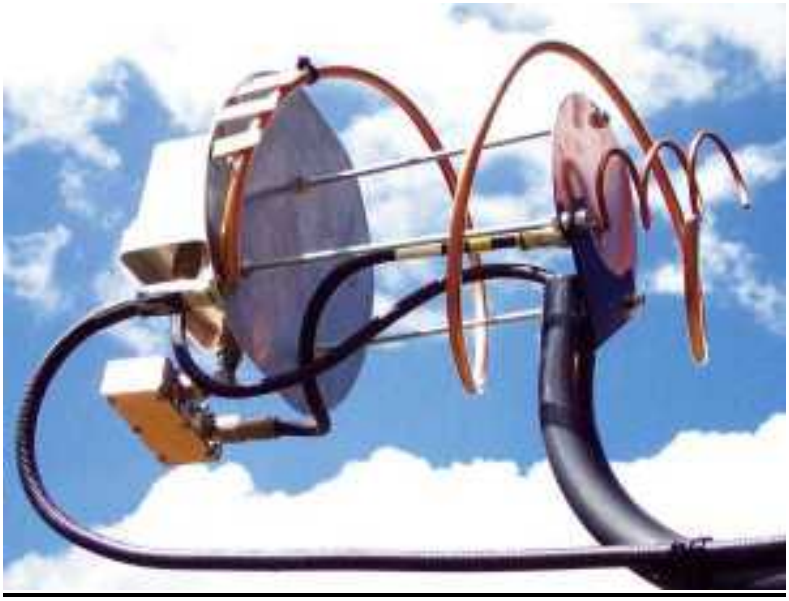
THE

QUEENSLAND

VHF'er



The Magazine of the Brisbane VHF Group

No 1 **July 2006**

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The Brisbane VHF Group are responsible for the following:

Beacons

VK4RTT **144.440** MHz - 25 Watts – Location: Bunya Mountains – Status: operational

VK4RBB **432.440** MHz - 8 Watts – Location: Murrarie, Brisbane – Status: on air testing

VK4RBB **1296.440** MHz - 8 Watts – Location: Murrarie, Brisbane – Status: on air testing

VK4RBB **2403.440** MHz - 2 Watts – Location: Murrarie, Brisbane – Status: soon operational

VK4RBB **10368.440** MHz - 1 Watt – Location: Murrarie, Brisbane – Status: planned for later in 2006

Repeaters

VK4RBN **147.000** MHz (600 KHz negative offset) – Location: Mt Glorious – Status: operational

VK4RBC **438.525** MHz (5 MHz negative offset) - Location: Mt Coot-tha – Status: operational

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Editors Chat

Welcome to the first issue of “The Queensland VHF’er**”**

The aim of the Brisbane VHF Group is to promote the use of all modes of communication on all bands VHF and above.

Our newsletter title is inspired by and modified from an excellent publication called “The Victorian VHF’er” that one Bob Halligan VK3AOT prepared and published in the late 1960’s or early 1970’s, so acknowledgement is given to him for this. “The Victorian VHF’er”, for the few years that it existed, was an excellent mag with useful technical articles and up-to-date reports on VHF operation in that region. Bob Halligan’s enthusiasm for this subject is legendary! “The Queensland VHF’er” as a title seems sufficiently original and inspirational as well as, for some, resurrecting something that was so good so long ago.

During the mid 1990's Scott Watson VK4JSR also set an excellent standard of amateur radio journalism, through the editing and production of our previous newsletter titled "Making Waves". It featured technical articles and up-to-date operational reports, even a few commercial advertisements! Readership was very wide, down into NSW and up to North Queensland!! The only reason we haven't called our 'new' journal by that name is that the Greenpeace Organisation now has a regular publication by that name!

I am a newcomer to the region, having moved to Southern Queensland from Darwin a few years ago. I live in the Town of Warwick which is located in the Darling Downs about 150km south west of Brisbane at an altitude of 490mtrs…a pretty good VHF/UHF site. My main interests are in the satellite and weak signal areas, although I am currently moving down the digital route at the moment with most of my operation…and enjoyment coming from working PSK31.

Yes, QRP operation is possible on VHF/UHF, I’ve yet not to work a station that I can hear. My current rig is a FT817, I still own a FT290 and an IC202 that I bought in 1980!

The editorship of this magazine is my contribution to amateur radio in the region.

I intend to promote a high proportion of technical articles, covering all levels from simple projects for the new influx of foundation members, to state of the art techniques for the more technically inept.

This magazine can only grow and flourish if contributions are sent to me on a regular basis, so no excuses, jot down some notes on that last project of yours that worked…..or didn’t, and either e mail or post it to me for the next issue. I intend to publish 4/5 issues each year and if contributions are sufficient, that can grow to 6…..or more.

This first issue contains articles gleaned from various sources, and full acknowledgement is given to the author and source (where known). But in this age of litigation and refusal to accept responsibility for one’s own actions, I am told that some form of disclaimer is necessary to prevent the incompetent and the unwary from holding the author, editor and members of the group liable for the consequences of using any of the information contained in this magazine to injure or harm themselves, their equipment or any third party. You must accept that any consequences that occur through following any information in this magazine are entirely your own responsibility.

Having said all that, I hope you enjoy reading the following articles, and learn something of value to this great hobby of ours.

Graham VK4SG

ONE SOLUTION TO PAGER INTERFERENCE TO 2M RADIOS

Doug Friend, VK4OE

Background: Pager transmitters in the first half megahertz or so above 148 MHz have long been a source of interference to amateur radio FM transceivers operating on two metres. In amateurs' experience, there are some radios that are obviously more susceptible to this interference than others. Several factors are involved here.

- Many modern radios that have 'scanning' potential built in may possess difficulties/compromises in RF design arising from their necessarily broad receiver front ends (compared to single band radios of the past)
- It is interesting to observe that pager interference is almost exclusively a problem of 2M FM transceivers, with very little reported from multi-mode radios, even when used on FM frequencies. [Comments by others may confirm or disprove this.]
- Phase noise from phase locked loops in some transceiver designs may be generating spurious responses in the 148 MHz segment.
- Inability of some 2M radio front ends to deal with potentially high receiver input signal levels that arise from nearby pager transmitter(s) – such radios are probably also not that good in dealing with close-by in-band transmissions.
- Some amateurs have the problem and some do not, due simply to their geographical location in relation to pager transmitters.
- Sometimes pager (or other) interference can be due to intermodulation in the antenna or feedline due to impedance 'bumps', corrosion, dissimilar metals, etc., etc. Using a different antenna and feedline is the way this can be discovered.
- Also, sometimes the interference can be due to a 'dirty' pager transmitter, but this is not usually the case. Logical testing using a filter can determine this.

My Story: Being usually a "weak signal" VHF'er, I haven't been a great user of FM repeaters; using FM more for simplex operations during contests. (My multi-mode radios usually stay on SSB!) 2m hand-helds at my QTH, whether mine or belonging to others, have consistently shown intractable pager interference that was enough to deter anyone from monitoring the 2m FM frequencies!

I tried early pager filter designs – QST, AR magazine, and some helical notch filters on loan from Gary VK4AR – but all to no avail. I also made a centre tuned half wavelength band pass filter but it was not sharp enough to substantially reject the problem 148 MHz signals. (It did allow me to use an FT290R on 144.1 SSB when located on the top of Mt Gravatt, the extra 2 MHz separation being the difference!)

After hearing good reports about the Yaesu FT2800, especially that it has a "bullet proof front end", I decided to purchase one to be a separate radio devoted to that mode. (The price was right too!) But it too, yes even the FT2800, suffered significant interference from the strong 148 MHz signals at my location.

I tried alternative 2 metre antennas at home to see if the interference was caused by intermodulation in the antenna or feedline. All were the same! I even borrowed some commercially made cavity filters which were able to demonstrate that my interference was simple front end overload and not a 'dirty' pager transmitter. Furthermore, spectrum analyser observations showed that there are some "mean mother" pager signals present in the 148+ MHz band at my place, some even coming up to the -15dBm level!

As an aside, taking the FT2800 mobile with a ¼ Wavelength whip or a 5/8th wavelength ground plane is interesting, with interference prevalent when driving around in the city, compared to no significant interference received when driving in rural areas. Pager interference definitely is a result of urbanization!

Solutions: One 'sudden death' solution to pager interference is to insert some attenuation (say 10 or 20 dB) in the coax feeding the receiver front-end. Both the interfering signals and the desired signals are attenuated, but the tendency for front end overload is greatly reduced. However, in most amateur installations using commercially available radios, separating the receiver and transmitter feedlines is not an option. Nevertheless, simple attenuation is a real option if you can live with the downside of reduced receiver sensitivity, say, if you only want to work strong local signals!

[If the attenuation is inserted in the antenna coax, much of the transmitter power will be dissipated as heat in the attenuator and the attenuator would need to have an adequate power rating. This will surely lead to not being able to key up distant repeaters, but some will regard this as no great loss…..]

Another solution, only suitable for single frequency use, is to install a sharply tuned cavity filter in the receiver line. However, as for attenuation, separating the receiver and transmitter feedlines is not an option in most amateur installations. If such a filter was to be placed in the antenna line (TX + RX) operation would be severely restricted to the simplex frequency to which the filter is tuned.

Still on the subject of using a sharply tuned cavity filter, if there is only one pager transmitter that is causing you a problem, the cavity could be configured as a notch filter on the pager frequency. This would work, but in urban areas there are usually many pager signals on the air (intermittently or continuously) and a single cavity filter cannot notch all of them at once!

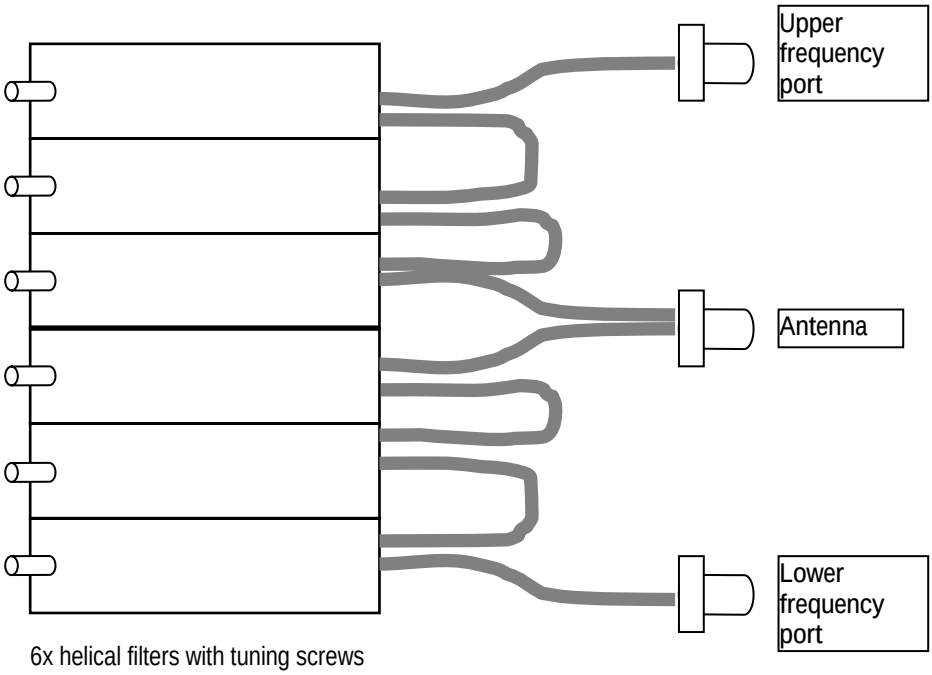
As a result of all of the above experiences, I reasoned that finding a broadly tuned filter that will accept all or much of the 2M band whilst attenuating frequencies in the 148+ MHz pager range was what I needed.

A six pole VHF helical filter set was noticed on Australian eBay (from a Chinese seller) and I decided to investigate it. It is described as being designed for duplexing two VHF transmitters into one antenna (probably a mobile whip) as long as the two transmitters are a minimum of 3.5 MHz apart and a maximum of 15 MHz apart. Despite the apparent tuning restriction, I reasoned that I would buy one of these filters and see if it might be useable for reduction of pager interference on my FT 2800. These filters are Chinese made and brand new.

The specified details for the VHF duplexer from this source are:

- 35W RF power Handling
- 6 cavity Design
- Minimum Tx and Rx frequency difference: VHF 3.5Mhz
- Maximum Tx and Rx frequency difference: VHF 15Mhz
- Power Isolation >75dB
- Power loss <1dB
- Support Frequency: 135-175Mhz
- N connectors.
- 1.2Kg, (15.5 x 22 x 3)cm

A simplified diagram of the Chinese VHF Duplexer is as follows:
(Compare with photo 1.)



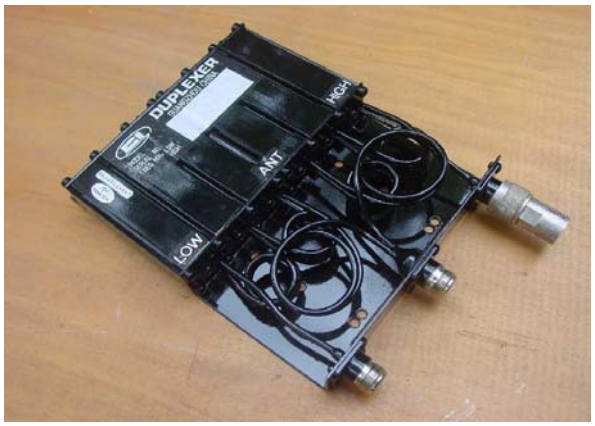


Photo 1

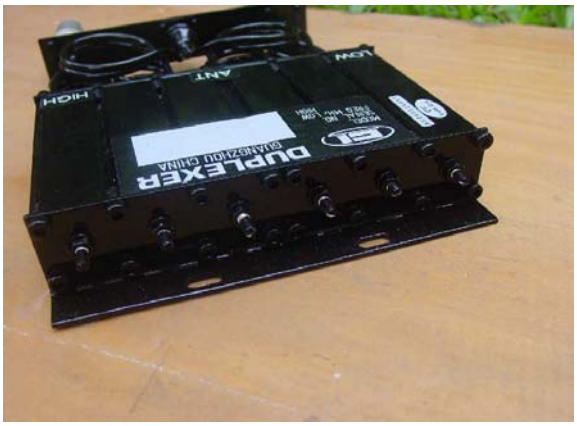


Photo 2

In my successful use as a 2 metre band pager interference suppressor, the antenna is connected to the centre port, the transceiver is connected to the lower frequency port, and a 50 ohm resistive load is connected to the higher frequency port.

This seller doesn't feel free to just send out a filter untuned (he says: "Send me the high/low frequency"), but my intended usage did not meet his minimum Tx and Rx frequency difference of 3.5 MHz. I therefore ordered it tuned to a Tx frequency of 145.0 MHz and an Rx frequency of 148.6 MHz.

On arrival, I immediately began optimising the filter performance to the way I wanted to use it. Using a leveled signal generator, isolator and accurate power meter, I obtained the following results:

MHz	Attenuation (dB) transceiver to antenna port	Attenuation (dB) transceiver to 50 ohm load port	Return loss (dB) at transceiver port with other ports terminated
144.0	0.80	17.0	
144.5	0.70	18.2	
145.0	0.65	19.6	
145.5	0.80	21.0	
146.0	0.95	24.0	
146.5	1.15	27.6	35.0
147.0	1.75	16.2	23.5
147.1	2.00		
147.2	2.20	12.5	
147.3	2.60		
147.4	3.00	10.0	
147.5	3.65		16.4
147.6	4.50	7.7	
147.7	5.65		
147.8	7.10	5.8	
147.9	9.00		
148.0	11.4	4.1	18.5
148.1	14.0		
148.2	16.8		
148.3	19.8		
148.4	22.8		
148.5	26.5		
148.6	30.6		
148.7	30.8		
148.8	32.4		
148.9	33.9		
149.0	34.0		

In order to achieve broad attenuation across the 148.0 and above segment, these results show a steep increase in attenuation and reduction in return loss above 147.2 MHz. Obviously, I have had to sacrifice any repeaters that have input or output frequencies higher than 147.2 MHz (or even 147.0 MHz, looking at return loss figures). For me, this is not a great loss but if some amateurs want or need to use those frequencies, then this type of solution may not be not viable.

Hopefully those amateurs will be living in areas where 148 MHz pager signals are either non-existent or not as strong as at my place. It may even be that no pager filtering would be required at all! It may also be that, if they do have problem pagers, they are further up in the 148 MHz band than mine were and that the filter they use could be tuned just that little bit higher than reported here.

For me, on-air results have been most satisfying with the FT2800 now giving very short (200mS) interference bursts only about five times per day when tuned to any of the frequencies I use. The received pager signals are largely routed to the 50 ohm 'N' connector load visible in the first photograph. Photo 2. features the tuning screw end of the filter unit.

For anyone wishing to proceed down this path, some careful tuning activity will be required, and it would be difficult to do this without some sort of RF power measurement equipment. However, the DIY tuning approach suggested here is both educational and a good avenue for experiencing practical VHF radio things. I recommend anyone getting themselves into this practical side of our hobby! If any local amateur reading this wants assistance in tuning up their filter, please feel free to contact me at: friends@squirrel.com.au

To look for one of these filter units on Australian eBay, just do a search using the word "duplexer". There are usually some VHF duplexers for sale and some UHF duplexers, many from the one seller "KitsParts". For better or for worse, this seller appears to be non-negotiable with respect to the high charge he requires for shipping. Sellers over-charging for shipping is a bit of a problem that the eBay administrators are generally watching, but that's another story! I have no connection with this eBay seller other than being a satisfied customer!

A reportedly effective pager filter is commercially available out of Canada, but this writer has had no experience with it.

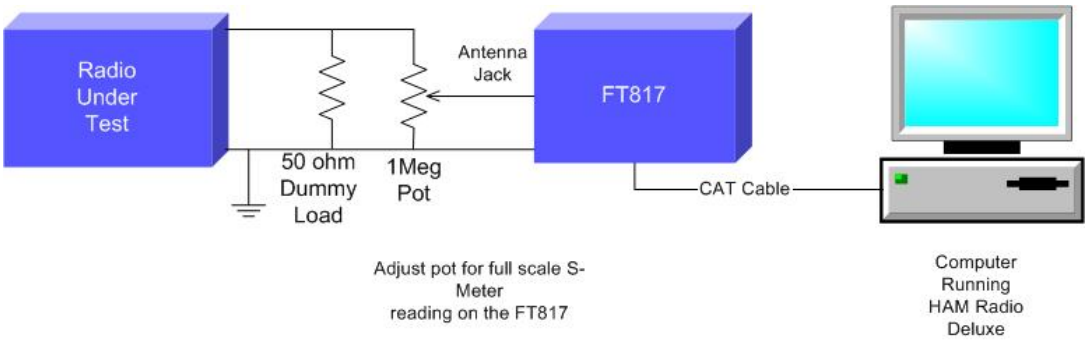
Congratulations to Doug VK4OE for winning the 24 Hour Portable Single Operator section of the John Moyle Memorial National Field Day 2006. Doug scored 2512 points, more than double the score of the second place getter VK2KWM (1276)

Doug portable at Taroom (QG44XD)

Due to the location, most of Doug's contacts were of a distance of over 300km which contributed to the high score. Contacts were made on HF,144, 432, and 1296.The two 'best' 2M QSO's were to Kempsey (VK2MAX/2) and to Charters Towers (VK4FNQ), respective QRB's both being around 750 Km without aircraft enhancement!

The Web can sometimes be a mine (minefield) of information, but sometimes a real gem can turn up:
(Original author unknown, but to be congratulated for his/her lateral thinking)

Poor Mans CAT-based Spectrum Analyser



How to use Ham Radio Deluxe in combination with your FT817 and a CAT cable to act as a Spectrum Analyser:

Go to http://hrd.ham-radio.ch/ Click on the ***User Support Forums***,

Download version ***HRD V3.1 Beta*** (The Beta version has the Bandscope feature). ***The new V3.2 now has bandscope as standard - Graham***

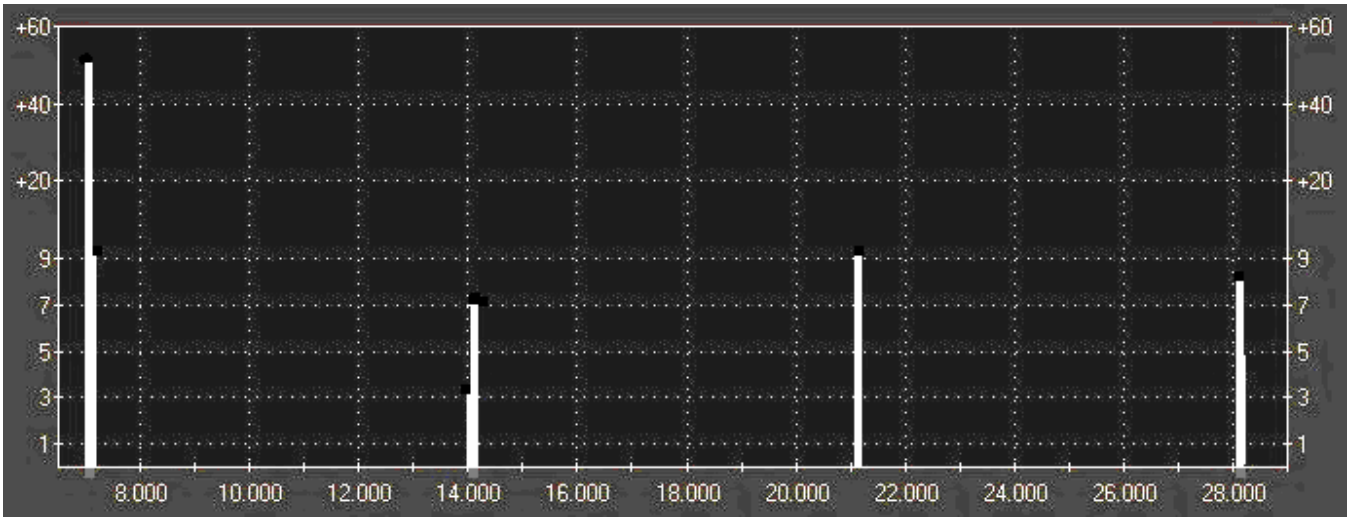
Direct connection is: http://hrd.ham-radio.ch/downloads.html#Beta_Kits

Connect to your rig and verify that HRD tracks VFO movement and S-Meter Readings

Try a Bandscope sweep (You may need to click on ***Tools/Bandscope*** to enable)

Try playing around with the Bandscope settings (There are a number of icons to the left of the Bandscope window) When you are happy with how the bandscope works, try to connect a rig as in the graphic above and you should be in business.

I used it to generate the following graph of the harmonic output of an ATS3



This system will also work on other types of rigs that are supported by Ham Radio Deluxe

Amateur Satellites – Hamsats – OSCAR what's it all about? (Part 1)

A basic introduction – Graham VK4SG

Let's have a little chat about these satellite thingies….. I've been using the satellites since OSCAR (***O**rbiting **S**atellite **C**arrying **A**mateur **R**adio*) 7 went up in the late 1970's – and it's still there and usable most of the time.

In this first part I want to tell you a little *history* and get you familiar with the type of equipment you will need to track and listen to some of the satellites. The second part will tell you how to operate using the satellites as a repeater in the sky, and the third part will tell you about the new high elliptical orbit satellites that are due to be launched in October this year.

Right, go out now and buy the latest multi band, multi everything rig ($3000), include a new Pentium 8/ 500GHz computer with full interfacing to the above rig ($2800), broadband internet access ($30/month) as well as computer controlled rotator system ($900), with an antenna array of stacked helices on a 20-metre tower ($2500).

(***Santa/Tooth-fairy/Mother***, if you're reading this take notice of the above list, I promise to be *real, real* good)

But…. If you're like most hams who can't afford a new bottle of water to wet the string you call an antenna, you could ask me (or any other ham who plays with the satellites) to print you out a prediction chart for a week/months worth of passes for a satellite you are interested in. *In 1975-8 BC (Before Computers) these prediction charts were in each issue of AR or Break-In and were what all hams used to locate the satellites.*

A single line format gives you the data for the middle of a pass,

Date	Time (local)	SAT ID number ↓ Satellite	Beam Heading ↓ Azimuth	Height above Horizon ↓ Elevation	Distance from you ↓ Range (km)
29-06-2006	06:39:03	AO-16	276.1	22.6	1635
29-06-2006	07:19:39	LO-19	275.8	21.2	1695

The three line format gives you the AOS (**A**cquisition **O**f **S**at), as well as the LOS (**L**oss **O**f **S**at)

Date	Time		Satellite	Azimuth	Elevation	Range(km)
29-06-2006	06:33:09	AOS	AO-16	338.5	3.0	2950
	06:39:03			276.1	22.6	1635
	06:45:03	LOS		213.6	3.0	2995
29-06-2006	07:13:51	AOS	LO-19	336.6	3.0	2947
	07:19:39			275.8	21.2	1695
	07:25:33	LOS		214.9	3.0	2992

Now with these charts, and the frequency of the downlink from the satellite, all you need to do is to set your receiver to the frequency and listen at the listed time and you will hear it……..now about Doppler shift…….

Doppler shift is the effect that an object coming towards you, passing you and traveling away from you has on your reception of a transmission from that object.
Think about a truck blowing its' air horns as it passes you. The sound is higher in pitch as it approaches, and drops in pitch as it leaves you. This effect is also noticed in the frequency of your received signal from the satellite. On a 29 MHz downlink you have to start about 800Hz high, 148 MHz about 6 kHz and 436 MHz about 12 kHz. *(On a 2401MHz downlink you start 40 kHz high and end up 80 kHz lower on a ten minute pass so you can get very busy indeed!!)*

Now all the satellites up at the moment are in a relatively low orbit above the earth and rotate around this planet of ours between 270km (**I**nternational **S**pace **S**tation) and 2100km (RS15) above the earth, and orbit between 11(RS15) to 16 (ISS) times a day. So RS15 moves relatively slowly (6 km/sec) and is quite high so it is available for about 35mins on a high elevation pass, and has around 5 passes that we can hear each day. The ISS moves the fastest (around 8 km/sec) and is the lowest satellite so a high pass is available for only 10-12mins and on a low pass only 3-4mins. ISS is available around 3-4 passes each day. *The two high elliptical satellites scheduled for launch later this year will be available for up to 9 hours at a time, 5 times in a three day period, and orbit between 250 and 45,000 km above the earth.*

Now what antennas will you need……. Well RS15 with its 29.352 MHz down link can be heard on any HF antenna, and AO16 on 437.025 MHz can be heard on the rubber duckie on my FT817 sitting on the bench when it's 2500km away!!!
I use the satellites as beacons to "tune up" my antennas and antenna aiming skills, and can regularly receive AO16 and LO19 at less than 0.5 of a degree of elevation. So both can be heard whenever they are in line of sight, just as they rise over the horizon.

Here is a list of the most reliable satellites and their beacon frequencies

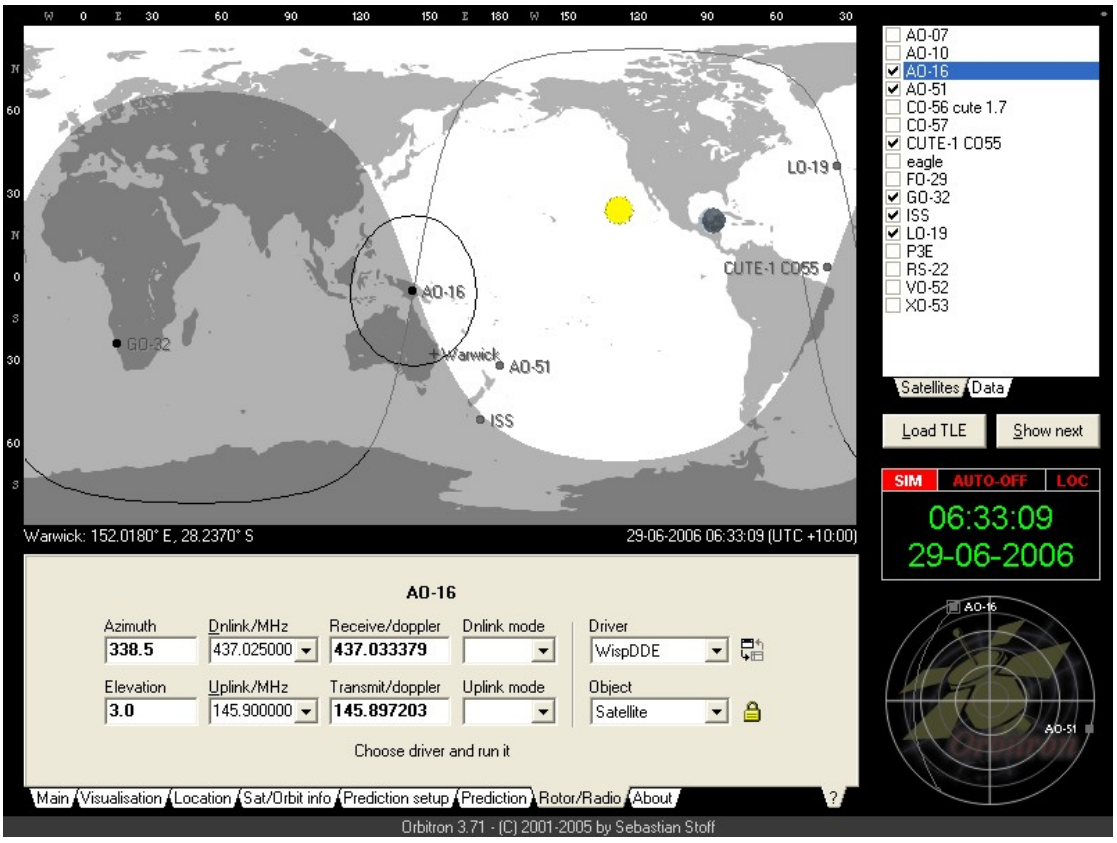
	HF	*VHF*	*UHF*	*Microwave*	*Mode/s*
RS15	*29.352*				*USB*
AO7	*29.502*	*145.9775*			*USB*
VO52		*145.860/936*			*FM/USB*
RS22		*145.840*	*435.352*		*FM/USB*
ISS		*145.800/825*	*436.000*		*FM*
AO51			*435.150/300*	*2401.200*	*FM/USB*
AO16			*437.025*		*FM*
LO19			*437.125*		*USB*
FO29			*435.795*		*FM/USB*
GO32			*435.225*		*FM/USB*
Cute-1			*436.8375*		*LSB*
Cute-1.7			*437.385*		*LSB*

So even if you only have a HF rig and a 2mtr FM rig, you can still hear 5 satellites.

The list shows the easiest satellites to hear, and AO16 and LO19 are very strong, strength 5 plus on a 5/8ths-wave vertical. A beam or a dedicated satellite antenna (crossed dipoles with reflector etc) obviously makes it easier to hear, but they all can be heard with nothing more than a vertical.

Now if you have a computer at home, there are many programs available to help you track the satellites. I have tried dozens of them (and I must admit keep trying all the new ones), but I keep going back to one program called ***ORBITRON,*** written by ***Sebastian Stoff*** of Poland. The latest version is 3.71 and it is FREE, and a 2 MB download. (Just type ***Orbitron*** in your search engine and follow the prompts) If you don't have Internet access, just see me at the next club meeting and I can give you a cd with the program and the latest **kep**erlian elements……Now about those keps….

The satellites have a relatively stable orbit but as they spend more time up in space they tend to fall down towards earth at an ever increasing rate until they re-enter the atmosphere and burn up. This causes the orbits to change slightly over time, and, in order to have our timing correct, we need to keep updating the keps, the more often the better, but we can get away with once every 2 months or so. They are available from several different web sites. *AMSAT (*www.amsat.org*)* is one, or once again see me at a club meeting and I can give you a new disc full. Here is a picture of what the screen looks like, with some of the useful info displayed……But more next issue….



Now….How about a challenge for all you antenna experts….

From VK4SG

I recently built a new antenna for 432Mhz and it ***isn't a DL6WU***……I know, I know…I must be going silly, but lets look at it from my point of view…..

I built a ***K1FO*** 22 element, copied the design directly from the handbook, used the materials specified and put it up, measured the return loss and it didn't need any further adjustment. It works exactly as described in the handbook.

My other antennas are a loop Yagi for 1296, made as per the microwave handbook article, from the materials specified, and it also works exactly as described…..

My 144 MHz antenna is….Now don't laugh, a ***G2BCX*** 14 element ZL special beam as described in Practical Wireless circa 1980 …..Once again built exactly to specs, both materials and dimensions, and guess what…..it works exactly as described. (This is the third one of these I have built since 1980 and they all work)

Now why didn't I build a DL6WU…..everybody knows they work well….

I spent 6 months looking for a DL6WU design that specified the materials, dimensions and driven element dimensions that I could use. All I wanted to do was be able to buy the materials (in Aust), make the antenna (cut to specified dimensions), put it up and use it. (Maybe make minor adjustments with the test equipment I own…a good SWR meter). Guess what…….No such design exists…at least not that I could find it!!!

David Tanner VK3AUU wrote an algorithm that can be used in a spreadsheet to find some dimensions, Guy Fletcher VK2KU wrote an excellent article on boom corrections and element lengths, Ian White G3SEK has another algorithm, and at least 20 other web sites have their own version of the DL6WU. And that's not to mention the myriad of driven element designs, folded, lengthened, shortened, insulated, grounded and twisted…..And then comes the balun (or not)…… It's a case of confusion by information overload……or maybe it's just me that's confused.

So you experts out there…..I have the following material.

25mm square alloy tube 5.8mtrs long (an Aussie length)

Lots of 6.3mm (1/4") alloy rod (available anywhere cheaply)

I would like to mount the elements through the boom, and ground them at the centre (or mount them above the boom preferably not insulated, but maybe you can convince me otherwise)

I would like the driven element to be close enough at manufacture to only require adjustment with a good SWR bridge. (Design frequency to be 144.200 MHz)

You design it, I will build it, take it to the forthcoming antenna measurement day and if it works as described, I will publish the design, and you will be famous the world over for being the first person to publish a ***practical, build with confidence, DL6WU design***.

From the web again: the only mod that I have done to my FT817:

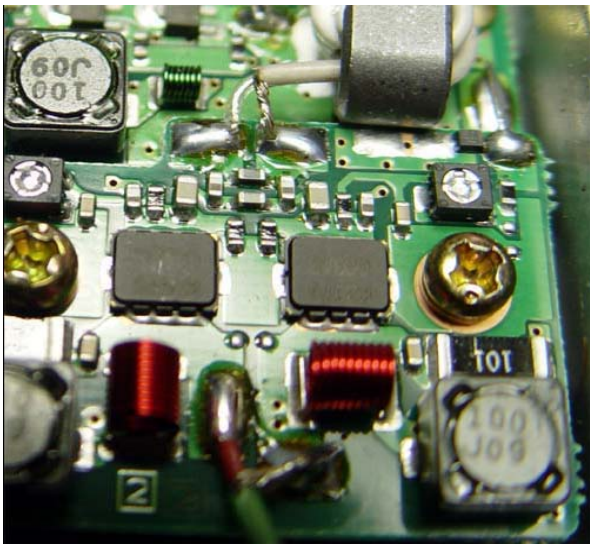
The FT817 comes with a ferrite core that is clamped around the power supply cable to stop a tendency or the rig to "take off" when operating on 70cm. It doesn't work very well!!!! This problem spoils an otherwise excellent rig. This is the basis of an article written by ***KC3VO*** that fixes the problem.

To Quote KC3VO**:** I have discovered that under some conditions, the FT-817 may be susceptible to an INTERNAL OSCILLATION of the final and driver stages, which will result in excess current being drawn, and POSSIBLE damage to the affected stages.

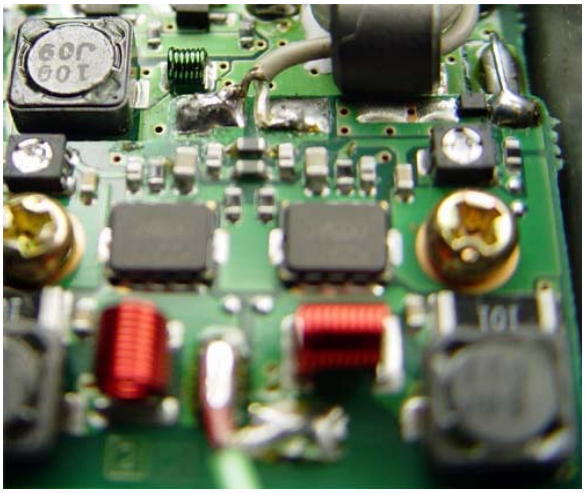
I ALSO have determined that this problem can be solved by simply REVERSING the PHASE of the drive signal to the input of the final output board, and this is done by un-soldering and reversing the shielded cable from the driver stage output balun, at the input to the final board.

It DOES take a good eye, steady hand, proper tools, and a little skill to SAFELY and properly accomplish. (You simply swap the shield and centre conductor connections of the input coax to the final board)–Do this at ONLY the final board end. The coax COLOR on the correct balun is grey/white-NOT the blue one!

A standard unmodified FT817 PA board



The modified coaxial input lead to the PA



Once the modification is complete, as further insurance, I advise checking the final stage IDLING BIAS current. This may be done by un-soldering the 13.8 volt bare wire power jumper from the P.A.(final) board, and connecting a milliampere meter in series, to read the idling current.

The radio should be connected to an EXTERNAL power source of 13.8 volts D.C. and operated in the SSB mode with NO AUDIO input (Turn SSB mike gain menu to ZERO)-When you energize the PTT circuit, in SSB mode, with no audio, you SHOULD see a current of 70 to 90 milliamperes, and if you adjust the bias pots, one at a time, COUNTERCLOCKWISE on the final board, each pot should take it DOWN to approximately ½ the value previously noted. (35 to 45 milliamperes each), for the TOTAL of 70 to 90 ma. (If all is normal, RETURN the pots to their original setting. Do NOT exceed 100 milliamperes when adjusting!)

After this simple, no-parts fix, you will ALSO likely note that the “Ferrite Bead” on the external power cable is NO LONGER NEEDED! Be certain, however, that the top cover screws are properly secured before using the front BNC antenna jack, or you could induce feedback via this route.

Hopefully this will put an END to the mysterious “Finals Blowing”
Lastly a word of WARNING. If you are not sure, or do not fully UNDERSTAND this procedure, or do not have proper tools and skill, seek qualified assistance! Failure to do so MAY result in DAMAGE to your transceiver!

73, and good DX! KC3VO, Bob Curry. *Thanks Bob this really works…Graham*

Question Section : ASK DOUG, (a regular feature)

Rob VK4ZDX asks: ***Could it be that poor isolation between ports on a 'good' Dow Key coaxial relay is the cause of demise of several 1296 MHz front-end transistors?***

Doug VK4OE says:

There are relays, there are coaxial relays, and there are "coaxial switches"! Of course, the traditional open style of relay with simple change over contacts usually does not offer much isolation between the energised circuit and the currently open port. These are only really appropriate for HF applications although there are small ones that you can get away with at low power up to 2 metres. [I have even seen simple open style relays used in low noise circuits at 144 MHz with cleverly designed matching components added to 'tune out' the reactance of the contacts and other non-coaxial parts of the relay!]

When you start to consider coaxial relays, there are many to choose from, both new and from the surplus market. Generally speaking, the ones that have a coaxial mounted 'blade' for a moving contact (Dow Key and similar) are useable on 2 metres and 70 centimetres with the maximum power level determined from the manufacturer's specifications.

The essential issue is that as the frequency used increases, isolation between the open port and the energised internal connection decreases. Then, as the power level increases the amount of RF energy getting to where you don't want it to be naturally also increases. Furthermore, as you get to the maximum rated power level for the relay, things start to warm up inside, dielectric materials (other than air) may soften and the whole internal isolation situation quickly becomes worse.

One may be tempted to presume that a good looking small coaxial relay is going to have good isolation at 1296 MHz, but that tiny gap between the open contact and the moving blade when it's in contact with the other port has enough capacitance to allow an amount of energy adequate to blow up a transistor junction to pass to the open contact. Sometimes, a designer of a piece of, say, 900 MHz equipment may have chosen the likes of a Dow Key coaxial relay to merely switch between two antennas or loads, a situation where high isolation is not an issue. When we amateurs acquire this equipment, we usually think of that relay being used in a TX-RX change-over application and we can be easily "caught out" at the cost of several receiver front-ends!

There are some coaxial relays that terminate the unused port when both energised or unenergised. These offer significantly improved isolation and they are kinder on receiver front-ends due to the front-end 'seeing' a 50 ohm load rather than being open circuit during transmit periods.
But if these relays are from 'surplus' sources, their history will be unknown and the internal terminating resistor(s) may be blown up! And unless the fact that terminating resistors are present is shown by a diagram on the relay itself, we probably will not know about them anyway.

The best type of solenoid driven coaxial change-over device is what Hewlett-Packard and many other manufacturers determinedly call a "coaxial switch". This is separate to the hand operated box-plus-knob affair that can be used to route coaxial circuits to two, three, four or more coaxial loads. [There are some hand operated multi-port coaxial switches that are good up into the microwave arena, but amateurs don't often see or use them – some are often available on US eBay!]

What I am describing here are the neat little units with, most commonly, three SMA connectors. These may have a momentary or "fail-safe" style of action, or they may be "latching" where the switch remains in one state until a pulse of energy is next applied. Isolation with these devices between ports is remarkably high (~80dB) and they are often rated for use up to 12 or even 18 GHz. This type of coaxial relay is readily available on the US surplus market (through dealers and via eBay), but availability on the Australian market is a bit limited.

Also, there are some designed for excellent isolation for, say, us in test equipment (very low insertion loss and return loss at low power), and there are others that are designed to be used at reasonable power levels – and by "reasonable" I mean 100-200 Watts at 1 GHz and 40 Watts at 10 GHz!!!!!

There are other issues that could be further described on this subject including (a) transient RF levels when switching, and (b) need for and use of a sequencer to control change-over and TX amplifier power-up timing, (c) interesting internal construction variations of these "switches", etc., etc., but I will leave them until another time.

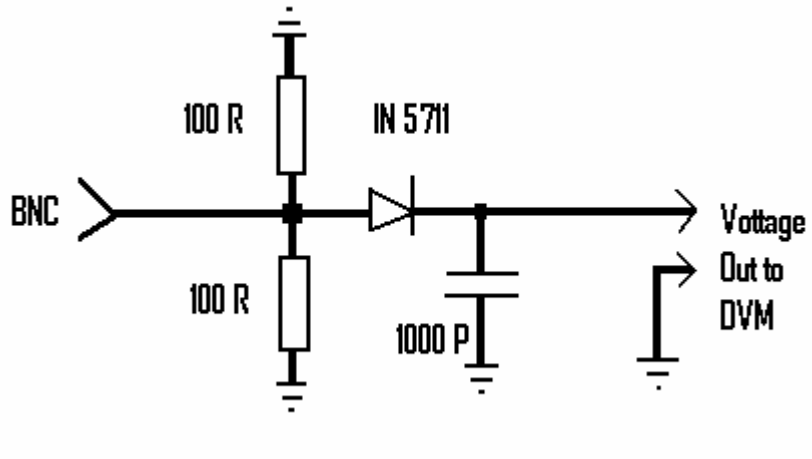
At the end of the day, one can get a fair idea of the isolation between coaxial relay ports if you have access to an RF power meter of some sort. Simply measure the power passing from the common port to the port currently in use, then carefully place the power meter at the currently open port. The ratio of the two powers is then simply determined in db. The 'good' SMA coaxial switches usually show close to identical isolation whether it's "Port 1" or Port 2" that is being measured, but the moving blade type often shows a significant difference between isolation measurements at the "NO" and "NC" ports. This is because the moving blade doesn't always look like a 50 ohm transmission line at all frequencies and whether it is in the 'open' or 'closed' position.

One thing I would like to briefly mention is the availability these days of small plastic, printed circuit mounting, coaxial relays. Such items were originally developed for the 900 MHz cellular market and even fifteen years ago were found to be fine on 1296 MHz. Their immediate drawback is a low maximum power level, nominally 10 Watts (or less), but I have been using a National brand one of these for many years at the 25 Watt power level! Their isolation and return loss specifications are pretty good as well. Looking at the Mini-Kits website www.minikits.com.au , I notice that there are now some of these that even are useable to 2.4 GHz.....another example of amateurs taking advantage of industry's development of products for certain other "niche markets".

So, Rob, there are a few thoughts arising from a simple question. Yes, the apparently "good" Dow Key relay may well be the source of the energy that has been melting your front-end transistor junctions. I trust that you and other readers will benefit from something I have said above!

Remember to submit your questions for next issue…Graham

While trying to determine the output of a local oscillator on 576 MHz, I found this little circuit in an old RSGB vhf/uhf handbook.



The Schottky diode (Dick Smith Z3231, 97c) has a voltage drop of 0.16V, so the power output is determined by:

$$P = \frac{(V + 0.16)^2}{100}$$

It can be all mounted on a BNC socket with minimum lead lengths, and it accurately (compared to a Bird) measured the output of my transverter (1.2 w at 1296 MHz). Using 2 Watt resistors, I use it as a power meter for my QRP rigs. Ie: IC202 voltage output is 13.5V which calculates to 1.83 Watts

What to do in your spare time! (From LeapSecond.com)

Chess anyone?

Ok, put down your soldering iron, turn off your spectrum analyser, and let's play chess.

Ingredients

50-ohm BNC, SMA, and N terminators with various BNC, SMA, N, APC7, F, UHF connectors and inter-series adapters; or any other RF connectors you can find around the house. White gets nickel or stainless steel and black gets gold top pieces.

Rumours are that the “on air” rolling chess tournament starts after the morning aircraft enhancement net, weekends 08:30 local time on 144.2 MHz Mode PSK31

Who are these People?

They’re just sitting around

Well, maybe they’re not?

Read all about it in the next issue

Plus EME on 144 with a pair of K1FO yagi’s to 11 countries using WSJT by Phil VK4CDI

And finally a concern for us all……. (From Soaring Magazine 1997)

DIRTY ELECTRICITY…ARE YOU BEING RIPPED OFF?

It was revealed in State Parliament today that some electricity consumers are being ripped off by unscrupulous Shire Councils. This is apparently is being done by charging premium prices for low grade electricity.

The Electricity Commission produces two different grades of electricity. Thermal electricity which is produced by burning coal, and Hydro electricity, which is produced by water. The electricity produced by coal is of a much lower standard than that produced by water. This is due to a large amount of coal residue which is left in the electricity and it causes problems such as:

1. Blackening of the ends of fluorescent tubes, thus reducing tube life.
2. Reduced incandescent bulb life also due to blackening.
3. Electric heaters run less effectively due to the coal residue being deposited on the element.
4. A black edge appears on TV screens, which gradually gets larger and can in extreme cases blot out the picture completely.
5. Electric stoves become difficult to clean
6. Reduced motor life for refrigerators, freezers and air-conditioners
7. Toasters take longer to make toast
8. Electric irons leave black marks on clothes
9. Transceiver DX range is limited and audio reports become muffled

Hydro electricity has a small amount of water residue which causes absolutely no problems at all with electrical appliances. This water residue is actually beneficial when combined with thermal electricity to produce domestic grade electricity.

The electricity supplied to Shire Councils is usually in the proportion of 75% Thermal and 25% Hydro.

The council is then supposed to blend the two different grades to produce domestic grade before selling it to the consumer. A good blending plant costs $200 000 and when installed and used correctly, the residue is flushed out of the thermal electricity by the water residue in the hydro electricity. This combination of water and coal is then pumped into an evaporation tank where the water is evaporated and the coal reclaimed for future use.

As the demand for electricity increased over the last decade, most blending plants were too small to handle the increased requirements and had to be replaced.

Some Shire Councils cut cost by not installing larger blending plants and gradually phased out their old ones. This has led to the situation where they are supplying 75% of their customers with low grade electricity and 25% with premium grade. The customers receiving premium grade are getting a bargain but the ones receiving low grade are being ripped off as they are both paying the same price per unit.

How then can you tell if you're being ripped off and what can you do about it?

Check all your electrical appliances and lights for any of the previously mentioned problems. If you find any, contact your local Council immediately and demand to know what kind of electricity you are being supplied with.

Contact your local member and demand that an investigation be carried out immediately.

If these measures produce no result, convert to gas.