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

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

VK6WH

VK6WH

PATRON MR. F.W.DAWSON

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ACTIVITIES	TERRY LEITCH	VK6ZLT		PUBLICITY	VACANT	
MATERIALS	JACK BORTHEN	VK6KDX	447 5933	LIBRARIAN	ILMAR BELTS	VK6AIB

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

VK5 MATERIALS

As you will have observed from the front sheet of the bulletin the materials officer is now Jack VK6KDX. He can be contacted at most times on telephone number 447 5933.
If you are interested in the VK5 materials (a summary of some items available below) please have your order in by the monthly meeting and all going well your order will arrive in time for the following meeting.

VK5 Materials. A full list will be available for perusal at the meeting or your may get one from the materials officer for the cost of the photo copying.

Pre-amps

VK5 VHF pre-amp kits for 6M, 2M and 137Mhz WXSAT	$35 or $25 (no relays)
VK5 UHF pre-amp kits 70cm and 579Mhz	$40 or $24 (no relays)
VK5 UHF pre-amp Kt 1240-1300	coming soon

RX convertors

YM3UMV 1296Mhz 2.5Db NF	$60.00
DF9DA 1691Mhz short form kit MGF1302	$40.00
YM3UMV 2304Mhz 3.5Db NF	$65.00
VK5ESC 2400Mhz satellite rx gasfet front end coming soon	

Transvertors etc

VK5 6M Transvertor kit	$170.00
VK5 70CM Transvertor kit	$140.00

Linear amps

Short form kits using MITSUBISHI linear modules

6M M57735 10W	$70.00
2M M57713 10W	temporarily out stock (TOS)
70CM M57716 10W	TOS
23CM M57762 10W	$70.00
13cm 5W	TOS
ATV VK5 1250 Mhz ATV RX convertor	$30.00
VK5 2372 Mhz ATV RX convertor	$50.00
VK5 479.25 Mhz FM IF/Demodulator	$80.00
VK5 1250 Mhz FM ATV TX	POA
VK5 2300 Mhz FM ATV TX	POA

There also oscillator kits, xtals, direction finding kits and packet radio kits available .
Components A wide variety of UHF special semiconductors, MMICS, Mixers and integrated circuits as also available at reasonable prices.
Please note there is handling charge of $2.50 per order to cover post and packing costs. Also prices quoted were as at Dec 1993.

THE FAMOUS MAY JUNK SALE IS ON

BE THERE

The usual May junk sale will occur on Monday May 23 after a very brief General Meeting.
There will be a clearance of a number of assorted power supplies and bits and pieces associated with the recently purchased 420-450 Mhz gear.
There are still some 3.5 kW units available.

However the success of the sale depends on sellers (you don't have to be a member of the group) bringing along their goodies. In view of the interest in UHF and microwaves anything in this line will sell well. Some of the guys from the bush said they may be attending with wads of money. So bring along those treasures.

Low loss coax
LDF 450 type cable. Don't forget the group still has 10.1 metre lengths of coax with n type connectors still available at $20 for members and $25 for non members.

Article by David Minchin VK5KK.
A further portion of this paper is presented in this issue. Thanks again to David for allowing us to publish this paper.

Related to both the size and construction of a Component , the Capacitance and Inductance , becomes more significant as frequency increases. The Reactive component will reach a point where losses increase at an alarming rate , actually giving the component a cutoff frequency. An example of this is the use of SMD type chip capacitors at frequencies above 2 GHz. The multi layer construction of some of these capacitors introduces a fair amount of Inductance when combined with the deterioration of the dielectric and hence the Q factor produces mediocre results.

Rule four. Losses introduced by mismatch become more critical as frequency increases.

Those familiar with lower frequency RF transmission will recognise the term SWR or Standing Wave Ratio. This factor is introduced to measure the matching or energy transfer efficiency of an Antenna at a particular frequency. It follows that the lower the SWR , the higher the efficiency of the Antenna and thus the greater the transfer of energy. Conversely , the higher the SWR , the lower the efficiency and thus the lower the energy transfer. In real life , this matching is applied to more than just Antennae.

Let us translate SWR to a more universal term , Return Loss. Return Loss is read in db and simply the difference between the forward and reflected RF from a circuit. The higher the db factor , the closer the circuit is to its target impedance. Any part of a circuit that is designed to connect to a standard impedance transmission line , whether that be coax or PCB , will present a return loss to the source or load it is connected to. If matching is optimum , it follows that minimal RF will be lost through radiation , heating in components and poor loading in active components.

Active devices also have complicated matching characteristics , with both real and imaginary factors varying with frequency , voltages , etc. Manufacturers summarise these characteristics as S parameters , obtained by analysing the input and output ports of the devices at different frequencies with return loss measuring equipment. It is beyond this paper to discuss the matching calculations , however it is suffice to say that if components are changed in a proven design for those that have different characteristics , matching will change. The result with high gain devices is not only a reduction in gain (or loss) but a deterioration in circuit stability. If the design is sound to start with . correct matching will only result if all factors already raised are adhered to.

Losses invariably increase with frequency . the trick is recognise the factors and minimise there occurrence.

Just Where Do You Start?

Before embarking on any projects , try and obtain some of the following publications. Those with an * can be obtained from the WIA Bookshop or Stewart Electronics . Melbourne.

ARRL Microwave Handbook*
UHF Compendium Part 1 & 28*
UHF Compendium Part 3 & 48*
UHF Compendium Part 5*
Microwave Updates 1986-92*
Central States VHF Society 1986-92*
Dubus Technik 3
Dubus (Quarterly Magazine , ex Germany)
VHF Communications (Quarterly Magazine , German , translation ex UK)
RSGB Microwave Handbook Parts 1 & 2.

While it would be great to have all of the above (which would represent over 80 % of published material available !) , Perhaps the best start is a cross section , with a subscription to atleast one of the Quarterly Magazines. Enlist the help of a local UHF enthusiast or club. You will soon get a good idea of what you are looking at , from the numerous construction articles.

Along the way you will have to decide just what part of the spectrum you are going to start with. Traditionally , people start at a lower frequency and experiment in the 400 MHz region. A lot of kits are available , to start with that will give you practise at getting things right. Having a ready made PCB takes a lot of the guess work out , eliminating physical dimension errors. However , you can just as successfully build something "Dead Bug ". What is Dead Bug ? . more on that latter. Practise on something safe and easy to get going , it is a lot less expensive if things don't work straight away. And if things don't work straight away , you will find you will learn more as you find out what is not right. Patience is an important thing when starting . as with any field , there are a lot of things that won't make sense until you see it working.

For the following , it is assumed that you already have some experience in Electronics and , in particular , RF construction work.

Example One

For this example we will look at an UHF (400 MHz) Receive Preamplifier. The particular amplifier is sold as a kit by the Wireless Institute of Australia , in South Australia. It uses a single Dual Gate Gasfet as the active device , with additional circuitry to detect any transmitted power and switch out the preamplifier. This is normally used where the preamp is used in a single Antenna feed line installation to a transceiver.

* Transparency One..... Circuit of UHF preamp.

You will notice that I have highlighted several parts of the circuit , from the input to the output. It is something to get into the habit of doing while you are learning. Mark, which components form part of the direct frequency processing. The primary path of the UHF signal is easy to identify, just simply follow the 50 ohm input signal from left to right through the active device.

The Input. of the device, is matched by a simple capacitive divider across a RF inductor. The adjustable ratio of the capacitive divider provides a mean to match the device to the input load, chiefly to optimise Noise matching of the device.

The secondary paths are from this line to RF ground. I say RF ground, because as you can see this is independent of any DC (the active device is fed with DC in order to function). It follows that anything connected to the UHF path could (and usually will) absorb RF. Any DC feed must be properly terminated , ie be at RF ground. This is normally done with a combination of a RF inductor (minimum of a 1/4 wave) and a bypass capacitor , one side of which is at DC and RF ground.

Both of these items are commonly where problems start. The quality of the bypass capacitor is critical as any internal inductance can cause unwanted resonance. The capacitance is selected to coincide with the lowest value to give acceptable low value Reactance at the required frequency. Too higher capacitance may introduce other unwanted resonances. In many applications two or more different values may be used in parallel to give effective bypassing to virtually DC.

For our UHF Preamp. 680 pF Miniplate capacitors with short leads (1-2mm) are more than sufficient. 680 pF is almost optimum for bypassing at 400 MHz . the style of capacitor is sufficiently small to handle frequencies up to 1000 MHz

Lead length is critical. a 100 pF capacitor with 6mm long leads. will resonate at around 1200 MHz. At a point above 1500 MHz. most normal ceramic bypasses. with leads, will reach self resonance. The only safe options above these frequencies are either chip or trapezoidal capacitors. All bypasses must have as short as possible leads. For the UHF project the PCB has been made double sided so as to make it easy to obtain short ground connections. Both connections are important.

Decoupling inductors are just that. They need to be atleast a 1/4 wavelength long . whether that be a wire wound or printed circuit inductor. A lot of people forget that the inductor does have a field of its own. It must be placed at 90 degrees to any other inductors in the vicinity. It is easy to get all this right with a PCB based project as hopefully , all this has been thought out previously.

The Drain decoupling inductor in this project , is broadly resonant at 400 MHz. The drain coupling is not optimum . however has been done thus to provide a more broad-banded output.

Perhaps the only other consideration in this project is the length of leads on the active device. The most important leads are the Source or Emitter leads on an active device. Any inductance introduced between the device and RF ground , actually introduces a form of Negative Feedback. This will normally reduce the gain of the device however unusual amounts of inductance can cause possible stability problems. The matching of the device will always change with variations introduced. It is not going overboard . but always make these connections As Short As Possible. Any visible lead is too much .

remember that internally there is already quite an amount of inductance in the device.

For assembly, you will need a good quality Soldering Iron (25 Watt). the holes in the glass fibre printed circuit board are plated-through. making it easy to get good bonding to the groundplane.

Example 2

For this example . we will look at a Microwave Power Amplifier for 3.400 MHz. This two stage amplifier is constructed on Double sided Teflon Printed Circuit Board with the components mounted on the component side only. the other side being solid copper.

This project introduces the concept of striplines , that is inductors installed above a solid ground. Striplines have an impedance that is determined by the thickness of the stripline and the Er (dielectric constant of the PCB). The Impedance is inversely proportional to the thickness of the stripline. The length, as a function of wavelength. of a stripline is also related to the Er of the PCB.

The first noticeable difference is the thickness and the type of Printed Circuit Board. We are now using 0.8mm thick Teflon fibre PCB , as apposed to 1.6mm Glass fibre. Glass fibre becomes lossy above 1000MHz . as the dielectric deteriorates. This loss can be controlled , but at around 2.500 MHz Glass fibre is finished. The Er of Glass fibre (around 4.9) means that both the PCB thickness and length of inductors becomes a designers nightmare. Variations in Glass fibre PCB quality alone means that results can no longer be repeated without grading.

Thickness does become a factor at these higher frequencies as any dielectric between a stripline and the groundplane will create a loss. The greater the thickness of material , relative to wavelength , the greater the amount of RF energy lost to free space.

0.8mm thick Teflon PCB has an Er of approximately 2.5 , giving more manageable inductor widths and lengths. A 50 ohm stripline is approximately 2.1mm wide. This PCB material is useable to 10,000 MHz and beyond. Ceramic Substrate is also used at these frequencies . but has

THE WEST AUSTRALIAN VHF GROUP (INC)

SUBSCRIPTION RENEWAL NOTICE

Your membership subscription for the VHF Group is due and payable before June 30 1994.

SUBSCRIPTION RATES

COUNTRY MEMBERS	**$15.00**
METROPOLITAN MEMBERS	**$17.00**

If you have already paid, kindly ignore this notice.

If you have any queries please contact Jack on 447 5933.

REMITTANCE ADVICE

To: The West Australian VHF Group (Inc)
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Applecross WA 6153

From: Call Sign:

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Thank you for your continued support of the VHF Group.

THE WEST AUSTRALIAN V.H.F. GROUP BULLETIN

MAY **1994**

THE WEST AUSTRALIAN V.H.F GROUP (INC)
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