The PROPAGATOR

Illawarra Amateur Radio Society Inc.

The monthly newsletter of the Illawarra Amateur Radio Society Inc.
Registered by Australia Post publication number :- NBH - 1491.

Meetings are held on the second Tuesday each month (except January) at 7.30 pm in the State Emergency Services building in Montague St, Nth Wollongong.

Visitors are most welcome.

VOLUME 91 ISSUE 1 FEBRUARY 1991

EDITORIAL COMMENT

Well, here's that Propagator magazine again. That means that there must be a radio club meeting coming up. Better think about going to it.

Welcome to 1991 from we the Editor of no fixed abode. After the monster December issue of the Propagator, we had a rest during January, so there was no January issue. We hope that you were still banding yourselves around the bands (remember, use it or lose it etcetera).

So. A new year. I suppose we should become all topical and talk about resolutions and all that. No. We will talk about Towers, about Club Stations and about Broadcast operators. However we have a lot of months left to bother you about that.

But altogether, welcome back and we hope you enjoy the year. Just remember - we could be listening and make you famous!

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PROGRAMME

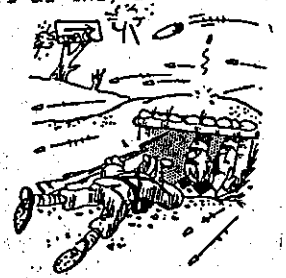
FEBRUARY: **DONT KNOW YET**

Also in February is the much-publicised Gosford Field Day. Don't forget that the Society is figuring on having a bus trip to this for your convenience.

MARCH: Due to the disorganisation of the start of the year, we don't really know what will be going on this year at meetings.

JULY: Annual general meeting. Get your year off to a great start by practising for a position on next year's committee.

OCTOBER: Jamboree on the Air. Another chance to get some young, impressionable people into amateur operating. Rumors exist of the possibility of an under-canvas event to be held somwhere - more details as they come to keyboard.



★ "STAND to attention when you speak to an officer!"

DENNIS's ANTENNER COLUMN

Clever readers will have noticed recently in this magazine that our World Reknowned Antenner Expert has been laying low for a while. However, like a pheonix from the ashes rises the Greatest to write for us once more.

Our technical expert has returned to the air once more, this time as a full-blown (well, at least partly-blown) amateur operator. After some serious studying and being nice to Keith, the callsign of Victor Kilo Two Ultimate Designer Brain has hit the bands in earnest. Users would be advised to watch out for this one.

So far, the station consists of a 2 metre rig, coupled to a DDS (Dennis Design Service) 11.5 elephant yagi beam of about 99.4 dBi gain, pointed in just about any direction. (Gain figure quoted by manufacturer). This results in a signal into VK2RAW equivalent to one of Lyle's microwave rigs at 100 paces.

So it seems that instead of relaying information about the experiments of one of the astute members of the commmunity, you can now enjoy first had discussions with the Paul Keating of antenner design. Well done Dennis.

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ZAPHOD's HINT No TH-215

While key thumping away in an attempt to bring you this tome for the month, I was trying to call Rob VK2MT to demand a Repeater Report so I could thump it in. After returning the mic to its holder, I noticed signal strength on the meter, and the display reading 7875. I had locked the button in. Lucky nobody noticed!

POWER MONGERS

In keeping with the Dapto-ites' habits, John VK2XGJ now runs low power into VK2RAW to be polite. Unfortunately, he tends to get beaten out of call-backs after broadcasts. Such is the problem with being polite.

It would never happen on packet. (Which reminds me - Ray VK2XCC has been very quiet recently.

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COOL PETER HITS THE WAVES

Peter VK2FPN now has a backyard pool. He was recently sighted swimming laps with his sunglasses still in place. This sort of behaviour was believed to have gone out of fashion, but Peter has no prejudiced.

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December Committee Meeting of the IARS, Tuesday, 18 December, 1990 SES HQ Montague Street, North Wollongong Start 19:30

Present: VK2's KWG (Chair), KLH, TKE, XSV, KCV, KHE, GID

Apologies: VK2's FPN, XGJ, JBS, XQX, KEY, TPH, XCC, MT

The minutes of the previous Committee Meeting OF 20/11/90 were read and received.

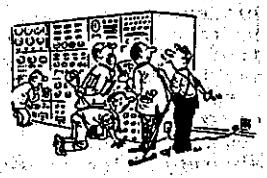
Business arising:
The tower base was laid 1/12/90. Present were VK2's XSV, KWG, XLA, KHE and harmonics.
The next project will be to raise the tower as one section by crane. This will be left for organising at the next committee meeting of 5/2/91. Vic, VK2XSV, has built a rotator and presented it to the club. Bill, VK2JBS, is organising the bearing and Ken, VK2KWG, will be composing a suitable epitaph for the plaque to those who laboured long and hard on the tower.

Peter, K2KHE, is organising a list for the Gosford Field Day Bus Trip. Pat, VK2KCV will write to the Central Coast ARC to enquire about group bookings.

General Business:
Pat, VK2KCV, to request advise from the WIA regarding application for 6 Metre repeater frequencies for Hill 60 under the WIA Band Plan.

An upgrade of VK2RAW telemetry system is being considered.

Brian, VK2KLH, to organise preliminary details regarding the Regional Conference of Clubs.



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Pat, VK2KCV, to write to WIA requesting a guest speaker for February or March meeting.

Peter, VK2KHE, to examine possibilty of encouraging local amateurs with ATV experience to give a talk and demo at February meeting.

Next Committee meeting: Tuesday 5th February, 1991.

Next General meeting: Tuesday, 12th February, 1991.

Meeting closed 21.45 local.

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Liquid crystals

A summary of one of the most widely-used display techniques

by J. C. Varney, Ebauches Electroniques SA, Switzerland

Watches containing liquid crystal displays are now widely available and liquid crystal panel displays are becoming more widely used. Yet the name — liquid crystal — appears to be an anomaly and the question "How can a crystal be a liquid?" is continually asked. Then again, when the display is described as a thin film of liquid crystal sandwiched between two transparent, conductively-coated glass plates, the problems involved in making reliable devices are not obvious.

A SOLID CRYSTAL is a material in which the constituent ions or molecules are rigidly held in a specific lattice structure; in other words, they are well ordered. In a liquid crystal the material is fluid but the constituent organic molecules are still ordered to some degree, the degree of ordering determining the type of liquid crystal. Thermotropic liquid crystals[1] occur when a solid crystal is melted and exist until the fluid becomes clear and isotropic. This means the liquid crystal properties occur over a temperature range and, for a display system, this range should cover the operating temperatures likely to be met.

In a nematic liquid crystal, where the molecules generally lie parallel to each other, the main properties are the differences in dielectric constant and in refractive index values parallel with, and perpendicular to, the long axis of the rod-like molecule. These differences are termed the dielectric anisotropy and the optical anisotropy respectively. The former gives rise to a torque on the molecule in response to an electric field such that, with negative anisotropy, the molecule lies perpendicular to the field while with positive anisotropy it will tend to lie parallel to the field. Combined with the optical anisotropy, reorientation of molecules leads to modifications of the light transmission properties of thin films of the material.

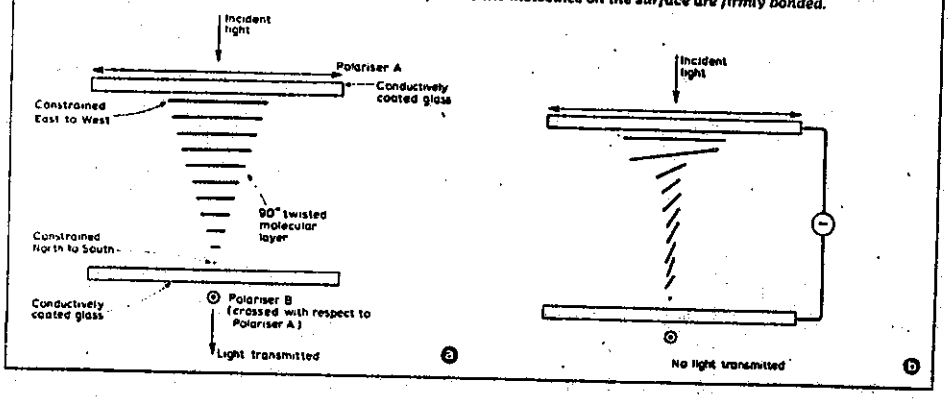
A display device can now be envisaged as a thin film of material whose optical properties are changed by the application of an electric field but the precise ways in which the properties change are many and varied. The first electro-optic phenomenon used practically was termed dynamic scattering. If a negative dielectric anisotropy material is doped to become slightly conductive, the interaction between dielectric realignment and ionic current flow causes turbulence in the film. Ambient light is scattered to produce a cloudy display against a clear background. It should be stressed that liquid crystal displays do not emit light but merely act on light passing through the system.

The thin film is made by sandwiching the liquid crystal between two glass plates each with a transparent, conducting coating of tin or indium-tin oxide. The shape of the display is determined by the pattern selectively etched on the two coatings and the distance between the plates is set by a spacer about 12μm thick. The first room temperature nematic liquid crystals were very sensitive to moisture and a hermetic cell had to be developed to give them a usably long life. Cell fabrication techniques vary throughout the industry but generally the sealing and spacer material used is a glass frit although thermoplastics are also used.

The cells can be filled using the two hole method, where two holes at opposite ends of the cell allow the liquid crystal to be injected at one end and air to escape at the other. More commonly, the vacuum fill technique is used where a cell with one hole is evacuated and then dipped into a liquid crystal, atmospheric pressure forcing the material into the cell. Final seals include indium plugs for the hole, solder end-cap sealing techniques and even laser-heated, glass frit soldering. The cell should be driven by a.c. since the use of d.c. causes electrolysis effects which substantially reduce lifetimes.

While the dynamic scattering effect is still used for large displays, another effect has superseded it in the smaller

Fig. 1. *Twisted nematic crystal with (a) no voltage applied and (b) threshold voltage applied. Note that when a voltage is applied the molecules tilt in the bulk of the cell and the 90° twist throughout the cell is destroyed. However, a remnant of the twisted structure is left at each surface as the molecules on the surface are firmly bonded.*



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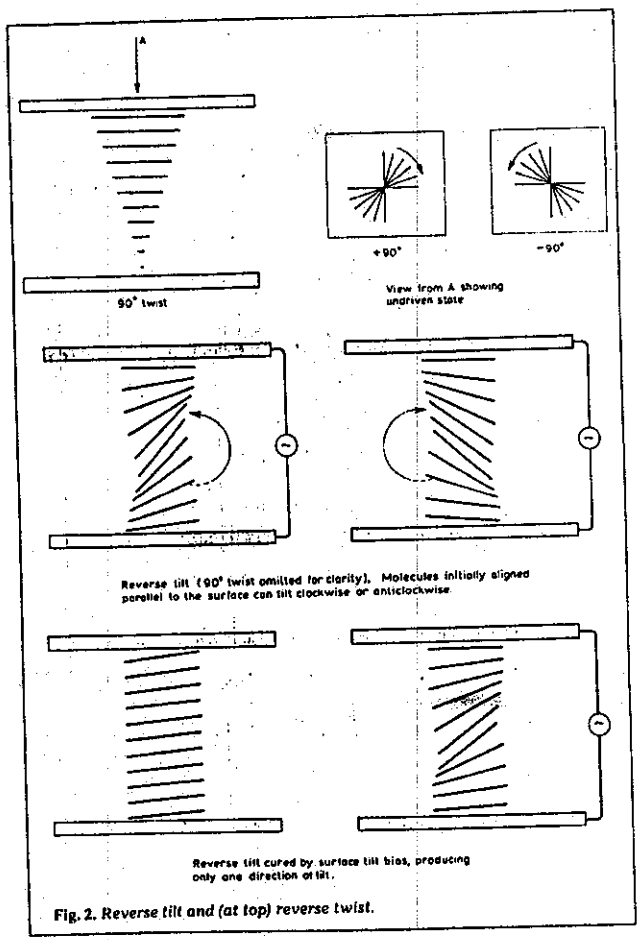

Fig. 2. *Reverse tilt and (at top) reverse twist.*

panel meter and watch displays. This is the twisted nematic[2] (sometimes called the field effect) display where molecules on the glass plates are constrained to lie at ninety degrees to each other so imposing a ninety degree twist in the molecular structure. This molecular structure guides the polarisation of light passing through the cell so that inserting a twisted nematic cell between crossed polarisers allows light to be transmitted (Fig. 1a). Using a positive dielectric anisotropy material, application of an electric field destroys the twisted structure, and stops the guiding effect and so the polariser and cell sandwich does not transmit light. Two types of display are possible: dark on clear with crossed polarisers; or clear on dark with parallel polarisers. Coloured displays[3] can also be made by using optical effects, such as coloured polariser material, or a birefringent layer.

Material stability problems using the original room temperature materials could still exist with the twisted nematic although the cell techniques employed enable these materials to be successfully used. The invention of the extremely stable biphenyl liquid crystal family[4] slightly relaxed the demands made on the cell technology and a positive dielectric anisotropy mixture of the biphenyl family can have a nematic range of −10° to 60°C.

The main problem peculiar to the twisted nematic display has been achieving the desired molecular orientation at the glass surface. Evaporation of a dielectric material[5], e.g. SiO, at an angle to the surface has been generally adopted. The orientation of the molecules at the surface depends on the angle of evaporation, the molecules tending to tilt away from the surface at certain angles. As the tilt angle gets smaller, so the viewing angle of the display increases and the voltage response curve becomes more non-linear, both desirable qualities.

Early twisted nematic displays, and some less well-made present displays, suffer from reverse twist and reverse tilt (Fig. 2a). Reverse twist occurs when the ninety degree twist is in a different sense, i.e. +90° and −90°, in various areas of the cell so giving rise to a patchy appearance in the undriven state. It can be cured by the addition of a small amount of cholesteric liquid crystal[6]. (See *Wireless World*, May 1975 p.229-234.) The cholesteric material is a nematic with an inherent twist which biases the twisted nematic towards one twist sense. Reverse twist occurs when the molecules are parallel to the surface so that when a voltage is applied the molecules in the centre of the film can be reorientated in either direction to produce regions of different tilt angles, and a patchy appearance in the driven state. Reverse tilt in the driven state can be solved by giving the surface molecules a slight tilt to bias the driven-state tilt-angle in one direction.

The main advantages of the twisted nematic over dynamic scattering are the reduced power consumption (because the twisted nematic is a pure field effect while dynamic scattering requires current flow), enhanced contrast and greater aesthetic appeal.

At present the twisted nematic display is the dominant liquid crystal display in the watch and panel meter markets. The best displays have a wide viewing angle, reasonably bright background, no patches in either 'on' or 'off' areas and appear generally uniform. Response times are of the order of tens of milliseconds and, again, the best displays do not have the sluggish appearance of the poorer quality displays. Early liquid crystal displays tended to fail after a short time but, with the improvement in cell fabrication techniques, and the use of a.c. drive and newer materials, lifetimes of five years have been generally quoted, with longer lives anticipated as test data is accumulated.

What of the future? It seems probable that the twisted nematic liquid crystal display is perfectly suited to use in watches with respect to both the power requirements and the interface with c.m.o.s. circuitry. Under development at the present time is the dyed phase change effect[8] where a dichroic dye (absorbing when light is polarised parallel to the long axis of the dye molecule, non absorbing when light is polarised perpendicular to the dye molecule long axis) is dissolved in a cholesteric-nematic mixture. The cholesteric imposes a twist on the nematic so that a helical structure is formed and, because of the dye, this appears coloured in the undriven state.

Application of an electric field to the positive dielectric anisotropy material results in a breakdown of the helical structure so that the display appears

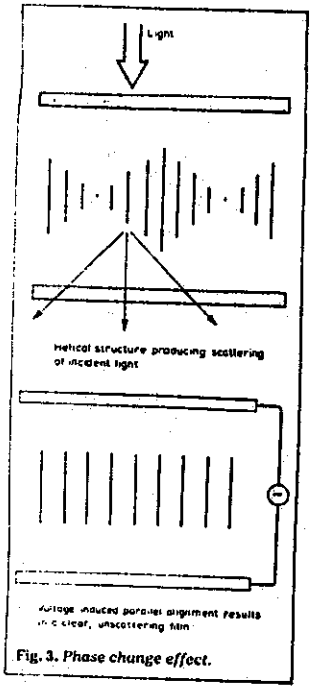

Fig. 3. *Phase change effect.*

clear due to the dye realigning in sympathy with the voltage realignment of the nematic molecules (Fig. 3). This display is brighter than the twisted nematic display since it does not require any polarisers, and it is hoped to make the contrast sufficiently high by the development of suitable dyes. The effect is considerably faster than the twisted nematic but requires higher drive voltages and quite stringent control of cell spacing. The main problem lies in developing dyes with good solubility in the nematic material, good dichroic properties, good colour characteristics and the required resistance to u.v. light. These are not trivial and no satisfactory solution has yet been found.

Many of the liquid-crystal display products on the market now employ multiplexing techniques. This means that instead of each segment being directly driven, the applied voltage is time-shared between several segments. Unlike l.e.ds for example, where multiplexing is easy due to the unidirectional, non-linear behaviour of the device, liquid crystals are not easy to multiplex. Since the device has a poor voltage threshold which also varies with temperature, multiplexing of liquid crystals is usually limited to two or three ways and is used extensively in the Japanese calculators and some watches. As the techniques improve, multiplexing will become commonplace in the field of liquid crystal displays, more especially so if the number of ways can be increased, and dedicated, multiplexing integrated circuits become readily available (the latter being particularly important for the o.e.m. market).

One common criticism of early liquid crystal displays, particularly in watches, was that they could not be seen in the dark. This has been overcome by two techniques; the first uses a filament microbulb plus a plastic light pipe to direct the light behind the display. The second technique uses tritium-activated "betalights" where pressurised tritium gas (radioactive hydrogen), inside a glass tube, emits electrons ('beta' particles) to strike a phosphor coating on the inside surface of the tube. This coating emits the desired light and these devices have a useful life of over 15 years.

Liquid crystal displays have come a long way since the first prototypes were made and the development effort now in full swing throughout the world promises to improve the devices even further. The advantages of low power consumption and continuous display will enable them to dominate the digital watch and calculator markets. With the multiplexing and aesthetic improvements on the way, liquid crystal displays will find applications in many of the markets where l.e.ds and fluorescent displays now dominate. □

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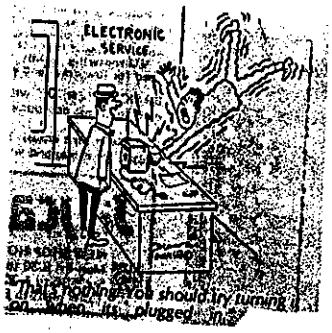

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NAME THAT COUNTRY

Many operators know the interest of amateur contests. Special interest are in the worldwide DX contests. As such, the Society is running its own international DX contest.

Pictured below is a DX country. A prize will be awarded to the neatest, correct entry of which country it is. To enter, tear off the top of a Kenwood 950-SD and send it in with your entry.

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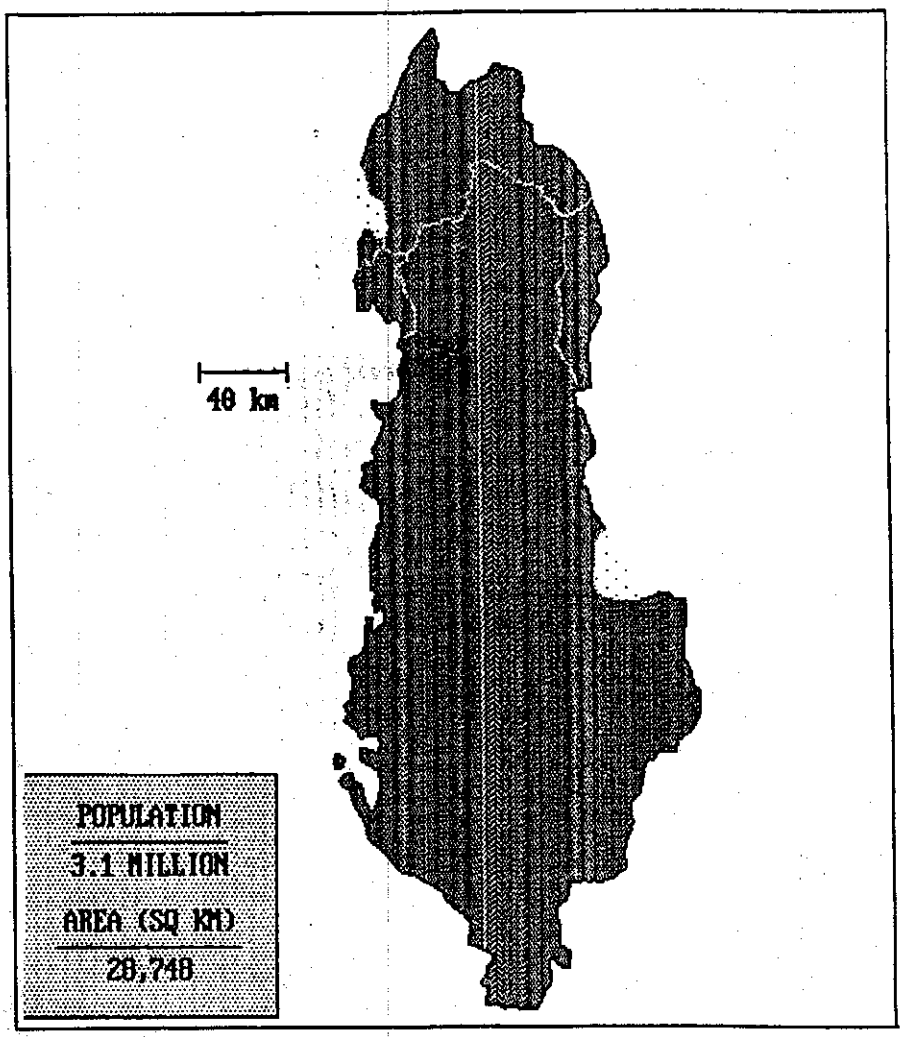

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STOLEN

Alinco ALD-24T dual band VHF-UHF mobile radio, serial number 10107310. Stolen from Dapto late January. As advertised on the recent W.I.A. broadcasts. Contact Phil VK2TPH or any police station.

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FOR SALE

One Alinco ALD-24T dual band VHF-UHF mobile radio, serial number 10107310. In very good condition. As recommended by Phil VK2TPH "a good rig". Internal diplexer bypassed. See the fella down Dapto pub in the shady corner, Tuesday nights.

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A NICE COMMENT ABOUT PETER

Peter VK2KHE asked us if we could write something nice about him, so here it is. Poor Peter had a dead antenna system, so we won't hassle him too much.

Peter also commented about the reason why the WIA Stolen ad called VK2TPH Peter. He said all the good looking blokes are called Peter. Zaphod fails to understand this logic.

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ZAPHOD's HINT No VK2ZNS

Zaphod has recently discovered why the legendary Noel, VK2ZNS talks at warp factor seven. Regular listeners to Noel will no doubt be aware that he laughs all the time (even with a broken arm). To be able to fit a decent over in before the repeater times out, he needs to get the words out quickly.

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DOTC QUESTION(S)

We have two DOTC questions outstanding: Keith asked - what will happen when a junction diode is forward biased? The answer was (b), the potential barrier of the diode will decrease (which allows current to flow).

Keith also asked, what is the impedance of a yagi when the driven element is a folded dipole? The answer is (e), 300 ohms, although this is subject to protest by the management. A folded dipole has an impedance of 300 ohms, but adding parasitic elements as in a yagi array reduces the impedance (depending on how many elements are added). Hmmm....

For this month, the Editor asks (because I have misplaced the sheet of questions Keith gave me...): What are the limits of the Amateur 12 metre band?

(A) 18.060 to 18.268 MHz
(B) 18.000 to 18.300 MHz
(C) 24.890 to 24.990 MHz
(D) 24.500 to 24.999 MHz
(E) I'm not a Full-Call and I'm sick to death of all these HF questions. Let's have something about VHF packet or Rosie or something for a change!

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FOR SALE

Kenwood TR751A all mode, 2 metre amateur transceiver. In mint condition, complete with all accessories. Asking price is $800.00 ono, which is pretty good considering that it is in great nick. Contact Tony Stone on (042)716811 VK2VTS. (Licenced operators only).

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WORK WANTED

Family man requires work. He is experienced in meat and smallgoods delivery, labouring, welding and general fabrication. He holds a class 4A driver's licence.

If you have a use for a widely experienced, hard working gentleman, call Peter [illegible] (048)-851449.

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REPEATER REPORT

Well this Report is different for me. I'm sitting at Simon's operating table on his computer. Normally I type the report at my place & with dog in toe, walk over the paddock to Simon's. At home I can type away quietly by myself.

This time I have the full complement of Editors looking over my shoulder, watching every word I type. At least this way there won't be any spelling mistakes & I might be able to stop all those editorial comments from being added. (Hah!...Ed) By the way the reason I'm at Simon's is that half an hour ago they rung me & said they wanted a report, a week early. So here goes.

At the last meeting, the Christmas get together, it was unaminously passed that VK2RUW repeater will stay at Knights Hill. The Hill 60 spot we still have is being looked at for future expansion of our local repeater network. Over Christmas Repeater work was put to one side due to the obvious family commitments.

On the Saturday morning, the 5th January, Ken TKE, Dale DSH & myself went to Knights Hill to do some work on RUW. The owners of the tower had donated one of the 7/8th inch Foam Heliax lengths to the 200' level.

Ken had made up a really heavy duty bracket that would hang the collinear 8' from the tower & would fold back against the tower for easy access for maintainence. We had to relocate the heliax on the tower as we dropped the feed line back to the ground & reroute it back up the tower. The weight of 200' of this type of cable must have been close to 60-70 kgs. It was an effort not helped by the 35 degree temperatures.

While we had it on the ground we thought we'd check the length for loss. With 15 watts in we were only getting 5 watts out the end. A far bit of loss. We then checked the heliax by taking the large N-type socket off. When it finally came off we had a small flood of water. The feeder's foam dielectric was saturated. Checked the other end & the inside of the connector was green. The feedline should have been more appropriately called a downpipe. Instead of spending any more time there, we headed home early, much to the surprise of my dear wife.

I checked the history of that piece of heliax that next week & it turned out it had been pensioned-off in the last 12 months, ends taped up & left there. The taping job was pretty bad so we now had one rather lengthy & lossy piece of coax. After some more scrounging at work I managed to obtain two 140' pieces of never used 7/8" heliax. Also scrounged some N connectors to suit & we were back in business.

We had a visit planned to the Hill on Thursday arvo the 18th. The weather was great, but unfortunately something came up in the Middle East that morning, namely a War. That incident put my workplace into a total mess & I couldn't get away. We postponed it till the next day.

Unfortunately the weather wasn't so kind. It was foggy with occasional misty rain. We went anyway. In attendance was Ken TKE & son, John XNH, Bill EU, Peter BIT & myself. We first tested the 2 new pieces of feeder & we had mixed feelings about the results.

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We decided to install the system anyway. Ken & myself hooked on to the side of the tower a mere 20 storeys up. The bracket installed OK & we hauled up one piece of heliax & bolted it onto the tower.

But time & weather was against us. A lot of the time we couldn't see the ground from up the tower & as it got darker the dew point dropped & the fog started condensating on the tower. So now it was dark, foggy & slippery. We decided we'd had enough.

Also Steve had fully built an amplifier with accompanying power supply for RUW. This would boost the output of the repeater from around 6 watts to almost 20. Unfortunately when installed the extra RF caused some squelching problems. Some earthing of the system & other work should fix that. The extra RF will help equalize the RX & TX performance. At the moment the repeater has an extremely good set of ears thanks to Graham CAG. Another visit to the site is proposed the week before the meeting.

2 days later on Sunday the 20th, Ken, Steve, Bill & Phil TPH went to Mt. Murray to put RAW's proper antenna back up after it's run-in with a bolt EH voltage. The re-installation went to plan & thay had the system back on the air before the WIA broadcast. The antenna they pulled down was the packet's antenna, but instead of re-installing it on the packet mast it was decided to take it back home & fix-up the excessive VSWR.

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The current Packet antenna, an old rusty 2mx ringo, is performing rather poorly so it is an urgent job. Reports on 6850's returned antenna have been very good. The old antenna & the loaned packet antenna VSWR were over 3 to 1, upsetting the diplexing & causing desensing of the RXer. The repeater is now very sensitive, again.

Till next time,
Rob-VK2MT

PACKET NOTES

We rang John VK2XGJ's residence for some comments on the Packet stauts of the region. The reply is copied below:

"Blart...beeeep...buzz...poink... wheeee....splop."

So there you have it, straight from the computer that knows Packet better than any other in the Area.

ANTENNA PRICES

Every smart amateur knows about Cavion's at Bulli - that goldmine of cheap and useful goodies (see ad in this issue, or any other). Recently, the fellas from Nowra came up and found some cheap, wideband UHF antennas at $15 each. They bought a couple at the time. Rob VK2MT bought one as well.

A couple of weeks later, the boys from Nowra came up again to take some more off the place. The price had gone up to $25 each.

Phil VK2TPH heard about the bargain, and went to cash in for himself. Of course, the people at Cavion's realised they had a hot seller here, and charged Phil accordingly. That's inflation for you.....

Relativity and time signals

"The theory is so rigidly held that young scientists dare not openly express their doubts"

by L. Essen, D.Sc., C.Eng., F.R.S.

Perhaps best known for his quartz ring clock — which revealed variations in the earth's rotation — L. Essen's main activity during his 44 years with NPL was the measurement of frequency and time, "but with sidelines" he admits. He built the first caesium clock in 1955, later used with the US Naval Observatory to define the atomic second. One of his early sidelines was a determination of the velocity of light by cavity resonator which showed Michelson's value to be 17 km/s too low. (Which illustrates a peculiarity of Nobel prizes — Michelson got one, Essen didn't.)

He's always been interested in relativity, and repeated the Michelson-Morley experiment with quartz crystal in 1937 and with radio waves in 1955, when he first pointed out a basic error in the theory. "No one has attempted to refute my arguments," Dr Essen told us, "but I was warned that if I persisted I was likely to spoil my career prospects."

ONE OF THE EARLIEST applications of radio was the transmission of time signals as an aid to sea navigation and today signals are used to synchronise atomic time throughout the world for navigational and other purposes. The comparison of distant clocks by radio is now a precise and well known technique. This was not the case in 1905 when Einstein published his famous paper on relativity and there is some excuse for the mistakes he made in the thought-experiments which he described in order to determine the relative rates of two identical clocks in uniform relative motion. But there is no excuse for their repetition in current literature.

The mistakes have been exposed in published criticisms[1] of the theory but the criticisms have been almost completely ignored; and the continued acceptance and teaching of relativity hinders the development of a rational extension of electromagnetic theory. It could be argued that the truth will eventually prevail but history teaches us that when a false view of nature has become firmly established it may persist for decades or even centuries. We cannot afford to wait that long. The energy reserves are dwindling rapidly and if there is to be a scientific breakthrough to solve the crisis it will possibly be in worthwhile therefore making another attempt to weaken the stranglehold of relativity by explaining the basic mistakes in still greater detail.

Measurement of time and the comparison of clocks

The passage of time is measured by counting the number of repetitions of some regular periodic event such as the revolution of the earth, the swings of a pendulum, the vibrations of a piece of quartz, or the radio waves emitted by an atom. Whichever event is chosen the result of the count is converted for convenience into one-second ticks which are then counted on a clock dial and expressed as hours and minutes.

"The general public is misled into believing that science is a mysterious subject which can be understood by only a few exceptionally gifted mathematicians."

The only way of comparing distant clocks is to transmit the ticks by radio so that at each station there are two clock dials, one counting the ticks from the local clock, and the other the ticks from the distant clock. In practice a continuous count may not be necessary because the result may be known approximately from experience or may be given by a coded message on the transmission, but the principle remains the same. The relative rates of the clocks are found by comparing the rates at which the readings on the two dials increase, and the complication of synchronizing the two clocks before the start of the measurement does not arise.

Einstein's prediction

Einstein predicts, to use his own words, that "the time marked by the moving clock, viewed in the stationary system, is slow by ... ... $\frac{1}{2}(v/c)^2$ second per second", where v is the relative velocity between clocks, and c is the velocity of light. In practical terms the only meaning that can be attached to this rather vaguely worded statement is that the reading on the clock dial recording the ticks from the distant moving clock increases more slowly, by $\frac{1}{2}(v/c)^2$ s/s than the reading on the dial recording the ticks from the local clock. According to Einstein's relativity postulate either of the clocks can be regarded as the moving one and the full prediction is therefore

clock B, viewed at A, goes slower than clock A by $\frac{1}{2}(v/c)^2$ s/s—(1)

clock A, viewed at B, goes slower than clock B by $\frac{1}{2}(v/c)^2$ s/s—(2)

This result is not logically impossible but it has an important consequence which does not appear to have been appreciated by Einstein or subsequent writers on the subject. More ticks are transmitted than are received and this process continues indefinitely whether the clocks are approaching or receding from each other, the effect being proportional to v^2. This loss of ticks is inexplicable but it is inherent in Einstein's prediction. However being unaware of the consequence, relativitists, including Einstein, later make the more reasonable assumption that all the transmitted ticks arrive at the other clock in the course of the measurement. They thus unknowingly make two contradictory assumptions and naturally they obtain paradoxical results.

Einstein's prediction contains no mention of the ordinary Doppler effect, which is proportional to v/c. This is eliminated by Einstein's definition of time — a point which is not discussed by relativitists. The measurements will in practice include the term for the Doppler effect but for simplicity the prediction is given here exactly as Einstein gave it.

The clock paradox

Einstein described the following thought experiment. Two identical clocks, A and B say, are side by side. One of them B moves in a straight line at uniform velocity away from A to a point x. Einstein states that, in accordance with his result (1), B will be slow compared with A. Now this is not in accordance with (1), the phrase "viewed at A" having been omitted. The clock B continues to travel in a number of straight line paths until it arrives back at A, when it will be found to read less than A.

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Einstein calls the result peculiar but gives no explanation.

The paradox is not immediately obvious because Einstein gives only half of the result. Although accelerations must be applied to obtain the round trip, no correction is made for them and they are not even mentioned. As far as the experiment is concerned the clocks are in uniform relative motion and either clock can be taken as the moving one. The full result is

clock B goes slower than clock A by $\frac{1}{2}(v/c)^2 s/s$
clock A goes slower than clock B by $\frac{1}{2}(v/c)^2 s/s$

which is obviously paradoxical.

There is no problem if the experiment is carried out correctly. The ticks from B are received on a dial at the position of A; and another dial travels with B to receive the ticks from A. At the end of the experiment the dials will record the result (1) and (2) as they must do since a thought experiment cannot give a result that contradicts the initial postulates.

Consequences of Einstein's mistake

The paradox result follows from a simple "experimental" error but it was accepted by Einstein and has been accepted by relativists ever since and it is important to consider the consequences. It is based on the assumption that no ticks are lost. This assumption is reasonable but it contradicts the prediction (1) and (2). By accepting the result they thus reject the relativity theory. They still accept the existence of the second-order time contraction but it is now a real physical effect just as in the Lorentz theory from which Einstein started.

Introduction of gravitation and acceleration

In 1918 Einstein published a paper[3] which took the form of a discussion between a relativist and a critic. The relativist admits that the paradox result contradicts his initial postulates.

"Students are told that the theory must be accepted although they cannot expect to understand it. They are encouraged right at the beginning of their careers to forsake science in favour of dogma."

He then describes a thought experiment in which gravitational fields are switched on and off at different points of the path of the moving clock as it makes a round trip; and concludes that the result obtained earlier by assuming that acceleration has no effect is due to the gravitational fields. It is not surprising that this paper with its damaging admission, its irrational assumptions and its "experimental" mistakes is seldom mentioned in the literature. Many writers on relativity nevertheless advance a similar argument. They conceal the paradox, as Einstein did, by giving only one half of the result, and justify this by pointing out that the two clocks are not symmetrical, overlooking the fact that they have made them symmetrical, as far as the experiment is concerned, by assuming that accelerations have no effect. Without this assumption they would not be able to obtain any result at all. Vague suggestions are then made that the result is due to the accelerations.

Does it matter?

It has been explained how Einstein, in the course of his paper, rejects the relativity postulate and returns to the Lorentz theory, which is still found to be useful. It might be asked therefore whether the mistakes are important. I suggest that they are immensely important. Students are told that the theory must be accepted although they cannot expect to understand it. They are encouraged right at the beginning of their careers to forsake science in favour of dogma. The general public are misled into believing that science is a mysterious subject which can be understood by only a few exceptionally gifted mathematicians. Since the time of Einstein and of one of his most ardent supporters Eddington there has been a great increase in anti-rational thought and mysticism. The theory is so rigidly held that young scientists who have any regard for their careers dare not openly express their doubts.

Experimental checks

It is often claimed that the special theory of relativity has been confirmed by experiment. In fact no experiment has been carried out in which symmetrical measurements have been taken at each of two stations moving relatively to each other with the required high velocity; and there has therefore been no check at all on the relativity aspect of the theory, which is of course its essence. Any checks that have been made can only relate to the Lorentz theory to which Einstein returns by accepting the paradox result. Moreover even with this limited interpretation the checks are always far from convincing.

This is true for example of a recent experiment[4] in which four atomic clocks were compared with similar clocks at an observatory after they had travelled round the world in both an eastward and westward direction. It was claimed that the result provided an unambiguous resolution of the clock paradox. Now the paradox result was deduced, mistakenly, from the special theory which was concerned only with uniform relative velocity, but the results predicted for this experiment were based on gravitational and kinematic effects. It does not seem therefore to have any connection with the clock paradox, as described by Einstein. The untreated results given in the paper indicate that the average clock lost 132ns (nanoseconds or 10^{-9}s) for the eastward journey and gained 134ns for the westward journey, but since the difference between individual clocks was as much as 300ns little, if any, significance can be attached to these average values. The authors do not use all the results and apply a statistical analysis, details of which are not given, to those they do use. They conclude that the average clock loses 59ns on the eastward flight and gains 273ns on the westward flight in close agreement with the predicted values. These criticisms were rejected by *Nature* but subsequently published elsewhere[5].

"... the continued acceptance and teaching of relativity hinders the development of a rational extension of electromagnetic theory."

A hope for the future?

There are fortunately a few writers who are breaking with tradition and developing new ideas which may be fruitful. In this country there are two small volumes[6] by H. Aspden and in France R. L. Vallee has published[7] a theory of energy which appears to be gaining in spite of much opposition. A society, the S.E.P.E.D. has been formed for the promotion of his ideas. One important conclusion he reaches is that space contains an unlimited amount of high frequency energy which could possibly be extracted and used with safety and efficiency.

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AUCTION REPORT

We haven't said anything about November's acution night. It was such an entertaining evening that I thought we should say a bit to those who didn't make it.

Having never been to a Society auction before, I didn't really know what to expect. I was very surprised at the roll-up. But then the bidding commenced and the entertainment came thick and fast.

The emcee for the evening was Tony VK2ENX, assisted by Alyce McKnight VK2MT. Things started off fairly casually. Later in the night, people were amazed to see Keith VK2OB and Wayne VK2XTE trying to outbid each other for an item.

In an attempt to out-wierd these two, Steve Benko bought an item that he had donated for the auction. This caused a full scale bid-off for some further items. In the end, both teams declared a draw, after gettting hernias from carrying their newly bought stuff.

Some of the bargains of the night included a panel looking a lot like ex-WIN TV equipment, with 5ó SO-239 sockets. Price, only two dollars. Some weatherproof power points, courtesy of Steve Benko, for $12 (yes, Steve bought some too).

After a while (a long while), the excitement died down and everyone packed up their stuff. Ken VK2TKE was the Treasurer for the evening, and must have been the only person not to make a bid all night.

Next auction looks like being in May. This should cause some excitement from some corners, and a chance to go for some entertainment. Be there.

RAMBLING RECOLLECTIONS

Here we are. We are planning the February propagator, which means that there has been little happenning to talk about. After our monster December effort, we could rest on our laurels and just have a short issue. However we have a job to do (fill these pages up), and so fill them we will.

An interesting job, this Propagator Editor. Sometimes the stories flow so easily, and other times the magazine starts looking very anaemic. So we start this funny raving (Peter VK2FPN will know exactly what we mean), and the pages fill up anyway. I suppose people still read this.

Every first-week-of-the-month, we sit and wait for the magazine, then read it with interest. Even though we wrote it ourselves, and so know every line back to front, we still read it. Crazy people, aren't we?

There doesn't seem to be much to some of the jobs in the Society - for a lot of work put in, there is very little that members see for it. Rob VK2MT and his merry band (or whatever they can be called) slave away weekend in and weekend out to keep the repeaters on the air, with no-one really giving it a second thought.

But being the editor, we get to see something concrete (or at least paper) for our efforts. A pile of magazines sitting in the corner to show the lost weekends. Memories of the broadcasts, where we get the material for the Zaphod's hints.

Anyway, that's another column of useless drivel, and so we get closer and closer to the back page.

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Letter of the Month

Mandatory Morse

Scanning through the letters pages of your magazine I must admit that I am surprised at the number of people who are complaining about the Morse test. So far all the excuses given for 'not doing it' are extremely lame. Let us look at one or two of these pathetic excuses and translate their meaning.

1; "Young people don't have the time these days". (I would rather spend my spare time in the pub/disco/watching television/sleeping on the sofa).

2; "I will never use the mode". (I would like to have the bottom 50 kHz for SSB / When the going gets rough I will turn up my linear to 30dB of clipping and splatter all over the band. I have no idea of the advantages of CW in adverse conditions).

3; "I find it impossible to learn Morse". (I have not tried hard enough/ Really I am not that interested in getting an amateur radio licence / The Morse course I bought was in Russian).

4; "I can't see why we have to have a Morse test". (I would like to have everything for free).

It also seems that these people think that the older members of the amateur fraternity had things easier. I assure them that this is not the case. I assure we had to commence with a written examination and did not have the advantage of electronic Morse tutors etc. I often wonder how many of these "Morse moaners" would answer a question like:-

Q: Draw the Circuit of a 50 watt AM transmitter for use on the 3.5MHz band. Give details of components and explain their function.

Possibly by saying "I shall never use 3.5 MHz".

In this world if something is worth having you normally have to work for it, or to put it another way "There is no such thing as a free lunch". If you want something badly enough and it is just out of reach you will have to struggle harder to obtain it. However, once you have gained the object of your labours you will take great care not to damage or discard it. This applies as much to obtaining an amateur radio licence as anything else, and is I believe a valid reason for keeping the Morse test as part of the required qualifications.

— R. Gouldstone. G3TAG

Comment

We at HRT feel there is a valid reason for some form of distinction between different classes, i.e. different operating privileges, of amateur licences. We agree that greater privileges should not just be 'handed on a plate'. However if some of the more mature members of our licenced amateur fraternity would have had to have answered an RAE question such as "How would you communicate between the UK and Australia with 100% error free copy using 25W on 2m and 70cm, and automatically store the QSO for later retrieval?" many, including myself, would have thought the examiner was off his rocker. Time and technology does not stand still, it changes. Amateurs are continuing in their tradition of being at the forefront of technology, however we're not doing this effectively by arguing amongst ourselves. We're doing this by searching out and finding new, efficient forms of communication, such as using advanced forms of data modes which can be used where Morse doesn't stand a chance. Fact.

Ask the professionals who are now doing what we amateurs have shown them can be achieved. The days of the radio officer manually bashing SOS out in Morse on a sinking ship or failing aircraft are no more.

However, Morse is still one of the most simple forms of communication, and to many experienced users it's an art form which is thoroughly enjoyed. It can also be transmitted with relatively simple equipment, and as long as it's limitations are realised it can be a useful low cost start into amateur radio. It's use should certainly not be abolished, but we would invite readers to offer their views on whether it's knowledge should be mandatory, and if not then what the alternative should be.

Maybe as well as, or instead of, retaining a Morse test we should also examine the prospective Class A on how to recognise various data signals of primary users of the HF bands, including that of Morse, so that we do not simply 'tune up' on top of them. Possibly also knowledge of the sound of an emergency data distress call from common devices such as a personal EPIRB (Emergency Position Indicating Radio Beacon) should be tested, and those of other users of the worldwide radio spectrum that we must not interfere with.

We need to inject new blood into the hobby, lest we die. Simple Morse communication could be one way. However over 1,000,000 licensed amateurs in Japan, a country who's population many would argue generally know their stuff in electronics technology, may use HF with no requirement for a Morse test.

So who designed and built your transceiver?

SHORTWAVE SNOOPING

What! A column on shortwave listening in the Propagator? Fairly unusual, but it does indicate yet another side to the hobby. We have been snooping around the non-amateur bands lately - all this interest about life in those parts of the world more Middle Eastern than others has got us as well.

We thought we might tell you some of the things that await your ears if you connect them to a HF general coverage receiver. Smart readers will know that HF has the ability to wind its way around the world, so that we can hear things happening from the front here at the back.

Snooping around just above the amateur twenty metre band gave us a look at the long range military communications of the US. Further observations above the fifteen metre band (in the broadcast segment) allowed us to listen to the Voice of America broadcasts on the matter - interesting propaganda. This is the same place that the TV news get their information from.

This isn't meant to be serious, heavy-duty snooping frequencies, just a little something to whet your interests. It's another side to amateur radio operation that can also be interesting and entertaining, and that is what we are supposed to be here for.

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