Bulletin
of the Rutherford Appleton Laboratory 14 June 1982 No.8

First Results from New Detector

An important first step in the development of a new particle detector has been taken by a group from RAL. Working in a test-beam at CERN, they have obtained results with a 2-dimensional charge-coupled device (CCD) used for the first time as a detector of high energy particles.

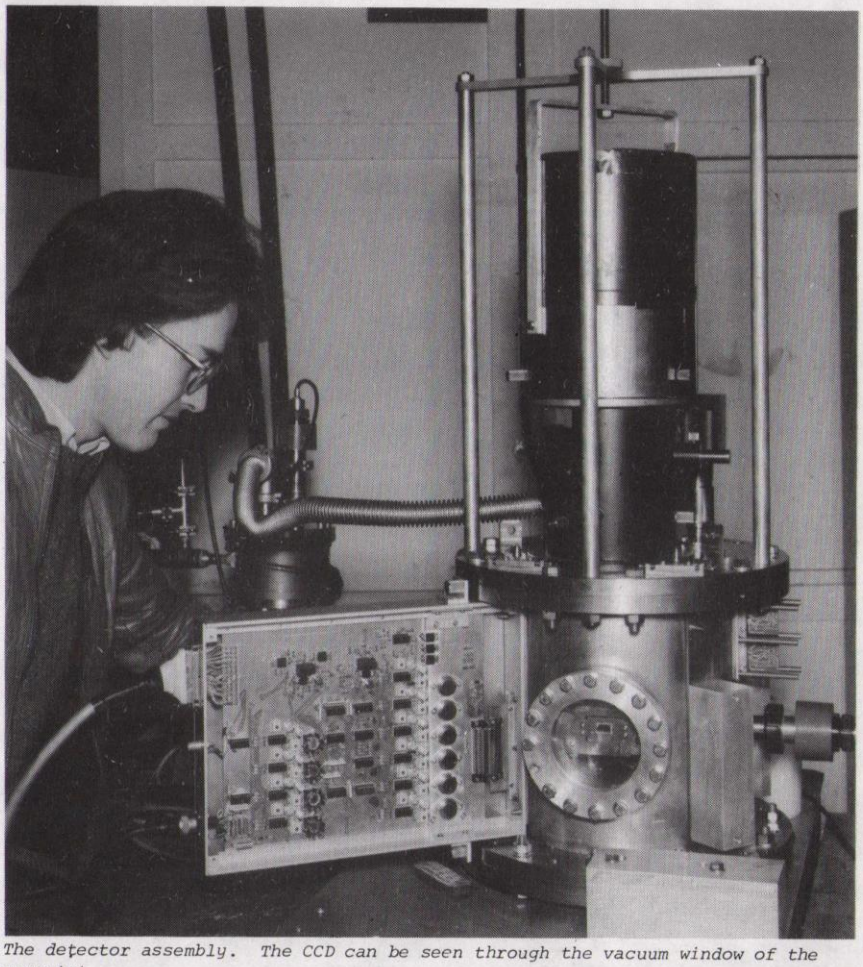
Charge-coupled Devices

Imaging CCDs are among the largest area integrated circuits in the world. They consist of a matrix of potential wells just below the surface of the silicon. These are created by a system of implants and electrodes, which allow electric charge to be stored locally (where it is generated) and then moved, element by element to an output point where (by measuring the induced voltage) its magnitude is determined. While these devices were primarily developed for the solid state TV camera market, their sensitivity to extremely small charges when operated at low temperature has given them an increasing importance in astronomy, as detectors of very faint images.

In view of their high charge sensitivity, it has been apparent for some time that they hold considerable potential for development as detectors of high energy particles, with good precision (few microns) and excellent 2-track resolution. The main application of such detectors would be the reconstruction of tracks very close to the interaction point in high energy collisions. By looking in precise detail at these tracks, it is possible to decide which (if any) emerge not from the primary interaction point, but are slightly displaced as a result of the decay of some short-lived particle. There is considerable interest in heavy particles with lifetimes on the order of 10^{-13}sec, since they generally possess some peculiar characteristics (charm, beauty, etc).

CERN Tests

In the initial tests at CERN, a CCD of active area 1 square cm is operated in a beam of high energy particles. These each release a small charge which is stored in the detector. After putting approximately 1000 tracks through the device, it is read out (ie the charge in each of the 250,000 cells is measured and recorded). By using a system of low noise analogue electronics (25 electrons per pixel RMS noise) the small signals from the beam tracks (about 800 electrons from the 10 micron depletion depth in the detector) are clearly visible.



The detector assembly. The CCD can be seen through the vacuum window of the cryostat.

(Photo. CERN.)

The next step will be to include more detectors in the cryostat, so that efficiency and spatial precision can be properly measured, and to implement options for very high speed readout.

We thank Dr Chris Damerall for this news.

INTERNAL Events

REMOTE SOUNDING SEMINARS
LECTURE THEATRE - 1400 hrs

15 June Dr F W Taylor/Oxford
"Remote Sounding of Venus and Jupiter"

22 June Dr M J McDonnell/DSIR New Zealand
"Experiences in Digital Image Processing"

20 July Dr P H Moffat/RAL
"Results from the LIMS Experiment on NIMBUS-7"

HEP SEMINARS
R61 CONF. RM - 1100 hrs

15 June Dr V Smith/Bristol
"Hyperon Semi- Leptonic Decays"

23 June
LECTURE A Petrides/I.C.
THEATRE "Structure Function Measurement with the Narrow Band Beam in BEBC

NIMROD LECTURE
R61 CONF. RM - 1400 hrs

14 June Prof R H Dalitz/Oxford
"A Magnetic Monopole"

22 June Dr F E Close/RAL
"How to Look for Constituent Glue"

CONDENSED MATTER SCIENCE SEMINARS
R3 CONF.ROOM - 0930 hrs.

15 June DEF Fender/ILL
"Structure, Bonding and Dynamics of Proton Conductors and Unusual Hydrates"

29 June EP Wohlfarth/I.C.
"Metallic Magnetism Under High Pressure"

EXTERNAL Events

PHYSICS COLLOQUIA
H H WILLS LAB - BRISTOL - 1700 hrs

14 June Prof. G M A Cole/Hull
"Physics of Planetary Interiors"

THEO. PHYS SEMINARS
TPD - HARWELL - 1400 hrs

15 June Prof S F Edwards/Cambridge
"The Dynamics of Long Molecules"

22 June Dr D Duffy/Reading
"Line Defects and the Glass Transition"

ELEM. PART. PHYS SEMINARS
NPL - OXFORD - 1430 hrs

15 June Dr J Ritchie/Rochester
"Charm Production"

THEORY GROUP SEMINARS
DARESBURY - 1400 hrs

14 June Dr D Flower/Durham
"Ro-vibrational Excitation in Heavy Particle Collisions"

PART.PHYS. DISC. GP. MEETINGS
BIRMINGHAM - 1615 hrs

18 June Mr M Edwards/Birmingham
"First Results from Experiment UA1 at the pp Collider"

TECHNICAL SEMINARS
MANCHESTER - 1430 hrs

15 June John Baines
"Ambiguity Resolving Drift Chambers"

Jan Chrin
'Electrodeless Drift Chambers'

PHYSICS COLLOQUIA
CLARENDON LAB - OXFORD - 1615 hrs

11 June Prof. Sir Rudolf Peierls, FRS/Oxford
"The Beginnings of Neutron Physics"

18 June "A survey of neutron-related work at the Clarendon Laboratory 1935-1947".

The Neutron and its Applications

This exhibition was recently shown at a Royal Society Soirée (a joint contribution from AERE, ILL and RAL) and is now in Icknield Way House, AERE.

It will be open from 12 noon to 2pm on June 9,10 and 11 and at the same times for the whole of the week beginning 14 June.

The contributions from RAL include the SNS and much fascinating historical material about the early days of the neutron. It is well worth a visit.

Library Notice

We have received a complete set of microfiche from the Jet Propulsion Lab, which we did not order. We think they might belong to a 'private collector'. If so, they can be collected from the Library issue desk. The report number is JPL 5 MM ED-2 - List by Species!

Sales to Employees

Tenders submitted in response to Rutherford Appleton Laboratory Circular 9/82 were opened on Monday 24 May 1982 by Mr J Jenkins in the presence of Mr DJ Price, Union Site Convenor, Mrs M Goodchild, Staff Side Representative and Mr H Aldred, Chief Storekeeper.

The high level of interest in items offered for sale maintains that shown on previous occasions and, despite a considerably larger quantity of goods on offer, only six items failed to attract a bid.

The successful applicants have been individually notified.

Sales of scrap metals and plastics, (subject to the usual conditions) will take place in the Scrap Compound R40, at 12.30 pm on Friday 25 June.

Trade Exhibition

There will be a one-day exhibition by TDS Circuits Ltd of their audio/visual unit which demonstrates PCB manufacture on Wednesday 16 June from 10.00-16.00 hours in R12 Conference Room.

Film Badge Notice

It is Period 6, Colour Strip ORANGE

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

Hockey

If any lady currently working at SERC wishes to join the Harwell Ladies Hockey Club, please contact Sue Merrifield ext, 585. Sandwich students etc are welcome to come along too.

ROSAT - The Röntgensatellit

This X-ray survey satellite, a collaborative project with UK Universities and German astrophysicists, was first mentioned in an article on RAL's plans for using NASA's Space Shuttle (Bulletin 9, 1981).

Now a year further ahead in preparation, the ROSAT project is described for us in more detail by Martin Courtier.

The Project

X-rays were first identified late in the last century during a surge of scientific discoveries in basic physics. For a long time they have been known as Röntgen rays after their German discoverer, and have had practical applications in numerous fields. The title Röntgensatellit (ROSAT) symbolises a return to the scientific discovery of X-rays in the present era of astronomical investigations from space.

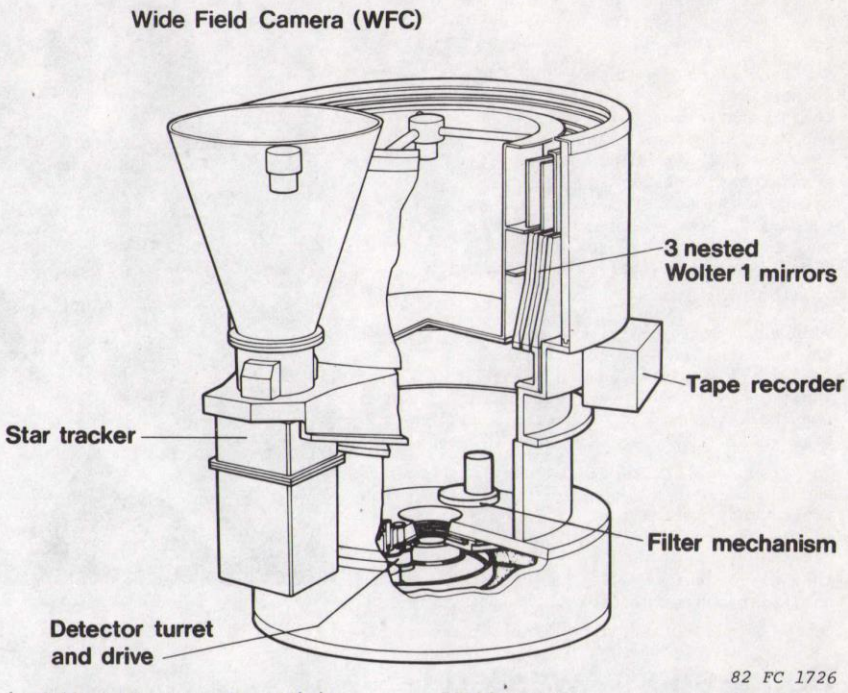
ROSAT was initially conceived within Germany as a powerful X-ray observatory spacecraft aimed at a comprehensive all-sky survey in the waveband 0.6 - 10 nm. By virtue of its size, its sensitivity will be comparable with the best achieved to date over only limited regions of the sky. The German instrument comprises an 80 cm diameter X-ray telescope, with imaging proportional counters, located centrally in the spacecraft structure. This primary telescope is to be complemented by a second instrument from the UK. First proposed by the X-ray astronomy group at the University of Leicester in 1980, following invitations from Germany, it is now called the XUV Wide Field Camera (WFC) and is being developed by a consortium of UK astrophysics groups, including RAL.

The WFC is a telescope of 60 cm diameter with a sensitivity matching the ROSAT telescope but operating in the 5 - 30 nm waveband, and having a larger field of view (5° diameter) at the expense of resolution ($\sim 1^{\circ}$). It has the advantage of being much smaller than the primary telescope. The provision of this instrument, together with a contribution to the German project to cover its accommodation on the spacecraft and inclusion in the mission, was approved by SERC as a new ASR Board project last year.

The Mission

Both telescopes will operate independently with their own on-board data storage. The survey will be achieved by scanning great circles on the celestial sphere once each satellite orbit. One face of the satellite which supports a fixed solar array for power generation will continually face the sun. This is therefore the only X-ray source not accessible to the telescopes, which completely cover the sky in a six month period as the satellite roll axis follows the sun. In addition to a survey phase, detailed observations of individual sources will be made by accurately pointing and holding the telescopes on a fixed sky position. In this way more accurate mapping to study extended sources including extra-galactic populations can be achieved. Binary, rotating and other variable stars will be observed and longer exposures for spectroscopic analysis will permit spectral classification of new sources and insight into their astrophysical processes, particularly at XUV wavelengths. By extending the present catalogue of X-ray sources to a predicted 10^5-10^6 and reaching further back into time with distant sources, new discoveries of cosmological significance are expected to arise.

It is planned to launch the satellite with shuttle into a 57° inclination orbit which allows command and data transmission to the German space operation and control station at Weilheim. Up to 450 mbits of scientific data will be transmitted from the satellite on each pass, 4-5 times a day. The satellite will manoeuvre itself to an operational altitude of 450 km, some 200 km above that where it is unloaded from the shuttle. Germany is currently negotiating with NASA to obtain a launch in exchange for some US involvement in the scientific observations and providing a high resolution detector.



82 FC 1726

RAL's Role

RAL is involved in all the major aspects of the WFC programme. Preliminary studies in Germany and UK, managed from RAL, have now converged with those for the German National ROSAT programme. As a result of a joint specifications study also managed from RAL the project baseline comprises a spacecraft configuration that will accommodate the Wide Field Camera. The next phase B2 is a full project definition study of the spacecraft and two telescopes which will be managed by the German Aerospace Research and Development Establishment (DFVLR). Within the UK, the WFC consortium is led by the University of Leicester group and includes groups from Birmingham University the Mullard Space Science Lab, Imperial College and RAL. The WFC altitude measurement system filters and drive mechanisms, thermal analysis and blankets are particular responsibilities of RAL. RAL will also continue to coordinate the UK programme with the German Project management and provide formal liaison on technical matters between the consortium and the ROSAT prime contractor. Funding for major payload items will also be managed through RAL, who will place the corresponding contracts on behalf of the consortium. Some of the facilities for X-ray mirror manufacture are also being developed by RAL.

The WFC data reduction and analysis will be shared by all participants employing a data base centred at either Leicester or Chilton which will receive the data from GSOC. Quick look analysis will be performed by WFC personnel located at a scientific control centre near Munich and guest observers will be invited to make use of the UK share of the pointed observations with both telescopes. The launch of ROSAT is currently planned for early 1987 with up to $2\frac{1}{2}$ years operations in orbit so the project is expected to occupy the whole decade.

Marathon Medallists

Now fully recovered from their gruelling experiences in the Abingdon Marathon and pictured wearing their hard won medals are some of RAL's staff who finished the 26¼ mile run. (They're most insistent about the quarter mile).

Sue Bond (centre right) Joan Mackie (centre left) Nigel Carter (centre top) Kieth Fermor (bottom left) and Bob Mannix (bottom right) were sponsored as a team and raised the grand total of £456.21 which is going to the Cancer Research Campaign. None of them had ever run the distance before, but all (when last spoken to) threatened to do it again.

Alan Hannaford (top right) and Robin Lascelles (top left) were individually sponsored and are sending their money to the general fund for the charities nominated by the organisers.

The group would like to thank all who sponsored and supported them. Of course many more RAL staff took part in the Marathon; we're only too sorry not to have been able to find out who they were - but to all we offer our heartiest congratulations.

82 RB 2721

Suggestion Awarded

82 RB 2888

Philip Gordon is a young man who only arrived at RAL in 1978 and has already proved his worth to the SNS team. On Tuesday 25 May he was presented with his first "Suggestions Award", a cheque for £230, by his Division Head, Dr David Gray.

The Award was given for another of those simple ideas that only occur to one when actually faced with a job. Signals are received from the Injector system of the SNS via two screened cables inside 'Kopex' flexible conduit. These in turn are run through steel trunking. Specifications suggested that 20mm conduit should be used, but friction prevented the conduit from being drawn through the trunking. Philip suggested that the cross-section of the conduit should be made elliptical rather than round by using the R4 rolling machine. The cables were then found to pull through easily and saved many extra runs of trunking.

This idea indicates that so called 'simple solutions may not have been previously recognised, the need for them never before having arisen. So, keep your suggestions flowing.

Coffee at Cosener's

Well, not this time, but normally coffee morning get-togethers of the wives (and children) of RAL staff are held at Cosener's House Abingdon.

On Thursday 24 June however, for a change, the coffee-morning will be held at the home of Mrs John Thresher, The Old Farmhouse, Frilford Heath. She extends a warm welcome to all who would like to join her that morning.

The farmhouse is on the A415 Kingston Bagpuize road, just beyond Josca's School (if you're coming from Frilford cross-road.

For further information please contact -

Ann Corbett	Abingdon 20434
Mary Rousseau	Wantage 3676

Jubilee Garden Parties

This year the Laboratory is 25 years old. To mark the occasion two garden parties are being arranged to take place on Saturday 19 and Sunday 20 June.

"Where is my invitation", is the next thought in many peoples minds - well, the answer is; most of you are much too young!

The problem of how to fit a quart into a pint-pot is very acute with a laboratory of 1600 people and perhaps several thousand university Users. (We only have Cosener's House not Wembley Stadium). So, we have invited a representative cross-section of university colleagues, firms involved in our early PLA, Nimrod days, ex-staff and long serving members of staff. The theme of the parties is obviously going to be 'we were there'.

An exhibition of photographs has been prepared for the occasion and will be set up in the foyer of R1 after the garden parties, giving the youngsters of our community the chance to see life as it was in the early days, what handsome lads our older colleagues were and how our role in science has expanded and diversified in the intervening years.

Bulletin

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