THE PROPAGATOR

The monthly newsletter of the Illawarra Amateur Radio Society Inc. (IARS)

Meetings are held on the second Tuesday each month (except January) at 7:30pm in the State Emergency Services building in Montague Street North Wollongong.

VISITORS ARE MOST WELCOME

Volume 94 Number 6 June 1994

SIGN UP A MEMBER AND SAVE FIVE DOLLARS

With membership renewals being due to be paid by the August meeting the club is offering a $5 discount on YOUR membership with every NEW MEMBER you sign up. If you sign up enough new members you will get your membership FREE. Think about it. Now please read and complete the "Important Notice To All Members" elsewhere in this issue.

VALE, ERIC FISHER, VK3UQ (ex VK2DY)

New was recieved of the death, late in April of Eric Fisher, VK3UQ.

Eric, who later became VK2DY, and his father were both foundation members of the Wollongong Radio Club when it was first formed in 1948. He became the second President of that club, after Howard Booth, VK2AMD moved to Windang - and remained active in club affairs until he and his wife, Peg, moved to Frankston, Victoria after he retired from work in the Combustion Department of AIS, approximately 20 years ago. There he became VK3UQ and retained that call until his recent death.

He was made Vice President of the Club (which was later to become The Illawarra Amateur Radio Society) when it was resurrected in 1962 - see earlier episodes of this history.

Amongst his club activities were the classes which he conducted to assist aspiring Amateurs in the Wollongong area to gain their tickets. These were held at his home in Port Kembla and later at AIS. They are well remembered by those studying for their Licences in the 1960's era.

So another "Old Timer" passes on, though the family amateur radio tradition lives on in his son, Colin, who has a VK4 callsign.

Lyle VK2ALU.

REPEATER REPORT (2/5 - 4/6/1994)

Before I start, congratulations & best wishes to Barry (VK2BZ) on his new position as Chairman of NTAC (NSW Technical Advisory Committee). Of course thanks must also go to the retiring Chairman, John (VK2XGJ).

VK2RIL (5650)

Not much to report. The rptr has performed flawlessly & has been beautifully quiet (no pagers) for the past month. Still looking for a possible better site for the system.

Quite often in the evenings, every 15 minutes, someone's Packet Station Beacon has been going off on the rptr. If you have your Beacon set to 900 seconds, please check that you disconnect your TNC when coming back to monitor 5650.

On Friday (25/5), I rung & spoke at length (over an hour), to John Martin (VK3KWA) who is the Chairman of FTAC (Federal Technical Advisory Committee). He is a very pleasant person to speak to, (that is obvious from the length of our conversation) & appears to be very knowledgable with regards to the RF spectrum.

The 2 main topics of conversation were the amount of Pager problems/interference that this region (Sydney & surrounds) suffers from & also our moving of the Sublime Point rptr to 5650 in an effort to try and alleviate our lengthy & ongoing Pager probs.

He explained that the Pagers around Melbourne were not near as bad as they were up our way, due to Melbourne being so "flat", there are only a few major Pager sites to cover the area. In comparison, even W'gong has more Pager sites to cover our hilly topography. Sydney is the same, but of course requiring even more sites again.

Possible ways of alleviating the interference problems were discussed, but none are easy to implement or guaranteed to work.

Regarding our use of 145.650MHz for the Sublime Point rptr, he was concerned we were there, but said he fully understood our frustration & reasoning for using this frequency in an effort to be rid of the continuing interference. In fact, after explaining our reasons to him, he accepted that the use of the 145MHz band could be an alternative for the many Pager-plagued rptrs in this region. A lot more discussion & investigation is needed for all of the possible alternatives. Hopefully, with Barry (BZ) now batting for us, a solution may shortly be available.

VK2RAW (6850) No problems to report, the rptr has been working fine.

VK2RUW (8225/29.040)

Once again not much to report. The rptr itself appears to be OK, but occasionally is besetted with what appears to be very strong broad-band noise. It holds the mute open sometimes & can also make weaker stations unreadable. Michael (VK2XCE) has confirmed from his own professional observations, that there does appear to be a TXer somewhere in this area putting out this interference. Investigations continuing.

The WIA Sunday Broadcast relay from Mt Murray is still working well. Very pleasing.

Our plans to change 8225's antenna system from the present omnidirectional colinear to a pair of high-gain yagis facing up & down the coast is still proceeding.

On Sunday (15/5), Michael (VK2XCE) visited the site (see next par). While there he changed the 10m Gateway frequency back to 29.040MHz. This puts us back in line with the VK4 Gateway. Also, I received a Packet message from Will (VK6UU) (he writes "Rptr Link" in AR). If all went well, they were going to install a 10m Gateway onto one of the Perth 2m rptrs on the weekend of 28 & 29/5. Haven't heard anything further.

VK2RUW (ROSE Packet)

As stated above, Michael (VK2XCE) visited Knights Hill. The main reason for his visit was to re-install the Packet ROSE system. (The system was taken off the air months ago due to unresolvable interference problems of both the intentional & unintentional kind.) Anyway, Michael decided to give it another go anyway. He made the DR200 TNC more "bullet-proof" in an effort to increase it's reliablility.

All went well for the first day, many users started using the system & John (VK2XGJ) was routing BBS traffic thru it, when the next afternoon it decided to stop again. It apparently lost it's "memory", as if it had had it's power removed, but it was running continuously off the cubicle's 200AH battery bank. Tis a mystery...

Michael has gone up again, but other problems have beset him, least of which the many, many extra work hours he has had recently. Hopefully, the ROSE problem will be resolved shortly.

VK2RIL (8725) - Nothing to report, stll TXing slightly low in frequency & will be rectified next visit.

Till next time - Rob (VK2MT)

WAY BACK THEN.....Episode 30.

The VK2AMW Moonbounce Project
1978 - 1982 (The period in between) - Part 2.

(i) The two band disc feed system.
(ii)The 1296MHz W2IMU circularly polarised feed horn.
(iii)The relocation of the dish to the new site.
(iv) The dish structure and new Operating Building goes up.
(v) We commence refurbishment and installation of equipment.

Last month's episode covered happenings in 1978. This month I will cover the events up to the end of 1982.

Early in 1979, the University called for a firm quote for the transport of the dish to the new site, based on the route and procedure which had been arrived at by our investigations over the previous months. This confirmed the earlier estimated cost, however much time was to elapse before the move took place.

THE TWO BAND FEED SYSTEM.

By now the 1296MHz transmitter had been constructed by VK2ALU and was being tested. The next matter to be considered therefor, was that of the feed system to be used in the dish at 1296MHz.

During 1978 VK2ALU had visited the Parkes Radio Telescope and had discussed one of the feed systems employed there. This was a "low profile" design and consisted of two circular plates with air spacing between them. As the Parkes dish has a f/d = 0.4 which was the same as that of our 30 foot dish, the half power beamwidth of this feed would also suit our dish.

As we were considering operation on both 432 and 1296MHz in the longer term and were not keen on having to go through the tedious and time consuming procedure of having to change dish feeds when changing bands, it seemed that a design which would operate efficiently on both of these frequencies would be worth looking into. This was done, both locally and by overseas enquiry but such a design did not appear to exist. Those that had been tried suffered from two problems -

(i) the feed used for the higher frequency obstructed that used for the lower frequency and altered its radiation pattern.

(ii) the phase centres of the two feeds (ie the position in space, along the axis of the dish, where radiation theoretically emanated) was displaced from one another - thus resulting in a compromise position of the feeds in relation to the focal point of the dish - and hence reduction in dish gain.

It seemed to VK2ALU that the low profile design, or "disc feed" as he christened it, may have characteristics which would overcome these problems. A composite design, based in papers on single frequency low profile feeds, kindly supplied by staff of the CSIRO Radiophysics Division, was investigated. This resulted in a "piggyback" arrangement (like a layered cake) which was made up with the assistance of the University Dept of Electrical Engineering workshop - who did quite a bit of the machining and fabrication of items for the Project, by the way.

The CSIRO Radiophysics people, who had taken quite an interest in the design, then offered to determine its radiation pattern characteristics on their Antenna Test Range.

Sure enough, the test results (still held in chart form by VK2ALU) showed that quite suitable radiation patterns, in both the "E" and "H" planes, existed on both 432 and 1296MHz. Also the phase centres of the two feeds were coincident!!

Something new and very useful had been accomplished.

Also, a "bonus" for this system was that it was easy to adapt it for circular polarisation (the polarisation which was becoming adopted as standard for 1296MHz EME operation). Not only that, but the 432MHz section could be operated with linear polarisation (that usually used because a most used Yagi arrays on this frequency) while the 1296MHz section operated with circular polarisation!

The only obvious drawback of this design was that the diameter of the groundplane part of the 432MHz section was such that it could only be efficiently accomodated in dishes of about 20 feet diameter and upwards. However, at 432MHz, dishes of diameter of less than 20 feet were not more efficient than large arrays of Yagi antennas anyway (and were more difficult to construct).

THE W2IMU DUAL MODE FEED HORN.

The next matter to be addressed was - how could we get a "standard of comparison" feed for the "disc feed" on 1296MHz?

Well, in September 1979, VK2ALU had been visited by Dr. R. Turrin, from the Bell Telephone Laboratory in USA, while he was in Sydney giving a paper at a Seminar. Dick Turrin, in addition to being a member of Bell Telephone Lab's. eminent antenna design an research team, was also W2IMU, and as such was was one of the early EME'ers - who was leading the well known Crawford Hill VHF (EME group. This group was running a very successful 1296MHz operation under club call W2NFA.

Dick suggested that we might make up a new design of feed that he had just developed, as this feed was a very efficient radiator when used in dishes of approx 0.5 f/d and over. It was also (and primararily) capable of providing a very good circular radiation pattern, using a "inbuilt" polarising arrangement. (By the way this feed has become the "standard circularly polarised feed" for EME dishes operating at 1296MHZ and upwards- to 10GHz and beyond!). Even though our dish f/d was only 0.4, Dick was happy that his feed design would fill needs.

Although VK2ALU received the necessary design and the construction information for the 1296MHz version of the W2IMU circular polarised feed from Dick Turrin shortly after his return to the States it was quite some time before the University workshop made up this of equipment.

THE DICKE SWITCH RADIOMETER RECEIVER.

By the end of 1979 it was realised that the staff of the Elec. Eng. Dept. of the Uni. who were involved in organising matters to do with Project may be otherwise employed for a period. So, in an attempt to interest the Physics Dept. people in its possible availability as a rad telescope (in addition to its EME role) VK2ALU undertook to build up a "Dicke Switch Radiometer" receiver. This is a special type of receiver used for radio telescope purposes, which incorporates means of nullifying the small variations in receiver gain which affect the accuracy of readout of level of very weak signals from radio noise sources.

This receiver was completed , ready for demonstration to the Physics people - but no real interest was forthcoming.

RELOCATION OF THE DISH etc.

After a break of approx. 7 months the Elec. Eng. Dept. people concerned became available again. In the meantime the other bodies who were associated with the new site had indicated their agreement to the dish being located there and the D.O.C. had also given permission for EME operation of VK2AMW on 1296 and 432MHz at the site, with the usual restrictions.

By August 1980 work had commenced at the new site, for the digging of foundations for the dish structure - quite a large block of concrete being required below ground on which to support the dish against wind loading effects etc.

It was early one Sunday morning in October that several members of the Moonbounce Group saw the dish loaded on to a large low-loader at the West Dapto site and then followed it on the slow trip to its new site.

Suffice to say that all went remarkably smoothly with the transport (obviously the haulage contractor was well versed in handling large and awkward loads!) The track into the new site from the road had been considerably widened by the removal of trees and undergrowth (probably would have trouble in getting this done these days!!) and by late morning the dish and dish supporting structure were in their storage positions on site.

We had been fortunate that the only vandalism damage which had been suffered by the dish during its unattended period at West Dapto was the theft of the large duralium tripod from the surface of the dish, which was required to support the feed system etc. How that had been accomplished without seriously damaging the cover on the dish surface we could not figure out!

Another long delay, of approx. 18 months then ensued before permission was received (money made available?) for the concrete to be poured in the dish structure foundation hole and for work to commence on the construction of the brick building to be used as an Operating Building, the draft plans of which we had submitted earlier.

However by July 1982 VK2ALU was able to report in the Propagator that erection of the dish structure had been recently completed and that the Operating Building was ready for us to start to install equipment.

One of the problems at this "remote" site was the reliability of the electrical mains power supply, which came from a local pole mounted transformer on a long AIS circuit for their mining operations in the area. Part of the Project was thus the installation of an emergency petrol driven generator set. This set could supply either the EME installation or the adjacent University Astronomical Observatory, if required.

REFURBISHMENT AND INSTALLATION OF EQUIPMENT BY IARS MEMBERS.

From September to the end of the year many members of the IARS attended working bees on site every week or two - cutting old metal away and rewelding various metal structures, cleaning down and repainting, reinstalling the dish drive motors and their equipment, moving in equipment which we had removed from the West Dapto site before the worst of the vandalism there, then the big job of running the many hundreds of metres of cable of various types (1000 metres of 440 volt cable alone!). Then came the even larger job of terminating all these cables (up to 13 core cables).

Some of the "old hands" reading this may remember the picnics and barbeques enjoyed in pleasant bush surroundings by them (and sometimes their families). Some said that "never did a a tinny taste so good as after a hard day's work in the sun up there"!!!! Some photos still exist to prove it!

Oh, what a far cry from the situation in the Club today!!

By the end of 1982 we were really getting our teeth into the resurrection of the Moonbounce Project!! (but the High Power Permit had still not been issued for this site).

Lyle....VK2ALU.

The PIG that Flies
Part 1 - Circuit Throughput

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ABSTRACT

The arrival of the Wollongong Packet/Internet Gateway (PIG) has attracted a fair number of stations to its (currently) single frequency of 146.425 MHz. The mixture of users of both simple AX.25 and TCP/IP over AX.25 has provided an opportunity to examine packet circuits under load conditions. This series of articles discusses results of traffic monitoring on the gateway frequency.

The data presented here has been collected using a set of programs called monax25 written by WB6YMH and NK6K. These programs were described in a paper to the 6th ARRL Computer Networking Conference in 1987 and you should obtain a copy of the conference proceedings if you want more information on the programs[1]. Before examining the data, one should be aware that the raw data was collected from a radio circuit - not a normal computer network cable. Consequently the results will be influenced by the usual variables which influence radio circuits (e.g. antenna height and receiver sensitivity) and will be affected by the capture effect of FM detectors. Also, because the antenna used to gather the data is rather low, the receiver will undoubtedly not be hearing all stations on the frequency i.e. the receiver will suffer from the 'hidden transmitter' effect.

The data was collected in 5 minute sample periods on 146.425 MHz over the 72 hours from 07:40hrs Friday 15th April 1994 through to 07:40hrs Monday 18th April 1994. Figure 1 shows the total number of data bytes (i.e. the contents of the AX.25 data field) seen on the channel in each 5 minute period (i.e. frames that my TNC decoded without errors).

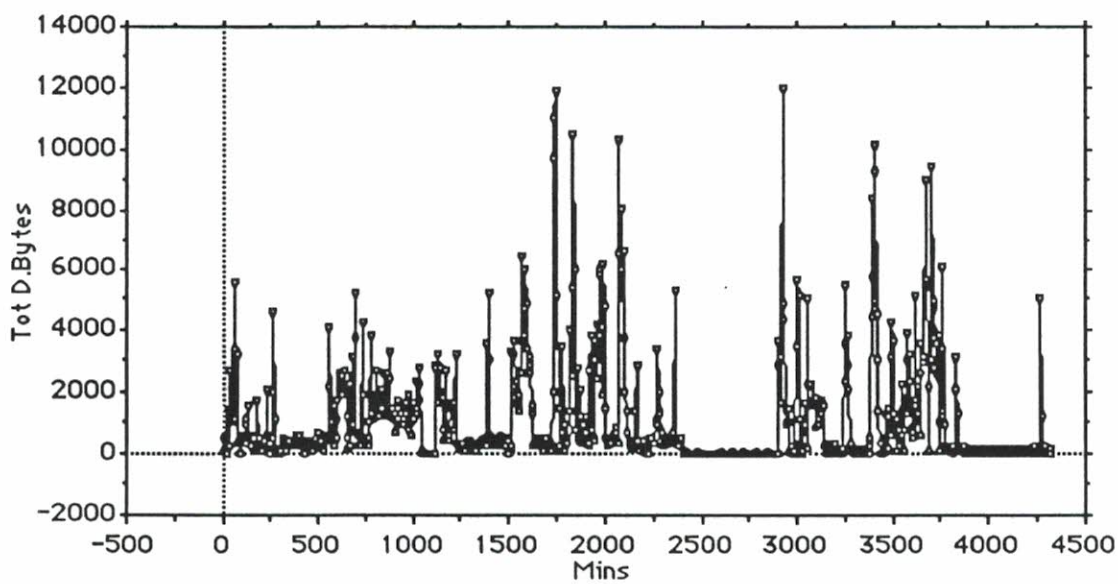

Figure 1 - Total Bytes per 5 minute period

The raw data was processed using a statistical analysis package to produce the graphs included in this article. Discussion on the interpretation of the data will be broken up into several instalments over the next few issues of the Propagator. Bear in mind that this is not a rigorous investigation with absolute results, but a discussion on what the data seems to indicate. If you have any discussion on the interpretation of the data, then send something to Michael,

[1] Indeed, that conference saw several interesting papers on packet performance and tuning.

VK2GNV, the Propagator editor. I'm sure he'd be only too happy to put a 'letters to the PIG' section in with one of the following instalments of this article This month, I'll start by examining the channel throughput characteristics.

We operate on the PIG frequency in a particular manner: most of the traffic is between the gateway and the many user stations - a one-to-many topology, whereas a simple packet channel is normally a many-to-many situation. What this means (I think!) is that the unique data throughput of the PIG channel should be higher than an equivalent 'normal' packet channel because the 'B-end' of the circuit is common to all user stations (the 'A-ends') thus there is contention for the channel (and potential collisions) from multiple A-end stations, but only a single B-end. To calculate a mean circuit throughput, I have chosen to use the average packet size and the maximum packet throughput.

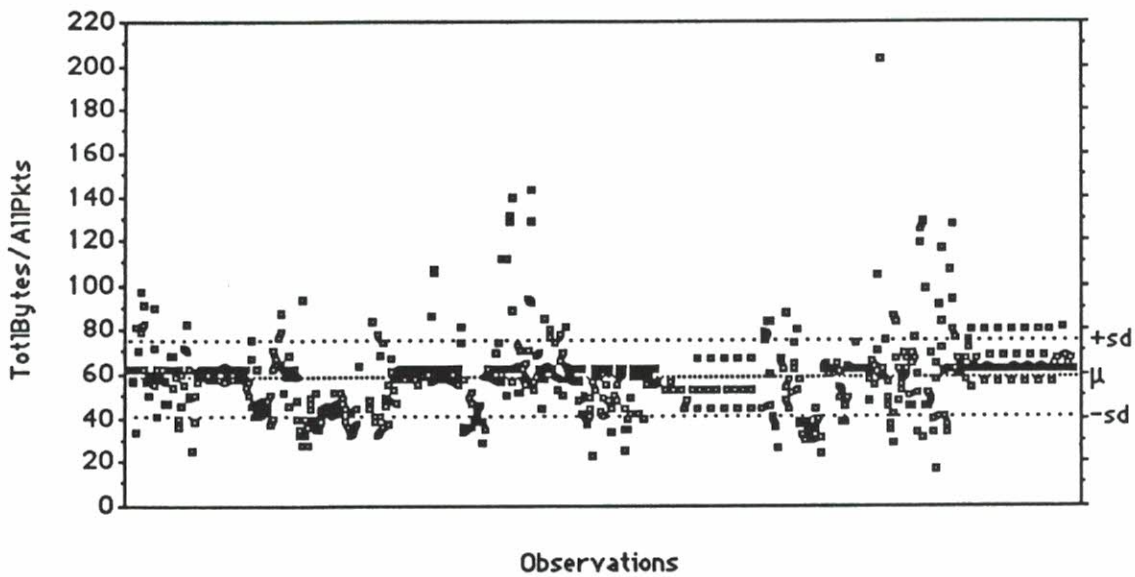

Figure 2 - Average Packet Size

Figure 2 shows a plot of the average packet size, calculated by dividing the total number of data bytes for a 5 minute period by the total number of packets for that same period against time (Figure 3 shows a frequency distribution of the same data).

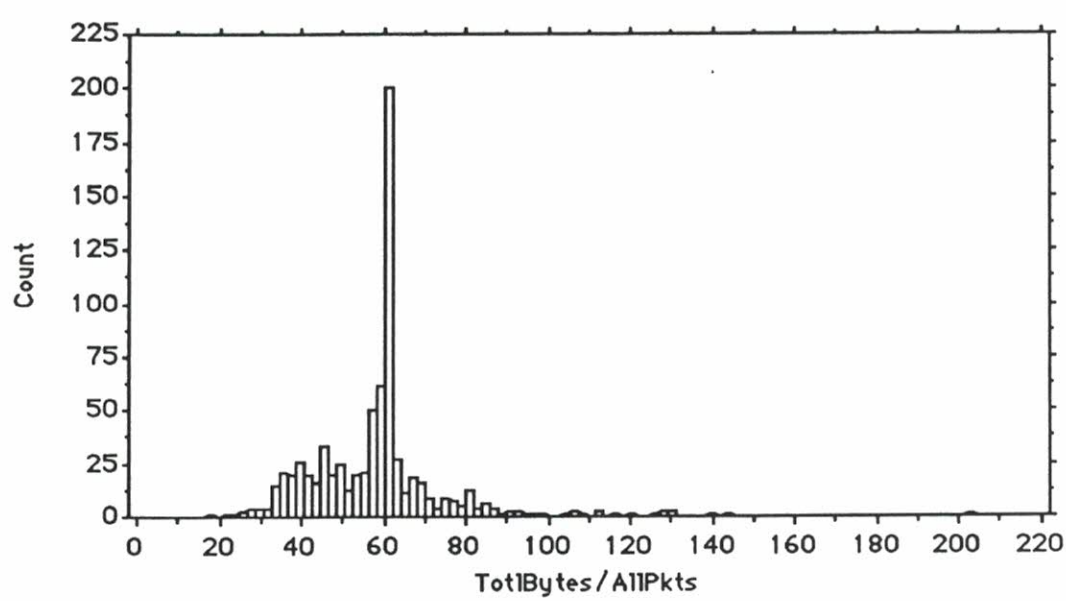

Figure 3 - Frequency Distribution of Average Packet Size

The smallest packet seen was 17 bytes, the largest was 203 bytes and the mean (μ in Figure 2) was 58 bytes. From Figure 3, it can also be seen that the mode is 62 bytes.

From Figure 4, the maximum number of packets which can be put onto the circuit while still having data get through to the other end is around 155 packets (the equation above the figure is that of the polynomial regression through the points). This plot is a round-about way of determining the maximum throughput. Packets with the poll bit set are sent out when a timeout indicates to the sender that the last frame sent by it was lost (i.e. when the AX.25 t1 timer expires). The number of packets with the poll bit set can therefore be used to infer the number of lost packets which will increase because of collisions with increasing channel load. Using the average packet size of 58 bytes from Figure 2 gives a maximum amount of data which can be fed across the circuit of around 9,000 bytes for a 5 minute period.

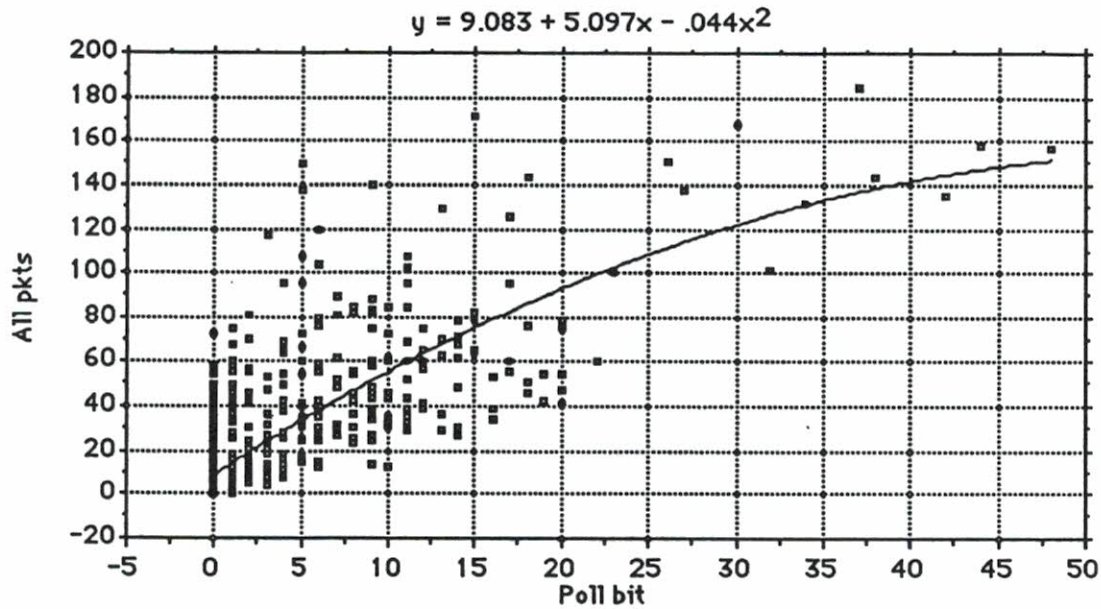

Figure 4 - Plot of Total Packets vs Packets with Poll Bit Set

Figure 5 uses a different plot to determine the same characteristic. Plotting the total data bytes seen on the circuit against the number of packets seen with the poll bit set reveals a value of around 7,000 bytes (these figures are rather rough, you know!). These two values equate to roughly 200 bps which is about 17% of the nominal 1200 bps for the circuit. What this means is that users on the gateway frequency, under medium load conditions (of about 3 or 4 users) can achieve a maximum throughput of about 200 bps each. In Table 1, we calculate the total transmitted length of the packet with the average 58 byte data payload.

Field	Length (bytes)	
Flag	1	
Address	14	(with no digipeating)
Control	1	
PIB	1	
Data	58	(from Figure 2)
FCS	2	
Flag	1	
Total	78 bytes = 624 bits	

Table 1 - Total Length of Average Packet

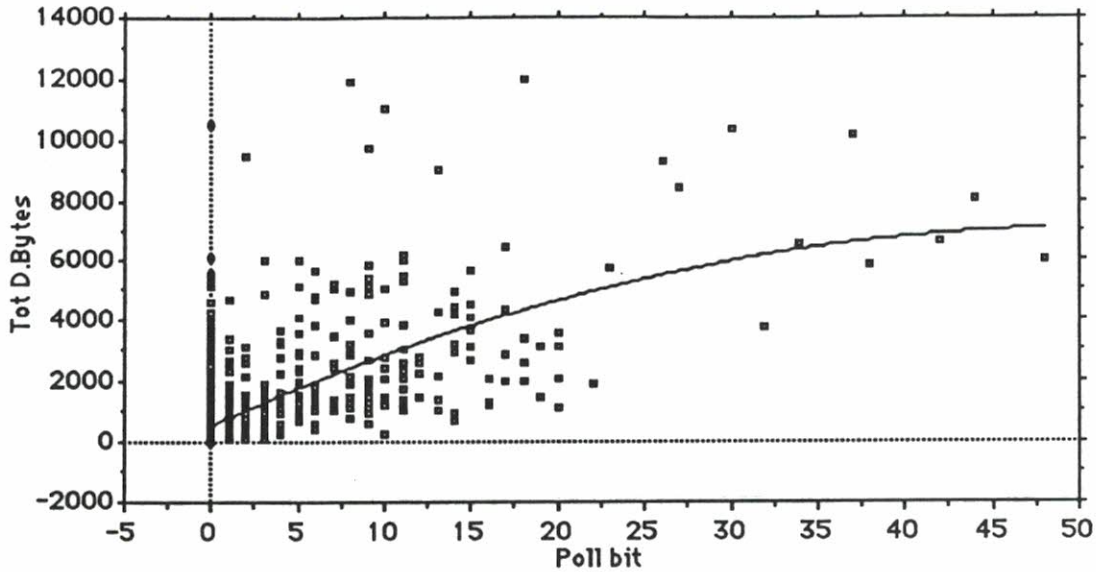

Figure 5 - Plot of Total Data Bytes vs. Packets with Poll Bit Set

At 1200 bps, this frame will occupy (624 / 1200) = 520 ms of air-time. However, to this time must be added the transmitter key-up time and the transmission wait time[2]. A typical value of 350 ms for the transmitter key-up time and 160 ms for the wait time bring the total to transmit the average 58 byte packet to (520 + 350 + 150) = 1020 ms. This equates to a maximum channel throughput of (624 / 1.020) = 612 bps. As you can see, the transmitter key-up time and transmitter wait time are the dominant variables affecting channel throughput. For example, if the data rate were increased to 9600 bps (an 8 fold increase) then the maximum throughput would rise to (624 / 0.565) = 1104 bps - an increase of only twice the throughput of the 1200 bps channel. I have seen arguments that the values for these overhead variables (which I have left fixed) can be lowered with increasing data rate, and in the case of transmitter wait time, I agree. However, I have not found this to be the case with the transmitter key-up time which from my observations seems to depend only on the transmitter characteristics. On my particular, rather old transmitter I can reduce this time down to 350 ms without risking loss of data, however, I loose packets as a result of carrier instability if the value is reduced down to about 300 ms. The value of 612 bps for the maximum channel throughput is consistent with the value obtained earlier of 200 bps per user[3].

Well, that's enough for one month. By the way, the monax25 programs are available by anonymous ftp from uow-gw.vk2amw.ampr.org or ucsd.edu for those with Internet access[4]. Alternatively, give me a blank 3.5" floppy at a club meeting, and I'll get you a copy.

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[2] This is the minimum time between the end of the last received packet and key-up of the transmitter for sending the next packet. This parameter is referred to as DWAIT on a normal TNC and is equivalent to (and replaced by) the time generated by the p-persistance algorithm of a TNC in KISS mode.

[3] The next installment reveals an average of 3 users on the channel, hence (3 x 200) = 600 bps.

[4] The plots, however, were created using a separate statistical analysis package which is not included with the monax25 program.

****IMPORTANT NOTICE TO ALL MEMBERS****

MEMBERSHIP FEES ARE DUE TO BE PAID BY AUGUST MEETING.
KINDLY FILL OUT BELOW AND BRING TO NEXT MEETING OR
MAIL TO:

THE TREASURER
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PO BOX 1838
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POST CODE.....

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FULL MEMBERSHIP $20 PA.
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POST BOX - "THE ILLAWARRA AMATEUR RADIO SOCIETY Inc"
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REPEATERS	VK2RIL	145.650 *	Voice/RTTY	Sublime Point - TEST freq only.
	VK2RIL	438.725	Voice/RTTY	Sublime Point
	VK2RAW	146.850	Voice	Mt Murray
	VK2RUW	438.225	Voice	Knights Hill
	VK2RUW	29.020	UHF Gateway	Knights Hill
	VK2RUW	144.775	Packet (ROSE)	Knights Hill - Off air.
	VK2AMW-1	146.425	Packet	Wollongong UNI (Packet Internet Gateway)

BROADCASTS - The Wireless Institute of Australia, N.S.W Division broadcast is relayed to 29.620 MHz and 146.850 MHz at 10.45am and 7.15pm each Sunday. Callbacks after the broadcast.

NEWS LETTER - The "PROPAGATOR" is published each month to reach all financial members in the week preceding the Club meeting. Articles and letters are always welcome. Commercial advertising $60 per ad per year, member's classifieds free for one issue. See Mick VK2GNV for details.

MEMBERSHIP - $20.00 P.A, concessions $15.00 P.A, expiring immediately after the AnnualGeneral Meeting in July.

LAWRENCE HARGRAVE AWARD - VK stations require 10 contacts with IARS members. Overseas stations require 5 contacts. One contact with the Club station VK2AMW is suitable. Details of contacts are to be sent to the Club secretary.

********** COMMITTEE**********

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