

## MICROWAVE MODULES

### MML 144/100-LS

### 144MHz 100W Linear Amplifier

If you are the owner of one of the many 144MHz portable rigs such as the C58, FT290, TR2300 etc., the subject of this review will be of interest. Most portable transceivers arrive with power output levels of between 1 and 3W, ideal for their primary purpose, but usually found to have a transceive capability heavily biased towards the receiving end, when pressed into mobile or fixed station use.

The MML 144/100-LS is the high power version of a range of four 144MHz linear amplifier/receive pre-amplifier combinations manufactured by Microwave Modules and specifically designed for use in conjunction with low power equipment.

Circuit-wise the 144/100-LS p.a. section features two active devices, the first of which is a 2N6082 fed via a *pin* diode switched input attenuator, which is controlled by a front panel mounted miniature toggle switch. Depending on the switch setting the full output rating can be obtained from either a 1W or 3W drive level. The switch is of the centre-off variety and in this position the amplifier stages are bypassed by two double-pole relays.

The output of the first stage device feeds the single SRF 1397 r.f. power transistor final stage via printed strip line elements. This 13.8V device is rated at 250W dissipation and in this circuit configuration is quoted to be capable of withstanding the combined effects of a 50 per cent overdrive and 15V supply.

The complete amplifier is biased for linear operation with the biasing network tracked against temperature variations. Both transistor devices are

bolted directly to the internal face of the purpose-extruded black anodised aluminium heatsink section, which forms three sides of the housing. Low pass filtering is provided at the output to remove any harmonic energy.

Also contained on the same double-sided glass fibre p.c.b. is an r.f. sensing VOX circuit for controlling the twin r.f. changeover relays. A delayed VOX action may be selected via a further front panel toggle switch; the VOX is automatically overridden by connecting the rear panel mounted phono socket to earth, via the p.t.t. line control of the driving rig.



As previously mentioned, most portable rigs will have a considerable receive capability in hand, however when running at the 100W output level the provision of additional receiver pre-amplification is usually necessary. The 144/100-LS contains a pre-amplifier fitted with a 3SK88 low noise dual-gate MOSFET, in a noise matched configuration. The specified overall noise figure is better than 1.5dB and associated gain limited to 12dB by a pi-section attenuator at its input. Should the existing front end stage noise figure better that of the

pre-amp, which is unlikely, it may be switched out of circuit, once again by means of a front panel control switch. All switching actions are confirmed by l.e.d. status indicators also mounted on the front panel.

### Operating

Being a 13.8V device the 144/100-LS obviously requires quite a meaty p.s.u. if you're going to run it in the shack. You *could* use a car battery and the amplifier *is* fitted with a sizeable reverse polarity protection series connected diode/15A fuse, **but** the effects of shorted battery terminals are decidedly dangerous and fire insurance always seems to be getting more expensive!

When driven by a Trio TR-2300, via the 1W input setting, the amplifier produced slightly over 90W into a 50Ω dummy load. Equally impressive results were obtained when driven by an Icom 202S 3W s.s.b. portable.

After an hour of contest style operating the amplifier warmed up appreciably; for extended duty cycle operation fan cooling would be advisable. Linearity was maintained throughout the temperature excursions and reports received indicated tight, spurious free output at all times.

It is of paramount importance to ensure that the amplifier is well matched to the antenna system; ideally both input and output feeder lengths should consist of  $\lambda/2$  multiples, allowing for the appropriate cable velocity factor.

The slim-line construction of the 144/100-LS (265 x 117 x 54mm, overall weight 1.5kg) allows it to be readily shoehorned into most mobile installations, but with a consumption of 14A, operating whilst stationary should be kept to a minimum to avoid the bump starting mode. Quiescent current (with zero drive) of the combined p.a. and pre-amplifier is approximately 1.6A.

In conclusion then the MML 144/100-LS is a well designed 144MHz workhorse suitable for all operating modes and during several months has consistently performed on demand.

Thanks for the loan of the review sample go to **Microwave Modules, Brookfield Drive, Aintree, Liverpool, L9 7AN. Tel: 051 523 4011.** The current VAT inclusive price of the MML 144/100-LS linear amplifier is £148.00 inc. p&p and it is available from the above address or through their many agents.

John M. Fell

