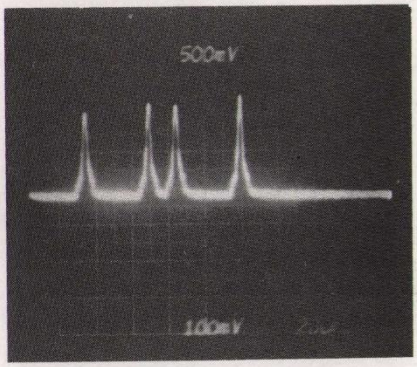
JEAN BANFORD R20

Bulletin

of the Rutherford Appleton Laboratory 15 Oct 1984 No.15

SNS Proton Beam Extracted at First Attempt



Signals from a beam monitor in the synchrotron and one in the extracted proton beam line, added on the same oscilloscope trace.

The beam pulse photo above says it all. The first two peaks in the photo are the 550 MeV beam bunches passing through superperiod 5 in their orbit round the synchrotron, the second two peaks are the extracted bunches; in just under half a microsecond they have come round to superperiod 1 for the last time, to be kicked upwards by the extraction magnets. Their fate was to be absorbed in a two metre long graphite beam dump, but in a few months their successors will be guided down the extracted proton beam line and into the uranium target of the SNS to produce our first neutrons.

Preparations started one week earlier with repairs to some drift tube stems in the 70 MeV injector. The fast kicker magnets and the extraction septum, the extraction beam line first vertical and horizontal bending magnets, beam monitors, a quadrupole and the beam dump had all been newly installed and tested. Were they fully protected by their interlocks? (Failure of the cooling system for the septum would leave it a molten wreck if the power supplies were not turned off within seconds).

So the commissioning run got under way. There were the inevitable minor hiccups; then, at midday on Friday 28 September, prospects looked more hopeful as we achieved a healthy circulating beam of 10^{12} protons at 550 MeV. The septum magnet was primed with 7000 amps and the first magnets of the extracted beamline were set to guide the proton bunches into the beam dump. Finally the call went out to a lone sentinel in R4, home of the fast kicker power supplies, 'Turn on the Kickers'. The six pulsed supplies were switched on, all pulsing together at 28 kV and synchronised within a few nanoseconds. All eyes in the control room were turned to the extracted beam monitor and - there they were, two equal one hundred nanosecond pulses neatly extracted and on their way into the extracted beam line with no sign of unextracted protons to cause radiation within the synchrotron.

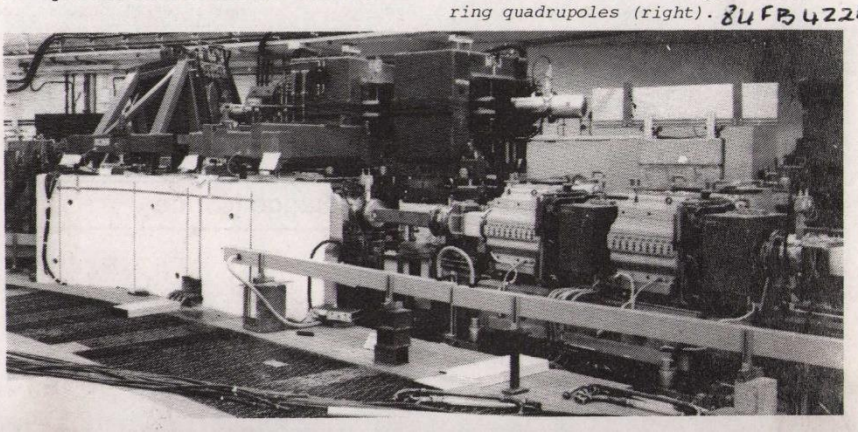
After some fine tuning of the beam line magnets (such as reversing the polarity of one of them) the extracted protons were guided into the graphite, a factor confirmed by regular and reassuring flashes from a thin sheet of plastic scintillator placed between the end of the beam pipe and the graphite and viewed remotely via a TV monitor.

The 3 fast kicker extraction magnets are made of ferrite and have a single turn of copper conductor which is pulsed with a current of up to 5400 A. The current rises to full amplitude within 224 nanoseconds between the individual beam bunches rotating in the synchrotron and remains constant to within 1% during the extraction period of 700 nanoseconds. Six separate pulse forming networks are charged to ±40 kV and discharged simultaneously in series pairs to give 80 kV across each magnet. The magnetic field produced in the magnet apertures is 0.038 Tesla. The proton bunches are kicked into the input aperture of the septum magnet 120 mm above the median plane of the synchrotron at an angle of about 1°. The septum magnet has a curved iron yoke 1.8 m long on a 22° arc. The field in the gap is about 1 Tesla produced by 9000 A passing through an 8 turn coil of water cooled hollow copper conductor. Some 250 kW is dissipated in the dc magnet. At the septum itself the conductor is only 9 mm deep and cooling the conductor with the resultant high current densities is a technical problem.

It was a successful run in other ways. The prototype remote monitoring and handling facility, the "Liska Arm", was first used in earnest. This is a remotely controlled extending arm attached to the synchrotron crane gantry. It was fitted with a radiation monitor and could be pivoted and extended to measure at close quarters the induced radiation on the components of the synchrotron ring.

(see over)

The beginning of the SNS Extraction Beam-line. The graphite beam dump is seen clearly above the synchrotron ring quadrupoles (right). 84FB4229



INTERNAL Events

CONDENSED MATTER SEMINARS
R3 CONF ROOM - 1330hrs

23 Oct R E Gordon/Oxford Research Systems
"Use of NMR in Biology and Medicine In-Vivo Studies"

30 Oct J B Pendry/Imperial
"Quantum Limits to the Flow of Information and Entropy"

6 Nov J Ryan/Oxford
"Picosecond Dynamics of Hot Carriers in Semiconductor Multiple Quantum Well Structures"

JOINT THEORY SEMINARS
R3 CONF ROOM - 1330hrs

25 Oct M Child/Oxford
"Molecular Collisions and Catastrophes"

COMPUTING SEMINARS
COLLOQUIUM - ATLAS CENTRE - 1400hrs

19 Oct Ed Russell/SLAC
"SLAC CMS Batch System"

ASTROPHYSICS EVENTS
R68 CONF RM - 1400hrs

31 Oct Dr T Carroll/Oxford
"Active Galactic Nuclei"

7 Nov Dr G E Bromage/RAL
"IUE Observations of NGC 4151

GEOPHYSICS SEMINARS
R68 CONF RM - 1400hrs

16 Oct Dr P Minnett/RAL
"Sea Surface Temperature Measurement Using Infrared Radiometry from Space"

HEP SEMINARS
CONF RM 2 R1 - 1100hrs

17 Oct D V Bugg/QMC
"Nucleon-Nucleon Interaction - The Present Situation"

NIMROD LECTURES
R61 CONF ROOM

22 Oct D Saxon/RAL
"Electroweak Interference in e^+e^- Annihilation"

29 Oct G G Ross/Oxford
"CP Violation in the Standard Model"

External Events

THEO PHYS SEMINARS
TPD - HARWELL - 1400hrs

23 Oct Dr R Holdaway/RAL
"Satellites and Space Science at the Rutherford Appleton Laboratory"

30 Oct Dr D C Clary/Cambridge
"Energy Transfer in Molecular Collisions!"

SNS *(cont'd from p1)*

The facility is equipped with TV monitors to watch the movement of the arm and relay the readings from the radiation monitors to the main control room. It was used at regular intervals to monitor the induced activity on the septum and is a significant step towards the safe remote radiation monitoring which will be essential when the SNS is complete and taken to its full design intensity and energy.

We thank G Sandels for this latest information from SNS.

Computing Seminar

The next seminar in this series will take place in the Atlas Centre, Colloquium at 2.0 pm on Friday 19 October.

SLAC CMS BATCH SYSTEMS
by
Ed Russell
SLAC Computer Center

Several years ago the Stanford Linear Accelerator Center (SLAC) Computer Center made the decision to convert to VM rather than MVS despite several years experience with OS, HASP, and ASP. One major recognised deficiency in going to VM was the lack of decent batch processing capability.

This seminar will describe the SLAC Batch System which has been developed over the last four years. It is based on the INTEL Batch Monitor IUP but has been extensively revised. Tape setup capability and multiple CPU support are also provided. Ed Russell is the author of this batch monitor.

If there is time and interest a brief discussion of the reasons SLAC chose VM over MVS could be included.

Film Badge Notice

It is period 11. Colour strip YELLOW Please be sure you are wearing the correct dosimeter, and return all old ones

NEXT FILM ISSUE
Monday 5 November

RAL TECHNOLOGY LECTURES

The next lecture in this series will be held on Thursday 25 October at 3.00 pm in the R22 Lecture Theatre.

EXOTIC APPLICATIONS OF LASER PRODUCED PLASMAS
by
Dr M H Key
Laser Division
Rutherford Appleton Laboratory

It is surprising at first to find that the fastest growing research applications of plasmas produced by high power lasers are in such improbable areas as biological microscopy, analysis of semi conductor surface transformations, new particle accelerator concepts, laboratory simulation of planetary bow shocks and α particle radiography.

The reason is the uniquely intense electromagnetic field strength and emission of X-rays and fusion particles from laser-produced plasmas which make them a million times brighter sources than SRS or SNS!

FOR YOUR DIARY: The next two lectures in the series will be on Thursday 22 November 1984 by Dr John Lawson, Technology Division and will be entitled "New Techniques in Particle Acceleration"; and Thursday 20 December 1984 by Professor Gerald Musgrave, Brunel University, and will be entitled "Computer Aided Design".

Mr 'Chilbolton' Retires

84RB4005

In RAL circles the names John "MAC" McGivney and Chilbolton are synonomous. From the beginning in 1965, it was Mac who supervised the construction and commissioning of the Observatory, and it was Mac who guided it through 30 years of triumphs and tribulations, from its inception as a tool for astronomy to its present note at the forefront of radio communications research. (With a little help from his friends).

No wonder then, that on his retirement he was treated to two presentation ceremonies (one at Chilton on Thursday 13 September and, naturally, one the following day at his beloved Chilbolton) where we learned of his further exploits, from John Norbury, making the presentations on behalf of the many colleagues who hold Mac in great esteem and affection.

Mac joined the Radio Research Station at Slough (afterwards Appleton Laboratory) in 1958 and from 1959-1962 spent a very memorable period at the Falklands Observatory, returning to Slough for a couple of years before starting his "life's work.

Thanking everyone for the gifts of a framed photograph of 'his dish' and a Diastar slide-viewer, Mac spoke with pleasure of his days in the Falklands and at Chilbolton and of the lasting friendships he had made. "Even", he joked, "amongst queer people like the AMPTE lot, who go around tracking things that move - unlike nice stars which are always there! It has been a priviledge to work with you all and I wouldn't have missed it for the world. Thank you for coming to see me off. It is much appreciated," he concluded.

Out with a Bang

Alan Thorp has had a long and varied career as a mechanical engineer including some 23 years with the Rutherford Appleton Laboratory (including NIRNS). At his retirement presentation (held when the editor was on holiday), Ron Newport spoke warmly of his contribution to the work of the Laboratory and in particular of his excellent work on the Rapid Cycling Bubble Chamber for CERN, a project on which they had worked closely together.

Before the presentation Bob Swadling presented Alan with a magic wand in recognition of the help he had given him in designing various tricks. Alan was then invited to demonstrate the use of the wand in what turned out to be one of the most explosive farewells on record.

A stunned audience probably didn't hear Ron thank Alan for his dedicated efforts before presenting him with a Black and Decker planer, a cheque and the now obligatory and prized Ray Roberts cartoon.

Alan responded and expressed his thanks to his friends and colleagues many of whom were present, though partially hidden by smoke.

84RB3790

Thanks

David Salter would like to thank everyone from RAL, Central Office, Harwell, ILL Grenoble and the Universities who contributed towards such a splendid "send-off" on September 7. He sends apologies to the many people at the Laboratory to whom he missed saying goodbye and hope to see them again before too long.

John McGivney also wishes to express his thanks to all for the marvellous slide viewer and photograph. "I shall treasure the card which came with it as in the years to come, it reminds me of all the friendly people I have been lucky enough to work with. To those I was not able to see personally, I hope this note will be some substitute", he writes.

Golf

1984 Matchplay Champion

The final of this year's Matchplay Championship was played at Frilford Heath Golf Club on 14 September and was won by Geoff Manning. For the second year running Eddie Fitzharris reached the final and once again had to be content with the runner-up position - our commiserations Eddie.

Geoff has reached the final twice since the inauguration of the Competition. He was Champion in 1980 and this year came through against strong opposition (18 players took part) to become the title holder.

Bulletin

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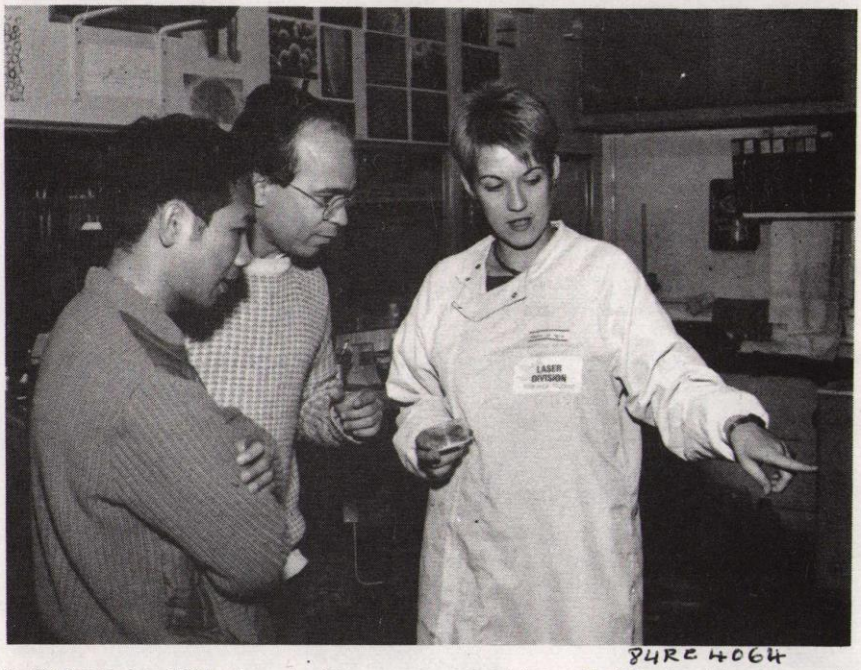
Deadline for insertions:

Laser 'Open House'



84RC 4064

On 20 September 1984 close to 200 visitors from Universities, Polytechnics and Research Laboratories attended the Laser Division 'Open House'. In a programme of talks and tours, visitors, many of whom had never visited RAL before, learnt of the very wide range of research activities pursued by users of the Central Laser Facility (CLF).

Of major interest was the recently completed 12 green beam target chamber which is fed by the VULCAN multi-terrawatt glass laser system. This facility gives University users opportunity to perform compression physics experiments of international standing. More recently developed programmes of research utilising the intensely bright X-ray emission from plasmas generated by VULCAN or the high power UV laser system, SPRITE, caused great interest. With such sources, major advances in fields such as pulsed X-ray diffraction, time resolved EXAFS and X-ray microscopy of live biological specimens have been made very recently at the CLF. The latest results in X-ray laser research were a big attraction. International programmes in the development of X-ray lasers are now advancing rapidly with CLF work well to the forefront.

Biologists and chemists were keen to learn about the new Laser Support Facility (LSF) which will soon be in operation and will give them access to world class laser facilities. The LSF work will provide a wide range of advanced pulsed, high repetition rate UV and visible tunable lasers with pulse lengths in the picosecond to nanosecond regime either as central facilities at RAL or on short-term loan to University Departments.

The activities of the joint Laser/Technology Division programme on pulsed UV laser lithography clearly interested many visitors since this SERC/DTI funded programme is starting to produce important new results which could dramatically change the technology of microcircuit fabrication. In addition some of the novel technologies developed to support the CLF research activities such as microtarget fabrication and laser micromachining of polymer targets were demonstrated and caused considerable interest. The photograph above shows Miss Terese le Roux, a student from Lanchester Polytechnic in the Target Fabrication Group, explaining to two visitors from Southampton University details of the techniques used to process microspheres for laser compression experiments.

The Open House was a popular event and it advertised widely the unique facilities available to users of the CLF. We expect that many of the visitors will soon reappear as active users.

Coffee at Cosener's

Do remember to join us for coffee on Thursday 18 October at Cosener's House, Abingdon, from 10.30-12 noon.

All RAL wives and their pre-school age children are most welcome.

For further information contact Suzanne Litchfield, Abingdon 21310 or Zoe Patrick, Wantage 68809.

Missing

The following item is the subject of a loss report. Information on the whereabouts of the item should be relayed to H S Taylor R3 Ext: 6526.

Sharp Calculator type PC 1211
Inventory No. XO10954 Ser.No. 1008447.

Trade Exhibition

ENDEVCO UK LTD will be bringing to you in their mobile exhibition outside R20 their latest range of instrumentation for measuring vibration, shock and pressure. Endevco staff will be available to discuss your dynamic instrumentation needs from 10.00 to 16.00 hrs on Monday 22 October."

LIGHT ALLOY LTD are suppliers of aluminium containers, electronic equipment housings and various forms of access equipment and will be bringing a mobile exhibition bus for a one-day exhibition on Monday 29 October outside R20 from 10.00 to 16.00 hrs."

E LEITZ (INSTRUMENTS) LTD will be exhibiting here on Tuesday, 30 October in their mobile demonstration unit, parked by R20. Staff are invited to use microscopes, photographic and video equipment, some of which will be shown for the first time."

Sales to Employees

The sale of scrap metal and plastics to employees, subject to the usual conditions, will take place on 26 October at 12.30 pm in the R40 scrap compound.

Tenders submitted in response to Rutherford Appleton Laboratory Circular 19/84 were opened on Monday and Tuesday 24th & 25th September by Mr P Coleman in the presence of Mr A Ferrari, Union Site Convenor, Mr P Seager, Staff Side Representative, and Mr A C Peters on behalf of the Stores Section.

The successful applicants have been individually notified.

Christian Fellowship

Meetings are held in R2 Conference room at 12.30 pm on Thursdays unless otherwise stated. Everyone is very welcome.

Oct 18 - Cassette Ministry - Trevor Lucas
25 - Fellowship - Jimmy Darius
Nov 1 - Bible Study - Chris Biddlecombe
8 - Prayer Meeting - Ray Powell
15 - Mission England Video - Open Meeting (venue to be arranged)
22 - Fellowship - Martin Steel
29 - Invited Speaker

For more information on Fellowship activities please contact Margaret Summers Ext 5658.

JEAN BANFORD
R20

'SCIENCE & GOVERNMENT'

A SERIES OF SEMINARS CHAIRED BY

THE RT HON. LORD SHERFIELD AND

ROBERT JACKSON MP

The Seminars will be held on Fridays at 5 pm

at

ALL SOULS COLLEGE, OXFORD

RAL staff wishing to attend should write direct to Robert Jackson MP, House of Commons, London SW1A 0AA.

19th October	BRITISH SCIENCE POLICY IN AN HISTORICAL AND COMPARATIVE PERSPECTIVE	
	Sir Douglas Hague,	Chairman of the Economic and Social Science Research Council
	Sir Fred Dainton,	Former Chairman of the University Grants Committee
26th October	WHITEHALL: CUSTOMER AND SPONSOR	
	Sir Henry Chilver,	Vice-Chancellor of the Cranfield Institute of Technology
	Dr Robin Nicholson,	Chief Scientific Adviser at the Cabinet Office
2nd November	THE RESEARCH COUNCILS	
	Professor Sir David Phillips,	Chairman of the Advisory Board for the Research Councils
9th November	SCIENCE IN THE UNIVERSITY	
	Sir Peter Swinnerton-Dyer,	Chairman of the University Grants Committee
	Dr Tony Kelly,	Vice-Chancellor, University of Surrey
16th November	THE INTERNATIONAL COLLABORATIVE DIMENSION	
	Dr H.-O. Wuster,	Director of the Joint European Torus at Culham
	Sir Hermann Bondi,	Chairman of the National Environmental Research Council, and former Chief Scientist of the Ministry of Defence
23rd November	RESEARCH IN INDUSTRY	
	Kenneth Durham,	Chairman of Unilever, PLC
	Derek Roberts,	Technical Director of the GEC
30th November	MILITARY RESEARCH AND DEVELOPMENT	
	Sir Ronald Mason,	Former Chief Scientist in the Ministry of Defence
7th December	POLITICAL CHOICES FOR THE FUTURE	
	Sir Keith Joseph MP,	Secretary of State for Education and Science
	Margaret Thatcher MP,	Prime Minister