Rutherford Laboratory

30 April - 7 May

bulletin 16

REPORT ON THE RECENT EPIC MEETING

At the recent EPIC Meeting a number of discussions on e^+e^- and ep (i.e. positron electron and electron proton) storage rings took place. We are grateful to Grahame Rees and Bill Toner for the following report on this meeting and the previous Nimrod lecture on the PEP proposal.

In the past few years, there have been major advances in the design and utilisation of storage rings. There have also been major advances in our understanding of the electromagnetic and weak interactions. About a year and a half ago, it was realised that the combination of these two factors made it probable that e^+e^- and e^-p storage rings could be built at reasonable cost to provide a substantial interaction rate for experiments at very high energies. Most important of all, it seems likely that the experiments could lead to quite dramatic advances in elementary particle physics.

Representatives from the Universities, Daresbury Laboratory and the Rutherford Laboratory are participating in a number of working parties, examining the possibility of building such an Electron Proton Intersecting Complex at RHEL. Members of the various working parties on EPIC attended a series of talks and discussions held at the Lecture Theatre on the 11th and 12th April, including a general description of possible parameters and limitations for EPIC.

Earlier in the week, Professor S Berman (SLAC) gave a NIMROD lecture in which he outlined his reasons for believing that PEP experiments could lead to discoveries of fundamental importance. (PEP is an American proposal for a system similar to EPIC). He described the results on ep interactions at SLAC and on e^+e^- annihilation at the various storage rings which lead to the expectation that interaction rates will be high and discussed the great importance of testing the interpretation of these results as due to interactions with point-like constituents of hadronic matter (partons). He particularly stressed the importance of making measurements of weak processes, even at low counting rates, at energies where they compete on an equal footing with electromagnetic interactions.

The meeting later in the week was introduced by Dr Stafford. He was followed by G H Rees (RHEL), who outlined the possible intermediate stages in the long-term development of the EPIC complex. The machine now envisaged has a maximum development potential of 14 GeV for electrons and positrons, and 200 GeV for protons. There are two distinct alternatives under study for the first construction stage. In the first, there is a single conventional magnet storage ring that would allow collisions of electrons and positrons with incident energies up to 11 or 14 GeV. In the second, there are two magnet rings, one conventional ring to store electrons to energies up to 14 GeV and one superconducting 'missing-magnet' ring to store protons to energies up to 100 GeV. A modified Nina would act as a booster for the complex.

Professor Amman (Frascati) gave a detailed account of the limitation in performance of existing e^+e^- storage rings. He explained the importance of the beam-beam interactions, and stressed the strong dependence of luminosity on incident particle energy.

Professor Bernardini (Frascati) described the large magnetic detector which is being assembled for use at ADONE. He also spoke about long term plans for a possible e^+e^- facility with 10 GeV per beam and the interesting physics which could be explored with it. In particular, he mentioned the usefulness of exploiting the polarisation of the beams.

Dr Wiik (DESY) described two large magnetic detectors being constructed for use on the DORIS e^+e^- rings at DESY, which come into operation next year. He also described future plans for the use of colliding e^-p rings with 3.5 GeV per ring. There is very great interest from the machine physics point of view in developing what would be the first ep colliding beam facility. Dr Wiik also stressed that useful physics would result, competitive with what can be done at SLAC, in the case of the study of electro-produced hadrons.

In describing the machine performance at SPEAR, John Rees (SLAC) gave the results of accurate measurements on the beam-beam interaction, and on the observed bunch lengthening. The beam-beam Q-shifts achieved in SPEAR are a factor of three higher than those used in the design of the machine, which is very encouraging. However, no satisfactory theories have yet been put forward to explain the bunch lengthening process. SPEAR has just begun operating with a large 4 kG solenoid filled with magnetostrictive spark chambers and with scintillation counters. The first physics runs on SPEAR were taking place during the meeting, so no details of the performance of the detector were available, except that its operation did not lead to any deterioration in machine performance.

The final machine talk was given by Le Duff (ORSAY). Again, the important aspects of beam-beam limits and bunch-lengthening at ACO were described. The future plans at ORSAY include the design of new storage rings, DCI, a two-ring system with each ring containing both electrons and positrons. The beam-beam space charge forces are reduced by such a scheme, with resulting improvement in the luminosity.

Readers who are interested in learning more about EPIC are referred to the lecture to be given on Monday 7 May by Mr D A Gray entitled "What is EPIC". Details are given on page 2 of this issue. - Ed.

HARWELL TRANSPORT - TECHNICAL COLLEGES

Attention is drawn to a notice which appeared in the AERE news on 18 April. It points out that as students are not using the Harwell transport provided for them, departing Social Club at 17.35 and the Oxford Polytechnic at 20.30, these facilities will be withdrawn as from 30 April. If any students wish to object they should contact the Education and Training Centre, extension 72-2350.

FOUND A ball point pen in Building R1 and a Yale type brass key marked 1A on the back, outside Building R20. Enquiries to Mrs S Fones, Personnel, Ext 495

Two sums of money were found in the Laboratory just before Easter. Enquiries to Mrs C Smith Ext 6693

Sunvic Precision Amplitude Pulse Generator Type PG1, Serial No 153. Will the owner please contact Loan Pool, Building R18. L Tombs Ext 6673 or V Thorp, Ext 382.

INTERNAL EVENTS

NIMROD LECTURE SERIES
Monday 30 April
11.30
Lecture Theatre

The Reactions $K^-p \to \bar{K}^0 n, K^-p \to \Lambda\pi^0, K^-p \to \Lambda\eta, K^-p \to \Sigma^+\pi^-, K^-p \to \Sigma^-\pi^+$ between 3 and 4 GeV/c

Dr C Wohl/University of Oxford

SPECIAL NIMROD LECTURE
Wednesday 2 May
14.30
Lecture Theatre

Photon Spectra at Large Transverse Momenta from 300 GeV Proton Interactions at NAL

Dr A Roberts/NAL

SEMINAR IN COMPUTING
Friday 4 May
11.00
Conference Room, Building R12

Observations on Machine Intelligence

A G Bell/RHEL

References to machine intelligence have occurred in literature for at least 300 years. Despite this antiquity it is a subject which has only recently become available to University Students and is still treated with suspicion in many areas of the computer world. To ask "what use is it?" is a meaningless question; the attraction and interest appears to be subjective. This talk merely observes what some people have said and done on the subject from Swift up to the present day.

NIMROD LECTURE SERIES
Monday 7 May
11.30
Lecture Theatre

Measurement of the Real Part in $\pi^{\pm}p, K^{\pm}p, \bar{p}p$ Scattering Between 1 and 2.6 GeV/c by Means of the Coulomb-Nuclear Interference

Dr M Ferr Luzzi/CERN

APPLIED PHYSICS LECTURE
Monday 7 May
14.15
Lecture Theatre

What is 'EPIC'

D A Gray/RHEL

Major aims in the development of particle accelerators are the production of high total energies in particle interactions, with high interaction rates.

'EPIC', an Electron-Proton Intersecting Complex, is an

arrangement of interleaved magnet rings for accelerating electron and proton beams. Interactions with very high total energy occur at the intersection regions and several different types of interactions, ie e^-p, e^+p, pp and e^+e^-, can be studied. Useful beam-beam interaction rates can be obtained with bunched beams and low β (small transverse beam size) techniques. Apart from optimising the energies of the component accelerators, there are problems of lattice design, beam-beam limits and method of production of low β insertions to be solved.

The status of the design and the relevant world developments will be presented.

EXTERNAL EVENTS

THEORETICAL PHYSICS SEMINAR
Monday 30 April
16.15
Queen Mary College

The Ising Model and Beyond

Professor H N V Temperley/Swansea

PHYSICS & GEOPHYSICS COLLOQUIUM
Monday 30 April
17.00
University of Bristol

Metal-Insulator Transitions in Vanadium Oxides

Professor Sir Neville Mott/University of Cambridge

BRITISH COMPUTER SOCIETY - READING BRANCH MEETING
Tuesday 1 May
20.00
University of Reading

Operating Systems and Job Control Languages

Professor D W Barron

THEORETICAL PHYSICS SEMINAR
Wednesday 2 May
14.30
University of Manchester

Renormalisation of Spontaneously Broken Gauge Theories

Professor T W Kibble/Imperial College

THEORETICAL PHYSICS SEMINAR
Thursday 3 May
16.15
Clarendon Laboratory, Oxford

Spontaneous Breakdown of Symmetries

Dr P Higgs/Edinburgh

LOW TEMPERATURE AND SOLID STATE PHYSICS SEMINAR
Thursday 3 May
14.30
Clarendon Laboratory, Oxford

Magnetic Domains and their Interactions with Crystal Defects

Dr J P Jakubovics/Dept of Metallurgy

COLLOQUIUM
Friday 4 May
16.15
Clarendon Laboratory, Oxford

Teaching Science in the Open University

Dr M Shott/Open University

STOP PRESS

PURLOINED POSTER

Will the person who removed a small calendar poster from the telex office kindly replace it please. If this is not possible, a calendar poster of equal quality will be acceptable.

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

FILM BADGE NOTICE

Period 5 commenced on Monday, 23 April. Colour Strip - YELLOW for βγ films and neutron packs.

Please check that you are wearing the correct dosimeter and that all old ones are returned.

Six monthly TLD change for people with surnames commencing Q, R, S, T.

OVERSEAS VISITS

Dr G C Stirling, to the USA, 27 April - 4 May, to attend ZING Workshop to be held at the Argonne National Laboratory. The ZING (Z stands for ZGS, and ING is for Intense Neutron Generator) proposal would use the proposed 500 MeV ZGS injector to provide a pulsed netoron source.

Dr A S L Parsons, to CERN, 29 April - 3 May for discussions on S99.

The Director, to Geneva for meeting with Professor Salvini on 3 May and to attend ECFA Plenary Meeting on 4 May.

Mr D A Gray, to CERN, 3 - 4 May to attend ECFA Plenary Meeting.

SOCIAL NEWS

RECORD SOCIETY

Tuesday, 1 May at 12.40 in the Lecture Theatre.

At the end of last February the Record Society presented an interesting programme of organ music. A lot of people missed this and have asked for a repeat. The following 'write up', repeated from the February Bulletin describes the programme which was compiled by John Hardaker.

"When an electronic organ sets out to be a comparable replacement for a pipe organ the purists set about knocking it down. The Allen Company in America, using the technique of digitising waveforms and storing them in a computer memory, are making a new break-through, which is standing up well.

Stephen Hicks uses its faster than pipe organ attack time to play The Ride of the Valkyries also Vidor's Toccata and Simon Preston playing Crown Imperial by Walton on the Westminster Abbey organ as a finale.

(John Hardaker who has contributed the above, may in truth have set the cat amongst the pigeons as it were. The transient response of a pipe organ of course varies considerably according to the type of organ but it should be interesting to head this new electronic organ - Ed.)"

CHRISTIAN FELLOWSHIP

All welcome to join for a time of prayer led by Des Ould of RI. The meeting commences at 12.30 on Friday 4 May in the R12 Conference Room.

RUTHERFORD AND ATLAS RECREATIONAL SOCIETY AGM

An Annual General Meeting of the Rutherford and Atlas Laboratories Recreational Society will be held in the Lecture Theatre on Wednesday, 2 May at 12.40

If you want to have a say in the activities of the Society for the coming year why not come along and voice your opinions.