

**OFFICIAL NEWSLETTER FOR THE WEST AUSTRALIAN VHF GROUP(INC)
P.O. BOX 189, APPLECROSS WA 6153.**

**MEETINGS ON THE FOURTH MONDAY OF EACH MONTH AT WIRELESS HILL
TELECOMMUNICATIONS MUSEUM, ALMONDBURY RD, ARDROSS**

VK6WH

VK6WH

PATRON MR. F.W. DAWSON

PRESIDENT	BOB BLINCO	VK6KRC H277 7049	SECRETARY	BOB PINE	VK6ZFY H 339 3273
VICE PRES	TERRY LEITCH	VK6ZLT H332 7008	TREASURER	JACK BORTHEN	VK6KDX H 447 5933
COUNCILLOR	BRUCE DOUGLAS	VK6BMD	BULLETIN ED.	VACANT	
COUNCILLOR	ROSS TOLCHARD	VK6KAT	MUSEUM REP.	BOB PINE	VK6ZFY
COUNCILLOR	CEC ANDREWS	VK6AO	MUSEUM REP.	TOM BERG	VK6ZAF
ACTIVITIES	TERRY LEITCH	VK6ZLT	PUBLICITY	VACANT	
MATERIALS	JACK BORTHEN	VK6KDX H 447 5933	LIBRARIAN	ILMAR BELTS	VK6AIB

CALENDAR

NOV	15	COMMITTEE MEETING	DEC		
	20	FOXHUNT			MERRY XMAS
	22	GENERAL MEETING			
JAN	17	COMMITTEE MEETING	FEB	21	COMMITTEE MEETING
	22	FOXHUNT		26	FOXHUNT
	24	GENERAL MEETING		28	GENERAL MEETING
MAR	21	COMMITTEE MEETING	APR	18	COMMITTEE MEETING
	26	FOXHUNT		23	FOXHUNT
	28	GENERAL MEETING		25	GENERAL MEETING
MAY	16	COMMITTEE MEETING	JUN	20	COMMITTEE MEETING
	21	FOXHUNT		25	FOXHUNT
	23	GENERAL MEETING		27	GENERAL MEETING
JUL	18	COMMITTEE MEETING	AUG	15	COMMITTEE MEETING
	23	FOXHUNT		20	FOXHUNT
	26	GENERAL MEETING		22	GENERAL MEETING
SEP	19	COMMITTEE MEETING	OCT	17	COMMITTEE MEETING
	24	FOXHUNT		22	FOXHUNT
	26	GENERAL MEETING		24	ANNUAL GENERAL MEETING

SO YOU WANT TO BUILD A SIX METRE TRANSVERTER!

So do I, and here is how I am going about it. First of all, let me give you the reason why I want to have a good shot at 6 metres. Years ago, I spent an evening listening to activity on 6m with an old friend 'Tiny' Coles, VK6ZCC. I was fascinated by the range of chatter considering that 10 metres was almost dead and 144 was extinct.

The beauty of 6m is that it isn't exactly HF nor is it VHF so there are times when good HF will enhance 6m and at other times it's like 2m with tropo and all that stuff.

So, I saved up and bought an IC 506 and had very limited success on the band but was doing alright with a transverter for 2m with my TS-520S which I had at the time.

I had made a couple of receiving converters for 2M and 6M so the idea of a transverter was OK for 6M but I needed a better base unit to work from.

That part of the deal came true when I obtained a 430S for HF work. I'm not going to worry about those people who swear by one transceiver or another - I was happy with what I had. The first thing to do was install an FM board which gave me a reasonable operation on all WARC bands plus FM on 10.

My country location inhibited the dragging about of lots of gear. Let me put that in XYL terms - "We're not going to have enough room for you and all that junk of yours!"

So for a short while, VHF took a very backward step. But here in Jurien things are different. I haven't got any more room than I had 10 years ago, I have just developed a more persuasive way with words. So when the opportunity arose for the David Minchkin VK5KK transverter to be built, I grasped the idea with both hands.

I spent the first half of '93 on Long Service Leave so it took me a while to get the package and find time to put it together. I haven't finished yet, but here is a progress report and some hints if you want to join me.

First of all, read all the instructions before you start. This may sound over the top, but I read as much as I needed to get started and did so only to find out when I turned a few pages that I needed to make a few changes for the 28 MHz IF! Once you've read it all, tear out the pages with the circuit diagram, parts overlay and parts overlay extra for 28 MHz.

That way you can have all the relevant documents in front of you as you are working. It's also handy to have a small drill bit as the pre-drilled holes are very tight on most

CC-0-1001
LH-10-1001

**PROPOGATION ON THE BANDS
50 MHz TO 1296 MHz
by Eric Jamieson VK5LP
Part 3 of 3**

The irony of our finally completing WAS was that Col and I and some others had to wait so long to complete the all state tally, whereas some relatively new operators were able to achieve the same results in their first year of operation and all on the one day! Such is life!

The two metre operator who consistently uses the low end of the band is always on the lookout for special conditions which lead to greatly increased operating distances. It is for this reason that several stations from northern Australia have worked over the equator to Japan on two metres, the first being VK8GB to the JA6 area. The current two metre distance record is held by VK4BFO who worked JI7DMB on 15/04/91 at a distance of 6763 km. So far there seems no penetration of these signals to VK2, 3 or 5.

Tropospheric conditions or tropo can be found by monitoring the daily weather patterns, looking for large and relatively stationary high pressure systems with isobar pressure gradients around 1032 hectopascals, or higher. VK3, 5 and 6 are well situated to gain from these high pressure systems, particularly in the summer when the centre of the high is more often found low down in the Great Australian Bight and the outer edges encompassing the whole of the lower part of the continent.

With a slow moving high pressure system, good conditions can prevail for several days, particularly from Albany to Adelaide and often Melbourne. The resulting enhanced propagation can produce startling results, even on the trailing edges of such a high, particularly over the 1800+ km Adelaide to Albany path, encompassing all bands at least to 3.5 GHz and probably higher as technology improves.

The appended weather map of 16 March 1988 shows a virtually stationary and typical high pressure system which produced outstanding results from Albany to Adelaide and Melbourne over a period of four days, on all bands to 3.5 GHz.

To give credit where it is due, in the late 1950s Mick VK5ZDR was one of the first Australian amateurs to recognise the relationship between enhanced tropospheric propagation and the weather pattern. Certainly in South Australia Mick pioneered the use of two metres between his location at Henley Beach and several amateurs in Albany, using the weather forecasts and maps to know when it was worthwhile attempting contacts. Today, Mick's methods are still in use for contacts now extending from the 144 MHz to 3.5 GHz.

It is interesting to note that in later years, ample proof has emerged that enhanced tropo conditions do not necessarily follow in band order to the higher bands. Whilst good conditions on 144 MHz generally lead to good conditions on 432 MHz and possibly 1296 MHz, however, it is possible for 432 to be better than 144 or 1296 may be better than either of the lower bands, or it can be any combination. Hence, one can never assume that because conditions may be fading on 144 that the same circumstances prevail on the other bands - therefore, always check!

Temperature Inversions The use of temperature inversions is another means by which long distance contacts can be made. They affect most radio frequencies but the effect is more noticeable from 144 MHz upwards and do have some effect even at 10 GHz. Following a hot day, a cool evening breeze coming from the ocean forces the warm air to rise from the ground and the accompanying change to the temperature/water-vapour gradient or refractive index of the lower atmosphere, can result in an inversion which induces VHF signals to follow the curvature of the earth over extended distances. An inversion occurring near the ground results in a relatively small increase in the VHF signal range, but an inversion occurring at a higher level and extending over a wide area will further increase the range.

A stationary inversion at a very high level can result in the formation of an atmospheric duct which is able to sustain VHF and UHF signals over distances approaching the width of southern Australia or more than 3000 km. (The existing USA records for contacts to Hawaii on 144, 220, 432 and 1296 MHz were all achieved as the result of ducting.) However, these ducts are generally most

usable within close proximity to the coastline, inland stations at times not sharing in the enhanced conditions, but it is possible for something akin to an inversion to form in inland regions, especially during the autumn when a warm calm day is followed by a cool night with the conditions produced able to support extended VHF propagation. Stationary patches of smog over cities also is an indication of a temperature inversion.

It should be remembered that inversions are not only a night time phenomenon but can occur or be sustained in the morning with the rising sun warming the upper air before it can warm the ground air. For a couple of hours after sunrise very good VHF propagation conditions may exist, at times superior to those during the evening. It is normal practise for experienced operators who have been involved in extended contacts during the night to rise early next morning and continue the process until the conditions slowly disappear as the sun warms the air equally. Such night and morning exercises may continue for several days until a change of weather pattern ends the event.

VK5 stations usually commence using an inversion by contacting stations in Albany on as many bands as possible, then as the air mass slowly moves eastwards the Albany and Esperance stations will disappear and stations in western Victoria and Melbourne may appear, followed by those to the east of Melbourne. Temperature inversions are used not only for the most distant stations but also for any that may be operating in between. e.g. Mount Gambier stations should be available simultaneously with those in western Victoria.

Enhanced propagation can result from an aurora, the same as six metres. VK5 stations most commonly work VK3 and VK7 stations, but usually only with the antenna at both ends pointing south. The garbled raspy sound makes SSB signals difficult to read, hence CW is often the most appropriate mode.

Aircraft enhancement A form of relatively reliable communication over considerable distances for a short period of time was pioneered by Gordon VK2ZAB and called "aircraft enhancement." Gordon has written at length about this subject and his articles are to be found in Amateur Radio magazine. Briefly, Gordon found that he could use the flight paths of airliners between Sydney and

Melbourne to give him contacts on 144 MHz with amateurs in Canberra and Melbourne, provided their location was in the correct relationship to the aircraft flight path. Signals were strongest around the centre of the flight distance and often available for ten minutes or so. Contacts via this mode are being regularly made on 144, 432 and 1296 MHz.

It is fortunate that the flight path between Sydney and Melbourne passes over areas such as Canberra, where there are a number of active amateurs. Few attempts at this mode have been initiated in VK5 as the flight path from Adelaide to Melbourne appears to be more difficult due to amateurs being too far south of the usual flight path.

Time does not allow discussion on a number of uses of two metres, such as EME, RTTY, WICEN, satellites, packet etc., each being a specialised field and about which much has been written; the latter three are the subject of papers and discussion at this Symposium. The usage of any or all of these extra modes will unfold to the newcomer as knowledge and understanding of these interesting facets of amateur radio are realised.

432 MHz or 70 cm This band becomes the next logical step after two metres and the same modes of operation are used here as on two metres plus amateur television (ATV) and ATV repeaters. These repeaters have a rather complex system of inputs and outputs, some on 426/444 MHz, others around 579 and 1250 MHz, but all are listed in the Australian Radio Amateur Call Book. There is also a RTTY repeater in Sydney on 434/439 MHz. The 70 cm voice repeaters have inputs on 433/434 MHz and outputs on 438/439 MHz.

A calling frequency for SSB and CW has been established on 432.100 MHz while the area below that as far down as 432.000 MHz is used by EME stations around the world. It is a popular band for EME enthusiasts as high gain antenna systems become more practical than on two metres. Repeater use 433/438 MHz.

A well equipped station has the same general requirements as two metres but greater care is necessary in achieving optimum results. With careful selection of components and adherence to well documented construction techniques, it is now possible to use masthead amplifiers with noise figures of less than 0.5 dB. For

best results this is used with an easily constructed high gain antenna system fed with heliax cable of at least 16 mm diameter. In conjunction with a 100 watt amplifier you can become part of the big league if that is your desire.

However, you can have a lot of fun and plenty of long distance contacts using only 10 watts direct from your transceiver, but at all times use the best antenna system you can afford as this assists both transmitting and receiving. Given the right conditions, I have worked to Albany with good results using only three watts over the 1900+ km from my home at Meningie, but when I turn on the 100 watt linear the results can be quite startling! 432 MHz signals appear capable of penetrating buildings but hills and mountains are good attenuators.

The propagation types used on two metres also apply in the same way on 70 cm except for meteor reflection where it is considered amateur power levels are too low. There have been no confirmed occurrences of Es on 70 cm, but some years ago during a large Es opening on two metres, Roger VK5NY reported that he had tried to contact a station in Brisbane that he was sure he was hearing on 70 cm. Roger thought that the reception may have been Es because no other stations were heard over the intervening distance which is often the case where tropo is involved. Interesting.

1296 MHz or 23 cm For a long time this band received little attention from the rank and file amateurs but was the domain of those skilled in plumbing techniques. Few suitable receiving valves were available for such a high frequency so the band was silent for long periods.

With the advent of improved transistors and GaAsFets, receivers and preamplifiers have taken on a new look with excellent performance and very low noise figures. Solid state 1296 MHz transverters with an output power of about 2 watts were released by Microwave Modules and some other manufacturers. These operated in conjunction with a two metre transceiver and were instrumental in stirring more amateurs to commence operation on the band.

More recently transceivers designed for 1296 MHz have appeared on the market. The first

were for FM only but it was not long before multimode transceivers appeared with the same features as their counterparts on 432 and 144 MHz. A section of the band has been set aside for those using FM and FM repeaters are gradually increasing in numbers. Again, refer to the Call Book for information on frequencies. 1296.100 is a calling frequency for narrow band modes.

Despite the availability of commercial gear, there are still those who construct their own equipment and very well made high performance pre-amplifiers, receivers and transmitters now grace the operating tables of the more prominent experienced amateurs, especially those specialising in EME work. It was on this band in July 1960 that W6HB and W1BU established the first ever successful two-way contact via the moon.

For general working on the band, high power is not needed but it is helpful when the going gets tough. Much can be done with a few watts feeding a 27 element loop yagi through heliax cable up to 25 mm diameter, but it and its connectors are not cheap but seem mandatory for best results. Otherwise, it makes sense if you live in an average location without too many obstructions to not mount your antenna too high and feed it with 9913 coax. This will do quite a good job over the shorter distance especially if you use a masthead pre-amplifier to overcome cable losses on receive.

Forms of propagation are similar to those found on 432 MHz but with the definite certainty that there will be no sporadic E! Under normal conditions two ten watt stations on flat terrain should have reliable communication over a distance of 100 to 150 km and ten times these distances if you can make use of a temperature inversion or coastal duct. As with 432 MHz, your 1296 signals are likely to penetrate buildings but not adjacent hills or mountains which can act as massive attenuators.

1296 and 432 MHz are bands where you can have a lot of fun experimenting with your receiving and transmitting equipment plus your antenna. An added bonus is that you are unlikely to be troubled by TVI, especially on 1296.

If one looks back to the earlier days when transmitters and receivers used plumbing

techniques virtually requiring a lathe to prepare the brasswork, today's constructors have really got it easy. However, if you require a lot of power as in EME work, then the transmitter will need specialised preparation using cavities, blowers etc. for the still used valves such as the 2C39 series.

To provide warnings of possible openings, especially to interstate operators, a network of beacons have been established throughout Australia, most capital cities having beacons on the four bands up to and including 1296 MHz. In some places there are beacons on the microwave bands including 10 GHz.

With South Australia situated strategically in the lower centre of the continent, the four VK5 beacons provide a valuable warning system to the amateurs in VK3 and VK6, particularly the Albany area. The VK5 beacons have been very reliable for many years, but the Melbourne beacons leave a lot to be desired and apart from the two metre beacon there are no others in Albany.

The VK5s did have a very useful source for propagation warnings from the two metre beacon at Mount Gambier but this has been off the air for so long that the VK5s need to monitor the weather patterns and hope for the best or wait for someone to call them from other states. It's a sad situation.

My Meningie location is well situated for VHF activity and being about 130 km from the VK5 beacons on Mount Lofty I have noted a few interesting observations, all made without the use of the masthead pre-amplifiers.

The six and two metre beacons are usually S9+50dB, occasionally even stronger. The 1296 beacon is always S9 day or night, but the signal on 432 varies from S5 to S9+40dB! The variations can occur at any time although there is a tendency for the signals to be better at night. For some unknown reason there is a path loss, yet all beacons are at the same site with similar antennas with the 432 beacon having an output of 4 watts and 1296 about two watts, not that this difference in power is of any significance. This has been mentioned to illustrate what interesting situations turn up when you have several bands to compare.

As the frequency increases, to maintain a reasonable degree of efficiency your station does require a number of minimum requirements, with most being centred on the antenna system. On 1296, whilst a large antenna array of say four 27 element loop yagis is very useful and will clearly have an edge over those without one, much can be done with a single 27 element particularly if it can be fed with heliax cable of about 25 mm diameter plus a good masthead amplifier.

I have such a setup and there is not too much I cannot hear. My chief limitation is the transmitter output power of about ten watts, however, when the right conditions prevail I can be heard over long distances.

From my observations of other stations, their limiting factor seems to be the type of antenna cable they are using. Most coaxial cables are rather lossy at 1296 so that 10 watts generated at the transmitter may only be one or two watts at the antenna and considerably less if you only start out with say, two watts. Also, the received signal is reduced by the cable losses.

Despite what may appear as a few problems in getting going on 1296, there is considerable activity on the band including EME, CW, SSB, FM, ATV, RTTY, repeaters, satellites, packet to name some.

Closure There is no doubt the four bands discussed in this paper are of immense interest to the avid VHF/ UHF operator. Most discussion has centred on the six metre band but only for the reason that many of the modes of operation are common to all four bands. Where there are propagation variations these have been discussed separately.

Many of you receive enjoyment from working on FM, using the repeaters from home or mobile and there is nothing wrong with that form of operation. Nevertheless, there is much scope for trying new ideas of your own or those of others from the many articles published in various magazines. There are almost limitless opportunities for antenna experimentation and having extra bands allows a selection when you decide to make a crossband contact although crossband contacts can be made equally as well using FM both ways or cross mode for that matter. I find it a rewarding experience to conduct a crossband contact using 432 and 1296 with both stations running only a few watts output. Further interest is created if you can become involved in a round table when all four bands can be used, that's really a fascinating exercise!

Hopefully by now, some of you will be able to see how you can broaden your horizons if you are able to expand your station and make use of three or four bands offering a variety of modes of operation and challenging propagation conditions - it need not be an overly expensive exercise unless you want it to be - but whichever way you go it can be a lot of fun, so good luck and happy hunting on some extra bands!

Thanks again to Eric VK5LP for permission to publish and to Wally VK6KZ for his help.

components and too tight for the three pin regulators and a couple of trimmer capacitors.

Another gizmo which I find very handy is a set of slip on magnifying glasses which sit firmly in front of the face. I find it very hard under normal circumstances to read colour codes and numbers on the small components, so this is quite handy.

So far I'm up to fitting all of the solid state devices. Capacitors, resistors and inductors were fairly straight forward (especially when you read the instructions thoroughly) and I picked up an instrument box from Tricky's that's just the right size.

Between now and Christmas, if work commitments permit, I will complete the installation of the last bits, get the board in the box and get the show ready to connect to the 430S. I think that will be the hardest part but you can read about it in the New Year.

73's

Peter VK6APS

VACANCY

BULLETIN EDITOR REQUIRED.

APPLY TO COMMITTEE.

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