Frequencies VHF,UHF, and SHF Newsletter NZ

This newsletter is compiled by Kevin Murphy ZL1UJG to promote operational and construction activity on the VHF, UHF and SHF Amateur Radio allocations in New Zealand...(and overseas).

Articles for this Newsletter can be sent via email to rfman@xtra.co.nz or by post to K Murphy, 8 Tamar Place, Hamilton. Ph 07 8470041

Issue 2 1st October 2001

New subscribers to this newsletter if you wish to have Issue 1 please email me.

Contents

Hamilton Amateur Radio Club Market Day

The Market day was an opportunity to meet a number of readers of the newsletter and add new subscribers. The pcb's as mentioned in the previous newsletter were a sales success and it was interesting to note that there many 1296 MHz filter pcbs sold with the funds towards the Waikato VHF group (of which I am the editor ...as well)

New subscribers, groups and newsletters,

Greetings to new subscribers in New Zealand , Australia and Great Britain. And thanks to those who forwarded on the newsletter and gave me feedback.

Some subscribers already have groups on yahoo such as http://groups.yahoo.com/group/zlvhfcontest
http://groups.yahoo.com/group/akvhfgroup
http://groups.yahoo.com/group/akatv

G0NFA has a 144 MHz European newsletter which you can subscribe to by contacting G0NFA on email at g0nfa@aol.com

For those interested in ATV and Microwaves, Selwyn ZL2BJO who works for Telsat Communications has some interesting parts . Contact him on at satelliteTV@telsat.co.nz for details of their mid winter sale and associated newsletter. See also http://www.telsat.com

The Auckland VHF Group and also the Wellington VHF Groups have well stocked trading tables and interesting newsletters
Details of the Auckland VHF group can be found at http:/www.qsl.net/zl1bq
and for the Wellington VHF Group contact zl2wa@clear.net.nz

The Waikato VHF Group can be contacted through the editor if you are interested in joining

Transverter evaluation Day

The Auckland VHF Group attempts to assist getting on the higher bands

Two members arrived to see how their equipment was working. The first candidate was a 925 MHZ transverter. The IF radio available was measured at 0.5 W out in FM low mode at 145 MHz. The RF output was found to be around 0.4 W at this level, and with higher input 1 W output could be generated. This was much lower than expected so some trouble shooting was undertaken. The mixer output to the power block was found to be about 40 uW, explaining the low output. The mixer input was about 50 uW, also much lower than expected. The area for investigation was determined to be the IF change over and input attenuator.

Next followed some 23cm antennas. A 23cm transverter was used for a signal source, with an additional attenuator between the IF and transverter input. The transverter output was reduced to 0.3 W to keep heat generation down. A directional coupler with isolation of 25-30 dB was used for measurement. There was a local design yagi showing 0.25 W forward and 15 mW reverse power or 12.2 dB return loss. This corresponds to an SWR of about 1.7. A home made copy of a loop yagi came next. Forward power 0.3 W and reverse power 10 mW is 14.8 dB return loss or SWR 1.45. This antenna featured home made semi-rigid cable to the driven element. RG58 dielectric and center was inserted into copper tube from the local hobby model shop, a very innovative result*. The single slot antenna on display at Easter was measured as 160 mW forward and 0.7 mW reverse for 23.6 dB return loss or SWR 1.15. These measurements were made at a spot frequency of 1297 MHz. With perseverance a frequency plot could be made within the range of the IF radio's tuning.

Finally a mystery device was presented. It had SMA J1, J2 and a +15 volt terminal. With ZL1UWQ's help it was connected to an HP scalar analyzer to reveal a gain of around 32 dB over the range 400 MHz to > 1.5 GHz. The other signal generator present showed it still had a gain of 20 dB at 2.3 GHz but was dropping off fast. Saturated output seemed to be about 20 mW. This was likely to be an IF amplifier module from a satellite receiver system where the IF covers 700-1700 MHz. It could be a useful building block in a low power transmitter over that range.

There was more that could have been measured that afternoon, but other transverters must all be in hand in their development. Another attempt may be made prior to the December field day. **Peter Loveridge ZL1UKG**

*I have found a way around using hardline that is essential in the feed element in a loopyagi,What I did is use some copper tube which I found for three dollars in a model aircraft shop(try Mico Wakefield) and stripped some RG58 coax (in my case with a solid centercore)which is a good fit inside the tube,annealed the part that needs bending later on in front of a gas-heater and assembling the thing in the right order with a nice n-connector for that size cable,bent it in the right shape and it is now indistinguishable from the real thing. It also runs through a homemade brass bush which takes it through the boom section and looks just the way it is meant to be,have a look at the photo's on my web page(zlvhfcontest group) **Harry ZL1BK**

The mystery device sounds like one I sold some years ago. It is an IF amplifier out of a American RADAR unit. Perhaps some of the other clubs might have transverter evaluation days to verify VHF/UHF/SHF equipment and promote activity.I have thought of having an equipment setup at the Hamilton Amateur Club Market Day? **EDITOR**

1296 MHz Yagi and 2424 MHz Can-tennas.

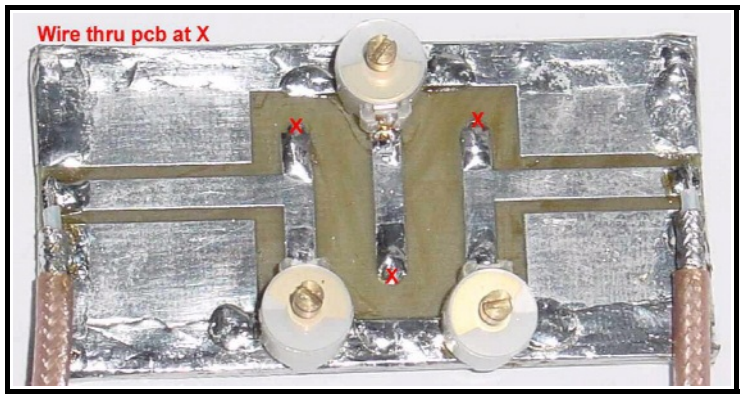
Micheal Sheffield ZL1ABS has produced a kitset antenna for 1296 MHz at reasonable cost.The editor has bought one to replace his wrecked French Tonna 23 element. It uses plastic 'P' cable clips to mount the elements on the boom and includes mounting hardware. Email zl1abs@xtra.co.nz for details (photo in the next issue)

A simple can antenna can be constructed out of a 820 gm fruit/ baked bean can with a RF connector BNC/ SMA 55mm from the lip of the closed end of the can and the BNC inner extended 29 1/2 mm from the teflon in the connector with about 1.8 mm wire. The editor made a successful 65 km contact across a mainly water path.

See photo on following page.

Filter

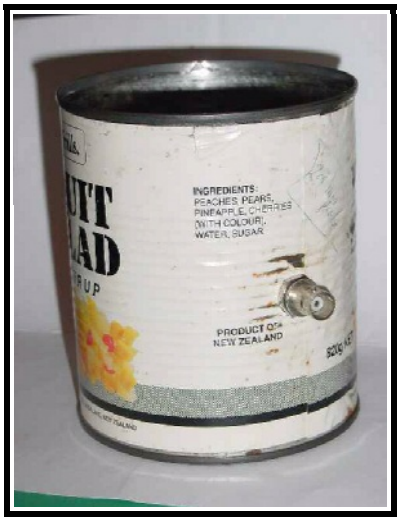
The filter is etched on a 1.6mm undrilled FR4 PCB (FR = Fire resistant) . There is no plated through holes so wiring through the pcb is done with component leads or tinned copper wire.
The addition of copper tape round the edges joins the two earthplanes together for good earthing (tape from Smith and Smith Glass /Farnell or the editor)
The filter has the middle capacitor fitted at the opposite end of the middle stripline. This results in slightly higher loss but gives a better response as the 3 capacitors together give an overcoupled response. Trimmer caps available from Auckland/Wellington VHF Groups, Farnell/ RS Components or the Editor
With the standard 1.5 -5.5 pF grey capacitors (or similar) the filter tunes 622 - 1296 MHz comfortably and may extend up to 1420 MHz for those interested in SETI.
The upper and lower limits of the filters can be extended with smaller/higher capacitance trimmers or fitting fixed values across the trimmers.
Kits, pretuned units,pcbs available from the Editor



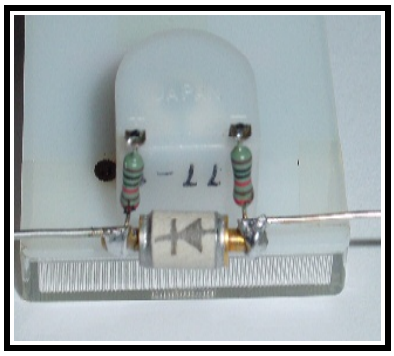
Loss and Rejection Figures

1296 MHz Loss	-3dB	Loss@-145 MHz -23 dB
		Loss@-290 MHz -36 dB
925 MHz Loss	-2.5dB	Loss@-145 MHz -30 dB
		Loss@-290 MHz -43 dB
622 MHz Loss	-2.1dB	Loss@-145 MHz -40 dB
		Loss@-290 MHz -50 dB

These figures are given to coincide with transverters that may use 145 MHz IF.

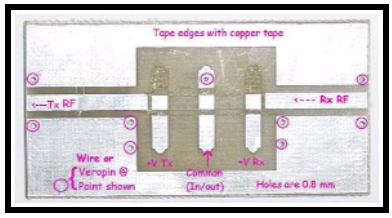


<----El cheapo Can-tenna for 2400/2424 MHz.
Remember to eat the contents first otherwise the SWR will be bad. A coat of primer on the outside and varnish on the inside will prolong its operational life.
One of my anteenas for 2424 MHz ; 2 times full wave diamond loops are enclosed in a plastic lunch box for waterproofing. It could be sealed with RTV but leave a breather hole underneath



Simple RF Detector

I quickly made up a simple RF detector for ZL2 BW to check Focal points of dishes and simple radiated power checks (also microwave oven leakage). The resistors are 10 k ohms. The diode can be an old 1N23 or a wire ended diode such as a HP 5082-2835 or similar. The meter is a 250 uA el cheapo meter. The 1/4 wave elements in mm from the diode package are 75000/ Frequency in MHz
At 1296 MHz the elememts are 58 mm each
At 2424 MHz the elememts are 31 mm each
See picture on left



Pin Diode Switch

I have cut & removed some tracks from the filter pcb and with the addition of a few components have made it into a low level RX/TX pin diode switch. Tests indicate 2dB loss when optimised at 2424 MHz . Adjusting the generator gave about 1 dB loss at 1296 MHz (although the capacitor/inductor values were not optimum. PCB losses increase with increasing frequency and we estimate about 1dB PCB loss @ 2424 MHz.
The picture left is the PCB cut for the pin diode switch .
The capacitors are chosen to be roughly series resonant and the inductors parallel resonant to minimise losses. At the junction of the diodes 2 X 1200 ohm SMD 1206 250mW resistors are in parallel as a DC load, reverse biasing the unused diode.
(A new pcb now allows 0805 size capacitors throughout)
BA379 pin diodes are available from the Auckland VHF Group trading table.

http://groups.yahoo.com/group/zlvhfcontest

After hearing about a good VHFDX opening (after the event) and after discussions with Harry ZL1BK we put forward that the above group also be used as a reflector so that others can be alerted of good propagation on the VHF/UHF/SHF bands. This will help promote more activity.

For example you may be hearing a beacon/repeater above normal strength or have just had a Auckland Wellington contact (direct).

Additionally it can be used if you are going to be active (portable/fixed) on VHF/UHF/SHF bands For example 1296 MHz SSB

Join the group now

VHF/UHF Activity

Ray ZL2TAL New Plymouth, ZL1AZ near Taumarunui and Dave ZL2BW Nelson have contacts every day on 144.5 MHz FM or 432.100 MHz USB (432.100 is the VK/ Oceania calling frequency) Contacts start about 1.00pm ZL2TE, ZL2VAL, ZL2TAL, ZL2WSP participate. Dave in Nelson can transmit 120 watts to a 64 ele vertical collinear antenna on 432 MHz. If conditions are favourable then 1296.200 MHz is used

VHF SSB net

Dick Greenbank ZL2TGQ coordinates a weekly, informal VHF & SSB interest net in Wellington, (it's been going for just on 2 years now).

ZL2TGQ, located at Newlands, calls for check-ins from 8:00pm Tuesday nights, 144.200 MHz USB, vertical polarisation. A warm welcome to everyone. If he does not hear your call, try a relay through another station, or E-mail him at "dickgreenbank@compuserve.com". If local noise is a problem at your QTH, he also has horizontal polarisation available at the flick of a switch, and that may help.

We are in danger of loosing most of the 3.4 GHz band?

Recently published on the MED web site is a discussion document "Proposed Auction of Spectrum Rights for WLL, LMDS & Cellular Services" It can be found at: **http://www.med.govt.nz/pbt/rad_spec/wll/index.html**

Contest Activities

Microwave Contest 614 MHz and UP

Saturday 6th and 7th October,2001

1600-2200 Saturday and 0800-1400 Sunday

From the Klondyke repeater site Harry ZL1BK will have 1296 MHz with 10 watts into a 27 el. loop yagi and hopes to work New Plymouth, Waikato, Brian, Ralph and anyone else who gets in the way.

Ray ZL2TAL ,New Plymouth will be operating from home and has 10 watt capability on 1296 MHz and about 1 watt on 2424 MHz

Dave ZL2BW, Nelson is active on 1296 MHz and preparing with 0.5 watts to a dish on 2424 MHz.. Dave runs 10 watts to 2 loop yagis or 30 ele skeleton slot on 1296 MHz

VHF Field Day Contest 50 MHz and UP

Saturday 1st and Sunday 2nd December,2001

1600-2200 Saturday and 0800-1400 Sunday

All contest logs should be sent to arrive within 2 weeks of the contest to Contest Manager, Wellington VHF Group, PO Box 12 -259, Thorndon, Wellington

Devices used in 1296 MHz and 2424 MHz Prototype RF Power Amplifiers

Some people enquired at the Market Day what devices we are using

The devices are from Stanford Microdevices (http:/www.stanfordmicro.com)

The 1296 MHz amplifier uses NGA-586 MMIC amplifier and SHF-0589 GaAs HFET

The 2424 MHz amplifier uses SXT-289 MMIC amplifier and SHF-0589 GaAs HFET

Let's go TROPO

. . ZL2TGQ / ZK3TZH

Dick Greenbank

No, not the mythical Island Paradise of winter dreams, but "troposhere", that layer of atmosphere surrounding the Earth to about 10kM. The troposphere can be important to VHF/UHF DX enthusiasts, for during some weather conditions it can provide extensive enhancement of signals, resulting in contacts over hundreds of kM, or even as far as VK-land.

The troposphere is the zone where all the world's weather takes place, so it can be a pretty disturbed place at times. In usual conditions, the air rises due to being heated at the Earth's surface, and as it climbs it gives off heat and cools, and the moisture in the air condenses to form clouds. These conditions result in some pretty sunsets, but are not much use to the VHF/UHF DX enthusiast. The meteorologists amongst you will recognise cyclonic weather, denoted on the isobar graphs by "L", and usually associated with steep isobar gradients, fronts and strong winds.

By comparison, in an anti-cyclonic weather system, the air is sinking slowly, it's temperature is rising, it's losing moisture, and this produces still, settled conditions. We love these anticyclones, (good fishing weather). It is during these more settled conditions that the warm, dry air can form a "layer" on top of colder, moist air below to provide enhanced radio propagation.

There are several enhancement "modes" which can aid the VHF/UHF DX enthusiast. Here are two that I find most useful.

Tropospheric Refraction (also called Nocturnal Inversion)

This is pretty common, or normal, during calm weather in the summer months. For example, I have become accustomed to good signals over the Wellington-Christchurch coastal path during evenings in the summer months due to nocturnal inversion.

The general principle is that in the evening the ground radiates the heat it has absorbed during the day, cooling the air near the ground, and sometimes condensing the water vapour in the air, producing fog, (nigh-time radiation/cooling). This cooling occurs at a faster rate than the cooling of the upper air. If the weather is settled, no mixing, or little mixing, occurs between the cooler air near the ground and the relatively warmer air above, and a layer forms with a distinct boundary. The refractive index of the two layers is quite different and VHF/UHF radio signals are refracted at the boundary. So signals that would normally terminate at the radio horizon, (4/3 geometrical horizon), or those that are normally lost as sky waves, are refracted, and propagate further. Coastal paths are the most prevalent areas affected, as the ground cools quicker than the sea. There is a saying, "fog prone = DX prone".

Initially, the refraction layer occurs relatively close to the ground, but rises during the night, as higher regions of air cool, but not usually above 500-800M above the ground. These conditions usually recede during the night as the temperature of the two layers normalise, and certainly will disappear with the rising of the sun. In my limited experience such conditions have resulted in QSOs over paths as long as Hawkes Bay - Christchurch, that's over 500kM.

Tropospheric Ducting

This is the biggie of VHF/UHF enhancement. Although it is less common, less prevalent, than nocturnal inversion, it is a mechanism that can provide mouth-watering longer distance propagation. Trans-Tasman contacts are readily feasible, at 2500kM plus, and certainly have been achieved in the past. The 2000/2001 Callbook "Records" section gives various VHF/UHF records, including 2M at 3420kM, 70CM at 2405kM, and 23CM at 2131kM.

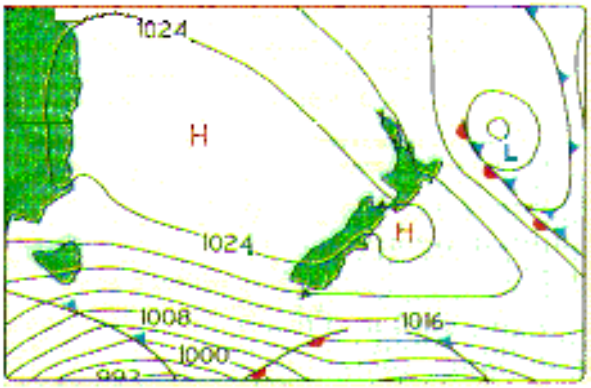
The general principle is similar to that of nocturnal inversion. In this case an anti-cyclone, or "high pressure" system, which has been established for a while produces settled conditions where a mass of warm dry air slowly subsides. As it sinks it is compressed and heated further, to sit on top of cooler, moist air trapped below. Due to the settled conditions, no mixing, or little mixing, occurs between the cooler air near the surface and the relatively warmer air above, and a layer forms with a distinct boundary. The refractive index of the two layers is quite different and VHF/UHF radio signals are refracted at the boundary. Refraction is so pronounced that waves are bent back to earth, where they are reflected upwards again, and so the wave is propagated along the duct in a manner analogous to microwaves in a waveguide, with very little attenuation.

The engine-room which produces the conditions which favour trans-Tasman VHF/UHF DX is Australia's interior, where in the spring and summer the Gibson and Simpson deserts form large masses of hot, dry air, anticyclones. These then progress to sit over the Tasman Sea, where they slowly subside, producing inversions. These occur at altitudes between 500-3000M and can extend completely across the Tasman Sea.

If the anticyclone drifts north or south, this lets cooler, moister air move in near the surface, enhancing the duct so that DX sometimes occurs along the edges of the anticyclone. Another factor to consider is that the higher the frequency the more effect that refraction has, so 23CM and 70CM may out-perform 2M.

Predicting when conditions are favourable

The most readily available guide is the little isobar charts reproduced in your daily paper. A high pressure system which sits stationary over the Tasman Sea for a number of hours, or better still a number of days, can result in the settled conditions which produce long-term inversions. Two considerations to bear in mind are the degree of reliability of weather forecasting, the forecasters don't get it right all the time, and the lack of information on humidity provided by the isobar charts.



Another service available to amateurs is provided by William Hepburn. This is a predictor specifically oriented to Tropospheric DX modes, and available via the world-wide-web.

I have been attempting to correlate this source of prediction with the isobar charts for several months. There have been occasions when an anticyclone is indicated where tropospheric ducting suggests it should be. Equally, the opposite is sometimes true, so the results are not conclusive, (but very interesting).

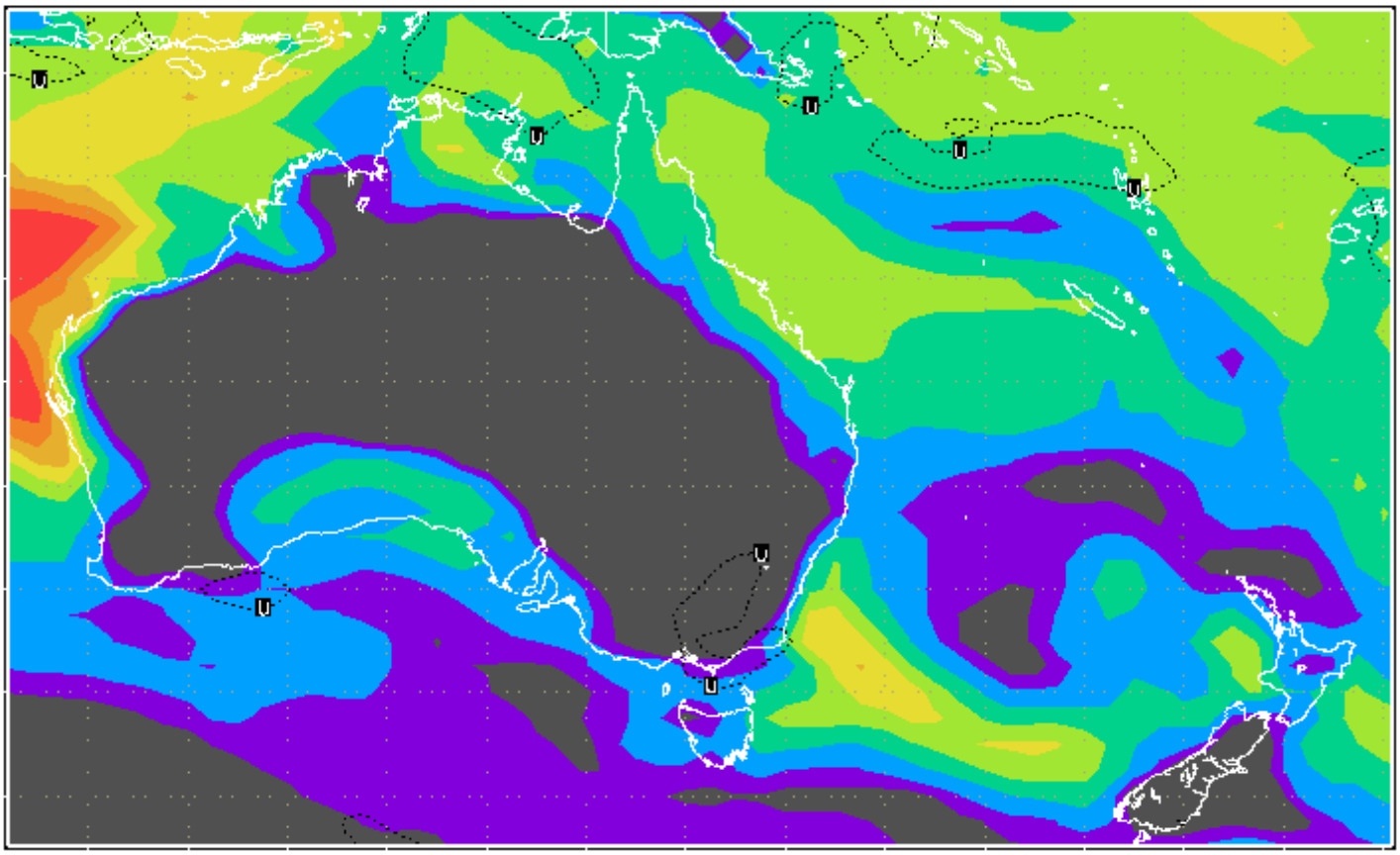
You can access the Hepburn Tropo Index for this area of the world at:

http://iprimus.ca/~hepburnw/tropo_aus.html

I have selected an example which demonstrates the less than absolute relationship between Tropo Index and isobar graph. In this example, the prediction is for strong to good likelihood that ducting can occur on a path from the west of N.Z. North Island to the east coast of Tasmania. Interestingly, although there may not be a lot of Hams active in Fiordland, a combination of nocturnal inversion and ducting could provide a path from there to Tasmania.

1.4	2	3	4	5	6	7	8	9
MRGNL	FAIR	MDT	GOOD	STRONG	V STG	INTENSE	V INTS	XTRM

Hepburn Tropo Index Australia - NZ



The relative position of the anticyclone shown in the isobar chart, and the highlighted area of the Tropo Index, suggests that tropo is likely along the southern edge of the "high", perhaps the high is moving and allowing cold, moist air under that edge. Closer observation over several 6 hour periods may indicate more adequately what is happening, and indicate the likelyhood of DX occurring.

Of course the real clincher would be coincidence between the Tropo Index, isobar chart, and a trans-Tasman contact.

Other indicators

Listen for the vision carriers of Australian TV stations. These are listed in the WIA Callbook, I can provide a copy of the relevant pages for anyone who contacts me.

Listen for the carriers of pager repeaters between 148.00 and 148.10. This service still functions on these frequencies around Melbourne.

Listen for stations in the SSB net run by Rob VK3EK located at Bairnsdale on the south-east coast of Victoria, a few kM from Lakes Entrance. Rob calls for check-ins from 8:30 EST every Wednesday night, on 144.150 MHz. Bairnsdale is fairly close to the shortest path between VK3 and ZL2, and those of you who are air travellers will be familiar with this point where Wellington flights going to Melbourne cross the coast.

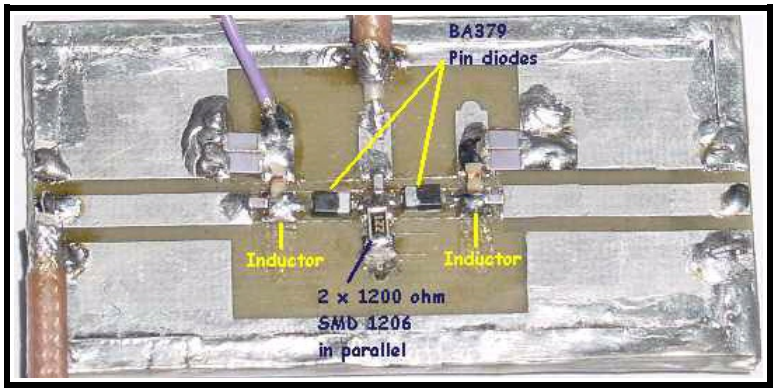
Incidentally, the mechanism of troposheric ducting has been known for a long time. The first recorded instance I can find is in the reports of investigations by Guglielmo Marconi in 1932, from the yacht "Elettra" to the Hotel Miramare at Santa Margherita, indicating "that signals of 600MHz could be received well beyond the optical range".[1] What wonderful foresight, or perhaps good fortune, that placed Marconi in the Mediterranean Sea, now well known for the "sirocco" winds from the Sahara Desert causing record breaking microwave DX.

Guglielmo Marconi

Tropospheric Refraction and Tropospheric Ducting can provide extensive enhancement of VHF and microwave signals. Trans-Tasman DX is a reality **give it a try**

.

1. The Marconi Review, Vol XXXVII, No 192, 1974, Centenary Issue



Pin Diode Switch contd See picture

2424 MHz component values are 10 pF SMD 0805 in the RF path, 10 pF and 1000 pF SMD 1206 for the decoupling capacitors and 33 nH SMD inductors.

1296 MHz component values are 22 pF SMD 0805 in the RF path, 22 pF and 1000 pF SMD 1206 for the decoupling capacitors, 100 nH SMD inductors.

925 MHz component values are 47 pF SMD 0805 in the RF path, 47 pF and 1000 pF SMD 1206 for the decoupling capacitors, 220 nH SMD inductors.

622 MHz component values are 100 pF SMD 0805 in the RF path, 100 pF and 1000 pF SMD 1206 for the decoupling capacitors 470 nH SMD inductors.

432 MHz component values are 220 pF SMD 0805 in the RF path, 220 pF and 1000 pF SMD 1206 for the decoupling capacitors 680 nH SMD inductors

144 MHz component values are 1000 pF SMD 0805 in the RF path, 1000 pF SMD 1206 for the decoupling capacitors 4700 nH SMD inductors.

The SMD 0805 inductors and capacitors are available from Farnell (Inductors-SIMID08B range-page 664) and from the editor . Contact editor for pcb's.