

# Bulletin

of the Rutherford Appleton Laboratory

5 Nov 1984 No.17

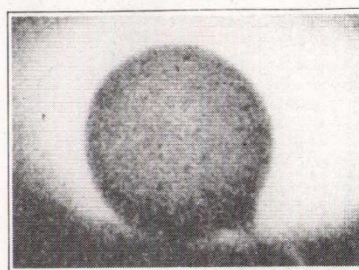
## 12 Green Beams on Target

Since Easter, Laser Division Staff and University users from Belfast, Bristol, Essex and Imperial College have been hard at work bringing the new 12-beam Target Area (TA West) into operation. It is the only facility in the world at present where the study of directly driven ablative implosions at sub-micron wavelengths can be pursued under the highly symmetrical conditions made possible with 12 beams and it will enable RAL and the VULCAN laser users to continue their pioneering work in this field.

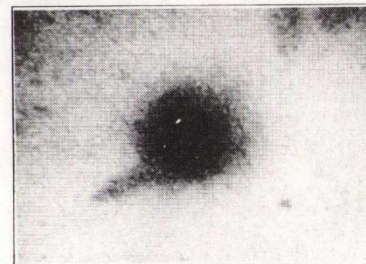
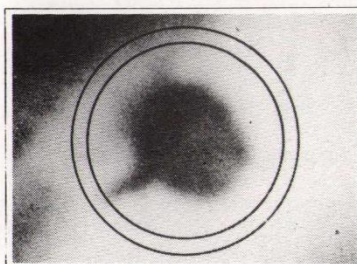
The commissioning experiment ended in mid September with the acquisition of an extensive set of pulsed radiographs of (almost) spherically symmetrical ablative implosions, one of which is shown in the figure. Even at this early stage of experimentation it is evident that implosion symmetry is substantially better than was achieved last year with six beams.

The implosions are produced when the frequency doubled (green) laser light is focused on the target (about 1/6 mm diameter), heating the surface to a temperature above a million degrees. The outer layers burn off and exhaust outwards so that the underlying material is forced towards the centre by the rocket-like reaction pressure. A high degree of spherical symmetry is needed to attain high values of compression: a twenty percent asymmetry at the surface will prevent the final target radius becoming smaller than about one fifth of the initial radius, for example. When the output power of the VULCAN laser was increased eighteen months ago to permit higher values of compression it became clear that at the Terawatt ( $10^{12}$  watt) powers now reached, the imperfections introduced by the cubic symmetry of the 6-beam system would be a limiting factor in the attainment of high densities in the compressed core. Theoretical studies suggested that twelve beams would bring a substantial improvement though there would be little benefit from going still further.

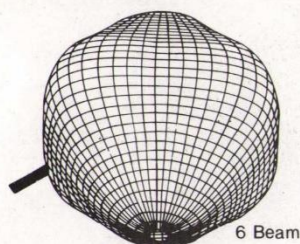
The new evacuated target chamber is 1.2m in diameter and has some 60 ports. It is the fourth of its line and all the remote controlled lens and target adjustments and the rapid pump down vacuum system are Mark IV streamlined versions of earlier designs. So are all



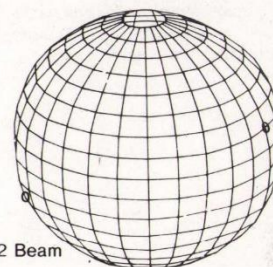
Uncompressed target



Data



6 Beam



Model

12 Beam

Pulsed x-radiographs of 6 beam and 12 beam implosions

the optical alignment systems. The operations staff find it a pleasure to "drive" such a smooth running machine.

The major new departure is the incorporation of a FALCON microcomputer into the alignment and control system: operators would otherwise have had a monumental task to keep track of switches and readouts for over two hundred remote controls. The operator is prompted through the alignment sequence by the computer and is enabled to adjust every beam with one

simplified set of controls. The computer keeps tally of what has been done. In this way the operator is free to concentrate on the delicate art of judging when the best alignment has been achieved. As a result of these and other improvements, better alignments can now be done with twelve beams than previously with six and in no more time. The computer also handles pre-shot checks so that the operators are free to deal with more diagnostic instruments than before.

(see over)



## 12 Green Beams

(cont'd from p1)

The staff have become quick change artists, since this development is just the latest stage in a continuous scheme planned to give a substantial improvement in capability every eighteen months or so without interruption to the user programme. The last six beam shot was fired into the old TA1 on 18th April. After Easter the laser continued running two of its beams for experiments in TA2 while the 12-beam system was being completed in TA West. TA2 and TA West have been receiving alternate shots since 6th June.

Debugging and re-commissioning diagnostics on the new chamber took up most of June and July and serious data taking then began. One of the side effects of going to dodecahedral geometry is the increase (from 8 to 20) in the number of equivalent diagnostic viewing positions between the main beams. This permits the simultaneous deployment of a larger number of diagnostic instruments than before so that valuable cross-checks can be made.

Every improvement shows up the next layer of problems to be tackled and although enhanced spherical symmetry has already been seen many details remain to be optimised. One asymmetry which has not yet been removed is that due to the target support stalk which shows up clearly on the radiographs and clearly perturbs the implosions. An inertial suspension system for stalkless targets is being developed by a Garching (Munich)-Belfast-RAL collaboration.

In the long term it is planned to double the output energy of VULCAN in order to exploit the enhanced symmetry to the full. Meanwhile, work is already in full swing to develop TA East to replace TA2 and make available the full laser energy in a variable geometry configuration for specialised experiments including the next generation of x-ray laser experiments.

W T Toner

Members of the Royal Swedish Academy of Engineering Sciences visited the Laboratory on Wednesday 3 October. Welcomed by Dr Paul Williams, they spent the day touring various examples of the work of RAL in the fields of Computer-Aided Design, Software Engineering, Computer Vision, Electron Beam Lithography and Superconductivity.

The photograph shows some of the group absorbed in the details of an experiment to determine the quench characteristics of a conductor developed for the DELPHI superconducting solenoid.

## To Kim With Thanks

84 FB 4329



Dr Kim Ward pictured holding a model of the UKS satellite, a farewell gift from his British and German colleagues of the AMPTE mission, presented in recognition of his outstanding services to the project.

The surprise ceremony took place at a very successful Progress Meeting, held on Thursday 11 October, at which it was reported from all quarters that the mission was performing extremely well.

## Swedish Engineers See Work of RAL



84 RB 4278



## BEM for 'Alf' Brown

84 RB. 4312



Mr Alfred John (Alf) Brown was presented with the British Empire Medal by the Lord-Lieutenant of Oxfordshire, Sir Ashley Ponsonby on Friday 12 October at RAL. The ceremony was attended by members of his family and colleagues from both the Laboratory and the Royal British Legion.

Dr Geoff Manning, Director of the Laboratory welcomed Sir Ashley, his wife Lady Martha and guests and expressed his pleasure and delight that a member of his staff had been so deservedly honoured. "As work-supervisor of the Site Heavy Gang," he said, "Mr Brown had for many years provided a unique service with great efficiency and great heart. I am delighted to be privileged to take part in this presentation."

Sir Ashley also spoke of his pleasure at being able to play a part in the ceremony. "You have much to be proud of," he said. "You have played a very special part in the work of the Laboratory, displayed great loyalty to your country and service to your people. On behalf of Her Majesty the Queen and with her Majesty's special congratulations

and best wishes I present you with this medal."

Thanking Sir Ashley for the kind words that were said of him, Alf spoke of his belief in team-effort. "I am extremely honoured by the award," he said, "for myself and on behalf of the teams at RAL and of the Legion. Any work done has been done as a group, and this medal is for those groups."

Mr Brown joined AERE in 1950 after a marine engineering apprenticeship and wartime service in the Royal Navy. In 1959 he transferred to the Rutherford Laboratory where he has earned a high reputation for his enthusiasm and energy. In private life he has been a member of the Hungerford Branch of the Royal British Legion for some 25 years serving as Branch Secretary, Branch Chairman and Club Secretary. For the past 13 years he has led a fund-raising committee which helps to finance the welfare work of the Branch.

Mr Brown has 5 sons and a daughter and 9 grandchildren. He lives in Hungerford where last year one of his sons was Mayor. His hobbies include sea-fishing and wine making.



The next lecture in this series will be held in the R22 Lecture Theatre on Thursday 22 November at 3 pm.

NEW TECHNIQUES FOR  
PARTICLE ACCELERATORS  
by

Dr J D Lawson

Many schemes can be devised for accelerating particles. Only a few of these however, have found practical application in useful particle accelerators such as the synchrotron and linear accelerator. In the last few years, faced by the enormous size

and cost of modern machines for particle physics, there has been an active search for new ideas and a number of proposals have been made, several of them employing high power lasers. Many of these were discussed at a Workshop in Frascati in September. An attempt will be made to classify the various possibilities for accelerating particles and some of the 'alternative' ideas put forward in the last 30 years will be described.

**FOR YOUR DIARY:** The next lecture in the series will be held on Thursday 20 December 1984 by Professor Gerald Musgrave, Brunel University, and will be entitled "Computer Aided Design".

## Impressions of Prague

The 6th General Conference of the European Physical Society was held in Prague at the end of August. It continued a sequence of general physics conferences which have previously been held in Florence, Wiesbaden, Bucharest, York and Istanbul. The meeting attracted 750 physicists from all over Europe, including a hefty 300 from the host country.

Unlike many conferences which cover a specific branch of physics such as elementary particles, nuclear structure or plasmas, this one is specifically designed to have a broad base. Indeed, as a particle physicist attending such a general gathering for the first time, I found the theme a huge success. Among the most memorable lectures were those on the "Quantized Hall Effect", "The Scanning Tunnelling Microscope" (stunning pictures of atomic structure), "Cosmology" (almost a concert performance by Zeldovitch) and the "Einstein-Rosen-Podolsky paradox in 1984".

In addition to the main talks, there were parallel symposia on widely differing topics. If one became bored by big bosons or fatigued by families of fermions, there were interesting talks on earthly catastrophes, mapping out the course of past and future ice ages. (It's all right, we have about 10,000 years to prepare for the next one.)

It was difficult to be unimpressed by the city of Prague. The beauty of the historic buildings has been maintained and there seem to be no modern architects who believe they can do better; the only building work going on was the restoration of the fabric of existing edifices.

Like most Eastern block cities, there is almost no litter. Moreover, it is possible to stroll around the ancient squares in the evening without being hunted by cars. Public transport is very cheap, in fact it is practically free, and since smoking is forbidden past the ticket barrier of the spotless underground, the atmosphere is in complete contrast with the squalor of the London, Paris and New York metros.

The food was surprisingly mediocre; it is hard to understand why a country more southerly than the UK could not produce an adequate supply of vegetables. However, Czech beer is justifiably world famous.

The cultural event of the conference was a concert of organ music in St. Nicholas' Cathedral. The programme was predominantly by Czech composers but included a performance of the addictive Fantasy in F minor for lovers of Wolfgang Amadeus.

In closing the conference, the President of the European Physical Society, Dr Godfrey Stafford, hoped that the aims of the meeting had been achieved, in bringing together physicists from different parts of the wide subject, to meet, talk, listen and to learn something from each other. All delegates agreed, it was a success.

Robin Marshall. HEP



## A Capital Facility

The R1 Lloyd's Cash Point official opening ceremony took place at lunchtime on Wednesday 17 October. Not to a fanfare of trumpets, we'll admit but there were two 'Money Girls' in attendance to give the occasion some razza-matazz.

Inviting Paul Williams, Deputy Director RAL, to use a Demonstration card to obtain an amount of money to be sent to the charity of his choice, Derek Park Manager of Lloyd's Bank, Harwell Branch, expressed the hope that the cash-point would prove useful to staff and visitors to RAL, alike. He was grateful to all who had helped to make the installation possible and hoped it would be well used.

"This is a further step in the relationship between Lloyds and RAL," said Paul Williams in reply. "A sub-branch has functioned on site since 1965 and the Bank has also looked after us in other areas. We hope the cash-point will provide a useful additional facility".

Then, using the card provided, he extracted the bank's generous contributions to - "Christain Aid".



84 RB 440 4/6

## Don, Robotics & Robert

We said to Donald Liska, who,  
As everyone agrees,  
Has talents many, and can charm,  
The birds down from the trees;

"We need a robot monitor,  
For our new Synchrotron,  
A sort of - 'Nosey Parker' thing;  
Now, can you help us Don?"

"I'll see what I can do" he said,  
"To satisfy this call,  
But listen guys, you know I must  
Be state-side in The Fall"

Well; now we have the 'Liska Arm'  
'And need not contemplate,  
The use of Mister Robert Hall  
To check the gamma rate:

For Bobby surely is a chap  
We wouldn't want to lose;  
He knows how much w'd miss him, in  
His sponge-soled B.C. shoes.

## Thank You All

"Now that I am back at work again, I would like to place on record my thanks to all my friends and colleagues for the help and support they have given me since May this year"

Chris (Bonfield)

## Coffee at Cosener's

The next Coffee morning and get together for wives of Rutherford Appleton staff will take place on Wednesday 14 November.

The venue for these gatherings is at The Cosener's House, Abingdon from 10.30 to 12 noon.

New residents in the area are especially welcome.

For more details, please contact:

Suzanne Litchfield Abingdon 21310  
Zoe Patrick Wantage 68809

## Christian Fellowship

The Fellowship meets in the R2 Conference Room on Thursdays at 12.30 pm and visitors and new members are warmly welcomed.

November's Programme is as below:

- 8 Prayer Meeting - Ray Powell
- 15 Mission England Video-Open Meeting
- 22 Fellowship - Martin Steel
- 29 Invited Speaker

## Blood Donor Sessions

RAL Blood Donors are once again invited to a donor clinic which will function on Wednesday 12 and Thursday 13 November from 10 am to 12 noon and from 1.30 to 3 pm. Sessions will be held in the Colloquium of the Atlas Centre.

Cards sent to donors are only a reminder and everyone is invited to support this vital service.

In May, 34 new donors were recruited at RAL but more are urgently needed. Please give serious consideration to becoming a regular donor.

## Film Badge Notice

It is Period 12 Colour strip RED.

Please be sure you are wearing the correct dosimeter and return all old ones.

NEXT FILM ISSUE  
Monday 3 December

## Attention

Extraordinary Meeting of the RecSoc.  
Monday 19 Nov. 1230 hrs. R22 Lecture Theatre.

Subject - RULE CHANGES.

The BAR won't open without them.  
So Be There!

# Bulletin

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