bably be wrong soon!), 23cm is far mroe susceptible to odd ducting, tropo scatter and hill fringing than is 2m. I regularly work G3WDG and G4KGC in Towcester despite it being only an average direction for me and a very poor one for them because of a large hill immediately to their south. Signal strength can fluctuate by 20dB many times a minute, and we believe these are due to variable contributions from cloud reflections, aircraft, tropo scatter and possibly hill fringing. Other than with tropo ducting, it is vital to have reasonable power available and a superb receiving setup to copy very weak scatter reflections. Very frequently ducts on 23cm occur over great distances of perhaps 500km when conditions on 2m are barely above average, although the really big ducts, such as occured in September 82 have always coincided with major ducts on the lower bands. Under such conditions, the received 23cm signals can actually be stronger than their lower frequency counterpart. It has often seemed to me, since I improved my station in 1981, that most DX is either clearly there, or virtually inaudible. Relatively few QSOs are on the verge of noise at considerable distances. This is totally different in my experience to 2m DX where I have frequently scratched around in the noise to get some rare station.

Fog, mists or rain do not seem to significantly affect local propagation on 2m, but on 23cm some very odd effects can occur. I have known cases in which there is a tropo duct above localised fog with the result that all signals from all directions seem to be very strong indeed, with only minor variations with aerial direction. Having discussed this with some other microwave enthusiasts who have experienced the same oddity we all assume that the top layer of fog refracts microwave signals downwards into the top of the antenna, hitting the diopole from above. On one occassion, when the effect was particularly marked, I actually thought my rotator had broken down.

Equipment

DX stations on 23cm can be remarkably strong, even when they are running only 1W output on SSB, and GU3KFT was up to 5 and 9 +20dB for hours at my North London station. A particular GW portable, running only 1W into an omni directional Alford slot, was received at 5 and 9+. These contacts typify the fact that 23cm conditions are much more variable than they are on 2m, it is this that makes the band so vary fascinating.

The crudest equipment that can be easily used on 23cm is a simple varactor tripler from 70cm to 23cm for TX, and a converter for receive.

Triplers

Most stations have started on the band with a fairly long length of coax up to an antenna which would usually be a single JVL loop Yagi, a Jaybeam 15/15 beam, or perhaps a single 23 element Tonna. All too often the changeover relay between TX and RX is in the shack fed by rather inadequate UR67, which will have a loss of around 5 to 10dB. Transmitted ERPs will be rather low, and the received system noise figure, with no RF pre-amp installed, can be effectively as high as 16 to 21dB!. The average tripler on TX might give an efficiency of 45% at best, but many have been incorrectly set up. Unfortunately, it is useless trying to tune one up using a normal watt meter on the output, for you may tweak it up as a doubler rather a tripler.

If you have a spectrum analyser available to you, then this should be used with a suitable attenuator load in which case you will be able to null out unwanted harmonics as well as peaking up the required one. I have found that the tuning points of the various capacitors in an average varactor tripler vary considerably for maximum output dependent upon the amount of applied power, and a tripler set up at 10W input may well be very much less efficient at 5W input and, surprisingly, vice versa. If you can mount a high power device on a good heat sink, it is possible to get 20W output from a tripler with 40W input. While this is recommendable for CW, the varactor may not last long with FM.

Receiver or system noise?

On the receiver side, it is no use adding an RF pre-amplifier straight in front of a ring mixer for, even if the pre-amp is a very good one, it will not only have to have a very high gain to overcome a normal mixer noise, but both the required frequency and the image frequency will be amplified, and the system noise figure will thus be deteriorated effectively by 3dB. A 20dB gain GaAsFET pre-amp having an inherent 1dB noise figure, interconnected with a ring mixer having 10dB noise figure, may give you only a 5dB noise figure in the system, ignoring coax cable losses. It is essential to use either a cavity, or inter-digital filter in between the pre-amp and the mixer to remove the amplified image frequency noise. Since it is much easier to cope with 2 x 144MHz image offset than 2 x 28MHz, very few stations have persevered with 28MHz IFs.

An enormous improvement can be obtained if the entire receiver pre-amplifier (and even mixer sections) can be put at the top of the mast, driven by a changeover relay of very low loss. The entire system noise figure would become perhaps 2dB, using the same pre-amp and inter digital filter/mixer as opposed to perhaps 12dB equivalent with the pre-amp in the shack without filter. Such a system can be further improved either by using a lower loss coax, eg Andrews LDF 4/50, or by having a higher RF pre-amp gain at the mast head. Around 23dB gain might be required to off-set the loss of a UR67 cable of 25 metres length interconnected with a transverter/-interdigital filter having a noise figure of 3 or 4dB. The formula shown in the figure will enable you to work out your system noise figure from antenna relay through one or two pre-amps into a transverter, and includes allowances for cable losses and any inter-digital filter loss. Note that noise factor and power gain or loss as a multiple should be entered, and not dBs of noise figure or gain.

Up in the air

One useful way of getting started on the band is to put the transverter at the mast head. Very shortly, Microwave Modules will be increasing the output of their transverters to around 2.5W, with a receiver noise figure of 1.9dB. If you have a very long cable between mast head and shack you might even be better off with this configuration, unless you are going to run more than 15W or so in the shack. Don't