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 3 November 25th 2001
New subscribers to this newsletter if you wish to have previous issues please email me.

Contents

VHF/UHF CONTESTS

Field Day Contest - 50 MHz and up. Saturday 1st and Sunday 2nd of December. 1600-2200 Saturday, 0800-1400 Sunday.
Cliff Betson Memorial Contest – 50 MHz and up. Saturday the 12th and Sunday the 13th of January 1600-2200 Saturday, 0800-1400 Sunday.
The rules were published in September/October 2000 Break-In. All contest logs should be sent, to arrive within two weeks, to: Contest Manager, Wellington VHF Group, P.O. Box 12-259, Thorndon, WELLINGTON.

Contest Activity

A number of stations were well prepared for the 614 MHz and above contest in early October. There would have been considerable activity on 1296 and 2424 MHz. However the weather got the better of a number of operators both portable and fixed.
There were a number of contacts in the Auckland Region on 1296 MHz between ZL1BK, ZL1TPH, ZL1TBG, ZL1AVZ and ZL2TQV (Information from Auckland VHF Group)
Tom ZL1THG in Hamilton also heard some weak signals on 1296 MHz

Field Day Contest - 50 MHz and up activity

ZL1BQ VHF Field day Contest Plans (via yahoo groups/ZL VHF Contest)
This will hopefully consist of Vaughan ZL1TGC, Tim ZL3VTV, John ZL1JD and possibly Michael ZL1ABS
Operation, as in previous years, will be nominally from Maunganui Bluff, north of Dargaville.
They plan to be away from Auckland MUCH EARLIER this year, like about 0900, to get to the site with time to set up and be operational before the contest starts, rather then half way through the first period!
Currently they are OK for operation on 6m and 2m. They are not sure if they have an operational multi-mode rig for 70cm. They have a transverter for 1296, and Michael ZL1ABS may be willing to loan his equipment for the higher bands.
Antennas - OK for 6m ,2m, 70cm, 23cm. Also have enough poles, etc.
Vaughan Henderson ZL1TGC e/mail vaughanh2001@yahoo.co.nz

Dave Walker, ZL2BHE and Leon Toorenburg,ZL2AOC (exZL2ULG) are going to Turoa ski field car park. They will be operating QRP on 2m and 70cm SSB and FM. Probably using horizontal polarisation - they are going to try some VHF rhombics! And have a 2m and 70 yagi on vertical. The rhombics will be pointed in the Auckland direction, and towards Wellington / Christchurch.

Rob Glassey, ZL2AKM, will try to be active from the Port Hills in Christchurch with 2m SSB and FM (horizontal Polarization).Christchurch plans to have a team, Nelson has similar plans, Ralph ZL1TBG is sited some where north of Auckland .Tauranga will be there with ZL1TAP and company, Home Operators Brian ZL1AVZ active from Muriwai beach, Ray ZL2TAL in New Plymouth, Murray ZL1BPU South Auckland ,Gavin ZL1UYJ in Warkworth

Harry ZL1BK will be at Whakapapa and will be qrv on 6m,2m,70cm and 23 cm with ssb and psk 31 with horizontal yagi's.The Wellington VHF Group is possibly going to be on Quartz or Hawkins hill

Peter Loveridge ZL1UKG is going to Mt Pureora RF71tk (West of Taupo) taking 2m FT290 5el yagi, 70cm FT790 2*10el yagi, 23cm DEM 35el loop yagi, 12cm DB6NT 45el loop yagi, 3cm ZL1GSG 40cm dish and will have ZL1ASV, ZL1TDA and ZL1TOC with him.

Andrew Barnett ZL2TQV and team will be located on MT Ranginui, on DOC administered land in the Pureora forest. The altitude there is 978 meters. Active with the following bands

6 meters	SSB, 52.2 QRP <5W	6 meters	FM, 52.5 QRP
2 meters	SSB, 144.2 +/- QRM	2 meters	FM, SSTV, PSK16, Hellscriber, 144.3 or as requested.
70 cm	SSB, 432.2	70 cm	FM, SSTV, PSK16, Hell, 432.5
1.2 GHz	FM, 1296.2 or as requested	2.4 GHz	mode TBA
10 GHz	any as required	Team members = ZL2TQV, ZL1QF, ZL1RWB and one other	

ZL1TPH Field Day 2001 Plans (via yahoo groups/ZL VHF Contest)

Stephen has decided to operate from Mt Egmont for this coming Field day contest.He has not visited this location before so he is not sure of what to expect but hopes to be in operation on Sat and Sunday.

Equipment He plans to take 144.2MHz, 925.2, 1296.2, 2424.2 and 10368.2 MHz SSB and will be located on the Stratford Plateau side of the mountain so is looking for contacts towards Wellington and also to the North. Will also be now taking 432 MHz 50 watts to a 11 element yagi and polarization on all bands will be Horizontal. With the predicted high level of activity on 144.2 MHz he plans to operate 15 kHz down on 144.185 MHz.

NOTE FROM STEPHEN In October I worked VK4OE portable in Auckland from Moirs Hill a 50 km path on 10368.2 and 2403.2 MHz to his hotel room in central Auckland. Signals very strong on both bands 5/9.

I operated first from my local hill in Orewa (not line of site to Auckland.) Contact was made on 10368.2 and a one and only path existed by reflection off the Whangaparoa heads and was most pronounced. I then drove up to Moirs Hill and made contacts on the above bands. Brian ZL1AVZ also worked Doug on 2403 & 10368 MHz ssb.

Stephen Hayman ZL1TPH e/mail zl1tph@xtra.co.nz

It is useful to have RX and TX capability for 2400-2404 MHz so that Satellites and VK's can be worked **EDITOR**

The Australian 13 cm Narrowband Allocation is:- 2403.100 Calling frequency: national primary
2403.200 Calling frequency: national secondary 2403.400 - 2403.500 Beacons

NOTE:- Further VK bandplans and Beacon details can be found at http://www.wia.org.au

RESULTS - MICROWAVE CONTEST - OCTOBER

Band	**Station**	**Points**	**Location**	**Certificate**
32 cm	ZL1TPH	144	RF72JP	*
23 cm	ZL1BK	222	RF72JP	*
	ZL1TPH	36	RF72JP	
12 cm	ZL1TPH	117	RF72JP	*
3 cm	ZL1TPH	117	RF72JP	*
AGGREGATE SCORE				
	ZL1TPH	414	RF72JP	*
	ZL1BK	222	RF72JP	

STATIONS ACTIVE: ZL1BK, ZL1AVZ, ZL1TBG, ZL1TPH, ZL2TQV

GREATEST DX

32 cm	ZL1TBG - ZL1TPH	107 km	23 cm	ZL1BK - ZL1TBG	107 km
12 cm	ZL1AVZ - ZL1TPH	65 km	3 cm	ZL1AVZ - ZL1TPH	65 km

Contest info from yahoo groups/ZL VHF Contest Its promises to be a great contest (my namesake permitting)

RF RELAYS Common Japanese antenna change over relays (as shown) for use up to 1 GHz with BNC & N connections have poor isolation to the unused port at 1- 2 GHz. This was typical of my BNC unit with approximately 17 dB isolation on RX at 2424 MHz.

The contacts for RF switching can be located by removing a large screw on the left face of this example shown (arrow) On checking I found a large gold contact on the RX BNC connector. By unsoldering this contact and putting on a small silver or gold contact from a discarded relay (ie from an old RT), the capacitance was reduced!

The isolation improved to between 25 - 30 dB on 2424 MHz and also a similar change on 1296 MHz. Thru loss was unchanged at less than 0.5 db loss at 2424 MHz. The modified contact is shown on the left of the photo It appears to be about half the diameter of the existing contact.**TOM BEVAN ZL1THG**

Oscillators **Kevin ZL1UJG**

Someone mentioned some time back, the use of low cost Voltage controlled Oscillators VCO's as the local oscillator of a transverter. All oscillators produce composite noise. This is made up of phase noise (as a result of small frequency variations) and Amplitude noise (as a result of Amplitude noise in amplifiers, power supply or even the oscillator itself.

If the oscillator was used as part of a phase locked loop then the action of the phase locked loop will produce a clean carrier on a certain frequency. However away from that frequency and the filtering action of the loop then the phase noise will be that of the oscillator as shown in its specification

In this simplified example the Minicircuits (www.minicircuits.com) POS 1400 (a 975-1400 MHz VCO) which might be used for a 1152 MHz oscillator in a 1296 MHz transverter. At 10 kHz away from the carrier (deemed to be outside the filtering of the PLL)the phase noise is -95 dBc/Hz. This means that the the noise is 95 dB below the carrier when measured in a 1 Hz Bandwidth.. I know that very few of us have a 1 Hz crystal filter in our receivers (RX) so lets listen in a 2400 Hz SSB bandwidth. This increases the noise by 34 dB (10 log 2400 Hz/1 Hz) so that becomes -61dBc/2.4 kHz. This has two effects.

If you are transmitting, someone who is 10 kHz away will be subjected to an increase in the noise floor of the RX if your signal exceeds the noise at his RX by 61 dB (assume he is listening in a 2400 Hz SSB bandwidth.) If he happens to be working that weak VK or ZL3 then bad luck to him...(this amateur may have the cleanest oscillator wrt phase noise but will still be subjected to this noise increase.)

If you are receiving then the shoe is on the other foot. The station 10 KHz away may have the cleanest oscillator but the phase noise in your VCO will produce an increase in your noise floor if his signal is larger than 61 dB. (Bad luck to you!!)

A signal level 61 dB above the noise could be produced by a contest station on a good site, a station across town (city), a beacon or repeater. At 100 KHz spacing the phase noise of the VCO is -115 dBc/Hz so the effect of the noise will be 20 dB less. If the bandwidth is increases (eg FM) the difference will decrease.

If an average crystal oscillator multiplied to 1152 MHz is used such as a Downeast Microwave MICROLOK then the phase/composite noise is -115 dBc/Hz at 10 KHz spacing so the noise increase problem becomes 20 dB less at 10 KHz. Crystal oscillator noise can be much less than this.

Low noise VCO's generally have a narrow tuning range (another Minicircuits VCO operating around 1100 MHz has 17 dB superior phase noise at 10 kHz spacing but tunes over a 35 MHz frequency range).

What some Microwave frequency sources do is have a mechanically tuned transistor power oscillator around 1100-1600 MHz and a small amount of VCO control (perhaps over 1 or 2 MHz) . The output of the transistor oscillator is often a few hundred milliwatts and this is multiplied through a step recovery diode (an efficient diode multiplier) then through a interdigital filter to supply a signal of typically 10- 20 mW from 2400 MHz up to 14000 MHz on different units. Some units have an internal phase lock system referred back to a crystal around 100 MHz The units that sometimes appear surplus in the NZ market have RF output in the 6 - 8 GHz range and have VCO control. The power oscillator would operate in the 1- 2 GHz range and rely on an external phase lock loop system

News Nick ZL1IU worked on 144.100 on Meteor Scatter in the Leonids shower early this week
VK2ZAB @1641z, VK2KU @1648z, VK2DVZ @ 1648z, VK2EI @1711z, VK4AFL @1713z
Congratulations Nick.

Oscillators   Kevin ZL1UJG

Amplitude noise. This can also lead to problems. A simplified example :-If a high order frequency multiplier is used (from 96 to 576 MHz or 192 MHz to 1152 MHz then the noise difference is set by the amplitude of the RF signal going into the multiplier and the multiplier noise floor (lets assume +10 dBm and a noise floor of -133 dBm (in a 2400 Hz bandwidth). Noise difference is 143 dB

This noise floor (or minimum discernable signal MDS) is where a signal is equal to the noise (0 dB S/N or 3 dB (S+N)/N. This noise floor of -133 dBm (in a 2400 Hz bandwidth)is typical for a 2 metre SSB rig. This is about 0.05 uV in a 50 ohm system. I digress so lets get back to the example.

Assuming that the multiplier is not efficient as it is a diode multiplier then about -20 dBm is on the multiplier output. Using the lowest noise MMIC amplifier it is amplified back to +10 dBm again, then the noise difference will be 30 dB worse as it is amplifying the difference between -20 and -133 dBm or 113 dB.

The use of high order multipliers can seriously degrade the overall composite noise performance of an crystal oscillator and frequency multiplier.

Power supply noise.

If noise on the DC feeding either VCO's or crystal oscillators is not sufficiently filtered this can introduce extra noise on the output of the oscillator chain and subsequently affect the TX and RX. When I was doing some work on my 10 GHz transverter using the G4DDK004 oscillator I was plagued by 3 terminal regulator noise producing extra composite noise on the oscillator and did tests by adding different capacitor types and values across the regulator output.

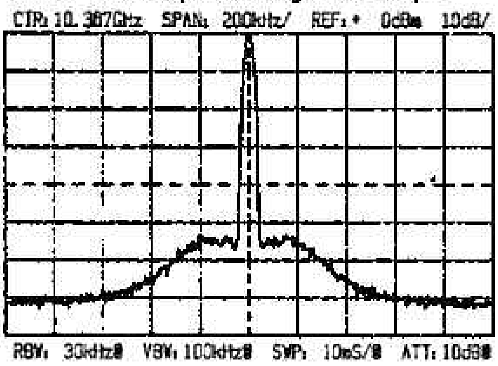
The graphs show the improvements. (These are from www.wa1mba.org via microwave reflector page.) (note do not use xtra account if registering)

Further info on PS noise found at www.minicircuits.com, www.wenzel.com.

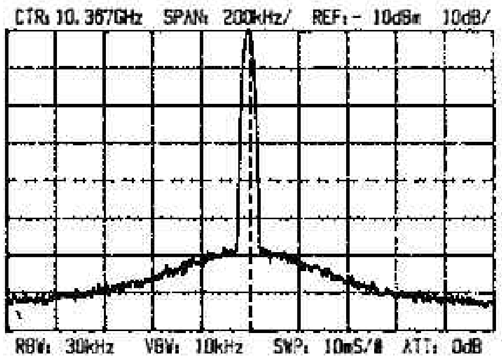
Another good article on crystal oscillators can be found at www.arrl.org/qex/stephensen.pdf

Graphs reproduced with permission of original author...

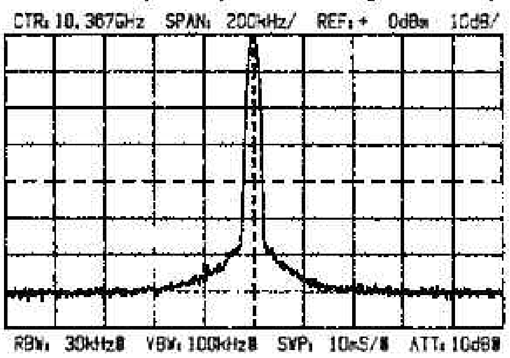
100 nF Electrolytic on Regulator output



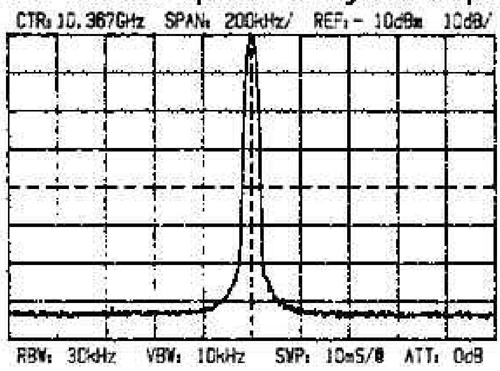
100nF Tantalum capacitor on Regulator outpu



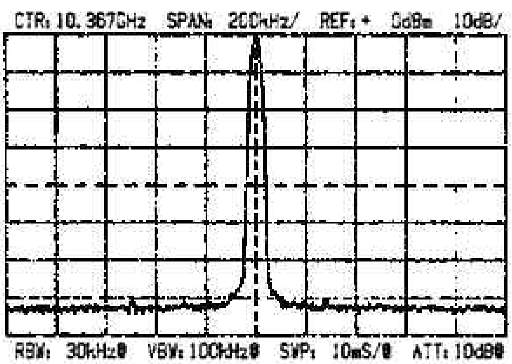
10uF Electrolytic capacitor on Regulator output



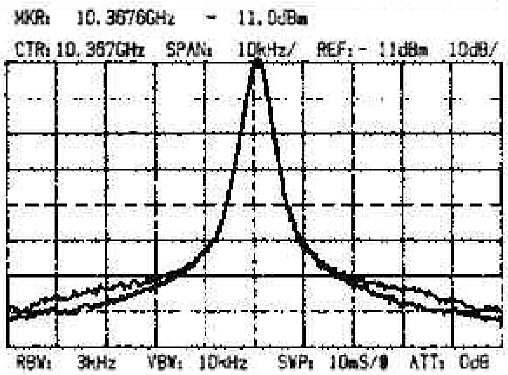
10uF Tantalum capacitor on Regulator output



10 uF Tantalum & (1000uF electrolytic!) on regulator output



10 uF Tantalum (upper trace) + 1000uF Electrolytic (lower trace)



RF Parts

I have purchased a number of useful RF devices (primarily for constructing preamplifiers/power amplifiers.) If any people are interested in purchasing small quantities for their own use. Please contact me for price details
The devices are as follows from Sirenza Microdevices (www.stanfordmicro.com)

SHF-0589 2 Watt Power FET Up to 2424 MHz
SXT-289 200 mW Bipolar driver for 2424 MHz
NGA-586 MMIC +18dBm o/p +18 dB gain — Can be used to drive SXT-289 for 2424 MHz Use or used to drive SHF-0589 on 1296 MHz (similar to ERA5)
NGA-386 MMIC +13 dBm o/p 18-21 dB gain — (useful as a RX 2nd stage (low noise figure) or as a 1st TX stage Similar to ERA3

The NGA-*** range offer similar performance to that of the Mincircuit ERA range although I believe some devices may run substantially cooler see NGA-586 vs ERA5

SPF2086-TK PHEMT 100 MHz to 4 GHz 0.28 dB NF @ 1 GHz 0.55 dB NF @ 4 GHz Useful package size
Phemt = (pseudo high elecctron mobility transistor) Biasing similar to GaAsfets
Similar devices and application notes are available from www.excelics.com

ARTICLES FOR BREAK IN The recent Break-In readership survey showed strong support for more constructional and project articles. In order to foster project construction and development Break-In will trial free advertising to Branches for constructional project PCBs, kit-sets and components.
Note the following conditions will apply. Adverts must be in HAMAD/ Classified format. Publication will depend upon space availability and are at the editor's discretion. This offer is available only to NZART Branches and affiliates. Please direct any questions about this special offer to the Break In Editor, phone 03-3489 084;
e-mail; staf169@it.canterbury.ac.nz

Tech Notes **Kevin Murphy ZL1UJG**

There is some activity on the construction front with some prototype work on preamplifiers using PHEMT fets (ATF 35143 available from FARNELL). Unfortunately the first 2...aahh... 3 devices have appeared DOA (dead on application...of volts!). Some further investigation was required to determine failure modes.
We took care with antistatic precautions however upon reading about handling of PHEMT's on the net we discovered that they are more susceptible to damage. After connecting the soldering iron tip by an additional lead to the work in progress we had a successful installation
The following note is from the Construction Information Appendix 3 from Charles Suckling G3WDG on his website http://www.g3wdg.free-online.co.uk/

Fitting the HEMT **Charles Suckling G3WDG**

Before this device is handled, some preparations need to be made to avoid potential damage to the device(s) from static discharge and/or soldering iron leakage. In the case of normal GaAs FETs, it is often possible to get away with no precautions at all and not experience any problems. With HEMTs this philosophy needs to be reexamined. HEMTs are much more susceptible to damage and this is usually not apparent in its DC characteristics, often a disappointingly high noise figure is the only observable consequence.

Damage from electrostatic discharge (ESD) is avoided by never allowing the possibility of the sensitive device having a different potential to any object it touches, including yourself. A simple static-free workstation should be made, such as a sheet of metal to which a wire is attached. The free end of the wire is joined to either a proprietary anti-static wristband worn at all times, or to some form of homemade body contact (such as a wire wrapped round a ring). For safety reasons it is recommended NOT to earth the workstation, and to use a high value resistor eg 100k ohms in series with the wire if using a homemade body contact. The device may than be safely unwrapped and placed on the worksurface.

Source leads are cut short next using sharp sidecutters., to fit between the source pins so that the device is flat on the board. Discharge the cutting blade of the cutters by handling the metal part EDITOR

The last stage in the construction of all units is the installation of the HEMT. The module should be otherwise complete and tested for correct voltages at the ends of the lines where the device is to be connected. With no power applied to the module, place it on the metal work surface and connect a wire between the worksurface and the module box. Next. arrange some form of connection between the soldering iron bit and the worksurface, separate from the mains earth. Check that even when hot, there is a low resistance path from the soldering iron tip and the worksurface. It is also worth checking that there is no leakage in the iron by measuring resistance between the tip and the heater connections of the iron, with the iron cold and hot. The device may then be placed in position and its source leads soldered. At the same time, make sure the solder also flows to the grounding pins It is important to avoid touching the gate and drain leads with the iron during this operation. Before soldering the gate and drain the iron should be completely unplugged (retaining the tip-worksurface connection of course).

One assembled into the circuit, devices should be safe. However if for any reason soldering operations are required in the future, be sure to repeat the precautions. The author has damaged devices in the course of developing modules when soldering in tuning stubs and forgetting to connect the iron-worksurface link, and/or unplugging the iron. Some irons claim to have an ESD connection - we would not trust this!

Material reproduced with permission of Charles Suckling G3WDG (Microwave Committee Components Service)

Similar precautions should be done for handling of all STATIC SENSITIVE RF DEVICES... Editor

1296 MHz mixers **Kevin Murphy ZL1UJG**

I am attempting to build a 2nd generation transverter for 1296 MHz use on the upcoming field day. I am looking at the performance of discrete 1296 MHz diode mixers (- 3dB 90 degree coupler) using Waikato VHF Group earlier mixer PCB's Vs a mixer using TUF5-SM packaged mixer from Minicircuits. (later issue)

I have built up a newer version of the diode mixer PCB with cut and pasting of the old mixer pcbs . This is done for two reasons 1) Reduction of PCB size for more efficient use of space and 2) The original PCB was configured so that the oscillator would arrive at the diodes with 90 degrees phase difference. This had the effect that the mixer would force itself to work as a RX mixer but as a TX mixer it was inefficient having read reports of similar designs having 25 dB loss! By the addition of an extra 90 degree (1/4 wave section) in one of the diode legs, this means that the oscillator arrives on either side of the two mixer diodes (in series) with a phase difference of 180 degrees This gives good cancellation of the oscillator at the IF junction and any oscillator reflections from the mixer diodes arrive at the RF port 180 degrees out of phase and hence cancel. The coupler is designed for both diodes to be on at the same time. (1)

The schottky mixer diodes can be two types Low barrier (HP5082 2835 or similar) these exhibit lower loss but also lower -1 dB compression point. The others are medium barrier (BA481, HP5082 2800 or similar) which exhibit higher loss but also higher -1 dB compression point. I used BA481's (obselete). SMD schottky diodes can also be used .

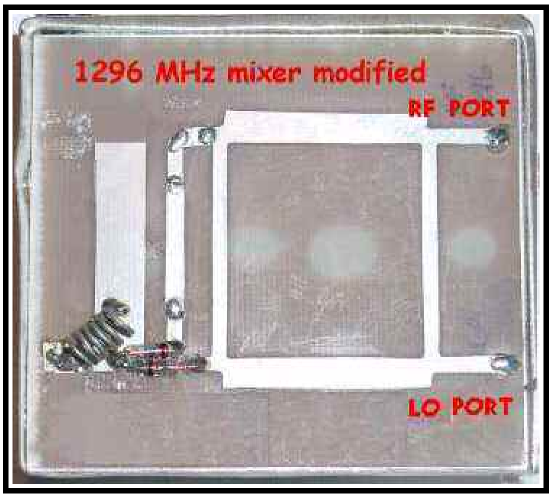
On the IF side of the diodes is a open circuit 1/4 wave section tuned to the oscillator frequency to notch out any remnants. Some designs have also a 1/4 wave section tuned to the RF frequency but since the levels encountered at this point are much lower it was not used in this design. With single balanced mixers (2 diodes) as per this design the norm appears to a series capacitor, a low pass filter LPF or in some cases a stub at the IF matched as part of a LPF. (as in this mixer). IF signals are then coupled in /out with a series 1nF capacitor.

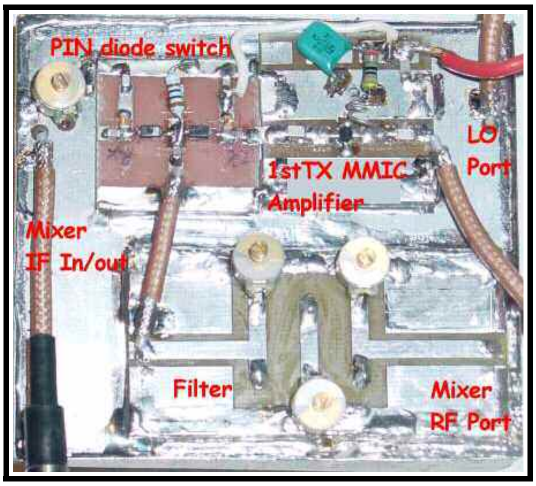
Because the 1/4 wave striplines are designed for a nominal frequency the mixer performance degrades (the loss and oscillator cancellation gets worse as one moves from the centre frequency)

The RF port feeds into a 3 dB attenuator then into a new filter PCB and into a PIN diode switch (very early filter PCB cut and pasted (consuming my older PCB's) The PIN switch Transmit (TX) output is fed into a NGA-386 / ERA-3 MMIC as a 1st TX amplifier.

This unit gives ~ +8 dBm (6 mW) RF at the output (at 1dB compression) for +4 dBm (2.5 mW) at IF.**(A)**

1 dB compression measurement shows the linearity of the system. Generally double balanced diode ring mixers (4 diodes) with a nominal + 7dBm (5mW into 50 ohms) will compress at 0 to +3 dBm (1- 2 mW) signal input if terminated with 50 ohms at all ports.





If the terminations on the ports of the mixer are not 50 ohms then the compression point ,mixer loss ,suppression of oscillator and its harmonics, and intermodulation products can be affected. Terminating MIXER ports is a compromise between added loss in the system and adequate mixer performance (oscillator & spurious rejection.)

The LO should be fed into the port as shown on the left picture. The filter attached to the RF port of the mixer will probably resemble something akin to 50 ohms around its design frequency (1296 MHz). However as the filter's response moves away from its centre frequency to say 1152 MHz then the VSWR (return loss) is varying until the frequency response flattens out as it approaches 1008 MHz (1152 -144 MHz) by which time the filter's VSWR is really...baaaaad. For this reason a 3dB 50 ohm attenuator was put in between the mixer RF port and the filter to minimise any strange effects of both .

The rejection of the oscillator (1152 MHz) at the NGA-386 o/p is ~ 30dB and the LO-IF product at 1008 MHz is ~ 45 dB relative to the + 3 dBm (2mW) level.

(A) The transmit IF signal is attenuated down to ~ -1 dBm to drive the mixer. (~ 5 dB below the -1 dB compression point.) The output from the NGA-386 or ERA3 is ~ +3.5 dBm (2.2 mW) The addition of another 1296 MHz filter for the TX signal makes the RF level ~ 0 dBm suitable for driving the 2nd and 3rd Transmit amplifiers consisting of a NGA-586 MMIC and FET amplifier SHF-0589 to < +33 dBm (2 watts PEP) (Article in later issue) .

This picture left is of the MIXER pcb and on the right is of the filter, PIN diode switch and 1st TX amplifier mounted on the reverse side of the MIXER pcb.

A two stage RX preamp feeds the RX port of the PIN diode switch. Due to the increasing number of other services an additional RX filter is used to minimise overloading of the 2nd RX amplifier. For this particular transverter a MAR6 MMIC is used (to use up my old devices) , however a more suitable device is a NGA-386 MMIC with increased gain and a noise figure of 2.7 dB @2 GHz

The gain in the RX side of the transverter will have to overcome the losses associated with the IF switching circuitry, mixer, attenuator and filter. In addition to this it also has to overcome the IF noise of the 2M transceiver . The 1296 MHz transverter is expected to have ~ +13 dB RX gain

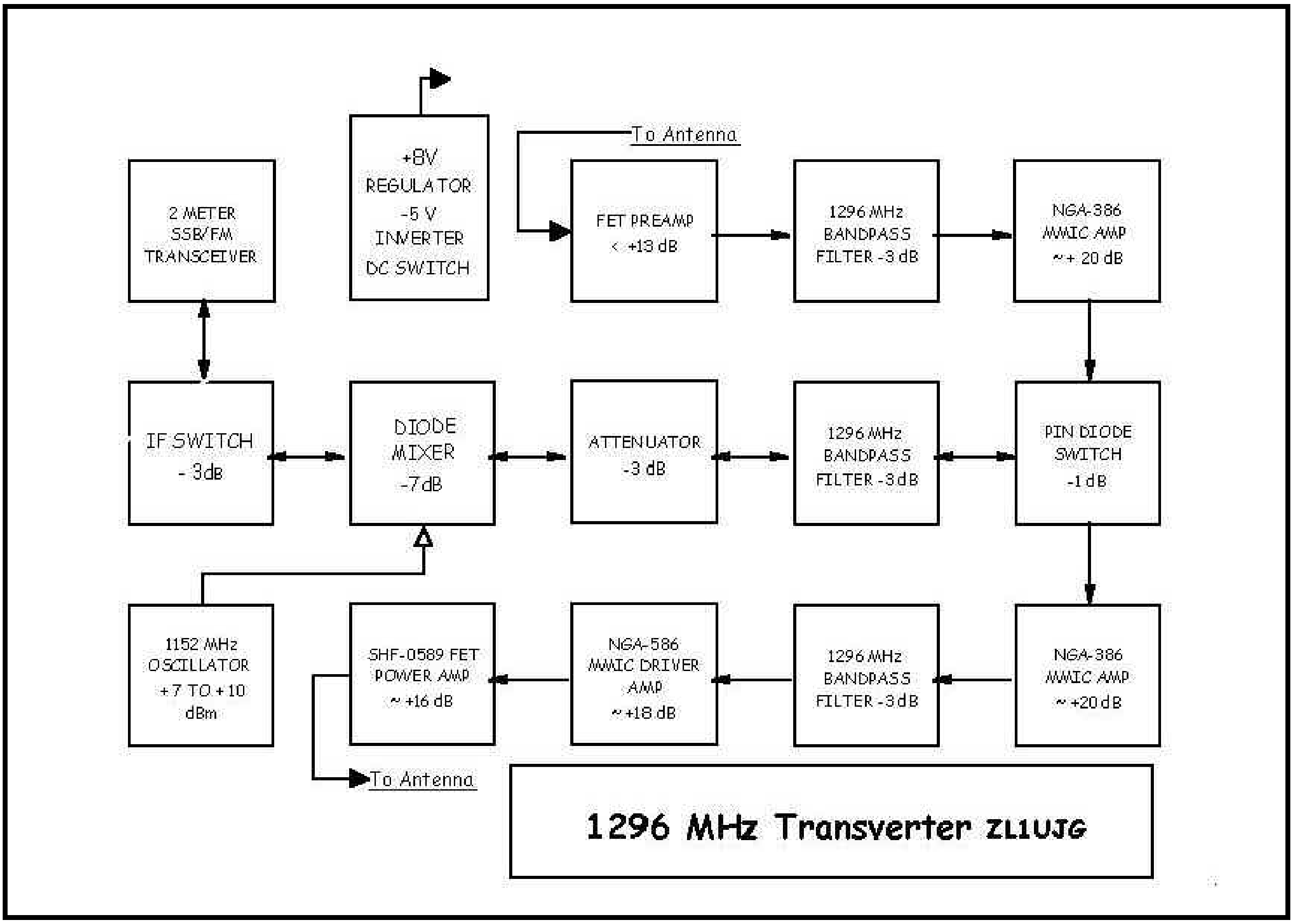
However the amount of gain in the RX side is a compromise between adequate signal handling and sensitivity on the receive side. Sensitivity is affected by noise generated or gain/losses associated with the RX converter. Receive converters are often stated as having X.X Noise figure. Noise Figure is a measure of how much excess noise is in your RX converter compared to a perfect receive converter (or receiver for that matter) with no noise generated. (A perfect RX would have 0.0 dB Noise Figure)

If you are working Satellites or EME then your Noise Figure (NF) needs to be low as affordable. However if you work terrestrial stations then a small sacrifice can be made in your noise performance by reducing overall system gain and thereby improving signal handling. The $64000 question is how much noise figure (NF) is too much? I personally think 1 to 2 dB NF of your converter is a suitable compromise for terrestrial work on 432 MHz and above. The 1296 MHz transverter is expected to have ~ 2dB NF including the IF noise contribution.

The Oscillator (LO) used for this transverter is the original one from my 1st generation transverter and starts at 96 MHz ,triples to 288 MHz, doubles to 576 MHz and doubles finally to 1152 MHz. Due to possible interaction between 288 MHz and 144 MHz this is not the preferred multiplication. 96MHz to 384 MHz and on to 1152 MHz is better and simpler. The output from the oscillator is ~ +8 dBm.(6 mW)

Ideally the mixer should be fed from a 50 ohm local oscillator source, but as the last frequency multiplier is being turned on and off, so its output impedance is far from constant. The next generation oscillator will have a buffer amplifier for this reason.

(1) RX CONVERTER WITH SCHOTTKY DIODE MIXER FOR 24 CM DJ5XA.VHF COMMUNICATIONS 2/1976



The block diagram above shows the functional units of the 1296 MHz transverter.

Linearity in Bipolar Amplifiers **Kevin Murphy ZL1UJG**

A point to note in rigs of the TS700,FT221 vintage or with bipolar amplifiers. The base of the power transistor should be monitored for degredation of the DC bias with drive. This can be done with a 1 k ohm resistor with short leads at the end of a meter probe. A TS700S that I had, dropped its DC bias from 0.7 V DC to 0.0 V DC (!) **This will affect linearity.** The reason for this is that bias circuit was a simple resistor/ diode arrangement from the supply and this was fed to the base through a 22 ohm resistor. The base current through the 22 ohms with drive was enough to nullify the 0.7 volts DC. I removed the series resistor and placed it to ground at the transistor base and fed the bias current through 10 t wire on a 10 k ohm resistor. The bias voltage now changed less than 50 mV... Also note that some transistor drivers for the RF power blocks also suffer from a similar effect.

Newsletter

The Editor is always interested in small (or large) articles for the newsletter and feedback, and also thanks readers for their information. If any articles are to reproduced in other publications, permission from the original author is required . **Kevin Murphy ZL1UJG**