

UK Microwave Group 76GHz Loan Equipment – Basic Operating Instructions.

SYSTEM DESCRIPTION

The 76GHz loan system was built by the late G4EAT and comprises separate receive and transmit modules on a common support structure. It also comes with a self-contained beacon transmitter, useful for setting up and carrying out short range tests.

On the RX & TX modules the IF is 145-147 MHz for 75.976-75.978GHz, switchable to cover 75.978-75.980GHz using an IF of 144-146MHz.

A full description of the system can be found on the UK Microwave Group web site.

PLEASE TAKE NOTE OF AND ACT UPON THE WARNINGS INCLUDED BELOW.

The system was constructed from surplus and expensive parts which if damaged are now impossible to replace.

CONNECTING UP THE SYSTEM

Both the TX/RX modules need to be connected to a stable 12V-13.8V supply using the combined leads supplied.

A suitable 144MHz IF transceiver is the Yaesu FT817 and a cable is supplied to connect this to the transverter.

PLEASE ENSURE YOU SET THE TRANSMIT POWER ON THE 144MHz IF RIG TO A MAXIMUM OF 500mW AND/OR USE A SUITABLE RF ATTENUATOR ON THE INPUT OF THE 76GHz TX MODULE.

The setting to use on the FT817 is “one bar” on it’s internal power meter

THE FT817 FEATURES A TRANSMIT INHIBIT INPUT AND WHEN CONNECTED TO THE TRANSVERTER VIA THE ACC CABLE IT ENSURES THE 817 CANNOT TRANSMIT UNLESS THE TX SWITCH ON THE TRANSVERTER IS IN THE “UP” POSITION.

NOTE THAT THIS FEATURE IS ONLY SUPPORTED BY THE FT817.

WHEN USING OTHER IF RIGS (NOT RECOMMENDED), PRESSING THE PTT WITHOUT FIRST OPERATING THE TX SWITCH WILL DESTROY THE TRANSVERTER’S RECEIVE MIXER!

PLEASE REMEMBER TO CONNECT THE “ACC” LEAD TO THE FT817 THEN USE A POWER METER TO ENSURE CORRECT OPERATION OF THE INHIBIT LINE EVERY TIME YOU TAKE OUT THE TRANSVERTER.

FAILURE TO DO THIS WILL MEAN YOU WILL DESTROY THE 76GHz RECEIVER WHEN IT IS CONNECTED TO THE 144MHz IF RADIO.

BEACON

The Stand-alone beacon TX unit is also powered from a 12V supply. Note there is no antenna for the beacon, output is via open waveguide. The beacon TX can be set to carrier plus occasional CW (sends ‘76GHz’) or can be keyed.

OPERATING THE SYSTEM

It is recommended that you allow at least 15 minutes for the modules to 'warm' up as they are not frequency locked to a standard. After the initial 'warm' up period the frequency stability is reasonably good, needing only an occasional re-tune of the IF radio to stay on the frequency of the received signal.

It is best to get some practice receiving the beacon TX module before attempting a QSO.

With the RX module switch set to 142 the beacon TX appears between 144.000 and 143.980MHz and will be drifting LF. With the switch set to 145 the signal will be between 147.000 and 146.980MHz. Note if your RX only receives down to 144.000MHz (with the switch in the 142 position) you will hear a number of spurious signals spreading up from 144.000MHz, some are quite strong, but the main carrier below 144MHz will be very much stronger.

The TX beacon (with open waveguide as antenna) has been received at good signal strength using the transverter over a 15km line of sight path.

Once you have mastered setting up and listening for the beacon TX you should be ready to attempt your first 76GHz QSO. Probably best to start with a relatively short range line of sight path.

You will need a stable platform (tripod) to support the transverter which is capable of being locked in position once you have found a signal. The beam width of the horn antennas is very narrow (a couple of degrees) so pointing accuracy is very important to ensure you are able to receive other signals.

Due to the frequencies (and frequency steps) available from the main frequency synthesizer you may need to use a different 144MHz IF than your QSO partner, i.e. if the other station is using an IF of 144.100MHz to transmit on 75.976100GHz you will need to tune to 145.100MHz (with the switch on the RX module set to 142).

When you are confident in using the system for short range contacts you can try longer distances.

BAND CONDITIONS

With the power levels available the system is probably only capable of line of site contacts (it was used when the UK distance record was set (which stands at 129km as of December 2017)). Moisture content of the atmosphere will attenuate signals easily adding 10's of dB loss on hot humid days, so best results are likely to be achieved on cold low humidity days.

It has recently been observed that 76GHz signals can under certain atmospheric conditions get bent even on line of sight paths. It was necessary to offset beam headings by up to 20° on a 90km path on one occasion. There is plenty to be discovered about 76GHz propagation!

Disclaimer

At the time of writing these operating instructions I was not in possession of the 76GHz system. They have been compiled from memory and from the notes I made during the year I had the equipment. If whilst using the equipment you find any inaccuracies or you think something should be added (or deleted) please let me know.

Neil Underwood, G4LDR. g4ldr@btinternet.com December 2017