

# Bulletin

of the Rutherford and Appleton Laboratories

17 Nov. 1980 No.17

## Millimetre Waves & Communication

*In issue No 15 of the Bulletin, Martin Hall introduced us to one application of the Chilbolton facility. John Lane continues the survey with this description of related work and explains the usefulness of millimetre waves and the future research programme.*

For decades the advantages of millimetre wave use for communication and radar have been widely known - so have the difficulties. Whilst easily exploitable longer wavelengths were available interest was limited. Now, with the ever increasing need to provide more channels for communications and radar due to congestion of these longer wavelengths, exploitation of the millimetric region is urgent.

### Special Features

The Radio Propagation group at Ditton Park anticipated this problem and have been investigating the possibilities of using the 1-10mm wavebands for several years. (Fading caused by atmospheric absorption and the lack of suitable sources of power are still formidable problems. Nevertheless the special features of millimetre wavelengths - a large capacity for carrying information, high gain antennae of a convenient size, interference-free operation and, in radar systems, high angular resolution - are compensating advantages worth intensive investigation.

### For Instance

Applications include local services such as television and viewphone, links between computers, communication links and radar in harbours and congested waterways and at airports. They can also be used in intruder alarm and protection systems and in space-to-space communication.

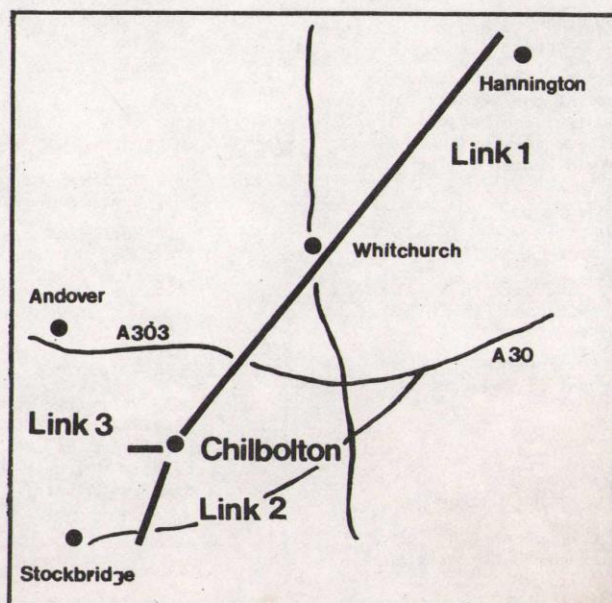
### Studies Needed

What is most needed is a study of how the Earth's atmosphere and terrain might affect the reliability, information capacity and susceptibility to interference of millimetre systems. Many of the problems require basic studies of, for example, absorption spectroscopy, scattering by water and ice particles, and diffraction by various types of obstacles. These factors become progressively more important as the wavelength decreases.

Some progress has already been made in this field and it is proposed to extend this work, especially in collaboration with universities. The programme of research will be based largely on the needs of UK organisations involved in communications, and the planning of future systems. Some topics, such as atmospheric absorption will also have applications in the Geophysics and Radio Division's work on microwave techniques for studying the Earth's surface.

### Future Programme

The field measurements will be carried out at the Chilbolton site in Hampshire (see map), while supporting laboratory work will be based at Chilton. The facilities envisaged at Chilbolton will include transmission paths of 20, 3 and 0.5km (ie links 1 to 3 in the map) and these will operate in conjunction with the existing radar using the 25m steerable antenna. The 20km path will carry a transmission at 27GHz (1.1cm wavelengths), primarily for studies of the effect of abnormal variations in refractive-index on fading and bandwidth. The shorter paths will provide data on absorption, scintillation and usable bandwidths at frequencies up to 220GHz (1.4mm wavelength). On the 500m path, there will be additional measurements in the visible and infra-red (0.6 and 10 microns respectively). These data will facilitate a comparison of millimetre and optical waves for communications, active and 'passive' (thermal-imaging) radar. Some measurements of attenuation on Earth-space paths (eg on the effect of cloud and rain) will be made; by satellite transmissions, if available, or by radiometric techniques.





# INTERNAL Events

## SAFETY FILM SHOW LECTURE THEATRE

- 9 Dec 'It's Not Thursday - Is It?'  
1230, 1315 An excellent 'office' safety  
& 1400hrs film which deals with the  
attitudes of personnel  
working in office situations.  
The film portrays the real  
life attitudes of which we  
are so well aware!
- 15 Dec 'After Dark'  
1200, 1230 With the onset of Winter it  
& 1315hrs is as well to remind  
ourselves of the increased  
hazard of night driving.  
This film emphasises some  
of the problems.  
This film was shown on  
14 Oct.

## SCIENTIFIC DISCUSSION MEETINGS BOARD RM - DITTON PARK - 1500 hrs

- 19 Nov Dr J W King/RAL  
"Outstanding Ionospheric  
Problems Relevant to  
Communications"

## NIMROD LECTURES LECTURE THEATRE - 1400 hrs

- 17 Nov Dr R M Brown/RAL  
"The Charged Hyperon Beam  
Experiment at CERN"

## HEP SEMINARS R61 CONF RM - 1100 hrs

- 19 Nov Dr M Ninomiya/RAL  
"Absence of Neutrinos  
on a Lattice"

## ASTROPHYSICS SEMINARS R61 CONF RM - 1400 hrs

- 19 Nov Dr Alan H Gabriel/RAL  
"Scientific Results from the  
Solar Maximum Mission"
- 3 Dec Prof A Jack Meadows/Leicester  
"Asteroids"

## SPECIAL LECTURE LECTURE THEATRE - 1500 hrs

- 24 Nov Prof. P A McKown  
"The SRC Ultra-Precision  
CNC Diamond Turning Machine  
for X-ray Mirrors"

# EXTERNAL Events

## NPd COLLOQUIUM CONF RM H8 - AERE - 1530 hrs

- 20 Nov Dr J Byrne/Sussex  
"The Half-life of the Neutron"
- 27 Nov Prof of D L Smith/Argonne  
"Recent Neutron Activation  
Experiments at the Argonne  
Fast Neutron Generator  
Facility"

## THEO. PHYS SEMINARS TPD LECTURE ROOM - AERE - 1400 hrs

- 18 Nov Prof J H Fremlin/Birmingham  
"Risk Relativities"
- 25 Nov Prof R H Silsbee/Oxford and  
Cornell  
"Spin Transport in Conductors"

## THEORY GROUP SEMINARS DARESBUURY - 1400 hrs

- 17 Nov Prof S Y Tong/Wisconsin  
"Study of the Geometry of  
Molecules Adsorbed on  
Metal Surfaces by Angle  
Resolved Photoemission"

## PHYSICS COLLOQUIA CLARENDON LAB - OXFORD - 1615 hrs

- 21 Nov Prof. J T Houghton FRS/RAL  
"Observing the Climate  
from Space"
- 28 Nov Dr L E J Roberts, CBE/AERE  
"Disposal of Radioactive  
Waste"

## SOLID STATE SEMINARS CLARENDON LAB - OXFORD - 1430 hrs

- 20 Nov Prof J B Goodenough  
"Photoelectrochemistry and  
Solar Energy"

## COMPUTERS AND NATURAL LANGUAGE NPd LECTURE TH - OXFORD - 1630 hrs

- 20 Nov Dr R W Last/Hull  
"Computer Assisted Learning  
of Languages"
- 27 Nov Dr H Thompson/Edinburgh  
"Understanding"  
Natural Languages:  
What Computers Can and  
Cannot do!

## THEO PHYS SEMINARS CLARENDON LAB - OXFORD - 1615 hrs

- 20 Nov Prof J Hertz/Chicago and  
NORDITA 'Quantum Spin  
Waves Near One Dimension'
- 27 Nov Prof G S Rushbrooke/Newcastle  
"Some Comments on the Present  
State of the Theory of the  
Static Dielectric Constant  
of Polar Fluids"

## HEP SEMINARS DAMPT - CAMBRIDGE - 1500 hrs

- 21 Nov Dr I Halliday/Imperial  
"Infrared Problems in QCD"
- 28 Nov Dr P Norton/RAL  
"Tests of QCD Scaling  
Violation in  $\mu N$  scattering"

## HEP SEMINARS CAVENDISH LAB - 1430 hrs

- 19 Nov Dr J R Fry/Liverpool  
"Preliminary Results from  
a Calorimeter Analysis  
of Hard Hadron - Hadron  
Scattering Data"

## THEO. PHYS SEMINARS MANCHESTER - 1430 hrs

- 26 Nov Dr M Saitoh/Tokyo  
"Electrons on the Surface  
of Liquid He"

## HEP SEMINARS MANCHESTER - 1400 hrs

- 18 Nov Dr D Webber/Liverpool  
"A Schrodinger Equation  
for Lattice Gauge Theories"
- 25 Nov Dr I Baker/Manchester  
"A Quick and Easy Method  
for Testing QCD on Structure  
Functions"

## PART PHYS SEMINARS BIRMINGHAM - 1615 hrs

- 21 Nov Dr D Morgan/RAL  
" $p\bar{p} \rightarrow \pi\pi$  in Resonance Region"
- 28 Nov Dr D Websdale/Imperial  
"Results from Goliath"

## PHYSICS COLLOQUIA BRISTOL - 1700 hrs

- 17 Nov Dr D Bettes/Sussex  
"Ultra Low Temperatures"
- 24 Nov Dr J D Lawson/RAL  
"Free Electron Lasers: FELIX"

## SHEP SEMINARS SOUTHAMPTON - 1430 hrs

- 21 Nov Dr P Litchfield/RAL  
"The Last Baryon  
Formation Experiment"
- 28 Nov Dr D M Scott/Cambridge  
"How Not to Find t's  
and W's in  $p\bar{p}$  Collisions"



# EISCAT at Chilton

The 15th meeting of the EISCAT Council took place at the Laboratories' Chilton site on 6 and 7 November. Council members from all six member countries, together with the EISCAT directorate met under the chairmanship of Sir Granville Beynon CBE FRS, member of the Science Research Council from 1976-80. Dr H H Atkinson of SRC Central Office and Dr H Rishbeth of Ditton Park are the other UK council members.

EISCAT - European Incoherent SCATter Radar System - is funded by the UK, West Germany, France, Norway, Sweden and Finland, and will be used to study the ionosphere and magnetosphere at high latitudes. The system will have its ground stations north of the arctic circle at Tromsø in Norway, Kiruna in Sweden and Sodankylä in Finland. The user community for EISCAT comprising about 12 university and establishment groups will have access to a data base at the Rutherford and Appleton Laboratories, Chilton.

An article on EISCAT and its scientific objectives will appear in a later issue of the *Bulletin*.



The EISCAT Council pose for a commemorative photograph of their visit to Chilton. Sir Granville Beynon stands centre (in dark suit), Dr Atkinson 7th from the right and Dr Rishbeth 2nd from the left.

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## Archives

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Staff are reminded that the Archive (Record Office) is open for business. Anyone wishing to deposit files should contact Mary Snaith, R61, Ext. 6163.

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## Missing

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Would anyone knowing the whereabouts of the following item please contact Mr D Williams Ext 520.

Phillips Transcribing Machine  
No X004728.

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## Trade Exhibition

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There will be a one-day exhibition by Hakuto International (UK) Ltd, of their range of photomultiplier tubes of general interest to scintillator work and also photomultiplier tubes designed specifically for high energy physics, on Monday 24 November in Conference Room 1 from 1000 to 1600hrs.

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## Traffic Flow Advice

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The attention of staff is drawn to RLN9/79 which sets out the arrangements to allow employees to enter the Chilton site during in-muster and leave during out-muster as safely and quickly as possible.

It is emphasised that during out-muster north bound traffic from Fermi Avenue must join the A4185 only at the end of Library Avenue. All south bound traffic must go past the Frome Road bollards; traffic approaching these bollards along Perimeter Road or Frome Road must mix on a one-for-one basis, except at bus departure times.

The west bound lanes at the end of Library Avenue and at Frome Road bollards must at all times be left free for incoming traffic and there must not be double-banking in Library Avenue, Fermi Avenue or Perimeter Road.

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## Film Badge Notice

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It is Period 12, colour strip YELLOW.

Please check that you are wearing the correct film.

Next Film Change

Monday 1 December.



Lecture Theatre - 27 November 3.15pm

'QUARKS & THE COSMIC ONION'

by

Dr Frank Close

First, a general non technical introduction will be given into the history of the search for the ultimate building blocks of matter and the study of the forces that bind them. A background will then be given to some recent developments in high energy physics in which RL has been involved. A survey of our present outlook will include the possible unification of the natural forces and convergence of ideas in particle physics with those in cosmology.



## Her Voice was Ever Soft

Staff at Ditton Park recently gathered together to mark the departure of a colleague whose helpfulness and friendly approach to her work have made her well liked not only throughout our laboratory but among many who have dealt with us over the years.

Paradoxically, for someone so well known, the formal announcement that Miss Wadman had been granted V.P.R. met with little more than polite interest. Translated into the more familiar 'Kathy on the switch-board is taking early retirement' it produced a most generous response from far and wide.

Kathy Wadman's career with the G.P.O. has been very largely spent at Government establishments. She joined the Radio Research Station at Ditton Park in 1961 and has therefore spent almost twenty years with us in our various aliases and fortunes. Throughout this time she has coped with our telephonic panics, ill-temper and, regrettably, occasional down-right bad manners. All has been accomplished politely but with a certain chirpiness of spirit which could signal to all, save the most oafish, that they were nearing the limit of acceptable manners.

Appreciation of her virtues was left in no doubt when her many friends were present to wish her well for the future and hand over, a gift which will, we think, be of use to her in the travels which, are one of her interests, and which retirement will enable her to pursue even more vigorously.

## REMAP

Those old paint tins which are cluttering up your shelves at home may contain useful paint. Why not donate it to the REMAP workshop, where it can be put to good use?

Primers and top coats of any colour, varnishes and glues are acceptable. Please contact A C Peters, Ext. 6203 or P D Hey, Ext. 432.

## Horticultural Society

Don't forget our Wine and Cheese evening on Friday 5 December at 8.00 p.m. in the R22 Coffee Lounge. This is a revised date - previously the event had been scheduled for November. Tickets are £2.50 and can be obtained from Mrs B Miles, AERE Ext. 4706.

A visit to the Orchid Farm at Chilton is planned for Saturday, 7 February and we are trying to arrange a talk on alpinism which should interest many people. Another evening we would like to arrange a gardener's quiz.

In the meanwhile, if there are subjects you would like to hear about, let us know. Of course, if you know any good speakers on interesting subjects we are always glad to have names.

For further information please contact Mrs B Miles, AERE, Ext. 4706.

## Thanks

John Rimen wishes to thank all those who contributed to his farewell gift, and apologises to those he was unable to thank personally. "Cheerio, and the very best of luck to you all!"

Angie from the "R22 Shop" would also like to thank all her friends and customers for their gifts and flowers. She sends a special thank you and cheerio to all those she couldn't see in person before she left.

## Lunchtime Music

Lecture Theatre - 26 November 1230pm

'Journey to the Centre of the Earth'  
Rick Wakeman

'Journey to the Centre of the Earth' was recorded in concert at The Royal Festival Hall on 18 January 1974 with the London Symphony Orchestra and the English Chamber Choir conducted by David Measham. The production is narrated by David Hemmings.

The story is taken from Jules Verne's book of the same title.

## Christian Fellowship

Lecture Theatre - 27 November 1230pm

Why not come in out of the cold and enjoy a film about 'The Glory that was Greece'. This film charts the Greek's brilliant history of achievement and quest for excellence. Beautiful colour photography captures the beauty of both ancient and modern Greece and the excitement of Olympiad. It is also thought provoking concerning the philosophies of the Greek culture centred around the statue that was found on Mars Hill in Athens - "to the Unknown God".

The annual Keswick Convention is world famous for the expounding of the Word of God. A recording of one of these sermons can be heard at 12.30 p.m. in the R2 Conference Room on Thursday 20th November.

## Sales to Employees

Sales of scrap metal/plastics as set out in RLN 12/73 will be made on 5 and 19 December at the Scrap Compound, rear of R40 from 1200-1230hrs.

# Bulletin

Editor: Jean Banford  
Building R20  
Rutherford and Appleton Laboratories  
Chilton, Didcot, Oxon OX11 0QX  
Abingdon (0235) 21900 ext 484

Deadline for insertions:

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