Evaluation of the MiniKits EME223-630m Transverter Kit (Part 2)

by Stephanie (Steph) Spirat, VK5FQ, ©2/04/2018.

This last instalment is about setting the bias on the output FET device, checking the RF output signal and using the transverter for transmit and receiving on air.

**Biasing the RF output transistor:**

Simply, follow the kit supplied written instructions. It may take several attempts to correctly set the Bias trim-pot, *VR4*, correctly. Be patient. It may pay to wait a short period of time for the FET to cool a little, between measurements. If possible, ensure that you have a suitable heatsink for the RF output FET. It may also be beneficial to use a small cooling fan on the heatsink when used in data modes for extended transmission periods. As the FET gets hot, the FET has a natural tendency to reduce its output.

![Photo 1](image.jpg)

**Photo 1:** This photo shows the bias voltage monitoring point, when adjusting the FET BIAS trimpot, *VR4*.

The above photo also shows the TX GAIN, RX GAIN and L/O adjustment trimpots. They are all configured the same – turn clockwise to increase and counter-clockwise to decrease.

Initial test setup suggests that both the TX GAIN and the RX GAIN trimpots be turned fully clockwise (set at maximum).

**NOTE:** If you have a different DC power supply, say, 13.8 VDC, then your transmit current will be different to that given in the tune up procedure (done at 12V). This is normal.
Remember: Once the correct bias has been determined with the chosen DC supply, any variation in the supply voltage to the output FET, will change its bias conditions! Also, make sure your DC power supply can handle any peak load current variations and maintains them at a constant voltage. Measuring the supply voltage on transmit with a multimeter may be a simple test to verify this.

Checking the RF output signal:

Only when the bias has been setup correctly, should you then attempt to transmit for any extended periods of time.

The RF output of the transverter was connected to a dummy load with a sampling port and monitored by a spectrum analyser when “fired up” by the HF (3672.2KHz) transceiver with 5 watts (37dBm).

![Plot 1](Image)

Plot 1: This plot shows the main carrier on 472kHz being just over 5 watts and the 2\(^{nd}\) & 3\(^{rd}\) harmonics being greater than 50dB below this carrier (>50dBc). This plot is comparable to the one on the Minikits website.

On air testing using WSPR:

1. Receiving:
The RX GAIN trimpot, VR3, is turned fully clockwise to produce maximum receive input signal on the receiving transceiver. This was done and could easily be confirmed while listening to a local WSPR signal being transmitted at the same time. I left this trimpot set fully clockwise at maximum. The bandpass filter minimises any out of band signals on receive (and transmit), allowing for maximum selection of in band signals.

2. Transmitting:
To put this transverter under a real on air test, the transverter was connected to my Elecraft K3 transceiver and a 630m antenna. Using WSPR software on my laptop computer running WSJT-X software, I proceeded to tune my antenna, dial up 5 watts output on 3674.2kHz USB on the K3 and proceeded to transmit over the next hour and a half on the 630m WSPR band frequency of 474.2kHz (plus the audio offset). The PA would be transmitting continuously for two minute time periods, during each WSPR transmission.
Screenshot 1: A 100 minute period of various WSPR reporters and their distances when using the transverter connected to my 630m antenna. This little 5 watt transverter certainly seems to work!

(Note: On the 630m band, one tends to use EIRP values for reporting, as opposed to the normal method of reporting the Total Power Output (TPO) in watts, due to the large antenna inefficiencies.)

It can be seen in these results, that there is reported drift values of 1 and 2 by a number of reporting stations. Reading the WSPR documentation, this represents a drift in output frequency of 1 and 2 Hz over a 1 minute of a
two minute period of transmission. This could be due to receive conditions and/or receiver frequency stability. If it is a monitoring receiver problem, then it is likely to show up for other WSPR transmissions for that monitoring station. Unless the transmitting station is located far away, it is not likely to be due to atmospheric conditions. This leaves the transmitter itself as the source of error / drift. Obviously, the better frequency stability, the less drift value being reported. Having a drift value of +1 or -1 is entirely acceptable and can be decoded by remote monitoring stations.

The drift issue seen in this case, is due to the crystal oscillator frequency being affected by temperature. This issue has been resolved by Mark using a higher temperature crystal heater and is supplied in the kit. Measurement over extended testing periods showed no further drift issues when running WSPR.

An On-Air test was also performed using a two-way SSB QSO on 472 kHz and was moderately successful. The success was due entirely to the antennas being used at either end for transmitting and receiving. Conversations could be heard and understood as in a normal SSB QSO, albeit a bit low in actual signal strength. A tall loaded vertical is a requirement for a good local contact. It does work better with a bigger antenna.

**Final conclusions:**

Well, there you have it. I’ve covered some of the detail presented in both the supplied kit documentation and the Minikits website. I hope this gives you some understanding into the extent to which this kit has been designed and tested by Mark of Minikits. A credit to a local business being able to produce fine quality kits for the Amateur market.

Again, I have to say, it has been a fun project to build and would be a great weekend kit build, which has the potential of allowing anybody access to being a player on the 630m band.

![Photo 2: The kit I built and used for this evaluation was v1.1 and is shown here mounted to a heatsink with an attached speed controlled fan.](image)

This concludes Part 2 of the **EME223-630M Kit** evaluation.