvern

NUCLEAR PHYSICS COLLOQUIUM
Thursday 8 March
15.30
Conference Room, Hangar 8

Photoactivation Analysis of Biological and Environmental Samples

Dr J Hislop Analytical/Sciences Division

EXTERNAL EVENTS

NUCLEAR STRUCTURE AND NUCLEAR ASTROPHYSICS SEMINAR
Monday 5 March
14.30
Nuclear Physics Lab., Oxford

Polycarbonate Damage Trade Detectors and the Electro-fission of Magnesium - 24.

Professor A E Litherland/University of Toronto and Oxford

THEORETICAL PHYSICS SEMINAR
Monday 5 March
16.15
Queen Mary College

Linear Response Theory

Professor N G van Kampen/Utrecht

PHYSICS & GEOPHYSICS COLLOQUIUM
Monday 5 March
17.00
University of Bristol

Dislocation in Cholesteric Liquid Crystals

Dr J Rault/Paris and Bristol

PHYSICS COLLOQUIUM
Monday 5 March
17.00
University of Reading

Concentraction Fluctuations in Binary Liquid Alloys

Professor N H March/Sheffield University

DARESBURY LECTURE SERIES
Tuesday 6 March
14.00
Lecture Theatre

Production of Particles with High Transverse Momentum at the I S R

R Cool/Rockefeller University

THEORETICAL PHYSICS SEMINAR
Tuesday 6 March
14.30
Imperial College, London

Large Transverse Momentum

Dr P V Landshoff/Cambridge University

APPLIED PHYSICS COLLOQUIUM
Wednesday 7 March
16.30
University of Reading

Advanced Passenger Train

G Mitchell/British Rail Centre

ROYAL SOCIETY MEETING
Thursday 8 March
09.30
6 Carlton House Terrace, London

Proton-Proton Scattering at Very High Energies - A Meeting for Discussion

Organised by J M Cassels and A M Wetherell. Speakers will include Drs Cocconi, Prolcoshkin,Amaldi, Cool, Morrison, Phillips and Martin.

APPLIED MATHS SEMINAR
Thursday 8 March
14.30
Royal Holloway College

Triple Differential Cross Section Calculations for the Ionization of He by Electron Impact.

D H Phillips/Royal Holloway College

THEORETICAL PHYSICS SEMINAR
Thursday 8 March
16.15
Clarendon Laboratory, Oxford

Electron States in Super-Heavy Elements

Dr P G Reinhard

COLLOQUIUM
Friday 9 March
16.15
Clarendon Laboratory, Oxford

Mistakes and Crystal Morphology

Dr Judith Milledge/U C L

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

LOST PROPERTY? Found in a library book: a card with a list of cigarettes and spirits to be bought at Geneva Airport AND address and telephone numbers of two ladies in Geneva. Owner may apply to the Editor in confidence!

INSTITUTE OF PHYSICS AWARDS FOR 1973 Amongst the list of awards for 1973, which will be presented at the Annual Dinner in London on 1 May 1973, the following are to prizewinners who have connections with RHEL:-

Guthrie Medal and Prize to Sir Hermann Bondi of the Ministry of Defence, for his applications of physics to astromony and Cosmology.

Rutherford Medal and Prize to Professor J M Cassels of the University of Liverpool, for his experimental contributions to the study of nuclear and sub-nuclear particles.

Thomas Young Medal and Prize to Dr W T Welford of the Imperial College, for his contributions to optics, theoretical and practicular for his work on the optics of bubble chamber design and operation.

FILM BADGE NOTICE It is Period 3. Colour Strip - BROWN for βγ films. Please note that all neutron packs for previous parcels should now be returned.

OVERSEAS VISITS Dr J J Thresher & Dr R M Brown to CERN, 4-6 March to attend meeting to discuss hyperon experiment at S.P.S.
Dr J Solomon, to CERN, 4-7 March, to discuss future uses of Omega & Mini-Omega project.
Dr M R Jane, to CERN, 4-7 March, for discussions on Omega Neutron Trigger Experiment and future uses of Omega.
The Director, to CERN, 6-7 March to attend Nuclear Physics Research Committee.
Mr K C Myers, to CERN, 4-8 March, to attend safety conference.
Dr B D Jones, to CERN, 4-8 March to attend meeting on future use of SPS Hadron Experiment.
Mr H Hurst to the USA, 5-20 March, to attend SHARE Conference at Denver, to various IBM Laboratories for discussions re IBM systems and to various scientific laboratories for discussions on a large-scale and scientific computing.

SOCIAL NEWS

RUTHERFORD & ATLAS RECREATIONAL SOCIETY SUPPER DANCE This will be held on Friday 16 March in the.Rutherford Restaurant, from 8.30 till 1.0 am. Dancing to "The Good Tymes". Tickets, 65p on sale from:-

Mrs V Goodwin, R1., Mrs T Batchellier, R34; Mrs M Stoker, R1; Mr F Cooke, R9; Mr P Craske, R2. Hurry - tickets are going fast.

CHESS - LATEST NEWS Round 8. Bill Turner beat Peter Hemmings and now has 7½ points. Peter Craske beat Alan Gilby and is one point behind Bill with 6½ points. Jim Riddle beat Bob Maybury. With only one round to go Bill Turner must retain his title whatever happens. The best Peter Craske and Jim Riddle can manage will be to draw level. A Full report will be published at the completion of the tournament.

RECORD SOCIETY Tuesday 6 March at 12.40 in the Lecture Theatre.

Beethoven: Piano Concerto No 1, Friedrich Gulda with the Vienna Philharmonic Orchestra conducted by Horst Stein.

RUTHERFORD FOLK CLUB The Folk Club which now meets monthly has a top line presentation lined up for its next evening which is on Friday 2 March at 8 pm in the Coffee Lounge R22.

"Mick Malone" well known member of 'The Johnsons', will be playing banjo, mandolin, guitar and singing English and Irish folk songs.

It sounds like a good evening so why not come along, and bring your friends.

CHRISTIAN FELLOWSHIP All are welcome to attend a prayer-meeting led by Barny May of R2. The meeting, on Friday 9 March, commences at 12.30 in the Conference Room, Building R12.

SEVEN-A-SIDE SOCCER LEAGUE Fixtures for week beginning 5 March:-

Monday - Atlas v Admin (AERE
Tuesday - 351 (AERE v R9
Wednesday - CA Div v Transport
Thursday - Apprentices v R.H.G. (AERE)
Friday - R55 v Casuals (AERE)

FOOTBALL LEAGUE TABLE - 28 FEBRUARY

TEAMS	P	W	L	D	F	A	Pts
G.O.	2	2	0	0	13	2	4
R25	2	1	0	1	4	2	3
Atlas	1	1	0	0	5	1	2
351	1	1	0	0	3	1	2
Casuals	1	1	0	0	3	2	2
R9	1	1	0	0	2	1	2
Admin	1	0	0	1	1	1	1
Trans	1	0	1	0	1	2	0
R H G	1	0	1	0	1	3	0
C A Div	1	0	1	0	1	3	0
Apprentices	2	0	2	0	4	9	0
R55	2	0	2	0	1	12	0