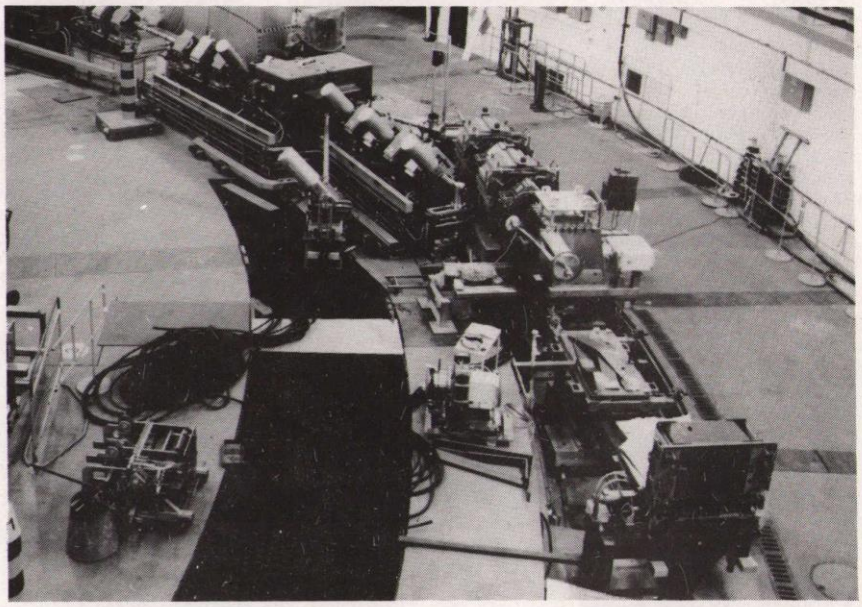
Bulletin

of the Rutherford Appleton Laboratory 20 June 1983 No.9

They've Done It Again

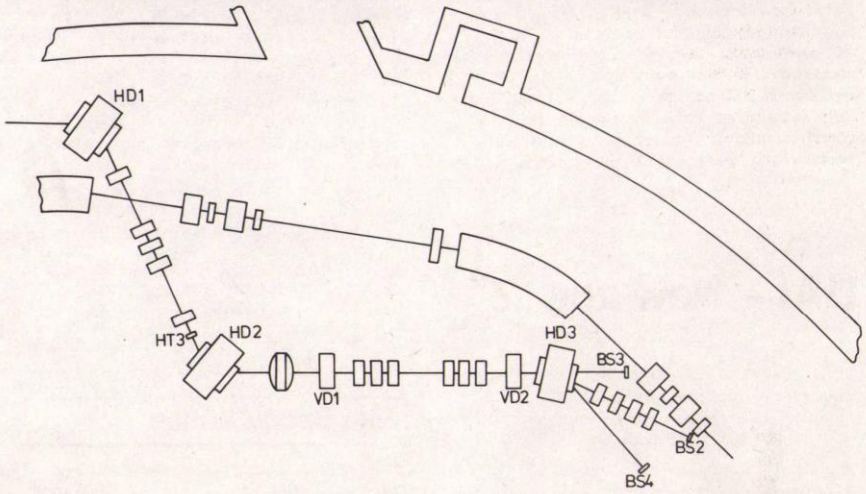
Early this year the 'Bulletin' reported news of three important results achieved by RAL experimental teams. Since then the IRAS project has continued to produce notable discoveries at regular intervals, the latest being the sighting of a second comet on 26 April. Now news has reached us of the discovery of the Z^o particle by the UA1 team (who gave us the W) and of the first successful transfer of beam from the 70MeV linac into the synchrotron room, up to the point of injection into the SNS.



SNS - Another Milestone

The SNS injector first accelerated H^- ions to 70 MeV in January of this year. (Bulletin No. 2 1983). Since April, the linac has been operated on most Thursdays in order to optimise beam transmission through the accelerator, commission additional equipment such as the buncher, and to measure the properties of the emergent beam. During this period reliability has improved to such an extent that 70 MeV is regularly achieved within about 4 hrs of start-up. A retractable beam stop (BS1) has prevented the beam from leaving the linac tunnel in the synchrotron room.

Meanwhile, the beam line to transport the ions to the SNS injection straight-section has been built up. This consists of quadrupoles, dipoles, correction magnets and diagnostic equipment, all of which was pre-aligned on measurement benches and then installed on carefully aligned stands. In order to test this beam line a 36-hour running period was scheduled for the week-end of the 4/5th June, since the synchrotron itself is being constructed during normal working hours. On Thursday 3 June the vacuum line was closed, the pumps started, and by lunch time on Friday the personnel interlock system was complete and tested. Intensive work on the magnet power supplies resulted in all 35 magnets in the transfer line having power available, and at 15.00 hrs on Saturday a 3.4 mA, 70 MeV H^- beam was handed over to the experimenters.



The last section of the beam line which carries the H^- ions from the linac to the SNS synchrotron.

After checking the beam dimensions and displacement with wire profile monitors (PM s) in the linac tunnel, Beam Stop 1 (BS1) was removed at 16.40 hrs. A beam signal was immediately detected by a toroid (HT3) positioned about 30m along the 50m-long transfer line, but within a few pulses the beam was automatically shut down by neutron

(cont'd over)

SNS *(cont'd from p1.)*

detectors placed in the north tunnel entrance to the synchrotron room. In order to surmount this problem, it was decided to reduce the pulse repitition rate rather than to reduce the beam intensity. With the beam re-established, a small alteration to the current in the first of the three horizontal bending magnets (HB1) resulted in 3.4mA being recorded at the toroid. Shortly afterwards dramatic noises from one of the modulators announced that 2 kV and water cannot co-exist, and mopping-up operations were necessary. The beam was back on after about an hour. At 19.50, after tweaking HD2, beam was seen on a glass scintillator immediately in front of Beam Stop 3 (BS3).

When normal injection is taking place, the last horizontal dipole (HD3) bends the beam through 24° (onto BS2), but there are two other diagnostic lines at 0° (BS3) and 50° (BS4). The next stage was therefore to power HD3 and search for beam in the 24° line. Pausing only to celebrate the 0° success with a glass of lucozade, beam was detected on the three PM s in front of BS2 at about midnight. At this stage transmission down the line was estimated to be about 50%.

Further adjustments to magnet currents subsequently brought the transmission up to about 80%. Beam position and width was measured throughout the line under the anxious eyes of prominent members of the neutron community, who generously provided further supplies of lucozade. Beam was seen on BS4, and the chopper (a 50kV electrostatic deflector to provide short beam pulses for diagnostic purposes) brought into operation for the first time. It worked immediately giving 20μsec - and then 2μsec-long pulses on demand. This provided a most satisfying end to a very successful week-end. During the experimental phase the 70 MeV beam was available for about 90% of the time, a remarkably high figure at this stage of commissioning. Congratulations and thanks are due to all concerned.

M.Harold

UA1 - Now the Z^0

On 3 June the UA1 team announced the discovery of five examples of the Z^0 intermediate boson, the neutral partner of the W (see Bulletin No 2 1983).

The Z^0 is a member of a trio of particles predicted by the electroweak theory to unify two of the four basic forces in nature: the electromagnetic and the weak nuclear forces. Many had believed that a particle so elusive and so difficult to produce could not be discovered so speedily. Its identification following intensive periods of data analysis terminating over the week ending 27 May, is proof of the originality, selectivity and reliability of the equipment operated round the clock to translate into reality the brilliant ideas put forward by the boson hunters.

The event was discovered using the very large detector built and operated by the UA1 collaboration, which includes teams from Birmingham University, Queen Mary College and RAL. The detector records the tracks of the many charged particles emerging when the proton and its antiproton collide head on with a combined energy of 540 GeV (the highest man-made particle collision energy ever studied). The low rate of Z^0 events requires that intense beams of antiprotons be produced and already the record luminosities achieved last year have been surpassed as a result of brilliant accelerator physics at CERN. Exploitation of the collider by the experimental physicists has yielded one of the greatest advances in physics of all time.

IRAS - Second Comet

On 13 May special software, developed by Dr Brian Stewart of RAL and Mr Simon Green of Leicester University, detected a moving object in the routine IRAS sky survey scans. Dr John Davies (Leicester University) and Dr H H Aumann (on the IRAS science team from the Jet Propulsion Laboratory, California) with the help of RAL's 'quick look' facilities decided the object was probably a comet. Ground-based observatories were alerted and astronomers at the SERC's Schmidt Telescope in Australia confirmed the detection of a faint comet on 18 May. The official announcement of the new comet was made by the International Astronomical Union on 19 May.

The comet is 17th magnitude, one million times fainter than comet IRAS-Araki-Alcock was at its closest approach and requires large telescopes for its observation. It is calculated that the comet passed the Sun on 22 January at a distance of 130 million miles which means that it is now moving farther from our solar system making it even more difficult to see even with large telescopes, though it was seen again a further three times by IRAS on 23 May.

Detection of such a faint comet is a major achievement for the IRAS satellite as chance discoveries of very faint comets are rare.

Film Badge Notice

Film Badge issue commences Monday 20 June.

Colour strip YELLOW; please change your films promptly and return all old ones.

Library Notice

Please could everyone check offices and labs for the following books/ journals and return to the Library R61.
"Advances in Engineering Software"
Vol 5 No 2 April 1983
Bishop - "Electronics for Technicians".

Internal Events

HEP SEMINARS
LECTURE THEATRE - 1400 hrs

22 June Prof D H White/Brookhaven
"ν_μe Elastic Scattering

R61 CONF. RM - 100 hrs

29 June Dr Hong-Mo Chan/RAL
"Loop Space Formulation of Gauge Theories"

NIMROD LECTURES
R61 CONF. RM - 1400 hrs

20 June Prof. F Vannucci/Ecole Polytechnique
"Massive Neutrinos"

27 June Dr C Plyton/CERN
"The Role of Cosmic Rays in the Development of Particle Physics"

CONDENSED MATTER SEMINARS
R3 CONF. RM - 1330 hrs

21 June V J Morris/ARC Norwich
"Polysaccharides which Gel and Thicken"

28 June A J Cheetham/Oxford
"Some Applications of Neutron Scattering and Complementary Techniques in Inorganic Chemistry"

Trade Exhibition

Industrial Ceramics by Royal Worcester

There will be an audio visual programme on the production and uses of Alumina Ceramics on Tuesday 28 June between 10am and 4pm, in the Conference Room in R12. Special presentations will be every hour on the half hour."

Euro Electronics & Livingston Hire

There will be a display of equipment from the very wide range of advanced electronic research and test instrumentation available from these firms. This ranges from complex digital test systems to sophisticated RF testing and magnetic field measuring instruments - plus much more. On Tuesday 5 July in Conference Room 5, R20 from 10am to 4pm."

Croquet

Would anyone interested in playing croquet at RAL or at the SERC Sportsday, please contact Roy Platon, Ext 5161. He would like to hear from experts, beginners or those who would just like to give it a try!

Thanks

Many, many thanks to all who contributed to my retirement party and presentation on May 27th. I am writing this at the desk you so generously gave me. The party was a truly joyous occasion for both my wife and myself. Thank you very much indeed for a most memorable day.

Alan Gibson

Goodbye Alan - and Welcome

On Friday 27 May 1983 Alan Gibson retired from his post as Head of Laser Division. To mark the occasion a 'Farewell Lunch' was arranged at Lains Barn, Tulwick, to which Laser Division, the Laser User Community, friends and colleagues were invited - and they all came!

Geoff Manning, making the presentation of a desk to Alan on behalf of the many well wishers who had contributed to its acquisition, spoke of his pleasure at being able to perform the ceremony, and his delight at being able to welcome Alan back to the RAL fold as a User. "It marks a complete circle," he said, "as Alan started as one of the community that made the original case for the Laser Facility. Alan is not retiring - just changing sides, and will return as a part-time user of the facility as an honorary Professor at Essex University." Speaking to Alan, Geoff said, "The gathering here today shows the esteem in which you are held, not only as a colleague but as a friend. You have given excellent service to the Lab and to the community, and we welcome you as a User to the facility you have created."

Mike Key, for Laser Division, then presented Alan with, "Something on behalf of your more immediate colleagues", which when unwrapped revealed a pewter tankard, ("That's what I asked for", said Alan amidst laughter), and a bound copy of the Laser Annual Report, hot off the presses.

"We all recognise your brilliance academically," said Mike "but you are also a superb person to work with; this is the side we shall really miss. We wish you all the best."

Alan replied that he was rarely speechless, but at that moment he was overwhelmed. He had thought it difficult to make the speech when, in the past, he had been doing the presenting but he hadn't realised it was such an impossible job to reply. "I'm so delighted you've come to this party. I feel it's a tremendous gift that you're all here and I appreciate it enormously," he said, "thank you all for the magnificent gifts and the kind words of Geoff and Mike. Physics is fun, but the icing is put on the cake by having such nice colleagues."

Alan then thanked Heather Grover and Mike Key for organising the splendid occasion, and Mrs (Dave) Craddock for the special cake "absolutely superb - fantastic - a laser layout as it should be done!" He then raised his glass and toasted Laser Division, wishing them every success in the future.

The more formal part of the proceedings over, Alan was presented with a specially commissioned card by the Division's resident artist, Dave Baker, and carolled by the Laser Division Glee Club (under the direction of Chris Reason) with a specially composed ditty by their poet laureate, Chris Hooker. A joyous salutation to a much admired man.

Alan cuts the cake, watched by an expert, Mrs Gibson.

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So Much Achieved

Alan was one of the main campaigners for the setting up of the Laser Facility and vacated the post of Head of the Physics Department at Essex University to join it soon after it started in 1976. Since that time he has directed the rapid expansion of the Division from its initial handful of people through to its present level of over 50 staff. Under his supervision, the glass laser has been progressively upgraded from a single beam 100GW system feeding only one target area to the present multi-wavelength, multi-terrawatt, kilojoule system feeding 2 experimental chambers. His enthusiasm for short wavelength gas lasers has given rise to a dynamic programme, starting with the relatively modest electron beam pumped excimer laser, ELF, and leading to the present complex of sophisticated lasers that make up the multiplexed Raman shifted SPRITE system. The user facilities have also been expanded and diversified by the setting up of the UV Radiation Laboratory which has rapidly become immensely popular with chemists, biologists and even physicists. In addition, in the last few weeks he has successfully brought to a conclusion the planning and approval stages for a new Laser Division programme to investigate the impact of excimer lasers on lithography technology.

As a fitting tribute to his distinguished career Alan was elected a Fellow of the Royal Society a few years ago. In addition he has just been awarded the Glazebrook Medal of the Institute of Physics in honour of his work establishing and developing the Laser Facility.

Alan leaves the Division with a healthy future ahead of it. Since his £2 million proposal for capital expenditure on glass and gas laser facility development over the next 5 years has just been approved by Council.

We Won the Cup

On Saturday 14 May, the Laboratory was host to the 1983 "Bubble Chamber Soccer Tournament" and welcomed teams from Birmingham (trophy holders), Imperial College, Oxford and University College London. The hospitality however, did not extend to the field of play and one of the three Laboratory teams entered in the competition ('Rutherford-B') carried off the trophy.

In the qualifying leagues, the Rutherford-B team disposed of Imperial-A, Oxford-A and Rutherford-A to head their league with an unbeaten record, thus qualify for the semi finals. Rutherford-A, last years beaten finalists, fielded a weakened team and failed to reach a qualifying place. In the second qualifying league, Rutherford-C scored more goals than any other team in the two leagues but still contrived to come third, failing to reach the semi finals.

The best football of the competition was played in the semi-finals. Rutherford-B swept into the final with an easy 4-1 win over Birmingham-B but their performance was missed by many spectators who were drawn to a thrilling match between Birmingham-A and Oxford-B in the other semi-final. The scores were level at the end of normal time and each side scored once in extra time. Oxford remained the cooler during the penalty kick decider and deservedly reached the final.

The final was something of an anti-climax in comparison and Rutherford-B were rarely troubled, coasting to a 3-0 win. They bring the trophy to the Laboratory for the second time in its nine year history.

Congratulations to the winning team: pictured here (left to right) Mick Young, Geoff Pearce, Bob Brown, Robin Marshall, Martyn Davenport and Andy Clark, and to the tournament organisers Ken Paler and Dick Roberts. We all look forward to the 1984 competition in Hyde Park.

Farewell to Peter

Friday 27 May turned out to be a memorable day for Peter McCarthy, SNS vacuum-man par excellence. Fêted by his friends and colleagues, heaped with gifts, and thanked by his Division Head, he left RAL to enjoy a well deserved and busy retirement.

Peter joined Nimrod Vacuum Section in 1960 and helped with the round-the-clock testing of the fibre glass vacuum vessels; and when Nimrod became operational, transferred to the Vacuum Lab to become immersed in the development of vacuum controls and instrumentation. With the advent of beam lines he specialised in fast-shut-off-valves. Building and improving the control systems, he soon became an expert in their idiosyncrasies.

Peter was in at the birth and death of Nimrod and also the birth of SNS. He and Wally Stanbrook had the honour (dubious) of building (on their own) the first super period of the SNS, right from the raw material - polystyrene! Model it may have been, but it was full-size and in colour and from a short distance it did look real enough. For quite a while it was all of the SNS that RAL had to show.

He has also, of course, been building the real thing. There are few parts of the SNS vacuum system that Peter has not had a hand in putting together and testing including helping to build the ceramic vacuum vessels.

David Gray spoke warmly of Peter's efforts on behalf of the Lab over the twenty or so years he had been with us, and wished him well in his new career as full-time trout fisherman, vintage car addict, jazz musician, and from the nature of the gifts presented, Do-It-Yourself expert.

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Peter replied that it was, "Mighty kind of everyone. I've done very well," he continued, surveying the selection of electrical tools, "it seems I shall have a large programme of DIY in front of me. It's been nice working here. Thank you all very much indeed", he concluded.

Outdoor Sports Day

This year's sportsday is to be held on Friday 8 July at the Civil Service Sportsground, Birmingham. Transport for competitors and spectators will be arranged leaving RAL at 0845 hrs, and bookings should be made through Ian Forster, R2 Ext. 6363, by 22 June.

Team entries for all events, tennis (mens's and mixed) football five-a-side, croquet, cricket six-a-side, angling, netball, bowls (triples and pairs), tug-of-war (mixed (4 + 4) and a new athletics event the 3000 metres open, should also be made to Ian. Trophies will be presented at 1845 hrs and transport will leave Birmingham at 21.00 hrs.

Bulletin