1999 QRP Contest Results

Dissecting the Dipole

Adi AR-147 Reviewed

MFJ-269 Analysed by G1TEX

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New IC-756 Pro II 1.8 - 52MHz 100W
Auto ATU 51 Bandwidths
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* 29 Programmable Functions
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* 20 Memory Channels
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* Uses 6 x AA Cells (not inc.)

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* 2m / 70cm Handheld
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* 25 / 12.5kHz Steps
* Auto Repeater Shift
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* AM Airband Receive
* Ni-cads Cells & Charger

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* 6m / 2m / 70cm Handheld
* 5W Output on 13.6V DC
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* 123 Multifunction Memories
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* Programmable Features
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* 2m & 70cm Handheld
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* LCD Backlight & Timer
* Runs from 2 x AA Cells

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* Very compact, supplied with all hardware

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Practical Wireless, November 1999
Practical Wireless, November 1999

NOVEMBER 1999

7 BACK ISSUES SALE
Mixed out on an issue of PW from 1991, 1993 or 1997? Why not order a Rock from our back Store using the order form on this page! All copies only £1 each including P&P.

8 FREE CALLSIGN LISTING CD
See just what's in store with the PW Callsign Listing CD offer and collect your first coupon towards your own copy!

16 LOOKING AT...
Gordon King G4TVP returns this month and continues his series with a look at the intermediate-frequency (IF) stages of the superhet receiver.

20 RADIO BASICS
This month Rob Manning G3XFD describes how to use the 'Base-Probe' and 'Base-Tracer' projects.

22 PW 144MHz QRP CONTEST - 1999 RESULTS
It's that time of year again and Neil Taylor G4NXL, our long-serving adjudicator, has been busy collating all entries and here he presents the 1999 PW 144MHz QRP Contest Results.

28 LAKES & LOW POWER
Phil Davies M0ATB describes how he took part in the 1997 and 1998 PW 144MHz QRP Contest in the Lake District. He describes equipment and antennas used as well as a list of safety points which you might like to consider.

30 GET GOING ON MICROWAVES - PART 2
David Butler G4ASR continues his series on microwaves by looking at some microwave equipment and activity including the klystron transceiver and the Gunn diode... plus much more besides.

34 CARRYING ON THE PRACTICAL WAY
This month the Rev. George Dobbs G1WVR changes frequency from 13 to 2.6 GHz as he describes an interesting "home detector" idea.

36 THE ADI AR-147
144MHz FM TRANSCEIVER
Rob Manning G3XFD reports on two interesting 144MHz transceivers and points out which the AR-147 incorporates Airband receive.

40 COUNTING UP FROM THE MILLENNIUM
It's that time of year again and Ned! Taylor GMT/1, our long-serving adjudicator, has been busy collating all entries and here he presents the 1999 PW 144MHz QRP Contest Results.

46 ANTENNA WORKSHOP
Antenna In-Action kicks off this month with an "Antenna Workshop" written by John Heys G3BQK which designs and tests the latest in antennas - a "practical" for 20MHz.

54 DISSECTING THE DIPOLE
Tony Harwood G4HIZ explains an experiment whereby he set about building and measuring a dipole and then going on to explain the impedance of the theoretical and practical antenna compared in practice.

64 COLLECTING OLD QSL CARDS
John Heys G3BQK shares his thoughts on 'Collecting Old QSL Cards' and shows you how rare cards from his own collection.

68 THE PW PERSONAL ORDER FORM
This month we're launching the PW Personal Order Form and Roger Hall G4TNT, our Advertising Manager, describes how you can buy with extra confidence from advertisements in this magazine.

70 THE PIN PERSONAL ORDER FORM
You can send mail to anyone at PW, just insert their name at the beginning of the address, e.g. rob@pwpublishing.ltd.uk

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Practical Wireless, November 1999
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Family Hiking Kit
Two MOTOROLA PMR446 Transceivers and a GARMIN GPS111 for £475

**Axminster Used**

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<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>IC-725</td>
<td>160-10 inc WARC bands 12v</td>
<td>£395.00</td>
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<tr>
<td>IC-726</td>
<td>160-6 gen cov rx 100/10W</td>
<td>£525.00</td>
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<tr>
<td>TS-430S</td>
<td>160-10 general cov rx</td>
<td>£525.00</td>
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<tr>
<td>TS-450SAT</td>
<td>160-10 gen cov rx ATU fitted, 12v</td>
<td>£625.00</td>
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<tr>
<td>TS-530SP</td>
<td>160-10 WARC bands valve pa</td>
<td>£250.00</td>
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<tr>
<td>TS-520</td>
<td>80-10 valve pa</td>
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<td>TS-880</td>
<td>160-6 gen cov rx , 12v</td>
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<td>TS-690</td>
<td>160-6 gen cov rx ATU fitted, 12v</td>
<td>£695.00</td>
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<tr>
<td>TS-850SAT</td>
<td>160-10 gen cov rx ATU fitted, 12v</td>
<td>£750.00</td>
</tr>
<tr>
<td>TS-940</td>
<td>160-10 gen cov rx ATU fitted</td>
<td>£750.00</td>
</tr>
<tr>
<td>FT-901</td>
<td>160-10 non WARC valve pa</td>
<td>£200.00</td>
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- JRC HF Receiver £750.00
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- 2m/70cms Mobile (1 Month old) £225.00

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WM-918 Electronic Weather Station allows the measurement and display of weather data. Displays indoor/outdoor temperature, relative humidity, dew point, wind speed, wind direction, wind chill, barometric pressure and daily & accumulated rainfall. Four weather symbols show you a weather forecast: sunny, partly cloudy, cloudy and rainy. Memory for highest/lowest temperature, relative humidity, dew point temperature, maximum wind speed, minimum wind chill, daily and accumulated rainfall. Weather alarm warns you of high and low temperature extremes, rate of rainfall, wind chill, wind speed and drops in pressure. £179.95 inc P&P.

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There are a limited number of back issues available from the PW Bookstore. This could be your chance to ensure that your collection is complete!

They cost £1 each including P&P!

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Please send me the following Back Issues:

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If you do not want to cut your copy of PW, a photocopy of this form is acceptable.

Back Issues
The buying of new equipment and the constant re-circulation of second-hand equipment within the radio hobby is one sign of a living (despite what some say to the contrary!) pastime. One look at our 'Bargain Basement' pages every month will confirm that very many of us are truly active. My own occasional adverts in the column prove the point!

However, the very success of our free 'Bargain Basement' advertisements are still continuing to cause some problems and, although the difficulties caused by poorly prepared and badly written adverts have decreased, thanks to the co-operation of everyone involved and the bold '??' marks! I’m dismayed at the number of people using the 'BB' service who do so (from their own admission!) without supporting the magazine itself!

It seems very unfair to me that there’s a chance of someone not having bought a magazine themselves, and thus not helping to ensure the future of the magazine, could have their advert published whereas someone (a little later in the queue) who had bought a magazine had lost out because we didn’t have room that month. So, to be fair to those who do support PW every month, whether by subscription or buying it locally, I am in future going to ensure that everyone who does buy the magazine can be recognised as a ‘regular’ reader whenever they submit an advert.

So, from this issue onward we will be publishing a monthly colour-coded and dated ‘corner flash’ which must be attached to the advert sent in. We will always endeavour to include an advertising coupon in each issue, depending on space and the number of adverts (we try to ‘clear’ the backlog each month) and this can be photocopied if you don’t wish to deface your magazine. However, all advertisements must be accompanied by a ‘corner flash’ if they are to be accepted. And those arriving in the Editorial office after Friday 29th of October 1999 will not be accepted for publication.

Incidentally, I must thank those readers, very often ‘first time buyers who (when sending in an enquiry or request for help) very kindly send evidence that they have bought a magazine. This gesture, although not a requirement, is always very much appreciated by the Editorial team of a magazine which is struggling for ‘shelf space’ amongst the 3500 or so different publications available for sale on the bookshelves each month. Thank you all!

Finding PW To Buy
As I’ve just hinted at, specialist publications such as PW are becoming particularly difficult to find and buy in England, Wales and Scotland. Although in Northern Ireland and the Republic of Ireland - thanks to the survival (at the moment) of smaller shops - it’s easier (again, at the moment anyway) from my own experiences to find the magazine displayed for sale.

In early July I had a very enjoyable visit to the Moorlands & District Amateur Radio Society in Stoke-on-Trent. Here, in the pleasant surrounding of the Creda Factory (No, I did not get presented with a new tumble drier!) the difficulties in finding PW on the shelves came up during a lively ‘Question & Answer’ session after the talk.

Several MADARS members said they found PW virtually impossible to find in the area as previous outlets closed down in favour of other shops following trade ‘mergers’ and the resultant single newsagent did not carry PW unless it was a ‘firm order’. In reply, another club member said he’d found several enterprising smaller newsagents in the area who still stocked the magazine, and this answer gave me an idea!

The idea is that, in future, we will provide the most comprehensive list we can to help...
regular

readers find PW on sale in their area and to start off this month we’re publishing (see ‘News’ section) a list of all the radio dealers where you can buy PW.

To help everyone further, I would be very pleased indeed if those readers who buy from a newsagent/bookshop, etc. could write in to us with the details so we can compile a list to help others find PW on sale in their area. Please provide the name, full address and telephone number (if possible please) of the source you either use or have found and I think it will also be a good idea to tell the shop owner/manager what we are trying to achieve.

As an alternative, you can also leave a message on our marvellous new digital telephone answering machine if you wish. The list will be kept on hand here in the office so we can assist anyone who telephones in asking where PW can be found in their area. We will also aim at publishing the list eventually to help those who’ve read the magazine elsewhere, but would like their own copies.

Although we’ll not be able to acknowledge individual assistance - you can be assured how grateful we’ll be for your help.

Channel Island Import

Following the publication of Bill Strickland M1BRB’s letter (‘A Bargain ... after import duty’) in the September issue, regarding the imposition of import duty on second-hand Amateur Radio equipment from the Channel Islands, there was a great deal of interest and comment from readers. Many expressed surprise as they’d found Customs & Excise Officers to be helpful and understanding when they were dealing ‘face to face’.

However, I’m sorry to say that Bill M1BRB’s ‘appeal’ to the Customs & Excise people was unsuccessful and it’s been ruled that duty was ‘correctly applied’. This obviously caused embarrassment to both Bill and the Channel Island based Amateur who sold the equipment.

All I can say is this: Bear in mind that it could be to your advantage to combine a purchase from outside the European Union (which the Channel Islands are for this argument) with a holiday as the C&E ‘Enforcement’ Officers have and are able to exercise common-sense and discretion in individual cases. Anyone who has travelled on the heavily laden return flights from the Dayton Ham-Vention will know how true this is! So, by all means buy ‘abroad’ - but to get full advantage ... perhaps you should have a holiday too?

Please Enter ‘Officially’!

I’ll end up this month by writing a plea to all those stations who, although they came up on air and joined in the fun during the 144MHz QRP Contest in June, did not send in an ‘official entry’. Although I don’t normally like to criticise all our friends in Northern Ireland and The Republic - you were the main culprits!

As reported, I thoroughly enjoyed being on air and it was delightful to work so many EI and GI stations, along with those from Cornwall and Wales - but I ask you as a friend ... could you all please spare a little time to send in those logs? As you’ll see (on pages 20 to 23) Contest Adjudicator Neil Taylor G4HLX, comments on this point.

So, although it was wonderful to talk to you on the day - how about an ‘official entry next year’?

The ‘Millennium’ contest on Sunday 18th June is to see the introduction of some very special encouragement for Novice Radio Amateurs to enter and a particularly ‘collectable’ souvenir for everyone who submits an entry.

So keep your antennas ‘beamed on’ for further announcements! Cheerio for now.

Rob G3XFD

All this information on one, easy-to-use, CD ROM from your favourite Amateur Radio magazine. The CD ROM will be FREE (plus a contribution to postage) to readers who collect all three coupons in PW.

When the two coupons (from November & December) have been collected all you have to do is to attach them to the final combined coupon/form (in the January 2000 issue) and send two £1 coins (details later) for UK addresses, or $5US (overseas) as a contribution to postage and packing, and in return you’ll get your CD ROM!
Long-term Morse Memory

Dear Sir

First of all, thanks for your kind wishes on my recent illness when I telephoned the PW office. I'd suffered a stroke and during a bedside conference in Glasgow Royal Infirmary, one of the Doctors - a pretty Sudanese lady - noticed PW on my bedside table and asked about it. "We are concerned about your long-term memory" she said and asked if I could remember the Morse code. I said that I probably could but had not really used c.w. since passing the 'dreaded' test about 10-12 years ago.

So, I was instructed/requested to write out all the letters and numbers I could remember and next morning gave over a sheet of paper with only X and Y missing. She took the paper and said that since she couldn't read Morse, could I please write it all out again and she would collect it in 30 minutes and compare one against the other. I wonder if any other reader has been tested in such a way?

Neil Barrowman GM6LTQ

Editor's reply: We've been in contact with Neil several times and he is 'on the mend'. Yet another use for Morse code.

More On Morse!

Dear Sir

I have read many reasons for dropping the Morse code and can accept the argument that the code does not make the person a better operator and I can accept that Morse code is a very old form of communication. Perhaps it's because it is old and effective that its usefulness must be derided.

I do not accept, however, the argument that it is difficult to learn or 'I have no interest in Morse so why should I bother'. The history of radio and, for that matter, telegraphie communication relied on Morse and would not have progressed very far without it. It is part of our heritage, fun to use and, once it has been mastered, most rewarding. If you doubt this, just listen to the c.w. part of each band and listen to the activity. It's the 'real ale' of Amateur Radio and I am sure no one would suggest that we should stop brewing it because it's old!

Clearly, the RAE is not very difficult and anybody who can read and add up would be able to pass it. It may take some people a little longer than others. However, if a person really wants to succeed in what is a technical hobby, he or she will be able to pass the RAE if real effort is put into it.

The same applies to the code, anyone can learn to send and read at 12 words per minute. They must, however, want to do so. I was one of those people who had difficulty. I actually worked on my own with an old Sinclair computer and it took about six months at ten minutes a day. To begin with I was hopeless, but I really did want to succeed and gradually I improved and began to read Morse, off air. This did wonders for my morale.

It's clear that Morse is still a useful medium for communication. People who have lost the ability to see or hear, or perhaps both, can communicate by use of the code. It would not be hard to imagine the sheer joy experienced by a person who suddenly became unlocked from his silent sadder sightless existence to a new dimension of local and world-wide communication. And how sad it would be if, having achieved success in the code, there was no one with whom hothearted or they could communicate.

Let's hear no more about Morse being out-modeled or unnecessary. If you really want to do it, you most certainly will succeed. After all, I did and it was a small price to pay for the many hours of enjoyment I have experienced over the last 18 years.

John Collins G6DHU

Plymouth

Kinship with CB? Not Me!

Dear Sir

Walter Farrar G3ESP (Letters' August) said that kinship between the CB and C.W. hobbies may admit kinship in some cases but to the average CB operator and even the average CB enthusiast he is a complete stranger. There is a general trend at the moment, for people not to join clubs any more but this still applies to all hobbies and interests and is certainly not unique to Amateur Radio. Nowadays, a Radio Amateur can talk to friends every day with ease. We can chat on the local repeater while walking the dog, on the way to and from work and even, in some cases, while working. Yes, this is when we chat about the Internet and E-mail, etc. and anything else in which we share a common

Magic of Wireless

Dear Sir

As a young boy I was introduced to the magic of wireless when an older friend showed me a crystal set he had built - a toilet roll former with some cotton covered wire wound around it attached to a pair of ex government headphones! With a length of wire stretched from his bedroom window down the garden to the top of a clothes line post and the headphones clipped firmly on my head I could hear the BBC West of England Home Service. To me, it was MAGIC and nearly 50 years later it is still MAGIC!

After my experience with my friend's crystal set and discovering that it did in fact use a crystal and a condenser as well as a microphone, I was hooked on Wireless. With help from my father and later magazines such as PW and Radio Constructor I was able to build my own set and was listening to stations from all over Europe and eventually the World. I joined the School Science Club and later, when I was 12 years old, heard some local Radio Amateurs talking on 1.8MHz on a wireless that covered the 'Trawler Band', discovered Amateur Radio.

I also joined the National Society for Radio Amateurs, the RSGB and became a Short Wave Listener. The Society's magazine was 'my window on the world' and I had a great sense of belonging to a world wide brotherhood of radio enthusiasts. Over 40 years later, RadiCom, as it is now known is still a 'good read' and worth every penny of my subscription to RSGB.

In the 1960s, I joined the South Dorset Radio Society. Over 30 years ago most members were middle aged or over and for a while it seemed I was the only person under 40. These days, far from what some may admit, there are many young people in the hobby and the activity on the bands is certainly as high as it was 30 years ago. Morse Code is still in daily use by thousands of Radio Amateurs all over the world and the greatest problem for most h.f. operators is QRM caused by the high level of activity.

Although I held a radio licence for almost 20 years, I had learned the Morse code in my teens. I can't imagine Amateur Radio without Morse. Even before I obtained the full 'A' licence, the ability to read the code was essential for the identification of beacons and other radio signals as weak signal working for which no other mode is it's equal.

Some things have changed of course, that's the nature of science and human nature as well. However, I have a copy of the RSGB Amateur Radio Handbook and was more than pleased to see that in some cases, while working. Yes, this is when we chat about the Internet and E-mail, etc. and anything else in which we share a common

More On Morse!

Dear Sir

I have read many reasons for dropping the Morse code and can accept the argument that the code does not make the person a better operator and I can accept that Morse code is a very old form of communication. Perhaps it's because it is old and effective that its usefulness must be derided.

I do not accept, however, the argument that it is difficult to learn or 'I have no interest in Morse so why should I bother'. The history of radio and, for that matter, telegraphie

-40. These days, far from what some may admit, there are many young people in

Dear Sir

Walter Farrar G3ESP (Letters' August) may admit kinship between the CB and C.W. hobbies may admit kinship in some cases but to the average CB operator and even the average CB enthusiast he is a complete stranger. There is a general trend at the moment, for people not to join clubs any more but this still applies to all hobbies and interests and is certainly not unique to Amateur Radio. Nowadays, a Radio Amateur can talk to friends every day with ease. We can chat on the local repeater while walking the dog, on the way to and from work and even, in some cases, while working. Yes, this is when we chat about the Internet and E-mail, etc. and anything else in which we share a common
and abilities of Castle Electronics, but getting spares for older equipment must be difficult for them at times. Radio Amateurs are fortunate ... try getting spares for other consumer electronics - it's virtually impossible for anything over 10 years old!

International Standards For RAE

Dear Sir

I reply to Bob Clements' (Letters' September PW). The exam for the RAE has never been as easy and has been set at an internationally agreed standard. This to ensure that all wireless operations, whether amateur or professional, know what they are doing when let loose on the short wave bands with long range transmitting equipment. It was set at its present standard for good reason.

I am very sorry Bob failed but so do many people taking all sorts of exams, you pick yourself up, keep studying and take it again. I took the RAE 41 years ago and failed, six months later I took it again and failed. Six months after that I PASSED! I have just completed 40 wonderful years on short wave bands - don't give up Bob!

Good luck with the December exam. I hope to hear you on '40m' in the New Year!

Bill G3NQX

Preston

Sprites & VHF Propagation

Dear Sir

I hope that the Editor is well and recovered from 'running out of battery' during the PW 144MHz QRP contest! I'm also writing to say I think that the Patrick Alley GW3KJW article ('Red Sprites & Blue Jets', page 56 September PW) on sprites and v.h.f. propagation was first class. It brought back thoughts that I had after Professor Jenkinson's article in the April RadCom about five years ago (which I thought was an April Fool's joke at the time).

The Professor made an antenna from short coils with a metal plate top and bottom. Maxwell's equation and the theory of Displacement current was given as the antennas mode of operation, e.g. the field set up by the r.f. in the coil created a virtual conductor through the middle of the coil which assisted in the transmission of radio waves, etc.

When I first saw film of sprites from space I was again reminded of the Professor's antenna. With masses of power from the lightning I wonder if electrons are made to spiral to create a virtual conductor which will radiate any r.f. that hits it? I have an electrical background but not enough knowledge or maths to sort out Maxwell. I guess that I am putting my head into the lion's mouth writing about ideas like this. Perhaps a reader with all the right knowledge could clear up the matter?

Albert Heyes G3ZHR

Cheshire

Editor's comment: Car battery now OK Albert - and it's over to you readers, to write (further) on sprites!

Software For Morse Operation

Dear Sir

I am responding to the letter from Paul Morrison G0VHT (August 'Letters', p.8). In that letter, Paul questions whether someone is capable of designing software to allow him to use a PC to operate c.w.

My response is that c.w. via a PC is already available. Software such as G4BKM's BMXmulty offers a c.w. mode. Multi-mode TNCs such as the RAM and PK232 also offer c.w. The Patton's PC-16000 transceiver (recently reviewed for PW by Roger Cooke G3LDLI) includes a keyboard with which to operate c.w. and RTTY. I believe there have been one or two c.w. keyboards* (see below) - you type, they key the radio (but you have to decode the receiver c.w.).

I agree with Paul that it should not be too hard to link the output from a voice recognition program into a c.w. program and operate c.w. by talking into a microphone. I guess this would lead us to the logical step of digitising the audio and shipping it via r.f. as digital data ... but who wants to eliminate c.w.?

Ian Brothwell G4EAN, SB3TI

Secretary, British Amateur Radio Teledata Group (BARTG)

*The MFJ-451 Morse Keyboard was reviewed in the June 1994 PW by G0SKR. Copies available from the PW Book Service, see page 78.
**Headline News**

**Kenwood's New Millennium Transceiver**

*Practical Wireless* readers in Japan, the USA and New Zealand - who have been fortunate enough to visit the major Japanese trade show in the summer - have confirmed the rumours that Kenwood are planning to launch a new 'Super Rig' - probably in the Spring of 2000.

Much speculation, down to the level and model number of the h.f. and 50MHz 'major rig' has been promoted in Europe and the USA recently and this led the *PW* Newsdesk to contact Kenwood Electronics in Watford for a statement.

While neither confirming or denying the existence of Kenwood's new 'Millennium' package, the Kenwood spokesperson said that "*PW* will be the first magazine to know about and review any new h.f. rig coming from Kenwood". Knowing what we already know here at *PW* from those attending the Japanese show ... that means there's a nice surprise coming our way. So, watch this space!

**Amateur Radio Via The Net?**

The ever-growing influence of the Internet has led to a parallel growth of Amateur Radio related 'Web sites' and 'links'. This has also led - especially in the USA - to the computer based system enabling European Amateurs to gain access to the Amateur Radio bands in the United States. This in turn - so *Rob Mannion G3XFD*, Editor of *PW* writes - has generated many rumours regarding the possibilities of authorised Amateur Radio operations via the Internet. "at an early stage" are underway between themselves, the Amateur Radio hobby "and other very interested parties". The "other very interested parties", so G3XFD was able to confirm, are the various telecommunication organisations who are concerned about possible loss of revenue, despite the fact that they play a major part in the necessary telephone links.

It remains to be seen whether extending our hobby via the Internet will become officially part of the necessary telecommunication frontiers and promotes international friendship, that the hobby, one which knows no borders is not over - he - like many of his generation - was not over-keen on talking about himself. I first met Jan and his delightful wife Gaby in 1994 when we presented a prize - the SG-2000 transceiver, donated by the Japanese *CQ magazine* and so we've been unable to mention it until this issue, but it is quite exciting news.

This new rig, Icon state: "places a whole range of new and improved features within reach of the serious h.f. operator and DX enthusiast". It contains a 32bit DSP Transceiver which was launched at the JABA fair in Tokyo in the middle of August this year.

**Icom's New HF 32bit DSP Transceiver**

Dale Blackman at Icom (UK) Ltd has been in contact with the *PW* news desk to tell us all about the brand new IC-756PRO h.f. plus 50MHz. 32bit DSP transceiver which was launched at the JABA fair in Tokyo in the middle of August this year.

The press release which we received from Dale was actually under a publications embargo until the 19 September 1999 (when the product will appear in the Japanese *CQ magazine*) and so we've been unable to mention it until this issue, but it is quite exciting news.

This new rig. Icon state: "places a whole range of new and improved features within reach of the serious h.f. operator and DX enthusiast". It contains a 32bit floating point, i.f. DSP which, Icon say, will improve noise reduction and provide auto-notch functions as well as a 5 inch (127mm) TFT (Thin Film Transistor) colour, e.g. "a first in an h.f. transceiver" they claim! The i.c.d. displays the following information: dual frequency display; memory frequency and memory name; i.f. filter bandwidth; RTTY tuning indicator and received characters; real-time spectrum scope and voice memory.etc. memory keyer content.

The IC-756PRO also contains the following operations: a digital voice memory; digital twin pass band tuning; real-time spectrum scope; dual-watch; a.g.c. loop operation; digital i.f. filter; low distortion, r.f. type, speech compressor; built-in RTTY demodulator/dual-peak A/PF as well as a built-in a.c.t.u. (with 50MHz coverage), an electronic keyer and a memory keyer function and

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**Kitmaster**

David Johns has been in touch with *Practical Wireless* to tell us all about the new business which he has started up. *Kitmaster*, of which David is the proprietor, is a business based in Colchester which specialises in radio and electronic kits and manuals (modern radio, valve radios and many more) - you might have seen his advert in last month's *PW*.

David tells us that he has 50 types of kits to sell and all of the radio circuits use common transistors and components and he says that they are easy to build. What's different about Kitmaster's kits?

Well, since retiring, David tells us that all the spare time which he had on his hands led him to building a large workshop in his garden and it is from here that he began to "study and develop many interesting radio circuits, whether valve or using solid state design".

"It is quite interesting what you can achieve when you put your mind to it", David tells *PW*, "I built a particular two valve regenerative set in my radio shack and it picks up from all over the world. All the parts can be picked up from the radio rallies and club meetings for a few pounds". David says that his kits will "centre on the practical side of building circuitry with basic, easy to get hold of, components, only after much study of building techniques".

So, fancy having a go? Why not contact *Kitmaster*, 37 Gosbecks Rd, Colchester, Essex CO2 9JR. FAX: (01206) 390226. The kits and manuals will be sold via mail order and their advert can be found on p.47 of this issue.
Jan 'Lucky Lutterot' GOLUT - A Tribute

SCC, that he'd won in one of our competitions. Jan's delightful Dutch-English accent was joined by Gaby's gentle Britonsian burr and such was their wonderful cheerful nature that they left a lasting mark here in the PW offices and the resultant photograph was published on page 13 of the July 1994 issue of the magazine.

At my request, Jan - a retired Merchant Marine Radio Officer who had survived numerous incredibly 'Close Encounters' during the Second World War - then wrote an article entitled 'Lucky Lutterot' which was published in the March 1996 issue of PW. The stories outlined (and they could only be outlined even though they deserved a book of their own) included that of the time when a direct hit on the bridge and radio room of the Royal Dutch Shell tanker killed everyone except him. Despite this and many other 'adventures' Jan survived (in his own words) 'floating around on volcanoes'. Despite that, both he and the ship survived until 'retirement' after the war!

In fact, Jan Lutterot, originally PAOLUT, eventually gaining GOLUT, spent the rest of the Second World War and the rest of his sea-going career on aviation fuel tankers. Jan was one of only two survivors of his marine Radio Officer's Course that had been organised by Radio Holland (which was operated in a similar fashion to Marconi in the UK).

Jan Dirk Lutterot was born in Alkmaar in the Netherlands on 4th July 1919 and died in Bristol on 1st July 1999. He met Gaby (Gabrielle, his wife) in Bristol and they were married in 1942. After retiring from the Merchant Navy Jan became a TV Service Engineer for Granada (and other organisations) before ending up with his own TV & Radio Shop - eventually taking up Amateur Radio with gusto.

However, as he never formally adopted UK Citizenship he had one of the 'rare' G5 callsigns and after several 'hicups' he eventually obtained GOLUT permanently. A very keen member of the Shirehampton Club (only a stone's throw from Avonmouth Docks) he helped many members through their Morse Tests and made many more life-long friends.

Such a man was Jan Lutterot GOLUT* and our sympathies and admiration go to Gaby, their Daughter and Son-in-law and relatives in Holland. It was a privilege to have known him.

(*I'm sorry to say that my short tribute can only 'scratch the surface' of such an eventful life and in 'condensed' form cannot do justice to the subject. However, I will be pleased to forward photocopies of the 'Lucky Lutterot' article and the notes supplied by Hasso G4BYJ as a continuing tribute to Jan in exchange for a stamped addressed envelope (s.a.e.) sent to me at the PW offices in Broadstone.)

Rob G3XFD

Sun Valley Business Park, Winnall Close, Winchester SO23 0LB. Or why not visit their Web site at: www.yaesu.co.uk

The Toughest Hand-Held Ever?

Yaesu UK Ltd sent the PW news desk some information about their brand new 50/144/430MHz triple-band heavy-duty f.m. transceiver the VX-5R which, they claim is the "most durable hand-held ever" and we're not prepared to argue with them! The VX-5R, with its die-cast aluminium construction, Yaeas tell us, provides transceive operation on 50, 144 and 430MHz amateur bands with 5W of power output (4.5W on 430MHz) as well as ultra-wide frequency coverage of the 8kHz, spectrum plus a.m. medium and short wave broadcast reception - and the radio only measures 58W x 87(W) x 28(d)mm (without knob and antenna)! Yaesu also tell us that the VX5R includes an "optional Barometric Pressure/Altimeter Unit (SU-1), which can help alert you to changes in weather conditions". Other features of the Yaesu VX-5R (all listed on promotional literature) include: easy-to-read dot matrix LCD; dual watch for checking activity on two frequencies; 'Spectra-Scope' for monitoring adjacent frequencies; Automatic Range Transponder System (ARTS); extensive memory system with alphanumeric labels and finally CTCSS and DCS encoder/decoded built-in.

For more information on this - or any other Yaesu product - please contact them direct on Tel: (01962) 866667, Fax: (01962) 856801, Unit 12, Sun Valley Business Park, Winnall Close, Winchester SO23 0LB. Or why not visit their Web site at: www.yaesu.co.uk

Swindon's 'Breaker'
Baker Silenced!

A Swindon-based CB operator - Mr Victor Albert Baker - has now been silenced thanks to the response by the Radiocommunications Agency (RA) to a petition from the local CB radio community regarding his use of illegal high power transmissions on 27MHz.

The RA press release, issued by them on 17th June - and released to PW on 8th September, states that the offences were committed on March 22 1999 and the resultant Magistrate's Court case was heard on 19th June.

The press release states:

For a free mention on these pages send your news & product information to: PIV DESK TODAY!
**Web Watch**

*Waters & Stanton*'s Web site: [www.waters-and-stanton.co.uk](http://www.waters-and-stanton.co.uk)

*Unicorn* (UK) Ltd's Web site: [www.unicorn-ultricom.co.uk](http://www.unicorn-ultricom.co.uk)

*ICom (UK) Ltd*’s Web site: [www.icomuk.co.uk](http://www.icomuk.co.uk)

*Yaesu UK Ltd*’s Web site: [www.yaesu.co.uk](http://www.yaesu.co.uk)

*Nevada's* Web site: [www.nevada.co.uk](http://www.nevada.co.uk)

*BBC World Service Book Shop* Tel: The Strand, London 0171-557 2576

*Axon Systems* Tel: Newbury (01635) 330 33

*Breakers World* Tel: Bordon, Hants (01420) 474864

*Jaycee Electronics* Tel: GJenrothes, Fife (01592) 756962

*LAR Communications* Tel: Wakefield 0113-252 4586

*Lowe Electronics* Tel: Derbyshire (01629) 580800

*Micron* Tel: Belfast (01232) 438610

*Modern Radio* Tel: Bolton (01204) 528916

*Northern S/W Centre* Tel: Carlisle (01228) 590011

*Poole Logic* Tel: Poole (01202) 630093

*The QRP Component Company* Tel: Haslemere (01428) 661501

*Radio World* Tel: West Midlands (01922) 414796

*Short Wave Shop* Tel: Christchurch (01202) 490099

*SMG Communications* Tel: Tiveton, Devon (01884) 259090

*Unicorn* Tel: Horne Bay, Kent (01227) 3655

*Waters & Stanton* Tel: Essex (01702) 206835.

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**Regular**

*Waters & Stanton’s Web site: [www.waters-and-stanton.co.uk](http://www.waters-and-stanton.co.uk)*

**Icom (UK) Ltd’s Web site: [www.icomuk.co.uk](http://www.icomuk.co.uk)**

**Nevada’s Web site: [www.nevada.co.uk](http://www.nevada.co.uk)**

**Yaesu UK Ltd’s Web site: [www.yaesu.co.uk](http://www.yaesu.co.uk)**

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**Web Watch**

*Waters & Stanton* (W&S), regarding the new MFJ-269 Antenna Analyser which will, they tell us, retail at £299.95 inclusive of VAT. (Free delivery is available on the MFJ-269, especially for *PW* readers!). "Following on from the great success of the MFJ-259B antenna analyser, MFJ have now developed model 269 which extends the frequency range to include u.h.f. and in addition to reading v.s.w.r. and frequency up to 70cm (430MHz) . . . "

There are a couple of changes which have been made to the 269 and for more information on these, please see the Antennas-In-Action pages in this issue where you will find a review of the MFJ-269 by Tex Swann G1TEX.

*Waters & Stanton* can be contacted on (01702) 206835, FAX: (01702) 205843, Spa House, 22 Main Rd, Hockley, Essex SS5 4QS. E-mail: info@wsple.demon.co.uk Alternatively, why not visit their Web site: [http://www.waters-and-stanton.co.uk](http://www.waters-and-stanton.co.uk)

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**Dealers Selling Practical Wireless**

As announced in ‘Keylines’ (please see page 8), from this issue onwards we're planning to assist readers who are having difficulties in finding *PW* 'on sale'. The service starts this month with a list of dealers who stock *PW* each month.

**Amateur Radio Communications**
Tel: Merseyside (01250) 220881

**Axon Systems**
Tel: Newbury (01635) 33033

**BBC World Service Book Shop**
Tel: The Strand, London 0171-557 2576

**Breakers World**
Tel: Bordon, Hants (01420) 474864

**Jaycee Electronics**
Tel: GJenrothes, Fife (01592) 756962

**LAR Communications**
Tel: Wakefield 0113-252 4586

**Lowe Electronics**
Tel: Derbyshire (01629) 580800

**Micron**
Tel: Belfast (01232) 438610

**Modern Radio**
Tel: Bolton (01204) 528916

**Northern S/W Centre**
Tel: Carlisle (01228) 590011

**Poole Logic**
Tel: Poole (01202) 630093

**The QRP Component Company**
Tel: Haslemere (01428) 661501

**Radio World**
Tel: West Midlands (01922) 414796

**Short Wave Shop**
Tel: Christchurch (01202) 490099

**SMG Communications**
Tel: Tiveton, Devon (01884) 259090

**Unicorn**
Tel: Horne Bay, Kent (01227) 3655

**Waters & Stanton**
Tel: Essex (01702) 206835.

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**License Free Listening**

Mike Devereux at Nevada wrote to Practical Wireless to tell us all about the brand new FMR-446 transceiver - the *Alinco DJ-SR1* which was released at the end of August. It is small enough to fit in a top pocket, Mike says, but still has many features including selectable CTCSS, switchable high/low power, superb receive/transceive audio quality, scan facilities and companion-channel finder facility.

Mike goes on to say that there is also a range of "compatible accessories" from the "existing Alinco range". The DJ-SR1 will retail for £99.95 (batteries and drop-in charger not included). Look out for the review of the DJ-SR1 in next month's *Practical Wireless*.

For more information about this or any other Nevada products, please contact Nevada on Tel: 0239-266 2145, 189 London Road, North End, Portsmouth PO2 9AE. E-mail: info@nevada.co.uk or visit their Web site: [www.nevada.co.uk](http://www.nevada.co.uk)
including large displays of computer equipment and a Bring & Buy. Refreshments are available in the hotel along with full facilities for QSLine via the brewery. Talk-in will be on S22 from 1000 and will be manned until 1400. More details from Stephen Hand, Hotel Tel (01365) 751478 evenings. FAX (01365) 751200. Mobile (0872) 932485, E-mail: stephen@7twin.freeserve.co.uk or Ken O'Reilly Tel: (01365) 723286, FAX: (01353)179209, Mobile (0780) 536449, E-mail: kenoreilly@enterprise.net

November 6/7: The Thirteenth North Wales Radio & Electronics Show is to be held at the North Wales Conference Centre, Llandudno. The show opens at 1000 both days and the entrance fee is £2 for adults and under 14s free, when accompanied by an adult. There will be a Clubroom and an extensive Bring & Buy. More information from M. Mee GW7NPF, Rally Secretary on (01745) 507601 (combined telephone and fax number).

November 14: The Great Northern Hamfest is to be held at the Metrodome Leisure Complex, Queen's Road, Barnsley, near to town centre, less than two miles from junction 31 M1 motorway, just five minutes walk from the train and bus stations. Doors open at 1000 and admission is £2. The venue is all on one level with excellent disabled facilities. There will be the usual trade stands, component and specialist interest groups and a large Bring & Buy. Morse tests on demand, from 1200 until 1800 don't forget to bring two passport photos and the appropriate fee with you. Talk-in on 145.500MHz. Ernie G4LUX on (01226) 716350 or 0861 748888 between 1400 and 2000.

November 14: The Midland Amateur Radio Society are holding their 11th Radio & Computer Rally at Stockland Green Leisure Centre, Slade Road, Erdington, Birmingham. Doors open at 1000. There is a large free car park, free bouncy castles, trade stands, local clubs and special interest exhibits. For trader information call Norman GH6HE on 0121-422 9787 or for general information, call Peter GH6HN on 0121-443 1189.

November 14: The Bishop Auckland Radio Amateurs Club (BARAC) Rally will be held at Spenstony Leisure Centre. Please note this is a venue ideally suited to both trader and disabled, as it boasts good parking and easy access to a large ground floor. There will be the usual radio, computer, electronics and Bring & Buy stalls, as well as catering and bar facilities. Morse tests are available on demand. As you can imagine, there is a lot to do within the confines of the leisure centre, for those of the family not interested in radio. Doors open 1100 (1030 for disabled access) and admission is just £1, under 14s free of charge if accompanied by an adult. Talk-in on S22. Keith MOLBN on (01958) 601401 or (0374) 417160.

November 16: South Normanton & District ARC are holding their Mini Radio & Electronics Equipment Fair at New Street Community Centre, South Normanton near Alfreton, Derbyshire starting at 1800. Easy access from the M1, J26, or the A38. Everyone welcome, refreshments available. Limited number of tables available, strictly on a first come, first served basis so booking is essential. Further details free of charge (and to book tables) Russell Bradley G0OKD on (01773) 863889 or E-mail: Duncan Walters G4DFY on tealad@cwcwm.com.

November 21: The West Manchester Radio Club are holding their Red Rose Rally at Horwich Leisure Centre, Horwich, Bolton, off J6 M61. Doors open 1100, 1030 for disabled visitors. Admission by programme, which costs £1.50, £1 for OAP on the door. There will be the usual stalls, plus refreshments and a Bring & Buy. Don Atchison GBSBA on (01942) 871620.

November 21: The Bridgend & District Amateur Radio Club are holding their 13th Radio & Computer Rally at the Bridgend Recreation Centre, Bridgend, Mid-Glamorgan. Doors open from 1000, admission is £1.50. All the usual radio and computer traders, licensed bar, Bring & Buy, refreshments, family attractions and free parking. Plenty of room for visitors to mingle and browse, signposting will be from junction 35 of the M4. Talk-In on 145.550. More details from Maurice GW2TJN on (01656) 864579, FAX: (01656) 864579.

November 27/28: The London Amateur Radio & Computer Show is to be held at the Lee Valley Leisure Centre, Picketts Lock Lane, Edmonton, London N9 OAS. The Lee Valley Leisure Centre has modern facilities, well illuminated halls, extensive free parking and easy access by roads.

December 4: The Rockdale & DARS are holding their traditional radio rally (yes, on Saturday!) at St Vincent de Paul Catholic Church Hall, Calderstone Road, off the A660 Edenfield Road, approx two miles west of Rockdale. Follow the orange arrows from M62 J 20. Doors open 1100 (1045 for disabled visitors). There will be refreshments and a rest area. John GTOJ, evenings, on (01706) 376294.

2000

January 23: The Lancastrian Rally will be taking place at Lancaster University. Routes from south - M6 off of junction 33, routes from north - M55 off of junction 34. opens at 1100, 1030 for disabled visitors. Entrance fee is £1.50. There will be a Bring & Buy, Morse tests on demand - two passport photos required. Licensed Cafe on site. For booking details contact (01772) 621954.

February 6: The 15th South Essex Amateur Radio Society are holding their Radio & Computer Rally at the Paddockows, situated at the end of the A130, Lang Road, Canvey Island, Essex. Details and bookings for special interest groups and features include Amateur Radio, Computer & Electronic components exhibitions, Bring & Buy, ESGB Morse testing on demand (two passport photos required). There will also be home-made refreshments, free car parking with a specially allocated area for disabled visitors. Admission is just £1. More information from Brian G7TII on (01260) 753531 before 2100 please.

Off At Leicester!

Practical Wireless and Short Wave Magazine were both present at the Leicester Show this year at Donington Park on the 24 and 25 September 1999. The PW Publishing stand had a number of books on sale as well as the usual One Year Free' subscription offer which promised three years for the price of two! Thank you to everyone who visited the stand and told us how much you are enjoying both magazines. We always look forward to meeting the readers who always, without fail, give us very valuable feedback - all opinions are important to both magazines and we hope that you will continue to support our show - both through buying the magazines and through your continued support at the various shows and rallies which we visit throughout the year. There will be more news about the Leicester Show in next month's PW. I hope to see you at Picketts Lock - in March 2000 - the next rally which the Editorial team will be attending!

Joanna Williams (PW News & Production Editor)
The Intermediate Frequency (I.F.) Stages of the Superhet are located between the mixer and detector and it’s here where the main gain and selectivity of the receiver are established (Fig. 1). There are sometimes two different I.F.s, each produced by its own mixer and local oscillator (Fig. 2) — this is double-conversion. A triple-conversion uses three mixers and three different I.F.s.

The I.F. of early superhets was just above the audio spectrum in the supersonic range, around 30kHz. The word superhet is a shortened version of super-sonic-heterodyne, as this kind of receiver was originally Christened in 1918 by its American inventor Edwin Howard Armstrong. Most amplitude modulation (a.m.) I.F.s are now in the region of 450 to 480kHz, while the I.F. for v.h.f. I.F. receivers has been standardized at 10.7MHz.

Tuned bandpass couplings to and from the I.F. stages provide the required response shaping and selectivity, sometimes aided by ceramic or crystal filters along, perhaps, with Q-multiplication, in some amateur and more specialised receivers.

Double-Conversion Receivers

The first I.F. of double-conversion receivers is generally in the megahertz range and the second I.F. in the kilohertz range. The first mixer receives the antenna signal, which may be amplified by an r.f. stage, plus the local oscillator (L.O.) signal to produce the first I.F.

The second mixer receives amplified first I.F. signal plus a signal from its own oscillator to produce the second I.F. Although double-conversion is found mainly in professional and communications receivers, there has been a British f.m./a.m. hi-fi tuner-amplifier, engineered for the domestic market (the Armstrong Model 636), whose a.m. section was designed for double-conversion, using first and second I.F.s of 3.1MHz and 455kHz respectively.

Interesting Design

The first I.O. in the interesting Armstrong 626 design consists of a voltage-controlled oscillator (V.C.O.) tuned by a solitary capacitor diode (varicap) over the range of 3.245 to 4.725MHz. The varicap’s reverse bias is adjusted by a tuning potentiometer, which facilitates continuous coverage of both the long and medium wavebands without band switching.

The design includes a balanced dual-diode first mixer, to which the antenna signals are fed via a low-pass filter of 1.7MHz turnover, along with the first L.O. signal. The first I.F. is thus produced by this mixer from antenna signals ranging from 145kHz at the start of the long waveband right through to 1.625MHz at the end of the medium waveband as the V.C.O. is tuned. The first I.F. signal is then fed to the second mixer along with the second L.O. signal to produce the second I.F.

To simulate the capacitance swing of a mechanical tuning capacitor from around 250 to 10pF with, say, a voltage change of 1 to 30V, a varicap needs to have a large junction area. Many latter-day designs include varicaps arranged in series-opposed pairs, often encapsulated. The trick here is to minimise losses with the maintenance of a high Q-factor, while helping with the required linear capacitance swing.

Such devices are often found in f.t., mixer and oscillator stages, the tuning being accomplished by a potentiometer which alters the reverse bias of all the varicaps together. The resistance of a varicap is high and its leakage current low when reverse biased. It then exhibits capacitance owing to the depletion layer acting like a dielectric between the two pads and regions. As the reverse bias is increased so the depletion layer widens and the capacitance reduces. (Varicaps in frequency synthesizers were looked at in last month’s instalment).

It’s easier to achieve high gain and the required bandpass characteristics at a low rather than a high I.F. At frequencies in kilohertz stray capacitances are less troublesome and coupling circuit Q-factors are easier to keep higher than at frequencies in megahertz. This is probably one reason why E. H. Armstrong chose 30kHz for the I.F. of his first superhet!

Image Frequency

As the I.F. is reduced so the image frequency becomes closer to the signal frequency. For example, the main response of an a.m. receiver tuned to 800kHz and with the I.O. at 830kHz occurs at 30kHz (830-800), which is the I.F. However, an incoming signal of 860kHz (two times the I.F. above the receiver-tuned frequency) would also produce the 30kHz I.F. (860-800kHz). This is the image response.

The higher the I.F., therefore, the less difficult it is to attenuate the image response by enhancing the selectivity of the tuned stages prior to the mixer. A 47kHz I.F. is certainly better than one of 30kHz in this respect, but a fair degree of pre-mixer selectivity is still desirable. Good pre-mixer selectivity also helps to tame the potential for other spurious responses.

For example, an f.m. receiver tuned to 95MHz will produce an I.F. of 10.7MHz when the L.O. is tuned to 105.7MHz. If a strong antenna signal at 100.35MHz is also present its second harmonic would be 200.7MHz.

The second harmonic signal, along with the second harmonic of the L.O. at 211.4MHz (105.7 x 2MHz) would appear at the mixer, the two producing the 10.7MHz I.F. (211.4-200.7MHz). This is called the half I.F. response because the response occurs at a frequency which is half the I.F., away from the tuned frequency. When the L.O. is operating at the I.F. above the signal frequency the image and repeat spot responses also occur above the tuned frequency and vice versa.

With double-conversion, the first I.F. keeps the image and other spurious responses well away from the receiver-tuned frequency, while the lower second I.F. is designed for gain and response tailoring. Rejection filters may also be included to prevent the I.F. stages themselves from responding to signals within their passbands.

The next instalment will continue with the I.F. amplifier and will look at circuits and response characteristics. So, stay 'on frequency' until then.

Cheers!

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This month, now that he’s completed the description of the constructional side of the ‘Basi-Probe’ and ‘Basi-Tracer’ projects, Rob Mannion G3XFD provides some hints and tips for using them on other projects built during the series.

Now that we’ve built the ‘Basi-Probe’ (BP*) and the ‘Basi-Tracer’ (BT*) projects, I’m going to describe how you can use them in a practical fashion and, as it seems an ideal way to go about the job … I’m going to use the projects we’ve built together so far during this series. (Note: All references to the Basi-Probe will be made as BP and those to the Basi-Tracer will be made as BT). On the reproduced circuit diagrams the test points (where the probes of BP or BT are to be placed) will be indicated with the appropriate abbreviation and coloured Blue for BP and Pink for BT. Don’t forget that the ‘RF’ probe on the BT is that which uses a diode detector and the ‘AF’ is that using a capacitor.

Crystal Diode Receiver

So, to start off the procedure I’m going to look at the simple ‘crystal diode’ receiver (Receiver 1, Fig. 1) with one stage of audio amplification, which was published in April 1998 on page 17.

Firstly, the crocodile clip lead should be attached to the 0V (‘chassis’ or ‘earth’) when using either the BP or BT units. But don’t forget to ‘switch on’ the probes each time they’re used (or temporarily ‘bridge’ the switch gap to free up one of your hands). Secondly, don’t forget to switch on the receiver under test and connect the antenna and earth! If your receiver and headphones are working OK you should hear the tone from the BP at the headphone input, it won’t be very loud, but if you don’t hear anything … suspect the headphone circuitry (including socket if used). Using BP at the junction connection of C1 and R1 it should be louder as Tr1 provides amplification.

If not, suspect problems with the BC108 stage. Applying the audio frequency (AF) probe of the BT at the same point should provide audio from a broadcast station. However, if you’re not sure whether the detector stage is working - apply the BP to the r.f. side of D1 (tuning side). If nothing’s heard … change the diode and make sure the polarity is correct.

Radio Frequency Amplifier

Next, we move on to the receiver featured in May 1998 on page 16 (Receiver 2, Fig. 2). Here the same tests for Receiver 1 can be applied. However, to test that the interstage coupling is OK, you should apply the BP to the MPF102 side of the 500pF capacitor. If all is well, then apply BP to the tuned input (Gate) of the MPF102.

You can also apply the radio frequency (RF) probe of the BT to either side of the 500pF capacitor to listen for the signal coming from the BP. If neither test produces a signal, check the resistors, the choke (r.f.c.) and the MPF102 itself.

The Traditional TRF

Now we’re moving on to the ‘traditional’ tuned radio frequency receiver (t.r.f.) (Receiver 3, Fig. 3), which was featured on page 17 of the September 1998 PW. This receiver employs a very sensitive (but easily overloaded) regenerative detector stage (Tr2).

You can check for any a.f. output by using the BT 'AF' probe on either side of C7. You should hear a gentle ‘pop’ from the tracer’s loudspeaker as the regeneration control R6 is operated - accompanied by a gentle ‘hiss’ if the stage is operating satisfactorily, which is caused by the regenerative detector stage.

If all is well, leave the BT connected (either side of C7 will do) and apply the probe of BP very close to, but not actually touching (this is very important!) the L2 side of C5. In this way you’ll be applying enough multivibrator signal to the (sensitive - if it’s working!) detector, but at the same time avoiding ‘blocking’ it.

Very many experienced constructors have been caught out by thinking that a regenerative detector is insensitive when, in fact, they’ve actually ‘blocked’ it with too much signal! So, please avoid this trap! However, if all is OK and you can hear the multivibrator’s tone - you can proceed to test the input side of L2 on the L2 side of C4. Suspect the coil, its tuning or coupling if you can’t receive anything as you tune the receiver.

Next, if the receiver seems rather ‘deaf’ apply BP to the Gate (G) on Tr1. If the stage is working well (in other words - amplifying the signal) a signal applied to G on Tr1 should appear to be louder than a signal produced by applying the BP to the Drain (D) side of C4. If not, carry out the tests and replacements already described for Receiver 2.

The 3.5MHz Converter

Next in line for treatment is the ‘Radio Basics’ 3.5MHz to medium wave converter project (Receiver 4, Fig. 4) described on page 13 of the November 1998 PW. This, as
you'll remember, was used in conjunction with a car radio operating over the lower end of the medium waveband.

Obviously, you can easily check that the car radio is working satisfactorily by connecting a suitable antenna to the coxial input. But to familiarise yourself with how the BP's test signal will sound after passing through the receiver's circuitry, you can apply the probe near to (but not actually touching) - you can place a thin sleeve over the probe if you wish - the antenna input socket to provide enough coupling so as not to overload the receiver. This action will provide a useful reference experience for (possible) future fault finding.

Testing of the converter's i.f. (medium wave with the 'down converted' 3.5MHz signals) output can be done at the BP test points on either L3A or L3B. On the L3B side you'll probably hear the BP signal plus medium wave stations as the probe will also act as a simple antenna. The L3A side provides a complete check for the assembly (which is of course the i.f. output tuning and coupling circuitry for the tuneable intermediate frequency (i.f.) provided by the car radio).

Test point BP on the Gate (G) of the Mixer's MPF102 should provide a fairly loud signal, although this stage does not provide much signal 'gain'. However, the test signal should be heard. Test the r.f. stage in the same way as I suggested for the r.f. stage in Receiver 2.

Basic testing of the two oscillators used in the converter, the local oscillator and the beat frequency oscillator (b.f.o.), is best carried out with an electronic 'sniffer' device. Much favoured by 'Carrying On The Practical Way' author, the Rev. George Dobbs G3RJV (and myself) - they are very simple to make and use.

All you need is either a sensitive multimeter, a diode (the same type used for your 'crystal' diode receiver will do) and some stiffish copper wire (preferably enamelled to provide insulation). Using a pencil as a former you should then wind a coil of about 10 turns and provide 'lead out' of around 100mm to enable connection to the meter.

The assembly can be made on a length of plastic tube (an old ball-point pen casing minus the ink reservoir is ideal). Position the 'sniffer' coil so that it's just clear of the pen barrel and tape the wire leads to the sides. One lead (eventually terminating in flexible wire) can go straight to the meter's - (negative or 'common') socket. It should be switched to 1V or less range for this test - but when testing other equipment you should always start off with a 10V (or similar higher range) and then select a suitable range to provide full scale deflection (f.s.d.) with the signal produced. This precaution could save your meter from damage!

The other lead is cut (either side of the tape) so that a diode can be connected. Connect one end of the diode (polarity not important) to the coil end and the other to the meter lead. (Polarity is not important, because if the meter needle moves in the wrong direction you simply change over the connections).

Note: A suitable probe was described - full details complete with simple printed circuit board design - in his 'Getting Started The Practical Way' article by the Rev. George Dobbs G3RJV on page 32 of the August 1991 PW. Photocopies are available from PW Book Service.

In use, you just place the probe near the drain (D) circuits of the MPF102 f.e.t. transistors. Depending on your meter you should get a strong deflection if the oscillator is generating r.f. signals. Generally speaking the oscillators are relatively 'generous' in output and you should have no problems in detecting their outputs with the 'sniffer'. If you've built the 'Tiny Dipper' you can (with the appropriate coil plugged in) 'tune' for the signals with the power off (Dipper switch in 'Wavemeter' position) and look for an indication on the meter. This should move upwards (with 'edge reading' type) or from 'zero' - depending on the meter you've used.

No Space!

I've decided - as I've no space left this time - to prepare a separate project to provide modulation on the 'Tiny Dipper' project rather than within this edition of Radio Basics. However, I hope you'll enjoy the test procedures I've described this month. You'll perhaps find them testing yourself - but interesting I'm sure!

Cheerio for now!
It's that time of year again and Neill Taylor G4HLX, our long-serving adjudicator, has been busy collating all the entries and here he is with the 1999 PW 144MHz QRP Contest Results...

The 17th Practical Wireless 144MHz QRP Contest on 20th June included all those features that we have come to expect from this day of low-power v.h.f. activity on a summer Sunday, with many good QSOs for most operators. Some additional highlights this year included a sporadic-E (sp-E) opening, bringing signals from as far away as Romania and a welcome appearance on the band from our esteemed editor, Rob Mannion G3XFD.

This year, entries were received from 63 stations with about half of them single operators and, although many more stations were active during the contest, the winners worked 283!

Overall Winners!

Amongst the entries were many of our regular competitors and, of course, a number of individuals and groups were entering for the first time - and it was one of these who achieved the number one spot in the results table! Congratulations to the Bristol Contest Group (MW1BCG/P) who achieved an impressive margin over our regulars the North Wales Wafflers (GW0NWR/P) in second place and Oldham Radio Club (G1ORC/P) in third place (who have both been overall winners in recent years).

The Bristol group comprises Matthew Jeffery G7ORR, Neil Powell M0AXF and Steve Tombs M1AHH. They operated from the summit of Pen-y-Gadair Fawr, one of the highest peaks in The Black Mountains, at 800m a.s.l., using an array of four 5-element yagis.

The rate at which they held QSOs at the start of the contest was phenomenal, with 91 contacts completed in the first hour. This gave them a lead which they maintained throughout the day, also clocking up an amazing 43 locator squares, including almost all UK squares plus a good number on the continent.

Fig. 1a: one of the photos sent in to Neill Taylor G4HLX, showing the sites chosen by this year's contenders, this is EI5IF/P in his four-by-four.

Rob Mannion G3XFD/P joined in the fun this year, and here he is on site on private farmland approximately 750m from the main road between Shaftesbury and Blandford Forum.

Their own comment was: "We used a new site with a 360° view, so worked lots of squares which were unusual for us, e.g. in EI/GI and north-west France". Their efforts win them the Practical Wireless QRP Contest Winners Cup and also the special prize of a 100m drum of Japanese-made "Super Low Loss" 5D-5B coaxial cable, kindly donated by Mike Devereux G3SED of Nevada. The North Wales Wafflers, as runners up, will receive some solar panels from Key Solar Products, generously offered by Bob Keyes GW4EED.

Scottish Stations

Amongst the Scottish stations, David Dodds (GM4WLL/P) achieves the top spot to gain the Tennamast Trophy in Memoriam to Frank Hall GM8BEX, donated and sponsored by Tennamast (Scotland) Ltd. David's success as a single-operator breaks the four-year sequence of wins by the Cockenzie & Port Seton Amateur Radio Club (GM0CLN/P).

Comments sent by the Cockenzie & Port Seton club show that they are most gracious in defeat: "We reckon that GM4WLL/P has won the Tennamast Trophy this year by a good margin. Many congratulations to him and if we can't win it with GM0CLN/P then at least it has gone to another Cockenzie & Port Seton ARC club member!".

Eire & Northern Ireland

A disappointing number of entries from Eire and Northern Ireland (see 'Keylines'), considering a reasonably high level of activity heard there during the contest. The chart is led by Peter Lowrie (GI7JYK/P),

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to win the PW EI/G1 Trophy Clock for the third successive year.

**Single Operator Stations**

Dave Hewitt continues to dominate the single operator stations, leading for the fourth year running, this year as 2C8ZRFJP, making use of the special commemorative prefix for the launch of the Welsh Assembly.

Dave had a serious challenge this time, though, from Mike Baguley (G3TLQD/P), only 18 QSOs behind Dave after careful scrutiny of the logs. The friendly rivalry between Dave and Mike has been evident in a number of recent 2m (144MHz) contests, but this is the closest they have been in a PW QRP contest, although both have been entering regularly for many years.

**Other Results**

You'll find lists of all the other results in the tables. Certificates go to all those listed under "Leading Stations" and also to the leading station in each locator square.

Congratulations to all. The full detailed results table will be sent shortly to all who submitted an s.a.e. now to the PW offices, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW or by visiting the contest Web site: http://home.neilLorg/contest where you will find not only this year's results table but also an archive of older results and various other information about the contest.

**Appalling Weather Conditions?**

For many hill-topping portable stations, appalling weather conditions made getting to the site and setting up the station a real challenge. The story told by Oldham Radio Club (G1ORC/P) is typical: "The day started nice and bright when we left, but as we got within 500 yards (457m) of the site the heavens opened and we were subjected to a very heavy shower which lasted for an hour and completely soaked the whole team.

"Our shelter is a big blue canvas sheet which we drape over a rock and make a lean-to shelter, trying to erect this in the wind and heavy rain, it looked more like a scene from the wreck of the Hesperus than a radio contest".

Those who travelled to their site the previous evening had it no easier, as at the North Wales Wafflers (GW0NWR/P): "The weather through the night was so windy, I was amazed we stayed on the mountain".

The high winds gave some entrants a hard time getting their antennas aloft, such as Barry G1JDP and Maurice G1JGE, operating as G1JDP/P: "The weather was windy, about 30/35mph (48/56kph) and caused a few problems erecting the mast and antenna. We used two 10ft poles joined together with a new internal scaffolding connector, but we found that this was not strong enough to take the weight of the rotator and the 17-element beam - while being hosted up, it bent. We tried a second connector, but it did the same".

The Macclesfield & District Radio Society (GXM4WS/P) were another group suffering from the weather: "Our start was delayed by heavy rain while erecting the antenna mast (not too nice operating when soaked to the skin)". But for most stations it had become dry by the time the station had to be dismantled.

Tony Crake (G0OVA/P) experienced "torrential rain and a howling gale rather like being at the wrong end of a jet washer", but later "the weather did improve greatly and I was able to take off my clothes and hang them on the roof rack to dry out!" It wasn't wet for everyone though. For example, the comment of the Cornish Choughs DX Group (G4STBL/P) is simply: "WX brilliant".

**Poor Propagation?**

For most of the day, the poor weather was matched by generally poor propagation, according to most operators. Dave Hewitt (2C8ZRFJP) found "no real DX this year from my QTH, the afternoon conditions were terrible, with long periods of noise".

David Dodds (G4WLL/P) writes "conditions could best be described as peculiar. At 1030UTC I was seriously considering digging the linear out of the boot, giving away points and then going home! An hour later things were really quite lively but conditions were up and down all day." Peter Thompson (G8DDV/P) goes further: "propagation was poor, I think that my score is the worst since I started doing the contest".

However, although many operators didn't notice it, for a period of about an hour around midday there was a major sp-E opening to Hungary and Romania, from a fairly broad area of southern Britain.

Several contacts well in excess of 2000km were made. Some who heard a little of this could not believe their ears, like Lawrence Atkinson (G4FAAP): "thought I heard a YO but probably only in my dreams!" Some others succeeded in working the DX and were very happy about it, such as Mark Tuttle (G0MTT), who "worked YO3JW in KN34. My best contact on 2m Ever!"

But many stations who heard the Romanians, found it hard or impossible to get through to them with 3W, partly because the opening suddenly attracted a number of high-power stations onto the band.

Tony (G0OVA/P) noted "the major sporadic-E event in the middle didn't help. This brought out the QRO stations so the racket was terrible for about an hour".

**Dirk Everaet (ON1AE) also notes:** "there was trouble working stations because there was sporadic-E and the big guns working over the long distance. I have heard YOMPR/P in KN34AW, YO4BDW/P in KN27GD, YO4WZ/P in KN44EW, but with 2.5W I wasn't able to work them".

Another problem...
Thankyou Neill!

On behalf of everyone on the PW Editorial team and the many enthusiasts who enter the contest every year, I would like to pay tribute to Dr. Neill Taylor G4HLX’s continuing hard work organising, adjudicating and overseeing the event. It’s a truly year-round effort and Neill manages despite tremendous international commitments ranging from the USA to Geneva. So, thank you Neill - for all your many years hard work. Here’s to the future and the 18th event!

Rob Mannion G3XFD, Editor PW.

Fig. 2: G4HLX/P with assistant Katherine 2E1HFX on the Berkshire Downs near Wantage.

was that some of the YO stations appeared uninterested in working contest stations. Tony (G0OVA/P) writes “I worked YO6DBA/P (KN36) but he yelled at me ‘no contest, no serial numbers’. I actually logged seven other unco-operative YOs.” At the Burnham Beesches Radio Club (GGWIR/P), too, “stations in YO-land were heard, but wanted DX not G contest stations”.

Editorial Excitement

Apart from this opening, another bit of excitement was hearing our very own PW Editor, Rob Mannion (G3XDF/P), on the air. The Cornish Choughs 1X Group (G4STB/P) remarked “nice to hear Rob on the air”, as did several other entrants - and yes, G4HLX/P was back on air for the contest this year, after a two year absence while overseas. It was pleasant to work many of our regular contest operators again, assisted by my daughter Katherine 2E1HFX (See Fig. 2).

You will probably have read more about Rob’s exploits in the contest in his article in the September 1999 issue of Practical Wireless. Rob sent me his log as a checklog, since he probably felt that his famous callsign put him at an unfair advantage in attracting QSOs. Actually I’m not so sure, as everyone wanted to stop and chat with him, which might have slowed down his contact rate.

Anyway, I’m pleased to say that, if Rob’s log had been scored as a normal entry, it would have put him at a very creditable 20th place in the results list.

While some operators were having trouble believing the YO callsigns they were hearing, others were puzzled by the 2C prefixes used by some of the Welsh stations. At least one operator wrote the calls in his log believing that he must have made a mistake.

Mike Baguley was one who used the special commemorative prefix, as 2C7LQD/P. His comment is “the 2C callsign proved novel, although I did spend quite a lot of time explaining what it was all about. It was rather a mouthful and I shall be glad to get back to GW”.

Declining Numbers

It’s sad to see the number of stations entering the contest declining again this year, continuing the gradual downward trend since the peak in 1983. There has been a similar pattern in all v.h.f. activities and not just this contest.

When it was announced that Novice licensees were to be given access to the 2m (144MHz) band, we hoped that this would be in time for the contest. Unfortunately, the new regulations came into effect just one day too late, on 21st June! Still, we hope that Novice stations will boost the activity in next year’s QRP Contest. It’s an ideal event for the newcomer and, as an inducement, we hope to be offering a special award for the leading Novice station entering our year 2000 contest.

There were, of course, a number of Novice operators as members of the team in some of the groups in this year and, as always, some operators were having their first taste of v.h.f. contesting. Derek Southey GOEYX and Stan Houlding G0BYA, both keen c.w. operators, were in the contest as GOEYX/P.

Derek writes: “this was our very first contest and we both had a super day’s activity and all so friendly. We intended to do the contest using only c.w., but this was not to be - we called for 20 minutes and achieved only one QSO! It is regrettable that there is not more c.w. activity, as this is not to be one way of getting the most out of QRP. Some stations do revert to this mode towards the end of the contest, when it all gets rather quiet, presumably in the hope of ‘winkling’ out those few really distant contacts which couldn’t quite be achieved on s.s.b.

Now here’s an idea from the North Wales Wafflers (GW0NWR/P): “The camp cook’s Chilli con Carne was even better than last year (it seems to get hotter each year). We really ought to have a contest operators recipe spot in PW! Any other contest groups care to share with us their culinary secrets for a successful portable station?”

Next Year

So, that brings us to thoughts about next year’s contest. Several entrants remarked about their plans to make improvements to their stations. The Macclesfield and District Radio Society (GX4MWS/P) were one group who vowed “we will be back next year and hopefully we will be a bit slicker, quicker and better prepared” and it’s never too soon to start that preparation!

Most entrants could think of a few things they would like to improve: whether it’s a better portable site; a better antenna or one that’s easier to erect (in bad weather?); some improvement to the receiver performance maybe (how did yours cope with all those strong signals?); lower loss feeder; better microphone and headsets; better logging arrangement - be they paper-based or by computer; better power supply (one that doesn’t involve flattening the car battery!); or maybe just a hotter Chilli! Whatever your needs, now is the time to start planning.

The date of the next PW 144 MHz QRP Contest will be Sunday 18th June 2000. Let’s hope that we’ll all be able to make it a really special event - look out for the rules and other details in Practical Wireless next year.

Finally, my thanks to all who supported the contest this year. The logs were generally in good form for my job of adjudication and I really did appreciate the substantial number of entrants who made use of the new facility to send their logs by E-mail. So until next year ...

Neill Taylor G4HLX

Practical Wireless, November 1999
### Leading Stations Using A Single Antenna

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<th>Position</th>
<th>Name</th>
<th>Callsign</th>
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<td>1</td>
<td>Dave Hewitt</td>
<td>G0OVA/P</td>
<td>6-14m</td>
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<tr>
<td>2</td>
<td>Tony Crake</td>
<td>2C2ZRE/P</td>
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<td>Peter Thompson</td>
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<td>4</td>
<td>Colin &amp; Jo</td>
<td>G0JVR</td>
<td>12-14m</td>
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<td>5</td>
<td>Bristol contest Group</td>
<td>G01ORC/P</td>
<td>14-16m</td>
</tr>
<tr>
<td>6</td>
<td>Tony &amp; Judy</td>
<td>GW0ZOP</td>
<td>16-18m</td>
</tr>
<tr>
<td>7</td>
<td>David &amp; Other</td>
<td>G44FL/P</td>
<td>18-20m</td>
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<td>Tony &amp; Judy</td>
<td>G01ORC/P</td>
<td>20-22m</td>
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<td>G01ORC/P</td>
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### Leading Single Operator Stations

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<th>Squ</th>
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<th>Ant</th>
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<td>Mike Baguley</td>
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<td>2x9Y</td>
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<td>2330</td>
<td>106</td>
<td>20</td>
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<td>17Y</td>
<td>400</td>
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### Leading Stations

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<th>Overall Winners</th>
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<td>Runners Up</td>
<td>North Wales Wafflers</td>
<td>GW0NWR/P</td>
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<tr>
<td>Leading Single Operator</td>
<td>Dave Hewitt</td>
<td>2C2ZRE/P</td>
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<tr>
<td>Runner-up Single Op.</td>
<td>Mike Baguley</td>
<td>2C2ZLG/P</td>
</tr>
<tr>
<td>Leading Fixed Station</td>
<td>Paul Baxter</td>
<td>G42VYN</td>
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<tr>
<td>Leading English Station</td>
<td>Oldham Radio Club</td>
<td>G1ORC/P</td>
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<tr>
<td>Leading Welsh Station</td>
<td>Bristol Contest Group</td>
<td>MW1BCG/P</td>
</tr>
<tr>
<td>Leading Scottish Station</td>
<td>David Dodds</td>
<td>G44MVLP/P</td>
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<tr>
<td>Leading N. Ireland Station</td>
<td>Peter Lowrie</td>
<td>G1J2K/P</td>
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<tr>
<td>Leading Elre Station</td>
<td>Pat Molloy &amp; Gareth Martin</td>
<td>EISIF/P</td>
</tr>
</tbody>
</table>

Just a reminder that the 18th PW 144MHz QRP Contest will take place on Sunday 18th June 2000.
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Practical Wireless, November 1999


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<td>TS-800SD HF MINT BASE 240V</td>
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<td>TS-680SAT HF / 6M / 50W</td>
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Practical Wireless, November 1999
The Ups And Downs Of Mountain Scenery...

Phil Davies M0AYB describes how he took part in the 1997 and 1998 PW 144MHz QRP Contest in the Lake District. He describes equipment and antennas used as well as a list of safety points which you might like to consider if you would like to take part in QRP in the lakes - or wherever!

First Effort

My first effort at the PW 144MHz QRP contest was in 1997, using an Icom IC-706 rig on open ground near Egremont, just to the west of the mountains overlooking the Irish Sea. To gain the last few metres of height, the rig was set up on the top of a small hillock, with a trailing power lead connected to my car in the field nearby.

The site, at an elevation of over 100m, had the benefit of a clear take-off south (to North Wales), west (to the Isle of Man and Ireland) and north (to the south western part of Scotland).

On the other side of the coin, the mountains rising behind made it difficult to make contacts with any station in the eastern half of the compass. Using a newly acquired Tonna 9 element portable Yagi (see Fig. 1), I made 495 points (49th position), a reasonable first effort at a contest.

Encouraged, I bought a second hand Yaesu FT-290 Mk II (See Fig. 2), apparently known in some circles as the Electric Handbag (sorry, Yaesu). This is a popular 2.5W portable rig, having the benefit of an internal power pack holding rechargeable NiCad cells.

The next effort at a contest was a disaster. In summer 1997, I carried the Yaesu and the Yagi to the top of Black Combe for one of the series of RSGB 'Backpackers' contests. Located at the south western corner of the Lake District, and at 600m, Black Combe is a promising take-off point for the south and west.

Unfortunately, because of a problem with the charger, the new batteries, despite showing working voltage, hadn't been fully charged. They died within a few minutes of pre-contest listening and I had to pack up and trudge back down the mountain without making a single QSO.

Lesson number one, was learned the hard way! I've now learned to charge and gain confidence in new NiCad batteries in general use before recharging them and relying on them in a remote spot.

Another high Lake District peak, with a proven track record in v.h.f. contests and good take off towards the south, is Coniston Old Man, at 801m. This is generally occupied by other stations and, after the Black Combe debacle, for my 1998 contesting I sought another high location.

After much study of Ordnance Survey maps and some field trials with a handheld transceiver, I decided to try Skiddaw, locator IO84KP. From the top of Skiddaw (see Fig. 3), at 931m, there would still be mountains between my station and almost all the others in the contest, but it has the advantage of being the highest point in the northern part of the range.

Morning Of The Contest

On the morning of the contest, it was dry, but the cloudbase sat at around 500m, half way up the mountain. I had an early start, allowing two hours to walk from the car park (at 290m) up the main walker's route to the peak about 5km away. I made it to the top at the contest start time, but encountered increasingly violent weather en route: fine spray within the clouds, and strong wind whipping across the peak, making it quite difficult to walk.

I had a choice - locate myself on the highest point, where take off would be slightly impeded by a rocky ridge to the south, or on the south edge of the ridge, with better take off south, but less elevation and impeded to the north. I chose the highest point.

Having got to the top, I ducked for cover behind a small drystone windbreak wall and contemplated the next move.

Even in the lee of the wall it was chilly - lesson number two (fortunately well known by me) is to have plenty of warm and weatherproof clothing for such trips.

Fig. 1: The Tonna F9FT 9-element portable antenna which Phil uses for 144MHz

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Fig. 2: Phil MOAYB uses a Yenue FT-290 MkII 2.5W portable transceiver for his portable contesting.

Although the cloud cleared away, the wind continued to be a problem all day, and, at times, it was shrieking past the antenna. The main operating problem was to keep the antenna pointing in the desired direction.

One station reported that I'd dropped down in QSB, but I had enough of a signal to be able to report that the problem was due to the beam swinging around in the gusts.

Eventually, I tied a length of washing line (of course) to the tip of the boom, and from the shelter of my windbreak, used this to stabilise the antenna and pull it round to positions within a limited arc. It was rather like adjusting the set of a sail.

During the morning, the fell walkers started arriving, some apparently dismayed that I'd laid claim to the least draughty spot on the summit. As a windswept ambassador for the hobby, several times I endured the ribaldry "... it's a draughty place up there."

The wind dropped slightly during the afternoon, enabling me to add the third section of the antenna and raise it to its maximum height, which is only about 2.5m I need a more ambitious mast, I think.

The majority of contacts had been made within the first three hours of the contest, and by later in the day, things were getting quiet. I heard a weak Belgian station at one point, but couldn't make the contact. I was, however, pleased to make my single f.m. contest contact of the day on Channel 22 with enterprising GW0PZ0/P. I had assumed that all the action would be on s.s.b. around 144.300MHz and was only scanning the f.m. channels around 145.500MHz to see what else was happening in the world.

I'm already studying the OS maps again, looking for the site that could put me into the big time next year. My 1998 contest result, was an improvement on 1997. I got as far as JO01 (G1WKS/P, in Kent?) this time, diagonally in the opposite corner of England, so maybe I'll get across the Channel in 1999? Alright, I didn't make the highest score in 1998, but perhaps I had the highest station!

**Out & About**

If you are not familiar with being out and about on high mountains, consider the potential hazards before you embark on a remote portable operation. Here are some suggestions for controlling risk and having a safe and enjoyable day out:

1. Don't bite off more than you can chew. The radio and other equipment you will need will probably add up to a fairly heavy rucksack load. Experience transporting the equipment and portable operating at a near-civilisation or low-level location before committing yourself to a high altitude or remote contest site.
2. Be accompanied if possible. If you must operate alone, you will be safer at a location which is frequented by others, such as a popular walker's destination.
3. Recognise that, if mist descends, you will be disorientated. You need to be aware of your locations and options for 'escape routes' at all times. A proper map and compass should be carried on all but the smaller hills and you should know how to use them. A satellite navigator could be useful as well, although I haven't yet tried one.
4. Let someone responsible 'back at base' know where you are. They should have an agreed action plan to implement if you are late returning. You may have encountered a problem and be in need of assistance.
5. A mobile phone will work from many locations. If you've got one, take it for emergency backup.
6. You may be out in the weather for many hours (for example, 11 hours in the case of my Skiddaw event). The mountain tops are often much colder, windier and wetter than lowland or valley locations and you should have warm and weatherproof clothing with you, even in mid-summer. Good sun protection is advisable too, including a hat.
7. Use proper mountain footwear to avoid slipping and to protect your ankles from twisting.
8. Leave plenty of time for the whole event. Unless you plan to camp out, this includes walking off the mountain with daylight to spare.
9. Take plenty of food and drink.
10. Be prepared to quit early or turn back if the weather turns unfavourable. Get the antenna down and get yourself off the top at any sign of lightening.

With all that in mind, I hope that you decide to have a go at mountain top contesting - it has it's advantages!
In the second of his three part series on microwaves, David Butler G4ASR takes a look at some microwave activity and equipment including the klystron transceiver and the Gunn diode ... plus much more besides!

Microwave Activity

Amateur Radio microwave activity in the UK started nearly 60 years ago in January 1950 when the first recorded two-way contact on the 10GHz band took place. The contact between G3LZ and G3BAK (now VK5ZD) across the Manchester Ship Canal was over a path of less than 3km. The equipment used consisted of a low power klystron (a microwave valve) transmitter/receiver arrangement, feeding a small parabolic reflector.

The 10GHz band was virtually the only microwave band that experimenters could use at that time. The release of government surplus radar equipment, which operated at 3cm wavelengths, provided an abundant source of waveguide components. Waveguide consists of a hollow pipe (often rectangular but it can be round) usually made of brass or copper. It's used to carry s.h.f. signals from one part of a system to another just like you do with coaxial cable. However, unless coaxial cable is very specialised and specifically designed for microwave frequencies, it will be very, very lossy.

On the other hand, waveguide is relatively low loss, usually one or two orders of magnitude lower than coaxial cable when used at the same frequency. Waveguide differs from cable in that the cross-section of the guide is related to the frequency in use. Therefore, the size of waveguide must be selected for the particular band in use. Because of this, waveguide is impractical for use on lower frequencies such as the 1.3GHz and 2.3GHz bands.

Another aspect of using waveguide is that, due to its physical size, components can be built inside it or around it. These components include frequency sources, mixers, filters, directional couplers, screw tuners, attenuators, wavemeters, in fact everything you would find in a transmitter/receiver system. Individual waveguide components containing these items are then bolted together to form a complete r.f. system.

The Klystron Transceiver

For 25 years or so, the klystron transceiver was the only practical method of getting onto the microwave bands. The most popular klystron during this period was the 723A/B which was configured as an oscillator producing an output of around 30mW.

The reflex klystrons, such as the 723A/B were designed to work between 8.5 to 9.6GHz but enterprising amateurs found a way of adjusting the device to enable it to work around 10.1GHz. The 723A/B, similar in appearance to a small metal octal valve (i.e. metal covered having an 8-pin base), was often used as the frequency source for both the...
transmitter and the local oscillator (lo) for the receiver. On receive, a simple diode (such as a 1N23E) was configured as a mixer picking up the receive signal with no pre-amplification. Full duplex (that is simultaneous transmit and receive) contacts using frequency modulation (f.m.) in occupied bandwidths of 200kHz were the order of the day. A similar arrangement using a 726A klystron could also be used on the 3.4GHz band. Unfortunately, this type of equipment consisted of a large amount of microwave 'plumbing' which was rather bulky. You needed a waterproof and windproof enclosure for the klystron and a whole bundle of waveguide based components such as a directional coupler, mixer mount, wavemeter and changeover relay.

The klystron valve also required a power supply unit (p.s.u.) with outputs of 6V, +400V and -150V. All this to produce a low-power, wide band f.m. transceiver that was generally unstable and definitely very insensitive. Little wonder that it tended to deter many operators from trying microwaves. But those that did had great fun in proving that they could work some reasonable distances with equipment that could almost be likened to microwave crystal sets!

The Gunn Diode

In the mid-1970s a solid-state device called the Gunn diode appeared on the surplus market which effectively brought to a halt the use of cumbersome reflex klystron transceivers. Although the output power levels are comparable to the 722A/B klystron, the Gunn device only requires a simple p.s.u. of around 10V at 150mA.

The frequency drift from switch-on with a Gunn diode is relatively small (but only suitable for wide band operation) and it can be tuned up to 500MHz by a single knob control. Like the klystron predecessor, the Gunn diode is easily modulated to produce wide band f.m. of a very acceptable quality. The Gunn source is both a transmitter and a receiver at the same time just like the old klystron duplex system. The Gunn diode is placed inside a piece of suitably-dimensioned waveguide operating as a free-running cavity oscillator. It transmits the microwave energy out of the waveguide into a small piece of suitably-dimensioned waveguide operating as a free-running cavity oscillator. It transmits the microwave energy out of the waveguide into a small (horn) antenna. The system also receives at the same time by using the same Gunn source as a local oscillator and mixing it with the incoming receive signal from the other station. That is used to produce an intermediate frequency (i.f.) determined by how far apart each Gunn frequency is separated from the other Gunn frequency. For example, if one station operates on 10.100GHz and the other station operates on 10.200GHz then the i.f. frequency for both stations is the difference which, in this case, is 100MHz.

The receiver is still insensitive because it uses nothing more than a mixer diode mounted inside the waveguide. However, some advances have been made to reduce the noise figure and a standard f.m. portable radio (or scanner) operating at 100MHz is often used as a simple tunable i.f. stage, detector and audio amplifier.

Using small parabolic antennas (such as the 460mm PW dish), many operators would go out portable from the hill tops to make wide band f.m. contacts up and down the UK. In August 1976 a new world record was created when G4BRS/P (The Barry Radio Society) operating from Cornwall contacted G3WDD/G4DDK in south-west Scotland over a path of 521km. They were using simple 10mW Gunn transceivers to small dishes 600mm and 750mm in diameter. The signals were exchanged directly on the 10GHz band and were some 45dB above the noise floor - very strong indeed.

For over 25 years all microwave contacts were conducted using wide band f.m. systems. However in the last 1970s a small group of UK amateurs started developing more complex narrow band systems for use on the 10GHz band. Narrow band in this context means modulation modes with bandwidths of 3kHz or less, nowadays taken to mean s.s.b. or c.w.

There are a number of reasons why the group went to all the effort of doing this. Primarily this was because the use of a very stable transmitter and receiver allows the receiver bandwidth to be reduced considerably improving the carrier/noise ratio. For example, by going from a 200kHz bandwidth to 200Hz you get (10log200/0.2) a 30dB increase.

In practice, a narrow band system will give much better receiver performance and you can run much less transmit power than the equivalent wide band system. Of course, nowadays, more power and more sensitive 10GHz receivers give even greater system performance.

Narrow Band Systems

The original narrow band systems consisted of a crystal-controlled v.h.f. oscillator running a few watts output driving a chain of varactor diode multipliers. This provided a stable c.w. or n.b.f.m. transmitter with an output power of a few milliwatts. The receivers still used simple diode mixers as there were no transistor devices available at that time that would work as pre-amplifiers or mixers on the 10GHz band.

One microwave enthusiast Mike Walters G3JVL went one better and developed a waveguide based transverter system that translated a 144MHz c.w. or s.a.b. signal up to 10.388MHz, the narrow band section of the 10GHz band. However, the unit still lacked any form of receive amplification and the output power was often less than 1mW.

It was in the early 1980s that a step jump was made in the development of Amateur Radio microwave equipment. One of the reasons for this was the availability of transistors and other components designed to work at frequencies up to 12GHz. This was a spin-off from new technologies such as satellite television and terrestrial microwave communications.

Microwave Sub-Systems

Two amateurs, Sam Jewell G4DDK and Charlie Suckling G3WDD were instrumental in the late 1980s for the development of state-of-the-art microwave sub-systems. Sam had designed various high stability oscillator sources for use at frequencies up to 2.5GHz and Charlie used these as an integral

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part of a solid-state narrow band transverter he had
designed for the 10GHz band.
The photograph, Fig. 1, shows a typical
G3WDG/G4DDK kit system. Transmit power levels of
100mW and receiver noise figures of 2dB were now
being achieved. The point to note here, is that these
modern designs use no waveguide whatsoever.
Everything is constructed on a printed circuit board of a
suitable dielectric material and uses small coaxial SMA
connectors with 0.141 inch semi-rigid cable for module
interconnectivity as shown in the photograph, Fig. 2.
The only place you may find anything resembling
waveguide is associated with the antenna. Narrow
band techniques really are plug-n-play. Once it's
working you don't need to touch it again, just apply
12V and away you go!
However, the downside to all this was that, virtually
overnight, everyone stopped using their
earily constructed wide band f.m. systems and
committed themselves to the new but complicated
technology.

Tremendous Growth
During the 1990s the tremendous growth in
commercial satellite and microwave systems enabled
Radio Amateurs to reap the benefits of new devices
and surplus equipment. Satellite TV technology in
particular has opened up another method of receiving
signals on the 1.3GHz and 10GHz bands.
A low-noise block down-converter (l.n.b.)
consisting of a feed horn, local oscillator source (a
dielectric resonator called a d.r.o), mixer and
associated r.f. components can be easily modified to
cover the 10GHz band. It's also possible to use the
d.r.o. as a reasonably stable, low power transmitter in
its own right.
The indoor set-top satellite receiver usually covers
the 750-1800MHz band, providing a ready-made
receiver for television, data or f.m. telephony modes on
the 1.3GHz band. (I will provide more detail about this
next month).

It's now also possible to buy 'off-the-shelf systems,
either ready made or in kit form, for all amateur
bands from 1.3GHz through to 75GHz. The
availability of low noise amplifiers, transverters, high
power amplifiers, antennas and specialist feeder
cables has revolutionised microwave construction.

Many stations now have a system capability which
allows operation from home instead of going out
portable on the hill tops. Noise figures of 1dB and
solid-state powers of around 5W on the 10GHz band
are now easily attainable.

Surplus travelling wave tube (t.w.t.) amplifiers
have been available for a number of years enabling
stations to run many tens of watts on this popular
microwave band. Even moonbounce contacts have
been made on the 10GHz band by a few UK stations
and it doesn't stop there.
The 24GHz band has also seen a dramatic change
from wide band to narrow band modes with the
introduction of surplus equipment and commercial
kits. The 47GHz band has seen a shift to narrow band
operation although wide band systems still
predominate.

On lower frequencies, surplus C-band satellite and
terrestrial communication equipment is being pressed
into service on the 3.4GHz and 5.7GHz bands. A number
of stations have solid-state tetrode amplifiers on the latter
band running 10W output and a few operators have
been lucky enough to procure 100W units!
At the bottom end of the microwave spectrum, 1.3GHz and 2.3GHz, even more power is readily
obtained nowadays from solid-state devices provided
you have the money to pay for them. If you can't afford

solid-state power amplifiers then TV transmitting
valves such as the YL1050 or YL1052 are available on
the surplus market. These are coaxial tetrodes and
various designs have been published for amplifiers
running up to 1200W output on the 1.3GHz band.

As an aside, I will mention that the break-up of
the former Soviet Union has provided opportunities
for the ambitious builder of real high power
amplifiers. Valves costing as little as £40, such as the
GS35b triode, can produce 1.5kW output on
frequencies up to 1GHz and the GS23b tetrode can
deliver 2kW output on the 430MHz band!

If you want to get started on microwaves you need
to decide which constructional technique, waveguide
or coaxial, is best suited to what you want to achieve.

For simplicity, a wide band waveguide-based
system using a Gunn source has much to commend
itself. It's inexpensive, easy to get going and will
provide you with much hill top fun. You can also use it
for data, telephony or TV links on a point-to-point
basis.

The same wide band modes can also be achieved by
modifying surplus satellite TV equipment, although
this does restrict operation to either the 10GHz or
1.3GHz bands.

If you want the ultimate in system performance to
work terrestrial or satellite DX, then you will need to
consider building (or buying) a narrow band coaxial-
based system.

Next Month
Next month I'll take a look at each microwave band in
turn and explain the various options
you have for the different
transmission modes. I'll also
be giving you details of where
to obtain specialist
components, what kits are
available and
where to find
that elusive
surplus
equipment.

In the meantime,
if you have any
questions relating to
microwave construction
please feel free to contact
me. My details are
shown in the "VHF
Report" column
of this magazine.

73 From
David G4ASR

Practical Wireless, November 1999
Antenna Range from ANTRONIX

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<th>Reference</th>
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<td>Yagi Beam</td>
<td>20-70 MHz</td>
<td>15 dB</td>
<td>MOONRAKER (UK) LTD. UNIT 12, CRANFIELD ROAD UNITS, CRANFIELD ROAD, WOBURN SANDS, BUCKS MK17 8UR. TEL: (01908) 281705. FAX: (01908) 281706.</td>
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<td>Yagi Beam</td>
<td>20-70 MHz</td>
<td>12 dB</td>
<td>MOONRAKER (UK) LTD. UNIT 12, CRANFIELD ROAD UNITS, CRANFIELD ROAD, WOBURN SANDS, BUCKS MK17 8UR. TEL: (01908) 281705. FAX: (01908) 281706.</td>
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<td>Yagi Beam</td>
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<td>10 dB</td>
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<td>Yagi Beam</td>
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<td>8 dB</td>
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<td>H8N10</td>
<td>Yagi Beam</td>
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<td>6 dB</td>
<td>MOONRAKER (UK) LTD. UNIT 12, CRANFIELD ROAD UNITS, CRANFIELD ROAD, WOBURN SANDS, BUCKS MK17 8UR. TEL: (01908) 281705. FAX: (01908) 281706.</td>
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**Accessories**

- **Audio Filter** - £29.80
  - **Description**: Clean your reception!
  - **Equipment**: Reduce noise and interference

- **Mounting Hardware**
  - **Description**: All galvanised
  - **Components**:
    - 4 elementos.
    - 12 elementos.
    - 18 elementos.
    - 24 elementos.

- **Base Antenna**
  - **Description**: 3.5 dB
  - **Components**:
    - 2 metros.
    - 4 metros.
    - 6 metros.

- **Halo Loops**
  - **Description**: 3.5 dB
  - **Components**:
    - 2 metros.
    - 4 metros.
    - 6 metros.

- **G5RV Wire Antenna**
  - **Description**: 30-60 MHz
  - **Components**:
    - 2 metros.
    - 4 metros.
    - 6 metros.

**Accessories**

- **Audio Filter** - £29.80
- **Mounting Hardware**
- **Base Antenna**
- **Halo Loops**
- **G5RV Wire Antenna**

**Contact Information**

- **Tel**: (01908) 281705
- **Fax**: (01908) 281706
- **Website**: www.moonraker.com
This month’s project has led the Rev. George Dobbs G3RJV to change frequency from r.f. to a.f. as he describes an interesting ‘tone detector’ idea. Ideal to help you get on frequency during that QSO, after all (of course!) the usual appropriate quotation!

There’s no doubt that the human ear favours the pitch of certain notes. If you go to a concert hall, before the concert begins you’ll notice that the musicians of the orchestra adjust their instruments to a note played usually by the Principal Oboe.

The musicians are tuning their instruments to 440Hz, which is referred to as ‘standard pitch’. This frequency was accepted by most of the Western nations at an international conference in 1939.

The earliest music written in notation was ‘plain chant’ and Gregorian Chant has become popular again with those who like relaxing music. In this music the cantor’s starting note is usually standard pitch A (440Hz) or the C above (512Hz). There’s certainly something that seems to please the human ear in the 400-500Hz range.

Unfortunate Product?

It’s has perhaps been an unfortunate product of convenience that’s led to 800Hz becoming the usual ‘accepted’ pitch for c.w. Morse reception. However, things can change!

Some time ago, that stalwart of the G-QRP Club Gus Taylor G8PG, did some research on using a lower pitch for receiving c.w. Not surprisingly he found that a pitch in the order of 400 to 600Hz appeared to be more comfortable for most experienced c.w. operators. An added bonus discovered by Gus was that the lower pitch allowed better discrimination between adjacent signals on the band.

In the days when I operated a separate transmitter and receiver and my receiver had a beat frequency oscillator (b.f.o.) pitch control, I often used quite a low pitch to listen to c.w. signals. However, it would seem that the commercial world has bequeathed us a tone of 800Hz for c.w. listening.

Modern transceivers have a fixed off-set for c.w. reception and to ‘zero beat’ the transmission with the other station, the operator has to adjust the pitch of that station to 800Hz. This technique should place the transmission on the same frequency as the desired station but relies on the operator being able to judge that pitch, although in many cases the sidetone of the transceiver does give an 800Hz note on transmission which can be used as a guide.

So, if the station being received sounds at about the same pitch as the internal sidetone (on transmit) all is well. Even so, the whole process is rather subjective!

Visual Indication

Some years ago I recall seeing a circuit which gave a visual indication of a specific audio pitch. The circuit used an LM567 tone decoder chip and I remember this device very well.

In the days when our sister publication Short Wave Magazine was primarily an Amateur Radio title, they published a circuit of mine, which used the 567 to provide a c.w. filter. It was an odd circuit where the 567 filtered the receiver audio output and any signal at 800kHz triggered an audio oscillator.

So, with that approach in reality the listener heard the audio oscillator rather than the actual signal. The circuit described below is very similar except that it triggers a light emitting diode.

"I heard a thousand blended notes while in a grove I sate reclined"

William Wordsworth,
(Lines written in Early Spring)
The circuit described below ... triggers a light emitting diode (I.e.d.), which illuminates when the signal is at 800Hz. This shows that the received station is at the required pitch to zero beat with the transmitter.

Phase Locked Loop

The LM567 chip contains a phase-locked loop and the pin designations are shown in Fig. 1. When the input frequency matches the chip's internal chosen frequency, Pin 8 goes low. (The internal frequency of the chip is set by the timing resistor and timing capacitor at pins 5 and 6).

The 567 is capable of detecting any chosen frequency between 0.01Hz and 500kHz. The bandwidth of the tone detection is set by the low pass capacitor at pin 2.

A practical circuit for tone detection is shown in Fig. 2. This closely follows the manufacturer's application notes for the device. In this circuit the potentiometer and the 0.01µF capacitor at pin 6 set the internal frequency. This allows for adjustment either side of the desired 800Hz frequency. I guess that a pre-set potentiometer would be the ideal choice for this application. My prototype used a small shaft driven potentiometer for ease of testing the circuit.

The circuit in Fig. 2, shows a 1µF capacitor used at pin 2 to determine the bandwidth of the circuit. This value gives a bandwidth of about 100Hz, which suited the application well. Increasing the value to 2.2µF would reduce the bandwidth to around 70Hz. (The individual constructor might like to experiment with this value).

The detected tone drives the I.e.d. which illuminates when pin 8 goes low. An LM567 chip works with a voltage in the range 4.75 to 9V.

As I imagine most applications of the circuit will be used with a transceiver that has a 12V power supply, I added a three pin integrated circuit voltage regulator.

Driven From The Top

The circuit works well being driven from the top of the audio gain control in most transceivers. Again, this is open to experimentation and other places in the audio chain of the transceiver could be tried.

The 0.1µF capacitor on the input isolates the circuit from the transceiver audio stage d.c. supplies. Set the frequency of the chip by 'ear' using a received tone on the transceiver or use an audio signal generator if one is available.

A refinement might be to build two of the circuits and set the internal frequencies a few tens of Hertz apart. The two I.e.d.s lighting would then mark the required pitch. This may be easier to use than hitting the exact frequency to light up the I.e.d. on a single circuit.

So, here's another 'illuminating' little circuit to try - have fun!
Top Class Performance - Budget Prices!
The ADI AR-147 144MHz FM Transceiver

Rob Mannion G3XF D reports on two interesting 144MHz transceivers the latest of which, the AR-147, incorporates ‘Air Band’ receive. He thinks they provide “Top class performance at budget prices”.

Early on this year, just before my holiday in Ireland, I was able to borrow a budget-priced transceiver - the Taiwanese manufactured ADI AR-146 to take with me as I was expecting to have a great number of QSOs during my visit using my new callsign EI5IW. I wasn’t to be disappointed, either by the number of QSOs with friends, or the performance of the transceiver!

To go with the original transceiver I’d also borrowed a replacement for my own antenna - which had been stolen from the roof of my car when (would you believe it) I’d been attending my local hospital as an out-patient! The replacement antenna was the beautifully made and extremely robust Comet SB15 Triband and it too performed beautifully, which was kindly provided by Nevada in Portsmouth.

I’m writing this report on the earlier AR-146 transceiver model and the new one (the ADI AR-147), which comes fitted with ‘Air Band’ receive because I know that there will still be many of the earlier rigs available.

Hidden Under A Bushel

The ADI range of equipment really does seem to be ‘hidden under a bushel’ when it comes to publicity and availability. As you’ll realise from my report, although we don’t know a lot about the manufacturers (the ADI Communications Corporation) the performance is in the ‘Top Class’ range and they really do provide excellent performance at budget prices - despite the two problems which I discovered on the transceivers.

The receive side of both the earlier AR-146 and the newer AR-147, are based around dual conversion superhet with the standard intermediate frequencies of 10.7MHz and 455kHz. The audio output is quoted as being 2W into an 8Ω load. Transmitter output on both 144MHz transceivers is a maximum 50W on n.b.f.m. It’s capable of being switched down from the 50W to approximately 25 and thence to 7W.

Cooling for the transceiver is provided by natural convection from the extensive heat-sinking fins on the rear. They do their work very well too!

What’s On Offer?

So, what’s on offer with the transceiver? What does it feel like to use? Well, in presentation it’s very small and compact and measures 140 x 40 x 166mm, with almost half of the physical dimensions being taken up by the heat-sinking.

The internally mounted loudspeaker is located under the top side of the casing.

Designed around a small, neat and ‘non fussy’ control panel (with main controls incorporating illumination) the transceivers are dominated by the back-lit, pale yellow coloured liquid crystal display (l.c.d.). screen. This, although it works well, can prove difficult to read in bright sunlight and some of the annunciators can be difficult to read.

The front panel controls are all neatly placed, easy to use and, even with my larger fingers, caused no problems during the long periods I had both transceivers on test. The fist-held microphones are also relatively easy to use. However, the microphones are also the source of the second of the only two problems I discovered with the transceivers (see comments under the heading ‘My Opinion’). As you’ll be able to see from the photograph, Fig. 1, the microphone has a host of controls - including the ‘tone burst’ for repeater working. It requires some dexterity in use!

Manual & Controls

The supplied manual is well written and readable, although some of the diagrams (referred to in the manual’s text) are not as clear as they could be. However, the 46-page booklet is very comprehensive. Incidentally, the manufacturers mention that the same manual covers the 430MHz version, the AR-447. So, apart from a higher frequency coverage and lower transmitter output you can assume it’s basically the same transceiver.

I’ll list the main controls and most important functions and facilities because to list everything that’s available will take up too much space! To start, it’s important to realise that the newer AR-147 comes ‘ready to go’ with CTCSS functions, especially useful as more repeaters in the British Isles are being so equipped.

Front panel controls include: PWR (power) switch,

Fig. 1: Close-up photographs of the ADR microphones, clearly illustrating the complex functions provided (see text for comments on repeater working). The newer AR-147 microphone (left) is provided with a ferrite sleeve.

Practical Wireless, November 1999
Audio distortion - often caused by poor mounting is long-term. The speaker - despite being a smaller unit copes very well. Pressing the **TONEDUAL** key is used for selecting sub-audible tone signalling modes and the required frequencies of the tones. The **DUAL** function allows you to 'watch' two different frequencies. This includes: listening on the dial frequency under M1, listening on the dial frequency and one memory, listening on the dial frequency and a memory frequency under scanning.

These are also 81 memories available. The data that can be stored includes: Receive frequency, transmit offset frequency, transmit offset direction (high or low), repeater access tone, CTCSS tone frequency, DCS code/polarity, continuous squelch code, CTCSS/DCS status, pager/con. squelch status, auto-repeater mode stays, DTMP transmit speed, DTMP transmit delay time. (Although not all apply here in Europe as yet).

**On The Air**

In reality most of us want to know 'just how did it work when on the air' when it comes to making a decision to buy a particular transceiver. Well, in answer to that often asked question I've got to say that both the AR-146 and later AR-147 worked impeccably for many hours over months of use.

Additionally, the transceivers were also reported to have very good audio reports on transmit - even though I'd initially found that I'd been talking (with my well known loud voice) too closely into the AR-146's microphone. On receive I must say that the AR-146 and '147 also proved remarkably sensitive and selective, coping extremely well with other transmissions close by both in frequency and physical terms when I was 'on air' from my car at the Longleat rally in July where I had much competition on adjacent channels!

As I tend to talk too much and brevity is not my style on air - the generous heat-sinking was put to the test in some QSOs! With the transceivers (not at the same time) mounted in the front passenger's foot well in my car I was able to judge just how hot the aluminium fins on the heat-sink got. However, they proved their worth and very quickly dissipated the heat when I operated the rig at maximum r.f. output.

The sensitivity of the transceivers was really 'tried and tested' with some extreme range mobile-to-fixed QSOs I had with Liam EI7FE and other friends in Ireland. In particular I remember working Liam (through hilly terrain) at close on 120km under difficult conditions.

If you're keen on 'Air Band' listening the AR-147 is available with this option. All that has to be done to access the 118 to 135.995MHz band is to turn to VFO mode, press the MHz key for one second and it will display 'A' on the I.C.D. screen. Pressing the MHz key for longer than one second returns the receiver back to the amateur band.

Audio output is more than adequate for mobile use and the speaker - despite being a smaller unit copes very well. Audio distortion - often caused by poor mounting is not a problem on this rig due to the innovative 'three-legged' suspension collar (see Fig. 2). Very nifty!

My Opinion?

In summing up, my opinion it's important for me to stress just how good these 'budget priced' transceivers are on air. Don't be put off by the lower prices - in this case, it really doesn't mean you're not going to get good equipment. On the contrary, they are good and very reliable.

The only complaints I have about both the older AR-146 and the newer AR-147 is that the main I.C.D. screen cannot cope with bright sunlight and the awkwardly placed repeater tone button on the microphone on both the AR-146 and 147. The former only requires the rig to be placed (as far as possible) out of direct sunlight so the screen can be easily read. The latter can be overcome by using a properly installed switching unit combined with a boom microphone for (legal)'hands free' operation.

I think we may hear more from ADI in the future and I'll look out for anything they offer for h.f. as it could be very interesting indeed!

My thanks go to Waters & Stanton PLC of Spa House, 22 Main Road, Hockley, Essex SS5 4QS, Tel: (01702) 206835, FAX (01702) 205843 for the loan of the review transceivers. The older AR-146 is no longer available (except second-hand) but W&S can supply the AR-147 for £199.95 plus £6 P&P. PW

**Manufacturer's Specifications**

**General:**
- Frequency range: Transmitter/receiver: 144-148MHz
- Receive only: (Air 2ndi.a.m.) 118 to 135.995MHz
- Mode: F3E (F.m.)
- Operating temperature: -20°C to 60°C (4°F - 140°F)
- Power requirements: 13.8Vdc ±15% (11.7 to 15.6V)
- Ground: Negative

**Receiver**
- Current drain: Transmit mode: Less than 12A
- Receive mode: Less than 600mA

**Transmitter**
- Modulation: Dual conversion superheterodyne
- Frequency range: 10.7MHz/655kHz
- Sensitivity (12dB SINAD): Less than 0.11uV
- Selectivity: 70dB
- Squelch Sensitivity: Less than 0.1uV

**Modulation**
- Spurious radiation: < 50dB
- Maximum frequency deviation: ±5kHz
- Audio distortion: ±6dB
- Microphone impedance: 500Ω
- Antenna impedance: 50Ω
- Frequency stability: ±10ppm
- Dimensions (w x h x d): 140 x 40 x 166mm
- Weight: More than 2W (8Ω load)
- External Speaker Impedance: 8Ω

**Rob's Review Score: 8 out of 10**
Hello once again and I hope you all enjoyed the various rallies and shows during the summer!

Did you experience the odd effects to radio propagation during the eclipse? I know I did.

Do you not find that fate conspires against you sometimes? At a rally a few weeks ago I noticed a Royal Navy transmitter for sale. I looked over the set and pondered if I should buy it but as I had never seen its matching receiver offered at any rally (though I have seen one in a museum) I decided against it.

Guess what I saw at a rally a few weeks later? Yes, you're right ... it was the matching receiver. Of course I had to have it and now live in the hope of finding the transmitter being re-offered at another show somewhere.

Made By Murphy

The receiver, Fig. 1, was made by Murphy in the early 1960s and is very nice indeed. The example I have is in excellent condition and, after a full tune up, is performing very well although the home-brewed power supply unit (p.s.u.) that came with the set did need a bit of attention.

In use, the set needs a 150V regulated high tension (h.t.) supply for the oscillators. The home-brewed p.s.u. had a stabiliser incorporated but, with the incorrect value of dropper resistor fitted, the regulator was in fact not firing and thus not holding the h.t. line stable. A quick application of the soldering iron and a new resistor soon sorted the problem.

The set is designated CAS or AP100335. The matching transmitter is (apparently) a Type 618, the set has 13 valves and is a single conversion superhet. With a tuning coverage of 60 to 550kHz and 1.5 to 30MHz the receiver covers the wide range this in a total of five ranges. The set has switched i.f. bandwidths offering 8, 3 and 1kHz and 200Hz settings. The beat frequency oscillator (b.f.o.) can be switched to provide a crystal calibrator function and the normally tunable local oscillator can also be crystal controlled for accurate 'spot frequency' operation.

I found that the receiver operated on the bands very nicely, although the tuning is a little 'tight' on the higher bands (but that's typical of this type of set). Stability after an initial warm up is good and the only problem experienced was with the gain change using the automatic gain control (a.g.c.) On and Off setting, but this might have been a fault rather than a feature.

Czech Set

Another receiver I have been playing with for a few days is a Czech set marked R4-1, Fig. 2. This very nice receiver covers 1.5 to 12.5MHz in five bands, has a built-in S-meter, which also doubles as various other options like allowing the different valve voltages to be measured. It even comes with a variable i.f. filter control which, at its widest, is suitable for amplitude modulation (a.m.) reception and, at its narrowest, ideal for c.w. reception.

High and low impedance antenna connections are provided together with high and low impedance audio outputs. Switched a.g.c., volume and r.f. gain controls and an antenna trimmer control all add to this receiver's features.

The power supply unit can run from 12V and uses a rotary generator for this purpose. When operating from the 'mains' the receiver employs a standard transformer type circuit.

The set has a crystal calibrator for accurate setting of the dial, the centre pointer of which is adjusted by a small screw slot to align it with 'zero beat'. Two pre-set positions can be locked into the dial on two spot frequencies.

In use, the set is very good. The ability to vary the i.f. bandwidth is ideal on the crowded bands and is very easy to use. The tuning, via the lower left knob (see picture, Fig. 2), is very positive with no backlash whatsoever.

Two Drakes

Now, how about the two receivers in Fig. 3, both from Drake in the USA? Both cover the Amateur Radio bands.

Although they're from the same well known 'stable', the two sets are separated by a few years. The receiver on the right is the older Drake 2-B, made around 1961 to 1965 and is a triple
conversion 10 valve superhet.

The set on the left is the Drake R-4C, made from around 1973 to 1979, again a triple conversion design, but this time incorporating six valves plus 15 transistors.

The 2-B receiver covers 500kHz segments from 3.5 through to 28MHz as standard with a spare five positions on the wavechange switch that could be used to install any 500kHz segment from 3 to 30 MHz.

A small modification allows 1.8MHz 'Top Band' to be fitted, as on my example. The main tuning dial has 1kHz divisions marked around the edge and tuning is quite good, but as it uses a cord drive, it's prone to slipping.

The intermediate frequency (i.f.) passbands of 3.6 or 2.1kHz and 500Hz are selectable as are diode or product detector demodulation, fast and slow a.g.c. and a noise limiter. A crystal calibrator could also be fitted as an option.

The R-4C receiver again covers the 3.5 to 28MHz bands as standard. However, it also has provision for a further 15 separate 500kHz segments to be fitted between 1.5 and 30MHz.

Usually, the R-4C usually came with only the s.a.b. filter fitted, the optional filters are mounted on the rear wall of the case so can easily be checked for their existence if purchasing a set. (The practice of making other filters an 'option' still seems prevalent today, even if you're spending thousands on a rig!).

The receiver has i.f. passband tuning, a variable notch filter and switchable a.g.c. speeds. Tuning is direct and very smooth, the R-4C as a whole is an exceptional set and a joy to play with.

Test Set

Although not often mentioned here when I write this column, I throw in the test set item, shown in Fig. 4, by way of a small change. The set in question, a BC-906D, is a Second World War vintage cavity wavemeter with a single valve amplifier.

The BC-906D was more or less the standard frequency meter used to tune up the United States Air Corps. IFF (Identification Friend or Foe) sets (Mk III). The BC-906D was used in various test set combinations (my database says 1E-13, 46, 48, 50 & 56) and (at least some cases) these test sets also included the BC-1066 Signal Generator.

Some information about BC-906D from the Surplus Schematics Handbook from CQ magazine of the 1960s says that: “The BC-906D is a frequency meter of the absorption type. Frequency range is 150 to 225MHz. The required voltages are 1.5V for valve heater, a type 185 and 45V for the anode supply”. (These were provided by batteries housed inside the case).

I fitted batteries and tried out this example and did notice a blip on the meter from my 144MHz transmitter but, in reality, I think the unit is now more of a display item than a shack tool. My thanks go to William Donzelli and Bruno SM7HKM, for information on this test set.

So that's all for now. I know it's over two months away but a happy Christmas and have a very good new year. As always, I can be contacted at: 62 Cobden St, Kidderminster, Worcestershire DY11 6RP, or E-mailed on G4BXD@compuserve.com. Visit my Web pages at http://ourworld.compuserve.com/homepages/G4BXD/ PW.
Most of us are somewhat tired of the various 'count downs' to the coming 'Millennium'. However, for the remaining part of 1999 Rob Mannion G3XFD is doing something quite different by 'counting up' from the Millennium! Rob is letting his imagination run wild with 'cuttings' of imaginary Amateur Radio 'news' item which (might) appear in the magazine in future years.

They're intended to be thought provoking, sometimes controversial and interesting but above all ... totally imaginary!

A Mixed Bag Of History

From The Editor's virtual desk, March 2108: Before I leave to join the Interplanetary Amateur Radio Union's conference at the Intergalactic Communications Centre on Mars I've found just enough time to share with readers a remarkable discovery which furthered the knowledge reported in the Wessex Archaeology Report of January 2108, and published within a recent PW magazine-disk. Additionally, we have great pleasure in announcing that there's a definite link to PW dating back to the late 1990s!

However, I'll now pass the narrative over to Professor Norman G. Swann, who has the Chair of Electronic Industrial Archaeology in the University of Wessex, who has a quite remarkable story to tell.

Professor Swann tells us that: "It all began when I was called in by the Wessex Archaeological consultants to the remains of what was known as a 'house', near to the present community dome complex where I now live. In fact, I was called in because there's a long lost family connection in the area as my Great-Grandparents were believed to have lived in what was known as a 'Street' or 'road' in the days of the inefficient individual living modules referred to as 'homes' before everyone learned to live in energy-efficient Community Energy Limited Living Systems (CELLS).

'I was particularly interested following the find of what turned out to be very ancient electronic components, as reported in your own magazine-disk. My own hobby-interests are in the history of electron microscopy, particularly engineering at sub-visual levels and mainly medical microscopic capillary pumps, etc. This interest was inherited I think from my late Great-Grandfather, one Norman George Swann who although originating from what was Northern England, eventually settled in the South.

The other interesting thing - as far as your own magazine-disk is concerned, is that my Great-Grandfather had some connection with your subject in the days when it was published on paper. He (we think) worked as a photographer in the latter days when chemicals and 'film' were used and as some form of Editor - in fact he may have been Editor at one time, although we have little information on this aspect - using a very ancient form of electronic writing which was carried out on a device called an 'Apple' I believe.

Although we could not condone such waste now - reading a magazine on paper must have been so inconvenient and tiring. All I've got to do now is to plug my neural-transfer band to my forehead, insert the news-disk into the interpreter unit and lie back and enjoy the 'direct image neural transfer' transferred from your disk. That's the way to read - with your eyes closed and while you're relaxing" said Professor Swann.

Mixed Bag

Questioned on the interesting industrial archaeology discovery, Professor Swann told PW that: "The bag of mixed components was discovered in a large concrete bun-like structure which - so we've learned - was built to protect a 'house' during one of the many wars that took place between 1914 and 2020. We're not sure quite when the building was erected - but it's still strong now, even though there's no sign of the original 'house' it was associated with.

"Double-wrapped in what was known as 'plastic' and sealed in a waterproof sealed box, it is thought that the components were actually placed deliberately as a form of 'time capsule'. A message containing the strange acronym GI'TEX (still being decoded) was found written on paper (yes ... paper!) which, although it had survived, was badly stained from absorbing condensation, brought about by the close proximity of the sea". (Here, Professor Swann pointed out that, although the site was originally 80 metric units above the European Channel (formerly English Channel), it was now only just above the tide-line.

Investigations continue on the contents but great mystery surrounds some of them just what (for example) is a CB Converter and what's an 'AM' radio? Also in the package were devices labelled 'relays' and 'compact cassettes'.

Intriguingly, there's one rectangular object - with a semi-opaque viscous jelly-like substance (very well preserved) which appears to be made up from a material similar to the vege-protein now used instead of the (now illegal due to health regulations) old fashioned Hen's Egg, once so popular in the (now outlawed as politically inappropriate) 'English Breakfast'. Marked as a 'Numerical Liquid Crystal Display' unit - this particular item is proving very interesting indeed.

No doubt, we'll hear more about it as the Industrial Archaeologists dig into the long history of electronics! There's much more to electronics than vege-genetic programming and we must not forget the days when 'radio' was carried out with the help of metal wires and lead-tin-alloy metals. Let's not forget our history!

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Antenna Workshop

An Experimental Fractal Dipole For 28MHz

John Heys
G3BDQ designs and tests the latest in antennas - a fractal.

Puzzled? You won't be after you’ve read the article!

Fractals are shapes, now often computer generated, that have ever increasing ‘layers’ of patterns that are diminished copies of an original outline. They are a branch of the mathematical discipline of topology. Until Professor Nathan Cohen N1IR, of Boston University experimented with antennas based upon fractal patterns in 1998, these figures did not appear to have any practical or useful function.

Always ready to try out something new in antenna design, I set about making a fractal antenna for the 10m (28MHz) band. I could not discover any constructional data anywhere so had to set about the task empirically without instructions or guidelines.

I’ve shown a typical fractal in Fig. 1 which has three iterations (repetitions) each being made up with squares having a missing side. A fractal, when outlined with a wire, can accommodate a great wire length within a small area. In the example shown, a wire 77 units long can be arranged within an area just 19 by 13 units. Bending a wire along a fractal pattern doesn’t appear to prevent radiation taking place when the wire is then employed as an antenna.

A fractal designed for use at v.h.f. or u.h.f. presents fewer constructional problems for the conductor of tubing or thick wire can hold itself in position with little support. This simplicity ends when fractal antennas for the h.f. bands are considered, so I had to work out a radically different method of construction.

Out Of The Blue

It is uncanny how an answer to a pressing problem can suddenly appear ‘out of the blue’. I was in my garden one afternoon and chanced to notice some unused plastic mesh netting lying by my compost heap. This material is sold to make fencing or to lie as protection for seedlings and vulnerable plants. A former use for it had been to prevent a heron invading my fishpond but it had been replaced by a less visible substitute.

The mesh is quite sturdy and is made with 50mm (2 inch) squares. My piece was about three metres long and almost half a metre wide. It was white but I also had some lengths that were coloured brown. It dawned on me that an antenna wire could follow a fractal pattern by being wound through and around the mesh squares and held in position by using a few nylon cable ties at strategic points.

Knowing that a bent wire always has a resonant frequency higher than a straight one, I followed the fractal pattern until I had used up a temporary 3.6m (12ft) length of thin insulated tinned copper wire. A true quarter wave wire for 28.5MHz is 2.5 (8ft 3in) long so I had used considerably more wire than usual.

The mesh, with its fractal wiring on board, was then hung vertically from my loft trap door which is above the landing outside my shack. Some 50Ω coaxial was connected, the inner going to the fractal wire and a straight quarter wave ‘radial’ joined to the coaxial braid and laid along the floor of the landing. My Autek Antenna Analyser revealed resonance was somewhat below 28MHz. Some judicious pruning of the fractal wire to a total length of 3.47m (11ft 5in) resonated it on 28.32MHz.

I now had a quarter wave vertical antenna which was a simplified version of the fractal design shown in Fig. 1, but with only two iterations. The pattern enabled the wire length to fit on a section of mesh only 1.06m (3.5ft) long. A ‘normal’ quarter wave wire for the 10m (28MHz) band is 2.5m (8ft 3in) in length. My half wave fractal design antenna, as actually used, is shown in Fig. 2.

Initial Testing

When the half finished fractal antenna was connected to my transmitter, I was surprised to hear how lively the band seemed. A few c.w. signals were as strong on the fractal as they were on my outdoor antennas. The s.w.r. was about 1:3:1 at the c.w. end of the band and when using just 50W of power, I was amazed to work and receive good reports from Oman, Turkmanistan and 5R1GC in Madagascar. (I actually ‘cracked’ a pile-up to work that station!).

Spurred on by the results so far, I soon wired up the other half of the dipole. The total length of mesh netting was now 2.132m (7ft) which held the complete half wave 10m dipole. As usual when feeding a balanced antenna with an unbalanced feeder (50Ω coaxial), I used a current balun just below the connection point. This can be made with a couple of clamp-on ferrites, a few turns on a ferrite ring or rod or some ferrite beads slipped over the (5mm diameter) coaxial cable.

The completed dipole was first set up horizontally, tied to the wooden bannisters along the landing and I found that in that position, no doubt because of nearby electrical wiring, etc., some additional trimming was needed. I soon got it resonant on 28.2MHz where the s.w.r. was about 1.3:1. A few more trimmers were used and it was now resonant on 28.01MHz where the s.w.r. was 1.3:1 and above its resonant frequency, the s.w.r. rose to 2:1 - 3:1.

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Then I replaced all the thin antenna wire with a thicker insulated multi-strand wire which had little effect upon the resonant length. With my fractal pattern the wire length for a half wave dipole is 38% greater than 'normal'. This would not apply were a different pattern to be used. In this case some experiment would be needed.

Genuine Reports

The finished fractal dipole was used to work c.w. and s.s.b. DX and I received some genuine 59 reports. All continents were worked including W, UA0, LU, VK6 and 8Q7. Checks against my good outdoor antennas usually indicated that they were from 1 to 2 5 points better than the indoor fractal. By positioning the dipole over the landing as a sloper at 45° the fractal became quite directional and was poor towards its high end. When using 100W to the fractal dipole a neon lamp could be struck along most of its wire length. The r.f. voltages at its ends must be considerable and care must be taken to avoid them being touched.

A most surprising coincidence was to hear and contact the 'father' of fractal antennas, N1IR himself. Nathan 'Chip' Cohen and I had much to talk about. At the time he was using an outdoor fractal quad loop antenna, which he said was some 3 to 4dB better than a standard quad loop antenna.

If you discover and develop a new and perhaps unusual type of antenna it often invites ridicule and ribaldry. In our conversation, 'Chip' said that the apparent lack of 'open-mindedness' had been a disappointment and even now he finds some sections of the amateur community seem to find it difficult to take him seriously. Just why folk think that a Boston University Professor should try to fool us is difficult to understand but when a few more folk make and try out fractal antennas perhaps reactions will improve.

The first 'airing' of 'Chip' N1IR and his work with fractal antennas in the UK appeared in April this year (a similar article called 'Aerial magic', was published in the New Scientist magazine dated the 31 January 1998). But here in the UK, the first mention was in the technical topics section of RadCom and many readers thought that it was Pat Hawker G3VA's April Fool joke!

But rest assured, the fractal antenna is not an April fool's joke! The antenna works well, although we do not yet know why fractal antennas work so well. Even the discoverer, N1IR himself, does not yet really know why they work despite their diminutive size, but work they certainly do. I intend making a fractal quad loop antenna for the 50MHz band soon and this should be an interesting project.

Still Indoors

My dipole has not yet been used out of doors but I see no reason why fractal antennas with their inherent small physical size should not be put up as fence sections in gardens. They could be mounted above existing hedges, walls or wooden fencing. If the wire used was the same colour as the plastic mesh they would become almost invisible.

A fractal dipole can easily be rolled up if it is to be transported and would then make a convenient parcel. A quarter wave antenna for the 1.8MHz band (about 40m long) could be replaced by a fractal end fed by using repeats of the pattern given in Fig. 1. It would only take up a 10m length of garden, so who will be the first to use a fractal on the l.f. bands?
Hello and welcome to Tex Topics for November 1999. This is rather a strange month as I have no news, or books for your bookshelf this month. But let me first say that by the time you read this there should be Volume 6 of the Antenna Compendium series of books available.

I shall try to review the new Volume 6 of the Antenna Compendium in the next Tex-Topics column but, in the meantime, a short news release from the ARRL's book service, mentions that there will be 43 new previously unpublished antenna articles in the new volume. There will also be a CDROM containing data and executable programs for IBM PCs or compatible computers with the book. For further details contact our book sales department for the price and availability of the new Antenna Compendium Volume 6.

Voltage-Probe Antenna.

My project for this issue is an unusual receiving antenna from Peter Buchan G3INR called the 'Voltage Probe Antenna' (v.p.a.) shown in Fig. 1. But instead of waffling on about the antenna, I'll let Peter describe it:

"Browsing through old radio magazines is a fascinating and sometimes rewarding pastime. Recently, whilst looking at a few copies of Ham Radio (USA), all nearly 30 years old, I came across the interesting title 'Voltage-Probe Antennas' (v.p.a.). This article described some research on a very small active antenna which claimed to out-perform the common 'on-set' whip antenna and an external ground mounted five metre vertical antenna. The active circuit made use of discrete components (including an F.E.T.) but no detailed information was given.

"I was not familiar with the v.p.a. but had had considerable experience making and using Voltage-Pros (v.p.), instruments used to search out electric fields and interference when conducting research on the nervous systems of insects. Glass electrode impedances greater than 1,000MΩ were common and Faraday cages were required. A different instrument was used to sort out magnetic fields.

"Early v.p.s used discrete components but later ones made use of the then innovative Op-Amp, and a little later of course the F.E.T. input Op-Amp. Bearing in mind the 1MHz Band-Width, it took but 30 minutes or so to knock up a v.p. using the ubiquitous 741 Op-Amp. The basic circuit I adopted is shown in the diagram of Fig. 2.

"Instead of the normal search probe a very small antenna was constructed as per the photograph in the original article. (The photograph of Fig. 3 shows the small piece of Verto-Board that Peter used to build the small amplifier circuit.) Connecting the battery supply and the probe output, through a coaxial cable to a Ten-Tec 585 antenna socket, a search of the lower frequencies commenced. The results were quite extraordinary. The v.p.a. was also tested using an ICOM 745 with similar results. The v.p.a. out-performed a 20m end fed antenna from 100kHz up to 1MHz, increasing the strength of signals at the lower end by as much as 40dB.

"Here was evidence that a very useful active antenna could be constructed from just a few components. Further work showed that the v.p. must be contained in a

Continued on page 50...
The RF1 adds antennas, feedlines, and RF networks, from 1.2 to 35 MHz in 5 bands. It measures RF values of true impedance (0 - 2000Ω), SWR (1 to 15:1), C (0-9999pF) and L (<0.04 to 300μH). It instantly reads out impedance and SWR. Feedline loss and phase Q, tuned-circuit resonance can be accurately measured and adjusted. L and C are measured at the RF frequency of interest, not at 1kHz or 100 kHz, as with other L and C meters. The RF1 fits in the pocket, and runs on a standard 9v battery.

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screened enclosure, and positioned at least two metres from any type of metal work. This includes the receiver itself and such devices as filing cabinets, water piping, and electrical conduit or wiring. To avoid overloading, the v.p. should be used remotely from a large antenna. An improvement in overloading, the v.p. should be conduit or wiring. To avoid water piping, and electrical such devices as filing cabinets from any type of metal work. This includes the receiver itself and such devices as filing cabinets.

The v.p. however, with the Op-Amp connected as a Voltage Follower presents a very high input impedance, especially so the LF356 with its input resistance claimed as being 1111 (101211). The Op-Amp is not acting exactly as a matching device but nevertheless allows the signal to be presented to the receiver at an impedance of about 50Ω. The output impedance of both the 741 and LF356 Amps is about 50Ω.

**Construction Straightforward**

"Construction of the v.p.a. is quite straightforward, being made up into a small Eddystone die-cast box, shown in Fig. 4, with the addition of an on/off switch, a BNC coaxial socket, a 4mm plug and socket (banana plug) plus an 8 pin DIL socket a small piece of Vero-Board and of course a 741 or LF356 'op-amp' i.e. The antenna was constructed by soldering 50mm of 68A threaded rod into the 4mm plug, on top of the rod was fixed a discarded tin lid 60mm diameter, first drilling a 6BA clearance hole into the centre of the lid, then securing the lid with a 6BA nut on both sides and then soldering the nuts to the lid. A coat of paint was added later.

"Further tests were carried out using an AKD HF3 receiver, which tunes from 30kHz, using the same 20m Hz range. The AKD out-performed the Ten-Tec and other receivers, below 1MHz by a fair margin but with the addition of the v.p.a. the low frequency performance was considerably enhanced, especially below 100kHz".

I have to thank Peter for the project, and having tried Peter's prototype I can verify the superb signal quality that comes from the antenna. I think it would make a useful basis for a 136kHz receiving station.

**Comparative Query**

Now to some of your other letters. I've had a comparative query letter from a reader who bought a Scanmaster LP1300 log...
70% less than the SO-239 of its forerunners. The output socket is now an N-type, rather than the spartan at times. My main 'quirble' is that as the paper is rather stiff, it doesn't look too good after it has been folded to fit in the rather small, though adequate box, that the unit is supplied in.

The degree of gain (losses) is very dependent on the antennas and surroundings in each case.

I also explained that when I carried out my original v.s.w.r. tests on the Scanmaster LP1300 antenna I a very short low-loss coaxial cable, with the antenna mounted above head-height pointing vertically upwards into the sky. The tests I carried out were using an MFJ-259b antenna analyser from 1000 - 1200 MHz, then with confirmatory tests using an FT-736 in the 144, 430 and 1200MHz bands.

The tests that I carried out to check the s.w.r. are, at best, merely an indication of the matching of the antenna, not of its effectiveness or gain. Although I carried out no comparative tests that may be carried out is extensive (although they need careful analysis) and useful. And to help you make up your mind, let me state three various scenarios for your consideration.

1) If you have an MFJ-259B and use it only occasionally, then perhaps you should stick with the one you have.
2) If you have an original MFJ-254 and an interest in antennas, my advice would be to upgrade soon.
3) If you do not have any similar test equipment, then this unit is ideal and is 'a must have now!'
Vertical Antennas

An E-mail from Peter Talbot M1DQG took me and the column to task, when he started out "Let me get the wining out of the way first, having read your great magazine for over a year I am some what disappointed with the antenna section of the magazine, as it seems to lack any construction of vertical or small antenna of any description for the v.h.f. and u.h.f. bands. I apologise now if I have missed any articles on this subject but it seems that you are all obsessed with big h.f. antennas and forget we are not all 'A' licensees but many of us are proud to hold a 'IV licence. 'A' licensees but many of us are obsessed with big h.f. antennas and forget we are not all 'A' licensees but many of us are proud to hold a 'IV licence."

Peter then went on to say "I have got to the point of giving up trying to build my own as all the relevant literature always seems to be written for people with a good knowledge of this subject. I live on a ground floor flat with no garden, I have very understanding neighbours who let me put up a 25 foot (8m) pole with a home made quarter wave groundplane and four-element beam in the communal washing line area."

"The ground plane antenna is the one which I would like to improve as I live in the bottom of a valley and receive very little activity on 144MHz, this not without trying for some time. Unless I use the repeaters, I only seem to make contacts when mobile outside of the valley. I have tried constructing a pole with little success."

Peter asked about some advice on improving his situation. Considering Peter's location in a valley it's not an ideal position, more so for vhf/uhf operation where distance worked tends to rely more on 'line-of-sight' conditions. On h.f. of course there are semi-reflecting layers (D, E and F layers) in the sky to push the signal back down towards other amateurs.

I described a simple end-fed 144MHz antenna, the 'Pigtail', published back in the April 1992 issue of PW as a very effective antenna for use in restricted locations or mounted at the top of a simple pole or mast. The bandwidth of my original was adequate to cover the whole of the f.m. section (1145-146MHz) easily (and could be returned to cover the datamode section as well as the lower part of the f.m. simplex channel).

About the point, of Peter considering collinear antennas. Well, they do do give a higher gain and a lower angle radiation pattern (this helps to improve the coverage for v.h.f./u.h.f. signals) over a simpler 1/4 or 5/8 vertical antennas. But they do so, at the expense of reduced bandwidth in general. I and I doubt that things will change much!

Peter also asked why advertisers didn't put pictures of the antennas they sell in their adverts. which I couldn't answer - perhaps one of our advertisers would supply an answer to this question. But I cannot recommend buying an antenna just from a picture alone It's a recipe for disappointment!

In answer to the request for v.h.f. and u.h.f. antenna projects, I hope to bring you a variety of vertical antennas for several v.h.f./u.h.f. bands in the next year or so. So, keep an eye on the Antennas-in-Action column. But if readers have their own ideas and projects, then please write in and get your 'name in lights' here in A-I-A.

Crazy Dipole

In the last A-I-A there was an idea for an asymmetric dipole from Bill G3ZXF and, in response I've had a letter from Tony F5VBY/G3TZH who courteously included Ann FSVBX/G0SYH at the end of the letter when he said: "I noticed an article from my dear friend G3ZXF this month where Bill was describing what he calls "The Crazy Dipole". It is great to see some of the older style antennas being considered and I can only think that the reason for demise of most of them is the space required.

"This particular antenna is in fact the "Coaxial-fed Fullwave" and was first used by myself in 1967 for DXing on 3.5MHz. Its origins were never determined by myself, but with the references at the time to the VS1AA Windom makes me think that it was a monoband derivation. In effect, I am not surprised that Bill had success with the antenna described on 7MHz, because its dimensions are a full wave fed at the 1/4 point.

"If dimensions are true, then the feed impedance is nearer 90 and it was normally fed with 75 ohm coax in practice with the braid to the short end. It can be seen as two halfwaves out of phase and as such works the same as a fullwave with a similar four-lobed radiation pattern. At 20m high on 7MHz it will very low angles of radiation and hence the DX worked by Bill.

"A similar antenna was used at this QTH in 1997 for a few months on 3.5MHz where the first trial yielded an XE on s.s.b. In the afternoon just before we washed up after our excursions into the trees! A note that may be of interest, my antenna exhibited a marked change in feed Impedance when the 1/4 wave end was dropped in the fashion of an Inverted "V" which resulted in a far easier method of making the 50Q coaxial cable match better than the usual cut 'n try - any comments?"

"I have since noted that John Heys G3BDQ has also made reference to this type of antenna and gives some useful information on tuning and extending it to Include additional 1/2 wave lengths."

I'm happy to add your additional information Tony (and Ann) I have always said that I'm just here passing on many of the comments you, the readers make. Please keep your comments and projects coming in, even if you think sometimes that it's 'nothing much'. Sometimes a number of "not muches' add up to a great deal when they are all put together.

Men's Toys

It's often said that separating the men from the boys is only the cost of their toys. Well on a recent trip to my local high-point I met up with Wilko Melenhorst PA1WM (and his XYL and two young sons) who managed to combine both ages of man by using the method shown in Fig. 5 to hold elements on the boom of his Yagi antenna. I was very impressed, a multi-element antenna stripped and packed away in a few minutes, due mainly to the simple and cheap fasteners.

The screw is a "Mechano"-like bolt made totally of plastic and very easy to drill. The resilient plastic material of the bolt shrinks back slightly after being drilled to grip the element pushed into it very tightly. A 'snack' in hot water before fitting would help in difficult cases I think. A hole the same size as the outside diameter of the bolt is drilled through opposite sides of the square section boom and the bolt fitted through.

Well as usual, I've run out of space again this month so keep those letters and E-mails rolling in. That way we can share the information about antennas, gradually improving all our stations. See you next time.

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OCTOBER SHORT WAVE MAGAZINE

Whether you are brand new to the hobby of radio monitoring or a seasoned DXer, there is something in Short Wave Magazine for you every month!

BROADCAST SECTION

◆ Bandscan Europe
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Broadcast Special

The story of Scotland’s land-based pirates has never been told anywhere until now. Daniel Burke explains all in ‘A Long Closed Pirate Radio Station’. Back in 1990, Michael Osborn travelled to Bulgaria and spent several weeks living in the capital Sofia. He also worked for the English service of Bulgarian Radio and witnessed a country and radio station slowly emerging from the dark decades of Communism.

Ged Lynch travels back in time to find out just who transmitted that first radio signal - a fascinating story.

Is long wave sadly neglected these days? Firoz Mohamed seems to think so. He explains about his desperate search for a small, cheap radio with the long wave facility.

Back in the late 1980s, the popular Mailbag programme from Radio RSA in Johannesburg won a faithful following among British short wave listeners. Michael Osborn recalls the show’s special appeal and how it shaped his love for radio.

Also This Month

Invited by Radio Devon to broadcast live commentary for the eclipse from the Hoe, Lawrence Harris did exactly that, after all, he had been waiting 40 years to see this eclipse!

Joe Carr K4IPV explains the design and construction of combiners and splitters in Part 1 of Passive RF Parts You Can Use. Essential for anyone wanting to connect two or more antennas to a receiver or share an antenna between several receivers.

CRAMMED FULL OF ESSENTIAL INFO FOR ANY RADIO ENTHUSIAST - CAN YOU REALLY AFFORD TO BE WITHOUT IT?

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I'm one of those people who have been lucky enough to have had a career which included doing a lot of things I thoroughly enjoyed. In my case, this was working as an engineer in broadcasting. I included building antennas and working on radio wave propagation, combined with technical writing. Now, having retired and been blessed with a large garden - thoughtfully provided by nature - with tall trees at the front and back, I can now pursue these interests simply out of sheer curiosity. This article is one of the results of this curiosity. Why not, I thought, put up a dipole, measure it and see how the results fit in with the theory?

**Analysis Of The Dipole**

The analysis of the dipole is quite a mathematical feat. One of the first successful attempts was made by Erik Hallen at the university of Upsala in the 1930s. Hallen showed that the dipole impedance at the centre point of a length of wire split into two halves, depends on the ratio of the length to diameter of the wire and on the frequency. He showed that, for a dipole in free space - and this is a very important point - the impedance at low frequencies is equivalent to a small resistance in series with a high capacitive reactance.

As the frequency is increased and the length of the antenna in wavelengths becomes greater, the resistance increases and the reactance decreases. This continues until a point is found where the impedance is purely resistive, the antenna is resonant and also has a value of about 73Ω. At this point, the overall length of the dipole is slightly less than one half wavelength, about 0.47 wavelengths for a thin antenna and somewhat less for a fat antenna.

Increasing the frequency still further results in an increase in resistance in series with an inductive reactance. This then initially rises but reaches a maximum before falling to zero at a second resonant point where the resistance is very high - about 4000Ω for a very thin antenna. Here again, the length is somewhat less than a full wavelength, at about 0.96 wavelengths.

From here on, increasing the frequency results in decreasing resistance and a capacitive reactance until a third resonance occurs, the resistive value being somewhat greater than 73Ω, 80 to 110 being a typical range at length of about 1.45 wavelengths.

Increasing the frequency still further repeats the pattern with the high resistance values getting progressively smaller. For a 'fat' dipole the pattern is similar, but with a much reduced spread in range of resistance and reactance. For instance, with a diameter to length ratio of 60, the resistance at first resonance is about 72Ω, but at the second is about 95Ω.

The graph of the impedance is usually plotted with the reactance as the vertical scale and resistance horizontal, the result being a spiral as shown in Fig. 1. This then is the problem I set out to investigate and, to begin with, I had to construct the dipole.

**Dipole For 3.5MHz**

I decided to go the whole hog and construct a dipole for 3.5MHz using materials to hand, adjust it for resonance at 3.65MHz and then check its performance across the 3.5MHz band.

The main 'legs' were constructed from some old three core twisted wire mains cable with the insulation removed (to reduce the weight), the overall diameter of the three wires was about 2mm. As the overall length comes to some 38m, giving a length to diameter ratio of 1900, it certainly qualifies as a thin dipole.

In order to be able to adjust the length easily, the outer ends were passed through an insulator and doubled back through the insert from a chocolate block connector used to grip the wire, thus allowing for adjustment, (see 'Antennas-in-Action', page 83, November 1997 PW).

To start with, I made the overall length 39m and used a 13.5m length of 75Ω balanced twin feeder with a velocity factor of 0.66, giving an equivalent feeder length of 20.45m (a quarter wave at 3.65MHz). I arranged this to come in via the shack window so that all measurements were made in relative comfort. When erected, the dipole centre point was about 17m, approximately 0.2 wavelengths, above ground. I make my measurements using a Wayne Kerr B801 admittance bridge (something I acquired for sentimental reasons, as it was the bridge I cut my teeth on as a young BBC engineer), which actually measures the parallel components of the admittance. It's capable of measuring both balanced and unbalanced systems and, for these tests, all measurements are in the balanced mode.

The signal source is an old AVO signal generator and the receiver a Lowe LF225, which enables quick and accurate determination of frequency by means of the

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**Fig. 1:** The Hallen spiral showing the theoretical variation of Impedance with length in wavelengths of a thin centre fed dipole.

**Fig. 2:** Measured input impedance of the 3.5MHz dipole after adjusting for resonance on 3.65MHz.

**Fig. 3:** Impedance of the dipole at the centre point, the classic dipole impedance curve.
keypad. To analyse and process the results I use a computer spreadsheet which also draws the graphs and, for convenience, I've turned the measurements into series form.

The method I use is to enter measurements as I go along, with the computer plotting the graph 'before my very eyes' as I proceed, since 'deliberate mistakes' are then easy to spot. (This is a far cry from the slide rule and Smith Chart I used in the middle of an antenna farm in the 1960s, but the old method is just as effective!). I use either Lotus 1-2-3 or the shareware spreadsheet. Assay-Ax, both of which are very well suited to this sort of task.

So, on to the measurements...

'Nitty Gritty'

Down to the 'nitty gritty' now and here is not the place for a discussion of the theory of transmission lines and the method of calculating the impedance at the dipole from measurements at the input - perhaps that will do for a later article.

A measurement is made in the shack, converted to the theoretical figure and plotted (Fig. 2); the impedance at the dipole is then calculated and plotted. The first attempt at measurement gave some very curious answers which proved to be due to a 30m long receiving antenna some 10m from the dipole. Lowering this gave measurements much closer to expectations, the first lesson had been learnt!

My initial dipole length, as expected, proved too long. The resonant being at about 3.85MHz with capacitive reactance across the 3.5MHz band. A process of shortening, repeating the measurements and shortening again eventually resulted in a classic dipole plot as shown in Fig. 3 - with a resonance at 3.65MHz, capacitive reactance below and inductive above.

The standing wave ratio (s.w.r.) across the band is also included a plot of resistance and reactance against dipole length in wavelengths as Fig. 6, which shows where Fig. 5 on page 62 of November 1997's 'Antennas-in-Action' comes from.

Once again there are lessons to be learned. The first is that the resonant points are not precisely harmonically related to the lowest 3.5MHz band resonance. In fact, the 7MHz and 14MHz resonances are a long way from the high impedance resonances which occur at about 10.5MHz, not too far from the amateur band.

The second point to note is that the s.w.r., with respect to 7511, is high at all but the design frequency. This does not mean that the antenna can't be used on the other bands, it requires the use of a good a.t.u. and I managed to load up my Icom IC-737 easily with an external a.t.u. (VCI VC300DLP) on all bands using the 7611 feeder.

It was considerably easier to load up using the high impedance twin wire feeder connected to the balanced input and with this I could even get an acceptable performance with only the IC-737's internal a.t.u. in circuit, the antenna being connected via a 1:1 balun.

At this point, the weather took charge and the post Christmas gales made short work of some of the temporary erection methods used to enable speedy raising and lowering for adjustment, thus bringing an end to experimental work for the time being.

So far I've only considered the impedance of the dipole, nothing has been said about its directional properties. These should be the standard text book patterns with a circular pattern about the axis and the pattern at right angles changing with frequency. When the dipole is below one wavelength, as at 3.5MHz, and 7MHz, the pattern will have one lobe which will be slightly narrower on 7MHz than on 3.5MHz. Above this, the pattern splits into lobes, the number depending on the length in wavelengths.

The overall pattern is modified by the height of the dipole above ground but, in general, the dipole should give good all round general coverage on all bands. However, with a better performance in some directions than others, the worst directivity being at low angles along the length.

For The Future

Having achieved my original aim of finding how the impedance of the theoretical and practical dipole compared in practice, the time had come to consider projects for the future. Ideas that come to mind are an analysis of the G5RV and my trap dipole. I'm particularly interested in how the trap dipole's impedance varies as the trap frequency is approached.

Also of interest is the possibility of making an artificially 'fat' dipole by using a fan of wires rather than a single wire element and I'm contemplating the possibility of such a dipole working on two adjacent amateur bands such as 14 and 21MHz without the use of an a.t.u. As they say, 'watch this space'.
Practical Wireless, November 1999

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As our stock is always changing, please ring or email first to confirm availability. Why not join the Adsmcroft Communications newsletter and, via email, keep up-to-date with the new stock arriving?
To join, visit the website and follow the instructions there.

We are constantly seeking first hand Amateur and SWL equipment and we are currently buying quality scanner accessories. Then your surplus equipment will be sold. Ring us today! Commission sales, stock clearances and settled keys are our speciality.

This month we will be at some of the following rallies and we look forward to meeting you at one of them.

---

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**DELTA**

**HF & VHF LOW PASS FILTERS & BANDPASS TRANSCEIVING FILTERS**

**50Ω LOW PASS FILTERS**

<table>
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Most lowpass filters are made from thin lightweight materials, assembled with pop rivets, and do not even have earth terminals! Their performance is, to say the least, poor. Delta Lowpass Filters are designed for performance not economy, giving a tough solid construction, with attenuation slopes which avalanche downward immediately above the transmitting frequency range. No other current filters compare favourably with these designs. Delta Lowpass Filters allow frequencies below the rated cut off point to pass with little or no attenuation, while those above the cut off frequency are harshly attenuated. These filters are heavily built deep notching Chebyshev designs, ideal for preventing interference from harmonic or spurious emissions - a must for good operating. Low power models use silver-mica capacitors and phenolic connectors. High power models use thick teflon TFE insulation sheet, brass or copper capacitor plates, and all connections are soldered.

Filters are non-polarized and non-directional and should be mounted as close as possible to your station earth. They may be stacked for additional attenuation. Insertion Loss is 0.1dB - 0.4dB approaching cut off. Attenuation is 70-90dB.

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**50Ω TRANSCEIVING BANDPASS FILTERS**

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These Bandpass transceiving filters are designed to lessen or eliminate interference from nearby transmitters operating in close proximity to transceivers. As they are transceive style, they will also effectively reduce any transmitted spurious and harmonic emissions from your transmitter. The 412 and 413 are two stage, parallel resonant circuit, top-coupled designs. Each unit will pass the listed band of frequencies, and attenuate or block all frequencies above and below that band segment.

The filters are not polarised, and can be connected either way round between the transceiver output and the antenna. Direct grounding of the filter may in some circumstances offer better overall performance, but generally the station's earth ground will be sufficient. Insertion loss is 0.5dB.

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Collecting Old QSL Cards

We all know what QSL cards are and you probably have your very own collection but, do we realise just how far back QSL cards go and do we realise the immense variety of cards that exist. Well, John Heys G3BDQ shares his thoughts on ‘Collecting Old QSL Cards’ with you and shows you nine rare cards from his very own collection.

I love collecting QSL cards, not just those acquired from stations I have contacted, but older and even ‘antique’ cards, that were once treasured by their recipients. During the last twenty five years I’ve examined more than 100,000 cards, the earliest dating back to 1922 - about the time when QSLing began. Early cards are scarce and difficult to find, but there are still many cards about that were used after 1945. As the amateur movement has grown, the number of cards has proliferated. Amateurs often express their interests and personalities through the design of their QSL cards and these cards are a long way from the once universal depiction of call signs in bold lettering. These days, those OMls with deep pockets and the YLs with deep handbags can splash out and have really beautiful artwork on their cards. If you contacted some of the recent giant DXpeditions you could have been rewarded with some super productions in full colour to grace the shack wall.

The Spice Of Life?

Variety is said to be the spice of life and the QSL card collector can find variety in abundance. My collection has many sub-sections and includes historic DX ‘firsts’. I have a card from ZL1AH to G6GM (see Fig. 1) confirming the very first GZL QSO on 1.8MHz on October 17th 1933. Subject cards abound. I have sections on the topics of ships, glamour, humour, religion, Marconi, military, space, VIPs, advertising, scouting, field days, politics, etc. Many of the finest designs originate from overseas. For some reason (economics?) many UK amateurs are very conservative in their design choices and just pick a design from the limited range presented by the card printers.

Unusual Materials

Cards can be made from unusual materials. I have a slate card from GW3KJW, several printed on wood and cork, and some printed on mint obsolete bank notes. One card had its design made entirely from coloured feathers.

A warning though, if you must decorate your shack walls with QSLs, please avoid drawing pins or the putty-like blue stuff which, after a time, makes nasty marks which percolate through to the front of the card.

Choice Specimens

I was asked to choose several cards to illustrate this article, but I have so many choice specimens that this proved to be difficult. I’ve done my best and here are a few descriptions of just a handful of my own cards from my own collection.

John L Reinartz, who held the calls 1-XAM and 1-QP (Kewpie) (see Fig. 2), was involved in making the first amateur Trans-Atlantic QSOs. He also designed an effective regenerative receiver circuit which was copied and used universally between 1923 and the Second World War. Many pre-war cards state ‘Receiver-Reinartz’ 0-V-0 or 0-V-1. My Reinartz card was sent to GSBU in 1924 to confirm hearing his signals from over the ‘Pond’ on 100 metres.

Mr. P. D. Walters G5CV was an early experimenter on the 5 metre band and was the first to receive USA television over here in 1930. On May 21 1933 he used a simple super-regenerative receiver on the five metre band when in a light aircraft over the North Sea. He clearly heard ‘Dud’ Chairman G6CJ and other stations when 97km from London. This demonstration helped to
convince the BBC that transmissions on 7 metres could provide TV signals right across the home counties and G5CV's QSL card is rarer than a Penny Black postage stamp! (See Fig. 3). The late Rev. Marshall D. Moran 9N1MN gave many of us a treasured QSO from Nepal. His card (see Fig. 4) has almost everything.

Fig. 3: Rare card from G5CV confirming reception of G6CJ whilst flying over the North Sea using a simple receiver in the 5m band. There's a photo of him in his shack and even Mickey Mouse shows his face. It was sent to the late GM3PGO, whose cards I acquired recently.

Being a little long in the tooth myself, I well remember the dramatic sinking of the S.S. Flying Enterprise more than forty years ago. The ship's Captain, Kurt Carlsen, held the call W2ZXM/MM and his graphic QSL (see Fig. 5) was sent to the late top DXer G3BID. When I was first licensed, the rarest station on the air was using the call AC4YN in Tibet. In 1946, its operator was Reg Fox at the British Mission in Lhasa and my card was sent to VU3BC. (See Fig. 6). At that time there were very few active stations in Zone 23, so a contact with Reg gave a new Zone and a new country.

Fig. 4: Attractive card from Rev. Marshall D. Moran in Nepal for a QSO with his station in 1983.

Older Cards

Most of my older cards were obtained from personal contacts with the remaining old timers who had been active before the Second World War, some being involved in the Trans-Atlantic tests of the early 1920s. Their widows were sometimes persuaded to let me have the accumulations of old cards rather than disposing of them on the bonfire or for salvage.

Over the years, many thousands of interesting cards have been lost forever. It is not too late to get hold of many fascinating cards, for many of the G3s are still with us and they have been active from the 1940s and up to the present day.

Advertising in the amateur press is one way to find cards, asking around at club meetings or rallies can also be useful. There are still many wonderful QSLs to be found and prized.

What about this 'listener report' sent to 2CX (later G2CX) in 1928? 'Dear Sir, would it be possible for you to broadcast something more interesting than 'Hello-Hello-Hello-2WR' on Sunday mornings, as you interfere with the musical programme from Hilversum? Yrs truly...'.

QSL cards are more than just a verification of contacts made, they are a snippet of history and I hope that more Radio Amateurs take care of the ones sent to them and perhaps consider the design of their own QSL cards more thoroughly - you never know who will be examining it 40 years from now!

Fig. 8: Rolf Kluge, a former radio Officer on the Graf Zeppelin, was still an active Radio Amateur in 1984. He was certainly a survivor, living through the Nazi regime and the Second World War.

Fig. 9: An unusual card from W8ARW in 1936. It was before the days of 'Women's Lib' and today would be regarded as rather sexist.
Many readers will have noticed how the battle for their custom has become more intense as the popularity of the hobby has declined. Fewer amateurs buying less equipment means there are now some great deals to be had but it also means that some dealers may try to cut corners when it comes to honouring their commitments. Also, as the real cost of Amateur Radio equipment has fallen and the competition for your custom has increased, some of the smaller shops have either gone out of business or been swallowed up by the bigger companies. In some areas, it's almost impossible to find a local shop and now the trend is towards mail order purchasing.

This, in itself, is not a bad thing but it does mean you'll probably be buying from a shop you've never visited and from a salesperson you've never met. So, how do you know who to trust with your money? You could go on air and ask about the dealer you're thinking about from a shop you've never towards mail order purchasing.

The truth is, as the popularity of the hobby has declined. Fewer amateurs buying less equipment means there are now some great deals to be had but it also means that some dealers may try to cut corners when it comes to honouring their commitments. Also, as the real cost of Amateur Radio equipment has fallen and the competition for your custom has increased, some of the smaller shops have either gone out of business or been swallowed up by the bigger companies. In some areas, it's almost impossible to find a local shop and now the trend is towards mail order purchasing.

This, in itself, is not a bad thing but it does mean you'll probably be buying from a shop you've never visited and from a salesperson you've never met. So, how do you know who to trust with your money? You could go on air and ask about the dealer you're thinking about buying from, but the risk is that there may be one or two vociferous individuals who will be happy to tell the world about their grievances while the majority of satisfied customers just keep quiet. The same is true of the Internet. The various radio related newsgroups are a good place to ask but, again, you may not get a representative (or honest) selection of answers.

The truth is, there is no real way of telling beforehand how your transaction will be handled, how well the equipment will perform or whether it will go wrong. All you can do is to take reasonable precautions before you buy and know what to do if the worst happens. This is where we aim to help. First of all, take a look at the Top Ten Tips in the Buyer's Guide box. If you follow those guidelines before you buy, you'll have minimised the chance of something unforeseen cropping up and you'll be prepared should the worst happen and you have to return the goods.

Secondly, whenever you order goods from an advertisement in PW, make sure you use the Personal Order Form that is printed in every issue from now on. Call around your list of potential suppliers first and then post or FAX them this form when you place the order. It has been carefully laid out to help you make sure you've not forgotten anything and it will act as written confirmation of the deal. If you post it, don't forget to keep a copy! If you have placed the order over the telephone, still send them the form with ORDER CONFIRMATION written across it.

The vast majority of transactions are trouble free but, if you are one of the unlucky ones who does have a problem, here's what you should do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to the supplier enclosing a copy of the order form and the advertisement (you did do. Write to

### The PW Personal Order Form

This month Roger Hall G4TNT – PW's Advertising Manager – describes how we're launching the PW Personal Order Form service to help readers buy with extra confidence from advertisements in this magazine.

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**Buyers Guide**

**Top 10 Tips**

1: Telephone first to confirm the price and details are as in the advertisement. Dealers often have to send in copy up to 8 weeks before the magazine is published and prices and availability can change in that time.

2: Ask if it's a parallel/grey import or if it came from the authorised UK importer.

3: Ask if it is the full UK specification and if it has CE approval.

4: Ask about extra charges (delivery, VAT etc.) and find out the final, all-inclusive price.

5: Ask about their return/refund/repair policy for faulty goods and if they have a restocking fee for the return of non-faulty items.

6: Ask for a written quotation if it's a large order.

7: Make a note of all calls and who you spoke to and keep copies of all paperwork.

8: Pay by personal credit card whenever possible as the card company has insurance to cover all transactions above £100 and you will almost certainly get your money back from them should something go wrong.

9: Check everything as soon as it arrives. Open all the boxes and check that you have been sent everything exactly as ordered. If there is a problem, contact the supplier immediately.

10: If a problem develops later, write the supplier a concise and accurate letter outlining the problem and asking them how they intend to rectify it. If that fails, write to us with copies of all relevant paperwork and we'll take it from there.

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Practical Wireless, November 1999
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Practical Wireless, November 1999
Up until the Year 2000, we will be focusing on the last century of Amateur Radio and events which have shaped its course. Last month we took a look at such books as Tesla - The True Wireless, 100 Radio Hookups, Watchers Of The Waves, World At Their Fingertips, Crystal Radio: History, Fundamentals And Design and Wireless For The Warrior - Volume One. Continuing the historical theme this month, the 'Book Profiles' on these pages, compiled by the Editorial team, focus mainly on elements of Amateur Radio such as Tesla, twinplex regenerative receivers, neutrodyne receivers and valve receivers. We hope that you enjoy reading about them and that you'll consider expanding your historical Amateur Radio knowledge with one or two of these books.

TELEPHONE, FAX, E-MAIL OR USE THE ORDER FORM ON PAGE 82

To order any of the titles mentioned on these pages please use the order form on page 82.
Detailed book with some very good illustrations - a must for Second World War British Army communications enthusiasts and, although not cheap, it is a very big book with a lot of information on Wireless Sets such as the No.10, 19, 22, 38, 46, 53, 68 and many more besides. Highly recommended.

Wireless For The Warrior
Volume Two
Louis Meulstree

If you saw last month's 'Book Profiles' on page 91, then you would have seen the profile on Volume One of Wireless For The Warrior which concentrates on Wireless Sets No.1 to No.88. In this month's 'Book Profiles' we are taking a look at Wireless For The Warrior Volume Two: 'Standard Sets Of World War II'. Once again, this is a book dedicated to looking at "A technical history of Radio Communication equipment in the British Army" only this time, as the front of the book tells you, it concentrates on the sets used by the British Army in the Second World War.

In the Introduction to the book, the author, Louis Meulstree explains: "The books are merely written to serve as a reference for anyone interested in the technical history and development of British Army radio equipment". Louis goes on to say that the majority of this book is taken up with "descriptions and illustrations of fitting sets into a variety of vehicles. This has been done explicitly as it shows the sets in actual use and also gives illustrations of the many station ancillaries".

Wireless For The Warrior, Volume Two is an extremely detailed book with some very good illustrations - a must for Second World War British Army communications enthusiasts and, although not cheap, it is a very big book with a lot of information on Wireless Sets such as the No.10, 19, 22, 38, 46, 53, 68 and many more besides. Highly recommended.

RCA Receiving Tube Manual
Reprinted by the Antique Electronic Supply

This popular reprint, put together by the Radio Corporation of America (RCA), comes in a well-presented paperback format and is essentially a designer's handbook. Prepared, it claims, in order to assist "...those who work or experiment with electron tubes and circuits. It will be found valuable by engineers, service technicians, experimenters, students, Radio Amateurs and all others technically interested in tubes".

Not only a valve listing, the RCA Receiving Tube Manual comes complete with 'thumbnail' design data for the RCA's receiving 'tubes' (the American term for 'valves'). Not only this, but it covers application notes, theory, practical circuits, base pin-outs, internal circuitry and much, much more. Its 384 pages explains a lot about valve theory and their applications and some of the chapters include: 'Electrons; Electrodes and Electron Tubes'; 'Electron Tube Characteristics'; 'Electron Tube Applications' and 'Electron Tube Installation'. Very Highly Recommended.

RCA Transmitting Tubes
To 4kW Plate Input
Reprinted by Antique Electronics Supply

Are you trying to build a valved linear? The RCA Transmitting Tubes - To 4kW Plate Input will point you in the right direction. It is a 316 page book covering valves from the 955 'acorn' type (yes, it was a transmitting valve!) to well known favourites such as the 833 and 6763. Apart from anything else, this book is an interesting read. Packed with information, pin-outs, design data and circuit ideas (including amateur band transmitters) this book will prove very useful for collectors and constructors alike. Again, such chapters include: 'Power-Tube Fundamentals'; 'Construction and Materials'; 'Power-Tube Applications'; 'Power-Tube Installation' and much, much more. Highly recommended.
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We have been busy shopping to find you the best deal around.

We now see parallel imported cars and motorcycles in the UK and at the end of the day the whole point is to offer better prices to our customers without sacrificing services.

As we are part of the EEC, industry throughout Europe is now accepted and encouraged, it seems that if we take the time to look around we can find prices that are significantly lower.

I can understand that you may be worried about after sales support and service and I can reassure you that we have two fully qualified RF engineers working for us to ensure the fastest turnaround of repairs possible.

We urgently require your treasured set. We pay outright for cash. Alternatively, use your old equipment as a deposit on finance for a new or used set.

FINANCE

WE NOW CAN OFFER YOU A COMPETITIVE FINANCE PACKAGE WITH NO DEPOSIT.

Multicom 2000 is a licensed credit broker APR 19.5%.

Written quotations are available upon request.

FINANCE EXAMPLE. APR 19.5%

<table>
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<tr>
<th>Cash Price</th>
<th>No deposit</th>
<th>Balance for finance</th>
<th>36 months APR</th>
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<td>£288.00</td>
<td>£10.45</td>
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COMING SOON

COME VISIT OUR NEW IMPRESSIVE SHOWROOM!
SALES HOTLINE 01480 406770
NO DEPOSIT FINANCING AVAILABLE
USED EQUIPMENT URGENTLY WANTED!

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SEND YOUR ADVERT TO PRACTICAL WIRELESS, BARGAIN BASEMENT, ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW

For Sale

500 FZ, £700 LF, £500 LF. Exchange for PRC receiver. Tel: Evans 01235 810202

Digital SX-400 as p.s. £10, SHAMAR 74GHz £50. Neat Refurbished AVP-300 3m (116414.049) ft. with p.s. 0.6m, various models. Tel: 01452 673333.

Dual channel Modemhub micro s/w £1200, 3,500MHz £500. Making offer. Tel: 01635 677011.

Microwave modules £145, 10m, 1544MHz. New, SWL output. Tel: 01235 781402.

Microwave modules 144450, 100, 1544MHz near, 10W input, built in switchable pre-amp. £250 each, £400 for complete set including manual, plus postage. Tel: John (01367) 731523.

Bargain Basement

Advertisements from traders or of equipment that is Illegal to possess, use, or possess which will not be accepted. No responsibility will be accepted for equipment that is professionally built, home-brewed or modified.

The Publishers of Practical Wireless also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

For Sale

2m £60, 1.2m £50, 900MHz £40, 430MHz £30, 1440MHz £20, 70cm £10, 690MHz £10, 433MHz £10, 430MHz £5. II $110, II $20.

For Sale

1250, £1350 LF. Excellent, £1850 LF. New, £2750 LF. £190, £300 PRC. £90, £120 LF. £30, £45 LF.manual, £60, £90 LF. plus postage. Tel: 01952 828372.

For Sale

Dedicated 1.542GHz £450, 1.543GHz £250, 1.544GHz £150, 1.545GHz £100, 1.546GHz £75. Tel: 01367 828372.

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Wanted

S/V Second World War spy transceiver

wanted. Any model. Ideal for project, display, exhibition. BAL/CH. Ideal for college, museum, society. Complete with cables & manuals. Valued at £1200,000. Please see this advertisement in the next available issue of Practical Wireless.

Please insert this advertisement in the next available issue of Practical Wireless.

Contact Details

Name
Address
Telephone Number

Please only write in the contact details you wish to be published with your advert.

Sale Wanted Exchange

New items only. No second-hand or used items.

Please insert this advertisement in the next available issue of Practical Wireless.

Exchange

14MHz linear amplifier 15W vs. 3000 watt unit, every performance tested.

Wanted: 120x 40W transistors, 100x 10W transistors.

Wanted: A large selection of new and used components.

Please insert this advertisement in the next available issue of Practical Wireless.

New items only. No second-hand or used items.

Please only write in the contact details you wish to be published with your advert.

Sale Wanted Exchange

New items only. No second-hand or used items.

Please insert this advertisement in the next available issue of Practical Wireless.
MULTICOMM 2000
LARGE SHOWROOM BEST PRICES

ANTENNAS

** FULL RANGE OF COMET ANTENNAS IN STOCK AT DISCOUNTED PRICES **

R-7000
MULTIBAND VERTICAL
£259

R-6000
40-10  £289

R-6000
20-6  £259

X-7
20-10  £425

A3S
20-10  £299

MA5B
20-10  £275

RECEIVERS

ICOM IC-R75E
Short wave receiver
£615

YAESU FRG-100
Short wave receiver
£369

DRAKE R-8B
Short wave receiver
£929

JNC NRD-545
Short wave receiver
£1199

AOR AR7030
Short wave receiver
£669

AOR AR5000
SW/VHF/UHF receiver
£1099

ICOM IC-R6500
SW/VHF/UHF receiver
£1099

ICOM PCR-100
SW/VHF/UHF receiver
£199

FAIRHAVEN RD-500
SW/VHF/UHF receiver
£799

ICOM PCR-1000
SW/VHF/UHF receiver
£249

AOR AR-3200
SW/VHF/UHF scanner
£349

DJX-10
SW/VHF/UHF scanner
£259

IC-R10
SW/VHF/UHF scanner
£225

MVT-9000MKII
SW/VHF/UHF scanner
£325

MVT-7100
SW/VHF/UHF scanner
£189

THIS IS ONLY A SMALL SELECTION OF OUR CW EQUIPMENT

VIBRUKER DELUXE
£139

ORIGINAL DELUXE
£169

TAMBIC BRASS RACER
£75

BENCHEK BY-1
£69

BENCHEK BY 4 GOLD
£129

Please mention Practical Wireless when replying to advertisements
USED EQUIPMENT WANTED

Practical Wireless, November 1999
Reports & Information by the Last Saturday of Each Month.

David Butler G4ASR
Yew Tree Cottage
Lower Maescoed
Herefordshire
HR2 8HP

Tel: (01433) 860679
E-mail: g4asr@brinternet.com

Packet Radio & G87MAD
UK DX Cluster & G7DVC

This Month: David Butler G4ASR looks at the Leonids Meteor Shower and wonders if this year's activity will be better than last.

The general principle of scattering radio waves off meteor trails is easy to understand and I've illustrated it in the diagram, fig. 1. The transmitting station is located at a large distance, about 500-2000km away from a receiving station. Because of this constraint, direct radio contact is generally impossible due to the curvature of the earth.

When a meteor enters the atmosphere, its trail may reflect the radio waves from the transmitter to the receiver. As the receiver, where the signal is received, the transmission can be received for a short period as long as the meteor trail is present. Such reflections, called 'bursts', last a few minutes to several minutes. That is the general principle of meteor scatter, often called MS, or MS propagation.

Terms Misleading

The term 'meteor scatter', though, is misleading. It isn't the meteors themselves which scatter signals beyond the horizon, but the ionized trails which are left behind as these high velocity fragments burn up. The meteors which create these trails are, for the most part, bits of metallic and non-metallic material in orbit around the Sun and are almost entirely of cometary origin.

When the particles strike the molecules in the upper atmosphere the released kinetic energy raises the temperature of the gas molecules to a temperature at which they ionize. They then form a plasma of electrons and positive ions, not each different than those within the ionosphere, except that the trail is more in the form of a line charge. Variations in mass, composition and velocity result in trails between 20-65km long and about 1/10 in diameter.

The trail rapidly expands as the electrons diffuse into the surrounding space due to the repulsive nature of the electrons for each other. This dispersive effect may give rise to a small amount of doppler shift, particularly at the start of ionization. The multipath distortion degrades the quality of the signal and becomes more severe at higher frequencies (144MHz and 430MHz) where the wavelengths are shorter.

Only a small number of meteors that produce an ionized trail will be suitable for a given path and, in order to be usable, they must meet three critical criteria. First, they must produce an ionized trail with an acceptable reflection scattering loss typically about 70 to 80dB. This requires a meteor with a typical mass of 0.001 grams and a diameter of 1mm, literally about the size of a grain of sand.

Large meteors, termed meteoroids, are even more desirable but their abundance is inversely proportional (fortunately for us on Earth) to their mass. Although they produce substantial ionization they are of little concern because their rate of occurrence is extremely low.

Smaller meteors are termed micrometeoroids or meteons, which billions of which billions enter the Earth's atmosphere daily, are more plentiful but not as useful. These slowly settle through the atmosphere without being destroyed. Eventually, the larger meteons that make it to the Earth's surface are called meteors.

The second criteria that a meteor trail should possess is that it must lie within a common volume that is line of sight of both stations and at an altitude of between 80 to 120km.

Finally, the trail should be situated mid-way and at 90° to both stations. This last criteria can be relaxed somewhat for the more dense trails.

VHF Report

The majority of reflections take place at a height of around 90 to 120km which corresponds to a maximum distance of between 2000 to 2250km. This will easily allow contacts to be made all over Europe on the 50MHz band.

However, because of the limited European access to the 70MHz band, contacts here will be more problematical, especially as the minimum distance for MS work is around 300km. This is the reason why reflections on the 70MHz band within the UK are generally poor.

The reflection height for the 144MHz/430MHz bands are theoretically lower as the trails need to be more dense to support MS communication at these frequencies. However, the distances worked on the 144MHz band are very similar with a peak occurring in the range 1500 to 1900km.

Reflections are generally longer and stronger on the lower V.H.F. frequencies such as the 50MHz and 70MHz bands. Theoretically bounces at 144MHz are weaker but increased antenna gains, higher transmitter powers and a higher level of European activity make this an ideal band for MS work. Contacts can also be made on the 430MHz band but this is approaching the limit for practical amateur communications.

Two Categories

Meteors occur in two categories: sporadic meteors and those associated with meteor showers, sporadic, or random, meteors arrive all the time and from all directions. Their rate of arrival varies with the time of day and season of the year.

Sporadic meteors are more plentiful at sunrise as the Earth sweeps up its orbit as the Sun and less plentiful at sunset as the Earth rotates away from them. The average velocity of the morning sporadic meteors is higher than the evening meteors so they tend to ionize at a higher altitude and their trails dissipate more rapidly.

Random meteors are more prevalent in late summer around July-Aug and are at a minimum in February. If you want to make schedules for m.s. tests then the best times will be around 0500UTC during July. However, there's no guarantee that suitable random meteors will occur during your sked period. If you want almost guaranteed results then it's best to attempt m.s. contacts during a shower period as these are quite predictable.

Shower meteors appear at particular times of the year because they travel in fixed orbits around the Sun which the Earth intersects annually in its own orbit. (By the way, please don't think of showers as a right time phenomenon as many of them occur during daylight hours). Meteor showers occur every month of the year with the exception of February and I've shown some of the more productive events in the chart, fig. 2.

Each shower will possess its own unique characteristics such as when it is visible above the horizon, the event duration and the speed of the propagated signals. Others such as the Ursids in December will have a broad period of activity but no specific peak.

The Perseids are above the horizon 24 hours a day and is termed a circumpolar shower. It's important to note that there's a considerable difference between the times quoted for visual sightings and that for radio propagation. For instance: the Perseids in July are a maximum in August but no specific peak.

Meteor showers are not uniform streams of debris and calculating the specific period of maximum activity can be rather difficult. However, this is made easier if you keep records of last year's peak and then add 365.25 days (one year, six hours). For lean years, you must also look at the Leonids, which is a shower that dates after February 29 (including the Quadrantids in the following calendar year).

Leonids Meteor Stream

In a few weeks time the Earth is going to pass through the Leonids meteor stream. This meteors shower occurs every year in the period November 15-19 with peak activity on, or around, November 17.

The shower rises above the horizon at about 2230UTC and sets the next day around 0300UTC giving nearly 12 hours of activity. The shower meteors are very fast, entering the Earth's atmosphere at speeds of over 234,169 kmh (150,000 mph). Besides being fast, the stream usually contains a large number of very bright meteors that produce highly ionized trails.

The Leonids shower is usually nothing to worry about. It's
there, year after year creating some minor activity for the m.s. enthusiasts but in the last few years the activity has increased tremendously.

Recently it has been proved that there's a connection between annual meteor showers and comet orbits. Comets are composed of ice and dust and every time one approaches the Sun the ice melts and material is released.

Over the course of hundreds of years the dust spreads completely around a comet's orbit track. However, this spread is not even and much of the material stays close behind the comet.

In the case of the Leonids showers the parent comet is called Tempel-Tuttle and it makes an appearance in our skies every 33 years, the last time being in 1986. As Tempel-Tuttle passed closest to the Sun in February 1998 it was expected that activity during November 1998 would produce some very strong displays.

LAST YEAR

Many people described what occurred during last year's Leonids meteor shower as "brilliant", "wowing", "amazing" or "one lifetime" and that doesn't convey the true excitement of what actually took place. Last year the Earth encountered the Leonids shower in a few weeks time? So what might happen done the next few years?

A FEW WEEKS TIME

Scatter procedures under normal circumstances, you need to follow the Region 1 meteor scatter procedures laid down by ARU. These can be found in various v.h.f. handbooks but, for really up to date details, it's best to point your web browser to the RSGB VHF home page.

http://www.rsgb.org/vhf/vhf/rv_h.htm

These web pages give details of timing, reporting systems, reporting procedures and confirmation procedures.

Although it's worthwhile noting the correct procedure, I'm hoping that the shower will be a repeat of last year's performance. In this case, you can dispense with conventional signal reporting methods and make quick s.s.b. exchanges using traditional signal reporting methods.

EQUIPMENT NEEDED?

So, what equipment is needed to join in the fun? As I mentioned earlier, nearly all of the contacts will be made on s.s.b. on the 50MHz or 144MHz bands. In my opinion, you should try to get equipment ready for the 144MHz band as openings of this type are more unusual at these frequencies.

Although you may be able to make contacts with low power it can be a bit frustrating. Medium power 50-100W will give good results, especially if coupled with a good antenna and low-loss feeder cable.

A horizontally mounted Yagi antenna of between 8-16 elements will be sufficient, but it will be useful to be able to rotate it towards selected activity areas throughout Europe. Don't go for huge multiple arrays as the reduced beamwidth will restrict the amount of meteor trails it can "see."

HINTS & TIPS

Based on experience of last year here are a few hints and tips that you may wish to adopt. Prepare all equipment and make sure it is working correctly. Pay particular attention to the antenna and feeder system, have a standby transceiver or amplifier ready just in case.

Prepare the shack, log books, plenty of spare paper, pens, pencils, about operating portable from a hill top and view the meteors at the same time. Make sure you get plenty of

Roger Ward CW5SNF (IOI81 running 20W into a 9-element Yagi antenna on the 144MHz band. A mobile station, DL4HAE/M, running 20W into a small vertical antenna even managed to make an m.s. QSO whilst driving to work. With a little bit more power the results were more impressive.

John Eaton GM4BCY running 50W on an 8-element Yagi stuck on a pole with no rotator contacted stations in Croatia, Estonia, Hungary, Lithuania, Italy, Poland, Switzerland and Yugoslavia. His best DX contacts, on s.s.b. were Russian stations DXIAS (1980km) and RW1AW (1938km).

The more experienced m.s. operators worked even more DX with some well equipped stations making over 200 contacts during the night. On the 144MHz band the top three European distance contacts reported were C4AFHR5 (3451km) to RW1AW (IOP50) at 2231km, EA7CTG (M870 to SP7FAX (1083) at 2371km and F5OVN (253) to LA7JFL (1897) at 2871km.

A few m.s. contacts were also made in Europe on the 432MHz band although it is very difficult at these frequencies. Over in North America the stations of W7KUH (E153) and N6RM1 (D141) made a contact over a 2036km path creating a new world record for the band via this mode.

Following the experience of last year, Rytis LY2BIL suggests you listen for periods when frequent, two to three minute bursts are being heard on the 144MHz band. You should then switch immediately to 4322000Hz and attempt some very quick s.s.b. contacts.
sleep beforehand as you will be up all night.

Go into the shack around 2300UTC on November 16, point the antenna into mainland Europe and start listening on 144.200MHz. You probably won't hear anything at first, but after an hour or so you should start to hear some DX stations.

Listen to the operating practices of more experienced stations before you get going. Don't stay on 144.200MHz all the time. Spread out around the s.s.b. sub-band. When a burst occurs other stations will find you. Continue this until 1200UTC on Wednesday 17 November.

It's difficult to determine when the best times will be, but I reckon it may be between 0200-0900UTC on November 17. Use s.s.b. but be adventurous. Try f.m. (with a directional beam) on the simplex channels and see what happens.

Use clear unambiguous phrasing. Make rapid exchanges, call signs and reports are all you need. Try to keep individual exchanges to around five seconds and a complete QSO in less than 15 seconds. May the DX be with you.

DEADLINE TIME

That's it again for another month and it's 'Deadline Time'. Don't forget to be in the shack between 2300UTC on Tuesday November 16 and 1200UTC on Wednesday 17 November. Please let me know what you heard or worked on any of the v.h.f. bands during this period.

Forward any details to the address and by the date given at the top of the column. Alternatively, you may find it more convenient to make a simple telephone call.

GOOD LUCK WITH THE DX

DURING THE LEONIDS METEOR SHOWER. SEE YOU AGAIN NEXT MONTH.

73 David GA4ASR.

Web Watch

RSGB VHF Committee Web Site: http://www.scit.wlv.ac.uk/vhc/faxru.1.vhmf.4e/SB.html
UK Six metre Group Web Site: http://www.uksmg.org/deadband.htm

HF FAR & WIDE

LEIGHTON SMART GWOLBLI
33 NANT GWYN
TRELEW
MID GLAMORGAN
CF46 6DB
WALES

TEL: (01443) 411459

LEIGHTON SMART GWOLBLI has TWO PAGES OF REPORTS FOR YOU THIS MONTH AND IN THOSE TWO PAGES HE DISCUSSES PROPAGATION CONDITIONS FROM THE LAST MONTH, THE ECLIPSE, NEWS FROM A NOVICE AND YOUR REPORTS.

Propagation conditions during August tended to be on the patchy side according to reports, but there were quite a few occasions when long-range signals were prevalent on the higher frequency bands. That's where most of our reporters spent their operating sessions this month and a Sag of DX was their reward!

A number of reporters have mentioned over the past few months that general conditions haven't lived up to their expectations, particularly regarding the period of the sunspot cycle. I must admit to having to agree with their tentative opinions, things are not like they used to be!

Well, the good news is that it's still a going concern and membership details can be obtained from Bill McGill G6JDB, 14 Farquhar Road, Mablethorpe, Lincoln, North Yorks, LN15 8PD, tel: 01754 814010 between 1900 and 2100.

PROPAGATION REPORT

Now for the Propagation Report and we start off down in Yeovil in Somerset with Don McClean G3JNOF, who says: "Except for the 14MHz band, conditions on HF have been generally poor during the daytime. Once again 14MHz was the most reliable band and it never seemed to close. New Zealand and Australia were often quite strong between 0600 and 0900UTC on the long path, while a few short path openings to the same part of the world occurred after 2000UTC."

"On the 18MHz band there were a few openings over the North Pole into the Central Pacific area at around 0730 to 0830UTC and the short path to Asia was apparent from 1000 to 1600UTC with north Americans coming in at various times between the hours of 1100 and 2300 UTC."

"The short path to Asia was open on the 21MHz band between 0900 and 1800UTC, while a few Australian signals were heard around 2200UTC on the long path. North America came in between 1300 and 2300UTC, with south America in late evenings. Some African stations were heard between 1600 and 1800UTC, with the band remaining open until the early hours."

"Both the 24 and 28MHz bands were very patchy this month, although there were some openings to north and south America at around 2200UTC on Monday and mostly south Americans were heard during the mornings and evenings on the 28MHz band."

YOUR REPORTS

Now on to your reports for the month starting with the 10MHz band, as our reporters have been DX hunting on the higher frequencies of late. First up comes Carl Mason GW1SVS of Skeewen in West Glamorgan who has been using slightly higher power levels this month, at 50W into a half-size 9XW.

Carl's 10MHz list includes all c.w. contacts with 7I/PAPA4A (Dominica) at 0843UTC, 7V7VP (Federation of St. Kitts and Nevis Islands) at 0719UTC, 9W5ASCV (Gambia) at 1824UTC, as well as YR99E (Romania) at 1828UTC and TA2J (Turkey) at 2213UTC.

Between them the QRP Manager of the Milton Keynes ARS, Sean Gilbert GA4UQ has been about on the bands and recounts that conditions have ranged from "excellent to absolutely awful!" However, receiving the QSL card from ZL9CI heumed her up a bit, only to be disappointed again when he discovered that 10MHz contacts don't count for DXCC. She says: "It goes without saying that this is ridiculous. Why shouldn't contacts on the so called 'WARC' bands count towards awards such as DXCC. Does anyone know?"

Still more back to Sean's report and we see that his J50C w.e. reached out this month to 4L1UN (United Nations, New York) at 0031UTC, 1W7FC (Venezuela) at 0129UTC, CY9CWI (St. Paul Island) at 0304UTC, FG5FR (Guadeloupe) at 2348UTC and finally, a 3W QRP contact with U7/CN7 (Kazakhstan) at 2359UTC.

THE 14MHz BAND

On the 14MHz band now and celebrating his very first QRP c.w. contact with Australia is Eric Masters G0KRT of Milton Keynes. "I've already worked VK with QRP" says Eric, "but this is my first with c.w.". Eric was operating from the Wimbeldon & District ARS Annual Summer Camp at Chessington and the only antenna used for the contact was a G5KVR. Not bad Eric and I trust you
Fig. 1: Paul Godolphin 2E0AOX with just some of his awards.

and the lads (and ladies) had a good time!

Eric's 14MHz report includes 3W c.w. contacts with RA3DAA (Russia) at 2135 UTC, VK1DQS (Australia) at 0750 UTC and U5M9H (Asiatic Russia) at 2314 UTC. His 100W s.s.b. contacts included LU1LAF (Argentina) at 2300 UTC and YE9DQG (Canada) at 2310 UTC.

Down in Yeovil, s.s.b. Don McLean (G3NOF) has been busy around the bands. This month he spent more time on the higher bands but on 14MHz he lists contacts with G4UCI (Paul Godolphin, UK), U2K7T (Russia), VC0WP (Canada) and WP2Z (USA).

Meanwhile, using 3W c.w. into an indoor dipole, Sean G4UCI listed FY5YE (Trinidad & Tobago), 9VI XE (Singapore), P17/K2GSI (Saba (Netherland Antilles), RIA3X (Argentina), VP5NQD (Bermuda) at 2056 UTC.

THE 18MHz BAND

It seems that 18MHz was 'the place to be' this month, as most of our reporters have very long logs for this band. However, Ted Trowell (G2HKU) has been under the weather of late and, as such, was unable to get on the air as much as he'd like to. However, he tells me that he's now on the mend, which is good news. Glad to hear that you're feeling better Ted!

Ted's log includes all c.w. contacts with LU0AZ (Asiatic Russia) at 0800 UTC, as well as 4Z5AD (Israel) at 1500 UTC, while operating at 1500 UTC brought him 5A1A and Eric G0KRT lists a single contact for the band in the shape of 45A7B (Sri Lanka) at 1751 UTC.

THE 24 & 28MHz BANDS

Finally, we come to the 24 and 28MHz bands, where it seems conditions have left a great deal to be desired! However, our intrepid reporters were not put off by this and despite the poor conditions managed to log a few contacts here.

Ted G2HKU listed FY5YE (French Guiana) and ZD7BG (St. Helena Island) at 1800 UTC on the 24MHz band, while Sean G4UCI also used c.w. hooked up with J27TV (Maldives Islands) at 0932 UTC and T77C (Republic of San Marino) at 1611 UTC on the 28MHz band.

THE 18MHz BAND

Also showing promise this month was the 21MHz allocation, which attracted the attention of Don G3NOF, whose 21MHz s.s.b. log includes contacts with the likes of AP2ZB (Pakistan), DJ1KKY (Philippines), G8BRA (China), FR5XO (Reunion Island), AG6A (Arizona), 6Y5DN (Bahrain), VA3HNS (Belize), ZD7VC (St. Helena Island), 5H1TL (Tanzania), UA6FF (Asiatic Russia), 9VTTH (Vietnam), as well as 9TVW (Singapore), 8Q7AN (Maldives Islands) and V73CW (Tuvalu Islands).

"Fifteen metres" was also the place where Sean G4UCI had a nice catch, which included 10W c.w. contacts with P49V (Anuab Island) at 1030 UTC, B7QT (Maldives Islands) at 1330 UTC, EP2WMO (Islamic Republic of Iran), H3A5U (Japan) at 1437 UTC, K4AON (North Montana Islands) at 1519 UTC and U5H-6U (Argentina) at 2238 UTC. The pick of his QRP crop was K1CX (USA) at 1029 UTC, CO9LY (Cuba) at 2134 UTC, 4L1UN (Republic of Georgia) at 1621 UTC and ZS9KO (Paraguay) at 2310 UTC.

Ted G2HKU refused to lie down and take his medicine it seems, as he also includes reports of his activities on 21MHz as well, listing c.w. contacts with 2N28R (Monaco) QSL via F3QG and E21BC (Thailand) at 1700 UTC, while operating at 1900 UTC brought him 5A1A and Eric G0KRT lists a single contact for the band in the shape of 45A7B (Sri Lanka) at 1751 UTC.

SIGNED OFF

I receive endless letters from our readers telling me that they find the information in the columns of great use to their QSLing, especially the times of contacts given and so on, as well as letters from new licensees saying that reading the reports in 'HF Far & Wide' gave them that extra 'boost' needed to pull their fingers out and go for the RAE and Morse Tests.

It's always a pleasure to receive such letters, but I must be honest and say that it is your reports which make this column a success. I'm just the bloke who puts it all together! So, thanks to all our reporters for their valuable time and effort. Keep up the good work!

AS USUAL, REPORTS & INFORMATION (AND PHOTOS AS I'M STILL LOOKING FOR PHOTOGRAPHIC REPORTS OF OUR REPORTERS!) BY THE 15TH OF EACH MONTH, DETAILS AT THE TOP OF THE COLUMN.

PW LISTENING & OPERATING WATCH LIST

(All times are in UTC)

Charlie Blake (M6MJ) listens and operates: 0500-0700 on 7.06 MHz s.s.b. with an NRD-525 receiver and Sloping Wire antenna and is also busy with his mobile rig.

John Nevs (G3BDQ) operates: mainly weekends during daylight hours on the 136kHz band using 100W and an end-fed wire.

George Woods (G3LJF) operates: an open net on 29.630 MHz, every weekday morning except Monday at 0930 local time.

Don McLean (G3NOF) operates: 1030 Saturdays on 3.685 MHz on the ISWL Net or 1030 Sundays on the Yeovil ARC Net on 3.665 MHz s.s.b. using a Kenwood TS-950 and trapped dipole antenna.

John Wheeler (G4LUE) monitors: 28.600 n.f.m. every evening between 1730 and 2230 regardless of conditions using a Yaesu FT-817 running 100W and a 2-aerial element, broad beam antenna/half-wave vertical antenna.

Leighton Smart (G8WBI) operates: on 1.948 MHz s.s.b. and around 1.820-1.836 MHz c.w. on weekday evenings between 1900 and 2130 using a Yaesu FT-747D QRP transceiver at 5W maximum and a 60m long wire Marconi antenna.

Ram Mansfield (G3XFD) is QRT from home at the moment due to a pending move to a new QTH soon. However, he'll continue to try to get on h.f. (also v.h.f.) from his car. Normal service will be resumed as soon as possible!

Sean Gilbert (G4UQG) operates: around 0700-1100 and 2100-0000 seven days on 14MHz and 7MHz using an FT-900 (and an Adcom DX-70 transceiver at 30W output) and a G5RV dipole antenna in the lofty space.

DATA SCAPES

NEWS, VIEWS & PICTURES TO: ROGER COOKE G3LDI TEL: (15108) 570278 E-MAIL: rcooke@g3ldi.freeserve.co.uk PACKET: G3LDI & G87LDI

THIS MONTH ROGER COOKE (G3LDI) TELLS YOU HOW YOU CAN KEEP UP-TO-DATE WITH WHAT'S ON YOUR FAVOURITE WEB SITES, LOOKS TO THE FUTURE & FINALLY TELLS YOU A BIT MORE ABOUT DIGITAL TECHNOLOGY AND HOW IT MIGHT AFFECT RADIO AMATEURS.

Ever wished you could remember to keep a check on every one of your particular sites that you are interested in? Keeping updated! need no longer be a problem. You can now ask somebody else to do it for you. Or rather, visit the Web page tracking service at www.netfinder.com See Fig. 1 for their introductory page.

You can ask to receive an E-mail alert whenever your favourite page, or pages, are updated. This saves you the bother of trying to keep ahead. I
recently signed up to receive an E-mail alert for the GeoClock page. Sure enough, I just received the e-mail prompt for me to go look! It's easy and convenient! I only have to click on it to invoke your browser.

You can track hobbies, business information, job openings, band tours, and so on using the Web page tracking service. It has been rated and prices will be coming down to cheaper, most machines will be using the Web page as the standard, with many CD-ROM drives and possibly a flat screen monitor. This might be slightly delayed because of the cost. Presently it is still prohibitive for the average individual user, but the cost will reduce.

Laptops will be faster and cheaper, most machines will be using the Celeron low-cost 300MHz chip and prices will be coming down to under £1000.

**DIGITAL TECHNOLOGY**

A controversial new Digital Power-line Technology (DPL) recently announced, could pose a major problem for the Radio Amateur. If you've ever lived near any major power-lines, you will appreciate the hazards these radiances present to equipment when wet and this problem will be exacerbated if this new suggested technology takes place.

The proposal is to deliver Internet access over power-lines and unless we protest at this, political pressure will force the government to deploy it and it is already presently on trial in Manchester. This power-line technology would give insufficient protection to Radio Amateurs and no precautions can be taken against the radiation from the power lines. Earlier this year, the Radiocommunications Agency (RA) warned that any service launched using existing digital power-line technology could be shut down because of potential interference with military, GCHQ and the Civil Aviation Authority transmissions.

The following comments came in from Peter KD7MW recently: "This evening between 04:00 and 06:00 UTC, I had my all-too-usual, frustrating experience of hearing several European stations on PSK31 that were too flitty to copy much of the time. "Evidently, the North Magnetic Signal-Eater is directly between my LBS and much of Europe, because I heard stations in Southern California and Texas successfully working these Europeans. I did manage a brief QSO with F8R7., but that was all. "Signal strengths were 54-57, and I could copy c.w. IDs with no problem. I believe that Feldhellschreiber signals would work well under these polar flutter conditions. Please, Europeans, Give Hellhellschreiber a try. If you're already using PSK31, your radio and your computer are already set up for Hellhellschreiber. All you need is the software!" Thanks Peter, information on Hellhellschreiber and links to software is available at 
http://www.qsl.net/ai1hpu/. Also, there's excellent WinKnok soundcard software (best with a Pentium) available at 
http://www.gamesfree.com/varie/ninepis/radio/ai1h/ai1h.htm There are Web sites available for both PSK31 and Hellhellschreiber. At each one you can subscribe to receive all the news for each mode. If you are of reading it all, you can always unsubscribe to any subscribed site, so nothing is permanent. See Fig. 2a & Fig. 3.

**DIGITAL VIDEO DISK**

Digital Video Disk (DVD) looks like becoming the future standard for more DVD offerings on the way, prices will reduce and it will catch on, given time. The origins of DVD go back to 1994, when Philips and Sony, the original developers of audio CD and CDROM, proposed the large capacity MMCD.

Toshiba and Matsushita, among others, countered an alternative proposed format, SD, with even greater capacity. This early 'standards war' was a foretaste of things to come. Even now the DVD industry is still plagued by dissent, particularly over re-writable DVDs.

Sadly, the founding of the DVD Forum comprising most of the major DVD manufacturers, has done little to end the battle of the standards between the rival factions. Most observers agree this acrimonious bickering between the competing companies over the DVD format has set back its acceptance by both industry and consumers. Strange how little changed I remember the same battle over PAL and NTSC and the theoretical battles over digital TV standards!

To be fair, most DVD standards have stuck. Like CDROM, DVD is available in DVD-ROM, DVD-R and DVD-RAM formats. The DVD-ROM serves as Read-Only Memory for computer data as well as for the DVD-Video.

The DVD-ROM was the first data format to be jointly developed by the computer and entertainment industries. The basic capacity was originally determined by the US film industry and is large enough to hold a 133 minute MPEG-2 encoded movie. The one-time writable DVD-R is primarily used for disk mastering, while the DVD-RAM is quite similar to Magneto-Optical (MO) technology and is re-writable many times.

DVD has the same format factor as the CD: a diameter of 120mm and a thickness of 1.2mm. A DVD disc, however, can consist of two 0.8mm thick disks that are glued together.
back-to-back. Each side can also have two information layers (dual layer). As a result of this dual-layer, an DVD-ROM disk can have one of four capacities, see Fig. 4 for more detail. Dual-sided drives, either ROM or RAM, are not available at the moment. You have to manually flip a double-sided DVD read to read or write the other side, rather like large capacity MO drives. DVD-RAM drives are now available from makers such as Hitachi, Panasonic and Toshiba. Prices are falling under £350 now. Cartridges capable of 5.2Gb are available at £20 with single-sided 2.6Gb at around £13. On top of this, DVD-RAM offers high reliability and usability and, like an ordinary hard disk, it is optimised for random, sector-level recording of data. It also supports defect management without the need for host-resident management software. These characteristics make DVD-RAM suitable for many applications where the primary requirement is low cost per megabyte and fast access to data. This means that, in addition to conventional secondary storage applications, DVD-RAM is likely to find high acceptance in many back-up and archive applications.

World-wide sales are estimated to top 16 million in 1999, compared to around 7.36 million in 1997. With figures like this, it's only a matter of time before the prices will tumble even further and make the re-writable DVD the user standard.

With software such as Office 2000 being distributed on seven CDROMs, it is conceivable that, as these programs grow, they will be eventually distributed on DVD. More information on this DVD format can be found at www.dvdforum.org.

HEALTH & SAFETY

I wonder how many of us have actually thought seriously about Health and Safety when designing our computer installations. Most 'designs' are an AOC Act Of God - anything which you can't explain when looked at from the Health and Safety point of view.

We put the computer on whatever work surface is available (it really is amazing how many horizontal surfaces are regarded as targets for our papers), grab what chair we can, accept the lighting that just happens to be there and so on. All this is not conducive to our health. If it happened in the work place, not only would we complain, but the employer would be legally liable.

Under the Health and Safety at Work Act 1974, computer installations should be designed in such a way that the users of the systems do not suffer health problems, stress or discomfort. The desk should have work space for pens and paper, as well as room for the computer and other equipment. There should be space under the desk for the knees. The chair should be adjustable in both height and the back support, preferably with lumbar support and be a swivel type with castors. The monitor should be placed in such a position and at such a height that it does not cause neck-strain and should swivel and tilt. The keyboard should be stable and detachable.

The monitor is important too. Working in a pleasently decorated room in pastel colours with adequate ventilation and lighting all helps. Noise can be reduced with the use of acoustic carpets on the floor and curtains at the windows. The monitor shouldn't face a window, avoiding reflections, an adequate desk angle-poise type lamp is ideal for the work-station, as is a copy-holder. Even a plant can add to the pleasant atmosphere. Eating, drinking and smoking at the computer is forbidden (that lets me out - I usually have a glass of orange-juice around!). I wonder how many shocks I have just described? Oh well, we can all dream of the ideal can't we!

LINUS RECEIVES BACKING

Linux recently received backing from IBM that could help the open source operating system win approval from corporate users. This system has its stawlart users and many amateurs among them, lots of software is now designed to be run under Linux. Under the agreement with Red Hat Software, a Linux distributor, developers from both companies will work to improve performance, reliability and security for Red Hat Linux for commercial installations. IBM has also released a beta version of its DR2 database for Linux and is working on Linux versions of Lotus Notes and Domino software.

IBM doesn't plan to sell computers with Linux pre-installed. Instead, resellers will load the operating system onto the machines. This should all be good news to the Linuxáveis among us!

That's all I have for you this month. Keep me informed of anything which you feel you would like mentioned in this column.

APOLOGIES

Finally, I have an apology to make. In last month's 'Data Scope', you may remember that I wrote about Iover GIBAJv spectular antenna system and I was able to print a Web site address for those of you interested in taking a look at more of the pictures.

Unfortunately, the Web site address wasn't complete and if you've tried to no avail than that is why. The full address should be:

www.miscomputer.com/gibajv Please take the opportunity to visit this site, it is very interesting and, once again, my apologies.

* Apologies from the Editorial department for saying (in the captions accompanying the 'Data Scope' column) that this site belonged to Fred VETPL. It is actually Iover GIBAJv's Web site and his antenna arrays!

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# An RAE Students Notebook

This month's "Book Of The Month" comes from the shack of Bob Griffiths G7NHB and is quite topical for the time of year. If you've started an RAE Course this year, then An RAE Students Notebook could be just what you need to back up what you learn in the lessons.

It claims to have been "Developed and proved in practical use with 80% first time passes for students" and the author himself says that "This book is not enjoyable reading but is also essential for the aspiring radio 'ham' who wishes to make radio an Interesting hobby". Flicking through the book, you'll discover that everything you need to pass the RAE is in this book, but, most importantly, the author states that it will also help you to get the best out of the radio hobby. This month the PW Book Store is offering An RAE Students Notebook to our readers for the price of £6.95 including P&P.

UK AND OVERSEAS. Hurry though, offer ends 30 November 1999!

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**DXTV**

- DXTV For Beginners: Simon Hamer - 35 pages, £3.95
- DX TV For Beginners: Keith Hamer & Gary Smith - 35 pages, £3.95

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**General**

- Buying A Used Short Wave Receiver New 4th Edition: F. Oliverm - 75 pages, £5.95
- Getting On Track With APRS: Stan Horanen WH4L - 105 pages, £11.90

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**Beginners (inc RAE)**

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- An RAE Students Notebook: Bob Gottling GR9HI - 76 pages, £6.95
- How To Pass The Radio Amateurs Examinations: Chive Smith G4ZFN and George Bannow G3DR - 8 pages, £6.95
- Practical Transmitters For Beginners: John Case GW4MHR - 130 pages, £9.95
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